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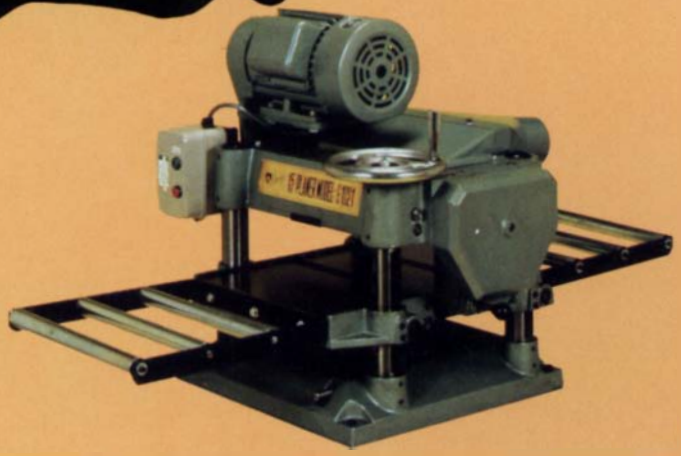

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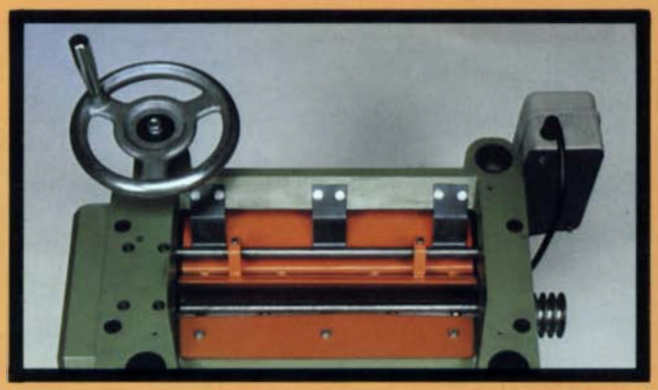

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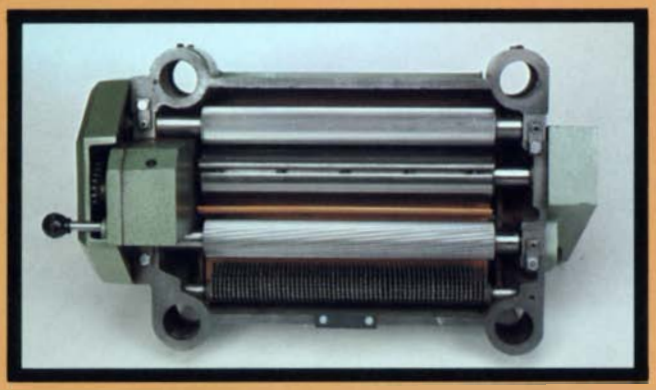

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Fine WoodWorking November/December 1986

Mack Headley, Jr. shows the straightforward way to carve the flowing lines of a period shell in the article beginning on p. 47.

Fine Woodworking (ISSN 0361-3453) is published bimonthly, January, March, May, July, September and November, by The Taunton Press, Inc., Newtown, CT 06470. Telephone (203) 426-8171. Second-class postage paid at Newtown, CT 06470, and additional mailing offices. Subscription rates: United States and possessions, $18 for one year, $34 for two years; Canada and other countries, $21 for one year, $40 for two years (in U.S. dollars, please). Single copy, $3.75. Single copies outside U.S. and possessions, $4.25. Send to Subscription Dept., The Taunton Press, PO Box 355, Newtown, CT 06470. Address all correspondence to the appropriate department (Subscription, Editorial, or Advertising), The Taunton Press, 63 South Main Street, PO Box 355, Newtown, CT 06470. U.S. newsstand distribution by Eastern News Distributors, Inc., 1130 Cleveland Road, Sandusky, OH 44870.

DEPARTMENTS

4 ***Letters***

8 ***Methods of Work***
Quick edge sander; removing water stains from oak; tiny drill bits

12 ***Questions & Answers***
Soundproofing a shop; gluing oily wood; finishing teak

116 ***Events***

118 ***Books***

120 ***Notes and Comment***
Unconventional convention; furniture competition; snow job

ARTICLES

40 **Lumber** by Jeremy Singley
Where it comes from, how it's made

47 **Carving a Scallop Shell** by Mack Headley, Jr.
Gouge's sweep determines the curves

52 **Grinding Wheel Primer** by Jerry Glaser
Choosing the best wheel for your steel

55 **Sharpening With Oilstones** by Michael S. Podmaniczky
No jigs, no gadgets, no nonsense

57 **The other side of the edge** by Jim Cummins

60 **California Crossover** by John Marlowe
Multi-media works out West

65 **Unlocking Cherry's Color** by Tom Dewey

66 **Creating a Couch** by Scott Dickerson
Laminated curves for multipurpose seating

72 **Mack Truck Super Liner** by Richard Blizzard
Ten-wheel tractor for tiny truckers

76 **Shop-Built Pin Router** by Hans Sporbeck
Delicate carving with a precision machine

78 **Joinery with a pin router** by Kelly Mehler

80 **Making a Mosaic Bracelet** by Richard Schneider
A laminated helix from colored veneers

84 **Twisted Dovetail Joint** by Alan Peters
Japanese puzzler explained

86 **Hammer Veneering** by Christopher Faulkner
Laying the leaves without a press

92 **Deck the Halls** by Robert Tolone
Curious Christmas creatures

Postmaster: Send address changes to The Taunton Press, Inc., PO Box 355, Newtown, CT 06470.

I read the article about Thomas Moser's burgeoning business (*FWW* #60) with strongly mixed feelings. I remember reading about his endeavors in *FWW* #15, and wishing him the best of luck. But now there are two conflicting opinions that I (and I suspect many of my woodworking friends) can't resolve—the conflict between those old adversaries, creativity and finances.

Running a small business is one of the most difficult things to do. Most woodworkers resent the time consumed in keeping track of the cash flow. I know I did when I was self-employed. Even though I now work in the Federal Government (where the cash flow is extorted from the populace in virtually limitless quantities), I'm still sensitive to the needs of independent craftsmen. After all, one of the best ways to ensure continuation of the craft tradition is for people to be able to make a living at their chosen crafts. For that reason I am delighted to see articles on the business side of woodworking.

On the other hand, the article on Moser left me with a slightly sour taste in my mouth. Just as I'm delighted with his financial success, I'm saddened (for him) at the new direction of his creative efforts. Creativity takes many forms, none of which are superior to any other. Making fine furniture and establishing a thriving business are both very creative, but they're not the same. If the article is accurate, the only conclusion I can reach is that now Moser is just another businessman seeking the best way to market his wares. It just so happens that his products happen to be "handmade" furniture and not toothpaste or shoes, but that doesn't change the essence of my point. His activities are now those of the administrator, not the woodworker. I am excited for him if that's what he really wants, and I don't begrudge his success one bit.

However, I can't help but recall the earlier article where Moser expressed dissatisfaction at being pressured by college administrators to do what they wanted, not what he felt like doing. Does he now feel the same toward his accountant, lawyer, banker, etc? Despite his financial success, I wonder if he wouldn't have been better off if he stayed where he was 15 years ago and continued to make a few pieces in the basement. At least then he didn't have hundreds of thousands of dollars and the futures of several employees riding on every decision.

I hope I don't sound too negative. The article was excellent and I hope craftsmen can glean new tactics for staying alive. It just wasn't about woodworking, that's all.

—Donald C. Williams, Washington, D.C.

Ten years ago I started as an apprentice in a small wood shop in West Germany. Since then I have learned a lot, through experience and what other people have taught me.

A year ago, because I was interested in woodworking in the United States, I visited some small woodworking shops in North Carolina. Upon returning to Germany, I contacted my government to see if I was eligible for any type of exchange program. One was being set up and I applied, but I never heard anything more about it. Is there some other way to come to the States for about a year and get in some sort of private exchange program, since the government programs don't seem to offer much for the trades?

—Phil Friedrich, Welschbillig, West Germany

I was able to relate to Bob Vaughan's article on pad sanders (*FWW* #60) and I'll back his stand on the Porter-Cable Speed-Bloc. The university workshop that I run has about eight of them. Some were purchased way back in 1971. One or two were stolen and only one died completely. The rest are still with us, after suffering through the most grueling service imaginable in the hands of students. Albeit, they've been repaired, rebuilt and jury-rigged. But, they run! Bearings, switches and cords break down most often. Students borrow the sanders and wrap the cords around them so the sanders will fit into their lockers. Sticky bearings can be restarted by smacking the top of the unit with a mallet! If, after rebuilding, the Speed-Bloc "shudders," fool around with the rubber posts. Twist and turn them until the shuddering stops. I've also found that loosening the four Phillips screws in the pad that secures the posts, and then tightening them while the unit is running works about 75% of the time. *—Bernie Maas, Cambridge Springs, Pa.*

I, too, share Steve Cook's disgust with "corner dipping" belt sanders. I've been considering building a drum sander for some time, so I was overjoyed to see his commendable article on the shopbuilt drum sanders in *FWW* #58.

I'd like to make some observations. I believe he would be happier if he used a pair of ¾-in. pillow block bearings with grease fittings on the sander drum. Also, the feed rollers rotating in the same direction as the sanding drum is a built-in hazard and scares me to think of it. On thin stock, anything that would raise the feed rollers even slightly would result in the work being thrown out the outfeed end with great force. Curtis Erpelding says he was surprised to find that the rollers and drum rotated in the same direction on the Kuster kit. If Mr. Kuster stands at the outfeed end when operating the sander, it might well be Kuster's last stand.

—Bob Smith, Sandy Lake, Pa.

Re making S.R. Cook's thickness sander: Rubber-covered feed rollers for home-built tools and jigs can be a problem. Commercial rollers are expensive and often the wrong size. To make my own, I employed a technique used to re-grip golf clubs. A trip to a local industrial salvage yard yielded some ¾-in. cold rolled shafting, and some scrap ¾-in. and 1¼-in. industrial air hose.

To begin, wrap double-faced tape (such as carpet tape) in a spiral around the steel shaft. Pour a solvent, such as paint thinner or mineral spirits, over the tape and thoroughly wet the inside of the ¾-in. air hose. While the hose is wet, slide it over the shaft and position it as required. It should be a snug fit. The hose will be "glued" to the shaft in 10 to 12 hours. To increase the diameter, repeat using the larger hose. (The ¾-in. air hose I obtained had an O.D. of about 1¼ in.) When dry, the hoses will not slip and can be removed only by cutting them from the shaft. *—William E. Shepp, Florence, Ala.*

With respect to the article "Oak: red or white" in the Notes and Comment section of *FWW* #60, the article refers to sodium nitrate ($NaNO_3$) but the formula is for sodium nitrite ($NaNO_2$). Please clarify. *—Jerry Glazman, Southbury, Conn.*

EDITOR'S NOTE: Sorry, our mistake; it is sodium nitrite ($NaNO_2$).

In *FWW* #37, David Ferguson submitted a tip on bending wood using a solution of hot water and Downy fabric softener instead of steaming. I carried this a step further and steamed the wood after soaking it in the solution. There was a dramatic improvement in both the results and the ease of bending compared to either process alone. For a ¾-in. by ¾-in. by 56-in. continuous-arm Windsor chair back, I used a 2-in. ABS pipe for soaking the back in a near boiling 1:12 mixture of Downy

and water. I set the pipe in the sun to keep it warm for 1 to 1½ hours, then steamed it for 3 hours. Even pieces with wavy grain bent without cracking or tearing.

—Kenneth D. Hoyt, Walla Walla, Wash.

Perhaps you might enjoy a small success story concerning the Letters column in *Fine Woodworking*. In the May-June issue, you ran my letter asking if readers might know a source for a faceplate for my antique Greenfield lathe. I got an immediate call from Ed Kallal of Chesterfield, Ill., who offered to make a faceplate for me. I shipped him my lathe shaft, and he perfectly fitted a faceplate to the shaft, at quite reasonable cost. Thanks to *FWW* and Mr. Kallal, my old lathe is now complete.

— Carl Krumhardt, Chicago, Ill.

I had exactly the same problem as Mr. Krumhardt when I bought an old lathe—trying to find a faceplate to fit its spindle. I solved my problem by having a machine shop turn 3/16 in. off the spindle end, thus removing the old threads. Rethreading gave me 1 in. by 12 tpi; faceplates of this size are readily available.

—C.C. Conner, Jr., Chicago, Ill.

I read Carl Krumhardt's letter in *FWW* #58. A friend had a similar problem with a lathe with an unusual thread on the headstock spindle. He had a machinist friend turn an adapter for it. One end is threaded to fit the headstock spindle and the other end has a 1-in. dia. 8-tpi screw that fits faceplates and other accessories currently being marketed.

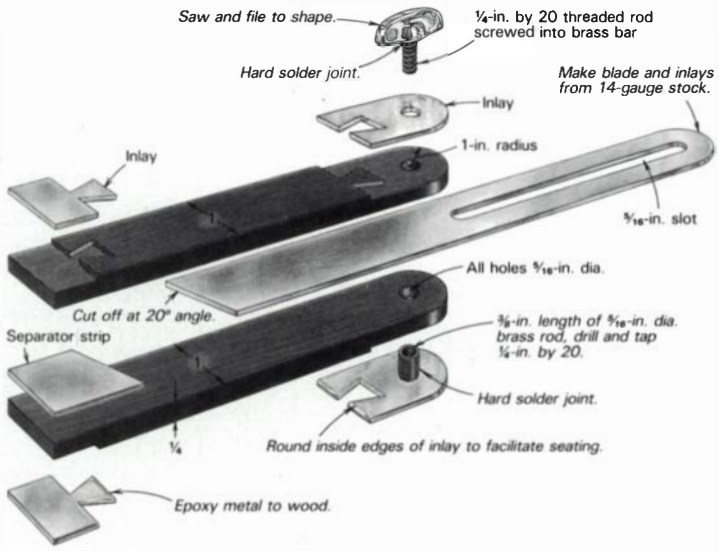
I know such an adapter may cost a few dollars, but it eliminates the problem of finding a suitable faceplate and increases the versatility of the lathe. Flats can be filed on the adapter to allow tightening and removal. This adapter has been a success for my friend.

—H.K. Nancekiuell, Thunder Bay, Ont.

The article by Joy O'Neal on Workshop Noise (*FWW* #59) came too late for me. I am experiencing the continuous ringing or hissing (tinnitus) she described. I'm only a weekend woodworker, but apparently the damage has accumulated over a period of nearly 40 years. So be forewarned and wear earplugs. . . it can happen to you.

—Jay E. Rubel, Atlanta, Ga.

ERRATUM: Because of a printing error, the dimensions on the bevel gauge in *FWW* #60 were omitted.



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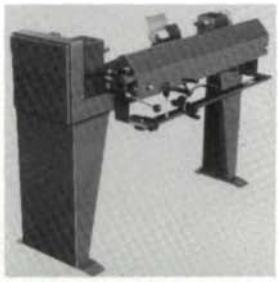

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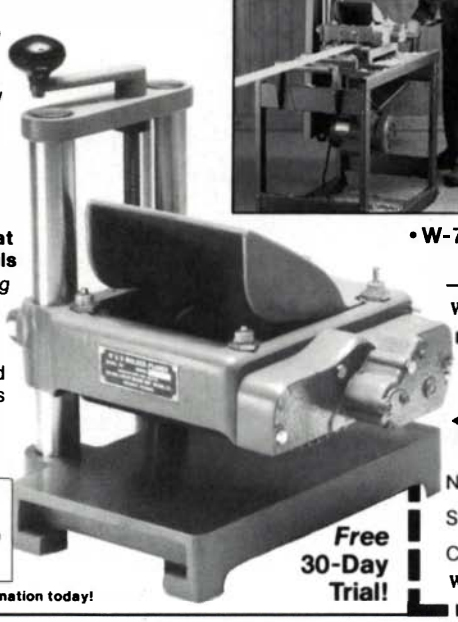

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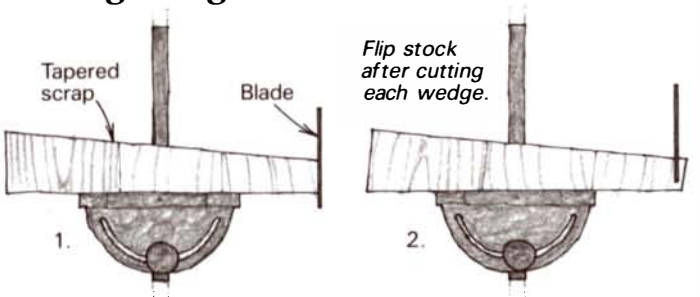
edited and drawn by Jim Richey

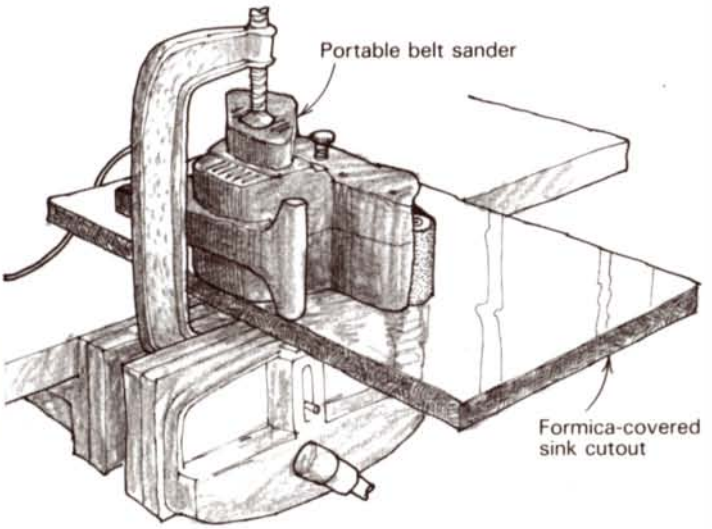
Cutting wedges on the tablesaw



I like to use the wedged through-tenon joint, and have developed a way to cut consistently tapered wedges quickly on the tablesaw. The key to the method is to save the waste cut-off ends of glued up tabletops and the like. I use a tablesaw jig to taper one edge of these scraps at ½-in. per foot, or 2° (the taper shown in the sketch is exaggerated to about 5° for clarity). To cut wedges I simply crosscut the tapered scrap piece, flipping the piece after each cut. Rather than measure, I eyeball the width of the wedge, making sure to cut the thin end of the wedge smaller than needed. When fitting the wedge, I trim off the thin end with tin snips until the wedge fits the kerf in the tenon perfectly. *—C.M. Chappell, Houston, Tex.*

Quick tip: I have a Sears tablesaw and a Sears router table, and I discovered one day that these two machines are compatible in a way that I never would have expected. To set the router table up, I slip two of its foot flanges under the tablesaw's rip fence; when I tighten the rip fence, it clamps down and holds the router table securely on top of the tablesaw, at a convenient working height. *—Craig Wynett, Charlottesville, Va.*

Quick edge sander



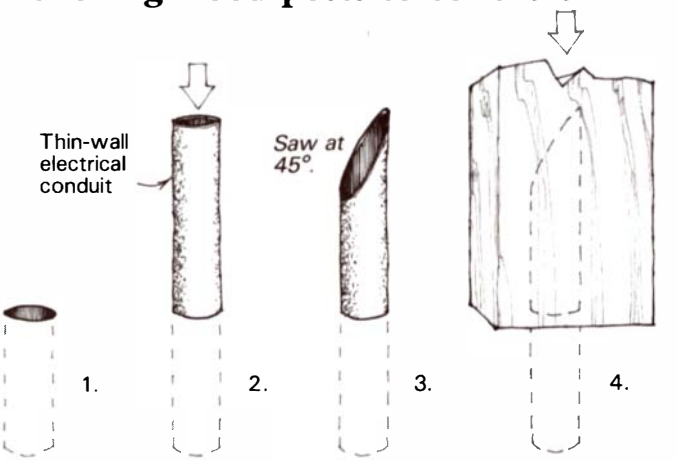
Here's how to convert your belt sander to an edge sander quickly and easily. Clamp a piece of plywood (I use a Formica-covered sink cutout) to your belt sander with a large C-clamp, as shown in the sketch. Then tighten the clamp in your workbench vise. *—Bob Elliott, Ankeny, Iowa*

Plastic film protects workbench

If you're tired of cleaning dried glue residue off your workbench, try covering it with a piece of clear plastic film. I use the 4-mil-thick film that is available at many hardware stores for covering windows. Glue drops that fall onto the film dry quickly and, once dry, can be easily cleaned off by pulling the plastic over the edge of your saw table. The residue will peel right off leaving the film clean for your next project.

—Marilyn Warrington, Shiloh, Ohio

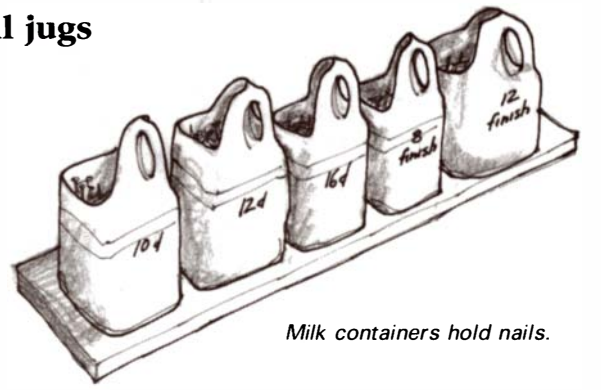
Anchoring wood posts to concrete



Here's a simple but strong method of anchoring wood posts to a concrete floor. First drill a ⅝-in.-dia., 2-in.-deep hole in the floor. Force-drive a 6-in.-long scrap of ½-in.-I.D. thin-wall electrical conduit tubing into the hole. Saw the tubing at a 45° angle 2 in. above the floor. Now accurately position your post over the anchor and sledge-hammer the post onto the tubing until it is down tight to the floor. Use two anchors if the post must resist twisting. *—H.J. McCurry, Jr., Lilburn, Ga.*

Quick tip: I have a grinder with a goose-neck light mounted directly on it, and the vibration causes even a "severe-service" bulb to blow out within a few minutes. The solution turned out to be a 40-watt appliance bulb, for use in stoves and refrigerators. It is tough, and just bright enough. I've heard since that a bulb from a stop-and-go traffic light would also serve, but where to find one? *—Gordon Mulholland, Streator, Ill.*

Nail jugs



Milk containers hold nails.

When my new house was completed I collected quite a variety of half-full nail bags from the site. To make the collection readily available, I trimmed the necks off plastic milk cartons, marked each jug with the size of its contents and stocked them neatly on wall shelves. The jugs are convenient, durable and ready to transport to any project.

—Ralph E. Hall, Pisgah Forest, N.C.

Quick tip: Here's a simple tip for those of us who continue to drop our tablesaw's arbor nut into the sawdust when changing blades. After you've loosened the nut, place your index finger on the end of the arbor shaft and use your thumb to spin the nut off the shaft and onto your fingertip. The system works equally well in reverse. *—J. Hugh Capron, Winona, Minn.*

Lowering a radial-arm saw

Here is a dead-simple method for quickly and precisely lowering the blade of a radial-arm saw just enough for through-cuts. Lay a playing card (which you keep conveniently on top of the arm assembly) on the saw table over the saw's line of

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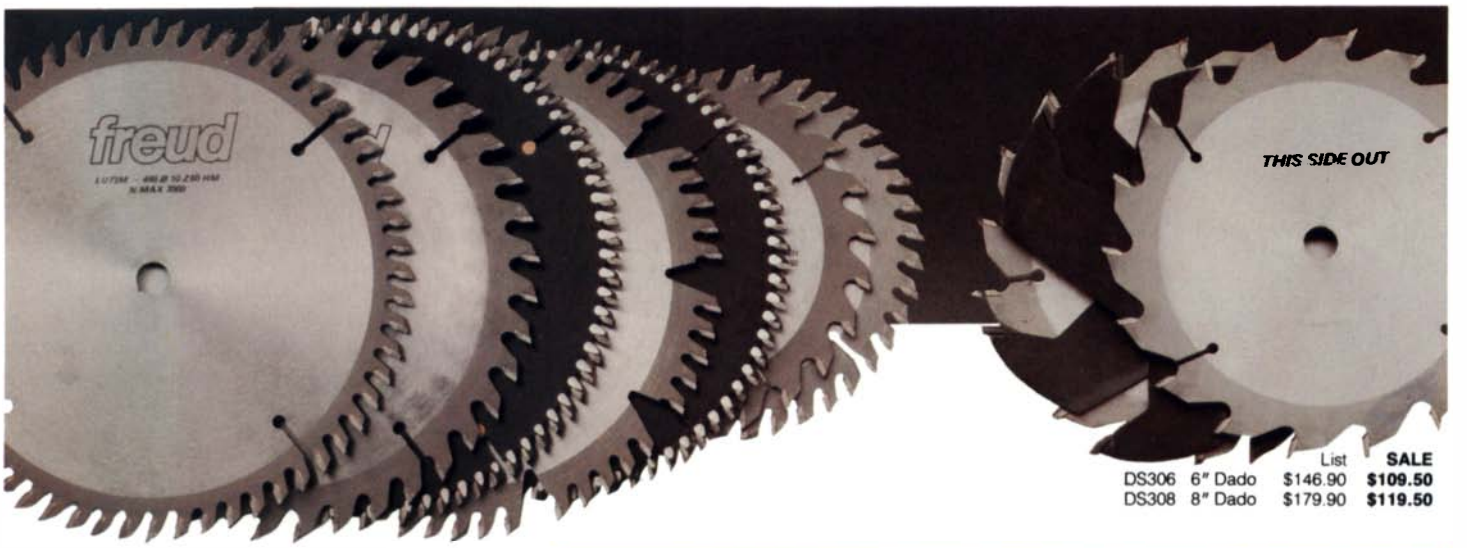

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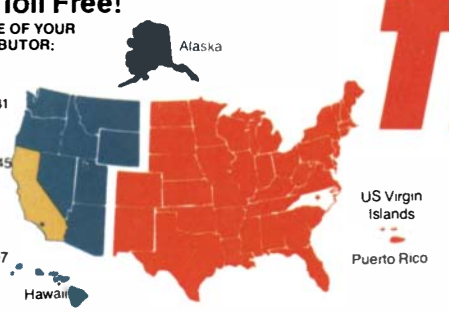

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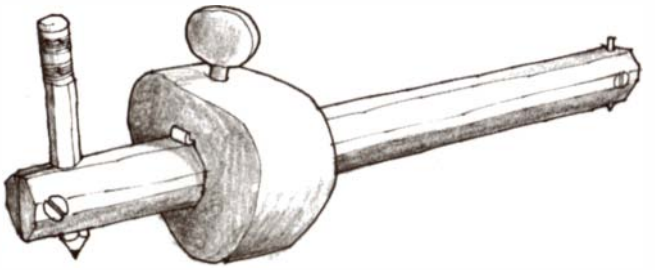
travel. Lower the blade onto the card until it buckles slightly but obviously under the pressure of the blade. The blade is then just at the correct level for through-cutting.

I invented this little trick after lowering the blade into the table with a thud several times, which I figured wasn't doing any good to the blade, the lowering mechanism or the saw's alignment. —*Raymond Francis, Pelham, N.Y.*

Quick tip: I was making a cabinet with a shelf that was curved the length of its front edge. The shelf was plywood and the edge had to be banded, but how was I to true the band-sawn curve to make a hairline joint? A technique from lens grinding came to mind: I used a length of one of the curved offcuts as a sanding block; some sanding soon produced a perfect arc. —*John W. Williams, Bellevue, Wash.*

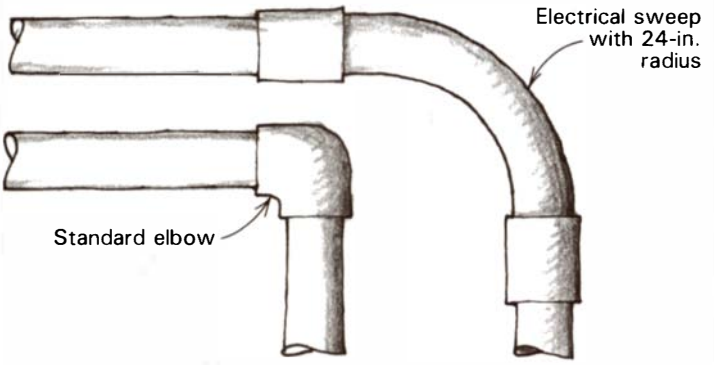
Double-duty marking gauge



To double the usefulness of a marking gauge, install a pencil in a screw-tightened hole at the unused end. There are many situations where a pencil line is preferable to a scratch. One can also put an india-ink drafting pen in the hole and draw nice smooth lines parallel to an edge—they look very much like ebony inlay. —*Simon A. Watts, San Francisco, Calif.*

Quick tip: The best way to fit a miter gauge to its slot is to measure the gap with a feeler gauge, then epoxy appropriate brass shim stock along the full length of the bar. Shim stock is available in various thicknesses—from foil-thin on up—at auto supply stores. If the resulting fit isn't perfect, a little sanding will make it so. —*Jacob Schulzinger, Houston, Tex.*

Dust-collection system improvements



When I put together my dust-collection system using common 4-in. PVC pipe I found that, with all the 90° elbows that were necessary, the air flow was restricted and inefficient. Then, at an electrical supply house, I discovered a special 24-in.-radius PVC elbow called an electrical sweep. The new wide-turn elbows have solved my air flow inefficiencies.

—*John S. Gallis, Deer Park, N.Y.*

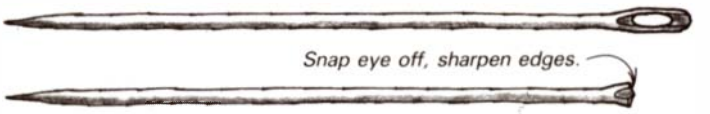
Quick tip: The plastic spreaders sold at auto parts stores for spreading body putty make excellent glue applicators for wood glue. They are flexible, available in several sizes, easy to clean and inexpensive. —*Richard Pallaria, Cochecton, N.Y.*

Removing black water stains from oak

To bleach out black water stains on oak use a 20% solution of phosphoric acid. For safety's sake, don your goggles and rubber gloves, then just brush the acid solution on the oak and put it out in the sun. Neutralize the acid after it is dry with a TSP (trisodium phosphate) or bicarbonate of soda solution. I use this procedure on old oak barrels and find it more effective than the two-step oxalic acid system sold in paint stores. The phosphoric acid also removes rust deposits from iron and steel, much the same as Naval Jelly.

—*Peter S. Birnbaum, Sebastopol, Calif.*

Making tiny drill bits

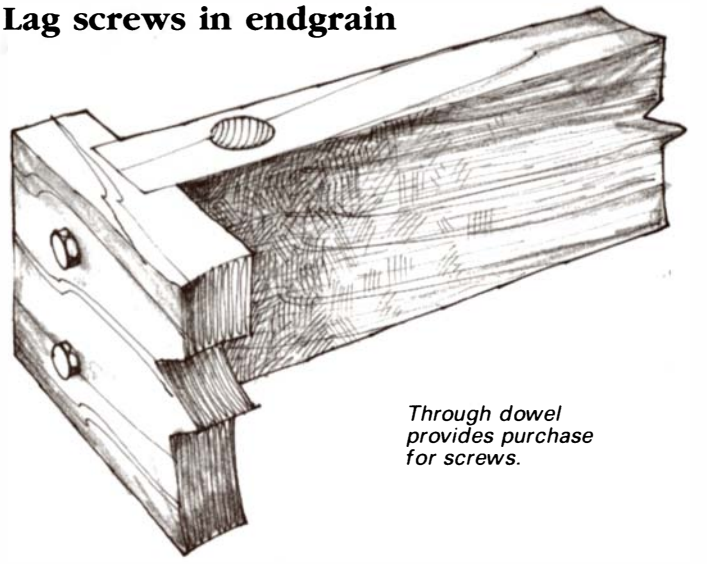


Drill bits of 1/32 in. or less are hard to find, expensive and break easily. But in minutes you can make a tiny drill bit from an ordinary sewing needle. These are readily and inexpensively available in a multitude of small sizes. To make a bit, use two pairs of pliers to snap the needle right at the bottom of the eye. The resulting blank is too hard for filing but, if held in a pin vise, can easily be stoned by hand to yield good cutting edges. (A Foredom Micro Chuck that will adapt your regular chucks to hold hair-thin bits is available from Woodcraft Supply, 41 Atlantic Ave., Woburn, Mass. 01888.) I have used these needle-bits not only in marquetry, where they are indispensable, but also for drilling 1/60-in.-dia. holes 1/2 in. deep in oak.

—*Edward C. Kampe, Zellwood, Fla.*

Quick tip: Recently I came across an office-type paper cutter that could no longer cut paper. I tried it on veneer, however, and was amazed. It works very well, and will cut veneer at any angle to the grain. —*Herb Kuschel, Jefferson City, Mo.*

Lag screws in endgrain



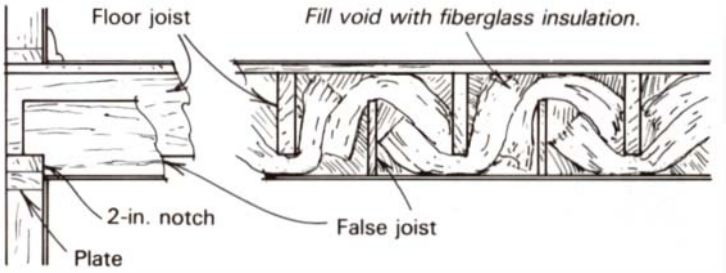
Lag screws driven into endgrain are weak and won't hold under pressure. But if you drill a hole through the member and add a dowel as shown, the screw can bite into the long grain of the dowel and turn a weak dado into a strong, practical joint. I used this construction to connect the front and side rails of a knockdown pine sofa frame. —*Jack Fisher, New Hope, Penn.*

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 return only those contributions that include an SASE.*

Soundproofing a shop

I'm setting up my new shop in the basement under the bedroom end of my house. Since I have small children, I am worried about noise from the shop keeping them awake. Is there any way to soundproof the ceiling, which now consists of 2x8 joists on 16-in. centers?

—Barry R. Wallenstein, Eatontown, N.J.



Michael Podmaniczky replies: I had a similar problem with noise in my last house. My tenant's studio apartment was right over our kitchen and our waking hours didn't coincide. When I was remodeling the kitchen, I took out the ceiling and installed a second set of joists between the upstairs floor joists. Since the secondary joists don't carry a load, I cut them from 1-in. stock. I notched the ends of the secondary joists so they landed on the plate, as shown, and extended about 2-in. lower than the original joists, thus free-spanning the room without contacting the floor boards above. Before screwing the sheetrock ceiling to the new joists, I filled the voids between the joists with fiberglass insulation. This created a completely independent membrane which, combined with the insulation, was able to deaden Little Richard doing "Good Golly Miss Molly" at three-quarter volume. The same system should effectively deaden noise in your shop, although you might avoid running hardwoods through the planer at 3 A.M.

[Michael Podmaniczky is a woodworker and furniture conservator in Williamstown, Mass.]

In praise of ancient walnut

Why is old walnut so different from what we have today? I've noticed that wood from 100-year-old beds or paneling is mellower, lighter in weight, easier to cut and uniformly darker all the way through the board. Why the difference?

—Jon Gullett, Washington, Ill.

Jon Arno replies: I suspect most of the difference between old walnut and new walnut is in your mind, rather than in the wood. There's something special about old wood. I have some walnut salvaged from a Michigan church built in 1848. Even though its grain is fairly straight and it has lost any hint of the purple highlights it must have had once, I wouldn't trade it for a truckload of new walnut straight from the mill.

Setting emotion aside, however, there are tangible reasons why 100-year-old walnut differs in color, density and working characteristics. First of all, walnut cut in the mid-19th century was very likely harvested from slow-growth, virgin timber stands. A semi-ring-porous species like walnut tends to be less dense if it grows slowly in this type of forest environment.

Also, fluctuations in humidity over the years can subtly change a wood's working characteristics. These moisture cycles tend to make the wood more uniform by relieving the stresses set up when the wood was initially dried. And, if the wood were exposed to periods of high humidity, it may have been invaded by microrganisms that cause decay and gradually weaken the wood tissue.

Wood colors almost always change over time. Exposure to light generally bleaches out the color, but this is somewhat counteracted by the wood's natural aging process, which slowly forms a dark patina. Also, most woods that were originally finished with oil, a method that was popular a century ago, will eventually turn almost black, and the color will be drawn deep into the tissue.

Kiln-dried walnut is now steam-treated, which darkens the sapwood and dulls the wood's overall color. Also, regardless of how it has been dried, walnut seems exceptionally susceptible to color changes due to the soil and climate where it was grown. I know West Virginians, for example, who swear that their native-grown walnut has a unique blue-black beauty unequaled by walnut from other parts of the country.

[Jon Arno is an amateur wood technologist and woodworker in Brookfield, Wisc.]

Finishing method for teak

I'd like to know how commercial manufacturers finish teak. Lacquers and varnishes aren't usually recommended for teak, but the oils I've used turn the wood reddish brown. Commercial furniture appears more yellow and has residual material on the surface, which I never got when I applied oil.

—Kenneth J. Rerie, Manitoba, Canada

Otto Heuer replies: Commercial manufacturers are unlikely to reveal any of their trade secrets for finishes, but here's a method that should help you achieve the effect you describe. Teak has a bad reputation with many finishers because it contains an oil that comes to the surface, thereby interfering with the adhesion of any film-forming coating. As a result, coatings like varnish or lacquer tend to peel off in six months to a year.

To avoid this peeling, I'd recommend you wash the teak with a mixture of 90% alcohol by volume and 10% commercial-grade phosphoric acid. Be careful and wear rubber gloves to prevent skin contact. Apply the solution freely. Don't just dampen the teak. After the wood dries, repeat the alcohol treatment and let the wood dry again. Then apply a clear vinyl sealer (available from Sherwin Williams Co., 101 Prospect Ave., Cleveland, Ohio 44115, and its local distributors) followed by several coats of lacquer or varnish.

[Otto Heuer is a finishes consultant in Waukegan, Ill.]

Gluing oily wood

I operate a small furniture design and construction business. Could you give me some advice on gluing teak used in outdoor furniture exposed to the elements year-round in Minnesota? *—Van Cline, St. Paul, Minn.*

George Mustoe replies: For species such as teak, rosewood, yew and lemonwood, the best adhesive is an epoxy resin specifically formulated for oily wood. One of these is G-2 Epoxy, manufactured by Industrial Formulators of Canada, Ltd., 3824 William St., Burnaby, British Columbia V5C 3H9. It is available by mail in one-liter bottles from Flounder Bay Boat Lumber, 3rd and O Avenue, Anacortes, Wash. 98221. Casein, resorcinol and urea-formaldehyde plastic resin glues are all sufficiently weather resistant for most outdoor uses. Casein and resorcinol produce hard-to-hide glue lines, however, and urea formaldehyde glue has a limited bonding ability on oily woods.

[George Mustoe is a geochemistry research technician at Western Washington University in Bellingham, Wash.]

Fiberglass for *shoji* screens

In the past year I have made several shoji ***screens with rice paper between the*** kimiko ***(muntins), as shown in Toshio Odate's article in*** FWW ***#34. I understand durable, thin fiberglass sheets can be substituted for the more traditional paper. Is this fiberglass material available in this country, and how could I attach it on exterior doors without using staples? Also, Odate's screens had one side of the door with the muntins showing, and the other with just the overlap-***

ping paper exposed. Some customers would like to see the kimiko ***from both sides. Is there any way I could sandwich the paper or fiberglass in the middle of the wood pieces and still be able to replace it if it becomes torn or soiled?***

—Ben Erickson, Eutaw, Ala.

Toshio Odate replies: My article described the traditional method of making *shoji* in Japan. Methods for using fiberglass and sandwiching the opaque material between the wood were developed by Japanese gift-shop operators in the United States. Whether you use paper or fiberglass is a matter of individual preference. In Japan, paper is still preferred because it's more traditional and seems to produce a softer feeling than the fiberglass. If you want fiberglass, you can order it from Miya Shoji and Interiors, 107 W. 17th St., New York, N.Y. 10011.

If you want to sandwich the paper or fiberglass, you must build two identical *kimiko* assemblies. One is fixed to the frame; the other is removable. Staple the paper or fiberglass to the fixed *kimiko*, then tack on the second one with pins or small nails. Don't use glue because you'll have a great deal of trouble removing the paper if it ever needs to be replaced. Remember, the *kimiko* side of a *shoji* is usually the back side of the screen, the side facing the interior of the house, and the paper side is the face side. With your modified *shoji* you will, in effect, have two back sides and no face side.

[Toshio Odate, author of *Japanese Woodworking Tools: Their Spirit and Use* (The Taunton Press, 1984), conducts workshops on Japanese tools and techniques and teaches sculpture at New York's Pratt Institute.]

Calculating pulley speeds

I recently acquired a used jointer with a ½-HP 1,750 RPM motor. There's a 2¾-in.-diameter pulley on the machine and a 7¼-in. pulley on the motor. The unit seems slow and underpowered, but I'm not sure how I should modify the setup.

—Boyd Benham, Cambria, Calif.

Rich Preiss replies: One of the first things I do when I'm considering modifying a machine like a jointer is to calculate the cutterhead speed, using the following formula:

$$\frac{\text{Speed of drive pulley} \times \text{Diameter of drive pulley}}{\text{Diameter of driven pulley}}$$

With your machine that gives us:

$$\frac{1{,}750 \times 7.25}{2.75} = 4{,}613 \text{ RPM}$$

This is about the right speed for your jointer, and should produce a good surface. Most manufacturers recommend cutterhead speeds from 4,500 to 5,000 RPM for a jointer. If you feel the machine is underpowered, you could replace the existing motor with a larger one, say 1.5 HP, as long as the RPM are the same and the mountings can be matched. Keep the same pulleys or use the formula above to make any desired speed changes.

[Rich Preiss is head of the woodworking program at the University of North Carolina at Charlotte.]

New life for old chisel

I just spent a day resurrecting an ancient 1-in. corner chisel. It's all metal, about 18-in. long, and weighs several pounds. I suspect it was designed for timber framing. The steel is quite soft, easily worked with a file and holds an edge poorly. Judging from the mushroom on the top of the tool, it has been beaten mercilessly with a large hammer. Should I try retempering it? How should it be resharpened?

—Dave Schinbedder, Mindemoya, Ontario, Canada

Norm Vandal replies: A chisel treated as badly as yours will probably have been ground so harshly that the edge has burned, removing the temper. You should retemper it, if you can. It may have been made with low-carbon steel and would be unhardenable.

Tempering is a two-step process. You must harden the tool, then back off the hardened state to temper it. First grind the edge close to its finished sharpness while it is still soft. Next heat the chisel red hot and quench it in water. Hold it in the water until it cools. If the metal can be tempered, the chisel should now be hard and brittle. You shouldn't be able to cut it with a file. If you tried to use the tool at this stage, the hardened edge would break off.

If the metal is hardened, heat it slowly and evenly to a straw color, then quench it again. Some workers prefer to heat the metal red and let it cool to straw before quenching, but I haven't been able to notice any difference in the tools produced by each method. Finally, sharpen and hone the chisel. Use the same angle you would use for any bench chisel—25° to 30°.

You should also grind away the mushroomed part of the handle. Otherwise you risk having a piece fly off into your eyes the next time you strike the end.

[Norm Vandal makes period furniture in Roxbury, Vt.]

Follow-up

I was very interested in Beau Belajonas' method for producing a crackled finish by applying a solution of shellac and alcohol over a tacky coat of varnish (Q & A, FWW ***#56). I think I followed the procedure exactly as he recommended, but it didn't work for me. Where have I gone wrong?***

—L. Arsenault, Rochester, N.H.

Beau Belajonas replies: The shellac over varnish technique is a very temperamental method. I was a little puzzled that the method didn't work for you. Then I remembered that every time I had used the method it was a very hot and humid summer day. The moisture in the air is apparently a crucial factor in making the finish crackle.

Rather than have to depend on such a variable as humidity, I developed a more foolproof method for creating an old-paint type of finish. First, coat your wood with a flat groundcoat of the color you desire. The paint should be an alkyd base, such as Benjamin Moore Saniflat (Benjamin Moore & Co., 51 Chestnut Ridge Rd., Montvale, N.J. 07645, and its local distributors). After this coat has dried overnight, lightly sand with 220-grit sandpaper and apply a coat of spar varnish. I recommend a phenolic resin varnish such as Masury Cosmo Spar (Masury Paint Co., P.O. Box 778, Baltimore, Md. 21203, and its local distributors).

When the varnish has turned from wet to tacky, about 30 minutes to an hour, apply another full-strength coat of flat alkyd paint. In about 10 or 15 minutes, the paint will start to crack right before your eyes. About 20 minutes later, when the flat paint looks dull instead of shiny, you can take a dry, crumpled paper towel and dab it here and there to distress the finish even more. Remember that the base coat will show through the top coat, so choose an appropriate color combination. Let the distressed finish dry overnight, then apply a glaze of burnt umber artists' oil colors mixed with flat alkyd varnish. Wipe most of it away before it dries completely, but leave some of the color in the cracks and crevices for accent.

Timing is important in this process. The sooner you paint over the varnish, the bigger the cracks you'll produce. You can also get some interesting effects by using flat latex or milk paint over the spar varnish.

[Beau Belajonas is a professional wood finisher in Camden, Maine.]

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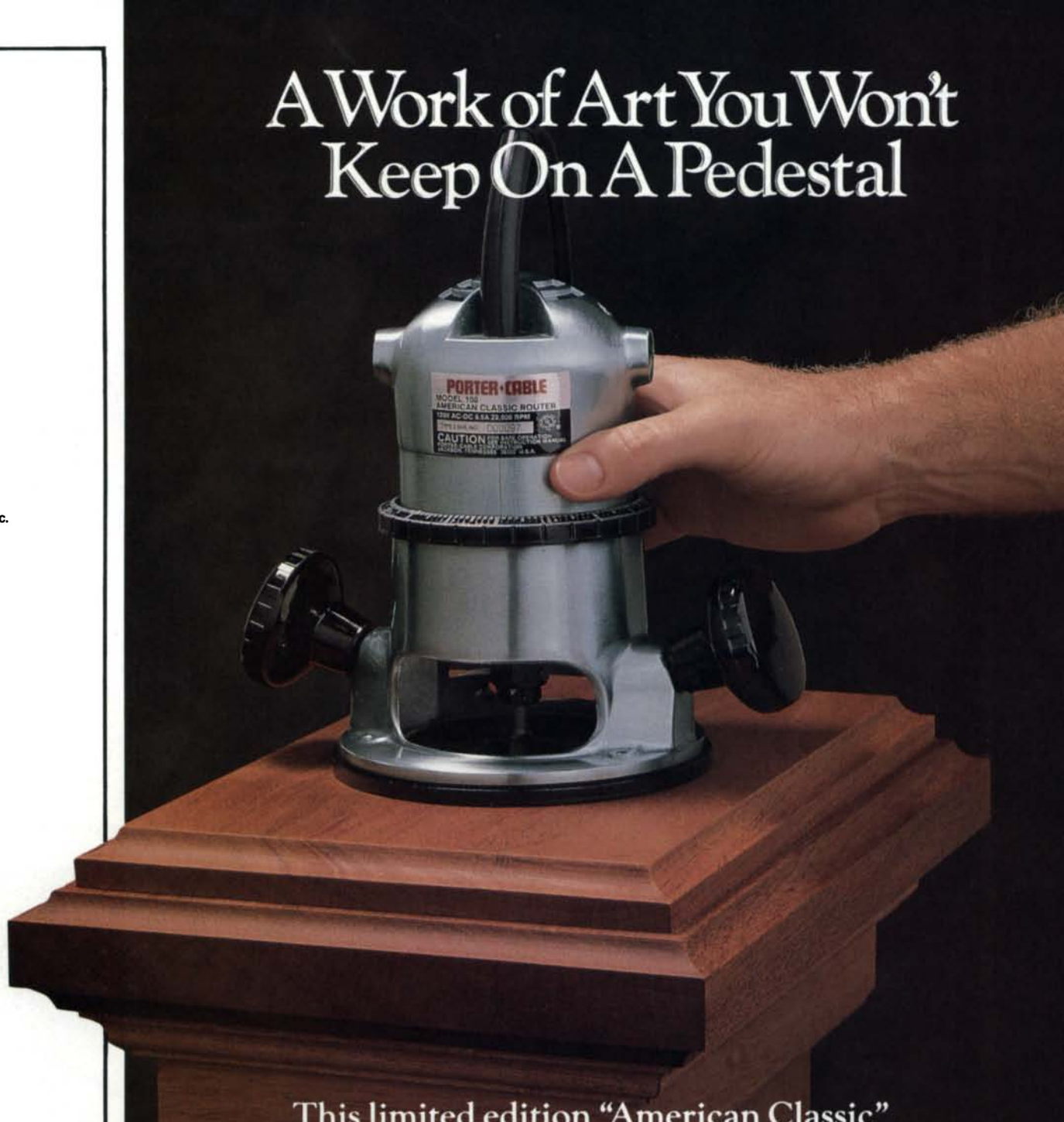

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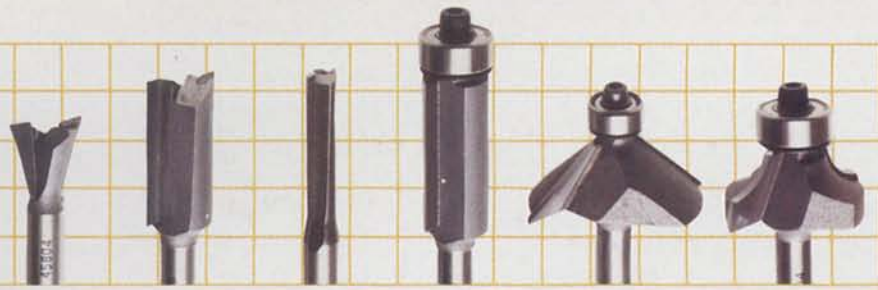

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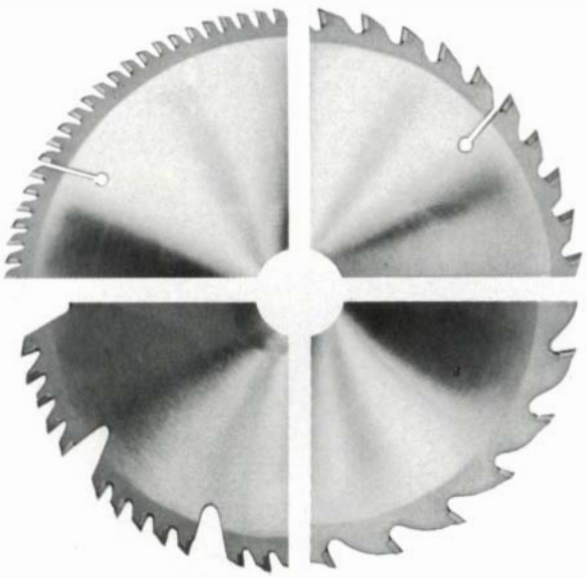

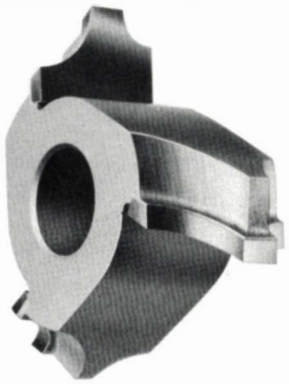

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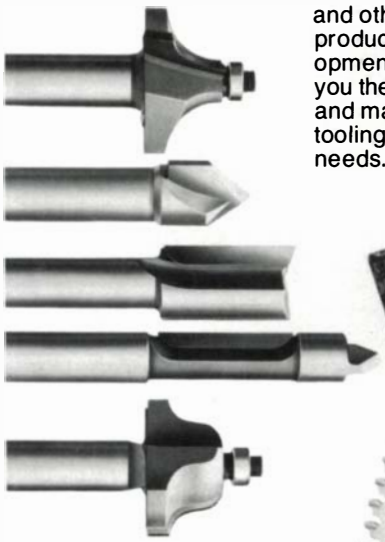

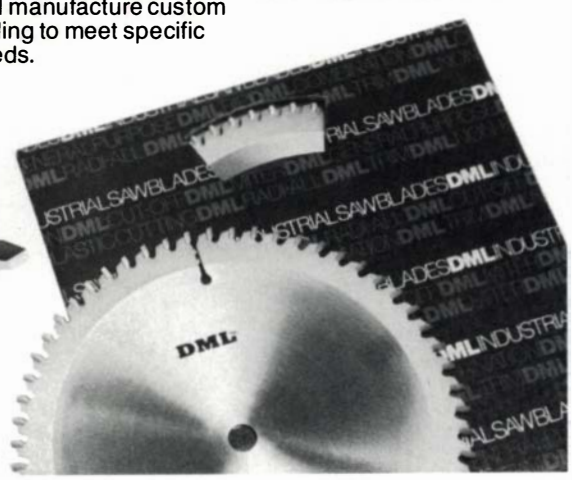

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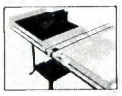

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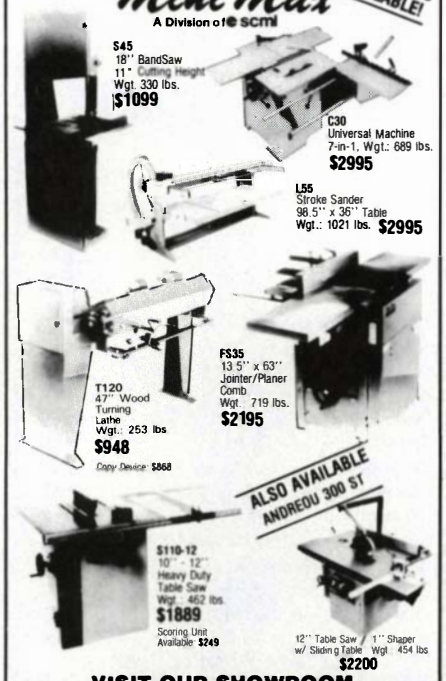

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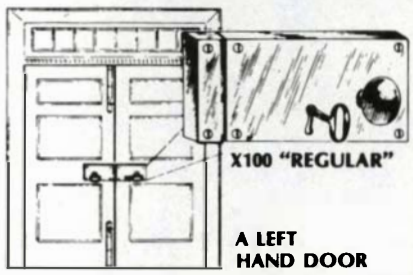

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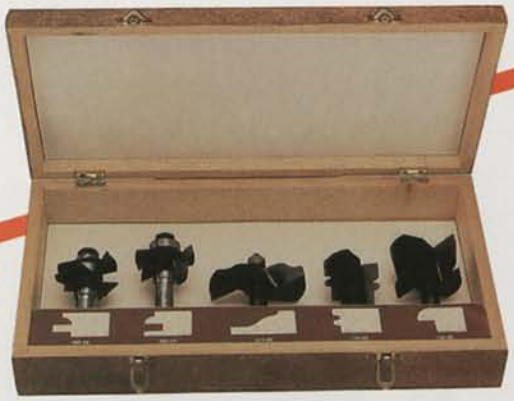

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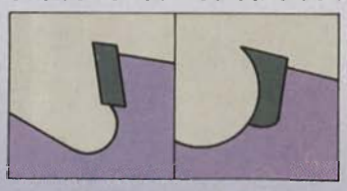

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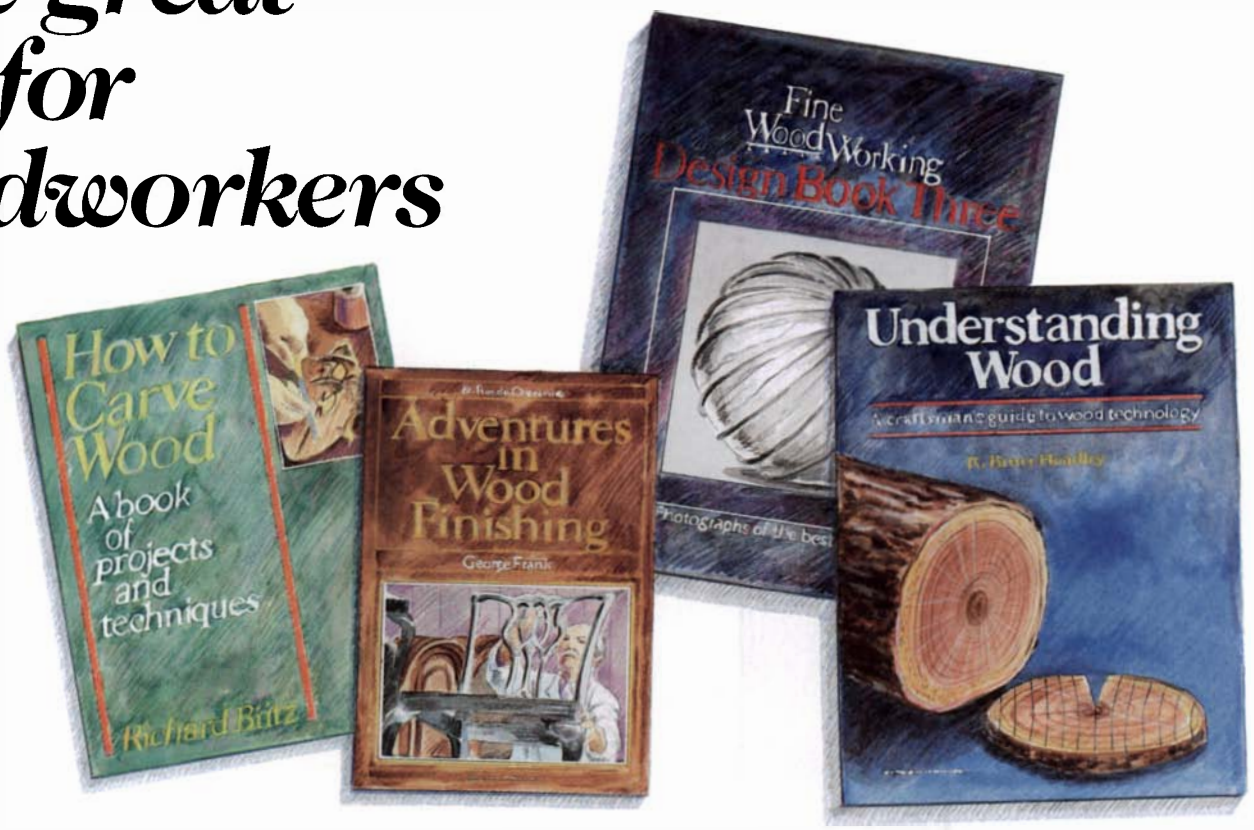

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In New England, high-speed bandsaws have replaced most of the big, old circular saws. This 38-ft.-long blade, at the A. Johnson mill in Bristol, Vermont, is about to be rolled to the sharpening room, which is equipped to weld on new teeth if necessary.

Lumber

Where it comes from, how it's made

by Jeremy Singley

Whenever woodworkers gather, there are sure to be gripes about the cost of lumber. I used to complain myself, until I worked a stint, ten years ago, at the A. Johnson Lumber Mill in Bristol, Vermont. There I learned firsthand that the work starts early and ends late for those who make lumber, because lumber is what the economics professors blithely call "labor intensive."

To begin with, trees have to be fetched; they don't come to you. Once home, a good run of hardwood logs will lose about a third of its bulk as waste. Of the remaining lumber, only about 35% is top grade, but all 100% must be handled, and the only way to sort and stack hardwood boards is to bend down and pick them up, one at a time—ten, a hundred, a thousand a day.

It's like that right down the line. Trees to be cut are marked by a forester who spends every working day walking the woods. They are harvested and dressed by men and women wielding chainsaws, peaveys and axes. The tree-length logs are chained to tractors, drawn out of the woods, and cut to length with chainsaws again. These jobs are performed year-round, in rain and snow, at 30° below and 100° above, from dawn 'til dusk.

To get the whole story of where prime lumber comes from, I talked with some of the people who do these jobs: Tom Bahre, county forester for Addison County, Vermont; Bernie Badger and Bob Slater, loggers; and Phil Johnson, part-owner of the A. Johnson Co. sawmill, a family business that has grown into one of the top 500 mills in the country.

Wood on the stump—When you pull a dozen clear 14-in.-wide boards off the lumber rack, you're handling approximately two cups of topsoil minerals plus around 35,000 days of rain, snow, sun and wind: the makings of a tree. Tom Bahre's job is to see to it that another hundred years hence today's saplings will have grown to produce more of those 14-in. boards. You might think that means he spends most of his time planting seedlings, but growing trees is not his job at all. Bahre's job is to kill trees.

In New England, trees are like ants at a picnic. You can't keep them out. Like ants, trees are greedy. Let the wind and animals carry seeds onto an acre of clear land and in 30 years you'll have so many trees jostling for that acre's nutrients that they'll be murdering each other. Many potentially high-grade trees will be killed off. Leave the stand to mature for another 70 years or so and then let the loggers loose on it and the picnic's over—only weed trees will be left to re-seed the gaps. Do this repeatedly over decades and you'll find it harder and harder to find cabinet-grade lumber. This is exactly what's been happening to our hardwood forests all over the United States.

Forty years ago good trees were so plentiful in the Northeast a team of two loggers, using handsaws and horses, could cut a quarter-million board feet in one winter. The standard board length then was 16 ft., because any stem a logger cut was likely to contain three 16-ft. clear logs. It wasn't unusual to see whole truckloads of high-grade logs as big as 3 ft. in diameter, or sometimes even loads with just one log the full width of the truck bed, 5 ft. across.

Three developments changed all that: the baby boom, the chainsaw, and the tractor. As population (and wealth) increased, demand increased, and the chainsaw arrived just in time to enable the need to be met. When demand outstripped even the chainsaw's output, the tractor showed up to replace horse-drawn sledges. No one thought to improve on nature, however, and woodlands became inexorably depleted.

To counter this trend, the United States Department of Agriculture has long encouraged individual states to adopt land-use

The skidder, a specialized tractor, tows a train of logs toward the decking area, where the logs will be cut to length.

Photos: Erik Borg; drawings: Michael Janos

From logs to boards

The route of a log through a mill is fast and efficient. The A. Johnson mill in Bristol, Vermont, supplies the woodworking world with one quarter million board feet a week, by the trainload or by the board, for everything from golf tees to buildings. It begins as stacks of logs in the yard, about 30,000 of them at any given time, which logging crews keep replenished at an average rate of ten truckloads a day.

From the yard, a diesel-powered forklift bites up mouthfuls of 5 or 6 logs at a time and loads them onto the sawmill's debarker deck, the first stop on a fast ride to oblivion:

The debarker (1) rotates each log while a set of toothed wheels chews off the bark, which would otherwise hide defects, dull sawblades and make subsequent saw waste unusable for paper manufacture. The stripped bark is hauled off and used to fire the company's drying kilns.

From the debarker the logs move to a holding area (2), from which the head-rig carriage (3) picks them up. The head-rig sawyer, stationed in his electronic control booth, directs a hydraulic cant turner near the carriage to juggle the log into position for the first cut. Seeking the best face, he may flip the log almost one full turn in a series of short hops. Working up to 30 switches per minute, and making split-second decisions as fast as the debarker can deliver logs, the sawyer inspects the surface for defects hidden inside. He aims to slice off the most valuable timber from the log with the first cuts, which, as shown in the drawing at right, produces the highest proportion of valuable boards.

The head-rig sawyer directs the carriage along a set of rails past the head rig's 38-ft.-long by 1-ft.-wide bandsaw blade. Powered by a 150-HP motor, this saw routinely slices the length of a 16-ft. log in less than two seconds.

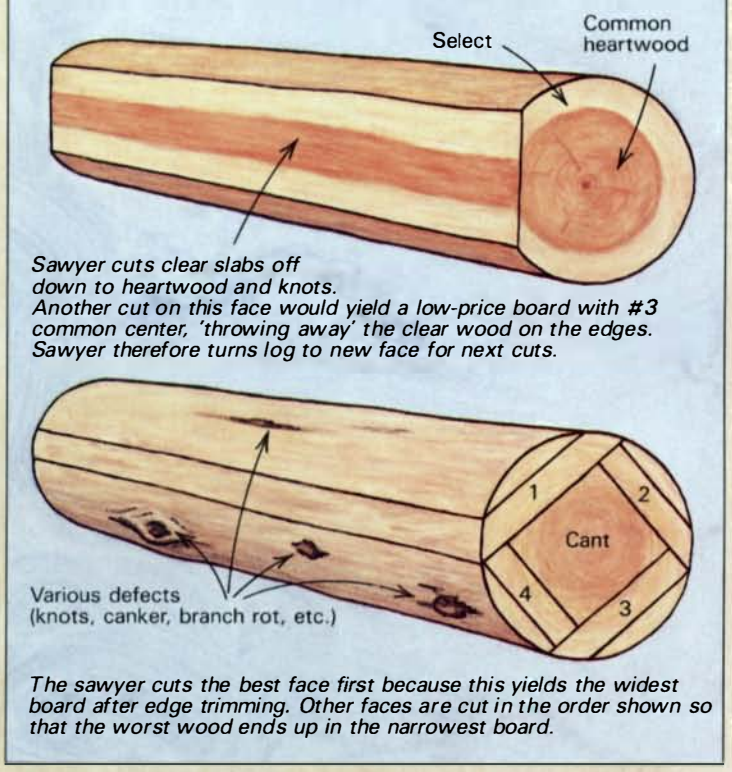
If the first sawn slab contains no usable lumber, the saw's outfeed conveyor (4) is shunted aside (5) to let the slab drop to a shaking conveyor trough in the basement. This conveyor jostles useless slabs and other waste to a chipper that works something like an oversize lawnmower, chewing up the average slab in about a second. Chipped waste eventually goes to a pulp mill or to wood-fired utilities. In a sawmill, everything salable is sold. This is partly to get every cent's worth out of the tree, but it's also necessary to keep the mill from being buried in its own waste.

Usable slabs are caught on the saw's outfeed conveyor and directed to an edge trimmer (6) that cuts the irregular edges square and parallel. Meanwhile, the head sawyer may take one or two more passes from the first face of the log—this is the best time to slab off an 8/4 or 12/4 clear board, if the log has one in it.

Next the sawyer will flip the log a quarter-turn and repeat the process. Two more quarter-turns leave the log square.

The squared logs, called cants, are dropped from the head-rig carriage onto the outfeed conveyor and directed to a second holding area (7) feeding the resaw (8). The resaw sawyer will then take repeated cuts from the best face of each cant until he exposes inferior-grade stock, then he'll flip the cants to cut the second best face, and so on. The first and best resaw cuts make the widest boards; the last cuts, near the tree's heart, are the lowest grade.

Cutting strategies at the mill



The sawyer cuts the best face first because this yields the widest board after edge trimming. Other faces are cut in the order shown so that the worst wood ends up in the narrowest board.

The drawing on p. 45 shows why—within the fully grown tree is the skeleton of the sapling it once was, complete with overgrown branch stubs and all the other scars incurred in the past. The bigger the log, the better. Whether a log is 10 in. dia. or 20 in., it will likely contain the same 5-in.-dia. heart of #3 common lumber. In fact, a hollow log may yield as much cabinet-grade lumber as a solid one.

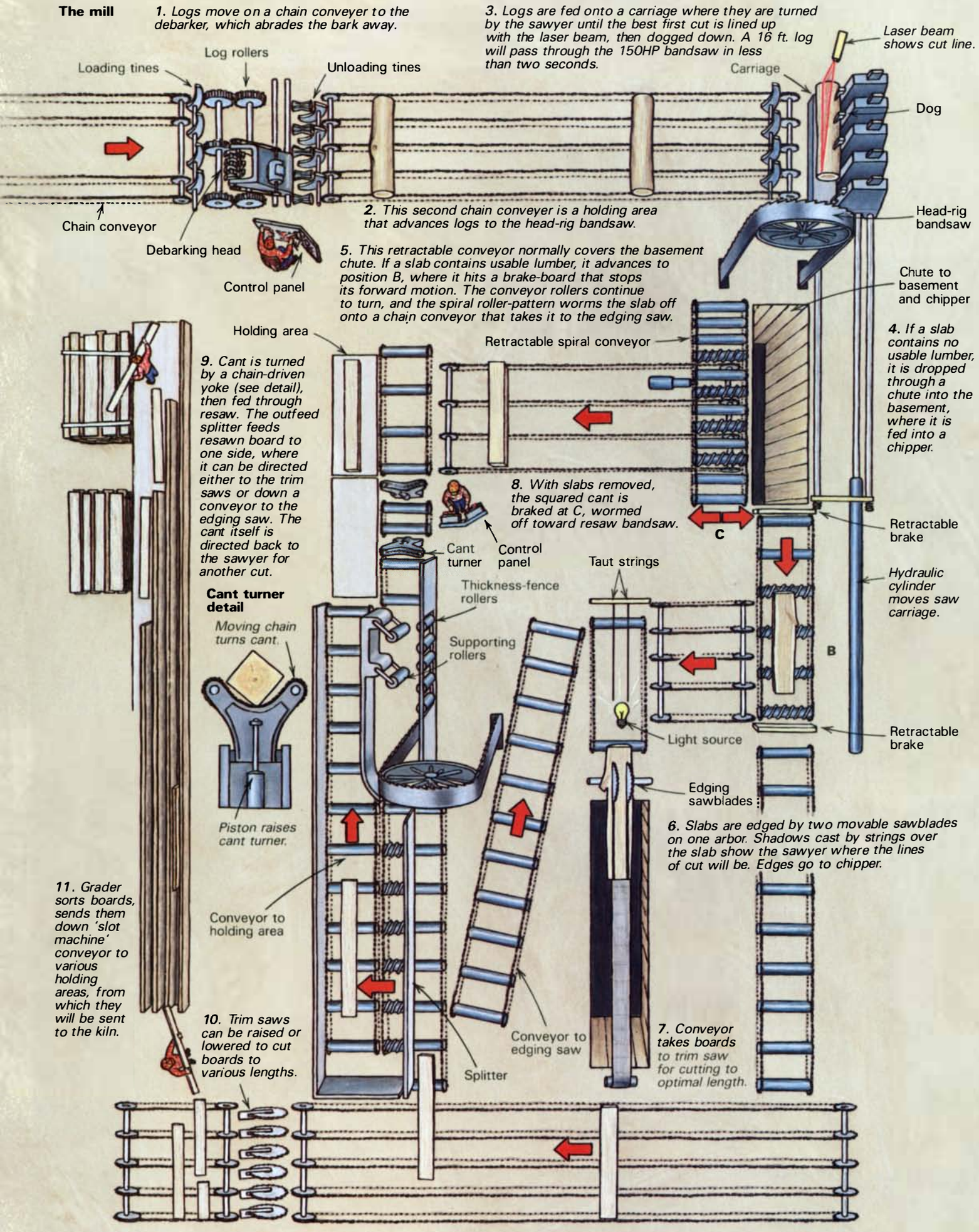
The resawn boards move to the trim saws (9). The trim saw operator electroncially selects from a bank of circular cutoff blades hovering above the conveyor and directs selected blades to drop down and cut each board to length. A 16-ft. #1 common board that is knotty on only one end will fetch more at market if cut into an 8-ft. select and an 8-ft. #2 common.

Finally, the trimmed boards are sorted by a grader (10) who feeds them, according to grade, thickness and species, into different slots in the "slot machine" (11). Rollers between the slot machine's fences carry the boards to different loading decks, where laborers stack and sticker them into packages ready for drying.

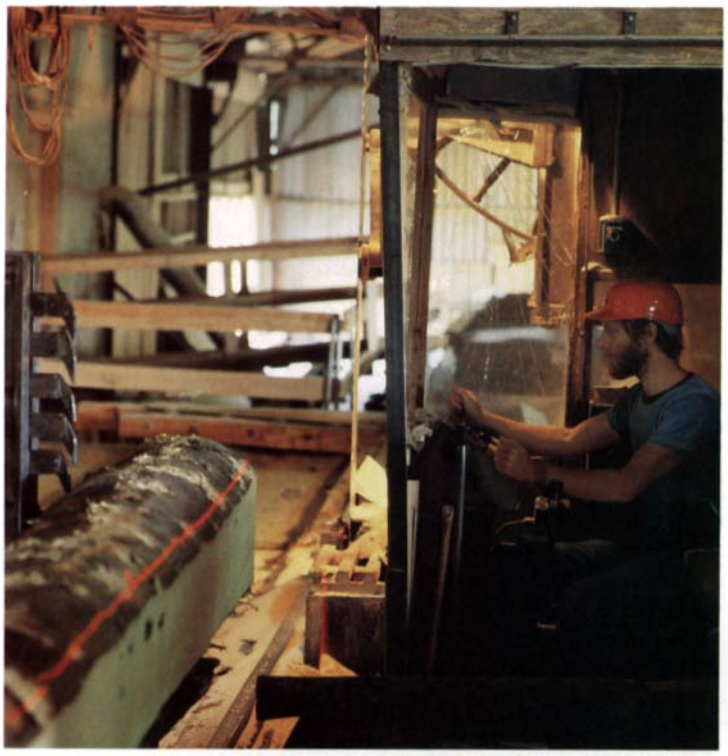
Periodically during the day, forklifts will move the finished packages to the drying kilns. There they will remain for up to 50 days, after which the dry lumber will be re-sorted for grade. Dried and graded lumber may be milled, warehoused for later sale, or loaded on trucks for shipment to wholesale buyers; most low-grade lumber is wholesaled green.

The path of a log through the mill is meant to be as efficient as possible, which is one reason the price of lumber hasn't risen over the past decade. The total elapsed time from debarker to slot machine is usually about three minutes—not much time, you'd think, for the sawyers to take much care in what they do.

Yet this, too, represents an efficiency—a human one, honed by generations of experience—found all along the line from forest to kiln. —*J.S.*


The mill
1. Logs move on a chain conveyer to the debarker, which abrades the bark away.
Loading tines
Log rollers
Unloading tines
Chain conveyor
Debarking head
Control panel
2. This second chain conveyer is a holding area that advances logs to the head-rig bandsaw.
3. Logs are fed onto a carriage where they are turned by the sawyer until the best first cut is lined up with the laser beam, then dogged down. A 16 ft. log will pass through the 150HP bandsaw in less than two seconds.
Laser beam shows cut line.
Carriage
Dog
Head-rig bandsaw
5. This retractable conveyor normally covers the basement chute. If a slab contains usable lumber, it advances to position B, where it hits a brake-board that stops its forward motion. The conveyor rollers continue to turn, and the spiral roller-pattern worms the slab off onto a chain conveyor that takes it to the edging saw.
Chute to basement and chipper
4. If a slab contains no usable lumber, it is dropped through a chute into the basement, where it is fed into a chipper.
Holding area
Retractable spiral conveyor
9. Cant is turned by a chain-driven yoke (see detail), then fed through resaw. The outfeed splitter feeds resawn board to one side, where it can be directed either to the trim saws or down a conveyor to the edging saw. The cant itself is directed back to the sawyer for another cut.
8. With slabs removed, the squared cant is braked at C, wormed off toward resaw bandsaw.
C
Retractable brake
Cant turner
Control panel
Taut strings
Thickness-fence rollers
Hydraulic cylinder moves saw carriage.
Cant turner detail
Moving chain turns cant.
Supporting rollers
B
Light source
Retractable brake
Edging sawblades
Piston raises cant turner.
6. Slabs are edged by two movable sawblades on one arbor. Shadows cast by strings over the slab show the sawyer where the lines of cut will be. Edges go to chipper.
11. Grader sorts boards, sends them down 'slot machine' conveyor to various holding areas, from which they will be sent to the kiln.
Conveyor to holding area
Conveyor to edging saw
7. Conveyor takes boards to trim saw for cutting to optimal length.
Splitter
10. Trim saws can be raised or lowered to cut boards to various lengths.

With a normal backlog of 30,000 logs on hand, high-power machinery, like this debarker, is necessary to keep things moving. Three minutes from now, this log will have been sawn into boards ready for grading.



The headsaw, a 150-HP bandsaw, can slice the length of a 16-ft. log in less than two seconds. Here the log is being manipulated for a second cut; the red line is a laser beam that shows the sawyer where the cut will be.

Squared-up logs, called cants, are sawn into boards on a bandsaw similar to the head rig shown above and on p. 40. Here the sawyer has just seen a defect in the cant, and is flipping it to a new, clean face for the next cut.

management programs. In Bahre's province, the state pays half to two-thirds of the owner's property tax in return for his agreement to manage his woodlot. That's when Bahre gets out his paint gun and starts marking trees for execution.

In a managed woodlot the aim is to make virtually all growth productive. Undesirable trees, or "culls," are removed and sold for firewood or pulpwood. If the remaining high-grade trees are still overcrowded, some will be removed and sold for pulp or, if big enough, timber. The hardwoods that remain will then receive their full share of sun and nutrients. The amount of wood fiber the stand will produce will be no greater than it was before managing, but its yield of cabinet-grade wood will often be doubled or tripled. Harvesting roughly 20% of the trees every 20 years, a rate that doesn't exceed the soil's ability to regenerate, can ensure a steady supply of prime lumber forevermore.

Lean times—All in all, the future of our managed forest lands looks bright. At the moment, however, loggers have to work harder for every dollar they make than at any time in the past. As independent logger Bob Slater says, "Considering the culls we have to take out and the small percentage of high-grade trees we're allowed to cut, the amount of clear lumber being trucked out of the average woodlot is a small proportion of the material removed." On most jobs Slater must cut two or three times as much firewood as sawlogs. Not that anyone's complaining. Good logs are so scarce today that loggers must get into the firewood business anyway, in order to cover the costs of moving their equipment onto a woodlot.

It wasn't always so tough to make a living logging, a job Bernie Badger retired from in 1970. In his more than 35 years in the woods, he figures he's cut at least 40 million feet of timber. His was a case of being in the right place at the right time—the trees were there, and he had the tools.

Badger saw his first chainsaw at a demonstration in Albany, Vermont, in 1950. With a 6-ft. blade and a 1-qt. oiler at the tip of the bar, the two-man machine weighed 109 lb.

Badger recalls: "My boss, William Blake, asked me what I thought of the saws, and I told him that they were bound to change everything and I wanted one, but I couldn't afford it. It cost $800, which was a helluva lot of money in 1950. Mr. Blake said he'd buy one for us and take 50 cents per thousand log feet out of our pay. By the end of the year we had two saws bought and paid for. We started that year working two horses and ended it working five. The year before we had cut about 500,000 feet, that year we cut almost two million."

Moving the timber, though, was still a crude operation, because horses drew timber on sledges that needed snow to run on. That meant logging could only be a half-year job. By 1954, when Badger went to work for the Ward Lumber Co. of Stockbridge, Mass., that part of logging changed, too. The Ward Company replaced their horse teams with tractors.

"We'd cut brush and the tractors would pack it down to make what we called a 'beaver road' because it looked a lot like a beaver dam. With those roads, the tractors could haul logs out of the woods year-round."

Since Badger's day chainsaws have gotten smaller and tractors bigger, evolving into a machine built especially for moving logs: the skidder. Modern skidders weigh in at 6 to 12 tons and sport quarter-ton tires as big as 7 ft. in diameter. All four wheels are powered by a diesel engine, and the tractor's frame is articulated at its waist to enable it to maneuver in the woods.

In the mountains of New England, skidders are used in con-

junction with bulldozers. The latter machine is used to clear and grade an "archroad" or "dugroad" from the nearest road to the farthest end of the lot, often a distance of several miles. As each log is felled and trimmed, the 'dozer drags it from the woods to the archroad. There a skidder picks logs up in bunches with a multihooked cable, called a gang-hitch, and hauls them to the end of the road, where they are "decked," loosely stacked on a level clearing made for the purpose. There the logs are trimmed to length for the mill. Cutting strategies can make the difference between profit and loss at this point, and some considerations are shown in the figure at right. From the deck the logs are loaded into a truck with a built-in crane and are trucked off to the mill.

In most operations in the Northeast, all these jobs are performed by crews of just two or three people, who spend some of their time on the ground and some operating machinery. On an average day they will get out one truckload of 5,000 bd./ft. of sawlogs plus twice that in firewood and pulpwood. That's about 35 good trees and 100 bad. For the sawlogs, they may receive from $20 per thousand bd./ft. (for hickory in a bad year) to $500 (for oak in a good year). The firewood will go for about $30 a cord, wholesaled in log lengths. Under the best conditions that's $2,500 for saw timber plus maybe $500 for firewood. When you subtract the $1,500 stumpage fee paid the landowner, this leaves $1,500 per 10-hour working day for three people. Sounds great, until you consider that it costs more than $5,000 per month to run the equipment. (For openers, a skidder tire can cost $1,000.)

Then, of course, there's Mother Nature. On any logging site, the standard conversation opener is: "How are they opening up?" which means how much red rot, wind shake, blister rust, scale, insect damage, dozey-center, blight, stain, brash, etc., etc. are you finding hidden inside those nice-looking trees you paid good money for?

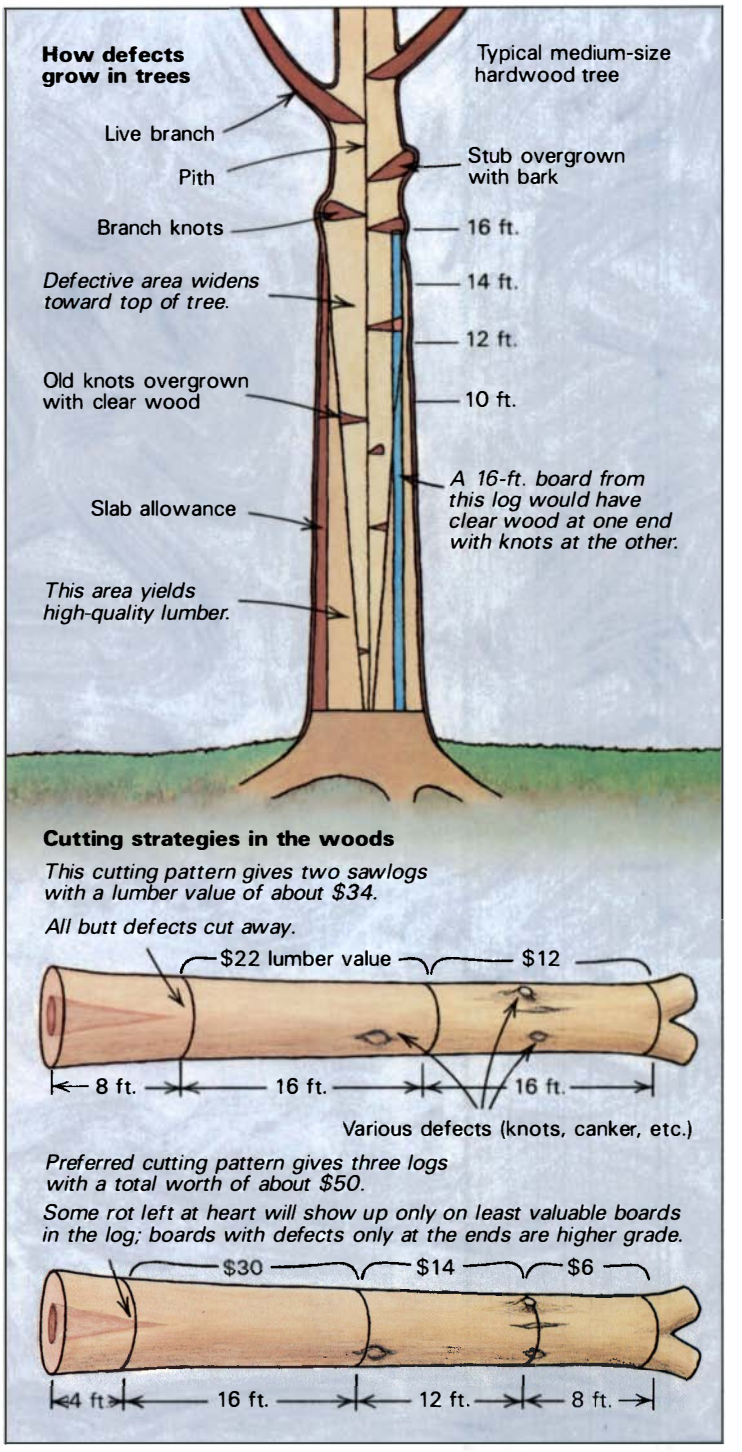
The next question is "How are they selling?" You can get $2,500 for a load of oak only if the mill wants oak that badly. They're just as likely to not want it at all. "When I send out a load that I've scaled at 5,000 feet and the mill sends back a slip saying it was 600 to 700 feet less, they're telling me in very direct terms they'd rather not see any more oak," says Slater. Which is too bad, because he's already paid for the trees.

A sawmiller's tale—How can one person's measure of a log load differ from another's? "There are more methods of grading and scaling logs than there are logs in the state of Vermont," according to Phil Johnson, whose great-grandfather started the sawmill in 1906. When the demand for logs drops, things like catfaces (roundish distortions on the bark that indicate a knot inside) can make a marginal log unacceptable.

Slater and Johnson, by the way, are personally on the best of terms. Most loggers realize that the mill owner is in the same roulette game, and for much higher stakes. A competitor of Johnson's is a case in point. He bought a plot of standing oak when the oak market was running away three years ago, paying $410 a thousand for 60 acres of 2-ft.-diameter trees on the stump, $97,000 total. The selling price of milled oak lumber dropped too low to yield paying lumber before one tree was cut. The trees are still standing, and until he cuts them he'll not only pay interest on his money, but, according to his contract, he'll be charged for the accrued timber growth as well.

The story could have been sadder. The demand for other woods has dropped even more than for oak. Economic slowdowns are part of the cause, but Johnson believes competition from more efficient overseas companies is hurting U.S. wood products far more. "About 10% of our lumber is exported, mostly to Japan and Hong Kong, but also to Italy, Germany, Denmark, Australia and Korea. During the big dock strike in the early '70s, the Japanese were so desperate for lumber they were flying it over in planes. They buy our best maple to make ceiling-fan blades and pool cues. Then they ship them back here."

Curiously, considering all the effort to get big, clear boards from a tree, most of Johnson's highest-grade lumber gets cut up into small bits. Items include parts for toy pianos, actions for real pianos (Steinway), golf tees, door harps, dollhouse siding, paintbrush and putty-knife handles (Red Devil), and parts for folding beach chairs. Some does find its way into furniture, mostly mass produced, and perhaps 15% is sold directly from Johnson's warehouse for local consumption. Of this, an increasing amount is going into architectural work. Cherry or elm flooring, solid oak



Buying retail from the mill

When buying anything, it's tempting to get as close to the source as possible, thus cutting out the middlemen. Buying lumber directly from a mill *can* save you money, but it's not quite the same as dealing with a retail lumberyard.

First, keep in mind that a yard that deals by the million board feet is doing you a favor selling you a pickup load, and no mill owner has time to haggle. But if you like the price, consider that what the mill has in stock can fluctuate radically. If you see wood you know you'll need later, buy it now.

If you buy lumber often, it's a good idea to pick up a grading handbook and learn the basics—if your project calls for lots of small parts, it's often cheaper to buy more of a lower grade and throw the defects away. (An introductory booklet on hardwood grades is available from the National Hardwood Lumber Association, P.O. Box 34518, Memphis, Tenn. 38184, for $1.25 postpaid.)

Get price and availability quotes over the phone. Grade is grade, but color, figure, size, straightness and soundness can vary. Check to see if the mill will cut and plane lumber to order. Most won't. Sawmill boards are random-sized, so you'll need to buy about 30% extra to allow for overage.

If you want top-of-the-line, expect to pay extra for picking through the pile (and remember that some grades are one face only; flip each board and check the back). In my experience, it's better to buy lumber as it comes and get plenty of extra.

Don't be embarrassed if you don't know what you're looking at. Even pros get their species mixed when handling rough-sawn boards. Also, small mills may sell only green or air-dried lumber, but even with kiln-dried, there's no way you can tell how dry the wood is without a moisture meter. Even if you have one, the yard probably won't let you drive its prongs into their boards, so plan to buy a sample board to test. Many woodworkers play it safe by wintering their lumber on stickers in a heated room before using it. Take along a tarp to cover your truckload in case it rains.

If you find major hidden defects inside a board (such as honeycombing), don't work it any further. Take it back to the yard. Minor defects, on the other hand, are a matter of course. That's one reason to buy extra. —*J.S.*

paneling and pine siding can add inestimable charm to a building, and, bought directly from the yard, can be surprisingly inexpensive. Johnson's kiln-dried maple flooring, for example, sells for $1.30 a foot, cherry for $2.00.

Cabinetmakers also buy retail lumber from Johnson, who stocks maple, oak, cherry, ash, hickory, yellow birch, pine and other woods in a variety of thicknesses. Lately, hobbyists have begun to buy there, too, which Johnson encourages (see above), although this business barely takes a chip out of the mill's million-board-foot monthly production.

Coke bottles—The pace of a modern sawmill is astounding. The head-rig bandsaw at the Johnson mill can take a slab off a 16-ft. log in less than two seconds. A typical log's ride through the mill is diagrammed and explained in the box on p. 42. When all goes right, a log goes in one end and becomes boards, bark, chips and sawdust in about three minutes. But sometimes things go wrong.

Trees have a habit of growing around man's debris: "We've sawn through Coke bottles, splitting wedges, chains, cables, and fence wire, but the thing we hit most often is sap spouts left by maple-syrup makers," laments Johnson. When that happens the blade must be removed and rolled into the sharpening room, where new teeth will be welded on in place of broken ones. Occasionally, all the teeth must be ground away entirely and new ones filed in, an all-day job.

Johnson can list lots of other things that can go wrong. "About ten years ago I was sawing a big ash log on the headsaw. Apparently the tree grew on the side of a hill, because when the blade had cut all but the last foot or so of the first cut, tension wood popped the log open and sent the slab flying. It took off the top of the control booth three inches above my knees."

These kinds of problems are difficult to prevent, but the unforeseen accounts for only a small portion of slowdown. Human error is the most frequent cause of accidents, and "while you can't prevent stupidity," as Johnson says, "you can guard against it. We've had people walk across toothed conveyor rollers while they were operating. A fellow lost half his foot that way here last year." Another man lost two fingers when he tried to clear a jammed planer without shutting down.

To prevent such accidents, Johnson's mill is installing such safeguards as deadman's pedals to automatically shut machinery down when the operator leaves his post. These changes are being made as part of a general overhaul to make the mill more efficient. Other changes include programmable electronics to set up the bandsaw and trim-saw cuts and direct material to different conveyors, and the installation of a faster "skrag" saw to rip the undersize cull logs that must be removed from managed lots. One change that has already shown substantial savings is the conversion of oil-fired drying kilns to bark-fired. This step has reduced oil consumption from over 25,000 gallons per month to less than 2,000 per year.

"We're probably at the end of an era here," says Johnson. "Mills are becoming more and more efficient. Already there are softwood mills on the West Coast where lumber is never touched by human hands."

Johnson's era has some time yet to run. While softwoods are usually gang-sawn indiscriminately into construction lumber, producing quality hardwood boards is still a one-on-one job. Woodworkers still need everybody down the line—forester, logger, sawyer—to ensure we get the boards we want.

The result of increased mill efficiency has been a virtual freeze in wholesale lumber prices over the last ten years, despite the fact that our nation's tree supply has been at its lowest ebb for the same period. In fact, if inflation is figured in, the wholesale price of lumber has been steadily dropping for a decade.

With over 400 million acres now under management, our forests should be making a comeback, so it's likely the news will get even better. That's encouraging, because forester Tom Bahre tells me that, without enforced management, trees would be made into pulp faster than the environment could replenish them. Personally, if this meant western man had to settle for plastic fan blades and golf tees, I wouldn't be too upset, but a polyvinyl Windsor doesn't much appeal to me. Besides, when it comes to trees, my sentiments match Bernie Badger's: "Lord, I hate to see 'em go." □

Jeremy Singley, who wrote about making chairs in FWW *#46 and #50, lives in East Middlebury, Vt.*

Carving a Scallop Shell

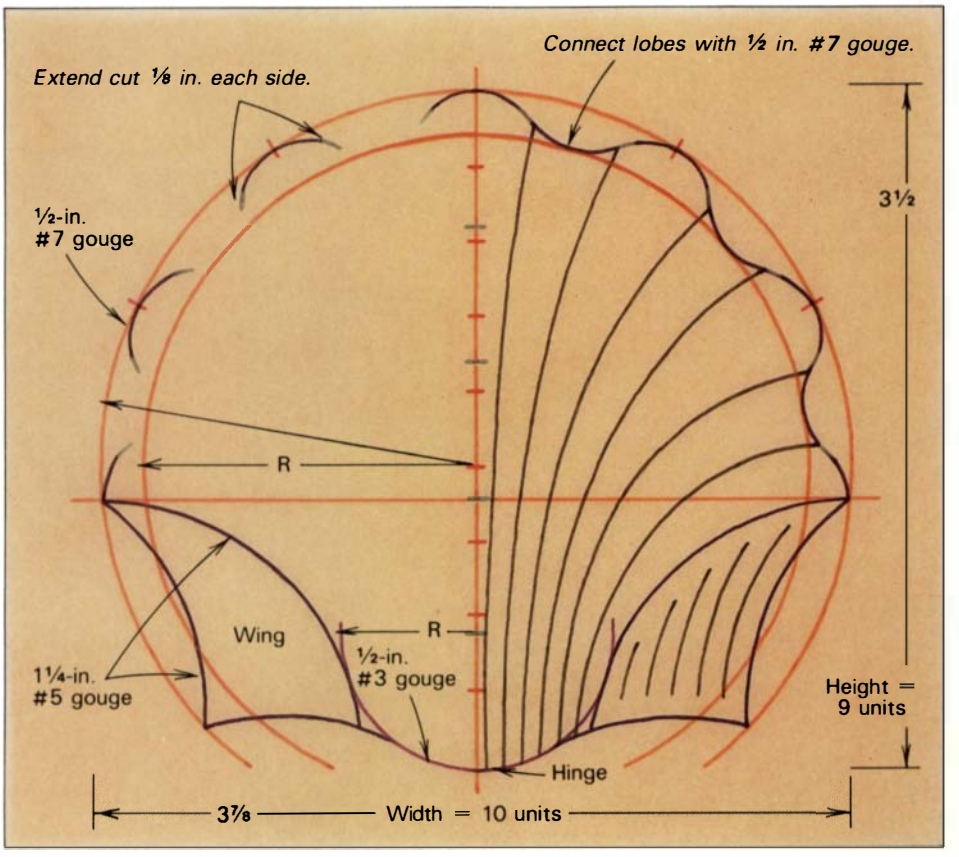
Gouge's sweep determines the curves

by Mack Headley, Jr.

Fig. 1: Laying out the shell

A. Divide height into 9 units (red) and draw arcs to define lobes and wing corners. Divide height into 5 units (blue), draw arc to define hinge and line to locate outer rays.

B. Outline perimeter with imprint of gouges shown.



C. Sketch in lines to define convex and concave rays. Save for reference. Make concave rays slightly narrower than convex rays.

The shell was a very popular detail on English and Colonial furniture throughout the 18th century. Carved on drawer fronts, knees of cabriole legs, and the crest and seat rails of chairs, the shell was appreciated as more than just decoration. The study of nature was fashionable at the time and artisans attempted to analyze, and capture in their designs, the symmetry and proportion they found in natural forms. Classicism was also in vogue, so symbolic meanings (the Greek goddess Aphrodite arose from the sea on a scallop shell) would have added a dimension to its popularity which is hard for us to appreciate today. Yet the shell's appeal as a decorative detail endures.

In this article, I'll go through the step-by-step development of a shell. This particular shell is a style common on Pennsylvania furniture. I've chosen to carve an applied shell—one that will be glued onto a flat surface. You can apply the carving techniques to carve shells directly on drawer fronts or crest rails.

Carving gouges are made in various widths and curvatures. The curvature, or sweep, is designated by a number from 1 to 11. The higher the number, the more pronounced the curve. Curves are carved by selecting gouges with the appropriate curvature and transferring their shapes to the wood.

Make a full-size drawing of the shell on paper or wood, following the layout shown above. The perimeter is defined by the imprints of the gouges shown. These same tools will later be used to carve the shell. The sweep numbers given correspond to my gouges. Because sweeps are not standardized, however, you may find that your gouge doesn't exactly match the curve in the drawing. In that case, choose another gouge to get the right shape.

This shell measures 3½ in. high and 3⅞ in. wide, based on proportions of 9 units high by 10 units wide. By using these proportions, you can scale the shell up or down to suit your needs. The lines between the rays are drawn freehand, pivoting off the knuckle of the little finger to control the curve. Save the final drawing as a reference for laying out the rays on the carving.

Mack Headley, Jr. is master cabinetmaker at Colonial Williamsburg, Va. A videotape of Headley carving the shell in this article is available from Taunton Press.

Drawings: Lee Hov

1 With dividers, lay out the perimeter of the shell on the back side of a ⅝-in.-thick board, as shown in the photo at left. For a beginner, it might be more comfortable to start with a paper pattern traced from your drawing, although I'm inclined to stay away from paper patterns because of the bloated character caused by the thickness of a pencil line. Outline the perimeter with the gouge imprints shown.

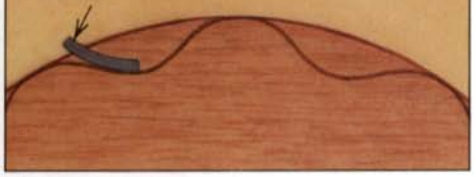
The next step is to saw out the blank on a bandsaw or with a coping saw. Saw slightly outside the gouged outline of the wings and hinge, and around the arc that defines the limits of the convex rays. It isn't necessary to saw in and out around the lobes because it's easier to remove this material with a gouge.

Lay out the perimeter of the shell on the back side of the board. Then outline the perimeter with gouge imprints (left).

After sawing around the perimeter, cut to the imprint line with the appropriate gouge. Angle the tool so the bevel is vertical, then lean into the tool and push down with your weight. Cut down 3/16 in. and lever out the chip.

Fig. 2: Avoiding tearout

Where possible, keep the corner of the gouge extended beyond the wood to avoid tearout.



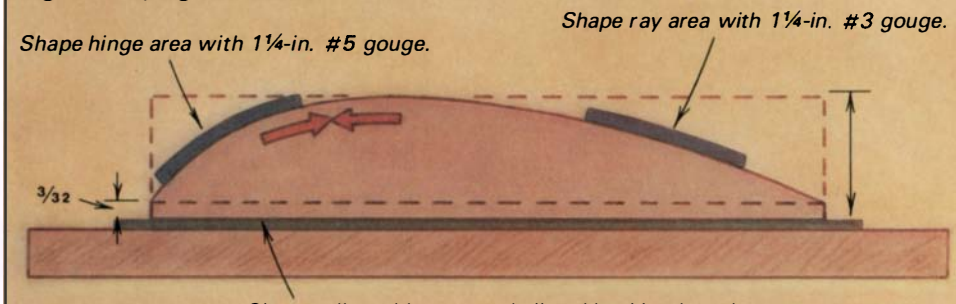
2 Next, with the appropriate gouge, cut right to the line. Angle the gouge so the bevel is vertical, and cut straight down 3/16 in. The force comes from the forearm and body. Lean into the tool and push down with your weight, as shown in the photo at left. Lever out the chip at the bottom of the cut. These bordering cuts establish the edge around the bottom of the shell, as shown in figure 3.

Remove the wood from the concave rays first. Be careful that the corners of the gouge don't get under the grain at points where the outline runs diagonally across the grain. The danger of tearout is greatest at the tip of the center ray, where the cut follows the grain, and least at the tips of the outer rays, where the cut is across the grain. Try to keep the corner of the gouge extended beyond the limits of the wood as much as possible, as shown in figure 2.

You can remove the wood at the side of the wings with little chance of tearout. If you have a lot of wood to remove or you are working with especially hard wood, shear across the grain diagonally with a skewed cut.

Sculpt the shell surface by transferring the shape of a 1¼-in. #5 gouge to the hinge area and a 1¼-in. #3 gouge to the ray area. The #5 cuts (top) follow the grain while the #3 cuts sweep from the center ray down to the wings on each side (above, left and right). The gouge should lie evenly on the finished surface.

Fig. 3: Shaping the shell

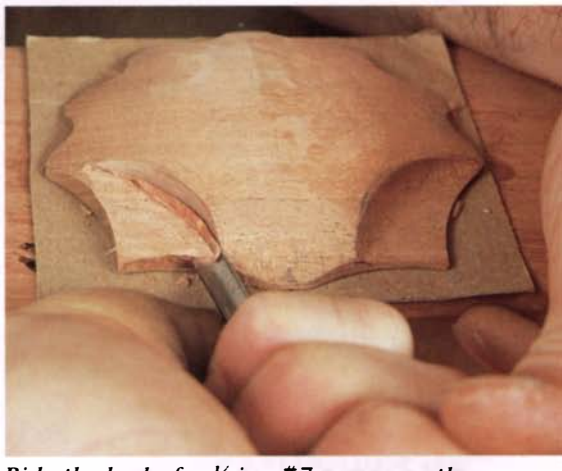


3 After you've outlined the perimeter, glue the shell, layout facedown, to a board about 14 in. long, with a piece of cardboard in between. I use hide glue, but any water-soluble glue will work.

The next step is to sculpt the surface of the shell. The curvature at the hinge area is formed by a 1¼-in. #5 gouge, cutting with the grain as shown in the top photo. When the #5 gouge lies evenly over the hinge portion, shape the flatter portion of the shell with a 1¼-in. #3 gouge.

With these cuts, your wood will begin to reveal itself. Unless your stuff has very even grain, you'll have to adjust your cuts to the direction of the grain. Begin the cuts with the 1¼-in. #3 gouge, working from the tip of the central ray out toward the outer rays at the wings. These cuts, sweeping diagonally across the grain, should work cleanly across the most distorted grain patterns. Blend the cuts from the #3 gouge into the curve from the #5 gouge. The surface is finished when the #3 gouge lies evenly over the surface of the shell up to the junction of the #5 curve.

Define the wings by cutting straight down with a 1¼-in. #5 gouge (top) and levering out the chip (above).



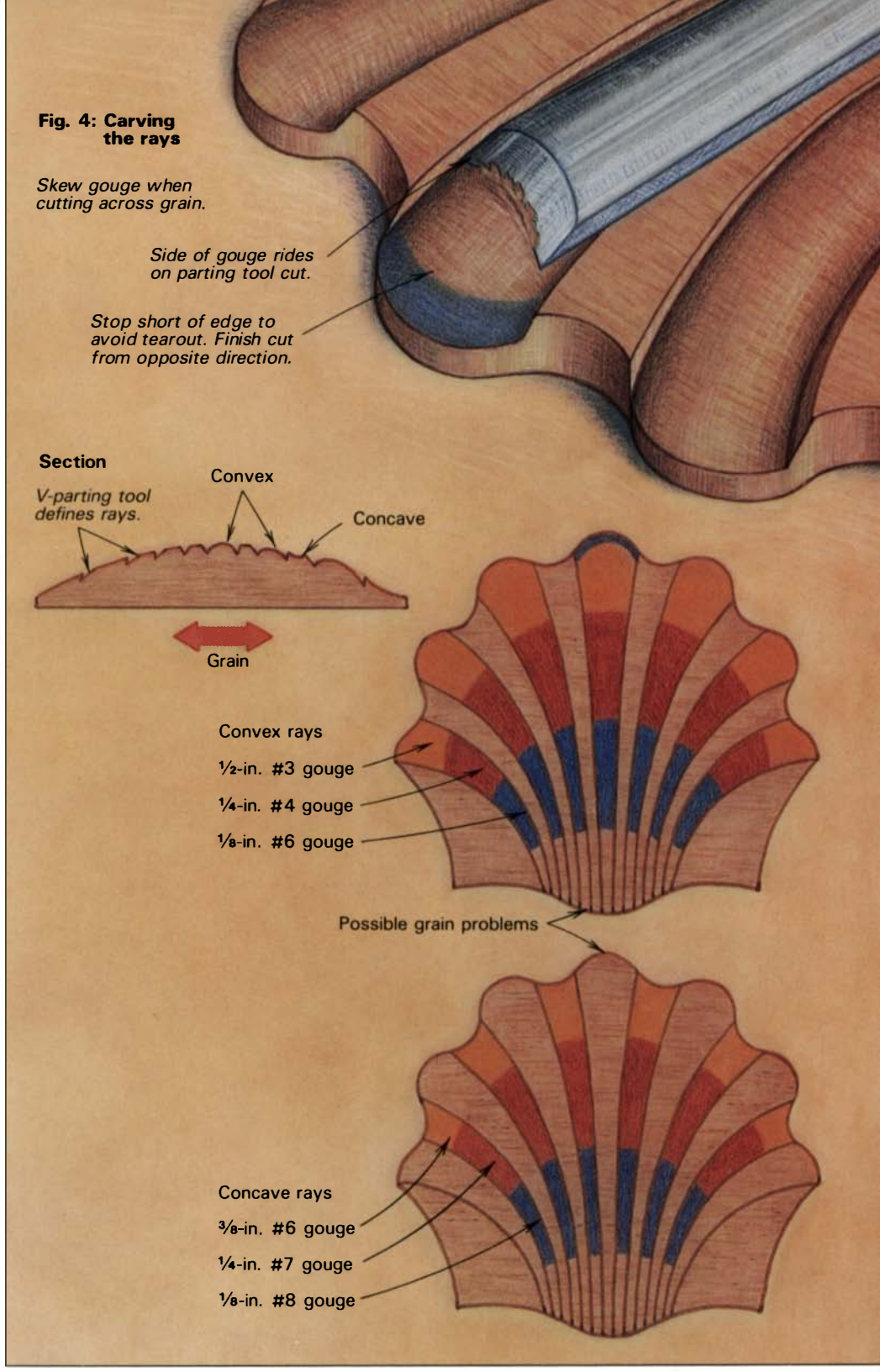
Ride the heel of a ¼-in. #7 gouge on the shoulder left by the #5 gouge to create a radius at the bottom of the shoulder.

4 Remove most of the extra wood at the wings with the 1¼-in. #5 gouge. With the tool held vertically, cut straight down to within ¼ in. of the back of the shell and lever out the chip. Then, ride a ¼-in. #7 gouge along the base of the vertical shoulder that you just cut, working from the hinge to the tip of the outer ray, to create a radius at the bottom of that vertical shoulder. Ride the heel of the gouge at a low angle against the shoulder and raise it until it begins to cut. Reduce the wing surface to a 3/32 in. thickness with a ½-in. #2 gouge.

Pivot off your knuckle to control curves when drawing the rays (top). Define the rays with parting tool cuts (above). Adjust spacing by leaning the tool.

5 After the wing areas are completed, draw the rays on the sculpted surface of the shell. Follow your layout drawing and practice the technique of pivoting on your knuckle to control the curves. With a V-parting tool, make shallow cuts along these lines to separate the rays, working from the high center point of the shell toward the edges. This is an opportunity to read the grain of your wood, and to determine from which direction final cuts need to be made. The edge of the V bordering the concave rays will be saved, as shown in figure 4. Give special attention to the cuts that go across the grain diagonally. A very sharp V-parting tool will make these cuts with minimal tearout, but if tearout does occur, come in from the other direction and clean it up. The area of greatest difficulty will be at the hinge portion, where the cuts run straight across the grain, 3/32 in. apart. Be careful not to tear out the wood between these cuts. To prevent tearout at the edge, stop the cut just short of the edge and complete it from the other direction. You could also make a vertical cut with a straight chisel. After the shallow cuts are made, deepen them to a strong 1/16 in. at the rays, tapering to a strong 1/32 in. at the hinge. As you deepen these cuts, this is your last chance to adjust them sideways for good spacing and flowing curves.

Fig. 4: Carving the rays



6 The next step is to shape the areas between the parting tool cuts into convex and concave rays. Because the rays diminish in width from the tip to the hinge, several different gouges will be needed to shape the full length of each ray, as shown in figure 4. The transition areas, where the curve produced by one gouge meets the curve from another, will need to be blended to get a smooth, flowing line. Strive to produce a finished surface with your tool so there's little, if any, need to sand.

Begin with the convex rays, starting about 3/4 in. from the tip and working out toward the edge with a 1/2-in. #3 gouge. Be careful not to tear out the edge when you're cutting across the grain. Cut down to the bottom of the V left by the parting tool and ride the side of the gouge against the shoulder left by the parting tool cut, as shown in figure 4. If the corner of the gouge cuts into the facet, you will ruin your work, so be careful. At its tip, the ray should show the full curve of the gouge. Shape the first 3/4 in. of all the convex rays with the same tool, then switch to a 1/4-in. #4 gouge to shape the

Shape tips of convex rays with a ½-in. #3 gouge, carefully avoiding tearout on cross-grain cuts (above). Left hand helps control the tool on concave rays (below).

Cut from the bottom upward with a 1/16-in. #11 veiner to carve the veins in the wings.

The finished shell is ready to be separated from its backing and glued on a piece of furniture. The curves and flats are designed to catch and play with light and shadow.

next 1 in. or so of each convex ray. Lastly, switch to a ⅛-in. #6 gouge to shape the remaining section. Cut in the direction of the hinge on this last section.

Shaping the concave rays will also require a series of gouges. Again, be careful when the gouge exits across the grain and at points where the gouge cuts against the grain on the diagonal. You don't need to shape the concave rays at the hinge area, where they are spaced only 3/32 in. apart. The parting tool cut alone will give the desired visual effect in the hinge area.

7 The last detail will be to cut the five small veins on the wings with a 1/16-in. #11 veiner. These break up this large, flat surface, and accent the linear quality of the hinge area. The cuts should run parallel to the side curve of the wing and be spaced about ⅛ in. apart. Enter the wood with the veiner perpendicular to the surface to capture the full curve of the tool as it enters the wood. As with the parting tool, you may want to make a shallow cut and adjust the spacing by leaning the tool to the side. The veins should be a shallow 1/16 in. deep. Dragging the veiner back through the cut burnishes and polishes the surface.

Some areas may need a light sanding with worn 220-grit sandpaper, folded to get into corners. Be careful not to round off the crispness of sharp corners and ruin the definition they should give when the finish is applied.

To remove the shell from the backup board, slip a thin knife or palette knife between the layers of cardboard and gradually work it under the shell until it is free. The excess paper can be removed by lightly wetting it with water to soften the glue. Your shell is now ready to be glued in place. □

Grinding Wheel Primer

Choosing the best wheel for your steel

by Jerry Glaser

Good results on a bench grinder depend on having the proper grinding wheel for tool steel, which is almost certainly not the all-purpose wheel that came with your grinder. Also, you'll need some means of keeping the wheel dressed, which means sharp, clean and round. Without both of these, you'll have to grind painfully slowly to avoid burning the tool and you'll still not have the edge you want.

About 25 years ago, I was really frustrated with grinding. The wheel on my power grinder seemed as likely to burn the steel as sharpen it. The wet sandstone wheel I had bought as a cure was almost worthless. Then one day at work I happened to notice that the guys in the tool room were grinding with white wheels, not gray, and I started asking questions. (The company I work for uses half-a-million dollars worth of abrasives a year, for grinding everything from turbocharger parts to bronze bushings. The wheels range anywhere from 3 in. on up to monsters 30 in. in diameter and 6 in. wide.)

Notice the chart on the facing page. All American-made grinding wheels are marked, on the paper washer at the side of the wheel, with a series of letters and numbers that tell you the wheel's characteristics. This code covers the type and coarseness of the abrasive (the hard grains in the wheel that actually do the grinding) and the type and concentration of the material used to hold the grit together, called the bond. There isn't room in a magazine article to cover all the grinding wheel variations (and I admit that in some places I'll be simplifying things), but here's what you should know about choosing a wheel for grinding woodworking tools.

Let's cover the simplest thing first, the bond type, which can be V, S, R, B, E, or O. For our purposes, you can forget any bond type but V, or vitrified, which means that the abrasive particles are held together by ceramic material fused in a furnace—the other bonds are mostly for high-speed cutoff wheels and other industrial applications far removed from tool grinding. A vitrified wheel is similar to glass or china, which makes it waterproof (and oil proof), allowing it to be cooled if you are so inclined. It is perfectly safe to use a misting or spraying system when grinding, but don't allow a wheel to sit with one edge in water; enough may soak in to leave the wheel dangerously unbalanced the next time it's turned on.

The next symbol to consider is the type of abrasive. Diamond and the new cubic boron nitride are out of this discussion because of their cost, at least five to ten times more than the standard abrasives, namely silicon carbide and aluminum oxide. Silicon-carbide (C) wheels may be green or black in color. They are used for grinding cast iron, brass and aluminum, and the green ones can sharpen carbide tools. They are not a good choice for tool steel, however, because the individual grain particles lose their sharp edges in use, and the dull grit generates heat without removing steel. In contrast, aluminum-oxide (A) wheels remain sharp because the individual grit particles fracture and chip in use, constantly exposing new cutting edges.

There are a few different kinds of aluminum oxide, distinguished by color. The familiar gray wheel, the one that comes with the grinder, is not a bad choice for all-purpose grinding. But the other aluminum oxides, which are white, off-white, or pink are a better choice for tool grinding because the grains fracture more easily—the wheel grinds cooler, stays sharper and requires less frequent dressing to keep it clean of embedded steel particles.

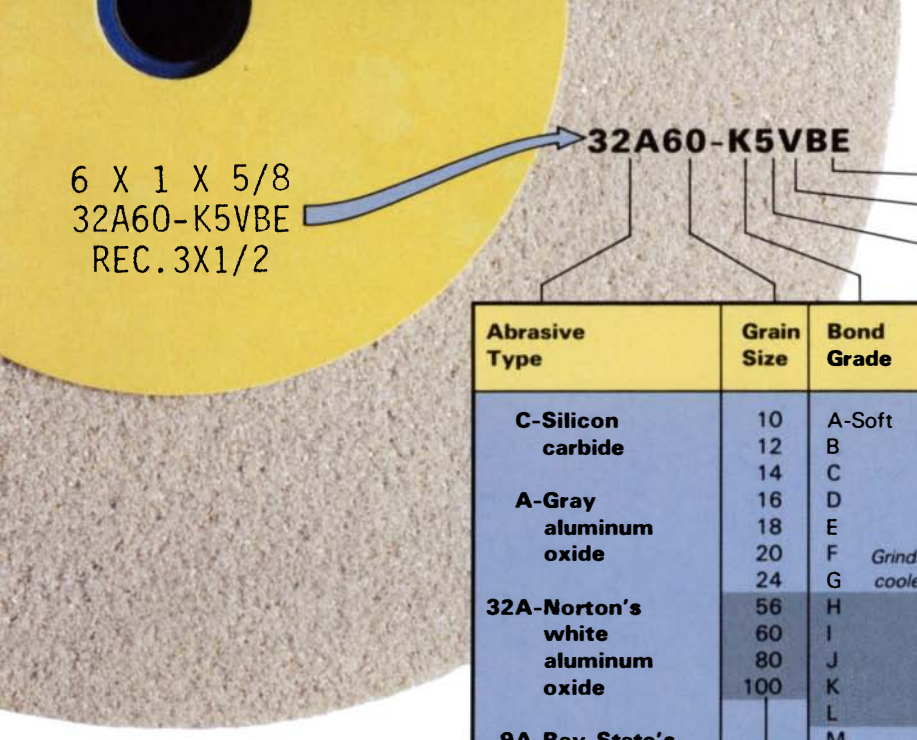
If you're looking at wheels on the shelf, you can see the color. If ordering sight-unseen from a catalog, look for a qualifying number ahead of the A in the code—Norton's white wheels (off-white, actually) are called 32A, for example, and Bay State's are called 9A. Any of these pink or white wheels is an excellent choice for both carbon steel and high-speed steel.

The remaining part of the code—the grain size, the structure and the bond grade—is more complicated because each is interrelated with the others.

The *grain size,* ranging from 10 up to 600, refers to the size of each particle, and is the same grading used for sandpaper: Grain particles are sorted by passing them through a series of screens with larger or finer openings. Other things being equal, the large grains in a 36-grit wheel remove steel more quickly and with less heat than the finer grains of a 100-grit wheel, but the tool's surface will be rougher and require more honing before it can be used.

The *structure* of a wheel refers to how much open space there is between grit particles, and is designated by a number ranging from 1 to 15. The higher the number, the more space between particles. Wheels in the 5-to-8 range are all good for grinding tools. Generally speaking, if two wheels are the same grit size, 60 let's say, an 8 structure will grind faster than a 5, and will run a little cooler. But the denser 5 wheel will grind a smoother surface. Thus, structure tends to "modify" grit size—a dense 60-grit wheel acts like it has finer grit, and an open one acts coarser.

The *bond grade* of a wheel, ranging from A to Z, tells you how much bonding material is in the wheel. The less bonding material, the faster the wheel will shed grains from the surface during grinding, and the more self-cleaning and self-sharpening the wheel will be. Harder wheels hold each grit particle longer, and thus have a longer life. Wheels in the H to M range are all good for grinding tools. The H (softer) wheel will wear out faster, but



Abrasive Type	Grain Size	Bond Grade	Structure	Bond Type	Manufacturer's Record Symbol
C-Silicon carbide	10	A-Soft	1-Dense	**V-Vitrified**	Example: VBE is a vitrified bond, with Norton modifications.
	12	B	2		
	14	C	3	**S-Silicate**	
A-Gray aluminum oxide	16	D	4		
	18	E	5 *Smoother, long lasting, hotter*	**R-Rubber**	
	20	F *Grinds cooler*	6		
	24	G	7	**B-Resinoid**	
32A-Norton's white aluminum oxide	56	H	8		
	60	I	9 *Faster cutting, cooler, more self-cleaning*	**E-Shellac** (virtually obsolete)	
	80	J	10		
	100	K	11		
	↓	L	12		
9A-Bay State's white aluminum oxide		M	13	**O-Oxy-chloride**	
	600	N *Grinds hotter*	14		
		↓	15-Open		
Various 'A' numbers for white and pink aluminum oxides		Z-Hard			Indicates range recommended for steel tool sharpening.

The Norton wheel above is the author's first choice for grinding high-carbon tool steel and high-speed steel. Chart at right interprets code numbers used by all U.S. manufacturers.

it won't clog as quickly and will grind cooler than the M wheel. Bond grade modifies grit size in the same way structure does—a hard, 60-grit wheel cuts finer, and hotter, than a soft one.

So, what's the best wheel for you? As a woodturner, I do a lot of grinding of both carbon steel and alloy steel, and I use a Norton 32A60K5VBE grinding wheel. Disregarding the 32A (Norton's white aluminum oxide) and the VBE (vitrified, the BE is a Norton code and pretty much immaterial to us), the important part is 60K5. Because I spend a lot of time at the grinder, I like a 60-grit wheel. It removes metal quickly and coolly, yet leaves the tool smooth enough to hone easily. I could probably get used to a 54-grit wheel just as well, but wouldn't want to go much coarser and still hone by hand.

I also like a dense wheel (the 5) because it lasts. If you want a wheel like mine, your best bet is to shop at your local industrial-hardware or machine-shop supplier (larger Yellow Pages often have a separate listing under "Abrasives"). Specify the wheel diameter and arbor size to fit your grinder.

I find my wheel ideal for lathe tools, but someone with less practice grinding might prefer a softer, more open wheel that would be less likely to overheat the tool. If so, you don't have to look far. Woodcraft Supply (P.O. Box 4000, Woburn, Mass. 01888) sells a 9A60J8V5 wheel in 6 in. and 7 in. diameters. The wheel is made by Bay State, and 9A is their code for white aluminum oxide. Woodcraft also sells 6-in. and 7-in. wheels of 9A10018V, which should be good for very fine grinding of small carving tools and the like. Prices range from $23.50 to $33.50 (depending on the size), which is about what I'd expect to pay for a well-made wheel. But you might consider shopping around locally to see if you can get a better bargain—now that you understand the code, you might find a very usable wheel on sale for half what it's really worth.

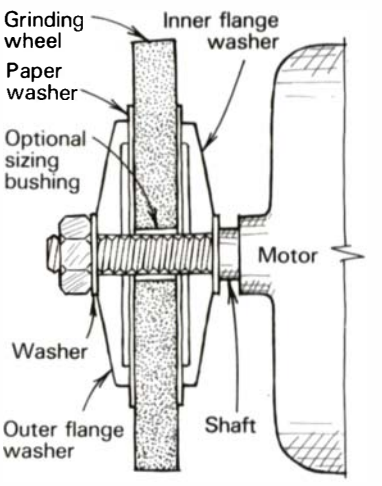
I advise against buying an inexpensive imported wheel, which is likely to contain a percentage of low-cost, low-performance abrasive, such as flint.

Mounting and dressing a wheel—As mentioned earlier, a vitrified wheel is glass-like, and a new one should always be tested for cracks. Put a dowel through the hole to suspend the wheel, then tap the side with a small piece of hardwood. A good wheel will ring. A cracked wheel will sound dull, like a cracked baseball bat. The drawing below shows how to mount the wheel.

All grinding wheels are labeled with the maximum safe speed, but this is not likely to be a factor unless you're working with a shopmade grinder that has been set up with an unsuitable pulley combination or fitted with a too-large grinding wheel. The usual commercial grinder has protective shrouds that limit wheel size, and the motor speed is chosen accordingly.

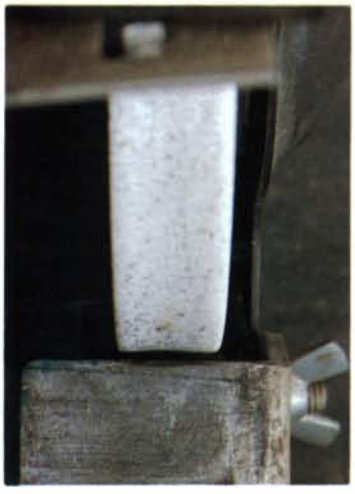
The first order of business when you turn a grinder on is to stand to the side for a minute or so, to be sure that the wheel is not going to fly apart. Obviously, any guards and side shrouds should be in place before running the machine.

Once the wheel is mounted, it will have to be dressed true to the arbor. A wheel running out-of-round will cause the tool to bounce around and make smooth grinding impossible. Dressing, which means scraping or chipping away the high spots while the wheel is turning, is the cure. Dressing is also used to rejuvenate a wheel that has become dull or clogged with metal particles; it trues the surface of a wheel that has become rounded or grooved, and can also shape the profile of a wheel for special jobs, like regrinding the flute of a gouge.



When mounting a new wheel, clean the shaft of grit and remove any paper-washer residue from the flange washers. Do not overtighten nut.

There are basically four dif-



Bottom photos show Bay State's 100-grit wheel before and after dressing. At left, after much grinding of lathe tools, the wheel is worn concave with some embedded steel particles, which cause excess heat. Top photo shows the initial coarse dressing with a star wheel; center photo shows final truing with a Norbide stick.

Norton's 60-grit wheel, off-white in color, with a variety of wheel dressers (shown counterclockwise from top): a star wheel, a single-point diamond, a Norbide stick and a plain abrasive stick.

ferent tools that can be used to dress a wheel. The simplest and least satisfactory is nothing more than an old piece of coarse grindstone or the coarse abrasive sticks sold for the purpose. The second type is the star-wheel dresser, which chips away at the surface of the wheel removing large quantities of grit quickly. Then there are diamond dressers and finally boron-carbide sticks (Norton calls theirs Norbide), both of which are hard enough to wear the wheel down. All of these dressers should be available at the nearest industrial hardware supply house.

The star-wheel dresser is the best tool for the initial dressing for the simple reason that its mass, width and fierce chipping action make it easy to get the wheel true. The usual diamond dresser, in contrast, cuts at a single point, and must be rigidly controlled in a straight, square path across the wheel to work effectively. If your grinder has a tool-holding setup that will accomplish this, then a single-point diamond dresser will work fine, but otherwise, a diamond dresser may leave a wheel grooved and more out-of-round than it was to start with. You can buy multi-point diamond dressers, which are easier to use, but these are expensive and a star wheel costs less than $10.

To dress a wheel, support the star-wheel dresser against the tool rest and bring the star wheels into full contact with the rotating grinding wheel. Then sweep the dresser across the face of the grinding wheel using only a light force to push the two together. After a couple of passes the wheel should be running true. Wear safety glasses and a face mask during the operation. The peripheral speed of a grinding wheel can approach 60 MPH, and dressed-off grit particles will be traveling at this speed.

A star-wheel dresser tends to open up a wheel, leaving the surface rougher than it will be after you've ground a few tools on it. This is because some of the freshly exposed grit has higher cutting edges than the other particles. The effect can be a good thing because the wheel will run cool, but the wheel will also cut a little coarser. For a finer grind, re-dress the wheel very lightly with a diamond or a carbide stick.

As a last note, most wheels are marked "Do Not Grind on Side." There are a few reasons for this: First, it's less efficient to grind on the side of a wheel because the surface speed is less than on the face. Also, when the side of a wheel becomes glazed and clogged it is much more difficult to dress. Another problem is the danger of grooving or undercutting the wheel, which might weaken it to the point where it could shatter. Occasional light grinding on the side of a wheel shouldn't cause problems, but my general advice is to avoid it unless there is no other choice. □

Jerry Glaser is manager of manufacturing engineering at Garrett Automotive Products Co., in Torrance, Calif.

Podmaniczky's favorite sharpening setup is the Multi-Stone (rear), a set of three stones mounted so they can revolve through an oil bath to keep them clean. His boxed stones, bought 15 years ago, are a medium-grit India (right) and a hard black Arkansas.

Sharpening With Oilstones

No jigs, no gadgets, no nonsense

by Michael S. Podmaniczky

There are legions of would-be woodworkers who think that the edge that their new chisel arrives with is forever. I know because I've met some of them. But charity and understanding are needed rather than contempt; after all, I hate to think what I will do the first time I have a masons' trowel in hand, or at which end of the cobblers' bench I would sit down. No, this sort of thing is not at all inherent and must be learned like everything else.

In fact, without a good grounding in sharpening procedures, nothing else that follows can be properly done, and that includes, well, everything. I hate to think how many beautiful projects have been discouraged because the tools just didn't perform as expected. Sharpening is so important that it must eventually become second nature to the wood craftsman. We will discuss the various steps necessary to take a chisel or plane iron from dull to sharp: establishing the bevel on the bench grinder and sharpening on the various stones, from coarse to fine. While this is a step-by-step procedure, I hope that in due time those steps will blend together in your subconscious so that there will be no more thinking, only doing.

Before doing, however, must come knowing. What exactly does "sharp" mean? We know the ideal, a perfect wedge of steel, tapering down to microscopic nothingness. Unfortunately, whether in foreign policy or tool handling, ideals are easier to imagine than to attain. When steel is pushed across even the finest stone, bits of metal are worn away and microscopic serrations are formed on the edge—these correspond in dimension to the grit of the stone. What we try to do is minimize the size of the serrations and maximize their regularity.

Most edge tools are pushed through the wood, and consequently require the finest serrations so as not to drag on the wood fibers. For this, a progression of stones is used, ending with the finest grit possible. A knife, drawknife, or other tool that is used in a slicing motion, such as (forgive me) a steak knife, works best with slightly greater, but still regular serrations on the edge. In this case, the progression through stone grits can stop short of the finest. Our task is to be able to consistently produce the edge we need for the best woodwork possible.

As I have said, this should be second nature, so I'm afraid that that means out with all the paraphernalia pushed by the tool

catalogs to "help" with sharpening—jigs, holders, rollers, etc. You are perfectly capable of doing without all of that. There are, however, a few things you can't do without, such as benchstones, so let's discuss them first.

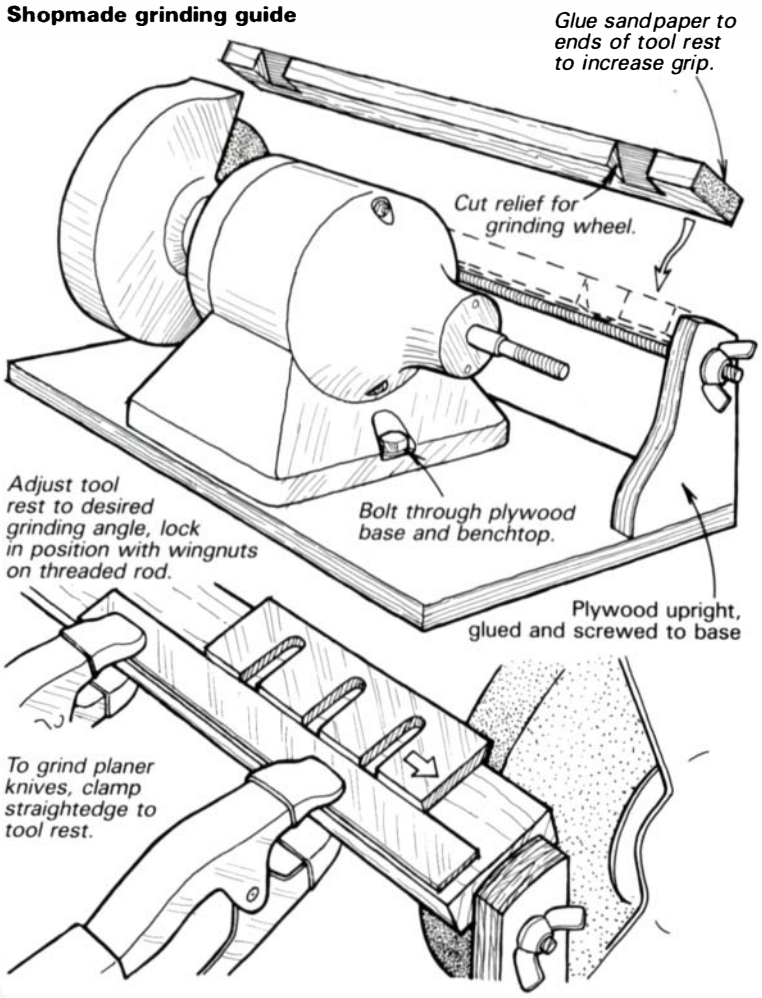
I don't much care for Japanese waterstones. One reason is that waterstones wear hollow much faster than the harder oilstones and must be regularly dressed in order to keep them flat.

I use oilstones, and feel that the best way to go, if you can afford it, is the Norton Multi-Stone. It holds a medium Crystolon stone, which you will use about once a year, a fine India, and a hard, black Arkansas (pronounced ar*kan*zas), both of which you will use almost every time you sharpen. These three stones are mounted on a shaft so they can be revolved through an oil bath to keep them clean.

Like the grinding wheel, benchstones are made up of many sharp micro-particles, bonded together in such a way that they cut steel until they are dull, and then wear away from the stone. Man-made Crystolon, a Norton trademark, is "soft," with large (relatively), loosely bonded particles; it cuts rapidly and wears down just as quickly. It's really only useful if you don't have a bench grinder and have to remove a lot of meat by hand. India (also a Norton trademark) is a bit finer grit and stronger bond (i.e. harder); it's the best all-around stone, well-made and well-wearing. Natural Arkansas stones can be purchased from coarse/soft to fine/hard, but with high-quality man-made stones available for most of the range, I stick with the top of the line—hard and black. These are the stones that surgeons sharpen scalpels with.

If you can't go the Multi-cost (about $175, from Woodcraft Supply, Box 4000, Woburn, Mass. 01888), buy the Norton combination stone (Crystolon on one side, fine India on the other), and a separate, hard black Arkansas. Spend some money for a change: buy a bit of really nice exotic wood and make a couple of nice hinged-top boxes for the pair of them. This will keep them clean and give you the pride and confidence necessary to keep up a well-sharpened set of tools.

Shopmade grinding guide



This brings me to another reason why I don't like waterstones. They are said to cut faster than the oilstones that we of Western tradition are used to, but this is a bit misleading. For one thing, the Japanese grit-numbering system is very different from the American. For example, a 1200-grit Japanese stone is roughly the equivalent of a 550-grit oilstone (about the grit of a soft Arkansas stone), and a 6000-grit Japanese stone is about the same as a hard Arkansas stone (our 800- to 1000-grit). If you compare the speed of cut between a 1000-grit Arkansas stone and a 6000-grit Japanese stone, you'll find that they are about the same and that they give an equivalent finish to the steel.

The other thing that affects cutting speed is the fluid used to keep the stone clean. A stone should be flooded with an appropriate liquid during sharpening in order to float particles of steel and stone away and prevent the abrasive from clogging up. Natural Arkansas, and most man-made stones, require the use of oil, other man-made stones require water. The problem is the common understanding of what is meant by "oil." I have actually heard responsible people say that the oil is used to *lubricate* the stone, so they use heavy, viscous oil (sometimes even marketed as "honing" oil) and it does indeed lubricate. Unfortunately that is the last thing one wants. We want friction, we want to abrade, so it's no wonder that waterstones seem to cut faster; there's less lubrication with waterstones, mostly abrasion.

I use a very light oil. Kerosene and fuel oil are about right, but I discovered a few years back that WD-40 not only has a good viscosity, it also doesn't smell bad on my hands. Unlike the use of water, residue on the tool inhibits, rather than promotes, rust. Buy WD-40 in the half-gallon jug and use it for everything except salad dressing. For your kitchen stone, try a little liquid dishwashing soap as a lubricant, or better still, Norton's honing oil, which is a highly refined mineral oil and safe to use around food.

The other stone you should be concerned about is the wheel on your grinder. There are volumes written on abrasive wheels, and in fact there's an article about them in this issue. The different types of stones do different jobs and produce different finished surfaces, but since I put the important, finished edge on with benchstones, I just use what works for me, the white aluminum-oxide wheels sold by Woodcraft Supply. They wear down faster than gray wheels, but have less tendency to burn.

Given the lack of extended operation any of us will ever ask of our grinder, it's not necessary to go overboard buying one. Just be sure that it's well-anchored to your sharpening bench, and that there is plenty of room around it. I discard the tiny tool rests that are usually supplied with grinders and fabricate my own. The drawing at left shows my setup, which is versatile yet easy to make. It's merely a loose wooden rest held in position between two uprights by wingnuts and threaded rod. As shown in the detail, the tool rest can be used for sharpening jointer and planer knives. I clamp a metal ruler to the rest and run the knife along it. For fine adjustment, you can simply pivot one end of the ruler; it doesn't have to be exactly parallel to the face of the wheel.

Putting tool to stone—A plane iron is ground at approximately 25°, but a free-handed tool, such as a chisel, can be ground to a range of angles depending on the circumstances. A very fine angle, say 20°, will cut very nicely, but unfortunately will also break

The other side of the edge

by Jim Cummins

All the time in the world spent sharpening a bevel won't give you a sharp tool if the back of the edge is scratched, rusty or pitted. These imperfections cut into the edge from the back side. Just as a nicked jointer knife leaves its trail on the work, so does a chisel with a dull back.

Sharpening a bevel takes but a few seconds, for there is very little metal to be removed. Flattening and sharpening a back, however, is a long job. Here are a couple of extensions to the basic sharpening stones, which I learned of several years ago from Robert Meadow, of West Saugerties, N.Y., that can help bring your chisels to their full potential.

The first is a diamond plate, made by Eze-Lap, P.O. Box 2229, Westminster, Calif. 92683. The main virtues of the plate, which sells for about $55, are that the entire surface is covered with diamonds and that the plate is dead flat, which provides a reference surface—when the scratch pattern is even across the width of the chisel, then the chisel itself is flat.

You *could* stop right here. The flat back, by itself, will make your chisel a superior tool. You'll be able to pare with it flat, the edge will be straight, and the corners will be sharper than ever before. But you can still improve things.

Move to your coarse stone and make a few passes to see the new, finer, scratch pattern superimposed over the old. Use each stone in the series to remove the previous stone's scratches.

After the Arkansas stone, the final step is to buff the chisel back by pulling it across a hardwood block coated with rottenstone, a fine abrasive available in paint and hardware stores. To make the block, mix rottenstone with water and apply it as a thick paste. When the paste has dried, use the block as a strop, working away from the chisel edge, not into it, on both back and bevel. The photo at right shows the results, and I only wish chisels came like this in the first place.

The photos also show a new diamond-sharpening system developed by Robert Sorby in England. It consists of a flat ceramic tile and an aerosol can of diamond particles in a lubricating fluid. You spray diamond on the tile, then use it much like a regular sharpening stone.

There are three grits—medium, fine and super-fine—covering the range that compares with oilstones from coarse up to about fine India. At least, that's the way the cutting speed and polish seem to me. Each grit and its accompanying tile costs $53.50 (from Garrett Wade, 161 Ave. of the Americas, New York, N.Y. 10013).

Initial tests showed that it flattened chisel backs faster than anything. Further testing by woodworker Frank Klausz and his five-man crew in Pluckemin, N.J., suggested that the system wasn't at its best in all-around shop sharpening work. The slurry becomes black with metal particles almost instantly, requiring a woodworker to wash up before continuing work. The same metal particles quickly clog the lubricating fluid and slow the cutting action, tempting the user to spray another shot of expensive diamond on the tile. When Klausz ran out of spray, he figured the cost at $1 per tool, and was so unimpressed that he asked me to check with Sorby for their side of the story.

Sorby's technical spokesman, Tony Walker, said we had somewhat missed the point. After the first few sprayings, the tile should be used dry, until the diamond remaining on it ceases to cut. This cutting action may be slower than with fresh, wet diamond, but it will still do the job at a reasonable pace. The advantages of the tile are that it stays flat, like the diamond plate mentioned above, and that it can be used to sharpen high-speed steel tools with just a few light strokes. (High-speed tools, popular with woodturners, are notoriously difficult to sharpen with the softer abrasives found in regular honing stones). Also, Walker went on, the tile can be used to hone the flat faces of a carbide router bit. A couple of strokes each time you use the bit will keep it like new. □

The strong point of Robert Sorby's aerosol diamond slurry is the flatness it gives to the backs of chisels and plane irons. The diamond can also sharpen carbide router bits.

To extend the range of the typical sharpening stones, you can use a diamond plate for initial flattening, and a wooden block coated with rottenstone for final polishing. Mirror-like results are shown at right.

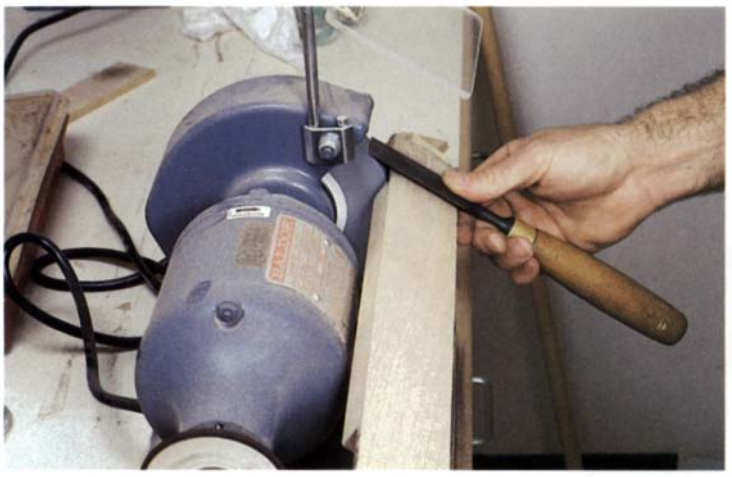
Jim Cummins is an associate editor of Fine Woodworking.

down most quickly. A blunter instrument, say 40°, won't break down as fast, but requires more muscle to drive into the work ("Hand me the commander!"). This all works out in practice, since the lovely carving and parting tools you use on fine work are hard enough to take a fine edge, and you would seldom put a mallet to them. Your mortise chisels or drawknife, at the other end of the spectrum, are made from softer, tougher steel, and therefore need a blunter edge, which in turn stands up longer to the abuse you'll deliver when using them.

As a matter of fact, those tools at the rough-and-tumble end of the tool kit—hatchets, axes, some drawknives, some adzes—can often be sharpened with a file to a slightly rounded, blunter edge, giving that edge longer life.

Adjust the tool rest on the grinder to the desired angle and begin removing steel, passing the blade back and forth across the face of the stone, keeping the forefinger of your holding hand tucked underneath and riding against the edge of the tool rest. This regulates constant but light pressure on the stone, which will hollow grind the tool bevel—producing in profile a concave bevel the same radius as the wheel—and removing steel much faster than you would be able to on the handstones. Light but firm—don't press down or hold the tool in one spot, or you'll burn the edge and ruin your day.

When you feel the tool heating up, remove it from the wheel and hold it in the draft of the grinder until it cools down. A lot of people cool the tool by dipping it in water from time to time as grinding proceeds, but I was once told by a blacksmith that such treatment, if repeated often enough, can subtly affect the steel. I have quenched with water many times when I was in a hurry, but I don't feel comfortable with the practice.



As a guide, Podmaniczky runs his forefinger along the front of his shopmade tool rest (see figure 1). Next, working at the ends of the stone, he hones the chisel with a circular motion, about as fast as you'd stir a cup of coffee. The grip maintains a steady angle and balanced pressure directly on the cutting edge.

Remember, if you blue the steel, the edge is shot, so you might as well start over. Don't try just lapping the blue surface oxidation off on a whetstone—it's a waste of time, because the steel underneath is still burned and softened. Set the angle of the tool rest to 90° and grind the tool edge blunt, square to the face of the wheel, until you are past the burned material (or the chip you took out of it when you dropped it on the cement, or hit that nail that wasn't there. . .). Reset the rest to the angle you are working on and resume grinding the bevel.

Never grind to a featheredge—It's almost impossible not to burn the steel if you allow it to get too thin; the heat just has nowhere to dissipate. As you grind, stop every so often to look at the bevel. The area that's cleanly ground will slowly increase as the area along the edge that had been previously hand stoned decreases. When your grinding is about a shy 1/64 in. from the edge (or just touching the blunted edge you put on in the last paragraph) stop and move to the benchstones to finish removing metal right out to the edge.

Slosh the fine India with oil, or if you're using a Multi-Stone, give it a turn through the oil bath, and you're ready to go.

The next step is the dealer's choice: grip your tool. I'm afraid that there's no "one way" to do it. At one extreme is Ian Kirby's interlocking-fingers golf grip (which I have never been able to master), and at the other extreme is the three-fingered-with-one-hand-in-your-pocket grip (which I have always liked in a very cold boatshop). Any way that works is the right way. Try holding the plane iron or chisel with the right hand, leaving enough room to place one or two fingers of the left hand on the back of the blade near the edge to distribute the pressure evenly.

The object of this is to be able to set your blade to the stone at the desired angle, and hold that angle throughout the sharpening process, so as not to rock the tool and round the bevel. You'll practice with clenched teeth and white knuckles for what will seem like ages, and one day you'll realize that you can't remember when you last thought about it. . . you'll be there.

Here's another plus for hollow grinding: Laying the bevel flat on the stone has a solid feel when both the edge and the heel of the bevel are in contact with the surface. Ever so slightly rock the heel off the stone, so that just the edge is in contact. . . and hold it! If you draw the tool back across the stone in this position, scraping oil away, you can then rock back and forth, heel to edge, and watch the little wake of oil form at the edge when the bevel is flat, and then flow away when the heel is picked up. All these little tricks can help you get used to the feel of the tool on the stone.

When you feel that you have a comfy grip, and can hold the angle, start moving the tool around the surface of the stone. Keep constant pressure on the edge with whatever fingers you have up there. A good rule of thumb is: keep the tool off the center of the stone. The natural impulse is to wear away in the middle, scrubbing away stone until there's a shallow dish instead of a nice, flat surface. This is a constant battle when you use waterstones, but even harder oilstones need to be dressed flat once in a very great while. To dress a stone, you can use coarse valve-grinding compound (from an auto supply store) spread on a sheet of plate glass. A few minutes spent rubbing the stone on the glass will flatten even a badly dished surface. Another way is to wet a sheet of coarse wet-and-dry sandpaper and lay this flat on a piece of plate glass (the water should hold it in place; if not,

The hollow-ground bevel, directly from the grinding wheel. The old edge has been squared off on the wheel, and the grind stops just behind the flat spot, in order not to burn the steel.

As the edge is honed sharp, the excess metal may come off as a 'wire edge.' This chisel has been deliberately honed with more pressure on one corner than the other to demonstrate the wire.

It's a waste of effort to hone the entire bevel. After four or five more honings, the polished area at the cutting edge will become wide enough that it will be worthwhile to regrind the bevel.

you can tape it down before wetting). But this chore shouldn't be necessary very often, provided that you don't provoke the condition; my hard Arkansas has stayed flat for more than 15 years. "Stay in the corners and the middle will take care of itself," the old guy used to say, and he was right.

Stone the tool at whatever pace feels comfortable. I've seen even experienced woodworkers stone tools in a series of separate, measured straight strokes, stopping often to gaze at the developing edge . . . like they were grooming their Karma or something. But I got away from that a long time ago (by the time they're on their third stroke, I'm finished). I sharpen in small circles at the ends, or the corners if the tool is small, moving occasionally from one end to the other, working at about the speed I would stir a cup of coffee. Staying in one small area helps me keep that angle without rocking. I'll finish up with a few brisk forward and back strokes the length of the stone in order to align those serrations as regularly as possible.

As the metal wears away, the edge eventually becomes so thin that it can no longer support itself and begins to bend back and away; this is what's called the burr. When you feel it forming across the whole back of the edge, flip the tool over and hold it flat on its back, moving it about the stone until the burr is no longer felt on the back, but on the bevel side of the edge. Repeat both steps and the burr is almost ready to come off as a "wire edge." Draw the tool edge backward across a clean piece of leather, or your palm, first on one side and then the other, or work the burr back and forth with your thumb (carefully) until the wire edge comes off. During the process of forming the burr, it's imperative that the back of the tool is kept perfectly flat on the stone, since any rocking and consequent rounding of the back eliminates the jigging action that a straight edge gives when in use. Try paring with a cheap chisel that has been belt sanded to shape and you'll soon see what I mean.

After the burr has come off, a tool that's going to be used primarily in a slicing manner may be ready for use. Try it and see if it does what you want.

If you need a finer edge, move to the hard Arkansas, and repeat the same operation, only this time rock the tool up a degree or so, so that you are sure you are working right at the edge. You will see a very fine, but unmistakable, polished line developing out at the business end of the tool. You will probably not bring up much of a burr on the hard stone, but if you do, and are able to work a wire off the edge, give the edge one or two extra passes along the stone in order to straighten out those microserrations. Trying to put what amounts to a polish on the whole bevel is time-consuming and unnecessary; after all, it's only the edge that's doing the cutting. A hard Arkansas doesn't take away much material per minute spent working on it, so don't beat yourself to death if you don't have to.

If you're new at this, and if you've been careful to follow the procedure, I can safely say that your tool is sharp, or at least that you'll be pleased with the results. There are a few esoteric ways of "testing" the sharpness you have achieved: Try shaving some hair from your arm *carefully*; lightly draw the edge in a slicing motion across the back of your thumbnail in order to feel if there are any invisible nicks; stand the blade on your thumbnail and see how far you can lower it down before it begins to slide across the surface of the nail; *look* at it. Except for looking, I don't do any of these things under normal circumstances, since, as I said, if everything was done right, the edge is sharp. If for some reason I'm not happy with the way the tool performs, I go back to the stones and freshen it up.

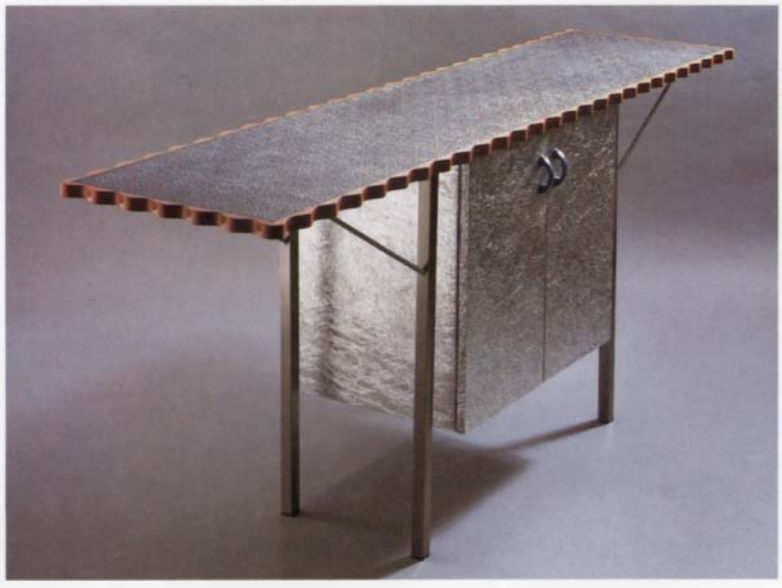
Work away until you notice that there has been backsliding by the tool to its old pre-sharpened tricks—there may be ridges developing on the wood due to tiny nicks or breaks in the edge; the cut surface is no longer clean and crisp—you'll know. For resharpening, stay with the benchstones until you have flattened out most of the hollow grinding on the bevel, or you've begun to round the bevel, or it's taking too long to bring back an edge. In order to bring up the burr, you'll find that you are ever so slowly increasing the angle to the stone with each subsequent sharpening, and it will eventually be necessary to grind again, establishing the hollow and proper bevel once more. You should be able to sharpen a chisel or plane iron in a minute or two, and get about four or five sharpenings per grinding. □

Michael Podmaniczky, a contributing editor for FWW, *works for the Williamstown (Mass.) Regional Art Conservation Laboratory.*

California Crossover

Multi-media works out West

by John Marlowe



▲ **The aluminum wings on either end of Garry Bennett's bench are alligators, the remnants of an ingot mashed into sheet by a cold-roller mill. Bennett bolted them to a lacquered plywood and cherry slab, then mounted the assembly on a pair of bandsawn feet.**

◖ **Tom Brown's sideboard, left, appears to be an all-aluminum-and-steel piece trimmed in wood, but the foil-covered carcase is actually bird's-eye maple, whose figure is visible from within. The plywood top is veneered with a sheet of old aluminum siding.**

◗ **For his desk, near right, Jerry Carniglia enlisted the help of a machinist to fabricate the aluminum stretcher and feet, and a painter, Cynthia DuVal, to paint the legs. She used a combination of auto-body and concrete filler to achieve the texture.**

◗ **The legs of Stuart Welch's bubinga table, far right, are test extrusions from Kaiser's research lab in Pleasanton, Calif. The slumping center section, which looks like solid metal, is really vacuum-formed plywood veneered with aluminum flashing. Welch's table sold for $3,500.**

Concurrent with last June's American Craft Council conference, two San Francisco-area businesses hosted shows that should give California furnituremakers a refreshing pause. The crossover from art to craft, craft to art is no longer a question. Art and craft can be the best of both, and no one worries about the blend. It's now a given on both coasts, and this show makes the case for the West.

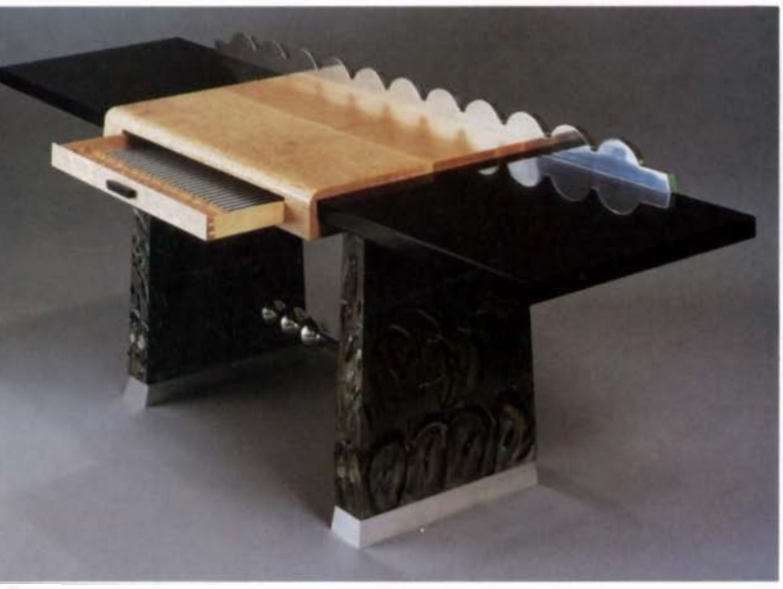
You might have seen it coming. My first clue was Funk, a Bay Area art movement of the 1960s, when, for example, a ceramist named Bob Arneson made a clay typewriter with fingers where the keys were supposed to be. Artists started making things and thingists started making art. Or each started doing something in between. Furnituremakers, furniture buyers, and furnituremakers-to-be paid attention.

Another major event, the Artist's Soap Box Derby in the 1970s, was a watershed extravaganza that inspired yet more crossovers. The rules were simple: make a soap box racer that rolls downhill, picking up speed and looking good doing it. The creations rolled down a curved hill in San Francisco's McClaren Park, and as they rounded a turn into full view, the spectators roared approval for velocity ***and*** aesthetics.

To make the final West Coast connection, take Garry Knox Bennett's infamous cabinet (*FWW* #24, back cover) a padauk piece of large dimensions, all skill and considerable flash. You'd buy it just to rub the grain. But Bennett, sensitive to the dead end of perfection for its own sake and sensitive, too, to the artists who made funky things and soap box cars, crossed over and banged a nail the size of a carrot into the sacred wood, making sure to leave a couple of half-moon hammer kisses around it, saying, in effect, "I can only take my craft so seriously."

The Derby and Funk showed us that the usual practical materials—wood, glass, plastic, metal, ceramics and cloth—could be used in entertaining and functional ways as they skittered out of the craft studio into the arts and back again. Put all of this together and you understand the background that led to last summer's two terrific shows: "Furniture in the Aluminum Vein" at the corporate headquarters of the Kaiser Aluminum Co. in Oakland, and "American Style" at Macy's Union Square department store in San Francisco.

These two shows were neither gallery nor museum. Macy's show was smack in the middle of its seventh-floor furniture department, while Kaiser's was on a busy, foot-traffic-central mezzanine on the



Photos, except where noted: Schopplein Studio

Al Garvey

◗ Lewis Buchner's quilted maple nightstand, left, is a hybrid of high-end woodworking and electronic gee-whiz. A dozen light-emitting diodes hidden along the edge of the stand's top illuminate gold leaf applied to the tops of the legs. The piece retailed at the Macy's show for $3,000.

◗ Kaiser's research center couldn't provide the thin-walled tubing he needed for his playful walnut and aluminum spoof of a pipe organ, right, so Sandor Nagyszalanczy prowled a local scrapyard in search of supplies. On the show's opening night, he delivered a slightly muffled punch-line by playing Bach on a boom box hidden inside the cabinet.

◗ Like many trained as fine artists, Patricia Dreher has developed an interest in furniture as a three-dimensional canvas for her painterly pursuits. For the room screen shown at bottom right, she glued canvas to a plywood panel mounted in a pine frame. The textured color was accomplished with a combination of gesso and oil and acrylic paints. It was shown at Macy's but didn't sell at $2,800.

◗ Although he is best known as a maker of inventive laminated wooden sculpture, Michael Cooper's 'Grani Pneumo Allo' table, left, was one of several mostly metal pieces in the Kaiser show. At the twist of the valve beneath the tabletop, the two granite leaves expand with a hiss of compressed gas.

◗ For his entry doors, far left, Al Garvey mirrors the color, texture and architectural flavor of the home in which each door will be hung. Garvey imparted a gritty texture to this door's straightforward frame-and-panel construction by dragging a paint knife through partially cured body putty buttered on the panels. The doors are made of vertical-grain fir with Finnish plywood panels.

John Bagley

way to the company cafeteria. Although the two shows were different, their message was similar. Macy's starts from craft and Kaiser comes from art. Macy's, through the Baulines Guild, sent a call out to craftspeople asking for objects of all kinds, not just furniture. In doing so, the store continued a tradition of occasional display of handcrafts that dates back to at least the 1940s.

Macy's show was divided in two. Half of the floor was devoted to the Baulines contemporary craft and half to a display of early 20th-century Arts and Crafts furniture, most of it by Gustav Stickley, but some by the architects Charles and Henry Greene. The Stickley section, which was curated by D.J. Puffert, a Bay Area collectibles dealer, had a fine educational twist, complete with an excellent video about the leaders of the crafts movement and their work. To Puffert's credit, all of the furniture was up to Stickley's reputation. These were all simple, strong pieces, the kind of American Prime that relies on 90% function and 10% decoration.

Like Macy's, Kaiser has an excellent track record for arts and crafts support. Dr. Bernard DeHovitz, the director of the Kaiser Center's art program, sponsors regular high-quality shows in its mezzanine gallery. As one of the world's major producers of aluminum, a material with obvious potential for furniture construction, Kaiser wondered what a group of craft furnituremakers might come up with if given a chance to experiment with it. So Kaiser asked Norman Petersen, a Bay Area furnituremaker, to organize an aluminum furniture show to coincide with the ACC convention. Kaiser's Pleasanton, Calif., research facility would provide the aluminum if Petersen could find furnituremakers willing to work it. He did and they did. This evolved into a California version of the ColorCore show Formica organized in New York two years ago.

One point I thought both shows made was that now enough good Bay Area craftspeople and artists work in wood and/or furniture to make consistently high-quality shows possible. Local standards are now high enough and the gene pool can handle it. Stuart Welch, who worked with the Baulines Guild and Macy's, was clearly pleased by the progress: "In Boston, if you advertised a furniture show, you could easily get twenty-five or more excellent furnituremakers. Now we can do that here. We could never do that before now."

By the simplest and most crass standard—money—Macy's was the more successful show. Close to $40,000 of contemporary crafts sold and Puffert moved many of his Stickley pieces. Macy's donated $5,000 to Baulines' apprenticeship program, not to mention a 60/40 split of the proceeds, with the fat part going to the craftspeople and another 5% from the skinny part going back to the Guild. And on top of all that, a lot of regular folk got to see, in a "safe" place, a lot of high-quality crafts.

Both shows' success, however, goes well beyond money. They succeeded as a whole because of their parts, and the parts were very good. A look at Gary Bennett's Ribber's Rip bench in the Kaiser show is illustrative. Bennett like others, has one foot in furniture and the other in art. He is the first to object to an art label, but he does so with as much credibility as Jerry Lewis asking an audience to stop applauding. He *pushes* his furniture into galleries. Picture this: He stands in an elevator that opens into an effete gallery, very New York. Levi's, hickory shirt, a Nordic myth of a beard. A uni-sex clerk with an art degree and an upwardly mobile attitude says, "Oh, what is that?"

"Furniture," says Bennett.

"Oh, bring it into the office."

"It's show now, later it's for go," says Bennett, adding, "You got any beer?"

Bennett's slab bench is nothing if not well made. The seat,

made of lacquered Finnish plywood and cherry, has a slick, red patina Superglue wouldn't stick to. It has Bennett's quirky signature base, decorated with checkerboard doodles and an Art Deco bandsawn waviness. Like Stickley's work, Bennett's bench is sturdy in a working class way. I wouldn't feel guilty standing on it to get something off a top shelf. The bench is capped at either end with an aluminum "alligator," a frog mouth twice the size of a flattened football that is left over after an aluminum ingot is squeezed into a sheet by massive cold rollers. The rich seat is carefully fitted into the aluminum, so one is continuous with the other. That it works as a bench was amply proved as I walked by the first time, missing it because people sat on it, unaware that they were kept off the ground by some big-time furniture.

What made the pieces in these two shows most interesting, at least from the West Coast perspective, is that inspiration came not so much from traditional notions about furniture as from sources more rooted in California culture. Petersen made the point succinctly: "What separates me, Bennett, and others like us from the people on the East Coast is that we often start with an *object* which might develop into furniture. A more traditional furnituremaker would most likely start with a chair or a table in mind."

His view is, I'm sure, arguable by any East Coast art furnituremaker but the issue of a discernable California style, with its own evolving traditions, seems less open to question. You could see this by looking at two snazzy desks by Jerry Carniglia in the Kaiser show. The back of the tops are trimmed with an aluminum scallop, a soft, curvy cloud edge that goes along the back. The top is actively and abstractly painted, and inserted in the middle of it is a bird's-eye maple drawer that fits like a watermelon plug. The first time I saw these I thought they were Bennett's. That's a compliment. They are part of a natural evolution, not copies; the continuation of Bennett's work, they are able to stand on their own. And that's fine. We now have a couple of generations of furnituremakers on the West Coast.

Humor played a great part in Funk and Derby and it did in these shows too, even though craftspeople are not always noted for their humor. Not too many stand-up comedians stand up to a lathe. But some of this stuff is quite funny.

Take Sandor Nagyszalanczy. Please. He had a pair of conservative tables in the Macy's show but at Kaiser he showed a small cabinet called "Pipe-Organism." It is the miniature send-up of a pipe organ, complete with secret compartments. This is a perfect example of what the organizers hoped for. I can imagine Nagyszalanczy spotting these aluminum pipes and I can see the light bulb going on over his head. "Pipe-Organism" has a shiny, linoleum kind of surface, the kind you find on the silly organ in your aunt's house, the one she, God bless her, never plays.

In the Macy's show, Al Garvey displayed a couple of big, sturdy doors. Welcome welcomes to any house. Coated with a textural colored-icing of paint, the doors are portal-able anthologies of artistic and architectural ideas, as if the doors individually carry the philosophical and artistic weight of the house for which they provide entry. The thick, chunky colors call attention to themselves and away from the craft, which serves to make them less serious than a plainly finished wooden door would be.

Another creator of furniture in the humorous vein is Michael Cooper. Cooper is best known for his contorted, free-laminated wooden sculptures, menacing hybrids of motorcycles and firearms. His Kaiser entry, "Grani Pneumo Allo," doesn't have a splinter of wood in it, but it is right in the spirit of the show. Cooper was a racer in the Soap Box Derby, and this table shows it. It has fat, squat wheels, a lot of fancy lifts and braces, and a nitrogen-powered pneumatic system for raising and lowering the drop leaves, which are pure, polished marble, sliced from the loaf of the earth and played against the factory-made aluminum. It's set dinner high, and all of the high-tech rigmarole ends with a parenthesis of classical marble.

Stuart Welch's aluminum and wood table is a visual/intellectual joke that calls for a wry smile rather than a knee slap. It's an off-balance table that should collapse in the middle, but doesn't. A high table terraced in two, the levels are connected by a thick, rounded hook of aluminum that disrupts the plane. Unfortunately, it got a little middle-heavy; the offset planes were not parallel and the legs were a mite splayed, the result of some rush-rush moving. Snugging up the bolts later in the show cured the problem.

The attention to and execution of details in these two shows was, in general, excellent. But all generalizations have their limits, as was clearly evidenced in a screen by Patty Dreher in the Macy's show. Her screen is really a painting that ends up a screen because you have to call it something. The craftwork is a little above a high-school wood shop "B," right down to the Ace Hardware hinges. But it was the painting, not the making, that carried this one.

I guess I agree with Bennett's sentiment in driving a nail into his perfect cabinet. It's dangerous to be *too* good. I was sorry to see that one of my favorite artists, Peter Gutkin, made that error. At the Kaiser Center, he showed a very fancy cocktail table with a hard, glassy veneer and a lot of gold-plated balls spaced evenly around the base. The wood is maple, and it's technically perfect in every regard, but that perfection and extra-careful execution reminds me of people who take dance lessons, learn all of the right steps and can duplicate them perfectly, but who lose the essential élan. Several of the all-aluminum pieces have this cold, perfect quality.

The Kaiser show raised an interesting question: Can you make furniture without wood? The chic answer is: of course. I say you can also wash your feet with your socks on. I'm reminded of a friend who can swim well enough, but he never gets too far from a pool side, a rock, a branch or a boat, that he cannot reach out and touch *something*. I feel the same about wood. Sure, I can appreciate plastic, poured cement and fancy aluminum, but I like wood around the ranch. Even in the aluminum show, wood is ubiquitous, even when it appears gratuitously. Tom Brown had a nifty aluminum buffet table with a scalloped wood border around the tabletop. That wooden trim symbolizes the show for me. Wood has a dignity and workability; it is forgiving with simple access. Wood held these shows together.

A few kind words about the sponsors: Two signs caught my eye in Macy's. In Puffert's Stickley section, it was the hunkered-down, homey kind of sign you would expect to see in a turn-of-the-century shop: We Sell Life Time Furniture. Not a bad motto. The other sign, on the contemporary side, meant business. It read: Electrolysis And Ear Piercing Are Available In Our Beauty Salon, a serious reminder that both Macy's and Kaiser gave a lot of valuable floor space for these fine shows. They lent their name and their space to the arts and the crafts in an effort to present "life time furniture" when their real purpose is turning a buck. I appreciate that. □

John Marlowe is a writer and art critic, and lives in San Francisco, Calif.

Household lye penetrates into the surface of cherry, accelerating the natural aging of heartwood. The finish then intensifies the color.

Unlocking Cherry's Color

by Tom Dewey

Cherry heartwood darkens with age, eventually yielding a patina of rich, naturally varied color that no stain can duplicate. I have several antique cherry pieces that were restored by my father. Every time I made a new cherry piece "to match," regardless of whether I used oil stains or aniline dyes, the artificial and uniform tones of the new work made it look out of place among the clear, vibrant color of the old.

Five years ago, quite by accident, I discovered a chemical treatment that seems to duplicate natural aging. I had spilled a few drops of Easy-Off oven cleaner on the cherry countertop in my kitchen, and, although I quickly cleaned it off, there before my eyes was the 100-year-old look—several deep burgundy-brown stains. The treatment seems to color the wood according to the pigments and extractives that nature has deposited in it. Sapwood darkens only moderately, as it would over the years, but heartwood ages instantly. Boards from different trees color slightly differently, just as they do in old furniture.

I read the Easy-Off label: "Contains sodium hydroxide (lye)." Indeed, the label read like an OSHA alert: six "Do not's," four "Avoids." But, if you can use Easy-Off in the kitchen, why not in the workshop? Out I went to experiment.

Easy-Off proved troublesome because of its soapiness. Drano, another product containing lye, was out because it's mixed with aluminum chips, which react to produce intense heat and gas—fine for blowing out a drain, but rough on a candlestand. Straight household lye, however, worked fine.

The photo shows the results of various concentrations. The stronger the solution, the faster and deeper the color change. If the solution is weak, further coats don't darken the wood much more. You want a concentration that gives you the desired color in one application. It's a good idea to experiment, starting with one tablespoon to a quart of warm water; add more dry lye powder until the solution produces the desired color. Mix and keep the solution in a plastic bottle with a plastic lid, to avoid corrosion. I recommend plastic goggles and gloves, and protection for clothes and workshop surfaces.

Apply the solution with a nylon brush (natural bristles will be reduced to mush within minutes) or spray it on using a plastic spray-pump container, such as many household cleaners come in. Don't use conventional spray equipment for two reasons: first, the solution reacts with aluminum, and even more important, overspray is very nasty stuff.

Try to cover a surface as quickly and evenly as possible. The process is moderately forgiving—apparent blotchiness during application tends to disappear when dry—but careful, overlapping, full-wet treatment is the key to success. In doing a small cherry pedestal table, for example, I begin with the work upside down. I spray all visible surfaces, then turn the work over and spray the pedestal and legs again. Drips and runs don't seem to matter; it's the full-wet initial contact that counts. For the top, I'll generally switch to a brush, mostly because by that time my finger is getting tired pumping.

Occasionally I've tried to neutralize any lye residue by treating the wood with vinegar, but I don't really believe that this is necessary. The active ingredient in the lye appears to use itself up working on the wood. I've never had trouble with final finishes either, whether oil or lacquer.

Clean your equipment with soap and water. Allow the work to dry, which may take overnight. Because the lye mixture is water based, it will raise the grain somewhat. I use 180-grit silicon-carbide paper to remove any fuzz. The color change penetrates the surface, but even so, be careful not to sand through at corners, etc., as touching up such areas is time-consuming and difficult. I usually work up to 400-grit paper before applying the finish.

Obviously, this method shouldn't be used on children's toys or items where there will be contact with foodstuffs. I'm not sure that even then there would be problems, but why take chances?

Try the treatment yourself on other woods. There are always offcuts to practice on. I've found it doesn't do much for maple, and for my money it darkens walnut too much. You may or may not like the brown color it gives to oak, or the intense red it produces on Honduras mahogany.

Colors can change with time, especially when exposed to bright sunlight, but in my house at least, the lye treatment has been the only way my projects could have blended in with my father's treasures. I'm reminded of my luck every time I pour a cup of coffee—those brown spots are still on the countertop. □

Tom Dewey has been designing and building furniture for ten years in Coudersport, Pa.

Creating a Couch

Laminated curves for multipurpose seating

by Scott Dickerson

Some time ago, a client approached me to design and make the furniture for an open, combination dining and living room. Basically, he placed the 22 ft. by 46 ft. area on my drawing board and said, "Fill it up with what we need." My solution, shown on the facing page, included the designing and making of two couches, which I'll describe here.

The primary challenge in couch design is accommodating the sizes and postures of different sitters and a variety of uses—conversation, reading, reclining, napping and so on. These demands produce conflicting requirements. Seat depth, for example, shouldn't exceed 16 in. for a small person to sit comfortably, but a large person requires a seat at least 21 in. deep to lie down on. The customary approach to these conflicts is to compromise the different uses and measurements, accepting that all people can't be accommodated equally well. I think that beginning the design process with compromise greatly diminishes the chances of success. Therefore, I begin by trying to satisfy all needs—I may conclude with compromise, but usually the level of dissatisfaction is much lower.

My first step was to measure and map the room, locating the relevant details—windows and sliding glass doors opening on a harbor view, a brick fireplace opposite the view, red oak flooring, eggshell white walls, and a spiral iron stair to the second floor. Next the clients and I discussed how they wanted to use the seating. They usually entertained small groups, occasionally a large party. The couch would be used for reading, napping, watching television, looking at the harbor and fireplace gazing. How, I asked, can I give you a good view of both the harbor and fireplace, since they are on opposite sides of the room? That's your problem, they said with a smile.

After ten days of casual consideration and a day of drawing, I decided that the only way to serve both views was with a pair of J-shaped couches placed facing each other. The encircling couches would also work well for conversation. The relatively straight section of each couch would be long enough for a person to lie down on, while the sharper curve would be a better place to sit and talk. A table in the center could hold books, snacks and beverages, or a portable television. The clients liked the plan and we agreed to proceed.

From my sketches, I prepared scale drawings. I use 100% rag vellum tracing paper printed with a faint blue ⅛-in. or ¼-in. grid (available in rolls 20 yd. long and 42 in. wide from Charrette, 31 Olympia Ave., Woburn, Mass. 01888.) The grid lines greatly simplify the enlarging of scale drawings to full size.

As I drew the seat curves in plan view, I suddenly realized that the J-shape could provide for both sitting and lying without compromise. I had assumed that the seat had to be the same depth all around the curve. Now it occurred to me that I could change the depth along the curve to suit the different postures: narrow at the tightly curved end for sitting, widening toward the other end for lying down. Sitters with different leg lengths would have a choice of places to sit comfortably. I found that a seat depth increasing from 15 in. to 24 in. would function well and produce fair curves without irregular bulges or hollows.

Next, I drew the elevation views of the end frames. The client had requested an erect and alert sitting posture, so I chose a back recline angle of 15°, as suggested in ***Humanscale 1/2/3***, a useful book of ergonomic information published by MIT Press (28 Carleton St., Cambridge, Mass. 02142). Most people prefer a back with greater recline, say 20°. (If you chose a greater angle, reposition the top rail and replot its curve.) A back cushion height of 18 in. keeps them as low as possible without reducing comfort; when the sitter compresses the seat cushion a couple of inches, the cushions will reach the average sitter's shoulder blades.

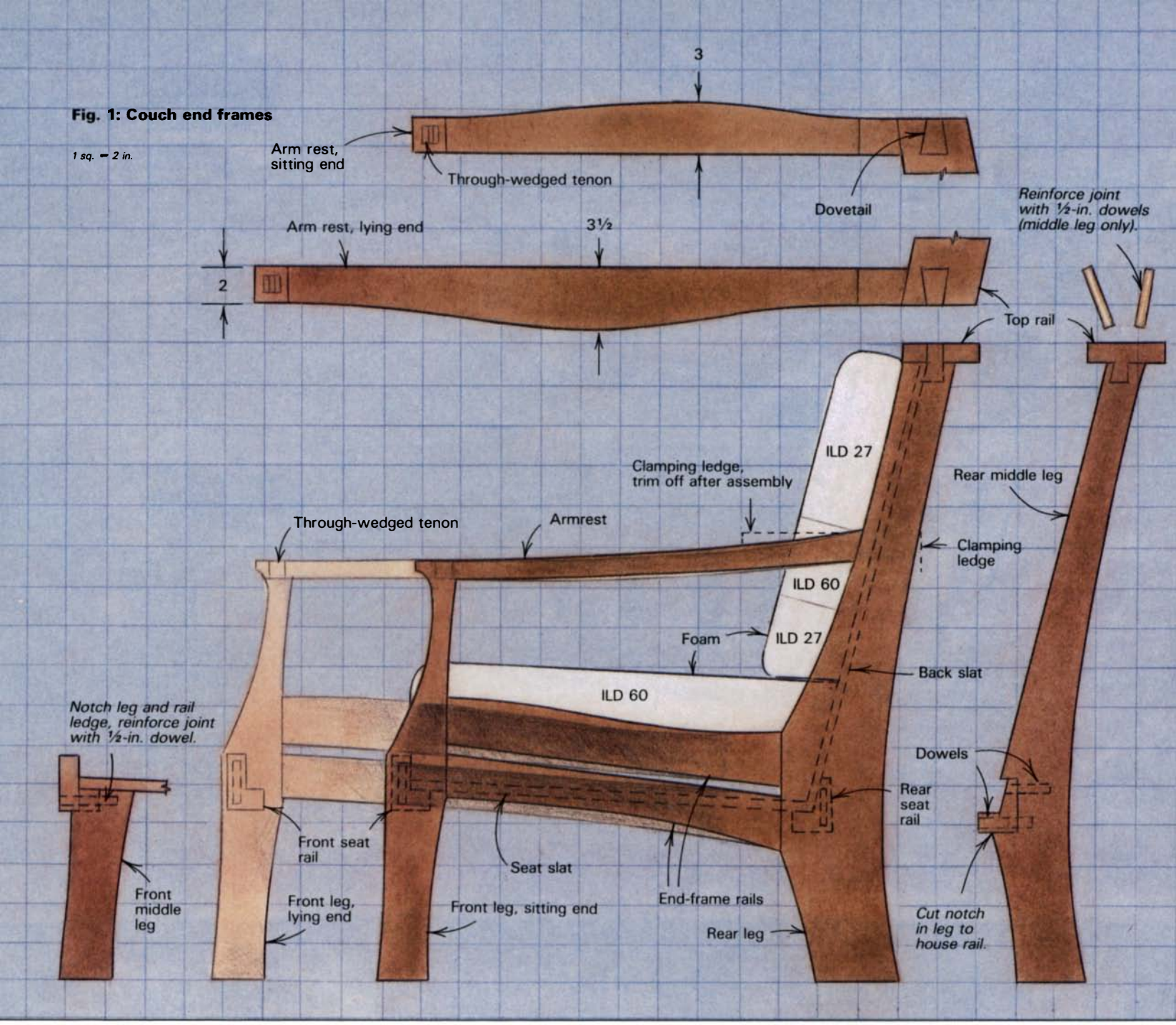
The client had emphatically demanded a couch that he could rise from without a struggle. A seat height of 15 in. and very firm seat cushions makes rising much easier, but still allow the sitter's feet to reach the floor. Seats for a relaxed posture should rise slightly from back to front so the sitter doesn't slide forward, away from the support of the back cushion. I made the seat 1 in. higher in front than in back; the sitter's weight increases the angle of incline. The 1 in. difference is less noticeable at the lying end of the couch because of the greater seat depth, so someone lying down won't be tilted into the back cushions.

After establishing the essential measurements for the couch frame, I designed the cushions. The profile of support for a sitter's body is a line that curves from the back of the knee down slightly and around the buttocks, behind the sacral vertebrae and pelvis, up and forward into the lumbar vertebrae, then back around the thoracic vertebrae and ribs. The complex curvature of this profile is not provided by cushions made from flat slabs of foam of uniform compressibility, especially in the lumbar region of the back. A better support profile can be created by laminating foam blocks of different compressibilities to make a cushion core. Figure 1 shows the foam blocks I used for making the back cushion. The ILD (Indentation Load Deflection) numbers are used by the foam industry to specify foam compressibility—the lower numbers are softer than the higher numbers.

The ILD 60 foam specified for the seat is extra firm, many people would prefer a bit softer cushion, ILD 45. The back cushion is block laminated with a soft foam, ILD 27, in the sacral and thoracic areas to allow the sitter to sink farther into

These couches neatly resolve several conflicting seating requirements. The pair of curved shapes allows easy conversation. Varying seat width permits both sitting and lying in comfort. Curved laminated rails carry slats that support the seat cushions (below).

Photos this page: David Klopfenstein



the cushion. The lumbar block of ILD 60 presses support firmly into the lumbar area. The seat cushion is 6 in. thick; the back cushion 3 in. The foam core of each cushion is wrapped with polyester fiberfill to soften the surface texture of the cushion and bridge the different foams to create a smooth support curve.

Because the curvature of the support profile is provided by the foam core, the structure supporting the cushions can be flat. I use wood slats because they're resilient and durable: ash for the seat, cherry for the back to match the cherry couch frame.

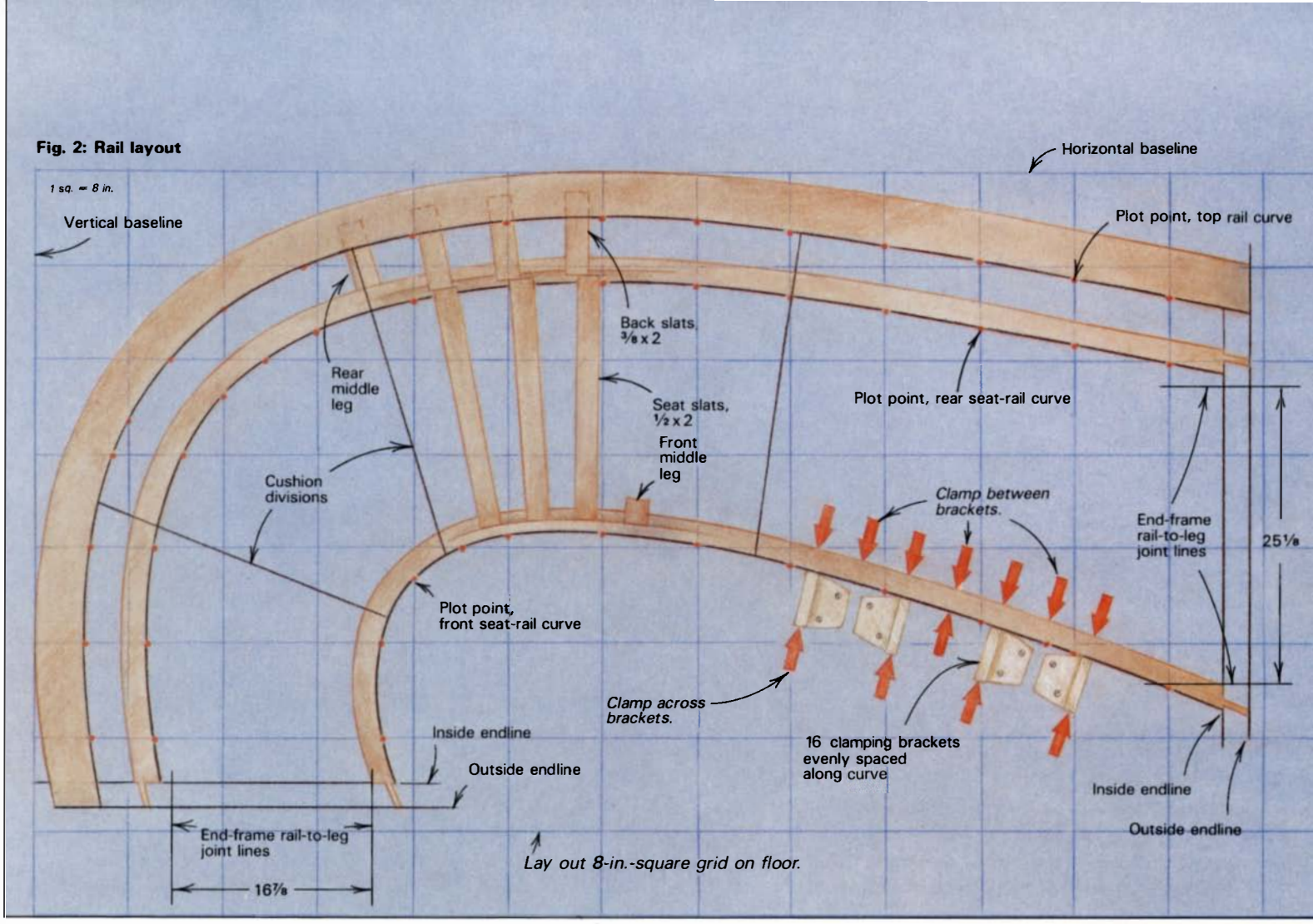
The remaining end-frame design detail was locating the armrest. A sitter rarely uses couch armrests for resting arms; instead, armrests assist in rising from the seat and in keeping pillows from falling off. Proper armrest height for supporting a sitter's arm is 10 in. above the compressed cushion surface, but that would allow a pillow to slip out under the armrest, so I lowered it to 8 in.

The couch has three curved rails, glued up from thin laminates. The top rail is a flat surface 4 in. wide, which hides the junction of the back slats and top rail and visually emphasizes the curvature of the couch. The width also provides necessary lateral stiffness. The end-frame legs, rails and armrests have simple curvilinear lines consistent with the general form of the couch. Two middle legs support the seat rails where they curve from the lying to sitting sections.

Making the couch begins with a continuation of the design process—drawing a full-size plan view on the workshop floor. The floor drawing establishes the lines of seat and back rails so clamping forms can be set along those curves for laminating.

A clear area, at least 8 ft. by 12 ft., is necessary for bending the laminate strips. The clamping forms are screwed directly to the floor, so it must be flat—the glued laminations will conform to any humps, hollows, or twists. (Plywood or particleboard will work where the floor is uneven or concrete.) I paint the floor flat white so the pencil lines will show well. With a chalkline, lay out a grid of 8-in. squares, including horizontal and vertical baselines, then plot the points to scale-up from your ⅛-scale grid drawing. Draw the inside line of each rail—it's easier to bend and clamp the laminates around a convex than a concave curve. Drive a four-penny finish nail into each point, then spring a flexi-

Fig. 2: Rail layout



ble batten of straight-grained pine or spruce around the nails.

The fairest curves are drawn using a batten just thin enough to bend around the curve without being permanently deformed, but thick enough to be stiff between nails. I used a ¼-in. and ½-in. batten. Where necessary, relocate the point nails and re-spring the batten until the line is fair. Make sure the final version of the line extends at least 2 in. beyond the actual rail length, for extra clamping stations to hold the laminates through the curve. Mark the inside and outside faces of each end frame, as shown in figure 2. These lines are necessary for marking the cut-off and joint lines on the completed rails.

I made 16 brackets as clamping stations and screwed them to the floor at equal intervals around each curve, in turn, for laminating (figure 3). The brackets will be closer together for the front seat rail than for the other rails, which is fortuitous since the thinner laminates required for sharper curves need closely spaced clamps. Tack a ½-in.-thick strip of wood to the floor in front of each bracket to support the laminates. This allows the faces of the clamps to be centered while saving your knuckles.

An additional clamp between each bracket is necessary for tight joints. Softwood pads between the clamp faces and laminates spread the pressure and avoid marring the lamination surface. To keep the glue that is squeezed out from sticking to the floor and brackets, I waxed everything—floor, brackets, spacer strips, and clamp blocks—with a heavy coat of paste wax.

I determined the right thickness for the laminates by bending samples of different thickness around the form. The laminate should bend easily and spring back when released, indicating that its fibers haven't been strained and, therefore, weakened. While thinner strips also passed this test, they don't make tight glue joints between clamps. The thicknesses I used are indicated in figure 3. Measure around the brackets to find the laminate length—make them plenty long. During clamping, laminates slide around; I cut them ¼ in. wider than the rail height shown on the drawing so I could plane the rails to size.

I prefer to cut laminates for each rail from a single plank. Reassembling them in order blends the color and grain pattern back together and makes the glue lines barely visible. I rip the strips on the tablesaw with a Forrest Custom-Line 10-in. carbide ripping blade, specially ground to produce a glueable surface without planing. I rip only the number of laminates I am planning to glue that day, since freshly worked wood surfaces glue much better. Because I work alone, I glued the back top rail in three stages—first the inside section, then the middle, which forms a ledge to support the back slats, and finally the outside. This gave me time to spread the glue and place the clamps before it dried, and made it easier to align the strips. I V-marked the top of the plank with red lumber crayon so I could reassemble the laminates in order, and marked the centerline across the plank to match a rail centerline marked on the floor.

I've laminated with Titebond, a yellow aliphatic glue, for ten years without a joint failing or creeping. It's non-toxic, cleans up with water before curing, and sets well in the 65° temperature of my workshop. It sets up quickly, however, so you have to be very organized and move fast. I advise making a dry run to work out procedures. Distribute the clamps and their softwood pads near the brackets. Spread glue onto each surface of the laminates, except the inside and outside faces. Stack them in order and rush over to the brackets, matching the centerline on the laminates with the centerline marked on the floor. Begin setting clamps at

Fig. 3: Rail lamination

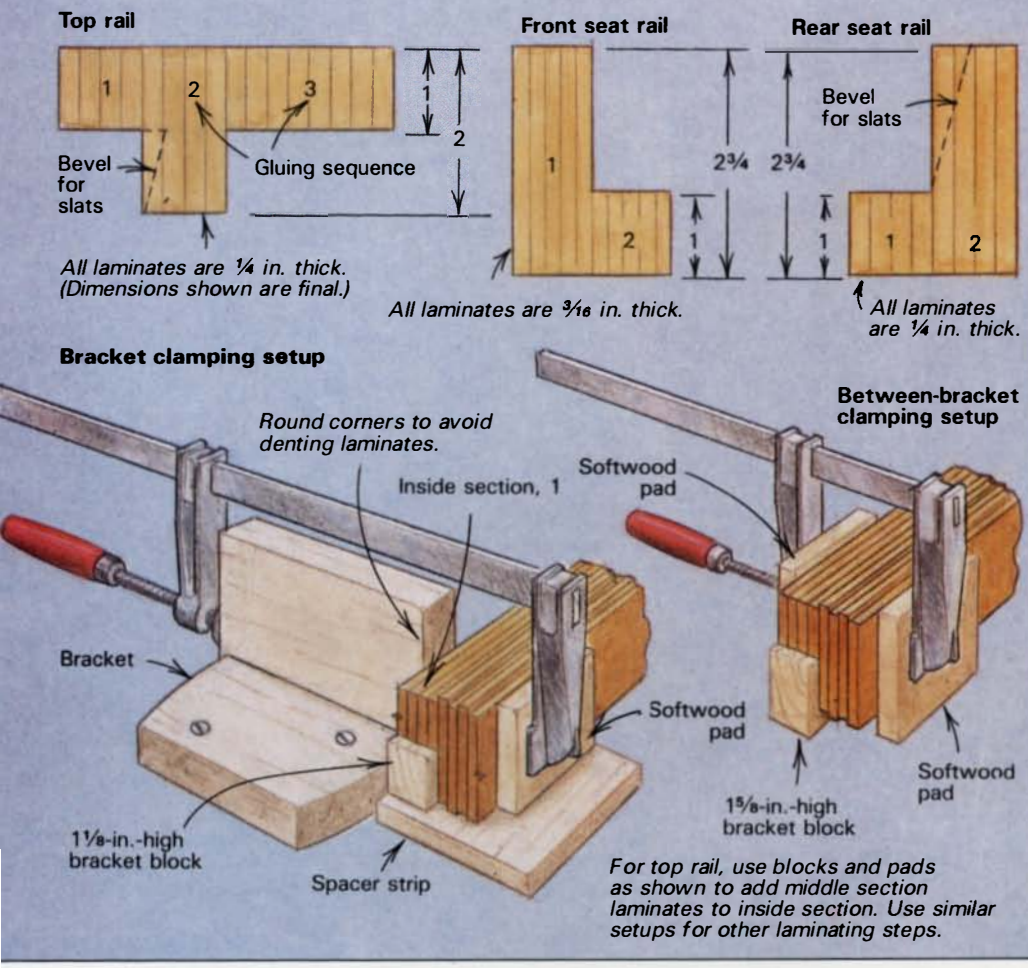
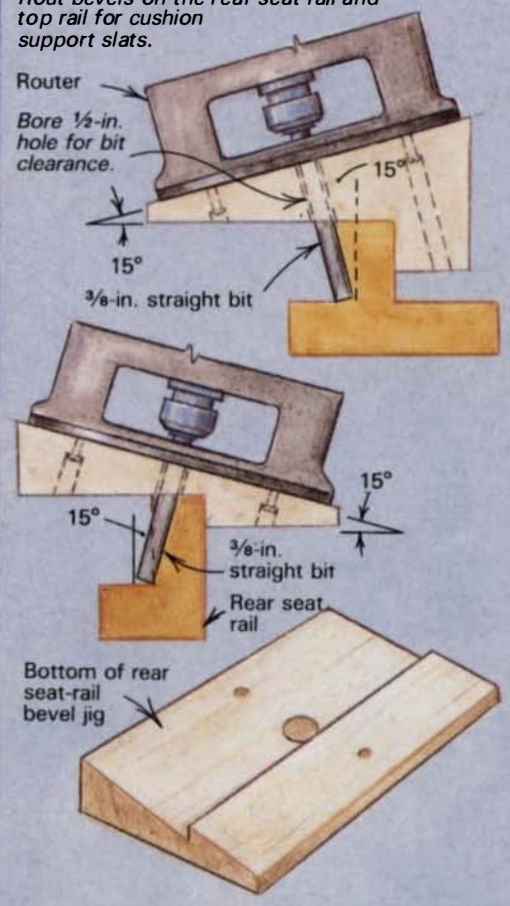
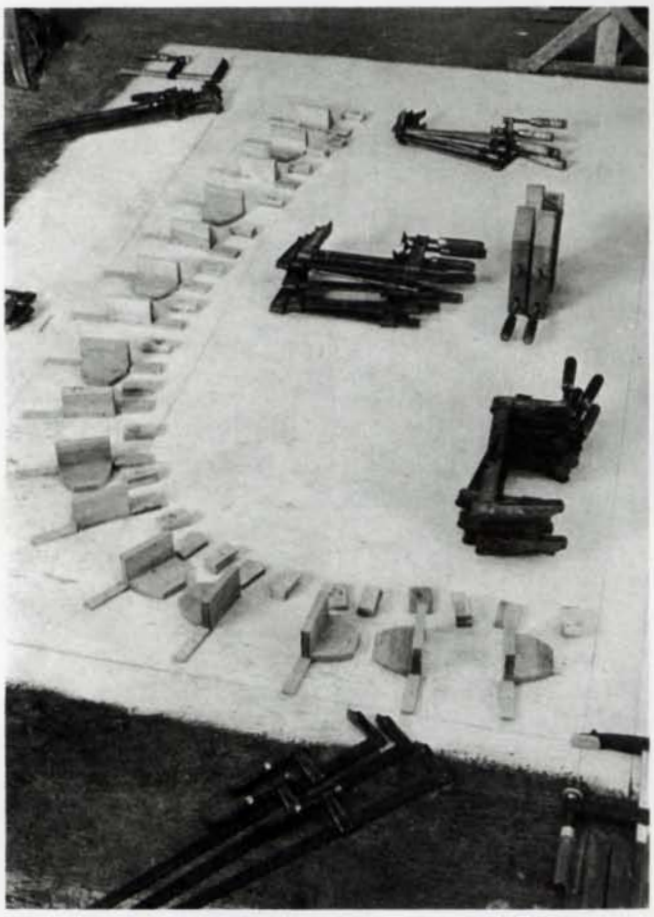


Fig. 4: Bevel-routing jigs

Rout bevels on the rear seat rail and top rail for cushion support slats.

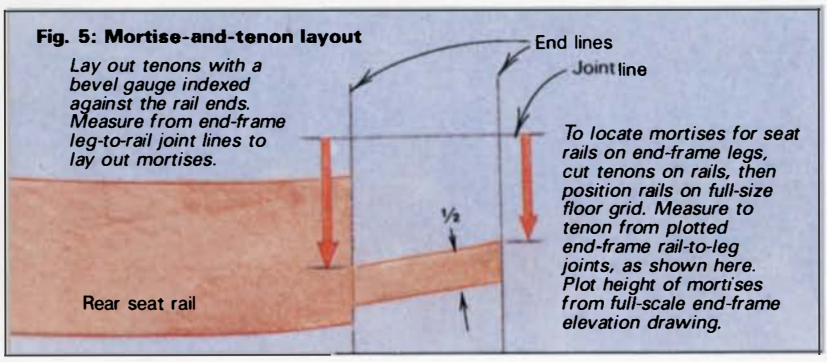




You will need to work fast when laminating, so lay out everything you need before spreading the glue.

Align the rails on the floor drawing and knife their ends and shoulder lines against a straightedge. Try squares help position the straightedge exactly above the end-frame lines.

Fig. 5: Mortise-and-tenon layout



Photos this page: Scott Dickerson

the middle. Work to one end then return to the middle and set the clamps to the other end. Don't leapfrog a bracket—the laminates won't be able to slip by each other and will gap between the clamps. After completing the bracket clamps, go back and set the clamps and pads between the brackets.

I leave the laminates in the form for eight hours at 65°, then scrape off the excess glue, joint one edge and thickness plane to 1⅛ in., which leaves some extra height to correct misalignment when joining the next section. Saw the laminates for the middle section and re-organize the gluing set-up. Blocks are necessary at each bracket to raise the inside section so it joins the upper part of the middle section, and to transfer clamping pressure between the bracket and the middle section (figure 3). The clamps between brackets require blocks for the same purpose.

After the glue has cured, I scrape the glue squeeze-out and handplane the middle laminates flush with the top edge of the inside section. Then I joint first the bottom, then the top, of the assembly to bring it to its final thickness of 2 in. Adding the final outside section is a repeat of the previous operations, except that the blocks holding up the outside laminates are not required to transfer clamp pressure, so I use them only between brackets. The block should hold the outside laminates ⅛ in. above other sections to allow for slippage. Plane the top edge of the outside section flush with the others by hand—it won't pass through the planer without twisting on the bed. I planed the uneven ledge surface with an electric block plane, working up flush to the middle laminates with a rabbet plane.

The procedure for making the front and rear seat rails is essentially the same as that for the top rail. Each of these laminations requires two steps—one to make the slat ledge, the other to add the wider apron to it. After planing the assembled seat rails to the finished height, I routed the bevels for the slats on the seat back and top rails using a jig, as shown in figure 4. It took several cuts to complete each bevel, and constant concentration to follow the curve and hold the router flat on the rail. I put the rails aside for a few days while I assembled the end frames of the couch; this allows bending stresses to settle, resulting in a more stable curve.

I drafted a full-size drawing of the elevation view of both end frames on ⅛-in. grid paper. These drawings enable exact measurements to be taken of the parts and angles of joinery. I also use them to make patterns for the parts—place carbon paper between the drawing and pieces of Marlite (⅛-in. tempered hardboard, painted white on one side). Trace the part, then bandsaw the Marlite to the pattern. The end-frame joinery is straightforward mortise and tenon. I split the end-frame rail in two, as shown in figure 1, to avoid the stress to the joint caused by the seasonal expansion and contraction of a wider rail.

To mark the length of the curved rails and the joint shoulder lines, put the three rails on the floor grid, aligned with their respective layout lines. The rails won't follow the lines exactly, but adjust the position of each rail to minimize the discrepancy. Put a few ¾-in.-thick shims under the top rail to lift it to the same level as the seat rails. Place a straightedge on top of the rails, aligned with the outside face of the end frame. Now knife a line along the straightedge—this marks the cut-off line for the rails. Repeat the procedure for the inside face of the end frame to mark the shoulder lines. Extend all the lines with knife and square on the front and back faces of the rails.

It's very important to cut off the ends of the rails true to the plane of intersection with the outside face of the end frames to provide a square-edged, flat surface for laying out the joints. The seat rails join the end frames with through tenons 2¼ in. wide and ½ in. thick. For greatest strength, the tenon should parallel the direction of the grain of the rail; because the curvature of each rail is different, the angle of the tenons to the rail ends will differ. I used a bevel gauge against the rail end to lay out the tenons. I knifed the tenon outline on the top and bottom surfaces, then cut the tenons with a backsaw and paring chisel.

The mortise layout is complicated by the angle of entry of the tenons. Once again, a true plane is needed for lay out. I measured from the joint line between the end-frame rail and leg to lay out the mortise cheeks on both faces of the leg (figure 5). To determine the measurements, place the rail on the floor grid again, and mark the position of the tenons on the end-frame layout. The elevation drawing will give you the measurement from the ends of the legs to the mortises. After laying out, bore out the waste, guiding the bit with a bevel gauge set at the angle of the mortise, then pare the cheeks to fit with a chisel.

Before gluing the seat rails and end frames together, cut the dovetail tenon for the top rail on the back leg. It's easier to do this now while the end frame can be held in the workbench vise. I glued the seat rails and end frames together clamping a wooden handscrew clamp to the rail to provide purchase for the quick-action clamps. Gluing 120-grit sandpaper to the wooden clamp faces kept it from slipping. If the joints are well fitted, it's not necessary to apply great pressure to bring them together. Drive a pair of wedges into the tenons to lock the joint. After the glue cured, I reinforced the joints with ½-in. by 3-in. dowels, driven into holes bored into the ledges.

Lay out and cut the dovetail in the top rail, first cutting away the ledge back to the shoulder line. Before gluing the top rail in place, locate and cut the simple notch joints for the middle legs. I clamp the back leg to the seat rail and knife lines for the top notch on the rail and for the bottom notch on the leg. A similar procedure works for the front middle leg. After gluing and clamping the middle legs, I reinforce the joints with ½-in. dowels.

I cleaned off the excess glue at all the joints, rounded all the corners and edges, and sanded the couch. After three saturation-coats of Watco Danish oil, the couch was ready for slats. The 26 seat slats are straight-grained white ash, ½ in. by 2 in., distributed as evenly as possible around the flaring curve of the seat. Round their edges and oil them, then cut each to fit and attach with wood screws. The ⅜-in. by 2-in. back slats are cherry, nine at the the sitting end, twelve at the lying end. I spaced the slats evenly on the bottom rail, then used a level to plumb each slat position vertically onto the top rail. This produces slightly varied spacing on the top rail, but I prefer plumb slats to exactly equal spacing.

After a couple more wipedown and rubout oilings with Watco, the couch was ready for the upholsterer. I gave him sketches that showed the details of cushion construction—block laminating the foam, wrapping with polyester fiberfill—and discussed the job with him. The back cushions have to bend around the curve of the back rails, so we decided to use heavy-duty snaps to hold them to the slats. Dividing the back space with smaller cushions at the sitting end, progressing to wider cushions at the lying end, allows the narrower cushions to fit into the sharper curve more easily; I also liked the emphasis that size progression gave to the flare of the couch. Since it's important that the cushions fill their spaces so the slats don't show at the corners of the cushions, they should be made a bit oversize, to be compressed slightly to fit the space. □

Scott Dickerson designs and makes seating and furniture in Cape Rosier, Maine.

Mack Truck Super Liner

Ten-wheel tractor for tiny truckers

by Richard Blizzard

British craftsman Richard Blizzard was inspired to build this Mack truck after seeing the massive 18-wheelers on American interstate highways. The mahogany cab, more than 2 ft. long, has the mirrors, lights, bulldog mascot, and sleeping cabin of the full-size rig.

When I visited the United States a couple of years ago, I was impressed by the size and power of the huge trucks that roared down the highways every hour of the day. One of my favorites was the monster Mack. We don't have anything quite like it in Europe today. When I returned home to England, I was determined to reproduce this giant of the American trucking scene.

I wanted my truck to be accurate, so I wrote to the company for brochures to help me draw the plans and develop the marvelous details created by the company's designers. If you'd prefer a toy instead of a model, you can use my overall dimensions and construction ideas to come up with a simpler truck that will inspire any child's imagination. On a toy, omit details like the rigid exhaust pipes, metal mirror supports and other small items that could be dangerous in young hands.

The truck's chassis is beech and the superstructure is mahogany. You can use other hardwoods, but the body looks best when it's made from a dark-colored wood. I turned the cylindrical parts on the lathe, but did most of the other work with hand tools. Assembly is pretty straightforward, but here are a few helpful hints.

As with any vehicle, begin by first constructing the chassis, the foundation of the whole truck, then do the cab and superstructure. Don't glue the parts together until you've cut everything out and dry-fit all the parts, to make sure everything fits properly. Cut all the components and joints before doing any shaping. The parts are easier to work when they are flat on the bench, rather than fastened to a partly assembled cab or chassis. Pieces representing things like fuel tanks and fenders should be rounded over and sanded smooth, for a softly curved metal look. Every piece should be sanded or scraped clean before assembly.

With a complex model like this, always plan ahead. Parts that must be mirror images of each other, such as the long chassis supports and ladder uprights, should be taped or clamped together and marked out as a pair. Machine them together, if possible. Pieces like the ladder uprights can be drilled while they're fastened together. Try to do all the cutting, shaping and boring on each piece before assembly. On the long chassis supports this means cutting the front of the chassis for the axle crossbar, and boring holes for the dowel rods used to attach the fuel tanks.

The rear wheel carriage assembly really conveys a sense of the massive power of this machine. The two wood and metal suspension units look real, and allow one wheel to be raised while the

Photos: above, Linda Lane; facing page, Richard Blizzard

others remain on the ground. For this action to occur, the axle holes must be slightly elongated to oval shapes. I drilled the ovals by making pairs of overlapping holes, then cleaned up to the layout lines with a rat-tail file. The rear axle mounting blocks are fairly simple, but use a drill press to ensure that the holes shown are bored perpendicular to the surface of the blocks.

The steering assembly, shown in detail on p. 75, is a bit tricky. Cut the parts shown and chamfer the front axle block recesses so the stub axle units can turn freely. Smooth each of the small parts, so everything fits well, by rubbing the parts over sandpaper on a flat surface. After boring holes and inserting the metal axles, align the pieces as shown, tape everything together and drill right through the axle block and stub axle to ensure good alignment. This requires a good deal of care, so if the telephone rings, don't answer it!

Begin construction of the superstructure with the engine cab side panel. Since these panels are set at an angle, it's a good idea to draw them full-size on paper, then use the drawing to mark off the angles for the forward and rear spacers, which are mortised into the panels. To compensate for the angled "off-set" of these panels, plane the outside of the panels to the correct angle.

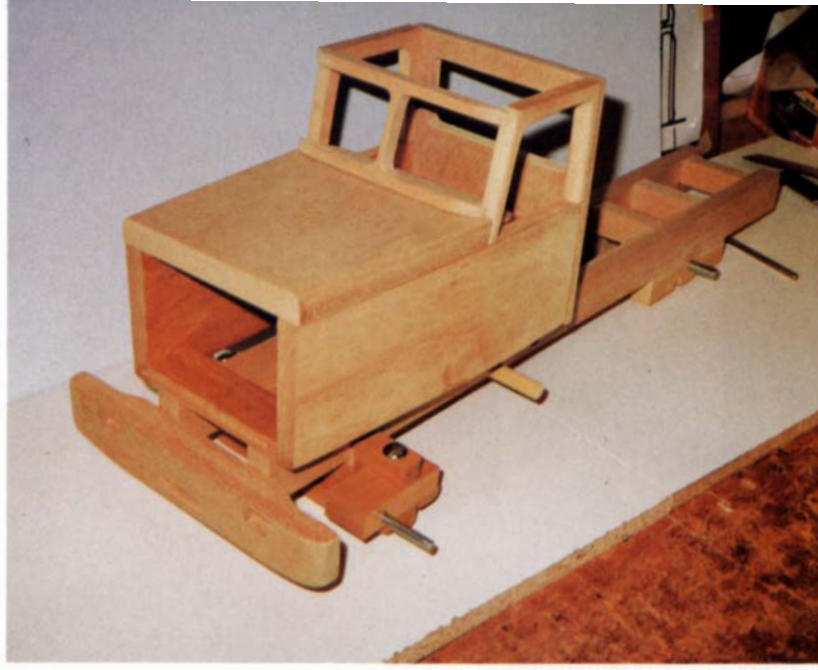
The massive radiator requires quite a lot of work. Use a knife to mark out the radiator recess on a wood block, then rout out the area. Next, glue the six small wooden strips across the recess. To create the three-dimensional look of a real radiator, narrow strips of aluminum mesh (the screens used in auto body shops to patch holes in cars) are glued in between the wooden strips, then a larger piece of aluminum mesh is shaped over the wooden strips and fastened with headed straight pins and narrow strips of wood glued at the top and bottom of the recess.

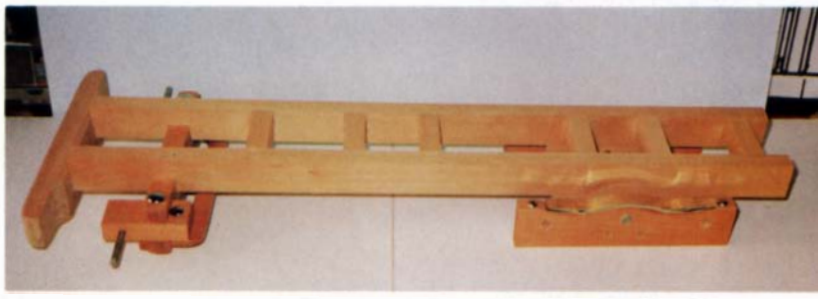
I carved the steering wheel by drilling holes to remove most of the waste and rough out the hub and two spokes, then shaped them with fine rasps. The windows are 1/16-in. clear Plexiglas, available from hobby and model shops. You can heat the plastic in an oven and bend it on a mold, but you'll likely end up with gobs of plastic all over the stove. It's safer to glue the plastic to the cab, then glue the window frame over the plastic. The curve of the frame will create the illusion of a curved windscreen.

The mirror and aerial assemblies on Mack trucks do so much to capture the look of the truck that they justify a little metalwork. Make the mirror supports from 1/16-in.-dia. brass wire. Paint the wires silver, and glue them into small holes bored into the cab's side wall and wooden frame. The mufflers are turned on the lathe. The narrow tenon left at the top fits into a piece of black plastic pipe. The mufflers are then covered with aluminum mesh, pinned together at the back, and screwed to the cab's rear wall. Another word of warning. If a youngster will be playing with the truck, fit flexible tubing to the tops of the mufflers, otherwise some very nasty accidents could happen. The truck's front fenders are cut from solid blocks of wood and glued to the cab. I cut the inside first, then clamp the block in a vise and file or sand off the saw marks. Then, I cut the outside shape and round the outer edges.

The ladders for the driver's bunk and the sides of the cabin are made by taping two 10-in. pieces of wood together, locating the rungs and drilling through both pieces at once. Separate the two halves and lightly countersink each hole on the inside faces. Glue all the dowel rods into one side first, start the dowels into the other side, then put the ladder in the vise and squeeze the sides together. Finally, cut the ladder into three sections.

If you'd like, you could build a flat-bed or closed trailer to go with the cab. It would be fun for you and your children to model it after a trailer you like. Add strips of wood, braces and wheel





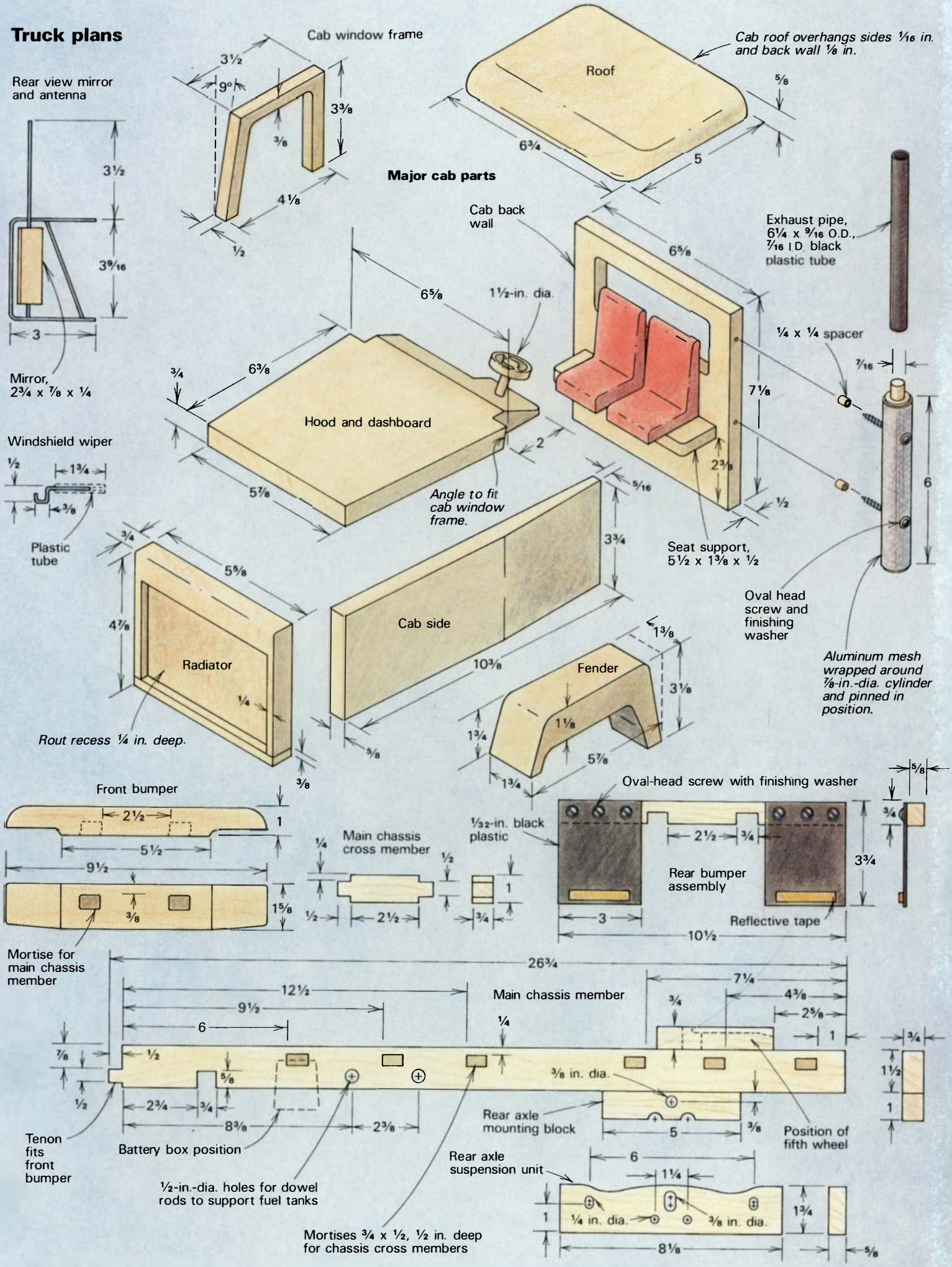
The front view of the partially assembled truck, top, shows the front spacer that sets the width of the cab and is screwed to the frame pieces. Also supporting the cab is a rigid chassis, above, a series of beech crossmembers mortised into two long frame pieces, which are, in turn, mortised into the front bumper.

assemblies to match the trailer you've selected, much as you did in building the Mack. I'd suggest you build your trailer around a 1/8-in.-thick plywood bed about 42 in. long and 8¼ in. wide, and supported by 1-in. by 3/8-in. edging strips glued to the plywood edge. The chassis members should be hardwood strips 1½ in. wide and 7/8 in. thick, the same length as the bed. I cut half-lap joints along the length of the chassis members to house matching half-laps on the five 2½-in. by ¾-in. crossmembers. The crossmembers look very realistic if they're the same width as the bed and beveled at the ends to fit flush with the edging strips. If you want to build a closed trailer, rabbet the sides of the trailer panels to fit over the plywood instead of the edging strips, and insert the roof into rabbets cut on the top edges of the panels. To make it possible for the cab to tow your trailer, glue a block of wood, about the same size as the cab's fifth wheel, between the chassis members about 2 in. from the front of the bed. A ½-in. dowel pin in the block fits into the cab's hitch. Experiment with pin location and size to make sure the hitch works before you glue it in.

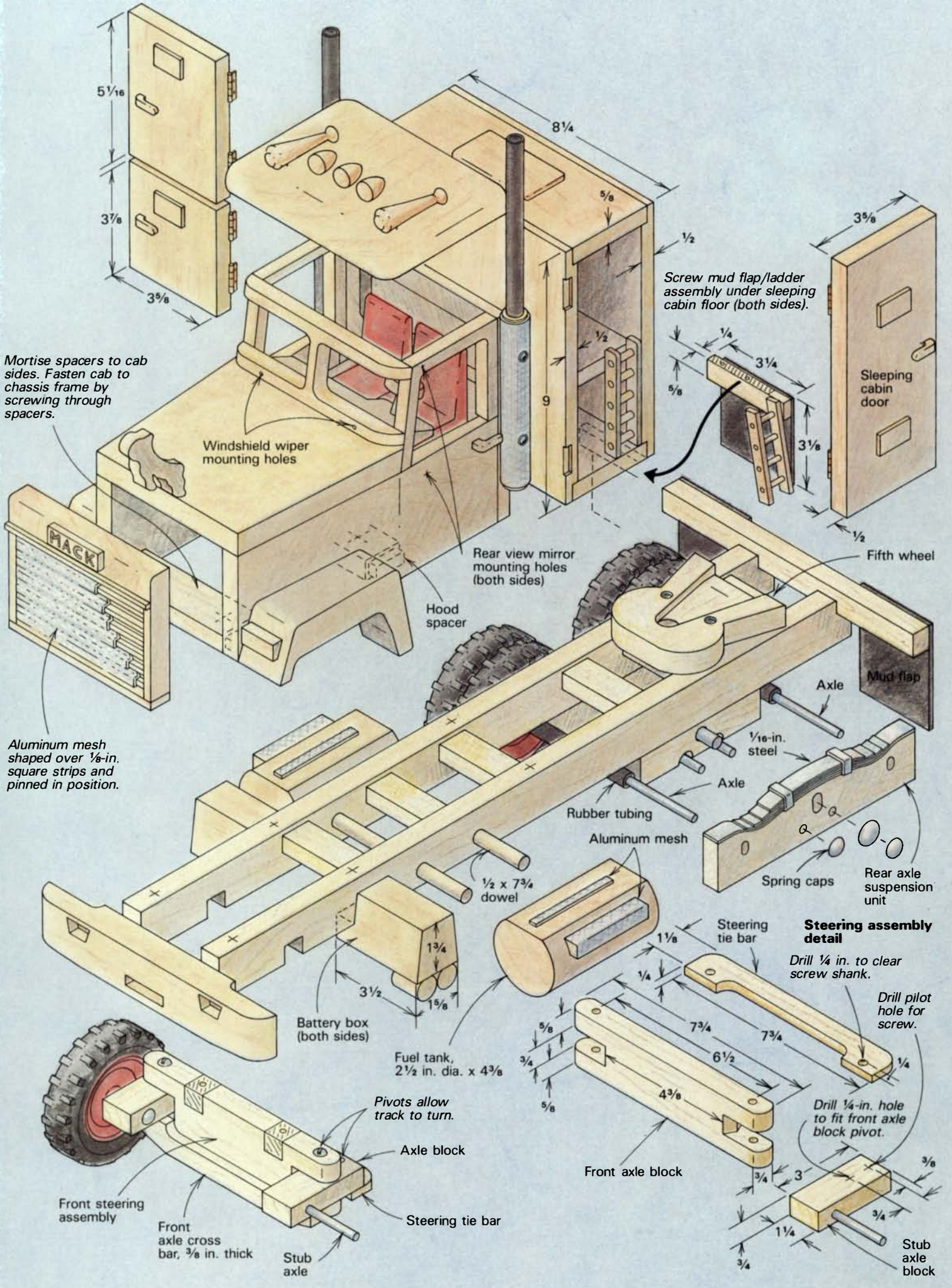
I finished the model with four coats of polyurethane varnish rubbed on with a cloth, followed by a coat of wax polish. Then, I mounted the 4-in. wheels (available from Craft Supplies, Ltd., The Mill, Millers Dale, Buxton, Derbys., England SK17 85N) with ¼-in. mild steel rods and chrome-plated spring caps. No Mack truck would be complete without its bulldog bonnet mascot. I cut out the basic shape with a coping saw and shaped the dog with small chisels, gouges and wood rasps. I'm sure that other craftsmen will be able to fashion a far more bullish dog. □

Richard Blizzard is an author and designer, and host of a British Broadcasting Corp. television series on making toys.

Truck plans



Drawing: Caren Mastranardi


5 1/16
3 7/8
3 5/8
8 1/4
5/8
1/2
9
1/2
3 5/8
Screw mud flap/ladder assembly under sleeping cabin floor (both sides).
1/4
3 1/4
5/8
3 1/8
Sleeping cabin door
1/2
Mortise spacers to cab sides. Fasten cab to chassis frame by screwing through spacers.
Windshield wiper mounting holes
Rear view mirror mounting holes (both sides)
Hood spacer
Fifth wheel
Mud flap
Axle
1/16-in. steel
Axle
Rubber tubing
Aluminum mesh
Spring caps
Rear axle suspension unit
Aluminum mesh shaped over 1/8-in. square strips and pinned in position.
1/2 x 7 3/4 dowel
1 3/4
3 1/2
1 5/8
Battery box (both sides)
Fuel tank, 2 1/2 in. dia. x 4 3/8
Steering assembly detail
Steering tie bar
1 1/8
1/4
Drill 1/4 in. to clear screw shank.
Drill pilot hole for screw.
5/8
7 3/4
7 3/4
3/4
6 1/2
1/4
5/8
4 3/8
Drill 1/4-in. hole to fit front axle block pivot.
Front axle block
3/8
3/4
3
3/4
1 1/4
3/4
Stub axle block
Pivots allow track to turn.
Axle block
Front steering assembly
Front axle cross bar, 3/8 in. thick
Steering tie bar
Stub axle

Shop-Built Pin Router

Delicate carving with a precision machine

by Hans Sporbeck

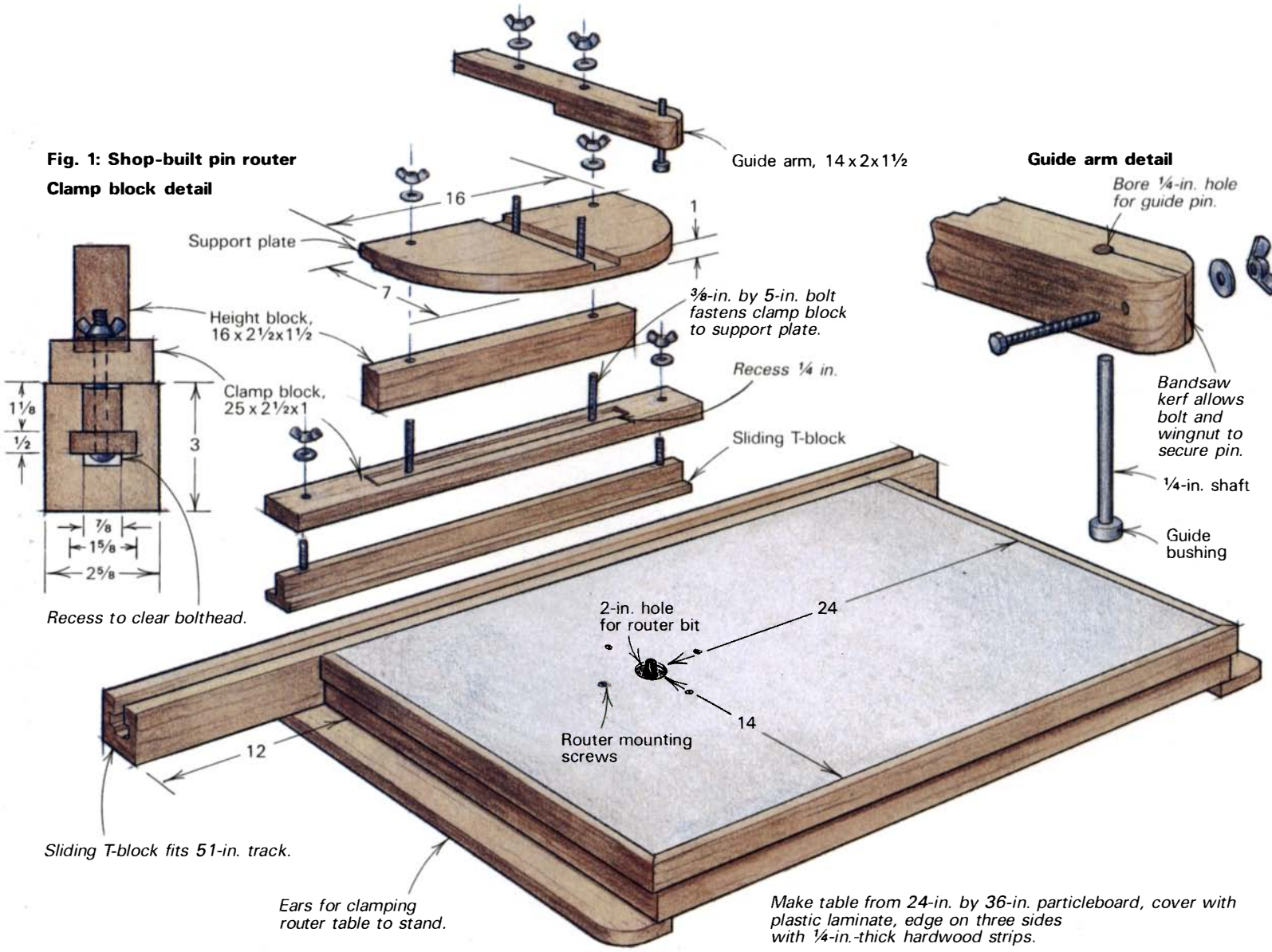


Fig. 1: Shop-built pin router
Clamp block detail
Guide arm detail

I have always enjoyed solving the problems that accompany each new woodworking project. The thrill is in figuring out how to build a piece, modifying tools and making jigs to produce the piece efficiently, then having everything come out right. Many of my projects involve carving, such as hollowing trays and cutting geometric patterns and decorative recesses on the lids of boxes and platters. Since hand carving is often too tedious and time-consuming, even for a hobbyist, I began looking for a better way. The pin routers I'd read about seemed ideal for my work, so I decided to build one onto my router table.

My router table was designed by Wally Kunkel (*FWW on Woodworking Machines*, Taunton Press). I built it because it has a large work surface, is more solidly built than many metal versions being sold and has a versatile fence that slides in a T-shaped track. This track is ideal for mounting a pin router arm. Since the router table worked so well and I didn't want to lose it completely, I designed the pin router so I wouldn't have to alter the basic table, and could quickly switch from pin router to router table. My router arm could also be modified to fit other router tables.

Before you build this pin router, you need to know how the machine operates. Commercial models are usually overarm routers (see photo, p. 78). A spindle chuck that can hold a bit up to ½ in. in diameter is mounted at the top of a C-shaped frame, which extends over a movable table. In the middle of the table, centered directly under the bit, is a guide pin, which gives the tool its name. The table can be raised or lowered with

a foot pedal, and has a stop to regulate the depth of cut.

An overarm router can do everything a shaper or router can. Used with templates, it can also do much of the contour and pierced cutting normally done with a bandsaw or jigsaw. The machine's versatility is due to a combination of factors—the pin itself that guides and steadies the work while it's being cut; the almost endless variety of available router bit sizes, shapes and styles, many of them with pilots that guide the work the way the pin does. In addition, you can clamp straight and shaped fences to the table to guide the work. Once you get used to the machine, you can also do quite a bit of work freehand.

Unlike a commercial machine with its cutter mounted over the table, my setup has the cutter underneath the work, just like a regular router table, and the guide pin is suspended over the work and cutter. This means that you can't see the bit when you're hollowing out a tray or cutting a rabbet, but this hasn't been a problem. In fact, I feel it's a safer way of working. Regardless of its diameter, the cutter is always centered directly beneath the pin, as shown in figure 1, so you always know where you're cutting. Because the cutter and pin are aligned in this way and the cutting edge is so narrow, the bit doesn't tend to grab the work.

You can build the pin router attachment shown in the drawing with any hardwood. Assembly is pretty straightforward, as long as you're careful to align all the bolt holes. I taped the clamp board to the T-shaped slide and with my drill press, bored the holes shown through all three pieces at once. Remember to recess the bottom of the T-slide for the bolt heads. After the bolts are inserted and the T-slide fitted into the router table track, the clamp block is added and the whole assembly tightened with wing nuts, thus locking the slide into place.

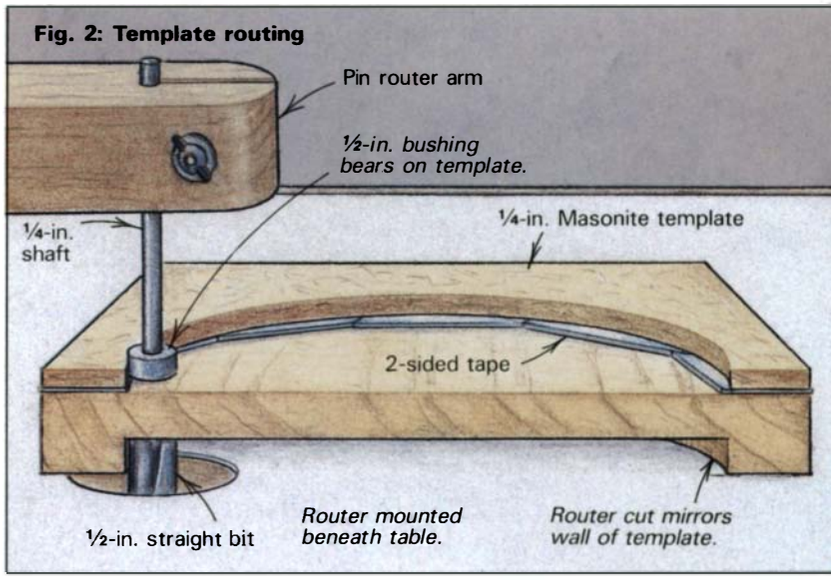
The clamp block also connects the pin guide assembly to the slide. I routed a ¼-in. recess in the clamp block, then squared the corners to fit the height block shown. This 1¼-in. block sets the pin at a good working height for my ¼-in.-shank bits, but you may need larger blocks if you have longer bits. Before shaping the support plate, I cut a 7-in. by 16-in. rectangle, then rabbeted one long edge, as shown, to fit the height block. I curved the front of the support plate mainly for looks—make it any shape that pleases you. To hold alignments for the bolt holes, again tape or clamp the three pieces together and drill the holes shown. At this time you could also drill the two holes needed for bolting the support plate and guide arm, and recess the bolt holes on the bottom of the support plate and clamp block.

After I assembled the unit, I visually lined it up over a ¼-in. straight bit chucked in the router. The straight bit is the same diameter as the shanks of the guide pins I use, so the alignment has to be accurate. Next, I raised the router to score the bottom of the straight arm, removed the arm and used my drill press to bore a ¼-in. hole through the score mark. At the same time, I bored a hole next to and perpendicular to the pin hole. After bandsawing from the front of the arm to the hole, as shown in the guide arm detail, and gently rounding the arm's front end, I added a bolt, washer and wingnut to secure the pin. The sawkerf gives the arm enough flexibility to make an efficient clamp. Whenever I want to realign the router and pin, I locate the arm so I can drop a ¼-in. rod through the guide pin hole and into the router's collet. Then I tighten the T-clamp to lock the arm in place.

My table is built from 2x4s, with the crosspieces fit into half-laps cut in the uprights. I just clamp the table to the base so I can disassemble the unit when it's not being used. The table height is a matter of personal preference—mine's about waist high, with the router table surface 36½ in. from the floor. I also wrapped the whole base in clear plastic, as shown in the photo above, to confine most of the chips and sawdust under the table, where they can easily be picked up with a shop vacuum.

Unlike commercial models, Sporbeck's shop-built pin router has an overarm guide pin and the cutter is mounted beneath the table. The plastic wrapped around the router base keeps chips and sawdust from flying all over the shop. To clean up, just open the sheet and vacuum away the waste.

Fig. 2: Template routing



Most of the time I make a ¼-in.-thick Masonite template for the design I want to cut (figure 2), then fasten the template to the stock with double-faced tape (Scotch 400 Crepe line Double Coated tape, #021200-07131, manufactured by Industrial Specialties Division of 3M, St. Paul, Minn. 55144). I cut out the templates on an old 20-in. Delta jigsaw. Rather than messing with threading the blade through holes bored into the inside pattern areas, I cut the templates with a fine-cut sabersaw blade mounted in the lower collet of the saw. The blade is stiff enough to make an accurate cut on the thin Masonite. Usually

Joinery with a pin router

by Kelly Mehler

The pin router is one of the most versatile tools in my shop—it can do many cutting and shaping jobs by itself, and it complements the tablesaw, drill press and other tools I use. The router is particularly handy for finishing parts rough cut on the bandsaw or tablesaw. Using quick-release clamps or tacks, I fasten the rough-cut piece to a shaped template. By running the template against the guide pin, as shown in the photo at right, the router bit will plane the rough edges smooth and cut the stock to the shape of the template. If you replace the straight bit with a cove or roundover bit, you can mold the edge of the piece without changing templates.

Some of the router jigs can be used on more than one machine, a big production aid. The jig shown in figure 3, for example, is used with both the pin router and the drill press to mortise and bore ladder-back chair posts. The top of the jig has a V-shaped trough to support the post, and the bottom is Masonite with routed areas for slot locations. I clamp the post in the jig, fit a 1/4-in. guide pin into the first slot and rout the rocker slot with a 1/2-in. spiral upcut bit. After taking the jig to the drill press, I bore the side rung holes, rotate the post 100° and bore the holes for the back rungs. Finally, I go back to the router and fit the 1/4-in. guide pin into the bottom slots and rout mortises for the chair slots with a 1/4-in. straight bit.

I use the router most often to cut mortises and tenons, a common joint on the custom furniture I build. Instead of the guide pin, I clamp the fence shown in the drawing to the table. After sizing the pieces, I cut the mortises freehand with a

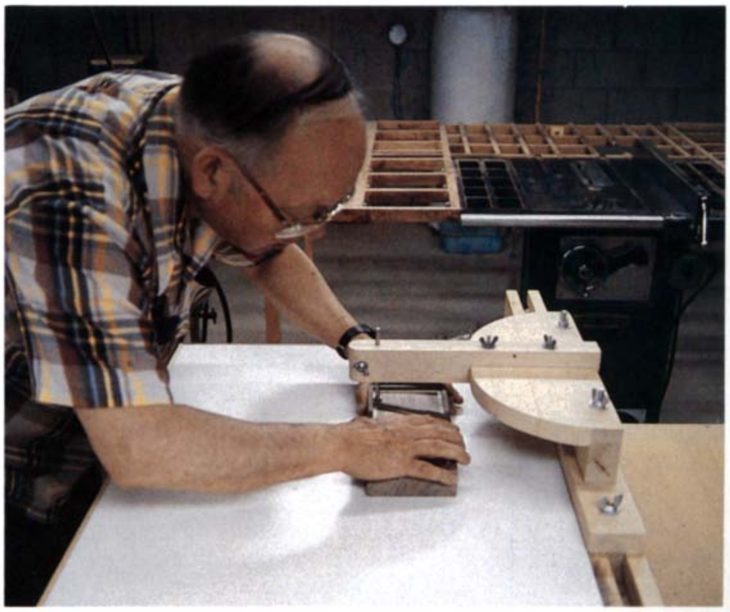
To shape a tray, Mehler tacks the piece to the template, then cuts the edges while running the template against the router's guide pin, left. To check if the bit is mortising the center of the stock, he holds the wood against the fence and scores it with the bit, above. After flipping the piece end-for-end, he scores another mark. The two marks should coincide.

3/8-in. straight bit. For mortises the same width as the cutter, I adjust the fence by eye so the bit will cut in the center of the workpiece. To check it, I score the wood slightly with the bit, then flip it end-for-end and score again with the other face against the fence. If everything lines up, the two circular score marks coincide as they do in the photo, above right.

To cut a mortise wider than the bit, I locate the fence to set the thickness of the mortise wall, then cut to depth on that side before flipping the piece and cutting to depth on the other side. Any waste in the middle can be removed freehand. The depth of cut is controlled by a stop on the table mechanism. Generally I set it so the depth will be 5/8 of the width of the piece being mortised. When cutting, I seldom take off more

the cut is smooth enough that I don't need to sand the cut edge. Because of the size of the router table and the length of the pin router arm, the templates can be fairly large. The arm gives you 10 in. of work space between the router collet and the fence, so you can rout pieces up to 20 in. in diameter.

The pin router attachment is easy to use. I center the template over the bit, then bring the pin down and start cutting. The 1/2-in.-thick guide bushing on the pin only has to bear on a narrow section on the template, but I adjust it to reach the full depth of the template. When the bit is set to take a light 1/8-in. to 3/16-in. cut, you can hold the workpiece on the pin without making contact with the cutter. I turn on the router, slide the workpiece until the guide pin bears against the template, and plunge the work down onto the spinning cutter. The bushing will be bearing on at least the top 1/16 in. to 1/8 in. of the template, which is more than enough for guiding the cut. I follow the outline of the template on the first pass, moving the piece so that it's always going into the rotation of the cutter. Once I've outlined the pattern, I move the entire assembly back-and-forth, working from left to right, until I've cleared the waste in the center. I tend to take fairly light cuts, especially in the final stages when I'm trying to get a very



When cutting a recess on a box lid, Sporbeck follows a Masonite template fastened to the workpiece with double-faced tape.

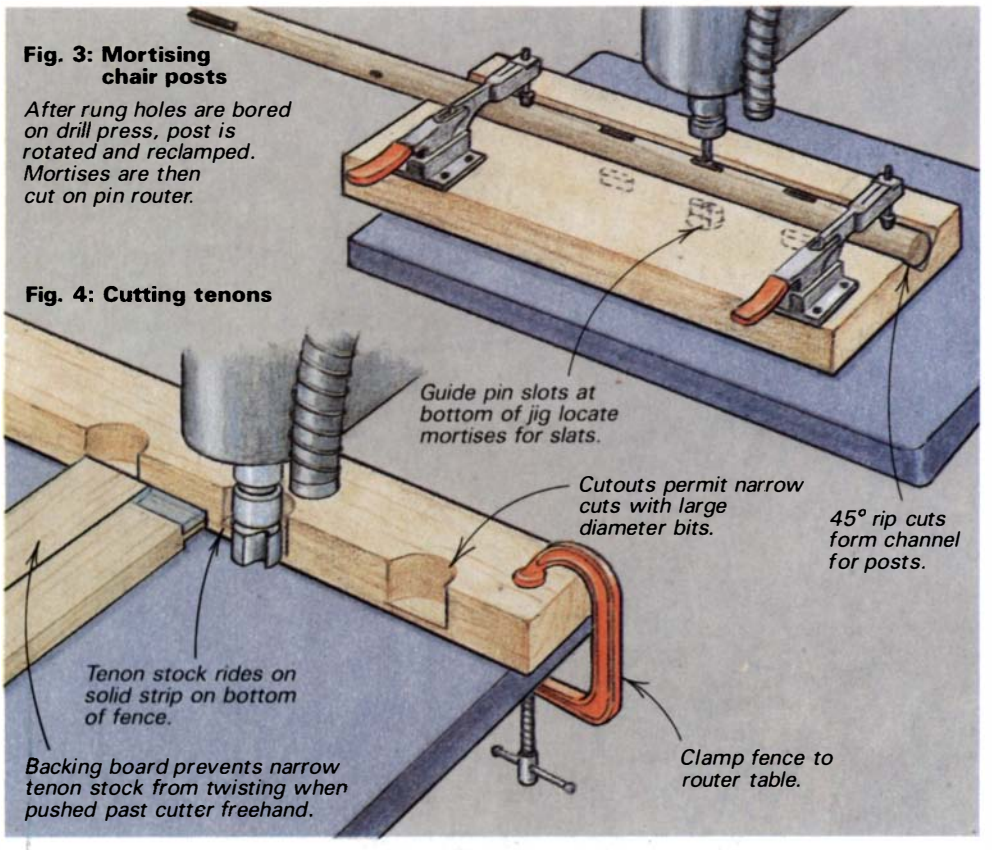


Fig. 3: Mortising chair posts

After rung holes are bored on drill press, post is rotated and reclamped. Mortises are then cut on pin router.

Fig. 4: Cutting tenons

than ⅛ in. to ¼ in. per pass, to avoid heating and dulling the bit.

I rout the tenons freehand after setting the fence and cutter depth by trial and error. The fence has a solid edge at the bottom, beneath the large openings that fit around the bit. By holding the end of the tenon stock against the solid section, as shown in the drawing, I can run the end past a 1½-in. straight bit. After making the first pass to cut the tenon shoulders, I hit the edges with a hand sanding block to remove any fuzz that might throw the cut off. The backing board behind the piece prevents tear out and stabilizes narrow pieces. I round the tenon edges with sandpaper until they fit the round ends of the mortises.

The pin router can follow both simple and intricate patterns. To shape a pull on a drawer front, I use a template with the shape of the pull cut into its base. When this shape bears against the pin, the cutter will form an exact duplicate shape in the work clamped on top of the jig. I often use a dovetail bit when shaping the handpull of a drawer front to create a pleasant undercut groove. If the router's normal guide pins are too large to fit into an intricate pattern, I substitute a tiny wooden plug that can follow delicate curves. Tiny router bits (Manhattan Supply Corp., 151 Sunnyside Blvd., Plainview, N.Y. 11803 has 1/16-in. end-mill router bits with ⅛-in. shafts) are especially useful for restoration work. To repair damaged fretwork, for example, I'll glue the old piece together and tack it to a piece of stock. By running the guide pin in the original fretwork, I can cut an exact duplicate without making a new pattern and sawing out the fretwork.

The pin router can do anything a router can do. It's great for breaking or rounding over edges, making molding, chamfering, and cutting any type of rabbet. With a straight bit, you can use it to mortise hinges into cabinet stiles. I even use it to round over spindle stock before turning. It's faster than sawing off the waste or turning from the square. Used freehand, it can cut letters. I use it to cut steps in chair blanks, removing most of the waste before I begin carving. The pin router is good for almost any type of joint. About the only joints I regularly cut by hand are dovetails. The machine will cut them, but I prefer the hand-cut look, and besides, I find cutting dovetails to be pretty relaxing. □

Kelly Mehler operates the Treefinery Woodshop and Gallery in Berea, Ky.

fine surface that won't require much sanding. My Craftsman 1½-HP router has a rack-and-pinion adjustment, making it fairly easy to raise the cutter with just a turn of the height-adjustment knob. As for any type of routing, sharp bits are important. Carbide bits hold up best. A more powerful ½-in.-shank router might work even better, and minimize the chance of bits being broken when cutting tough hardwoods.

My guide pins have ¼-in. shafts, the same diameter as the router bit shafts, but the actual bushing surfaces range in diameter from ⅛ in. to 1 in. I made the ⅛-in. pin by turning down one end of a ¼-in. drill rod. For the other guide pin I purchased drill rods in diameters from 5/16 in. to 1 in., in 1/16-in. increments. I mounted each rod in a 3-jaw chuck on my lathe and bored a ¼-in. hole through the center. Next I bandsawed each rod into ½-in.-thick discs. I then slide whatever bushing I want onto the ¼-in. guide pin.

The size of the bushing is important. Most of the time I use one that's the same diameter as the router bit. To cut straight-walled partitions, I use a ¼-in. bit and ¼-in. pin. Since the guide and the cutter are the same size, the router will cut an opening that is an exact mirror image of the template. This saves me the trouble of figuring out how much undersize I have to make the templates, as you often have to do when using various diameter pilots and bushings with a router, or making different templates to accommodate different size bits.

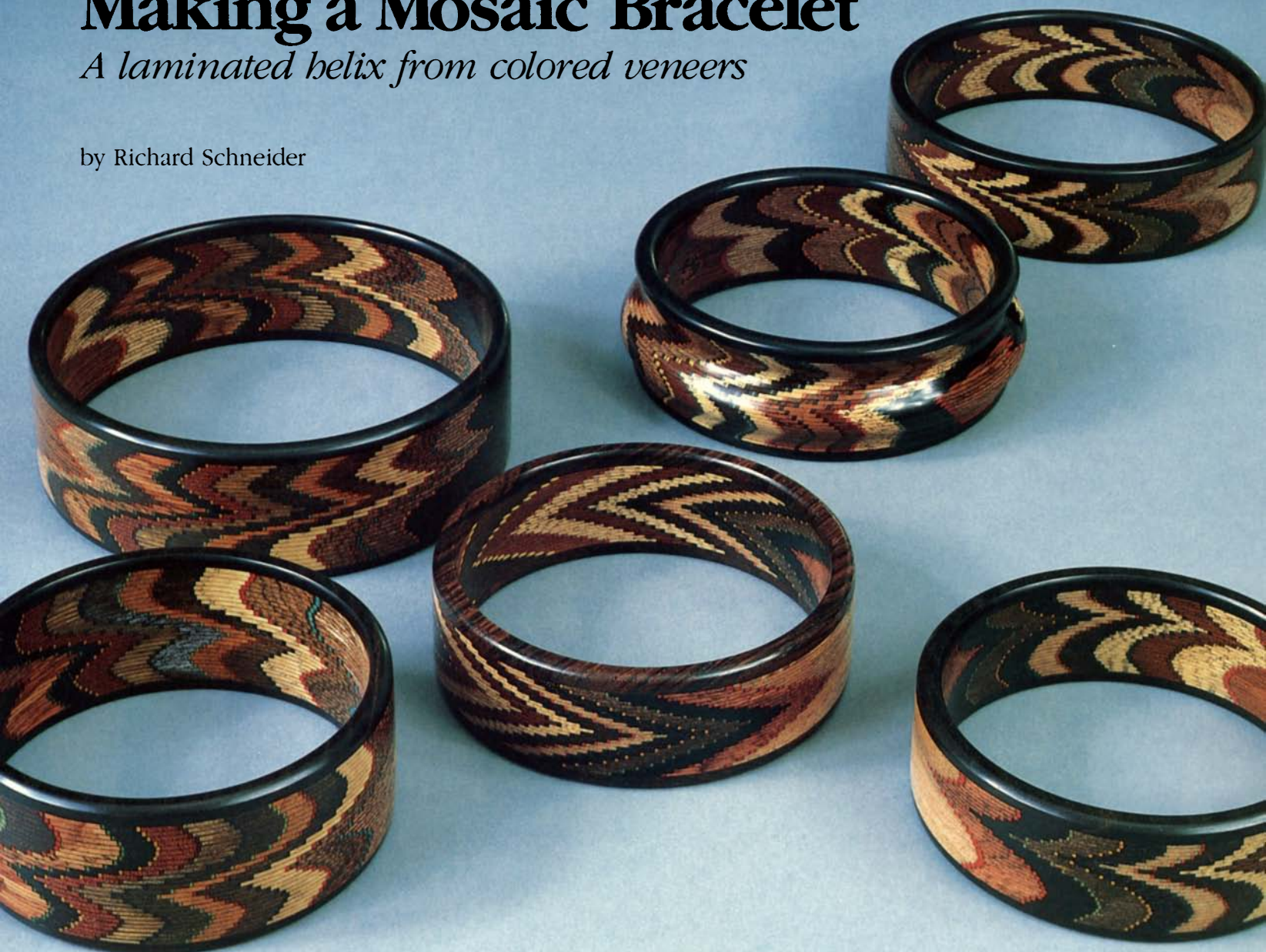
You can achieve some nice effects by varying the size of the bit and bushing. For example, I often cut patterns using a ⅜-in. bit with a ½-in. guide pin, which makes the routed opening ⅛ in. smaller than the template. Next, I use a ½-in. cove bit with the ½-in. pin. This cut removes the final ⅛ in. of material, making the opening the same size as the template, and pleasantly curves the walls of the recess. You could also use the same template to cut a rabbet along the edge of the recess, for a lid, for example, by using a bit wider than the pin. If you cut the recess with a ¼-in. bit, for example, you might make a shallow cut around the edge with a ⅜-in. bit to cut a 1/16-in. rabbet. The effects you can create by varying the size of the guide pin and the size and style of bit are almost endless. This is one of the nice things about pin routing. You get speed and precision, and still have lots of freedom to work in those custom touches that set off any project. □

Hans Sporbeck lives in Pewaukee, Wisc., and is a maintenance supervisor for an aerospace firm in Milwaukee.

Making a Mosaic Bracelet

A laminated helix from colored veneers

by Richard Schneider



The helical structure of the DNA molecule gave me an idea for a bracelet. From a flitch of rosewood veneer, I cut sixteen matched pieces, 3 in. square. I drilled a hole in the middle of each, stacked them on a pin and rotated each square slightly as I glued them together. The bracelet I turned from the helical stack had a spiral grain pattern, but it wasn't very striking. Later, Terry Ryan, one of my apprentices, suggested making the squares from some multicolored veneer laminates I was using in my work. The problems of getting from the idea to the finished product were not all that easy to conquer, but the resulting bracelet was one of the most startling pieces of laminated woodworking we had ever seen.

In this article, I will describe how I make a helical-mosaic bracelet. Once you understand the helical-mosaic concept, the possibilities for variation are endless. The concept can be applied to turnings in any number of ways.

Most women can wear a bracelet with an inside diameter between 2¼ in. and 2⅝ in., with 2⅜ in. about average. The outside diameter should be ⅝ in. larger, which will leave a wall thickness of 3/16 in. For a more delicate bracelet, reduce the wall thickness to 5/32 in. I don't recommend making them thinner than that.

Making the bracelet blank—The striped squares that are stacked up to form the helix are resawn from a glued-up block of hardwood laminates and dyed veneers, as shown in the drawing on the facing page. One-quarter-in.-thick hardwood laminates make an attractive pattern, but any thickness from 1/16 in. to ½ in. will work, and each will produce different effects. Even thickness is important—if the laminates taper, you will have problems. I resaw the laminates slightly thicker than I want,

then sand them to thickness on an abrasive surfacer.

To build the block, I stack up several varieties of hardwood laminates, generally alternating between light- and dark-colored woods. Then I slip colored veneers in between the laminates. The number of laminates isn't important, but the height of the stack must be greater than the outside diameter of the bracelet you want to make. An average-size bracelet needs a 3¼-in. to 3⅜-in. stack.

Any thin epoxy can be used to glue up the block. I use Resin #1000 and Hardener A-95 (or AB-91 for longer pot life) made by R.B.C. Industries, 25 Holden St., Providence, R.I. 02908. I wipe oily hardwoods with rubber-cement solvent or acetone. After the solvent dries, I wipe epoxy on each piece with a bondo scraper or a discarded credit card. I've found that epoxy sets up more quickly if left in a container so, to extend the pot life, I flow the mixed epoxy out onto a piece of coated paper (freezer paper would work) and scrape it up with my applicator.

After completely surrounding the laminate stack with wax paper, I clamp the stack with C-clamps. If the pieces slide too much, I use clamps across the edges to keep the block square.

After jointing the block square and trimming the ends, I mark off and drill the ½-in.-dia. holes needed for the dowel pin in the bracelet-gluing operation, as shown in the drawing. The laminated block is now ready for resawing.

Resawing—Because the slices need to be so thin, the resawing process is one of the most difficult tasks in making the bracelet. You will not get satisfactory results unless the table is square to the blade and the blade is tracking properly. I use a ¼-in. 14-tooth raker blade, .025 in. thick (manufactured by L.S. Starrett Co., Athol, Mass. 01331), and the fence setup shown in the drawing at right.

To set up, I place the wooden fence against my saw's adjustable metal rip fence and adjust both fences for a test cut slightly thicker than .032 in. Then I lock down the adjustable fence.

To minimize tearout at the bottom edge of the cut, I cover the bandsaw table with Masonite. Once I've locked the adjustable fence, I remove the wooden fence and saw part way through the Masonite, guiding it against the metal fence and stopping when the sheet covers the table. I then replace the wooden fence.

With a large piece of walnut or oak, I run a series of test cuts to check the setup for thickness and parallel. Using business cards as shims between the fences, I can move the wooden fence until I get a cut of .032 in., plus or minus .005 in., for the full length of the cut, at which point I clamp the wooden fence securely to the table. This process will take forever and at some point you will just settle for the best you can do. Once set, resaw the entire block without changing the setup or making adjustments.

As I make the first pass through the saw, I note which side of the block is up. I'll call this up side "odd" and the bottom side "even." After the first cut, I put the odd side of the block against the jointer fence and joint the face I've just cut. I make the second cut with the even side up. Then, the even side goes against the jointer fence and my third cut will again have the odd side up. Flipping the block like this cancels out any minute errors in the bandsaw or jointer being out of square.

Proceed to cut the block into slices, moving the block slowly and evenly, never stopping in the middle of a cut, and always applying a constant pressure against the fence. As the slices come off the saw, it's very important to lay them on top of each other and keep them in the order they came off the block. Continue sawing until you have cut at least 25 slices.

Cut the stack of slices into four decks, as shown in the drawing below. Each deck of tiles will make one bracelet. It is very important to keep the tiles in order, so I place a rubber band around each deck until it is time to glue up the bracelets.

Gluing up the blank—I've found that the bracelets are much more elegant if a solid piece of hardwood—ebony, rosewood or cocobolo—is glued to both sides of the deck to form the edges of the bracelet. The edge pieces should be ⅛ in. to 5/16 in. thick and surface sanded on both sides. If the deck is glued up without these pieces, the edges of the bracelet will be the striped laminate itself.

Make a glue-up board, as shown in the drawing on p. 82, long enough that one end can be clamped to your bench. Drill a ½-in. hole three-fourths of the way through the board 2½ in. from one

Fig 1: Laminating the block

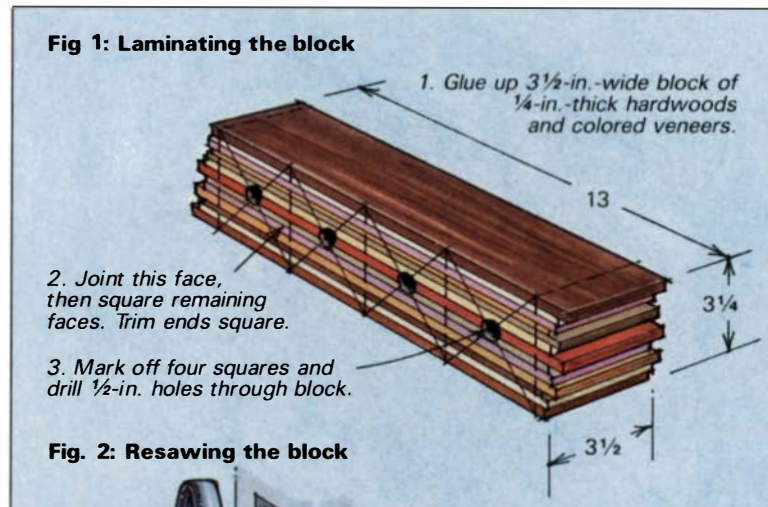


Fig. 2: Resawing the block

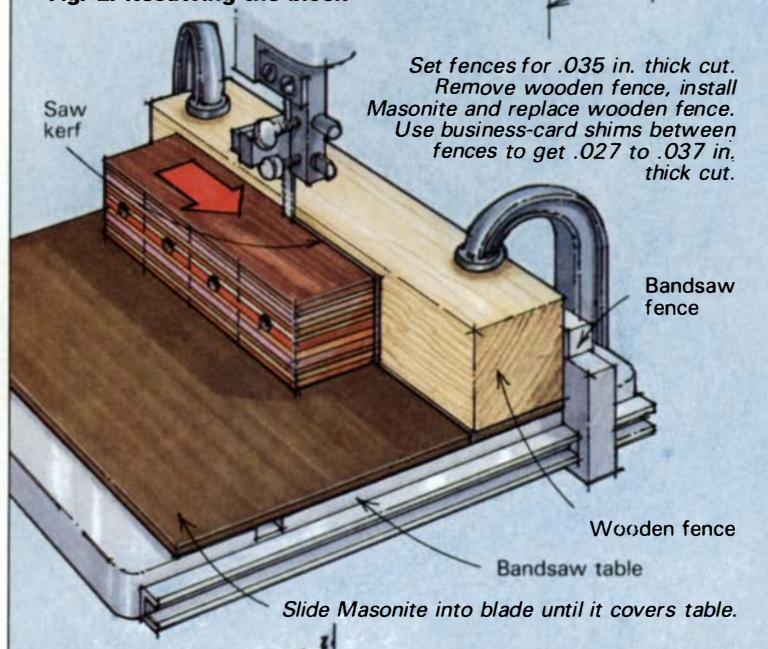
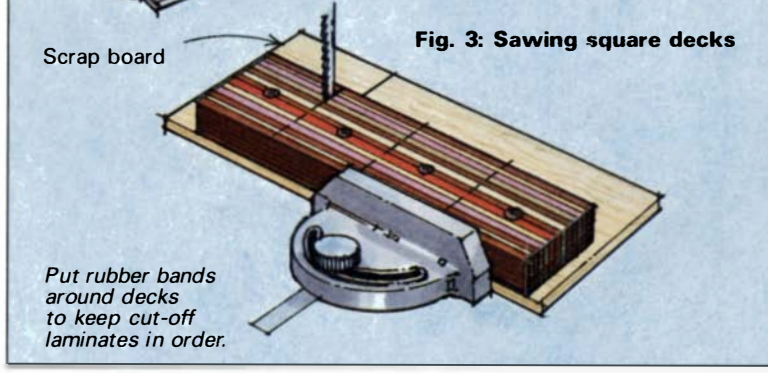


Fig. 3: Sawing square decks



Drawings: Joel Katzowitz

Fig. 4: Gluing up the blank

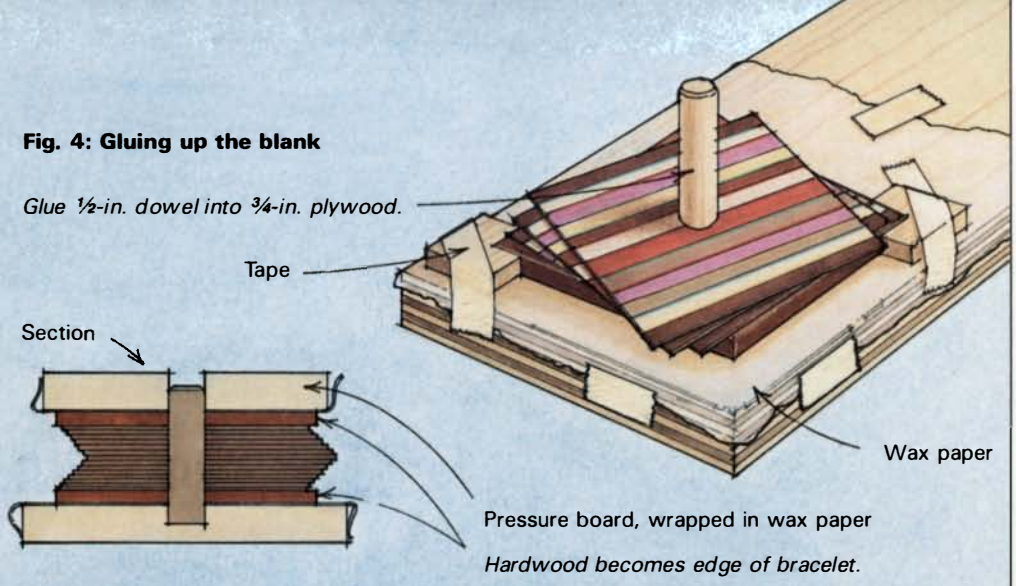


Fig. 5: Freeing the blank

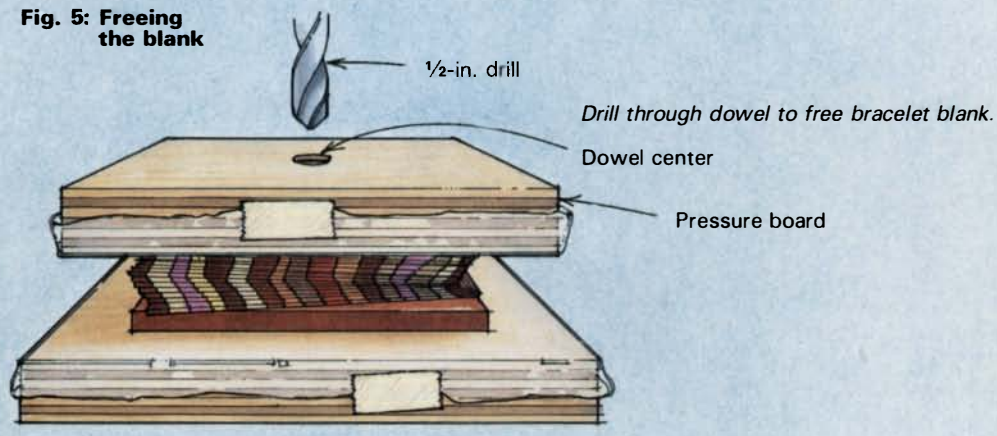
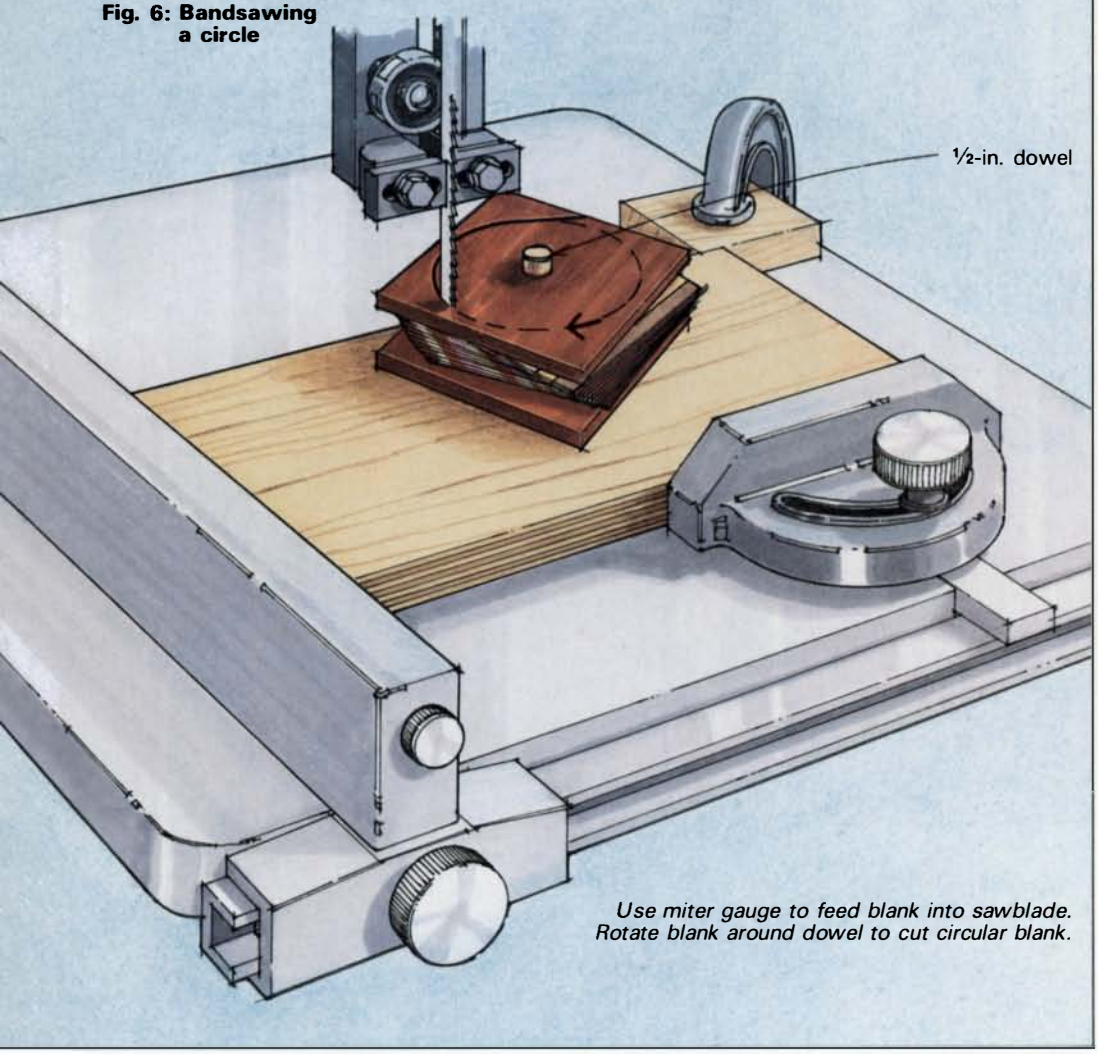


Fig. 6: Bandsawing a circle



Schneider forms a chevron pattern by rotating the colored tiles on a ½-in. dowel (top). When the design is right, he caps the deck with a hardwood edge piece and a pressure board before applying clamps (center). For turning, the bracelet is mounted on a mandrel in a 3-jaw chuck. To cut the inside, the parting tool (drawing, facing page) is plunged straight into the face of the bracelet (bottom).

end on centerline. Glue in a ½-in. wooden dowel long enough to pass through the bracelet deck and edge pieces and protrude about ⅜ in. into a pressure board, as shown. The pressure board is just a piece of plywood about the size of the bracelet deck—a little larger won't hurt—with a ½-in. hole all the way through the center. I bevel the top of the dowel pin to facilitate sliding the tiles on. Before gluing, I cover the glue board and the pressure board with wax paper.

Now you're ready to design and glue the bracelet all at once. I recommend that you wear rubber gloves and that you have good ventilation. First, spread a thin coat of runny epoxy on the inside surface of one of the edge pieces, and slide it down over the pin. Next, take the first laminate tile from the deck, wipe epoxy on both surfaces, and slide it down on the pin and set it on the edge piece so that the laminate lines fall in the direction of the grain of the edge piece. Repeat this process with each tile until the entire deck has been glued and placed on the pin.

Rotating the pieces determines the design. How you do this is completely up to you, but I recommend that you make the simple chevron design the first few times.

To make the chevron, rotate each piece by the same amount until you have reached halfway plus one (assuming you are starting with an odd number of tiles in the deck), then reverse the rotation and return to the starting point. Each piece may be rotated 1/16 in. or 3/16 in., or you can even vary the amount, gradually increasing the rotation with each piece. A good way to get the feel is to do a number of dry runs trying different rotations.

When you are satisfied with the design, cap it with the other edge piece and the pressure board. I like to align the top and bottom edge pieces so the grain runs in the same direction. Install a very large C-clamp directly over the dowel hole with the screw beneath the board to combat the torque problem. Apply pressure very slowly—the whole business wants to spin on the pin and destroy your design. If the epoxy is too thick it will be impossible to clamp the bracelet without ruining the pattern.

Once the large clamp is tightened successfully, place four smaller C-clamps on the four corners of the pressure block as close to the middle clamp as possible, tightening them little by little as you would tighten the lug nuts on a car wheel.

The next day, remove the clamps and clamp the glue board to the drill-press table. Drill a ½-in. hole right through the dowel and into the glue board, allowing the blank to come free. Next, bandsaw the blank round, as shown in the drawing at left, leaving as much material as possible. The bracelet is now ready for turning.

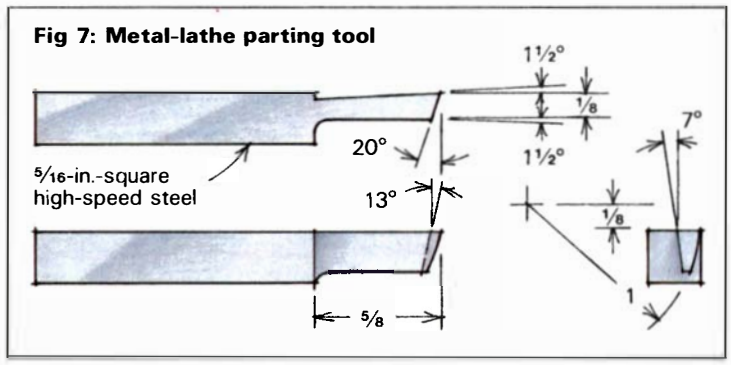
Turning the bracelet—I turn bracelets on an old 6-in. Craftsman metal lathe which I run at 836 RPM—dropping to 532 RPM for final sanding. Although I've never tried it, I can't see why you shouldn't be able to turn these bracelets on a wood lathe.

Before you can turn the bracelet you have to get hold of it somehow. I do that by mounting it on a mandrel made of ½-in. stainless steel threaded rod 4 in. to 5 in. long, with a washer and nut on each side, as shown in the photo at left, which I grip in a 3-jaw chuck. If the bracelet doesn't fit tightly on the mandrel, I wrap a piece of paper or masking tape on the threaded area of the rod.

First, I turn the outside diameter of the bracelet. Then, I face off the edge piece until it is the thickness I want. I then chuck up the other end of the mandrel and face off the other edge piece to the same thickness.

At this point, I cut a 45° bevel on the edges, then sand the bracelet right to finish while it is still solid. Reversing the rotation, I usually sand from 120 grit through 400 grit. I finish sand

Fig 7: Metal-lathe parting tool



with a 3M product called Wetordry Tri-M-ite 15-micron polishing paper (available from The Luthier's Mercantile, P.O. Box 774, 412 Moore Ave., Healdsburg, Calif. 95448). This polishing paper seems to burnish the surface, causing it to glisten.

Once the bracelet has been sanded, it can be parted off. I made the parting tool, shown in the drawing above, from a 5/16-in.-square high-speed steel tool bit blank (available from Campbell Tools Co., 2100 Selma Road, Springfield, Ohio 45505). It is a fragile bit and must be kept sharp and installed in the tool holder properly or it will break off, usually ruining the bracelet in the process.

Install the parting tool in the tool holder so that the length of the tool is parallel to the mandrel and the tool point is at the height of the mandrel's center. Move the cross slide away from center until the tool is aimed to cut the inside diameter. Wind the longitudinal slide to plunge the tool straight into the face of the bracelet, stopping when you've cut halfway through the bracelet. Then back out and without changing the setting of the cross slide, chuck up the other end of the mandrel and repeat the process from the other side. When the cuts meet, the bracelet will fall free. Stop the lathe immediately to avoid damage from the chuck jaws.

If the mandrel is the slightest bit crooked, the two cuts will not meet perfectly and there will be a ridge on the inside of the bracelet. This ridge can be sanded off using a sanding spindle on the drill press.

When the inside is smooth, I chuck it up again with just the tips of the 3-jaw chuck's jaws applying pressure outward from the inside of the bracelet. Tape on the jaws protects the bracelet. I sand the inside that projects beyond the jaws with sandpaper wrapped around a dowel. Then I turn the bracelet around, and sand from the other side.

Before finishing, I flatten the edges of the bracelet on a piece of 400-grit paper taped to a smooth surface and then repeat with the Tri-M-ite polishing paper.

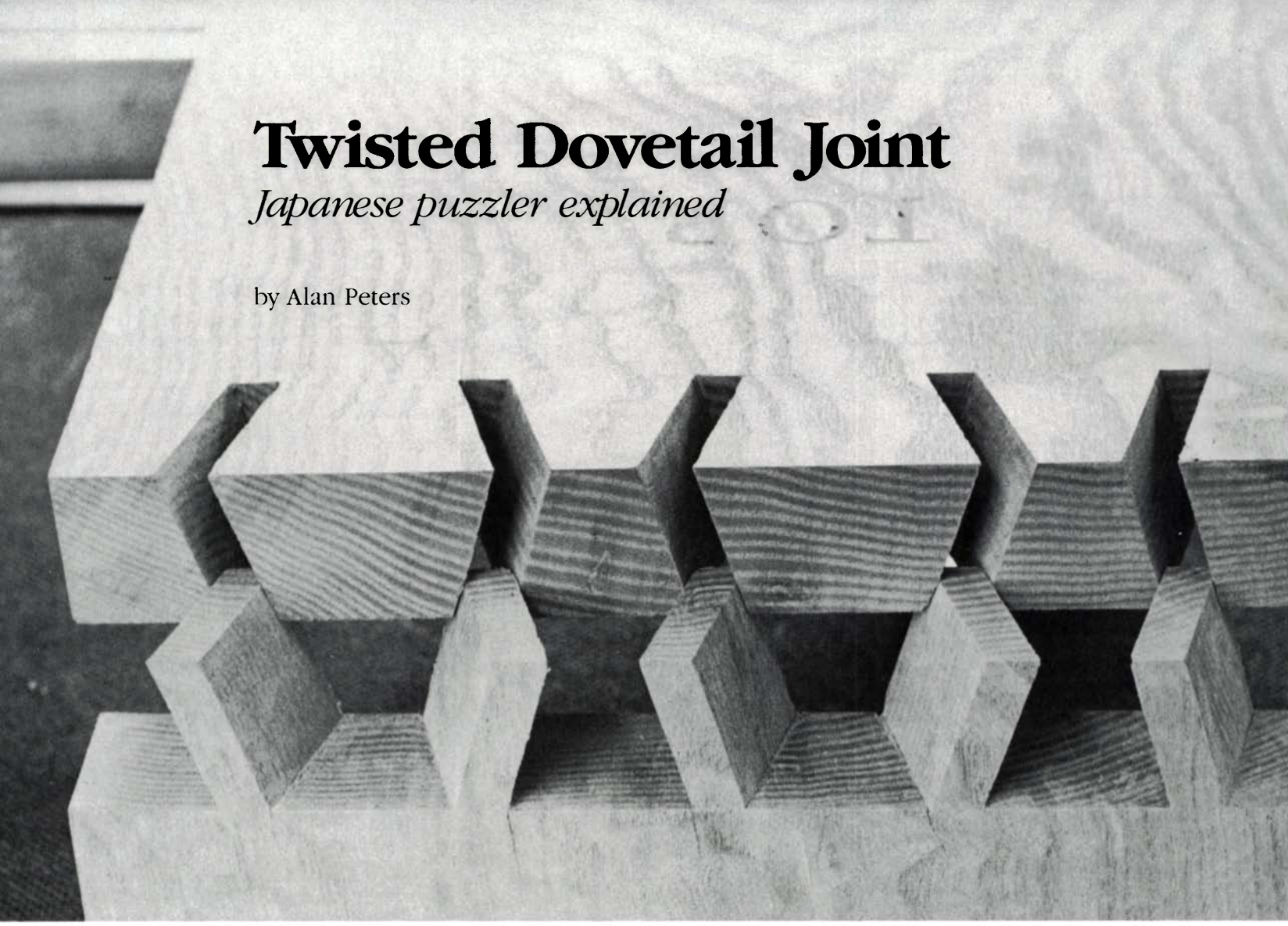
I finish my bracelets by wiping on a coat of ZAR Satin Wipe-On Tung Oil Finish (manufactured by United Gilsonite Laboratories, Scranton, Pa. 18501). I allow it to stand a few minutes, then wipe it off with a lintless cloth. I then hang the bracelet on a dowel to dry for 24 hours. When dry, I wipe it down with a paper towel or cloth and return it to the lathe, spin on a second coat, and wipe it off immediately. I turn it around, coat the other side and return it to the dowel to dry. A final sanding with Tri-M-ite and a coat of Johnson's Paste Wax applied on the lathe, finishes the job. □

Richard Schneider, of Sequim, Wash., has been building classical guitars professionally for 23 years. He began making wood jewelry in 1973.

Twisted Dovetail Joint

Japanese puzzler explained

by Alan Peters



The Japanese twisted dovetail joint, *nejiri arigata*, was taught to me by a young Japanese furnituremaker, Kintaro Yazawa, who spent a week with me at my home in Devon, England, while on a pilgrimage to study the work of the British Arts and Crafts Movement. Structurally, the twisted dovetail joint is tremendously strong and it appears that it cannot be driven apart. However, in many ways it's not a difficult joint to cut. A glance at the photos will reveal most of the mysteries.

One difficulty I encountered was in assembling and gluing the 20-in.-wide table shown above—I would strongly recommend a shorter trial joint rather than what I arrogantly attempted in my first effort. Also, yew, which I selected for its decorative qualities, proved an unwise choice due to the wildness of the grain. Instead, I'd recommend you use a clear, mild-grained hardwood that saws and chisels cleanly. The timber should be machined or hand-finished to an accurate width and thickness, then accurately crosscut into three pieces, for the top and two ends.

The chief problem in making the joint is one of layout. The joints can't be scribed from one piece to the other as with normal dovetails and pins, so each piece has to be accurately marked out and cuts made directly to the line. All the endgrain shoulders are at a normal 90°, and whatever angle is chosen for the slope of the dovetails is constant both on the long grain and on the endgrain. This angle is best marked using a bevel gauge. Once the gauge is set, you simply flop it over to mark the reverse angle. I sloped the dovetails about 15°, but this angle isn't critical, as smaller or larger angles would also work.

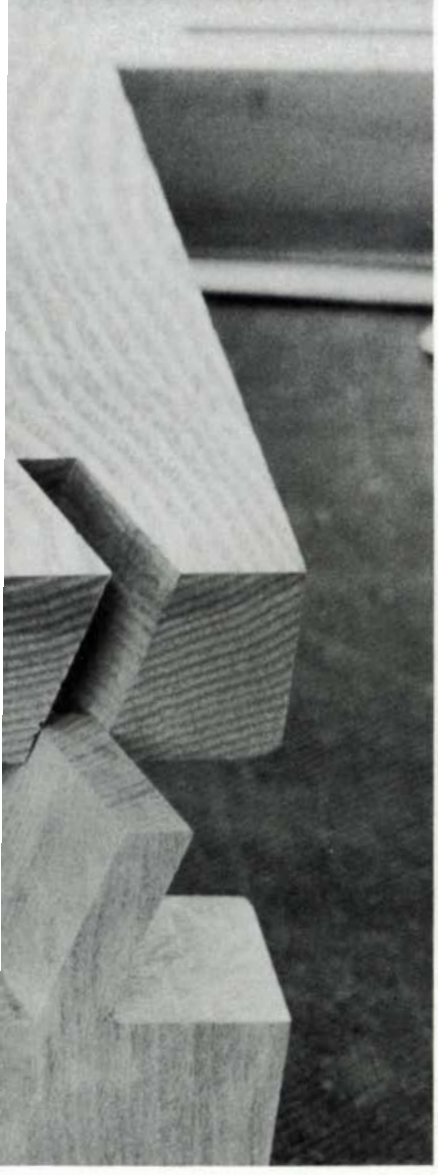
In laying out the joints, I didn't allow for any joint projections to be flushed off afterward, but gauged my shoulder lines exactly to the thickness of the material, which was 1¼ in. The gauge lines were heavily incised on the inside surfaces, but lightly cut on the outside, so they could be planed off after assembly.

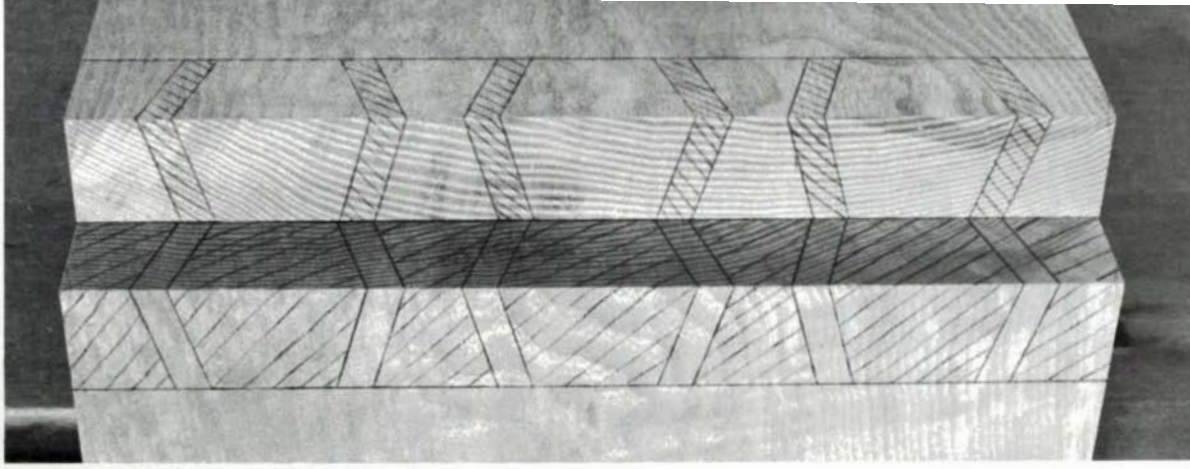
It takes trial and error with dividers, plus some judgment, to arrive at well-proportioned, aesthetically pleasing dovetail spacing. Once that's decided, mark out each joint as shown on the facing page, top right, with identical measurements on both pieces. I used dividers to space the lines, then marked all the waste areas.

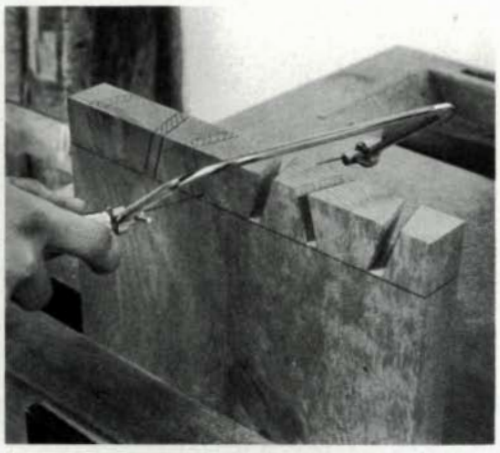
When cutting the top, aim for a series of identical parallel slots. I see no reason why, with a little ingenuity, this part could not be cut on a machine. I decided not to risk it on that lovely expanse of yew, and cut them by hand. I feel that the best joint comes when cut direct from the saw with no paring. I also consider it bad practice to adjust the workpiece in the vise so you're always sawing at 90° to the bench. It is far better to perfect the technique of sawing at any angle required.

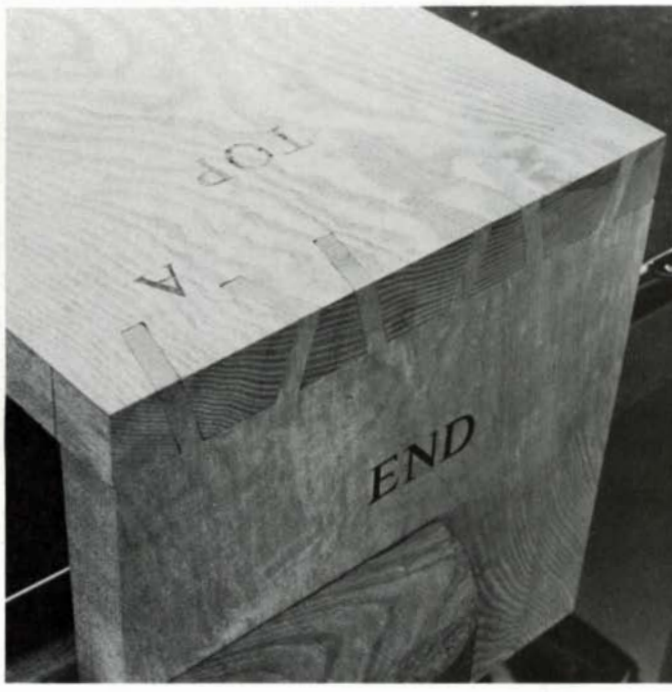
To remove the waste, I used a coping saw, as shown on the facing page, then pared back to the shoulder lines with a chisel, the normal process with endgrain. Check the rows of slots carefully—if the sawcuts wandered, as sometimes happens, you will have to pare back to your pencil lines. Do this and any other tidying up ***before*** attempting to cut the two end pieces: It is possible that you may have to increase the width of one or another slot. If so, be sure that you alter the corresponding tenon on the matching end piece.

When cutting the ends, your aim is a series of parallel tenons all identical in angle (and also in thickness, unless they have









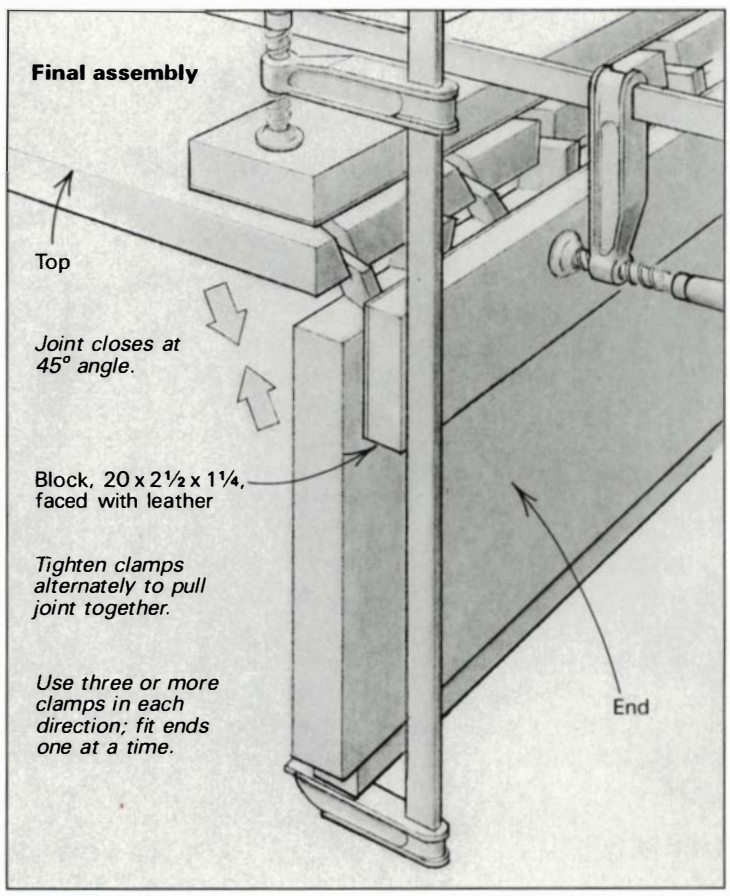
Top photo shows joint layout with top and end oriented as they will be in the finished table. Cut down the line with a backsaw and remove the waste with a coping saw. Next step is to chisel the shoulders square. Assembly (facing page) starts at the corners, then the joint closes at a 45° angle. The finished joint (assembled dry here) looks impossible, unless you know the secret.

been modified for previous errors). The problem is that they are all at a compound angle and, therefore, require extra care in sawing to the line. The waste is once again removed with a coping saw and pared back to the shoulder lines.

Dry-fitting the joint is tricky. The point of entry is right at the corners, and the joint then comes together at a 45° angle. I found it best to clamp the top down on the bench so that I could drive the ends on using a heavy hammer and large hardwood block. As this was only a dry run, I didn't seat the joint completely home, but drove it off again, eased the odd spot that was obviously too tight, then sanded the interior surfaces.

For final assembly I prepared leather-covered, stout hardwood blocks that would allow me to exert clamping pressure as shown in the drawing at right. By tightening top and side clamps alternately, the joint is brought together at a 45° angle. The leather on the blocks is obviously to avoid damage to the workpiece, but it also absorbs any discrepancy on the exposed surfaces of the joints, enabling pressure to be exerted on each individual portion of the joint.

I applied PVA adhesive sparingly on the side grain but not at all on the endgrain except on the four outside shoulders. In theory, clamps should not be necessary to draw up a well-fitted dovetail, whether standard or twisted. In fact, the first joint went together perfectly with mallet and block, but I did need the clamps on the second one. Once the shoulders were tight, the clamps were removed and the glue joint left to cure. □



Alan Peters is a furniture maker in Cullompton, Devon, England.

Hammer veneering is a technique for laying veneer without clamps or a press. Hot hide glue is applied to both sides of the veneer and a veneer hammer (shown above) is used to force the excess glue out from underneath. The veneer sticks as the glue cools.

Hammer Veneering

Laying the leaves without a press

by Christopher Faulkner

There are several ways to attach veneer, but the method I use in my own work is called hammer veneering. The technique is simple to describe: Hot animal glue is applied to the plywood ground and both sides of the veneer. The veneer is then laid on top of the plywood and most of the glue is forced out from underneath by bearing down with your weight on the head of a veneer hammer and moving the hammer over the glue-covered veneer. The glue is forced out at the edges and ends. As the hammer continues to move, the thin film of glue that remains underneath cools, fixing the veneer in place.

Hammer veneering has several advantages over other techniques: it doesn't require a press or clamps; it's relatively fast and, because there are no clamps or cauls in the way, you can see what you're doing as the veneer goes on. Hammer veneering is best suited for smaller veneering jobs or larger surfaces where many small pieces are laid one-at-a-time to make up a pattern. It's possible to hammer veneer large single sheets of veneer but the glue cools faster than you can hammer and you'll need to re-melt it with a household electric iron.

To illustrate the technique, I'll explain how to lay a four-leaf match on a small tabletop. This project involves joining endgrain to endgrain and long grain to long grain. To make things more interesting, we'll add an inlaid line and crossbanding around the edge. To be honest, there's nothing basic about laying a four-way match, let alone adding inlaid lines and crossbanding. Before you try, I suggest that you read through this article, then take some hot glue, a veneer hammer, an old piece of plywood, an iron, ten 6-in. by 12-in. sheets of straight-grained veneer and practice. Lay a sheet then re-heat it with the iron, rip it off the plywood and lay another. When you've done all ten, read the article again. You will now have the basics.

If you've laid veneer with a press, you have probably trimmed the edges and ends of the veneer square, taped the joints together and pressed on the entire sheet at once. Hammer veneering

Fig 1: Four-leaf match tabletop

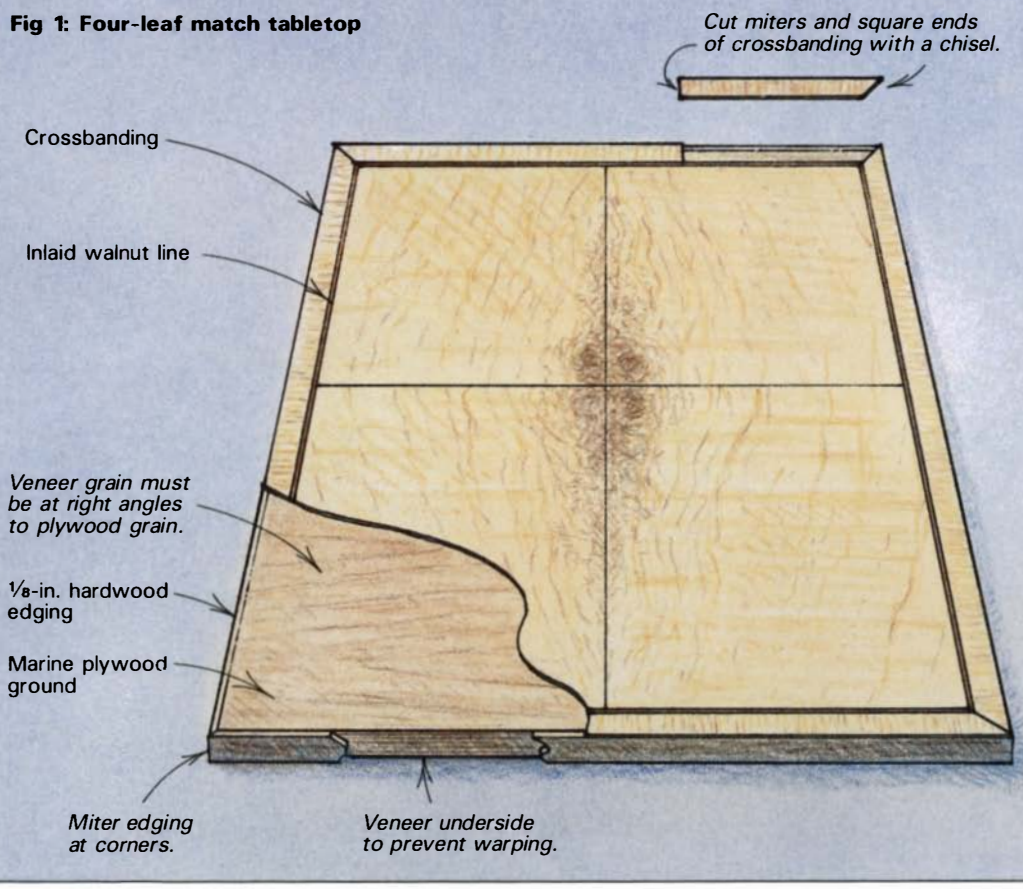
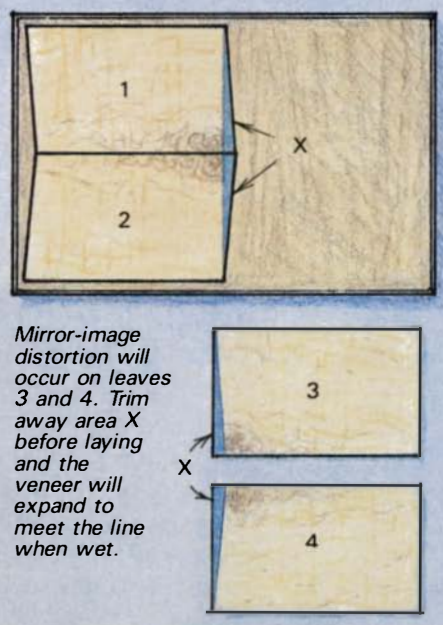


Fig. 2: Expansion problems

The veneer may distort when it soaks up glue and expands. The overlay method shown in Fig. 5 requires no correction but if you're butting ends squared with a shooting board and plane, you'll need to trim off area X with a knife before laying leaves 3 and 4.



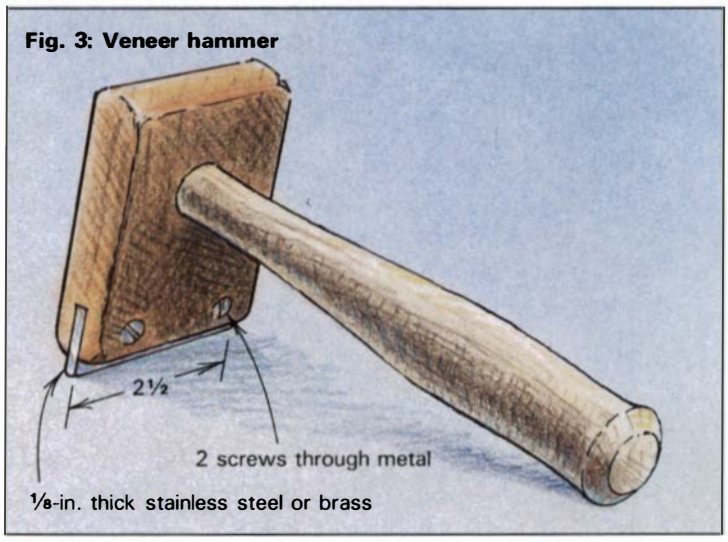
Mirror-image distortion will occur on leaves 3 and 4. Trim away area X before laying and the veneer will expand to meet the line when wet.

takes a different approach. Each leaf is applied separately. The joining and matching is done right on the groundwork as the leaves are fixed in place by gluing down the second leaf so its edge overlaps that of the first leaf, then knifing through both leaves at once. This is called the overlay method, and is the technique I'll use here to lay the four-way match. This method produces a very good joint. The disadvantage is that although the grain pattern created by the joined leaves will be an accurate match (since you're trimming the same amount from each sheet), you can't see the *exact* pattern until after you've made the cut. All this sounds complicated, but lay one leaf next to another with the edges overlapping and it will all make sense.

An alternative method is to joint the matching edges, before laying, with a shooting board and plane, as shown at right. With the edges squared in advance, you simply butt the edge of one leaf against the other as you lay them. If you shoot the edges, however, you may run into the expansion problems shown in figure 2, which must be corrected by trimming with a knife. Shooting is best suited for long lengths of reasonably straight-grained veneer, because the plane iron tends to tear out highly figured veneer. Sometimes, on 4-way matches, I'll shoot the cross-grain ends prior to laying, and overlay and knife through the long-grain edges.

A shooting board is one way to produce an accurate straight edge on relatively straight-grained veneer. Highly figured veneer is best cut with a straightedge and knife.

Fig. 3: Veneer hammer



My veneer hammer has a 2½-in.-wide iroko head with a ⅛-in.-thick strip of stainless steel (brass will do, but regular steel will stain the veneer) fitted into a groove and screwed from behind. The metal edge is rounded over with a file, then burnished with fine sandpaper. The edge should be flat or very slightly convex along its length. Some veneer hammers are 3½ in. wide, but I prefer the smaller size.

Hide glue is readily available in dried form, and must be soaked in water before heating (see *FWW* #57). You can spend a lot of money for a thermostatically-controlled glue pot, but any

Hinged mirrors enable you to preview the pattern of a 4, 8 or 16-way match before you cut the veneer.

The first hammer stroke pushes from right to left, overlapping the edge. Glue on the surface lubricates the veneer hammer.

double boiler setup will work as long as the glue is not in contact with the source of heat. The glue must never boil. A glass jam jar in a saucepan of water has served me well for years.

I never veneer anything other than marine plywood of the best quality or solid wood that's hard and stable. On plywood, the veneer grain must run at right angles to the grain of the outer plies. On solid wood, the veneer grain must be parallel to the grain of the wood. Plywood has barely perceptible undulations on the surface as a result of the gluing process during its manufacture, and these have been known to ghost through the veneer. To remove them, plane the plywood lightly with a smoothing plane, with the grain. Then sand lightly with clean 80-grit sandpaper. A solid-wood ground gets the same treatment.

The veneer that I'm using in the photos is white ash—hard, rippled and very wild, with a distinctly un-flat surface. Typical stuff for matched work. I suggest that you avoid such wild-grained veneer for your first attempts at hammer veneering. Relatively straight-grained veneer is easier to handle.

To preview the 4-way match, I use a pair of mirrors fixed to a ply backing and hinged, as shown in the photo above. I can sit the mirrors on the bundle of veneer and, by changing their angle with one another, see what pattern a 4, 8, or 16-way match of any particular area will produce.

Once you've selected an area that makes an attractive pattern, remove the top four sheets from the bundle. With a razor knife and straightedge, cut the leaves 1 in. longer and wider than required for the finished top. Locate the cuts with respect to some grain feature—a knot or similar mark—so that each leaf ends up with the same grain pattern.

You'll also need veneer for the underside of the top in order to balance the shrinking and pulling caused as the top veneers dry. Two leaves will be sufficient, joined at the long-grain edges. The grain should run in the same direction as that of the leaves you'll be laying on the top, and 90° to the grain of the plywood.

You'll probably need to flatten the veneer before you can work with it. Spray the leaves lightly with water from an indoor houseplant sprayer. Not too much, just enough to raise the moisture content. Do the same to some unprinted newsprint (don't use a newspaper or the ink will stain the veneer) and place a sheet of the damp paper between each leaf. Now press the whole bundle of leaves together between two flat pieces of wood. After 24 hours, replace the damp paper with dry paper and leave for another 24 hours.

Before laying the veneer, the ground must first be sized on both faces. Size is diluted glue, one part glue to eight to ten parts water. Put a bit of glue into a jam jar and dilute it with hot water. Mix well and apply with the glue brush. Stand the board up vertically to drain, and allow the size to dry for 24 hours.

As I mentioned earlier, for this particular top, I intend to overlay and knife through the edges. The directions given below apply to that method. If you elect to shoot the cross-grain ends instead, allow ½ in. extra length on the other end of each leaf so you have the option of switching to the overlay method if something goes wrong. I tend to allow myself options such as this because it's impossible to predict exactly what will happen.

Check your tools. The glue should be hot, the iron warm (just above the heat setting for nylon). The consistency of the glue is important. The best way to discover the right consistency is to raise the brush above the glue pot and watch the glue flow from the brush. If it's lumpy, it's too thick. The glue should flow in as thick a stream as possible. The stream shouldn't break up into drops. Glue that's too thin will thicken after a half-hour or so of evaporation in the pot.

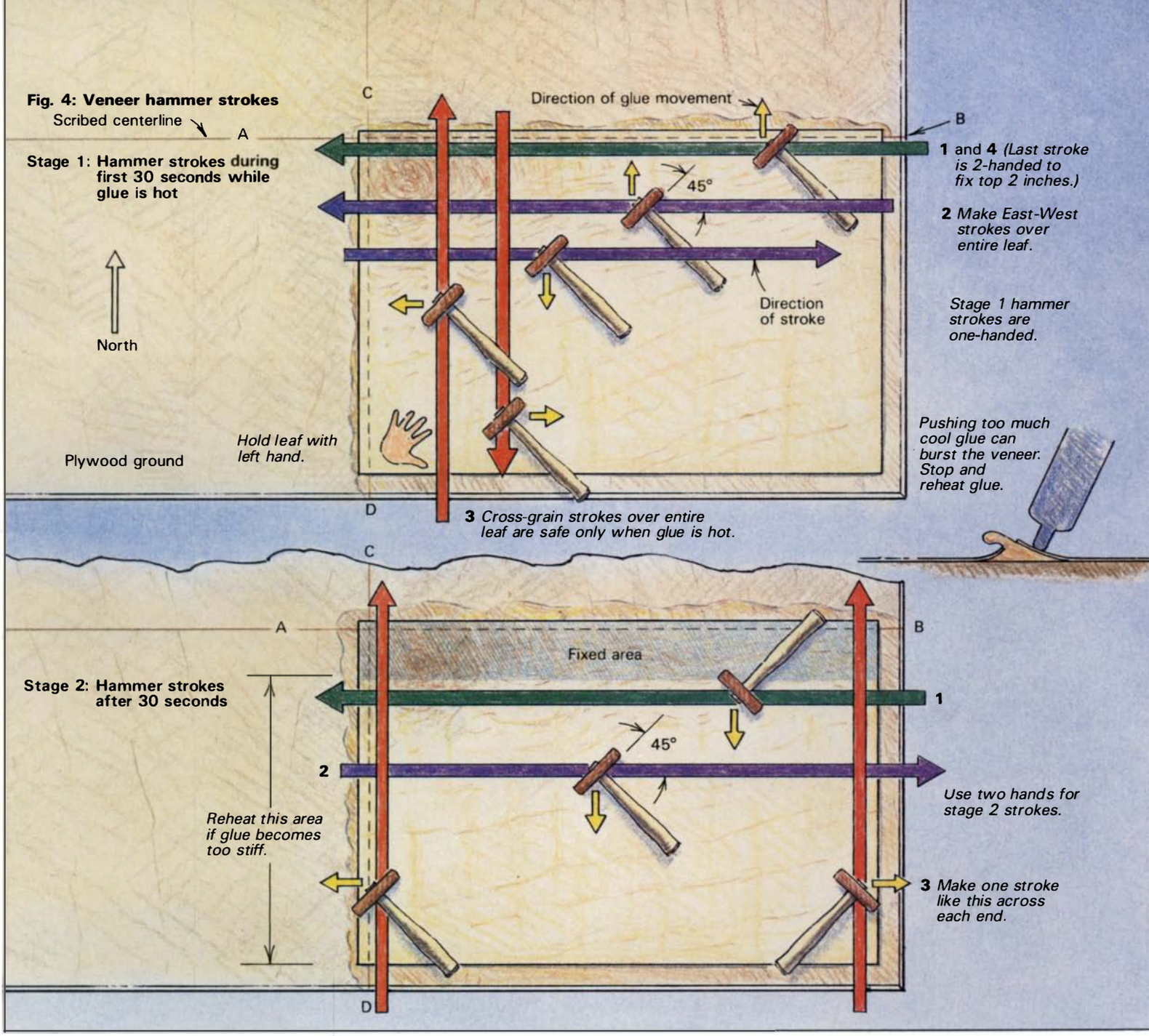
Fix the plywood in position on the bench with bench stops, holdfast clamps or whatever system you prefer. Lay the balance veneers on the back, using the techniques explained below for the top veneers. The balance veneers should overhang the edges of the plywood by ⅛ in. When the glue is dry and the surface scraped, cut the ply to finished size. To cover the edges of the plywood I glue on a ⅛-in.-thick hardwood lipping with mitered corners before veneering the top. I never veneer the edges.

Re-clamp the plywood to the bench. There must be no obstruction on the lower right-hand quadrant of the board, where you'll lay the first leaf. With a marking knife, mark centerlines AB (horizontal) and CD (vertical) on the plywood. Don't use a pencil—the graphite will act as a barrier to the glue in a place where you need the glue the most.

Leaf 1 will be laid with its long-grain edge overlapping line AB ¼ in. and its cross-grain end overlapping line CD by ¼ in. (If you've shot the end square, lay the end right on line CD.)

Brush glue on the lower right quadrant of the ground. (This should take no more than 10 seconds.) Lay leaf 1 upside down on that glue and brush glue on the exposed side of the leaf with a less well-loaded brush (10 to 15 seconds). You can't rush or you'll break the veneer, but you must not pause or the glue will cool. Now turn the leaf over and slide the leaf into position so that it overlaps the centerlines, as mentioned above (5 seconds). The top side of the leaf will have picked up sufficient glue from the ground for the hammer to slide easily over the surface. About 35 seconds have now elapsed since you first picked up the glue brush.

During the next 30 seconds, while the glue is still hot, your



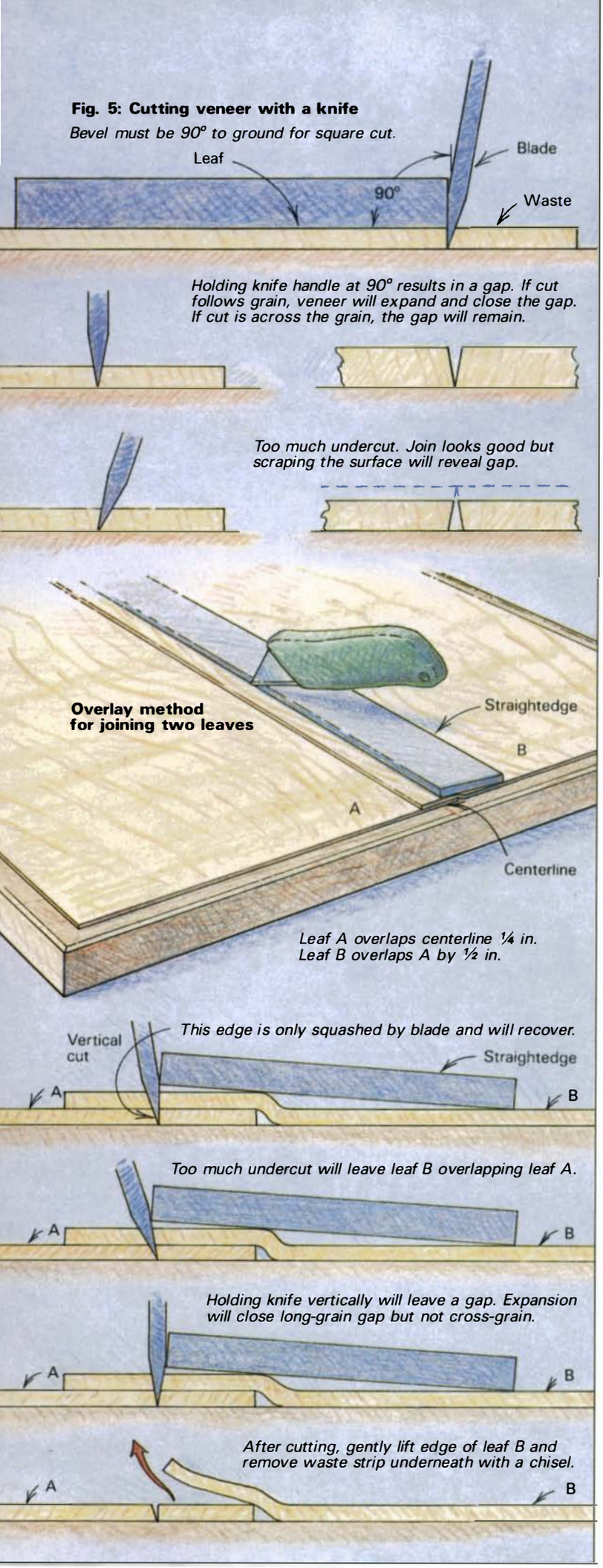
goal is to force out most of the glue before it cools. The hammer movements for this stage of the process are shown in figure 4, stage 1. The leaf is now saturated with glue and tends to slide around on the plywood so hold the leaf in place with your left hand. Pick up the hammer in your right hand and make the first stroke from right to left along the edge AB, overhanging the edge a little. Turn the hammer head 45° to the direction of the stroke, forcing the glue out at the North edge, as shown in the drawing (5 seconds). Follow this with one-handed strokes along the grain, over the entire leaf, forcing glue out at the North, West and East edges. After this, make one-handed cross-grain strokes, forcing the glue out at all edges. Never pull or push the hammer across the grain except when the glue is very hot or for single strokes across the end of the leaf to get the last bit of cool glue out. Cross-grain strokes may tear the veneer or stretch it, which will result in small cracks when the veneer shrinks. This is called blanching.

As you hammer, a layer of soft, cold glue will build up around the working edge of the hammer. Let the glue stay there, it facilitates the hammer strokes.

Once you've forced out most of the glue, wait about a minute for the glue to cool. Make sure the leaf is still correctly positioned and then, with two hands on the hammer and a bit of weight from the shoulders, repeat the first stage 1 stroke parallel to line AB. Your goal is to fix a 2-in.-wide area along line AB. If the glue is still hot enough, you'll be able to turn the hammer 90° clockwise and continue the stroke in the opposite direction. The glue will come out from the edge with a crackling sound, now that it's cooler. Suddenly you'll find that the leaf is fixed. If it has become fixed in the wrong position, a bit of heaving with both palms flat on the leaf will shift it. If not, use the iron to re-warm the glue.

Stage 1 of the process is now complete. The leaf should now be fixed for a hammer width along line AB. Enough glue should have been forced out from under the rest of the sheet to allow the veneer to lie flat on the ground, with only a few undulations. Your goal during stage 2 of the process is to force out the remaining glue and fix the rest of the leaf.

If you are quick and the room temperature is over 65°F, the glue will probably not have hardened or cooled too much, and with good weight on the hammer you can keep the glue mov-



To join two leaves with the overlay method, knife through the center of the ½-in. overlap, then lift out the waste piece underneath with a chisel.

ing with long, slow, overlapping strokes along the grain. Glue must not be forced through the fixed area, so all glue must be forced South, East and West, using the hammer movements shown in figure 4, stage 2. Now the cool glue will really crackle out at the ends. You may need to make an occasional cross-grain stroke across each end towards the centerline AB, forcing glue out at East or West. The secret to good veneering is to time the hammer work so that you can move all the glue with a minimum of strokes. An overworked piece of veneer will become starved of glue, and won't stick.

It is frequently the case that the glue cools too quickly. You'll feel it. The glue will build up stiffly and threaten to burst the veneer ahead of the hammer. This is the time to pick up the iron and re-melt the glue with one slow stroke of the iron up and back along the leaf, taking care not to disturb the area that's already fixed. The excess glue on the surface of the veneer helps to spread the heat from the iron and prevents the iron from scorching the veneer, so if the veneer surface needs lubricating, put a little glue on top before using the iron. Remember, you're working with water so always unplug the iron before handling it to eliminate the danger of electrical shock. You can now hammer the work as before.

When the entire leaf is firmly fixed and you feel you have removed all the glue, lay the hammer down and use your fingertips and fingernails to feel or listen for bumps where there will be either glue or air. If there is glue which is too cool to move, re-heat it with the iron. If the glue is near the middle of the leaf, and you can't take it out to the edge, slit the veneer with the grain and work the glue out through the slit. If it's an air bubble, slit the veneer and put in a little glue with a brush. Allow it to cool somewhat, then work out the excess glue with the hammer. A clamp with a pad of wood and unprinted newsprint can be helpful if a lump refuses to flatten under the hammer.

After the first leaf is fixed, turn the board around so the fixed leaf is in the upper left corner and re-clamp it to the bench. Leaf 2 joins against the long-grain edge of leaf 1. Apply glue to the second quadrant and leaf just as you did the first, and position leaf 2 so it overlaps leaf 1 by ½ in. and the centerline AB by ¼ in. Hold it in place with the left hand and run the hammer once along the centerline next to the joint, but not over the double thickness of veneer. Still holding the veneer with the left hand, run the hammer over the double thickness. Use the stage 1 strokes to force the glue out, as you did with the first leaf.

When the 2-in. strip along line AB is fixed, clamp a straightedge along line AB and knife through both leaves with about three strokes. It is very important to hold the knife at such an angle that it produces a perfect 90° edge. Figure 5 shows what to

The inlaid walnut line around the border can be held in place with pins until the glue cools (top). To fix the crossband, begin with short strokes toward the center of the board then switch to strokes along the length of the crossband (right). Angle the head at 45° to the direction of the stroke. Allow the crossband sections time to expand, then square up the end with a chisel (above) before laying the next piece. The mitered corners are also cut with a chisel.

avoid here. Now you can peel off the top waste strip and, with the aid of a ¼-in. bevel-edge chisel, lift the edge of the newly-laid leaf and tease out the waste piece from the first leaf. Be careful not to leave any splinters behind or damage the butt edges.

There may be enough warm glue left underneath to simply lay the edge of leaf 2 down again and hammer. If not, apply a little glue and push most of it out with the hammer. Wait for the glue to cool then fix the leaf down with a well-weighted stroke from right to left along line AB. The hammer head should be angled toward leaf 2 to encourage the raised edge down alongside leaf 1.

Apply leaves 3 and 4 as you did the first two. After laying each leaf, knife through the end-grain overlay along line CD. Clean off all the surplus glue with a blunt cabinet scraper (a warm wet one is very satisfactory) and a damp rag before it hardens.

To prepare for the inlay line and crossband, trim the veneer with a cutting gauge to create a border 1 in. wide. Scrape excess glue from the ground on this border.

Cut some 1/16-in.-wide strips of contrasting veneer (I used walnut) for the inlaid line with a straightedge and knife. Apply some fairly cool glue along the edge of the veneer and gently smooth the strip of walnut against the edge of the veneer, standing the strip up on its edge. Wait a little for the glue to cool and hold the strip with pins if necessary. Holding a metal tool against the line acts as a heat sink to quickly cool the glue. Allow the glue to harden before attempting to lay the crossband.

With a knife and straightedge, cut the crossband strips. The grain should run across the width of the strip. Lay the corners first. Cut miters on the corner pieces with a chisel before laying them.

Apply cool glue to the ground (I don't bother to apply glue to the crossband itself), put a crossband strip in place and smooth it out with your fingertips, forcing some glue out. Spread that glue across the top of the strip. The first hammer strokes should be straight into the center of the board, up to the inlay line, with the head turned 90° to the direction of the stroke. When the strip becomes fixed, you can run the hammer along the band, with the head at 45°. Then let it cool, making sure the band stays tight against the inlay line. Don't clean off the cooling glue under the edge that overhangs the plywood—this glue helps to draw the crossband down tight onto the ground overnight. Square up the end with a chisel, before butting the next strip against it. I make the cut by eye, without bothering to use a square. Don't lay more than 15 in. of banding at once. Allow a few hours for the veneer to expand before continuing.

Next day, trim the top off the inlaid line with a chisel and a block plane. Scrape the surface with a sharp cabinet scraper, gradually decreasing the pressure on the scraper to finish up. This helps to remove the very small score marks that the burr on the scraper leaves. These will show up on dark wood only after you have applied a finish.

Because the glue is water soluble, veneered work must be well protected against liquid penetration. Usually a combination of synthetic, non-porous sealer and then natural wax is best, but everyone has his own finishing answer. □

Christopher Faulkner makes furniture and teaches woodworking at Ashbridge Workshops, Tigley, Totnes, Devon TQ9 6EW, England. He offers one or two-year courses for full-time students.

When he's not shaping and painting Christmas ornaments, Tolone works on larger, equally colorful creatures.

Casual Pig

Deck the Halls

Curious Christmas creatures

by Robert Tolone

I am a painter and a sculptor, and in addition to my regular work, I have for years been making wooden Christmas ornaments for my family and friends. Occasionally I thought about making some for sale, but had never really done anything about it. Two years ago, some friends encouraged me to show my ornaments to a gallery owner. So, I carved 27 different ornaments, figuring that if she wasn't interested, I'd at least have my Christmas list filled for the year. Fortunately, she was very enthusiastic and ordered some for sale.

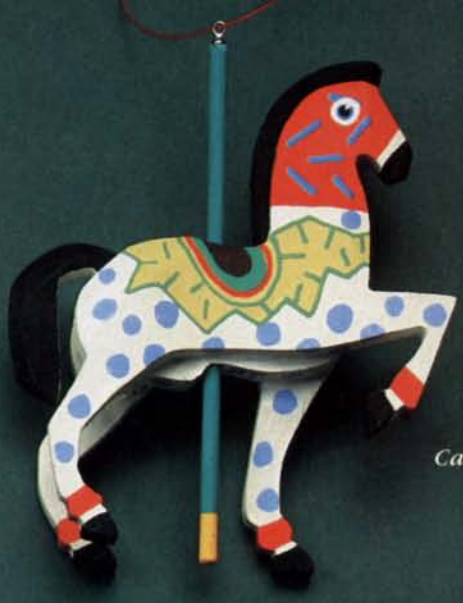
Encouraged, I sent a set of slides of the ornaments to the Los Angeles Craft and Folk Art Museum. The next morning, the museum director called. "They're enchanting," he said. "We love them. We'll take 63 dozen."

That success spurred me on and more slide sets were mailed. A week later I was on a plane to New York and meetings with galleries there.

Falling Boy

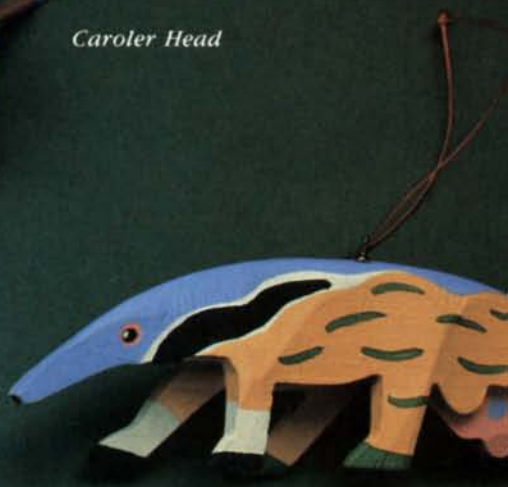
Falling Girl

Ram's a' Running



Carousel Horse

Caroler Head



Giant Anteater

"How many did the Craft and Folk Art Museum buy?" asked the director of the American Folk Museum galleries. "Sixty-three dozen," I told her. "Well, we can do better than that," she said. "We'll take 85 dozen."

Six weeks after finishing the original set, I had sold more than 4,000 ornaments to fifteen galleries nationwide. I was euphoric. Never had anything I'd made gotten so overwhelming and favorable a response. On the strength of my orders I got a loan from my father for some necessary tools, and two weeks later had added a Hegner jigsaw, radial-arm saw, compressor and spray equipment, bandsaw, and assorted small tools to the shop, along with several hundred board feet of jelutong and alder.

"How many $\frac{1}{4}$-in. dowels do you have in stock?" I asked my lumber dealer. "More than you can possibly use," he said. "Good. I'll need four thousand feet." "That's more than three-quarters of a mile of dowel!" he exclaimed. "What do you need it for?" "I make Christmas ornaments," I told him. He shook his head, "Lotta ornaments."

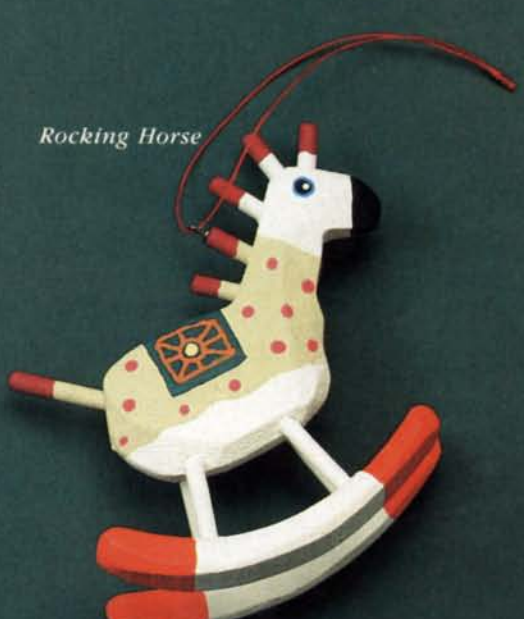
He was right. It was a lot of ornaments. I sat down at my workbench and figured out my cutting lists. Some of my designs were simple, only one piece. Others were very complex, up to 23 pieces in one ornament. It came out to more than 12,000 individual parts, all hand carved, hand sanded, hand painted. Into all those pieces holes had to be drilled and more than 20,000 assorted lengths of dowel inserted, ranging from $\frac{1}{4}$ in. to 2 in. My early euphoria subsided as I began to take realistic measure of the work before me. It was an enormous task. I was most concerned about quality. It's easy to make something well when you need do it only once, but how can you maintain craftsmanship when a job needs to be repeated thousands of times? Quality control became the summer's theme.

I had exactly four months to fill the orders. Still, I was confident I could deliver on time. All I needed to do was work 18 hours a day, seven days a week, and enlist every friend I had to help whenever they could. All told, more than 27 friends volunteered their time. We held doweling bees, like the old-time quilting bees, where friends came over and hammered thousands of dowels into thousands of holes. It was a wild, exhausting summer.

In the end, the deadline was met, the orders filled on time. Quality was maintained by dividing each job into simple, easy steps. We split up repetitive tasks so that each job got done before the monotony became unbearable. Most importantly, we enlisted my mother as Quality Control Officer, and she became as ruthless a nitpicker as ever bedeviled a production line. In every case, the production ornaments were better crafted than the prototypes, and of this I am quite proud.

"What about next year?" my friends all asked. "Are you going to do it again?" I sure am. As an artist, I am all too familiar with the struggle to succeed financially, and making my studio profitable has been tremendously exciting. Interestingly, showing the ornaments has led to many offers from galleries to do shows of my larger sculptures, as well as several commissions for large pieces. All in all, it's been a wonderful year. □

Robert Tolone is a painter and sculptor in Venice, Calif.



Rocking Horse

RYOBI TOOLS

		List	Sale
S500A	3x5 1/2 Finish Sander	70	41
SU6200	Finishing Sand. 1/2 Sheet	142	88
B7075	3x21" dustless Belt Sand.	179	116
B7100	3x24" dustless belt Sand.	208	140
B7200A	4x24" dustless Belt Sand.	269	165
D100VR	3/8" VSR 0-1200 rpm drill.	91	49
W640	7 1/4" 13 amp circular saw	158	99
W740	8 1/4" 13 amp circular saw	171	109
JS60	Jig Saw-Single Speed	172	99
JSE60	Jig Saw-electronic v/speed	198	123
R150	1 H.P. Plunge Router	138	86
R330	2 H.P. Router	220	138
R500	3 H.P. Router	265	163
E3800	Drywall screwdriver 0-4000	126	79
L120U	3 5/8" Planer	142	89
BD1020R	3/8" 2-spd Cordless Drill w/free holster-Xtra special buy	148	95
TS251U	10" Mitre Box	300	169
SG1150C	4 1/2" H.D. Mini-Grinder	99	59

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MILWAUKEE TOOLS

		List	Sale
0224-1	3/8 drill 4.5A magnum	173	109
0234-1	1/2 drill 4.5A magnum	173	112
0244-1	1/2 drill 4.5A magnum	173	115
0222-1	3/8 drill 3.3A 0-100 rpm	159	99
0228-1	3/8 drill 3.3A 0-1000 rpm	139	92
0375-1	3/8 close quarter drill — NEW — 3.5 amp	191	118
0210-1	3/8 cordless drill — NEW — 2 speed	189	95
6539-1	cordless screwdriver — NEW — 190 RPM	99	59
1007-1	1/2" drill 4.5A D-Hdle	217	145
1107-1	1/2" drill 4.5A D-Hdle	222	145
3300-1	magnum rt angle drive kit	271	170
3102-1	Plmbrs rt angle drill kit	287	180
1676-1	HD Hole Hawg w/cse 2 sp	363	235
5395	3/8 sgle sp hammer drill kt	203	150
5397	3/8 var sp hammer drill kit	208	155
5371-1	HD mag. hammer drill 1/2"	313	207
5373	HD mag. ham. drill 3/8"	262	175
6511	2 speed Sawzall w/case	197	122
6226	port band saw 2 sp w/case	416	280
6234	TSC band saw port w/case	416	280
6405	8 1/4" circ. saw 13 amp	191	127
6460	10 1/4" " 15 amp w/case	380	245
6165	12" Chop saw 15 amp 4200 R.P.M.	311	189
6255	v/sp Jig Saw 3.8 amp	217	140
6245	sgle sp Jig Saw 3.8 amp	191	125
6012	1/3 sheet HD Orb. sander	173	110
6014	1/2 sheet HD orb. sander	184	112
5660	1 1/2 HP router 10 amp	289	175
5680	2 HP router 12 amp	342	220

DRYWALL SHOOTERS

6753-1	3.5 amp 0-4000 rpm new	125	79
6747-1	4.5 amp 2500 rpm	157	100
6750-1	4.5 amp 0-4000 rpm	141	90

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Univ. Bore — Professional Series

CARBIDE TIPPED SAWBLADES

Item No.	Description	Diam.	Teeth	List	Sale
PS203	Gen'l Purp.	7 1/2"	24	27.24	17.50
PS303	Fine cutting	7 1/4"	40	32.97	20.50

5/8" Bore — Industrial Grade

CARBIDE TIPPED SAWBLADES

Item No.	Description	Diam.	Teeth	List	Sale
LU72M010	Gen-l Purp.	10"	40	68.58	34
LU81M010	Gen-l Purp.	10"	40	69.30	35
LU73M010	Cut-Off	10"	60	79.65	36
LU82M010	Cut-Off	10"	60	86.40	44
LU84M010	Combination	10"	40	70.99	36
LU84M011	Combination	10"	50	74.51	37
LU85M010	Super Cut-Off	10"	80	110.88	62
LM72M010	Ripping	10"	24	64.85	34
DS 306	6" Dado			139.00	92
DS 308	8" Dado			170.00	105
TR 100	3 blades & Dado set			399.00	255

MAKITA CORDLESS FESTIVAL OF VALUES

Model		List	Sale
4300DW	Jig Saw	158	99
5081DW	3 3/8" Saw Kit	174	95
5600DW	6 1/4" Circular Saw	224	125
9035DW	Finishing Sander	128	73
6010DWK	3/8" Cordless Drill Kit.	152	88
6010SDW	3/8" Cordless Drill	84	45
8400DW	3/8" Hammer Drill	188	105
DA3000DW	3/8" Angle Drill	176	98
6010DL	3/8" Drill w/Flashlight	162	89
6012HDW	3/8" 2 spd Driver Drill w/Bat & Metal Case	178	98
DK1002	3/8" Drill w/Flursnt Lt	164	90
6710DW	Cordless Screwdrvr Kit	148	84

LEIGH DOVETAIL JIGS

Model	List	Sale
TD514	149	125
TD514L	219	195
D1258-12	299	245
D1258-24	359	275

MAKITA BRAND NEW X-TRA SPECIAL

Model	List	Sale
5007NBA-7	7 1/4" Saww/Elec. Brake	186	115
5008NBA-8	8 1/4" Saww/Elec. Brake	212	130

MAKITA TOOLS

		List	Sale
BO4510	Sander	86	43
9900B	3"x 21" belt sander	218	119
9924B	3"x 24" belt sander	208	130
9924DB	3"x 24" b/sand. w/bag	234	130
9035	1/3 sheet finish sander	88	48
9045B	1/2 sheet finish sander	184	90
9045N	1/4 sht fin. sand. w/bag	184	105
4200N	4 3/8 circ. saw 7.5 amp	168	93
5008NB	8 1/4 circ. saw 13 amp	198	105
5201NA	10 1/4 circ. saw 12 amp	398	215
4300BV	v/sp jig saw 3.5 amp	218	120
4301BV	orbv/spjig saw3.5 amp	230	125
JR3000WL	2 sp recip saw w/cse	188	120
JR3000V	vs recip saw w/case	198	120

* * * MAKITA TOOLS * * *

SPECIAL PROMOTION

LS1000	New 10" Mitre Box	368	198
792210-7A	Carbide Bld for above	49	31
9820-2	Blade Sharpener	268	159
741074-9	60 (coarse) Grdg Whl	33	23
741070-7	1000 (med) Grdg Whl	31	22
741071-5	6000 (fine) Grdg Whl	43	30
1900BW	3 1/4" planer w/case	178	92
1100HD	3 1/4" planer w/case	312	160
3608BK	3/4 hp router w/case	132	85
3601B	1 3/8 hp router	198	115
3700B	1/2 hp trimmer 28.000 rpm	148	82
BO4530	6" Round Sander	90	48
DA3000	3/8" angle drill	188	105
DP4700	1/2 v/sp w/rev" 4.8 amp	172	92
HP1030W	3/8 v.s.r. hammer drill w/case	158	98
6300LR	1/2" angle drill w/rev	268	152
841988-2W	1/2" s sp. hammer drill w/case	268	150
QV5000	Disc Sander	98	53
6800DB	2500 rpm 3.5 amp	134	79
6800DBV	0-2500 rpm 3.5 amp	144	89
6801DB	4000 rpm 3.5 amp	134	79
6801DBV	0-4000 rpm 3.5	144	89
2030n	12" planer/jointer	2360	1475
2040	15 5/8" planer	1930	1195
1805B	6 1/8" planer kit w/case	466	265
JV1600	var. speed jig saw	162	89
JV2000	var. speed orb. jig saw	188	100
5005BA	5 1/2" circular saw 8 amp. with brake	176	98
9207SPC	7" var/speed electronic sander/polisher	238	130
9303BH	4 1/2" sander-grinder kit	146	95
4014NV	var/speed blower	138	79

DELTA — BRAND NEW

Model		List	Sale
34-080	10" Miter Box w/rotary table	279	179

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33-425	PL-425 1" x 25' Rule	18.95	8.95
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Model	DRILL KITS	List	Sale
1930	3/8" rev/hi speed	165	110
1950	3/8" High Torque	165	110
5930	Reversible Hammer	179	120
1970	3/8 rev/hi torq. screwdrvr	179	120
1980	Rev/adj. clutch Scrudrill	179	120

BRAND NEW! SUPER SPECIALS from MILWAUKEE

Model		List	Sale
0214-1	3/8" c/less drive/drill	189	109
8975	H.D. heat Gun. 11.6A Low 570°F - High 1000°F	81	49
5920	belt sander 3x24 w/o bag	315	199
5925	belt sander 3x24 w/bag	315	215
5930	belt sander 4x24 w/o bag	326	209
5935	belt sander 4x24 w/bag	348	214

STATIONARY TOOL SELL-A-THON

Model	from MAKITA	List	Sale
2020	8" Longbed Jointer with elec. brake 12A	1700	850
2040	15 5/8" Planer 13A	1780	1150
2030	12" Planer-Jointer	1980	1150
2030N	12 1/2" Plnr-Jntr w/elec. brake	2160	1350

RYOBI

BS50N	7" Band Saw	995	585
BS360NR	12" Band Saw	1936	1150
RA2500	10" Radial Arm Saw	536	385
AP-125	12 1/2" Planer	1680	950
AH-115	12 1/2" Planer-Jointer	2195	1245

DEWALT by BLACK & DECKER

3436	12" Dewalt Radial Arm Saw	1550	1240
7790	12" Contractors Rad. Arm Saw	1045	836
7749	10" Deluxe Radial Arm Saw	606	485
7779	10" Contractors Rad. Arm Saw	710	568
3486	8" Rip & Crosscut Panel Saw	1034	827

DELTA

		List	Sale
34-621	Contractors Saw w/o motor 9"	551	425
34-710	Super 10" Saw - 1 H.P.	621	475
15-091	15" Floor Model Drill Press	510	395
15-090	15" Bench Model Drill Press	510	395
11-072	32" Radial Drill Press	409	330
22-651	RC33-13" Planer - 2 H.P.	1729	1195
46-140	11" Lathe w/Stand w/o Motor	448	350
33-150	Sawbuck-Frame & Trim Saw	707	499
33-990	Deluxe - 10" Radial Saw	630	475
33-890	12" Rad. Saw w/1 1/2 H.P. Mtr	1422	950
28-283	14" Band Saw comp/ 3/4 H.P. Motor & enc. std.	970	670
28-243	14" Band Saw w/open steel std less motor	621	475
28-560	16" Motorized Band Saw comp. w/stand	467	349

★ X-TRA SPECIALS ★

MAKITA TOOLS

		List	Sale
6010DL	C/less Drill w/flashlight-charger & case	174	90
DP3720	3/8 drill Rev. 0-1800 rpm	98	47
6510LVR	3/8 drill Rev. 0-1500 rpm	136	67
6013BR	1/2" Drill rev. 6 amp.	198	100
5402A	16" Circular Saw-12 amp	518	315
2414	14" Cut Off Saw-13 amp	308	169
3612BR	3 HP Plunge Router	318	175
9401	4x24 belt Sander w/bag	268	160

BOSCH TOOLS

		List	Sale
1581VS	Top Handle Jig Saw	225	126
1582VS	Barrel Grip Jig Saw	126	118
1604	1 3/4 H.P. Router	199	118
1942	Heat Gun 650°-900°	99	85
1272	3x24" Belt Sander	259	159
1272D	3x24" Belt Sander w/bag	274	169
1273	4x24" Belt Sander	274	169
1273D	4x24 Belt Sander w/bag	289	179

★ NEW LOW PRICES ★

PONY CLAMP FIXTURES

Model		List	Sale	Lots of 12
#50	for 3/4" Black Pipe	11.23	7.15	79.00
#52	for 1/2" 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"	2 1/2"	12.45	8.10	43.75
#3/0	6"	3"	13.36	8.50	45.95
#2/0	7"	3 1/2"	14.36	8.95	48.35
#0	8"	4 1/2"	15.97	9.95	53.75
#1	10"	6"	18.25	11.35	61.25
#2	12"	8 1/2"	20.94	13.60	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 — 2 1/2" Throat 1/4" x 3/4"

Model	Jaw Length	List	Sale	Lots of 6
3#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

Who Has The Saws That Cut It Across The Board?

BLACK & DECKER of course!!!

Model	WORM DRIVE SAWS	List	Sale
3050	6 1/2" 12 amp - 4600 rpm	247	169
3051	7 1/4" 13 amp - 4300 rpm	232	149
3052	8 1/4" 13 amp - 4300 rpm	247	169
	SUPER SAWCATS		
3047-09	7 1/4" w/brake - 12.5 amp	226	149
3048-09	8 1/4" w/brake - 13 amp	240	155
	BUILDERS SAW CAT		
3030	7 1/4" 13 amp - 5800 rpm	155	100
3035	8 1/4" 13 amp - 5800 rpm	175	125
3034	7 1/4" 13 amp - 5800 rpm	162	115
3033	6 1/2" 13 amp - 5800 rpm	162	115
	JIG SAWS		
3157-10	var/sp orb action d/hdl	174	115
3153-10	var/speed 4.5A 0-3100	158	105
3159-10	2/sp orb action barrel grip	178	120
	CUT SAW KITS		
3103	2 sp 6 amp-2400 strokes	163	100
3105	v/sp 6 amp-2300 strokes	170	110
3107	v/sp orb 6A 0-2300 strokes	183	119
4300	Drill Bit Sharpener	289	205
1321	1/2" drill 450 rpm 6 amp	175	115
4010	Palm Sander	80	48
4015	1/2 Sheet Finish Sander	160	105
	DRYWALL GUNS		
2034	v.s.r. 0-4000 rpm	121	79
2037	v.s.r. 0-4000 rpm	139	89

"Door Openers" from MAKITA

		List	Sale
9501B	4" Grinder Kit	119	55
2708	8 1/4" Table Saw	348	199
5007NB	7 1/4" Circ. Saw	158	94

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Model 6365 — 7 1/4" Circular Saw

List $169.00 Sale $99.00

Lots of 3 — $289.00

MORE MAKITA TOOLS

Model		List	Sale
6070DW	3/8" Cordless V/Sp. Drill	98	59
3705	Offset Base Trimmer	198	125
DA3000R	3/8" V/Sp. Angle Drill	192	110
HP2010N	Hamr Drl, 2 Sp., V/Sp.	224	145
HR1821	11/16" Rotary Hammer	440	295
HR2511	1" Rotary Hammer	490	325
HR3851	1 1/2" Rotary Hammer	680	419
HM1301	Demolition Hammer	780	495
HK1800	Power Scraper	348	245
PC1100	Concrete Planer	438	319
4110B	12" Angle Cutter	418	295

FREUD WOOD CHISEL SETS

WC-104	4 pc- 1"-3/4"-1/2"-1/4"	29.90	17
WC-106	6 pc- 1"-3/4"-5/8"-1/2"-3/8"-1/4"	39.90	26
WC-110	10 pc- 1/4" to 1 1/2"	66.90	46
CS-106	6 pc- Carving Set	74.90	54
CS-112	10 pc Carving Set	139.90	95
TT108	8 pc Turning Set	67.90	45

All of the above come in beautiful wood cases.

CM100	Carvers Mallet	9.90	7.50

AEG POWER TOOLS

Model		List	Sale
EZ 501	C/less Scrwdrvr **Brand New**	59	35
EZ 502	C/less Scrwdrvr-190 rpm	98	52
EZ 505	C/less Drill/Drivr	139	79
EZ 506	C/less Electronic Drl/Drvr	159	94
EZ 581	C/less Caulk Gun var/sp	179	106
SCR1E	Drywall Screwgun 0-2000	125	74
SCR11E	Drywall Screwgun 0-4000	125	74
BE8RL	3/8" var/sp drill 3.8 amp rev	86	51
BE10RL	3/8" var/sp drill 5 amp rev	125	74
SBE401RL	3/8" Ham Drill v/sp h.d.	88	52
SE2E13RL	1/2" Ham Drill 2 sp h.d.	169	101
TC25E	Tech Driver v/sp 5 amp	150	89
PC70	7 1/4" Circular Saw 12 amp	157	93
VS130	Orb Sndr 20,000 OPM 1/3 sh	75	48
VS260	Orb Sndr 25,000 OPM 1/2 sh	156	88
VSS260	Orb Sndr 25,000 OPM w/bag	189	118
Hbse75S	Belt Sander v/sp 3" x 21"	199	118
BSPE60	JigSawOrbv/sp 4.6Aw/case	214	127
RSK600	Recip Orb Saw 10 amp	229	136

ROTARY HAMMERS

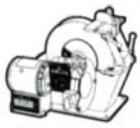
PHE 16RL	3.8 amp 5/8" capacity in concrete	269	175
PH 210	5.2 amp 3/4" capacity in concrete	398	260
PHE 20	Same as above — except var/sp 0-750	418	270
PHD 26	6.3 amp 1" capacity in concrete	495	320
PH 38	7.5 amp 1 1/2" capacity in concrete	549	355

All above complete with cases

SKIL TOOLS

		List	Sale
551	5 1/2" Circ. saw 6.5A	99	73
77	7 1/4" Worm Saw	240	135
367	6 1/2" Worm Saw	239	135
825	8 1/4" Worm Saw	270	165
807	7 1/4" Skilsaw 13A-Super	153	100
808	8 1/4" Skilsaw 13A-Super	172	110
2016-02	3/8" Cordls Drl complete w/charger, case & 2 batteries	199	95

DELTA MACHINERY



		LIST	SALE
23-700	Universal Wet/Dry Grinder	159.95	119.95
40-601	18" Scroll Saw, Variable Speed	1,117.00	699.00
43-375F	3 H.P., 1 Ph. Hvy. Dty. Wood Shaper	2,195.00	1499.00
34-080	10" Miter Box, Electronic Brake	279.00	210.95
22-651	13 x 5.9 Planer 2 H.P., 1 Ph.	1,729.00	995.00
40-500	15" Hobby Scroll Saw	105.00	78.00
34-410	10" Contractor Saw, 1½ H.P., Complete	1,073.00	675.00
34-897F	Unifence, 50" Capacity	398.25	305.00
37-350	8" Jointer, 1½ H.P., 52-671 Stand	1,350.00	1154.00
46-541S	12" Lathe, ¾ H.P., Variable Speed	2,771.00	1,399.00

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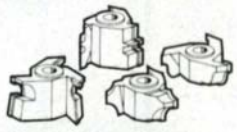

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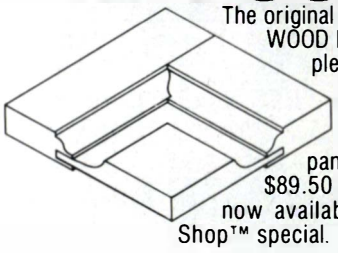
THE DOOR SHOP™



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40-601 Scroll Saw
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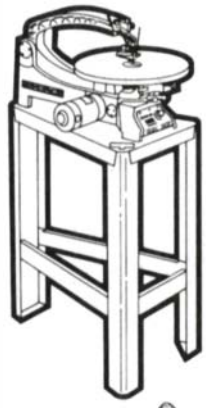

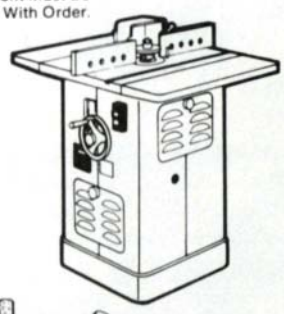

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1100	3 1/4" Planer Kit	$ 179.95
1805B	6 1/8" Planer Kit	297.80
1900BW	3 1/4" Planerw/case	108.65
2030N	12 1/2" Plnr/Jntr	1445.00
2040	15 5/8" Planer	1235.00
2708W	Table Saw W/Carbide Blade	230.80
3601B	Router	119.95
3612BR	3 HP Router	195.25
3612B	3 HP Router W/Square Base	205.25
3700DW	Cordless Trimmer	99.95
3705	Dffset Base Laminate Trimmer	129.95
4300DW	Cordless Jig Saw	108.95
4301BV	Vr. Sp. Orbtl Jig Saw	133.25
5007NBA	7 1/4" Circular Saw	109.30
5008NBA	8 1/4" Circ. Saw	122.00
5081DW	3 3/8" Cordless Saw	114.70
5402A	16" Circular Saw	319.95
6000R	Uni-Drill	104.70
6002DWK	2 Spd Cordless Driver/Drill	109.95
6010DL	Cordless Drill w/charger light & case	99.95
6010DWK	Cordless Drill w/charger & case	88.95
6010SDW	3/8" Rev. Cdlss Drill	54.50
6012HDW	Cdlss Drill Kit, 2 Sp.	118.40
6070DW	3/8" Cordless Drill, Var. Sp.	69.95
6510LVR	3/8" Drill—Rev.	84.95
6710DW	Cordless Screwdriver	116.95
6800DBV	Drywall Screwdriver	94.70
9045B	Finishing Sander	108.30
9045N	Dustless Sander	113.60
9207SPB	7" Sander Polisher	149.95
9401	4" x 24" Belt Sndr	172.55
98202	Blade Sharpener	179.95
9900B	3" x 21" Belt Sndr	131.75
9924DB	3" x 24" Belt Sndr	143.95
BO4510	Finishing Sander	53.95
DA3000DW	Cordless Angle Drill	111.00
DA3000R	3/8" VSR Angle Drill	109.00
DP3720	3/8" Reversible Drill	54.50
DP4700	Drill Reversible	104.30
GV5000	Disc Sander	63.95
JR3000V	Recipro Saw	129.60
JV2000	Orbtl. Var. Jig Saw	108.50
LS1000	10" Miter Saw w/vise	239.90

AEG TOOLS

BE8RL	3/8" VSR Drill	$ 59.95
BSPE60	Orbtl. Top Handle Jig Saw	138.90
EZ501	Cordless Screwdvr	39.95
EZ502	Cordless Driver w/adj. handle	54.95
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EZ509	Cdless Hammer Drill	139.95
EZ560	Cordless All-Pro Driver/Drill	114.95
HBSE75S	3" x 21" Belt Sndr	129.95
PC70	7 1/4" Circular Saw	97.95
PC80	8 1/4" Circular Saw	114.95
RSK600	Orb. Recip. Saw	146.95
SBE401RL	3/8" Hammer Drill	55.95
SB220RLD	1/2" Hammer Drill	124.95
SCRIIE	Electronic Drywall Driver	77.95
SSP2800	Recipro Saw, 2 Sp.	105.95
SSPE800	Recipro Saw, VSR	119.95
VS130	1/3 Sheet Orbtl. Sndr	49.95

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		Each	Pkg. 6
No. 7224	24"	17.30	15.70 Ea.
No. 7230	30"	18.10	16.45 Ea.
No. 7236	36"	18.70	16.95 Ea.
No. 7248	48"	20.75	18.70 Ea.
No. 7260	60"	22.65	20.55 Ea.
No. 7272	72"	24.55	22.25 Ea.

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No. 3712	12"	5.90	5.35 Ea.
No. 3724	24"	7.30	6.60 Ea.
No. 3730	30"	8.20	7.40 Ea.
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JORGENSEN HAND SCREWS

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No. 1	6"	11.30	10.15 Ea.
No. 2	8 1/2"	13.45	12.15 Ea.

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No. 4524	24"Open	20.85	18.85 Ea.
No. 4530	30"Open	21.90	19.65 Ea.
No. 4536	36"Open	22.90	20.60 Ea.

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AP125	12 1/2" Planer	1021.55
AP10X	10" Planer & Jigsaw	399.95
B7075	3" x 21" Belt Sndr	138.90
B7100	3" x 24" Belt Sndr	121.65
B7200AS	4" x 24" Belt Sndr	177.20
BS360NR	Hvy Dty Band Saw	1197.30
BS50N	9 1/4" Band Saw	650.00
JSE-60	Electronic Jigsaw	116.35
R151	1 HP Router	97.40
R-330	2 HP Router	179.05
R-500	3 HP Plunge Router	167.45
RA2500	10" Radial Arm Saw	375.80
RA2500SP	Radial Arm Saw/Kit	475.10
TR30U	Laminate Trimmer	79.20
TS-251UB	10" Miter Saw w/ Freud LU85M10 Blade	229.00

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0228-1	3/8" VSR Drill	$ 103.35
0234-1	1/2" VSR Drill	123.50
0375-1	3/8" Rev. Angle Drill	130.00
1107-1	1/2" VSR D Handle	153.95
5660	1 1/2 HP Router	199.95
5680	2 HP Router	236.75
5935	4" x 24" Belt Sndr	238.00
6014	1/2 Sheet Sander	134.95
6215	Electric Chainsaw	159.95
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6367	7 1/4" Circ. Saw	129.95
6508	2 Sp. Sawzall w/case	139.95
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C6DA	6 1/4" Circular Saw	139.90
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P50	6 5/8" Planer	279.00
P100F	12" Planer	1043.95
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SB8T	3" x 24" Belt Sander 2 sp. w/dust bag	154.00
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No. 7456	Clamp Pads	2.95	2.50 Ea.

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4010	Palm Sander	49.95
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28-243	14" Band Saw	563.90
28-283	3/4 HP Band Saw	745.00
28-560	16" Band Saw	389.95
31-730C	Belt and Disc Sndr	1281.00
33-150	Sawbuck	529.00
33-990	10" Radial Arm Saw	474.50
34-410X	10" Contractor Saw	699.00
34-761	1 1/2 H.P. Unisaw	1395.00
34-782	3 HP Unisaw W/Unifence	1895.00
37-220C	6" Jointer	1250.00
37-255	6" Jointer	495.00
40-500	15" Scroll Saw	99.95
40-601	Electronic Scroll Saw	699.00
43-122	1 H.P. Wood Shaper	528.95
43-375	3 H.P. Wood Shaper	1399.00
46-140	11" Lathe	433.95
46-541S	12" Lathe	1399.00

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	80	10.00 pk.	8.60 pk.
Assortment	60	10.50 pk.	9.20 pk.
of 10 $12.95	50	10.70 pk.	9.40 pk.
	40	11.00 pk.	9.60 pk.
3" x 24"	120	12.00 pk.	9.30 pk.
	100	12.00 pk.	9.30 pk.
	80	12.20 pk.	9.70 pk.
Assortment	60	12.60 pk.	11.20 pk.
of 10 $13.95	50	13.10 pk.	11.50 pk.
	40	13.40 pk.	11.80 pk.
4" x 24"	120	16.80 pk.	14.60 pk.
	100	16.80 pk.	14.60 pk.
	80	17.30 pk.	15.10 pk.
Assortment	60	17.80 pk.	16.40 pk.
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	40	18.90 pk.	17.60 pk.

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LU73M12	12"	72	Cut-Off	76.90
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LU82M10	10"	60	Cut-Off	39.95
LU82M12	12"	72	Cut-Off	85.95
LU84M11	10"	50	Comb.	36.95
LU85M10	10"	80	Cut-Off	59.95
LM72M10	10"	24	Ripping	33.95
DS306	6"	Dado		89.95
DS308	8"	Dado		99.95

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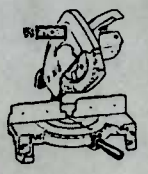
RYOBI POWER TOOLS



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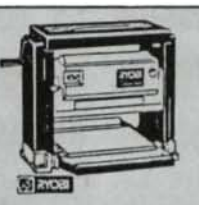
10" Mitre
$155

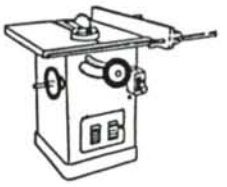
RA 2500
10" Radial Arm Saw
$309
Stand Optional
$29

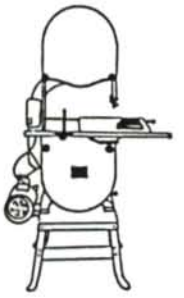
TS 380
14" Mitre
$309

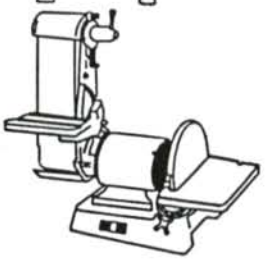
W 200S
16" Circular Saw
$299

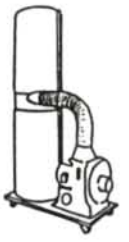


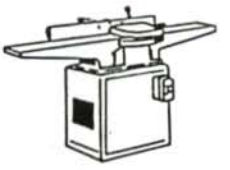
AP 10
10" Planer
$349











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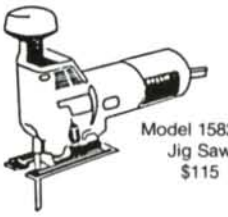

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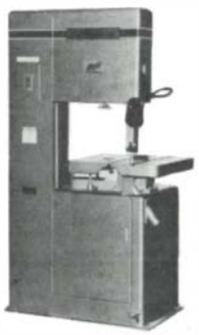

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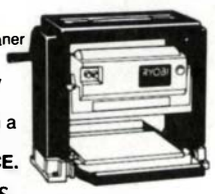

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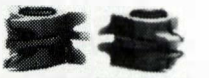

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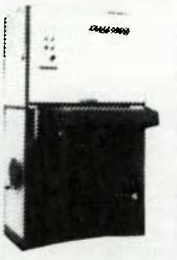

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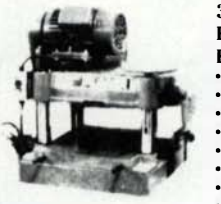

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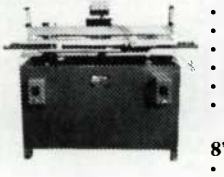

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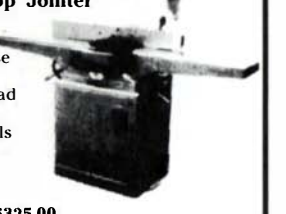

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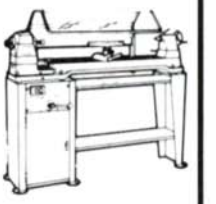

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Publications

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Listings are free, but restricted to happenings of direct interest to woodworkers. Our Jan./Feb. issue will list events between Dec. 15 and Mar. 15; deadline Nov. 1. Our Mar./Apr. issue will list events between Feb. 15 and May 15; deadline Jan. 1.

ARIZONA: **Shows**—Ed Moulthrop, wood artist, Nov. 1–30; The Art Form of Wood Turning, works by 19 artists. Nov. 20–Dec. 31. At The Hand and the Spirit Gallery, 4222 North Marshall Way, Scottsdale, 85251.

CALIFORNIA: **Workshops**—Woodworking for women, beginners and advanced, traditional furnituremaking, focus on handtools. Contact Debey Zito, 103 Wool St., San Francisco, 94110. (415) 648-6861.
Show—Northern California Woodworking, featuring demonstrations, seminars, Nov. 21–23. San Jose Convention and Cultural Center, Exhibit Hall, 291 South Market St., San Jose. Contact Irene Devine, (800) 826-8257.
Exhibition—1986 Western Regional Images in Marquetry, through Oct. 31. Center Hall Gallery, 931 N. Harbor Blvd., Anaheim. Contact Gordon C. Olson, 16707 Garfield St., No. 1217, Paramount, 90248. (213) 630-2922.
Exhibition—West Marin Woodworkers Association 5th annual exhibit, Nov. 29–Dec. 15. Closed Sundays. Adraskand Gallery, Main St., Pt. Reyes. (415) 663-1775.

COLORADO: **Juried exhibition**—2nd annual Colorado Woodworkers, through Dec. 16. Pioneers' Museum of Colorado Springs, 215 S. Tejon, Colorado Springs. Contact Woodworkers Guild of Colorado Springs, Box 9594, Colorado Springs, 80932. (303) 632-8548 or (303) 630-1422.
Workshops—Furniture design and construction; bandsawn boxes; Art Carpenter, Nov. 15-16. Contact Ray Scott, Woodworking Weekends of Colorado, 12922 W. Montana Ave., Lakewood, 80228. (303) 986-9102.

CONNECTICUT: **Juried exhibition**—18th Annual Celebration of American Crafts, Nov. 10–Dec. 23. Write Roz Schwartz, Creative Arts Workshop, 80 Audubon St., New Haven, 06511.
Juried fair—15th Annual Woodbury League of Women Voters craft fair, Nov. 22. Mitchell Elem. School. Contact Helen Cronk, 13 White Deer Rd., Woodbury, 06798.
Juried exhibition—3rd Annual Woodworkers Guild of Connecticut exhibition. through Dec. 7. Wethersfield Historical Society, Old Academy Museum, 150 Main St., Wethersfield.
Workshops—Birdcarving, through Nov. 6; woodworking, through Nov. 16. Contact Brookfield Craft Center, Box 122, Brookfield, 06804. (203) 775-4526.
Show—11th annual creative arts festival, Nov. 22–23. Sponsored by Westport Young Woman's League. Staples High School, North Avenue, Westport. Contact Sharon Schroeder, (203) 226-3247.

GEORGIA: **Seminars**—Bowl turning, Liam O'Neill, Oct. 31–Nov. 2; basic joinery, Zach Etheridge, Nov. 8; routers and jigs, Zach Etheridge, Nov. 15. Highland Hardware, 1045 N. Highland Ave., Atlanta, 30306. (404) 872-4466.

ILLINOIS: **Show**—16th Annual Midwestern Woodcarvers, Nov. 1–2. Belle-Clair Exposition Hall, 200 South Belt East, Belleville. Contact Don Lougeay, 1830 East 'D' St., Belleville, 62221. (618) 233-5970.
Seminar—Illinois Woodworking Teacher's Association, Nov. 7. Illinois State University, Circus Room of University Union, Normal. Contact Steven M. Pille, 11502 West Grubb Road, Mapleton, 61547.

LOUISIANA: **Juried show**—Made in the Shade, 19th Annual Louisiana Crafts Coucil, Jan. 30–Feb. 20. Slide entry deadline Nov. 1. American Crafts Council Southeast Conference, Louisiana State University, Baton Rouge. For prospectus send SASE to: K.B. Davis, 1717 Stanford Ave., Baton Rouge, 70808.

MASSACHUSETTS: **Workshops/seminars**—Numerous events. Contact The Woodworkers' Store, 2154 Massachusetts Ave., Cambridge. (617) 497-1136.
Juried show—7th Annual Fair of Traditional Crafts, Nov. 1 and 2. Contact Frank G. White, Old Sturbridge Village, Sturbridge, 01566. (617) 347-3362, ext. 236.
Show—Contemporary folk art, including painted wood sculpture by Sandra Berry. Oct. 26–Nov. 22. Contact Ten Arrow Gallery, 10 Arrow St., Cambridge, 02138. (617) 876-1117.
Show—American Furniture: Past and Present, antique and contemporary furniture, through Oct. 27. Contact Meryl Zassman at The Society of Arts and Crafts, 175 Newbury St., Boston, 02116. (617) 266-1810.
Fair—Worcester Craft Center's 17th annual craft fair, May 15–17. Application deadline Feb. 14. Contact Craft Fair Registrar, Worcester Craft Center, 25 Sagamore Rd., Worcester, 01605. (617) 753-8183.
Workshop—8th annual wood identification, R. Bruce Hoadley, Jan. 20–23. Registrations accepted from Oct. 1st. Contact Antoinette E. Tomasik, Program Coordinator, Div. of Continuing Education, Goodell Bldg., Room 608, Univ. of Mass., Amherst 01003. (413) 545-2484.

Photo: George Erml

Edward Burak's smoking pipes are in the inaugural exhibition at the new American Craft Museum, 40 West 53rd St., New York, NY 10019, opening October 26th.

MICHIGAN: **Exhibition**—Woodworking '86, 5th annual show by Michigan Woodworkers' Guild. Oct. 30–Nov. 2. Somerset Mall, Big Beaver at Coolidge, Troy. Contact Greg Cornell, (517) 546-3688.

MINNESOTA: **Workshops/seminars**—Numerous events. The Woodworkers' Store, 3025 Lyndale Ave. S., Minneapolis. (612) 822-3338.

NEW JERSEY: **Juried exhibition**—New Jersey Arts Annual, fiber, metal and wood, Nov. 1–Jan. 11. New Jersey State Museum, 205 West State St., Trenton, 08625. (609) 292-5420.
Show—Creative Crafts 1986 show and sale. Glass, textiles, wood, pewter. Nov. 2–5. Sponsored by Sisterhood Temple Emanu-el, 756 East Broad St., Westfield, 07090. Contact Susan Rosenbaum, (201) 232-0711.
Show—Holiday toys for big girls and boys, Dec. 2–Jan 3. Sheila Nussbaum Gallery, 358 Millburn Ave., Millburn, 07041. (201) 467-1720.

NEW MEXICO: **Festival**—14th Annual Southwest Arts and Crafts Festival. Nov. 14–16. New Mexico State Fairgrounds, Albuquerque. Write Southwest Arts and Crafts Festival, Box 11416, Albuquerque, 87192.

NEW YORK: **Workshops**—Japanese hand tools and timber frame construction. The Luthierie, 2449 West Saugerties Rd., Saugerties, 12477. (914) 246-5207.
Exhibition—The Chair Fair, seminars and display. Nov. 10–Dec. 6. International Design Center, New York, Center Two, 30-20 Thomson Ave., Long Island City. Contact Christopher Flacke, The Architectural Center of New York, 457 Madison Ave., New York, 10022.
Tour—Moroccan Craft Tour, Nov.15–29. Contact Tom Muir Wilson or Sherry Clark, Directors, Craft World Tours, 6776 Warboys Rd., Byron, 14422. (716) 548-2667.
Juried exhibition—Mixed media, Dec. 6–7. Schenectady Museum & Planetarium, Nott Terrace Hgts., Schenectady. Contact Karen Engelke, 1791 Central Pkwy., Schenectady, 12309. (518) 372-9155.
Juried exhibition—33rd annual national, sponsored by the Mamaroneck Artists Guild, Oct. 24–Nov. 9. Community Unitarian Church, Rosedale Avenue, White Plains. Contact Open Juried Exhibition, Mamaroneck Artists Guild Gallery, 150 Larchmont Ave., Larchmont, 10538.
Exhibition—FRESH–never shown in N.Y. market, through Nov. 2. Contact Vanessa S. Lynn, The Gallery at Workbench, 470 Park Ave. South, New York, 10016. (212) 481-5454.
Conference—sponsored by Cryder Creek Wood Shoppe, lecturers/demonstrators, Ellsworth, Stirt, Sharpless, Loar, Nov. 1. Alfred University, Alfred. Contact Cryder Creek Wood Shoppe, Box 35, Whitesville, 14897. (607) 356-3304.
Juried show—1st annual international carving, art of the wooden bird, Nov. 15–16. Best Western Red Jacket Inn, Niagara Falls. Contact Melvin J. Ott, Dovetails Etc., 324 Ward Rd., North Tonawanda, 14120.
Exhibition—Bent Wood and Metal Furniture: 1850-1946, through Nov. 15. Sponsored by The American Federation of Arts, Derek Ostergard, curator. IBM Gallery of Science and Art, New York City. Contact Sandra Gilbert, 41 E. 56th St., New York, 10021. (212) 988-7700.
Exhibition—4th Annual Theater Place Showcase of Craft Arts, multi-media. Nov. 9–10. 101 Theater Place, Buffalo 14202. Contact Charles Breihof, Executive Director, Downtown Buffalo Management Corp., 671 Main St., Buffalo. (716) 856-3150.

NORTH CAROLINA: **Show**—1986 Woodworking World–The Charlotte Show, Nov. 21–23. Charlotte Civic Center. Contact Convention Designs, Inc., Box 485, Plymouth, NH 03264. (603) 536-3768.

OHIO: **Demonstrations/seminar**—New Inca 12-in. tablesaw, Mark Duginski, Nov. 4; Inca machinery, Nov. 18. Call for details. Woodcrafters Supply Co., 20 Arcadia, Columbus, 43202. (614) 262-8095.
Juried exhibition—Cincinnati Woodworking, Nov. 29–Dec. 21. Emery Galleries, Edgecliff Campus, Xavier University, 2220 Victory Parkway, Cincinnati, 45206.
Show—Artistry in Wood, woodcarving and woodworking, Nov. 22–23. Registration deadline Nov. 3. Hara Arena, Dayton. Contact Ralph Moeller, Registration, 22 Temple Dr., Xenia, 45385.

OREGON: **Juried show**—Masks, mixed media, through Nov. 9. Hoffman Gallery, Oregon School of Arts and Crafts, 8245 SW Barnes Rd., Portland, 97225.
Exhibitions—Life-size bird carvings, Del Smith, Nov. 9; New Zealand craftsmen, their native materials, Dec.–Jan. The Gallery, World Forestry Center, 4033 SW Canyon Rd., Portland, 97221. (503) 228-1367.
Workshops—Box building, Nov. 1–2. Oregon School of Arts and Crafts, 8245 S.W. Barnes Rd., Portland, 97225. (503) 297-5544.

PENNSYLVANIA: **Show**—10th-annual Philadelphia Craft Show, sponsored by the Women's Committee of the Philadelphia Museum of Art. Handmade mixed-media. Nov. 7–9. 103rd Engineers' Armory, 33rd St., Philadelphia. (215) 787-5431. Guided bus tour of private homes, Nov. 7. (215) 787-5448.
Exhibition—Wharton Esherick, sculpture, furniture, utensils, daily. The Wharton Esherick Museum, Box 595, Paoli, 19301. (215) 644-5822.
Symposium—Jack Lenor Larsen on decorating with crafts, Nov. 8. Stein Auditorium, Drexel Univ., Philadelphia. For reservations call (215) 787-5448.
Juried exhibition—1st annual Pennsylvania National Arts and Crafts and Christmas, Dec. 5–7. David Lawrence Center, Penn. Ave., Pittsburgh. Contact Kay Kishbaugh, Pa. National Christmas Show, Box 11469, Harrisburg, 17108. (717) 763-1254.
Seminars/demonstrations—Ornamental carving and inlay, Will Tillman, Nov. 1; small repairs, Nov. 15; Inca power tool demonstrations, Nov. 8, Dec. 6, 13; power tool joinery, Chris Schwamb, Jan. 17. Olde Mill Cabinet Shoppe, RD 3, Box 547-A, York, 17402. (717) 755-8884.

TENNESSEE: **Show**—20th annual fall, Nov. 14–16. Civic Center, Oak Ridge Turnpike, Oak Ridge. Contact Foothills Craft Guild, Inc., Box 99, Oak Ridge, 37831.
Juried exhibition/workshops—Space: New Form, New Function, mixed media, Oct. 25–Jan. 24. Spring 1987 assistantships, Mar. 9–Apr. 3, application deadline Jan. 17. Arrowmont School of Arts and Crafts, Box 567, Gatlinburg, 37738. (615) 436-5860.

VIRGINIA: **Juried show**—Annual hand crafts, Oct. 24–26. Radisson Hotel, Lynchburg. Contact Lynchburg Fine Arts Center, 1815 Thomson Dr., Lynchburg, 24501. (804) 846-8451.

WASHINGTON: **Show**—6th annual woodcarving, sponsored by Northwest Carvers Association, Nov. 8–9. Western Washington Fairgrounds Expo Hall, 9th and Meridian, Puyallup. Contact Evelyn Gosnell, 115 Del Monte Ave., Fircrest, 98466. (206) 564-3278.
Show—Western Washington woodworking, Oct. 31–Nov. 2. Seattle Center, Exposition Hall, 305 Harrison, Seattle. Contact Irene Devine, (800) 826-8257.
Classes—Basic and precision woodworking and furniture making, Nov. 1–15. Contact George Herrmann, Everett Community College, 801 Wetmore Avenue, Everett, 98201. (206) 259-7151, ext. 448.
Classes—Cutting 5-10 tenon miter joints, Nov. 16. Contact Charles Mastro, 4268 10th Avenue South, Seattle, 98108. (206) 767-9185.
Workshops/demonstrations—Tools-In-Action series, free, every Saturday, 10 A.M. Boatbuilding, woodcarving, sharpening, other woodworking topics. The Wooden Boat Shop, 1007 NE Boat St., Seattle, 98105. (206) 634-3600.

WISCONSIN: **Juried show**—15th annual festival of the arts, Mar. 29. College of Fine Arts, University of Wisconsin, Stevens Point campus. Write: 15th Annual Festival of Arts, Box 872, Stevens Point, 54481.

AUSTRALIA: **Show**—Multi-media craft show, Nov. 26–30. Sydney Showground. Write Australian Craft Show, 5 Henley St., Lane Cove, N.S.W. 2066. (02) 427-6120.

ONTARIO: **Exhibition**—Virtu '85, Nov. 6–30. Toronto Design Centre Gallery, 160 Pears Ave., Toronto.

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DELTA

Building On Tradition

The Pine Furniture of Early New England by Russell Hawes Kettell. *Dover Publications, Inc., 180 Varick Street, New York, N.Y. 10014; 22nd edition, 1984. $15.00, cloth-bound; $12.50, paperbound; 288 pp.*

This book, originally published in 1929, shows 229 pine objects ranging from pipe box to highboy. Each photo (black and white) is accompanied by a short text and there are measured drawings of about 50 of the pieces. The separate sections on hardware, boxes, chests, stools, etc., are introduced by short chapters that serve to pull the whole work together.

The author was a woodworker himself; throughout the book he calls attention to construction methods, both good and bad, and forthrightly speculates about why some of the more curious works were ever made at all. A museum scholar could well argue that much of the work shown is not the best quality, and that the author is too subjective and overenthusiastic. Also, a strict pedant might not appreciate the frequent touches of wry humor. Yet the author's sheer love of these earliest American antiques, and the people who made them, shines through undimmed by the more than fifty years since the first printing. I feel like I've met a new friend and joyfully recommend the book to anyone who doesn't have it already. *—Jim Cummins*

The Art of Turned-Wood Bowls by Edward Jacobson. *E.P. Dutton, Inc., 2 Park Ave., New York, N.Y. 10016; 1985. $16.95, paperback; 88 pp.*

Woodturning is a craft that's come of age, but unlike its older siblings, clay, glass and metal, which have long been courted by museums and the art press, woodturning remains a wallflower in the eyes of the art world. There are signs that this is beginning to change. A few individuals—Stephen Hogbin, David Ellsworth and Mark Lindquist, to name three—have broken the art barrier by using the lathe to produce works that are purely sculptural. Seeing their success, other avant-garde turners have followed suit, moving further and further away from woodturning's roots—the down-home utilitarian object.

No less deserving of recognition are the turners who prefer to make wooden bowls. *The Art of Turned-Wood Bowls*, a photo gallery of 87 pieces from the collection of Edward Jacobson, a lawyer in Phoenix, Ariz., showcases the work of 19 talented bowl turners. A photo of each turner (mostly at-the-lathe shots) is accompanied by a biographical sketch, a brief "statement from the artist" and several pages of finished-work photos. For an aspiring bowl turner, the book is a veritable cornucopia of ideas and inspiration, from 1930s-modern shapes by turning pioneer James Prestini to the forthrightly functional bowls of Alan Stirt. I don't know of another book that allows the reader to compare and contrast such a wide range of styles. *—David Sloan*

Recreating the Double Barrel Muzzle-Loading Shotgun by William R. Brockway. *George Shumway Publisher, R.D. 7, Box 388-B, York, Pa. 17402; 1985. $20, paperback; $27.50, hardcover; 198 pp.*

If you have a taste for fine vintage shotguns, this is definitely the book for you. In it you'll find all you need to know to make a classic English double gun, either flintlock or percussion. This sort of high-style gunmaking could be called the decathlon of home-workshop projects. It will challenge your skills in designing, carving, inletting, filing, engraving, welding, machining, checkering, polishing and finishing.

Like decathlon champs, top-notch gunmakers don't grow on every tree. Rarer still is the expert gunsmith who can write well about his craft. Brockway pulls it off with style. Detailed photos of his work attest to his skill with the tools and his crystal-clear explanations are a pleasure to read. Hundreds of photos and line drawings (including two full-size shotgun drawings that may be used as patterns) left few of my questions unanswered. Why can't all how-to books be as good as this one? *—David Sloan*

Sharpening and Care of Woodworking Tools and Equipment by John Sainsbury. *Guild of Master Craftsman Publications Ltd., 170 High St., Lewes, East Sussex, BN7 1YE England; 1984. $14.50 U.S., £8.50 U.K., paperback; 115 pp.*

With a half-dozen titles in print, John Sainsbury is one of the most prolific woodworking authors around today. His latest book, *Sharpening and Care of Woodworking Tools and Equipment*, is a hodgepodge conglomeration of tool tidbits. Part grinder catalog and part how-to-do-it, the book looks and reads like it was thrown together in a hurry. There's a lot of fluff, but there is some substance, too. Neophyte woodworkers will find portions of this book useful.

Sainsbury tells briefly how to sharpen just about any tool that slices, drills, scrapes or saws. There are some nice tips—how to grind jointer knives on a drill press, for example. Most of the information, however, is very basic. Don't look here for in-depth analysis of the pros and cons of secondary plane-iron bevels—they're illustrated, but nothing is written about them. Electric sharpening machines (most of them European) are described and pictured in large black and white photographs, but Sainsbury never bothers evaluating any of them. *—David Sloan*

The Garland How-To Index by Grady Lynn Holt. *Garland Publishing, Inc., 136 Madison Ave., New York, N.Y. 10016; 1985. $27.00, hardcover; 275 pp.*

Holt, a do-it-yourselfer, woodworker and, apparently, magazine collector, got tired of flipping through his stack of back issues searching for faintly remembered bits of information. This index is his solution to the problem. It covers issues of *Popular Mechanics, Family Handyman, Fine Woodworking, Workbench, Woodsmith, Rodale's New Shelter* and *Popular Science* from 1972 through 1984. The 7,500 entries seem to concentrate on woodworking and home-maintenance; there are 294 entries, for example, about tables. This is a useful, if expensive, book for those pack rats who actually want to make use of the stacks of magazines about to crash through their attic floor. *—Roger Holmes*

Contract Joinery by Ken Austin. *Northwood Books, London, 1981; distributed by R. Sorsky, 3845 N. Blackstone, Fresno, Calif. 93226. $24.95, hardcover; 169 pp.*

Small shops still make a lot of Britain's architectural woodwork—you can't order a window for a 17th-century cottage from a catalog. Austin's book was written for apprentice joiners who are required to know the old methods as well as the new (in Britain, it's often hard to distinguish between the two anyway). *Contract Joinery* covers a lot of territory—doors, windows, partitions and paneling, staircases, handrails and ecclesiastical joinery. There's not much on technique here—the students would be getting that in the workshop. The drawings are useful, particularly the sections, but the text is hard to follow. There might be rewards for the patient stair builder—the drawings interested me, although the welter of geometry and calculations defeated my cursory read. *—Roger Holmes*

Jim Cummins, David Sloan and Roger Holmes are associate editors of Fine Woodworking.

Sound craftsmanship

Patrick Shanahan

David van Edwards of Norwich, England, calls his left-handed lute a 'moderately authentic' copy of an Italian original made in 1582. It was one of many outstanding musical instruments in the Crafts Council Gallery Exhibition in London.

If you work, as I do, exclusively in one woodworking specialty, it's refreshing to see the exceptional work done by craftsmen in other disciplines. As a carver and gilder, the work I produce exists purely on aesthetic terms. There's no need for a bit of carved molding to fulfill some utilitarian purpose. More is expected of furniture, which must be both visually pleasing and functional.

Because they exist only to make sound, musical instruments are unique in terms of form and function. But, as a secondary quality, they can also be beautiful, as I found out last summer at an exhibition of instruments sponsored by the British Crafts Council.

In all, some 250 instruments were displayed, including an impressive grouping of large keyboard instruments. One highlight of the exhibit was a display of 50 instruments from the collection of David Munrow, who was influential in reviving interest in early musical instruments.

After touring the show I felt that even as a non-musician (or perhaps especially so) it was worth seeing. It was a stimulating insight into an aspect of woodworking I don't see very often and it got me to thinking about how my own work fits into the grand scheme of things. *—Ben Bacon, London*

An unconventional convention

Since 1972, the Guild of American Luthiers (G.A.L.) has been working alongside a hard core of guitarmakers—helping them expand their knowledge, share their skills and perhaps increase their chances of survival. It's been a tumultuous 14 years for the Guild. Sputtering along for the first four years, it managed to build an organization of 1,500 by the early 1980s. When the economy turned sour in 1981, the Guild fought hard to keep from delaminating. The boom days of the country/folk revival were a distant memory, with nothing on the horizon to replace them. "The market was never any good for luthiers," says Tim Olsen, editor of the Guild's quarterly publication, *American Lutherie*. But when things get tough, Olsen figures that the custom luthier is "the most expendable of all." The last thing people need is an expensive, hand-crafted guitar—especially when Japan is churning out good-quality instruments for a fraction of the price of a handmade guitar.

The Guild survived the recession, and has boosted its membership to almost 2,300. A handful of members are beginning to achieve a measure of recognition and financial success making guitars for musical luminaries such as the Everly Brothers, Joni Mitchell, Alex de Grassi, and Julian Bream.

Once every two years, the Guild of American Luthiers puts their show on the road and stages a convention. This summer was the Guild's 10th such event, held in Tacoma, Wash.—home of the Guild's headquarters and the offices of *American Lutherie*. I've been to many gatherings of woodworkers over the years, but it was clear from the start that the Guild convention would be different. Most conspicuous by their absence were the salesmen, who seem to congregate wherever woodworkers get together. Apart from a handful of wood dealers, there was no one pitching signature sawblades or even Chet Atkins pick-guards. I suspect that every instrument in the room was for sale, but no sane luthier would try to sell an instrument to another starving maker.

Instead of making deals, this three-day, biennial convention was all about making instruments. Like proud parents showing off a new child, about 200 members trucked their latest and best guitars across the country to show what they had done since the last Guild convention.

Information was officially exchanged in workshops and lectures on subjects as diverse as French polishing, exotic woods and non-traditional aesthetics. In a talk about corporate guitar design, for example, "white-collar" luthier Tim Shaw, Research & Development Director for Gibson, described the opportunities and sacrifices of guitarmaking in the fast lane.

One particularly interesting forum brought together five veteran steel-string guitarmakers with wildly divergent perspectives. Questions ranged from the technical realm of wood selection and humidity control to the netherworld of production and sales figures. While one custom maker on the panel claimed to have built every guitar to satisfy only himself, Jean Larrivee of Vancouver, Canada, talked in terms of profitability and captivating markets. His small company's lifetime production of 8,000 to 9,000 guitars elicited an audible gasp of amazement from the audience.

While such forums and workshops are useful, the real exchange at the G.A.L. convention took place on the exhibition floor, where it was possible to inspect at close range the best efforts of some 70 luthiers. Several hundred acoustic guitars were in evidence, along with a sprinkling of solid-body electrics, and a garnish of twelve-string guitars, banjos, dulcimers, harps, lutes and harpsichords. I'm sure I've never seen (and may never see again) so many elegant instruments assembled in one room. Dick Boak, of Nazareth, Pa., brought his latest creation—a laminated, solid-body, fretless electric bass comprised of 20 species and 129 pieces of wood. With the assistance of his Apple computer, California maker Steve Klein demonstrated some of the ways in which

micro-chip graphics might revolutionize guitar design in the next decade.

Much of the guitar's art (and certainly its price tag) is reflected in the maker's choice of wood and the design of the rosette and peghead. To my eye, however, one of the most interesting instruments at the convention was not the flashiest. Pushing my way past rows of inlaid pegheads and molded epoxy rosettes, I was delighted to discover the "rough-cut" guitar made by Max Krimmel of Boulder, Colo.

Displayed on a ratty green bath towel, in calculated contrast to the glitz of the concert guitars all around, Krimmel's guitar had no rosette, no purfling, no mother-of-pearl inlay. But what looked at first to be quick and dirty, was actually Krimmel's latest effort to determine how important a carefully planed soundboard is to the tone of an instrument. The outside surface of the spruce top was un-planed, left exactly as it came off the bandsaw, save three coats of sprayed lacquer. The inside was finished with a plane and scraper, "just as immaculately as I can make it," Krimmel said. All of Krimmel's latest instruments have been experimental—pushing the form as far as he could. From what I could tell, the action and the sound were easily equal to most of the instruments in the room.

For the luthier, hearing other maker's instruments is as important as seeing them and the din of the exhibition hall was no place to give proper audience to a fine guitar. But that didn't seem to stop anyone, as the makers took every opportunity to compare the sound of their own instruments with that of their colleagues'. When all the programmed events were concluded, informal concerts and instrument trials sprouted in dorm rooms, carpeted stairwells and empty lounges, carrying on well past midnight. Luthiers plucked each other's guitars in search of a certain evanescent quality, a crispness of note, a transparency of tone that distinguishes a great guitar from a good one. Long into the night, they struggled in a language all their own to assign words to the color of music: overtones, wolftones, fundamentals and sustain.

In its brief lifetime, the Guild has faced the same harsh realities as the rest of the craft world. There is no more money now—probably less, in fact—than there ever was for the makers of custom guitars. Many of the less-successful luthiers have long since been winnowed out. It seems clear that the newcomers must find a shorter route to the front than the largely hit-or-miss, self-taught path of their predecessors. In that respect, the G.A.L. fills a vital function. It is also a relief to discover that the Guild is still small enough to bring the family together every other year just to see the kids, pay homage to the old-timers and swap a few recipes.

Guitarmaker Richard Schneider demonstrates his vacuum clamping system at the Guild of American Luthiers convention in Tacoma, Wash.

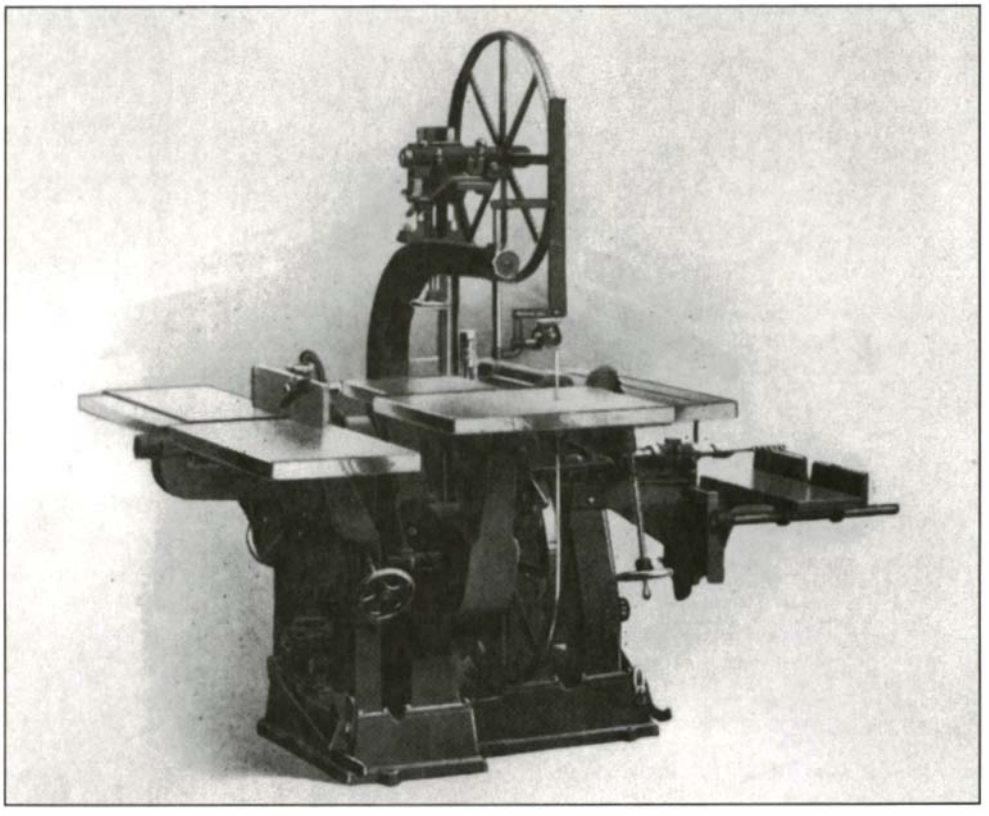
Membership in the Guild and a year's subscription to the Guild's quarterly journal, *American Lutherie*, costs $25 and may be obtained by writing The Guild of American Luthiers, 8222 South Park Avenue, Tacoma, Wash. 98408.

—Scott Landis, Newtown, Conn.

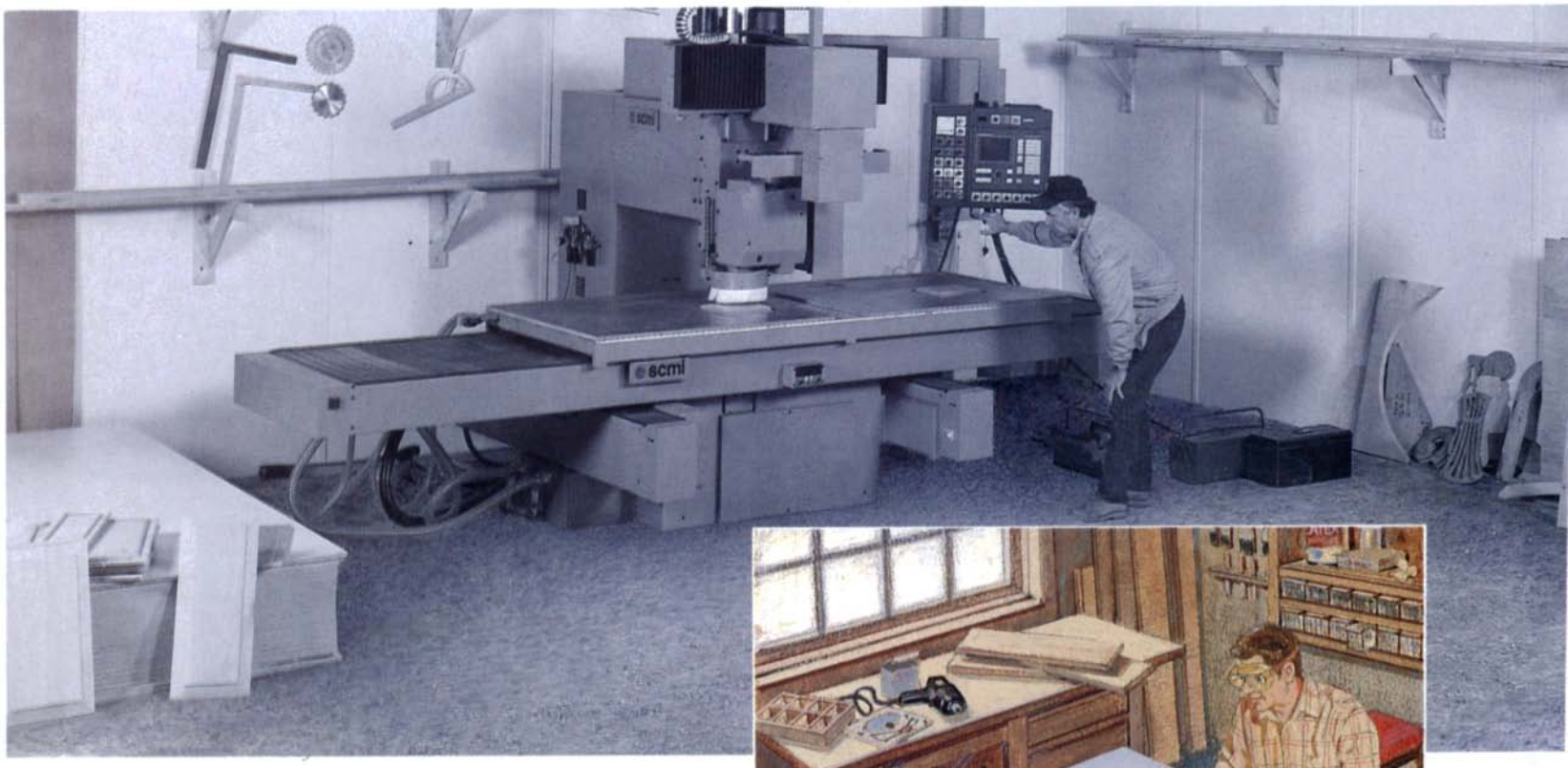
Universal Wood-Worker Association

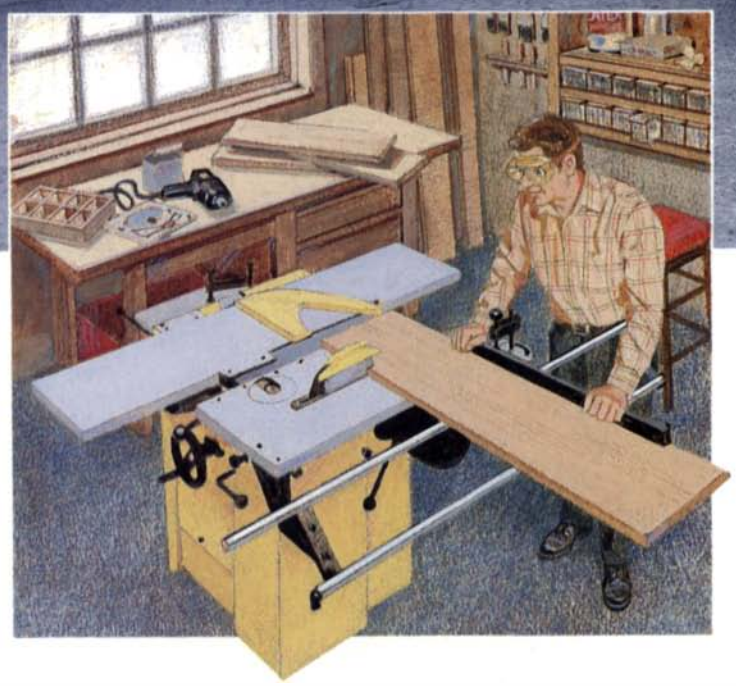
The Universal Wood-Worker was the Crescent Machine Company's do-everything combination woodworking machine. In production from the late 1890s to the early 1940s, the Universal combined bandsaw, jointer, shaper, tablesaw and horizontal borer in one space-saving package, which tipped the scales at 1,700 to 5,200 lb., depending on the model. Ads claimed that five men could work at the various belt-driven machines at the same time without interfering with each other.

Times change. Today, these cast-iron dinosaurs haunt forgotten corners of rickety barns and ancient factory buildings. But if you're interested in sleuthing out one of these antiques and bringing it back to life, get in touch with the Universal Wood-Worker Association. Started by Bill Mueller, who owns and operates a Universal himself, the U.W-W.A. can provide assistance in finding, restoring and operating the Crescent Universal Wood-Worker. Members get a subscription to the Association's bi-monthly newsletter. For more information write: Bill Mueller, Universal Wood-Worker Association, Rt. 1, Box 262, Middlebourne, W. Va. 26149.



Crescent Machine Company's Universal Wood-Worker packed five machines into one space-saving package. Bill Mueller, a West Virginia enthusiast, has turned his interest in the machine into the Universal Wood-Worker Association.





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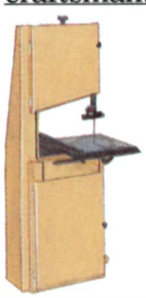

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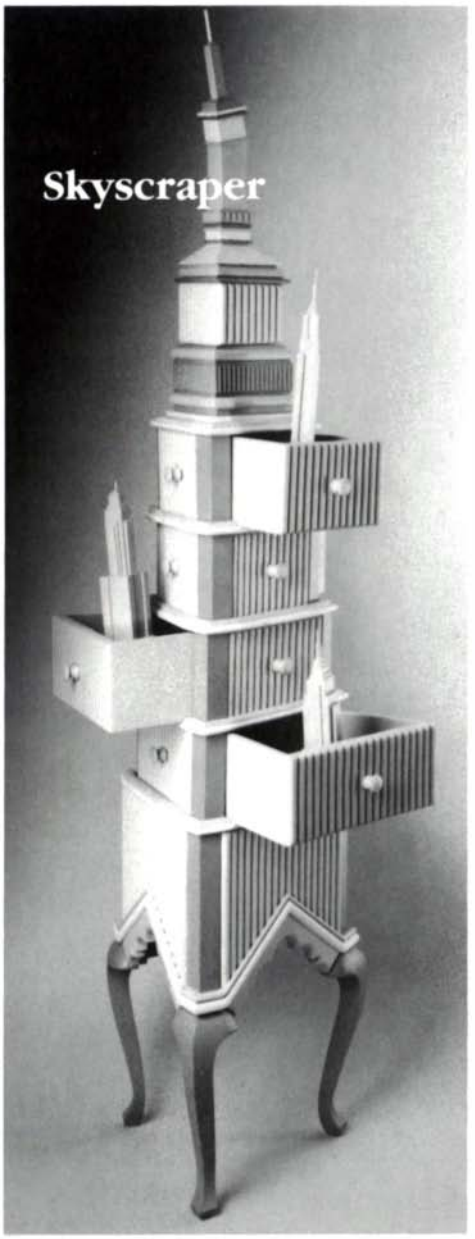

'Sometimes I lean to the right, Sometimes I lean to the left,' is the title of this painted poplar chest by John McNaughton of Evansville, Ind. Photo courtesy of Liberty Gallery, Louisville, Ky.

Furniture competition

Furniture designers are invited to enter their original designs in *Progressive Architecture* magazine's seventh annual International Furniture Competition. All types of furniture and lighting designs are eligible, as long as the design has not yet been marketed. Designers may submit project drawings or color slides of either finished pieces or models. Entries must be received by January 9, 1987; judging will take place in February. Winners will be published in the May, 1987, issue of *Progressive Architecture*. A $35 entry fee must accompany each submission. For details write to *Progressive Architecture*, 600 Summer St., P.O. Box 1361, Stamford, Conn. 06904.

Client connection

When Toni Fountain Sikes wanted a dining-room suite for her Madison, Wisc., home, she thought she'd commission a local furnituremaker to design something special. But finding one proved difficult, since one-off furnituremakers don't often advertise. Knowing a marketing problem when she saw one, Sikes put her mind to bridging the gap between the maker and the customer.

The Guild: A Sourcebook of American Craft Artists is the fruit of her labors. This 360-page color catalog showcases the work of more than 300 craft artists in every imaginable medium and style. Sikes figured that the best way to reach affluent customers was to convince their architects and interior designers to think crafts. "We tried to fit in with how these designers already worked," she says. A catalog made sense because they were already accustomed to shopping through manufacturers' catalogs.

Kraus Sikes, Inc., the publisher, retains a public relations firm to promote the catalog and 10,000 copies were distributed free among designers and architects. Others are for sale for $75 per copy.

A second edition is already full, but space in the third edition is available at a base rate of $870 for a single page. For details write: Kraus Sikes Inc., 150 West 25th St., New York, N.Y. 10001.

Equal opportunity employment

In 1937 the nation was in the grips of the depression, with unemployment over 14%. The only way you could get a job was to know somebody. My connection was a family friend who was about to leave his job, as an assembler of furniture frames, for a better position. He thought he could get me in the door as his replacement. *His* connection was that he and the factory owner, Mr. Martin, had worked together in their younger days.

I soon learned that the way I was hired would cause me some problems. The shop foreman was a Czech named Joe, who normally did the hiring himself—he had two sons, a father-in-law, brother-in-law, cousin and several friends on the payroll. I found myself very much in the minority. Joe assigned work orders to the assemblers in lots of from 10 to 100 suites per order. This was piecework and the pay was from 25¢ to $1 per suite. After you had learned the ropes you could earn from $15 to $25 per week, which was good in those days.

The trick was you had to learn by memory which parts went into a given suite number. For example, a model 1052 suite had ball-and-claw feet and carvings at the top of the chair and sofa backs, besides all the frame members. The assembler had to know which parts to pull from stock. If I made a mistake, Joe would berate me in German, Czech, English and Quaker right in front of the other assemblers.

But still, a job was a job and I hung on. Sometimes I spent two or three days at my work station without an assignment, house cleaning or watching some of the other operations. I made friends with a carver named Mike Berry. He sat on a high stool with his feet on rests like stirrups with a high-speed cutter almost in his lap. I was amazed at how fast and how precise his work was. He could produce an intricate carving in just a few minutes. This was also piecework and it was rumored that he averaged more than $1 per hour.

Another job that caught my eye was what was called a "pattern maker," (not to be confused with the patternmakers associated with foundry operations). When the furniture designers finished a new design, they brought the blueprints out to Joe, and he and the pattern maker would make a set of templates, drill jigs, router forms, etc., and build a suite from them to proof out their tools before production. I would have loved to have had an opportunity to learn that job and besides, the pattern makers spoke English!

We used to get off work at noon on Saturdays. One day, I was waiting on the corner for the trolley car to town when Mr. Martin, the factory owner, stopped in his Cadillac and offered me a ride. He asked me whether I could run a lathe, and it turned out he wanted some personal work done during my spare time in the shop, things such as lamps, salad bowls from myrtlewood, chess sets from exotic woods, etc. I jumped at the chance.

Mr. Martin asked how I liked my job, and I told him I loved it, but I was having difficulty learning the make-up of all the different suites of furniture and I wished that we had drawings or a parts list for each suite. His reply was "Oh, we have blueprints with a parts list, just see Joe, he has them." The next time Joe gave me a work order, I asked him for the blueprint. Joe said "You no need blueprint, ask me, I show you." Well, I had been down that road before, so later I went over to the mill and asked the pattern maker where they kept the blueprints. He looked at me with amusement for a moment, then looked around as if to see who was near enough to hear and said to me in a low voice, "Kid, after we make a set of patterns and check them out, Joe studies that drawing from A to Z and then the drawing goes in *there*." He pointed straight at the incin-

INDEX TO ADVERTISERS

A.J. Tool	102	Educational Lumber	23	Leigh Industries	23	Sharpco of Canada	28
Abbey Tools	96	Elektra Beckum U.S.A.	97	LeNeave Supply	108	Shophelper	31
Acme Electric	115	Emco USA	33, 121	Lignomat USA	121	*SignCraft Magazine*	11
Adams Wood Products	24	*Fine Tool Journal*	119	Lignum Press	15	Silverton Victorian Millworks	103
Addkison Hardware	103	Fine Tool Shops	95	Lyon Electric	119	Singley Specialty Co.	30
Advanced Machinery Imports	11	Fisher Hill Products	32	Manny's Woodworker's Place	23	Sisco Supply	119
Amana Tool	19	Foley-Belsaw Co.	100, 119	Mason & Sullivan	95	The Source	105
American Woodcrafters	18	Forrest Manufacturing	104	McFeeley	119	Stone Mountain	101
Andreou Industries	24, 100	Freeborn Tool	127	Midwest Shop Supplies	26	Sugino USA	95
Aristocrat, Inc.	101	Freud	9, 25	MLCS	27, 32	Sunhill	111
Armor	103	Frog Tool	119	Morse Design	39	Swanger Brothers	30
Aronson	97	Furniture Designs	18	Native American Hardwoods	103	The Taunton Press	34-37
Ashman Technical	114	Garrett Wade	103	Nova Tool	20	Tool City	110
Aviation/Industrial Supply	23	Gilliom	23	Nyle Corp.	101	Toolmark	24
Ball & Ball	24	Grizzly Imports	2, 15, 27 111, 121, 125	Parker's	119	Toy Designs	98
The Bartley Collection	100	Hida Japanese Tool	103	Parks Woodworking Machine	30	Trend-Lines	99
Benny's Woodworks	11	Highland Hardware	27, 95 106	Paxton Hardware	103	TWS Machinery	5
Berea Hardwoods	114	Hiller Hardware	97	Penn State Industries	101	Univ. of No. Carolina Press	24
Black & Decker	29	Home Lumber	31	Performax Products	18	Vega Enterprises	96
Brady Corp.	28	Home Workshop	30	Philipps Bros. Supply	32	Versatile Saw	31
Bratton Mach. & Supply	28	Horton Brasses	39	Portalign	18	Wall Lenk	24
Bridge City Tool Works	115	Hot Tool	18	Porter Cable	16, 17	Watco Dennis	11
Buckeye Saw	23	House of Tools	95	Powermatic	21	Waverly Woodworks	98
Cane & Basket Supply Co.	18	HTC Products	111	Precision Technology	26	Werntz	106
Cascade Precision Tool	108	J. Philip Humfrey	98	Primrose School	121	Wetzler Clamp	24
M. Chandler & Co.	96	Iaccarino & Son	98	Pro Shop	121	Whole Earth Access	109
Classified	112, 113, 114	Imp. European Harware	95	Pro Tools	22	Wilke Machinery	13
Maurice L. Condon	95	Industrial Abrasives	5	Quest Industries	30	Williams & Hussey	7
Constantine	119	International Woodworking Equipment	106	Reliable Grinding	108	Wood Shed	30
Craft Supplies USA	31	Japan Woodworker	39	RH Products	11	Woodcraft	39
Craftsman Wood Service	20	W. S. Jenks & Son	105	Ring Master	23	Woodmaster Tools	39, 106
Custom Sawmill	15	Jet Equipment	6	RJS Custom Woodworking	15	Woodshop Specialties	107
Dakota Woodworks	107	Keller Dovetails	96	Roberts Hardware	18	Woodworkers Store	103
Dallas Wood & Tool Store	20	Klockit	18	Roger A. Reed, Inc.	33	Woodworking World	98
Day Studio Workshop	106	Kuster	33	Ryobi	38	Worcester Craft Center	11
Delmhorst Instrument	31	Kwikcut	104	Safety Speed Cut	39	Workbench Tool	23, 125
Delta	26, 117	Laguna Tools	98	Sand-Rite	96	Working With Wood Show	15
DML	20, 28	Robert Larson Co.	5	Sara Glove	15	Xylophile's Co.	7, 107
Dupli-Carver	20	Laser Machining	31	The Sawmill	121	ZAC Products	97
Ebac Lumber Dryers	105			SCMI/Mini-Max America	123		
Econ-Abrasives	98			Seven Corners	94, 125		
				Shaker Workshops	98		

erator. The pattern maker added, "I guess that it's Joe's job security. Nobody else here knows as much as he does."

About this time a fellow named Ham was re-employed in the assembly room. Ham must have seen my position in the pecking order. He took me under his wing and we became fast friends. Ham coached me constantly. He suggested that during my waiting time between jobs why didn't I clean up that corner of the assembly room that had become a catch-all for anything and everything?

After a couple of weeks Mr. Martin noticed and he stopped by my bench to tell me he appreciated what I was doing. He also continued to bring me an occasional "government job."

Meanwhile, a rumor had spread over the shop that I was the owner's nephew. This worried me and I talked to Ham about it. I told him I was afraid of how Mr. Martin would react if this rumor got to him. I felt like an imposter. Ham said, "What are you worried about? The rumor hasn't hurt you any, has it? Isn't Joe treating you better? Aren't you getting better job orders?" All this was true. Although it still bothered me, I decided to quit trying to squelch the rumor.

A few weeks later Mr. Martin stopped at my work station and asked if I would like to be a carver. He said he was buying a new Onsrud carving machine, and if I was willing to learn on my own time, the job was mine. I started coming in early and staying late to learn carving and I made the grade. I was soon earning that unbelievable $40 per week and could realize two of my life's goals—to own my own car and to marry the pretty little brown-eyed brunette I was so crazy about.

Years later I think back and wonder how much that rumor contributed to my success. I believe it probably had a lot to do with it and what's more, I believe Ham started the rumor in the first place.

—Devore O. Burch, Ft. Worth, Tex.

Turners' quarterly

Barely a year old and going strong with more than 700 members, the American Association of Woodturners has expanded its newsletter into a quarterly woodturning magazine. A.A.W. president David Ellsworth, of Quakertown, Pa., said *The American Woodturner: Journal of the American Association of Woodturners* will contain technical articles on all aspects of turning, as well as interviews with turners, a calendar of turning shows and workshops and a classified-ad section. David Lipscomb, of Knoxville, Tenn., has been appointed editor in chief.

Membership in the A.A.W. is open to anyone interested in woodturning. Regular membership costs $15 a year and includes a subscription to the magazine. You can find out more about the A.A.W. and *The American Woodturner* by writing The American Association of Woodturners, P.O. Box 982, San Marcos, Tex. 78667.

Snow job

I make my living designing and building furniture in Orofino, Idaho. When my business hit a slack spot last December, I wondered how to keep busy and keep the bills paid at the same time. Orofino is logging country, and winter doesn't stop the loggers here. We had had a few good snowstorms already and I knew that if we had more snow they would be hiring snow shovelers in the woods. We did have a couple more snowstorms, so I made a few phone calls. Before I knew it I had a job. I was to meet one of the sawyers in a parking lot at 5:30 the next morning to get a ride to the woods.

We made the 35-mile trip from town to the logging job in an hour. It was snowing that morning and there was a large warming fire lighting up the log landing when we arrived. I went over to the fire and met the boss, who handed me a heavy-duty steel snow shovel. I had just enough time to warm up the shovel by the fire and rub the blade down with a piece of paraffin wax to prevent wet snow from sticking to the shovel. When I looked up, one of the fallers motioned me with his finger to follow him in the semi-darkness. We climbed aboard a gigantic rubber-tired skidder and headed for the timber, holding on for dear life as the operator bounced and jolted up the rough skid trail. I shoveled my first tree before the sun came up that day.

A snow shoveler has two main jobs to do: shovel around each tree all the way to ground level so that the faller doesn't waste any of the tree, and provide the faller with pre-walked trails to each tree so he can get around while carrying his chainsaw, axe, wedges, gas and oil. My first day on the job, the snow was waist deep in most places and chest deep in some spots. You literally had to shovel your way to each big tree. So here am I, grown indolent from working in a warm and comfortable shop, digging my way from tree to tree, not having time to worry about the snow down my neck as I desperately try to keep ahead of the faller and keep out of the way of the falling trees.

I slept very well the first night. My only regret was that the day seemed so long and the night went by so quickly. The next morning we were in the timber before sunrise. There were no coffee breaks on this job; start shoveling at 7:00 A.M. and break for lunch at 11:00 A.M. Lunch was a cheerful combination of food, wonderful warmth and lively conversation spent around a fire. Unfortunately, all this activity is crammed into a mere half-hour. Then it's back to the brush until quitting time at 3:30 P.M. Toward the end of the week, I began to dream of the weekend and a chance to rest my weary body. Imagine my horror when the boss announced we were working Saturday.

Sunday was warm, restful and short. On Monday we moved to a stand of huge old-growth trees at a higher elevation. By counting the rings, we determined that the biggest trees were about 190 years old, many of them 4 to 5 ft. in diameter. Shoveling around the big trees took a lot longer. Of course, falling a giant like that takes time and I didn't have much trouble keeping ahead of Charlie, the faller. Some of the large cedar trees were "schoolmarmed," meaning that the trunks forked into several distinct trees a few feet above the ground. For safety's sake, the faller had to cut each tree separately off the common trunk, sometimes having to stand on the blade of the skidder to reach high enough. This delay made my job easier. Snow shovelers like schoolmarmed trees; fallers hate them.

One morning, as Charlie started his saw into a very large Douglas fir, I began shoveling the tree slightly uphill from him. I had shoveled that big fir the day before, and I knew that it would fall down the hill. I felt certain that I was safe uphill. Suddenly Charlie yelled "Look out!" Terrified, with my feet sunk deep in the snow, I looked up just in time to see a tree coming straight at me! Fortunately, it wasn't the big fir. It was a small tree that Charlie had to saw out of his way and I was able to deflect it away from my body without getting injured.

I put in three weeks of hard shoveling before I quit. Two large jobs had come into my shop while I was off in the woods. With a tighter stomach, a straighter back and a thicker wallet, I returned to the luxury of my warm shop. □

—Nicholas Cavagnaro, Orofino, Idaho

Notes and Comment

What's new in woodworking in your area? Notes and Comment buys brief articles about interesting events, shows and people and welcomes all manner of commentary. Send manuscript, if possible with color slides or black-and-white photos (preferably with negatives), to Notes and Comment, Fine Woodworking, ***Box 355, Newtown, Conn. 06470.***

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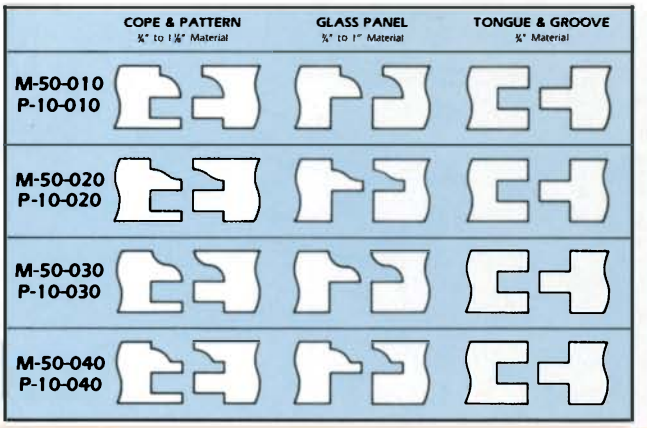

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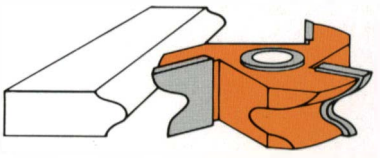

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BOUND TO BEND

Photos: Courtesy of Carpenter and Hochman Gallery, N.Y.

Fujii Chuichi sculpts wood with wire and rope, and time. Rather than chisel or saw timber to fit an image in his mind, he gently coaxes 15-ft.-long shaggy-bark cedar and cypress logs into startling curves. Cables attached to trees up to 2½ ft. diameter are tightened and adjusted hundreds of times during the year it takes to complete a sculpture. Chuichi, who lives and works in Nara, Japan, describes his role as just helping the 4,000-lb. tree assume the form that was deep within it all along. He has not revealed how he accomplished the seemingly impossible bends without splitting the log apart or tearing off the bark. The completed sculptures stand alone, or nuzzle together like the reclining cypress logs of "Untitled," above, which stand about 10 ft. tall.