Fine WoodWorking

MARCH/APRIL 1983, NO. 39, $3.00

Furnituremaking in the Northwest

Fine WoodWorking

Back Issues

1 Checkered Bowls, Bench Stones, Hand Planes, Carving Design Decisions, Tramp Art, Marquetry Cutting, Birch Plywood, Library Ladders, French Polishing.

2 Marquetry Today, Split Turnings, Eagle Carvings,Telephone Chest, Oil/Varnish Mix, Hand Dovetails, Mechanical Desks, Antique Tools, Gustav Stickley, Shaker Lap Desk, Micro Bevels.

3 Wood, Mortise and Tenon, Desert Cabinetry, Hand Shaping, Plane Speaking, Hidden Drawers, Green Bowls, Queen Anne, Gate-Leg Table, Stroke Sander, Sources for Furniture Plans.

4 Water and Wood, Hidden Beds, Heat Treating, Hardwood Sources, Exotic Woods, Veneer, Ornamental Turning, Tackling Carving, Shaped Tambours, Workbench, Mosaic Rosettes, Found Wood Sculptures.

5 Stacking, Carcase Construction, Dealing With Plywood, Patch-Pad Cutting, Gothic Tracery, The Bowl Gouge, Drying Wood, Guitar Joinery, Shaper Knives, Serving the Eye as Well, More Hardwood Sources.

6 The Wood Butcher, The Scraper, Wood Threads, Dry Kiln, California Woodworking, Serving Cart, Bent Laminations, Expanding Tables, Stacked Plywood, Pricing Work, Woodworking Schools.

7 Glues and Gluing, Three-Legged Stool, Lute Roses, Bowl Turning, Doweling, Spalted Wood, Antiqued Pine Furniture, Solar Kiln, Carving Fans, Bending a Tray, Doweling, Index to Volume One.

8 Triangle Marking, Painted Furniture, Steam Bending, Chain-Saw Lumbering, Gaming Tables, Wooden Clamps, Elegant Fakes, Measuring Moisture, The Flageolet, Sawing by Hand, Aztec Drum.

9 Designing for Dining, Hardware Specialists, Drawer Bottoms, Entry Doors, Tall Chests, Routed Edge Joint, Health Hazards, Basic Blacksmithing, Shaker Round Stand, Turned Boxes.

10 Wooden Clockworks, Hammer Veneering, Hot-Pipe Bending, Two-Way Hinge, Periodicals, Claw and Ball Feet, Chain-Saw Carving, Laminated Turnings, Small Workbench, Circular Saws.

11 Spinning Wheels, Leather on Wood, Hanging a Door, Drawers, Scratch Beader, Dulcimer Peg Box, Parsons Tables, Notes on Finishing, Turning Spalted Wood, Tiny Tools.

12 Cleaving Wood, Spindle Turning, Holding the Work, Greene and Greene, Whetstones, Wooden Wagon, Dust-Collection System, Tambours, Used Machinery, Sanding, Stains, Sharpening.

13 Laminated Bowls, Stock Preparation, Tung Oil, Relief Carving, Machine Maintenance, End-Boring Jig, Lumber Grading, Shaped Tambours, Index to Issues 1-13, Roll-Top Desks.

14 George Nakashima, Improving Planes, World Globe, Box-Joint Jig, Air-Powered Tools, Tapered Lamination, Koa Table, Bolection Turning, Incised Lettering, Polyhedral Puzzles in Wood.

15 The Shape of a Violin, Router Tables, Milk Paint, Treadle Lathe, The Mortise and Tenon Joint, Flying Woodwork, Staved Containers, Carved Shells, Routed Signs, Flight of Fancy.

16 Edward Barnsley, Circular Stairway, Locking the Joint, Harvesting Green Wood, Shop-Built Vacuum Press, History of Marquetry, Hollow Turnings, Before the Finish, Three Stairways, Workbench.

17 Working with Heavy Timbers, Bending Compound Curves, Furniture from Photographs, Sawmilling, Inlay Routing, Finishing Materials, Die-Making Trade Tips, Library Steps, Solid Wood Doors.

18 Tapered Sliding Dovetails, Tables, Haunched Mortise and Tenon, Methods of an Old World Cabinetmaker, To Finish the Finish, Woodturning Chisels, Paneled Doors and Walls, Cabriole Legs.

19 Wharton Esherick, The Jointer, Making Toys, Oyster-Shell Veneering, PEG for the Woodworker, Oil/Varnish Finishes, More Mortising, Mortise and Tenon by Machine, Chip Carving, Turning Tips.

20 Michael Thonet, Knockdown Tabletops, Plans for Pigeonhole Desk, Working Woven Cane, Shaper Cutters, French Polishing, Japanese Planes, Repairing Chairs, Hardwood Sources.

21 Hans Wegner, Making Sanding Machines, Abrasives, Dowel Joints, Low-Tech Thickness Sander, Dovetailing Carcases, Japanese Saws, Appalachian Crafts/Thirteen States, Index to Issues 1-20.

22 Kerf-Bent Boxes, Alpine Peasant Furniture, Cowhide for Chairs, Wood-Drying, Furniture Conservation, Sharpening Saws, Shop Math, Marquetry with Flexible Veneers, Totem Pole.

23 Period Furniture Makers, Harry Nohr's Bowls, Abrasive Planer, Disc Sander, Turning Thin Spindles, Carbide-Tipped Circular Saws, Hardwood Plywood, French Fitting, Carousel Horse.

24 Setting Up a Small Shop, A Walking-Beam Saw, Workbenches, Sawhorses, Vises, Carving Gouges, Joiner's Tool Case, Survey of Combination Machines, Dial Indicator, Treadle Band Saw.

25 Sam Maloof, Dust Collection, Bandsaw Boxes, Precision Joinery, Butterfly Joint, More Than a Box, Tuning Up Your Lathe, Pedestal Table, Finishing Marquetry, Elm and Chestnut, The Drawknife.

26 Gimson and the Barnsleys, Mosaic Door, Clear Finishes, Tall-Case Clock, Patternmaking, Mitering on the Table Saw, Woodworking Education, Survey of Schools, Curved Dovetails, Abnormal Wood.

27 How Inlay is Made, Inlaying Mother-of-Pearl, A Jigsaw for Pearl, Shaker Blanket Chest, Spline Miters, Coloring with Oils, Chisels, Alan Peters, Basics of the Bandsaw, Inventing Marquetry.

28 Wooden Jointer, Binding and Purfling, Small-Scale Cabinetmaking, Single Bed, Fumed Oak, Decorative Joinery, Box Joints on the Radial-Arm Saw, Coopered Columns, Hand-Carved Turnings.

29 Woodworking in Mendocino, Pin Router, How to Sharpen, Two-Board Chairs, Stroke Sander, Spindle Laminations, Finishing on the Lathe, Grinding, Japanese Blades, The Apprenticeshop.

30 Building Stairs, Tool Cabinet, Panel-Raising Planes, Carved Signs, Sharpening Equipment, New Furniture, Routing Mortises, Steam-bending, Round-Top Table, Index to Issues 1-30.

31 The McKinley Connection, On Designing Chairs, Lacquer Finishing, Cross-Country Skis, End-Grain Lamp, Spindle Cradle, Shop-Made Bowl Lathe, Piecrust Table, Gluing Up, New Furniture.

32 The Turned Bowl, Timber, Torsion Box, The Business of Woodworking, Slip Joints on the Radial-Arm Saw, Grainger McCoy's Carved Birds, Shaker Carrier.

33 Green Woodworking, Designing for Machine Craft, Backgammon Board, Old Finishes, Woodlot Management, Trussed Log Bridge, Appalachian Dulcimer, The Scribed Joint, Shop-Built Panel Saw.

34 Japanese Sliding Doors, Plate Joinery, Fly Rods from Split Bamboo, The Legacy of Harvey Ellis, Repairing Finishes, Stereo Equipment Cabinets, Period Furniture Hardware, Using the Tablesaw.

35 Early Varnishes, Three Decorative Joints, Router Joinery Along Curved Lines, Relying on the Router, Framing Pictures, Stripper Canoe, Dough Trays, Harpers Ferry Conservation Shop, Bench Planes.

36 Lapstrake Boatbuilding,Curved Moldings on the Radial-Arm Saw, The Taming of the Skew, Chainsaw Lumbermaking, Gilding, Workbenches, Stools, Woodworking Injuries, Linenfold Carving, Photographing Your Work.

37 Art Carpenter, Dovetail Jigs, Horizontal Boring Machine, Making a Molding Plane, Woodworking with Kids, Fine-Tuning Color Finishes, Building a Lapstrake Boat, Turning Tips.

38 Secretaire-Bookcase, Turning Matched Bowls, Marquetry on Furniture, Goblets, Repouring Babbitt Bearings, Exotic Hardwoods, Knife Work, Super-Surfacers, The Rise of Artiture, Branching Into Chairs.

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Cover: Detail of Pro-Forma's rosewood china cabinet, which was shown last October at the Western Forestry Center in Portland, Ore. Each month the center, above, sponsors a weekend show devoted to some kind of woodworking. Pro-Forma, a five-person shop in Portland, was one of fourteen shops juried into the center's annual furnituremakers' show. For more about the show, the center and the woodworkers of the Northwest, see p. 76. Cover photo: Joseph Felzman.

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DEPARTMENTS

ARTICLES

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Bob Johnson's article on babbitting (*FWW* #38, p. 73) is a good one and covers the area well, but I differ with him on a few points. I prefer to melt the babbitt directly in the pouring ladle. This preheats the ladle and allows a little more time during the pour. Regular plasticine, the modeling clay sold in toy stores, works admirably as a damming material. It's not reusable, but I've never had trouble with it leaking during a pour.

Also, the critical factor in set-up is not so much centering the shaft within the bearing shell, but rather making sure that the business end of the shaft—the knife-holding section of a jointer or a planer—is right in relation to the rest of the machine. On a thickness planer, for example, the shaft should be supported by two identical blocks resting on the bed (to ensure parallelism), and it should be checked to make sure it's equidistant from the chipbreaker. Because of years of wear and repairs, it is quite common to find that a properly positioned shaft won't be exactly centered in the bearing shell.

The greatest danger in pouring babbitt is moisture. Even a tiny drop of water, on coming into contact with molten babbitt, turns to steam and expands dramatically, flinging molten babbitt in all directions. Though preheating the bearing shell will usually drive out any moisture, this danger should be kept in mind, particularly with regard to sweat dripping off your face as you lean over to get a better view of the pour. A full face shield is cheap insurance.

Finally, babbitt can be used in ways machine manufacturers never dreamed of. Some modern bandsaws suffer from a sloppy or misaligned support post for the upper blade guide. The hole for this post can be drilled out and babbitted to whatever degree of precision your patience will allow. Old babbitt-era equipment often has slow-moving parts that are in direct, metal-to-metal contact. Reaming and babbitting can renew the parts in question.

—Mac Campbell, Harvey Station, N.B.

'I thought you'd be interested in seeing my walnut collectors' cabinet which was shown last summer along with the work of three professional woodworkers and the Berea College student woodworking industry.' —Warren A. May, Berea, Ky.

Don Newell's reply regarding H.B. Skinner's question on solvents for carnauba wax (*FWW* #37, p. 38) doesn't take into account the solvent effect of lacquer thinner. While mineral spirits, a mixture of aliphatic hydrocarbons, will remove wax or serve as a vehicle for applying it, lacquer thinner is a different animal. It typically contains methyl ethyl ketone, toluene and other relatively strong solvents. If used on a varnished surface to remove or apply wax, it can act like a varnish remover and ruin the finish. *—J.G. Stauffer, Chester, Pa.*

One of the most harrowing accounts of a close call in the shop that I ever heard was from a Tennessee man who produces fine furniture and elegant turned four-poster beds.

Back in the 1930s, my friend Bill had promised several neighborhood boys that he would make some baseball bats for them. He put the job off until one day after church, when the youngsters reminded him. He decided to go right then and quickly make the bats.

Alone in his shop, he chucked some straight-grained ash in his lathe, a 10-ft. long machine that he had made using rail from a defunct copper mine. The lathe was driven by an electric motor connected to a flywheel with old-fashioned leather belts.

In his determination to finish the job, Bill forgot about his Sunday necktie. Sure enough, as the chips were flying, his tie caught on the stock and in a split second had jerked his neck hard into the spindle. The cravat tightened around his Adam's apple like a noose, choking off his breath, and Bill was using all his strength to try to pull his head free. He pushed himself away from the machine several times, but just as he thought he was about to escape, the belt would grab again and spin the tie back down into the stock, like a yo-yo.

Just as he was about to pass out, Bill realized that he was still holding on to his gouge. He quickly pulled the tool up to his necktie and dragged it across the fabric. The tie ripped free and Bill—still struggling to push away from the lathe—vaulted across the shop to land on a woodpile.

The whole episode took about a half-minute, Bill said, adding that he was glad he had just come from church because he had been certain his time was up. "It was just dumb carelessness," he says now. "If I had been using one of these high-powered new machines with rubber belts, they'd have found me hugging that lathe as my last act on Earth." As it turned out, he grins, "The only thing I lost was a good necktie."

—Stan Wellborn, Washington, D.C.

The letter in *FWW* #37 (p. 4) about the Makita miter box alarmed me. All of the power miter boxes are potential guillotines. They are all supported by springs that succumb to metal fatigue and could break at any time. I have replaced three myself in an old Rockwell 9-in. miter box. One should assume that the spring could break at any time, so never put your hands under the blade while it's spinning.

I have another complaint about these tools. I own a Makita model 2401B miter box. The first four months of using it were a pleasure, but then a wobble showed up and the blade began to vibrate, so that the cuts were no longer straight. After checking with the local tool repair shop, I was told that this is a common problem with all power miter boxes. The $\frac{1}{64}$-in. blade wobble, caused by the motor, renders the rest of this fine tool useless.

—Dennis Callesen, Palmer, Alaska

One of your readers suggested having a machine shop make a fitting so $\frac{1}{4}$-in.-shank cutters can be used in the $\frac{1}{2}$-in. Shopsmith router chuck. Makita makes a $\frac{1}{4}$-in. collet that will fit both their 3600B router and the Shopsmith. I got it at a Makita dealer for less than $2.50.

—Dick Potter, Memphis, Tenn.

You missed the boat in *FWW* #36 by failing to mention a woodworking bench made in the U.S. by The Cutting Edge (3871 Grand View Blvd., Los Angeles, Calif. 90066). The cost is $620. I have owned one for the past ten

INDEX TO ADVERTISERS

months . . . assembled it in two weekends and have used it frequently ever since. The construction is all-maple, and by doing the assembly myself, I know it's of good quality. *—George Baker, Chatsworth, Calif.*

I really have a great deal of difficulty in understanding the purpose or logic in the current trend of expression through what I term "Avant-Garde" woodworking. This is not to be confused with the purely sculptural—an honest expression of purpose and creativity. It seems like so much misdirected energy to construct such involved, complicated objects that are out of proportion to their use. I don't mean to be offensive, but one of the more outrageous examples of this genre is the chess table by F. Armijo (*FWW* #36, p. 103). All that, just to play chess? Or am I missing some obscure point?

—James C. Henneberg, Skokie, Ill.

'I carved this pirate out of cherry. His hat lifts to reveal an ice bucket, his pistol conceals a corkscrew and his peg leg is a small, removable bottle of rum.'
—L.W. Welker III, Berwyn, Pa.

Here are three features of my shop-built horizontal boring machine that could be incorporated into the design described in *FWW* #37, p. 98. I eliminated chip buildup at the fence by spacing it ¼ in. off the top surface of the table. I drilled and tapped my aluminum plate table and used standard bushings as spacers. The chips drop right through, relieving you of the need to repeatedly brush or blow them off. The same idea works on the radial saw. My table hold-down is a wooden cam, which works faster than a screw clamp and also pushes the stock against both the fence and the table. The cam is a scrap of banister handrail mounted horizontally in brackets that suspend it above the fence and table. It pivots on lag-bolt axles screwed eccentrically into the handrail end grain. Most of my doweling is done with a ⅜-in. bit, so I pressed a ⅜-in. ID drill bushing (available from machine-tool supply houses) into the fence to increase the machine's accuracy.

—Scott Lowery, St. Paul, Minn.

I know that publishing a magazine of the scope and detail of *Fine Woodworking* is no easy task. Nonetheless, whoever proofread the bill of materials on p. 60 of your January 1983 issue, #38, was sleepy indeed. If only one of each part (save for 16 drawer sides) is required, then I want to be there to witness the assembly of the finished secretaire-bookcase! I am sure that the requisite number of parts can be puzzled out; even so, I hope you will publish a corrected list.

—Abram Loft, Rochester, N.Y.

EDITOR'S NOTE: Ouch, we goofed. Secretaire builders will need only one of some parts. For the rest of them, here is a list of part numbers followed by the correct number of pieces:

1-4; 4-2; 7-2; 8-8; 9-8; 10-3; 13-2; 14-2; 18-2; 20-4; 21-2;

22-4; 23-2; 24-2; 27-2; 28-2; 29-2; 30-4; 31-2; 32-4; 33-2; 34-2; 35A-2; 36-8; 37-2; 39-2; 41-3; 42-2; 43-2; 49-2; 51-2; 52-4; 53-2; 54-2; 55-2; 56-2; 57-8; 59-2; 60-8; 61-2; 62-16; 63-8; 64-8; 65-2; 66-2; 67-4; 68-2; 70-2; 71-3; 72-4; 73-4; 78-3; 79-3; 80-3; 81-3; 84-2; 85-2; 86-2; 87-2. If you'd rather have a new p. 60, drop us a note and we'll mail it to you.

In a Methods of Work letter in *FWW* #37, p. 24, a woodworker mentioned hot-melt glue as an alternative to yellow carpenters' glue for securing lathe turning blanks to a waste board. I am frightened and appalled by this idea. Though I and my college students occasionally use the hot-glue gun for temporary gluing, hot-melt is *absolutely* not strong enough to safely hold turning blanks. While most woodworking teachers will tell you that the tablesaw is very dangerous, pieces flying off the lathe can cause the most serious accidents, including brain damage and, in some cases, death. Any piece that can easily be broken off the waste board with a chisel is not secure enough for lathe-turning.

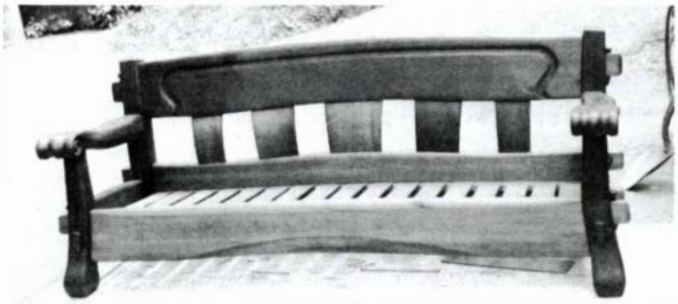
—Liz Bradbury, Jamestown, N.Y.

Having owned a garage for 25 years, I feel I am qualified to comment on Robert Vaughan's suggestion in *FWW* #38, p. 22, of using automobile valves for rod stock, special punches and screwdrivers. Many exhaust valves contain a sodium salt solution inside the stem. To cut or rupture this could result in an explosion. You could use the intake valves, which are identifiable by their smaller stems, but I prefer to buy myself a good set of punches.

Jim Hassberger's remarks on balancing bandsaw wheels might work, but I suggest balancing wheels the way we used to balance aircraft propellers in the Navy during WW II. Mount the wheel on a proper-size mandrel and support it between two horizontal, parallel knife edges that are perfectly level. The heavy portion of the wheel will naturally go to the bottom and you can then drill holes in the wheel to remove the excessive weight. When balanced, the wheel will remain still.

Another reader mentioned using playing cards for shims. Of course, 0.011 in. is quite close for woodwork, but a good automotive supply house will have brass shim stock from 0.001 in. on up in increments of 0.001 in.

—Henry R. Bombard, Miami, Fla.



'I taught myself redwood tub construction...all of my tanks had been made of coastal (Sempervirens) *redwood until I discovered the beauty of mountain* (Sequoiadendron giganteum) *redwood...which lends itself to stout, hobbit-style construction, like this sofa.'* —Philip Armstrong, Three Rivers, Calif.

In browsing through an old issue, I read a letter from a reader looking to replace the worn-out rubber tires on his bandsaw and not being able to find the right size. I had the same

problem with my old bandsaw. So I cut two cross-sections from an old truck inner tube and stretched them evenly around the bandsaw wheels. This made a continuous rubber band with no ends to join. I then neatly trimmed the edges of rubber with a razor blade. The tension of the rubber is enough to keep them in place with no adhesive. My saw now runs smoothly and the rubber holds up well.

—*Stephen A. Dean, Welch Creek, Ky.*

In his article on the Stanley #55 in *FWW* #38 (p. 89), I was surprised that Gregory Schipa did not mention my publication, *The Stanley Rule and Level Co.'s Combination Planes,* first printed in 1975 and now in its sixth printing. In addition to giving an historical account, this book also gives instructions on the use of the #45 and #55. The book can be bought for $5.13 postpaid by writing me at Box 151, Fitzwilliam, N.H. 03447. —*Kenneth D. Roberts*

Several years ago, while I was scrounging old mahogany planks from the railroad wrecking yards, a friend of mine in Ontario was buying hardwood direct from a sawmill and he wanted to know if we would like some in Winnipeg. In terms of scarce local hardwoods, Winnipeg is second only to Yellowknife in the Northwest Territories. So I contacted a few friends and we got together an order of 2,600 bd. ft. of cherry, maple and ash. We were all pleased—we learned how to stack and sticker. I went off to the Arctic for two years and forgot about it, but last fall when I returned, there it was waiting—just like money in the bank, but it feels and smells better.

This venture was so successful that I just bought another 7,000 bd. ft. of cherry, butternut, walnut, oak and hickory, shared among 25 fellow woodbutchers. I got a back haul on a cattle truck (cow manure no charge) and our final cost averaged $1.03 per ft. That's not bad in a town that's more than a thousand miles from the source, and where cherry retails for $3.85 and walnut for $6.00 to $9.00.

—*Buster Welch, Winnipeg, Man.*

I recently decided to buy a 6-in. adjustable steel square made by Starrett. In their catalog, one of your advertisers sells this square for $36.50 plus $4 for packing and shipping. This price seemed high to me, so I called a local supply house (M.D. Larkin, in Dayton, Ohio) and purchased the same square for $21.90. I hope you publish this so my fellow woodworkers will know that it pays to shop around.

—*Jim Hale, Waynesville, Ohio*

On p. 12 of *FWW* #38, the first item is the table of sines for half the angle of a chord or arc, which is multiplied by the given diameter to obtain the exact length of the chord. We use this in patternmaking to lay out gear teeth and other niceties when layout space or the room to swing a long trammel beam is insufficient.

I mention it to say this: Each craftsman in wood can profit from careful examination of the engineers' and patternmakers' manuals to be found in libraries. In the appendices of these books will be found the various tables for angles, chords, arcs, polygons, etc., which are of immense help in otherwise complex projects. It is with great pain that I restrain myself from sending you a fistful of them.

—*David P. Young Sr., Gray Court, S.C.*

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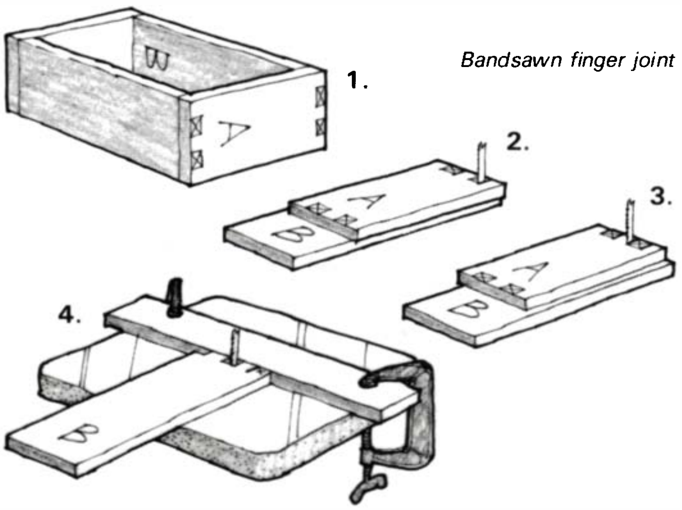
Cutting finger joints on the bandsaw

Here's how to cut finger joints on the bandsaw. In addition to being simpler and faster than the tablesaw approach, this method may be used with long boards (impossible on the tablesaw), and it allows you to lay out uneven spacing of tails and pins for decoration if desired.



First lay out the spacing of the pins on the ends of the box members as shown in step 1, above. Strike an X through the areas to be sawn out. Now select one end and clamp it on top of its adjoining side member, offsetting the edge by one sawkerf as shown in 2.

Clamp a stop to the saw table behind the blade, extending the full width of the table. Position the stop so that the stock will be cut to the proper depth (just a shade deeper than the stock thickness). Make sure the stop is perpendicular to the blade's actual line of cut, which may drift to right or left.

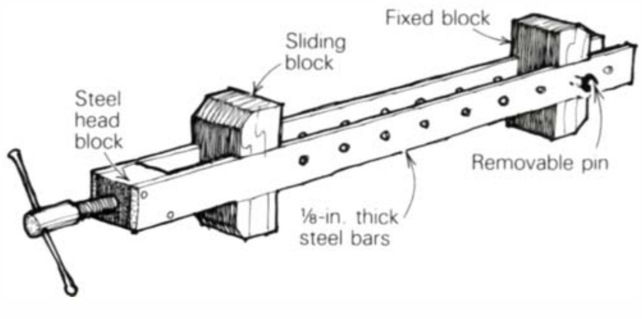
To cut the joint, feed the clamped workpiece into the saw to the stop. On the first pass cut only the *left* side of the pins, splitting the line to the waste side. Now unclamp the two workpieces, shift the top workpiece (the box end) two sawkerfs to the left, reclamp and saw the right side of the pins (3).

Next unclamp the two boards and, working with one workpiece at a time, nibble out the waste between fingers by sawing kerfs as close together as possible. Dress the bottom of the notch by feeding the stock sideways across the face of the blade (4). Repeat the waste-nibbling process on the other workpiece. The two should fit together perfectly. If the joint proves too tight, don't shift the two boards quite as much for the second set of cuts.

—Walter D. Sweet, Hazardville, Conn.

Homemade bar clamps

You can never have too many bar clamps. But a woodworker's cash usually goes toward tools and machinery, leaving clamps for another day. The homemade model below, though made from light, cheap material, will do most (though not all) things a bar clamp will do. The two bars are made of mild steel, ¾ in. wide by ⅛ in. thick. Clamp the two bars together and drill ¼-in. holes spaced 1½ in. apart. Make the head block from a ¾-in. cube of steel tapped for a ⅜-in. threaded rod. With the head block carefully lined up and clamped in position, fasten it to the bars by welding, brazing or riveting.



Make the 2¼-in. by 1-in. by 1-in. sliding block and the fixed block from any dense hardwood. Cut a ⅛-in. deep groove on each side of the blocks to give a sliding fit between the bars. Drill a shallow ⅜-in. hole in the sliding block to take the end of the threaded rod. So the rod won't continually bore its way into the wood, force a pellet of ⅜-in. steel into the bottom of the hole.

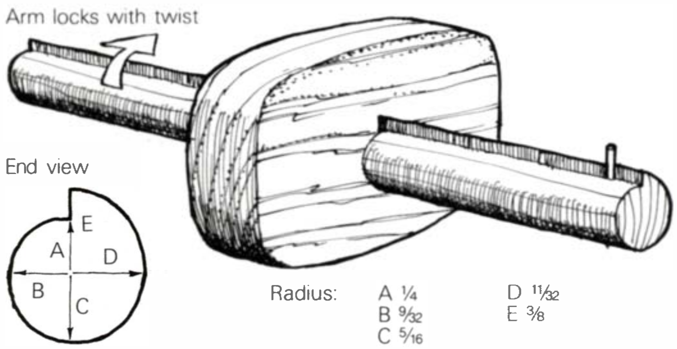
Braze a short length of pipe onto the end of the threaded rod and drill it to accept a tommy bar of ¼-in. steel rod. Peen the ends of the tommy bar to keep it from falling out of the hole. In use, the work is slid between the bars to ensure even clamping pressure, and the fixed block is moved and pinned in the appropriate place for the width of the work.

This clamp will handle work up to ¾ in. thick and perhaps 24 in. wide. The clamp could be scaled up using heavier materials for thicker or wider applications.

An alternative use for the clamp is to prevent "spelching" (the splitting off of the end grain during hand planing). Move the clamp to the edge of the board so its blocks are flush with the end grain. The clamp may be used many times before its wood blocks need replacing.

—Robert Wearing, Shropshire, England

Archimedes' marking gauge



This marking gauge employs a simple bar-locking system consisting of one moving part. The shape of the bar is an adaptation of the Archimedes spiral—actually it is a scroll curve made up of tangential circular arcs. Make the bar and the fence from a close-grained hardwood such as beech. A slight twist of the bar will hold it securely, and a reverse twist will release it for adjustment.

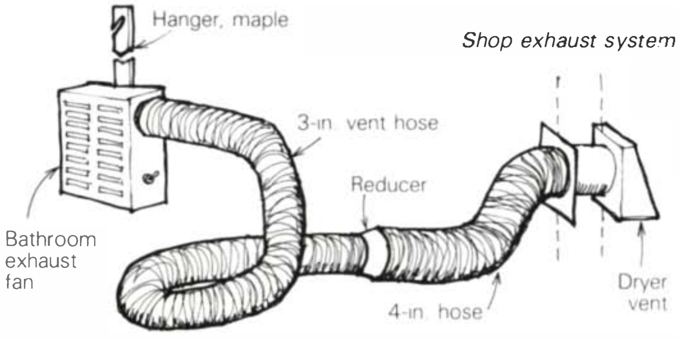
—John Arthey, Southampton, Ont.

Portable exhaust fan

The various home-workshop exhaust systems I'd seen either were too expensive or would simply suck all the precious heated air from the shop. The latter problem is important when you live in a northern climate and like to spend long winter nights over a lathe.

The dust-exhaust system I built solves these problems. It is inexpensive, portable and of low velocity (so as not to empty all the heat from the shop). I mounted a 70-CFM bathroom fan to a 4-ft. long maple strip notched to hang on nails adjacent to my work areas.

The fan is vented through a standard dryer vent using



3-in. flexible bathroom vent hose. Since the vent hose is 3 in. in diameter and the dryer vent is 4 in. in diameter, I installed a PVC hose reducer to mate the two sizes.

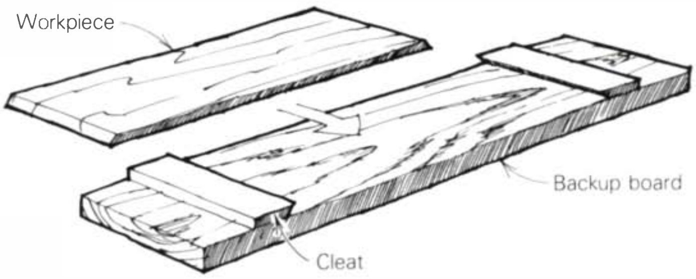
For convenience and neatness, you can run the electrical wire through the hose or tape it to the outside. I installed a toggle switch to the fan box for turning the fan on and off.

The fan is handy for drawing paint fumes away, in addition to its main job of removing dust. But the darned idea works so well that even chips are drawn into the hose—I have to uncouple the hose and dump them out about once a month. —*Ronald R. Stoltz, Guelph, Ont.*

Dressing thin stock

This jig allows you to dress stock to thinner than ⅛ in. on a conventional thickness planer. Without it the thin workpiece will vibrate and often splinter on the ends.

To make the jig, glue 45° beveled hardwood cleats to a length of lumber as wide as and slightly longer than the wood to be dressed. The cleats can be any thickness, since they will be planed down to the final thickness desired, at which time they serve as a rough thickness gauge for subsequent duplicate planing.



To use, bevel the ends of the workpiece so that it fits snugly under the cleats. Wax the back of the jig, slip the stock in the jig and run the jig through the planer, taking light cuts down to the desired thickness. Push the jig into the planer, then pull it through from the other side to prevent the feed rollers from pushing the workpiece out of its cleats.

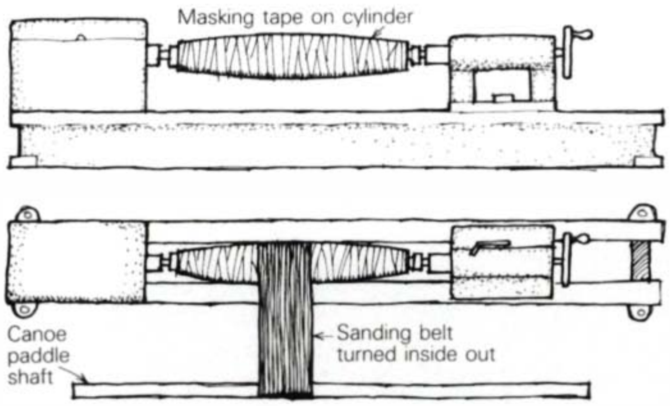
—*John S. Pratt, Avondale Estates, Ga.*

Sanding canoe paddles

This setup speeds up the tedious job of rounding canoe paddle shafts. I suspect it has other applications as well.

To start, turn a wooden cylinder 18 in. long and 3 in. in diameter. Wrap it with masking tape, building it up in the middle to form a crown. This will help center the sanding belt as you work. Then turn a sanding belt inside out and place it over the wrapped cylinder.

I prepare the handle by squaring off a blank, then cham-



fering the corners, except where the blades will be glued on. I then stick the handle into the sanding-belt loop, pull tight and sand round. It will take a little practice at first, but eventually you will be able to make a difficult task simple.

—*Wright E. Bowman, Jr., Honolulu, Hawaii*

Collapsible finish containers

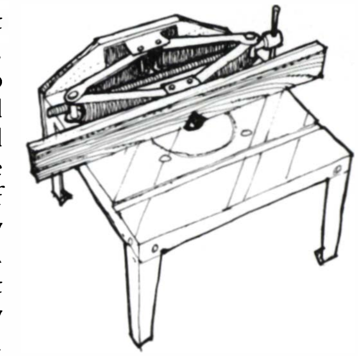
Collapsible plastic bottles for photographic chemicals (available from photo supply houses) make excellent working and storage containers for tung oil and other finishing materials that skin over or polymerize in half-empty cans. As the finish is used up, the bottles can be folded like an accordian before the top is screwed on, which eliminates just about all of the air.

—*T. Carpenter, Calgary, Alta.*

Scissor-jack fence

After years of enduring the inconvenience of removing and resetting numerous small bolts to adjust the fence on my router table, I made an adjustable fence that makes the whole process simple, rapid and accurate.

The fence is built around a used Toyota scissor jack that I found at an auto wrecking yard. First I spent a few minutes with a hacksaw to remove the portion of the jack that fits the underside of the car. Next I cut down the base to the width of the jack and bolted it to a ¾-in. plywood backboard. To make the fence, I attached a piece of straight, well-seasoned cherry to the top of the jack. With the careful use of shims, I set the face of the fence exactly perpendicular to the tabletop.



The fence is easy to adjust precisely. Once it's in position, I anchor it with small C-clamps on both ends.

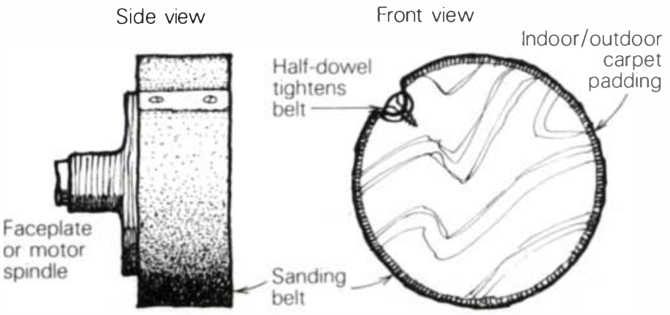
I suspect that these readily available scissor jacks could easily be adapted to a wide array of clamping, pressing and fine-adjustment problems.

—*John B. Moon, Mount Vernon, Wash.*

Sanding drum

This homemade sanding drum is sized to fit belt-sander abrasive cloth belts. I use mine on a shaper, running it at less than 1000 RPM, but it would work on a lathe, too. To make it,

glue up a slightly oversize round blank as wide as the sanding belt you plan to use. To determine the required diameter, divide the belt length by *pi* (3.14). Turn down the blank so



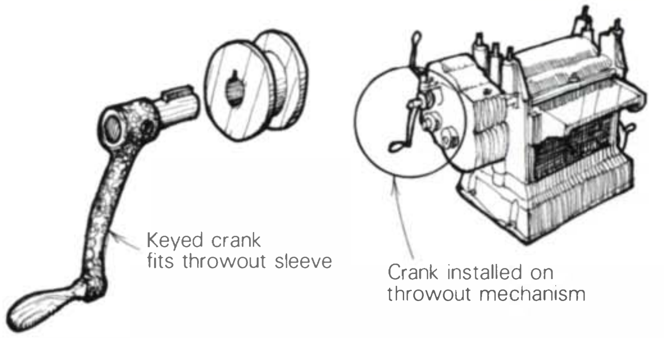
that the belt plus padding fits snugly. To tighten the sanding belt on the drum, rip a ¾-in. dowel in half and install it in a slot in the circumference with flathead screws, as shown.

—Charlie Thorne, San Luis Obispo, Calif.

Hand-feed for the Parks planer

Here's a simple way to get an infinitely variable feed rate on a Parks Model 97 thickness planer, without altering any part of the machine. Simply install a hand crank on the throwout sleeve. Although no planer is 100% tear-proof, it sure makes a big difference once you get used to the feel of cranking wood through by hand.

To make the crank, I started with an old farm machinery crank and fitted it to a short keyed shaft that slides into the center hole of the throwout sleeve. To use it, I simply disengage the power feed and start cranking. Make sure you remove the crank before you use the power feed.

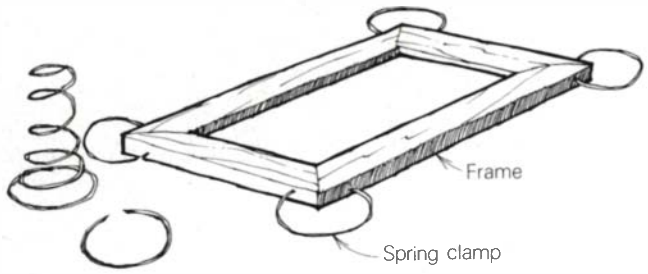


This idea could probably be adapted to other planers that have a similar feed disengagement mechanism.

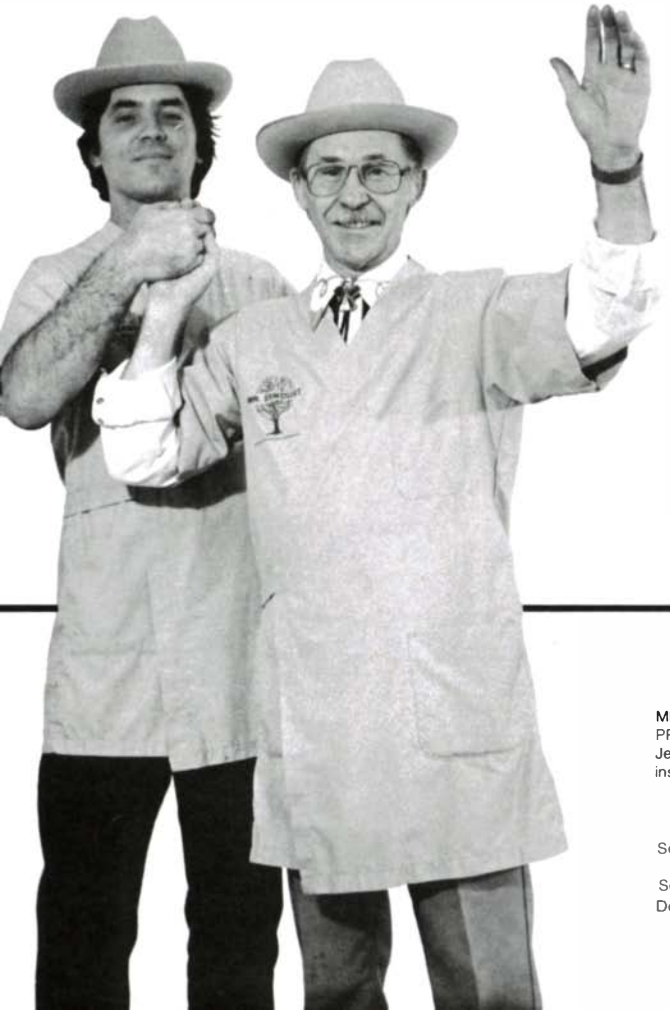
—John Colombini, Pittsburgh, Penn.

Picture frame clamp

These light-tension spring clamps are made by cutting up coils from an old bedspring. Sharpen the ends to needle points, then bend the circle so that the points are aligned,



California, here we come!



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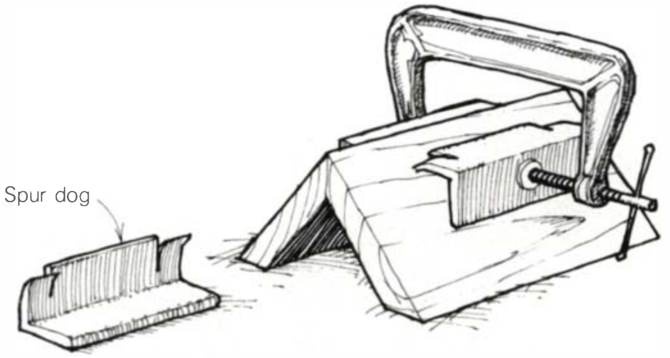
leaving a $\frac{3}{8}$-in. gap. To use, simply place the frame to be glued on a flat work surface and use one of the spring clamps at each corner to clamp the frame. The points leave pinholes in the frame, but if care is taken, damage is minimal. For heavier or lighter clamps, just select and cut up an appropriate spring. *—H. Hugh Miller, LaHabra, Calif.*

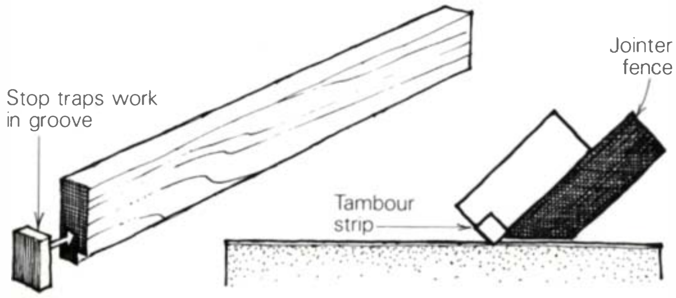
Spur dogs for clamping miters



Here is a method that allows you to clamp up mitered edges. The method is based on a spur dog, a device that provides a perch for C-clamps and spreads clamping pressure evenly over the joint. To make the dogs, cut several pairs of 3-in. sections from a length of 1-in. angle iron. In each section, hacksaw two $\frac{5}{16}$-in. deep slots about $\frac{1}{2}$ in. from each end of one side. Bend the two tabs down about $\frac{3}{32}$ in. and file the spurs sharp, as shown in the sketch.

To use, spread glue on both faces of the miter and press together for a light tack. Tap the two (or more) dogs into place and clamp. The spurs enter the wood grain about $\frac{1}{8}$ in. and therefore leave small scars on the wood. These scars can be removed by rounding over the corner, or they can be closed up some by steaming. You might decide to simply tolerate them. *—Peter Bird, Midhurst, Ont.*

Chamfering tambour strips



Here's a jig I developed to safely chamfer the edges of narrow strips, such as tambours. It consists of a straight piece of scrap as long as the strips and wide enough to be handled safely. Rabbet the bottom edge of the jig a fraction narrower and shallower than the strip, and attach a stop to one end of the rabbet. Now set your jointer fence to the desired angle, place a strip in the rabbet, and run the jig across the jointer. The depth of cut determines how wide the chamfer will be.
—Greg Forney, Gilcrest, Colo.

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OLD RECORDS AIM FOR NEW TARGETS

BY VICTOR J. TAYLOR

Things have been happening fast at the Record Ridgway plant in Sheffield, England, including a name change to Bahco Record Tools and a thorough overhaul of their catalog. To deal with the name change first, Record Ridgway was acquired in 1981 by A.B. Bahco, a Swedish tool firm whose founder invented the world's first spanner in 1892.

As hand and power tool users, we all know too well what happens when one company takes over another company—our favorite tools always seem to be high on the chop list, particularly if they are hard-to-find hand tools. So when I flipped through Bahco Record's latest catalog (November 1982), I had some trepidation about what tools had been axed and whether some old faithfuls had been laid to rest.

I needn't have worried. Though the catalog contains two pages of deletions, an alternative product is shown alongside each deletion, along with the explanation for the change. The trimmed-down list is not so much the result of an ax but more the work of a surgeon's knife.

In common with many comparable manufacturers, Bahco Record has had to contend with a flood of cheap imported tools. In such circumstances it's a case of beating them or joining them. Bahco Record has decided to beat them by marketing a variety of tools that, although rationalized by the deletion of moribund or duplicated items, still offers a comprehensive range at reasonable prices.

For example, the old 24-in. No. 08 jointer plane with the 2⅝-in. cutter has been replaced by the No. 07 jointer, 22 in. long and with a 2⅜-in. cutter—surely no deprivation. And the No. 405 multi combination plane has been superseded by a new 045C plow plane that can be transformed into a multi combination plane by means of a conversion kit. So, instead of having to buy two separate planes, you can now get the new plow plane and the conversion kit at the same price as the old multi combination plane alone.

Record's name is well known in the United States, since the company has supplied a network of wholesale and retail outlets for many years. Bahco Record will expand these, ensuring that spares and replacements will always be available, without the frustrating delays that so often plague imported goods. Spare parts for all withdrawn tools will be held for five years.

For the record (no pun intended), the group now comprises C. & J. Hampton (Record tools), William Marples, William Ridgway, The Gilbow Tool and Steel Co. (metal-cutting shears and chisels), F.E. Lindstrom AB (pliers for electronics), and A.B. Bahco Verktyg (pipe tools, spanners, screwdrivers and pliers). The reorganization has been applied to all companies in the group, not just those handling woodworking tools. Each company will retain its own brand name and product type.

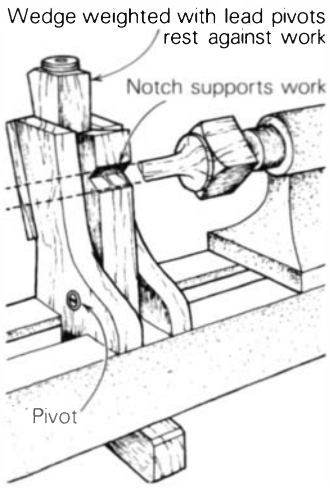
If you would like a catalog, write direct to Bahco Record, Sheffield S9 3BL, England, or to any U.S. tool dealer who handles the line. □

Victor J. Taylor has written seven books and was editor of the British magazine Woodworker.

Slender turnings—*I do custom woodturning, and while I have no problem with bulky parts like Victorian newel posts or balusters, slender chair spindles and other small parts give me fits. Turning them between centers in the usual way provides too little support, and the parts tend to vibrate and break under the force of a cutting tool. I realize that many of the parts I'm asked to duplicate were produced on automatic lathes; nevertheless, there must be some freehand techniques for controlling small-diameter work.* —*Paul Mahany, Bethesda, Md.*

RICHARD STARR REPLIES: Slender turnings flex in two ways—they bend and they twist. Bending occurs when you push the tool against the wood, and rather than surrendering a shaving, the wood resists and tries to climb the tool's edge. At best, you get a chattering, intermittent cut. At worst, you break the piece. Twist occurs as you work a thin turning some distance from the driven end. The wood resists the tool and winds up like a spring which then releases and overcomes the tool. The result is spiral-shaped chatter marks.

To keep the wood from bending, some turners use a steady rest—a mechanism that clamps to the lathe ways and supports the wood near where the tool is cutting. The drawing at right shows one design for a steady, taken from F. Pain's *The Practical Wood Turner* (Sterling Publishing Co. Inc., 2 Park Ave., New York, N.Y. 10016), which, by the way, is an excellent reference book on turning.



I've used rests but prefer to use my hand to steady the work. I hold the tool with my right hand, so I place my left thumb on the top surface of the tool, curling my fingers around the work and supporting it against bending as I cut. Friction heats the hand, which is why old-timers pause often to cool the palm on the lathe's pulley housing. Keep your tool sharp and take fine cuts to keep cutting resistance—and twisting—low. For cylindrical and tapered turnings, limit twisting by using a hand plane instead of a turning tool. You can control the plane's depth of cut and there's no danger of digging in. Try a block plane with a sharp iron set for a fine cut. Steady the tool as shown in the photo, with the edge of the blade swung at least 45° to the axis of the work. Travel slowly along the work in the direction the plane is pointing.

On very long pieces, you can reduce twisting by reversing and rechucking, so you are always working the half nearest the headstock. If you've got a 3- or 4-jaw chuck that's hollow in the center, you could just project the work through it, extending the turning and moving the tailstock as you go. Keep the lathe speed low, because a thin, flexible piece could whip off the lathe if run too fast.

R. PERRY MERCURIO REPLIES: If the quantities required are small enough, the old-time method of spokeshaving thin spindles clamped in a shaving horse is a good and surprisingly fast solution. But if you've got lots to turn, I'd suggest looking for what's called a hand lathe. It's a regular lathe fitted with a steady rest in which a cutter is mounted. A lever allows the operator to move the steady into the spinning work, thus cutting and supporting it simultaneously. Hand lathes can be set up with duplicating templates that produce the same profile time after time. Before the automatic back-knife lathe came into use, hand lathes were the only machine that could make thin turnings—a good operator could produce a thousand pieces a day. I'm not sure that the type of hand lathes we used are still made, but you might be able to find a used one. Check with James F. Murphy Co. Inc., 86 Cambridge St., Burlington, Mass. 01803. This company also sells adjustable ball-bearing steady rests that might help.

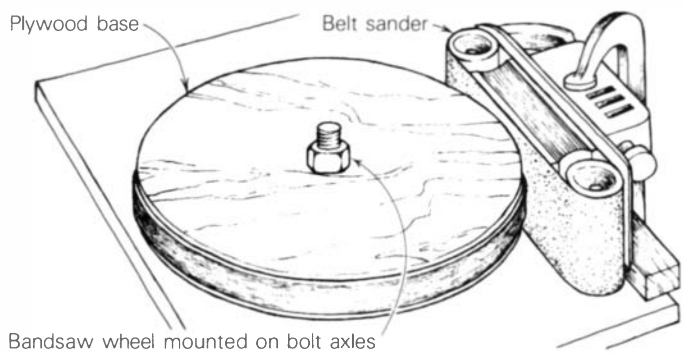
Clock acoustics—*I have a commission to build a mantle-type wooden clock case. I've listened to several chime clocks and they sound like an orchestra playing with jackets over their instruments. What can I do to make my clock produce a resonant, delightful sound?*
—*Roger G. Joshua Sherman, Baltimore, Md.*

ANDY MARLOW REPLIES: If you are working to a fixed clock design, you can't change the shape of the clock's sound chamber much, and you would have to change it quite a bit to make much difference anyway. Rods or gongs mounted on hardwood will produce more volume but a harsher sound; softwood, a softer and more pleasing note. I'd experiment with the material on the striking surface of the hammers. They are usually faced with a hard leather button. You'll get a surprising variation in sound quality by using a softer leather such as chamois or a piece of kid glove. Don't forget to drill holes in the clock back to let the sound out.

Vibrating bandsaw—*I built a 12-in. bandsaw from a Gilliom kit and I used oak plywood for the wheels. The machine runs and cuts well, but there is a slight vibration which I think comes from the tires being of uneven thickness. How can I grind the tires flat and even?*
—*T.T. Ormiston, Outlook, Sask.*

RICH PREISS REPLIES: Bumps or bulges in the tire could be caused by the wrong size tire, crud that got under the tire during installation, or a joint that isn't smooth. To find the high spots, rotate the wheel by hand and read the runout with a dial indicator, or clamp a block in a fixed position on the saw frame and see if the rotating wheel contacts it evenly.

Try spot-sanding with coarse sandpaper to knock down the high spots. If this doesn't work, use the belt-sander jig shown in the drawing below to bring the tire into round. Recrown the tire by hand-sanding or by mounting the belt sander on a beveled block, otherwise the blade won't track correctly.



If the vibration persists, the wheels themselves may be out of round or twisted. Remove the tires and true the wheels on

Drawings: Karen Pease

a lathe large enough to accommodate the wheel diameter. Since the wheels are of wood, you can plane or sand out any twist, using winding sticks to check the results. Finally, check that the wheels are aligned and in the same plane when you mount them back on the saw. Hold a long straightedge across the face of the wheels—the straightedge should contact the rim and hub of both wheels evenly.

Salvaging sinkers—*I have access to a number of squared white oak beams which sank to the bottom of a river during the timbering years between 1810 and the early 1900s. These timbers are up to 40 ft. long and average 16 in. square. Can you advise me on how best to salvage and market this wood?* —*D.H. Martin, Brockville, Ont.*

R. BRUCE HOADLEY REPLIES: Sight unseen, I can't judge the condition of 100-year-old sinkers. Many factors, including water temperature and chemical content, affect wood immersed for long periods of time. But I'd guess that squared white oak would have a minimum of sapwood, and the heartwood, if completely waterlogged, might be in pretty good shape. You could sell the squares as timbers, without drying them. Craftsmen doing barn and historic home restoration are always in the market for such material, as are boatbuilders restoring old ships. The Association for Preservation Technology, Box 2487, Station D, Ottawa, Ontario K1P 5W6, might be able to connect you with potential buyers.

If left full dimension, such large timbers would be difficult to dry in less than several years. If you saw them into boards, however, air- and kiln-drying can proceed routinely. The biggest problem may be finding a mill willing to saw them—sinkers are often embedded with grit and gravel, which take a toll on sawblades. You may also have to buck the timbers down to 16-ft. lengths, the maximum many mills will accept.

Sulfur inlay—*In an antiques magazine, I recently saw a photo of a Pennsylvania chest described as having sulfur inlay. Is this really sulfur, and if so, how was it done?* —*Bernard J. Perry, Akron, Ohio*

GREG LANDREY REPLIES: The inlay you refer to is actually sulfur. Once called "white wax," sulfur inlay is found in surviving furniture made by German immigrants who settled in southeastern Pennsylvania. To re-create this inlay work, cut a groove to receive the sulfur just as you would for any other type of inlay. Warm powdered sulfur over an alcohol burner until it melts, and then pour it into the recess. Work in a well-ventilated area, and don't burn the sulfur or it will release sulfur dioxide, a noxious gas. You may have to experiment a little with the heat to reduce air bubbles in the molten sulfur. Once the sulfur has cooled and solidified, trim it flush with the surrounding surface with a chisel or a cabinet scraper. You can then finish the sulfur with the same material you will use on the rest of the piece.

Dyeing hardwoods—*How can I dye hardwoods, mostly red oak, different colors? I want a deep black finish that allows the grain to show through. I'd also like some bright reds, blues and greens as accent colors.* —*Kurt Martinson, Coeur d'Alene, Id.*

OTTO HEUER REPLIES: There are three kinds of dyes that can be used to stain oak: water-, oil- and alcohol-soluble aniline dyes. All three should be available in a well-stocked paint store, though you may have to special-order them. Some dyes

can be bought mail-order from H. Behlen and Bros., Rt. 30 N., Amsterdam, N.Y. 12010. All of these dyes can be brushed or wiped on, or sprayed on with the pump-type sprayer of the type used for insecticides.

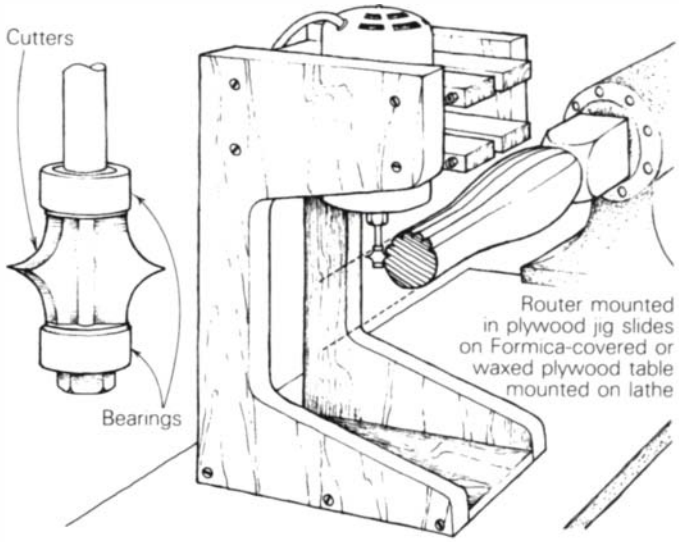
Water-soluble aniline stains are the most lightfast. In a plastic or glass container, mix about 4 oz. of dry stain powder in a gallon of hot water, allow it to cool and strain it through a triple layer of fine cheesecloth or muslin. Vary the application rate to get the color you want. Water-soluble aniline stains should be freshly prepared for each application, and they shouldn't be stored in metal containers.

Alcohol-soluble aniline stains will produce bright colors, but they are likely to be light-fugitive, especially the reds. To mix them, add 2 oz. to 6 oz. of powder to 1 gal. of a mixture composed of 8 parts methanol and 2 parts denatured alcohol.

Oil-soluble aniline dye mixtures can be made by mixing 2 oz. to 6 oz. of stain powder to a gallon of toluol, xylol or any other aromatic petroleum solvent. Agitate the mixture well, let it settle, strain it and apply as above. Avoid breathing the vapors from this mixture and don't work around open flames—the solution is extremely flammable. To bring out the colors of any of these dyes, especially the blacks, you may need to add a top coat of semigloss or gloss lacquer, or reduced white shellac.

Follow-up:

Re reeding on turned bedposts (*FWW* #37, p. 34). Here's a better method for reeding turnings, be they straight or curved. You need a custom-made router bit, available from Fred Velepec, 71-72 70th St., Glendale, N.Y. 11385. I mount the router in a plywood jig, as shown in the drawing below. I rig a wooden spring latch to my lathe that engages the holes in the indexing wheel, locking the headstock for the router operation.

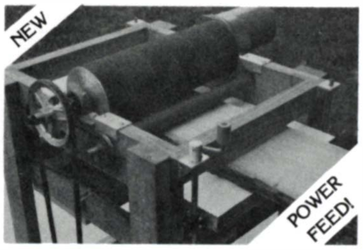


A cove turned at both ends of the reeded section allows the bit to exit and enter cleanly, so no hand cleanup work is needed. *—James B. Small, Newville, Pa.*

. . . three-wing cutters for fluting and reeding (for the method described above) are also sold by Sur-Tool, 1625 Milwaukee Ave., Chicago, Ill. 60647.

—Duane Waskow, Cedar Rapids, Iowa

Re cleaning up glue squeeze-out (*FWW* #37, p. 34). I solve the problem this way: I clamp up the joint dry and



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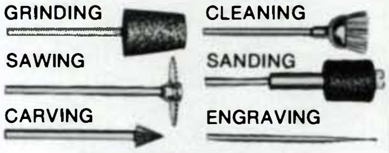

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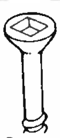

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apply masking tape to both sides of the joint to within ⅛ in. or so of the glueline. Then I coat the area around the joint with rubber cement, take it apart and glue up as usual. Any squeeze-out ends up on top of the cement and will peel right off, or it can be removed with a rag moistened with rubber cement solvent. —*Bill Rockhill, Fort Wayne, Ind.*

Re Queen Anne legs and furniture kits (*FWW* #37, p. 40). In addition to selling the remaining inventory of Rollingswood, Windsor Classics Ltd., 222 Wisconsin Ave., Lake Forest, Ill. 60045, will be manufacturing many of the kits formerly made by that company.

Readers can't find:

. . . a source for motor and light assemblies for ceiling fans. —*George L. Ficke, North Royalton, Ohio*

. . . plans and parts for an old-fashioned oak crank-operated telephone. —*Richard A. Hoffman, Worcester, Mass.*

. . . plans for a Wooten desk. —*Bob Freedman, Berkeley, Calif.*

. . . an owners' manual for a Montgomery Ward 6-in. jointer-planer. —*David Willemain, Towson, Md.*

. . . parts and an owners' manual for a Heston and Anderson Model 1, 14-in. bandsaw.—*Robert L. Caldwell, Aloha, Ore.*

Readers want to know:

I'm looking for some good ideas on how the length of jointer tables can be extended. —*Frank Rotella, Somerville, N.J.*

Does anybody else have a Turn-O-Carve lathe? I'm looking for information or an operators' manual for this machine. —*Thor Lonning, Suffield, Conn.*

Sources of supply:

—Australian Hytest-brand axes (*FWW* #38, p. 32) are available from Tom's Saw Service, W. Main St. and Rte. 7, Georgetown, Conn. 06829.

—Harrigan Roller Co. Inc., 1421 Ridgely St., Baltimore, Md. 21230, will resheath planer rollers in rubber, or manufacture new rollers to your specifications.

—For xylophone and marimba bars, try Ludwig Drum Co., 1728 N. Damon St., Chicago, Ill. 60647, or Slingerland Drum Co., 6633 N. Milwaukee Ave., Nile, Ill. 60648.

—I've tried all the well-known furniture oils, but the best furniture finish I've found is a gunstock oil made by Birchwood Casey, Eden Prairie, Minn. 55344. —*Jim Clifton, Green Bay, Wis.*

About our answer people:

RICHARD STARR is an educator and the author of a book on teaching woodworking to children.

R. PERRY MERCURIO is a retired engineer who worked in the woodturning industry.

ANDY MARLOW is a cabinetmaker and writer.

RICH PREISS supervises the woodworking shop at the University of North Carolina at Charlotte.

R. BRUCE HOADLEY teaches wood technology at the University of Massachusetts at Amherst.

GREG LANDREY is furniture conservator at the Henry Francis du Pont Winterthur Museum in Winterthur, Del.

OTTO HEUER is a finish chemist and consultant.

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

WOOD DUST POSES HIGH CANCER RISK

BY MICHAEL McCANN

Wood dust is not as innocuous as people have assumed. For many years such problems as irritant and allergic dermatitis, hay-fever type allergies (rhinitis), conjunctivitis, asthma, and hypersensitivity pneumonia have been associated with wood dust, especially that of tropical woods. Recently there has been growing evidence that wood dust can also cause several types of cancer—40 or 50 years after first exposure.

Most prevalent among woodworkers is cancer of the nasal cavity and nasal sinuses. The first study showing this, done in High Wycombe, England, found that 15 out of 17 men with nasal cancer worked in the furniture industry. A recent survey in 12 countries showed that 61% of nasal and nasal sinus cancer cases were woodworkers, and that 78.5% of nasal and nasal sinus adenocarcinoma cases were woodworkers. Analysis of the exposures of these woodworkers showed that many of them had worked only with wood dust, not with solvents or other chemicals. Hardwood dusts are definitely implicated; as yet, there have not been any studies of woodworkers exposed only to softwoods.

The statistics show that 7 out of 10,000 woodworkers will develop nasal adenocarcinoma each year, compared to only 6 out of 10,000,000 in the general population. The average latency time, or time from first exposure to developing the cancer, is 40 to 45 years. In a few cases, however, very short exposure periods—as little as 18 months in one instance—followed by no exposure for decades have resulted in nasal cancer. It has been estimated that as many as 2.5% of furniture workers will develop nasal cancer, mostly adenocarcinomas, within 50 years of entering the furniture industry.

These statistics, of course, are based on cases resulting from high exposures to wood dust over the last half-century. With today's better working conditions and lower dust exposures, it would be expected that the cancer rate would decrease.

Preventive measures include keeping wood dust levels down by using dust collectors and vacuum cleaners, and seeing a specialist if you experience persistent nasal dripping, stuffiness or nosebleeds.

In the last couple of years, studies of woodworkers in the U.S. auto industry have found an excess of colon cancer, rectal cancer and salivary gland cancer among pattern and mold makers who had worked with solid woods, chemically treated woods, wood laminates and some plastics. At this stage it is not clear what might have caused these types of cancer. □

Further reading

"Cancer Morbidity Among Woodworkers" by G. Swanson and S. Belle. *Journal of Occupational Medicine* 24 (4), 315 (1982).

"Health Effects of Wood Dust—Relevance for an Occupational Standard" by L. Whitehead. *American Industrial Hygiene Association Journal* 43 (9), 674 (1982).

"Nasal Carcinoma in Woodworkers: A Review" by J.H. Wills. *Journal of Occupational Medicine* 24 (7), 527 (1982).

"Pattern and Model Makers, Proportionate Mortality 1972-1978" by C. Robinson, R. Waxweiler and C. McCammon. *American Journal of Industrial Medicine* 1, 159 (1980).

Michael McCann is editor of Art Hazards Newsletter *(published by the Center for Occupational Hazards, Inc., 5 Beekman St., New York, N.Y. 10038), from which this article is adapted.*

Apprenticeship in Craft edited by Gerry Williams. *Daniel Clark Books, Box 65, Goffstown, N.H. 03045, 1981. $9.50 postpaid, paperback; 215 pp.*

About 10 years ago, with a year in my own little shop in Nebraska under my belt, I went to England to work for furnituremaker Alan Peters. I figured I had gone as far as I could teaching myself how to work wood. It was luck, as much as anything, that I got in touch with Peters and that he could take me. The whole process, including obtaining work permits and visas, took a year to arrange. But all the work and worry was worth it—during my 15 months with Peters I learned more than I could have taught myself in years, if ever. I have no doubt that the best way to learn a craft is to work with a master craftsman.

Since then, more college and university craft programs and specialized, craftsman-run schools have appeared. Yet the demand for schooling still exceeds the supply, particularly for workshop training with a practicing craftsman. There just aren't enough craftsmen to go around.

Apprenticeship in Craft is a collection of essays by 45 craftspeople, educators and administrators that covers current thinking on craft training. Most of the essays were presented at the Conference on Apprenticeship in Craft held in 1978 at Purchase, N.Y. The book doesn't list schools or craftsmen offering apprenticeships, but it will help you to compare the types of training available and to decide which suits you best.

The authors seem to agree that apprenticeship is a good thing. But, beyond the essential ingredients of an eager pupil and a willing master, there is little agreement about what an apprenticeship is, or should be. The term is applied to any sort of workshop craft training, from indentured servitude in the school of hard knocks, to a consciousness-raising exercise led by the master as guru. An apprenticeship can last from three months to more than five years. It may involve only the master and pupil, or a whole panoply of agencies and institutions. Most of the writers think modern apprenticeship should be more than the acquisition of technical skills. Apprenticeship, they suggest, could be a vehicle for personal fulfillment, a means of remaking part of the educational system, or a step toward reform of society.

No one in *Apprenticeship* recommends that 14-year-old children leave school to serve five years in the local joiner's shop. For most of today's would-be pupils, the rigors of a traditional apprenticeship would be unacceptable. The alternatives discussed in the book fall into three categories: the creation of craft programs at existing universities; the starting of new schools devoted solely to craft teaching; and variations on traditional apprenticeship, averaging a year and a half, and offering the apprentice some opportunity to do his own work.

Craft programs in colleges or universities probably serve the most students, and many award degrees. Instruction is intensive, facilities extensive, and faculties are studded with accomplished craftsmen. The Rhode Island School of Design, Boston University and the Rochester Institute of Technology, among others, have established such programs.

Some college programs incorporate bits of the real world. Since the founding of Berea College in Kentucky in the 1920s, its students have been working 10 to 15 hours a week in college-sponsored cottage industry, learning trade skills while earning money. In the 1970s, the previously industrial jobs were broadened to include crafts, starting with the Ceramic Apprenticeship Program. The program blends a working craft shop—the resident potter derives 85% of his income from his own work—with classroom and college-studio education.

A number of contributors in *Apprenticeship* discuss internships, where a high school or college student works in the shop of a practicing craftsman. A high school program in Scarsdale, N.Y., sounded excellent—I imagine that lots of high school students would be thrilled to get out of the classroom and be encouraged to work with their hands. College internships, however, are more common. Some colleges pay the master, some masters pay the student. Colleges usually award the intern academic credit, which means rules, reports and some attempt to measure what's been learned.

At best, college craft programs give the student room to experiment while learning technical skills from resident master craftsmen. They have disadvantages, too, as Arline M. Fisch, a jeweler and art professor at San Diego State, mentions in her piece: Prospective students must meet academic entrance requirements, and once enrolled, they must conform to the broad liberal arts program. This diffuses the concentration needed to master materials and techniques. Master's degree candidates are encouraged to specialize, but there are still academic requirements. And college can be expensive.

Private schools that offer only craft training can avoid these pitfalls, but they can't award the Bachelor's or Master's degree so useful for getting the teaching jobs that support many craftspeople. Often run by an established craftsman, they accept from a few to several dozen students for courses ranging from weekend seminars to three years of full-time study. Most have tuition fees, though some are run as cooperatives that defray costs by selling what the students and teachers make. Wendell Castle, who runs his own school in Scottsville, N.Y. (see p. 103), would like apprenticeships to "concentrate on

training skilled technicians, who are in great demand. . . . Not all woodworkers possess design talents." Such talents, Castle believes, can be developed but not taught. (I disagree with Castle about the demand for skilled craftsmen—most shops operate on a shoestring and can't afford employees.)

Training in the workshop of a practicing master craftsman is the third type of apprenticeship, and there are many accounts in this book of this schooling from former apprentices and masters. Also included are the results of a 1978 survey of 250 former apprentices, conducted by the Daniel Clark Foundation, the publishers of *Apprenticeship*. Their apprenticeships lasted an average of 12 to 15 months, often following a period of craft training at a university. Most of these people became apprentices to overcome the shortcomings of their college training: ". . . to learn what I had not learned in school—practical knowledge about how to make a living with my craft," as one young potter put it. I'd add that this kind of training is the best way to learn to work quickly, accurately and efficiently—qualities essential for survival as a professional.

So what are the chances of finding a workshop apprenticeship today? Not good, I'm afraid. Though almost every contributor to this book calls for the creation of a central referral service to link prospective apprentices and masters, such a service has yet to appear. The majority of the apprentices in the 1978 survey obtained their places by writing to and visiting as many craftsmen as they could, and this still seems to be the best bet. Some local craft organizations, such as the Baulines Guild in California (*FWW* #37, p. 68), have set up their own referral services—they're a good place to start.

Craftsmen interested in setting up apprenticeship programs can get advice from the National Council for Apprenticeship in Art and Craft, formed after the 1978 conference. Its members are craftsmen, educators, arts administrators and government representatives. An international council appeared a year later. You can find out more about these organizations from Gerry Williams (c/o Daniel Clark Books), who is president of the National Council and vice-president of the International Council. (A report on a 1981 National Council apprenticeship workshop is available from him for $1.00.)

Holtzapffel's Construction, Action and Application of Cutting Tools by Charles Holtzapffel. *Early American Industries Association, PO Box 2128, Empire State Plaza Station, Albany, N.Y. 12220, 1982. $20.00 ($12.00 to EAIA members), hardbound; 597 pp.*

On the subject of tools, materials and construction, Charles Holtzapffel's five-volume set is a landmark reference. Originally published in the mid 19th century, Holtzapffel's books are slowly finding their way back into print. This is volume two of the set, an exhaustive discourse on how tools such as planes, chisels, saws, drills and files work. The book is well-illustrated with some 700 woodcuts, and it's easy to see why Holtzapffel's work was at the leading edge of technology in his day. Two other volumes, *Hand and Simple Turning* (volume four) and *Ornamental or Complex Turning* (volume five), are available from EAIA or from Dover Publications, 180 Varick St., New York, N.Y. 10014. Holtzapffel's volumes on materials and abrasives are out of print but can sometimes be found in a used book store. ☐

Roger Holmes is assistant book editor of Taunton Press.

COMMERCIAL WOODWORKING: Big jobs and big paychecks

BY JONATHAN COHEN

I've always divided the woodworking market into either commercial work or gallery work. And while many of my clients don't fit neatly into one category or the other, there are basic differences between the two. I think of gallery work as one-of-a-kind pieces made to sell through a gallery or designed especially for a client, usually with no formal contract. Commercial work consists of copying existing furniture or building multiples of one piece—a half-dozen desks, say, or twenty file cabinets—often from drawings provided by an architect and always with a formal, written contract.

The biggest difference between gallery and commercial work is scale: the latter entails bigger jobs, bigger headaches and bigger paychecks. The payoff for commercial work also has some hidden benefits. For one, big companies have more money than private individuals do, and because they can write off the cost of your work come April 15, they're quicker to commission. And, don't forget, offices are staffed by people who may commission you when they see your work. On a recent job I did for a law firm, several of the partners were fascinated by the chisels and dozuki saw I used to install a set of mahogany bookshelves. They all asked for business cards (carry plenty when you deliver work), and now I'm doing interesting pieces for a couple of homes and an office.

Terms like "corporate woodworking" and "contract furniture" conjure up images of large, hangar-sized shops with a swarm of workers scurrying about on a production line. Many of us have neither the space to hold 40-ft. conference tables nor the machinery and tools required to produce them. With a bit of ingenuity, however, you can usually overcome construction problems. One solution is to job out work you aren't equipped to do. A local millworks can run out moldings; a finishing shop can spray the lacquers and varnishes commercial jobs frequently call for. You'll have to exercise careful control over quality, and jobbing out work will take a chunk out of your paycheck, but leaving this often worrisome work to others is worth it.

If you figure ways to build a large piece in your shop, remember that it must also fit into the client's building. Make sure you measure all doorways and elevators you will encounter on delivery before you decide how to divide up the piece. If it is designed for a building yet to be constructed, check to see how big these openings will be. Overlooking these considerations may force you to take drastic measures later on—like hoisting your work up the outside of a building, or setting it on top of the elevator from the floor above.

Aside from scale and cost, the most important item in commercial woodworking is the contract. If for some reason you are dealing with a client who doesn't offer one, I strongly recommend that you insist on putting something in writing, signed by all parties concerned. A contract should include a

complete description of the pieces to be built, the materials, type of finish, cost, completion date and method of payment. Others will be involved besides you and the client, and inevitably there are going to be communication problems. The contract should establish responsibility. This will decide who must foot the bill for mistakes and changes. I generally ask for materials money in advance, with the remainder due upon completion. With long jobs, it is acceptable to specify "work-in-progress" payments or draws. But if you are working for a large interiors or architectural firm, they may be used to dealing with furniture companies that don't expect payment until after the job is delivered.

Keep these points in mind when writing a contract: First, have your client sign a sample of such details as moldings, hardware, and especially stains and finishes. Then if he doesn't like the way a finished piece looks in a new light, you can compare it to the sample and show him that you have delivered what he requested. If you job out the finishing work, have the jobber sign the sample also. Then if the finish doesn't match the sample, have him do it over. Another note on samples: Commercial work generally contains enough money to pay you to make mock-ups, which are well worth your while. They will give both you and the client a clearer idea of what the finished piece is going to look like, and can often help you sway a client toward a detail you want to use.

Second, never rely on measurements from a blueprint. Visit the site and make your own. And last, if possible, keep installation costs separate and charge for these by the hour. Then you won't mind so much when you have to wait 45 minutes each time you use the service elevator, or if you must return to the shop to trim a half inch from the cabinets because the carpet-layer came before instead of after you. If your client balks, point out that some states consider installation as a separate part of the job, and one which is not taxed. If you deal with a firm that does not want itemized costs—and many large firms do not—be sure to generously inflate your price to account for the inevitable installation problems.

Remember that this is a bigger league than gallery work. Make sure that you get paid well. I've actually lost bids with people who were not familiar with my work, because I bid too low. Perhaps they thought that my low prices indicated work of poor quality. Designers and architects are starting to realize, however, that small shops can offer them certain advantages: quality, for one; quicker delivery dates and no shipping costs since they don't have to send to North Carolina factories, for another; and, given the mind-boggling cost of factory-made office furniture, reasonable prices.

The final problem involved in commercial woodworking is where to find those elusive commissions. Architects and interior designers are a good start. Take a portfolio (not Polaroids in a family photo album), and perhaps a small piece that demonstrates the quality of your work. Make sure to leave a business card.

Many woodworkers will contend that this is not "real" woodworking. But the challenges are still there, albeit a bit different. I prefer to balance this work with my gallery work, which I find better satisfies my craftsman urges. A few large commercial commissions a year can help offset a good many smaller, underpaying gallery pieces. Let's face it, there's gold in them thar offices. ☐

Jonathan Cohen makes furniture in Seattle, Wash.

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Events

Listings are free but restricted to events of direct interest to woodworkers. The May issue will list April 15 to July 15: deadline March 1; the July issue will list June 15 to Sept. 15: deadline May 1.

ARIZONA: Arts festival—March 25–27, Scottsdale Arts Ctr., 7383 Scottsdale Mall, Scottsdale, 85251. (602) 994-2301.
Festival—Hayden's Ferry, Festival of the Arts, April 8–10. Write MAMA, Box 3084, Old Town Tempe, 85281. (602) 967-4877.

ARKANSAS: Art fair—Eureka Springs Convention Ctr., May 6–8. Slide deadline March 31. Send legal SASE to Venita Sellers, Eureka Springs Guild of Artists and Craftspeople, Box 182, Eureka Springs, 72632.

CALIFORNIA: Trade/consumer show—"The How-To's of Woodworking," April 22–24. Fort Mason Ctr., San Francisco. Write Jan Cadwallader, Woodworkers Foundation, 4960 Hamilton Ave., Suite 211, San Jose, 95130.
Exhibition—Woodcarving, Tom Banwell and Robert Orr, March 4–31. Artbeat Gallery, 209 W. Main St., Grass Valley, 95945.
Trade show/seminar—Excellence in Woodworking, April 22–24. Los Angeles Convention Ctr. Write Marvin Park & Assoc., 600 Talcott Rd., Park Ridge, Ill. 60068. (312) 823-2151.
Meeting—Joint Industry Convention, April 20–23, Silverado Country Club, Napa. Contact Tony Carroll, Woodworking Machinery Distributors of America, 1900 Arch St., Phila., Pa. 19103. (215) 564-3484.
Juried craft fair—Fort Mason Ctr., San Francisco, Aug. 11–14. Slide deadline March 10. American Craft Enterprises, Box 10, New Paltz, N.Y. 12561. (914) 255-0039.
Workshop—Chairmaking, Grew-Sheridan, March 26–27. The Cutting Edge, 1836 Fourth St., Berkeley, 94710. (415) 548-6011.

CONNECTICUT: Workshops—Wooden instrument making, Robert Meadow, March 26–27; duck decoy carving, April 9–10; advanced bird carving, Bud Kronenberg, April 23–24; Japanese woodworking techniques, Toshio Odate, April 16–17; lofting for boatbuilders, Simon Watts, May 7–8; Windsor chairmaking, Michael Dunbar, May 14–15; survey of contemporary woodworking, John Kelsey, May 21; design for woodworkers, Michael Hurwitz, April 30–May 1; business of arts, Elena Houlihan, April 23–24; photographing crafts, Bob Hanson, April 30–May 1; plaited basketry, Shereen LaPlantz, April 9–10; basketry as artform, Jane Sauer, March 26–27; natural basketry, Jean Farley, May 7–8. Brookfield Craft Center, Box 122, Brookfield, 06804. (203) 775-4526.
Exhibition—Contemporary American handmade furniture, Feb. 22–March 26. The Elements Gallery, 14 Liberty Way, Greenwich, 06830. (203) 661-0014.

WASHINGTON, D.C.: Show/sale—Departmental Auditorium, 1300 Constitution Ave. N.W., May 6–8. Write Women's Committee of the Smithsonian Associates, Room 3101, Arts & Industries Bldg., Smithsonian Institution, Washington, 20560. (202) 357-4000.
Workshop—Turned bowls, Bob Stocksdale, late April. Contact Ed Mark, Washington Woodworkers Guild, 1565 Dunterry Pl., McLean, Va. 22101.

GEORGIA: Workshops—Planemaking, March 4–6; advanced joinery, April 9–10, May 14–15. Contact John McGee, 218 S. Boulevard, Carrollton, 30177. (404) 834-7373.

ILLINOIS: Juried festival—June 18–19. Slide deadline April 15. Contact Evanston Chamber of Commerce, 807 Davis St., Evanston, 60201. (312) 328-1500.

INDIANA: Juried fair—June 11–12, Talbot St. Art Fair. Deadline March 1. Joan Kisner, 630 N. Washington St., Danville, 46122.

KANSAS: Exhibition—Crafts. Entry deadline March 13. Contact Larry Peters, Topeka Public Library Gallery, 1515 W. 10th St., Topeka, 66604. (913) 233-2040.

MARYLAND: Crafts festivals—Numerous arts and crafts festivals throughout '83, at several sites in Maryland and Virginia. Space fees, no commissions. Write Deann Verdier, Sugarloaf Mountain Works, Ijamsville, 21754. (301) 831-9191.

MASSACHUSETTS: Craft program—Hands On Summer in the Arts for Teenagers. July & Aug. '83, Kents Hills School. Contact Jane Sinauer, 374 Old Montague Rd., Amherst, 01002. (413) 549-4841.
Exhibit—Adelaide Sproul: Sculpture in Wood and Fibers for the Wall by Women Artists, Feb. 10–March 12. Society of Arts and Crafts, 175 Newbury St., Boston, 02116.

MICHIGAN: Show—Woodcarving, May 1. John Lindell Arena, 1403 Lexington Blvd., Royal Oak, 48073.

MISSOURI: Seminar—Joinery, Ian Kirby, March 11–13. Kansas City. Contact Cheryl Hays, (800) 255-9800.

NEW HAMPSHIRE: Auction—Catalog sale, rare tools, March 25–26, Holiday Inn, Nashua. Richard Crane, Hillsboro, 03244.

NEW JERSEY: Seminar—Hand tools, Frank Klausz, April 16. Contact Dr. Gabriel A. Longo, Brookdale Community College, Lincroft, 07738. (201) 842-1900.

NEW YORK: Rhinebeck—Deadline March 7. Trade, June 21–22; public, June 24–26. American Craft Enterprises, Box 10, New Paltz, 12561. (914) 255-0039.
Exhibition—Woodturning, through June 3. American Craft Museum II, International Paper Plaza, 77 W. 45 St., New York, 10036.
Juried wholesale/retail market—New Halloran Convention Ctr., Pennsauken, N.J. Sept. 22–25. Entry deadline May 10. Contact Richard Rothbard, Craft Market America, Box 30, Sugarloaf, 10981.
Workshops—Japanese hand tools, April 9; subscription series, March 19–20, April 16–17, May 14–15. Robert Meadow, The Luthierie, 2449 W. Saugerties Rd., Saugerties, 12477. (914) 246-5207.
Exhibition and sale—Croton Point Park, June 18–19. Deadline March 10. Great Hudson River Revival, c/o Penny Cohen, RD 1, Box 304, Putnam Valley, 10579.
Juried festival—Lincoln Ctr., New York City, July 2–3. Deadline March 25. Brenda Brigham, American Concern For Artistry and Craftsmanship, Box 221, Uptown Station, Hoboken, N.J. 07030.
Juried fair—May 27–30, Sept. 2–5. Slide deadline April 1. Ulster County fairgrounds, New Paltz. Quail Hollow Events, Box 437B, Woodstock, 12498. (914) 679-8087.
Exhibition—Six Plus Twelve, contemporary craft, through March 26. Pyramid Arts Center, 163 St. Paul St., Rochester, 14604.
Summer workshops—Lake Placid. Write Office of Special Programs, Parsons School of Design, 66 Fifth Ave., New York, 10011. (212) 741-8975.
Exhibits—A Quintet of Wood Workers, March 1–31. Patterson Gallery, S. Portage St., Westfield, 14787. (716) 326-2154. Design Department Student Exhibit Part II, Upton Hall Gallery, April 28–May 13, State Univ. College at Buffalo, 1300 Elmwood Ave., Buffalo, 14222. (716) 878-6032.

NORTH CAROLINA: Workshops—Two- and three-week workshops beginning May 30 through Aug. 26, with John McNaughton, Wendy Maruyama, Hunter Kariher, Simon Watts, Seth Stem, David Elsworth, David Anhalt, Dan Rodriguez. Penland School of Crafts, Penland, 28765. (704) 765-2359.
Workshops—Blacksmithing, David Brewin, woodcarving, Helen Gibson; woodworking, Dana Hatheway, March 18–20. The John C. Campbell Folk School, Brasstown, 28902. (704) 837-2775.

OREGON: Exhibit/sale—Handmade wooden musical instruments, Feb. 26–27; wild bird sculptures in wood, April 16–17; decorative woodburning, March 19–20; log home fair, March 26–27. Western Forestry Center, 4033 S.W. Canyon Rd., Portland, 97221. Contact Linda Smeltzer, (503) 228-1367.

PENNSYLVANIA: Show/sale—Lancaster County Woodcarvers, April 30–May 1. Lititz Recreation Ctr., 21 N. Spruce St., Lititz, 17543. Contact Charles A. Smith, 311 Valley View Dr., New Holland, 17557.
Juried exhibition—Port of History Museum, Penns Landing. May 20–July 4. Deadline March 1. Society of Philadelphia Woodworkers, 4101 Lauriston St., Phila., 19128.
Juried exhibition—July 5, Museum of Art, Pa. State Univ., Univ. Park. Deadline April 1. Send SASE to Shirley H. Siegenthaler, 126 W. Marylyn Ave., State College, 16801.
Show/competition—Woodcarving, April 9–10. Penn State Abington Campus. Write Arnold Bookman, Pa. Delaware Valley Woodcarvers Assoc., Box 69, Willow Grove, 19090.
Show—Pa. Farm Show bldg., April 22–24. Slides by March 6. Contact Susan Gahres, Pa. National Arts and Crafts Show, Box 4537, Harrisburg, 17111. (717) 652-1324.
Exhibition/seminar—Green wood show, contemporary chairs, March 2–April 30; woodworking careers seminar, April 23. Jeffrey Greene Design Studio, Ney Alley, New Hope, 18938. (215) 862-5530.
Workshop/exhibition—Design and Turning, David Elsworth, Feb. 25–27. "A Gallery of Turned Objects," Feb. 20–March 12, Kipp Gallery, Indiana Univ. of Pa. Contact Christopher Weiland, (412) 357-2367.

RHODE ISLAND: Craft fair—July 22–24, Newport Yachting Ctr. A.C.E., Box 10, New Paltz, N.Y. 12561. (914) 255-0039.

TENNESSEE: Workshops/juried exhibition—Wood laminate construction, Ron DeKok, March 7–11; woodturning, Mark Lindquist, March 28–April 1. "The Figure: New Form, New Function," Nov. 5, 1983–Jan. 7, 1984. Slides due Sept. 10, 1983. Contact Arrowmont School of Arts and Crafts, Box 567, Gatlinburg, 37738. (615) 436-5860.

TEXAS: Craft fair—Open to trade, March 24; public, March 25–27. Market Hall, Dallas Market Ctr., 2100 Stemmons Freeway, Dallas.
Juried crafts fair—March 19–27, Houston Festival. Barbara Metkyo, 1950 W. Gray, Suite 2, Houston, 77019. (713) 521-9329.
Seminar—Woodturning, Dale Nish, March 19–20. Enrollment limited. Myer Frauman, Dallas Wood and Tool Store, 1936 Record Crossing, Dallas, 75235. (214) 631-5478.

Events *(continued)*

UTAH: Symposium—Woodturning, April 28–30, Ray Key (England), Dale Nish, Leo Doyle, others. Contact Dale Nish, Brigham Young Univ., 230 Snell Bldg., Provo, 84602. Workshop—Woodturning, May 2–6, Ray Key. Contact Craft Supplies, 1644 S. State, Provo, 84601. (801) 373-0917.

VERMONT: Exhibitions—Winter into Spring, through March 12; Folk Art, March 19–April 23; Baskets, April 30–June 4. Vermont State Craft Ctr., Frog Hollow, Middlebury, 05753.

VIRGINIA: Exhibit—Wood: Made in Virginia, ends March 4. Fine Arts Assoc. One Gypsy Hill Park, Staunton, 24401. (703) 885-2028.

WEST VIRGINIA: Workshop—Production techniques, C. Bradford Smith, Feb. 28–March 4. Cedar Lakes Crafts Ctr., Ripley, 25271. (304) 372-6263.

WISCONSIN: Lecture—Ian Kirby, March 18–20; Toshio Odate, April 29–May 1; Roy Underhill, May 14. Punkin Hollow Wood and Tool, N34 W24041 Capitol Dr., Pewaukee, 53072. (414) 691-9411, (800) 558-8665.

NOVA SCOTIA: Seminar—Veneering and torsion box construction and design, Ian Kirby, March 25–27. Contact Woodcraft Manufacturing Co., RR 2, Armdale, Halifax County, B3L 4J2. (902) 852-3331.

ONTARIO: Crafts festival—March 24–27, International Center, 6900 Airport Rd., Toronto. (416) 429-7780.

ENGLAND: Summer courses—Four one-week courses beginning Aug. 7. Write Alan Peters, Aller Studios, Kentisbeare, Cullompton, Devon, EX15 2BU.

Connections

In Connections we'll publish membership calls for guilds, 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.

Woodworking cooperative in Annapolis area seeking additional members. Share machinery, gallery space, and purchasing, plus individual work space. Contact Harvey Walters, 1505 Circle Dr., Annapolis, Maryland, 21401. (301) 974-6655.

Would like to hear from and communicate with other woodworkers. Osmar Valente, Rua Coronel Meirelles, 877, Penha-Cep-03672, Sao Paulo, Brazil.

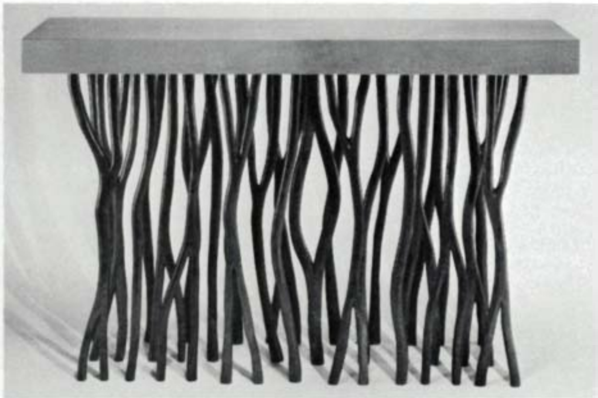
Boston Univ. Program in Artisanry: For schedule of 1982/1983 Artists-in-Residence lectures, write PIA, Boston University, 620 Commonwealth Ave., Boston, Mass. 02115.

Winners of the Hardwood Institute's Daphne Award contest will be announced April 17 in High Point, N.C. For more information on the Daphne, write the Hardwood Institute, 230 Park Ave., New York, N.Y. 10169.

Colorado Woodworkers' Guild Show: Spring or early summer in the Denver Metro Area. Anthony R. Brazzale, 149 W. Bayaud, Denver, Colo. 80223.

Old tool lovers: Join the Early American Industries Assn. Write S. Watson, Box 2128, Empire State Plaza Sta., Albany, N.Y. 12220.

New guild: Central Florida Woodworkers, Box 4321, Winter Park, Fla. 32793.



Robert Whitley calls this 59-in. long, 36-in. high, maple and walnut table 'Forest Console.' He and twenty-two other contemporary American woodworkers will be exhibiting an estimated fifty pieces at The Elements Gallery, 14 Liberty Way, Greenwich, Conn., from Feb. 22 to March 26. The gallery has previously specialized in all-media crafts exhibitions, and this is their first venture into presenting an all-woodworking show.

A Green Scheme

BY MARK JORDAN

My decision to make big money air-drying lumber, like all my get-rich-quick schemes, was made on impulse, without any market research, retail planning or knowledge of the process. But at the time it seemed like a good idea. Normally, I'd forget such an impulse after a good night's sleep—something about 7 AM makes a solid realist out of me. If that doesn't do it, the inevitable cash outlay usually sobers me up fast. This time, however, I was primed for action.

My father-in-law, a shoot-from-the-hip entrepreneur who happened to be sitting across the dinner table from me, listened to my just-hatched plan. "Look," I said, "green oak costs only forty cents a board foot from the sawmill, dried oak at the lumberyard is close to a buck and a half. If we could buy it green, and air-dry it in a year, we could sell it for eighty cents. We can't lose!" A gleam came into his eye, and when he finally spoke, it was resolved—we would go it together, he with the capital and I with the management. The next day I called in my order: two thousand dollars' worth of oak lumber, all in 1x6s and 1x4s, 12 ft. long.

Have you ever seen five thousand board feet of green oak lumber? Can you imagine it stacked in front of your house on a semi with an impatient driver, who wonders aloud why the forklift you promised would be there isn't? Have you ever stood atop a semi-trailer, heaving five thousand board feet of wet, heavy lumber board by board onto the sidewalk, working frantically, sweating, hoping the friend who'd claimed he'd be there to help would show up—and all this while curious onlookers poked their heads out of doors and windows and passing cars? Have you ever tried explaining to a policeman why you've just piled two thousand dollars' worth of green oak lumber onto a public sidewalk?

I have. Never in my life did I work so hard. The wood *was* heavy. Weeks later, when I could laugh about the experience, I figured out just how heavy. Dry oak weighs about 4 lb. per bd. ft. At that weight the pile would have weighed 20,000 lb. But this was fresh, wet wood—that extra water tacked on another 2 lb. per bd. ft., for a not-so-grand total of an extra 10,000 lb. Just knowing that the sap alone weighed five tons made me appreciate the work I had in mind for my co-worker, Mr. Air. Still, I was allowing him a full year to lift the water out of the wood, while I was in the process of moving three times as much weight in an hour.

Help did eventually arrive. I was about twenty minutes into the heap when my friend and a friend of his hopped aboard. It's an understatement to say that I rejoiced.

We finally unloaded the truck, and the anxiety of dealing with an agitated truck driver disappeared (I really shouldn't have told him I could get a forklift). We treated ourselves to a Coke, and when we returned to examine the woodpile and plan our next maneuver, there flashed a patrol car. The man in blue stepped out and scratched his chin as he surveyed the woodstack. "Uh, we've had a complaint that you're blocking a public walkway," he began, then added, "big pile of wood you got there." "To tell you the truth, Officer," I said, "I hadn't anticipated quite this much wood when I ordered it. But I *guarantee* we'll have it out of the way in an hour."

The policeman was appeased by my guarantee, though it was not well received by my two partners. Even so, they pitched in, and with new fervor the fifteen tons of grudging *Quercus alba* got moved again. Or, to look at it another way, a thousand boards got carried three at a time to their yearlong residence two hundred feet away, in an hour. That was the theory, anyway. Had I taken the time to calculate it, I would have discovered that it would take 111 trips—that works out to 8.4 miles per hour, a smart pace for three guys, each carrying a hundred pounds of flexing, tilting boards. Actually, it took us about two hours, two sweat-soaked hours. In our haste to clear the public thoroughfare, we elected to simply throw the boards in another heap and properly stack them later. My comrades thought me a tyrant when they found out that "later" meant that night, as soon as the sidewalk had been cleared.

My original plan had been to stack the lumber in my back-by-the-alley garage, but the pile soon outgrew the building and so a second stack was erected outdoors. I had done some homework on air-drying and at least I had sense enough to get the stacks a foot off the ground. I'd also planned for sticker boards, that's what the 1x4s were for. Unfortunately, I hadn't done enough homework, so I made some mistakes. I didn't know to treat the ends of the boards to forestall checking. And I didn't know that air-dried wood is not yet ready for the living room, although that was not my original concern in retailing it. (I did use some of the lumber myself, though, and found out the hard way that air-drying is not enough.) Lastly, I didn't know that sawmills that specialize in skids and pallets have a different standard of what is graded lumber than do furnituremakers. I later estimated that 25% was unsuitable for any cabinet work (about 5% was unsuitable for anything), and I found that many knots had to be cut from the other 75%. Also, the figure in much of the wood was disappointing.

As we were stacking the last boards in place late that night, I began to experience a feeling quite opposite to the one that had gotten me into this mess—despair. It was becoming clear to me why sawmill lumber is so much cheaper than store-bought cabinet wood. As we three beaten workers climbed atop my investment and gazed at the stars, one of my helpers verbalized what was deep in my heart, but unsayable: "Man, I sure hope a lot of people are planning Christmas woodworking projects—big ones."

That was four years ago. The piles of oak are a memory now. A year after they were formed, I placed a classified ad in the local paper. Calls came, then customers. They included a school shop teacher, a cabinetmaker, some do-it-yourselfers, a guy wanting to trade some used bricks for wood, and one of the guys who had helped me out that day.

Did I sell it all and double my money? Not exactly. I sold about a thousand board feet at 80¢ a bd. ft., as planned. Customers seemed quite pleased with the deal and I heard no complaints about the lumber. But before I extended the ad, another wave of euphoria swept me up. My father-in-law and I teamed up again, this time to buy a condemned building for renovation. Most of the rest of that wood went into the project as siding, paneling, doors and cabinets. I kept about a hundred board feet for myself.

In the end nothing was lost, in fact much was gained. I learned about marketing, air-drying, and human endurance. But the most important lesson was this: If you're going to handle 5,000 bd. ft. of green oak, get yourself a forklift. □

Mark Jordon teaches high school English and enjoys woodworking. 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.*

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Letting the Wood Bend Its Own Way

A flexible method for laminating compound curves

by Seth Stem

Wood sawn into thin strips and bent is almost animate in its flexibility. With the rudimentary formwork shown in the photo below, author Seth Stem laminates a stack of strips into a sweeping compound curve.

One of the most exciting ways to design with wood is to bend thin strips freely in space, letting form and line depend as much on the wood's natural flexibility as on any preconceived shape. When I first started bending wood, I discovered that the woodworking I had done before was really rigid, beginning and ending with fitting one flat plane of wood into another. I had learned little about the pliant nature of wood that makes dramatic sweeps and curves possible. Such curves may seem to be more in the domain of the sculptor than the furnituremaker, but I've found challenging, direct and practical application of these forms.

Traditionally, wood has been bent either by plasticizing it with steam or by cutting it into thin strips for wrapping around a form and layering up to thickness. This latter method suits the kind of furniture I design and build, although the technique described in this article is considerably different—instead of building the form and forcing the wood to fit it, you bend a single thin strip until you get a curve you like and then you build the form to suit. This method's real value is as a design tool. Compound curves—those which bend in more than one plane simultaneously—are difficult to envision, let alone to draw. I often find considerable disparity between the curve I imagine and the one the wood is actually able to assume. I start my lamination projects with a series of thumbnail sketches, followed by a scale model made of 12-ga. copper wire held together with hot-melt glue or tape. The model, though, takes me only part of the way through the design, because to bend thin strips of wood compoundly, you have to twist them. This process creates shapes difficult to predict with a model. I really don't know how a compound curve will come out until I actually begin bending the wood. My model, then, serves only as a guide for making a full-size, mock-up bend. Once I've bent a single strip to the curve I want, I build a simple but sturdy framework to both guide the shape of the curve and support the weight of clamps when I glue on more strips. When the bend has cured, I shape it to the desired cross-section with hand tools.

Cutting the strips—After I've made the sketches and models, I select the wood. Color and figure are a consideration, but the species' ability to bend is just as important, particularly if I'm planning tight curves. Oak, ash, hickory, beech and elm bend well. Maple, poplar, teak, mahogany, and softwoods such as pine and fir should be limited to gentler curves.

Ideally, lumber should be knot-free, straight-grained and, if possible, air-dried, since it will be less brittle than kiln-dried lumber and will bend better. If you plan severe bends, cut your laminate strips so the annual rings run across their width, and position the heartwood toward the inside of the curve, as in figure 1. If you have rift-sawn (quartersawn) lumber and you plan a severe bend, simply rip your laminae from the edges of the boards. This method is quick and you'll be able to maintain grain continuiry. If you have only plain-sawn lumber, first rip the boards to the laminate width and then resaw to the proper thickness. This method is quite wasteful, and grain continuity is sacrificed if you have to build up a thick lamination.

Strips sawn from the center of a plain-sawn board will have short grain, which is more likely to break, particularly in a severe bend. Put the fragile short-grain pieces to the inside of the curve, with the more pliable long-grain pieces supporting the outside.

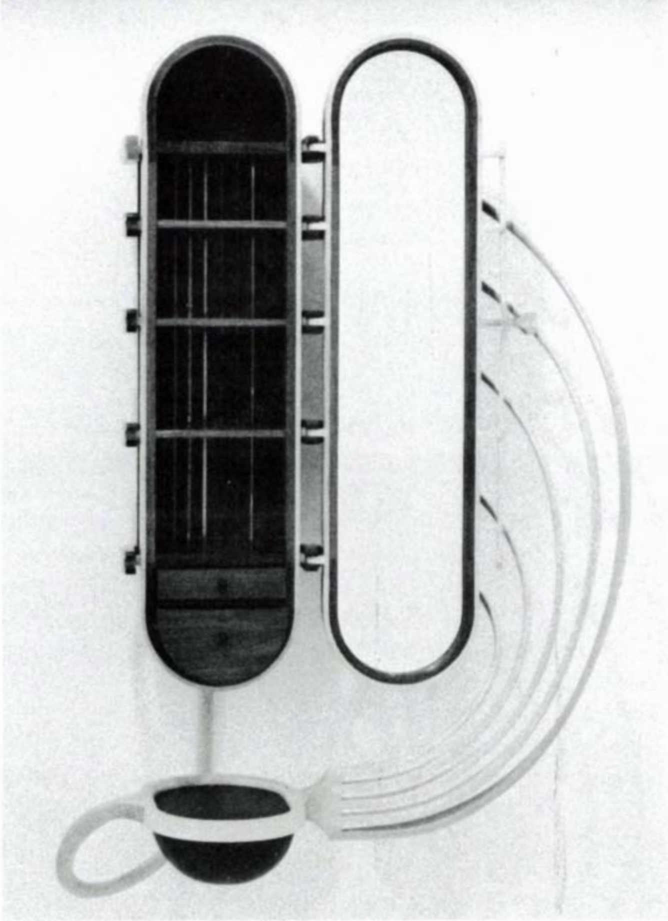
Expect about 50% waste in converting rough stock into strips. That means a board 6 in. wide in the rough will make a stack of $\frac{1}{8}$-in. thick laminae 3 in. high. The strips should be cut a few inches longer than the length of the finished curve and about $\frac{1}{4}$ in. wider to compensate for slippage, splaying, glue removal and subsequent shaping of the bend. Before sawing, I witness-mark the face of the board with a large V, as a guide in maintaining grain continuity during assembly.

How thick should the strips be? That depends on the severity of the bends. You can get a good idea of the right thickness by cutting a test strip and bending it to the breaking point. Keep in mind, though, that the moisture in the glue will relax the wood's fibers, so a sharper curve is possible than with a dry strip. Curved laminations spring back slightly; if this will create problems in your design, you can minimize it by using thinner strips. If radical curves are wanted, dry-bend the laminae in your form after they've been soaked in hot water for an hour or steamed for 20 minutes. This will make the strips easier to bend and it will lessen springback by giving the wood fibers "memory." Let the strips dry for a day or two before gluing them.

I find that a bandsaw fitted with a 4-TPI, $\frac{1}{2}$-in. or wider blade is the most efficient tool with which to cut laminate strips. It's fast and safe, and the saw's narrow kerf minimizes waste. I rig the saw with a fence or guide block set to cut a strip about $\frac{1}{32}$ in. to $\frac{1}{16}$ in. thicker than the final size I want. The extra material will be planed off later when the strips are smoothed for gluing. Rip a strip off each edge of the stock, joint both edges of the board to remove the sawmarks, and rip two more strips, continuing until the board is too narrow to be jointed safely.

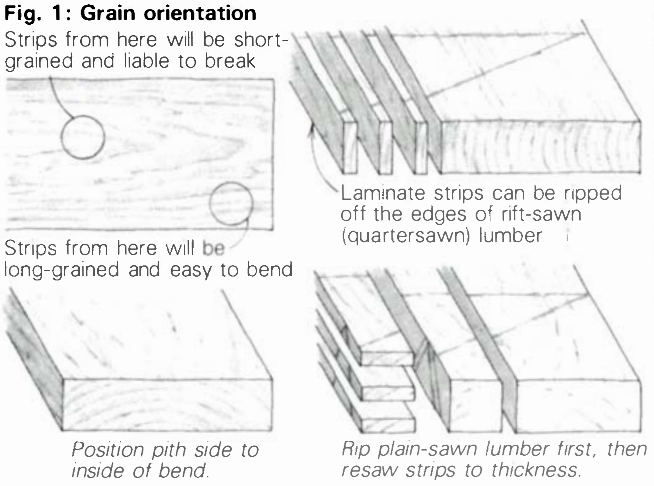
The strips will be smooth on one side, but you'll have to remove the sawmarks on the other side. To do this, I use either a tablesaw set up with a 40-tooth carbide blade or a thickness planer. The carbide blade acts as a planer, producing a clean surface excellent for gluing. Install a wooden throat plate on your saw and run the blade up through it, so the slot is the exact thickness of the blade. This way, thin strips will be supported as they pass by the blade.

The advantage of the tablesaw method is that thin or ir-

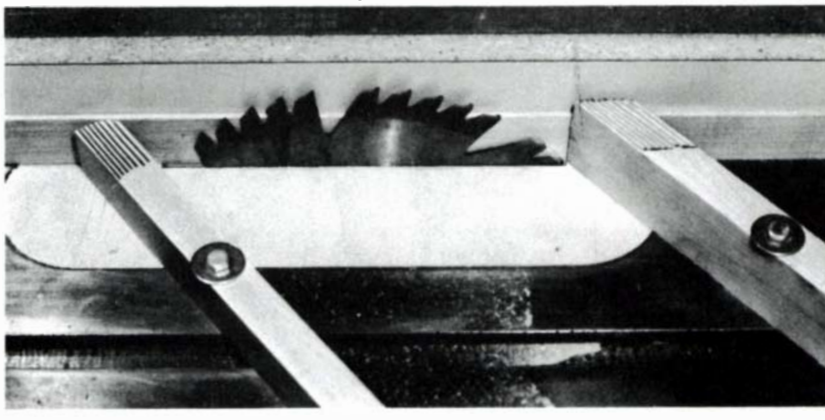


Laminated compound curves can be strong visual and structural elements of functional furniture. For this wall cabinet, Stem laminated maple strips into fluid arcs that connect the tray at the base of this cabinet to its sides.

Fig. 1: Grain orientation

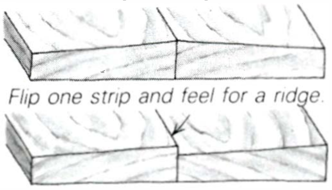


For a good glue bond, laminate strips must be free of sawmarks. One way to remove them is to attach a wooden auxiliary fence to the tablesaw and, with the strips held against the fence by featherboards bolted into holes tapped in the saw's table, pass the strips by the blade. A 40-tooth carbide combination blade will leave an excellent gluing surface.



regularly grained strips can be smoothed without tearout or breakage. But make sure the blade is parallel to the fence (not just square to the table), because any thickness error will be multiplied in a stack of strips. Check for uniform thickness by trimming two strips and laying them side by side on a flat surface. Feel the adjacent edges for a ridge. Flip one strip over, and feel for a ridge again. Any thickness discrepancy will be apparent.

To check for uniform thickness, lay strips edge to edge.



Flip one strip and feel for a ridge.

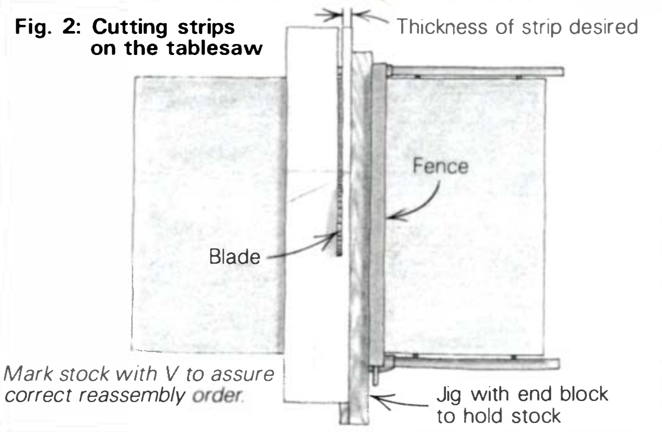
The thickness planer does a good job of removing sawmarks from straight-grained material, but it's likely to chew up figured wood, in part because thin strips bear unevenly against the machine's bed rollers, which results in uneven, grabby planing. Bridging the planer's bed rollers with an auxiliary bed made of Formica-covered particleboard or a similarly smooth material should solve this problem. I've planed veneer as thin as $\frac{1}{28}$ in. with an auxiliary bed on a Makita 2040 planer. Sharp knives, of course, will limit tearout and will leave a better surface for gluing.

Though it's more hazardous and wasteful, strips can be ripped directly on the tablesaw, without planing off the sawmarks. But I don't recommend setting the fence to the strip thickness and then ripping with little space between the blade and the fence—a repetitious operation that invites an accident. A safer way is to support the stock with a wooden form, as in figure 2. Push the form and stock forward with your right hand while applying pressure against the form, in front of the blade, with your left.

You can save yourself the waste and the relatively hazardous work of milling strips by buying $\frac{1}{10}$-in. thick veneer, a material especially well-suited for making wide bends. These sliced veneers are available in many species from Chester B. Stem, Inc., Grant Line Rd., New Albany, Ind. 47150. You may have to purchase a complete flitch, which is expensive, about $150 minimum plus shipping. But getting out your laminae from flitches saves time and makes grain-matching automatic. To cut the strips, I clamp part of the flitch to a bench, chalk lines to mark the strip width on the top piece of veneer and cut the whole stack with a portable circular saw.

Bending form—The key element of successful compound-curve lamination is the bending form. It must be versatile enough to conform to the curve, yet strong enough to hold the laminae rigidly in place during glue-up. A bend even 3 ft. long acts as a powerful lever, exerting tremendous force when a stack of laminae are bent. Nothing is worse than having parts of the form pop loose during glue-up. The fixture I describe here shows one way to support and clamp the laminae; see the boxes on pp. 62-63 for some other ideas. Any device—2x4s tacked to the ceiling and floor, steel pipes, even the shop's supporting posts—can be pressed into service, so long as it supports the laminae and remains firmly in place.

Fig. 2: Cutting strips on the tablesaw



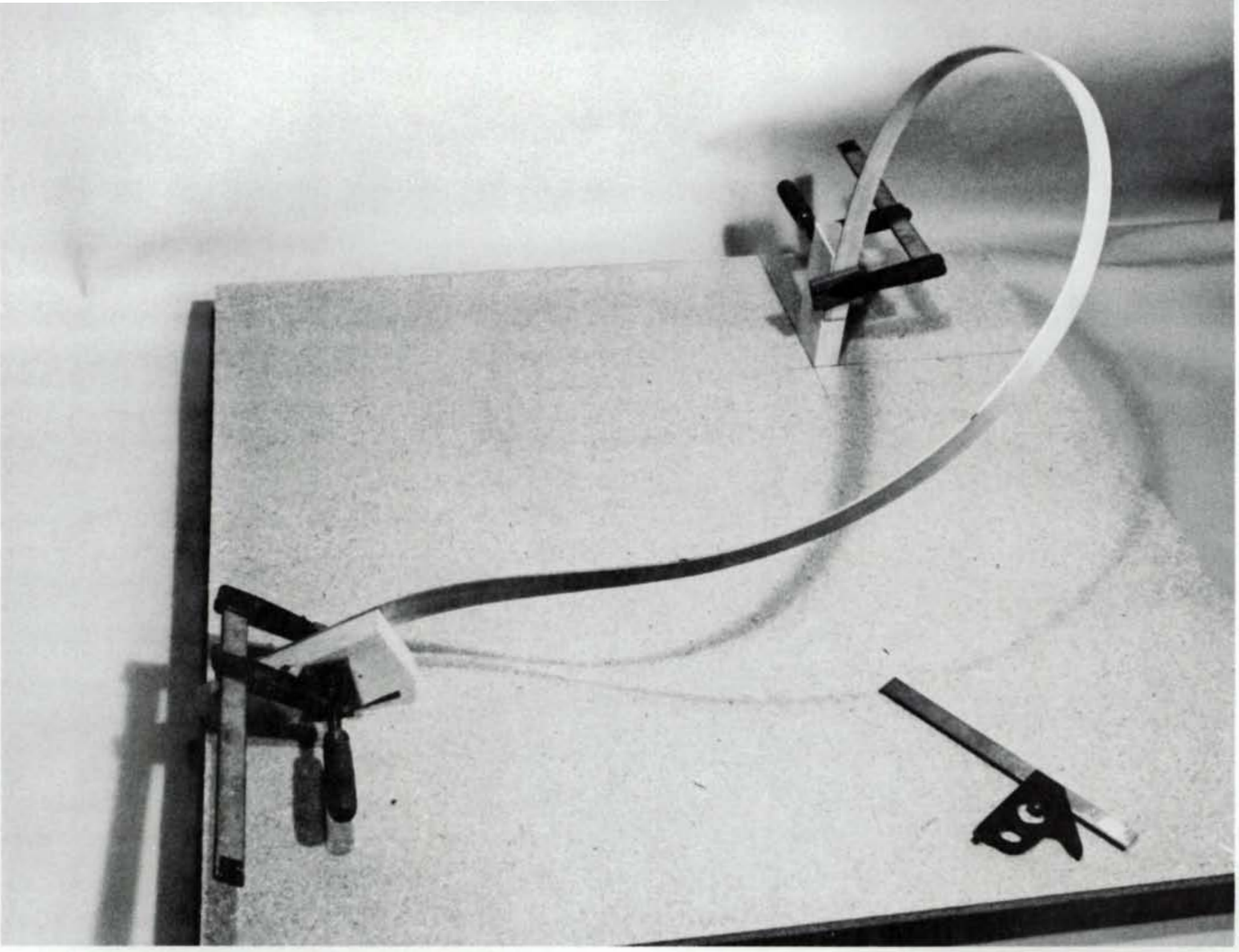
Begin the form by making a base plane, which can be particleboard or plywood if your design is small, or the shop floor if it's larger. I sometimes strike a grid pattern on the base as reference points to aid the layout of the curves, but I translate the model lines to the form mostly by eye—the spontaneous nature of this method makes it difficult to more exactly duplicate the model.

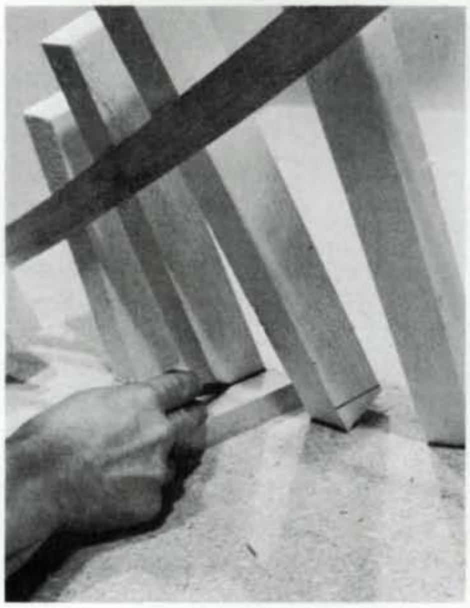
Once you've laid out the curve on the base, mark reference points where both ends of the curve will rest on it and temporarily screw down two 2x4 blocks to serve as anchors for clamping both ends of a laminate strip, as in the photo at the top of the facing page. You're now ready to try a mock-up bend—a single strip that will illustrate the actual form, and will tell you what kind of radius can be bent with a certain thickness strip and what sort of compound curve is possible.

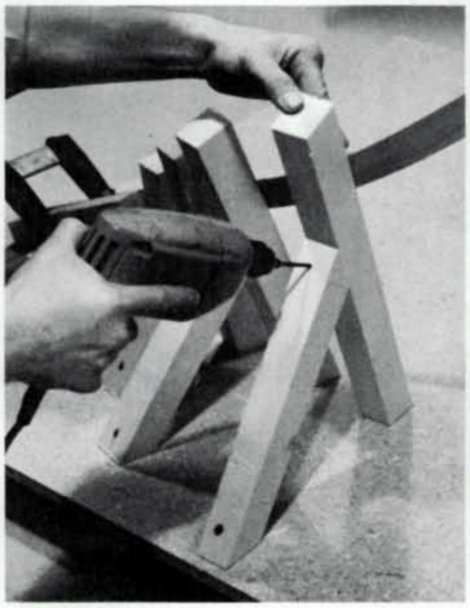
With one end of the test strip clamped down, start bending it in the direction you want it to go. Remember, strips of wood will bend easily only in one direction; you'll have to twist them to get compound bends. Take your time. Experiment with strips of varied thickness and try different bends and twists. Once you've got a pleasing curve, stand back, look it over from various angles and compare it to your model. The mock-up strip should describe fair, consistent curves with no unintended kinks, flat spots or quick turns. Don't be afraid to play around with the strip and form until you get just the curve you want.

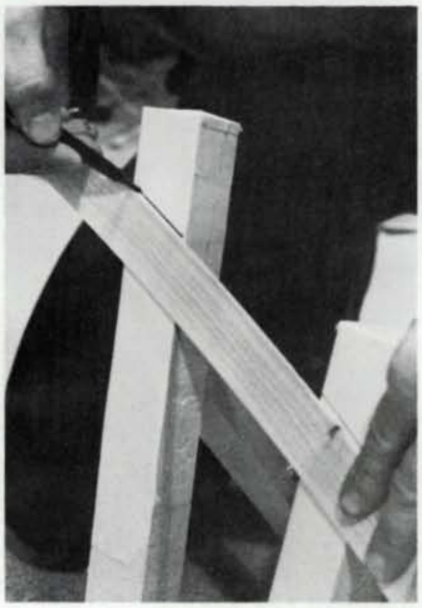
Using the mock-up strip as a guide, you can now make the bending fixture from construction lumber (2x2s, 2x4s, plywood, etc.), fastened together with hot-melt glue and drywall screws. But first rebuild the end blocks, anchoring them with stouter stock, or at least reinforce them with corner blocks and screws. Then make a series of 2x2 braces and locate them on about $2\frac{1}{2}$-in. centers, as in the middle photos on the facing page. These braces will hold the curve's position in space and will also support the weight of the clamps. You should support the curve anywhere along its length where the weight of the clamps is liable to distort the bend. But if you use lightweight clamps, such as the rubber inner tubes and bolt-clamps I'll describe later, you won't need to brace the curve as stoutly. I like to keep 2x2s, screws and hot-melt glue handy during the glue-up to shore the curve if it sags unexpectedly. To keep from gluing the bend to the form, cover with masking tape those parts of the supports that may come in contact with glue. Mark the point at which your mock-up strip intersects the braces, so you'll have a way to line up the laminate stack when you make the actual bend. Then remove the mock-up strip from the form.

Clamping and gluing—Each compound curve calls for its own clamping scheme, depending on the severity of the curve and thickness and width of the laminae. Quick-action or C-clamps will work, but if you're attempting a large bend you may not have enough, or there may be insufficient space

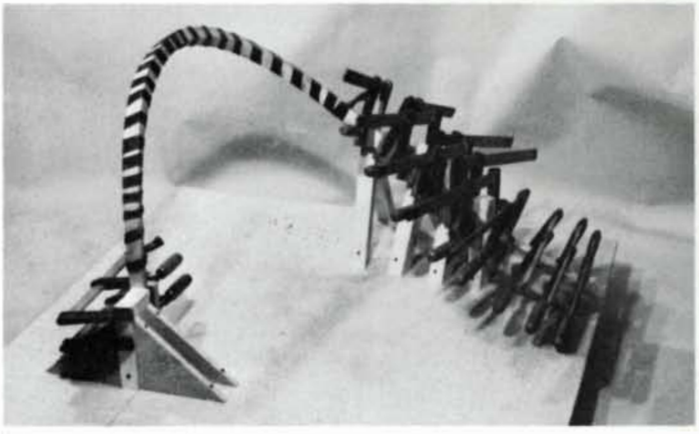






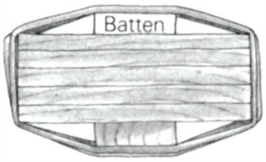


A mock-up strip determines the actual shape of the compound curve around which the bending form is built. Establish a base plane first, as in top photo—a piece of particleboard for small bends, the shop floor for larger ones—then tack down temporary anchor points. Clamp one end of the strip and start bending, twisting the strip to make it curve compoundly. When you've got the bend you want, build a form out of 2x2 lumber to support it. A scrap held against the bottom of the 2x2s. above left, provides reference for marking the base angles, which can then be cut on the bandsaw. Fasten the supports with hot-melt glue and screws, then add 2x2 braces for additional strength, above center. Before removing the mock-up strip, mark its position on the formwork, above right, so you'll be able to relocate the strips for the glue-up. Compound bending calls for clever use of clamps. For the bend shown at right, Stem used quick-action clamps, an old bicycle inner tube wrapped candy-cane fashion around the laminate stack, and shopmade bolt-clamps. Let glue cure overnight before you remove the bend from the form.



to fit them all in. Here are alternative clamping methods:

Cut the valve stems out of an old bicycle inner tube, tie off one end and wrap the tube around the laminae in a spiral, candy-cane fashion, stretching the tube as you pull it tight. Inner-tube clamps don't work well on laminations over 2¼ in. wide because the pressure bears mostly along the edges of the strips. Laminations wider than 2¼ in. can be clamped by this method if a ¼-in. thick strip is used as a batten between the inner tube and the laminae, as in the drawing at right. Rope or heavy string can be used similarly, though it doesn't have the elasticity. It is good for adding pressure to trouble spots.



Lightweight, inexpensive clamps can be made of two 1-in. by 1-in. by 3½-in. wood bars connected by two ¼-in. or 5⁄16-in. bolts or threaded rods, as in figure 3 on the facing page. A slot in the top bar allows the clamp to be put in place quickly, with both top nuts already started. Wax the wood parts to resist glue. The bolts can be spun on quickly using an electric drill fitted with the socket adapter shown in the drawing. As the laminae are bent, their edges will sometimes splay out of alignment, especially if clamps are tightened unequally. A handscrew, clamped across the edges of the

A platform fixture for a fancy table

by Baile Oakes

When I was commissioned to design and build the white ash dining table shown below, I worked out the forms and jigs as I went, starting with a sturdy, perfectly level platform fixture built of plywood and 2x4s, around which the bentwood table grew.

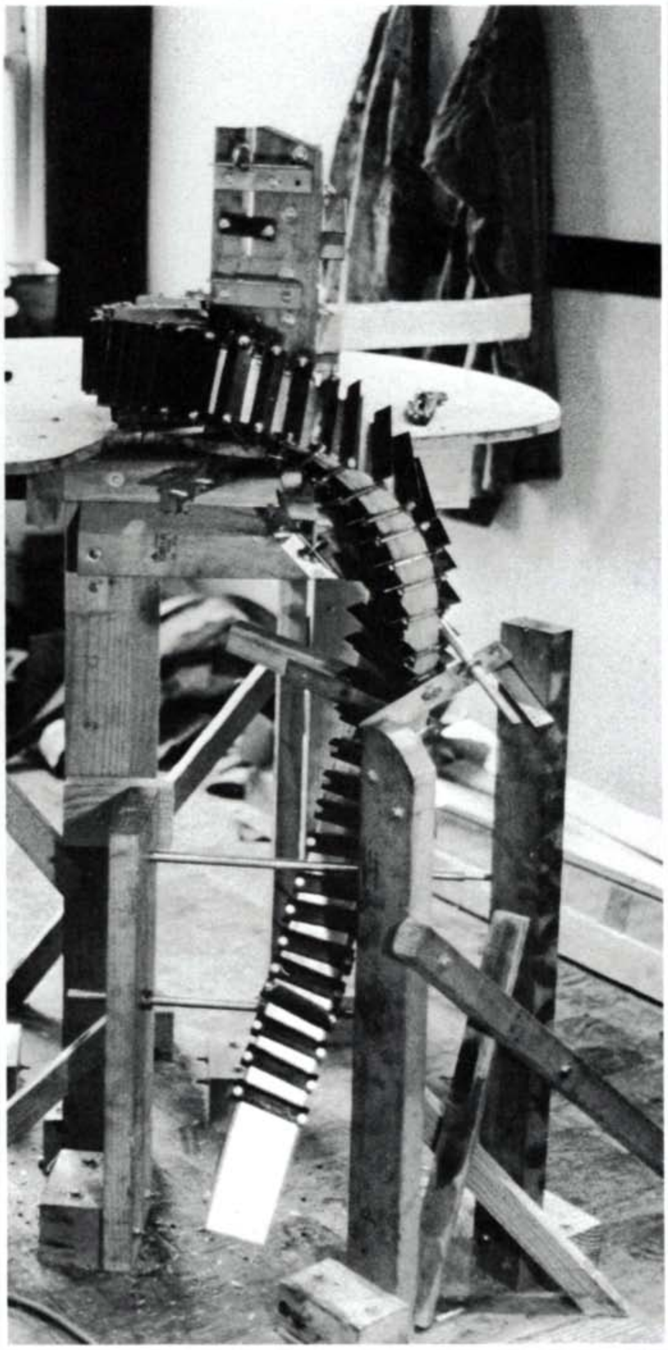
I first transferred to the fixture table a full-scale plan view of the bends that form the table's rails. Where the legs sweep up to join the rails, I fashioned a form and then anchored a single laminate strip which I bent and twisted until I got the leg shape I wanted. The legs were glued up by bending all the laminae at once, supported by a form of steel rods and angle iron. I put a strip of sheet metal between the clamps and the outermost laminae to spread clamping pressure and to protect the wood against marring.

So I would have less shaping to do, I tapered the leg laminae in a thickness sander, using a form similar to the one described in *FWW* #14 on p. 49. With complex compound bends like those on this table, I use epoxy glue from Chem-Tech, 4669 Cander Rd., Chagrin Falls, Ohio 44022—its 4-hr. working time is a necessary luxury because the bends take so long to complete. My shopmade clamps are similar to Seth Stem's, but instead of wood bars I use steel strap, angle or channel iron connected by 5⁄16-in. machine bolts. To keep the laminae from splaying, I put the clamps in place finger-tight before I make the bend.

After the glue cures, I shape the laminae with a drawknife, Surform, spokeshave, file, cabinet scraper, and airbag sander, pretty much in that order. The table shown was dyed a rosewood color with powdered dyes and then finished with an oil/varnish mixture. □

Baile Oakes makes furniture in Westport, Calif. Photos by the author.

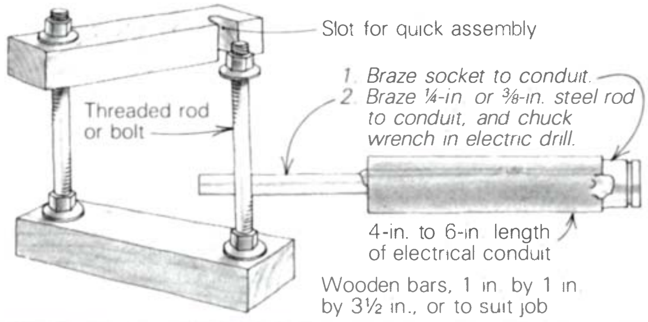
In compound-bend laminating, the bending form can sometimes be as involved as the object it's intended to produce. For this glass-topped white ash table, left, Oakes made a platform fixture from plywood and 2x4s. He made dozens of clamps out of steel strap, angle or channel iron connected by bolts or threaded rod.



strips, will push the stack back into alignment.

The ideal glue for bent lamination should have a long working time and a high resistance to gradual slippage or cold creep, as the laminae try to straighten themselves out after the bend. The glue should also be sandable after curing, without it gumming up sandpaper or abrasive discs. An adhesive called Urac 185 (made by American Cyanamide) meets these requirements. It is sold in quarts and gallons by Nelson Paint Co., PO Box 907, Iron Mountain, Mich. 49801. Urea-formaldehyde glues (such as Weldwood's Plastic Resin) work nearly as well and are sold by most hardware stores. Urea-formaldehyde glues are powdered resins which, when mixed

Fig. 3: Shopmade clamp and socket wrench



Bending with the help of steel hands

by Steve Foley

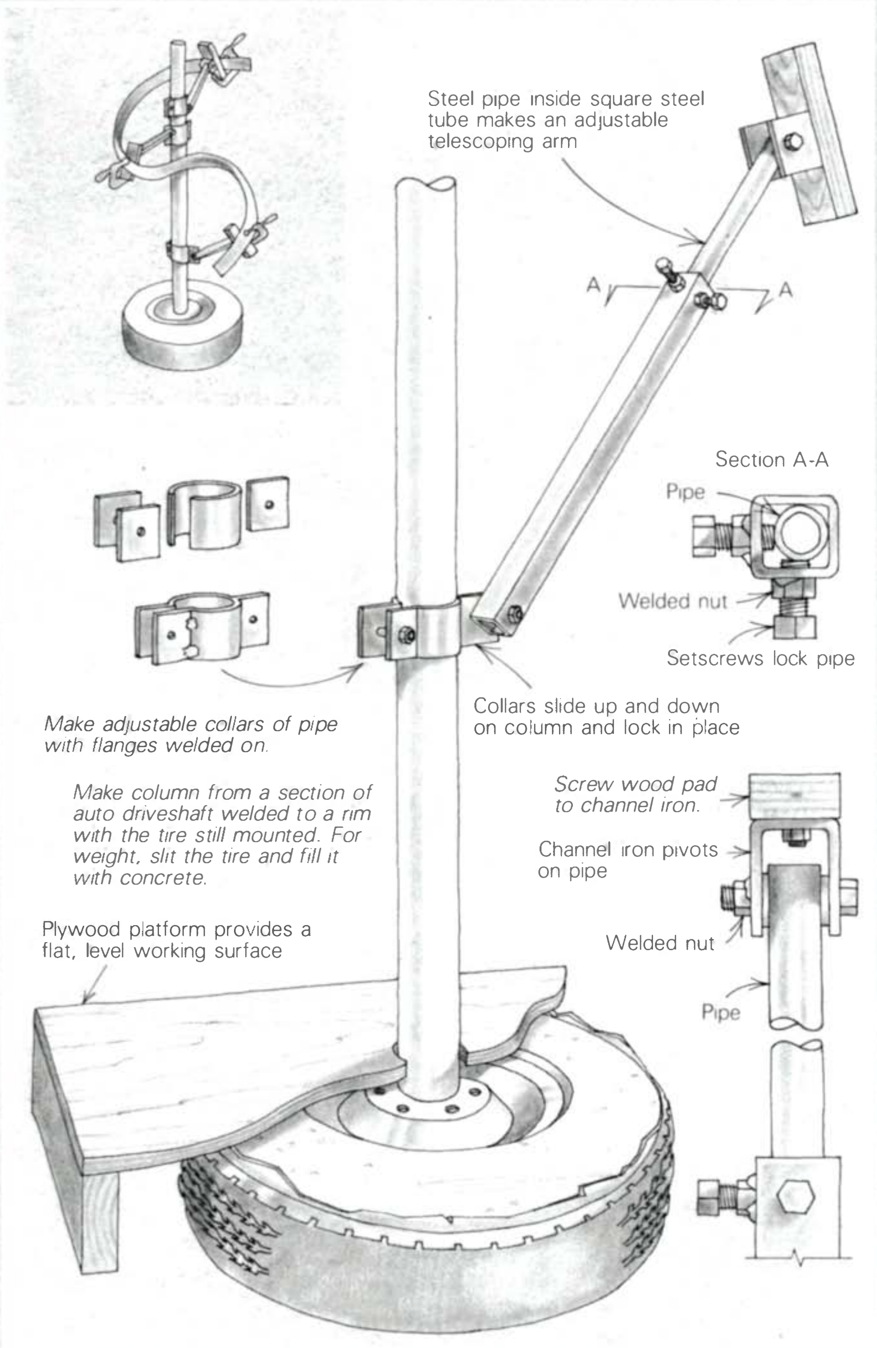
Playing around with a pliable strip of wood is an illuminating but sometimes frustrating way to arrive at compound curves. If you grab one end of a thin strip and start bending and twisting, any number of shapes will emerge—you'll sense, however, that even more would be possible if you could just grab the thing in the middle and give it a twist this way *and* that.

Having spent many hours yearning for more bodily appendages to do just that, I have developed this universally adjustable device which can lock onto various points of a wood strip twisted and curved in space. The idea is to bend a strip using the fixture as extra hands, and then build the necessary formwork around the strip to support clamps when you glue up more strips. This device is good for one-shot pieces, but I've also found it invaluable for building forms that can be reused.

All the materials were gotten from the local welding shop/junkyard—one of those places where they weld up leaky gas tanks with the gas still in them. You could substitute any kind of scrap parts you can get, so long as the device is adjustable yet rigid when all the parts are snugged down.

As the drawing shows, the fixture consists of a central column with adjustable telescoping arms that can be positioned anywhere to support a strip. Build as many collar-arm assemblies as you think you might need. Though my device is rather cumbersome, it works, especially with helical bends. And it was put together on a budget, always a preoccupation in the small shop. It can be modified for individual needs, and I'd like to hear about any improvements or refinements anyone can suggest. □

Steve Foley works wood in Lake Oswego, Ore.

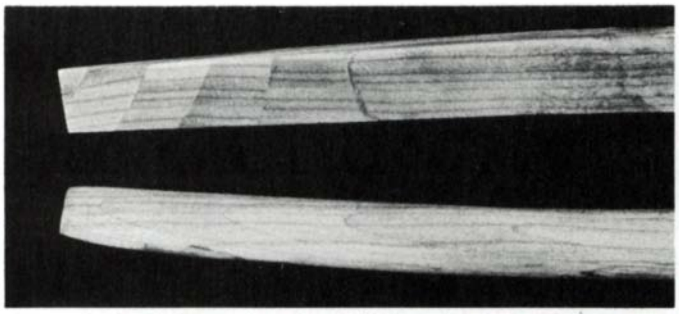


with water, have a working time of about 20 minutes under normal conditions, less if you're working in a warm shop. Working time can be extended by chilling the glue in a refrigerator or by adding ice cubes to the mixture.

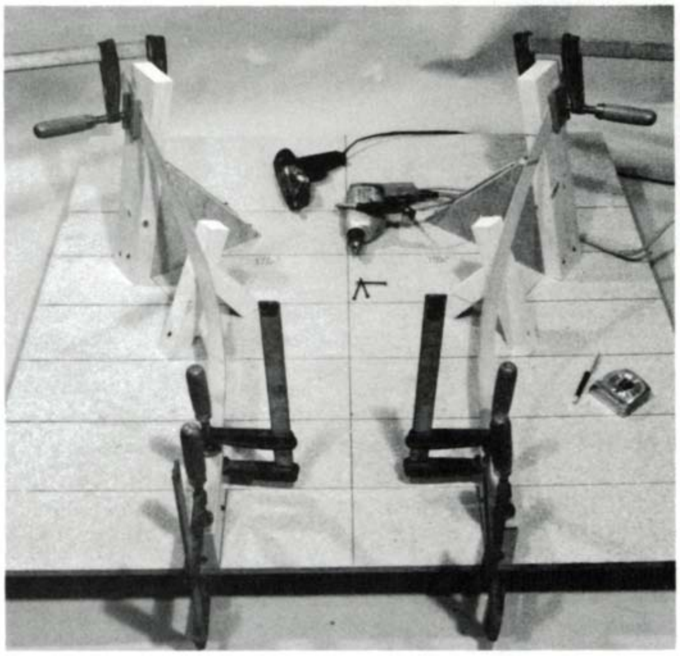
For a proper bond, the glue must be well mixed and lump-free. Also, make sure you store these glues in tightly sealed cans—premature contact with atmospheric moisture will crystallize the powder, ruining its bonding qualities. You could use yellow glue (aliphatic resin), but it is thermoplastic and thus quickly gums up and ruins sanding discs and belts. I never use white glue; it has little resistance to cold creep.

Glue-up is messy work. I suggest you do it on a bench covered with newspaper or plastic. With a brush or a 2-in. wide paint roller, apply glue to both sides of all but the outermost two laminate strips.

When all the strips are coated, align their edges and clamp one end of the stack in the form. As you make the bend, the glue-coated strips will resist, but you'll feel them sliding past each other as they seek mechanical equilibrium. Continue the bend, lining the strips up with the marks on the supports. Take your time—don't force the wood where it doesn't want to go, or you'll open up gaps between the strips.



A graceful, dramatic compound bend can be ruined by insensitive shaping. Angular shaping of the top lamination in this photo has exposed gluelines and reveals a discordant grain pattern. The lower one was rounded and the resulting shape is more harmonious with the wood's figure.



Furniture often wants symmetrical or mirror-opposite bends, for looks and strength. To make such bends, draw a grid on the formwork base as in the photo above, and locate the supports for both curves on the same lateral lines, equidistant from the grid's centerline.

Start clamping at one end of the bend and proceed to the other, thus forcing out gaps between strips. With inner-tube clamps, wrap the strips before you actually make the bend. This will reduce splaying and will also make tighter radii possible (the inner-tube wrapping supports the outer strips against breaking, and since the inner tubes stretch during the bend, they apply more clamping pressure). But bend *slowly,* so the individual strips can slide by each other to conform to the curve.

When the curve is all clamped up, check for open gluelines and use your finger to scrape off the oozing glue. Close any gaps with additional clamps.

Clamping time depends on temperature and humidity. Urac 185 and urea-formaldehyde adhesives will usually cure overnight. Check the cure with a chisel. If the hardened squeeze-out chips like glass, it's set; if it dents or gives, don't remove the clamps, or delamination is likely.

Shaping and sanding—After the glue has set, remove the clamps and unwrap the inner tubes. Sand off excess glue with a 16-grit to 36-grit abrasive disc on a body grinder or on an electric drill. Be careful not to remove too much material at this point. Once the glue has been cleaned off, you can further shape and refine your bend with a #49 cabinetmakers' rasp or a half-round Surform plane, followed by a cabinet scraper. Be sensitive about your shaping, however. Cutting into the face of the laminae is likely to reveal unattractive, randomly spaced gluelines. Better to use soft-edged, rounded shaping that will produce forms more sympathetic to the wood's grain patterns and to the shapes you are likely to build using this method of lamination.

Drawknives, spokeshaves, planes, knives and other edge tools can be used for shaping, though I prefer abrasive tools, especially for initial cleanup. Holding a bend for shaping sometimes calls for resourcefulness, but a quick-action clamp or a patternmakers' vise will usually do.

One or more completed bends can be joined together with conventional joints such as a mortise and tenon or a spline. As you would expect, these joints are difficult to lay out, so I prefer to simply design my bends so that they merge smoothly and can be glued long-grain to long-grain. For a better glue joint, flats can be planed on the bends along the length of the joint.

Used singly or joined together, laminated shapes can be strong elements—visual and structural—of chairs, cabinets, tables and other functional furniture. Before I learned this technique, I felt my woodworking constrained by method—my designs were too often dictated by the processes I was familiar with and, in retrospect, I had a lesser understanding of what wood as a material is truly capable of. Now I have a larger technical vocabulary with which to express my ideas, and one flat plane fitted into another is only a small part. □

Seth Stem teaches furniture design and construction at the Rhode Island School of Design in Providence, R.I. Photos by the author; drawings by David Dann. For more on lamination, see FWW *#6, p. 35; #7, p. 62; #14, p. 48; and #17, p. 57. Two books on the subject are* Tage Frid Teaches Woodworking: Shaping, Veneering, Finishing, *by Tage Frid, published by The Taunton Press; and* The Wendell Castle Book of Wood Lamination, *by Wendell Castle, published by Van Nostrand Reinhold Co.*

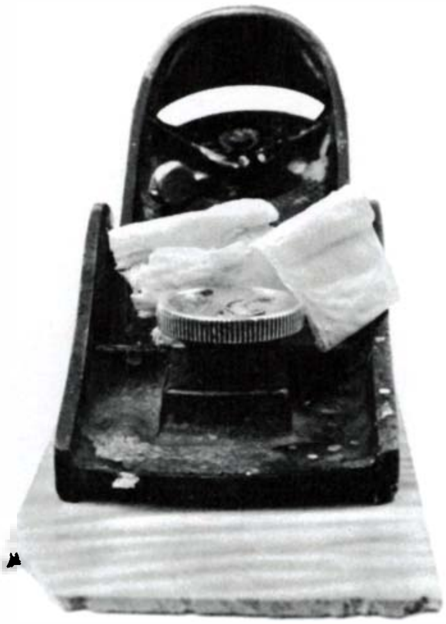
Souping Up the Block Plane

It's a matter of geometry, plus perception

by Richard S. Newman

Imagine trying to hand-plane a strip of curly maple sawn to one-sixteenth inch thick, or a one millimeter ebony veneer. This is daily work for luthier Robert Meadow, who creates exquisite lutes of exotic and highly figured woods. As every musician knows, some instruments must be forced to make sound, while others sing at the slightest touch. So it is with tools. Meadow's planes consistently take shavings you can see through, the full width of the iron and the full length of the board.

This is not just extraordinary skill at work. Meadow has spent years investigating how edge tools work. His desire to share his experiences has led to the formation of a school providing intensive instruction in hand-tool work, and to frequent workshops across the country where he impresses audiences with his ability to plane the nastiest wood. I visited Meadow at his school and workshop in Saugerties, N.Y., and discovered that he has evolved to almost exclusive use of Japanese edge tools, both in his own work and at his school. He is convinced that these tools are the ultimate solution to cutting wood. I wasn't ready to take that plunge, so I asked him to share his earlier work with metal planes. In this article I'll describe how Meadow would turn an ordinary block plane into a fine finishing tool.



This tuned block plane easily smooths a curly maple strip that showed severe tearout after a pass over the jointer.

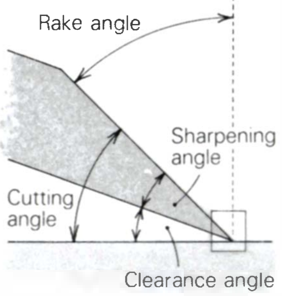
To begin with, Meadow claims that for fine work, hand tools are a practical, even superior, alternative to machines and abrasives. Planes remove wood a lot faster—and cheaper—than sandpaper. The surface is clearer, feels better and is far more beautiful than an abraded one. Of this last I have no doubt, as Meadow later planed half of a ¹⁄₁₆-in. curly cherry veneered tabletop for me on a visit to my own shop, in order to relax after a trying workshop. His surface was so much better than the adjacent sanded surface that I was inspired to tune up my own planes in order to complete the job. You can test this by applying a coat of oil to a wood surface sanded as smooth as you can get it. The oil will soak into the minute scratches that were left by sanding, leaving a dull surface that will require many coats of oil to improve. Apply oil to a planed surface and even the first coat will gleam.

Meadow says, "Tools, hand and power, are really only kits as they come from the manufacturer." Getting the most from a tool means not only mastering its use, but understanding how its design works and tuning it, or even reworking it, to do its job. A razor-sharp edge won't take a good shaving if the plane's bed is warped, nor will a perfectly lapped sole help a plane if its blade is sharpened at an inefficient angle. All the components must be balanced.

In order to soup up a plane, we must try to understand what happens between the cutting edge and the wood. Textbooks contain complex formulas on the subject, but Meadow bypasses the mathematics and goes directly to the results, talking in terms that craftspeople can understand.

A balance of forces—There is a complex balance of forces and resistances when you plane wood. *Back pressure* is the sum of all forces acting to keep the cutter out of the work. Some back pressure is due to the resistance of the wood to being cut, and some comes from friction generated by the plane's sole. Too much back pressure requires excessive effort. *Cutting pressure* is the force the blade exerts as it cuts the wood. A sharp blade working at the correct angle exerts only a small amount of cutting pressure, just enough to sever the wood fibers right at the cutting edge. If the pressure at the edge overcomes the fiber strength of the wood very far ahead

Fig. 1: Plane geometry



*A secondary microbevel deliberately honed onto the face or back of the plane iron will increase its cutting angle (**A**) or reduce its clearance angle (**B**). This can help you in dealing with ornery woods, reduce deflection and chatter, and prolong the life of the edge.*

*Honing the iron with a soft strop or a buffing wheel is liable to add an unwanted, rounded microbevel. On the face of the iron (**C**), a rounded bevel will increase the cutting angle. On the back of the iron (**D**), it may so reduce the clearance angle that the iron can't cut at all. Bearing down too hard while sharpening is liable to reduce the sharpening angle and leave a fragile edge (**E**).*

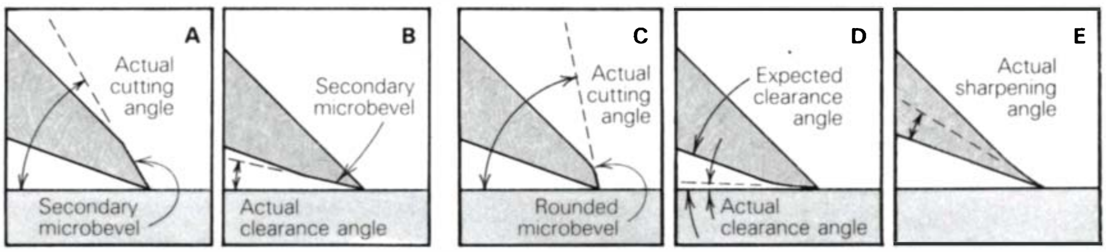
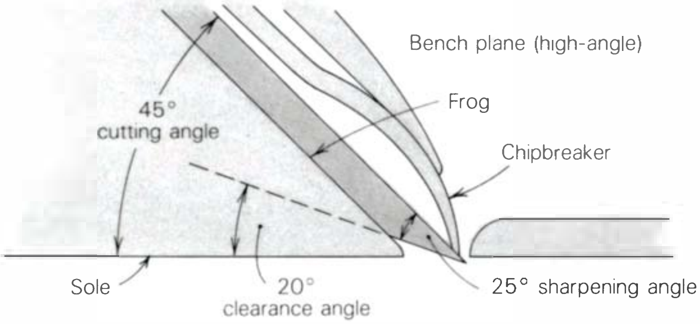
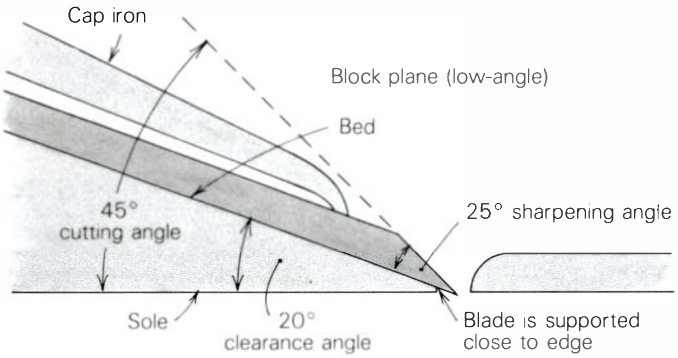


Fig. 2: Bench plane vs. block plane



A high-angle plane and a low-angle plane can both have the same clearance angle, the same sharpening angle and the same cutting angle. But the low-angle plane suffers less from deflection and chatter because its blade is better supported at the cutting edge.



The block plane's cutting angle can be adjusted by honing a secondary microbevel on the face of its iron, and this change does not affect its clearance angle. But a secondary bevel on the bench plane's iron reduces only its clearance angle, without affecting the cutting angle.

of the blade, hardwoods will tear out, and softwoods will compress and crush. *Leverage* refers to the tendency of the cutting pressure to bend or deflect the blade at the cutting edge. Leverage varies according to the bed angle, the cutting force and how well the plane body supports the blade.

Edge geometry—The geometry of the cutting edge—its cutting angle, sharpening angle and clearance angle—are familiar concepts, but they can be deceptive (figure 1, p. 65). Slight changes in the angles right at the cutting edge, made by microbeveling or stropping, can yield actual working angles that are very different from those built into the plane. These angles can easily be varied and balanced to suit particular jobs.

The *cutting angle* affects the amount of cutting pressure and the way it is applied to the wood fibers. Softwoods generally require a lower cutting angle than hardwoods, otherwise the wood can crush ahead of the blade. On highly figured hardwoods, a low angle introduces a riving action that causes tearing out. Western planes have a variety of cutting angles ranging from bench planes at 40° to special scraping planes at 115° or more. For a block plane, the cutting angle is actually determined by the *sharpening angle*, as shown in the comparison between the bench plane and the block plane in figure 2. By varying the bevel angle or by adding a microbevel not much wider than the shaving is thick, you can, in effect, change the design of the plane. On a bench plane, the sharpening angle is a compromise. The lower it is, the sharper the edge (but thinner, more fragile and more subject to deflection); the higher the angle, the sturdier the edge, but increasing the sharpening angle simultaneously reduces the *clearance angle*.

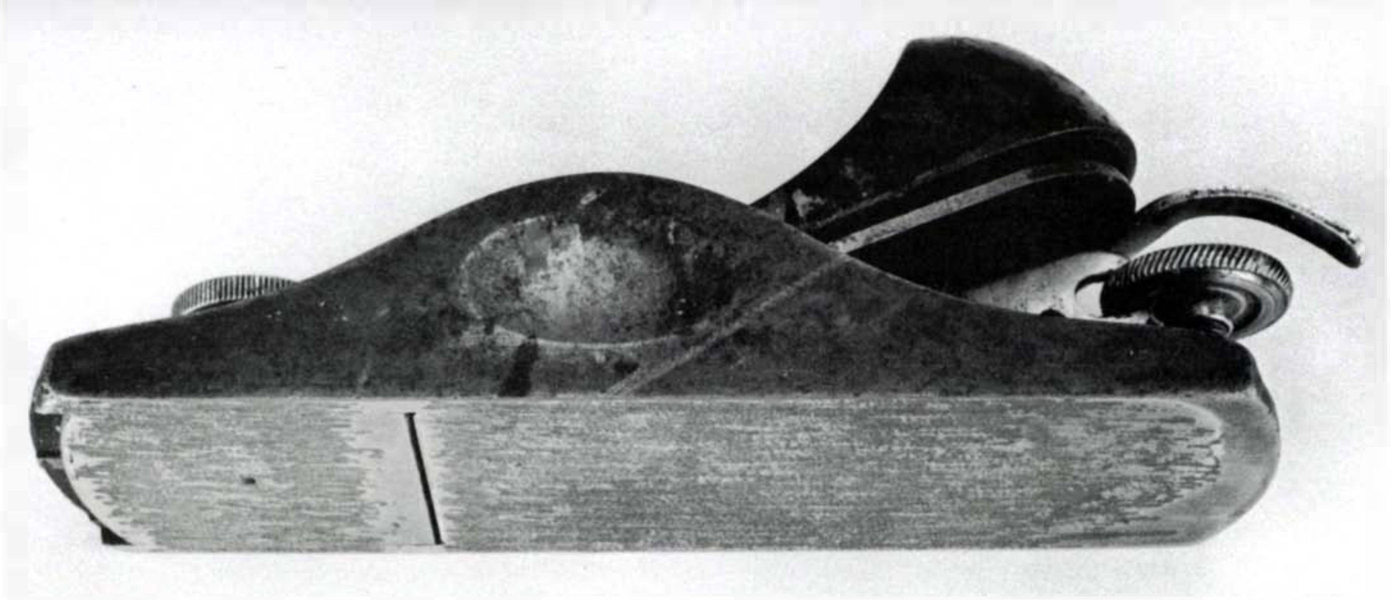
Clearance reduces back pressure. The cutting edge must press downward, thus compressing the wood as it works, but the wood springs back immediately after the cut. The clearance angle makes space for this expansion. Harder woods require less clearance, while softer, more compressible woods require more, but all woods require some. Insufficient clearance causes friction that heats the cutter, dulling it quickly. A plane iron loses clearance as it dulls. This tends to hold the blade out of the cut, so that the plane skids without cutting.

Why choose a block plane?—Metal planes can be divided into two basic types: bench planes (high bed angle, bevel down) and block planes (low bed angle, bevel up). These planes can look very different yet have essentially the same clearance angle and cutting angle. The ubiquitous Stanley and Record bench planes are a good example of high-angle design. The cutting angle is set at 45° by the frog, and the clearance angle varies according to the sharpening angle. These planes suffer badly from leverage problems and blade deflection, causing chatter and torn wood, because the blade is not supported close to its edge. This weakness is compensated for by the chipbreaker, a misnomer, as its function is more to pre-stress the cutting edge than to break the chip.

In a block plane, clearance is built into the design by the plane's bed angle. This angle is usually either 20° (Stanley No. 9½) or 12° (Stanley No. 60 or 65). Because the block plane's iron is mounted bevel up, clearance can be modified only by adding a microbevel to the back of the blade, or by stropping. The bed supports the blade right up to the edge, effectively eliminating leverage problems. The cutting angle is variable, determined by the sharpening angle. Meadow says that most woodworkers will find a low-angle block plane to be the best bet for tuning up as a fine finishing plane.

Tuning a plane—For this article, we modified an old No. 9½ block plane. Start by making sure that the back of the blade is perfectly flat, by truing it on a series of stones, on plate glass with carborundum powder, or on diamond-coated steel plates (EZE-Lap-Diamond Sharpening Products, Box 2229, Westminster, Calif. 92683). Then check the mating of the blade to the bed, especially right at the throat. Coat the back of the iron with machinists' layout dye or artists' oil paint (phthalo blue works well) and position it on the bed. When you remove the iron, blue dye on the bed will mark high spots that need to be filed down. If there is any space at all between the iron and the bed, it will fill with dust as you work, deflect the edge, and cause uneven shavings. Remove the burr left by hand-filing, then square up the front edge of the bed by filing a narrow land, just wide enough to see.

Now flatten the bottom of the plane, with the blade tightened in place so the plane body will be stressed as in use. Lap the sole flat or have it ground flat by a machine shop (*FWW* #35, p. 87). This cures the common problem of a store-bought plane that bears down most at its ends, leaving the plane body unsupported at the cutting edge and inviting chatter. The plane actually needs to bear only at its throat and at both ends of its sole. Meadow speeds the flattening process by using a ball mill in a Dremel tool to hollow out parts of the sole, much as the Japanese relieve the soles of their wooden planes. This looks terrible, but it reduces friction and back pressure without affecting the tool's stability.



Its sole relieved with a ball mill to cut friction, the plane bears only at its ends and its throat, and leaves a smooth surface.

Now the iron must be properly sharpened. Meadow shapes his bevels flat, not hollow-ground, in order to limit deflection. He shapes the primary bevel to about 25° and then hones the secondary microbevel to whatever angle works best. Steels vary. For any blade, if the sharpening angle is too small, the blade will tend to chip. If the angle is too large, the blade will get dull a little more quickly. It's a lot easier to hone a blade sharp again than it is to reshape a chipped edge. So each time he hones a particular blade, Meadow gradually makes the sharpening angle smaller until the blade starts to chip, then he retreats. The ordinary alloy-steel iron in the No. 9½ plane is prone to chipping even when sharpened at 25°, so we thickened it up by putting a few degrees of microbevel onto its flat back side. This simultaneously reduced the plane's clearance angle, which is generally not a good idea. But the 20° clearance angle built into the No. 9½ is several degrees more than necessary for planing hardwoods anyway.

The edge of the plane iron should not really be straight but slightly convex, so that a full-width shaving will feather out to nothing at its edges. Meadow makes this curve by bearing down more at a corner as he sharpens. The amount of curvature is greatest on a roughing plane and least on a fine plane: it should approximate the thickness of the shaving.

Meadow cautions that too much pressure when sharpening distorts the metal at the cutting edge. When the metal springs back, the blade has an actual sharpening angle smaller than anticipated. This results in too thin an edge which, although sharp, will quickly break down.

Meadow does not use a leather strop because its surface is too soft. It rounds over the edge, changing the plane's geometry. Instead he makes a hard strop from fine-textured wood—cherry, pearwood, poplar or basswood—planed even and smooth, not sanded. He then rubs a little wet mud from his waterstones onto the wood. When the abrasive mud dries, the strop is ready. Meadow recommends the same procedure for honing carving gouges. Take a pass with the tool on a piece of scrap, and you've made a wooden slip-strop that matches its curvature. After stropping, Meadow washes the blade and his hands in clean water to remove abrasive particles, and then wipes the blade dry and laps it on the palm of his hand.

Adjusting the throat opening is the last step before making a shaving. The throat should be narrow enough to compress the wood ahead of the blade, but when the blade is sharp, the throat opening isn't critical—tearout will be prevented mostly by the geometry of the cutting angle. As the blade dulls, narrowing the throat will eliminate some tearout, but friction and heat will increase the rate at which the blade dulls, and may even draw the steel's temper. Again, a balance is necessary.

Now the plane should work perfectly. If he encounters problems with a plane, Meadow doesn't automatically blame the cutting edge, but rather looks to see if the planing action is imbalanced. The tightness of the cap iron, for instance, affects both the plane body and the blade. When your plane is set up perfectly, you will find that you can vary the thickness of the shaving just by tightening or loosening the cap iron.

Meadow quotes the Japanese saying, "A master is the person who sharpens least and has the sharpest tools." The real enemies of a sharp edge are friction and impact. Dragging a plane backwards across the work, between strokes for instance, dulls the blade, as does too narrow a throat or insufficient clearance. The most dulling part of the cut is the impact of forcing the edge into the wood in the first place. As long as the edge is firmly in the cut, and doesn't chatter, it dulls relatively slowly. A well-tuned plane helps keep edges sharp. Meadow adds that oiling the cutting edge reduces friction. A thin film wiped on with the fingers is enough, but it must stick to the blade and not be wiped off. Meadow uses camellia oil, but olive oil also works well.

The next step in tuning up a plane, Meadow says, would be to replace the standard blade with one made of laminated steel. Japanese plane irons are laminated, but practically impossible to fit into a metal-bodied plane. Another possibility is to use an old iron from an antique wooden-bodied plane. These heavy, tapered cutters are made of mild steel with a forge-welded edge of high-carbon steel. The qualities of the carbon steel and the forging process create an iron that is capable of taking and holding a much keener edge than the alloy steel used in modern irons, which compromise cutting qualities for ease of manufacture. It would probably be easiest to adapt a laminated iron to a bench plane rather than to a block plane; some ingenuity would be required, but in the long run it might be well worth the trouble.

In woodworking, as in any discipline, the best work can be done only when our tools inspire us. Whether they are antique or modern, Western or Japanese, the challenge is to use them to their fullest potential. But in the end, says Meadow, a craftsperson's most valuable tools are his or her own perception and understanding. □

Richard Newman is a furnituremaker in Rochester, N.Y. Robert Meadow's school is The Luthierie, 2449 West Saugerties Rd., Saugerties, N.Y. 12477.

Sharpening to a Polished Edge
A cool, easy grind and a hard felt buff

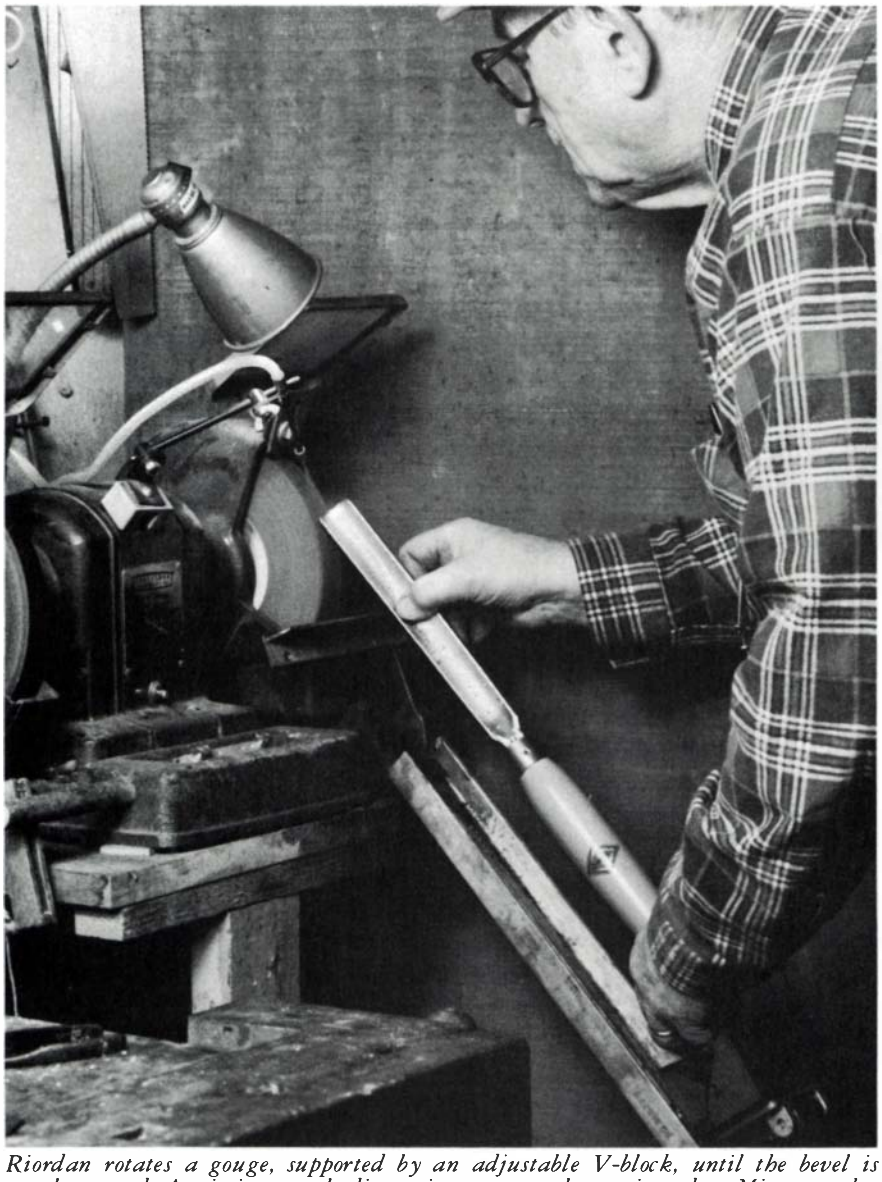
by Charles F. Riordan

I've heard so many craftsmen complain about the length of time (and the expenditures for equipment) involved in bringing tools to a razor-sharp edge that I feel I must pass on the sharpening method I've evolved in the fifty-odd years I've been making shavings and sawdust.

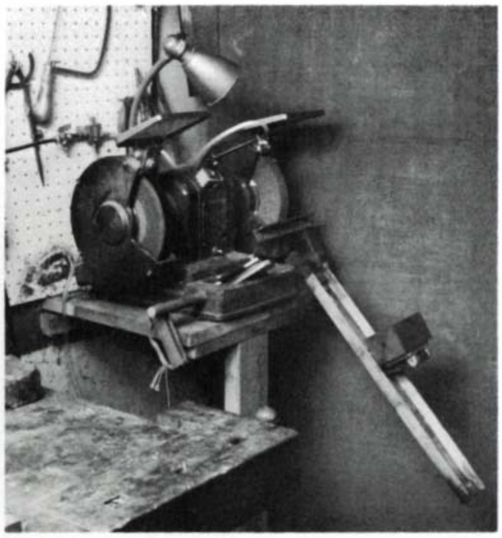
My first mentor taught me to do it all by hand, using three grades of oilstones, with the final edge honed on a waterstone like those used to prepare a straight razor for the final stropping. After all these years I can still hear him saying, "If you can't shave with it, don't try to carve with it." While I can't disagree with his goal, his process was, at best, tedious. I began to search for methods that would let me spend more time using my tools than I was spending sharpening them.

An interest in gunsmithing led me to take courses in machine-shop practice, patternmaking and toolmaking. This, coupled with several years of machine-shop experience during World War II, taught me that there was a great deal more to sharpening a tool than scrubbing it back and forth on a flat stone, oil or otherwise.

I learned, to my surprise, that a coarse-grit grinding wheel properly dressed with a diamond dresser could remove metal faster than a fine-grit wheel, and leave a very good finish, with less chance of burning. And I found that using mist to cool the edge while grinding practically eliminates burning.



Riordan rotates a gouge, supported by an adjustable V-block, until the bevel is evenly ground. A misting nozzle directs its spray at the cutting edge. Mist, together with a light touch, keeps things so cool that there are hardly any sparks.



Riordan's full rig consists of an 8-in., 36-grit aluminum-oxide wheel, a misting device, a rest that maintains the proper angle, and a hard felt wheel. To sharpen plane irons, below, he uses a tool holder that slides parallel to the diamond-dressed face of the wheel. The safety shields have been lifted for the photos.

Photos: Sharon Burr

Then I discovered that buffing the ground edge on a hard felt wheel charged with gray compound would leave a razor edge. I also learned that to produce a good, even bevel on a tool, a positive rest (for gouges and small chisels) and a holding jig (for plane blades and wide chisels or skews) are absolute necessities. I have seen the results of freehand grinding by craftsmen who really thought that they were getting good results, until they tried sharpening with my rig.

The grinder I use is an old model Craftsman (Sears) $\frac{3}{4}$-HP with an 8-in., 36-grit wheel. The wheel is 1 in. wide and leaves a hollow grind that is neither too shallow nor too deep. You can adapt my system to whatever grinder you have. I removed the tool rest that came with the machine and fitted a 20-in. long arm that extends down in front of the grinding wheel. It is made from two pieces of 1-in. angle iron (preferably stainless steel) welded or bolted together by means of separators at each end so that there is a $\frac{5}{16}$-in. slot running its whole length. I bolted the arm to the clamp that came with the grinder, which allows the arm to pivot up and down. It can be clamped at whatever angle is necessary. As a socket for tool handles, I made a wooden V-block about 4 in. long and attached it to the arm by means of some strap iron and a carriage bolt extending through the slot. It can be secured at any point by tightening a wing nut. These two adjustments make it easy to get just the right bevel, whether the tool is a long-and-strong turning gouge or a small carving gouge.

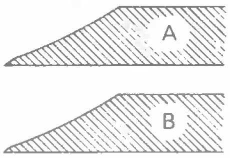
For sharpening plane blades, skew chisels, skew turning tools and chisels that are wider than the wheel, I use a tool holder that rides on a 1-in. wide, 7-in. long piece of strap iron that can be adjusted parallel to the axis of the wheel. I wax the tool rest—it makes the jig slide much more easily. The strap iron can remain in place, as it will not get in the way when you are using the V-block.

I use the strap-iron rest in dressing the wheel with the diamond dresser—a small diamond chip mounted on the end of a handle. When the diamond contacts the spinning wheel, it removes glaze and trims off any high spots. You won't get a good edge unless your wheel is free of glaze, perfectly round and vibration-free. The ideal way to diamond-dress a wheel, of course, is to have the dresser mounted in a fixture that has a micrometer adjustment into the face of the wheel and a screw-feed across it. However, a little practice with the dresser, moving it slowly across the face of the wheel with very light, even pressure, can make you very adept at it. Diamond dressers can be obtained from any machine-tool dealer who handles grinding machines. A good one costs about $60, but it will last a long time—I've had mine for 25 years.

I use a compressed-air-driven misting device to cool the cutting edge while I grind. I won't go so far as to say that you can't burn an edge using mist, but it sure makes it a whale of a lot more difficult. The mist also keeps the wheel cleaner and thus minimizes dressing. I usually use plain water in the misting device, but coolant concentrates are available from mill suppliers and I would especially recommend the use of one with a good rust inhibitor if the water in your area tends to be acidic. The misting device I use is manufactured by Kool Mist Corp., 13141 Molette St., Santa Fe Springs, Calif. 90670; it costs about $22, and works fine at 40-lb. air pressure. If you do not have a compressor and do not wish to invest in one, you might try using plant sprayers or some other source of sprayed water instead. But mist, generated by high pressure, is a much more efficient coolant than water droplets—people who use water come close to drowning.

After grinding, Riordan buffs a secondary bevel onto his tool edges, using a hard felt wheel charged with gray compound. He holds the tool so rotation is away *from the edge, otherwise the wheel might catch the edge and hurl the tool.*

Once I have ground the edge to the point where some people would accept it as sharp, I turn to the felt wheel, buffing the tool as shown in the photo above. This leaves a secondary bevel that has the strength to make many cuts before needing a touch-up. As shown in the drawing at left, a felt wheel as large as, or larger than, the grindstone can leave a fairly flat bevel (A), whereas the usual kind of polishing wheel, sewn-cloth, would undesirably round the edge (B). You can get a $\frac{5}{8}$-in. wide, 8-in. hard felt wheel for about $50 from Paul H. Gesswein and Co., 255-A Hancock Ave., Bridgeport, Conn. 06605.



When I buff, I hold the heel of the bevel slightly away from the wheel, which results in a secondary bevel about $\frac{1}{16}$ in. wide across the cutting edge. Use very little pressure—too much and the cutting edge will be burned, and you will have to start over. In fact, most of the time I shut off the motor and get a good edge as the motor runs down.

For touching up the tool while working, I make three or four passes over a smooth leather strop, leading with the heel of the bevel. The strop is simply a piece of leather belting stretched over a heavy hardwood block and soaked with a light mineral oil. I charge the strop by vigorously rubbing gray compound into it. One application lasts a long time. This strop restores the cutting edge amazingly well and cuts down on the number of trips to the buffing wheel.

No doubt, there will be those who will read this article and not be moved to try the method. For those who do decide to give it a whirl, however, I can guarantee that you will have no regrets—and very sharp tools, quickly and efficiently. □

Charles Riordan makes reproductions of period furniture and repairs antiques in Dansville, N.Y.

Wallace Nutting
Advocate of the Pilgrim Century

by Bill Dulaney

• Woodworking by artificial light is unsatisfactory • Prefer a fine reproduction to a cheap antique • Mahogany is better than maple or cherry • Highboys and lowboys are structurally unsound • Beeswax mixed with turpentine is as good a finish as can be found • No furniture built after 1830 is worth reproducing •

Such Olympian pronouncements might be expected from a dogmatic master cabinetmaker. They were, in fact, delivered with finality by Wallace Nutting, a man who couldn't plane a board. Nonetheless, Nutting's eye for line and proportion, and his pursuit of perfection (although tempered at times by commercial reality), gained for him the continuing interest of both connoisseur and craftsman, and established him as a major figure in stimulating interest in early American decorative arts.

Nutting was born in 1861 near Marlboro, Mass. Educated at Harvard and at Hartford and Union Theological Seminaries, he won acclaim as a dynamic Congregational minister before leaving the pulpit at age 44 to pursue his interest in American antiques. Although Nutting cited ill-health and nervous exhaustion as reasons for leaving the ministry (he enjoyed preaching but wearied of counseling), he exhibited enormous energy in pursuing his more worldly interests. He pronounced upon, photographed, collected, reproduced, bought and sold, and lectured and wrote about American antiques with a sweep unmatched before or since. He even tasted antiques, a procedure he recommended for detecting shoe polish used to hide end grain in new wood.

Nutting, impressive and imperious.

Today, Nutting is best known to the public for his hand-tinted photographs of landscapes and colonial interiors, and his prodigious output of books on early American furniture. These volumes remain landmark references, and though considered incomplete by many, they are ubiquitous elements of many a collector's library. Yet his role in the world of American antiques was more colorful and lively than his stilted photographs. Nutting's activities between the World Wars gained for him the reputation of authoritative writer on antiques (super-collectors such as Henry Francis du Pont and Henry Ford referred to his three-volume *Furniture Treasury* when buying, while the masses were told how to furnish their homes by Nutting's articles in popular magazines). A discriminating collector—Nutting's ownership of an item was calculated to increase its price as much as tenfold—he was overseer of a workshop whose reproductions were bought by collectors, curators, and a public desiring to furnish their homes and offices tastefully.

In 1917, with his picture business thriving, Nutting turned to reproducing American antique furniture and ironware. At a 17th-century ironworks site in Saugus, Mass., he set up shop and declared that his reproductions would be "in the best form, put together in the finest manner." He placed above each workman's bench a copy of his Ten Construction Commandments (facing page), "to encourage individuality and to make men while making furniture."

Nutting picked the brains of museum directors, antique dealers and major collectors. He took photographs, borrowed pictures (which were often unreturned), measured furniture, and had detailed drawings made. He spent endless hours on the road chasing what he judged to be the finest furniture styles. By the mid-1930s, Nutting estimated that he had authorized the reproduction of some 1,000 different items of furniture. He asserted in a 1924 catalog: "There is no article of furniture known to have been used before 1720 which my reproductions fail to duplicate in style." Most of the reproductions were intended for the public (whose taste Nutting doubted), and were marketed through gift shops as well as department and furniture stores. His reproductions were sold throughout the United States, and also in Canada, England, Australia, Mexico and China.

At the peak of production, 25 craftsmen labored in Nutting's shop. Many, if not most, were foreign-born or were first-generation Americans. In a 1938 letter, Nutting said he preferred foreign workers because they were better trained than Americans. Wishing to romanticize the activities of his shop, however, he stated in one of his reproduction catalogs: "The force consists of fine American mechanics, men of character, whom it is a privilege to know. Many live on their own little farms. . ." And, he might have added, cared little for beauty of line or furniture of the Pilgrim Century. With few exceptions, they were skilled craftsmen living in and around Boston who were interested in making a living and who regarded Nutting as something of an oddity.

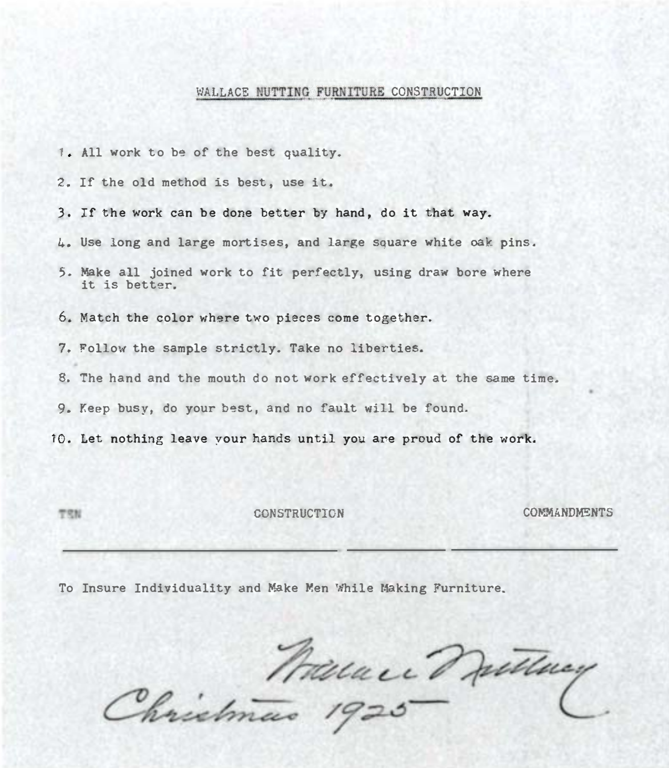
"Whatever is new is bad..."—Attempts have been made to link Nutting with the Arts and Crafts Movement and the philosophy of its leading American exponent, Gustav Stickley, who preached plain lines and the importance of function for furniture. Such efforts appear to have been based largely on Nutting's early promotional material, which appealed to the simple virtues of home and hearth. It is true that Nutting and Stickley both appreciated handcrafted furniture and opposed the fussiness of Victorian styles. But Nutting was also a traditionalist who scorned efforts such as Stickley's to develop new furniture forms. He asserted: "It may absolutely be affirmed, so far as the forms of domestic art and architecture are concerned, that whatever is new is bad. . . . New furniture is either a reproduction or it is not. If not, it lacks style and character and merit, because no new style has been evolved that can bear comparison, side by side, for a moment with the old styles." So steadfast was Nutting in his reverence for the old that he initially found little merit in furniture styles and woods used after the early 18th century.

Apparently fascinated with Windsor chairs, in 1917 Nutting wrote his first book on that subject, *A Windsor Handbook,* and he amassed over 100 different styles of the chair. Other early Nutting favorites were the substantial cabinet pieces in maple, oak, pine and walnut, which, to Nutting, characterized the Pilgrim life and American development up to 1720. He cautioned that persons "looking for 'mahoganized' imitations" need not stop at his shop.

Eventually, Nutting found it necessary to adapt his taste to changing market demands. He began to see the virtue of a cabriole leg and the beauty of mahogany, and he began to appreciate Queen Anne and Chippendale furniture. He recalls in his autobiography: "My first attempt at mahogany was to copy the most beautiful and elaborate piece of American furniture—a secretary in Providence which had been bought from Goddard. I took six of my craftsmen to study it by the hour and to make all measurements and sketches. . . . I knew if I made that piece as well as the old, I could make anything." He was apparently satisfied with his craftsmen's efforts, for he regarded the block-front secretary (shown on p. 72) with its nine shell carvings as the gem of his reproductions. It was his most expensive piece, wholesaling for $1,800 in 1930. A Nutting employee recalls that only six were produced.

Perfection vs. profit—While Nutting-the-romantic could wax rhapsodic about block-fronts, court cupboards and Windsor chairs, Nutting-the-businessman was by 1930 producing 17th-century versions of an oak radiator cover, a stenographer's swivel chair, an oak typewriter chest and a check-writing desk intended for bank use. Such items were but a nod by Nutting toward commercial realities, for, while the country was heading deeper into economic depression, he continued reproducing furniture "of all good periods including mahogany." As economic conditions worsened, he cut his work force and asked remaining employees to accept furniture reproductions in lieu of pay, which some reluctantly did. Nutting estimated in 1936 that he had lost $100,000 in the furniture business. While some of his losses may be attributed to the Depression, his employees recall that Nutting's quest for perfection often proved costly.

A cabinetmaker remembers: "Nutting would approve a pattern for a bureau or chair and the men would turn out a dozen or so, and they would all get sold. Nutting would then call in his foreman and say we were to make more. But he would say to change this and change that. We'd have to recut patterns and reshape templates, and it would cost half again


WALLACE NUTTING FURNITURE CONSTRUCTION

1. All work to be of the best quality.
2. If the old method is best, use it.
3. If the work can be done better by hand, do it that way.
4. Use long and large mortises, and large square white oak pins.
5. Make all joined work to fit perfectly, using draw bore where it is better.
6. Match the color where two pieces come together.
7. Follow the sample strictly. Take no liberties.
8. The hand and the mouth do not work effectively at the same time.
9. Keep busy, do your best, and no fault will be found.
10. Let nothing leave your hands until you are proud of the work.

TEN CONSTRUCTION COMMANDMENTS

To Insure Individuality and Make Men While Making Furniture.

Wallace Nutting
Christmas 1925

Nutting signed this copy of his Ten Construction Commandments, which was apparently used as a promotional Christmas greeting in 1925. A copy of the Commandments was placed above the bench of each of his workmen.

to make the new chair. He said he didn't care if it cost him $1,000 if he was right, and he always thought he was right."

Doctrinaire in judgment and possessed of a monumental ego (he once gave a studio portrait of himself as a birthday present to a 17-year-old great nephew), Nutting never doubted the merit of his work. He asserted in a 1930 catalog: "My furniture, when homes are broken up, is never sold as secondhand. In all instances that have come to my attention, it has brought more than was paid for it! Wide-awake persons now know that my name branded on furniture means style and quality." He predicted that his reproductions would be "the antiques of tomorrow," and he was right in the sense that some of them, found in both private and museum study collections, today do command prices close to those of their antique counterparts. His Windsor chairs sell for between $300 and $700, depending on style. A Nutting reproduction of a Brewster chair that retailed for $50 in 1937 sold five years ago at auction for $850. A Connecticut sunflower chest originally offered by Nutting for $275 brought $1,285 at the same auction. An oval Windsor stool produced in Nutting's shop could have been bought for $7.25 in 1928; the asking price today is around $200.

While Nutting would have been pleased by this confirmation of the value of his reproductions some 40 years after his death, he would hardly have been surprised. Their quality was recognized during his lifetime by such important students and collectors of American antiques as Luke Vincent Lockwood and Francis P. Garvan. Garvan, whose collection is housed in the Yale University Art Gallery, bought one of each of Nutting's finest reproductions, according to Nutting's bookkeeper, Ernest John Donnelly.

For Nutting, the most gratifying recognition of his work must have come from Colonial Williamsburg. That relationship, however, illustrated the conflict sometimes posed for Nutting when he was forced to balance commerce against craftsmanship and to choose between perfection and profit. In 1932, representatives of Williamsburg, seeking furnishings for restored and reconstructed buildings and unable to secure enough period furniture, turned to Nutting. They ordered 12 Flemish armchairs to be used in the council chambers of Colonial Williamsburg's capitol. The prototype chair, reproduced under Nutting's direction (Nutting himself, as previously noted, had no woodworking aptitude), was rejected. Colonial Williamsburg's representative made a critical sketch (shown on facing page), reporting that the arms, posts and carving were not faithful to the original. Unfortunately, Nutting had proceeded with work on the remaining 11 chairs before having the first one approved. He resisted efforts to rework the chairs, agreeing to do so only after viewing the prototype alongside the original at the Wadsworth Atheneum in Hartford, Conn.

Nutting eventually produced 12 chairs acceptable to Colonial Williamsburg and was paid $112.50 each. He softened the blow to his vanity by offering a largely negative critique of the original chair in his book, ***Furniture Treasury***. He disposed of the chair's merits in two sentences, picked it apart for a page, and then concluded, "This chair affords a rich opportunity for the study of the old methods, and one is bound to say that in this example everything was sacrificed to appearances." Nutting may have honestly believed that the antique chair from which the reproduction was taken should have been constructed along the lines of his own unacceptable prototype. His workmen recall that he more than once tried to improve upon originals by reproducing them with bolder turnings and deeper carvings. When others sought to alter the work of the masters, he thought it akin to barbarism. But for Nutting himself to do so was to confer perfection.

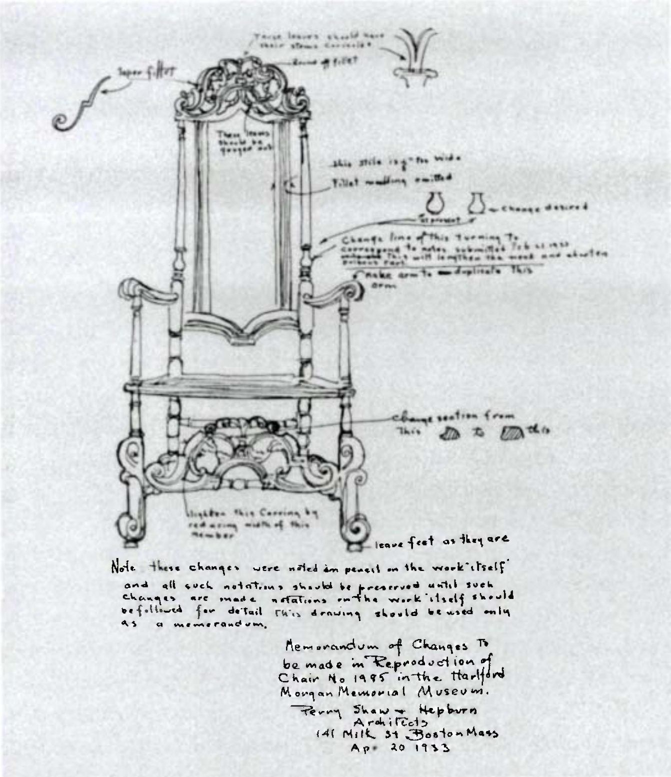
This block-front secretary of the 'Goddard School' was Nutting's favorite reproduction. He kept one beside his desk in his office. A cabinetmaker who worked for Nutting recalls that only six of the 9-ft.-tall pieces were reproduced.

Two grades of furniture—That Nutting's shop could reproduce furniture acceptable to Colonial Williamsburg and major collectors of the day as well as to the public at large adds support to speculation that Nutting might have manufactured two grades of furniture: one for collectors and others interested in superior products, unmarked and indistinguishable from the original; the second for the general public, clearly marked and clearly reproductions. There is no solid evidence of such a practice by Nutting, and an explanation may be that he sold his furniture reproduction and picture businesses in 1922. Unhappy with the new owner's products, however, he repurchased both businesses a year later. In any case, in the eyes of both amateur collector and connoisseur, there are clear differences in quality among comparable items supposedly coming from Nutting's shop.

Nutting himself once noted that some of his products were being bought and sold as antiques: "A child's high chair made by me, and sold for nineteen dollars, was artificially aged and resold for a cool thousand. Nobody but the maker could have discovered the imposition. . . .Thus even museums have been hoaxed, and the public is buying new furniture and paying ten prices for it." Museums continue to be fooled by his reproductions:

Photo this page: Yale University Art Gallery, The Mabel Brady Garvan Collection

Colonial Williamsburg Archives



This sketch with corrections was made by a representative of Colonial Williamsburg to guide Nutting in reproducing 12 Flemish armchairs for the capitol's council chambers. The sketch is of Nutting's prototype chair, which was judged unacceptable by Colonial Williamsburg.

Winterthur Museum a few years ago removed from exhibition a supposedly 18th-century Windsor high chair after it was suspected of having originated in Nutting's shop.

Three different markings were used on Nutting reproductions: paper label, Wallace Nutting's signature carved in script, and WALLACE NUTTING burned into the wood in block letters (chair bottom or drawer side). The paper labels appear to have been used on the first reproductions in 1917 and until at least 1927. Nutting noted in a 1920s catalog, however, that henceforth he would acknowledge only those items with his name burned into them in block letters. He added: "I will not be responsible for a script letter formerly used as such a mark." The script letter was possibly used during the 1922-23 period when he had temporarily retired from his business. To further confuse identification of Nutting reproductions, there are pieces of furniture with a Nutting catalog number burned into them but not the Nutting name. And, finally, some unfinished items left Nutting's shop without mark or label. Promotional material stated that Nutting's name would not be stamped on furniture sold without finish "because of danger of swelling and unsatisfactory finish." Ironically, while Nutting railed against fakery, his efforts to protect his name by disassociating himself from his own unfinished furniture may have contributed to some reproductions finding their way into antique collections.

Photographer and writer—Nutting appears to have consistently lost money in his furniture reproduction business, a situation he attributed to the public's inability to estimate good work properly—"It never did, even in the ages of better taste," he said. His picture business kept the whole enterprise afloat. His black-and-white photographs were hand-tinted by up to 100 colorists known as "Nutting girls," and signed by Nutting (or more usually by an employee who could copy his signature). An office catalog listed 10,620 different photographs, and Nutting once estimated that his prints hung in ten million American homes. Consigned to attics by the World War II generation, Nutting's prints are today collected enthusiastically. A print that sold for $3 or $4 in Nutting's time today brings as much as $40.

Although pictures and furniture are no longer being produced with the Nutting name, Nutting's writings have run through numerous editions. He wrote 18 books (plus revised editions), and his mammoth *Furniture Treasury* (volumes one and two), published in 1928, is now in its twelfth printing. As critics have noted, Nutting misidentified provenance and maker for more than a few of the 5,000 items pictured in *Furniture Treasury*. Yet he corrected many of these errors in volume three (1933), and volumes one and two still remain an indispensable reference work. Nutting's collection of furniture of the Pilgrim Century (1620-1720) is also an invaluable resource. Nutting sold the collection—in order to repurchase his businesses in 1923—to J.P. Morgan, who gave it to the Wadsworth Atheneum.

While Nutting continued to buy and sell antiques and to reproduce them until shortly before his death in 1941, his waning years were not happy. Beset by financial problems, trying to make a few dollars on antiques with which he would rather not have been publicly associated (bucket benches and strap hinges), lashing out in shrill prose at the New Deal, and bitter over what he regarded as the public's failure to appreciate his reproductions, Nutting, in 1938, wrote to a friend and former employee: "Business is worse here. We cannot sell anything because so few people are earning, and when the people have to leave us, then we are taxed to support them and then we have nothing to pay the terrible taxes with. . . . It is age that really compels me to quit. But the fad for different styles would also be enough. We make some very fine pieces, several each, and the public is stuck in another tack. Another thing, they want a different color anyway."

Few, if any, art historians regard Nutting as a scholar; his interest in furniture was style and proportion, not social history. Nutting did, however, with his boundless energy and eye for style and line, manage to leave in his reproductions, in his writings and in his collection of furniture of the Pilgrim Century a legacy that continues to interest, inform and occasionally awe students of American decorative arts. □

Bill Dulaney is a professor of journalism at The Pennsylvania State University, and a Nutting collector.

Further reading

The following books by Wallace Nutting are of interest to woodworkers and are still in print:

The Clock Book (revised edition, reprint of 1924 edition), Associated Book, 147 McKinley Ave., Bridgeport, Conn. 06606, 1975. Hardcover, $15.00.

Furniture of the Pilgrim Century (two volumes), Peter Smith Publ. Co., 6 Lexington Ave., Magnolia, Mass. 01930, 1965. Hardcover set, $22.00.

Furniture Treasury, MacMillan Publ. Co., 866 Third Ave., New York, N.Y. 10022. Vol. 1 and 2, $29.95; vol. 3, $24.95.

Wallace Nutting Supreme Edition General Catalog, Schiffer Publ., Ltd., Box E, Exton, Pa. 19341, 1978. Paperback, $8.50.

A Windsor Handbook, Charles E. Tuttle Co., Inc., 28 S. Main St., Drawer F, Rutland, Vt. 05701, 1973. Paperback, $4.95.

A Southern Huntboard

Cock bead is an elegant touch for doors and drawers

by Carlyle Lynch

"With the Southern forests rich with game and the housewife eager for the results of the day's hunt," wrote Paul Burroughs in *Southern Antiques*, "the sport was engaged in by all classes. The hunting boards around which the owners of Southern plantations gathered before and after the hunt resemble the sideboard. They were often simple in design. . . . As a general rule, they were taller than sideboards . . . and were used chiefly in halls, where members of the hunt could stand and partake of wine and food in the fashion of a buffet lunch." Besides serving as informal hall furniture, huntboards helped keep the muddy hunters off the chairs.

This huntboard is adapted from one that I measured and drew in 1952 while it was on loan to the Museum of Fine Arts in Richmond. It's like most of those illustrated in Burroughs' book in that it has four legs instead of the six usually found on sideboards, and it's of a convenient size. Within reason, the piece can be made longer, deeper or taller without destroying its appearance. When I built the huntboard, I put doors on the two end compartments instead of the deep drawers of the original. The center compartment could be fitted with doors or with two drawers of differing depths.

The edges of the doors and drawer fronts of the original were decorated with a plain, but elegant, molding called cock bead and I recommend retaining this detail. Though cock bead is defined as any beading that stands proud of the surface it is meant to decorate, it is best applied as a strip glued to the edges, as shown in the drawer detail in the drawing, rather than merely stuck on the front. Cock bead is common on drawer fronts and door edges of furniture of the Chippendale, Hepplewhite and Sheraton styles. I see no reason why it couldn't be used to good effect on more contemporary furniture. Because cock bead is an applied molding, it can be of a different wood than that of the drawer or door, giving the maker an opportunity to experiment with colors and textures. I made the cock bead of cherry, which contrasts subtly with the walnut used for the rest of the piece and with the holly inlaid in the doors and drawer fronts.

Building the huntboard is straightforward. The carcase consists of two solid wood sides and a back mortised into the four tapered legs. Openings for the doors and drawers are formed by rails attached to the front legs. Two solid wood partitions, mortised into the front stiles and nailed through the carcase back, divide the case into three compartments. Except for plywood doors veneered with walnut, I built with solid wood throughout. But you could substitute plywood for the drawer bottoms and the carcase bottom.

Start by making the legs. They are rectangular in section, $1\frac{1}{2}$ x $1\frac{5}{8}$, as on the original. Lay out and cut the joints to join the sides, back, and front rails to the legs. Then cut and fit the stiles, the center rail, the drawer runners and the two partitions. Dry-clamp the carcase before gluing it up. Before assembly, groove the bottom front rail to accept the bottom; the bottom itself, though, can be fitted later. For added strength, the leg, back and rail tenons should be pinned after assembly.

So they won't warp or swell, the doors should be made of $\frac{3}{4}$-in. plywood veneered on both sides. Don't forget to allow for the thickness of the cock bead when sizing the doors. If you squeeze the leaves of the hinges a bit in a vise, you can mortise them entirely into the legs instead of into both leg and door edge—this makes a neater appearance.

Drawer construction is conventional. I allow for the cock bead on the top and bottom edge of the drawer fronts by making the fronts narrower than their sides by an amount equal to twice the thickness of the cock bead. Or, you could glue up the drawer and cut down the drawer front after assembly. In either case, cock bead on the drawer sides is let into a $\frac{5}{16}$-in. wide, $\frac{1}{8}$-in. deep rabbet. The rabbet should be cut after assembly so that the rearmost edge of the bead will just touch the tapered ends of the dovetail pins.

I make cock bead by ripping thin strips and then using a jack plane to remove the sawmarks and shape the small radius on the bead's front edge. Once made, the bead is simply mitered to length and then glued in place so that it projects about $\frac{1}{16}$ in. You'll have to cut a stopped miter where the wider bead along the top and bottom edges of the drawer fronts meets the narrower bead on the drawer sides. □

Carlyle Lynch is a retired designer, cabinetmaker and teacher. He lives in Broadway, Va. More of his drawings are available from Garrett Wade or Woodcraft Supply.

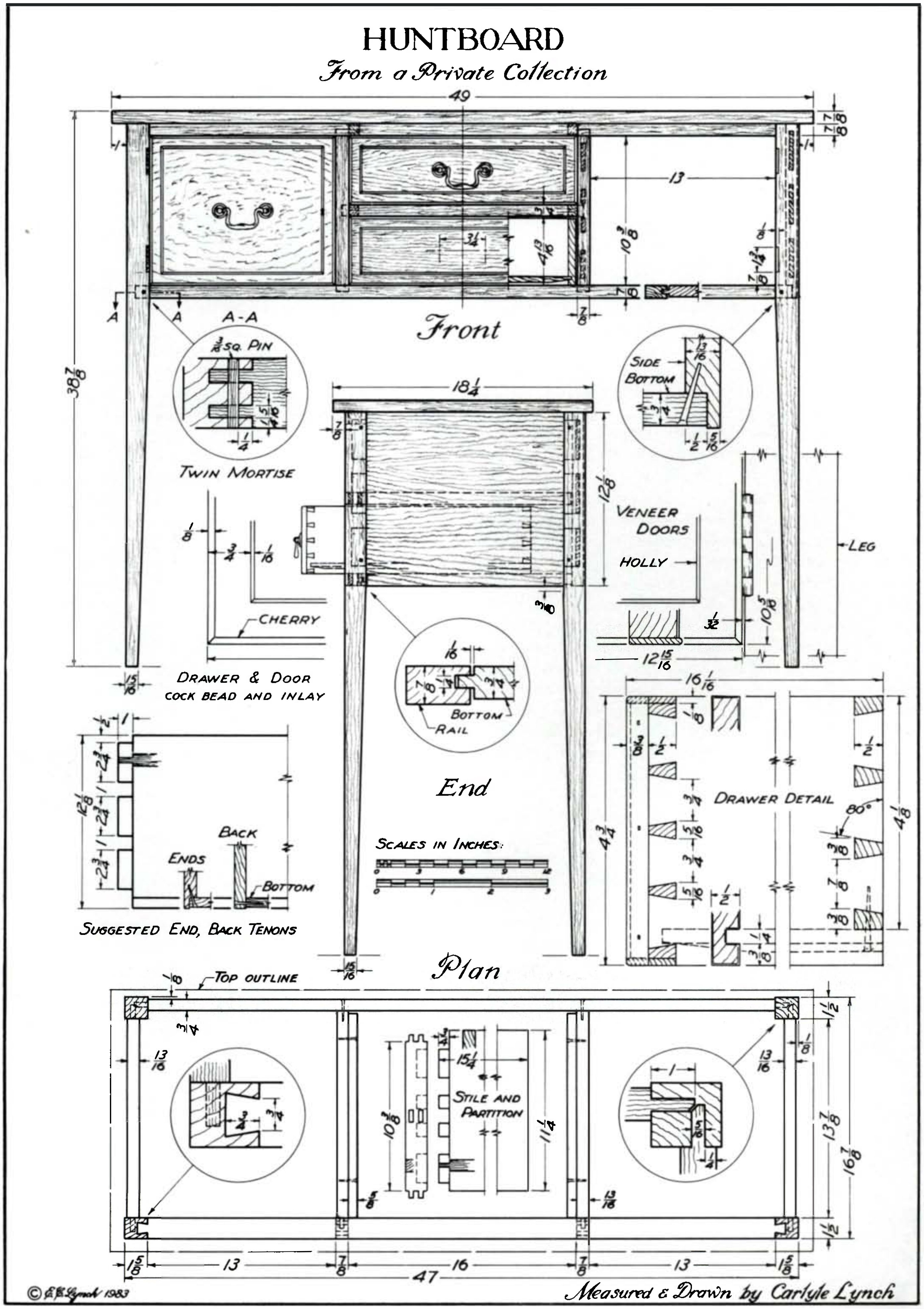
Materials List

4 Legs: $1\frac{1}{2}$ x $1\frac{5}{8}$ x 38
2 Sides: $\frac{13}{16}$ x $12\frac{1}{8}$ x $13\frac{7}{8}$, shoulder to shoulder (s/s)
1 Top rail: $\frac{7}{8}$ x $1\frac{1}{2}$ x $43\frac{3}{4}$ (s/s)
1 Bottom rail: $\frac{7}{8}$ x $1\frac{1}{2}$ x $43\frac{3}{4}$ (s/s)
1 Back: $\frac{3}{4}$ x $12\frac{1}{8}$ x $43\frac{3}{4}$ (s/s)
2 Stiles: $\frac{7}{8}$ x $1\frac{1}{2}$ x $10\frac{3}{8}$ (s/s)
2 Partitions, pine: $\frac{13}{16}$ x $11\frac{1}{4}$ x $14\frac{1}{2}$ (s/s)
1 Center rail: $\frac{3}{4}$ x $1\frac{1}{2}$ x 16 (s/s)
1 Bottom, pine: $\frac{3}{4}$ x $14\frac{3}{4}$ x $46\frac{1}{8}$

1 Top: $\frac{7}{8}$ x $18\frac{1}{4}$ x 49
2 Doors: $\frac{3}{4}$ x $10\frac{5}{16}$ x $12\frac{15}{16}$ plywood, plus veneer of desired species
2 Drawer fronts: $\frac{13}{16}$ x $4\frac{1}{2}$ x $15\frac{15}{16}$
2 Drawer backs: $\frac{1}{2}$ x $4\frac{1}{8}$ x $15\frac{15}{16}$
4 Drawer sides: $\frac{1}{2}$ x $4\frac{3}{4}$ x $15\frac{5}{8}$
2 Drawer bottoms: $\frac{3}{8}$ x $15\frac{7}{16}$ x $15\frac{3}{8}$
4 Drawer runners, pine: $\frac{5}{8}$ x $\frac{3}{4}$ x $14\frac{1}{4}$ (2 are kickers)
15 linear ft.: $\frac{1}{20}$ x $\frac{1}{16}$ x 36 holly inlay

14 linear ft.: $\frac{1}{8}$ x $\frac{7}{8}$ cock bead
2 linear ft.: $\frac{1}{8}$ x $\frac{3}{8}$ cock bead
14 Joint pins, walnut: $\frac{3}{16}$ x $\frac{3}{16}$ x $1\frac{1}{2}$ (2 in front, 4 each end, 4 in back)

Hardware: 2 pairs brass butt hinges, $1\frac{3}{4}$ x $1\frac{3}{8}$ open; 4 bright brass drawer pulls, $3\frac{1}{4}$-in. bore; 2 brass thread or inlay escutcheons; 2 cupboard locks, $\frac{3}{4}$-in. selvage to key pin, with barrel keys.


HUNTBOARD
From a Private Collection
Front
A-A
3/8 SQ. PIN
TWIN MORTISE
SIDE
BOTTOM
VENEER
DOORS
HOLLY
LEG
CHERRY
DRAWER & DOOR
COCK BEAD AND INLAY
BOTTOM
RAIL
End
DRAWER DETAIL
SCALES IN INCHES:
BACK
ENDS
BOTTOM
SUGGESTED END, BACK TENONS
Plan
TOP OUTLINE
STILE AND
PARTITION
© C.H. Lynch 1983
Measured & Drawn by Carlyle Lynch

The Designer's Intent

Six Northwest woodworkers trace their roots

by Rick Mastelli

The growing fashion among aggressive furnituremakers these days is to paint wood or to opaque-lacquer it, or at least to set it off with some startlingly colored plastic, metal or ceramic accent. So last October, when I entered the soft-lit, timber-framed rotunda that housed the annual Furnituremakers' Show at the Western Forestry Center in Portland, Ore., I was taken aback. Nary a striking color in sight—only solid, natural wood, fourteen cubicles of familiar furniture. Even the upholstery was brown. Initially the work seemed provincial, reminding me of what has been called California furniture, only quieter. Certainly there were recognizable sources: Sam Maloof's rocker (*FWW* #25) and Art Carpenter's wishbone chair (*FWW* #37) seem to be the working models of the West Coast.

But the show went on for three days, and I spent those days looking closely at this work and talking closely with its makers. It wasn't long before a theme developed in my conversations. I wanted to know why an individual's work looked as it did. Were these woodworkers conscious of the styles they worked in? Most of them are self-taught. Had that fostered imitation? I asked each maker, what is the intention of your work? I learned that it is important to know where a person's work comes from. You can underestimate furniture like that shown here as typical reiterations of common contemporary forms. Look closer. There's a sure refinement that comes from working and reworking those forms. It's the people behind the pieces that gives them perspective.

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Michael Elkan began working in his father's clothing business, packing cartons, shipping, then selling and buying. By age 25, he told me as he pinched his hand-rolled cigarette, he was designing and merchandising men's clothing, and he developed a line of knitwear, the skinny rib, that remained fashionable for ten years. He learned to think in "thousands of dozens," acquiring a practical, positive understanding of marketing and of fashion.

Four years ago (he was 36), he left the clothing industry, and eastern Pennsylvania, for a life in Silverton, Ore., where he began making boxes out of burl. He discovered his material glistening in the rainy forests of the Cascades. Captivated, he's cut, polished and displayed these organic gems. Elkan's burl boxes sell widely, volume having tripled in the last two years—now more than fifty galleries throughout the country carry his wares. The product lends itself to quantity production, while each piece has the unique character of a special piece of wood. It's burl he sees now as his long-run fashion.

Early in his venture, Elkan read of the work of furnituremaker George Nakashima (*FWW* #14), of whom he'd not been aware when they were neighbors back in New Hope, Pa. On a trip East he visited Nakashima's studio, and sensed an affinity with this shrewd elder who finds the one perfect use for each odd piece of wood. Elkan speaks with spirit and awe of the Saturday afternoon when he returned to the studio to talk with Nakashima and to show him his work. "I felt stupid," he recalls. "I had all these questions to ask him, and I couldn't get the words out. There seemed no point. I knew what the answers would be as I was standing there. It was like meeting your guru." He showed Nakashima the boxes, slipping 25 of them, one by one, from their velvet cases and laying them out on the steps of the studio. "What do you do with these boxes?" Nakashima asked. "I sell them, I try to make a living from them," Elkan replied. "How much are they?" asked Nakashima. "You mean like for a gift?" Elkan hemmed. "You want to buy one to give to someone?" "No," said Nakashima, "I want to sell them in my studio." Nakashima directed Elkan to pick out half a dozen, and to write an invoice. A browser drew Nakashima's attention, and while Elkan was arranging his wares, another browser bought a box. Elkan's face was all grin as he showed Nakashima the check. "Well," said Nakashima, "maybe you'd better give me a couple more." And while Elkan was arranging that sale, another browser bought another box, and Nakashima asked for another couple more.

Elkan's rocking chairs (facing page) developed out of his burl box business and out of his admiration for Nakashima's furniture: they share the intention to exalt special pieces of wood. They also share a sense of production. The seat, arms and crest rail usually come from a single burl. The rungs, legs and spindles come from another single tree, to achieve a unity that will contrast with the burl. Elkan jobs out the turning and employs several people to help with the sanding and the finishing. He concentrates on where to cut, and on coordinating the parts for harmony of figure. And he tends his business. "I'm basically taking Nakashima's thing and exploring it," he told me. "I don't know yet where it's going. I'll have to make maybe hundreds more before I can *begin* to understand what Nakashima does."

Already, in the last of his second dozen rockers, Elkan's work reveals an attractive individual style. These chairs are not Nakashima reproductions. Nakashima's designs are severe in their simplicity. Look at the understructure of Elkan's rockers and you will see there more members than Naka-

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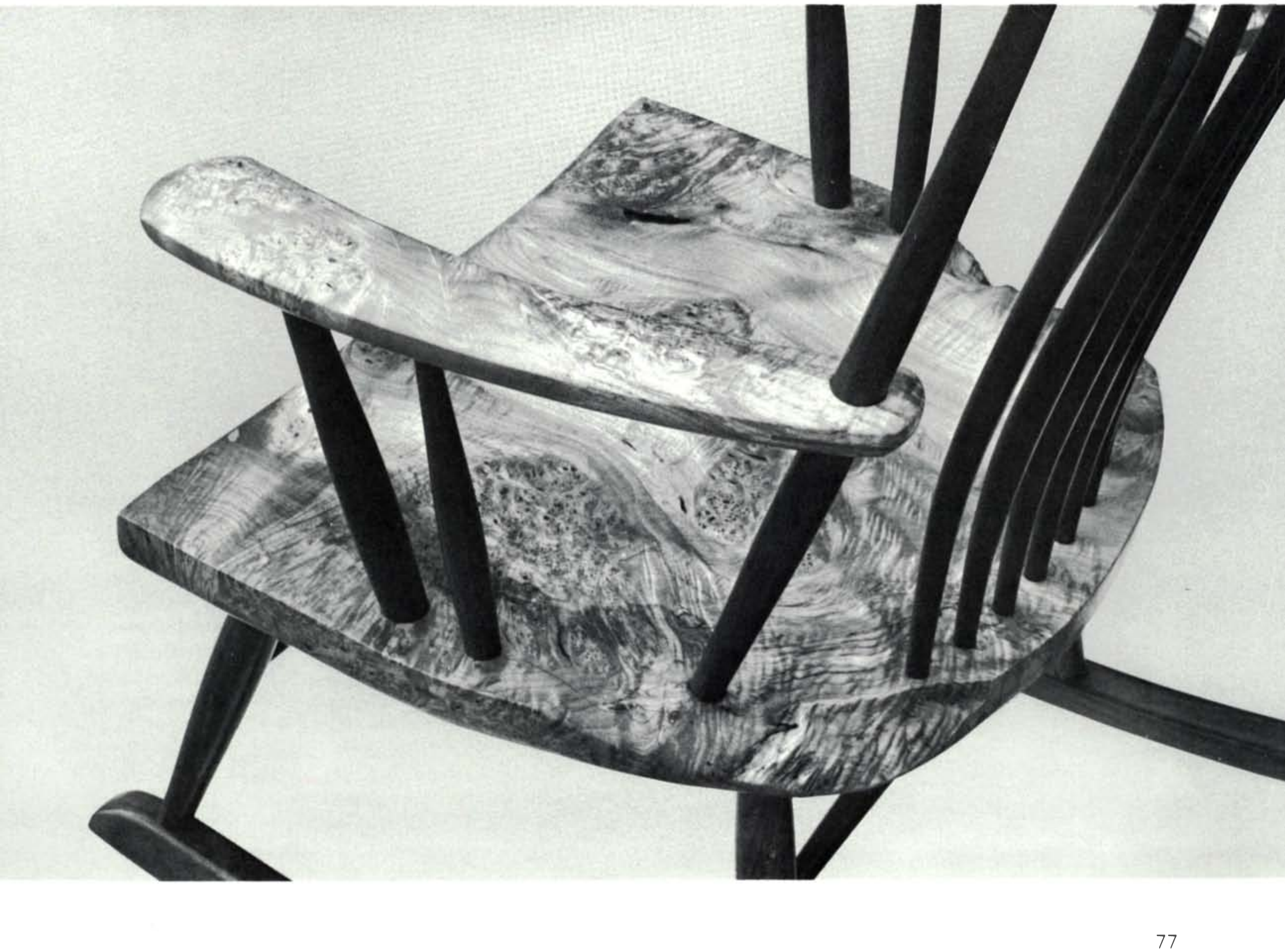
Rick Mastelli is associate editor of Fine Woodworking. *The Western Forestry Center is a non-profit educational institution with museum exhibits, classes, field trips and research projects that involve the community in everything from forest ecology and woodlot management to lumbermaking and woodworking. They also sponsor a weekend show each month devoted alternately to the work of local birdcarvers, woodturners, toymakers, miniaturists, boatbuilders, musical intrument makers, and (as represented here) furnituremakers. For more information, write 4033 Southwest Canyon Rd., Portland, Ore. 97221.*

Furniture photographed by Joseph Felzman, portraits by the author

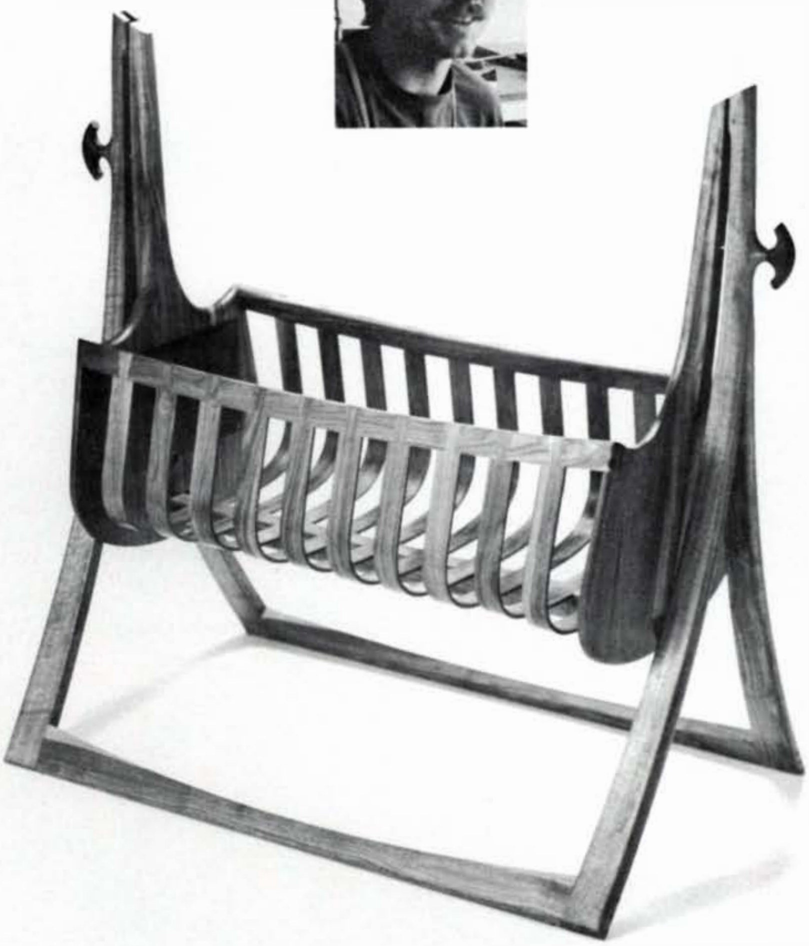
Curtis Almquist

Michael Elkan began his woodworking career by making burl boxes. The maple boxes above are from one burl, and nest just as they grew in the tree. His rockers, of walnut crotch and oak (far right), and maple burl and walnut, sell for $1250 each. Note the spline in the armrest, below, to strengthen the burl where the spindle passes through it.

Staff



John Economaki's work is attractively coherent, the result of repeating simple shapes that leave strong, open spaces. Coatrack was priced at $1500; cradle, $4500; and serving trolley, $2400. All three pieces are of walnut, with ebony and maple accents.

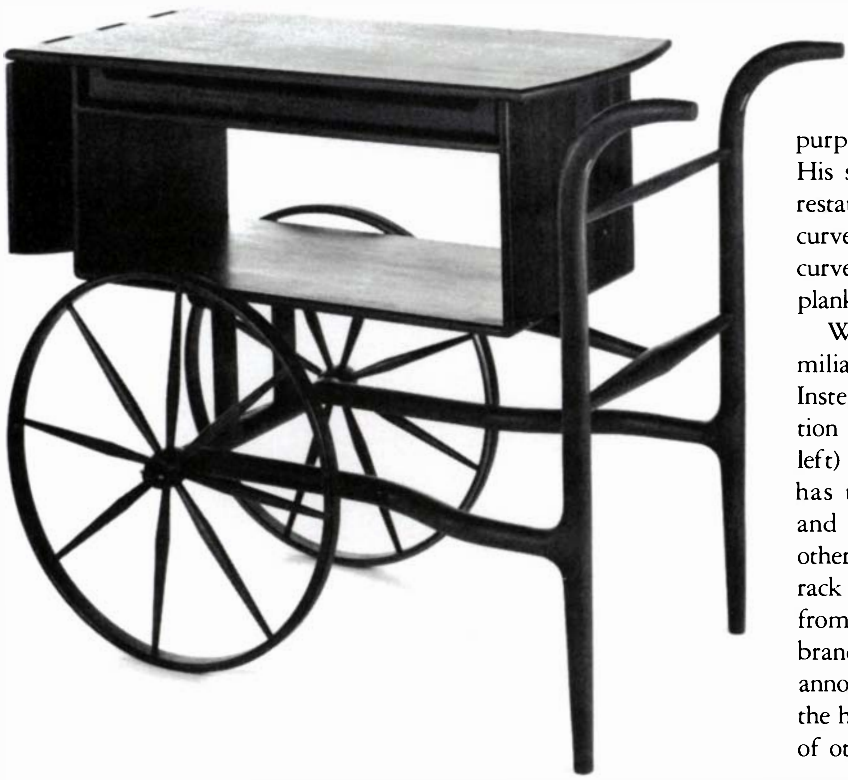


shima would use. Elkan's back spindles are steam-bent; Nakashima's, austerely straight. Elkan's rockers are homey, American in character. Although they'd have no trouble fitting into a contemporary room, I kept imagining them with needlework samplers, if not on the wood (who'd want to cover that energetic burl?), at least nearby. I sat in one for a good half hour, chatting with Elkan; it was comfortable and cozy. "It's the wood," Elkan reminded me. "I'm into it for the wood."

• • •

John Economaki calls himself a hack. Born and raised in Iowa, he took a degree in industrial arts from Iowa State University. He'd never seen a mountain before he went West in 1973 to look for a teaching job, and he couldn't resist Oregon, not with its Cascades and the position Lincoln High School in Portland offered him. He taught there for six years. His turning point was the summer of 1978, when he took a three-week workshop at Anderson Ranch with furnituremaker Sam Maloof. In his introductory remarks, Maloof claimed that industrial-arts teachers didn't know anything. Economaki came to agree with him. He returned to school itching to design and make furniture. Before the next year was out, he'd sold his first desk and had commissions for four more pieces, $10,000 waiting to be earned. He realized that he could make the transition from salaried teacher to self-sustaining craftsman without the usual trepidations, so he did.

Like Maloof, Economaki has an easy, practical attitude toward promoting his work: "Maloof taught me that selling



And the inward curve of the bottom stretchers is easy on the back, allowing parents to stand that much closer when they reach down to lift Baby.

These happy coordinations of visual and practical purpose are very much a part of Economaki's design ethos. His serving trolley (left) was designed to carry desserts to a restaurant's tables. Its large, maneuverable wheels suggest the curve of handles, which lead to the curve of the yoke. These curves allow the parts to nestle when they're laid out on a plank for bandsawing. Every detail, worked out on paper.

While these pieces owe their understated elegance to a familiarity with Maloof's work, they are not Maloof's pieces. Instead there is in Economaki's work the best sort of assimilation and growth from a venerable source. The coatrack (far left) is Economaki's latest piece, and the least Maloofian. It has the rhythmic repetitions around strong negative spaces, and the sure Scandinavian stance that comprise Economaki's other work. But here is an extra-terrestrial character. The coatrack was conceived from a doodle, and the challenge to make from it something functional. The piece is that, but it is also branching tree and skeletal butler, and clarions held aloft to announce your comings and goings. The gouge marks left on the horns' inner surface, the only hand-tooled texture in a show of otherwise smooth-sanded finishes, were a pleasing touch.

your work is selling yourself. People come to your work through you, and you've got to make contact. Maloof will go to a party and come home with three or four orders. I've made a point of including in my portfolio pieces that lend themselves to 'emotional' purchases. Cradles, nutcrackers, coatracks, they're the sort of things people react to first, think about the price of second. I don't look at my furniture as a designer. I look at it as a consumer. It's covetousness. When I see my furniture, I *want* it." There's such boyish intensity behind these words, Economaki's clients can't help being caught in his energy.

Economaki, 31, emphasizes the personal satisfaction he gets from his work. "Woodworking was my hobby," he says, "before I quit my hobby." Full of ideas impatient to be realized, he guards against requests to reproduce his pieces, for fear they will impose on his time for exploration. Every other piece he does is speculative. "I'm not interested in technique or process," he told me. "I'm interested in the final form. I'm getting to the point now where I can draw and then make from wood exactly what I want. Before, I relied on my experience of what I'd seen in wood—a lot of my pieces are Maloofian. But now designing is becoming a gut-level experience. I'm learning how to draw."

Economaki's forms have a clarity and coherence that made his booth at the Western Forestry Center the most unified. His strategy is to make full-scale drawings and to cultivate the repetition of shapes. Every detail is worked out on paper. You can see his rocking cradle (above left), for instance, as composed on the theme of curve and dovetail. The handles that stop the cradle in its swing on brass pins, and the smiling line that terminates the verticals of stand and cradle pick up the overall shapes of the piece. The cradle end-boards are a curved, inverted version of the dovetails that join slats to rail. Practical rewards accrue from this unity of design: It's nice to be able to bring a crier close by—the curve of the cradle bottom allows it to rock on the floor, detached from its stand.

Throughout the three days of the show, I kept returning to Todd Miller's booth, trying to come to terms with his mild-mannered furniture (next page). Among all the quiet wood, this work whispered. You had to lean close, but when you did, there were all kinds of delights: curved panels, concealed hardware, parts matched not only for grain but also for chatoyance (the stiles shimmered equally when viewed from one angle, then both lost their shimmer simultaneously as you shifted your view). Miller, 30, is an affable, unimposing guy, receiving me with an easy grace each time I found myself needing to put into words what I was seeing.

When I told him that his furniture reminded me somewhat of James Krenov's, he smiled and shrugged. He'd been repairing boats in Seattle, he told me, when he came across Krenov's *Cabinetmaker's Notebook*. In it he saw a violin case made of Oregon pine, which turned him right around. "My God," was his reaction, "you can do something with *that*? Here Oregon pine grows by the thousands of acres, and you make molding from it and paint it." He began to make careful, subtle furniture, inspired by the wood to do his best. He didn't set out to duplicate Krenov's style, but over and over Miller has discovered that for him there's no better way. When he resawed the maple panels for his white oak cabinet (p. 80), the maple cupped. At first he was annoyed, then he accepted the curve, resawing and strip-laminating the rails to accommodate it. Later in Krenov's books he discovered the same curve, along with the attitude that regards such quirks of wood as gifts. He's become confident with his skills, able to execute neat dovetails or the minutely angled grooves that hold faceted glass in a curved door, without their precision being deadly or fussy. "I want technique as a foundation. I don't love cutting dovetails. I build what I build not because of the tools or the design, but because of the wood. It's the wood that motivates me."

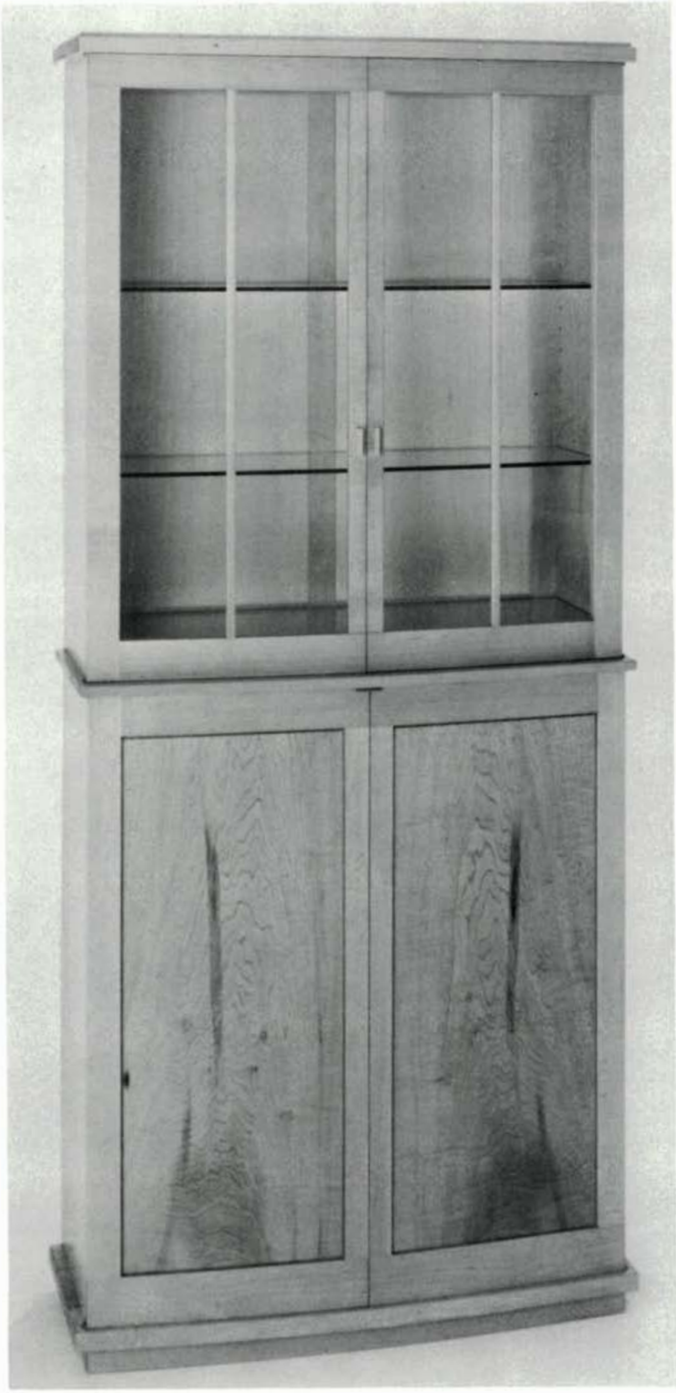
Like Krenov, he plays with the standard cabinetmakers' vocabulary for special effect. In his tall maple china cabinet, below, look at the various ways that rail meets stile, visually tying the upper and lower cases together, while terminating the top and bottom of the piece as a whole. A Krenovian trick. But Miller's pieces are different from Krenov's in their scale. If you've first seen Krenov's pieces in his books, it is surprising to discover how small they really are. Miller's work has a familiar, human scale.

He tried for a while to make a living from this work, but was unable to support his family. He has returned to a full-time job repairing boats, and he makes furniture only now and then. This confounded me. Why was the practical attention to the marketplace, which succeeds for Elkan and Economaki, not part of Miller's story? "My furniture isn't different enough," he told me. "Most rectilinear furniture is mass-manufactured, and people have to get awfully close to see that mine's handmade. Also, light woods don't have the impact that dark ones do. People associate light wood with unfinished furniture. I suppose I could drive a nail into one of my cabinets, to catch people's attention, but my goal is to survive, not to be famous. I'd rather do something else than compromise the character of what I do."

• • •

By general assent, the outstanding piece in the show was a rosewood chest-on-chest (facing page) that stands just tall and dark enough to afford stature, without being imposing. Its soft swells contain a fullness, as if the piece had just inhaled and were holding its breath to present itself best. Slow, gracious rhythms entertain the eye, traveling the flex of its plinths to the sweep of its sides and stopping periodically at the brass accents of the knife-hinges before fitting the plinths again against the gentle arcs of the chest bottoms and top. The sumptuous rosewood figure has also been made to fit: the sides are quartersawn, leaving the more pronounced flatsawn figure to follow the curves of the carcase edges, the door frames and the plinth. Yet with its consummate proportions and flawless detailing, the piece is fresh, as if its design were a gesture drawing.

I was amazed to discover how much of a group effort the chest was. Pro-Forma Designs, in Portland, is the business of Douglas and Jonelle Courtney, and they employ two shopmen, Jim Boesel and David Crafton. Doug Courtney de-



China cabinet of maple, above, and cabinet of maple and white oak, right, by Todd Miller, were priced at $3000 and $1750, respectively.

signed the piece and made most of the carcase, Boesel shaped the compound-curved parts, while Crafton made and fit the doors and frame-and-panel back. The integrity of all these features demonstrates the harmonious working relationship among its makers. "We're all here to grow," says Courtney. "We come from different backgrounds, and we each bring something special to the work. This piece wouldn't look quite like it does without each of us."

Courtney was a freelance architect for 11 years before he became frustrated with the lack of freedom and control over the whole of a project. Seven years ago, with $300 and a radial-arm saw, he set out to learn how to make furniture. He concentrated on repairs and restorations, and then on reproductions. "I had no knowledge of furniture, no architect does," he said. "Most buildings are made to be used *up*. Furniture, people care about. That's why they bring it to you for repair. You can learn everything repairing furniture. You can open a carcase and tell what kind of shop produced it."

I asked whether it was his being an architect that had made this rosewood chest so deft. Was it the training he had had translating ideas into drawings and drawings into objects? "My drawings for this piece are just rough sketches," he replied. "You have to have a picture in your mind. You have to know the whole of a piece before you begin. But drawings can be taken too far. Inches don't matter until you're actually working with the material. You don't want to design out your options." The touchstone of Courtney's values seems to be freedom: freedom to explore. "That design has been in my head for a long time. It's the client who offered me the opportunity to realize it. My excitement comes from working with others: clients feed you, and others in the shop feed you. I get off on creating something greater than a client has in mind when he comes to me, and for a fair price. Having to be fast doesn't compromise a design. You're heading for that last minute. All your experience and all the picturing of the work before you begin, the whole purpose is to get you to that last minute when everything comes together."

Boesel and Crafton share this momentum. Both spent more than five years in other woodworking shops before coming to Pro-Forma less than a year ago. Boesel's strengths are in chairmaking and carving (whence his double-shaper operations on the rosewood piece), and Crafton's earlier work concentrated on small-scale production. As journeymen, they are not unusual to this business. Pro-Forma has been part of the development of some twenty-two woodworkers in the past seven years. They tend to stay a year or two and then move on, often to their own shops, Courtney told me. Boesel and Crafton, though, are in no hurry. "Involvement is pretty intense here, more intense than if you work alone," Boesel said. "There's always some part of a project you don't particularly enjoy or do well. When you work with others, you can concentrate on what you really want to do. And like with the rosewood piece, the whole is greater than the sum."

I asked Boesel and Crafton where their influence was rooted. In tradition, they told me. "We've all done a lot of repair and restoration," said Boesel. "That work is like programming your computer. You see what breaks, what makes designs work. You fill yourself with that kind of experience. And when it comes to a juicy commission, you know how to say something. Too many woodworkers aim for an individual style right off, and it comes out shallow. You've got to learn from sources." □

Pro-Forma's East Indian rosewood cabinet, designed to display a china collection, remains fresh as a gesture drawing, though it represents 432 hours' work. The makers, above, are Douglas Courtney, Jim Boesel and David Crafton.

These bowls came not from the lathe but from single, flat boards that were bandsawn into tapered concentric rings and glued together before being shaped with abrasive discs. The bowls can be of one kind of wood or of several contrasting woods.

Un-turned Bowls

They may be round, but you don't need a lathe

by Peter Petrochko

About eight years ago, I discovered a way to make wooden bowls of many sizes and shapes, even though I didn't own a lathe or know how to use one. Playing around with a bandsaw I'd just bought, I found I could saw a flat board into tapered, concentric rings that could then be glued into a stack and shaped, using sanding discs and carving tools, into a finished bowl. I've since made hundreds of bowls this way, some in sizes and shapes that would be impossible to achieve on the lathe.

Small, shallow bowls can be made with as few as one ring; deeper ones may consist of as many as a dozen rings, all cut from the same board. For design variation, I sometimes saw the rings from a blank laminated up from several different-colored woods. Typically, my bowl blanks are boards as wide and as long as the bowl's major diameter and from ¾ in. to 2½ in. thick. The bowl's height, shape and wall thickness are governed by the initial shape cut out of the board, its thickness, the number of rings and the angle of their taper—variables that can be precisely controlled at the bandsaw. Besides it being unconventional and fun, I've found that turning a flat board into a bowl is the essence of economy.

Peter Petrochko turns boards into bowls in his Oxford, Conn., shop. Photos by Andy Badinski, except where noted. Sanding discs described in this article are sold by Sculpture Associates, 40 E. 19th St., New York, N.Y. 10003.

Many bowl forms are possible—round, oval, free-form—but don't draw a shape with smaller radii than you can easily cut on your bandsaw. I use a ¼-in. wide, 6-TPI, skip-tooth blade. I mark off perpendicular reference lines, which I later use to align the sawn rings. Next I draw a guidemark completely around the top surface of the bowl blank about ¼ in. in from its outside edge. This line marks the cut for the bowl's top ring.

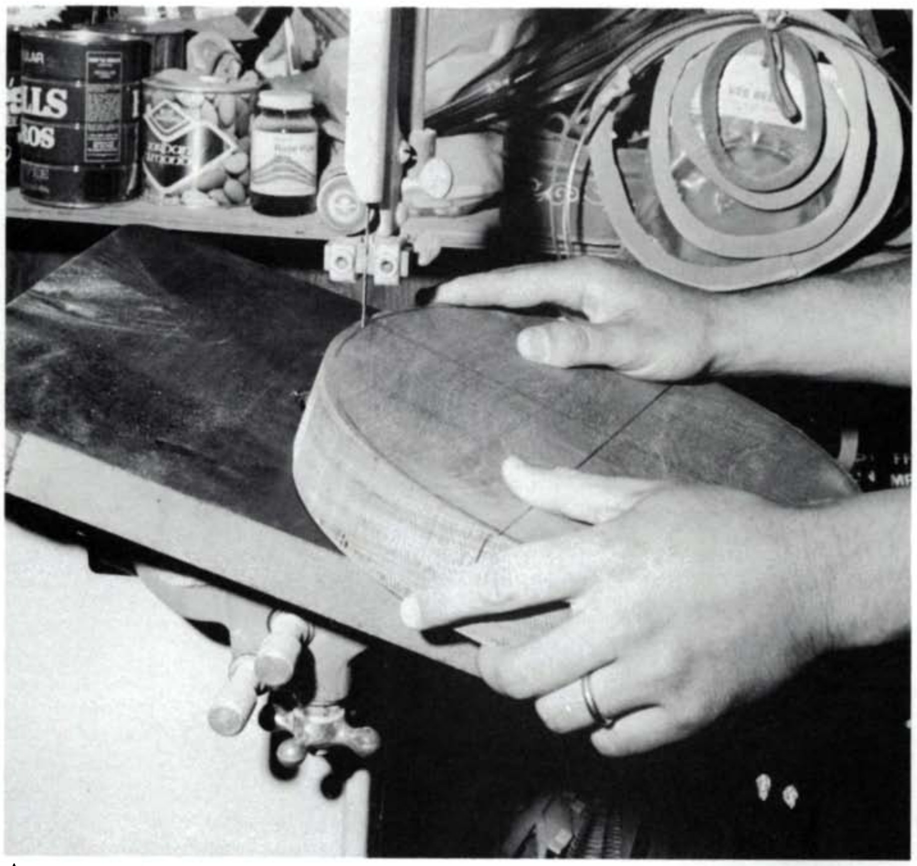
Before cutting the first ring (**A**), I set my bandsaw table at about 20°, an angle that I've found produces a workable taper. I start my cuts parallel to the grain because this yields a cleaner joint later on, when I glue the bandsaw kerf shut. Saw carefully and exit the blade where it entered—a tapered ring of wood is now cut loose from the blank.

To mark out the next ring, I trace the inside bottom edge of the first ring onto my blank (**B**). Before I saw, I decide on the vertical shape of my bowl, which is determined by the ring taper angle. For a shallower shape, I start with the table set at 30° or more and I increase the angle by about 5° or more per ring. Starting around 18° and increasing the taper of each ring by 3° or 4° makes a more vertical bowl. I start the second cut on the opposite side of the blank from the first so that when the bowl is glued up, the kerfs will be staggered. I saw rings in this manner until my original blank is much smaller, but not too small to be a stable bottom for the bowl. Once I've chosen the size of the base, I trace onto it the edge of the ring that will be just above it. With a gouge, I hollow out the base inside this line.

At this point, I take the pleasure of test-stacking all the rings over the base so I can see what the bowl will look like. Photo **C** shows a three-ring bowl. Before the rings can be assembled, the bandsaw kerfs must be glued. I use urea-formaldehyde glue (Weldwood's Plastic Resin) and spring clamps for each joint, with cauls to spread the pressure. Sometimes I sandwich a piece of veneer in the kerf to highlight it. I let the rings cure for a day, unclamp them, and file off any excess glue from each seam so that the rings will stack flat and tight.

I've developed a direct approach to gluing up my bowls: I pile a few hundred pounds of concrete blocks atop a bowl inverted on a firm, level surface. I sometimes use large screw clamps, similar to a veneer press, but the blocks are

Petrochko's bandsaw method lends itself to tapered shapes such as this mahogany bowl.



A. *Sawing the first ring.*

B. *Tracing the second ring.*

C. *A bowl makes its debut.*

handier, even if cruder (**D**). Be mindful of the stack's center of gravity. If it's skewed, the rings will slide out of alignment or, worse yet, the entire thing may come crashing down.

Next I'm ready to give the bowl its final shape. If you are making a round bowl and you have a lathe, you could screw it to a faceplate and finish it just like a turned bowl. Instead, I disc-sand it. I prefer industrial-grade discs made by Merit.

A scrap of rug on the bench keeps the bowl from slipping while I rough-sand the outside. Smaller bowls have to be clamped to the bench. First I shape the outside of the bowl with a 36-grit, 7-in. disc, and then I refine it with finer, 5-in. discs mounted in the drill press. I sand the inside next (**E**), starting with a 36-grit, 3-in. disc on the drill press. I wear a face shield because the coarse disc sends glue beads flying. Medium and fine sanding, done with 80-grit to 150-grit discs, take much less time. After sanding, I finish the bowls with either mineral oil or 8 to 16 coats of Behlen's Salad Bowl Finish. When the finish has dried, I sand with fine wet-or-dry sandpaper, using vegetable oil as a lubricant, followed by fine steel wool. For the final sheen, I buff my bowls with a pad charged with polishing compound. □

D. *Clamping the bowl.*

E. *Sanding the inside.*

Bandsawn Baskets

Spiral your way to a collapsible container

by Max Kline

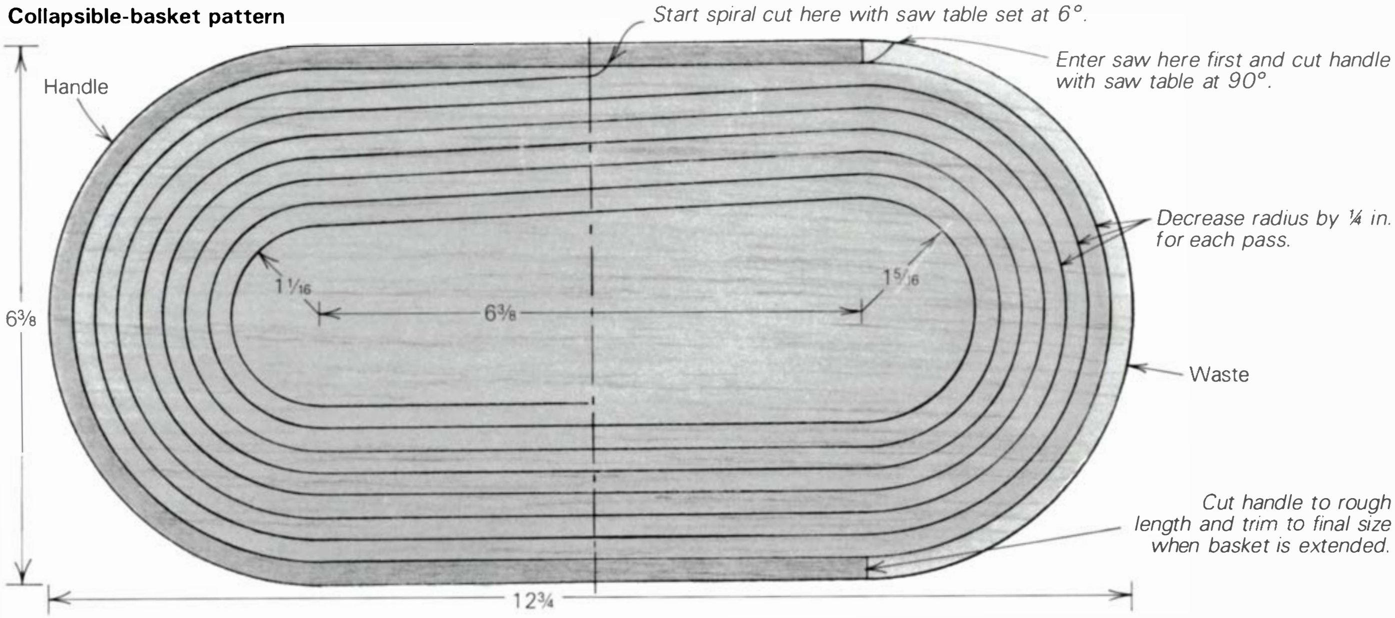
The idea for these collapsible baskets came from those fold-up drinking cups that were popular as novelties years ago. You simply bandsaw a continuous, spiraling kerf into a flat board at a slight angle, so the segments wedge against each other when the basket is opened. These baskets are useful for holding all sorts of things, from fruit to floral arrangements. When collapsed, they make nice tabletop trivets.

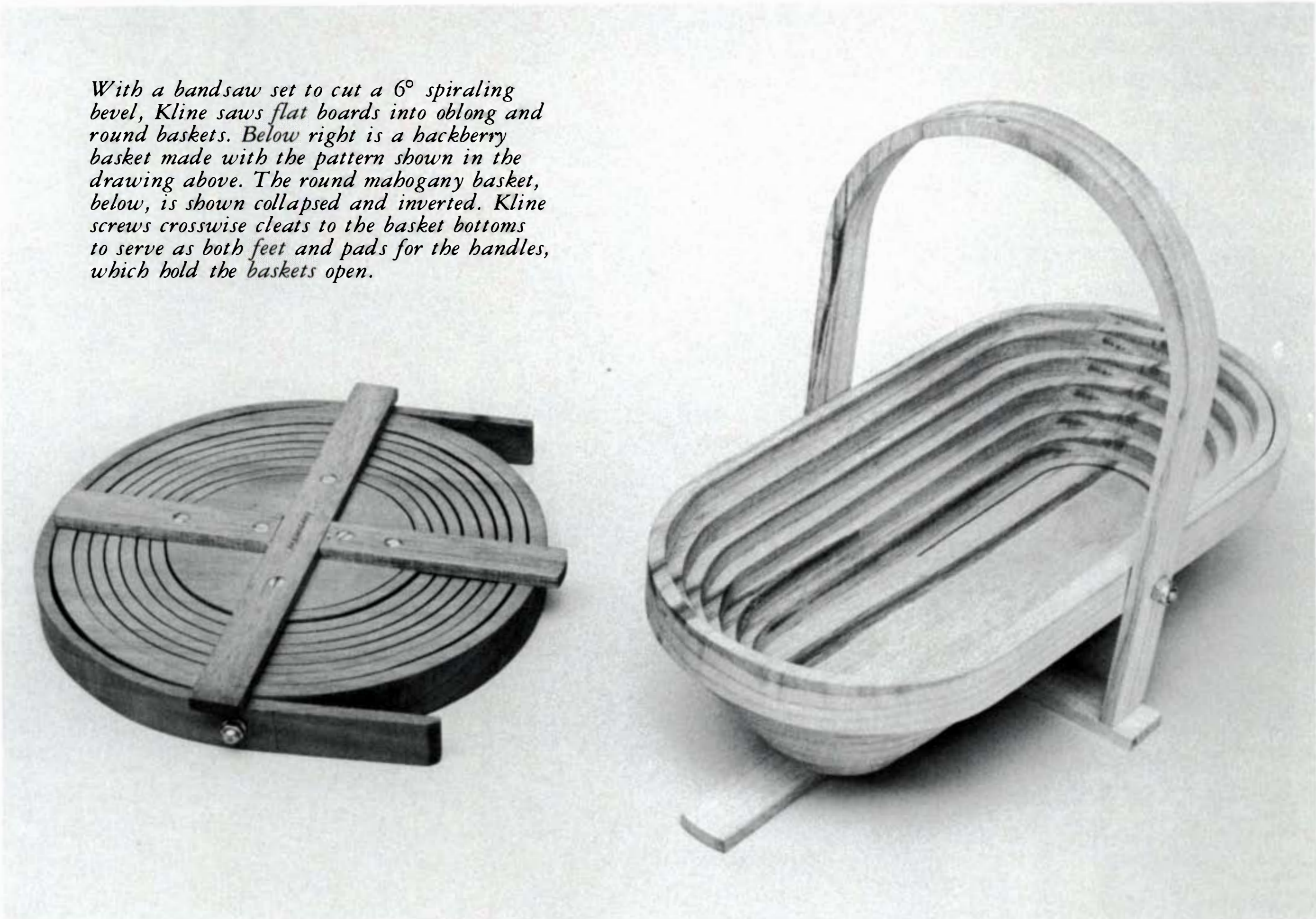
I make the oblong baskets from a ¾-in. thick board, 12½ in. by 6½ in. You could make larger baskets, but I don't recommend smaller ones because accurate sawing becomes difficult. I've made round baskets using the same technique, but I don't find them as attractive. Any wood species will do, although it should be knot-free, not too brittle, and resistant to checking. Very hard, light-colored woods such as maple and ash will sometimes burn when cut, particularly if the blade is dull. This burning is practically impossible to sand off.

To make a basket, scale up the pattern shown in the drawing and attach it to your board with rubber cement or double-faced tape. A new pattern is needed for each basket, so I photocopy them a few at a time to keep on hand.

As the drawing indicates, cut the handle with the bandsaw table set at 90°. I use a ¼-in., 6-TPI, skip-tooth blade. After the handle has been cut and removed, tilt the saw table to about 6°—an angle that seems to produce the best bevel to wedge the segments together when the basket is opened. Increasing the angle makes a shallower basket, but if you decrease it too much, the segments will drop through without wedging and you'll have a wooden "Slinky" toy. Thicker wood, say, 1-in., can be sawn at about 5°. As you saw around the pattern lines, the board will become harder to

Collapsible-basket pattern





With a bandsaw set to cut a 6° spiraling bevel, Kline saws flat boards into oblong and round baskets. Below right is a hackberry basket made with the pattern shown in the drawing above. The round mahogany basket, below, is shown collapsed and inverted. Kline screws crosswise cleats to the basket bottoms to serve as both feet and pads for the handles, which hold the baskets open.

control because the spiraling cut makes the blank springy. To maintain an accurate cut, grip the stock tightly at the sides and squeeze the segments together. When you reach the end of the pattern, back the blade out.

Next, glue back in place the free end where the saw entered. I sand the handle and the outside contours with a 1-in. belt sander. If you follow your pattern accurately, you shouldn't have to sand the inside of the basket. Attach the handle with flat-head stove bolts countersunk on the basket's inside and fastened with brass or chrome cap nuts. My pattern produces an extra-long handle which must be trimmed and positioned so that it holds the basket open at its full height but stores snugly when the basket is collapsed. Screw or glue the two lengthwise cleats and one cross-cleat to the basket bottom, and finish as you desire—I use Watco oil, followed by wax. □

Max Kline is a retired chemist. He lives in Saluda, N.C.

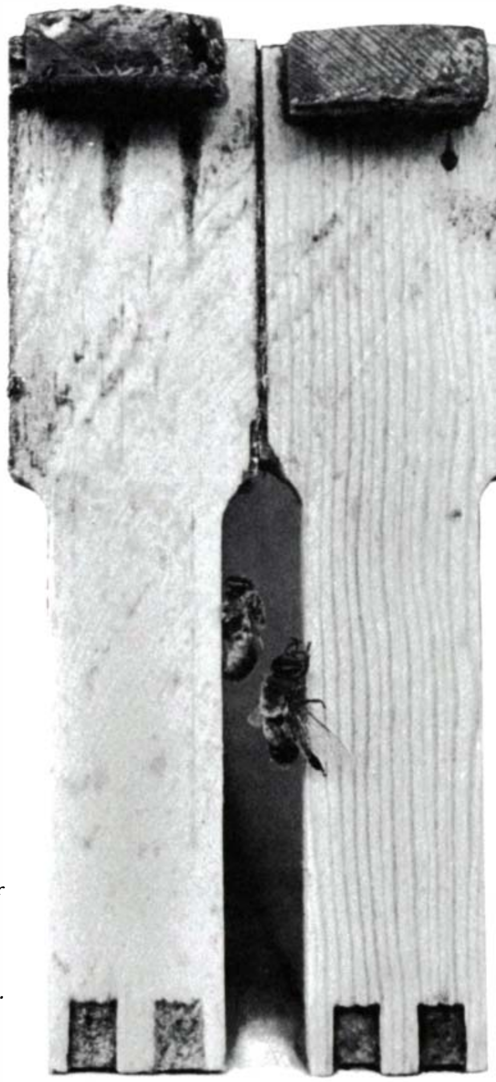
Making Wooden Beehives

Precision homes for the honeycombs

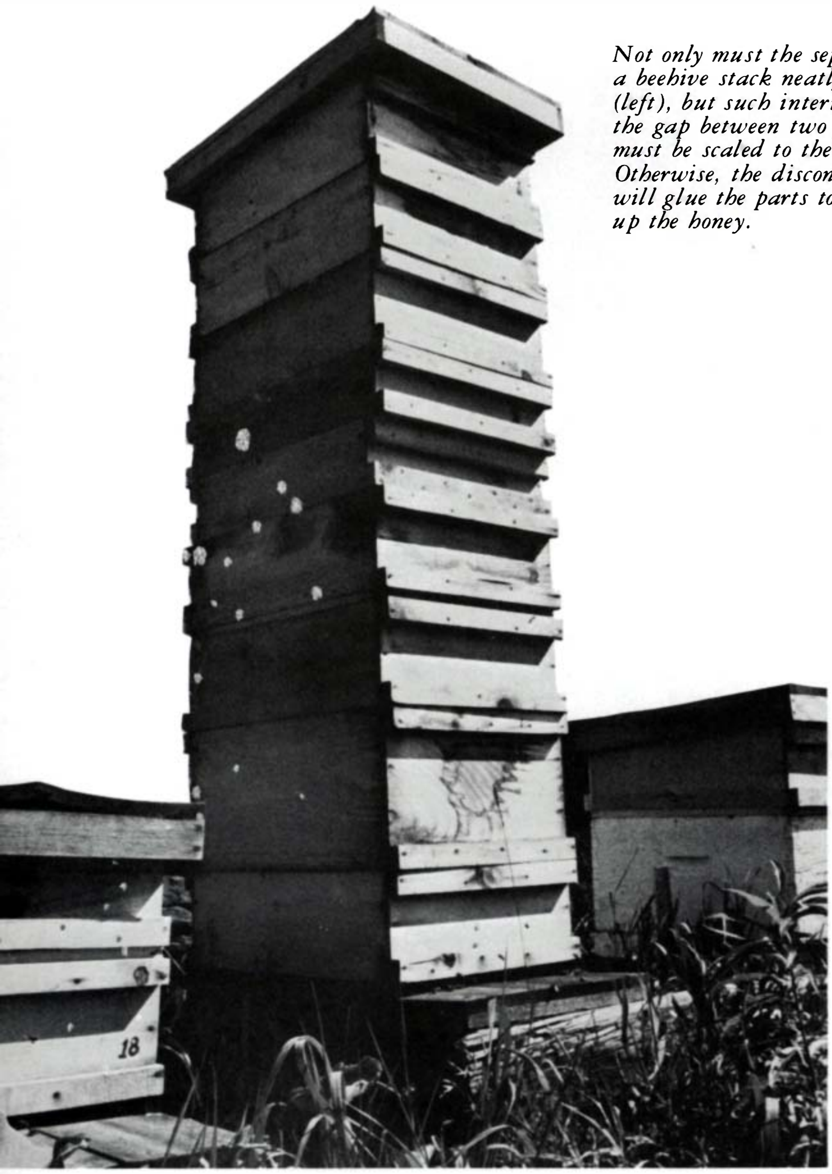
by Kevin Kelly

Within the woods where we gather and saw fine lumber, a few trees conceal, under their bark, hollows stuffed with honeycomb. This is winter food, to sustain a colony of bees while the flowers are gone. But it's a rare tree that has a perfectly shaped cavity to hold all the honey the bees could make. By taking lumber and constructing an ideal beehouse, the craftsman encourages the bees to gather more honey than they'll need for winter, and he pockets the surplus as his rent. The woodworker who ordinarily builds to close tolerances, but is the only one to know it, will find bees to be appreciative guests, for bees care about even a sixteenth of an inch. Mistakes slim to our eyes can cause the bees to construct an unworkable mess inside their hives, to the woe of the keeper.

In the past, bees were kept in all kinds of things, but principally, in old Europe, in the dome-like straw "skep" so often pictured on honey jars. In that primitive method both the skep and the bees were destroyed when the honey was harvested. About a century ago an ingenious hive system, made completely of wood, started beekeeping along its modern practice of conserving both hive and bees. Wooden stuff has worked so well with beekeeping that even today, despite the unbalanced tilt toward a world of plastic, most beehives are still made of wood. You can get people to live in plastic houses, but bees, so far, rebel.



Not only must the separate stories of a beehive stack neatly and tightly (left), but such interior spaces as the gap between two frames (right) must be scaled to the bees themselves. Otherwise, the disconcerted insects will glue the parts together, locking up the honey.



The contemporary beehive is a stack of boxes piled up as high as needed and able to be taken down easily. The lowest box is the hive proper, where the bees live and raise their young. The upper boxes, properly called "supers," are where the honey is stored. There are no tops or bottoms inside the stack, but each story is divided within by ten intricate frames, arrayed like slices in a loaf of bread. Hives and supers must stack neatly, and supers should be interchangeable—they will be removed and replaced as they fill. Their outside dimensions are standard throughout the United States, with the inevitable exceptions here and there. Heights, however, can vary, although two sizes, "shallow" and "deep," are most common. Any woodworker making bee equipment should resist the temptation, no matter how compelling, to produce equipment not to standard size.

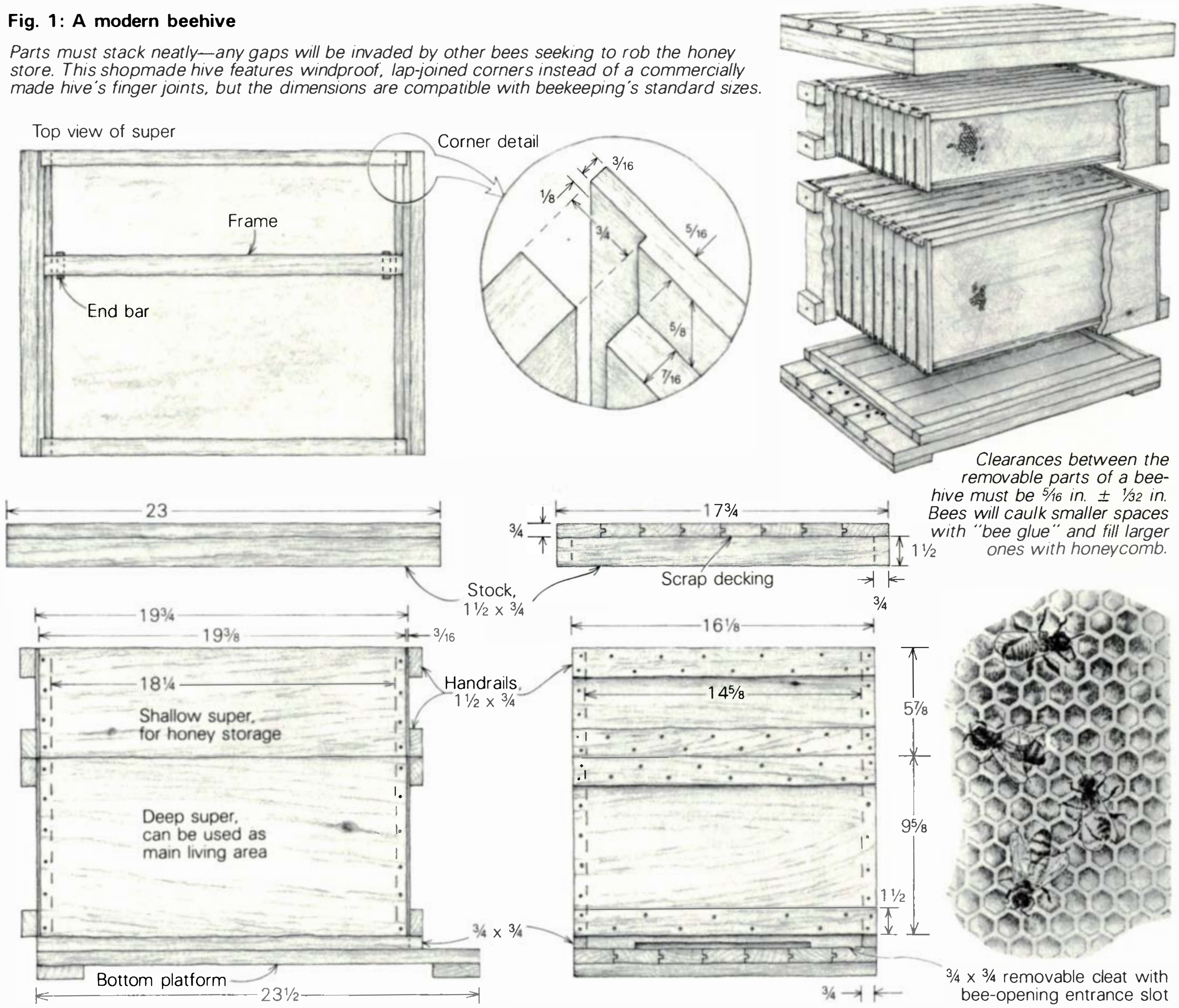
The side pieces of the box-like super are plain rectangles that fit into rabbets cut on the end pieces. Measurements for the cuts have been planned to form a box with inside dimensions of 18¼ in. by 14⅝ in. (figure 1), which allows a constant space between the edges of the frames and the inside wall. This gap is called the "bee space," and its discovery and application by the Reverend Langstroth in 1851 was the key to modern beekeeping. He measured the natural space maintained between combs built by bees in the wild and found it to be exactly 5/16 in. ± 1/32 in. Any gap less, even 1/32 in. less, had been caulked by bees with a secretion called "bee glue," and any void wider had been filled with honeycomb. Bees are slightly more tolerant when it comes to the built-in spaces in a wooden hive, but the hive maker, by aiming to construct a consistent 5/16-in. gap between movable parts of the hive, ensures that the bees will leave the gaps unfilled. Thus, each internal piece will be able to be lifted out, emptied of honey and returned.

Super construction—The sides of the supers are traditionally joined with a finger joint, erroneously called a dovetail joint in bee craft. Finger-jointed hives are strong and durable. By using multiple blades, this is also a quick cut for commercial manufacturers, and this style is childishly simple to assemble—an important feature, since most beehives are sold "flat," to be put together by the buyer. An easier joint to make on small runs is the half-lap joint, secured with 8d nails, which is adequately strong, and more weather-resistant besides. It has two clear advantages: it creates a windproof corner and it uses shorter sections of boards. If laid out carefully, a 6-ft. board—too short for a finger-jointed super—will conveniently build a half-lap super.

We began building our own hives because we had access to about 1,000 bd. ft. of small but well-proportioned white pine scraps that would otherwise have become winter heat. For half-lap supers, the longest piece need be only 19¼ in., with a width of about 5⅞ in. for the shallow supers and 9⅝ in. for the deep. Small knots, cracks and other minor defects in the wood are for once usable, because the bees will repair them by chinking them with their bee glue, called propolis, a sticky resinous all-round filler, glue and varnish that they apply to interior parts. So ubiquitous is this propolis that one of the very few vital beekeeping tools is a flat prybar, which is used to separate the supers in a stack—the bees automatically glue them together. Don't go overboard with nasty wood, however, because bees have two character traits that will work to your eventual disadvantage. First, they are fussy craftspeople themselves—they will waste much time smoothing rough wood and repairing cracks, instead of going outdoors to

Fig. 1: A modern beehive

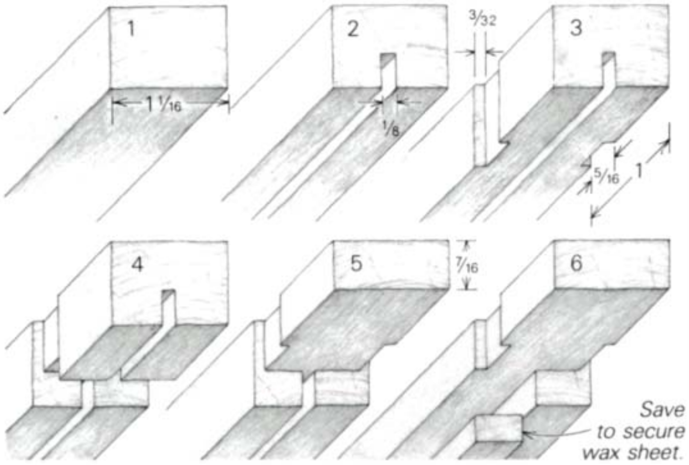
Parts must stack neatly—any gaps will be invaded by other bees seeking to rob the honey store. This shopmade hive features windproof, lap-joined corners instead of a commercially made hive's finger joints, but the dimensions are compatible with beekeeping's standard sizes.



Clearances between the removable parts of a beehive must be 5/16 in. ± 1/32 in. Bees will caulk smaller spaces with "bee glue" and fill larger ones with honeycomb.

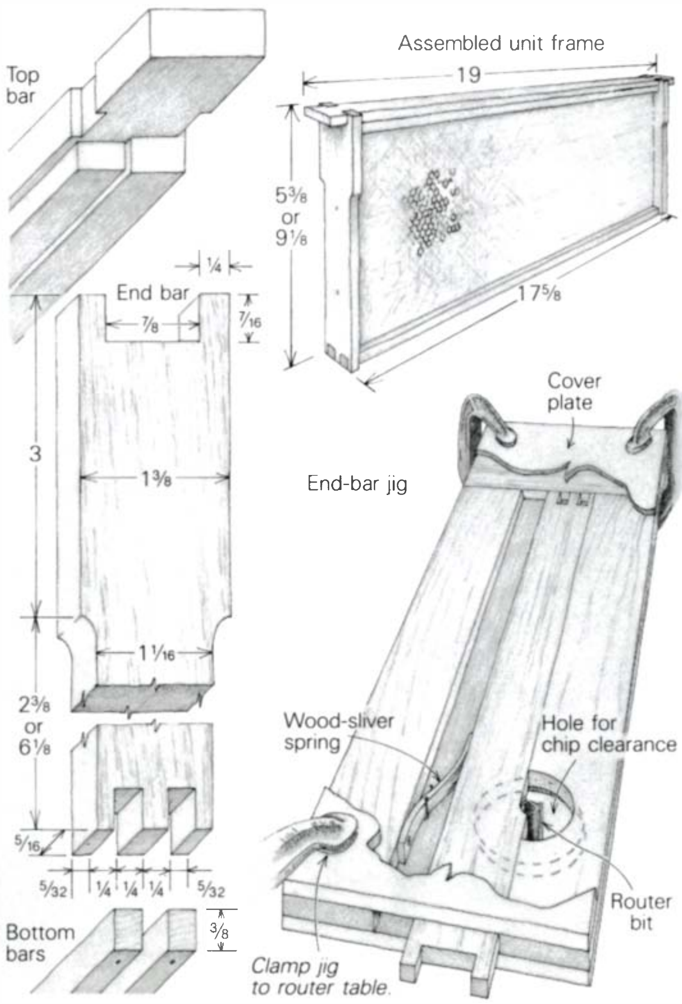
Drawings: Christopher Clapp

Fig. 2: Cutting sequence for top bars



Stacks of parts are dadoed in a 'chute' composed of the tablesaw fence and a length of wood clamped to the table.

Fig. 3: Making the end bars



gather nectar. Second, while not exactly what anyone could call lazy, they will take the path of least resistance in their search for sweetness—bees will steal honey from a neighboring hive flawed by an unrepaired bee-sized chink in its armor.

The unit frames, as shown in figures 2 and 3, are a critical construction. Each consists of four parts: two vertical end bars, a horizontal top bar bridging the length of the box, and a bottom bar (which is most easily made from two pieces). The top bar extends beyond the two end pieces to form tabs from which the frame hangs in the super. The bottom bar has a ¼-in. wide slot down its length to hold a sheet of beeswax, the base on which the bees will build honeycomb.

The beeswax sheet is inserted into the slot of the bottom bar, and is supported at the top in a rabbet, secured by the thin wood strip that was cut out when the rabbet was made. Most wax foundation is sold with stiff wire embedded in it so that it does not balloon like a sail and sag into its neighbor. The sides can also be supported with thin wires through holes in the end bars. Once in the hive, all the edges will soon be secured by propolis or by wax comb.

The end bars, by placement and shape, set the proper 5/16-in. bee space throughout the entire hive. When the frames are placed in the hive, the end bars are recessed from the walls to give the bee space. The end bars are wider than the top bars they hold, so that on adjacent frames the shoulders of the end bars touch, while the top bars have a bee space between them. The length of the end bars is calculated so that they hang exactly 5/16 in. above the set of frames in the super below. And the lower half of each end bar is routed on both sides to a narrower width, so that when they are placed side by side there is a passage of 5/16 in. between frames.

The top bars are easily cut from ¾-in. stock in a sequence of cuts shown in figure 2. The bottom bars are also simple to cut. But because the end bars must measure 5/16 in. by 1⅜ in., if they are cut from ¾-in. stock, the stock should first be resawn to 5/16 in. thick and then 1⅜-in. wide blanks cut. The blanks are next arranged face to face in a long train and fed through a chute formed by the tablesaw fence and a board clamped to the table. As the blanks go through the chute, a ⅞-in. dado blade cuts the top notch. With the pieces flipped over and the blade set to take a narrower ¼-in. kerf, two subsequent passes slice the lower notches for the bottom bar.

To rout the contour of the end bars—half a bee space—we devised a simple jig placed on a router table. The jig has a stop and a wood sliver as a spring to keep the piece in place, as shown in figure 3. Routing these pieces is the most tedious task of the run, but when the chips settle, you should harvest a uniform pile of accurately sized end bars.

The assembled parts ought to hug each other snugly. We marry them with Weldwood plastic resin glue. Ordinary carpenters' glue will fail, quickly deteriorating in the tropical conditions inside the hive. Resin glue is waterproof and insectproof, yet seems agreeable to chemically finicky honeybees. The frames will have to undergo a strain of several "g"s while spinning in the centrifuge that whirls the honey from the comb, and they will be battered by tools prying apart propolized pieces, so the units must be rigid. We reinforce each glued joint with 1-in., 18-ga. brads.

The new, cleanly cut frames and inside walls of the hive gradually become stained with a glossy yellow-orange color as the bees use their home, even during the first season. In time the interior collects a lacquer of uneven amber glaze from the thin layer of propolis painted by the bees. I enjoy opening an older hive and inspecting the mellow shellac that's been literally rubbed into the wood by millions of tiny bee feet. This natural finish must have intrigued earlier woodworkers, because Stradivarius and other famous violin makers of old Cremona, Italy, used propolis as a principal component in their varnish.

A beekeeper always finds more propolis than he wants. The stuff is compounded of 30% waxes, 55% resins, and 15% oils and oddments, and it readily dissolves in acetone or ethyl alcohol. Someone with an experimental bent may someday rediscover how to apply this as a radiant wood finish.

To complete the hive, some sort of handhold is needed on each super to enable you to move it around. Full of honey, a deep super weighs 60 lb., and even a healthy farmhand will have to grunt to set it gently on top of a chest-high stack. The shallower, and thus lighter, size is still surprisingly heavy. Customarily, a scalloped handhold is routed into each side of the box. Ormond Aebi, however, who earned the world's production record for extracting 33½ *gallons* of wildflower honey from one hive, finds that the routed handhold cools the hive at that spot, diminishing yields. Instead, he attaches two wooden rails on each opposite end, which also enables the super to stand on end, taking less ground room when a tall hive full of bees is being dismantled. We now do the same.

Early in this century, hives often sported peaked roofs, shingled like tiny cottages. They were picturesque but uneconomical. Flat roofs can be made of plywood, covered with sheet metal. But both roof cover and the bottom platform are best made of odd pieces of hardwood flooring or softwood decking. For the top, narrow strips should be splined together—it is best not to use wide pieces because they will cup from the rain and sun, even if thoroughly nailed down with 8d galvanized box nails, as we do. For the bottom, join the boards with tongue and groove so that rain water and melting snow can drain out.

Ignoring tradition, we leave our hives completely unpainted. The primary reasons beekeepers paint hives white are to keep them groomed and to prolong the life of the wood. The hives may or may not do better, but the bees inside do not. More often than not, when a colony of bees dies over winter, wet is to blame rather than cold. Cold weather condenses the moisture in the hive onto the comb and walls. This film of pooled water breeds mold and crippling bee diseases. Wood can breathe the wetness out, even as it sheds rain and snow. Paint hinders this respiration. But, even if it made no difference to the bees, and the hives were painted just to keep things tidy, we'd still not lift our brushes. Wood has a grace in weathering, and the natural graying of the pine is genuinely attractive—much like an old barn or a dock. There are other benefits: In remote apiaries, vandals and beehive rustlers may overlook unpainted hives. In towns, neighbors who might protest against bees may never notice them. We once kept an unpainted beehive on a porch roof in the middle of a village—no one realized it was full of bees and honey, because it looked like a collection of old boxes, and as everyone knows, beehives are painted white.

Photos by the author

Fitted with sheets of wax foundation and arrayed like slices of bread in a loaf, the precisely fitting frames in each super can be lifted out for inspection or honey extraction.

If one is not careful and lets it, the paraphernalia in any craft will overcome its practitioner. We have deliberately kept our bee supplies to a spartan minimum: a smoker, bee veil and pry tool. The only purchases we must regularly make are wax sheets. These will last for ten years or so, and then can be melted by the sun's heat, sent away as wax lumps to a bee supplier and, for a small fee, "worked" into new foundation sheets. There are a dozen major suppliers and scores of smaller ones, all shipping wax sheets, tools, books, and cages of live bees (sold by the pound!) through the mail. Our favorite for price, variety and service is the Walter T. Kelley Company, Clarkson, Ky. 42726. The bulk of trade for all the suppliers is selling wooden hive parts to be assembled by the buyer. One sample set could be bought to use as a template for building others.

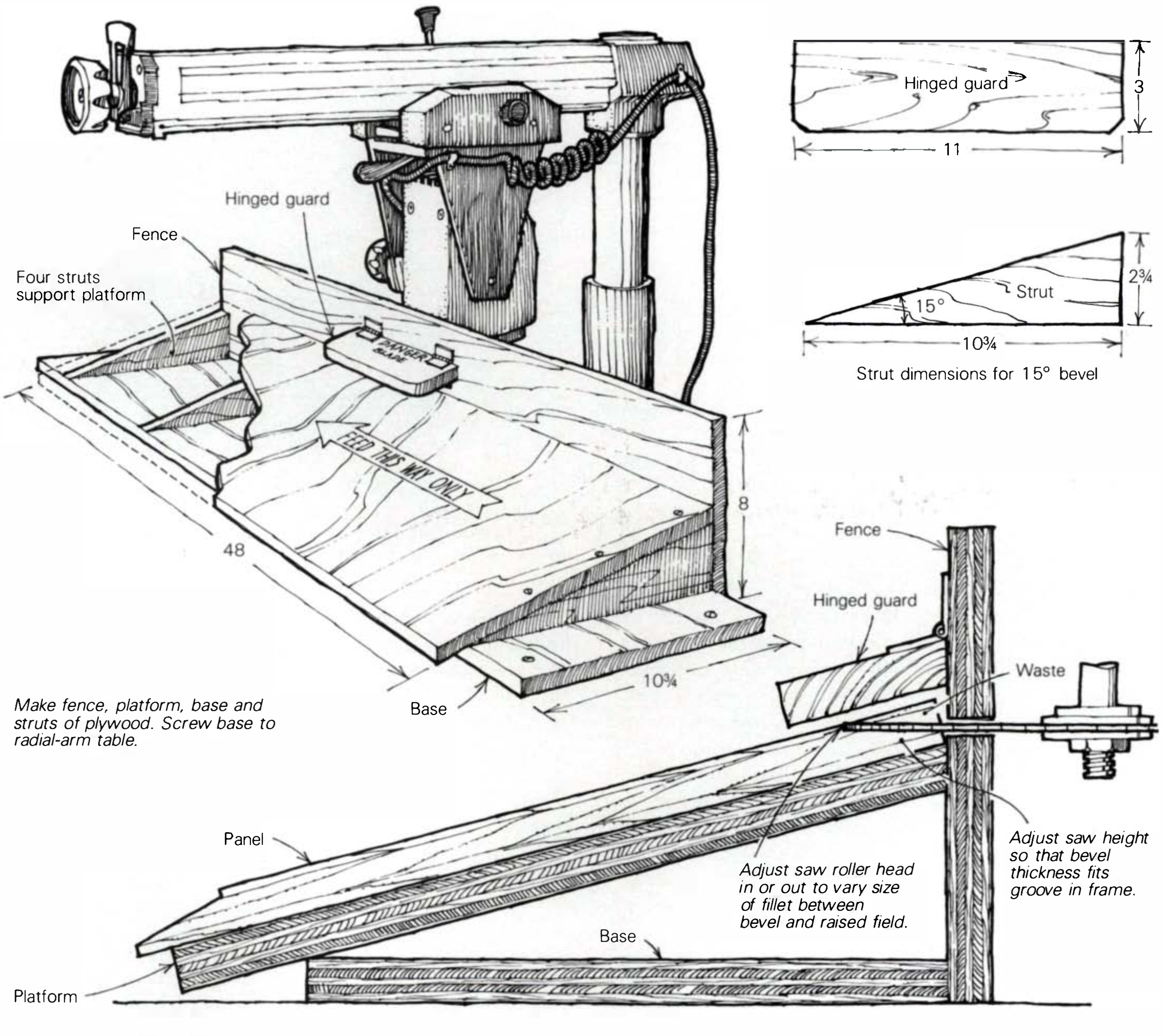
The best time to start a hive and fill it with bees is in the spring, about the time the dandelions bloom. Hopefully you'll need lots of supers—a good colony in peak season can produce 20 lb. of honey a day. Cutting heaps of hand rails, stockpiling rows of end bars, and gluing up frames to be fitted with wax sheets a little later is the kind of relaxing woodwork we fit around the edges of the day's chores. It's best done anytime but summer, when the bees are returning in haste, heavily laden with sweet nectar, unable to wait. What is not stored is lost. What is kept is shared. ☐

Kevin Kelly keeps bees, travels, and publishes Walking Journal, *Box 454, Athens, Ga. 30603. For more about beekeeping, read* First Lessons in Beekeeping, *Dadant and Sons, Hamilton, Ill. 62341, 1980, $1.40, 144 pp.*

Radial-Arm Raised Panels

You can even make them out of plywood

by William D. Lego

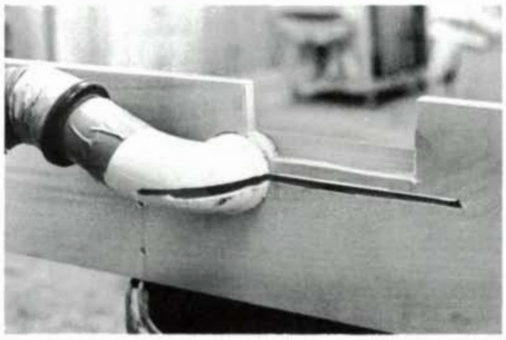


I use raised panels in much of the cabinetry I build, but like many small-shop woodworkers, I can't justify the expense of buying a large shaper just for this purpose. I probably couldn't shoehorn one into my shop anyway. Instead, I designed this jig that allows me to cut all sizes of raised panels with my radial-arm saw. As shop aids go, this one is practically bullet-proof—you can make it out of scrap, set it up in no time and, when it's not in use, hang it up on the shop wall, out of the way.

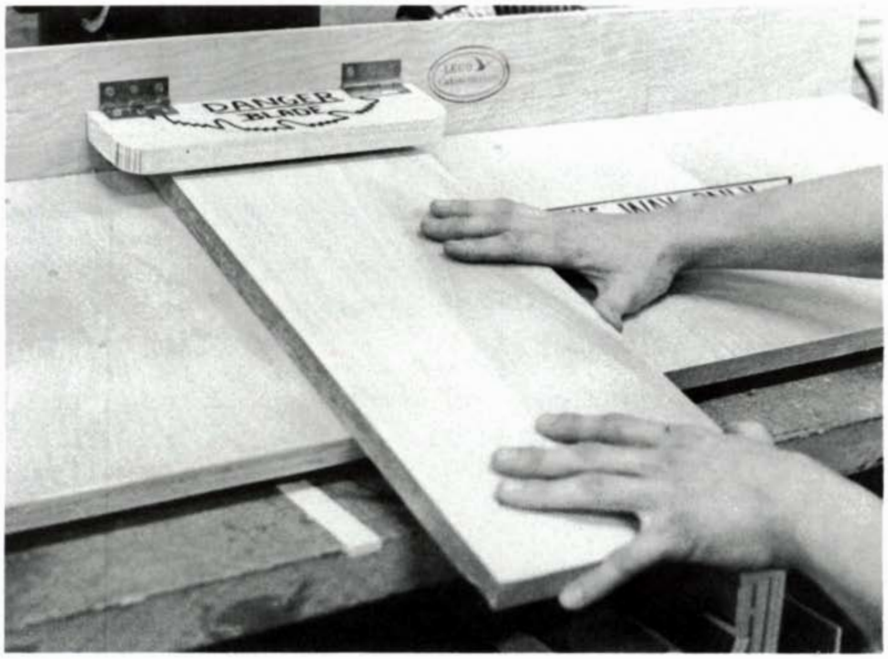
I built this jig two years ago, and I've found that it has two advantages over a shaper: it's safer to operate and the panels have smoother, splinter-free bevels. This last point is important to me because I make my raised panels out of hardwood plywood and then cover the exposed edges of the plies with veneer backed by a thermosetting adhesive. This veneer, which I buy in rolls and sheets from Allied International Inc., PO Box 56, Charlestown, Mass. 02129, can be applied with a hot iron. The technique may not delight the purist, but with all the crooked, twisted lumber we seem to get these days, using plywood saves the time and frustration of gluing up solid stock and then milling it flat. This method seems best for panels that will be painted, but if you apply the veneer carefully, you can get decent results with clear finishes. Of course, the jig works just as well with solid wood panels.

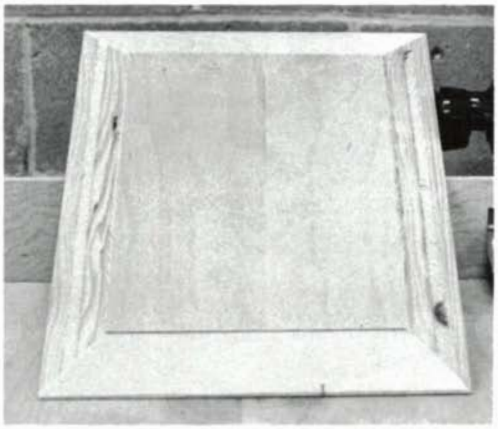
As the drawing shows, my jig consists of an inclined platform mounted on a base that can then be screwed or clamped

Drawings: Jim Richey

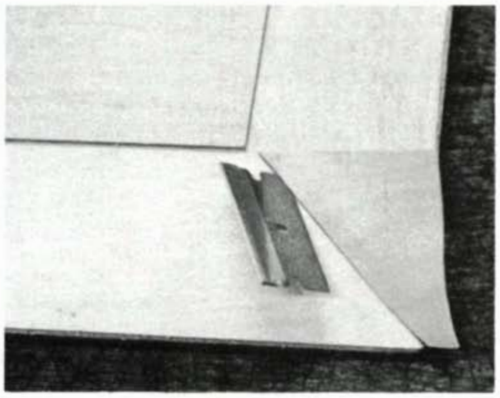


A 2-in. PVC elbow, left, mounted behind the fence and connected to a shop vacuum collects the dust from Lego's panel-raising jig. He glued the elbow in place before slowly sawing its blade slot. Fence cutout accommodates saw motor when sanding bevels. The photo below illustrates safe hand position for feeding a plywood panel past the sawblade. Hinges attach the guard to the fence, allowing it to pivot up slightly, so offcuts won't jam.





Exposed plies on the bevels of a plywood panel won't do, but once they are covered with adhesive-backed veneer tape, above, they look fine and they will take an excellent paint finish. The veneer tape is applied with a hot iron. Where it meets at the corners, Lego razors a neat miter joint, below.

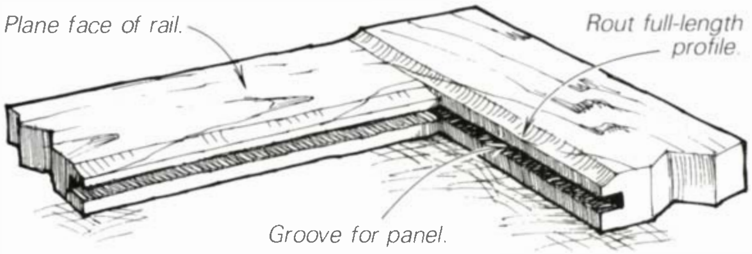


to the radial-arm table. You can experiment with the platform angle, but 15° is a good starting place. I'm kind of a safety nut, so I installed a hinged guard above the point where the blade projects through a slot in the jig's fence. The guard has to pivot only slightly, but don't use a rigid guard—the panel offcuts might jam between the blade and the guard. To collect dust and chips, I used construction adhesive and a few brads to mount a 2-in. PVC elbow in the fence behind the blade, then connected the elbow to my shop vacuum, as in the photo at top left.

Once you've built and positioned the jig, make some test cuts and adjust the height of the saw until the panel bevel tapers to a perfect fit in the grooves of the frame it will go into, as shown in the drawing at left. To vary the size of the fillet between the bevel and the panel's raised field, move the saw roller head in or out. Steel combination blades work well for panel-raising, but because they dull quickly, I find that I have to install a sharp blade after raising a half-dozen panels or so. A carbide-tipped blade would last longer. If I'm using solid wood, I sand the sawmarks off the bevels using a Sears 8-in. sanding disc with a 2° taper (catalog number 9 GT 2274). This tapered disc contacts the wood with a small, conical-shaped section instead of the wide, swirling arc of a flat sanding disc, thus leaving fewer sanding marks. You don't have to sand the bevels of plywood panels, since they'll be covered by veneer tape anyway. □

William Lego owns and operates a six-man cabinet shop in Springfield, Va. Photos by the author.

Decorative joint enhances frame



For my cabinet doors I use a simple frame-and-panel construction with mortise-and-tenon joints. The method described here allows me to add a decorative molded profile to the inside edge of the frame, without having to cope the molding joint at the corners or to go to the trouble of making a masons' miter.

First I mill all my stock to the same thickness, cut the frame members, mortise the stiles and tenon the rails. After the joints have been fitted, I plane 1/16 in. or so off the face of each rail. This step puts the face of the rail on a different plane than the face of the stile. Now you can rout a shallow (no deeper than 1/16 in.) profile on the inside edges of both stiles and rails. Of course, the decorative molding runs the length of the stiles rather than stopping at the inside edge of the frame. The effect, though not traditional, is handsome, and the resulting doors are strong and light.

—Pat Warner, Escondido, Calif.

As Dries the Air, So Shrinks the Wood

Why woodworkers keep a weather eye on relative humidity

by R. Bruce Hoadley

Most woodworkers realize that wood moves, shrinking and swelling according to its moisture content. Accordingly, we use joints and constructions that allow for a moderate amount of wood movement, and many of us now use moisture meters to ensure that our wood has been dried to a safe level. But a one-time check of moisture content isn't enough. Here in the northeast, you can take delivery of wood kiln-dried to 7% moisture content, but if you then store it in an unheated garage, it will gradually adsorb moisture from the air and increase to a new level of up to 14%, which, if unanticipated, would come as an unpleasant surprise.

The amount of moisture in wood balances and adjusts to the relative humidity of the air around it. Assessing the humidity of the air in shop or storage areas, therefore, is as important as working with wood that has been properly dried in the first place. An extremely dry or damp period may not last long enough to cause much dimensional change in a board, but moisture exchange in the board's surface layer, which takes place immediately, can cause disheartening problems with glues and finishes.

Equilibrium moisture content—One sometimes comes across wood that has been sitting in a well-ventilated, unheated barn for thirty or forty years. It probably reached its lowest moisture content within the first two or three years, and it is not any drier or more stable today than it was then. In wood, *moisture content* (MC) is the ratio (expressed as a percent) of the weight of water in a piece of wood to the weight of the wood if it were completely dry. Green wood may start off with more than 100% moisture content (the sapwood of green sugar pine is actually more than twice as much water as wood, averaging 219% MC), but it will commonly be dried to about 7% to 9% MC for woodworking purposes. Water is held in the wood in two ways: *free water,* held in the cell

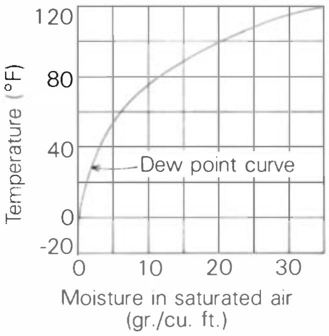
Weather, temperature and humidity

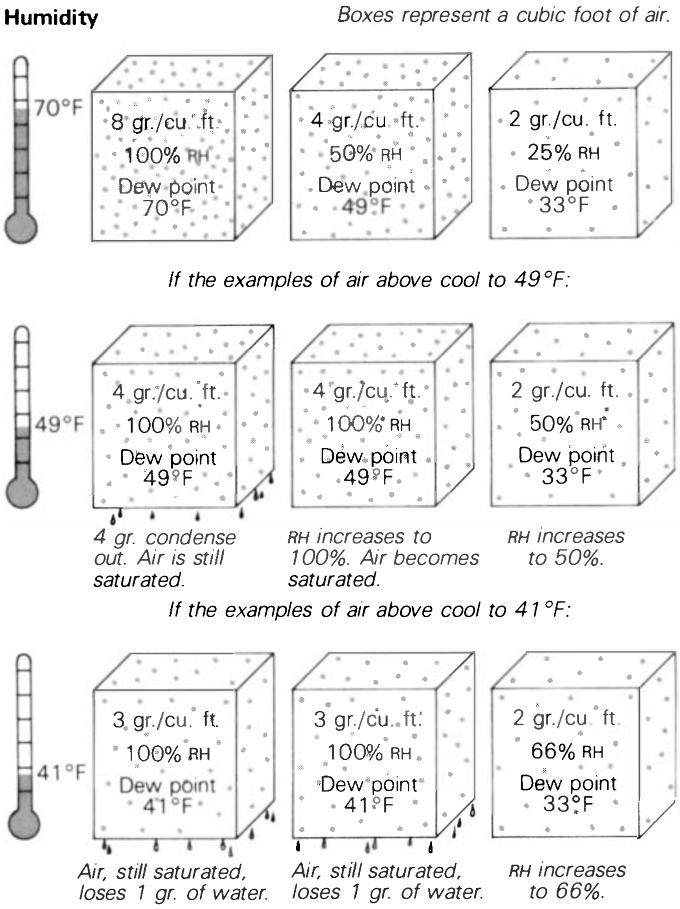
Weather systems bring air masses having a certain *absolute humidity,* the actual amount of moisture in the air at a given time, expressed in grains per cubic foot (there are 7,000 grains in a pound). Because the maximum amount of water the air can hold depends on the temperature of the air, temperature determines the upper limit of absolute humidity.

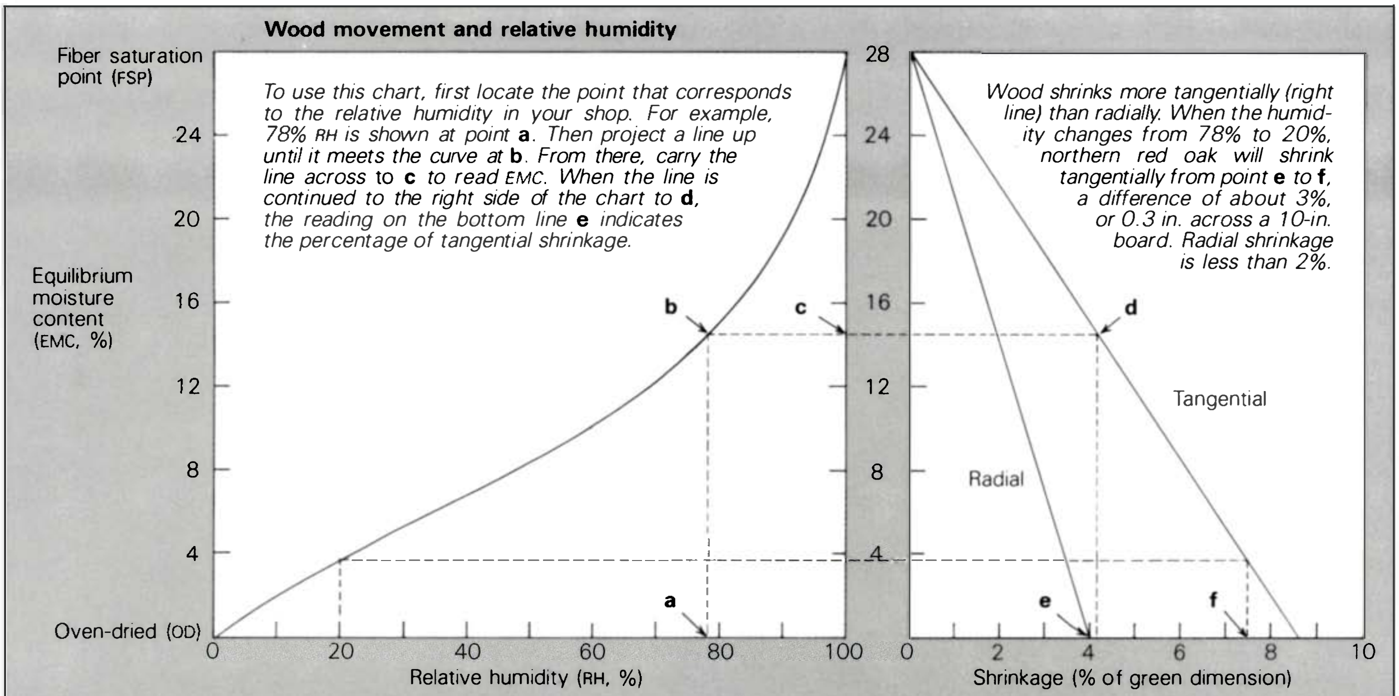
As shown at right, at 70°F the air can hold 8 gr./cu. ft., whereas at 41°F the air can hold only 3 gr./cu. ft. We naturally associate cold weather with low absolute humidity and hot weather with high absolute humidity. It isn't absolute humidity, however, that causes the problems for woodworkers but relative humidity. And where relative humidity is concerned, the generalization does not always hold true. A hot summer day can be dry; winters can be cold and damp.

Relative humidity (RH) is the ratio (expressed as a percent) of the amount of water in the air at a given temperature to the amount it could hold at that temperature. Since air at 70°F could hold 8 gr./cu. ft., if it actually held only 4 gr./cu. ft., the RH would be 50%; if it held 2 gr./cu. ft., the RH would be 25%, and so forth.

Dew point is the temperature at which air of a given absolute humidity becomes saturated. As an example, air that contains 4 gr./cu. ft. has a dew point of 49.3°F. That is, when cooled to 49.3°F the air will be saturated and therefore will be at 100% RH. If it gets any colder, moisture will condense out. *—R.B.H.*







Moisture migrates slowly through wood as relative humidity changes. Dimensional change in thick pieces may take weeks or months, but a difference in moisture content between surface and center causes stresses that jeopardize gluing and finishing. This composite chart for northern red oak, a typical species, relates wood movement to relative humidity (RH). The left side of the chart shows how the wood's equilibrium moisture content (EMC) changes as RH changes. The right side of the chart shows the percentage of dimensional change.

cavities, and *bound water,* held within the cell walls themselves. When wood dries, it loses free water until the moisture content drops to about 30%; from then on it loses bound water. As the cells lose bound water they shrink, creating stresses that can lead to checking and warping.

Even after kiln-drying, wood cells continue to lose and gain moisture until there is an equilibrium between the amount of bound water and the surrounding air's *relative humidity* (RH, explained in the box on the facing page). When this balance with RH is reached, the MC of the wood is called the *equilibrium moisture content* (EMC). Note the left side of the chart above, which is based on red oak, a typical species; other species differ only slightly. Generally the EMC can vary from 0% (when oven-dried, in effect at 0% RH) to a maximum of about 30% (in an atmosphere where the air is saturated with moisture, in effect at 100% RH). A 30% moisture content is all the bound water the cells can hold, the *fiber saturation point* (FSP). The wood will not adsorb more moisture from the air than this, although if rained on or soaked it would absorb some free water again at the surface layers.

Left outdoors (as in a typical drying pile), the wood will arrive at an average equilibrium moisture content depending on the average relative humidity of the area. This is called its *air-dried moisture content,* and once the wood reaches this point it will more or less stay there, varying slightly with environmental fluctuations. Air-dried moisture content can vary widely from region to region—wood reaches a different EMC in southwestern deserts than it does in the northwest's rain forests. EMC can vary depending on local conditions within an area; the windward side of a lake, for instance, is measurably drier than the leeward. As I mentioned earlier, air-dried wood reaches an equilibrium at about 14% EMC in the northeast. This is because the relative humidity here averages about 75%. In your own part of the country, you can determine the EMC for air-dried wood if you know the average RH.

Some people define EMC as *surface moisture content,* an appropriate reminder that the wood cells at the surface attain an immediate equilibrium with the surrounding air. When we put a finish on a wooden object, it slows down moisture exchange, giving some protection from sudden changes in relative humidity. And even raw wood takes time to adjust fully—the rate of moisture migration into wood is quite slow, and one or two days of high humidity are not enough to cause much dimensional change in thick pieces. But even temporary change in a raw-wood surface layer can have critical consequences, and abrupt changes in relative humidity, particularly in the workshop, can cause serious problems: drawers that will never work right, faulty glue joints, finishes that won't shine or, at worst, won't adhere at all. These problems can come as a surprise because human beings are relatively insensitive to changes in relative humidity. While the average person can estimate indoor temperatures within a few degrees, sensitivity to relative humidity is quite another matter. We become acclimated to gradual seasonal changes, and our sense of "normal" adjusts to summer humidity and winter dryness.

I'm frequently reminded of this in my daily work. Our laboratory has an experimental room closely controlled at 72°F and 50% RH. When I enter it in winter it seems oppressively muggy and damp, while in summer it seems cool and dry. We cannot trust our senses, but must rely on instruments such as those shown on p. 95 to tell us of conditions that to us may feel only moderately uncomfortable, but to a woodworking project may spell disaster.

Effects of changes in RH—The chart above correlates dimensional change in wood to EMC and RH. My basement, surrounded by bedrock, is also my workshop, and its RH can swing from more than 90% in August (relative humidity rises when hot, muggy air is cooled by the basement) to 5% in midwinter when I have been using the woodstove. Extremes of this magnitude can cause as much as a ½-in. variation in the width of a 10-in., flatsawn red oak board. Wood exchanges moisture with the air fastest on the surface and through the end grain. Abrupt changes in RH mean that the inside of a piece of wood is at an EMC (and size) different from the surface. A sudden dry day can cause microscopic surface checking that will interfere with the quality or adhesion of finishes. Wood has a certain elasticity that allows it to absorb stresses caused by moisture changes, but this elasticity can be lost. A sudden damp day can have somewhat the same effect as a dry one—the surface, restrained from swelling by the center, becomes *compression set* (*FWW* #14, pp. 80-81). When the surface redries, checks result.

EMC can interfere with gluing. Silicone adhesives will not bond properly if the EMC of the wood surface is too high, and plastic resin glues (urea-formaldehyde) will not bond well if the wood is *drier* than about 7% MC. As the left side of the chart on p. 93 shows, one might encounter problems with urea-formaldehyde glues when the shop RH drops below 40%.

While thick pieces of wood may take days, weeks or even months to completely adjust to a new RH, thin veneers can reach equilibrium within an hour or less. Thus they don't surface-check, but they may quickly undergo the maximum overall change in size. I would not work veneer in my basement when its RH is approaching either extreme.

With the RH in my basement so unstable, even moderate-size pieces of wood, drawer parts for instance, can move enough from one weekend to the next to make precision cuts meaningless. Although I manage to store my wood someplace else, upstairs usually, in a closet, under the bed, in the mudroom or wherever, it still leaves me with the problem of what to do with projects that are half-done. I routinely wrap wood sculptures in plastic between work sessions to protect them, because changes in RH can cause extreme stress between the center and the surface of a thick block. Plastic film or bags have the same effect as a coat of finish—while they can't maintain the moisture content of a piece of wood indefinitely, they can isolate the wood against drastic responses to temporary swings by making changes slow and uniform.

Controlling RH—The ideal moisture content for wood is not necessarily the numerical mean between the highest and lowest extremes, but depends on the yearlong seasonal variation. Indoors, the average RH in the northeast averages close to 40%, mostly due to heating in winter, which commonly lowers levels to 20% for weeks at a time. Red oak furniture, therefore, will eventually reach an average EMC indoors of about 7% to 8%. This is the reason woodworkers in the northeast start out with wood dried to this level. Our workshops, then, should be maintained at a humidity level of about 35% to 40% in order to keep our stock at a 7% to 8% EMC. One would do well to think: "My lumber should be at an equilibrium with 40% relative humidity," rather than thinking only about the wood's 7.5% moisture content. This approach has the advantage of automatically accommodating the different EMCs of various wood species and of wood products such as particleboard, fiberboard and hardboard.

Without its being our intent, many of our daily activities affect indoor RH. In our homes and workshops, we routinely modify temperature by heating and cooling the air. If we increase the temperature while the absolute humidity remains unchanged, the relative humidity will be lowered. If we cool the air, such as happens when I ventilate my cool basement with warmer air from outside, the relative humidity will rise. Routine activities such as cooking and washing may release surprising amounts of water. Mopping a kitchen floor and allowing it to dry, for instance, may add several *pounds* of water to the indoor air. So will moving a quantity of green wood into a storage area filled with wood that has been carefully dried. On the other hand, air conditioners and dehumidifiers cool the air below its dew point. The water condenses out and drips away. Muggy summer air can lose so much moisture as it passes through an air conditioner that it will be comfortably dry when it mingles with the warmer air inside the room. The principles involved above are the basic ways we can control humidity. Some of the methods are expensive, and corrective methods are, in the end, based on economics.

One key factor in deliberately controlling humidity is the size of the area—the smaller and better insulated, the more isolated from volumes of outdoor air, the easier (and cheaper) the job. It is probably futile to try to control RH in a drafty area with leaky doors and windows. Where an entire workshop is too large to be brought under control at a reasonable cost, part of it can be sealed with polyethylene sheet, and small heaters or dehumidifiers can be used to lower RH. If RH must be raised, a humidifier such as the vaporizers sold in drugstores for respiratory relief (about $15 and up) will suffice. In a tight shop, even a pan of water placed on a heater outlet may be enough.

The individual woodworker must decide how much variation he can stand. Rough drawshaving of green-wood chair parts can be done at just about any RH. A marquetarian, however, should monitor humidity very carefully, in both workshop and storage area.

One way to keep an eye on RH is to listen to weather reports, and perhaps to arrange a visit with a local meteorologist (television, radio or university) to get information about local high and low periods and the times of year when drastic change is most likely. This, combined with good instruments, will give you a jump on the most dangerous periods.

In winter, with my woodstove drawing in and heating large amounts of already dry winter air, there is a practical limit to the RH that I can maintain in my basement shop. As it gets to a reasonable level, water condenses on cold walls and windows. In summer the outdoor temperature may reach into the 90s, with RH levels above 85% for days at a time. Letting this air into my basement is disastrous. It is frustrating to get ready to spend a weekend on a project, only to discover that low or high humidity makes it unwise to work. For many of us, woodworking is a periodic or a sporadic activity. We can, perhaps, choose our work times to coincide with suitable shop conditions. Someday, when I get to it, I'll partition and insulate part of my basement, at least enough for storage, and I'll use a small heater, dehumidifier and humidifier to get me through the extremes. In the meantime, I'll watch my instruments, exercise restraint, and keep exhorting woodworkers to pay attention to humidity. ☐

R. Bruce Hoadley is professor of wood technology at the University of Massachusetts at Amherst, and author of Understanding Wood, *published by The Taunton Press. See also "Drying Wood,"* FWW *#5, pp. 40-43; and "Measuring Moisture,"* FWW *#8, pp. 78-79.*

Measuring relative humidity

Perhaps the most familiar instrument for measuring relative humidity is the dial-type hygrometer commonly found in home weather stations. This type uses a hygroscopic material, such as animal skin or hair, connected to the pointer on the dial. It has the distinct advantage of providing continuous readings at a glance. But it is subject to inaccuracy for several reasons: the sensing element may react differently to rising humidity than it does to falling, it may lose accuracy after being exposed to extremes, and it can be quickly contaminated by sawdust. These dial instruments are cheap ($15 and up) and convenient, but most of them come with inadequate directions. If you use one, keep it clean, mount it where there will be good air circulation around it, and check its calibration regularly.

The instrument most frequently used to calibrate other hygrometers is the sling psychrometer (about $35). It consists of two thermometers mounted side by side. One thermometer bulb is covered with a dampened wick. As water evaporates from the wick, it lowers the temperature of the wet-bulb thermometer. The difference is called the *wet-bulb depression.* On dry days, the water evaporates more rapidly than it does on damp days, so the drier the day, the greater the wet-bulb depression. Wet-bulb depression can be converted (by consulting a chart such as the one below) to relative humidity. To ensure that the air around the wet bulb does not become saturated with evaporating moisture, the instrument is swung in vertical circles (by means of its swiveled handle) until the wet-bulb temperature no longer drops.

A variation of the sling psychrometer is the stationary dual-bulb hygrometer ($10 and up). You can easily make one from a pair of matched thermometers. Wicks can be made from stretchy cotton slipped tightly over one bulb with the free end dangling in a small reservoir. It's best to use distilled water so that mineral deposits don't accumulate in the wick. Keep a good airflow (fan it until the wet-bulb temperature no longer drops), avoid mounting the instrument where conditions such as direct sunlight would affect the dry-bulb reading, and keep the wick clean.—*R.B.H.*

Sources—Here are some suppliers who carry instruments for monitoring RH:

Abbeon Cal. Inc., 123-78A Gray St., Santa Barbara, Calif. 93101 (805) 966-0810

The Ben Meadows Co., PO Box 80549, Atlanta, Ga. 30366 (800) 241-6401

Edmund Scientific Co., 5975 Edscorp Bldg., Barrington, N.J. 08007 (609) 547-3488

Fisher Scientific Co., 711 Forbes Ave., Pittsburgh, Pa. 15219 (412) 562-8300

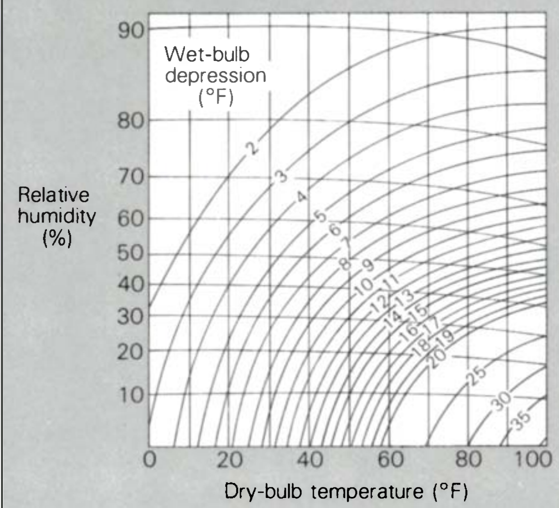
Fine Tool & Wood Store, 724 West Britton Rd., Oklahoma City, Okla. 73114, Tel: (800) 255-9800

TSI Company, PO Box 151, Flanders, N.J. 07836, Tel: (201) 584-3417

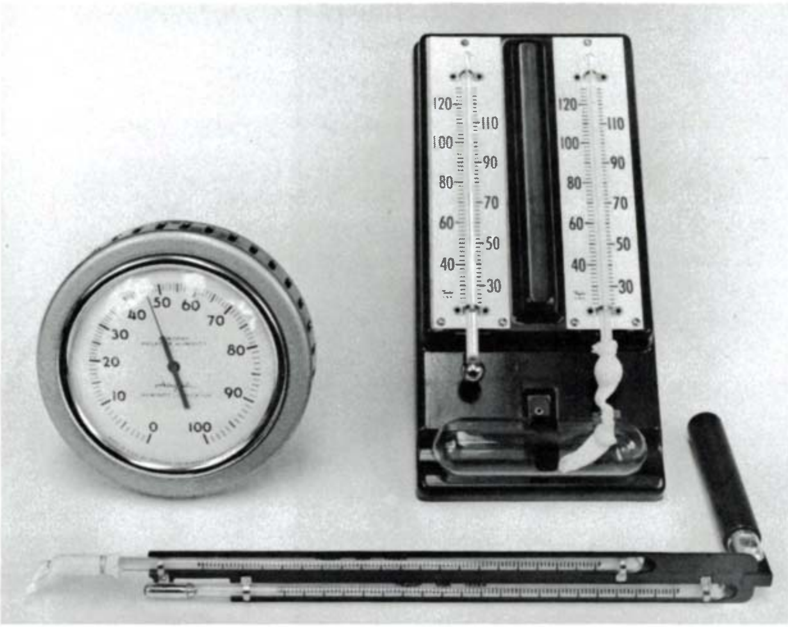
Sporty's Tool Shop, Clermont County Airport, Batavia, Ohio 45103 (513) 732-2411

Part of a dry-kiln control system, this cellulose wafer (left) reacts almost instantly to changing RH levels to yield EMC readings directly, without reference to conversion charts. Available from Lignomat USA (14345 NE Morris Court, Portland, Ore. 97230), the device currently costs $80 without the meter, mostly due to the cost of the kiln-proof holder—the wafers themselves, which are replaced every three weeks, are only about 35¢.

Reading a psychrometer



Find the dry-bulb temperature (the room temperature) on the bottom line; read up to meet the curved line that indicates wet-bulb depression (the difference between wet-bulb and dry-bulb readings), and then read the RH, as indicated by the lines numbered at the left.

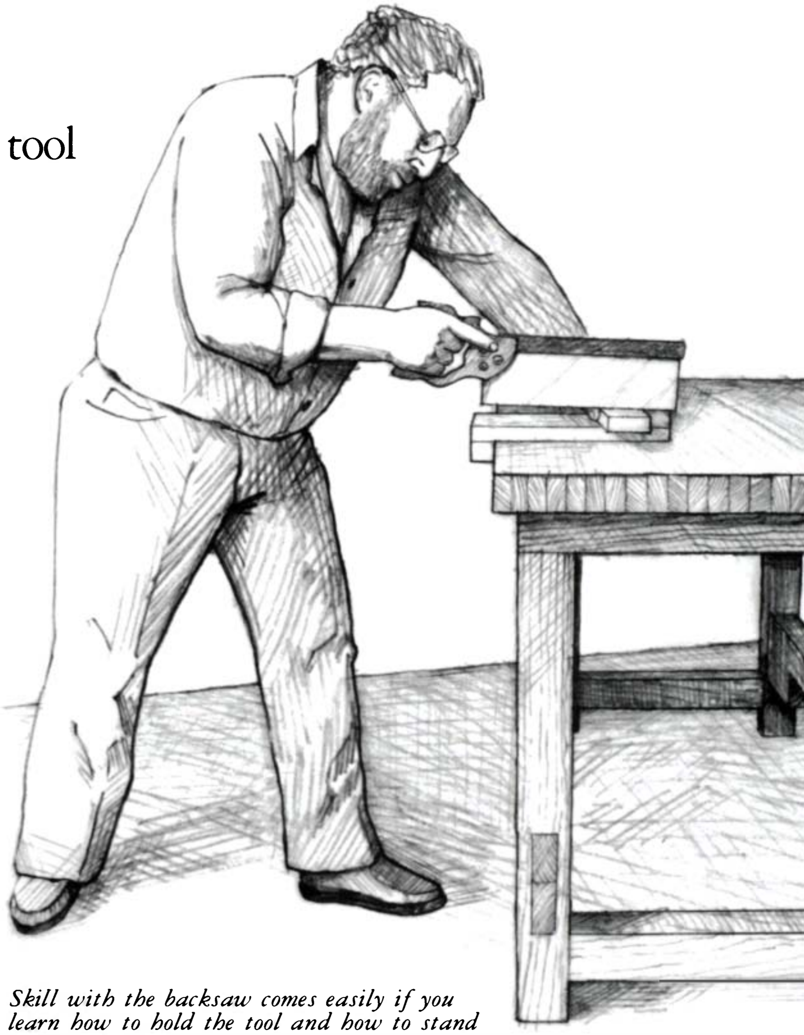


Instruments to help you avoid the frustrating woodworking problems caused by uncontrolled relative humidity in work and storage areas. Clockwise from upper left: dial hygrometer, dual-bulb hygrometer, sling psychrometer.

The Backsaw

How to buy, use and sharpen this basic tool

by Ian J. Kirby



Skill with the backsaw comes easily if you learn how to hold the tool and how to stand comfortably. Sawing is primarily an arm movement and it's encouraged by the stance illustrated above. Kirby saws right-handed, so he places his right foot farther back and bends slightly at the knees. You should modify this stance to your own comfort. He grips the saw much like a pistol; the pointed index finger is important, as it spreads and strengthens the grip, and helps you keep the saw vertical.

Backsaw is the generic name for any handsaw with a metal stiffening strip along its top edge, opposite the teeth. A backsaw works like any handsaw that cuts on the push stroke, but a finer cut is possible because the saw's reinforcing strip allows a thinner blade. This saw shouldn't be overlooked by the machine woodworker—it's a versatile tool for cutting tenons, dovetails and other joints, and for clean crosscuts.

Of the better-quality saws now manufactured, there are two main types—the tenon saw and the dovetail saw. The tenon saw is the larger of the two, and it is commonly sold in three lengths: 10-in., 12-in. and 14-in. Selecting the length is really a matter of personal preference. The 12-in. length is probably the most useful; the 14-in. is heavier and therefore more difficult to use. Tenon-saw blades are about 4 in. wide and usually have 13 or 15 points per inch. The dovetail saw looks like a miniature version of the tenon saw. It is commonly 8 in. long and about 3½ in. wide, with 20 points to the inch. Dovetail saws with blades 2 in. wide are sold. These usually have a turned rather than a pistol-grip handle.

The dovetail saw's finer teeth leave a smoother surface than does a tenon saw, inviting its use for cutting tenons. Don't yield to the temptation, because dovetail saws are quite delicate and should be reserved for sawing thin wood. A good rule of thumb is that the dovetail saw will keep an accurate cut 1 in. deep in 1-in. thick maple, maximum.

The best-quality backsaws available in North America are brass-backed and English-made, though steel-backed saws of good quality are sold. If you order a saw through the mail, inspect it carefully before you accept it. First, hold the saw end-on at arm's length with the handle away from you and sight down the blade. The sides of the brass back should be parallel to the sides of the blade. Misalignment doesn't affect the way the saw cuts, but sighting along the back is the easiest way to keep the saw upright, and learning to compensate for one that is askew is a skill you can do without.

Next, turn the saw teeth up and sight along them for straightness. A slight curve at one end or the other can be gently bent out of the blade, but an S-curve should be rejected. Rotate the saw 90° and view it again to check the blade for wind or twist. A slight twist can be corrected by bending it the other way. An inaccurately mounted handle may make the blade appear twisted, a difficult condition to adjust.

Finally, sight the back for straightness. This isn't easy, because the metal is folded and distorted during manufacture, but you can at least gain an impression.

Using the backsaw—The backsaw can cut along the grain, as when sawing tenon cheeks or dovetails, or across the grain, as in cutting boards to finished length or sawing tenon shoulders. For each type of cutting, there are refinements of technique, but the basic operation of the saw is the same.

Grip the saw with three fingers wrapped around its handle, the index finger pointed alongside the handle toward the saw tip. Extending your index finger is important: it spreads and strengthens your grip, and it helps you keep the saw vertical. Wrap your thumb around the back of the handle so that it just touches your middle or ring finger.

From your grip to your shoulder, the saw, wrist, forearm and upper arm should be in a straight line when viewed from above. From a side view, the forearm should be in a line that if extended would intersect the saw at about the center of its length. Work to be sawn should be positioned on the bench at a comfortable height (which obviously varies with the individual) that gets you closest to this alignment. The rest of the body doesn't do anything when you're sawing—the action is entirely an arm movement—but you must position yourself so that you can easily move your arm like a piston. If you are off to the left or right of the line of sawing, your wrist will turn and the saw will jam.

Stand comfortably away from the workpiece and lower your body to a crouch by placing your right foot (if you are sawing right-handed) farther back and bending your knees

Ian J.. Kirby is an educator, designer and cabinetmaker. For more on the backsaw and the joints it will cut, see FWW *#2, p. 28, and #15, p. 46.*

slightly. Standing with your feet too close together bunches up the whole flow of movement and is an almost universal fault among beginners. You'll never get your foot back far enough by inching it back, so put your rear foot ridiculously far back, then inch it forward.

Before you actually begin to saw, you will have to learn to position the saw correctly on the work. This is best done by sighting down the saw back and developing a feel for where the saw is, relative to the work. You want to hold the blade vertical, at right angles to the surface you are cutting, and at the same time learn to sense the angle at which the line of teeth strike the wood. To sense verticality, you could have a friend stand in front of you and simply tell you when you are tilting the saw—a warm gesture but pretty much a waste of time for your friend. A better method is to prop a mirror in front of you on the bench and make the observation solo. You could also set a small square next to the saw for reference, but I think that this method is less accurate than the mirror.

Learning to control the angle at which the teeth strike the board is just as important, otherwise you may pitch the front of the saw—which is at the opposite side of the workpiece and difficult to see—so it cuts deeper than you intend, past your marks when making tenons or dovetails. The sense of angle comes with practice. Start by holding the saw with all the teeth flat on the bench. Memorize this feel and you'll be able to tell precisely where the saw's cutting edge is, and you won't be surprised by an overcut.

Before you begin, boards to be crosscut, tenons, and dovetail pins and tails should be marked out with a knife, gauge or pencil. You must, of course, decide whether you will split the line or cut to one side of it. In most instances, it doesn't really matter which you choose as long as you are consistent. When crosscutting a board or sawing a tenon shoulder, however, it is advisable to cut to the waste side of the line and then trim to it with a chisel or a plane.

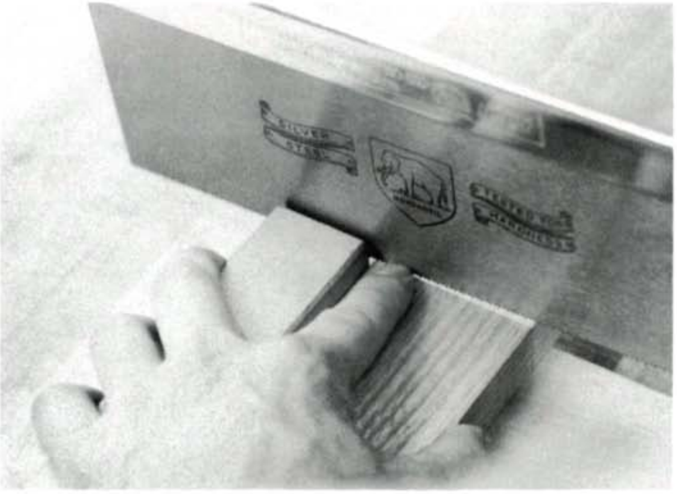
Boards must be held firmly and at a height that will encourage a comfortable stance. For crosscutting, a bench hook or sawing board (for a bench hook, see *FWW* #13, p. 54) is helpful; it gives you a way to grip the board, while protecting the bench from a wayward blade. For tenons or dovetails, mount the work in the vise.

Whether you are sawing along the grain or crosscutting, the cut is started in the same manner. Place the saw's forward-most teeth on your mark at the far edge of the board, with the saw pitched up 10° or so at the handle end. Using your thumb and/or index finger to position and guide the blade, make your initial cut about ⅛ in. deep, then gradually pivot the saw down and carry the kerf over to the near side of the board. If you are crosscutting a board to length, complete the cut with the saw held flat in the kerf. Don't force the saw by bearing down on it. A steady hand and a light touch will give the best results.

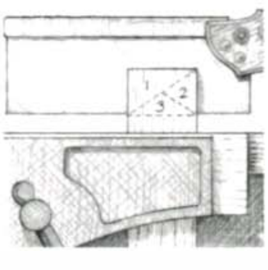
To saw tenon cheeks, start the cut as before, but once you've carried the kerf over, pivot the saw down farther at the handle end and saw down the tenon cheek line facing you to the shoulder line. Don't lift the saw out of the kerf when you pivot it. Reverse the workpiece and saw down the other cheek line. Then hold the saw flat in the kerf and saw almost to the shoulder line. Complete a tenon by crosscutting the shoulders.

For dovetails, after starting the cut, keep the saw flat in the kerf, and saw to the knife line at the base of the pins or tails. Finish the joint by sawing the waste with a coping saw and

The fine teeth and thin blade stiffened by a brass or steel back make the backsaw an ideal joint-cutting tool. Backsaws are of two types: the larger are called tenon saws, the smaller are dovetail saws. Shown above are a 12-in. English-made brass-backed tenon saw, an 8-in. dovetail saw, and a 7-in. dovetail saw with the straight turned handle preferred by some craftsmen.



Kirby grips a board in a bench hook to demonstrate a crosscut. Start the cut by placing the saw's forward-most teeth on the mark at the board's far edge. Then tilt the saw up about 10° from the handle end and begin the cut with a slow, firm thrust. Use your index finger (not the bench hook's block) to guide the blade. Make the initial cut about ⅛ in. deep, then carry the kerf across the board to guide the saw and complete the cut.



To saw tenon cheeks, mount the workpiece in the vise at about a 60° angle as shown above and start the cut at the edge of the piece opposite you. Carry the kerf over, and without lifting the saw out of the cut, pivot it toward you and saw down the cheek line until you reach the shoulder. Reverse the workpiece in the vise and saw down to the other shoulder line.

To saw dovetails, clamp the workpiece upright in the vise, and hold the saw to match the tail and pin angle. Guide the cut with your thumb and, keeping the saw flat in the kerf, saw down to the line marking the base of pins and tails.

paring to the line with a chisel (*FWW* #27, pp. 74-75). Some woodworkers clamp the work in the vise at an angle so they can hold the saw vertical, but I think it's better to clamp the work upright and learn to control the angle of the saw.

A couple of recurring problems plague novices learning backsaw use. One is holding the saw at too great an angle to the wood when starting the cut and forcing it on the first stroke or two. Keep the angle about 10° and hold the saw with no more than its own weight on the wood, less than its own weight if starting problems persist. Another problem is learning just the right arm movement so that all but the three or four teeth at each end of the blade are used. Using only the middle four inches of the saw is inefficient, but burying the ends of the saw in the cut frequently jams the blade. Try sawing in slow motion to get a sense of where you should be taking the saw for optimum results.

As with any tool, practice is essential. A common fallacy is that you should make finished joints to practice with tools. The end results, of course, bear all the scars of bad workmanship. So practice first, and soon enough you will have the skills to use the backsaw to its fullest advantage. □

Sharpening the backsaw

Many woodworkers send their saws out to be sharpened. Yet sharpening a saw is as easy as grinding and sharpening a plane iron or a chisel, and we don't send either of them out.

Half the battle is won by having the correct tools: a saw vise, a setting tool and the right files. Vises are available from several mail-order tool outlets, or you can make your own out of wood (*FWW* #22, p. 63, and #38, p. 18). You can buy a saw set or make the simple anvil described in figure 2, a particularly good one for setting dovetail saws, whose teeth are usually too fine for commercially made sets. The Tool Works, 111 Eighth Ave., New York, N.Y. 10011, is one source for saw-sharpening files.

Tenon saws and dovetail saws have more teeth than regular handsaws, but they are sharpened in much the same way. Sharpening itself consists of four separate steps: topping, shaping, setting and sharpening.

Topping is essentially getting the teeth in a straight line so that none projects above its mates and all cut evenly. Use a straightedge to see if the teeth are of uneven height. If so, clamp the saw in the vise and file the teeth into line with an 8-in. or a 10-in. mill file held flat.

Shaping will restore the proper profile to any teeth flattened by topping. You are aiming both for uniform gullet depth and for the approximate profile of the other teeth on the saw or for the profile shown in figure 1. To shape the teeth, use a slim or extra-slim, 4-in.-taper triangular file held horizontally and at right angles to the blade's length. Remove metal from both the front and back of the teeth.

To keep the saw from binding, the kerf must be about 1½ times as wide as the blade itself. This is done by setting the saw—bending the outer half of each alternate tooth outward. Using the setting anvil shown in figure 2, place the saw teeth on it so that their upper halves project just beyond the edge of the chamfer. Then, with a screwdriver (grind the blade down if necessary), set every other tooth, flip the saw end for end and set the rest of the teeth.

Fig. 1: Tooth profile and sharpness angles

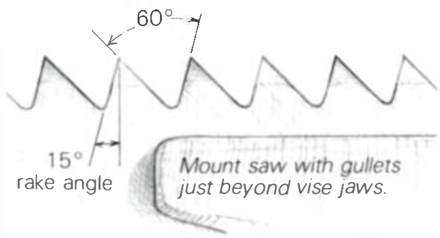
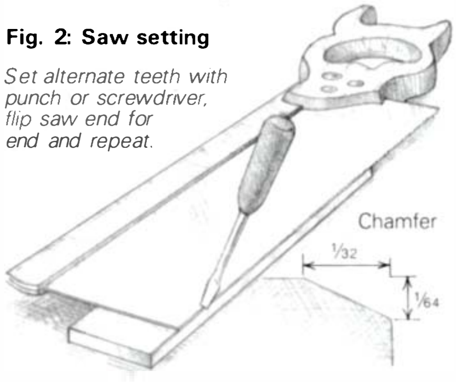


Fig. 2: Saw setting



Make setting anvil of ¼-in. steel bar stock, 2x10. Grind or file 1/64-in. chamfer.

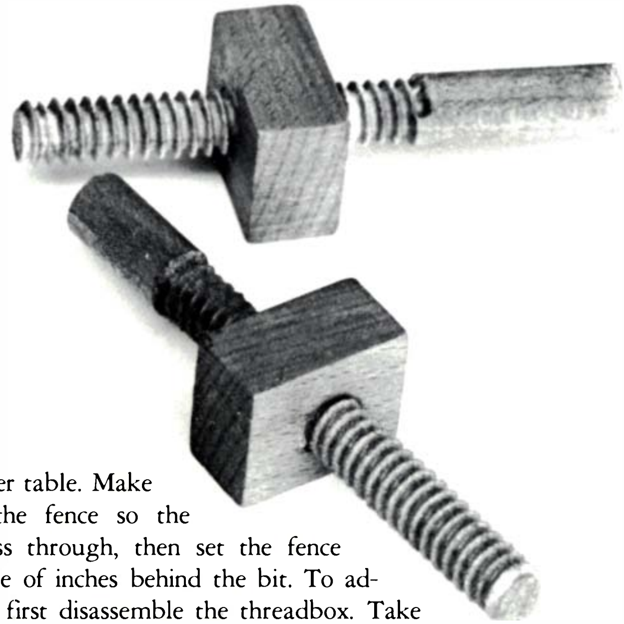
Sharpening is the final step. Before you begin, rub a piece of chalk over the teeth so you can keep track of which ones have been filed. Put the saw in the vise and, starting at the saw tip, work toward the handle. You can sharpen your backsaw as a ripsaw, with the front and back of each tooth filed at 90° to the saw's length, or as a crosscut saw, with the fronts and backs alternately beveled. If you bevel the teeth, make the angle slight—less than 15°—or you'll remove too much metal and weaken the tooth. Whether you bevel or not, position the file in the gullets so you are filing the front of one tooth and the back of the adjacent tooth at the same time. Four to six light file strokes per tooth should do it.

Test your sharpening job on a scrap of wood. The saw should start easily and cut quickly and smoothly. If it grabs or catches, one or more teeth may be overset and should be dressed into line with a benchstone rubbed lightly along the side of the blade. If you get in the habit of sharpening your saws before they become too blunt, you shouldn't have to do anything but set and file the teeth. Topping and shaping won't be necessary. —*I.J.K.*

Threading Wood

1. A router-table threadbox

by Andrew Henwood



I have always found setting up a hand threadbox (*FWW* #6) to be a fussy business. It has often taken me an hour or more of shimming the cutter in and out, up and down, and back and forth to get it right. Moreover, I was completely stymied recently when I tried to put 12 threads per inch on a 3/8-in. dowel. I spent half a day reducing a quantity of good dowel to round rubbish. Try as I might, I was getting all root and no crest.

I was unwilling to admit defeat. I wanted to make some little wooden clamps for delicate work, and I had put considerable time and effort into making a metal tap that did a dandy job of threading the hole. The tap wasn't going to be much use by itself.

I figured that to succeed I would have to use a high-speed cutter, so I decided to build a threadbox with a router to do the cutting. I managed to produce an acceptable thread on my first attempt, within an hour of the time I'd gotten the idea. I'll show you how to do it, then you can adjust dimensions to suit your own taps.

Take two squared scraps of close-grained hardwood, as shown in figure 1. Screw the pieces together face to face. Don't use glue—you will need to take the pieces apart again as you make the threadbox, and also when you set the router bit. Drill through both pieces with a 9/32-in. bit (the pilot size of my tap). Now take the two halves apart and enlarge the hole in the front half to 3/8 in. Thread the hole in the back block, carefully cleaning away the wood frayed by the entry of the tap. Refasten the halves together and cut out the keyhole slot across the bottom, giving it a good flare in order to provide clearance for chips and room for the router bit.

Next chuck a 60° V-groove bit in your router, and mount it under a router table. Make a cutout in the fence so the dowel can pass through, then set the fence loosely a couple of inches behind the bit. To adjust the fence, first disassemble the threadbox. Take the back (tapped) section and center it so that the bit is exactly in line with the first crest of thread. You can judge this most accurately if you adjust the height of the bit until it matches the contour of the thread. The threadbox will work best if the crest just enters from the surface at the left-hand side of the keyhole, so you should plane the block down a little to achieve this. Now place the block so that its front face is just a hair behind the point of the router bit. The back half of the threadbox is now correctly aligned, and you can use its position to set the fence on the table. Hold the back part of the threadbox down firmly while you snug up and secure the fence. Mark the position of the block on the fence so you can reorient the threadbox after it's been assembled.

Screw the two halves of the threadbox together again and clamp the whole unit to the fence, centered over the bit. Raise the router bit until the point is fractionally above the minor diameter of the threaded portion. Switch on the router, insert a dowel into the pilot hole, and rotate it clockwise as you apply pressure to push the dowel in. As soon as a turn or two of dowel is engaged in the tapped section, it will self-feed as you turn it.

A few pointers that may help: Make darn sure you provide a positive way to remove the waste, otherwise it will jam up in the thread behind the bit and wreck the work (my router vacuums the waste down through the keyhole slot). Also, I find that I get a better thread that is less likely to crumble if I

Fig. 1: Router-table threadbox

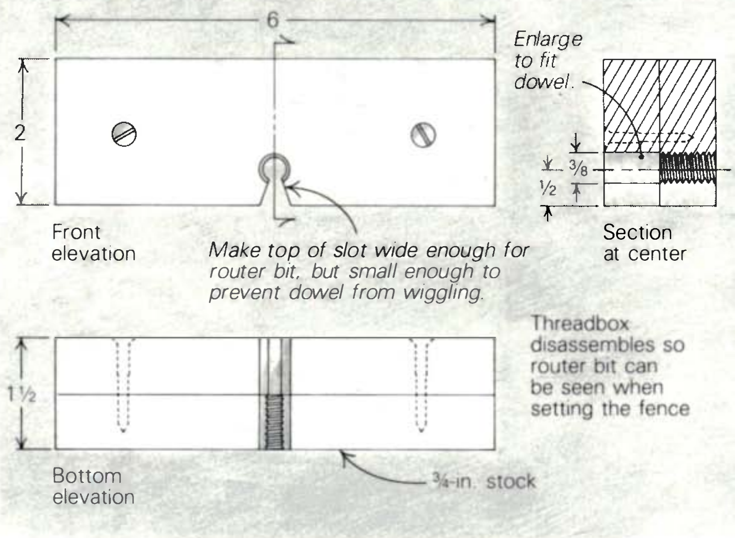
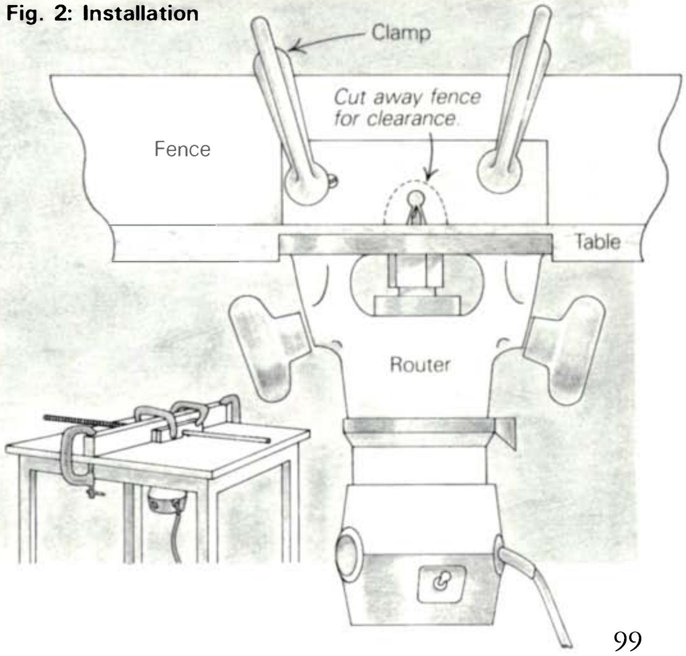


Fig. 2: Installation



Drawings: David Dann

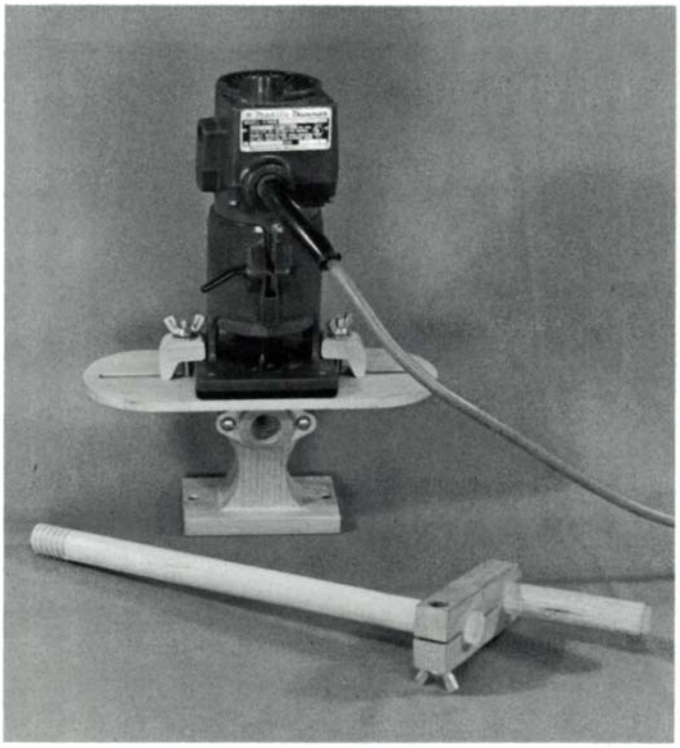
first dip the dowel in Watco oil or mineral spirits. Don't be in too much of a rush when feeding the dowel—in my enthusiasm I tried mounting the dowel in a brace for fast and easy turning, but I found that too much speed rips the crest off the thread. Feeding with the fingers lets you feel what's going on. I've found that it's a good practice to chamfer the end of the dowel for easy starting. The results will readily reveal whether the bit should be raised or lowered for the desired depth of cut. If the dowel won't feed, you have only to nudge the fence a trifle forward or back.

I can just barely stand the noise of routers, even with earplugs. I much prefer the quiet, crisp sound and feel of a hand threadbox as it slices its way around a dowel. But all in all, I don't suppose I ever would have gotten twelve threads on a three-eighths stick that way.

Andrew Henwood is an airline pilot and furnituremaker living in Georgetown, Ont.

2. A commercial threader

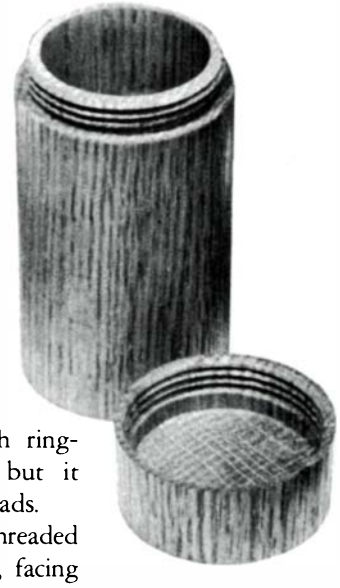
To speed production on their line of threaded novelty items, J&J Beall, of 541 Swans Rd. N.E., Newark, Ohio 43055, devised a threadbox that clamps to the base of a router. Shown here as a wooden prototype, it will be manufactured in reinforced plastic, with interchangeable leadscrew inserts (three sizes to fit the taps included). You attach the threadbox to a router, center and adjust Beall's three-flute V-groove bit, then simply screw a dowel into the wider end of the leadscrew. As the thread is cut, it automatically follows the leadscrew's pattern. The device will sell for about $130, and it is likely that more leadscrew sizes will become available, and eventually left-hand threads too. *—Jim Cummins*



Any standard router attaches to J&J Beall's dowel threader.

3. Versatile threadbox cuts inside *and* outside threads

by Robert J. Harrigan



I needed some wood threads, and had in mind a jig for one size. After a while at the drawing board, however, I came up with a tool with interchangeable guides and thread sizes to fulfill all of my threading needs. All you really need to start making one is a tap and a matching threaded rod. The tool shown cuts outside threads up to 3⅝ in. and inside threads up to 2⅞ in. Some chipping occurs with ring-porous hardwoods such as oak, but it doesn't affect the action of the threads.

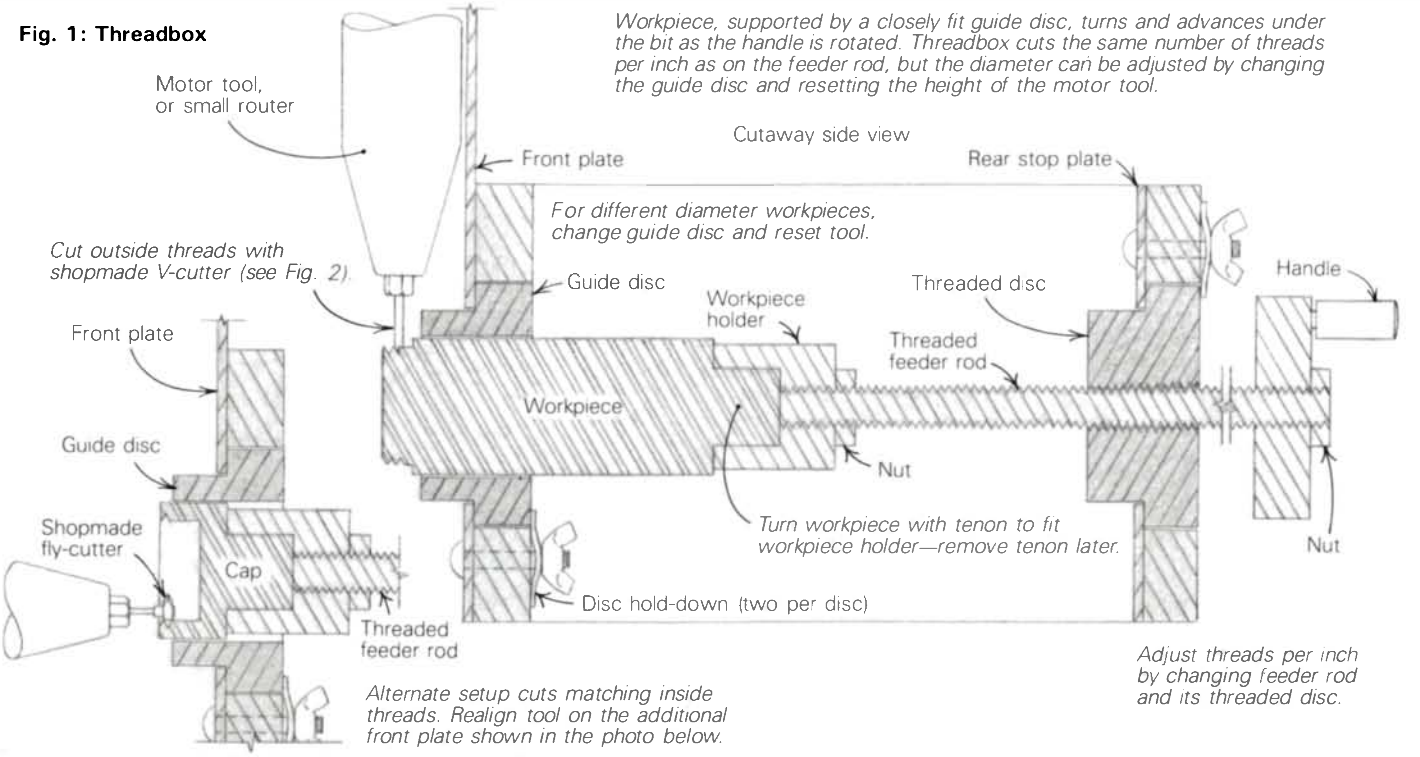
The key to the threadbox is the threaded feeder rod inside the box (figure 1, facing page). When you turn the handle at the back of the box, the workpiece rotates and advances past the cutter. The feeder rod affects only the coarseness or fineness of the thread, and has nothing to do with the diameter of the work you are threading. Change the feeder rod to suit the job. As a general rule, use fine threads on containers, and coarse threads when you are making clamps, so they will tighten up faster. A different guide disc is needed each time you change the diameter of the work, but you can make as many sizes as you need. Use plywood for the guide discs—you end up with a rounder hole than if you had used solid wood.

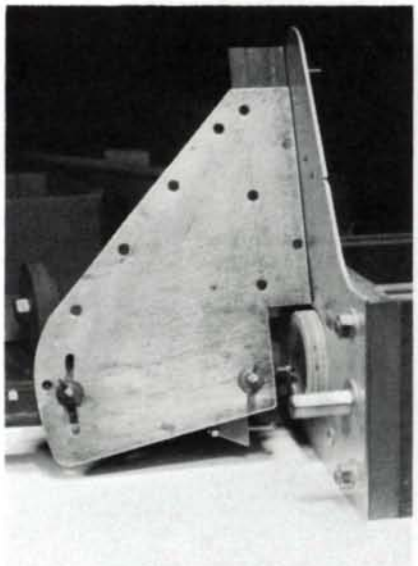
The large photo on the facing page shows the threadbox cutting an outside thread. I'm using a Weller model 601 motor tool. It rides in a track on the front plate that allows coarse adjustment of the cutter; fine adjustment is done with a machine screw that runs through an aluminum block. It's important that the work fit the guide disc precisely. If the holes and the work are slightly oval, the errors will double and the thread will show it.

To cut inside threads, you reposition the tool on an auxiliary plate that holds the tool in a horizontal position. Here also the work moves past the cutter as you turn the handle. The depth of the threaded section is limited by the length of the fly-cutter's shank, but a lot of thread would just be a nuisance on a container anyway.

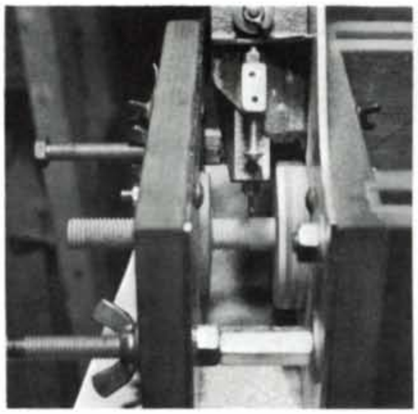
When you want to make a long threaded dowel, such as for a clamp, tap a threaded disc to support the dowel as it comes out the front of the box. The bottom left photo on the facing page shows an extension plate I made to hold the extra disc. There is a rear extension plate also, which can be used to make dowels longer than the box. Use a scrap when you set the thread depth, and increase it little by little until a nut fits right. The dowel will chip when you take a series of light cuts like this, but when the depth is set correctly, you'll get a clean cut with one steady pass. Use the tap to thread the holes in the clamps. If you are working oversize threaded dowels, such as for a press, and you don't have a tap big enough to match

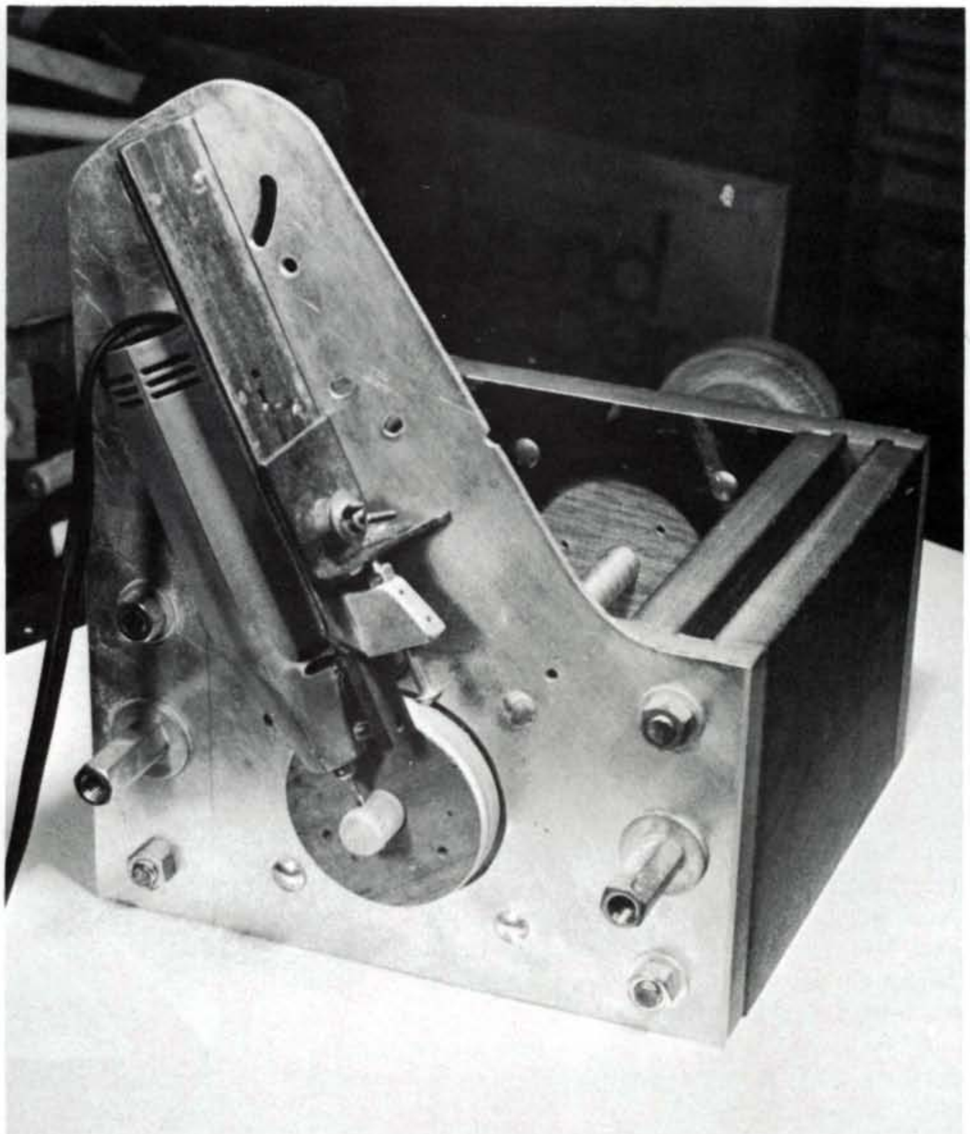
Fig. 1: Threadbox





To cut inside threads, the motor tool is mounted on an auxiliary aluminum plate. Instead of the V-groove cutter that makes outside threads, a fly-cutter is used. The length of the threaded section is limited by the length of the bit's shank, but a container doesn't need many threads. Below, a front extension supports and indexes longer work.





In cutting outside threads, as the rear handle is turned, the work advances according to the pitch of the threads on the feeder rod inside the box. For adjusting to different diameters, the motor tool slides in a track; depth-of-cut is set with a fine-adjustment screw.

Harrigan's threadbox makes threads in various sizes.

Fig. 2: Cutters

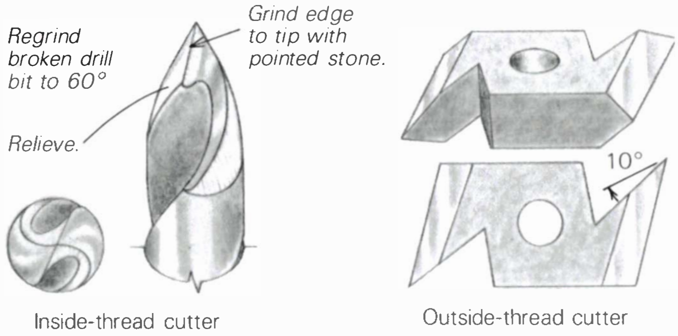
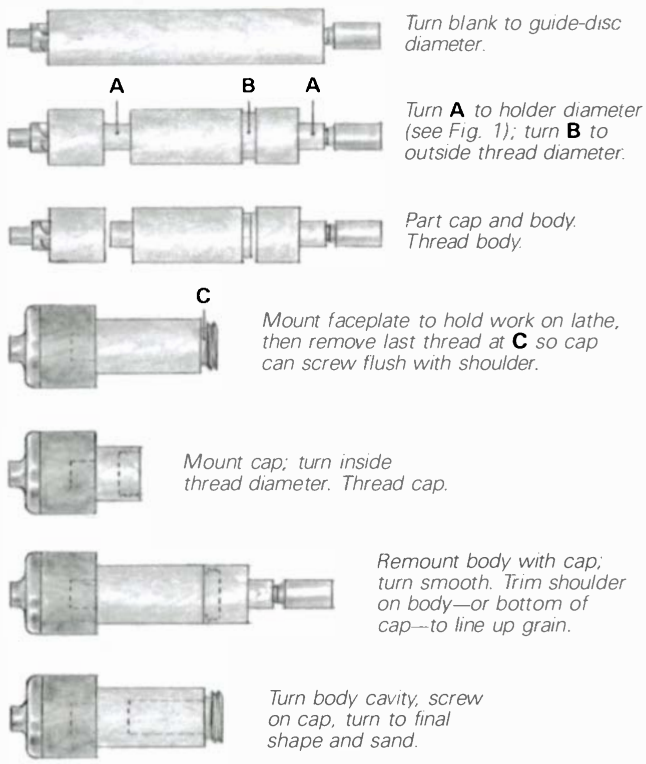


Fig. 3: Making a container



the threads, simply make an inside-threaded plug that fits the dowel. Glue it, just as you would an embedded nut, where you need it.

I make my own V-groove cutters from broken drill bits ⅓₂ in. wider than the thread pitch. I grind the end to 60°, then sharpen inside the cutting flutes with a pointed stone held in the Weller, using angles as shown in figure 2. Relieve the back of the cutting edge as you would a normal drill bit. I make fly-cutters from pieces of lawnmower blade—any high-carbon steel will do—screwed or bolted onto an arbor that fits the tool. You can buy high-speed bits instead, but they are bulky and won't cut as close to a shoulder.

To make a container, it helps to visualize the steps involved. Figure 3 shows how I do it. The most tedious step is turning the outside diameter so that it fits the guide disc. I use the disc itself as a gauge—I hang it over the tailstock center, and size the work from that end, turning off the lathe and sliding the disc along to check the fit.

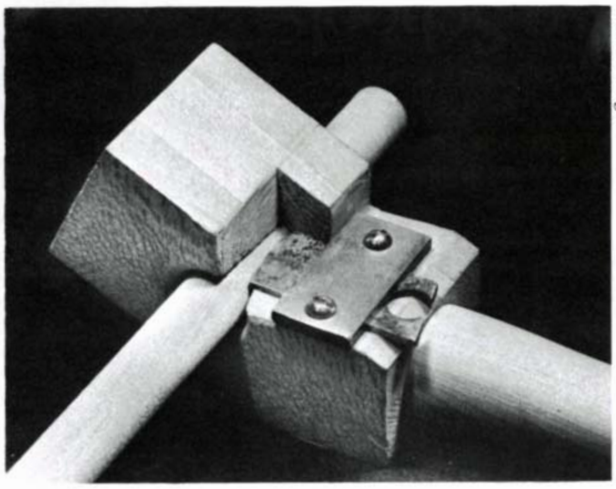
When you turn the tenons that will fit into the holder inside the threadbox, it's better to turn them small rather than too large. You can always build them up with a turn or two of masking tape for a tight fit.

To avoid chipping, cut the body threads in one pass. When they are done, turn off an unthreaded neck below the threads on the body—if you don't, the cap won't screw on all the way. When making the cap threads, take a series of light cuts. You will find that you can remove the cap from the threadbox to check the fit without changing the cutter setting. Put a little more thread in the cap than you think you will need. This extra length will allow you to trim the bottom of the cap down later, so that the grain on cap and body will match when the cap is screwed tight.

When you turn out the end grain from the cavity, secure the blank to the faceplate with a couple of nails through the tenon for more support. □

Robert J. Harrigan has a stained glass and woodworking shop in Cincinnati. Photos by the author.

Truing dowels



Michael Harrigan

This lathe tool trues a dowel to exact size. Taper the entrance hole to the finished dowel size at the end of the blade, and relieve the blade's cutting edge at the corners to prevent the work from binding. —*R.J.H.*

Two Schools

Castle and Krenov—different ideas about how to teach

by Paul Bertorelli

Any list of designer-craftsmen who work in their own lasting, recognizable styles would be a short one, but both Wendell Castle and James Krenov would surely be near the top. Such is the influence of these two craftsmen that you can hardly attend a woodworking show of any size without seeing pieces that owe much to inspiration from one or the other of these two men.

Castle has since moved on to furniture of a more classical bent, but most people associate him with stacked and bent-laminated wood, boldly sculpted into curvilinear contemporary furniture. Krenov is best known for his delicate, carefully detailed display cabinets and boxes, which he has discussed in four lavishly illustrated books. Though their furniture is vastly different, Castle and Krenov have in common a refusal to compromise to shortcuts of any kind—a philosophy each has expressed through books and by teaching at big-name woodworking schools. Both now head their own schools, Castle at his studio near Rochester, N.Y., and Krenov at the College of the Redwoods in California.

I visited both schools last summer, and later spent some time talking to the students and viewing their work. I learned that although Castle and Krenov share the belief that students should explore their individual possibilities free of compromise, the two men have very different ideas about how that exploration should be carried out.

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Since his early days as a struggling designer-craftsman, Wendell Castle has supported his woodworking by teaching, as much out of financial need as for love of the academic discipline. After a couple of decades of not always happy relationships with regular universities, in the fall of 1980 Castle started his own school in the 90-year-old bean mill in Scottsville, N.Y., that has been his studio and residence.

He set out to correct what he saw as the failings of other schools. "They were either heavy on the creative aspects of woodworking or heavy on the technical, but no one offered a good combination," Castle said. Yet Castle's years of teaching have led him to conclude that not everyone can be taught to be a good designer—some have the talent and some do not. "I saw a need to train woodworkers who could build the designs of others or work in industry, but if a student doesn't at least learn what's involved in design, he is missing something."

Castle executes his philosophy through a highly structured curriculum, more like that of a large university than a private academy. The two-year program is taught by three full-time and two part-time instructors, including Castle himself, who teaches two days a week. Students can sign on for a third year by proposing, in contract form, their own curriculum.

New students (about 14 are admitted every year, for a total enrollment averaging 26) spend about half their first year learning how to use hand tools to prepare stock and to cut joints—no power tools are allowed except the bandsaw. These basic and, later on, more advanced techniques are taught by Stephen Proctor, an English furnituremaker who used to work for Castle in his studio but who is now the school's dean and teaches full-time. Castle is a strong believer in drawing and model-making as design tools, and in fact rarely starts a new piece of his own until he has visualized all of its aspects by way of sketches. Thus first-year students get a strong dose of drawing, spending at least a day a week at the drawing board. They practice not only mechanical drawing but perspective and life drawing as well.

First-year students build what they are assigned in the form of fairly rigid design briefs. They learn that design is a step-by-step process and each problem comes with its own peculiar limitations. The first project, a stool, must be conceived without curved planes and must be made of wood of a given dimension, joined with mortise and tenon. Haphazard groping toward a contrived solution won't do.

Students who come to this school accustomed to designing on the fly are likely to find this sort of discipline confining at first. It's frustrating to spend hours toiling at the drawing board when a fully equipped shop as impressive as Castle's beckons. In time, though, this ordered sifting gives students new fluency to express their creativity.

I saw the results of this teaching when Castle showed me around two Rochester galleries where student work was being shown. On display was a delightful variety of furniture, ranging from first-project stools to large case pieces, some dressed up in colored lacquer. All of the pieces were flawlessly executed, but different from what I had seen elsewhere in a way that I couldn't quite figure at first. Later, it dawned on me that all the work had a restrained, sober quality devoid of the whimsy that seems inevitable when students force themselves to make something new. "That's the way their work should look now," Castle told me, "I don't want to see a lot of contrived, self-conscious efforts."

Castle's second-year students, having grown accustomed to the discipline of the drawing board, are presented with a new set of challenges in the form of progressively more open-ended design assignments. And there is an element of competition. They are asked, for example, to design and build the lightest possible structure that will support a 150-lb. anvil. The lightest entry wins.

The course I'd expect to find most interesting is the professional practices course that Castle himself teaches. He lectures on how to buy equipment and set up a shop, and, more important, on how to price and where to sell what you want to make, a skill just as vital as those learned at the drawing board and bench. Castle illustrates these lectures by discussing his own work-in-progress in a once-a-week tour of his studio on the ground floor of the mill.

I visited the school in May, during the year-end rush to finish final projects, but the students told me that the pace is always hectic and the days are long, consistent with Castle's own commercial and artistic imperatives.

Castle has always evidenced enormous energy in his ever-changing fascination with the new. Even though his current work is inspired by classical furniture forms, his motivation here is as always: to take on formidable technical and aesthetic challenges. This brand of self-searching leads to a rigorous learning environment in which the students I talked with seemed to revel.

"College was like recess compared to this," said Kenneth Martin, a first-year student from Florida who had been a carpenter before he enrolled. "It's a lot more demanding than I thought it would be. If you want to keep up, you have to be pretty dedicated. . . I've been working 65 hours a week."

Castle doesn't expect all of his students to become one-of-a-kind furnituremakers. By the time students complete the two-year program, Castle figures he has started them on a continuum. Their work will evolve through experience and each will find his own niche. "One-of-a-kind furniture is the hardest way to go. . . people need bookcases, stores need fixtures. I hope I'm teaching my students to realize that they can't make a design statement in everything they do. You've got to learn to ingest others' ideas, and to make what you can sell for a living."

It's on this point that the philosophical differences between Castle and Krenov are most apparent. Where Castle teaches his students to yield peaceably to the vagaries of the marketplace, Krenov urges a less flexible view of craftsmanship that is likely to run head on into the realities of running a small business.

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When I visited Krenov at the College of the Redwoods, he told me that the school wants the kind of student who is likely to be patient, self-searching and not overly concerned with earning a living as a woodworker. "We don't sidestep this problem," he said, "we are not unaware of the real world, but our deep concern is that our students become all they wish to be. In a way, we're a refugee camp for people who don't want to run the fast track and don't want to be entrepreneurs."

This school grew out of the summer-long seminars that Krenov taught in Mendocino, Calif., a region of the state that is home to a growing number of professional woodworkers (*FWW* #29, pp. 36-43). It's aimed not at teaching basics to novices, but at inspiring woodworkers of some experience to more refined levels of workmanship.

The college, housed in a spacious, 4,000-sq.-ft. building in Fort Bragg, Calif., offers a nine-month program loosely divided into thirds. Students (about 22 are admitted each year) spend the first third learning to tune and sharpen hand tools, and making wooden planes, tools for which Krenov has a particular affinity. Later, they undertake a simple project such as a small box or chest. The second trimester is devoted to studying refined methods of joinery and such techniques as sawing and applying veneers, and building coopered doors, skills that can be applied to a more ambitious project during the final third. Two former students, Creighton Hoke and Michael Burns, help Krenov with the teaching chores.

The teaching style here is a reflection of Krenov's own strongly held views on handcraft, developed during fairly rigid training in Sweden under Carl Malmsten and later reinforced by a stint as a designer-maker. Krenov, his students told me, works in a conservative kind of intensity with none of the frontier ethos that characterizes Castle's work.

There is no formal classroom and no drawing room, since Krenov does not rely on drawing, preferring instead to work out ideas by mocking up the actual piece. When a technique is to be taught, the students gather in the shop or the well-equipped machine room for a chalkboard lecture or a run-through by Krenov or one of his assistants. Krenov then consults each student individually, explaining how new techniques can be best applied.

When I visited Fort Bragg, student projects were on view in two Mendocino galleries. A handful, obvious adaptations of Krenov designs, might have stepped from the pages of one of his books. There were also some nice exceptions, notably a chair with a handsomely carved crest rail by Paul Reiber, and a couple of finely detailed music boxes by Ken Walker, who is a retired Air Force pilot. Like the other half-dozen students I spoke with, Walker decided to attend the school because he had read Krenov's books and had liked his eloquent, sometimes poetic prose about the nature of craftsmanship. "When I saw his first book," Walker said, "I was just fascinated. I thought it remarkable what you are able to do in woodworking if you learn to pay attention to detail."

Krenov believes that woodworkers can support themselves through their work, but if students are to realize their true abilities, they must work in a relaxed, reflective way, unfettered by the survival aggressiveness that steers some professional woodworkers into creative binds. He expresses open impatience with the notion that work must be vividly original to be valid. Krenov prefers a discussion of how minute manipulations of detail and wood figure can alter a cabinet's aesthetic dimension, rather than a debate about who might buy the piece, and for how much.

Learning in this way can be exhilarating for some, painful for others, and not without tensions for everyone. The students I talked with described their nine months at the College of the Redwoods as intense and emotional. Some of them clearly had difficulty dealing with Krenov's sometimes temperamental nature, especially after having formed an image of him based on his writings. "I think we all went in expecting a guru of woodworking," Walker said, "but we found Jim to be a real person with all the same problems, conflicts and idiosyncrasies as the rest of us."

Despite some students' failed expectations—some said they would have liked more drawing and classes on how to set up and run a shop—this school can probably provide the much-needed nudge to woodworkers who have self-taught themselves into a rut. "I'm still discovering things I learned in that nine months. I feel like I'm in a whole other world with my work," said Paul Reiber, who worked as a carpenter before joining the school but now is making furniture full-time.

Krenov has heard the criticism about his school, but remains convinced that there is a need for the skills and values he wishes to instill in his students. "We don't pretend or aspire to be the complete school for woodworkers, we can only cover the important aspects of cabinetmaking," Krenov told me. "If at the end of a short year our students are aware of how they relate to this patient searching, then we have not failed." □

Paul Bertorelli is an assistant editor of this magazine. For more information on these schools, write to them at the addresses listed in the school survey on pp. 105-107.

College of the Redwoods students can make what they like, including complex case pieces such as this pearwood desk that Krenov, left, helps maker Creighton Hoke check for square.

Sam Dickinson, a third-year student at Castle's school, built 12 of these dining chairs on commission. The job was an exercise in gearing up a small shop for production, which Castle, right, insists is a survival skill his students must learn.

Woodworking schools

If you're looking for a woodworking school, it may be listed in the following survey, an up-to-date revision of one we published in *FWW* #26. We sent questionnaires to more than 600 schools in the United States and Canada, and turned up 16 new schools; meanwhile, about a dozen had closed or had cancelled their woodworking programs. If you're a student or a teacher in a woodworking program we haven't listed, please let us know—we will update this survey in the Connections section of our July issue.

Some of the schools listed are full-time, some part-time, and others offer evening or summer seminars. You can refer to the previous survey for more information on course offerings or, better yet, write to the schools for a catalog. Woodworking programs at many universities are set up to train industrial-arts teachers, so look for the courses you want in the school's education department.

ALABAMA

Wallace State Community College, Box 250, Hanceville 35077.

ARIZONA

Arizona State University, Art Dept., Tempe 85287.

Eastern Arizona College, 616 Church St., Thatcher 85552.

Northern Arizona University, Flagstaff 86001.

University of Arizona, Art Dept., Tucson 85721.

Yavapai College, 1100 E. Sheldon, Prescott 86301.

ARKANSAS

Arkansas Art Center, Box 2137, Little Rock 72203.

University of Central Arkansas, Conway 72032.

CALIFORNIA

Bakersfield Community College, 1801 Panorama Dr., Bakersfield 93305. 2-year program.

Baulines Craftsman's Guild, Box 305, Bolinas 94924.

California College of Arts and Crafts, 5212 Broadway, Oakland 94618.

California Polytechnic State University, San Luis Obispo 93407.

California State University, Chico 95926.

California State University, Fresno 93740.

California State University, Dept. of Art, Fullerton 92634.

California State University, 5151 State University Dr., Los Angeles 90032.

California State University, 18111 Nordhoff, Northridge 91324.

California State University, 5500 State College Pkwy., San Bernardino 92407.

College of the Redwoods, 440 Alger St., Ft. Bragg 95437.

Cuesta College, Box J, San Luis Obispo 93403.

The Cutting Edge Workshop, three locations: 3871 Grand View Blvd., Los Angeles 90066; 1836 Fourth St., Berkeley 94710; 7626 Miramar Rd., Suite 3500, San Diego 92126.

Ganahl Lumber Co., 1220 E. Ball Rd., PO Box 31, Anaheim 92805.

Grew-Sheridan Studio, 500 Treat Ave., San Francisco 94110.

Laney College, 900 Fallon St., Oakland, 94607.

Long Beach City College, 1305 E. Pacific Coast Hwy., Long Beach 90806.

Merritt College, 12500 Campus Dr., Oakland 94619.

Orange Coast College, 2701 Fairview Rd., Costa Mesa 92626.

Palo Alto Woodworking, Ramona St., Palo Alto 94301.

San Francisco State University, 1600 Holloway Ave., San Francisco 94132.

San Joaquin Delta College, 5151 Pacific Ave., Stockton 92207.

Sierra College, 5000 Rocklin Rd., Rocklin 95603.

Southwestern College, 900 Otay Lakes Rd., Chula Vista 92010.

COLORADO

Anderson Ranch Arts Center, Box 2410, Aspen 81612.

Metropolitan State College, 1006 11th St., Denver 80204.

University of Southern Colorado, 2200 Bonforte Ave., Pueblo 81001.

Western State College of Colorado, Gunnison 81230.

CONNECTICUT

Brookfield Craft Center, Rt. 25, Box 122, Brookfield 06804.

Craftsmanship in Wood, 12K Commerce St., Glastonbury 06033.

DISTRICT OF COLUMBIA

Concoran School of Art, 17th St. & New York Ave. NW, Washington 20006. Credit and non-credit courses.

FLORIDA

Brevard Community College, 1519 Clearlake Rd., Cocoa 32922.

Florida A & M University, Boulevard St. FAMU, Tallahassee 32307.

University of West Florida, Bldg. 70, Pensacola 32504.

GEORGIA

Atlanta College of Art, 1280 Peachtree St. N.E., Atlanta 30309.

Berry College, Mt. Berry 30149.

University of Georgia, Athens 30602.

HAWAII

Hawaii Community College, 1175 Manono St., Hilo 96720.

University of Hawaii, 1776 University Ave., Honolulu 96822.

IDAHO

Ricks College, Rexburg 83440.

ILLINOIS

Chicago Academy for Fine Woodworking, 1633 W. Fullerton, Chicago 60614.

Chicago State University, 95th at King Dr., Chicago 60628.

Northern Illinois University, DeKalb 60115.

University of Illinois, Urbana 61801.

John Wood Community College, 1919 N. 18th St., Quincy 62301.

INDIANA

Ball State University, Muncie 47306.

Herron School of Art, 1701 N. Pennsylvania Ave., Indianapolis 46202.

Indiana State University, 8600 University Blvd., Evansville 47712.

IOWA

Des Moines Area Community College, 2006 Ankeny Blvd., Des Moines 50021.

Eastern Iowa Community College, 152 Colorado St., Muscatine 52761.

Iowa State University, Ames 50011.

William Penn College, Oskaloosa 52577.

Southeastern Community College, 285 Messenger Rd., Keokuk 52632.

Waldorf College, Forest City 50436.

KANSAS

Bethel College, North Newton 67117.

Fort Hays State University, 600 Park St., Hays 67601.

Independence Community College, Continuing Education, College Ave. and Brookside Dr., Independence 67301.

Neosho County Community College, 1000 S. Allen, Chanute 66720.

Pittsburg State University, Pittsburg 66762.

Wichita State University, 17th & Fairmount, Box 77, Wichita 67208.

KENTUCKY

Eastern Kentucky University, Richmond 40475.

Louisville School of Art, 804 E. Chestnut, Louisville 40204.

Murray State University, Murray 42071.

Western Kentucky University, Bowling Green 42101.

LOUISIANA

Louisiana State University, Baton Rouge 70803.

MAINE

The Apprenticeshop, Sea St., PO Box 539, Rockport 04856.

Southern Maine Vocational Technical Institute, Fort Rd., South Portland 04106.

University of Southern Maine, College Ave., Gorham 04038.

MARYLAND

Catonsville Community College, 800 S. Rolling Rd., Catonsville 21228.

Chesapeake College, PO Box 8, Wye Mills 21679.

Maryland Institute College of Art, 1300 W. Mt. Royal Ave., Baltimore 21217.

University of Maryland, College Park 20705.

University of Maryland, Eastern Shore, PO Box 1124, Princess Anne 21853.

MASSACHUSETTS

Boston Center for Adult Education, 5 Commonwealth Ave., Boston 01226.

Boston University Program in Artisanry, 620 Commonwealth Ave., Boston 02215.

Horizons: N.E. Craft Program, 374 Old Montague Rd., Amherst 01002.

Leeds Design Workshops, One Cottage St., Easthampton 01027.

North Bennet Street Industrial School, 39 North Bennet St., Boston 02113.

The Worcester Craft Center, 25 Sagamore Rd., Worcester 01605.

MICHIGAN

Andrews University, Berrien Springs 49104.

Delta College, University Center 48710.

Lake Superior State College, Saulte Ste. Marie 49783.

University of Michigan, 2000 Bonisteel Blvd., Ann Arbor 48109.

Western Michigan University, Kalamazoo 49001.

MINNESOTA

Dakota County Area Vocational Technical Institute, PO Drawer K, Rosemount 55068.

Mankato State University, Mankato 56001.

Moorhead State University, Moorhead 56560.

St. Cloud State University, St. Cloud 56301.

University of Minnesota, 2400 Oakland Ave., Duluth 55812.

University of Minnesota, 159 Pillsbury Dr., 125 Peik Hall, Minneapolis 55455.

University of Minnesota, 1954 Buford, 425 Vo Tech, St. Paul 55108.

Winona State University, Watkins Hall, Winona 55987.

The Wood Carving School, 3056 Excelsior Blvd., Minneapolis 55416.

MISSISSIPPI

Mississippi State University, Drawer NU, Mississippi State 39762.

Mississippi Valley State University, Itta Bena 38941.

MISSOURI

Missouri Southern State College, Newman and Duquesne Rd., Joplin 64801.

Northeast Missouri State University, Kirksville 63501.

Northwest Missouri State University, Maryville 64468.

The School of the Ozarks, Point Lookout 65726.

Southwest Missouri State University, 901 S. National, Springfield, 65804.

MONTANA

Montana State University, Bozeman 59717.

Northern Montana College, Brockman Center, Havre 59501.

Primrose Center for Fine Woodworking and Furniture Design, 401 W. Railroad St., Missoula 59802.

Western Montana College, Dillon 59725.

NEBRASKA

Peru State College, Peru 68421.

Southeast Community College, Beatrice Campus, Highway 136, Beatrice 68310.

University of Nebraska, Teachers College, Lincoln 68588.

NEVADA

Northern Nevada Community College, T & I, Elko 89801.

NEW HAMPSHIRE

Keene State College, Keene 03431.

University of New Hampshire, 6 Garrison Ave., Durham 03824.

NEW JERSEY

Kean College, Morris Ave., Union 07083.

Montclair State College, Valley Rd. & Normal Ave., Upper Montclair 07043.

William Paterson College, 300 Pompton Rd., Wayne 07470.

Peters Valley, Rt. 615, Layton 07851.

Mr. Sawdust, Box 4, Schooley's Mountain 07870.

Trenton State College, Armstrong Hall, Trenton 08625.

NEW MEXICO

Eastern New Mexico University, Station #11, ENMU, Portales 88130.

New Mexico Highlands University, Las Vegas 87701.

NEW YORK

Wendell Castle Workshop, 18 Maple St., Scottsville 14546.

Craft Students' League, YWCA Bldg., 610 Lexington Ave., New York 10022.

Hartwick College, Oneonta 13820.

Knowhow Workshop, New School, 17 W. 17th St., New York 10011.

National Trust for Historic Preservation, 635 S. Broadway, Tarrytown 10591.

Rochester Institute of Technology, School for American Craftsmen, One Lomb Memorial Dr., Rochester 14623.

State University College at Buffalo, 1300 Elmwood, Buffalo 14222.

State University College, New Paltz 12561.

State University College, Oswego 13126.

State University of New York, Visual Arts, Lincoln Ave., Purchase 10577.

Thousand Islands Museum Craft School, 314 John St., Clayton 13624.

Woodsmith's Studio, 142 E. 32nd St., New York 10016.

NORTH CAROLINA

Appalachian State University, Boone 28608.

Asheville-Buncombe Technical College, 340 Victoria Rd., Asheville 28801.

Bladen Technical College, Box 6, Dublin 28332.

Brevard College, Brevard 28712.

The John C. Campbell Folk School, Rt. 1, Brasstown 28902.

Cleveland Technical College, 137 S. Post Rd., Shelby 28150.

Country Workshops, Rt. 3, Box 221, Marshall 28753.

East Carolina University, Greenville 27834.

Guilford Technical Institute, Jamestown 27282.

Haywood Technical College, Freelander Dr., Clyde 28721.

North Carolina State University, Box 5488, Raleigh 27650.

Penland School of Crafts, Penland Rd., Penland 28765.

Pitt Community College, Box 7007, Greenville 27834.

University of North Carolina, Charlotte 28223.

NORTH DAKOTA

University of North Dakota, Grand Forks 58201.

OHIO

Bowling Green University, Bowling Green 45405.

Dunbar-Conover Woodworking School, 18125 Madison Rd., Parkman 44080. One-week intensive courses.

Ohio Northern University, S. Main St., Ada 45810.

Ohio State University, Rt. 250, Wooster 44691.

Ohio University, 69 W. Union St., Athens 45701.

OMI College of Applied Science, 100 E. Central Pky., Cincinnati 45221.

OKLAHOMA

Central State University, Edmond 73034.

East Central Oklahoma State University, Ada 74820.

Northeastern State University, Tahlequah 74464.

Northwestern Oklahoma State University, Alva 73717.

Oklahoma State University, 104 Industrial Bldg., Stillwater 74078.

Panhandle State University, Box 307, Goodwell 73939.

Southeastern Oklahoma State University, Station A, Durant 74701.

Southwestern Oklahoma State University, 101 Campus Dr., Weatherford 73096.

OREGON

Oregon School of Arts & Crafts, 8245 S.W. Barnes Rd., Portland 97225.

Oregon State University, Corvallis 97331.

PENNSYLVANIA

Amaranth Gallery and Workshop, 2500 N. Lawrence St., Philadelphia 19133.

Edinboro State College, Edinboro 16444.

Indiana University of Pennsylvania, Sprowls Hall, Indiana 15705.

Kurtztown State College, Kutztown 19530.

Millersville State College, Millersville 17551.

Philadelphia College of Art, Broad & Spruce Sts., Philadelphia 19103.

Temple University, Philadelphia 19122.

Williamsport Area Community College, 1005 W. Third St., Williamsport 17701.

Woodworking Exchange, Canal Studios, 4101 Lauriston St., Philadelphia 19128.

RHODE ISLAND

New England Institute of Technology, 184 Early St., Providence 02907.

Rhode Island School of Design, 2 College St., Providence 02903.

SOUTH CAROLINA

Piedmont Technical College, Box 1467, Greenwood 29646.

SOUTH DAKOTA

Black Hills State College, 1200 University, Spearfish 57783.

Dakota State College, Madison 57042.

Freeman Junior College and Freeman Academy, 748 S. Main St., Freeman 57029.

University of South Dakota, Springfield 57062.

TENNESSEE

Appalachian Center for Crafts, University PO Box 347-A1, Smithville 37166.

Arrowmont School of Arts and Crafts, Box 567, Gatlinburg 37738.

Austin Pea State University, Clarksville 37040.

East Tennessee University, Box 22600A, Dept. of Industrial Education, Johnson City 37614.

Middle Tennessee State University, Murfreesboro 37132.

Tennessee Technological University, Box 5106, Cookeville 38501.

TEXAS

Abilene Christian University, ACU Box 8107, Abilene 79699.

East Texas State University, Commerce 75428.

North Texas State University, Denton 76201.

San Antonio College, 1300 San Pedro, San Antonio 78284.

Southwestern Adventist College, Kenne 76059.

Sul Ross State University, Alpine 79830.

Tarleton State University, Box T489, Tarleton Station, Stephenville 76402.

Texas A & I University, Box 203 TAIU, Kingsville 78363.

Texas A & M University, College Station 77843.

University of Texas, 3900 University Blvd., Tyler 75701.

West Texas State University, Box 767 W.T., Canyon 79015.

UTAH

Brigham Young University, 230 SNLB, Provo 84602.

VERMONT

Michael Coffey School of Fine Woodworking, RD 2, Poultney 05764.

Kirby Studios, B.C.I.C. Bldg., North Bennington 05257.

Marlboro College, Marlboro 05344.

VIRGINIA

Virginia Commonwealth University, 221 Shafer Ct., Richmond 23284.

WASHINGTON

Central Washington University, Ellensburg 98926.

Cornish Institute, 710 E. Roy, Seattle 98102.

Evergreen State College, Olympia 98505.

Spokane Community College, N. 1810 Greene St., Spokane 99207.

Walla Walla College, College Place 99324.

Western Washington University, Bellingham 98225.

WEST VIRGINIA

Augusta Heritage Arts Workshop, Box 1725, Elkins 26241.

Fairmont State College, Fairmont 26554.

Huntington Galleries, Park Hills, Huntington 25701.

West Virginia University, Locust Ave., Morgantown 26506.

WISCONSIN

Blackhawk Technical Institute, Rt. 3 Prairie Rd., Janesville 53545.

Cardinal Stritch College, 6801 N. Yates Rd., Milwaukee 53217.

District One Technical Institute, 620 W. Clairemont Ave., Eau Claire 54701.

Madison Area Technical College, 211 N. Carroll St., Madison 53703.

Northeast Wisconsin Technical Institute, 2740 W. Mason St., Green Bay 54303.

University of Wisconsin, 455 N. Park St., Madison 53706.

University of Wisconsin, River Falls 54022.

Wisconsin Indianhead Technical Institute, 1900 College Dr., Rice Lake 54868.

WYOMING

University of Wyoming, Box 3374, University Sta., Laramie 82071.

Canada

ALBERTA

Fairview College, Trades Div., Box 3000, Fairview T0H 1L0.

Northern Alberta Institute of Technology, 11762 106th St., Edmonton T5G 2R1.

Red Deer College, Technical & Apprenticeship Div., Box 5005, Red Deer T4N 5H5.

Southern Alberta Institute of Technology, 1301 16 Ave. N.W., Calgary T2M 0L4.

BRITISH COLUMBIA

British Columbia Institute of Technology, 3700 Willingdon Ave., Burnaby V5G 3H2.

Douglas College, Box 2503, New Westminster V3L 5B2.

Kwantlen College, 13479-77 Ave., Surrey V3W 6Y1.

Northern Lights College, 11401 Eighth St., Dawson Creek V1G 4G2.

Vancouver Vocational Institute, 250 W. Pender St., Vancouver V6V 1S9.

NEW BRUNSWICK

New Brunswick Community College, Box 70, Power Rd., Edmundston E3V 3K7.

New Brunswick Community College, Campus de Grand-Sault, 160 Reservoire St., Box 1270, Grand Falls E0J 1M0.

New Brunswick Craft School & Center, Box 6000, Fredericton E3B 5C3.

NEWFOUNDLAND

District Vocational School, Clarenville A0E 1J0.

District Vocational School, Grand Falls A0H 2H0.

District Vocational School, PO Box 340, Lewisporte A0G 3A0.

St. Anthony Vocational School, Box 550, St. Anthony A0K 4S0.

ONTARIO

Algonquin College, 1385 Woodroffe Ave., Ottawa K2G 1V8.

Conestoga College, Doon Campus, 299 Doon Valley Dr., Kitchener N2G 4M4.

Fanshawe College of Applied Arts and Technology, 1460 Oxford St. East, PO Box 4005, London N5W 5H1.

Georgian College of Applied Arts & Technology, One Georgian Dr., Barrie L4M 3X9.

Humber College, 205 Humber College Blvd., Rexdale M9W 5L7.

Humber College of Applied Arts & Technology, 56 Queen Elizabeth Blvd., Toronto M8Z 1LM.

Niagara College, 59 Wellandvale Rd., St. Catharines L2R 6V6.

Northern College of Applied Arts & Technology, Box 970, Kirkland Lake P2N 3L8.

Sheridan College of Applied Art & Technology, 1460 S. Sheridan Way, Mississauga L5H 1Z7.

St. Clair College of Applied Arts & Technology, 2000 Talbot Rd. W., Windsor N9A 6S4.

PRINCE EDWARD ISLAND

Holland College, Burns Ave., West Royalty C1A 7N9.

SASKATCHEWAN

Wascana Institute of Applied Arts & Science, Box 556, Maxwell Campus, Regina S4P 3A3.

Boatbuilding

Norfolk School of Boatbuilding, Box 371, Norfolk, Va. 23501.

Northwest School of Wooden Boatbuilding, 330 10th St., Port Townsend, Wash. 98368.

Prothero School of Wooden Boatbuilding, Box 401, Port Townsend, Wash. 98368.

Sculpture/carving

City College of San Francisco, 50 Phelan Ave., San Francisco, Calif. 94112.

Florida State University, 123 Education St., Tallahassee, Fla. 32306.

Evanston Art Center, 2603 Sheridan Rd., Evanston, Ill. 60201.

The College of St. Catherine, 2004 Randolph Ave., St. Paul, Minn. 55105.

Delta State University, Cleveland, Miss. 38733.

Webster College, 470 Lockwood, St. Louis, Mo. 63119.

The American Carving School, 21 Pompton Plains Crossroad, Wayne, N.J. 07470.

Art Life Studios, 1384 3rd Ave., New York, N.Y. 10021.

Haber School of Sculpture, 1170 Old Northern Blvd., Roslyn, N.Y. 11576.

Riverbend Art Center, 142 Riverbend Dr., Dayton, Ohio 45405.

University of Akron, Akron, Ohio 44325.

Wooster Art Center, E. University St., Wooster, Ohio 44691.

University of Tennessee, Chattanooga, Tenn. 37402.

Hardin-Simmons University, Hickory & Ambler Sts., Abilene, Tex. 79698.

Ethan Allen Community College, Box 905, Manchester Center, Vt. 05255.

Cambrian College of Applied Arts & Technology, 1400 Barrydowne, Sudbury, Ont., Canada P3A 3V8.

Stringed instruments

Roberto-Venn School of Luthiery, 5445 E. Washington St., Phoenix, Ariz. 85034.

Ervin Somogyi School of Lutherie, 3052 Telegraph Ave., Berkeley, Calif. 94705.

Kenneth Warren & Son School of Violin Making, 28 E. Jackson Blvd., Chicago, Ill. 60604.

La Gitana Instruments, 83 Riverside Ave., Concord, Mass. 01742.

Stringfellow, 233 N. Pleasant St., Amherst, Mass. 01002.

The Luthierie, Robert Meadow, 2449 W. Saugerties Rd., Saugerties, N.Y. 12477.

Bob Zatzman Guitar Studio, 6655 McCallum St., Philadelphia, Pa. 19119.

The Apprentice Shop, Box 267, N. Main, Spring Hill, Tenn. 37174.

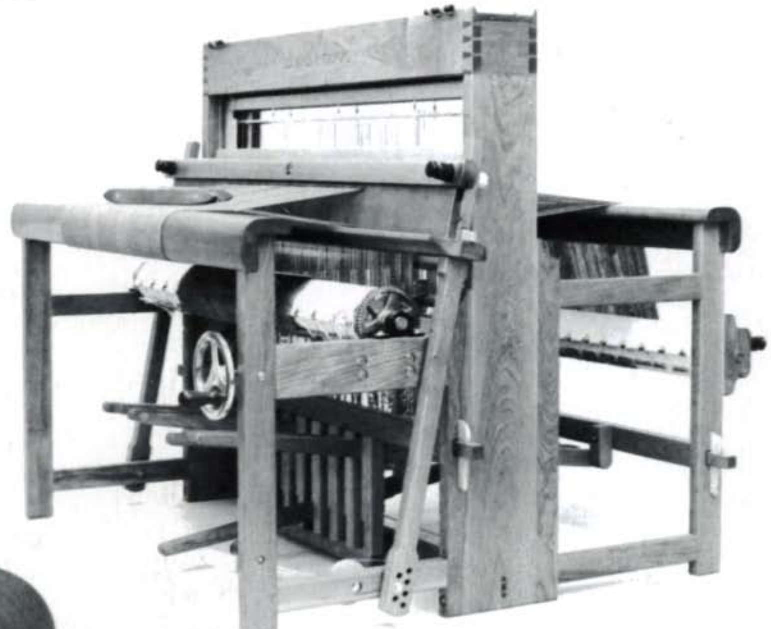
Northwest School of Instrument Design, Box 220, Skykomish, Wash. 98288.

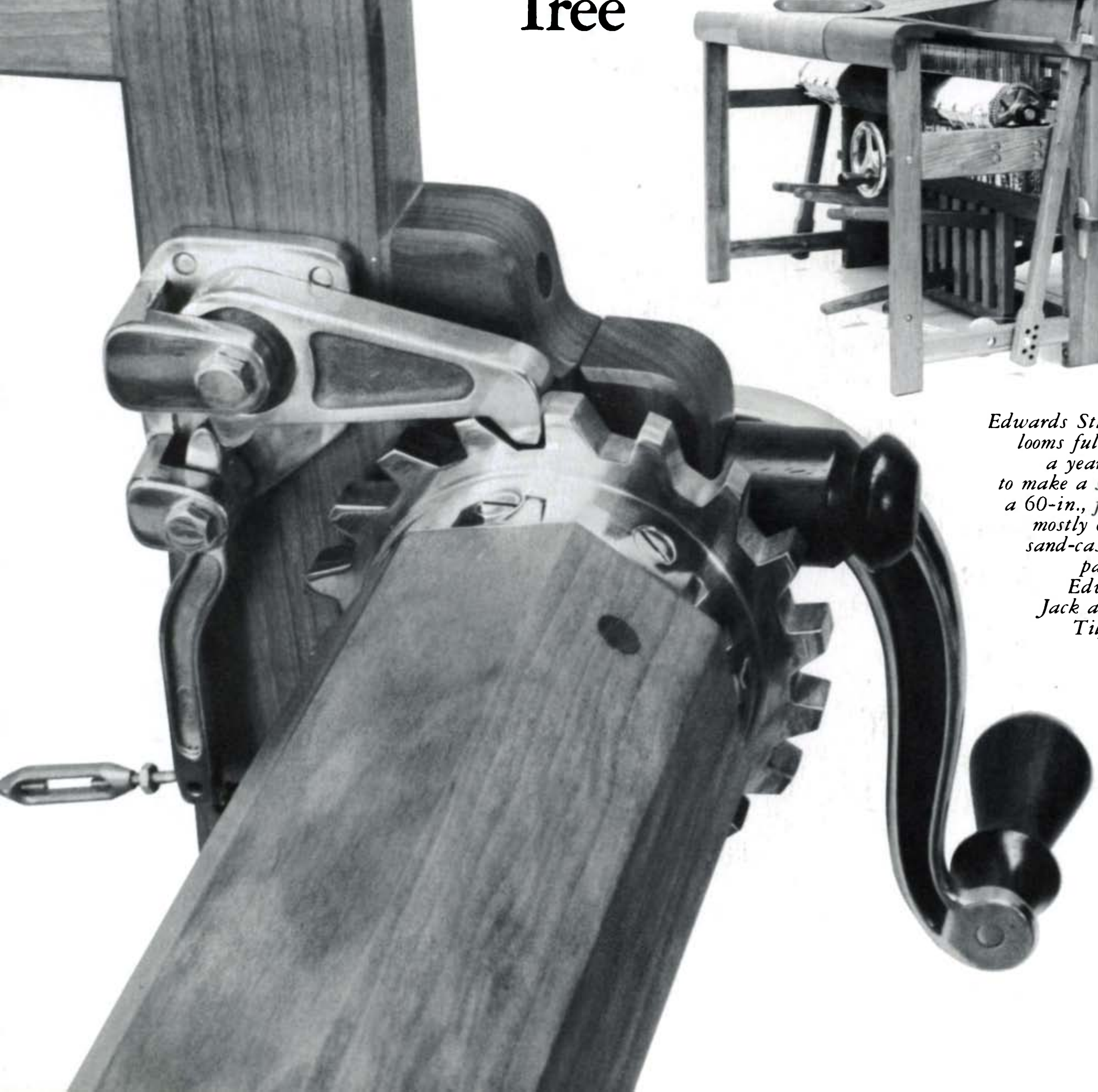
Once a Tree

Santa Fe's annual Once a Tree exhibition was the highlight of Woodworker's Week in New Mexico last September. With 200 pieces by 50 artisans, a veritable potpourri of materials, styles and scales, it was difficult to settle upon favorites. Nevertheless, here are three of the pieces I liked best. *—David L. Bell*

Albuquerque psychologist and woodworker Gerald Otis bent his armchair from 1/8-in. strips of walnut and ebony. The divergence of the legs' ebony accent around the walnut risers is a particularly graceful way of emphasizing form.

Voragina (whirlpool), by Alan Paine Radebaugh of Albuquerque, succeeds by virtue of acute proportion and impeccable detailing. Tenoned together on a hub-and-spoke system, the 20-in. high table incorporates padauk, ebony, birch and brass. A wooden rim visually anchors the glass top to its base.





Edwards Studios of El Rito makes looms full-time, and about once a year pulls out all the stops to make a special piece. No. 24 is a 60-in., four-harness loom made mostly of cherry, with ratchets sand-cast of brass from wooden patterns. Design by Jack Edwards, construction by Jack and Viki Edwards, Jim Tilford and Ted Bucklin.

Photos: Dick Kent
Ralph Gerter
Jack Edwards