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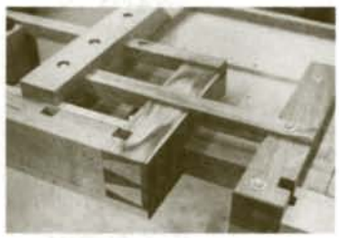
Fine WoodWorking

July/August 1985, No. 53

Cover: The Reid Classics shop in Mobile, Ala., specializes in making period beds. Their post turning methods will work in any small shop, as shown beginning on p. 28. Photo: Alex Thigpen.



Jaws, too? Exactly, but these are padded with leather so as not to mangle the work. Other ingenious features of Frank Klausz's workbench are shown in the plans beginning on p. 62.

Innovative woodturner Stephen Hogbin has pushed the lathe just about to its limits. Lately he's been 'turning' giant-scale textured sculptures not on the lathe, but with a router mounted on a long swinging arm, as explained on p. 44. Photo: Rudi Crystal.

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Departments

4 ***Letters***

10 ***Methods of Work***
Hidden shelf hinges; octagon marking gauge; lumber dollie

16 ***Questions & Answers***
Drilling a saw table; finish repair; disposing of toxic solvents

94 ***Events***

100 ***Books***

110 ***Notes and Comment***
White knuckle joinery; product review; artisanry program

Articles

28 **Making Period Bedposts** by Asher Carmichael
Methods from the Deep South

34 **Perspective in Marquetry** by Silas Kopf
Renaissance work inspires contemporary maker

38 **A Simple Banjo** by Richard Starr
Making a wooden-top 5-string

41 **Drill-Chuck Reconditioning** by Richard B. Walker
Overhaul cures lockjaw

44 **Variable-Arm Milling Machine** by Stephen Hogbin
Exploring the router's sculptural potential

47 **Ted Hunter's router mimic** by Mary Hui

48 **Shop-Built Moisture Meter** by Rick Liftig
Printed circuit guides you through electronic maze

50 **Gauging wood movement** by Tom Liebl

51 **Two Dovetail Layout Tools** by Jim Richey

52 **Measuring Antiques** by Dick Burrows
Educated guesses fill in the gaps

55 **Compiling a materials list** by Jeff O'Hearn

56 **From Cedar to Sea** by Douglas C. Granum
Carving and steaming a dugout canoe

58 **Antebellum Shutters** by Ben Erickson
Movable louvers from simple jigs

62 **A Classic Bench** by Frank Klausz
Workstation's center is worth building right

68 **The Mysterious Celt** by Allan J. Boardman
One way it spins, the other way it refuses

69 **Tip tops** by Girvan Milligan

70 **Leather and Wood** by Seth Stem
Three clever combinations

74 **Woodturning in Ireland** by David Sloan
National guild hosts a seminar

Re the backcover of your May issue. The staircase is attractive, fun and ingenious, but very dangerous. Considering the degree to which building codes go to dictate safe, legal standards for stairs (the cause of many household accidents) this flight of fancy belongs in a curio musuem, not a house. Besides lacking a handrail, it lacks a barrier at the top to prevent someone from descending, unaware that the stairs have been left in its whimsical state. I'll wager a year's subscription to *Fine Woodworking* that no building inspector ever approved that staircase. If it's art, move it over to the other wall of the hallway and play with it there. Put a safe staircase in the hole, one that'll be there when you take that first step at the top.

—M. Felix Marti, Monroe, Ore.

TOM LUCKEY REPLIES: You're right, the staircase would not be passed by a building inspector. When I built it in 1970, code didn't apply and even if I could build another, I'm not sure I would. Yes, the staircase is a hazard but not an unreasonable one, providing those who use it are made aware of its existence and exercise care and common sense in using it.

With reference to John Kelsey's interview with Tage Frid in *FWW* #52: How refreshing it is to hear "the old craftsman" bring up the profit motive when discussing woodworking. Somehow the word craft, when associated with wood, has come to mean "the giving of one's time for the propagation of the art."

This definition [suggests] that the craftsman has nothing else to do but create exotic and expensive-looking pieces of art woodwork. The craftperson doesn't eat, sleep or have bills to pay. He just creates, using old techniques and old equipment. The old craftsmen were experts at "mothering the necessity of invention." They made do in order to make it. Figure out how to build that stuff fast enough, in order to make enough, in order to feed the family.

Frid's comments confirm that our challenge today is still the same: Produce quality work using whatever techniques produce a profit.

Thanks Mr. Frid, I guess now I know that I live in the same world that you do. *—Roger King, Wendell, Idaho*

As a recorder of the German handiwork in Renfrew County, eastern Ontario, Canada, I was delighted to read Jon W. Arno's article on ash (*FWW* #51). We have no native walnut, chestnut or cherry here, and black ash—which most outsiders mistake for oak—appears to have been the favorite furniture wood of the immigrant German settlers and their descendants. In preparing a book about the early days (*Harvest of Stones*, to be published by Toronto Press in 1985), I often asked why black ash was so frequently used. The puzzling answer that I heard was "Black ash didn't burn!" Further questioning eventually got me the whole answer: The other native hardwoods, such as oak, maple, blue ash, green ash and white ash were burned as settlers cleared their land for farms. But black ash and cedar grew in the swampy lowlands, which were seldom drained. So these two trees reached their maximum heights and girths undisturbed. *—Brenda B. Lee-Whiting, Deep River, Ont.*

"My carbide-tipped saw blade whistles so loudly it's ear piercing. Is there anything you can do to quiet it down?" Having worked in a saw shop for nearly eight years, I have heard this complaint literally hundreds of times. There are many reasons why a carbide blade rings or whistles...the unplugged holes in the blade are commonly the culprit. The holes are drilled at the ends of expansion slots to keep cracks from developing. The slots keep the blade from warping in heavy use by allowing the rim of the saw to expand. We now plug all blades that come into the shop, and after doing hundreds of them it dawned on me that anyone can do this. Here's how:

With a good metal-cutting countersink bit, countersink the holes half way through the blade from each side leaving a wedge-shaped or flared hole to help hold the plug in. Clean any oil from the blade and press a piece of masking tape across each hole on one side of the blade. Using two-part steel filler epoxy (gray in color, not clear—available in small tubes at most hardware stores), work a small amount into each hole from opposite sides with a screwdriver ensuring that it fills the bevel next to the tape. Leave a small mound of epoxy on the blade and allow to harden overnight. Slice the excess off with a chisel held at a low angle and tapped with a hammer. Slicing the epoxy off just before it dries seems to pull it out of the hole slightly or loosen it. The epoxy withstands any cleaning solutions your blade will encounter at a saw shop, and we have never had a plug come out. Give it a try. It may be what your noisy blades have always needed. *—Douglas McAdoo, Concord, Calif.*

With several thousand books at home and several thousand more in my antiquarian bookshop, I've had occasion to build quite a few bookcases, and to look hard at the bookcases of others. There are some flaws in the bookcase design in your Jan./Feb. 1985 issue.

It has no roof. The top books on the top shelf will gather a remarkable amount of dust, especially as infrequently read books tend to be put there. Thirty-six inches is too long a span for a shelf of ¾-in. pine. Filled with moderately heavy books, it could develop a noticeable sag. I never span more than 30 in., and prefer a 48-in. wide case with vertical supports at 24 in. You get more shelf-feet for your money that way.

The rows of holes for the adjustable shelf supports are not well positioned. If, as is likely, the books are shelved flush with the leading edge of the moveable shelf, and then one book is pulled forward, the whole shelf could tip forward and spill the books. The article does, however, avoid some other common bookcase-design flaws, such as using cornices and wide edge-molding that trap and sometimes damage books.

—Wayne Somers, Schenectady, N.Y.

My impression is that a preponderance of articles in *FWW* are exercises in the hard way to do things, often to the detriment of the product and its function. The Adirondack chair (*FWW* #52) is an example. It's "everybody to his own taste," as the old lady said when she kissed the cow, but to me the simplest practical construction and maximum utility usually results in a better, more attractive product. Here, two [Adirondack chairs] were cut out and assembled on a Saturday afternoon using a handsaw and mostly nails for fastenings. They weathered half-a-century on the waterfront and a continuous siege of children. The broad, flat arms served as writing desks, motorcycles, saw horses, bucking broncos, story telling-benches for wide-eyed elves and yes, occasionally as side tables for a mint julep.

Also, I was pleased to see the planer test article in the same issue until I learned that the author had not interviewed a sampling of owners of each machine. He managed to meander for seven pages with the tact of a bureaucrat before bestowing his unsustained, preformed opinion. *Fine Woodworking* did its readers no service with that piece and may have done Grizzly and Belsaw a disservice. The writer's assumptions about the American-made Belsaw are in total contradiction to the thirty-year experience of a friend and the twenty-year experience of C.E. Banister of *Workbench* magazine. The worst disservice you did was to your own credibility.

—D.B. Gonzalez, Jr., Pensacola, Fla.

A few points in your recent planer test article need to be clarified. Our warranty covers both parts and labor, not just parts as

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stated in the article. And we don't charge the shipping cost of parts going out under warranty to customers.

The problems that David Sloan encountered were very minor and having sold literally hundreds of the Grizzly planers nationwide, and having constantly used past owners as references, we can safely attest that our planer is one of the best on the market today.

From his closing remarks it is quite apparent that Sloan is biased towards the Delta machine. By his own admission the Grizzly Planer has excellent castings and outweighs the Delta by more than 200 pounds. I would say you could probably wear out two Deltas before you could one Grizzly.

—S. Balolia, Grizzly Imports, Inc., Bellingham, Wash.

I read your reports on comparative tests of woodworking equipment with much interest. Here's one for the record book: In 1937 I bought my first power tool, a Delta 10-in. bandsaw. Recently, because of my own ineptness, I broke a small and intricate part in the upper blade-guide assembly. Fully expecting failure, I called Delta's Pittsburgh office. There a polite young lady told me to call Memphis (800-223-7278). I did. The part was in stock and is now on its way. Try this with one of the imported "look alikes."

—H. Myles Jacob, Flemington, N.J.

I think David Sloan missed a good bet in the Shopsmith planer. While designed to mount on a Shopsmith multipurpose machine, it's available as a free-standing unit ($899-$949). I'm quite pleased with mine. *—Thomas E. Zumdzinski, Oxon Hill, Md.*

In response to Thomas Newman's letter in *FWW* #51 regarding Greg Landrey's article on finish conservation, Newman is comparing apples and oranges when evaluating amalgamation versus finish conservation. The function of finish conservation is just that; to conserve (preserve) the finish that exists already. What Landrey suggests is that cracked finishes can be dealt with without the introduction of new finish material. In spite of Mr. Newman's confidence, reamalgamation is only occasionally successful, particularly with respect to long term (50 to 100 years) stability.

The introduction of new materials always runs the risk of incompatibility with the old finish, no matter how careful the restorer. Landrey was simply attempting finish conservation in its purest form, and I applaud both the effort and the results.

—Donald C. Williams, Washington, D.C.

As a beginning woodworker I am attempting to tool-up my shop and found the article on chisels in *FWW* #51 to be very informative. I did feel that the article should have included a rating of the method of handle attachment and handle quality. I was impressed with the quality and affordability of the Footprint chisels but have been unable to locate a supplier. Could you please provide me with name and address of one?

—Richard G. Smith, Tenino, Wash.

EDITOR'S NOTE: For information on where to buy Footprint chisels, write Robert Larson Inc., 82 Dorman Ave., San Francisco, Calif. 94124

With reference to your article on testing chisels: Although we and our steel supplier have micro-examined tens of thousands of chisels as part of our batch-testing process, we have never found evidence of oxide inclusions as shown by your test. We use a high quality aluminum-killed steel for our chisel blades. The aluminum deoxidizes the steel and refines the grain size.

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—Robert J. Surfleet, Babco Record Tools, Sheffield, Eng.

Re Mr. Mayer's letter on finishing teak (*FWW* #52, p. 16) I would like to offer the following advice. I recently installed three teak bathroom floors and had to finish/strip/refinish each floor due to my inexperience with this wood. Polyurethane was a disaster taking nearly four days to finally harden. Gym finish was no better. Even the solvent-release finishes, such as lacquers, took days to dry. The only product that worked well was a product called Glitsa Swedish Finish (distributed by Glitsa American, 1921 First Avenue So., Seattle, Wash. 98134 (206) 622-1468). This is a two-part system consisting of a first coat that smells like lacquer but has a separate container of catalyst to be mixed with it, followed by a second coat that seems like a normal lacquer. This product worked very well, with each coat taking about an hour or so to dry. I got the product at my local wood-flooring dealer. The cost was $8.00 a quart. *—Wayne Weber, Honeoye Falls, N.Y.*

I cannot help but feel that *Fine Woodworking* implies that because a furnituremaker paints wood, or searches for new forms, that he or she is a lesser craftsman, with less love for the material and processes than the "Oh-Holy-Cow-Zen-Au Natural" woodworking group. This attitude is not only insulting to art-furniture makers but also shows disregard for some very finely made things.

I have been painting on wood (both sculptural and functional pieces) for about eight years. Frequently I have been confronted with remarks such as "why wood, why not plastic?" A funny remark when you consider how much plastic is made to look like wood in our culture. I've worked in metal and plastic and clay and none of them even come close to the directness of wood. I've tried to keep secondary processes (drawings, jigs, patterns, etc.) to a minimum, which allows me to work through visual problems quickly and with fluidity. When you work on wood, the product is done...no cooking, firing, annealing, etc. is needed. This is why I use wood and not plastic. Painting on wood is so much a part of our craft's heritage, I just don't understand why there is such hostility towards the act of surface embellishment.

Art furniture is not just a fad. After the initial splash, and now that the smoke is clearing, the level of sophistication and advancement of this movement is just now becoming apparent. These objects will have historical importance for their beauty, craftsmanship and as a new way of seeing our environment and culture. That is what "art" is supposed to do.

—Paul M. Sasso, Murray, Ky.

I am puzzled about the answer given to Arthur Kay on spraying lacquer. Besides the disadvantage Mr. Morris gives, there is one major reason manufacturers of airless sprayers give for not spraying lacquer from their sprayers. Lacquer thinner can be explosive and a spark from an electric gun could set it off. It would be much safer to purchase an air compressor and sprayer designed to do light hobby or touch-up work from a local hobby shop (I use a Badger 400 detail touch-up gun). Also, an explosion-proof fan should be used in ventilating lacquer mist. *—Harold Anderson, Milwaukee, Wis.*

I've read and re-read Allen Girvin's letter regarding his concern about wood dust and his ventilated face-mask solution

(*FWW* #52, p. 4). I too am concerned, because his mask seems too risky. He mentions nothing about filtering the "fresh air" that is being pumped into his plastic mask. Please spare me the idea of using a hair dryer as a source of "fresh air." Without a pre-filter, the contaminated ambient air will have billions of microscopic dust particles which you are being forced to breathe.

Here is my alternative for someone else to pick apart: a breathing-assist respirator, available from Lab Safety Supply, P.O. Box 1368, Janesville, Wisconsin, 53547-1368. Its approximate cost $240.00. This device is battery powered and rechargeable and will provide up to eight hours of continuous operation on a charge. As they advertise, it's "intrinsically safe." I'm all for inexpensive alternatives but let's not be too frugal with our health. —*David M. Coons, LaGrange, Ill.*

In response to Don Lohr's inquiry about sleighs (*FWW* #52, p. 4), I recommend the Shelburne Museum, in Shelburne, Vt., (802) 985-3344. The Museum has a huge barn full of well-preserved 19th-century sleighs and carriages. They are protected not by glass or ropes, but by old folks who will bend your ear, if you'll let them, about "riding around in a sleigh just like this one with grandpa when I was a kid."

They also have a truly nifty collection of old-time woodworking tools which you ought to show in your magazine some day. It is a really neat place. —*Reid Wistort, Winooski, Vt.*

In your article on marionettes in the May issue, Abrams is given as the publisher of *The Duiggins Marionettes.* Actually we purchased all rights and copies from Abrams several years ago. Please inform your readers that they may obtain the book from Plays Inc., 120 Boylston Street, Boston, Mass. 02116, for $29.95 plus $1.00 per copy for postage.

—*Miriam Madfis, Plays, Inc., Boston, Mass.*

I liked the idea for the foam faceplate in *FWW* #48 (p. 10). However, if the design does not call for a foot, here is a faster procedure than the glue and paper method. It lets you utilize the total thickness of your stock.

I use double stick tape, manufactured by Permacell, New Brunswick, N.J. 08903. The double stick tape can be sandwiched directly between the faceplate and turning blank. Clamp for about 30 minutes and you are ready to turn. To separate the finished piece from the faceplate, simply "hammer" a semi-sharp chisel gently between faceplate and bowl. Any excess tape residue may be taken off with paint thinner. It's wise to use the tailstock for extra support while shaping the outside of the bowl. Also, excessive heat or finishing oil can loosen the tape. —*Helga Winter, Nashville, Tenn.*

Re David Hupp's letter in *FWW* #51. Keep showing traditional work as well as the well-done avante garde, and quality things in between. However, I don't see the need for more philisophical rationales. The work presented should stand by itelf, without being propped up by etherial puffery. Good work doesn't need to be "explained" by pretention, though admittedly it may sell work to the gullible. As to the motives behind a piece of work, let the readers judge for themselves by viewing the work in pictures and diagrams and by reading about the methods of construction. Whether sincere or otherwise, quality work is diminished by "pfalse filosophy."

—*Everett Traylor, Bettendorf, Iowa*

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	50	1.10	.96	ea
	40	1.20	.93	ea
3"x24"	120	1.22	.97	ea
	100	1.26	1.12	ea
	80	1.31	1.15	ea
	60	1.34	1.18	ea
	50	1.68	1.46	ea
	40	1.73	1.51	ea
4"x24"	120	1.78	1.64	ea
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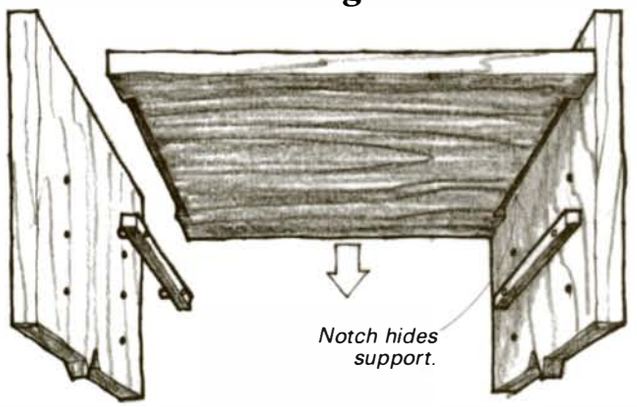
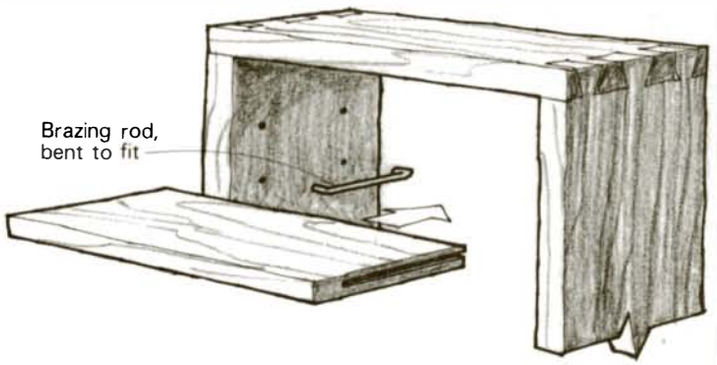
edited and drawn by Jim Richey

Two hidden shelf hangers



Here's how I provide adjustable shelves in bookcases and hide the unattractive support hardware. First I cut a ⅜-in. thick, ½-in. wide support slightly shorter than the width of the shelf. I peg the support with two ¼-in. or ⅜-in. dowels and drill a series of holes on each side of the carcase to match the pegs. Finally I rout a recess into each end of the shelf to accommodate the support so that it is visible only from below.

—Alan Platt, LaGrangeville, N.Y.

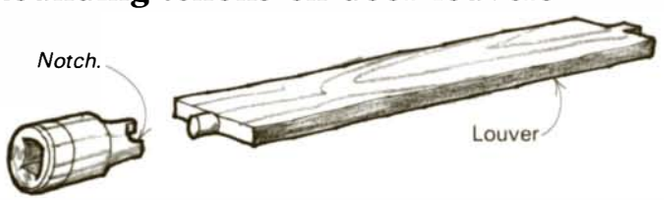


I use these hidden shelf-supports in small wall cabinets and the like. I suppose they could be scaled up for larger carcases, but they seem better suited for smaller work with, say, ½-in. thick, 18-in. long shelves.

First bend brass wire into wide U-shapes, as shown in the sketch. I like to use 3/16-in. diameter brazing rod. The base of the U must be the same length in all the pieces. I use the jaw width of a small machinists' vise as a handy length gauge. Heat the rod with a propane torch if you have trouble with the rod breaking at the corners.

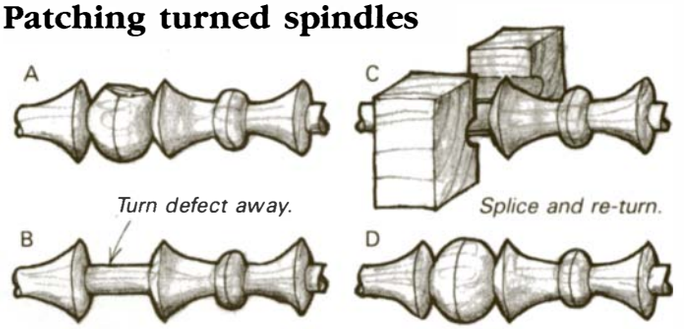
Next drill a series of paired holes along both sides of the cabinet to fit your brass-rod pins. Cut a 3/16-in. stopped groove down the center of each end of your shelf. To install the shelf simply pop two brass supports into matching holes and slide the shelf on from the front. The support is locked in place and is perfectly invisible. *—Fred Gati, Providence, R.I.*

Rounding tenons on door louvers



Recently I had to make louvered shutters out of walnut for a custom interior job. Everything was straightforward until I got to the little round tenons on each end of about 500 louvers. When I cut the louvers, I left a ¼-in. square stub on each end, which needed to be rounded to pivot in the door frame. Stumped, I finally discovered that I could chuck a ¼-in. hex socket in my drill press and it would effectively chew the tenons round. The socket worked fine without any modification, but I had so many louvers to do that I decided to make the cutting action cleaner—I ground a notch in the socket, as shown in the sketch, to form a cutting edge. The edge should be ground at the middle of one of the socket's flats, at the point of minimum diameter. *—Paul G. Carson, Cashiers, N.C.*

Patching turned spindles

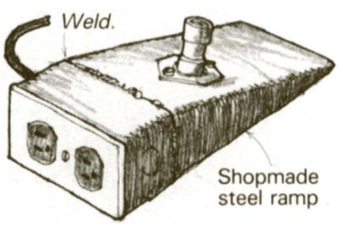


If you mess up a detail in an otherwise good turned spindle, you can cut a small block of similar wood and use it to patch the work, as shown in the sketch. The procedure can also be used to create unusual effects with contrasting woods.

—John Sillick, Gasport, N.Y.

Quick tip: To replace a broken caster on a cedar chest without having to disassemble the rivited metal axle, I made a new wheel, split it into halves, then glued it together again around the axle. *—George W. Addison, Cambridge City, Ind.*

Low-cost footswitch



A foot-operated switch is not only a convenience, but also makes many woodworking operations safer. I was able to make mine at a reasonable cost from hardware that I obtained locally. The main part of the unit is a foot-operated starter switch from a farm tractor (I used International-Harvester part no. 64931-h). It has a 400-amp capacity, more than enough for any 110-volt, single-phase motor found in the wood shop.

Begin construction by brazing or welding a ramp-shaped steel plate to a regular surface-mount electrical box. Drill a hole in the ramp and mount the switch just below the box. Wire a standard 110-volt receptacle into the box using heavy (no. 12 or no. 14) electrical cord and a box connector. Connect the cord's neutral and ground wires to the receptacle but route the "hot" or black wire through the switch. Tape the switch connections well to insulate them.

The switch will operate only when foot-pressure is applied and thus functions like a "dead man" control found on industrial machinery. Locate the switch where no one will step on it accidentally, or if that seems difficult, construct a safety cover. You may wish to fasten a wooden block around the ramp to allow a more comfortable foot angle.

—Robert L. Koch, Tarkio, Mo.

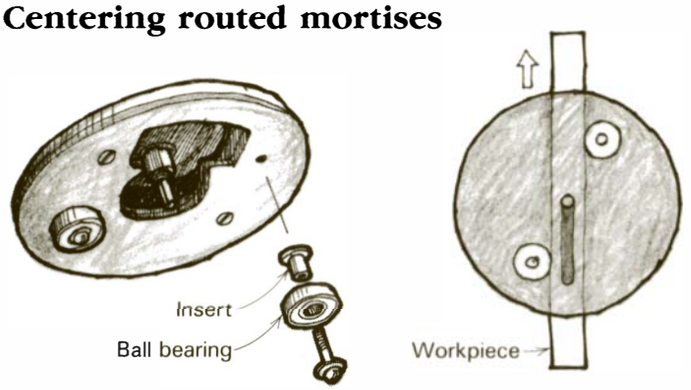
Belt sanding concave surfaces

Here's how to modify a belt sander to shape and smooth large-radius concave surfaces, such as a seat on a deacons' bench. Between the belt and the bottom of your sander, you will find a flexible, polished-steel plate that cuts down friction. Simply prepare a plywood shim with dimensions to fit your sander

and one face curved to a slightly smaller radius than your work. Slip the shim under the flexible steel plate. Belt tension will pull the plate to the same curve as the shim, and will also hold the shim in place during operation. I easily sanded a curve with a 3-ft. radius this way, and don't see any reason why tighter curves couldn't be sanded as well. This method wouldn't work very well to dish out a bowl shape, however, as only the edges of the belt would cut.

—Tom Hanson, Victor, Mont.

Centering routed mortises



John Birchard's door-making article (*FWW* #49) prompted me to send this mortise-centering idea I've used for quite awhile. Like Birchard, I use a plunge router to cut mortises in the stiles of frames. However, instead of using a fence to center the mortise, I attach two small ball bearings under the router base. On the Hitachi router I use (and most other routers), the subbase is attached with four screws. I remove two diagonally opposite screws and replace them with the bearing shown in the sketch. The bearing rides on a shopmade press-fit insert that is slightly longer than the bearing's thickness, and that has an inner diameter to fit the bolt. The flange at the end of the insert can be machined as part of it, or it can be a separate washer. It need only be thick enough to prevent the bearing from rubbing on the router base.

In cutting the mortise, the bearings ride against the sides of the stile, automatically centering the mortise in the work. The size of the bearings is unimportant, as long as both are the same. Note that when cutting mortises near the end of the stile you must have an excess length, a "horn," for the bearing to ride on. Leaving a bit of excess to be trimmed off later is good practice anyway. *—David Ring, Yodfat, Israel*

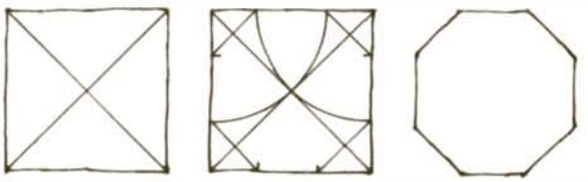
Quick tip: When raising the grain while sanding chest and table tops, try rubbing alcohol. It does as well as water, but dries much faster. *Karl Dittmer, El Reno, Okla.*

Octagon marking gauge

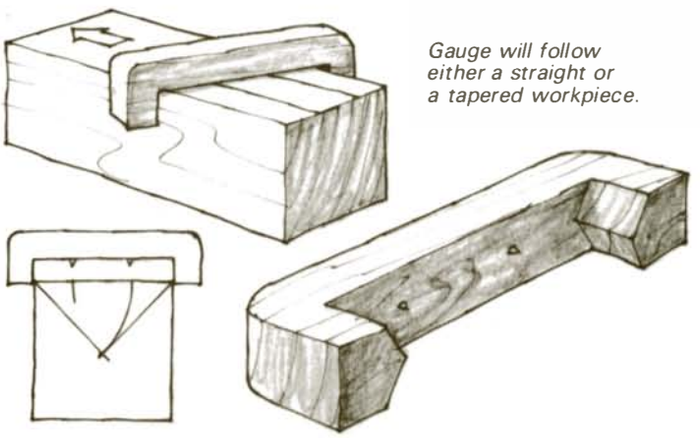
Many craftspeople know the traditional method for marking a square to make an octagon: First draw diagonals as shown in the sketch at the top of the next column. Then, with a compass set to one-half the diagonal, draw arcs from two corners. Reset the compass and walk it around the square to mark the corners of the octagon.

Repeating this procedure for different-size workpieces can be tedious. So here's a gauge, borrowed from boatbuilding sparmakers, that will scratch the lines you need along the length of a square workpiece of any width (less than its capacity), even if the workpiece tapers.

To make the gauge, first cut a cardboard square equal to the largest section you expect to deal with. On the square, draw diagonals and arcs to locate the two scribe points, as shown in the sketch. From a stout piece of hardwood make a U-shaped gauge body to fit over the cardboard square. Drive nails in the



Scribe diagonals; then compass shows true octagon.

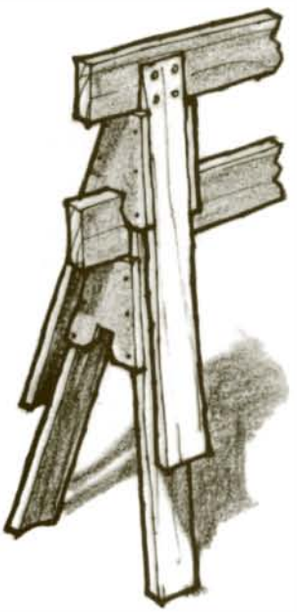


gauge at the proper locations and sharpen. To allow the gauge to be used for smaller work, cut the ears into a prow shape as shown in the drawing.

To mark the square workpiece, angle the gauge until it bears against the sides and draw it along. If the wood tapers, the angle of the gauge will change but the proportions of the spaces across the wood will remain correct.

—Percy W. Blandford, Stratford-upon-Avon, England

Quick tip: To center the bit when cutting a mortise with a router, chuck a V-grooving bit in the router (you could substitute an old drill bit ground to a point). With a pointed bit in the router, it's easy to adjust the router's fence so that the bit is over the centerline on the stock. Now remove the centering bit, replace with the mortise bit and rout the mortise dead-center. *—David V. Nicholson, Vancouver, B.C.*



Stacking sawhorses

When my husband, John, and I built our sawhorses, we took a lot of Sam Allen's good advice on the subject (*FWW* #24). But we found that by modifying his basic design slightly the horses were much easier to deal with around our shop, a place that always seems a bit too crowded. To allow the horses to be stacked for storage, we notched and beveled the plates of ½-in. Baltic birch plywood that reinforce the legs. Only a touch of clearance is required for a comfortable and stable fit. Our horses stack six or eight high with no wobble.

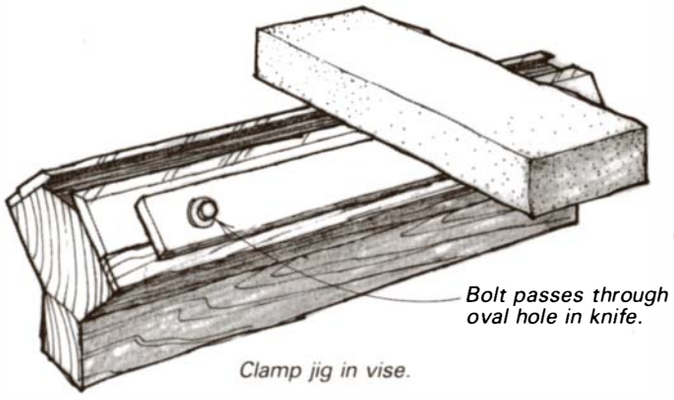
—Carolyn Grew-Sheridan, San Francisco, Calif.

Waterproofing turned vases

To prevent water damage to turned flower vases, I have tried built-up plastic finishes and even melted candle wax. Neither will last permanently and a failure will ultimately ruin a beautiful piece of wood. Glass test tubes, available at chemistry sup-

ply stores, provide the solution. They are available in a wide range of diameters and lengths to suit your needs. With a sharp spade bit, drill a hole in the vase slightly deeper than the test tube you will be using. There is a lip on the tube that will rest on the surface of the vase and allow for easy removal for cleaning later. *—William D. Vick, Jr., Rockville, Va.*

Jig for honing two jointer knives

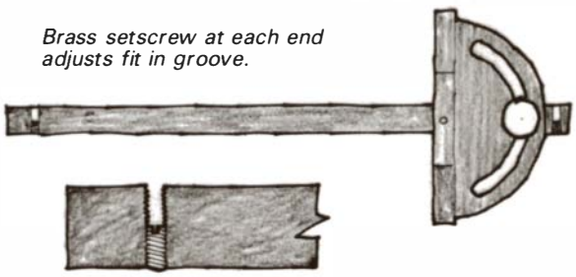


My Inca jointer has two 10¼-in. knives, which cost $12 to sharpen. Not satisfied with the price and inconvenience of that, or with the homemade sharpening devices I'd seen in the Methods of Work column, I built the device shown here, which allows manual sharpening of both blades at once. This mostly-wooden jig is inexpensive, and accurate if smooth strokes are used along the full length of the knives.

To make the jig, start with a piece of straight-grained, 2-in. square hardwood as long as your knives. Chamfer the top of the block so that the bevels will be parallel to the top of the block. Glue on wooden strips, slightly thinner than the thickness of the blades, to act as stops. Make sure these strips align the blades so that the beveled edges are in the same plane. Cut and drill steel strips and install them as shown in the sketch to hold the blades securely.

For safety's sake wear a glove and be careful. A slip could cause a nasty cut. *—John Toffaletti, Durham, N.C.*

Remedy for a worn miter gauge

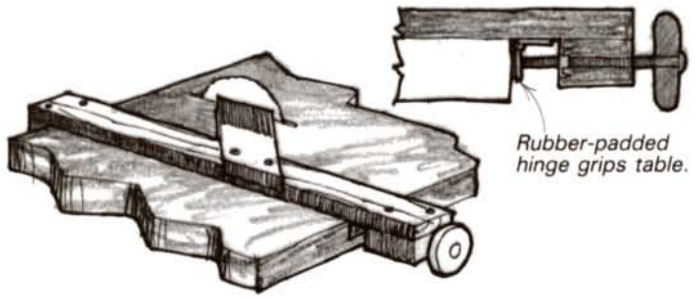


Here's a better way to take out the slop in a loose or worn miter gauge rail. It's certainly a more elegant solution than peening the rail as has been suggested in a past issue. First dismantle the gauge. Drill and tap a hole across each end of the rail bar to accept a ¼-in. setscrew. I make my own brass setscrews by cutting the head off a brass bolt and hacksawing a screw slot. Install the setscrews in the bar and adjust them until the rail fits the slot perfectly.

—Harrie E. Burnell, Newburyport, Mass.

Self-clamping featherboard

Most woodworkers recognize the value of using a featherboard when feeding narrow stock through a saw or shaper. But too often we fail to use the device because it's simply too much trouble to clamp and adjust. This featherboard is no more trouble to adjust and use than a rip fence. It has paid for itself

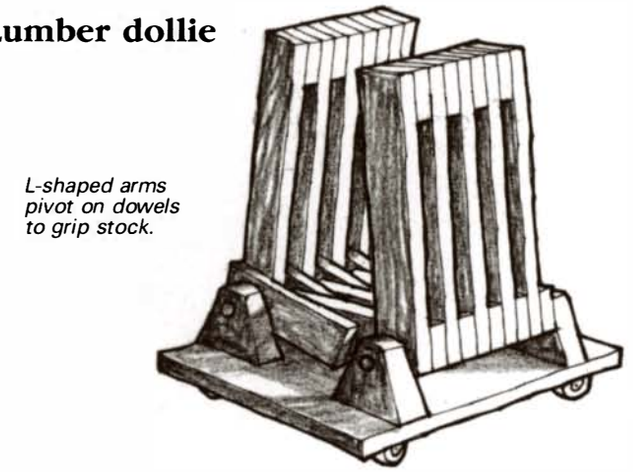


many times over in time and material savings. My version grips the table by means of a rubber-padded hinge, activated by a bolt running through a T-nut, as shown in the sketch—the handwheel is held on by epoxy. You could adapt the design to grip securely on virtually any rip fence rails.

—Bert Whitchurch, Rockaway Beach, Mo.

Quick tip: If you have to put screws in tight places where a regular drill won't fit, such as between close-set drawer supports, a spare Jacobs chuck makes a handy short drill handle for making a pilot hole. It also makes a matching screwdriver if it's fitted with a short blade such as those meant to be used in electric drills. My spare chuck usually has a countersink bit in it while I work. A couple of turns by hand will countersink any pilot hole in a jiffy, much faster than constantly changing bits to do the job. *—Nicholas Cavagnaro, Orofino, Idaho*

Lumber dollie



Working single-handed in a small workshop, I found it tiring and awkward to move numbers of 4x8 sheets of plywood or large planks from the delivery truck to my machine area. So, I built two of the "bogies" shown here from scraps and inexpensive heavy-duty casters. They have saved me hours of back-breaking work.

First I laminated L-shaped blocks, about 18 in. tall and 8 in. wide at the base, from plywood. Then I drilled a ¾-in. hole through the blocks and mounted them to the base so they could pivot on dowels, as shown.

To use the dollie, spread the arms of the blocks to take the sheet of plywood, which is lowered in. The weight of the wood then levers the arms down to clamp the plywood in place. One dollie, placed in the center, is enough for most loads, but for extra heavy or awkward pieces you can use two.

—Chris Yonge, Edinburgh, U.K.

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

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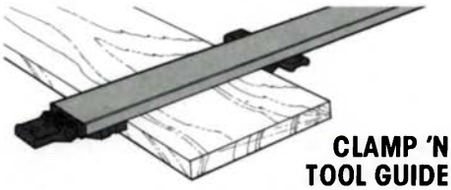

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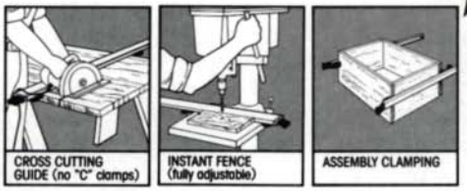

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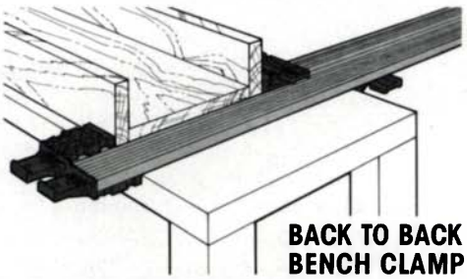

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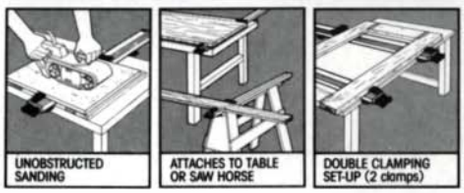

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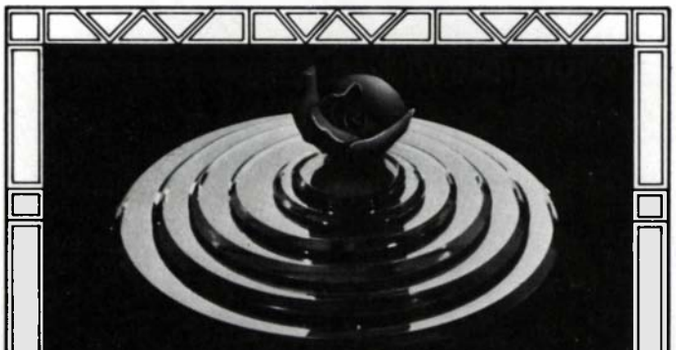

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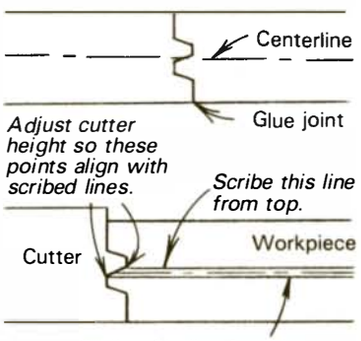
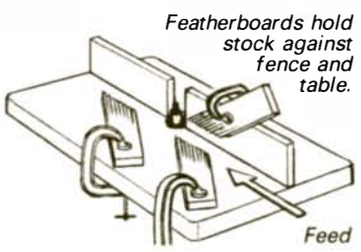
Glue-joint shaper cutters

I purchased a reversible glue-joint cutter for my shaper, and don't know why I can't get the mating boards to align. What can I do to make this $14.99 gadget work?

—John Sherman, Kimberly City, Mo.

John Gibbons replies: Before you blame the cutter, check the stock and your shaper setup. The stock must be uniformly thick throughout and held down firmly against the shaper table at the point where it passes the cutterhead. This requires stiff hold-downs placed close to the cutterhead. The spring hold-downs supplied with small machines may not be stiff enough for this if the stock has much warp. A featherboard attached to the fence works well.





If this doesn't solve your problem, the height of the cutter may be incorrect. Cutter height can be set one of two ways. You can scribe two lines on the end grain of a sample piece, one off each face, and compare them to the cutter profile as shown. The cutter is at the correct height when the alignment is symmetric at top and bottom. The other method is to run two sample pieces past the cutter, put them together, and adjust the cutter up or down one-half the amount that the two board surfaces are out of alignment.

If you're working with moderately flat stock on a small machine, a reasonable surface-alignment tolerance to expect is plus or minus 1/32 in. over 95% of the area. For critical work with thin, carefully prepared stock, our shop has managed alignment tolerances of plus or minus 0.01in. This is hard.

[John Gibbons is a professional woodworker in Hurley, Wisc.]

Windsor chair finishes

I'd appreciate an expert opinion on an appropriate finish for Windsor chairs. Is there a toner or stain that will even out the color of the different woods—pine, birch and red oak—that make up the rungs, legs, seat, back and spindles? I'd like to use Watco for a final finsh.

—Calen Fitzgerald, Grand Forks, B.C.

Michael Dunbar replies: In the Federal period (1780-1810), when most American Windsor styles were developed, these chairs were always painted—green being the most popular color. It's often said that Windsors were painted only to cover the different woods that make up the chair but I disagree. Instead, I believe that the painted surface existed in the chairmaker's mind before the chair design did and that Windsors look the way they do because of this choice of finish. If the wood was meant to be seen, Windsor designs would be very different.

A lot of utilitarian furniture in the Windsor era was painted. Wood was perceived simply as an abundant, versatile material. Today however, when so much of our furniture is made of chrome and plastic, our perception of wood is different. For us, wood is precious—a link to the natural world. The phrase "natural beauty of wood" has become a cliche and a clear finish has become an extension of that cliche. Painted furniture goes against current fashion.

To use a natural finish on a Windsor, however, is to try to separate the chair from the paint around which it was designed. Color coalesces the verticals, horizontals and curves of a Windsor into a whole and prevents the eye from being distracted as it moves along the lines of the chair. The different woods in a Windsor were selected, not for what they looked like, but for the physical characteristics of the species. When these woods are visible, the different colors of the oak, birch and pine are distracting, as you've already found. As a result, one tries to turn the chair into a uniform shade of brown with chemicals and stains. In other words, one tries to paint with dyes instead of paint.

I finish my Windsors with milk paint because it resembles the original lead-based painted finish (available from The Old-Fashioned Milk Paint Co., Box 222, Groton, Mass. 01450).

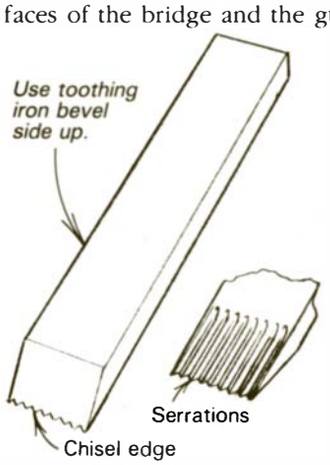
[Michael Dunbar makes Windsor chairs in Portsmouth, N.H. He is the author of *Make a Windsor Chair With Michael Dunbar,* 1984, Taunton Press.]

Gluing guitar bridges

What glue is best for attaching an ebony or rosewood bridge to the spruce or cedar soundboard of a steel-string acoustic guitar? ***—Mike Terris, Glen Gardner, N.J.***

Dick Boak replies: There are many glues strong enough to do the job. Aliphatic-resin glues like Titebond are acceptable. I don't recommend hide glues or epoxies because if hide glue isn't handled just right it will release too easily, and epoxy won't release easily enough if the bridge must be repaired or removed. At the Martin Guitar Company, we currently use a polyvinyl-based glue (available from Woodworker's Dream, c/o Martin Guitar Co., P.O. Box 329, Nazareth, Pa. 18064). Clamping time for this glue is short (20 minutes) although we clamp it for 24 hours due to the 189-lb. pull that the strings will exert on the bridge.

To ensure a wood-to-wood joint, always scrape off the finish on the top where the bridge goes. I always rough up the surfaces of the bridge and the guitar top with a "toothing iron."



This allows the fibers to interlock and makes a much more effective glue joint. Many woodworkers and glue experts claim that roughing a gluing surface does nothing to improve the bond. At Martin, we've tested this roughing-up procedure by gluing on bridges, then chiseling them off to see where the joint fails. The roughed-up bridges always came off with spruce fibers from the guitar top attached. The untoothed bridges usually broke clean at the glue line, indicating a weaker bond.

[Dick Boak manages Woodworkers' Dream for the Martin Guitar Co. in Nazareth, Pa. and also makes custom guitars.]

Drilling a saw table

I'm considering drilling and tapping the surface of my tablesaw to mount jigs and fences. I'm concerned about safety and the resale value of my saw. Can you offer any suggestions? ***—Dan Beatty, Louisville, Ky.***

Rich Preiss replies: I wouldn't hesitate to drill and tap my tablesaw surface, but the effectiveness of a jig will be only as good as the thought that precedes it. This also holds true for its safety. You surely don't want to reduce or restrict the basic effectiveness of your saw for the sake of an add-on function. Be sure to mark out, drill and tap carefully so that you don't disfigure the table surface or make more holes than necessary. Check all your underside clearances carefully in advance to

avoid drilling into or too close to the table ribs. Consider designing your jigs so that they can fasten to a common mounting plate instead of drilling separate holes for each jig. Though resale value is a consideration worth noting, I've seen many used saws with cleanly-tapped holes from production jigging retain their full resale potential.

[Rich Preiss runs the woodworking shop at the University of North Carolina in Charlotte.]

Finish repair

When a wet tray remained too long on my 30-year-old cherry serving cart it removed spots of the beeswax finish. Can I repair this wax finish without damaging the patina?

—Frank W. Hollin, Philadelphia, Pa.

Beau Belajonas replies: You may be dealing with more than just a wax finish. There could be varnish, shellac or lacquer underneath the wax. If the water spot has only damaged the wax then the remedy is very simple. Mineral spirits dissolves wax. All you need to do is give the piece a good scrubbing with 000 steel wool dipped in mineral spirits and wash away the wax, dirt, grime and water spot. To restore the patina, make some tinted wax by melting Amber Butcher's paste wax and adding a dash of raw or burnt-umber oil color. Wax is highly flammable so be sure to do this in a double boiler so the heat source can't ignite the wax. (Keep a fire extinguisher handy and be careful; a wax fire recently destroyed my shop.) Let the wax cool overnight.

Apply a thin, even coat of this colored wax and allow it to dry for 24 hours. Rub the wax down hard with lots of paper towels or old cotton sheets to get an even sheen. Allow to harden overnight. Repeat this colored-wax application and rubdown process at least three times. Apply a final coat of regular Amber Butcher's wax.

If there's varnish, shellac or lacquer underneath the wax and the water spot has penetrated the finish, the repair is a little more difficult. You have to rub off a thin layer of the finish where the spot has penetrated. First remove the wax as described above. After drying with paper towels, dip 000 steel wool into a solution of 1 part boiled linseed oil to 1 part mineral spirits. Instead of steel wool, you can make an abrasive paste by mixing rottenstone or 4F pumice with the oil solution and carefully rub it on with a soft cloth.

Rub the water spot slowly and carefully. The oil solution gives you some body and acts as a lubricant so you don't cut into the finish too quickly. This process should remove most spots and is also a good way to level minor chips in the finish. If the spot still doesn't come out it's penetrated too far and the entire finish must be removed.

After the spot has been successfully rubbed out, clean off any oil residue with mineral spirits and wipe the surface dry. Apply a thin coat of satin varnish (alkyd or urethane) diluted 4 parts varnish to 1 part mineral spirits. Tint the varnish lightly with raw umber if desired. Allow to dry for 24 hours then carefully rub it smooth with worn 400-grit wet/dry sandpaper and follow with a wax polish. To add more color and depth you can follow the varnish coat with the colored wax process described above.

[Beau Belajonas is a professional wood finisher who lives in Camden, Me.]

Disposing of toxic solvents

What is an ecologically sound method for disposing of waste solvents and paint? —Roger O. Rolf, St. Louis Park, Minn.

Dr. Michael McCann replies: If you're in business and produce waste solvents regularly, contact a toxic-waste disposal service. Look in the Yellow Pages under "waste disposal." For home-shop waste, check with a nearby college or high school. If they subscribe to a toxic-waste disposal service they may be able to dispose of waste solvents for you. If not, the second best option is simply to set the open container outside and allow the volatile solvents to evaporate. You can dispose of the solids that remain along with your regular household trash. This may sound like a bad practice, but the air-pollution factor is minimal. Pouring solvents down the drain and into the water supply causes much greater environmental damage.

[Dr. Michael McCann is the director of the Center for Occupational Hazards in New York.]

Cleaning furniture

My teak dining-room chairs are dirty from years of handling. What's the best way to clean them and spruce up the old finish? —Victor A. Lazar, Ithaca, N.Y.

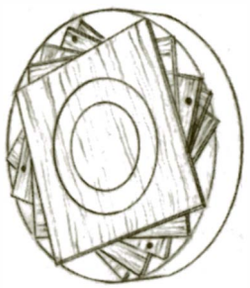
George Frank replies: Give the chairs a thorough scrubbing with any good laundry detergent and 0000 steel wool. Get some help for this job because it must be done fast before the water can penetrate too deeply into the wood. As soon as an area is clean, have your helper wipe it dry.

When the chairs have dried thoroughly, knock off any whiskers raised by the water by sanding lightly with 180- or 220-grit sandpaper. Then wipe off the dust and apply a coat of tung oil or tung oil varnish.

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

Follow up:

Re laminated bracelets (*FWW* #50 pp. 70-71). Here's a method for turning laminated bracelets that doesn't involve any steaming or bending. It will also make napkin rings or embroidery hoops. With epoxy glue, laminate a sandwich from six to eight 4-in. squares of colored veneer. Make sure that the grain of each layer runs at an angle to the layer underneath. When dry, tack the sandwich to a wooden disc mounted on a faceplate. With a parting tool, cut the inside first, then cut the outside. You can sand by hand, or touch up the bracelet on a mandrel like the one in Lawrence Trombly's article.



—Stockton Webb, Honolulu, Hi.

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...tool sellers and bookshops that sell woodworking books in Europe. ***—Henk J. van Dijk, Amsterdam, Holland***

Readers can't find:

...parts and owner's manual for a Yates Model 199, 12-in. jointer, serial No. 29547. ***—Frederick A. Hugi, Springfield, Ore.***

...manual for the Sargent's combination plane. ***—R.W. Rowat, Lebanon, Mo.***

...2-in. to 3-in. dia. toy wheels with rubber tires and steel axles. ***—Ron Dosedel, Randolph, Minn.***

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—¾-in. bore shaper cutters that will convert to ½-in. bore by means of a bushing are available from LRH Enterprises, Inc., 6961 Valjean Ave., Van Nuys, Calif. 91406. (See p. 108 for more on this company.)

—Swivel-and-tilt desk chair hardware is available from Valley Creek Woodworks, Box 68, Lakeland, Minn. 55043

—Cabinet lights and switches are available from Specialty Lighting, Inc., P.O. Box 1680, Shelby, N.C. 28150

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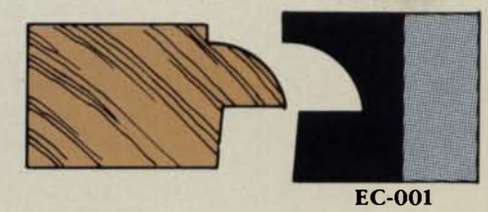
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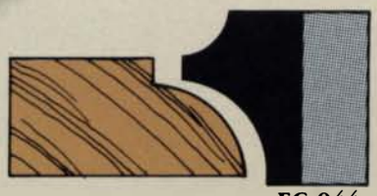
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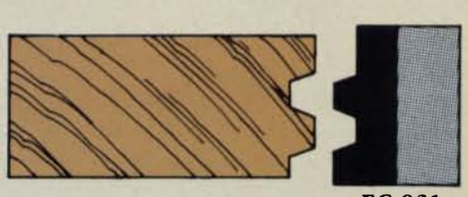
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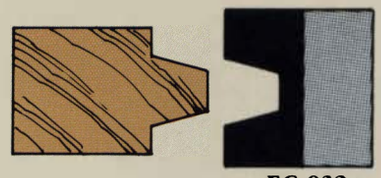
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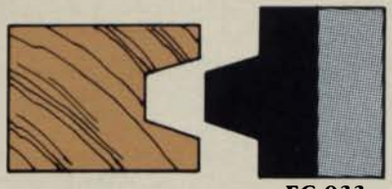
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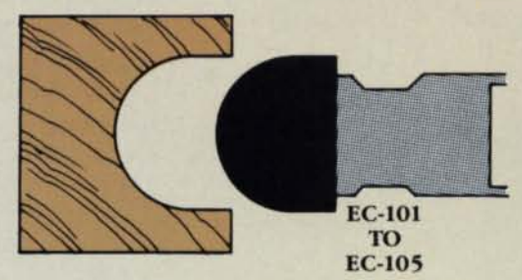
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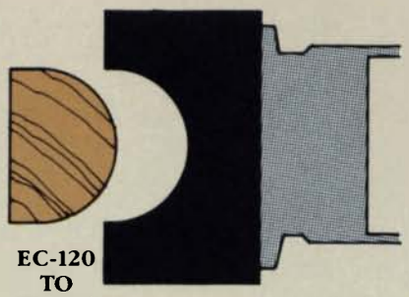
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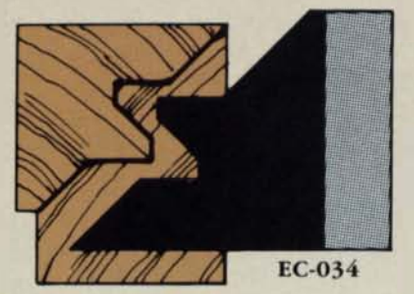
EC-124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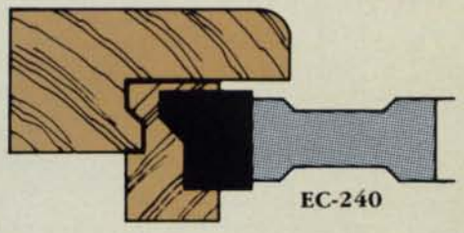
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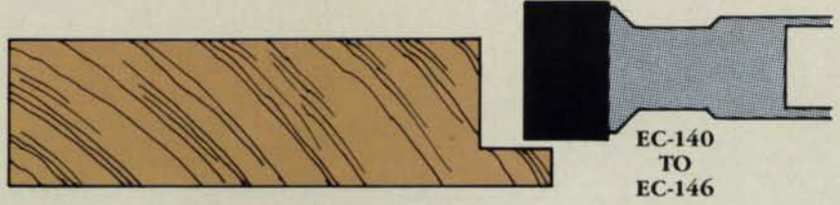
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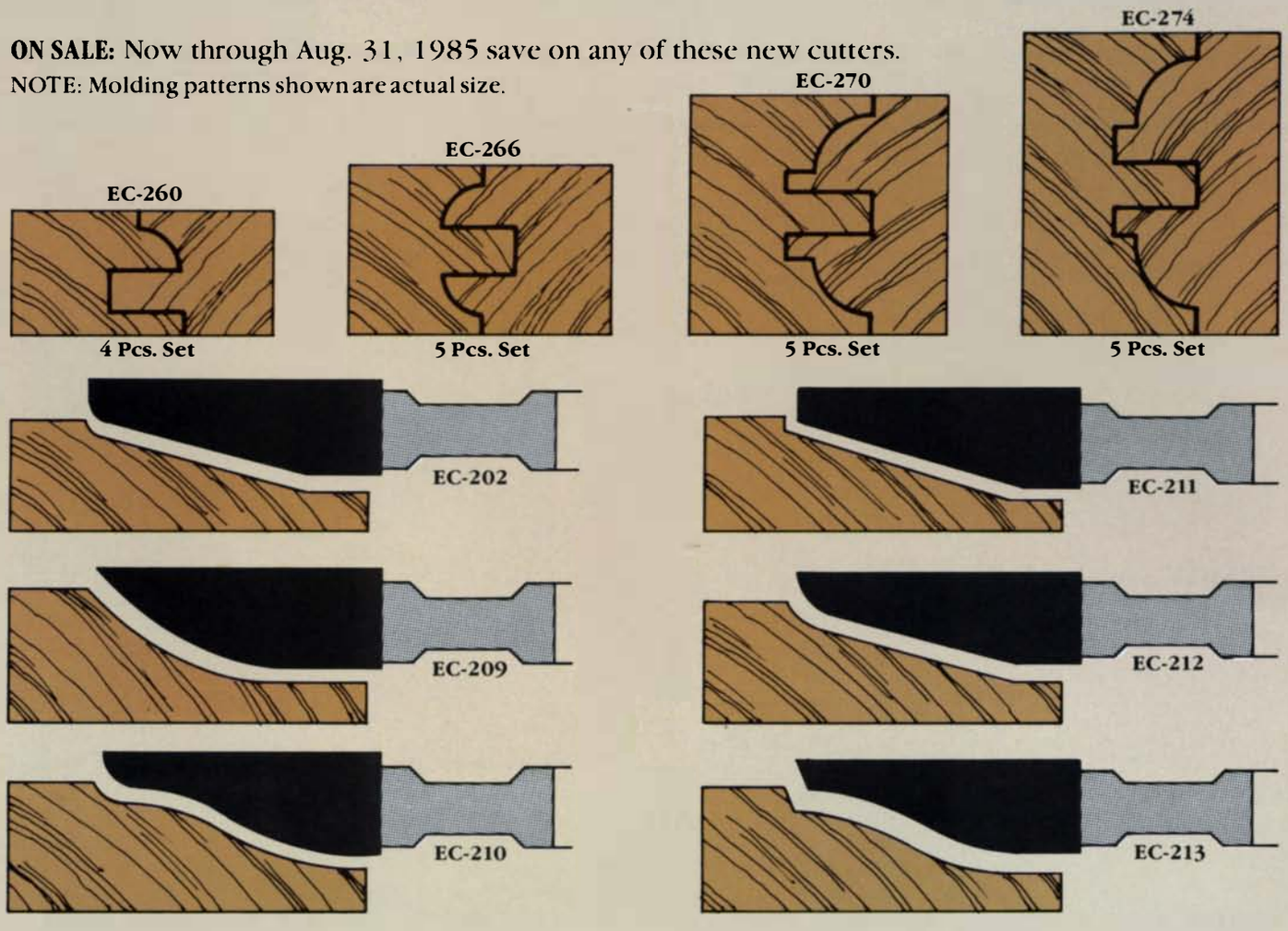

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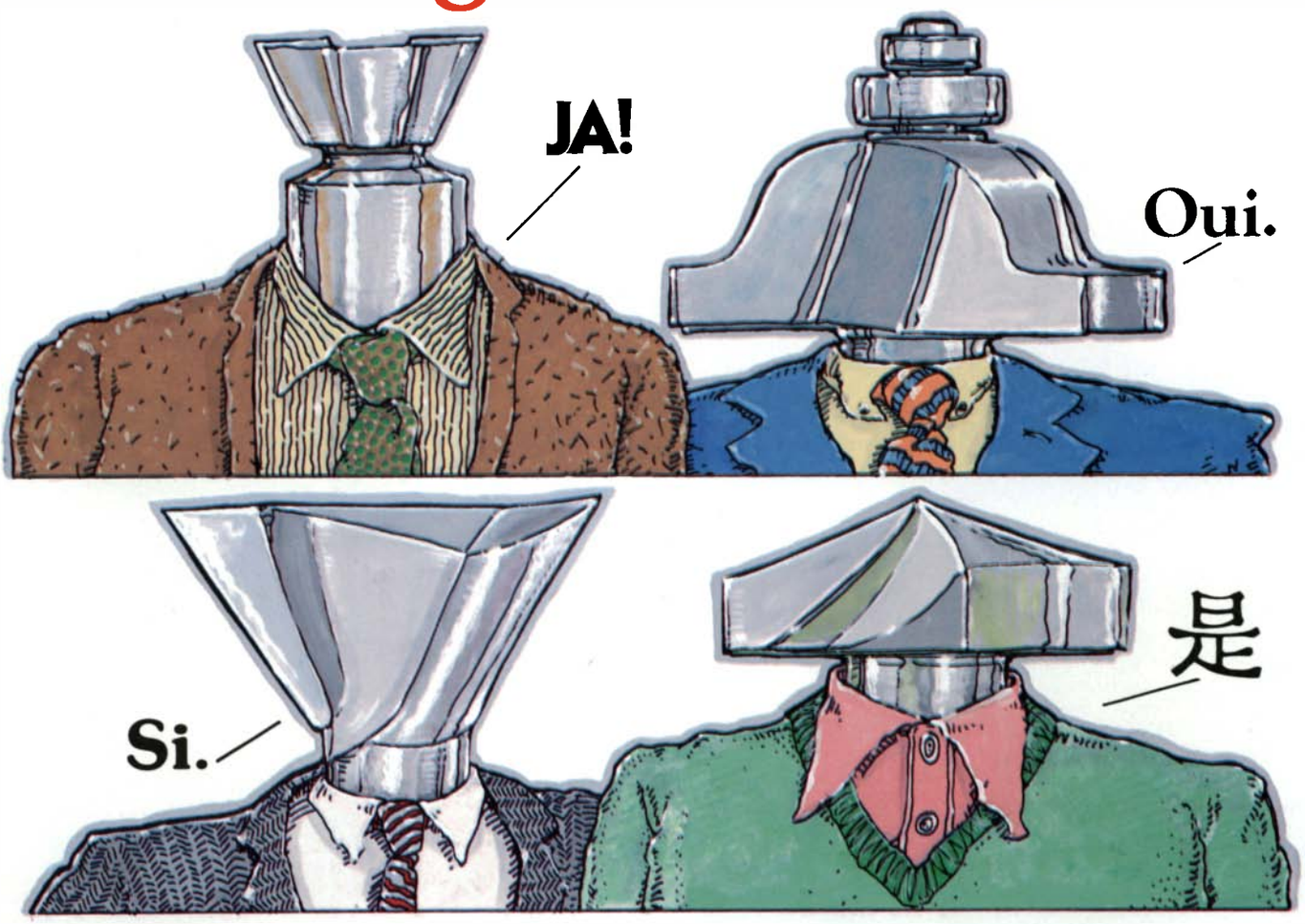

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C	LU85M010	10" x 80 Teeth Super Saw ATB	110.88	73.90
D	LU84M011	10" x 50 Teeth Combination 4 & R	74.51	44.90
E	LU85M009	9" x 72 Teeth Super Saw ATB	101.98	64.90
F	PS203	7¼" x 24 Teeth Gen. Purpose ATB	27.45	18.90
G	PS303	7¼" x 40 Teeth Gen. Purpose ATB	32.97	24.90
H	DS308	#3 Dado 8" Max. Width of Cut $^{13}/_{16}$"	170.25	119.50
I	04-106	¼" Diam. ¾" Cut. Length Solid Carbide	11.05	8.80
J	16-100	½" Diam. Mortising Bit C.T.	12.73	10.10
K	30-106	½" Radius Cove Bit C.T.	33.64	25.90

	ITEM	DESCRIPTION	LIST	SALE
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M	34-110	¼" Radius Rounding Bit C.T.	27.62	22.10
N	38-100	$^{5}/_{32}$" Radius Ogee Bit C.T.	32.90	26.30
O	42-106	½" Diam. ½" Cut. Length Flush Trimming Bit	15.62	12.50
P	64-100	Solid Carbide Flush Trim Bit	7.64	6.10
Q	66-100	Solid Carbide 7° Bevel Bit	8.30	6.64
R	3557R	35MM Diam. 10MM Shank Boring Bit	31.90	25.50
S	06218	2⅛" Diam. ½" Shank Boring Bit	89.00	69.80
T	C310	Set of 3 4" x $^{5}/_{8}$" x ⅛" Jointer Knives	18.29	13.40
U	C350	Set of 3 6" x $^{5}/_{8}$" x ⅛" Jointer Knives	27.45	19.90
V	C441	Set of 3 8" x $^{5}/_{8}$" x ⅛" Jointer Knives	36.58	28.90

Sale Extended Until Dec. 31, 1985

Note: All Saws & Dado have $^{5}/_{8}$" Bore
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Making Period Bedposts

Methods from the Deep South

by Asher Carmichael

A spinning beam 4 in. square and up to 7 ft. long has a lot of inertia, and turning one into a bedpost might seem a frightful task. Yet in the course of visiting several bed makers in the Mobile area, I discovered that proper planning and some ingenious jigs can take the risk and the mystery out of the job. Mobile is a bedmaking center, the home of one major bed manufacturer, Reid Classics, and a few one-man shops as well. The jigs and fixtures shown in this article can be used not only for bedposts, but for any long turnings.

The Reid Classics story began some 50 years ago, when Robert Reid went to work for Roy Blake, a cabinetmaker who specialized in restoring and reproducing the many antiques found in the Mobile area. After WW II, Reid and his brother Julian opened a general woodworking shop that in its early years made everything from horse-drawn carriages to tennis rackets. Because of demand, they eventually specialized in period four-poster beds. Over the years, they have devised machine-production methods that still maintain the uncompromising excellence of detail they had learned from Blake (who in his late seventies still does some work in a one-room shop in his home).

The Reids have, over the years, done their best to perpetuate their methods and the traditions that Blake started. Of the three other bedmakers in the area, two—Milton Collins and Glenn DeGruy—worked for the Reids for years before starting their own shops, and the third, William Blake, learned his craft from his uncle Roy, the same old master who steered Robert Reid into woodworking so many years before.

Beds are knockdown construction so that they can be moved. A typical four-poster is shown in the photo on the facing page. End rails and side rails—usually 2 in. thick and 5 in. wide—are tenoned to fit into mortises cut in square sections of the posts, as shown in figure 1, then held in place with long bolts and embedded nuts. The standard hardware used in the 18th century is still available today from many local hardware stores, and if not, period-hardware suppliers such as Horton Brasses (Box 95, Cromwell, Conn. 06416) will have them.

The headboard is never glued in place. It is kept from loosening by the location of the bed bolts—the bolts securing the end rails are above the ones in the side rails, so that they constantly pull in on the posts and the headboard. The tester (pronounced teester, and often spelled that way in old records) is sometimes straight and rectangular, sometimes arched or serpentine. The top of each post carries a brass or steel pin that passes through

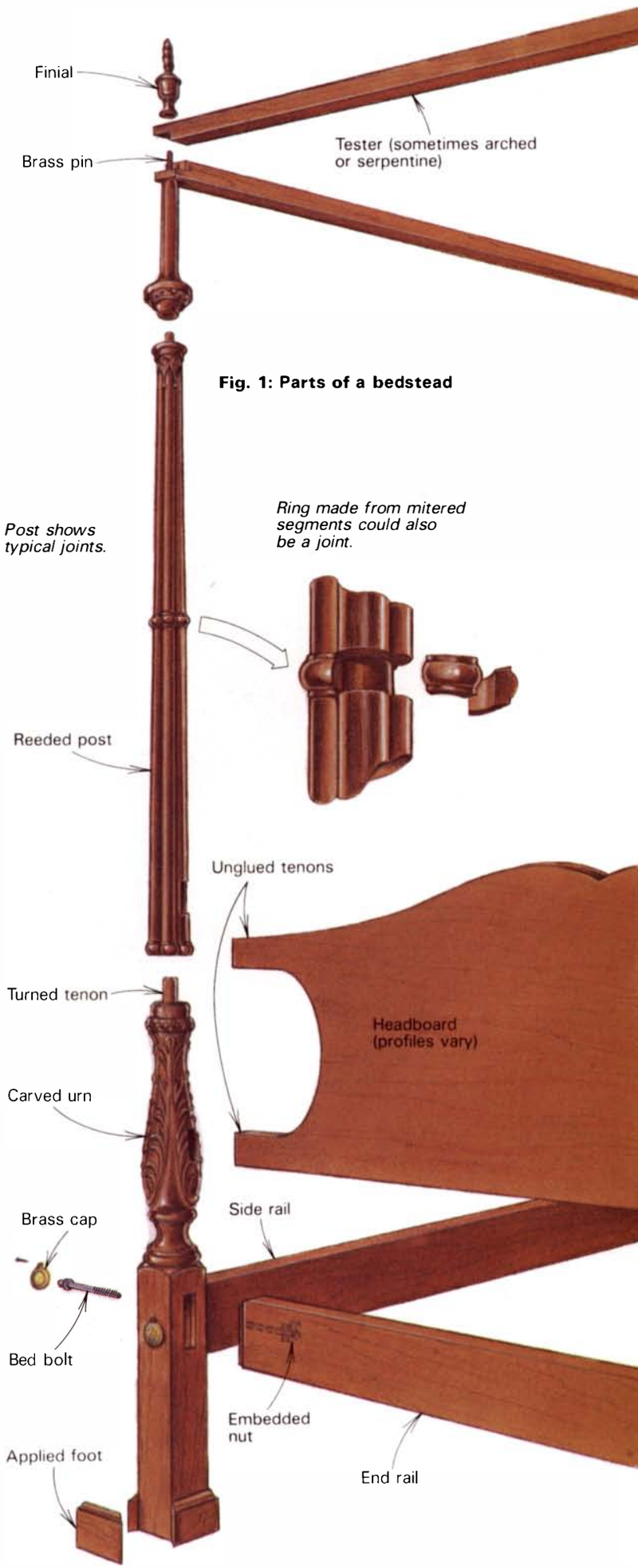


Fig. 1: Parts of a bedstead

Shown chronologically left to right are posts in the Chippendale, Hepplewhite, Sheraton and early Victorian styles. A lightly draped bed with serpentine tester is shown at right.

the tester to hold it in place. The finial then slides onto the pin to conceal it. In Colonial days, testers carried the weight of voluminous side curtains of expensive imported fabric, which could completely enclose the bed and its occupants. A richly draped bed provided privacy and shelter from drafts, and showed off the family's wealth as well. One old document lists 56 yards of material ordered as bed "furniture," which is what they called the fabric. Today's four-posters are seldom so fully furnished.

Mattresses, filled with up to 40 pounds of down, were at first supported on thick stuffed pads laid directly on the floor, but methods of raising them up on webs of rope and canvas were soon devised, with the ropes secured through holes or pins in the rails. Reproduction beds are usually adapted to take standard box springs in the same ways used for regular beds.

The Reid shop makes scores of period designs by combining about thirty different posts with various headboards and testers. By studying bedposts in museums, and making templates of antique posts that come in for repair, the Reid shop has accumulated authentic patterns that span periods from early Chippendale to late Victorian. As a rough guide, Chippendale's influence shows in cabriole legs with ball-and-claw feet, and also in square posts with applied foot moldings. Hepplewhite's style had reeding instead of the earlier fluted designs and Sheraton introduced round, tapering legs. Such distinctions are not always easy to make because styles and influences overlapped. The tall posts favored up to around 1820 soon gave way to heavier designs with shorter posts, no drapery, and sometimes even fancy foot rails in addition to the structural members. Such changes marked the end of an era. As Wallace Nutting once wryly wrote: "A foot rail did not come in until good styles went out."

The furnituremaker in the 18th century often turned bedposts in one piece except for the finial. In those days, turning a one-piece post had advantages. For one thing, their boring tools were probably not as efficient as today's, and it would have been difficult to drill accurate dowel holes to join a post made in sections. In addition, turners used manually powered lathes, which allowed them a range of slow speeds that took most of the danger out of turning long, heavy stock. This and the use of a steady rest diminished the tendency of slender work to whip and vibrate.

A few of the shops in the Mobile area have lengthened their lathes to accept longer than usual work. One approach is to remove the headstock and tailstock from a standard lathe, and then make new lathe ways from heavy angle iron. The headstock and tailstock are attached by whatever means is practical, and the whole assembly is raised up on a sturdy wooden stand. Another way to lengthen a lathe is to remove the tailstock from one and the headstock from another, and to bolt the two lathe beds in tandem atop a long support table.

Yet even though they have the means, no one in Mobile regularly turns full-length posts. Instead, area bedmakers have developed methods to join posts turned in shorter sections. These ideas can be used by any turner to join long work such as standing lamps and coat racks as well as bedposts. If you begin with full-length stock, as most bedmakers in Mobile do, you can make the grain in the finished work match from section to section. Yet this isn't absolutely necessary. Shorter stock may be much more available—and economical—and there is usually so much decoration around the joints that the continuity of the wood grain will be somewhat obscured in any case. A big advantage to working in sections is that your present lathe will probably be up to the job. Also, a post turned in sections will turn out straighter than a one-piece post.

The Reid shop rips post stock full length from 4-in. thick planks, and a typical blank will warp a little as it is cut from the

Photos this page: Alex Thigpen

Fig. 2: Bedpost template

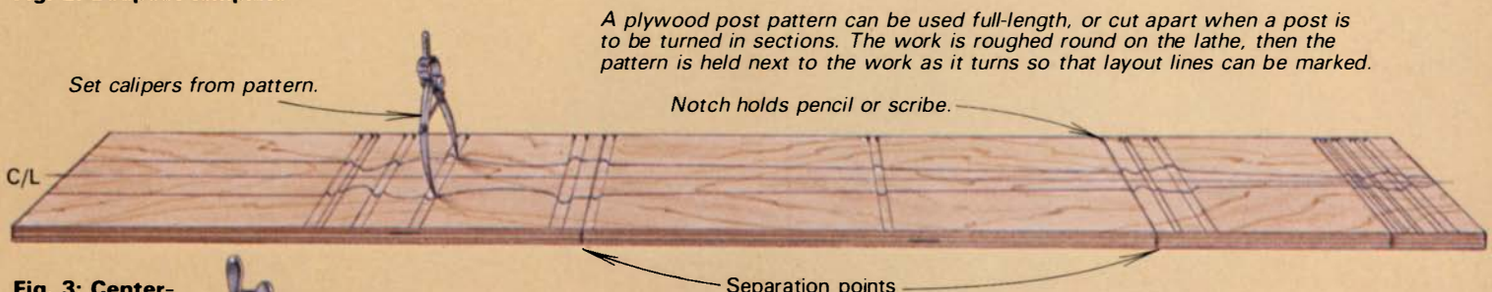
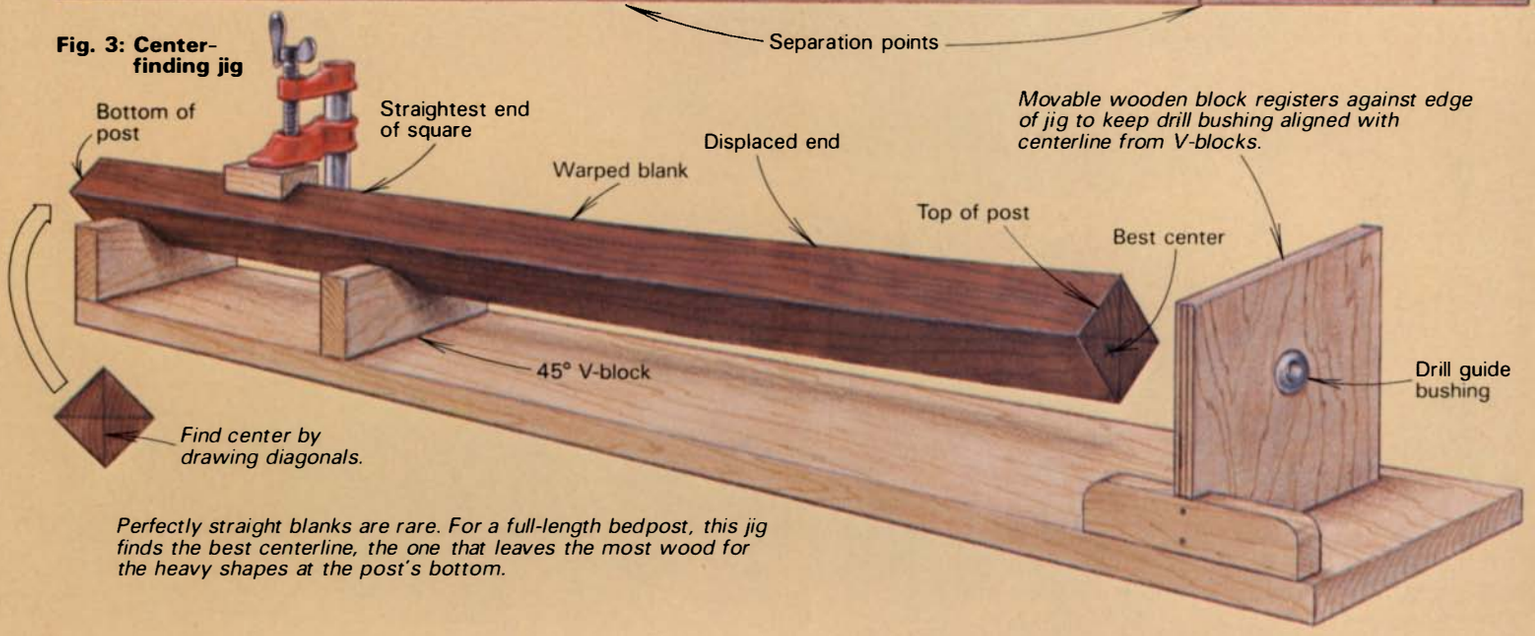


Fig. 3: Center-finding jig



Perfectly straight blanks are rare. For a full-length bedpost, this jig finds the best centerline, the one that leaves the most wood for the heavy shapes at the post's bottom.

board. If you are planning to cut a post into three or four sections, warp will not be too much of a problem, because you can square up the joints on the lathe, undercutting the endgrain a little for a perfect fit.

When working in sections, it's wise to consider which part of the joint should be tenon and which part mortise. There are often deep cove cuts either immediately above or below a joint, and the rule is to bore the mortise through what will be the heavier part in the finished post. It is a good idea to keep any joint mortises well away from the square mortises for the bed rails, in order not to weaken the post at this critical point. Bedposts typically separate as shown in figure 1, and an average tenon might be 1-in. to 1¼-in. dia., and about 3 in. long. Tenons are grooved to allow glue squeeze-out.

A crucial step in making a bedpost is to draw this sort of information, including the separation points, on a full length plywood pattern of the post, as shown in figure 2. If the post is to be turned in sections, the pattern can be cut apart and used to scribe separation points onto the stock, allowing extra length for integral tenons (at upper joints, where strength is not so critical, it is often possible to substitute a dowel, which conserves post stock and makes for better grain matching).

With the work in the lathe, hold the pattern next to it for marking the points where the profiles change. At the base of the post, and with the lathe turned off, mark the point where the square section ends, and scribe the lines around all four faces. Then round off the corners with the point of a skew chisel. Mark the other points on the work after it has been roughed round with a gouge—simply hold the pattern next to the stock as it turns and slide a pencil down the notch in the pattern. Then set calipers according to the pattern and transfer the diameters to the work with a parting tool.

If you cut full-length stock into sections, be sure to mark their orientation on the end grain as soon as you cut the divisions, so that they can be turned and assembled in the correct order. You can mark the matching sections A (for the bottom of the post), then B-B, C-C, etc. These letters will serve to keep you from accidentally reversing a section when you put it in the lathe. These marks will probably be turned away when you square up the joint lines, but you can mark them again at that time so you won't intermix post sections later.

If you have a long-bed lathe and decide to have few separation points in your design, you will have to consider how much the stock is warped. In ordinary turning, a slightly warped piece of wood is simply center-marked at both ends, and the warp is turned away. But in a bedpost, such a procedure may cause problems. It is necessary for the square section of the stock to stand straight and to be perpendicular to the bed rails. This means that the blank must be chucked in the lathe with the square part of the post on-center—any warp in the blank must be confined to the length of the post that will be above the rails. Figure 3 shows a jig that finds the best centers for a full length post. The bottom of the post (the straightest end of the blank) is marked with diagonals to show its center, then is held in a pair of V-blocks. The warped end is allowed to go its own way. A movable wooden block with a drill-guide bushing in it then locates the "center" at the finial end. If you make a jig like this, locate the drill-guide bushing in the block according to the size of the V-blocks and the stock. To check that the bushing is correct, put the block at the base of the post (the end that will remain square); the bushing must align exactly with the marked center. Of course in stock that is too badly warped, you may not

Drawings: David Dann

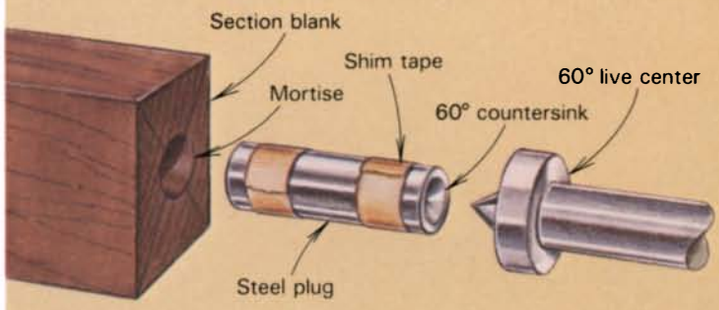
Robert Reid gauges a bedpost tenon to the right diameter, using calipers and a parting tool at several places along its length.

be able to turn full length without running out of wood.

When the finial center has been drilled, the blank is usually divided into two sections before turning. Because the tenon is turned at the top of the square section of the post, the upper post section must have a mortise at its bottom end as well as one for the finial pin. It is no trick to center a turned tenon, but it would be almost impossible to accurately center the matching mortise if it were drilled after the stock had been turned. The solution is to bore the mortise before turning, then insert a steel plug in the hole, as shown in figure 4. One end of the plug is countersunk to match the 60° live center at the tailstock, which centers the pre-drilled mortise so that the post can be turned around it. When mounting the work in the lathe, the finial end goes at the head-stock, and is driven by a spur center that instead of having a point, has a center pin that fits the finial mortise. Both mortises, therefore, end up centered in the post.

The center-finding jig is also useful if you plan to make a pencil post bed, one with octagonal posts instead of turned ones. When the Reids make a pencil post, they first find the center and drill the hole for the finial pin, then they mount the blank on a sliding jig that runs past a commercial shaper, which cuts each face of the tapered octagon in turn. Robert Reid got the basic idea from Roy Blake, whose original jig worked on the bandsaw, as shown in figure 5. The jig indexes the finial mortise on a pin that allows the post to be rotated for successive cuts. The band-saw blade cuts a straight taper from the top of the post, but the taper ends above the square base of the post. Thus, the bottom of the post can be used to index each cut in turn, by resting first on a flat face and then on a corner. In order that the taper end gracefully, the corner cuts must be stopped before the blade exits the work. The blade is then backed out of the cut and the waste

Fig. 4: Aligning joints

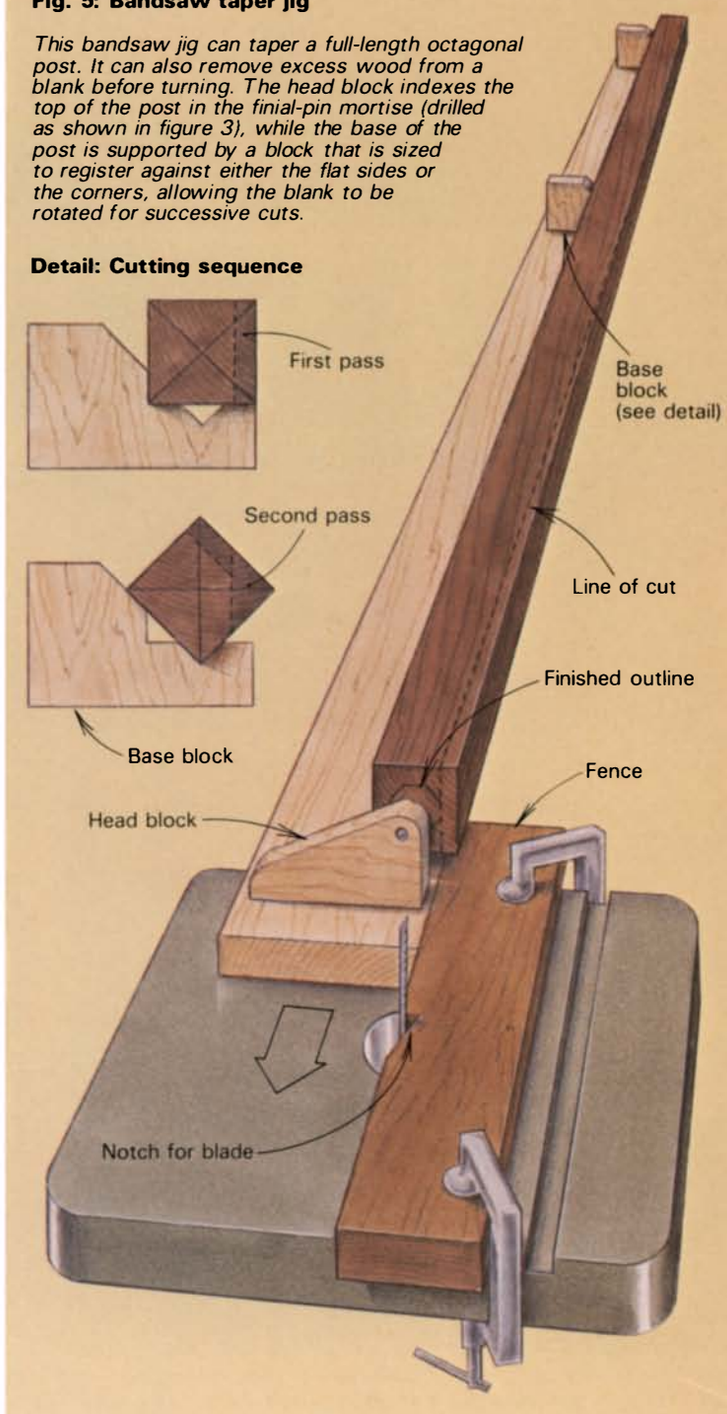


Tenons are turned on the lathe, which ensures that they are perfectly centered and parallel to the section's centerline. Mortises are bored in the square stock, then the post section is turned using a plug in the mortise to ensure that the post is centered around it.

Fig. 5: Bandsaw taper jig

This bandsaw jig can taper a full-length octagonal post. It can also remove excess wood from a blank before turning. The head block indexes the top of the post in the finial-pin mortise (drilled as shown in figure 3), while the base of the post is supported by a block that is sized to register against either the flat sides or the corners, allowing the blank to be rotated for successive cuts.

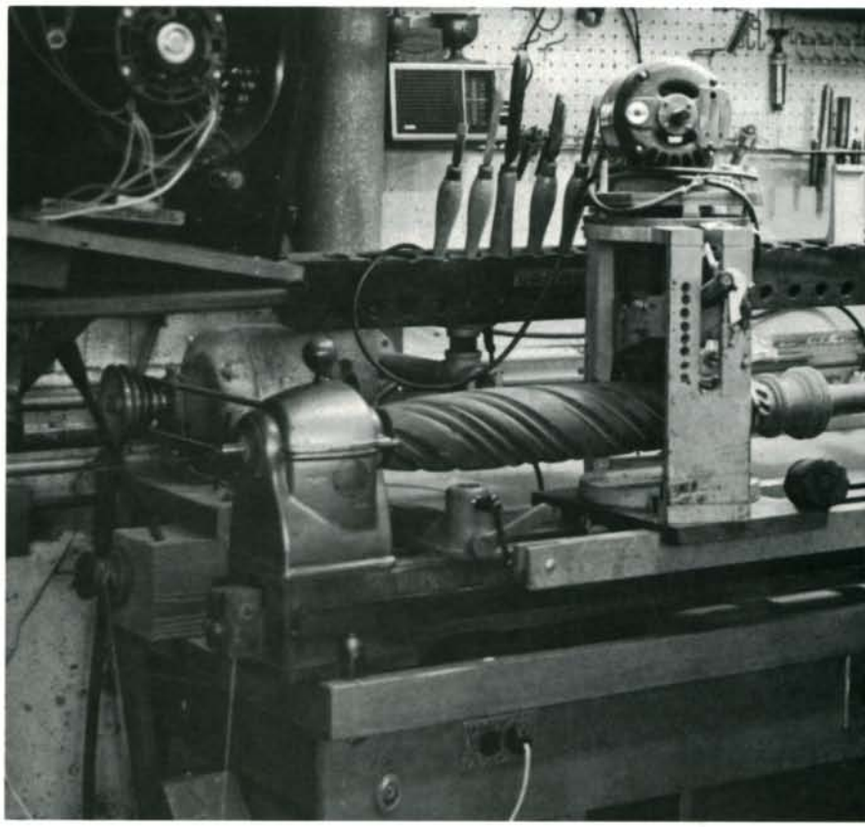
Detail: Cutting sequence

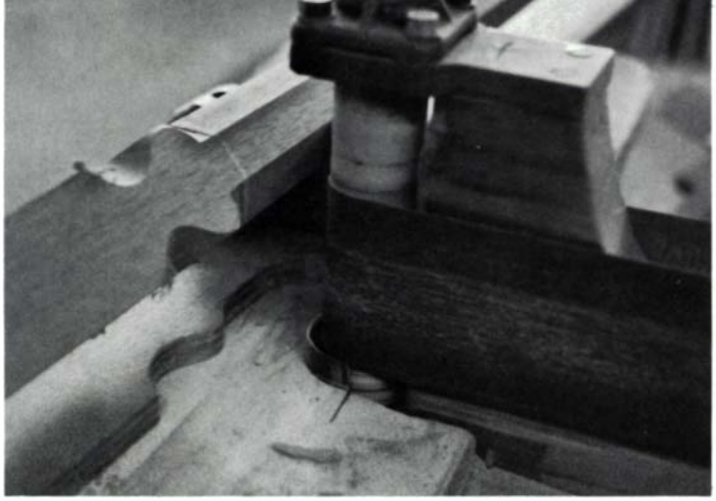


Julian Reid, above, operates a reeding jig—a carriage that rolls along the lathe ways carrying a router mounted on a pivoting arm. A bearing on the bit holder follows the contours of the work, which is locked in position by an indexing plate at the headstock. Mobile bedmaker William Blake, left, demonstrates his similar jig, which uses a simpler solid-pilot bit machined from tool steel (far left). The setscrew visible at the end of the bit locks the V-shaped cutter in place.

Reid's ingenious rope-twist machine, shown below, uses a bit similar to the straight-reeding machine (top), but in this case the carriage is attached to a cable arrangement that hooks up to the headstock spindle. As the operator moves the carriage along the ways, the work rotates a specific, adjustable amount for each inch the carriage moves.

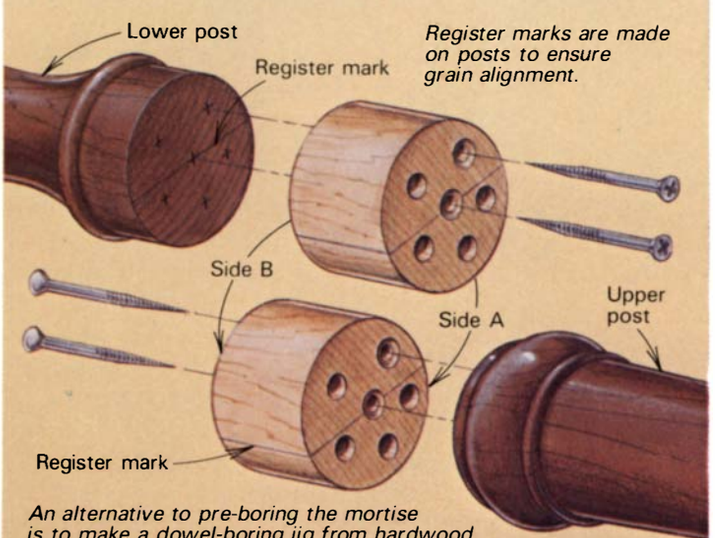
Robert Reid's shopmade duplicating router carves four knees at once, following a pattern mounted in the center.



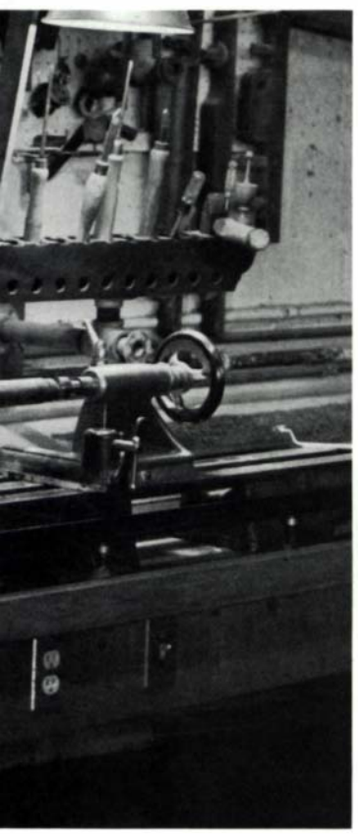


The Reid shop shapes lamb's tongues on a pencil-post by pattern-sanding the curves on a belt-sander.

Fig. 6: Aligning multiple-dowel joints



An alternative to pre-boring the mortise is to make a dowel-boring jig from hardwood. The jig is easiest to center if it is the same diameter as the joint. Screw jig to post end before boring.



A bed with cabriole legs must have unusually heavy corner posts to withstand the strain put upon the rails. Note that this section of the post carries the tenon. If the tenon were on the upper section, the corner post would have to be mortised, weakening the construction.

nipped off, leaving enough wood for either a lamb's tongue or a simple cove. The Reid shop makes lamb's tongues by pattern-sanding, as shown in the top photo on this page. Lamb's tongues can also be shaped by hand with spokeshaves, carving tools or drum sanders in an electric drill. The tapered faces can be cleaned up with a few strokes of a plane.

An alternative method for aligning sections of a post is shown in figure 6. The joint is held together by four dowels, which are accurately located by means of a hardwood boring jig screwed to the end of the section. The jig is easiest to center if it is made the same diameter as the finished post. Grain alignment is accomplished by registering the jig on reference lines marked on the stock before it is turned. Posts can be clamped up by jacking them against a ceiling joist or by building an extra long clamp.

The jigs shown thus far are enough to make several authentic bedpost designs. But fancy ones call for reeding, fluting, carving and other decorations. In the old days, these chores were done by hand, but Robert Reid quickly found that handwork was too costly, and he soon invented some production methods. As he says: "Any time a machine can make a perfect duplicate of handwork, a man would be foolish to insist on doing the job by hand. But a 100% machine-produced object that arrives at only a 98% duplication of handwork is a compromise with integrity. What you want is whatever the machine can do—25%, 75%, 98%—plus whatever handwork it takes to finish the job right."

The four-man Reid shop can turn out about 125 beds a year, each one taking about two weeks through the system. Every bed is a custom order—the shop will make any combination of posts, headboard and tester. Machines do most of the roughing out, but the final touches still require handwork. There's a duplicating lathe, for example, that follows a pattern with four ounces of pressure on its stylus, and applies 400 pounds of pressure to cut the wood. The bedpost comes off the lathe clean enough that a lot of factories would then simply sand, stain and lacquer it, but Reid's remounts the work on another lathe and refines the shapes by hand-turning.

Similarly, Reid built a router jig, shown in the top photo on the facing page, for reeding bedposts. The work is locked in position by an indexing plate at the headstock. Then the carriage is moved along the lathe bed by hand, and a router mounted on a pivoting arm follows the contours of the work, piloted by the bit holder. Reid's uses a commercial bit holder, with a ½-in. shank and ball-bearing pilot (see cover photo). Bedmaker William Blake has adapted the idea using a bit machined from steel, with the cutter held in place by a setscrew from the end. Blake's cutter and jig are shown in the photos at far left on the facing page.

Reid also built a duplicating router (bottom left, facing page) that follows a carved leg and makes four simultaneous copies. These also get their share of hand carving before stain and lacquer go on. One of Reid's most ingenious machines (left, center) looks like a great-granddaddy of the Sears Router-Crafter. It's a router setup that makes helical rope-twist bedposts, and he cobbled it up from Model-A parts when he was only nineteen years old. Reid recalls the first Victorian rope-twist bed he made: "I had to carve each post by hand, and it seemed like I would never finish. If there's an easier way to do something, I'm going to do my best to uncover it." But it's a safe bet that he's not going to lower his standards to do so. □

Asher Carmichael, whose spider-leg carriage table was in FWW *# 40, works for Emperor Clock Co., in Fairhope, Ala. Black-and-white photos by the author.*

Perspective in Marquetry

Renaissance work inspires contemporary maker

by Silas Kopf

As a marquetarian, I often used to feel that I was working far away in time and place from the roots of my craft, which began in Italy in the Renaissance and had its major flourishing in Europe before the 17th century. I had studied as much as I could of the old work in books, yet still yearned to see the real thing. So when the chance came to tour some of the old marquetry centers in Italy, I jumped at it.

Like anyone else working with veneers today, I take my power scroll saw for granted, and I enjoy a practically infinite variety of world timbers for my palette. It came as something of a shock to see how my craft was practiced in the old days. Although the tools were primitive, the workmanship was superb and the concepts went far beyond anything I had ever attempted. The trip changed my perceptions of what marquetry could be.

I traveled through Tuscany and Umbria with Judith and Alan Tormey, two scholars who know intarsia well and also know where the best work is to be found. We started in Siena, the intarsia center in the 14th century, from which master craftsmen were sent throughout northern Italy to ply their trade. There is also fine work in Perugia, Lucca, Bologna and Florence—a city that in 1480 had a population of 150,000, yet was able to sustain 84 workshops specializing in intarsia and wood decoration.

As practiced at that time, intarsia had aspects of both inlay and marquetry. In an inlay, a hole is routed into the background and plugged with a contrasting wood. The plug is then flushed off. Marquetry yields the same look but is, in fact, a veneered overlay—thin pieces of veneer are cut and assembled as a sheet, which is then glued to a thicker backing.

One method of intarsia was like a jigsaw puzzle glued one piece at a time to a panel of poplar or pine, about ¾ in. to 1 in. thick. In the second method, the major backgound pieces were glued to the panel, and then the smaller pieces were inlaid. The portrait shown at top left on the facing page is one of a set of panels done by Antonio Barili for the cathedral in Siena. Barili used a combination of the jigsaw-puzzle and inlay techniques. Another of his panels, shown top right on the facing page, portrays an open cupboard containing the tools of his trade—bowsaw, plane, dividers, layout tools, pliers, glue pot, and a long-handled knife.

The knife was Barili's main tool for cutting pieces to shape, because the fretsaw was not invented until about 1600. At the beginning of the 15th century, the picture parts were about ¼ in. thick. By the 1500s, the craftsmen were sawing the wood thinner, yet even so, after the wood was planed and ready for the picture, it was still about ⅛ in. thick. Barili would have been able to brace the knife's long handle against his shoulder for extra leverage, but still, cutting and shaping such heavy veneer must have been a challenge, and very laborious.

The distinction between fine art and craft which many make today was unthought of in the 15th century. Intarsia was considered to be among the most important of the arts. According to Giorgio Vasari, a painter and chronicler, the intarsiatori Benedetto di Maiano achieved such renown that he was summoned to the court of the King of Hungary. "He made two chests with difficult and most splendid mastery of wood mosaic, to show to the King. So he packed his chests and sailed for Hungary." The King was anxious to see them but when he opened the parcels most of the veneers fell off, apparently because the glue had been softened by the dampness of the sea voyage. Benedetto repaired the damage, Vasari tells us, but "was disgusted with that kind of work, not being able to forget the vexation he had suffered, and gave it up, taking to carving instead."

Some of the panels have cracked and warped over the centuries, but on the whole the work I saw has held up remarkably well. I suspect that this is partly because the panels have been in churches, and therefore not subjected to the extremes of humidity found in a building with central heating. Neglect and insect damage have been much more damaging to the work than any problems with wood movement.

The intarsiatori chose their themes with care. The Renaissance interest in solid geometry paralleled the reborn interest in the Greek classics. Plato considered the five regular solids to be linked to the fundamental metaphysical elements. Writers in the Renaissance allied these forms (and mathematics as a whole) with concepts of perfection and order, representations of God. An influential book, *De Divina Proportione* (1498) by Luca Paciola, elaborated on these ideas.

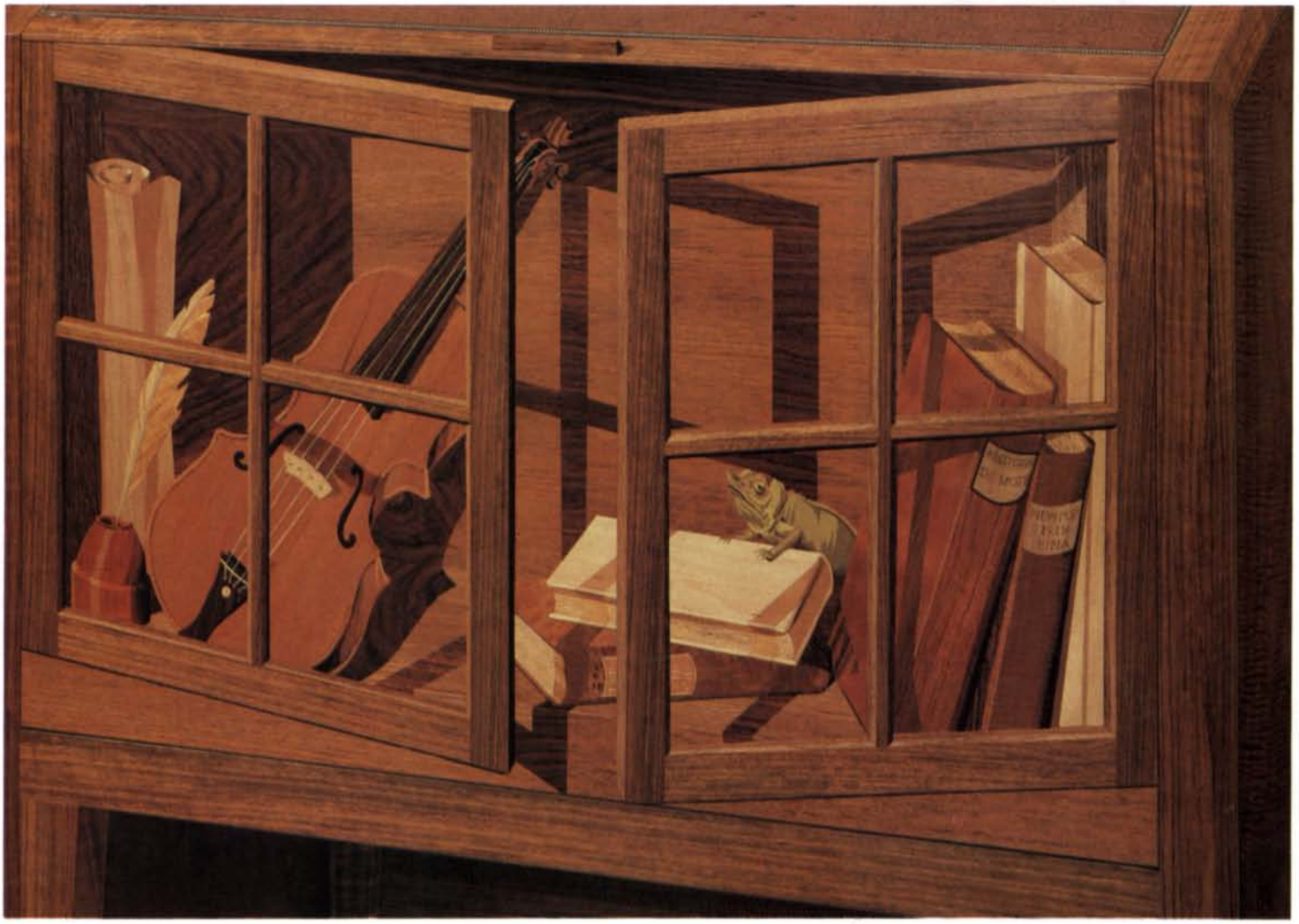
Some panels were designed by famous Renaissance painters such as Botticelli and Piero della Francesca. They worked out the designs on paper and then turned them over to the intarsiatori to translate into wood. After assembling the panel, the craftsman often added details of inlay, some pieces as small as a grain of rice and some lines as thin as 1mm. The finest intarsia pictures display a beautiful use of chiaroscuro by inserting small slivers of wood into larger shapes to create highlights or shadows through the way they are bunched together, much the same way modeling can be done in an etching by having many or few lines in a given area. The slivers will also sometimes curve to accentuate a rounded form, as shown in the drawing.

A story of one master, Fra Damiano da Bergamo, tells of an

Massimo Listri/FMR

Massimo Listri/FMR

Inspired by Renaissance works such as this open-window panel by Barili (above left), Kopf responded with a whimsical cupboard with marquetry occupant.



Barili's intarsia tools seem stored away for another day's work in a panel in a church in Siena (top right). Kopf borrowed some of the master's techniques and concepts to give the illusion of a cabinet full of books, a violin and a pet chameleon.

Photos, except where noted: Dave Ryan

The open 'doors' and the contents of Kopf's desk are actually two-dimensional marquetry, as is the drawer, even its pull.

audience with Charles V of the Holy Roman Empire. The Emperor thought the wood in a particular picture must have been touched up with paint. Offended, Fra Damiano ran a plane over the picture, showing the Emperor that the colors and tones were not just applied to the surface. Some panels have been restored with wood fillers, but originally all the parts were wood, and they fit very tightly. Any hairline gaps were filled with earth pigments mixed with beeswax. The wood came mostly from northern Italy (tropical woods were not imported until the end of the 16th century). Nut woods and fruit woods were prevalent. These are all in the white to brown range, but the veneers could have been dyed for greater tonal variation.

There is some disagreement among scholars about how much dyeing was done. Although no one disputes that green was used (the evidence is still there to be seen), there is little remaining of other colors. There is good reason for this—most of the other colors would have faded over the centuries, or shifted in tone because of color changes in the woods they were applied to. I feel strongly that Renaissance intarsiatori took advantage of the large, varied palette available to them from the flourishing cloth-dyeing industry of the time. Wood could have been dyed much the same as cloth, using decoctions of cochineal insects for red, indigo for blue, and saffron or turmeric for bright yellow.

Marquetarians today prize veneers with bold figure and striking grain, but in the Renaissance straight-grained woods were the most common, probably because they were much easier to work with. It is only in the later intarsia that unusual grains are found. For example, Fra Damiano used burls to represent marble columns, and curly-figured wood for drapery in a door panel in the choir of the church of San Pietro in Perugia. Visitors to such places often ask "how long did it take to make a panel?" We can make a guess. Barili contracted to make 19 panels for the cathedral in Siena. He had a nephew working with him at the time. The panels were to be completed in two years or Barili would forfeit a penalty. That works out to approximately one panel every eleven weeks per man. In fact, because of other commissions, the work was not finished for 20 years.

The strength of the classic intarsia was grounded in mathematics and the newly discovered principles of perspective geometry, whose basics are explained on the facing page. When the work did nothing more than mimic painting, it became stale. Vasari, presumably echoing (or leading) contemporary tastes, came to disdain the craft "as work requiring more patience than skill."

As for me, the challenge is still new. Before my trip, I had limited most of my marquetry to floral patterns. Now I am attempting three-dimensional illusions on furniture. Some subjects are humorous, some symbolic, but I hope that each design is harmonious with the piece of furniture and that the total concept proves provocative and interesting.

I picked up some good techniques in Italy, and I have gotten over my prior feeling that it is somehow cheating to use dyed wood—I'll use whatever I have to. In the cat cabinet shown at left, for example, the eyes and the pads of the feet are dyed. The cabinet, actually a fall-flap desk, is a mix of old and new techniques. I first made a full-size drawing in black and white, eyeballing the perspective instead of using geometry. A mathematically perfect drawing would have been accurate only from one viewing height and angle, so I tried instead to suggest the feeling of depth rather than attempt a strict portrayal of it.

Most important to the illusion are the tones of light and dark, the reason I made my working drawing in black and white rather than color. The lightness of the open door on the right thrusts it forward, as does the bright edge on the other door. Similarly, the cabinet's dark interior falls back visually from the surface plane.

With these bold areas established, I sketched the outline of the drawer and the cabinet's contents, then gave them depth by carefully plotting the contours of the shadow lines. Until I had seen the work of the old masters, I had never guessed how important shadows are to defining contours and shapes.

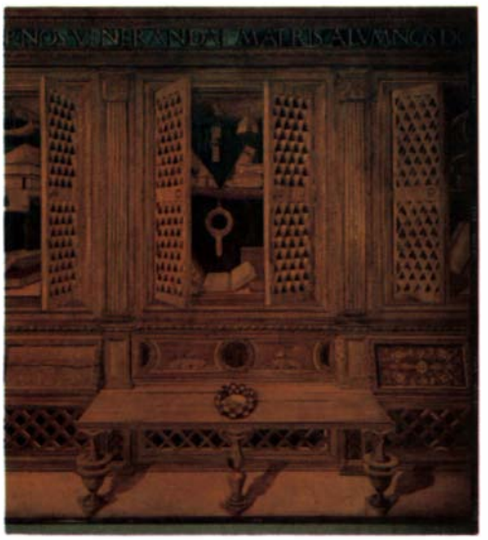
I had also not realized how important it was to overlap objects in the picture to help suggest depth. As I worked on the drawing, I took every chance to do so. One book overlaps the other, the cat's back leg overlaps both books, and the tip of the tail continues out over the drawerfront.

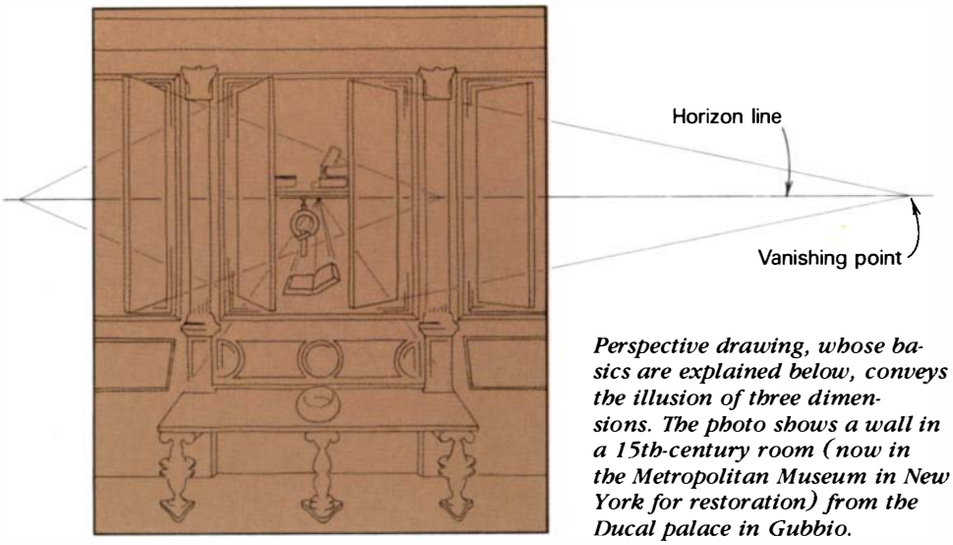
When the drawing was complete, I transferred it to various veneers with carbon paper, taking care to follow the lightness and darkness of the drawing so that the cabinet would look like one sort of wood exposed to various degrees of light intensity. I then cut the straight lines with a knife and the curved forms with the double-bevel technique. I taped the pieces together into a full-picture sheet and veneered it onto medium-density fiberboard, and then inlaid the fine details, such as the title of the book and the cat's whiskers. Studying the finished picture, I realized that the books did not stand out as well as they should, so I also inlaid a fine shadow line around their covers.

As a final touch, I inlaid the shadow of the left-hand door onto the solid-wood post of the leg. Barili, I hope, would have approved of his new apprentice's efforts. □

Silas Kopf is a professional marquetarian in Northampton, Mass. He wrote about veneer-cutting techniques in FWW *#38.*

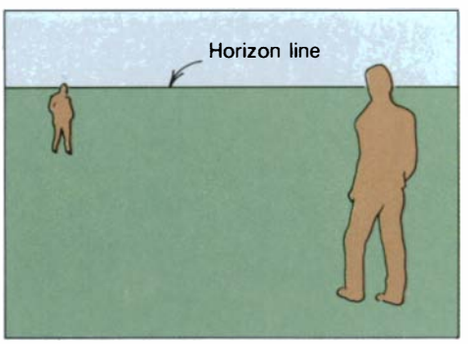
Basic rules of perspective



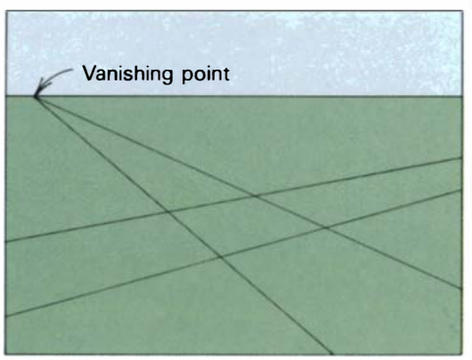


Perspective drawing, whose basics are explained below, conveys the illusion of three dimensions. The photo shows a wall in a 15th-century room (now in the Metropolitan Museum in New York for restoration) from the Ducal palace in Gubbio.

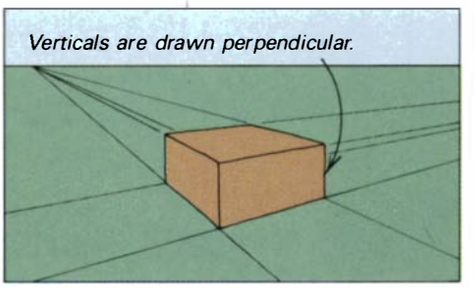
As shown in the drawing below, a picture contains a *horizon line,* always at "sea level" whether sea level is visible in the picture or not—in interior scenes, for example, it usually is not. The horizon line is always at the eye level of the observer. If the picture contains people the same height as the observer, the horizon line is at their eye level, too, provided that the land is flat. The farther away people and other objects are, the smaller they look.



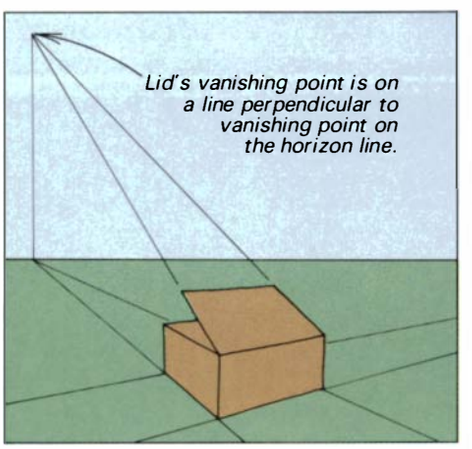
Parallel lines appear to get closer together with distance, until they meet at a *vanishing point,* as shown below. If the lines are also parallel to the earth's surface, they will converge on the horizon line or its extension outside the picture.



Planes, such as the sides of a box, converge to the same vanishing points as the box's top and bottom. In conventional drawing, planes perpendicular to the earth are drawn perpendicular, as in the drawing of the box, below. This assumes that the observer is looking straight ahead. Exceptions occur in unusual circumstances or for exaggeration, such as when looking up at a tall skyscraper—its sides would be drawn converging.

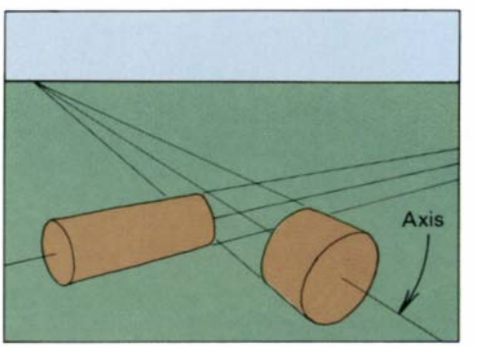


The plane of an open box lid is neither parallel to the earth nor perpendicular, hence its vanishing point is not on the horizon line. It may be above the line or below it, depending on the hinge location.



Circles in perspective are seen as ellipses. The more the circle is turned, the narrower the ellipse becomes.

The axis of a cylinder laid on its side is in a direct line with the minor axis of the ellipse representing its top. The cylinder's sides converge to a point along the axis.



Many of the laws of geometry are still true in perspective drawings. For example, the center of a circle can be found at the intersection of the diagonals of a square drawn around it. The center of a circle in perspective can be found the same way: Draw a square in perspective around the ellipse and then connect the corners.

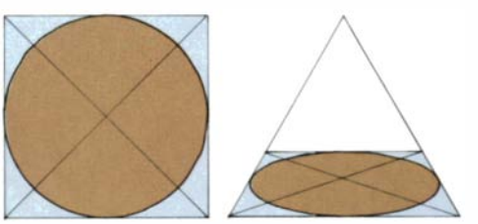


Photo this page: The Metropolitan Museum of Art, Rogers Fund, 1939

A Simple Banjo

Make a wooden-top 5-string

by Richard Starr

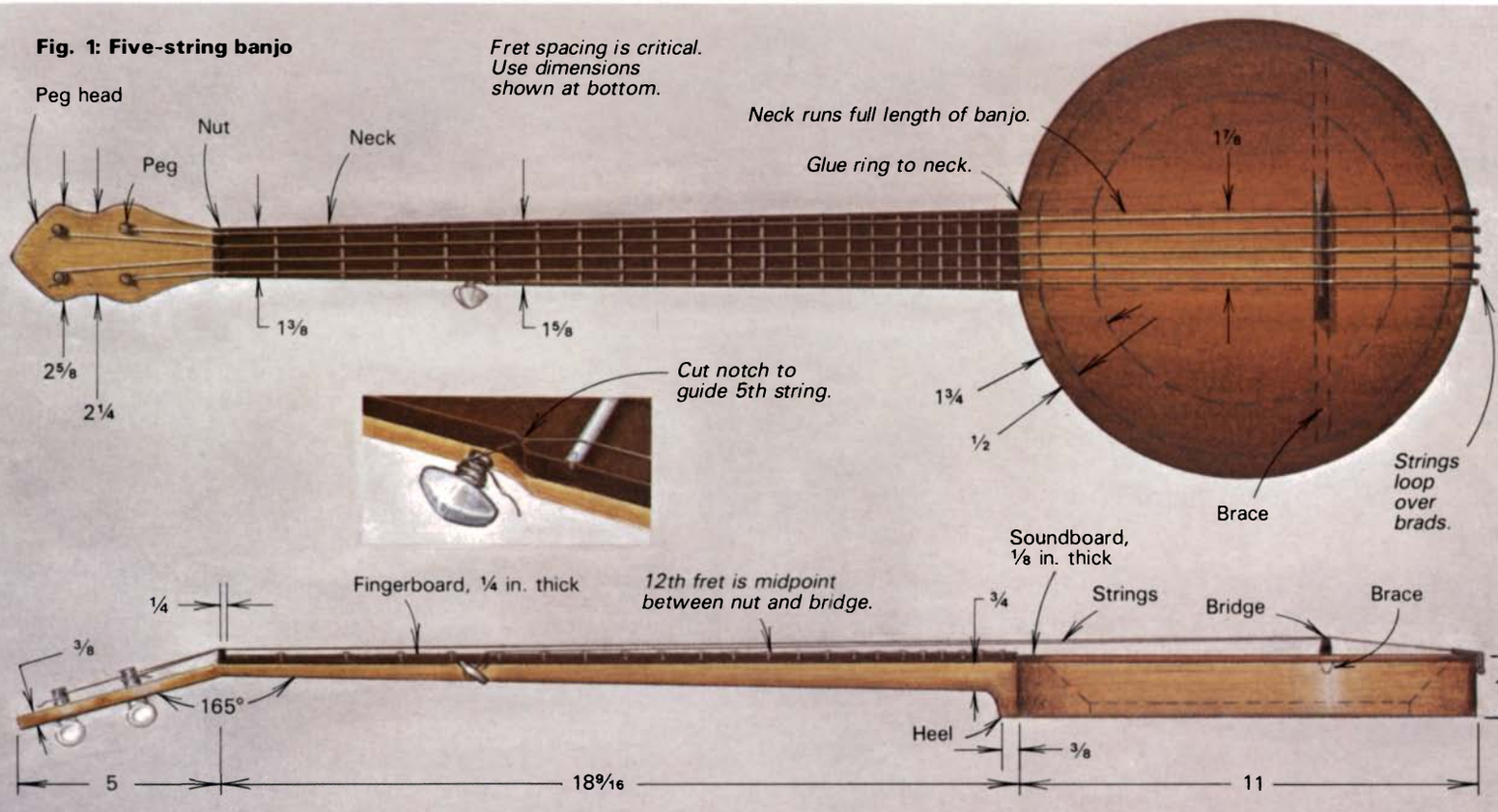
I never would have thought to design a banjo if several kids in my school shop hadn't wanted to make one (nothing seems too complicated to a 12-year-old). Regular banjos have skin or plastic drum heads, but mine uses a wooden soundboard. It isn't as brilliant or quite as loud, but it has an appealing ker-chunky sound that is lovely for mountain-style clawhammer playing.

This banjo's structure couldn't be simpler. There is no fancy joinery or bolts and no bent wood. The soundboard is glued to the rim of the banjo, eliminating the need for complex and expensive tensioning hardware. To make the banjo, a bandsaw is indispensable and a power jointer speeds the work, but you can, as do my students, manage with hand planes.

Begin by drafting a full-size pattern for your instrument, both top and side view. My students used dimensions from the book *Foxfire 3,* edited by Eliot Wigginton (published by Anchor Press/Doubleday, 245 Park Ave., New York, N.Y. 10167), but you can use the dimensions shown in figure 1, or copy an existing instrument. If you have such a model, be sure to note the following dimensions: length of the neck; width of the neck at the nut, fifth fret and where it joins the rim; height of the strings above the last fret and at the nut. Measure the positions of the frets to the nearest millimeter, using the nut end of the fingerboard as zero. You may choose to make a fretless banjo—our design fits in well with the warm, primitive, fretless style of playing.

After drafting the basic shape of your instrument, mark out the extension of the neck through the rim by drawing lines parallel

Fig. 1: Five-string banjo



Fret number	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22
Distance from nut to fret kerf in millimeters	32	73	108	140	171	200	226	253	277	301	322	343	362	380	398	414	429	443	456	469	481	494

A wooden soundboard gives Starr's banjo a mellow, pleasant sound.

to the centerline, starting where the neck intersects the rim as shown in figure 1. This defines the width of the whole neck piece and the shape of the rim halves. Trace the neck and the rim halves onto another piece of paper and cut them out as patterns to trace on the wood.

Frame—Sturdy native hardwoods like maple, ash, cherry and hickory were used by mountain instrument makers. I made my banjo of 8/4 cherry. For the neck, choose stock a couple of inches longer than the entire banjo and a tad wider than the section of the neck that extends into the rim. If your peg head is to be wider than that dimension, add the length of a second peg head to the overall length of the neck blank. Joint one face and two edges of the stock. As you joint the second edge, bring the stock down to its finished width. If you're widening the peg head, cut the extra section off, rip it up the middle and glue the jointed edges of these two pieces to the sides of the neck.

The two C-shaped segments that form the rim are made from stock the same thickness as the neck. Joint a face and an edge, then trace the pattern with the ends of the C flush against the jointed edge. Bandsaw the C-shape and save the outer waste pieces to use later as gluing cauls.

Now bevel the inside edge of each rim segment. On the end of each segment, draw a line as shown in figure 2. This line establishes the 45° bevel. Use a compass to scribe a line around the inside of the rim as shown. Set the table of your bandsaw to 45° and carefully follow that line to guide your cut. Smooth the inner surfaces of the rim segments with a spokeshave and scraper. This can also be done on a drum sander. The outside curve is best left rough until later.

Hold one of the rim segments in place against the neck and trace a line on the neck where the bevel meets the neck. Cut out the relief section of the neck as shown in figure 2.

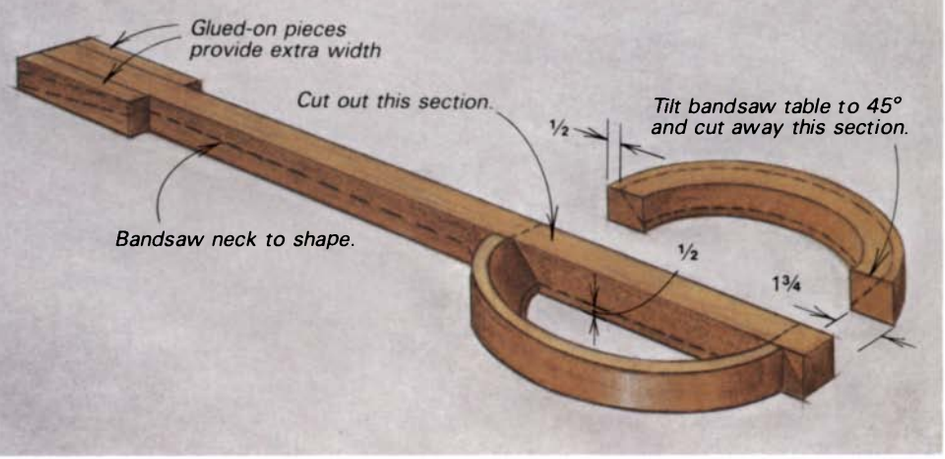
Bandsaw the neck and peg head to shape. Glue the rim segments to the neck as shown in the photo below. When the glue is dry, check to see that the top edge of the rim is exactly even with the face of the neck. If it's not, true it up with a hand plane. Trim the tailpiece extension of the neck flush with the rim. Plane the back surface of the rim and neck so that they're smooth and flush with each other—I planed off about ¼ in.

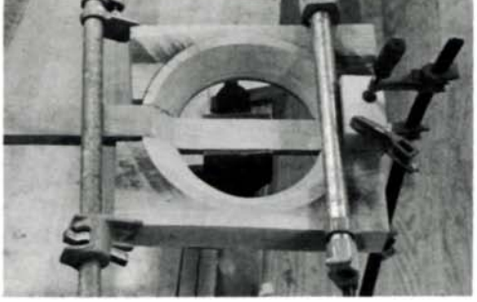
Soundboard—Quartersawn spruce, cedar or redwood gives a rich, resonant sound. An easy way to get a decent soundboard is to pick through a pile of spruce or cedar clapboards at your local building-supply house. Look for annual rings that are perpendicular to the faces of the board. Cut two lengths of clapboard a couple of inches longer than the soundboard, joint the edges and glue them together to get the width you need. When the glue is dry, plane and sand the board a tad thicker than ⅛ in.

Trace the inside and outside edges of the rim on the bottom side of the soundboard. The soundboard is round, except for a flat section where it butts up against the fingerboard. Be sure that the grain of the soundboard runs parallel to the neck. Bandsaw the curved shape ⅛ in. outside the traced line, but cut right to the line on the flat section.

Cut a brace from spruce or pine as shown in figure 1 and glue

Fig. 2: Making the frame





In gluing the rim segments to the neck, the scrap pieces left from bandsawing the rim become the cauls. A few clamps and small cauls at the tail end keep the parts from slipping around while the pipe clamps are being tightened.

it across the underside of the soundboard. This cross-grain brace helps resist the downward pressure of the bridge and reduces the chance of the soundboard splitting.

Now you're ready to glue the soundboard to the rim. Hold the banjo in a machine vise by the part of the neck that passes through the rim. Spread glue on the upper edge of the rim and set the soundboard in place. Be sure that the flat section of the disc is lined up where the neck joins the rim and that the soundboard overhangs the rim evenly all around.

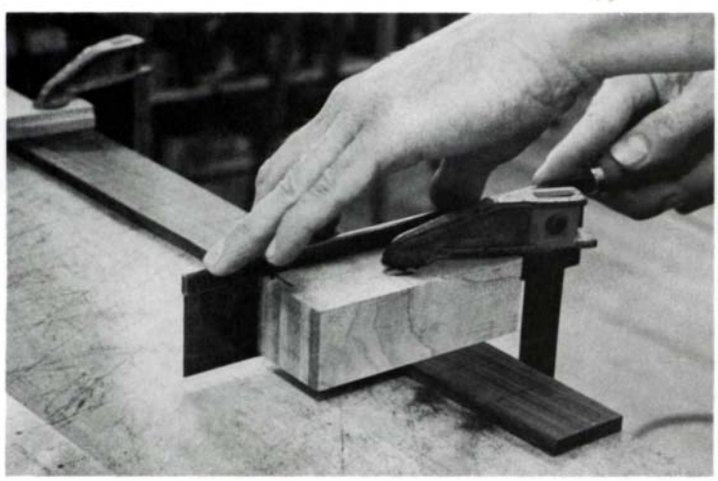
For a good glue job, it's important to apply gentle clamping pressure at every point on the rim. When the glue is dry, use the bandsaw to trim the soundboard flush with the rim.

Fingerboard—A fingerboard that contrasts in color with the neck of the banjo is appealing. Mountain folk used native woods: walnut, cherry or maple would work well. No part of the instrument receives more wear and tear, so very dense woods are best—the finest banjos have ebony or rosewood fingerboards.

Cut a piece of stock slightly wider than the neck and a couple of inches longer than its length. Joint one face and one edge, then thickness the piece to about ¼ in. Pencil a line up the center of the stock and lay out the shape of the fingerboard centered on this line. If you want frets, mark the position of each fret along the jointed edge of the stock, then use a square to project each mark across the fingerboard.

Fretwire has a T-shaped cross section and the shank of the T is jammed into a slot in the fingerboard. You'll need about 5 ft. of fretwire and a fretsaw, or a dovetail saw whose kerf gives a snug fit to your particular fretwire. If the saw cuts too wide, you can narrow the kerf by sliding a file lightly along the sides of the saw, reducing the set of the saw's teeth. Don't make the kerf too tight or the neck will bow when you hammer all the frets in. Guide the saw against a block of wood clamped to the fingerboard, as shown in the photo below. This block can also serve as a depth stop. Trim its height so that the back of the dovetail saw catches on its top edge when the cut is to depth—about 1/16 in. deeper than the shank of the fret. Practice cutting frets in scrap before trying it on your fingerboard.

After you've cut all the fret slots, saw the fingerboard to shape and glue it to the neck. Be sure that the centerline of the fingerboard is true to the centerline of the neck and that the end butts up against the flat section of the soundboard. Use a scrap of wood roughly the size of the fingerboard as a caul to distribute the clamping pressure. Now bandsaw the sides of the neck to match the shape of the fingerboard.



To saw the fretwire slot, guide the saw against a block of wood clamped to the fingerboard. Trim the block height so that the back of the dovetail saw catches on its top edge when the cut is about 1/16 in. deeper than the shank of the fretwire.

Carving the neck—Carving the back of the neck is probably the fussiest job in this project. The curve in cross section must be rounded almost to the top edge of the fingerboard, while the shape along the length is almost a straight line. At the same time, the neck gets slightly wider and thicker from the nut to the rim and is faired gently into the peg head and heel. Rough out the shape with a spokeshave and refine it with a scraper or file. Sandpaper on a hard block works best for truing the surface lengthwise. A well-shaped neck is a musician's joy, so examine your work with your fingers, as well as your eyes. It's helpful to handle a completed banjo to get an idea of how a neck should feel.

Fretting—Inject a small amount of white or yellow glue in the fret's kerf and tap in a length of fretwire using a lightweight, deadblow hammer. Be sure to support the neck with a block of wood directly under the fret you're installing. Using a pair of nipping pliers, trim the overhanging ends of the fretwire. File the ends even with the fingerboard and round them slightly at the top, so no sharp edges protrude. If you file the wrong way, you'll lift the fretwire. To remove the file burrs, sand the edges of the fingerboard with 220-grit paper on a hard block. Run a long file lengthwise up and down the neck to level any high frets.

Now you can smooth the outer edge of the rim with a spokeshave and sandpaper, and finish-sand the whole instrument.

Set-up—Install tuning pegs according to the manufacturer's instructions, or make your own tapered friction pegs. To guide the fifth string over the fifth fret, we cut a simple notch in the fingerboard. You could also insert a small round-head wood screw between the fourth and fifth frets so that the head of the screw holds the string down tight on the fifth fret. Instead of a tailpiece, we used five round-head brass brads driven into undersized holes at the tail end of the instrument. These brads secure the ends of the strings. Be sure that the heads of the brads stand about 1/32 in. proud to catch the string's loop. Round the edge of the soundboard slightly where the strings bear on the corner. Fashion a nut and bridge from dense hardwood, and trim their height to give the proper action (the height of the strings at the nut and last fret). The nut glues against the peg head and the end of the fingerboard. File shallow notches for each string. String the banjo and position the bridge so that the 12th fret is midway between the nut and bridge. Adjust the bridge so that holding down each string at the 12th fret produces a tone one octave higher than the open string. Move the bridge slightly closer to the nut if the octave is flat, further away if it is sharp. Don't glue the bridge to the soundboard. The tension of the strings will hold it in place.

An oil finish, wet-sanded with 400-grit wet-or-dry paper, will give you a fine-looking and serviceable musical instrument. A good book for beginners is *How to Play the 5-String Banjo* by Pete Seeger (Oak Publications, Div. of Music Sales Corp., 799 Broadway, New York, N.Y. 10003). Good playing! □

Richard Starr teaches woodworking at Richmond Middle School in Hanover, N.H., and is the author of the book Woodworking with Kids *(The Taunton Press, 1982). Photos by the author. Banjo tuning pegs and strings are available from Stewart-MacDonald Mfg. Co., Box 900, Athens, Ohio 45701.*

Drill-Chuck Reconditioning

Overhaul cures lockjaw

by Richard B. Walker

Binding, sticking, hard-to-operate drill chucks rank high on most woodworkers' pet-peeve list. Yet few of us do anything about them. A hoary myth is floating around that balky chucks can't be repaired. And since new ones aren't cheap (name-brand half-inchers are nudging $45 these days), most of us opt to struggle along with the same old cantankerous chuck year after year.

But the truth is, chucks can be readily field-stripped for servicing. Knowing how is the key. Like interlocking Oriental wooden block puzzles, a chuck's disassembly procedure is not immediately apparent. But once you find out how to get one apart, chances are excellent that just cleaning, deburring and lubricating will cure its problems. And, should any components turn out to be worn, replacement jaws, nuts and sleeves are available for most name-brand chuck models. Even a badly worn chuck can be totally rebuilt to like-new condition for roughly half the price of a new one.

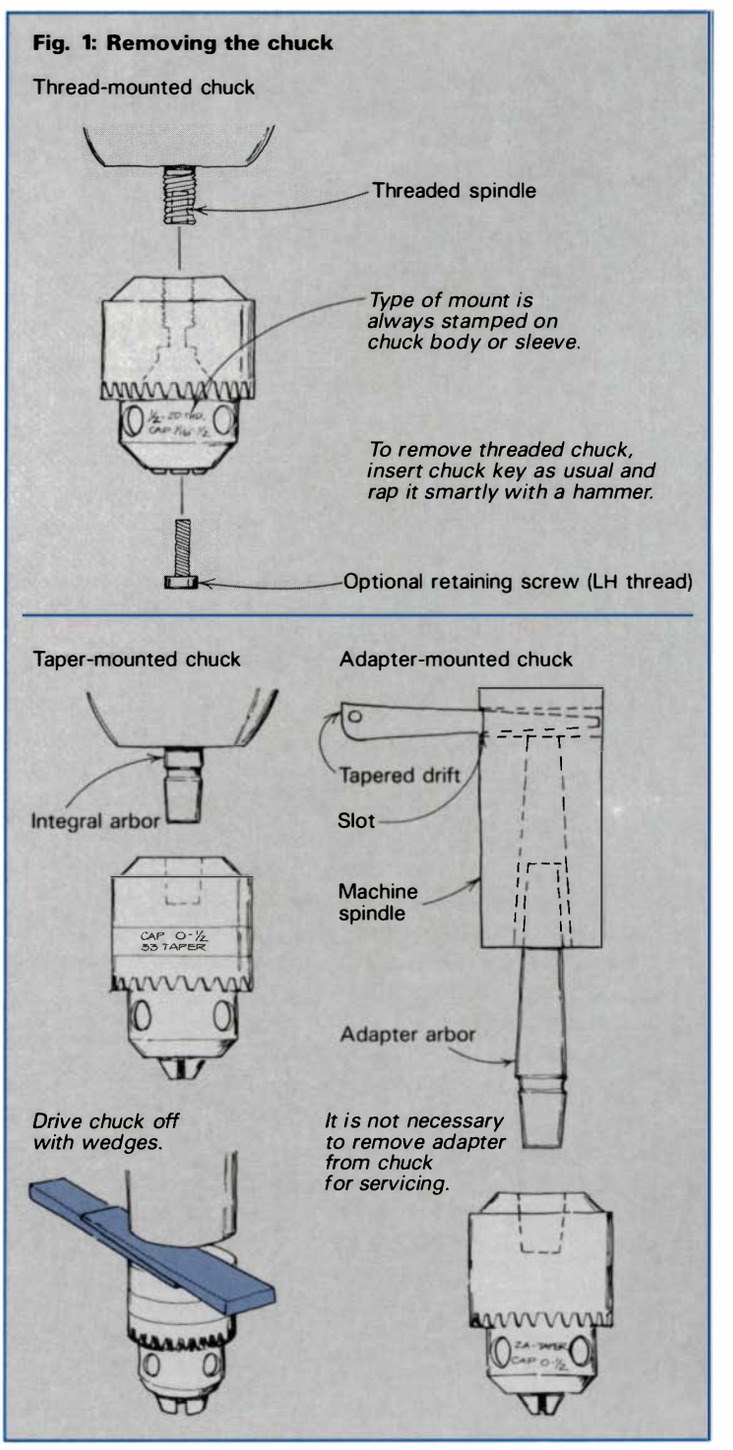
I'd advise doing one thing before commencing any overhaul. Carefully inspect the gripping surface of the jaws. If the jaws are badly flattened, scored or unevenly worn, you'll probably need new ones. If that's the case, check to see if replacement jaws are available for that particular brand and model of chuck. If not, it makes no sense to do an overhaul, and you might as well resign yourself to buying a new chuck.

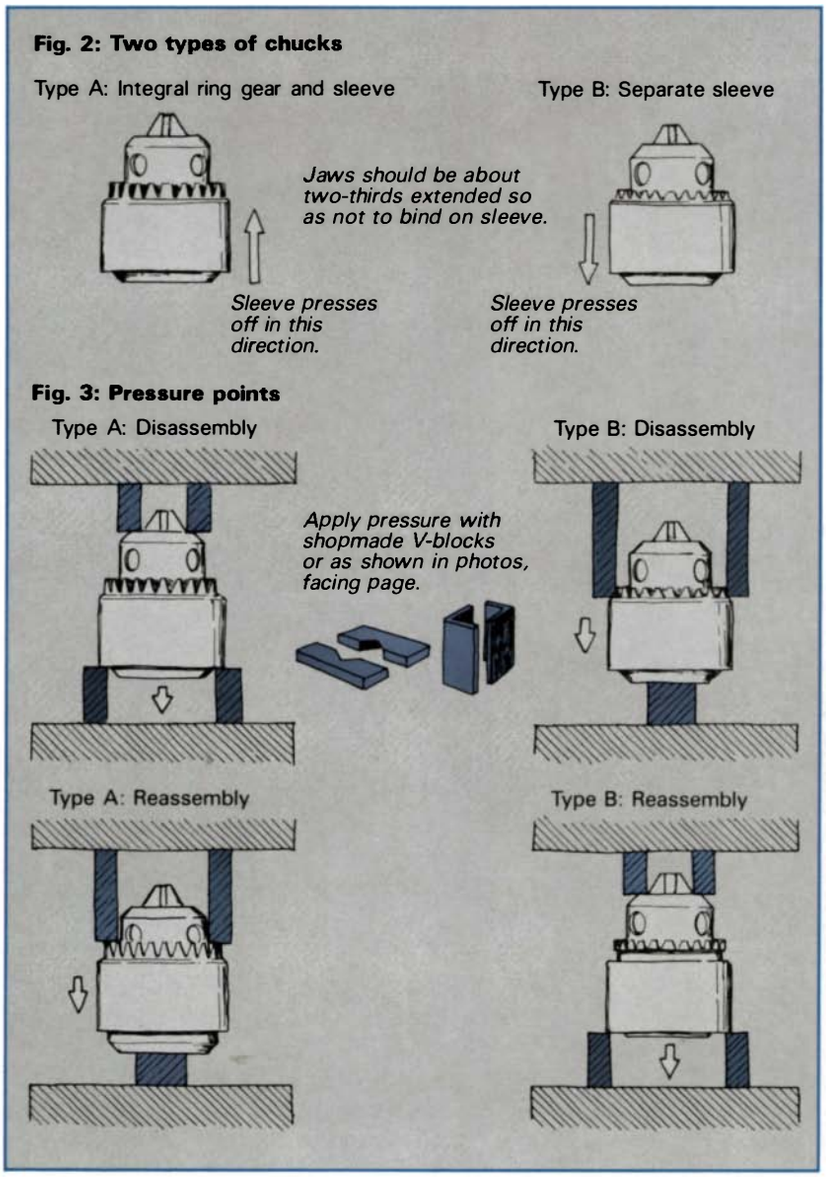
Removing the chuck—Thread-mounted chucks are used on portable tools and a few drill presses. Taper-mounted chucks are standard on the majority of drill presses, mounted either directly onto the machine spindle or via an intermediary adapter arbor, as shown in figure 1.

Usually you can remove taper-mounted chucks with wedges or a drift as shown, but if in doubt, consult your owners' manual for directions. For thread-mounted chucks, first open the jaws completely and check inside for a retaining screw. All reversing drills plus a few fixed-rotation models use them. Take care in selecting the proper size screwdriver to avoid damaging the slot. . . which could preclude ever removing the chuck. Retaining screws are always left-hand thread, so remember to turn *clockwise* for loosening. Sometimes factories apply a dab of thread-locking compound, and cracking it loose takes some force.

Disassembly—Almost all key-operated chucks fall into one of two families. Each type requires a different disassembly procedure, as shown in figure 2 on the next page. Determine which type you have by inspecting the sleeve area immediately behind the ring gear. Separate sleeve-and-ring gear models (the B type)

Fig. 1: Removing the chuck





In the type A chuck (most Jacobs chucks are type A), the ring gear is part of the outer sleeve. A separate split nut works the jaws. Note that it's not necessary to remove a tapered spindle adapter to disassemble a chuck.

In the type B chuck, the ring gear is part of the split nut that works the jaws. Pressure must be directed against the narrow outer edge of the sleeve, not against the ring gear, to slide the sleeve off.

show a faint joint. Integral sleeve-and-ring gear units (the A type) have no demarcation line. Except for their economy consumer line (which is just about impossible to get apart without destroying the sleeve), Jacobs brand chucks are all A type, Supreme brand ones type B. Up until about 15 years ago, most chucks were made by these two companies. The recent flood of imports has changed this. And they're as apt to copy one type as the other, so you really have to check carefully. If you get it wrong, not only will your chuck fail to press apart, but you run the risk of damaging it as well. Both types are shown disassembled in the photos above.

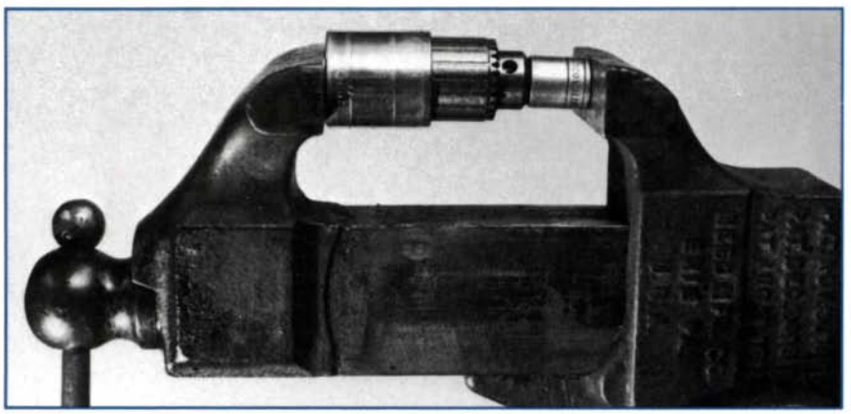
Typical medium-size shop vises can press apart most ¼-in. and ⅜-in. capacity chucks plus some ½-in. ones. In the case of a really stubborn fit, you can resort to a gear puller or an arbor press. If you can't talk your corner gas station owner into letting you use his, most auto parts stores will rent pullers or the use of their bearing press for a few dollars.

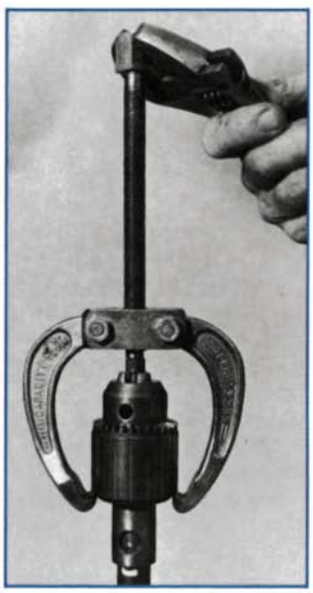
Pounding the chuck apart isn't usually recommended because it may damage the sleeve or the body. But on a chuck that's in marginal condition, it may be the way to go. Choose a thick concrete slab or large block of timber as your base. Wield a heavy hammer. Scraps of aluminum or brass are preferred over steel for use as bushings/spacer blocks because they won't cause damage.

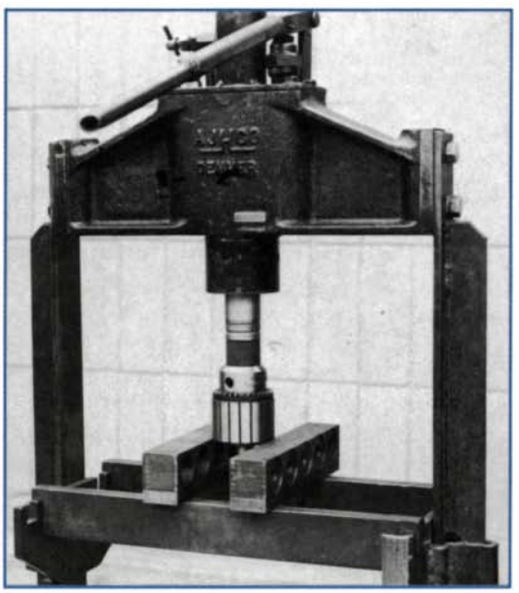
Quite often the hardest part of an overhaul is finding the appropriate-size metal bushings for pressing the sleeve off or on. Various sockets from U.S. or metric socket sets usually will work on up to ½-in. capacity chucks. For larger chucks, metal spacer blocks can be substituted. Positioning becomes more tricky, however, especially when you're using a vise. A pair of straight bars will serve, but V-type spacer blocks work a little better, providing four points of contact instead of two. You can easily make homemade V-blocks by hacksawing them from scraps of ⅜-in. to ½-in. thick steel plate or flat stock. Thick aluminum will also work (you can saw it on the bandsaw), but it will get quickly chewed up if you overhaul more than just a few chucks. Or you can saw two short, equal-length segments from an appropriate-size length of angle iron and use them upended.

Before pressing, close the chuck jaws about two-thirds. When they're open too far, they project into the path of the sleeve as it slides off, and damage can result.

Since you wouldn't be disassembling your chuck if it wasn't sticking, the jaws probably will be quite stiff to slide out of their channels. Try rotating them off-center a little while pushing and pulling. If that fails, pry them free, one notch at a time, using an old screwdriver as a lever. Jaws are keyed to their particular channels, so mark each as you remove it. Using the sharp edge







Three setups for disassembling a type A chuck: For small to medium chucks, a vise can often do the job as shown above, using SAE or metric sockets as bushings. For stubborn chucks, a gear puller usually works (below left). Note that it bears against a bolt placed in the partly open chuck, not against the chuck's jaws. Really stubborn cases may require a hydraulic press, a tool your local gas station may let you use.

Burrs, which cause the jaws to bind, can form at sharp edges inside the chuck. Typical trouble spots are shown by arrows in the photo above. To remove existing burrs and help prevent reoccurrence, chamfer such edges with a knife, round needle file or stone.

of a grinding wheel, I slightly nick the jaw tops once, twice, three times, respectively, and scribe corresponding lines on the chuck body.

Reconditioning—An old toothbrush and small wire brush will clean away any old lubricant or dirt from chuck components. If the grease has congealed and is stubborn, soak the parts in a pan of solvent and try the brushes again.

Now assess if replacement parts are required. Check the nut threads, jaw threads, jaw gripping surfaces and ring-gear teeth. Except in cases of severe abuse or extreme usage, these parts are usually quite durable, at least in name-brand chucks. But, some imports are a different story.

Most sticking and hard-operation problems are caused by internal foreign matter or burrs on the chuck body. Especially susceptible to burrs are the areas receiving thrust loads from the nut, and the jaw-cavity areas near the tip of the body, as shown in the photo above right. Some chuck bodies are hardened steel, and you will have to use slipstones to remove burrs. On unhardened bodies, you can use round files or even chamfer sharp edges with a knife. Work on rough areas until you have all the jaws sliding smoothly throughout their normal operating range, but don't change the overall size and shape of the channels.

Reassembly—Lubricate the components sparingly with oil or, better, a light grease. Oil will allow you to quickly spin the chuck open and closed, but grease gives a more solid feel to its operation and lasts far longer.

Position the jaws so all project the same distance, then replace the split nut. You can now manually turn the nut to check the chuck's operation throughout its entire range. As with disassembly, remember again to close the jaws about two-thirds. Double-check to make sure all jaws are projecting the same amount (it's easy to get one a notch out of place), and press the sleeve back on. The trick is to initially slide the sleeve over a ***vertical*** chuck body, thus ensuring the split nut remains in its proper position. Should anything bind or not feel right, press the sleeve off and start over again. Also take care that you're pressing straight and not slightly cocked.

When reinstalling taper-mounted chucks on spindles or adapters, clean both mating surfaces and always assemble dry—never use grease or oil.

Finish off your reconditioning job by purchasing a new chuck key. Chances are you could use one, and you've earned it. □

Richard B. Walker is an Irvine, Calif., citrus grower who writes about metalworking and also makes guitars. Photos by the author.

Variable-Arm Milling Machine

Exploring the router's sculptural potential

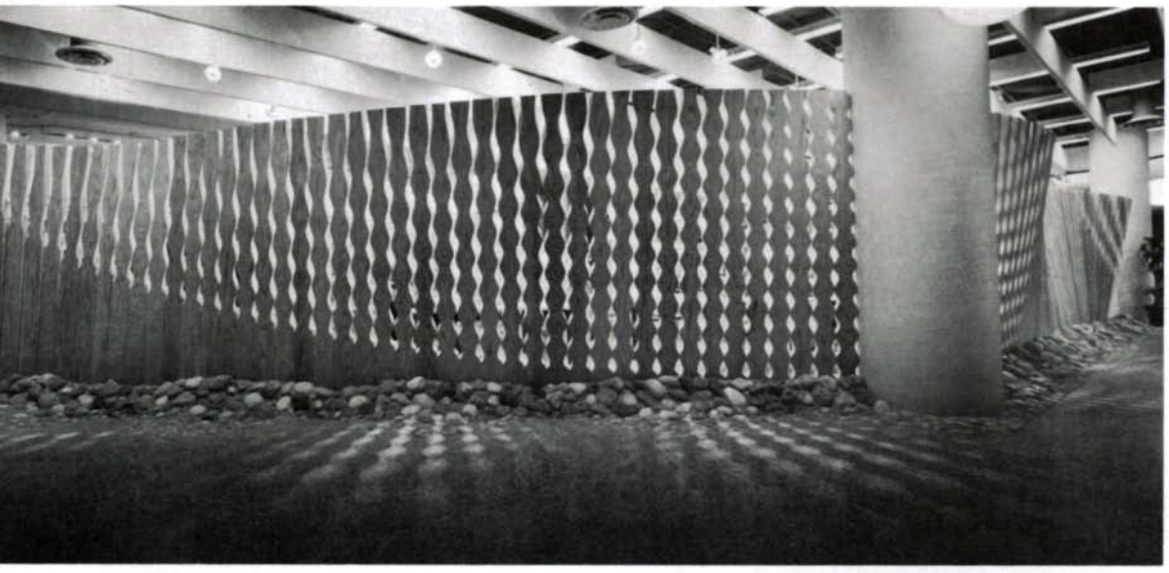
by Stephen Hogbin

I've always been interested in exploring machines that are capable of making more than one letter of the visual artist's alphabet. The weaver's loom, the potter's wheel and the woodturner's lathe are all machines that allow tremendous variations within limited configurations. The variable-arm milling machines described in this article are another example.

These machines grew out of a request I received from an architect in 1974. At that time, I had been making turnings, some of quite large scale, which I would then cut in half and glue back together in another order, revealing the progression of the turning's cross section (see *FWW* #21). The architect had seen a small screen fashioned from one of my segmented turnings and wondered if I could make a larger one for the Metropolitan Toronto Library. This seemed reasonable enough, until I discovered that the screen he had in mind was up to 200 ft. long and 7 ft. high. Conventional woodturning, even at large scale, was clearly not the best approach for this job. Rather than swinging a huge mass of material on the lathe, it seemed appropriate to hold the material and pass a cutting head across its surface. This action is similar to that of a milling machine.

When faced with such a technical requirement, I usually think about precedents—what existing machine might do the job? I don't want to start from scratch unless I have to and I don't want to become a designer of machines which are an end in themselves rather than a means to an end. However, this was not to be the case. For the screen project, the router seemed a good choice, both for basic shaping and for texturing. With its wide selection of bits, the router is among the most versatile—and I suspect underused—tool available to the woodworker. It can cut a hole or a groove; multiple grooves generate a ribbed or fluted surface that brings a flat surface into the third dimension. The practical and visual uses of this language are numerous, from functional hollows in which objects are stored to decorated surfaces which wrap around functional things such as furniture. The trick is to identify a relationship that works and apply it.

As the drawing on the facing page shows,the machine I developed is essentially a pivoting horizontal arm that rotates about two axis. The arm, a steel I-beam, supports a 2-HP router which travels on a roller carriage. For regulated work, the router carriage can be precisely positioned by means of a lead screw that runs the length of the arm. The router is fitted with either a ¼-in. or ⅜-in. collet to accept bits of ¼-in. to 2-in. cutting diameter. A simple template at the end of the arm or beside the work, allows me to reproduce and repeat a profile as of-



Hitched to an I-beam trammel arm, the router reveals itself as a sculptural tool of rich potential. To regulate the cutting, Hogbin attached his router to a carriage which slides along the arm to be precisely postioned by a long lead screw threaded through the carriage. He used this variable-arm milling machine to create a massive red oak room divider for the Metropolitan Toronto Library, above.

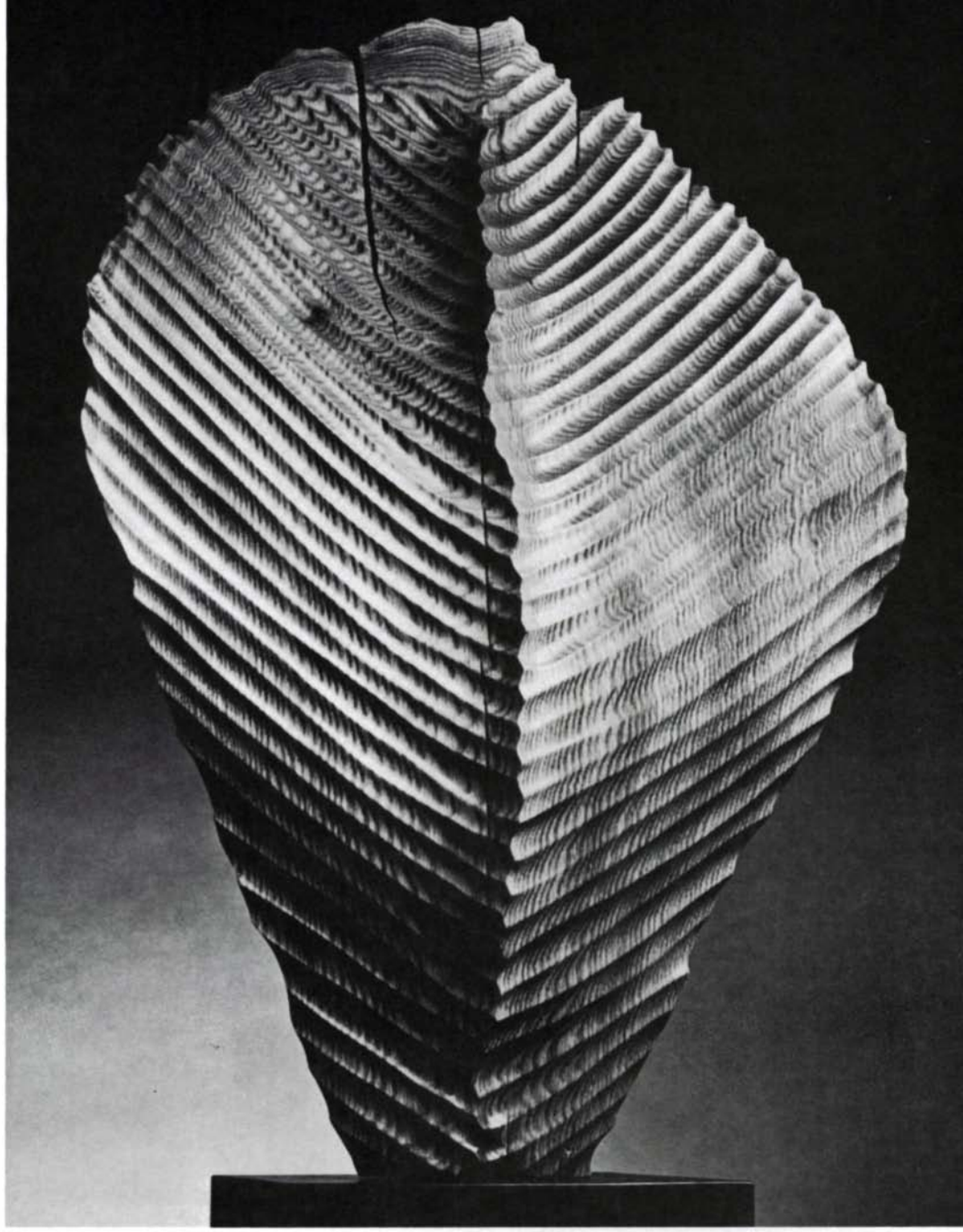
ten as I want. To make most things, and perhaps to make anything worthwhile, it takes considerable time to learn the techniques which relate to the forms desired. Once the machine was built, I began experiments to discover its potential. I need to understand technique before I can move to the biggest challenge: putting my experiments into a cohesive visual statement. First I cut and milled a number of blocks individually to learn what basic cuts could be made, and the relationship of one cut to another. Whether individual pieces worked visually or had any application was unimportant at this stage. The idea was not to make art but to develop an alphabet of possibilities which would later become visual poetry.

As I progressed, I discovered both the potential and the limitation of my machine. The arm weighs about 50 lb. when held at its outside end but feels progressively heavier as you move closer to the axis. Maneuvering the boom gave me tremendous back and neck pain. To relieve it, I inserted a piece of elastic into the rod that supports the arm. This gave me fingertip control at almost any point on the arm. The pain subsided, the forms improved and I could forget about the burden of process and move freely with the balance of form and material.

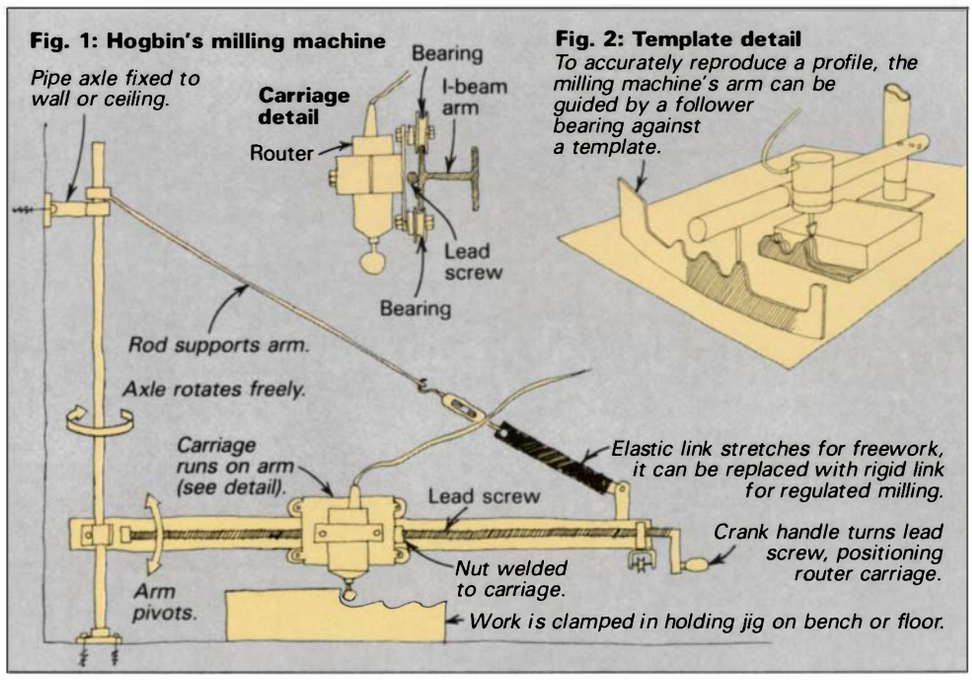
My initial attempts seemed rather stiff and lacked the subtle interpretation I could achieve at the lathe using a hand-guided chisel. The act of milling is part of the engineer's tradition rather than the artist's. Out of frustration from the weeks of tinkering, I dropped a large, irregularly shaped log beneath the arm and ran the router across the surface. The result was a vigorous patterning that had the qualities of crashing waves, wind-blown sand dunes and mountains. Finally, the form was evocative and challenging.

I applied this new-found language in making the library screen, shown on the facing page. The screen consists of 350 red oak boards set into a steel channel and stone base built on the floor. To allow light and air to pass through the otherwise solid wall and to impart a lively and evolving pattern, I placed the boards in a jig 50 at a time, edge up and face to face. Milling the edges, first on one side and then on the other by turning the boards over, produced a sequential texture with a semicircular effect. This process was repeated to get the necessary number of boards for the screen.

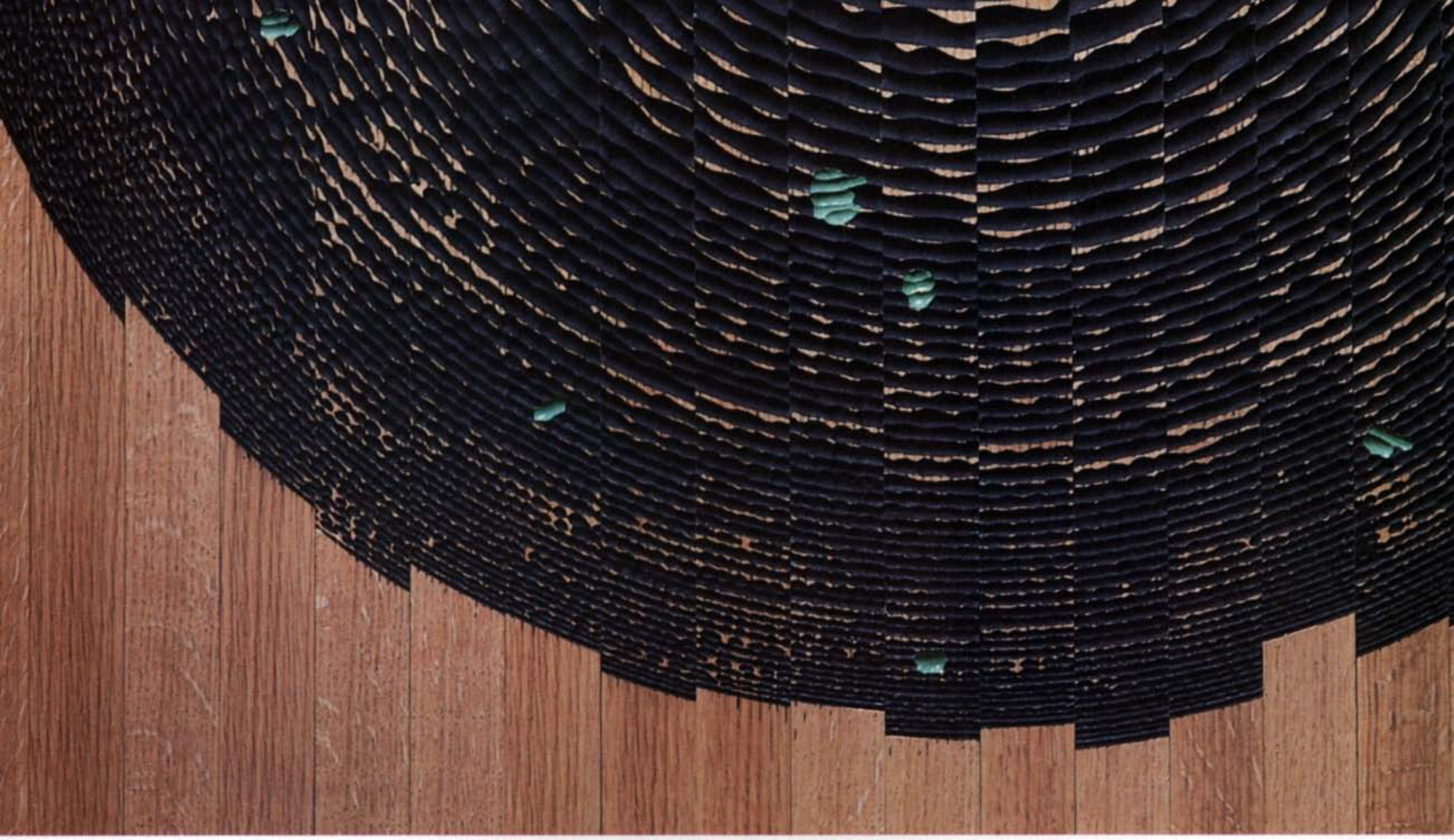
The last architectural-scale piece I



Combined with the milling machine's versatility, off-the-shelf router bits impart striking texture to wood. This sculpture shows the tool's remarkable expressive potential.



Black and white photos: Rudi Crystal



Frances Sanagan

To make one version of Calibrated Earth, *top, author built the small milling machine, right. The arm is less cumbersome and the work can be mounted on a turntable, making possible more the fluid, painterly compositions shown at far left and right. By painting the routed squiggles, Hogbin achieved an illusion of depth which suggests a cloud-filled sky or a flock of birds.*

made on the large milling machine was for C-I-L Inc., a Canadian chemical concern. The piece, which is called *Calibrated Earth*, makes reference to the image of earth. A small, painted derivation of it is shown above. The textured wood evokes clouds, water, sand, cracked mud, plowed fields or the desert. I used 11 different round-nosed cutters to produce the texture, but started the first groove with a V-cutter to give the finest start possible. The grooves were scraped with shaped cabinetmakers' scrapers and left without sanding.

For developing the models which eventually resulted in *Calibrated Earth,* I constructed a bench-sized version of the milling machine. By clamping the wood to a turntable beneath the arm instead of to a fixed holding jig, I expanded the machine's vocabulary, thus permitting the possibility of complex geometric carving much like that done by ornamental woodturners. However, I chose to explore forms that are freer. I achieved an elementary form of picture making by learning to organize these potentially disparate lines into a compelling whole.

Texture can be a key visual element of work produced on this machine. Spatial illusions can be produced. In *Calibrated Earth* the texture was cut from a flat surface but it appeared to be spherical because I used progressive sizes of cutters. Small cuts in the surface appear farther away than larger cuts. Optically, a cut can appear to be raised on the surface, especially if the hollow is lit from the bottom.

These kinds of effects are part of two-dimensional space and relief rather than three-dimensional space. These qualities of surface led me more and more toward "picture making."

Relief surfaces are sensitive to light. If they are not properly lit, the subtle visual qualities are lost. One way to overcome poor light conditions is to add color in order to gain back the high contrast of hollow to flat surface. Initially I added color with caution, thereby evolving the vocabulary further. Now, three years later, the wood in my work is often completely covered with paint, even though its texture and the structure of the panel are still evident. I have also recently pulled prints from the surface—using the texture as the basis of the printed image.

Since 1974, and that initial request by the architect for a large screen, I have evolved from woodturning, machine

Color photos except where noted: Stephen Hogbin

building, variable milling and now to printmaking. Although the techniques are different, in each process the wood surface is cut to produce different qualities.

This vocabulary-building activity—discovering similarities, making references and using one process as a metaphor for another—is a necessary part of giving form. This essay concentrates on technique and form; both are precursory to idea and content. Ultimately the poetry of any language is not contained in grammar, but in the spirit that motivates its form and content. □

Stephen Hogbin, a designer and artist, lives on Owen Sound, Ontario. An exhibition of his recent work is to be shown in July at the Ontario Crafts Council Gallery, 346 Dundas St., Toronto.

Ted Hunter's router mimic

by Mary Hui

Finding a conventional lathe unsuitable for the large, textured turnings he wanted to create, Toronto sculptor Ted Hunter designed and built this machine, which is an adaptation of the mimic some machine shops use to duplicate parts.

Its chief mechanism is an arm which connects a template follower to a router suspended above the workpiece. The arm is capable of 30 in. of longitudinal movement, which equals the radius of the turntable. The turntable can be turned at 6 RPM by a motor, or it can be rotated by hand. A crank belted to a lead screw moves the center post along a track, mechanically translating the template's profile to the work. Once set up, Hunter finds that turning/sculpting proceeds very quickly.

"But in some ways," Hunter says, "the process has been slowed down. I have more time to think about what's happening."

Much of the machine's potential remains undiscovered. In his early experiments, Hunter found that a router bit left a textured surface which enhanced his work. "Before building the machine, I had ideas for shapes I wanted to create," says Hunter, "so I built the machine to create them. Now, using the machine, I come up with more ideas. With a chair, for instance, you know that when it's finished you're going to sit in it and that's partially how you know it's finished. The machine is part of a process [and] never finished because the end result is unknown." □

Mary Hui is a Toronto free-lance writer.

Shop-Built Moisture Meter

Printed circuit guides you through electronic maze

by Rick Liftig

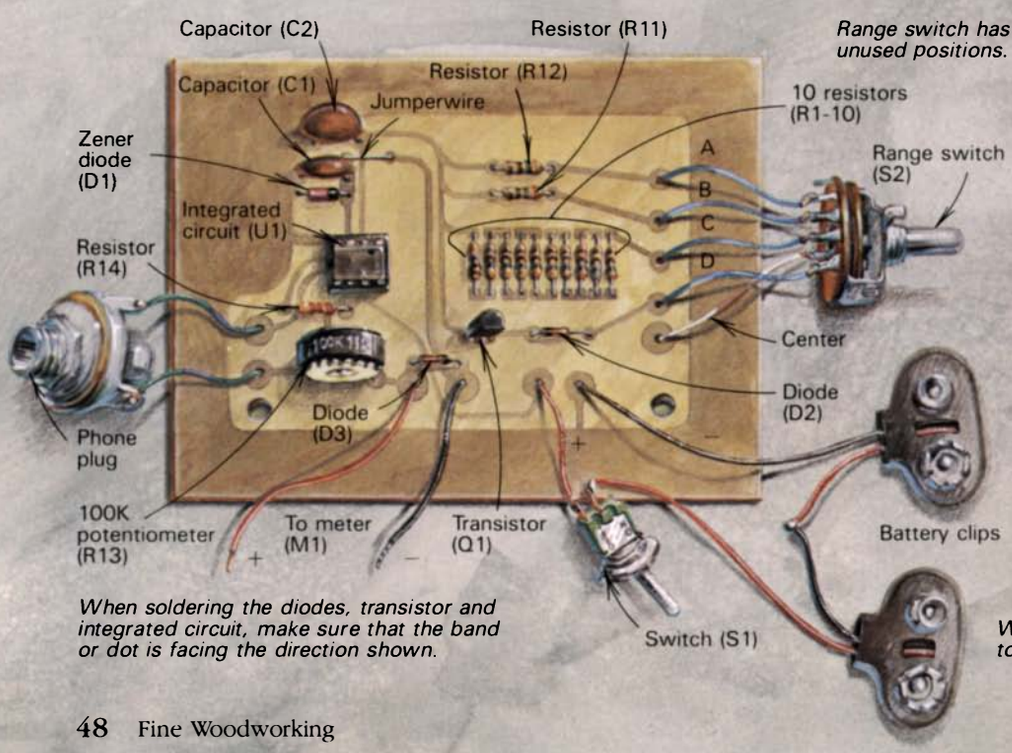
Even though I've occasionally had problems with wood warping and cracking or joints coming loose because of moisture-related wood movement, I never could justify spending $100 or so to buy a moisture meter to check my stock before I used it. I've always been interested in electronics, so I decided to build my own meter. My home-built version, shown in the photo on the facing page, cost $30. I've relied on fairly simple electronic procedures, so even if talk about soldering and circuits makes you uncomfortable, you should be able to build the meter.

The moisture content of wood can range from 0% for oven-dried samples to more than 100% for soaking-wet green wood, where the water in the wood weighs more than the wood tissue itself. Traditionally, technologists determined the moisture content by weighing a wood sample, oven-drying it until it was bone-dry, then weighing it again. The weight difference divided by the oven-dry weight, multiplied by 100, gives you the percentage of moisture content. This time-consuming method requires such an extremely accurate scale that it's impractical in most shops.

My meter, and many commercial models, bypasses drying and weighing by taking advantage of the fact that wet wood conducts electricity, while dry wood, a good insulator, resists the flow of electricity. By measuring this electrical resistance (expressed in units called ohms) and comparing your reading with standards developed by the U.S. Forest Products Laboratory and other agencies, you can determine wood's moisture content. The system works fine if the wood moisture content is in the 6% to 30% range, which is fairly common. Depending on the season and locale, most air-dried wood has 12% to 15% moisture content. Properly kiln-dried wood should be 6% to 10%. The electrical resistance in very wet or very dry samples is too erratic to give accurate readings.

Since we are measuring ohms, you might think that any off-the-shelf ohmmeter could measure resistance in wood. Wood is such a good insulator, however, that only a high-range ohmmeter capable of measuring in megohms (one million ohms) can be used. Early instruments used vacuum tubes and expensive high-voltage circuits, but my unit uses a modern, integrated circuit called an operational amplifier which can be wired to compare the wood's resistance to known resistances in the meter circuit. The details aren't too important; what's important is that the meter is sensitive enough to measure the moisture in a wood sample. Once I worked the bugs out of the system, I modified my meter dial to

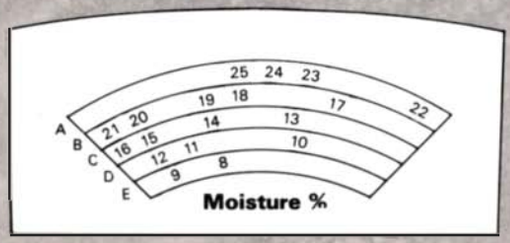
Fig. 1: Building the circuit board



When soldering the diodes, transistor and integrated circuit, make sure that the band or dot is facing the direction shown.

Wire two 9-volt transistor batteries together in series to give 18-volts.

Fig. 2: Customized dial



Pasting full-size dial to meter face converts megaohms directly to moisture percentages for Douglas fir. For other species see conversion table. The five scales correspond to A-1 megohm; B-10 meg.; C-100 meg.; D-1,000 meg.; E-10,000 megohm.

Drawing: Mark Kara

show percentage directly, as shown in figure 2 on the facing page, so I wouldn't have to keep checking resistance charts. Just glue figure 2 to your dial face with rubber cement and you're ready to go. I find my readings, based on Douglas fir standards, are accurate enough for most uses, but if you want more accurate readings that account for the physical differences of each species, use figure 5. If the species you are testing isn't listed, you can assume its readings would be much the same as one of the listed species from the same geographic area and with similar density and structure. The values are probably within 2% of each other. Even within one board, you may find that much of a variation because of wood structure, uneven drying and contamination.

Construction—The simplest way to build the meter is to make a printed-circuit board from the pattern shown, drill holes to accept components, then solder the components on. The completed board, along with its gauge and switches, can be housed in any type of box—I used a cherry case fitted with a ¼-in. walnut deck. The printed circuit is not as mysterious as it looks—it's just a way of replacing wiring with thin copper lines drawn and etched on a board. All you have to do is buy a printed circuit kit from Radio Shack, or some other supplier, and follow the instructions in the package to the letter.

The probe is a 1¼ in. dia. piece of Plexiglas rod drilled to accept the probe leads, which are soldered to the steel points (taken from a cheap drawing compass) epoxied into the rod. I spaced the electrodes about ¾ in. apart, but the spacing isn't critical. Make the probes long enough to penetrate one-fifth to one-quarter the thickness of the boards you want to test. If you don't want to bother with a probe, drive a pair of nails into the wood and connect them to the meter with alligator clips.

Calibration and use of the meter—The meter must be calibrated before use. Solder four 10-megohm resistors together in a four-unit "daisy chain" series. Touching the ends of the chain to the probe tips, adjust R13 (the 100-K potentiometer) to read 14% moisture content, with the meter set to scale C. Do not touch the

A few common electronic components, a plastic probe and species chart let you gauge moisture levels and anticipate wood movement for about $30. Jazz the unit up with a custom made box.

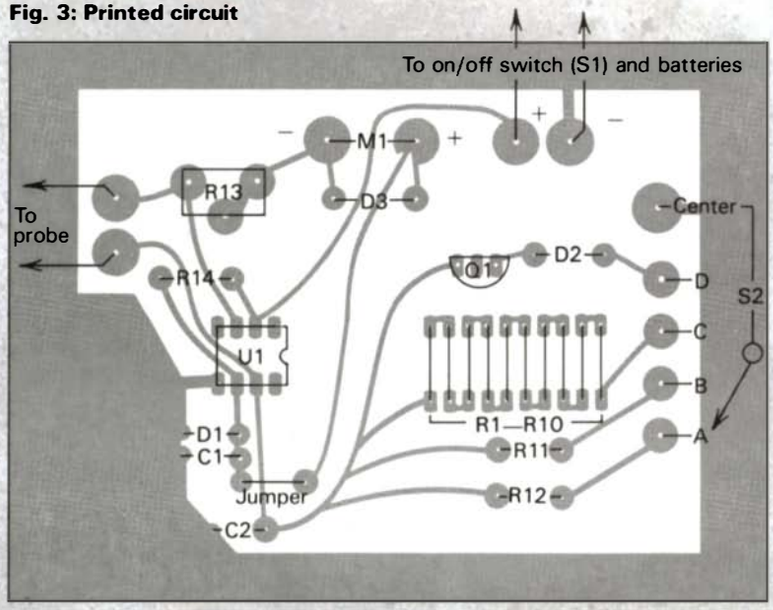
Fig. 5: Species corrections

Species	Meter Readings (%) 7	8	9	10	12	14	16	18	20	22	24
Birch	0.9	1.0	0.8	0.7	0.7	1.0	1.0	1.3	1.4	1.6	1.6
Douglas Fir	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Mahogany, African	0.7	1.4	1.6	2.0	2.8	3.2	3.6	3.8	3.8	3.8	3.8
Mahogany, Honduras	0.3	0.3	0.3	0.4	0.6	0.5	0.2	0.0	-0.5	-1.0	1.5
Mahogany, Philippine	-1.2	-1.2	-1.5	-1.9	-2.4	-2.8	-3.3	-3.7	-4.5	-5.2	-5.8
Maple, hard	0.7	0.7	0.4	0.1	-0.2	-0.1	-0.2	0.0	0.2	0.5	1.0
Oak, red	-0.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-0.2	0.0
Oak, white	-0.1	-0.2	-0.4	-0.5	-0.5	-0.5	-0.8	-1.1	-1.5	-1.8	-2.0
Pine, ponderosa	0.4	0.6	0.7	1.0	1.4	1.6	1.6	1.4	1.2	1.2	1.6
Pine, white	0.0	0.1	0.2	0.3	0.7	1.1	1.3	1.3	1.2	1.1	0.4
Poplar, yellow	0.1	0.6	0.7	0.7	1.2	1.6	1.6	1.6	1.7	2.0	1.7
Redwood	0.0	0.0	0.0	0.0	-0.2	-0.5	-0.8	-1.0	-1.0	-0.2	0.0
Walnut, black	0.5	0.6	0.4	0.4	0.4	0.5	0.3	0.2	0.0	-0.2	-0.4

Conductivity varies with different species. All species compared with Douglas fir standard. Example: When testing birch and meter reads 10%, look opposite Birch under 10%. Add 0.7% to meter reading for 10.7%. For woods not on chart, use figures for species of similar hardness and grain configurations.

Adapted from *Furniture and Cabinet Making* by John L. Feirer ©1983, Bennett & McKnight, Peoria, Ill.

Fig. 3: Printed circuit



Use diagram to lay out printed circuit and add components. Black lines are connections on the top of the board. Grey patterns are circuits printed on underside of board. Underside of board is shown here. The parts are coded and refer to the parts list at right.

Fig. 4: Parts list

Qty.	Radio Shack Part Number	Diagram Code	Description
1	270-1752	M1	0-1 milliamp DC meter
1	276-561	D1	6.2 volt, 1 watt zener diode
1	None	U1	LM308 N Op Amp
1	276-2009	Q1	MPS2222 Transistor
	276-1576		Printed circuit fabrication kit
	276-1577		Direct etching dry transfers
2	276-1620	D2 & D3	1N914 Silicon diode
1	271-220	R13	Printed circuit potentiometer 100K
15	271-1365	R1 - R11	10 Megohm resistors ¼ watt
1	271-1325	R14	2200 ohm resistor ¼ watt
1	271-1356	R12	1 Megohm resistor ¼ watt
1	271-1624	S1	On-off switch (SPST)
1	271-1385	S2	One pole 12 position rotary switch
2	270-325		9-volt transistor-battery clips
1	274-252		Phone Plus
1	274-256		Phone jack
1	274-414		Knob for switch
2	272-134	C1 & C2	0.05 UF disk capacitors

Misc: 5 in. section of 1¼-in. diameter Plexiglas rod, 22-gauge wire, solder for electronics.

Parts available from Radio Shack; Jameco Electronics, 1355 Shoreway Road, Belmont, Calif. 94002; or Digi-Key Corp., P.O. Box 677, Thief River Falls, Minn. 56701. Unless you're very familiar with electronics, don't try to substitute electronic components.

Gauging wood movement

by Tom Liebl

Many people will tell you woodworking is a simple enough craft—the right tools (with plenty of horsepower), the right glue, no problems. Then, when your beautiful tabletop cracks even though you glued and screwed hefty cleats across its underside, you wonder if maybe there's more to it.

"That's wood movement for you," the pros say as they scan your cracked top, but what does that mean? With a careful reading of Hoadley's *Understanding Wood*, the fundamental characteristics of wood will become clear, but in the workshop we are more often interested in how much movement than why. Few of us can get too excited about searching out just the right book, wading through a bewildering mass of data aimed at scientists, not craftsmen, then tracking down a pocket calculator just to figure out how much slack to build into a set of drawerfronts.

You could wing it, but cutting it too close could bring a summertime house call and a tarnished reputation. Leaving a ¼-in. gap would be playing it safe, but doesn't do much for looks. To solve this dilemma, I developed this chart on the movement and tendency to cup of most commonly used wood species.

I use the wood movement chart most, and when I combine potential movement with the cupping tendency of flatsawn lumber, I get a good idea of a species' dimensional stability. If I had a choice between red or white oak for a tabletop, I'd lean toward the white.

To use my chart, you must know three factors: the width of the piece, its annual ring orientation and the moisture content (MC) range where you live. The table is based on 12-in. wide boards, a convenient size for measuring expansion and contraction. Ring orientation may be either tangential (flatsawn) or radial (quartersawn). When in doubt, assume tangential since they move more than quartersawn.

After wood has been kiln- or air-dried to equilibrium with its environment, it will continue to shrink and swell with any change in relative humidity. You can determine your annual moisture range by monitoring local conditions or by consulting a moisture-change map, like the one in Hoadley's book.

I feel that for my area (and much of the midwest and the northeast), a 7% change in MC (5% to 12%) is appropriate for wood that has been treated with a moderately moisture resistant finish, like polymerized oil. Wood with a highly resistant finish (lacquer, shellac or varnish) might change as little as 3%. For many coastal areas, plus much of the south, a 3.5% range would work nicely.

Think of the measurements in the table as baselines, which you can adjust for changes in width, MC, or both by simple arithmetic. For example, take an 18-in. flatsawn red oak door panel. The table gives a movement of .31 in. over a 7% MC cycle for a 12 in. width. Since movement is directly proportional to width, the calculation is simple—18 is 1.5 times 12, so the movement for an 18-in. board is 1.5 times the movement of a 12-in. board or $1.5 \times .31 = .46$ in.

The MC range is figured in the same way. If you live in a 3.5% area (half of our 7% baseline), simply halve the result of your movement calculation.

For best results, you also must determine the current moisture content of the wood, usually with a meter like the one shown on page 49. If we want to install the 18-in. panel in a frame, our answer of .46 means that we must allow for at least a .23 in. movement in each side slot, but we must know the panel's current moisture content to decide whether to fit tight or loose.

Fitting tight in the summer and loose in the winter is a general rule. In any case, it's best to allow a little extra for movement, especially if you can't determine the current MC or face conditions that could produce extreme variations—say, furniture built in the dry southwest being shipped to the Pacific northwest. Once you understand how moisture affects wood movement, almost any situation can be anticipated. □

Tom Liebl designs and builds furniture and boats in Madison, Wisc.

Dimensional changes

Species	Movement of 12 in. wide board over 7% change in moisture content		T/R[1]
Hardwoods	**Radial**	**Tangential**	
Ash, white	.14 in.	.23 in.	1.6
Basswood	.19	.28	1.4
Beech	.16	.36	2.2
Birch, yellow	.22	.28	1.3
Butternut	.10	.19	1.9
Cherry	.11	.21	1.9
Elm, American	.12	.28	2.3
Hickory	.22	.35	1.4
Locust, black	.13	.21	1.6
Maple, sugar	.14	.30	2.1
Oak, red	.13	.31	2.1
Oak, white	.15	.31	1.8
Sassafras	.12	.18	1.6
Sycamore, American	.14	.25	1.7
Walnut, black	.16	.23	1.4
Willow, black	.09	.26	2.6
Yellow, poplar	.13	.24	1.8
Softwoods			
Baldcypress	.11	.18	1.6
Cedar, Alaska	.08	.17	2.1
Douglas-fir (coastal)	.14	.22	1.6
Pine, eastern white	.06	.18	2.9
Redwood (second growth)	.08	.17	2.2
Spruce, Sitka	.12	.22	1.7
Imported Woods			
Khaya	.12	.17	1.4
Lauan, Dark red	.11	.22	2.1
Mahogany	.14	.20	1.4
Teak	.08	.16	1.8

Decimal equivalents

.03 = 1/32-in. .125 = 1/8-in. .31 = 5/16-in. .44 = 7/16-in.
.06 = 1/16-in. .25 = 1/4-in. .38 = 3/8-in. .50 = 1/2-in.

[1] *Ratio of tangential to radial shrinkage (green to oven-dry) indicates tendency to cup in flatsawn lumber. Higher ratio means a greater chance of cupping.*

probe tips or resistors with your hands as this will change the reading. The meter is now calibrated for all ranges, and should remain accurate as long as the batteries are good.

To use the meter, jam the probe straight into a clear area of the board's face, so that an imaginary line between the points runs parallel to the grain. For the most accurate reading, measure the wood at room temperature. Also, don't insert the probe towards the end of a sample, which will probably be drier than the rest of the board. When measuring, switch the meter ranges from lowest to highest (i.e. A to E) and stop at the position that gives a mid-range reading, usually the most accurate and easiest to read. If you can't get a reading, the sample probably has a moisture content of 6% or less. Readings may vary from one part of the board to another due to improper drying, abnormalities in grain structure, dirt and other surface contamination. If you have any doubts about a reading, probe several other areas of the sample.

I've found that having such a useful and inexpensive instrument in the shop is a real plus. If you're contemplating working with wide panels it would be wise to determine the moisture content of the stock before you begin work. The time and trouble you'll save is well worth the effort. □

Rick Liftig lives in Meriden, Ct., where he dabbles in woodworking and electronics.

Two Dovetail Layout Tools

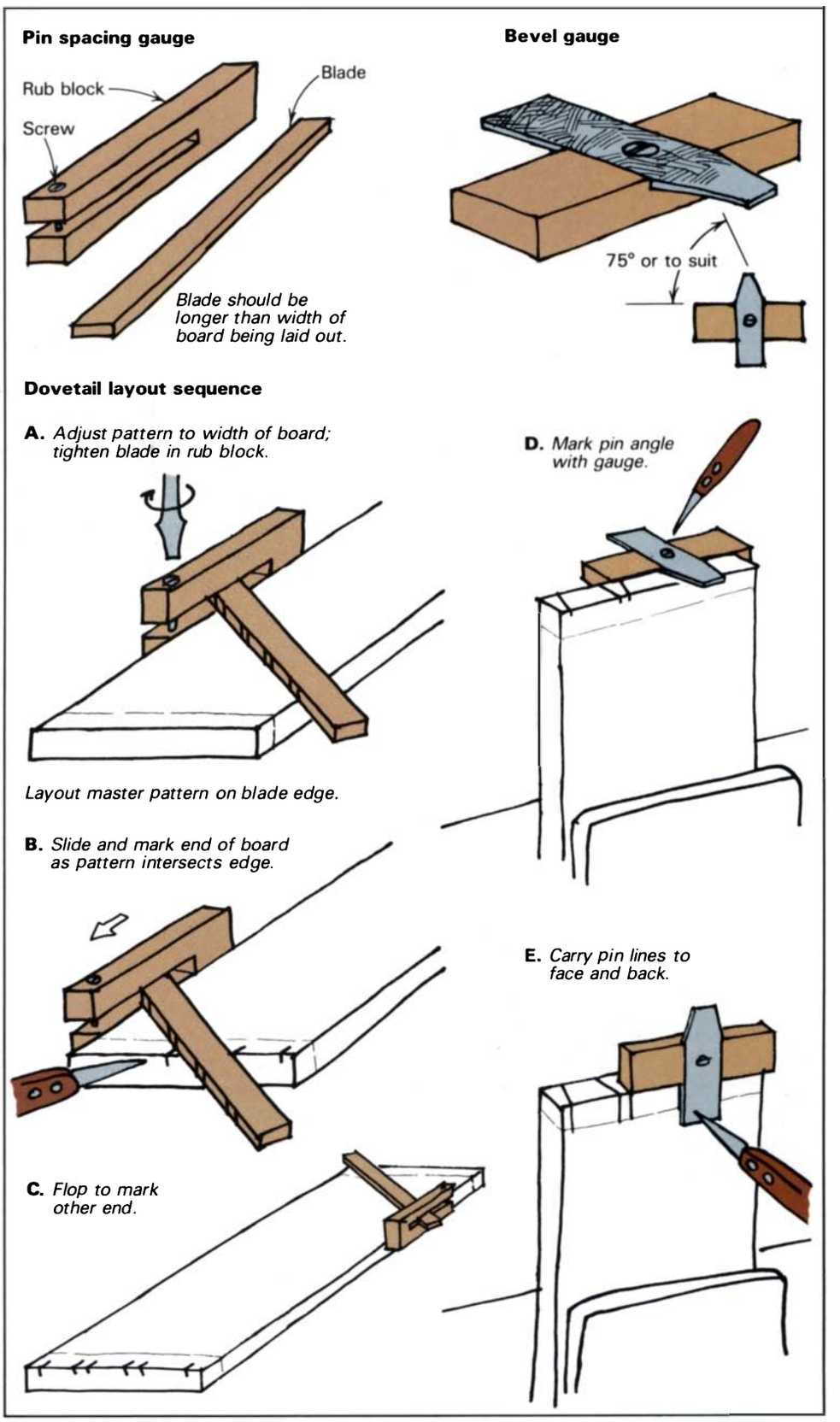
by Jim Richey

If you don't cut dovetails regularly, laying them out is a time-consuming and sometimes error-frought chore. Here are two tools I use in my shop to speed up the job. The first helps with spacing and the second is a pre-set bevel gauge that is easier to use than the larger and more awkward adjustable bevel gauge that it replaces. You can make both in a couple of minutes out of shop scraps.

The pin-spacing gauge consists of two parts: a 6-in. slotted rub block and a wooden blade that fits into a ¼-in. slot in the block. The blade length is variable. Make it long for dovetailing a wide carcase side, short if you're doing a bunch of drawer sides. I made up several blades, some with even pin spacing, others with varied spacing.

To make the spacing tool, mark out the proportional spacing of pins and tails on the blade. Use any spacing you like. I normally use multiples of ¼ in. or ½ in. because they are easy to lay out. Just make sure that the pattern is wider than the boards to be joined and leave enough length at one end so it can be gripped in the block. Position the tool as shown in the drawing and mark out the pin spacing. It will automatically maintain the proportions you lay out on the blade, regardless of board width. Take care not to let the blade pivot in the block, otherwise the spacing will be inaccurate.

With the pin spacing set, you are ready to mark the pin bevels with the other gauge. This gauge consists of a blade (metal, plastic or wood) let into and screwed to a hardwood block. If you mark-out with a knife, as I do, a metal or plastic blade will survive an errant cut. The taper angle can vary from the 1-to-7 run-to-rise (80°) of the fine pins in traditional furniture to the coarser 1-to-4 ratio (75°) of most commercial dovetail router bits. The other end of the blade should be square to the block, for carrying down the pin lines on the faces of the board. □



Jim Richey edits and draws Methods of Work for Fine Woodworking. *He lives in Katy, Texas.*

Measuring Antiques

Educated guesses fill in the gaps

by Dick Burrows

In colonial times, furniture making was both a highly refined art and a farmhouse necessity. In the larger coastal cities craftsmen, trained in rigid European apprenticeships, produced stunning pieces for the wealthy and status-conscious. Meanwhile, numerous country craftsmen were turning native lumber into practical, yet elegant, family furnishings. Ironically, the best examples of both styles have become classics, creating a seemingly insatiable demand for historical and construction notes on vintage pieces.

Since few cabinetmakers managed to preserve their construction drawings or to take notes, you usually must rely on the furniture itself to show how the old guys did it. Museums and private collections abound with fine 17th- to 19th-century pieces, and are, in effect, living libraries of plans. Carlyle Lynch, cabinetmaker and retired teacher, has devoted years to measuring furniture at places like Old Sturbridge Village in Massachusetts, Old Salem and the Museum of Early Southern Decorative Arts (MESDA) in North Carolina. Although I've never been an aficionado of the old ways, I found Lynch's enthusiasm for period furniture infectious.

While he insists that there are no magic tricks to measuring furniture, there's more to it than poking around with a ruler. Before you can do it right, you need to learn how boards were surfaced, how joints were cut and how furniture was built in the days when hand tools were the *only* tools. Otherwise, you'll never grasp what's hidden by veneers, moldings and thick layers of yellowed finishes.

Analyzing antiques is part detective work, some guesswork and much careful measurement. Lynch finds a 6-in. sliding rule good for measuring small pieces like drawers and as a caliper to gauge thicknesses. The 16-drawer mahogany case he's examining is one of the jewels hidden in Duncan Phyfe's tool chest.

Surprisingly, if your skills at reassuring nervous owners are as good as Lynch's, you can examine many pieces. As you trace the delicate carvings with your fingertips and examine centuries-old joints for telltale marking lines and tool marks, the maker and his art come alive. For me, that was the best part of working with Lynch when he measured Duncan Phyfe's personal tool box (the results are shown in the drawing on page 54) at the New York Historical Society and two pieces at MESDA. Before you begin work, make sure the owners of the piece clearly understand what you want to do and how you plan to do it. Some old pieces may be too fragile to be moved or handled much. One owner might let you remove and trace an escutcheon, while another will ask you to leave for just suggesting you want to remove any hardware.

To avoid missing any vital details, Lynch works systematically. He starts with overall dimensions, measuring each major component in turn—sides, top, back, front—then works down to each joint, curve and angle, carving, molding and turning. He sketches each piece, measures it, then marks the measurements on his sketch. Then he remeasures it. By measuring everything twice, you ensure accuracy and the odds are you won't overlook an important detail twice.

When we measured the toolbox used by Phyfe when he was the darling of trendy New York in the early 19th century, Lynch began with a general appraisal of the large, dovetailed pine chest. The chest is painted brown and is as drab as Phyfe's furniture is elegant, although the box's interior is a woodworker's delight of chisels with pewter ferrules, finely set planes and exquisitely shaped saw handles. After removing some of the tools and the chest's sliding inner cabinet, Lynch made one rough, box-like sketch showing the front and side view and another showing the top view. He prefers to make freehand perspective drawings to record his measurements, but any sketch will do as long as you can decipher your notes and match the right measurements to the right part. Lynch strives to be accurate to within $\frac{1}{32}$ in.

He began measuring on the right side. Holding a zig-zag carpenter's rule on the outside of the chest, he measured the depth and height of the end. Then he determined how the side was fastened to the top, bottom, front and back, and noted these details on his sketch. Since the box corners are dovetailed, he measured the pins to find the thickness of the back and front pieces. By inserting the rule inside the chest along the same end, he obtained the inside dimension of the end and verified that it, plus the width of the front and back pieces, equaled the outside

Lynch prefers a folding carpenter's rule, left, because it won't snap back as a steel tape might. Holding his bevel gauge handle parallel to the chest corner, he angles its tongue to match the dovetails, above. He records the angle with a protractor. For something as irregular as this tavern table leg, he uses a simple pen holder to trace contours. The Plexiglas edge of the wooden upright is set directly over the angled pen. As you run the plastic along the piece, the pen records the contour on paper on the instrument's base.

dimension. He also measured the interior height of the box and located the chest bottom on his drawing. Then he made notes of the size, shape and location of hinges, pulls and handles. All the joints were visible and easily identified, but larger carcases can be more complex.

Lynch takes most of his measurements with his carpenter's rule (photo above, left) or a small 6-in. wood-and-brass sliding rule. Both easily extend across or into a carcase, and they can't snap back and scratch a piece the way a metal tape measure can. Metal tapes are handy, however, if you have to flex a rule into a very tight corner. In addition to the two rules, his measuring kit, which is compact enough to fit into a regular briefcase, includes a flashlight and an angled mirror (much like an oversized dentist's mirror) for peering into dark corners; several soft pencils; 10-in. dividers and several sizes of calipers; metal contour gauge; a Plexiglas contour tracer (photo above, right); plumb bob for measuring chair angles; a clipboard with note paper and tracing paper; bevel gauge and protractor; small screwdriver; a thin, flexible palette knife for probing inside joints; and a large sheet of cardboard (mat board or backing board) to protect a piece if you want to turn it on its side.

When he was a beginner, Lynch also brought a detailed checklist of crucial measurements. He would prepare the list at home, based on his cabinetmaking work and studies of period furniture, then fill it in step-by-step when he saw the piece. Now he's experienced enough to rely on a mental checklist, but the written version is good training for neophytes.

Forgetting a significant dimension can be a problem if the piece is miles from your home, or is sold to owners who don't want a stranger poking through their furniture. Sometimes Lynch can entice an owner to check a dimension or refresh his memory about certain details, but a better memory check comes from his camera. He always photographs the overall piece and its details with 1000 ASA daylight color film.

Whenever possible, he also backs up his measurements by tracing details or making a rubbing of distinctive features, like dovetails. For example, you can use your clipboard to hold paper upside down over the top of a carcase and trace the corner. Or, you could put the board under a leg and trace the shape of a ball-and-claw foot. Mark the measurements on each tracing.

To make a rubbing, put a piece of paper over the object, then use the side of a soft lead pencil to rub over the paper (soft pencils are better than pens for all your work—a pen might smudge or leave a permanent stain). Rubbings are ideal backgrounds for sketching-in details or recording measurements. On the Phyfe chest, Lynch made rubbings of the dovetails, then gauged the angles of the pins and tails with his bevel gauge and protractor. A bevel gauge is good for measuring most angles, but for something like a sloping chair back, he uses a plumb bob. You can, for example, plot the angle of the back by dropping the plumb line from the highest center point of the back, then measuring the distances between the bob's vertical line and the back of the seat rail.

To record the shape of the tool chest's hand-forged handles, Lynch cut two long notches into a sheet of paper so it would slide over the handles and lie flat on the metal backing plate, then made another rubbing. Next, he sketched in the details of the handle and added measurements. Sometimes he unscrews smaller hinges, escutcheons and other hardware, then traces them, but that's not always permitted.

After measuring the back, front, bottom and top in the same meticulous way he did the sides, he concentrated on the chest's special features, like the saw rack fastened to the inside of the lid and the removable set of drawers that fits inside the chest. Since the saw case couldn't be removed from the lid, he had to probe with the saw blades and a bevel gauge tongue to determine the construction of the case. He inserted the probe as far as he could, then measured the penetration. By comparing this measurement with the outside dimensions, he figured the thickness of the walls and the location of interior partitions.

Until we had examined the mahogany drawers in the small cabinet, we had underestimated Phyfe's pride. In most of the chest, the dovetails are fairly large and evenly spaced, but Phyfe had glued 3 in. of solid mahogany to the pine, and dovetails there were tiny and close together. We guessed initially that Phyfe used

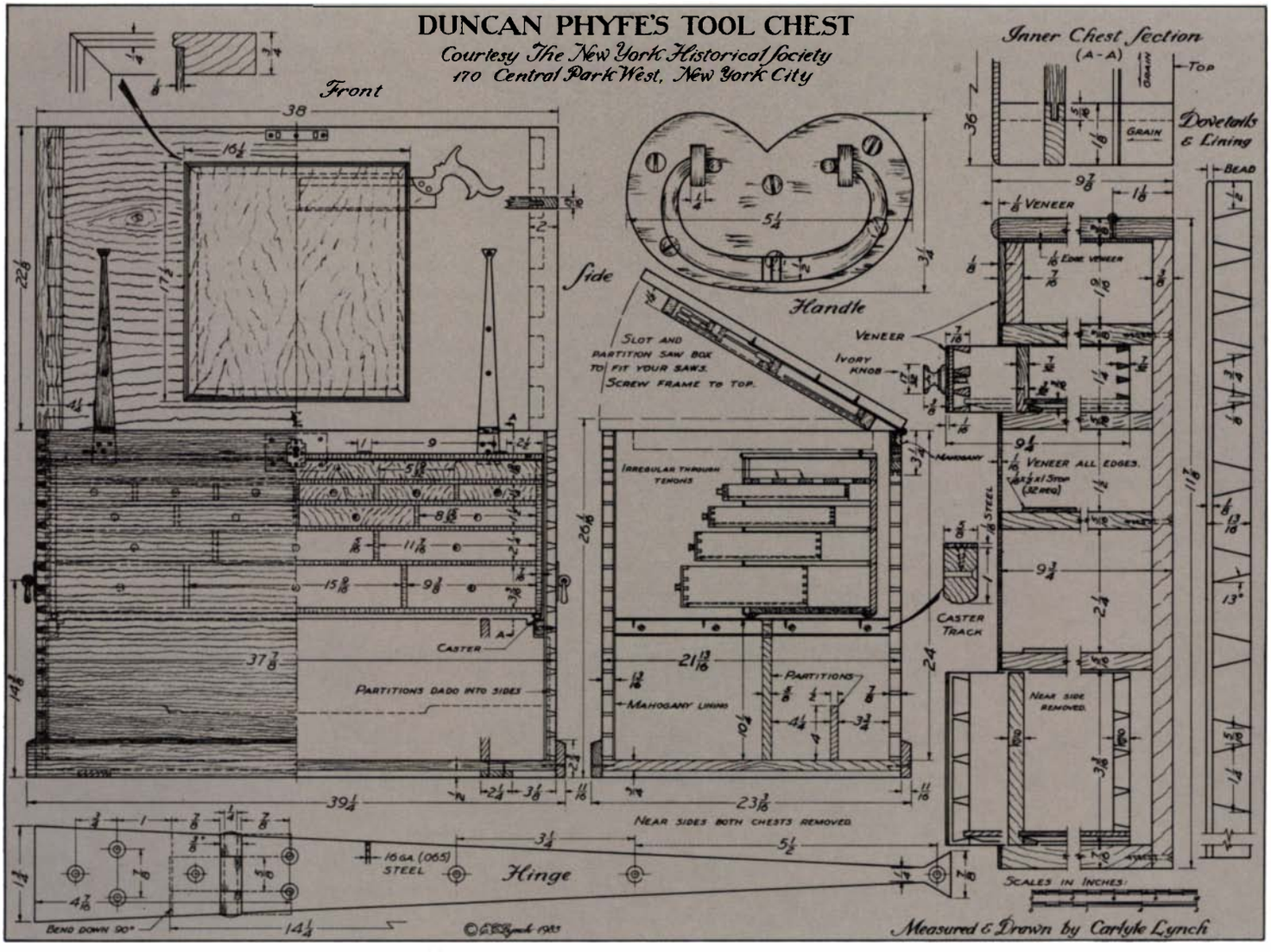
the mahogany to strengthen the hinges, then cut fine dovetails in the stronger hardwood and larger ones in the weaker pine.

After examining the case's 16 solid mahogany drawers with their turned ivory pulls, we changed our minds. The drawers had delicate dovetails, with pins tapering to less than 1/16 in. Even on something as mundane as a tool box, Phyfe apparently couldn't resist showing off his skill and added the dovetails for a decorative effect. Of course, that's just a guess, but guessing is part of the fun—it's almost a game that the original makers encourage. Those old guys prided themselves on having all kinds of tricks, many of them unknown to us, and it often seems as if they intentionally left false trails to befuddle those who followed.

While Lynch measures each piece in the same way that he did the tool chest, large carcases are more difficult because of their complex joints, moldings, veneer and decorative carvings. When we measured a Chippendale four-drawer chest at MESDA, for example, we couldn't figure out how the top was attached to the base. We suspected the sides were slip dovetailed to the top, a common technique in Charleston, S.C., where this piece was built, but we couldn't verify it. The joint was invisible, stopped before reaching the top's front edge and hidden at the rear by the case back. Lynch tried to insert a thin knife into the joint, hoping to feel a tenon, nail or dovetail, but the joint was too tight. We couldn't find any sign of a telltale pencil, knife or marking-gauge line that might indicate the kind of joint the maker cut. In cases like this, the owners of the piece may be valuable resources, if they have ever repaired the piece or obtained letters or order forms pertaining to it. We learned that the top had been repaired and a sliding dovetail noted. If you can't find any clues from the owners, you can check other contemporary pieces and come up with an educated guess.

The chest held another mystery. On the dust shelf under the top drawer we found a dovetail groove—its only purpose seemed to be to confuse us. Again, we put ourselves in the old cabinetmaker's boots. In the days before electric thickness planers, we probably wouldn't throw out a surfaced piece either, just because of a miscut groove in a part that wouldn't show. But you wonder if that's the real explanation.

Lynch used several sizes of calipers to measure the width of molding and the thickness of the sides. Since the stiles made it impossible to measure the sides directly, he put his folded carpenter's rule behind the stile against the side and used large calipers to measure both the side and ruler. After measuring the caliper opening, he subtracted the width of the rule to get the thickness of the piece. He used 10-in. dividers to straddle small corner blocks where his ruler wouldn't fit, then measured the distance between points. To record molding profiles, he used a finger-type contour gauge, which looks like a band holding hundreds of tiny, sliding metal strips. When the gauge is gently pushed straight down over the molding cross section, the con-



Compiling a materials list

by Jeff O'Hearn

One of the best ways to begin most cabinetry jobs is to invest a little time in studying your construction drawings and compiling a materials list. By sizing each part before you begin work, you'll save time and lumber because you'll be able to cut everything at once. Preparing these lists improves your mind's eye, too—you'll become more adept at dissecting furniture, analyzing joinery and visualizing assembly procedures.

Even though materials lists are fussy, time-consuming work, I've always found they are worth the trouble unless the work is curvilinear or involves many angles in its layout. Your best bet here is to make a full-size drawing on the floor to verify the dimensions, then build directly from the drawing.

For rectilinear work a clearly drawn elevation or front view is a good starting point for developing materials lists, but the most important drawings are the sections drawings, which are imaginery slices through the elevation. You can do most of your figuring with two section drawings—a vertical section showing the front and back faces, and a horizontal section showing what the object looks like from above or below. Drawings of complex pieces may have separate sections wherever the overall profile of the interior parts change.

Organize your materials list in a chart like the one shown above, right. Start anywhere, choose a part, give it a name and call it number one. Is it a vertical or horizontal part? Your vertical section drawing will 'cut through' a part which is on a horizontal plane, and vice versa. For example, you can see the bottom panel of a cabinet in a vertical section. Generally, dimensions are listed in the order thickness/width/length. It's up to you whether you call the depth of the bottom panel the length or the width on your chart, since the width of the part and the width of the cabinet may be different directions, but there are rules of thumb. If the part is wood or has a face veneer, the length is always in the intended direction of the grain. For a plastic-laminated or painted panel, the length is the larger dimension.

No.	Pcs.	Part	T	W	L	Material	Machining
1	1	Drawer bottom	3/16	8 29/32	15 3/16	Mahogany	3/32-in. by 3/32-in. rabbet with bevel at 3 edges.
2	2	Drawer sides	9/16	3 1/8	9 1/16	Mahogany	Blind dovetails 1/8-in. from front. Through dovetails at back. Dado for 1.
3	1	Drawer front	3/8	3 1/8	15 9/16	Mahogany	Blind dovetails at both ends. Mahogany veneer, 1/16-in. thick. Dovetail for 1.
4	1	Drawer back	9/32	2 15/16	15 9/16	Mahogany	Through dovetails at both ends.

To determine the length of part number one, first visualize the plane of the part, subtract the thicknesses or widths of adjacent parts from the appropriate overall dimension, then add the distance that any joinery extends into the adjacent parts. For example, in the Phyfe tool chest, facing page, the drawer bottoms in the inner cabinet section are shown extending under the drawer backs, and, with a 3/32-in. tongue, into the 7/16-in. thick drawer fronts. The drawers are 9¼ in. deep, so the width of all the drawer bottoms is 9¼ in. minus the 7/16-in. thickness of the drawer front and its veneer facing plus 3/32 in. for the tongue. This gives you a total width of 8 29/32 in.

The drawer bottoms similarly fit into both drawer sides, so the length of the middle bottom (largest) drawer is 15 9/16 minus the thickness of the two drawer sides (2 in. by 9/32 in.) plus the tongues extending into the sides (2 in. by 3/32 in.). The total works out to 15 3/16 in. In the machining column, note any joints and edge moldings. The notes should help to clarify the differences between the material list dimensions and the part's final fitting sizes.

Continue with the tool chest's bottom middle drawer and check each of the dimensions, remembering that the process is little more than examining all of the drawings information, and then subtracting thickness and adding joinery distances from the largest relevant dimension.

Proceed in this fashion with each part. When I think that I sized every part, I go back to the drawing and label each part with the number I've assigned to it on the materials list. To distinguish the labels from actual measurements, I circle each one and draw an arrow to the part indicated. If the same part appears in several sections of the drawing, I label it each time. Finally, I go over the drawing again to make sure each part has a circled-number label.

One last tip: Go back through the completed list with someone else. It's easy to make an error or two. □

Jeff O'Hearn is a project engineer for Art Woodworking in Cincinnati and makes sculpture in his basement workshop.

tour of the molding will push the metal strips up different distances. When the gauge completely engulfs the molding, the metal strips will mirror the molding shape.

To record carvings, like the shell on the leg of a Queen Anne dressing table, we used a rubber-based impression material called Coe Flex (Coe Laboratories, Inc., Chicago, Ill. 60658), which is available from many dental supply houses. The material and its catalyst come in toothpaste-type tubes. Mix the two together according to the package directions and trowel the frosting-like stuff over the carving. After it dries (time depends on temperature and humidity), you can peel it off and end up with a mask-like replica of the carving, which can be used to cast a plaster-of-paris model. Exact reproduction is important—no two carvings are alike so you want to preserve each piece's individuality.

Measuring the Phyfe chest took Lynch about five hours. No matter how meticulously he has analyzed the piece, questions linger. "The main problem is: Should I draw it as it is now or as I suspect the maker would have liked it to be if he were working under ideal conditions? I record it as it is, but tell what I think might make it better. Sometimes, though, you can't tell what joinery is involved. You just have to take an educated guess." □

Carlyle Lynch, a designer, cabinetmaker and retired teacher, lives in Broadway, Va. His drawings appear regularly in Fine Woodworking *and are available from Garrett Wade, Lee Valley Tools Ltd. and Woodcraft Supply.*

From Cedar to Sea

Carving and steaming a dugout canoe

by Douglas C. Granum

"Do not fall too heavily, else you, great supernatural one, might break on the ground." So prayed the ancient Northwest Indian carver as he prepared to fell a great cedar for a dugout canoe. In a hole cut on the windward side of the trunk, he set a fire which slowly ate away the wood until several days later the cedar fell to earth. Carved with a variety of adzes from a single log, the canoe was then steamed and bent to a graceful, seaworthy shape. I did not fell the cedar log for the dugout shown on these pages, but with a little help from a chainsaw, I tried to follow most of the Indian building methods.

Good canoe trees are rare. High-altitude cedars, slow growing with tight rings are best. Yellow cedar, Sitka spruce and giant cedar (for the largest canoes) were used. My high-altitude red cedar log came from the Cascade Mountains. Logs, like gemstones, come as you find them. Though you can carefully assess the outside, the inside nearly always reveals unexpected problems—center rot, branch stems, major checks, bark seams or ingrown bark. The Indians sewed such defects together with spruce root then packed them with pine pitch. I fixed some center rot with a glued and pegged wooden patch.

Before doing any carving I built a scale model. Carved, steamed and bent the same as the planned larger canoe, the model helps avoid disaster. The exterior form of the canoe has to be as close as possible to the desired shape before the inside is dug out. It took me about a month to remove the sapwood and contour the hull with adzes that ranged from ¾ in. to 6 in. wide. The finished, slab-sided shape would seem odd to anyone familiar with boats. When steamed, however, the bottom flattens and the sides flare out to a graceful peapod shape. Later, bow and

Granum's dugout canoe, based on a traditional Northwest Indian design, is carved from a single red cedar log, then steam-bent to its final shape. Shaping is done with a variety of adzes (top, left and center). The wood bridge prevents warping during carving. Hot rocks heat the water for steam bending (top right), and 2x6 spreaders almost double the width of the log. Granum painted the finished canoe with his own grizzly bear designs.

stern projections are pegged on to give the needed shear.

The sides of the hull are one forefinger thick below the capped gunwale, the bottom is two forefingers. Sides, bottom and chines must be of uniform thickness otherwise unequal pressure set up during steaming will cause splits. To accurately gauge the thickness while carving, I bored a series of holes along the length and breadth of the canoe. Then I pegged the holes with cedar dowels of appropriate length—carving down to the dowel end ensures correct thickness.

When the canoe was ready for steaming, I filled it with about one hand's span of water, then dropped in hot rocks. I covered the steaming canoe with canvas to keep the heat inside; fires along both sides heated the hull and made it easier to bend. An occasional splash of water kept the wood from checking and charring.

When the wood was sufficiently pliable, I spread the sides apart with three 2x6s, inserting them diagonally to the sides, then slowly working and wedging them perpendicular. At the same time, I gently jacked up the bow and stern. Steaming and spreading increased the beam from 26 in. to 45 in., and the bow and stern rose 2½ in. The green canoe required jacks and levers to move; the steamed hull was comfortably carried by two people. When the shape is correct, the three thwarts, which keep the dried hull in constant tension, were sewn in place with a spruce root. After a week, the canoe was dry and I carved and painted it with grizzly sea bear designs of my own, original but within the conventions of the traditional Northwest Indian form. The transformation from the slab-sided hull to the graceful bent and steamed proportions struck me as not unlike the emergence of a butterfly from a cocoon. □

Douglas C. Granum is a sculptor in Southworth, Wash.

Photo of finished canoe: Chris Eden

Antebellum Shutters

Movable louvers from simple jigs

by Ben Erickson

Antebellum frame houses are still common in my part of western Alabama. Some of these Greek-revival gems have decayed beyond repair, but many are being restored. Back then, all fine Southern houses sported exterior louvered shutters, many of which had movable louvers to control ventilation and light. After a century-and-a-half of sun and rain, it's a rare restoration indeed that doesn't need at least a couple of new ones. Reproducing these shutters is an important sideline of my woodworking business and I've developed some ways to speed the process.

Old shutters in my area are usually heart pine or cypress. These woods are scarce now so I use clear redwood. It's stable, holds paint well and is naturally resistant to decay. Windows in these old houses average 3 ft. by 6½ ft. and it takes about 50 b.f. of 2-in. lumber to make a pair of shutters for a window this size.

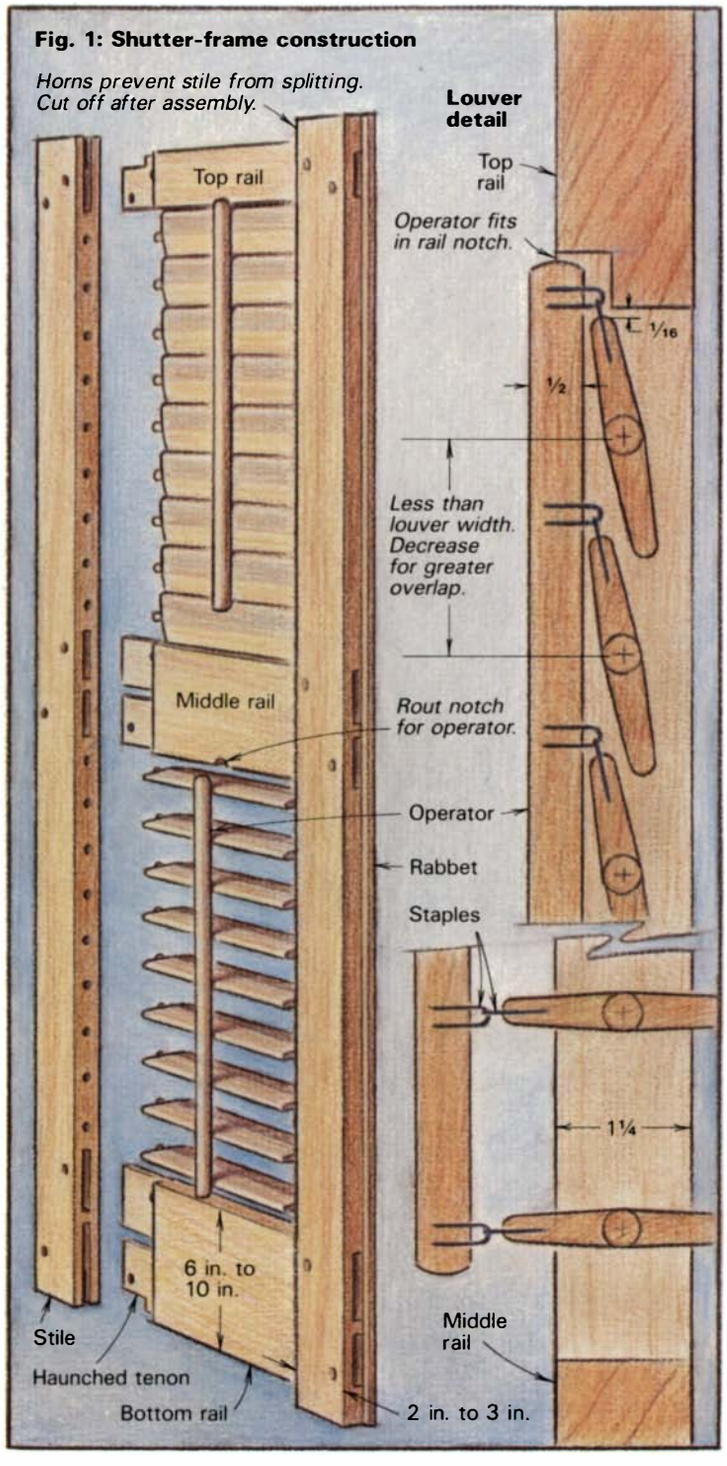
The frame is through mortised and tenoned, just like a frame-and-panel door frame. Pegs alone held the old ones together. I usually use a haunched tenon for the top and bottom rails. Figure 1 shows how a typical antebellum shutter goes together. If I'm making several shutters for the same house, I try to find an average one to copy because the dimensions can vary considerably from shutter to shutter. Old windows vary too, so it's best to measure each window. When laying out, add ¼ in. to the width of each shutter to allow for the rabbets where the shutters overlap in the center of the window.

After dimensioning the frame stock, lay out and chop the rail mortises in the stiles. I use a ⅜-in. hollow-chisel mortiser in the drill press. Next, I cut the rail tenons on the tablesaw. I mount two combination blades on the arbor, with washers and sheet-metal shims between them to get the right spacing. This setup cuts both tenon cheeks in one pass. Check the tablesaw setup with scrap stock exactly the same thickness as the frame stock and trial fit the test tenon in the stile mortise. The tenon should slide snugly into the mortise. Mark the face side of the rail stock and always keep this side against the fence of the tenoning jig as you cut the tenons to avoid alignment problems later. I cut the shoulders on the radial-arm saw and saw the haunch, if any, on the bandsaw. A stop block against the radial-arm-saw fence ensures that all the tenons are the same length.

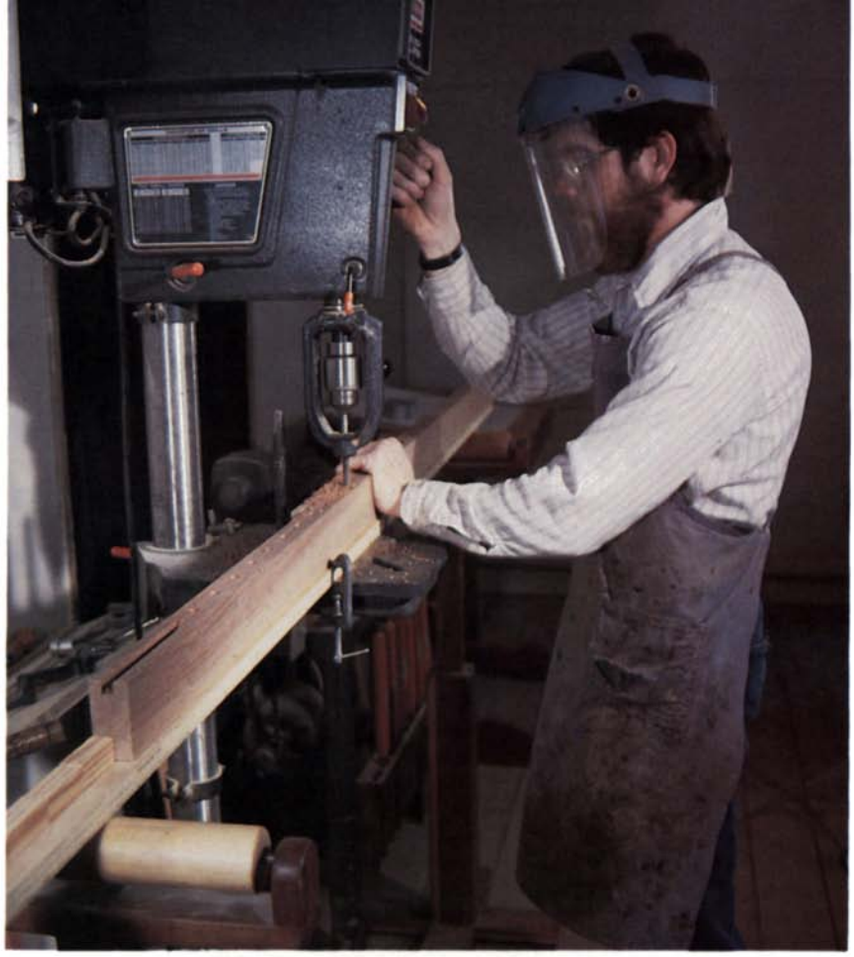
Dry assemble the frame and check the outside dimensions against the window measurements. If you've made an error, it's best to find out now, before proceeding.

If you're copying an old shutter, measure the distance between the centers of the holes the louvers pivot in. These will probably vary, so measure several and average them. If you're working from scratch, here's one way to space the holes: On the

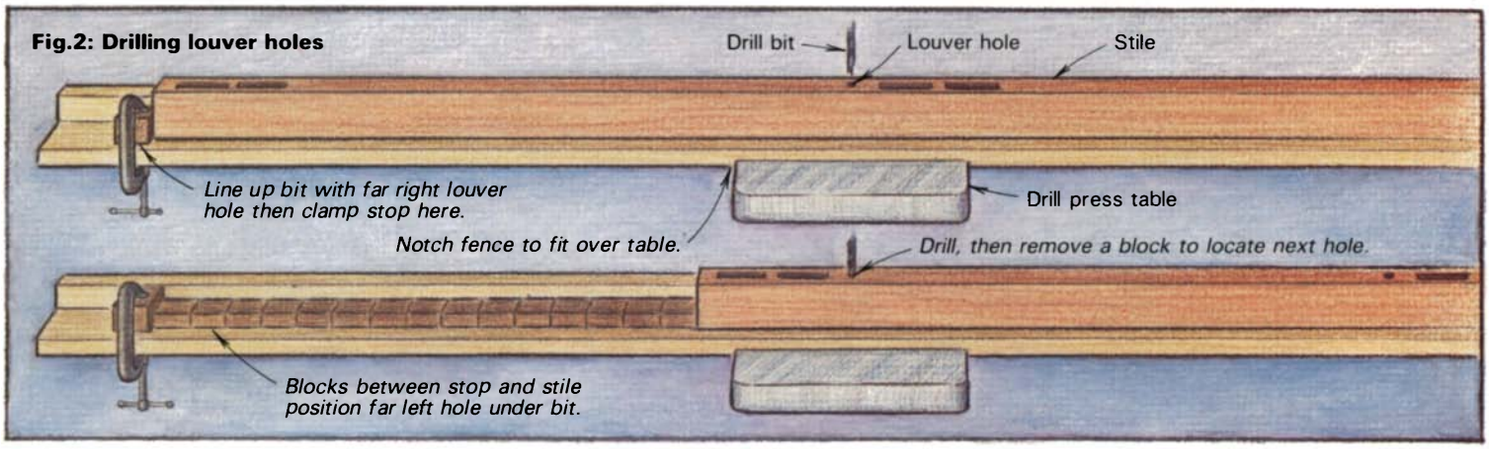
Fig. 1: Shutter-frame construction



Drawings: Lee Hov



With two blades on the tablesaw arbor Erickson cuts both rail tenon cheeks in one pass, above. Rather than risk fingers cutting free-hand, he's designed a tenoning push stick that rides the rip fence and holds the stock upright. A 1x2 table and fence support the stile while drilling the louver holes, right. The block system shown below ensures accurate hole spacing.



stiles, mark the holes for the top and bottom louvers in each opening. These louvers should clear the rails by about 1/16 in. to allow the louvers to close completely. So, for a 2¼-in. wide louver, you'd mark the centers 1 3/16 in. from the rails. The louvers should overlap each other about ¼ in. Divide the distance between the two centers you just marked by the number of louvers you want. The result should be about ¼ in. less than louver width, or roughly 2 in. for 2¼-in. wide louvers. If larger, the louvers won't have enough overlap, so add another louver and divide again. If a lot smaller than ¼ in., try removing a louver. For example, to fit seventeen 2¼-in. wide louvers into a 35-in. space, divide 35 by 17 = 2 1/17 in. Rules aren't graded in 17ths so set your dividers as close as you can and step off the distance (or measure in metrics and eliminate the fractions).

The method I use to drill the holes, shown in figure 2, ensures accurate spacing. I set a stop block on the radial-arm-saw fence and cut scrap blocks as long as the center-to-center distance between holes. A long combination fence/table extension on the drill press supports the stile. With the bit over the first hole on the right, I clamp a stop on the fence at the left end of the stile. When I line up the blocks between that stop and the left end of the stile, the bit should be directly over the first hole on the left. You may have to make several sets of blocks with just slight variations in length before you get it right. Line up the blocks, drill a hole and remove a block to position the next hole. Both stiles may be drilled on the same setup.

Antebellum louvers are usually about 3/8 in. thick and 1¾ in. to 2¾ in. wide. Viewed from the end, the louver has an elongated diamond shape. I find it convenient to plane this shape on 4 ft. to 8 ft. lengths, then cut them to exact louver length.

After the stock is dimensioned rectangular (usually 3/8 in. x 2¼ in. or so), I taper the louvers on the thickness planer. As shown in figure 3, page 60, my taper setup is simply a strip of wood as wide as the louvers and as long as my planer bed, ripped to a 3° angle. It's sandwiched tightly between two wooden guide strips which are clamped to the bed. I just feed the louver strip through on top of the angled wooden strip for the first two passes and double the angle for the third and fourth passes. Start with some sample pieces and run a marking gauge down the center. Scribble on the

Fig.3: Tapering louvers

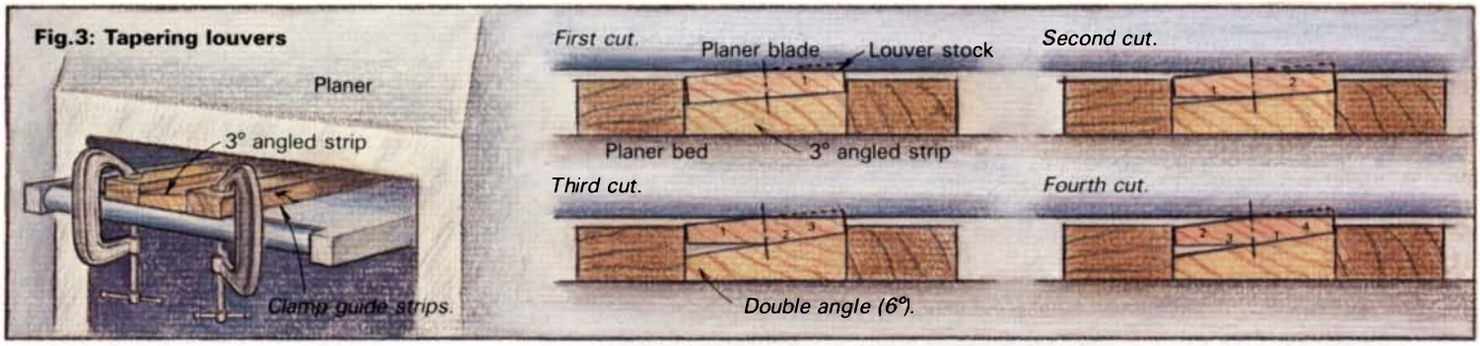


Fig.4: Cutting louver tenons

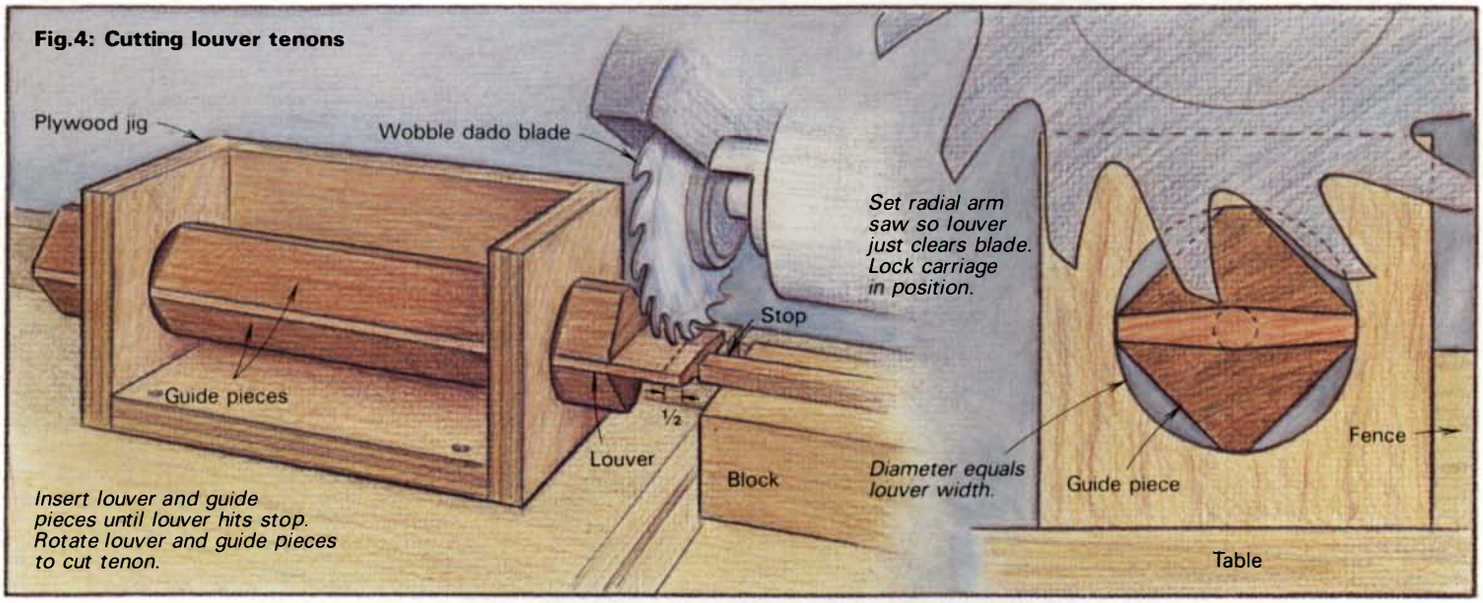
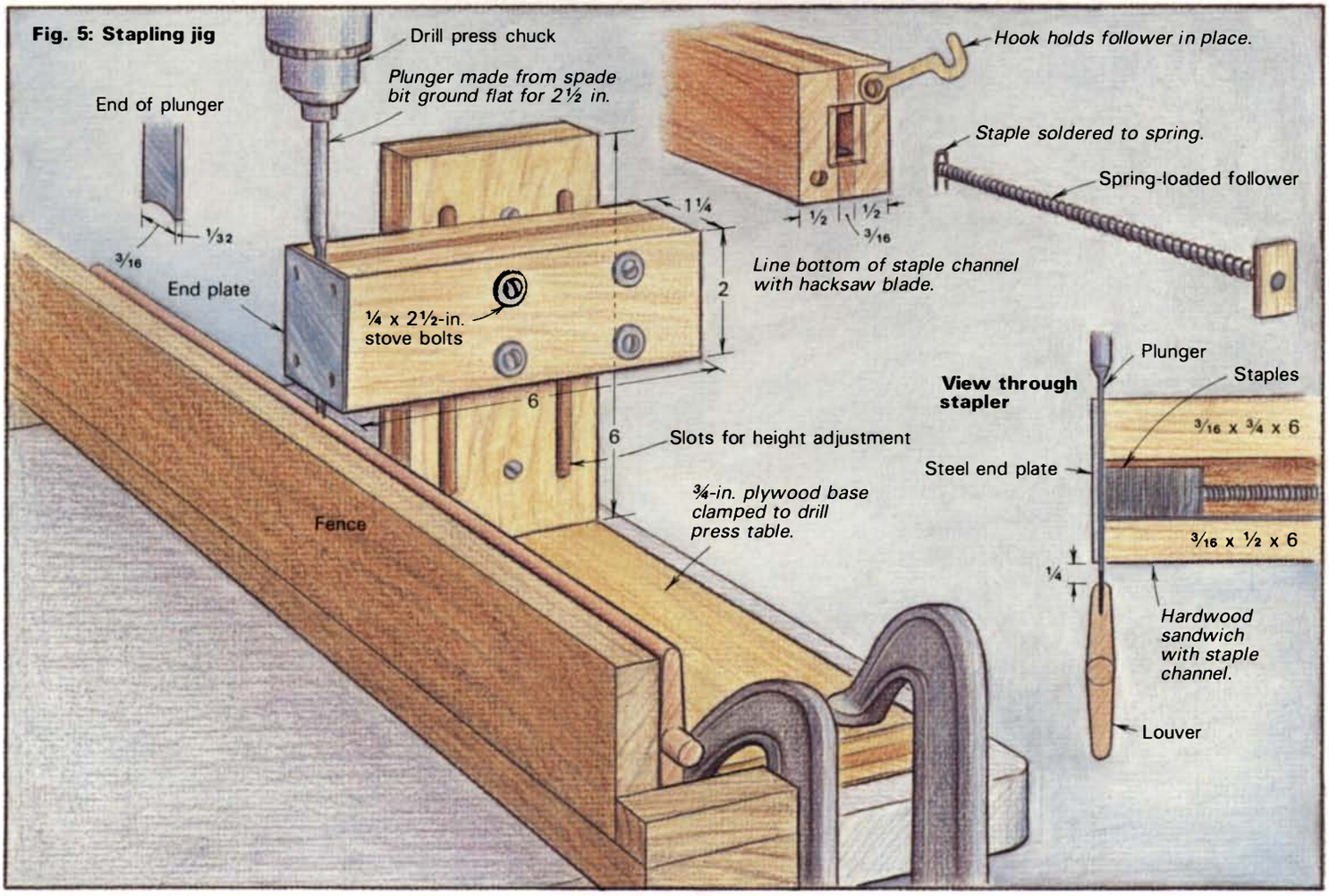


Fig. 5: Stapling jig



sample with a pencil or crayon so you can see how close the planer cuts to the center line. The object is for the louver edges to end up about ¼ in. thick, while the center is a full ⅜ in. thick when viewed from the end. Adjust the planer height until it planes to the center line. Now, run all the louver stock through, flip the louvers over (without changing ends) and run the other side through. Double the angle either by adding another 3° angled strip on top of the first one, or replacing the first strip with a 6° strip. Using the samples again, readjust the planer height to cut to the middle of the louver. Reverse ends on all the pieces and run the remaining two sides through as you did the first two. It's easy to get confused and run the wrong side through, so work out a system of stacking to enable you to remember which sides haven't been planed. After beveling, you can round the edges on the shaper or router table with a ¼-in. round-over bit.

Cut the louvers to length, usually ⅞ in. longer than the distance between the stiles. This allows for a ½-in. long round tenon at each end.

I cut the tenons on the radial-arm saw with the jig shown in figure 4. The louver fits snugly into the circular cutouts in the plywood uprights. So it doesn't wobble in the cutouts, I sandwich the louver between two triangular guides. I mount a wobble dado blade on the saw and adjust the blade height so that the louver, in a horizontal position, just slides under the blade. A stop that hits the end of the louver in its center (where the tenon will be) is clamped to the fence. This stop determines the length of the tenon. With the saw carriage locked in place and the saw running, insert the louver sandwich through the jig holes. Push it through horizontally under the blade until the end touches the stop block, then rotate it to cut the tenon.

Author photo

After gluing the frame joints, Erickson inserts the louver tenons into their holes in one stile, then tightens the clamps enough to slip the other ends in the opposite stile. With both ends in place, he draws the clamps up tight. Louvered shutters were standard features on Southern antebellum houses. The shutters at left were made in the 1840s. Only the bottom louvers are movable.

The operator is a strip of round or half-round stock about ½-in. in diameter that moves the louvers in unison. Each louver is connected to it by two interlocking staples, one in the louver and one in the operator. I use U-shaped galvanized staples about 3/16 in. wide and ⅝ in. long. Each shutter needs two operators, one for the louvers above the center rail, one for those below.

For small jobs in softwood, or for minor repair work, you can break up a row of staples with a knife or heat, then hammer them in with a tack hammer. However, if there are many to do, it can be very time consuming and if the wood is even moderately hard the staples tend to bend. To cope with these problems I designed a stapling jig that uses the drill press to press the staples into the louvers (see figure 5). It works just like a regular staple gun. It's basically a hardwood sandwich with a space in the center just wide enough and high enough for a row of staples to slide into. I lined the bottom of the staple channel with an old hacksaw blade to keep the staples from digging into the wood. I scavanged the spring-loaded follower from an old Arrow hand stapler. I ground the sides of the spring-loaded follower's rod down to fit through the row of staples, removed the clip at the end and reattached the spring with a lump of solder at the end of the rod to keep it from coming off. Unlike air staplers, my jig allows me to control the depth of penetration. By using the same blocks that I used to drill the louver holes, I can also space the interlocking operator staples perfectly. Accurate spacing here is essential for smooth operation.

To staple the louvers you'll need to make a fence to support the louver at 90° to the drill press table. Unplug the drill press, chuck up the jig's plunger (ground from a spade bit) and set up a stop on the fence that quickly centers the louvers under the stapler. Adjust the height of the stapler until it's about ¼ in. from the louver. Lower the quill to press in the staple. Adjust the drill-press depth stop so the staple protrudes about 3/16 in. from the edge of the louver and staple all the louvers.

Replace the fence with one the same height as the thickness of the operator and center the operator's width under the stapler. Position the stapler above the operator so there's room enough to slip a louver under the stapler. Reset the depth stop on the press. On the long fence, line up the same set of blocks that you used to drill the louver holes and use a similar stop setup to locate the staples at the ends of the operator. Place the operator end against the stop block, and insert a louver under the stapler at right angles to the operator. Press in a staple that interlocks the louver staple. If you don't want to line up each louver by eye, set a stop and butt one end of the louver against it. If your operator is round, draw a pencil line down its length to keep the staples in a straight line.

Before assembling the frame, drill or rout a slot in the edges of the top and middle rails for the ends of the operators (see figure 1). I use Weldwood plastic resin glue for the frame joints because it's water resistant and sets up slowly. Spread the glue and pull the joints together with pipe or bar clamps until all of the joints are within an inch or so of being tight. Insert the louvers in one stile. Tighten the clamps until the opposite ends of the louvers almost touch the other stile, and insert these ends in the holes. Now pull the frame tight. Watch for any sign of binding that might indicate that a louver isn't in it's hole. When the glue is dry, drill and peg the tenons, cut off the horns and cut the rabbet where the shutters overlap. As a final touch, I run a decorative bead on the overlapping edge. □

Ben Erickson is a professional woodworker in Eutaw, Ala.

Frank Klausz created his ideal work area in a small space by pairing a hefty workbench with a utility table. The bench provides lots of clamping power and the table contains storage bins and drawers.

A Classic Bench

Workstation's center is worth building right

by Frank Klausz

If you are a serious woodworker who prefers handtools, one of your first investments should be a hefty, well-designed workbench. My joiner's workbench, shown in the photo above, is the heart of the ideal workstation. Based on a traditional design, my bench is outfitted with shoulder and tail vises and steel dogs that can clamp a workpiece in a variety of positions. And it's built solidly enough to be stable under any kind of sawing, planing, scraping, or pounding.

Near my workbench is a wooden chest with my chisels and other handtools, all sharpened and ready to use. To make it easier to use the chest I built a small platform that raises the box 10 in. to 15 in. off the floor. If your bench is near a wall, you might prefer a wall-hung cabinet, as workmen in Europe often do. A 27-in.-high utility or helping table with a 40-in. by 60-in. work surface is located about 4 ft. behind the bench. This table, shown in figure 1 on the facing page, houses 12 plastic drawers (available from W.W. Grainger, Inc., 5959 W. Howard St., Chicago, Ill. 60648): small ones for dowel pins or screws, larger ones for chisels and other tools. Larger planes and portable power tools fit on its bottom shelf. Don't try to save steps by putting the drawers in your main workbench—if you clamp a large piece in the shoulder vise, you can't open the drawers. You could build drawers

Frank Klausz

Assemble the 27-in. high utility table with mortise-and-tenon joints. Locate shelves to fit standard plastic drawers for small tools and odds and ends. Larger tools go on the bottom shelf. Make the 40-in. by 60-in. top from particleboard and ¼-in. maple plywood. To plane long boards, right, Klausz uses a bench slave with the shoulder vise.

that open from both sides of the bench, but putting them in the utility table is much handier.

By arranging my workspace like this, I have plenty of room to work comfortably and can easily step over to get a chisel or a handful of screws. Everything is at my fingertips. The workbench and table also work well together. I do all of my planing, sawing and joint cutting on the bench, then assemble the pieces on the table. The table, being several inches lower than the bench, is perfect for holding a chair or a chest of drawers at a comfortable work height. When I'm assembling on the table, I still have a clear workbench for trimming joints and other last minute touches.

Apart from the knots in the base, my workbench looks pretty much like any other traditional cabinetmaker's bench. Our ancestors invested more than 1,000 years in developing its design and they left very little for us to change. When I worked in Europe, I visited many different shops and the workbenches were always the same design and about the same size—7 ft. by 3 ft.—although the bench height was tailored to the height of the cabinetmaker who used it. Apart from little touches like the stops and oil dish shown in figure 2, the only difference I found was that some craftsmen treat their benches with loving care and some don't.

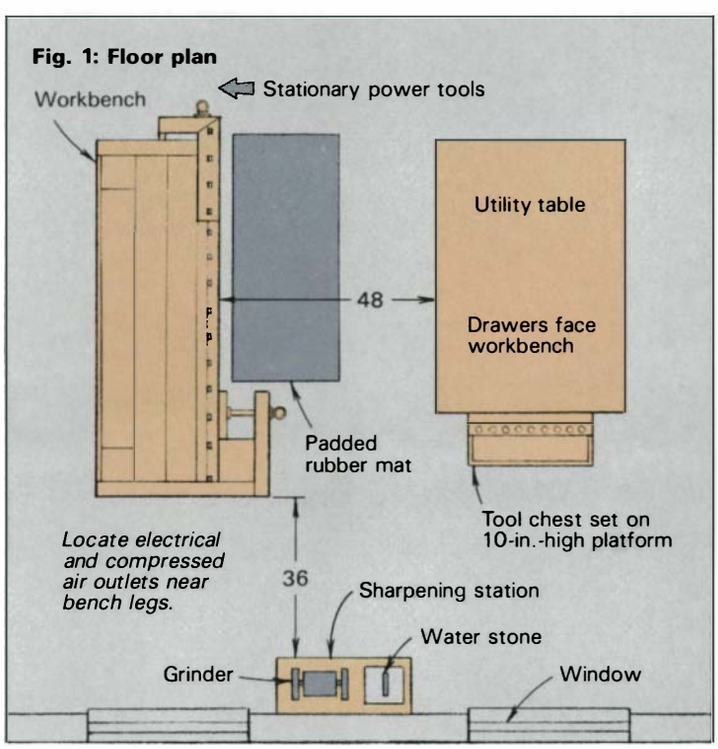
All the European cabinetmakers I visited used similar shoulder and tail vises to hold their work. The bench screw (available from Garrett Wade Co. in New York City and Woodcraft Supply Inc., Woburn, Mass.) on my shoulder vise gives it about a 7-in. capacity. It can hold a short piece by itself or, working with a bench slave (see figure 2), hold a long piece in an efficient work position. The slave is a notched 1½-in. by 2-in. piece of hardwood tenoned into a cross-lapped base. A wooden block hanging from two wooden ears connected with a dowel supports the work.

The tail vise can hold wood in the same manner as the shoulder vise, but it's most often used with the bench dogs to lock pieces down flat on the benchtop. I use traditional square metal dogs (I ordered mine from Garrett Wade). It's crazy to try to use dowels for bench dogs. They might work if the dogs just kept the wood from sliding on the benchtop, but they must also clamp the work tightly against the top. Square dogs have slightly angled faces so you can pinch the board between the jaws, then drive the dogs down to snug the piece against the top. A workpiece suspended in midair between the dogs will chatter when you work on it.

A good bench should be built of hardwood, heavy enough so that you can't move the bench with a stroke of your handplane. Hardwood is expensive, so I cut costs by buying green wood and drying it myself or scavenging rejects at local sawmills. The bench legs and base are cut from second- or third-class chunks of red oak, white ash and beech—any hardwood will do. It's not scrap, but it's not good enough for furniture.

Though each workbench is a little different, depending on the material you have to work with, don't drastically alter the basic dimensions shown on the drawings. You could go a little wider or longer without creating a monster, but scaling the bench down and using much thinner stock eliminates the weight essential to a good bench. The correct height of the bench is easy to determine. Stand up, put your hands next to your pockets and your palms parallel to the floor. The distance between your

Fig. 1: Floor plan



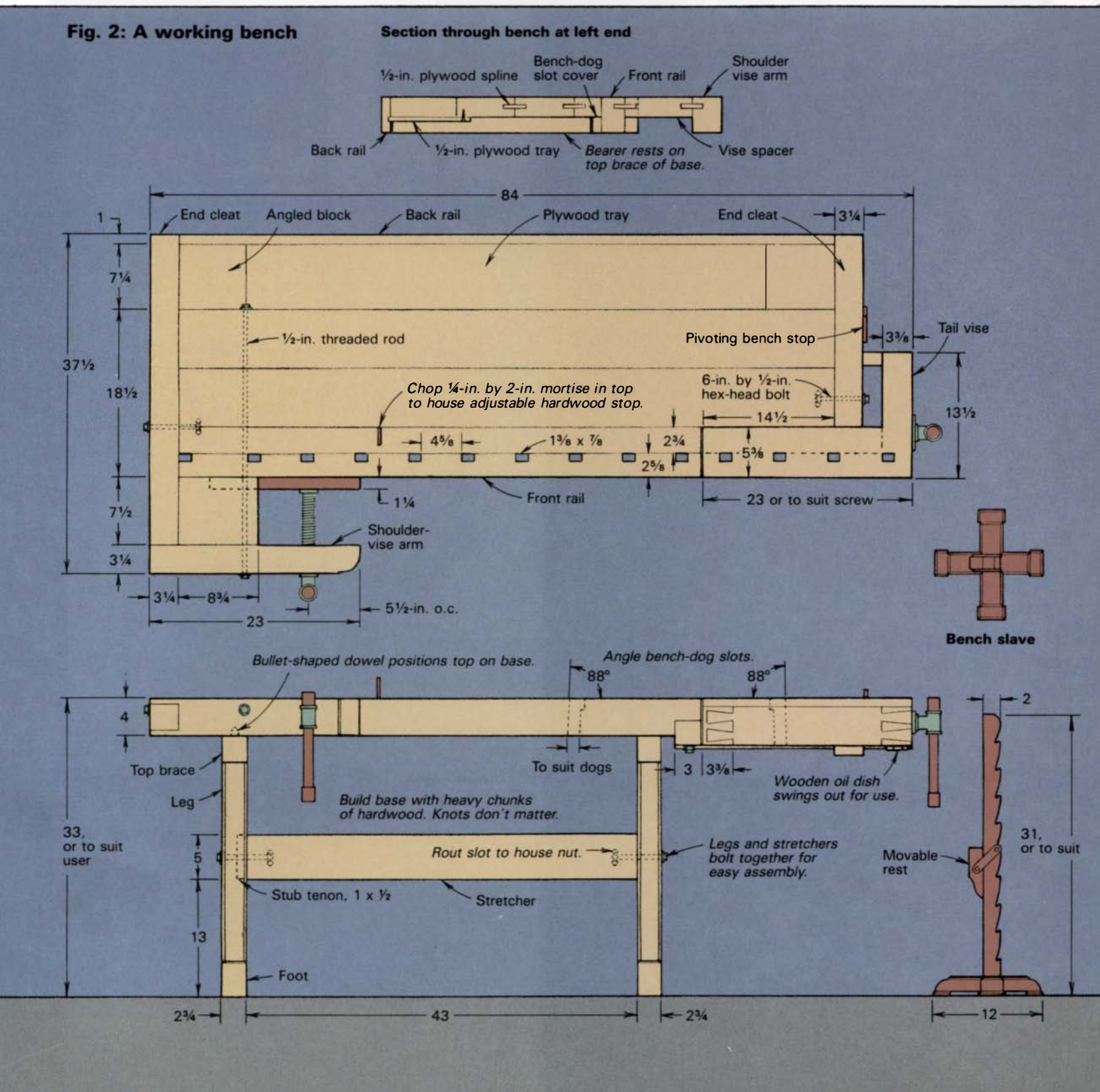
Drawings by Lee Hov

palms and the floor equals the bench's height. If you make the bench higher, you can't take advantage of your body weight when handplaning. Using your body weight, not just your arm muscles, will give you hours of easy planing while the other guy is pushing and shoving.

Construction of the base—My bench is supported by a sturdy base: two heavy uprights joined by a pair of wide stretchers. The pieces for the uprights are mortise and tenoned; the leg-to-top-brace joints are through-wedged; the others blind. So the bench can be broken down to be moved, the stretchers are fastened to the legs with bolts and captured nuts. To position the top, bullet-shaped dowel pins in the top braces of the uprights fit into holes bored in heavy bearers screwed to the underside of the bench top. The weight of the top holds it on the base.

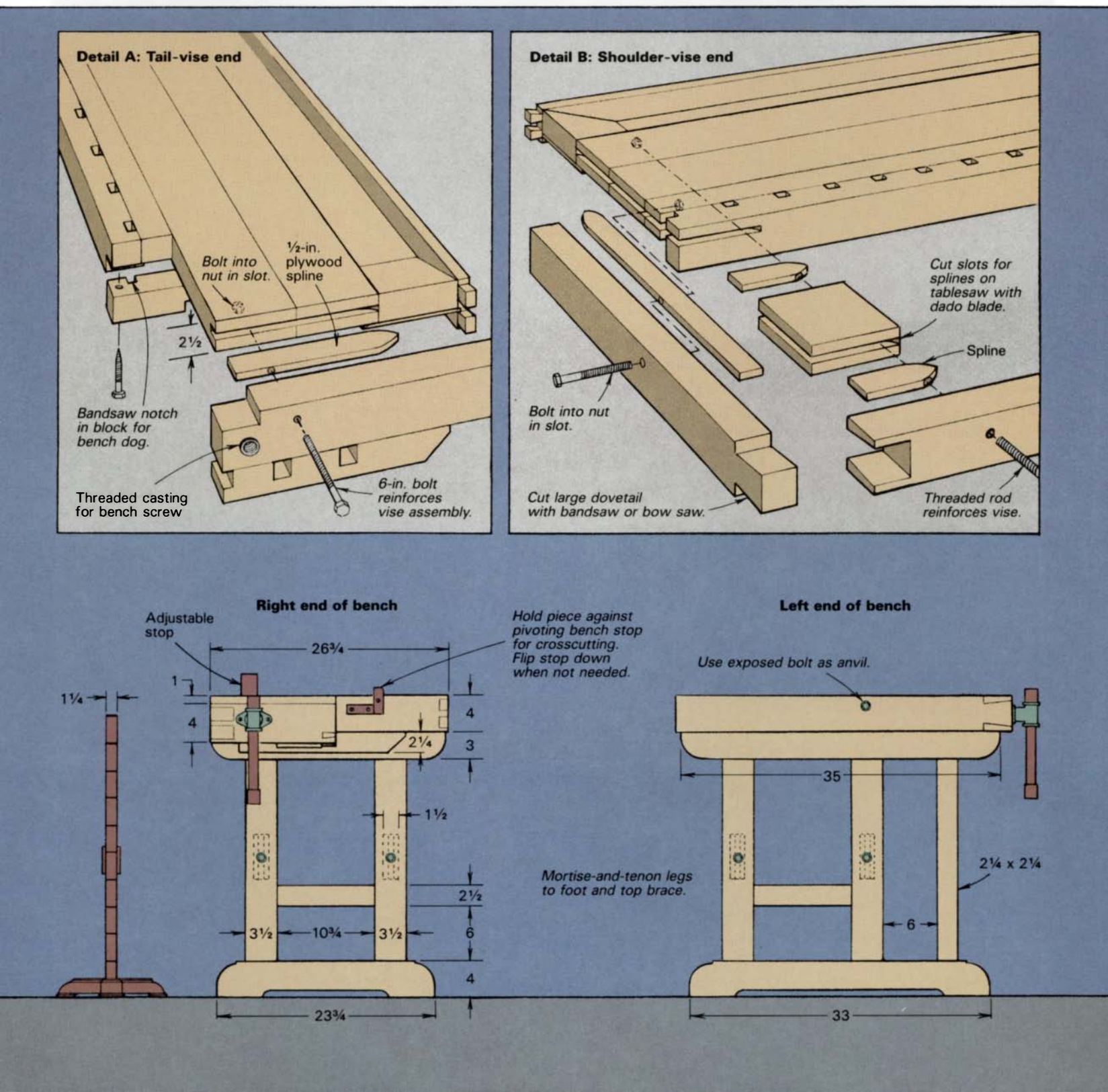
Begin base construction by determining the height of your bench, as discussed above. I'm 6-ft. tall and my bench is 33-in. high. Adjust the leg length, up or down, in the area between the stretchers and feet, then cut all the parts as shown in the plan. I cut the mortises with a hollow-chisel mortiser, but you could chop them by hand or mill them with a router. Drill a bolt hole through each stretcher mortise from the inside of the mortise. Insert the stretcher tenon and use the hole in the leg as a guide to bore into the end of the stretcher. Remove the stretcher and deepen the hole to accept a 6-in. hex-head bolt. I rout a slot at the end of the bolt hole to house the captured nut.

Fig. 2: A working bench



Assembling the top—The benchtop, with its tool tray and two vises, is the most complicated part of the bench so you must measure very carefully when making the parts. It consists of 2½-in. thick boards sandwiched between a thick front rail, which is mortised for the dog slots, and the tray and back rail assembly in back. Both ends are capped by heavy cleats. All pieces are splined and glued. The vises themselves are constructed separately and then fitted to the top.

For the 2½-in. stock, I used quartersawn maple, but you might want to jazz up your top by using several different woods. That's OK if the different species are about the same density and will move with the seasons and wear at similar rates. Lay out the glue joints so that the notch for the tail vise is created in gluing up—this avoids a lot of sawing and awkward cleaning up later. Since you want to reinforce the shoulder vise with a threaded rod through the top, as shown in the drawing, remember to bore a ½-in. diameter hole through each component before assembly. You can take care of the splines and minor alignment problems when you attach the vise. Glue the 2½-in. pieces together with 1½-in. by ½-in. plywood splines, trim the assembly to size, then cut the grooves for the end cleats, as shown in the drawings. Although the glued-up top is big and heavy, you can cut the grooves by standing the top on end and passing it over your tablesaw's dado head. If this sounds too nerve-racking, use a router. Always reference the top surfaces of the benchtop and cleats against the fence or router base so the grooves will line up. Next,



Benchtop is positioned on the base by bullet-shaped dowels, left. The base itself is low-grade hardwood. Before assembling the top, above, chisel out dadoed slots so L-shaped dogs fit flush with top.

mill the front rail and the bench-dog slots in it. Note that the front rail and tail-vise face must be the same thickness so the bench-dog slots line up. I cut the slots with a dado head on my radial-arm saw, then chisel the L-shaped notch for the dog's head by hand. After assembly, I glue a backing piece to the front rail to enclose the notches. Test the fit of each dog before you glue up. If they are too tight, it will be hard to trim the slots after the rail is glued to the top. I set the dogs into the bench at an 88° angle, nearly perpendicular to the surface. A greater angle might increase the dog's down-clamping pressure, but you'd lose the ability to reverse the dogs and use them to pull something apart—the dogs would slide out of the angled slots. I use the dog's pulling ability in my restoration work. If I have to disassemble a chair that's too fragile to withstand much hammering, for example, I reverse the dogs, fit the chair parts between the padded dogs, then crank the tail vise out until the joints separate. This technique also works on other kinds of furniture.

The tool tray is a piece of ½-in. plywood screwed to the underside of the 2½-in. top and housed in a groove in the back rail, which is in turn dovetailed to the end cleats. I glued two angled blocks in each end of the tray to make it easier to clean.

The end cleats support the two vises. Six-inch by ½-in. hex-head bolts and captured nuts reinforce the splined glue joints. The holes are not too long to bore with standard hand or power auger bits. Chisel or rout the blind notches for the nuts in the underside of the top. I leave the bolt heads exposed. That good-looking hex head makes a handy little anvil for blunting nails so they won't split wood, or for tapping out hinges or other hardware. Before you glue on the cleats, however, make the vise parts and assemble everything dry to make sure it works okay.

Design of vises—I prefer 2-in. dia. wooden bench screws for vises, but they are so rare that most people use metal screws, even though they don't have as nice an action. Tailor your vise to fit the length of the screws you have. The shoulder-vise screw in the drawing is 1¼ in. in diameter by 13 in. long. The tail-vise screw is 1¼ in. by 17 in. Be sure to have the screw (and all other hardware) before you build the vise.

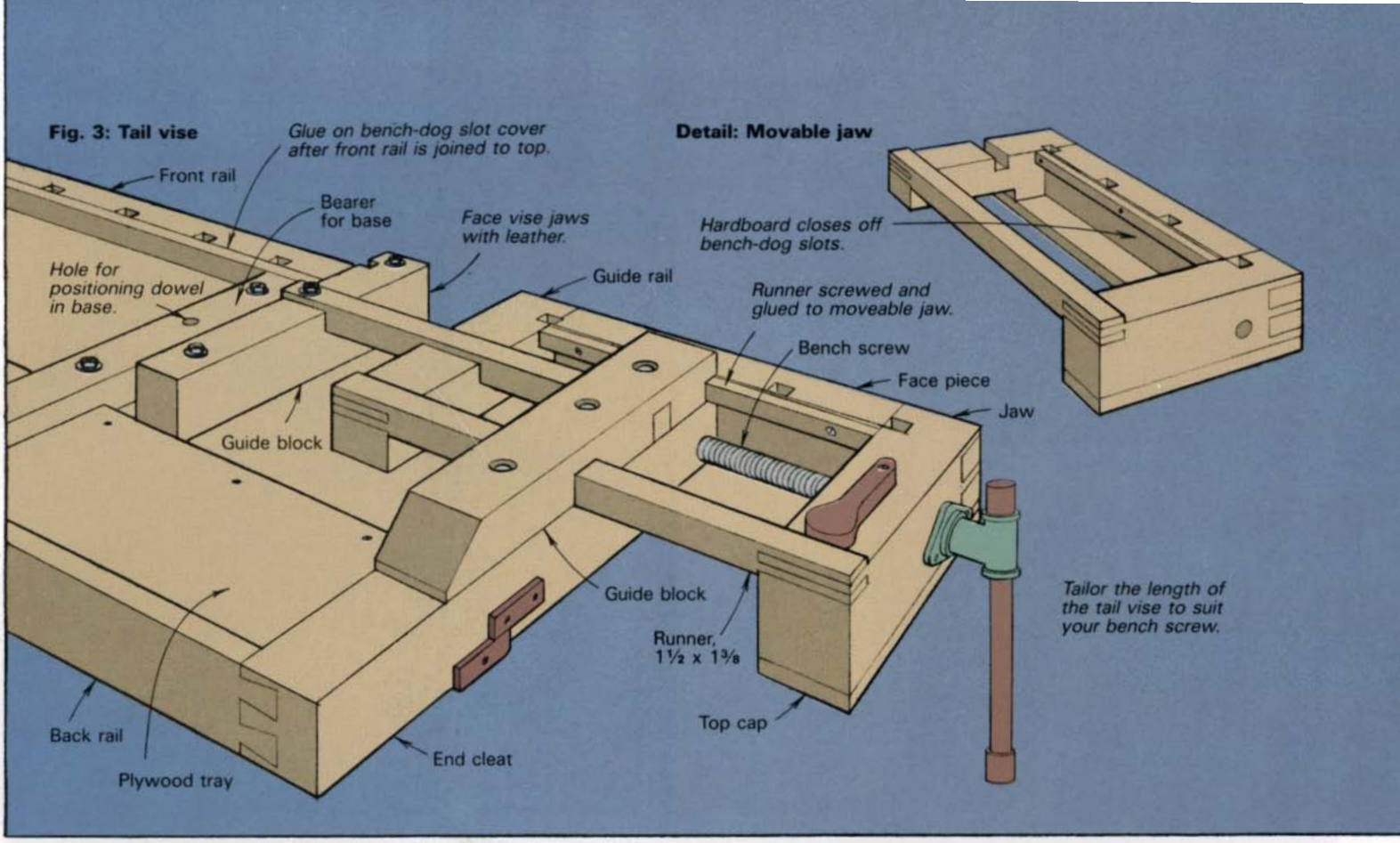
The tail vise has two parts—a jaw assembly and guides fixed to the benchtop. The jaw assembly consists of a heavy jaw and face piece dovetailed together. The jaw houses the screw, the face piece is the same thickness as the front benchtop rail and is likewise slotted for bench dogs. A guide rail, parallel to the jaw, is dovetailed to the face piece and a runner connects it and the jaw. This assembly is further held together by two top caps, whose top surfaces will be flush with the benchtop. Two guide blocks bolted under the bench are notched for the runners that guide the jaw assembly. The vise-screw nut is housed in the end cleat.

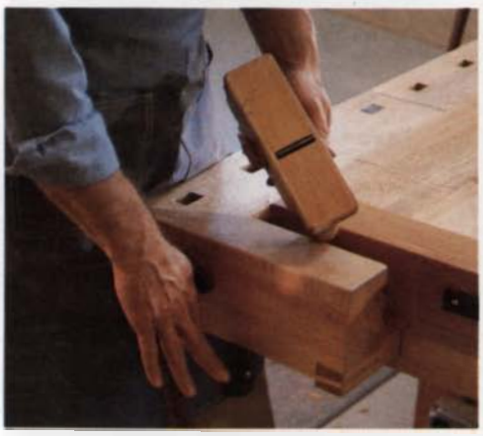
I cut the large dovetails on the bandsaw or with a bowsaw. The dovetails are very strong, beautiful and show craftsmanship. Finger joints would work, too. You can cut these on the tablesaw. The dog slots are cut using the same method as on the front rails. Close off the open side of the slots by gluing on a piece of ¼-in. plywood after the jaw assembly is glued up.

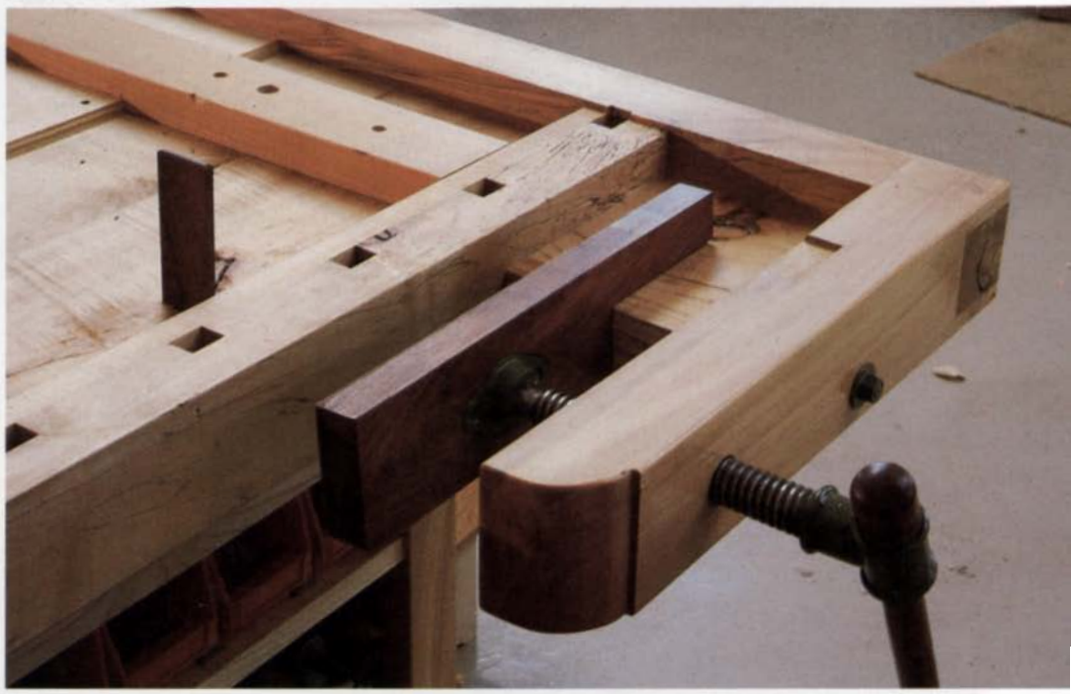
To ensure proper alignment, bore the holes for both vise screws on a drill press before assembly. I first bored a 1⅞-in. dia. hole for the depth of the embedded nut, then, using the same center point, bored a 1¼-in. dia. hole through the piece for the screw. After boring the end cleat, I clamp the tail vise to the bench and use the drill bit to mark the center of the screw hole. Unclamp, transfer the center point to the outside of the piece and bore a 1¼-in. dia. hole. Make fine adjustments with a rasp.

After assembling the tail vise on the bench, I close it and, to make sure its faces are parallel, saw through where the end of the vise meets the bench with a sharp, fine-point backsaw, being careful to keep the saw between the two pieces. Then I glue top-grain cowhide to each face.

The shoulder vise is much more straightforward, but you may have a little trouble with the treaded rod running through the top to reinforce the dovetail joining the end cleat and vise arm.







Flip-up bench stop is handy for crosscutting near tail vise, top left. Carved oil cup under vise swings out when you need to lubricate plane sole or saw, left. Underside of bench near shoulder vise, above, shows hardwood bench stop and the track that guides vise jaw.

Since you drilled the top pieces before assembly, you should be able to clear the splines and any misalignments by running a bit on a 12-in. extension in from the front and back. Then bore the vise block and arm separately before attaching the unit to the top.

To finish the bench, level the top with a sharp jointer plane, checking by eye, straightedge or winding sticks, then sand with a large vibrator-type finish sander. I put two coats of Waterlox (available at large building supply houses) on every wood surface, then add several more coats to the top. Next rub on paste wax for a beautiful shine that will protect the top from glue or stain. Wax your bench regularly and resurface it every year. I believe lots of people, including customers, look at your bench as an indication of your craftsmanship. Besides, I am spending about 10 hours a day looking at and working at the thing, and it should be beautiful. □

Frank Klausz makes furniture and restores antiques in Pluckemin, N.J. Klausz's two videotape workshops, Dovetail a Drawer *and* Wood Finishing, *are available from The Taunton Press. For more on building workbenches, see* FWW #4.

The Mysterious Celt

Behold the mysterious celt,
With a property that amuses.
One way it will spin,
The other way it refuses.

by Allan J. Boardman

Many thousands of years ago, some nameless neolithic craftsman fashioned a chopping implement from stone. Based on the Latin word for chisel, *celtis,* such tools are called celts (soft "c"). But for some reason, the nearly symmetrical shape of this particular celt incorporated a subtle distortion that gave it a peculiar dynamical property. When spun on a smooth surface, it turned freely in one direction; spun the other way it wobbled, rattled and reversed its direction. Not all celts exhibit this odd property.

The odd motion of some celts inspires many who see it to suggest that the explanation is magnetism, aerodynamics, the Coriolis effect or some form of trickery. A few look at it and say, "So what." In reality, the behavior is a function of the celt's shape, as is its free-spinning direction—clockwise or counterclockwise. I have made more than a hundred celts from a variety of materials, but mostly from wood, and each one has individual idiosyncrasies. Some are less than 2 in. in length, others are over 1 ft. long; some reverse direction several times before stopping.

Once a few important points are understood, it isn't difficult to make one of these curiosities. The exact shape can be mathematically derived, but trial-and-error is easier and, for woodworkers at least, more enjoyable. The general shape, size and proportions can vary considerably, but where the celt contacts the table, the configuration is critical and its surface must be very smooth.

Select a piece of dense hardwood about 5 in. long, 1 in. wide and ⅜ in. thick. I prefer rosewood, ebony, lignum vitae or desert ironwood. Finish the top surface flat and smooth. Lay out the outline shown in figure 1 and saw to shape. With a rasp, sanding disc or knife, round the bottom surface as symmetrically as possible. As the shape develops, check for symmetry and balance by placing the piece on a tabletop to detect tilt. Carefully correct any lopsidedness. When the blank is balanced, sandpaper to a very fine finish—the objective at this stage is graceful curves, smoothness, balance and symmetry, so that when the piece is sitting still, its flat top is parallel to the table.

At this point you may have already produced a celt, having unwittingly created one of the infinite number of shapes that will work. Spin it both ways—it should exhibit very little friction and its behavior should be different in each direction. If it spins freely both clockwise and counterclockwise, you were too successful in your attempt at symmetry—but fear not.

The next step is to deliberately upset the symmetry in a par-

Fig. 1: The celt blank

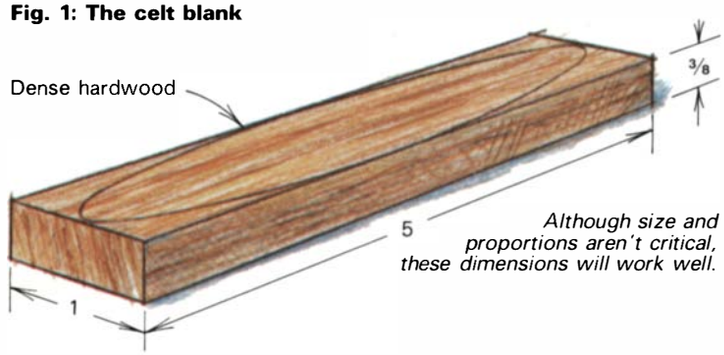
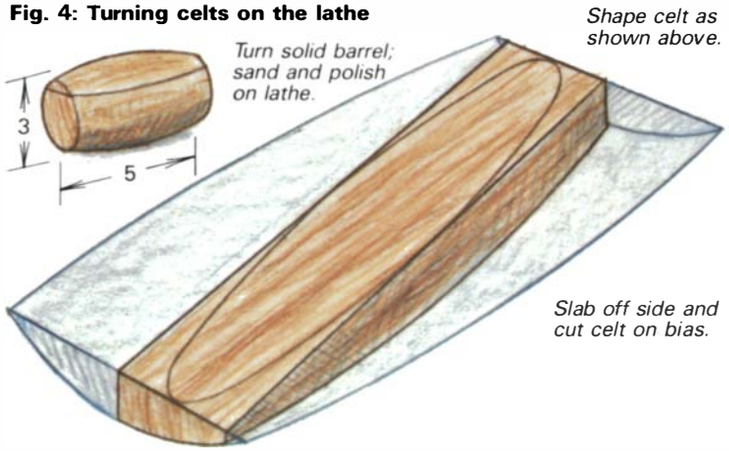


Fig. 2: Proper balance

Fig. 3: Shaping the bottom

Asymmetry has been greatly exaggerated for clarity.

Fig. 4: Turning celts on the lathe



Tip tops

by Girvan Milligan

Like most woodworkers, I have a large accumulation of wood scraps. At times I think of them as kindling, but then I remember all the useful and playful things I've made from scrap and how scarce and expensive solid wood is becoming. Tops are fun to make and to play with, and save some of the scraps from the firewood pile.

The idea of making tops came when my granddaughter showed up with a rather poorly-made top that cried out for improvement. I started by gluing up a stack of ¾-in. stock to make a turning block like the one shown in the drawing. (This makes a pretty hefty top; make smaller blocks for smaller tops.) I learned from my granddaughter's top that balance is *all* in a top, so I was careful to make the stack from wood that was as uniform as possible. After trimming waste on the bandsaw, I centered the stem portion on a ½-in. dia. live tailstock center and simply turned the stem down to the center's diameter.

Top shape is largely a matter of choice, but whatever the shape, turn a 1-in. shoulder at the top of the body to provide a bearing surface for the handle. Sand the top between centers, then turn the bottom to a fairly blunt point before parting off with a skew. For a more durable point, you can insert a 1 in. length of ¼-in. bronze brazing rod in the bottom after rounding the rod end in the drill press.

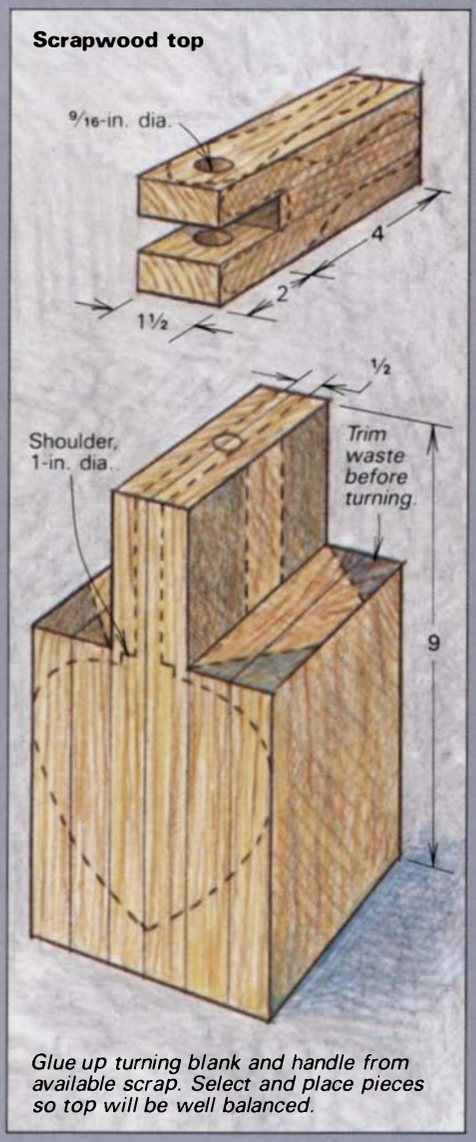
The handle is a three-piece lamination made of the same ¾-in. stock as the top. Drill the 9/16-in. hole for the stem before cutting away the waste and shaping the handle. Remember, children's hands are small.

Bore a ⅛-in. hole for the string in the middle of the stem and cut the stem flush with the top arm of the handle. To finish the top, I submerge it in Watco oil until the bubbles stop appearing. Attach the string—nylon masons' line works well—to a toggle to give a good grip.

To spin the top, put the stem in the handle, thread the string an inch or so through the hole, hold the top horizontally and turn it to wind the string onto the stem. On a smooth surface, hold the top by the handle and *pull*. Lift off the handle and watch the top go! □

Author

Tops are splendid projects for recycling scrap. This one is made of birch plywood.



Glue up turning blank and handle from available scrap. Select and place pieces so top will be well balanced.

Girvan Milligan is a woodworker in Carmel, N.Y. Photo by the author.

ticular way to achieve the behavior we're looking for. To do this, file, scrape or sandpaper diagonally opposite quadrants of the celt's bottom, as though you were making it slightly propeller-like. Figure 3, facing page, illustrates this—greatly exaggerated for clarity. Be careful not to remove too much wood, and be sure to maintain diagonal symmetry. This propeller-like distortion should be barely perceptible in the finished celt. Again, test on a tabletop. You'll have to smooth the bottom to a high degree to test both for balance and to see if you have arrived at the desired shape. You may not get it the first time, but keep trying. Experimentation will reveal how subtle variations will affect the spinning motion, the liveliness and the reversing properties. When you're satisfied with the celt's performance, a slight chamfer or rounding of the edge and a bit of oil or wax will finish it.

My friend, Jerry Glaser, developed a method for making a celt on the lathe, which is illustrated in figure 4. The bottom surface is sort of automatically produced, and the same turned barrel can make two or three additional celts.

In general, the smaller the celt, the faster it will rattle and reverse. The larger models have a sluggish, lumbering behavior. Why does the celt do what it does? Simply put, a dynamic imbalance excites an instability that transfers its energy to a wobbling motion which, in turn, induces a counter rotation. Or maybe it's magnetism. As far back as the 1890s, mathematical and descriptive treatises have been written about the celt.

The celt has been called by other names—"wobblestone" and "rattleback," for example. One particularly interesting name, "tates," is said to originate from the little-known historical fact that prehistoric Celtic (hard "c") people used this object as a navigational compass. When the tates was spun, it would ultimately come to rest pointing in a completely arbitrary direction—a different direction each time. Obviously, as a compass, the tates was a dud. But the valiant, if unsuccessful, effort of this early people to harness natural phenomena did give rise to an important adage in common usage to this day: He who has a tates is lost. □

Allan J. Boardman, of Woodland Hills, Calif., is an amateur woodworker and a corporate officer in an aerospace firm. For a scientific explanation of the celt, see "The Mysterious 'Rattleback'" by Jearl Walker, Scientific American, *October 1979.*

Leather and Wood

Three clever combinations

by Seth Stem

Leather cemented onto a plywood panel can be an attractive alternative to a solid-wood panel in furniture. After applying contact cement to both leather and plywood, Stem positions the leather carefully and smooths it down onto the plywood.

There are unlimited opportunities to use leather in furniture. Leather's color, texture, and surface character greatly complement the grain pattern and natural warmth of wood. Because its appearance can range from a natural look to slick surfaces or bizarre colors, leather works in almost any context, from utilitarian to purely decorative. I've covered flat surfaces, such as a desk top or panel, with leather, upholstered with it and formed it into three-dimensional shapes that function as containers or ornament on furniture. I'll discuss techniques for doing each of these, but first a little background.

Leather is a durable and strong yet flexible material, made up of fibers interwoven in all directions. Once removed from the animal, the hide is given baths in various chemicals, scraped of its hair and fat then submerged in tanning agents. Tanning keeps leather from putrifying and, depending on the tanning agent, increases its resistance to heat, water and chemicals. Chromium salts and vegetable matter containing tannin—oak bark for example—are the most commonly used tanning agents. (Chrome-tanned leather shows a bluish-gray color in cross section.)

Most retailers sell leather by the square foot in half hides, the hide being divided along the animal's backbone. Half cowhides are usually 20 to 25 sq. ft., and the measurement is stamped on the back side of the hide. It's most economical to buy a half hide, and many retailers won't cut a hide into smaller lots.

Leather is also classified by weight in ounces per square foot, and weight correlates directly to thickness—1 oz. equals 1/64 in. Garment leather is generally 2 oz. to 3 oz./sq. ft., belt leather is 7 oz. to 9 oz./sq. ft., and furniture sling leather is 8 oz. to 14 oz./sq. ft. Quite an amazing range of leather is available—cowhide, deerskin, lizard, pigskin, horsehide, and goatskin are common. Suede is a hide with the skin side removed.

Because there is such a variety of leather available, it's best to visit a leather retailer rather than rely on mail order. If you can't, here is a mail-order source I've used: Berman Leathercraft, 145 South St., Boston, Mass., 02111.

Leather panels in a wood frame are an attractive alternative to all-wood panels. I glue leather to plywood with contact cement, then I fix the panels in the frames using one of the methods shown in figure 1 on the facing page. Use at least 3-oz. leather for panels because surface irregularities in the plywood will telegraph through thinner leather. I also glue leather to both sides of the plywood so there is no chance of the plywood warping, just as it would if you applied wood veneer to only one side. Leather on only one side will probably do if the panel is held firmly in a frame.

The procedure for cementing the leather to the panel is the same for the methods shown in figure 1A, B and C. Cut the plywood panel to size and lay it over an area of leather that is free of defects. Mark and cut the leather about ½ in. to 1 in. away from each edge of the panel. I use a razor knife or single-edge razor for cutting and trimming leather. Apply contact cement to both the backside of the leather and to the plywood. Make sure that the gluing surfaces are free from dirt and cement lumps, which will telegraph through the surface. When the contact cement has dried (20 minutes or so), position the leather carefully and, starting from one edge, press it down smoothly on the plywood with the flat of your hand. Trim the excess, then glue and trim the other side.

A panel in a rabbet can be glued or screwed into place (figure 1A) or held by a molding strip (figure 1B). If a screwed or glued panel is to be seen from the inside, I first trim the leather on the inside surface so it overhangs the plywood slightly, then trim it accurately with a razor knife after the panel is in place.

A grooved frame and leather-covered panel can be assembled

permanently, but I prefer to be able to remove a damaged panel. Figure 1C shows a method for the side panel of a desk or cabinet. The panel slides into grooves in the stiles and bottom rail, and is held in place by a two-piece top rail. The outer half of the top rail is mortised to the stiles, the inner half is loose. Chamfer the edges of the panel with a razor knife so they can slide easily into the grooves without peeling the leather off the plywood.

The method shown in figure 1D raises the leather slightly above the frame. I used this method for the top panels on the desk shown at right. The effect of this raised panel is crisp and professional, whereas a flush panel made using the same method will show a crevice between the leather and the frame due to the curvature of the leather as it wraps around the plywood. The depth of the frame rabbet should be half the frame's thickness. Cut a plywood panel to fit snugly in the frame, then rabbet the panel to create a lip that's as thick as the frame rabbet is deep. (The plywood need not be the same thickness as the frame.) I do this on the tablesaw, placing the panel on end, top surface toward the fence for the first cut, then placing it flat on the table, top surface up, for the second. The thickness of plywood varies slightly throughout a single sheet, and this method ensures that the lip will be a uniform thickness.

Next, trim the panel to allow for the thickness of the leather. Place two pieces of leather scrap in the rabbet on each member of the frame, toward the corners, then try the panel in the frame. Saw or plane the edges until the panel fits the opening snugly. It may take several tries, but a good fit here is very important.

Cut the leather for the panel large enough to wrap over the edges of the plywood lip and allow for waste. Contact cement the leather to the face of the panel, then cut small squares out of the overlapping leather at each corner of the panel. The corner of a square should come to within ⅛ in. to 3/16 in. of the plywood corner. Cement the overlap to the edges of the lip, stretching the leather over the apex of each corner and smoothing out any puckering. Trim and chamfer the leather all around the panel; no leather should adhere to the underside of the lip. Finally, glue or screw the panel into place. Single-edge razor blades slipped between the leather and the frame work like shoehorns and help slide the panel in. Remember the leather will compress slightly, so a real tight fit is possible.

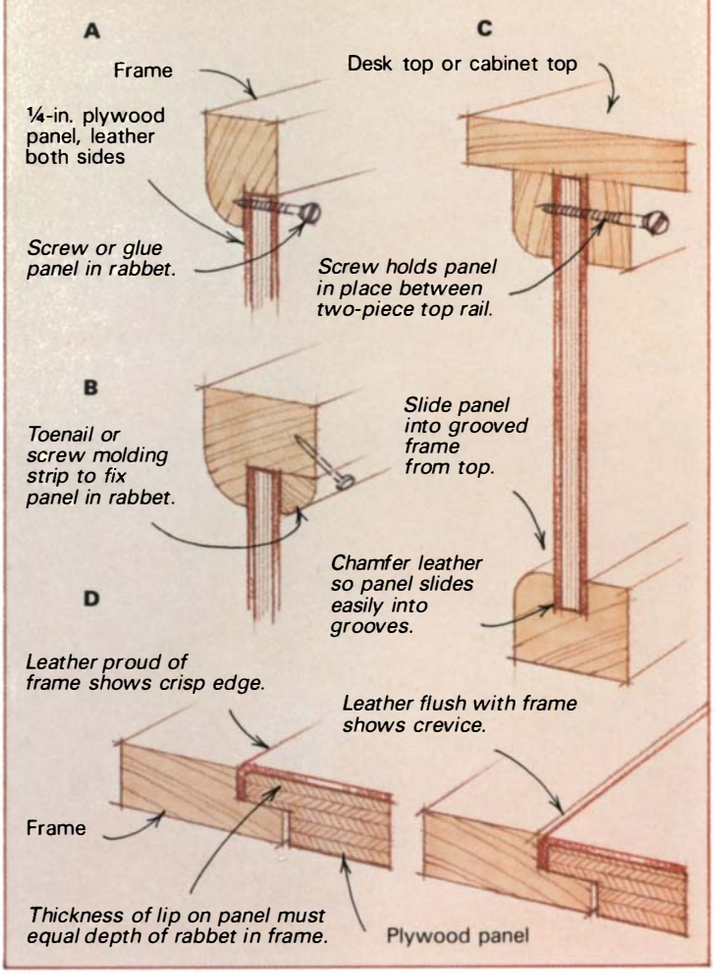
Simple leather upholstery can be done using the same frame-and-panel system and 1-in. to 2-in. thick foam-rubber padding. The round stool shown on p. 72 has a leather upholstered seat

Single-edge razor blades help ease a tight-fitting panel into place in a rabbeted frame.

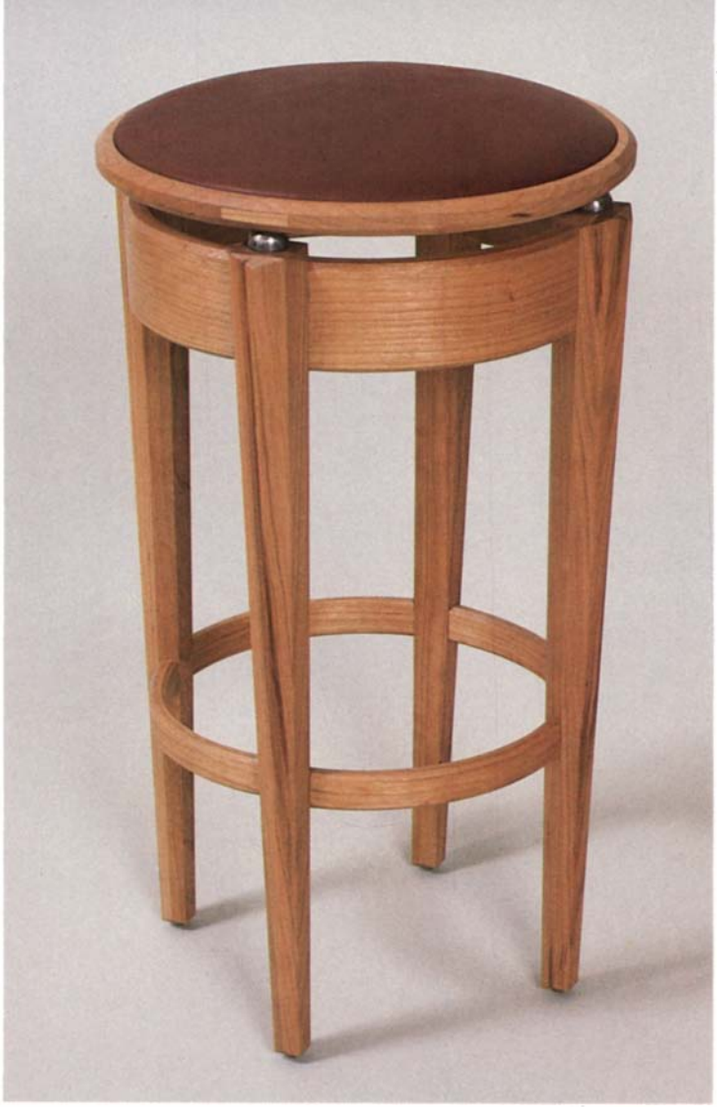
Author photo

Stem's desk has raised-leather-panel writing surfaces; the side panels of desk and credenza are flat.

Fig. 1: Leather-covered panels



Drawings: Joel Katzowitz



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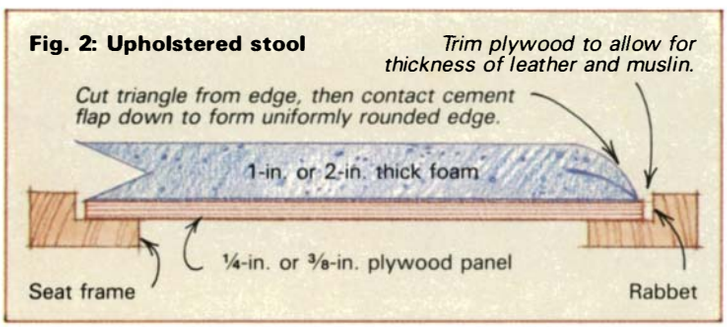
By sandwiching foam between the leather and panel, you can adapt the frame-and-panel leatherworking method to upholster a seat, as in this stool made by Matthew Burke.



Flat-nosed pliers give added pull when tacking the leather to the seat panel.

fixed in a round frame, but the method will work for seats of any shape. Construct the frame, cut the plywood to fit, then glue the foam to the plywood with contact cement and trim it flush with the edges of the plywood (see figure 2). Left square, the edge of the foam would compress irregularly as the leather was stretched over it. Using a sharp razor blade, I cut a triangular section out of the edge and glue the foam flap down with contact cement so the edge will retain its shape.

Next, stretch muslin over the foam, tack or staple it to the plywood and trim off the excess. First tack the muslin in four places, 90° apart, so it won't gather too much during stretching. The muslin helps make the rounded foam edge uniform, and allows the leather to shift slightly over this surface when the stool is being used, without the leather wearing or pulling directly on the foam. Stretch 3-oz. to 4-oz. leather over the muslin and tack it in the same sequence, using flat-nosed pliers to stretch it if necessary. If the leather puckers or gathers at seat corners or around curves, wet it with a sponge and stretch it smooth. Trim off excess leather with a razor and screw the plywood backing to the seat frame from underneath.

Wet leather can be molded over a form and when dry, it will retain the form's shape. One-layer shells of 8-oz. to 10-oz. vegetable-tanned leather will be extremely stiff and hold their shape well. (Lighter-weight vegetable-tanned leather will also form, but won't be as stiff.) By gluing together two lightweight layers of chrome- or vegetable-tanned leather over a form, you can make a rigid leather shell with finished surfaces inside and out, like the one on the wall-hung basket on the facing page. Leather can be specially tanned to keep stretch at a minimum, so it is best to discuss the intended use of the leather with your retailer.

Single-layer and double-layer shells can be made on the same form. Try slightly rounded or bullnose shapes first, avoiding shapes that cause the leather to bunch or gather. Forms can be lathe-turned or hand-shaped of any material that will hold nails and that won't deteriorate when wet. The final surface must be smooth, as any imperfection will telegraph through the leather. I made the form for the wall basket of fiberboard, with a top layer of plywood to take the nails.

After you've made the form, collect a plastic bucket, regular flat-nosed pliers, a tack hammer and a razor knife or single-edge razor blade. Cut a piece of leather slightly oversize to go over the form. An easy way to measure the piece is to place the form on the leather and roll it to the form's edge, then mark 2 in. or 3 in. from the edge. Roll it to the opposite edge and so on. Soak the leather in a bucket of very hot water for approximately 20 minutes, then tack it along one edge of the form with 1¼-in. brads. Put the smooth side out if you're making a single-layer shell, smooth side in for a double-layer shell. Pull and stretch the leather over the form using flat-nosed pliers, and tack it down. To remove puckering, pull the brads out one at a time and stretch the leather further. Replace the brads with #6 upholstery tacks during the last round of stretching. The leather is dry when it returns to its original color. With a razor knife, remove a one-layer shell from the form now by cutting just inside the tacked area.

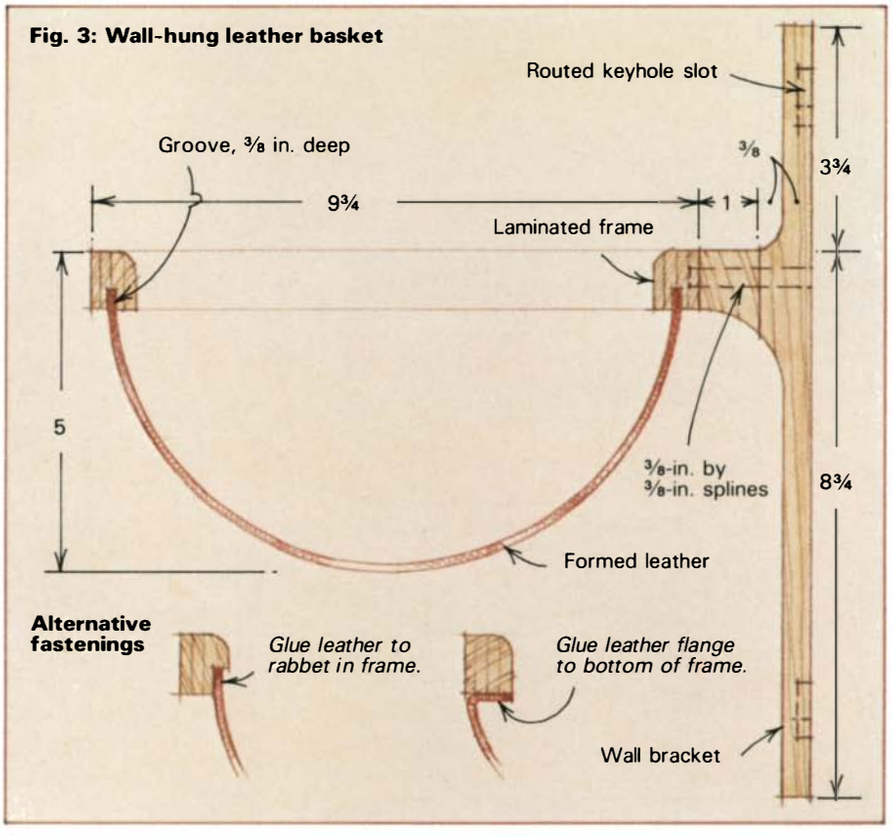
For a two-layer shell, stretch the first layer, finished side in, then brush on a very generous layer of yellow glue, such as Titebond, then wet-form a second layer of leather over the first, finish side out. The degree of stiffness can be controlled by the amount of glue applied. For a very hard shell, three or more layers of leather can be glued together.

Formed leather can be attached to a wood frame in a groove,

Stretch the wet leather in stages, holding it temporarily in place with brads. Fix it with upholstery tacks during the last round of stretching. Glue two (or more) layers of leather together on a one-piece form for a very stiff shell. Wet, stretch and tack the first layer to the form. Spread yellow glue on this layer, then stretch and tack the next layer.

Leather shells or containers can be made by stretching wet leather over a form. When dry, the leather will retain the shape of the form, and can then be mounted in a wooden frame.

Fig. 3: Wall-hung leather basket



in a rabbet or by a flange, as shown in figure 3. The wall basket is glued into a groove routed in the form-laminated hickory rim; the groove must match the shell's perimeter exactly. The groove is as wide as the thickness of the leather and about ¼ in. to ⅜ in. deep. I usually chamfer the edge of the leather with a razor blade first, to allow for easier entry into the groove.

Leather glued to a rabbet can be stretched slightly to meet the rabbet, then it must be tacked or clamped in place while the glue dries. You'll also need to trim the shell's edge precisely to butt against the rabbet, unless the inside is hidden from view.

If when you cut the leather free of the form you retain the flange (the area of leather tacked to the form), you can glue this to a wood structure. Trim the puckered areas of the flange with a razor knife and pound them flat on the form with a hammer. Then trim the flange ½ in. to ¾ in. wide. If you're gluing the flange down with yellow glue, the frame must allow access for the clamps. If this is impossible, use contact cement. □

Seth Stem teaches at the Rhode Island School of Design and designs and makes furniture in Marblehead, Mass.

Woodturning in Ireland

National guild hosts a seminar

by David Sloan

Once a reform school, the Connemara West Centre in Letterfrack is a training school for crafts. It was the site of last year's Irish Woodturners' Guild conference.

Connemara, in the west of Ireland, is a rugged, lonely land of mist-shrouded mountains, steel-gray lakes and stark, treeless bogs. Here and there the cloud ceiling dips low to blur the line between ocean sky and barren landscape. The narrow road is well traveled by cattle and sheep—less so by cars. There I was last October, banking my little Fiat through the curves, trying hard not to turn sheep into mutton. In this out-of-the-way corner of the country the Irish Woodturners' Guild was hosting a seminar and I was on my way. From all over Ireland, turners were descending upon the village of Letterfrack in County Galway for a weekend of talk and demonstration.

I learned of the Irish Woodturners' Guild last July when I struck up a correspondence with Liam O'Neill, a turner from Shannon. O'Neill started turning in 1968, and for several years he ran the woodturning program at Retos Ltd., a rehabilitation facility for the handicapped in Shannon. He was the driving force behind the first seminar in September 1982 and the Guild's organization in March 1983. From him I learned that there were more than a few talented woodturners in Ireland. Since most of them would be at the Letterfrack seminar, I accepted an invitation to attend.

Turning isn't new to Ireland. Wooden-bowl fragments dating from the 13th century have been unearthed from the peat bogs. But unlike the utilitarian utensils produced by earlier generations of Irish turners, much of today's work is made to be looked at. This difference may seem inconsequential, but it's a major turning point in the development of the craft in Ireland, with particular significance to those who try to earn their living as woodturners. The ramifications of this trend were passionately debated at the seminar.

The conference provided a chance for turners to discuss their work, get inspiration and evaluate the work of their peers. The village of Letterfrack was chosen as the site to take advantage of the facilities at the Connemara West Centre. This cavernous 19th-century building, shown in the photo at left, was once a reformatory, but today operates as a crafts school communally owned by the people of Letterfrack. There, unemployed young people receive full-time training in woodturning, cabinetmaking and woodcarving with the hope that, after they're trained, they'll provide jobs in the area for themselves and others.

For me, the high point of the weekend was the tables where everyone's work was displayed. Here was a sampling of the best turning in Ireland, all in one place. The design sophistication and the level of technical proficiency were consistently high. Judging from the disproportionately large number of delicate green-turned, natural-edge bowls, I guessed that Irish turners as a group were drawing their design inspiration from the same source. This assumption proved close to the mark. Each year, the Guild invites internationally known turners—Richard Raffan from Australia, Ray Key from England and Michael O'Donnell from Scotland—to demonstrate at the seminars. Because these demonstrators were seen by so many Irish turners, their influence has been pervasive.

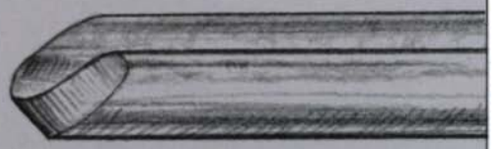
The guest demonstrators this year were David Ellsworth from the United States and, once again, Michael O'Donnell. Guild members Ciaran Forbes, Liam O'Neill, Niall Fitzduff and spindle turner Jim Foley also demonstrated during the course of the weekend.

O'Donnell, once an engineer with Rolls Royce, now turns full time in the far north of Scotland. He demonstrated his techniques for turning large, functional bowls from green wood. O'Donnell impressed me as being a thoughtful, patient teacher. The first thing that caught my eye was the shape of his deep-fluted bowl gouge. Instead of grinding it straight across, he'd extended the bevel well back on either side of the gouge. Several of the Irish turners have adopted the same shape for bowl turning. The box on the facing page explains how and why.

O'Donnell's own work has taken a unique direction. His wife, Liz O'Donnell, got the idea to saw pieces from a thin-walled bowl that he'd rejected. The result looked, to her, like a bird. Now Liz creates birds from Michael's bowls. After drawing on the

The guild's seminar drew turners and work from all over Ireland and Great Britain. Michael O'Donnell, top right, shows how to control a deep-fluted bowl gouge. Below, one of his delicate bowls turned into a fanciful bird by his wife, Liz.

Regrind a gouge



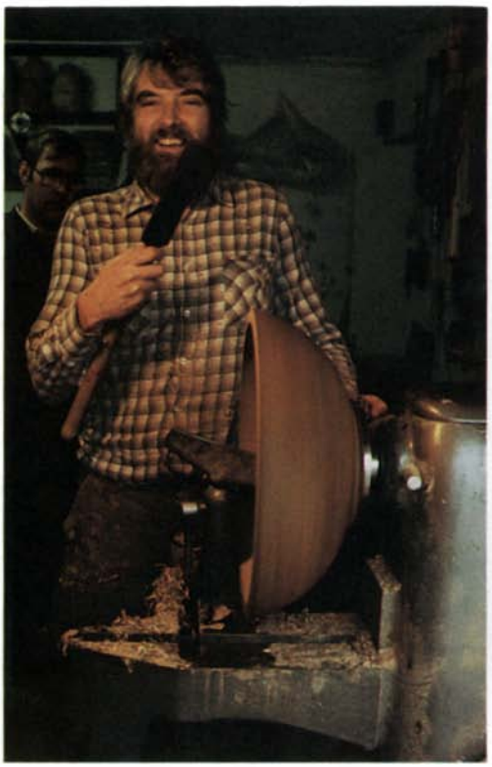
Most turning books suggest a straight-across grind for a deep-fluted bowl gouge and a "fingernail" shape for a shallow-fluted coving gouge for spindle work. But the "fingernail" shape—extending the bevel well back along the sides of the tool—works well on a bowl gouge too, and changes the handling characteristics of the tool. There's more available cutting surface and, since there are no shoulders to catch on the inside of a bowl, the possibility of a catch is greatly reduced. It takes practice to grind this bevel smoothly, and a bit more practice to get used to it, but give it a try. If you don't like it, you can always re-grind straight-across. —*D.S.*

David Ellsworth rides again. Irish turners watch as Ellsworth, from the U.S., straddles the lathe to hollow out the inside of a form.

finished bowl and sawing out the shape, the eyes, beak and other details are carved in and painted with oils.

Everyone seemed eager to learn how David Ellsworth turns his hollow decorative forms. Ellsworth works green, and his methods are somewhat unorthodox. He straddles the lathe when he's turning the inside of a form and it's not uncommon for him to stop the lathe and attack a piece with a chainsaw. His 4-ft. long tools resemble harpoons more than lathe tools. My personal favorite features a high-speed steel cutter, similar to a metal-lathe cutter, clamped in a slot at the end of a long steel shaft. This cutter can be turned and clamped at different angles with respect to the shaft. It scrapes rather than cuts and with it, Ellsworth can turn the inside of a piece through a very small opening. Boisterous and outspoken, Ellsworth is as flamboyant as his techniques, but his work is graceful, delicate and devilishly hard to imitate. It will be interesting to see the influence his purely sculptural forms have on Irish turning.

Ciaran Forbes is a Benedictine monk, and the resident woodturning instructor at Connemara West. Forbes is an accomplished bowl turner with a scathing wit and a penchant for doing imper-



Connemara West's turning instructor, Ciaran Forbes, left, brandishing a heavy scraper which he uses to clean up the gouge marks from the bottom of an 18-in. diameter bowl. Above, a yellow holly bowl by Forbes.

sonations. He introduced me to "bog oak," an Irish oddity which local turners seem to take for granted. Dried peat or "turf," as it's called locally, is burned for heat in many rural homes. Ancient, water-logged oak trees are regularly unearthed from the bogs as a nuisance by-product of the turf-digging industry. Carbon dating shows some of these trees to be 3,000 years old. The wood ranges in color from jet black to a dark brown striped with black. It's wet and stringy and, as it dries, more unstable than any wood I've ever encountered. In a matter of hours, a bowl turned from wet bog oak distorts severely. One jet-black bowl that Forbes turned looked, several days later, as if it had been sat upon. I found this unpredictability intriguing but I never did get a chance to turn any during my visit.

The group-discussion sessions were lively, and marketing was a much-debated topic. A few turners in America and England manage to command high prices for their work by selling it through galleries to wealthy collectors. The best Irish turners are producing work of comparable quality, but the domestic market for high-priced "turnings as art" is very small. There are several reasons for this. Ireland is a small, largely rural country about the size of Maine. Country people just don't buy expensive non-functional turnings. As Michael O'Donnell put it, "People want to justify buying turnings on some practical use." The Irish tax system is another obstacle to sales. Like many European countries, Ireland imposes a value added tax (VAT) on most purchases. VAT rates differ depending on the item. Craft items are considered luxuries, and taxed at 35%—the highest rate. If a turner wholesales a bowl for £40 (about $40) and a shop tacks on another £40, the 35% VAT kicks the price up to £108 (about $108). In a country where, in 1980, the average person earned less than $6,000, that's a prohibitive price. Foreign tourists, on the other hand, are exempt from paying VAT which makes them the best potential customers.

Seven of the 72 people at the seminar were full-time turners, and those few who aspired to make a living from their craft wanted to learn the ropes from O'Donnell, Ellsworth and O'Neill. They were not exactly encouraging. Ellsworth cautioned, "Don't kid yourself, woodturners don't make a lot of money...It's hard. My wife works, my kids work...." O'Donnell said that he "had to create a market in Scotland," and that he was "only beginning to reap the benefits after 10 years of work." Eventually the hobbyists, who had come to improve their turning—not marketing—skills, grew impatient with the subject and the discussion shifted to design and technique. Ellsworth summed it up: "Don't forget...how nice it is to turn for pleasure."

After the seminar, I drove around the country, visiting craft galleries and the workshops of several turners I'd met at the seminar. First, I dropped in on Nick Adams, an instrument maker in Miltown Malbay. I was fascinated with a magnificent set of Uillean pipes, the Irish bagpipes, that Nick had displayed at the seminar. Turned from African blackwood and ivory, the detail was exquisite as was the tone. Adams makes the entire instrument himself, from the turnings to the brass fittings, reeds and leather bellows.

In Shannon, I hooked up with Liam O'Neill and Michael Dickson, a doctor and woodturner from County Antrim. O'Neill's studio is in a pre-fab structure behind his house. There I spent the day as he turned a few bowls and small boxes from laburnum, holly, walnut and African blackwood. For large functional bowls, O'Neill screws a green blank to a 4-hole faceplate with two opposing holes parallel to the grain. He roughs it out, then air dries the 1⅜-in. thick bowl for several weeks. As the bowl dries and shrinks across the grain it distorts into an oval. When it's remounted on the faceplate for finish turning, the two screw holes that were parallel to the grain will still line up with the faceplate holes and the bowl will be on center.

Several times during the seminar, I'd heard people mention that they finished their turnings with "melamine." They were referring to a thick-bodied, lacquer-based product called Craftlac Melamine (sold by Craft Supplies Ltd., The Mill, Millers Dale, Buxton, Derbys., SK17 8SN, England). As O'Neill demonstrated, it quickly produces an attractive sheen. While the piece was on

Michael Dickson watches Liam O'Neill finish off a large walnut bowl with a ¼-in. gouge. The rim of the bowl is jammed into a groove turned into the pine disc, which is screwed to a faceplate. Above are two bowls by Liam O'Neill and below a large elm bowl by Michael Dickson.

the lathe, he brushed on the Melamine, waited a few minutes for it to dry, then polished with fine steel wool.

Michael Dickson took me to see Ray Cornu who runs a production-turning shop and retail store in the Bally Casey Craft Workshops outside Shannon. His 800-sq. ft. workshop includes an Ebac drying kiln in which he drys all his wood—mostly local elm, ash and sycamore. Cornu and his employee, 20-year-old Martini Currams, produce functional items: bowls, towel holders, barometer plaques, salad & cheese servers, etc. After hours, Currams, who has been turning for only three years, works on her own designs. I predict that she'll develop into one of Ireland's most innovative turners.

Irish bowl turners seem to prefer the short-bed Union Graduate lathe made by T.J. Harrison & Sons Ltd. in England (available in the U.S. from Craft Supplies U.S.A., 1644 S. State St., Provo, Utah 84601). It has four speeds, weighs nearly 400 lb. and can handle bowls up to 19½ in. dia. I heard the same complaint from every Graduate owner that I spoke with: The headstock pulley is fastened to its shaft with a setscrew. This screw works loose and when it does, the pulley spins ineffectually on the shaft since there's no keyway to prevent it from slipping.

Ireland's woodturners are in a unique position. Their's is the only national woodturning guild in the world. Trends in the craft that take years to spread across the U.S. sweep across Ireland in months because of the regular communication among turners. Michael O'Donnell commented that the "work had changed enormously" since his last visit. Right now, Irish woodturners as a group are learning and borrowing techniques and styles developed in America and the United Kingdom. Don't be surprised when the new ideas start flowing the other way instead. □

David Sloan is an associate editor of Fine Woodworking.

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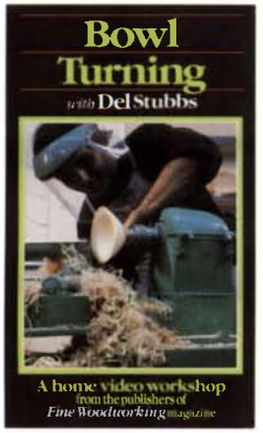

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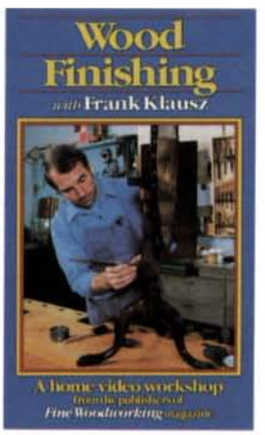
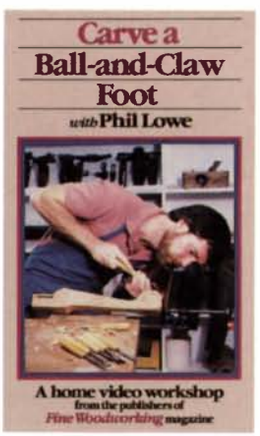




Carve a Ball-and-Claw Foot *with Phil Lowe*

Woodworking instructor Phil Lowe shows you how to make that hallmark of 18th-century furniture, the cabriole leg with a ball-and-claw foot. While he offers tips on handling a wide range of styles, Lowe focuses on the Colonial Philadelphia version. You'll learn how to scale the piece to your furniture plan and then bandsaw a graceful cabriole ready for carving. At the bench, Lowe shows you how to lay out the form of the ball-and-claw, cut in the ball using a mallet and gouge, and shape the dragon's claw for a vigorous-looking grip.

A specialist in period furniture reproduction and a woodworking instructor at Boston's noted North Bennet Street School, Phil Lowe can help you master the carving tools and techniques you need to do period work.

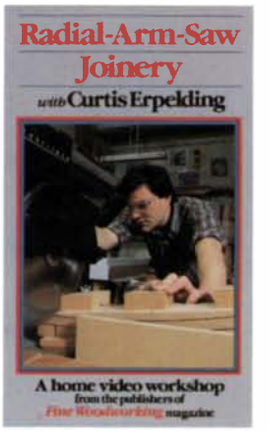
Approximately 115 minutes, ***$59.95***

Radial-Arm-Saw Joinery *with Curtis Erpelding*

Many woodworkers find the radial-arm saw helpful for some jobs, but frustratingly inaccurate for repetitive precision cutting. Now Curtis Erpelding, a craftsman who brought fine joinery to the radial-arm saw, shows you how to make impeccably precise cuts time after time. You'll find out how to set up and fine-tune your machine, how to lay out and cut a series of identical slip-joints, and how to use these same methods to cut increasingly complex joints. Erpelding also shows you how his artful jigging techniques open up a host of new design possibilities.

This is no standard introduction to the radial-arm saw, but a chance to find out about the jigs, fixtures and techniques you need to make the most of this versatile but often misunderstood machine.

Approximately 110 minutes, ***$59.95***



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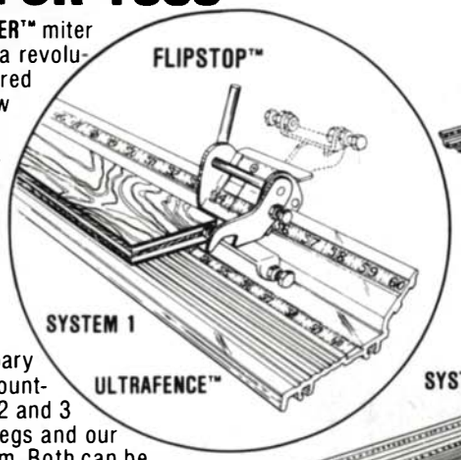

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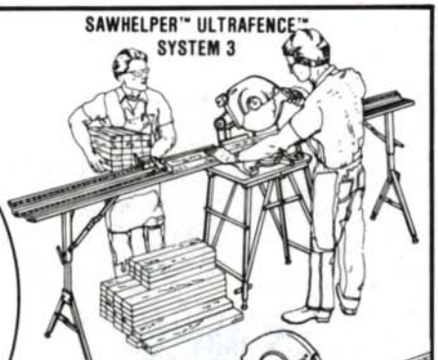

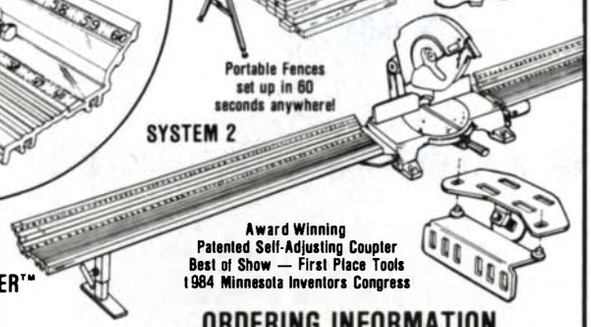

NOTE: Miter fence lengths are calculated from the saw blade to the end of the fence. Each fence section comes with all necessary hardware and one stick on tape. The lower tape groove uses a 3/4 inch tape refill, use one from your shop, or order a 10 foot refill from us for $5.95 ea.
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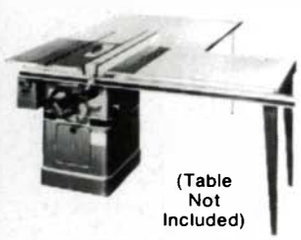

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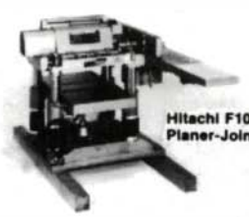

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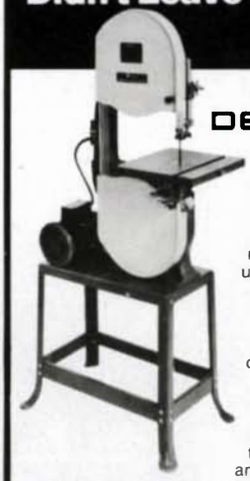

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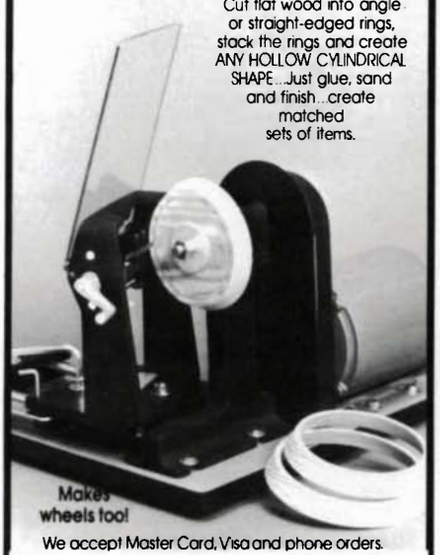

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5395	3/8 sgle sp hammer drill kt	203	150
5397	3/8 var sp hammer drill kit	208	155
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6511	2 speed Sawzall w/case	172	123
6226	portband saw 2 sp w/case	382	280
6234	TSC band saw port w/case	382	280
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6405	8¼" circ. saw 13 amp.	179	127
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6378	8¼ HD worm saw 13 amp	249	165
6165	12" Chop Saw 15 amp 4200 R.P.M.	267	189
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LU84M011	Combination	10"	50	74.51	40
LU85M010	Super Cut-Off	10"	80	110.88	62
LM72M010	Ripping	10"	24	64.85	37
OS 306	6" Dado			139.00	95
DS 308	8" Dado			170.00	107
TR 100	3 blades & Dado set			399.00	255

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#203	Standard	11.95	8.95
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#219	4" Long — 30 Sticks	5.99	4.25

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Model 2708 — 8" Table Saw

	List	Sale
8" Table Saw	$336.00	$199.95
Holder Set	28.00	23.95
Carbide Blade	19.00	16.95
Table Saw Stand	48.00	39.95
Buy Each Piece Separately		$280.80
or Buy Total Package for		$275.00

#LS 1400 — 14" Mitre Box w/bag & blade

List Price 568 ★ SALE PRICE 398

MAKITA TOOLS

		List	Sale
B04510	Sander	79	43
9900B	3"x 21" belt sander	198	124
9924B	3"x 24" belt sander	204	135
9924DB	3"x 24" b/sand. w/bag	214	140
9035	⅓ sheet finish sander	79	48
9045B	½ sheet finish sander	156	100
9045N	½ " " " w/bag	170	110
4200N	4-3/8 circ. saw 7.5 amp	152	95
5008NB	8¼ circ. saw 13 amp	178	110
5201NA	10¼ circ saw 12 amp	348	225
5402A	16-5/16 " " 12 amp	468	375
4300BV	v/sp jig saw 3.5 amp	192	120
4301BV	orb v/sp jig saw 3.5amp	208	130
2401BW	10" mitre saw	319	185
2400BW	10" mitre saw (for vice)	359	249
JR3000WL	2 sp recip saw w/cse	168	120
JR3000V	vs recip saw w/case	178	125
6010DWK	3/8 cordless drill w/case	152	89
5081DW	3-3/8 cordless saw kit	165	109
1900BW	3¼" planer w/case	154	95
1100HD	3¼" planer w/case	278	165
1805B	6-1/8 planer w/case	416	265
3608BK	¾ hp router w/case	132	85
3601B	1-3/8 hp router	198	120
3700B	½ hp trimmer 28,000 rpm.	124	85
DA3000	3/8" angle drill	158	105
DP4700	½ v/sp w/rev " 4.8 amp	154	96
HP1030W	3/8 v.s.r. hammer drill w/case	145	98
6300LR	½" angle drill w/rev	229	152
84198B-2W	½" 2 sp. hammer drill w/case	238	150

DRYWALL SHOOTERS

6800DB	2500 rpm 3.5 amp	123	79
6800DBV	0-2500 rpm 3.5 amp	133	89
6801DB	4000 rpm 3.5 amp	123	79
6801DBV	0-4000 rpm 3.5	133	89
2030	12" planer/jointer	1980	1350
2040	15-5/8" planer	1780	1195

NEW *from* MAKITA

9207SPC	7" Electronic Sand/Polish	209	130
DK1001	drill (6010D) charger/vac	178	125
6010SDW	3/8 cordless drill, rev.	82	45
DA3000DW	3/8 angle drill, cordless 700 7.2 volt	172	105

DELTA

		List	Sale
33-890	12" Radial Saw featuring "Turret-Arm" Action	1280	975
33-990	Deluxe 10" Radial saw	589	475
34-621	9" contr. saw w/o motor	500	395
34-410	10" contr. saw w/o motor	871	650
34-710	super 10" motorized saw	579	450
34-010	motorized mitre box 9"	231	169
15-091	15" floor model D/press	467	375
15-090	15" bench model	467	375
37-207	Saw/Jointer Combination	1018	810
37-609	6" Motorized Jointer	413	335
37-290	4" deluxe Joiner w/o motor	346	275
22-651	RC-33 — 13" Planer	1943	1450
43-122	Wood Shaper w/stand and 1 HP Motor	669	495
46-140	11" lathe, gap bed model w/stand w/o motor	407	335
52-493	1 hp motor for #34-621	170	130
62-042	1½ hp motor for #34-410	230	170
62-144	½ hp motor for #37-290	136	105
62-142	½ hp motor for #28-243 and #46-140	121	85

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		List	Sale
551	5½" Circ. Saw 65A	99	75
77	7¼" Worm Saw	240	139
367	6½" Worm Saw	239	149
825	8¼" Worm Saw	270	185
807	7¼" Skilsaw 13A-Super	153	100
808	8¼" Skilsaw 13A-Super	172	110
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#28-243	14" Band Saw with Open Stand without Motor	
List		$594.00
Sale		$440.00
#22-651	13" Planer	
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Sale		$1295.00

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#9501-B	4" Grinder Kit	
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#5007 NB	7¼ Circular Saw	
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		List	Sale
6010DL	Cfless Drill w/flashlight charger & case	162	90
DP3720	3/8 drill Rev. 0-1800 rpm	88	50
6510LVR	3/8 drill Rev. 0-1050 rpm	114	67
6013BR	1/2" Drill Rev. 6 amp.	174	100
5402A	16" Circular Saw-12 amp	468	315
2414	14" Cut Off Saw-13 amp	282	169
3612BR	3 HP Plunge Router	286	180
9401	4x24 belt Sander w/bag	279	165

PORTER-CABLE

		List	Sale
630	1 HP Router	135	95
691	1½ HP Router D/handle	210	145
696	H.D. Shaper Table	150	105
695	H.D. 1½ hp Router/Shaper	278	190
514	2½ HP Router 12 amp	435	315
399	Drywall Cut-Out Unit	100	70
736	V/Speed *Speedtronic* Band Saw	450	330
7564	½ " X.H.D. Drill 8 amp	205	145

BOSCH TOOLS

		List	Sale
1581VS	Top Handle Jig Saw	225	128
1582VS	Barrel Grip Jig Saw	126	118
1604	1¾ H.P. Router	199	110
90900	Heat Gun 650° — 900°	99	65
1272	3x24" Belt Sander	259	159
1272D	3x24" Belt Sanderw/bag	274	169
1273	4x24" Belt Sander	274	169
1273D	4x24" belt sander w/bag	289	179

DELTA

		List	Sale
34-010	Motorized Mitre Box	231	149

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#50	for ¾" Black Pipe	11.23	7.40	80.00
#52	for ½" Black Pipe	9.36	6.10	67.50

JORGENSEN HAND SCREWS

Model	Jaw Length	Open Cap.	List	Sale	Box of 6
#5/0	4"	2"	11.59	7.25	39.15
#4/0	5"	2½"	12.45	8.10	43.75
#3/0	6"	3"	13.35	8.50	45.95
#2/0	7"	3½"	14.35	8.95	48.35
#0	8"	4½"	15.97	9.95	53.75
#1	10"	6"	18.25	11.35	61.25
#2	12"	8½"	20.94	13.50	72.95
#3	14"	10"	26.56	16.75	91.35
#4	16"	12"	34.55	23.75	128.25

JORGENSEN BAR CLAMPS

STYLE 37 — 2½" Throat 1/4" x 3/4"

Model	Jaw Length	List	Sale	Lots of 6
#3706	6"	7.88	5.50	29.70
#3712	12"	8.73	5.95	32.13
#3718	18"	9.64	6.95	37.53
#3724	24"	10.54	7.35	39.69
#3730	30"	11.76	8.25	44.55
#3736	36"	12.85	8.95	48.33

STYLE 39 — 3½" Throat 5/16" x 1"

#3906	6"	18.89	12.95	69.95
#3908	8"	19.45	13.50	72.95
#3912	12"	20.69	14.50	78.00
#3918	18"	22.55	15.85	85.50
#3924	24"	24.45	17.25	93.00
#3930	30"	26.16	18.35	99.00

STYLE 45 — 5" Throat 5/16" x 1 3/8"

#4506	6"	22.49	15.95	86.15
#4508	8"	23.04	16.50	89.10
#4512	12"	23.85	17.50	94.50
#4518	18"	25.16	18.95	102.35
#4524	24"	26.61	20.95	113.15
#4530	30"	28.06	21.95	118.50
#4536	36"	29.54	22.95	123.95

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		List	Sale
97650	½" dual range var/speed hammer/drill kit w/case	201	130
9614	½" D-handle hammer/drill kit w/case 8 amp 1500 rpm	254	165
97638	3/8" var/speed rev. hammer/drill kit w/case	171	120

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622	Fastner/drill var. speed 4 amp-2 *Tools in One* hvy dty 3/8" drill or twist collar to convert to a positive clutch Screw-driver 0-1000 RPM-Rev.	165	110
7541	Xtra hvy. duty tek driver 5.2 amp — 2000 rpm	159	105
7542VR	Xtra hvy/dty rev. tek driver variable speed — 5.2 amp — 0-2000 rpm	165	110

PORTER-CABLE

		List	Sale
314	4½" Trim Saw 4.5 amp	180	115
587	7¼" circ. saw 14.5 amp	199	130
315-1	7¼" circ. saw 13 amp	166	104
368-1	8¼" circ. saw 13 amp	176	119
9548	HD v/s bayonet saw w/case	255	179
648	H.D. single speed bayonet saw 3 amp	255	169
9627	2 sp. tiger saw kit 8 amp	183	120
336	3" x 21" belt sander	171	125
337	3" x 21" belt sander w/bag	181	115
361	3" x 24" belt sander	255	175
360	3" x 24" belt sander w/bag	275	180
363	4" x 24" belt sander	275	180
362	4" x 24" belt sander w/bag	290	190
505	H.D. ½ sheet finish/sander	165	105
330	spdbloc sander ¼ sheet sz	87	56
304	Professional 7" disc sander	160	105
305	Professional 7" polisher	160	105
7511	3/8"xtra hvy v/s drill 5.2 amp	154	100
7554	½" xtra heavy drill 8 amp	205	135
309	3.8 amp laminate trimmer	120	80
310	3.8 amp laminate trimmer	180	130
312	offset base laminate trim.	195	135
319	tilt base laminate trimmer	205	140
167	block plane 2.5 amp	129	86
9652	Versa-Plane Kit	419	285
9118	Porta Plane Kit	289	195
518	NEW 3 hp speedtronic 5 spd microprocessor prod/router 10-13-16-19-22,000 rpm	475	325
520	NEW 3 hp production router	435	275
100	7/8 H.P. router	134	88
690	1½ H.P. router	189	130
536	1½ H.P. speedmatic router	295	210
537	1½ H.P. D-Hdle router	310	218

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7544	5.2 amp — 2500 r.p.m.	154	100
7545	5.2 amp — 0-2500 r.p.m.	154	100
7546	5.2 amp — 4000 r.p.m.	149	100

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		List	Sale
3047-09	7¼" super Sawcat circular saw	226	150
3048-09	8¼" super Sawcat circular saw	240	160
3157-10	v/sp orb. jig saw 4.5 amp	174	115
4010	sander palm grip w/bag	80	45
2037	drywall 0-4000 rpm 4.5amp	139	89

AEG Power Tools

ROTARY HAMMERS

		List	Sale
PHE16RL	3.8 amp 5/8" capacity in concrete	269	175
PH 210	5.2 amp-3/4" capacity in concrete	398	260
PHE 20	Same as above — except var/sp 0-750	418	270
PHD 26	6.3 amp-1" capacity in concrete	495	320
PH 38	7.5 amp-1½" capacity in concrete	549	355

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CS 106	6 Pc. Carving Set	74.90	58.95
CS 112	12 Pc. Carving Set	139.90	110.95
TT 108	8 Pc. Turning Set	67.90	52.95
WC 104	4 Pc. Chisel Set	29.90	18.95
WC 106	6 Pc. Chisel Set	39.90	30.95
WC 110	10 Pc. Chisel Set	66.90	50.95

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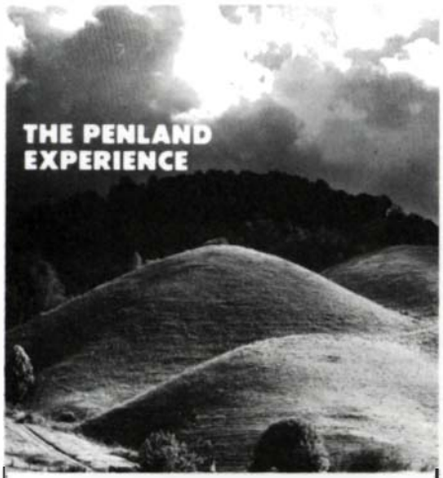
33-320	PL-320 ¾" x 20' Rule	16.95	7.95
33-425	PL-425 1" x 25' Rule	18.95	8.95
33-430	PL 430 1" x 30' Rule	20.95	9.95



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THE GOLD LEAF PEOPLE™, genuine, imitation sheets, rolls, supplies, and texts. In USA: Three Cross St., Suffern, NY 10901-4601. Canada: 454 Lawrence West, Toronto, Ont. M5M 1C4.

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Demos & Shows

WOODWORKERS: There is still time to apply for the next jurying at the National Craft Showroom, New York's wholesale showroom representing over 300 craftsmen. Act now! Send $1 for application and information. National Craft Showroom, 11 East 26th St., New York, NY 10010.

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CHAIR CANING SUPPLIES— Cane webbing, rush, splint, ash, rawhide, cord. Catalog $1 (refundable). The Caning Shop (FWM), 926 Gilman, Berkeley, CA 94710.

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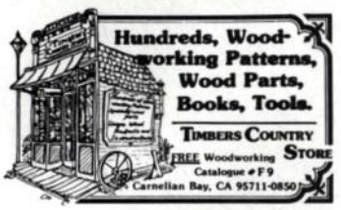

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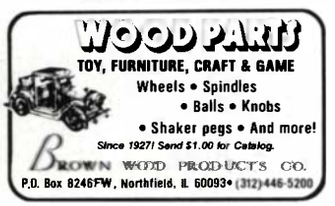

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Wanted: sources of black locust, osage orange. Thayer Jones, PO Box 995, Berkeley, CA 94701.

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18-36-in. bandsaw, 3-5HP shaper, 15-24-in. finish planer, 5-10HP rotary phase converter. Ed Horan, Rte. 1, Box 1626, Lewistown, MT 59457.

Listings are free, but restricted to happenings of direct interest to woodworkers. Our Sept./Oct. issue will list events between Aug. 15 and Nov. 15; deadline July 1. Our Nov./Dec. issue will list events between Oct. 15 and Jan. 15; deadline Sept. 1.

CALIFORNIA: **Workshops/classes**—Including furniture, carving, boatbuilding, restoration, finishing, home improvements, miniatures. Hands on Wood, Building F, Fort Mason Center, San Francisco. Contact Jon Lopez or Sherilyn Tharp, (415) 567-2205.
Show—4th Annual Design in Wood, June 20–July 7. Del Mar Fairground, Del Mar. Contact Southern California Exposition, Del Mar, 92014. (619) 296-1441.
Show—First Annual Wooden Boat, Sept. 21. On Main St., Mendocino. Contact Ft. Bragg-Mendocino Coast Chamber of Commerce, PO Box 1141, Ft. Bragg, 95437.
Exhibition—3rd Annual National Turnings, June 8–30. Artisan's Guild Store, 45050 Main, Box 1515, Mendocino, 95460. (707) 937-5300.
Exhibition—School of James Krenov, until June 30. Highlight Gallery, 45052 Main, Mendocino. (707) 937-3132.
Exhibition—Expressions in wood, furniture to small carvings, through July 11. Del Mano Gallery, 11981 San Vicente Blvd., Los Angeles, 90049. (213) 476-8508.
Workshop—Chair and seating, John Nyquist, June 24–29. Fullerton College, 321 Chapman, Fullerton, 92632. Contact Chris Feddersohn, (714) 871-8000 Ext 277.
Competition—Tri-Valley Woodcarving Circus, Sept. 8. Carnegie Park, 4th St. (between J and K Sts.), Livermore. Contact Liz Finigan, (415) 447-3186.

COLORADO: **Juried exhibition**—2nd Art of Crafts Festival, July 26-28. Denver Art Museum. Contact The Art of Crafts, PO Box 38233, Denver 80238. (303) 592-7238
Workshops—Numerous, June 17–Aug. 23. Anderson Ranch, Box 2410, Aspen, 81612. (303) 923-3181.
Show—Wood forms as furniture, accessories, sculpture, Robert Jorgensen, through June 28. Show of Hands, Inc., 2440 East Third Ave., Denver. Contact Deborah Kneale, (303) 399-0201.

CONNECTICUT: **Classes**—Woodturning, Richard Rafan, June 29–30; boatbuilding, July 8–Aug. 31. Brookfield Craft Center, PO Box 122, Brookfield, 06804. (203) 775-4526.
Juried exhibition—Contemporary boatbuilders, July 5–14. Brookfield Craft Center, 286 Whisconier Rd., Brookfield; July 20–28, Brookfield Craft Center, 127 Washington St., South Norwalk. Entry deadline June 15. Contact BCC Boatbuilding Exhibition, PO Box 122, Brookfield, 06804.
Juried exhibition—17th Celebration of American Crafts, Nov. 11–Dec. 23. Creative Arts Workshop, 80 Audubon St., New Haven, 06511. Entry deadline July 15. Send SASE and resume to Creative Arts Workshop. Contact Marnie Halsey, (203) 562-4927.

GEORGIA: **Exhibit**—Woodworking machinery, furniture, Sept. 6–9. Hall "A" of Georgia World Congress Center, Atlanta. Contact Cherif Moujabber, (203) 964-0000.

IDAHO: **Exhibition**—Contemporary Northwest furniture, Aug. 9–Sept. 15. Boise Gallery of Art and travel in Northwest. Boise Gallery of Art, 670 South Julia Davis Dr., Boise, 83702. Contact David Willard, (208) 345-8330.

ILLINOIS: **Juried exhibition**—6th Annual Fountain Square Arts Festival, June 29–30. Fountain Square, Evanston, outdoor show. Contact Evanston Chamber of Commerce, 807 Davis St., Evanston, 60201. (312) 328-1500.
Classes—Swiss method of chip carving, through Oct. 7. Alpine School of Woodcarving, 225 Vine Ave., Park Ridge, 60068. Contact Wayne Barton, (312) 692-2822.

In summertime, workshops blossom. The one shown above, at Ernie Conover's in Parkman, Ohio, gives the idea—everyone picks up some skills and goes home with a chair.

Workshops—Furniture conservation, one week classes, June 17–July 11; woodcarving, Wallace Gusler, July 11–13. Campbell Center, PO Box 66, Mount Carroll, 61053. Contact Laurie Scott (815) 244-1173.

INDIANA: **Juried show**—Lafayesta 1985, arts and crafts, Aug. 31–Sept. 1. $5,000 in prizes. Contact Sue Paschke, Greater Lafayette Museum of Art, 101 South Ninth St., Lafayette, 47901.

IOWA: **Show**—10th Annual Craft, Aug. 30-Sept. 2. Grounds of Traditional Country Music Assn. Inc., 106 Navajo, Council Bluffs, Iowa, 51501. (712) 366-1136.
Exhibition—19th International Woodcarvers Congress, June 19–23. Putnam Museum, Davenport. Contact Chet Salter, Affiliated Woodcarvers, Ltd., PO Box 406, Davenport, 52805.

MAINE: **Workshops**—High school, summer. New England Craft Program. Contact Jane Sinauer, 374 Old Montague Rd., Amherst. (413) 549-4841.
Workshops—Numerous, through Sept. 6. Haystack Mountain School of Crafts, Deer Isle, 04627. (207) 348-6946.
Show—Turned wooden vessels, Todd Hoyer, through June 23. Maple Hill Gallery, 367 Fore St., Portland, 04101. (207) 775-3822.
Show—Various crafts, July 26–28. Deering Oaks Family Festival, Deering Oaks Park, Portland, 04101.
Show—Designs in wood, Tony Lydgate, July–Aug. Maple Hill Gallery, 367 Fore St., Portland, 04101. Contact Lou Kimball, (207) 775-3822.

MARYLAND: **Juried exhibition**—20th Anniversary Maryland Crafts Council, Jan. 12–Feb. 28. Courtyard Galleries, Baltimore City Hall, Baltimore. $1,000 in awards. Entry deadline Aug. 1. Contact Nancy Press, Maryland Crafts Council Biennial, 6206 Lincoln Ave., Baltimore, 21209. (301) 358-7743.

MASSACHUSETTS: **Workshops/fair**—Extensive schedule. For calendar, write Old Sturbridge Village, Sturbridge, 01566. 6th Annual, traditional crafts, Nov. 2–3. Old Sturbridge Village. Contact Frank G. White, Old Sturbridge Village, Sturbridge, 01566. (617) 347-3362, Ext. 236.
Exhibition—Scent Bottle Invitational, July 5-Aug. 31. Signature galleries in Boston and Hyannis. Contact Signature, Dock Square, North St., Boston, 02109. (617) 227-4885.
Workshops/seminars—Numerous events: joinery, veneering, caning, turning, cabinetmaking, marquetry, finishing. The Woodworkers' Store, 2154 Massachusetts Ave., Cambridge. (617) 497-1136.
Courses—Timber framing, July 8–Aug. 9; cabinetmaking, July 8–12; and more. Heartwood Owner Builder School, Johnson Rd., Washington, 01235. (413) 623-6677.
Exhibition—Wooden puzzels, Stewart T. Coffin, Oct. 1–31. Worcester Library, Salem Square, Worcester. Contact Penny Johnson, Worcester Public Library, (617) 799-1660 or Joseph Lemire, (617) 757-2124.
Show/demonstrations—Small Expressions: Two Centuries of Little Furniture, through Jan. 1986; students of North Bennett Street School constructing traditional fine furniture, July 6, 13, 20–Aug. 3, 10, 17, 24, 31. Essex Institute, 132 Essex St., Salem. Contact Sally Miller NBSS, (617) 227-0155.

MICHIGAN: **Juried show**—Michigan Woodworkers Guild 5th Annual, Oct. 24–27. Somerset Mall, Troy. Contact Gregg Cornell, 3655 Musson Rd., Howell, 48843. (517) 546-3688.

MINNESOTA: **Workshops/seminars**—Numerous events: joinery, marquetry, veneering and caning. The Woodworkers' Store, 3025 Lyndale Ave. S., Minneapolis. (612) 822-3338.
Workshop—Annual summer woodcarving, July 28–Aug. 3. Villa Maria Retreat Center, Minneapolis. Contact Villa Maria Workshop, PO Box 37051, Minneapolis, 55431.

MONTANA: **Workshop**—Hand tool joinery, Steve Voorheis and West Lowe, July 8–14. Primrose Center, 401 West Railroad, Missoula, 59802. Contact Terry Young, (406) 728-5911.
Juried exhibition—Northwest Woods, functional and nonfunctional construction, sculpture and carving, Aug. 9–Sept. 20. Entry deadline July 1. Hockaday Center, 2nd Ave. East at 3rd St., Kalispell, 59901. (406) 755-5268.

NEVADA: **Juried show**—KNPR Craftworks Market, Oct. 26–27. Reed Whipple Center, 821 N. Las Vegas Blvd., Las Vegas. Entry deadline July 1. Contact Craftworks, 5151 Boulder Hwy., Las Vegas, 89122. (702) 456-6695.

NEW HAMPSHIRE: **Workshops**—Violin and bow maker's, June 17–Aug. 23. Univ. of New Hampshire, Durham. Contact Violin Craftsmanship Institute, Univ. of N.H., Div. of Continuing Education, Brook House, 24 Rosemary La., Durham, 03824. (603) 862-1088.
Fair—51st Annual Craftsmen's, Aug. 4–12. Mt. Sunapee State Park, Newbury. Contact League of N.H. Craftsmen, 205 N. Main St., Concord, 03301. (603) 224-3375.
Workshop—Timber frame, Ed Levin, Aug. 26–31. Dartmouth College, Hanover. Contact Peter Robbie, Hopkins Center, Dartmouth College, Hanover, 03755. (603) 646-2347.

NEW JERSEY: **Workshops**—Carving half hull boat models, Andrew Willner, July 1–3; Build a table, John Marcoux, July 8–10; Japanese tools, Toshio Odate, July 19–21; Handplane and dovetail box, David Van Hoff, July 23–Aug. 5–8; and more. Peters Valley Craft Center, Route 615,Layton, 07851. (201) 948-5200.

NEW MEXICO: **Workshops**—Tablesaw joinery, Scott Taylor, July 14. 423 Walter S. E., Albuquerque. Turning, Rob Sterba, Aug. 11. 12000 Prospect N.E., Albuquerque. Sponsored by Albuquerque Woodworkers Association. Contact William Pike, (505) 265-4077.

NEW YORK: **Juried exhibition**—2nd Annual Autumn Crafts Festival, Aug. 31, Sept. 1–2, Sept. 6–8. Lincoln Center, New York City. Contact Brenda Brigham, American Concern for Artistry and Craftsmanship, PO Box 6221, Hoboken, N.J. 07030. (201) 798-0220.
Juried show—Chautauqua Crafts Festival, '85, July 5–7, Aug. 9-11. Bestor Plaza, Chautauqua Institution, Chautauqua. Contact Gale Svenson, Chautauqua Crafts Festivals, PO Box 89, Mayville, 14757.
Workshops—Numerous hands-on classes, including Japanese hand tools, making a shoji screen, through Aug. 9. The Luthierie, 2449 West Saugerties Rd., Saugerties, 12477. Contact Bonnie Robiczek, (914) 246-5207.
Exhibition—"Designed and Made for Use," American Craft Museum, beginning January 1986. Entry deadline June 15. Contact "Designed and Made for Use," American Craft Museum, 45 West 45 St., New York, N.Y., 10036. Contact Susan Harkavy, (212) 869-9425.
Juried exhibition—Crafts: National, Oct. 6–Nov. 15. Upton Hall Gallery, State University College at Buffalo. Contact Chairperson, Design Department, S.U.C.B., 1300 Elmwood Ave., Buffalo, 14222. (716) 878-6032.
Exhibition—Best Design Concept, ready-to-assemble home furnishings, June 27–30. New York Coliseum, New York City. Contact Susan Becher, KDESIGN '85, Design Awards, Cahners Exposition Group, 999 Summer St., Stamford, Conn., 06905. (212) 496-1394.
Lectures/demonstrations—Windsor chairmaking, Mario Rodriguez, July 13; working with exotic woods, Joshua Hoffman, Sept. 9. Joshua's Trees, 113 North Seventh, Brooklyn, 11211. (718) 387-9016

NORTH CAROLINA: **Show**—High Country Crafters, Inc., July 4–7. Scaly Mountain, Route 106. Contact Elizabeth Kdan, (704) 254-0070.
Fair—Woodworking and upholstery, Aug. 1–3. Charlotte Convention Center, Charlotte. Contact Cherif Moujabber, Cahners Exposition Group, 999 Summer St., PO Box 3833, Stamford, Conn., 06905. (203) 964-0000.
Workshops—Green-wood chairmaking, Drew Langsner, July 8–12; toolmaking, Darry Wood, July 22–26; timber framing, Daniel O'Hagan, Aug. 5–9; Japanese woodworking, Carl Swensson, Aug. 19–23. Country Workshops, 90 Mill Creek Rd., Marshall, 28753. (704) 656-2280.
Fair—38th Annual Guild, July 18–21. N. C. Civic Center, Asheville. Contact Southern Highland Handicraft Guild, PO Box 9545, Asheville, 28815. Karen Canfield, (704) 298-7928.
Classes—Wood crafts of southern Appalachia, through November. John C. Campbell Folk School, Brasstown, 28906. (704) 837-2775.

OHIO: **Juried show**—American Contemporary Works in Wood, Sept. 21–Oct. 20. Contact American Contemporary Works in Wood, PO Box 747, Athens. Dick Mulligan or Linda Comeaux, (614) 592-4981.
Workshops—Woodworking, Tage Frid, June 17–21; John Greven, June 24–28; Geoff Eacker, July 11–13; Wendy Maruyama, July 15–19; Jim Killy, July 22–26. Miami University, Rowan Hall, Oxford, 45056. (513) 529-7395.
Exhibition—2nd Annual "Art by the Falls," June 15–16. Riverside Park, Chagrin Falls. Contact Dori Garey, Valley Art Center, 155 Bell Street, Chagrin Falls, 44022. (216) 248-4528.
Workshops—Including handtool techniques, joinery, turning, Windsor chairmaking, June 17–28. Conover Workshop, 18125 Madison Rd., Parkman, 44080. Contact Susan Conover, (216) 548-3481.
Exhibition—National Furniture Invitational, Oct. 4–Nov. 10. Entry deadline July 15. Sylvia Ullman American Crafts, 13010 Larchmere-Woodland, Cleveland, 44120. (216) 231-2008.

OKLAHOMA: **Show**—9th Annual National Woodcarving, July 12–14. Southroads Mall, 41st & Yale, Tulsa. Contact Jay Park, 492 W. 36th Place, Tulsa, 74107. (918) 445-0920.

OREGON: **Juried show**—Salem Art Fair and Festival, July 19–21. Bush Park, Salem.
Juried show—Riverfest '85, July 19–21. Clackamette Park, Clakamette Dr., Oregon City. Contact JoAnne Stalder, Oregon Tri-City Chamber of Commerce, 108 8th St., Oregon City, 97045. (503) 656-1619.
Demonstration—Woodturning, Bob Stocksdale, Aug. 3. Sitka Center, PO Box 65, off Highway 101, Otis. (503) 994-5485.
Workshop—Introduction to Japanese carpentry, Makoto Imai, July 15–20. Oregon School of Arts and Crafts, 8245 SW Barnes Rd., Portland, 97225. (503) 297-5544.

PENNSYLVANIA: **Juried exhibition**—19th Annual Sidewalk Sale and Exhibition of the Central Pennsylvania Festival of Arts, July 11–14. Penn State Campus, State College. Contact Lurene Frantz, Box 1023, State College, 16804. (814) 237-3682.
Juried exhibition—Luckenbach Mill Gallery, 459 Old

York Rd., Bethlehem, Sept. 14–Oct. 27. Contact Janet Goloub, Historic Bethlehem, Inc., 501 Main St., Bethlehem, 18018. (215) 691-5300.
Juried exhibition—"The Woodworker," Sept. 20–22. Philadelphia Armory (Drexel Campus). Contact Craft Market America, Box 30, Sugarloaf, N.Y., 10981. (914) 469-2158.
Festival—Hay Creek Valley, crafts, antiques, Sept. 6–8. Historic Joanna Furnace Plantation, southern Berks County (9 miles south of Reading, 3 miles north of Penn. Tnpk Morgantown interchange #22 on Rte. 10). Contact Hay Creek Valley Fall Festival, Box 36, Geigertown, Penn., 19523. (215) 286-0388.
Show—Super Craft Weekend, Sept. 20–22. Valley Forge Convention Center, King of Prussia. Contact Creative Faires, Ltd., PO Box 1688, Westhampton Beach, N.Y. 11978. (516) 325-1331.
Lectures/workshops/exhibitions—Symposium in American Lutherie, June 27–30. Williams Art Center, Lafayette College, Easton. Contact Dick Boak, Church of Art, 14 South Broad St., Nazareth, 18064. (215) 759-7100.
Class—10th NHLA Hardwood Lumber Grading, July 15–19. Mann and Parker Lumber Company, Constitution Ave., New Freedom, 17349. Registration deadline July 5. Contact Sharon French, (717) 235-4834.
Workshop—Turning, hands-on demonstrations, David Ellsworth, Kevin Kerwin, Albert LeCoff, Palmer Sharpless, June 15. George School, Route 413, Newtown. Contact Albert LeCoff, (215) 483-5401 days, or (215) 844-0151 evenings.
Juried show—Pennsylvania Festival of Fine Arts & Crafts, Sept. 13–15. Bucks County Fairgrounds. Contact United Craft Enterprises, Ltd., Box 326, Masonville, N.Y., 13804. (607) 265-3230.
Show—16th Annual Fair in the Park, Sept. 6–8. Sponsored by Craftman's Guild of Pittsburgh. Mellon Park, Pittsburgh. Entry deadline July 1. Contact Craftmen's Guild of Pittsburgh, PO Box 10128, Pittsburgh, 15232.

TENNESSEE: **Shop tours**—Tennessee Hardwood, daily M–F, 10-4:30. 800 Main St. (Hwy 70-S.), Woodbury, 37190. (615) 563-2223.
Workshops—Wood construction, July 1–12; turned bowl, July 15–19; turning and construction, Aug. 5–9; hollow vessels, Aug. 12–16. Arrowmont School of Arts and Crafts, PO Box 567, Gatlinburg, 37738. Contact Clare Verstegen, (615) 436-5860.
Workshops—Chairmaking, box making, furniture, joinery, turning, June 17–Aug. 2. Appalachian Center for Crafts, Route #3, Smithville. Contact Wendy Maruyama, Appalachian Center for Crafts, Box 347, Rt. #3, Smithville, 37166. (617) 597-6801.
Juried show—Third Mississippi River Folkfest Crafts Fair, Aug. 31–Sept. 2. Entry deadline, June 21. Contact Kate Pouncey, Mud Island, 125 N. Mid-America Mall, Memphis, 38103. (901) 528-3685.

UTAH: **Festival**—16th Annual Park City Art, Aug. 3–4. Historic Main St., Park City. Contact the Kimball Art Center, PO Box 1478, Park City, 84060. (801) 649-8882.

VERMONT: **Exhibition**—Rare tools and machines, ongoing exhibit. The American Precision Museum, Windsor. (802) 674-5781.
Exhibition—12th Annual Woodcarvers, Aug. 17. American Legion Hall, Main St., Morrisville. Contact C.A. Brown, Box 268, Waterville, 05492. (802) 644-5039.
Exhibitions/workshops—Series at Vermont State Craft Center at Frog Hollow, Middlebury, 05753. (802) 388-3177.

VIRGINIA: **Show**—11th Annual Woodcarving, "Artistry in Wood," Nov. 30–Dec. 1. Marymount College, Glebe Rd. & Old Dominion Dr., Arlington. Contact Charles Schafer, 7014 Murray Lane, Annandale, 22003. (703) 256-2779.
Juried exhibition/workshop—Southeast crafts, Spotlight '85, June 25–July 26. Bedford Gallery, Longwood College, Farmville. Sponsored by the ACC Southeast Region. Contact Spotlight '85, Art Dept., Longwood College, Farmville, 23901. (804) 392-9359. Sam Maloof, June 27–29. Campus of Longwood College, Farmville. Contact Mark Baldridge, Art. Dept., Longwood College, Farmville, 23901.
Fair—10th Annual Richmond Craft, Nov. 8-10. Richmond Arena, Richmond. Contact Ann Vazquez, Hand Workshop, 1001 East Clay St., Richmond, 23219. (804) 649-0674.
Seminars—Decoy Carving, June 28–30 and July 26–28. P.C. English Enterprises, Inc., 906 Lafayette Blvd., Fredericksburg. Contact P.C. Enterprises, PO Box 7937, Fredericksburg, 22404. (703) 371-1306.
Juried show—1985 Handcrafts, Oct. 25–27. Radisson Hotel, 601 Main St., Lynchburg. (804) 846-8451.
Show—2nd Annual International Creative Marquetry, Oct. 1–27. Virginia Wesleyan College, Norfolk. Contact ICMS, 1501 Mill Dam Rd., Virginia Beach, 23454. (804) 481-4567.

WASHINGTON: **Seminar**—Kasha design guitarmaker's classes, June 30–Aug. 3. Lost Mountain Seminar, 754 Lost Mountain Rd., Sequim. Registration deadline June 20. Contact Lost Mountain Seminar, PO Box 304, Sequim, 98382.
Workshop—Hands on Japanese joinery, June 23. Neu Woodworks Shop, 1311 N. 35th St., Seattle. Contact Charlie Mastro, 4268 10th Ave. South, Seattle, 98108. (206) 767-9185.
Show—Anacortes Art and Craft Festival, Aug. 3–4. Anacortes Arts and Crafts, PO Box 6, Anacortes, 98221. (206) 293-6211.

WISCONSIN: **Workshop**—Third Annual Festival of Wood, June 28–30. University of Wisconsin-Stout, Office of Continuing Education, Menomonie, 54751. In Wis., (800) 277-8686, outside Wis., (800) 457-8686.
Show—10th Annual Art Festival and Waterfowl, July 13. Delafield Municipal Bldg (near State Fish Hatchery), Delafield. Contact Lake Country Carvers & Whittlers, c/o Rich Riemenschneider, 37935 Genesee Lake Rd., Oconomowoc, 53066. (414) 965-2513.

ONTARIO: **Show**—Sculpture, furniture, instruments, woodcarving, Aug. 9–11. Durham Community Center, Jct. Highways 6 and 4, Durham. Contact The Wood Show, Box 920, Durham, Ontario, Canada N0G 1R0. (519) 369-6902.
Exhibition—Summer pleasures/summer treasures, including woodcarvings, Daniel Griffith, June 15–Aug. 31. Heritage Hallmark, Brockville. Contact Heritage Crafts, Sheridan News, King St. West, Brockville, K6V 5W1. (613) 342-2521.
Juried exhibition—Designed by Commission, July 24–28. Harbourfront, 235 Queen's Quay West, Toronto.
Show—Christmas Craft, one of a kind, Nov. 1985. Automotive Building, Exhibition Place, Toronto. Contact The Canadian Craft Show, 2 St. Clair Ave. East, Suite 202, Toronto, M4T 2T5. (416) 960-3680.
Seminar—Woodturning with Michael O'Donnell, Sept. 14. Chalet Woodcraft, RR 4, Waterford, Ontario N0E 1YO. Contact Jeff Parsons at Chalet, (516)-443-7121.

SASKATCHEWAN: **Conference**—Contemporary furniture design and technique, Aug. 3–5. Kelsey Institute of Fine Art and Science, Idylwyld Dr. 33rd E., Saskatoon. Application deadline June 15. Craft Council, Box 7408, Saskatoon, S7K 4J3. Contact Craft Council, Michael Martin, (306) 653-3616.

Timber Monographs by Edmondo Palutan. *Edmondo Palutan, Milan, Italy; 1981. Three-volume set available in English from Stobart & Sons, 67-73 Worship Street, London EC2A 2EL, England; £27.50 per volume.*

This work is an English translation of the Italian original (also available in French) which does not seem to have received the publicity it deserves. Its unique features lie in its format: each of the three volumes is an elegant "loose-card" binder consisting of forty 8-in. by 10-in. cards. Each card has a 4-in. by 5½-in. veneer sample pasted on its face and technical data about the wood species printed on the reverse. I understand that the publisher's future plans call for releasing additional cards, which can then be instantly added to the existing binders.

Admittedly, there are already a number of good, readable books on timber species on the market, like Constantine's *Know Your Woods* (Albert Constantine and Son, Inc., 2050 Eastchester Road, Bronx, N.Y. 10461, $17.95) or books with real samples like Edlin's *What Wood Is That?* (The Viking Press, Inc., 625 Madison Ave., New York, N.Y. 10022. $16.50). But compare Edlin's forty ⅞-in. by 3-in. samples with Palutan's one-hundred-twenty 4-in. by 5½-in. samples, and the difference in ambition between the two becomes immediately apparent—and thereby amply justifies the difference in cost as well.

As always, the selection of species can be endlessly argued. Palutan's three volumes adequately cover the species that are currently available on world markets, unlike some older books that deal with species that seem to have disappeared from world trade nowadays. As might be expected from a European book, this selection is heavily biased toward European and African timbers. Some, like macassar ebony or American black walnut will be familiar; others, red African ivorywood or lampati from Asia, may not. So, though the book won't settle any arguments about many domestic American woods, it will help identify the latest exotic to show up in town. —*Antoine Capet*

The Art of Making Furniture in Miniature by Harry W. Smith. *E.P. Dutton Inc., 2 Park Ave., New York, N.Y. 10016; 1982. $21.95, paperback; $32.50, cloth; 288 pp.*

I have often complained that authors of how-to books on trade or craft often seem to give enough information to satisfy their publisher, but alas, leave out their "real secrets." Harry Smith is a notable exception to this unfortunate tendency. *Making Furniture in Miniature* is the most complete treatment of the subject available between two covers. Smith is a highly accomplished craftsman who clearly feels no threat to that status and, therefore, is completely open and frank about his methods, materials and tricks.

Much as the craft of bird carving is divided between coldly exact realism on the one hand, and more artistic, impressionistic carving on the other, scale furniture making—indeed modelmaking in general—includes roughly two types. First are the magicians, often machinists, pattern-makers or tool-and-die makers, who, using any and all methods (even those not true to the original), produce models of incredible perfection that stand scrutiny, even under intense magnification. Then there are the miniaturists who, while no less talented, reproduce less for microscopic perfection than for the true feel of the original, only in tiny scale. The latter is the world that Smith opens up to us. If you cut with a saw in full scale, well then, cut with a saw in miniature; if wood is joined with pinned mortise and tenon, then by all means, tiny tenons shall be locked with hair's-breadth pins into minuscule mortises.

The only serious objection I make to Smith's techniques is his use of "full-scale" wood on miniature furniture. Walnut, mahogany, and especially oak grain and fiber pores are enormous in small-scale work, and appear at best, as entirely different woods, and at worst, almost worm damaged. Smith acknowledges the difficulty of matching scale to original wood, but uses that difficulty to justify his use of original species in scale. I would suggest experimenting with dense, tight-grained substitutes for the real thing. When properly colored, heart apple, dogwood, and hornbeam all work very well as "scale wood." These woods will also hold a sharper, cleaner edge when cut, a necessity for the small-scale carving and shaping that a person with less than Mr. Smith's skills might have difficulty doing on the softer or more open-grained original woods.

A real plus are the book's completely legible and relevant photos and drawings. Smith is a skilled commercial artist and illustrator, and has done all of his own art work, ensuring that nothing is lost or misunderstood as sometimes happens between author and illustrator.

The first six chapters bring the reader down to scale with an extensive discussion of tools, materials and methods. This is reinforced and elaborated upon with the construction of 18 different miniatures from Pilgrim to Victorian styles.

Familiarity with full-scale furniture and its construction techniques would certainly be helpful, and a fair mastery of woodturning is essential for the prospective miniaturist, but Harry Smith supplies the rest. —*Michael Sandor Podmaniczky*

The Forgotten Crafts by John Seymour. *Alfred A. Knopf, 201 East 50th St., New York, N.Y. 10022; $18.95, hardcover; 192 pp.*

John Seymour is one of those sorrowful, lost souls who, like the followers of King Lud, actually believes in the possibility, as well as the good, of reversing the progress of the techno-industrial society. To this end he has produced a staggering compilation of sixty-plus crafts and trades existing at various points along the brink of extinction.

Seymour's introduction will be a bit tedious for those who returned from Back-To-Nature somewhere around 1970. "Boredom he (the olde craftsman) is a stranger to," for example, could only have been written by someone who wasn't born into a life such as led by the poor Joe on page 29, glimpsed driving home yet one more of a never-ending procession of ladder rungs. Even Mickey Mouse had it better with those parading brooms. Though I am not at all tempted by them, these archaic ways of scratching out an existence nonetheless interest me as novelty: chair bodgering to hedgerowing, wheelwrighting to peat cutting, coach making to millstone dressing. No *Foxfire* book, this merely describes each craft in one to four pages, depending on the author's familiarity or interest.

I would say that 25% to 30% of this book is "wood related," but being illustrative rather than instructional, it all makes pleasant reading. Remarkably clear and detailed illustrations by Eric Thomas contribute greatly to this very attractive and well-designed book. One could live without it, but I'm glad to have my copy. —*Michael Sandor Podmaniczky*

Build It with Plywood: 88 Furniture Projects by Don Geary. *Tab Books Inc., Blue Ridge Summit, Pa. 17214; 1983. $13.50, paperback; 295 pp.*

Mother's 101 Workshop Projects. *The Mother Earth News, Inc., Hendersonville, N.C. 28791; 1984. $14.95, paperback; 207 pp.*

People often assume that I learned woodworking from my father since, during the 50s and 60s when I was in school, girls didn't take shop. But Dad is hardly what you would call handy

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with tools; he once nearly cut off his thumb with a handsaw. I learned almost all I know about woodworking—enough to make a living as a cabinetmaker—from books and magazines.

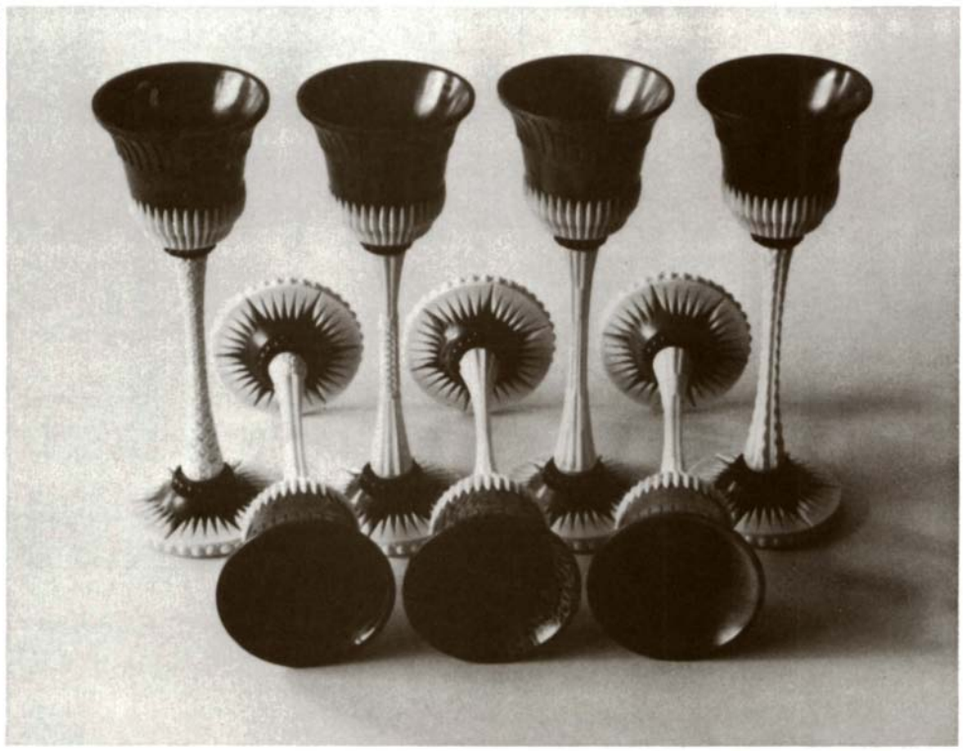
I used to buy and read just about anything with "wood" in the title. The field was less crowded than it is now, but I still acquired a lot of almost useless material. Eventually, I realized that woodworking books that aren't very good all suffer from the same problems and, by flipping through most books, it's easy to tell which ones will be useful and which ones won't. I avoid books that have lengthy general discussions of tools and techniques (unless they're books strictly about technique), those that have artwork that is poorly reproduced or not original, and those that illustrate projects exclusively with line drawings rather than photographs.

Build It with Plywood: 88 Furniture Projects is exemplary of everything I do not want in a woodworking book. Don Geary spends two-thirds of his book discussing plywood manufacturing, hand and power tools (including mention of the lathe), woodworking techniques and finishing. While every woodworker needs to know the information Geary presents, every woodworking book does not need to reiterate it. This section of the book is copiously illustrated with blurry, half-page photos of such things as an ordinary electrical outlet or three finishing nails, and more-focused pictures supplied by power tool and plywood manufacturers and associations. For the most part, the text explains basic technique adequately, but the pictures of isolated and static tools, fasteners and paint brushes would be more appropriate in a dictionary or an advertisement than in this expensive handbook.

Two of the 88 projects are shown on the cover in the book's only full-color photograph, the rest are presented in the author's drawings and some drawings supplied by Georgia Pacific and the Hardwood Plywood Mfg. Association (although additional sources are credited in the introduction). I am skeptical of such presentations. I once made a love seat that gave you whiplash every time you sat down on it because the back was too low—the drawing in the magazine looked really comfortable. I have not made any of Geary's 88 projects; they may all work out fine, but that's only part of it. With even the simplest furnituremaking there is an element of sculpture. Evolutions in design occur during and because of actual construction. I want to learn woodworking from this process, whether it is mine or someone else's, and in books I expect to learn from work that has actually been done at least once by someone, preferably the author.

I expect books about woodworking to be written and edited with the same care and consideration for design and materials that I give to my work. Where *88 Plywood Projects* failed to do this, *Mother's 101 Workshop Projects* succeeds. The projects cover a range from a plain pine table to a welding table, with toys and tools and all sorts of other neat stuff in between. There's no extraneous material here. Photographs are clear, many in color, and someone has carefully made and documented each project. Unfortunately, the editors decided not to tell us who these craftspeople are. This book is too eclectic to buy sight unseen, but if you have been trying to come up with a squirrel-proof bird feeder or have always wanted to make a boomerang, here are clear plans supported by careful explanations. —***Ann Taylor***

Antoine Capet teaches at the University of Rouen in France. Michael Sandor Podmaniczky builds boats in Thomaston, Maine. Ann Taylor makes furniture in Winnetka, Ill.



Bill Thurlow

Ornamental turner Fred Howe made these goblets identical in form, but used different woods for the cups and bases, which are connected by ivory stems and blackwood collars and spacers. The seven pieces of each goblet screw together.

Turned on

Half the joy of woodworking is in the tools—their sharpness, balance, finish and feel. Last winter at the Science Museum in London, England, I saw what is without a doubt the ultimate woodworking tool: an 1894 Holtzapffel Ornamental Lathe, at today's prices $100,000 worth of precision-engineered brass, steel, rosewood, ivory, and mahogany. It was made and finished so beautifully that I admired it as much as the real object of the show—turned and elaborately decorated pieces made on the lathe (or one similar) by Fred Howe, considered by many to be the finest ornamental turner of this century.

In an ornamental turning, the extremely complex and precise surface decoration is far more important than the turning itself. The decoration is worked by a galaxy of small shapers and tiny cutters that can be mounted on the machine. If you've tried to flute or reed round chair legs using a router and jig suspended over a lathe, you have some inkling of the process. Multiply the complexity of the ornamentation by a thousand, imagine machinery so precise that the Bank of England used Holtzapffel vertical lathes to produce the intricate patterns for banknotes and stamps, and you will have a fair idea of what ornamental turning is.

On view at the museum were two dozen of Howe's elaborately decorated cups, bowls, goblets and salt cellars, all superb examples of delicacy and precision. Howe, like other ornamental turners, worked with exotic materials, primarily ivory, lignum vitae and African blackwood. These take minute detail well, and their intense colors make a strong impact even in small pieces.

Particularly striking was a chalice made from an ostrich egg, ivory and African blackwood. Use of the slightly rough, off-white ostrich egg was an inspiration. Its large, undecorated form contrasted beautifully with the fineness and sophistication of the ornamented ivory. I thought that it was the most imaginative piece in the show. Also impressive was a set of twelve wine goblets (seven are shown above). Identical in shape, the goblets are distinguished by subtle differences in ornamentation and by the use of a different rare wood in each.

About 2,600 Holtzapffel ornamental lathes were made between 1790 and World War I. The lathes were originally intended as amusement for the rich, and though ownership is less restricted today, the machine's scarcity and complexity limits use to devoted enthusiasts. The Society of Ornamental Turners, one of the show's sponsors, represents 350 of these devotees, most in the USA and Britain. It provides a forum for sharing technical knowledge and skills, publishing a bi-yearly journal and staging regular meetings. For information, write the Society's secretary, Phil Holden, 17 Chichester Drive East, Saldean, East Sussex BN2 8LD, England.—*Ben Bacon, London, England*

White-knuckle joinery

I was out of my depth and Patrick, the shop foreman, knew it. His sharp eyes watched and waited as I wished a hundred times to be anywhere but in this joiner's shop confronted by such a bewildering pile of sticks. "How," I asked myself, "did I get in such a fix."

Recently married, my wife and I arrived in a tiny English village with dreams of earning a living woodworking. But apart from an occasional antique repair and the odd piece of furniture, unknown joiners went hungry. Faced with more debts than food, we prayed for work and so it was with considerable expectation that I spoke with Norman, owner of a joinery firm in town, when we were introduced at one of our church socials. "Another one of your woodwormers" my friend said, grinning, as he left us to get acquainted.

Norman's firm was large and well known for its high standards. He asked me if I could make showcases. "Oh yes," I told him, "that's just the sort of work I like most...." This was almost as much news to me as it was to him. But Norman saw more than I realized at the time. It was a credit to his generosity that he gave me a job.

Monday morning found me rushing in, as fools do, to a situation somewhat different than I had imagined. There was no wooden arts and crafts barn, no old molding planes and hand tools hanging from the walls. My confidence decreased in inverse proportion to the size and number of machines that arose like steel dinosaurs from a concrete swamp. Chain and chisel mortisers, 3-ft. wide planers, tenoners, molding machines, and many others unknown to me. My tour and the last of my confidence came to an abrupt end with an introduction to Patrick, the foreman. Never had I seen a man with such a scowl (I found out later that he suffered from severe indigestion). His gaunt and pock-marked face rarely smiled. Known for a sharp and bitter tongue, his Irish blood simmered beneath a mat of red hair, and I was to become well acquainted with that hooked nose down which he would glare at me after silently examining my work.

Without ceremony I was shown to my bench, one of ten in the assembly room. Patrick wasted no time, dumping a pile of molded stiles and rails on the bench. "Put these together," he said, and walked off. No instructions, no plans and nothing to copy. Palms sweating, I arranged my tools and tried to appear nonchalant. An air of quiet industry filled the assembly room. Eight men besides myself busied themselves on every imaginable type of showcase. With half an hour gone and nothing accomplished, I turned, only to find myself trapped by the withering stare of Pat-

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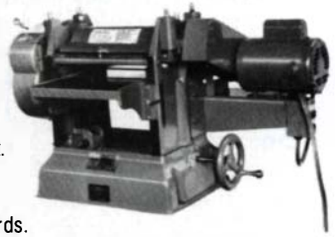

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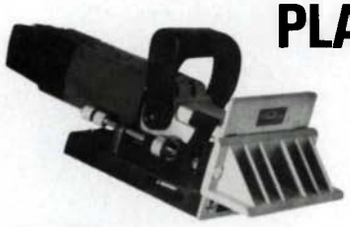

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rick, who had crept up behind me. My ears burnt as I stammered, "Where's the plans Patrick? How am I supposed to put this lot together without drawings?" He fixed his eyes on me like a cat watching a mouse. "You'll find the rods over there..." he said and pointed to a shelf on the wall. I walked across the room with a powerful sinking sensation in my stomach. "Rods?—what on earth are rods," I said to myself, picking up a small roll of quite unintelligible plans. Another half hour slipped by as I watched out for Patrick and tried to make some sense of what lay before me. All to no avail.

Into this tense and humiliating situation came an angel by the name of Brian, who worked at the adjacent bench. Quietly and calmly he explained the sequence of assembly and by watching him (when Patrick was absent) I began to make some progress. A short, dapper man in his early forties, Brian always came to work wearing a jacket, slacks, shirt and tie, replacing his jacket with clean white overalls before starting. A "rod," Brian showed me, was a type of plan in which all the dimensions, sections and joints were drawn in one plane only, no elevations. As time passed we became firm friends.

"This was the end. Patrick had won, and to the victor the spoils would go—my pride and my job."

Tuesday found me gluing my first frame. Joints had to fit perfectly, no forcing. Every frame was hand scraped, not sandpapered. Things went well enough until I noticed Patrick hovering in the background. Suddenly, like a hawk, he hovered above me. "Run a quirk with the Elu on the inside edge of that case will you?" he said pointing to a small display case at the far end of the room. Incomprehension soon turned to panic as Brian explained that a quirk was a small rabbet, or reveal, on the edge of a frame and the Elu was a router, something I had never used before. Crouched over a $3,000 showcase with this screaming machine in my hands brought me to new heights of anxiety.

In between my skirmishes with the shop foreman, work was bearable, but only just. Mistakes (by others) were rare. Exacting demands produce pressure, and I didn't work well in such an environment. I spent the next few days assembling more frames. No one mentioned speed. Quality was number one. During this time Patrick left me alone, but I sensed he was biding his time. As the youngest joiner in the shop I knew there were more tests to come.

I didn't have long to wait. One morning I found Patrick scrutinizing my door frames. With a casual flick of the wrist, he pointed to an enormous showcase. Four doors, totaling 14 ft. wide and 7 ft. high, were to be hung within the face frames. The case lay on its back like some stranded boneless whale, for the particleboard carcases had little, if any, inherent strength. For once Patrick spelled out what he expected. "One-sixteenth-inch clearance all round" he said. "No more, no less. Be sure to use the steel hinges, four per door, and set the knuckles flush with the face frame and tight in the quirk." Site carpenters replaced the steel shop hinges with brass ones and the narrow clearance was acceptable for showcases that were rarely opened.

I ruefully examined the job. No hinge templates or routers could help me. Thirty-two hinge mortises in hard ash, chiseled to a hairline, then handplane and scrape the frames to fit. My oilstones never had so much use, nor my arms for that matter. Two days of nerve-racking labor later I stood back, weary and triumphant. Not a scratch marked the frames. Everything aligned and the case here, still on its back, fitted, scraped, polished and above all, conquered. I sidled up to Patrick, suppressing a grin. "What's next, Patrick me boy," I said in my best fake Irish brogue, his icy stare bouncing off my smugness. Without a word he strode over to my showcase. Unsuspecting I followed, sure of my work. With not so much as a glance at fit or finish he peered inside. For a second I saw a gleam in his eye as he turned slowly toward me, "You boned it first of course, didn't you?" he said, his face expressionless, and before I could think he spun on his heel and was gone.

Ah, that moment lives on still! And worse was to come. Heart pounding, I shot over to Brian. "Boning" he said, was standard practice for all large cabinets that were to be transported and installed, whereby sides and case were plumbed and squared in order that proper installation would duplicate the fine fit achieved in the shop. Awful realization dawned. I had hung every door in the case as it lay and never a thought to check the thing for squareness.

This was the end. Patrick had won, and to the victor the spoils would go—my pride *and* my job. I wandered over to the evidence and in hopeless defeat flipped my tape across the diagonals. Wait a moment. I grabbed a level, checking over my shoulder that no one was watching. Strange, the case was level. A few more checks and I let out a stifled woop. It was square! How could that be? As I turned I caught sight of Brian sharpening a chisel—with just the breath of a smile upon his face.

—Chris McMinn, Santa Rosa, Calif.

Gordon Hodge

Robert Emmett built his version of a traditional walnut highboy with ball-and-claw feet and carved knees in the 1960s.

Robert G. Emmett school to open

A group of former students and associates of Robert G. Emmett is organizing a school dedicated to the Knoxville, Tenn., cabinetmaker and the art of fine furniture-making and restoration. Emmett, who spent much of his life studying and reproducing American period furniture (*FWW* #23, pp. 32-35), died in 1983 at age 81.

Michael Perrin, president of the Emmett Foundation, said plans call for the school to open a 7,000-sq.-ft. shop in the former Van Gilden School in Knoxville's historic Mechanicsville district in six to nine months. Initially, the school will concentrate on seminars and part-time courses on cabinetry and furniture work, but the goal is to establish a full-time institution as soon as possible.

A former Emmett student himself, Perrin says the school will be a fitting tribute to his teacher, who was always eager to pass on his skills to young people who wanted to learn. "Bob revered the old masters, but felt we ***must*** try to improve, learning from their mistakes." He also stressed that old-world hand skills and modern machine technology could complement each other in the quest for quality work. For more information about the school, write to Perrin at Rt. #7, Emory Road, Knoxville, Tenn. 37938.

Arise ye artificers!

The other day, while browsing through Funk and Wagnalls *Standard Handbook of Synonyms, Antonyms, and Prepositions*, I came across the word, "mechanic." Among the words listed as a synonym was "artificer." My curiosity having been piqued, I read on. The book suggested than an artificer is somewhere between an artist, who creates things and "holds to the aesthetic sense," and an artisan, who "follows the mechanical or industrial sense of the word." An example was given that an artist is one who paints a beautiful picture while an artisan is one who makes pin heads all day. Pin heads? Aw, come on, gentlemen, with all due respect!

An artificer, continues Funk and Wagnalls, puts "more thought, intelligence, and taste into his work than the artisan, but less of the idealizing, creative power than the artist." Whew! Pretty heady stuff! Undaunted I decided to investigate the subject further.

The Oxford American Dictionary defines artificer as "a skilled or artistic manual workman, a craftsman, an inventor." *Webster's Collegiate* differs only by replacing inventor with "one that makes or contrives." Both define artisan as a skilled manual workman in industry or trade.

This caused me to start thinking about the word "artisan" as commonly used in describing not just highly skilled, but also highly creative woodworkers producing unique, original designs. Artisan sounds as if it ought to describe someone making things in an artistic, or creative manner. However, the word by definition, to put it somewhat crudely, implies that the person merely knows how to cut a straight line and can do a mean job of gluing boards together. I'm not sure that this is the connotation most people want to give when they describe an outstanding woodworker as being an artisan. On the other hand, maybe they do....

At any rate, to continue this word game, the way I see it, when you conceive a design for a functional piece, drawing not only on the traditional foundations of woodworking knowledge, but also injecting into those foundations original concepts of design, you are close to, if not in fact an *artist-designer*.

When you make a conscious selection of wood for grain and color to not only best express the inherent beauty of that wood, but to also best complement the intent and the structural requirement of the design you conceived, you are an *artificer*.

When you lovingly hand-cut dovetail joints of impeccable quality and skillfully transform rough pieces of wood to silky smoothness, you are functioning as an *artisan*.

You are taking on the role of a *mechanic* when you set up your machinery for different operations. And, after setting up the machine, you can put on yet another hat and render service as an *operative* making repetitive machining operations.

Needless to say, all of this pedantic exercise in semantics comes to a screeching halt when you look out the front window and see a lumber truck waiting to be unloaded. Artificer, artisan, who cares? You go out and haul all that lumber into your shop, working as a laborer. Now I'll bet there isn't going to be much dispute about the use of that word.

—*Yosh Sugiyama, Redding, Calif.*

Product review

CO-ST Cutters, *LRH Enterprises, Inc., 6961 Valjean Ave., Van Nuys, Calif. 91406.*

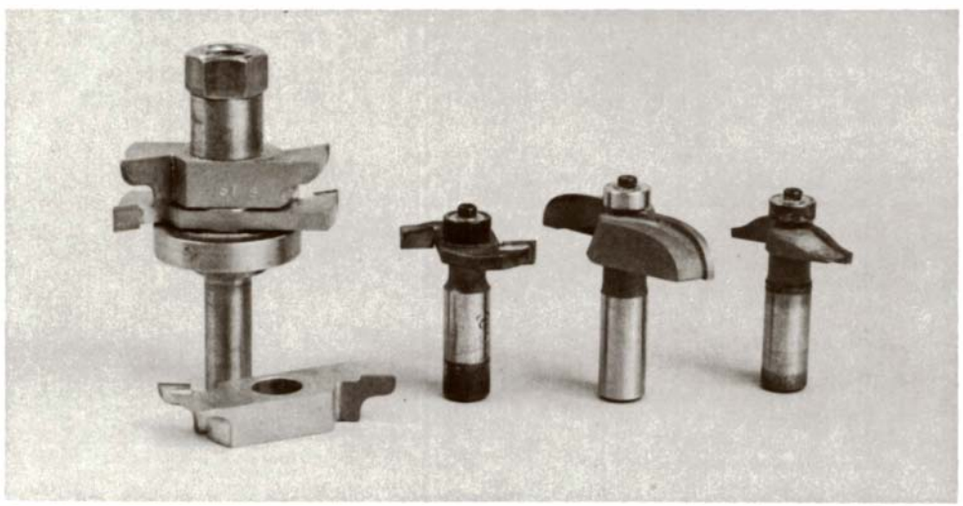
Cope-and-stick router bits, *Furnima Industrial Carbide Inc., Box 308, Barry's Bay, Ont., Canada K0J 1B0*

Cope-and-stick is a useful method of shaping and joining the rails and stiles of doors and windows. The "coped" rail end mates to the "stuck" stile edge, producing a joint that appears to be mitered.

The method's disadvantage has been the cost of setting up to do it. Only production work justifies the $1,000 price tag on a set of cope-and-stick cutters for a 1-in. spindle shaper. If you're only remodeling your kitchen or building a few doors, that kind of expenditure just doesn't make sense. Sets of ¼-in. cope-and-stick router bits are available, but the work they'll do is severely limited. For years I searched in vain for larger, sturdier sets at reasonable prices.

Now that powerful ½-in. collet routers are more readily available, several moderately priced heavy-duty cope-and-stick router sets have appeared. Here's what I found when I tried two of them.

Furnima offers a three-bit set that cuts cope, stick and raised panels. A reversible ogee does the coping and sticking; a slotting cutter (available in various widths), panel raiser and detailed instruction manual complete the outfit. (A version for ¼-in. collet routers has a smaller diameter panel raiser—I tested the ½-in. set).



John Birchard

Cope and stick for the masses: LRH's CO-ST bits (left) are two-wing cutters stacked with bearings on a ½-in. arbor. (The matching cope cutter sits by the arbor.) Furnima's three-piece set includes a slotting cutter, panel raiser and reversible ogee.

Furnima president Rob van Nieuwenhuizen says he wanted "to provide people who do not have access to expensive machinery the opportunity to make good quality panel-and-frame doors." His sets certainly accomplish this, but as a professional, I found the four separate set-ups needed to make all the cuts to be quite cumbersome. The depth of cut is always determined by the ball-bearing guides, but if your height adjustments aren't just right, the joints will gap. Of the several sets of cabinet doors I made with the bits, I had to hand-pare just about every joint to get a good fit.

The ½-in. long stub tenon, though, should be strong enough to hold a cabinet door together without dowel reinforcement. Also, the router's high speed makes for very smooth cutting. Even end-grain cuts on my raised panels needed only a light touch with steel wool. The extra-thick carbide chips can be re-sharpened many times. Though Furnima's bits could not handle full-sized entry doors 1½ in. to 1¾ in. thick, the different-sized slotting cutters offered make it possible to work doors up to 1¼ in. thick.

At a little under $100 for the entire set, Furnima's is certainly the most inexpensive

INDEX TO ADVERTISERS

Addkison Hardware	109	Freeborn Tool	102	Paxton Hardware	8
American Design & Eng.	83	Freud USA	20, 21, 27	Penland School	90
American Woodcrafters	90	Furniture Designs	96	Philipps Bros. Supply	95
The American Woodworker	90	Garrett Wade	17, 88, 101	Porter Cable	24 25
AMI	13	Gilliom Mfg.	99	Primrose Center	94
Armor Products	99	Grizzly Imports	22, 26	Pro Tools	17
Arrowmont School	90	Guild of Master Craftsmen	90	Qualitech Products	103
Aviation Industrial Supply	86	Hardwoods of Memphis	105	Quest Industries	84
Ball & Ball	13	Herman Miller	105	Real Woods	105
The Bartley Collection	19	Hida Japanese Tool	102	Reliable Grinding	78
Berea Hardwoods	13	Highland Hardware	84	Ring Master	86
Biesemeyer Mfg.	11	Hiller Hardware	15	The Rustic Shop	107
Black & Decker	111	Hock Handmade Knives	99	The Sawmill	98
Blue Ball	103	Horton Brasses	107	Seven Corners Ace Hardware	85, 89
Box-Art	109	Hot Tools	99	Shophelper	78
Brady Corp.	107	House of Tools	98	Singley Specialty	97
Bratton Machinery & Sup.	83, 88	HTC Products	95	Sunhill Enterprises	5
Cane & Basket Supply Co.	96	J. Philip Humfrey	98, 107	The Taunton Press	79, 80, 81, 82, 82A-D
Cascade Precision Tools	96	Imported European Hardware	96	Trend-Lines	9, 85, 99
Chapman Mfg.	24	Industrial Abrasives	5	Tru-Grip	15
Cherry Tree Toys	107	Intl. Woodworking Equip.	87	U.S. Mahogany	105
Classified	91, 92, 93	Jegt Industries	13	Wetzler Clamp	84
Colonial Saw	19	Jesse Jones Industries	109	Wilke Machinery	85
Maurice L. Condon	103	Keller Dovetail Templates	13	William Ross	13
Constantine	90	Kingstown Tools	87	Williams & Hussey	7
Craft Supplies	84	Kity U.S.A.	102	Wisconsin Knife Works	11
Cress Woodworking	8	Kuster Woodworkers	84	The Wood Show	94
The Cutting Edge	13	Laguna Tools	19	Woodcraft	90
Dallas Wood & Tool Store	109	Lee Valley Tools	8	Woodmaster Power Tools	24, 87, 101
Deft	24	Lignomat	105	Wood-Mizer	5
Delmhorst Instrument	97	Lignum Press	103	Woodpecker's Tools	8
Delta Int'l	7, 17, 82, 88, 97	Lyon Electric	99	Woodshop Specialties	88
DML	23	Mafell	22	Woodsmith Publishing	19
Ebac of America	24	Mahogany Masterpieces	26, 105	Woodworker's Supply	86
Elektra Beckum U.S.A.	7	Manny's Woodworker's Place	78	Woodworking World	93
Factory Lumber Outlet	87	Masterpiece Tools	93	Workbench Tool	8
Fasco Fastener	8	McDonald-Harrington	99	Wyndham Woods	96
Fine Tool & Wood Store	105	Mini-Max	2	Xylophile's Co.	101
Fine Tool Shops	107	MLCS	95	Yukon Lumber	84
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ready-made, carbide cope-and-stick set for cabinetwork that I know of.

LRH's CO-ST Cutters (co-pe and st-ick) are essentially two-wing, ½-in. bore shaper cutters—one for the cope, one for the stick—stacked on a ½-in. arbor. Sets come with ball-bearing spacers and either one or two slotting cutters. A $300 set works for frame-and-panel and frame-and-glass doors as well as tonguing and grooving. A less expensive set handles only wood panels; single pieces can also be purchased.

The company's sales manager, Norman Huber, said these bits were originally designed for use with industrial routers that run from 10,000 to 20,000 RPM. But, he assured me, they work just fine in the heavy-duty, ½-in. collet routers available for the home market. Still, when I put a set in my Makita, I ducked my head below the table. They're huge compared to normal router bits, but they ran just fine, with only a little noticeable vibration as the switched-off machine wound down. And, of course, at that speed they cut very cleanly. Huber says they have never had a warranty claim on the bits, and they've sold quite a few.

I found changing bits a little cumbersome because of the slowness with which my router raises and lowers. Be *very* sure that the arbor is tight in the collet. You'll also need a 2½-in. diameter hole in your router table's top so you can lower the bits below the surface for some cuts.

The CO-ST bits cut cleanly on my ½-in. shapers, too, if not quite so smoothly at the lower RPM. The workmanship all seems top quality, as it should be if they're going to be spinning at up to 23,000 RPM.

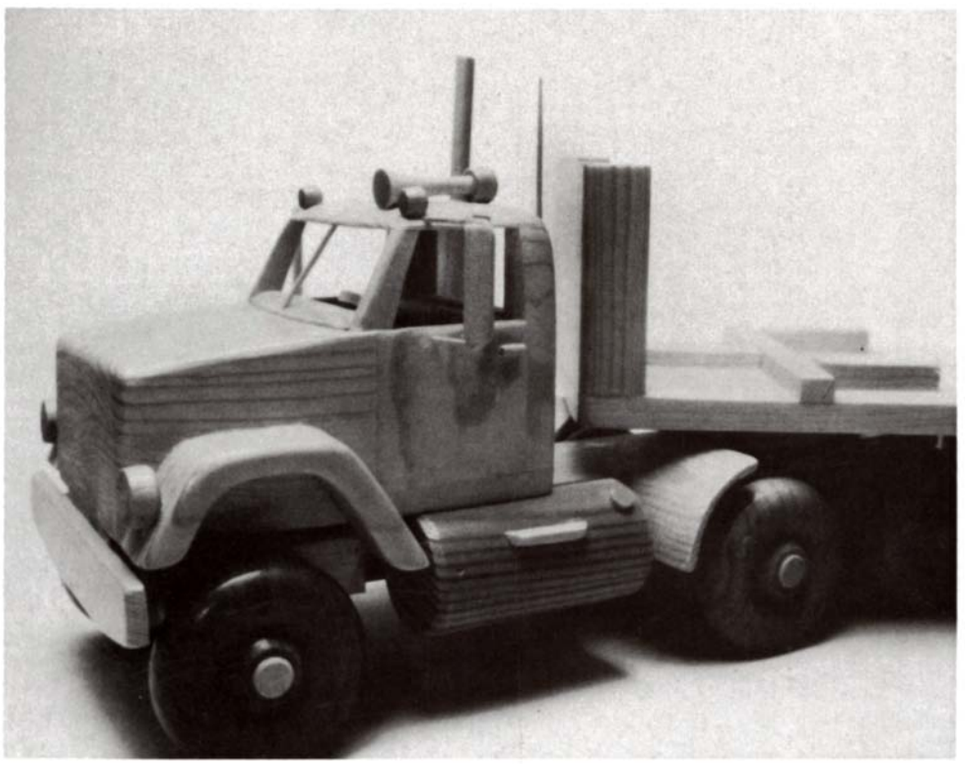
Porter-Cable introduced a 3-HP, ½-in. collet router this year. The Model 518 Speedtronic has five speeds between 10,000 and 22,000 RPM, some fancy electronics, and lists at $475, though a local dealer quoted me $329. If you're considering cope-and-stick for cabinet work, this might be the wave of the future.

—John Birchard, Mendocino, Calif.

Mini motors

Despite what the photo below may lead you to believe, Robert Bretz, of Decatur, Ill., didn't set out to make toys or precise scale models. Too delicate for children and not truly to scale, Bretz's trucks and earth movers are the result of a challenging production problem. "I made a dozen tractors in one run the last time I turned them out—sort of a mini-assembly line—it took ten days." The sense of accomplishment is Bretz's reward, not profit—he's sold a few, given a few away.

Obviously, Bretz couldn't park a Jimmy tractor in his workshop and the local dealer couldn't provide line drawings, so Bretz improvised. "I scaled off a set of plans from the photos in the sales catalogs," he writes. "Estimating the size the overall model would be based on 2-in. wheels, I scaled up from the photos then converted the measurements with an electronic calculator."



Robert Bretz used sales catalogs to draft plans for his nicely detailed wooden trucks, whose scale is based on readily-available 2-in. diameter hardwood toy wheels.

PIA bounces back

Recently shown the door by Boston University (*FWW* #52, p. 102), the Program in Artisanry has found a new home just down the road at the Swain School of Design in New Bedford, Mass. The ten-year-old PIA moves from the huge BU campus (25,000 students) in metropolitan Boston to tiny Swain, whose 155 students study painting, printmaking, graphic design and sculpture in the old whaling town's historic district. If all goes well, the PIA plans to be in business next fall.

PIA director Bob Cardinale said the faculty and students voted overwhelmingly for Swain rather than accept an offer from a larger, technically oriented college. New Bedford is within commuting distance of Boston, which will allow the PIA to maintain Boston ties and allow current students and faculty with Boston commitments to commute. Most of them will make the move, says Cardinale, along with all the program's equipment, from surfacers to sinks.

Swain, founded in 1881, has never had a craft program, and school president Bruce Yenawine is enthusiastic about the merger. Swain's low overhead solves many of the PIA's finanacial problems, and the school's low tuition (half BU's $10,000 per year) should help attract more students. Yenawine says that at its current 80-plus enrollment, the PIA would break even at Swain and would be in gravy if expanded to 150 students.

New Bedford is awash with the remnants of its once bustling ship-building and textile industries. These vast, disused 19th-century industrial buildings are ideal for workshops. Yenawine says city officials are excited about the merger, too, and prospects are good that the city will offer the school one of the old buildings at highly favorable terms. The PIA plans to continue its full range of metal, wood, ceramics and fiber courses at graduate as well as undergraduate levels. A program in architectural artisanry, on the drafting board at Swain before the amalgamation, is also likely to be offered. For more information write Swain, 388 County St., New Bedford, Mass. 02740.

—Roger Holmes

Notes and Comment

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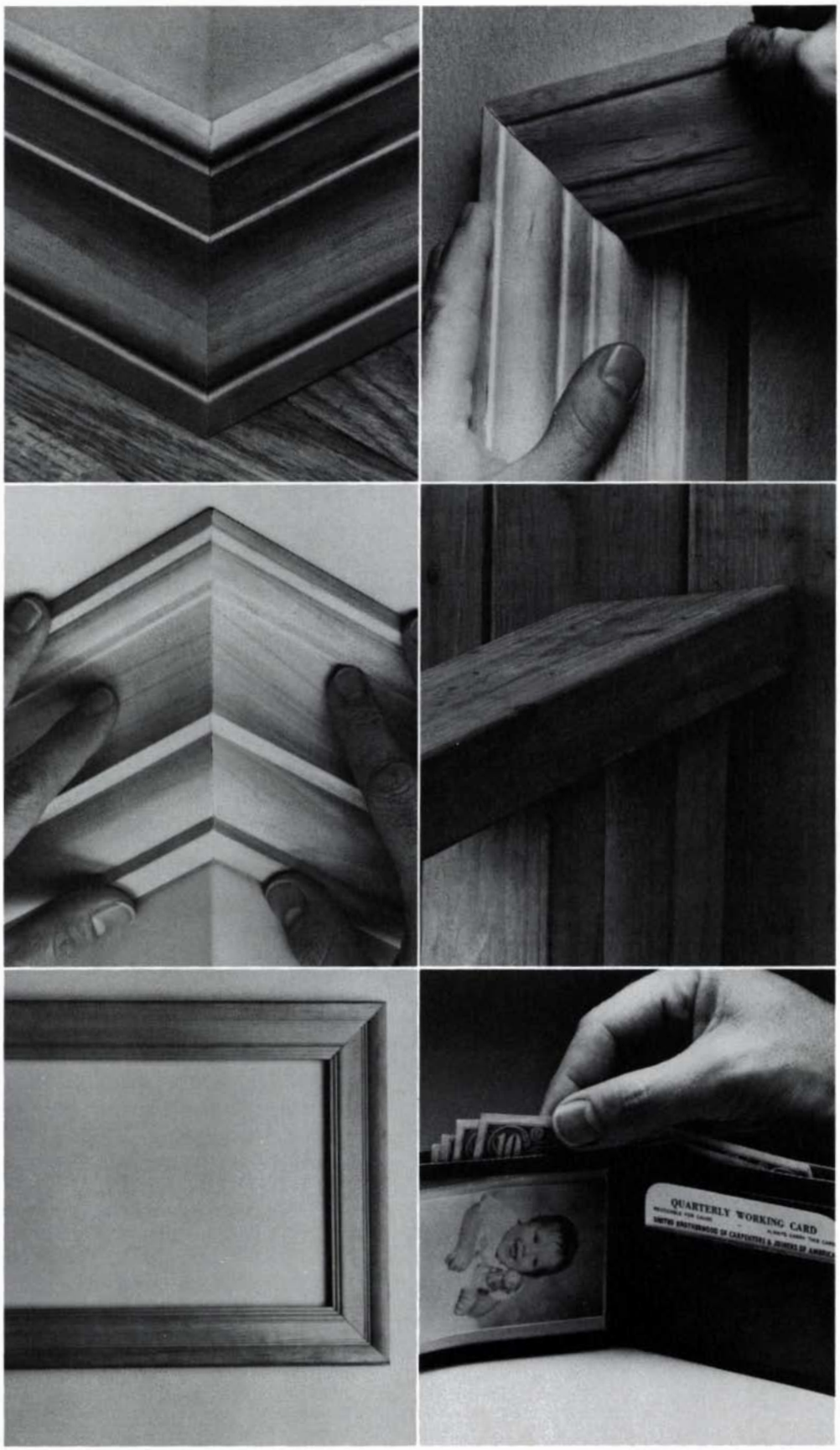

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Breakfast in Bed is made of various hardwoods and burls. The croissants were bandsawn on the diagonal from a single, thick donut.

Breakfast in Bed

Michelle Holzapfel, of Marlboro, Vermont, begins her sculptures on a metalworkers' lathe, precisely shaping hardwood burls, crotches, limb scars and spalted woods by manipulating the cross-slide and compound (*FWW #34*). She then re-shapes the work with carving gouges, burrs, sanding drums and various polishing methods to make "portraits that emphasize the beauty of the familiar object." She says her raw materials have "unusual grain patterns and inspirational forms, and to a great extent suggest the forms they should or could take. I work with the inherent tendencies in the wood. It is very much a process of collaboration."

The beet leaves were carved from 9-in. dia. rings. Holzapfel cut a V-groove into the circumference, then parted off the ring along the bottom surface of the leaf, cut it into segments and carved the details. The cauliflower's center was suggested by the natural surface of the burl.