Fine WoodWorking

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Plunge Router Test

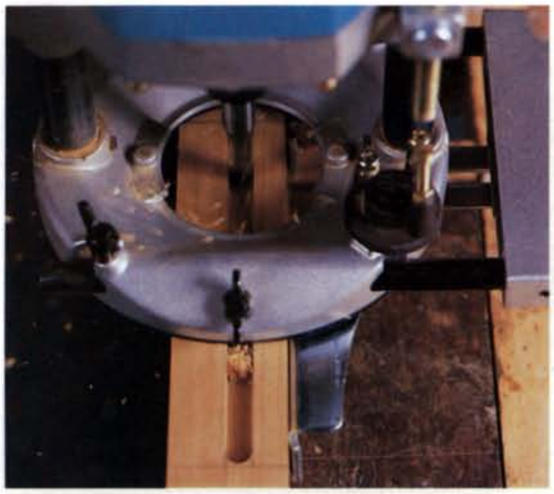
Rustic Furniture

Wood Dyes

Designing Wall Paneling

Vacuum Jigs

Mortise-and-Tenon Joinery



Plunge routers, once the mainstay of the production cabinet shop, are finding their way into the amateur's shop as well. To find out how the top three Japanese machines compare, turn to p. 56. Cover: Michael Podmaniczky demonstrates mortising techniques described in detail on p. 67.

Fine Woodworking is a reader-written magazine. We welcome proposals, manuscripts, photographs and ideas from our readers, amateur or professional. We'll acknowledge all submissions and return within six weeks those we can't publish. Send your contributions to *Fine Woodworking*, Box 355, Newtown, Conn. 06470.

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Was I ever excited when I received the latest issue of *Fine Woodworking* and saw Gerrit Rietveld's Red and Blue chair on the cover. I've been interested in Rietveld for many years and have built several of the chairs for my own gratification. I finished the first two in the same colors as the original, but left the third chair natural. I next plan to build a footstool that duplicates the seat portion of the chair.

The chair is surprisingly comfortable, especially when you consider that you're sitting on solid wood.

—Alan R. Stenicka, Louisville, Ky.

Do you know if there's a book or set of plans available for the Red and Blue chair you featured on the cover of *FWW* #65, or for the Zig-Zag chair mentioned in Glenn Gordon's article?

—Herbert Kurtz, Melrose Park, Pa.

EDITOR'S NOTE: We weren't able to locate measured drawings for the Red and Blue chair, but the next best thing is the excellent line drawings featured in *The Furniture of Gerrit Thomas Rietveld*, by Daniele Baroni, Barron's Educational Series, Inc., 113 Crossways Park Drive, Woodbury, N.Y. 11797, $23.95. No joining details are given, but some of the drawings are superimposed on a metric grid, so dimensions can be readily calculated.

As a subscriber, I date back to your first issue, but now I discover that you must be slipping. Just look at the chair on p. 44 of *FWW* #65—I built one better than that out of crate wood during the Great Depression. My mother wouldn't even let me put it in the backyard. Come on!

—H.C. Conkling, Jr., South Dartmouth, Mass.

I'd like to add to the comments of Scott Landis about the "rough-cut" guitar mentioned in his article about the Guild of American Luthiers convention in *FWW* #61. Although I could not have articulated this at the time I built the instrument, the most important reason for building it was to help discover for myself what quality in craft is. In this case, it was demonstrated that craft is not defined by a "perfect" finish.

The surfaces of the top, sides and back of the body on my rough-cut guitar were left as they came to me, straight off the saw, with only a light coat of lacquer. One can even detect traces of the sawyer's numbers on the book-matched top.

In the "normal" construction of a guitar, the top is first joined together then rough-sanded to thickness, braced, inlaid and assembled into the rest of the instrument. At the last possible minute before applying lacquer, the instrument is finish-sanded to clean up any slight nicks and scratches. With the rough-cut guitar, I have no opportunity to remove out-of-flat spots in the joint, excess glue, miscellaneous marks or minor errors made during the rest of the construction; I have one chance to take my best shot and keep it looking its best. This is a different method of working than the "patch, fill and tinker" style so common in instrument building. Other problems come up, too, such as the impossibility of measuring the effective thickness of the wood. I must rely on my sense of its weight and stiffness.

It generally takes the first-time viewer several minutes to discover and appreciate this style of instrument building. Part of my intent was to bring the viewer into this recognition of craft via the backdoor of the rough exterior.

—Max Krimmel, Boulder, Colo.

The article in *FWW* #64 on shopmade sash clamps was interesting and beneficial. May I suggest that the threaded cross-member be held in place with a small bolt rather than glue so that short and long bars can be interchanged to suit the job.

—Charles H. Price, Winnsboro, Tex.

I'd like to reply to your recent article (*FWW* #64) regarding the new Freud JS100 plate joiner. Two points were disturbing. First, as a long-time reader of your magazine, I've always agreed with your viewpoint that the cost of a tool, while important, should remain secondary to the tool's quality, reliability and versatility. I gather that you have some strong doubts about the reliability of the Freud machine—yet you suggested that the reader buy two! Now, with a Freud machine in each hand, it's unlikely that this woodworker will be interested in hearing about the added speed and flexibility provided by [the Lamello's] swiveling front plate or, for that matter, the many attachments and accessories which will greatly increase the versatility of a Lamello machine.

Second, I note that, in the same issue, the Lamello Junior (functionally similar to the Freud machine and able to accept Lamello accessories) was advertised for $299. I suggest woodworkers consider purchasing one Lamello Junior and several boxes of plates, rather than purchasing two complete machines.

As woodworkers, we're all concerned about maintaining high quality in our products and charging accordingly. Are we now being asked to reward lower quality from our tool manufacturers?

—Bob Jardinico, Colonial Saw Co., Inc., Kingston, Mass.

In regard to the Method of Work, "Making tenons on chair rungs," in *FWW* #64, I'm surprised that you would print a drawing of this potentially dangerous jig. If the chair rung slips, either the router bit or the chair rung could easily explode into little pieces. The correct way to build this jig would be to cut out a small piece in the bottom of the V-block to contain the router bit so that the bit projects only as far as the depth of cut. This way, the bit can't grab, even if the dowel slips.

If you design the jig as I suggest, a slipup can be corrected by another pass over the router bit.

—Gerald Bayne, Brackney, Pa.

I don't want to drag out the discussion on bandsaws, but there was one omission which could be of interest to the craftsman who cuts both wood and metal: a converter sold by Sears. The converter is a "little black box" that fits on the motor shaft with a steel strap fastened on the motor mount. Wood-cutting speed is maintained, and a simple slip of the belt to an adjacent pulley reduces the speed.

When the drive pulley is set-screwed to the motor shaft, an adjacent pulley of the same diameter—supported by the motor

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shaft, but turning independently at one-tenth of the motor's speed—is driven by a two-belt arrangement in the black box.

I bought my converter from Sears in 1963. The current Sears tool catalog lists a converter that might be an updated version, judging from the scanty description and miniature picture. It's available through the catalog for $140.

My converter is small but acceptably well-built, with six sealed ball bearings and belts toothed like a timing belt. It came with a chart of speeds obtainable with various sizes of saw pulleys.

—Elmer W. Stecher, Oak Park, Ill.

In the Methods of Work column of *FWW* #62, Bill Amaya had a good design for a sliding tablesaw carriage made of roller-skate wheels. As readers ponder his plans and sketches, the first question that comes to mind is this: where do you buy steel skate wheels? I did a project article incorporating roller-skate wheels for another woodworking magazine, and Carl F. Haeussler, Jr. (Gee Vee Line, Inc., Box 461, Feasterville, Pa. 19047) informed readers in a later issue that his company produces steel or aluminum ball-bearing roller-skate wheels. They can be purchased directly for $.95 each, postpaid. The minimum order is 20 wheels, and you should specify whether you want aluminum or zinc-plated steel.

—Donald F. Kinnaman, Phoenix, Ariz.

For the last 15 years, I've seen tool catalogs state that the small end of a Warrington Hammer is for driving brads. I've had it! Please be informed that the small end is for setting cap irons on both wooden and metal planes, and also for adjusting the side set of molding-plane irons. *—Eugene Welker, Cornish, N.H.*

Like Gary Korneman (Methods of Work, *FWW* #59) I needed drawer pulls and couldn't find what I wanted. An even simpler way to make pulls than the one Korneman describes is to bore a 1-in.-dia. hole through the length of a block of wood about 4 in. long and 1¾ in. square. If you rip this block into quarters along its length, you'll have four drawer pulls. On the sander, you can shape the pulls to suit your taste. You may want to round the corners, and maybe make the front edge thinner than the edge that screws to the drawer front.

—Henry Jaeckel, Nevada City, Calif.

I was delighted to see David Shaw's excellent article on filling open-pore woods in *FWW* #60. I'd like to add a few of my own observations, gleaned from years of doing that rather tedious but necessary task.

Although filling pores with shellac or clear lacquer does indeed offer a different look, it carries with it a drawback. The filler and top coat share the same solvent, so the filler will be redissolved during coating, causing it to swell up initially, then shrink down over a long period of time. Even if such a finish is rubbed out flat initially, it will start to exhibit shrunken pores within two years. The main advantage of fillers such as the plaster Shaw mentions is that they don't share a common solvent, and hence won't move after coating. In the case of silex fillers, they're too dense with solids for any significant effect to occur. One way around this dilemma is to fill the pores with a clear material (such as catalyzed polyester) that won't redissolve with the lacquer top coat. Once the polyester is cured and sanded back, lacquer can safely be applied over it and will adhere, provided the polyester is only in the pores. A barrier coat of vinyl sealer will also help.

With silex fillers, I find that a light coat of vinyl before filling not only makes it easier to rub off the dried filler, but allows you more control in coloring the wood. For example, to get that old, warm, filled look on mahogany, you might want to stain the raw wood first with a light, yellow aniline, seal it with thinned vinyl, then fill it with a dark cordovan filler. Though the pores would be darkly contrasting, the surrounding wood would not be affected by the stain in the filler, and you could easily attain that golden, aged (but filled) look characteristic of old mahogany. After scuffing the filler, a sealer coat of vinyl envelopes the filler in the pores and reduces the small amount of shrinkage that occurs—even with silex fillers under a lacquer finish.

—Michael M. Dresdner, Spinnerstown, Pa.

I was interested in the Method of Work from John Gallis in *FWW* #61. He described his difficulty in finding a 4-in. PVC angle that didn't have the restriction of the standard 90° elbow, for use in his dust-collection system.

Gallis and your other readers may be interested to try a trick that I learned from plumbers installing a swimming pool. To get the PVC to conform to the irregular shape of the pool wall, they bent the pipe by first allowing the exhaust gas from their truck to pass through the pipe for two or three minutes. They'd made a coupler for the truck tail pipe that allowed the PVC pipe to fit inside the coupler. With the engine at idle, the exhaust gas made the pipe soft enough to bend to any shape. As soon as the PVC cooled, it retained its new shape.

Incidentally, the pickup truck was out in the open, and the heated PVC pipe was handled with insulated gloves.

—Anthony H. Bathurst, Tucson, Ariz.

In "New life for old chisel" in the Q&A section of *FWW* #61, Norm Vandal describes the hardening and tempering procedure, but then adds: "Some workers prefer to heat the metal red and let it cool to straw before quenching." This procedure will not harden the steel. Quenching must be done while the steel is still red-hot. After quenching, tempering can be done by heating the steel to about 450°F, which would result in the straw color mentioned in the article.

One other tip: When quenching, hold the end of the chisel with a pair of tongs and quickly lower it straight down into the water. This way, all surfaces of the steel will be cooled at the same time with less chance of warping, which could result from uneven cooling. *—Lloyd E. Emond, Milwaukee, Wisc.*

Annoyed by my sharp chisels being nicked, I found a solution in my increased girth. I have several old leather belts which no longer fit my middle. One was the kind made with two faced pieces of leather, sewn and glued together. Using a pocket knife, I cut a 1-in. section and separated the two pieces of leather along the glueline to form a pocket about ¾-in. deep. The chisel slid easily into this makeshift sheath, and the rough, split leather provided enough grip to keep it in place. No more nicked chisels! And I really prefer leather to plastic against a fine honed edge. I have, alas, enough belt left over to last a lifetime. If I lose a sheath, I just make another when necessary.

—Howard J. McHugh, Raleigh, N.C.

Regarding Ben Erickson's disappointment in his Makita B04510 finishing sander (*FWW* #62): my experience is just the opposite. My Makita sander works just fine. I've found no reason to complain. Placing a drop of silicone lubricant on the clamping arms periodically makes them easy to operate. I bought the Makita after a Speed Bloc rattled itself apart. The Makita also eliminated the need to look for a screwdriver every time I wanted to change paper.

I've had no problems with paper slipping from the clamps, although I can load paper faster if I clip about $\frac{3}{16}$ in. from the length of the paper after quartering it. I've found it to be a dependable, well-balanced, efficient machine.

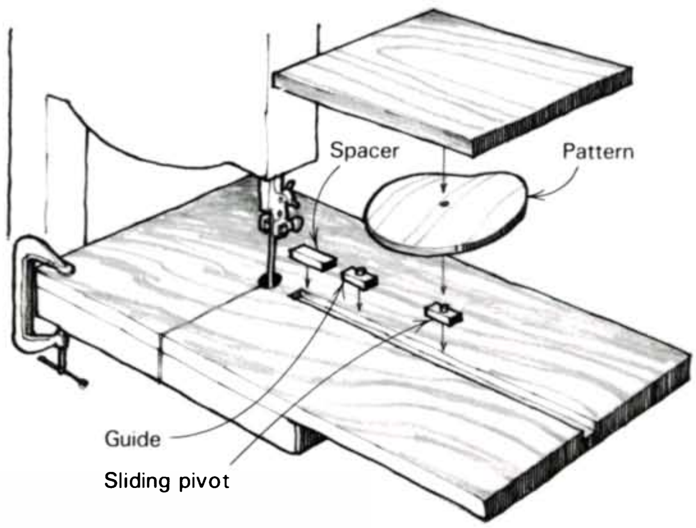
—Reese Crispen, Bolton, Mass.

edited and drawn by Jim Richey

Sawing duplicate pieces on the bandsaw

I had experimented with various bandsaw techniques for sawing duplicate pieces, but I was dissatisfied with the results and the lack of flexibility. As a result, I developed this simple fixture. It lets you duplicate a pattern quickly and accurately, provided the curves aren't too abrupt for the blade to follow. Another advantage of the fixture is that you need only one pattern to produce various-sized duplicates.

The fixture evolved from a common circle-cutting jig that uses an auxiliary table clamped to a bandsaw table. The table is simply a piece of ¾-in. Formica-covered plywood with a ¾-in. groove routed in the top (the centerline of the groove is aimed at the cutting edge of the blade). The rest of the fixture consists of a guide pin, a sliding pivot pin and a spacer. The guide pin and the sliding pivot pin are both ¼-in. dowels pressed into small blocks sized to fit the groove.



To use the fixture, first cut a pattern an inch or two smaller than the finished size of your workpiece and drill a pivot-pin hole near its center. Next, place the guide pin in the groove at an appropriate distance from the blade. The distance from the guide pin to the blade will determine the enlargement of the finished duplicate over the pattern. Fix the guide pin at this distance by placing one or more spacer blocks between the guide and the end of the groove.

Now, attach a blank to the pattern with brads, two-sided tape or hot-melt glue. Fit the blank/pattern assembly over the pivot pin and cut the duplicate by rotating it while applying gentle pressure toward the guide pin. The pivot pin will slide back and forth in the groove as the pattern follows the guide pin. Generally, the stock is too large to allow the pattern to contact the guide pin at first. In this case, simply turn the pattern and feed the stock into the blade until the pattern touches the pin.

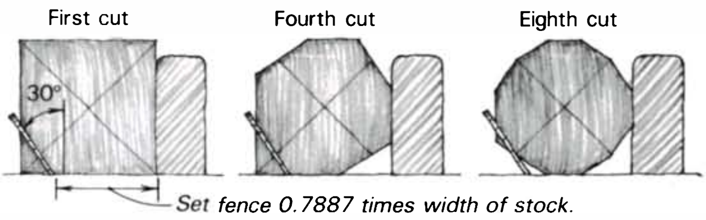
The fixture is useful for many applications. Curved pieces—such as the back of a crowned chair—can be ripped quickly and easily. If the fixture is adapted to a scroll saw, it can be used to cut elliptical picture frames. With minor modifications, the setup can also be used to cut circles.

—Peter J. Cranford, Windsor Junction, Nova Scotia

Making twelve-sided turning blanks

It's common practice to rip the corners from square turning stock, making it octagonal, in order to reduce the amount of material to be roughed off in the lathe. It's just as easy to produce a twelve-sided turning blank, which requires even less stock removal in the lathe and doesn't require racking the saw blade over to 45°, where my tablesaw, at least, doesn't behave very well.

First, set the tablesaw blade at 30° away from vertical. Set the



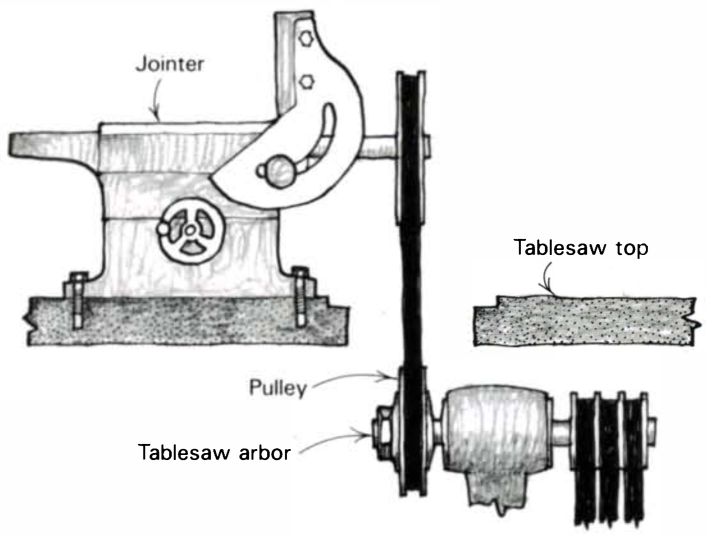
rip fence at 0.7887 of the stock width from the blade. This setting can be approximated accurately by taking ¾ in. plus 1/32 in. for each inch of face width. Mark both ends of the stock with an X, as shown in the sketch, so as to be able to keep track of which corners to cut off. Rip the corners from the square, turning the stock 90° clockwise each time if your fence is to the right of the blade. Now turn the stock end-for-end and repeat the process keeping the original faces, which are now not the widest ones, against the fence and saw table.

A 10-in. saw will handle a 7½-in.-thick blank. The procedure is inadvisable for stock less than 1½ in. wide, because the faces become too narrow to guide safely against the fence and table.

—Warren Miller, State College, Penn.

Quick tip: I make router subbases out of 3/16-in. Plexiglas, to increase visibility. *—Jerome Crawford, Durham, N.H.*

Powering other tools with a tablesaw



If you work in a small shop as I do and space is at a premium, here's how to drive another tool, a small jointer for example, with your tablesaw's motor. First slip a pulley on the saw's arbor and tighten the arbor nut as you would with a sawblade. As with any tool setup, be sure to size the pulley to drive your tool at the proper speed. Place the jointer on the saw table and clamp or bolt it in place. If you plan to use the arrangement often, you may wish to drill and tap fastening holes for the jointer right into the saw table. Next, slip a belt over the pulleys and lower the saw motor until the belt is tensioned. The whole arrangement takes no longer to set up than any other tablesaw accessory, and you save the price of a motor and gain a little space in your shop as well. *—Luc Mercier, Laval, Que.*

Blade covers

After spending several hours honing a new 3-in.-wide fishtail gouge, I considered fabricating a special blade cover to protect the cutting edge. A better idea came to me as I paged through a mail-order supply catalog and spied a product called Plastic Dip, normally used for coating plier handles.

Here's how I made a blade cover with Plastic Dip. First, I spread some Vaseline on the blade so the plastic wouldn't stick

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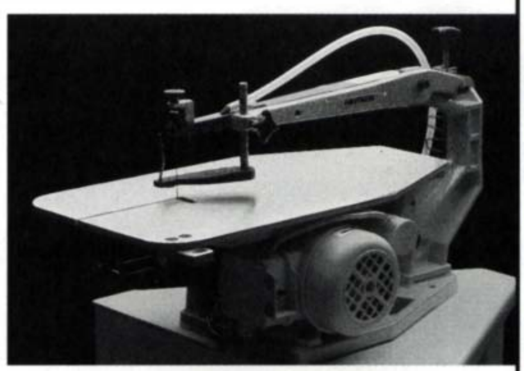

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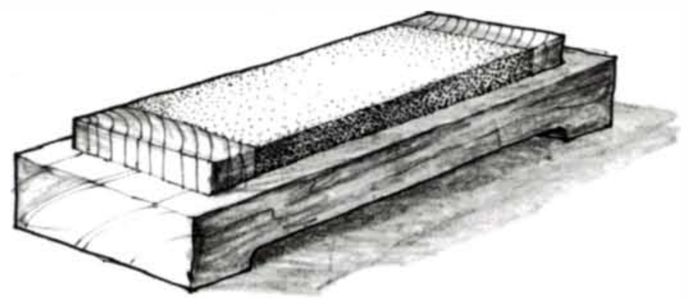
to the metal. Then, I dipped the blade in the plastic once a day for four days. After four applications, I trimmed the top of the dip and pulled at it gently. My newly made blade cover came off with a thwock! The dip had molded itself perfectly to the blade, and the Vaseline allowed easy removal. I couldn't ask for a tougher material. Plastic Dip is sold by Leichtung (4944 Commerce Parkway, Cleveland, OH 44128) for about $8 per can.

—Carl Hungness, Speedway, Ind.

Improved sharpening-stone box

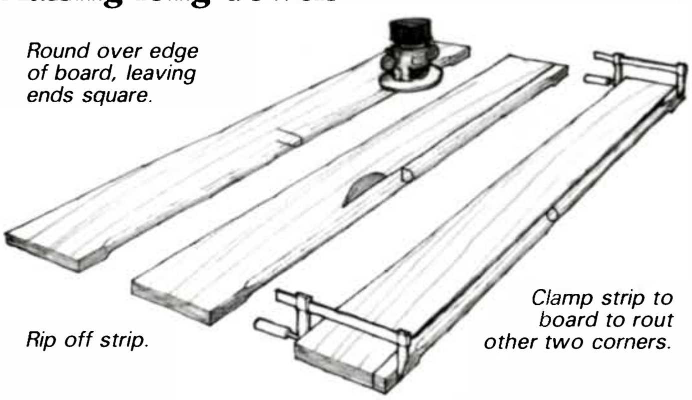


By mortising two endgrain blocks into your sharpening-stone box (one on each end of the stone), you'll provide support for longer sharpening strokes—the tool won't skip abruptly off the edge of the stone at the end of a stroke, nor do you risk catching the edge on the end of the stone at the beginning of a stroke. Longer strokes will reduce wear in the middle of the stone and greatly increase the stone's life.

—James Gauntlett, Boise, Id.

Quick tip: Tapping a hole in cast steel, and feeling too lazy to get my tapping fluid, I grabbed a convenient bottle of Teflon-based lubricant. The tap turned in just like a bolt into an already-threaded hole! I've since tested the fluid to both drill and tap holes in mild steel, brass and aluminum, with good results in all. *—Gordon Mulholland, Streator, Ill.*

Making long dowels



I needed a ¾-in.-dia. oak dowel more than 6 ft. long to use as a curtain rod. Unable to find a source of supply, I came up with a method to make the dowel in my shop without a lot of effort. First, I rounded the edges of a 7-ft.-long, ¾-in.-thick oak board with a ⅜-in. corner-round bit in my router. I didn't round over the first and last 6 in. of the board because I knew I'd need the square ends for a clamping surface later. Moving the board to the tablesaw, I set my fence at ¾ in. and ripped off the rounded edge. I then flipped the stick over, clamped it back to the board with three quick-action clamps (for stability) and rounded the top and bottom edges again to produce a dowel. Of course, I had to reposition the middle clamp to finish the rounding. When I trimmed off the two square ends, I had my long dowel, ready to scrape, sand and finish.

—Phil Lisik, Hemlock, Mich.

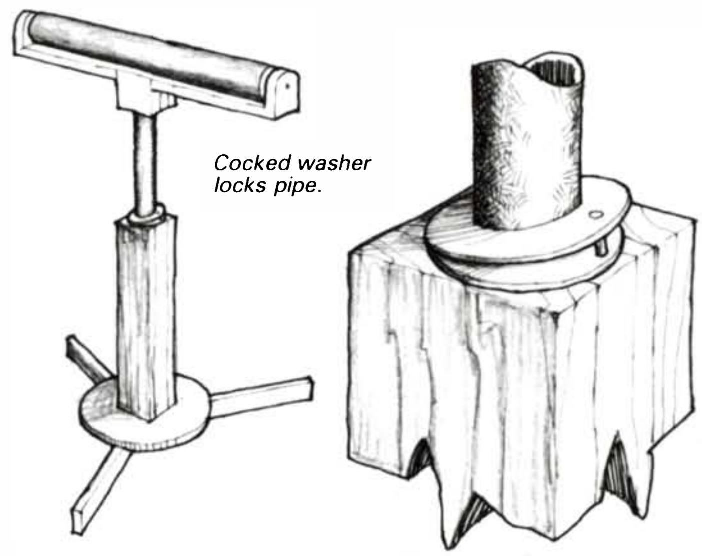
Double bifocal shop glasses

Last year, it finally became necessary for me to begin wearing bifocals. The close-up area of the lens worked fine—as long as the work was below me. But the glasses didn't help at all if I was doing close or detailed work *overhead.* So, I had my optician make me a pair of shop glasses with bifocal areas on both the top and the bottom, as shown above. The particular design is known as Double D28, Occupational Segments. The glasses have greatly improved my enjoyment of woodworking.

—Rod Goettelmann, Vincentown, N.J.

Quick tip: Many woodworking glues are strongly fluorescent. If you have an ultraviolet lamp, you can use its ghostly light to spot glue residue that otherwise would come back to haunt you later. *—Allan E. Gilmore, Sacramento, Calif.*

Roller-stand adjustment revisited



My three-legged roller stands are similar to Tim Anderson's (*FWW* #60). But I have substituted a 1-in.-dia. steel pipe in place of Anderson's sliding dowel, and I use a cocked washer mechanism for adjustment and locking. It's the same idea found on many pipe and bar clamps. To make the adjustment mechanism, first locate a couple of steel washers with holes about ⅛ in. larger than the outside diameter of the pipe. Rivet a ½-in.-long steel bolt to one side of one washer. The bolt will cock the washer against the pipe and automatically lock the roller assembly at any height. The second washer prevents wear on the stand. To release the mechanism, simply lift up on the low side of the top washer.

—Ingwald Wegenke, Montello, Wisc.

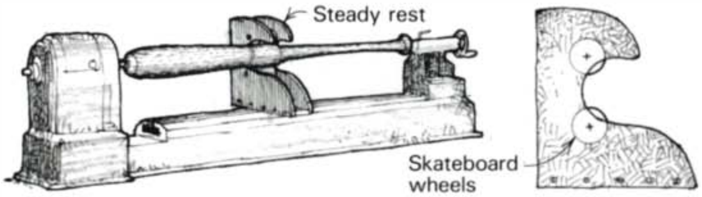
Lubricating sealed bearings

If you ever have a power tool with a noisy sealed bearing, here's an unorthodox but effective way to lubricate it. Place the dry bearing in a can of oil, and place the can inside a bell jar on a vacuum pump. Switch the pump on and watch the air

bubbles come to the surface of the oil. When the bubbles stop rising, turn the pump off. Normal air pressure will force the oil into the sealed bearing.

Some of you are probably asking where you can get a vacuum pump and bell jar. Check with the head of your local high school's science department. If you're a tax-paying resident of that town, you'll most likely be allowed to use the school's equipment. *—William Warner, York, Pa.*

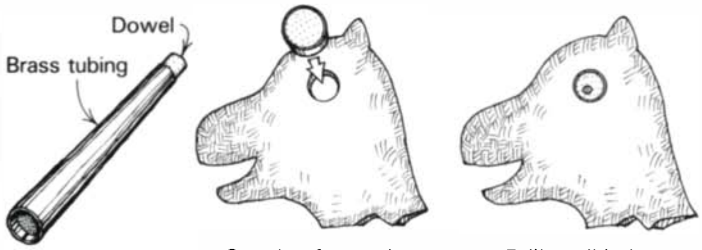
Steady rest for baseball bats



For years, the eighth graders in my woodworking class have wanted to turn baseball bats. I've always put them off because the small diameter of the bat's handle invariably results in whipping and chattering, especially at the hands of an inexperienced turner. I licked the problem by making the steady rest shown here out of skateboard wheels, threaded rod and a couple of scraps of hardwood. The urethane plastic skateboard wheels can be bought for less than $15 a pair.

To use the steady rest, turn a cylinder, then tighten the steady rest in place with both wheels riding ahead of the handle. Turn the bat to shape, except the area right near the steady rest. My students spokeshave this area off, then sand and finish their bats. *—Paul Damato, Morristown, N.J.*

Fancy eyes for pull toys



Cut plug from tube, install in eye hole.

Drill pupil hole, install brass rod.

Here's how to make eyes for wooden-animal pull toys that give them an animated and professional touch. First, drive a 3-in. dowel into a 3-in. length of brass tubing with the same outside diameter as you've chosen for the eye. If you round the nose of the dowel and proceed carefully, you should be able to drive the full length of the dowel through.

Next, cut a short plug off the brass-encased dowel and epoxy it into an eye hole you've drilled in the toy's head. When the glue has set, drill an off-center pupil hole near the bottom edge, and tap in a piece of brass rod. Use a file and sandpaper to bring the eye flush with the toy's head. A drop of lacquer over the entire eye will prevent the brass from tarnishing and preserve the gleam. Brass tubing and rods are available in various sizes at most hobby stores. *—Mark DiBona, Kensington, N.H.*

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'll return only those contributions that include an SASE.*

Wavering tablesaw cuts

I couldn't get my tablesaw to track true when I tried to rip 1¼-in. by 2¼-in. Sitka spruce laminations for a sailboat mast. My 10-in. Sears tablesaw with carbide-tipped blade would cut a wavering, crooked line for a foot or two, then bind. I had to finish the job with a handsaw. I recently had similar tracking problems cutting Douglas fir plywood for shelves. What's going on? —*J.J. Gibbens, Lafayette, La.*

Harold Payson replies: The ripping problem with the mast laminations sounds quite familiar. Each time that "binding" problem happens, I look hard at the stick to see if it's twisted. You don't say how long the planks are, but just a small amount of twist over the length of the plank, or trying to saw a plank with the concave curve next to the fence, will bring the best of saws to a roaring halt. What's more, the chance that the rip fence is toeing in a little makes sawing long planks on a tablesaw a chancy thing for anyone working alone. Long pieces are best sawn with a helper ready to jam a screwdriver in a closing kerf and help steer the stick.

Even a roller supporting the end of a stick can produce the results you mention. If the roller is slightly askew of the plank's line of travel, the plank will slip sideways and bind. Grain tension can skew the plank, too, but you'd spot that problem quick enough when the kerf started closing on you.

It doesn't sound as if the saw is at fault, but I'd definitely check the fence for misalignment. If the fence opens just a hair from being parallel to the back of the sawblade, that's okay. But a toe-in is a definite fault and must be corrected.

Finishing the cut with a handsaw was your last resort and it would have been mine, too. I would have skipped the handsaw part and reached for my Skilsaw. Using a Skilsaw with a guide makes sawing long lengths like this a breeze.

I'd suspect your problems with plywood are due to the feed being too fast, the sawblade being set too high or unnoticed toe-in of the fence. I have to assume that your equipment is otherwise in good shape and that your saw sharpener did a good job. Improperly sharpened saws, either hand or power, with teeth longer on one side than on the other (or dull on one side) can get you into the binding problems you describe.

All of these problems can ruin your day and keep you from doing a proper sawing job. Worse yet, they're enough to drive you nuts because they're often almost imperceptible.

[Harold "Dynamite" Payson is a writer and boatbuilder in South Thomaston, Me.]

Jim Cummins replies: In addition to the good advice above, let me add a couple of things. First, the saw is underpowered. You can install Sears' 1½-HP motor to good advantage. Second, your blade sounds dull, or perhaps you're trying to rip with a combination blade instead of a blade designed for ripping. Or, maybe you're using a rip blade, but one with too many teeth. What happens with a dull or incorrect blade—especially with an underpowered saw—is that each tooth doesn't have the power behind it to take a full cut. Instead, the blade bogs down and the teeth skid, producing friction and heat. This can actually cause the disc of the blade to buckle slightly from expansion, at which point cutting becomes impossible. When the blade cools off, it flattens out again. I saw this happen once years ago when cutting Plexiglas with an 8-in. plywood blade—the blade began first to bind, then to wander, then it stalled. The blade disc was warped almost an inch out of true. Fifteen minutes later, it was flat again. I suspect that the same thing happens with wood, because the symptoms of a deteriorating cut are the same, even when the kerf appears to be open.

You won't be sorry if you treat yourself to a 10-tooth ripping blade from a good sawshop. I bought one about eight years ago from Winchester (2633 Paper Mill Rd., Winchester, Va. 22601) for $45. The same blade costs about $65 today, but that's inconsequential when you average out the cost over the anticipated life of the blade. Also, it will pay for itself in the wood you don't ruin. I still think, though, that you'll need the larger motor as well. As a last thought, my saw would barely cut a 2x4 when at the end of a 50-ft. extension cord—plug your saw directly into a wall or floor outlet if you can.

[Jim Cummins is an associate editor at *Fine Woodworking.*]

Staining softwoods to match hardwoods

Recently, I applied some fruitwood stain to the oak trim in my new home. When I applied the same stain to the new pine windows, the wood turned considerably darker than the oak. Can I lighten the pine without stripping or bleaching the windows? —*Edward J. Stolfa, Palatine, Ill.*

David Shaw replies: The solution is simple if no finish has been applied over the stain. Just rub the stained pine with a rag that's been lightly moistened with lacquer thinner. The color will rub off slowly, so you'll have enough control to reach the shade you want. Don't use a heavily soaked rag, or you'll risk streaking the color. If the stain streaks no matter what you do, substitute lacquer retarder for lacquer thinner.

If the thinner removes too much color, you have to start from scratch, but this time seal the trim with a thin coat of shellac before applying the stain. A sealer is usually necessary on pine because softwoods absorb more stain than hardwoods. Once the sealer coat dries, apply the stain with the grain. Be careful near joints where the grain direction changes.

If you already applied a finish coat over the stain, the lacquer thinner may eventually work through the finish enough to lighten the color. If the finish is polyurethane, oil-based or just plain thick, you'll probably have to head for the nearest paint-supply store and buy some stripper. The only other alternative is to color the finish with a thick, light-colored pigment and fake the grain. Trust me: stripping is a lot easier.

[David Shaw is a writer and finisher in Kelly Corners, N.Y.]

A cure for smelly furniture

Is there any way to remove a foul smell from furniture? We have a 150-year-old chest, and the drawers smell so bad (we think from mothballs) that we can't put anything in them. —*S.D. Takle, Fridley, Minn.*

R. Bruce Hoadley replies: Since you don't know exactly what caused the odor, you may have to experiment a bit. First, you should sprinkle ordinary baking soda (bicarbonate of soda) liberally inside the chest, especially on the drawer bottoms. Leave the soda there for a week or more before vacuuming it thoroughly. If the first treatment seems to reduce the odor, repeat the process. I've also heard that ground coffee is as effective as baking soda in removing odors.

If the odors are due to cats, mice or another animal, you might try washing the wood with a weak solution of neutroleum alpha—available from drugstores, vets and pet-supply stores.

[R. Bruce Hoadley is professor of wood science at the University of Massachusetts at Amherst.]

Furniture panels keep cracking

I'm trying to repair an antique English chest. The top and side panels have large cracks along the grain, and the cracks are getting worse. What do you recommend for a repair/restoration method? I believe the wood will continue to crack and have advised the owner just to consider the cracks part of the piece's character. —*Ken Hardin, Arlington, Tex.*

Bob Flexner replies: Whenever furniture is subjected to a change in environmental moisture, as in being moved from a damp climate to a dry climate, the wood will shrink across the grain to adjust to the lower humidity. Though wood may warp when subjected to these changes, it doesn't usually split unless

it's secured to a frame that prevents it from shrinking freely. Frame-and-panel construction is designed to allow for shrinkage by permitting the panel to float inside the grooves in the frame. Chances are, your split panels are glued or frozen into the groove, which would cause them to split when they shrink. The proper repair is to remove the nails or glue immobilizing the panels and, if possible, glue them back together before reinstalling them to float in their frames.

The top repair will probably be more complicated. If the piece is still functional and especially rare or valuable, the owner should try to live with the crack. But the cause of the problem is surely the same—the top is splitting because it is tied to a frame. If it is held down with screws or nails, remove them, glue the splits back together and reattach the top with some system that allows it to float. I'd suggest screws in the front, and brackets with slots instead of holes in the back. If the top is glued to the frame and this is the original construction, you can release it by injecting alcohol into the glue joint with a syringe. This will crystallize the hide glue that would have been used on such an old piece and allow the top to be removed. Then, follow the above procedure to reattach the top.
[Bob Flexner restores furniture in Norman, Okla. His videotape, "Repairing Furniture," is available from The Taunton Press, Box 355, 63 South Main St., Newtown, Conn. 06470]

Bending thick stock

I recently tried to bend nine feet of 1¾-in. by 3½-in. Spanish cedar on a frame with a 49-in. radius. I left the stock in a steamer for seven hours before unsuccessfully trying to bend the wood with two helpers and many bar clamps. The next day, I hooked the steamer to a steam-cleaning machine generating pressurized steam. The only thing I got was three days of harassment from the two flunkies helping me. Why won't it bend? ***—Chuck Leonard, Thibodaux, La.***

William Keyser replies: My research indicates your Spanish cedar has "moderately good steambending properties." Much of your problem arises from the fact that you're trying to bend 3½-in. stock, and that takes tremendous force—even with stock having the best bending properties. I suggest that you try bending the wood in three pieces, then laminate them together after bending. Bend the inner piece first and allow it to cool and dry. Bend the next layer over the first, with both pieces on the bending form. After that bend has set, repeat with the third layer. After this composite has completely set, remove the three pieces from the form, spread the piece with your favorite waterproof glue (I suggest the West System—Wood Epoxy Saturation Technique—developed by Gougeon Brothers, 7066 Martin St., Bay City, Mich. 48706) and clamp the pieces back on the form. When the glue has cured, proceed with machining the cross-section details.
[William Keyser teaches design and woodworking at the Rochester, N.Y., Institute of Technology.]

Oil finish for red oak

I've experimented with many different oil and oil/varnish finishes on red oak, but haven't found one I like. The oil always seeps back out of the porous sections of the wood, which creates an uneven finish. Any suggestions?
—Kent Korgenski, Salt Lake City, Utah

Otto Heuer replies: You should be able to get good results with any oil finish. The one advantage of these finishes is ease of application, but you can only get a good-to-excellent finish by working hard to prepare the surfaces before applying the finish. Scrape the surface to remove any trace of machine marks, then sand with a cork sanding block and 120-grit sandpaper. Always sand in the direction of the grain. Continue the sanding with finer and finer grades until you have a very smooth surface with 220-grit. Naturally, it's important to remove all the sanding dust. I find vacuuming to be the best method.

Next, dip a rag in water and wring it out so it's damp, not wet, and wipe the wood surface. This will raise the wood grain. After the surface has dried thoroughly, sand again with 220-grit paper. Some people skip the wetting step, saying the first coat of oil will also raise the grain, but I think surfaces treated with water dry faster and are easier to sand.

After cleaning the surface thoroughly, apply a thin coat of finish with a rag or brush. I'd recommend thinning the oil 50/50 with mineral spirits or, better yet, turpentine. Let the first thin coat dry until tacky, then wipe off the excess. Let the finish dry 24 hours before applying a second coat, this time with undiluted oil. Some finishers use 400-grit wet/dry silicon-carbide paper to apply the second coat, but that's a matter of individual preference. The important thing to remember is that the finish must be applied in light coats. If you put on heavy coats, the excess will ooze out of the pores for days.

Normally only two coats are required, but you may want to apply a third after the second coat dries for a week.
[Otto Heuer is a finishing consultant.]

Router bits for shapers

I've been considering buying a shaper. It seems to me that the usefulness of this machine depends on the selection of cutters available. Since I always have a reasonable collection of carbide router bits, I was wondering if any shapers accept them. Wouldn't this feature make the machine much more versatile? ***—William S. MacTiernan, Schenectady, N.Y.***

Sven Hanson replies: You *can* buy shapers that will run your router bits and spread the economic pain of purchasing a full range of cutters over a longer period of time. This method also allows you greater versatility in choosing patterns, and offers the flexibility of using cheap router cutters for light jobs.

Your initial investment is still going to be steep. All of the shapers I found that would accept router-bit adapters were interchangeable-spindle machines; the most economical of them (a Taiwanese-made model) was $795. The router-arbor spindles on these machines accept ½-in.-shank router bits, but you'll have to sleeve the spindle down with special adapters to use ⅜-in. or ¼-in. bits. Two companies that offer router-adapter spindles as an accessory/option on their shapers are Delta International Machinery Corp., (800) 438-2486, and Chang Iron, distributed by Woodworker's Supply of New Mexico, (800) 645-9292.

Bear in mind that router cutters generally are considerably smaller in diameter than shaper cutters. So, a router bit used in a shaper will run at half the speed (or less) of a full-size shaper cutter used in a shaper, or a router bit used in a router. You'll have to compensate for this reduced speed (measured in linear feet per second) by feeding the stock more slowly. The following equation will help you determine the speed of various shaper cutter and router bit combinations:

$$\text{Speed (linear fps)} = [(\text{RPM} \div 60) \times (\text{bit dia.} \div 12)] \times 3.14$$

[Sven Hanson, founder of the Albuquerque Woodworkers Assocation, builds custom furniture in Albuquerque, N. Mex.]

Repairing a guitar bridge

Shortly after my acoustic guitar went out of warranty, the tension on the strings pulled one corner of the bridge about ¼ in. off the deck of the guitar. How can I repair the bridge?
—Ed Mikolajczyk, Orange, Calif.

William Laskin replies: Bridge lifting, especially on steel-string guitars, is not uncommon. Whether the problem was caused by string tension, a failed glue joint, a warped or shrunken guitar top that allowed the bridge to angle forward or a combination of these problems, the remedy is the same. Essentially, you reattach the bridge with a large clamp and any

good resin glue, such as the aliphatic or yellow glues.

I'd recommend you first remove the bridge from the guitar using one of three possible methods. First, tune the guitar up to tension and allow a few weeks for the strings' pull to lift the bridge a bit more. As the bridge lifts, it might be easier to slide a thin flexible tool, such as a 1-in. paint scraper, into the gap to pry the bridge off. Prod gently, working a little under one edge of the bridge, then repeating the maneuver under the opposite edge. Mask off the top around the bridge with tape to prevent scratching. Your goal is to shear off the bridge without tearing any wood from the bridge or the top.

If the string tension doesn't lift the bridge, your second option is to go through the prying operation described above using only the present gap in the glueline as an entry point for your scraper. Your third choice is to respond to the natural fear of accidently damaging the guitar and do none of the above. Take the instument to your local instrument repair shop instead.

If you decide to go ahead and remove the bridge yourself, the next step is to clean the dried glue from both the bottom of the bridge and the top. Then, fit the bridge's underside to mate with the top, either flat or slightly convex if the top curves. Finally, I'd reglue the bridge by clamping it to the top between a wooden support block on the underside of the top and a clamping jig on the bridge. The support block and jig are necessary to spread the gluing pressure. The block going inside the guitar will have to be slotted to avoid the braces and allow it to contact the bridge plate (if there is one) or the top itself. Secure it in place with masking tape. I'd leave the whole thing clamped overnight to let the glue cure.

It might also be possible to reglue only the portion of the bridge that's lifted. To do this, work glue into the opening, then clamp the bridge between support blocks as descibed above and hope for the best. The problem here is that you will probably only be regluing the old glue to itself. Without cleaned wood surfaces, adhesion will most likely be short-lived.

[Grit Laskin builds custom guitars in Toronto, Ont., Canada.]

Finishing both sides of drawers

One of the first finishing rules I learned was to apply the same finish to both sides of a board—to prevent warping and uneven moisture movement. But Tage Frid's article on drawers (*FWW *#45) recommends using no finish other than paraffin on the outside of drawer sides or inside of carcases. Does the paraffin balance the finish on the other side?

—Steve McGee, Seattle, Wash.

Tage Frid replies: If drawers are finished on the outside and the cabinet is finished on the inside, the finish might gum up and glue the drawer to the carcase. The paraffin avoids this problem and also provides an adequate finish for protecting the wood, since the drawers are usually closed and very little air gets inside. If you look at old furniture, you'll notice that the inner sides of the cabinet were left unfinished—as, in many cases, were drawer interiors. Because the case sides are rigidly joined, warpage is not usually a problem. With a large tabletop, however, I'd still finish both sides. A top can't be restrained the way a carcase side is, so it's liable to warp.

[Tage Frid is professor emeritus at R.I. School of Design.]

Send queries, comments and sources of supply to Q&A, Fine Woodworking, ***Box 355, Newtown, Conn. 06470. We attempt to answer all questions but, due to the great number of requests received, the process can take several months.***

Holdfasts for the Roubo workbench—The antique workbench featured in issue #65 prompted blacksmith, machinist and woodworker Norm Peschke to let us know that he's been using hand-wrought holdfasts for years. He says that they're the sort of thing that can be forged by any competent, neighborhood blacksmith. As a guide for those who might be so inclined, Peschke offers the following hints: The steel he uses is some old ⅝-in. rod that he bought as scrap, but any mild steel or even wrought iron can be made to work. Depending on the springiness of the material, thin and flatten the neck of the holdfast so that there is a balance between the wedging action of the holdfast in its hole and the downward spring of the clamp's head against the material. Peschke's own holdfasts fit the end of his shaving horse, and serve to clamp workpieces between it and another low bench similarly equipped. They're a little smaller than the ones shown for the Roubo bench: about 15 in. long, with an 8-in. reach. If you can't find a local blacksmith interested in the job, Peschke himself will make you a holdfast for $20. You can write him at Rt. 1, Box 160, Marshall, Ind. 47859.

Chemical staining with lye—Reader response to Tom Dewey's article,"Unlocking Cherry's Color," which appeared in *FWW* #61, has raised some cautions. These apply not only to using lye, but also to using any of the chemical dyes mentioned in George Frank's article in this issue.

Briefly, Dewey's method calls for using up to six tablespoons of household lye per quart of warm water. When this mixture is sponged or sprayed on cherry, it darkens the heartwood to the color it would naturally achieve with decades of aging.

The first concern is that lye might be left on the surface, thereby making the wood unsafe to use around food. Dewey himself would not use the treatment on a salad bowl, but chemical engineer W.J. Collings, of Cleveland, Ohio, wrote to explain that any lye residue would quickly react with the carbon dioxide in the air to form harmless sodium carbonate. He went on to say that, "It would be impossible to get any lye exposure from a salad bowl unless it was filled with a fresh solution."

Yet the whole story appears to be a lot more complicated, with chemical interrelationships that no chemist we've been able to find can quite explain.

After treatment and drying, the wood surface is left in an alkaline condition. Woodworkers using catalyzed lacquer on chemically dyed cherry have run into serious problems—the first coat appears to adhere, but the second coat peels.

We called Sherwin-Williams, makers of some catalyzed lacquers, to find out what was going on. John Wolfe explained that the catalyst used to harden the lacquer is an acid; applying it to an alkaline surface inhibits the hardening, producing a soft base coat. This soft undercoat doesn't have the resilience to resist the next coat's shrinking and hardening action. Wolfe suspected that the same effect would occur if alkyd ureas or conversion varnishes were used. He went on to advise that he'd apply vinyl sealer as a first coat under any subsequent finish. This turns out to be the sealer Dewey himself has been using for years, followed by nitrocellulose lacquer.

John Grew-Sheridan, of San Francisco, Calif., had a harrowing experience of another kind using the lye treatment on three cherry tables. The job was slated to cost $4,700—with about $1,000 worth of wood alone—and the whole thing nearly crashed when the lye went on. "You wouldn't believe the blotches, the overlap marks, the runs and drips," Grew-Sheridan exclaimed. "Despite all our efforts to apply the solution evenly, we knew we were in deep trouble when the surface dried. There was no way the customer could accept modern furniture with such uneven coloring."

Grew-Sheridan had not blindly stumbled into his dilemma; there had been a week of testing lye concentrations, application methods and compatibility with the planned finish (his tests were thorough enough to have discovered the problems with catalyzed lacquer). But chemical finishes are, by their nature, uncertain in their use, because they react with substances in the wood—and no two pieces of wood are exactly alike. Dewey makes mostly period pieces, and some variation in the patina is not objectionable. But Grew-Sheridan had to find a cure.

After Grew-Sheridan's efforts with a belt sander had complicated matters, he finally enlisted the help of Bay Area finisher Hugh Fite, who surveyed the damage and said the job would be easy enough, but would take a little time. Fite applied vinyl sealer, then numerous coats of nitrocellulose, with strategic glazing coats of toner in between to even out the color. By week's end, the tables had a deep, rich gleam, and blood pressure had returned pretty much to normal.

Two weeks ago, we got another letter, this one from Philip N. Werner, of Pavilion, N.Y.:

"I tried Dewey's method of aging cherry on two pieces I built and it produced some beautiful results. Unfortunately, though, these results were short-lived. In less than a month, both pieces, which were finished with lacquer, were covered with white streaks and blotches.

"I assumed that there was still some active lye on the surface, so I removed the finish from one piece, then applied vinegar to neutralize the remaining lye. This proved to be a disaster. The entire piece turned white, and I tried everything I could think of to bring the color back, but nothing worked. As a last resort, I tried some methylene chloride paint stripper on it, and as soon as it touched it, the color returned."

Back we went to a new round of chemists for an explanation. There was a general consensus that the wood surface might have been made more hygroscopic (water-absorbing), and that the excess water in the wood could have caused the finish to whiten. But nobody was sure whether this was due to the chemical condition of the wood or its physical condition after the lye treatment. The only agreement was that the subject was, chemically, a can of worms. Vinegar, indeed, proved to be a bleach, but this surprised everybody we talked to.

Paint chemist Erick Kasner, of North Brunswick, N.J., offered the caution that such unpredictable results aren't uncommon with chemical dyes. He confirmed the advice that vinyl sealer makes the best first coat, and went on to say that he'd use it in subsequent coats as well. "Vinyl sealer is usually pure vinyl pellets dissolved in toluene; you can add 10% to your lacquer top coats and improve moisture resistance by about 50%."

Michael Dresdner, a guitar builder in Zionhill, N.J., apprenticed in the antique-restoration trade. He said he learned about chemical treatments from the "old guys," and went on to add: "You never saw a profession where the old masters were so eager to give up all that alchemy and use stuff right off the shelf. They were all really grateful when anilines came along."

Shop-built moisture meter update—Rick Liftig, whose project for a shop-built moisture meter appeared in *FWW* #53 and has since been reprinted in *FWW on Wood and How to Dry It,* has come up with a summary of common problems and some substitutions for the discontinued Radio Shack parts.

Liftig wrote to warn that substitutions for part LM 308 may not work, and that well-meaning salespeople may have been leading woodworkers astray. If necessary, you can replace the part with NTE 909, or order the correct part from Digi-Key Corp., Box 677, Thief River Falls, Minn. 56701, (800) 344-4539.

The black-and-white plans featured in the reprint are a little more difficult to follow than the original color plans (in which, however, the meter polarity in figure 3 was reversed;

rely on figure 1). Be sure that the bands on the diodes are facing the correct way—U1 should have a dot in the upper right-hand corner (or a notch facing right); D1 and D3 should have their bands facing right; D2 should face left. The center lead of transistor Q1 should not be connected—it just acts as a resistor in the meter.

Concerning the discontinued and re-numbered parts: You can use any 0-1 milliamp meter; S1 can be any SPST (on/off) switch; and the phone jack is now listed as Radio Shack part number 274-254, but any two-conductor jack and plug will work. Take special care not to hook up any parts backwards, or you may damage other components. When you switch the meter on, the needle should swing all the way to the right pin (full scale). If you touch the electrodes with your finger, the reading should fall back to zero. Scale E is obtained by turning switch S2 to any of the unconnected positions.

Mosaic bracelets revisited—We've had a few questions about where to get dyed veneers to make the laminated bracelets Richard Schneider wrote about in *FWW* #61. One source is Constantine's (2050 Eastchester Rd., Bronx, N.Y. 10461), which sells variety packs of dyed-through veneers for marquetry and other work. These, combined with natural colors from Constantine's other veneer assortments, can produce stunning effects. The author, however, dyes his own veneers according to the following formula:

Use aniline dye on rotary-cut maple veneer that's 0.025 in. to 0.032 in. thick (thicker veneer is very difficult to dye all the way through; rotary-cut veneer doesn't curl up during the dyeing process). The fastest way to ensure complete penetration is to dye the veneer in a 14-qt. pressure cooker. Cut the veneer into 3½-in. by 13½-in. strips and fill the cooker no more than two-thirds full of dye and veneer. Depending on the color, it takes anywhere from half an hour to several hours at 12 to 15 psi for the dye to penetrate.

After a while, cool down the cooker until it loses pressure, open it and move the veneer around to make sure that the dye covers all the pieces. Cook a second time, then remove a piece of veneer, dry it in the oven and cut it across the grain with a sharp knife to see if total penetration has been achieved. Wet veneer will not give a valid test result. Keep the rest of the veneer in the hot dye while you perform the test—allowing it to cool will leave the sheets bent and thus difficult to laminate.

If the test is successful, wash the rest of the veneer to remove any scale and hang the pieces on a line to dry.

Three more plate joiners—Paul Bertorelli's article on the new Freud plate joiner (*FWW* #64) aroused the interest of W.S. Jenks & Son (1933 Montana Ave. N.E., Washington, D.C. 20002), who plan to import the Mini 3D "Vario" made by Rudolf Kaiser in Austria. The machine, which has a 600-watt AEG motor, aluminum construction and a non-slip rubber faceplate, will be introduced at $399. For details, write Jenks at the above address, or call (800) 638-6405 or (202) 529-6020.

Two well-known tool companies, Porter-Cable and Bosch, are introducing their own plate joiners. Porter-Cable's model 555 will retail for $270, and should be available by the time this issue reaches you. Unlike other designs on the market, the 555's motor is vertically mounted, like a pad sander. Bosch's plate joiner, model number 1607, should be available next summer and is expected to retail for about $299. It's inevitable, of course, that both machines will be discounted by distributors. □

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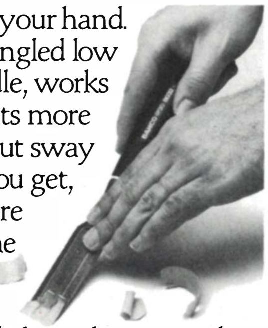

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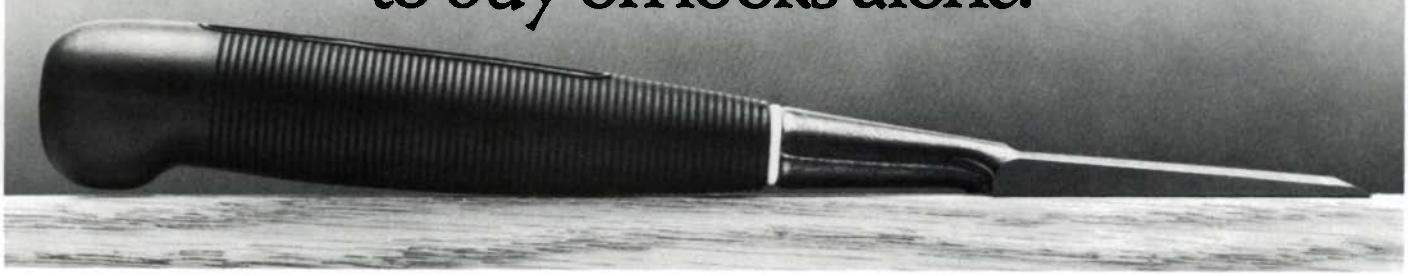

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		List	Sale
Set of 3 Blades		$272.77	$159.50
LM72M010	10 x 24 Flat	70.69	48.25
LU84M011	10 x 50 Comb	81.22	49.75
LU85M010	10 x 80 ATB	120.86	81.50

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DS306	6" x 18 Dado Set	$160.12	$125.00
DS308	8" x 18 Dado Set	196.09	135.00

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EC-900	5 piece Shaper Set	$489.41	$380.00

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		List	Sale
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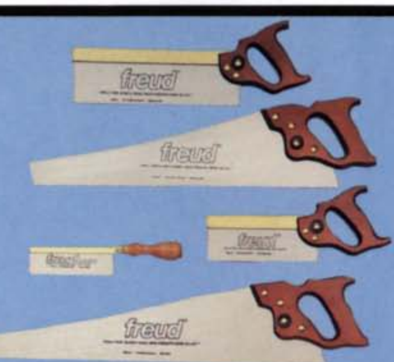

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PS022	22" x 10 points	20.93	18.25
TS012	12" x 15 points	26.71	21.25
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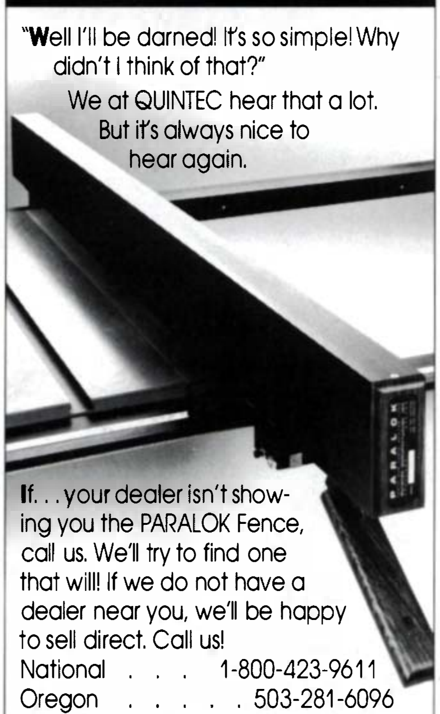

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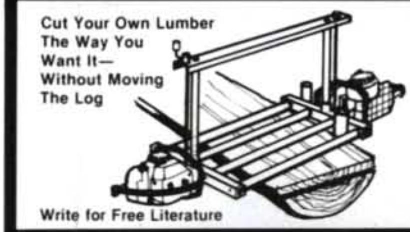

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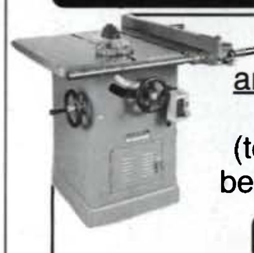

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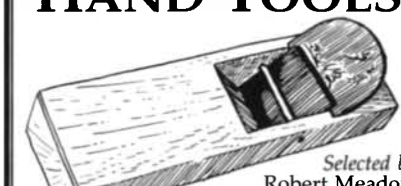

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B7075	3x21" dustless Belt Sand.	179	116
B7100	3x24" dustless Belt Sand.	208	140
B7200A	4x24" dustless Belt Sand	269	165
TS380	14" Mitre Box	629	385
W640	7¼" 13 amp circular saw	158	99
W740	8¼" 13 amp circular saw	171	125
JS60	Jig Saw-Single Speed	172	99
JSE60	Jig Saw-electronic v/speed	198	123
R150	1 H.P. Plunge Router	138	99
R331	2 H.P. Router	220	159
R500	3 H.P. Route	265	163
E3800	Drywall screwdriver 0-4000	126	79
L120U	3⅛" Planer	142	99
BD1020ARK	⅜" 2-spd Cordless Drill w/free holster-Xtra special buy	148	95
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SG1000	4½" H.D. Mini-Grinder	99	59

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0244-1	½ drill 4.5A magnum	179	115
0222-1	⅜ drill 3.3A 0-1000 rpm	165	99
0228-1	⅜ drill 3.3A 0-1000 rpm	145	80
0375-1	⅜ close quarter drill	195	118
0210-1	⅜ cordless drill 2 spd	195	115
6539-1	cordless screwdriver 19D rpm	103	58
3102-1	Plmbrs rt angle drill kit	295	175
3002-1	Electricians rt angle kit	290	170
5399	½" D-hdle ham drill kit	284	165
1676-1	H.D. Hole Hawg w/cs	375	230
6511	2 sp sazsall w/cs	207	118
6405	8¼ circle saw	199	122
6750-1	Drywall driver 0-4000	141	85
6798-1	Tek screwdriver	173	105
6226	2 sp bandsaw w/case	416	250
6234	TSC bandsaw w/case	416	250
6507	TSC sazsall w/case	219	129
6170	14" chop saw	349	209
6012	Orbital sander 3⅝" x 7⅜"	179	100
6014	Orbital sander 4½" x 9¼"	189	108
6305	6¼" cordless circle saw	239	134
6753-1	Drywall driver 3.5A	125	73
8977	Var temp heat gun	108	70
0214-1	⅜" v. spd cordless drill	209	125
5397-1	⅜" v. spd. hammer drill kit	227	145
0211-1	⅜" cordless driver drill	205	120
0212-1	⅜" v. spd cordless drill	229	125
5371-1	½" v. spd Hammer Drill Kit	313	199
3107-1	½" v. spd. Rt. Angle Drill Kit	305	189
1854-1	Super hole shooter-10A	530	350
6232	4¾" bandsaw w/case	452	275
6747-1	Drywall driver-0-2500	141	85
0230-1	⅜"drill 0-1700 rpm	165	100
3300-1	½" v. spd MagnumRt. Angle Kit	279	180
5620	Router 1 H.P. — 8 amp	289	175
5660	Router 1½ H.P. — 10 amp	299	180
5680	Router 2 H.P. — 12 amp	350	220
5455	7/9" polisher 1750 rpm	199	130
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LU82M010	Cut-Off	10"	60	86.40	44
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
PS203	Gen'l Purp.	7¼"	24	27	17.50
PS303	Plywood	7¼"	40	33	20.50

MAKITA CORDLESS

Model		List	Sale
6002DWK	⅜"Drill Kit 2 Spd. Rev. 7.2 v	178	91
6070DW	⅜" Var. Spd. Rev. 7.2v	108	57
6071DWK	⅜"Var. Spd. Rev. w/removable batt	180	102
4300WD	Jig Saw	188	99
5081DW	3⅜" Saw Kit	212	95
5600DW	6⅛" Circular Saw	284	125
9035DW	Finishing Sander	168	73
6010DWK	⅜" Cordless Drill Kit	174	88
6010SDW	⅜" Cordless Drill	94	45
8400DW	⅜" Hammer Drill	224	105
DA3000DW	⅜" Angle Drill	218	98
6010DL	⅜" Drill w/Flashlight	188	89
6012HDW	⅜" 2 spd Driver Drill w/Bat & Metal Case	208	94
0K1002	⅜"Drill w/Flursnt Lt.	176	90
6710DW	Cordless Screwdvr Kit	176	84

Model	MAKITA BATTERIES	List	Sale
7.2 Volt		40	27
9.6 Volt		44	29
10.8 Volt		99	66

MAKITA TOOLS

Model		List	Sale
5007NBA	7¼" Saw w/Elec. Brake	186	114
5008NBA	8¼" Saw w/Elec. Brake	212	130
B04510	Sander	92	43
9900B	3" x 21" belt sander	234	119
9924B	3" x 24" belt sander	222	130
9924DB	3" x 24" b/sand w/bag	248	130
9035	⅓ sheet finish sander	96	48
9045B	½ sheet finish sander	186	90
9045N	¼ sht fin sand w/bag	190	105
4200N	4⅜ circ. saw 7.5 amp	182	93
5201NA	10¼ circ saw 12 amp	438	215
4300BV	v/sp jig saw 3.5 amp	234	117
4301BV	orb v/sp jig saw 3.5 amp	248	125
JR3000WL	2 sp recip saw w/cse	198	120
JR3000V	vs recip saw w/case	208	110
LS1000	New 10" Mitre Box	396	198
9820-2	Blade Sharpener	288	159
410	Dust Collection Unit	410	269
3705	Offset Trimmer	218	115
1900BW	3¼" planer w/case	198	93
1100HD	3¼" planer w/case	328	160
9207SPC	7" Sander-Polisher	250	140
3601B	1⅜ hp router	218	115
3700B	½ hp trimmer	162	82
9501B	4" Grinder Kit	119	55
804530	6" Round Sander	98	48
DA3000R	⅜" angle drill	212	129
DP4700	½ v/sp w/rev 4.8 amp	178	92
HP1030W	⅜ v.s.r. hammer drill w/cs	168	98
6300LR	½" angle drill w/rev	288	152
8419B8-2W	½" s.sp. hammer w/cs	268	150
2708W	8¼" Table Saw	348	196
GV5000	Disc Sander	108	53
6800DB	2500 rpm 3.5 amp	146	79
6800DBV	0-2500 rpm 3.5 amp	156	89
6801DB	4000 rpm 3.5 amp	146	79
6801DBV	0-4000 rpm 3.5	156	89
2030N	12" planer/jointer	2580	1475
2040	15⅝" planer	2180	1195
1805B	6⅛" planer kit w/case	498	265
JV1600	var. speed jig saw	178	89
JV2000	var. speed orb. jig saw	198	100
5005BA	5½" circular saw	192	98
5007NB	7¼" Circ. Saw	158	94
9503BH	4½" sander-grinder kit	166	95
4014NV	var/speed blower	168	79
DP3720	⅜ drill Rev. 0-1800 rpm	99	47
6510LVR	⅜ drill Rev. 0-1500 rpm	144	65
6013BR	½" Drill rev. 6 amp	208	100
5402A	16" Circular Saw - 12 amp	542	315
3612BR	3 HP Plunge Router	338	172
9401	4x24 belt Sander w/bag	288	160

SKIL SIZZLERS

Model		List	Sale
5510	(551) 5½" Circ. Saw	130	83
5625	(552) 6½" Circ. Saw	164	108
5650	(553) 7¼"Circ. Saw	164	108
5665	(554) 8¼" Circ. Saw	185	118
5750	(807) 7¼" Circ. Drop Foot	175	115
5765	(808) 8¼" Circ. Drop Foot	204	130
5790	(810) 10¼" Circ. Drop Foot	350	225
5825	(367) 6¼" Worm Saw	252	135
5865	(825) 8¼" Worm Saw	277	149
3810	10" Mitre Saw	349	169
7565	Palm Sander	69	37

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73-717	7-1/4	18	11.72	6.45
73-737	7-1/4	24	14.92	8.20
73-757	7-1/4	40	27.40	15.10
73-758	8	40	39.90	21.95
73-759	8-1/4	40	40.66	22.35
73-739	9	30	29.52	16.25
73-769	9	60	64.40	35.40
73-740	10	32	30.98	17.00
73-770	10	60	64.90	35.75

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Model		List	Sale
476	Power Hammer (for do-it-yourselfer)	35	26
480	Power Driver — lowest priced trigger actuated comp w/case	159	110
482	Multi Driver — top of the line complete w/case	329	235

Model		Per 100/Box
15549	Penetration Control Discs ⅞" dia.	3.00
	POWER LOADS	
29278	Gray - Light Duty	4.25
29280	Brown - Medium Duty	4.25
29282	Green - Heavy Duty	4.25
29284	Yellow - Extra Heavy Duty	4.25
	STANDARD PIN	
58047	SP75 (¾")	3.85
58048	SP100 (1")	4.40
58049	SP125 (1-¼")	5.35
58050	SP150 (1-½")	5.85
58051	SP200 (2")	7.35
58052	SP250 (2-½")	8.35

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SFN2	Finishing to 2½"	529	398
SN2	Sheathing - Siding, etc.	525	395
M2	All Purpose	440	330
SN4	Const. Framing, etc.	635	485
LS2	Moulding & Trim	325	259
LS4	Moulding & Trim	330	265

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EY961B-7.2 batteries List 46.30 Sale 33.00
EY991B-Keyless chuck List 35.00 Sale 26.00
EY561B 7949 Holster (fits EY570B & EY561B) List 10.20 Sale 8.00

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#50	for ¾" Black Pipe	11.23	7.15	79.00
#52	for ½" Black Pipe	9.36	6.10	67.50

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Model		List	Sale
6092DW	Cordless Driver Drill Kit 2 Spd.-var. spd. rev. w/o clutch complete w/case	208	106
6093DW	Cordless Driver Drill Kit 2 Spd.-var. spd. rev. and 6 stage torque setting complete w/case	224	119
6891DW	Cordless Drywall Screwdriver Kit 0-1400 R.P.M.-Lt. weight - 2.9# complete w/case	204	109
3620	1¼ H.P. Plunge Router 7.8 amp-24,000 R.P.M. complete w/case	166	89
4302C	Electronic Jig Saw orbital, var. spd. 6 amp	256	139
5077B	7¼" Hypoid Saw (similar to worm drive) 13 amp-4,300 R.P.M.	250	133

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Model	WORM DRIVE SAWS	List	Sale
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3051	7¼" 13 amp - 4300 rpm	232	135
3052	8¼" 13 amp - 4300 rpm	247	169

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3030	7¼" 13 amp - 5800 rpm	155	100
3035	8¼" 13 amp - 5800 rpm	175	125
3034	7¼" 13 amp - 5800 rpm	162	110
3033	6½" 13 amp - 5800 rpm	162	115

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1920	⅜" Rev. H.S. Drill Kit	174	99
1921	⅜" Rev. H.S. Drill	135	84
1930	⅜"Rev. H.S. Drill Kit w/cs	181	103
1940	⅜" Rev. High-torque Drill Kit	174	99
1941	⅜" Rev. High-torque Drill	135	85
1950	⅜" Rev. High-torque Drill Kit w/cs	181	105
1970	⅜" Rev. High-torque Scrudrill w/cs	188	117
1975	⅜" Rev. High-torque Scrudrill	162	105
1980	⅜" Rev. Adj. Clutch Scrudrill Kit	184	100
1985	⅜" Rev. Adj. Clutch Scrudrill	158	98
2901	⅜" Rev. H.S. Clutch Scrudrill	192	118
2931	⅜" Rev. High-torque Clutch Screwdriver	192	118
5930	⅜" Hammer Drill Kit	199	124
5921	⅜" Hammer Drill	169	110

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		List	Sale
1581VS	Top Handle Jig Saw	225	129
1582VS	Barrel Grip Jig Saw	126	119
1942	Heat Gun 650º-900º	99	69
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
11212	Bulldog ¾" SDS Rotary Hammer	329	175
1920VSK	Var/Sp Cordless 2 Spd	169	79
1196VSRK	⅜" hammer drill v.s.	190	109
1198VSR	½" hammer drill - 2 sp v.s.	199	119

PORTER CABLE TOOLS

Model		List	Sale
630	1 H.P. Router — 6.8 AMP	150	93
690	1½ H.P. Router — 8 AMP	194	114
691	1½ H.P. Router D-Hdle	218	129
536	1½ H.P. Speedmatic Router	300	184
518	3 H.P. Router 5 Speed	490	323
520	3 H.P. Router 15 AMP	460	298
309	Trimmer 3.8 AMP	130	84
310	Trimmer 3 AMP	190	124
312	Trimmer Offset Base	205	133
319	Trimmer — Tilt Base	215	138
695	H.D. 1½ H.P. Router/Shaper	278	190
696	H.D. Shaper Table	149	104
351	3 x 21 Belt Sander w/o Bag	189	125
352	3 x 21 Belt Sander w/Bag	199	115
360	3 x 24 Belt Sander w/Bag	280	185
361	3 x 24 Belt Sander w/o Bag	260	175
362	4 x 24 Belt Sander w/Bag	295	198
363	4 x 24 Belt Sander w/o Bag	280	185
587	7¼ Speedtronic 14.5AMP Saw	199	125
315-1	7¼ Top Hdle. 13 AMP	166	96
617	7¼ Push Hdle. 13 AMP	166	96
346-1	6½" Top Hdle. 12 AMP	161	100
368-1	8¼" Top Hdle. 13 AMP	176	110
314	4½" Trimsaw 4.5 AMP	180	109
548	X-H Duty Bayonet Saw	235	155
9548	X-H Duty Saw w/case	255	169
9629	Recip Saw v/sp 8 AMP	204	133
9627	Recip Saw 2 Speed 8 AMP	193	124
666	⅜" H.D. v/sp Drill	165	115
620	⅜" H.D. 4 AMP 1000 R.P.M.	124	85
621	⅜" H.D. v/sp 0-1000 R.P.M.	130	78
320	Abrasive Plane	129	89
126	Porta-Plane — 7 AMP	265	179
9118	Porta-Plane Kit	299	186
653	Versa-Plane — 10 AMP	399	265
9652	Versa-Plane Kit	419	275
7545	V.S. Drywall Gun H.D.	163	110
505	½ sht pad sander	180	100
7511	⅜" v. sp. drill 5.2 amp	164	102
7514	½" v. sp. 0-750 H.D. drill	169	104
666	⅜" H.D. v/sp. T hdle 4A	165	110
303	Paint remover	220	145
304	7" disc sander 4000 rpm	175	110
305	7" disc polisher 2000 rpm	175	110
367	3¼" plane 6.5 amp	187	120
537	1½ HP router d hdle	315	189

X TRA SPECIAL BY PORTER CABLE

		List	Sale
9118	Porta Plane Kit	299	185
7548	Top Handle Jig Saw	199	119
7648	Barrel Grip Jig Saw	199	119
330	Bloc Sander ¼ Sheet	90	52

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Rustic Furniture

Crafting with nature's free-form designs

by Dick Burrows

Long before the turn of the century, guides and caretakers in the Adirondack region of New York State whiled away the winter hours making tables, chairs, bureaus and cupboards with a handful of nails and a few branches harvested from the woods near their homes. In the summer, their winter pastime became a cash crop when city folks with money flocked to the region and began outfitting their camps with local gear, looking for a taste of the primitive life.

The same style of rustic, twig furniture is still being made in the Adirondacks and other parts of the country today, but it's no longer restricted to camps and front porches. Now, rustic furniture is a trendy design item, commanding high prices in shops from Manhattan to Los Angeles.

The whole fad mystified me. I'd seen pictures of the great Adirondack camps, but most of the twig furniture inside the impressive buildings looked heavy, rigidly upright, uncomfortable—much like the campfire stuff we kids used to knock together with hatchets to appease our scoutmaster. Serendipity might occasionally have brought a bunch of branches and twigs together in a pleasing way, but you could hardly have called it craftsmanship.

Once I began looking at some of the old pieces and talking to contemporary makers, though, I began to realize that the only

Rustic furniture is surprisingly sophisticated, despite its backwoods origins. Barry Gregson created the flowing curves on his modern settee, left, by doweling yellow birch branches together and coping each joint to imitate a natural branch. The 19-century cupboard by Ernest Stowe, above, is equally high style, with split-branch fans and stars nailed to birch-bark sides.

thing wrong with rustic was my ignorance of it. The early makers were as inventive and sensitive to their materials as any of today's furnituremakers. They had few tools—handsaws, knives, hammers, drawknives, chisels, braces and augers—but they used them expertly. Many had an innate sense of balance, proportion and symmetry. Some makers were carpenters, but it's unclear how they learned about furniture. Their joinery was limited to the nailed butt joint or tenon and socket, but their decorative touches included all the sophistication of high-style furniture—quarter columns, inlay, parquetry and rosettes, like those shown in the photo above. Indeed, the pieces displayed in museums and private collections make it clear that the old-timers worked to high standards.

Except for the furniture, the independent and somewhat reclusive early makers left little to indicate what they were like. Furnituremaking was a sideline, so they didn't keep records. "Rustic is where they turned their creative energies in the winter," says Craig Gilborn, director of the Adirondack Museum in Blue Mountain Lake, N.Y. "They didn't have any tradition of building to follow. . . maybe the skill was in their fingertips because they knew the material and lived outdoors all their lives."

Gilborn, who recently completed a book on his 13-year study of Adirondack furniture, showed me some stunning pieces in the museum's collection and got me thinking about the builders. Traditions of design and technique are important to most of the contemporary woodworkers I know. But the old Adirondack makers apparently had only one tutor: a basic, almost druidic feeling for wood—not stacks of dimensioned, kiln-dried lumber, but gnarled, knotty, living branches of birch, willow, ash, cedar, ironwood and hickory.

I wondered what the contemporary rustic makers I was soon to meet would be like. Gilborn speculated that the lack of traditions would probably be an asset for them, leaving them free to explore better joinery methods and create furniture that was more comfortable than many of the old pieces.

He was right: Craftsmanship, comfort, durability and beauty are prime concerns of every modern maker I visited. Mostly self-taught, these craftsmen share a love for the forest and the beauty of natural forms. All rely more on their eyes than on squares. And each one seems perfectly suited for life in the turn-of-the-century camps described by Gilborn.

From 1870 until the turn of the century, life at these cottages was rustic and comfortable—not lavish, although people did have servants and guides. This period produced the best furniture. Up to this time, rustic furniture didn't receive much notice, although the guides had always made simple tables and benches for campsites. Gilborn theorizes that the interest in rustic furniture might actually have originated in cities like New York. Central Park played an important role because its designers incorporated so many rustic shelters, benches and other features. "You could make a case where city folks come up in 1850 and asked the locals to build the same kind of thing they saw in a New York park," Gilborn says. Later, the camps became larger and fancier, and people began to get rid of the twig furniture.

Rustic is appealing to Gilborn because of the variety of natural materials and textures used to achieve different designs. "Most of the designs are based on little variations, like jazz—something like just flipping a piece of birch bark to show its back side, or to alternate front and back sides of the bark." Because so little is known about the original makers, Gilborn thinks it's a mistake to read too much into their designs or to call the work sculpture. He sums it up as "intelligence, but no pretense." The resurgence of rustic in recent years is due to this appeal, he believes, as well as to what he considers a city phenomenon. "There's something especially satisfying about rustic furniture to people who live in apartments of glass, plastic and metal," Gilborn says. "The pieces are also relatively inexpensive, and no two are alike."

Ken Heitz, one of the first craftsmen to become involved in the revival of the craft in the Adirondacks, agrees that rustic is often considered an antidote to high-tech environments. A former IBM employee who moved to the Adirondacks from New Jersey in 1970, Heitz thinks rustic's revival is an outgrowth of the back-to-the-land movement of the 1970s and the renewed interest in timber and log homes. He now makes 60 to 80 rustic pieces a year. And while he doesn't advertise, Heitz sells pieces all over the country—mostly to repeat customers, or to people referred by them.

Heitz began making rustic furniture after the sawmill where he worked burned down. Jobs are scarce in the Adirondacks, so he used his free time to build a few rustic pieces for his home. He found the work interesting, and sold several pieces to tourists. The next thing Heitz knew, he was hauling a truckload of his furniture to a Manhattan gallery. Living at the time was pretty rustic: no water, no power, everything done by hand. Good experience, he says, but hard to make a living.

Now his shop off Route 28 in Indian Lake, N.Y., has power for lights, for the homemade lathe shown on the following page, for power drills and other tools—none of which has compromised his sense of craftsmanship. "If it's going to be something I'm

Photo: Ken Heitz

Ken Heitz

The ironwood posts on Ken Heitz's chair, above, are bent around a form and dried in a wood-fired kiln until the bend is set. Tenons cut on the ironwood rungs are glued and pinned into holes bored into the posts. The desk panels are made by gluing birch bark to pine. Tenons on the ends of bed rails and other long pieces can be shaped by hand, but Heitz finds it much faster to chuck the piece between centers on the 10-ft. bed of his homemade lathe, left, and turn the tenons and sloping shoulders.

proud of, it's going to be attractive and it's going to last," Heitz insists. Rather than copy old designs, he aims to make each piece an original, developing one-of-a-kind patterns to please the eye.

"At first, I just nailed pieces together because I didn't have the knowledge or the wherewithal to join them properly," Heitz explains. "The original pieces that survive *were* made properly: socket-and-tenon joinery, aged wood, either air- or kiln-dried." Now he glues tenons into bored holes and secures them with a nail or a wooden peg.

Heitz considers kiln-dried wood a must. He harvests most of his ironwood and white ash in the fall and winter; that way, the bark stays on, unlike wood that's cut when the sap is running. Heitz values the twists and curves that occur naturally in wood, but—like most of the makers I talked to—he doesn't hesitate to bend or shape a piece to achieve the desired effect. His kiln is equipped with braces and ropes for holding bent parts in place while they dry. This helps him get the right angle to pieces—the proper setback for rear chair posts, for example—without searching the woods for branches with just the right bend. The wood is left in the kiln three days to two weeks, which, Heitz says, is equivalent to three to four years of air-drying and long enough to set any bend you need.

After visiting Heitz in the Adirondacks, I decided to head out to Fall City, Washington (just outside Seattle) to talk with Monte Lindsley, a well-known West Coast maker. Lindsley makes his furniture out of willow, bending the pieces into easy-flowing curves. The willow bends easily when green, and doesn't seem to split as it dries slowly in the relatively damp Seattle air. By using about six of the thirteen varieties of thin-bark willow found in Washington, Lindsley can accent the curves with different tones, textures and colors. "I look at what I do as painting, not furniture-making. You want to bring out the colors, the colors of the earth." If the natural colors don't do the job, Lindsley sprays the willow with fabric dyes (see photo, right). He started dyeing wood after his work sold rather poorly at an Arizona show. Realizing that color is important in sunny climates, Lindsley decided to give his furniture something that would appeal to people unaccustomed to living with the natural color of trees.

For Lindsley, designing a piece means making it comfortable. "It's a challenge to take branches and make functional art pieces that you can sit on and enjoy." To reinforce the shape, he nails in X-braces whenever possible, or threads the curved members over and under each other—in effect, weaving together each piece. On a chair, for example, Lindsley might nail an arm's free-flowing curve to the inside of the lowest crossbrace, to both the front and the back of the seat and, finally, to a back brace. He blunts the nails and predrills the frame pieces to prevent splitting, then leaves the nails proud of the surface. After the pieces season a month or two, he pounds the nails down tight, cuts off the extra length with wire cutters and finishes the furniture with polyurethane varnish.

Lindsley has strong opinions about his work and the craft scene as a whole. He graduated with a forestry degree, but found the work too restrictive and drifted into craft woodworking. He read about willow furniture while working as a landscaper. After making some rustic pieces for his home, he started selling his work. Underlying his transition from forester to maker were his convictions about the environment, conservation and the value of the simple life. With his laid-back view on life, Lindsley is dismayed by craftsmen who become high-pressure mini-manufacturers, complete with computers, agents and employees.

That kind of concern keeps Lindsley a one-man shop, driving all over the country for shows. In recent years, he's done about 30 shows annually, many of them virtual black-tie events of the craft world. Now, he's trying to simplify his schedule, cutting back so he's not away from home for months at a time. But his goal remains unchanged: Lindsley still seeks to make a living by crafting objects that help people stay in touch with their heritage by letting them touch natural things, rather than plastic.

According to Hutch Traver, however, it's not enough just to use natural materials—the quality of work is also essential. "Good craftsmanship is good business," says the rustic maker, who works in Wake Forest, N.C. "People are somewhat suspect of rustic anyway. They have the notion that it's just thrown together. You have to be extra careful to counteract that feeling."

Although he's mastered dovetails and other classical techniques for joining wood into furniture, Traver—who made his first rustic piece as a youth at summer camp—is still drawn to the rustic style and continues to incorporate it in his work. "The main attraction is the shape of the wood," he says. "The forms of the bend give you a starting point. You get an idea from the shape of one piece, then you automatically seem to be led to another idea. The whole thing just seems to flow. Sometimes I concentrate on the wood forms. Other times, I concentrate on the negative space between the branches."

Like the other makers with whom I spoke, Traver relies on hand tools—an adze and a drawknife are his basic tools—but he's also partial to body grinders and heavily padded rubber sanding discs for finish work. The sanding is an important aspect of his

Monte Lindsley

Rustic furniture is a low-tech, build-as-you-go craft. After stripping the bark from a piece of green willow, Monte Lindsley bends the wet wood into a curve, right, that will become a chair back. He began dyeing willow pieces like the living room set, below, when he realized that people in places like Arizona respond to color more than they do to natural wood forms. The tabletop mosaic is created by nailing patterns of colored willow segments to a plywood base. The photo's background color is from Lindsley's unique photo studio—frozen ice on the pond behind his home near Seattle.

Photo: Monte Lindsley

Photo: Hutch Traver

Hutch Traver

An arching headboard sets off this bed by Hutch Traver. Made of eastern red cedar—what some people call juniper—it was ordered by a man who wanted to incorporate a toy in a bed for his daughter. Traver's solution was to put an abacus with maple and walnut beads in the footboard.

work. "I go for the smoothness, a very subtle feeling. Touching the wood is almost like touching the limb of a person." The color of red cedar, which Traver frequently uses, is also important to him. He carves off most of the sapwood, but leaves a little to create a harmonious counterpoint to the red of the wood and the scarlet of the knots. (Removing the sapwood also eliminates a hiding place for bugs.)

Traver's finish is linseed oil-based. He applies a couple of coats of linseed oil to clean the wood, resands, then applies a few more coats of linseed oil mixed with japan drier. For the final coats, he adds polyurethane to the linseed/japan drier mixture to produce a harder finish.

I was beginning to take a real liking to rustic furniture, but I still had some nagging questions about its continuing appeal. Tom Phillips, a woods manager in Tupper Lake, N.Y., who's been restoring rustic furniture for about 12 years and building his own for three, had a quick answer. "Wood is warm. People are tired of plastic and also tired of shoddy workmanship."

Primarily, Phillips builds tables and seating like the settee shown on p. 42, but he'll do "anything that the old guys before me did. I have the same philosophy. Anything usable in a camp can be made this way." He studied the old work during his restoration jobs, and spent three years examining chairs before making his first, which ended up in the woodstove. "Nobody is teaching anything about rustic stuff," he says. "If you don't have an aptitude for it, you're in for trouble. Each piece has a multitude of problems. You have to have a natural eye for balance and symmetry."

Construction details are pretty much up to the individual craftsman, but Phillips ticked off a few of his guidelines. The softer

Tom Phillips

Tom Phillips' yellow birch settee, above, is lighter than many 19th-century rustic pieces, yet strong because of its curved braces. To craft rosettes for embellishing rustic carcases, Phillips first makes a gently sloping cut into the side of a branch, top right, then twists the branch so the blade leaves the wood at about the same angle as it entered. The ovals are then cut in half with pruning shears and notched with a knife to fit together, right.

Gilbert Jacques

Gilbert Jacques' attractive little end table, far left, is made entirely from yellow birch, but the figured slab offers a bright contrast to the gnarled base. Makers often use wood harvested at different seasons to create other contrasts. Yellow birch is gray when young, but turns white as it ages. Willow is red in the fall and winter, but turns gray in spring and summer. The desk shown at left has a yellow birch base, white pine top, birch-bark panels and red willow inlays. The top frame is pine, screwed together and braced with angle iron. The legs are notched to accept the frame.

the wood, the thicker the components need to be. Brace as much as possible without spoiling the look of the piece. To prevent splitting, predrill holes for screws and nails. Make sure everything fits together as well as possible before assembly. For fastening veneer, Phillips recommends 1-in., No. 4 hardened and ring-shanked, color-finished nails. As a general rule, root stock or the butt end of the branch goes down and the taper aims toward the top. For contrast, try to include at least two different colors of wood—or wood and splints—in each piece.

Phillips also notes that the color of individual species varies from season to season, with the age of the wood and by the area where the tree grew, so it's important to spend a lot of time in the woods looking for good stock. Phillips relies on a chainsaw, a small bowsaw and pruning shears to cut stock. His finish is Glidden Ultra-Hide sanding sealer (No. 5035, clear).

When I told Phillips how much I liked the applied rosettes I'd seen on museum pieces, he demonstrated how he makes them (see photos above). The first step is to cut an elongated oval section off the side of a small branch. (Phillips did this freehand on the tablesaw, with a sort of twisting motion of the branch.) Start the cut on one side, sloping into the branch until you reach its midpoint, then move the branch so the cut will slope out of the branch at about the same angle as the entry cut. Cut each oval in half with shears, notch the ends to fit together with a knife and assemble the rosette as shown. Variations in thickness between individual pieces are removed with a sander.

Another Adirondack maker, Gilbert Jacques, embodies the no-pretense attitude I imagine was characteristic of the original rustic

Photo: Barry Gregson

Barry Gregson

A massive white birch bed by Barry Gregson, above, exemplifies the rugged feeling many people associate with rustic furniture. Like many rustic makers, Gregson harvests wood during the fall and winter months, when the sap is down, to ensure that the bark won't peel off his completed work. The pieces are joined together with dowels fit into holes bored into mating pieces. For a tight fit between the curved members, Gregson copes each joint with carving tools. Hand tools and carving are important parts of the rustic process.

Photo: Dan Mack

Dan Mack

Daniel Mack lets the wood suggest movement in his functional, yet sculptural, pieces. The maple and red cedar shelving unit above features a favorite Mack device—the foot-like shape on the front leg, which whimsically suggests a mock cabriole.

makers. He says his only formal technique is to gather a bunch of sticks and nail them together. A retired highway superintendent who produces beautiful work, Jacques lives high on a hill in Keene, N.Y., with a spectacular mountain view. When I admired the panorama, Jacques replied, "Yeah, you ought to be here in the winter, when there's snow everywhere, and you can't go anywhere or do anything except watch the thermometer drop."

Jacques began making rustic furniture about five years ago while recovering from a stroke. He got hooked while duplicating an old settee. Now when he's not building, he's looking for good material. "I carry a bowsaw with me all the time. I never know when I'll see a tree I want to cut into. Wood you get that way is a lot better than the stuff you buy."

Relying on wood that catches the eye is an important aspect of Jacques' design approach. Rather than work out proportions or designs beforehand, he simply starts with an eye-appealing branch and builds from there. This approach led to the gnarly little end table shown at bottom left on the facing page. Jacques also does more deliberate work, such as the little desk with bark and split-branch surface decorations, also shown.

Moving east from Jacques' home, I visited Barry Gregson, who began making rustic furniture in Schroon Lake, N.Y., about five years ago. A mason by trade, Gregson was looking to turn a long-time interest in woodworking into a source of winter income. After pricing tablesaws, planers and other tools, he was ready to forget the whole idea. But then a friend suggested he get a hatchet and some chisels and try his hand at making rustic furniture. After studying Roy Underhill's book, *The Woodwright's Shop* (1981, The University of North Carolina Press), Gregson was off to a running start.

Gregson likes the whittled, hand-hewn look obtained with hand tools. He splits out blanks with a froe and shapes them on a shaving horse with a drawknife. Tenons are also shaped with a drawknife, then shaved with a plane.

Gregson's early work was largely symmetrical, made of peeled wood with joints toe-nailed with pegs. Lately, however, he's turned more to sculptural pieces. There's no limit to design, he says, considering the number of curves you can find on a tree. "I like lots of graceful curves. One of the best places to look for wood is where logs were cut 15 or 20 years ago. New growth is invariably twisted."

Daniel Mack has an unexpected location for a rustic maker—a second-floor shop at 225 West 106th Street, right in the heart of Harlem. Mack likes New York City because of its built-in marketing benefits. He has plenty of visibility, thanks to local news coverage, and is very accessible to potential buyers looking for a natural touch for their city apartments. But there's also a more personal reason. "If I lived in the woods, the natural tree forms might not be as exciting as they are to me every morning. For a while, I thought it was ironic to make rustic furniture in the city. Now, I think the city is why I do it."

Mack made his first rustic chair as a gift for his daughter in 1978; by 1983, he'd given up a career in broadcast journalism to become a full-time maker. Most of his work is commissioned—some of it for store displays, some for the sets of soap operas and other productions. "The style comes out of the wood more than anything," he says. "Looking at old pictures isn't as important as deciding on the symmetry of the piece. Often, I tweak high style with things like mock cabriole legs. I like humor in the work."

Mack's goal is to make objects that are as much sculpture as they are furniture. Many of the makers I spoke to would object to the sculpture label, but they all draw their inspiration from the forest. A copy blurb on Mack's catalog sums it up: "This is a celebration of forest-inspired furniture. The possibilities are as infinite and beautiful as the trees themselves." □

Dick Burrows is an associate editor of Fine Woodworking. *Craig Gilborn's book,* Adirondack Furniture and the Rustic Tradition, *will be published this fall by Harry N. Abrams, Inc., 120 Woodbine St., Bergenfield, N.J. 07621.*

Carved Bowls

Texture enriches the basic shape

by Alan Stirt

I began carving the outside of my turned bowls about ten years ago after seeing fluted Chinese porcelain bowls. Once I started carving textures, I found all sorts of possibilities. At first, I carved wide flutes like the ones on the big bowl shown below, but later I began experimenting with other textures. The fine-line pattern on the shallow bowl, for instance, was inspired by photos of African masks. Carving the bowls makes them somewhat evocative of the porcelains and masks that inspired them, and the process allows me to create bowls ranging from those with a fragile, delicate quality to others that stress strength and movement.

I originally cut flutes by pressing my bowls against abrasive drum sanders of various diameters mounted in my lathe's Jacobs chuck. I liked the finished pieces, but hated the technique and the dust so much that I switched to a carving gouge. The carved flutes weren't as precise as sanded ones, but they had a wonderful texture and a pleasingly irregular look. To give my sore arms a break, I later bought an electrically powered Rakuda flexible-shaft carver with interchangeable bits (available for about $200 from Woodline, The Japan Woodworker, 1731 Clement St., Alameda, Calif. 94501). I powered the shaft with a ⅛-HP, 3450-RPM motor equipped with an on/off foot switch. The tool's reciprocating gouge is easily guided by hand. Less pressure is needed than when using regular carving tools, but the same techniques apply. The Rakuda makes clean cuts.

The basic techniques for carving fluted bowls are the same for both green and dry wood, but I prefer green wood—it's easier to carve and is readily available near my home in northern Vermont. By taking advantage of the drying power of a microwave oven and a heat gun, I can start with a green-wood block in the morning and end up with a carved, dry-enough-to-be-stable bowl in the afternoon.

I begin by roughing out the green blank so the bowl approximates the shape I want, leaving the walls ¾ in. to 1 in. thick. I like bowls with finished walls about ¼ in. to ⅜ in. thick, so my roughing out leaves plenty of stock to compensate for any warping that might occur when I zap the piece in the microwave. In designing the bowls, I also leave the areas to be carved about ⅛ in. to $^{3}/_{16}$ in. thicker than the rest of the bowl; the exact amount of extra thickness depends on the length and depth of the flutes I have in mind. I often carve flutes from the bottom of the bowl to the rim, but if just a section of the bowl will be fluted, I create a

Stirt carved the flutes and other textures on his turned bowls with an electric reciprocating gouge. Large flutes were inspired by Chinese porcelain; fine-line patterns by African masks.

visual boundary for the carving by cutting a cove or by changing the angle of the wall.

After screwing a faceplate to the rim side of the bowl, I shape the outside with ½-in. and ⅜-in. high-speed-steel, deep-fluted bowl gouges with their sides ground back and their noses relatively blunt. The long side edges can remove a lot of material quickly, and the blunt nose is good for following sharp concave curves—especially on the inside of bowls. The roughing cuts are made mostly with the sides of the tool, with the bevel rubbing. When I shape the outside of a bowl, the gouge's flute faces away from me and the cutting is done with the left side of the cutting edge, moving from the foot to the rim (the wood cuts more easily this way, as compared to cutting from the rim to the foot). On the inside of the bowl, I cut from the rim toward the center—again with the gouge's flute facing away from me, but cutting now with the right side of the tool's cutting edge.

I've successfully microwave-dried roughed-out 15-in.-dia. bowls, but the process works best for bowls 10 in. in diameter or less. Drying time depends upon the mass, species, moisture content and grain structure of the bowl, so I can't give any exact "recipes." However, there are some general principles that work for me. For example, I do all my drying on a defrost cycle—usually a couple of ten-minute treatments are enough. I never get the bowls too hot to hold in my hand, and I use a turntable stand (built-in on some microwaves or available as an accessory in department stores) to rotate the bowls and ensure even heating. I haven't had much luck microwaving bowls with a moisture content greater than 20-25%, so I let roughed-out bowls that are really wet air dry for a while before I microwave them. If the bowl is too wet, endgrain checking and honeycombing below the surface of the wood are likely to occur.

After microwaving the blank, I remount the bowl on the lathe with a three-jaw chuck (or, with a faceplate and double-face tape) and finish turning it. I employ the same techniques used for roughing out, but take very light cuts to produce the cleanest and smoothest surface possible. On the outside, I sand the areas that won't be carved—sandpaper grit is hard on carving tools. I sand the inside with a foam-backed abrasive disc chucked in an electric drill. If I skip the microwave and go directly from green blank to finished bowl, I usually don't have any problems sanding the outside, but the interior walls may be wet enough to gum up the sandpaper. I get around this by directing a heat gun into the inside of the spinning bowl for a few minutes until the surface is dry enough to be sanded. Salad bowls are then finished with food-safe Livos Kaldet Resin and Oil finish (available from Woodpecker's Tools, Inc., 614 Agua Fria St., Santa Fe, N.M. 87501). Decorative bowls and platters are finished with tung oil.

At this stage, the bowls are ready to be fluted. To draw guidelines for the flutes, I center the bowl on a plywood layout grid with 48 equally spaced lines radiating from a center point, as shown in *FWW* #59, p. 14. (There's nothing magical about having 48 radius lines, by the way—it was simply the number of indexing points on the lathe where I drew my first layout disc. After experimenting with other numbers, I decided I liked the look of 48 flutes best.) I also draw a number of concentric circles from the same center point to help align the bowl on the grid. Then, I center the bowl by eye, rim side down, over the circle that most closely matches the circumference of the bowl and mark the 48 points on the rim before remounting the bowl on the lathe.

To draw guidelines for straight flutes, I substitute my tool's regular tool rest with the wooden guide shown in the top left photo on p. 46. I made the guide by bandsawing a slight curve on a flat piece of scrap; so far, it's fit every bowl I've turned. One end of the guide is screwed to a post that fits into the lathe's tool-rest holder. The flat surface of the guide keeps the pencil horizontal and locates its writing point at the exact center of the spindle. This ensures that the flutes will be perpendicular to the faceplate—if they're off a little, they just don't look right. Using the points on the rim as starting points, I slide the pencil along the rest of the area to be carved to indicate the flutes.

I use basically the same procedure to make a bowl with spiral flutes, only the scrapwood guide is used to transfer the points on the rim to the bottom of the area to be fluted. The result is 48 evenly spaced points on both borders of the carving area. To draw the spiral flutes, I just connect offset dots with a straight,

Top: The author shapes the outside of bowls from foot to rim with ½-in. and ⅜-in. deep-fluted bowl gouges. The tool's flute faces away from him as the left side of the tool shaves the green wood. Above: The right side of the cutting tool cuts the inside of the bowl.

A wooden straightedge on a post fit into the lathe's tool-rest support, above, lays out the lines for flutes. Stirt then carves the flutes with a Rakuda reciprocating gouge, right. The jig shown holding the bowl is constructed from scrapwood, and is large enough to fit bowls of all sizes. The backing board is adjusted to hold the bowl at a comfortable work height. For a smooth flute, Stirt makes several light passes, cutting from the base to the rim, below.

flexible plastic ruler. I usually skip two or three dots, but you can use any offset that looks good. I've also carved some flutes marked out with a flexible, ***curved*** piece of plastic. There are many possibilities, so don't hesitate to experiment.

The jig shown for carving the bowl is very simple—a backing board, a plywood base, a shelf to rest the bowl on and a 1-in. by 1½-in. hardwood cleat fastened to the base board with ½-in. threaded rods and wing nuts (see large photo, above). Set the backing board to a height that's comfortable for carving. Lean the base board against a workbench, rest the bowl on the shelf and clamp it in place with the cleat by tightening the wing nuts. I carve from the foot toward the rim, as shown. With the power carver, you just push the gouge into the wood and the blade will begin to cut. The reciprocating action is so slight that you barely notice the back-and-forth motion, although the noise can get a little irritating at times. Usually, I increase the depth of cut slightly as I move up the bowl. Most flutes take about three or four passes with a shallow gouge. The width of the blade generally sets the width of the flute. For a bowl like the one shown here, I use a 24mm gouge with a #7 or #8 sweep; 16mm and 30mm blades with #7 and #8 sweeps are also handy. After carving the uppermost segment of the bowl, I loosen the wing nuts, rotate the bowl and bring another section to the top.

As you progress around the bowl, the grain orientation constantly changes from endgrain to side grain, then back to endgrain again. Adjust your carving for each flute: the wilder the grain or harder the wood, the slower the movement and lighter the cut. With a little practice, it's relatively easy to judge how fast and deep to carve. If you don't have a power carver, you can hand-carve with a ½-in. to 1¼-in. #7 carving gouge. I recommend that you push the tool by hand, rather than use a mallet and risk cracking the turning.

If you want to try some other textures, substitute a ½-in., 60° V-groove parting tool for the gouge. You can also carve several fine lines by eye between the layout lines on the side of the bowl, experiment with various cross-hatching effects or even carve along the bowl's rim. To carve the rims of bowls, I make a layout guide like the one shown in the top right photo. I cut a

To lay out the rim design, Stirt bandsaws a piece of scrap to fit the rim, rotates a straightedge from it until he likes the angle (top), then glues the pieces together. The fixture is then moved around the bowl to mark the lines. Above, the thin lines along the rim of a cherry bowl are cut with a ½-in., 60° V-groove parting tool.

curve in a scrap of wood so it fits snugly against the rim, then play with the angle of the lines by rotating a straight piece of scrap jutting out from the curved piece. When the angle looks right, I Super Glue the two pieces together, then move the guide around the rim and pencil in guidelines at intervals that look right. Next, I carve the lines with the bowl on the lathe.

Once you're done carving, finish the carved areas with the same oil applied to the rest of the bowl previously. I set green-wood bowls aside for a week or so, just to make sure everything is dry and stable. Dry bowls sit for a day or two until the oil sets up.

Finally, the bowls are remounted on the lathe and rotated at the slowest speed—about 200 RPM on my lathe. I oil and wet-sand everything (except the carving) with 400-grit wet-or-dry sandpaper. To remove any rough spots on the flutes, rub them lightly (particularly the ones on the side grain) with grocery-store-variety Scotch-Brite pads. The ridges left by the carving tool remain. □

Alan Stirt is a professional woodturner in Enosburg Falls, Vt.

To carve the handles and feet of this mahogany salad bowl, Boyce followed faceplate turning with gouge work, revealing delicate sections turned into the bowl's sides and bottom.

Carved handles and feet

by Dale Boyce

Sometimes, the shapes that come directly off the lathe are just a little too round for me, so I've been experimenting with sawing apart or carving my turnings, exposing section profiles that would otherwise be hidden. To add interest to this otherwise featureless round salad bowl, for example, I carved three feet into the bowl's base and shaped a pair of handles from a rib turned around the bowl's circumference.

Here's the basic turning sequence I used to create the bowl. With the blank screwed to a faceplate, I first turned the bottom profile. The center of the bottom should be kept as flat as possible so that the faceplate can be attached to it for remounting the bowl on the lathe.

Next, I wasted the bowl's inside and turned the outside profile and the rib for the handles. To do so, I first glued a scrapwood disc to the bowl's now-flattened bottom. I inserted a piece of newspaper in the glue joint so the disc and bowl could later be separated. An alternative to the paper joint is to use Dexter-Hysol hot-melt glue, applied with the company's 3010 gun (glue and gun are both available from Dexter-Hysol Corporation, 164 Folly Mill Road, Seabrook, N.H. 03874). When the bowl has been turned, the hot-melt glue can be parted with a heat gun, and the bowl's bottom can be cleaned up with a scraper and mineral spirits (a solvent for the glue).

Once the disc is glued down, carefully center and screw the faceplate, then remount the bowl on the lathe.

After turning the outside and inside profiles and the rib, I laid out the handles while the bowl was still on the lathe. For strength, the long grain of the bowl should run into the handles. With the rib turned thin, carving the handles and wasting the unwanted portion of the rib was easy with a ¾-in., No. 3 carving gouge. Before laying out and carving the elliptical cutouts that form the bowl's three feet, I removed the disc by tapping a wide chisel, bevel facing the disc, into the paper joint. Sanding and a coat of walnut oil (see *Fine Woodworking on Faceplate Turning* or "Walnut-oil finish is safe for food," *FWW* #38) completed the bowl. □

Dale Boyce is an architectural woodworker and turner. He lives in Portland, Me.

Sharpening Carving Tools

The essential steps for a keen edge

by Ben Bacon

Author Bacon lays a parting tool on the grinding wheel's tool rest and shapes its bevels by grinding one face, then the other. Depending on the hardness of the wood to be carved, he grinds a bevel angle between 22° and 30°, judging his progress by eye.

As a professional carver, I maintain a kit of a couple of hundred tools, and often find myself at the sharpening bench twenty times a day. I have to be fast at carving ***and*** sharpening. After all, I get paid to carve—not fiddle with my tools.

The techniques for sharpening carving gouges and chisels are very similar to those for sharpening other edge tools. First, grind the edge to the proper shape and bevel. Then, hone the bevel on successively finer benchstones to remove the grinding marks and to smooth the edge. The honing will raise a burr on the back of the bevel, which will fall off when the edge is honed on a slip stone. Finally, polish the tool's bevel by lightly stroking it on a leather strop loaded with jewelers' rouge. You can also polish the bevel using a rubberized abrasive wheel.

I'll explain this process in greater detail, but let me add here that sharpening carving tools presents unique difficulties. First, it's critical that you maintain the shape or definition of the tool's edge. The hallmark of good carving is crispness and clearly delineated lines where cuts intersect. You can't cut cleanly if you carve with tools that have had their corners rounded off by careless honing or polishing. If the entire edge of the tool isn't cutting, the intersection of cuts will be left rough and ragged.

Secondly, many carving tools have a curved edge. Sharpening straight-edge and skewed carving tools is a lot like sharpening chisels or plane irons, but you'll need to practice on tools with curved or multiple edges to gain sharpening proficiency. For this reason, I'll discuss sharpening V-shaped parting tools and gouges, although the same steps apply for all carving tools.

Grind the tool with a bevel angle between 22° and 30°. The harder the wood, the higher the angle. A low angle will give you a very sharp edge, but it will also be delicate and prone to chipping when forced into very hard wood, such as maple. It's better, therefore, to go with a steeper angle—one with more steel behind the edge—when carving hardwoods. As a general rule, you want to use the smallest angle possible. Only experience will teach you just how fine an angle you can get away with. In the beginning, though, it's better to play it safe.

I grind my sharpening tools on a 1000-grit horizontal waterwheel (available from Woodcraft Supply, 41 Atlantic Ave., Woburn, Mass. 01888). The water cools the edge as it's shaped, the horizontal wheel gives a flat and sturdy bevel, and the fine grit often lets me skip honing on a medium stone and go straight to a fine, hard Arkansas—the stone used in final honing.

You can also grind on a standard bench grinder, but this requires a much lighter touch, and honing takes three to four times as long. These wheels spin at a much higher RPM, so there's a greater risk of burning the tool. Quench the tool frequently and watch the cutting edge carefully for any change in the steel's color. If you see yellow, you can still save the tool's temper by quenching it immediately. A bronze color is borderline. But if you see black or blue discoloration, it's too late—you've overheated the edge.

Regardless of the type of wheel you're grinding with, be careful to maintain the shape of the carving tool's edge. I grind by eye and have achieved consistency in my grinding by practice. On the waterstone, I steady the tool by resting my hand on the tool rest. Then, I lay the back of the bevel against the wheel and tip it forward to achieve the correct angle. Check your progress every so often—the goal is to produce a single true, flat bevel right up to the cutting edge. With a dry grinding wheel, you would aim for a slightly concave bevel. Honing on a benchstone tends to round off the bevel, producing a blunt edge, so the object of both kinds of grinding is to produce a bevel fit for honing.

Grinding a V-shaped parting tool is reasonably simple: grind one bevel, then the other. If you're working with a grindstone as fine as the one I use, round off the point where the two bevels meet by gently rocking the tool back and forth. If you're using a bench grinder, then I suggest you do this on a benchstone where there's less risk of removing too much metal. Even with the waterstone, be careful not to remove too much material—the wheel removes metal quicker than you might think.

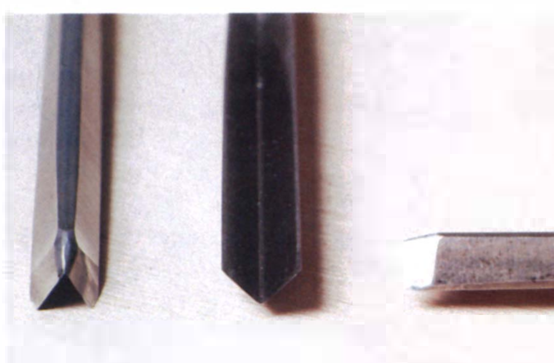
If you're not grinding on a very fine wheel, hone the parting tool on a medium India stone (a man-made stone). When honing large tools, you can push and pull the tool across the stone as you please, because the large bevel will give stability on the stone. But smaller, fine tools require a more deliberate touch: Push *or* pull the tool along the stone, but lift the tool on the return stroke. Then, repeat the process. Hold the tool perpendicular to the long axis of the stone with one bevel flat against it; secondary bevels (small, second bevels right behind the cutting edge) are rarely used on carving tools. The bevel has been sharpened when marks from grinding have been removed, and when a small but even burr has been raised on the inside of the tool. You can see this burr on larger tools or those made of softer steel; on smaller tools, you can feel it with your fingertip. Gently hone the juncture where the two bevels meet by rotating the tool as you move it along the stone. This removes any burr that projects at the intersection of the bevels. The bottom right-hand photo on this page shows what to aim for. Move to a hard Arkansas benchstone and repeat the process, honing the outside bevels.

The next step is to remove the burr raised during honing by rubbing the tool's inside face on a medium slip stone, followed by a rubbing on a fine slip stone. Slip stones are made from the same material as whetstones: bonded, man-made abrasive crystals (such as India and Crystolon stones) or natural crystals (such as white and black hard Arkansas stones). They come in a variety of shapes, including round convex, round concave, triangular and conical. The type you use isn't as important as getting one that matches the shape of your carving tool as closely as possible. Slip stones are available through most major tool catalogs, especially those that sell or specialize in carving tools. On rare occasions, they also turn up in industrial-supply catalogs, so check these, too.

In removing the burr, the slip stone should be parallel to the long axis of the tool. Draw the tool back and forth until you

To hone a parting tool's bevel, lay one face flat on the benchstone and push or pull the tool along the stone. Lift the tool at the end of each stroke, and repeat the process. Note that the tool is held perpendicular to the length of the stone.

Above: Remove the burr that's raised in honing by inverting the parting tool over a slip stone and sliding it gently back and forth. Below: parting tools after sharpening, showing the rounded juncture where the two bevels meet (left), the inside corner, which is left sharp (center) and the bevel after polishing (right).



Photos: Robert Aberman

A gouge is ground similarly to a parting tool, but requires a little extra dexterity. Begin grinding by laying one corner of the bevel on the wheel (top, left) and spinning the tool slowly so the entire bevel is evenly ground. Next, hone the gouge's bevel by starting at one corner and moving the tool down the length of the stone, maintaining the bevel's angle (above, left). Rotate the tool during each pass to hone the entire bevel. When done, a burr should be raised along the edge. To remove the burr, hold the slip stone on the bench, invert the gouge over it and rock the tool back and forth until the burr breaks off (above).

Polish the inside face of the gouge on a leather strop rubbed with jewelers' rouge. Flex the strop to match the curve of the gouge (above, left). An alternative to leather-strop polishing is to polish the tool on a rubberized wheel (above, center). The inside face can be polished on the corner of the wheel, the bevel on the face of the wheel. Test a carving tool for sharpness by making parallel cross-grain cuts in a pine block (above, right). The ridges between cuts should be sharp with no tearout.

see—or feel—that the burr is removed. If the burr proves stubborn and doesn't want to break off, you may have to go back and lightly dress the bevel again on the hard Arkansas benchstone.

A gouge is ground in a similar manner to a parting tool, but the job requires a little extra dexterity. Start grinding with the corner of the bevel against the grindstone. Keeping the bevel against the stone, spin the tool slowly so the entire bevel is evenly ground. It's a little tricky to maintain the bevel's angle as you do this, but—with practice—you'll get the hang of it.

Next, hone the gouge perpendicular to the long axis of a medium India (or hard Arkansas) stone. Place one corner of the curved bevel on the stone and push it down the length of the stone. Pivot the gouge slightly as you do this so the entire bevel is honed when you reach the end of the stone. Repeat these passes until the bevel is properly honed. An alternative is to place a corner of the bevel on the stone and push it along the stone so that only a portion of the bevel is honed. This technique is useful for removing local high spots in the bevel, but it leaves a faceted edge, and the facets will have to be removed by using the previously mentioned honing technique.

Next, as with the parting tool, hone the inside of the gouge with a slip stone. If you're using a tapered slip stone, be careful not to move the tool up where the stone is wider than the tool's edge—you're sure to round over the cutting edge.

To maintain as much control as possible in sharpening most carving tools, I recommend that you place the slip stone on the bench and move the tool over the stone. With very small or complex carving tools, however, it's sometimes easier to move the stone over the tool.

After honing on the slip stone, polish the edge by stroking both the inside face and the bevel on a leather strop charged with jewelers' rouge. Polish the exterior surface of carving tools by laying the strop on the bench and moving the tool over it. For the inside of a gouge, I flex the leather to the curvature of the tool. For parting tools, I stroke the tool on the edge of the strop.

You can also polish the tool on a rubber wheel. Proceed carefully, however, as you can burn the tool on one of these wheels. The wheel must be moving away from you; otherwise, the carving tool will cut into it. You can polish the inside surface of flatter carving tools on the corner of the wheel. Polish the bevel in the same manner that you sharpened the tool, but go lightly to avoid rounding off the bevel.

I avoid giving carving tools their final polish on a cloth buffing wheel loaded with polishing compound. These wheels have a tendency to round off corners and round over the bevel behind the cutting edge. This changes the tool's cutting angle and causes the wood to exert more pressure on the tool as it's pushed into the cut. I can, however, see using these buffing wheels with sharpening tools that are used in large sculpture work. Here, great tool definition isn't essential and—because the tools take a greater pounding and have to be sharpened more frequently—you'll need a quick method of restoring the edge.

When sharpening is completed, test the sharpness of the carving tool by making parallel cuts across the grain in a piece of scrap pine. If the ridges between these cuts are sharp and free of tearout, the tool is sharp. If not, go back to the fine benchstone and take the honing process from there. If the tool still isn't sharp, go back to the medium benchstone and try it again.

I use a lightweight oil as the lubricant in honing, and I clean metal residue from the sharpening stones every so often by brushing them off with gasoline or any fluid that will cut oil and dirt, such as lighter fluid. Obviously, it's important to use powerful solvent with care and to clean the stones outdoors or in a well-ventilated area.

Carving tools have a tendency to wear out the center of a benchstone, so I suggest you get a separate set of stones and reserve them just for these tools. In so doing, you'll preserve the flatness of your other stones so they can be used to hone larger edge tools that require flatness, such as plane irons.

I resharpen a carving tool after about 15 minutes of hard use. It takes me a minute to re-hone a simply shaped carving tool, and three or four minutes to completely regrind and rejuvenate the edge (usually done after about ten sharpenings). At the absolute most, I spend 20 minutes repairing a damaged tool.

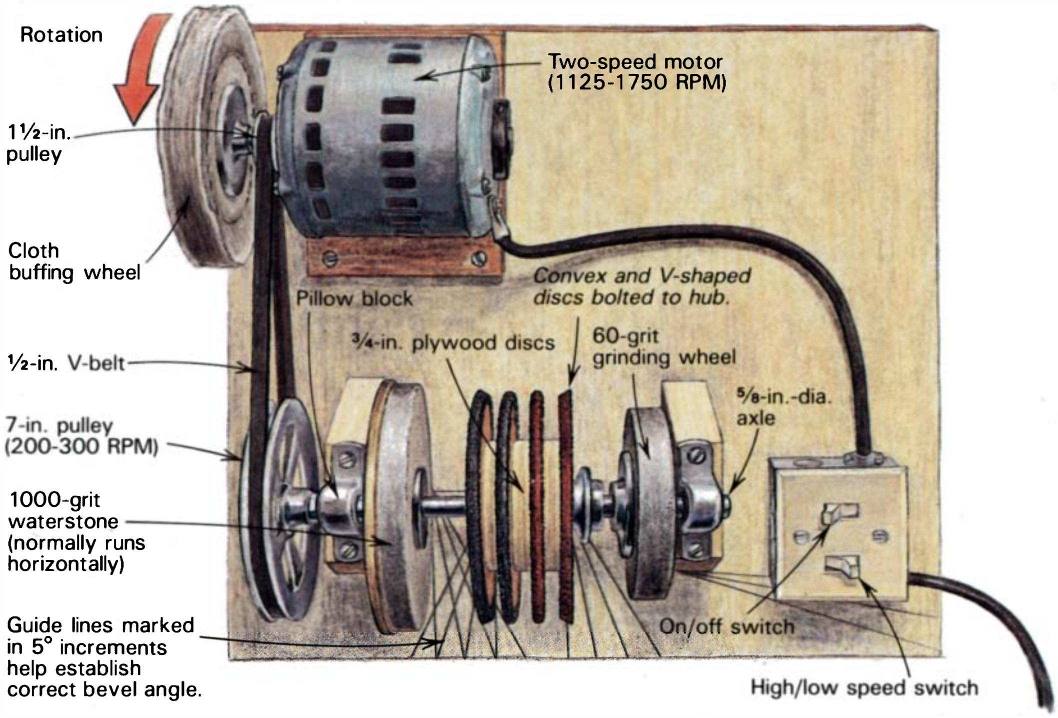
Sharpening your carving tools might not be much fun, but once you get good at it, you become so quick that you can get back to the carving in short order. □

Ben Bacon, formerly a Virginian, now resides in London, where he earns his living in a carving shop.

Multi-wheel sharpening system

by Russell Orrell

Homemade carving tool sharpener



You could spend a fortune on a bench grinder and numerous gadgets to keep your carving tools sharp, but I believe my homemade system of plywood discs, cloth buffing wheels and grindstones is even better. The system can sharpen all kinds of carving tools, plane irons and chisels. I built it with used materials for $30 (excluding the 1,000-grit waterstone); made from new parts, it would cost about $100.

The system is powered by a used two-speed (1,125 and 1,750 RPM) ½-HP motor salvaged from an evaporative cooler. These motors might be hard to come by if you live outside the warmer areas of the country, but check with your local motor shop anyway. If you can't find one, you'll have to use a motor with a different speed (a good motor source is Burden's Surplus Center, 1015 West O St., Box 82209, Lincoln, Neb. 68501-9973) and modify the pulley arrangement.

The motor is wired to a dual-switch three-pole wall switch used to control on/off and high/low speed. The motor's arbor runs a cloth buffing wheel and a 1½-in. pulley. From this pulley, a ½-in. by 38-in. V-belt runs to a 7-in. pulley that drives the gang-wheel assembly.

Mounted to the ⅝-in. axle running through the large pulley are a 1,000-grit Makita waterstone; four 7-in.-dia., ¼-in. plywood discs loaded with red rouge or emery compound; and a 60-grit grinding wheel. The discs and wheels turn at around 300 RPM at high speed and 200 RPM at low speed. The discs are separated by ¾-in. by 4½-in.-dia. plywood washers. Two discs have a 60° edge angle, and two have a rounded edge to match carving-tool profiles. Sight lines are located beneath the wheels to help me establish the bevel angle (I sharpen freehand). I modified a hub from the scrapped evaporative cooler and ran two bolts through it to keep the discs and washers clamped together and fixed to the axle. I epoxied another hub to the 60-grit grinding wheel to fasten it to the axle. A V-belt pulley epoxied to the wheel would also have done the job. □

Russell Orrell is a professional woodcarver and carpenter who lives in Los Angeles, Calif.

Drawing: Michael Janos

Old-Fashioned Wood-Coloring

Reviving the dyes of yore

by George Frank

There can't be much doubt about the advantages of using modern ready-mixed stains or dyes for coloring wood. They're readily available, easy to apply, reasonably fade-resistant and they yield consistent results. But if you're a one-piece-at-a-time wood artisan interested in obtaining a quality of color you can't get directly out of a can, there are great thrills and advantages to making your own homemade wood-coloring mixtures by following some of the old-fashioned, bygone ways of preparing natural and chemical dyes. I learned about various natural extractive dyes and chemical mordants in Paris in the days following World War I. Although the old woodworking section of Paris has undergone many changes since the unforgettably charming days of the 1920s, and while the old ways of dyeing wood are slowly disappearing, I haven't forgotten what I learned and still depend on many of these techniques today.

Why go to all the trouble of making your own coloring concoctions when you can get reliable, ready-made stains at the corner paint store? First of all, using a dye instead of a stain allows you to color the wood without adding a cloudy layer of pigment that can conceal the grain and cover up the wood's natural beauty. Unlike paint or stain, a dye consists of a liquid medium—usually water or alcohol—in which pigment particles are dissolved, not merely suspended. Thus, the pigment can't settle out. And since these dissolved pigments are less opaque than suspended particles, a dye solution is more transparent than a stain.

Furthermore, many of the techniques I'll describe produce their color by chemical reaction with the wood itself. The effect they achieve has a clarity and vibrant *quality* of color that, in my opinion, far exceeds that of their modern equivalents, such as aniline dyes. The old-fashioned dyes can also be the right way to get an authentic color when refinishing certain antiques.

The use of dyes to change the natural color of a material goes back to textile dyeing—a craft that evolved well before recorded history. Woodworkers undoubtedly gleaned the experience of these textile artisans in developing their own methods for dyeing wood, often to make light, inexpensive woods resemble the darker, more coveted varieties.

The palette of color-creating substances compatible with yarn and fabric is vast, yet relatively few of these materials have been adapted to the wood-dyeing craft. One of the most useful and well-known of these dyestuffs is brewed from the hulls of walnut shells by so simple a means as a pot simmered on the kitchen stove or by extracting the dyestuff with ammonia. This venerable ***brou de noix***, which Jon Arno wrote about in *FWW* #58, produces very handsome rich-brown colors when applied to wood.

But allow me to introduce you to the two most versatile stars for natural wood-dyeing, derived from various species of South American hardwoods: logwood (also known as "campeachy wood"), so called because it is imported from Central America in heavy, dense logs; and brazilwood, frequently referred to simply as "brazil." In the old days, these logs were reduced to chips or sawdust and marketed as dyestuffs. The product was boiled down, strained, bottled and stored for future use. Since these exotic chips are far from easy to come by these days, we must buy extracts of them (available as powders—see "Sources of supply," p. 55), ready to be dissolved in water. Yellowwood and catechu are also available as extracts, but they're far less versatile than logwood and brazilwood.

Applied by themselves, these extractive dyes will produce pleasant yellowish and reddish-brown tones. But combine them with chemical mordants and you open the door to a multitude of superb colors (see facing page). Mordants like sodium sulfate also help increase the fade resistance of brazilwood and logwood dyes. Before I provide a how-to on combining dyes and mordants, however, allow me to explain what a mordant is and how it works.

The word "mordant" comes from the French verb, ***mordre***—"to bite." The mordant helps the dye penetrate into the fibers of the wood and bind there. Quite frequently, the chemical combination of dyes and mordants also gives birth to deep, rich, vibrant colors impossible to obtain in any other way. The reason is this: While a dye creates color with dissolved pigment, mordants create or change color by chemically reacting with dyes or other substances found in the wood itself.

Sometimes mordants are used without dyes to create color. For example, untreated oak becomes darker after being exposed to fumes from a heated ammonia solution. By "fuming" the oak in this manner (caution: the use of a vapor respirator with an ammonia cartridge is essential during this process), the natural tannin present in the wood reacts with the ammonia mordant to cause a color change. This effect can also be achieved on other woods lacking tannin by simply applying a tannic acid solution before fuming (see bottom right, facing page).

There are no hard-and-fast rules on how best to combine dyes and mordants. Typically, the dye is applied first, then the mordant when the dye is dry. Sometimes the mordant comes first and the dye follows, but rarely are the two mixed. In some instances, it's unknown which component—dye or mordant—actually creates the color change.

There are countless possible combinations of mordants and dyes, and the key to discovering the magic of brilliant color is experimentation. Experimenting is like creating a play on the stage: The actors are the ingredients; the plot is how you make

Sample results using various dyes and mordants

This white ash sample shows some of the colors obtainable with logwood dye and various chemical mordants. All solutions were mixed in a 15% concentration.

Ferrous sulfate over logwood dye

Logwood dye alone

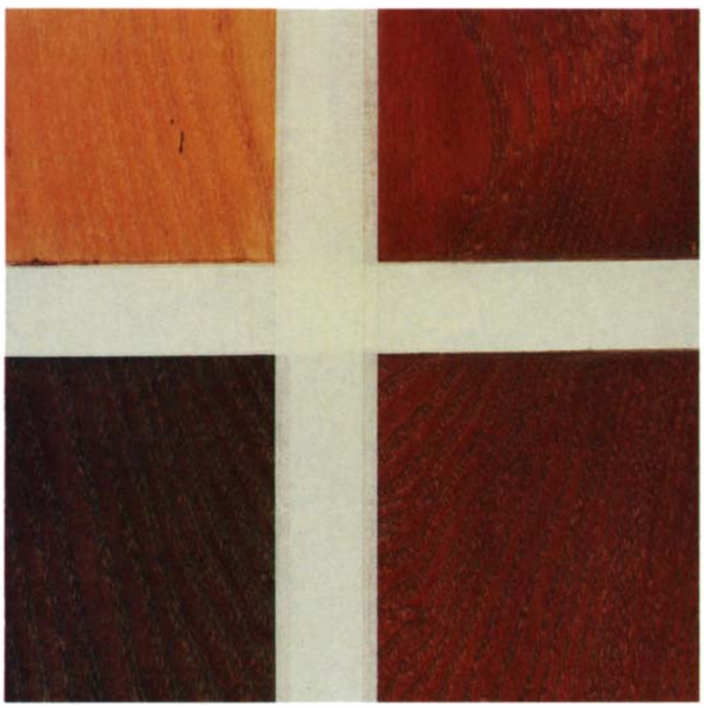
Alum over logwood dye

Potassium dichromate over logwood dye

After topcoating this white ash sample with brazilwood dye, different shades and tones were created by varying the concentration of potassium dichromate mordant used.

Brazilwood dye only

5% solution



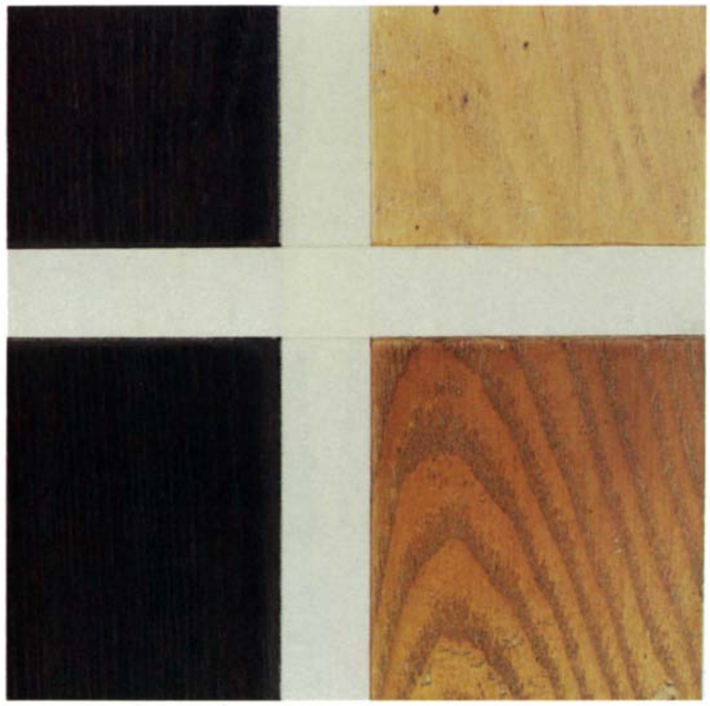
20% solution

10% solution

An interesting range of colors can be created by using mordants in combination—with or without dyes. This entire white ash sample was first coated with tannic acid. Then, various second coats were applied, as indicated.

Ferrous sulfate over tannic acid

Alum over tannic acid



Ferrous sulfate over tannic acid with logwood dye topcoat

Potassium dichromate over tannic acid

You can darken woods that have a natural tannin content (such as oak) by exposing them to ammonia fumes. Furthermore, non-tannin woods such as birch and ash can be fume-darkened by first topcoating the wood with a tannin solution.

Oak

Birch

Ash

Your wood-dyeing experimentation kit needn't make your workbench look like Dr. Frankenstein's laboratory. The most important tools include: disposable mixing cups, mixing sticks and applicators; masks, goggles, gloves and other protective devices; and an accurate scale.

them perform. Here's the chance for you to do for wood-coloring what Shakespeare did for the stage.

The basic tools you need to begin are shown in the photo above. They include: a reliable scale to measure the weight of the powdered dyes and chemicals (mine was made by Kodak—I paid $15 for it in 1941); a graduated cylinder or beaker to measure the water; disposable plastic cups to mix small sample batches (I use small urine sample cups available from any hospital-supply store); a few dozen Popsicle sticks for stirring each mixture separately; cotton swabs or scraps of old foam rubber for use as disposable applicators; and a notebook for taking notes on the various combinations of mixtures and the results they yield on different woods—so you can reproduce your best results in the future.

Before you do any mixing, however, a word of warning: Most of the chemicals described here are poisonous (see "Mordanting chemicals" below), so treat them with respect. Bottle the chemicals in safe containers, label them properly and store the containers in a locked cabinet or high out of reach. Keep kids and pets out of the shop while you're experimenting (mixed in solution, deadly potassium dichromate looks just like orange soft drink), and avoid all contact with these chemicals by wearing protective goggles, an organic-vapor/acid-gas particulate cartridge (available from MSA, P.O. Box 426, Pittsburgh, Pa. 15239), an apron and rubber gloves. And, most important, concentrate on what you're doing. Add the woodfinisher's most essential ingredient to every mixture: plain horse sense. In six decades of working with these chemicals, neither I nor any of my workers have had a serious mishap.

Start your experiments by cutting and smooth-sanding a number of thin sample boards or strips from whatever wood you plan to work with. Section off several separate areas on each one with masking tape. Now, fill the disposable cups with warm distilled water (or rainwater), and add small amounts of the various dyes and mordants. Use a separate Popsicle stick to stir each mixture (you can write the contents of each mixture on one end of the stick for quick identification). For most general experimenting, I mix dyes and mordants in about a 15% concentration. To speed the process of proportionally combining dry weight with liquid

Mordanting chemicals

The following is a list of common, readily obtainable chemicals that can serve as mordants in the wood-dyeing process. Please handle, store and use these substances with care.

Alum—Usually mined as a mixture of several metallic aluminum sulfates, alum is sold in drugstores as a white, astringent powder or crystal. Relatively non-toxic, it brings out purplish or dark-crimson tones when used over logwood and other dyes.

Potassium dichromate (potassium bichromate)—These orange crystals of chrome, available from darkroom-supply stores, are *extremely* poisonous (five grams can kill an adult) and are considered carcinogenic. Avoid all contact with the skin, and use them only in well-ventilated areas. Applied alone, they will darken the natural color of mahogany. When applied over logwood dye, they tend to create rich browns; applied over brazilwood dye, they produce deep reds and browns.

Copper sulfate—Also known as blue vitriol. Plumbers use large quantities of this turquoise crystal to kill the tree roots that clog sewer lines. Highly poisonous, copper sulfate can often be purchased at hardware or plumbing-supply stores. When used in conjunction with logwood, it produces dark gray and olive tones.

Ferrous sulfate—This toxic form of iron comes in tannish crystals that are poisonous in the amounts used for mordanting, although minute quantities of the chemical are used in iron-supplementing vitamins. Ferrous sulfate will produce an ebony-like black when applied over logwood, or a deep gray over tannic acid.

Stannous chloride—A white crystalline form of tin, stannous chloride is moderately poisonous. Toxic fumes are generated when the chemical is mixed with water, so use maximum ventilation, or mix and apply it outdoors. Stannous chloride can be used in combination with alum, potassium dichromate or copper sulfate for color variations. It will produce a nice light red over brazilwood, and a deep yellow over yellowwood. When applied over madder dye (or alizarin, a synthetic replacement for madder), stannous chloride yields a pink color.

Potassium bitartrate—The most common form of this white powder can be purchased at the grocery store as cream of tartar. Since it's used in cooking and saucemaking, potassium bitartrate is obviously non-toxic. It will sometimes brighten red or yellow when applied over dyes of those colors. Over logwood dye, it creates a gray-brown; over brazilwood, a reddish-yellow.

Sodium sulfate—Also known as Glauber's salt, sodium sulfate is a white or colorless crystal that is thought to assist other mordants and dyes in molecularly bonding colors to the fibers of wood, yielding better and brighter colors with improved light-fastness.

Ammonia—This is a clear liquid with powerful fumes. While the non-sudsing, household-grade ammonia sold in grocery stores will work, a 28% solution called aqueous ammonia (sold by industrial-supply companies) is most effective for darkening the color of oak with fuming. Ammonia will yield a dark violet-brown when applied over logwood dye, a light brown over brazilwood and a yellow-brown over yellowwood dye. It is hazardous to the eyes, skin and respiratory tract, so wear goggles, rubber gloves and an ammonia-cartridge-equipped vapor mask during use.

Tannic acid—This slightly toxic chemical can irritate sensitive skin. Tannic acid is naturally present in oak and is the "ingredient" that gives tea an astringent quality. It can be applied to the surface of non-tannic woods to make them susceptible to darkening by fuming, or it can be used in combination with other mordants to produce color—with potassium dichromate, for example, it produces a yellowish-brown.

Calcium oxide—Also called quicklime, calcium oxide can be employed by itself to enrich mahogany, walnut or cherry. Slake calcium oxide with warm water and coat the wood with the freshly made paste. Let it dry overnight. The next day, brush off the lime and wash off the residue with rainwater. Neutralize with vinegar. —*G.F.*

volume, nothing beats the metric system. Since 1 cubic centimeter (cc) of water weighs 1 gram, 15 grams of powder dissolved in 100cc of water automatically yields a 15% solution. Try calculating *that* with liquid and dry ounces!

With a foam applicator, brush on the first coat of dye or mordant. Once dry, remove the raised grain with 400-grit sandpaper, sanding on a slight diagonal to shear the fibers off rather than just pushing them down. Next, brush on an even coating of the mordant solution (or dye, if you used mordant on the first coat). With some applications, the color changes will be rapid; others—ferrous sulfate over logwood dye, for instance—will continue to darken for several hours. If you like the color attained but want to darken it, you can either mix a higher concentration solution of the dye and/or mordant, or you can try a second application of either mixture—or both mixtures.

Once you're satisfied with the hue and intensity of the color, sand the piece lightly and top coat it with the finish of your choice—acknowledging that most finishes will add a slight yellow cast to the color and that some may not adhere to the dyed wood. Although natural-dye colors are reasonably light-fast (particularly when fixed with a mordant), everything in life eventually fades—even the natural color of most woods themselves. These old-timers' dyes, however, will age with dignity.

If you don't get quite the color qualities you're after with the substances I've described, feel free to experiment with others. There are many possible substitutions for the mordanting chemicals discussed here. If you're familiar with safe procedures for using diluted forms of nitric, sulfuric or hydrochloric acid, for example, you might try them in lieu of other mordants. These acids yield a whole range of deep reds, purples or yellows, depending on the dye over which they're applied. Don't be timid in your experiments, but *do* be careful using these materials. And *never* attempt to dilute a concentrated acid by pouring water into it; instead, add the acid to the water gradually, stirring constantly.

There are many other possible sources for dyestuffs. Antique restorers, for instance, achieve a very subtle faded-gold hue in their refinishing by applying final coats of a dye brewed from Chinese black tea (available in brick form from Chinese food and gift shops). In the old days, some finishing masters knew how to use the stone and iron sediment from the bottom of the water trough under a sandstone grinding wheel to make three different color dyes: green, brown and red. They'd boil the mud in vinegar and, over a period of days, skim off liquid at different intervals to produce the three colors. Although I've never tried this formula, I've had success making a grayish-color dye from the aluminum oxide dust and steel particles gathered from below my bench grinder.

Although the old ways of wood-dyeing are usually slower, less predictable and sometimes more dangerous than the modern practice of "finishing by the numbers," they can add valuable tricks to the repertoire of the artistic woodfinisher. □

George Frank is a retired master woodfinisher living in South Venice, Fla., and is the author of Adventures in Wood Finishing *(The Taunton Press, 1981).*

Sources of supply

Dyeing materials and mordanting chemicals:

Olde Mill, R.D.#3, Box 547A, York, PA 17402 (also offers a kit of dyes and mordants).

Woodfinishing Enterprises, 1729 N. 68th St., Wauwatosa, WI 53213.

By letting a tree's natural circulation system absorb his pigmented solutions, LeRoy Frink is able to create a rainbow of unnaturally colored woods.

Dyed-in-the-wood pine

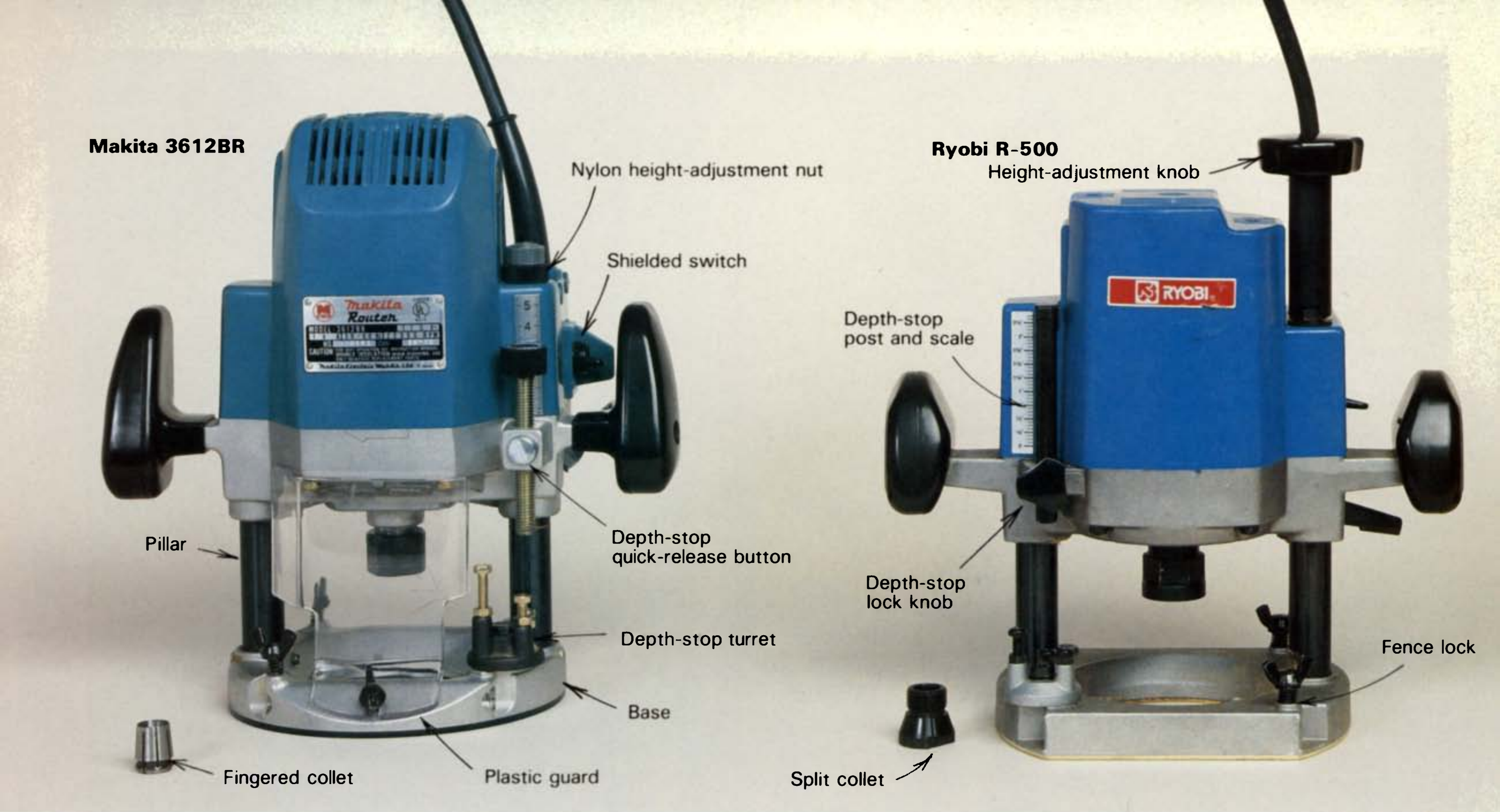
by Sandor Nagyszalanczy

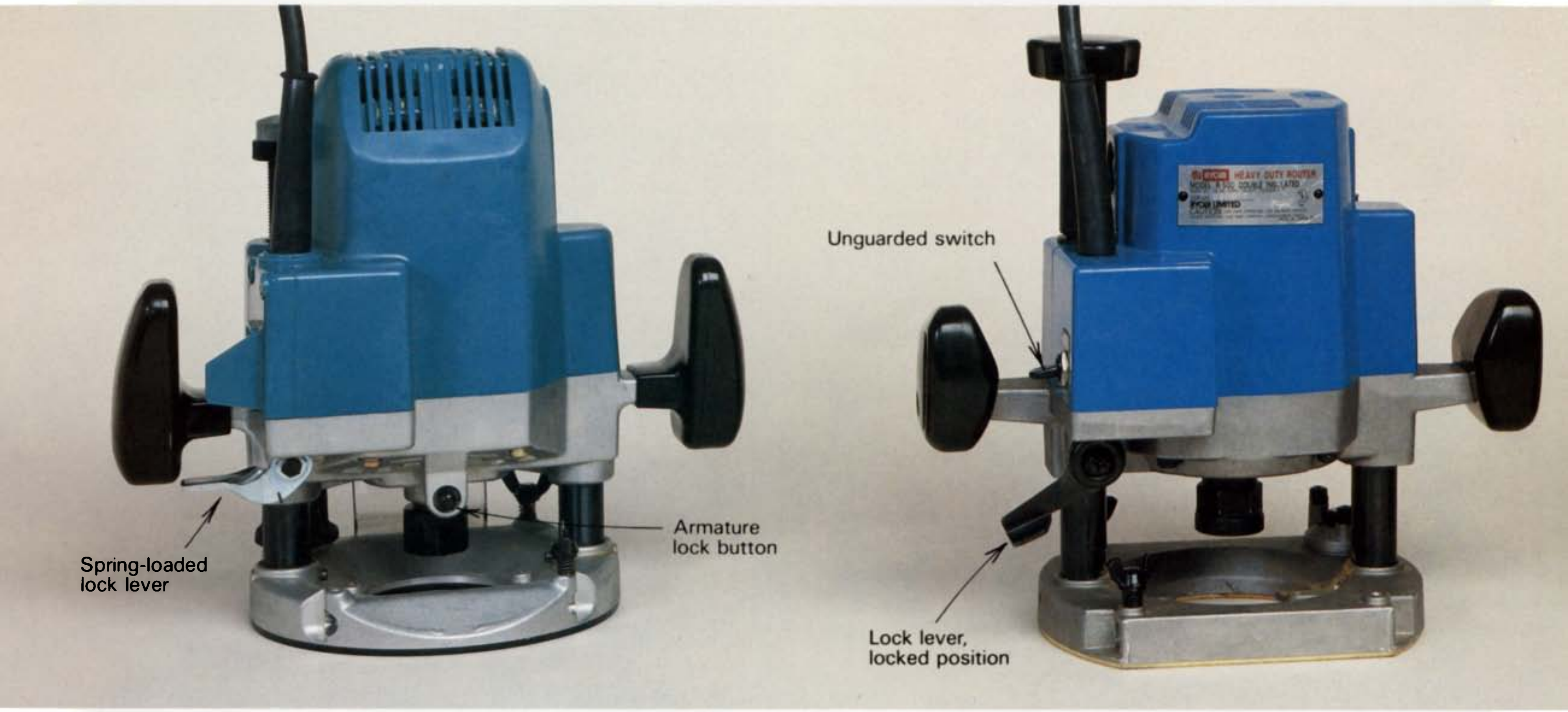
The next time you have trouble getting the stain off your clothing or fingertips, think of LeRoy Frink. About 30 years ago, Frink got the idea that it would be neater and more economical to color wood while it's still in the living tree. It took him 10,000 experiments to perfect his unorthodox method of dyeing: Frink bands each tree near its base with a probe consisting of multiple hollow needles. Through these needles, he pipes a water-based pigment solution (the exact nature of which he's understandably secretive about) fed by a ⅛-in.-dia. hose connected to an oil drum reservoir. The tree's active transport system, which normally circulates water and nutrients through the living portion of the plant, pumps the dye solution into every inch of sapwood and right out into the leaves or needles. A 16-in.-dia. to 20-in.-dia. tree takes about a month to assimilate the color, sucking dry an entire 55-gal. barrel.

Although the process works on all types of trees (including hardwoods), Frink prefers Ponderosa pine since it's fast-growing and consists mostly of sapwood. He once dyed 2,000 aspen trees simultaneously for a production run of colorful paneling, but he rarely colors more than 500 trees "intravenously" at the same time.

Semi-retired at 68, Frink runs a thriving craft business and uses thousands of small pieces of the unnatural-colored woods for making earrings and pendants, which he sells in his shop in Loveland, Colo. In addition to dyeing wood, Frink has explored other applications for his process. With the help and advice of several chemical companies, for example, he has introduced fire retardants, insect repellents and fertilizers into trees. □

Sandor Nagyszalanczy is an assistant editor at FWW.



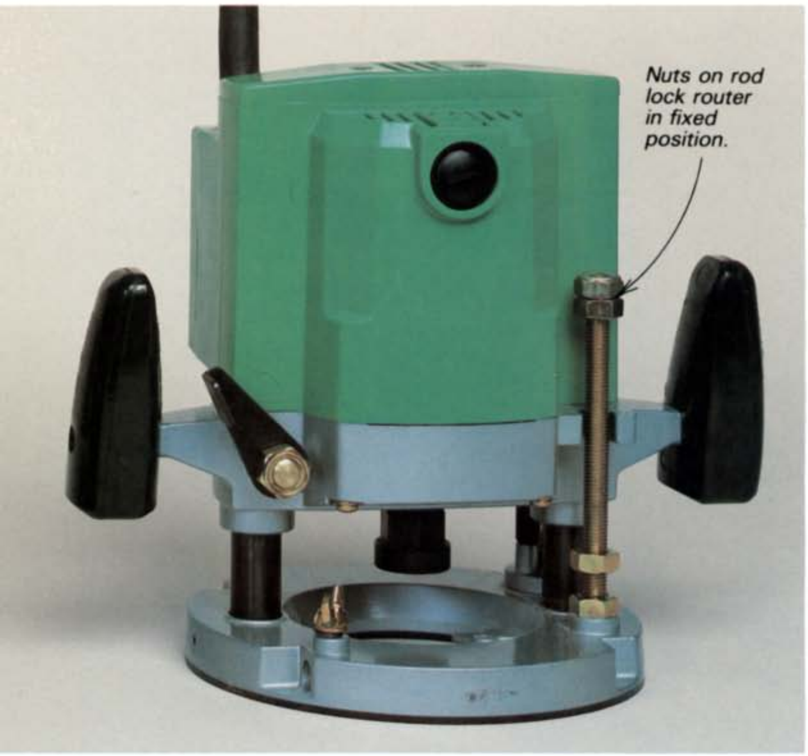


Husky, versatile plunge routers have become the workhorses of many cabinet shops. The three most popular choices—all imported from Japan—are shown here with their various features labeled. The article explains subtle but significant differences.

Plunge Routers

A comparison of the top three Japanese imports and a new machine from Europe

by Bernard Maas



Not too long ago, routers were limited to the arsenals of production shops. But after hiding in the wings for nearly forty years, they've come of age. Today, the ¼-in.-shank, fixed-base router is commonplace in basement and garage workshops, and the number of brands and models on the market is truly bewildering. Woodworkers without routers wonder if they should buy low-cost, lightweight machines as a means of finding out what routing is all about, while many ¼-in.-shank router owners I've talked to are impatiently planning to step up to machines that will accept ½-in.-shank bits.

In my opinion, ½-in.-shank bits have clear advantages over the ¼-in. variety. First, the beefier shank is more rigid and less subject to vibration, so its greater mass and momentum make for cleaner cuts. Second, the larger surface of a ½-in. shank gives more gripping area to the collet, reducing the chance that a bit will shift position in use. Finally, ½-in.-shank bits are available in a more professional selection of shapes, sizes and lengths.

There are two categories of ½-in.-shank routers: fixed-base and plunge. In this article, I'll try to show why I prefer a plunger to a fixed-base machine, what you should look for in buying a plunge router and what can go wrong with them. I'll concentrate on the top three Japanese machines, which are the plungers most woodworkers consider. But, first, allow me to give just passing mention to some other makes: The big, old Bosch industrial router is, frankly, in need of a redesign—it's a good machine, but outdated. Black & Decker's big Elu (see p. 59) is an outstanding machine, but so new we barely had time to squeeze any mention of it into this issue at all.

Why plunge? The advantage of a plunge router is evident in any joinery/template operation where lots of material must be removed. This includes dadoes, tenons, mortises, grooves and template work. Consider the drawbacks when using a fixed-base machine to start a cut in the middle of a board—it must be tilted and have its bit eased into the work surface. The usual result is kickout, temporary loss of control, ruined lumber and generally unsafe routing. For deep cuts, you have to repeat this business at ever-increasing depth settings—at ever-increasing risk. The plunge router, however, is set over the board and the rotating bit is gently lowered in, much as you'd lower a bit with a drill press. To allow this, the motor rides on two upright pillars and is spring-loaded so it'll retract again when the cut is finished. A lever locks the router body in position at any point on the pillars. This lever is essential to using the machine for plunging (as will be described shortly) and can also be used to convert a plunger into the equivalent of a fixed-base machine.

Most plunge routers employ three built-in, adjustable-height stops, located on a rotating turret. Having these stops can save time in routing work where more than one depth is involved, such as a series of haunched mortises. However, most work requires that only one stop be set—the one for the final depth. Stock removal is accomplished by plunging the bit to take a light cut, then locking the lever and routing. The lever is then unlocked, the bit is plunged a little more, the next increment is routed away and so on. It's easy to develop a rapid-fire rhythm that repeats these steps over and over until the depth stop bottoms out. These tiny, rapid cuts prevent vibration, burning and lugging down. Contrast this with the same operation performed with a fixed-base router where the usual practice is to try to chew off ¾ in. in one or two laborious shots, usually filling the room with smoke as the overtaxed bit tries to remove too much wood at one pass.

Until recently, two plungers dominated the heavyweight market: Hitachi's TR-12, first marketed here about seven years ago, and Makita's 3612BR, a beefed-up version of the company's pioneering 3600 model, which debuted about 13 years ago. These two workhorses are to be found in countless cabinet shops, either as freehand machines or mounted in router tables. Ryobi's R-500 plunge router is a lesser-known newcomer that, in my opinion, has some nice features the others lack. We also tested two other lightweight plunge routers from Ryobi—the R-150 and the tiny R-50. Both of these machines, however, have ¼-in. collets, so their utility is limited. Nonetheless, these lightweights are well-suited for shallow plunging jobs, such as letting in hinges or lock strikes.

The machines were tested in my home workshop and by stu-

The lightest, most nimble plunger available is Ryobi's R-50, which weighs in at about five pounds and turns an amazing 29,000 RPM, resulting in smooth (albeit light-duty) cuts.

dents at the university where I teach. We ran a multitude of bits, including carbide and steel, dull and sharp. Our tests were fairly extensive, but nothing exotic: average shop conditions and run-of-the-mill project requirements. All in all, we found that all three heavyweight routers performed about the same. The differences boiled down to subtleties in design and personal preferences.

Studying the specs—The chart below lists factory specifications, with no attempt on my part to remove hype. I wouldn't place too much weight on the manufacturers' claimed horsepower; amperage is a better indication of a router's power. For example, the Makita 3612BR—rated at 14 amps—draws almost two amps more than the Hitachi TR-12 and turns 1,000 RPM faster. Yet distributor ads usually claim 3 HP for both machines (something nobody would think of claiming for a 14-amp tablesaw motor). The Ryobi R-500 falls in between yet, as a seat-of-the-pants impression, seems to get to speed a little faster than the others. I'd say that all of these routers are comparably and adequately powered for most woodworking jobs.

Retail price can't be believed, either—buying a router is like buying tires: nobody ever pays list price. In ads run in *FWW* #65, I found the Ryobi at about $150, the Hitachi at about $165 and the Makita at about $175. Price isn't the full story, however—you have to consider standard accessories, too. The Hitachi comes with a full line: a template-guide bushing, a universal-template adapter that accepts Porter-Cable template guides, a router fence, a roller guide and a ½-in.-dia. carbide, two-flute bit. The Ryobi R-500 comes with everything except the universal-template adapter and the bit. But the Makita 3612BR—the most expensive of the three—comes with none of these. If you want a Makita fence, you'll have to shell out about $20 extra (discount price). Another $20 will get you a template guide and a roller guide.

I got each router's weight directly from its manufacturer, and the figures quoted are listed in the chart. Like horsepower, however, manufacturers seem to figure weight differently than I do. The Hitachi TR-12's reported weight of 12.3 lb. pretty closely matched the 12.6 lb. I got using a postal scale—the difference might be just that I included the weight of the cord. The Makita weighed 1 lb. more than claimed, and the Ryobi 1.7 lb. more. Why do manufacturers try to out-hype each other on something that's so easy to check? Weight is a matter of compromise anyway: A light router is less fatiguing to use and somewhat easier to move around, but a heavy router is more stable.

My students all preferred the Ryobi R-500, which, un-hyped, is still a pound or two lighter than the others. This model also has the smallest base, making it very maneuverable. A small base might seem like a disadvantage at times, since a large base is inherently more stable. But it's my practice at the school to fit

Manufacturer specifications

Plunge router model	RPM X 1000	HP	Amps	Collet lock	Collet size	Retail price	Weight in lb.	Base shape	Plunge depth	Accessories included
Black & Decker/Elu 3303	24	1	6.5	N	¼	$235	6	OB	1 15/16	SF,UT
Black & Decker/Elu 3304	8-24*	1	6.5/5	N	¼	$285	6.2	OB	1 15/16	SF,UT
Black & Decker/Elu 3337	20	2.25	12	N	½	$475	11.25	RF	2 7/16	SF,UT
Black & Decker/Elu 3338	8-20*	2.25	12/10	N	½	$520	11.5	RF	2 7/16	SF,UT
Bosch 90303	22	3.25	15	N	½	$700	19.25	RF	2	CA
Hitachi TR-8	24	NR	6.9	N	¼	$218	6.6	RE	2⅜	SF,TG,UT,CB
Hitachi TR-12	22	NR	12.2	N	½	$338	12.3	RD	2⅞	SF,TG,UT,RG,CA,CB
Makita 3620**	24	1.25	7.8	N	¼	$166	5.7	OB	1⅜	
Makita 3612BR	23	3	14	Y	½	$338	12.5	RD	2½	CA
Makita 3612B	23	3	14	Y	½	$338	12.5	S	2½	CA
Ryobi R-50	29	0.75	3.8	N	¼	$146	5.12	OB	2¼	SF
Ryobi R-150	24	1	6.5	N	¼	$171	5.9	OB	2	SF
Ryobi R-151**	24	1	6.5	N	¼	$187	5.9	OB	2	SF
Ryobi R-500	22	2.25	13.3	N	½	$302	9.7	OB	2⅜	SF,TG,RG,CA
Ryobi R-501**	22	2.25	13.3	N	½	$312	9.7	OB	2⅜	SF,TG,RG,CA

Base shapes: OB: oblong; RE: rectangular; RD: round; S: square; RF: round with flat side
Accessories: SF: straight-guide fence; TG: template guide; UT: universal template adapter; RG: roller guide; CA: collet adapters; CB: carbide bit
* Electronic speed control ** Switch in handle

new special-purpose subbases to most routers anyway, and these can be made any size (see "Router Joinery," *FWW* #57).

All three routers have similar plunge mechanisms—twin pillars in the base slide into bushings in the motor housing. If the plunge mechanism is sticky when you unpack a plunge router, don't panic—this is a common problem. If it doesn't stick new, it likely will after it's been in use for a while. Plungers do need some looking after—tolerances are close, and gunk (primarily sawdust and grease) works its way into the bushings. The solution is to undo the nuts or knob atop the adjustment screw and dismount the motor from the base. Be careful not to lose small parts from the locking lever assembly. With a rag or paper towel, wipe off the posts and bushings. Don't use solvents—they may dry out oil-impregnated bushings. Lubricate the mechanism with silicone spray or a light oil and reassemble. If the plunge is still balky, check the posts—slipped wrenches can dent or ding them. Once such rough spots are filed away, easy plunging should be restored.

A sticky plunge is especially troublesome on the upstroke, because the base can lift off the work, unstick and kick out, jarring the work and possibly ruining the cut. The Makita seems more prone to this than the others, requiring the routine maintenance described above more often.

The plunge mechanisms on all three routers work best if the base is fully supported. They also work fine if the base is supported only on the left side. But none of them plunge correctly when only the right side is supported—a condition that must have something to do with the location of the locking lever. The heavier the router, the worse the jamming. But this is a problem you can work around—by using the router so the base is properly supported, and by maintaining even pressure on the handles.

I found that each router has comfortable grips, and that all of them allow the average hand to reach all the controls—switch, locking lever, depth stops—while the machine is running and on the workpiece. The Makita switch is guarded with a projecting flange, but the Ryobi has no guard. I first thought this was dangerous—that the switch was liable to be bumped accidentally—but I found I couldn't make this happen.

Ryobi makes a model R-501 router, which is basically an R-500 router with the switch installed in the handle. I don't like switches in handles—it's too easy to turn the machine on by accident when picking up the router. Hitachi mounts the switch on the front of the machine, so you have to move your thumb from the handle to reach the switch. The motion seems awkward at first, but you get used to it. Some lefties, in fact, work this router from the back, and reach around to flip the switch with their left index finger.

Other considerations—All three routers come with collet adapters for ⅜-in. and ¼-in. bits (Makita plans to discontinue including its ⅜-in. adapter). Ryobi and Hitachi both use the familiar conical, split-nut collets common to most routers. Makita sports a nicely machined collet with fingers, and is the only router with an armature lock that enables you to change bits using just one wrench. Both of these features are nice to have and give Makita an edge.

Ryobi and Hitachi have similar depth-control setups, and I can't say I like either of them very much. The top center photo on p. 56 shows Ryobi's version of the device: a post slides up and down and measures the depth on a scale. The post is locked in position by a skimpy clamp screw with a plastic knob. This is just the sort of arrangement that loves to vibrate loose, and usually does unless pains are taken to really torque it down. But, as I can attest from experience, you can crack the plastic knob by overtightening it. Makita's solution is better—its depth control is a threaded rod that can

A new arrival from Europe

While prototypes of new plungers by Swiss power-tool maker, Elu (with whom Black & Decker recently allied in an effort to upgrade its image), arrived too late to be included in the comparison of the three top-rated Japanese machines, they so far surpassed anything else I tested as to redefine the standards.

Basically, B&D/Elu has two plunge router models: the middleweight 3303 and the heavyweight 3337, both available with slow-start/electronic-speed control. The ¼-in. collet machines incorporate the twist-knob plunge lock of Ryobi's tiny R-50, but use the same old ho-hum stopper-pole depth controls. The monster ½-in. models, however, incorporate precise, zero-reference depth adjustments. Magnifying indicators make this feature absolutely outstanding.

I can live without electronic speed control—it's really designed for cutting materials other than wood. But I'd spend more for it just to get the slow-start feature that squelches shotgun-kickback router starts, making them as gentle as turning on a Norelco shaver. Another powerful plus is the double-action collet that won't drop the bit, no matter how tough the cut. It's a great safety feature that also prevents errant bits from ruining work. Such precision doesn't come cheap—¼-in. and ⅜-in. collets for the ½-in. models cost about $30 each. The bottom line, at discount prices, is that the big plungers will most likely cost more than double the price of a Japanese machine.

Overall, the 3337 offers the smoothest, chatter-free cutting action yet, plus a plunge mechanism you can really count on. Powerful springs ensure positive returns; jamming is a thing of the past. However, this machine requires hefty pressure for plunge spring compression and has a tough-to-twist spring-release plunge lock that can be worked only by large, powerful hands. So unless B&D/Elu remedies this in their current redesign, woodworkers who are slight-of-build or arthritic may miss out on a great machine. *—B.M.*

With a proven track record in Europe, the top-of-the-line Elu variable-speed plunger will now be sold here by Black & Decker.

be turned for fine adjustments; coarse adjustments can be made by pressing a button that releases the threads in the nut so that the threaded rod slides freely. It helps to have three hands, but the arrangement is hefty and will stay put.

Besides the regular locking lever, all three routers have supplemental means to lock the motor in place on the pillars. I like Ryobi's system best: a large plastic knob that sticks up above the router body. You can easily turn the knob up and down to adjust bit projection—just crank the bit out as far as you want it, then lock the lever. For added security when the machine is used for fixed-base work or in a router table, the depth-stop rod can then be locked against one of the stops on the turret.

Hitachi's height-locking system consists of two nuts on a threaded rod. It works well, but requires a metric wrench—something of a nuisance. Another drawback is that these locking nuts fit loosely on the threaded rod. It's a setup that's all right when you have them snugged up to lock the router, but when you want to go back to plunging again, you have to fully unwind the locking nut and jam it against the nut at the top—otherwise, it'll vibrate down when the router runs. You might finish a cut and find that the router won't retract enough to lift the bit from the hole and, with just a little inattention, you might clip the workpiece. Makita's "positive lock" is a nylon nut on a threaded rod. It works on the same principle as Ryobi's, but is much less convenient to reach and turn.

The Makita, incidentally, comes with a plastic safety shield to prevent chips from exiting in the direction of your face—a feature the other two routers lack. The shield is no substitute for safety glasses, however, and in practice it defeated itself—its curved shape caught glare from my workshop lights, and I had to remove it in order to see what I was doing. Nice try, but no points for this one.

With three nearly identical machines, you might wonder about durability. On the Hitachi I bought several years back, the bearings failed during the warranty period due to dust penetration. Rather than losing work time in my shop by sending the router back for evaluation, I just bought new factory parts. The bearings (shielded, not sealed) soon went again, but when I replaced them with sealed bearings, the problem vanished. Hitachi is somewhat inconsistent in its use of bearings. Sometimes they supply their machines with sealed bearings, sometimes shielded. Apparently, what you get is the luck of the draw. Bearing replacement is not unusual with routers, and bearings are readily available from local suppliers (look under "Bearings" in the Yellow Pages). When it's time to replace your bearings, I suggest that you upgrade the originals (probably grade 4) with grade 7 or higher bearings, at a cost of only about $10 or $15 each.

Dust also did in the switch on my original Hitachi, causing it to arc and burn out. When I replaced the switch, I covered it with a shield of modeling clay, and there have been no further problems. To my knowledge, Hitachi still uses the same switch. As soon as a Hitachi comes into the shop, we pull the cover plate off the switch and seal it as preventive maintenance. This wouldn't be a bad idea with any router.

Suspecting that my problems were pretty typical of all plunge routers, I called a major West Coast repair center, unaffiliated with any specific manufacturer. The manager confirmed that troubles with bearings and switches are the most common complaints. "We always replace bearings with sealed ones," he said. "As far as availability of parts goes, all three are about the same. Once in a while a part may be back-ordered, but that can happen with any tool."

As detailed above, all of these routers have some nice features—sometimes in function, sometimes in price. If you don't have the budget to consider the Elu, I don't think you'd make a mistake with any one of the Japanese machines. Of these, my money is on the Ryobi for several reasons: Its smaller base makes it maneuverable on clamp-crowded workpieces; its easy-to-work adjustment knob brings the cutter into line without wrenches; and its light weight makes it easy to use all day long. This is a very nice combination of features to work with, and the price is right. □

Bernie Maas teaches at Edinboro University of Pennsylvania.

Plunge to destruction

by Jim Cummins

How long does it take to wear out a plunge router? Try four to six hours a day for three weeks, routing about 600 monster mortises for huge loose tenons.

What's the result? Chatter, bearings that sound like cornflakes and a plunge that sticks unpredictably and repeatedly, despite hourly disassembly and cleaning toward the end of the run.

Who would put a machine to such a cruel test? The firm of Waxter and Lee, just north of Annapolis, Maryland.

Here's the story. Peter Waxter and John Lee have a 3,000-sq.-ft. shop that's geared for production work. When the order came in for fifty $4,000 doors, they said, "No problem." They had a shaper for coping and sticking, and an industrial-grade hollow-chisel mortiser for chopping into all the stiles. The rails, however, required mortises in endgrain—a job for which a hollow-chisel hardly excels—so they shopped for a plunge router.

"If we'd known at the time that Bosch makes a $700 plunge router, we might have been tempted," says John Lee. "But we wanted to get going quickly, so we bought a Makita, figuring it would be a throwaway. Peter did all the routing, then I'd take each rail and run it through the shaper to cope it. All told, we're pleased with the Makita, and plan to rebuild it for general shop work. It held up at least as well as my partner did. When that last mortise was done, he walked out the door and went straight to Hawaii for a two-week rest." □

Jim Cummins is an associate editor at Fine Woodworking.

Coachmakers' Rabbet Plane

An ebony beauty for smoothing curves

by Jeff Lock

The author's coachmakers' rabbet plane is a reproduction of those used by 18th- and 19th-century artisans. Made of ebony with a bone sole and wedge, it's used as a finishing tool to clean up the marks left by gouges and chisels on curved surfaces.

Custom planemaking is ideal for those who find pride and beauty in handworkmanship. It's for the person who understands that patience and concentration are necessary to produce the best work—the person who puts cost effectiveness in its proper place. Those who appreciate the subtle distinctions between a hand-carved pediment and the cold perfection the shaper yields will grasp the essence of this craft.

Our ancestors fully appreciated the spirit of producing things of beauty—including the tools they used to make those products. Coachmakers, violinmakers, cabinetmakers and coopers all had their own specialty planes. Of these, I find the planes used by violinmakers and coachmakers to be the most beautiful.

I started making my own planes because I feel my woodworking and violin restoration warrant the most effective tools possible. Also, many of the planes I need are now available only as high-priced antiques.

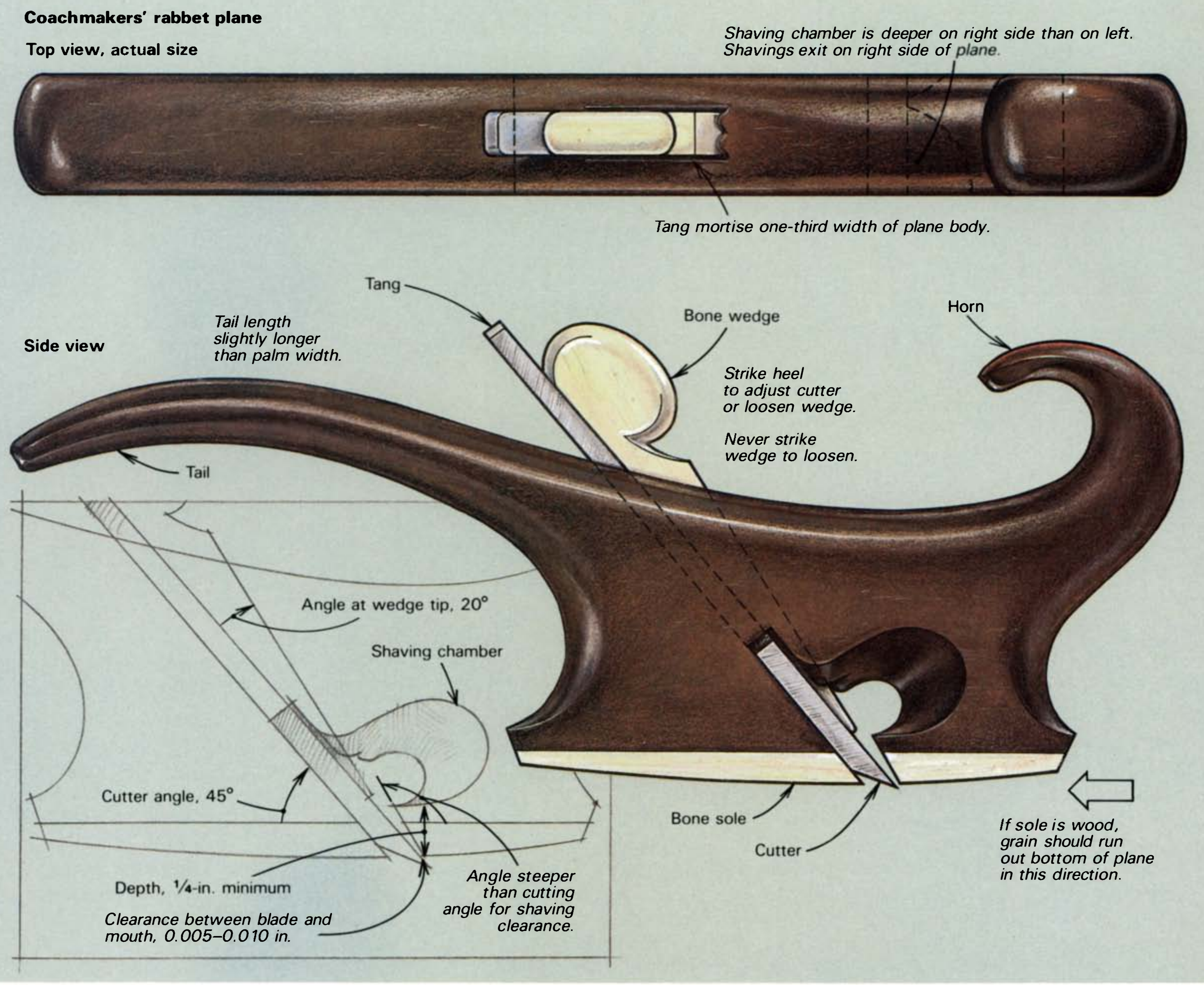
The coachmakers' plane shown above is typical of those used by 18th- and 19th-century artisans. Its gently rounded sole allows it to be used to smooth curved surfaces—even the curved rabbets often found in carriages and musical instruments. It can also be made with a sole flat along its length for working straight rabbets. To provide enough clearance for the cutter to clean up the sides of a rabbet, the cutter is 0.005 in. wider than the plane body at the cutting edge, then tapers from the edge to the tang—the long, narrow part of the cutter.

The plane's body is ebony, its sole and wedge are beef bone and its blade is made from a discarded file (see "Making and Modifying Small Tools," *FWW* #50). A cutter from the Stanley No. 75 bullnose plane (available from Highland Hardware, 1034 N. Highland Ave. N.E., Atlanta, Ga. 30306) is thinner and will need some re-grinding, but works well. The plane may look awkward to those accustomed to standard bench planes, but rest assured that its design is efficient, having been refined and streamlined over the centuries. I never use this tool for rough work, but instead reserve it for finish-planing. I find it invaluable for smoothing the ridges left by chisels and gouges in shaping a violin's top plate, for instance, but there's no reason why the plane couldn't be used to clean up the ogee in a chest's bracket feet, too.

Begin the plane by selecting materials. If exotic woods aren't available, beech, cherry and apple are all traditional plane-body woods. You can make the plane with a wood, bone or ivory sole. You may find it difficult to locate ivory, but if you decide to use it, a good source is antique piano keys for thin soles or billiard balls for thick ones. If you're using an applied sole, dimension the plane accordingly. I usually make an applied sole about 3/16 in. thick at its center.

If you plan to use bone, visit your local butcher and get a fresh piece of shinbone from the front leg of a steer. These bones have a thick wall and are ideal for soles and wedges. Saw off the knuckles to expose the marrow on both ends of the bone, and boil it in a large pot for two to four hours. Adding an onion to the water will speed the process, and also helps bleach the bone. After all of the marrow has been cooked away, hang the bone in the sun to dry or place it in a pan on a south-facing roof for a few weeks (bring the bone inside if it starts to rain). The bone is ready when sawing it produces fine, dry powder.

Bone can be worked like dense hardwood. It dulls chisels quickly, so sharpen your tools to a less acute angle than normal—about 30° to 35°. I use resorcinol glue to attach the bone to the plane's sole. Mix the glue to the consistency of a paste; if you mix it to the directions given on the package, it'll be too thin. Also, score both the bone and the mating surface of the wood with the corner of a file or with 40-grit sandpaper. This helps the glue adhere to both surfaces. Be careful to keep all score marks about 1/16 in. away from the edges of the sole, lest the marks show on the glue joint after the plane is finished. If you use an exotic



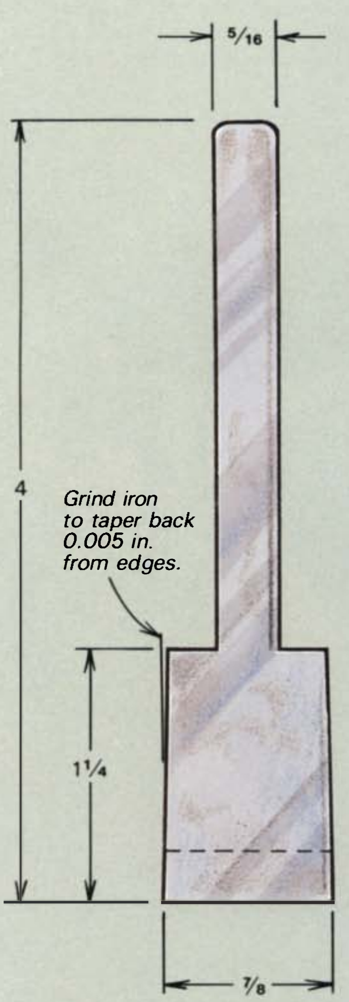
wood, remove traces of resin by wiping the wood's mating surface with lacquer thinner after the scoring is completed.

Now, draw the profile of the plane body on the blank you've selected and cut it out on a bandsaw. If you're making a wooden plane that's self-soling, be sure the grain runs out the bottom of the sole *opposite to* the direction in which the plane will be pushed. (Think of the grain as cat's fur: If you move with the grain, you lay it down; move against the grain, and you raise it up.) Save the outline cutoffs, too—they're ideal for protecting the plane when it's clamped in a vise during shaping (see top left photo, facing page). Now, shape the plane body with chisels, rasps and files.

Next, lay out the 45° angle that beds the blade and the wedge. (Don't mortise for the blade or make the throat cutout until the plane's profile is completely roughed out—the body may crack from the clamping force needed to hold it in the vise during rough-shaping.) Make the tail slightly longer than the width of your palm. Also, your thumb should fit comfortably inside the horn.

Make the first cut for the 45° mouth slot with a fine backsaw, dovetail saw or bandsaw. Don't use a tablesaw—its kerf is too wide. Next, measure the thickness of the blade and make a second cut that distance from the first. For now, you want the blade tightly seated in the opening. Later, you can pare or file away enough wood to shape the throat opening—the most critical dimension in making the plane. Cut out the shaving chamber with a scroll or coping saw, and bevel the chamber's edge using carving chisels and gouges. The bevel allows shavings to curl out after they enter the chamber. Otherwise, they jam up like an accordian's bellows.

Carefully bore down from the top of the blank to start the mortise for the tang. The wedge bears down mostly on the tang, so the bottom of this mortise must be flat and smooth. Otherwise, the cutter will have a tendency to slip under cutting force. I clamp the plane in a vise and bore the tang mortise hole by eye, judging the angle by the layout lines drawn on the side of the plane. Stay clear of the layout lines to avoid chewing up the final bed surface. I use an extra-long drill bit (also available from Highland Hardware) in an "eggbeater" hand drill for boring this hole. You could make a jig and use an electric drill instead, but I prefer doing this by hand since it allows me to proceed slowly and carefully. The top of the mortise is pared to the wedge angle, and the bottom of the mortise is finished by paring as described later. Make the mortise ⅛ in. wider than the tang's width to allow the cutter lateral adjustment.



Save the outline scraps from the plane's body to help clamp it in place during shaping (above, left). Flatten the cutter bed after the mouth is cut out by clamping the plane in the vise and filing the bed in line with the top of the vise jaw (above, right). Test fit the cutter after its mortise is completed (below), and hold the plane up to the light to reveal any gap between cutter and bed.

Clamp the plane in a vise with its bed parallel to the vise jaws and extending about 1/32 in. above them (see top right photo). Then, flatten the bed with a fine, thin file, using the top of the vise jaw as a guide. Use a mortise chisel to bring the tang mortise in line with the bed. Slip the cutter in place, and hold the plane up to a strong light to check that it fits precisely to the bed. It's critical that the blade bed down accurately. If not, the plane will chatter during use. After making minor adjustments, make a final light check to ensure that the blade beds precisely. Chalk or graphite rubbed on the blade's back will mark any remaining high spots. Be careful not too remove too much material when bedding the iron or you'll risk making the mouth too wide.

Now, bandsaw the wedge and test-fit it. Trim it as needed—with a file if it's made out of bone, with a block plane if it's made out of wood. The wedge should slip easily into place and bear against the top of the tang mortise, not the sides. If it rubs against the sides of the mortise, the wedge won't snug up properly, and you could crack the plane along the mortise trying to tighten the wedge by driving it in place. The wedge should require only a light tap with a small mallet to seat properly.

Now, check the throat opening for chip clearance with the blade wedged in place. Remove the blade and file or pare the mouth so there's a 0.005-in. to 0.010-in. space ahead of the blade—to allow for chip clearance. Automotive feeler gauges are great for checking this dimension.

Dry-sand the plane, beginning with 120-grit paper and following it with 220, 320, 400 and 600 grit. I also wet-sand the body and the sole, and final-polish with polishing compound, such as jewelers' rouge. I finished my plane with ten coats of Minwax Antique Oil Finish.

Cutter adjustment with these planes is simple, requiring only a light touch. Deepen the cut by gently tapping the back of the tang. Back the cutter out by tipping the plane forward and lightly tapping the plane at the heel. Loosen the wedge by tipping the plane forward and firmly striking the plane's heel (*never* loosen the wedge by striking it directly or working it back and forth).

The plane is demanding to build in that it requires concentration and careful workmanship. But I didn't pay attention to how long it took to build—I was enjoying myself too much to care. For me, one's enjoyment while working is the real bottom line. □

Jeff Lock is a woodcarver and violin restorer in Tallmadge, Ohio.

Photos this page: David Sloan; drawing: David Dann

Pennsylvania stands such as this one produce much of the top-grade cherry available today. Black cherry was the first tree to get a foothold after the region was clear-cut about 100 years ago. The drawing below (actual size) shows cherry blossoms in late May.

Cherry

A rose among woods

by Jon Arno

To the American cabinetmaker, there's something special about our domestic black cherry, *Prunus serotina.* It's the second most popular hardwood (after oak) used by furniture manufacturers in this country. And if price is to be taken as a measure of popularity, only black walnut is consistently more expensive than cherry among our major native-grown timbers.

The mystique behind cherry's popularity (and I can't deny it influences me more than it should) is tradition. Cherry was a much-prized wood among Colonial cabinetmakers and also among the magnificently skilled Shaker craftsmen of the 19th century. Certainly, its great working characteristics were important considerations to these old masters at a time when hand tools were the *only* tools. But, I suspect, there was yet another, ulterior motive for its use, at least among the Shakers: Members of that religious sect disdained frills, and the natural beauty of cherry allows a woodworker to create a piece that's exceptionally appealing to the eye—without compromising the functional design with fancy moldings or bric-a-brac.

Cherry is a member of the rose family, *Rosaceae.* This family, with its more than 3,000 species, is one of the most important in the plant kingdom. Were the rose family to vanish tomorrow, it would take with it not only the beauty and fragrance of the rose, cherry wood and cherry pie, but also a host of other flowers and edibles—plums, peaches, apples, raspberries, almonds and many, many more. The so-called "rosewoods" of commerce, by the way, come from tropical species of the genus *Dalbergia,* which is a member of the pea family, *Leguminosae.* None of these rosewoods is close kin to the true rose. The rose family is well-endowed with woody perennials, shrubs and even trees, some of which—like apple and plum—have been used in cabinetmaking for small items and woodenware since ancient times.

Like apple trees, orchard cherry trees don't produce a lot of usable wood because much of the tree's energy goes into fruit production, rather than toward making timber. Only our wild black cherry is plentiful enough—and energetic enough—to fight for its place in the forest canopy and produce logs of usable dimensions. Black cherry can attain diameters of 4 ft. to 5 ft. and heights of about 100 ft., but seldom in the same tree. A 3-ft.-dia., 80-ft.-tall cherry tree is a mighty respectable specimen. While black cherry is the giant of its family, it's a mere also-ran among the maples, yellow-poplars, oaks and walnuts it competes with in the wild.

Cherry has an average specific gravity of 0.47 (green volume to oven-dry weight), making it hard enough for most furniture and woodworking purposes. On the average, it's 8% to 10% lighter in weight than American black walnut, more than 15% lighter in weight than sugar maple and downright soft in comparison to most of the oaks.

For a wood that's so beautifully figured, cherry is exceptionally easy to cut with reasonably sharp tools. This is a great blessing on those tedious but necessary little jobs, such as mortising for hinges, hand-joining and surface-planing.

Cherry is excellent on the lathe. It's in a class with walnut and,

Photo: Fine Hardwoods Association; drawing: Kathy Bray according to USDA Forest Products Laboratory tests, even superior to maple, which is a primary wood for spindles, rollers and other turned articles. In many respects, cherry and maple have comparable working characteristics and are well-suited for similar applications. What cherry gives up to maple in terms of strength and wear properties, it more than makes up for in its ease of working and in the beauty of its color and figure (with the exception of some of maple's special grain patterns, such as fiddleback and bird's-eye, but these are not typical). In fact, one of the great virtues of cherry is its remarkably attractive figure. Across the spectrum of cabinetwoods, generally only the open-grained or ring-porous woods will rival cherry for figure. This is a key point in truly understanding cherry's unique place among the great woods of North America, because cherry is one of the very few woods that combine a diffuse-porous cellular structure with nearly ideal density and a truly beautiful figure. Although fine woods in many applications, other diffuse-porous woods—basswood, yellow-poplar, birch and maple, for example—are either too soft for furniture that will experience hard use, or too bland to produce a finish with real character.

Why cherry captures the important benefits of a diffuse-porous wood while offering a fabulous figure is perhaps best explained by contrasting its cellular arrangement to that of a more typical diffuse-porous wood, maple. The modest, flatsawn figure of typical maple results from thin bands of fibrous tissue along the annual rings that are produced by the tree at the end of each growing season. The pores are of small, uniform diameter and are very evenly dispersed throughout the wood. In cherry, however, the pores—formed early in the growing season—are slightly larger and form a band along the annual ring. This anatomical distinction is quite subtle, but it's significant enough to give cherry's figure far more character than maple and other typical diffuse-porous woods. In effect, cherry is a semi-diffuse-porous wood (see photo, below right), and owes much of its beauty to this feature.

America's other great (and, some would say, finest) timber, black walnut, approaches the other side of the spectrum in that it is semi-ring-porous. This distinction may seem academic—of little interest, except to botanists—but it's important. The size and arrangement of pores—or, more accurately, vessel cells—give cherry a clear advantage over walnut in at least one important furniture application: tabletops. Cherry's grain is so tight that it virtually never needs to be filled in order to achieve a glass-smooth finish. Just an extra coat of a reasonably high-bodied varnish followed by a good rubdown will do the trick. To use this same technique on walnut is possible but, at best, it's a labor of immense love because walnut will drink up the first two or three coats of varnish like an overworked camel.

It's my opinion that, among common domestic hardwoods, only sugar maple is functionally superior to cherry for tabletops. That's due to maple's finer, less-porous texture and greater dent-resisting hardness. Even this conclusion, however, is suspect when the issue of relative stability is brought into consideration. On this feature, maple is adequate, but cherry is outstanding.

Cherry is extremely stable in terms of expansion and contraction when exposed to changes in humidity. This feature made it a favorite species in the printing industry when poured-lead type was the state-of-the-art. A printer could set a page on a cherrywood block and store it for months without fear of having the block distort the next time it was put on press. But while stability is indeed a great virtue of cherry, I must confess that when I was a much younger man, my blind faith in wood technology books—which universally extol the stability of cherry—led to one of my most embarrassing woodworking blunders.

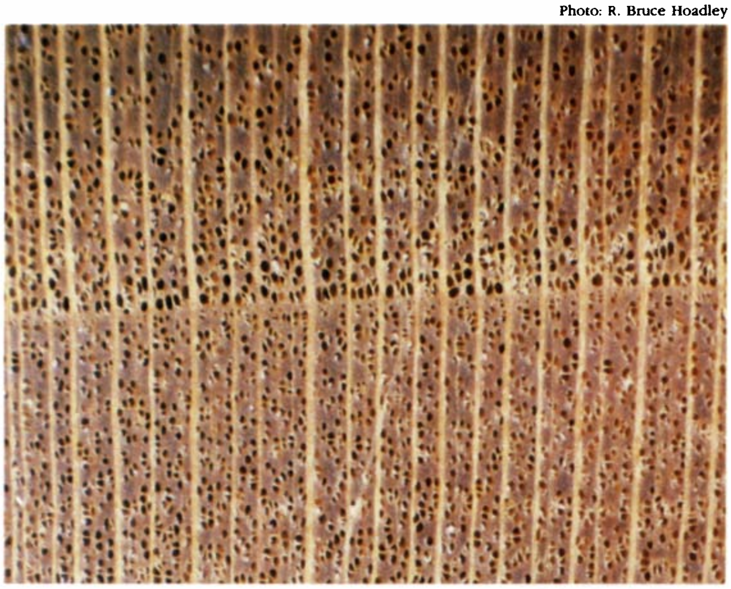
I already had plenty of shop experience with cherry, but my first opportunity to get a real "steal" on the stuff came about when some trees had to be cut down to clear a lot in my neighborhood and make way for a new house. After years of paying $3 a board foot for store-bought stock, I was absolutely ecstatic when the builder told me these cherry trees were mine for the taking—*free!* With abject faith in the renowned stability of the species, I was totally certain that air-drying the wood was going to be a piece of cake. So, to hasten the process, I brought it home green from the mill and stacked it up with stickers in our very hot attic. There, it spent the months of July, August and September, completely undisturbed.

By summer's end, the wood was indeed dry, but as I lifted the attic door and turned on the flashlight, the sight that greeted me had the general dimensional configuration of a curly head of windblown hair, split ends and all. To this day—with the exception of what I fed to my fireplace—the only usable thing I've gotten out of what should have been well over 200 board feet of prime cherry is one Shaker cabinet doorknob. Aside from its potential in providing an occasional 6-in. lathe billet, the cherry that's left is totally worthless. To draw a moral from this story (and perhaps spare others the same experience), cherry is exceedingly stable ***once*** it's dry, but not necessarily ***while*** it's drying.

Over the years, I got to know the black cherry species well from many other perspectives. As a firewood, it is superb. When a stick or two of slightly green cherry is laid on the hot coals of a fire, the aroma is unforgettably delightful. The fruit is small, almost black in color and, in my opinion, it'll never replace the commercial Bing for flavor in the raw state. It's bitter to the point of unpalatability when eaten off the tree, but it makes a good wine with a deep purple-red color. In Colonial times, the fruit was packed into jars of rum to produce a potent favorite of the era called "cherry bounce." That, too, I've experimented with, and it is indeed tasty, but really not substantially different from a modern fruit brandy.

American black cherry is not a reliable producer of fruit—at

Photo: R. Bruce Hoadley



This ten-power macrophotograph of cherry endgrain shows the slightly larger pores at each annual ring. These give the wood a desirable grain pattern without making the grain hard to fill.

These three veneer samples show the range of cherry's character, from the very high grade on the left, to gummy (center), to the figured heartwood at right.

least, not in the harsh climate of northwestern Wisconsin where I cohabited with it. Some years it will hardly set fruit at all; in other, good years, the crop will be plentiful to the point of becoming a nuisance. The cherries litter the lawn, and their dark juice stains clothing. Swarms of birds devour, process and deposit them on cars, sidewalks, roofs and windows. The botanists would call this bird-to-cherry relationship "symbiotic" because it helps to propagate the species—not only to nearby fencerows and under telephone lines, but across considerable distances. As a result, black cherry has a sporadic and yet very extensive range. It's most plentiful in the hardwood forests of the eastern and midwestern United States and southern Canada, but its range extends down through the mountains of Mexico into Central America.

Like most other hardwoods, black cherry grows wild, not in planted stands. As long as there's a supply of seeds from local trees and sufficient sunlight, the trees do well. In fact, experiments over the last 20 years have proven that cherry does best if left alone: Efforts to produce knot-free wood by pruning low branches from selected trees seem to generate more branches.

The heart of cherry's U.S. range, and where it produces timber with maximum vigor, is in the central and Appalachian states. However, latitude, altitude and other macro-geographic and climatic factors are only part of what is important to the tree with respect to habitat. Cherry isn't very shade-tolerant. This, combined with its less than formidable maximum growth potential, makes good cherry lumber dependent on opportunistic natural events. The tree will grow vigorously in full sunlight along a fencerow, but it will branch out low, form a broad crown and, over time, pick up a fence staple or two when it happens to be growing right where a post ought to be. All of this, of course, degrades the quality of the wood.

The best source for cherry right now is in the mountainous region running up through Pennsylvania and into New York. That part of the country was almost completely clear-cut about 100 years ago, and cherry—being something of a pioneer species—got off to a good start. Seeds spread by birds were abundant, the saplings were mostly unshaded by older trees and competition between the trees made them reach up for light, promoting tall stems. Foresters in the early 1970s were delighted to discover the maturing resource, just at the time when the trees were reaching their peak. (If left unharvested over the next 100 years, these cherry trees would eventually succumb to the beech and maple growing in the forest's understory.) At the time, the demand for cherry was quite low, because there wasn't enough quality wood available from other parts of the country to promote and maintain much interest. As recently as the 1950s, cherry was one of the *least* used of our native timbers, having sunk to 28th place in the number of trees harvested. It was so scarce, in fact, that it ranked in price with rosewood and ebony. When the steady supply of Pennsylvania cherry began coming into the marketplace, however, popular demand grew as more and more people began to see the quality of the wood. Today, as mentioned earlier, the demand for cherry is second only to oak.

Cherry has a tendency to be a rather gummy wood, especially trees that have grown under less-than-ideal conditions. This gumminess can be a negative, especially when sanding the endgrain. The surface may quickly burn or darken when belt-sanded, requiring a great deal of tedious hand-sanding to soften the color. The safe approach is to give the endgrain a whisk or two with a sharp scraper, followed by gentle hand-sanding with a fine-grit sandpaper. Personally, I like "gummy" cherry. A certain amount of gum streaks well-dispersed in a slowly grown, wavy-grained piece of heartwood can be very attractive.

In furnituremaking, one of cherry's great attributes is the color it will eventually attain as time and chemistry work together to produce its unmistakable patina. The translucent, warm, amber-orange hue that only old cherry furniture exudes has eluded stain manufacturers to this day, and very likely always will. For starters, I have yet to find a convincing technical explanation of the chemistry of cherry's patina—I doubt if scientists really understand it yet.

Exposure to light definitely affects cherry and might accelerate the patina-building process, but I know from my own otherwise bitter experience in that absolutely pitch-dark attic, one of the few things my stack of cherry did right was to darken. (I think maybe I roasted it.)

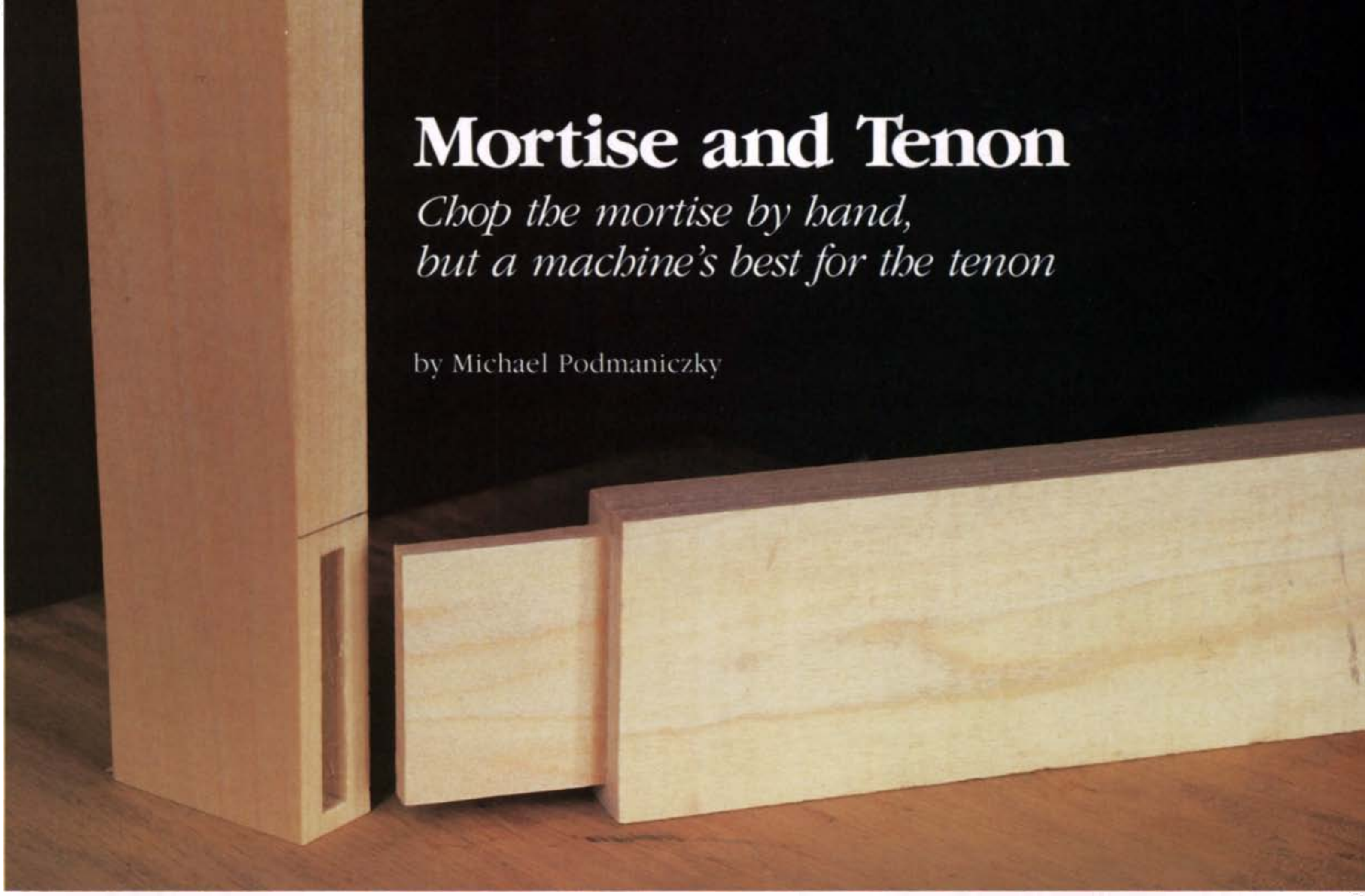
The chemistry of cherry is certainly complex and not entirely friendly. Like peaches, almonds and some of its other close relatives in the rose family, cherry produces cyanic acid which, in high enough quantities, is lethal. Although the wood itself is non-toxic, wilted cherry leaves have poisoned livestock. There are traces of the poison in both the bark and the fruit pit. In fact, peach pits are high enough in cyanic acid to have once been an economically viable source for the deadly poison, cyanide.

I have no reservations about working with cherry wood and would do so far more often if it weren't for its price. Cherry is quite plentiful here in Wisconsin, but even here the best price I've found for FAS, kiln-dried stock is $2.80 per board foot, unsurfaced. I've chased down a few sources of freshly cut green material at well under $1 per board foot, but I'm understandably a little apprehensive about that alternative. Actually, I *have* successfully air-dried a few pieces of cherry since that disaster years ago (taking the normal care necessary with any wood), and my self-confidence has healed to the point that I would gladly take on the challenge again, but that's not the problem. I simply can't find good, wide pieces of cherry heartwood at the local mills. Demand for this "rose among woods" is intense, and doubtless the best of Wisconsin's production is shipped off to furniture factories and to woodworkers with fatter wallets than mine. What the mills here attempt to pawn off on us locals are narrow widths, slab cuts and sapwood. The art of avoiding that kind of "deal" is a skill the backwoods scavenger soon learns.

You know, come to think of it, it's only about a ten-hour drive from here to the cherry belt in Pennsylvania. □

Jon Arno is a woodworker and amateur wood technologist who recently moved from Brookfield, Wisc., to Schaumburg, Ill.

Photo: Fine Hardwood Veneer Association



Mortise and Tenon

Chop the mortise by hand, but a machine's best for the tenon

by Michael Podmaniczky

Easily cut by a combination of hand and machine methods, the mortise and tenon is among the most versatile of all furniture joints.

I've always considered the basic mortise and tenon the workhorse of joinery and the primary joint to master for most furniture work. Like the dovetail, the mortise and tenon allows wood to "turn the corner." It's also the basic joint we use for frame joinery to join rails and stiles to make doors, join aprons to legs to make tables and join rails to posts for chairs. Marked out and cut in multiples, it's a perfectly acceptable—albeit more time-consuming—alternative to sliding dovetails, miters or lap joints for carcase work, but I'll limit my discussion here to frame joints.

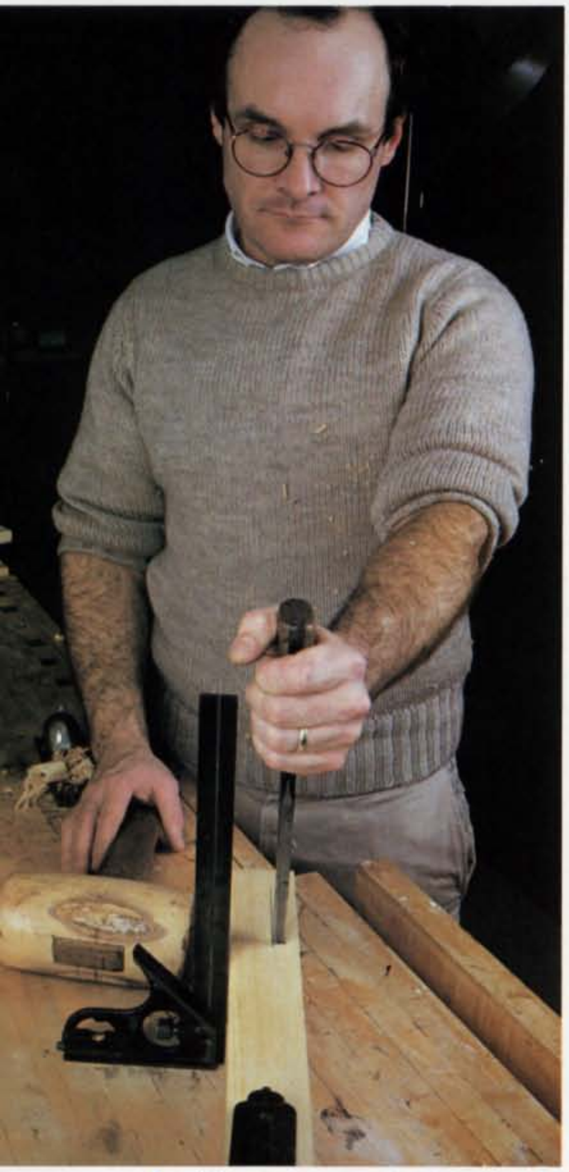
When I grit my teeth and do the very best I can to remain objective, neither falling into the argument that the old ways work best nor advising that nothing really works well in the 20th century unless it does so at deafening decibels, I have to admit that I usually cut my mortises by hand and my tenons by machine. I've arrived at this method after years of working in shops with no proper mortising equipment. Certainly, the router will do a decent job on a shallow mortise, but most furniture work will require a mortise at least 1 in. deep and probably deeper. If you have a slot mortiser or a hollow-chisel setup, you're lucky. Most of us don't have these tools, so it makes sense to learn to mortise by hand. Tenoning is another matter. For just a few rails, sawing tenons by hand is quite reasonable and not all that hard to learn. But one tool that almost all shops have—the tablesaw—is easy and safe to set up for tenoning.

Chopping a mortise by hand doesn't require mind-numbing attention to accuracy. Unlike an edge-glued joint, which is jointed straight and then clamped tight, the mortise and tenon needs to be really "tight" only where the tenon shoulder meets the mortise face. It's possible, of course, to achieve a piston-like fit on the tenon, but there's no practical need to do so since modern glues are more than able to fill minor gaps. In fact, if the fit of the joint was as tight as a clamped edge joint, you'd probably split the mortise apart during assembly. Still, it's a good idea to cut the joint precisely, and I'll describe my procedures for doing so.

But, first, the mortise. You'll need these tools: a combination square, a mortise-marking gauge, a layout knife, a hefty mallet and, of course, a mortise chisel. An accurate square (I like my Starrett combination) is a must for marking both the mortise and the tenon. For marking lines that must be carried completely around the stock, nothing is more annoying than an untrustworthy square that multiplies its error at every turn. For marking out the mortise (and later the tenon), you'll need a mortise-marking gauge—essentially a regular marking gauge, except that it has two spurs instead of one. One spur is fixed to the gauge's beam; the other is adjustable, and both can be moved in relationship to the gauge fence. This allows mortises and tenons of various thicknesses to be marked out and positioned anywhere in the stock thickness.

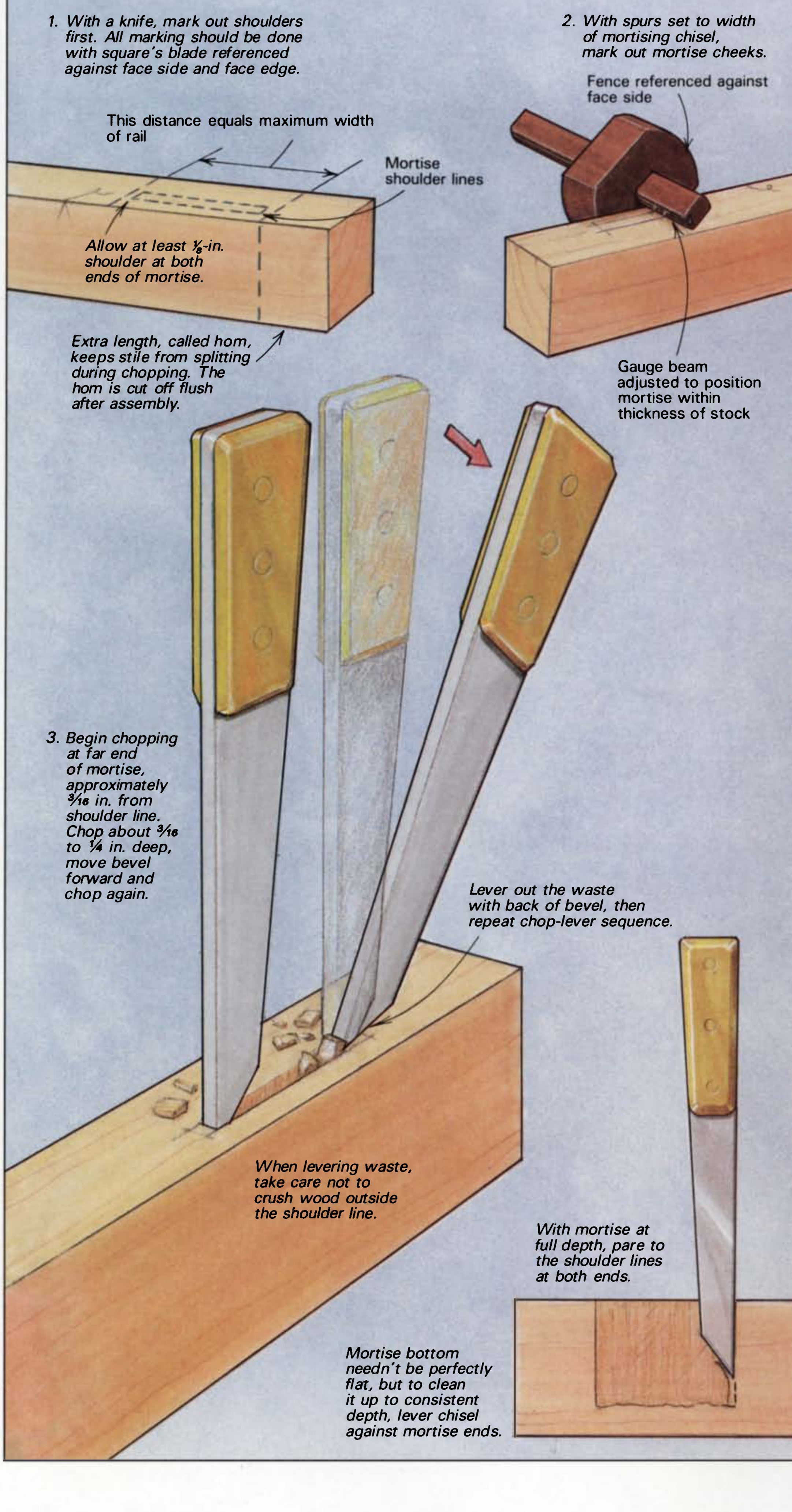
I realize that some tool catalogs sell what they refer to as "mortise chisels," and there are plenty to pick from. Essentially, a mortise chisel differs from bench and paring chisels in that it has a rectangular section that's deeper than it is wide, with sides that should be parallel to each other (and, with careful sharpening, perpendicular to the cutting edge). I consider the proper mortiser one that can be driven into the side of a utility pole and jumped on by John Madden without breaking or bending. I haven't found a commercial tool that completely fills the bill, so I've taken to making my own by a process described on p. 71.

You can try to sneak by with a paring chisel—I suppose small, shallow joints can be cut this way. But as soon as you start getting into deep mortising, your little paring chisel will twist and there's just no way that the mortise cheeks are going to stay par-



Top, marking out a mortise begins with setting the mortise-marking gauge to the width of the mortising chisel. Above, a square stood on the bench aids in keeping the chisel perpendicular to the work during chopping.

Fig. 1: Marking out and chopping a mortise



allel. So the loose joint is loaded up with gap-filling glue, and the door (chair, table, whatever) lives happily ever after. Best to do it right and buy (or make) a set of mortising chisels.

Mortising chisels are most commonly sold in four widths: ¼ in., 5/16 in., ⅜ in. and ½ in. If you aren't going to buy a set, choose a size or two most likely to fit your needs. This leads us to the question of sizing the mortise in width, length and depth. To determine mortise width, some woodworkers simply divide the stock thickness by three. Thus, ¾-in. stock would require a mortise ¼ in. wide with a tenon of matching thickness, less a bit of clearance. Most furniture is, however, frightfully overbuilt and anything reasonably close to this rule is plenty strong.

To begin, cut out your stock to the desired dimensions and make sure you've gotten the faces square to the edges—otherwise your mark-out lines won't align as you carry them around each piece. Allow extra length on the part being mortised (which I'll call the stile), and plan to position the mortise to leave at least 1 in. of additional material between the end of the piece and the edge of the finished joint. This extra length (called the "horn") will keep the stile from splitting out as you chop the mortise. Later, the horn will be cut off flush.

Mark the length of the mortise (allowing for shoulders of at least ⅛ in. on both ends) and the horn on the end of the stile. Then, scribe the lines for the mortise with the double spurs on your marking gauge set to the width of your mortising chisel (see top photo, left), and the gauge fence set to roughly center the mortise in the thickness of the stock (unless you want it closer to one edge, as in an apron-to-leg joint for a table). Once I've marked the mortise, I cut the lines a little deeper with my knife. This makes them read well and also allows the first cuts with the chisel to pop waste out without tearing up the edges.

To chop the mortise, clamp the stock to your bench with the joint positioned over a leg so that the shock of your mallet is directly transferred to the floor. You'll be doing some pounding, and even though vises are tough, they really aren't designed for this kind of punishment. The position of your body is critical to hand mortising, so don't try to cheat. With the chisel in your hand, positioned in the marked-out joint, stand in such a way that you can sight down the piece and—with your back straight and arms extended—get the feel of the tool's relationship to the work. This exercise will enable you to develop the skill of perpendicular chopping. To gain confidence, try standing a square on the bench near your work to give yourself a reference to eyeball to keep the chisel perpendicular to the benchtop (see bottom photo, left).

Begin chopping at the far end of the mortise. Start the chisel about 3/16 in. in from the line marking the finished edge of the joint (see figure 1) with the bevel toward you. Hold the tool as plumb as you can, and give it a good whack with your mallet. Move the bevel about a ¼ in. closer to you and have at it again. After this shot, lever the chip out of the slot, being very careful to keep the arc of the levering in the same plane as the mortise. Repeat this process until the levering almost crushes your mark-out line at the near end of the mortise. Now, turn the chisel around and march back in the other direction, repeating the process in reverse.

You'll quickly notice how nicely the thick blade of the mortise chisel is jigged along the waste-levering arc in a single plane by the slot you've already cut. The parallel sides keep the blade from twisting and digging in, so that if you're careful at the start, the blade will virtually follow a straight line, right to the bottom. The deeper you go, the more muscle you'll need to put into levering out the waste, and the more you'll appreciate the extra meat you left on at both ends of the mortise: This provides a fulcrum so that the crush doesn't encroach on visible wood outside of the joint.

The force you can apply in this process is considerable, and you'll be thankful for the extra length of the horn. Were it not there, you'd probably rip the endgrain right out of the wood with a deep, waste-clearing pry. Check the depth of the mortise from time to time, measuring with a metal rule or a combination square. How deep is deep enough? That depends on the application. A good rule of thumb is to make the mortise as deep as possible, chopping to within ¼ in. to ⅜ in. of the backside of the wood. Obviously, if you're mortising into very wide stock—say a 6-in.-wide door stile—you needn't go as deep. The mortise should be slightly deeper than the length of the tenon, and the depth can be checked with the blade of your combo-square set ⅛ in. longer than the length of the tenon; after all, you don't want the tenon bottoming out before the shoulder is tight against the mortise face.

Once you're as deep as you want to be, scrape the bottom reasonably flat with levering strokes. Finish up by paring away the material left shy of the line at the ends of the mortise. You can trim up to the final line with shallow paring cuts or with careful, mallet-driven chops, with the chisel's bevel facing into the mortise. Check again that the depth is consistently correct, and the mortise is done.

If you aren't really inclined to doing handwork or if you've got dozens of mortises to chop, there's one method that speeds things along. I have, on occasion, set up a right-angle fence on the drill-press bed, bored out most of the waste and pared to the final line. If the diameter of the drill bit used is the same as the width of the mortise, paring merely involves cleaning off the ridges between overlapping drill holes with a wide paring chisel worked parallel to the mortise length. A reasonably accurate mortise results. I say "reasonably accurate" because any paring of mortise cheeks runs a very high risk of taking them out of parallel.

I usually cut tenons by machine, but there are times that hand-cutting makes more sense, is faster and more enjoyable. I'm about to build a reproduction of an 18th-century spice chest, the top case of which is closed with a pair of raised-panel doors. Since everything else is dovetailed together, I'll only have to produce eight mortise-and-tenon joints—hardly a backbreaker. In fact, it's hardly worth the time to set up the jigs and robots to do the job. When I finally succumb to the familial pressure for new kitchen cabinets, however, I plan to defeat that endless army of tenons with the tablesaw. The set-up time will be insignificant relative to the total job, and I can expend my energy on more creative concerns.

Gaining time by machine-jigging exacts a price: There must be absolute uniformity of materials. You don't have to mark out every tenon, nor do you have to concentrate on each jigged cut. But because both edges and/or faces of a rail are used alternately to reference against your jigs, all of the stock must be exactly the same thickness and length, and must also be dead-square. Otherwise, the tenons aren't going to be uniform—they just won't fit right.

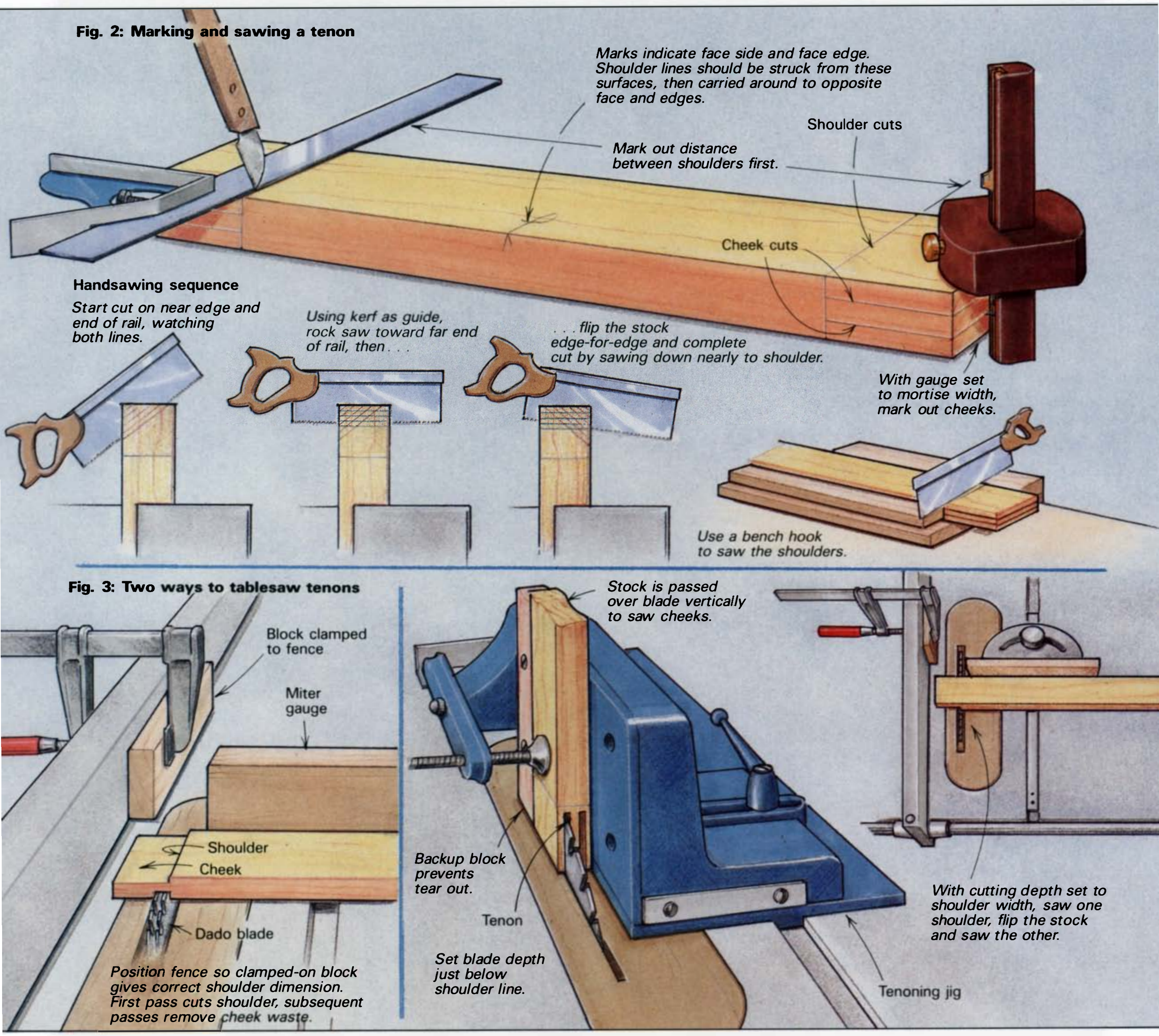
Hand-cutting the tenon is demanding in a different sort of way. Each piece must be individually marked, usually from only one reference surface or edge, and cutting is done freehand to the lines, requiring skill with the saw and absolute concentration. A tweak here with a shoulder plane, a trim there with a chisel and the piece goes together the way you want it to.

So, on to hand-cut tenons, beginning with stock preparation. In determining the length of a part to be tenoned, some woodworkers add the length of tenons to the distance between tenon shoulders. They then set a marking gauge to the length of the tenon and, working off the end of the board, mark back to the shoulder. Not only is this a bit like driving from New York to Boston via Cleveland, it doubles the effort required for accurate shoulders by requiring that the end of the tenon be made perfectly square, which—as far as joint fitting and strength is concerned—it doesn't have to be.

To me, the more sensible approach is to roughly cut the rail to overall length, mark where the shoulders will be (leaving equal lengths of tenon on both ends of the board) and then scribe a crisp line around the stock with your combination square and layout knife. Since there are always at least two rails of the same length in any job, gather them together on the bench after marking shoulder positions on one and knife one edge of each shoulder on all of the pieces simultaneously. The remaining three sides of each tenon can be marked off these initial lines.

The tenon cheeks can now be marked with the gauge set to the same dimension you used to lay out the width of the mortises. If the rails and stiles are to be flush on the face—as on a cabinet door—the gauge setting doesn't have to be touched. If the stile is to be proud of the rail (as some table legs are proud of the apron face) the depth of the gauge must be reset to reflect this. Strike lines across the ends and edges of each tenon, being careful to always work off the same outside face of each piece.

Figure 2 illustrates how to saw the tenon. A good backsaw will do the job nicely. The cheeks needn't be perfectly smooth and crisp, but the shoulder wants to have a nice, clean edge. So, I knife a second line at a slight angle to the first on the waste side of the line, creating a deeper notch to help guide the saw for the first few strokes. If the shoulders aren't right to the line or if they aren't smooth, true them up with a paring chisel if the tenon is narrow, or



Making a mortising chisel

I've never been able to find commercially made mortising chisels capable of withstanding the considerable pounding of heavy work, so I designed my own set a few years ago. I know very little about blacksmithing, but I took drawings of what I wanted to a machine shop and asked them to make up a set of three chisel blades, each a different width. The shop used ordinary oil-hardening tool steel, hardening it in an oven after the blades were shaped and then tempering them.

If you don't have a suitably equipped machine shop nearby, you can make the chisels yourself just as well. A good general-purpose oil-hardening tool steel is O-1 (Source: Cardinal Engineering, Route 1, Box 163, Cameron, Ill. 61423). It's available in the annealed (or soft) state, and can be shaped by grinding or with a hacksaw and file. Don't grind too aggressively, however, or else you risk heating the steel and hardening it prematurely. Drill the holes for the scales before heat treating.

To harden O-1, heat it cherry red with a pair of propane torches, then quench it in a bath of clean motor oil. Since there's a lot of steel in these chisels, small torches may be capable of heating only the lower third or lower half of the blank. As long as the cutting edge is hardened, this will work fine. Tempering can also be done with the torches. (For more information on tempering, see "Making and Modifying Small Tools" in *FWW* #50 or *Fine Woodworking on Hand Tools.*)

Author Podmaniczky designed his own mortising chisels and had them made. The chisels are fashioned from oil-hardened tool steel with bronze handles.

At the time I made these chisels, I planned to produce them in quantity, so I shaped patterns for scales out of wood and had them cast in bronze. If you want to make just one set, you can easily shape quarter-hard brass with files and/or a belt sander. I lightly countersunk the holes in the scales, then riveted them on with ¼-in. brass rod stock (see photo, left).

To ensure that the leading edges of the blade's back were straight and sharply squared, I hollow-ground the blade's length to within ¼ in. of the cutting edge (similar to a Japanese chisel) and stoned it. I then ground the bevel flat and a bit more obtuse than a bench chisel. Finally, I stoned the bevel flat on a fine India. —*M.P.*

with a shoulder plane if it's wide. To trim a tenon that's too thick for its mortise, pare the cheeks evenly, either with a wide chisel or a rabbeting plane. (See "Paring Chisel Basics," *FWW* #64.)

There are two ways to saw tenons on the tablesaw (see figure 3). The method I prefer is to cut cheeks and shoulders at the same time by multiple passes over a dado blade. The other method is to saw the cheeks in one pass using a rip blade with the part standing vertically, held by a jig or running against the fence. The shoulders are then cut with a cross-cut or planer blade with the rail lying flat and the end of the tenon jigged against the fence. It's important to clamp a block on the fence. Otherwise, the off-cut cheek can jam and shoot back at you like a cannonball.

If you're really confident at machine setup, you don't have to mark even one tenon, but I always feel better when I have a line to work to. One of the secrets of machine tenoning is to have plenty of waste stock so you can run test pieces for each new setup, making practice tenons than can be tested in the mortise they're intended for before committing actual stock. Knife-in one shoulder on a scrap piece and strike one set of cheeks with the marking gauge you used for the mortises earlier.

You're going to remove cheek material with a cross-cut motion over the blade, so for maximum stock removal per pass, it's expedient to install all of the dado chippers. Set the depth of cut to just less than the depth of the tenon shoulder and, using your miter gauge, make a test cut. If your tenon is centered in the rail, the other cheek can be cut by flipping the stock over and repeating the same procedure. Test the tenon fit and adjust the depth of cut so that the tenon enters the mortise with just the slightest resistance. Better a little loose than too tight. If the tenon isn't centered, every tenon will have the same cheek cut before flipping it over. Then, the depth of cut must be reset to give the correct tenon thickness.

The stand-up method of tenoning requires a shop-built vertical jig or one of the commercial jigs sold for the purpose. Woodcraft Supply sells a lightweight aluminum jig (catalog number 17L21, $69.50). Delta makes a nice, heavy, cast-iron tenoner that attaches to tablesaws and shapers (catalog number 34-172). For shop-made jigs, see *Fine Woodworking on Proven Shop Tips,* p. 70. All of the jigs do the same thing: They clamp the stock firmly so it can be passed safely through a rip blade on the tablesaw. As with the dado method, set up the tenoning jig using a piece of scrap marked out with shoulder and cheek lines. I cut the cheeks first by setting the saw's depth of cut so the top of the kerf will be just shy of the shoulder line. Saw one cheek on each of the pieces, flip the stock edge-for-edge, readjust the jig (for off-center tenons only) so the tenon thickness is correct, then saw the other cheeks.

Before committing all of your tenons to that second cheek cut, however, it's a good idea to make the second cut on your scrap piece and then saw the shoulder lines so you can test the tenon's fit. Instead of messing around resetting the tablesaw's depth of cut, you can roughly handsaw or bandsaw the cheeks on your scrap to try the fit. If it's satisfactory, complete the second cheek cuts, then set up your miter gauge for the shoulder cuts (see figure 3).

In assembling mortise-and-tenoned parts, clamp just firmly enough to ensure that the shoulder is solidly positioned against the mortise face—don't crush anything with overclamping. Correct for square and true, if necessary, by canting the clamp slightly. When the glue has set up, saw off the horn and you're in business. □

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Vacuum Jigs

Holding the work with thin air

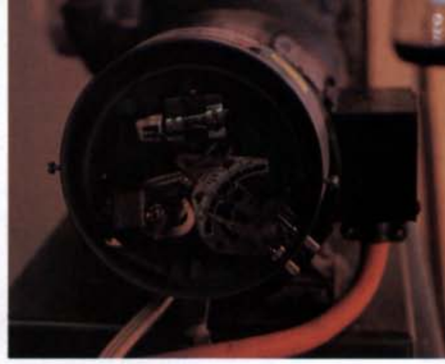
by James L. Kassner, Jr.

Furniture manufacturers and short-run production shops are constantly searching for new, efficient ways to hold workpieces of all sizes and shapes for machining. Air clamps and lever-lock hold-downs are often slow and clumsy—they frequently get in the way while machining, making it necessary to reclamp the part several times. An alternative that's rapidly gaining wide acceptance in production workshops (although it's still rarely considered in smaller shops) is vacuum-pressure workholding. With these systems, the holding force is sufficient to solidly lock down a piece for routing, shaping or turning. Vacuum systems can be turned on and off quickly for part changes. They also flatten thin, warped material, and leave the top and edges of the workpiece exposed for machining, obstruction-free. Often, you can completely machine a part without reclamping it, thus eliminating a source of error in machining.

Vacuum jigs are fairly simple to make. They're also durable, and can be adapted to a home shop. A typical system (see figure 1) consists of a vacuum pump connected by a hose to a plywood or particleboard jig outfitted with an assortment of holes, grooves and gaskets. A groove is routed into the face of the jig, just inside the periphery of the area where the workpiece will rest. A special soft-rubber gasket (channel seal) fits into this groove to form an airtight seal between the workpiece and the jig. The workpiece is placed on the jig, and the pump is turned on to suck the air out from under the part. The force exerted by atmospheric pressure on top of the part locks it firmly to the jig.

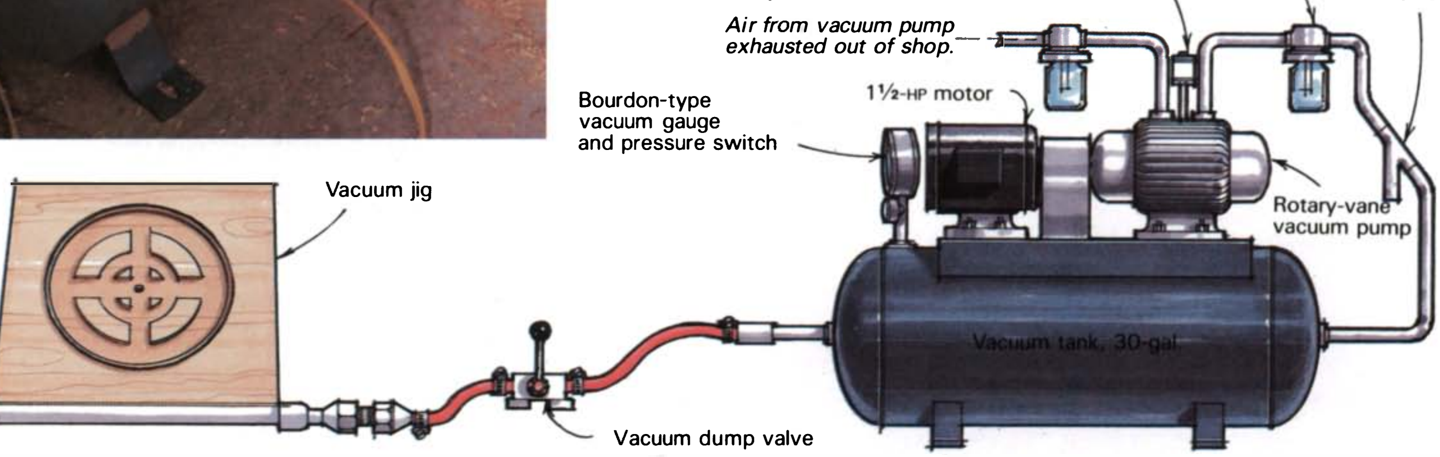
A vacuum jig usually carries the work into a blade or cutter, or locks the work in place while the cutting tool comes to it. The jigs tend to have low profiles, since the suction is applied to the back of the workpiece. We use vacuum jigs with computerized routers on production runs of wooden clock parts, but the jigs also work well with low-tech machines: shapers, drill presses, lathes or pin routers.

Building a vacuum system is expensive—you need a vacuum pump, plumbing, fittings and related hardware. However, your work volume may be sufficient to justify the expense—especially since the system can be used for other operations, such as vacuum-veneering panels (see *FWW* #16 and #56).



Left, the vacuum system is supplied by a 30-gal. tank and a 6.2 cfm pump driven by a 1½-HP motor. The large Bourdon pressure gauge is seen on the front of the tank, with the vacuum-pressure gauge below it. The inlet filter is mounted near the tank's back, above the pump. The oil lubricator is positioned above the pump, and the exhaust filter is mounted to the right. The check valve is barely visible behind the inlet filter. The vacuum dump valve (above, left) applies or releases vacuum to the jig. The valve connects to both the pump and the jig with ½-in. ID radiator hose. A close-up of the Bourdon gauge (above, right) shows the needles that read the high and low setting for the vacuum pump. The pump is activated and switched off as vacuum rises above and falls below prescribed levels.

Fig. 1: Schematic of vacuum system



Vacuum pumps are classified by the manner in which they move air: rotary-vane, piston, diaphragm and blower models are common. Rotary-vane pumps—either lubricated or oil-less—are best-suited for vacuum-holding work. All vacuum pumps are rated in two different ways: by the maximum vacuum they can create under zero air flow, and by the vacuum they produce at a specified air flow. The vacuum attainable from any vacuum pump is steadily reduced as the air flow in cubic feet per minute (cfm) increases.

Within the scope of your budget, my advice is to buy a vacuum pump with as high an air-volume-handling capability as possible. Rotary-vane vacuum pumps can range from 1 or 2 cfm to hundreds of cfm. Remember that wood is porous, so air will leak into the vacuum system through the pores in the workpiece. Additional air is drawn through leaks in the jig itself. In order for the pump to sustain a fairly high degree of vacuum under the workpiece in the presence of substantial air leakage, the pump must be rated for a reasonably high vacuum at a substantial air-volume flow rate. Our pump is a Gast, Model 2565, rated at 6.2 cfm at a vacuum pressure of 20 inches of mercury, or about 9.5 psi of vacuum-gauge pressure. This capacity enables us to handle four or more vacuum forms simultaneously on our computerized router. For the average small shop, a pump in the 3-to-6 cfm range should be sufficient. These pumps cost roughly $400 new, but they can be purchased used for $50 to $150 and then be reconditioned.

I think lubricated-type pumps are better than oil-less pumps for woodworking applications because they handle more air and generate slightly higher vacuum pressure. Lubricated pumps are also better able to handle the dusty air that's inevitably sucked into the vacuum system.

Like air compressors, vacuum systems work better when they're equipped with a tank (see photo, above left) that provides reserve capacity so the pump doesn't have to run full-time. The tank's extra capacity also helps handle the air-flow surge when the vacuum is turned on and the part is sucked down tight. We use a 30-gal. tank, but a smaller tank would undoubtedly work just as well on a less elaborate system.

A word of warning: Ordinary compressor tanks should *not* be used on vacuum systems. Tanks under vacuum may collapse if they're slightly out of round, so they must be made of heavier-gauge metal than compressor tanks. Air tanks rated for 400 psi or more should be suitable for vacuum applications.

Almost any kind of piping can be used to connect the system's components. I've had good results from ¾-in. ID galvanized steel and copper pipe. Seal all of the threaded joints with Teflon tape, which makes the joints easier to disassemble than when standard joint cement is used.

We install an ordinary brass, water-type flapper check valve (available from any plumbing-supply shop) to separate the pump from the reservoir tank. The valve prevents the reservoir from being bled down due to back leakage through the pump when it isn't running. The valve also allows the pressure to equalize across the pump so, once the pump is turned off, it doesn't have to start again under full load. The check valve should be positioned so its flapper hangs vertically. Grease applied around the

Drawings: Joel Katzowitz

Fig. 2: Vacuum jig

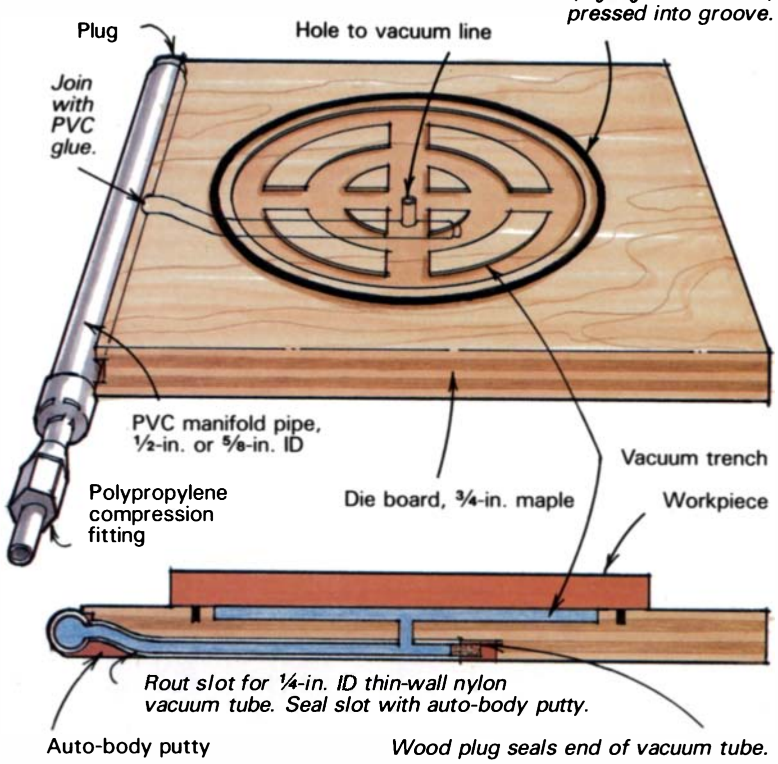
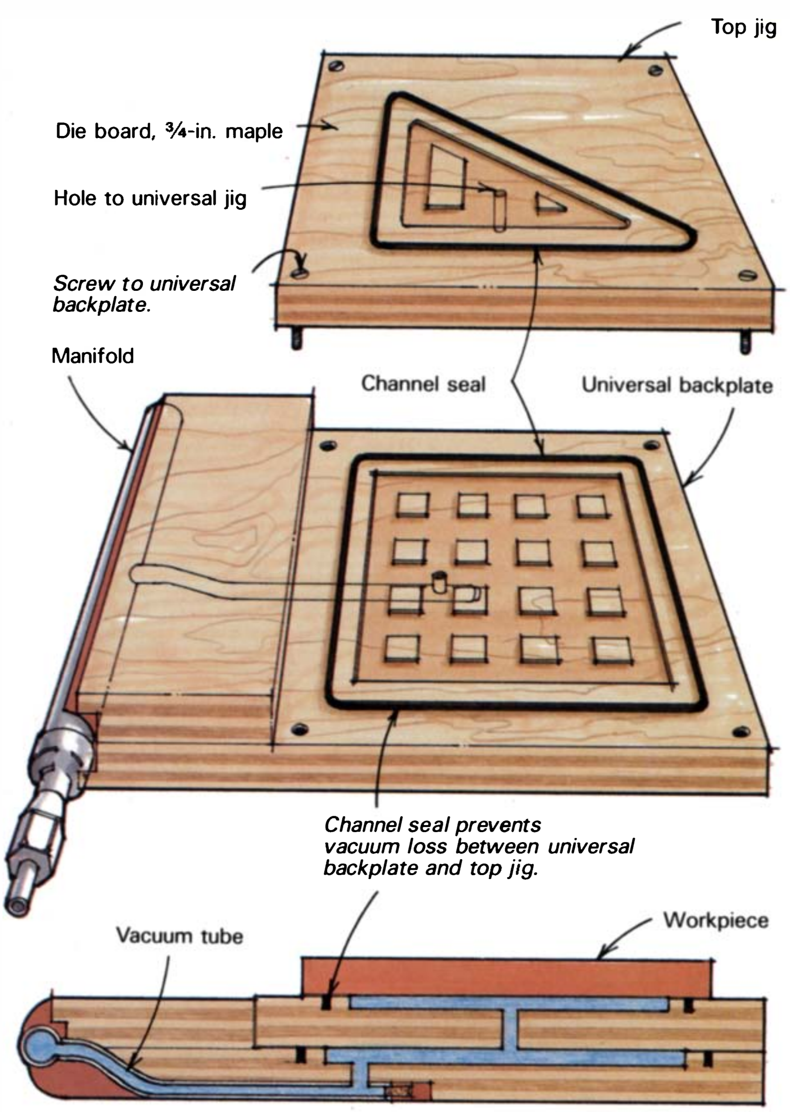


Fig. 3: Universal vacuum jig



flapper helps seal it against leakage, but also necessitates frequent maintenance, since the grease collects wood dust.

The inlet filter located between the tank and the pump (see figure 1) also helps keep dust out of the pump. Due to the low pressure in the vacuum tank, wood dust that enters the system through pores in the workpiece during machining rapidly settles out in the tank. However, it's advantageous to use different tank outlets for the vacuum pump, the line to the vacuum jig and the pressure control. This gives the dust an even better chance to settle out in the tank, and lets the pressure control do its job more reliably. The filter on the exhaust port or muffler helps trap and collect lubrication oil mist in the glass jar. Venting the muffler's output outdoors via a garden hose keeps oil mist out of the shop air and greatly reduces workshop noise.

The most important routine maintenance item on the lubricated-type vane pump is to maintain the oil level with #10-weight detergent oil in the lubricator. Each filling should last for around 25 to 60 hours of operation. More rapid oil consumption does no harm; it simply exhausts more oil mist into the air.

As woodworking goes, making vacuum jigs is relatively simple. There are two different types of jigs. The simplest—designed to hold a specific workpiece—is shown in figure 2. If you need to hold several types of workpieces, I suggest you build the universal jig shown in figure 3. The beauty of this jig is that you can build one or two of the bases, then make as many custom formboards to fit on top as you want. You remove the formboard by loosening a screw or two, then replace it with another board that's shaped to the requirements of a different workpiece or a different operation. This eliminates the problem of building the more complicated base for each workpiece or operation. If I had to build my jigs over again, I'd build more universals and fewer single-purpose models.

If you were able to create a perfect vacuum under the workpiece (impossible to do, because of inevitable air leakage), the full weight of the atmosphere would bear down on it at 14.7 psi at sea level. The difference in the pressure above and below the work is described as "differential" or "gauge" pressure and is expressed in psi or inches of mercury. Vacuum pumps and gauges are most often rated in inches of mercury, not psi. However, psi is easier to convert into pounds of holding force, using this equation: Holding force (lb.) = area (sq. in.) × gauge pressure (psi). (In preparing your calculations, consider 15 psi roughly equivalent to 30 in. of mercury.)

As an example, assume the air pressure is about 15 psi, which—give or take a pound or two—will be the case in most parts of the world. A typical high-volume vacuum pump will remove enough air from behind the workpiece so that about 9.5 psi of air is bearing down on it. Multiply this gauge pressure by the area inside the gasket sealing the workpiece—let's say 10 sq. in.—and you have about 95 lb. of force holding the workpiece.

A typical jig setup is shown in figure 1. A trench cut into the top of the jig distributes the vacuum over the area of the part, and the vacuum dump valve serves as a "switch" to apply vacuum to the jig or to release it.

I recommend the use of ¼-in. nylon or rigid PVC tubing on these jigs. Polyethylene, polypropylene, Teflon and Tygon tubing can't be glued to anything, but nylon and PVC can be fastened to the formboard with epoxy, PVC cement or auto-body putty. Before assembly, sand the outside of the tubing so the body filler can grip it. Apply PVC pipe cleaner on the ends of the tubing, on the tubing's connections to the manifold and around the holes bored in the manifold. Then, glue the tubing to the manifold with PVC glue. Build up three or four layers of the glue so that it forms a substantial connection between the tubing and the manifold. Cement the manifold and the tubing in place with body filler after the glue has dried. The last step is to sand the bottom of the jig to make it as flat as possible. After all, it's the reference surface for your work.

Also, use ½-in. ID (or smaller diameter) automotive radiator hose to connect the jig to the vacuum system. This hose is flexible enough to allow the jig to move freely.

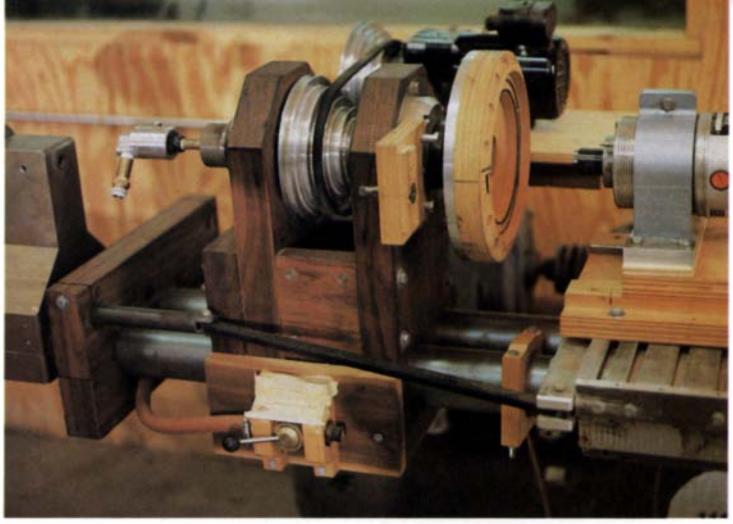
The best materials for jig bodies are Baltic birch plywood, hard maple die board and medium-density fiberboard (MDF). The main requirements are that the material remain flat and be dimensionally stable. This rules out solid wood, which is prone to cross-grain expansion and contraction with the rise and fall of humidity. MDF is suitable for formboards subject to moderate wear and tear. It has relatively little adhesive binding the wood fibers together, so it tends not to retain threaded inserts very well when they're used frequently. Also, intricacies in the formboard tend to crumble with heavy use. MDF is extremely porous. After the vacuum trenches and the gasket grooves are cut, seal the whole jig with shellac to minimize vacuum leakage. Shellac plugs the pores thoroughly, while even multiple coats of other finishes don't. You can also buy ¾-in. MDF that's veneered on both surfaces. The veneered surface is pretty tight, but the interior remains porous.

A word of caution: MDF contains grit that quickly dulls ordinary high-speed steel bits, so cut the gasket grooves in it with a ⅛-in. solid-carbide bit. Cut the grooves in one pass, moving the bit in one direction. Don't backtrack, or you're liable to make the groove too wide for the gasket. The gasket groove should be at least 3⁄16 in. from the edge of the vacuum trench. If not, the space between the trench and the groove might crumble.

Finnish or Baltic birch are good choices for jigs because both woods stay flat—even after machining to make the form. These birch plywoods are sold through hardwood supply houses and often through local lumberyards. Die board is a specially laminated hardwood plywood, the bulk of its veneer being hard maple. It's the most expensive, but it's also the most durable and it machines almost as cleanly as aluminum. Use only die board with five or more laminations. Jigs made from die board and most other plywood substrates are relatively nonporous when compared to particleboard. Thus, vacuum loss is less of a problem.

Die board can be drilled and tapped to accept coarse-thread machine screws, largely eliminating the need for threaded inserts. The direction of tapped holes should be perpendicular to the face of the board; threads tend to crumble in the endgrain. Use a standard metalworking tap and blow the chips out of the hole frequently during tapping. The threaded portion of the hole should be two or three times the diameter of the screw in length to provide adequate grip.

Even if vacuum loss in plywood jigs is minimal, it's a good idea to seal them with wood sealer, such as those available through the "Sources of supply" listed at right. These thin sealers penetrate deeply and help harden wood threads, making them more durable (although the hole may need rethreading after the sealer has dried). For ease of operation and to save the threads, wax any screws that will be inserted and removed often. If there's a danger of running a cutting tool into the screw, use brass, nylon or at least unhardened cadmium-plated steel screws. Carbide router bits will cut through unhardened screws, usually without damage. Never use hardened-steel screws or hard-steel dowel pins on formboards. A router bit will shatter if it hits a hardened metal, throwing steel and carbide fragments around the shop at high velocities.



The author built a lathe and vacuum chuck to handle clock parts that need to be turned. The principle of the chuck is the same as for jigs: sufficient vacuum is applied through it to lock down the workpiece. However, the setup requires a ball-bearing fitting to allow the vacuum line to remain stationary while vacuum is applied through the spinning headstock.

All stops or components that might easily be damaged or need to be replaced should be held in place with screws. For maximum accuracy, use mild-steel or brass locating pins in addition to the screws. Wax the pins to make them easy to remove. Parts may slide horizontally on the jig when heavy cutting forces are applied by a router or shaper. Prevent this movement by gluing 100-grit, A-weight, open-coat sandpaper to a large area inside the gasket with Titebond glue (contact cement would be too flexible). The sandpaper will grip the part when it's pulled down on the form by the vacuum. If the completed part has one or more holes in it, these can be drilled first, and mating wood dowels can be positioned on the formboard to engage the holes. (It's not usually necessary to install a gasket around the dowel if it fits its hole well.) In addition to preventing slippage, this doweled construction provides accurate location.

Vacuum workholding need not be restricted to flat objects; curved surfaces can also be machined. Holding curved pieces simply requires a bit more ingenuity on the part of the craftsman in designing and making the jig. □

James Kassner, Jr. builds and sells wooden-clock-movement kits at Kassner Woodcraft, Inc., in Tuscaloosa, Ala.

Sources of supply

Occasionally, surplus pumps, vacuum gauges and assorted electrical control relays can be obtained through:

Arbee Sales, 313 North Morgan St., Chicago, IL 60607.
Herback & Rademan Co., 401 E. Erie Ave., Phila., PA 19134.

Complete vacuum systems, dump valves, vacuum gauges, rotary couplings and channel seal are available directly from:

Magna-Lock U.S.A., Box 7012, Rockford, IL 61125.

Die board:

Lenderink, Inc., Box 98, Belmont, MI 49306.

Baltic birch plywood:

Allied International, Box 56, Charlestown, MA 02129.

Sealer:

Nelsonite Chemical Products, Inc., 2320 Oak Industrial Dr. N.E., Grand Rapids, MI 49505.
Prillaman Co., Box 4024, Martinsville, VA 24112.
Guardsman Chemicals, 1350 Steele Ave. S.W., Grand Rapids, MI 49507.

Wall Paneling

General application and design principles

by Graham Blackburn

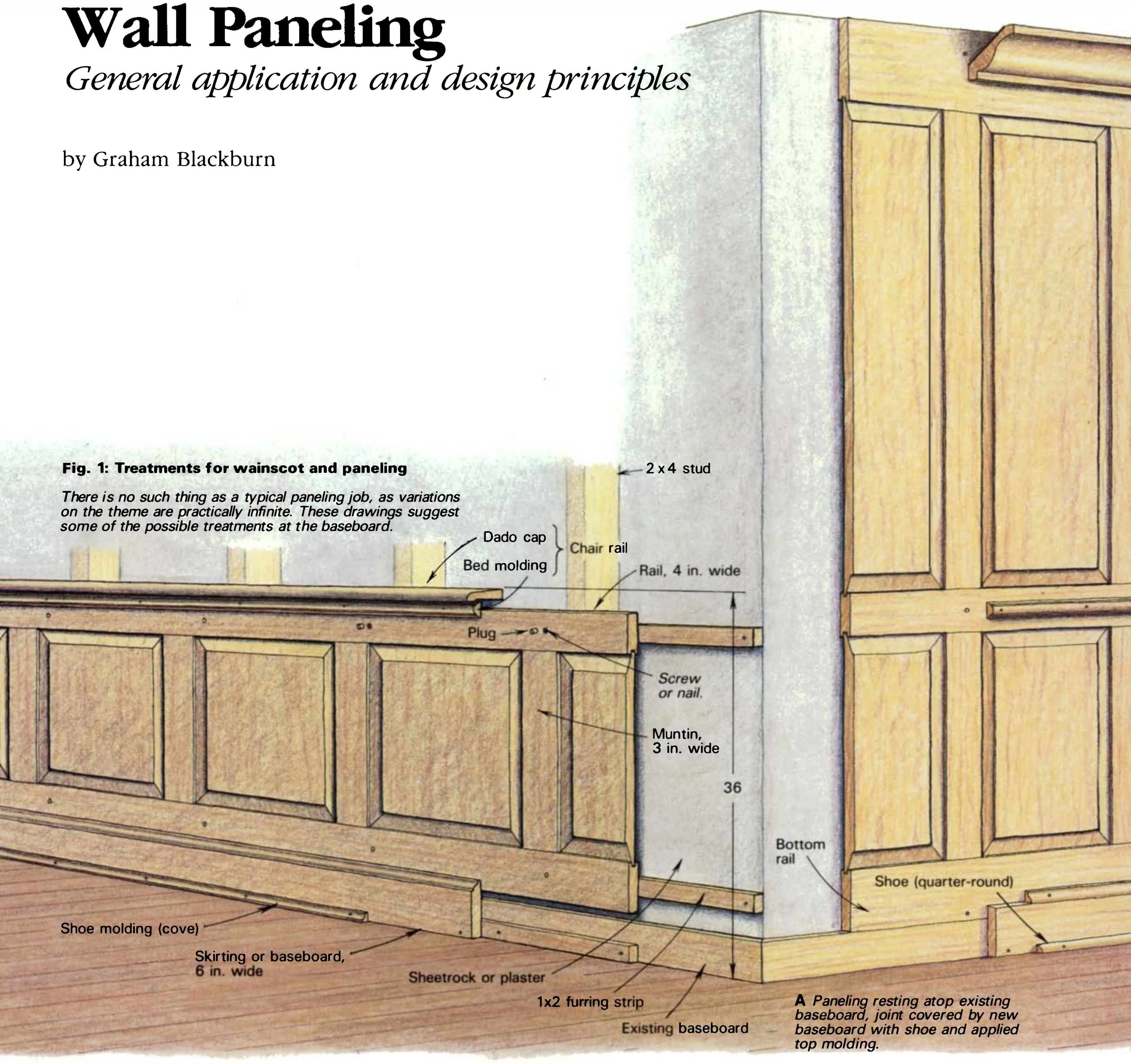


Fig. 1: Treatments for wainscot and paneling

There is no such thing as a typical paneling job, as variations on the theme are practically infinite. These drawings suggest some of the possible treatments at the baseboard.

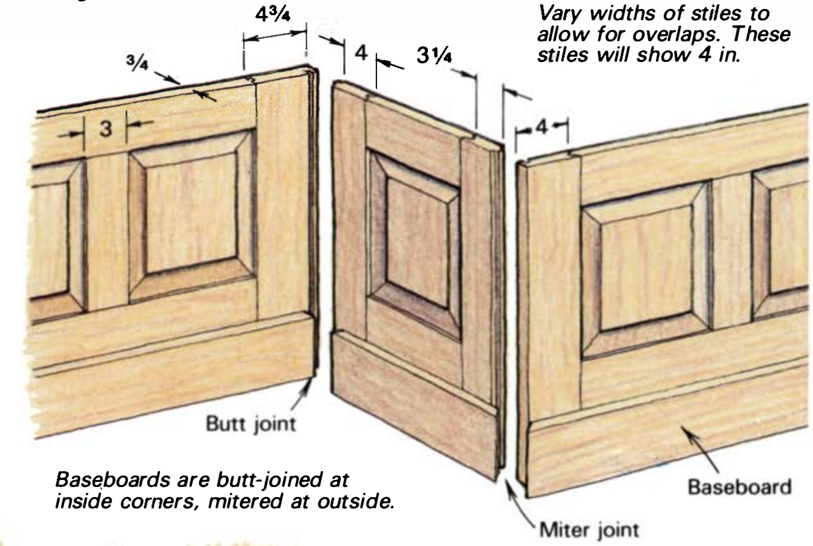
Paneling came into general use as a form of interior decoration for walls during the latter part of the Middle Ages. Because of its infinite adaptability, paneling is a practical form of wall covering even today. Admittedly, one immediately thinks of older architectural styles—Colonial or Georgian, for example—but, used in the right way, paneling can be just as appropriate for the most modern setting, whether it be a boardroom needing tasteful dignity, or a small apartment looking for a way to disguise a Murphy bed.

The elements of a paneled wall—both half-paneling known as "wainscot" and full floor-to-ceiling paneling—are illustrated in drawings throughout this article. Essentially, paneling is a modular system in which solid-wood panels are held in grooves in a mortised-and-tenoned frame composed of rails (the horizontal members) and stiles (the full-length, vertical ones). The short framing members between rails are called "muntins." The grooves in the framing allow the panels to expand and contract with changes in relative humidity, and the frame also keeps the panels from warping.

The system is modular because it consists of a series of repeating elements that can be added or subtracted, depending on the space to be covered. These elements needn't be entirely regular—they can be modified in size and shape to conform to fireplaces, windows, beams, doors, etc. as required.

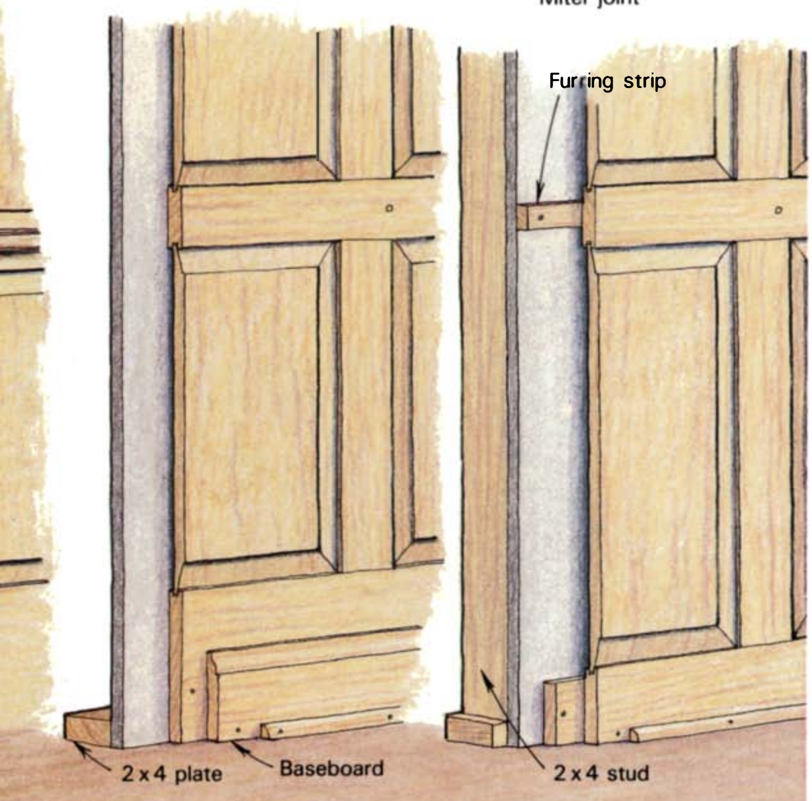
Turning corners

Although inside corners may simply be butted and covered with molding, a tongue-and-groove joint is more secure and makes assembly alignment easier.



Vary widths of stiles to allow for overlaps. These stiles will show 4 in.

Baseboards are butt-joined at inside corners, mitered at outside.



B *Paneling all the way to floor, trimmed with top-molded baseboard and shoe, and fixed through wall to plate.*

C *Bottom rail fixed over existing baseboard, then trimmed with shoe. Higher rails fixed to furring strips screwed or nailed to wall framing.*

Changes in architectural style and interior decoration have dictated the form of paneling in various eras. To mention just a few outstanding styles, there are the distinctive linenfold patterns of the late Gothic, the graduated rectangular panels of the Tudor period, the panels-within-panels of the Jacobean era and the pilastered and classically friezed panels of the 18th century. These characteristic forms may appear to be the dominant element in any particular type of paneling, but all are usually based on certain fundamental principles of design. When you know how to recognize them, these principles constitute the intrinsic "rightness" and success of a paneled wall in any style.

It would be a great pleasure to design a paneled wall of perfect proportion and symmetry, and then have a contractor stop by and build the house around it. Such, of course, is seldom the case. Whatever overall plan of design we decide upon, it must usually accommodate existing windows, doors, electrical outlets and switches, plus out-of-plumb and irregular surfaces. In the drawings, I've tried to suggest a number of ways of dealing with such things.

Before I go further, there are two points I must emphasize. First, it's the overall pattern of the paneling that must prevail if the wall is to be successful. If inconsistencies take over a major part of the job, the wall will look disjointed and inharmonious. Second, keep in mind that paneling a wall is a major project, deserving much forethought and preparation. Before beginning construction, produce as detailed a drawing as you can. This will help identify potential problems. If an unusual window presents a great disruption, for example, consider replacing it. The same is true for outlets and switches with inconvenient spacing or height—it may be less work to move them than to force the design around them, and the end result will look far better. This isn't to say that you must keep the design entirely regular. A wall that is too uniform can look "manufactured," while a wall with tasteful minor variations looks "tailored" and is all the better for it.

There are several ways to go about setting the proportions of the elements in a paneled wall. In the Middle Ages, craftsmen depended on mathematical theory and geometry to create design systems based on whole numbers and their relationships to straightforward forms, such as the square and the circle. As the guilds became more sophisticated, subtler ideas evolved, such as the ratio of the "golden mean" (or "golden section," as it's sometimes called), which I'll explain in more detail later. The Renaissance saw the reintroduction of classical Greek and Roman proportionalism, and this found its way into the design theory practiced by 18th-century joiners and cabinetmakers in the form of "the five orders of architecture." Such study can become extremely technical and is beyond the scope of this article, but those interested in pursuing the topic will find references in the books listed in the "Further reading" bibliography, p. 81. The most useful, pragmatic fact to remember about design is that, unless you have an "absolute eye" for what is aesthetically right (like certain musicians have absolute pitch), success will come only if you arrive at your design by way of some rational approach.

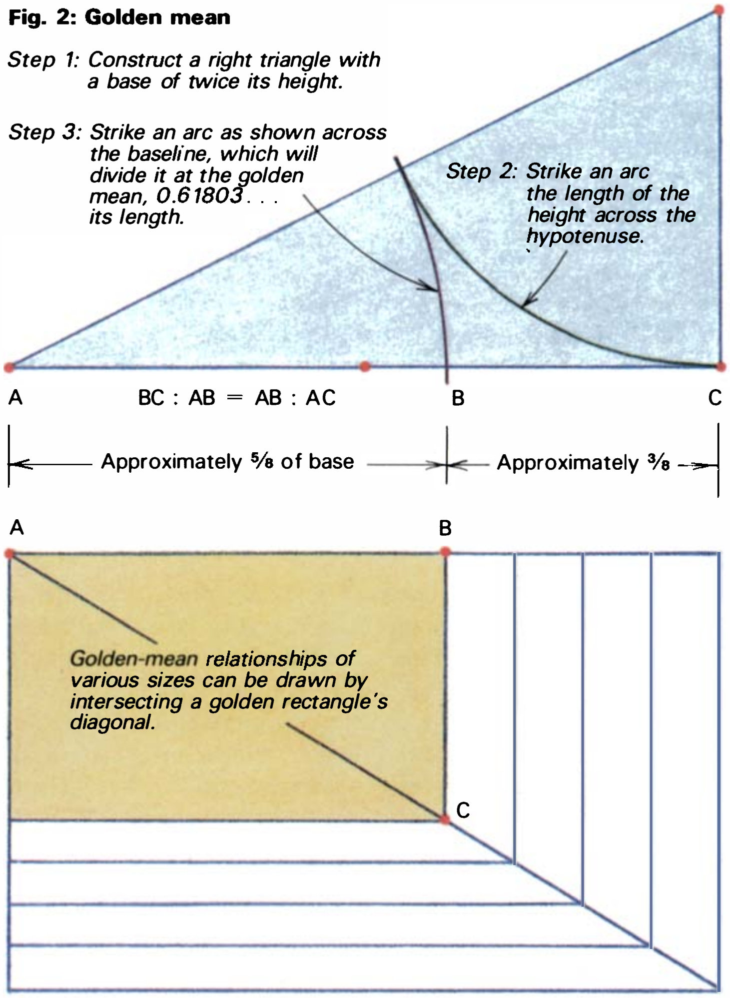
Look at the whole space, not just the area to be paneled. Try to imagine what will tie the whole thing together. If a room is broken up by a variety of windows and doors with varying heights and proportions, try designing the paneling so that part of it, such as a visually strong top rail and crown molding, stretches across the entire length of the wall. This molding can then be carried around the entire room, even if the paneling is not. If this isn't possible, try designing the paneling either with a strong regularity or with one particularly salient member—the wainscot shown in figure 1 is a good example. Its chair rail is a powerful enough feature visually to unify the design. Doors and windows will appear as relatively unimportant interruptions in a predominantly regular plan. Similarly, bookshelves adjacent to a paneled wall can have their shelves aligned with the rails, and may be able to carry unifying moldings.

Of course, if the basic space already possesses its own pleasing rhythm, such as a wall with a fireplace in the middle and two equally spaced windows on either side, then it makes sense to design the paneling around the existing pattern, for the space is already tied together.

The design should look balanced and stable, not as if it were

Drawings (except where noted): Lee Hov

Fig. 2: Golden mean



about to topple over. This balance can be achieved by using heavier or bigger parts at or near the bottom. For wall paneling, this means making the skirting (or baseboard) the widest member or, perhaps, designing a chair rail to be visually strong by making it wider or more heavily molded. Chair rails are typically about 36 in. from the floor; their purpose is to protect the paneling from chair backs. Paneling doesn't always require a rail at this height, however, as can be seen in figure 6.

A more sophisticated plan, and one particularly well-suited to the problem of how to divide up an area into the typically smaller parts required by paneling, is to base the arrangement—even loosely—on the golden mean. This is a ratio discovered by the Greeks and used ever since by artists, sculptors and architects as a kind of pattern on which to base their designs. In its basic form, the golden mean is simply the division of a line at such a point that the smaller part is to the larger part as the larger part is to the whole. This translates into dividing the line at roughly five-eighths of its length. By using one part as the width and the other as the height you will construct a "golden rectangle." There are several ways of arriving at the golden mean of any given line; one of the easiest is shown in figure 2.

Having decided on a general overview of how the area should be divided up (two of the countless possibilities include: a thin row of panels at the top, a wider one in the middle and, perhaps, the widest row at the bottom; or, two narrow columns of panels flanking windows, with a much wider column of panels in the center) it's now necessary to delve into greater detail and decide the relative dimensions of the various framing members. The variations are endless, and the best way to start getting an idea is to study all the examples you can find, both in real life and in pictures in books. Key points to look for are the width of the stiles in relation to the width of the various horizontal pieces; and the width of the horizontal ***and*** vertical members in relation to the size of the panels themselves.

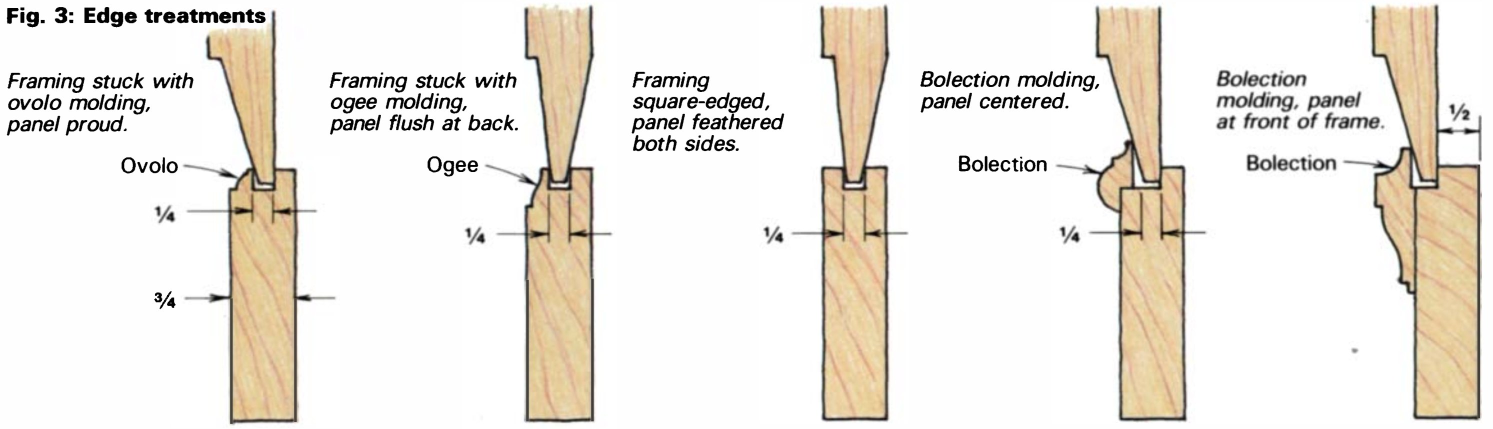
After a while, you'll begin to notice a few trends, which can be expressed as generalities only (there are always justified exceptions). Stiles tend to be equal in width, while rails are often graduated in width, from the bottommost ones to the top ones. Furthermore, the upper rails are frequently the same width as the stiles, and the panels are usually no narrower than the combined width of two stiles. Outside stiles look best if they are somewhat wider than any inside stiles, and yet at corners—both inside and outside—the width of the stiles may be somewhat reduced, since the combined effect of two regular-width stiles would appear excessive.

I must stress that these proportions are generalizations only. There are also optical "tricks" that can change how things look. For example, the use of molded edges on the framing members creates extra lines of shadow and makes the framing members look narrower. Similarly, overlapping bolection moldings make both the frame members and the panels look narrower. Another extremely potent factor is the design of the panels themselves.

Panels can be simply flat, but it's more common to bevel the edges to produce a central "field." This field can also be "raised" by having a vertical shoulder, as shown in figure 3. Fielded panels can be made to look quite different by changing the width of the beveled areas. Try designing the same size panel with a very wide margin and then a very narrow margin, and observe the difference.

Internal proportions must relate to other features in the room, such as the size of any door panels or window trim. A framing system with very narrow framing members surrounding windows

Fig. 3: Edge treatments



Laying out Georgian-style paneling

by Malcolm MacGregor

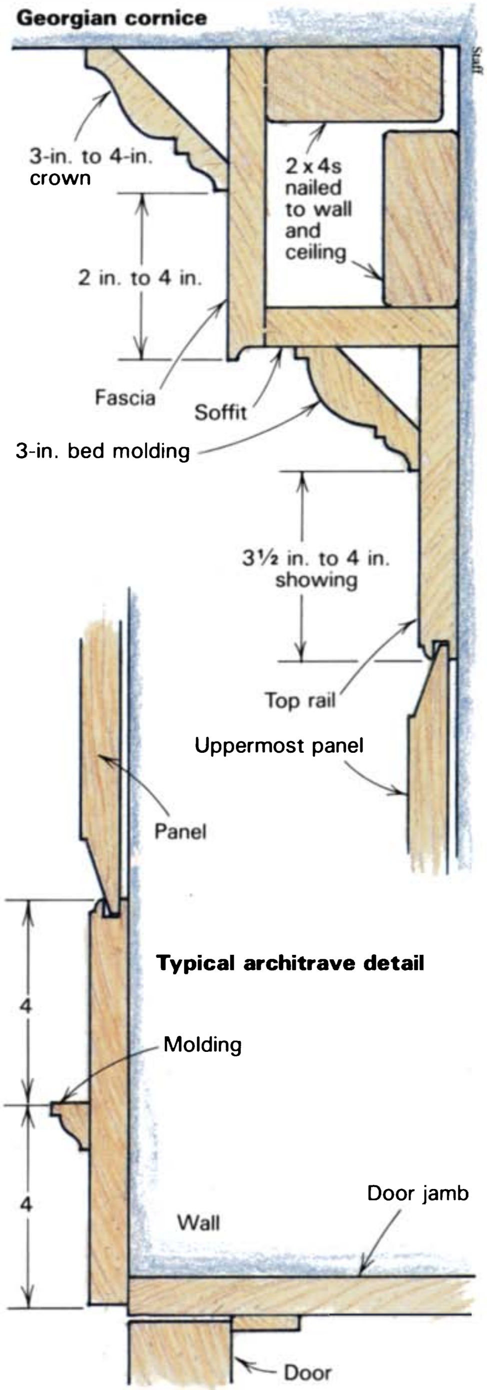
As it was two centuries ago, wall paneling should be considered the focal point of a treasured room, such as a formal parlor or a library. It's possible, of course, to panel an entire room floor to ceiling—and even panel the ceiling itself—but I advise my customers against it. Besides its huge expense, a fully paneled room is too much of a good thing. It's visually overwhelming and not very pleasant to be in. Instead, I prefer to panel only one wall of a room floor to ceiling, then tie it to the rest of the room visually by installing wainscot or a simple chair rail on the adjacent walls and running the cornice around the room.

In the mid-18th-century New England houses I often work in, the Georgian style—with its classically derived moldings and architectural elements—was quite popular, so most of my paneling follows Georgian design principles. As with any period, Georgian spans a stylistic range. At its most modest, a Georgian paneled room might be rather plain, with no architraves and only a simple crown molding topping off the paneled wall. More elaborate walls will include fluted pilasters flanking a formal fireplace, doorways with gabled pediments and the formal double-crown molding shown in the drawing. Typically, New England mid-Georgian design is strongly vertical, with two rectangular panels extending upward from the floor. Sometimes, a squarish median panel separates the two vertical panels. In either case, the baseboard is almost always rather plain.

Paneled walls traditionally have a visual focal point that anchors the design. In Georgian rooms, this is usually a fireplace around which the most complex elements (pilasters, bolection or multi-part moldings forming an elaborate architrave or a complex pediment, for example) are clustered. To either side of this center, the design is deliberately less busy, thus drawing the eye to the most interesting parts of the wall.

I begin a paneling job by very carefully measuring the floor-to-ceiling height at several points along the wall, as well as the side-to-side distance. With a 4-ft. level, I check the walls for plumb and floors for level, recording my findings in a notebook as I go. If the floor is relatively level, I chalk a level reference line on the wall that roughly represents the paneling's center rail. All vertical measurements can then be made from this line to establish the overall height of the panel section and the location of each rail. Similarly, one of the adjacent walls (or a plumb line drawn on it) can serve as a reference plane to lay out the position of various elements in the wall.

If the floor is way off—say 1½ in. in the run of the wall—I adjust my reference line to split the difference. It's far more important that the wall be straight and square with the room—minor variations in plumb and level are easily masked by moldings or trim at the paneling's edges. By far the best way to account for structural inaccuracies is to install the paneling *before* the adjacent drywall and floor are installed. This is especially true in Georgian panel systems, because the bottom rail often doubles as the baseboard. It's much easier to lay the floor up to the rail than to scribe the rail to an uneven floor.



I draw my paneling design to scale on graph paper. Before figuring panel sizes and proportions, I decide upon the size and profile of the architraves surrounding the fireplace and/or doors, since the space between these fixed elements determines how much room I'll have for the panels themselves. The drawing shows one way to mate an architrave to the paneling. An architrave can be as simple or elaborate as you like, but in the interest of visual harmony, I try to make the combined width of molded sections closely match the width of the floor-to-ceiling stiles, which are usually about 4 in. to 4½ in. wide. I make the intermediate stiles (also called "muntins") 4 in. wide.

In Georgian walls, there's one critical horizontal alignment that's rarely violated: The paneling's center rail almost always aligns with—and is the same width as—the lock rail on the doors in the room. With this rail and the architraves drawn in as inflexible elements, I begin sketching in the paneling. I rely heavily on books for inspiration, but from the research I've done, I've settled on some favorite designs. Rooms with 7-ft. ceilings look best with two vertical panels, the top panel being about 1½ times the length of the bottom panel. In two-panel walls, I generally make the bottom rail 6 in. to 7 in. wide, the center rail 7½ in. to 8 in. wide (or to match the lock rails) and the top rail 3½ in. to 4 in. wide, exclusive of the crown molding.

Higher ceilings work well with three panels. In this case, what would normally be the center rail is split into two separate rails—the top one about 5 in. wide, the lower about 4 in. wide. A panel that's slightly wider than its length fits between the rails. Horizontal panels, such as the large ones above a fireplace, usually line up with the outer sides of the architrave, not the opening in the wall. Panel widths as narrow as 4½ in. are practical, but I never make them wider than 20 in.; seasonal shrinkage across that much wood can pop the panels out of their grooves.

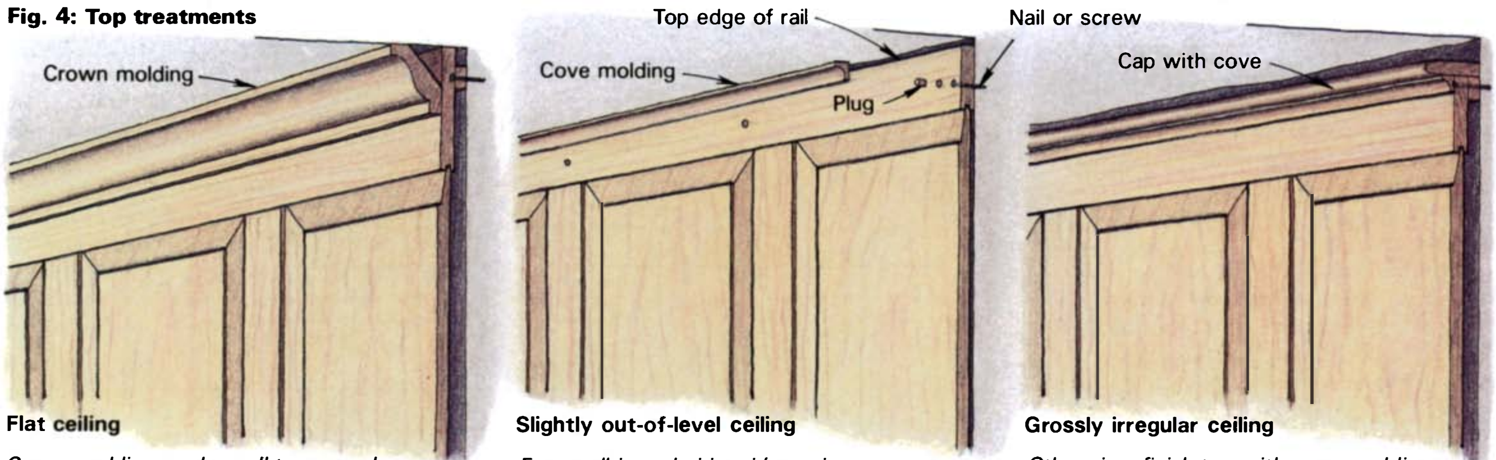
The rails, stiles and panels are made in the shop, dry-assembled and carried into the room in sections. The sections are tacked to the wall to check for fit. The joints between sections should occur at floor-to-ceiling stiles. There's usually enough give in the paneling so that the tenons between sections can be slipped into their respective mortises as the panels are attached to the wall. Smaller sections of paneling can be assembled face-down on the floor and lifted into position. □

Mal MacGregor runs Piscataqua Architectural Woodwork in Durham, N.H.

that have totally different trim proportions and molding treatments will look very uncomfortable, and not at all tied together. One solution would be to remove the existing trim, and bring the edge of the paneling up to the window, as shown in figure 5.

One last but vital consideration in designing the overall plan together with the internal details has to do with how the paneling is secured to the wall. In practice, this usually isn't much of a problem. The overall structural integrity of the paneling makes it very easy to secure with screws—or even nails—at relatively few points. Applied moldings offer a choice of sites at which screws can be used, since they'll later be covered by molding. Screws can also simply be plugged, or—if the wall is to be painted—the paneling can be nailed to the wall and the nails can be set and filled. All fixing, of course, must be done through the rails, stiles and muntins, because the panels themselves must be left free to expand and contract, unrestrained. The bottom of the paneling can be screwed into the floor, the plaster grounds or to wall-framing plates (see figure 1). Studs in wood-framed houses are spaced closely enough so that stiles or rails can be lined up with them and be screwed or nailed through. Masonry offers even more choices, although a little more work is entailed: holes are drilled wherever you want them, then filled with wood plugs to provide fixings for screws. In brick walls, occasional bricks can be removed and the resulting spaces filled with wood blocks called "noggins." Should you be working in a stone house constructed of super-hard granite, it's not hard to find a mortar joint that can be drilled out and filled with

Fig. 4: Top treatments



Flat ceiling

Crown molding works well to conceal attachment methods, provided ceiling is level.

Slightly out-of-level ceiling

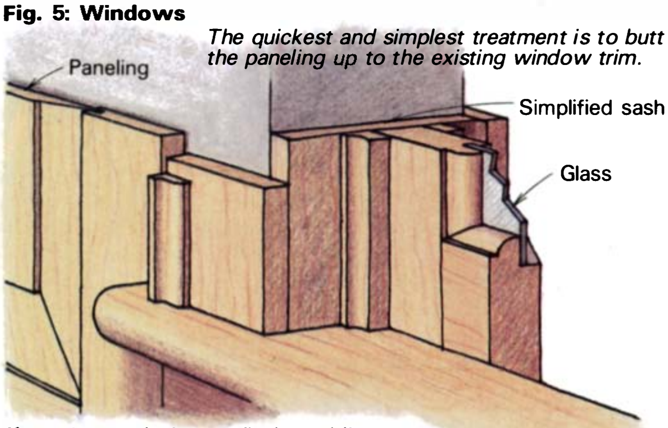
For small irregularities, it's easiest to cover gaps with quarter-round or cove that's narrow enough to bend.

Grossly irregular ceiling

Otherwise, finish top with a cap molding, simple or ornate, and either leave existing wall to show or scribe Sheetrock to fit opening.

Fig. 5: Windows

The quickest and simplest treatment is to butt the paneling up to the existing window trim.



If paneling and trim are flush, molding can cover joint; if not, molding can butt against higher edge, covering minor gaps.

To cover gaps caused by problems with plumbness, squareness and surface height, a furring strip may be used to bring window trim forward to overlap paneling.

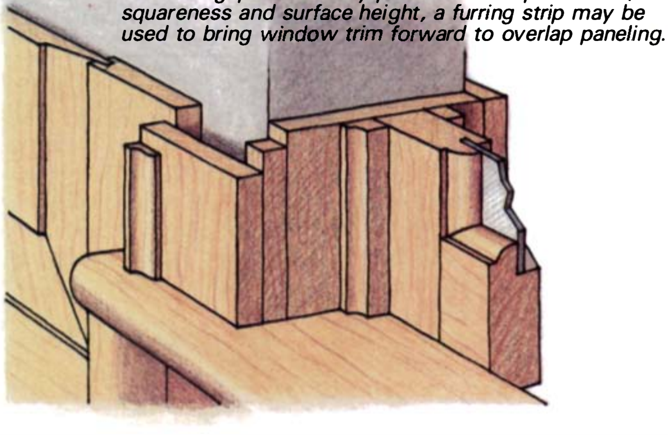


Fig. 6: Sample wall

The first design decision was to unify the wall with a visually strong dado rail beneath the windows, with a row of panels of the same height below it. The middle, frieze and top rails would also be kept in continuous horizontal lines as much as possible. Spacings of these higher rails approximate the golden mean (as shown at far right). The unequal spaces caused by the windows were made more uniform by dividing them into two vertical rows of panels each. With these major decisions established, minor difficulties were dealt with as described on the drawing.

Windows not same size: For small difference, widen rail as shown; if this space were much larger, it would be better to install two very narrow horizontal panels, as at top of window.

Old outlets in baseboard: Holes cut in new baseboard over existing outlets. If there had been many more outlets and/or switches, it would have been best to rewire the wall according to code, positioning the electrical boxes so that they would appear in frame members, not in panels.

a wood plug. Instead of these traditional wooden plugs, you can also substitute any type of modern wall anchor in a masonry wall.

By far the biggest difficulty you might encounter is with walls that aren't plumb and floors that aren't level. Occasionally, it may be a good idea to go with the flow, but usually the best rule is to true up the new work rather than attempting to accommodate any irregularities in the building. Nine times out of ten, this will look better and—despite what you may think—be easier to do. The first job is to establish an absolute level at the bottom of the wall (if the floor is uneven or sloping) and work upwards from the highest point of the floor. You have two choices: You can either make the bottom rail perfectly regular and level, covering any resulting gap with a baseboard that's scribed to the uneven floor line along its bottom edge, or you can scribe the bottom framing member itself. The first method is usually the best because it guarantees that at least a part of the bottom of the framing can be made to look consistently wide. By working from the floor's highest point, the baseboard or bottom framing member will never appear too narrow since you started at the point where it was narrowest. A bottom framing member that appears too wide here and there (from accommodating a dip or slope in the floor) looks far better than a bottom framing member that looks too narrow in spots.

An out-of-plumb wall is confronted similarly. Once again, work from the proudest part of the wall, and design the paneling so that gaps at doors and windows can be covered with scribed trim pieces in the same way as using a scribed baseboard at the floor line. If the wall is leaning badly one way or the other, this will entail blocking out some of the fixing points, so plan ahead to ensure that these will remain accessible. Sometimes it's best to plumb and level the wall with graduated furring strips, scribed to the wall and/or blocked out where necessary before you begin paneling. If the wall undulates badly, say in an old house where settling has taken its toll, it may be wiser to allow a little out of plumbness in favor of a smooth, flat surface. Large humps in the wall's surface make it difficult to achieve tight joints between the framing members.

With this much covered in theory, I'd like to conclude with a concrete example of one way to panel an actual wall, dealing with the sort of peculiarities that theory never quite seems to anticipate. This wall is not imaginary, by the way, but is found in a country farmhouse built around 1840. Figure 6 shows the methods I'd use to get around each problem. More important than the individual solutions, however, is the general approach. First impose the design upon the whole wall and—only then—depart from it judiciously where needed. □

Graham Blackburn is a contributing editor to FWW, *and has written numerous books on woodworking and tools. His shop is in Santa Cruz, Calif.*

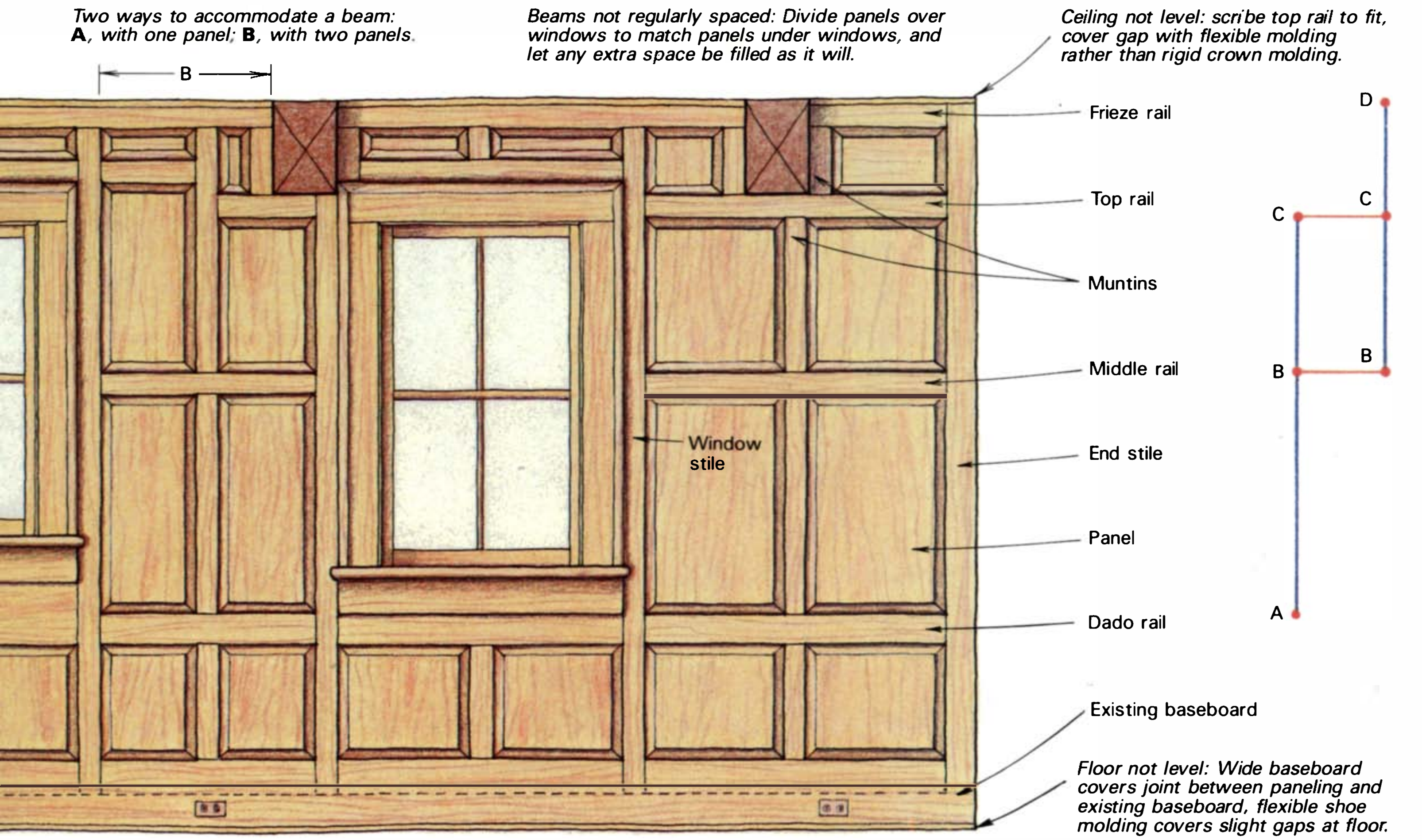
Further reading

Colonial Architecture of Cape Cod, Nantucket & Martha's Vineyard by Alfred Easton Poor. Dover Publications, Inc., 31 East 2nd St., Mineola, N.Y. 11501, 1970.

Early Domestic Architecture of Connecticut by J. Frederick Kelly. Dover Publications, Inc., 31 East 2nd St., Mineola, N.Y. 11501, 1963.

Period Details by Martin and Judith Miller. Crown Publishers, Inc., 34 Engelhard Ave., Avenel, N.J. 07001, 1987.

For general background on classical proportions: *FWW On Making Period Furniture.* The Taunton Press, Box 355, Newtown, Conn. 06470, 1985.



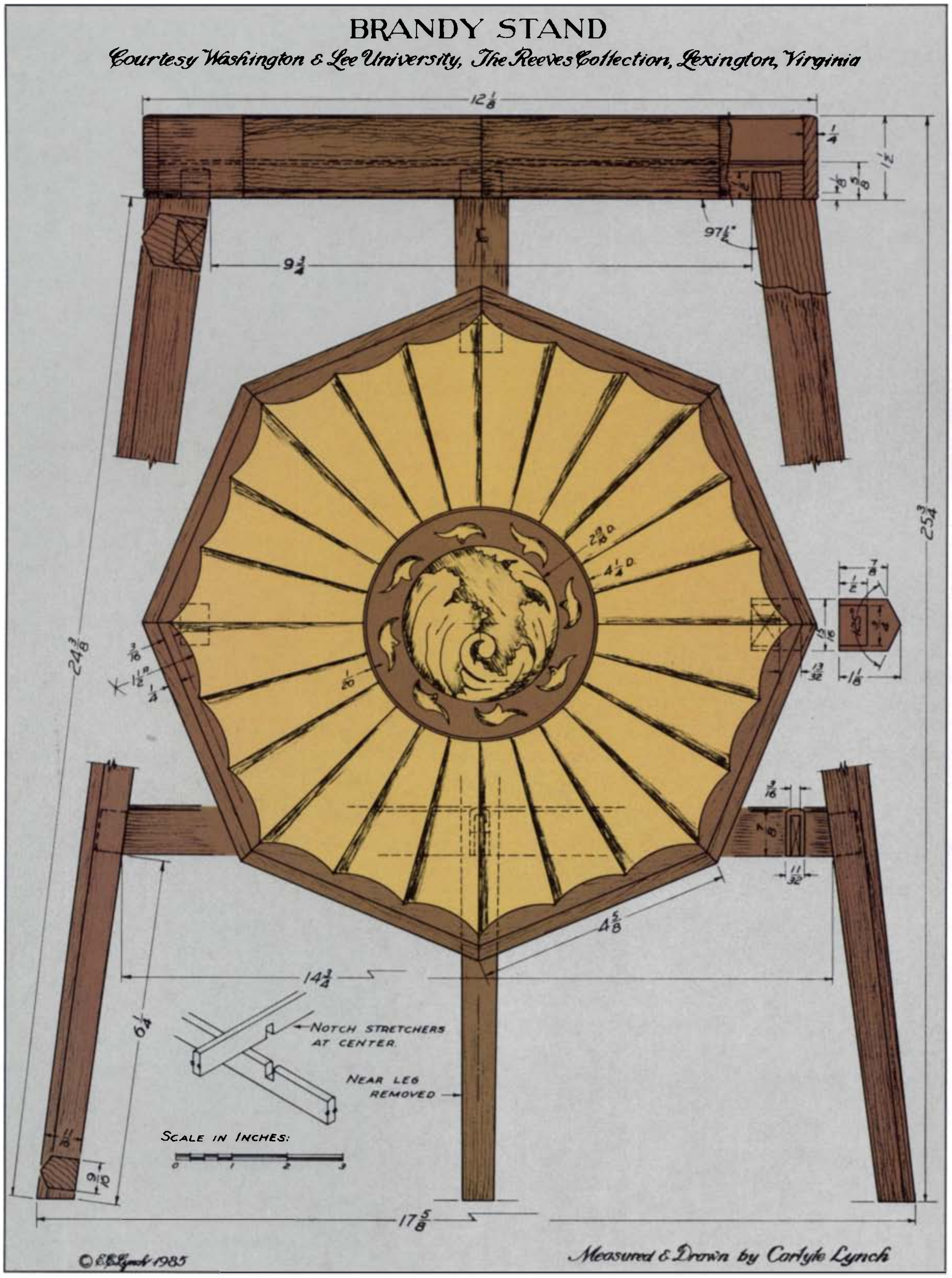


Photo below: Roy Early; other photos: Carlyle Lynch

Lynch's delicate brandy stand, above, is a reproduction of an original pair, probably used as urn stands, from The Reeves Collection at Washington and Lee University.

Brandy Stand

A lightweight table with a marquetry top

by Carlyle Lynch

The cherry block is grooved and excavated, left, for the inlay. With the block attached to a faceplate, above, a shoulder is cut on the face to the final diameter of the pattern before a thin disc is cut off. The text below describes a safe tablesaw method, in which the block is left square, not turned round.

Some years ago, Washington and Lee University in Lexington, Va., was given a collection of antique Chinese export porcelain of such beauty and value that a museum was built to display it. This bequest included several pieces of furniture, among them a pair of small mahogany stands with marquetry tops. The exact age of the stands has not been determined, but similar ones, identified as urn stands, appear in George Hepplewhite's 1794 classic, *The Cabinet-Maker & Upholsterer's Guide*.

I was eager to tackle a marquetry project, and the curator at the university museum graciously gave me permission to measure the original stands and make the drawing you see on the facing page. Since the stand is a good height to place by an easy chair to rest one's late-afternoon pick-me-up upon, I think it's appropriate to call it a "brandy stand." The maple, mahogany and greenish-color wood (possibly yellow-poplar heartwood) marquetry on the originals is handsome, but you may prefer to create your own design or substitute other woods. Use your imagination to make a pair of these old and unusual stands, given a new name to suit a new use.

Construction notes—Begin with the stand's top, which consists of a substrate covered by the marquetry design. Since solid wood could shrink and swell, damaging the marquetry, I used dimensionally stable ¾-in. birch plywood with the good side facing down, where it will show. Start by cutting out an octagon from a 10¾-in. square of the plywood. Use a fine-tooth handsaw and cut close to your lines. Now, draw a 4⁹⁄₃₂-in.-dia. circle on the center of the top's top and carry all of the octagon's diagonals through it. These lines will be helpful in aligning the marquetry pieces later. You also need to decide if the mortises for the legs on the underside of the top will be straight or angled. Mark and chop out these mortises before you begin to veneer.

I can't tell how thick the veneer is on the original stands, but it's probably thicker than the commercial veneer available today. I cut all my own ³⁄₃₂-in.-thick veneer on a tablesaw with a fine-tooth plywood blade projecting through a close-fitting throat plate. You'll need to resaw enough stock (I used maple) to get four 3½-in. squares for the pattern in the center disc, as well as the 24 fan leaves and eight small arabesque figures that surround the center design. Also cut eight (or more, for mistakes) 4½-in.-long strips of cherry veneer for the scalloped border. Make them ½ in. wide to allow for trimming after they're glued in place.

The decorative marquetry that forms the center of the disc on my stand is made from the four maple veneer squares with the grain running in different directions and with some of the edges hot-sand-scorched to give the design a three-dimensional quality. To cut the central design, use the patch-pad marquetry method (see *FWW on Marquetry and Veneer*, pp. 32—33). Draw a 2¹³⁄₁₆-in. circle on one square and trace the pattern on it. Now, stack the four squares so their grain runs in different directions like a pinwheel, and use a fine-bladed fret or jewelers' saw to cut through all four layers at once. Hold the blade perfectly vertical throughout. Split the line when sawing the curvaceous center portion, but saw to the outside of the line marking the circle. Cut out the rest of the maple and cherry marquetry pieces, and lay them aside for the time being.

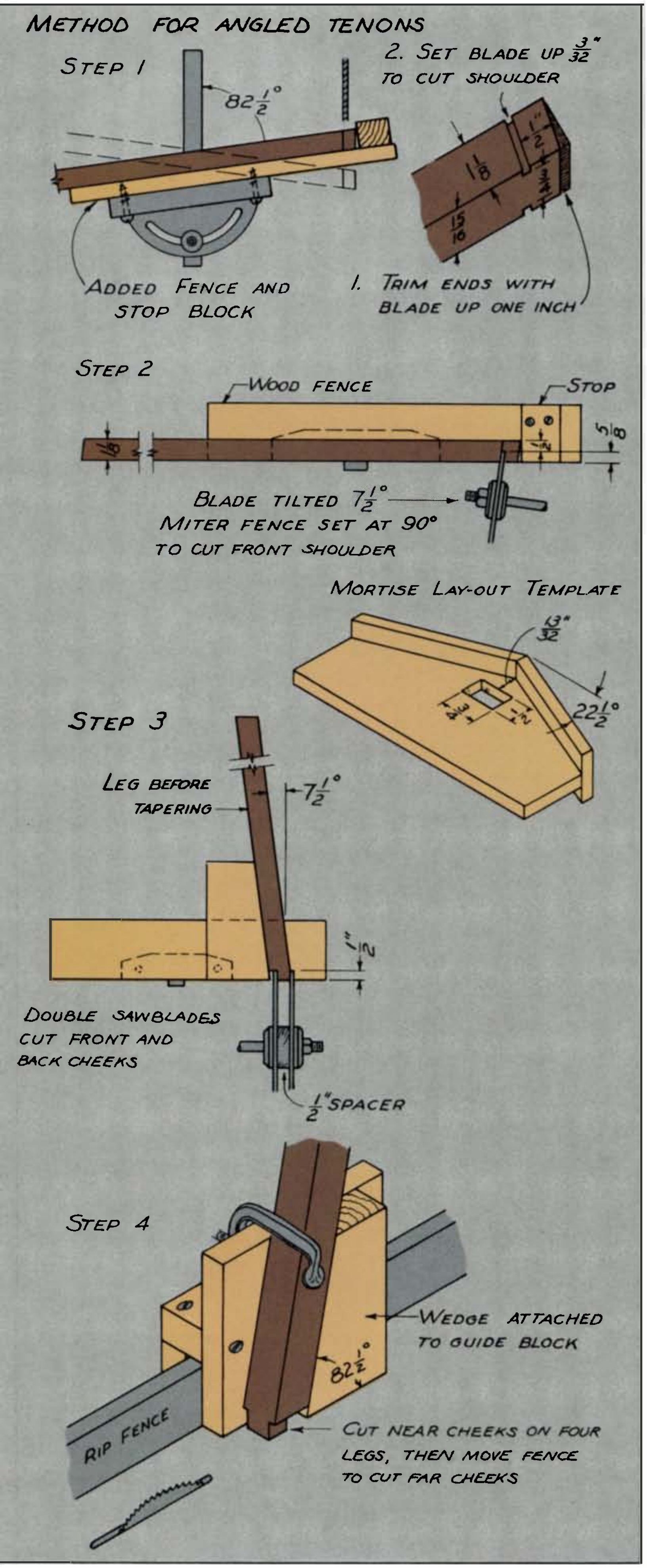
For the background of the center scene and the arabesque border, bandsaw a 5-in. square of 4/4 stock (cherry is a closed-grain wood that cuts clean for inlays). Use short screws to fasten the block to a faceplate and mount it on the lathe. Face the piece flat and smooth, and cut a ³⁄₃₂-in.-deep by 2¹³⁄₁₆-in.-dia. recess in it for the center design (see photo, above left). Next, use a narrow chisel (I ground one to size from a file tang) to cut a 4¼-in.-dia. groove ¹⁄₁₆ in. deep by ¹⁄₂₀ in. wide for a line of holly inlay (available from Dover Inlay, 234 E. 2nd St., P.O. Box 134, Mineola, N.Y. 11501). After removing the faceplate from the lathe, mark the position of the block on it (so it can be remounted in the same position later) and unscrew the block.

Now, arrange the small arabesque pieces in place and draw around each piece with a needle-sharp pencil. Use a carving gouge and a ⅛-in. chisel to excavate a recess ³⁄₃₂ in. deep for each arabesque. Then, loosely assemble the four parts of the center design and trim their outer edges to fit into the recess that was cut on the lathe.

In a saucepan on a hot plate, heat a couple of cups of clean white sand (sandbox sand from a building-supply store is fine) and use it to scorch some of the edges of the marquetry pieces, shown on the drawing as shading. This may distort some of the delicate center pieces but, when cool, most of the distortion will disappear as the pieces regain their lost moisture.

When all of the inlays have been fitted, spread yellow glue in the recesses and press the marquetry pieces in place. Press one end of a 14-in. strip of the narrow holly inlay into the circular groove cut earlier with the file tang. Use the face of a hammer to

Drawings: Carlyle Lynch



press the holly into the groove. Work your way around the circumference, and trim the strip to length with a sharp knife.

Now, place a scrap of wood over the freshly glued veneer and clamp the surface evenly. Before the glue dries, remove the clamps, wipe off excess glue and reclamp the piece with wax paper positioned between the marquetry and the clamping block.

Once the glue is dry, reattach the block in its original position on the faceplate and mount it on the lathe. With a parting tool, cut a ¼-in.-deep shoulder 1⁄16 in. outside the holly inlay, and turn the ***top third*** of the block's thickness to 4½ in. in diameter—to avoid ripping out the holly. (Note: This method leaves two-thirds of the block square, and makes the next step—sawing off the inlaid disc—safer and easier than working with a block that has been turned in its entirety, as shown in the top right photo on p. 83.) Now, cut a 3⁄32-in.-thick wafer from the face of the block by passing it through a tablesaw set to cut the disc off on the left side of a fine-tooth blade. Make the cut in four passes, rotating the block 90° each time.

After gluing the marquetry disc to the center of the plywood top, you're ready to trim the edges of the fan leaves to fit the center disc on one end and the scalloped border pattern on the other. To aid this part of the fitting job and make smooth, accurate concave curves, I made two sanding drums from cylinders turned on the lathe: one with a 2¼-in. radius for the center curves, another with a 1½-in. radius for the border curves.

Next, fit each of the eight sets of three fan leaves in the spaces between the diagonal lines drawn earlier. Be sure to number the leaves in order to avoid a mix-up. When the leaves are all trimmed and fitted, lightly scorch their clockwise edges (see shaded areas of drawing on p. 82) with hot sand. Take care not to overdo the scorching—any charring will result in unwanted ridges when the top is leveled. After gluing the leaves and scalloped border in place, trim the edges of the overhanging border strips with a small handplane, and use a hand scraper to level the marquetry.

The eight pieces that form the top's raised rim are cut from a single 40-in. length of stock that has a small bead along its bottom edge (cut with a scratch stock) and a rounded-over top edge. Miter the ends of each piece to 22½° and fit, glue (no nails) and band-clamp them to the plywood top, as well as to each other.

Once the top is completed, construct and assemble the legs and stretchers. Since the legs on my stand are splayed, they join the top at an angle, presenting the dilemma of cutting angled mortises and straight tenons, or vice versa. It's easy enough to cut angled mortises by hand, but I chose to cut angled tenons instead, using the tablesaw jigs shown at left. In either case, the methods illustrated are handy for cutting the angled shoulders.

Before tapering the legs, lay out and cut the mortises for the stretchers and the tenons on the ends of the legs. To lay out the legs, measure from the back side—the one side that will remain untapered. I tapered the legs neatly on the tablesaw using a notched-board tapering jig. Then, I drew a centerline down each leg's front side and planed two 125° chamfers, checking my work with a T-bevel. Although tedious, this made nice-looking legs.

The tenons on the stretchers are cut in the same manner as the ones on the legs, only thinner. Join them with a 90° lap joint where they meet in the center before rounding their top edges.

You can finish the stands any way you like, but the tops should certainly have an alcohol-proof finish—after all, somebody might accidentally knock over a snifter of Courvoisier. □

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

This tiny plane leaves scale-size tool marks on Robertson's miniatures, and is the handiest tool in his shop for truing edges.

William Robertson

Glimpses into a miniaturist's world

by Jim Cummins

One of Bill Robertson's dreams—if he ever catches up on orders—is to build an 18th-century tool chest. You may have seen the kind he means—a box resplendent with colorful inlay and intricate compartments. Robertson's dream is to build the chest itself, and then fill it with shopmade replicas of 18th-century hand tools—plow planes, measuring and marking tools, chisels, gouges and bowsaws, all as elegant as the originals. His plan is to use these tools and nothing more to build a piece of Philadelphia high-style furniture from scratch—straight from the log. To get enough lumber, Robertson will need a log at least a foot long and as thick around as his arm.

The world of miniatures may be far from what most of us think of as woodworking. The woods must have super-tight grain and can be as daunting to work as brass. Indeed, most of the measuring and cutting techniques derive from metalworking—a discipline Robertson mastered before he turned to miniatures.

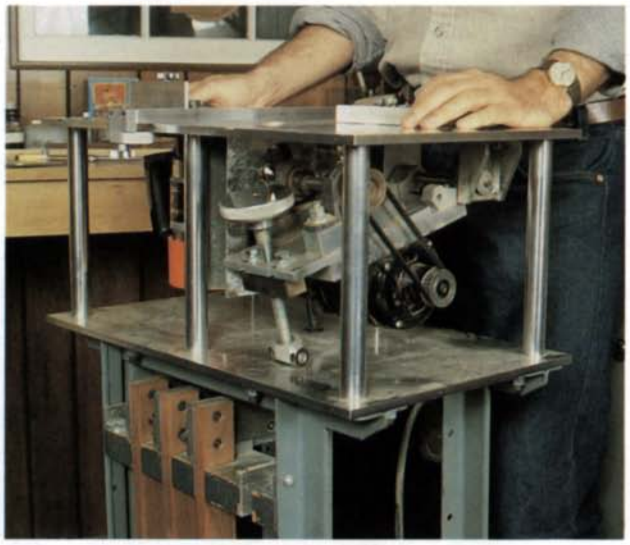
Robertson has been written up in several magazine articles, the authors of which invariably point out that *the boy flunked shop!* In truth, Robertson was outstanding in shop from seventh grade on. By twelfth grade, he was an accomplished machinist, but he'd had his fill of goof-off fellow students and apathetic teachers, so he cut class 23 times. If that's flunking shop, I'm a monkey.

Robertson's next few years were spent in a patchwork career with but one unifying characteristic: he was good at whatever he tried. His mother, Esther, was the catalyst that hooked her son on miniatures. She'd been interested in miniatures for some time and wanted to make a dollhouse for her granddaughters. Bill was reluctantly lured into helping. In an effort to discourage his mother from proceeding, Robertson hand-cut hundreds of cherry flooring strips, drilling them with 1,500 holes for her to hand-peg. The ploy failed miserably: Descending the stair one morning, Bill found a slipper-clad, bed-robed Esther hard at work, pegging to her heart's content.

Shortly thereafter, Robertson was walking through a miniatures show seeking a gift for his mother when, suddenly, he realized that he could do all the work he saw—better, in fact. His flash of insight proved correct: Before long, he had orders for eight 18th-century

Left: Robertson's miniature reproductions include an 18th-century Norfolk ladies' writing desk with working drawers; an 18th-century Elnathan Taber clock made of cherry and briarwood with working locks and solid-gold keys; a slipper chair upholstered with 60-mesh Bargello needlepoint; and a piecrust table copied from a Nathan Singer original. All pieces are fully joined as appropriate—even the minuscule candle screen has dovetailed leg joints. Under the desk is a working 77-piece mousetrap crafted from nine woods plus brass. Below: Robertson's handmade and rebuilt tools include router bits for period moldings (left); a combination tablesaw/router table (center); and (right) a 30,000 RPM drill press.

Photo: Bill Robertson



Norfolk ladies' writing desks like the one shown in the top photo, above. He kept one desk for his own collection—a practice he continues today, even on commissions.

His initial miniature venture turned out so well that Robertson cleared out the basement and set up shop. Ten years later, the shop has grown in capability, if not in size. The machines stand shoulder-to-shoulder, as if in a dealers' showroom. There's no need for room to feed long stock—there's no long stock. The lumber pile reminded me of kindling.

Robertson has little regard for modern machine-tool catalogs. "For a long time, most workmen knew how to make what they needed," he notes. "Then, gradually, production shifted to factories, and people stopped making things for themselves. First, the tools disappeared; then, the products started to disappear. You can't find the old molding shapes now, nor the tool to make them."

It seemed like a Catch-22 at first. But then Robertson met an old modelmaker, Paul Runyan, who taught him not to waste time searching for something that can't be found. Instead, he advised, "Teach yourself to make what you need."

Robertson still heeds that advice. He scours salvage dealers and flea markets for pre-World War II machinists' tools and gauges, and has rebuilt a large number of precision machines—including a lathe that can cut more than 200 threads per inch, with which he makes his own hardware and working locks (with solid-gold keys). Having taught himself heat-treating, Robertson can now make his own router bits for running moldings. Occasionally, he'll modify a standard bit, but he generally gets better results starting with a length of drill rod. He turns the drill rod to the desired profile, then grinds two lengthwise flutes and the necessary relief angle. Some of the longer bits (see photo, above left) have more than one cutting profile ground along their length. By using various parts of bits, Robertson can combine and recombine the profiles to run many different molding shapes. For instance, the 36 bits shown in the photo above can make more than 100 period molding shapes.

In small-scale work, routers often do the jobs of full-scale stationary machines, such as jointers and planers. There are two main routers in Robertson's shop. One is a small drill press that turns at 30,000 RPM. Fitted with an end-mill bit, the drill press can thickness wood down to about 0.004 in.—as thin as paper. To do so, Robertson holds the wood flat against the table, then moves it around under the rotating bit. A series of passes at successively lower heights (checked with a dial indicator) completes the job.

Robertson's other router is part of a combination tablesaw/router table he made from scrap (see middle photo, facing page). In building it, his tool-room experience enabled him to transform other people's junk into precision machinery. For example, the entire drivetrain and arbor of his tablesaw cost him $8—motor, arbor, bearings, blade-raising tilting carriage and toothed belt and pulleys included.

The tablesaw also has a 4-in.-dia. slotting blade with about ten teeth per inch and no set. When I asked why it didn't burn the wood, Robertson explained that the saw runs at 1,725 RPM—slow enough to cut smoothly without getting hot enough to burn. The tablesaw's miter fence is made of extremely stable, 1-in.-thick Plexiglas. All sliding accessories for the saw table run smoothly on nylon bearings—standard ¼-20 license plate bolts from the hardware store that are run through tapped holes in the jigs so they project a hair and contact the table. Robertson cuts the bolt heads off and saws screwdriver slots in their tops for fine adjustment.

One of Robertson's greatest strengths is his cosmopolitanism. He's interested in everything—particularly anything pertaining to miniatures. His knowledge of the field is expansive. There are all sorts of miniaturists—shipbuilders, dollhouse builders, railroaders, wildlife carvers. Makers tend to pick a category, stick with it and ignore what the rest of the world is up to. As an example, Robertson says, "It's a big thing right now to try to weather and age buildings. Well, model railroaders have been doing that for years; they've got most of the tricks worked out already."

Recently, the National Geographic Society chose Robertson to curate a comprehensive miniatures show, which will run this year from mid-October through January 1 in Explorers Hall at the Society's National Headquarters in Washington, D.C. The show is a follow-up to one Robertson curated two years ago—a ten-week event attended by 64,000 people. Robertson thinks he's mounted the best miniature show ever. In accepting work, he looked for outstanding design and/or daring execution. "One exhibit is the interior of a car on the Orient Express," he says. "It has 85 light bulbs, and when I see how they glisten off the polished varnish and reflect in the windows—wow, that's *neat!*"

The show coincides with the completion of Robertson's most ambitious project to date—a scale-model American Georgian house with 13 main rooms, not counting attic, basement, back stairwell and all the other nooks and crannies found in ambitious houses. As usual, Robertson is making a duplicate for himself—prompting him to name the dwellings Twin Manors. The rooms will be graced by the best work of other miniature artisans, as well as Robertson's own. The chairs, tables and cabinets will be accompanied by accoutrements of 18th-century gracious living: hand-painted ceramics, embossed silver, paintings in oil—even Oriental carpets handwoven from pure silk. (At a miniatures show I visited last summer, I discovered that, on the average, each of these items costs almost exactly the same as its full-scale counterpart. An upholstered sofa for $1,500 sounds about right.)

Robertson says that Twin Manors is a high-tech project. He built the structure around a metal frame—both for stability and so the walls can be slid away for viewing. The electrical system is state-of-the-art, and many parts are made from modern casting resins that allow the maker to produce one perfect wooden pattern, then cast the others from it. The finished house, however, will display no high-tech evidence to break the illusion, and Robertson hopes to work on evolving every aspect of the house in years to come—with Esther Robertson's help, of course.

The roof, for example, will proceed in a scene reminiscent of the Robertsons' first flooring job—he'll cut the shingles and begin the pattern on the roof, then Esther will step in and finish the job, freeing her son for more complex tasks. Esther doesn't aspire to perfecting the art of miniature carpentry, but she *is* a maker of exquisite needlepoint. The mother-son team once collaborated on a Philadelphia tilt-top gaming table with a stainless steel plate sandwiched in its top to prevent warping. The table's needlepoint insert was a miniature masterpiece containing 33,000 stitches. When it came time for her son to glue the needlepoint down—a delicate, one-chance deal—Esther Robertson was so nervous she had to leave the house.

Robertson's most ambitious project to date is a pair of American Georgian houses, entitled Twin Manors. One of the houses was commissioned by The Toy and Miniature Museum of Kansas City (Mo.); the other will remain in Robertson's collection.

Esther Robertson is a serious collector. While I was there, she was having doubts about whether a recently acquired lace scarf was of the correct time frame for a room she was composing. One member of her collecting circle is an expert on such matters, and the circle was to meet that evening at the Robertson home. As the time approached, I could feel the tension mounting. But there was to be no answer for me until the next day—on meeting nights, Esther throws the men out. Bill, his father and I wandered over to a nearby hamburger shop, their standard refuge on such occasions, and we all gladly abandoned talk of miniatures for a while.

The next morning, I returned to hear the verdict on the scarf. As feared, the lace pattern was *not* known in America at the time depicted in the model room—it was about ten years off. Esther Robertson was clearly disappointed. She added that the expert had given her one possible "out": The scarf might have been brought to this country by a relative visiting from Scotland, where the pattern was coming into vogue. Mrs. Robertson didn't think this option was quite honest. "What would *you* do?" she asked. I told her I'd buy the relative story and go with the scarf.

Thinking back on it now, I realize that all three Robertsons are made of pretty solid stuff, and that the miniature world I'd peeked into doesn't leave much space for compromise. I'll bet the scarf doesn't end up in the room. Esther's instincts were right all along. I'm as sure of that as I am that, someday, Bill Robertson will build himself a tool chest, fill it and make some furniture by hand. And, like the best of the other woodworkers I've run into over the years, he'll love every minute of it. □

Jim Cummins is an associate editor at Fine Woodworking.

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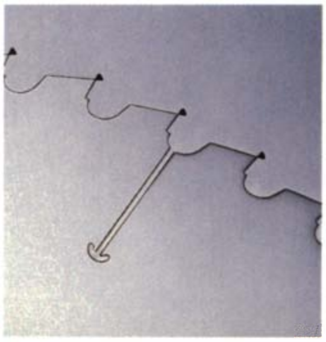

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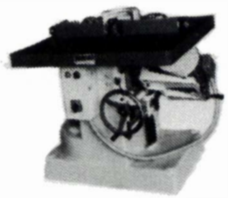

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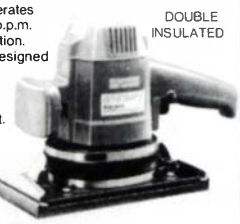

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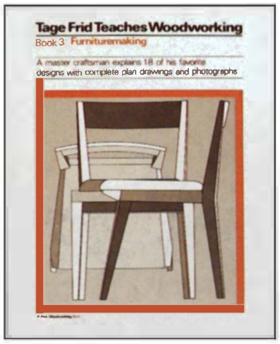
from the publishers of *Fine Woodworking*

Furnituremaking



Tage Frid Teaches Woodworking Book 3: Furnituremaking
Master craftsman Tage Frid offers photographs, step-by-step instructions and complete working drawings for 18 of his most distinctive pieces. There's his well-known workbench, three-legged stool and more. In each case Frid explains how he designed the piece, outlines the steps involved in making it and describes in detail the steps that are most difficult or interesting. Includes a photo gallery.
Hardcover, $18.95
#43

Building a Houseful of Furniture
by Simon Watts
Build furniture for any room in your home. Cabinetmaker Simon Watts gives you complete plans for 43 of his favorite pieces: sturdy bed frames, handsome chests, a variety of tables, desks, bureaus, comfortable sofas, chairs and more. Some projects are perfect for beginners, others will challenge even the most experienced woodworker. Throughout the book, Watts covers the difficult spots in construction, and explains his own techniques for overcoming them.
Softcover, $19.95
#22

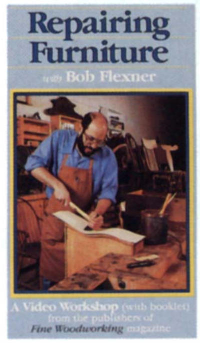
Tage Frid Teaches Woodworking Book 1: Joinery
Frid shows you step-by-step how to select and make virtually all the joints useful to cabinetmakers, and how to decide which joint is best for a given application.
Hardcover, $18.95
#09

Federal Furniture
by Michael Dunbar
Noted period woodworker Michael Dunbar shows you how to make 20 federal pieces from his home, including a card table, candlestand, and Hepplewhite and Windsor chairs. He provides measured drawings and plenty of construction tips. There are also detailed photos, drawings and instructions for reproducing an aspect of the piece that is uniquely federal.
Softcover, $18.95
#41

Tage Frid Teaches Woodworking Book 2: Shaping, Veneering, Finishing
Frid uses hundreds of photos, drawings and step-by-step instructions to teach bending, turning, veneering, carving, inlaying and finishing.
Hardcover, $18.95
#19

Frid three-book set: *$44.95*
#90

VIDEO

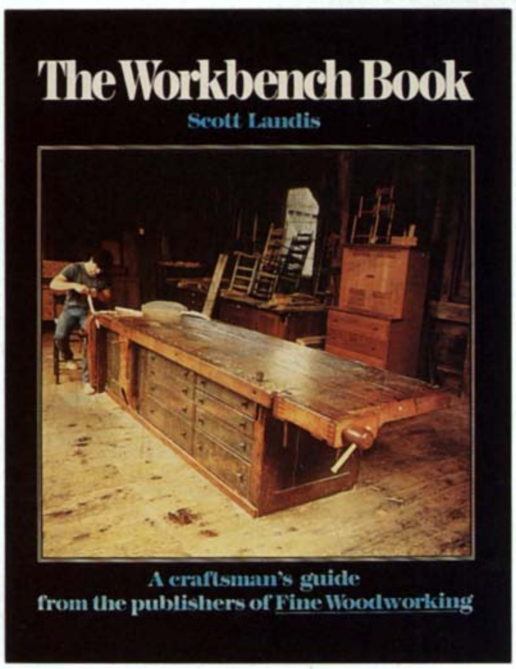


Repairing Furniture
with Bob Flexner
Here's a vast repertoire of straightforward techniques you can use to repair furniture. Expert furniture restorer Bob Flexner explains why wood joints fatigue, how to safely clamp problem pieces like round tabletops, disassemble pieces safely, choose the right glue, mend broken parts, match missing moldings and reglue or replace damaged veneer. By watching Flexner, you'll be able to repair a piece so it won't suffer the same fate again. And Flexner also shows you how to keep the orginal character of the piece intact. Best of all, you won't need an elaborate shop or extensive experience to perform your repair work. With Flexner's instruction, and the information in the accompanying booklet, those wobbly chairs and battered bureaus are as good as fixed.
70 minutes, $29.95
(Rental: $14.95)
#619 (VHS), #620 (Beta)

***Fine Woodworking* on Chairs and Beds**
Expert woodworkers show you how to design and make chairs, stools, sofas, cribs and beds in 33 articles collected from the pages of *Fine Woodworking.*
Softcover, $7.95
#45

***Fine Woodworking* on Tables and Desks**
In 32 articles from *Fine Woodworking* magazine, skilled craftsmen reveal their methods for making and designing every kind of table and desk.
Softcover, $7.95
#46

NEW BOOK



Available October 15

Explore the strengths and weaknesses of the world's great workbenches. Taunton Press editor Scott Landis calls on the insights and discoveries of skilled craftsmen as he examines benches for every kind of woodworking and every kind of shop — from a traditional Shaker bench to a mass-produced Workmate®. Landis shows you how each bench works and leads you through the tough spots in its construction. With 19 pages of measured drawings, more than 100 illustrations, 250 color and black-and-white photographs, two chapters on vises and a list of sources of supply, *The Workbench Book* is sure to become a woodworking classic.
Hardcover, color, $24.95
#61

To order from The Taunton Press, use the attached insert or call 1-800-243-7252.

Small Shop

Small Shop Tips and Techniques *VIDEO*
with Jim Cummins

Jim Cummins lets you in on the tips and tricks he's picked up in his years as associate editor of *Fine Woodworking*'s Methods of Work column. He teaches you how to use common tools and machines to achieve uncommon results. Among the things you'll learn: how to get a home-shop bandsaw to work better, how to expand the role of your drill press, how to make hand tools and machines work together, how to be precise and safe at the tablesaw and how to sharpen dull twist drills. An accompanying booklet includes notes, drawings and supply sources for easy reference.

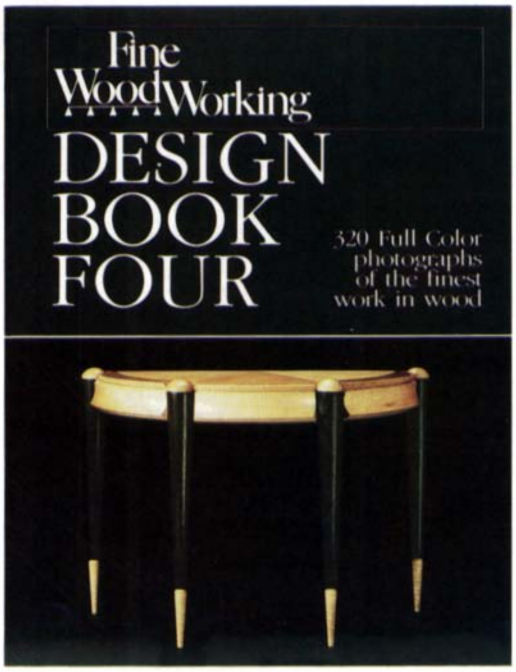
60 minutes, $29.95
(Rental: $14.95)
#625 (VHS), #626 (Beta)

Fine Woodworking on The Small Workshop

In 41 articles from *Fine Woodworking* magazine, experts share ideas on setting up shop, storing tools, clamping work, controlling dust and more.

Softcover, $7.95
#33

NEW BOOK



Available September 15

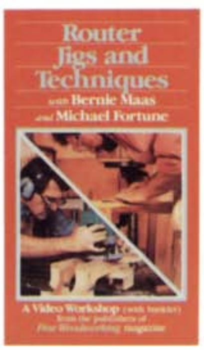
An all-new, full-color look at the best in contemporary woodworking. Selected from some 10,000 photos submitted by *Fine Woodworking* readers, the 320 objects pictured here show just how far the craft has come since we published our first *Biennial Design Book* in 1977. Woodworking like this takes your breath away, whether it's a beautifully crafted period piece or some playfully painted art furniture. There's a new sense of mastery among woodworkers, and a new fascination with color and materials other than wood. *Design Book Four* captures all the excitement with stunning photographs and essays by seven designer-craftsmen.

Softcover, color, $16.95
#65

SALE ON Earlier Design Books
Three volumes of superb woodworking at specially reduced prices. *But only while supplies last.*

#02	Biennial Design Book, *Softcover,* ~~$11.95~~ ***$10.75***
#08	Design Book Two, *Hardcover,* ~~$13.95~~ ***$12.55***
#25	Design Book Three, *Softcover,* ~~$13.95~~ ***$12.55***
#91	Set of three books ~~$39.85~~ ***$31.50***

Machines



VIDEO

Router Jigs and Techniques
with Bernie Maas and Michael Fortune

Experts Bernie Maas and Michael Fortune show you what your router can really do. Maas focuses on basic router joinery, covering spline joints, sliding dovetails and mortise-and-tenons. Fortune shows how the router can work with a series of ingenious jigs to produce the subtle shapes required to create a handsome hand mirror. Plans for the jigs and the hand mirror are in the booklet that accompanies the tape.

60 minutes, $29.95
(Rental: $14.95)
#615 (VHS), #616 (Beta)

Fine Woodworking on Making and Modifying Machines

Yes, you can make your own woodworking machines and improve your old favorites. This collection of 29 *Fine Woodworking* articles shows you how. You'll find plans for a tablesaw whose cross-cutting mechanism works better than anything you could buy, a slick long-bed jointer, a way to use a router for thicknessing stock, a boring machine for super-precise joinery, and jointer safety tips.

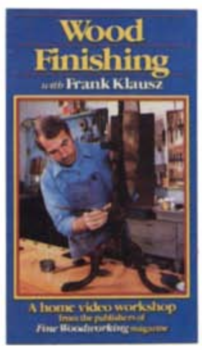
Softcover, $7.95
#47

Fine Woodworking on Woodworking Machines

What machines do you really need in your shop? How can you get the most out of your router? What's the best way to adjust a jointer or a thickness planer? How can you tell whether that old cast-iron bandsaw is worth your rescue efforts? These are just a few of the questions addressed by experienced craftsmen in these 40 articles from *Fine Woodworking*.

Softcover, $7.95
#37

Finishing



VIDEO

Wood Finishing
with Frank Klausz

Learn finishing directly from a skilled professional—in your own home, at your own pace. Drawing on his 20-plus years as a cabinetmaker, Frank Klausz shows you how to use a smoothing plane, a scraper and sandpaper to prepare an ideal surface for finishing; how to choose between oil, alcohol and water stains; and how to apply tung oil or spar varnish. Also, how to spray lacquer with professional results and French-polish your work to an exquisitely glossy finish.

110 minutes, $39.95
(Rental: $14.95)
#603 (VHS), #603 (Beta)

Adventures in Wood Finishing
by George Frank

A master wood finisher shares the secrets and stories of a lifetime in the trade. During the 1920s and 1930s, George Frank was one of Europe's most sought-after craftsmen, and he tackled an incredible range of finishing jobs for an equally incredible array of customers. To meet these challenges, he developed a vast repertoire of techniques, many of which are recounted here. You'll learn about everything from how old-timers brewed dyes from plant extracts and chemicals, to the culmination of Frank's search for the perfect wax, from a mirror finish that shines to an "antique" finish that fools the experts.

Hardcover, $10.95
#14

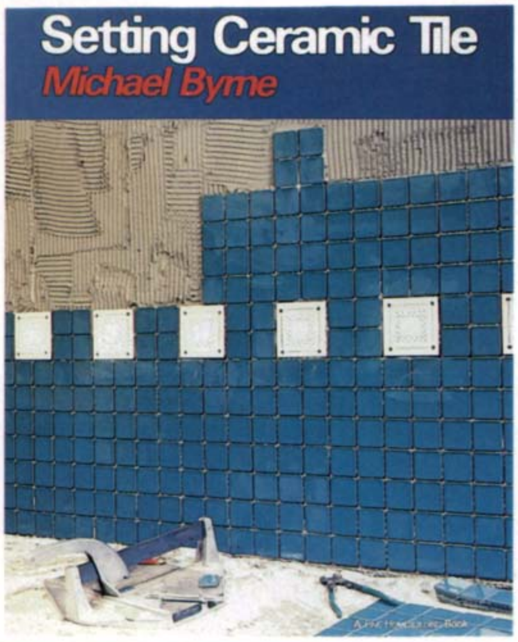
Fine Woodworking on Finishing and Refinishing

How can you control the shine of varnish or achieve a glossy black finish? Experts explain their formulas and methods in 34 articles from *Fine Woodworking*.

Softcover, $7.95
#48

To order from The Taunton Press, use the attached insert or call 1-800-243-7252.

NEW BOOK



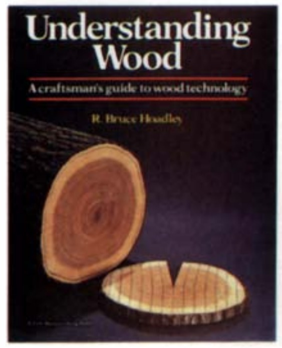
Available October 20

At last, a clear, comprehensive book on tilesetting. Master tilesetter Michael Byrne begins with the basics: the varieties of tile available, setting methods, surface preparation and layout. He then guides you step-by-step through a series of actual home installations—floors, walls and countertops—demonstrating both the popular thinset method and the traditional thick mortar-bed technique. Additional information on repairs, problem installations and sources of supply make this book an invaluable resource for novices and pros alike.

Softcover, color, $17.95
#53

Companion videos coming in December.

Wood



Understanding Wood
by R. Bruce Hoadley
A noted wood scientist and woodworker tells you why wood behaves and misbehaves as it does, and how you can work with it, instead of against it. Hoadley shows you how to cut, season, machine, join, bend, fasten and finish wood. Photographs, drawings and charts help explain how a tree's growth influences the wood's figure, and more.
Hardcover, $21.95
#11

***Fine Woodworking* on: Wood and How to Dry It**
Forty-one articles from *Fine Woodworking* tell you how to buy, dry, store and mill lumber. Also how to cope with wood's seasonal swelling and shrinking.
Softcover, $7.95
#52

Magazine Indexes

Available October 1
***Fine Woodworking* Supplementary Index**
(Issues 51-65)
This new, 12-page Index picks up where our larger index leaves off, with listings of articles, letters and photos from issues 51 through 65. There are even entries for the Methods of Work and Questions and Answers sections. Lets you quickly find the issue and page number you're looking for, and the corresponding page in the appropriate *Fine Woodworking on...* and *Techniques* books (up to *Techniques 9*). Prepared by an expert indexer and woodworker, this index features superb cross-referencing and priceless pieces of information that would elude a non-woodworking indexer.
Softcover, $1.95
#75

***Fine Woodworking* Cumulative Index**
(Issues 1-50)
Complete listing of articles, photos and columns from the first 50 issues. Covers the first six *Techniques* books and eight *Fine Woodworking on...* books.
Softcover, $3.95
#71

Complete Index Set
Both indexes at a special price.
Softcover, $4.95
#76

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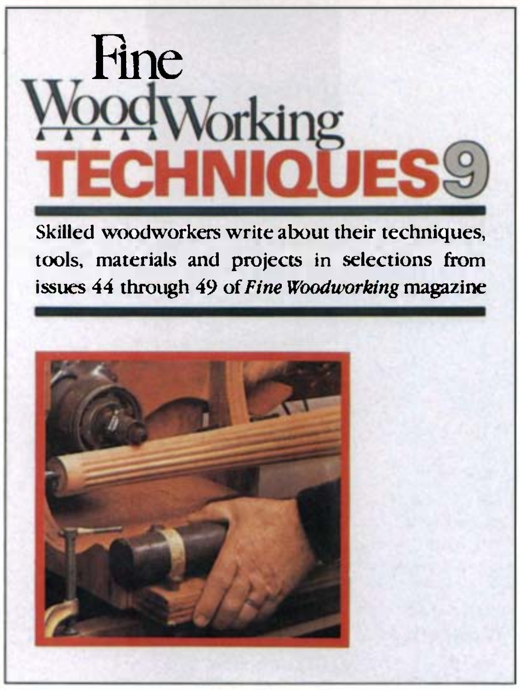


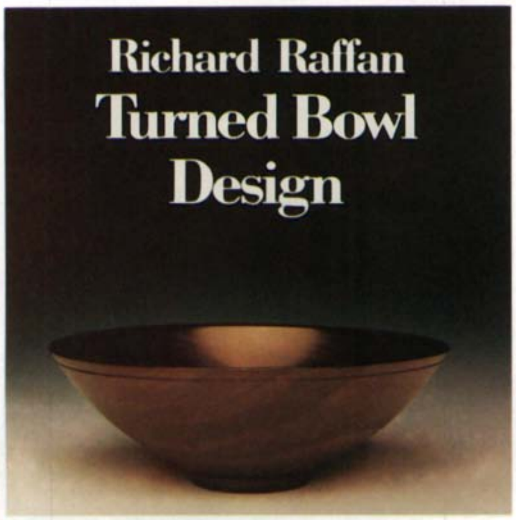
Available October 15

Full-color articles by skilled woodworkers on techniques, tools and materials. *Techniques 9* captures an exciting year's worth of articles from the 1985 issues of *Fine Woodworking* (numbers 50-55). You'll learn about Frank Klausz's classic workbench, how to turn a lidded box, what wood grain really means, how to design with veneer and how to make a Queen Anne handkerchief table. Plus, there are articles on Japanese lacquer, making marionettes and testing chisels.
Hardcover, color, $19.95
#64

Note: We've reduced the price on *Techniques 8* to match our low price on *Techniques 9*. You'll find the whole series listed on the next page.

To order from The Taunton Press, use the attached insert or call 1-800-243-7252.

NEW BOOK

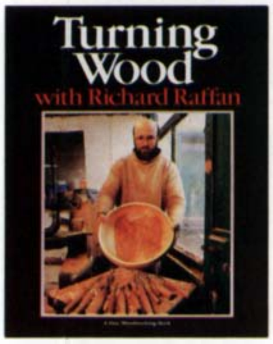


Available December 1

The first in-depth examination of bowl design from a master turner. Richard Raffan takes you beyond the skills he taught in his first book and video, and shows you how to design bowls that remain beautiful after the color and grain have faded. Raffan covers all the steps from timber selection to polished piece. You'll learn how to refine the shape, cut sides, decorate surfaces, analyze curves and more. There are templates and a full-color photo gallery of design ideas.

Softcover, color, $17.95
#63

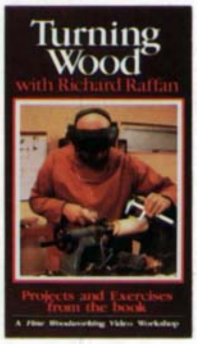
Turning



Turning Wood
with Richard Raffan
Master turner Richard Raffan gives an extensive introduction to turning. The heart of the book is his chapters on centerwork and facework turning, but you'll also learn about setting up your work area, lathe, tools, stock, abrasives and finishes. Raffan gives exercises and projects to help you develop the skills you learn. You'll be able to angle a tool to get the cut and surface you want, position your body to affect the outcome of the finished piece and more. Photos and drawings highlight every detail and a 16-page gallery of Raffan's work shows you how far you can take your skills.
Softcover, $17.95
#39

Fine Woodworking on Spindle Turning
Explore the variety of things that can be turned between centers. Thirty-nine articles from *Fine Woodworking* cover the turner's gouge, the skew chisel, more.
Softcover, $7.95
#57

VIDEO

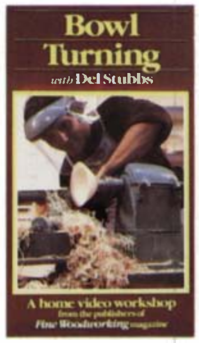


Turning Wood
with Richard Raffan
Produced and directed to capture the book's dynamic details, this tape lets you experience the sights and sounds of woodturning from a variety of useful perspectives: up close, over Raffan's shoulder and from a distance. Raffan demonstrates his tool-sharpening techniques and a series of gouge and skew exercises. He then takes you through six complete projects: a tool handle, light-pull knob, scoop, box, bowl and breadboard. Page references on the screen refer you to the book.
117 minutes, $39.95
(Rental: $14.95)
#611 (VHS), #612 (Beta)

The Raffan Set
(book and video), $49.95,
#99

We ship books and videos via UPS, so you can expect them a week to ten days after we receive your order.

VIDEO



Bowl Turning
with Del Stubbs
Noted turner Del Stubbs shows you the basics of bowl turning and then some. You'll learn the different ways to lay out and mount a bowl blank, use different gouges and flat tools to shape the outside and excavate the inside of a bowl, evaluate and sharpen your cutting tools and more. You'll even learn how to handle special challenges like turning thin-wall, bark-edge and end-grain bowls. And with the video format, you get up close to see the careful contact of edge on wood, and step back to study the effect of various tool positions, grips and stances.
120 minutes, $39.95
(Rental: $14.95)
#607 (VHS), #608 (Beta)

Fine Woodworking on Faceplate Turning
A rare look at how some of today's best turners create everything from drinking goblets to giant bowls—all from 42 *Fine Woodworking* articles
Softcover, $7.95
#58

Also of Interest

Fine Woodworking Techniques Series

Techniques 8, *issues 44-49*
Hardcover, color, $19.95
#55

Techniques 7, *issues 38-43*
Hardcover, $17.95
#42

Techniques 6, *issues 32-37*
Hardcover, $17.95
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Techniques 5, *issues 26-31*
Hardcover, $17.95
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Techniques 4, *issues 20-25*
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Hardcover, $17.95
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Techniques 1, *issues 1-7*
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Hardcover, color $24.95
#28

Fine Homebuilding
Construction Techniques 2
Hardcover, color, $24.95
#44

Building Your Own Kitchen Cabinets
by Jere Cary
Softcover, $12.95
#23

Carving

How to Carve Wood
by Richard Butz
Softcover, $13.95
#30

***Carving Techniques and Projects**
with Sam Bush and Mack Headley, Jr.
90 minutes, $29.95
#617 (VHS), #618 (Beta)

***Carve a Ball-and-Claw Foot**
with Phil Lowe
115 minutes, $39.95
#605 (VHS), #606 (Beta)

***Fine Woodworking* on Carving**
Softcover, $7.95
#50

* VIDEO
Also available for rent at $14.95

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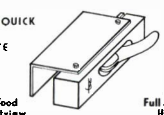

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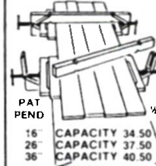

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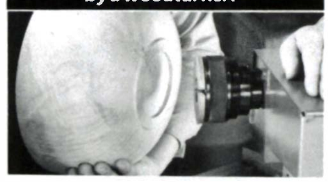

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Listings of gallery shows, major craft fairs, lectures, workshops and exhibitions are free, but restricted to happenings of direct interest to woodworkers. We'll list events (including entry deadlines for future juried shows) that are current with the months printed on the cover of the magazine, with a little overlap when space permits. We go to press two months before the issue date of the magazine and must be notified well in advance. For example, the deadline for events to be held in March or April is January 1; for July and August, it's May 1, and so on.

ARIZONA: **Show/sale**—"Working with Wood," Oct. 16–18. Centinal Hall, Mesa. Seminars, exhibit/sale of tools, machinery, hardware, wood, kits. Admission: $5. Space available. Contact J.D. Productions, 467 Saratoga Ave., Suite 110, San Jose, Calif. 95129. (408) 973-0447.

ARKANSAS: **Exhibit/Sale**—Turned wood objects, Sept. 19–27. Gallery B, The Market Place, 11121 N. Rodney Parham Rd., Little Rock, 72212. (501)221-0266.

CALIFORNIA: **Workshop**—Build a petaluma with Simon Watts, Sept. 26–Oct. 3. Contact National Maritime Museum Assoc., Bldg. 275, Brissy Field, San Francisco, 94129. (415)929-0202.
Workshop/classes—Ornamental traditional woodcarving. Contact Dave Whillock, 2800 20th St., San Francisco, 94110. (415) 550-0116.
Juried show—4th annual exhibition of contemporary crafts, Jan 24–31. Slide deadline: Oct. 19. Entry fee: $15; exhibition fee: $50-$80. For prospectus, send SASE to Baulines Craftsman's Guild, D88, Schoonmaker Point, Sausalito, 94965. (415) 331-8520.
Exhibition/sale—2nd annual Valencia Arts & Sports Festival, Sept. 13. Valencia Meadows Park, 25671 Fedala Rd. Booth fee: $30. Contact Karen Grant, 24107 N. San Fernando Rd., Newhall. (805) 259-1750.
Exhibition/demonstrations—Tri-Valley Chapter of the Calif. Carvers Guild annual woodcarving show, Sept. 12–13. The Barn, 3000 Pacific Ave., Livermore. Table fee: $6/carver, $18/vendor. Contact L. Finigan, 587 South N St., Livermore, 94550. (415) 447-3186.
Fair—8th annual Christmas Wood Fair, Dec. 5–6. Application deadline: Oct. 31. Contact Janice Slife, Ganahl Lumber, Box 31, Anaheim, 92805. (714) 772-5444.
Show/workshops—Woodworking machinery, supplies, tools; workshops and seminars, Sept. 25–27. Del Mar Fairgrounds. Contact The Woodworking Show, Marketing/Assoc. Services. (213) 477-8521.

COLORADO: **Workshop**—Greenwood chairmaking with Drew Langsner, Sept. 26–Oct. 3. Contact Peter Haney, Box 581, Fort Collins 80522. (303) 224-3324.
Juried show—3rd annual exhibition by Colorado woodworkers, Nov. 28–Jan. 10. Pioneers' Museum, Colo. Sprgs. Contact the Woodworkers Guild of Colo. Sprgs., Box 9594, Colo. Sprgs., 80932. (303) 634-4683.

CONNECTICUT: **Workshops**—Hand joinery, Frank Klauzs, Oct. 3–4; veneer inlaying, Tom Duffy, Oct. 10–11; solid woodworking, Josh Markel, Oct. 24–25; production woodworking in the small shop, Bob Green, Nov. 7–8. Contact Brookfield Craft Center, Box 122, Brookfield, 06804. (203)775-4526.
Juried show—The Doll Show, Oct. 4–24. All media. Contact Guilford Handcrafts, Box 221, Guilford, 06437.
Juried show—52nd annual show of the Society of Conn. Craftsmen, Nov. 7–Dec. 4. Newspace Gallery, Manchester Community College. Slide deadline: Sept. 11. Entry fee: $15. Contact S.C.C., Box 615, Hartford, 06142.
Juried show/sale—9th annual holiday exhibition & sale, Nov. 7–Dec. 23. Slide deadline: Sept. 15. Send SASE to Holiday Exposition, Box 589, Guilford, 06437.

DIST. OF COLUMBIA: **Lecture**—Tage Frid, Sept. 20. Smithsonian nstitute. Contact Mogul Gallery, 1905 19th St. N.W., Washington, 20009. (202) 328-8222.

FLORIDA: **Juried show/sale**—25th annual Coconut Grove Arts Festival, Feb. 13-15, 1988. Outdoor show. Slide deadline: Sept. 15. Fees: $10 jury, $200 space. Contact C.G.A.F., Box 330757, Coconut Grove, 33233.

HAWAII: **Show**—2nd annual Big Island Woodworkers Guild show, Sept. 8–30. Wailoa Center, Hilo. Contact Bob Gleason, (808) 966-8943.

ILLINOIS: **Expo**—Woodland Expo, Oct. 2–3; forestry products, equipment and machinery. DuQuoin State Fairgrounds. Contact M. Malinauskas, Southern Illinois University, Carbondale, 62901. (618) 536-7751.
Exhibition—3rd annual American Craft Exposition, Sept. 10–13. To benefit Evanston/Glenbrook hospitals. Henry Crown Sports Pavilion, Northwestern University, Evanston. Admission, $6. Contact B. Traeger, Evanston Hospital, Evanston, 60201. (312) 492-4718.
Show/sale—2nd annual Chicago International New Art Forms Exposition, Sept. 18–21. "Design for Living," opening night benefit, Sept. 17. Contact Margie Korshak Associates, Inc. (312) 751-2121.
Exhibition—17th annual Midwestern Wood Carvers Show, Nov. 7–8. Belle-Clair Expo Hall, 200 South Belt East, Belleville. Space available. Contact Don Lougeay, 1830 East D St., Belleville, 62221. (618) 233-5970.
Exhibition—"Tuning the Wood," a display of the works of Illinois luthiers. University Museum, Carbondale, Sept. 28–Nov. 8. Contact T. Suhre, Illinois State Museum, Springfield, 62706. (217) 782-7386.

INDIANA: **Juried show**—Madison Chautauqua of the Arts, Sept. 26–27. Contact M.C.A., 1119 W. Main St., Madison, 47250.
Show/demonstrations—"Working with Wood," Oct. 23–25. Indiana State Fairgrounds, Indianapolis. Tools, machinery, hardware, wood, kits. Admission: $5. Space available. Contact J.D. Productions, 467 Saratoga Ave., Suite 110, San Jose, Calif. 95129. (408) 973-0447.

KENTUCKY: **Symposium**—American Assoc. of Woodturners, Oct. 1–3. Lexington Center, Lexington. Demos, lectures, woodturners' trade show. Contact A.A.W.T., Box 9821, San Marcos, 78667. (512) 396-8689.

MARYLAND: **Juried shows**—11th annual Maryland Crafts Festival, Maryland State Fairgrounds, Timonium, Oct. 16–18; 12th annual autumn crafts festival, Montgomery County Fairgrounds, Gaithersburg, Nov. 20–22; 10th annual winter crafts festival, Montgomery County Fairgrounds, Gaithersburg, Dec. 11–13. Send three stamps (66¢) for postage to: Sugarloaf Mtn. Works, 20251 Century Blvd., Germantown, 20874. (301) 540-0900.

MASSACHUSETTS: **Exhibition**—Shaker furniture, thru Sept. 20. Art Complex Museum, 189 Alden St., Duxbury, 02331. (617) 934-6634.
Seminar/workshop—Woodcarving, Benoi Deschenes, Oct. 10–12. Northeast Metropolitan Regional Vocational School, Wakefield. Contact Maria LaGoy, 141 West St., Leominster, 01453. (617) 537-1805.
Workshops—Woodworking, Dan Drollette, Sept. 29–Nov. 24; working in solid wood, Josh Markel, Oct. 10–11. Contact Horizons, 374 Old Montague Rd., Amherst 01002. (413) 549-4841.
Show—2nd annual fine wood furniture show, thru Sept. 30. Contemporary work. Contact Nancy Dean, Salmon Falls Artisans Showroom, Box 176, Shelburne Falls, 01370. (413) 625-9833.

MICHIGAN: **Juried show/sale**—7th annual exhibition of the Michigan Woodworkers' Guild, Oct. 21–25. Somerset Mall, 2801 W. Big Beaver, Troy. Carving, turning, cabinetmaking, millwork. Contact Pat Belanger, Box 7802, Ann Arbor, 48107. (313) 348-1993.
Show/workshops—Woodworking machinery, supplies, tools; workshops and seminars, Oct. 30–Nov. 1. Michigan Fairgrounds, Detroit. Contact The Woodworking Show, Marketing/Assoc. Services. (800) 826-8257.

MINNESOTA: **Workshop**—10th annual kiln drying short course, Sept. 14–18. University of Minn., St. Paul campus. Lectures, demos, hands-on. Contact Harlan Petersen, 202 Kaufert Lab., University of Minn., 2004 Folwell Ave., St. Paul, 55108. (612) 624-3407.
Show/workshops—Woodworking machinery, supplies, tools; workshops and seminars, Oct. 16–18. Minneapolis Auditorium. Contact The Woodworking Show, Marketing/Assoc. Services. (800) 826-8257.
Classes/Seminars—Woodcarving, woodturning, tool sharpening. The Wood Carving School, 3056 Excelsior Blvd., Minneapolis, 55416. (612) 927-7491.

MISSOURI: **Exhibition**—5th annual Midwest Woodworkers Assoc. show/sale, Nov. 7. National Guard Armory, 701 E. Ash St., Columbia. Contact Gary Straub or Danny Roberts, Box 7093, Columbia, 65201.

NEW HAMPSHIRE: **Expo**—6th annual "Woodworking World," Oct. 23–25. Big E. Seminars, demonstrations, exhibit/sale. Contact Woodworking Assoc. of North America, Box 706, Plymouth, 03264. (603) 536-3876.

NEW JERSEY: **Conference**—"Making Connections," Oct. 22–24. Montclair State College and Kean College. Demonstrations by Sam Maloof, Oct. 22, $10. Open meeting, lectures, panel discussion, Oct. 23–24, $40 (includes 2 meals). Contact N.J. State Council on the Arts, 109 W. State St., Trenton, 08625. (609) 292-6130.

NEW MEXICO: **Workshops**—Sponsored by the Albuquerque Woodworkers' Assoc. One-day seminars thru year end. Relief carving, building a table, shaping wood, router techniques. Contact A.W.A., (505) 296-5939.

NEW YORK: **Classes**—Woodworking, beginner to advanced, Maurice Fraser, Sept. 28–Jan. 15. Days or evenings, $180. Y.W.C.A. Craft Students' League, 610 Lexington Ave. at 53rd, N.Y.C. Contact (212) 755-4500.
Workshops—Small projects, Japanese hand tools. The Luthierie, 2449 West Saugerties Rd., Saugerties, 12477. (914) 246-5207.
Exhibition—Art Nouveau Bing, thru Oct. 11. Furniture, jewelry, prints and decorative objects by Siegfried Bing. Organized by the Smithsonian Institution Traveling Exhibition Service. Contact Cooper-Hewitt Museum, 2 E. 91st St., New York, 10128. (212) 860-6868.
Free demonstration—Making dovetails, Sept. 17 & Sept. 21. Contact Y.W.C.A. Craft Students' League, 610 Lexington Ave., N.Y.C. (212) 755-4500.
Juried show—1987 internationa art & craft competition, Sept. 9–28. Studio 54 Gallery, N.Y.C. Contact Metro Art, Box 286, Scarsdale, 10583. (914) 699-0969.
Juried show—Woodstock-New Paltz fall arts & crafts show, Sept. 5–7. Ulster County Fairgrounds, New Paltz. Contact Quail Hollow Events, Box 825, Woodstock, 12498. (914) 679-8087 or 246-3414.
Juried show—Crafts: National II, Sept. 9–Oct. 8. Buffalo State College. Sponsored by State University of New York. Contact Design Department, Buffalo State College, 1300 Elmwood Ave., Buffalo, 14222. (716) 878-6032.
Juried show—Arts & crafts, Sept. 19. Rye Art Ctr. Contact J. Levine, Box 582, Rye, 10580. (914) 967-0700.
Juried show—The Guild American Crafts Awards. Slide deadline: Sept. 30. Entry fee: $15. Kraus Sikes Inc., 150 W. 25th St., N.Y.C., 10001. (212) 242-3730.

NORTH CAROLINA: **Juried shows**—9th annual Indian summer art & craft show, Oct. 1–3, Asheville Mall, Asheville; 4th annual High Country art & craft show, Oct. 9–11, Mountain Hillbilly Crafts, Scaly Mtn. Send legal SASE to High Country Crafters, Inc., 29 Haywood St., Asheville, 28801. (704) 254-0072.

OHIO: **Show**—Indian Summer Festival, Sept. 18–20. All media. Washington County Fairgrounds, Marietta. Contact Tanya Wilder, (614) 373-8027.
Show/workshops—Woodworking machinery, supplies, tools, workshops and seminars, Sept. 11–13. Cincinnati Convention Ctr. Contact The Woodworking Show, Marketing/Assoc. Services. (800) 826-8257.
Juried show—Contemporary works in wood, Sept. 19–Oct. 18. Contact Southeastern Ohio Cultural Arts Ctr., Box 747, Dairy Lane, Athens, 45701. (614) 592-4981.
Juried show—Indian Summer Arts & Crafts Festival, Sept. 18–20. Washington County Fairgrounds. Contact I.S.A.C.F., Box 266, Marietta, 45750. (614) 373-8027.

OREGON: **Exhibition**—Annual show, Guild of Oregon Woodworkers, Oct. 23–25. World Forestry Center, 4033 S.W. Canyon Rd., Portland. Contact Ed Mattson, (503) 231-1643.
Annual meeting—International Wood Collectors Society, Sept. 11–14. Beachwood gathering, myrtlewood factory tour, sawmill and logging-show tour, auction, displays of members work. Contact Swede Pearson, 6957 N. Montana, Portland, 97217. (503) 289-1974.
Conference—Western region conference, Timber Framers Guild of North America, Nov. 6–8. Timberline Lodge, Mt. Hood. Contact T.F.G.N.A., Box 1046, Keene, 03431. (603) 357-1706.

PENNSYLVANIA: **Juried show**—9th annual Long's Park Art & Craft Festival, Sept. 5–7. Contact L.P.A.C.F., Box 5153, Lancaster, 17601.
Juried show—18th annual Fair in the Park, Sept. 11–13. Mellon Park, Pittsburgh. Contact Craftsmen's Guild of Pittsburgh, Box 10128, Pittsburgh, 15232.
Juried show—Contemporary crafts, Oct. 3–Nov. 1. Luckenbach Mill Gallery. Contact Historic Bethlehem Inc., 501 Main, Bethlehem, 18018. (215) 691-5300.
Juried show—Sponsored by Conestoga Valley Chapter of the PA Guild of Craftsmen, Oct. 4–25. Market House Craft Center Gallery. Send SASE to John Ground, Market House '87 Gallery, Box 552, Lancaster, 17603.
Juried show—International Turned Object Show (ITOS). Co-sponsored by the American Assn. of Woodturners, the Society of Philadelphia Woodworkers and the City of Philadelphia. Show will open in Oct. '88; international tour planned. Slide deadline: Nov. 11, 1987. Send legal SASE to American Assn. of Woodturners, ITOS Show, Box 982, San Marcos, TX 78667.
Show—"Yorkarvers" woodcarving & decoy show, Sept. 26–27. York College. Contact Etta Murray, 871 Satellite Dr., York, 17402.
Show/workshops—Woodworking machinery, supplies, tools; workshops and seminars, Oct. 23–25. Pittsburgh Convention & Expo Ctr. Contact The Woodworking Show, Marketing/Assoc. Services. (800) 826-8257.

TENNESSEE: **Juried show**—Spotlight '87, Oct. 15–Dec. 12. American Craft Council Southeast Region Assembly, Arrowmont Gallery. Contact Arrowmont School of Arts & Crafts, Box 567, Gatlinburg, 37738.
Workshop/conference—"Craft in the 80s: The Medium & The Market," American Craft Council Southeast Annual Conference, Oct. 14–17. Arrowmont School of Arts & Crafts. Varied program of seminars, demonstrations, lectures, etc. Contact Sandra Blain, ACC-SE Conference & Exhibition Coordinator, Arrowmont School, Box 567, Gatlinburg, 37738.
Show/workshops—Woodworking machinery, supplies, tools; workshops and seminars, Sept. 4–6. Nashville Convention Ctr. Contact The Woodworking Show, Marketing/Assoc. Services. (800) 826-8257.

TEXAS: **Exhibition**—Texas Woodcarvers Fair, Sept. 5–7. Coushatte Ranch, Bellville. Sponsored by the Texas Woodcarvers Guild. Contact Paula Devereaux, 22411 Greenbrook, Houston, 77073.
Annual meeting—Los Amigos Del Mesquite, Sept. 11–13. Hershey Hotel, Corpus Christi. Technical presentations, demos, woodworking trade show, exhibits. Contact

K. Rogers, Texas Forest Products Lab., Box 310, Lufkin, 75901-0310. (409) 639-8180.

VERMONT: **Juried show/sale**—2nd annual Vermont State Crafts Fair, Aug. 21–23. Killington Ski and Summer Resort. Admission: $4 adults, $3.50 senior citizens, children under 12 free. Contact Vermont State Craft Center, Mill St., Middlebury, 05753. (802) 388-3177.
Juried show/sale—5th annual crafts fair, Oct. 9–11. Kennedy Bros. Marketplace. Contact Kennedy Bros., 11 Main St., Vergennes, 05491. (802) 877-2975.

VIRGINIA: **Juried show**—7th annual Virginia crafts festival, Sept. 18–20. Prince William County Fairgrounds. For information, send three stamps (66¢) to Deann Verdier, Sugarloaf Mtn. Works, Inc., 20251 Century Blvd., Germantown, MD 20874. (301) 540-0900.
Juried show—12th annual craft show, Nov. 20–22. Richmond Convention Ctr. Contact Hand Workshop, 1812 W. Main St., Richmond, 23220. (804) 353-0094.
Juried show—13th annual woodcarving show, Nov. 28–29. Marymount University, Arlington. Contact Northern Virginia Carvers, Box 524, Oakton, 22124. (703) 790-1034.

WASHINGTON: **Seminars**—Lofting, Eric Hvalsoe, Sept. 21–25; novice boatbuilding with Simon Watts, Nov. 14–21. Contact The Center for Wooden Boats, 1010 Valley St., Seattle, 98109. (206) 382-2628.
Show—Judith Ames, Hank Hoelzer, Michael Peterson, Sept. 3–27. Northwest Gallery of Fine Wood Working, 202 First Ave. So., Seattle, 98104. (206) 625-0542.
Juried show—Contemporary furniture made in the Northwest, Oct. 1–Nov. 8. Northwest Gallery of Fine Wood Working, 202 First Ave. So., Seattle, 98104. (206) 625-0542.

WEST VIRGINIA: **Exhibition/sale**—Oglebay woodcarvers show, Aug. 29–30. Wheeling Park. Contact Elwood Burris, Peters Run, Wheeling, 26003.

CANADA: **Workshop**—Build a sailing pram with Simon Watts, Aug. 22–29. Sherbrooke Village, Nova Scotia. Fee: $270. Contact Richard Tyner, 11 Brenton St., Dartmouth, Nova Scotia, B2Y 1W2. (902) 466-3306.
Workshops—1987-88 workshop series. Mixed media, business topics. Contact Anne Fox, New Brunswick Craft School, Ecole d'Artisanat du N-B, Box C/P6000, Fredericton, New Brunswick, E3B 5H1. (506) 453-2305.
Juried show—"Explorations in Wood," Nov. 5–Dec. 6. Slide deadline: Sept. 30. Contact Maltwood Art Museum and Gallery, University of Victoria, Box 1700, Victoria, British Columbia, V8W 2Y2. (604) 595-8508.
Juried show—The Southern Alberta Woodworkers Society annual show, Sept. 10–Oct. 3. Muttart Gallery, 1211 2 St. S.W., Calgary, Alberta. (403) 266-2764.
Juried show/seminars—2nd annual Woodstock Wood Show, Oct. 2–4. Woodstock Fairgrounds. Seminars, exhibits. Contact Woodstock Wood Show, Box 1272, Woodstock, Ontario, N4S 8R2. (519) 539-7772.

ENGLAND: **Exhibition/sale**—Annual Chelsea Crafts Fair, Oct. 7–21. Chelsea Old Town Hall, King's Road, London, SW3. A major sales event for contemporary crafts. For information, send a large SASE to the Crafts Council, 12 Waterloo Place, London SW1Y 4AU, England.

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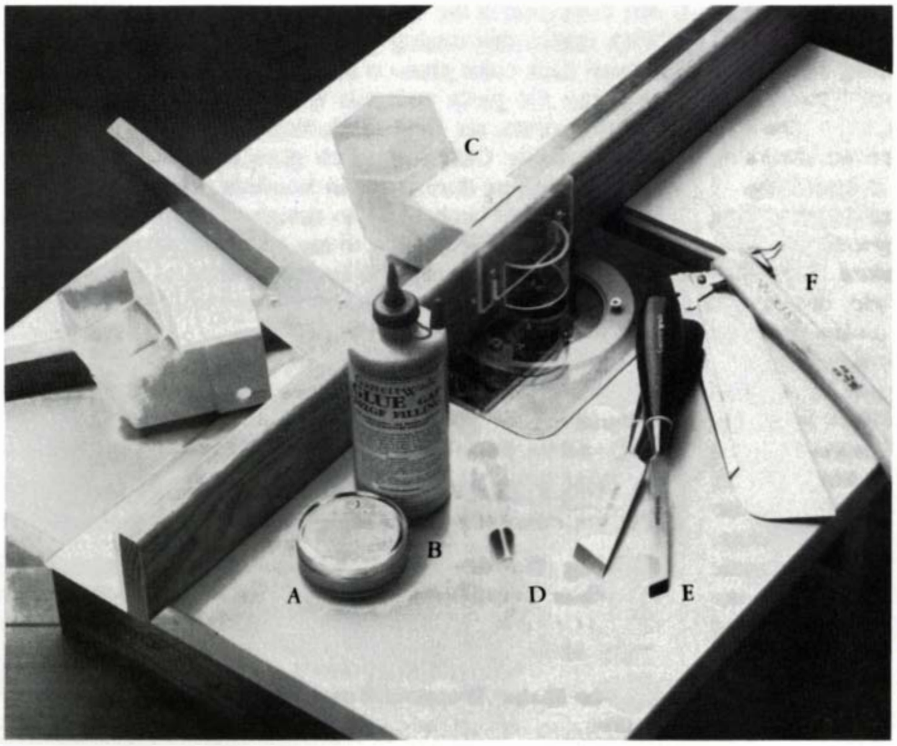

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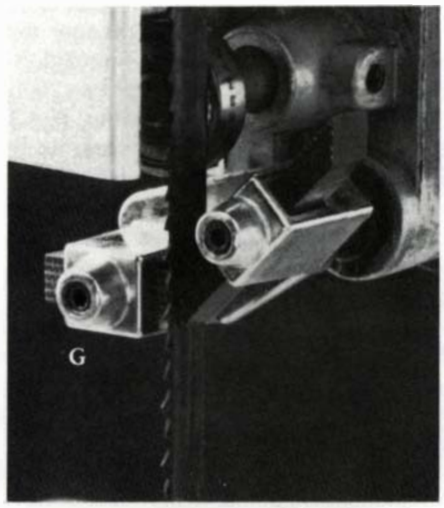

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The Encyclopedia of Furniture Making by Ernest Joyce, revised by Alan Peters. ***Sterling Publishing Co. Inc., Two Park Ave., New York, N.Y. 10016; 1987. $29.95 ($42.95 in Canada), hardcover; 520 pp.***

When I was struggling to teach myself woodworking in the early 1970s, the only resource available was the local library. Back then, there was nothing like the saturation of writing on the subject that exists today. With its collection of a dozen woodworking books, our small library was a treasure trove of knowledge. I found two books that formed the foundation of my woodworking learning: Ernest Joyce's *The Encyclopedia of Furniture Making* and John L. Feirer's *Cabinetmaking and Millwork.* These two texts, to my mind, are still landmarks in the field, despite the large number of authors who've written since in greater depth on the same subjects Joyce and Feirer covered only sketchily.

Feirer has periodically revised his book to report on progress in tools and materials, but, until recently, Joyce's book has plugged along in its original version. Frankly, it was looking tired in comparison to the other books on the market. Aware of this, Sterling two years ago hired Alan Peters, an accomplished British designer/craftsman and author of his own book, to revise Joyce.

In his introduction to the revision, Peters admits to some misgivings over tampering with Joyce, and rightfully so—the original is pretty sound stuff. Its real strength is that it's aimed not so much at readers needing step-by-step technical instruction as at those who want to augment basic skills with a reliable reference source to answer tricky questions about building furniture. Joyce was—and remains—a good place to look when you're puzzling out the finer points of carcase or drawer construction, or exploring joinery options for a leg-and-apron table. You'll have to look elsewhere for detailed hand- or power-tool how-to's.

Building upon the sound foundation of Joyce's original text, Peters' chief task was to bring a text published in 1970 into the 1980s. With some help from the editors at Sterling, he managed this by doing three things: reorganizing the chapters in a more sensible order; keying the drawings and photos more closely to the text; and adding new information on the economic and aesthetic concerns of contemporary craftsmen. In the process, Peters has wrung out some of the quasi-industrial tone that bogged down the original and replaced some of the photos of obsolete equipment with those of newer models. Two color sections—one covering wood characteristics, another showing some nice craft-made furniture—have also been added. The text, however, is still tough going in spots, but most of the technical processes are illustrated by good, clear line drawings. And, in deference to American readers, British woodworking terms have been modified, so a clamp is now a cramp/clamp; rebates are now rabbets.

I'm sure hundreds of woodworking books have been published since *The Encyclopedia of Furniture Making* first appeared, but I've yet to encounter one that's as valuable a general reference text for the serious furnituremaker. Original Joyce was good, the revision is better. I'll recommend it to my local library, and add a copy to my bookshelf. —***Paul Bertorelli***

Late 19th and Early 20th Century Decorative Arts by Frederick R. Brandt. ***Virginia Museum of Fine Arts, Richmond, Va.; distributed by the University of Washington Press, Box 50096, Seattle, Wash. 98145-5096. $50, hardbound; $24.95, paperback; 288 pp.***

Students of furniture history often have to look long and hard for good books on the subject, but if their period of interest falls after the mid-19th century, the search can be even more frustrating. Museum catalogs offer some promise but, often, these are wordy, academic tomes more concerned with historical footnoting than useful design discussion. I found *Late 19th and Early 20th Century Decorative Arts* to be a delightful exception.

This book covers all of the decorative arts, but 46 of the 100 color plates depict furniture pieces from the Lewis Decorative Arts Collection of the Virginia Museum of Fine Arts in Richmond. What makes this catalog different from others I've seen is its brevity: Each color photo is accompanied by a concise essay that describes the piece and puts its maker into historical context. Some favorites are here, including the Italian designer Carlo Bugatti, Emile Gallé—a French glass craftsman who turned to making furniture during the Art Nouveau period—and Harvey Ellis, an American architect who designed for Gustav Stickley. Yet much of the book was new to me, including furniture by French makers Hector Guimard and Louis Majorelle, as well as a number of others. This is not a master reference work but a good, readable windshield survey of the period. —***Paul Bertorelli***

Making Old-Time Folk Toys by Sharon Pierce. ***Sterling Publishing Co. Inc., Two Park Ave., New York, N.Y. 10016; 1986. $8.95, paperback; 128 pp.***

Making Folk Toys & Weather Vanes by Sharon Pierce. ***Sterling Publishing Co. Inc.; 1984. $8.95, paperback; 109pp.***

Making Wooden Toys: 12 Easy-to-Do Projects with Full-Size Templates by James T. Stasio. ***Dover Publications, Inc., 31 E. 2nd St., Mineola, N.Y. 11501; 1986. $2.95, paperback; 48 pp.***

Fun-to-Make Wooden Toys by Terry Forde. ***Sterling Publishing Co., Inc.; 1986. $9.95, paperback; 136 pp.***

Making Action Toys in Wood by Anthony and Judy Peduzzi. ***Sterling Publishing Co., Inc.; 1985. $8.95, paperback; 120 pp.***

Whenever I consider a toy-making project, four factors enter into my decision on which toy to make. First, how will a child enjoy playing with the toy? Next, what about salability—is the toy complex enough to appeal to the *adult* who will buy it? Third, does the project challenge and showcase my toy-making abilities? And, not least, does the toy conform to the fact that—like most woodworkers—I'm a lot better at woodworking than at painting.

Sharon Pierce juggles these factors divinely and comes up with toys well worth the effort for everyone—child, adult and maker. Her two books, *Making Old-Time Folk Toys* and *Making Folk Toys & Weather Vanes,* are possibly the best books for beginning toymakers I've seen. The toys are simple enough to stimulate a child's imagination and attractive enough to sell at craft fairs. Pierce provides detailed instructions on construction, and also on painting—right down to the proportions of paint to mix to obtain the correct colors. Yet while she assumes that the reader knows nothing about toy-making, the construction of the toys themselves is difficult enough to provide a good deal of pleasure. If you're looking for good advice on making toys, invest in *Making Old-Time Folk Toys,* but save money on *Making Folk Toys and Weather Vanes*—borrow it from the library.

In *Making Wooden Toys: 12 Easy-To-Do Projects,* James Stasio goes a little too far down the road to simplicity for most *FWW* readers. These toys are geared for the inexperienced hobbyist, with extremely simple construction and very few details. These are the kinds of toys kids love to play with, but their overriding simplicity (combined with other factors, such as the fact that the proportions are a little off) means most adults won't buy them.

If James Stasio goes too far down the road to simplicity, Terry Forde in *Fun-to-Make Wooden Toys* and Anthony and Judy Peduzzi in *Making Action Toys in Wood* go too far in the other direction. Don't get me wrong: both of these books are full of detailed directions, and the toys depicted would delight the heart and challenge the skills of most woodworkers. Rather, the

complexity of these toys rests in the drawing and painting skills required to pull them off. Forde's toys—and, to a much greater extent, the Peduzzis'—require advanced painting abilities. In some cases, the painting alone would consume as much as three-quarters of the total project time. Given that caveat, however, both books offer toy designs that strike an admirable balance between playability and salability. In fact, you might want to make *Fun-to-Make Wooden Toys* the second book you buy—especially if you already have good painting skills. And *Making Action Toys in Wood* is well worth an inter-library loan request, if only for the anecdotes that spice the text. Check it out—especially if you enjoy detailed painting. *—Richard Griffin*

Model Sailing Ships: Design and Construction by Robert F. Brien. *B.T. Batsford Ltd., London; distributed by David & Charles, Inc., North Pomfret, Vt. 05053; 1987. $22.95, paperback; 119 pp.*

The recent upsurge of interest in ship models has led to the publication of a number of how-to manuals on the subject. This book, a recent addition to the literature, is intended to be a brief introduction to the basic methods and techniques. It follows a logical development, from choosing a model to build, through materials selection, tools and final display. It's illustrated with photos of a variety of models—either in museums or built by the author himself—and contains many drawings.

So, at first glance, *Model Sailing Ships: Design and Construction* might seem ideal for the novice. Unfortunately, much of the information presented—whether describing ship nomenclature, history, seamanship or techniques—is either wrong or misleading. Indeed, I found errors on nearly every page. For example, tea should never be used to dye sails, as the acid content of the brew will lead to rapid deterioration of the sail material. Also, dry-transfer lettering shouldn't be used on models since it will soon crack and peel. And the idea that the faces of the rudderpost and rudder were flat up until the mid-19th century is a misstatement of historical fact. If this were true, it would be impossible to turn the rudder!

Despite the stated intention of the book to stick to simple construction techniques, there's a section describing a complicated plank-on-frame method known as "dockyard" construction, and the exposition is totally wrong. Obviously, the author lacks a basic understanding of how this kind of model is put together.

The beginner should be able to profit from a book like this, picking up knowledge on construction and absorbing historical knowledge along the way. But, as it is, the novice reader will ingest much that will need to be unlearned. The experienced ship modeler will readily spot Brien's errors and inaccuracies—but this book is intended for beginners.

It may appear that these points are finicky judgments or fine details, not worth worrying about for the first efforts in model-building. But a ship model is the result of all the knowledge, skill and craftsmanship of the builder, and the success of the model reflects the state of mind of the creator. It is just these small matters and points that make a model worthwhile.

—Lloyd McCaffery

Paul Bertorelli is editor of Fine Woodworking. *Richard Griffin is an amateur woodworker, a minister and a former Inter-Library Loan librarian who currently lives in Sumner, Neb. Lloyd McCaffery, a resident of Boulder, Colo., has been making miniature ship models for 29 of his 38 years.*

Photo: Larry Montgomery

The building of Timberline Lodge

On any clear day in Portland, Oregon, the view to the east reveals 11,000-ft. Mount Hood, a dormant volcano looming on the skyline. From Portland, the road to Mount Hood is a serpentine ribbon that winds between dense stands of Douglas fir, Ponderosa pine and hemlock. Occasional breaks in the trees open to the sculpted facets of ice and rock on the rough ridges of the mountain. There, slightly more than halfway up the mountainside between the last line of trees and the open snow fields, is a National Historic Landmark called Timberline Lodge, which celebrates its 50th birthday this September. I recently visited this year-round resort, and discovered that its spectacular alpine setting isn't the only feature that makes it unique.

Timberline Lodge is the only government-owned and sponsored building of its type in America today. Its designers wanted to create an American-Alpine style with a distinct regional identity, so they furnished the building almost entirely with indigenous materials—locally quarried stone, native species of fir and pine, hand-woven fabrics, forged iron—and craft objects characteristic of the 1930s. (The lodge still contains hundreds of the original craft pieces.)

With an architectural character regarded simply as "Cascadian"—a reference to the mountain range that includes Mount Hood—Timberline Lodge was built almost entirely by hand in the depths of the Great Depression, from 1935–1937. Timberline also represented a remarkable collaboration of individuals and agencies: It was proposed by private citizens, funded by Congress, organized and engineered under the auspices of the United States Forest Service and built by workers hired by the Works Project Administration (WPA).

Margery Hoffman Smith is credited with the consistent integrity of the handcrafted theme carried throughout the lodge's interior. Smith drew her inspiration from the Arts and Crafts Movement popular in this country around the turn of the century—a style typified by simple designs executed in unpretentious materials.

Nowhere is the Arts and Crafts leitmotif more clearly pronounced than in the lodge's furniture and interior woodwork. The lodge contains more than 13 different chair styles, numerous love seats and couches, wall seats and beds. Sturdy plank-and-panel fir cabinets, desks and bookcases reflect a design priority of function and comfort. Ornamental craft pieces include a dozen carved-animal-form newel posts, Indian and forest scene relief carvings and several large marquetry wall panels. Each piece—be it an occasional wooden coat rack or one of the chip-carved chairs in the Blue Ox Bar—stands on its own merits of simple, clean lines and appropriate materials. The fact that much of the furniture has been in daily use for almost 50 years is also a testament to rugged design and the skill of its builders.

Ray Neufer was the WPA supervisor responsible for the furniture construction and wood carvings at the lodge. Neufer was a struggling furnituremaker in the Portland area when Margery Smith recognized his talent and put him in charge of setting up a 30-man woodworking shop. I went to visit with Ray Neufer recently at his Clackamas, Ore., home—within view of Mount Hood.

Ray is now 87 years old, but he stood as straight as a plumbline when he rose to greet me. I shook his hand, rough and hard-callused from the carving he still does, and asked him about the origins of the furniture designs. "We never did have any plans for that furniture. Margery (Smith) would just come in and tell us how many tables and chairs she would need. We had to figure out for ourselves how they should be built. Our first project was the newel posts. They brought us a load of old telephone poles, and we carved them up, trying to give them the feeling of heft and strength."

I found it quite remarkable that no plans were compiled until *after* the furnishings were built and installed. Perhaps even more surprising is the fact that Ray Neufer never had the opportunity to visit the lodge site prior to the dedication ceremonies performed by President Roosevelt. Despite his unfamiliarity with the lodge, the talented craftsman conceived and built furnishings that are perfect complements to the building itself. Ray described his inspiration in simple terms: "We hadn't ever been out to the lodge, but the mountain impressed us. We were working for the mountain. That was our scale."

Throughout the lodge, the unity of architectural scale and furniture design is readily apparent. The hexagonal pattern of the main house, with its 92-ft.-high, freestanding stone chimney and fireplace, is carried over to tabletops and segmented couches. Also, the structure's impressive carved arch-and-beam construction is repeated in mirror frames and chair backs.

I was curious to find out from Neufer

Timberline Lodge was built from native timber and stone during the Great Depression. Its furnishings, such as this plank bench and desk, were inspired by turn-of-the-century Arts and Crafts designs.

why fir was the predominant choice for the furnishings, rather than traditional hardwoods. "A lot of it was used material—local buildings that had been taken down, railroad ties, things like that. I was the one who decided that we should use only fir . . . we didn't have much machinery, most everything was done by hand." Old-growth Douglas fir is prized by builders in the Pacific Northwest for its tight, straight grain and excellent handworking properties. When it's exposed to sunshine, the fir gradually turns the color of good whiskey held up to firelight.

Since Timberline Lodge opened to the public in 1938, an estimated 30 million visitors have visited the Depression-era project. With the same collaborative spirit that led to the creation of Timberline, many organizations have worked to preserve the lodge's handcrafts and numerous buildings. Timberline's curator, Linny Adamson, took me to the Blue Ox Bar to view one of the typical contributions of these dedicated volunteers. She pointed to a new fir bar chair, complete with a chip-carved back. It was such an accurate replica of the originals that I couldn't distinguish it from the others lining the room. "This was donated to us last year," she explained. "It was built by Ray Neufer when he was 85 years old."

—*Larry Montgomery, Portland, Ore.*

For information on 50th Anniversary events scheduled at Timberline Lodge, contact the lodge at (503) 272-3311.

Product review

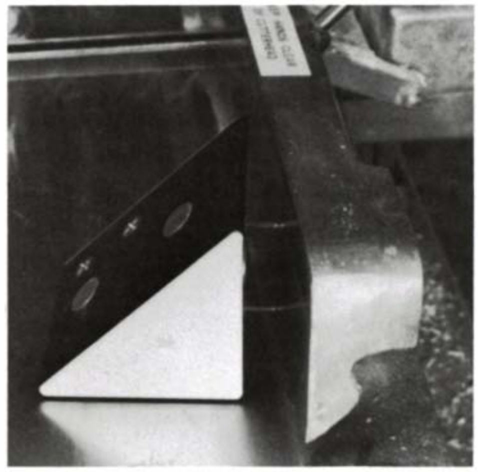
Square It electronic square, *$49.95, Zac Products Inc., 34 Renwick Street, New York, N.Y. 10013.*

If you're tired of fooling around trying to set up fences and blades to a true 90° with an out-of-whack square, there's a new device called Square It that provides a quick, simple way to check squareness or 45°. And the device never leaves you in doubt: it lights up when the setting is correct.

I've been trying out the Square It in my workshop, and despite my skepticism about electronic gadgets, it's proven to be a practical device. The Square It is perfect for jobs like squaring a blade on a tablesaw, setting the angle of the jointer fence or checking regular metal squares and bevel gauges for accuracy.

Here's how it works: The Square It has two pairs of factory-calibrated metal pins: one set to check square, the other set to check for 45°. When either set of pins comes in contact with a metal sawblade or fence, an electric circuit is completed and a bulb inside the device lights up. Zac—which claims +/− 0.0005 in. accuracy for the device—calls Square It "electronic," but that's a bit of sales hype. The device is really just a continuity tester.

Once I got the hang of keeping the light plastic triangular case flat while checking adjustments, the Square It was easy to use and consistently accurate. The tool has only one limitation (besides its fairly hefty



The Square It lights up when both metal probes touch the 90° fence.

$49.95 price tag): It works only on metal surfaces. This means you'll have to remove the belt or disc on a stationary sander before the table angle can be set, or tape a piece of foil to anything wooden you want to check.

Square It can be used on virtually any shop machine with a blade or fence that projects at least 2¾ in. from the table (a special model is available for use on smaller machines). On drill presses and shapers, a length of drill rod provides the smooth surface for the probes to contact.

Unless you want to go to the trouble of making and calibrating your own version of this device, the Square It is a neat, ready-to-use tool. It's earned a place in my shop.

—*Richard Preiss, Charlotte, N.C.*

Photo: Mats Nordstrom

This huge birch-burl chair was made by sculptor David Holzapfel, of Marlboro, Vt., to dignify an Italian grotto-style solarium at a corporate headquarters building. It weighs 300 lb. and rides on casters concealed in the base.

Wanted: Reader comments on lathes

More than any other woodworking machine, a lathe must strike a balance between two mutually exclusive requirements: for spindle work, it needs a robust tailstock riding on a good, solid bed; for faceplate work, it's often best to have no bed at all, to accommodate large bowls and such. Do any manufactured lathes manage the compromise while still being heavy enough to resist the vibration induced by an out-of-balance turning blank spinning at several hundred RPM? In a future issue, we'll explore that question in an article on how to select a lathe.

In the meantime, we'd like to hear your comments on lathes. What brand do you own? What are its strengths? Its weaknesses? Have you modified it? Would you buy the same machine again?

Send your comments to Lathe Talk, c/o *Fine Woodworking,* Box 355, Newtown, Conn. 06470. If you wish, use the postage-paid envelope bound into this issue. We'll acknowledge your submission and notify you if it will be published in the magazine.

Daphne's demise

For the last six years, the Daphne Furniture Award competition has recognized and rewarded the furniture-designing talents of industrial designers and small-shop custom woodworkers alike. And while the awards were never as glamorous or well-publicized as the Academy Awards, the Daphne contest was to hardwood furniture design what the Oscar is to the motion-picture industry.

Now, the Hardwood Institute, a division of the National Hardwood Lumber Association and creator of the Daphne, is discontinuing its sponsorship and ending the competition due to lack of support from the industry the awards were intended to promote. Daphne Director Richard Silver explains, "The awards had become too much like the industry patting itself on the back. In order to parlay the promotion into a national event, sales and merchandising needed to extend the prestige and

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uniqueness of Daphne-awarded furniture to the public. As it was, too many Daphnes just ended up in executives' desk drawers."

Though the Daphne award was aimed at promoting the furniture industry, the less conventional work of limited-production makers often received greater visibility in the press and at the Daphne gallery display at High Point, N.C. Last year, Marshall Fields—a prominent Chicago department store—bought and exhibited one of each of the limited-production winners' pieces.

The press coverage received by Daphne winners did produce some recognition for previously unknown designer/craftsmen. Former architect Po Shun Leong's career as a furniture designer took off when his winning dining chair design—the first of three Daphnes he won—was purchased for commercial production. Leong now designs furniture for five companies.

But winning the walnut Daphne trophy, designed by Wendell Castle, was in and of itself hardly a guarantee of furniture-design stardom. For instance, while Jeff Kellar and Judy LaBrasca went through long-term negotiations to contract the design of their Daphne-winning rocking chair, the only thing that came of the award was enough publicity to generate several commissions.

A unique aspect of the Daphne was the criteria employed for selecting winners. Winning pieces were chosen not only for their aesthetic merit, but for their value, based on the actual selling price of each piece. Finalists' entries in two categories—large-scale manufacture and limited production—were judged by a panel that included trade publication editors, museum curators, design school instructors and representatives of the retail field.

Thomas Moser, a limited-production furnituremaker and recipient of two consecutive Daphnes, says the award was worth winning because, "The whole contest wasn't just an academic exercise. It recognized a designer's ability to make something beautiful that's also marketable in the real world."

—Sandor Nagyszalanczy

They laughed when he showed the drill

"They laughed at me at Sears," cried the old gaffer as he stood at the bench of his home workshop, holding out a ¼-in. electric drill.

"Best little drill I ever had; bought it right after the war. I've used it to build my house and lots of the furniture that's in it. Never overheated—but it finally wore out its gears. So I took it back to Sears, and this dude held it up and said it must be at least 40 years old and laughed at me. They handed it all around and said the only place I'd find parts for it would be at the Smithsonian.

"I got around those jackanapes at the service counter and found the lady who runs parts. She's good. The nameplate and model number were long gone off that old drill, but I gave her the numbers I had found cast on the inside of the drill.

"With nothing else to go by, she used those numbers and located the series of model numbers for my drill. She let me look at the screen. 'NIS—not in stock.'" He shook his head sadly. "If Sears was going to make a drill to last 40 years, they ought to have kept parts for it that long."

I told him he sure had a fine-looking shop. On the pegboard wall behind the bench, all his screwdrivers and pliers stood at attention in an orderly manner. Tall ones down to short ones, flat-blade screwdrivers separated from Phillips-head. I said it looked like it must have cost him a fortune.

"Nope. I bought them over the years, one by one. Never borrowed nothin'. When I needed something, I went out and bought it. Then I *kept* it." He reached out and got a small pair of lineman's pliers and a stubby screwdriver with an old-fashioned wooden handle. "These were the first. Bought them right after we got married."

I commented on how good they looked, all with red-painted handles. He chuckled, "Makes them easy to find in the grass—or in somebody else's shop."

He said his son had given him a brand new variable-speed, reversible ⅜-in. drill. "But when you've used a tool as long as I used that old ¼-in. drill, it gets to be a part of you." He slipped it back into a box like a mother with a sick baby.

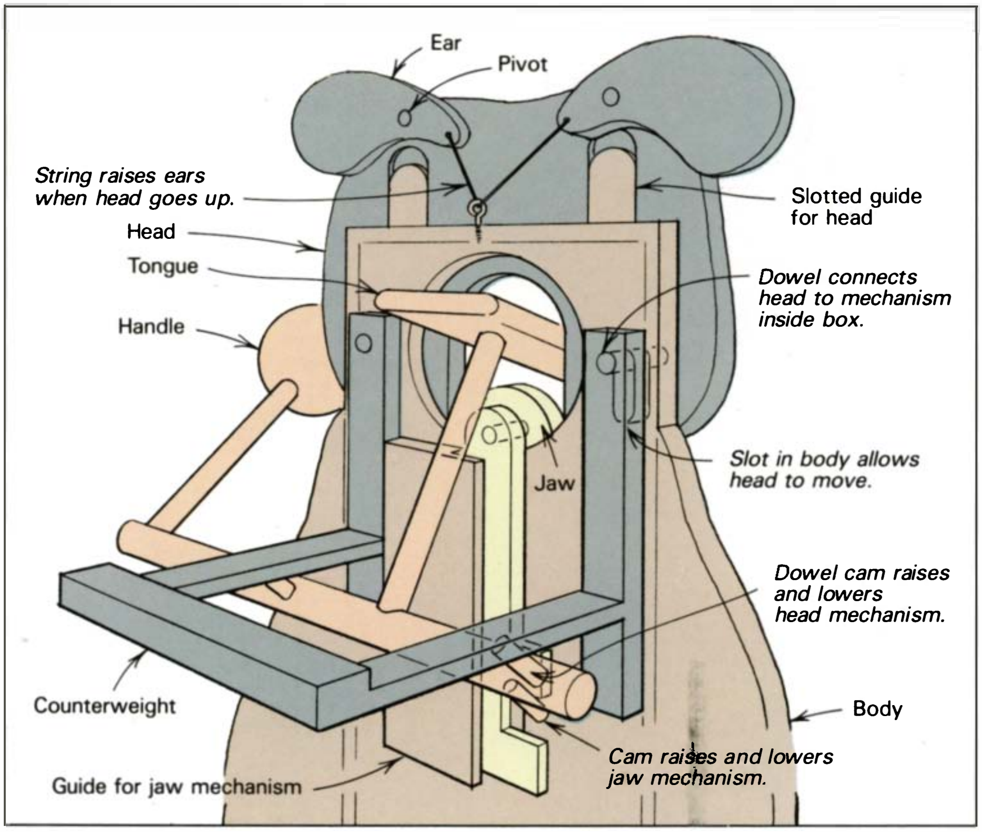
"Someday I'll find somebody with an old drill like mine. We'll swap parts 'til one of us has a good drill." ☐

—Gordon Baxter, Beaumont, Tex.

This essay first appeared in The Houston Post.

Inside the bank

This is a drawing of the workings of the bulldog bank on the back cover. The view is from behind, minus the box that surrounds it. In this view, the dog's tongue is sticking out. Push the handle back and the cam-actuated tongue and jaw retract, and the dog's ears droop.



Notes and Comment

Do you know something we don't about the woodworking scene in your area? Please take a moment to fill us in. Notes and Comment pays for stories, tidbits, commentary and reports on exhibits and events. Send manuscripts and 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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For less.

You won't find better quality carbide-tipped saw blades than the ones we make. They help your Delta saw — or just about any other saw — perform at peak efficiency. And right now, eight of our most popular carbide-tipped blades are on sale at participating Delta distributors.

**Sale prices.
And a no hassle guarantee.**

At prices like these, now you can afford to settle for *more*. Because like our saws, Delta carbide-tipped blades are designed to give you more cutting performance and service life. In fact, we're so sure you'll like them that we're offering this guarantee: if your Delta carbide-tipped saw blade doesn't perform as well as any blade you've ever used, simply return it to your Delta distributor. We'll replace it or refund your money. No questions asked.

Cat. No.	Description	Sug. Price	**Sale Price**
Combination/Planer			
35-606	9"x40 ATB&R	$82.05	**$46.75**
35-617	10"x50 ATB&R	$87.60	**$46.75**
35-657	12"x60 ATB&R*	$91.60	**$66.00**
Miter Box			
35-619	10"x60 TC&F	$105.40	**$49.50**
Sawbuck® Frame & Trim Saw			
35-593	8"x48 TC&F	$92.20	**$49.50**
Special Purpose			
35-611	10"x18 FT (Rip)	$74.60	**$43.50**
35-614	10"x48 ATB (Ply & Comp)	$98.15	**$46.75**
35-624	10"x80 TC&F (Laminates)	$137.60	**$82.50**

**1" arbor hole. Others ⅝" arbor hole.*

So hurry. The sale ends December 31, 1987. And if you miss the opportunity to get a Delta carbide-tipped saw blade at these prices — you may have to settle for something less.

For the name of your nearest Delta distributor call toll-free:
Delta International Machinery Corp., 800/438-2486 (in PA, 800/438-2487).
In Canada call 519/836-2840.

DELTA
Building On Tradition

BULLDOG BANK

As a child, toymaker David Kirk of King Ferry, N.Y., sharpened his mechanical skills by collecting and fixing toy robots. His know-how came in handy years later when—as an artist—he found his paintings too expensive to sell, so he began building toys. This bulldog bank is one of 30 Kirk designs, ranging from devil banks to jack-in-the-boxes. Made of poplar, mahogany and cherry, the clever canine waits doggedly for a deposit. Pull the lever and her mouth drops open and her tongue pops out. Simultaneously, her ears perk up while she awaits the reward of a coin in lieu of a dog biscuit. Crank the handle back and she gulps the coin down. A sketch of the mechanism for the 12-in.-tall pooch appears on p. 118.