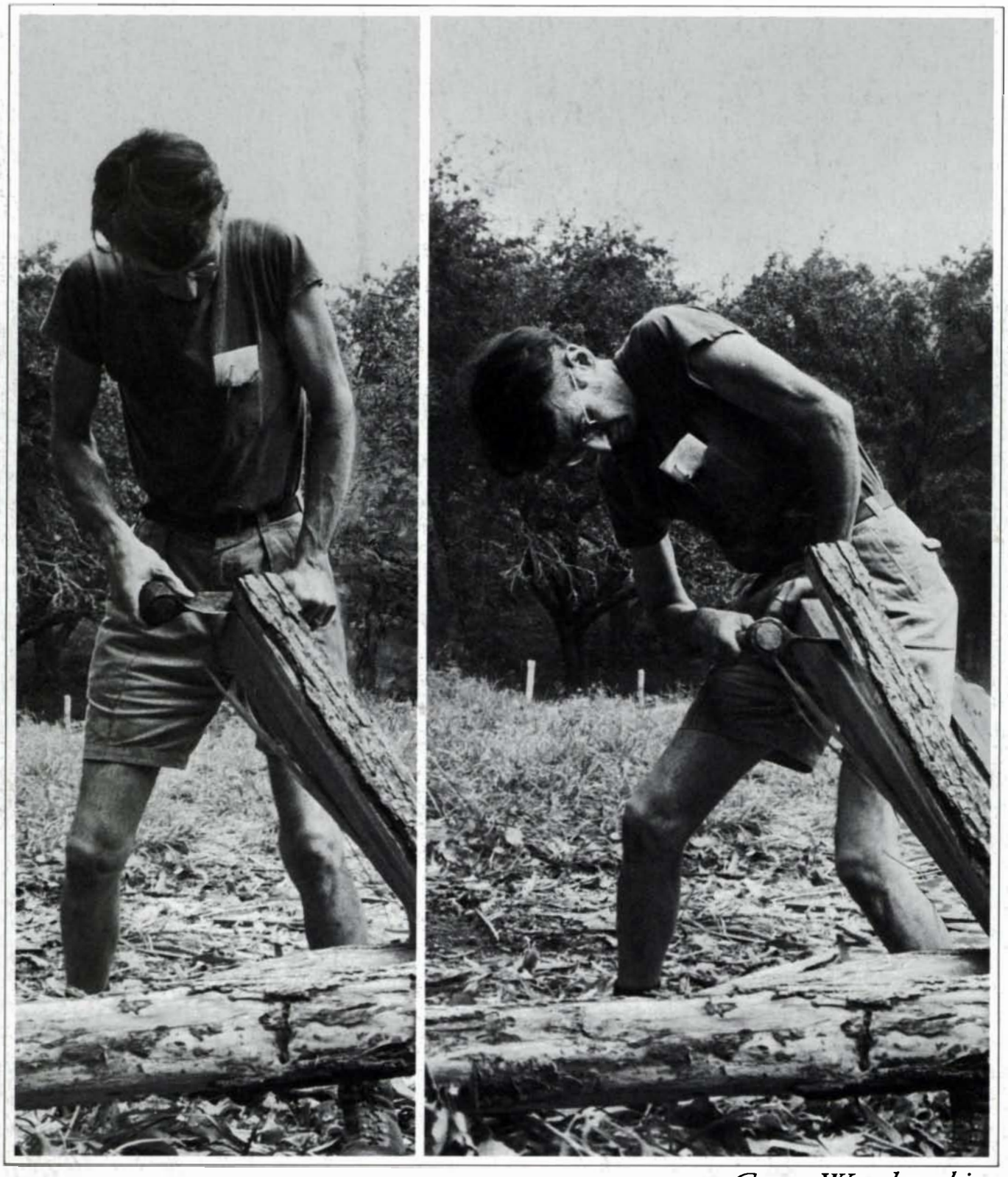
Fine WoodWorking

MARCH/APRIL 1982, NO. 33, $3.00



Green Woodworking

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Cover: Dave Sawyer leans on a froe to size a blank for making into the leg of a post-and-rung chair. Wood ready to work can be split, rather than sawn, directly out of the log. Sawyer taught how to bust chairs out of green wood last summer at Country Workshops in Marshall, N.C. Above, he shows a student how to drawknife a rung. For more about how to work green wood, see p. 50.

Fine WoodWorking®

MARCH/APRIL 1982, NUMBER 33

DEPARTMENTS

ARTICLES

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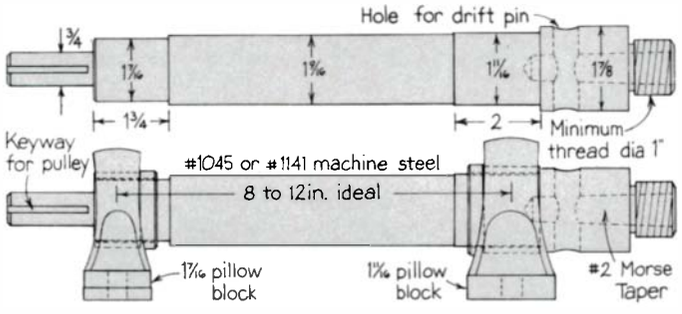
Letters

With regard to the headstock of Don Bjorkman's bowl-turning lathe in the Nov. issue of *Fine Woodworking* (#31), I feel obliged to offer a suggestion that should improve the quality of work produced on it. The two bearings as shown are widely spaced, and with a slender arbor of only an inch or so in diameter, this invites serious vibration problems....

The accompanying sketch shows a simple but effective



spindle design. This design can be altered to suit many applications. The main points are that it offers a firm shoulder to seat against the front bearing, the spindle has plenty of beef to resist vibration, and the pulley location at the extreme left end allows easier belt management. This also removes the belt and pulley away from the left arm while turning the back of a bowl, but of course a guard should still be installed. I have shown a hole crossways the spindle to receive a tapered drift pin with which to remove tooling having Morse tapers. A #2 MT should be the minimum size because of the vibration problem. Incidentally, Bjorkman's motor mount should have a locking device to eliminate belt and motor bounce. —*R. Perry Mercurio, Kingfield, Me.*

Most of us have thrown together a skate-wheel coaster, a toy-box or a rocking horse for our own kids. Soft pine, nails, putty and a coat of paint usually did the job. Everything is different when you become a grandfather. First of all it is assumed and expected that you have nothing to do but turn out toys, games, puzzles and wagons for the new grandson or granddaughter. Second, the quality of the product must improve by several magnitudes....

I have been a grandfather for two years. And it has been a most enjoyable challenge to turn out wooden games and toys for the grandson, using woods new to me like padauk, bubinga, putumuju and tulipwood. The ultimate joy happened last spring when I presented my grandson with a full-size operational hardwood runabout....Grandchildren provide a constant and compelling urge to move from the office desk to the woodshop. —*Herbert L. Eggleston Jr., Glendale, Calif.*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...For the lathe tool-rest and tailstock hold-down bolts, it is very convenient if the nuts which receive these bolts are recessed and epoxied into the block which slides under the ways, rather than being loose. In this way, all adjustments, clamping, etc., can be done without the frustration of going up from below with a wrench. This is a minor point, but I find that reducing the frustration-coefficient on any machine, especially those which I make myself, is well worth the effort.

If possible, keep up the "make it yourself" articles on machinery; the satisfaction. as well as the monetary savings, is part of our hobby. —*George H. Davis, Granby, Conn.*

Am I the only woodworker who makes mistakes? I see article after article in your fine magazine on how to do everything right, but rarely if ever see any advice on what to do when something goes wrong. What's the best way to patch a chipped dovetail? What if you dent or chip or scratch a surface? Cut a tenon too small? I'm not talking about restoration hints, I mean rescue advice for mistakes made during construction.

No one starts out perfectly. I admire the work in your magazine but can hardly reproduce it. You don't get to be that good without making a lot of mistakes and learning tricks to correct at least some of them. What secrets are your contributors holding back? —*John Goodman, Washington, D.C.*

Since sources of supply are obviously important to any woodworker, I would like to share with your readers my experience with John Harra Wood & Supply Co.

During March of 1981, I ordered birch plywood, a marking gauge and a pair of safety goggles. The total order was $172.67. Subsequently, I received the goggles (the price of which was $2) and a copy of my order form indicating that the marking gauge and plywood had been back ordered. In May, I called to check on the status of the order and was told that the items were expected shortly and would be shipped promptly.

On August 1, since I had not received the goods, I wrote to John Harra, cancelled the order and requested a refund. On August 12, I had not received a reply to my letter, so I called and was advised the the order had been shipped before my letter had been received. Since I had not yet received the order, I assumed that the driver of the ox cart was still en route from New York to Pittsburgh and decided to wait another month to permit the journey to be completed. When I called Harra on September 11, I was advised that the order had never been shipped but that a refund check would be issued that day. Two weeks later, on September 24, when the promised refund did not arrive, I called again and was told that the order would be shipped on October 2, but that if I wanted a refund I could have the refund. My reply was that I didn't care which I received but that I wanted either the order or the refund.

As I am certain you have surmised by this time, I have not yet received the plywood, the marking gauge nor the refund. In effect, I have paid $172 for a $2 pair of safety goggles.... —*Michael R. Stabile, Jr., Carnegie, Pa.*

EDITOR'S NOTE: When contacted by telephone on Jan. 7, Harra claimed he had shipped the plywood to reader Stabile around Sept. 11. He said he had not been able to supply the marking gauge, so had asked his accountant to refund its price. Harra said he was surprised to learn that Stabile had received neither the plywood nor the partial refund. He promised to refund the full $170 forthwith. Asked why this order had languished from March until September, Harra

THE BEST BUY IN CARBIDE SAW BLADES

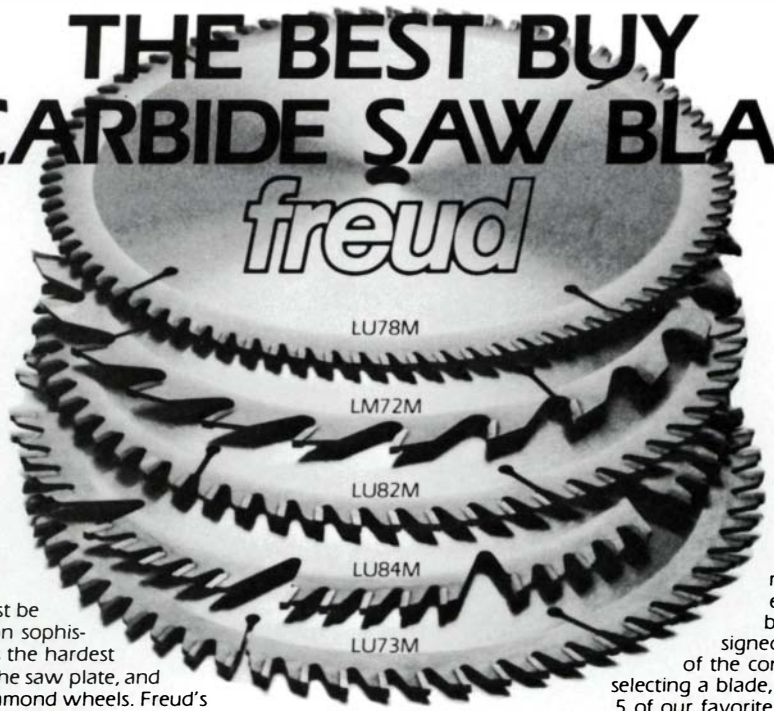

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Plate. The body of a premium blade is made from milled tool steel, cheaper blades are made from stamped cold-rolled steel. After a premium Freud blade is machined, it is heat treated twice and then surface ground on both sides. Finally, each premium Freud blade is hammered on automatic equipment to tension the blade and checked by hand for trueness. A properly tensioned blade, with its stresses relieved, will stretch evenly at high running speeds while a cheaper blade will distort and vibrate.

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								9"	54	82.29	**65.00**
Precision Cross Cutting	NR	G	E	E	E	NR	NR	10"	60	82.29	**65.00**
Wood & Veneers								12"	72	117.49	**94.00**
LU78M								10"	80	111.45	**89.00**
Chip Free Cutting	NR	G	F	G	G	E	NR	12"	96	134.16	**107.00**
Plastic Laminates											
LU84M								8"	40	68.12	**54.00**
								9"	40	67.61	**54.00**
Combination Blade	G	G	G	G	G	F	E	10"	40	67.61	**54.00**
4 ATB Teeth & 1 Square								10"	50	70.96	**56.00**
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said, "So many papers get lost around here that we're currently changing over from a manual system to computers. We definitely have to improve our office flow."

Stabile's complaint is typical of the 30 we received about Harra's business during 1981, ten times the number lodged against any other advertiser. *Fine Woodworking* staff members took each complaint directly to Harra and as far as we know, he eventually made good on all of them. Against these complaints, Harra points to hundreds of happy customers, as well as to discount prices.

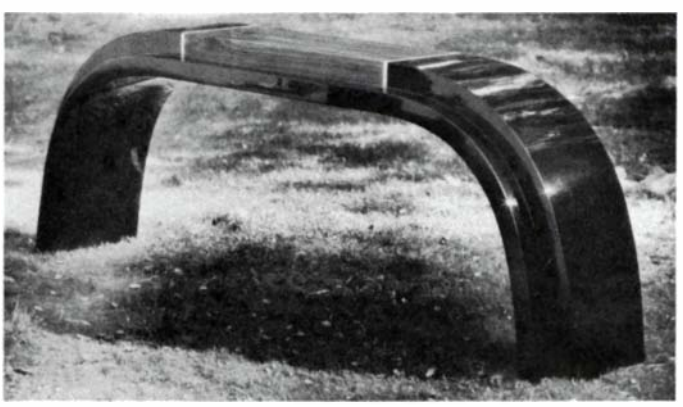
. . . Besides being a very keen amateur woodturner, I am also a member of the International Wood Collectors Society, and, combining the two interests, I am turning a collection of goblets from as many woods as I can obtain. I have seen reader enquiries about what woods to use for turning. My own experience is that all woods seem to be able to be turned successfully, although some are easier to work than others. The way to find out is to put some wood between centers and try it. So far I haven't found a timber that I have not been able to turn, having made egg cups and bud or specimen vases from very soft woods like balsa and also very hard woods such as lignum vitae and our Australian mulga. In addition, some of the timber not usually used commercially, such as fruitwoods and other ornamentals, makes beautiful items. I season some wood myself, obtaining it from various sources including the local council gardener, who has been only too happy to oblige, especially after being bribed with an eggcup or two.

—Neville Sanders, Gawler, Australia

Re methods of finishing redwood to retain its original color (*FWW* Jan. '82, Q&A). I have turned bowls from dry and very soft redwood burls that would turn black when any normal finish was applied. I solved the problem by applying a wash of white glue (white glue thinned with about an equal part of water). Test on a scrap piece. The solution must have body but be thin enough to be completely absorbed by the wood, leaving no ridges or lumps. When thoroughly dry, this was lightly sanded, taking care not to expose untreated wood. This was followed with several coats of varnish using 0000 grade steel wool between coats to break the gloss and even the surface. The varnish doesn't penetrate the wood, thus does not affect the color. The white glue wash has no effect on the color and does harden the surface. Results are beautiful smooth objects showing all the natural wood grain and color.

—Jack Gardner, Anaheim, Calif.

Enclosed are photos of an entry table I recently completed. The dimensions are 74 in. by 16 in. by 32 in. Birch plies were bent over a hardwood frame and about 30 coats of black lac-



quer were applied. After lacquering, rosewood was inset and brass was inlaid....I have been working with wood for 35 years and still find it to be the most rewarding work I have done. *—Dennis Fingold, Ojai, Calif.*

After the fact, verbatim from a woodworker's journal:

Woke up with making up for yesterday's mistakes on my mind—decided on a procedure, went ahead with its execution with dust mask and ear guards and plastic goggles that obscured more than protected my vision. I was cutting a piece too small from another piece not big enough, on a table saw not lit well enough, with blades not sharp enough.

Later, after the helpful plastic surgeon reconstructed my middle and index fingers on my left hand, I decided I've been pushing my luck and myself too hard. Deadlines and dilemmas *can* wait. Back to the basics.

—R.S. Labrise, Howard Beach, N.Y.

In your January/February issue (#32), I was appalled by the item in Methods of Work (p. 14) that suggested using a radial-arm saw as a jointer. A radial-arm saw was designed for cross-cutting lumber. Used for any other operation it is dangerous at best. The method you published assumed far too much. To achieve the "perfect" setup required to perform this operation with even a modicum of safety almost necessitates the use of a jointer in the first place to get long and straight stock material. While I understand that most of your readers would know to use a push stick to perform the operation, as a shop teacher I feel it is never wise to assume anything where safety is concerned. Have we forgotten the function of the hand plane?

—W. Keith Thompson, Bridgeport, Conn.

HOMAGE TO THE BELT SANDER

The handplanes of old are gathering dust,
They sit on the shelf, beginning to rust;
More and more belts for my sanders I crave,
So I sold all the scrapers, drawknives and spokeshave.

My mask, my scarf, my goggles, I don,
My outfit with earplugs and gloves I put on.
I bow three times to 220 three-phase,
On Aluminum Oxide I happily gaze.

Soon to be screened from the world outside—
Norton, Behr-Manning, my patrons, my guide;
Cable and Porter, Decker and Black,
Silicon Carbide—none do I lack.

Once I begin the only sensations
Will be the dust cloud and the thrilling vibrations.
I pick up a sander, the cord I plug in,
I advance to the altar, my work to begin.

With reverent pause, I turn on the switch
And submit to the roar and the sounds that bewitch.
Abrasion, vibration, my only sensations
My art I pursue of instant creations.

The corner, the flat, the roughness—they call;
All to be conquered—form above all!
Form follows function, the function divine
Of me and belt sander; we grind and refine.

—William Post Ross, Georgetown, Me.

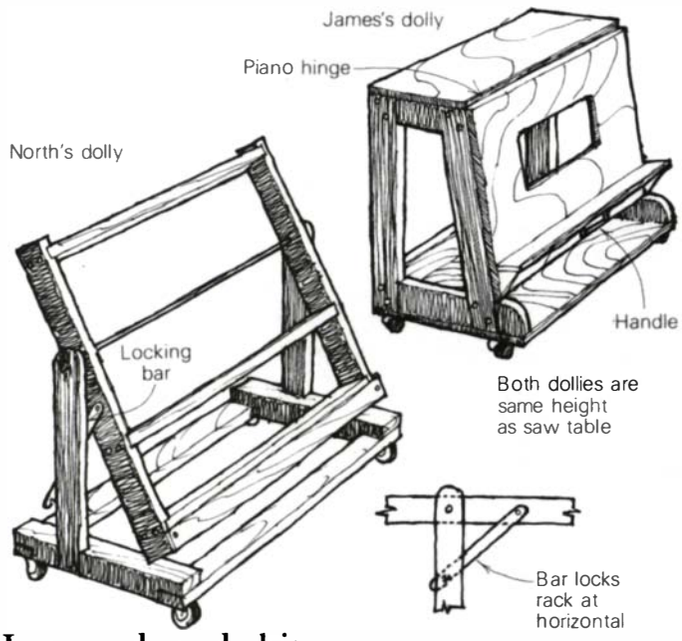
Two plywood dollies

Struggling with sheets of plywood is a real strain on my back, so I built this plywood dolly that makes handling those sheets easy. When I bring plywood to my shop in my pickup truck, I wheel the dolly up to the back of the truck with the cradle locked in the horizontal position. Then I slide the plywood from the truck onto the dolly with the long edge of the sheet resting against the foot. To tilt the cradle for transporting I just tap the locking bar with my foot to allow the cradle to swing to the vertical position. The cradle, when loaded with plywood, is almost evenly balanced but with a little more weight on the side with the foot. That way the cradle always tips the right way. When I wheel the plywood up to the saw, I tilt the cradle back to the horizontal position where the locking bar falls into a notch and locks. Since the dolly is the same height as my saw I can feed the plywood directly into the saw from the dolly.

—R.W. North, Burbank, Calif.

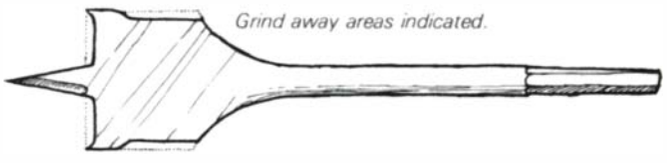
I've used the dolly sketched below right for years to handle large, heavy panels. I use it to tilt the panels up to the top of my table saw and unload panels from my truck. It also serves as a roll-around stepladder and a portable work surface.

—Ben James, Jacksonville, Fla.



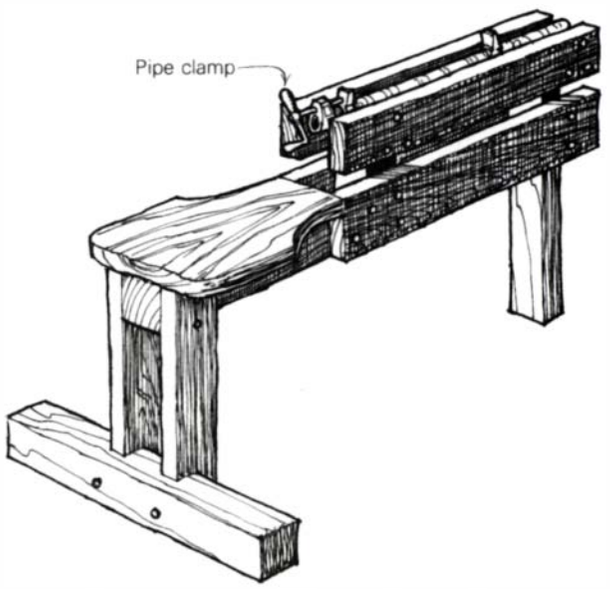
Improved spade bit

You can improve the performance of the common spade bit by regrinding it to the shape below. The reground bit will cut a smoother hole and won't tear out the grain as much when it comes out the other side. *—Ray Yohe, Altoona, Pa.*



Pipe-clamp shave horse

At the summer camp where I work we introduced high school kids to the kind of woodworking that might have been done by Michigan settlers before electricity; each student made a mallet. First he split out an oak handle with a froe, then shaped it with a drawknife on a shaving horse. Next he worked on the mallet head. We soon realized that, while the shaving horse worked well for the long handles, the short heads were tricky to hold and work in the horse. To solve the problem I



designed and built an alternative to the traditional shaving horse that uses a pipe clamp to hold the work.

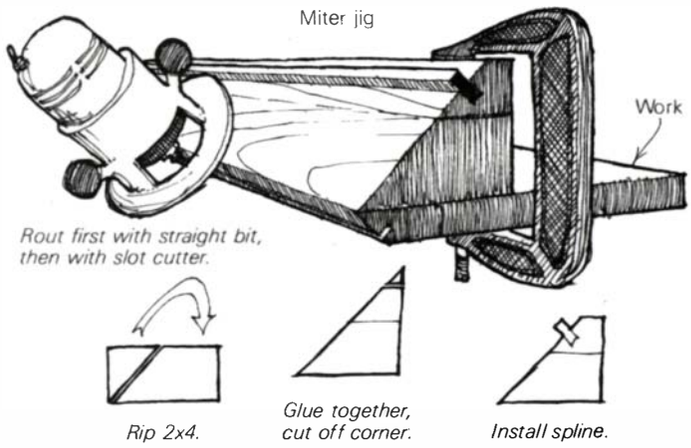
The horse's frame is made from 2x4s, 2x6s and 4x4s bolted together. To fasten the pipe to the frame I drilled two holes through the pipe to take a ⅜-in. threaded rod. Each threaded rod has four nuts, one on each side of the pipe and one on each side of the horizontal top member of the frame. I countersunk the outside nuts so there is no danger of striking them with the drawknife. *—Mark Lankton-Lenzo, Saugatuck, Mich.*

Routed miter joint

I recently had to make two 24-in. long splined 45° miter joints to join a coffee-table top to its sides. Since the tabletop was too large for me to use my table saw, I devised a way to cut miters and spline gooves with my router and a simple homemade jig.

To make the jig, select a 2x4 slightly longer than the required joint and, using a carbide-tipped blade for smoothness, rip the board at 45°. Glue and screw the smaller piece to the main piece to extend the face of the jig, as shown in the sketch. Rip a ¼-in. groove a little less than 3 in. from the pointed edge of the jig and install a spline in the groove. The spline serves as a straight-edged guide for the router's base.

To use the jig, rough-cut the workpiece at 45°, leaving it about ⅛ in. long. Position the jig exactly on the cut line and



clamp in place. Chuck a double-fluted carbide straight bit in your router and feed the router along the jig slowly and carefully. The ends are especially delicate. After the mitering cut is complete, leave the jig in position, chuck a slot cutter in the router and rout the spline slot. For a blind spline just stop the cutter an inch or so from the end. Repeat the process on the

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SEMINAR I: Friday, 9-12 noon

R. Bruce Hoadley, Ph D , Professor of Wood Science & Technology, U. of Massachusetts. One of America's foremost Wood Technologists, Wood carver, author and lecturer. Contributing editor to Fine Woodworking.

Moisture and wood: A review of wood technology . . . the nature and structure of wood as a material . . . the how and why of drying wood . . . the practical effect of moisture in wood . . . designing to account for dimensional changes as a result of moisture.

SEMINAR II: Saturday, 9-12 noon

James Krenov, Cabinet maker, lecturer and author. Teacher of woodworking at The College of the Redwoods, Mendocino, California.

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SEMINAR III: Sunday, 9-12 noon

Ian Kirby, Furniture designer and maker, author and educator. Consulting Editor to Fine Woodworking. Director of Kirby Studios, a working studio and school of furniture design and furniture making, North Bennington, Vermont.

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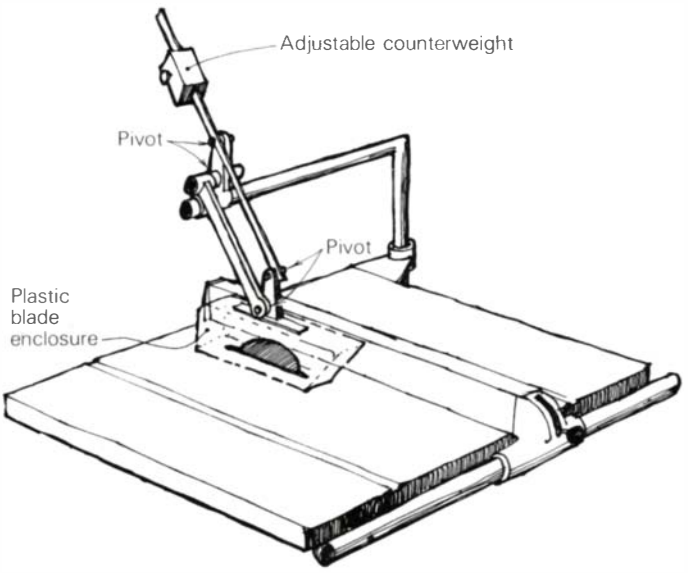
matching 45° piece. If the jig is made accurately, you'll be amazed how perfectly the joint will turn out.

—Paul Darnell, Phoenix, Ariz.

Space-age saw guard

This table-saw guard, developed for cutting space-shuttle insulation, holds several advantages over conventional guards. Because it is counterbalanced, the guard makes lighter contact and is easier to operate, especially with thick materials. By sliding the counterweight up or down the arm, the operator can adjust the downward force of the clear plastic enclosure. The guard doesn't preclude dadoing and grooving operations, which are impossible with some other types of guards. The design was developed by Benjamin R. Dunn and Paul P. Zebus of Rockwell International.

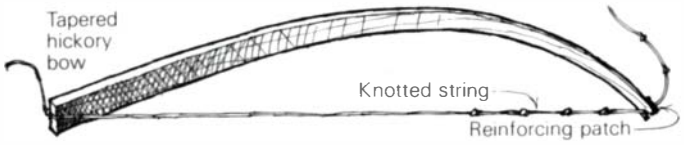
—NASA Tech Briefs, Johnson Space Center, Tex.



Adjustable curve

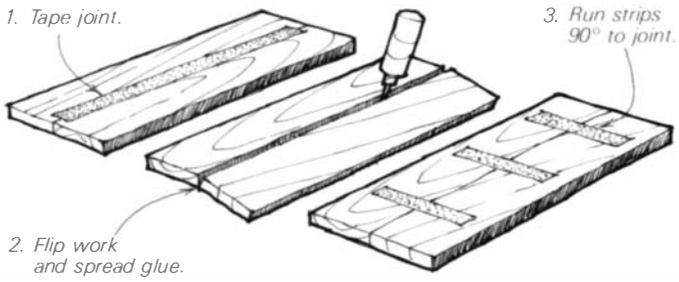
To make this adjustable curve, start with a piece of fine, straightgrained hardwood—hickory is best. Cut a ¼-in. thick strip about 36 in. long and 1½ in. wide. Now taper the strip to ¾ in. wide and 3/32 in. thick at one end. Glue a reinforcing patch on the thin end and saw a small notch in each end of the piece. To complete the curve tie a series of knots in a string and string up the curve like a bow. Unstring the curve when it's not in use.

—Floyd Lien, Aptos, Calif.



Edge gluing without clamps

Here's how I edge-glue boards using wide masking tape rather than clamps. First be sure your boards mate perfectly; the finished joint is no better than the initial fit. Now with the boards on a flat bench top, pull the joint together and run a strip of tape down the joint, spanning the crack with the tape. Turn the boards over, pull the boards to the edge of the bench and let one board drop a wee bit. Put glue in the open crack and flex the boards like a hinge until the joint is covered with a layer of glue. Slip the boards back on the bench, pull the joint



together hand-tight and, after pausing a few seconds to allow the excess glue to squeeze out, run two or three strips of tape across the joint at 90°. A distinct advantage of this technique is that the boards don't slip out of position as they sometimes do under clamps. *—V.L. Luther, Tarrant, Ala.*

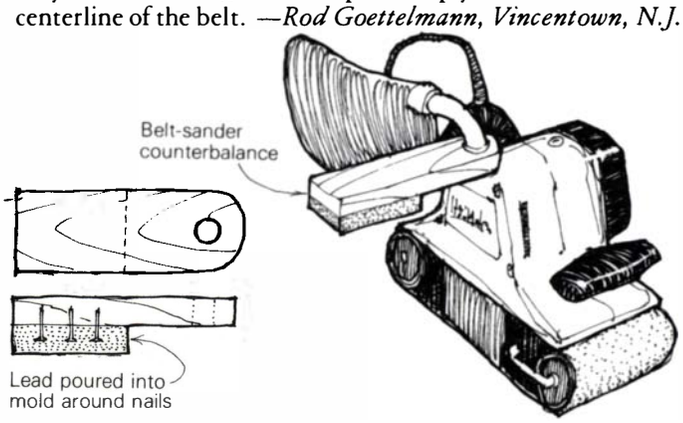
BRUCE HOADLEY COMMENTS: Luther's system would, as he suggests, be no better than the quality of surfacing and evenness of glue spread. I can believe that a strong joint could be attained, but I don't believe it would consistently equal the strength of a clamped joint. However, most glue joints are far stronger than they need to be.

Aside from the strength issue, the taping approach has some important advantages in handling. First, it indexes and holds the pieces conveniently. Second, it enables both surfaces of the joint to be spread simultaneously while controlling the excess from dripping. Third, it eliminates the squeeze-out from at least one face of the assembly, which could be extremely beneficial in later stages. In summary, I think the idea has advantages that would pay dividends when combined with more standard clamping methods.

Counterbalance improves belt sander

The belt sander can be a valuable tool in the production-shop world of tight schedules and competitive prices. But most belt sanders are designed with a flaw that renders them difficult to control: The motor hangs off one side, throwing the machine off balance. Unless you apply constant corrective hand pressure the sander will gouge or edge-scoop the work. A balanced machine will not scoop and allows the user to concentrate on direction and coverage.

To correct the imbalance I add wood and lead weights to my belt sanders. The amount of weight and position will vary with the sander. Fasten the weight under handles, knobs or whatever. The counterbalanced machines pass my test when they balance on a ¼-in. thick piece of plywood set under the centerline of the belt. *—Rod Goettelmann, Vincentown, N.J.*



Planing thin stock

I have found that the following procedure for preparing small pieces of veneer works well. Bandsaw a ⅛-in. thick slice from the desired veneer stock which has already been planed. Then glue the slice to a scrap board with rubber cement. Apply the

rubber cement to both the scrap board and the smooth side of the ⅛-in. thick slice. Press the two pieces together after the cement has dried. With the scrap as a base you can hold the work securely for planing to final thickness. To remove the veneer, insert a putty knife between veneer and scrap; then slide it along the scrap. Rub the veneer with a rough cloth to remove the remaining rubber cement.

—Alan U. Seybolt, Harwich, Mass.

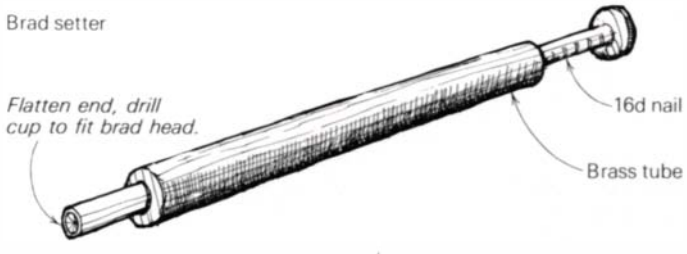
Here's how I safely smooth resawn veneer on the jointer. I secure the veneer to a flat back-up board with double-stick carpet tape. The back-up board holds the veneer flat and gives it the stiffness it needs. If the veneer is short or narrow I tape scraps of the same thickness to the back-up board to keep it from tipping. Set the jointer for a light cut and proceed slowly.

—Rock Thompson, Centerville, Utah

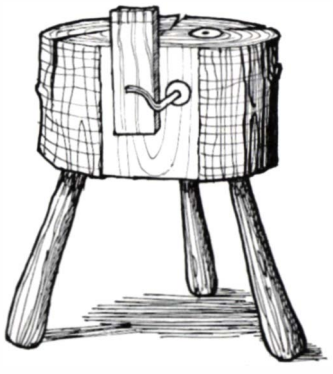
Brad-setting tool for tight places

Here is a simple tool to set brads or escutcheon pins in tight places. It consists of a 16d nail and a 3-in. brass tube that slides over the nail. Grind the point of the nail flat, dimple the end with a center punch, then drill a small cup with a no. 32 drill bit. To use, set the brad in its pilot hole, drop the tube over the brad to the work surface and tap the brad home with a small hammer.

—Malcolm Murlless, Staunton, Va.



Outdoor workbench



I needed a small outdoor bench for fair-weather work outside my shop and demonstrations at the county fair. To make the bench I cut a beefy slice of oak tree and mounted it on three legs canted outward. For the "vise," I fitted the bench with holes for my cast-iron hold-down (available from Woodcraft Supply, 313 Montvale Ave., Woburn, Mass. 01888, and other suppliers). I bored a 2-in. hole into the top of the bench clear through to the bottom (so rainwater wouldn't collect in the hole). Then I plugged the top 2 in. of the hole with hardwood and centerbored the plug to fit the hold-down shaft. I flattened a place on the side of the oak slice and fitted a plug as above so I could use the hold-down to clamp work vertically. The arrangement works surprisingly well.

—J.B. Small, Newville, Pa.

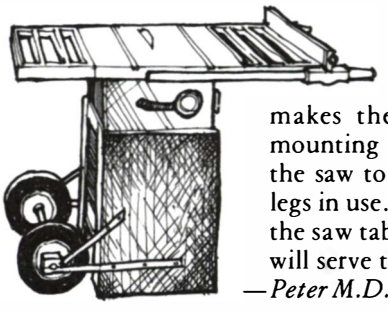
Maintaining sharp carving tools

I ran across this tool-sharpening trick on a trip to Mexico. There I watched a carver working on mahogany chairs frequently plunge his gouge into a pine bowl full of some waxy sub-

stance. Upon inquiry he said the bowl contained a mixture of beeswax and fine carborundum abrasive powder. The plunging kept a keen edge on his sharpened carving tools. When I returned home I tried the trick and found it to work fine—especially on a warm day or near a stove so the wax stays soft.

To make the concoction, warm up ½-lb. of beeswax and knead in two or three tablespoons of 400-grit or 600-grit carborundum powder. The grit is available at any lapidary shop. To protect your carving tools, keep the mixture in a softwood box or bowl. *—Jim Thomas, Cerrillos, N.M.*

Portable table saw



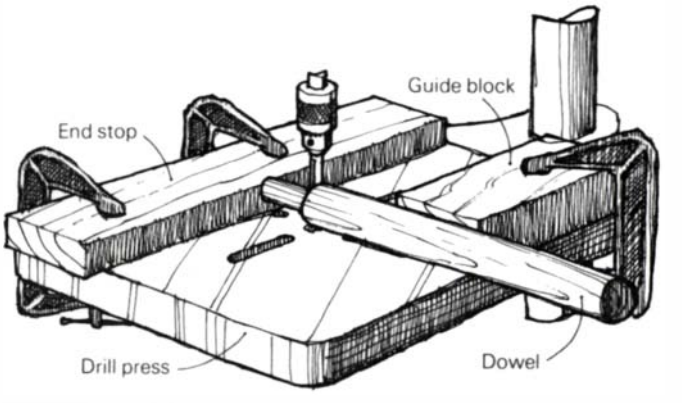
I have fitted wheels to my table saw, as shown in the sketch at left. The arrangement makes the saw portable (without mounting it on a dolly), but allows the saw to sit on its own four stable legs in use. You can fit handles under the saw table, or extended fence rails will serve the same purpose.
—Peter M.D. Darbishire, Hensall, Ont.

Magnetic pipe-clamp pads

The best pipe-clamp pads I've seen were made by facing hardboard with sticky-back magnetic tape. The hardboard is hard enough to resist deforming yet soft enough to not mark softer woods like walnut and mahogany. The magnetic tape holds the pads in place better than a third hand, yet the pads are easily removed. Magnetic tape (I used 3M Plastiform brand) can be obtained locally at sign shops and some hardware stores, or it can be mail-ordered from Woodcraft Supply, 313 Montvale Ave., Woburn, Mass. 01888.
—Mike Graetz, Lakeland, Minn.

Reduci g the diameter of dowels

The sketch below shows an old patternmaker's trick to reduce the diameter of a dowel. Simply chuck a router bit in a drill press and clamp down a couple of scrap blocks to guide the dowel and to serve as a length stop. Lower the quill to take a light cut, lock the quill in place and rotate the dowel under the bit. Continue taking light cuts until you're at the desired diameter. *—Wallace C. Auger, Fairfield, Conn.*



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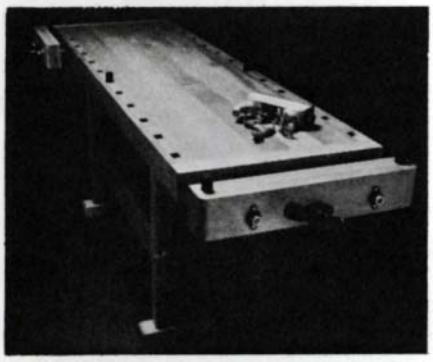

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½"	½"	1¼"	2⅞"	8	$ 9	
½"	¾"	1"	2⅝"	9	$11.50	
¼"	½"	1"	2⅝"	10	$10	FLUSH TRIM BIT WITH B.B.
½"	½"	1"	2⅝"	11	$11	FLUSH TRIM BIT WITH B.B.
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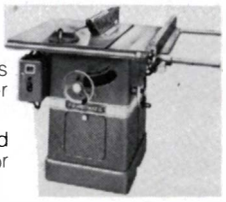

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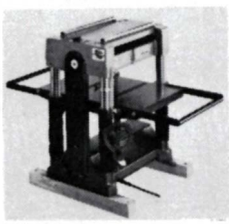

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Jig Saw JHT-60A 2 speed (3,200/2,700) stroke 1" 3.5 amp, 115 volt, capacity: wood 2⅜", steel ¼", roller bearing drive guide, universal split-shaft blade holder, 4 blades, center guide, circle guide, weight 5.2 lbs **Sale $155 ppd.**

Jig saw JHV-60 variable speed 0-3,200, stroke 1", 3.5 amp, 115 volt, capacity: wood 2⅜", steel ¼", roller bearing guide, universal split-shaft blade holder, 4 blades, center guide, circle guide, weight 5.2 lbs. **Sale $162 ppd.**

Miter Saw TSB-15" for cutting wood, plastic, aluminum. 45°-90-45° safety lock switch, dust bag, capacity 4¾" high x 6⅜" wide at 90°, 4¾" x 4¾" wide at 45°, ac/dc switch, 13 amp motor, 1" arbor, easy set angle stop, weight 55 lbs. **Sale $450 ppd.**

Miter Saw TSB-10" for cutting wood, plastic, aluminum, 45°-90°-45°, safety lock switch, dust bag, capacity 3⅛" high x 4$^{15}/_{16}$" wide at 90°, 3⅛" high x 3⅛" at 45°, ac/dc switch, 13 amp motor, ⅝" arbor, easy set angle stop, weight 44 lbs. **Sale $305 ppd.**

Universal Saw SR-15 Electric Miter-Saw; wood, steel, aluminum, piping 45°-90°-45°, 15" c.t. saw blade, 15 amp motor, ac/dc switch, hold down clamp, cutting capacity 7¾" wide x 5" high at 90°, 4⅜" wide x 5" high at 45° easy set angle stop, arbor 1", weight 91.3 lbs. **Sale $650 ppd.**

SB-110 Dustless Belt Sander, 4" x 24", 2 speed 8.7 amps, 115 volts, 15 belts, metal friction plate, center guide, belt tensioner. Weight: 17.1 lbs. **Sale $250 ppd.**

SB-75 Dustless Belt Sander, 3" x 21", 2 speed, 8.7 amps, 115 volts, 15 belts, metal friction plate, center guide, belt tensioner. Weight: 10.8 lbs. **Sale $150 ppd.**

SO-110 Finishing Sander 115 volts, 3.2 amps, 10,000 rpm motor, 105 pieces of sandpaper, foam rubber cushion, 4½" by 9" sheet size, removable handle, weight: 5.9 lbs. **Sale $130 ppd.**

SOD-110 Dustless Finishing Sander 115 volts, 3.2 amps, 10,000 rpm motor, 105 pieces of sandpaper, foam rubber cushion, 4½" by 9" sheet size removable handle, weight: 6.6 lbs. **Sale $140 ppd.**

B-750A 24" Band Resaw 3 hp or 5 hp, 1 or 3 phase (call for specifics), 800 rpm, positive blade guide, 3" Stellite tipped blade, 14¾" depth of cut, 23" depth of throat, tilt 0 to 45 degrees, table size, 31½" by 27⅝", auxiliary out feed table, weight: 1013 lbs. **Sale $2800**

Super Drill DR-10 variable speed, reversible ⅜" key chuck side handle, speed control switch, 0-2600 rpm, 3.5 lbs., 3.3 amps steelcase, Phillips bit, capacities in: wood ⅝", steel ⅜", teks screw ¼", tapping: ¼"steel ⅜" aluminum, belt hook. **Sale $125 ppd.**

DTC 10⅜" Cordless Drill 2 speed, reversing, battery pack, 29 watt quick recharger, key chuck, 2 Phillips bits, 2 straight bits, trigger lock, weight: 4.6 lbs. **Sale $120 ppd.**

Cordless Drills DRC10 2 speed, 300/650 rpm, reversing, adjustable, torque settings from 6.9 lbs. to 34.7 lbs., battery, charger, key chuck, 2 Phillips bits, 2 straight bits, trigger lock, weight 3.3 lbs. **Sale $130 ppd.**

Cordless Hammer Drill VTC-10 2 speed 750/1500 rpm, reversing, hammer drill, screwing, drilling, capacities in: wood ½" steel ¼" brick ⅜", battery, charger, key chuck. Weight 4.9 lbs. **Sale $147 ppd.**

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Router TR8 Plunge cutting, 1½ hp, 115 volts, 6.9 amps, 24,000 rpm, ¼ collet, wrenches straight guide and guide bar, template guide bar holder. 3 plunge cutting depth stops, ½ and ¼" c.t. router bit, precision depth gauge, round and straight base. Weight: 6.4 lbs. **Sale $185 ppd.**

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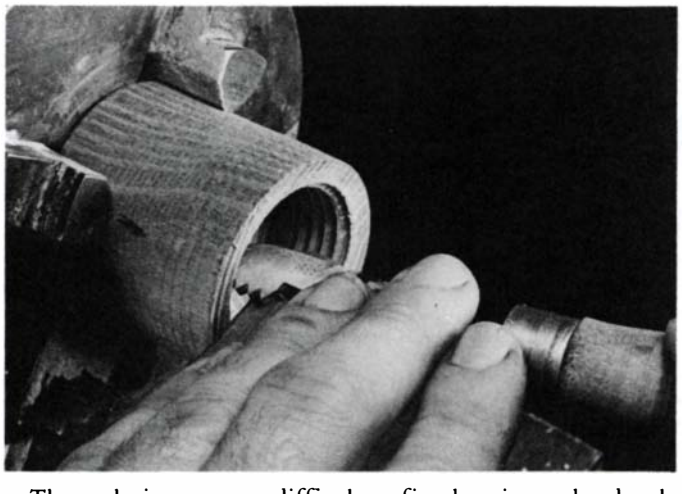
Q & A

Making threads in end grain—*I recently bought a tap and die set for making threads in wood and it does a fine job when cutting face grain. But when I tried tapping threads in end grain, such as the end of a dowel, the threads simply tore out. I tried oiling the wood, soaking it in paraffin and I even set up the job in a machinists' tapper to avoid wobble. None of these methods worked very well. I finally solved the problem by cutting the threads in turned plugs made from face grain and then gluing the plugs in place. That method works fine but it takes a lot of work. Are there any better ways?*

—Henry J. Bellarts, Richland, Wash.

RICHARD STARR REPLIES: As you have concluded, tear-out in thread making is a difficult problem, and woodworkers as far back as Leonardo DaVinci have wrestled with it. Leonardo came up with a long, tapered tap, cut into three sections and mounted on a Y-shaped yoke. The tapers allowed gradual cutting, and tear-out was probably reduced that way.

Another way of cutting threads is to hand-chase them on a lathe, a method that works well with a bit of practice. Inside or outside threads can be chased by filing a tool to the shape of the thread profile. With the lathe turning at about 500 RPM, the thread is "struck" by moving the tool into the work with a stroking motion so that a full thread is produced in one revolution of the lathe. Once the strike is completed the actual cutting or chasing of the thread is accomplished by repeated scraping that results in very clean threads in the harder woods. I make my chasing tool out of ⅛-in. die stock that is soft and easy to file. I use a triangular file to cut the notches; their spacing is determined by the screw's pitch. For cutting 8 threads per inch, I use a five-notch tool, but more or less would probably do. This photo shows inside threads being chased:



The technique seems difficult at first but it can be developed with practice. There is an unmistakable feeling of "rightness" when you've learned how to match the tool movement to the speed of the lathe. For a more detailed discussion of thread chasing, I suggest reading *Hand or Simple Turning* by John Jacob Holtzapffel (Dover Books). This book also describes several other methods of making wooden threads. In the meantime, your method of making face-grain plugs and gluing them in place may be as good as any for small numbers of threaded pieces. [Richard Starr is a contributing editor of this magazine.]

Mixing oils for color—*Can Watco and Minwax be mixed to get a finish of a different color?*

—David Dike, Norfolk, Va.

OSCAR MACQUIDDY REPLIES: No, don't mix the two types of oils. Stay within finish families and use color as the manufacturer recommends. If you start with Watco, stay with Watco. Watco stains are strong colors and I dilute them 50% with methanol until I get the color I want. Remember, wet color is different from dry color so experiment on a scrap piece of wood. [Oscar MacQuiddy teaches antique restoration and refinishing in Southgate, Calif.]

A warped veneered tabletop—*I recently glued strips of oak ⅛ in. thick and 2¼ in. wide to a base of ¾-in. mahogany plywood to form a circular tabletop. It has since developed a terrible warp and the strips are pulling away from each other. I am pleased with the pattern and want to make another but how can I avoid the warp?*

—Bob Sickenger, Union City, Calif.

R. BRUCE HOADLEY REPLIES: It sounds like you have created a classic example of unbalanced construction. The plywood in your top is quite stable but the oak strips aren't and when they tried to shrink when exposed to drier conditions, the movement was resisted and the warp resulted. There are several ways to avoid the problem. One is to make certain that the moisture content of the oak pieces is at equilibrium with the environment the table will eventually be in. This approach, although difficult to do where relative humidity varies, will make further movement unlikely and should prevent the warp. You could also glue up the tabletop out of solid stock and fasten it to a supporting frame in such a way as to allow movement across the grain. Veneering both sides of the plywood with the same thickness of wood should also help since it would create a balanced construction similar to that of plywood composed of an odd number of individual plies. Finally, coating both sides of any glued-up woodwork with an equal amount of finish should minimize unequal moisture exchange that leads to warping. [R. Bruce Hoadley is a wood technologist and a contributing editor to this magazine.]

Mysterious finish is tough to remove—*I've been trying to remove a brightish-red finish from an oak high chair and so far I've tried methylene chloride, straight lacquer thinner, denatured alcohol and finally lye. Only the lye worked and not very well. Do you have any idea what kind of finish I'm dealing with?* *—Joe Van DeRostyne, Aberdeen, S.D.*

JOHN SCHMUECKER REPLIES: Without seeing the piece, it's difficult to identify the finish, but what you may have is wood that was dyed rather than stained or finished in any conventional way. If it was covered with a topcoat, your strippers have probably long since removed that layer. Try applying household bleach liberally with a brush, starting at the bottom of the chair. If the chair is dyed, the bleach should lighten most of it. Failing that, an acid-based methylene chloride stripper might work better than the one you used. Acid-based strippers are sold by several companies dealing in furniture stripping products. [John Schmuecker is president of Bix Process Systems Inc., a manufacturer of stripping products.]

Protecting tools from rust—*A couple of years ago I purchased a six-piece Swiss carving set from a mail-order company. A while back, I noticed they were getting patches of rust on them, even the ones I don't use. I thought about putting oil on them to stop the rust but I'm afraid the protective coating will spoil my carvings. How can I clean and preserve these tools between use? How should I store these tools to protect them?* *—George Adams, Louisville, Ohio*

A bit of fine steel wool should knock off any rust spots on your tools. After you have done that, you could treat them with a rust-preventive spray, or wrap them in protective paper. One type of spray is available from Schwab Industries Inc., 330 Alta Ave., Santa Monica, Calif. 90402. Protective paper is

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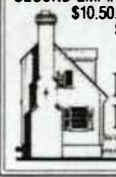

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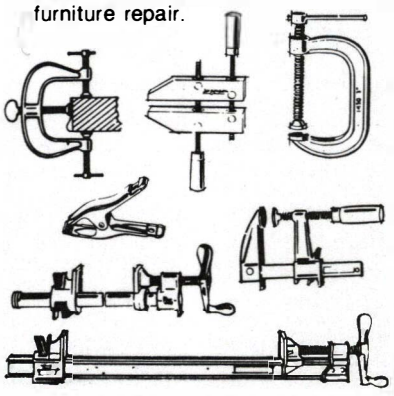

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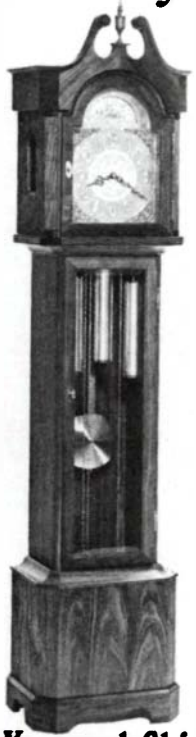

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Flat or glossy lacquers, which is harder?—*I've been using lacquers of various gloss levels in my shop and some of my customers say that the flat finishes are softer and scratch more easily. Is this true?*

—R.J. Burke, Belmont, Calif.

HERB YATOVITZ REPLIES: Technically, yes, practically no. Straight lacquers are high gloss and are made flatter by adding flatting agents such as silica gel or magnesium silicate. These chemicals crystallize in the lacquer film when it dries, and break up light as it strikes the surface, thus reducing the reflectivity or gloss. As more flatting agents are added, the crystals slightly reduce the lacquer film cohesion, and this does make it a bit softer. But the practical difference in hardness is so slight that it is generally not noticeable. [Herb Yatovitz is a chemist for National Chemical and Plastics Co., a manufacturer of wood lacquers and finishes.]

Inlaying a wooden light frame—*I've just finished building a wooden light frame for my bathroom and I want to inlay decorative strips around the perimeter an inch or so in from the edge. I've never attempted inlay before and I would like your advice on how to proceed.*

—Ed Jonke, Glen Arm. Md.

TAGE FRID REPLIES: If you have a router, use a ⅛-in. diameter straight-flute cutter to rout a groove to accept the inlay. Set the router to cut a groove just slightly shallower than the thickness of the inlay you plan to use. Clamp a board or straight-edge to the light frame to serve as a guide for the router, and move the router against the rotation of the bit. When you have cut the grooves, rip the inlay for a tight fit and force it into the grooves with a bit of glue spread on the inlay. When the glue has cured, plane or sand the inlay flush with the surface of the frame. Another tool for doing the same thing is called an inlay cutter and it cuts the groove with a small iron like a plane. Inlay cutters can be bought from Woodcraft Supply, 313 Montvale Ave., Woburn, Mass 01888. [Tage Frid is a contributing editor to this magazine.]

Toxic dusts from plywood and particleboard—*Products like plywood and particleboard are constructed with formaldehyde glues and since I use a lot of them, I wonder about the danger of breathing dust when cutting them. I have built a shroud for my table saw and connected it to a shop vacuum. This setup reduces the dust level but does it limit exposure to possible toxins?* *—John M. Gaffin, Gualala, Calif.*

MICHAEL MCCANN REPLIES: Formaldehyde from glues used in woodworking shops is a real health concern for two reasons: it is a suspected carcinogen, and breathing it can sensitize some people so that they experience allergic reactions when exposed subsequently. The chemical is released when materials glued with formaldehyde adhesives are cut or processed in woodshops. In fact, a certain level of "outgassing" releases formaldehyde into the air even when the panels are in storage. Dust masks are of little help because the formaldehyde is in gaseous form. Probably the best way to minimize the hazard is to install a dust collection system that exhausts air and dust outside the shop itself. Although it will raise utility bills by pumping heat out during the winter, this ventilation method

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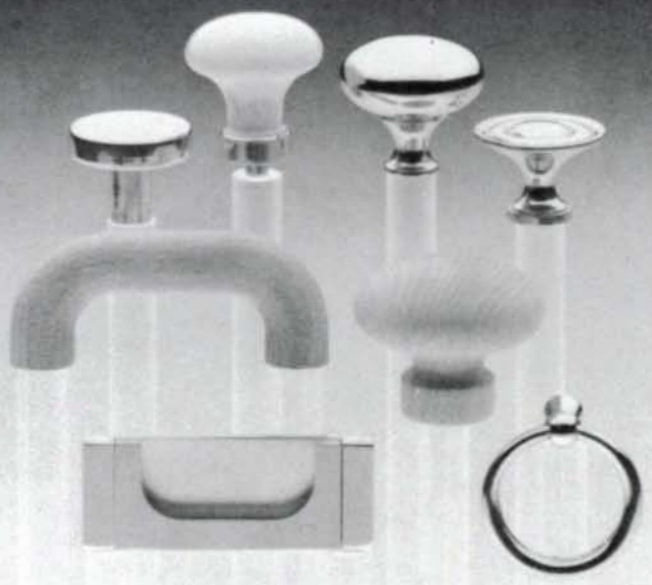

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will reduce formaldehyde levels. Pending more conclusive data on the cancer-causing effects of formaldehyde, those exposed to it should watch out for such allergic reactions as asthma, skin problems, headaches or other medical symptoms that may have no other clear cause. Once you are sensitized to the chemical, you can get allergic reactions from many sources including carpets, insulation and a range of synthetic fabrics. [Michael McCann is the author of *Artist Beware*, a book on hazardous materials used by artists and craftworkers.]

Chemical dye—*For years, I've been using a concentrated solution of potasium dichromate to darken cherry so that it appears aged after finishing with linseed or Danish oil. Am I correct in assuming that this is harmless to the wood and that it is not a stain?* —*E. Jeff Justis, Memphis,*

GEORGE FRANK REPLIES: To my knowledge, potassium dichromate is completely harmless to wood and it isn't a stain but a dye. On woods with no tannic acid, it may convey its own yellow-orange hue; on woods with tannic acid, potassium dichromate can produce a great variety of colors. When using it, be sure to work in a room with good ventilation and wear eye protection and gloves. [George Frank is a consulting editor to this magazine.]

Cone-cut veneer—*Looking through a book on forestry, I saw a picture of a table veneered in something called "cone cut," a patented method for slicing veneer. As I understood it, the cut is similar to the shaving produced when sharpening a pencil. How is this veneer made and where can I get it?*

—*Stan Simmons, Meraux, La.*

JIM LEE REPLIES: The cut you refer to is actually called a naturally matched circle cut and it was manufactured up until about 25 years ago by Hartzell Hardwoods Inc. of Piqua, Ohio. Your understanding of the process is quite correct: the veneer was sliced from tapered logs varying in length from 30 in. to 8 ft. After the taper was milled, the log was rotated into a stationary knife and a continuous piece of veneer was sliced off.

The process produced disc-shaped veneers with no joints, perfect for making a round table, which was in fact what the stuff was used for. Hartzell cut naturally-matched circles as large as 48 in. in dia. although most were smaller. The veneer discs had small circular openings in their centers, which Hartzell dealt with by enlarging the hole with a star-shaped die and then inserting a decorative patch of corresponding shape. Hartzell is still in business and apparently still has the machinery to produce matched circle cuts but no longer does so because of low demand. [Jim Lee is with the Fine Hardwoods/American Walnut Association.]

Finishing a walnut grandfather clock—*Can you give me information on how to finish a walnut grandfather clock? I would like to use an oil finish to do justice to the wood's beautiful color, texture and grain.*

—*Robert Stewart, Eddystone, Pa.*

ANDY MARLOW REPLIES: To prepare the surface for finish, remove all visible planer marks, saw marks and other blemishes with 60-grit garnet paper, always sanding with the grain. When the marks are gone, keep sanding about the same length of time, still using 60-grit paper.

Now, using 80-grit paper, sand for a single period of time (call it a cycle) to remove the deepest scratches left by the 60-grit paper. Follow with 120-grit open-coat finishing paper

for two cycles. Do not use finer grit paper at this time.

Brush on a generous coat of boiled linseed oil. Allow it to dry (for four to six hours) until a thin film or skin begins to form over the surface. The timing is crucial. Then rub vigorously with a coarsely woven cloth until the surface appears dry. Allow it to sit overnight, and then sand for one cycle with 220-grit finishing paper. An oily substance will build up on the paper, by which time it will have served its purpose.

Repeat, with as many applications of oil, fine-sanding between each, as is necessary to achieve the desired gloss. Apply the last two coats without sanding. This process can produce a beautiful finish, but depending on the kind of use it will receive, some maintenance may be required in the form of later applications of oil. [Andy Marlow is a cabinetmaker and a consulting editor to this magazine.]

Readers Want to Know:

I would like to know if anyone has any experience using the Parks jointer-planer combination machine.

—Mark Goetsch, Detroit, Mich.

I'd like to know about books and booklets that deal solely with, or have entire chapters on, shop-built equipment, jigs and such. A comprehensive list might be a real boon.

—Matt Olsson, Pekin, Ill.

I have a special interest in wooden toys and rocking horses and I'm looking for historical information and books on the subject. Any help would be appreciated.

—Thomas S. Lix, Roslindale, Mass.

Fine Woodworking readers frequently ask for manuals and information on Walker-Turner machinery. We have on file a manual on the Walker-Turner Lathe but we would like copies of the other machine manuals for this brand. If you have manuals on such equipment please send us a photocopy or your manual, and we will copy it and send it back to you. Send manuals to Q&A, Box 355, Newtown, Conn. 06470.

Readers Can't Find:

. . .slide supports that extend automatically for a slant-front desk or secretary. *—Steve Zanki, Long Beach, Calif.*

. . .a router with an offset collet.

—Homer Lindsay, Greenwich, Conn.

. . .a two-wing wheel cutter for toy wheels.

—Randy Dehes, Chandler, Ariz.

. . .an instruction manual for a Porter Cable Speedmatic type K-88C radial-arm saw.

—Kenneth King Jr., Greenwood, Miss.

. . .information on Shopmate 10-in. radial-arm saw.

—Karle Meyer, San Diego, Calif.

. . .information and parts for a Parlec 12-36 lathe manfactured by the Universal Tool Co., of Hawthorne, Calif.

—Steven Rogers, Santa Barbara, Calif.

. . .a two stage reduction gear for a Shopmate 4-in. beltsander model 2530T0. *—Delbert Graham, Ottumwa, Iowa*

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—Used and antique furniture parts: Stantondales Furniture Restoration Supplies, 4012 Keltner, El Paso, Tex. 79904.

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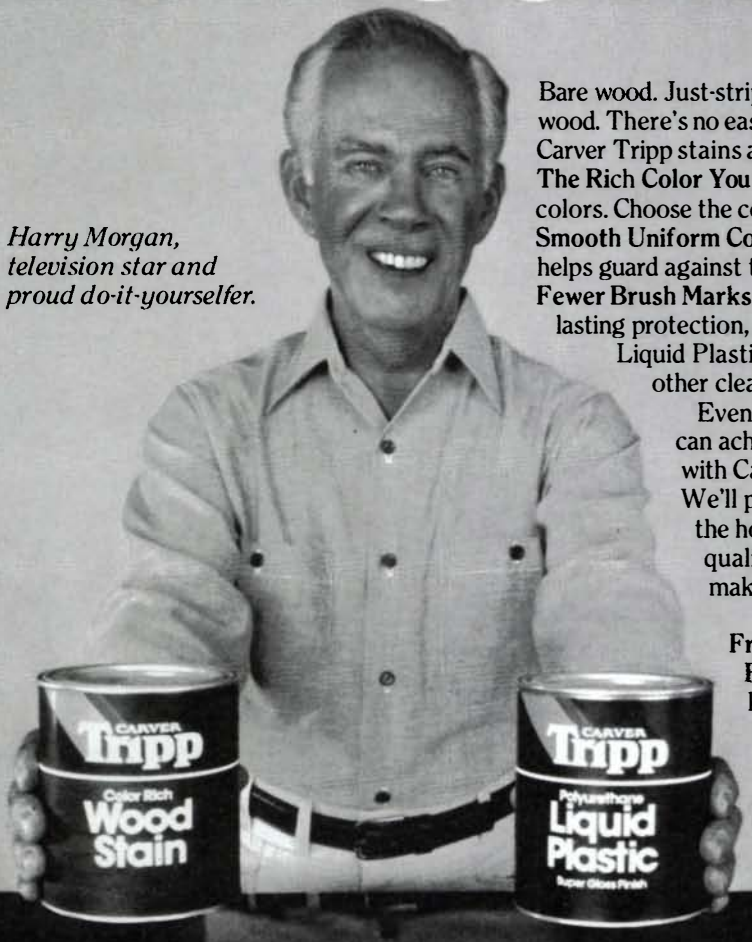

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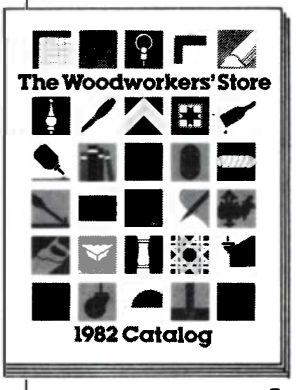

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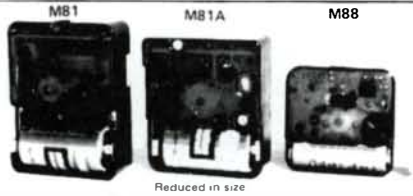

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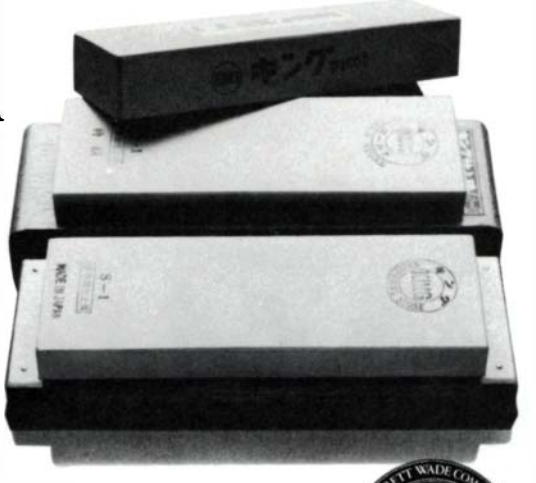

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ON ROUTER NAMECHANGES AND REAPPEARING RUSSIAN PLYWOOD

The hand-held electric router, which was exotic ten years ago, is becoming a favorite tool. Even the U.S. Bureau of the Census has noticed: its computers have revealed that the router is now the third most commonly owned power tool, behind drills and saws. Not surprisingly, router manufacturers are doing a brisk business and no small amount of shuffling as their marketing people discover just who buys the machines and why. At last count, there were eight U.S. companies making routers, three Japanese firms exporting them here and one European company making plans to sell its popular plunge-base router on this side of the Atlantic.

Two lines of routers will soon undergo name changes. Rockwell's power handtool division was sold to a holding company which will begin marketing all of its hand power tools under an old name, Porter Cable. The routers will retain the same model range and approximate price. Stanley's electric tool division has been bought by Bosch Powertool Corp., a German firm, and its routers will appear under that name. But don't rush out and expect to find a router in Bosch's blue trademark color; until the Stanley units meet the Bosch standard for double insulation, they will be sold as "generic routers" with no brand name at all. Stanley says it will satisfy the insulation standards sometime this year with all of its routers carrying the Bosch label by 1983. At least one American router has disappeared from the market. When Benchmark bought McGraw-Edison's tool division, it decided to drop that firm's router because it wasn't double-insulated.

U.S. manufacturers are worried about competition from Japan, particularly from Makita's line of plunge-base routers that are gaining popularity because of their versatility. Two other Japanese firms, Hitachi and Ryobe, are less in evidence but are still proving worrisome in a rapidly growing market. Elu, a German firm, is looking for motors that are compatible with U.S. electric systems so it can market a plunge-base router here. Elu may have routers for sale in the United States in about two years, according to a company official.

* * *

Seldom do the distant events of international politics invade the woodshop, but that's what happened two years ago when longshoremen protesting the Soviet invasion of Afghanistan refused to unload Russian shipments of Baltic birch plywood at eastern U.S. ports. The millimeter-ply board, sought for drawer and carcase stock, was in short supply in some parts of the country until June 1981, when courts ordered the longshoremen to resume unloading. Since the protest has ended, supplies have slowly gotten back to normal but nobody knows how long they'll stay that way.

Finland exports a similar plywood but it isn't as readily available to buyers of small amounts. For information on purchasing any amount of Russian plywood, contact Allied International, Box 56, Charles Town, Mass. 02129. If you want more information about plywood from Finland, contact Plywood and Door Manufacturers Corp., 1435 Morris Ave., Union, N.J. 07083. —*Paul Bertorelli*

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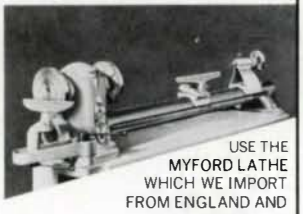

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Books

The Woodwright's Shop: A Practical Guide to Traditional Woodcraft by Roy Underhill. *University of North Carolina Press, PO Box 2288, Chapel Hill, North Carolina, 27514 1981, Hardcover $21, Softcover $11.95.*

A patchwork quilt of old-time techniques, *The Woodwright's Shop* is a good introduction to methods of working green wood. It's author, Roy Underhill, has an unusual talent for clear and concise explanation; the book is full to the brim without bulging at the seams.

The first half of the book is thorough and interesting, with lots of useful information. There's a wonderful way to make a shaving horse, split and hewn from an oak log. A resourceful beginner could build a serviceable post-and-rung chair after reading Underhill's twelve pages on the subject. Making rakes, hay forks and dough bowls is also well presented.

The second half is not as strong: The chapters on blacksmithing and log and timber frame building are just tastes of complex subjects. Underhill on dovetailing and frame-and-panel construction offers little that you wouldn't find in any good book on joinery. And there is a great deal left unsaid about turning. That's the problem in trying to cover a broad field in a "practical guide." But *The Woodwright's Shop* does manage to be a very serviceable introduction.

No book can do everything, which is why bibliographies are so valuable. Underhill acknowledges the proliferation of new books on old methods, but he directs you only to the antique books from which many new ones derive, like Henry Mercer's *Ancient Carpenter's Tools* and George Sturt's *The Wheelwright's Shop*, which are fine general reading. But he does not refer the interested novice to those books that cover in depth the various subjects he introduces: Ted Benson's excellent book, *Building the Timber Frame House* and John Alexander's *Make a Chair from a Tree*, for example. There is also *Country Woodcraft* by Drew Langsner, another potpourri, which overlaps Underhill in some respects but offers additional information and a different point of view. Underhill's scanty bibliography is a serious lapse.

The Woodwright's Shop relies on photographs for illustration but many of them are so poorly reproduced that their meaning is obscured—a disappointment in an otherwise attractive book. The writing style is easy and fun and peppered with several memorable anecdotes.

Underhill has also developed a television series for the Public Broadcasting System. Like the book, it is called *The Woodwright's Shop*, and it's worth a look. —*Richard Starr*

Woodworking: The New Wave by Dona Z. Meilach. *Crown Publishers, Inc., One Park Avenue, New York, N.Y. 10016, 1981. $12.95 softcover, $25.00 hardcover; 276 pp.*

If you are already interested in unusual woodworking—carved, laminated or bent constructions that may or may not be useful—the 684 photographs in Dona Meilach's latest book will show you what others who share your interests are up to. However, if you need to be convinced about the value of such stuff in the first place, you will have to look elsewhere: Meilach's copy offers only assertions, not analysis.

Meilach sums up her approach early on when she writes, "Whether a form and its elements are assembled with traditional joinery, carved from a block of wood or from a log, turned on a lathe, hand-tool-gouged or developed with a

chain saw or bandsaw is not important. The result must speak for itself. It must express the artist's thoughts, his originality, his ability to create a pleasing object. His touch is as individualistic as his signature at the bottom of a letter."

Personal expression seems to be the defining characteristic of Meilach's "new wave." With such logic she reduces everything to idiosyncracy. The reader struggling to understand these pieces is given little help. Meilach's interviews with the makers yield only ethereal quotes and scant information about what these people do and how they do it. Concentrating on inspiration, Meilach dismisses the importance of those concrete things—materials, tools techniques and specific purposes, practical or otherwise—in which the creative process exists. The text is glib and superficial, the photos may enrage or inspire you. *—Roger Holmes*

Patented Transitional and Metallic Planes in America 1827-1927 by Roger K. Smith. *North Village Publishing Co., available from Roger K. Smith, 1444 North Main Street, Lancaster, Mass. 01523, 1981. $60 hardcover; 336 pp.*

The American Cabinetmaker's Plow Plane: Its Design and Improvement 1700-1900 by John A. Moody. *"The Tool Box," 8219 Old Petersburg Road, Evansville, Ind. 47711, 1981. $34.50 postpaid; 248 pp.*

Tool collecting naturally leads to a search for knowledge. These two books offer excellent histories of the planes their authors have chosen to collect.

Iron-bodied planes, Smith's specialty, have a surprisingly long history, from at least the first century A.D., although they were not made in quantity until early in the 19th century. Smith concentrates on the development of the modern cast-iron plane, from the first American patent issued in 1827 to Hazard Knowles, until 1927, by which time most of the planes had assumed the shapes and features familiar to us today. He traces such manufacturing and technical innovations as the cutter adjusting and holding mechanisms and the corrugated sole. He sketches the lives of the people behind the planes, including pioneers like Knowles and Charles West, the manufacturer Leonard Bailey, and the talented designers at the Stanley Rule and Level Company. Smith's book is exhaustive. Around 600 U.S. patents were issued for iron planes, and he has located specimens of the 200 or so that made it off the drawing board and into production. The book illustrates these with 300 photos and 41 color plates, as well as drawings.

Plow planes are the passion of John Moody. Their pedigree is also extensive. Ancient Egyptian panel construction implies some sort of plow plane for making grooves, although the earliest surviving examples of this plane-type date from the 16th century. One developmental chapter covers efforts to keep the outrigger fence parallel to the plane body, another examines combination planes, the aristocrats of the family. Moody is drawn to the embellishments on many plow planes, but he rightly pinpoints the desire to do a job better, quicker and cheaper as the source of innovation. The last half of his book contains drawings, summary descriptions and specifications of all the patent documents relating to plow-plane improvements in both the United States and Britain.

Smith and Moody have both published their books privately. Thus, they are expensive but well worth the money for the serious collector or student of rhykenology. *—Roger Holmes*

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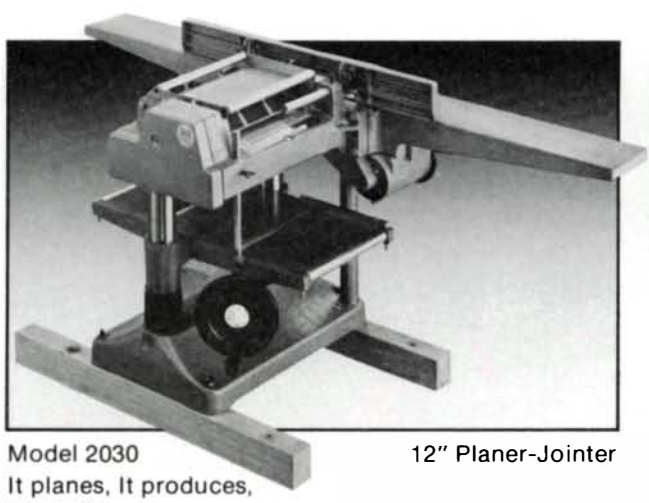

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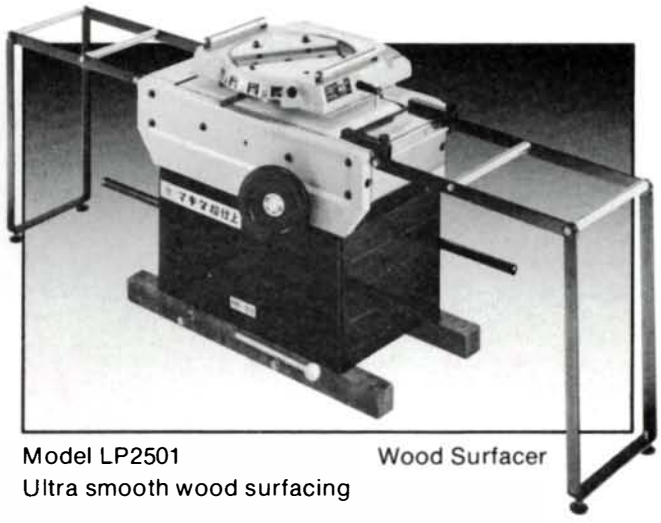
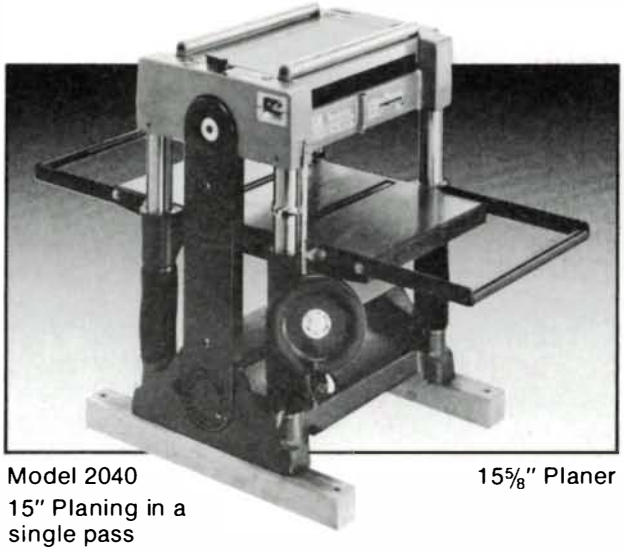
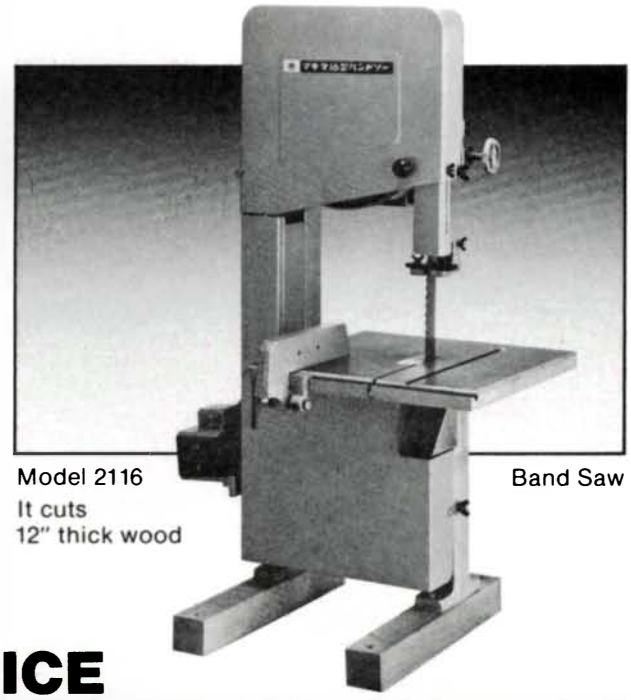


Model LP2501 Wood Surfacer
Ultra smooth wood surfacing



Model 2040 15⅝" Planer
15" Planing in a
single pass



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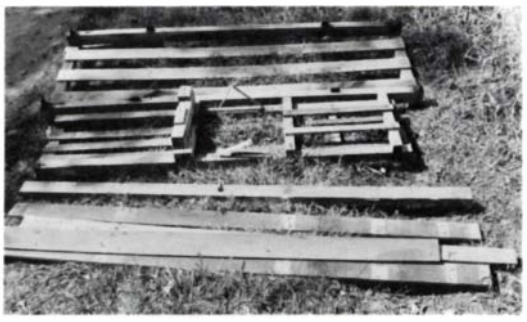
FROM CRATEWOOD TO CRADLE

BY RICK LIFTIG

I had a hard time believing the wood was free. "You made that from cratewood?" I asked as I admired Sam's new pistol case. "Yep, and all the bikes come packed in it. This stuff is just like mahogany."



The Honda Motorcycle Company has graciously decided to crate its goodies in Asia's most available wood, which happens to be lauan from the Philippines. This is rough-cut cratewood, but some of it is very dense hardwood. The local Honda shop was glad to see the wood being used rather than being trucked to the dump.

Though the wood intrigued me, a use for it evaded me for a while. I was still in school and had no room for a shop, let alone time to think about woodworking. One year later, with school behind me, I realized that I owed a folk-singing friend a wedding present. I'd built dulcimers in the past using only hand tools, and figured that making him one would be the perfect gift. I started thinking about it....

Procastination, however, has a subtle way of altering plans. One year later I still owed the wedding present, but the dulcimer idea had to be scrapped in favor of a cradle. Eagerly, I started tearing apart Honda crate after Honda crate, giving no thought to what I would use for a shop, tools or bench. When I finally thought of those three items, I realized that this could become a very expensive belated gift.

I got together the various trade bibles and chose every tool that I could ever need. I checked prices on power tools, combination tools, and every other tool. When the pipe dreams cleared, I once again realized I wasn't wealthy—that was the reason I was using cratewood in the first place.

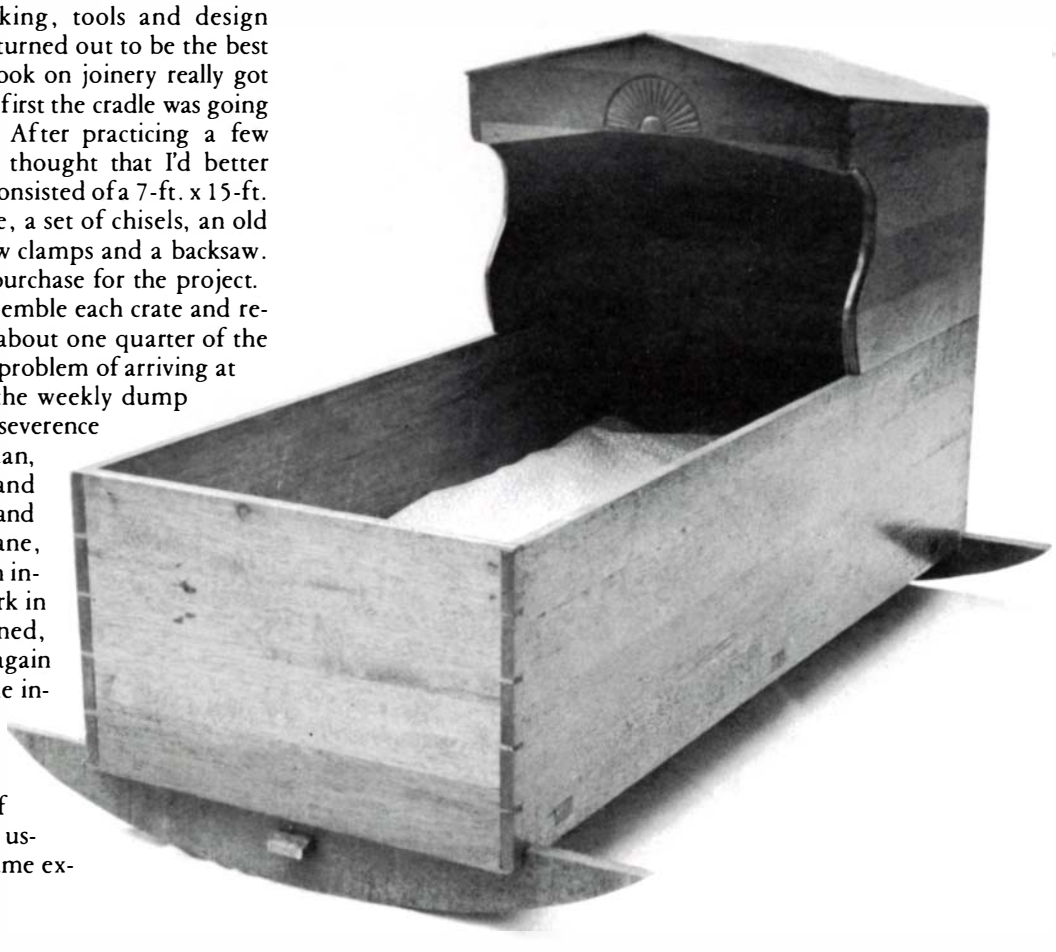
In one area I didn't spare the cash: that was with books. I read voraciously about cabinetmaking, tools and design before I finally started cutting. This turned out to be the best investment I could have made. A book on joinery really got me going. It looked so simple that at first the cradle was going to be all mitered dovetail (hah!). After practicing a few through-dovetails with hand tools I thought that I'd better buy a router instead. The shop then consisted of a 7-ft. x 15-ft. porch, a Black and Decker workmate, a set of chisels, an old plane in need of a chipbreaker, a few clamps and a backsaw. The router was my only major tool purchase for the project.

It took me about an hour to disassemble each crate and remove the nails and hardware. Only about one quarter of the wood was usable. There was also the problem of arriving at the Honda shop ten minutes after the weekly dump run had been made, but through perseverence I garnered a respectable pile of lauan, mostly ⅜ in. to ½ in. in thickness and 3 in. to 4 in. wide. All smoothing and jointing had to be done with my plane, but after much frustration, I found an inexpensive scrub plane that cut my work in half. Finally the boards had been planed, squared, jointed, glued and planed again to thickness. I began to appreciate the invention of electrically powered jointers and thickness planers. Each board though, taught me something new about the properties of wood and the hand tools that I was using. I could never have gotten the same experience using machines. I was all set for my new router to dovetail the whole thing together in a matter of minutes, but the commercial dovetail jig did not enjoy ⅜-in. stock. Out of desperation, I started practicing hand dovetails again and found that each joint was getting better. At the first properly made practice joint, I let out a whoop and started a joint on the cradle. I learned how to hide many mistakes that night.

After a four-month gestation, oblivious to its humble beginnings as a Honda crate, a handsome cradle stared back at me. It had its faults, but in no way could those little mistakes reduce my grin. I applied a tung-oil finish, delivered the cradle, and then faced the final test... the baby was rocked asleep in moments.

By completing an ambitious project with few power tools I learned a lot about woodworking. I realize now which power tools will be useful to me and that most of the hand tools I originally drooled over would have been little use if I couldn't use the basic ones well. The books were my life preserver and teacher. Read, read, read, make your mistakes, get discouraged and then learn. Jump in and swim. Even if you ruin some of your stock on the way, remember, it's only cratewood. □

Rick Liftig is a dentist living in Northfield, Conn. He's built himself a sturdy workbench and is just about to buy either a table saw or a car. Photos by the author. 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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One hour fast charge with removable battery most powerful cordless available. Comes with battery, charger phillips bit. Weighs only 2.4 lbs.
LIST: $ 124.00 OUR PRICE **79.99**

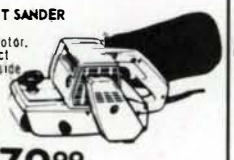
DRYWALL SCREWDRIVERS

Models: 6800 DBV & 6801 DBV
Variable speed, reversing. Simple, positive depth adjustment. Well balanced, weighs 3.3 lbs. Powerful 3.5 amp ball bearing motor, 6800 DBV has speed range of 0–2500 RPM, 6801 DBV has 0–4000 RPM. Metal hip clip. Comes with insert bit and magnetic bit holder.
LIST: $ 130.– OUR PRICE **85.99**

FINISHING SANDER Model: BO 4510

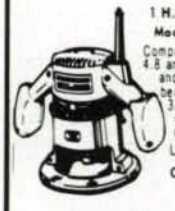
Good for heavy duty applications of cabinet shops, auto body shops etc. Light weight: 2.4 lb. Powerful 1.8 amp. motor turns 12,000 RPM. Orbital action. All ball bearing construction.
LIST: $ 72.– OUR PRICE **44.99**

4" X 24" BELT SANDER
Model: 9401



8.5 amp powerful motor, 1148 ft/min. Perfect for flush- along- side sanding. High efficiency dust collector. LIST: $ 260.–
OUR PRICE **179.99**

1 H.P. ROUTER
Model: 3608B



Compact design for easy handling. 4.8 amp. motor turns at 23,000 rpm. and developes 1 H.P. All ball bearing construction. Accepts 3/8" & 1/4" shank bits. Comes with 3/8" & 1/4" collets, wrenches. Weighs 5 lbs.
LIST: $113.– OUR PRICE **74.99**

2 3/4 H.P. ROUTER
Model: 3600 B

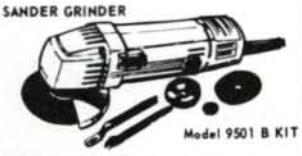
Makita's best. Super duty plunge type production router. Powerful 12 amp motor turns at 22,000rpm. All precision ball bearing. Quick change of cutting depth between 0–5 7/8". Accepts 1/2", 3/8", 1/4" shank bits. Comes with 1/2", 3/8", 1/4" collets, wrenches, guides are optional (All three pc. set add $ 18.50.)
LIST: $ 281.00 OUR PRICE **189.89**

10" MITER SAWS

Best powered miter saws on market. Electric brakes. Model 2400 B accepts vise and holder set and comes with dust bag. List:324.00 $ 249.99
Model: 2401B has positive stops at 45 & 90°. List: 298.00 $ 209.99

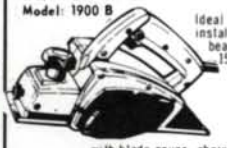
14" MITER SAW
Model LS 1400 cuts 4¾" deep. Electric brake. Accepts vise and holder set.
LIST: $ 489.00 $ 349.99
(Vise and holder set add $ 28.00

4" SANDER GRINDER



Model 9501 B KIT
Compact, light weight. Industrial duty. Powerful 3.5 amp motor turns at 10,000 RPM for high efficiency. Weighs only 4 lbs. Comes with grinding wheel, guard, flange, lock nuts, rubber pad, sanding disk, wrenches.(side handle add $ 2.80, sanding disks $ .69/each, cup brush $ 8.–, metal cut-off wheel $ 2.40, tile , concrete cutting blade $ 59.–.)
LIST: 108.– OUR PRICE **69.99**

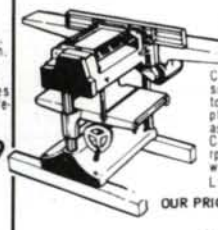
3 ¼" PLANER
Model: 1900 B



Ideal for door and cabinet installations. 4 amp. ball bearing motor turns at 15,000 rpm. 3¼" blade capable of chamfer cuts using the unique center groove in sole plate. Weighs only 5.5 lbs. Comes with blade gauge, sharpening holder, socket wrench, guide rule, blades.(Carbide blades add $ 37.00) LIST: $ 132.00 **89.99**

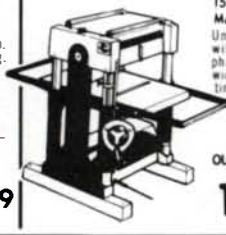
6 1/8" PLANER
Model: 1805
World's widest cut, World's biggest planer. Bevel planing 0 – 45 with large gide rule. Ideal for stationary planing with optional stand. Powerful 8.5 amp motor turns at 15,000 rpm. Weighs 17.6 lbs. Comes with gude rule, wooden carrying case, sharpening holder, blade gauge, wrench, blades(Carbide blades add $ 85.– Stand add $ 32.–) LIST: $ 378.– OUR PRICE **269.99**

PLANER – JOINER
Model: 2030



Compact design, 2 H.P. single phase 115 V. motor, 12" width, 6½" depth planer, 6¾" joiner. Fully assembled, ready to run. Comes with blades, sharpening holder, spanner wrench. Weighs 275 lbs.
LIST: $ 1880.– OUR PRICE **1389.99**

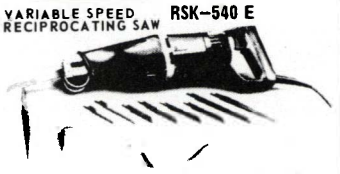
15 5/8" PLANER
Model: 2040



Unit is fully assembled with 2 H.P. motor. Single phase, 115 V. 15 5/8" width, 7 5/8" deep cutting capacity. Weighs 254 lbs. Comes with blades, socket wrenches, wooden leveler. LIST: 1680.–
OUR PRICE **1249.99**

AEG Electric power tools from AEG-TELEFUNKEN

VARIABLE SPEED RECIPROCATING SAW RSK–540 E



Variable 2 range speed control. 0–1700 & 0–2400. Powerful 5 amp. motor is all precision ball bearing construction. Comes in a heavy duty steel carrying case with 8 assorted blades.
LIST: $170.– OUR PRICE **129.50**

7 1/4" CIRCULAR SAW PC 70

A professional quality AEG saw. 12amps. 5800 rpm. Max depth of cut of 2 1/2" comes with 18 tooth cabide-tipped blade
LIST: $146.– OUR PRICE **109.50**

VARIABLE SPEED DRYWALL SCREWDRIVER

5 amps, interlocked reversing feature. Comes with 1/4" magnetic bit holder, locking collar & depth locator. Two models: SCRIE 0–2500rpm. SCRIIE 0–4000rpm.
LIST: $131.– OUR PRICE SCR II E **99.50**

BOSCH Power Tools

ORBITAL ACTION JIG SAW(VARIABLE SPEED)
Model: 1578

Speed control maintains full power output even at lower speeds. Unique blade action control. Weighs only 5.5 lbs.
LIST: $ 215.– OUR PRICE **159.99**

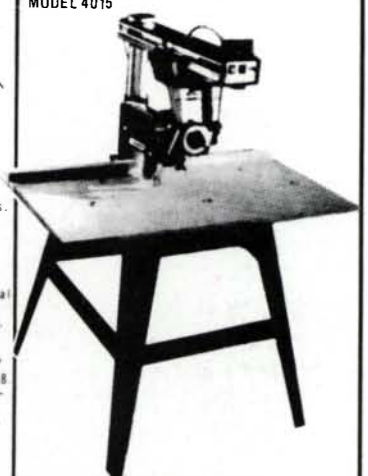
ORBITAL ACTION JIG SAW
Model: 1580

Industrial duty 3400 RPM Powerful, all ball bearing motor. Unique blade motion control. Weighs only 5 lbs.
LIST: 195. OUR PRICE **139.99**

Model: 1580 VS
Same tool as 1580 with variable speed control. List: 215.– **159.99**

TOOLKRAFT

10" DELUXE RADIAL ARM SAW
MODEL 4015



10" Radial Arm Saw designed for the do-it-yourself market. Powerful ball bearing motor develops 2 ¼ H.P. and features a high speed (15,800 R.P.M.) accessory shaft for decorative woodworking. Automatic braking action stops both blade and spindle in seconds.
Shipping Weight: 130 lb List: 499.95
OUR PRICE **399.50**

10" DELUXE TABLE SAW
MODEL 4122

Ground cast iron table for precision and durability. Build-in ball bearing motor developes 2½ H.P. Self-aligning rip fence locks from front and back with one motion. The two adjustable steel extensions provide up to 50" of table support.
Shipping weight: 140 lb.
List: 549.95 OUR PRICE **439.50**

MOTORIZED HIGH SPEED SHAPER MODEL 4256

It is equiped with a powerful one H.P. ball bearing high speed motor. It runs at 18 000 R.P.M. Ground cast iron table slotted for miter gauge. Cast iron fence with hard wood guides. Comes with stand as shown. Cutter height capacity 2". Shipping Weight 81 lb
List: 339.95
OUR PRICE **279.50**

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Events

Events listings are free but restricted to workshops, fairs, lectures and exhibitions of direct interest to woodworkers. The next deadline is Mar. 5, for events beginning May 1 to July 15.

ARIZONA: Show— Arizona Woodcarver's Assoc., March 8-12. Valley National Bank Center, 241 N. Central, Phoenix.

ARKANSAS: Juried Art Fair—May 7-9 at Convention Center. Slides by March 31, fee $45. Contact Don Kennett, R.R. #2, Box 324, Eureka Springs 72632.

CALIFORNIA: Juried Woodworking Exhibition—Open to residents of San Diego and Imperial counties. June 18-July 5. Slides by May 1. 22nd. District Agricultural Assoc. Fairgrounds. So. Cal. Exposition in Del Mar, (714) 755-1161.
Excellence in Woodworking—May 14-16, Los Angeles Convention Center, trade show with seminars by Ian Kirby. Contact Melvin Park & Assoc., 600 Talcott Rd., Park Ridge, Ill. 60068.
4th annual wood conference, Berkeley campus, April 3-4, $65. More info, 415-642-4111.
Juried Craft Fair—Fort Mason Center, San Francisco. Trade, Aug. 12; public, Aug. 13-15. Apply by March 10, fee $10. Write American Craft Enterprises, Box 10, New Paltz, N.Y. 12561.

CONNECTICUT: Seminars and Workshops—Mack Headley: "Colonial Woodworking," April 17-18; Bud Kronenberg: "Canadian Goose Carving," April 14-15; Stephen Hogbin: "Design for Woodworkers and Technology," March 27. Brookfield Craft Center, Box 122, Brookfield, 06804.
Classes—Basic hand woodworking, 8 sessions beginning March 2; $72. Farmington Valley Arts Center, PO Box 220, Avon Park, 06001.

FLORIDA: Juried Craft Competition—June 4-July 3. Slides by March 5; fee $10. Contact LeMoyne Center for the Visual Arts, 125 N. Gadsden St., Tallahassee, 32301.
Design Competition—multipurpose furniture, May 15-July 4. Metropolitan Museum, 1212 Anastasia Ave., Coral Gables, 33134.

GEORGIA: Workshop—"Building the Wooden-Bodied Cabinetmaker's Plane," March 13, 20, 21; also classes through May, contact John McGee, 218 S. Boulevard, Carrollton, 30117.
Classes—Ian Kirby on drawermaking, March 6-8; John Wermescher on marquetry, March 13-14; Bob Kelley on turning and lathework, March 27, on shop jigs and routers, April 10 and on joinery, May 8-9; Wendell Castle on stack lamination and design, April 23-25. Highland Hardware, 1034 N. Highland Ave. NE, Atlanta, 30306.

ILLINOIS: Workshops—Woodcarving, May 17-21; Furniture Conservation, Aug. 2-5, by Wallace Gusler, Curator, Colonial Williamsburg. At Campbell Center, PO Box 66, Mt. Carroll, 61053.
Juried Arts Festival—June 19-20, All media, apply by April 16. Fountain Square Arts Festival, 807 Davis St., Evanston, 60201.

INDIANA: Craft Exhibition—Feb. 28-April 4, Museum of Arts and Science, 411 S. Riverside Dr., Evansville, 47713.

KANSAS: Juried Crafts Exhibition—April 4-May 3, Topeka public library. Entry deadline March 14; fee $10. Contact Larry D. Peters, 1515 W. 10th St., Topeka, 66604.
Seminar—Wonderful world of woods, March 25-26. Wood science, selection of woods and marquetry. Fee $40. Whitesitt Hall, Pittsburgh State University. Contact Duane Griffiths (316) 231-7000.

MAINE: Seminars—Saturdays in Feb. and March. Woodbutcher Tools, Shelter Institute Building, 38 Center St., Bath, 04530.

MARYLAND: Juried Craft Fair—April 16-18, Montgomery Fairgrounds. To enter write Deann Verdier, Sugarloaf Mt. Works, Ijamsville, 21754.

MASSACHUSETTS: Weekend seminars: Handtools, March 27; Windsor Chairmaking, Apr. 24-25; Ash Splint Basketry Workshop, May 8-9.
National Invitational Furniture Exhibition, July 15-Sept. 11; Craft Fair—Wholesale May 14, retail May 15-16; Worcester Craft Center, 25 Sagamore Rd., Worcester, 01605.
Exhibition—*Artists in Artisanry*, work by Boston University faculty, March 4 to April 23, Federal Reserve Bank Gallery, 600 Atlantic Ave., Boston.

MINNESOTA: Demonstration & Show—Minn. Woodcarvers Assoc., March 27-28. Eden Prairie Center, 8301 Flying Cloud Dr., Minneapolis.

NEBRASKA: Juried Exhibition of furniture and rugs, through March 10. Craftsmen's Gallery, 511 S. Eleventh, Omaha, 68102.

NEW HAMPSHIRE: Competitions for New England craftsmen, March 22-Apr. 28. University Art Galleries, U.N.H., Durham, 03824.

NEW YORK: Exhibition—burl and spalted wood vessels by the Lindquists, March 9-Apr. 10, Elements Gallery, 766 Madison Ave., NYC 10021.
Rocking Furniture—antique and contemporary furniture, toys and art, through June at Gimbels.
Old Tools—"Historic Tools: Identification and Care," April 19, reg. by April 12. Fee $10. Farmer's Museum, 314 E. Seneca St., Manilus, 13104.
Northeast Craft Fair—Dutchess County Fairgrounds, Rhinebeck. Trade, June 22-23; public, June 25-27. A. C. E., Box 10, New Paltz, 12561.
Arts & Crafts Festival—Sept. 3-6, deadline May 1. Write Rubinstein, Box 437B, Woodstock, 12498.

OHIO: Spray Finishing Workshop—sponsored by

Bowling Green S.U. and De Vilbiss Co. March 22-26. Contact Dr. Kruppa, (419) 372-2436.
Workshop—Windsor chairmaking with Michael Dunbar at Hiram College, March 14-19 and 21-26. Contact David Factor, 18125 Madison Rd., Parkman, 44080.

OKLAHOMA: Workshop—Antique Restoration, April 16-17. $55 fee. Contact Joanne Kennedy, 4701 Twelfth Ave. NW, Norman, 73069.
Seminar—Ian Kirby: jointmaking, April 16-18; Wallace Kunkel: radial-arm saw, router and router-table, June 11-13. Fine Tool and Wood Store, 724 W. Britton Rd., Oklahoma City.

OREGON: Exhibition—Wild bird sculptures in wood, April 3-4. Western Forestry Center, 4033 S.W. Canyon Rd., Portland.

PENNSYLVANIA: Woodcarving Show—Penna. Delaware Valley Wood Carvers, April 3-4. Fiesta Inn, Rt. 611 & Pa. Turnpike, Willow Grove.
Exhibition—furniture construction, March 2-April 30; Advanced furniture design seminar, April 24, $65. Jeffrey Greene Design Studio, Ney Alley, New Hope, 18938.
Juried Crafts Exhibition—Museum of Art, Pennsylvania State University, July 6-Sept. 12. Slides by April 1. Write S. Mershon, Box 5, Lemont, 16851.
Workshop—"The Design Process and Method of Presentation for Private and Public Commissions," Stephen Hogbin, March 1-5. Contact Weiland, Indiana Univ. of Penn., 15705.

TENNESSEE: Juried Craft Exhibition—Tennessee Artists-Craftsmen's Assoc., March. University Gallery, Memphis State University, Memphis.
Courses—Bruce Beeken, steambending, June 7-18. Appalachian Center for Crafts, Rt. 3, Smithville, 37166.
Craft Fair—Southern Highland Handicraft Guild, at Mills Center. April 8-10, Gatlinburg.

TEXAS: Juried Exhibition—Texas Designer/Craftsmen, March 22 to April 3, Texas A& M campus. Write Box 821, Bryan, 77806.
Joinery Workshop—by Richard Tucker, March 13. Wood and Tool Store, 1936 Record Crossing, Dallas, 75235.
Juried Crafts & Art Fair—March 20-28, downtown Houston. Contact The Houston Festival, Crafts and Arts Exposition Committee, 6128 Village Pkwy., Houston, 77005.

UTAH: Juried Exhibition—all crafts. April 1-30. Write Iron Co. School District, Cedar City Art Committee, PO Box 879, Cedar City, 84720.

VIRGINIA: Show—Creative Wood Works/Utilitarian Objects, 1982, by Va. Woodworkers, through Mar. 14. Fine Arts Assoc., Staunton.

WASHINGTON: Woodworkers '82—show by Olympic Peninsula Guild of Woodworkers, Memorial weekend. Pope Marine Bldg., on Ferry Wharf, Port Townsend.

WASHINGTON, D.C.: Exhibition—de Stijl design movement, April 10-June 27, Hirshorn Museum, Washington, D.C.

WEST VIRGINIA: Workshop with Tage Frid, March 1-5. Write Cedar Lake Craft Center, Ripley.
Juried Woodworking Exhibition—June 20-July 31. To enter write John Ellis, Stifel Fine Arts Center, 1330 National Road, Wheeling, 26003.

NOVA SCOTIA: Courses—Plane and clamp making, Richard Tyner, begins March 24, $45; lathe instruction, furniture making, Deryk Jones, Fall '82. Contact Richard Tyner, 32 Edmonds Grounds, Halifax, B3N 1M6

ONTARIO: Show & Sale—Tools, April 4, York Farmers' Market, 7509 Yonge St., Thornhill.

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Company serving nationwide clients seeks original rocking furniture. ROCK-A-WAY, 3523 Hull Ave., Bronx, NY 10467. (212) 654-5026.

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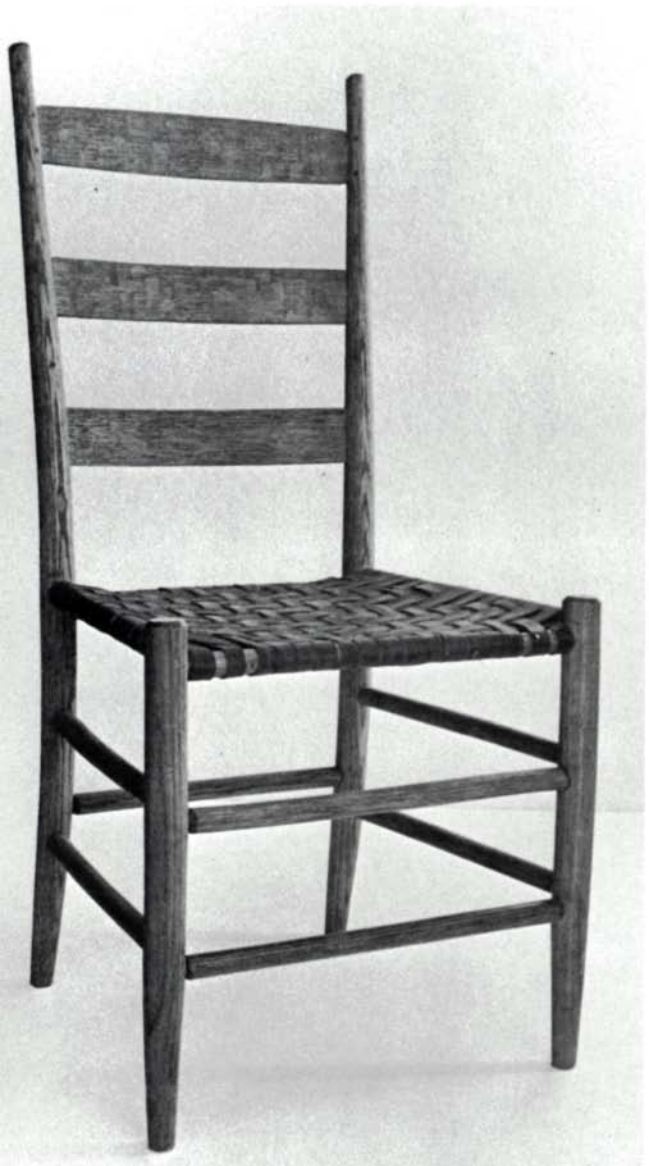


To make ten of Sawyer's chairs, left, one for each of us in the workshop, we started with a 6-ft. length of an 18-in. dia. white oak log. After quartering this with wedges to see the lay of the grain, we bucksawed lengths for chair parts. At top, two students saw a bolt for rungs. Steadying the log are Country Workshop sponsor Drew Langsner and his daughter Naomi. Above, teacher Dave Sawyer demonstrates drawknifing a rung on a dumbhead shaving horse.

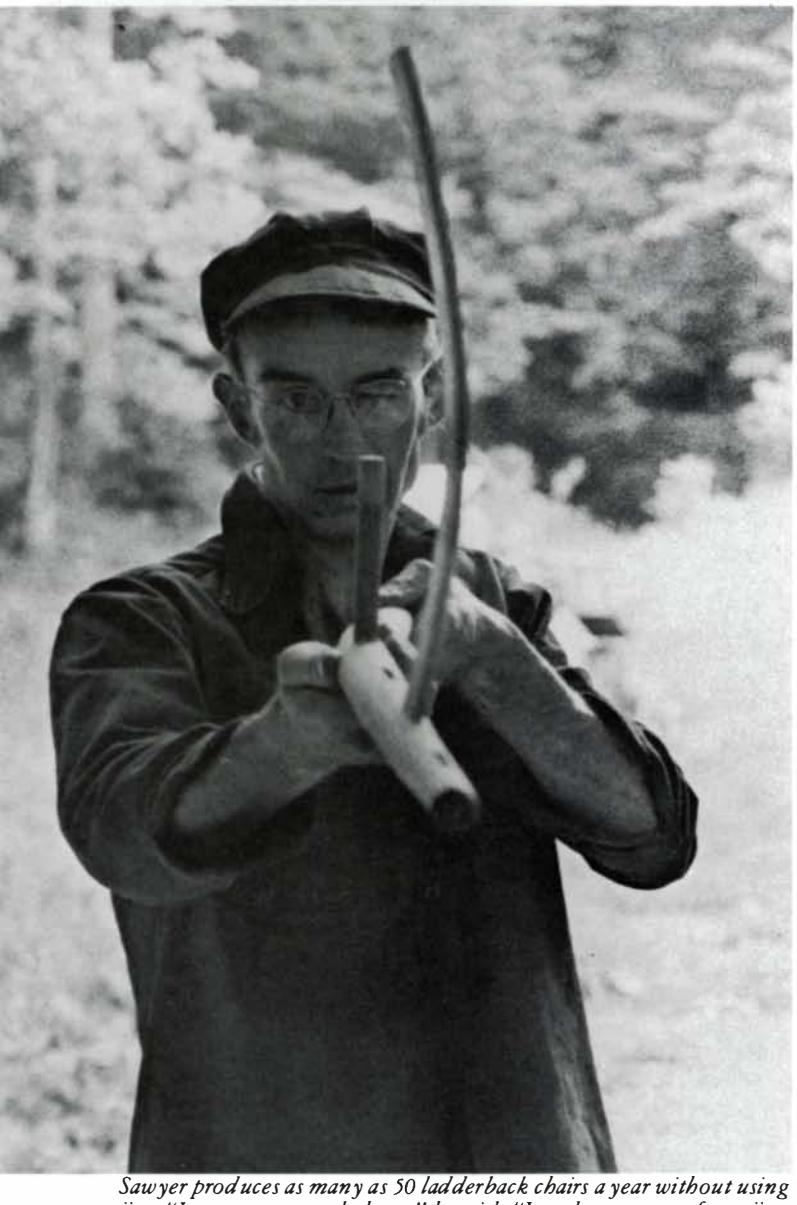
Green Woodworking

How I split and shaved a chair at Country Workshops

by Rick Mastelli

Last summer, amid the Blue Ridge Mountains of North Carolina, I attended a week-long chairmaking workshop that changed my ideas about working wood. Ten of us had come because we were interested in learning to make chairs in an old way. We put aside our electric tools and surfacing machines, and we kicked the habit of using mill-sawn, kiln-dried wood. We retreated from the cabinetmaker's craft, with its jointing and smoothing planes and sandpaper. Instead, we adopted the tools of the country joiner, who rives the wood and shaves it into sticks and panels.

The joiner's craft has been practiced for centuries in peasant communities, where everyone, for at least part of the year, produces food, shelter, clothing, utensils and furniture. Originally a homely craft, it evolved into a specialized profession, which in parts of this country is being revived as part of the modern-day homesteader's diversified livelihood. The country joiner does not employ a sawmill, but goes directly to the local tree and, treating wood like the bundle of fibers that it is, pries it apart with wedges, gluts and froes. He shapes this riven wood with drawknives and spokeshaves, retaining the



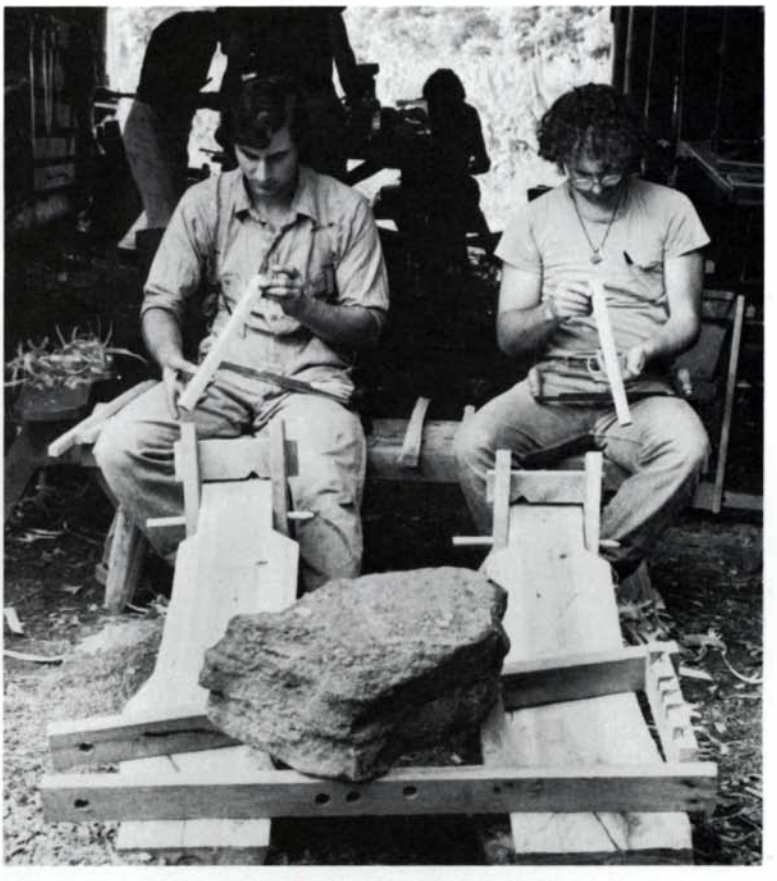
Sawyer produces as many as 50 ladderback chairs a year without using jigs. "In my power-tool phase," he said, "I made some very fancy jigs. But it turned out to be mindless. . . . And I'd be looking for them and fiddling with them, and they'd end up in the fire." So now Sawyer just clamps the posts to the bench, shims to "close enough" and guides his brace and bit with a T-bevel and his eye.

continuity of the fibers that a rip saw would sever. Riven wood is stronger than sawn wood, easy to work while green, and more resistant to the deterioration of age and weather. Its grain and figure can be felt, not just seen as in planed and sanded wood. Its texture is rich and varied. And when you rive and shave wood, there is no dusty air to breathe. Green woodworking relies upon simple tools, cheap materials and direct processes. The result can be as useful, beautiful and inspiring to make as the chair pictured here.

Our classroom was an old tobacco barn on Drew and Louise Langsner's 100-acre homestead in Marshall, N.C. To get there, you drive along increasingly rural roads, till the last half-mile or so of the Langsner's driveway, which is best walked. "When you come to Country Workshops," remarked Langsner as his truck bounced us up to within reach of the farm, "you come to the country." Each summer, the Langsners sponsor as many as five week-long workshops in country crafts, alternating their workshop responsibilities with their farm chores. We helped a little with those chores, ate three bountiful meals a day of farm produce, and slept in our own tents. We worked long days and into the night, not exploring our individual bents, but practicing craft in the age-old sense. We did not design, for instance, but copied a traditional design. And though we initialed the parts we made, we didn't take the identification too seriously—on the first day we shaved more than a hundred rungs and threw them into a communal pile. In this way we concentrated on acquiring skills and minimized prideful fussing, making extra parts when we were finished with our own, and sharing them readily.

The workshop reflected the character of its teacher, Dave Sawyer, a 45-year-old New Englander who now lives in East Calais, Vt. Sawyer has an M.I.T. degree in mechanical engineering, but he retired from that career at age 28. "If I'd lived a hundred years ago," he said one evening in the barn, while tenoning rungs at the pole lathe to help some of us catch up, "I'd have done fine in mechanical engineering, because then people built what they thought up." The rhythmic slap of the lathe punctuated his words. "But thinking's pretty far from doing nowadays in that field." So Sawyer tried restoring old cars, he spent a half year in Bolivia in the Peace Corps Craft Program, and he worked for a while with the Amish. His turning point was the summer he spent working in the shop of Daniel O'Hagan, another sometime teacher at Country Workshops. O'Hagan's example encouraged Sawyer to do direct, simple woodwork. In 1969 he put together his own shop, and he has been making furniture and utensils from green wood ever since.

The ladderback chair we made is little changed from the first one Sawyer made ten years ago. He took the measurements from the first comfortable ladderback he'd found, a factory-made chair from the 1920s that he saw in an antique shop. After some minor changes in the way he made the first six, Sawyer had his product and his procedures down. I asked him, while he was showing us how to shape the back slats, if he was ever tempted to vary the design, to make a fancy chair with carved slats, for instance. "No," he said, "I don't believe in art. I never carved anything in my life, and I don't believe I ever will." Why, I asked? "Because I have no imagination," he said. "I never got into that individual expression bit, and I never made anything original. I work on the Volkswagen theory. You stay with something that works, and you make little improvements as you see them. I tried making an arty



Top, Sawyer marks the end of a bolt for splitting with a froe. The finished rungs have to be ⅞ in. in diameter, and Sawyer lays out squares only ⅛ in. oversize. He controls splitting by arranging to split relatively equal portions (figure 2, p. 56), by splitting slowly, and if the split begins to run out, by exerting pressure against the heavier side of the split (figure 3, p. 56, and cover). Above, a student splits rung blanks in a small brake—two boards mounted like scissor blades to hold the work. By the end of the workshop's first day, we had shaved more than a hundred rungs, trying various styles of shaving horses and drawknives. The two horses, top right, are roughed out from thick slabs; the large stone holds them steady. At right, Sawyer loads the rungs into an oil-drum kiln.

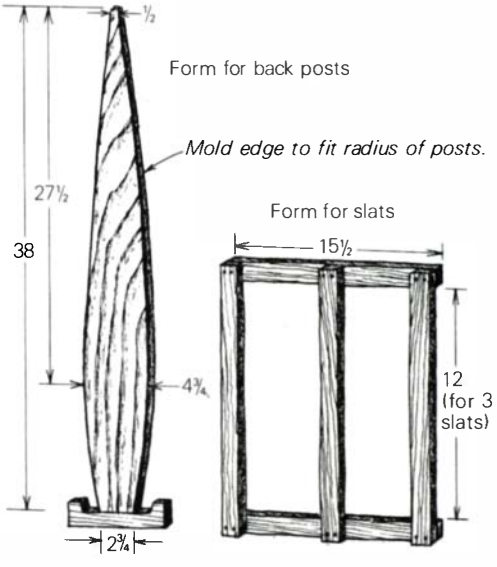
chair once. I prefer being productive." I remembered that Drew Langsner had warned me on the way to the farm: "You're going to meet a lot of reactionaries here, people who figure rough woodworking is just fine."

Sawyer's ladderback *is* fine. It is just as strong-lined and as comfortably proportioned as you'd expect a chair to be that has been unchanged through ten years and hundreds of copies. Its high back is well balanced by the thickening of the back posts below the seat. Sawyer steambends at the thickest part of the legs to increase the chair's stability and to angle the back comfortably. Other ladderback chairs, John Alexander's, for instance *(FWW* #12, p. 46), bend above the seat at the thinnest part of the back posts. Sawyer's chair is stouter than Alexander's elegant rendition. Sawyer's is a professional chairmaker's pre-industrial product, and he makes 20 to 30 of them a year, sometimes as many as 50. It takes him 12 hours from tree to finished chair, and he gets $115 for each. When he needs more money he makes wooden hayforks for $17 apiece. He once made 200 hayforks in two months.

So we learned how to make chairs in batches. For a week we became a green-wood chair shop. Our industry was interspersed with demonstrations and learned, talky meets; the ten of us went home knowing not only how to bust a chair from a tree, but also how to do it efficiently within a daily work rhythm. We began by making rungs because they are easiest to make, and because they want to be drier than the posts into which they are mortised. After assembly, the tenon absorbs moisture from the post and swells while the mortise shrinks, locking the joint firmly. It took us a day to split and shave the rungs, but by the end of that day, the best among us could shave a rung almost as fast as Sawyer, in under 3 minutes. While the rungs dried in a jury-rigged kiln—a

The chair parts are bent without steel straps. First we boiled the 1½-in. to 1-in. diameter posts in water for a couple of hours (the boiler rests between cement blocks in the background of the photo top left). Then we coaxed the bend into shape on the shaving horse. A pad under the horse's head prevents the stock from being marred. The posts are muscled in pairs onto drying forms, above, and held in place with leather thongs while they set overnight. The slats, left, were also boiled, but only for a half hour or so, then bent on the horse and over the knee until they fit on their own drying form. Plans for the forms are given at right.

Drying forms

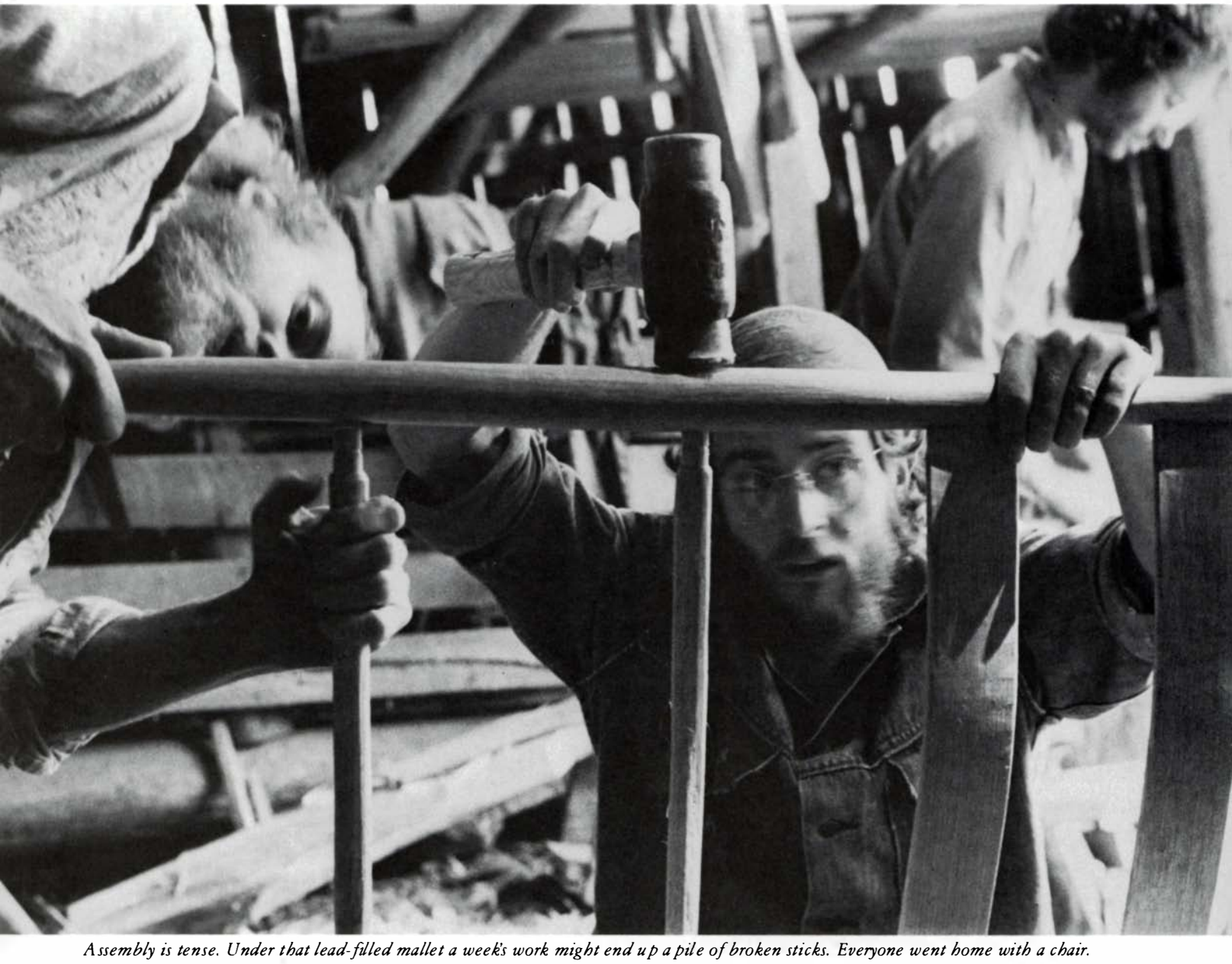


70-gal. oil drum perched over a smoldering campfire—we split and shaved the posts. By the third day we were dumping the back posts into a smaller drum full of boiling water to prepare them for bending. We flexed the hot posts on a shaving horse, then strapped them to simple forms and laid them in the kiln to set their curve while we split and shaved slats, which went through the same process. All the parts made, we bored the mortises for the front and back rungs and chopped the mortises for the slats. The evening of the fourth day we turned tenons on the ends of the rungs.

We assembled our batch of chairs on the workshop's last day, banging them together with a lead-filled rawhide mallet wielded over a hefty stump. It was heady stuff. First we pounded the front rungs into the front posts, then the back rungs and slats into the back posts. In these sub-assemblies, we bored the mortises for the side rungs, nicking the front and back rungs so the side rungs would interlock with them, like Lincoln logs. Tension was high as each of us brought our sticks to the assembly stump, sticks that represented a week's shaping and scraping. Driving oversize tenons into slender posts means real fear in that moment when the mallet is poised between blows. Yet chair after chair popped into being. I asked Sawyer why he preferred this daring finale to a project so painstakingly prepared—why not use clamps? It was easier and faster this way, he said, but also the experience should be intense. "If you can get a chair together without splitting, it's not going to split afterwards," he said. "Assembly is the worst time. It's like being born. If you can survive that, chances are you'll last another fifty years."

* * *

For most of us, the workshop was over that fifth night. Whether or not we stayed on for Sawyer's optional seat-

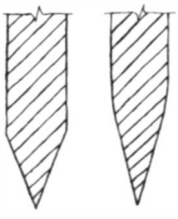


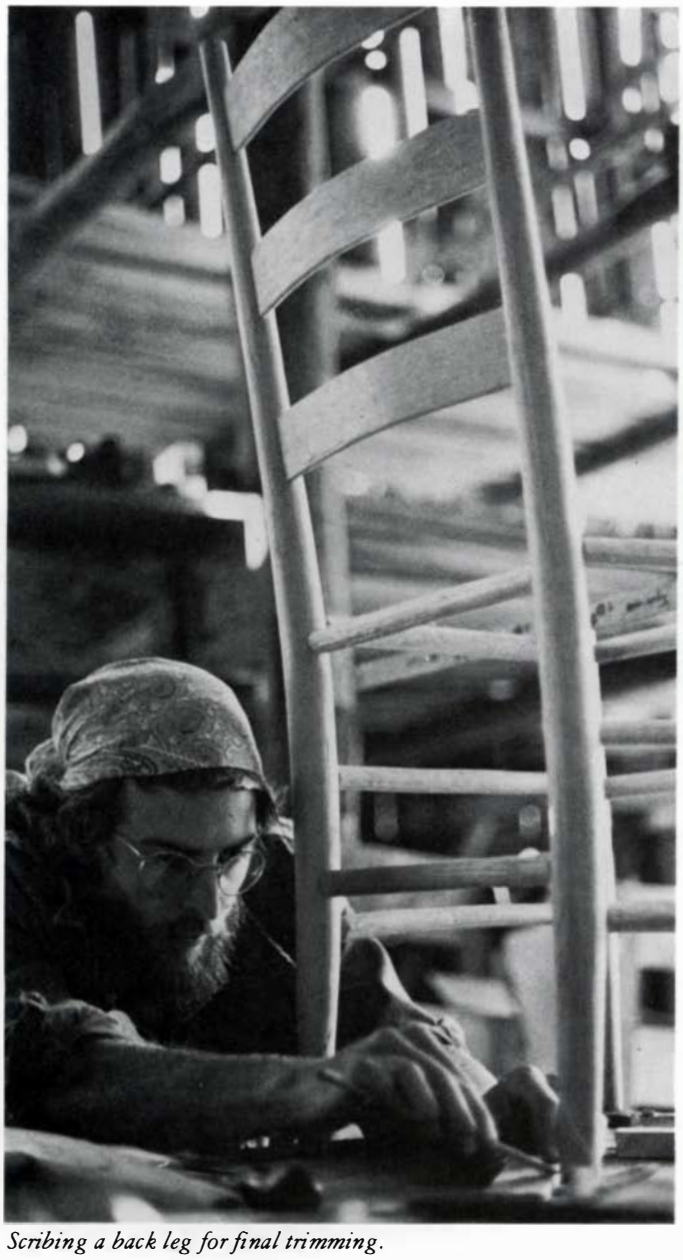
Assembly is tense. Under that lead-filled mallet a week's work might end up a pile of broken sticks. Everyone went home with a chair.

weaving demonstration the next morning, each of us went home with a chair, and that alone was worth the workshop's $175 tuition. But the real value was in what we'd learned, and the chair was there to remind us of that. I left with an appreciation for green woodworking that continues to grow. It was not the first time I'd sat on a shaving horse, but it was the first I'd done enough work on one to get sore. You learn a lot this way, subtle understandings along with plain, common sense. Surrounded by others to watch and new tools to try, the revelations come, and the horse gets comfortable. Here is some of what I learned.

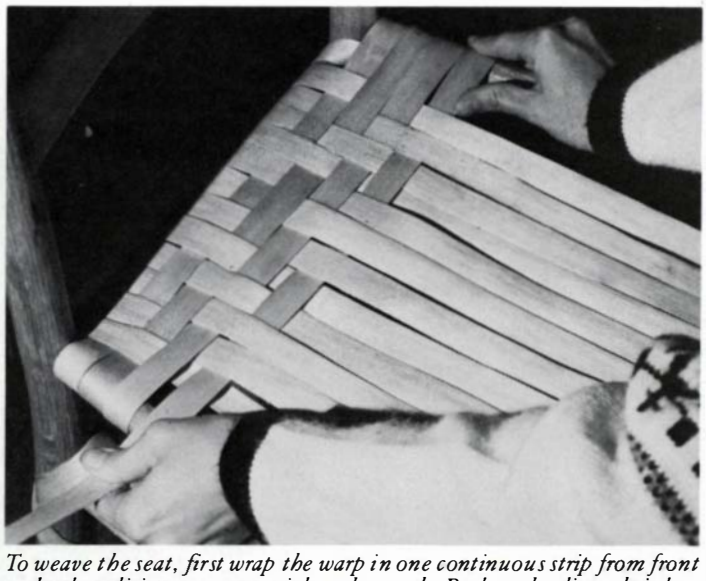
Measuring—There's nothing novel about cutting a number of parts to size and checking one against another. It's faster, easier and more accurate than measuring each individually. But many of us feel we need drawings covered with dimensions to be able to build anything. We didn't need a drawing to build Sawyer's chair, and there weren't many numbers to worry about either. All we needed to know was recorded on the two sides of a flat stick. It didn't get wrinkled and messy in the shop, and it was always handy to place on the wood to lay out tapers, bores, mortises or whatever. Figure 1, on the facing page, represents Sawyer's chair stick, and it's all the blueprint you need to make his chair.

Getting the most out of the wood—We split enough wood for ten chairs from a single white oak veneer-quality log 18 in. in diameter and 6 ft. long. We could get a back post and a front post, four short rungs, three long rungs or various other combinations out of the length. With wedges we split the log into quarters, then we read the grain to make best use of the wood. We crosscut the quarters into bolts, pieces the length of the various parts. Then a froe, that long-bladed, long handled, clumsy-looking tool, dimensioned the blanks faster, neater and more efficiently than a saw could. We were splitting blanks for rungs ⅛ in. oversize, blanks for posts ¼ in. oversize, and rarely having to reject a piece. The secrets of the froe are as follows: First, it doesn't need a sharp edge, but the bevel must be properly shaped. The bevel on a new froe is usually





Scribing a back leg for final trimming.



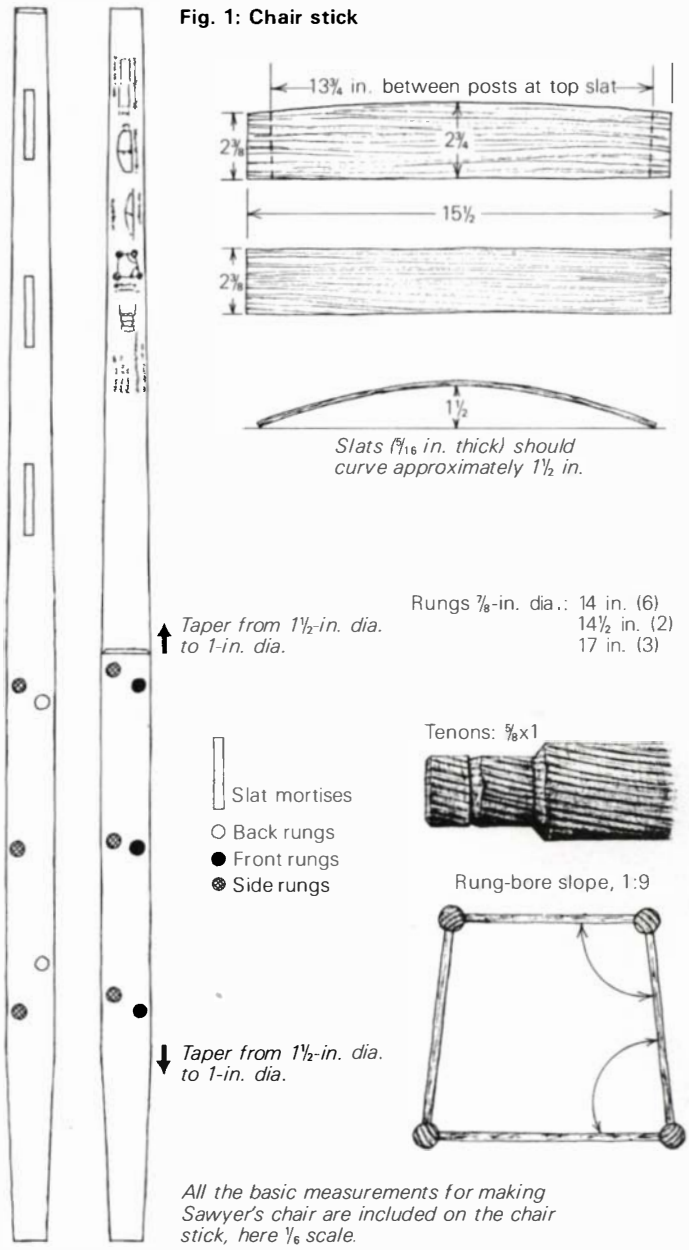
To weave the seat, first wrap the warp in one continuous strip from front to back, splicing your material underneath. Bark and splints shrink as they dry, so leave the warp overnight, then push it tightly together to fit another round or two of warp. The weft can create any number of patterns, here a diamond-shaped herringbone. The triangular spaces at the sides of the seat will be filled with short lengths woven into the weft.

too blunt and too angular. It should be no more than 30°, and it should blend smoothly into the sides of the tool to form a single, convex surface. A facet, as in a chisel or plane-iron bevel, tends to stick in the wood and does not rock smoothly during levering.

Second, the froe must be properly placed on the bolt. When you have to make a number of splits in one bolt, don't start at one end and work across, but start in the middle and then again in the middle of each of the halves, and so on (figure 2, next page). With equal portions on either side of the split it's easier to control its direction. The handle of a good froe is about 16 in. long, the blade about 10 in. Make sure the whole edge is in full contact with the wood before you strike—you're liable to shift the froe if it is slightly angled off the surface. Once you start a split (give it a good rap) you have to follow through, so make sure you begin in the right place.

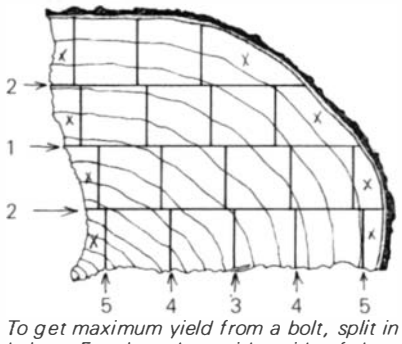
Now, put down your mallet. One or two blows are all that's needed—the rest is levering not severing. You need a rigid, fork-like arrangement of boards or logs, called a brake, to hold the bolt while you bear on it. If the wood begins to split unevenly, place the heavy side of the split down, and use your

Fig. 1: Chair stick



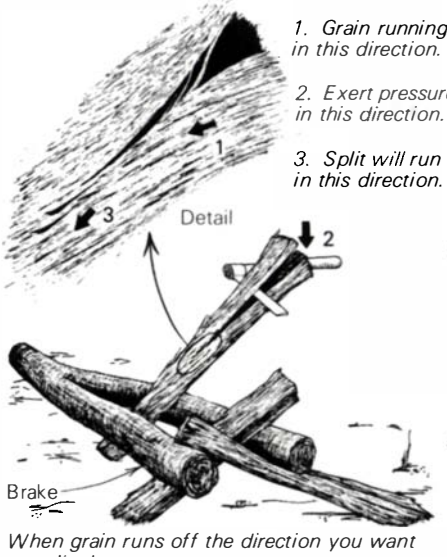
All the basic measurements for making Sawyer's chair are included on the chair stick, here 1/6 scale.

Fig. 2: Splitting order



To get maximum yield from a bolt, split in halves. Equal stock on either side of the split will make it easier to control runout.

Fig. 3: Controlling runout



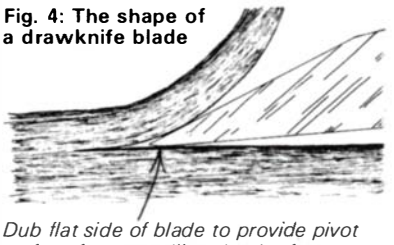
1. Grain running in this direction.

2. Exert pressure in this direction.

3. Split will run in this direction.

When grain runs off the direction you want to split along, exert greater pressure on the heavier side, and make the split "jump" the grain.

Fig. 4: The shape of a drawknife blade



Dub flat side of blade to provide pivot surface for controlling depth of cut.

Fig. 5: The position of drawknife handles

To best aim the edge into the cut, heat and bend handle tangs to align handles with bisector of bevel angle.

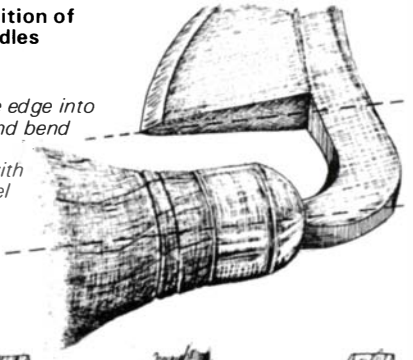
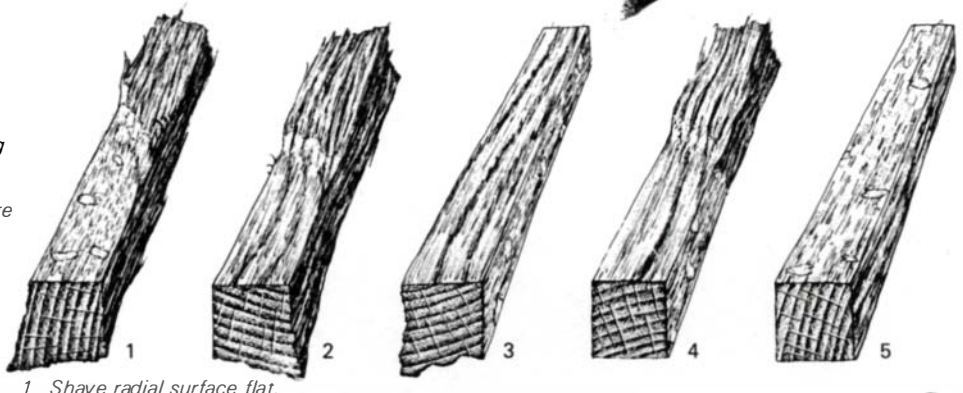
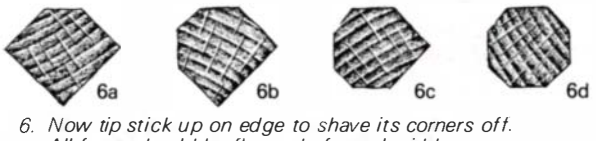


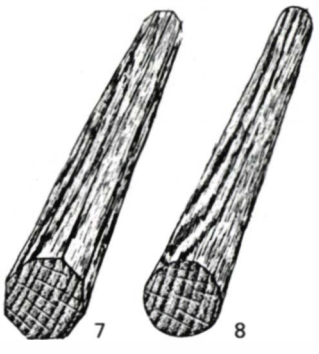
Fig. 6: Order of cuts in drawknifing a cylinder



1. *Shave radial surface flat.*
2. *Rotate 90° and shave tangential surface flat.*
3. *Turn stick end for end and repeat to produce two flat surfaces, square along their entire length.*
4. *Shave other two surfaces to produce a square section.*
5. *Repeat on other end to produce a square stick.*



6. *Now tip stick up on edge to shave its corners off. All faces should be flat and of equal width.*
7. *Repeat on other end to produce an octagonal stick.*
8. *Spokeshave stick round, first rotating, then turning end for end as necessary.*



hand to bend the heavy side away from the split. Go slowly. You need time to see which way the split is going and to direct it. If you have split firewood only, where you strike a single blow with a maul and pick up the odd pieces, you will be surprised at the control you have with a froe. Sure, wood splits along the grain. But by bending the wood away from the split, you can cause the plane of failure to jump the grain (figure 3 and front cover).

Shaving wood—If I never work another piece of green wood, I will still use my new drawknife and the shaving horse I recently built. These tools are surprisingly handy for all kinds of work. The shaving horse quickly clamps stock of various shapes and sizes so you can shave it, plane it, scrape it, or (heaven forbid) sand it. It doesn't take long to coordinate hand and foot: clamp down, take a stroke, release pressure, move the stock, and clamp down again. You can't do this sort of thing as fast with a bench vise. Your whole body works on the shaving horse, not just your hands and arms. The harder you pull with your knife, the more you push with your leg, and the tighter your stock is clamped. And all the while you're on your butt, building a chair while you sit.

I tried a number of different shaving horses and I like the dumbhead horse best (*FWW* #14, p.4). I tried different drawknives too, and it seems most can be made to work well, if properly sharpened (*FWW* #25, pp.93-94). The angle of the bevel should be relatively small, between 28°and 32°. I dub the edge on the flat side, the sort of thing that you'd never do to a plane iron. A plane iron is positioned in relation to the surface of the work by the sole of the plane. Only the edge of the blade touches the work and dubbing the back dulls that edge. The drawknife, having no sole, is guided by the back of the blade sliding on the wood (figure 4). You can regulate depth of cut—from ½-in. thick slabs to paper-thin shavings—simply by tilting the handles. To best aim the edge and control the cut, the handles should be parallel to a line that bisects the bevel angle (figure 5). You will have to heat the upper portion of the tangs and rebend the handles of most drawknives to establish this relationship. Some drawknives work better bevel-side down, as this surface provides something to rock the blade on. I find that dubbing the flat face produces a fine pivot surface for sensitive work.

Sawyer showed us how to hold the knife diagonally to the stroke, and to slide it sideways, slicing as we pulled it. He liked long, consistently thick shavings from long, even pulls. As we worked, he would wince at the crackling sound of badly cut wood. Good shavings whisper off the knife. □

Rick Mastelli is associate editor of Fine Woodworking. *This summer's Country Workshops will include hand-tool techniques, with Willie Sundqvist; basic country woodcraft, with Daniel O'Hagan; and chairmaking, with John Alexander. For details write Country Workshops, Route 3, Box 221, Marshall, N.C. 28753.*

Tool Lovers Get Together

Dengelshtocks and witchets shine at PATINA

by Stanley Wellborn

When was the last time you had the chance to root around in an aging tool chest, inspecting its scorps, trammel points and inshaves? A bunch of tool lovers in the Maryland-Virginia area get together every other month to do just that. The members of the Potomac Antique Tools and Industries Association, PATINA for short, buy, sell, trade, collect and are fascinated by old hand tools. At any meeting they might delve into that tool chest, or examine more exotic fare: witchets, jiggers, grailles, quannets, dengelshtocks and sugar devils—not to mention bick, flagging, chincing, meaking and trunnel irons.

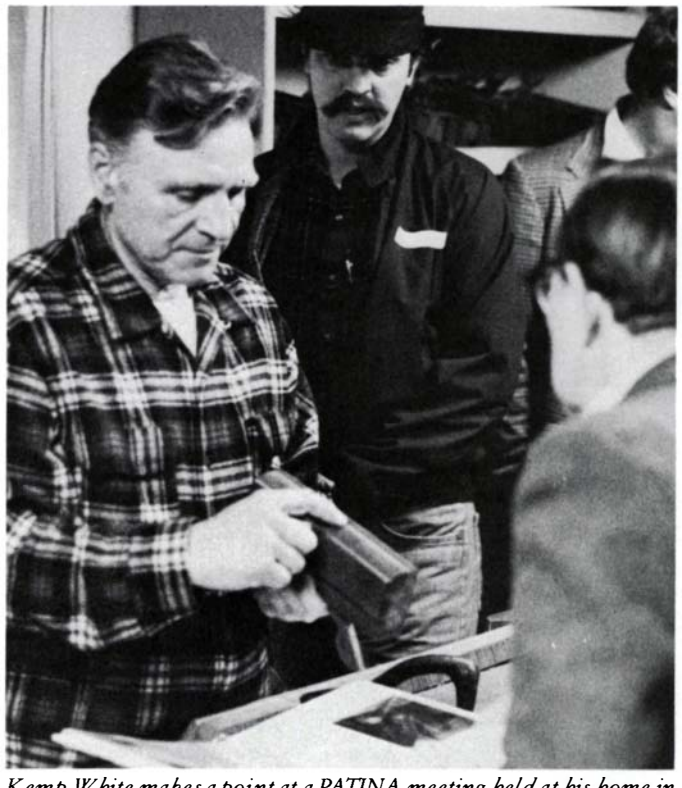
Faced with such variety, some of the members specialize in only one type of tool, or tools from only a certain era. The finest and rarest tools have grown far too valuable for any but the foolhardy or the purist to use, as a single nick or dent may halve the value. But you don't have to collect expensive tools. Harold D. Berry of Bealeton, Va., for example, is a Keen Kutter man. This company vied with Stanley for the mass market in the 19th century, and its tools can be picked up at sales or auctions for reasonable prices. Berry has often bought a whole boxfull of tools just to get one Keen Kutter—and he's got well over a hundred. Asked what it is that fascinates him about Keen Kutters, Berry looked puzzled. "Why, man, they're great tools!"

Dr. Richard F. S. Starr of Purcellville, Va., on the other hand, collects only the finest tools. He specializes in the superb planes made by an Ohioan of the same surname, but no known relation. PATINA members speak of Starr's collection in tones of awe, and are always on the lookout for things that might interest him. "He is *sharp*," one member said. "He hardly ever buys, and never sells."

"You eventually have to concentrate on some period or type of tool just because there are so many of them," said Bill Neyer of Landisville, Pa. "I've had to go into fairly heavy dealing to keep from going broke buying. I've got so much stuff I can't haul the half of it around anymore. On the other hand, if you're careful to stick to items of quality in good condition, it's hard to get burned. Average prices have gone up tenfold or more in the past few years."

The skyrocketing prices of old tools both please and distress the members. "It is good to see their value recognized," says one, "but it makes it hard for a person who is looking for fine old tools to use."

Many of the members seem less interested in buying and selling than in just talking about the tools and the men who made and used them. "In the old days a man wouldn't be seen with the kinds of tools they sell today," says PATINA president Don Paschal. "Pride in your work started with pride in your tools, and somebody who was thinking of hiring a man could find out all he needed to know about him by looking at his tool chest. A man was willing to pay a lot for a tool that was well made because it takes good tools to do good work, and he expected them to last a lifetime."



Kemp White makes a point at a PATINA meeting held at his home in Accokeek, Md. White is an accomplished woodworker who reproduces antique furniture in addition to being an avid tool collector.

Paschal picked up a folding rule from one of the tables. Carved of ivory and bound in brass, it might have been wrought by Fabergé for the Russian Czar. "This is not a piece of jewelry; it is a tool," he said. "The carpenter or cabinetmaker who owned it used it every working day. Maybe his son used it after him, and his grandson. If you were discussing a job with a man and he pulled this out of his pocket to take a measurement, you could be confident you were dealing with a *craftsman*."

Tool collectors generally agree on the proper categories for old woodworking tools. Three broad classes exist. There is a fairly sharp division between the English tools brought over by colonists and the early American tools, which are very similar but seldom so fine. Then there was a major change after the Civil War, which greatly accelerated the Industrial Revolution in this country. Mass production began to take over, and by about 1880 virtually all the common tools were more or less machine made.

PATINA member Tom Tully is curator of the Smithsonian Institution's collection of hand tools—and a master carpenter. He has developed a nine-step grading system for old tools. Some of the distinctions are pretty fine, but the novice can distinguish the major grades simply by the way collectors

or dealers present their tools at a sale or show: *1st grade*, unused tools in their original packaging or felt-lined cases; *3rd grade*, tools that may have been restored, but are still in original trays or boxes; *6th grade*, rough but usable tools, usually displayed on blankets; *9th grade*, interesting junk all jumbled together in battered milk crates.

"One thing you have to get rid of in grading tools are the concepts of good and bad," cautioned Tully, "Hand tools are expected to be used, and *used up* in some cases. Who am I to say that an axe used by a workman for 40 years that has been worn down almost to the handle is in bad condition? The workman may still be able to get a lot of use out of it. He may love that tool. He may have kept it in very usable condition, but it may look like a piece of junk. What I do have a bias against, I guess, is abused tools. A tool that may be in good condition, but which has evidence of being used by a careless craftsman is a tool that I react against. It is just a personal feeling—because tools are personal things." □

Stanley Wellborn, of Washington, D.C., is a frequent contributor to this magazine. Photo by the author.

EDITOR'S NOTE: PATINA publishes a monthly newsletter; for a subscription send $10 to Bob Nelson, 2800 64th Street, Cheverly, Md. 20785. There are groups of tool lovers dotted all over the country. One of the oldest is the Early American Industries Association, founded in 1933. The EAIA holds its own meetings, publishes a quarterly magazine, a bi-monthly newsletter and a number of books. They maintain a library, award several research grants each year, and keep up-to-date lists of regional and local tool groups. For further information on the EAIA, write John S. Watson, Treasurer, EAIA, PO Box 2128, Empire State Plaza Station, Albany, N.Y. 12220.

This year, Jack Bittner's big auction will be held May 10-12 at the Ramada Inn in Keene, N.H. For the catalog and information write Bittner at RFD #3, Box 54, Putney, Vt. 05346. Richard Crane holds a two-day show and sale in Nashua, N.H. This year's will be on April 2 and 3, and Crane expects to offer 450 to 500 lots of tools. For the catalog and information write Crane, Your Country Auctioneer, Inc., Center Road, Hillsboro, N.H. 03244. Crane and Bittner probably auction more old tools than anybody in the country, but if you can't make one of their sales, keep your eyes peeled for smaller sales in your area—there are good tools to be found at auctions, flea-markets, junk shops and garage sales everywhere.

Bittner's Old Tool Jamboree

by Norman Vandal

The old-tool bug is easy to catch. If you've got it, why not enjoy it? Each spring I put all else aside to attend Jack Bittner's Antique Tool Auction. Last May, Bittner's two-day jamboree drew collectors and craftsmen from 19 states, Canada, England, France, New Zealand and the Virgin Islands.

We all gathered in Brattleboro, Vt. to bid on 900 lots of antique tools. There were wooden planes, Stanley planes and English planes, hand-forged axes and adzes and documented 18th-century tools. Coopers' tools, measuring devices, braces, levels and many more rounded out the field. A well written and illustrated catalog arrived in the mail in ample time for me to convince myself that I couldn't do without this plane or that adze.

For me, the best part of each sale is the preview. Every item is available for handling and inspection—an incredible assortment of specialized woodworking implements. Their subtle lines, exotic woods and brass fittings have the look and feel only generations of use can impart. They tell us of the past and they can help us explore our work in the present. They remind us how windows or stairs or carriages were made, and maybe why. Some tools are versatile, others perform a single, simple function. All represent the lore of our craft. If you go to a Bittner preview, take your time, look closely, ask questions. It's not often that so many good tools are gathered together.

It always comes as a surprise how much collectors are willing to pay for a tool. Last May, Bittner auctioned two 18th-century American molding planes, one for $1100, the other for $750. A Stanley #9 cabinetmakers' block plane went for $1050, and a brass-bound, red beech Marples Ultimatum brace went for an astonishing $1250. But the craftsman needn't be discouraged. Good deals were plentiful. Stanley tools, some wooden planes, lots of chisels, drawknives and spokeshaves went for reasonable prices, so did broad axes, framing and corner chisels, and boring machines. Stanley bench planes in perfect condition sold for $20 to $60, below catalog prices for new planes, and usable molding planes went for $8 to $25 each. English brass or iron wood-filled planes sold below their appraised value. I bought a like-new Norris coffin-shaped smoother, reputedly the finest smooth plane ever made, for $150, far below its average retail of $225. There was something for just about everyone—of those who attended, 9 out of 10 went home with a new old tool. □

Auctioneer Jack Bittner calls for bids on one of the hundreds of old tools that he put on the auction block last May. Bittner's two-day auction is an annual affair, a meeting place for collectors, craftsmen and other lovers of old tools.

Norman Vandal builds period furniture and architectural components in Roxbury, Vt. Photo by the author.

Designing for Machine Craft

Desmond Ryan's route to handsome boxes

by Roger Holmes

For nearly ten years Desmond Ryan has been making little wooden boxes—boxes for all sorts of things, from jewelry worth fortunes to sentimental trinkets. He makes boxes one at a time and in batches of ten or twenty, with traditional hand tools as well as with modern machinery. His favorite machine has become the overarm router that stands in the middle of his shop; Ryan has learned to use this router with the sensitivity usually associated with a handtool, and his designs capitalize on the machine's strong points. He's succeeded in blending craft with industrial design, handwork with machine work—he is toolmaker, jigmaker and old-fashioned bench craftsman all rolled into one.

Last fall I visited Ryan at his shop, in a 176-year-old paper mill in the town of Maidstone, 37 miles east of London. The mill sits in a tight wooded valley, and Ryan's shop, a long narrow room lit by a wall of windows, is on the second floor of a timber-clad building. It is a large shop for one man, but Ryan prefers to work alone. The extra space is for making furniture, a side of his work overshadowed by the success of his boxes. "Nobody actually needs boxes," he told me, "they aren't necessary like tables, chairs and cabinets. But it is surprising how many people indulge themselves."

Few craft woodworkers have exploited the router as thoroughly as Ryan has for his boxes. Almost every woodworker has a router; they are cheap, take up little space, and can perform a bewildering array of operations. The router can replace whole chests of molding planes, hollows, rounds, gouges and more. It works quickly and precisely—sometimes too easily. The unwavering accuracy of a routed surface doesn't complement every design. Ryan therefore designs with the router in mind. He derives the basic shapes and joints of many of his boxes from it, and often a routed detail will tie a whole design together. The jewelry box pictured at the top of p. 61 is a good example. A coved rabbet frames the ends of the box when closed, and it connects with the routed handles on the four trays when they are set into the open box for display. "It is one object closed and a different object when open," explained Ryan. "I usually try to do this with boxes. I try to keep them simple on the outside, and when you open them, there is a more complex but visually harmonious interior."

One-off boxes need a lot of handwork. Ryan's batch-production boxes are almost entirely machine-made, and usually routed out of a solid block of wood: no assembly necessary. Some of his production ideas develop from one-off commissions, like the paint box (p. 61) and some of his game boards; others come while playing around with ideas and with the machine itself.

Batch production has different requirements for design, production and materials than one-offs. The designer must eliminate complicated, time-consuming constructions or details. These can be absorbed when done once, but are prohibitive when they must be repeated over and over. A logical succession of simple, quick and accurate operations is the key to successful production, and there isn't much margin for error. "You have got to have an absolute sure-fire way of controlling production operations," says

Ryan. "If you work to the sort of precision possible with the machine and you fit one piece into another, the consistency has got to be there."

Ryan chooses his materials as carefully as he constructs his jigs. "When I'm doing a production piece," he says, "I don't see individual pieces of wood. With the hexagonal boxes (p. 63), for example, I wasn't trying to create interest in the wood. I used walnut or rosewood for their color against which I contrasted an interesting wood, amboyna, which is decorative in itself, but is a bit like wallpaper. One box lid was different from another, but it was really the color and texture I was after, not a specific piece of wood."

I wondered if he couldn't just as easily make his boxes from metal or plastic. "I suppose I use wood rather than metal because I like the warmth and feel of it. It also machines well, handles easily and can be worked with hand tools." The ideal wood? He laughed, "I suppose it would be something like a firm cheese that you could work and harden up afterwards."

Having worked on the design, made the first jigs and started a half dozen prototypes, Ryan is liable to abandon the project. "That happens quite a lot. Either I reject them because I am not happy with them visually, or I feel that the price is going to be too high to justify finishing them off. It is very costly."

A box that has made it past these obstacles must still prove itself. "I like to leave boxes lying around and observe people handling them," Ryan said. "The longer they keep one in their hand, perhaps turning it over absent-mindedly while talking, the more successful the box."

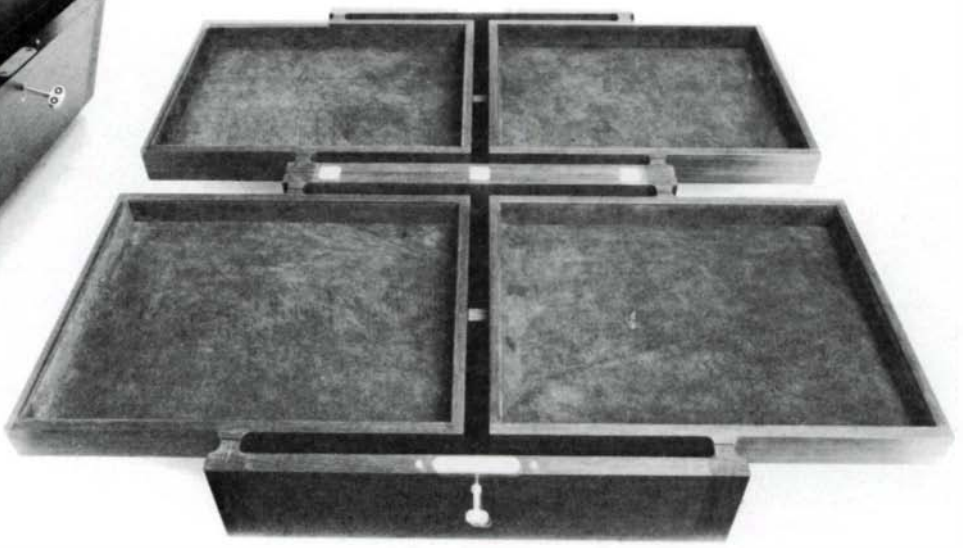
Ryan's pleasure in the boxes is designing them, figuring out the jigs, and wrestling with the machine, seeing what he can make it do. "The trouble," he confesses, "is really that I lose interest when I've made all the jigs and done the first one. My production pieces are never in that high a production, usually tens or twenties. I spend perhaps two or three weeks with a production piece, take it to a certain stage and then it gets left and taken on to the next stage later. There is never enough time between commissions to finish them." They are not, therefore, great money makers. Friends, steady clients and exhibitions take most of them off his hands.

Recently, Ryan has spent more time making furniture, a change from boxes that he finds stimulating. "Boxes are an isolated thing and fit into whatever scheme of decoration people have," he says. "Furniture has got to fit in with what is already there." At first glance, his chunky furniture seems much different from his precise boxes. But the same functional economy and attention to detail is there. Other ideas carry over, too. He doesn't want the wood to compete with the form, in boxes or furniture, so he builds table tops, for instance, of thin strips of wood rather than wide, figured boards.

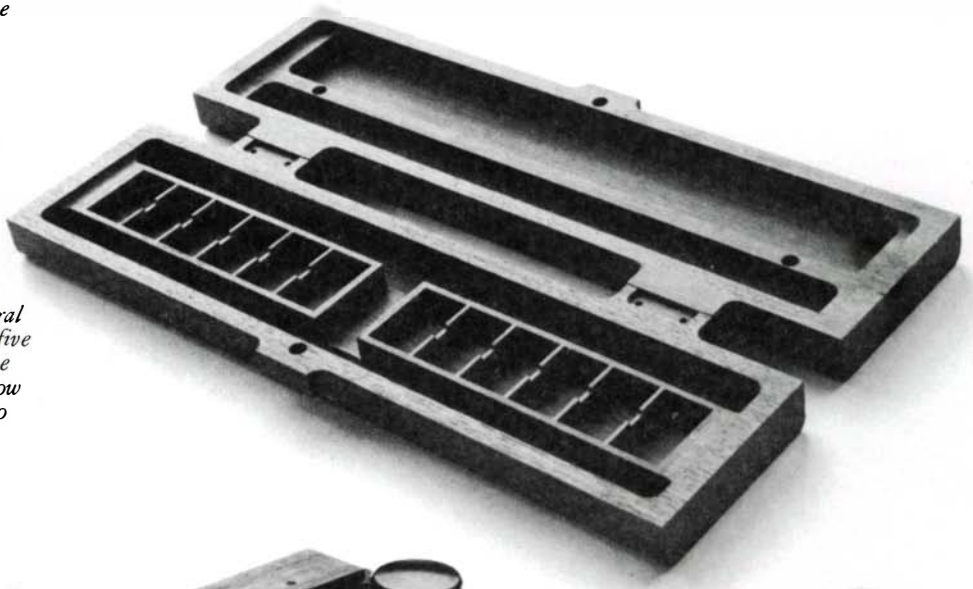
Ryan is interested in doing more with decorative effects, but he's wary of them. Game boards whose surfaces are necessarily decorative were an easy first step. "But I can't bring myself to use decoration much on furniture," he said. "I want to use a decorative surface without destroying the form. Perhaps I'm afraid of it and don't want to push too hard in case something strange comes out." He has firm beliefs about furniture, and if they seem old-fashioned, they are nevertheless sound. "You make furniture to be used. There are similarities with sculpture, painting, and so on, but I can't accept furniture that doesn't do what it should—be useful."

Ryan has been interested in furniture since he was a boy; after technical school, he studied furniture and industrial design at Beckenham Art College and at the Royal College of Art, where he received a masters degree in 1965.

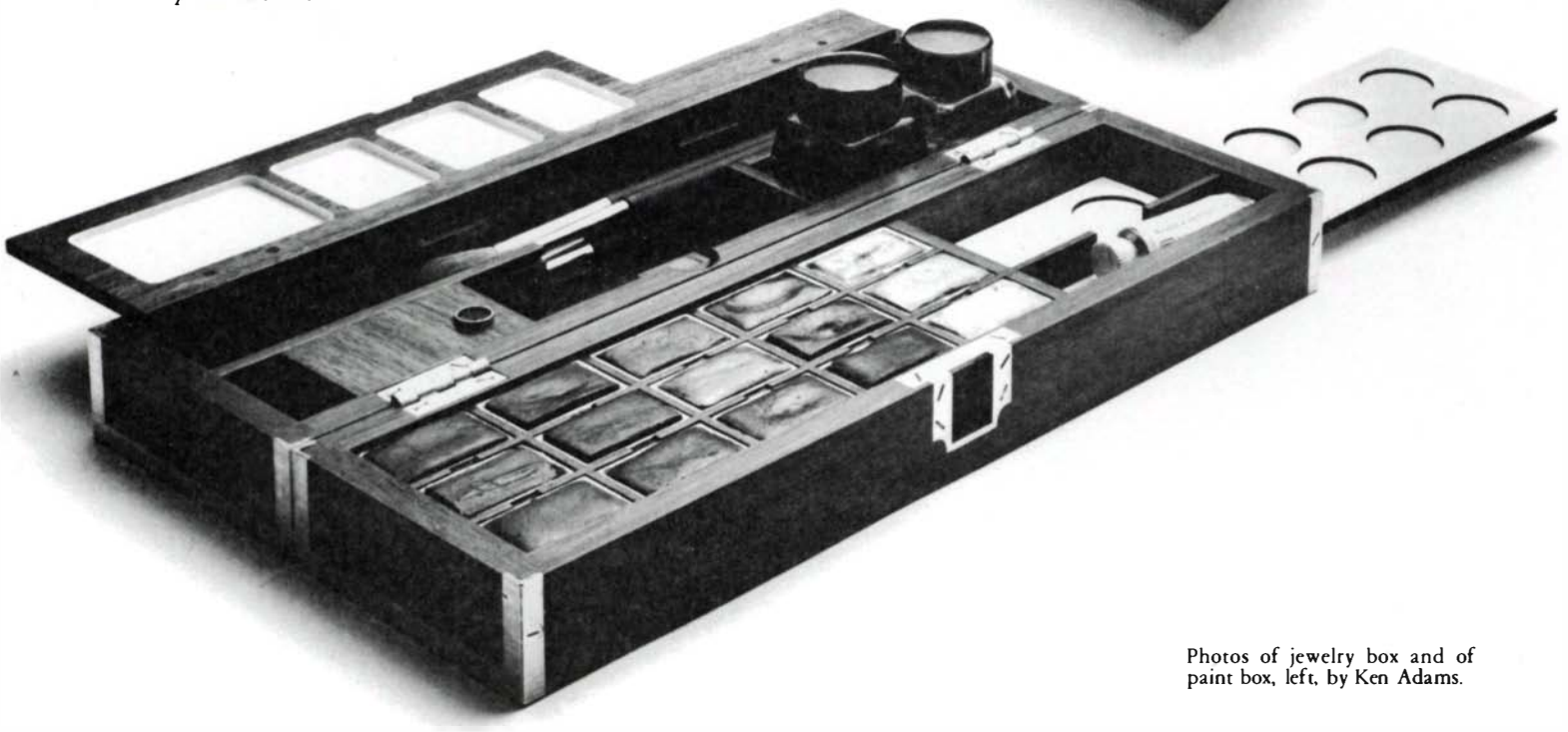
All this college training—eight years studying design—may seem odd to Americans who are more likely to knock together a bench, buy a few tools and open for business, picking up design and woodworking skills as they go. The British



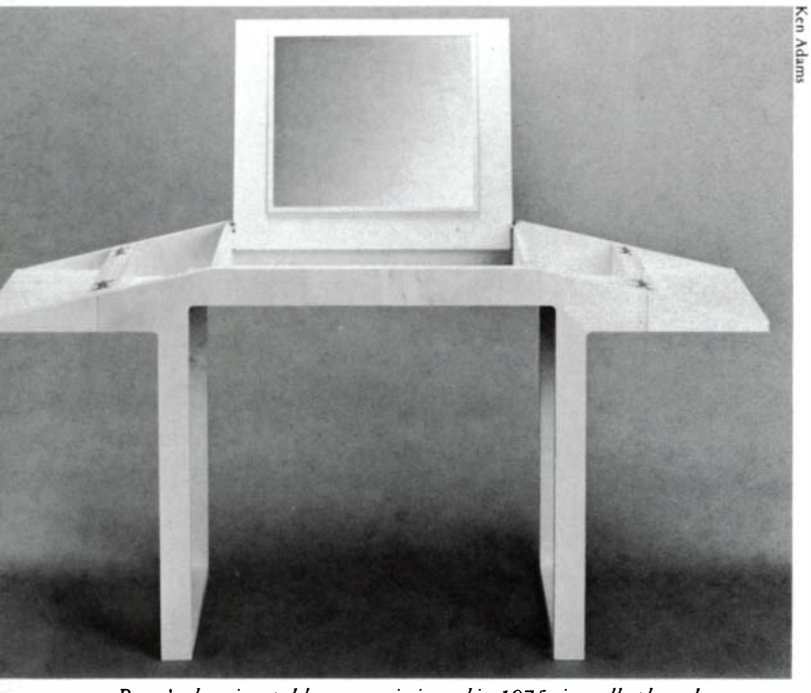
A museum in Munich, Germany, commissioned this rosewood box (19½ in. by 16½ in. by 9 in. when closed) to display as well as to store its changing collection of jewelry. Ryan wove the function of the box together with its appearance. The reveals on the end frames set off the panels against the seamless surface of the box. When the box is open, the upper of the two panels in each half can be removed, and the four trays positioned by brass pins. The curve echoes throughout the box: the coved rabbet bends around the mitered corners, the handles flow into the trays—even the hinges, lock plate and dead bolt are radiused.



The characters of production and of one-off work contrast in these two paint boxes made by Ryan. The one at right (unfinished) is his most complicated production piece, requiring several cutters, jigs, router-fence settings and about five hours to machine. It was designed to serve the basic needs of any watercolorist. The box below was commissioned by a professional painter to hold exactly what he needed for his tramps around the countryside. Though there is as much machine work in this as in the production box, it has more personality than the production box.



Photos of jewelry box and of paint box, left, by Ken Adams.



Ken Adams

Ryan's dressing table, commissioned in 1975, is really three boxes on a stand, but boxes and stand have merged—the rails of the stand are also the sides of the boxes. The table is 42 in. long when closed, 13½-in. wide, 29 in. high and is finished with cellulose lacquer.

have always followed a more formal path. Until the 1960s, many makers of craft furniture endured an apprenticeship of five or even seven years, or else spent several years as a paying student in a workshop. During the last twenty years, however, students from art and design colleges have chosen to make, as well as to design, for their livings.

Ryan was one of the first of this generation. A year in industry followed college and convinced him that making was as important to him as designing. "Industry was too restrictive," he said. "Designing on paper at drawing boards is like composing music that is never played. I strongly believe that you should design as much in the workshop as on paper, by making mockups and prototypes as well as finished pieces."

He is a self-taught woodworker and doesn't think of himself as a craftsman. He said, "I suppose designer-craftsman is the closest one can get to a classification. What fascinates me most is problem solving: linking the object's function to its appearance and juggling them to get the most exciting result with the least compromise."

Like many designer-craftsmen, most of Ryan's work is commissioned. "I think people like to buy something from the person who has made it," he said. "They are buying a bit of somebody's life, almost."

Today, at 41, Ryan is established and earns a living from his workshop. But it has been a long time coming. He subsidized his work for many years by part-time teaching, but he found that this proved to be a distraction that took the edge off his business drive. Each time he dropped a day's teaching his own work improved. Still, it wasn't until 1978 that he could afford to work wood full time.

I asked him about all the eager newcomers setting up workshops today, what were the prospects for them? He thought that a lot of them would fall by the wayside. "It's not just training you need, you have got to be right for it, it's more of a vocation. It's got to be a vocation to work for the money you get and the long hours you put in." He paused and continued, "Every job that I take on, I treat as if it is the one and only thing in my life, and I've got to do it to the utmost. This isn't necessary if you just want to make a living, but it is if you want to say anything. That is what I want to do—it is a means of expression, I suppose." Momentarily embarrassed by his own profundity, he fussed with his pipe and added with a smile, "though I don't know what it is I'm trying to say. . . ."

Whatever it is, his clients get the message: "One of the nicest comments I've received was from a client who said, 'You know, Des, every time I come down in the morning those objects of yours give me pleasure and I see something new in them.' All the effort that I had put into things that seem so simple paid off." □

Roger Holmes is assistant editor of this magazine. For more on pin routing see FWW *#29, p. 63.*

How Ryan makes hexagonal boxes

Ryan is a master at coaxing precise work out of his overarm router. His secret is accurate jigs. A jig may be just a piece of wood clamped to the router table or it may be a more complex construction that guides the cut by means of a template. Either way, careful preparation and set-up are essential.

Much of Ryan's work is pin-routed, clamped to a baseboard which is attached to a template. The template guides the cut by running against a pin set into the router table; the pin's centerline is the same as the cutter's above it. With a rise-and-fall table, this set-up is ideal for excavating solid blocks of wood to make boxes.

The little hexagonal box pictured here is made in batches of ten or twenty, and takes advantage of production economies even at that small scale. Ryan pin-routs the inside of the solid block, and routs the foot and the lid rabbet against a fence. He uses the disc sander like a milling machine to grind the outside surfaces of box and lid to size while keeping their edges sharp. The lid is about 1/64 in. undersize (for what Ryan calls a "rattling good fit"); it closes with a satisfying click. Here are some tips on making jigs like Ryan's.

Preliminary jigs: Use rough-and-ready jigs to test rough-and-ready designs. You can even nail or screw the prototype blank to the baseboard and make the template from wood—the jig will be used only once or twice. Work from the design to the jig and back again to eliminate small errors and inefficiencies—they make a big difference when repeated tens or hundreds of times.

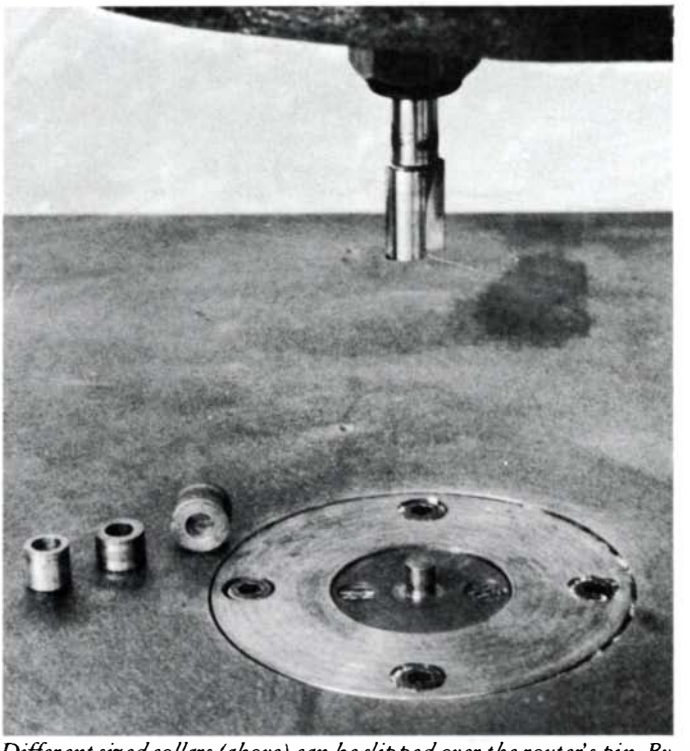
Production jigs: After the bugs have been worked out and the final design has been decided, make production jigs. They need not be expensive or complicated, just sturdy and accurate—they must produce exactly the same cuts time after time. Jigs should be heavy enough to help counteract the router's torque and large enough to keep hands well away from the cutter, but they should not be unwieldly. Chipboard is ideal for baseboards. The template gets the most wear; good template materials are mild steel and Formica.

The template size: The size of the template is determined by the sizes of the router cutter and the pin. If the pin and cutter are the same size, the routed shape or opening will be exactly the size of the template. If the pin is smaller than the cutter, a routed opening will be larger and an outside shape smaller than the template by the difference in their respective diameters. For example: A 1/4-in. pin and a 1/2-in. cutter will produce an opening 1/4 in. larger than the template. Likewise, a pin larger than the cutter will produce a smaller opening.

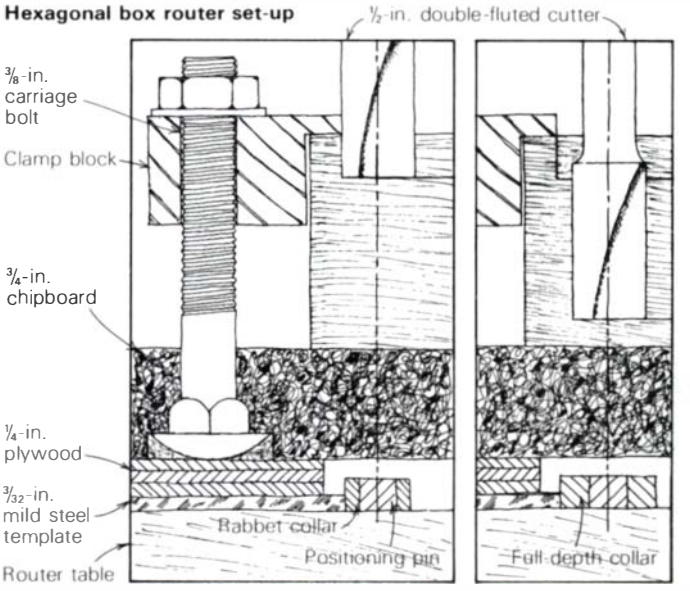
Pin collars: Ryan routs different sized openings in the same piece, without changing cutters, pins or jigs, by slipping collars of various diameters over a single pin. The smallest collar produces the largest opening, and larger collars produce the smaller openings.

The cutter: Ryan uses high-speed steel router cutters. A carbide edge lasts longer, but a high-speed steel edge can be honed. Sharpening a fluted cutter minutely alters its diameter, so check this regularly and alter the jig to compensate. Ryan hones both face and bevel of the cutting edges with a triangular Arkansas slipstone. He sharpens after every four or five boxes for such hard stuff as rosewood, to produce surfaces that require only light sanding or scraping to finish.

The design of this rosewood and amboyna hexagonal box takes advantage of the overarm router's production strengths.



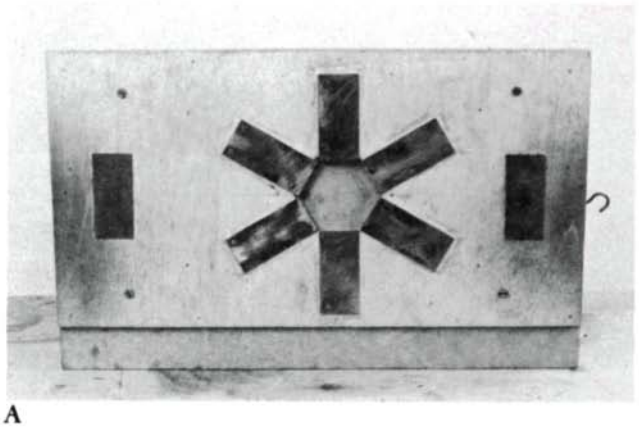
Different sized collars (above) can be slipped over the router's pin. By bearing against a template, they control the size of the rabbet or box opening as shown below.



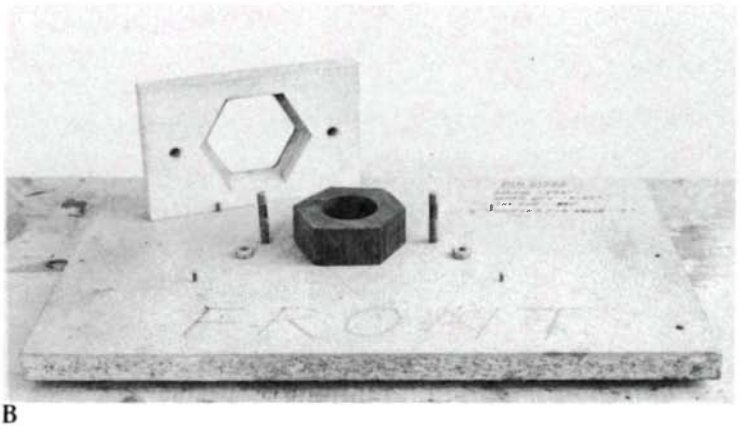
The jig

To make the router jig for his hexagonal box, Ryan started with the template. First he laid out the exact size of the template in the center of a piece of ¼-in. plywood. He positioned the 3/32-in. metal strips, each the width of a box side, and screwed them in place. Taking the strips off, he cut a slightly oversized hole in the plywood so the strips would project slightly beyond the opening. Next he screwed the strips back in place, tapping them into exact position. He ran epoxy glue around them to ensure against movement. Finally he flushed off the strips and screwed two additional ones at the two ends for stability (photo A).

To make the baseboard (B), Ryan positioned the clamping block and its two hanger bolts, transferring the template position to the baseboard top by measurement. The box blank must be held directly over the template, and the clamp bolts must clear the router, yet be close enough to exert direct pressure on the blank. Ryan bolted the hard maple clamping block in place, and routed out its center by guiding the template on the pin collar for the box's rabbet—the largest opening to be routed. Then he enlarged this hole to comfortably fit a blank, chopping to within ¼ in. of the clamp's top surface. The fit need not be tight—three chisel-pointed panel pins embedded in the baseboard keep the blank from twisting while it's being routed.



A



B

The box

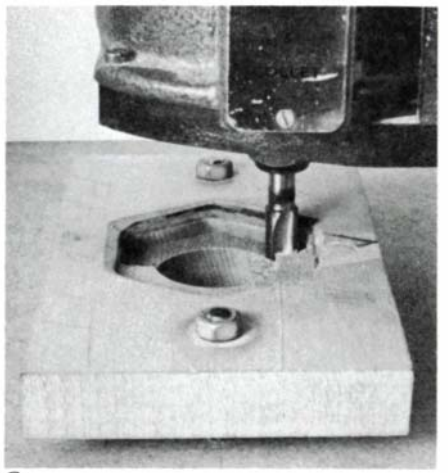
Ryan starts a batch of boxes by bandsawing the blanks about 3/16 in. oversize, from selected rosewood or walnut blanks planed to final thickness. He drills the waste from the center of each blank, then clamps it to the jig. He places the first (smallest) collar on the router pin and routs the rabbet for the lid to its full depth in one cut (C). Using the second (largest) collar and three depth stops, he routs the inside of the box to its full depth (D). Safe depth depends on the wood, the cutter size and sharpness, and on the power of the machine. With the final collar, minutely smaller than the second, he takes a finishing cut of a couple of hundredths of an inch to remove tears and burns left from the heavier cuts. As before, he goes to full depth in three steps.

All router work should be moved into the cutter against the direction of rotation, otherwise the cutter self-feeds and grabs the work. Sometimes difficult grain requires feeding in the same direction as the router rotates—in tough spots like these, Ryan hogs the waste in small bites and finishes by careful backcutting, making sure his clamps are tight and his hands well clear.

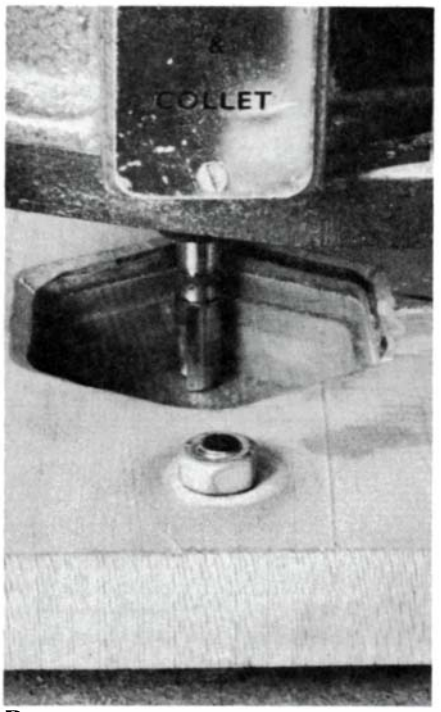
With the inside cuts completed, Ryan moves to the 12-in. disc sander to shape the outside (E).

The sanding jig is glued up from two pieces of ¼-in. plywood the exact size of the box rabbet, but one of them has radiused corners to fit the routed opening. Inserted into the box, the sharp-cornered piece forms the jig's template. It is pushed against a brass strip that is fixed to the edge of a board clamped on the sander's worktable. The distance between the strip and the disc determines the thickness of the box's walls.

Ryan sands around the box several times, taking care not to overheat the wood. When the boxes have all been sanded with 80-grit, he changes the disc to 120-grit and moves the board with the brass strip fractionally closer to the disc for a finishing pass.



C

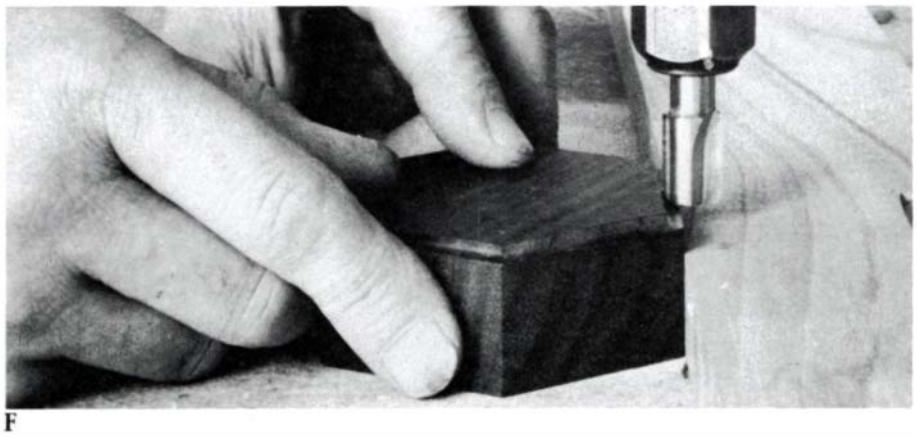


D

E

Back at the router, Ryan clamps a fence to the table, sets a depth stop and routs a foot on the bottom of the box using a double-fluted cutter ground to a very small radius (**F**). This completes the machining.

Ryan hand-sands the outside faces with two grades of fine paper glued on opposite sides of a flat board. He draws the box across the paper, taking care not to lose the sharp edges, then sands small, crisp chamfers. He removes small ridges on the inside with tightly-rolled sandpaper.



F

The lid

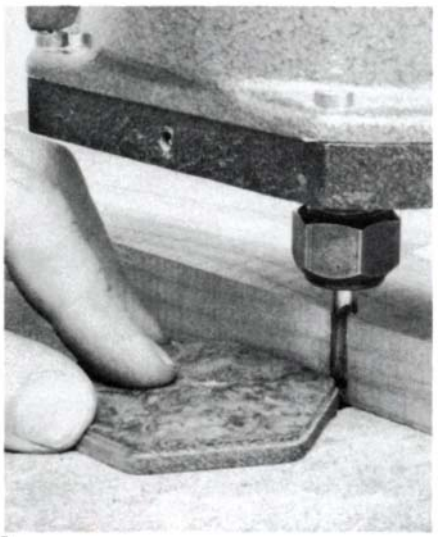
To make the box lid, Ryan planes, thicknesses and bandsaws to size solid padouk blanks, aligning the points of the hexagon with the grain direction. He veneers the blanks top and bottom with amboyna, the richly figured burl wood of padouk. After veneering, the lids are rough-sanded on the disc (**G**) to remove glue and tape—a difficult and risky operation when hand-holding such a thin piece.

G

He shapes the lid on the disc sander the same way he shaped the box. A plywood jig (**H**) is cut the exact size of the lid; it should allow for slight shrinkage in the box. A rabbet in the jig forms the template and lets the jig clear the brass fence and just touch the sanding disc. Small radii worked on the points on the underside of the template fit the lid to the box rabbet. Four tiny pins set in the jig hold the lid in place during the machining—their holes are lost in the wild figure of the amboyna.

H

On the router, Ryan works a decorative rabbet around the top of the lid (**I**), using the rounded cutter that routed the box foot. As he routs, he works around each corner with a series of small cuts, keeping the edge of the lid hard against the fence. Any difficult grain is back-cut—very carefully.



I

Next he routs a stopped rabbet on two adjacent sides of the bottom of the lid (**J**). Pushing on this corner pivots the lid on the rabbet stops and pops it up for removal. Ryan uses the same setup as before but moves the fence so the width of this rabbet will just exceed that of the ledge in the box. The depth remains the same. Pencil lines on the baseboard mark where to begin and end the cut. This rabbet starts $\frac{3}{16}$ in. from one point of the hexagon and moves through an adjacent point, ending $\frac{3}{16}$ in. from a third. It includes two sides that run across the grain direction of the veneered padouk so the thin division between the lid's upper and lower rabbets will be end grain and not weaker edge grain.

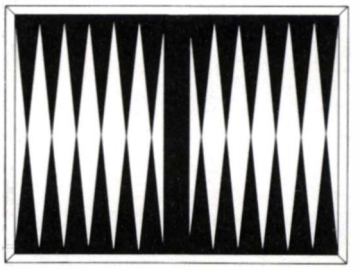
J

Ryan finish-sands the lid on the fine-paper boards and then he lightly chamfers its edges. Finally he wipes the box and lid with teak oil, keeping the oil clear of the bottom where the suede must be glued, then he stamps his name on the bottom. —*R.H.*

Backgammon Board

Solid wood and geometry instead of veneer

by John Boyland



The most common way to make a backgammon board is to cut veneers into triangles and diamonds and then glue them to a ground. The method is fairly easy and the results look nice, but for those who don't like working in veneers, the same project done in solid wood can be a challenge. If you have ever tried a solid wood backgammon board, you probably discovered as I did that it's almost impossible to cut 24 identical triangles and 12 identical diamonds individually. The pieces are just too small and the angles too acute to be handled safely, or with any accuracy. When you try to glue them up, the edges won't close for a tight, clean joint.

For almost a year I puzzled over a way to get all the pieces to come out right and finally concluded that cutting separate pieces wasn't the answer. I discovered the job could be done by using applied geometry.

The method I developed involves ripping boards of contrasting colored woods into strips, and then gluing them into a solid panel. This panel is then ripped at an angle into bias-cut strips which, when crosscut to the proper length, can be glued up to make the finished playing board.

1. I begin by making a full-scale layout of the board; its overall dimensions are 19½ in. by 26 in. For a board having triangles with 2-in. bases, the best angle for the sides is 84°, as shown in figure 1. You can alter the size of the board, but be sure to measure the correct angles for the triangles from the full-scale layout for that size board. When laying out, the points of the opposing triangles must line up.

Next, select your 4/4 stock from woods of contrasting colors and compatible shrinkage and expansion rates, such as cherry and poplar or walnut and ash. Rip the stock into eleven strips 46 in. long and joint them to exactly 2 in. wide. You can skip jointing them by sawing with a planer blade or smooth-cutting carbide-tipped saw. Take care to hold the stock against the fence, and feed it smoothly to avoid saw scoring and burning.

2. Pieces cut, glue them into a single panel. To minimize waste and compensate for saw kerfs in re-ripping, stagger them at 12°, as shown below. The outside strips are shifted to provide a foot for clamping. After I've dry-clamped the assembly and checked it for fit, I strike a pencil line to index the pieces for final glue-up.

Fig. 1: Layout for board triangles

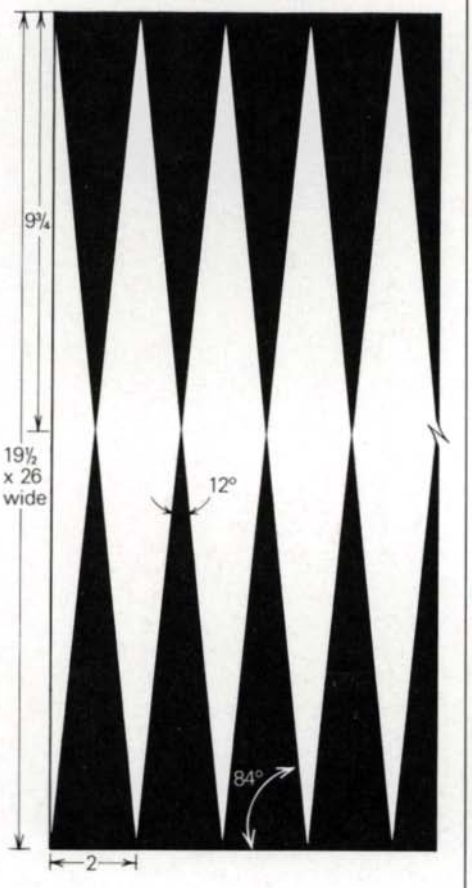
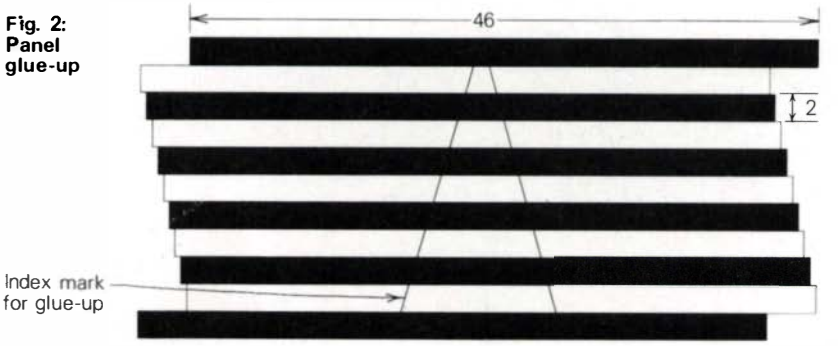
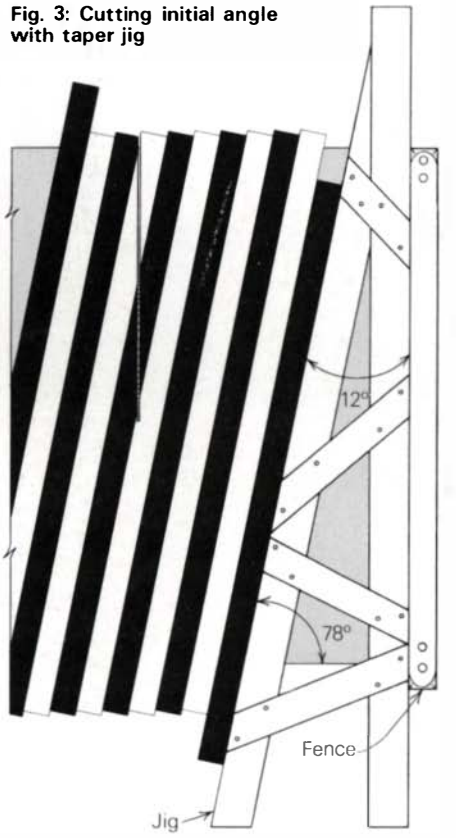


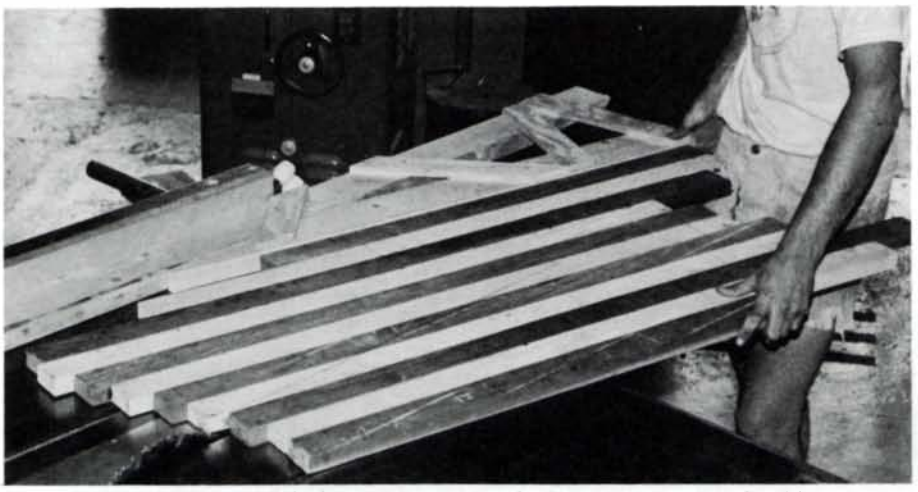
Fig. 2: Panel glue-up



3. While the glue is curing, make a taper jig for re-ripping the strips. For the size board I use, the re-rip angle is 12° measured from the fence, or 78° measured from the front of the table. You can use any type of taper jig to cut the angle, *FWW* #9, Winter'77, p. 37 shows one. Before ripping the glued-up stock, map out all the cuts to make sure you will end with enough pieces—the location of the first rip is critical. I begin, as shown below and in the photo at the top of the facing page, near the glue line between the eighth and ninth strips from the fence.

Fig. 3: Cutting initial angle with taper jig





Use a 12° taper jig to establish the initial angle for the bias-cut strips. Rip should begin on a glueline between the eighth and ninth strips, halving the panel.

Fig. 4A: Ripping bias strips

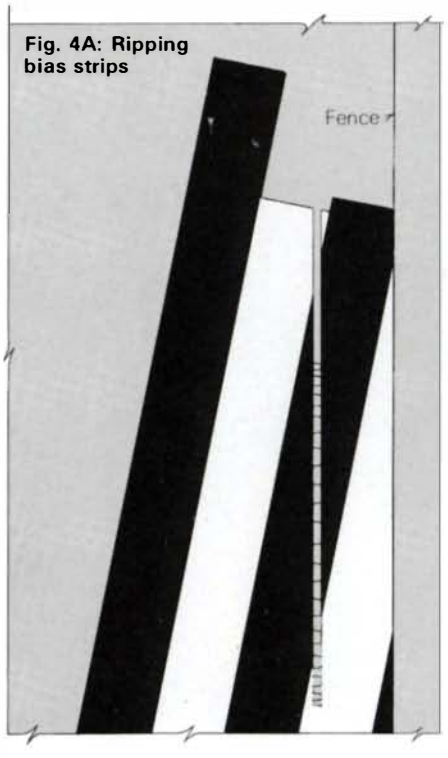
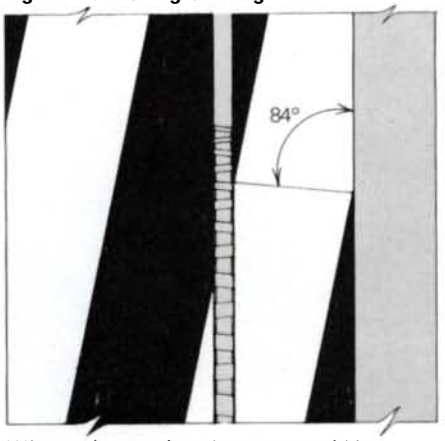
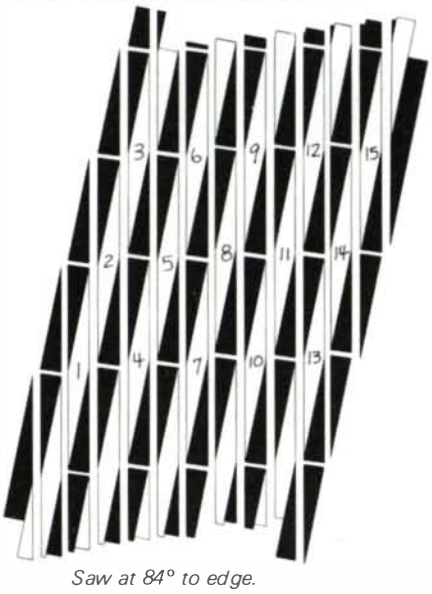


Fig. 4B: Checking the angle



When strips are ripped to proper width, diamond points will align at 84° to edge.

Fig. 5: Crosscutting strips to length



Saw at 84° to edge.

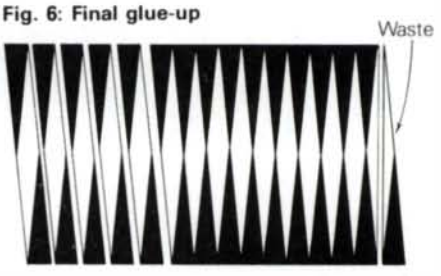
4. After making the angled cut, put the jig aside, then rip in the normal way, as shown in figure 4A. You will cut the panels into bias-cut strips about 2 in. wide, producing a series of alternating light and dark diamonds.

The fence setting is critical if the tips of the playing triangles are to line up. Check the first piece you rip. Instead of measuring the sides of the diamonds, connect the points of two dark diamonds across a light diamond. I use a protractor to check that this line falls at an angle of 84° to the edge (figure 4B). If the first piece checks out correctly, the fence is set to the correct width, and I go ahead with the ripping. Otherwise I readjust the fence until it's right.

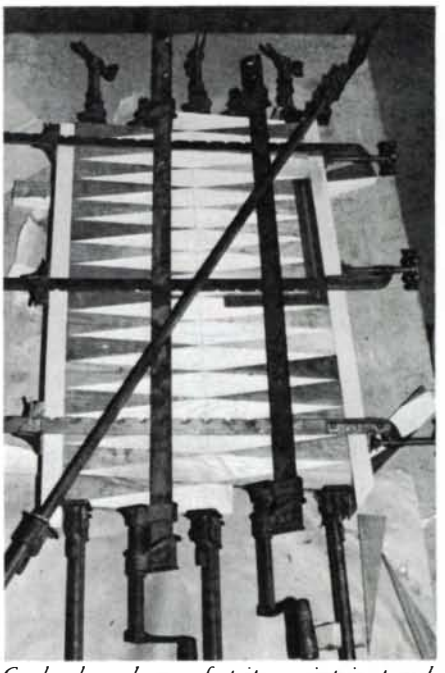
5. To produce the dark playing triangles, cross-cut the strips through the dark diamonds. The cross-cuts must be at 84° to the strips' edges (figure 5), and the finished strips must be the same length. The tips of the diamonds get nipped, but I add a molding to the finished board that covers them. The cross-cutting should yield 15 bias-cut strips. Only 14 are needed, but I glue all of them and trim off the excess later.

6. Cutting complete, the strips can be arranged in the proper order (figure 6), and dry-clamped for fit. I use clamp cauls running along the base of the playing triangles on each side of the board; this keeps the assembly from sliding along the glue lines as pressure is applied. Waxed paper or newsprint between the cauls and the board will prevent the cauls from sticking during assembly. A diagonal clamp is used to square up the board (photo, below).

Fig. 6: Final glue-up



A. Assemble 15 crosscut strips. *B. Glue up.* *C. Trim to yield 13 playing triangles.*



Cauls along bases of strips maintain panel alignment during glue-up. A diagonal clamp must be used to square the assembly.

7. Once the glue has cured, the clamps can be removed and the board trimmed square to yield 12 playing triangles, plus one extra in the middle to be covered by the bar. To clean up the glue lines, you can pass the assembly through a 20-in. planer if you have access to one, or you can plane and sand it by hand. After clean-up, the board can be halved and hinged, or mounted in a table. If you set the board into a frame, be sure to leave enough room in the frame's groove for seasonal movement. □

John Boyland teaches industrial arts in Orange, Va. Photos by Jimmy Abbott.

The Appalachian Dulcimer

How Warren May makes traditional instruments

by Billy F. Best

Visitors walking past the Upstairs Gallery in Berea, Ky., are likely to hear dulcimer music. The player, and the instrument maker, is Warren A. May, who has been making dulcimers for nine years. Because there is no definitive standard, dulcimers tend to be one-of-a-kind projects that allow the maker to take advantage of available sizes of wood, and to vary the overall shape, the decorative scroll carving, the shape of the sound holes, and even the number of strings. Four years ago, when he was making instruments at the rate of two per week, May realized that certain shapes and sizes no longer varied from one to the next. He'd settled the length of the fretboard and its fret spacing, the shape and size of the pegbox, scroll, and tailpiece. Why, he asked himself, was he still making these parts one at a time?

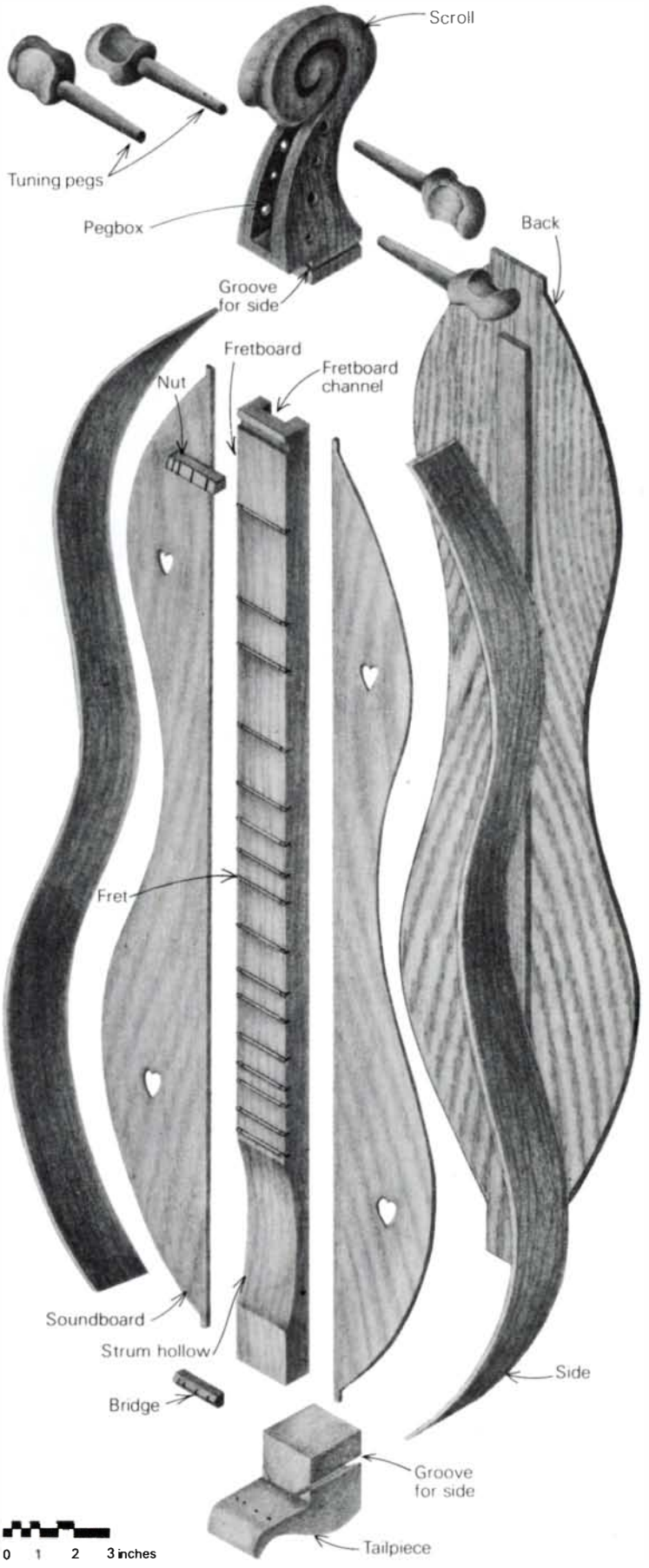
By applying production techniques, jigs, and time-saving ingenuity, he figured he could make more, and better, dulcimers. May will make about 400 instruments this year, yet finds he has more time to make music as well. By building around a standard framework (composed of pegbox, tailpiece, and fretboard), and by making multiples of only those other parts of the instrument that don't change, May frees himself from routine tasks, finds time to search out unusually figured wood, and can custom-build body shapes to suit individual customers' preferences. If he has a fine piece of spruce a little wider than usual, he won't cut away good wood, he'll just make a wide dulcimer.

What follows are some of the ways May has improved both the production and the musical quality of his instruments, without compromising his freedom to design.

May has established a straightforward routine for pegboxes: He squares up the stock, bandsaws the rough shape, and tablesaws the tapers. He drills out the channel with a Forstner bit, then forms the scroll with a router-equipped pantograph. Then he rounds the edges with a router, flap-sands, and takes his time carving the finishing touches with a penknife.

Cutting the grooves for the frets is an exacting job. They have to be correctly spaced, or the instrument won't play in tune. They have to be the right depth and width, else the fret-wire inserts won't fit properly. Instead of cutting the grooves one at a time, May uses a home-made gang-saw based on pillow blocks, with a sliding table made with drawer glides (photo, facing page). A saw-sharpening shop ground the teeth of the inexpensive 4-in. blades (from Sears) to make a 0.020-in. kerf for the fret wire. The next time he changes blades ("It only runs four hours a year. . ."), May plans to use industrial quality. One extra-thick blade cuts the groove for the nut. This rig can saw two fretboards per minute. May channels the underside of the fretboard as far as the strum hollow with a dado saw. Then he shapes the strum hollow with a bandsaw and a standing belt sander.

Any bandsaw would do to make the tops, backs, and sides, but May converted a 3-HP meat bandsaw that lets him deal



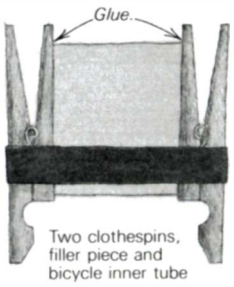
with difficult woods (like the poplar timbers he salvaged from a 100-year-old house in town) without bogging down.

Instead of beading the overhanging edges of the top and back with scrapers and carving tools, a 45-minute job that risked catching grain, or slipping and drawing blood, May uses a Dremel tool as a router. The sharpening shop reground a carbide router bit to May's design. Then May had the shank turned to fit the Dremel. Now the beading takes four minutes, and even a curly maple top is no problem.

May has abandoned full-instrument jigs. He feels that he gets better joints by free-clamping the parts of the instrument. This method allows him to vary body shapes easily, even though the length of the instruments remains the same.

May glues the two pieces of the soundboard to the channeled fretboard, forming a stiff, hollow-bottomed assembly. He bookmatches the back by jointing the glueline, taping the pieces together on the outside, and setting them up on the bench like a shallow tent, with the tape on the bottom. They are held in position by nails around the edges. When the tent is pressed flat by a weighted board, the nails spring the joint tight. This works with any size board and any irregular shape. When the top-assembly, back, pegbox and tailpiece are glued together, they form an open-sided framework.

The bookmatched sides are all the same depth and thickness because they must fit the standard grooves in the pegbox and tailpiece, but their length can vary according to the size and shape of the body. May soaks and overbends each side on an adjustable form made from a piece of plywood with dowels inserted to hold the sides upright. Finishing nails (covered with plastic straws to protect the wood from stains) are driven into the plywood to outline the shape. The exact shape isn't critical. May inserts one end in the tailpiece groove, then clamps and glues his way toward the pegbox, wiggling-in the bent sides as he goes. He clamps them in place with spring clamps which he alternates with clothespin clamps he makes in his shop (left). When he gets near the pegbox, he estimates the length needed to fill the groove, cuts off the waste, and slips the side into place. This operation determines the final shape and the strength of the finished instrument, so May takes his time here, averaging about ten minutes per side.



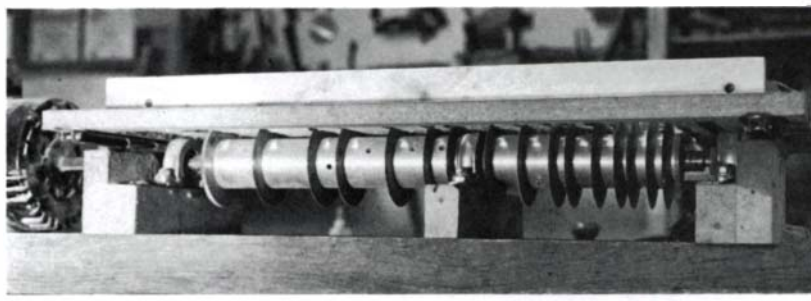
May has found that innumerable glue blocks around the sides are unnecessary, so he uses them only at points where the side is liable to spring in during glue-up. He uses interior bracing only around sound holes (where edges might catch on clothing), and in extra-wide instruments where he feels the back is bound to bow. "If they'd bow out," he says, "it would be all right, but when they bow in, they look terrible."

He chooses not to use lining around the inside. He finds it unnecessary for strength, and the absence of it frees the soundboard for easier, more responsive vibration. "Overbuilt instruments," he says, "can sound clunky."

Tuning pegs and their corresponding holes in the pegbox are tapered to a wedge fit, so the string will hold its tune. May rough-turns his rosewood pegs (or keys) and trues the tapers with a violinmakers' matched reamer and peg-cutter set, which assures smooth tuning. The set costs $50, but it speeds the work and assures uniform tuning on every instrument.

May uses two coats of sealer and two of lacquer on each dul-

Warren May details the scroll of a dulcimer with a penknife, after a series of jigs and machines have produced the basic shape.



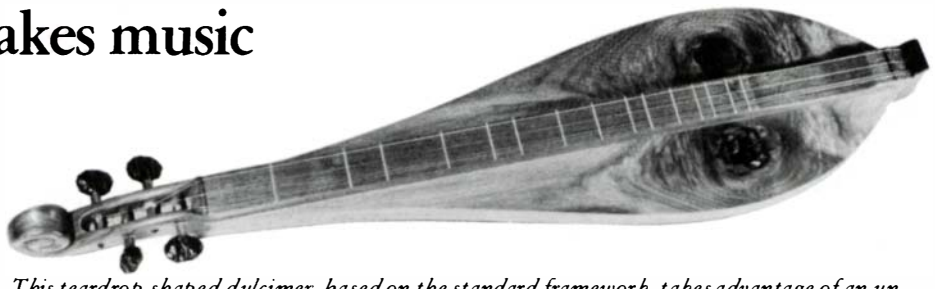
May's gang-saw, above, is a shaft running in pillow blocks, with blades ground to the width of the fret wire. The top is a sliding table made from plywood and drawer glides. Different-sized inserts can adjust the spacing of the blades. One pass will make all the cuts on May's standard fretboard, guaranteeing uniformity and accuracy. Below, May dry-clamps the framework, which is composed of the tailpiece, back, pegbox, and the fretboard-top subassembly. He wiggles-in the sides after the framework has been glued up. The plane merely steadies the pieces while May sets the clamps.

cimer. The second coat of lacquer can dry too glossy, out of place on a traditional instrument, but still a finish is necessary to protect the wood. May's solution is to polish the final coat with 0000 steel wool, using paste wax as a lubricant, which quickly produces a smooth, satin glow.

He uses yellow glue for most joints, and high-resin white glue for the sides, instead of the tricky (he says "undependable") hide glues that most instrument makers use. When it was pointed out to him that this would make the instruments harder to take apart for repair, May countered: "What repairs? I don't anticipate any. I've never had a joint come open, and there's nothing inside to come loose. My instruments all have a lifetime guarantee." □

Bill Best runs the Upward Bound program at Berea College in Ky. Photos by Steven Bradford.

How a dulcimer makes music



This teardrop-shaped dulcimer, based on the standard framework, takes advantage of an unusual piece of wood with naturally-formed soundholes. Photo: Frank Hudson.

A stringed instrument without the refinements is just a box that you can't open. Here are some of the details May has noted after years developing his traditional dulcimer design.

May uses five woods. His favorite dulcimers are made with quartersawn spruce for the top, and cherry for the back and sides. He likes the combination of volume (from the cherry) and tone (the spruce). When he builds an instrument from one wood, he'll use sapwood or lighter textured wood for the top, heartwood for the back and sides. The lighter wood responds to the string vibration, and the heartwood reflects the sound and resists the dampening effect of the player's body. He says walnut is the customers' general favorite, because it has a smoother sound than cherry, which he likes for its brightness. Curly maple has a smaller sound than cherry, but it's clean and crisp. Mahogany and poplar are his other standards. If you mix woods at random, May cautions, you can end up with an unmusical, hard-to-tune instrument.

When May uses a hard wood like curly maple for the top, he reduces its thickness so it will respond more easily to the strings. His tops are usually 3/32 in. thick, as are the backs and sides.

By channeling the fretboard, it is lightened (allowing the string vibration to pass through) without losing stiffness. The narrow gluing area also allows the top to vibrate freely. If you don't use a lining around the sides, you don't have to worry about binding and purfling *(FWW #28)* to restore the top's responsiveness at the outside edges.

String weight determines ease of playing and volume. May uses a bass string of wound 0.022-ga. steel, and three top strings of 0.012-ga. plain steel; guitar and banjo strings work fine. The strings are tuned G-G-G-C. The two bottom strings (farthest from the player's body) are drones, sometimes chorded. The melody is played on the top strings in unison. Notes are fretted with the fingers, or with a "noter," a stick used to press down the strings.

May plays his music in the traditional Appalachian style. He grew up in a log cabin with nine brothers and sisters, and has learned to play so well that the sound of his music pulls passersby into his Upstairs Gallery, in Berea. Although he's familiar with some of the other directions dulcimers can take (different bridge placements, soundposts, more frets) he feels that these distort the natural dulcimer sound and harmony.

He strums his instruments high up on the fretboard, close to his fretting hand. There's a reason for this style: since the string vibration travels to the soundboard at both ends (because of the construction of the instrument), the closer to the middle you strike the string, the purer the tone. When you use a pick, though, you play over the strum hollow, so you don't scratch the fretboard.

Pegbox design is trickier than it looks, because the strings must clear the wood as well as each other, otherwise tuning is an uncertain chore.

The length of each string determines its pitch. You can choose spacings for the tempered scale used on pianos and guitars, which averages out the correct spacings for different musical modes, or you can choose one mode in favor of the others. May has settled on Ionian mode spacing as the best suited to his kind of dulcimer music. This spacing is shown at the bottom of this page.

String height depends on the depth of the notches in the nut and bridge. The important thing to keep in mind is that if strings are too high, they'll hurt your fingers, and if they're too low, they'll buzz on the frets. The nut should keep the unstopped strings as low as possible without allowing buzzing (file the notch too deep, though, and you need a new nut), and the bridge should be high enough to keep the strings about 3/16 in. above the bottom fret. Frets can be adjusted and trued with a file so they're even.

The bridge floats on the fretboard; thus you can cant it down on one side (the bass strings are made longer) to keep the different weight strings in tune.

When you evaluate a dulcimer, remember that performers may look for volume and carrying power, but the average player wants a more intimate character. May recommends that you try out an instrument in a room like the one you'll play it in, or you won't hear its true sound. —*B.F.B.*

For more fine-tuning and different points of view, read Foxfire 3 *(New York: Doubleday, 1975); Hines,* How to make and play the Dulcimore *(Harrisburg, Pa.: Stackpole Books, 1973); and Harris,* Notes on Dulcimer Making *(Okla. City: Bois D'Arc, 1977).*

Fret spacing for the Ionian mode — ¼ scale

Old Finishes

What put the shine on furniture's Golden Age

by Robert D. Mussey

Finishing is the least studied and most inaccessible aspect of our antique furniture heritage. The proportions and workmanship of a Philadelphia highboy are direct and observable manifestations of the skills of its maker. But what of its finish? Is the mellow patina, much admired today, anything like the finish that left the workshop 200 years ago?

We can't learn much from the pieces themselves. Most museum conservators agree that perhaps only one percent of our antique furniture bears indisputable remnants of its original finish. Scientific tests may inadvertently detect later refinishings or modern materials indistinguishable from the originals: there's no way to tell new beeswax from old.

When we turn to historical documents, much obscure, ambiguous or mysterious material conceals the pearls of hard information. The old craft guilds guarded their trade secrets as closely as the independent finishers who proudly, and loudly, announced the discovery of the "perfect" finishing potion. Formularies, cabinetmakers' and varnishers' account books, bills, histories and dictionaries of the period are difficult to interpret. Account books, for example, so rich in information about woods used and prices charged, say little about finishes. When materials are mentioned, the names vary from region to region: 25 different words may describe just one material. And more than 200 different resins, oils, fillers, waxes and pigments were used in 18th and early-19th-century furniture finishes.

It is equally difficult to say who did the finishing in 18th-century American workshops. I haven't found a single reference to finishers in any of the hundreds of account books I have examined. Finishing was not a specialized trade in the U.S. as it was in Britain, though there were one or two well-known specialists in large cities, like Thomas Johnson in Boston, who did Japanning, graining, marbleizing and gilding. Fancy painting, as on the Baltimore chair, was done by fine-art painters. It seems probable that cabinetmakers, particularly in small shops, did their own finishing, aided by various guide books and formularies.

I have spent the past five years negotiating these obstacles, comparing and analyzing some 5,000 documents, reformulating many of the recipes for stains, dyes and finishes, and applying them using original methods to see how they work and to watch how they age. I have placed more emphasis in my research on books that were frequently reprinted. An often-reprinted book was probably a popular one with working craftsmen. The first furniture-finishing guidebook known to have been printed in America, *The Cabinetmaker's Guide*, (Greenfield, Mass., 1825), was reprinted numerous times, and parts were pirated for other books throughout the 19th century. The *Guide* was pocket-sized, easy to use. I have two copies, from 1827 and 1837, both are dog-eared, paint-splattered and muddied—signs of a well-used book.

I have formed some broad conclusions from my research; several of these have surprised me. I started out wanting to prove that shellac and French polishing were widely used during the 18th century. Instead, I discovered that French polish was not invented until about 1810, and that oil and wax were the predominant finishes of the period, favored even on many high-style pieces. And I found that the finish that left the shop was not mellow and glowing, but probably brilliantly colored, bright and shiny.

Stains, dyes, oils and waxes will be discussed here, limited to the period 1700 to 1830. Before that time, references are too scattered to be of use, and after 1830, mass production, chemical advances and burgeoning world trade profoundly changed furniture finishing. I'll discuss the varnishes of the 18th and 19th centuries in a subsequent article.

Surface preparation—The quality of the piece determined how much surface preparation it received. No elaborate smoothing practices were used on common pieces, and many table tops clearly display the corrugations left by hand planes. Finer furniture required more careful preparation. Andre Jacques Roubo's three-volume treatise, *The Art of the Woodworker* (Paris: 1769-74) suggests this elaborate sequence for veneered and marquetry pieces: smoothing planes followed by a variety of hooked cabinet scrapers, a hard rub with bundles of rushes (shave- or saw-grass), abrasion with solid pumice-stone blocks lubricated with water, further abrasion with sealskin, and finally, burnishing with slightly rounded blocks of hardwood.

The Cabinetmaker's Guide recommends glass-papering the surface after careful scraping. The author complains that glass-paper was being cheapened by adding sand, then gives his own instructions: pulverize broken window glass in an iron mortar, put it through sieves of appropriate fineness, and sift onto the glue-covered surface of heavy cartridge-paper.

Early in the 19th century, many recipes appeared using plaster of Paris, "hartshorn", and other natural clay-like materials to fill open grain before finishing. These could be dyed or stained and were mixed with a binder such as linseed oil or honey. Such fillers were previously used only on Japanned and gilded pieces where intensely pigmented varnish-paints were laid over a thick filler-ground. If clear finishes were applied over plaster-type fillers, the stain would eventually fade, and the filler would appear as unsightly white speckles.

In an earlier grain-filling method, the surface was covered with a thin coating of linseed oil and then abraded with a flat block of solid pumice stone. With enough pressure the resulting paste of oil and fine wood dust would at least partially fill the grain. After dyeing, the excess was wiped or scraped off.

Coloring—Craftsmen of the 18th century experimented with a vast range of materials for coloring wood and wood finishes. Documents of the period complain that colors "flee with the

light," and the search for permanent natural pigments and dyes, not only for wood but also for fabrics and paints, spawned an entire industry and vast "scientific" research. The American colonies were a major source of colorants, such as logwood, indigo, oak bark and walnut bark, all of which were exported in quantities of hundreds of tons.

Craftsmen then used the terms "stain" and "dye" as imprecisely as craftsmen today. We define "stain" as a thin layer of colored pigment lightly penetrating the surface of the wood. "Dye" is any substance producing color changes by chemical reaction with the wood fiber or by diffusion of the colored dye-stuff deep into the cellular structure of the wood. Most 18th-century stains and dyes would have colored the wood in several ways at once. Stains with strongly acidic vehicles, like uric acid, or stains containing material like iron filings, would have colored by chemical reaction as well as by pigments contained in the stain. Likewise, many dyes contained pigments, which lodged in the wood fibers.

The Cabinetmaker's Guide distinguishes stain from dye by degrees of penetration: "Staining differs from the process of dyeing, inasmuch as it merely penetrates just below the surface of the wood, instead of coloring its substance throughout, as it does in dyeing; and the one is used for beautifying the face after the work is finished, while the other is employed on the wood before it is manufactured, in the state of veneers, to be cut into strings or bands. . . for inlaying borders. . . and which has of late years got much out of use, principally owing to the fault so much complained of, of the colors flying. . . ."

Nearly all the stains and dyes of the period were extremely fugitive by modern standards. Some would not have lasted more than a few years. Often a museum piece displays only the faded glory of the finisher's art. Red and yellow colorants, frequently used, faded quickly. Brown stains, mixed with reds, greens and blacks, soon faded to the faint green tint we see today on some antiques. I have found bright red areas preserved beneath the brasses of mahogany pieces, a far cry from the brown, red-brown or yellow-brown stains used for period reproductions. Some of my reformulations of original mahogany stain recipes come close to this brisk hue.

There is strong documentary evidence that staining of furniture before finishing was much less common in the 18th century than we assume. Thomas Sheraton, in his 1803 *Cabinet Dictionary*, wrote, "The art of staining wood was more in use at the time when inlaying was in fashion; . . . at present red and black stains are those in general use." It is also possible that staining was more common in America than in England, but the documents I've examined from throughout the colonies infrequently mention staining and staining materials. Rural cabinetmakers may have used stains more often than their city cousins. Rural clients couldn't afford the finely figured woods or expensive mahogany favored in high-style Boston or Philadelphia work. So exotic woods were imitated by graining, mahoganizing and staining, or they emphasized the wild grain of a favorite wood, like tiger maple.

Nearly all colorant formulas were based on water or alcohol. These have great clarity and penetration, and deeply accentuate the structure and figure of wood. The rather muddy oil-based-pigment stains common in today's hardware stores were unknown in the 18th-century finishing shop. Likewise, only a very few period stains resemble the modern class of chemical stains, in which colorants or acids in the wood react with chemical counterparts in the staining solution.

More than one hundred different materials were used in the 18th century in the making of stains and dyes. These range from the exotic to the mundane—like old files or walnut husks in solutions containing vinegar, urine or wine. The *Cabinetmaker's Guide* calls for chipped logwood, a source of a valuable red-black dye, verdigris (copper acetate), copperas (iron sulphate), and barberry root among other ingredients for dyes. Stains might require archil, a Canary Island lichen, or dragon's blood, a resin from the fruit of the East Asian rattan palm. A red stain was made from brazilwood extract soaked in quicklime slaked in urine and painted hot onto the wood. If the customer only knew!

Attempting to give more brilliant lightfast colors, many of the recipes used such strong vehicles as sulphuric, muriatic or uric acids. Unfortunately these acids contributed to the decomposition of varnishes applied over the stains. The resins and oils used in the 18th-century varnishes were very sensitive to acids and alkalies, and may be rapidly degraded in reaction with these. This helps account for the survival of so few original varnish finishes.

Besides staining and dyeing the wood directly, finishers also colored the spirit varnishes they applied to the wood. Used to match the colors of diverse woods or to improve drab wood, they were called "changeing varnish," and were colored with various unusual substances as well as with wood chips and bark of oak, chestnut, walnut or sumac. Similar mixtures applied to tinware, brassware or furniture brasses were called "lackers." Shellac was the dominant resin in these "lackers," its reddish or golden color heightening the golden effect desired from brass. Shellac is a spirit-soluble resin that polymerizes significantly, the process speeded by heat. Shellac-based "lackers" were often baked onto metals, giving a very hard, lustrous surface, resistant to oxidation, discoloration, and the formation of copper acetates. Original furniture brasses were probably bright and "brassy," not at all tarnished like those favored on today's reproductions.

Finishes—Once the wood surfaces were leveled, smoothed, filled and stained, one of several types of coatings was applied. These fall within four broad categories: oil finishes, wax finishes, varnishes, and combinations of these.

Eighteenth-century writers on finishes list a whole array of criteria for the ideal finish: preservation of the wood from decay and insects, preservation of the color of the wood, and exclusion of atmospheric moisture. It should also be hard, shining, transparent and flexible, should not yellow or crack with age or turn white with spills, and it should hold up to hard use. The same qualities are sought by coatings manufacturers today, and no finish, then or now, fills the whole bill. Finishers experimented with an amazing range of materials in the 18th century, and some of their solutions were excellent. Indeed, some are still used today.

Since ancient times, craftsmen have known that various animal, vegetable and seed oils help to preserve wood. A wide selection of these was offered for sale by American merchants and manufacturers in the 18th century. Linseed (flaxseed) oil, the vehicle for most housepaints, was by far the most frequently used furniture-finishing material. Poppyseed and walnut oils were preferred for their light color and transparency, but they were expensive. Since the men who finished furniture were also gilding picture frames, Japanning tea waiters and painting houses and carriages, it is not surpris-

ing that, where possible, they used the same materials throughout their work.

Linseed oil finishes were widely used—despite their disadvantages: they were not durable, waterproof or alcoholproof, and they darkened with age, though they were repaired easily with fresh oil and some rubbing. Free from tariffs imposed by the English, both boiled and raw linseed oil were cheap and widely available. In lists of hundreds of furniture types, several influential English and American trade price-books quote prices only for oil finishing and polishing.

Pressed cold, linseed oil has a very light color; pressed hot, it is more plentiful, but considerably darker. To bleach out this color, fresh-drawn linseed oil was placed in shallow pans or bottles in the sunlight. Alternatively, the solid impurities were precipitated by adding fuller's earth (a naturally occurring aluminum silicate) which absorbed the brownish coloring matter. Egg-white was sometimes added as a purifier.

Linseed oil dries very slowly on its own. Coatings of raw oil may remain tacky for years. Over centuries, many methods had been tried to make it more siccative, or fast drying. In the late Middle Ages, the oil was merely boiled. Later, burnt horn and bone, garlic, powdered lead-crystal glass, or alum were added to the boiling oil to try to enhance its drying properties. Most recipes of the 18th century employed lead com-

French polishing with wax

Andre Jacques Roubo's *The Art of the Woodworker* was published in Paris between 1769 and 1774. Although it's out of print this excellent book is available in French at major libraries. Roubo, a master craftsman, set down detailed accounts of carpentry, carriagemaking and furnituremaking, illustrated with hundreds of engravings. This plate shows the methods, materials and tools used in finishing the finest veneered furniture, called *ébénisterie*.

Figures 1 and 2: Preparing the surface. A finely set toothing plane worked diagonally across the grain as indicated by the lines would not disturb the veneer fibers or joints. Planing as in *figure 2* is cautioned against because it will probably break the joint.

Figures 3, 4 and 5: Scrapers, shown here, followed the planes, worked in the same fashion or as indicated in *figures 14 and 15*.

Figure 6: Sharkskin, or "dogfish" skin, was used as an abrasive. For fine veneered work, the fins or "ears of dogfish skin" were recommended, also worked across the grain.

Figure 7: After planing and scraping, abrading with sharkskin or *prêle* (horsetail, a species of rush with corrugated stems) polished away the remaining fine scratches on the veneer.

Figures 8 and 9: The polisher, a bundle of ordinary rush, was bound tightly, dipped in hot wax which rose into the stems, allowed to cool and rubbed over the veneer.

Figures 10, 11 and 12: Polishing sticks, small strips of walnut or other finely grained wood, were shaped to various sizes and used to push wax into areas too small for the polisher or on moldings with delicate arrises.

Figure 13: A finisher forces wax into the grain of a veneered panel with the rush polisher. —R.D.M.

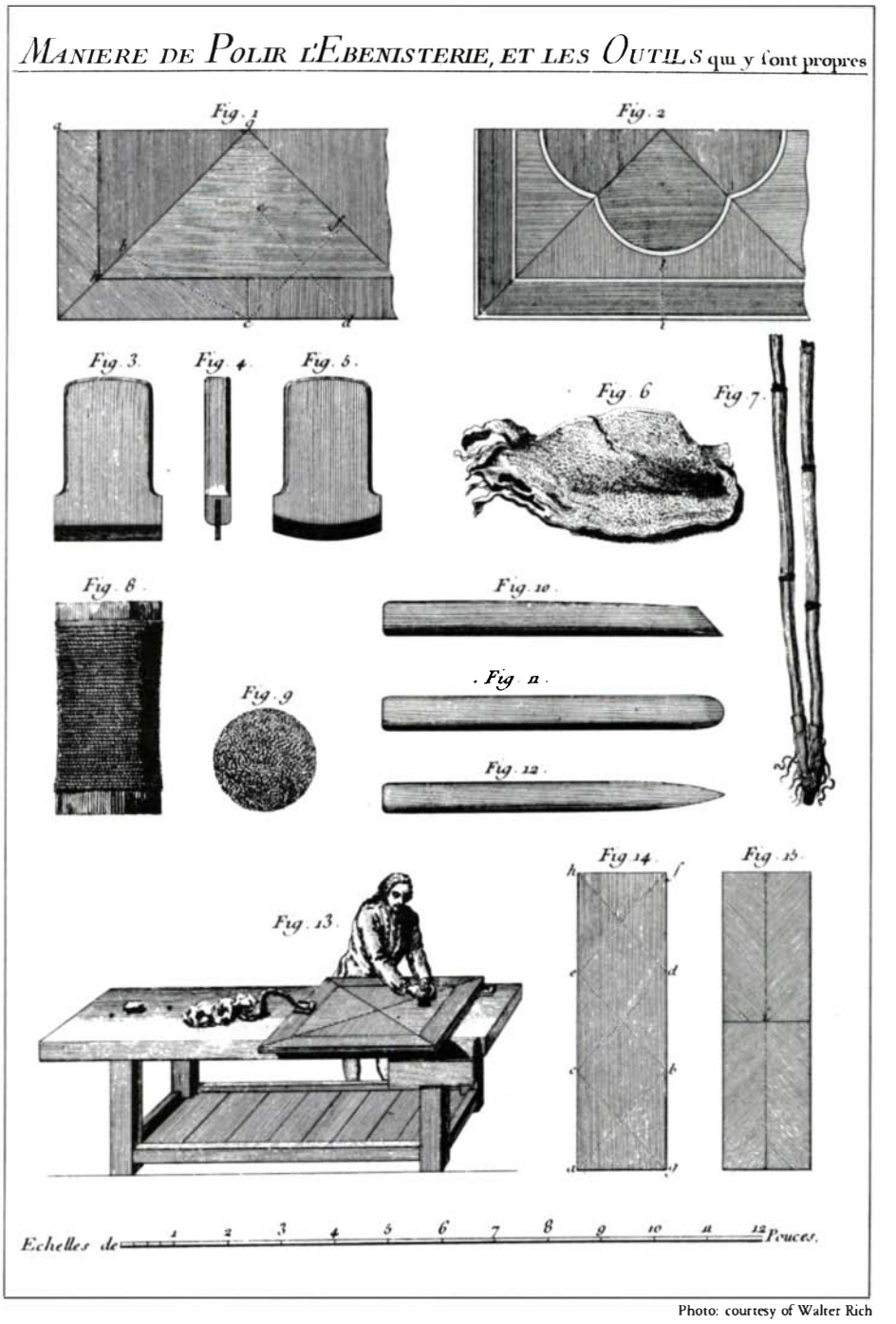


Photo: courtesy of Walter Rich

pounds as siccatives: litharge, massicot or minium, all lead oxides long used as artists' pigments. Once boiled, filtered, cooled and bleached, the oil was ready for use. The boiling and purification of linseed oil provided considerable income for many painters and varnishers in New England, but the occupation carried with it the danger of fire. Fire and lead poisoning were the bane of the finisher.

Oil finishing was as simple then as it is today. The oil was applied with a rag or brush, full strength or thinned with turpentine, and allowed to soak into the wood. The excess was wiped off with a coarse rag. After a day's drying time, another coat was applied, and ideally this was repeated until the wood would accept no more oil. In practice, a few superficial coats were probably all that were used. Total oil-finishing time for a desk may have amounted to only two to four hours. Prices for oil polishing formed a small proportion of the total costs recorded for making a piece.

Basic oiling practices varied. Sheraton, in his *Cabinet Dictionary*, outlines a method using brick dust and linseed oil, plain or stained red with alkanet root. Brick dust and oil formed a slightly abrasive paste which was rubbed on the surface until the wood warmed, then cleared off with wheat bran, leaving a bright surface. For off-color mahogany, or better grade mahogany that "wants briskness of color," Sheraton recommends a reddish polishing oil including alkanet root, dragon's blood, and rose pink, a pigment made with brazilwood dye.

I was surprised to find that wax finishes were also among those commonly used by 18th-century cabinetmakers. Wax, like oil, was cheap, available and easy to use. It was frequently listed in account books and mentioned in the literature of the period.

Other natural waxes were known, but beeswax had been favored for centuries as a finish on wood, a medium for paint, a waterproof stopping for boats, an embalming resin, and a flatting agent and final moisture barrier for varnishes. It is probably the natural organic finish most resistant to destructive oxidation. A modern analysis of beeswax used on a Punic warship showed that the wax remained chemically unchanged after 2,000 years. This extreme longevity was noted repeatedly by 18th-century writers on finishes. Beeswax was produced in large quantities in New England, where bee culture was a highly developed art. Samuel Grant, a prominent Boston upholsterer and merchant, bought up to 450 lb. at a time for use in his own shop, for sale to other cabinetmakers and for export to England.

The purification of wax by extraction of the honey impurities with water was cheap and simple, and two forms of purified wax, yellow and white, were known. The yellow still contained some impurities and was less expensive. The white, or clear beeswax, carefully filtered and bleached in the sun, was preferred for the finest work.

Thomas Sheraton describes two methods of wax polishing he says are typical. "Sometimes they polish with bees wax and a cork for inside work. . . . The cork is rubbed hard on the wax to spread it over the wood, and then they take fine brick-dust and sift it through a stocking on the wood, and with a cloth the dust is rubbed till it clears away all the clammings. . . . At other times they polish with soft wax, which is a mixture of turpentine and beeswax, which renders it soft, . . . a cloth of itself, will be sufficient to rub it off with."

For chair polish, Sheraton mixed wax with a small quantity of turpentine, heated this in a varnish pan (a double boiler), added Oxford ochre for color and a little copal varnish. The cooled mixture was worked into a ball and applied with a stiff brush, forced into the grain, and then rubbed off.

Wax finishes were widely used on high-style 18th-century French furniture. The only complete description of this process that I have found is in Roubo's *The Art of the Cabinetmaker*. For veneered cabinetwork, finest quality wax was melted into a polisher, which was a bundle of rags bound tightly with wire, and with which the whole surface was rubbed. The heat generated melted the wax, and the rubbing forced it into the pores. Roubo cautions against using cork polishers, which can get too warm and loosen the veneer.

When the wax was evenly spread, the excess was scraped off. Roubo's wax scraper was similar to a cabinet scraper, but with a slightly rounded edge instead of a burr. Cleaned and polished with a rag, the work was "extremely even, and glossy as a mirror." For porous or reddish woods like rosewood or amaranth, powdered shellac was spread over the wax and rubbed in vigorously with the polisher to fill the open grain and heighten the color. Colophony (rosin) was used to stop up open grain in black woods like ebony.

A high-gloss finish was typical of nearly all high-style furniture finishes of the 18th century. Experimenting with Roubo's wax finish, I found that it gives a much higher gloss than we associate with wax finishes today. Roubo built up a wax finish in the same way as a varnish finish, and the wax became a fairly thick coherent body on top of the wood. And he used only 100% pure beeswax, which has better refracting qualities than today's wax emulsions.

Roubo prescribes a different process for common furniture: the wax was mixed with one-third tallow and rubbed off with a serge cloth. "In order to spread the wax better and drive it deeper into the open pores, one uses sometimes a sheet-metal pan in which glowing coals have been put, and this is held as close as possible to the work in order to warm the wax. In place of the pan one can also use a glowing red-hot piece of iron, which is even better, because it makes the wax liquid which flows into the open pores more easily."

Though it was possible to get a high gloss finish with wax, most finishers probably found the required method too time-consuming. Wax also has many of the same disadvantages as oil finishes. An 18th-century writer summarized the advantages and disadvantages of the common wax finish, noting: "Waxing stands shock; but it does not possess, in the same degree as varnish, the property of giving lustre . . . and of heightening their tints. The lustre it communicates is dull, but this inconvenience is compensated by the facility with which any accident that may have altered its polish can be repaired, by rubbing it with a piece of fine cork."

Easy to obtain, fast and easy to use and repair, oil and wax finishes were ideally suited for 18th-century finishing needs. Though pure beeswax finishes are rarely used today, the many virtues of oil finishes, particularly their low sheen, are once again appreciated and have made them a finish of choice, as they were 250 years ago. □

Robert Mussey, of Milton, Mass., trained as a cabinetmaker and wood finisher then served an internship in furniture conservation at the Henry Ford Museum. He is head of the furniture conservation workshop at the Society for Preservation of New England Antiquities in Boston, Mass.

Stains and dyes from *The Cabinetmaker's Guide*

I reformulate original stain and dye recipes to determine what the original colors were like. But I use alcohol soluble anilines for restoration or conservation work because they dry quickly, don't penetrate as deeply or rapidly as water soluble anilines, and because they are reasonably lightfast—I want my conservation to last more than ten years.

One of the first principles of conservation is to make any repair reversible, so it can be redone if a better technique is discovered. Original colors are dramatic, and not yet completely accepted for conservation, so when I color a piece I put down a barrier coat first, then color the finish that goes over it. The stain has not soaked into the wood so the coloring is reversible. On new work, the choice of color is my own; furniture makers have much more freedom than conservators. I think original colors will become acceptable for furniture conservation, used where appropriate to show people what the maker saw when he had completed the piece.

These recipes are from *The Cabinetmaker's Guide:*

Red dye. Take 2 pounds of genuine brazildust, add four gallons of water, put in as many veneers as the liquid will cover, boil them for 3 hours; then add 2 ounces of alum, and 2 ounces of aquafortis, and keep it lukewarm until it has struck through.

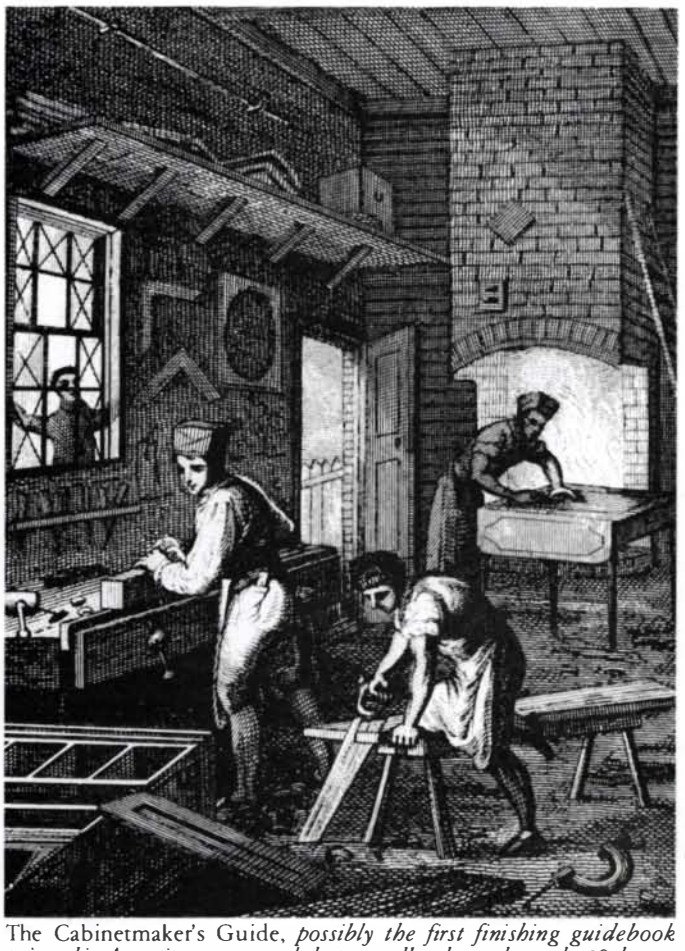
Brazildust; dust of brazilwood, *Caesalpinia echinata*, gives a very bright red dye. It was such an important item of commerce that the country was named after the tree. Aquafortis is nitric acid, reagent grade concentration.

Fine blue. Take a pound of oil of vitriol in a clean glass phial into which put four oz. of indigo, and proceed as before directed in dyeing.

This dye, and others for similarly unusual colors, would have been used for marquetry or by musical-instrument makers. Oil of vitriol is sulphuric acid.

To stain beech a mahogany color take 2 ounces of dragon's blood, break it into pieces and put it into a quart of rectified spirits of wine; let the bottle stand in a warm place, shake it frequently, and when dissolved it is fit for use.

Dragon's blood has been used for centuries, it is a dark, red resinous exudation from the fruit of the rattan palm, *Calamus drago*. Spirits of wine is alcohol distilled from wine; rectified means purified. Ethyl alcohol or shellac thinner from a paint store is the same thing. My reformulation of this stain came out a very bright red. Dragon's blood, when compared to other reds, is fairly lightfast. If you stain the wood directly, it is fugitive; but if you dye shellac with it, it is much less so, because the shellac locks the color in.



The Cabinetmaker's Guide, *possibly the first finishing guidebook printed in America, was a workshop standby throughout the 19th century. It hasn't been reprinted recently but may be available in major libraries. Note the worker polishing a tabletop by the fire, which is a good way to keep the wax flowing freely.*

Another method for black stain. Take one pound of logwood, boil it in two quarts of water, add a double handful of walnut peeling. Boil it up again, take out chips, add a pint of the best vinegar and it will be fit for use; apply it boiling hot. Note—This will be much improved if, after it is dry, we take a solution of green copperas dissolved in water, in the proportion of an ounce to a quart, and apply it hot to the above.

Logwood was an important dyestuff from *Haematoxylum campechianum*, a tree found in Central America and the West Indies. It gives a range of colors from red to purple to black and was used as dust, shavings or chips.

I have obtained materials for these and other recipes from the following firms: H. Behlen and Bros., Rt. 30 N., Amsterdam, N.Y. 12010; Laurence McFadden Co., 7430 State Rd., Philadelphia, Pa. 19136; A.F. Suter and Co. Ltd., Swan Wharf, 60 Dace Road, Bow, London E3, England; James B. Day Co., Day Lane, Carpentersville, Ill. 60110.

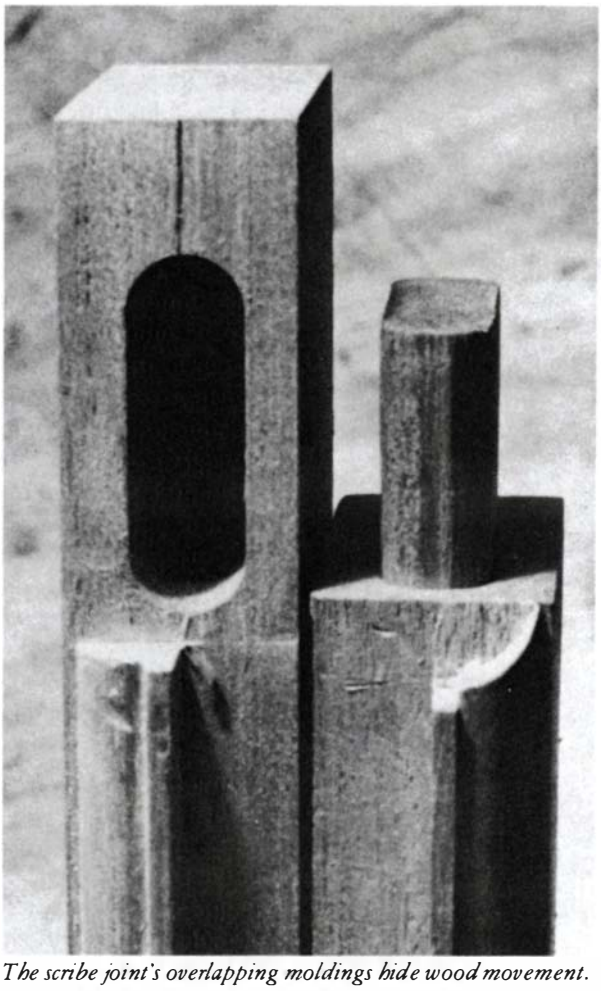
For further information: *The Artist's Handbook of Materials and Techniques*, Ralph Mayer, Viking, New York, rev. ed., 1982. *Painting Materials, A short encyclopedia*, Rutherford Gettens and George Stout, Dover, 1966. —*R.D.M.*

The Scribed Joint

Masking wood movement in molded frames

by Morris J. Sheppard

When moldings meet at an inside corner, as in framing a paneled door, they can be mitered by cutting each piece to a 45° angle. The joint is quick and it looks fine. . . until wood movement inevitably opens up the miter. Scribing the joint is an alternative to the miter. In this method, you cut the rail molding to the exact reverse section of the molding it will overlap on the stile. This allows the wood to move without breaking the joint. Where a center rail meets a stile the scribed moldings will slide and remain tight even with seasonal movement. In this article, I've used an ovolo molding or "sticking" on the frame parts, as shown in figure 1. However, any molding except those with undercuts can be scribed. Undercut molding must be mitered. A version of the scribe called the cope-and-stick joint can be done on the shaper or tenoner, but you can get excellent results by scribing with hand tools.



The scribe joint's overlapping moldings hide wood movement.

You'll need a small backsaw, chisels, a gouge and a miter template. A commercially-made template is brass, about 5 in. long and cut to a 45° angle at each end. You can make your own out of wood, but make sure it is dead accurate. Ovolo sticking is scribed with an in-cannel gouge whose radius matches that of the molding. You'll need a gouge to match each size of molding you want to scribe. Put a keen edge on the in-cannel by working the inside bevel with a slip stone and then remove the burr by holding the outside of the tool flat against a benchstone. Don't double-bevel the edge as you would a carving gouge. If you do, it won't cut straight.

Prepare your framework as you usually do. In my shop, we mortise the rails and the stiles on the slot mortiser, then insert a loose tenon. You can use a dowel joint or a conventional mortise and tenon, but when cutting the rails remember that their shoulders fit to the bottom of the panel rabbet and not to the inside edge of the molding. Mill the molding and the rabbet along the full length of the rails and stiles.

Begin the scribe by cutting away the molding on the stiles where the rails meet them—at the stile ends and the center of the rail if a middle stile is used. The molding should be cut back even with the depth of the rabbet and ought to align with the listel on the rail. To get an accurate mark, hold the rail against the stile and strike a knife line, as in figure 2. Then saw down with the backsaw, being careful not to go deeper than the rabbet's depth. Remove the waste by paring with a chisel or by bandsawing.

Now move to the rails. Place the miter template over the molding at the end of the rail as in figure 3. Align it so the miter cut will end exactly at the tenon shoulder; use the rail listel as a guide. Fix the template with a clamp and then use a sharp chisel to pare away the waste. On the final cut, rest the back of the chisel firmly on the miter template. With the miter cut, the contoured edge of the molding outlines the scribe cuts, which are then made perpendicular to the edge of the rail. Cut straight down with a straight chisel at the listel, and with the in-cannel gouge make the concave shape that will mate over the stile molding (figure 4). Several cuts may be needed but the trick is to make the last cut precisely at the mark outlined by the miter. It helps to stand directly above the work with light from the side, casting a shadow at the outlined edge. If the gouge is keen, it will be easy to place it right on the line, and a firm push will be all that's needed. Be careful with the thinnest corner of the scribed molding, as it is prone to damage. Hold the gouge square to the work or a gap will show in the finished joint. Use a small chisel to clean up the bottom of the cut.

The scribe joint will also work in frames with a groove for the panel instead of a rabbet. Then the molding on the ends of the stiles gets cut away to the bottom of the groove and one tenon shoulder is offset to accommodate the rear wall of the groove (*FWW* #18, p. 88).

Cut accurately, the scribed pieces should slide together perfectly, as in figure 5. And they should stay that way through many seasons of wood movement. □

Morris J. Sheppard designs and makes furniture and cabinets in Los Angeles, Calif. Photo by the author.

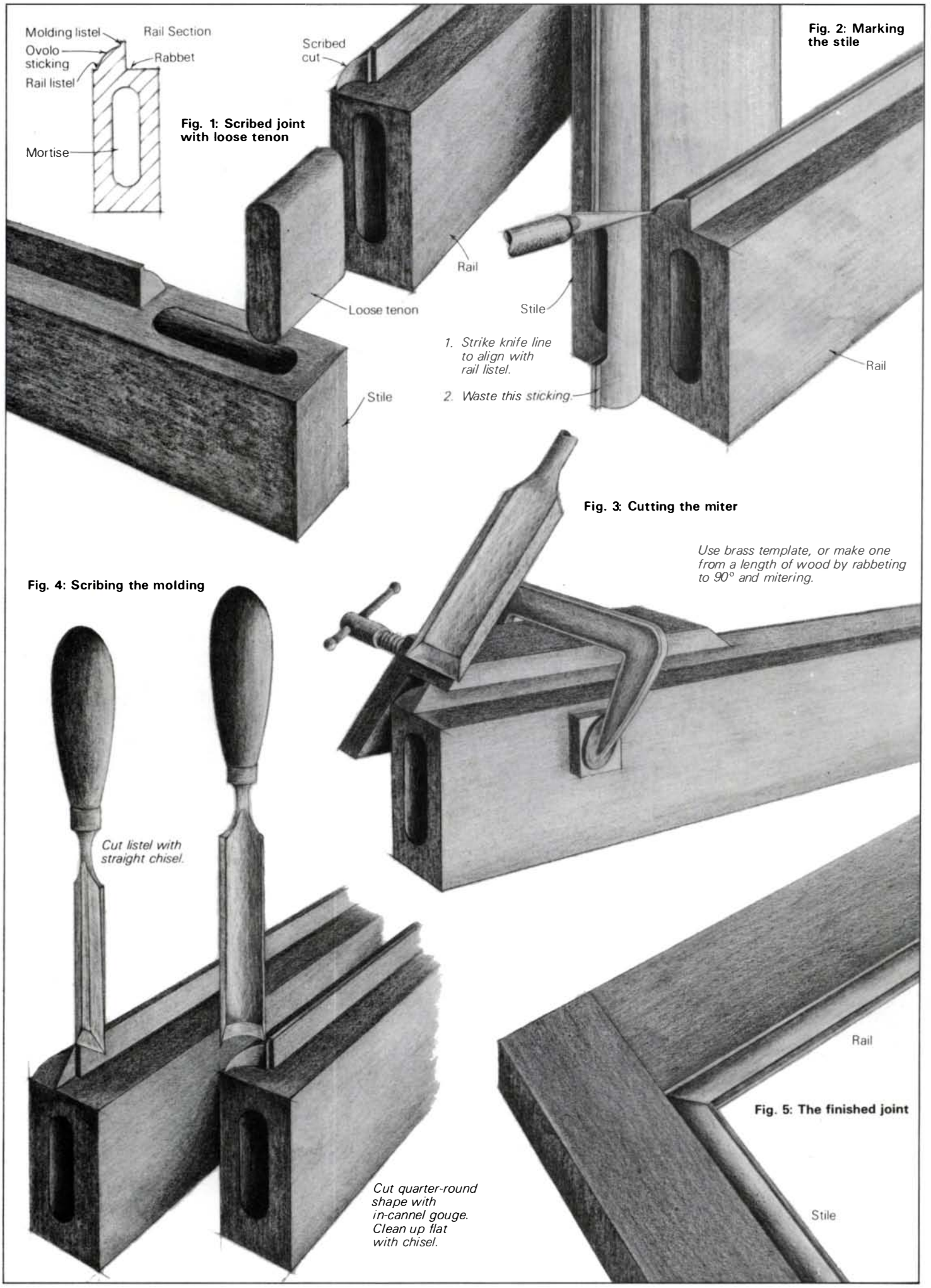


Fig. 1: Scribed joint with loose tenon

Fig. 2: Marking the stile

Fig. 3: Cutting the miter

Fig. 4: Scribing the molding

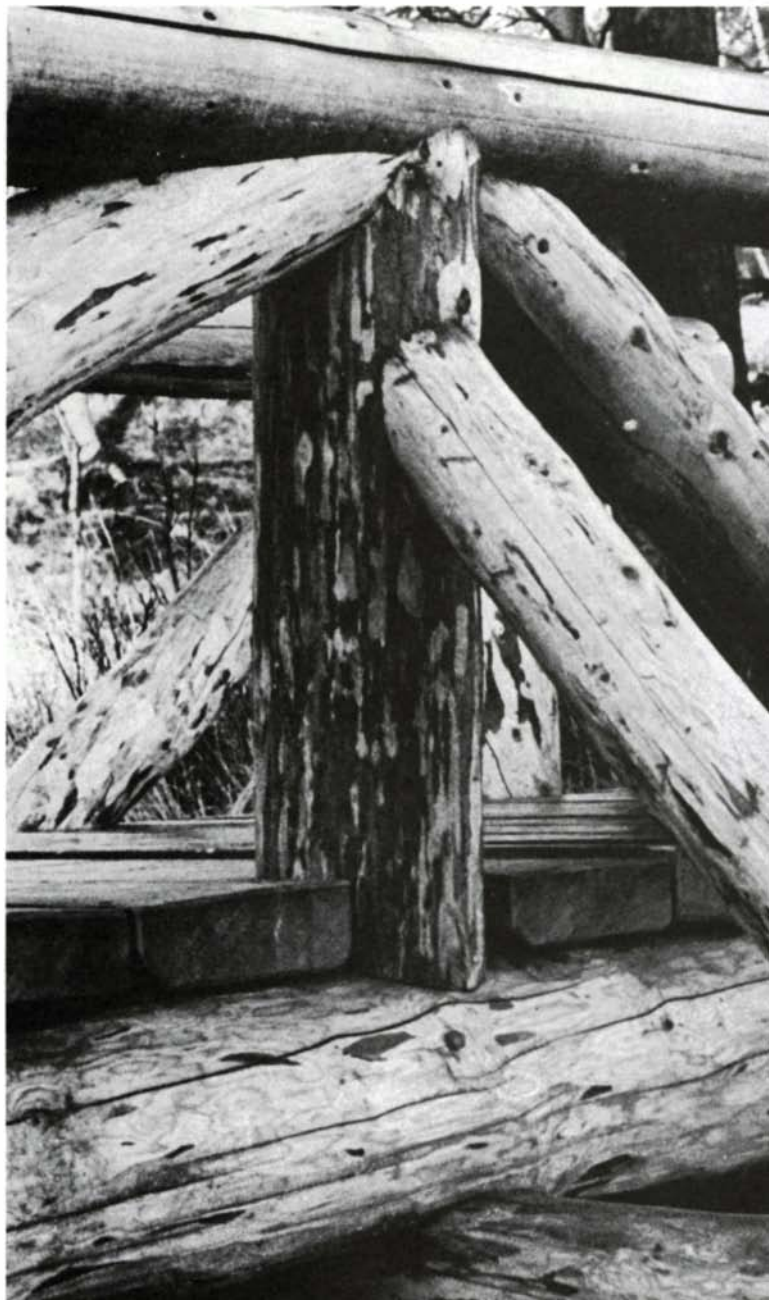
Fig. 5: The finished joint

Scribed mortise-and-tenon joinery in this 29-ft. trussed log bridge make all its parts securely interdependent.

Trussed Log Bridge

Scribed joints for structural strength

by Monroe Robinson



I hadn't thought of log work as being within the realm of fine woodworking until I saw the work of a master, Lee Cole, several years ago. After watching Cole work on a few jobs, I was ready to start a log project that had been offered to me eight years earlier: a 29-ft. trussed log bridge spanning a creek on a wilderness homestead at Lake Clark, some 140 air miles southeast of Anchorage, Alaska. The bridge was needed to connect the buildings that the owner had built on both sides of the creek. It needed to be strong and wide enough to support the front-end loader used on the homestead and to aesthetically complement the log buildings and the wilderness environment. It also required a rock foundation because the creek floods annually.

The project was started in the spring of 1978 when the creek flowed at its lowest. Two of us chipped through gravel and poured a concrete footing in water 18 in. below the water level in the creek. Before the spring breakup we built stone walls up above the high-water level of the creek. After we got the main logs, we finished up the walls about 8 ft. high and constructed a shelf on the top of each wall for the bridge to sit on. These had to be slightly different heights above the water line to accommodate the taper of the logs. All the rock, gravel and sand that we used we collected from the lake shore. Only the cement and reinforcing steel were flown to the site.

We obtained a permit to cut white spruce from federally managed land on Lake Clark, then selected, felled and peeled about two dozen logs. We skidded them into the lake, lashed together a raft with chain and towed it three miles across the

lake to the homestead. Some of the 10-in. to 16-in. diameter logs we sawed into 4-in. thick decking boards using an Alaska chain-saw mill (see "Chain-Saw Lumbering," *FWW* #8, Fall '77). We squared up the sides but left the natural taper of the log to get maximum decking.

The three main logs (one chord for each side of the bridge and one in the center) were moved into place on rollers and oriented bow-side down to increase the bow during drying, since the objective was to have a bridge that would be level or just slightly higher at the center. The decking was temporarily laid upon these logs, and the remainder of the logs put on a rack. All the wood was allowed to dry for a year.

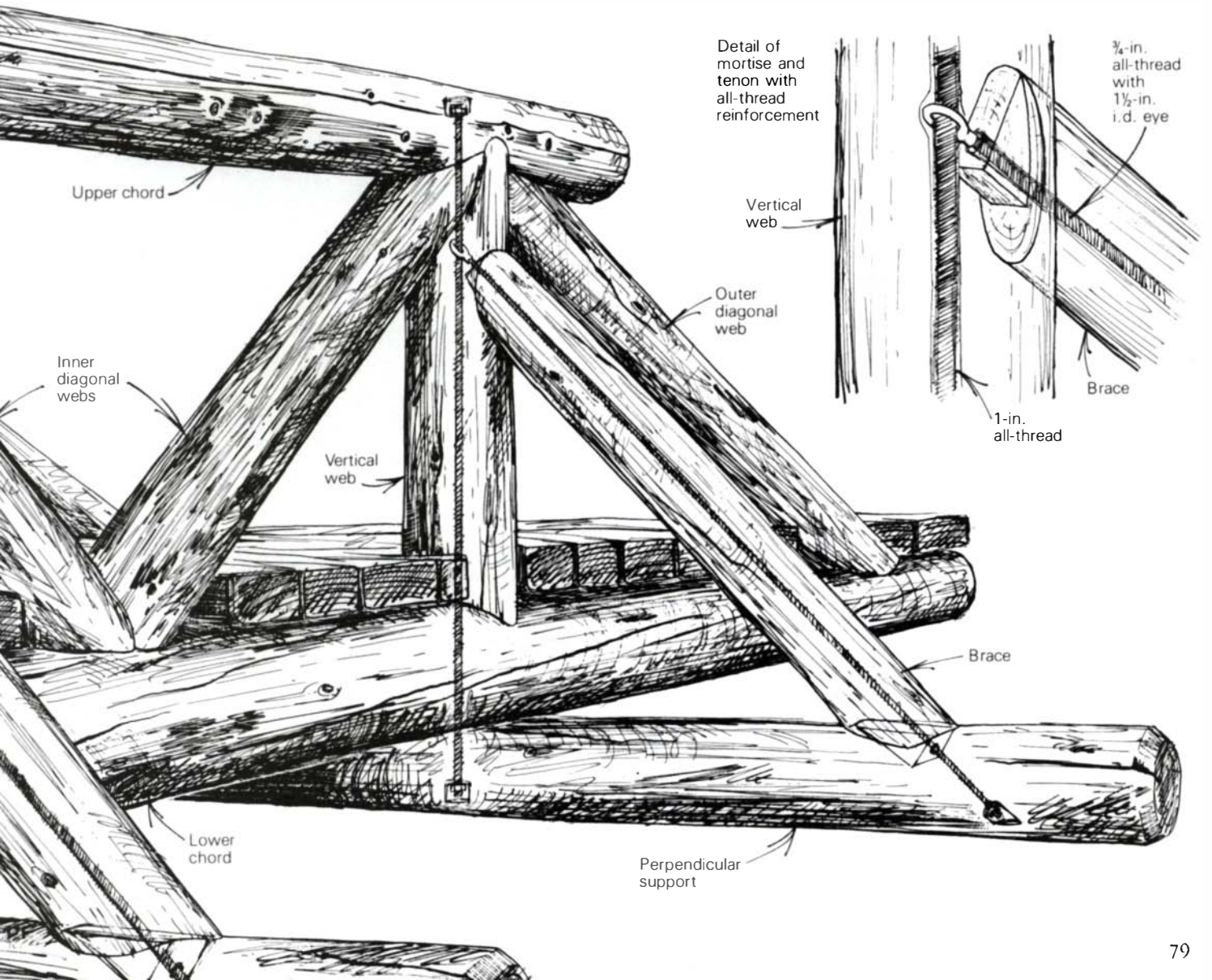
The following summer we removed the decking and turned the main logs over to have them bow-side up. We sawed a flat along the tops, making each log bow exactly ¾ in. Next we re-rounded the logs with a drawknife, leaving only a 2-in. wide flat along the top of each log for attaching the decking. A small flat leaves less area where water can collect.

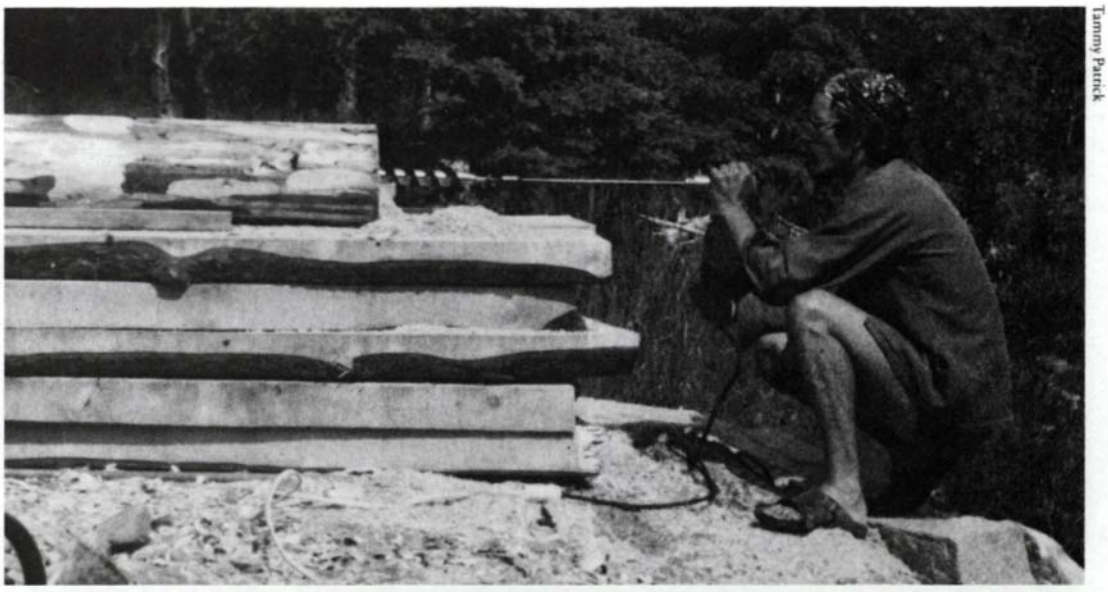
The log joints in the bridge differ from the joints in a log house. In a house one log is set above its eventual resting place, scribed to match the contours of the log beneath it, rolled over, notched out to the scribed line and then rolled back into place. If the joint doesn't close up tightly, a log can always be notched a little more without affecting those already in place. When the fit is tight enough the builder goes on to the next log.

With a bridge, all the logs on each side are dependent on one another. None can be shortened, rotated or angled differently to help make one joint fit without affecting the fit of the other joints. As the drawing shows, the bridge has mortise-and-tenon joints at both ends of the brace logs and at the lower ends of the outer diagonal web logs. All-thread bolts run through the length of the brace and vertical web logs, and the joints between all the logs are scribed. These make construction rather more complicated than stacking the walls of a house. No part of the structure is really in place until all the parts fit.

Before any joints are cut, the centerline of each log must be determined. This establishes the path of the bore in those logs to be connected by all-thread and helps in laying out the joints and positioning the logs in relation to one another. Since the true centerline is concealed within the log, I projected it onto the outer surface. First measure across the end of the log from any four directions, marking a line at the center of each measure. With these four lines, a point can be picked that most closely represents the center of that end. Now using a carpenter's level, mark a plumb and a horizontal line through the centerpoint extending to the edges. Do the same on the other end of the log. Then snap four chalk lines along the length of the log connecting the lines on the log ends. These chalk and end lines can now be aligned with a carpenter's level to position the log precisely as desired—vertically, horizontally, or at any angle or rotation.

Next the vertical web logs and the braces are bored along





Tammy Patrick

Author uses a ship auger with extensions to bore for the all-thread that secures the vertical web and brace logs, photo right. A pair of Starrett No. 85 dividers with a custom-made, adjustable target-bubble level, below, scribes the contour of one log onto the end of an adjoining log. The level helps keep the points of the divider plumb while scribing. Below right, Robinson has oriented the vertical web log horizontally to scribe its contour to the end of a brace log.

Tammy Patrick

their length to receive the all-thread. We used a ship auger with several extensions (photo, top) to drill 1½-in. holes for the 1-in. all-thread in the vertical webs, and 1 1/16-in. holes in the braces for ¾-in. all-thread. To assure that the hole ran the center of the log, I drilled half the length of the log from each end, meeting in the center. Ream out the juncture by drilling past it. It's best to drill these holes in the rough logs before cutting any joints, so that if a log has to be scrapped because a hole went astray, you won't have put wasted work into it.

Now the ends of each log must be scribed to match the contours of the adjoining logs, and in the case of the braces and lower ends of the outside diagonal web logs, tenons must be cut. To scribe the contour of one log onto another, I used a pair of Starrett No. 85 dividers with an adjustable target-bubble level, which I had custom made (photo, above). You can get one from C. Norman Brown, S.R.A. Box 4008Q, Anchorage, Alaska 99507, or make one yourself with compasses and a bubble level. With the bubble adjusted so the tip of the steel point can be kept plumb to the tip of the pencil, an exact transfer of the contour of a horizontal log can be scribed to the end of an adjoining log, whether that log is plumb or diagonal. It requires positioning the log to be scribed within a few inches directly over the horizontal log.

We scribed the bottom ends of the vertical and diagonal logs first, positioning them exactly above the spot where they would sit on the lower chord or on the perpendicular log, and at the proper angle. Waste from the decking provided braces for the log while scribing. The contour of the horizontal log is scribed on the end of the adjoining log, and the waste is removed using chain saw, ax and gouges. In the case of the

Gouges are used to finish shaping the scribed shoulder of a brace log, above. The hole, which will receive the all-thread, was bored the entire length of the log before the tenon was cut. Below, a finished joint.

outer diagonal webs and braces, stock for tenons must be left. To lay out the tenon, we measured 1 in. on either side of the centerline for the cheeks, and 1½ in. on the other side of the centerpoint from the acute angle of the log's end for the edge of the tenon; the tenon has three shoulders. We used a handsaw to saw down the cheeks, and removed the waste with gouges and chisels (photo, top).

The mortise for this tenon is located using the chalkline on the horizontal piece (measuring 1 in. on either side of it) and the scratch from the steel tip of the dividers when the pencil end scribed the contour onto the adjoining log. This scratch marks the farther end of the mortise; the other end can be judged by eye. The photo above shows the relationship between the mortise and tenon.

The joints connecting the top ends of all the diagonal logs to the vertical web logs are oriented perpendicular to the joints at the bottom end of these logs. Therefore the scribing technique using the bubble-level dividers cannot be used here; the bubble level only tells you when the divider points are plumb. Instead, I used two different methods to scribe these joints. For the joints between the outer diagonal web logs and the vertical web log and also for the joint between the lower ends of the inner diagonal web logs, I positioned the logs to be matched close together and held the divider points in line with one another, horizontally rather than plumb, without using the level. I set the dividers to mark ½ in. short of the final scribe, then notched out the waste and moved the logs closer for a more accurate rescribing and final fit.

For the other upper joints (between both the brace and inner diagonal web log and the vertical web log) I laid the vertical web log horizontal and then, using a carpenter's level, positioned the upper end of each diagonal log plumb above it at the proper angle. Then it could be scribed using the bubble-level-divider technique described earlier. I could have used this technique for the joint between the outer diagonal web log and the vertical web log, but the former is 10 ft. long and unwieldy to set up.

Before assembly all the joints and drilled holes were given numerous coats of creosote and a solution of pentachlorophenol in fuel oil. The all-threads were coated with grease, and the mortises were filled with enough grease to prevent water from being trapped if it ran in along a crack. The decking and exposed surfaces of the logs were treated with a mixture of 47½% fuel oil, 47½% creosote and 5% pentachlorophenol. Reading later about the health hazards of pentachlorophenol makes me leery about using it again.

To assemble, first the perpendicular support logs were positioned under the lower chord logs using temporary staging built on the creek bed. Then the vertical web logs were positioned, and the holes already bored in their length were used to guide the bit down through the lower chord log and the perpendicular support log. The braces were positioned, and the holes bored in their length were used to guide the bit down through the perpendicular support log and up into the vertical web log to meet the hole in its length. The brace was removed and gouges were used to enlarge the hole in the vertical web log to accommodate a 1½-in. i.d. eye that was coupled to the ¾-in. all-thread running through the brace. The eye was positioned in the mortise and the 1-in. all-thread passed through it, from the top of the vertical web log through the lower chord and perpendicular support logs, where it received a washer and nut for later tightening. The lower end of the all-thread running through the brace also received a nut that was tightened later. Next the outer diagonals were placed, then the inner diagonals. Mortise-and-tenon joints are unnecessary at the bottom of these inner diagonals because they wedge one another in place against the vertical web logs. Mortise-and-tenon joints at the tops of both inner and outer diagonals aren't needed either, because the upper chord log positions the others. The upper chord log was bored for the 1-in. all-thread and all nuts were tightened.

Within a year after construction the bow in the bridge had settled into levelness. □

Monroe Robinson is a woodcarver in Chugiak, Alaska, who also does architectural commissions. Photos by the author, except where noted.

Woodlot Management

Thinning and pruning for more valuable trees

by Irwin and Diane Post

Growing trees is, in many ways, akin to raising vegetables in a backyard plot. Just as a rich harvest rewards the gardener's weeding and watering efforts, so too can labor in the woodlot produce dramatic, if slower, results. And woodlot management holds a special value for the woodworker—the pleasure of working wood he or she has helped to grow.

Forest management need not be complex nor does it have to be practiced on boundless tracts of land. The techniques we've outlined in this article can be used by anyone, on woodlots as small as an acre or less. Most management work consists of cutting and pruning trees following a thoughtful evaluation of the woodlot. From some woodlot work, you will have to wait for results, but other benefits come quickly. We've begun to manage only a small portion of our 50-acre woodlot in Vermont and we already have 3,000 board feet of hardwood plus 50 cords of firewood to show for our work.

Our management plans are aimed at meeting our future needs for lumber and firewood for ourselves and for sale, and at growing a healthy forest. You can shape your plan to suit your needs, and the climate, soil and type of trees that grow best in your area. You can design your own management plan, or seek help and advice from county, state or consulting foresters in your area.

Where is the woodlot? How big is it?—It's amazing how many people don't know their property boundaries. The first step in woodlot management is to find and mark the boundaries. The penalties for cutting someone else's trees are high in terms of good, neighborly relations, and even higher in possible legal costs and damages. Sometimes the boundaries are marked with stone walls, fences or blazes left by a neighbor or previous owner. Other times it will be necessary to hire a surveyor. In any event, be certain of the boundary before marking it—few things are more troublesome than a boundary mark that's in the wrong place.

It's also important to know the real size of your woodlot. The size determines the value of the land and the property tax on it, and it is the basis for estimating your wood harvest. Until the advent of electronic calculators, finding the area of an irregular parcel was tedious and fraught with error. As a result many parcels were guesstimated and recorded as, say, 25 ± acres, with no limits on the plus or minus. We recently helped a neighbor resurvey a parcel that was recorded as 150 ± acres; it turned out to be only 120 acres. If you are buying a woodlot, we suggest requiring the seller to have a survey map prepared as a condition of sale.

The traditional way to mark forest boundaries is with painted blazes on unmarketable trees on, or nearly on, the boundary line. A blaze is made by chopping several square inches of bark off the tree at about chest height, then painting the wound a bright color. If you wait a few weeks before painting the wound, the paint will stick better. The blazed trees should never be harvested and they should be close enough together for the boundary to be easily followed. Repaint the blazes every few years.

A blaze is a wound, and a potential doorway for disease. If you want to avoid this risk, you can nail colored plastic to the trunk at eye level. Use brass or copper nails to avoid damage to sawblades if the tree is ever harvested, and plan to replace the plastic every couple of years.

Evaluating the woodlot—Once the boundaries are established, you can begin learning the characteristics of your land and of its trees. A forester "cruises" the woodlot by recording observations on a map and making field notes while walking through the woods.

A site index is a shorthand method of indicating the quality of the land and its ability to grow trees. The site index is a number indicating the average height of a tree species at a given age, usually 50 years. Thus a site index of 80 for white pine means that a 50-year-old white pine tree can be expected to be 80 feet tall. The site index reflects soil quality, topography, water availability and drainage. It does not depend on the number, health or size of the trees currently growing. A woodlot with a site index of 80 for white pine will still have a site index of 80 even after it has been clearcut.

You can figure site index by determining the ages and heights of representative trees of each species on your woodlot. These figures are then matched with a published table to find the index numbers. You can get site-index tables, comparative indexes, and help in evaluating your data from a state, county, or consulting forester.

The age of your trees can be found with an increment borer, an auger-like tool that removes a small core of wood from the tree trunk. Counting the annual growth rings from the pith to the bark gives the age of the tree, although you should add several years to account for the time it took the tree to reach the height of the bore. If you don't have an increment borer, you will have to figure age by felling trees and counting the annual rings. Cutting only a few trees will give enough data for figuring the site index.

Tree height can be measured with a variety of instruments including relascopes, clinometers and optical altimeters. But the simplest and cheapest instrument is a log and tree scale stick. This tool, resembling a truncated yardstick, is available from forestry supply houses and has a scale for determining tree height based on a simple sighting method.

Other qualities of the stand that should be noted during the cruise include tree diameters, rate of diameter growth, basal area, tree quality and species composition.

Tree diameter is usually measured at 4½ ft. above ground and is given as "DBH" or "diameter at breast height." Diam-

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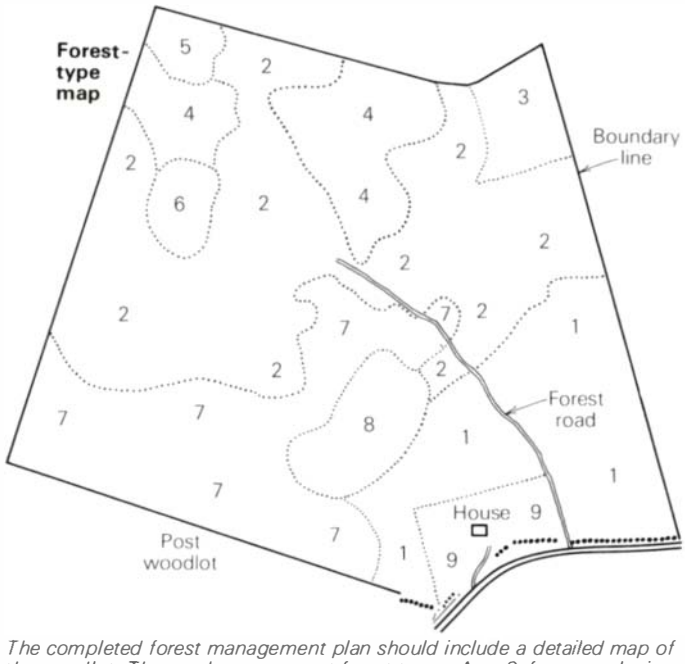
Irwin and Diane Post are forest engineers living in Barnard, Vt.

Short of felling trees and counting the annual rings, an increment borer, left, is the best way to tell the age of trees. The tool removes a small, fragile cylinder of wood, right. The rings aren't as easy to see as in a cut tree, and must be counted carefully.

eter growth rates can be gauged from the increment core: widely spaced annual rings indicate vigorous growth while close rings show slow growth. Slow-growing stands usually need thinning.

Basal area is a relative measure of how dense a stand is and it helps you decide if thinning is needed. To understand basal area, imagine one acre of your woodlot with all the trees cut at breast height. Measure the cross-sectional area in square feet of all the stumps and add them up to arrive at basal area in square feet per acre. The more crowded the stand, the higher the basal area. Management plans often specify thinning to a certain basal area, taking into account site index and management objectives. In New England, for example, we generally recommend that hardwood stands be thinned to 50 to 70 square feet per acre and softwood stands to 70 to 80 square feet. Foresters measure basal area by "point sampling" with a prism or tools such as a Cruz-All or Cruise-Angle. The forester stands at a randomly selected point in each forest type and makes a 360° sweep while looking through the instrument's sight. Each instrument comes with instructions on which trees should be counted for determining basal area.



The completed forest management plan should include a detailed map of the woodlot. The numbers represent forest types. Area 2, for example, is a 19-acre tract with sugar maple, ash and beech as the predominant species. Each forest type on the map has a specific management objective and a list of recommendations to reach the objective.

Tree quality, unlike the measurements described thus far, is almost entirely subjective. It includes such factors as straightness of the trunk, limbiness, evidence of rot, and size and health of the crown. Tree quality is a predictor of log quality, so we want to remove trees of low quality, thereby "releasing" nearby high-quality trees from competition.

Ground conditions should also be noted during the cruise because they will affect access to the timber at harvest. Steepness of slope, stoniness and location of bogs and watercourses should all be recorded on the woodlot map.

Woodlots, no matter how small, are seldom uniform. There are usually differences in species, tree size and site index from place to place. Homogeneous areas are known as forest types. The management plan treats each forest type separately, with specific recommendations for each type.

The management plan—The management plan consists of a statement of the overall management objective, the forest-type map, the description of each forest type and the management recommendations for each forest type. Most woodlot owners want several benefits, so conflicting objectives have to be weighed. It's important to have a good picture of how different management strategies will change the appearance of the woodlot and it is useful to examine managed woodlots nearby and to talk with their owners. As you set your goals, remember that your needs may not align with those of the commercial lumber producer. Burls or spalted lumber, for example, are highly valued by some craftsmen but are virtually useless to a professional logger.

There are two general management strategies: even-age and uneven-age. In even-age management all the trees on a given parcel are the same age and they will mature and be cut at the same time. After the harvest, a new stand will be established through planting or natural regeneration. Uneven-age management is not so orderly. There are trees of every age from seedlings to sawlogs and the stand will be harvested and

thinned every 10 to 15 years. The best management for your woodlot depends on what trees you already have and their ages, the species you hope to regenerate, and aesthetics. For example, some species, such as the birches and oaks, require nearly full sunlight to the forest floor for good regeneration, while other species like sugar maple and beech regenerate well under the shade of standing trees.

Management recommendations also tell what products can be expected in the near term such as firewood, pulpwood or sawlogs and what equipment is necessary for harvest. The duration of a management plan is usually ten to twenty years, after which it should be updated.

The management plan prescribes the harvesting, thinning or pruning for each forest type in the woodlot. How do you decide which trees to cut and which to leave? Generally, the higher-value species that grow well on the site should be favored over short-lived species that don't reach sawlog size, species that don't do well on the site, diseased or poorly-formed trees and weed species. For example, on our woodlot, sugar maple, white ash, yellow birch and white birch do very well. Black cherry does less well but we favor the healthy cherries because we prize their wood for cabinetwork. Gray birch is a short-lived species that rarely attains sawlog size, so we cut it for firewood. We cut our beech trees also, because they have contracted scale disease. Striped maple is a weed species that can blanket the forest and prevent regeneration of the species we want. We cut all the striped maple we find.

A management plan can also benefit wildlife. We have a small deer yard on our land, an area of dense coniferous growth where deer find shelter in winter. From a wood production viewpoint this deer yard should be thinned, but we prefer to leave this stand uncut for the deer.

If you plan to do the management work yourself or if you have a large woodlot, it may not be possible to do all the work in one year. You should set work priorities, thinning first the areas with good site indexes and with forest types that will benefit most from attention. Schedule the work carefully. If you plan to sell your wood, your timetable should be flexible enough to suit market fluctuations. For instance, it has not been possible to sell pulpwood in our area for the past year, so we aren't cutting it now.

It's easy to underestimate how much work managing a woodlot is—particularly during the first treatment of previously unmanaged forest. It can be very discouraging to fall far short of your goals, and it's no fun when every spare moment must be spent in the woodlot. Most people would find a goal of treating about one acre a year of previously unmanaged woodlot about right. A first thinning in a typical New England forest would mean coping with between 5 and 15 cords of wood per acre.

Picking trees to cut—In an old field that grows up naturally into forest, many thousands of seedlings may sprout, but as they compete for sunlight, water and nutrients, most will die. By the time they reach 18-in. DBH, perhaps only 75 trees per acre will survive. Nature, however, does not always select the same trees that we would select. We want straight, clear, sound logs of the species we value. By judiciously lowering the competition among pole-size trees with good prospects of becoming quality sawlog trees, we can improve the quality of our future harvests.

The total amount of wood grown on an acre of land will be the same whether we manage it or not. Thus, by reducing the competition among the best stems through careful cutting, we don't reduce total growth but concentrate it in the best stems. These trees increase in diameter faster and attain sawlog size sooner than if we let nature run its course. Vigorous, fast growing trees are also healthier than slow growing trees, and are less susceptible to disease and insect damage.

Given the object of producing high quality sawlogs, we can readily decide which trees to cut and which to leave for future growth. For illustrative purposes, think of an uneven-age hardwood stand with everything from seedlings to sawlog trees. Large trees that are obviously hollow or very poorly formed should be cut, unless you wish to leave a few as den trees for wildlife. These trees may not yield a single sawlog despite their large diameter. Sawlog trees that have a lot of dead branches in the crown should also be harvested. Such trees are overmature and growing very slowly. Certain other mature trees may have taken over more of the forest than they deserve, with too many branches and too large a crown. These "wolf trees" cut off sunlight from large areas of the forest floor, distressing and weakening surrounding trees. Healthy sawlog trees should be cut only if you need the wood or if they are overcrowded. The pole-size trees, 4-in. to 10-in. DBH, will dramatically respond to thinning by increasing their rate of diameter growth. Trees of good form of the desired species should be favored by releasing them from competition on at least two sides. Trees with a strong lean should be cut because they usually contain large amounts of reaction wood, a source of trouble for the woodworker. Pole-size trees cut during a thinning make good firewood and rarely need splitting. It is generally not worth thinning saplings and seedlings because tight young stands encourage these trees to grow straight and to self-prune their lower branches.

Picking which trees to thin and which to save is easier to do from an armchair than in the woodlot, but it can be learned with practice. We mark the trees we want to cut, but you can just as easily mark the crop trees you want to save. *Two cardinal rules of marking a stand are to look up and to look at all sides of a tree before deciding to favor it.* Many straight trunks are topped by dead or nearly dead crowns. A trunk that looks sound on one side may be hollow or cracked when viewed from another angle. Special marking paints can be used, but any bright-colored paint will work. We walk in parallel strips 50 feet wide looking for high quality trees of the species we want to keep. Diseased or low quality trees are marked for removal. We then look closely at the remaining trees (see the box on p. 86) and decide which should be cut to give space on at least two sides of a good tree's crown. We next examine trees of desired species but of only intermediate quality, and those of high quality but of less desirable species. We cut any of these trees whose removal will give space on two sides of the favored trees' crowns.

Ideally, our crop trees will be evenly spaced. However, we don't hesitate to leave two good trees closely spaced if there are poor trees around them that will be cut. In hardwood stands where there are no potential sawlogs, poor quality trees may be left standing. These trees provide future firewood and shade that favors regeneration of desired trees. Removal of all shade encourages brambles and short-lived pioneer species. We leave an occasional (one to four per acre) old but healthy tree with a good crown. These trees have little lumber value but offer food for wildlife, and nest sites in hollow branches.

Pruning is an often overlooked route to producing high quality logs. Post uses a standard 17-ft. saw to prune a white pine stem.

Pruning future sawlogs—Pruning is one of the most overlooked ways of improving sawlog quality and it's the route to the clear boards we so prize in our woodworking. Pruning is simply cutting off the lower branches of trees very close to the trunk with a polesaw. The tool is available from forestry supply houses for about $25. Trees are usually pruned to a height of 17 ft., producing one "standard" 16-ft. sawlog with an ample allowance for stump waste. Pruning any higher with a polesaw is difficult and is generally not done.

To reduce the risk of infection, the cut should be made immediately outside the branch collar—where the trunk swells at the branch's base. Vigorously growing trees soon heal over the wound and grow clear wood. All of the dead branches and a few of the lower live branches can be pruned without hurting the tree. Don't leave stubs when you prune—the tree can't heal over them. As a stub rots, it provides entry for moisture, fungi and insects into the heart of the tree.

The branches of pole-size trees are small, and pruning wounds heal quickly. However, large diameter trees have thicker branches that heal over slowly, making it likely that they will be harvested before pruning does them much good.

Since there are many more pole-size trees to the acre than there are future sawlog trees, only the trees with the best potential should be pruned. Since there is little point in pruning firewood, it is sensible for pruning to follow thinning.

Harvesting and regeneration—Harvesting your own timber can be very satisfying. Through harvesting, you change the character and appearance of your woodlot, as well as obtain valuable wood. With patience and care, you can leave your woodlot in better condition than most loggers would.

On the other hand, it takes heavy and expensive equipment as well as a lot of time and skill to harvest sawlogs. And it is dangerous work. Many woodlot owners find that they are better off selling the stumpage rights to a logger. We strongly recommend that every such timber sale be supervised by a consulting forester. In most cases, the forester marks the trees that will be harvested (and those the logger should remove as culls), prepares a notice of the timber sale, shows the woodlot to loggers, takes bids and helps the landowner decide which bid to accept. The forester draws a contract, oversees the harvest and holds a damage deposit from the logger to pay for any damages. The forester has the authority to shut down the logging operation in adverse weather, when heavy equipment might damage the forest floor, or if excessive damage is done by the logger. The forester's fee is more than made up by the advantages of competitive bidding and of having a third party decide questions of safety and damage. Many states have regulations that the logger must satisfy before he finishes, such as cutting evergreen slash (the tops and other debris) to a low height to reduce the risk of fire, and taking steps to reduce erosion. If you have special concern for the condition the roads are left in, possible erosion problems, or trees you don't want cut, the forester will specifically include these in your contract.

When the harvest is over, attention must be given to growing new trees in the woodlot. Planting seedlings or spreading seed is sometimes necessary, but usually natural regeneration will do the job.

Artificial regeneration is usually limited to conifers in woodlots that have been clearcut or to new plantations on former agricultural land. Hardwoods, with the exception of

prized species like walnut, are rarely planted for future sawlogs. Whenever trees are planted or seeded, it is important that they be suitable for the local soil, climate and water conditions. It is wise to plant species that are in reasonable demand. Thousands of acres of red pine were planted in the past, but there is currently so little demand that nobody knows what to do with them now. If you plan to start a tree plantation, remember that plantations need thinning just as often as natural stands.

Trees regenerate naturally in two ways: by germinating from seeds and by sprouting from stumps. Most hardwood species send up stump sprouts after a tree is cut. Some species are more prolific sprouters than others, and small-diameter stumps sprout more than do stumps of large diameter. Stump sprouts start life with a large root system and they often grow more than 5 ft. the first year. The problem with such sprouts is that there are often too many of them, and a stump may sprout double, triple and quadruple-stemmed trees. Cutting all but the best sprout from each stump may solve this.

In a given location, trees of a given species tend to have years of good seed production and years of poor seed production. It is often possible to affect the species composition of naturally regenerated forest stands by timing harvesting to follow an abundant seed crop of the species you wish to favor.

Although our efforts at harvesting and regeneration parallel those of the gardener, we do not have the gardener's ability to change crops from year to year. Our actions in the woodlot shape the forest for generations to come and that alone should give us pause to think twice about which trees we cut and which we encourage to grow. Few of us will live long enough to harvest sawlogs from seedlings we plant, but our children and grandchildren will benefit from our foresight if we decide wisely. □

For more information . . .

State, county and consulting foresters have lots of information on basic woodlot management, and much of it is free. Government foresters are often able to visit woodlots and offer advice, also free of charge. Some government foresters offer services at a nominal charge or they may charge for work that requires more than one day to complete. Check the white pages of your phone directory under the county and state listings to find the local government forester. If none are listed, ask the county agricultural extension agency for advice.

Consulting foresters are independent professionals, who must be licensed in some states. They can be contacted through the yellow pages, but it's better to check with the local government forester. Consultation fees vary, so discuss price before hiring a forester. Local foresters should also have information about tax advantages offered by some states to encourage woodlot management. Vermont's program, for example, reduces by 80% the taxes on our woodlot.

The tools described in this article, if unavailable locally, can be ordered from the following suppliers: Forestry Suppliers Inc., 205 Rankin St., P.O. Box 8397, Jackson, Miss. 39204; Ben Meadows Co., 3589 Broad St., Atlanta, Ga. 30366, and T.S.I., P.O. Box 151, 25 Ironia Rd., Flanders, N.J. 07836.

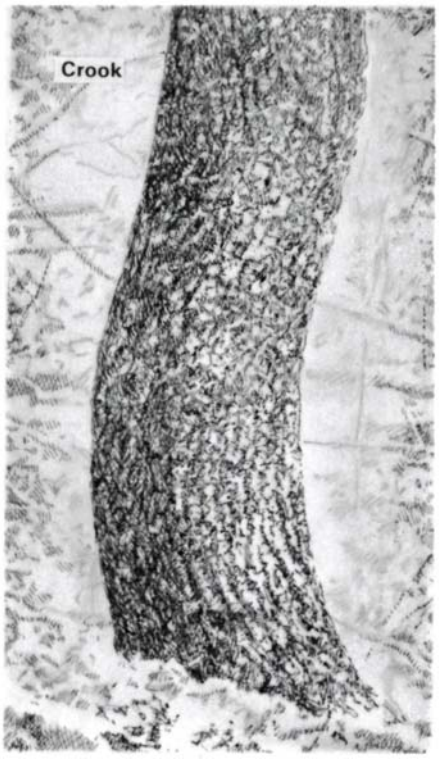
The American Forestry Association (1319 18th St. N.W., Washington, D.C. 20036) publishes a monthly magazine called *American Forests*. Useful books include: *Essentials of Forestry Practice* by Charles H. Stoddard, Ronald Press Co., New York, N.Y. and *Handbook for Eastern Timber Harvesting* (stock number 001-001-00443-0) by Fred C. Simmons, from the U.S. Government Printing Office, Washington, D.C. 20402. A booklet, *Woodlot Management*, is available from Garden Way Publishing, Charlotte, Vt. 05445.

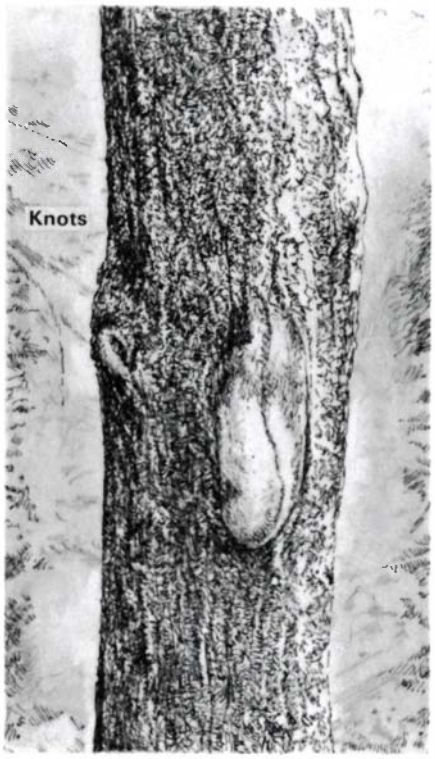
Tree quality: the good, the bad and the firewood

It doesn't take a trained eye to spot a perfect sawlog: it rises arrow-straight and branchless for 15 ft. or 20 ft., large enough to yield clear boards and showing no signs of wounds, fungus or insect damage. Deciding which of the many less than ideal trees in the woodlot will yield good quality lumber and which to consign to the cordwood pile is more difficult. Here are a few tips to help you make these decisions as you thin and harvest your woodlot.

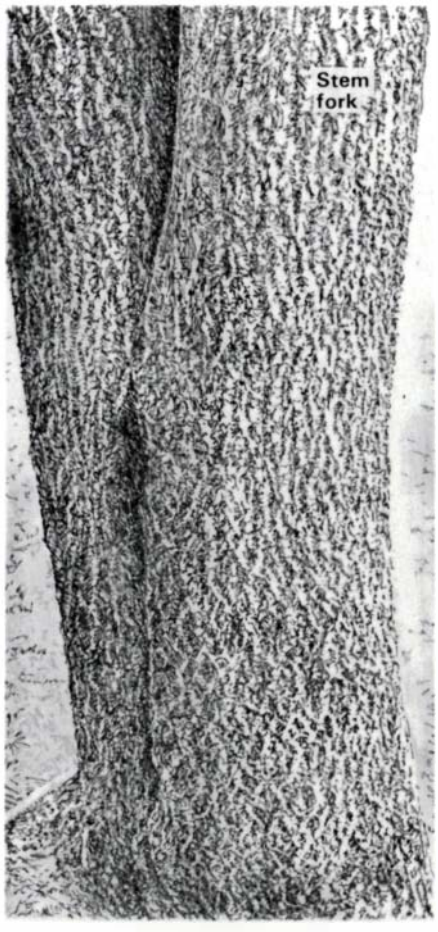
Crooks: An abrupt zig-zag in the trunk caused by the tree's changing growth direction as it seeks better light. Small crooks can be sawed but larger ones make handling the log difficult.

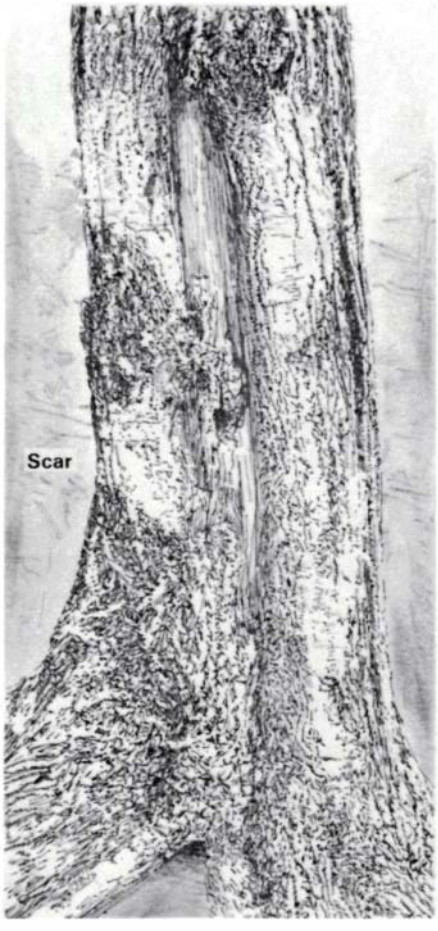
Curves and bows: Sweeping form in the trunk common in trees growing on hills. Curves occur, like crooks, because the tree wants better light. Trunks with curves usually contain reaction wood, difficult to saw, dry and use (see "Abnormal Wood," *FWW* #26).

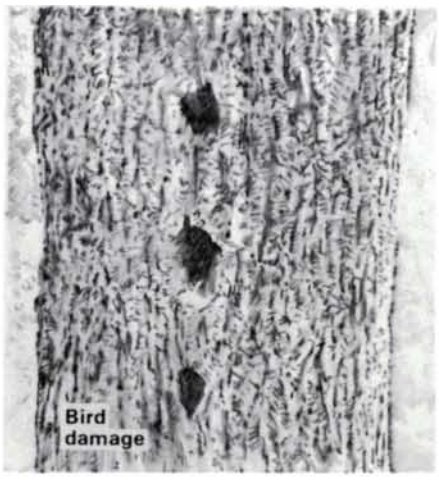




Drawings: Christopher Clapp







Knots: A common feature in nearly all logs, knots occur where branches grow out of the trunk. If the branch is alive when the tree is cut, the knot will probably be sound. If the branch is dead, particularly if it is large, the knot in the finished lumber may be loose.

Stem forks: Two stems on one trunk occur when the "leader" stem dies or stops growing. A second stem then forms and becomes the new leader. Stems that occur very low on the trunk reduce the lumber value of the logs.

Major dead branches: These occur when a tree is under stress and near death. If there are no good reasons to leave the tree standing, it should be removed for lumber or firewood.

Scars: Called "catfaces," scars are the signs of damage caused by fire or by previous logging operations. The wounds go through the bark to bare wood. If the tree survives, the wood above and below the scars may be sound.

Dead crowns: A healthy crown tops a healthy tree and those with dead or skeletal crowns are usually under stress. When the leaves have fallen check the crown's major branches for smaller branches; if these are numerous, the crown is probably healthy.

Cracks: Vertical cracks or seams caused by extremely cold weather or lightning can be several feet long and ¼ in. or so wide. The cracks heal over on the surface, but they can ruin a good log.

Insect and bird damage: Worm holes and loose bark can indicate significant insect damage. Bird damage is more apparent and sometimes the two are related because some birds feed on insects infesting trees.

Epicormic branching: Previously shaded trunks exposed to sunlight can grow small branches which cause minute blemishes in lumber cut from the logs. Care should be taken when thinning to keep trunks of potential sawlog trees at least partially shaded.

Overmature trees: Old trees with large, short trunks and heavy upper branches are often survivors from when the forest was an open field. Their lumber value is low but they do serve as wildlife shelters and are sometimes left standing for that reason alone.

Wind or ring shakes: Shakes are rarely detectable by reading a tree's bark but they will turn up as a defect in the lumber. They are caused by wind-created mechanical stresses that separate the tree's annual rings. —*I.P., D.P.*

Wind shakes in a maple log.

Air-Drying Lumber

Usable stock comes from a carefully stickered stack

by Paul Bertorelli

Air-drying your own lumber can be a cheap alternative to expensive and sometimes unavailable kiln-dried wood. If you live near a sawmill or have your own woodlot, green wood can be had for a fraction the cost of commercially dried stuff. But once you've got the wood, the real challenge is converting it into a material you can use in the shop. Conventional wisdom recommends air-drying green stock for one year per inch of thickness. That seems easy enough, but having seen more than a few piles of stained and checked boards, I suspected there was more to it. I visited Paul Fuge to find out.

Fuge, of Shelton, Conn., has made a business of buying sawmill-green lumber and air-drying it himself. After air-drying, he runs it through his small kiln before selling it. He got into drying his own for the same reason most of us do: he couldn't find decent wood at a price he could afford. Six years and several hundred thousand board feet later, he has learned that there's a bit more to lumber seasoning than neat piles.

Fuge dries thousands of board feet at once, but his techniques can be successfully applied in seasoning any amount of wood. Here's how he does it.

Sites and foundations—The worst checking, staining and warping is liable to happen very soon after the lumber is cut from the log. Therefore, Fuge picks drying sites before he buys lumber, allowing him to quickly stack, sticker and, if conditions warrant, cover his wood. He avoids swampy, damp, low-lying spots, and sites where high winds will dry the wood too quickly. Fuge's stacks are on south-facing slopes where nearby trees and shrubs moderate the winds. He places gravel or tarpaper under the stacks to control ground moisture.

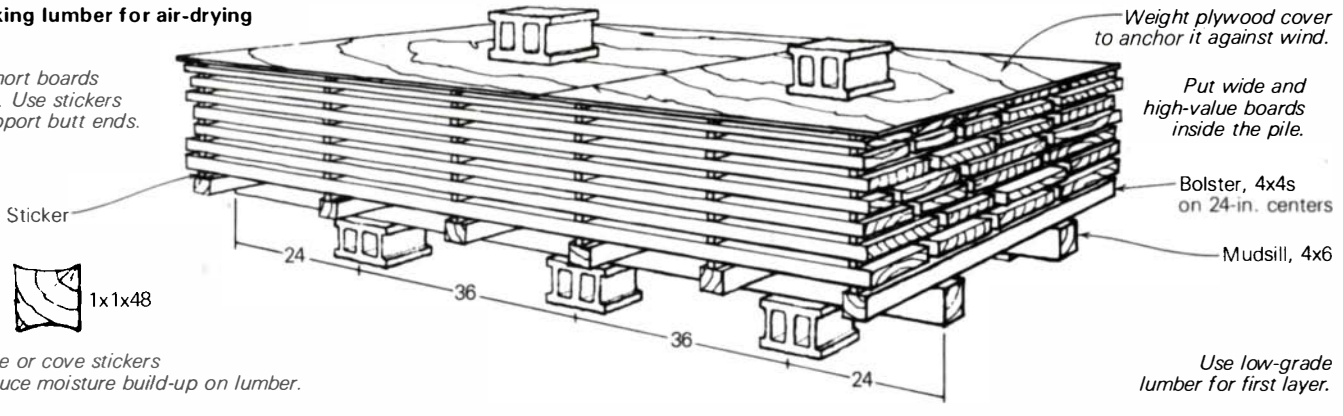
Lumber piles should be oriented with the wood's final use in mind. Some checking is acceptable in siding and structural lumber, for instance, so such stacks can be placed to achieve a high drying rate. That means exposing their sides to the prevailing winds, on a site with plenty of sun. Furniture lumber, on the other hand, should dry more slowly, so pick a more sheltered area and aim the ends of the stack into the wind, so the stickers will prevent it from blowing through the pile.

Fuge builds sturdy foundations for his stacks, and he is careful to keep the boards in parallel planes as the stack is built. The foundation should be high enough to keep the bottom layer of wood 1 ft. off the ground. For a foundation 10 ft. long, Fuge places two rows of three concrete blocks on their sides, each on relatively level ground. The rows are 30 in. apart and the blocks in each row are 36 in. apart. Atop the blocks, Fuge sets a pair of 10-ft. 4x6 timbers called mudsills. He sights along both mudsills to make certain they lie in the same plane, and shims under each concrete block to ensure uniform support. Next, six 4x4 bolsters go across the mudsills on 24-in. centers. With all the bolsters in place, Fuge uses a long, straight board to check them for alignment, and shims any that are not in line. If everything is in the same plane but still isn't level, Fuge is pleased. A pitched stack will shed any water that finds its way inside.

Stacking and stickering—Fuge keeps a large supply of carefully dimensioned stickers on hand. "I like white oak but if I have sassafras or locust, I'll use them too because they're lighter," he says. A 4-ft. long sticker, 1-in. square in section, seems the ideal size. Smaller stickers slow air movement and larger ones waste lumber and add weight. Don't use stickers with sapwood because it harbors the fungi that cause blue or sticker stain, a major source of lumber degrade. Stickers with bark are also rejected, says Fuge, because they deform under the pile's weight. Stickers can be grooved or coved along their length to reduce contact and moisture build-up on the lumber that can also cause stains.

With a sticker on each bolster, Fuge begins his pile with a layer of low-grade lumber that will act as a shield against ground moisture. If he is mixing lumber of various thicknesses, the heavier stock goes in the lower third of the pile where slower drying rates make it less likely to check. Fuge takes great pains to align each sticker vertically with the one below it, and to keep all the stickers over the bolsters' 24-in. centers. If the stickers creep out of line, the boards won't be supported evenly and those at the bottom will kink.

Stacking lumber for air-drying



Drawing: Claudia Westerbeke Chapman

As he stacks, Fuge also sorts boards by length and width. The longer stock goes to the outside of the pile, the shorter stock to the inside. High quality and extra-wide boards also go on the inside where slower drying makes degrade less likely. Extra stickers can be placed at odd locations inside the pile where the butt ends of short pieces meet between the fixed 24-in. centers. Bowed boards should be stacked with the bows facing each other, allowing the weight of the pile to straighten them. Cupped boards are stacked with cups down, permitting water that seeps into the stack to drain.

As the pile rises, Fuge sometimes finds that the sawmill has given him lumber tapered or wedge-shaped in thickness. To keep everything in the right plane, he keeps some odd-sized stickers around so he can shim out the variations. If the stack is building neatly, Fuge isn't afraid to make it plenty high—those in his yard go 10 ft. and better. "I figure if I'm going to go to the trouble to build a good foundation, there's no point in starting another pile unless I have to," he says. Mixing species is okay too, but you must remember that different woods have different drying rates. If the stack will be taken down all at once, it should be air-dried long enough to suit the slowest-drying wood.

When the stack is complete, Fuge tops it out with a layer of low-grade lumber followed by a roof of sawmill slabwood, plywood or other materials, canted to shed water, and anchored against the wind. Fuge advises against using plastic for roofs because it slows ventilation in the top layer and quickly decomposes and starts falling apart in sunlight. "Besides," he adds, "it looks like hell."

Paul Fuge makes sturdy foundations for his lumber stacks. He checks alignment of bolsters with a long, straight board fresh from the sawmill. To build a foundation with lighter stock, shore up with more concrete blocks or make a smaller pile.

Moisture control and maintenance—With the lumber stacked and roofed, Fuge turns his attention to controlling the drying rates and minimizing degrade. If he has built his pile during the peak drying months—April to October in the Northeast—he coats the butt ends of wide and heavy boards with glue or latex paint. This slows end-grain moisture loss and thereby reduces checking. "But if you don't coat them in the first two or three days, forget it, because the damage will be done already," Fuge warns. If a stack goes up in late fall or winter, little need be done until warmer weather approaches. And when spring does arrive, Fuge is ready. He shields his lumber against severe drying rates of hot, dry days by covering the pile with burlap or old blankets. The fabric is porous enough to slow (but not stop) moisture loss from the wood. As the weather moderates, Fuge uncovers the piles. If a stack end faces into the sun, it should be shielded with fabric or plywood throughout the drying cycle.

Fuge likes to leave 4/4 and 5/4 stock air-drying for a full season, that is, April to October. So a stack that goes up in the middle of the summer isn't considered dry until the middle of the following summer. Stock 6/4 and thicker may need two but certainly no more than three full drying seasons.

"After it's been out that long, it isn't going to get any drier and you might as well move it inside," Fuge says. He monitors moisture content with an electric moisture meter but an ordinary household oven and an accurate scale or balance will work just as well. Find moisture content by cutting a 1-in. cube about 2 ft. in from the end of a sample board. Weigh the cube and cook it in the oven at 212° to 221° until it no longer loses weight. Calculate moisture content by subtracting the oven-dry weight from the sample's wet weight. Then divide that figure by the oven-dry weight and multiply by 100. If he is in a hurry, Fuge checks the stack's moisture content every two weeks. When it reaches the 18% to 22% range, it's ready for the kiln even if it hasn't been out for a full season. The one year per inch guide is hardly written in stone. Vagaries in climate and species moisture content and drying characteristics make monitoring the lumber a must.

If you don't have a kiln, bring your air-dried lumber indoors to dry for final use. Fuge recommends stacking and stickering it in a heated, dry room for an entire winter. A small fan to circulate air through the stack will speed things along and by spring the lumber should be ready. "If you're willing to live with your wood in the house and treat it like you treat yourself, there's no reason you can't dry it entirely without a kiln," Fuge says. If domestic considerations make indoor drying impossible, Fuge suggests a dry garage, attic or shed. Any space in fact, will work except the basement—even the driest of basements is probably too moist for further wood seasoning. Once wood is dried down to about 12% it will pick up moisture in a damp basement.

With air and inside drying complete, stack your lumber tightly without stickers in a dry place. Further air movement through the pile will only restore part of the moisture you've worked so hard to remove. □

Paul Bertorelli is assistant editor of this magazine. For more on drying lumber see these FWW *back issues: R. Bruce Hoadley's* Water and Wood *in #4,* Drying Wood *in #6, and* Wood has to breathe, doesn't it? *in #14; William W. Rice's* Dry Kiln *in #6; Paul J. Bois'* Solar Kiln *in #7; Dale Nish's* Harvesting Green Wood *in #16; and Sam Talarico's* A Barn For Air-Drying Lumber *in #22.*

Shop-Built Panel Saw

Cutting plywood sheets down to size

by William F. Nelson

To support my woodworking hobby I practice architecture. Last year when we decided to move our offices, I offered to build the cabinets, and my partners accepted the proposal without hesitation. After drawing the cabinets and working up the bill of materials, which called for 75 sheets of plywood, I suddenly realized that my small shop had neither the space nor the equipment to handle that volume of material. Despite awful visions of wrestling dozens of cumbersome pieces of plywood around the shop and over the table saw, I was committed to the project and had to proceed.

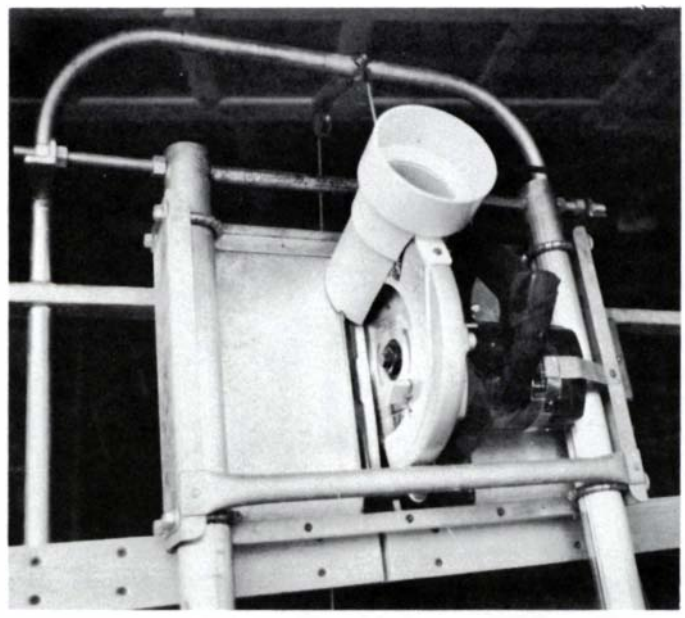
A couple of weeks before, I had been in a woodworking-equipment store in Houston. One of the things that had caught my attention was a panel saw, the kind with a vertical frame for holding large panels and with a circular saw mounted in a sliding carriage. I certainly couldn't afford to spend the $850 the thing cost, so I decided to make one.

I began by making a freehand sketch of the frame and the saw carriage, and was able to solve most of the construction problems on paper. The basic triangulated framework was fabricated from ordinary thin-walled electrical conduit and Unistrut steel channels, which I bought from an industrial supply store. Unistrut channels are commonly used to build warehouse shelving units and pipe racks. Because I have an acetylene welding rig, I decided to braze the metal parts of the frame together (figure 1a), but you could make it just as strong by using an assembly of wood top and bottom rails drilled to receive the vertical tubing members, fastening them together with sheet-metal screws through the back side of the wood into the tubing (figure 2). The framework must be rigid; it shouldn't rack or twist.

When the metalworking was done, I added the horizontal wooden strips and the wooden stock-support shelf at the bottom. I fastened the wood to the metal tubing with countersunk sheet-metal screws, which meant drilling pilot holes through one wall of the tubing. Be sure that the support shelf is perfectly straight and square to the frame. The saw carriage must clear the shelf and the blade must travel through it to complete the cut; the measurements given in the drawing accommodate 4x8 panels. For metric size plywood (about 5 ft. square), make the frame 1 ft. taller.

The part of the design that gave me trouble was the sliding saw carriage and guide bars. It was easy enough to make and attach the tubular guide bars to the frame, but providing for sliding bearings between the carriage and the bars was another matter. Finally I decided to use U-bolts on the carriage sides and to reduce friction and binding against the guide bars by making roller bearings from short lengths of stainless-steel tubing, whose inside diameter was the right size to fit over the U-bolts (detail A).

The guide bars are attached to the center tubular uprights at the top by means of right-angle flanges, threaded rod and nuts, as shown in detail B. The flanges can be either brazed or bolted to the uprights. Nuts on the threaded rod allow the guide bars to be adjusted so that the saw carriage will travel at a precise 90° to the base on which the workpiece rests, with no play between carriage and guide bars. At the bottom of the frame, the guide bars are fastened with a threaded rod to a ⅛-in. steel plate which is attached to the Unistrut bottom rail.



The counterbalanced saw carriage rides on steel-tube guide bars. U-bolts sheathed with short lengths of steel tubing act as bearings.

The saw carriage itself was the only part that I couldn't make in my shop. Because the design required channel-shaped flanges at each side to accommodate the U-bolts, I had to have it bent (brake-formed) in a sheet-metal shop. Two pulleys at the top of the uprights (one of them is fastened to an arm that is welded to the frame) and a counterweight complete the saw-carriage assembly. Without the counterweight, the saw is difficult to manage and will not stay at the top of the frame while you position the stock. To determine the exact weight to counterbalance the saw, I experimented with a plastic gallon jug filled with water.

My inexpensive 7¼-in. circular saw bolts to the carriage through the saw's base and is reinforced by a hose clamp and 18-ga. steel strap around the motor housing. I use a carbide-tipped blade because the glues in plywood and particleboard quickly dull standard blades. I installed a toggle switch at the top of the frame so I can pull the saw into the cut with the tubular crossmember on the carriage rather than by grasping the trigger switch in the plastic handle. I connected the saw to my dust collection system by setting a 3-in.-to-4-in. step-up PVC drain coupling astride the sawblade housing; a flexible hose fits snugly into the 4-in. part of the coupling (see photo above).

The saw is easy to use, and will produce accurate finish cuts the full width of a 4x8 plywood panel. It has been a real time-saver, too. Without rushing I was able to cut seven sheets of plywood into 62 finished pieces in 90 min. My cabinetmaking project took only 10 weeks, working evenings and weekends. During that time I also built myself a desk and credenza. I have since found the panel saw useful in ways I hadn't anticipated. Because it cuts at a perfect 90°, it's just the right tool for crosscutting long boards. With casters, the saw can be moved around the shop and then stored where it's least in the way. □

William F. Nelson lives in Beaumont, Texas. Photo and drawings by the author.

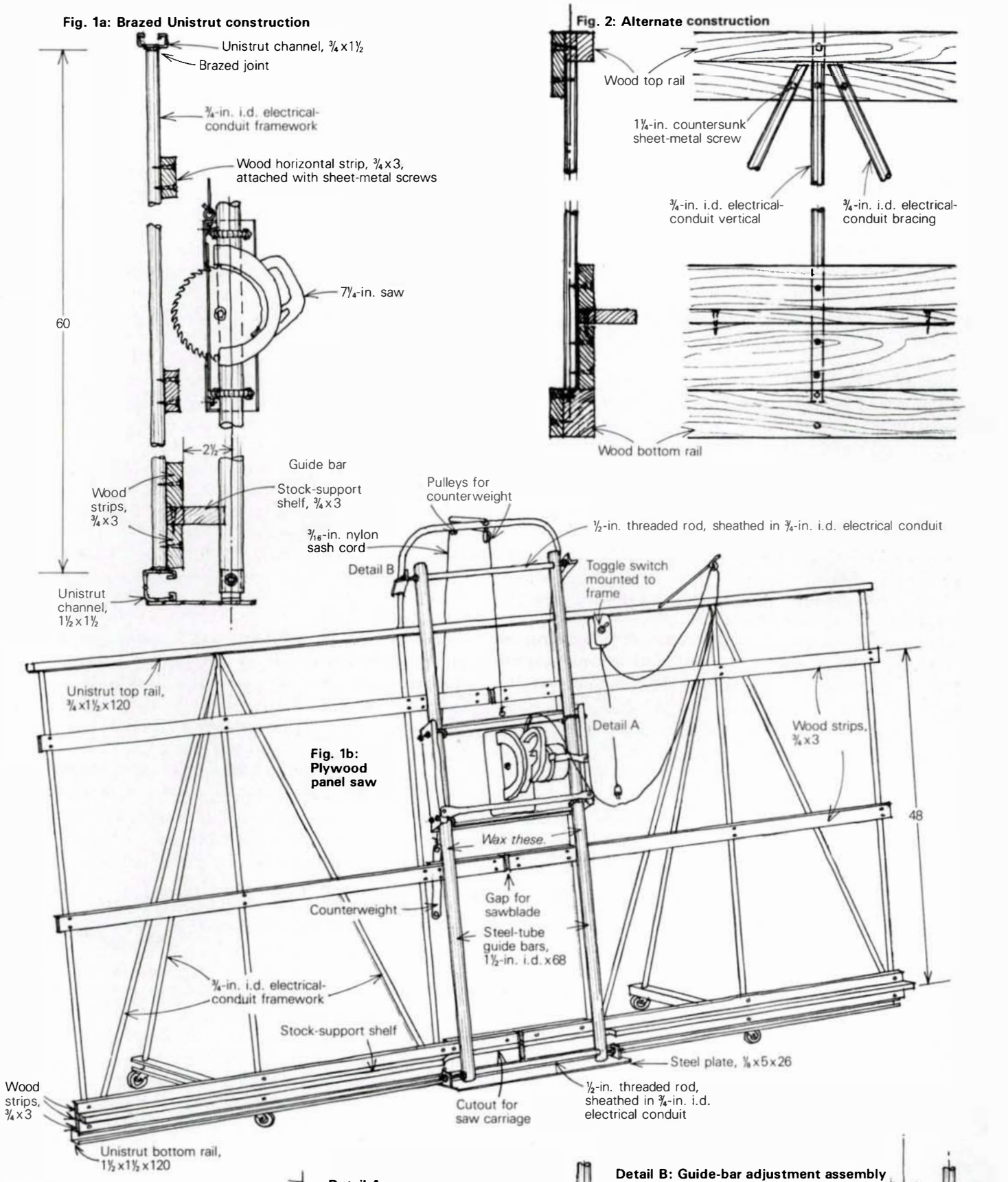


Fig. 1a: Brazed Unistrut construction
Unistrut channel, ¾ x 1½
Brazed joint
¾-in. i.d. electrical-conduit framework
Wood horizontal strip, ¾ x 3, attached with sheet-metal screws
7¼-in. saw
60
2½
Guide bar
Wood strips, ¾ x 3
Stock-support shelf, ¾ x 3
Unistrut channel, 1½ x 1½
Fig. 2: Alternate construction
Wood top rail
1¼-in. countersunk sheet-metal screw
¾-in. i.d. electrical-conduit vertical
¾-in. i.d. electrical-conduit bracing
Wood bottom rail
Pulleys for counterweight
½-in. threaded rod, sheathed in ¾-in. i.d. electrical conduit
3/16-in. nylon sash cord
Detail B
Toggle switch mounted to frame
Unistrut top rail, ¾ x 1½ x 120
Detail A
Wood strips, ¾ x 3
48
Fig. 1b: Plywood panel saw
Wax these.
Gap for sawblade
Counterweight
Steel-tube guide bars, 1½-in. i.d. x 68
¾-in. i.d. electrical-conduit framework
Stock-support shelf
Steel plate, ⅛ x 5 x 26
Wood strips, ¾ x 3
Cutout for saw carriage
½-in. threaded rod, sheathed in ¾-in. i.d. electrical conduit
Unistrut bottom rail, 1½ x 1½ x 120
Detail A: Saw carriage
¾
18
18-ga. sheet steel
¾-in. i.d. tubing with ends flattened
¾ x ¾ angle-iron stiffener
3
12
2⅛
Tubing
5/16
9/32
¼-in. U-bolt, sheathed with 5/16-in. lengths of stainless-steel tubing
Detail B: Guide-bar adjustment assembly
Braze or bolt angle-iron flanges to electrical-conduit upright.
Adjustment lock nuts
½-in. threaded rod, sheathed in ¾-in. i.d. electrical conduit
16
24
Guide bars

Twist Turning

Traditional method combines lathe and carving

by Eric Schramm

Spiral or twist turning was introduced in Europe during the 16th century and was used widely for chair and table legs in 17th-century England. Today, the technique finds uses in antique reproduction and repair and for the Mediterranean-style furniture popular in the Southwest and West.

Spirals, solid and hollow, are not turnings in the true sense of the word because most of the work is really carving. A spiral resembles a screw thread; it has pitch and lead. Pitch is the distance from center to center of consecutive ridges or bines. Lead is the distance the spiral advances along the cylinder in each revolution. In a single-twist spiral, pitch and lead are the same. A spiral with a short pitch and great depth will be weak because much of the long-grain wood has been removed. A longer pitch will be stronger but less pleasing to the eye. I find that a pitch about equal to or slightly less than the cylinder's diameter produces the nicest effect. The precise pitch, however, is governed by cylinder length, if the spiral bines are to be spaced equally and are to start and finish their lead symmetrically.

To lay out a single spiral, you must divide the cylinder's circumference into four equal parts. A quick method is to wrap a strip of paper around the circumference and trim it so the ends just meet. Remove the paper and fold it in half once, and then in half again. The fold marks, which will quarter the cylinder, can be transferred directly to the workpiece with a pencil. With the cylinder on the lathe and the tool rest acting as a straightedge, draw four lines along the length of the workpiece passing through these marks (figure 1a).

Next divide the cylinder's length into spaces that are equal to or slightly less than the cylinder diameter (figure 1b). These marks are the pitch lines and represent the distance between the spiral's ridges. Pitch lines drawn, divide the space between them into four equal spaces. You can now sketch the spiral ridge by drawing a continuous line diagonally through one after another of the quarter spaces between the pitch lines. A scrap of sandpaper makes a good straightedge (figure 1c) for drawing the diagonal lines. If you've done things properly, the ridge line will cross a pitch line with each revolution. With the ridge line completed, draw in another line parallel to it to roughly locate the spiral's groove. The ridge line will remain intact through the carving process.

A double spiral, the most popular form, is layed out similarly. The pitch remains the same, but the lead doubles. So this time, divide the space between pitch lines into two instead of four sections. Draw one ridge line as before, passing diagonally through the squares. In the length of one diameter, this ridge line will traverse 180°. Start a second ridge line 180° from the first, and draw the diagonals so the line remains 180° from the first throughout the length of the cylinder. Triple spirals can be plotted by dividing the circumference into six parts and starting the ridge lines at 120° intervals.

Ridge lines can be drawn also by wrapping a strip of paper around the turning, leaving a slight space between turns. A pencil line is then traced through the spiral space.

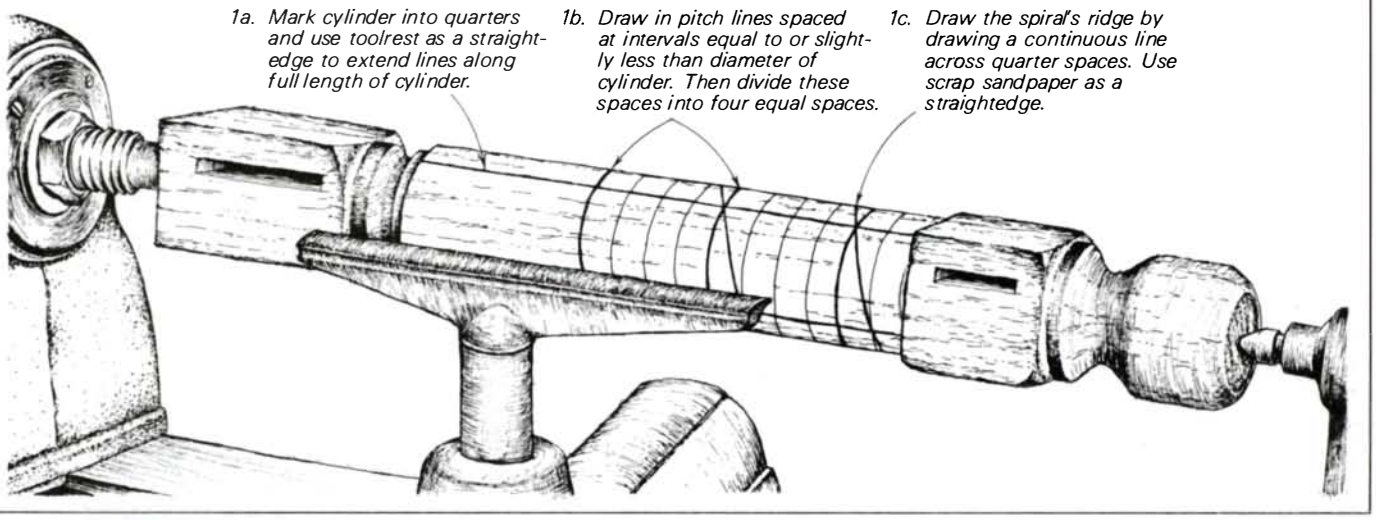
Actual cutting of the spiral is tedious but not difficult. First make a saw cut on the line that represents the bottom of the groove. Start with a saw with a strip of wood clamped to it or some masking tape to indicate the depth of cut, which should be about a quarter of the workpiece diameter (photo **A**). Rotate the work slowly while cutting so the kerf will follow the line. After sawing, the space between the bines is shaped by making broad V-cuts with a sharp chisel or No. 2 carver's gouge (photo B). Use a round file to clean up these spaces (photo C), then dress up the rounds with a flat cabinet file. The spiral can be rotated in the lathe by hand to permit longer file strokes and smoother results. The ridge line should be preserved throughout the process. Finish the spiral with sandpaper or use a shop-made pinwheel sander such as that described in *FWW* #30, p. 67.

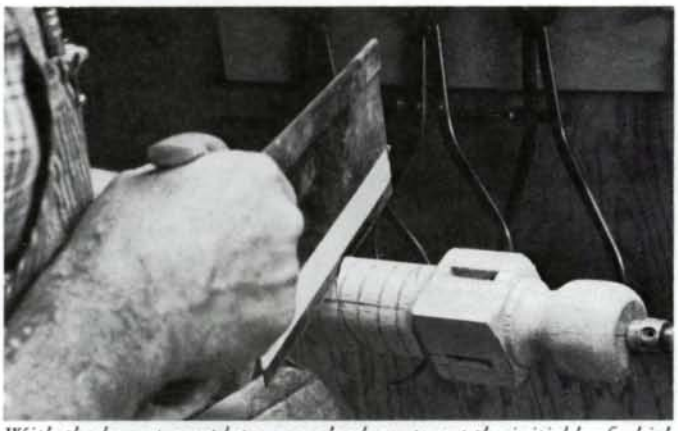
Another variation of the double or triple spiral is the hollow spiral where the bines of the spiral are separated by an opening. Hollow or open spirals generally lack sufficient strength for furniture legs, but are quite effective as candlesticks or lamp bases. The work is layed out as for the double or triple spiral, with the cutting line that represents the bottom of the groove used as a drilling line. A V-block is used when drilling to assure accuracy (photo **D**). The holes go through the turning and are best drilled half way through from each side to avoid splintering. Finish the shape with chisels, files and sandpaper (photo E). One of the best tools for cleaning out the inside is an ordinary sharp carving knife. Irregularities and tool marks can be removed with strips of sanding belt, pulled back and forth around the bines (photo **F**). Make the final strokes in the direction of the grain. A great deal of patience and skill is required for neat work. The wood used should be tough, hard, and free from defects.

Tapered spirals for flame finials are also possible. To lay out a taper, you must make the pitch vary so that it equals the diminishing diameter of the workpiece. Begin as above by striking four lines along the length of the taper. Then measure the diameter of the taper's large end and mark this distance on one of the four longitudinal lines. At this mark, measure the diameter again and mark this length along the taper. Repeat this process until you reach the end of the cylinder. Adjust the various pitch lines you have drawn so that they diminish proportionately. Draw in the ridge line and proceed with the cuts as in straight work. To make a flame finial, draw four ridge lines starting at 90° intervals from the large end of the taper. Use double ridge lines about ⅛ in. apart, and use gouges and files to remove the waste. I find a Moto Tool with a round burr a good tool for forming the flame. □

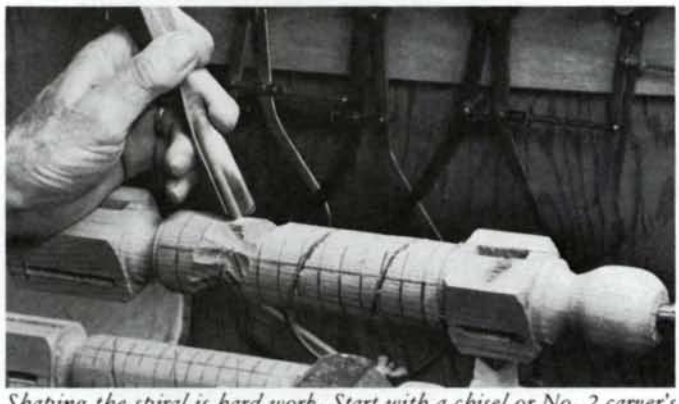
Eric Schramm designs and builds custom furniture in Los Gatos, Calif. Photos by Robert Schramm.

Fig. 1 Laying out the spiral



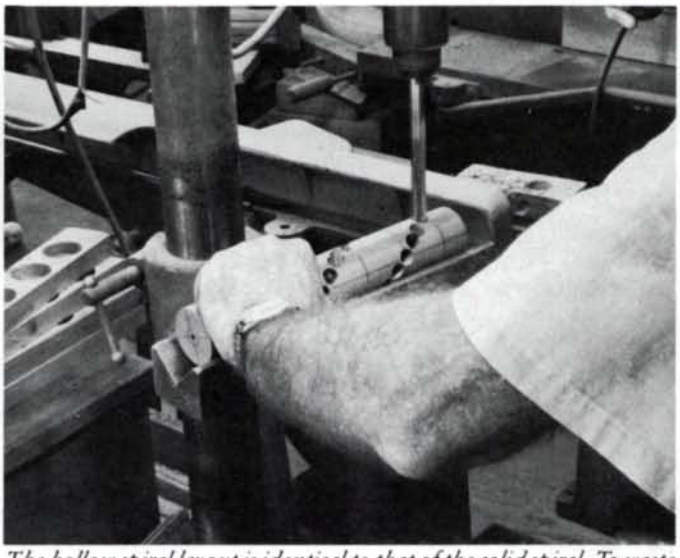


A *With the layout complete, use a backsaw to cut the initial kerf which will serve as a guide for carving the spiral's grooves.*

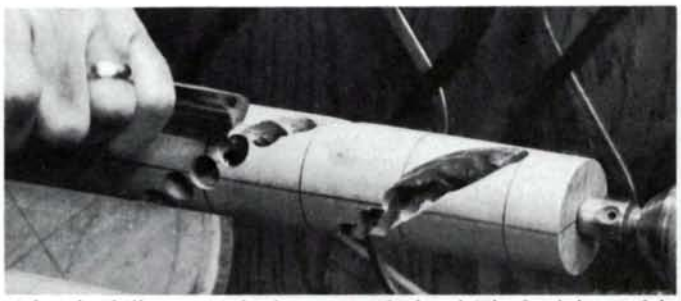


B *Shaping the spiral is hard work. Start with a chisel or No. 2 carver's gouge. You can control the shape of the grooves and ridges by varying the angle of your chisel cuts.*

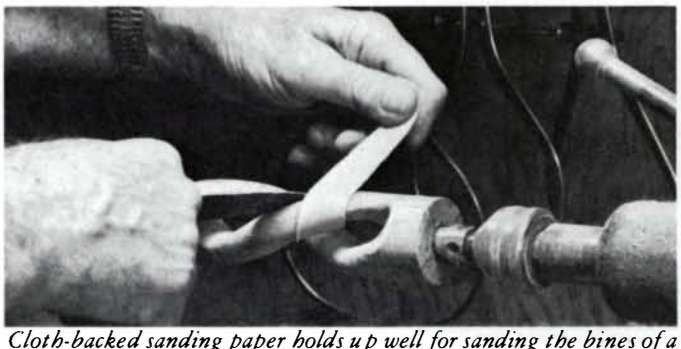
C *After carving, use rasps and sandpaper to form the spiral in the shape you want. Here, sandpaper is wrapped around a rasp that acts as a sanding block to maintain the radius.*



D *The hollow spiral layout is identical to that of the solid spiral. To waste the center of a hollow spiral, Schramm uses a drill press with the stock anchored against turning and slipping by a V-block.*



E *After the drill press, it's back to carving by hand. The final shape of the hollow spiral is done with chisels, knives, rasps and sandpaper. Lathe-mounting allows the work to be positioned while carving.*



F *Cloth-backed sanding paper holds up well for sanding the bines of a hollow spiral. Old sanding belts can be cut into strips for this job. Use progressively finer grits to get a good finish.*

Drawing: Karen Pease

A Mechanical Twist

The tablesaw can be used to lay out a helix and to cut its initial kerf at the same time. Then with a molding head on the saw and a guide pin running in that kerf, the bulk of the waste can be machined away. The basic method is to clamp an angled fence across the saw table just ahead of the sawblade, which is raised only ¼ in. above the table surface. A blank cylinder, lodged against the table and the fence and rotated over the blade, will feed itself along the fence regularly and automatically. The result is a helical kerf whose pitch is governed by the angle of the fence. A cylinder turned between square pommels, what you'd want for chair or table legs, can also be tablesawn in this way by screwing free-spinning end-blocks onto the stock, as shown at right. The end-blocks raise the stock off the table and away from the fence so its square sections don't interfere with its rotation.

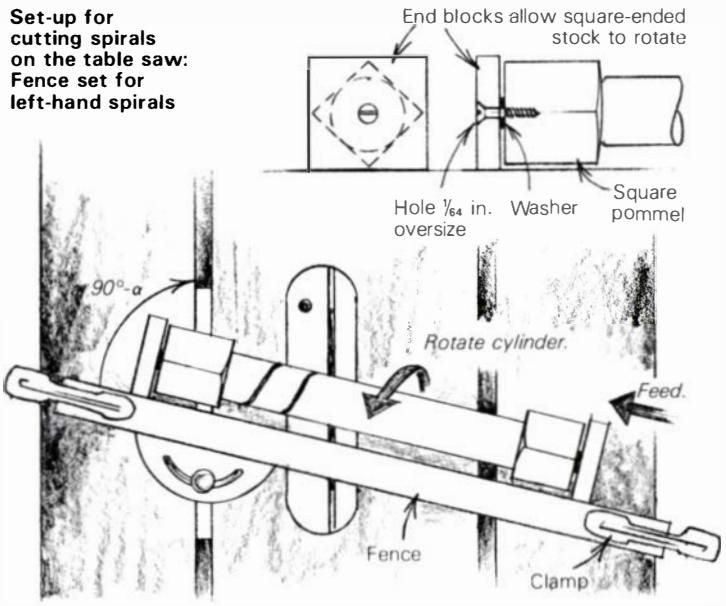
As in all twist turning, the first step is to turn the blank cylinder, straight or between square pommels, depending on the application. There's uncertainty in these procedures so make five blanks if you need four legs. Then choose the pitch angle (α), which determines how quickly the helix rises—that is, its pitch, or lead, how far apart its ridges are. A pitch angle around 18° saws a helix whose lead (L) about equals its diameter (D). This pitch angle is set by locking the miter gauge at 72° (that is, 90° minus 18°), and using the gauge to locate the fence on the saw table. Whatever the angle, the fence should be located so that the center of the blank cylinder is directly above the center of the sawblade. Moving the fence forward or backward has the same effect as changing its angle. To saw a double helix whose ridges are still one diameter apart, use a pitch angle around 32°, which means set the miter gauge at 58°. Pitch angle (α), diameter (D) and lead (L) can be figured with the following formula:

$$\tan \alpha = \frac{L}{\pi D}$$

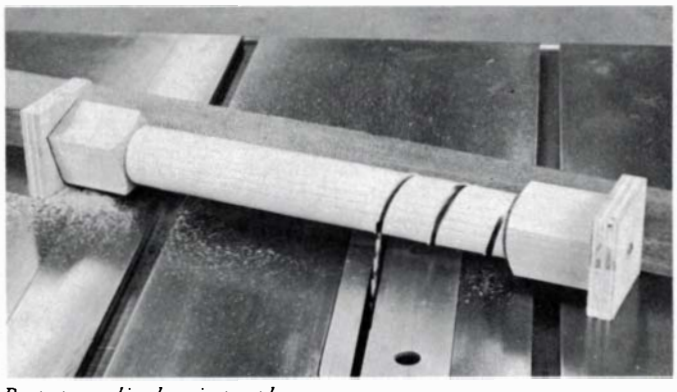
Always use a sturdy fence that's more than twice as long as the stock—a length of 2x4 is good. When the fence slopes away from the operator from right to left, the resulting helix will be like a left-handed thread. When the fence slopes away from left to right, the helix will be right-handed. Always feed the stock from the near side of the sawblade (the downhill side), always rotate it against the sawblade's rotation (so the blade doesn't self-feed), and always keep your hands well clear of the blade's path. For a double spiral, start the second kerf at a point 180° opposite the first.

After the helical kerf is cut, you can remount the stock on the lathe for carving, or you can further shape it with the molding head. Use coving knives in the head, and make a snugly fitting wooden insert for the tablesaw throat. Set a small dowel in the face of the fence (photo), just long enough to catch in the kerf. Fit this fence pin into the kerf and use the miter gauge (set as before) to locate the stock in relation to a molding knife. Clamp the fence to the saw table and rotate the stock into the molding head, slowly and carefully. The pin will automatically feed the stock. Shaping with the molding head has to be done in one pass because the cut removes the guide kerf. After the molding knives have done what they can, the helix can be cleaned up with carving tools, rasps and sandpaper. A strip of cloth-backed sandpaper in a bowsaw frame will speed the chore. —*Larry Green*

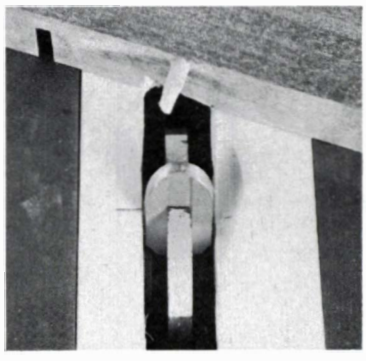
Set-up for cutting spirals on the table saw: Fence set for left-hand spirals



Position fence so stock center and saw arbor are vertically in line. Use miter gauge to set fence angle. Raise sawblade to cut ¼ in. into cylinder. Free-spinning endblocks provide clearance for square pommels, as shown in the detail at top.

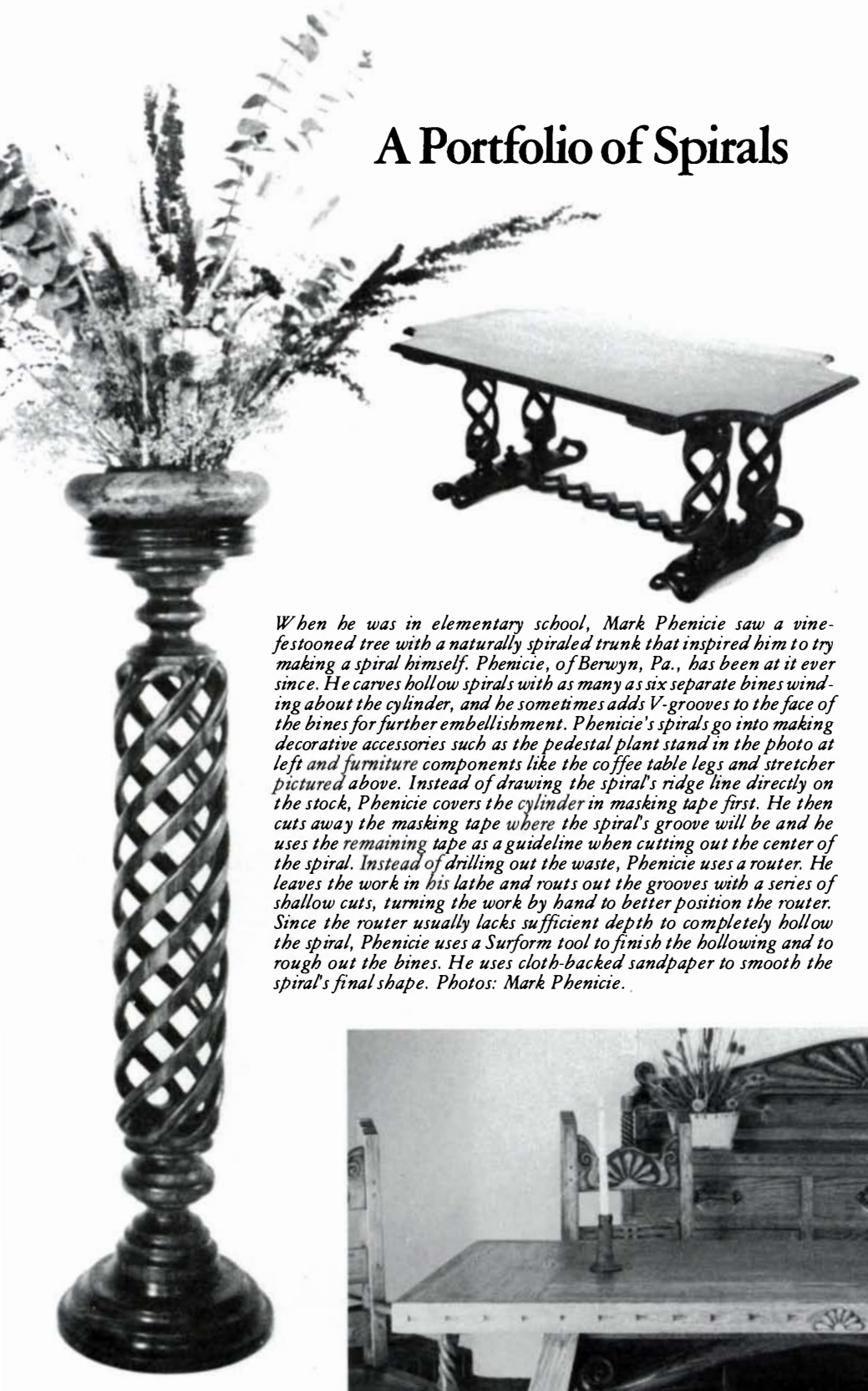


Rotate cylinder into the sawblade to cut helical kerf, above. It will feed itself along the angled fence.



Dowel pin set in fence will guide kerfed cylinder past molding head (right). Cut must be deep because a second cut is not possible (below). Go slowly to minimize tear-out.

A Portfolio of Spirals



When he was in elementary school, Mark Phenicie saw a vine-festooned tree with a naturally spiraled trunk that inspired him to try making a spiral himself. Phenicie, of Berwyn, Pa., has been at it ever since. He carves hollow spirals with as many as six separate bines winding about the cylinder, and he sometimes adds V-grooves to the face of the bines for further embellishment. Phenicie's spirals go into making decorative accessories such as the pedestal plant stand in the photo at left and furniture components like the coffee table legs and stretcher pictured above. Instead of drawing the spiral's ridge line directly on the stock, Phenicie covers the cylinder in masking tape first. He then cuts away the masking tape where the spiral's groove will be and he uses the remaining tape as a guideline when cutting out the center of the spiral. Instead of drilling out the waste, Phenicie uses a router. He leaves the work in his lathe and routs out the grooves with a series of shallow cuts, turning the work by hand to better position the router. Since the router usually lacks sufficient depth to completely hollow the spiral, Phenicie uses a Surform tool to finish the hollowing and to rough out the bines. He uses cloth-backed sandpaper to smooth the spiral's final shape. Photos: Mark Phenicie.

Fred Johnson of Andover, Mass., used the drill-press method to hollow the spiral for this pedestal table. He used a keyhole saw, rasps, rifflers and 'sheet upon sheet' of sandpaper to finish the piece. Photo: Fred Johnson.

J.R. Thomas of Cerrillos, N.M. designs spirals into his Spanish-influence furniture. But he doesn't use fancy formulas or complicated layouts to make them. "I just screw around with a bevel gauge until I get something that pleases my eye," Thomas says. The pieces shown here were done for a Santa Fe builder. Thomas carves his spirals entirely with V-gouges and in-cannels. He puts all the legs for a piece in his vise, carves them at once on the square stock, and finishes each individually with rasps and sandpaper. Photo: J.R. Thomas.

Vietnamese Planes

Cong Huy Vo turns scrap into tools

by Curtis Erpelding

When Cong Huy Vo, a Vietnamese boat refugee and furniture maker, settled in Portland, Oregon, he quickly found a job in a small antique shop. The first day at work, after looking around in dismay at the shop's limited selection of tools, he immediately set about making his own. I was beginning to make tools myself, so on a friend's recommendation, I paid Cong a visit.

Passing through the showroom full of Mission Oak and Grand Rapids-style pieces from the turn of this century—considered antiques here in the West—I entered the workshop in the rear of the store. Cong, a short, wiry man looking a decade younger than his 35 years, greeted me with a shy smile. He speaks only a few words of English, but with the traveler's repertoire of facial expressions and pantomime we communicated. He told me about his life in Saigon, his apprenticeship and his tool making.

When he was 14 years old, Cong apprenticed with his great-uncle, working four years for only room and board to learn the skills of carver and cabinetmaker. The apprentices all learned to make their own planes and carving tools, since there were few manufactured tools and little money to buy them. This necessity was no disadvantage. As Western woodworkers are rediscovering, home-made tools aren't that difficult to make, and they can be designed and modified to suit the individual and the problem at hand.

About 20 people, two per bench, worked in the Saigon shop. Apprentices learned how to work by hand, even though the shop had basic stationary machines: table saws, jointers, and so on. Each apprentice made a piece of furniture from start to finish, from the framing-out and carcase work to the carving, detailing and finishing. At the end of his apprenticeship Cong, like every other graduate, was dismissed—cheap beginners were preferred to wage-earning journeymen. Cong quickly set up his own workshop, training his brother, father and uncle to make everyday furniture and, from time to time, an elaborately carved cabinet for a wealthy client. In 1979, Cong left Vietnam, crammed with 33 others in a boat only 33 feet long, 8 feet wide and 3 feet deep. After 15 days at sea and 8 months in Thailand, Cong arrived in Portland. He brought nothing with him but his skill.

I first met Cong about six months after his arrival. He'd already made a bench plane as long as the western jack (about 14 in.), a rabbet plane, a dovetail plane with metal sole, and several special molding planes. Each had a simple beauty and logic, and some had features that were new to me. All the planes were made of a dense tropical hardwood resembling wengé, provided by the owner of the shop.

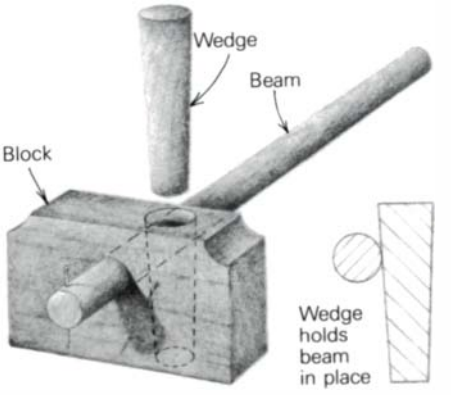
To make a plane, Cong dresses a block of wood to the appropriate size, then scribes lines for the opening with a square and his simple marking gauge. He bores out the waste and chisels the opening for the iron: mouth, throat and bed. The inner surfaces looked reasonably clean to me, but Cong pointed to the bed where the iron would rest and shook his head disapprovingly. It needed further smoothing, which Cong accomplished with a float, a file-like tool traditionally used for this purpose by makers of wooden planes *(FWW* #30, p. 63). Cong made his float by heating an old file to red hot and cooling it very slowly. The steel thus annealed, Cong easily filed or ground off the old teeth and cut new, deep ones with a cold chisel, straight across the file, spaced about ⅛ in. apart. He hardened the float by reheating it to a red color and then quenching it in oil.

Cong cut his jack-plane iron and cap iron from a used industrial hacksaw blade. The wedge, a piece of drill rod bent

Grasping his homemade jack plane by the handles set behind its blade, Cong planes an edge. He controls the cut with his wrists, index fingers and thumbs.

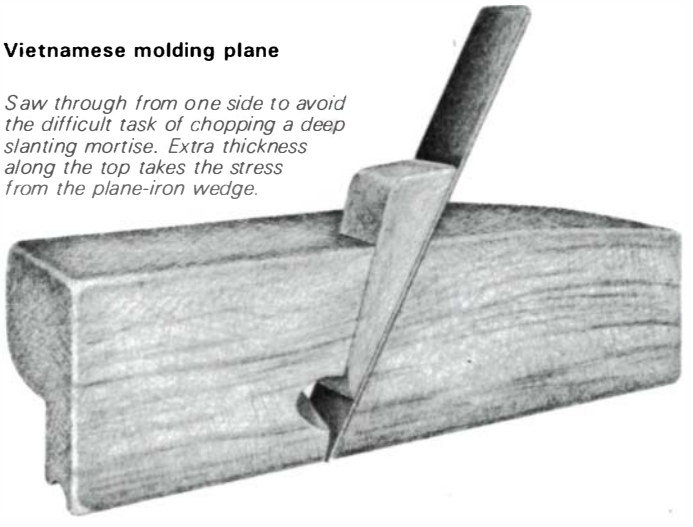
A quick marking gauge

Cong's marking gauge consists of two ½-in. dowels and a wooden block, and can be made in a few minutes. Bore a ½-in. hole for the beam through the center of the block. With a 7/16-in. machine bit, bore a hole for the wedge at a right angle to the beam hole, just breaking through its side wall. Taper the wedge hole by moving the drill bit around in it. You can avoid widening the bottom of the hole by clamping a piece of scrap to the gauge block, slightly wider than the gauge block and bored with a hole of the same diameter. The center of rotation will be in the scrap, ensuring a straight taper through the gauge. Carve or sand the dowel to fit snugly and drive a small brad through the end of the beam. You can make several gauges at once: substitute a pencil lead or a slitting cutter for the brad, or make longer beams for panel marking.



Vietnamese molding plane

Saw through from one side to avoid the difficult task of chopping a deep slanting mortise. Extra thickness along the top takes the stress from the plane-iron wedge.



to a U-shape with its ends tapered, is held in place by a pin that spans the plane's throat. The plane is adjusted with a steel hammer, as are Japanese planes. Their construction also resembles that of Japanese planes, but Cong pushes instead of pulls all of his planes. A ½-in. dowel fixed through the block behind the iron and wedge serves as a handle. The old floor-jack and crown-molding planes of the West also had dowel handles. Fixed through the plane's nose, the handles were pulled by an apprentice while the plane was guided by a journeyman. Cong's are one-man planes. He planes by grasping the dowel with one or both hands, standing beside a long board or behind a short one. He does not take a long, continuous shaving, but planes one area at a time as he moves down the board.

Because of their wide throats and poor-quality-steel irons, none of Cong's planes cut as cleanly, as free from tear-out or plane marks, as Japanese or Western wooden planes. In Vietnam, Cong's ordinary furniture didn't require highly finished flat surfaces, and the frame-and-panel construction of his ornate pieces was carved and embellished with split turnings. Planes were used to rough out the framework and panels, and to cut moldings. When flat, unblemished surfaces were required, they were scraped.

Several of Cong's molding planes feature an unusual and simple construction. By cutting the mouth and throat opening for the iron and wedge through one side, he avoids the tedious task of cleaning out an angled, closed mortise. After marking the opening on the face, Cong saws down as deep as the width of the cutting iron, then chisels out the waste. The thick upper part of the plane accommodates the stress from the wedge, and only the bottom inch or so of the sole is as narrow as the iron, which can be the same width throughout its length. As there is no need for a narrow offset tang like on Western molding plane irons, the wedge can cover the entire width of the iron, reducing chatter. The bodies of some of his edge-molding planes extend below the plane iron, and serve as fences that guide the cut. Like Western planes, the 55° to 60° pitch of the irons in Cong's molding planes is steeper than the 45° pitch of his jack and rabbet planes. This steeper pitch produces more of a scraping cut, reducing tear-out, an important feature since the plane has no cap iron.

Living up to the Vietnamese reputation for resourcefulness, Cong has scavenged many of the materials he uses in his tools. He has ground scratch blades and scrapers from hacksaw blades and from straps of spring steel salvaged from the guts of an overstuffed chair. His gouges are made from lengths of drill rod, using a forge, electric blower and anvil given to him by a neighbor. He shapes the gouges on a homemade swage block made by boring various diameter holes through a chunk of iron and then hacksawing through these at an angle to produce shallow, tapered hollows.

Cong hammers the heated drill rod between a groove in the block and a bar slightly smaller than the groove's diameter. After the general sweep of the gouge has been forged, he grinds the back and edge profile, files or grinds the bevel and tapers the shank to form a tang. The gouge is hardened by reheating to cherry red followed by a quenching in oil. As far as I could tell, Cong did not temper any of his tools after he had hardened them. I watched him make a gouge from the forging to the handle-fitting in 15 minutes, so if one breaks or cracks, another can be made on the spot to take its place. Cong's tools may be rough and ready, but he knows how to get the most out of them.

I visited Cong again last fall. He has married, acquired two cars and moved into a nice apartment. He is still repairing and restoring old factory-made furniture. But he would like to have the chance to make the kind of furniture he made in Vietnam. His tools are evidence of his skill, skill that continues a tradition of self-reliant technology in woodworking. □

Curtis Erpelding makes furniture in Seattle, Wash. He has taught planemaking in a number of workshops around the country. Photo by the author.

Current Work

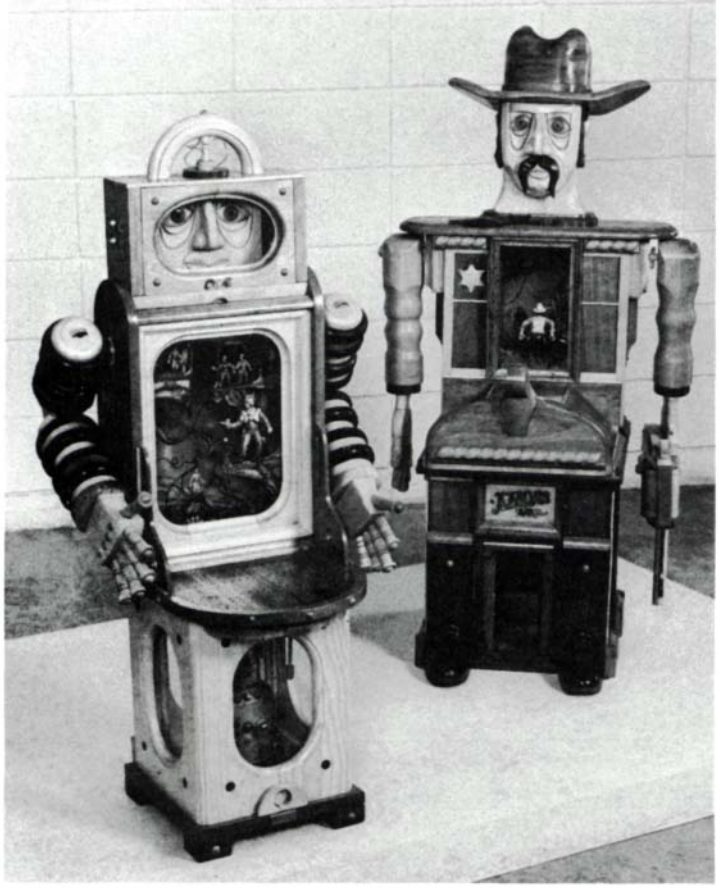
Iowa harvests a show of contemporary fancy

by Rick Mastelli

No four-lane highways link Waterloo, Iowa, with the rest of the country, but that didn't deter this little city (which boasts the world's largest tractor factory) from staging the first regional show of Midwestern woodworking. Last fall, more than 50 pieces made it to the Waterloo Recreation and Arts Center for a month-long exhibition. Art director Clarence Alling had talked with museum and crafts people throughout the Midwest, and the show he composed reflected his sense of humor and whimsy.

Waterloo loved it. Hundreds of people came and were delighted with the playful, fanciful, and often impractical woodwork, as well as with the more sober fare. Folks could imagine this stuff in their homes. It was the wood and the craftsmanship that they liked. If the artist chose to go off in some weird direction, he was allowed, and his efforts were applauded. Here are some of the pieces that played so well in Waterloo.

'Made of Wood,' at the Waterloo Recreation and Arts Center last fall, included gizmos and sculpture as well as furniture. The largest piece in the show (that whiskered form in the back center) was a magazine and newspaper rack by Ed Dadey, of Marquette, Neb.



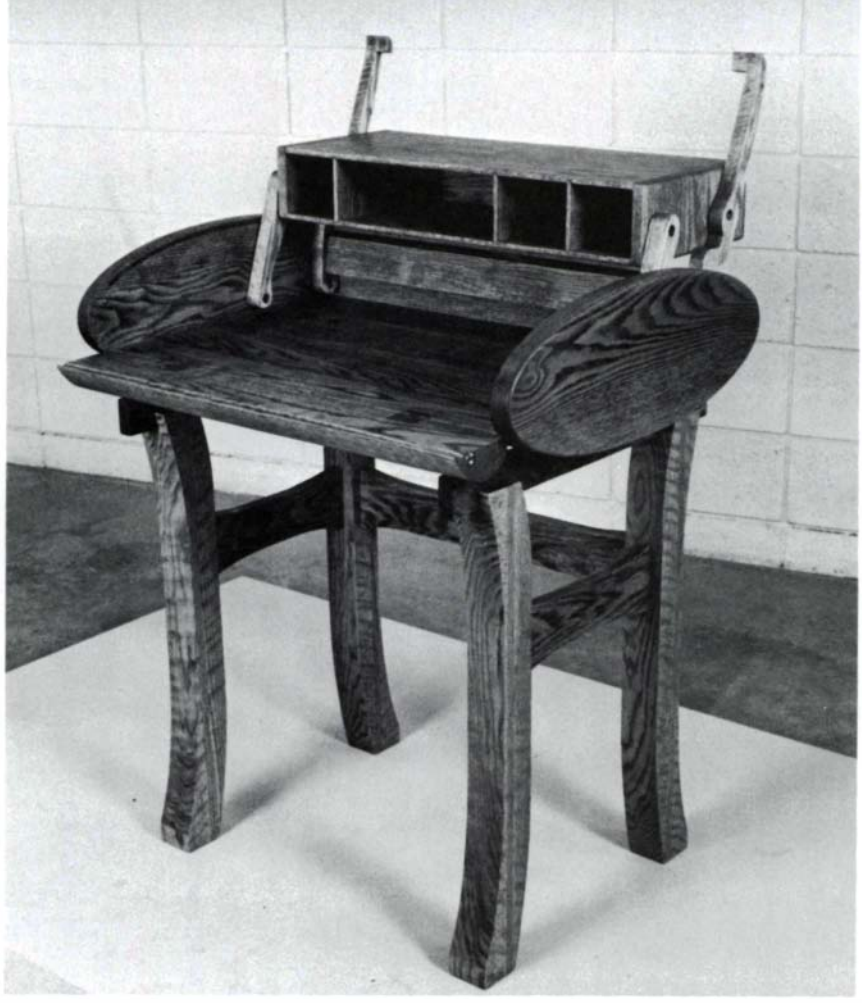
From Racine, Wis. . . .

"Cosmic Comic Book Kid Chair," left, and "Amos's Bar and Grill—Cowboy Chair" are two of a whole population David Holmes is creating, in which people are chairs. They are assembled like miniature architectural structures, the cowboy with paneling and molding, the space man with rivets and rubber rings. Instead of building an environment for each, Holmes includes an appropriate diorama inside the torso. Thus these guys are at home anywhere, carrying with them the scenes of their exploits.

From Minneapolis, Minn. . . .

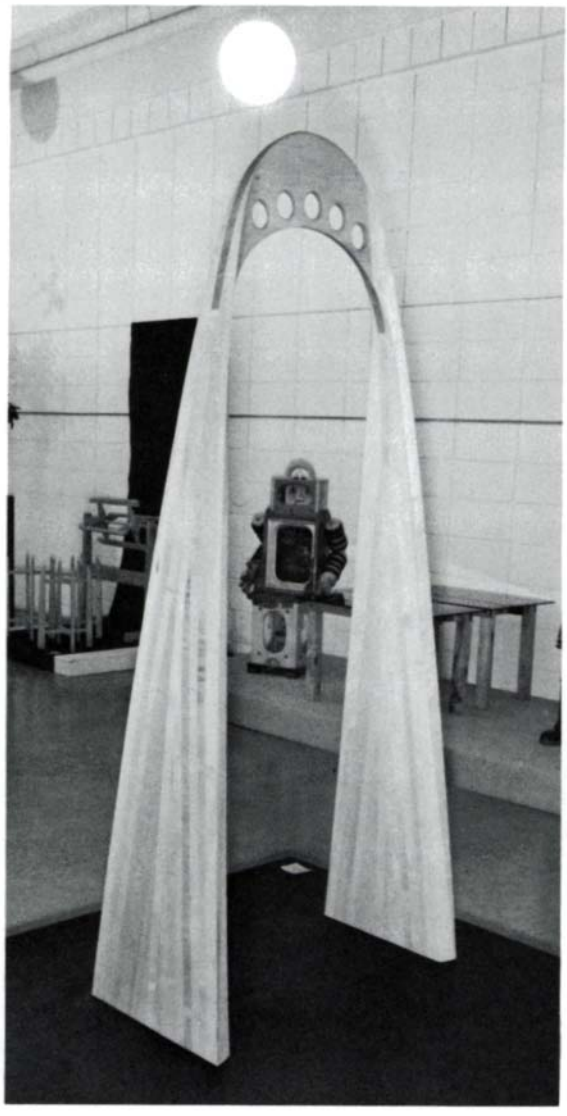
Randy Harmes makes boxes and cabinets that draw you inside. When you peek through the cross in the armor of his smugly contemplative "St. George," photo right, you see the gleaming red eye of a forlorn green dragon. When you open the bulging, coopered coat of the wall-hung military man (entitled "You Are What You Eat"), you discover the hanging head of a slaughtered pig. And in "Hatbox," he depicts himself, as if making containers were his predicament. When you lift the brim of the hat to peer inside, you find yourself peering back from the mirror that lines the bottom.

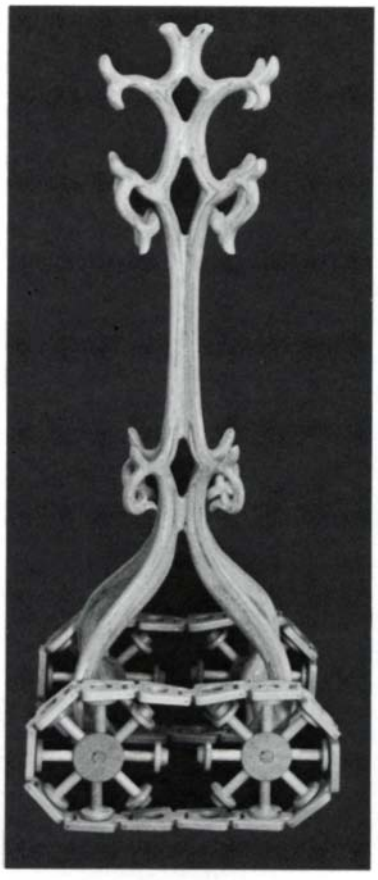
From Mt. Horeb, Wis....



Bruce Erdman is widely known through craft fairs and shops for his tambour boxes. Here he works this theme large, in a pigeonhole desk of white oak. The desk was the most handled piece in the show. No wonder, the way the writing unit, compact and self-contained when closed, glides easily open and swings up and out for use.

From Marquette, Neb. and St. Paul, Minn....





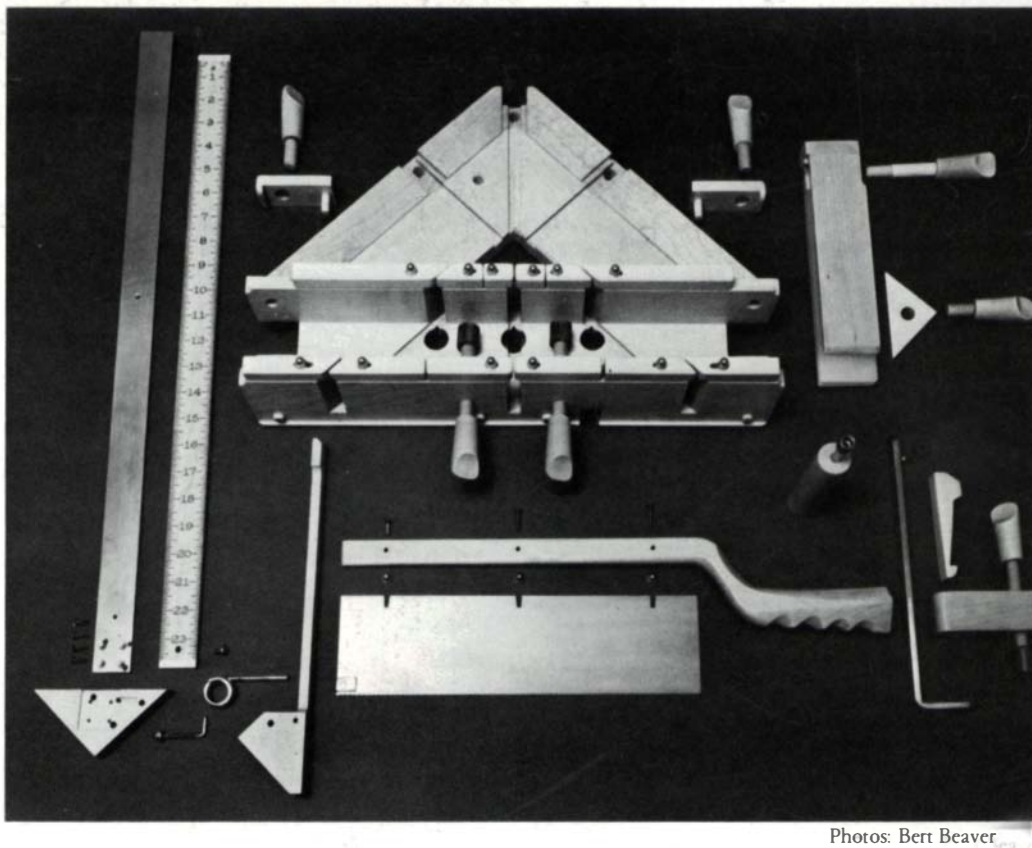
Two coat racks test unusual forms for a mundane function. Ed Dadey laminated maple in the shape of the Gateway Arch in St. Louis for a taut, pleasantly springy hanger holder, left. The convoluted tractor tree by Dean Wilson is of birch and birch plywood. □

Mighty Fine Miter Box

The metal tools we can so easily buy make us forget the potential of wood as a material for making tools. I made this miter box with wooden parts designed to last or be easily replaced, and it cuts smoothly and accurately. Wooden screws in the front fence secure the work, and a clamp holds the box to the bench. I made the saw by removing the handle and back from a Millers Falls backsaw and replacing them with a one-piece back/handle. I find that positioning the handle directly in line with the sawteeth gives better control, especially in small moldings. A sliding rule with a swiveling end-stop provides the measurement accuracy for repeat cuts. The length of the cut can be read in the circular window in the base of the box.

The tool is non-self-destructive because the sawteeth never touch the box. The saw is sandwiched at the top of the fences by guides that adjust the plane of cut both vertically and laterally; they also stop the saw from cutting into the bottom of the box. You tend to take exceptional care of tools you make yourself, so this box should work accurately for as long as I need it.

—John Marcoux, Providence, R.I.



Photos: Bert Beaver