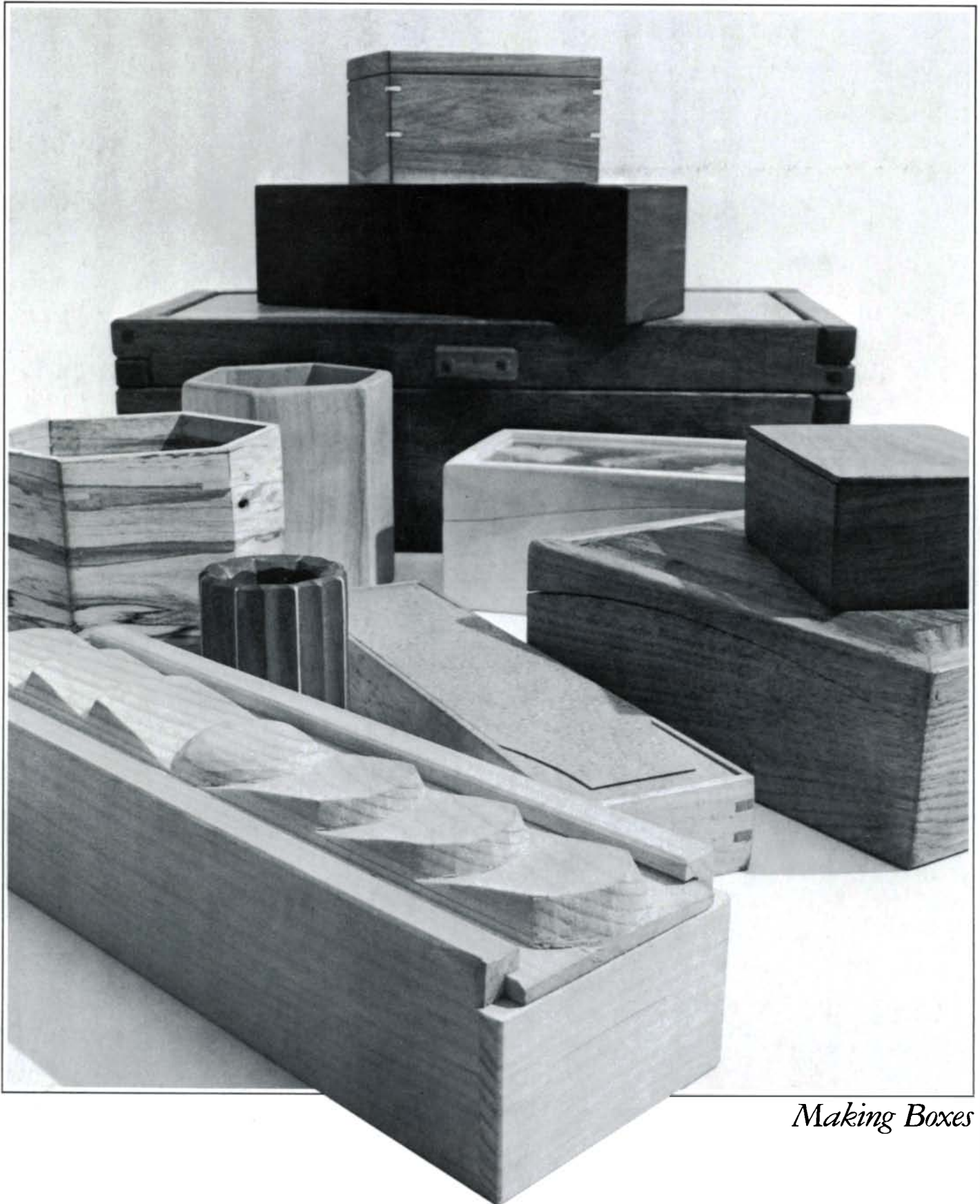


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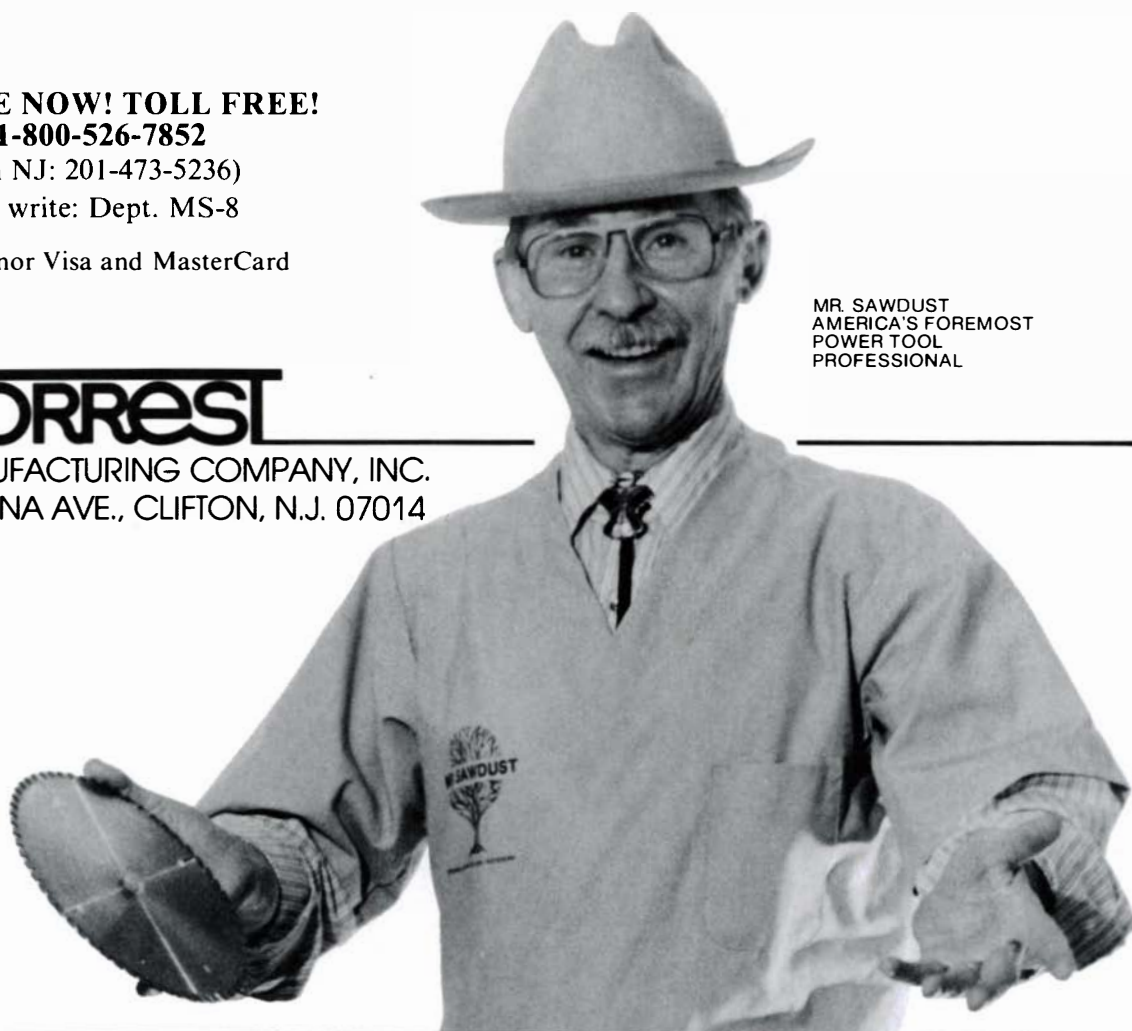
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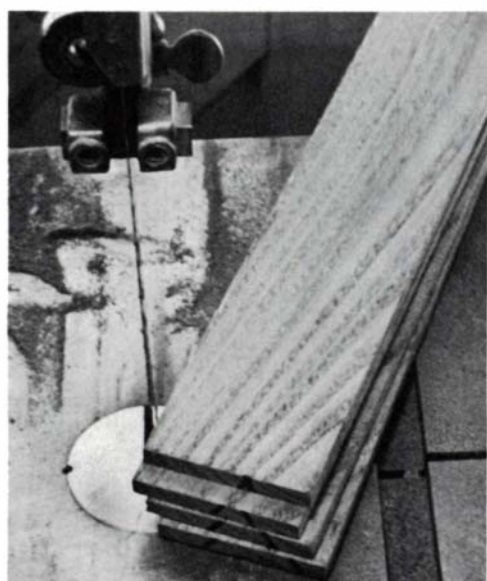
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Cover: A tableful of small-to-medium boxes, most of them quick to make on the tablesaw, with enough design variations to keep anybody busy with new combinations. As shown above, you begin by resawing a piece of scrap. Where to go from there is explained in the article beginning on p. 32.

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I enjoyed Phil Lowe's article on cabriole legs (*FWW* #42), and would like to pass on some information I came upon by chance twenty years ago. I'd been making legs the same way as Lowe does, bandsawing the pattern and then carving the pad. But I wasn't really happy with them because the pad seemed too small and it also threw the weight of the cabinet in front of the ankle line, stressing the ankle and risking a break.

One day, either in a museum or in an antiques magazine, I don't remember which, I saw an 18th-century cabinetmaker's template for a cabriole leg. It hit me like a ton of bricks: Although the pattern looked a lot like the one I'd been using, the curved line at the back of the leg went straight down to the floor instead of being undercut. On the next leg I made, I tried it according to the old pattern and found I could carve a much better-looking pad, about $\frac{1}{8}$ in. larger all around, which was also better balanced and had a less undercut foot. If you look at the pads on Carlyle Lynch's little highboy, on p. 32 of that issue, you'll see what I mean.

I do have to disagree, however, with Lynch's explanation in *FWW* #41 (p. 20) on how tea table tops were made. Round tabletops may have been dished out of one piece on the lathe, but as for the rectangular ones, the moldings were always applied. And tops were held on with glue blocks, not furniture buttons. Also, Lynch's outside profile is misproportioned. The "round" shown in his drawing should have been the actual tabletop. In the original, this is usually about $\frac{1}{2}$ in. thick. The molding is applied on this top. The only time I've ever seen one carved out of a block was if it had depressions to receive saucers for teacups.

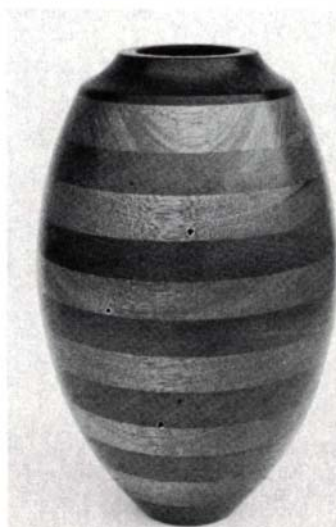
—Eugene Landon, Montoursville, Pa.

"Keeping Ten Fingers" (*FWW* #42) ought to be absolutely required reading. Your closing comment succinctly expresses an idea I hammer with regularity—don't do it if it doesn't look right. Experienced intuition is an acquired asset which must be trusted in matters of safety. We have invested far too much time acquiring skills to vaporize our primary tools in a moment of impatience. —R.J. Westra, Rolling Meadows, Ill.

Re your article "Souping Up the Block Plane," by R.S. Newman (*FWW* #39): Instead of sending the plane to a machine shop or lapping the sole, I use a scraping procedure. To begin, grind the teeth off the first inch or so of both sides of an old flat file. Next, form a radius on the end of the file. This creates two cutting edges. Spread a very light coat of bearing blue on a piece of glass and rub your plane over the bluing to mark the high points. Place the plane in a vise. Using the cutting edge of the file, scrape high points from the sole, using $\frac{1}{4}$ -in. to $\frac{1}{2}$ -in. push strokes. Alternate the direction of your strokes as work progresses, applying bluing when necessary to mark high spots. Continue until the bluing marks the surface uniformly. When you're done, the sole will be true, which will reduce drag as you plane.

—Richard H. Perrin, Ashaway, R.I.

As one who enjoys baseball as much as woodworking, I really appreciated Paul Bertorelli's glimpse of the Hillerich and Bradby "battery" (*FWW* #40, pp. 64-65). However, an opportunity to answer a question that has intrigued me all my



I laminate rings of wood together to make my vessels, which are not turned on a lathe but sculpted entirely by sight and feel.

—Robert St. Pierre, Hanover, Mass.

life was missed. What is the significance of the placement of the label on the bat? Among my earliest memories of the game is hearing one of the big kids hollering at me to hold the bat label up. Yet one sees Ben Oglivie and Dan Ford, for example, holding the label forward. What gives?

—Alan Abrams, Takoma Park, Md.

PAUL BERTORELLI REPLIES: I too remember being told to hold the label up. The reason is that ash, though springy and resilient, is a ring-porous hardwood, and the whack of a ball on the face grain can crush the earlywood layers, and weaken the bat. A thump on the edge grain rebounds on the hard latewood layers. So that batters can tell the difference, batmakers brand their labels into the face grain. If the label is held up—or down—the batter is more likely to hit the pitch with solid edge grain. H&B's Rex Bradley says that Oglivie and Ford, and many other major leaguers, are so intent on their stance and grip that they ignore label position. "It doesn't matter much to good hitters, though," says Bradley. "Bats usually break when the hit comes off the handle. A good hitter is going to make contact up on the sweet spot."

Having been a regular user of axes, mauls and similarly handled tools for over thirty years, I liked Delbert Greear's "Making Ax Handles" (*FWW* #41). Regretfully, hickory is not indigenous to my part of the Northwest or I'd surely make my own handles. I would like to add emphasis to his next-to-last sentence. I've witnessed some bloody and debilitating injuries caused by the use of axes with faulty handles. When the first sign of damage is noticed, put the ax away until the handle can be replaced.

There is a quick, if unorthodox, way to remove the wood from the eye of the ax. Drill a $\frac{1}{4}$ -in. hole about center, $\frac{3}{4}$ in. into the old wood. Give the ax head to an explosives expert. Ask him to put a dynamite cap in the hole and fire it. He'll know the appropriate precautions. I've used this method for some years. It has never damaged a head and always removes every last sliver of wood. Those not trained in handling explosives *must* resort to conventional methods of removing the remainder of the tool handle. Initiator explosives such as dynamite caps are frightfully dangerous to the inexperienced.

—Scott Heter, Lewiston, Idaho

Some may apply white glue to wedges before driving them to set an ax handle, but there is another way. I use a wedge cut from a rare, very heavy piece of "pitch pine" passed down to me from Grandpa Small. Touched off by a lighted match, the wedge flames and "bleeds" molten pitch, and it is driven home while flaming. It's stickier and more fun than using white glue.

—Jim Small, Newville, Pa.

As my subscription to *Fine Woodworking* comes due, I am questioning whether or not I want to renew it. In the past, I have considered it an essential part of my woodworking reference library. In the Methods of Work section, I have found and still do find suggestions. The layout and illustrations are top-notch, and even the advertising has been more useful than annoying.

I have noticed a steady decline in useful and uplifting information in the body copy, however. Plans for traditional furniture are available in reference sources which are more complete, and the presentation of innovative concepts and

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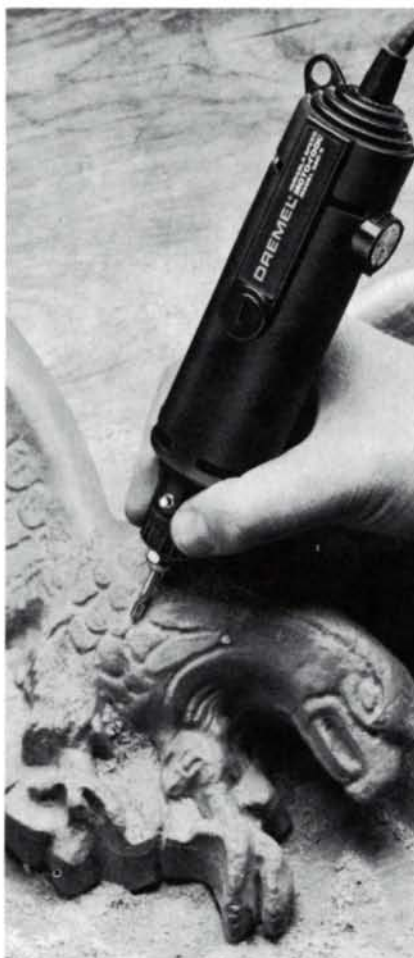
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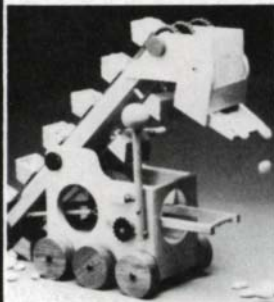
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design that I once found so prevalent are now few and far between. And why, oh why do you devote so much of your magazine to the likes of Wendell Castle and Sam Maloof? It's no secret that they are master woodworkers, that their work commands high prices. You insist on representing these people over and over again, while there are thousands of woodworkers, designers and craftspeople who are so deserving and worthy of coverage in a magazine such as yours. I cannot help but be disappointed.

—Kitty Kocol, Milwaukee, Wis.

I wish to compliment you on the September/October issue. As a specific illustration, I point to Ken Rower's trestle table article with its many nuggets of insight into accomplished furniture design—everything from proportions of overhang and stretcher placement to the use of beveling to blend in toe-board relieving. I realize that such things may be well known to professionals and students, but we self-taught chisellers have to glean the tricks anywhere we find them. Anyone who has ever watched a baseball game will know how to play first base, but as soon as the coach shows you how to tag up with your left foot instead of whatever is handy, he is replacing instinct with civilization. And that's where I'm at.

—Thomas H. Peer, Pittsburgh, Pa.

I am one who liked the format of the magazine the way it was. With all the advertising and such at the beginning half and the substance the second half, the mind could run free after the last page. Now advertising has taken priority.

—Ken Davignon, Muskegon, Mich.

Your illustration and description of the accessible saw switch (FWW #42, p. 10) leave something to be desired. The idea seems great as a quick way to turn the saw off in an emergency. But what about the ease of an accidental turn-on? A belt buckle might even do it as you lean over.

—William Steinmetz, Santa Barbara, Calif.

As an amateur woodworker and a pharmacist, I enjoyed George Mustoe's article on respiratory hazards (FWW #41). By chance I came across a review article on documented cases of aplastic anemia and red cell aplasia due to exposure to pentachlorophenol, a wood preservative. The article is authored by Dr. H.J. Roberts and appears in the January '83 issue of *Southern Medical Journal*.

Roberts cites six cases from 21 to 73 years of age. One 21-year-old, using pentachlorophenol at home for two days to paint furniture, developed aplastic anemia after a month. Another person developed the same anemia after eight months.

The author suggests that his research represents only the tip of the iceberg, because the cause and effect [of previous cases] were overlooked or not sufficiently documented.

—Peter J. Sargalski, Miami, Fla.

As a wood collector, I know of at least one domestic source for the doussié which David Kolanek inquired about in FWW #42, p. 16. He is Art Green, 117 Fairfield Ave., Bastrop, La. 71220. As James Krenov points out, the wood is unknown in this country as doussié, but when it is available, it's identified by its genus, which is *Azalia*, or African azalia.

—James J. Heusinger, Berea, Ohio

Just to keep the record straight, I'd like to comment on the bandsaw sharpening article in the May/June issue (to agree with what it said) and to take exception to what Harold Read said in his letter in the July/August issue. He calls the article wrong in saying that blades get brittle through work-hardening.

They *do*. I've spent more than fifty years investigating and coping with the idiosyncrasies of structural steel used in bridges, and there's a misconception that brittle fracture results *only* from repeated excursions above the yield point of the material. . . . Extensive research has proved that brittle fracture can result from repeated stress well below the yield point. Some steels will fail with only a few hundred thousand repetitions. Others will go several million. The best will go around ten million or more.

I think we can agree that a tightly stretched bandsaw blade goes through stress every time it flexes around a wheel. The stress is well below the yield point of the material, so no permanent deformation results. The number of these stress excursions between two moderate stresses, however, will mount up into large totals for a well-used bandsaw blade.

—Arthur L. Elliott, Sacramento, Calif.

Donald Bjorkman's router table (FWW #42) is a handsome variation on a tried-and-true design. Ours is quite similar, but a bit cruder in the finish. An easy addition to Bjorkman's jig is a hole cut in the back for a vacuum hose. With a closed box such as this, the vac really pulls the chips away from the cutter. I suspect that the airstream serves to cool the motor also.

—Bill Lego, Springfield, Va.

It all started when Chuck, a fellow woodworker, mentioned that he knew a farmer with five walnut logs for sale. Chuck and the farmer agreed on a price of \$40 for the logs, which were about 18 in. in diameter, straight, and about 8 ft. long. The logs were nine months old, but we considered it a trivial matter since they had been kept up off the ground and were good and solid. Luckily, the farmer had a tractor with a front-end loader, and that, along with much grunting and groaning, got the logs loaded on my pickup truck.

We pulled into the log-buyer's yard full of optimism. The buyer came out, looked at our logs for a few minutes and then said, "Looks like you fellows got a pretty big load of firewood here." He pointed out that the logs were full of radial checks and explained that sawlogs need to be sawn into lumber as soon as possible after cutting. If you can't get them sawn right away, you need to seal the ends and keep the entire log moist. Needless to say, it was a pretty quiet trip home. Still not totally convinced, I sawed one of the logs into firewood lengths and witnessed exactly what the buyer meant. The checks went all through the log. It wasn't exactly the kind of education I like, but a lesson on sawlogs I'll never forget.

—Tom Joch, Fairborn, Ohio

EDITOR'S NOTE: While checks may indicate a log unsuitable for sawing, chopping it into firewood is not the only alternative. The log can always be carved, and it can also be split, riven with a froe, and drawknifed into usable stock. The checks give you a place to start.

Paul McClure's reply to Douglas Newhouse's letter in FWW #40, p. 8, contains some errors. *Swietenia macrophylla* (aka Brazilian mahogany and Honduras mahogany, and by at least 16 other names) belongs to the family Meliaceae, not Meliazeae. Although *S. macrophylla* is the true mahogany of today's commerce, it was Chippendale and Hoplewhite who gave mahogany its lasting fame as a cabinet wood. What they used was probably the wood of *S. maha-goni*, West Indies mahogany, now scarce and virtually impossible to get. The botanical name for sapele should be *Entandrophragma cylindricum*, not *Enpandrophragma cylindricum*. Similarly, the correct binomial for tigerwood is *Lovoa klaineana*, not *Lovoa klainea* as printed.

—Robert D. Pinney, Cedarville, Calif.



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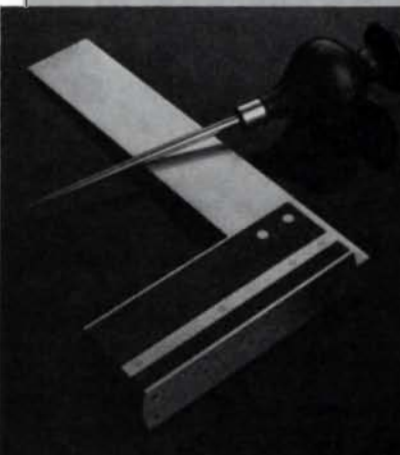
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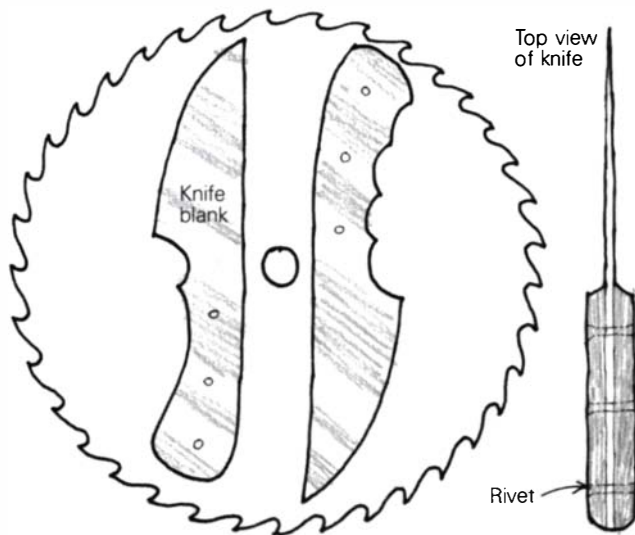
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Recycling sawblades into knives



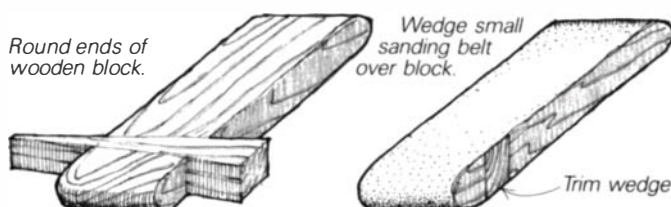
If one of your old circular-saw blades has seen better days, you may want to use it to try your hand at knife-making. Most sawblades are made of excellent high-carbon steel and are about the right thickness for a beefy camping knife or a custom-fitted woodcarving tool.

First, cut the blade into manageable pieces with an abrasive cut-off wheel. Then anneal the knife blanks using charcoal in a barbeque—play a hair dryer on the coals if you need more heat. Heat the blanks until they glow red (as seen in dim light), then allow them to cool very slowly in the fire as the charcoal burns itself out. Grind the annealed blank to shape and drill holes through the tang for the rivets that will attach the handle's "scales." Taper the blade's thickness from heel to point, and bevel the cutting edge with a belt sander, a file, or even sandpaper wrapped around a stick.

Now you're ready to harden the blade with the barbeque forge. Heat it cherry red, then plunge it into a pail of water. Next, polish the blade with sandpaper, and reheat it in a 550° kitchen oven for about twenty minutes, until the surface turns bronze, verging on purple. When the color is right, you can quench the blade in water or just let it air-cool. (For more about color and tempering, see *FWW* #4, pp. 50-52.)

Finally, attach the hardwood scales to the tang with epoxy glue and rivets. You can make your own rivets with heavy brazing rod or copper ground wire. This is not only a good use for old sawblades, but also a good use for those small pieces of fine hardwood that you just couldn't throw away: they make beautiful handles. —*Jim Stuart, Covina, Calif.*

Block sander from sanding belt



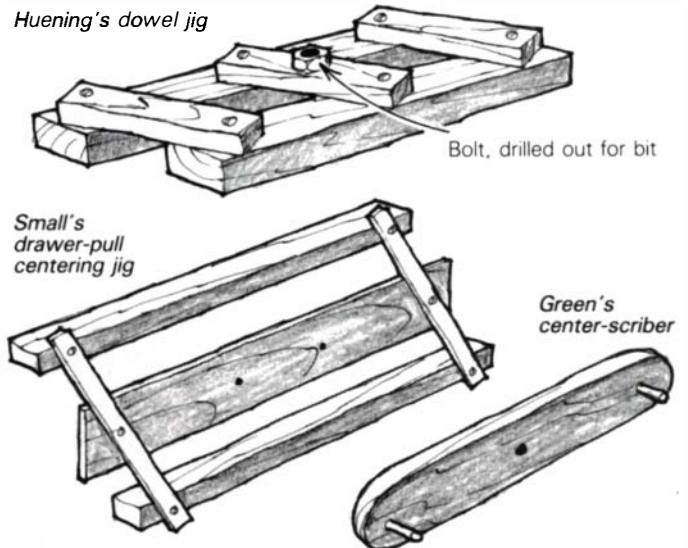
With the wedge-tightened block shown here, you can use small sanding belts as block sanders. The tight belt makes for better sanding action, and because cloth sanding belts are of a better quality than abrasive paper, the blocks last a long time. You can shape the end profiles for inside sanding, too.

—*Robert J. Harrigan, Cincinnati, Ohio*

Center finders—three variations on a theme

An old organ-builder friend showed me this handy home-made guide for center-drilling holes in the edges of boards to be doweled and edge-glued. The device consists of five sticks of hardwood screwed together in the configuration shown.

The sticks should pivot so that the device collapses like a parallelogram. For the drill guide, fit the center strip with a bolt $\frac{1}{8}$ in. larger than the bit size. Then, using a drill press for



accuracy, drill a pilot hole through the bolt using a bit one number larger than the bit you intend to use for doweeling. To use, first align the edges of the boards and mark off the dowel locations with a square. To center the dowels, set the device to straddle each board's edge and squeeze the parallelogram shut. Then slide the device to each mark, and drill.

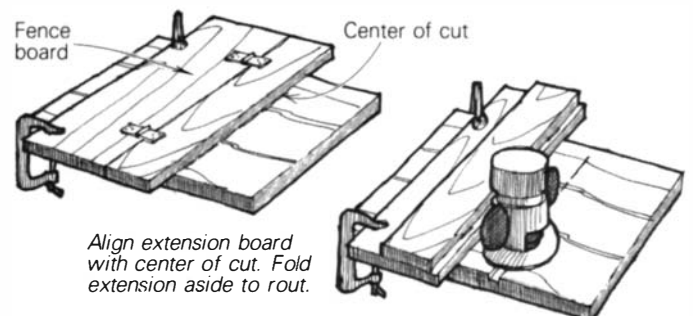
—*John Huening, Seffner, Fla.*

Here's a self-centering jig for boring drawer-pull holes. The pivoting sticks should be made long enough to span your widest drawer. The center plate may be fitted with drill-bit guide bushings or just small holes for marking with an awl.

—*J.B. Small, Newville, Pa.*

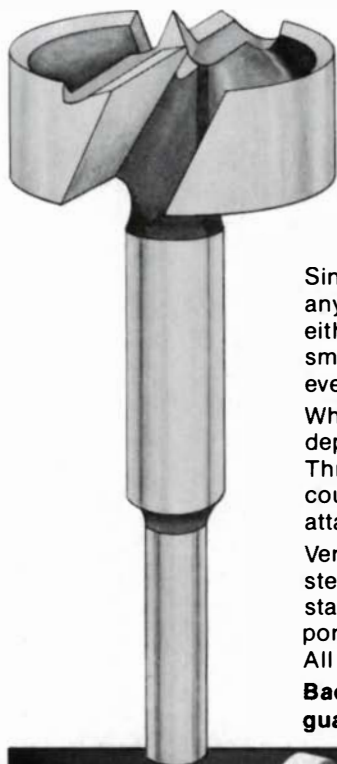
This old-time gadget is handy for center-scribing boards. Install dowel pegs at the ends of the device and drill a hole in the center for a pencil point. —*Larry Green, Bethel, Conn.*

Flip-up router fence



When routing grooves, some people draw a line on the work where the groove will be, then calculate where to clamp the fence. Others draw the line where the fence will be, instead of marking the location of the groove. Both methods have obvious drawbacks. But if you make a router fence that has a hinged extension, you can mark the center of the actual groove on the work, line up the extension with the mark, then flip it out of the way to rout the groove. Make the fence

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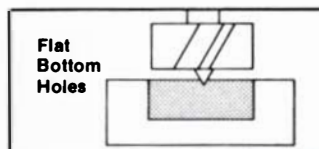
With your Forstners you can drill flat bottom holes, or bore **clean** holes in thin stock or veneers. . . and even end grain. They easily enlarge existing holes.

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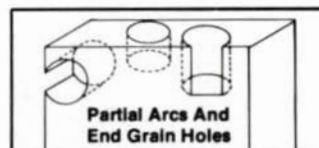
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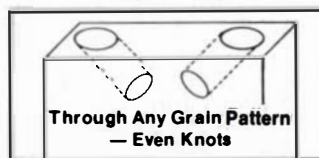
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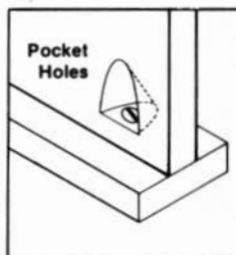
Flat Bottom Holes



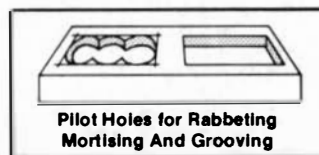
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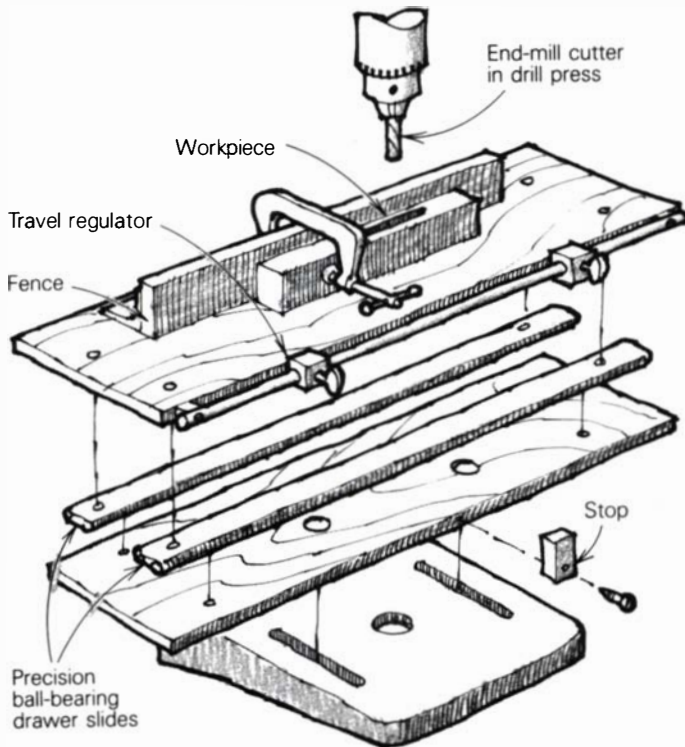
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out of a straight, flat 1x4. Now rip another board half the diameter of your router base (measure from the center of the bit to the edge of the base) and secure it to the fence with flat hinges. As shown in the drawing, offset the hinges so that they won't protrude when the extension board is swung up out of the way. —James F. Dupler, Jamestown, N.Y.

Mortising table for drill press



Frustrated with hollow-chisel and router mortises, I made this drill-press mortising fixture, which works even better than I expected. Its secret is a pair of precision ball-bearing drawer slides. Precision drawer slides have less play than regular drawer slides, and move so smoothly that I'm sure there are other uses for them in the shop.

This is how the fixture works. First chuck an end-mill cutter in the drill press, then set the travel regulators to produce a mortise of the desired length. Now position the fence to center the mortise in the thickness of the stock. To cut the mortise to the desired depth, gradually lower the cutter while sliding the table back and forth.

Rather than squaring up the ends of the mortise, I simply round over the tenon with a file.

—David Grimm, Richmond, Mich.



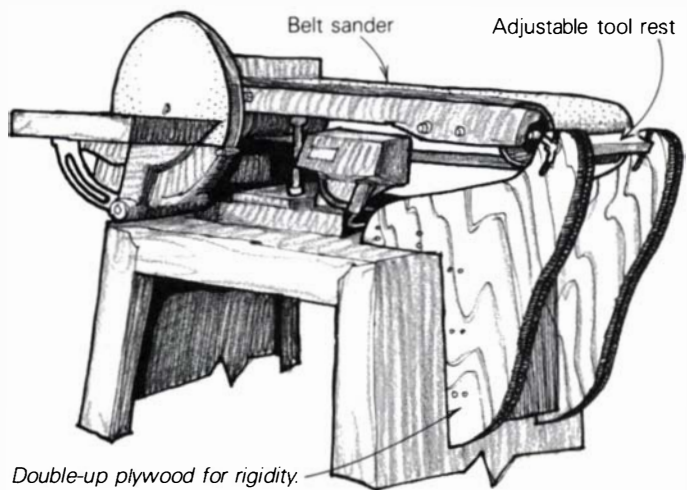
Improved wooden dog

A couple of years ago, we furnished our Tage Frid style workbenches with these maple dogs. They are strong, easy to make and adjustable to any height.

Cut the dog to rough shape, sizing it for a loose fit. Then drill a hole through the dog so that it won't split when you wedge it open. Next cut the dog's body with a bandsaw to the drilled hole. Wedge layers of thin veneer in the kerf until the two halves are flared enough to hold the dog securely.

—Michael L. Sandiland and Phil Holland, Vancouver, B.C.

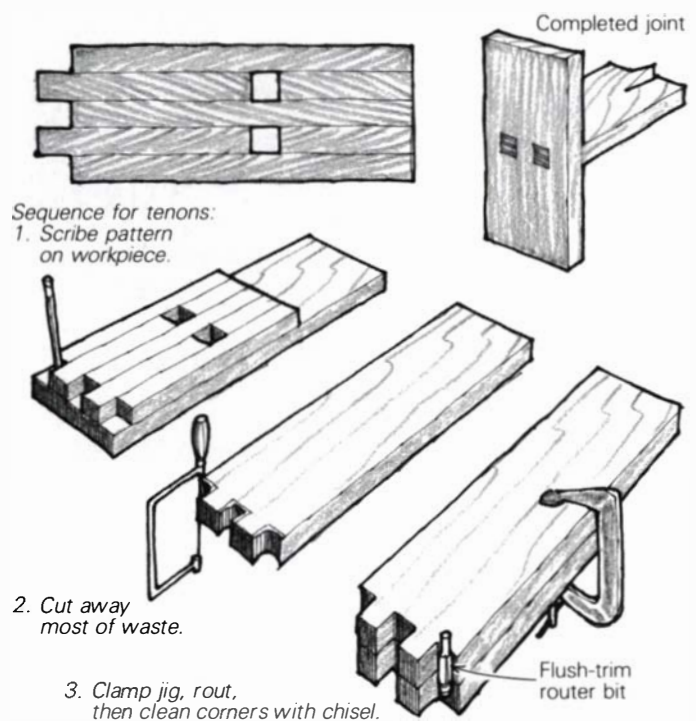
Tool-grinding fixture for the belt sander



We developed the fixture above to take advantage of our belt sander as a wide-surface grinder. Because the sanding belt has much more surface area than an abrasive wheel, the grind is cool, with less danger of overheating the cutting edge. The fixture is easily removed, so it doesn't interfere with other, more conventional uses of the belt sander. The tool rest can be reset using a wing-nut/slot arrangement to grind at different bevels, or to give more or less hollow grind.

—Steve Vetter and Norman Gritsch, Washington, D.C.

Routing multiple mortise-and-tenon joints



After several less-than-satisfactory attempts to construct through, wedged multiple tenons, I designed this router jig for accurate, repeatable results.

The jig consists of strips of plywood or particleboard laminated together as shown in the drawing. The long, continuous pieces correspond to the spacing between mortises. The shorter pieces are glued up to form openings and projections that correspond to the thickness of the stock.

To use the jig, place it over the workpiece to be mortised (or tenoned) and pencil in the outline of the joint. Remove

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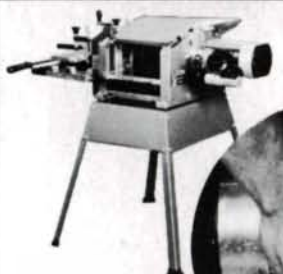
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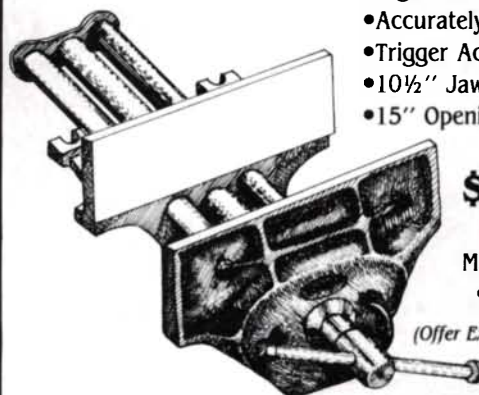
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most of the waste. Now clamp the jig in place under the workpiece so it becomes a guide for the bearing of a flush-trim router bit. This results in clean, accurate mortises or tenons with straight sides except in the corners, which must be cleaned up with a chisel. If the jig is accurately lined up with the edge of the workpiece, the spacing of the mortises and tenons will be identical. —Ed Devlin, Rothsay, Minn.

Shaping with pencil-sharpener cutter

In my woodworking classes, I have been using an old spiral cutter from a pencil sharpener, chucked in the drill press, for smoothing small-radius internal curves. The cutter works very well, and saves the time and tedium of sanding or filing.

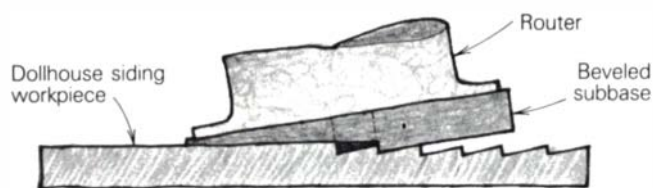
To make the tool, simply hacksaw one of the two cutters free of the mechanism. Replace the pin with a short length of $\frac{3}{16}$ -in. cold-rolled steel rod. Make sure the drive gear is on the bottom, for the correct cutting action. Hammer the bar a bit so that it will wedge tight in the spiral cutter. To use, chuck the cutter and lock the quill.

—David Glen Whitling, Bolivar, Ohio



Producing dollhouse siding

Here's how to produce simulated clapboard siding for dollhouses with a router and an easy-to-make subbase. First, to make the subbase, bevel a $\frac{3}{4}$ -in. thick, 6x10 block on the tablesaw in much the same fashion as you would cut a raised panel. Be sure to leave a $\frac{1}{16}$ -in. or so fillet, as shown. Now bore a hole through the block, and mount the router so that a $\frac{3}{4}$ -in. straight bit chucked in it is tangent to the fillet of the



base. After experimenting with the bit depth, you should be able to rout multiple beveled cuts across the workpiece, indexing each cut in the previous cut. For narrower siding, relocate the subbase on the router and use either the same or a smaller bit. —Jim and Dan Fortner, Newport, Ind.

Preserving green bowl blanks

To eliminate checking on green bowl blanks, simply store them in your freezer until you're ready to turn. I even use the freezer for storing work in progress if I'm interrupted before completing the rough-turning. This method is especially useful if you have a large number of green blanks and don't have time to rough them out so that they will dry properly. For long-term storage, wrap the blanks in plastic bags to avoid freezer burn and surface drying.

Another advantage of the method is that the frozen blanks turn without building up heat at the cutting edge—your gouge will need sharpening less frequently. Also, spalted wood, soaked and frozen, holds together much better.

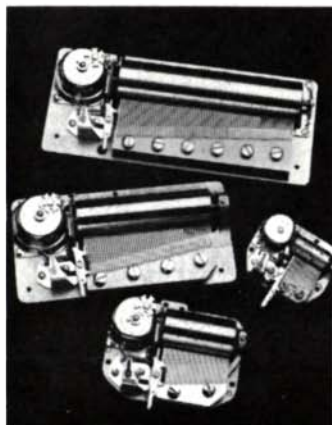
—Joel N. Kutz, Brockport, N.Y.

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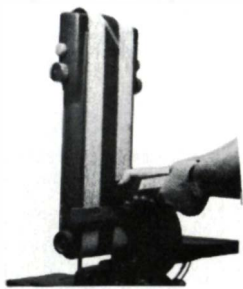


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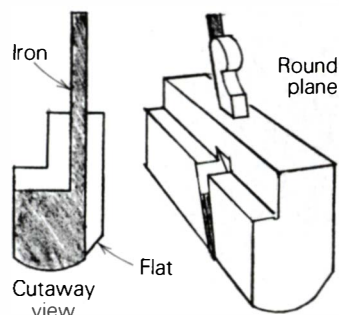
Old planes—*I have three sets of wooden tongue-and-groove planes. None of these planes cuts the tongue or the groove in the center of the stock thickness. The tongue and the groove match, and the boards fit together, but the joint is off-center. Is this the way these planes were intended to cut? Also, I'd like to know what the purpose of the flat spot is on some molding planes I have. Is this used as a guide to cut the molding?* —Bob Vinas, Bayside, N.Y.

NORMAN VANDAL REPLIES: There are two reasons why many wooden match planes were designed to cut the tongue and groove off-center. When tongue-and-groove boards were used as flooring, or in other applications where surface wear was a consideration, placing the groove farther from the face of the board allowed more wood to wear away before the joint was exposed. Second, the edges of tongue-and-groove boards used in wainscoting, paneling, or cabinet construction were often decorated with a bead as in the drawing below. An off-center joint left enough material on the finished face so that this bead could be cut without weakening or exposing the joint.



The flat you describe is commonly found on planes called hollows and rounds. These were sold in pairs: one cuts a concave and the other a convex segment of the same size circle. These planes have a number on the heel which indicates size, and were often sold in sets of nine pairs, numbered evenly from 2 to 18. There were no universal standards, however, so a number 6, say, from one maker will not necessarily be the same size as a number 6 from a different maker.

Hollows and rounds, having no fence to control the location or depth of the cut, are held freehand. The flat can serve as a guide when run along a fence clamped to the work, but its real purpose was just to shear off the side of the plane body. This exposes the iron along the edge, so the plane can cut all the way into a tight corner.



To get satisfactory results from these planes, you'll need to tune them. They tend to warp, especially around the mouth. Sight down the sole from toe to heel, with the iron removed, and note any inconsistencies. The sole of the plane must be straight, so correct any problems with a file and sandpaper. True up the iron so that it protrudes evenly at all points along the cutting edge. Now you're ready to go.

Paste wood-filler—*I recently used a paste wood-filler on walnut. I stained the filler and finally applied Watco oil. The filler seemed to leave a surface finish that prevented the oil from penetrating. Should the stain be applied before the filler?* —Kenneth A. Sovereign, Aurora, Ill.

OTTO H. HEUER REPLIES: If you're going to use stain, apply it before the filler. First, sand the wood with fine sandpaper, remove the dust and wipe the surface clean. Then apply the stain with a rag and wipe off the excess. I prefer an oil-based, pigmented wiping stain somewhat lighter in color than the wood filler. You can use either walnut-colored filler or a nat-

ural paste wood-filler colored to the desired shade with oil or oil-and-japan colors, available from paint stores in small tubes. Reduce the filler following the instructions on the label, or mix equal volumes of paste filler and mineral spirits. Apply the filler with a brush, then follow up by padding the filler into the pores with a rag. When you see the solvent flash, scrub off the excess filler with a piece of burlap, wiping across the grain. You may need several coats to fill all of the large pores in the wood.

Finally, wipe with the grain using a clean cloth and very light strokes. Allow to dry in a warm room for 24 hours, then rub lightly with very fine steel wool. You may now apply a light coat of Watco or some other oil finish, but the oil won't penetrate the same as on unfilled wood. You may want to use only the oil wiping stain and omit the filler. If you do, let the stain dry for 24 hours and rub lightly with fine steel wool, then apply the final oil finish.

Sawblade speeds—*I have a Rockwell 10-in. tablesaw which is rated to operate at 5500 RPM. Rockwell recommends using blades rated at 6,000 RPM. I've had trouble finding blades rated this high; in fact, most manufacturers don't advertise the RPM rating of their blades. What happens if I use a blade rated at 4500 RPM on my saw?*

—Mike Conner, Juneau, Alaska

TOM MILLER REPLIES: You are wise to consider the RPM of your machine when purchasing blades. Most blades don't have a blade body that can run at 6,000 RPM (which is also 100 revolutions per second) without experiencing metal fatigue and deformation, and they also tend to deviate or flutter at that speed. A faulty blade could even fly apart.

All blades are tensioned to run at a given RPM, and they will likely wobble or run out if they're run at a substantially different speed. Only the better-quality blades are hand-tensioned in the first place, so finding one will probably involve paying a bit extra. My firm, Winchester, hand-tensions its sawblades to run as fast as 6500 RPM.

As a general rule, 10,000 SFM (surface feet per minute) is the desirable speed at which to run a sawblade. SFM is a measure of the distance a saw tooth will travel in a straight line in one minute. In special applications, a different speed can be used. Most people, however, shoot for 10,000 SFM for general usage, and the chart gives these figures.

In the general shop, all blades should run at the speed recommended in the chart, but a coarse-tooth ripping blade can run 10% to 15% slower.

Recommended sawblade speeds (10,000 SFM)

Blade diameter	RPM
6 in.	6,622
8 in.	4,830
10 in.	3,831
12 in.	3,184
14 in.	2,732
16 in.	2,398
18 in.	2,123

Strip inlay—*I'd like to inlay a narrow wood strip into a stopped slot routed around a solid wood tabletop. I'm worried that cross-grain contraction of the top will cause the inlaid strips to pop out, since, at the ends of the table, the inlay grain runs perpendicular to the grain of the top.*

—Ben Erickson, Eutaw, Ala.

CARLYLE LYNCH REPLIES: Inlay always ignores grain direction. The practice seems to defy logic, and I'm at a loss to explain why it works so well. One theory is that the inlay is so thin that the shrinking top just compresses it.

I checked with four woodworkers and they all reported negligible failure, especially when working with stable woods such as mahogany. I spoke with a furniture restorer, who told me that he occasionally finds popped-out inlay on the

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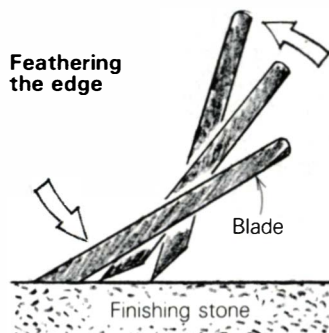
For best results, you must have a snug fit between the groove and the inlay, and a good glue bond. A syringe with a No. 19 needle puts the glue neatly in the groove.

Some people recommend using celluloid for string inlay (available from Constantine's, 2050 Eastchester Rd., Bronx, N.Y. 10461) because it bends easily around short-radius curves and isn't affected by stain, but I have never tried it. Furniture glue will not hold it, and varnish remover dissolves it into a stringy, rubbery mess.

Japanese chisels—*I recently purchased a set of Japanese chisels. When used with a carvers' mallet, the chisels tend to chip or become dull far too quickly. This is the first set of expensive chisels I've ever bought, and I wonder if I'm expecting too much.*—Richard D. Stone, Middletown, Ohio

TOSHIO ODATE REPLIES: When new, a well-tempered Japanese blade is slightly harsh and on the brittle side. Most Japanese craftsmen prefer a blade that is a little harsh when new because this shows that it was properly tempered. The very fine edge becomes extremely hard when the blade is tempered—harder than is easy to work with. This problem occurs more often with chisels than plane blades because a chisel edge must withstand the shock from a hammer blow. Thus, no craftsman will use a new blade, even the most expensive, as a finishing blade. A new blade, like a wild stallion, must first go through a breaking-in period called “taming the blade.”

Use a new blade vigorously and sharpen it frequently. Even though water is the lubricant on the sharpening stone, pushing the blade across the stone causes friction, which creates enough heat to slightly draw the temper of the very thin edge. To keep the cutting edge from chipping, sharpen the blade normally (see my article on sharpening in *FWW* #29), then feather the edge lightly on the finishing stone. Feather for one stroke and then rub the back flat as usual. Repeat this several times. Every time you sharpen the blade, finish by feathering. After about a week of vigorous use, you'll be able to omit the feathering step and sharpen the blade normally. If you treat the blade this way, you can tame the well-tempered blade without sacrificing its quality.



Lapstrake plans—*I've just read the lapstrake boatbuilding article in *FWW* #36, and I'm particularly interested in plans, books or general information on Alfred Sovik's contemporary Osolver boat, pictured on p. 57. What can you suggest?*—Thomas M. Krause, Wauwatosa, Wis.

STEVE MCALLISTER REPLIES: Osolver plans, and possibly information about Sovik, can be obtained by writing to Universitets Oldsaksamling, Frederiks Gat 2, Oslo, Norway, Attn: Emil Christenson; or from the Sjøfartsmuseum, N-5000, Bergen, Norway.

The book *Norse Boatbuilding in North America* has lines for and photos of the Osolver. A wonderful book on the general subject is *Inshore Craft of Norway*, published in 1977 by Frondahl & Son, Oslo, Norway. These are both available from the Maine Maritime Museum, 963 Washington St., Bath, Maine 04530.

Colored inlay—*A client of mine owns a 17th-century oak slant-top desk made in Flanders. Floral inlays on the lid*

have faint traces of green and red under what remains of the high-gloss finish. These don't seem to be the natural colors of the wood. How were these colors applied—dye, stain or paint?—Hap Johnson, Thetford Center, Vt.

ROBERT MUSSEY REPLIES: Marquetry inlays were often dyed before being cut to shape and assembled into a design. Veneers were steeped in natural dyes which, depending on the color desired, might have been a decoction of brazilwood, oak bark, madder root, french berries or scarlet-colored rags. Hundreds of old recipes document a wide range of natural materials for producing a rainbow of colors. Most of these dyes were fugitive, fading quickly on exposure to sunlight or through oxidation. Dying went out of fashion in the late 18th century, when woods with a strong natural color were more often used for marquetry.

Slicing a burl—*I recently acquired a piece of white oak burl, about 4 ft. in diameter, which weighs at least 1500 lb. How should it be cut? Should I keep it outside for a year or two, or should it be sawn, stacked and cured in my basement? I have a piece of plastic over the top, to keep the rain off, and I have oiled the ends.*

—Robert S. Wattles, Arlington, Va.

DAVID HOLZAPFEL REPLIES: Yours is the job of the diamond cutter. How you cut your burl depends on what you intend to make. A turner will see turning stock in a burl, a furniture-maker will see boards and a carver will see what needs to be removed. The burl itself, its shape, seams and end checks will also determine how it should be cut.

I would recommend that you rip saw “through and through,” from top to bottom as the tree grows. Leave the natural edge complete with bark. Don't crosscut, else the oak will check terribly and you will lose a lot. Slice the burl as soon as you can. The wood won't really begin to dry until you do. Immediately coat the end of each board with white glue, paint or tree surgeons' pruning tar. Since you will be air-drying the wood, keep it stacked outside off the ground, and cover it with a sheet of plywood or roofing tin to keep it out of the sun and rain for a year or more. Then store it in a heated room for another year. Use a moisture meter to be sure that the wood is at 10% to 12% moisture content before you use it. Good luck. Go slowly.

Finish-reviver—*I recently found a recipe for a furniture reviver that calls for raw linseed oil, vinegar and terebene. My problem is that nobody has heard of terebene. The chemical dictionary defines it as a “mixture of terpenes, chiefly dipentene and terpenene.” Could you tell me who sells it, or if it's called by another name?*

—Joe Wolinski, Minneapolis, Minn.

ROBERT MUSSEY REPLIES: Terebene is a generic name applied to a class of driers that were added to oils and varnishes during the late 19th and early 20th centuries. Combined in formulas containing linseed oil, terebene was supposed to keep the oil from remaining sticky and gummy. One recipe for terebene I found in an early-20th-century formula book is a mixture of medium kauri (a copal varnish resin), boiled linseed oil, flake litharge (a lead oxide), resinates of manganese (another metallic oxide drier) and American turps. All of these are available today except kauri—which may be just as well, since readily available, commercially made driers are easier to use and probably cheaper.

I don't suggest making and using this reviver. Even boiled linseed oil remains tacky for years before it finally polymerizes, and raw linseed is worse. It collects dirt and darkens with age, eventually becoming black if applied repeatedly. Linseed

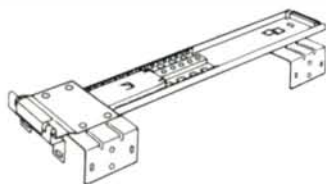
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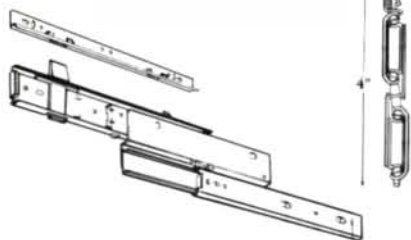
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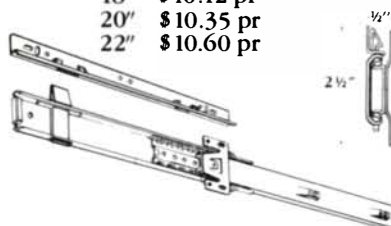
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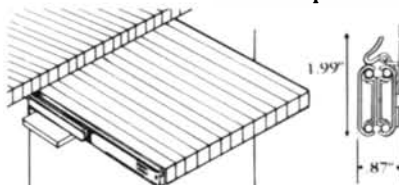
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14	12 1/8" - 14 1/2"	15" - 16 1/2"	10 1/2"
16	14 1/8" - 16 1/2"	17" - 18 1/2"	12"
18	16 1/8" - 18 1/2"	19" - 20 1/2"	14 1/2"
20	18 1/8" - 20 1/2"	21" - 22 1/2"	16 1/2"
22	20 1/8" - 22 1/2"	23" - 24 1/2"	18 1/2"
24	22 1/8" - 24 1/2"	25" - 26 1/2"	20 1/2"
26	24 1/8" - 26 1/2"	27" - 28 1/2"	22 1/2"



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oil revivers finally polymerize so completely that they're nearly impossible to remove without damaging the finish they were meant to restore, tempting the dutiful polisher to add another coat, which makes the mess worse. A good portion of my yearly work involves formulating solvents to remove linseed oil polishes, so I strongly advise against their use. Waxes are my favorite final coating for finish restoration. They are easy to apply and easy to touch up if damaged.

Follow-up:

Re a weathered look for cedar (FWW #38, p. 30). Here's a method that works well and is less caustic than lye. Mix about 1 to 1½ tablespoons of ferrous sulfate (a lawn fertilizer available at most nurseries) in a gallon of water and wash the wood with this solution. Expose the wood to sunlight until the desired color is achieved. As I recall, it takes days, not weeks, to work. —Daryl Proctor, Santa Fe, N.Mex.

... Paint the wood with a strong solution of tea and let the wood dry. Make a solution of ferrous ammonium sulfate (available from a chemical supply company), about one teaspoon per cup of water, and apply it to the wood. The darkness of the gray can be changed by repeated applications, or by changing the strengths of the solutions.

—N.H. Ceaglske, Minneapolis, Minn.

... You could just let the wood weather outdoors. In New England, cedar shingles take about three years to turn from brown to silvery gray. —Larry Green, Bethel, Conn.

Sources of supply:

—Parts lists and exploded-view drawings of old Rockwell and Delta machines and accessories are available for \$1 and a

large, self-addressed stamped envelope from David L. Brown, 1111 Huntington St., Huntington Beach, Calif. 92648.

—A free booklet, *The Best of Dear Walt*, describing the care and replacement of machine ball bearings, is available from Bearings Inc., 3600 Euclid Ave., Cleveland, Ohio 44115.

—Parts and kits for wooden crank telephones are sold by Phonoco, RR #2, Box 590, Galesville, Wis. 54630.

Readers can't find:

... an owners' manual and parts for a Wallace 8-in. jointer.

—William Waidner, Salem, Ore.

... plans for a folding library ladder chair.

—Edward Mattson, Norwalk, Conn.

... an owners' manual and parts for a Yates American 14-in. bandsaw. —Raymond Wisniewski, Glastonbury, Conn.

About our answer people:

Norman Vandal makes period furniture and architectural millwork in Roxbury, Vt. Otto H. Heuer is a finish chemist and consultant. Tom Miller owns Winchester Carbide Saw, Inc., in Winchester, Va. Carlyle Lynch is a retired furniture designer and maker who lives in Broadway, Va. Toshio Odate is a *shoji* maker and sculptor in Woodbury, Conn. Steve McAllister is assistant director of the Apprenticeship boatbuilding shop and school in Rockport, Maine. David Holzapfel makes whole-tree furniture in Marlboro, Vt. Robert Mussey is conservator at the New England Society for the Preservation of Antiquities in Boston.

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

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Sam Maloof: Woodworker by Sam Maloof. *Kodansha International Ltd.; distributed through Harper & Row, Publishers, Inc., 10 E. 53rd St., New York, N.Y. 10022, 1983. \$49.95, hardcover; 224 pp.*

Along with building furniture these past 35 years, Sam Maloof has been telling his clients and workshop students about his forthcoming book. It would be a compendium of his work, his talk, his life—and now done, it is all of that. In addition, it is magnificently made, as much the fine work of photographer Jonathan Pollock and the people at Kodansha as of Maloof. The book is one of those happy collaborations of various crafts, lush with color and duotone black-and-white photographs: sensuous full-page details amid illuminating layouts comparing years of refinement. Maloof's drawings, both working plans and scrap-paper sketches, show the strength of his graphic arts background. A number of photo essays depict this whiz of the bandsaw, router and rasp at work. And there are pictures of the awesome house he continues to build himself. Maloof speaks throughout, lacing his explanations with anecdote, on everything from his childhood and his start as a woodworker, to how he applies finish. It's a generous effort to tell all, though it's true to Maloof's ingenuousness: "My approach to solving many structural and design problems," he says, for instance, "is to rely on my common sense and experience."

Maloof is a model for our era's self-taught craftspeople. He began work in a single-car garage and he continues himself to make every piece he sells. Using only the machines and tools familiar to any home-shop woodworker, he has mastered the making of serviceable, stylish furniture, and he has gained international recognition. If Maloof is one of your inspirations, know that his book is out. —Rick Mastelli

The Ström Toys by Janet A. Strombeck and Richard H. Strombeck, illustrated by Marlene Ekman. *Rexstrom Company, Inc.; distributed through Sterling Publishing Co., Two Park Ave, New York, N.Y. 10016, 1983. \$9.95, paperback; 96 pp.*

There's an interesting idea behind this book: It's an illustrated children's story about how some 18-in. high, elfin Ströms (whose name means "stream" in their language) brought the author a line of toy designs in thanks for helping them defeat their enemy, the Slug Hog.

Here comes the gimmick: The book has photos of 40 of the toys, but contains plans for only 12 of them. The other 28 plans can be ordered from the authors, at prices ranging from \$2 to \$12 each. So what we really have here is a catalog, a sampler, and a book for children to page through, looking at cute drawings, and lusting for more toys.

Well, why not? After my initial feeling of having been taken, I imagined a family where all this would work: kids all reading, grandpa out working in the shop, everyone enjoying wholesome wooden toys. The toys themselves are average to better in looks, depending as much on careful painting as on woodworking skills. —Jim Cummins

Blizzard's Wonderful Wooden Toys by Richard Blizzard. *British Broadcasting Corporation, 35 Marylebone High St., London W1M 4AA, England, 1983. £6.95, hardcover; 224 pp.*

This book was published by the BBC to accompany a television series. The plans are carefully drawn and very clear, although some of these toys are complicated. The book starts

with a simple sand pit and ends with a Silver Cloud Rolls Royce—no project for the hasty-minded. In between are trailer trucks and Land Rovers, dollhouses, rocking horses, spaceships, forts, stoves and a lot more. The text is brisk, and consists of pointers and good advice rather than tedious how-to. Measurements are in metric, with inches in parentheses. Instead of following most of these plans exactly, I'd use them as a springboard for some designs of my own. —Jim Cummins

The Piano Makers by David Anderson. *Random House, Inc., 400 Hahn Rd., Westminster, Md. 21157, 1982. \$10.95, hardcover; 56 pp.*

Concert grand pianos are the behemoths of the music world. Each one is 9 ft. long, weighs half a ton and contains over 12,000 parts—a fascinating instrument, even if not one a weekend woodworker would want to tackle. Anderson's book, aimed at young readers (over age 10, I'd guess), gives a good idea of what goes into making one of these monsters. He follows a grand piano through Steinway's New York factory, from the woodlot to the shipping room. Although he compresses a year's work involving about 400 people into just over 50 pages of photographs and text, the level of detail seems just right for his audience. I learned a lot, too, and I'm not so young anymore. —Roger Holmes

Japanese Joinery: A Handbook for Joiners and Carpenters by Yasuo Nakahara. *Hartley & Marks, PO Box 147, Point Roberts, Wash. 98281, 1983. \$11.95, paperback; 239 pp.*

Over the centuries, Japanese carpenters have developed an astonishing variety of ways to stick pieces of wood together to make buildings. Over one hundred of them are illustrated here, and very good illustrations they are. I spent several hours absorbed in figuring out how the various joints fit together, though some interesting stuff defied my best efforts. Joint freaks among us will enjoy trying to run up copies in the shop, or figuring out how to work one or two into the next coffee table. Be prepared to ad-lib, though—the text is no match for the drawings, and there's nothing here about how to cut the joints. No matter, really—the value of a book such as this is the glimpse it gives of a rich and varied woodworking system unlike our own. Take what you can use and leave the rest. —Roger Holmes

L'Art du Menuisier en Meubles by Jacques-Andre Roubo. *Leonce Laget, Paris; distributed by Copeland & Laird International Corporation, 7323 Edmund St., Philadelphia, Pa. 19136. Facsimile of 1772 edition, 1982. \$115, unbound; 163 pp. text, 54 plates.*

In the latter half of the 18th century in France, before the last of the kings Louis climbed to the guillotine, the woodworking arts reached a peak. One master craftsman, Jacques-Andre Roubo, surveyed all that was known of his art, and wrote it all down. His topics included general woodworking tools and methods, joinery and architectural woodworking (both interior and exterior), coachmaking, fancy veneer work (ébénisterie), and "menuisier en meubles," or movable woodwork—that is, furniture. Roubo's work finally totalled about 1300 oversized (11½-in. by 16½-in.) pages of text plus almost 400 full-page illustrations.

The French firm of Leonce Laget (75 Rue de Rennes, 75006 Paris) publishes a facsimile of the complete Roubo, and now a Philadelphia entrepreneur, Walter Rich, is importing and selling the "movable woodwork" portion. This offer-

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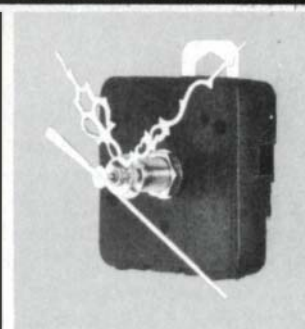
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ing details the design and construction of ordinary and fancy chairs, beds, desks and armoires. The text, though archaic, yielded to my high-school knowledge of French, and turned out to be fascinatingly full of practical information. The engravings, which include whole pieces as well as developmental drawings of difficult moldings and sections, are precise, detailed, scaled and exquisite. The rag-paper pages come unbound in a cardboard box, enabling one to mount and hang the plates. Rich hopes that there will be enough interest to warrant importing more of Roubo; the coachmaking portion is next on his list, though the first part, on tools and materials, would be next on mine. —John Kelsey

The Woodworker's Book of Wooden Kitchen Utensils by Vance Studley. *Van Nostrand Reinhold Co., Dept. RB, 135 W. 50th St., New York, N.Y. 10020, 1981. \$15.95, hardcover; 128 pp.*

Author Studley is billed as a designer and printmaker, and the drawings in this book are indeed handsome. The text, however, isn't much good. Aimed at the beginner, the book oversimplifies to the point of outright error. It claims that all oak is waterproof, for instance, and that you can buy waterproof white glue. The bamboo flour scoop can't be made from any piece of bamboo I've ever seen, and it beats me, when making the whisk, how you can bend an 11½-in. piece of bamboo into a 17-in. hoop. If you would like to make a honey dipper by sawing a 1-in. dowel into discs, drilling holes through them and then gluing them onto a ¼-in. dowel, maybe this book is for you. The drawings are worth a look for an idea or two, but I wouldn't buy the book. —Jim Cummins

Woodturning Music Boxes by James A. Jacobson. *Sterling Publishing Co., Two Park Ave., New York, N.Y. 10016, 1983. \$10.95, softcover; 187 pp.*

This book is about installing music movements in turned containers and bowls. Jacobson has come up with some clever designs that make the combination more successful than you'd guess—handsome, functional turnings that play a tune.

The chapters on how music movements work and on the history of music boxes are good. The directions for turning the containers are basic enough that a beginner wouldn't feel completely lost, but the book would be better in the hands of a practiced turner. These are projects to work up to, not start off with. The author says that when he first put a music movement in one of his turnings, it gave his lathe output a new dimension, a new excitement and a new life. If you are starting to wonder what in the world to turn next, there are some good answers here. —Jim Cummins

A Guide to American Wooden Planes and Their Makers by Emil and Martyl Pollak. *Astragal Press, One South Street, Box 338M, Morristown, N.J. 07960, 1983. \$15.00, paperback; 335 pp.*

If you have any interest in old wooden planes, whether as a beginner or an advanced collector, you'll enjoy this book. It gives an overall perspective of the types of planes and their makers (whose marks are usually stamped on), and some guidelines about value. In most parts of the country, you can still find usable old planes for about \$10. With the plane in one hand and this book in the other, you'll find yourself enriched, entranced, possibly hooked for life. I have five old planes on the shelf over my desk, and all the makers are listed. One plane is stamped "J.G. Sandkuhl." When I found his name,

dates and hometown in the book, I had the uncanny feeling that, instead of merely holding an old plane, I was reaching back through time to shake his hand. —Jim Cummins

The Chronicle of the Early American Industries Association, Inc. (Volumes 12-26, March 1959 to December 1973), edited by William D. Geiger, Raymond R. Townsend and Daniel B. Reibel. *The Early American Industries Association, Inc., PO Box 2128, Empire State Plaza Sta., Albany, N.Y. 12220, 1983. \$27.50, hardcover; 956 pp.*

Probably no other book so thoroughly covers the variety of antique tools, their histories and their manufacture as this one does. If that sounds like a pretty tall order, it is, but at nearly a thousand pages, the 14-year collection of *The Chronicle* covers a lot of ground. Few subjects and tools are covered in hair-splitting detail, but the references listed at the end of many articles provide a starting point for further examination.

The Chronicle is the quarterly publication of the Early American Industries Association, a group dedicated to the preservation and study of obsolete tools and artifacts, in order to understand how the tools were used. This volume also commemorates the EAIA's 50th anniversary.

Most of the articles represent substantial excavation on the part of the writer, information that would be difficult to ferret out otherwise. For instance, where else could a woodworker interested in shaping ox bows find several articles devoted to that subject? Even so, I found the diaries, letters and journals of woodworkers to be the most interesting part of the book. An 1840s diary of a New England cabinetmaker's apprentice tells of working six days a week, plus evenings, from March through September. After attending a house-raising, he writes disgustedly that he did not receive as much as a "thank you sir for it." —Roy Berendsohn

Thos. Moser's Windsor Chairmaking by Thomas Moser. *Sterling Publishing Co., Inc., Two Park Ave., New York, N.Y. 10016, 1982. \$8.95, paperback; 192 pp.*

The title of this book is a misnomer—"Chairmaking in the Windsor Style" would be more appropriate. The text starts out with a short treatise on the evolution of the traditional Windsor chair, with some restoration tips, but suddenly jumps the track and lurches into 20th-century mass production of modern Windsors. Then come short chapters on generic chair design, wood drying, wood selection, and wood bending by lamination. The section of measured drawings and photos of Moser's own Windsor hybrid designs is well done, and the last part of the book is a well-photographed look at the designs being produced at Moser's Maine shop. There is useful information here, particularly production tips, but Moser tries to cover too much ground in a short volume. —David Sloan

Provincial Furniture Design and Construction by Franklin H. Gottshall. *Crown Publishers, Inc., One Park Ave., New York, N.Y. 10016, 1983. \$24.95, hardcover; 150 pp.*

Another of Gottshall's volumes of excellent measured drawings and photos of 18th- and 19th-century American furniture, this book is a necessity for the period furniture maker. Included are 29 projects, each complete with instructions and bill of materials. Many of the pieces will challenge the advanced woodworker, particularly the slant-top desk and the large cupboards, but there are small cabinets, chests and tables here for the beginner, too. —David Sloan

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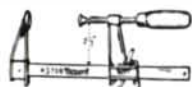
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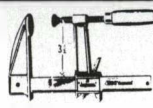
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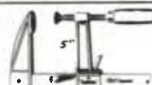
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Model	Type	Length	List	Sale
03	Smooth	9 1/2"	\$ 37.85	\$ 31.00
04	Smooth	9 3/4"	38.00	31.00
04 1/2	Smooth	10 1/4"	38.00	31.00
05	Jack	14"	48.20	37.00
05 1/2	Jack	15"	56.35	41.00
06	Joiner	18"	70.20	54.00
07	Joiner	22"	80.70	60.00

MILWAUKEE ELECTRIC TOOLS

Model		List	Sale
0222-1	3/8" Hole Shooter H.D. 3.3A	\$136	\$ 95
0224-1	3/8" Magnum Hole Shooter	144	99
0244-1	1/2" 4.5A H/Shooter 0-600	155	109
0234-1	1/2" Magnum Hole Shooter	155	109
6507	TSC SawzAll w/case	179	120
6511	2 Sp Sawzall w/case	167	117
6365	7-1/4" Circular Saw 13A	149	99
6405	8-1/4" Circular Saw 13A	167	117
6245	3.8 Amp Single Spd Jig Saw	129	91
5900	3" x 24" Belt Sander	311	218
5910	4" x 24" Belt Sander	330	229
5620	1 H.P. 8 AMP Router	215	145
5660	1.50 H.P. 10 AMP Router	239	165
5680	2.00 H.P. 12 AMP Router	299	209
5397	T.S.C. 3/8" Hammer Drill Kit	203	145
5399	1/2" 6.2A HD Hammer Drill Kit	239	169
6750-1	HD Dry/WShooter 0-4000 rpm	136	95
3102-1	Plumbers Drill Kit 500 rpm-right angle	229	171
3202-1	Plumbers Drill Kit 350 rpm-right angle	239	179
3002-1	Electricians Drill Kit 600 rpm-right angle	225	168
3107-1	H.D. Var. Speed Rev. Drill 0-500 rpm	249	186
3300-1	Magnum-0-850 Kit-right angle	235	176

HEAVY DUTY HOLE-HAWG™

Model	by Milwaukee	List	Sale
1670-1	Single Speed, 900 rpm Rev.	255	191
1675-1	Two-Speed, 1200 & 300 rpm Rev.	295	221
1676-1	Same as 1675-1 but w/steel carry case	319	239

MAKITA ELECTRIC TOOLS

Model		List	Sale
1900BW	3 1/4" Planer w/case	\$149	\$ 89
1100	3 1/4" Planer Kit	278	178
1805B	6 1/8" Planer Kit	416	285
9900B	3"x21" Dustless Belt Sander	191	127
9924DB	3"x24" Dustless Belt Sander	208	139
9401	4"x24" Dustless Belt Sander	273	179
B04510	Finish Sander, Square Base	79	49
B04520	Finish Sander, 5" Round Base	79	51
9045N	4 1/2x9 1/4" Finish Sand., Dustless	160	110
3608BK	1 H.P. Router — W/Case	128	82
3601B	1 1/4 H.P. Router	196	130
3600B	2 H.P. Plunge Router	299	190
6510LVR	3/8" Rev. Var. Speed Drill	114	68
DP4700	1/2" V.S.R. Drill 4.8 AMP	147	95
2400BW	10" Mitre Box	349	255
6010DWK	3/8" Cordless Drill w/case	148	84
4200N	4 3/8" Circular Saw	146	92
4300BV	Var. Speed Jig Saw	192	121

BOSCH POWER TOOLS

Model		List	Sale
90900	650° - 900°F H.D. Heat Gun	\$ 89	\$ 62
1581	Jig Saw, Single/Speed 3100	199	119
1581VS	Jig Saw, Var/Speed Orbital Action	219	129
1582	Jig Saw, Var/Speed Orbital Action	219	129



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Cuts 4 1/2" wide @ 90°

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6377	Milwaukee 7 1/4" Worm Drive Saw	\$220	\$139
6378	Milwaukee 8 1/4" Worm Drive Saw	235	149
7715	9" Dewalt Power Mitre Box	198	145
4015	Black & Decker Finish Sander — 4 1/2" x 11" paper size, 3 AMP, 10,000 O.P.M. — Rated for continuous production use	160	110
552	Skill 6 1/2" 10A 2 1/4 H.P. Saw	148	109
553	Skill 7 1/4" 12A 2 1/3 H.P. Saw	152	96
554	Skill 8 1/4" 13A 2 1/2 H.P. Saw	165	119
6012HDWC	Cordless 2-Sp. w/cd Drill *	164	107

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Model	SKILL	List	Sale
2011	3/8" Single Speed Reversible Drill & Screw Driver, 600 rpm	\$94.95	\$72.00



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Model	List	Box of 50	Case of 600
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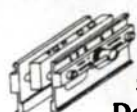
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Model: #1000

Model #2000



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Model	List	Sale
4010 Palm Grip Finishing Sander 1/4 Sheet. with Bag	\$ 73.	\$ 49.

Black & Decker Hammer Gun / Drill Model 5920

3/8" Reversible, 1850 RPM
(no load) 27,750 BPM — Ideal for
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Drill & Screwdriver

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Triple Gear Reduction. Rated for continuous
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pole long lived switches - Wt. 25 #
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Finishing Sander
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150C	100	21.00
180A	100	17.00
220A	100	17.00
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80x	1.80	10.80	48.40	80x	2.10	12.30	56.05
60x	1.85	11.10	50.75	60x	2.20	12.90	58.40
50x	1.95	11.50	51.95	50x	2.25	13.30	60.75
36x	2.10	12.30	56.05	40x	2.35	13.90	63.15
Size 3" x 21"				36x	2.45	14.50	65.25
120x	1.90	11.30	51.50	Size 4" x 24"			
100x	1.90	11.30	51.50	120x	3.35	19.90	90.30
80x	1.95	11.50	51.95	100x	3.35	19.90	90.30
60x	2.05	12.10	54.85	80x	3.45	20.40	92.65
50x	2.05	12.10	54.85	60x	3.55	21.00	95.59
40x	2.20	12.90	58.40	50x	3.70	21.70	98.55
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				36x	3.95	23.30	107.50

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Model	DRILLS	List	Sale
1180-09	3/8" VSR, 0-1200 rpm Xtra heavy duty Holgun Drill, 4.5 amp	\$129.	\$ 89.
1321	1/2" Extra heavy duty drill 6 amp — 450 rpm	167.	114.

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3036-09	6-1/2" 10 amp 5500 rpm, 11-1/4 lbs	154. 105.
3037-09	7-1/4" 11.5 amp 5500 rpm, 12 1/2 lbs	149. 100.
3038-09	8-1/4" 12 amp 5500 rpm 12-5/8 lbs	167. 112.
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3051	7-1/4" 13 amp, H/Duty 4300 rpm, 16-1/2 lbs	220. 145.
3052	8-1/4" 13 amp, H/Duty 4300 rpm - 16-3/4 lbs	233. 159.



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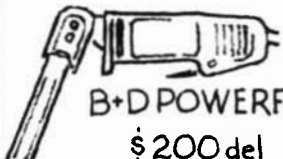
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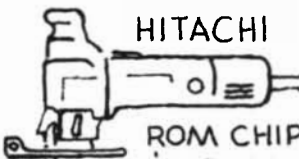
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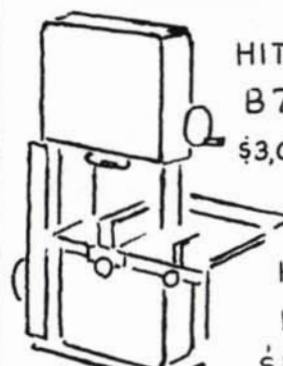
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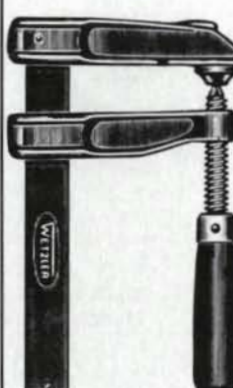
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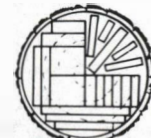
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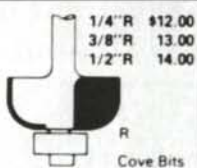
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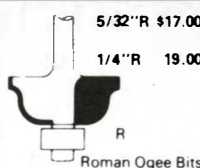
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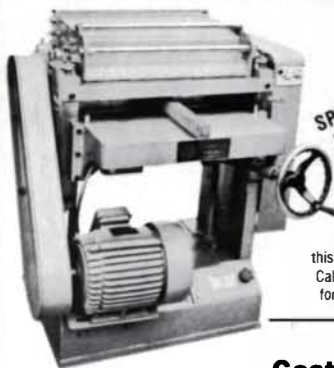
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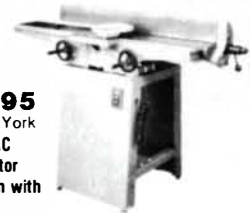
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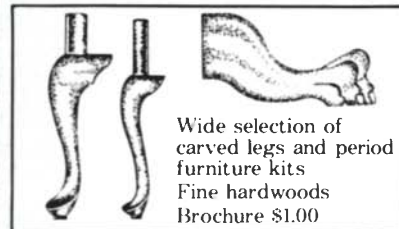
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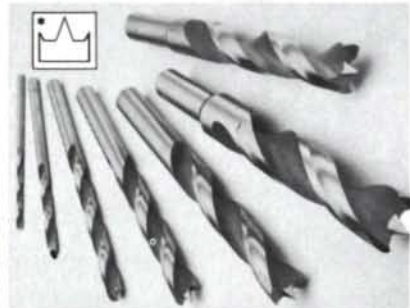
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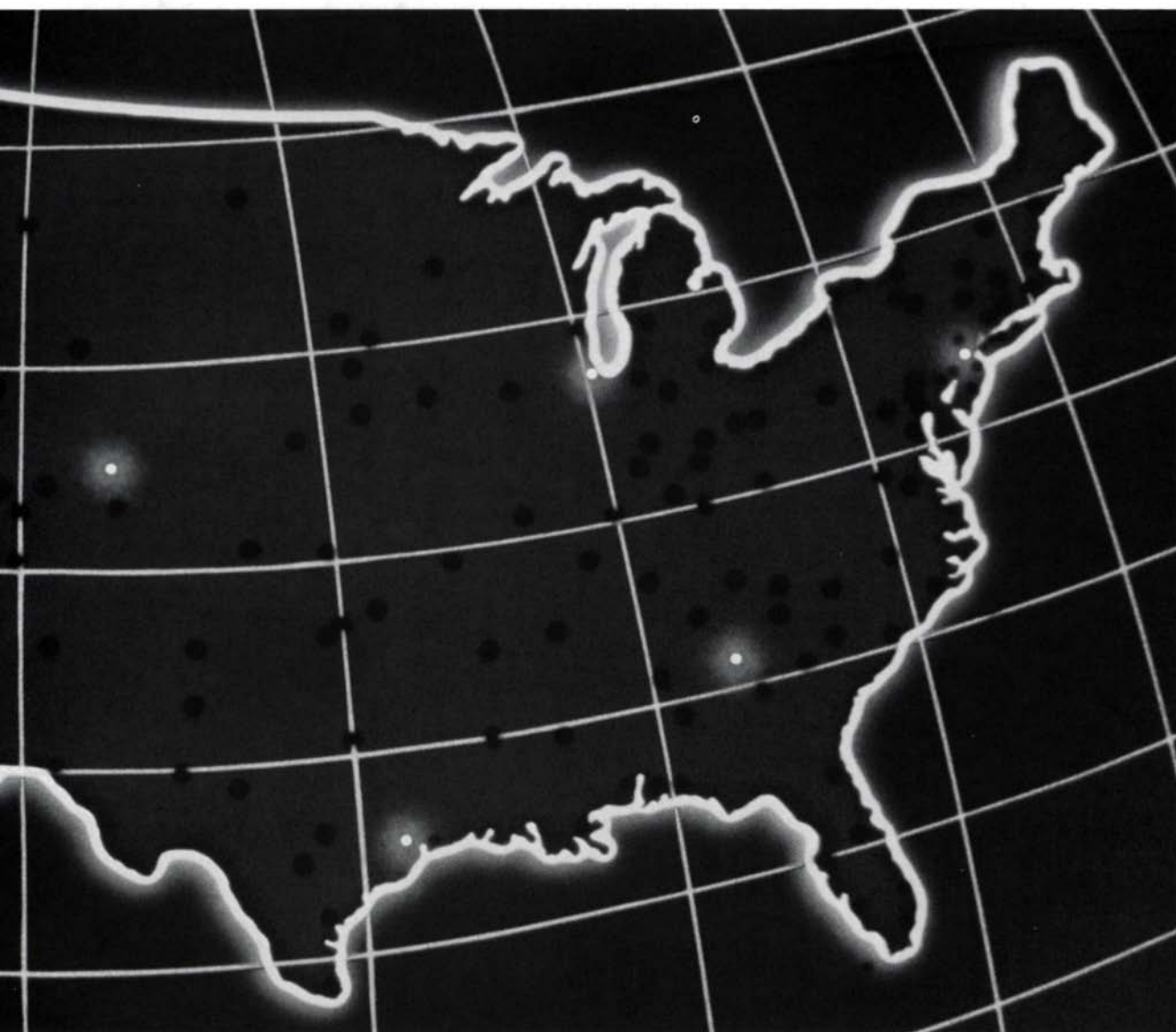
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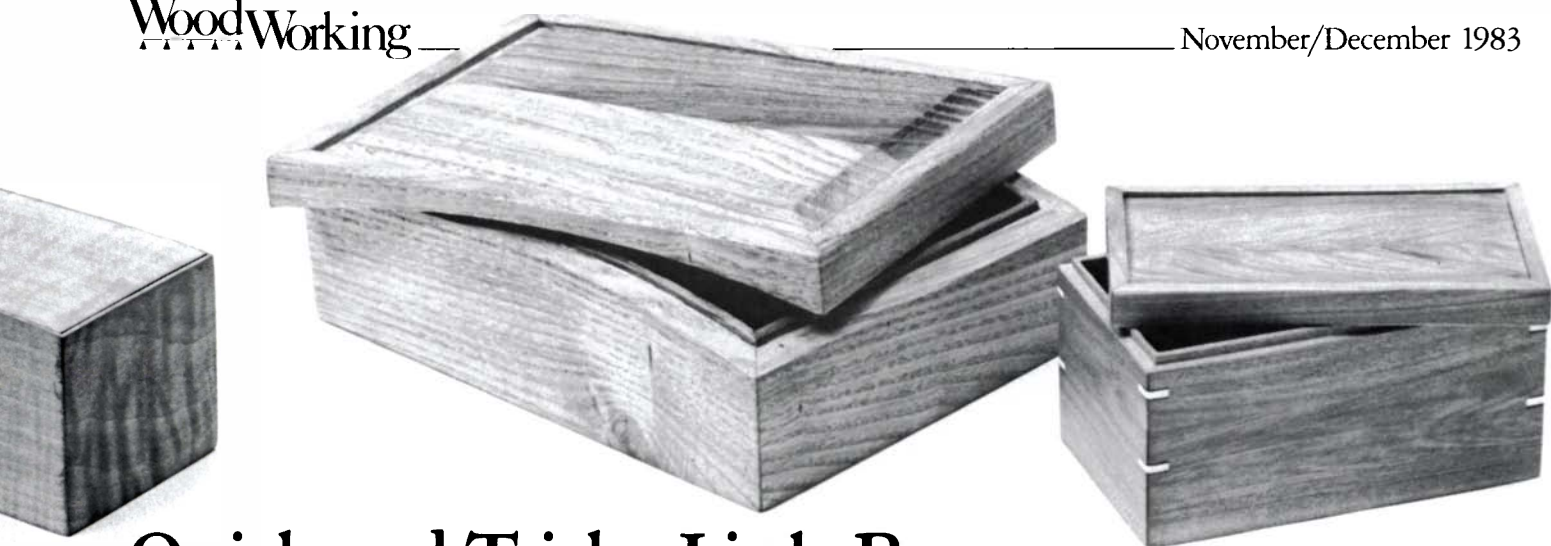


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Quick and Tricky Little Boxes

How I bookmatch scrap wood into Christmas gifts

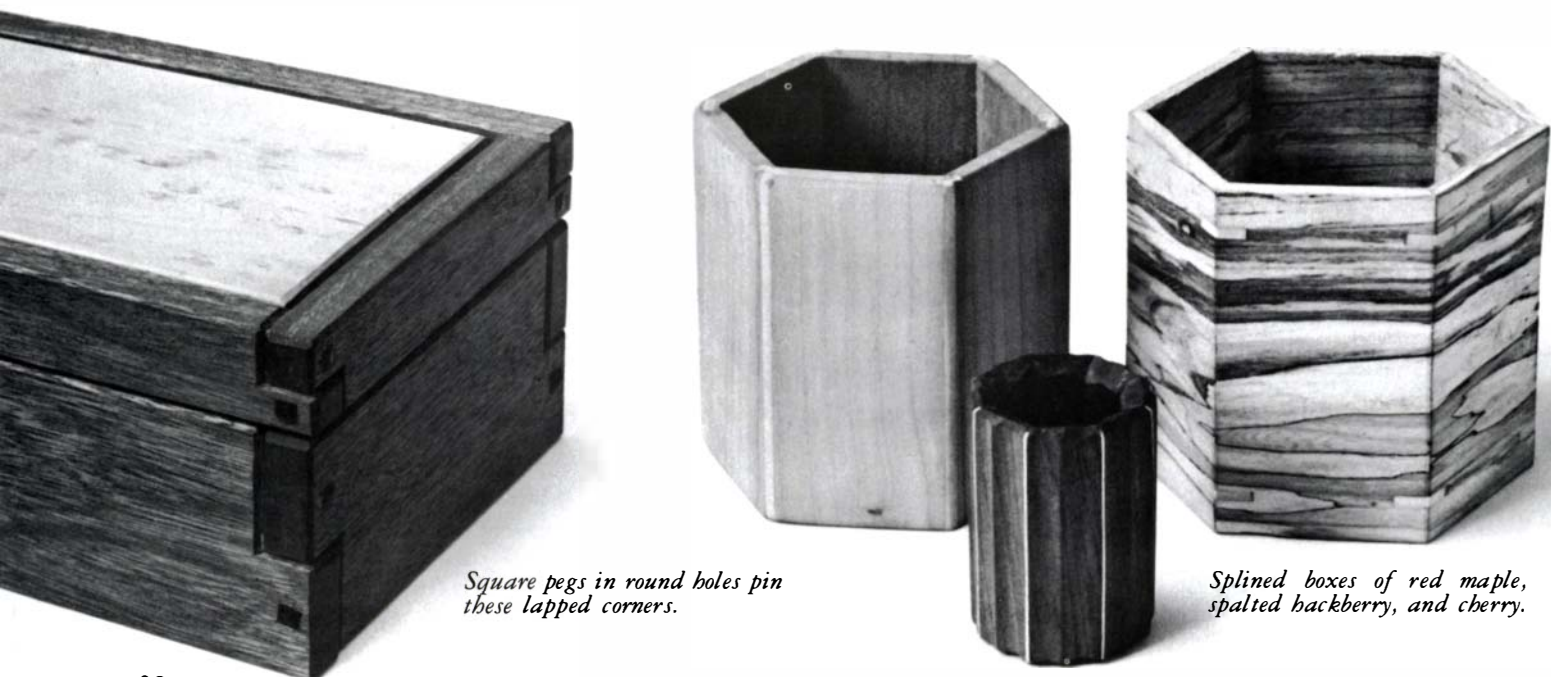
by Jim Cummins

I'm an impatient putterer with thrifty inclinations. Over the past year I've gotten a big kick out of converting my scrap pile into a bunch of Christmas presents. Inspired by Sam Bush's matched-grain box from *FWW* #32 (figure 1, facing page), I began exploring variations in the design and construction of small boxes, aiming to have fun while not making the same box twice. I ended up with a dozen variations, most of them figure-matched in one way or another, with different designs for lids and bottoms, and different joinery details. Some required a little thoughtful planning, some were last-minute adaptations based on chance, and a couple of my favorite details grew out of my efforts to fix mistakes. The elements can be combined in lots of ways, and there isn't a box here that can't be made in an hour or two, not counting the finishing, of course.

The first variation—Sam Bush's box in figure 1 comes out of a board, but my first bookmatched box, shown in figure 2, came from a walnut turning scrap about 2 in. square by 9 in. long. First I bandsawed it into four strips, and planed them smooth on both sides. On one pair of strips, I laid out the

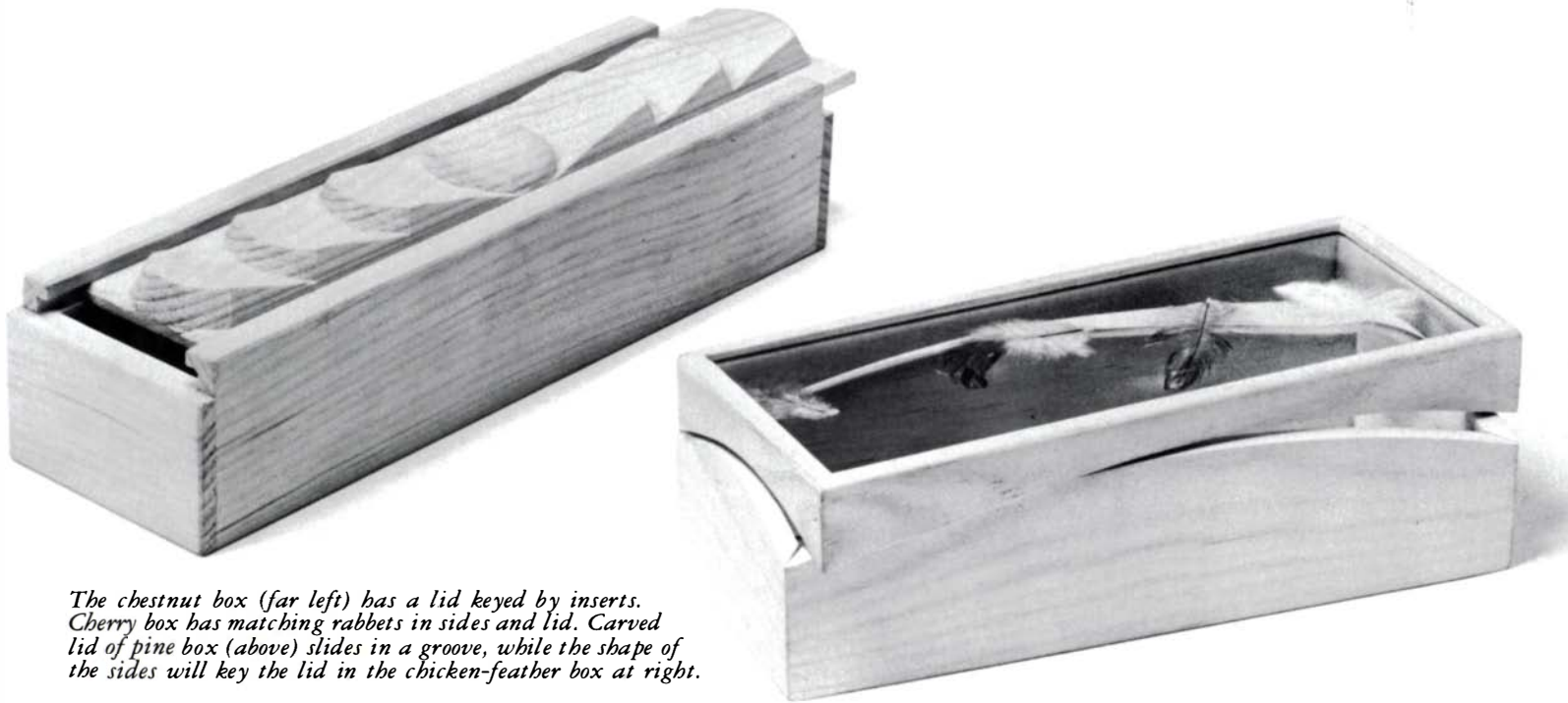
box sides and ends the same way Bush did. The other pair of strips I edge-glued, using masking tape to clamp the joint (p. 34). This bookmatched piece was as wide as the ends of the box, and long enough to cut in half to become the bottom and lid. While the strips dried, I rabbeted the top and bottom edges of the sides and ends as shown in figure 2A, then I mitered and glued them, again with tape, adding rubber bands for more pressure. While the sides cured, I rabbeted the lid and the bottom to fit into the rabbets in the sides. I glued the bottom in, using tape clamps, put the lid on and sanded the edges flush.

When I was done, I realized that I'd made three dumb mistakes. First, I hadn't examined the direction of the grain in the turning square. Bookmatching, because of the sawkerf, is never perfect, but if you arrange the grain as shown in figure 2B, it will be close. I had sawn the blank at an intermediate angle to the annual rings, which gave me pretty wood, but a poor match. My second mistake was in jointing and thickening the stock before I joined the sides. Bookmatched figure matches best right at the sawkerf, so you want to remove minimum wood from the show surfaces. I should



Square pegs in round holes pin these lapped corners.

Splined boxes of red maple, spalted hackberry, and cherry.



The chestnut box (far left) has a lid keyed by inserts. Cherry box has matching rabbets in sides and lid. Carved lid of pine box (above) slides in a groove, while the shape of the sides will key the lid in the chicken-feather box at right.

have smoothed the inside surfaces only, and waited until the box was joined before sanding the bandsaw marks off the outside surfaces. A more careful workman than I might plane both sides of the stock smooth before bandsawing, and might be sure to resaw exactly in the middle of the thickness. Then he could skim off the sawmarks before gluing up. Others might just tablesaw the stock to thickness in the first place. Since people argue about which resawing procedure wastes the most wood, I tested several tablesaw blades against my bandsaw. I found that by the time I'd planed away the bandsaw marks, I'd lost more wood than to an ordinary ripping blade. Two carbide blades—the Freud thin-kerf and the Forrest/Mr. Sawdust—left surfaces clean enough to sand.

The third mistake was the rabbet for the top and bottom: it left no allowance for wood movement. Even in this small box, the width of the top and bottom could drift $\frac{1}{16}$ in. from summer to winter, and sooner or later the glue joint would break, or the lid would stop fitting, or both. I knew all this, but I'd been too interested in the figure match to bother about it. Anyway, it is humid summer as I write, and nothing untoward has happened to my walnut box yet.

(continued on p. 35)

Fig. 1: How it all began

This simple bookmatching technique yields a box with perfectly matched grain at all four corners. The rough lumber need be only as long as one side and one end of the box, but thick enough to resaw. First resaw. The inside surfaces match, so reverse them to become the outside of the box. Cut the sides and ends sequentially, keeping all the waste to one end. To assemble, I prefer the dramatic matched effect of mitered corners, with spline reinforcements.

—Sam Busb, Portland, Ore.

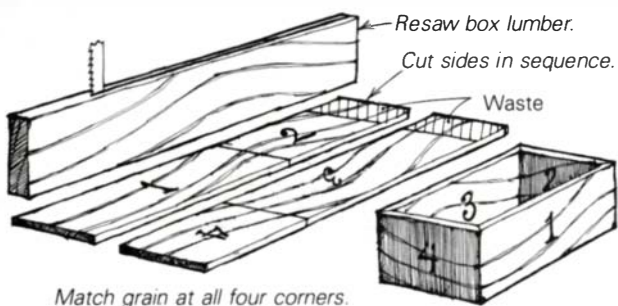
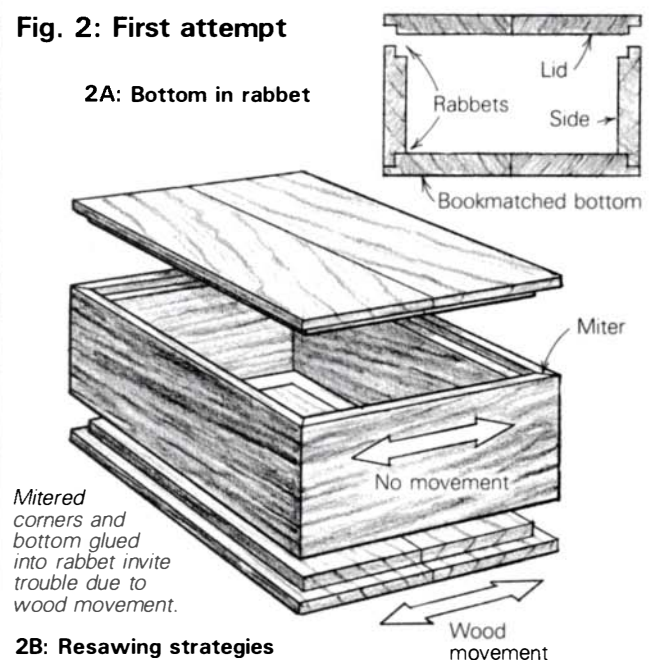
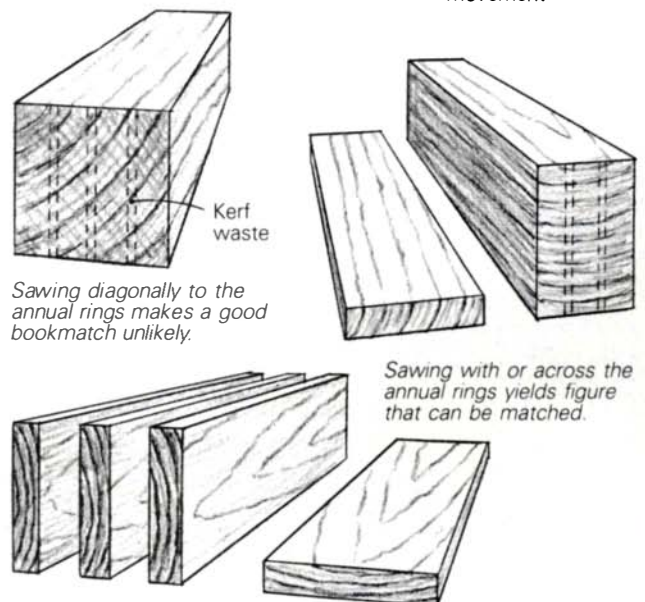


Fig. 2: First attempt

2A: Bottom in rabbet



2B: Resawing strategies



Miters, tape and glue

I use ordinary masking tape to clamp up a bookmatched panel for the lid or bottom of one of my little boxes. To glue up a box's mitered corners, I supplement the tape with rubber bands.

Before gluing up a matched panel, sand, plane or joint the good side of both pieces so that you can see the final figure. Then hold the pieces together in front of a window or a bright light, to make sure the gluing surfaces meet exactly. If they don't, plane them until no light shows through anywhere. You don't have to fret about square edges if you fold the bookmatch good-side-in, clamp the pair of boards in the vise and plane both edges at the same time. If you machine-joint, you'll get the cleanest gluejoint by skimming off the mill marks with a pass of the hand plane.

Both pieces of wood ought to end up the same thickness, but if at this stage they aren't, you'll have to take care that the good side glues up flat, with the irregularities on the back side only. To do so, lay the pieces on the bench good-side-up, and line up the figure. Run a piece of masking tape across the joint line to keep the figure from shifting. Next, lightly apply a strip of tape along the full length of the joint and flip the as-

sembly over. From the back, press along the joint to stick the tape down firmly.

Bend the joint open and apply glue. Yellow Titebond, as it comes from the jug, is formulated for filling gaps and thus is thicker than it needs to be for long-grain gluing. If your joint is light-tight, such a thick glue will leave a visible gluejoint. If you thin a tablespoonful of the glue by adding a few drops of water, it will hold better, and the joint will be invisible. To clamp the joint, run a short piece of tape opposite the first one, then similarly tape every 2 in. or so across the joint, taking care to balance the tension on both sides of the panel as you go, else it will curl. You should not need to weight the panel flat.

Miters for box sides are best cut with the wood flat on the saw table, with the blade tilted to 45° and the gauge set at 90° to the blade. I used to set the miter gauge with the aid of a carpenter's square, but a reader, Dustin Davis of Frostburg, Md., sent in a simple device (figure A) that makes the job much easier. It's a shim of 1/4-in. plastic that allows you to register the face of the miter gauge against the front edge of the saw table, which on most saws is accurately machined at 90° to the slots in

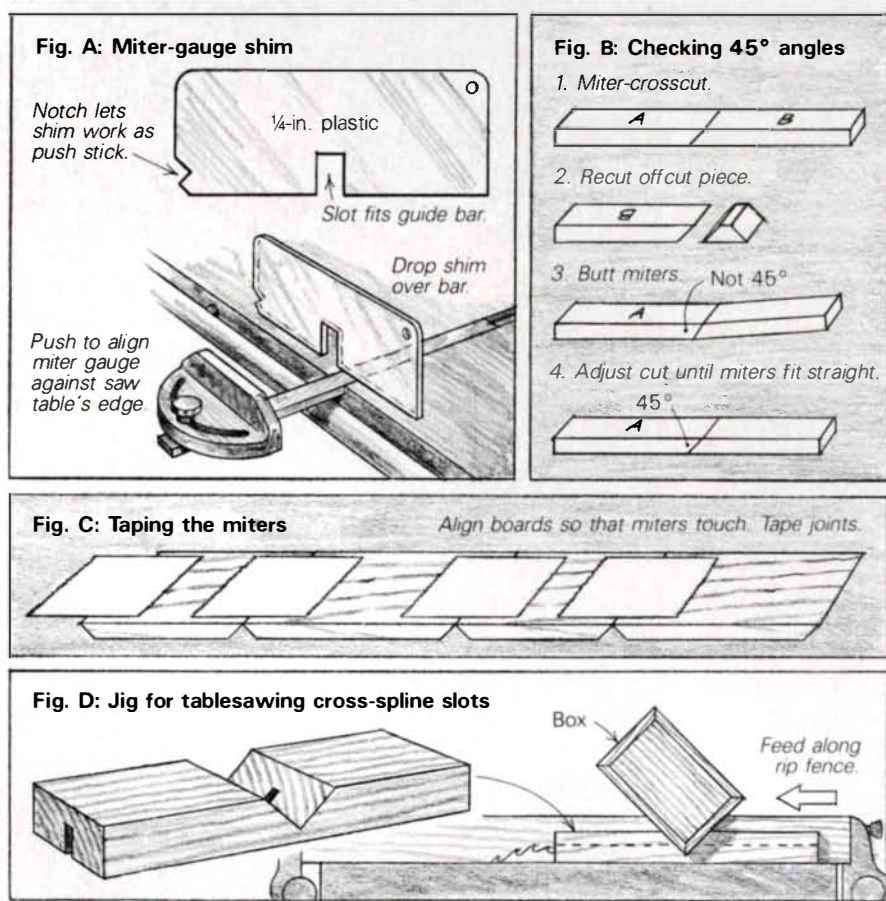
the table. Just drop the shim over the miter-gauge guide bar, push the gauge against the saw table, and tighten the knob. Some saws don't need a shim—you can just turn the gauge upside down for squaring against the table's edge.

The 45° setting is almost as easy. First, tilt the blade to a nominal 45°. To check the angle, take a straight, squared-up length of wood about 2 ft. long, and miter-crosscut it near its middle (figure B). Then recut the miter on the offcut end. Butt the mitered surfaces together and see if the wood lies straight. If it doesn't, the angle is not 45°, and the saw's adjustment wheel needs a twist one way or the other. On my saw, this trick will tell me if I'm as little as a sixteenth of a turn off. Save the test pieces. You can miter them quite a few times before they get too short.

To tape up a box, lay the sides and ends on the bench, outside up, with the points of the miters touching. Run wide tape along the length of each joint (figure C). Press down hard, but don't try to stress the tape so that it will exert pressure across the joint. Just keep the corners touching. When you roll up the box to check the fit of the top and bottom, the tape takes the long way around, automatically pulling taut.

The glued miter is strong enough for most small boxes, except when the sides are so thick that wood movement in the thickness can force the joint to open up, or so thin that there's just not enough gluing surface. To reinforce the corners, I insert a couple of cross-splines in table-sawn kerfs. I saw the slots with my sharpest rip blade (because its kerf has a flat bottom), supporting the box in a simple jig made from a scrap of 2x4, as shown in figure D. The jig runs against the saw's rip fence, and the clamping tape on the box corners is usually enough to prevent chipping.

If the miter angle is correct, you can use tape and rubber bands to clamp almost any number of sides during glue-up—one of my boxes has 15 sides. A possible pitfall: On my first hexagonal box (how I hate to admit this), I unrolled the box and put glue in all the joints, but I forgot to glue the miters at each end, leaving me one joint completely unglued when the tape came off. There might be a plus in that experience some day: If I'd left two joints unglued, the box would still have gone together fine, but later I would have been able to remove one side, and I probably could have figured out some way to make a sideways lid out of it. —J.C.



Coping with movement—In the next box, I made room for both the lid and the bottom to move (figure 3). I used some bird's-eye maple picture-frame molding, which was barely thick enough to yield $\frac{3}{16}$ -in. thick strips for the sides. I ran the rabbet for the lid and the groove for the bottom, cut the miters, and taped the corners together without glue. Then I cut the bottom and top to fit. I removed the tape from one corner of the box and unfolded the box flat on the bench. I applied glue to the miters, fit the bottom into its groove without glue, and rolled the box up tight, taping the last corner.

Because the sides were so thin, I felt I should reinforce the glue joint at the corners. So while the glue was setting, I grabbed a 2x4 scrap and made a jig (facing page) for sawing a couple of slots for cross-splines through each corner. Then I puzzled over what to do about the lid. As things stood, there was no way of getting it out of its rabbet, short of turning the box upside down.

I debated drilling a finger hole through it, but then remembered that Desmond Ryan (*FWW* #33, pp. 59-65) had worked out a lever-action lid with a built-in fulcrum. If you pressed one corner of the lid down, the other end would rise out of its rabbet. I used the same idea, and the relief cuts turned out to be decorative as well. To make them, I raised the tablesaw blade $\frac{3}{8}$ in. above the table, and clamped a stop to the fence at about the location of the arbor. Feeding with the stock faced against the fence produced the curved shape, which is simply the profile of a 10-in. sawblade. I cut the detail on both ends and both sides of the lid, so it fits and works no matter which way around it's put (figure 3A).

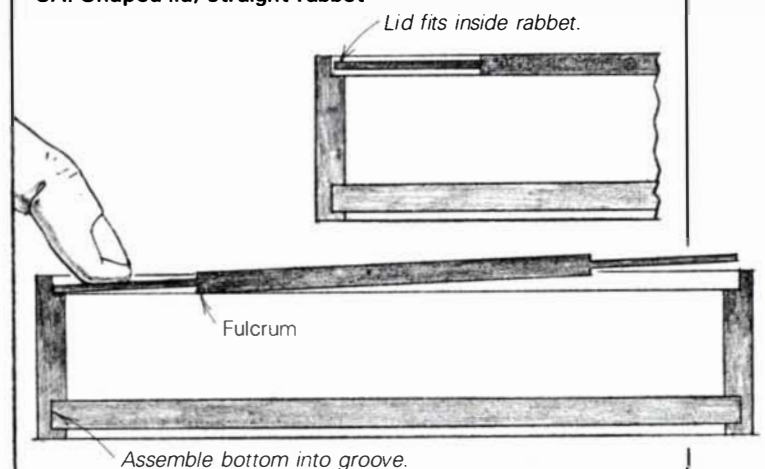
Two other variations of the lever-action lid are also shown in figure 3. In 3B, the fulcrum is built into the rabbet instead of the lid. Make the relief cuts on the tablesaw before the box is joined, and be sure to relieve the ends as well. In 3C, the fulcrum is in the lid, but it isn't obvious. The lid is symmetrically tapered on both faces of both ends, so that it fits either way, and the projecting lip of the rabbet is shaped to conform to the lid's curve.

It can be perilous to tablesaw box-sized pieces of wood, if you don't take precautions. When you're resawing or making relief cuts, the stock might slither down beside the sawblade, which you can prevent by making a new, tightly fitting table insert. Bandsaw the outline from $\frac{3}{4}$ -in. plywood, file or sand it to a good fit in the saw's throat, shim it (or relieve it) so that it sits flush with the table, then raise the blade through it to cut a snug slot. When ripping small pieces to width, be sure that the bottom of the fence is tight to the saw table, otherwise the work can slide under it and bind. Small pieces are notoriously prone to catch and kick back, so push sticks are essential. My favorite is a sharp ice-pick. With it you can hold the work tight on the table at the same time as you feed it forward. Strive to keep the work moving steadily through the blade, to avoid blade-marks and burns.

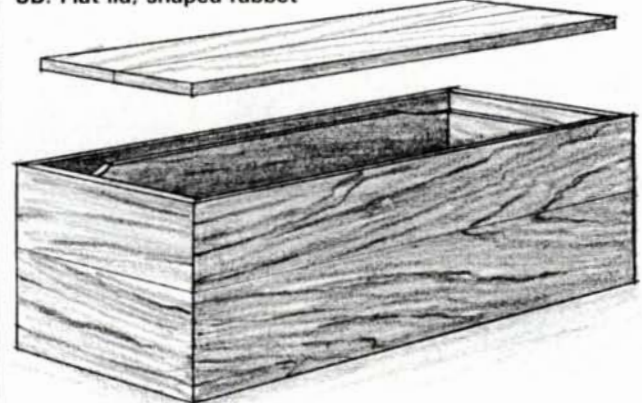
Frame-and-panel lids—Another type of lid that accommodates wood movement is the frame-and-panel assembly, essentially what I used for the bottom of the box in figure 3. Here are a couple of ways to secure such a lid without hardware. The little cherry box shown at the top of p. 32 has a rabbet in the lid that fits over a matching rabbet in the box. In a large box, it's easy enough to cut the rabbet in the lid before it is joined up around its panel, but in a small box the lid pieces are tricky to handle. It's better to glue up the whole

Fig. 3: Lever-acting lids

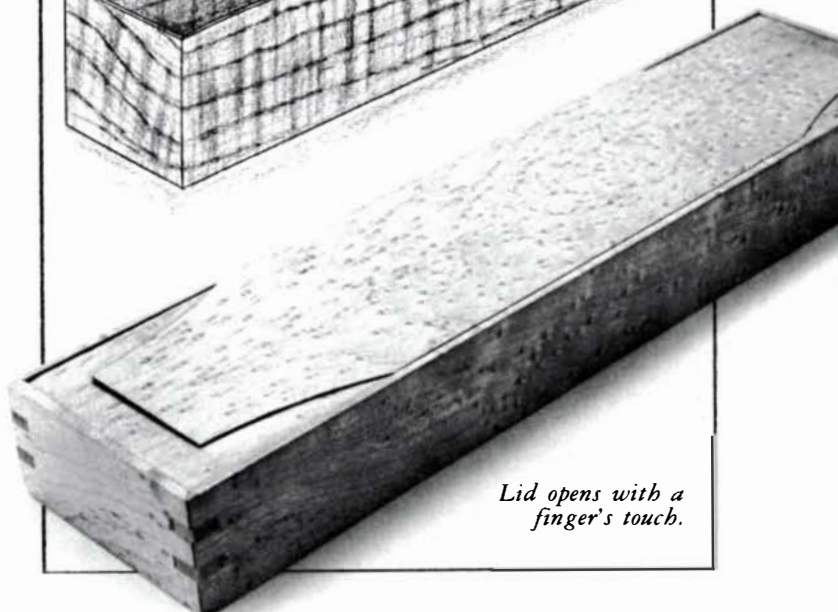
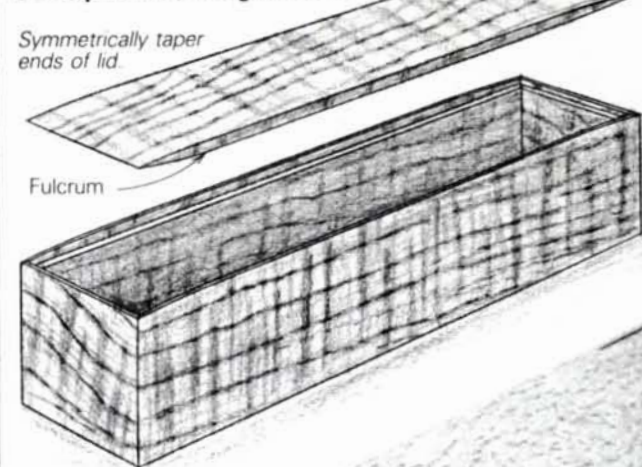
3A: Shaped lid, straight rabbet



3B: Flat lid, shaped rabbet

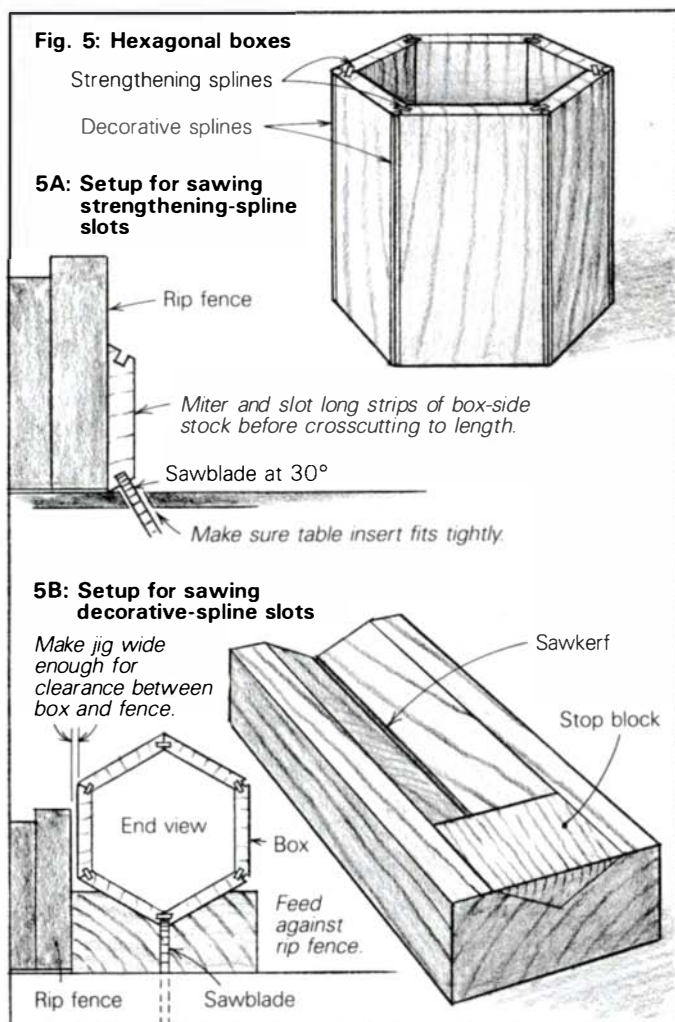
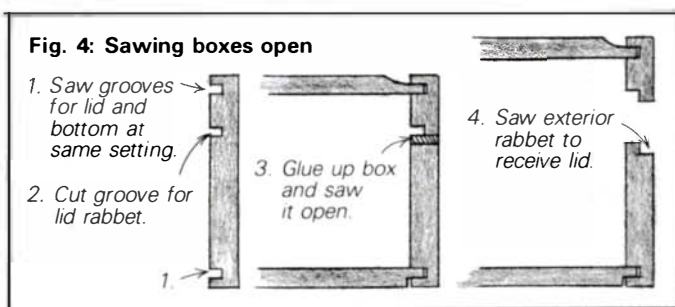


3C: Tapered lid, straight rabbet



box, then cut the lid off later, complete with rabbet.

The procedure, as shown in figure 4, is to groove the inside of the box at three places—top (for the panel in the lid), bottom (for the box bottom), and along the lid's rabbet line. Join up the box, then after the glue has set, cut the box open to leave the rabbet in the lid. Finally, run the box part over the tablesaw to make the exterior rabbet that receives the lid. By varying the width and depth of the cuts, this method can be generalized up to blanket-chest size, where it ensures that box and lid are not only figure-matched but also the same size. Some people find it most efficient to saw the groove for the exterior rabbet in the box sides before glue-up, while the square-bottom grooving blade is on the arbor. This saves a blade change, and also leaves no doubt about where the lid begins and ends when you saw the box open. Allow for the box-opening kerf when you lay out the grooves. If you use the tablesaw to separate the two pieces, cut one side at a time, and shim each kerf open before cutting the next, to keep the box



from closing and pinching the sawblade. If you handsaw, first scribe a line all around the box with a sharp marking gauge.

Frame-and-panel lids don't have to be straight. The chestnut box shown on p. 32 was cut open in a curve on the bandsaw. To form the lip that secures the lid, I inserted false sides in the box, then trimmed them to conform to the curve. Of course, false sides work just as well in a box that's been sawn open on a straight line.

In any frame-and-panel design, whether for a box lid or a piece of furniture, the way the edge of the panel is shaped affects, even determines, the look of the piece. Some of the options are considered on the facing page.

Hexagonal boxes—A dead hackberry tree yielded such strikingly spalted wood that I thought I'd try matching the corners all around a hexagonal box (p. 32). The method works just like Bush's, except that you lay out the box to get three equal sides from each half of the resawn blank's length. In my box, because the pattern in the wood ran at an angle, each sawcut threw off the match a little bit. As I taped up the sides, I found that I could accommodate the loss by shifting each side upward in order to align the figure. This trick finally caught up with me at the last corner, which ended up being not a good match at all.

When the box's top and bottom edges had been trimmed straight on the bandsaw, I removed the tape at one corner, unrolled the box flat, and tablesawed a groove for the bottom. I had no hackberry left, so I made a glass bottom instead: I rolled up the box dry, traced its outline, laid a piece of glass on the tracing, and cut out a hexagon, allowing for the depth of the groove. The glass hasn't broken, even though this box does daily work holding pens and pencils. I've since added cross-splines to each miter joint, because spalted wood cut $\frac{1}{4}$ in. thick needs all the help it can get.

In another box, shown in figure 5 and on p. 32, I planned to put lengthwise splines in the miter joints, both for strength and to make a pretty detail at the top rim. The box went together dry, but when I added glue, the splines swelled and forced open the joints at the outside corners. As I strained to get the joints tight, I became covered with slippery glue squeeze-out, masking tape and rubber bands, but I knew that if I tried to retreat, the mess would be even worse. I clamped up as well as I could and hoped for the best.

The corners dried open, but the splines were holding the box sturdy and tight. I rescued it by making another 2x4 jig (figure 5B), this one oriented to run a sawkerf the length of each corner. With the second round of splines in place, the box looks as if I'd planned it that way. For thin splines, such as in the little cherry box shown on p. 32, you can kerf the corners on the bandsaw—no jig necessary.

A self-keying lid—While I was making the chestnut box with the false sides, I noticed that the top automatically aligned itself in one direction because of the crown in the bandsaw cut. I reasoned that if I could get the crown on both the long sides and the short sides (pine chicken-feather box, p. 33), the top would align without my having to insert false sides. This meant that I would have to make the bandsaw cuts before the box was joined.

I resawed a piece of #2 common pine, about 3 in. wide and 14 in. long, then cut the sides to length, matching the grain the way Bush did. Then I ran a groove for the top and

bottom. Next I bandsawed a curve on each side, taking care that adjoining cuts would meet at the box's corners.

The marks from the bandsaw blade were very obvious, but planing or sanding the edges would have altered the fit of the lid. Instead I ripped thin slivers of pine (half the thickness of the bandsaw kerf) to mask the rough edges on both the lid and the box. I glued the edge-banding in place before I mitered the corners, using tape for alignment and a vise for pressure. Because all four sides were the same height, I could glue up the first side, clamp it in the vise, then simply add the other sides to the stack as I got them ready.

While the stack was in the vise, I cut a mirror for the bottom and a piece of old picture glass for the top. The picture glass was so thin that it rattled, but, luckily, two pieces

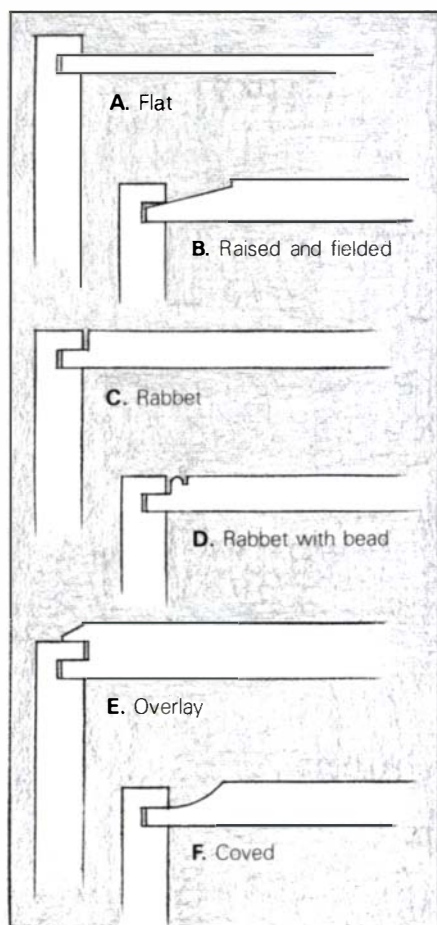
filled the kerf perfectly. To add some decoration, I stuck a few chicken feathers between the panes.

If I were making this box again, I'd do a couple of things differently. It is almost impossible to match the figure around the corners and match the bandsaw cuts as well. I'd forget about the figure, and concentrate on matching the bandsaw cuts—they're more important. Also, I'd seal the edges of the double glass with clear tape before I slid it in. When I sanded the resaw marks off the outside of the box, dust worked between the pieces of glass and muddied the clarity. I'd also take the time to catch a clean chicken, rather than just picking up any old feathers off the floor. □

Jim Cummins is an associate editor at Fine Woodworking.

Panels for lids

The simplest way to fit a panel into a frame is to make the groove the full thickness of the panel (A). In large-scale work, this has the drawback of requiring that the panel be very thin, or that the frame be weakened by a wide groove. So, usually, a panel is made thick enough to be stable, and then its edges are thinned down so that it fits a narrow groove in the frame. This process is called "raising" the panel, and it leaves a raised "field" in the center.



There are innumerable ways to raise panels, each with a different look.

For the little boxes in this article, treatment A succeeds because the pieces are so small that strength and stability aren't a factor. Also, the plain, flat panel doesn't interfere with your efforts to bookmatch the wood's figure.

In B, the edge has been tapered down and the center field defined by a little vertical shoulder, the traditional form of the frame-and-panel. In C it has been rabbeted, so seasonal wood movement will show up as variation in the width of the space between frame and field. The bead at D is an elegant touch that tends to conceal seasonal movement in the panel's width. It can be routed, but is easily hand-worked with a homemade tool called a scratch-beader (*FWW* #11, p. 60). The overlay panel at E conceals any evidence of wood movement. You can run the cove at F against an angled fence, cautiously raising the tablesaw blade a little on each pass until you reach the depth you want.

Where you make the groove affects how much the panel is raised. The top groove, if near the edge, can raise the panel higher than its frame (F), which looks fine on the lid. But if the same spacing were used for the bottom, it would cause the panel to project too far—you want the box to rest on the edges of its sides, not on the panel's raised field. You can also shape the edges of the frame to complement the treatment on the panel itself. Such details can be delicate on the lid, but shouldn't be too fragile if on the bottom or they may break off.

All these variables are easy to work into the design if you plan ahead for them—many require just a single pass over the tablesaw. If you wait until the box is glued up, however, trying to add even a simple detail may very well tax your patience.

—J.C.

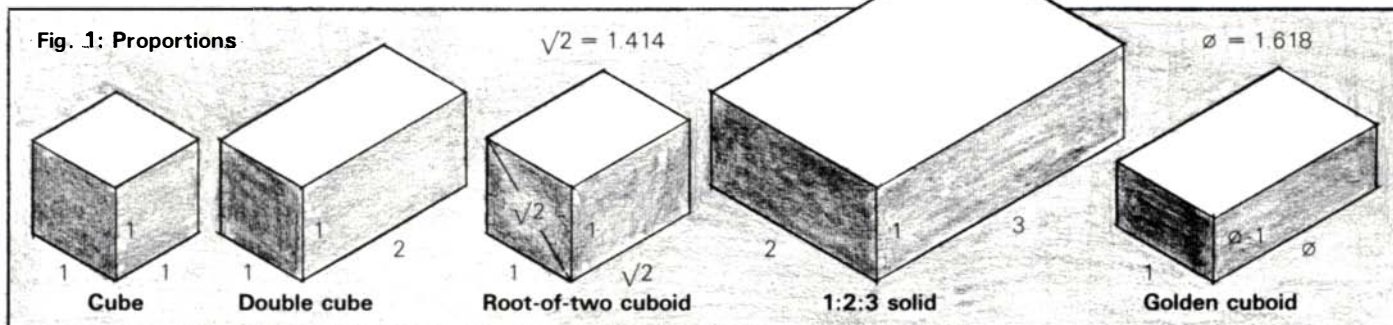
Starting and finishing—thoughts on design

by John Kelsey

A box is only a box. Still, there is an infinite variety of rectangular wooden boxes. What makes one simple box different from another? Three general considerations are the size and proportions of the overall form, the way the surfaces are decorated, and the detailing at corners and edges. These outline a rich universe of design possibilities.

The size and proportions of the boxy form often grow logically from function: what has to fit inside? Just as often, however, the box is being made simply to have a box, perhaps for a gift, and because *here's* a good-looking piece of wood. Some people have an eye for proportional harmony and somehow know when the components are long enough, wide enough, high enough. Other people prefer to devise some proportional scheme, instead of choosing dimensions at random or defaulting to the largest pieces possible within the given plank.

I like to think of proportion as the visual analog of rhythm in music. We see harmony in dimensions that interrelate. Perhaps we subliminally measure, by subconsciously comparing the time it takes the eye to traverse adjacent edges. As in music, simple proportional schemes are usually pleasant (figure 1, p. 38). But the very simplest, the cube, is dull as drumming until you embellish it. The double cube and the root-of-two cuboid are interesting; so is the 1:2:3 proportion. Whole volumes have been written on the intricacies of the golden

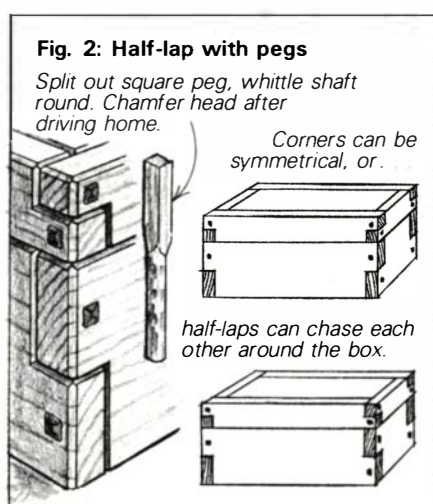


section: the division of a line into two parts such that the smaller part is to the larger as the larger is to the whole. It gives rise to the "golden cuboid." Many people think this looks just right, and its proportions are often rediscovered by artisans working entirely by eye.

"Surface decoration" usually means a design imposed on the form, worked out in paint, carving or inlay. But book-matched wood figure is also surface decoration. The woodworker perceives and enhances what grew in the tree, instead of laying on what's seen in the mind's eye. A featureless corner joint, such as the splined miter, doesn't compete with the main attraction.

With woods that don't have flashy figure, we can play up corner joinery and tooled edges. Even people who shudder at glued-on gee-gaws can usually accept the decoration of careful joinery, because the joint isn't an afterthought, it holds the box together. The half-lap with square pegs shown in figure 2 requires only the ability to saw on a line. The pegs are split out square and whittled round for half their length, then driven with glue into round holes. Decorative nails would do instead. The cleanest edge treatment is probably a bold chamfer, straight off chisel and plane.

The dovetail isn't the most difficult joint, but non-woodworkers don't know that, so it can make a small box into a real show-off. Dovetailed boxes with



paneled lids are customarily made closed and then sawn open, as shown in figure 3A. The grooves for lid and bottom usually exit through the sockets of the pins pieces, but they must be shaped in mid-tails, else a hole will show. Grooves are easy to stop when routed; if you tablesaw or hand-plane the groove, you can't make it stop, but you can whittle a peg to fill the hole. If your eye sticks on pegs and half-pins, chisel neat end-miters instead (figure 3B).

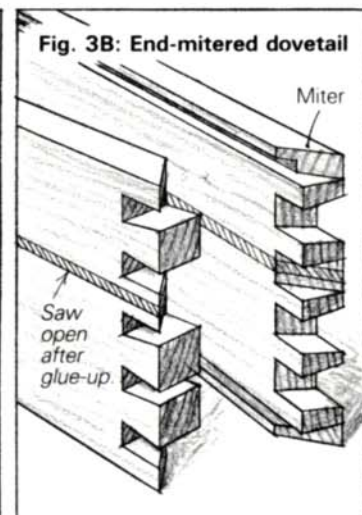
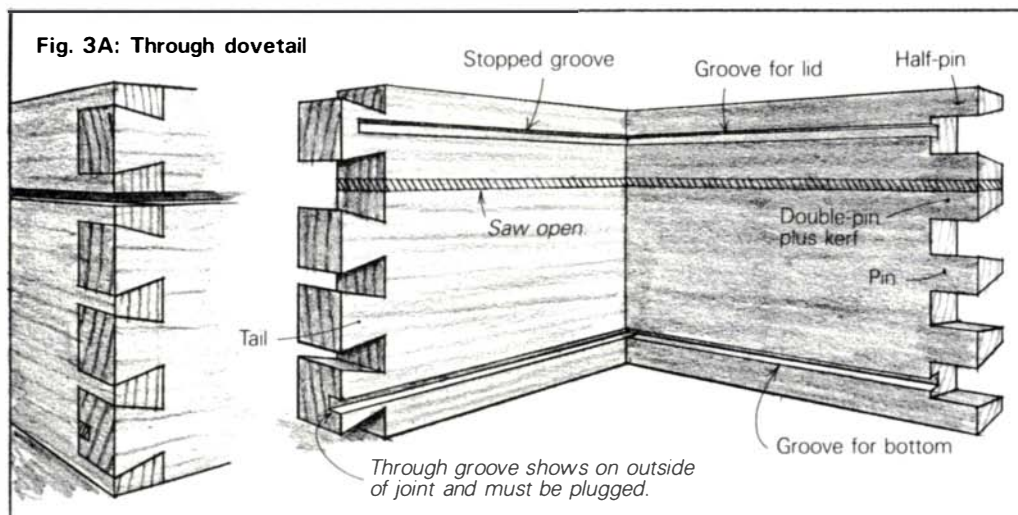
Antique dealers sometimes import veneered boxes from England. The best ones are dovetailed hardwood under the veneer, although most are made of pine joined by miters or rabbets, glued and nailed. Some boxes might even have se-

cret mitered dovetails, who can say?

When a box's reason for existence is its pretty wood, the quality of the finished surface is important. Varnish is too coarse and plasticky for little things. Bookmatched wood that's been planed smooth shows best under a glossy penetrating oil finish such as Minwax natural oil, a thin formula you have to build up and rub out hard. But it is an unforgiving finish, emphasizing flaws as much as beauty, and a waste of time if you've sanded your boxes, as grit and dust just muddy the oil's clarity. Watco Danish oil, McCloskey Tung-Seal and Minwax Antique oil complement sanded wood. They dry to a satin gloss when rubbed, and two coats are usually enough. Avoid linseed oil unless you want to smell it every time you lift the lid.

Oil finishes are no good for soft, absorbent wood or any wood that has spalted, because the oil soaks in, it takes forever to dry, and you have to apply so much to build up the finish that you'll bury the figure. One answer is a brushing lacquer such as Deft. Dense woods such as rosewood can take a high-gloss oil, but for best results you ought to fill the open grain. An alternative is a single coat of paste wax, buffed.

Finally, there's always no finish. Like a tool handle, small boxes acquire a nice patina from use. If what I'm calling "patina" looks like dirt to you, a light sanding will renew the wood. □



Splitting Out a Firewood Tote

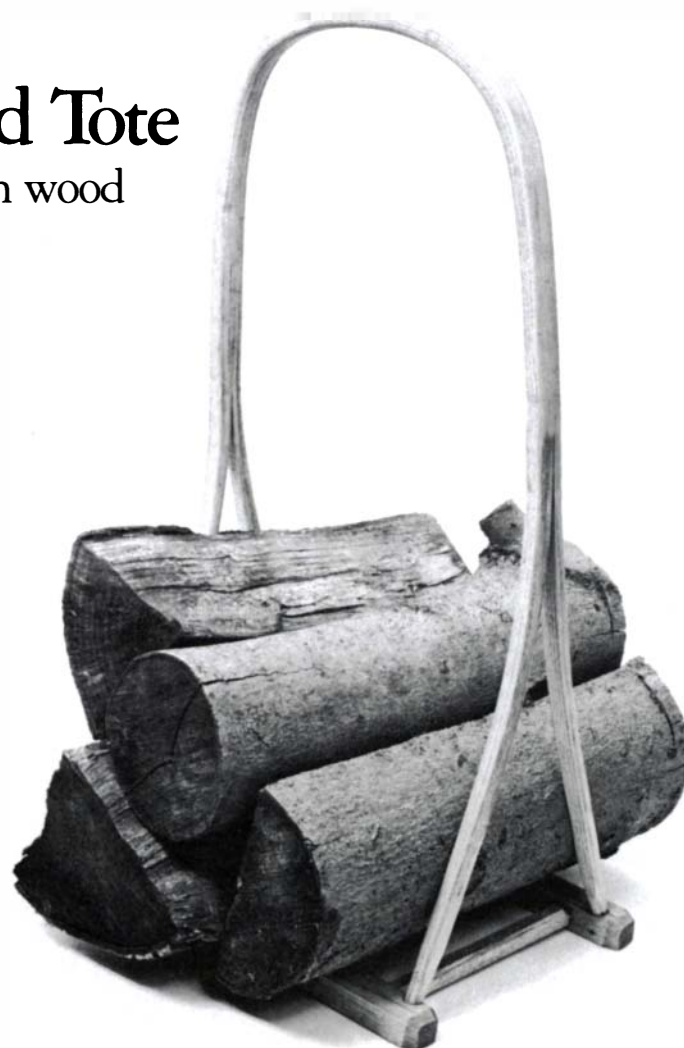
This project gets you started with green wood

by Wayne Ladd

The first time I met Vermont chairmaker Dave Sawyer, he was sitting on a shaving horse making a pitchfork. The only sounds were the creaking of the horse and the hiss of his drawknife. Having played at woodworking myself, I looked around the shop for the familiar router, bench saw and jointer, but saw only bits, braces, hand planes and, against one wall, a fine bench. Sawyer asked if I knew of any ash trees for sale. As it turned out, a huge, straight ash had blown over on my land. The following week, wedges in hand, Sawyer came over to split the trunk. We carried the splits to my car, then to his shop. The next day, I was amazed to find that he had a pitchfork made from my tree.

I was so impressed with Sawyer's skill and practiced eye for simple, sturdy woodworking that I spent the following year as his part-time apprentice. One of the first projects I learned was the log carrier shown here. Though the graceful bow gives the tote a fragile look, I've discovered that it can carry more wood than I care to heft at one time. And you can wrap twine around the foot rails and hang it from a rafter to make a wonderfully sturdy indoor child's swing.

Splitting green wood—Making the log carrier from riven green wood affords some important advantages over sawn, kiln-dried wood. First, you can go straight to your woodlot, fell a tree, and then split, shave and assemble it into a finished product, all in a matter of hours. Split along the grain instead of being sawn across it, riven wood is stronger than sawn wood, and satisfyingly easy to cut, bend and shape while green. You don't have to glue your projects together, either. Whittled tenons, dried over the woodstove, slip into mortises bored in wet wood, where they swell and lock the joint. For working green wood, you'll need two steel wedges, a mallet and a froe for splitting. A drawknife, spokeshave, brace and bit, and shaving horse complete the toolkit. For a shaving horse design, see the box on p. 41.



Green-wood tote holds all the wood you want to carry.

I use white ash for my carriers because it's the best bending wood that grows on my land. Hickory and oak also bend well. Whatever wood you choose, it should be straight-grained. Read the bark. If it's free of swirls and scars, chances are the wood will be the same. A 5-ft. log, 6 in. in diameter, will provide enough wood for a dozen carriers.

Quarter your log by first driving a wedge into one end and then leapfrogging the wedges up the side. If you've got a big log, split it into eighths. I use wedges only to get the log into manageable splits or bolts, which I then carry to the shop, where I split the parts closer to the final size with a froe. You'll need a brake—a mechanism that props the bolts at about 35° from the vertical for froeing. The crotch of a fallen tree or two heavy logs adjacent to each other make a suitable brake. Work with the bolt angled toward you.

Learning to froe is easy if you remember that this tool doesn't cut the wood, but rives or splits it along the material's natural fibers. Start the froe with a wack or two from the mallet. Then set the mallet aside, and continue the split by alternately levering the fibers apart and advancing the tool into the split. Split the unusable heartwood off the point of the quarter first. Then follow the sequence shown in figure 1, splitting in halves so that an equal amount of wood on each side of the froe will keep the cleave going straight down the length of the bolt instead of running off and exiting where you don't want it to. If the split does run out, put the heavy side down, and with the heel of your hand, put weight on this side of the split only. This will make the heavier half "give up" its grain. You can tell by the sound whether you

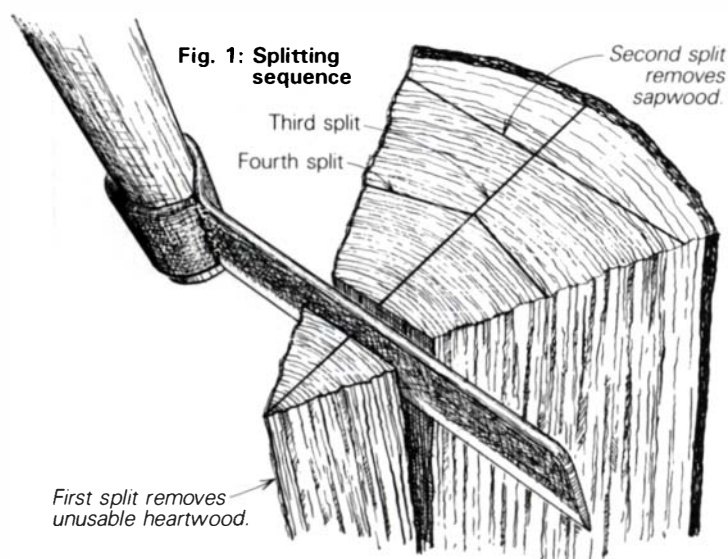


Fig. 2: The five parts of a tote

Overall length of bow is 57 in.

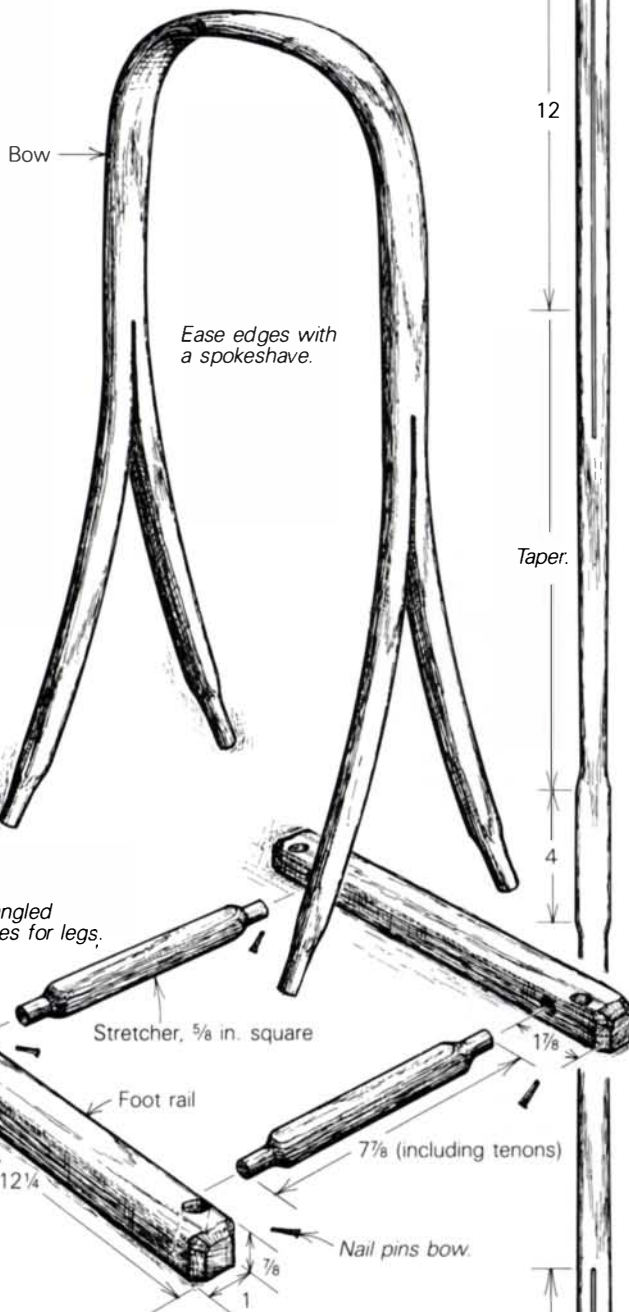
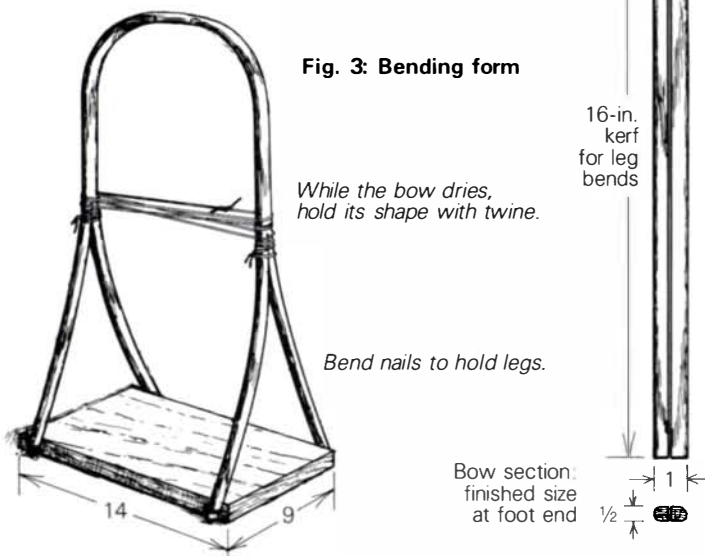


Fig. 3: Bending form



are following the grain. If it goes *tic, tic* and gives a little at a time, you're on. When it sounds like a branch breaking, it's jumping the grain and you need to straighten it out.

Make your rough splits $\frac{1}{4}$ in. oversize in section; you'll be shaving them down to finished dimensions with the drawknife. The bow will be steam-bent later, so keep grain direction in mind. Whether the growth rings are radial or tangential to the bend is up to you. I prefer a tangential split—it looks nicer and it makes it easier to follow the grain.

Drawknifing to size—Now the pleasant work can begin. Clamp the bow in your horse and shave one face smooth with the drawknife. Shave with the grain as much as you can and watch for tearing. You may not be able to read the grain, but your drawknife will. Downhill, the cut will be deliciously smooth; uphill, the knife will dig in. Pull in long, even strokes, sliding the drawknife sideways as you go. If you're doing it right, the slicing motion will peel off long shavings of even thickness. On each piece, smooth one face first, then square up an adjacent edge and shave the opposite face and edge to yield the finished dimensions. It's the same order of cuts you'd follow using a jointer, tablesaw and thickness planer. Keep the rails in a cool, damp spot so that they'll retain enough moisture to swell the tenons later. Dry the stretchers and the bow over a woodstove.

Define the handle's shape with graceful, $\frac{1}{8}$ -in. radius scallops on each side. By using the drawknife with the bevel down, you can control the depth and the shape of the scallop. Otherwise, the knife will want to dig in. Starting about 12 in. from each end of the bow, drawknife a taper toward the handle, as shown in figure 2. Also, hollow the inside (compression side) of the bow a little, maybe $\frac{1}{16}$ in. at the handle tapering to zero about 19 in. from each end.

Shape the handle to your liking, then ease the edges of the bow, rails and stretchers with your spokeshave. Finally, with a handsaw or bandsaw, rip 16-in. long kerfs at each end of the bow so that it can be wishboned into the rails after steaming.

My steamer is a stainless steel tube capped at one end, half filled with water and placed in the firebox of my woodstove. Any steel pipe or even an old steel drum will work. While the bow steams, make up the simple bending form shown in figure 3. It should be constructed to overbend the leg splits a little so that they'll have to be sprung back in to fit into the rails. This tension will stop the legs from splitting further.

With gloved hands, remove the bow from the steamer and limber up the bends by forming them over your knee. First put bends on each side of the handle about 4 in. from the center. This creates a bow with two "shoulders" rather than one that's a perfect half-circle. After you've defined the shoulders, bend the bow like Superman would bend a bar of steel. Make adjustments where needed—the handle has to look right, and you can't change the bend when it's in the form.

To keep the wood from splitting as you limber the leg bends, clamp the top of the kerf in your shaving horse and flex the legs into a graceful sweep from a point $1\frac{1}{2}$ in. below the end of the kerf. Watch for kinks. A couple of turns of twine at the end of the kerf will keep the split from advancing when you release it from the shaving horse. Put the bow in the form and pull its sides in with a twine wrap.

Assembling the carrier—I assemble the stretchers to the rails after first whittling $\frac{5}{8}$ -in. long by $\frac{1}{16}$ -in. diameter tenons at

the ends of the stretchers. Trim the tenons for a squeaky-tight fit in a test mortise bored into scrap. To avoid splitting out the mortises, flatten the top and bottom of the tenon with your knife, bore the mortises in the rails and then tap the pieces together. The dry tenons swell, so I don't use glue, but if you feel that this is tempting fate, use some.

The legs fit into angled mortises bored through the rails. I eyeball the angle by clamping the base assembly in my vise, boring $\frac{7}{16}$ -in. mortises from the top inside corner of each rail with a brace and bit. The mortises should be located about $\frac{7}{8}$ in. in from the end of each rail. I angle the brace so that the edge of the mortise will exit about $\frac{3}{16}$ in. from the outside bottom edge of each rail. Just as the point of the bit breaks through, I withdraw it and complete boring from the bottom up. This eliminates splintering.

Before you whittle the tenons on the bow, it needs to be cleaned up with a scraper. Any splinters or hairline cracks in the bends will show up when you put a finish on, so examine the bow closely. To trim it, I stand it on the bench between two sticks clamped $8\frac{1}{4}$ in. apart. Nails driven into the sticks stay the bow while I stand back and take a look. If the bow

appears crooked, I raise one leg or the other until it looks good. Then, using a compass to scribe them, I trim the ends of the long legs at an angle that will sit them flat on the bench.

The leg tenons should be 1 in. long. I shape the leg to taper right into the tenon. Shoved home at assembly, the joint fits tightly without fussing. Since these joints carry most of the stress, I glue them and drive a cut-nail pin from the inside of the foot perpendicular to the bow. Before pinning the joints, though, turn the carrier upside down and sight the legs. Align them by pushing one or the other beyond its mortise.

The final step is to trim the projecting leg tenons flush and to flatten the bottom, which always twists a little from the tension of the bow. I shave the feet with my drawknife, testing for flatness on the benchtop. When the carrier sits right, I sand out any dirty marks and put an oil finish on it. I mix a little stain in the oil to bring out the grain of the ash. □

Wayne Ladd turns trees into totes, treen and chairs at his home in East Calais, Vt. For more on the green woodworkers' art, see FWW #12, pp. 46-48 and pp. 64-67; #25, pp. 92-94; #33, pp. 50-56; and pp. 70-72 of this issue.

Plans for a Swiss shaving horse

by Drew Langsner

These plans are adapted from the shaving horse used every day for the past 60 years by Swiss cooper Ruedi Kohler (FWW #40, pp. 73-78). It has several advantages over other shaving horses. The position of the pivoting arm provides great leverage. The treadle extends forward for a comfortable reach, the bridge extends a generous 4 in. past where the head contacts it, and the angle of the head provides direct downward pressure, important because draw-

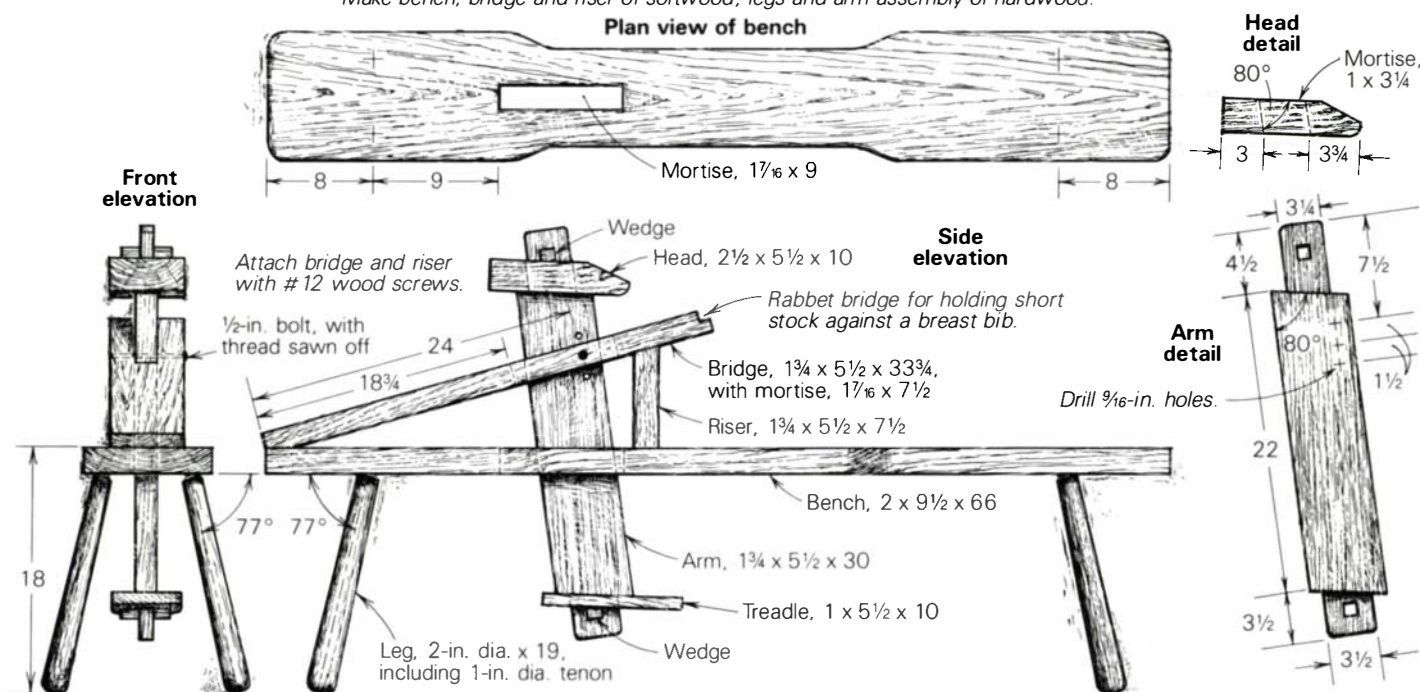
knifing tends to pull the stock forward. With the pivot holes at the front of the arm, the head swings open automatically when you release the treadle, so that it's easy to reposition stock. The central arm with the head open on both sides is a pleasure when turning long stock end-for-end.

Keep in mind that the shaving horse is a folk tool, and lots of variations are possible. Bridge height, for instance, can range from 7 in. to 11 in., depending on

your own height (I'm 5 ft. 8 in., and the height as drawn is good for me). The head and treadle are held by tusk tenons, which I find easy to construct, but I've bolted and face-glued heads to arms. All versions work well. One advantage of tusk-tenoning the parts is that it makes the arm easy to detach for transportation. □

Drew Langsner operates Country Workshops in Marshall, N.C.

Make bench, bridge and riser of softwood, legs and arm assembly of hardwood.



Shop-Testing Five Jointer-Planers

Combination machines solve some problems, have drawbacks too

by James A. Rome

After the machine saws, a jointer and a thickness planer are likely to be the woodshop's most-needed stationary tools. It would be delightful to own a big, cast-iron jointer with an 18-in. planer to match, but, even ignoring the cost, most of us just don't have the room. Faced with this problem a year ago, I went on a mail-order shopping trip for a jointer-planer: a machine that would combine both functions into one compact unit.

I discovered that at least six companies build such machines, based on two design schemes. European and American manufacturers have preferred the over-under design in which a single cutterhead does both jointing and planing. The Japanese favor a side-by-side design—really just a medium-size jointer fastened to the side of a thickness planer—with two separate cutterheads running on a common shaft. The difference between the two basic designs is more than mere appearances. Although you can make a side-by-side go from planing to jointing by walking a step or two, its jointer head is only half as wide as its planer. The over-under machines can joint stock the same width as they can plane, but changing operations requires manipulation of tables and guards.

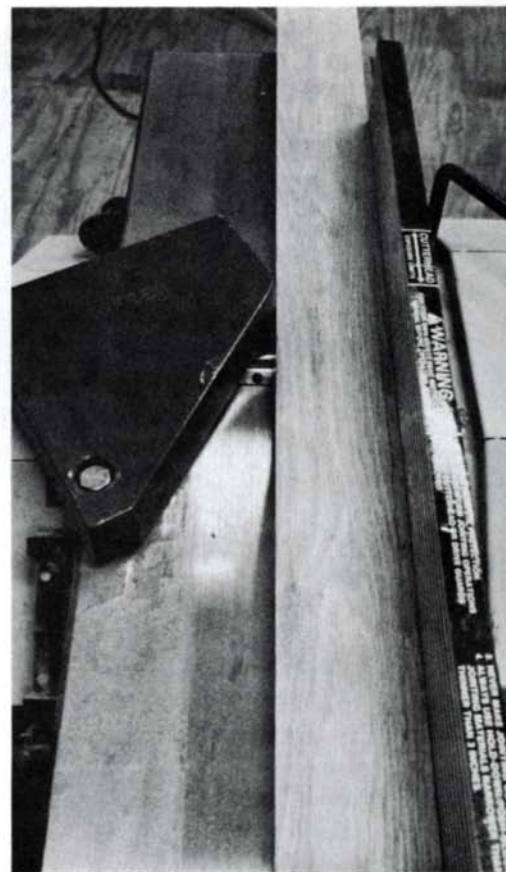
Lacking a useful way to compare one machine to another, I bought a Makita 2030 side-by-side, which I used happily for

a year, until an unfortunate accident (see box, p. 48) prompted me to replace it with the other Japanese combination, the Hitachi. When I offered to write about my experience with these two machines, *Fine Woodworking* arranged for me to test three more as well. In order of price, the test machines were the American-made Belsaw (\$700), the Austrian Emco (\$1,000), the Makita (\$1,350), the Hitachi (\$1,500) and the Swiss Inca (\$1,500). I did not test another American-made machine, the \$2,104 cast-iron Parks model #11, because it's available only on special order (Parks Woodworking Machinery, 1517 Knowleton St., Cincinnati, Ohio 45223).

Before getting down to specifics, let's review the basic functions of jointers and thickness planers. The jointer can start from a roughsawn surface and make it into a face side or edge: flat and smooth, free of twist, cup or warp. Once the cut has been started, the jointer is self-jigging in that it determines where it is going by referring to where it has just been. The thickness planer, on the other hand, power-feeds wood between its bed and cutterhead, and thus it requires one smooth, flat surface in order to create a true surface on the other side of the board. Many people, lacking a wide jointer, prepare both sides of a board by repeated passes through the planer. While this procedure will make both sides smooth



The Belsaw model 684, left, is one of two fabricated steel combination machines tested by the author. For conversion from a jointer to a planer, the hinged infeed and outfeed tables flip sideways, as shown in the photo above. The planer's maximum width of cut is 8 $\frac{3}{8}$ in., the narrowest of all the machines tested. The guard leaves part of the cutterhead exposed during jointer operation, right, and because it's hinged on, rather than to one side of the table, it reduces the jointer's effective cutting width by nearly 2 in.



and parallel to one another, it won't remove all of the warp.

Setting up the machines was straightforward, no thanks to the instruction manuals, which were universally terrible. I went about my analysis with the needs of a serious but non-professional woodworker in mind, using these tools in the course of three months of small-project woodworking. I checked the jointer and planer tables for flatness, and measured the noise level generated by each machine. I paid particular attention to how each machine's knives could be removed and replaced, since precise knife adjustment is crucial to accurate planing and jointing (all five machines have two-knife cutterheads). To find out how the combinations would handle various woods, I planed oak, redwood, and gonzalo alves, a hard tropical wood with interlocked grain.

The Belsaw 684 combination evolved from the company's popular 12-in. surface planer, the price of which has been kept low by the use of fabricated steel instead of cast iron. Unfortunately, in this case, cost-cutting has yielded a bulky, heavy tool (198 lb.) whose jointer is seriously flawed.

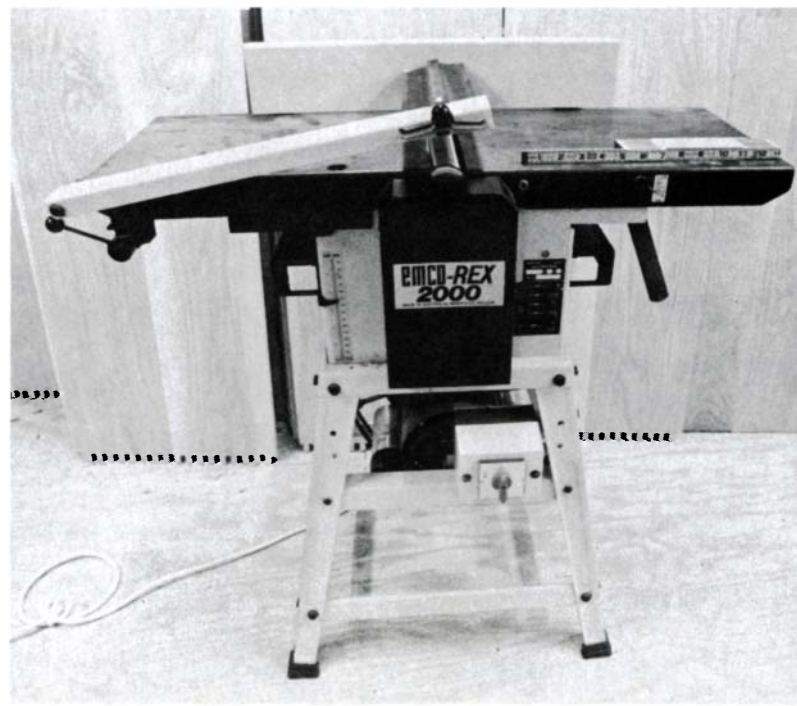
To convert the Belsaw from jointing to planing, you loosen a couple of catches and flip the tables sideways, so that the cutterhead shroud can pivot up from below, where it is stored when the machine is a jointer. A microswitch blocks motor operation unless the guard is installed, a safety feature the other two over-under machines lack.

As a planer, the Belsaw works reasonably well, given the 1-HP motor. Its feed rate of 28 ft./min. is brisk enough as long as you don't take too deep a cut in a single pass, in which case it stalls. The 8 $\frac{3}{8}$ -in. maximum width of the planer is inadequate for most cabinet work, and because the Belsaw lacks a depth feeler gauge, I found it hard to tell just when the knives start to bite. When I tried the dowel-cutting knife that Belsaw sent, the motor balked and blew my 20-amp circuit breaker. The other molding knives worked better.

Belsaw makes no attempt at sawdust control. Dust is dumped on the planer outfeed table, or under the jointer where it gets into everything, including the chain-and-sprocket depth-setting mechanism. To keep chips from jamming the works, you have to clean them out frequently by opening up the hinged side shrouds. There's also no anti-kickback device, but the machine's skinny rubber feed rollers probably grip the wood well enough to prevent it being shot out the back. None of the over-unders I tested has bed rollers, an omission that doesn't seem to hurt planing performance if you keep the tables waxed.

I found the Belsaw jointer almost unusable and somewhat unsafe. The fence, which tilts but doesn't slide, is inadequately supported and will deflect $\frac{1}{2}$ in. horizontally, somewhat less vertically. The hinged tables are unsupported on the fence side. Press down, they give, ruining the flatness of the cut. Also, the jointer guard pivots on the infeed table rather than to one side of it, reducing the cutting width from 8 $\frac{3}{8}$ in. to 6 $\frac{5}{8}$ in. Worse yet, in use, the guard leaves a dangerously large triangle of cutterhead exposed.

Belsaw's knife-setting system seems elegant, but is difficult to use. Each knife fits into a dovetailed slot in the cutterhead where two bolts bear against the back edge of the knife, raising or lowering the knife to the desired height, which you measure with a plunger gauge that straddles the knife slot. I could adjust knife height easily enough, but when I tightened the locking wedge, the knives crept up. I had to loosen the



The Emco-Rex 2000, the basic power unit of a versatile multi-purpose machine, has the overarm jointer guard common to European stationary tools. It detaches for planer conversion.

wedge and start over with the knives low so that snugging the bolts pushed them to the correct height.

The Emco-Rex 2000 is made by the same folks who make Unimat lathes, the Emco-Maier Company. Strikingly painted in orange and black, the 2000 is the basic unit of a multi-purpose machine. You can add a tablesaw, a slot mortiser and a shaper. The Emco is made of fabricated steel, but is smaller than the Belsaw and, at 143 lb., is also lighter.

To convert the machine from a jointer to a planer, you remove the jointer outfeed table by turning a couple of bolted catch hooks a half turn. A plastic guard placed over the cutterhead is wedged in place by moving the jointer depth control, which is a lever instead of the usual knob or handwheel. The guard also acts as a duct which funnels shavings into an adapter that can be connected to your shop vacuum.

The Emco's steel feed rollers are deeply serrated and feed positively, but when I tried to plane off a light cut, they left noticeable marks in the surface, requiring another pass at a deeper setting to remove. Since the feed rollers aren't adjustable, this is a real drawback, because on hard woods such as birch or maple, you sometimes have to take a shallow cut to get a good surface. If the rollers lose their grip on the stock, anti-kickback pawls keep it from exiting violently.

To adjust the knives, you raise them with a screwdriver and push down with a block of wood. When the knives are correctly positioned, you tighten bolts to fix them in place. To measure knife projection, you place a plastic gauge across the jointer mouth and then hand-rotate the cutterhead. The knives are right when they just grab the gauge at the top of their arc, scooting it a marked distance. On my machine, the sheet-steel tables weren't flat, so the short gauge was useless. I had to make a longer one out of wood. Even then, knife-setting was a tedious trial-and-error affair.

The planing performance of the Emco was good, although leisurely, at a feed rate of 16.4 ft./min. With its 2 $\frac{1}{2}$ -HP in-

duction motor, the Emco has plenty of power and never stalled, even when pushed hard. At the slow feed rate, thickening 100 bd. ft. of 4/4 lumber will likely take the better part of a day, and boards wider than the 10³/₁₆-in. maximum will have to be ripped down.

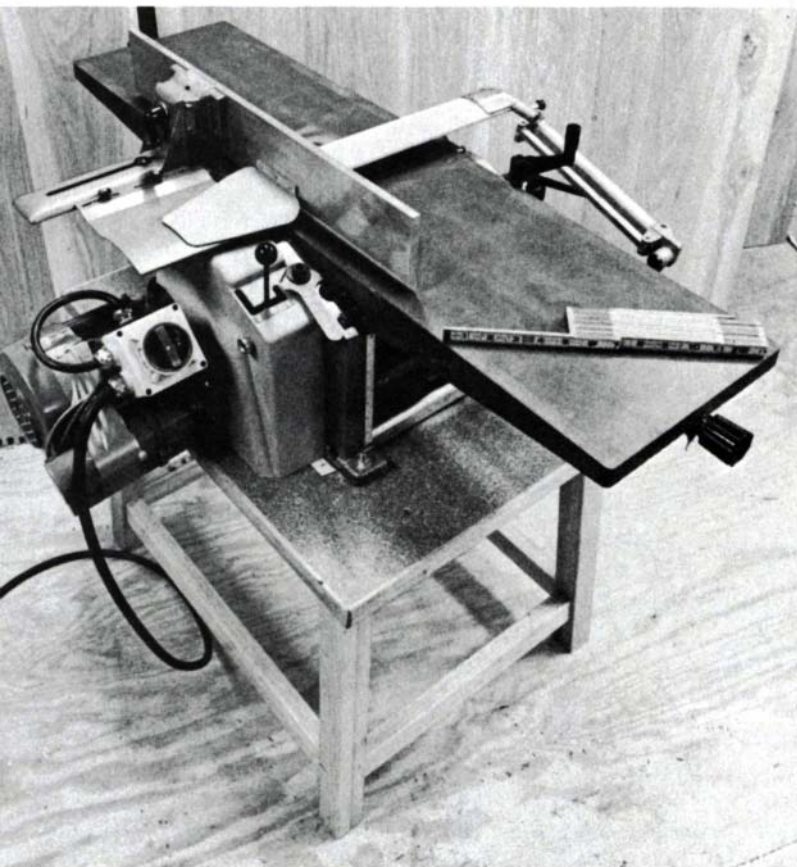
The Emco jointer guard consists of a sheet-metal stamping held above the cutterhead by an adjustable arm. For edge-jointing, it slides away from the fence; for face-jointing, you shove the board under the guard, an operation requiring you to lift your hands (or, better yet, push blocks) as you pass the guard. This little shuffle leaves an unjointed bump in the board, which the planer must skim off. I ignored the temptation to work without the guard: 10 in. of exposed cutterhead is too scary.

Because its tables are supported on both edges, the Emco jointer is more accurate than the Belsaw, but still too short for truing long stock. Anyone accustomed to an expensive jointer will find the movable, tiltable fence flimsy, yet it's solid enough, and would be quite good if you bolted a wide board to the fence to lengthen and stiffen it.

The Inca 343-190 jointer tables, bed and frame are made of pressure-cast aluminum, generously ribbed for strength and bending resistance, resulting in a tool that's very rigid, yet, at 114 lb., the lightest of the group. The tool I tested, which should be available this fall, is an improved version of the discontinued model 510. Its jointer tables are a usable 42¹/₂ in. long, and it will plane and joint boards 10¹/₄ in. wide.

The Inca has an unusual feature for a planer in this price range: a two-speed feed (11.5 ft./min., 16.5 ft./min., and

Inca's combination is the only one of five tested that sports two feed rates, which are controlled by the lever above the motor. The flap screwed to the jointer fence covers the cutterhead when the fence is moved forward.



neutral) which can be changed by a shift lever while the wood is being planed. When I wanted to shift speeds, however, I always found myself standing on the side of the machine opposite the lever. Anyway, even at its high speed, the Inca is a slowpoke. I would have been glad to trade the speed changer for a decent depth feeler gauge, which the Inca lacks.

The Inca does a beautiful job of planing, especially if you take thin cuts, which you can do because the knurled feed rollers don't mar the wood the way the Emco's do. On the goncalo alves, the Inca tore out less than did the other planers, perhaps because its cutterhead knives are supported right out to their tips, thus limiting chatter. The Inca was outstanding at planing very thin pieces of wood (less than ¹/₈ in.). The standard 1¹/₂-HP motor is too small, however, and prone to stall. Garrett Wade, the Inca distributor, says a 2-HP (220V) motor is a no-cost option. I'd recommend it.

The Inca converts from planer to jointer similarly to the Emco. Also, like the Emco's, the Inca's jointer guard gets in the way. When face-jointing, wide boards chatter unless you press downward fairly near the cutterhead. I found this awkward to do. The jointer fence is one piece of solid, heavy aluminum supported on a ribbed pedestal a third of the way down the infeed table. This arrangement isn't rigid enough, and though it's stiffest where you apply pressure when edge-jointing, it deflects more than I like at the outfeed end. I was able to rig my shop vacuum to collect the planer's shavings, but couldn't do the same for the jointer—it dumps them on the planer table. A new plastic hood developed by Inca supposedly solves this problem.

Of all the machines tested, the Inca's knife-adjustment system is the most accurate. Each knife has two slots into which the head of an Allen bolt fits. Turning these bolts raises or lowers the knife. This system is handy if you have knives that are low at the center, as mine were. I raised both ends about 0.005 in. until the center was at the correct height, snugged the center locking bolts, then lowered each end to the correct height. To measure knife height, Inca supplies a very nice \$80 dial indicator with an aluminum base, although I got just as close using the Emco method and a flat, straight piece of wood.

The Makita 2030 is one of a half-dozen stationary wood-working tools sold by Makita in the United States. Solidly constructed, it shows how the Japanese are using cast iron much the way Inca uses aluminum: relatively thin castings with plenty of stiffening ribs. You can also buy the machine with a 14-in. non-tilting circular rip saw mounted alongside the planer (model LM3001). If you already own a radial-arm saw instead of a tablesaw, such a combination might be ideal. The Makita will plane boards up to 12 in. wide and joint to 6¹/₈ in. wide.

The Makita arrives ready to run (ditto the Hitachi), but the two columns upon which the machine is supported elevate it only 20 in. above the floor—uncomfortably low for my 6-ft. frame. I bolted the machine to a 2x4 stand on locking castors, raising the jointer table to about 35 in. above the floor. I included castors on the stand so that I could roll the 276-lb. machine around in my cramped shop.

Most Japanese stationary machines, including the Makita and Hitachi combinations, are powered by universal motors, not induction motors. Universal motors, which also drive routers, are small and light, but must whine up to high

(continued on p. 46)

Learning how to read the grain

by R. Bruce Hoadley

Before feeding a board into a surface planer or hand-planing it, it's important to read the board's grain, or you risk tearout. There are many routines for doing this. Most woodworkers simply examine the edge of a board to determine the inclination of the cell structure. But close scrutiny may sometimes be too time-consuming, as when feeding a large quantity into a jointer or a surface planer, or when you simply cannot see any useful detail because the lumber has roughsawn edges. Even-grained and fine-textured woods such as basswood pose similar problems.

One helpful gimmick when planing flatsawn boards is to use the board's U-shaped or V-shaped surface figure to determine grain inclination. As shown in figure 1, on the pith side of a board (the heart, or inside, of the tree), the tips of the Vs point with the grain, so you would hand-plane in that direction. On the bark side, the Vs point against the grain. My memory crutch goes like this:

Pith side, **Plane** with the **Points** (of Vs)
Bark side, **Backwards**

The rule works on boards with any visible V-shaped markings. After a while it becomes automatic. You instinctively glance at the end when you pick up a board; if you are working a pith side, you subconsciously hand-plane with the points, and so on.

Of course, with wood it's not always that simple. For example, you may have a board with Vs going in both directions. Let's assume you have a board that has a bark side surface with the appearance shown in figure 2. The "bark side, backwards" rule of thumb helps you recognize zones of the board, so you would hand-plane zones A and C from left to right, as shown, but zone B from right to left. If you keep in mind that the knives of jointers and planers actually cut in the opposite direction to the direction of feed, reading the Vs would also help you decide to send the board into a planer left-end-first. You can anticipate good results over most of the board (zones A and C), but with possible trouble where the cutterhead would be working against the grain (zone B). Knowing where the troubles will occur, you can take lighter cuts, slow the rate

of feed, or use alternatives (such as abrasive planers or sharp hand-tools) to minimize filling and sanding later.

Complete Vs are handy, but they're not always present. Consider the boards shown in figure 3, where the points of the Vs are gone and only their sloping sides are present. The drawing shows which way the Vs pointed in the wider board from which each strip was removed. Careful inspection reveals that within each growth ring the latewood edge indicates which way the Vs point. This is difficult to determine with even-

grained woods (such as birch or maple), but with uneven-grained woods (such as spruce, hemlock, fir, oak or butternut) it will be as easy as looking at the V-direction. Another way to state the rule is: On the pith side, within each growth ring, plane from early to late; on the bark side, backwards.

Every board came from a tree stem—the growth-ring figure can help you to interpret the inclination of the grain. If you learn to read it and work with it, you will have fewer surprises, and better surfaces in your finished work. □

Fig. 1: Working with the grain

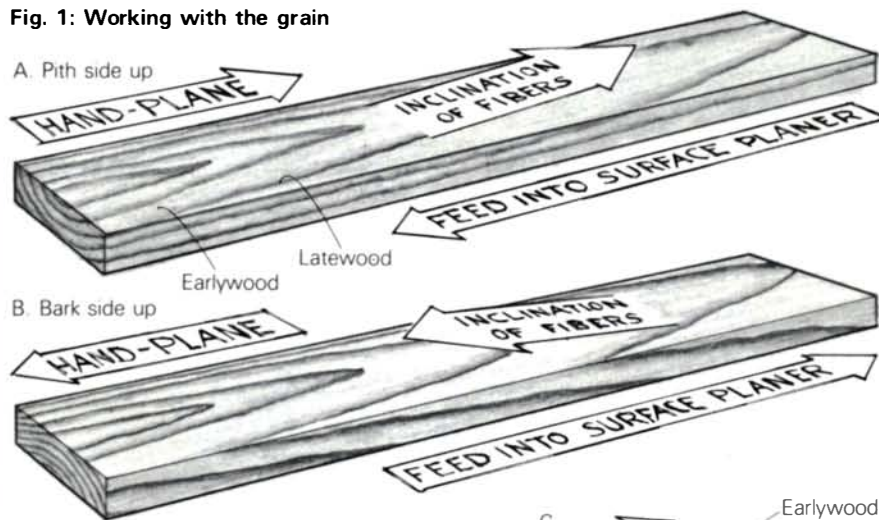


Fig. 2: Grain reversal

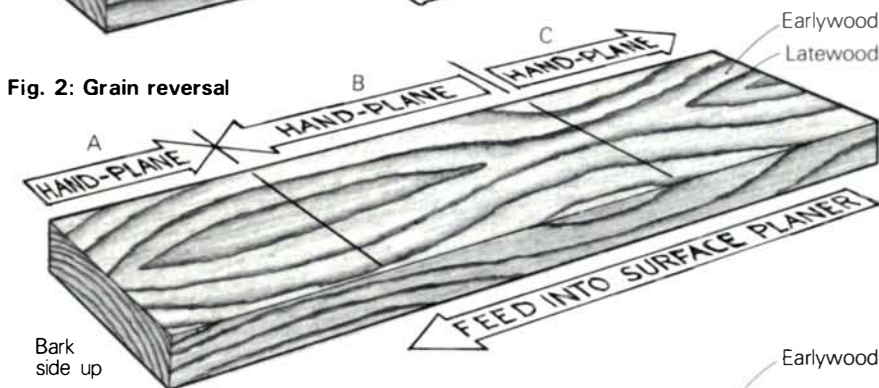
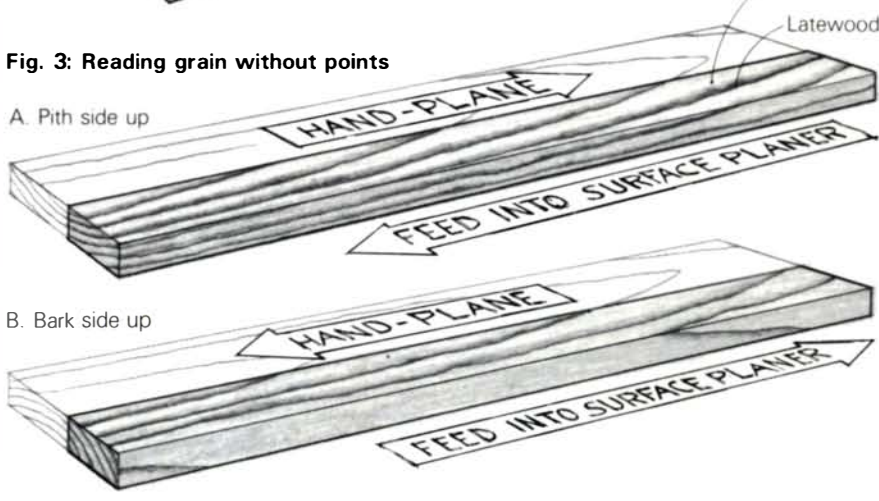
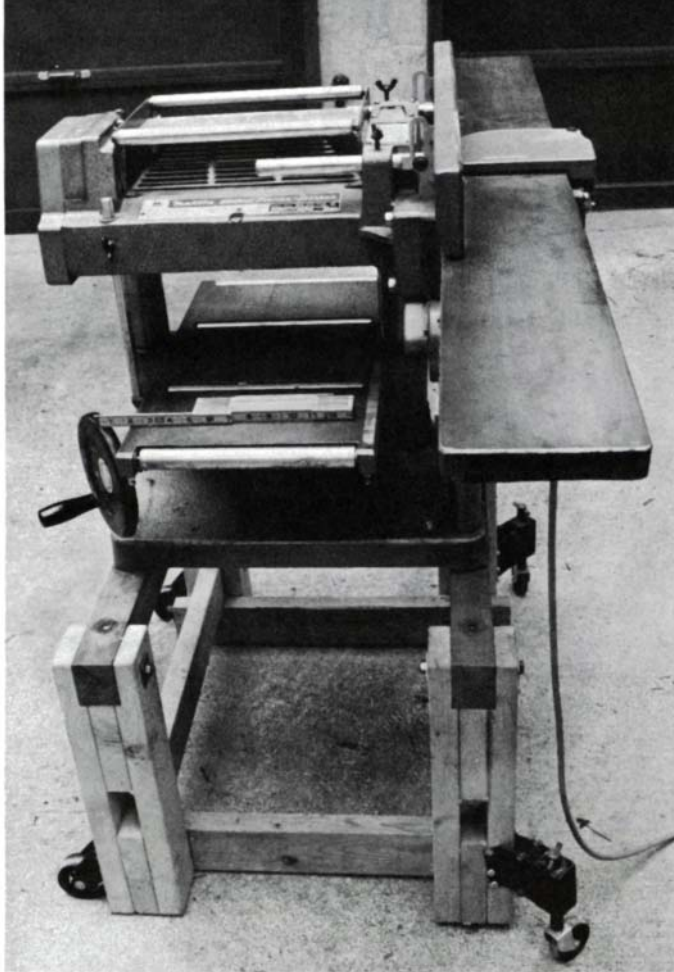


Fig. 3: Reading grain without points



Bruce Hoadley is professor of wood technology at the University of Massachusetts at Amherst, and the author of *Understanding Wood, A Craftsman's Guide to Wood Technology* (The Taunton Press).



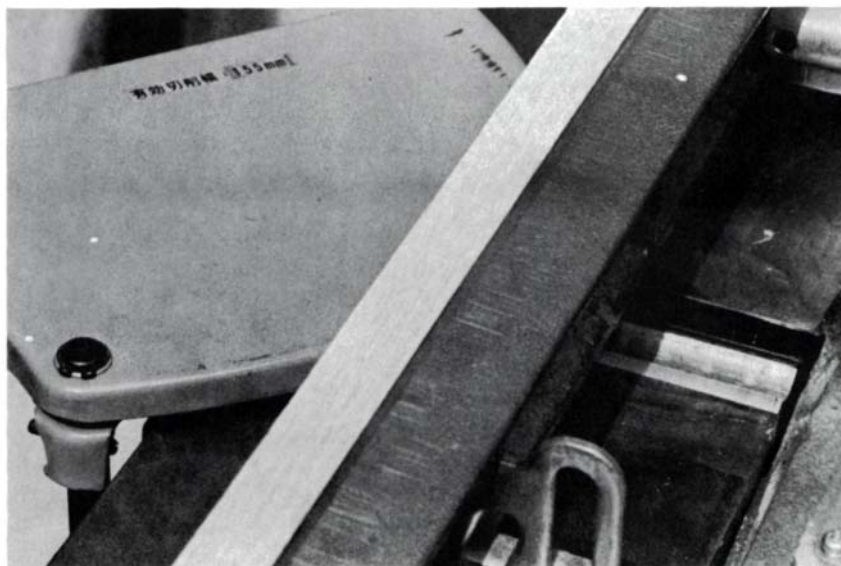
Four unpowered bed rollers support boards fed through the Makita 2030. While you walk around the machine, stock can be temporarily shelved on two return rollers on top of the planer.

speeds to develop their rated power. As a result, they are dangerously noisy (ear protection is a must) and, lacking torque, they bog down under load. The Makita's 2-HP motor is fine for most jointing and for planing narrow stock. It chokes when you try to plane more than $\frac{1}{32}$ in. off a wide board in a single pass. Set aside some time if you're going to mill a stack of lumber. And figure on cleaning up a mess—the planer tosses the chips onto the emerging board, the jointer leaves them on the floor. I liked the Makita's four adjustable bed rollers, especially the two outboard rollers which prop up long boards, preventing them from being sniped—gouged too deeply—as they emerge from the machine. Two return rollers atop the machine offer a handy perch on which to rest the board while you walk to the infeed end for another pass.

As a thicknesser, the Makita has great gauges. A plunger-type feeler gauge above the planer infeed table will tell you how much you're planing off a board before you feed it, and a nearby placard tells how much of a cut you can take for a given width without bogging the motor. The thickness indicator, also a plunger, is calibrated in eighths, reads easily, and can be set as a stop for repeated cuts to the same thickness. The jointer gauge (like all the others) is rudimentary at best.

After struggling with the short jointer tables on the over-under machines, I found it surprisingly easy to accurately edge-joint a long board on the Makita's 59-in. tables. The tradeoff, of course, is a $6\frac{1}{8}$ -in. cutterhead that's not very useful for facing wide, warped stock prior to planing. Supported at two points, the fence is rigid (although mine was warped), it's movable and it tilts. It has one glaring problem, though. If it's moved forward, the cutterhead is exposed on the back side. None of the other machines tested has this hazard.

Setting knives in the Makita is touchy. Instead of fitting



When the Makita fence is advanced over the cutterhead, the knives are left dangerously exposed as stock is fed.

into slots, the knives are sprung against a squarish cutterhead by steel clips and held fast by bolted-on, half-round covers. To adjust the knives, you stick a screwdriver through slots in the blade covers and pry up on the bottom edge of the knife. Two small wooden blocks, which span the jointer mouth or rest on machined surfaces above the planer cutterhead, push the knives to the correct level. Compared to the Inca, this is a crude arrangement, and it takes lots of trial and error to get right. The Makita does have one saving grace: the cutterhead has an external wheel, so you can rotate it by hand, with a pin to lock it at top dead center.

The Hitachi F-1000A, at 320 lb., is the heaviest machine I tested, and its four steel support columns make it sturdier than the Makita. Its planer and jointer capacity and running gear are similar to the Makita's, but the Hitachi lacks the outboard bed rollers, an annoying shortcoming which I remedied by mounting my own outfeed roller on a plywood outrigger. Rollers and castors can be bought from S.H.D., PO Box 13P, Sycamore Ave., Medford, Mass. 02155.

Though Hitachi claims 3 HP for the howling little motor that powers this machine, I couldn't detect any advantage over the Makita's claimed 2 HP. As planers, they perform equally, though the Hitachi is better at chip-handling. Planer chips are ducted through an oblong chute that exhausts out the side of the machine. Chips from the jointer are similarly ducted downward. I fashioned wooden plugs to fit into these ports, then drilled the plugs to accept the hose from my shop vacuum. I can run the machine all day without making a mess, though I have to empty the vacuum frequently.

Hitachi's knife-setting method is quite elegant and nearly as accurate as Inca's. Like the Makita, the knives are fastened to a squarish cutterhead by bolted-on plates. A detent pin on the handwheel locks the cutterhead at top dead center. The knives are spring-loaded, so you just pop them in place and push them down to height with a couple of magnetic clamps. They stay put while you tighten the locking bolts.

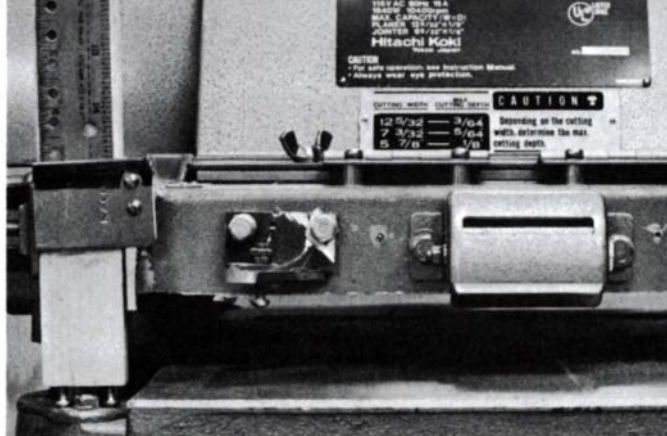
The Hitachi's cast-iron jointer fence is the best of all the machines I tested. It's heavy and easy to adjust, and it stays where you put it. I felt safer using the F-1000A, as well. It's festooned with bright yellow warning stickers, and has little

niceries such as a metal cover over the cutterhead handwheel and a little metal flap that guards the exposed knives when the jointer fence is pulled forward. For storage in a tiny shop, the jointer has one other clever feature: its 63-in. jointer tables unlock and pivot downward about a foot from each end.

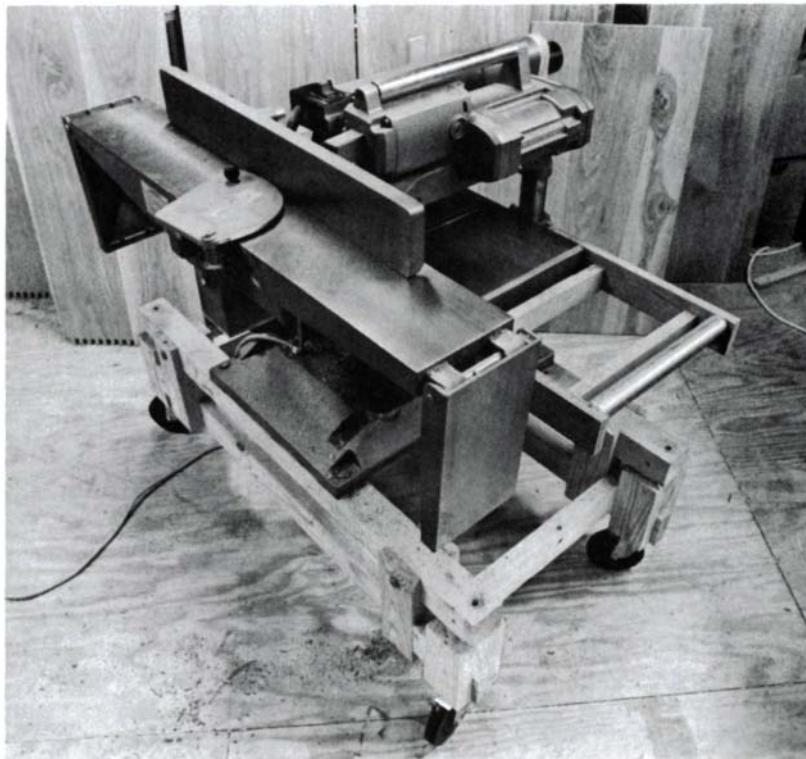
The Hitachi I bought has terrible gauges. The thickness gauge is calibrated in twelfths of an inch, and there's $\frac{1}{4}$ in. of parallax-producing space between the pointer and the scale. I cobbled up my own replacement out of a broken corner clamp and a metal rule. Originally, my machine had no feeler gauge at all, so I fashioned a crude version of the Makita gauge using the rest of the corner clamp and a stove bolt. Hitachi has since designed a gauge, and it's a beauty. It not only tells you where the blades will begin to cut, but how deep the cut will be. If you own an F-1000A without this, Hitachi's service manager, Hal Flora (10530 Lawson River Ave., Fountain Valley, Calif. 92708), will supply one for free.

Which to choose? In picking a jointer-planer, I'd take several things into consideration. First, how wide a jointer do you need and how long must its tables be? The over-unders have wider jointers which are perfect for flattening one side of a wide, cupped board in order to give the planer a true surface to work from. Because the tables are so short, though, you'll have a hard time truing the face or edges of a long board. The side-by-sides have longer tables but narrower cutterheads, thus wide boards must be ripped before face-jointing and then glued back up to width. If you have to follow this routine, the wider side-by-side planers will be preferable for cleaning up your glued stock. Weight and size should be considered too. A small, light machine can be more easily pushed aside when it's not needed, but tends to move about when you're shoving big pieces through the planer.

I had a couple of friends try these machines, and all of us agreed that as planers they stack up about equally. But we found the over-unders compromised as jointers, especially the Belsaw, because of their shape: they're so wide that you have to lean over them, feeding the stock at arm's length. A wide



The Hitachi F-1000A has two bed rollers but no outboard rollers. Rome mounted his own outfeed roller on a plywood outrigger. With standard table extensions, the Hitachi has 63-in. tables, the longest of the tools tested. Before Hitachi supplied him with a new, well-designed feeler gauge, Rome made his own from a stove-bolt plunger mounted in a broken corner clamp, above.



COMPARISON OF SPECIFICATIONS

	Belsaw 684 (USA)	Emco-Rex 2000 (Austria)	Inca 343-190 (Switzerland)	Makita 2030 (Japan)	Hitachi F-1000A (Japan)
Price	\$700	\$1,000	\$1,500	\$1,350	\$1,500
Watts input	1800	1920	1580	1400	1640
Advertised horsepower	1	2½	1½	2	3
Revolutions/minute	6,000	6,000	6,000	7,000	10,400
Feed rate (feet/minute)	28	16.4	11.5, 16.5	27.8	31.2
Cuts/inch	36.0	61.0	86.0, 61.0	41.9	55.6
Planer					
Blade width (inches)	8⅝	10⅜ ₁₆	10¼	12	12⅝ ₈₂
Maximum thickness (inches)	4½	5⅞	6⅝ ₁₆	6¼	6⅝
Minimum thickness (inches)	¼	⅛	⅛	¼	⅜ ₁₆
Table dimensions (inches)	8⅞ x 28½	9¾ x 17¾	10¼ x 15¾	11¾ x 23½	11⅞ x 24½
Jointer					
Blade width (inches)	8⅞ (6⅞ usable)	10⅜ ₁₆	10¼	6⅞	6⅜ ₃₂
Table size (inches)	9⅞ x 35⅞	12⅞ x 33¾	11 x 42½	6⅞ x 59	6⅞ x 39½*
					*63 with extensions
Weight (pounds)	198	143	114	276	320
Return rollers	0	0	0	2	1
Bed rollers	0	0	0	4	2
Sound level (dB)†	91	85	85	97	98

† Measured at ear level with a Radio Shack sound level meter, "A" weighting, no wood being cut. A difference of 3 dB doubles the apparent noise level.

jointer is nice, but what good is it if it's too short to true a long board? Then there's the matter of switching from one function to the other. Aside from the nuisance, you can't use both jointer and planer simultaneously. This can force you to use more inefficient sequencing while truing your wood.

I was disappointed with the Belsaw. Its low price isn't much of a value if half of the combination doesn't work. The people at Belsaw were helpful and happy to talk to me on their toll-free number, but goodwill can't offset a badly designed machine. Unless you are severely constrained by money, I can't recommend the Belsaw 684. On a tight budget, I'd consider Belsaw's model 804 planer-molder, about \$550, and a separate jointer.

The Emco-Rex 2000 is probably the better budget choice. It gets the job done, but it requires more care and skill to get good results than do the more expensive machines. Its sheet-steel construction gives me doubts about its durability.

The Makita is a worthy machine which I liked better than the Belsaw or Emco. Yet it suffers in comparison with the Hitachi. The \$150 lower price tag hardly offsets its draw-

backs. Makita's lack of customer service (see box, below) persuades me to take my future business elsewhere.

My difficulty is in choosing between the Hitachi and the Inca, machines that have obviously been designed according to different philosophies. Both are well designed and well made, though one is light and elegant, the other heavy and sturdy. I favor the Hitachi's side-by-side design, but I admire the Inca for its compactness and engineering finesse. I think the Inca would be best for the craftsman who does careful, low-volume work and who doesn't often need to straighten long boards. I'm glad I bought the Hitachi, however. Apart from face-jointing wide boards, it can do all that the others can, with considerably more ease. It was the only machine on which the fence and tables were perfectly flat and straight. It's built like a tank, and the people who sell it are knowledgeable and helpful. For me, that's a winning combination. □

James Rome is a part-time woodworker and full-time plasma physicist. He works for the U.S. fusion energy program in Oak Ridge, Tenn. Photos by the author.

Don't answer the phone while adjusting jointer knives

I was installing the knives in my Makita 2030 jointer-planer when the phone rang. When I finished the call, I went back and turned on the machine, forgetting that I hadn't tightened the bolts. As the knives whirled up to speed, a horrible screeching noise ensued, followed by a shower of shrapnel. The jointer guard deflected most of the metal shards and I wasn't hurt.

After I regained my composure, I realized what I had done wrong. It was a cheap lesson in how *not* to set jointer knives. Valuable as the experience was, I learned even more when I tried to fix the thing.

Just taking it apart was a chore. The jointer tables are attached to the planer by hardened-steel drift pins. Driven into blind holes, these pins seem designed more for fast factory assembly than for easy removal. Hours of tugging finally opened up a gap large enough to insert a hacksaw blade into. Several blades later, I cut through the pins and separated the tables.

There followed another struggle to remove the jointer head from its press-fit into a bearing cup in the outfeed table. While doing this, I realized that if the drive belt connecting the motor to the shafts ever breaks, the jointer head will probably have to be removed to replace it. In principle, it might be possible to slide apart the coupled pulleys that connect the planer and jointer shafts, but in practice, forget it.

I had to decide whether to fix the

tables or to buy new ones. This decision was surprisingly difficult. Although Makita stocks parts at various locations throughout the country, each distribution center has different prices and tells a different story. Makita in Atlanta was willing to sell me a new outfeed table for about \$400. Makita in New Jersey claimed that they had a sale on an old-style outfeed table and the price was

\$30. Makita in Atlanta said there was only one style of outfeed table. Makita in New Jersey said the sale was over.

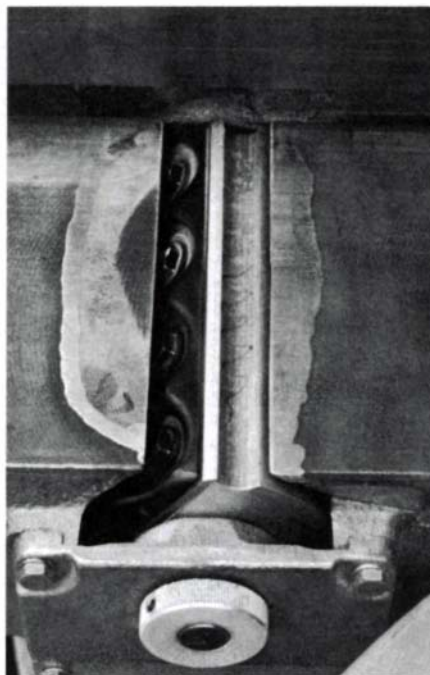
I decided to repair the machine. It cost me \$50 to get the cast-iron tables welded back together with nickel. It cost another \$50 to have the tops of the tables ground flat. The nickel was hard enough to ruin several carbide tools. I had to belt-sand down the bottoms of the welds facing the jointer head.

Reassembling the 2030 was relatively straightforward. My struggles, however, were not over. Without the jointer blades, the machine ran smoothly up to speed. But when I installed the knives, it vibrated severely enough to walk across the floor of my shop. I weighed the blades and their cover plates, and found them to be perfectly balanced. I bought a new planer head (another \$70) and readjusted the drive pulleys. The machine was still unbalanced.

In disgust, I sold it, as a planer only, to a friend. He found the problem. When I ordered a new spring-steel blade holder, Makita had sent me two of them stuck together. This raised the blade and its heavy cover about $\frac{1}{16}$ in., causing the out-of-balance condition.

My misadventures with the Makita explain why I am now the owner of a Hitachi F-1000A. —J.A.R.

EDITOR'S NOTE: To sort out customers' technical problems, Makita has recently added a national service manager to its staff. Write to 12950 E. Alondra, Cerritos, Calif. 90701, or call (213)-926-8775.



Rome's knife-setting accident tore chunks from both infeed and outfeed tables. Here they are reinstalled, after being built up by nickel welding and flat grinding.

Bandsawn Dovetails

Tilt, saw and chop

by Tage Frid

Routers and tablesaws aren't the only way to make through dovetails with a machine. I use my bandsaw to cut the pins and tails, and the results aren't much different from cutting the joint by hand. Start by using a marking gauge to scribe the baselines of pins and tails on both boards. Cut the pins first. Tilt the bandsaw table 10° (or whatever angle you wish your pins to be) to the right, and clamp a fence parallel to the blade and slightly farther away from it than half the width of the stock, as in drawing A. (If your table won't tilt in both directions, see *FWW* #17, p. 15, for a jig to solve this problem.) Clamp a stop to the fence so that the blade will cut just to the baseline. All the cuts for this method should be made with the inside face of the board up. Mark your stock so that you won't lose track. Make the first cut, which will be one side of a center pin, then turn the stock end-for-end and make the second cut, one side of the other center pin.

Between the stock and the fence, place a spacer equal in width to the pin spacing. For this example, you'll cut one center pin and two half-pins at each edge. Cut the half-pin on one end of the stock, then turn the board end-for-end and cut the other half-pin (B).

Now tilt the table 10° to the left, move the fence to the opposite side of the table, and use the spacer to cut the other two half-pins (C). Then remove the spacer and cut the other side of the two center pins (D). Chisel out the waste in the pin boards, just as you would in making hand dovetails.

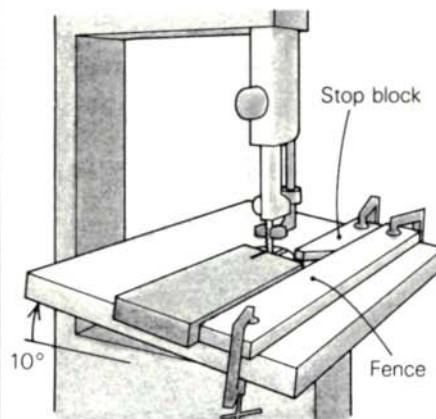
With the pins chiseled out, scribe their location directly on the tail board (E). Return the bandsaw to the horizontal position and saw freehand to the waste side of the lines that mark the tails. To remove the waste where the center pins will fit, saw up to the baseline repeatedly (F), shifting the stock sideways each time, before cleaning to the line with a chisel. To waste the area where the half-pins will fit, saw right up to the baseline (G). Try the joint and adjust its fit with a chisel where necessary. This method will work with wider boards, but you'll need more spacers to locate the other pins. □

Tage Frid is a cabinetmaker, author, and professor emeritus at the Rhode Island School of Design.

Bandsawn dovetails

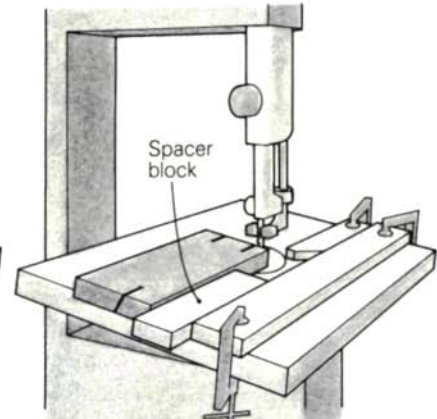
A

To cut one side of the center pins, tilt the bandsaw to 10° . Clamp a fence to the saw table slightly more than half the stock width from the blade. Make one pin cut; turn the board end-for-end for the other.



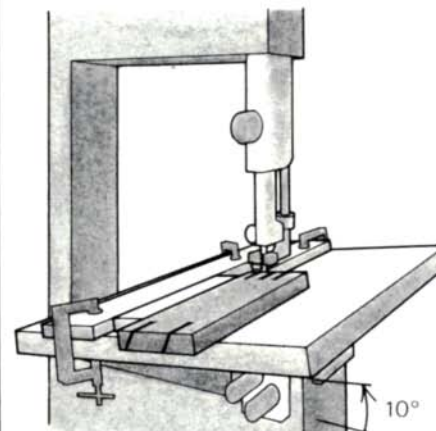
B

To cut the half-pins, put a spacer block between the fence and stock, and cut one half-pin. Turn end-for-end and repeat. Make the width of the spacer block equal to the pin spacing.



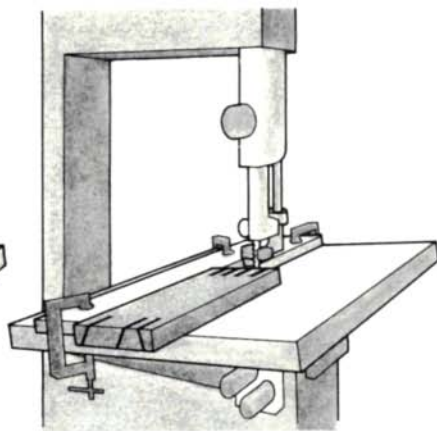
C

Tilt the table to the opposite angle and move the fence to the opposite side; using the spacer block, cut the other two half-pins.



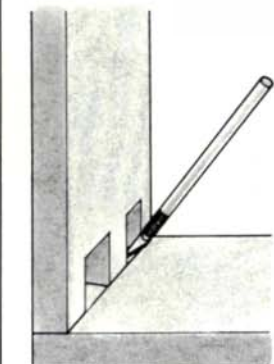
D

Remove the spacer block and cut the other side of the center pins. Chisel out the waste, as with hand-dovetailing.



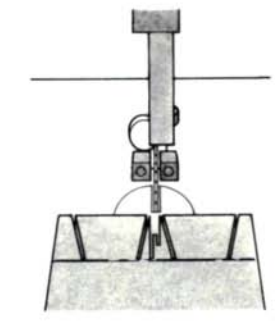
E

To cut the tails, mark them out directly from the pins.



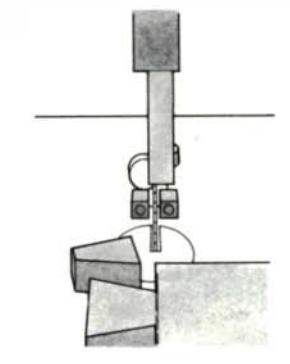
F

With the saw table horizontal, saw the outer edges of the tails, then nibble out the waste with repeated cuts.



G

Saw the half-pin shoulders, then pare with a chisel until the joint fits correctly.



Cutting Dovetails With the Tablesaw

A versatile way to join a stack of drawers

by Mark Duginske

For joining such basic casework as small boxes, chests and drawers, I've always felt that there was a missing link between the tedium of hand-cutting dozens of dovetails and the faster method of producing monotonous-looking joints with a router jig. With that in mind, I developed this tablesaw dovetail method which combines hand-tool flexibility with power-tool speed and accuracy.

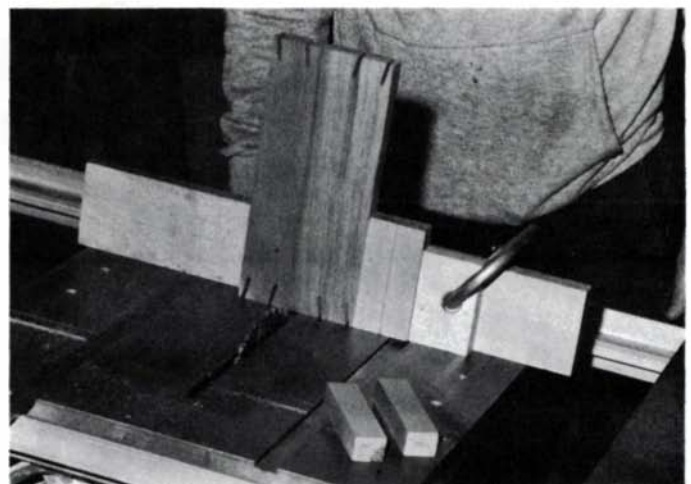
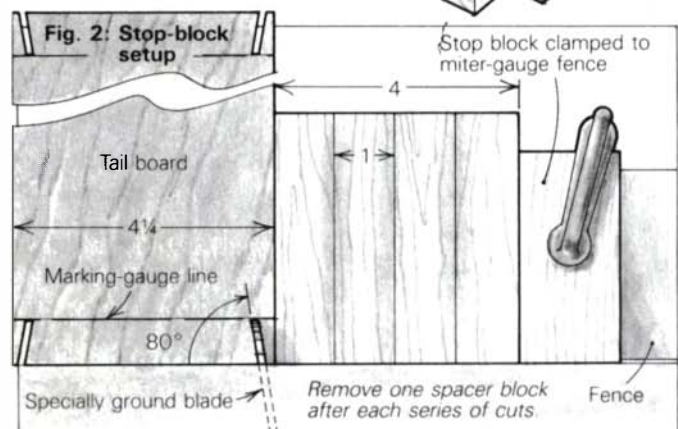
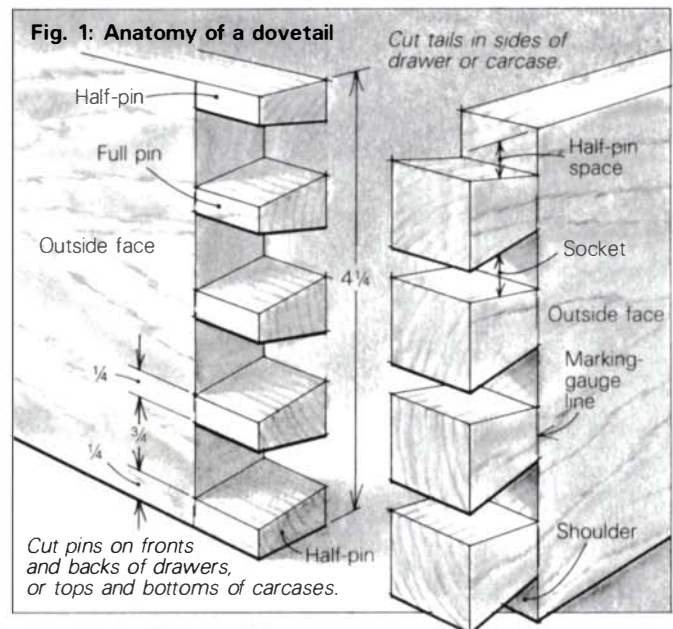
With this technique, you can vary both the width and the spacing of the pins and tails for practically any aesthetic effect. The blocks that set the spacing are self-centering and will produce perfect-fitting, interchangeable joints, eliminating the need to mark boards so that individual joints will fit, as with hand-dovetailing. Besides a good combination sawblade and dado head for your tablesaw, you'll need a marking gauge, a bevel gauge and a couple of sharp bench chisels. Before proceeding, screw a wooden fence to the saw's miter gauge. A 3-in. by 20-in. fence will safely support most work.

Begin by squaring the ends of the boards to be joined. Take your time with this step—inaccurately prepared stock virtually guarantees sloppy results. I spaced the pins equally for the 4¼-in. wide drawer parts I'm joining in the photos. You can mark the pin centers directly on the pin boards, or, as I did here, you can just cut the spacer blocks to create whatever spacing you want the pins to have. In any case, the width of the blocks should equal the distance between pin centers. You'll need one block for each full pin, plus one.

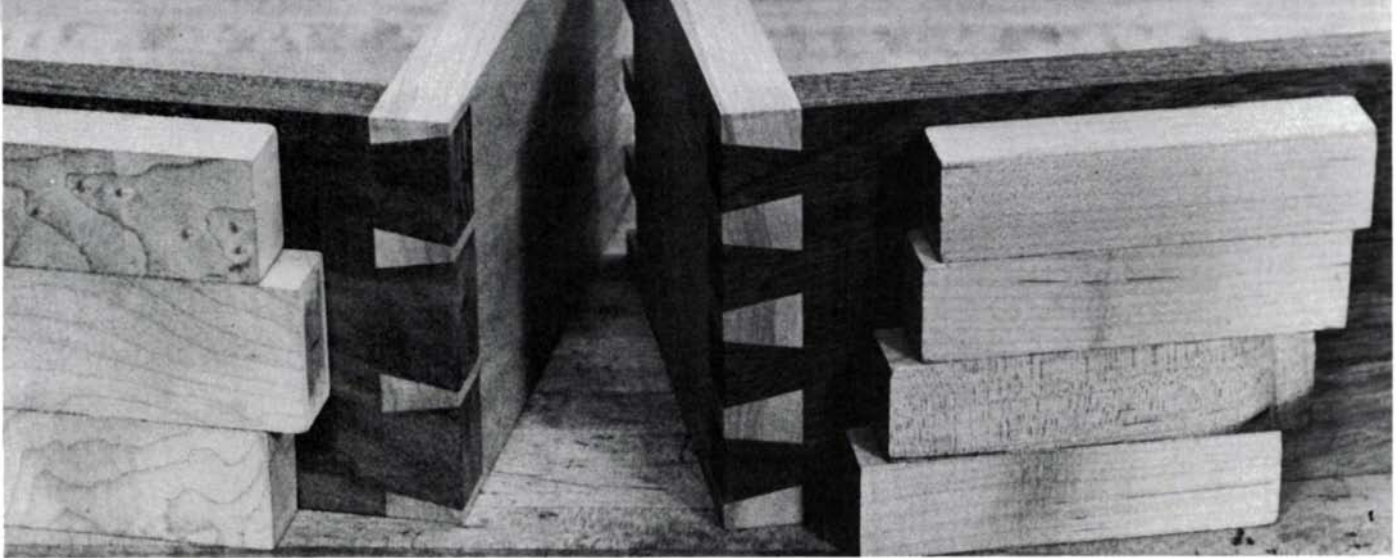
The pin size is also controlled by the blocks. When they're lined up edge-to-edge, the total width of all the blocks should be less than the width of the stock by an amount equal to the width of the narrow part of each pin, that is, on the outside face of the pin board. I chose ¼-in. pins for the drawer sides shown in figure 1; if you want finer pins, decrease this dimension. The blocks must be of consistent width, so I crosscut them from the same ripping, then sandpaper off any fuzzy corners so that they'll line up with no gaps. To mark the depth of the pin and tail cuts, set your marking gauge to the stock thickness, and scribe a line on the faces of the pin board and on the face and edges of the tail board.

Cut the tails first with the saw arbor (or table) tilted to 80°, an angle that I've found produces the best combination of appearance and strength. A bevel gauge set at 80° can be used to set both the sawblade for the tails and, later, the miter gauge for the pins. As shown in figure 2, position and clamp a stop block to the miter-gauge fence so that when all the blocks are in place, a half-pin space of the correct size will be cut. At its narrowest width, the half-pin space should equal the narrow width of a pin. Raise the sawblade until it cuts right to the gauge line, then, with all the blocks in place, begin cutting the tails, flipping the board edge-for-edge and end-for-end (photo, right). Continue this process, removing a spacer block each time, until all the tails are cut.

A good-quality carbide-tipped blade will saw crisp pins



In Duginske's tablesaw dovetail method, the tails are made first in a series of cuts with the table or arbor set at 80°. After each series, a spacer block is removed and the cuts are repeated for the next tail. The last tail is made with one block in place.



Machine-cut dovetails don't have to have the stiff, predictable look dictated by many router jigs. Using your imagination and the author's tablesaw technique, you can vary the width and spacing of pins and tails for infinite visual variety.

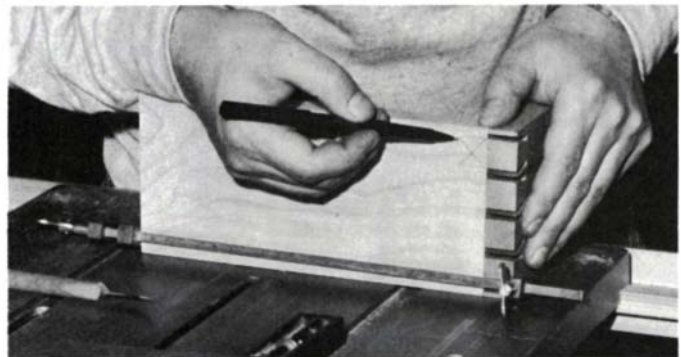
and tails, but set at an angle it leaves a small triangle of waste at the bottom of the cut that must be chiseled out later. To minimize handwork, I had the tops of the teeth on a carbide blade ground to 80° . The grinding cost \$12 and the blade can still be used for other work. If you have a blade ground, make sure that all the teeth point in the same direction, and when you tilt your saw, match the tooth angle.

To cut the pins, clamp the boards together and scribe either of the outermost tails onto the pin board with a knife, as in the photo at right. Mark the wood to be wasted with an X. Only one pin need be marked; the spacer blocks will automatically take care of the others. The pins will be formed in the series of three cuts illustrated in figure 3.

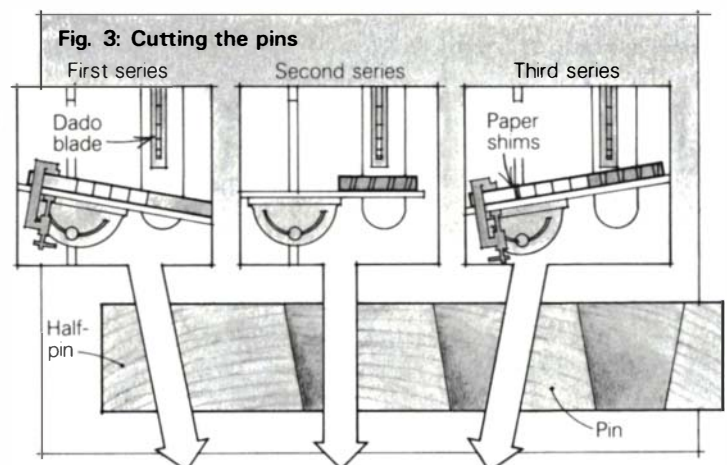
First, return the arbor or table to 90° and install a $\frac{1}{4}$ -in. dado blade raised to cut right to the gauge line. Adjust the miter gauge to 80° , and with all the spacer blocks in place, reset the stop block so that, with the outside face of the board positioned away from you, the first dado cut will be made just to the inside of the knife line. Make sure that the board is positioned correctly, or else you'll end up cutting the pin angle in the wrong direction. Make the first cut, flip the board end-for-end and cut only the opposite corner. Then remove the first block and repeat until one side of each pin is cut.

For the second series of cuts, set the miter gauge to 90° and waste the material between the pins. You'll have to remove a lot of wood in several passes to form widely spaced pins, in which case it's handier to judge the cuts by eye rather than relying on the spacer blocks. Don't waste too much material, else you'll nip off the opposite side of the pins. While the miter gauge is at 90° , use the dado blade to waste the wedge of wood remaining in the sockets of the tail board. If the sockets are narrower than $\frac{1}{4}$ in., nibble out the wedges on the bandsaw or with a coping saw and a chisel. Use a backsaw or the tablesaw to trim the shoulders where the half-pins fit.

Next set the miter gauge to 80° in the opposite direction, and reset the stop block so that the dado blade cuts just inside the other knife line. Make the third series of cuts like the first, but before proceeding, slip three or four strips of paper between the last spacer block and the stop block. Complete the cuts and try the joint. It should slip together by hand or with light mallet taps. If the joint is too tight, remove one or more paper shims, repeat the cuts and try again. Smooth the space between the pins and the tails, pare any tight spots with a chisel, and you're ready to glue up. □



The tail location is scribed directly onto the outside face of the pin board with a knife. A bold X marks the material that will be wasted to form the pins.



Once marked out, the pins are formed by wasting the wood between with dado-blade cuts. In the photo below, Duginske completes the second series of pin cuts.



Mark Duginske is a cabinetmaker in Wausau, Wis.

Goats Get Jim Pritchard

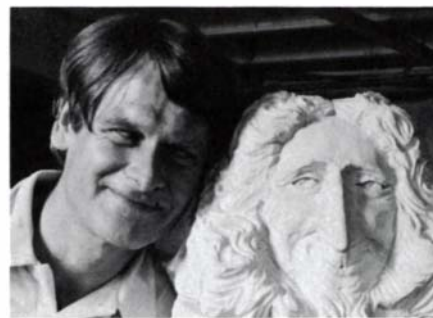
How a homebuilder became a figure carver

by Deborah Navas

"I'm used to seeing four walls, rafters and a joist system go up in the two weeks it takes me to carve one of these things," Jim Pritchard says, referring to the 4-ft. high carved wooden figures that took over his life two years ago. "It's just the opposite of carpentry. It's indefinite. When I start a figure, I never know if I'm going to pull it off or not."

Pritchard, in partnership with his wife, Laurel, has spent most of the last 20 years designing and building colonial-style homes in the Dublin, N.H., area. The only woodcarving he did was

strictly as a hobby, or occasionally to decorate furniture or architectural details. His venture into carving was pure happenstance. He had always been interested in old wooden advertising figures ("but too cheap to buy one," Laurel comments), and when he came across some pictures of figureheads, wooden Indians and other folk art at a local flea market, he thought, why not try making one for himself? He went home and carved a 3-ft. high Indian maiden. When he brought it along with him to the next flea market, much to his amazement it



Pritchard, left, and Louis XIV.

sold on the spot. Though he didn't know it at the time, he had just begun a career change from house builder to figure carver.

His early figures were mostly subjects from traditional folk art: Indians, a clown, a baseball player. Then, in a carving meant to be something else altogether, a leering goat-like countenance emerged. The satyrs evolved between trips to see the goats at the local Friendly Farm and forays through a shelf of European art books. Blending the earthy and the fantastic, Pritchard's goats would be dressed in period costume, and made to resemble the kings of Europe.

Though he carves both human and satyric figures, the goats (as he calls them) are Pritchard's favorites. They give him more artistic license than the human figures and they're faster to do. "With a strictly anatomical woodcarving," he says, "I have to be too careful not to blow it. I've spent up to twelve hours on a single arm. But with a goat, I can usually incorporate a mistake into the design—who's to say satyrs don't look like that?"

Because Pritchard first started selling his figures at a flea market, portability determined their size. "People buy them on impulse," he says. "If they have to wait a few days to borrow Uncle Harry's truck, they go home and think, 'Do we really need a satyr for our living room?'" Besides, the dwarfish size of the figures is appropriate for creatures of the imagination. A larger satyr would be intimidating, while a smaller figure would lack the uncanny presence.

The closest Pritchard came to any formal art training was a minor in art history at Keene State College; his carving techniques have evolved through experience and his knowledge of carpentry. A local sawmill saves him their clearest kiln-dried 2x12 Eastern white pine boards. He prefers pine because it allows him to work quickly—"these things aren't finely detailed, I'm not tempted to put in eyelashes." He lami-



Detail of Jim Pritchard's 'Renaissance Satyr.' Full view, facing page.

nates at least six boards between 3 ft. and 4 ft. long with Titebond, clamping with a house jack between an overhead beam and the cellar floor. Although many old wooden Indians are solid, they were often carved from the butt of a ship's mast, which had dried for many years. "Logs take an unholy amount of time to dry out," Pritchard points out, "and they're sure to check. Historically, most woodcarvings were either hollowed out or laminated from sawn stock."

He begins with a core, usually 12 in. by 12 in.—the length of the blank depends on the figure to be carved. On some the legs are carved out of the whole, on others they're added later. On his first few figures Pritchard drew both a front and side pattern, but he had trouble bringing the two together. Now he draws just a side pattern, then uses a chainsaw and an ax to rough out the profile. As his confidence grows, he's been relying more on the chainsaw, which he also uses as a power rasp. Then he determines the angle of the head, and starts right in on the face with chisels and gouges. He prefers working in his dim cellar, with the figure lit from the side to highlight its features as work progresses.

Pritchard establishes the figure's face first—"so my ideas don't get away from me," he says. "It creates the standard to work to. It also keeps me company and looks at me reproachfully if I do something wrong." When he needs a human model, he prevails on Laurel, or he uses himself; a few of his figures show a definite family resemblance.

Pritchard works as quickly as possible, adding on laminates for whatever protrudes from the core. He carves intricately detailed pieces such as hands separately in his vise, and then dowels them to the figure afterward. Though wood is a rigid medium, parts can be sawn off and replaced if necessary. Rotation was what saved the day for an earlier figure, "Dancing Girl," who when completed looked much too stiff. Dissatisfied to the point of scrapping her, as a last-ditch effort Pritchard sawed her in two and

rotated the top of her torso about 2 in., which solved the problem.

Fine rasps, riffles, scrapers and sandpaper are used for detail work. Laurel does some of the more painstaking shaping—her patient approach to the task contrasts with Jim's preference for doing things quickly. They've developed a good working relationship over the years, whether it be on houses or satyrs. "Jim's fired me a few times," Laurel told me, "but it was only when I was about to hand in my resignation anyway."

Many of the Pritchards' finishing materials and techniques are familiar to carpentry. For an aged, antique appearance, Jim will blowtorch the sanded figures to accentuate the grain. He then paints them with alcohol-based primers tinted with universal colors, and finishes with a deep brown or walnut-tinted polyurethane glaze. The goats, with their fancy costumes, call for a more elaborate treatment. They are primed gray and then painted with layers of tinted shellac or polyurethane. The layers give the skin a strikingly realistic tone and the costume an appropriately antique patina. When a goat is finally done, it's best if it leaves the house quickly (which most of them do): Pritchard is a tireless perfectionist and tends to worry over figures that are around too long, sometimes painting them over several times.

Pritchard's woodcarvings elicit strong reactions. He recently won the sculpture award for his whimsical figure "Plenty" at the annual New Hampshire Art Association's Members Exhibit. But "Renaissance Satyr" was juried out of the League of New Hampshire Craftsmen's Show. The goats inspire the strongest reactions, offending some people with their lecherous leers. Most people, however, respond positively to the spirit of playful fantasy that the satyrs embody, their come-hither look being an invitation to smile.

Pritchard is both amused and bemused by the whole thing. "My stuff appeals to the average person," he says, "the average person with a sense of humor, that is." Whatever the reason, the goats sell as quickly as they're dreamed up, and it looks as if the Pritchards may be permanently retired from the house-building business. □

Deborah Navas is a freelance writer in Peterborough, N.H.



Pritchard first establishes enough of his satyr's face for the goat to keep an eye on him through the rest of the work.



A chainsaw wastes most of the figure, and is also used as a power rasp.



Satyr strapped to sawhorses, Pritchard touches up a hand doweled in place.



Bookmatched doors hinged on concealed hardware make for clean, uninterrupted kitchen cabinets.

European-Style Cabinets

Frameless carcasses, hidden hinges and continuous veneers

by Bill Pfeiffer

About four years ago, I happened upon a dazzling maple kitchen in a New York loft that changed the way I look at kitchen cabinets. The kitchen's sleek, seamless doors and drawer fronts and clever concealed hardware gave it an uncluttered appeal that I'd never seen. When I looked closer, I discovered yet more refinement beneath the pretty shell—the cabinets were of a remarkably simple, direct construction that squeezed the most out of materials and space, both in short supply in the small rooms that become today's kitchens.

The cabinets were built in what has come to be called the European style, a no-nonsense construction that's gaining favor on this side of the Atlantic. Euro cabinets evolved in post-war Germany as tradesmen, strapped by materials shortages, struggled to restore bombed-out housing. To save wood, they turned to man-made materials, often attractively veneered

plywood and particleboard trimmed with thin strips of solid wood instead of a bulky face frame. And by joining panels with knockdown fasteners, cabinetmakers catered to the European custom of bringing the kitchen along when moving the rest of the furniture from one home to another.

In the United States, we don't take our kitchens with us when we move. Nonetheless, I find European-style cabinets appealing because of the sophisticated result I get without having to resort to long-winded joinery. You need only master a simple corner joint to build cabinets elegant enough to be adapted as built-in furniture for the living room, or even freestanding pieces for other rooms in the house.

Bill Pfeiffer makes cabinets and architectural millwork in New York City.

Layout and construction—In a nutshell, Euro-style cabinets are simple boxes made of $\frac{3}{4}$ -in. plywood, banded on their front edges with $\frac{1}{2}$ -in. by $\frac{3}{4}$ -in. solid wood strips. This banding replaces the wide, solid wood frame that trims traditional cabinets (figure 1). There are two advantages to frameless construction: you can bypass the tiresome job of mortising or doweled the face frame together and, once done, the cabinets are more spacious because there's no frame to encroach. As figure 2 shows, each base cabinet consists of two sides, a bottom, and a $\frac{1}{4}$ -in. back let into grooves. A doweled or mortised frame holds the top of the cabinet square and serves as a mounting surface for counters. Wall cabinets are similarly constructed, but have a plywood top instead of a frame top.

Before I explain construction details, I need to say a word about design. If a kitchen is to be functional as well as attractive, cabinets must be sized and located to encourage an economic work flow. This is a complex subject that's beyond the scope of this article, so I refer you to three books for help: Terrance Conran's *The Kitchen Book* (Crown Publishers), Sam Clark's *Rethinking the Kitchen* (Houghton Mifflin) and Jere Cary's *Building Your Own Kitchen Cabinets* (Taunton Press). I suggest you start your design by selecting appliances, favoring ones whose proportions will relate to the width of the cabinet doors—which, along with drawer fronts, are the single most important visual element. Once you've decided what will go where, draw cabinet and appliance locations on a scale floor plan.

As figure 3 on p. 57 shows, wall (upper) and base (lower) cabinets should conform to some standard depths and heights, but the width of each cabinet will be set by the appliances and room size. The 36-in. standard countertop height seems to be comfortable for most people. You can vary it to suit, but don't make it too low, else dishwashers and other under-the-counter appliances might not fit. Positioning the lowest shelf of the upper cabinets 52 in. above the floor, with 16 in. between countertop and cabinet, is the best compromise between working room and comfortable access to the upper cabinets.

I try to work out the width of my cabinets so that all the doors will be between 14 in. and 19 in. wide. These dimensions produce the most pleasingly

Fig. 1: Euro-cabinet vs. face-frame construction

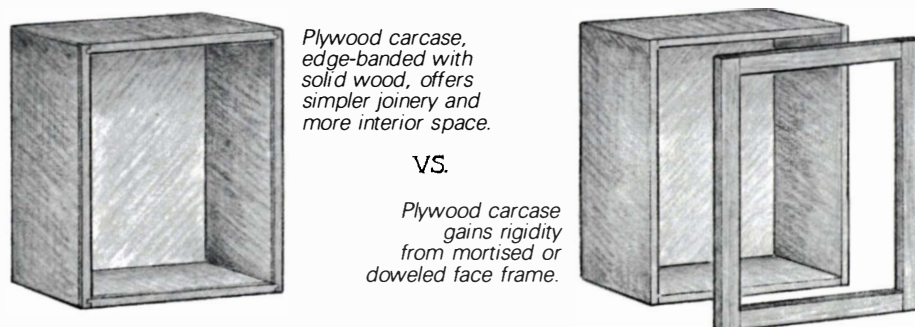
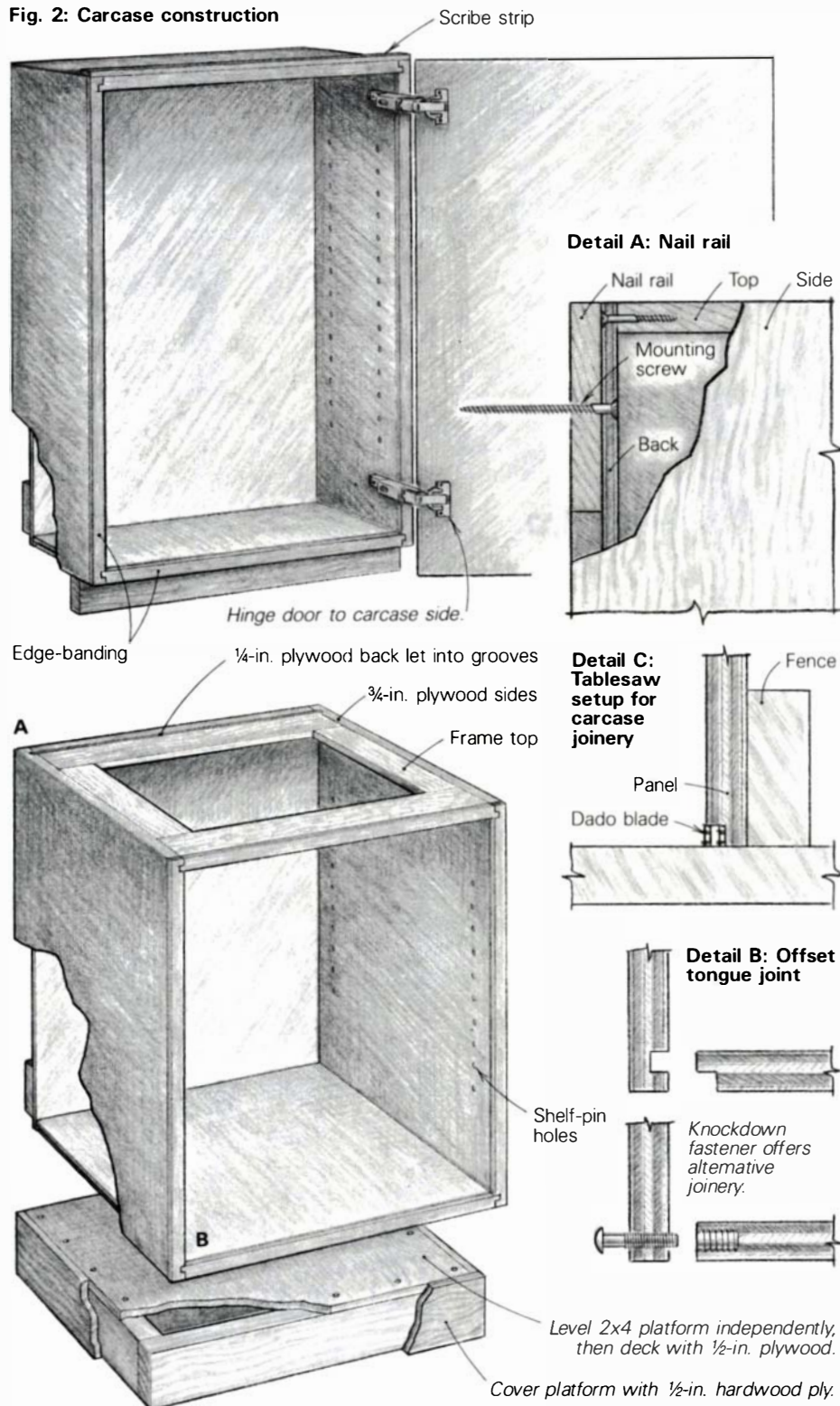


Fig. 2: Carcase construction



Scribe strip fits bumpy walls

In a new house, kitchen cabinets may be ready to hang as soon as they're finished. But in an older home where extensive renovation is contemplated, wall framing, rough electrical and plumbing work, and drywalling must be done first. Some makers install the cabinets before the walls are painted, but I prefer to wait until afterward, so there's no chance of paint spatters ruining the finish.

If I can offer any cardinal rule of cabinet installation, it's take your time and get at least one other person to help you. Even carefully crafted cabinets will look awful if sloppily hung.

So I won't have to clamber over the base units, possibly damaging them in the process, I install the wall cabinets first, beginning in the corners and working out. They're screwed directly to the wall studs with 3-in. No. 8 screws passed through the nail rails.

Begin by marking out stud centers on the walls. Measure and transfer these marks to the cabinets so you can pre-drill and countersink the screw holes. Taping two levels to the carcass—one vertically and one horizontally—will free up your hands for scribing, as shown in the drawing. Knock together a 2x4 T-brace to help support the load. The scribe should be trimmed to fit the wall as neatly as possible, but minute gaps,

say, 1/8 in. or so, can be filled with a bead of latex caulk and painted over.

A screw at each corner is plenty to hold a small carcass, but a larger one needs fastening in the middle of the cabinet's length. A shim between the nail rail and wall keeps the carcass from bowing back. Base and wall cabinets can be screwed together by driving extra-long screws through the hinge mounting plates.

Screw the base cabinets to a platform made of 2x4s decked over with 1/2-in. plywood. The platform, which forms the cabinet's toespace, is leveled independently with shims before it's screwed to the floor. Bolts passed through brackets fabricated from angle iron and into lead anchors will fasten the platform to a concrete or masonry tile floor. Once the platform is in place, the base cabinets need be scribed only where their back vertical edges contact the wall.

Setting the countertop completes the job. Plastic laminate is the most popular counter material, although wood, tile, marble, slate and granite are attractive, if expensive, alternatives. After they're scribed to the wall, the laminate, wood and the plywood ground for tile counters are anchored by screws driven up through the base cabinet top frames. Gravity and a bead of mastic will hold stone counters in place. —B.P.

rectangular proportions. Also, plywood shelves tend to sag if asked to span more than about 38 in. Carcasses can be wider and have three or more doors, but you'll need to install partitions on which to mount shelves and doors. Bigger carcasses are hard to keep square during assembly and installation.

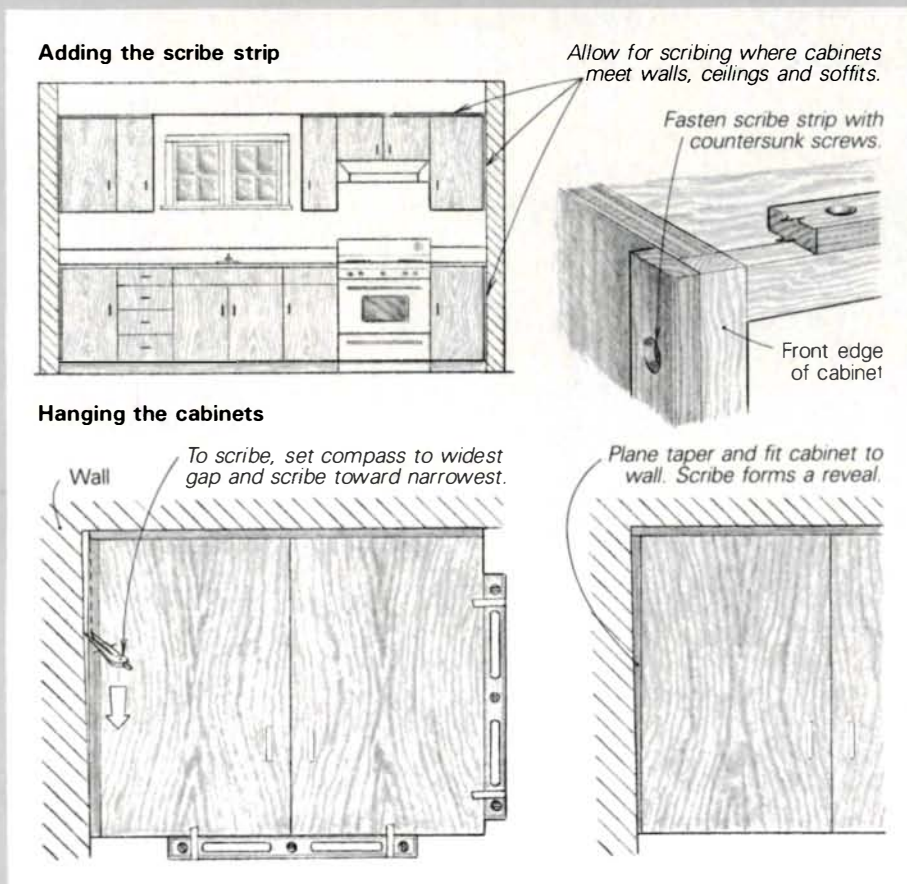
As you build a kitchen, you'll discover that square cabinets won't fit into the room as readily as a drawer might fit into a carcass. This is because walls, floors and ceilings, no matter how carefully constructed, are rarely plumb, level and square with each other. The sagging foundation of an older home makes this problem particularly troublesome, so you need a way to fit the cabinets.

Adding a scribe—a small strip of wood attached to the carcass to extend its overall dimensions—is the simplest way to do this. The scribe strip is first marked with a compass, then trimmed to match the contour of the wall or ceiling (see box at left). Usually a 3/8-in. by 1-in. scribe strip screwed to the carcass is enough, but badly out-of-plumb walls may need more. Before you calculate precise carcass sizes, check the walls and ceilings with a level, then decrease the overall carcass sizes to fit the minimum distances and allow for the scribe you need (*FWW* #41, pp. 42-45). For base cabinets, the 2x4 platform serves as a leveling device. It can later be covered by cabinet-grade plywood or by flooring material (figure 2).

With scribe accounted for, you can calculate the size of each carcass and the parts needed to make it. In figuring the size of each part, don't forget to allow for the solid wood edge-banding when you work up your cutting list. Plywood components for base cabinets, for example, can be rough-cut slightly narrower than their finished sizes, since gluing on the solid wood edge-banding will bring them to the finished width. Wall cabinet sides, which usually get edge-banded on both their front and bottom edges, can be sawn a bit undersize in both width and length.

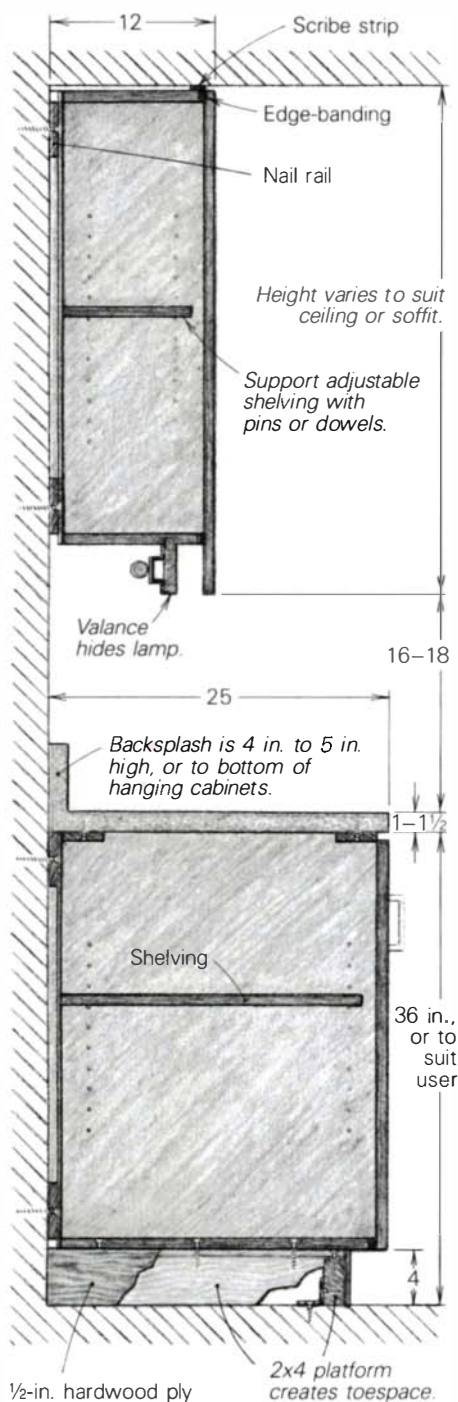
For an economical plywood cutting list, keep two things in mind: first, figure from large pieces to small, and second, to ensure uniformity, cut all similarly sized pieces at one saw setting. For most kitchens, expect to get six base cabinet sides or twelve wall cabinet sides from a 4x8 sheet of plywood.

I use 3/4-in. lumber-core red birch plywood made in Japan. This material is



not only cheaper than its American counterpart, it's also of more uniform thickness, thus making for more precise joinery. Cabinet-grade plywoods may be hard to find, but I recommend this material, even if you have to special-order it through a commercial cabinet shop. Interply voids in fir structural plywood make it troublesome to join, and its wild grain is unattractive, even if painted. Cabinet-grade plywoods are sold in dozens of species and several grade ranges. For kitchens, an A-1 or A-2 grade with a lumber, veneer or fiberboard core is suitable.

Fig. 3: Cabinet dimensions



Carcase joinery—Begin construction by cutting the plywood, labeling and stacking each piece as it comes off the saw. Next, glue on $\frac{3}{4}$ -in. thick by $\frac{13}{16}$ -in. wide edge-banding, which will later be ripped down to about $\frac{1}{2}$ in. wide when the plywood parts are trimmed to final size. Wall cabinet sides get bands on their front and bottom edges. So end grain won't show at the front of the cabinet, do the bottom edge first, trim a bit off the width of the panel to flush up the joint, and then band the front edge. Once the plywood parts have been banded, trimmed to size (including the top frame for base cabinets) and carefully checked for square, you're ready to cut joints.

Plywood lends itself to production machine joinery. I cut most of the joints on my shaper, but the only essential tools are a tablesaw, a router and the usual hand tools. For lumber-core and veneer-core plywood, the offset tongue joint shown in figure 2, detail B, is strong and quick. Plate joints (*FWW* #34, pp. 95-97) or dowels are better for particleboard and fiberboard. Knockdown fasteners are suitable for either material, if you prefer that method.

Whether you machine the offset tongue on a tablesaw fitted with a dado blade or on a router table, plywood that varies in thickness will cause some joints to be loose. One remedy is to machine the tongue slightly oversize and then hand-plane it to a good fit. A second, as shown in detail C of figure 2, is to feed the plywood vertically between the fence and the dado head, with the tongue against the fence. Most $\frac{1}{4}$ -in. plywood seems particularly scanty these days, being only 0.220 in. thick. If you don't have a 0.220-in. cutter but still want the backs of your cabinets to fit snugly, try cutting the groove in two passes with a $\frac{1}{8}$ -in. wide blade in the tablesaw. Move the fence slightly to widen the groove for the second pass.

With machining complete, you can sand the carcass parts before assembly. Glue-up is straightforward, but check carefully that everything is square, to avoid trouble when fitting the doors and drawers later.

After assembly, clean up the carcasses with a hand plane and/or a finish sander and ease the edges with sandpaper. Before you begin drawer and door construction, drill holes for the shelf pins using the template shown in the photo, above right. I use 5mm brass shelf pins,



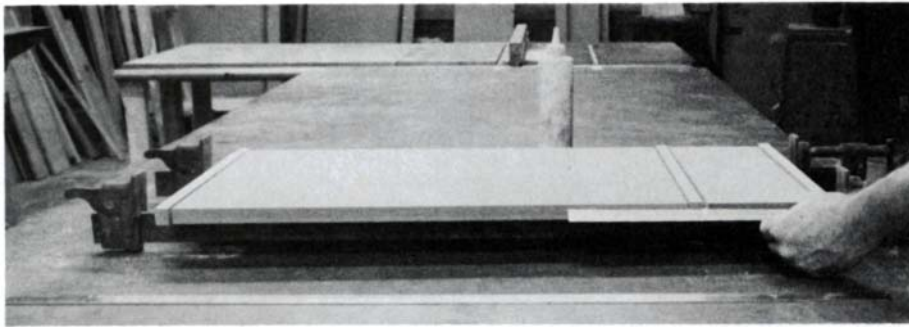
A plywood template, wedged inside assembled carcasses, speeds boring of shelf-pin holes, which should be spaced about $1\frac{1}{2}$ in. apart.

but dowels will also work, or, if you prefer, metal or plastic shelf standards. On narrow carcasses, you may want to drill the shelf-pin holes before assembly.

Doors and drawers—I figure door and drawer face sizes at the same time I calculate case dimensions, but if you're uncertain about these sizes, wait until you've completed the cases. If you're using full-overlay doors and drawer fronts, size them so that they will completely overlap the front edge of the carcasses. I leave about $\frac{3}{32}$ in. between two doors or between a door and a drawer front. This clearance is fine-tuned later by planing the doors and/or adjusting the hinges.

Concealed hinges work with plywood or solid panel doors, but they're also fine on frame-and-panel doors, provided that the hinge stile is wide enough for the cup flange, usually a $2\frac{1}{4}$ -in. minimum. I make my doors of $\frac{3}{4}$ -in. fiberboard edge-banded with solid wood and veneered on both sides. To allow for trimming later, I make the edge-banding $\frac{1}{2}$ in. wide.

Choosing the veneer with the customer is the highlight of the job for



After glue-up, the fiberboard and edge-banding assembly shown above will be veneered then crosscut to yield a cabinet door and drawer front with continuous grain. Figure 4, below, shows a similar setup for a bank of drawers.

Fig. 4: Drawer face cores

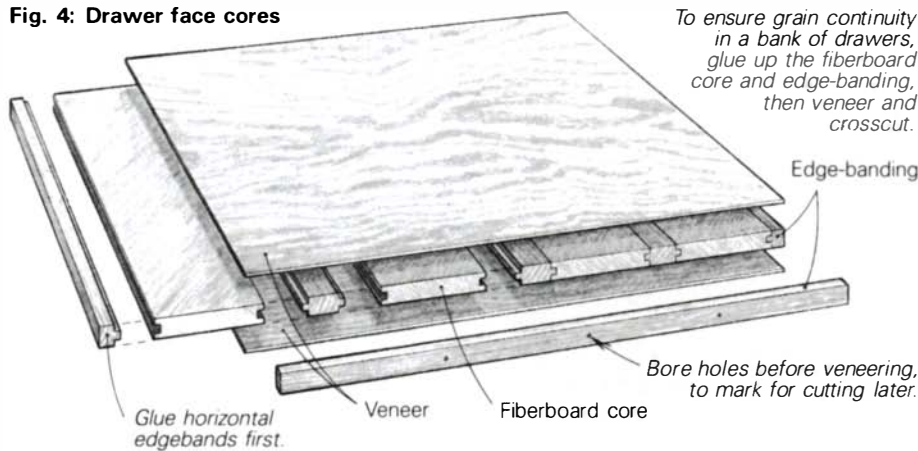
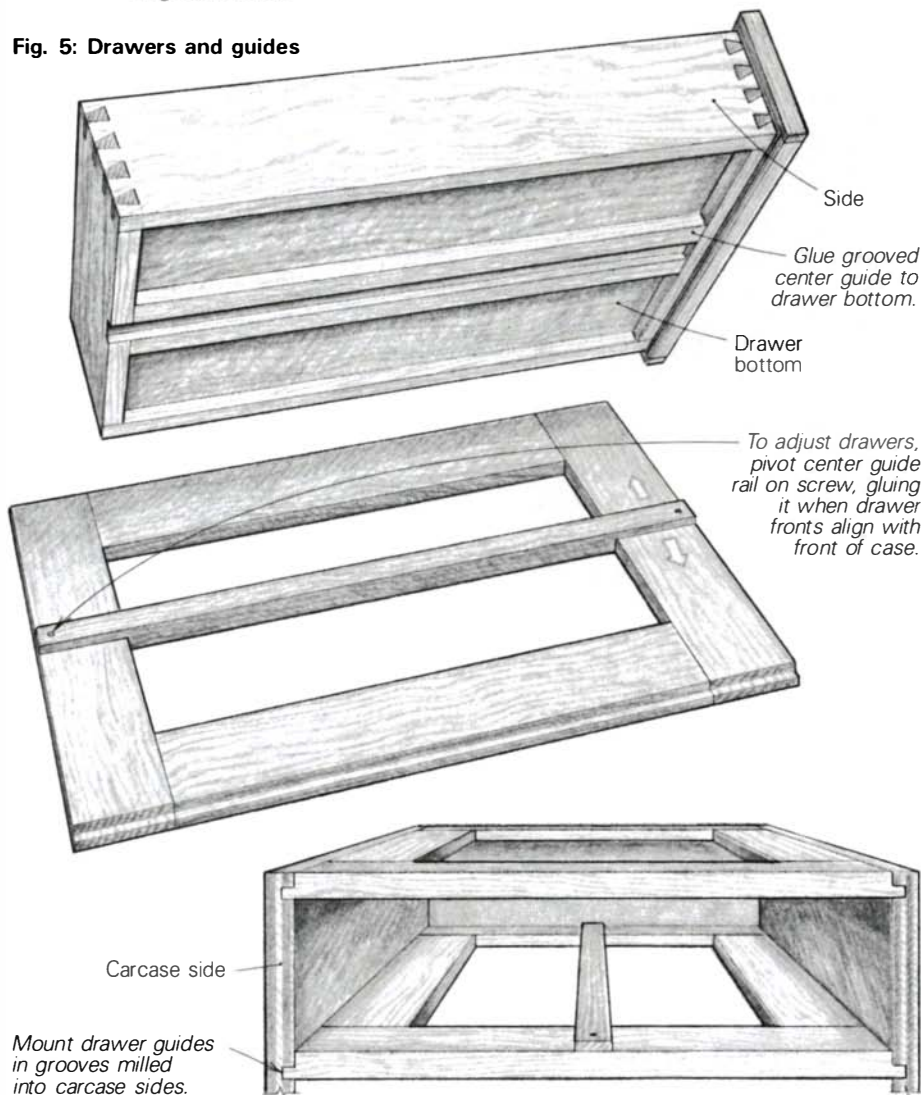


Fig. 5: Drawers and guides



me. We usually pick veneers from the same flitch, and it's fun to flip through the stack, envisioning how the raw log was sliced into so many thin sheets. We organize the veneers to be bookmatched or slip-matched in sequence for each door and drawer face. To assure grain continuity between a drawer face situated above a door or in a bank of drawer faces, I glue up a sandwich core (figure 4 and photo at left) which is then cut into components after it's veneered.

If I've got only a few doors to make, I veneer them myself on a shopmade press. Otherwise, I job out the work, sending the matched, taped veneers and cores to a local architectural millwork house, preferably one equipped with hot presses. If you don't want to bother with veneered or frame-and-panel doors, fiber-core hardwood plywood edged with solid wood is a stable alternative. To hang the doors, refer to the box on the facing page.

I like the whisper of a well-fitted wooden drawer sliding on a wooden track, so I use the drawer scheme shown in figure 5. The drawers slide on bearing rails grooved into the sides of the carcase. A grooved member glued to the drawer bottom slides on a center guide rail, making for smooth, accurate travel. But practically any method for hanging drawers is okay for kitchen cabinets, including metal ball-bearing slides, which are quicker to install than wooden tracks. Most metal slides require at least $\frac{1}{2}$ in. of clearance between the inside of the carcase and each side of the drawer, so be sure to allow for it.

Honduras mahogany router-dovetailed together makes strong, attractive drawers, but poplar, maple and Baltic birch plywood are excellent, less expensive alternatives. In fact, I recommend making drawers deeper than 10 in. out of plywood—they'll be less likely to warp. Once I've hung and fit the drawers to my satisfaction, I install the drawer fronts with screws driven in from the inside of the drawer. Make sure the edges of the drawer fronts align with each other and with the doors.

With all the doors and drawers in place, and before I apply the finish, I make any final adjustments that require planing or cutting. I coat the carcasses, doors and drawers with nitrocellulose vinyl sanding sealer, followed by a fine sanding two to three hours later. A coat or two of Flecto Varathane completes the finish. □

Hanging doors on concealed hinges

Staff photos

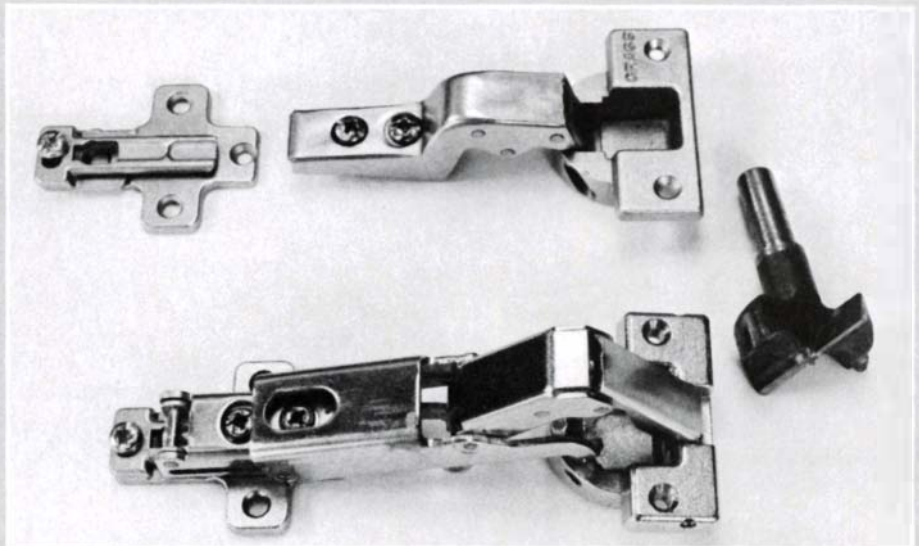
The trouble with a lot of cabinet hinges—including some expensive ones—is that you can't adjust the doors once they're hung. Some hinges permit a smidgen of adjustability through slotted mounting holes, but these are awkward and liable to work loose in service.

Concealed hinges made by several European firms solve these problems cleverly. Though formidably complicated in design, these hinges are simple to install. Besides remaining out of sight when the doors are shut, they are adjustable in three planes, by as much as $\frac{3}{16}$ in. for some models. You need only locate mortises to within a fraction of an inch—you can fine-tune *after* the door is hung. Euro hinges work with an elbow action that throws the door's hinged edge slightly sideways, keeping it from banging into the adjacent door. Though invisible when the doors are closed, concealed hinges are big and mechanical-looking when the doors are open.

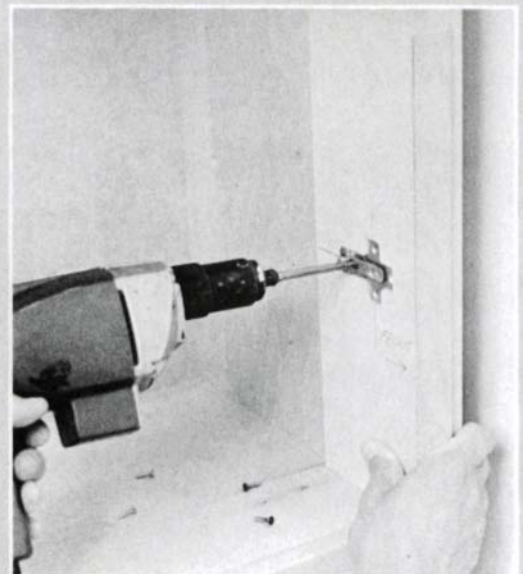
Most concealed hinges consist of two parts: a baseplate which you screw to the inside of the cabinet carcass, and a metal arm that pivots on a cup-shaped flange which you let into a round mortise in the door, as shown in the top photo at right. To hang a door, mark out and bore the hinge mortises. With a fence clamped to the drill press, use a $1\frac{3}{8}$ -in. (35mm) Forstner bit (available from hinge suppliers) to bore a $\frac{9}{16}$ -in. deep mortise for each hinge. The edges of the mortises should be about $\frac{5}{32}$ in. in from the edge of the door. Push the hinge temporarily into place. Locate the baseplate by holding the door in the position it will be when open, and transfer the center marks. A jig like the one shown in the photo, far right, will speed the mounting of baseplates. Screw the hinge cup into the mortise, then hang the door by sliding the hinge arms onto the baseplates.

Once the door is hung, you adjust it by turning screws in the hinge arm to move the door vertically, horizontally, or toward or away from the carcass.

You can buy spring-loaded, self-closing hinges or else use nylon roller catches to hold the doors closed. I find an Austrian brand of hinge called Grass to be the strongest and most adjustable. Grass hinges are sold wholesale by Kessler Inc. (229 Grand St., New York, N.Y. 10013), and are available retail (about \$9 a pair) from Woodcraft Supply; you can get a complete list of local distributors from the importer, Grass America (1377 S. Park Dr., Kernersville, N.C. 27284). —B.P.



Most European-style concealed hinges have two parts—a baseplate that attaches to the inside of the carcass, and an arm-on-flange that fits into a round mortise in the door. The top hinge opens about 100°; the lower, 176°. Made by Grass, both self-close, and are available for either inset or overlay doors. The bit bores a 35mm round mortise.



The setup shown at left bores the mortises for concealed hinges. In a production run, the plywood jig pictured above speeds mounting of the baseplates. It positions the plates at the correct depth, and equidistant from the top and bottom edges of each door opening.



In the arm of this hinge, the screw at the right controls the door's lateral position; the middle screw, its distance from the front edge of the carcass. The third screw, when loosened, allows the door to be moved up or down in the vertical plane.

Improving the Fretsaw

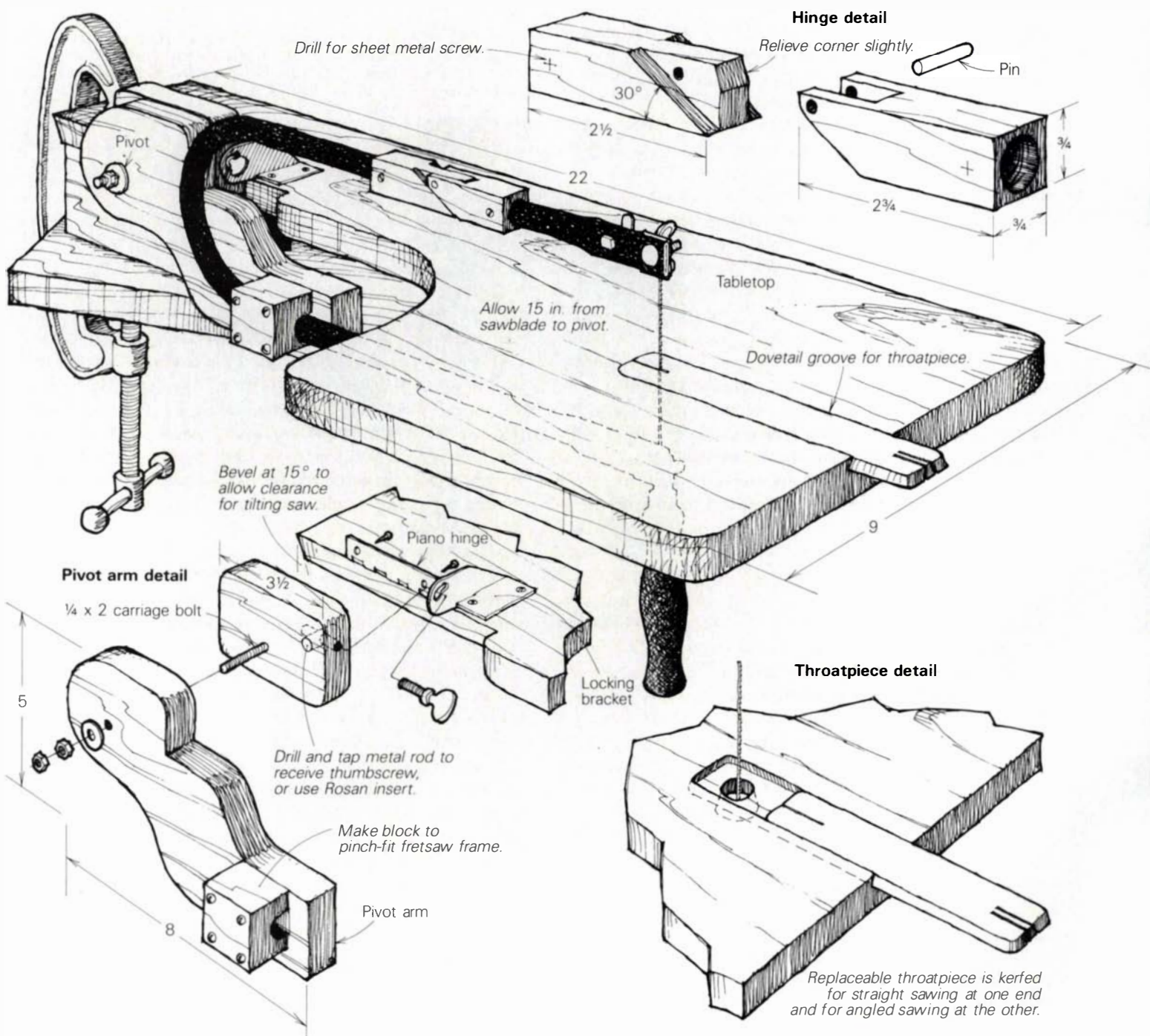
Pivot guides handsawing of marquetry veneers

by Ed Kampe

In marquetry, it's difficult to use a fretsaw freehand with only a bird's-mouth jig for support. With a few years of practice, you might become accomplished with this contraption, but I've already used up my three score and ten, and the designer in me insisted that there must be a better method. I wanted a jig that could be clamped to a corner of the kitchen table, something for the shut-ins or for the person in a wheelchair. Marquetry is a wonderful hobby that combines art

and craft. An easy-to-use fretsaw might help more people enjoy it.

With that in mind, I rigged up this jig which is suitable for the double-bevel marquetry cutting method explained by Silas Kopf in *FWW* #38, pp. 61-65. Instead of the entire tool moving up and down, my modified fretsaw is clamped to a wooden arm which pivots on a carriage-bolt axle attached to the saw table. This setup has three advan-



tages. First, the saw is always held at the correct angle, freeing me from the task of sliding work and saw around in search of the narrow notch in the bird's-mouth. Second, the saw's hinged upper arm pivots out of the way when a blade must be threaded through the workpiece. And third, the veneer can be held stationary as the saw is stroked. This last feature is handy because when the blade reaches the bottom of its maximum stroke, it will have advanced about $\frac{5}{8}$ in., offering good control when cutting fragile or pointed parts.

As the drawing shows, I made my jig to about the dimensions of a small, power scroll saw. The table, saw bracket and tilting mechanism are of pine, but a good grade of $\frac{3}{4}$ -in. plywood could be substituted. If unsupported, veneer will chip on the back side as it is cut. I solved this problem by inserting a throatpiece that slides in a 1-in. wide dovetailed groove milled in the tabletop. One end of the throatpiece is kerfed to accommodate the blade set at 90°; the other end has two kerfs at 12°, the angle I like for double-beveling.

The saw is clamped to a bracket, which is in turn attached to the table by a section of brass piano hinge. This allows the saw angle to be varied. A thumbscrew through a shopmade aluminum bracket locks the saw at the desired angle. I made my own barrel nut for the thumbscrew by drilling and tapping a $\frac{3}{8}$ -in. steel rod. A wood screw, or better yet a thumbscrew threaded into a Rosan insert, would serve the same purpose. The best pivot point turned out to be 15 in. from the blade and just below the surface of the table.

If I had had access to a machine shop, I would have made the upper arm hinge from aluminum so that it could be smaller. As it was, I had to use wood, and maple seemed a good choice. So that you won't have to contend with clamping the odd-shaped pieces on the drill press, bore the blind holes for the saw frame before you shape the hinge parts. I didn't have the 0.515-in. ($\frac{33}{64}$ -in.) bit to match the diameter of my saw frame, but an oversize $\frac{1}{2}$ -in. masonry bit I found in my collection worked fine after I ground off a few thousandths of an inch. For accuracy, I drilled a $\frac{1}{2}$ -in. hole first, and then, without changing the setup, enlarged it with my modified bit. Not all fretsaws have tubular frames (I got mine from Constantine's). If yours is of steel bar stock, you'll have to modify the mounting bracket and mortise the frame into the hinges.

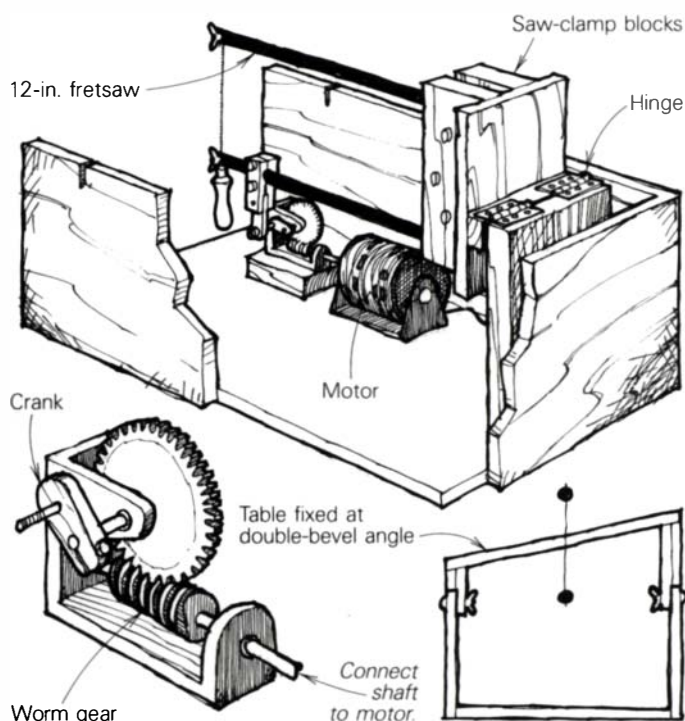
I cut and shaped the hinge sections on my 4-in. Dremel saw. Doing it by hand is nearly as easy. With a backsaw, saw the angled cheeks and shoulders of the male section, then chisel the slot in the female part until you get a slip fit. For the hinge pin, I sacrificed a $\frac{5}{32}$ -in. drill bit. Measuring the overall length of the hinge and subtracting the combined depth of the two holes tells you how long a section of the saw has to be cut out. Make sure that the blade clamps line up when you put the saw together. I fastened the hinge with sheet-metal screws driven through the wood and into the saw frame.

Installing a blade is easy. First, I clamp the jig to a comfortable work surface, which happens to be the desk in my den. I thread the blade through from the top and clamp it at the bottom. Resting the saw handle on my knee leaves both hands free to pivot the upper arm down and clamp the other end of the blade. □

Ed Kampe was a design engineer and general foreman in precision metalworking. He makes marquetry pictures in Zellwood, Fla.

Motor makes fretsawing fly

by Scott Littleton



As a marquetry beginner, I found that knife-cutting left my hands stiff and sore, so I set out to design and build a low-cost power scroll saw that would make a beveled cut. Ideally, a marquetry saw's blade should operate straight up and down. But a mechanism with a large throat to achieve this ideal seemed beyond my abilities. Some sketching showed me that a simple oscillating saw might work, since the force needed to cut veneer is small and the speed need not be great. One disadvantage of a rocking saw frame is that the cutting edge of the blade moves forward and back during the stroke. I found that with a short stroke ($\frac{3}{4}$ in.), the front-to-back motion is negligible.

I built my saw the simplest way I could and just slapped it together quickly, thinking it was an experiment to be improved on later. It works so well that the only improvement I may ever make is to increase the throat depth.

To make the saw, I clamped a 12-in. fretsaw between two bolted blocks. The blocks are attached to a hinged post mounted on a $\frac{3}{4}$ -in. plywood base. To remove any side play from the saw, put the hinges in a bind, or use a piano hinge. Up-and-down motion is achieved through a small electric motor, a small worm gearbox (or gearmotor) and a simple crank mechanism. After having tried several speeds, I find that about 300 strokes per minute is my preference. The motor to power the unit need not be large. I've found that even a $\frac{1}{120}$ -HP gearmotor (Dayton 200-RPM shaded pole gearmotor, stock #2Z812, about \$18.50) will cut two thicknesses of oak veneer without noticeably slowing down. □

Scott Littleton lives in Salt Lake City, Utah.

Which Glue Do You Use?

Chemical types, not brands, make the difference

by George Mustoe

Like the alchemists' attempts to transmute base metal into gold, much human effort has gone into the search for the perfect glue. This goal is probably as unrealistic as the dreams of alchemy, but the inventors' struggles have not been without reward: adhesives manufacturing is a big growth industry in the United States, and per-capita consumption is about 40 lb. per year.

Not surprisingly, "What kind of glue did you use?" is a frequent query heard whenever woodworkers gather. Unfortunately, these exchanges generate some old wives' tales, among them the colorful but incorrect assertion that cyanoacrylate "superglue" is derived from barnacles (*FWW* #37).

Because wood is a relatively weak construction material, most adhesives produce bonds that are stronger than the surrounding lumber, so claims of extremely high strength are seldom meaningful to the woodworker. Instead, the most important characteristics are setting rate, viscosity, resistance to water, flexibility, color, sandability, and gap-filling properties. As a woodworker who happens also to be a chemist, I've developed a keener than usual interest in the literally hundreds of glues sold today, discovering in the course of my research that only about a dozen kinds are useful for woodworking. Within each category, I've found that different brands will usually perform equally, so the choice for a particular project is best made by understanding the chemical makeup and characteristics of the glues we use.

In this article, I'll cover those glues that are best suited to general woodworking. In a second article, I'll talk about epoxies, hot-melt glues, cyanoacrylates and contact cements, all specialty glues that are usually more expensive, though not always better, than our old standbys.

Protein glues—The natural world abounds with examples of sophisticated adhesives which display impressive tenacity; barnacles and mussels, for example, cement themselves to beach rocks and ship bottoms with a substance that resists prolonged immersion in salt water. Though the chemistry of these natural adhesives is poorly understood, most sticky secretions are combinations of various complex proteins. Thus it is not surprising that early artisans discovered that the best raw materials for glue were protein-rich animal products such as skin, bone and blood.

Today, despite the advent of modern synthetic adhesives, animal-protein glues are still common. They can be divided into three types: hide and bone glue, fish glue, and blood glue. Of the three, hide and bone glues are of the greatest interest to the woodworker. The use of fish glue, which is derived from the water-soluble proteins in fish skins, is limited to industry, mainly for attaching labels to bottles and occasionally as a tack-improving additive to white glue. Blood glues, once developed as water-resistant adhesives for early military aircraft, are made by dispersing beef or pig blood in

water, with wood dust, lime or sodium silicate added as thickening. They're most often encountered in vintage plywood, but are practically impossible to buy today and have no significant advantages over readily available synthetics.

Hide and bone glues, on the other hand, are far from obsolete. Besides being widely used in industry for products such as gummed paper tape, sandpaper and bookbindings, hide glue finds plenty of uses in the woodshop. The setting time and spreadability can be varied, and the adhesive cures into a colorless, nontoxic, sandable glueline which can be undone by the application of moist heat—a feature that is attractive to luthiers, for instance, who may need to remove the soundboard of an instrument to repair it. Water also softens hide glue, and some furniture conservators use a 50% vinegar solution to speed the disassembly and repair of antiques.

Hide glue consists of protein derived from collagen, the main ingredient of skin and connective tissue. The glue is prepared by cooking animal hides, hooves and tendons into a protein-rich broth which is then cooled to a gelatinous solid, sliced, dried and ground into a coarse powder. In retail stores, hide glue is commonly sold as a pre-mixed liquid, but it can be bought in powder form, in which case it must be mixed with hot water. For an explanation on how to mix hide glue, see *FWW* #42, pp. 74-75. Liquid hide glues have two advantages over mix-your-own: you don't need a heated glue pot, and the slow setting rate may be valuable for complicated assemblies. During the heyday of hide glue, it could be bought in 18 grades, each with a different viscosity and setting time. Today, woodcraft suppliers usually offer only a single, high-grade product. Setting time can be slowed by adding more water, but this leads to a slightly weaker bond.

Many other proteins have adhesive properties. Soybean-based glue is used in some interior plywood. Casein or milk glue, which has been detected in medieval picture frames, is made from skim milk, and is used today for laminating interior beams and trusses. This glue is a light-colored powder that must be mixed with cold water and allowed to stand about ten minutes before use. Unlike the other protein glues, casein sets both by evaporation and by chemical reaction, forming calcium caseinate. The resulting neutral-colored bond is highly moisture-resistant but not waterproof. Casein can be used in cool weather and on woods containing up to 15% moisture. It is particularly effective with oily woods such as teak, yew and lemonwood. Powdered casein glue is available from National Casein, 601 W. 80th St., Chicago, Ill. 60620.

Petrochemical resins—Casein glue is sometimes confused with polyvinyl acetate (PVA) white glues. Part of this confusion stems from the milky appearance of white glue and also because dairy-related companies such as Borden, who once marketed casein, now sell PVA glue. Developed during the 1940s, PVA glue is part of a family of synthetic resin glues



Polyvinyl acetates are made by some 40 to 50 companies, and as this photo shows, prices for a 4-oz. bottle vary. Mustoe found that expensive brands aren't necessarily better.

that have largely replaced animal glues in the woodshop.

Derived from petroleum compounds and acetylene gas, white glue consists of minute PVA globules suspended in water. When the glue is spread on wood surfaces, the water evaporates and/or diffuses through the surrounding porous material, and the globules coalesce to form a tough film. Because of its reputation as a cheap hobby cement, white glue is sometimes undervalued as a woodworking adhesive. Actually, its low viscosity, rapid setting time and fair gap-filling qualities make it an excellent choice for general woodworking. It dries into a clear, slightly flexible glueline, and it remains fresh on the shelf almost indefinitely. PVA is nontoxic, making it safe for use around children.

The major disadvantages of white glue are its low resistance to moisture and the gummy, thermoplastic nature of the dry film: it turns rubbery under the heat of sanding and clogs the sandpaper. You can minimize clogging by removing excess glue with a sponge or a damp cloth before the glue sets, or by trimming away hardened glue with a chisel or a scraper. The soft film also causes PVA-glued joints to "creep" out of their original alignment when subjected to continuous stress. While this may allow joints to adjust to seasonal variations in humidity without cracking, it's not a desirable quality if great structural strength is needed.

Be cautious when buying white glue. Competition among the 40 to 50 manufacturers of PVAs has kept the price low, but with the predictable advertising hype. Weldbond, for instance, calls its PVA a "concentrated . . . universal space-age adhesive . . . not similar to any other type of bonding agent being offered." In fact, the adhesive contains a lower percentage of solids than Elmer's and several other brands of white glue. Weldbond's most significant characteristic may well be its relatively high price. In testing white glues, I found only one that yielded inferior results, a generic white craft glue distributed by a local hobby shop. Its adhesive properties compared favorably with leading brands, but the glue reacted with most woods to produce gray or black stains. Chemical analysis revealed that the glue was contaminated with high levels of dissolved iron.

In recent years woodworkers have been attracted to another type of PVA adhesive, aliphatic resin or yellow glue. Actually, the label is a bit of a marketing ploy, since both yellow and white glues are technically aliphatics, which means that they consist of long chains of molecules. Yellow glues have qualities similar to those of white glues, but they contain polymers that speed tack time and improve moisture- and creep-resistance, at the expense of a slower final cure. Yellow glues are

also less thermoplastic, so they won't gum up sandpaper as badly. Borden's Elmer's Carpenter's Wood Glue and Franklin's Titebond are two of the best-selling brands.

Yellow glue may be more difficult to apply because of its thick consistency, but it is also less likely to squeeze out when clamped. The viscosity increases as the glue ages in the container. Manufacturers recommend that the glue be used within 6 to 12 months of purchase, but some workers successfully store it for up to two years by stirring in small amounts of water to reduce the viscosity. Up to about 5% water can be added without affecting bond strength. Freezing can ruin white and yellow glues, both in the bottle and as they cure. Manufacturers add compounds to improve freeze-resistance, but any PVA that seems curdled should be discarded.

Water-resistant glues—Modern industrial processes have been revolutionized by the development of highly water-resistant synthetic resins, beginning in 1872 when the German chemist Adolph von Baeyer (of aspirin fame) discovered that he could produce a solid resin if he reacted phenol with formaldehyde. This basic chemistry forms the foundation of the plastics industry and has given birth to a family of versatile, reliable adhesives. Phenolic resins, because of their cost and heat-curing requirements, are used mostly in industry and for exterior plywood and water-resistant particleboard. But a chemical cousin of the phenolic resins, urea-formaldehyde resin, is cheaper and easier to use, making it an adhesive of choice when water resistance is needed, or when long open time between spreading the glue and clamping up is desirable.

Phenolics and urea-formaldehydes cure not by evaporation, but by cross-linking or polymerizing their molecules into hard films that aren't softened by water. The small-shop woodworker will be most familiar with the type that consists of a light brown powder which must be mixed with water before use. Weldwood and Wilhold manufacture this adhesive, both under the label "plastic resin glue." Another type, Aero-lite 306, is sold with a hardening catalyst that speeds curing.

Urea-formaldehydes are good general-purpose wood adhesives, especially for woods of relatively high moisture content. They cure into hard, brittle films which won't clog sandpaper, but, for the same reason, they are poor gap-fillers. The medium brown color when cured blends well with most cabinet woods, although bonding may be inhibited in some oily species such as rosewood and teak. Most urea-formaldehydes aren't recommended for marine use, but they are sufficiently water-resistant to withstand sheltered outdoor applications.

When high strength is not essential, urea-formaldehyde can

ADHESIVE SELECTION GUIDE

Adhesive	Application characteristics	Properties after curing	Recommended uses
Hide glue (hot)* (Behlen Ground Hide Glue, Behlen Pearl Hide Glue)	Fast tack, viscous, min. curing temp. 60°F, moderate gap-filling ability, nontoxic, requires glue pot	Transparent, not water-resistant, can be sanded	Musical instruments, furniture
Hide glue (liquid)* (Franklin Liquid Hide Glue)	Slow-setting, low viscosity, min. curing temp. 70°F, moderate gap-filling ability, nontoxic, may have strong odor	Similar to hot hide glue	Assembly procedures that require slow setting
Casein glue* (National Casein #30, slow cure; National Casein #8580, fast cure)	Glue must stand 10 to 20 minutes after mixing, min. curing temp. 35°F, moderate gap-filling ability, nontoxic	Neutral opaque color, high water-resistance, sands cleanly	Interior structural applications, especially good with oily woods and in cool working temperatures
White glue* (Elmer's White Glue, Franklin Evertite, Weldbond, Wilhold R/C-56)	Cures rapidly, low viscosity, min. curing temp. 60°F, moderate gap-filling ability, nontoxic, almost unlimited shelf life	Transparent, low water-resistance, creeps under load, clogs sandpaper	General woodworking, not recommended for structural or outdoor applications
Yellow glue* (Elmer's Carpenter's Wood Glue, Franklin Titebond)	Fast tack, moderate viscosity increasing with age, min. curing temp. 60°F, moderate gap-filling ability, nontoxic	Nearly transparent, moderate water-resistance, less likely to creep under load than white glue, can be sanded	General woodworking, indoor use only
Urea-formaldehyde glue* (Weldwood Plastic Resin Glue, Wilhold Plastic Resin Glue)	Glue powder must be mixed with water, min. curing temp. 70°F**, poor gap-filling ability, releases formaldehyde vapor, uncured glue is toxic	Medium brown color, high water-resistance, sands cleanly, thick gluelines are brittle and may crack under stress	General woodworking, structural uses indoors or in sheltered outdoor locations, bonding may be inhibited with oily woods
Resorcinol glue (Elmer's Waterproof Glue, U.S. Plywood Resorcinol, Wilhold Resorcinol)	Moderate viscosity, min. curing temp. 70°F**, good gap-filling ability, releases formaldehyde during curing, two-part system must be mixed, uncured glue is toxic	Opaque reddish color, waterproof, withstands most solvents and caustic chemicals, can be sanded	Marine use and outdoor construction

* Water-based adhesive may cause warping of veneer or thin panels.

** May be rapidly heat-cured at 90°F to 150°F.

be extended by adding up to 60% wheat flour or fine wood dust. The thermosetting nature of urea-formaldehyde glues can be both boon and bane. In a shop cooler than 70°F they will cure poorly or not at all, but at 90°F the mixture's pot-life is only one to two hours. Once the glue is spread and the pieces clamped, curing can be hastened by heating the glue-line to between 90°F and 150°F. Urea-formaldehyde's thermosetting qualities make it the most popular adhesive for use with the radio-frequency curing apparatus described in *FWW* #38, p. 26.

One drawback of urea-formaldehyde glues is the emission of formaldehyde gas during and after curing. Besides being a suspected carcinogen, this vapor may irritate the skin and eyes and cause headaches. The problem is liable to be most pronounced in homes constructed with urea-formaldehyde-glued paneling, but it's a good idea to work with this adhesive only in a well-ventilated shop.

The development of urea-formaldehydes marked a milestone on the road to the perfect waterproof glue sought by boatbuilders for centuries. Ironically, completely waterproof adhesives didn't appear until the wooden ship was nearly extinct. Today, resorcinol-formaldehyde glue is the most popular waterproof wood adhesive, with epoxy resin trailing as an expensive second choice. Resorcinol glue was developed during World War II for gluing the plywood used in bombers,

helicopter blades and antimagnetic mine sweepers. Today, it is used to bond marine and exterior plywood, and for laminating outdoor timbers. For the home shop, resorcinol is sold retail as a two-part system consisting of a dark red liquid resin, and a solid powder containing paraformaldehyde and an inert filler (usually powdered nutshells). Two brands are Wilhold and U.S. Plywood, both marketed as waterproof glue.

Resorcinol is fairly costly, and once mixed it must be used within an hour or two. For these reasons, it should be the glue of choice only when a completely waterproof joint is needed. It requires a minimum setting temperature of 70°F, and solidifies within eight hours, though it doesn't reach full bond strength for several days. Acidic hardwoods such as oak may require 100°F to 110°F temperatures for maximum bonding. The final glue film is extremely durable, tolerating boiling water, caustic chemicals and drastic temperature variations. Resorcinol glue is easy to apply and can be cleaned up with a damp rag. Disadvantages include the dark reddish glueline and the release of formaldehyde during curing. □

George Mustoe is a geochemistry research technician at Western Washington University in Bellingham, Wash. He wrote about respiratory hazards in FWW #41 and about making cross-country skis in FWW #31. Photos by the author.

Why glue joints fail

When wood joints fall apart, as they occasionally do, the glue is automatically suspect. Usually, though, bond failure occurs not because the glue isn't strong enough, but because the wrong adhesive was used, the wood's moisture content was too high or too low, the surface was improperly prepared, or the joint was clamped incorrectly.

The wide range of glues available will meet any woodworker's requirements, but for most indoor woodworking, white and yellow glues are the best choice, except for veneering, where water-free glues such as epoxy or hot-melt sheets will keep the veneer from curling. Powdered resin glues can give erratic results due to sloppy mixing or poor temperature control, but they are excellent when a hard, machinable glueline is required, and for moisture-resistant exterior work.

Too much or too little moisture in the wood is one of the most frustrating causes of glue failure. Consider this example: The center of a 2-in. thick board is liable to contain more moisture than the surface. If the lumber is planed and edge-glued before it reaches equilibrium moisture content, the porous end grain of the wood will dry and shrink faster than the middle, straining or breaking the glueline. To avoid this, stack and sticker your lumber after milling, postponing gluing until it has stabilized. An extra coat of finish on the end grain when your project is done will minimize subsequent stress on the glueline.

Climatic extremes can drive wood to equilibriums that will make gluing troublesome. In the desert Southwest, for instance, moisture content sometimes falls to 4%, which can draw the

water out of PVAs before the joints can be assembled. Conversely, the glue won't harden at all in wood much wetter than 12%. In these environments, using adhesives that don't cure entirely by evaporation—urea-formaldehydes and casein glues—will help. Temperature can also be a factor in glue failure. Below 50°F, PVAs come out of solution and cure in chalky, weak gluelines. At high temperatures, say, above 100°F, they are liable to skin over before assembly, which makes a strong bond virtually impossible.

Typically, adhesives bond to only the top layers of wood, so the surface must be smoothly cut, with no torn or partially detached fibers. Providing that it is straight and true, the best surface for edge-gluing is one left by a sharp hand plane. Next best is to use a jointer or even a sharp circular saw, preferably one that leaves undetectable sawmarks. Dull jointers and planers, on the other hand, produce a glazed, burnished surface which swells in contact with glue, encouraging failure. A sanded surface is similarly undesirable because the loose fibers left behind by the abrasive soak up glue but will part readily when the joint is stressed. Wood surfaces oxidize quickly, so try to mill and glue on the same day; machining a fresh surface on lumber that has been stacked for acclimation is advisable.

Mating surfaces should fit snugly without massive clamping pressure, but joints should have enough space to permit a glue film to develop; hammer-tight tenons or dowels will squeeze out most of the adhesive as they are assembled. If a joint is sloppy, don't rely on your glue's gap-filling qualities to rescue

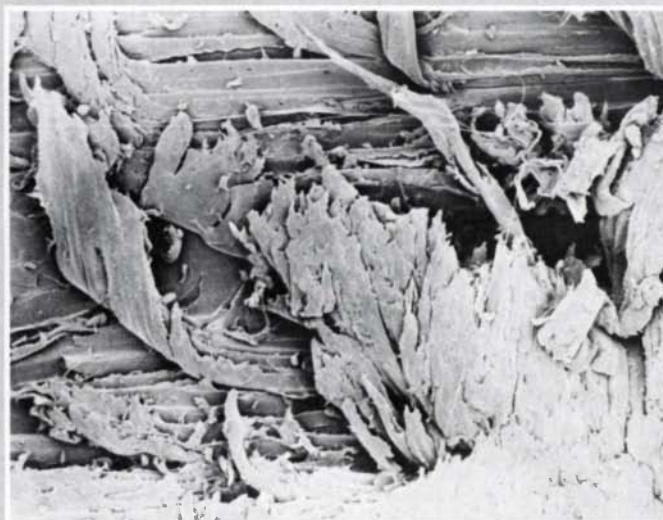
it. Better to recut the joint, or to salvage it with a strategically placed veneer shim.

Deciding how much glue to apply is a dilemma often not solved until it's too late. The ideal glueline is as thin as possible, but without starved spots. Thicker lines are generally weaker because they contain air bubbles or trapped solid particles, as well as internal stresses that develop as the adhesive shrinks during curing. Most glues, particularly PVAs, perform best if they're spread on both surfaces, and the surfaces then placed together and allowed to stand for about 10 minutes before being clamped. This "closed time" gives the adhesive time to penetrate and coalesce before the clamps squeeze it out.

To bond successfully, glues require surprisingly little clamping pressure—10 PSI is plenty, more will just squeeze out the glue, starving the joint. The most common clamping problem is an uneven glueline caused by poorly distributed pressure. Obviously, each job calls for its own setup, but a joint is clamped correctly when the glue squeezes out a bit just as the two parts mate, gap-free. Exert more pressure after that and you risk starving the joint or racking the assembly. For edge-gluing, a good rule of thumb is to space clamps at intervals equal to twice the width of each board. So two 4-in. boards should be clamped every 8 in., with generously dimensioned clamping blocks to spread the pressure and to protect the wood. Before actually gluing, dry-clamp your parts. If a joint won't close, fix what's wrong so you won't be tempted to draw it up later with crushing clamp pressure, introducing stresses that make failure probable. —G.M.



These scanning electron microscope photos illustrate why a crisply cut surface is better for gluing than a handsawn one. The photo of hand-planed maple at left shows cleanly sheared fibers



which allow liquid glues to penetrate. The partially detached fibers of a sawn surface, right, limit glue absorption to top layers and break readily under stress.

Disc Sander Sculpts Turnings

A way to cut spirals without an ornamental lathe

by William Hunter

I am a woodturner, and turning a bowl allows me to search a piece of wood inside and out for the fullest realization of the wood's potential. Sometimes the turned wood is so inherently beautiful that I cannot improve on it. But sometimes the form and figure warrant enrichment. One of my favorite ways to treat such a turning is to put it in motion, that is, to send the eye along a journey over its surface. I groove the bowl in regular or irregular spirals. Then I mount it on an asymmetric stand, a ribbon of wood sculpted to present the sculpted turning.

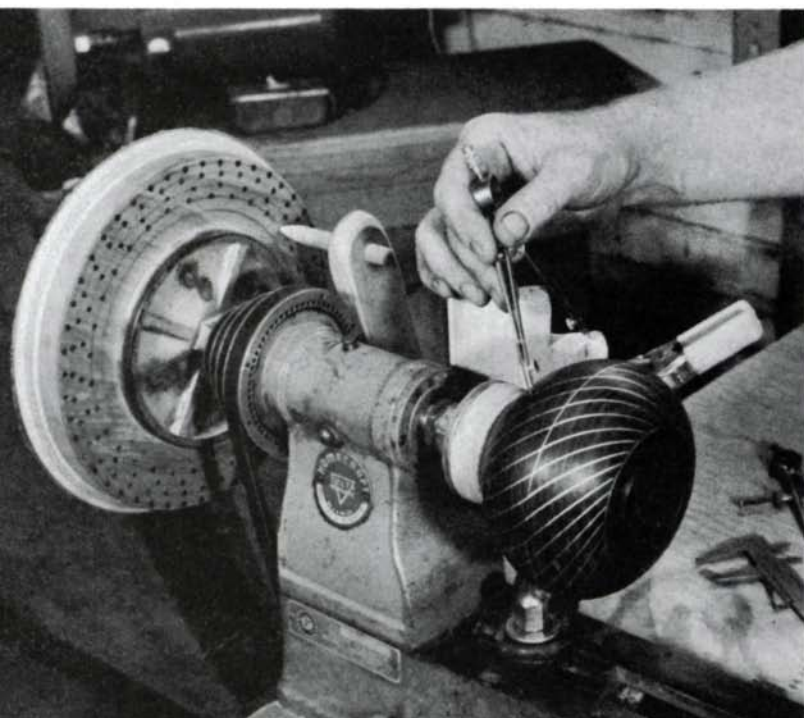
My method has evolved from 15 years as a sculptor and briar pipe maker. The effect is reminiscent of those formal patterns produced on a Holtzapffel ornamental lathe. But instead of employing mechanized cutters controlled by pulleys, cogs and ratchets, I sit in front of a stationary disc sander and move the piece freehand over the disc's spinning edge.

The method may seem dangerous. But in the several years I ran a five-man shop, and in the several teaching experiences I've had at the high school level, I've never witnessed a run-in with the disc sander that required more than a band-aid to cover a minor strawberry. This is the result of conscientious

attention to safe practices: always wear safety glasses with side screens; work in adequate light; use a stable, comfortable stool; wear a dust mask; maintain a concerted mental attitude. The mechanics of this technique are not inherently dangerous. The edge of the disc is not sharp, and disc speed is relatively slow. If you do accidentally touch the disc, centrifugal force throws your hand free. Because there is no table on my setup, there is no chance of pinch or kickback.

I begin such a turning by selecting a piece of wood that, while beautiful in color, is not exceptionally figured. I band-saw a circular blank, glue it onto a piece of hardwood of the same diameter as the faceplate, using 5-minute epoxy, and screw the glue block to a faceplate. Then I turn the outside of the form between centers and sand completely, from 80-grit down through 400-grit. I find that simple, closed forms work better than open, flared forms. Spheres are easier than spheroids with flat surfaces. In small work, I don't hollow the bowl until the very end.

To lay out a bowl, I first mark the limits of the spiral: With the lathe turning, I press a pencil to the wood $\frac{1}{2}$ in. from the bottom of the bowl and $\frac{1}{2}$ in. from what will be the



After the outside of a bowl is turned, regular spirals are laid out, above, by pivoting a compass from a block of wood, positioned first on one side, then on the other side of the lathe. A plywood disc mounted outboard indexes the blank. Freehand disc-sculpting, right, requires careful, measured, graceful movements. The sanding disc (which is the same piece of plywood that serves as the indexing wheel for layout) turns only 300 RPM to 500 RPM and is beveled on its back face to yield a definite edge against which the stock is drawn.





This 8-in. dia. marnut bowl on East Indian rosewood stand looks as if it were made on an ornamental lathe, but the spiral decorations were freehand-carved on the edge of a stationary disc sander.

lip of the bowl. I also make a mark around the bowl's largest diameter. This line will be the point where the spiral changes direction. It is also the circumference around which the spacing of the spirals is marked.

So that the spirals will be spaced evenly, I have mounted on the outboard side of the lathe a 12-in. plywood indexing plate. This plate (marked off in 28, 32, 40 and 48 increments, or however many you want) is a substitute for the lathe's smaller indexing plate. It is screwed to an outboard faceplate, offering a wider choice of indexing patterns and more control over tolerances. A pointer clamped to the lathe stand allows me to hold the bowl in position for each layout line. The spiral offers endless possibilities, but a good place to start is with 12 increments. As many as 24 increments work well on bowls up to 6 in. in diameter. I lay out each spiral with a compass pivoting from a block of wood clamped to the tool rest. Experiment with the compass and various tool-rest positions, looking for a pleasing sweep. Once decided, pencil an arc from the bowl top to the bowl center, crossing through each index mark. Reposition the tool rest on the other side of the lathe to complete the bottom of the arc, from the high point to the foot. Remove the turning, still attached to its faceplate, and examine the scribed lines to make sure that the layout is both accurate and aesthetically pleasing.

Now I move to the disc sander. This is the same plywood disc I have mounted outboard for an indexing plate: I cement 24-grit aluminum oxide (cloth-backed, resin bond) to the outside face and run the lathe at 300 RPM to 500 RPM. The slow speed affords better control for initial cutting, and the large diameter keeps the disc operating cool and also pre-

vents the paper from excessive loading. The edge of the disc is beveled at 30° toward its back side, so that there is a definite edge for cutting precise V-grooves. I cut with the outermost ¼ in. (or less) of the wheel, arcing the stock down along the edge, rather than pushing it straight in. I aim my cuts between the lines, trying to leave the pencil lines intact as reference until I approach finish-sanding. Disc-sculpting requires careful, measured, graceful movements, so it is important that you are seated comfortably, that your posture is relaxed and that your workspace is well lighted. Grip and wrist motion must be consistent so that all passes are equal. Therefore, you must maintain total concentration, without interruptions.

The first cut is very shallow and defines the basic form of the groove. Go once around the whole bowl, cutting about ⅛ in. deep in each groove. The second pass cuts deeper and wider into the established groove. You are now committed. Sometimes it takes only two passes to cut the desired arcs, sometimes as many as five. In this phase it is essential that each cut be equal and in sequence—never backtrack. Irregularities are better worked out with finer grits. It is also important to keep clear of the top and bottom guidelines; taper out the grooves later, with a finer-grit disc.

In the next phase I use an 8-in. Power Pad (available through Power Pad Mfg., 1223 W. 256th St., Harbor City, Calif. 90710) to refine form and to remove scratches. This is an industrial-quality foam disc that's flexible enough to sand contours easily. It's available in soft, medium and hard consistencies; I use mostly soft and medium. I cut my own sanding discs for the Power Pad from aluminum oxide and silicon carbide paper. It's less expensive than using pre-cut discs, but,



After the grooves are cut on the plywood sanding disc, Hunter uses a foam-backed disc to refine the shapes.

more important, you can control the amount of overhang. I use somewhere between $\frac{1}{32}$ -in. and $\frac{1}{4}$ -in. overhang, depending on whether I'm going for a hard line or a soft, rolled effect. Usually, $\frac{1}{8}$ in. is preferable. Also, after I cut an 8-in. disc out of $8\frac{1}{2}$ -in. by 11-in. paper, I am left with enough scraps to use for lathe sanding and drum sanders. I recycle discs worn at the perimeter by cutting them down for 5-in. Power Pads and orbital sander discs.

I sand each groove in sequence, going two or three times around the bowl with the Power Pad in each grit. I begin with 80-grit aluminum oxide paper, then repeat the process with 150-grit aluminum oxide, 220-grit aluminum oxide and 400-grit silicon carbide. Then I move to the Sand-O-Flex flap sander (which can also be run on the lathe), using a combination of 240-grit and 320-grit, $\frac{1}{8}$ -in. shred, for removal of sharp edges and concave finish work. Final-sanding is done on the Power Pad, with 400-grit and 600-grit, then I hand-sand. The piece is now ready for buffing.

The buffing process I use was originally designed for briar smoking pipes and works well on closed-grain hardwoods. The beauty of it is that, unlike metal buffing compounds, it

does not clog the pores of the wood and it tones but does not discolor hardwoods. It is quick, and it burnishes the wood, adds luster and depth, and produces a hard, gem-like finish.

I use buffing wheels, compounds and waxes available from Pimo Pipe Supplies, Box 59211, Chicago, Ill. 60659. The wheels, designed for pipemakers, have a beveled edge that allows more detail in buffing. I generally use a 1-in. wide beveled buffing wheel, 9 in. in diameter. Wider wheels work best on broad surfaces because they provide a consistent polish with less danger of removing soft areas in the wood's surface. All of these wheels are designed to run at 1725 RPM, either with a $\frac{1}{2}$ -HP motor or on the lathe. The compounds are colored waxes—green, red and white—impregnated with abrasive grits equal to 700-, 800- and 900-grit. I use four wheels. The first is a firm sewn muslin, which I use with green compound. The second is a softer sewn flannel, used with red compound. The third, a soft unsewn flannel, is used with white compound. The fourth, a very soft flannel, is for the hard carnauba wax. It is important not to overload the wheels with abrasives.

If all has gone well, you now have a spiraled bowl, the exterior of which is complete. Time now to return to the lathe to hollow the bowl. I prefer a closed form for my spiral-grooved turnings because it allows me greater surface area to explore sculptural techniques.

I find it helpful to begin with a $\frac{3}{4}$ -in. drill bit in the tailstock, to clear the center and define the bottom of the piece. I hollow-turn with a combination of handmade chisels, using a spear point for clearing waste and a roundnose for finishing. (For a detailed discussion of hollow-turning, see *FWW* #16, pp. 62-66.) After I'm satisfied with wall thickness, usually $\frac{1}{8}$ in. to $\frac{1}{4}$ in., and that the last chisel cut is smooth, I cut the bowl from the faceplate, beginning with a parting tool and finishing with a backsaw. I finish the bottom on the disc and belt sanders.

Freehand disc-sculpting is workmanship of risk. It takes hundreds of passes with the disc's edge before you capture the spiral and you hold the finished form in your hands. Then you feel its weight for the first time, to know the thickness of its walls, and the piece comes to life. □



Freehand disc-sanding also lends itself to less regular, asymmetric decoration, as in this 6-in. dia. Indian rosewood bowl.

Bill Hunter is a professional turner in El Portal, Calif.

An answer to breathing dust

Turning tropical woods, fossilized walrus tusks, soapstone and amber was a health hazard in my shop. Solving the problem has been quite a challenge.

My first step was to set up an exhaust system built out of parts from an old line-finisher (a shoe repair bar). These machines are outdated in the shoe industry and can be picked up relatively cheap: \$100 to \$200. They have a great 6-in. exhaust system built in. I cannibalized the one from our machine, and hooked it up to a 1½-HP motor and 6-in. stovepipe. This handled most of the dust from my lathe, but some left the force field, especially during power-sanding. So I experimented with a box, as shown in the drawing, that totally enclosed the headstock, the tool rest and the piece, yet still allowed work on the piece. For most turning, the box, in conjunction with the line-shaft exhaust system, worked. There are some drawbacks, however. You need several sizes for different scale work, power sanding is possible only awkwardly through the top, vision is limited, and the setup slows you down. Also, for turning soapstone (with its high asbestos content) and fossilized walrus tusk (which I'm highly allergic to), I needed more protection—I could still see small amounts of dust escaping. The lathe box is close to what I need, and I regard it as a must, so I'm still trying to improve it.

Meanwhile, I sought advice through the occupational safety program at San Francisco General Hospital. For only \$15, a team of experts, both medical and industrial, spent an evening discussing my problem with me. Two weeks later I received a package of safety information, including specs on the 3M Airhat, mentioned in the article "Respiratory Hazards" in *FWW* #41.

To be absolutely assured with this system, you have to get a licensed industrial safety engineer to come and test the particulate content of your shop. The cost of such a test was almost the cost of the \$400 Airhat, so I took the chance, figuring that if I had no allergic reaction when working walrus ivory, I would be adequately protected against other substances as well.

The Airhat includes a protective Lexan face shield, a beard collar, an air hose, and a battery and filter pump you wear on your belt. In conjunction with my lathe box and exhaust system it works great. I had no allergic reaction to walrus tusk at all. I have found the system as comfortable as a face shield, and I prefer it to a dual-filter respirator and

goggles. The helmet has several adjustments for proper fit. The battery pack and pump are light and behind you, out of the way. The hum of the pump isn't a problem; after a couple of minutes it seems to go away. I also wear a lab coat now, so *all* dust is left in the shop.

In my opinion, here are the positive aspects of the Airhat:

—It provides total face protection, even if you wear a beard, and partial head protection from "fly-off."

—There's no facial pressure or sweat as with a respirator-and-goggle combination; it's actually cool and pleasantly breezy inside.

—I've had no fogging problem.

—It provides dust protection in shop areas that don't have exhaust.

—Talking is easier than in a dust mask.

—It doesn't interfere with large ear protectors or eyeglasses.

—It's been easy to maintain and clean.

—You feel secure and healthy inside it.



Dust-free and breezy inside his 3M Airhat, Hunter turns a bowl in the dust-collection box drawn below.



Working materials like the ivory of this 4½-in. dia. bowl requires special attention to dust collection.

Here are the negative aspects:

—It costs \$400.

—Its batteries need to be charged for 12 to 16 hours after every 8 hours of operation. You'll damage them if you "top off" the charge frequently. An extra battery can be ordered, but this still requires orderly attention.

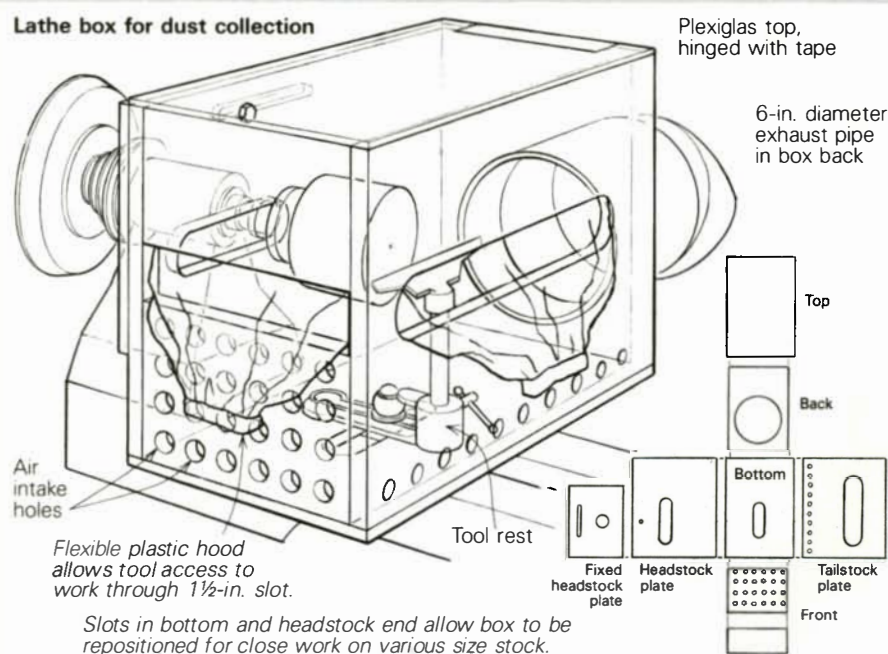
—It takes longer to put on and take off than other respirators, and it's tough to train yourself to use it *all the time*.

—You sound weird on the phone.

—Shop partners have a tough time taking you seriously.

I highly recommend the Airhat in conjunction with some form of shop exhaust system. I've had no experience in a totally dust-filled room using only an Airhat.

—W.H.

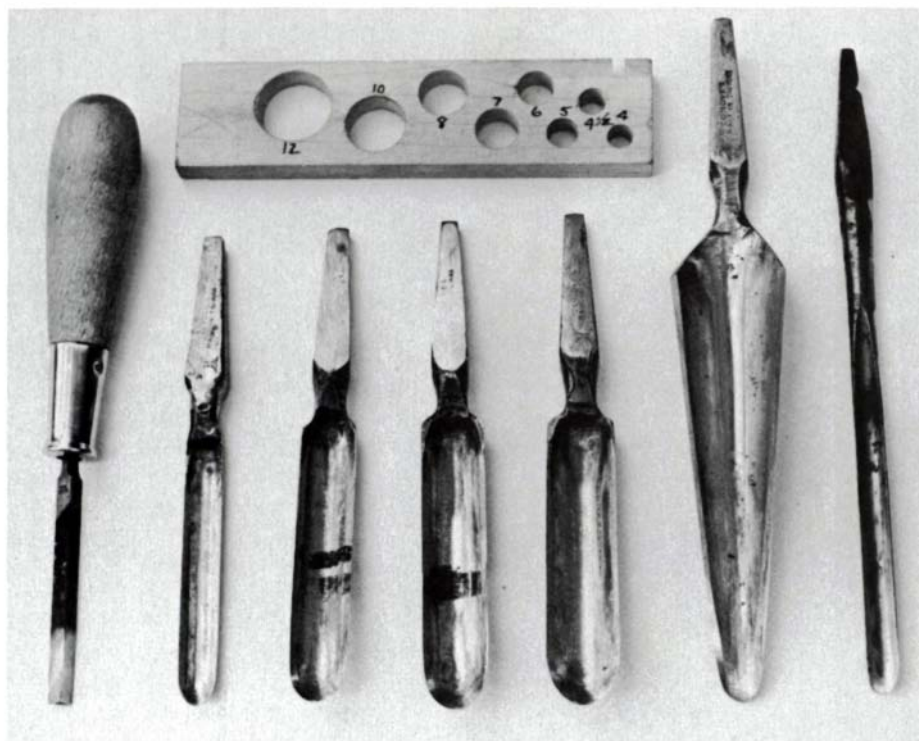


Drawing: Lee Hov

Spoon Bits

Putting 17th-century high technology to work

by David Sawyer



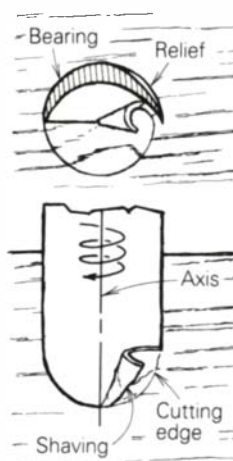
At left, a Windsor chairmaker's toolkit. The hardwood hole gauge provides references when sharpening. Lined up from left to right are the sharpening scraper, four spoon bits for mortises, a tapered reamer for leg-to-seat joints, and an old shell bit for back spindles. As shown above, bits are soft enough that you can sharpen them easily by scraping with an old file honed to a keen edge. They are tough enough to remain sharp for a few dozen holes.

For the last couple of years, Conover Tools has been selling a set of eight spoon bits and a tapered reamer in a neat canvas roll. They are copies, made in Taiwan, of a fine old set in Michael Dunbar's Windsor chairmaking toolkit. The bit sizes are six, seven, eight, nine, ten, eleven, twelve and sixteen sixteenths, with spoons about $2\frac{3}{4}$ in. long. The reamer tapers a hole at a 10° included angle, quite useful for chair leg-to-seat joints—although I'd prefer 8° , since 10° barely "sticks."

As bought, these spoons are straight-sided doweling bits, which were a mainstay for many craftsmen, such as coopers and brushmakers. Chairmakers either used the bits straight, as in Dunbar's set, or modified them into duckbill bits for boring the large-bottomed mortises found in so many old green-wood chairs. John Alexander, author of *Make a Chair from a Tree* (Taunton Press), explains the advantages of this joint on p. 72. Old-timers also used open-end spoon bits, called shell bits, which look almost like "ladyfinger" gouges. They are easier to sharpen than spoons, and cut nearly as well, even in dry hardwood chair backs. This is fortunate, since a used-up spoon bit will become a shell bit.

When you first unroll Conover's bits, they're beautiful. Upon closer inspection, they're kind of lumpy and bumpy, apparently finished in a hurry with a belt sander. Fear not—with a little tinkering and sharpening, they will work just fine. A lot of folks object to having to tune up new tools, but I find that this is a great way to learn all about the tools and make them truly your own.

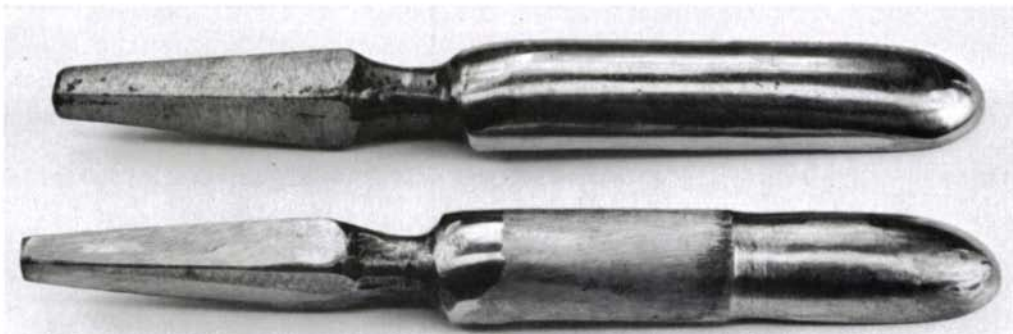
How a spoon bit cuts—The spoon bit cuts on only one side of its semicircular lip. No other part needs sharpening. The cylindrical portion guides on its outside, clears chips on its inside, and must not have a diameter greater than the cutting edge, to avoid binding or reaming a tapered hole.



Any cutting edge must have some relief on its underside. What I call the "lead" of a cutting tool would be the progress per revolution in a drill or a reamer, or the thickness of the shaving a plane takes. For a plane, lead is regulated by how far the blade projects beneath the sole; for an auger bit, it is regulated by the leadscrew. A machinists' twist drill is like a spoon bit with a straight cutting edge, and if you can visualize how it cuts and how it is sharpened, this will help you understand the spoon. Try to imagine the spiraling development of the hole and the bit following it. In a spoon bit,

lead depends entirely on how much relief you grind into it—if too much, the bit gets too hungry. The relief space shown above is exaggerated for clarity. It will be gradually used up as the bit is resharpened, and then the outside must be reshaped. The bearing surface gives stability in the hole.

As we all know, you can force a dull twist bit, or one that



The spoon bit at top is as it comes from the manufacturer. The one below it has been modified into a duckbill for boring the chairmakers' mortise, shown at right. When shaping the bit, maintain full diameter just behind the cutting lip, but relieve the sides so that the bit can pivot in the hole to enlarge the bottom without enlarging the opening. The mark on the bit is a depth gauge.

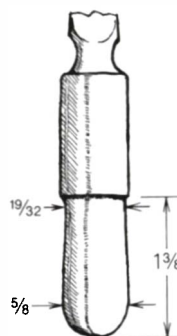
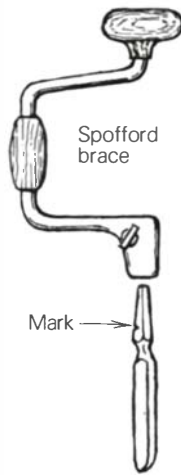


has lost its relief, to drill a hole if you press hard and compress the material. No doubt you can also do the same with a spoon bit, but it's more pleasurable to sharpen correctly and let the bit follow itself through the hole.

Tinkering—To avoid slop when boring, the axis of the bit must be right in line with the brace handle. At least one of my bits came with a misaligned tang, easily corrected with some vigorous taps on the anvil. Flattening the surfaces of the tang and some grinding at its base will improve the fit in the chuck. I use a Spofford (split-chuck) brace, and try various bit orientations to cancel errors. Then I mark the tang so that it goes in the same way every time.

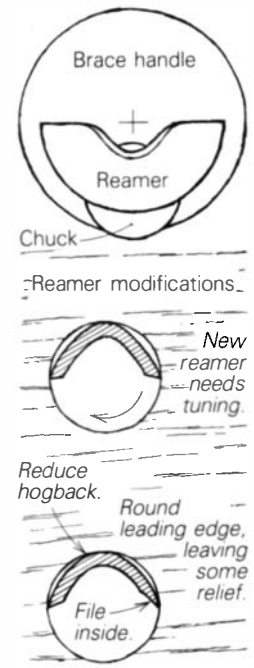
Conover's bits are hardened to Rockwell C45-50, which is soft enough to cut with a file but hard enough to drill numerous holes between sharpenings. A 10-in. mill smooth file is fine for truing up bits. You can eyeball the bit's diameter with a ruler, but vernier calipers are better. As an additional aid, make a hole gauge as shown in the photo on the facing page, or use draftsmen's circle templates, which come in $\frac{1}{32}$ -in. and $\frac{1}{16}$ -in. increments. By testing the bit in a series of round holes, you can judge its roundness and relief. A metal-cutting scraper sharpens the inside of the cutting edge by removing shavings like a one-tooth file. My scraper is an old broken-off triangular saw file, with teeth ground off two sides to yield a 60° straight cutting edge, which is then honed sharp.

First make the cylindrical portion of the spoon bit truly straight and round. Don't worry about maintaining diameter, because tenons can be made to fit. Then shape the outside of the point for relief and bearing, checking by eye with various diameters in the hole gauge. I would normally aim for clockwise rotation. My $\frac{5}{16}$ -in. bit has an imperfect left lip, which would have shortened its working life, so I sharpened it to turn counterclockwise. Now do some scraping on the inside and light stoning on the outside to remove the burr, and try some boring. After you've got the bit working well, you can convert it to a duckbill if you like. I relieved my $\frac{5}{8}$ -in. bit back about $1\frac{3}{8}$ in., as shown at right, to accommodate inch-long tenons.



The reamer—At first glance I thought the reamer was a disaster, since the tang is not cranked over to the centerline as on the spoon bits. But Michael Dunbar said no, just put it in the brace and ream holes, and sure enough it works fine. You just have to gently bend the tang until the reamer's axis aims dead on the brace handle. Don't even look at the chuck! The tang has a tiny waist and I noticed some twist in Dunbar's. So less brute force and more sharpening.

The reamer's cross section has a lot of hogback, which makes for too much lead and encourages a scraping rather than paring action. It's also somewhat barrel-shaped. All this is easily fixed by filing or grinding. There's plenty of metal, but you can check with calipers if you get nervous. After shaping, you can sharpen with stones and do some scraping at the point. If the point is sharp, the reamer works like a shell bit, and you need no pre-boring in softwood seats. It does a neat job of breaking through on the other side, too. You can bore and ream seats like mad, in one operation.



Making chairs—I worked up a kit for Windsor chairs and proceeded to put together two Federal period chairs using 17th-century high technology. After another dozen chairs I may see no need for Forstners, augers or brad points. I have a $\frac{5}{8}$ -in. duckbill for stretchers, $\frac{7}{16}$ -in. and $\frac{1}{2}$ -in. spoon bits and the reamer for seats, and a $\frac{5}{16}$ -in. shell and $\frac{3}{8}$ -in. spoon for spindles.

With a little practice, the bits start easily. To bore at an acute angle, it's best to start straight and change direction after the full cutting edge is in the wood. The chips are marvelous, tightly cupped spirals, like pearly-everlasting flowers. On through holes, you will be pleasantly surprised by the neatness of the break-through. Stretcher mortises can be enlarged at the bottom by canting the duckbill bit. You can do this nearly as well with a straight (doweling) bit. In either case, you will have to sharpen part of the side of the bit as well as the round point, to help the side-reaming action.

Tenons can be turned green, oversize, and dried in hot sand—a wonderful method I learned from Dunbar. This way, you can have green mortises and bone-dry tenons in the same

piece. Drying takes four to eight hours (depending on size) at 200°F. Over 200°F causes too much internal checking; at 400°F you get charcoal. Check dryness by rotating the tenon between your fingers: when it won't get any more oval, it's dry. With a little experience, you can turn just oversize enough so that joints will pop together (with a large hammer) with no further fitting. The larger diameter fits *tight* against the mortise end-grain; the smaller diameter is just snug on the sides. For $\frac{5}{8}$ -in. tenons, I allow $\frac{3}{64}$ in. oversize (7½%). You can start there, and adjust for your woods and bits.

For an angled joint, you can chamfer the shoulder of the tenon and one side of the mortise. Make the mortise extra deep so that the shoulder will seat. Shrinkage may open the joint a little, but it will still look good.

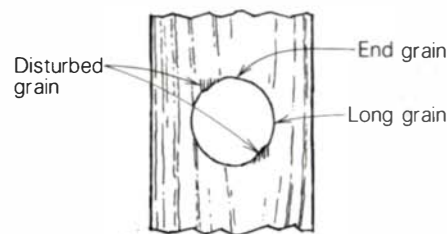
The same process of green-turning and sand-drying works with tapered leg-to-seat joints. I ream the hole in an air-dried pine seat, then fit the tenon with a cabinetmakers' rasp. With the leg properly oriented (major diameter against end grain), I rotate it back and forth a little. Then I file off the shiny spots, just like lapping the valves in a car. Repeat this until the leg feels really solid in the seat and is at the proper depth. Some angular correction is possible, and often needed. □

Dave Sawyer, the green-wood chairmaker featured in FWW #33, was trained as a mechanical engineer and now makes Windsor chairs. You can get spoon bits from Conover Woodcraft Specialties, Inc., 18125 Madison Rd., Parkman, Ohio 44080.

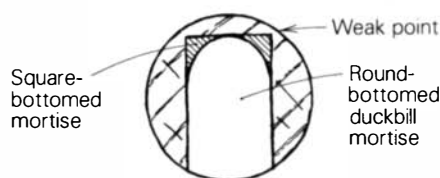
The incredible duckbill spoon bit joint

by John D. Alexander

There is no one way to drill round holes in round sticks. I have used auger bits, Forstner bits, Power Bore bits, multi-spur bits and spade bits to make chair joints, and I have a few more ideas. Modern bits, however, have drawbacks. You don't want a leadscrew or a point projecting ahead of the cutting edge, where it will poke through the other side of the chair leg before the mortise is deep enough. You don't want a flat-bottomed hole—because its bottom profile limits the size of the tenon, as explained below. Nor do you even want the hole to be truly round, because an oval hole conforms better to the tenon. Chairmakers traditionally used the duckbill spoon bit, and its peculiar quirks combine to make the ideal mortise for green-wood chairs. The duckbill even turns the spoon bit's main shortcoming, boring slop, into a virtue.

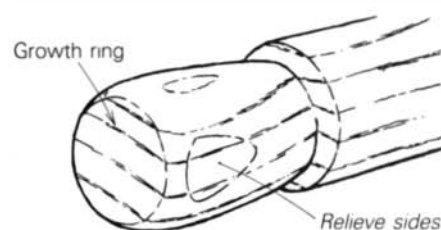


Spoon bits cut deeper in end grain than in long grain, producing an oval hole with characteristic tearout where the cutting edge makes the transition from a paring cut to a scraping cut.



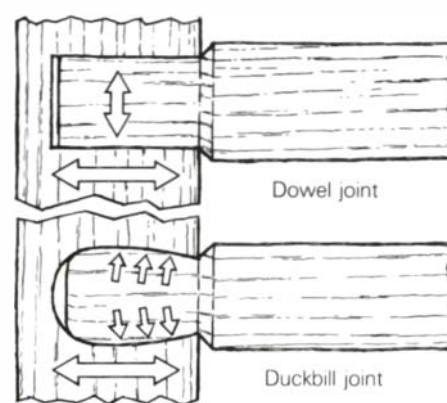
Rounded corners in round stock make for a stronger chair. If the mortise were square-bottomed, both mortise and tenon would have to be smaller.

By canting the duckbill bit during boring, you can cut the lower and upper walls of the mortise deeper, into a dovetail shape, without enlarging the opening or the sides.



Tenons are turned green, then dried. The tenon shrinks to an oval cross-section during drying, which automatically helps it conform to the oval mortise. In side view, the tenon should be shaped to conform to the mortise's dovetail profile, so that it will bear tightly against the end grain in the leg. The end of the tenon is larger than the mortise opening, but the green wood in the chair leg is compressible enough that the tenon can be pounded home. The sides of the tenon are relieved, so as not to split the chair leg as it dries and shrinks.

If a joint does not split when a tenon is pounded home, or very shortly thereafter, it is most unlikely to split later, unless the mortise is near the end of the stick. In a test piece, drive home a series of increasingly larger tenons until the leg splits, listening to the difference in sound as the peg seats. When it comes time to make the chair, drive home the size tenon just smaller than the one that split the mortise. One caution: Immediately after assembly, the dry tenon absorbs moisture from the green leg and swells, while the chair leg shrinks tighter against the sides until the leg is fully dry—if the sides of the tenon have not been relieved enough, the leg will split, starting in the areas of disturbed grain left by the spoon bit.



With cyclical changes in humidity, the mortise depth lengthens and shortens as the leg shrinks and expands. The length of the tenon, however, does not change. In the ordinary dowel joint, this creeping mortise eventually breaks the glue joint. In the duckbill joint, because of its dovetail shape, as the mortise changes, the tenon tends to remain wedged tight because it swells and shrinks in height. The duckbill joint does not rely on a glue bond, although glue doesn't hurt.

The joint, once assembled, can't be easily taken apart. If something goes wrong during assembly, the only solution is to saw off the tenon at the mouth of the mortise, bore it out and start again.

In extremely dry weather, the tenon may rattle in the mortise, but its shape prevents it from coming out. Because of all its virtues, you might think this joint would last forever, but if the joints are too dried-out, the chair will be wobbly, and the leverage effect at and within the mortise will eventually break the joints down. In a similar manner, extremes of humidity, such as in outdoor use, will sooner or later destroy the chair—there is opposing wood movement built into chair joints, and wood, once its compressible limit has been exceeded, cannot recover to normal size. □



British woodworking at The Studio in Miami. Even in the more colorful examples, the legacy of the Arts and Crafts movement is strong: bold rectilinearity and straightforward construction.

British Enter Miami

New gallery imports current work from Europe

by Rick Mastelli

Americans haven't had much opportunity to see contemporary European woodwork. Museums may be full of venerable English and French period furniture, but the only exposure most of us have had to what's being done lately across the Atlantic is through photographs. With the opening last spring of Charles Nesbit's Studio in Miami, Fla., a gallery devoted to work by British and eventually also by other European craftspeople, winter vacation plans can include a first-hand look at what the Old World is up to. Nesbit has just moved into a 2500-sq.-ft. space in the Decorative Arts Plaza in Miami's thriving design district. On display when I visited last April were some 35 pieces by 17 of the better-known woodworkers in England.

The vitality of the designs and the quality of the craftsmanship were at least equal to that of most gallery-displayed woodwork in this country. Many of the themes—color in wood and Post-Modernist whimsy—have become familiar to us as avant-garde. But here these practices took on sober respectability. They seemed not fads, but the most recent installments in an eminent tradition. Anchored by the straight-

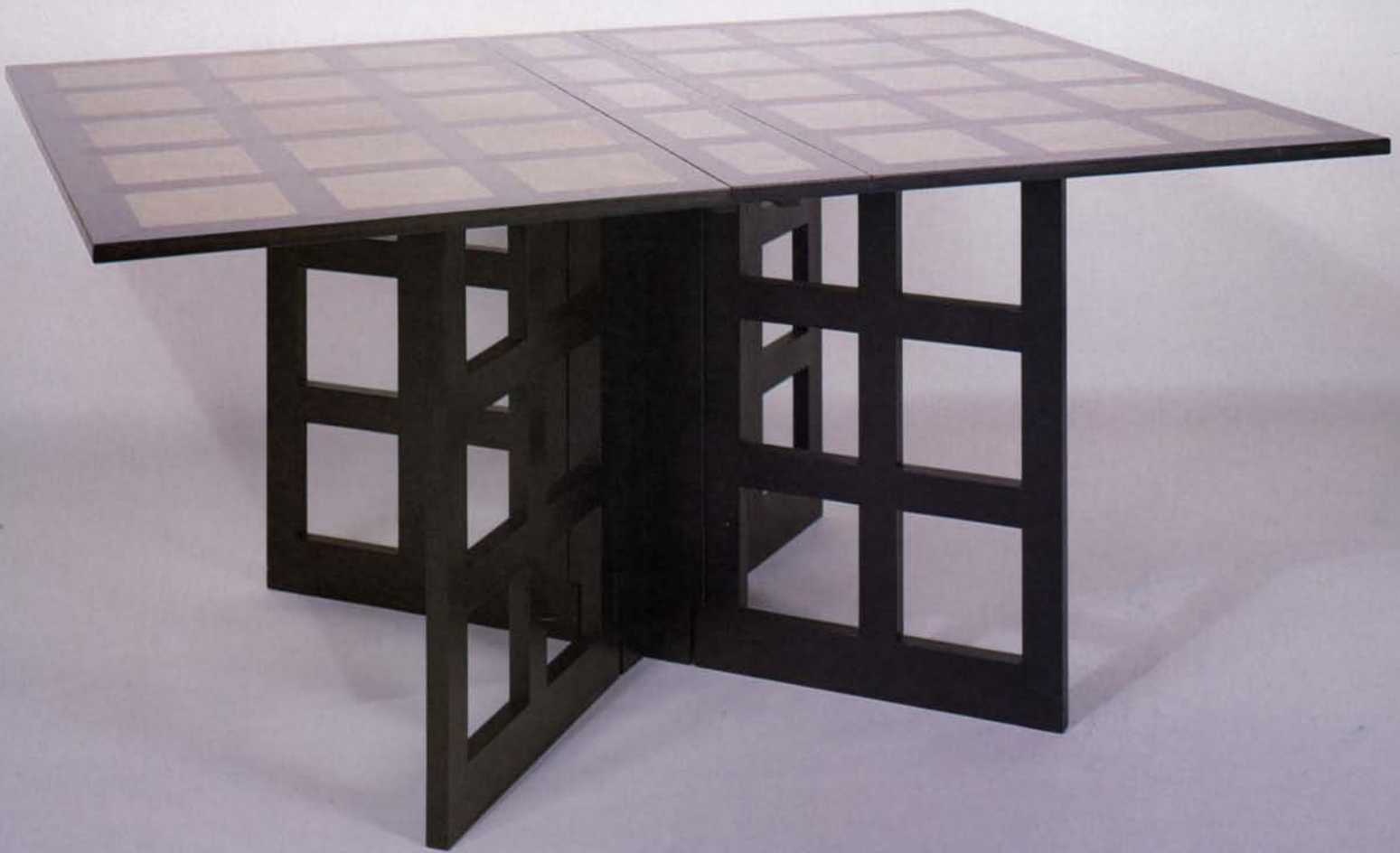
forward, rectilinear precedents of the Arts and Crafts movement, the British seem to come to design by way of craftsmanship, rather than the opposite tendency here in America.

Nesbit, a British-educated economist who retired from his own construction company to pursue full-time his avocation of collecting art and craft, describes the situation this way: "British craftspeople work no differently today than they ever have. They have the same modest workshops and serve the same class of patrons. Time is probably of less concern to British woodworkers than it is to Americans. Quality work is less extraordinary."

See what you think from the photos on the following three pages, but if you get to Miami, don't miss the real things. Nesbit's studio (at 4001 NE 2nd Ave.) is open weekdays, and in the spring he plans the first of what he hopes will be an annual event—a super-show of 100 pieces of furniture, all from Europe. The Events column in a future issue of *FWW* will list the dates.

(continued on next page)

Rick Mastelli is an associate editor of Fine Woodworking.



In this gate-leg table, above, Martin Grierson of London marries the lattice of its ebonized-birch base with the inlaid birch and sycamore-maple grid of its top, an effective adaptation of the Arts and Crafts motifs of C.R. Mackintosh. The 60-in. by 42-in. top folds to a neat 7½ in. wide, whereupon you see that the tabletop grid is carried through to the underside of the leaves. After 14 years as an industrial designer of office furniture and architectural woodwork, Grierson, 49, began eight years ago to make his own straightforward designs. He favors practical furniture which nonetheless evidences the special care and value that should come from its being handmade.

Sandy MacKilligan's 52-in. high liquor cabinet, left, with two sets of doors, front and back, is of complicated construction: the cross-shaped cross-section of the legs makes for rather busy corners at the top of the cabinet. But the motif, carried through in the aniline-dyed sycamore-maple veneers, inspires striking graphics. MacKilligan, 52, of Puttenham, Surrey, has made a series of these cabinets, differently patterned in different colored woods.



Ripe to hold jewelry or trinkets, this drawered apple of yew and ebony, one of a limited series, is the work of William Childe, 42, senior lecturer of furniture design at Edinburgh College of Art. The boxes are built in layers, each layer segmented to avoid visible end-grain. After glue-up, the outside is shaped not on the lathe, but with sanding disc, rasp and file, to yield a more naturally irregular shape. Then the 12 drawers are laminated to a curve that fits the inside of the box, and each bank of drawers is mounted to pivot smoothly on a vertical steel pin. This apple, 10½ in. high, was priced at \$1200.



What drew me to this 72-in. high sycamore-maple and ash cabinet by Robert Williams, 41, of Pearl Dot in London, is the woven ash doors—they offer such a pleasing alternative to the usual flat smoothness of showpiece woodworking. Close up, I could see that the wood was all sensitively handled: The sycamore is a subtle bird's-eye, set off, as is the ash base, by mahogany stringing whose width iterates the width of the spaces around the door. The legs present their quartersawn surface front, reserving the wilder flatsawn ash to be seen from the side. The only feature of the cabinet that disturbed me is the little square brackets that trouble the near three-way miter between legs and skirt. I could do without them.



Entitled "The Nash House, No. 1 Cornwall House Terrace," this 66-in. high linen cabinet by Margaret Martin is a portrait of the building that housed the British Interior Design Show of 1982, for which various designers refurnished this 19th-century townhouse. The cabinet is ash stained black inside and thinly gouached outside, so that the grain declares

itself wood beneath the facade. A delightfully playful piece, its real moldings frame a portico, balustrade and columns made of paint. Martin, 26, of London, has worked as a theater set designer, and is making furniture now for the greater degree of permanence that it enjoys. She plans to bring to the spring show a cabinet modeled after the White House. □

Applying Classical Proportions

A tea table built to 18th-century rules

by Mack S. Headley, Jr.

After sixteen years of restoring, reproducing and studying 18th-century furniture, I have joined the ranks of those who are convinced that the traditional artisan relied on a geometric proportioning system, based on the five classical orders. As a design exercise to test how the system might have been applied, I built the small table shown here.

Evidence of the system's use is widespread, but vague. Chippendale, quoted below, clearly stated that knowledge of the five orders was basic to the cabinetmaker's art. Some furniture historians insist that Chippendale was exaggerating, but Marcus Wiffen's observations about the character of Virginia buildings, also quoted below, agree with Chippendale. Many 18th- and early 19th-century design books also feature the classical orders, but, like Chippendale, don't tell exactly how the rules were used in designing furniture. This seems to have been privileged information, imparted during apprenticeship. In earlier times, I suspect it was one of the guarded secrets of the furnituremaking and architectural guilds.

I found that the only path toward understanding how the system was used was to go back to the pieces themselves. Surviving examples of period furniture have a great diversity of character, varying with the time and place they were built,

the current style (and how it was evolving), and the environment in which they would be placed. To unravel the complexity, I decided to concentrate on the design work of one man, Peter Scott, a Williamsburg, Va., cabinetmaker from 1722 to 1776. Thanks to Wallace Gusler, curator of furniture at Colonial Williamsburg, I was able to study numerous pieces in the collection. Scott's lifetime production is impressive, and filled with subtle variation, control and flair. Yet all his proportions are derived from the five orders: Tuscan, Doric, Ionic, Corinthian and Composite. Upon scale drawings of many of his pieces I have walked with my dividers for hours, discovering geometric relationships which encompass the whole piece—from its major negative and positive spaces to its actual structural elements, moldings and ornaments.

The origins of this design system reach back at least to the Greeks, from whom the Romans borrowed it. And it later served European craftsmen from the Renaissance to the beginning of the Industrial Age. The earliest surviving writings come from the first century AD, *The Ten Books of Architecture* by Vitruvius. He explains that the proportional relationships used in architecture were derived by "the ancients" from the relationships observed in living things. Leonardo

Of all the arts which are either improved or ornamented by architecture, that of cabinet-making is not only the most useful and ornamental, but capable of receiving as great assistance from it as any whatever. . . . Without an acquaintance with [the five orders], and some knowledge of the rules of perspective, the cabinet-maker cannot make the designs of his work intelligible, nor show, in a little compass, the whole conduct and effect of the piece. These, therefore, ought to be carefully studied by everyone who would excel in this branch, since they are the very soul and basis of his art.

—Thomas Chippendale, *The Gentleman & Cabinet-Maker's Director*, 1762

We need not be surprised if we find a high degree of standardization in the design of the eighteenth-century houses of Williamsburg, or of Virginia. The eighteenth century was an age that built according to the rules—the rules handed down in the shops of the various crafts, and the rules set down in the books on architecture. (Which is not to say that the two categories did not overlap, for shop rules were the staple of the authors of many handbooks, and book rules doubtless became the rote-learned formulae of the shops.) But the rules were felt to provide a discipline, not a straitjacket, and always the final appeal, in any disputed question of design, was to the eye.

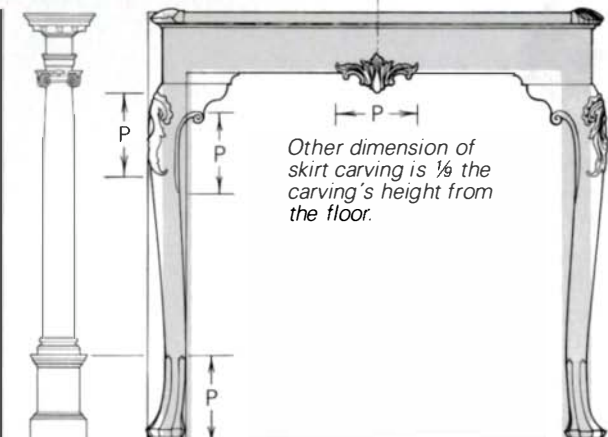
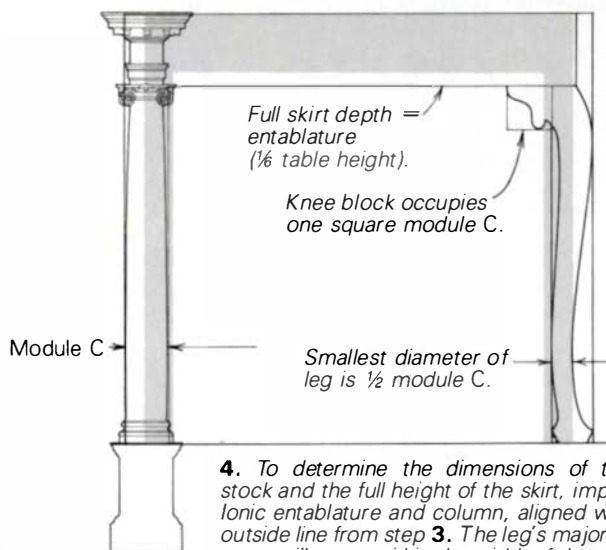
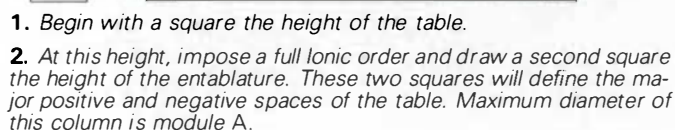
—Marcus Wiffen, *The Eighteenth-Century Houses of Williamsburg*, 1960



This walnut tea table isn't a reproduction, but a new design that conforms to classical rules of proportion.

John Westerveldt

In each classical order, the sizes of the pedestal, entablature and column are derived by proportioning the height. The largest diameter of the shaft is called a module, and is divided into sixty minutes, which are then used for scaling moldings. According to Chippendale, good furniture design depends on similar rules.



da Vinci's famous drawing of a spread-eagled man contained within a circle is based on instructions found in Vitruvius, who enumerates other ideal proportions as well. Actual human proportions conform to the ideal more or less for any particular person. By representing the variations, the classical orders portray character from the most masculine, Doric and Tuscan, to the most feminine, Corinthian and Composite. In antiquity, the order chosen for a particular temple or building depended on the character of the god it memorialized, or upon the building's intended use. Vitruvius attempted to codify the ancient proportions, but, as in people, the numbers are not absolute—the rules are guides to be followed with taste and discretion, not scientific formulas.

In each of the five orders, the rules for constructing a column with its pedestal and entablature are based on what its height will be. Figure 1 illustrates the basic directions Chippendale gave for the Ionic order. Similar procedures apply to the other orders as well. In every case, for each part, including the curves of the moldings, a rule is derived from what has gone before. In furniture, the rules appear to be less rigid. Relationships may be based on one of the columns alone or, as I chose for my table, on an order's proportions in various combinations of pedestal, column and entablature.

My plan at the outset was to build a small walnut tea table of moderate decoration. A number of pieces in Williamsburg were influenced by Oriental design. I liked this quality, and suggested it in the shape of the top molding. Many tea tables have knee blocks that run the width of the skirt, from leg to leg. Instead, I applied a small central carving. In addition, I had found a lovely three-million-year-old fossilized shell across the James River from Williamsburg, and decided to add its shape as a block at the corners, to soften them. The carvings on the knee, top and skirt (figure 2) called for something on the foot, so I designed a light stocking. In spite of so many personal design choices, which make the table unlike any single example in the Williamsburg collection, it is, because it was built using the same design vocabulary and the same family of relationships, still something like them all.

The system works whether you apply geometry or numerical measurements. In one surviving piece, Peter Scott used geometry. He drew lines directly on the back of the lower case to proportion the upper section, dividing the back into sixths and projecting diagonals. As an aid to visualizing how my table grew from Ionic proportions, figure 3 shows both the basic square I started with and the three particular sets of proportions I used to determine the actual shape of the table. Instead of a square, I could have begun with a rectangle that was a square-and-a-quarter, a square-and-a-half, or another such simple combination. In end view, for example, the table is twice as high as it is wide, or two squares high. When actually working out the design myself, I found it most convenient to use a calculator to determine the mathematical value of the geometric relationships. I roughly approximated the sizes I wanted the parts to be, then calculated exact sizes by means of Ionic proportions and laid these sizes out on scale drawings. If a part then looked too small, I chose the next larger Ionic relationship and used that instead.

The joinery is simple mortise-and-tenon. The mortises begin $\frac{1}{2}$ in. below the top of the legs to preserve the strength of the upper post. The ends of the tenons are mitered and do not touch each other in the mortise. The $\frac{3}{4}$ -in. long tenons on the top molding fit into the shell blocks, and the molding is

grooved to accept the top, which can expand and contract with changes in humidity. The knee blocks are glued in place. The central leaf-element was carved and applied to the skirt, and its projection backed up with secondary wood.

As do the more sophisticated 18th-century examples, the table has an animalistic stance with continuous curves in its legs—no flat, straight spots. Continuous curves are essential to avoid dead spots on legs and carvings. To tune the sculptural curves at knees and ankles, I used my larger, broad-sweep gouges. Sets of carving tools are designed around spiraling curves so that they can be used in various combinations, to control the movement of the spirals and S-curves both in overall sculpturing and in detailing. The larger the variety of gouges, the more control a carver has over the potential movement in a piece. The last master of the original shop in Williamsburg had 94 carving chisels and gouges. Not all would be needed for this table. For the details, you can modify the patterns shown in figure 2 so that they conform to your set of tools. Choose gouges that come close to matching the outline, stamp your pattern according to their curves, and transfer it to the work.

Acquiring experience within this system has been tedious, with lots of new terminology and concepts to understand and integrate. At times I have felt restrained and at other times stretched by where I am being led. But like learning any new language, fluency comes and expression becomes subtler. I no longer feel restricted by it, and in my small shop where diversity of production is important to me, I find that executing a new design is faster, and that the system is an invaluable tool in achieving effective traditional form.

There is another advantage, perhaps more important to the historian than to the furnituremaker. Once the particular classical order to which a piece belongs is understood, its dimensions scale out very close (say, to $\frac{1}{8}$ in.) to the hypothetical ideal. The system therefore is helpful in interpreting possible distortions in photographs, as well as aiding in the regeneration of missing parts in restoration work. And despite the freedom of choice enjoyed by the designer, there is more to the modular system than mere coincidence—many outright fake antiques and many modern pieces made "in the style of" can be spotted after just a few measurements have been taken: the system simply isn't there. □

Mack Headley, Jr., makes furniture in Winchester, Va. In search of period furniture makers, Fine Woodworking visited his and other shops in issue #23.

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Adapted from an original built in Charleston, S.C., around 1790, Heisey's Hepplewhite breakfront is made of solid mahogany. The serpentine doors are coopered, the drawer fronts sawn from 3-in. thick boards. Both are veneered with crotch mahogany.

A Hepplewhite Breakfront

One cabinetmaker's mahogany dissertation

by Richard L. Heisey

When a young Armenian couple visited my shop two years ago, I had assurances from friends that they were good prospective clients. Being from the old country, they had an appreciation for elegance that they'd been used to satisfying with fine antiques. I was therefore surprised and pleased when they commissioned me to build a whole roomful of furniture, including this Hepplewhite breakfront.

The piece is an adaptation of one in the Hayward-Washington House in Charleston, S.C. The original stands almost 11 ft. tall and is more than 8 ft. wide, so I had to scale mine down to fit the ceilings in my clients' home. On a trip to Charleston, I went over the original, recording my observations in great detail so that I could draw a full-size plan before beginning construction.

Like the original, my breakfront is made in three sections—the base, the display case and the pediment—which can be separated for moving. Construction called for some familiar joinery: dovetails for the carcasses and drawers, mortise-and-tenon for the display case doors. But the inlaid double serpentine shape of the base and pediment proved a stimulating technical challenge.

I coopered the doors, veneering over this assembly with crotch-grain and ribbon-stripe mahogany. I made a press just for the job. Now I keep hot hide glue on hand, and I realize how much quicker the process would have been if I had used the hammer-veneering technique described by Tage Frid in *FWW* #10, pp. 52-54.

But inlaying the boxwood stringing into the doors and pediment took the most time. After several risky schemes involving a router, I made my own inlay knife by soldering together two X-acto knife blades, separated by the width of the stringing. I steam-bent the inlay around hot forms, and then I glued it in place.

The pediment and doors of the original breakfront are embellished with bellflowers made of ivory, a scarce material



The breakfront's pediment is inlaid with boxwood stringing, with curly maple and mahogany carnations. Heisey fashioned the ivory bellflowers, visible at the corner of each door and in the pediment, from old piano keys.

today. After several fruitless searches, I contacted a local piano repairman, who supplied me with some old keys that were just the right thickness. I cut the 35 bellflowers with a jewelers' saw, then gently filed the edges to shape. Once the ivory was glued in, I worked it flush with a scraper.

My clients wanted a dark finish on the piece. I used a solution of potassium dichromate to darken the wood, followed by shellac and varnish. To more closely match the original, I glazed in

old, hand-floated glass that a local business collected for me. It adds an intriguing shimmer to the display doors.

All told, I invested some 900 hours of work in the breakfront, calling upon everything I'd learned during 10 years of woodworking, and then some. The piece has kindly been referred to by friends, who have doctoral degrees, as my dissertation in cabinetmaking. □

Richard Heisey makes custom-designed furniture in Winchester, Va.



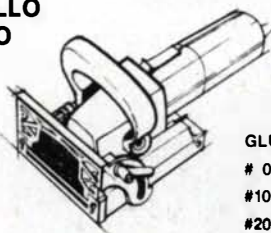
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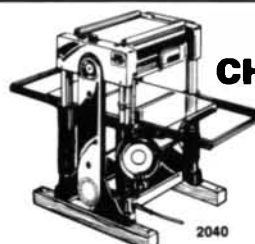
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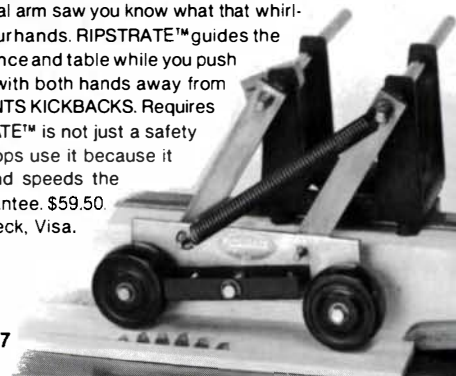
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A Holiday Book Catalog

From the publisher of *Fine Woodworking* and *Fine Homebuilding* magazines.

A couple of issues back, we told you we were preparing Simon Watts' book, *Building A Houseful of Furniture* (224 pages, softcover, \$19) for Fall release. Well, now it's available—worth the wait and just in time for Christmas.

Building A Houseful of Furniture presents complete plan drawings for 43 of Watts' most successful designs—the pick of his 20 years as a professional woodworker. "Of the hundreds of pieces that I have designed, I have selected these because they cover the whole range of furniture in an average home," he says in his introduction.

Included here are sturdy bed frames, a variety of tables, handsome chests, desks and bureaus, and comfortable sofas and chairs. The projects range in difficulty and complexity, from turned stools that will help develop the skills of beginning woodworkers to an oval dining table that will challenge experienced furnituremakers.

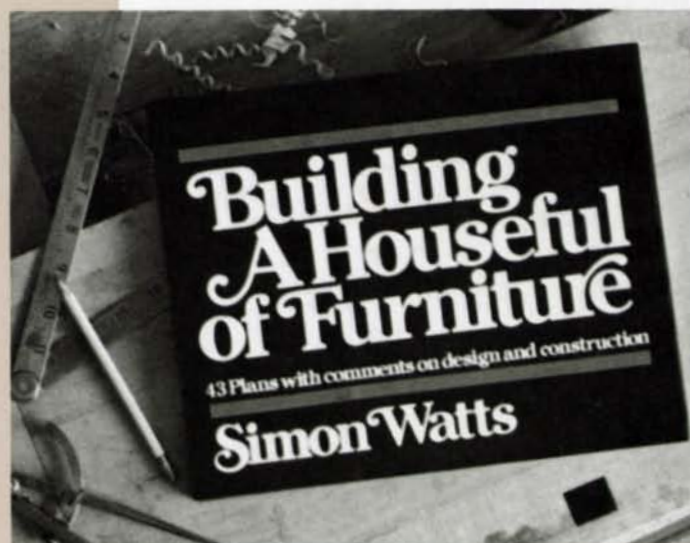
All the plans show how to build the pieces exactly as Watts did, but they can also be used as jumping-off points for your own creations. In addition, there are isometric drawings and sketches showing how to handle some of the tricky construction problems, and Watts is careful to describe in detail the procedures that worked for him when he built the pieces himself.

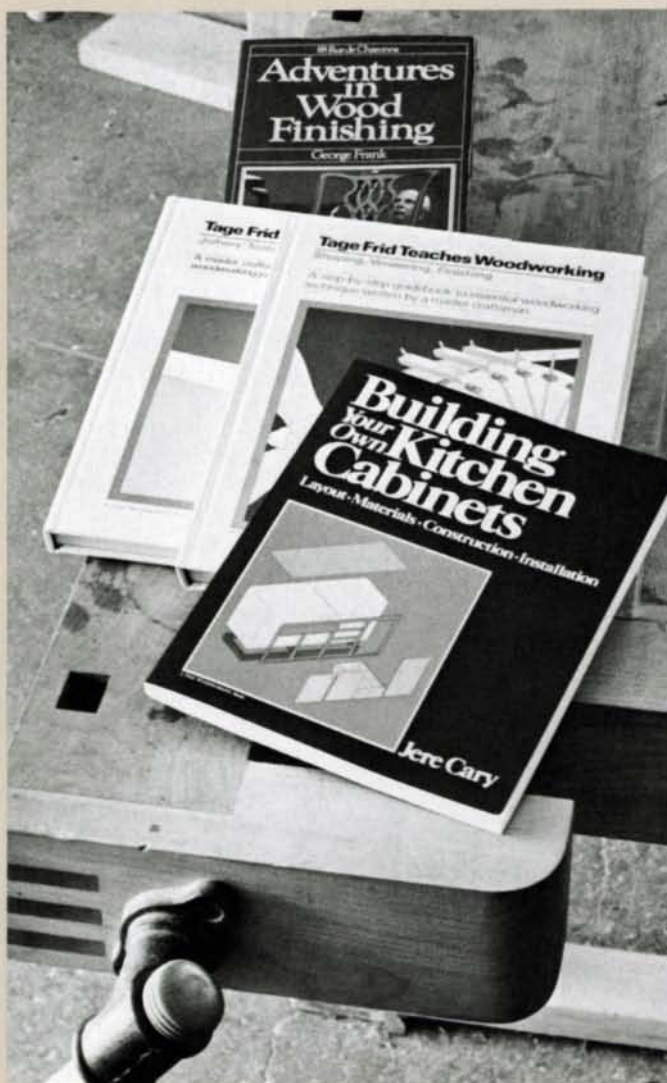
Watts says his furniture has been inspired by a variety of traditions, including the Shaker, Danish Modern and Arts and Crafts styles. All of his designs combine good proportion with durability and complement rooms decorated in just about any style. The pieces also show Watts' feel for structure and economy, the result of his background in engineering and architecture.

Finally, Watts includes some interesting thoughts about the history, uses and design of furniture, and some insights into the development of his own designs.

For anyone with a good grasp of woodworking tools and techniques, *Building A Houseful of Furniture* is an especially handsome and useful gift.

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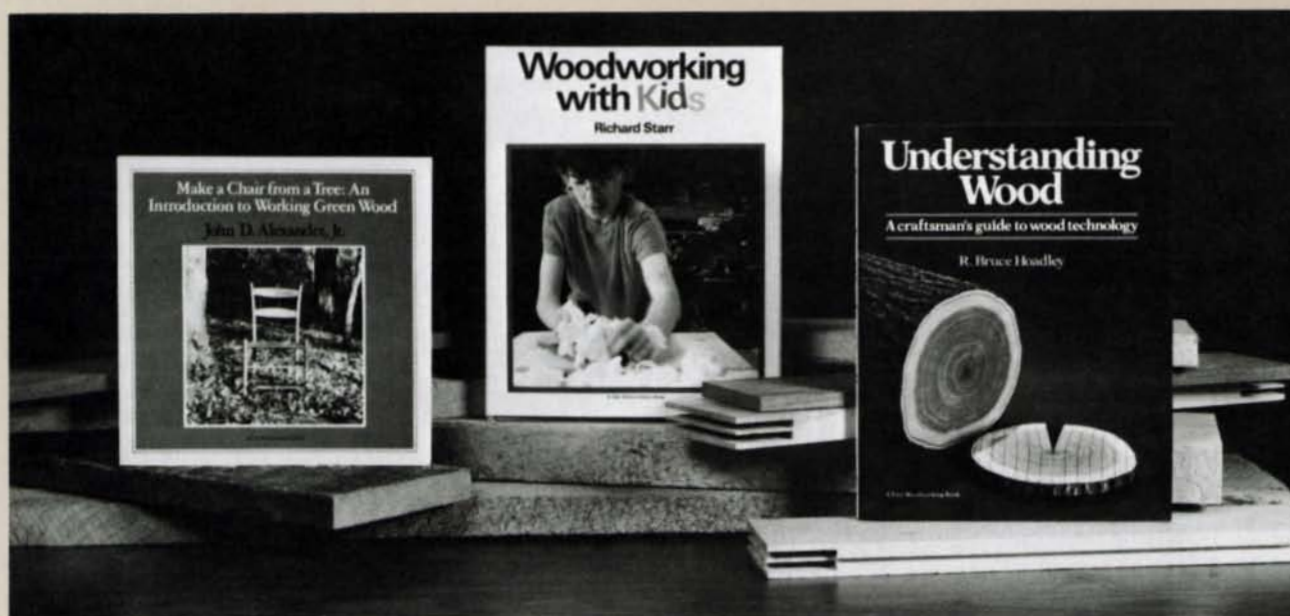


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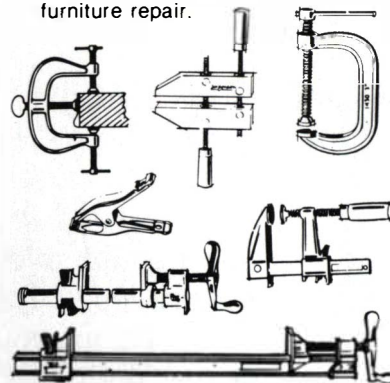


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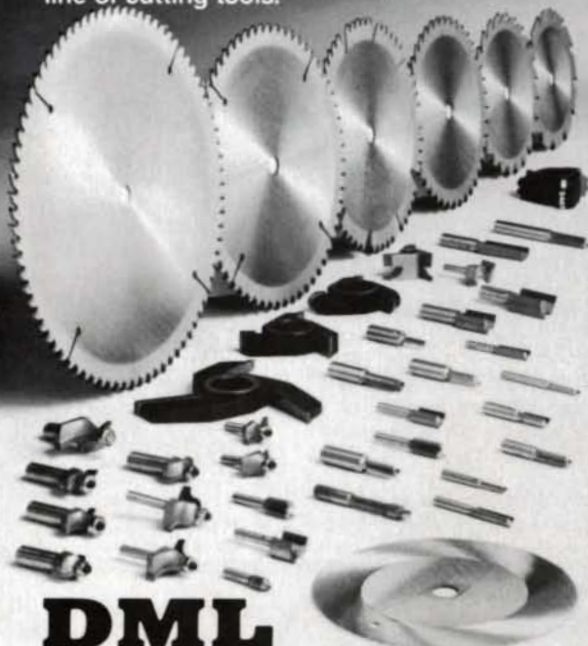
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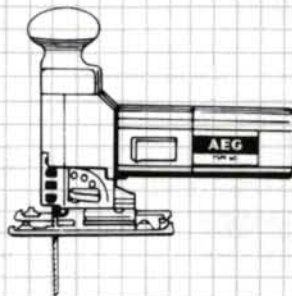
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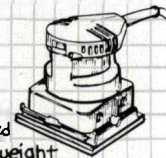
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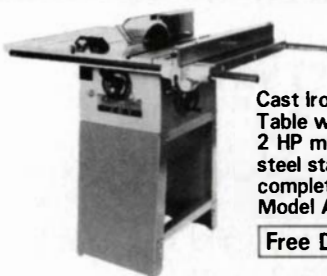
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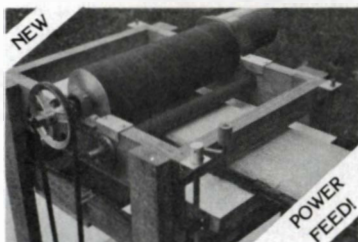
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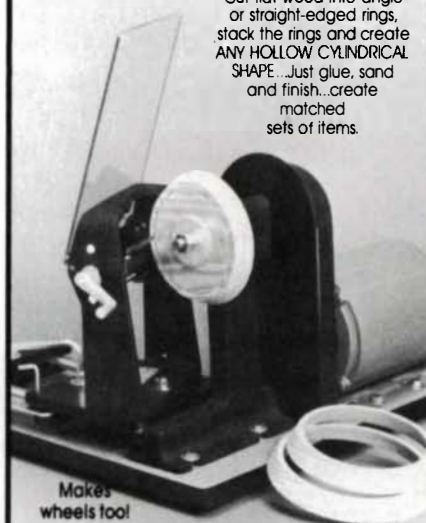
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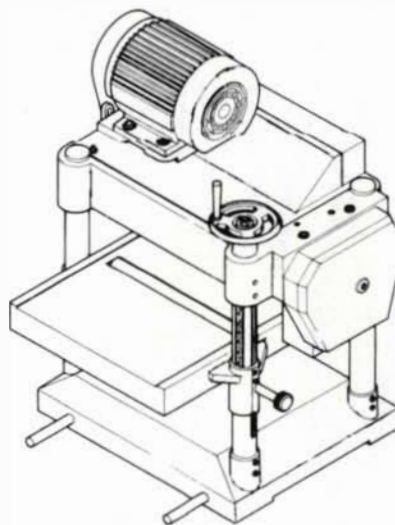
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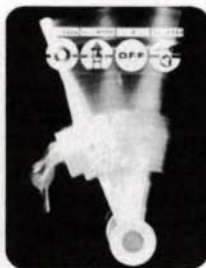
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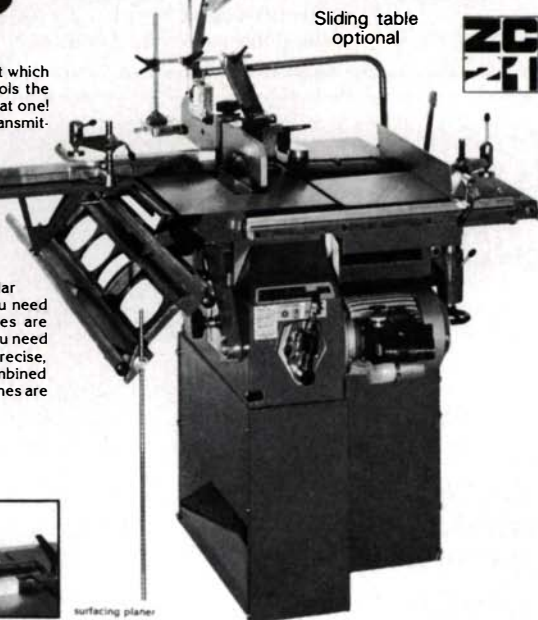
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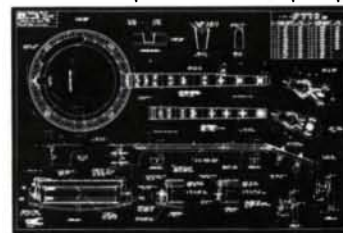
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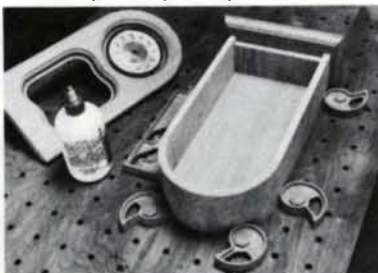
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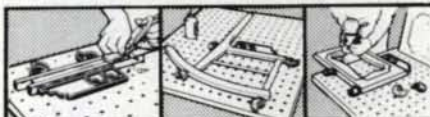


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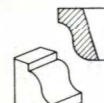
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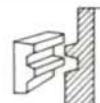
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MORE FREUD				
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7604	3/4 H.P. Router	49.95
7696	3 1/4" Planer	49.95

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No. 1 6"		11.80	10.65 ea
No. 2 8 1/2"		14.10	12.70 ea

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No. 4524 24"	Open.	18.15	16.35 ea
No. 4536 36"	Open.	20.20	18.25 ea
No. 103 3"	Open.	4.70	4.25 ea
No. 104 4"	Open.	6.35	5.75 ea
No. 106 6"	Open.	8.90	8.05 ea
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	60	.90 ea	.82 ea
	50	.92 ea	.84 ea
	40	.95 ea	.86 ea
3"x24"	120,100	.89 ea	.81 ea
	80	.91 ea	.83 ea
	60	.95 ea	.86 ea
	50	1.09 ea	.99 ea
	40	1.12 ea	1.03 ea
4"x24"	120,100	1.50 ea	1.36 ea
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	60	1.59 ea	1.44 ea
	50	1.65 ea	1.49 ea
	40	1.70 ea	1.54 ea

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Grit	A Weight	Pack of 100
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Have you outgrown your old tablesaw?

Here at *Fine Woodworking*, we've been planning for years to tackle the question, "Which is the best tablesaw?" One time, we even asked readers to write and tell what they thought, but because of so many different expectations, there seemed to be no clear answer. In my own 15 years of feeding sawblades, the real question has turned out to be, "What do I want my tablesaw to do?" Here's my sawdusty tale—I'd enjoy hearing from readers with their own viewpoints, whether the same as mine or different. Maybe we can sift out and print some universal truths after all.

When I bought into my picture framing shop, there was a 10-in. Sears Craftsman tablesaw sitting in the back, and it stayed there for 11 years—ripping moldings, making miters, dadoing, cutting the occasional plywood, being an extra workbench, and doing all the daily chores a frame shop could ask of it.

The saw helped me make my living for a long time, but I never actually *liked* it, if you know what I mean. For as long as I can remember, it had an annoying click in its arbor bearing, al-

though this didn't affect the cutting. About monthly the arbor pulley would work loose, and several times a year I would have to crawl around under the thing to remove sap and gum which were preventing the arbor from reaching a full 45° or a full 90°. It seemed to me that the saw could have been designed to avoid both chores. In addition, I was never able to get the blade to stay parallel to the table grooves. I recently learned that I could have cured this by spending a couple of bucks on better-quality trunnion bolts, a fix that would never have occurred to me then.

When I had the opportunity to buy a junked building for a new shop, I figured that I could buy a new saw to help with renovations, and then sell the old saw when I moved. Naturally, I bought another Sears, the \$449 "best" model at its perpetual sale price of \$100 off.

Tolerances had changed a little. Although my old miter gauges fit one table groove, I had to file out the other to accept them. I was a little disturbed that the new saw had angle-iron guides for the rip fence instead of the old saw's rack-and-pinion, and that the guides didn't extend all the way across the front of the saw so that I could rip on

either side of the blade, but I later added angle iron of my own, which worked pretty well. It took about five hours to file the groove, set up the vertical and angle adjustments, and true up the rest of the saw. A week later I noticed that the blade hadn't stayed parallel to the table grooves. And the motor wasn't up to heavy work—the overload protector kept shutting it down, despite my efforts to pace myself. One day it took three hours to cool off.

After a solid month of ripping up old wood for worktables, shelves and partitions, I heard the first ominous grumble from the bearing. It got worse by the hour. Sears explained that if I was using the saw professionally they couldn't honor the guarantee, and I explained that for \$9 it wasn't worth the hassle—all I wanted was a new bearing. Changing the bearing took all Saturday.

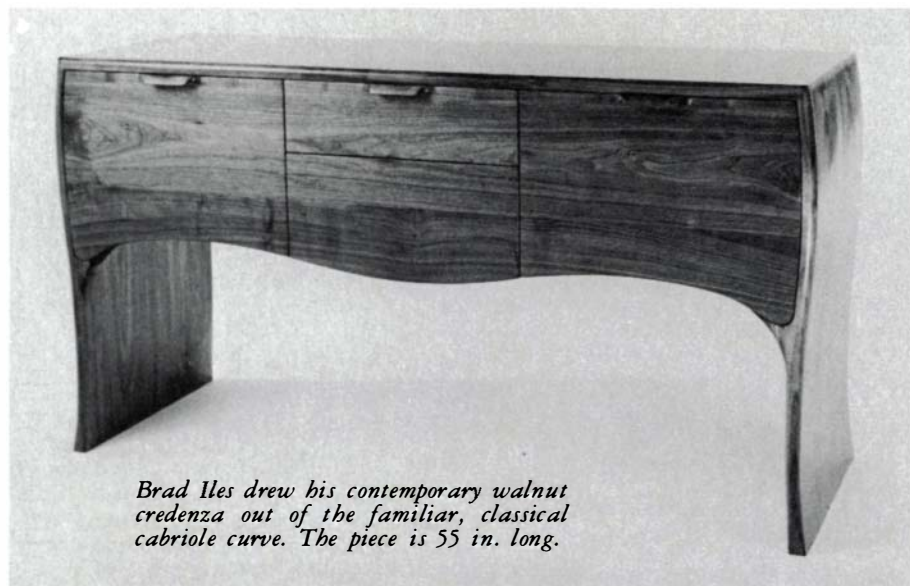
That saw built my new shop, and after the move, it made a lot of picture molding besides. But about this time I began to get interested in general woodworking, and here my new saw let me down. It had gobbled up sugar pine, but it balked at cherry, walnut or maple in any reasonable size. It just plain would not rip green wood. Ripping a

Feeling the wood in Eugene, Oregon

For three days in June, the public in Eugene, Ore., got a close look at what 15 local woodworkers can offer as alternatives to mass-produced furnishings. The show's success stemmed from its informal atmosphere, which permitted a browser to measure a chair's comfort with his back and inspect the finish on a softly rounded corner with his hand.

Nothing was roped off, and only delicate, turned miniatures were set behind glass. Streams of people tested and inspected the furniture and artwork. Enough of them lingered to buy and to commission new work for the organizers to consider their efforts worthwhile. The juried show, held at the Hilton Hotel, was put together by the Willamette Valley Fine Woodworking Association, PO Box 3010, Eugene, Ore. 97403.

—Ellen Frances, Eugene, Ore.



Brad Iles drew his contemporary walnut credenza out of the familiar, classical cabriole curve. The piece is 55 in. long.



Frank Mitchell insists that his wooden clocks tell time, and to make sure they do, he uses brass pivots in lignum vitae bushings.

Photos this page: Hugh G. Barton

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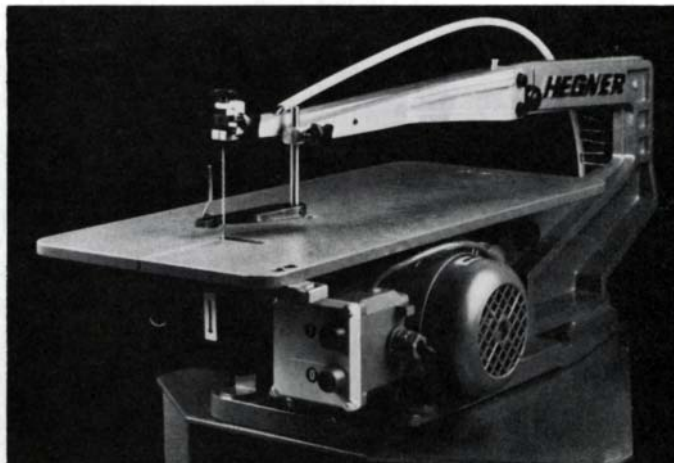
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2x2 turning square was an exercise in patience, requiring raising the blade a little at a time on a series of passes. I developed great reflexes for turning off the motor before the overload could. When you woodwork for a living, you quickly grow impatient with processes that eat up shop time without bringing a return. I started looking for a better saw.

When I explained my needs, the salesman extolled the virtues of the Rockwell Unisaw, until he came to the price—\$1800. I gasped, and he switched to the virtues of the Rockwell contractor's saw almost without taking a breath. It had the same bearings and trunnion as the Unisaw, came with an honest 1½-HP motor, and had a rack-and-pinion fence. Although it cost \$1,000 less, he carefully explained, it was no less a saw. Of course, it had stamped table extensions instead of the Unisaw's cast ones, and a flimsier base, but I could live with that.

When the saw arrived, I put aside an afternoon for the set-up and adjustments, and I got a pleasant surprise. There were no adjustments to make—90° was truly 90°, 45° was 45°, the blade was parallel to the table grooves, and the fence was parallel to the blade. The miter gauge fit neatly on both sides. The saw saved me \$40 worth of production time the first day, just by coming from the factory in working order. Once, the pulley wandered off the arbor, and the plastic adjustment wheel eventually stripped its slot, and I admit that I blow the overload once in a while, but it's my fault, not the saw's. The saw has enough power that I now can appreciate the efficiency of special-purpose blades. With the old Sears saw, nothing seemed to make a difference. It either cut or didn't, at its own whim and speed. Now my Winchester ten-tooth rip blade eats up walnut to full blade height, a Freud thin-rim veneer blade cuts without leaving a tooth mark, and I get glue joints I can

count on directly from a combination blade. By now I've spent more on carbide than I did on the machine itself.

I eventually sold the Sears saw to a man who came in one Saturday wanting me to make him a cherry display case. He was in a hurry, and he hung around while I did the job. Like a lot of other people, he'd apparently never had the emotional kick that comes when you first realize how furniture comes from trees. He got hooked on woodworking in about 20 minutes. He gave me \$225, about two-thirds what the saw cost new, and I gave him a year's guarantee. We both made a good deal—the Sears saw, while inadequate for my current needs, would last him forever.

Will I step up again, or stick with my Rockwell? I've been looking at the Swiss-made Inca, which costs about as much as a Unisaw. But for a picture framer, who rips a lot of shallow rabbets into moldings, the Inca just plain won't work—you can't retract a 10-in. blade low enough. At full-bottom it still stands about an inch above the table.

Over the past year I've also had access to an older, heavy-duty Wadkin. If my Rockwell saw is like a pickup truck, the Wadkin is a tractor trailer, and just as unforgiving of bad manners. I soon found out that it tears great chunks out of ill-fed boards, and that its big motor doesn't stall if a board binds. It sure cuts wood, but it takes some getting used to. Kickback, for instance, a relatively minor problem on a weaker saw, is a real hazard. If I were a full-time framer again—and could afford the price—I'd still have to think twice about its "advantages." Having a 5-HP table-saw in your shop might be like feeding crocodiles to your pet goldfish. You'd better have a pretty big goldfish.

One last word: Although I'm resisting stepping up to a better saw, I have to admit that I've never once wanted to step down.

—Jim Cummins

One gallery tells what it can sell

by Judy Coady

There aren't enough foyers in America to house all the hall tables built by contemporary furnituremakers. On the other hand, there is a real shortage of wall-mounted mirrors for the Me Generation. If your goal is to sell the furniture you make, your first order of business ought to be finding out who sells what, to whom, and how. As director of the Gallery at Workbench in New York City, I can tell you about our sales experience. You may be able to use it to better your own prospects.

Ask yourself first if your reason for making furniture is really to sell it. Some woodworkers build a piece on speculation, to showcase their talent, hoping to generate commissions. Some want publicity, or to be discovered by sympathetic art galleries. Then, too, lots of furniture is made for the sheer hands-on joy of it, for the satisfaction that comes from self-expression. Such pieces may be as much art as furniture, and there is a limited collectors' market. If artistic self-expression or complicated technical challenge is your reason for making, however, it's unrealistic to superimpose the goal of selling your work to the general public.

Cradles and music stands are cases in point. They present worthy aesthetic and technical challenges, yet they don't often sell in our gallery. We think it is because babies don't remain small enough long enough to justify a \$1500 crib whose mattress is the wrong size for standard sheets, and because most musicians are in the same tax bracket as woodworkers, and buy the \$29.95 adjustable metal stand.

To find out what is wanted and needed, ask your potential outlets what has sold there. The answer will depend on the geographic area and the type of business—shop, store, boutique, fair or gallery. If you think you want to sell, you can be sure these businesses do too. Find out who the typical buyer is, what

St. Louis showstopper

John Noel of Kansas City, Mo., won top prize in the table category for his koa table desk (30 in. by 30 in. by 60 in.) at the First Annual Midwest Wood Furniture Show and Competition during June. The event, featuring 37 pieces by 27 makers, was co-sponsored by Hibdon Hardwoods and the Craft Alliance, and was open to woodworkers living within 300 miles of St. Louis.



Notes and Comment

So there's a terrific exhibition of woodworking going on in your town? Just finishing some unusual project? Got a theory you'd like to try on the woodworking world, a beef you want to air, some news to share? Send text and photographs (preferably with negatives) to Notes and Comment, Fine Woodworking, Box 355, Newtown, CT 06470.

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woods have generally been preferred, what furniture functions have sold, and what price range is comfortable. At Workbench, our typical customer is buying one-of-a-kind furniture for the first time. He or she wants a piece that is easy to integrate with an existing environment. Consequently, we sell many stools, benches, coffee tables, mirrors and plant stands. Dining tables, game tables and desks are also popular, although the major barrier to this type of sale is the customer's uncertainty about picking a chair to match. We've learned to get the woodworker to recommend a commercially made chair, or to sketch one that he or she would like to build.

Most of the furniture we sell is in the \$800 to \$1500 price range, though mirrors and stools generally cost from \$300 to \$650. Desks and dining tables sell for \$1500 to \$3,000. For the general public that Workbench is introducing to handmade furniture, price is a major barrier. Consequently, our gallery is nonprofit, and has the unique, albeit controversial, policy of selling direct, without adding a commission.

Our customers seem to like and buy

fruitwoods (mainly cherry and pear) and light-colored maple. Padauk and rosewood are popular, oak is not. Painted furniture sells well, but veneer makes New Yorkers suspicious.

Learning a shop or gallery's aesthetic point of view is as important as knowing its sales history. I am not suggesting that you design to fit the gallery's taste and needs; rather, that you find one compatible with your own design philosophy. At Workbench, we aim to show impeccably crafted, functional pieces that embody original artistic statements. We do not show reproductions, and saleability is not a necessary criterion. We like a real mix—large scale and small, personal statements, real wood and man-made materials, and designs both flashy and discrete. Some galleries have an exhibit and sales strategy geared toward collectors, while others aim for those who seek only sensible, practical alternatives to mass-produced goods. The store's preferences ought to be obvious by what's on the sales floor, and you can always ask.

Once you've researched, designed, built and delivered your furniture to a

gallery, your job is not yet done—not if you really want to sell. Beautifully designed and meticulously crafted furniture does not sell itself. Galleries and craft shops work hard just to bring in prospective buyers. Closing a sale is tricky because handmade furniture is usually priced, function for function, like attractive antiques or fashionable Italian imports. What can give the woodworker a competitive edge is the appealing fact that he or she is alive—not dead for 150 years—and not anonymous like those slick foreign designers.

So, when you deliver your furniture, tell your sales representative about yourself and your work. Explain why you became a woodworker, what influences your design, how a specific piece was made, how you fantasize about building an entire billiard room. All of this is interesting to a potential customer. I don't suggest a dancing bear act, but picture this scenario, with the gallery owner and client standing in front of your sleek, well-crafted, \$800 pearwood end-table:

Client: "Nice table."

Sales Rep: "Yes, it really is."

Client: "Sure is a nice table."

Sales Rep: "Yes, it certainly is."

Client: "Well, I'll think about it."

And now the same scene, except that you briefed your sales representative:

Client: "Nice table."

Sales Rep: "Yes, the artist found that pearwood in a chicken coop in Vermont and had only enough for this one piece."

Client: "That so?"

Sales Rep: "Yes, John's shop is in Massachusetts, and he likes to work alone. He usually builds one-of-a-kind furniture favoring simple, understated lines, so the figure of the wood can speak for itself."

Client: "Well, he sure succeeded. I'll take it for my living room." □

Festival tent sells where galleries can't

by Michael Gilmartin

Many Georgians received a surprise last spring while touring the annual Arts Festival of Atlanta. Amongst the usual craft-show fare was an exhibit in a separate tent devoted to fine furniture. Entitled "IMPOSTERS—Sculpture Posing as Furniture," it consisted of 30 works that somehow related to furniture, made by six Southern artists.

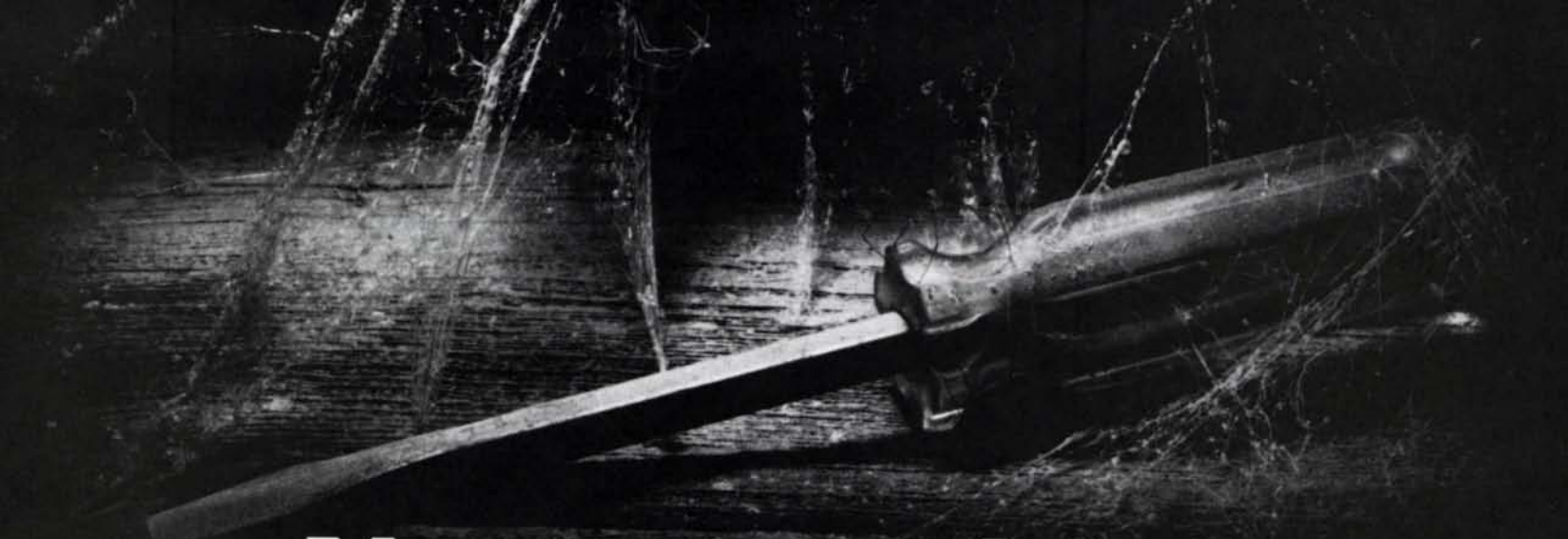
I organized the show, and my reason was twofold. First, I'm disenchanted with the ability of local galleries to properly display and sell sculptural furniture, and second, I saw a chance to tap into a

Photo: Sotheby Parke Bernet

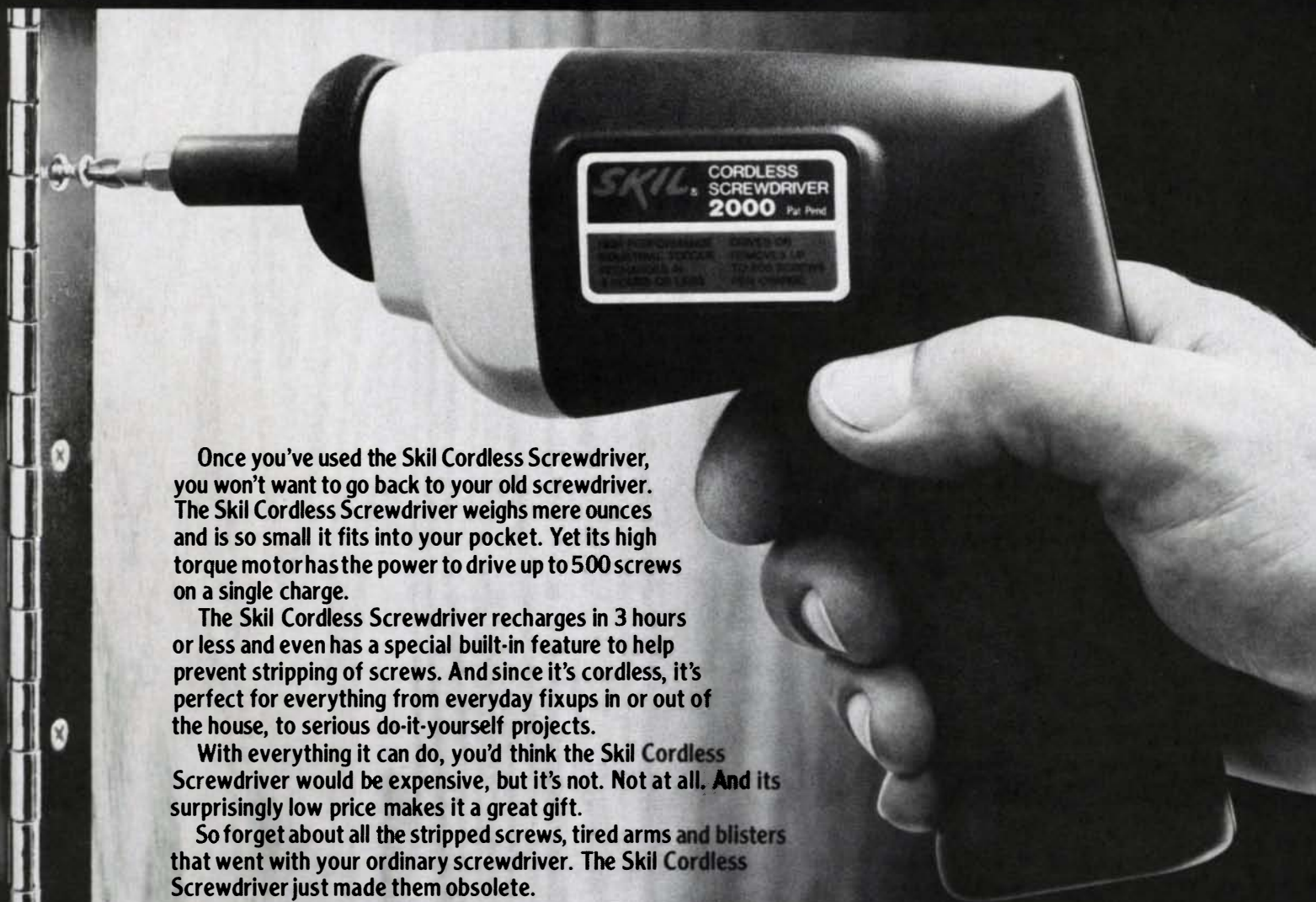


Too much?

Why does a piece of furniture set an auction record? This cabinet, built by Adam Weisweiler in 1784, once held the personal papers of Louis XVI. It accompanied the deposed king to the Tuileries while he was under house arrest, awaiting execution. Maybe that explains why somebody from New Jersey paid £990,000 for the piece last July at Sotheby's, London. □



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ready resource—the marketplace provided by the arts festival, a well organized nine-day event. It's become an institution by dint of its 30 years running, and draws well over one million people.

I'd participated in the festival for the last four years, but in the traditional way—12 pieces of furniture crammed into a 10-ft. square. This time, in our own large space, I invited several artists who normally don't participate in shows. Our group consisted of two woodworkers besides myself, a blacksmith and two sculptors. I chose them because of their style—they all take risks in their work, seeking other than standard solutions to problems of design and structure. Many pieces were mixed media, combining metal and glass with wood.

More than 80,000 people viewed our exhibit during its nine-day run. Although most of the pieces had been built on speculation and only a few of them sold outright, all of the artists reported considerable interest in new commissions. Just as important was the educational exposure of contemporary furniture as a mode of artistic expression to thousands of Southerners. My goal was to show what constitutes good woodworking, while reinforcing the fact that fine design and craftsmanship are affordable. The follow-up has proven the show successful, so much so that I'm already planning the next one. □

Four galleries, one dance hall

Woodworking galleries may bite the dust with dismaying regularity, but just as regularly new ones sprout. Four new galleries to report on here, each one looking for work to display, each one worth visiting to see high-grade contemporary pieces.

In Bethesda, Md., the craft shop Appalachian has opened a new department to present wooden furniture in a domestic context, amid handmade tableware, rugs and lamps. Partners Joan Farrell and Ann Powell mean to emphasize "living with and using" their wares, rather than collecting them. Nineteen furnitur makers were represented in the spring opening, at 10400 Old Georgetown Rd., Bethesda, Md. 20817.

New Mexico has two new galleries. The Archer/Haggard Gallery of Contemporary Woodwork opened last December in Santa Fe, and within two months it had sold 25 pieces. This success encouraged woodworker James Rannefeld to open his own gallery, Palisander, in Taos last July. Its opening show included

Promoters gamble for your gold

For the San Francisco woodworking public, and for the merchants who rented booth space, last April's big "Working with Wood" exposition was a great success. But the debris was hardly swept off Fort Mason Pier before the two entrepreneurs who had come together to organize the trade show split bitterly apart, leaving at least \$60,000 in unpaid bills.

Among the few things on which both sides still agree are these: producing the show cost more money than anticipated; all the money the show took in is long gone; and the other guy should now make good on the debts.

Even though one large and well-attended woodworking show lost money, these same two entrepreneurs are now separately promoting two competing shows to be held in the Bay Area next spring. The wood industry's merchants, the professional artisans, and the woodworking public, will now have to decide whether two shows are twice as good as one, and if not, which 1984 show to attend, if either.

The two entrepreneurs are Fred Damsen, who owns the Woodline/Japan Woodworker tool store in Alameda, and Wayne Inouye, a professional show promoter doing business as Exhibitor's

Showcase. In July of 1982, they signed a contract saying that Damsen, as show producer, would receive all the money and pay all the bills, while Inouye would promote, market and manage the event. Their dispute turns on clauses saying Inouye wasn't to incur debts or major costs without Damsen's prior consent. What actually happened isn't likely to ever be unraveled outside of court, but despite numerous threats, only one of the three major creditors has actually filed a suit.

Promoters generally try to cover hall rental and their pre-show expenses (mainly publicity, plus their own sales and office costs) by selling space, for anywhere from \$200 to \$700 per booth. Then their profits and their showtime expenses—guards, ticket-takers, haulers, sweepers—come out of the gate, at \$3 to \$5 per person. This sort of three-day show typically takes about six months to promote, during which time the magic number is percent of space sold. Merchants don't want to be left out of a successful show, but some shows never do sell enough booths to open, leaving the early-birds with nothing but worms. At Fort Mason, about 200 booths were sold for an average \$400 each, and about 12,000 people paid \$3.75 each to attend.

Damsen's Woodworker's Foundation has now joined up with another pro-

work by Californians Art Carpenter and Sam Maloof, as well as from several regional craftspeople. Archer/Haggard is at 129 W. San Francisco St., Santa Fe, N.Mex. 87501, and Palisander is at 4 Bent St., Taos, N.Mex. 87571.

In San Francisco, a 1500-sq.-ft. showroom in the shopper's heaven of Pier 39 begins displaying California woodwork-

ing this month. Planned to be more like a furniture store than a gallery, with room settings that will include all manner of crafts accessories, the as-yet nameless showroom will stage a feature show every eight weeks. Ron Ashby is gallery coordinator, and portfolios can be sent to him at Box 43, Albion, Calif. 95410.



At Danceteria, 'Mothra chair' by Main and Main.

Danceteria, the new-wave disco in Manhattan's West 20s, threw a two-day party last July to show off work by some of its neighbors: artists, furniture-modelers, decoratists maybe? The show was called "Ourhaus," and in a fashion akin to Italian Memphis, but pierced with Westside Punk, the place was decked in dry-cleaner plastic, corrugated fiberglass and dangling colored bulbs. The furnishings, which included a neon-trimmed coffee table, an ironing-board-backed chair, and tar-black chainsaws decorated in day-glow, were grouped together in ramshackle little environments that echoed their colors, textures or themes. I didn't find myself going *hmmpf* for more than a few minutes, before I was taken by the colorful exuberance of this stuff. —Rick Mastelli

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moter, Randy Thorsch of Thorsch Productions (2156 The Alameda, Suite C, San Jose, Calif. 95126), to present a "Working with Wood" show at the San Mateo Fairgrounds next Feb. 9-12. Thorsch, who has also produced a number of up-scale home shows, said he'd sold "15 or 20" booths during his first two weeks of trying.

Meanwhile, Inouye's firm, Exhibitor's Showcase (234 Marshall St., Redwood City, Calif. 94063), is not only promoting the "National Working with Wood" show, April 6-8 at the Showplace Square in downtown San Francisco, but also plans a leap to the East Coast next May 11-13, to the Nassau Coliseum on Long Island. Inouye said the San Francisco show is already more than half sold; Nassau, one-third.

Amidst the commercial clamor at Fort Mason last April was, for the first time at any such event, a major furniture exhibition. It was put on by members of the eight county-wide guilds that have banded together to form the Northern California Woodworkers Association (PO Box 776, Marshall, Calif. 94940). Though a real treat for the thousands of amateur woodworkers in attendance, hardly any of the furniture

got sold. The promoters didn't seem to realize what a draw such an exhibit might be, so they put no effort toward attracting a furniture-buying public. Thorsch promises a strong campaign next spring, so the NCWA executive has sanctioned his February show in San Mateo. On the other hand, at least one member guild has decided to withdraw, on grounds that weekend shows just aren't a good way to sell furniture.

Meanwhile, Peter and Ellen Engel of Convention Designs Inc. (35 Main St., Plymouth, N.H. 03264), promoters of computer conventions, quietly decided to try their own style of regional show under the banner "Woodworking World." Their first venture, staged last fall in Boxborough, Mass., drew 5500 people to see 63 exhibitors. Engel, who runs a shoestring operation, said they broke even in Boxborough and so were encouraged to try again: Woodworking World runs Nov. 11-13 at the Downingtown Farmer's Market near Philadelphia; the idea goes to Toronto Feb. 3-5, and back to Boxborough, which is near Boston, next April 13-15. Engel, himself an amateur woodworker, is looking for more locations around the continent.

And what about Marvin Park, who in 1980 organized the first show of this type? Park's "Excellence in Woodworking" show did well in Chicago, then grew into annual shows there, in New York and in Los Angeles. But last spring, when his Los Angeles date conflicted with the aforementioned extravaganza in San Francisco, Park decided that woodworkers posed too many problems for too little profit, so he got out.

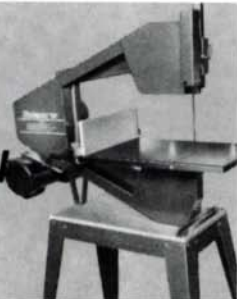
—John Kelsey

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Scientists in China are studying wood from a tall, slender tree that glows in the dark, according to a UPI report from the official Xinhua news agency. A type of poplar, the tree's wood, when wet, is said to emit a clear blue light.

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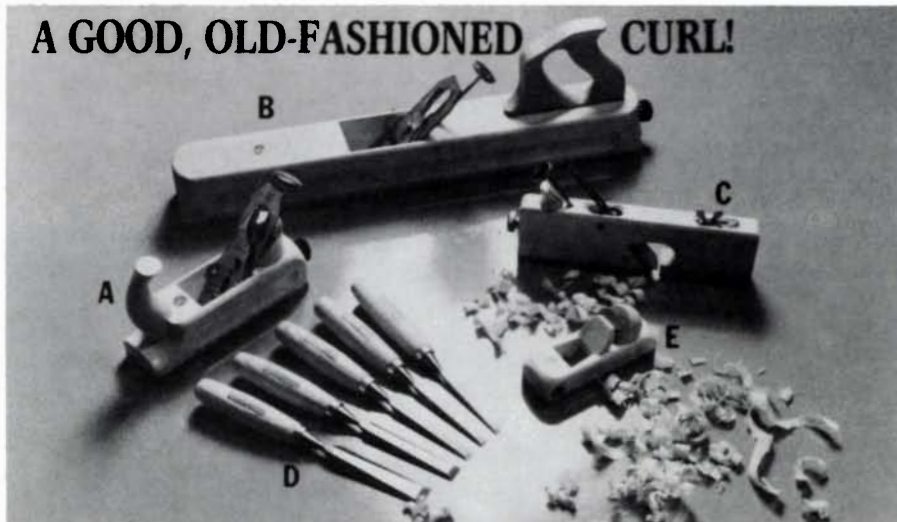
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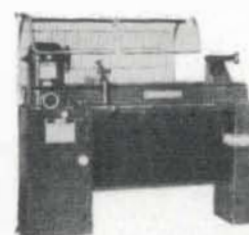
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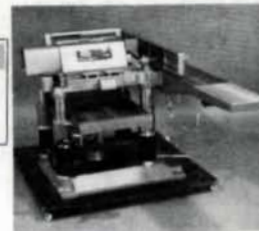
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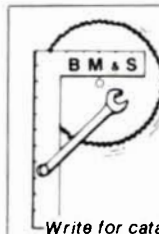
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MARYLAND: Exhibition—Peter Korn, through Nov. 30. Appalachiana, 10400 Old Georgetown Rd., Bethesda, 20814. (301) 530-6770.

MASSACHUSETTS: Craft fair—Nov. 5-6; Antiques I.D. and care, Nov. 17, Dec. 17. Contact Frank G. White, Old Sturbridge Village, Sturbridge, 01566. (617) 347-3362.

Exhibition—Through Oct. 15. Don Muller Contemporary Crafts Gallery, 16 Main St., Northampton, 01060. Contact Jill Singer, (413) 586-1119.

Craft fair—Formerly "Rhinebeck," Eastern States Exposition Center, West Springfield. Trade: June 19-20, 1984; public: June 22-24, 1984. Slides by Jan. 12, 1984. American Craft Enterprises, Inc., Box 10, New Paltz, N.Y. 12561. (914) 255-0039.

Christmas crafts—And antiques, Dec. 2-4, Hynes Auditorium; Dec. 10-11, Bayside Exposition Center, Boston. Cash awards. Write Boston Marketplace, 134 Beach St., Boston, 02111. (617) 426-9002.

Juried craft show—Dec. 9-11 at the Centrum, Worcester. Entry deadline Dec. 1. Write MII Productions, Inc., Box 93, Vernon, Conn. 06066.

MINNESOTA: Juried exhibition—Furniture, carving and accessories. Minneapolis, fall of '83. Write Minnesota Woodworkers' Guild, Box 8372, Minneapolis, 55408.

MISSOURI: Classes—Basic furniture refinishing, conservation, March '84; veneer repair, Jan., April; glazing and graining, Feb. SASE to The Finishing School, 1607 N. 2nd St., St. Charles, 63301.

NEVADA: Craft fair—KNPR Craftworks Market, Oct. 28-30. Reed Whipple Field, 821 Las Vegas Blvd., Las Vegas, 89122. (702) 456-6695.

Juried craft festival—Nov. 18-20, Convention Center, Reno. Send photos or slides to Steve Powers and Co., 1050 Rock Springs Rd. #202, Escondido, Calif. 92026. (619) 723-8001.

NEW JERSEY: Workshops—Windsor chairmaking, building Shaker furniture, marketing your product, Thomas Moser, Oct. 29. Contact Dr. G. Longo, Brookdale Community College, Lincroft, 07738. (201) 842-1900, ext. 586.

Show—Supercraft Sunday, Nov. 27, Dec. 18. Meadowlands complex, East Rutherford.

Lecture/demonstration—Woodturning, basic woodworking techniques, Palmer Sharpless, Nov. 4, Kean College, Union. Contact Guild of Designer Woodworkers, (201) 527-2307.

Show—Decoys, Nov. 4-6. Middletown High School South gym, Nut Swamp Rd., Middletown.

NEW YORK: Demonstrations—Professional woodworking techniques, Mr. Sawdust, Oct. 12-16, Nanuet Mall, Nanuet; Jan. 19-22, Sunrise Mall, Massapequa, L.I.

Exhibition—"Carved Images: African Art from the Permanent Collection," continuing. Neuberger Museum, State Univ. of N.Y., College at Purchase, 10577. (914) 253-5087.

Festival—American Crafts October Festival at Lincoln Center, Oct. 20-21 (wholesale), Oct. 22-23 and Oct. 29-30 (retail). Lincoln Center, Fordham Univ. Plaza, New York City.

Exhibition—"Small Works National '83," Nov. 26-Dec. 30. Zaner Gallery, 100-1 Alexander St., Rochester, 14620. (716) 232-7578.

Crafts festival—Nov. 18-20. Nassau Coliseum, Uniondale. (516) 794-9100.

Craft show—Nov. 25-27, New Scotland Armory, Albany. All media. Send SASE to Professional Craft Expo, Box 2, Johnston Rd., Slingerlands, 12159. (518) 456-3770.

Craft show—Lectures, demos, Nov. 12-13. New York Statler Hotel, 7th Ave. & 33rd St., New York City. (212) 580-9196.

Juried exhibition—"Rhinebeck '84." Trade: June 19-20, public: June 21-24, Dutchess County Fairgrounds, Rhinebeck. Apply by Jan. 15, 1984. Write MII Productions, Inc., Box 93, Vernon, Conn. 06066. (203) 745-5071 or 871-7914.

NORTH CAROLINA: Fair—Mostly glass, some wood. Oct. 20-22. Asheville Civic Center, Haywood St., Asheville. (704) 298-7928.

OHIO: Demonstration—Woodworking techniques, Mr. Sawdust, Nov. 1-6. Randall Park Mall, I-480, Cleveland.

Show—Artistry in Wood, carving and woodworking, Nov. 19-20. Dayton Convention Center. Contact Walter Grether, 265 Burgess Dr., Dayton, 45415. (513) 275-4582.

Show—Woodcarving, Nov. 5-6, by Lorain County

Woodcarving Club, Aqua Marine Resort, 216 Miller Rd., Avon Lake.

Workshop—Marketing crafts, Nov. 12, by Ohio Designer Craftsmen and Athens Artisans Guild. Write Bradley Pekoc, RR #1, Box 224, Chesterhill, 43728. (614) 554-7801.

OKLAHOMA: Workshop—Woodworking, Ian Kirby, Oct. 21-23. Fine Tool and Wood Store, 7923 N. May Ave., Oklahoma City, 73120. (405) 842-6828, (800) 255-9800.

OREGON: Exhibition—Boxes, Silverton woodworkers, November. Real Mother Goose Gallery, 9514 Wash. Sq., Portland, 97205. (503) 620-2243.

PENNSYLVANIA: Exposition—Nov. 25-27. David Lawrence Convention Ctr., Pittsburgh.

Demonstration—Woodworking techniques, Mr. Sawdust, Oct. 18-23. Willow Grove Mall, Exit 27, Pa. Turnpike, Willow Grove.

Exhibit—"Woodworking World-Philadelphia," machinery, wood, supplies, exhibits, demonstrations, Nov. 11-13. Downingtown Farmers Market Exhibit Hall, Rt. 30, Downingtown.

Christmas crafts—Nov. 25-27, Pennsylvania Farm Show Bldg., Harrisburg. Write United Craft Enterprises, Ltd., Box 326, Masonville, N.Y. 13804. (607) 265-3792.

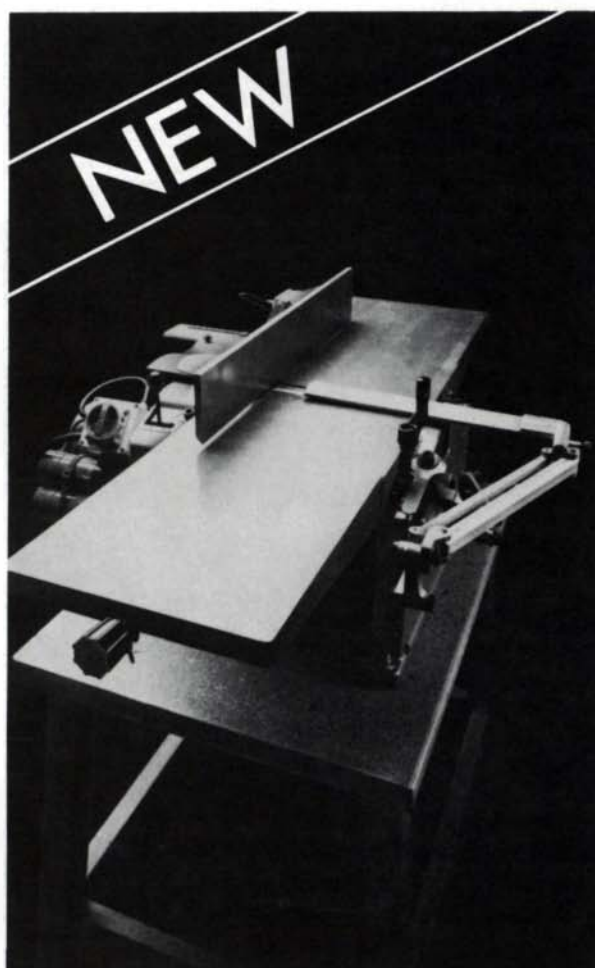
Show/sale—Folk art, country and period furniture, Nov. 18-20, Embers Convention Center, Rt. 11, Carlisle. Write Robert Goodrich, Box 375A, RD 4, Carlisle, 17013. (717) 243-7890.

SOUTH CAROLINA: Wood expo—Magnolia Park Woodcarvers and Woodcrafting Expo, Oct. 29-30. 10 miles south of Myrtle Beach: Magnolia Park, Hwy. 17 By-Pass, Murrells Inlet.

TENNESSEE: Exhibition—"The Figure: New Form, New Function," Nov. 5-Jan. 7. Arrowmont School of Arts and Crafts, Box 567, Gatlinburg, 37738. (615) 436-5860.

TEXAS: Show—Austin Area Woodworkers Guild show, scheduled for Nov., has been cancelled.

Juried fair—ACC Craft Fair at Dallas. Market Hall, Dallas Market Center. Trade: April 4-5; public: April 6-8. Slide deadline Oct. 20. Write American



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Craft Enterprises, Inc., Box 10, New Paltz, N.Y. 12561. (914) 255-0039.
Juried fair—13th Annual Crafts and Arts Expo. Demonstrations, auction. March 24–April 1, 1984. Entry deadline Dec. 1, 1983. Contact Barbara Mettyko, Houston Festival, 1950 W. Gray, Suite 2, Houston, 77019. (713) 521-9329.
Show/sale—Alamo Area Woodcarvers, Nov. 19, Wonderland Mall, San Antonio. Contact Alexius Robben, 2727 Ravina Dr., San Antonio, 78222.

VIRGINIA: Craft fair—8th Annual Richmond Craft Fair, sponsored by the Hand Workshop, Richmond Arena, Nov. 10–13.
Conference—International Trade in Forest Products, Nov. 7–9, Crystal Gateway Marriott Hotel, Arlington. Write FPRSZ, 2801 Marshall Ct., Madison, Wis. 53705. (608) 231-1361.
Show—Artistry in Wood, Nov. 26–27, Marymount College Student Center, 2807 N. Glebe Rd., Arlington, 22033. Contact Charles H. Schafer, 7014 Murray La., Annandale, 22003. (703) 256-2779.

WASHINGTON: Seminars—Steambending, Oct. 22. Northwest School of Wooden Boatbuilding, Glen Cove Indus. Park, 251 Otto St., Port Townsend, 98368. (206) 385-4948.
Shows—Chairs, through Oct. 30; containers, Nov. 16–Dec. 31. Northwest Gallery, 202 1st Ave. South, Seattle, 98104. (206) 625-0542.
Juried show/sale—Northwest carvers, Nov. 26–27, Fife Sr. Center, 2111 54th Ave. E.; demos and sale: Fife Sr. High School Cafetorium, 5616 20th E., Fife, Wash. Contact Norm Davis, 1535 24th S.E., Auburn, 98002. (206) 833-2765.

WISCONSIN: Seminars—Fall sessions, woodworking, chainsaw lumbermaking. Private studio, historic Cedarburg. Write Mike Hanley, Autumn Woods Studio, W-63, N-653 Washington Ave., Cedarburg, 53012. (414) 375-1912.
Seminars/workshops—Hand tools and woodworking techniques, Bill Stankus, through Jan.; tablesaw joinery, Mark Duginske, Jan. 14. Write The Woodworking Center, 714 E. Standish Pl., Milwaukee, 53217. (414) 351-6573.
Show—Badger State Carvers, Oct. 23. American-Serb Memorial Hall, 5101 W. Okla. Ave., Milwaukee. Tom Richards, 2860 S. 48 St., Milwaukee, 53219.

BRITISH COLUMBIA: Exhibition—"Beyond the Bowl: Contemporary Turned Vessels in Wood," Oct. 20–Jan. 29, 1984. Cartwright Street Gallery, 1411 Cartwright St., Vancouver, V6H 3R7.

MANITOBA: Juried crafts—"Reflections on Three Plains," Winnipeg Gallery, March 4–April 15. Alberta, Saskatchewan, Manitoba craftspeople. Entries by Oct. 28. Manitoba Crafts Council, 202-89 Princess St., Winnipeg, R3B 2X5.

ONTARIO: Juried exhibit—Toys, games and dollhouses, Nov. 24–Jan. 9. The Craft Gallery, Toronto. All media; entry deadline Oct. 18. Write Marie Show-Rimington, Craft Gallery, 346 Dundas St. West, Toronto, M5T 1G5.

QUEBEC: Show—Canada Wood '83, Place Bonaventure, Montreal, Oct. 27–30. Write Cahners Expo Group, 12233 W. Olympic Blvd., Suite 236, Los Angeles, Calif. 90064. (213) 826-6070.

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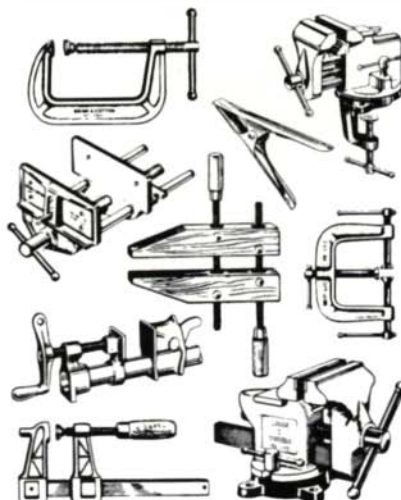
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Connections

In Connections we'll publish membership calls for guilds, queries from authors, and appeals from readers who want to share special interests.

Apprenticeships now being offered by the Baulines Craftsman's Guild. Contact Guild at 55 Sunny-side, Mill Valley, Calif. 94941. (415) 381-4194.

Bethesda woodworkers: area woodworking guild/organization forming. Contact M.W. Kandle, (301) 229-3208 after 6 PM.

Donations of tools, machinery, time and knowledge are desperately needed to equip and operate woodworking shop to fund our fight against child abuse. Tax deductible. Contact Terry Rowley, Odyssey Institute Corp., 817 Fairfield Ave., Bridgeport, Conn. 06604. (203) 334-3488.

Upholsterers wishing to share tricks of the trade, helpful hints, sources of supply, etc., can write National Guild of Master Upholsterers, 7728 44th Ave. W., Mukilteo, Wash. 98275. (206) 353-9784.

Midwest Woodworkers Association: membership open. Contact Gerald W. Jones, 311 Cumberland Rd., Columbia, Mo. 65201.

Augusta Woodworkers meet first Saturday of each month. St. Louis, Mo., area but open to all. Write the guild at at Box 15, Augusta, Mo. 63332.

Apprenticeship/internship in furniture conservation restoration, summers of '84 and '85. Emphasis on finishing. Woodworking experience necessary. Write Daniel L. Smith, Restoration Specialty Co., 1607 N. Second St., St. Charles, Mo. 63301.

New guild: San Joaquin Fine Woodworkers Assn. Interested members should write SJFWA, Box 789, Porterville, Calif. 93258-0789. (209) 781-4074.

For a disabled veteran, with some paralysis and no use of his right arm, another veteran and I are working out jigs and props to help him use lathe, bandsaw and other stationary power tools. Safety is our main concern and we would appreciate hearing from anyone with ideas.
 —Keth McManus, Rt. 1, Box 122, Wallace, W.Va. 26448.

School Update: The Finishing School, 1607 N. 2nd St., St. Charles, Mo. 63301. (314) 947-0030.

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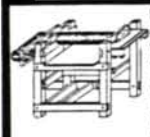
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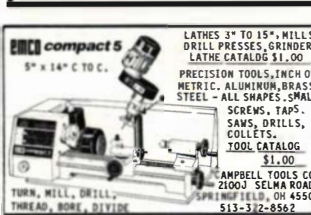
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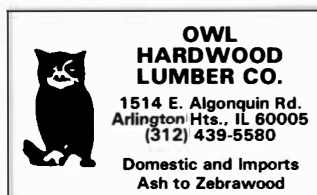


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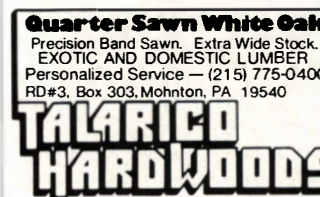
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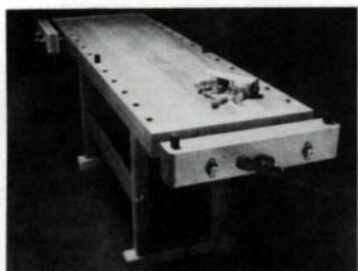
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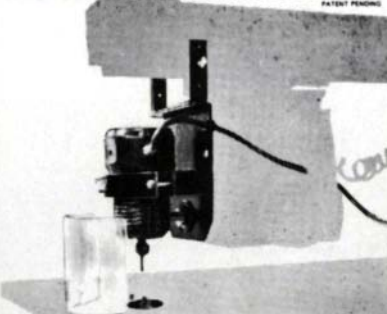
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OLD KEN'S BARNFUL OF TOOLS

BY JONATHAN COHEN

I live in Seattle, which is about as far west as one can go in the contiguous 48. For a woodworker who relies on hand tools, this can be a problem—especially if one believes that many old tools are of finer mettle (and metal) than their younger brethren. There just aren't many old tools out here, and that drives prices up. It also makes nice old tools into "antiques," which then become the mantelpiece curios and lampstands for scores of otherwise nice people. Which makes it all that much harder for woodworkers looking for these tools.

A short while ago, I was planning a trip back east to visit family, a golden opportunity to find some fine old tool specimens. As soon as I arrived in the little farm town in Upstate New York, I fulfilled my familial obligations and set out on my treasure hunt. As I went to general stores, antique shops and flea markets, however, I soon realized that something was seriously amiss. The stock of old tools was no less meager than that in Seattle, and prices were as high.

Well, I was dejected, and resigned to the idea of going home empty-handed. Shortly before I was to leave, though, a family friend remembered hearing of an elderly man living somewhere outside town who might have a few tools—"quite a few" was how the rumor went.

Although it was a snowy night, and my directions were vague at best, I set out on my quest. After endless forays down blizzard country roads, I finally spotted a light. Farms are not, by nature, very close together; there was only one house anywhere near the place my directions described. I ventured up what I hoped might be a driveway.

I made for the porch, hesitated, then knocked. I waited. Then knocked again, and again. Pressing my face to the icy glass, I could just make out an enormous, ornate woodstove. Next to it, in a rocking chair, with his head hanging precariously over the backrest, eyes closed and mouth open, was an elderly man. Encouraged, I pounded on the door once more. No reaction. As he was only a few feet away, I began to worry for his vital signs. Finally, though, a woman came to the door, the old man woke up, and I explained that I was a woodworker looking for tools.

"What for?" he asked.

"To build furniture," I replied.

He looked at me rather suspiciously. "You fixing to buy a whole truckload of my tools?"



Showing off his new old timber-framing machine, Cohen will say only that Ken Hoteling's barn is near Ithaca, N.Y.

I assured him that I was not, and a glance at my little car seemed to bear me out. He invited me in, hesitantly, and after some small talk, he introduced himself as Ken. Ken told me he was so defensive because people had twice come in tractor trailers and tried to buy his whole barnful, and twice he'd run them off with his shotgun. He pulled out a photo of the inside wall of a barn, lined with shelves jammed full of molding planes. I guessed at three or four thousand of them.

Ken couldn't show any tools to me that night, as there were no lights in the barn, but he showed me some of his work. He'd done quite a bit of chair caning, and he'd made some folk instruments, his favorite being a little banjo of "poppie" (poplar), with pegs he'd turned on the "lay" (lathe). He asked me how I'd come to hear about him, and after satisfying himself that I wasn't going to bring a truck, he agreed that I could return.

The next day I eagerly followed Ken into his barn. And there, indeed, was an entire wall of planes. They were almost lost, camouflaged amongst stalls, cabinets and chests overflowing with saws, mallets, chisels, planes, spokeshaves, braces and bits: every tool I'd ever seen and many that I hadn't. I knew not where to begin. I felt like a pauper inside Fort Knox.

Ken asked if I was interested in planes, and I immediately started to-

ward the wall, but he headed to the middle of the room and began pulling dozens upon dozens of wooden beauties from cavernous drawers. I stared, dumbstruck, until he gave me a look that seemed to say, "Well?" Timidly I picked up a matched pair of hollowing and rounding planes, both of which were stamped "Young and M'Master, Auburn, N.Y."

"I rather like these," I murmured.

"Would nine dollars sound fair to you?" Ken asked. "For the pair?"

I tried to hide my glee and set them over on my coat as an answer. We took a look at drawers full of chisels and slicks, my eye settling on a cherry-handled slick of immaculate steel. I felt embarrassed to ask how much. Ken chewed his knuckle. "Well," he hesitated, "that's a pretty nice one. I'd like to get four dollars."

It was like this the whole time I spent in his big, magical barn. We wandered from room to room, and he found brass sliding bevels behind buckets, chisels under chairs, saws next to saddles, and planes beneath plows.

When we were finished, Ken asked if I would like to see the basement, "where I keep my favorite tools." No arm-twisting required. His basement workshop was only slightly less crammed with tools. My favorite was an old metal plow plane with a floral decoration cast into each side. The clever part was that you could pull the guide away and pivot it 180° on an offset pin. This uncovered a second cutter, so the same tool now could cut a perfectly mated tongue. Ken seemed pretty fond of it.

As I paid for the armload of tools I had selected, Ken said he wasn't too sorry to see them go to "young fellows" like me, so they would have another life. He was still planning to leave the collection to his son, but sadly, it seemed as if the son was not all that interested. I thanked him and wondered if he would mind, when I got back east again, if I came and visited some more.

"Sure. Say, where did you say you were from?"

"Seattle . . . Washington."

He chuckled. "Kind of a long way to come for a couple of tools, ain't it?"

Not really, Ken. Not really. □

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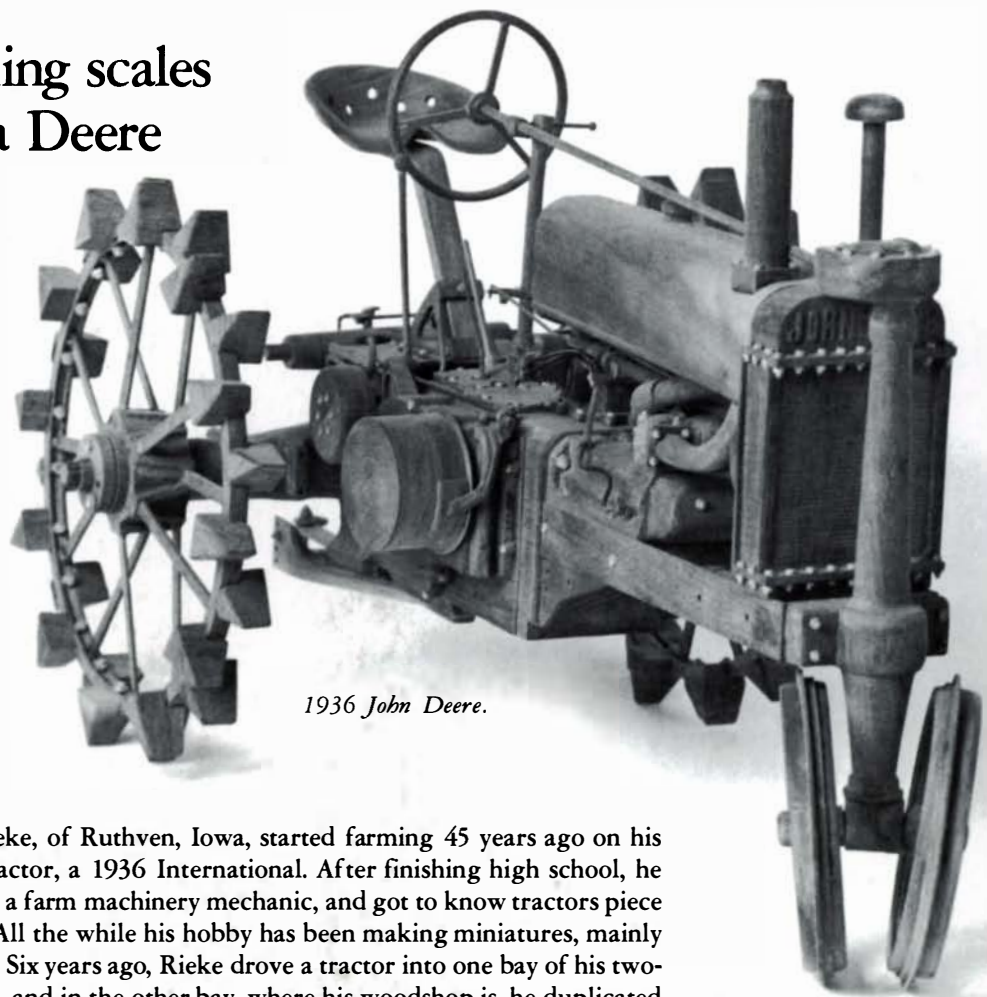
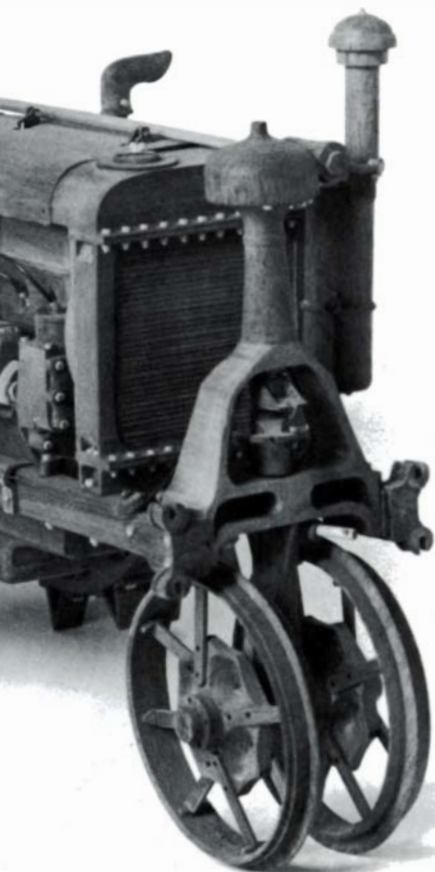


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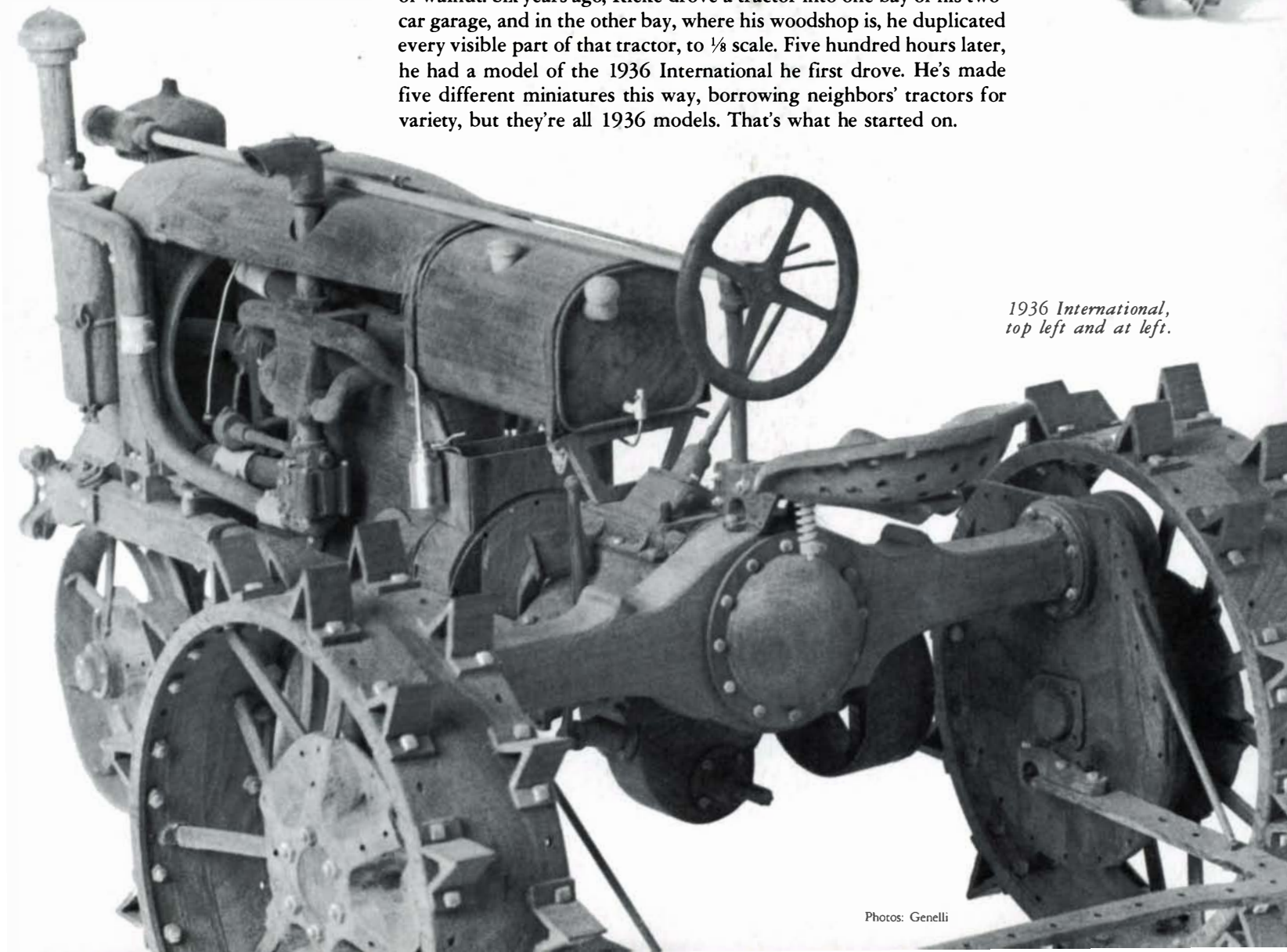
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*1936 International,
top left and at left.*