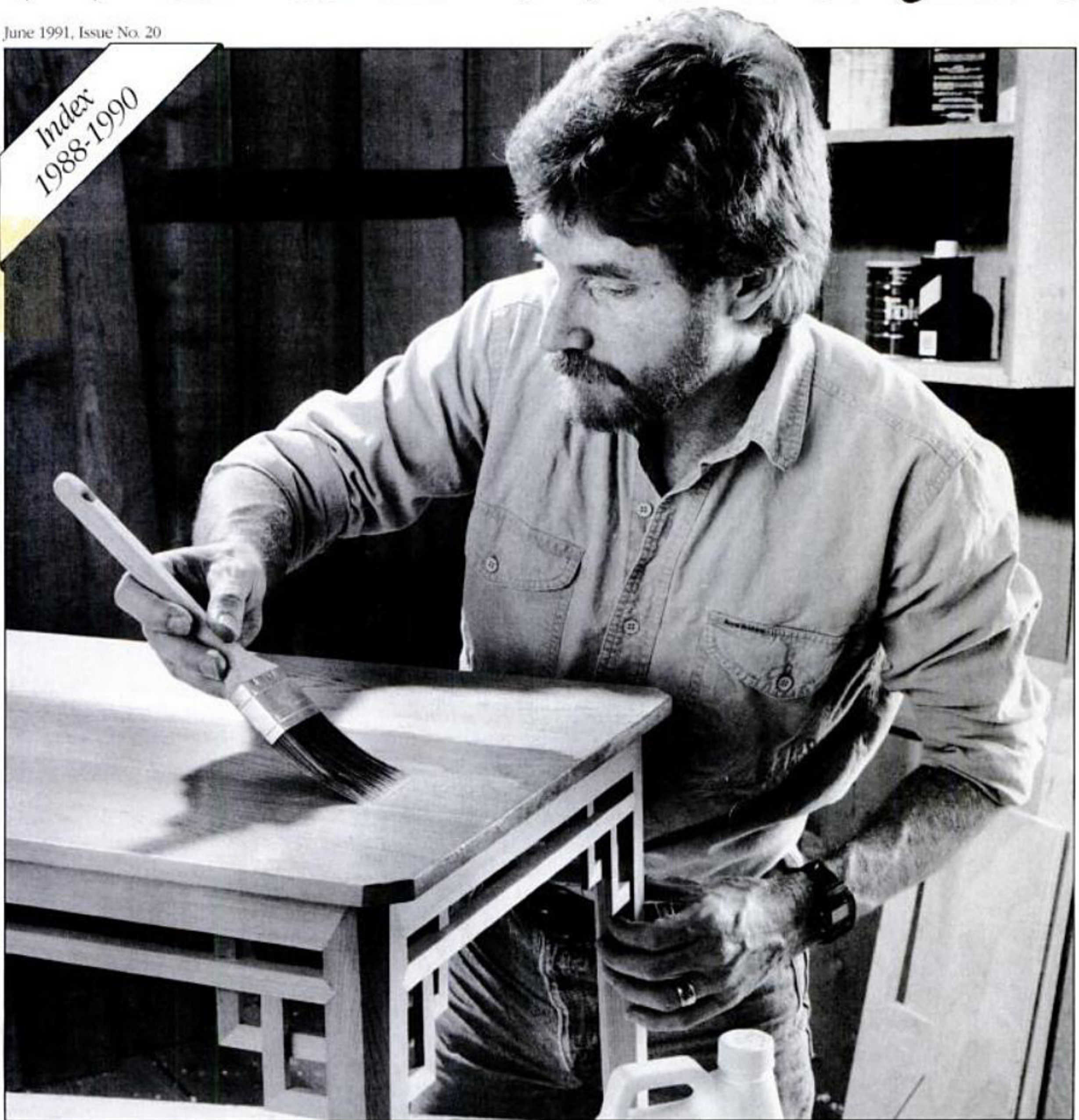


AMERICAN WOODWORKER

June 1991, Issue No. 20

Index
1988-1990



\$4.50



Update on Clear Water-Based Finishes

Editors Pick: Top 10 Woodworking Gadgets

Build Our Two-Seater Porch Swing

All About Cabinet Hinges

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BUILD YOUR OWN QUEEN ANN FURNITURE



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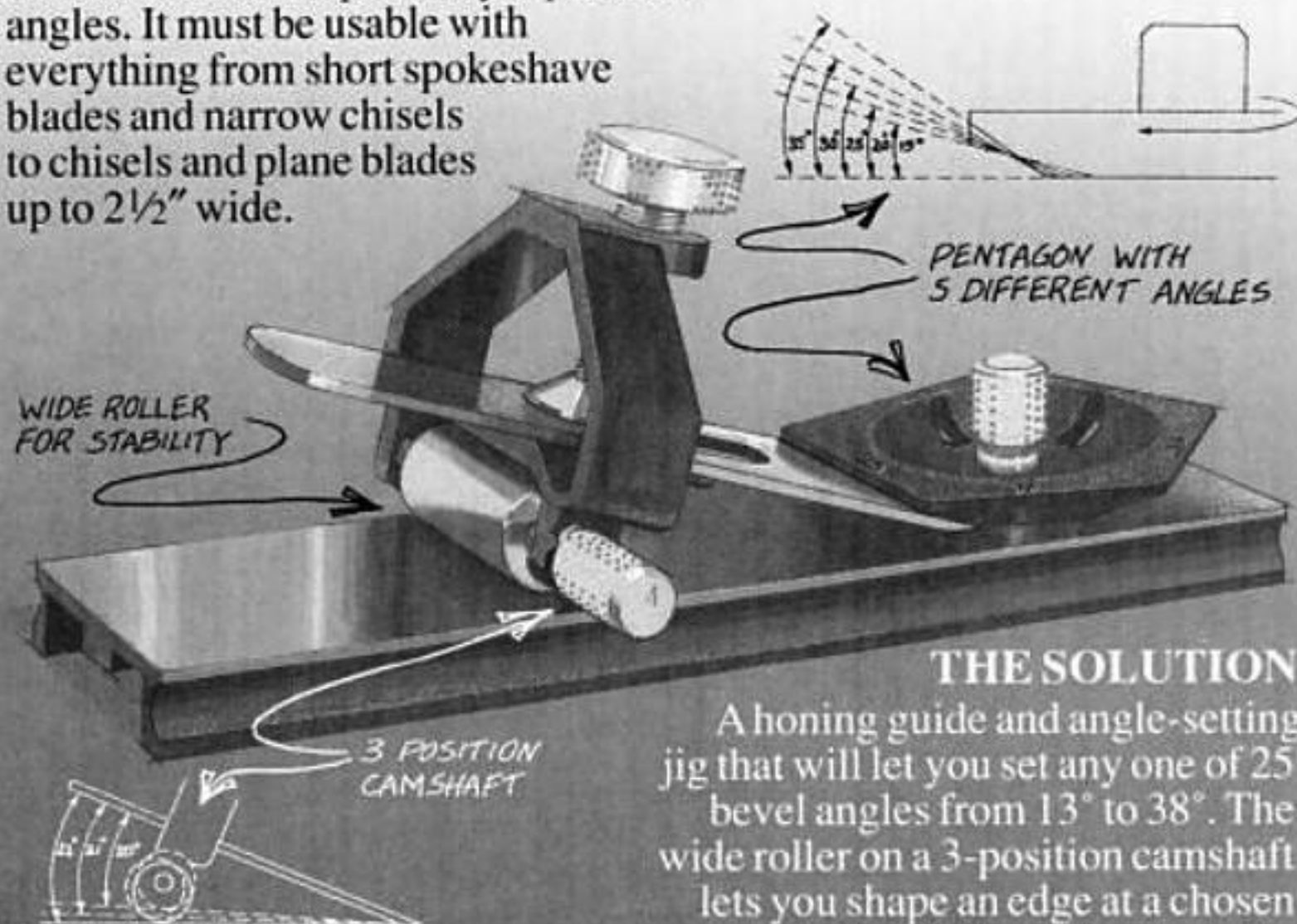
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CIRCLE NO. 1 ON PRODUCT LITERATURE CARD

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A WORD FROM THE EDITOR

HIT THE ROAD



It's a tradition. The Great American Summer Vacation. Pack the kids into the family bus and hit the road. While your annual summer jaunt is still in the planning stages, plan to schedule a woodworking side trip or two.

America's full of museums where you can see furniture, old tools or woodworking demonstrations. Here are some of the places I recommend.

If you want to see furniture:

Metropolitan Museum of Art, New York, NY
Philadelphia Art Museum, Philadelphia, PA
The American Craft Museum, New York, NY
Winterthur Museum, Winterthur, DE
Henry Ford Museum, Dearborn, MI
Independence Hall, Philadelphia, PA
The Gamble House, Pasadena, CA
Craftsman Farms, Parsippany, NJ
Wharton Esherick Museum, Paoli, PA
Ephrata Cloisters, Ephrata, PA
Hans Herr House, Lancaster, PA
Daniel Boone Homestead, Birdsboro, PA
House of the Seven Gables, Salem, MA
Historic Roycroft, East Aurora, NY
Falling Water, Bear Run, PA
Monticello, Charlottesville, VA

If Shaker furniture is your cup of tea:

Shaker Village of Pleasant Hill, Harrodsburg, KY
Shaker Museum, Old Chatham, NY
Canterbury, NH
Hancock Shaker Village, Pittsfield, MA
Sabbathday Lake, ME

If you're fond of antique tools (who isn't?):

Henry Mercer Museum, Doylestown, PA
Stanley-Sloane Museum, Kent, CT
Smithsonian Institution, Washington, D.C.
Old Sturbridge Village, Sturbridge, MA
Landis Valley Museum, Lancaster, PA
Shelburne Museum, Shelburne, VT

For hands-on demonstrations of early woodworking:

Colonial Williamsburg, Williamsburg, VA

If you want to see contemporary woodworking, your best bet is a big city. New York, Boston, Philadelphia, Los Angeles and San Francisco all have galleries that specialize in contemporary works in wood. Most cities have a gallery guide that tells you what's showing where.

For additional help in planning a U.S. trip, get your hands on a copy of *The Traveler's Guide to American Crafts* (1990, Dutton, Penguin Books USA Inc., 375 Hudson St., New York, NY 10014) published in two volumes: East of the Mississippi and West of the Mississippi.

Happy traveling. Let us know what you find.

DAVID SLOAN
Editor

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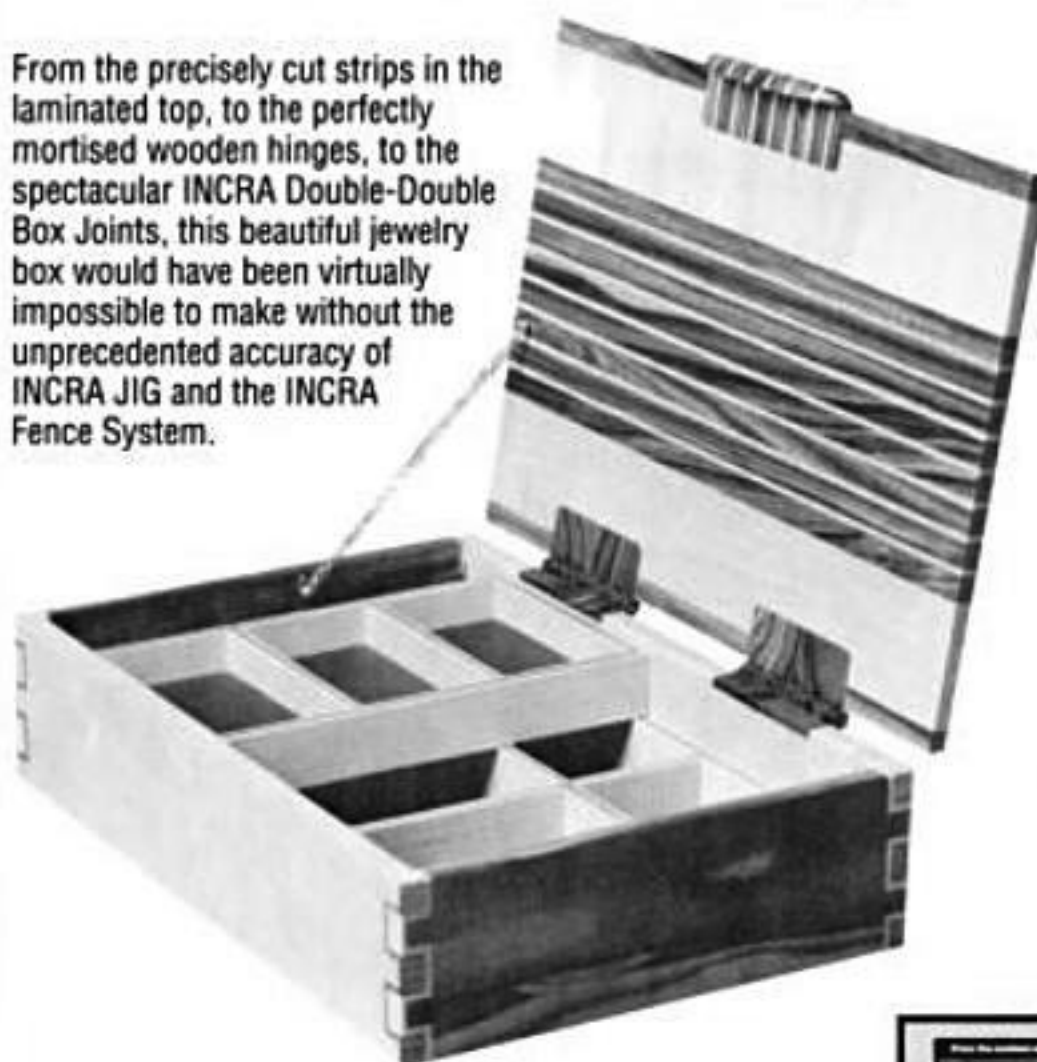
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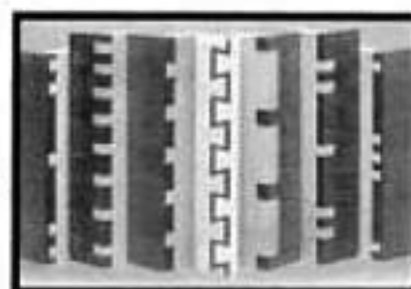


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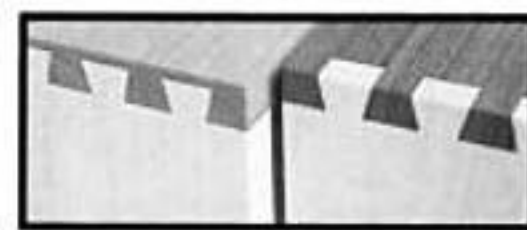


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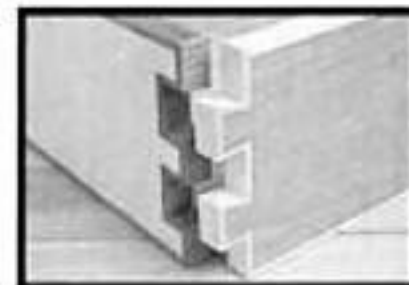


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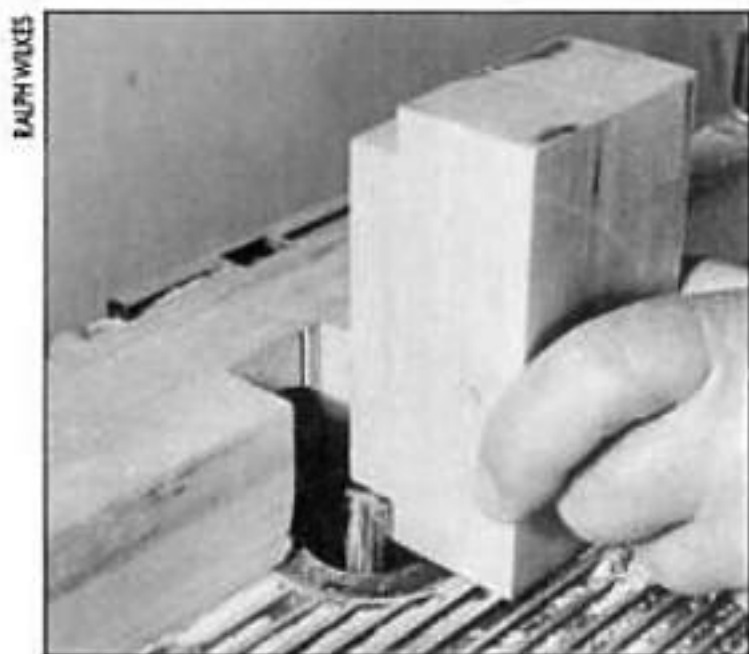
This 1 hour video has step-by-step instructions, by the inventor, for making box joints as well as half blind, sliding, and through dovetails, plus much more. Includes full video instructions and FREE templates and plans for making the INCRA

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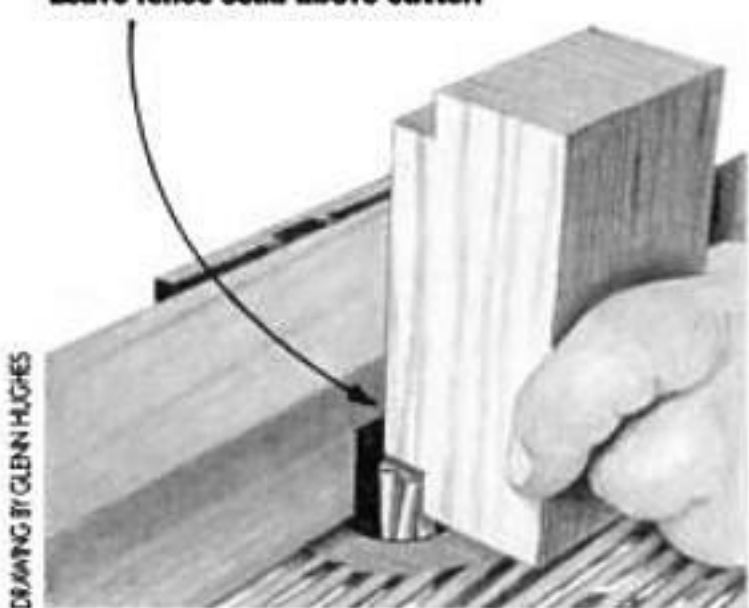


Tips to Save Fingers

The man rabbeting the block of wood on page 33 of the October 1990 issue (AW, #16) is setting himself up to have the block knocked out of his hand and possibly getting his hand in the router. The piece is too small to be run over the router, as shown.



Leave fence solid above cutter.



The drawing here shows a safer alternative. Cut out just enough of the fence to clear the router bit, allowing support at the top of the piece. Thus keeping the block from being pulled into the cutter.

Another safe method would be to rabbet the piece on the tablesaw. I hope these tips will save many fingers.

JAMES Q. BUFFENMYER
Lombard, IL

Clamor for Color

I'm a big fan of your magazine, but I'm bored with black and white. AW needs a shot in the arm. I'm talking about color. Just think what you'd be able to do! Finishes in color! Wood in color! People in color! Trees

in color! Furniture in color! There's no end to the possibilities. So here's my vote for a quick switch to color. What do you say?

GENE ZIGMAN
Santa Cruz, CA

All we will say is...stay tuned.

New Angle

In his article on sharpening (AW, #16), Roger Holmes says a thin-bevel plane iron slices more easily through wood than one with a larger angle. True for tools with bevel-up configurations such as block planes; largely false for common bench planes in which the wedge angle is determined by the bedding angle of the cutting iron. For the most part, the ease of "slicing" is fixed by this wedge angle, not the bevel angle.

ALLAN BOARDMAN
Woodland Hills, CA

Thumbs Up on Dado Review

On behalf of all Systi Matic employees, thank you for reviewing Systi Matic 8 Superfine Dado in your April, 1991 issue (AW, #19).

According to the article, your test results favored our product in the "tough to cut materials." This is very comforting to know we are producing products that meet real needs in the marketplace and do what we guarantee them to do.

The article was very informative and well done.

STEVE HAYES
Sales & Marketing Manager
Systi Matic Co.
Kirkland, WA

Black and White Bookmatch

In the February issue (AW, #18), you ran a Q&A from a woodworker who had a problem when he resawed a board to make a bookmatched door panel. The two halves of the panels reflected light differently—one was light, the other was dark.

This is a common problem faced by guitar makers when they book-

match spruce to glue up guitar tops. When one side of a guitar top is light and the other side dark, the condition is known as "black and white," and the top is a reject.

You can avoid this problem by carefully selecting the stock you plan to resaw and bookmatch. Look at the long-grain edge of the board. The grain should run parallel to the top and bottom of the board. If there's any runout, you risk a "black and white" reflection effect when you resaw and bookmatch.

AMIR FASAHD
Negril, Jamaica

Toxic Dilemma

I'm writing on the hope that one of your readers can help me. What's an environmentally safe way to discard paint thinner, denatured alcohol, brush cleaner and some of the other chemical stuff I end up with after finishing? I can't get a straight answer from anybody I've talked to, and none of the magazine articles I've read are any help at all.

LEE BAMFORD
Sebastopol, CA

We, too, have found it tough to get a straight answer to the toxic-solvent disposal problem. We'd like to hear from readers who have an environmentally responsible solution.

Try, Try Again

Oops! Isn't that a combination square, rather than a try square in photo #1 on page 21 (AW, #18)? It sure doesn't look like the try square shown in photo #2.

Otherwise, just the usual great stuff!

ROBERT BAUMANN
Copiague, NY

You're right. Next time we'll try to square things up.

Tell us what you think. Send your comments, compliments, complaints and corrections to: Editor, AMERICAN WOODWORKER, 33 E. Minor St., Emmaus, PA 18098.

Splicing a Sanding Belt

Q. I recently bought a new sanding belt for my belt sander and noticed the belt was spliced together at the joint with some kind of tape. I wondered if I could make sanding belts for my belt sander. Where can I buy that kind of tape? Is there any reason a home-shop woodworker shouldn't make his own sanding belts?

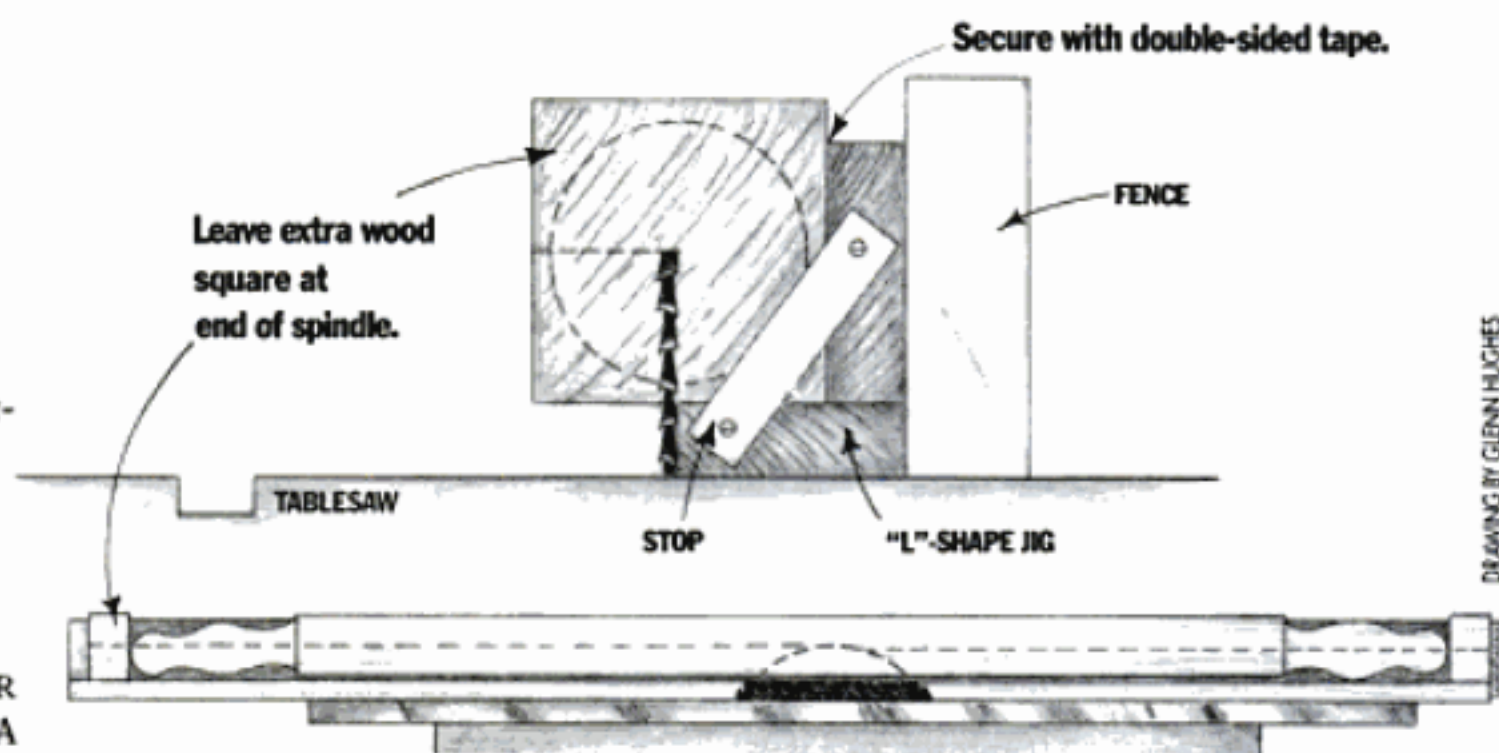
BOB WHEELER
Olympia, WA

A. I understand the temptation to make your own sanding belts, but I strongly recommend against it. The splice on sanding belts is under extreme stress from tension, bending and heat. The materials and adhesives used to make the splice require specialized equipment and procedures that would be difficult to duplicate in a home shop.

There are two types of splices—lap and butt. A lap joint is made by “skiving,” or removing, part of the thickness of the cloth backing material, where the ends will overlap, and then a two-part urethane adhesive is applied. This adhesive has a short pot life when mixed, and a highly volatile, flammable, organic solvent base. The adhesive is only sold in large quantities to industrial users.

The butt joint is newer and more effective. It's made with the specialized tape you saw. The tape makes a stronger joint with less of a “bump” than a lap joint, and the belt runs smoother and has a longer service. The belt can also be run in either direction. But the cloth backing of the belt requires special preparation for the tape to adhere well, and the butt joint must be cured in a heated press under tremendous pressure. What's more, the tape's self-adhesive backing begins to cure at room temperature, so it must be kept below 0°F until it's ready to use. It's shipped in dry ice. Even if the small consumer could obtain these materials, he just wouldn't be able to control the splicing process closely enough to ensure consistent quality.

WIN WILSON
General manager
Adirondack Specialty Adhesives
Albany, NY



Cutting Quarter Round from a Spindle

Q. Older homes often have wooden guard strips fastened to the vertical edge where two interior walls come together to form a corner that juts out into the room. These guards protect the plaster from damage. I made some plaster guards by turning a spindle 4 ft. long and 2½ in. in diameter on a lathe. Now I have to cut a quarter round piece out of the spindle along its length to fit the corner. I haven't been able to come up with a jig to help me make this cut accurately. Any ideas?

JACK CARR
Fairmont, WV

A. The key is to carefully joint and square up the stock before turning, and when cutting, leave about 2 extra inches at each end. When

you turn the spindle, leave this extra wood square at the ends. When the turning is complete, the ends will provide squared surfaces to lay against a simple jig.

Make the “L”-shape jig, as shown in the drawing. Put the jig on the tablesaw and mount the turned spindle in the jig. Use double-sided tape or screws (make sure the saw blade will miss the screws) to secure the spindle. Set the saw blade height so it cuts to the center of the spindle as it sits on the jig, and set the fence so the blade cuts to the waste side of a centerline through the spindle.

Make one pass over the saw, flip the spindle end for end, rotate it 90°, and repeat to separate the quarter round waste piece. Finally, cut off the square waste ends and sand the ends of the spindle to the desired shape.

BEN ERICKSON
Woodworker
Eutaw, AL

Drying Hardwood Burls

Q. I recently hauled home a maple tree stump that must have been the size of a small car. The stump was a complete burl, and most of the wood was spalted—a woodturner's dream. I paid \$10.00 for the “rotten” stump, and cut it into large pieces with my chainsaw. What's the best method for sealing and drying the wood to preserve it from splitting?

LAMAR FONTAINE
Portland, OR

A. To dry non-spalted areas of the burl, cut the burl into blocks about the size you want to turn.

Apply Woodsealer (available from Craft Supplies USA, 1287 E. 1120 St., Provo, UT 84601, 801-373-0917) on all exposed surfaces. The Woodsealer is specially formulated to let moisture through at a very slow rate to control checking of the wood. Store the blocks indoors under a plastic cover, loosely wrapped, and flip the plastic over frequently to release condensation. After six to nine months, rough turn the blocks into bowls with about 1-in. wall thickness. Finish drying the blocks uncovered indoors in a cool spot.

If you can't store the blocks indoors, store them in a ventilated shed, outdoors, off the ground and away from direct sun. Spalted blocks

can also be dried in an outdoor shed, but don't cover them with plastic.

To encourage spalting, simply pile the rough (unsealed) blocks directly on the ground in a moist, shaded area. Cover the blocks tightly with black plastic. Check the condition of the spalt after about three months by scoring the surface of the blocks with a chainsaw. Look for telltale spalt lines and color changes.

DAVID ELLSWORTH
Woodturner/artist
Quakertown, PA

Rubbing Varnish

Q. *I'm looking for a good rubbing varnish. For 30 years I've used Benjamin Moore's Dri-Dull, but it's not made any more. The varnish on the market now contains plastic or polyurethanes—and I can't get a good rubbed finish with pumice and rottenstone with these. Got any suggestions?*

EDWIN GREENE
Duxbury, MA

A. To understand the qualities you're looking for in a rubbing varnish, consider, as an example, the characteristics of a diamond and an automobile tire. A diamond is very hard and brittle, and can be rubbed or polished to a high gloss. A tire is tough, flexible and impossible to rub to a gloss. For a rubbing varnish, you want a product that produces a dried film resembling the hardness of a diamond rather than the toughness of a tire. (The toughness would be good for a varnish that's subjected to lots of physical abuse).

Varnishes are made by modifying a resin with oil. The three resins commonly used in varnishes are phenolic, alkyd and polyurethane. Phenolic is the hardest, while polyurethane is the toughest. Alkyd splits the difference between these two and is used because it's the cheapest of the three resins. Each of these resins can be adjusted to produce greater hardness or toughness by varying the amount of oil in it. The less oil used, the harder and more brittle the resulting film. (These are sometimes

called "short-oil varnishes.") The more oil used, the tougher and more flexible the film. (These are called "long-oil varnishes.")

The best rubbing varnishes are phenolic resin varnishes modified with a minimum of oil. I know of only two nationally distributed rubbing varnishes meeting this description: McCloskey Bar Top Varnish (available from Constantine's, 2050 Eastchester Rd., Bronx, NY 10461) and Behlen's Rock Hard Varnish (available from Wood Finishing Supply Co., Inc., 100 Throop St., Palmyra, NY 14522). These can be rubbed to a deep gloss of great clarity. You'll get the best results if you postpone rubbing them until they've cured for three or four weeks, or until you can no longer smell any solvent when you press your nose against the film.

BOB FLEXNER
Refinishing consultant
Norman, OK

Restoring Old Scroll Saw

Q. *I have an antique pedal-powered scroll saw. I need some help restoring the saw, but I'm having a hard time finding any information on how to do it. I'm more interested in getting the saw working than making a "museum" piece. The saw is missing the leather belt from the foot treadle to the flywheel, and the connecting rod from the flywheel to the saw frame. The name plate reads "W. F. & J. Barnes." Any suggestions?*

DAVE BALLARD
Ashville, OH

A. Restoration generally covers both mechanical and cosmetic concerns, but since you're interested in putting the saw in operating condition, I'll focus on that.

W. F. & John Barnes was a major American manufacturer that specialized in foot-powered woodworking machinery. Judging by the photograph you sent, I'd estimate your saw was made about 1910. The main point of wear is the flywheel bearings. Check these by moving the flywheel shaft side to side— $1/32$ in. or more of play means the wear is severe enough to rebuild the bearings.

A machine shop can remove the flywheel shaft, check it for wear and easily make new, bronze bushings to fit the shaft.

The saw probably originally had a leather strap connecting the foot treadle and the flywheel. To find leather belting, look in your yellow pages under "Industrial Supplies" or "Power Transmission." You'll need a leather strap about $1/16$ in. thick and $1/2$ in. wide.

The connecting rod from the flywheel to the saw frame was most likely made of wood. It's easy to fashion a new connecting rod. Use beech or birch, which machines well, is stable and is springy and tough to absorb the shock of the machine parts. (Oak is prone to warp and pine is too soft; boxwood is the very best if you can find it.) Saw out the shape of the connecting rod on a bandsaw, and carefully bore holes in each end to fit the crank pins on the flywheel and saw frame. Size the holes so there is no discernable play as they fit over the pins, but the connecting rod should rotate freely. Lubricate these wood "bearings" with dry graphite.

This should get your scroll saw running—with a little help from your own leg power.

ROBERT JOHNSON
Machine restoration consultant
Rossville, GA

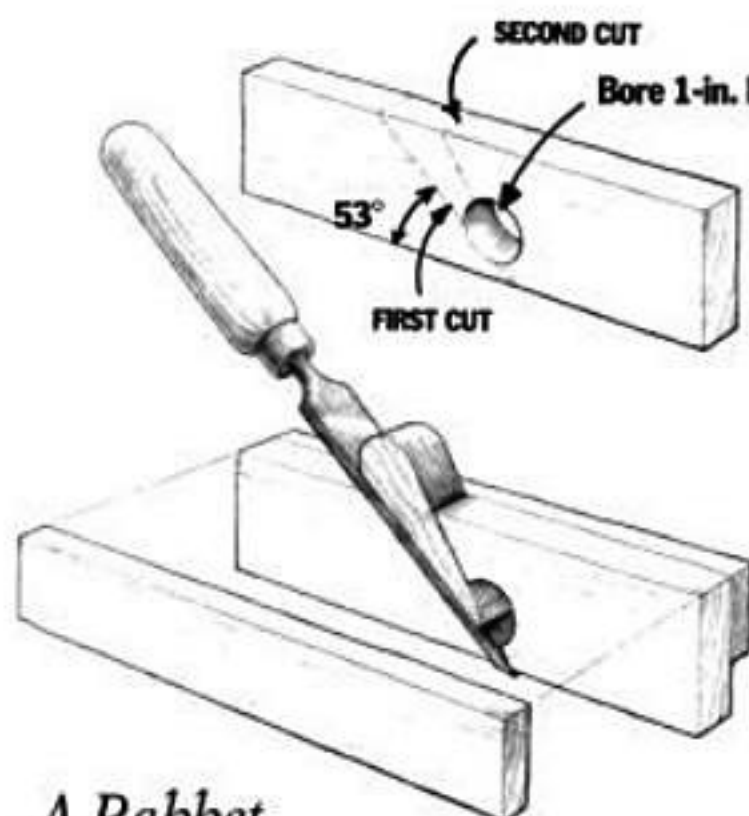
Where To Find It

Anti-tarnish cloth for lining the inside of silverware cases and jewelry boxes is available from Nancy's Notions, P.O. Box 683, Beaver Dam, WI 53916.

Stainless steel fasteners of all kinds including hinges, screws, bolts, chain, and bar, sheet, rod and angle stock is available from All Stainless, Inc., 75 Research Rd., Hingham, MA 02043.

A complete selection of toggle clamps is available from Reid Tool Supply Co., 2265 Black Creek Rd., Muskegon, MI 49444.

Got a woodworking question for the experts? Send it to Q&A, AMERICAN WOODWORKER, 33 E. Minor St., Emmaus, PA 18098.



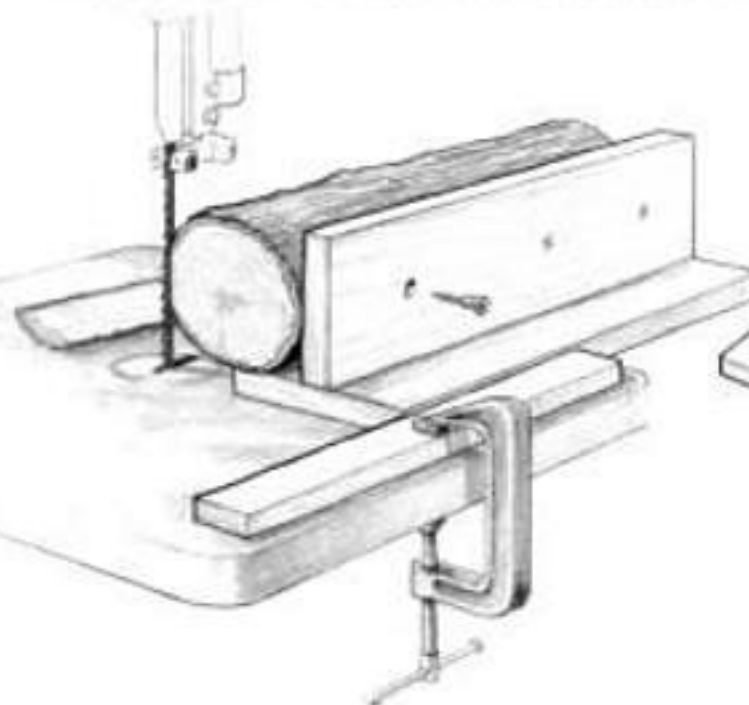
A Rabbet Plane from a Chisel

To make a rabbet or plough plane from a chisel, select a piece of stable wood 2 or 3 in. wide by 8 or 9 in. long, and plane it to a thickness equal to the width of the chisel. Bore a 1-in. hole through it, just forward of the center and $\frac{1}{4}$ in. or so from one edge. Next, cut it apart to give a cutting angle of about 53° , and cut back the rear of the front section to make room for a wedge. Finally, glue on two side strips to hold the two pieces together. Make a wooden wedge to hold the chisel in position.

RIC HANISCH
Quakertown, PA

To Saw a Log

I sometimes need to saw up a small log into small boards. I screw the log to a simple "T"-shaped carriage to

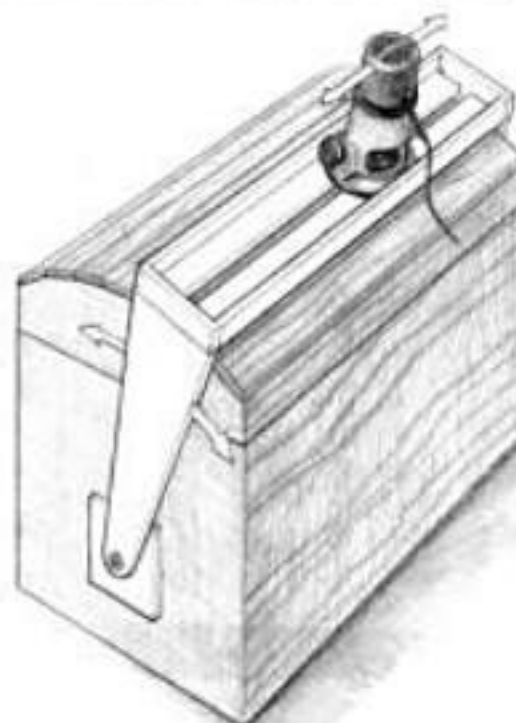


keep it under control while I saw two flat surfaces. Then I remove the carriage and use regular resawing techniques.

RIC HANISCH
Quakertown, PA

Rounding a Chest Top

To get the coopered top of a chest perfectly rounded, I pivot a tray for my router from the center of the arc of the chest top. The bit passes

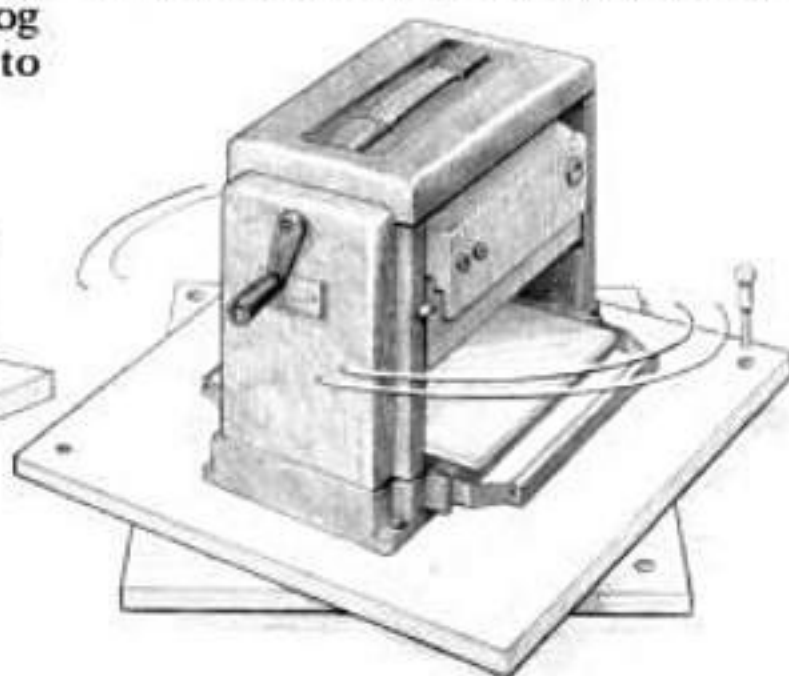


through a slot in the tray bottom and trims the chest top. The router goes from end to end of the tray while the tray pivots across the top.

BILL VOYLES
Vancouver, WA

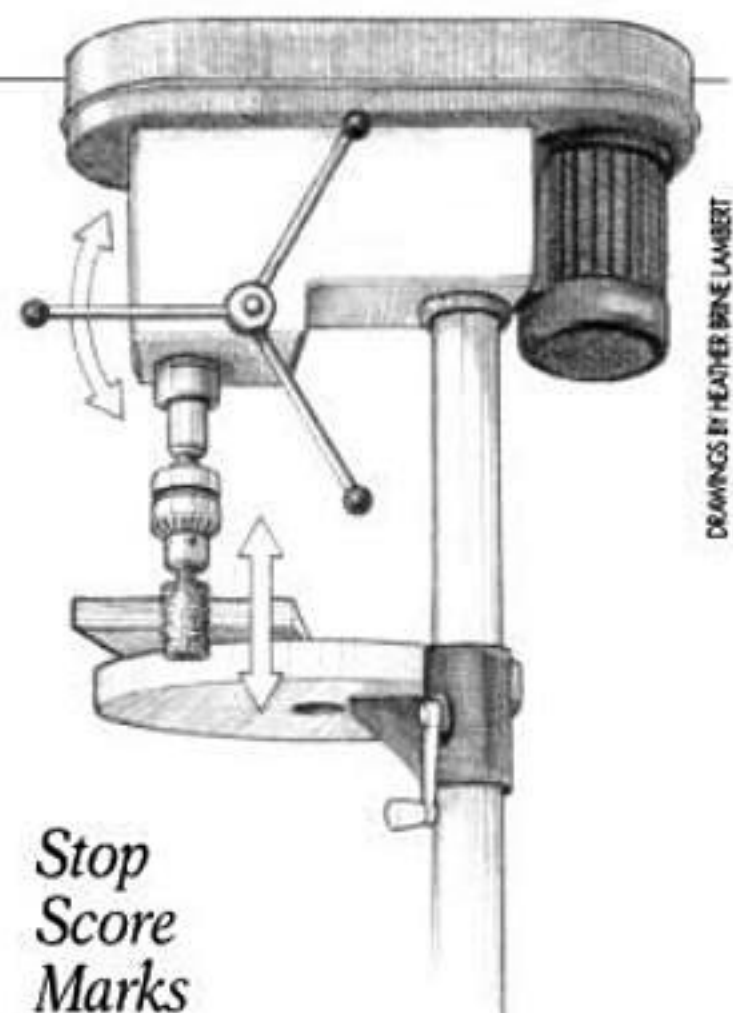
Lazy (Susan) Planing

When planing a number of boards on my small thickness planer, I got tired of carrying the boards around from the outfeed end to the infeed end. Instead, I rotate the planer 180°



on a heavy-duty lazy-susan bearing and run the boards back through to where they started. I mounted the bearing between two squares of $\frac{3}{4}$ -in. plywood and installed a removable pin to lock the planer in position while in use.

THOMAS WHALEN
Cohoes, NY



DRAWINGS BY HEATHER BRINE LAMBERT

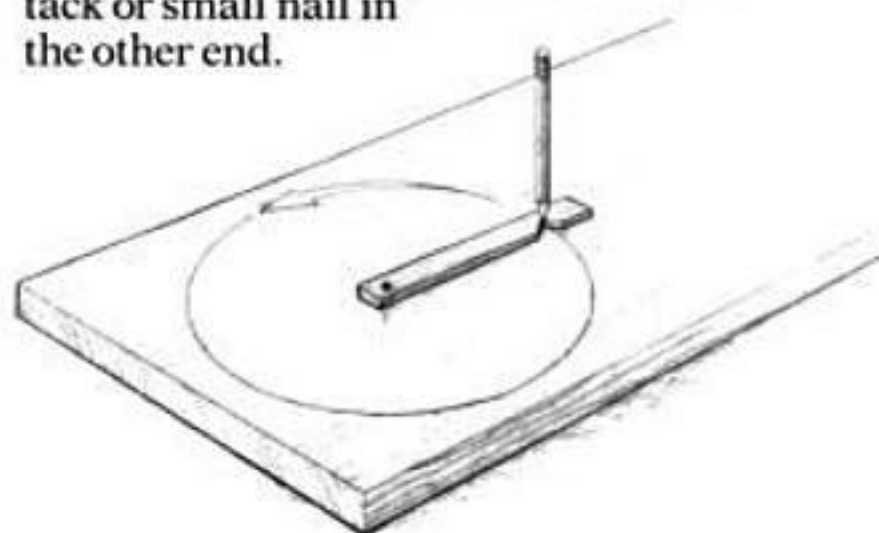
Stop Score Marks

A drum sander on a drill press usually leaves score marks on the workpiece. You can prevent the scoring by moving the drum up and down during the final sanding. The combined vertical and circular motion is similar to the action of an expensive oscillating spindle sander.

STEPHEN BLAISDELL
Naugatuck, CT

The Simplest Compass

You can make a compass in a hurry by cutting a notch in one end of a stick of any length and driving a tack or small nail in the other end.



Hold down the tack with one hand, and hold a pencil in the notch with the other hand, as you draw the circle. It works a lot better than the usual piece of string.

MIKE ENGSTROM
Grand Forks, ND

Know a better way of doing something? Designed a clever jig? Send your woodworking tips, along with a sketch or a snapshot to: Tech Tips, AMERICAN WOODWORKER, 33 E. Minor St., Emmaus, PA 18098. We'll pay you \$35 if we publish your tip.



Fast Random Orbits

Random orbit sanders are becoming well-known for combining the features of rapid stock removal with the ability to leave a fine, swirl-free sanded surface on the wood. The AEG VSR 500, and VSR 600 random orbit sanders have improved the efficiency of stock removal by raising the speed of the sanding head to 10,000 orbits per minute—faster

than other random orbit sanders. The sanding pads on the 5-in. dia. (VSR 500) or 6-in. dia. (VSR 600) models accept standard adhesive-backed abrasive paper disks. The 5-lb. tool has a 5.7-amp motor, and the random orbit sander head can be removed to convert the tool for use as a conventional small-angle grinder. (Price: \$220, VSR 500; \$230, VSR 600)

■ AEG Power Tool Corp., Dept. AWT, Three Shaw's Cove, New London, CT 06320, (800) 243-0870.

CIRCLE NO. 37 ON PRODUCT LITERATURE CARD

SHOP TEST

Clayton Oscillating Spindle Sander

You can't beat an oscillating spindle sander for sanding inside curves.

Since the sanding spindle combines the usual rotating motion with an oscillating up and down motion, it generates less heat, reduces scratches on the work, and extends the life of abrasive paper. But the four-figure price tag of these machines has kept them out of the reach of small shops and non-professional woodworkers. Most of us scrape and scratch with rasps or burn with drum sanders chucked into drills.

Now Clayton Industries has changed that by marketing a benchtop machine that does for oscillating spindle sanders what the Ryobi AP-10 did for thickness planers. The new Clayton #140 Oscillating Spindle Sander is a portable machine that delivers oscillating sanding action at an affordable price. It costs a bit more than a rotary rasp, but at \$625.00, it's a lot less than the two to four grand you'd spend for most other sanders of this type.

The #140 measures a compact 14 in. x 21 in. x 14 in. high. It's designed



to sit on a benchtop with no mounting necessary—little, rubber feet keep it from dancing around. The unit is solidly built of 10-gauge and 16-gauge steel and weighs about 90 lbs. That's heavy enough to absorb vibrations, yet light enough to stash under your workbench or move to a remote job site. This portability makes it ideal for handicapped woodworkers, too. I set the sander on a low stool where my wheelchair students can use it much more easily than a bigger, stationary sander.

A 1/2-HP motor drives the oscillating spindle through a system of differentially sized pulleys and a nylon cam. The bearings, motor and belts are industrial grade. Even the pulleys are machined steel instead of the usual die-cast metal clunkers.

To test the #140, I tried to stall it under reasonable pressure. It kept going without missing a beat. But that's no test—not in a school woodshop. Would it stall with *unreasonable pressure*? Putting myself in a student's frame of mind, I rammed a slab of red oak against the spindle with all my might and the motor barely lugged down. That's a test!

Tested by Bernie Maas

Spindles on industrial sanders are usually 9 in. long. The #140's spindles are only 4 1/2 in. long, but it will sand stock up to 3 1/2 in. thick, so the shorter spindle won't present any real disadvantage. To the contrary. The 4 1/2-in. sanding sleeves are cheaper than 9-in. sleeves, and because of the decreased leverage, a 4 1/2-in. spindle is harder to knock out of true than a 9-in. spindle.

The sander comes with four standard spindles (1/2, 3/4, 2 and 3 in. in diameter) which store neatly on a specially designed rack. A starter set of sanding sleeves includes a sampling of grit sizes and replacements, readily available from Clayton or most woodworking stores.

Drawbacks? Every machine has some. Neither the spindle nor the table tilts. But it's easy to cobble up a ramp if beveling or chamfering are called for. And with air quality such a problem for woodworkers, I'd like to see a dust collection port incorporated into the machine. Overall, I vote a definite thumbs up on this one. (Price: \$625.00)

EDITOR'S NOTE: As a result of Bernie Maas' suggestion, Clayton is installing a 3-in. dust-collection port on all new #140 sanders.

■ Clayton Machine Corp., Dept. AWT, P.O. Box 513, Clawson, MI 48017, (313) 548-2380.

CIRCLE NO. 38 ON PRODUCT LITERATURE CARD

TOOLBOX

Conover Quick Release ▼



When turning wood on a lathe, you have to move the tool rest often. This new quick-release lever (model CL16-406) for Conover wood lathes makes moving the tool rest much easier. The lever replaces the hand wheel that locked the tool rest on earlier-model Conover lathes. Now you just lift the lever to loosen the tool rest, and push it back down to relock

the rest. The quick-release lever will be standard on all new Conover lathes, but it can be easily retrofitted to existing lathes. You can also fit the lever to the tail stock. (Price: \$44.95, plus \$5.00 for shipping)

■ Conover Woodcraft, Division of Byrom International, Dept. AWT, P.O. Box 246, Chardon, OH 44024, (800) 722-5447.

CIRCLE NO. 35 ON PRODUCT LITERATURE CARD



Safe Paint Stripper ▲

Until recently, most chemical paint strippers contained toxic ingredients like methylene chloride (a suspected carcinogen), toluene or methanol. Woodfinisher's Pride Stripping Gels are made from a chemical base of clear, biodegradable, non-flammable, non-toxic ingredients that can be used in a well-ventilated workroom or basement. The slow-evaporating gel softens paint and varnish in about 30 minutes, so regular paint-stripping tools like scrapers and steel wool can remove the finish. It won't raise the grain on wood surfaces, and contact with your skin is not harmful. The stripper comes in two formulas: one for latex and oil-base paints, and one for polyurethane, varnish or shellac. (Price: \$11.49, 32 oz.; \$19.99, 64 oz.)

■ Creative Technologies, Inc., Dept. AWT, 7 N. Laurent St., Greenville, SC 29601, (800) 457-7433.

CIRCLE NO. 36 ON PRODUCT LITERATURE CARD

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RAISED PANEL #385 25" \$25.00	BEADING #450 1/8" \$11.00 #451 3/16" \$11.00 #233 1/4" \$13.00 #453 5/16" \$14.00 #454 3/8" \$15.50 #455 1/2" \$17.00	FLUSH TRIM #500 3/8" \$ 7.00 #502 1/2" \$ 7.50
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CIRCLE NO. 16 ON PRODUCT LITERATURE CARD

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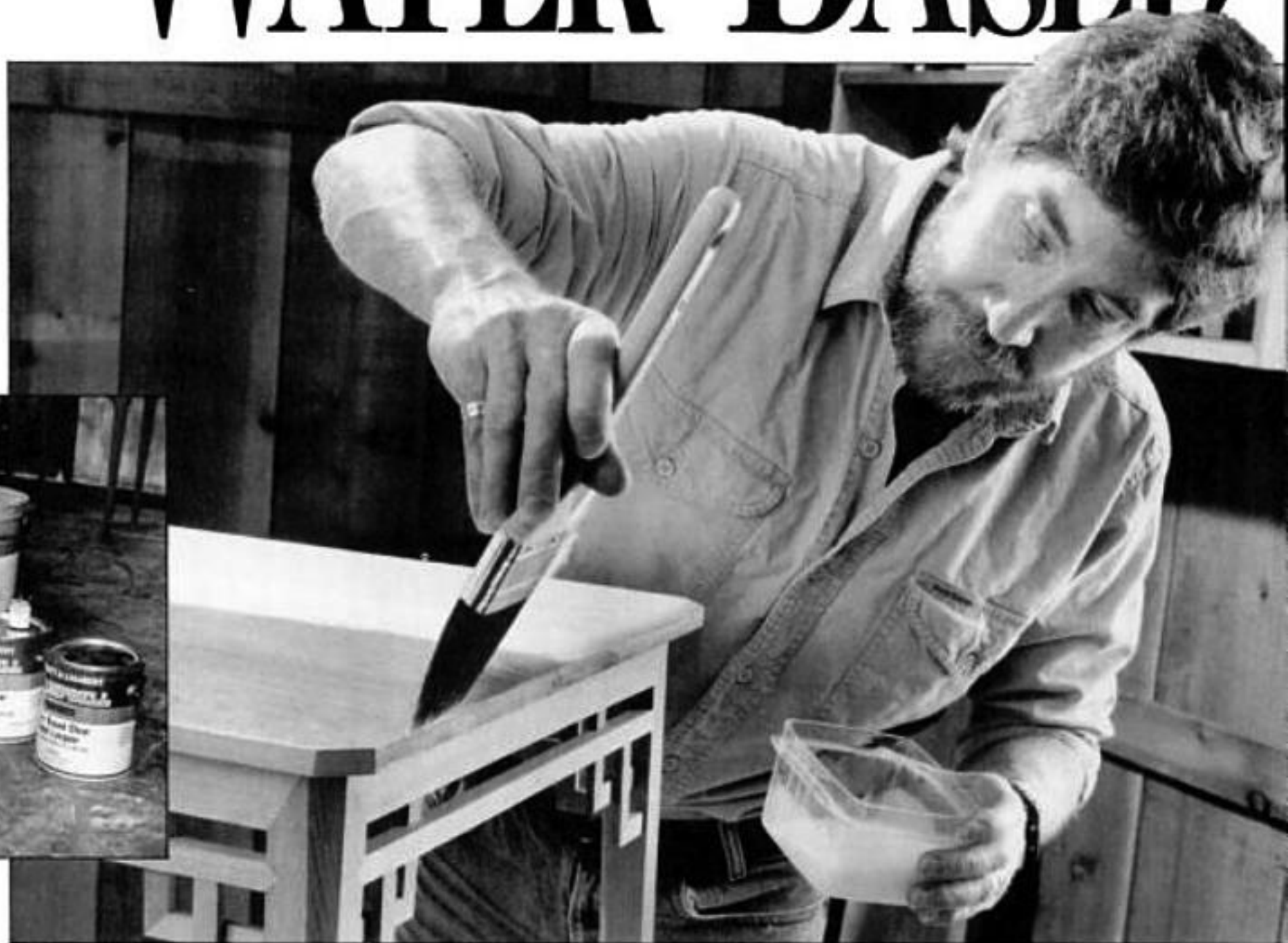
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CIRCLE NO. 26 ON PRODUCT LITERATURE CARD

*Clear Competition
for Old Solvent-
Based Favorites*

WATER-BASED

Clear, water-based finishes are the hottest development in wood finishing. Designed to replace solvent-based lacquer and varnishes, they're easy to use, non-flammable and easy on the environment. Author Michael Camp tested all the finishes shown here.



BY MICHAEL CAMP
Only a few short years ago, lacquer was the clearest film finish you could get.

Lacquer is still the standard for comparison when it comes to clear finishes, but there's a whole new family of clear, water-based finishes that are giving solvent-based nitrocellulose lacquer a run for its money. And it isn't just lacquer that's under the gun. These water-based upstarts are taking on solvent-based varnishes, too.

Water-based finishes have been around for more than 10 years, but finishers have been slow to take notice. Interest has peaked recently due to stricter air-pollution regulations, a revived public interest in preserving the environment, and improvements in the way that water-based products perform. New water-based finishes are coming out all the time—so fast, in fact, that it's tough to keep up with them. In this article, I'll talk about the pros and the cons of clear water-based finishes and provide a few tips about how to apply them. My goal is to help you select the best water-based finishing system for your shop.

Two Types of Finish

There are two basic types of clear water-based finish on the market today. They are water-based lac-



For best results, spray very thin coats. Start spraying off one side of the workpiece, move the gun over the work and off the other side before you stop spraying.

PHOTOS BY BOB MORAN

FINISHES

quers and water-based polyurethanes. The water-based lacquers are based on modified acrylic resin and formulated to perform much like nitrocellulose lacquer. The water-based polyurethanes are intended to replace solvent-based polyurethane.

These two finish types are more alike than they are different. To keep things simple, I'll refer to them both as water-based clear finishes, except when I need to make a distinction between the two types to point out a difference in the way they perform.

Personal Safety a Major Advantage

Why should you even consider a water-based finish over conventional solvent-based finishes? Personal safety is the first reason that comes to mind. Water-based finishes are safer to work with because they contain only small amounts of harmful organic solvents. (Some products claim to be solvent-free.) Adequate ventilation and a respirator are still required, however, especially if you're spraying. Some products contain more solvent than others, so check the product label for additional precautions.

Because they're water based, these products are also non-flammable and non-combustible. This safety factor is a big advantage in the home workshop, because you don't have to worry about the hazards of flammable solvent vapors or explosive lacquer overspray. You don't even need a spray booth to spray small jobs safely. All you need is a respirator and a window fan to evacuate the fumes. For the professional finisher, this non-flammable factor is an even greater advantage. There's no need for an expensive, explosion-proof spray booth and costly storage cabinets for flammable materials. These safety factors alone are enough to encourage anyone to consider water-based finishing.

Easier on the Environment

Protection of the environment is another good reason to consider water-based finishes. Strict air-quality standards, especially in California, are placing ever-increasing restrictions on the use of solvent-based finishes.

Nitrocellulose lacquer, varnish and other solvent-based finishes release air-polluting hydrocarbons or VOCs (Volatile Organic Compounds) into the air as they dry. VOCs contribute to a variety of environmental and health problems. In 1984, California started an aggressive program to reduce VOC levels in architectural coatings (California has always set the trend in pollution control programs) and I believe the rest of the country will follow suit in due time. Result? Solvent-based finishes will become harder and harder to buy and use legally in the future.

In addition to the air-pollution problem, solvent-based finishes pose a disposal problem as well. How do you dispose of leftover finish and solvents without

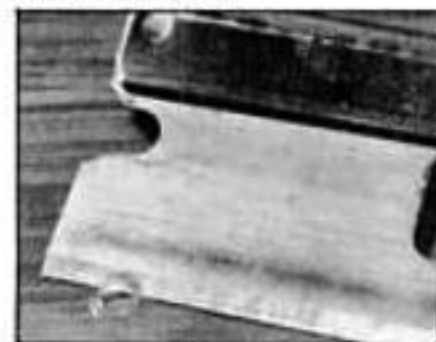


Sanding is the key to a perfect finish. Sand the sealer coat with 220-grit no-fill paper wrapped around a felt block or a blackboard eraser. Here, Camp sands a sample board on which he's applied finish over several different stains.



Rubbing will alter the sheen of the finish to make it more glossy or flatter. Finishing companies make rubbing compounds especially for water-based finishes, but any water-based compound will work.

Small defects in the finish can be scraped off with a razor blade, sanded flat, then recoated.



polluting the environment? The EPA folks will tell you to take them to a toxic-waste disposal facility. That's good advice if you're a large, commercial finishing operation. In fact, it's the law in many places. But few small shops and hobbyists have access to these disposal facilities. The sad truth is that a lot of toxic solvent ends up down the drain where it pollutes our water supply. Water-based finishes clean up with water instead of solvents. The waste is less damaging to the environment.

For health, safety and environmental reasons alone, it makes sense to consider water-based finishes. As more and more large commercial users make the switch to water-based, the quality and range of products available will continue to increase.

Water-Based vs. Solvent-Based: How Do They Measure Up?

Conventional lacquer is great stuff. It builds up fast, dries fast, sands and rubs out easily, and produces a very hard, durable surface. Water-based clear finishes possess these same qualities. Some water-based finish-

CONTINUED ON PAGE 21

APPLYING A WATER-BASED FINISH

No matter how you apply a water-based finish—spray, brush, roller or paint pad—the surface preparation steps are the same.

Sanding is the key to a perfect finish. Make sure you sand your work thoroughly with progressively finer sandpaper. Electric sanders produce swirl marks that will show through the finish, so do your final sanding by hand with 220-grit sandpaper, sanding with the grain.

Water-based finishes can cause steel screws and nails to rust and bleed onto the wood. Avoid using steel fasteners and install any steel hardware after the finish is dry.



TIPS FOR SPRAYING

Water-based finishes can be sprayed with conventional compressed-air sprayers, high volume, low pressure (HVLP) sprayers, airless sprayers and even electric “buzz” sprayers. In my experience, water-based finishes are so forgiving that you can get good results with very inexpensive spray equipment. On my compressed air gun, I use a #6 tip and 35 lbs. of air pressure and make additional adjustments at the gun. Check manufacturers recommendations for pressure and fluid tip size.

Thinner is better than thicker—Spray very thin coats to avoid runs and sags. A little practice is required to get the hang of how much material may be applied. Remember, you can always apply additional coats, but runs are very difficult to remove properly. Water-based finishes may also look milky if applied too thick.

Keep the gun moving—Keep the gun at the same distance from the project—from 6 in. to 8 in. Move your body, not your arm, so you don’t swing the gun in an arc. Start spraying in the air, off to one side of the project. Move the gun over the work and stop spraying just off the other side of the project.

Overlap your spray pattern—If your spray pattern is 8 in. wide, overlap the previous pass by 4 in.

STEP 1: Raise the grain.

All water-based finishes will raise the grain of the wood. You can minimize the extent of the grain raising by moistening the wood with water and sanding lightly with 220-grit paper when the surface is dry. Do this prior to assembly and you’ll get a more professional-looking finish. You’ll also save many tedious hours later trying to sand in hard-to-reach areas.

STEP 2: Stain the wood.

Almost any type of wood stain or dye can be used with water-based finishes, as long as you allow it to dry completely before applying the top coat. I have experienced some poor adhesion from inadequate drying of solvent-based stains. If you use a stain, check with the manufacturer’s recommendations on drying time. When in doubt, allow the stain to dry a full 24 hours.

I get the best results when I color the wood with alcohol-based or water-based aniline dyes. The incredible transparency of these dyes under a clear water-based top coat yields a spectacular finish on figured wood such as tiger maple, crotch mahogany, curly cherry, etc.

I’ve also had good results using water-based aniline dyes to tint the sanding sealer. The trick is to dissolve the dye in water and add tiny amounts of the dye to the sealer. Remember, if you apply three coats of colored sanding sealer, your tone will be three times as intense. I often add a little orange and red for woods like maple and cherry to warm up the color and add depth.

STEP 3: Apply the sanding sealer.

After the stain is thoroughly dry, it’s time to apply the sanding sealer.

Sanding sealer provides a sandable base coat for the final finish. It fills and levels the pores of the wood, raises the grain and fuzzes up the wood fibers so the surface can be sanded flat. The key is to apply multiple coats of sealer to build up a layer that’s thick enough to sand flat, without risk of sanding through and disturbing the stain or bare wood underneath.

Mix the sealer with a mixing stick using a slow and deliberate stroke, making as few air bubbles as possible. This type of mixing applies to all water-based products. Strain the sealer through a paint filter or nylon stocking.

Spray or brush on the first coat of sanding sealer as thin as possible. This technique will help seal the stain in the wood. Once this thin coat has dried, apply a second coat of sealer, a little thicker than the first coat. Sanding between sealer coats is usually not necessary because of the flowing characteristics of water-based sealers.

Water-based sanding sealers have a very high solids content, so you don’t need many coats. I’ve found that two coats of sanding sealer—a thin sealer coat followed by a second, thicker coat—is sufficient for tight-grained hardwoods like maple and cherry. More porous woods like oak, ash or mahogany may require additional

coats of sanding sealer to fill the pores.

STEP 4: Sand the sealer coat.

The care you put into sanding the sealer coat can make or break a finish. No amount of effort in the top-coat process will make up for poor sanding at the sealer-coat stage. The goal is to sand the sealer as flat as possible, while removing as little of the finish as possible.

I use a felt block or a blackboard eraser and 220-grit no-fill sandpaper. Proper sanding is a skill that can only be developed with experience. Try different techniques to develop your sanding savvy. For rubbing out turnings and hard-to-reach areas, I use an abrasive nylon pad. Don't use steel wool with water-based finishes—the steel particles will rust.

After sanding, remove dust with a damp cloth. Don't use a tack cloth with water-based finishes—the solvent residue can affect adhesion.

Now check your project for areas where you may have sanded through the sealer and damaged the stain. If you have to make repairs, a water-based aniline dye is the most effective type of color to use. Apply the dye with a rag, a cotton swab, or a brush. The aniline will penetrate the raw wood more easily, and you can spray over it with finish almost immediately. If you're brushing, brush carefully over these repairs to avoid redissolving the aniline and disturbing the repair. When the sanding sealer is dry, sand the repair to blend into the surface.

STEP 5: Apply the top coat.

The water-based top coat goes on the same as the sanding sealer. Stir and strain the finish as you did with the sealer coat. Spray or brush on an even coat of finish so it flows out flat. The flatter a top coat goes on, the better the final result will be. Two coats of the final finish are usually enough. I don't bother to sand between top coats unless I need to remove an imperfection.

If a defect shows up after the top coat has dried, scrape it off with a single-edge razor blade. Then sand the area flat and apply another coat of finish. If the defect is very minor, you may be able to avoid recoating. Scrape and sand the repair, then rub out the entire area with rubbing compound to restore the original sheen of the finish. If things go wrong, you can always recoat.

STEP 6: Rub out the finish (optional).

If you want, you can alter the final sheen of the finish to make it flatter or glossier. Some finishing companies offer rubbing products especially for water-based finishes. These products seem to work well, but they aren't the only alternatives.

You can't lose with any water-based rubbing material—you can always apply another top coat and try again if things go wrong. Avoid rubbing products that contain wax, because you can't apply another top coat over them.

Automotive paint stores carry an almost infinite selection of rubbing materials that will work with water-based finishes. I've gotten good

results with auto rubbing and polishing compounds mixed with water. I've also used wet/dry sandpaper up to 2400-grit. Pumice and rottenstone can be used dry or with water as a very fine rubbing compound. A slight imperfection in the final coat can be scraped flat with a single-edge razor blade and the whole surface rubbed to the same shine. I've even tried toothpaste on a satin finish to bring out more gloss, which worked quite well. —M.C.



TIPS FOR BRUSHING

With a good brush and patience, you can brush on a finish that looks every bit as good as a sprayed finish.

Choose the right product—Some water-based sealers and top coats are formulated specifically for brushing. (See chart, page 20). These products contain flow-out additives that slow down the drying time to minimize brush marks and allow plenty of time for the finish to flow out flat and level.

Even most spray formulas can be brushed successfully by adding flow-out additive to slow down the drying time. Consult the manufacturer's recommendations for the correct proportions.

Choose the right brush—Start with a good brush. It never ceases to amaze me that people will spend hundreds and even thousands of dollars on woodworking and finishing equipment and won't pay \$15.00 for a good brush. A brush is a tool and will last a lifetime if cared for properly.

Buy a brush with nylon or polyester bristles. Natural bristles absorb water and affect the flow of the finish. My favorite brush for water-based finishes, made by Dupont, is called CHINEX.

To save time covering large areas, you can spray on the finish from a plastic pump spray bottle, then tip off the finish with a brush. Buy a high-quality spray bottle—the cheap ones tend to spit. Experiment on scrap to get the feel for the technique.

A paint pad also works well for large, flat surfaces. Wash the pad before using it to remove any loose bristles.

Pay attention to sanding—For a top-quality brush finish, sand the sealer coat carefully. Make sure to sand away any brush marks and imperfections. The top coat will go on smoother and flatter.

Don't overbrush—Flow the finish on as quickly as you can. Get the finish on in two passes at most, over and back, then tip it.

Clean your brush to make it last—Clean the brush with soap and hot water. Work the suds in with a fingernail brush and rinse thoroughly. This will keep your brushes clean and soft.

CLEAR WATER-BASED FINISHES

FINISHING PRODUCT	SHEENS AVAILABLE	HOW APPLY?	SANDING SEALER AVAILABLE?	COMMENTS
AMITY CLEAR FINISH	GLOSS SATIN	BRUSH* SPRAY	YES	*BRUSH & SPRAY FORMULAS AVAILABLE
AMITY TABLETOP	GLOSS SATIN	BRUSH* SPRAY	YES	*ADD FLOW-OUT ADDITIVE TO BRUSH
AMITY URETHANE	GLOSS SATIN	BRUSH SPRAY	YES	
BEHLEN'S WATER REDUCIBLE SPRAY LACQUER	GLOSS SATIN	SPRAY	YES	
CARVER TRIPP CLEAR FINISH	GLOSS SATIN	BRUSH	YES	
CARVER TRIPP SUPER POLY	GLOSS SATIN	BRUSH	YES	
DEFT WOOD ARMOR	GLOSS SATIN	BRUSH	NO	
HYDROCOTE CLEAR BRUSHABLE	GLOSS FINISH	BRUSH	YES	
HYDROCOTE CLEAR WOOD FINISH	GLOSS SATIN FLAT	SPRAY WIPE	YES	
HYDROCOTE CLEAR POLYSHIELD	GLOSS SATIN	BRUSH SPRAY* WIPE	NO	EXTERIOR & INTERIOR *THIN WITH REDUCER OR WATER TO SPRAY
HYDROCOTE CLEAR POLYURETHANE	GLOSS SATIN	BRUSH SPRAY* WIPE	NO	*THIN WITH REDUCER OR WATER TO SPRAY
M.I. CAMPBELL WATER BORNE CLEAR WOOD LACQUER	GLOSS SATIN	SPRAY	YES	
McCLOSKEY HEIRLOOM CRYSTAL CLEAR ACRYLIC FINISH	GLOSS SATIN	BRUSH	YES	
McCLOSKEY HEIRLOOM CRYSTAL CLEAR POLYURETHANE	GLOSS SATIN	BRUSH	YES	
SHER-WOOD WATER REDUCIBLE ACRYLIC LACQUER	GLOSS SATIN	SPRAY	YES	
STAR WATER BASE ACRYLIC LACQUER	GLOSS SATIN	SPRAY	YES	
VARATHANE ELITE DIAMOND FINISH TRANSPARENT IPN COATING	GLOSS SATIN	BRUSH SPRAY PAD	NO	
WOOD-TEX WATERBONE LACQUER	GLOSS SEMI-GLOSS SATIN FLAT	BRUSH SPRAY DIP	YES	AVAILABLE IN COLORS
ZIP-GUARD CLEAR WOOD FINISH	GLOSS SATIN	BRUSH SPRAY WIPE	NO	

ARE THEY TOUGH ENOUGH?

To demonstrate the hardness and durability of clear water-based finishes, Hydrocote conducted a Sward Hardness test to compare Hydrocote Clear Wood Finish and Hydrocote Polyurethane to solvent-based nitrocellulose lacquer and polyurethane.

According to Eric Kasner, the developer of Hydrocote, the finishes were sprayed on metal plates and the films were subjected to abrasion from a swinging stainless-steel pendulum at intervals during the course of a week.

The chart below shows the hardness development of the four products tested. The hardness values given are based on 1.5 mil film allowed to

dry at 76° F and 45% relative humidity. (Scale: Hardness of glass = 100)

HARDNESS: WATER-BASED vs. SOLVENT-BASED

DRYING TIME	HYDROCOTE	HYDROCOTE POLY-URETHANE	POLY-URETHANE	NITRO-CELLULOSE LACQUER
1 HR.	15	3	2	20
2 HRS.	27	8	4	27
8 HRS.	38	22	18	30
24 HRS.	40	42	40	30
48 HRS.	43	56	55	30
1 WEEK	45	63	58	30

Courtesy of Hydrocote

ing systems even include hardeners or catalysts to produce finishes for extremely demanding situations.

While water-based lacquers and polyurethanes produce a finish that's comparable to conventional lacquer and polyurethane, there are some differences.

Clarity—Most water-based finishes look like milky water in the container, turning clear as they dry. Water-based acrylic lacquers are *absolutely* clear when dry and resistant to yellowing with age. Nitrocellulose lacquer is slightly amber in color and tends to darken with time. This amber tone can be a great disadvantage on solid colors, pickled woods, or where the absolute natural color of a very light wood is the goal, as with bird's-eye maple. Water-based polyurethanes vary in clarity from clear to slightly amber in color, depending on the brand. Even the amber-toned finishes are considerably clearer than conventional solvent-based polyurethanes.

Durability—Water-based lacquers and polyurethanes are harder and more durable than their solvent-based counterparts according to manufacturers tests. (See sidebar, page 20.) I conducted some tests of my own and found that the water-based finishes do hold up well under abrasion and liquid spills.

Water-based acrylic lacquers are durable enough for most furniture applications. Water-based polyurethanes tend to be tougher and can provide extra wear resistance in applications that will get a lot of abuse.

Application—Another significant difference is the application. Water-based finishes are very sensitive to temperature. They cannot be applied successfully under cold conditions. I recommend that water-based finishes be applied at room temperatures of between 70° and 75° F.

Compared to nitrocellulose lacquer, spraying techniques are much less critical with water-based finishes. Nitrocellulose can be applied in thicker coats with less risk of runs or sags. Water-based finishes must be sprayed on in thin coats and allowed to flow out during drying time.

Clean up—After working with almost every finish known, I consider cleaning up after water-based finishes the easiest and most enjoyable part of the job. Simply clean the equipment with hot water, then rinse with cold water. The cold water hardens any remaining material, allowing you to go back with hot water to get your equipment perfectly clean.

By now, it should be obvious that I'm impressed with how easy and versatile water-based finishing can be. For the professional and amateur alike, the safety and environmental advantages alone are reason enough to consider water-based finishes. I believe that using these finishes in your shop will give you maximum results with a minimum amount of effort, and will prepare you for the coming onslaught of new water-based finishing materials about to hit the market. Almost every manufacturer I spoke with indicated that new products are still being developed. ▲



Michael Camp reproduces 18th-century American furniture and does custom woodturning in Plymouth, Michigan.

SOURCES

Water-based lacquers and polyurethanes are available by mail from major mail-order woodworking suppliers including Garrett Wade, Highland Hardware, Woodcraft Supply, and Constantine's. For more information on water-based finishes, or the name of a distributor near you, contact the manufacturer.

AMITY RESTORATION PRODUCTS, INC.

1571 Ivory Dr.
P.O. Box 107
Sun Prairie, WI 53590
(800) 334-4259

DEFT, INC.

P.O. Box 19507
Irvine, CA 92713
(800) 544-3338
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Down-home comfort
and upscale appearance
come together in this
solidly built porch swing.

PORCH SWING

A Two-Seater for Life in the Slow Lane

BY BOB MORAN

Some outdoor furniture belongs in the backyard—out of sight. Here's a swing that belongs on the front porch—for the whole world to see. It's solid and comfortable, but most of all it's attractive.

Designed by Glenn Hughes, a talented furniture maker and designer, it features strong, easily made joints and corrosion-proof hardware. At home in either a contemporary or traditional setting, it'll cradle you in comfort until long after it's too late in the day to mow the lawn.

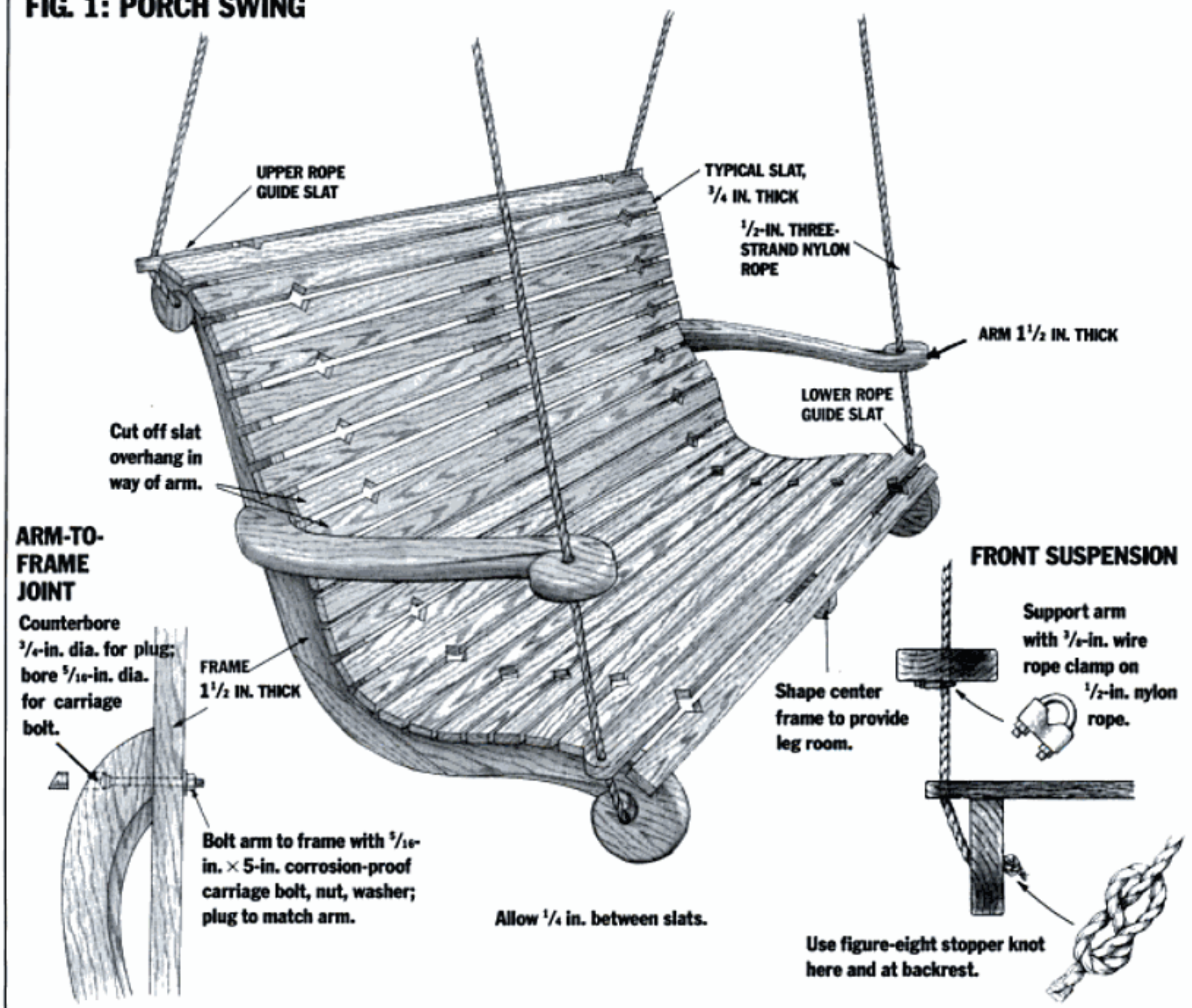
We built the swing you see here out of white oak, a rot-resistant wood traditionally used for building boats. Black cherry and black walnut would also be

good choices. If you intend to hang the swing where it will get full exposure to sun, wind and rain instead of on a porch with a roof, plantation-grown teak would be the best choice. (See *AW*, #19, page 24.)

The construction is quite simple and straightforward, as shown in Figs. 1, 2 and 3. The bench has three main framing members, each consisting of a seat support and a backrest support. The seat part of each frame joins the back part with a waterproof glue joint.

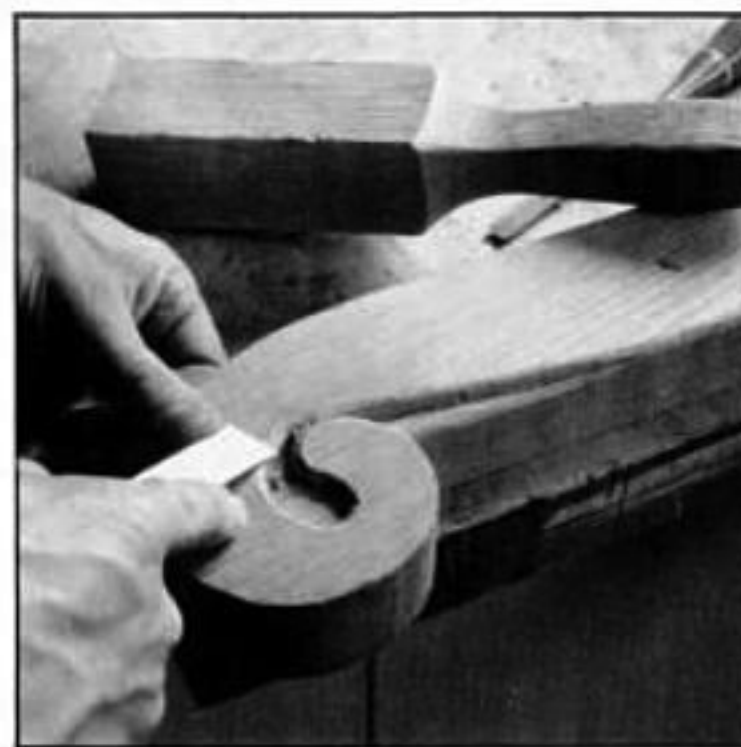
To keep the appearance of the swing clean and uncluttered, there are no wooden supports for the arms at the front. Instead, the front of each arm is supported by the ropes that hold the swing up. The rear of each arm is bolted to the end frame with a single bolt that allows the arm to pivot just a little. This bolted

FIG. 1: PORCH SWING



DRAWINGS BY KATHY BRAY

Rout a mortise for the reinforcing scab after the lap joint has cured. The lap joint and the mortise can be cut with either a router, as shown here, or with a dado head.



The carved scrolls on the arms and end frames can be as elaborate or as simple as you choose to make them. You'll only need a couple of carving chisels to make a big improvement in the appearance of these highly visible areas.

joint can be quite snug and still provide enough "give" to prevent damage if Uncle George should park his portly posterior on the arm instead of the seat. The slats for the seat and backrest are screwed to the three framing members.

Making the Swing Parts

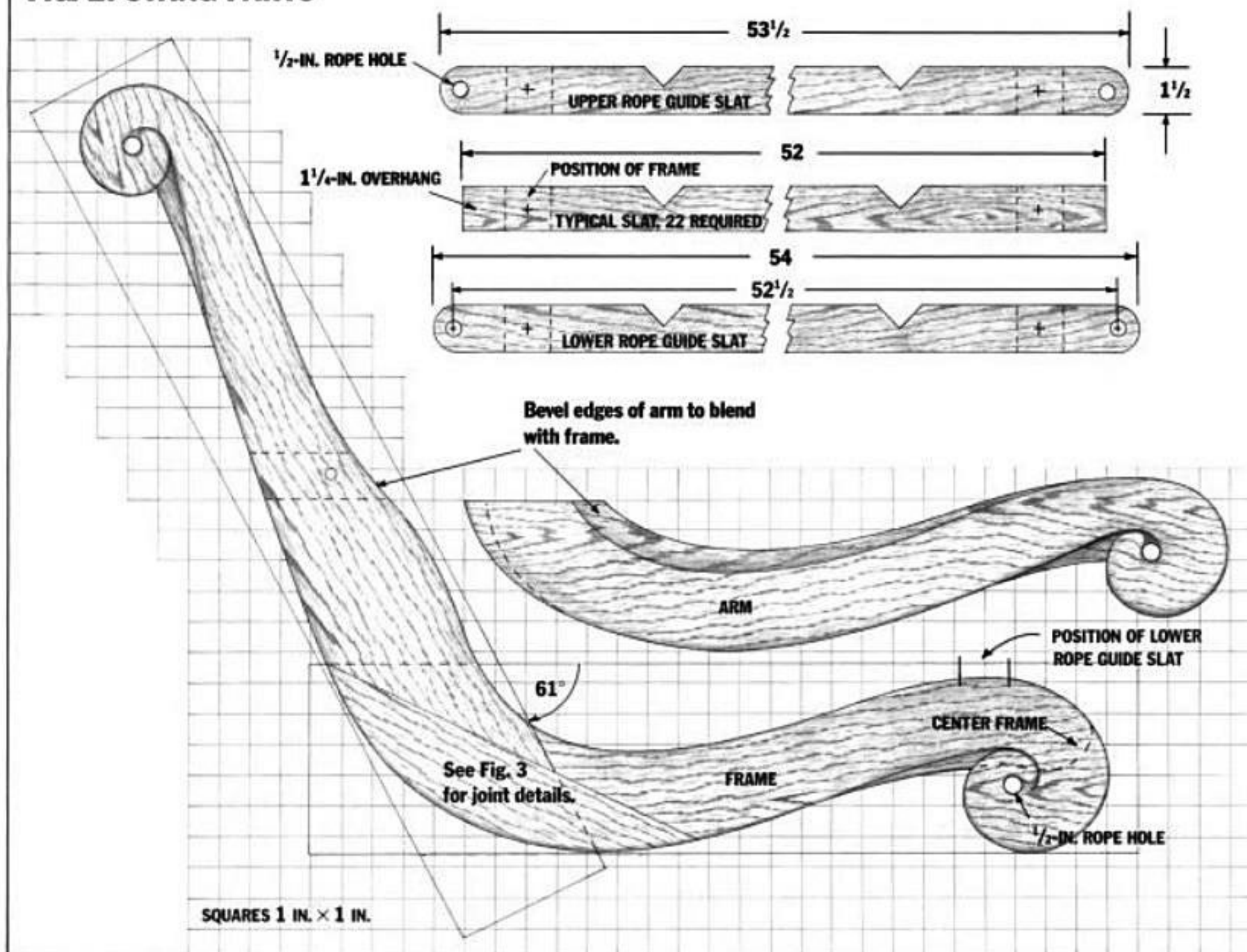
I suggest that you make the joints in the frames first. Next, shape the frames and armrests, cut out all of the slats, and finally assemble the pieces.

The joints in the framing members are strong, yet easily cut with a minimum of equipment. As Fig. 3

shows, each joint consists of a lap joint reinforced with a separate wooden "plate" called a "scab." The scabs are let in, flush with the frames. Cut the lap joints with a dado head or router and epoxy them together before routing the mortises for the scabs.

Shaping the arms and scroll ends of the two outer frames is a job for spokeshaves and carving chisels. The exact pattern is not critical. You can trace the pattern or sketch it right on the wood. You could even change the design of these parts to suit your taste, as long as you make sure that the rope hole in the arm is directly over the hole in the seat slat. (See Fig. 1.)

FIG. 2: SWING PARTS



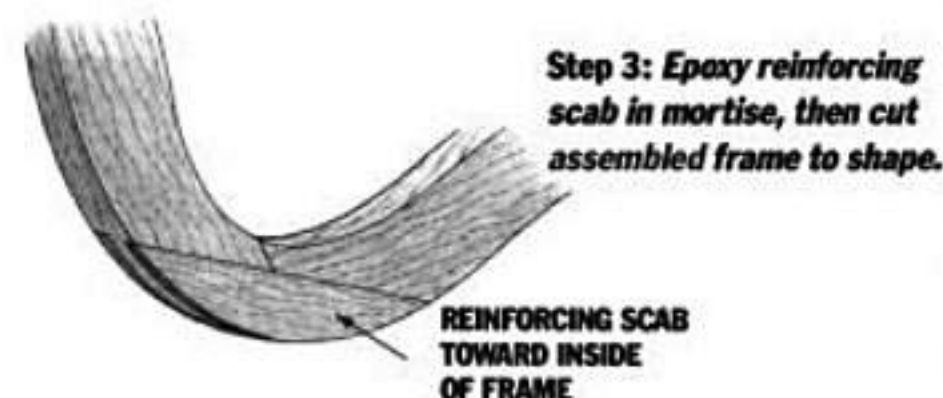
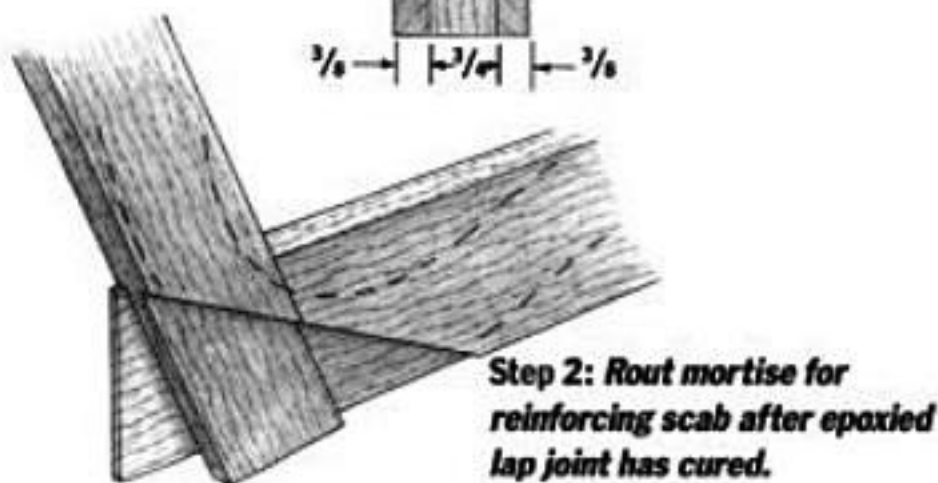
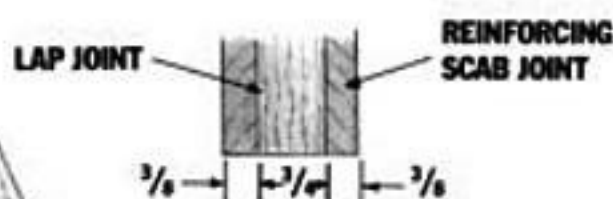
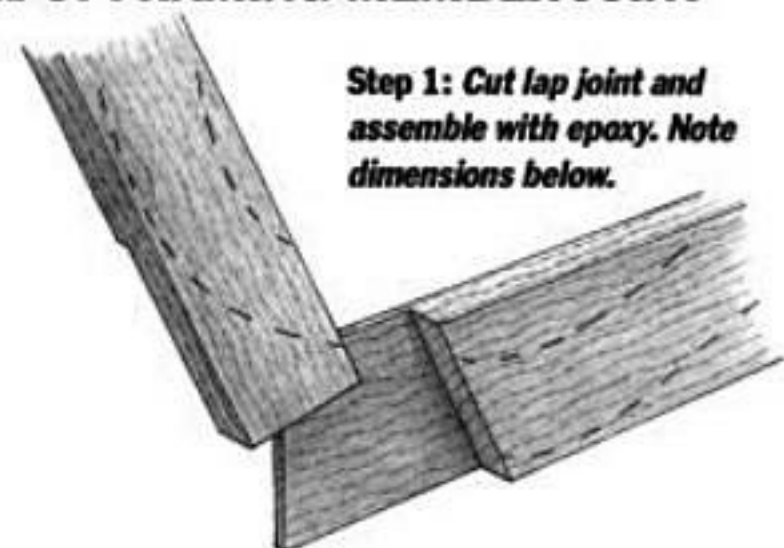
Use the bolt hole in the framing member as a guide for the bit when boring the bolt hole in the arm.



Applying a Finish

If you intend to apply a finish to the swing rather than let it weather naturally, apply it *before* assembling the bench. There are three good reasons for applying the finish before assembly. First, since the arm is designed to move slightly under stress where it attaches to the frame, you want to avoid exposing unfinished wood if it moves. Second, a continuous film of finish, unbroken where parts join, provides the best protection against water entering the wood. Third, it's a whole lot easier to finish the slats, without drips and runs, if you can easily reach all four sides at once. I'd

FIG. 3: FRAMING-MEMBER JOINT



WORKING WITH EPOXY



To join parts with epoxy, prime the surfaces with a straight resin/hardener mix, as shown here, then spread a thicker resin/hardener/filler mix on one surface and bring the parts together.

Epoxy will give you a strong, waterproof joint while being very forgiving of a less-than-perfect fit. If you haven't used epoxies before, here are a few tips from my own experience.

1. Avoid all skin contact with uncured epoxy. A combination of care and protective gloves are your best defense. Latex medical-examination gloves give the best fit and feel; nitrile gloves are a bit more chemically resistant. My own preference is for the latex.

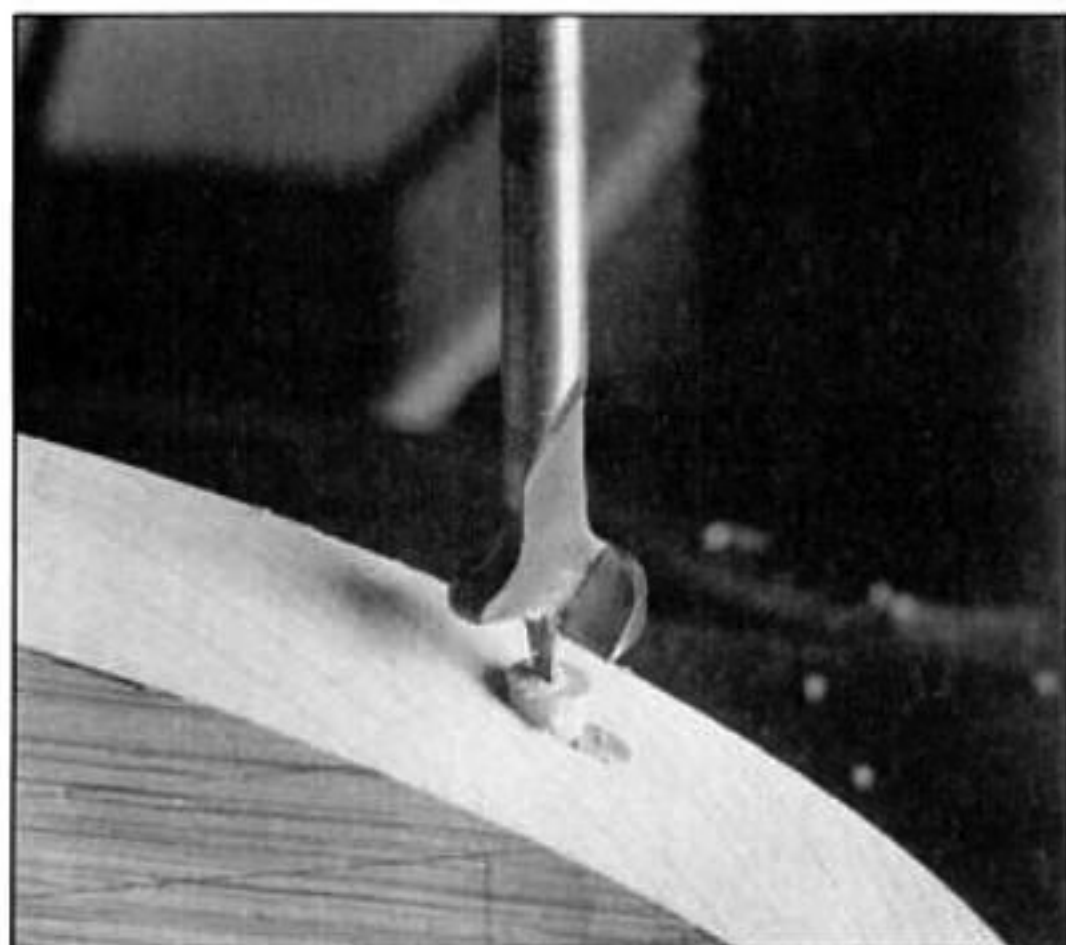
2. Thoroughly mix the resin and hardener in a small plastic cup. I use 8-oz. yogurt cups. Stir the resin and hardener for not less than 60 seconds.

3. Spread the mixed epoxy with small disposable glue brushes. They do a much better job than alternatives like sticks and are well worth the nominal price.

4. A good epoxy, formulated specifically for wood, is quite runny to penetrate deeply into the wood fibers, but it needs some thickening to keep it from draining out of a joint. To get the best joint, first coat the surfaces to be joined with a straight resin/hardener mix, and let it penetrate. Blend sander dust from the same species of wood into the remaining resin/hardener mix until it is the consistency of heavy whipping cream or soft peanut butter. Spread this mix onto one of the previously coated surfaces.

5. Clamp the parts together with only enough pressure to hold the parts in position. Heavy clamping pressure is not only unnecessary, it can squeeze all of the epoxy out of the joint. I frequently hold a joint together with just tape while it cures.

6. Allow epoxy to cure for at least 24 hours at room temperature before you do any cleanup sanding. Remember, epoxy resin and hardener can cause skin problems until they've fully reacted with each other. You don't want to breathe sander dust that contains incompletely cured epoxy. —B.M.



A dowel in the bolt hole in the arm provides a raised surface for the pilot of the counterboring bit to bite into. Drive out the remainder of the dowel after counterboring.

recommend that you use a spar varnish or boat paint, or at least a good porch enamel. House and trim finishes won't necessarily stand up to the physical wear that your swing will get.

Assembling and Hanging the Swing

When you assemble the swing, protect your investment of time and lumber by using non-corroding hardware. Corroding metal not only looks ugly, it also hastens rot in wood. The best choices are bronze and stainless steel. Good galvanized hardware may look rough but should stand up. (The hardware, rope, and



Tie a figure-eight knot in the rope ends to prevent them from passing back through the holes in the frames. When you've tried out the bench and are sure that you have the knots in exactly the right places, work the knots as tight as you can.

whipping thread in the drawings are available from Jamestown Distributors, 28 Narragansett Ave., P.O. Box 348, Jamestown, RI 02835, 800-423-0030.)

The counterbore for the bolt in the arm-to-frame joint is on the sloped surface of the arm. That can be a real problem, because only Forstner bits will start a hole cleanly at an angle. We solved the problem as follows. First, we bored the bolt hole through the framing member. We then clamped the arm in a vise, positioned the framing member over the arm, and bored the bolt hole in the arm using the hole in the framing member as a guide for the bit, as shown in the photo on page 25. We then plugged the bolt hole in the arm with a dowel, providing a raised surface for the pilot of the counterboring bit to bite into, as shown in the photo above. The arms must be bolted to the frames before you can fit the backrest slats.

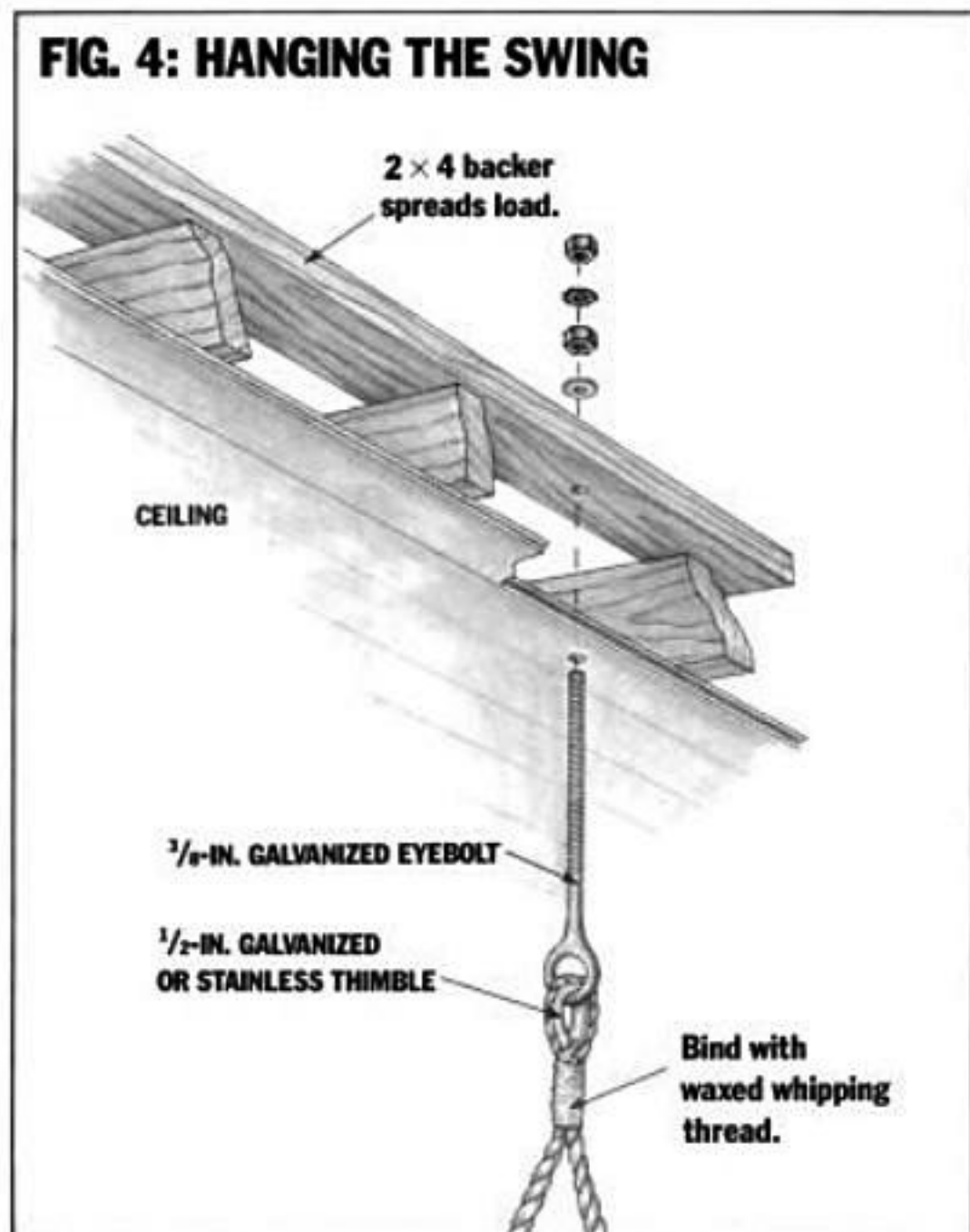
If you use ordinary brass wood screws to fasten the slats to the frames, be sure to drill the correct size pilot and shank holes. Prethread the holes with a steel screw identical to the brass screws before running in the brass screws; if you break off just one soft, brass screw you'll wish you had been more careful.

If you intend to counterbore and plug the screws, you might want to hold off on the plugs until you've had a chance to relax in the swing a few times. We tested the comfort of the design on quite a few people to get the lumbar support just right, but found that we couldn't please everybody with the same configuration. If your personal lumps and hollows are different from ours, you can remove the slats and modify the shape of the frames to suit yourself, but only if you haven't yet plugged the screw holes.

When you're ready to hang the swing, stop and consider the heaviest combination of likely occupants. Since we don't know how your porch ceiling is built, we can't make any specific recommendations, but we don't want you or your guests to wind up on the floor with pieces of ceiling in your lap. Use eyebolts, not screws, and if the ceiling is lightly framed, spread the load over several ceiling joists, as shown in Fig. 4.

Enjoy it. ▲

Bob Moran is assistant editor of AMERICAN WOODWORKER



TURNING PENS

A Touch of Class for the Desktop



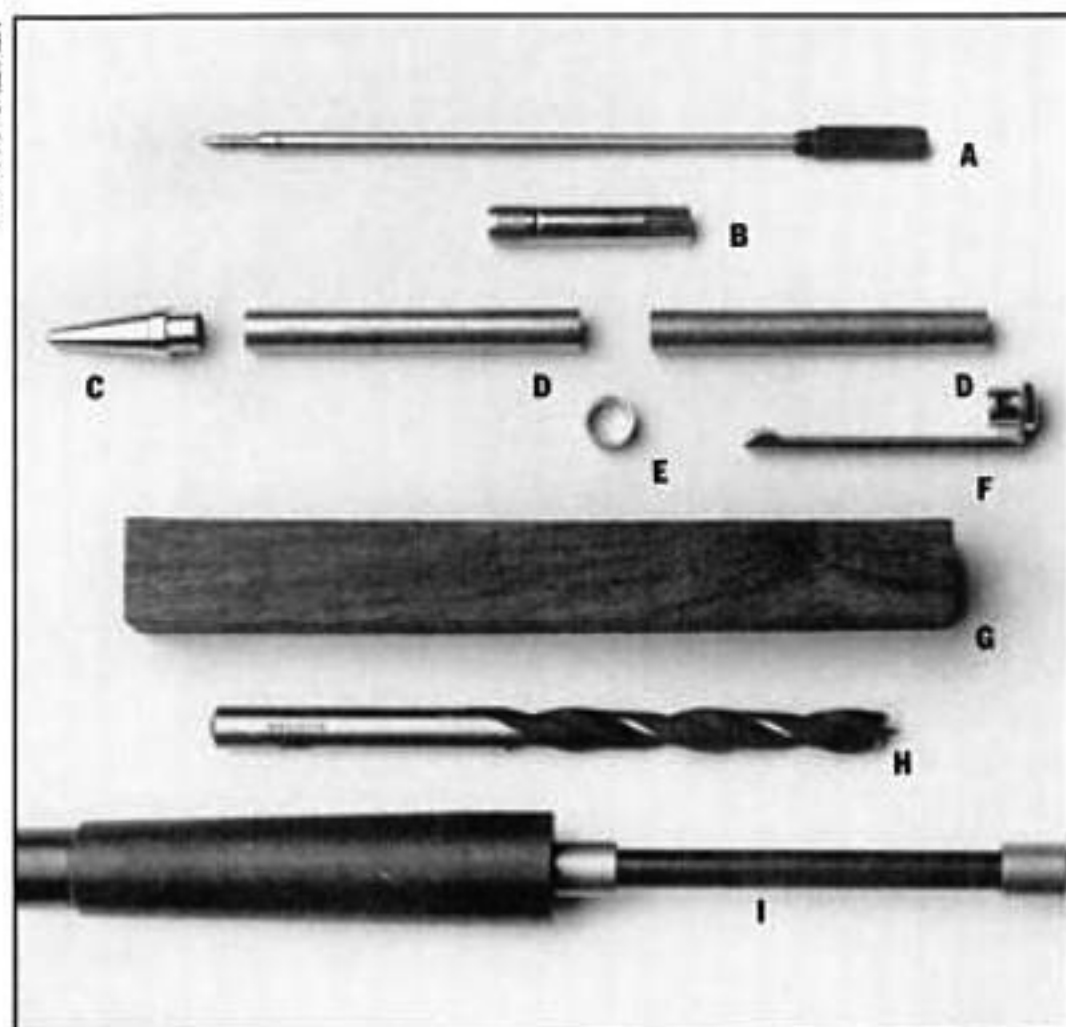
BY DALE L. NISH

Writing with a fine pen just feels right, like paring with a good, sharp chisel. In these days of laser printers, a turned wooden pen is a perfect way to personalize your writing, and of course, it would make a great gift for school graduations, Father's Day or for any busy executive.

The barrel of the pen is turned from wood, but you'll have to purchase a kit containing the mechanical parts to make the pen. (See Sources.) The kit includes a replaceable ball-point refill that screws into a twist-type retraction mechanism. The retraction mechanism and refill fit inside two thin-walled

A classy signature starts with a classy pen. Turn your own from some fancy hardwood.

SALLY DELLMAN



The barrels of the pen are turned from hardwood blanks, while the mechanical parts to make the pen are bought in a kit. (See Sources.) The kit includes a special turning mandrel, and a 7-mm drill bit you'll need to make the barrels. A: Ink refill, B: Retraction mechanism, C: Tip, D: Brass tubes, E: Brass ring, F: Pocket clip with end cap, G: Wood barrel blank, H: 7-mm drill bit, I: Turning mandrel.

wooden barrels that you turn on the lathe. A brass pen tip, pocket clip and two thin brass tubes to line the inside of the wooden barrels are also included in the kit.

A turning mandrel is another specialized piece of hardware you'll need to buy. (See Sources.) The mandrel is used to mount the wooden pen-barrel blanks in the lathe's headstock for turning. Without this special mandrel, it's nearly impossible to turn the wooden pen barrels thin enough. The mandrel comes in two different styles—with a Morse taper for mounting directly in the headstock, or a straight stub for mounting in a three-jaw chuck or a Jacobs chuck in the headstock. You can choose the type of mandrel mounting best suited to your lathe setup.

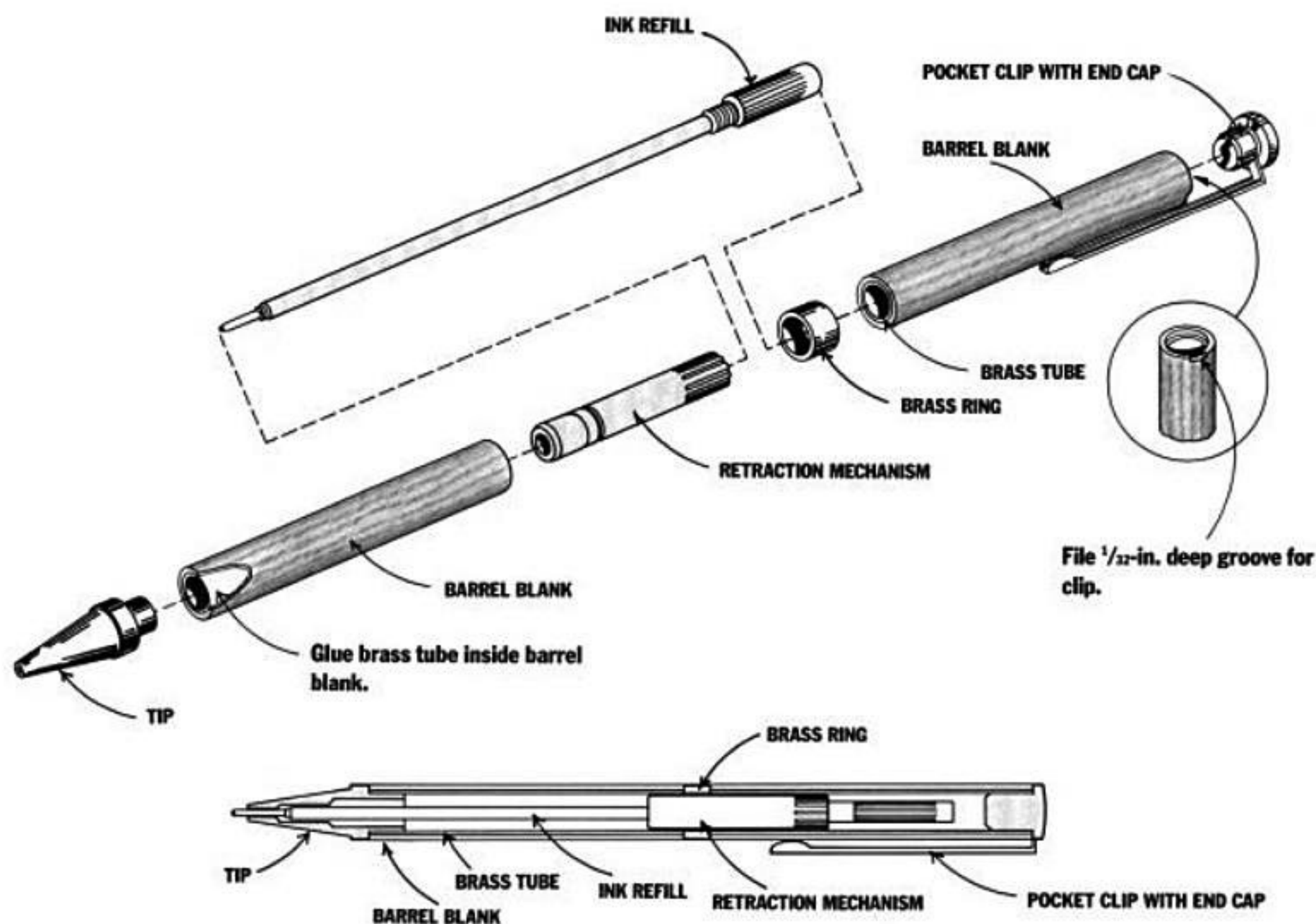
Turning the Wood Pen Blanks

STEP 1. Mount a wood barrel blank ($\frac{3}{8}$ in. sq. and 5 in. long) between centers on a lathe, and rough turn it to a cylinder $\frac{1}{2}$ in. in diameter.

When the blank is turned to shape, take it off the lathe and saw it into two pieces—each about $2\frac{1}{2}$ in. long. If you're turning more than one pen at a time, mark these two shorter barrel blanks, so you can identify them later as a pair. You want their grain to match when you put them together to make a pen.

STEP 2. Drill a 7-mm dia. hole down the center of each of the barrel blanks. Mount the round blank in a three-jaw chuck in the headstock, and drill the blank with a 7-mm bit (see Sources) mounted in a Jacobs

FIG. 1: WOODEN TWIST PEN





If you don't have a three-jaw chuck to hold the barrel blank for drilling on a lathe, hold the blank vertically in a $\frac{1}{2}$ -in. hole in a scrap board, and drill it on a drill press. Steady the blank with a pair of pliers.

chuck in the tail stock.

If you don't have a three-jaw chuck, you can use a drill press to drill the hole. Here's how: Drill a $\frac{1}{2}$ -in. hole in a piece of scrap clamped to the drill-press table. Insert the turned barrel blank in the hole (vertically), steady it by holding it with a pliers and carefully drill the blank all the way through with the 7-mm bit. Raise the bit frequently to clear the chips from the hole, and don't exert too much pressure, especially near the bottom of the hole, or the blank could split.

If you have a four-jaw self-centering chuck, you can drill the 7-mm hole in the square blank before Step 1.



Glue the brass tubes inside the drilled barrel blanks.

STEP 3. Glue the thin brass tubes from the pen kit into the two drilled barrel blanks. Use epoxy or gap-filling Super "T" cyanoacrylate adhesive. (See Sources.) Apply glue to the brass tube and push the tube into the blank, rotating it to distribute the glue. Seat the tube so its ends are recessed inside the ends of the blank. (See Fig. 1.) You'll trim the blanks flush with the ends of the brass tube later. Set aside until the glue hardens.

STEP 4. Turn a holding jig to hold the barrel blanks. To make the jig, screw a hardwood waste block 1 to $1\frac{1}{2}$ in. thick to a faceplate, and install it on the lathe headstock. Turn the waste block to a cone shape, as shown in the photo. Mount a drill chuck in the tail stock and install a $\frac{1}{4}$ -in. dia. bit. Drill deep into the waste block until all but about $\frac{3}{4}$ in. of the bit's shank is inside the block. Remove the drill chuck, leaving the $\frac{1}{4}$ -in. bit embedded in the waste block with its shank extending



Turn a cone-shaped turning jig to hold the barrel blanks. A $\frac{1}{4}$ -in. drill bit bored into the jig, with its shank sticking out, mounts one end of the blank. A cone center secures the other end.

out $\frac{3}{4}$ in. The exposed drill shank will act as a holder for the barrel blank. Turn on the lathe to check if the bit's shank is running true, and tap the waste block to center the shank if necessary.

STEP 5. Square the ends of the pen blanks. Put a barrel blank on the end of the drill-bit shank with one end



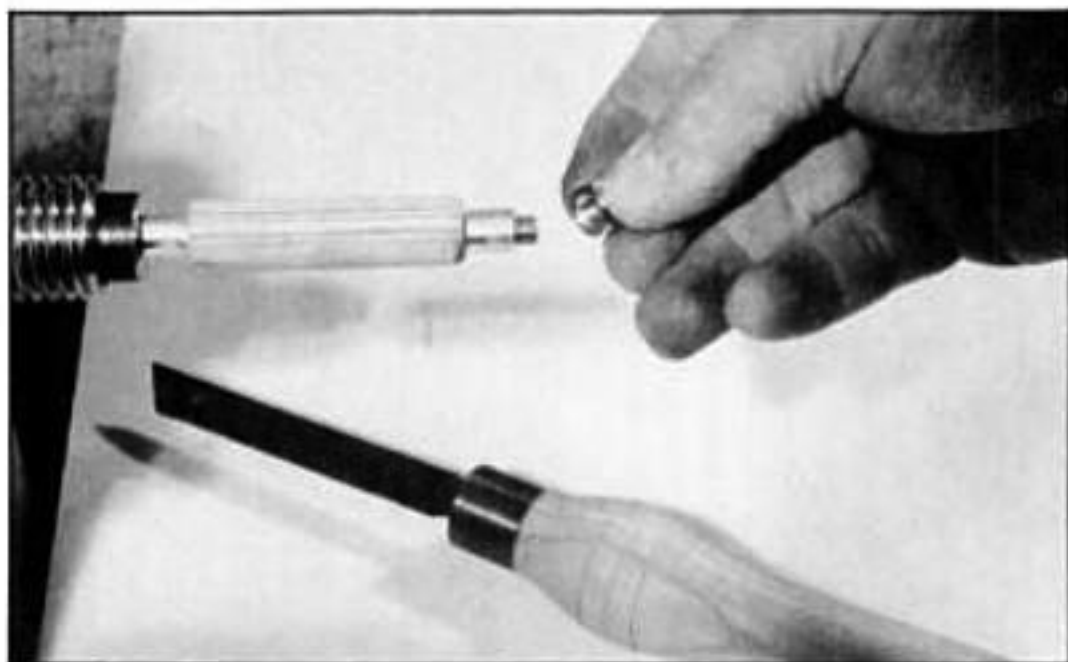
Trim the ends of the barrel blank with a sharp skew chisel, making them square and flush with the brass tube inside

against the waste block. Hold the other end of the barrel blank with a ball-bearing cone center in the tail stock. With the lathe speed set at 1500 to 2000 rpm, use a skew chisel to trim the ends of each blank even with the ends of the brass tube inside. Make the ends clean and square. The blanks should be about $2\frac{1}{16}$ in. long after trimming. Before I trim the blanks, I choose which one of the barrel blanks to install the pen's pocket clip on. For that blank, I leave about $\frac{1}{32}$ in. of wood extending past the end of the brass tube on the clip end only, and I mark the blank for later identification. All the other ends of the blanks are trimmed flush with the brass tubes.

If you have a disk sanding machine, you can clamp a block to the sander table square with the sanding disk and sand the ends of the barrel blanks square and to length.

STEP 6. Install the turning mandrel in the headstock, either in the Morse taper or a chuck, depending on the type of mandrel you bought. (See Fig. 2.) Advance the

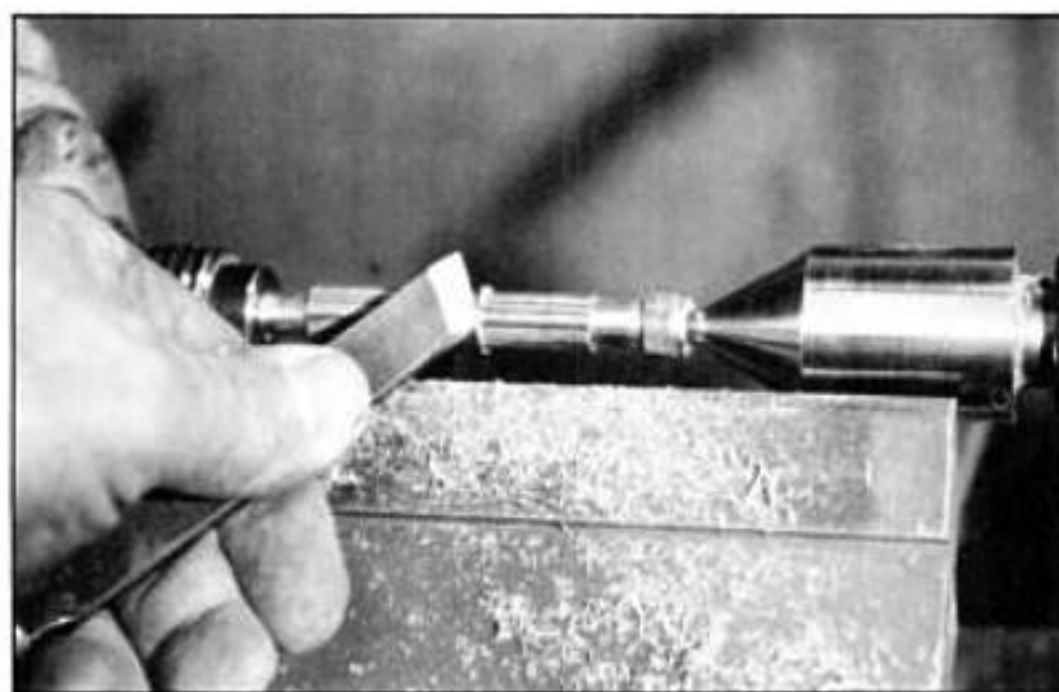
tail-stock cone center into the hole in the end of the mandrel to secure it. (Don't use a lot of pressure.) Run the mandrel up to speed to make sure it runs smooth and true.



Mount a trimmed barrel blank on the turning mandrel supplied with the pen-making kit.

STEP 7. Install one of the trimmed barrel blanks on the mandrel. After removing the threaded nut and outer brass bushing from the mandrel, slide a barrel blank on the mandrel against the inner brass bushing. Replace the outer brass bushing and tighten the nut. You need pressure on the blank to keep it from spinning on the mandrel when a gouge or skew chisel contacts the wood. Advance the cone center into the end of the mandrel again, but without too much pressure.

STEP 8. Turn the barrel blank to final diameter. Use a small spindle gouge or a skew chisel to turn the blank down to a diameter, round and straight, and

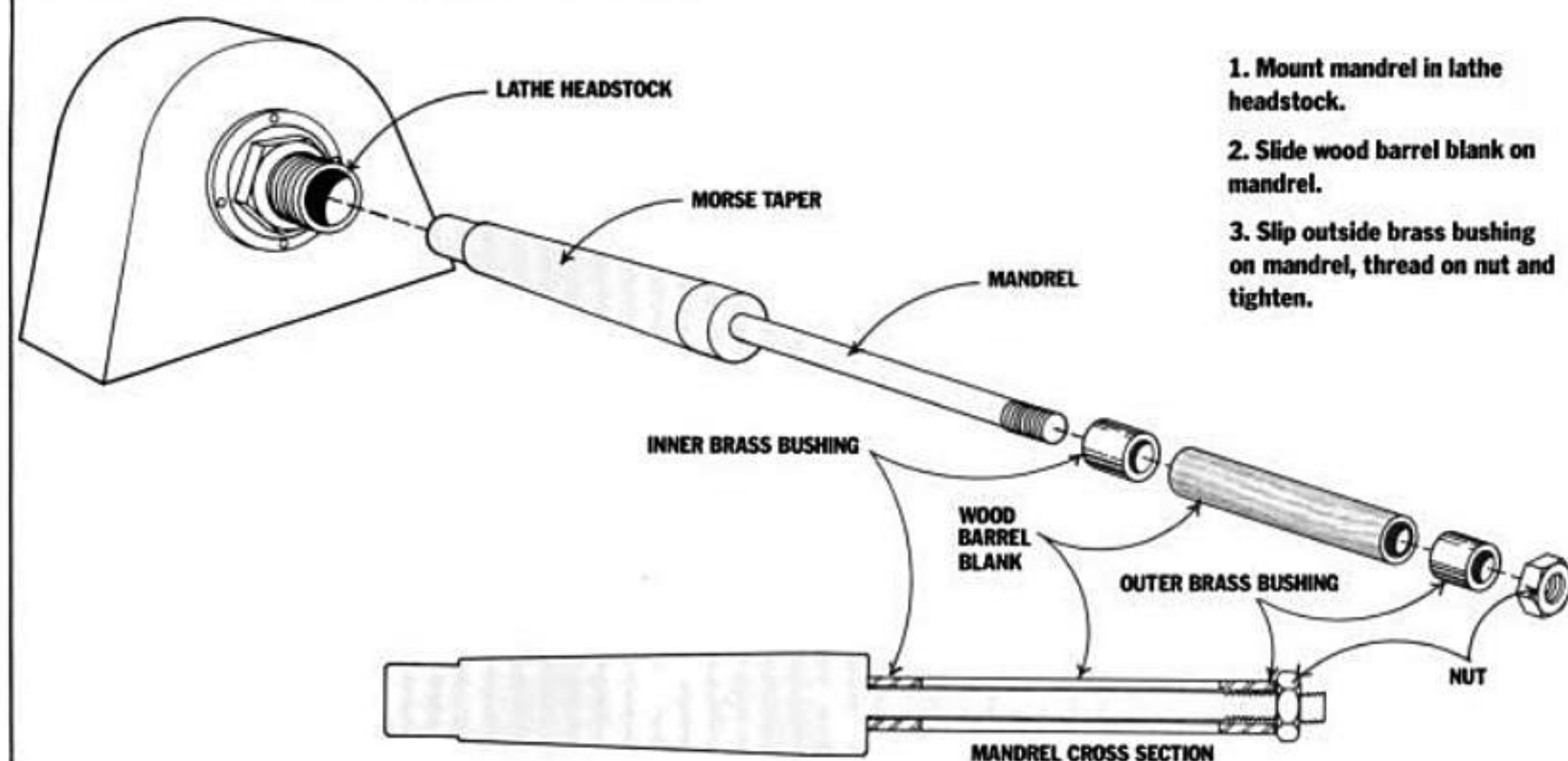


The mandrel allows you to turn the blank to a very thin wall thickness with great accuracy.

ready for sanding. Try to make clean cuts with no tear-out. Cut carefully, as the barrel's wall thickness is only $\frac{1}{32}$ in. or less. The mandrel's brass bushings are sized as a handy guide to barrel diameter. If you like a pen with a slightly fatter appearance, leave the barrel diameter a little bit larger than the bushing diameter. Remember, the final sanding will remove a bit of wood from the diameter, too.

STEP 9. Sand the barrel smooth, ending with 220-grit paper. (If the surface is rough you may need to start with 80- or 100-grit paper.) Be careful not to sand below the bushing diameter or you'll risk exposing the brass tube inside the blank. Turn the lathe off and sand lightly with the grain to remove any circular sanding marks.

FIG. 2: TURNING PEN-BARREL BLANKS



1. Mount mandrel in lathe headstock.
2. Slide wood barrel blank on mandrel.
3. Slip outside brass bushing on mandrel, thread on nut and tighten.

Note: Mandrel also available with straight end to fit Jacobs chuck or three-jaw chuck.

STEP 10. Apply a finish to the barrel blanks. I recommend sealing the wood with a fast-drying lacquer such as Deft Semi-Gloss Clear Wood Finish (available in many hardware or paint stores) or padding lacquer. (See Sources.) Apply a wet coat of the finish with a soft cloth while the lathe runs, and let it get tacky dry. Buff with a clean cloth until the surface dries to the touch and has a low-satin luster. Keep the lathe running and apply a light coat of carnauba wax, (see Sources) and buff with a soft cloth. You could also apply a light coat of paste wax with 0000 steel wool, and buff dry.



A light coat of carnauba wax from a wax stick puts the final touches on a finish of lacquer or padding lacquer.

Remove the finished barrel blank from the mandrel and repeat Steps 7 through 10 to complete the other barrel blank from the matched pair. Both barrel blanks should be the same diameter.



Press the pocket clip and end-cap assembly firmly into the end of the barrel with a vise.

STEP 11. Assemble the pen with the finished barrel blanks. Take the clip end of a barrel blank (identified with a mark previously) and file a tiny groove, about $\frac{1}{32}$ in. deep and as wide as the clip, across the end grain of the barrel. (See Fig. 1.) The groove provides a recess for the clip so the cap sits snugly on the end of the barrel. Now push the cap and clip assembly into the end of the barrel until the clip bottoms in the groove you just filed. Use a vise to exert straight, firm pressure on the pen blank (end for end) until the cap is flush with the end of the barrel. Press the pen's tip into the end of the other barrel, using the same technique.

SOURCES

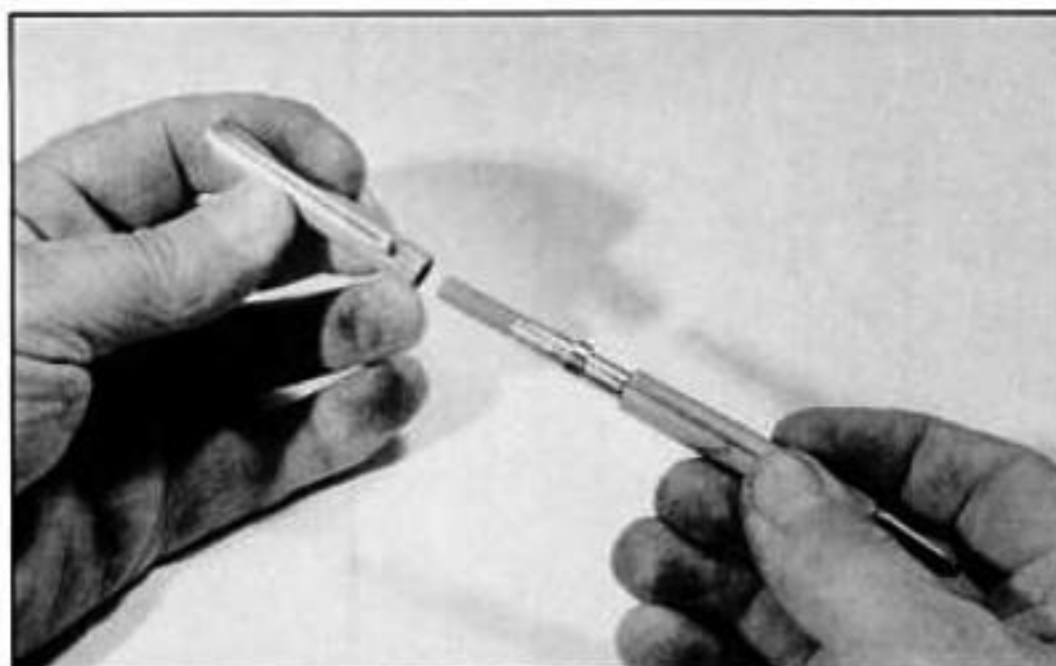
Complete kits containing all parts for five pens are available from **Craft Supplies USA**, 1287 E. 1120 S., Provo, UT 84601, (801) 373-0917.

Kit #AW050 includes an assortment of five wood pen blanks (bocota, cocobolo, bubinga, bird's-eye maple, and Honduras rosewood), five pen mechanisms, a turning mandrel with a #2 Morse taper, and a 7-mm drill bit. Price: \$32.50, includes shipping (regularly: \$42.25).

Kit #AW100 includes the same items as above, but the turning mandrel is a straight stub to fit a three-jaw or Jacobs chuck. Price: \$27.95, includes shipping (regularly: \$37.50).

Cyanoacrylate glue (Super-"T"), padding lacquer (French polish) and carnauba wax (Woodturner's Wax Stick) are also available from Craft Supplies USA.

STEP 12. Install the pen retraction mechanism into the other end of the barrel with the tip. Look for a small groove about $\frac{5}{16}$ in. from the end of the retraction mechanism. Press the mechanism in until this groove is even with the end of the barrel. Slide the polished brass ring over the mechanism until it contacts the barrel. Screw the pen's ink refill into place in the retraction mechanism.



Install the pen's retraction mechanism, brass ring and ink refill in the bottom barrel, then push on the top barrel. Twist to extend the writing point.

Put the two halves of the pen together by pushing the other barrel (with the clip) over the retraction mechanism until it contacts the brass ring. Now twist the top barrel (the barrel with the clip) clockwise while holding the bottom barrel until the ink refill's ball point is fully extended at the tip. Continue to twist the top barrel until the wood grain on the two barrels is lined up. The pen is now ready to use. To retract the ball point, just twist the top in the other (counterclockwise) direction. ▲



Dale L. Nish is a professor of Industrial Education at Brigham Young University. He is the author of three books on woodturning and wrote about turning peppermills in AW, #19.

Editors' Choice TOP 10

WOODWORKING

One of the neat things about any craft is the tools. In woodworking, you have your basic tools: saws, planes, jointers and so on. But then there are those handy, little shop aids and gizmos that don't quite qualify as a discrete tool, yet they're different from a jig or fixture that you cobble together yourself. We're talking gadgets here.

Gadgets help you to get things done by making your other tools work better. And lately, the growing interest in woodworking has generated a flood of woodworking gadgets. They come from basement inventors and the biggest tool companies, alike.

Every gadget promises to make woodworking safer, easier, more accurate and, well, more fun. Of course all gadgets aren't created equal. The best ones almost always meet a genuine need in a clever, but simple, way. Others turn out to be too complicated, too specialized or just poorly designed. They end up in a drawer gathering dust.

Every woodworker has favorite gadgets—the indispensable helpers he or she really wouldn't want to live without. We polled the *AMERICAN WOODWORKER* editors, and here are the editors' personal picks for the Top 10 Woodworking Gadgets.

JACOBS HAND-TITE KEYLESS CHUCK



I inherited the old 1/4-in. Black and Decker drill you see here from my grandfather. I'm quite fond of this cast-aluminum beauty. It's just the right size and heft, and it makes a friendly buzzing sound when I use it. I even like the gritty smell it fans out from the motor housing when it's running. Its original chucking system, however, earns no such praise.

Changing bits was a tedious ritual, requiring a keen eye, a steady hand and an ever-elusive allen wrench (in lieu of a chuck key). I'd have to insert this allen wrench into a small hole in the side of the drill chuck and then turn it, just so far, to hold a bit secure. It did the job, but it was a very weird design. And one that I abandoned without hesitation once I heard about the Jacobs Hand-Tite Keyless Chuck.

Fitting my drill with this Jacobs chuck has rendered my allen-wrench ritual obsolete. Now I just slip

a bit in the chuck and with a simple hand-twist to the soft rubber collar, the bit is locked in place. In fact, it's secured tighter and centered better than it was with the original chuck. A twist in the opposite direction releases the bit. It makes bit changes much faster and a lot more graceful. I think even my skeptical grandfather would've approved.

Price: \$21.45. Available from: THE WOODWORKERS' STORE, 21801 Industrial Blvd., Rogers, MI 55374, (612) 428-4101.

Lara Wilson



VIX-BITS

There's nothing flamboyant about Vix-Bits. They just sit quietly in a drawer until you need to mount hinges. The Vix-Bits then come out and drill pilot holes for the screws, perfectly centered in the hinge screw holes. There's nothing to adjust or figure out, no learning to do before using them well. You just chuck them in your drill and drill perfectly centered holes.

The Vix-Bit consists of a drill bit surrounded by a spring-loaded retracting metal sleeve. The sleeve has a conical end that automatically centers itself in the beveled screw holes in the hinge. When you start the drill motor and press down, the sleeve remains centered while the drill bit pushes out into the wood. The grain of the wood can't push the bit off-center, because the sleeve is still centered in the hinge hole.

That's all there is to it; simple, direct, efficient. You'll forget you own them, until you need to mount hinges; but then you'll remember, I guarantee it.

Price: \$6.50. Available in most mail-order catalogs and woodworking stores.

Bob Mann

GADGETS

Shop Helpers We Wouldn't Want to Be Without



MULTI-STOP

I spotted this gadget at a woodworking trade show about three years back. The inventor was demonstrating, and I stopped to watch. I was so impressed with the versatility of the Multi-Stop that I walked away with two of them. I've used them ever since.

The Multi-Stop works like a little vise with a cam-action lever that closes and opens the jaws. You clamp it to a machine fence or table (up to 1³/₄ in. thick) to serve as a stop for making multiple cuts. It also works well for limiting the travel of routers and all sorts of other machine operations that call for a stop. The "vise" body itself can be used as a stop, or you can insert 1/4-in. dia. stop rods (included) in four different positions to extend its capacity.

I use mine mostly on my radial-arm saw fence and on the fence of my tablesaw cutoff box for cutting multiple parts to the same length. Occasionally, I use it as a hold-down on the tablesaw rip fence. When making stop cuts on my tablesaw or router table, I clamp two Multi-Stops to the fence or the table to start and stop the cut. I've also used the Multi-Stop as a little vise for holding work on the drill press. It can do several other things I just haven't tried yet.

The Multi-Stop is a winner in my book and gets my vote for the best all-around woodworking gadget.

Price: \$32.00. Available from most mail-order catalogs, and woodworking stores. Information only from: **TIMESAVER TOOLS**, Deer Run Rd., Lincoln, MA 01773, (617) 259-0240.



MAGNA SET

I used to hate changing jointer knives. Setting the knives was such a hassle that I used to put off sharpening just as long as I could. All those springs and nuts and knuckle-nicking edges.



A couple of years ago, I succumbed to an ad for a Magna Set—a magnetic device that would enable me (so the ad promised) to "set jointer knives in 10 minutes." I got out my wallet.

The Magna Set made my day. It's stone simple (as are so many clever inventions) and virtually idiot-proof. Two strong bar magnets lock onto the jointer's outfeed table and extend over the cutterhead. Alignment marks on the magnets let you line up the knives with the top of the cutterhead arc. The magnets hold the knives at exactly the right height while you tighten the gib screws. Easy.

I still cuss a bit when I nick one of my knives, but with the Magna Set, I don't dread changing them the way I used to.

Price: \$49.95. Available from most mail-order catalogs and woodworking stores, or from: **UNIQUEST CORPORATION**, 585 W. 3900 S., Suite 6, Murray, UT 84123, (801) 265-1400.



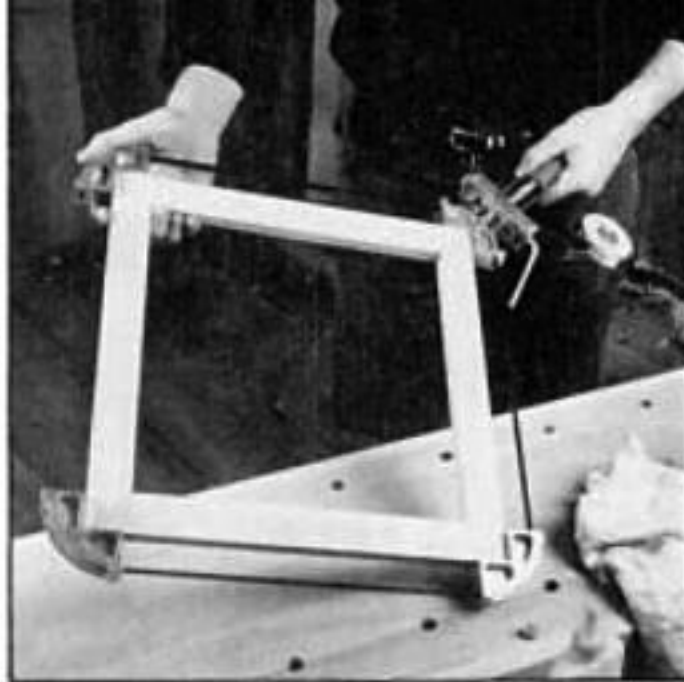
TRU-GRIP CLAMP 'N TOOL GUIDE

Nothing fancy here, just a 1/2-in. thick aluminum straightedge with adjustable, built-in clamping jaws. You bring a sliding clamping jaw up against the edge of the stock and flip a cam lever to clamp. I use this tool constantly as a guide for making straight cuts with a router or a circular saw. I also use the Clamp 'N Tool Guide as a fence on my drill press and bandsaw.

The Clamp 'N Tool Guide comes in two sizes: a short one that will grip up to 24 in. and a long one with a 50-in. grip capacity. I own both sizes, and I find them both very useful. I use the short one more often, but when I have to cut a 4x8 sheet with my circular saw, the long one is just the tool I want.

Price: \$40.00, 50-in. grip; \$30.00, 24-in. grip. Available from most mail-order catalogs and woodworking stores. Information only from: **GRISSET INDUSTRIES**, P.O. Box 10114, Santa Ana, CA 92711, (714) 662-2888.

DAVID SLOAN



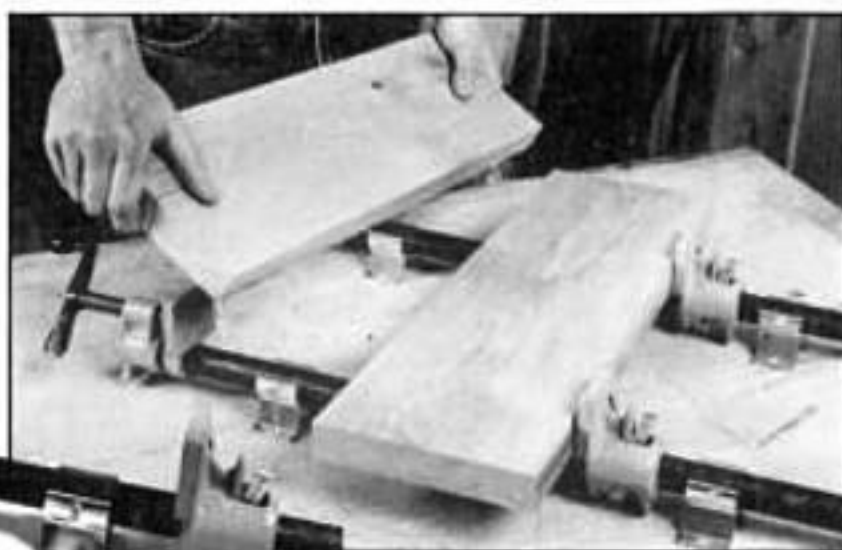
MERLE ADJUSTABLE CLAMP

My wife is an artist and often asks me to make stretchers for canvas or picture frames for her pastels. I also make wood-frame mirrors from time to time, and I've built my fair share of drawers. All these projects require clamping parts together absolutely square. The Merle Adjustable Clamp is the best gadget I've found for this job.

The Merle Adjustable Clamp consists of a 22-ft. retractable steel band, which passes through three adjustable corner saddles. A fourth corner saddle is attached to a hand-screw assembly, which cinches up on the ends of the steel band. Essentially, it's an adjustable loop with a saddle at each of four corners.

The real beauty of the Merle Clamp is how easy it is to use. Simply slip the loop around the frame or assembly you're gluing up, adjust the band, turn the hand screw and you've got it clamped—not only tight, but perfectly square, too. It's so quick and easy to do these glueups that it frees me to do other important things, like reading woodworking magazines.

Price: \$22.95 (\$19.95 each for four or more). Available from: MLCS, P.O. Box 4053, Rydal, PA 19046, (800) 533-9298.



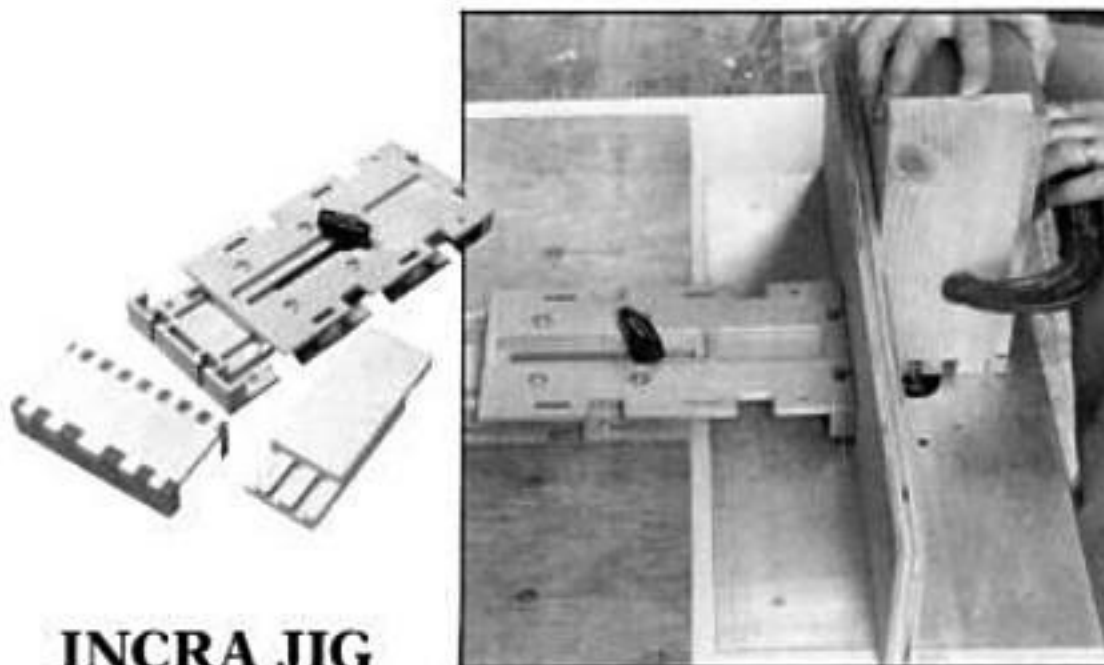
PONY 3/4-IN. PIPE SADDLES

If it's true that simple pleasures are the best, I think the same goes for woodworking gadgets. And these Pony Pipe Saddles are as simple as they come. They are aluminum saddles that slide onto a standard 3/4-in. pipe clamp to prevent the clamp from rolling over when you're doing a glueup. Each saddle has a thumb-screw for tightening it on the pipe. Also, there are two holes drilled into the base of the saddle, so you can fasten it to a benchtop or other work surface.

Large glueups, like tabletops, can be frustrating enough, and having my pipe clamps roll over on me can sometimes be the straw that breaks the camel's back. These saddles prevent that from happening, and that keeps me from throwing the nearest tool across the shop. They also lift the clamp up off the bench sur-

face, making the handle easier to turn, and the pre-drilled holes in the base allow the saddles to be easily mounted to any surface—even vertically. The saddles just make your pipe clamps a lot more versatile—I guess you could even do a glueup on the wall if your bench and floor are too cluttered.

Price: \$11.97 for four. Available from most mail-order catalogs and woodworking stores. Information only from: ADJUSTABLE CLAMP CO., 417 Ashland Ave., Chicago, IL 60622, (312) 666-0640.



INCRA JIG

The Incra Jig is one of the most useful gadgets I've ever come across. Though it sounds like a cliché to say it, I think its use is limited only by your imagination.

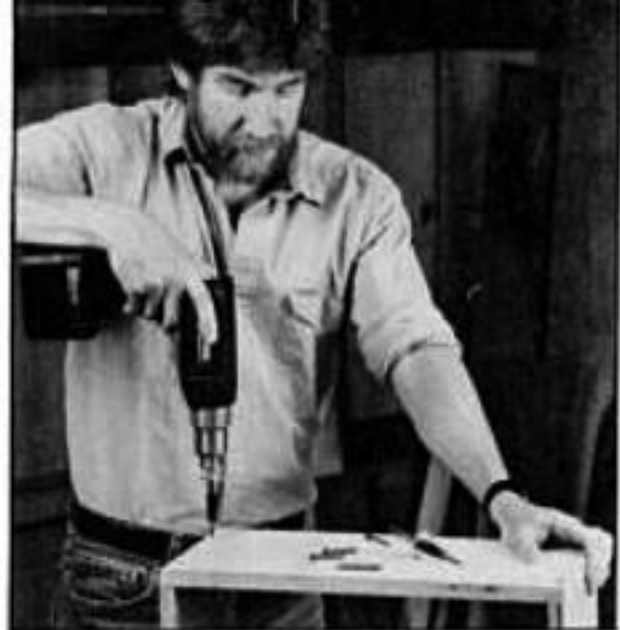
Simply put, the Incra Jig is just an incremental measuring tool, or as the owner's manual calls it, "a precision positioning jig." It is most useful as a fence positioner for router tables, tablesaws, etc., but can be used for a variety of other functions.

Here's how it works. The jig is made of two plastic body parts that fit together very precisely with opposing fine saw-tooth racks. The bottom half is attached to a stationary surface, like a saw table or router table. A fence is attached to the front of the top half. Because the teeth on the racks are exactly 1/32 in. apart, the fence can be moved in exact increments of 1/32 in. The addition of a 1/32 in. scale right on the jig eliminates the need for any other measuring device when adjusting the fence. The jig is not limited to 1/32 in. adjustments, however. The instructions tell you how to shim the racks so it can be "micro-adjusted" to an accuracy of 1/1000 in. Once the setting is adjusted, the two halves are locked together with a clamping knob.

With the ability to adjust and set a fence this accurately, you can make and duplicate finger joints, sliding dovetails, half blinds and many other joints quickly and painlessly. An *Incra Jig Handbook and Templates Package* is available for a few dollars more, and I highly recommend it. The handbook clearly describes many clever uses for the jig, including how to make the "Incra double dovetail," which is just about the slickest joint I've ever seen.

Price: \$39.95. Available from most mail-order catalogs, and woodworking stores. Information only from: TAYLOR DESIGN GROUP, P.O. Box 810262, Dallas, TX 75381.

Glenn E. Hughes



CHUCK MATE DRILL-N-DRIVE

I first saw this gadget on the PBS TV show, "The New Yankee Workshop." As host Norm Abram was fastening the plywood back panel on a cabinet, he paused so the camera could get a close-up of the tool he was using. It was a dual-purpose gadget that allowed him to drill a pilot hole and sink a screw without stopping to change bits in the drill's chuck. It struck me immediately as one of those "Gee, why didn't I think of that" ideas. Norm really liked it, too, so I got one to try. As a gadget, it turned out to be simple, foolproof and a real timesaver—just like a good gadget should be.

The Chuck Mate consists of a conventional pilot drill/countersink bit with a three-pronged adapter that allows it to fit snugly over a standard Phillips-head screwdriver bit. You mount the screwdriver bit in your drill's chuck and tighten it as usual. To use the drill/countersink, you slip it over the driver bit. The adapter's three prongs fit into the little gaps between the chuck's three jaws, which locks the bit into the chuck. It takes about two seconds to switch from drilling to screwdriving mode or vice versa without having to mess around with a chuck key.

If you use a lot of Phillips-head all-purpose screws in your woodworking projects, you'll wonder how you got along without the Chuck Mate once you try it. They're available in several different size bits for different screws, and also with a Vix-Bit attachment for installing hinge screws.

Price: \$12.95. Available from mail-order catalogs, woodworking stores and some hardware stores. For a retail outlet near you call: ROBERT LARSON CO., INC., 33 Dorman Ave., San Francisco, CA 94124, (800) 356-2195.

VERITAS HONING GUIDE AND ANGLE JIG



It seems that sharpening chisels and plane blades has been elevated to the status of an art in some woodworking circles. Perhaps for good reason—a super-sharp edge on your tools is a requirement for crisp,

tight joints and smooth surfaces. It takes practice to judge the right bevel angles and to hold the blades just right when stroking the stone. I never quite mastered the art of doing this freehand.

But that's what they make honing guides for. The Veritas Honing Guide has such innovative features that it quickly became my favorite. First, you don't have to guess the bevel angle—you set it exactly with the auxiliary angle-setting jig. (The honing guide and angle jig are sold together.) Choose one of five common bevel angles (15°, 20°, 25°, 30°, 35°) on the pentagon-shape angle jig. Use that as a "template" for mounting the blade at that exact angle in the honing guide. When you hone the blade on the stone, you'll get the chosen bevel angle perfectly. Second, the guide's roller is mounted on an eccentric axle which allows an adjusting knob to set the bevel angle up or down in 1° increments. What a neat trick. After you hone the basic bevel, just turn the knob, hone a bit more, and you get a perfect micro-bevel angled one degree more than the basic bevel. When it comes time to rehone the tool, you can reproduce the original bevel angle exactly with the angle-setting jig.

The Veritas Honing Guide is well-made, and will accept blades up to 2 1/2 in. wide and 5/8 in. thick. It will also hold short blades like Japanese chisels and spokeshaves. It works for me.

Price: \$26.00 for honing guide and angle jig. Available from most mail-order catalogs and woodworking stores, or from: LEE VALLEY TOOLS, LTD., 1080 Morrison Dr., Ottawa, Ontario, Canada, K2H 8K7, (613) 596-3073.

David Sellers

GADGET HAPPY? VOTE FOR YOUR FAVORITE



Good news is worth sharing. If you own a woodworking gadget that you think is really great, drop us a line and tell us about it. We'll need the name of the product and a brief description of how you use it and why you think it's great. We'll count up your votes and publish a list of AW readers' top-ten favorite gadgets in a future issue.

To qualify, your woodworking "gadget" must be a store-bought accessory designed to make a woodworking tool or machine perform better or more safely.

Send your votes to:
Gadgets
AMERICAN WOODWORKER
33 E. Minor St.
Emmaus, PA 18098



CARVING WOOD SPOONS

BY RICK MASTELLI

I've been making wood spoons since 1982. During these past years, I've frequently found myself, head down, totally absorbed in shaping a split branch into an uncommon kitchen utensil. Particularly before holidays or special birthdays, I gather up my hewing ax, knife and gouges and go rummaging through the woods looking for a branch with just the right crook to create something both useful and impressive. Hand-carved wood spoons have an uncanny power to capture people's best attention. Unlike metal spoons, wood spoons don't scratch pots, clink on your teeth or feel cold to the touch. A spoon shaped by hand from a living tree does more than simply hold food. It pleases the eye, and invites use. Such an object has value, and makes eating a little more wholesome.

It was in 1982 that I first met Wille Sundqvist, a Swedish master of the ax and knife who was teaching at Country Workshops in North Carolina. We've had a few encounters since—including a two-week visit in Sweden, where spoon making is a tradition—that have helped to make my proficiency in the craft almost as great as my enthusiasm for it. Wille is a model teacher, and his lessons form the foundation for this article.

My favorite method of spoon construction begins with an ax. A spoon born of the ax has bones, meaning it's stronger, because the ax rives the wood by following the grain. You split the wood and hew it to rough shape, finding strong planes and bold angles to structure the finer work you need to carve with the knife.

But lately, I've been exploring the character of spoons roughed out on a bandsaw. The bandsaw has a few advantages over the ax: It's less wasteful of wood, allowing you to sometimes make two or three spoons out of the same wood blank. It's also easier to visualize and rough out the initial shape. For that reason it's a good way to begin spoon carving.

What Makes a Good Spoon?

You can find all kinds of wood spoons in craft galleries; even discount stores sell packages of stirring spoons or sets of salad servers. Rarely are these pleasing or practical forms. They're either two-dimensional cutouts—rough-edged and coarse—or heavy, clunky masses of wood that attract the wrong kind of attention. Think of a propeller, whose function and function alone yields a beautifully coherent sculptural form. Wille says an object should have all the wood necessary to make it strong and useful, but not a gram more. Some of his spoons are so finely carved their bowls are translucent, and they have lasted in his kitchen for more than a decade. The secret is to align the shape of the spoon with the flow of the grain and avoid weak, short-grain areas. You can't make a good ladle, for instance, from a straight piece of wood. Good ladles come from crooks in branches that look

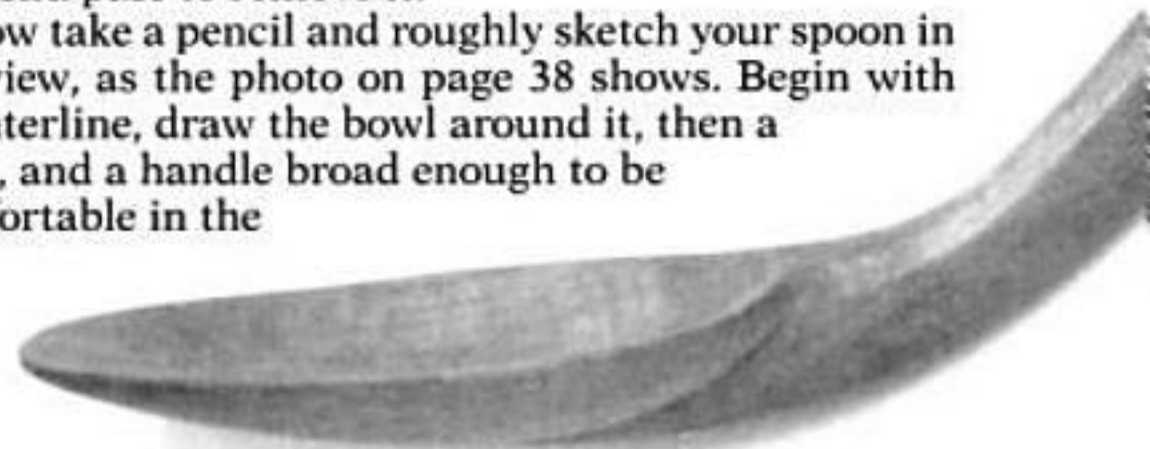
like ladles. But an eating spoon has a fairly mild curve to it, and although it's best made out of a piece of wood that has the same curve, (see Fig. 1) it is possible to coax an eating spoon out of a piece of dimensioned lumber or a split from a log. I prefer to work from split firewood or branches. Not only can you look for the right shape, but you can work them green, and carving green wood has it all over carving it dry. (We'll talk about drying a spoon without it cracking, later.)

What kind of wood makes a good spoon? Any close-grained, medium-dense hardwood, without an odor or resin to taint food, will do. That includes maple, beech, birch, all the fruitwoods (apple makes great spoons), and a good many shrubs, like holly, dogwood and laurel. Those in the photos are of soft maple.

Bandsawing the Spoon Blank

If you're working from a branch, start by sawing the wood along the pith or central point of heartwood. (See photo on page 38.) Left in the spoon, the pith would generate cracking. Usually, you can guess your way along the pith of a limb with a bandsaw. Sometimes it will surprise you, though, for the pith is not always in the center of a branch. You may need to take a second pass to remove it.

Now take a pencil and roughly sketch your spoon in top view, as the photo on page 38 shows. Begin with a centerline, draw the bowl around it, then a stem, and a handle broad enough to be comfortable in the



*From a
Crook to
the Cook—
Tableware
Shaped from
Tree Branches*

Morning porridge will taste a little more delicious with a spoon you carved by hand. Cast your eye over this lot to see how a common kitchen utensil fashioned out of wood can take on an infinite variety of forms.

hand. We all know what a spoon looks like, at least a metal one. But a wood spoon is a little different. It requires different thicknesses along its various sections. The lip can actually be thinner than on a metal spoon, if the bottom of the bowl follows the grain. The stem, because it's narrow in top view, has to be relatively thick in a side view. The handle, which is wide, can be relatively thin. (See Fig. 2.) Remember the propeller?

All of which leaves plenty of room for this to be *your* spoon. The shape of the bowl in top view can have much more variety than I've seen in metal spoons. (See lead photo.) Try a shovel shape, wider at the end than toward the stem. Proportioned properly, this can make a tempting eating spoon or an excellent serving spoon. If you intend this to be a kitchen spoon, angling the lip slightly (as seen in top view) will make it work better when scraping the bottoms and corners of pots.

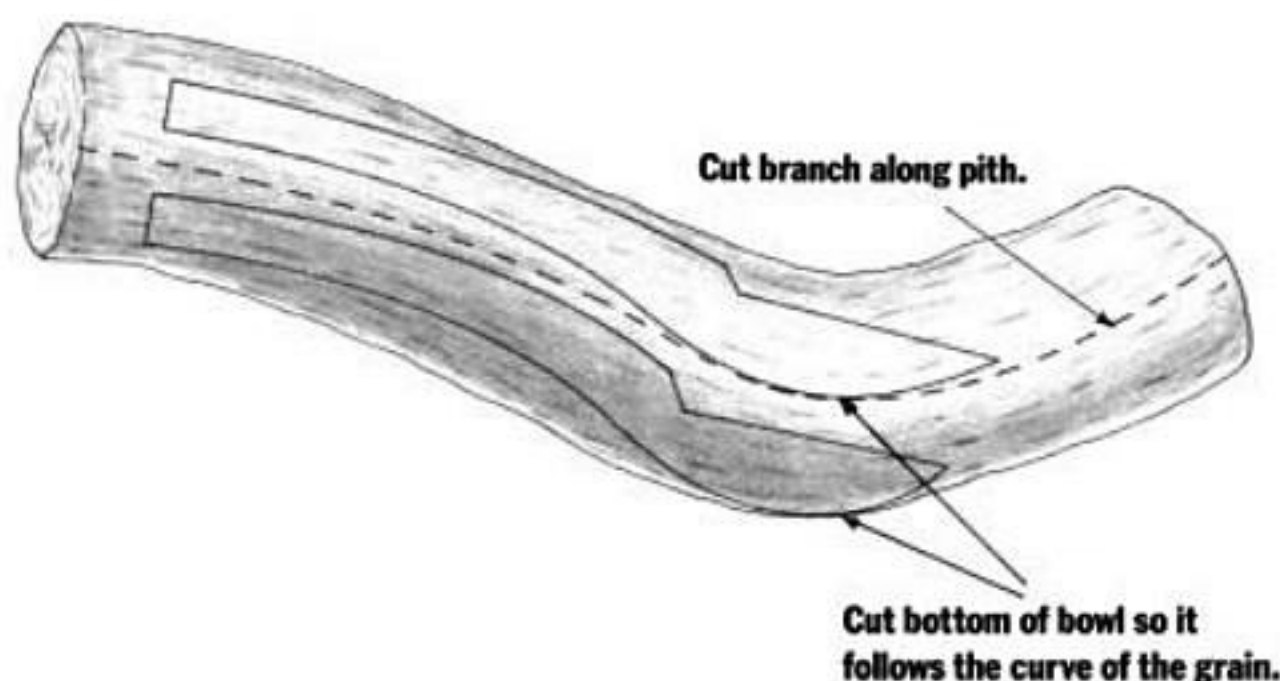
Handles can be comfortably shaped to suit any grip. You shouldn't have to compromise the spoon's function to express yourself creatively; no matter how original, if the spoon doesn't work well, it's not a good spoon. But a serviceable spoon, one that is a lasting

pleasure to use, can have all kinds of distinguishing characteristics. The creativity of craftsmanship lies in working within a set of sound design constraints.

Now bandsaw out the top view you've just drawn. This is pretty straightforward if you're working with a flat board. But if you're sawing a branch, there won't be stock directly under the blade to provide support while you're cutting. Keep a good, firm hold on the blank, lest it catch, roll and pinch the blade. I always begin with a couple of relief cuts where the bowl meets the stem. (See photo on page 38.) This makes bandsawing the bowl and the stem a cinch. Leave the handle a little long to allow room for a decorative finial.

Next, bandsaw the spoon's profile

FIG. 1: POSITIONING A SPOON IN A BRANCH



DRAWINGS BY KATHY BEAY



The best spoons start with a slightly curved branch. Begin by splitting the branch down the pith with an ax or on the bandsaw.

in side view. These cuts make the difference between a two-dimensional cutout and a functional piece of sculpture. You want to lower the plane of the bowl at an angle in relation to the stem. (See Fig. 1.) A relief cut at the stem and a long slice from the lip will release a triangular piece of waste. Remember to ensure that the bottom of the bowl follows the grain. The bowl is potentially the weakest place in the spoon, because it must be thin to get under food and into your mouth. So you don't want to see the annular rings of weak end grain in the spoon bowl. But you can fashion a relatively flat eating spoon from quarter-sawn (or split) stock without running into problems with the grain orientation. Note that the bowl is deeper toward the stem than it is near the lip. Remember to leave the stem thick, as well as the very end of the handle where you'll carve the finial. Your end result off the bandsaw should look something like the photo on page 39.

Carving the Spoon

Now I must tell you about the knife I use, the excellent Swedish *sloyd* knife (available from, Woodcraft Supply, 210 Wood County Industrial Park, P.O. Box 1686, Parkersburg, WV 26102, 800-225-1153). The size and composition of its blade distinguishes it from most carving knives familiar to American whittlers. It can vary, but the blade is typically 4½ in. long and ¾ in. wide, coming to a long, narrow point. The length may seem unwieldy or fragile, but every inch has its purpose and it is extremely rugged. The secret is the blade's laminated composition, consisting of hard, edge-holding steel in the center, sandwiched between layers of softer, less brittle, easier-to-hone steel. The combination maximizes the advantages of each steel.

The sloyd knife is sharpened with one long, perfectly flat bevel on each side of the edge. There are no micro bevels on a properly sharpened sloyd knife. The flat bevel provides support for the knife edge. You depend on that flat the way you depend upon the sole of a plane. If the edge were micro-beveled, you'd have to lift the back of the knife to get the edge in contact with the wood. Two problems result: You lose support for the edge, so there's no surface to guide the depth-of-cut, and you change the cutting angle. A sloyd knife should be sharpened to about 25°, the optimal cutting angle for most carving woods. The sidebar on page 40 describes the variety of grips and strokes used in carv-



PHOTOS BY IMAGE & WORD

Before bandsawing the spoon outline, make a couple of relief cuts where the bowl meets the handle.

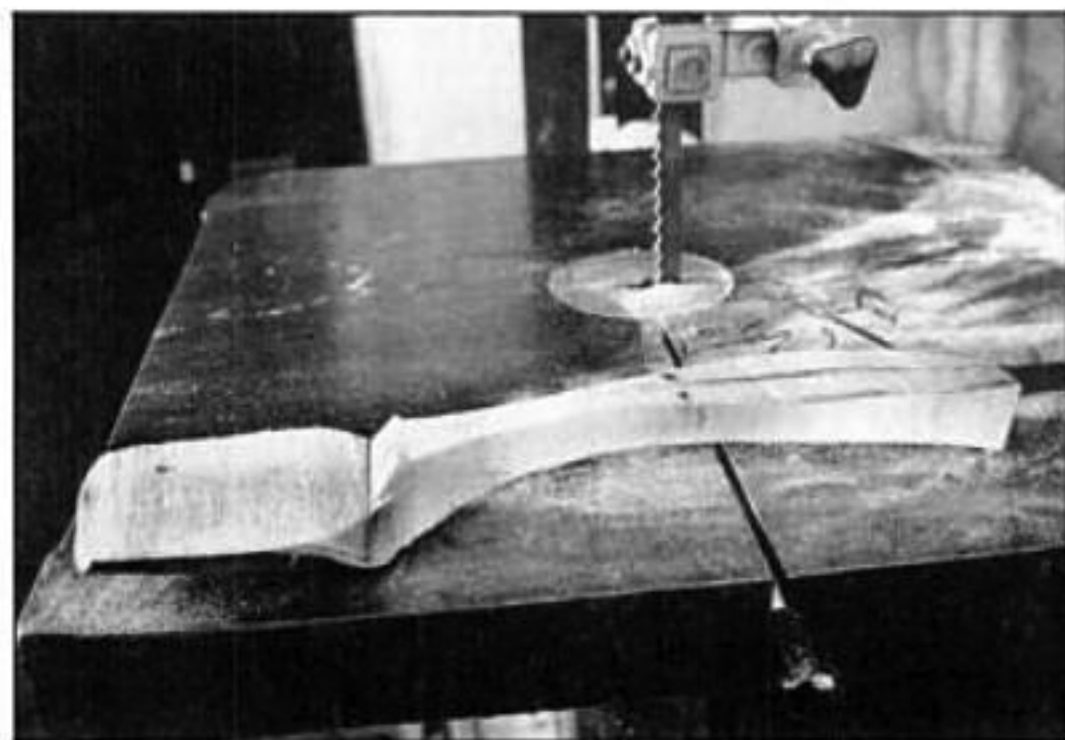
ing a spoon.

But before you do any carving, inspect your spoon blank carefully from all angles. Look for discrepancies in symmetry, both in the overall outline, and in the relative thicknesses of comparable areas. Also, look for any twist from the handle to the bowl. Your spoon doesn't *have* to be symmetrical; but it should have a deliberate shape. Wille says that a symmetrical spoon is more peaceful, because you don't have to wonder why it is not symmetrical. But asymmetry can be natural and pleasing, too, so long as it's purposeful. Look long and get to know the spoon you are about to carve.

As you take up your knife and begin redressing obvious problems, *continue* to look. Carving is like drawing in three-dimensions; you'll not be shirking progress if you stop often to see what you're doing. Carve with long strokes to balance the whole. When you see some gross thickness that needs thinning, get in and remove it all. Strive for large, smooth surfaces rather than carving in nicks, which just leave a scalloped surface, obscuring the overall shape.

Once you've cleaned up the bandsawn shape, you're ready to hollow the inside of the bowl. You need to know how big, what shape, and where the bowl will be before you can work out the balance for the rest of the spoon. Use a medium-sweep, straight, carving gouge, switching later to a wide-sweep, bent gouge.

As with the knife grips, you want to maximize



After you've handsawn out the general shape of the spoon, your blank should look something like this.

To hollow out the bowl of the spoon, use a medium-sweep straight gouge. Choke up on it, so that less than an inch of steel extends from your fist. A twist of your wrist will remove chips without endangering your flesh.



power, control, and safety. Take hold of the gouge by the shaft. Choke up on it so that the heel of your hand is within $\frac{3}{4}$ in. of the cutting edge. Cradle the bowl of the spoon in your other hand, and rest the heel of your tool hand on the edge of the bowl. Now a twist of the wrist will produce an arcing stroke—initiating the cut, following through and releasing the chip, as shown in the photo on page 39. Cut cross-grain to remove wood easily, and again, aim for long, smooth, complete strokes. Note that with the heel of your hand firmly lodged against the spoon, the edge of the gouge can't reach your flesh.

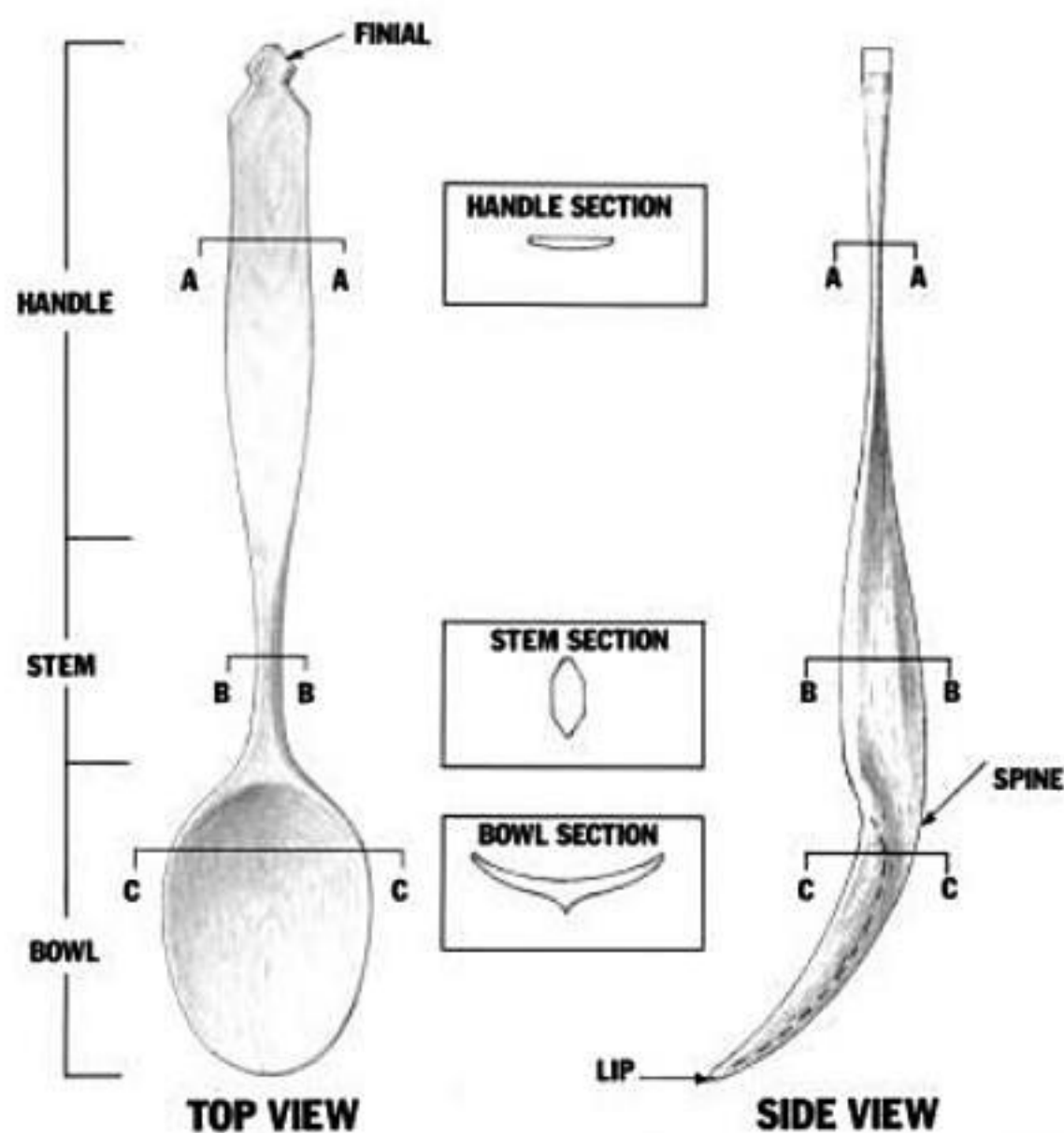
Shape the bowl shallow near the lip and deeper as it approaches the stem. (See Fig. 2.) You can make the sides of the rim thinner than the front or back, because the sides are stronger long grain. Be especially careful not to make the back of the rim too thin as it changes into the stem. That's short grain there. Don't carve too deep. You still have stock to remove from the outside of the bowl, and you don't really need a very deep bowl. That's a common beginner's mistake. You get so caught up in how intriguing it is to remove stock this way with the gouge that you forget to stop.

On the outside of the bowl, you can start with power strokes that waste a lot of wood. (See sidebar for description of strokes.) Then fine-tune the shape and smoothness of the surface with thumb-push strokes. (See photo, page 41.) Always work down grain, from the crown of the bowl toward the edges. Keep looking, regularly holding the bowl up to direct light to assess its thinness by the degree of translucency. Keep in mind that green wood is more translucent than it will be when dry. Use your fingers, too, as calipers. To carve a good spoon bowl, it's best to work back and forth between the inside and the outside of the bowl. But don't leave it unnecessarily thick, either. Remember, it should be a joy to use.

Next, work on the stem and handle. Start by smoothing all the planes that the bandsaw created. From the middle of the handle to its end, you'll be able to employ power strokes, but if the curve of the handle doesn't exactly correspond to the flow of the grain, you'll have to change direction and cut in from the handle end to the middle. Here, a thumb-joint grip works best, combining power and control. To smooth longer surfaces use the pull stroke. (See photo, page 41.)

Start beveling the edges of these smoothed planes. The pull stroke and thumb-push stroke work well here. You don't have to bevel everything, but it has the advantage of lightening the look and feel of the spoon, while retaining its strength. There's also a lot to be revealed, sculpturally by beveling these planes. A spoon is a sum of many bevels. It's important that these bevels work together to unify the form. One way to do this is to pay attention to the beginning and ending of each bevel; these can tie the shape together and make it flow.

FIG. 2: ANATOMY OF A SPOON



These bevels don't have to be consistent in width, as if made by a router bit. If you vary their depth, they'll vary in width, modulating the planes of the form. Edges can be softened to contrast with those left hard. Think of beveling as an accent, highlighting the dynamics of your spoon's form.

Along the stem, the bevels can be carved larger than the original bandsawn planes and, indeed, completely supplant them. The result is a stem that is a diamond in cross section, rather than a square. The lower arris of the stem, extending along the bottom of the bowl almost to the crown, creates one of the distinctive characteristics of the fine spoons Wille has taught me to make. This spine fortifies the bowl of a spoon and creates a stylish touch. It also presents a challenge to carve, and here is where the thumb grip (reinforced with the opposite hand), as well as the thumb-push stroke, work well.

Finally, the traditional way of finishing the handle's shape is to cut a decorative finial at the end. Wille says its purpose is to stop the eye, so it doesn't fly off into space. I've had the hardest time adding finials that don't look arbitrary and out of balance with the rest of the spoon. I've come to recognize that although there

are fortuitous exceptions, success arises from simplicity—the simpler the better. A couple of judicious nicks, one in each side, will finish your handle off nicely.

Drying the Spoon

The spoon isn't done, but eventually you'll find that the fraying of the green wood is hindering your finer cuts. This means that it's time to put the spoon aside to dry before finish carving. Drying hardens the wood and sets the fibers, making it possible to smooth the surface. The easiest way to dry it is to simply leave it in a moderately warm, moderately humid environment for a few days to a week. If you're in a hurry, you can dry your spoon overnight, hung over a wood stove or heat register. To keep it from cracking, boil up a potato and rub it all over the spoon, especially on end-grain areas. The starch in the potato will seal the grain and control the rate of drying, and because it's edible, there'll be no problem later.

Finish Carving

Finish carving is mainly smoothing cuts aimed at removing the ridges left by your rough carving. There's a lot of character to be added or brought out in



Power Strokes

FOREHAND STROKE: This is good for thinning the underside of the bowl toward the lip or the faces of the handle, so long as you can cut with the grain. Grasp the blank in one hand and plant the back of that hand, or your forearm, firmly on your thigh behind the knee-cap. Grasp the knife, edge away from you and back of the blade tilted well up into the web of your thumb. Locate the blade on the blank up near the hilt. Lock your elbow and power this stroke all the way from your shoulder. Angle the blade tip upward, so the tip trails along the cut, and you'll get a slicing action from hilt to tip. When the knife leaves the wood, it should release into air, no body parts in the way.



CHEST-LEVER STROKE: This stroke is as powerful as the forehand stroke, but a little shorter, providing a bit more control. Hold the knife handle so the edge of the blade points in the direction of the web of the thumb, and grasp the blank like the knife in the other hand. Place the blade across the blank up in front of your chest. Wrists locked and elbows akimbo, you can lever your arms apart off the sides of your chest. As with the forehand stroke, start at the hilt, let the tip trail, and the edge will slice, the knife flying out into air. This grip works wherever the shape and the grain don't require a stop cut.



Carving Toward Yourself

PULL STROKE: Hold the spoon blank at its end between thumb and forefinger, and stabilize the opposite end against your chest. Hold the knife close to the hilt with your thumb on the side of the blade. Lock your arms to your sides and use your thumb to press the blade firmly against the wood. Now when you draw the knife toward you, tip trailing for a slicing cut, the contact between arm and chest limits the travel. By bending your wrist through the stroke, you execute a relatively long, smooth cut, as is needed along the edges and bevels of the handle and stem. You get more power with this stroke by pushing the knife hand with the fingers of your other hand.

GRIPS AND STROKES

Spoon carving is not simply a matter of random knife strokes. A successful spoon is the end result of several different, fairly sophisticated strokes and grips. They all maximize power, control and safety. You need to cut with the grain, of course, and that means getting into some tricky areas. Also important for smooth, efficient carving is to *slice*, moving the cut along the length of the knife edge, rather than just pushing forward at one point on the knife edge.

finish carving, and usually it's the spoon itself that dictates the work. Once a line or plane is established, for instance, it begs to be smooth and regular and well balanced. There's not much debris produced in finish carving, so it can be done in your living room, or on a train (as Wille is wont to say), collecting the chips in an apron in your lap.

It is possible to finish your spoon finely enough with the knife alone. But more commonly, spoons are sanded after the finish carving. Follow the usual regimen in sanding, beginning with paper no coarser than 100-grit, and don't skip grits through to 220-grit. Because this is hand sanding, cloth-backed sandpaper, which can be folded and bent to fit the shapes of the spoon, works best (available from Woodworker's Supply of New Mexico, 5604 Alameda Place, NE, Albuquerque, NM 87113, 800-645-9292). Be careful not to soften edges or alter shapes accidentally. Sanding is actually a creative shaping process, and it will clarify your spoon's form.

Finishes and Final Touches

Spoons ought to be oiled to bring out the color and luster of the wood and to seal them somewhat against

food, liquids and such. Of course, you want to use a non-toxic finish. My choice is walnut oil, which can be found in health-food stores and, unlike many other vegetable oils, does cure. Apply several coats, leaving the spoon in an oven (on its lowest "warm" setting) overnight to hasten the drying.

Wood spoons are traditionally incise carved with the makers initials, a dedication, a date, and usually a decorative design, too. The possibilities are endless. For now, try holding your sloyd knife like a pencil, (the edge won't cut you if you don't slide around) and at least get your initials in the back of the handle. Two cuts per line, angled at about 60° to one another, releases a long triangular chip. Practice, of course, on some scrap wood. Once you see how easy it is, mark the evidence of your new skill with a date, too. ▲



Rick Mastelli is a free-lance writer, editor and video-tape producer in Vermont. He edited Wille Sundqvist's book Swedish Carving Techniques, published by the Taunton Press.

FOR CARVING SPOONS

Never forget that the knife should not end up in your flesh, which means either carving away from yourself, or incorporating stops in your strokes. There are lots of reasons why you can't always carve away from yourself, in spite of what you may have been told in shop class. There are places on the spoon where the grain changes direction, so you'll need to make very

controlled cuts (called *stop cuts*) that stop short of cutting against the grain. These same stops can keep the knife from cutting your flesh, too.

Knife strokes can be divided into three general categories: power strokes, carving toward yourself, and smoothing strokes. Here is a sampling of the ones most frequently used.—R.M.



DRAW GRIP: This grip has a couple of variations, depending on the direction of the stroke along the length of the blade: It can be from hilt to tip, or from tip to hilt. The general idea is to draw the knife toward the thumb, while the thumb pushes the wood past the knife. So fine is the control possible, it is common to bring the edge right up to contact the thumb, but you can get more of a slicing action and more power by moving the thumb to the side and cutting past it. This is a natural grip to thin any area accessible while your thumb presses solidly against the stock.



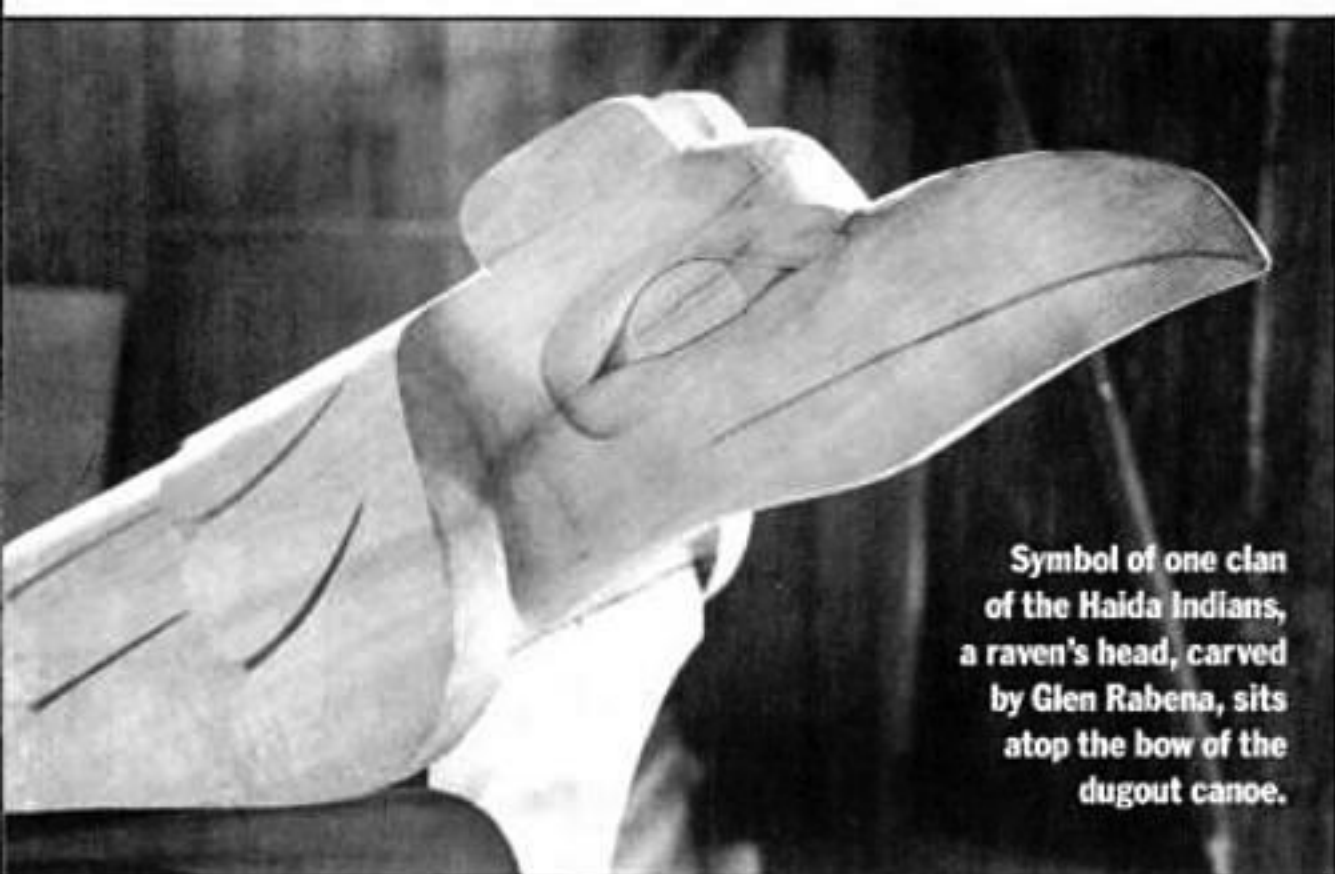
THUMB-JOINT GRIP: This grip uses the immense leverage that comes from wrapping the thumb around the stock (up to the first joint) and drawing the knife toward the thumb in an arcing motion as you close your hand (as if making a fist). The stroke stops short of the thumb when the knuckle of the index finger hits the bottom of the work. Hold the knife in your fingers rather than in the palm of your hand, and orient the edge away from your palm. The thumb-joint grip is one of the most versatile grips, useful along the length of the stem and handle, as well as the back of the bowl. As with the pull stroke, this grip can be reinforced by the other hand.



Smoothing Strokes

THUMB-PUSH STROKE: Most of the finish work on a spoon can be accomplished with this stroke. Simply rest the knife bevel on the blank and, holding the blank in your other hand, use the thumb of the blank-holding hand to push the blade forward. Use the knife hand to guide the blade at an angle through the stroke for a slicing cut. Aim for increasingly long, smooth strokes as you finish the spoon.

A TALE OF Two CANOES



Symbol of one clan of the Haida Indians, a raven's head, carved by Glen Rabena, sits atop the bow of the dugout canoe.

BY SIMON WATTS

A few months ago, two sea-going canoes were built simultaneously in the San Francisco Bay area. One was constructed at Fisherman's Wharf in San Francisco, the other, three miles across the bay in Marin County. When the projects began, neither group of builders knew of the others' existence. Word soon spread, and after some visiting back and forth, everyone involved saw a unique opportunity to compare

building methods, tools and differences in approach.

San Francisco Maritime, National Historic Park has an active teaching program, and for the first time a small class was building a 15-ft. canoe. I was the instructor. We were building it lapstrake. In this process, $\frac{1}{4}$ -in. red-cedar planks were overlapped (like clapboards on a house) and fastened with copper tacks. The design was traditional North American, an obvious grandchild of some ancestral birch-bark canoe. None of us had ever built such a craft before, but we had detailed plans and a building manual. When in doubt, we just followed instructions.

Meanwhile, across the bay in Marin County, a 26-ft. dugout canoe was being hewn out of a huge log of red cedar. Bay-area sponsors had invited two Haida-Gwaii Indians, Reggie Davidson and Glen Rabena, down from the Queen Charlotte Islands in Canada to build this traditional oceangoing canoe. The canoe began as a whole tree, a 500-year-old red-cedar log. "It was going to be turned into lumber," said Glen, "but we got there first."

It turned out that Reggie Davidson, the project leader, hadn't built a canoe before, either. All he had to go on were some old photos, a model he had made and the recollections of the older members of the tribe. His hands were guided by centuries-old tradition and his own intuition; our efforts were governed by a set of mere blueprints. From this followed the very different techniques (and attitudes) that the two groups used to shape their respective craft.

Our lapstrake crew started with an accurate set of forms, or molds, which determined the exact shape of the inside volume. We then planked the boat around these molds, attaching each plank to its neighbors with copper tacks. Next, we steamed slender ash ribs, bent them into the canoe and fastened them with copper rivets.

Reggie and Glen took a different approach. First, they shaped the outside of the log, roughing it out with a chainsaw and then did the final shaping with hand tools—adzes, planes and large chisels. Only when sat-

PHOTOS BY SIMON WATTS

The dugout canoe (left), carved out of a 500-year-old red-cedar log, stands in stark contrast to the lapstrake canoe, (right) built out of red-cedar planks and ash ribs. The dugout was built by the Haida Indians from a long-standing cultural tradition. The lapstrake was built during a course at the San Francisco Maritime from a set of blueprints.

ified with the shape of the outside did they turn the canoe over and begin hollowing out the interior.

As a guide to gauge the dugout's wall thicknesses at different sections, they drilled a series of small holes from the outside of the canoe. Into these holes they inserted pieces of lead-alloy solder equal to the desired wall thicknesses. They then roughed out the inside, and as soon as the blade of an adze found the shining disc of the solder, they knew exactly how much wood remained.

As the techniques varied, so did the tools. We, in San Francisco, used guided tools such as planes and spokeshaves—tools designed to remove only a few shavings at a time. For the builders of the dugout, free-swinging tools such as the adze were essential, because of the sheer volume of wood that had to be removed. These are difficult tools to master. They require a strong arm, as well as skilled judgment.

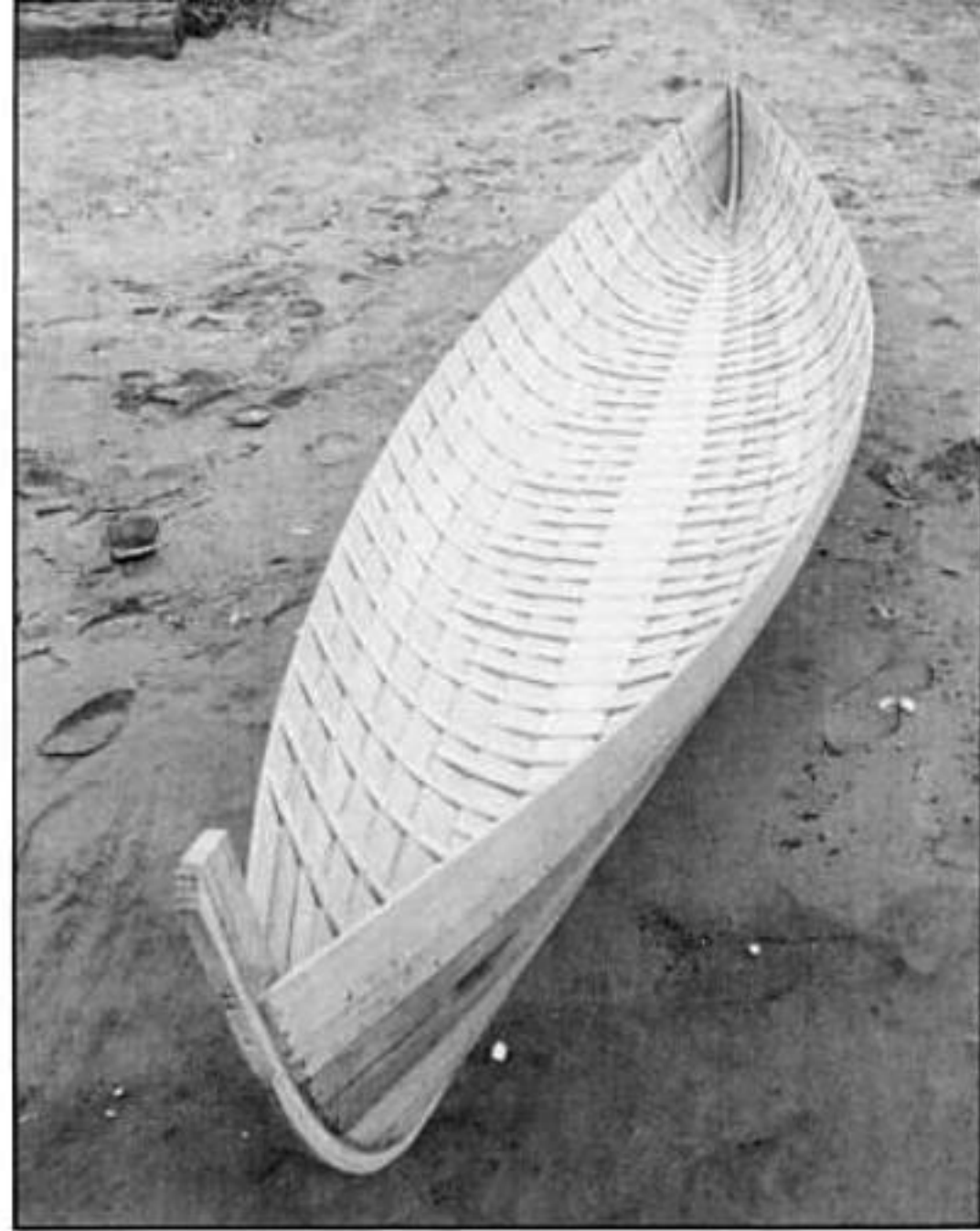
The width of our lapstrake canoe, called the beam, was already established by the molds. Spring back in the ash ribs increased it only fractionally. The beam of a dugout canoe, however, is governed by the diameter of the log with which you start. It can only be increased by spreading, a dramatic and crucial operation. Reggie and Glen decided to do this one night while there were no onlookers. First, they hoisted the canoe up, and placed two sturdy sawhorses underneath it at bow and stern. They then filled it about a quarter of the way with water, while rocks were being heated in an open fire. Dropping the hot rocks into the water heated it rapidly—eventually to a boil.

This heat and moisture, combined with the added weight of the rocks in the center, encouraged the canoe to sag slightly in the middle. This allowed the two sides to spread—from 41 in. to 53 in.—a gain of a foot. They then placed struts inside the canoe to prevent the sides from closing again.

While the dugout was being spread in this fashion, we had finished up our lapstrake canoe, strapped it to the roof of a car and watched it depart for Fresno, California, with minimal ceremony. A good project with no major mishaps, but not much magic, either.

When I next saw the dugout, it had been painted in traditional Haida style with red and black acrylic paints. Reggie was adding the finishing touches to a large raven carved by Glen, its wings partly spread. This raven, symbolizing the central character in Haida mythology, was later fastened to the bow with wooden pegs.

What had previously been a very large chunk of wood shaped like a canoe had become a work of art. I saw the paintings as depicting the complex relationships between all living creatures—birds and humans, humans with each other, fish, feathers and skin. Shark's fin and raven's wing; raven's wing and killer whale. Powerful images brought together in one con-



SIMON WATTS, COURTESY OF SAN FRANCISCO MARITIME NATIONAL HISTORIC PARK COLLECTION

sistent, gripping scenario.

I recognized, with some envy, that these men were working within a coherent and long-established tradition. They could create a canoe by drawing on literally centuries of experience—not just their own. As Robert Davidson, Reggie's brother and foremost Haida artist put it, "We don't have to talk of the 'last' boatbuilder or the 'last' carver anymore. We are a living culture."

Non-natives can go to history books and do the same thing, but that living connection to the past has, for the most part, been lost. Technological progress tends to make our knowledge and skills obsolete. We can no longer go back and ask our fathers to teach us how things were done.

Launching day is cold and rainy. The dugout canoe sits like a princess on the concrete floor of the drafty shed where it was built. Reggie strips to the waist and puts on his robes, a black shirt with a red Haida design on the back. A short robe of deerskin trimmed with white fur goes over that. On his head, a conical hat woven from spruce roots, and on his feet, anklets of tiny deer hooves that tinkle as he walks.

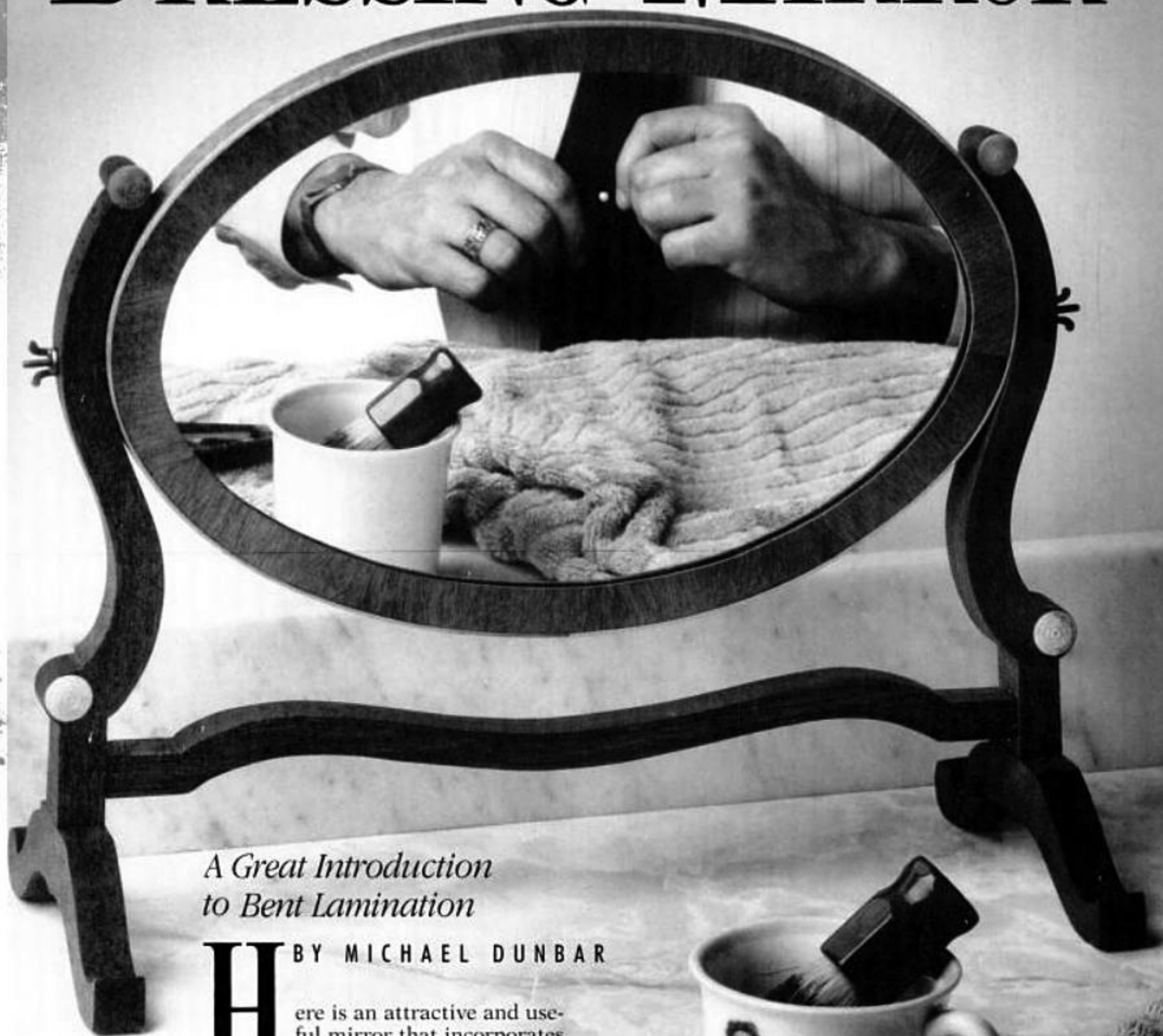
The rain pours down. Word of the launching has drawn a large crowd, which hushes expectantly as a drum begins to beat softly. Nonnie Florence, Robert and Reggie's grandmother, (and at 96 the oldest member of the Raven clan) says a prayer in her own tongue. Robert steps forward and places eagle down on the carved raven at the prow and then dusts the canoe from stem to stern. The sacred eagle feathers drift gently inside. Nonnie Florence names the canoe, "Yeth Tluu," (Raven canoe). Robert adds, "It must be named three times." The crowd repeats the words, "Yeth Tluu." Twice more, and the canoe is named. A conch

shell sounds and a sudden gleam of sun brightens the shed, lit from within and without. ▲



Simon Watts is a journalist and teaches wooden boatbuilding. He's also a contributing editor of AMERICAN WOODWORKER.

FEDERAL DRESSING MIRROR



*A Great Introduction
to Bent Lamination*

H BY MICHAEL DUNBAR

ere is an attractive and useful mirror that incorporates a variety of techniques that look rather impressive but aren't all that difficult. You'll learn to do simple bent lamination, cross-grain edge banding and miniature turning. And in the process, you'll turn a few small pieces of wood, too good to throw away, into a Federal-period reproduction.

The mirror has an interesting history. It originally belonged to the Pierce family of Portsmouth, New Hampshire, and may well have been made to furnish its Federal-period mansion, which still stands on Haymarket Square. The maker may have called it a "swinging looking glass," or just a "swinger."

Originally, a "swinger" was placed on a dressing table where a woman put on makeup and jewelry or a man shaved. (The mirror predates the development of the bathroom.) My wife and I keep the mirror at eye level where she can check her hair and I can make sure my tie is straight before leaving the house.

Building the mirror is relatively easy. First, you'll saw out an oval form and laminate strips of wood around it to make the frame. Next, you'll cut cross-grain banding and glue it to the face of the frame. Making the stand entails sawing out the parts and joining them with mortises and tenons. You'll need to turn the small button-like decorations called "paterae" that decorate the stand. For the final touch, you'll use a scratch stock to decorate the edges of the stiles and stretcher.

The visible parts of the original mirror (and the reproduction I'm making in the photos) are mahogany. The secondary wood (used for unseen parts) is white pine. You can make the mirror out of any hardwood you choose, but avoid a wood with large open pores that would show on the visible end grain of the feet.

Making the Frame

The oval frame of the mirror is made by bending three thin strips of wood around an oval mold or form and gluing them together, as shown in the photo on page 46. The form determines the size and shape of the inside of the mirror's frame.

To make a form, begin by drawing the oval shape on a piece of poster board, as shown in Fig. 2. Check the oval you've drawn to be sure it measures $14\frac{1}{8}$ in. $\times$ 9 in., and cut it out with a utility knife. Trace this poster-board pattern onto a piece of $\frac{3}{4}$ -in. thick plywood and saw it out.

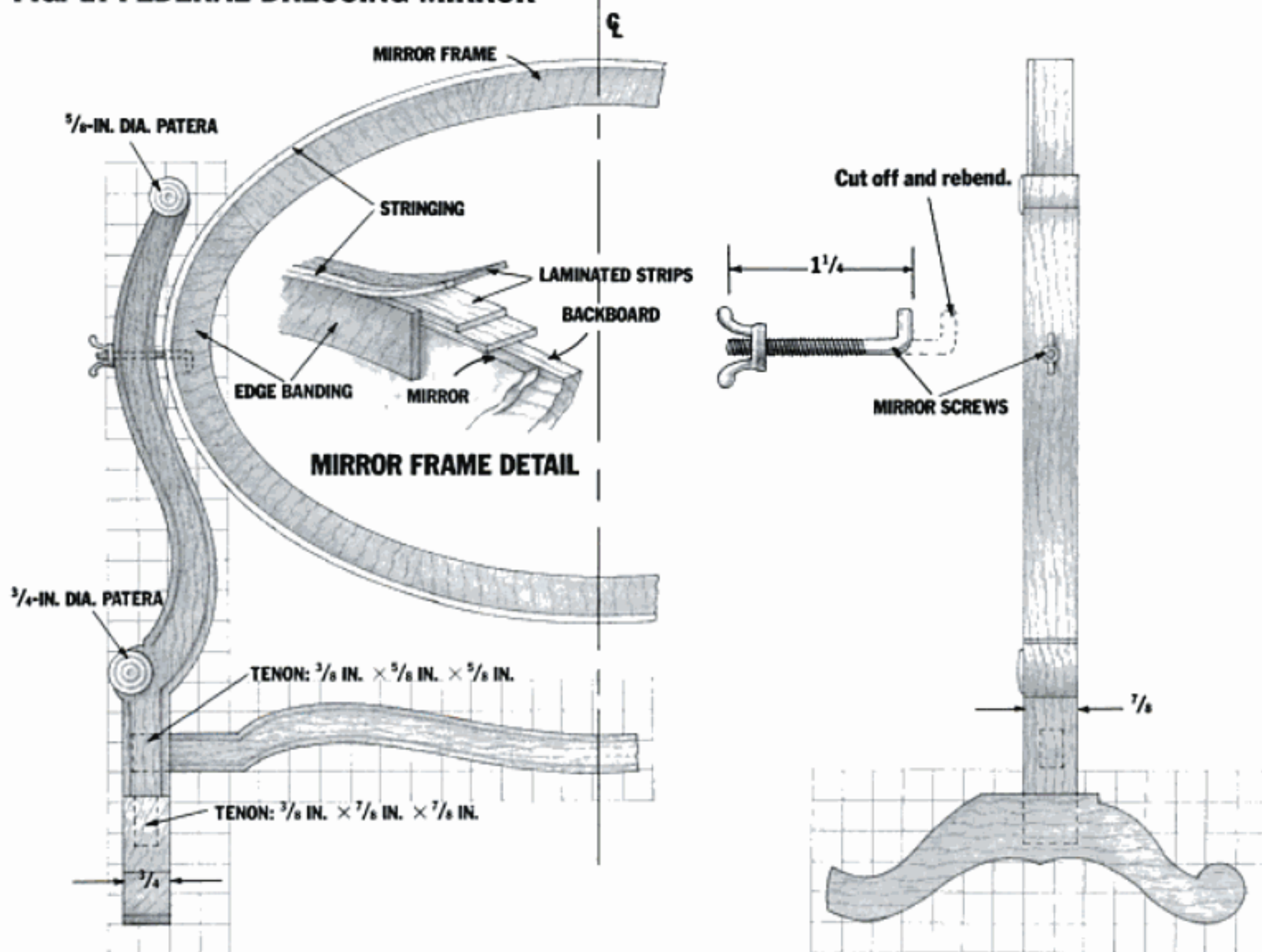
A backboard screwed to the back of the form keeps the edges of the laminating strips aligned. I made the backboard from a piece of $\frac{1}{2}$ -in. plywood several inches longer and wider than the oval form. Apply a layer of paste wax along the edge of the form and the adjacent part of the backboard. Wax will prevent squeezed-out glue from the laminated frame from adhering to the form or backboard.

The laminating strips must be cut from straight-grained wood without flaws that might make them bend unevenly. The outside lamination of the original is mahogany. The inner laminations can be a less expensive wood. (They're white pine on the original, but there is no reason why you can't use the same wood for all three laminations.)

Prepare the two inner laminations first. Begin with a straight-grained piece of wood at least 42 in. long and wide enough to give you two $\frac{5}{8}$ -in. wide strips. Plane it to a thickness of $\frac{3}{32}$ in.

A piece of wood this thin is best slit into strips with a cutting gauge (available from Woodcraft Supply, P.O. Box 1686, Parkersburg, WV 26102, (800) 225-1153) rather than a saw. Set the gauge's fence to $\frac{5}{8}$ in.

FIG. 1: FEDERAL DRESSING MIRROR





PHOTOS BY ANDY EDGAR

An oval form determines the size and shape of the mirror frame. Here, lamination strips are bent around the form and marked for length. The strips will then be glued to each other around the form.

and cut two strips, as shown in the photo above, right. While thin veneer can be cut through from one side with a cutting gauge, you may need to cut these laminations from both sides.

Wrap one of the strips around the oval bending form, overlapping the ends. Mark it where it begins to overlap and cut it off square with a utility knife so the two ends just butt, then wrap the strip around the form again. While holding it in place with one hand, wrap the second strip around the outside of the first strip and mark it for length. (A second pair of hands makes this a lot easier.) Cut the second strip to length. This outer strip will be slightly longer than the first.

Spread glue on the inner surface of the outermost lamination strip. Wrap the inner strip around the form, hold it in place, and wrap the outer strip over it. Position the two strips so the butt joints are at least several inches apart to avoid a weak spot. I put the joints on opposite sides of the oval. Draw the two strips together around the form with a band clamp. Before the final tightening, make sure the edges of the strips are aligned.

Prepare the third strip while the first two laminations are drying. The frame's outside corner (the third layer's forward edge) is a narrow strip of contrasting wood called stringing. I used maple for the stringing in my reproduction mirror frame.

I glued the maple to the mahogany before cutting the lamination strip to size. I began with a 42-in. long piece of mahogany about 1 in. $\times$ 1 in., and glued a $\frac{1}{2}$ -in. layer of maple to it. When the glue dried, I planed the maple layer to $\frac{3}{32}$ in. thickness, turned the piece over and planed the mahogany to $\frac{5}{8}$ in. thickness, for a total thickness of $\frac{23}{32}$ in.

From this sandwich, I ripped a thin strip with the stringing along one edge, then planed the strip to $\frac{3}{32}$ in. thickness. I hand planed the outer surface to remove any saw or planer marks.

When the two inner laminations of the frame are dry, remove the band clamp. The laminations fit tightly around the form, and you will have to pry them loose with a wide-blade tool, such as a putty knife, to

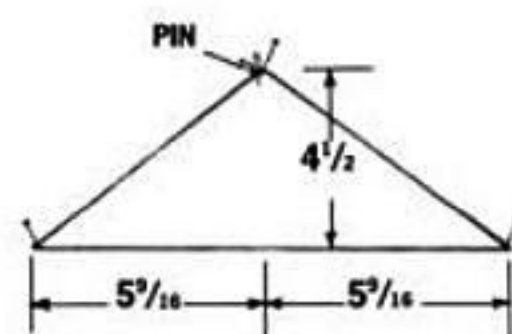


A cutting gauge will cut right through thin stock to make strips for laminating the mirror frame. It's quick, safer than a saw, and less hassle than a straightedge and knife.

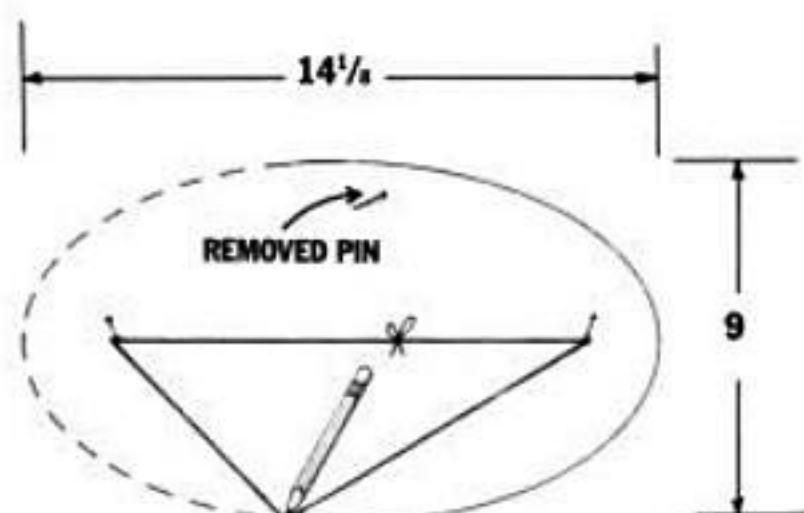


The corner stringing for the mirror frame begins as a layer of maple glued to mahogany. Plane the maple to $\frac{3}{32}$ in. thickness, turn it over, and plane the mahogany to $\frac{5}{8}$ in. thickness; then rip off strips with a maple edge.

FIG. 2: DRAWING THE OVAL FORM



1. Place pins as shown, and tie cotton twine snugly around them.



2. Remove pin as shown, and trace oval with pencil in cotton loop.

avoid denting the laminations. When the frame is off the form, scrape away any glue that you missed earlier, then run a sharp block plane over the edges to smooth and square them.

The next step is to make two additional poster-board patterns traced from the partially laminated frame. Lay the frame on the poster board and make the first pattern by tracing around the inside edge of the frame. This pattern will be for the mirror and backboard. Make the second pattern by tracing around the outside edge of the frame. This one is for the cross-grain edge banding shown in Fig. 1. Label the patterns so you don't confuse them. You may notice that these patterns are not quite the same shape as the pattern that you made for the form. That's to be expected; when a lamination is removed from a form it always springs back a little.

Next, put the frame back on the form and wrap the third lamination strip around it with the maple stringing facing upward. Overlap the ends, mark for length, and cut it as you did for the first two laminations. Apply glue to the third lamination strip, and clamp it in place with the band clamp. Once again, make sure that the butt joint is several inches away from the other joints. Before putting the frame aside to dry, remove any excess glue from the corner formed by the stringing and the inner laminations. When you apply the edge banding, you will want this corner to be clean and unobstructed.

While the third lamination is drying, return to the two patterns that you traced from the frame. Cut out the inside (mirror and backboard) pattern about $\frac{1}{16}$ in. inside the pencil line so the pattern is slightly smaller than the laminated frame's inside surface. Cut the backboard to this pattern. The type of wood you use for the backboard is not important; I used pine that I planed down to $\frac{3}{16}$ in. thick. When you're finished with the backboard, take the pattern to a local glass cutter to have the mirror cut.

The second oval pattern is for the edge banding that holds the mirror in place. Adjust a compass or pair of dividers to $\frac{9}{16}$ in. and trace a line inside of, and parallel to, the original line, creating two concentric ovals. Cut along both lines with a sharp utility knife, forming a $\frac{9}{16}$ -in. wide oval-shaped strip of poster board whose outside edge matches the inside edge of the stringing.

The edge banding forms a lip to hold the mirror inside the frame, as shown in Fig. 1. The edge banding is made from thin strips of wood cut so the grain runs across their width rather than along their length. To make it, begin with a piece of wood 4 in. to 6 in. wide

by a foot or more long, and thickness it to $\frac{3}{32}$ in. Hand plane one surface to remove any machine marks, and mark it as the finish surface.

Next, cut the poster-board edge-banding pattern into lengths that are slightly shorter than the width of your edge-banding material. My edge banding was cut from a piece of wood $4\frac{1}{2}$ in. wide and required cutting the pattern into nine pieces. Number the strips sequentially. One at a time, lay the segments across the width of the edge-banding material and trace their shapes. Number the pieces to match the patterns. Carefully cut them out with a utility knife, as shown in the photo below. Leave just a little extra at the ends so you can trim them.

The edge-banding segments should fit neatly inside the lip formed by the stringing on the mirror frame. Make any necessary adjustments to the outside edge of the banding with 220-grit sand paper wrapped around a hardwood block. Trim the ends of the segments. To get tight butt joints where the ends join each other, hold a block plane upside down and draw the edge banding over the blade.

When you're satisfied with the fit of all the segments, glue the edge banding to the oval frame. When the glue is dry, smooth the curve of the inside edge with 220-grit paper wrapped around a round sanding block, then finish sand the frame.

Making the Stand

Fig. 1 provides the shapes of the stiles, feet and stretcher. Note that the stiles are $\frac{7}{8}$ in. thick, while the feet and stretcher are $\frac{3}{4}$ in. thick. Saw out the parts with a jigsaw or bandsaw or by hand with a small bow saw or even a coping saw.

Clean up the saw marks and smooth the edges of all of these parts, then decorate the forward surfaces of the stiles and stretcher by incising the lines shown in Fig. 1 with a small scratch stock. (For more on this technique see *AW*, #19, page 62.)

The parts of the stand join together with blind mortises and tenons. Cut the joints, then assemble the stand without glue. Put the mirror frame in place between the stiles and gently clamp it there with the front face of the frame flush with the front face of the stiles. Drill the holes for the mirror screws (part U36 available from Ball and Ball, 463 W. Lincoln Highway, Exton, PA 19341, 215-363-7330). The holes should be centered in the edge of the stiles and in line with the major axis of the oval. The screws from Ball and Ball are too long for this mirror, so you'll have to shorten them, as shown in Fig. 1. Cut off the short leg of the screw at the right angle. Measure back on the rod $\frac{3}{8}$ in. and bend a new leg by holding the screw in

up at a hardware store. Mount the framed mirror between the stiles with the mirror screws, turn it to you, and notice the fine craftsman looking back.



Mike Dunbar is a furniture maker and author of books on Windsor chairs, Federal furniture, and antique tools. He is a contributing editor to *AMERICAN WOODWORKER*.

soaking in water.)

Carefully cut

The paterae are so small you'll need miniature turning tools. You can make these by grinding old screwdrivers to shape, or buy a set (available from Garrett Wade, 161 Ave. of the Americas, New York, NY 10013, 800-221-2942). Bone scrapes better than it cuts, so a round-nose scraper and a skew for the ring pattern will do nicely. Turn the edge of the disk to a circle, then smooth the face and make it slightly domed. Fi-

BENDING WITH A HEAT GUN

BY FRED MATLAC

Most woodworkers know that they can bend wood fairly easily by steaming it or even boiling it. Relatively few woodworkers realize that they can bend thin strips of

want to bend a bit tighter or that I want to take a permanent bend. As the bent strip of wood reaches the right temperature, the springiness goes out of the wood and it takes a permanent bend. The wood

Sometimes, doors so dominate pieces of cabinet furniture that woodworkers spend hours refining the door's design and detailing. Unfortunately, the choice of hinges is too often an afterthought. Hastily chosen hinges can mar the look you've so carefully considered or may not allow the door to work as you intended. And poorly designed or poorly made hinges can cheapen an otherwise exemplary piece of furniture. In this article, I'll describe different types of cabinet doors and offer a selection of hinges that work on the doors.

What makes a quality cabinet hinge? Traditionally, the best cabinet hinges were made of brass, a durable, relatively easy to work metal that looks like gold when it's polished. Brass is still used today, though well-made traditional-style hinges are sometimes available in other metals. (Forged-steel hinges made for period reproductions, and European hinges designed for high-quality built-ins are another kettle of fish entirely, and I won't discuss them here.)

I think the most important characteristic of a quality hinge is the fit of the interlocking knuckles to each other and to the pin they pivot on. (See Fig 1. for anatomy of a hinge.) The less play, the better. The leaves and barrel (the knuckles and pin as a unit) should also be robust. The thickness of the leaves will vary with the size and type of hinge, but in general, thicker is better. Finally, the hinge should be well-finished and its edges crisp and square, not skewed or rounded by careless machining or buffing. The screw holes should be accurately bored and countersunk. On decorative hinges, the details should be well defined.

You probably won't find the quality or variety of hinges in your local hardware store that you'd want for your own handmade cabinetry. That means the first step in hinge-conscious design is to expand your hinge horizons. You can start by studying the examples shown on these pages, selected from mail-order sources. They represent a good assortment of basic styles. A few dollars spent on the catalogs of the companies listed on page 53 will provide a nice library of hinges for reference.

Once you're "hinge literate," you'll need to ask yourself some basic questions to decide on the best hinge for the job: What kind of door are you hanging? How large is the door and how much does it weigh? How much of the hinge do you want to see? How far do you want the door to open? To help answer these questions, you'll first need to get familiar with the different kinds of cabinet doors.

Door Types

Hinged cabinet doors can be divided into four basic types, as shown in Fig 2. A *flush-mounted* door fits inside the carcass, its outer face in the same plane as the edges of the case or face frame. An *overlay* door fits over the carcass, covering the edges of the case. A *lipped* door fits part way into the carcass, its rabbetted lip covering a portion of the edges or face frame of the case. A *hybrid* door combines two types. A door that is flush with the carcass top and bottom but overlays the sides, for example, could be hung as a flush or an overlay door, depending on the hinge you choose.

Door size—As a rule, large, heavy doors require more and/or stronger hinges than small, lightweight



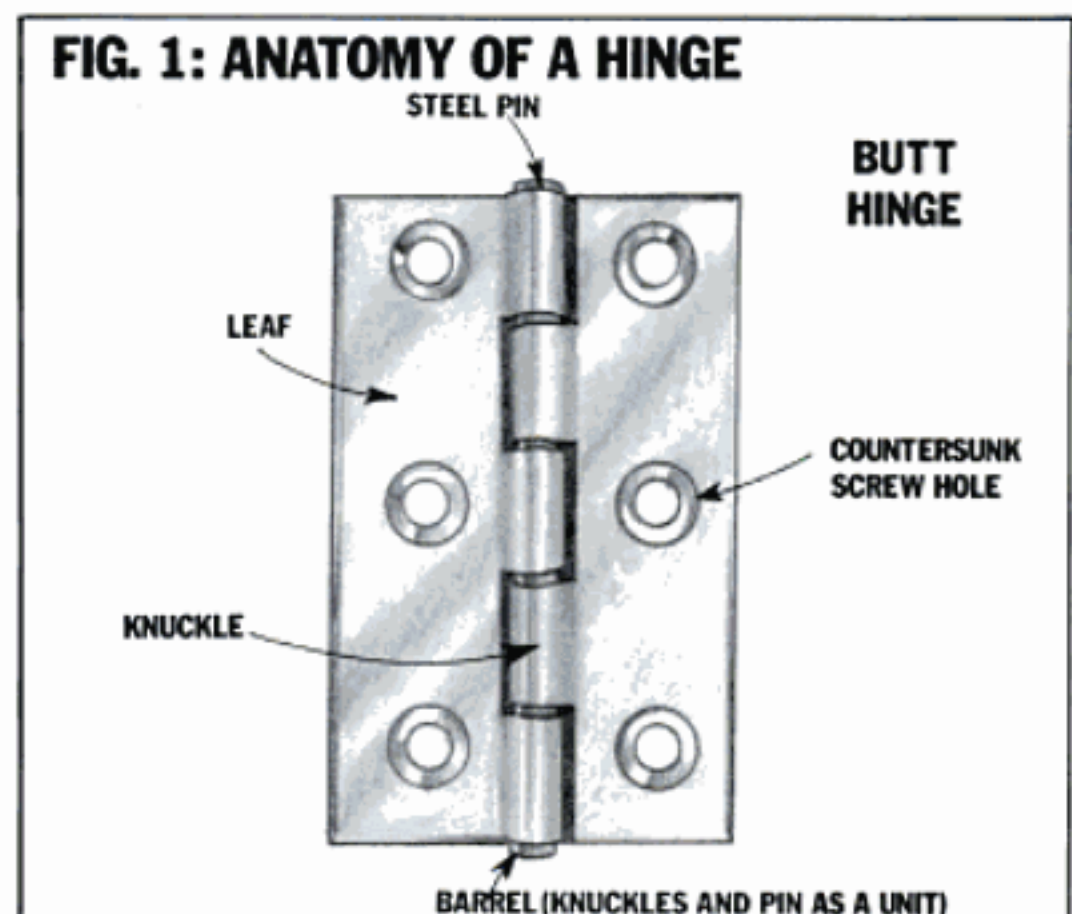
Cabinet Hardware Made Easy

BY ROGER HOLMES

doors. I'm inclined to use brass butt hinges rather than knife hinges on heavy or tall doors, so I can add a third hinge midway to help support the door or keep it from bowing. When you're considering size and weight, remember that a wide, lightweight door can put as much strain on its hinges as a narrow, heavy door can.

Appearance—Hinges can be highly visible and decorative, partly visible or completely concealed. There are handsome, surface-mounted decorative hinges for most types of door. Many of these hinges evoke an historical period, but some, like the "H" hinge, are equally in place on contemporary pieces. The leaves of brass butt hinges are usually hidden in mortises, but the polished brass of the slender knuckles, visible on the hinge stile, furnish a restrained accent. Offset knife hinges, showing only their thin pivots, are even less obtrusive, while a Soss hinge (the trade name of a common hidden hinge) disappears altogether. I'll describe all these later.

Door throw—This is not an Olympic sport. It's shorthand for how far a door opens. For convenience, most doors should swing through at least 90°, while a



DRAWING BY GLENN HUGHES

180° throw is usually more convenient. If you want to swing a door all the way around against the cabinet side, you'll need to get hinges that allow a 270° throw.

Mock it up—The maximum throw depends on the type of door, the type of hinge, and the position of the hinge's pivot point in relation to the door and the carcass.

To confirm that a hinge will work as expected, I advise making a full-size mock-up. To do this, draw a full-scale plan view (top view) of the intersection of the cabinet side and bottom on paper. On stiff paper, cut out a plan-view template of the hinge and part of the door. Lay the hinge and door template on the plan view of the cabinet and stick a straight pin through the hinge at the pivot point. Rotate the hinge to see if the door has adequate throw and clearance. Even if the mock-up checks out, it's a good idea to wait until you've received the hinges before starting to build the cabinet. You'll be certain of dimensions, and you won't discover halfway through the project that the hinge you've designed the door around is no longer

CONTINUED ON PAGE 53

Types of Hinges

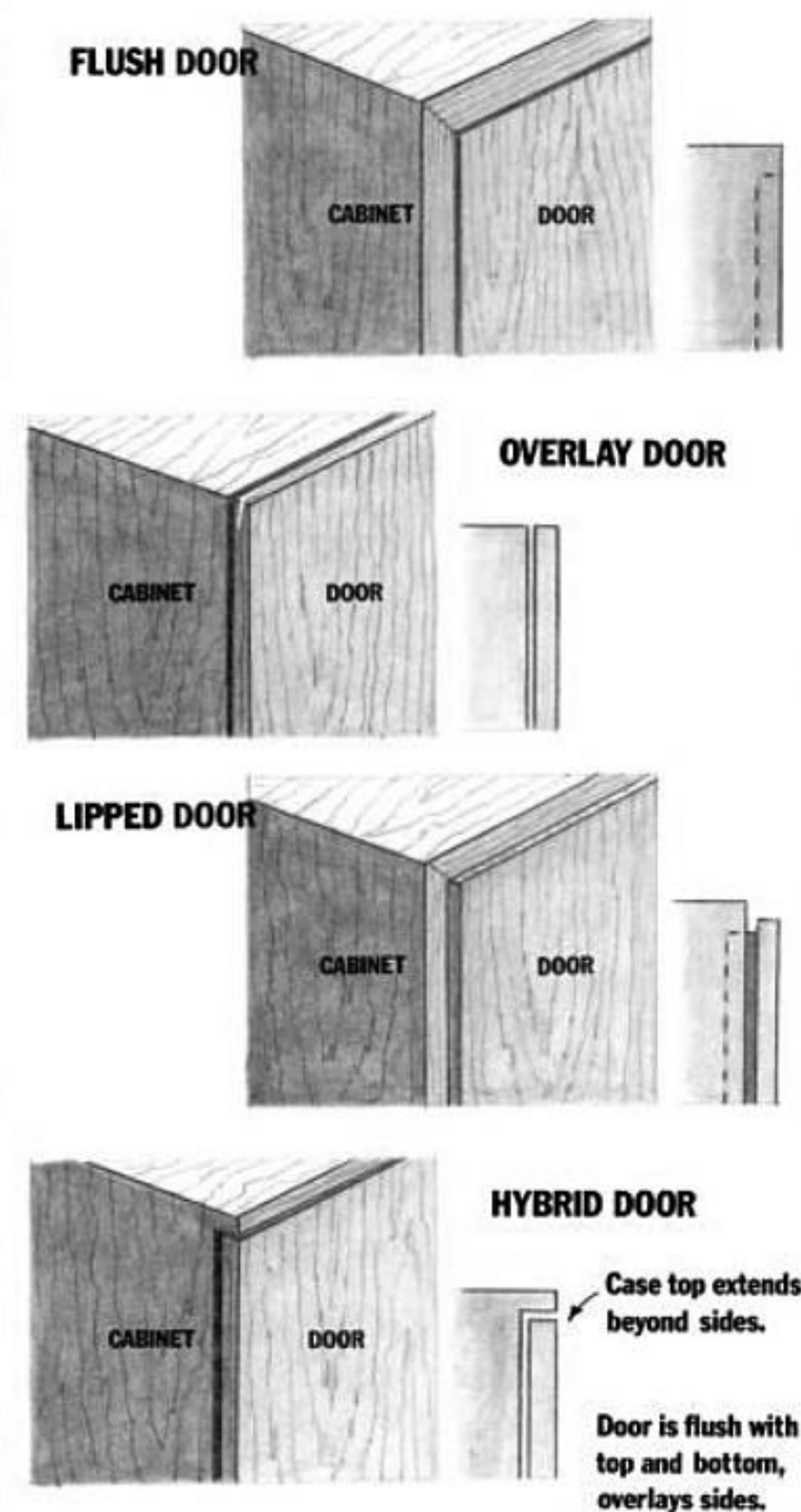
BUTT HINGES (See Sources: B, C, D, E, F, G, H)

Extruded butt hinges are my first choice for most flush doors. There's a size to support almost any door, from the tiniest desk cubby to the largest wardrobe. When I mount a butt hinge, I set both leaves in mortises. Depending on the position of the pin, a butt-hinged flush door can open up to 180°. I have hung overlay doors with butt hinges (mounted on the back face of the door and front edge or face frame of the cabinet), but it's not a particularly elegant solution.

Loose-pin and lift-off hinges (See Sources: B, C, D, E, F)

These are a variation of butt hinges. If you anticipate having to remove a cabinet door frequently, this type of hinge is a godsend. Because the pins are made to slide in and out of the barrel freely, such hinges may have more play than those with fixed pins. You may not like the looks of the balls or finials attached to the loose pins. Nevertheless, about the dozenth time I re-

FIG. 2: TYPES OF CABINET DOORS

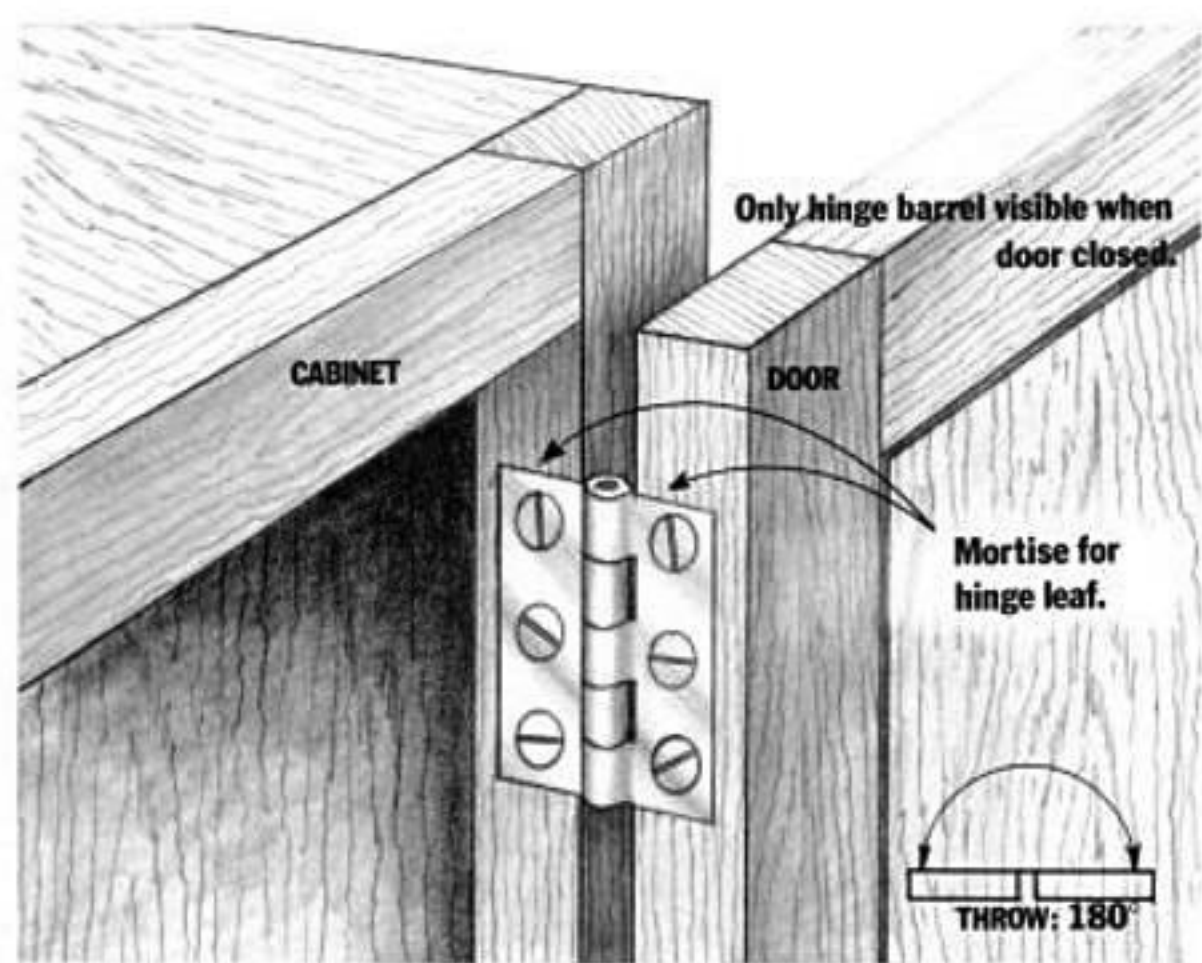


CRANKED HINGES (See Sources: C, F)

Although these three hinges are expensive (between \$27.00 and \$40.00 per pair) they're the only "traditional" hinging option I've found for certain configurations of overlay doors. The double-flap hinge makes it possible to mount two doors side-by-side on a single central stile, each door opening up to 180°. The other two cranked hinges are for end stiles. The single-flap hinge swings through a full 245°, so the door can fold back against the carcass side. The plain-cranked hinge is less elegant than the single flap and allows less rotation, but it's about \$10.00 cheaper and has less play. Depending on the door thickness, the hinges can be surface mounted, or you can mortise one or more parts to narrow the gaps between door and stile. (The drawing shows the hinges fully mortised.) Experiment on scrap pieces first to make sure nothing binds.

SURFACE-MOUNTED HINGES (See Sources: B, C, D, E, F)

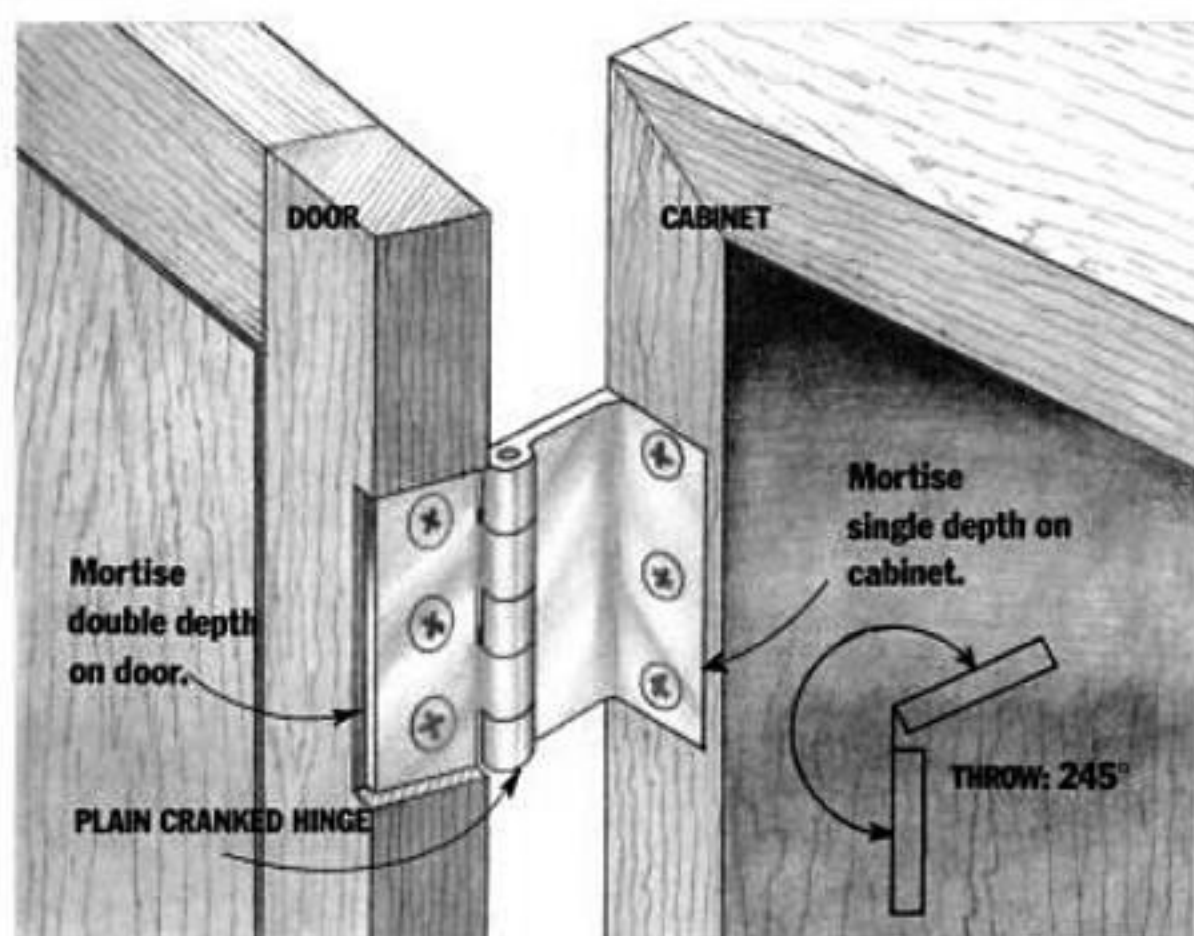
These hinges are fully visible, so they're usually selected for decorative purposes. (The ones shown here are for flush doors) There are no mortises to chop, so they can be quicker to install than butt hinges. Most permit the door to swing through 180°. The leaves of a number of these hinges are wide, restricting their use to cabinets with face frames. The snake hinge shown here is cast; the "H" and "HL" hinges are extruded. (The foot of the "L" leaf of the "HL" hinge is soldered in place.)



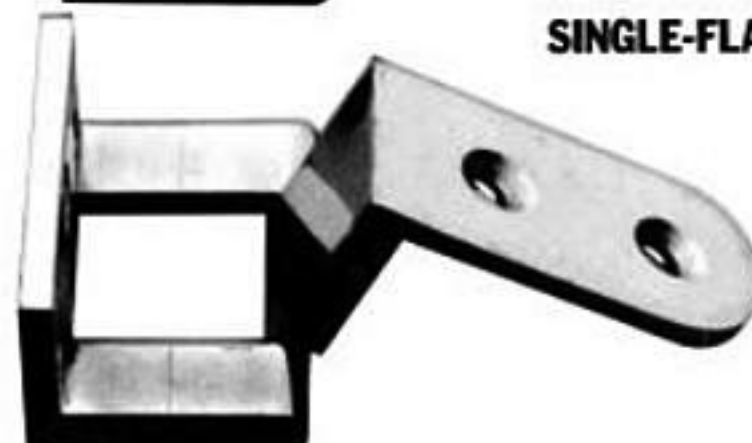
LOOSE-PIN HINGE

move a door during construction, I long for a loose-pin or lift-off hinge. But if the doors aren't going to come off when construction is finished, I resist the temptation.

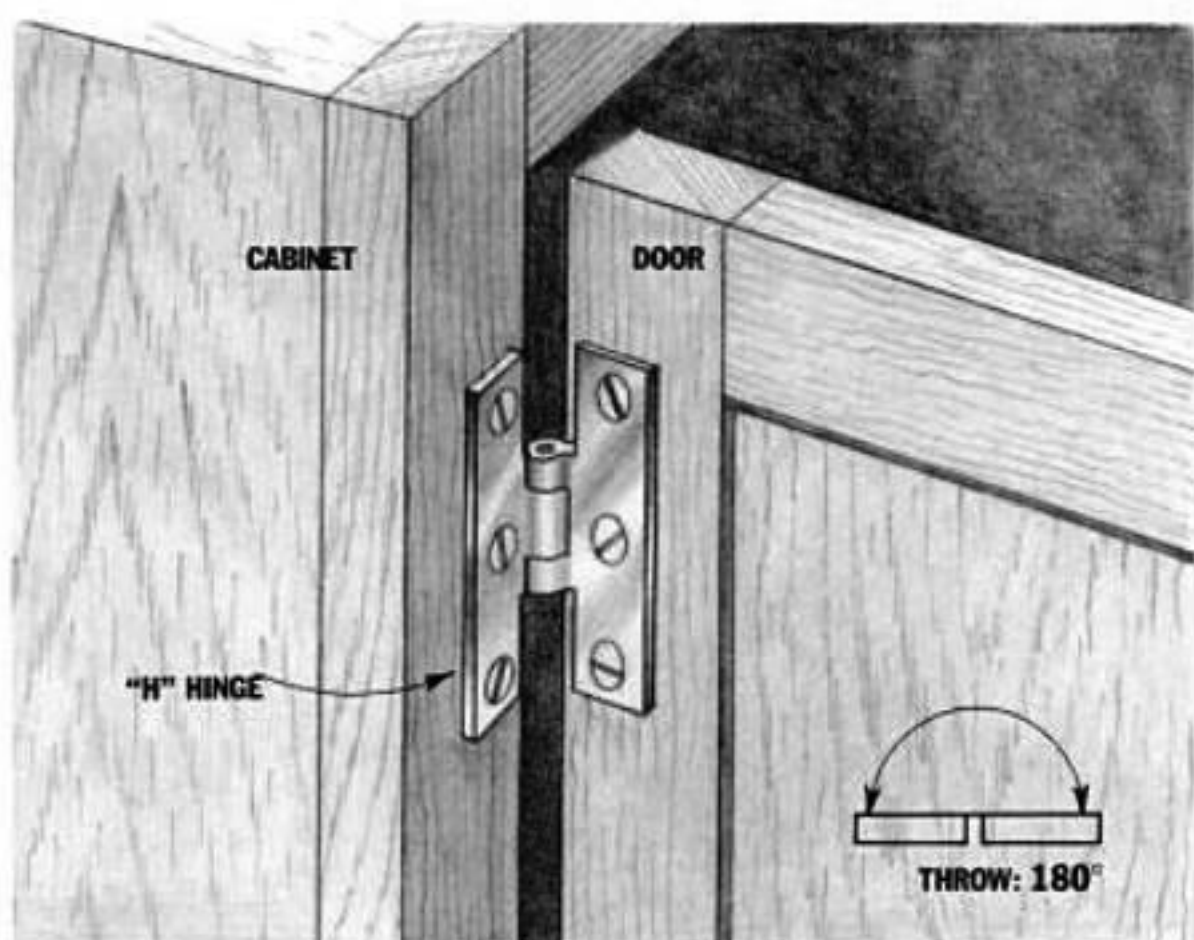
LIFT-OFF HINGE



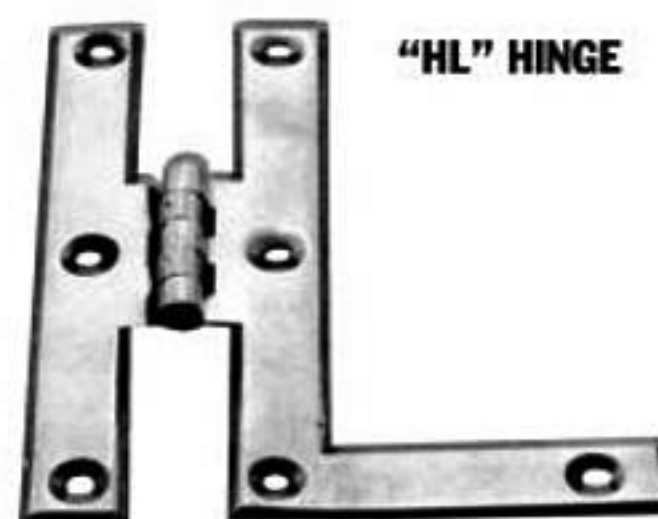
DOUBLE-FLAP HINGE



SINGLE-FLAP HINGE



SNAKE HINGE

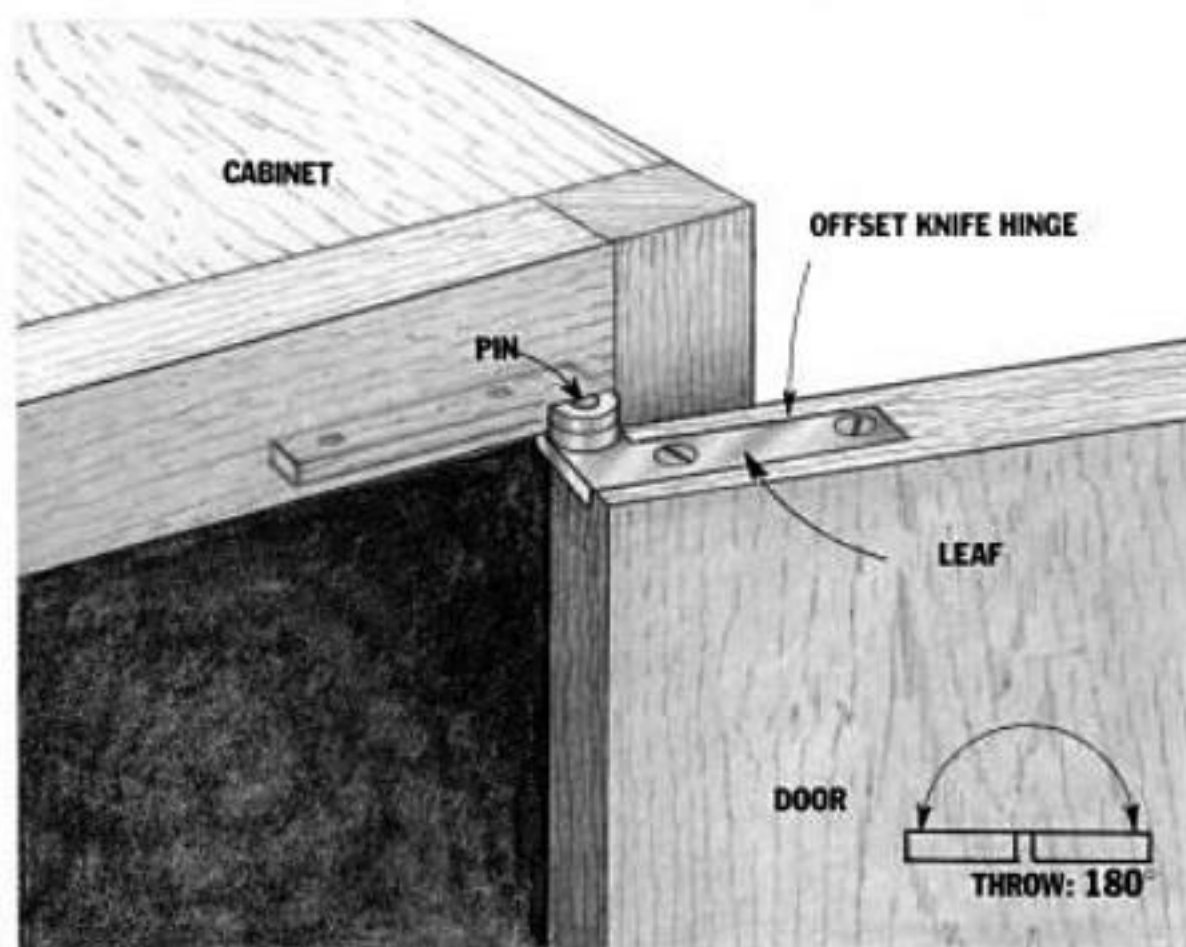


"HL" HINGE

KNIFE HINGES (See Sources: C, F, G, H)

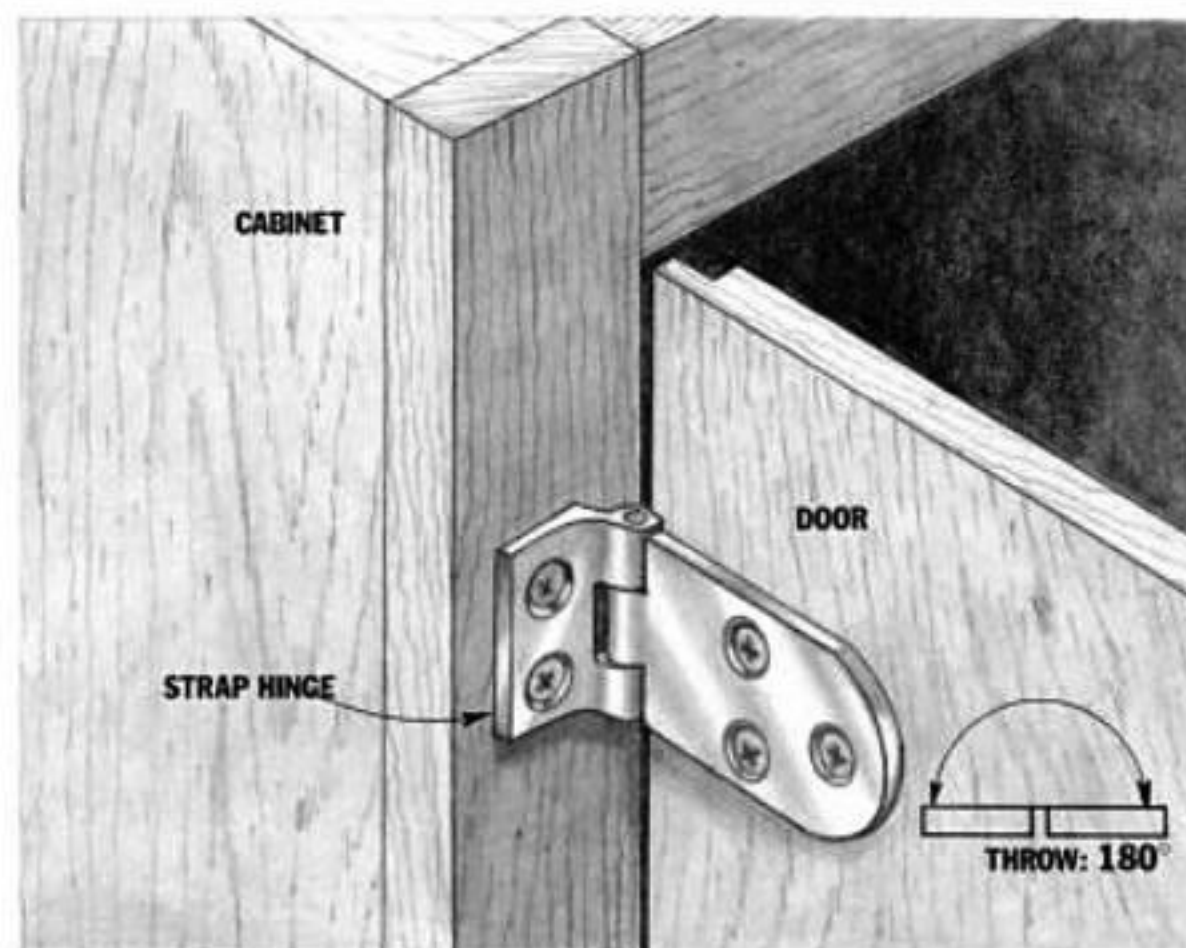
This hinge type can be used on flush doors and on hybrid doors that are flush with the carcass top and bottom but overlay the sides. Straight knife hinges can be unobtrusive or completely invisible. (If the hinge pivot is more than half covered by the door, you'll need to round the edge of the door or relieve the stile, or both, to permit the door to swing freely. Again, it's worth making a scrap-wood mock-up first.) When installing knife hinges, alignment is important. A line drawn through the centers of the pivot points should be parallel to the face of the door and to the cabinet side.

The best knife hinges I found are made in Michigan by a former woodworker named Larry Brusso (available from sources listed above). Frustrated by the quality of hinges available, Brusso started making his own. By 1986, hinge making had taken over his business. The leaves of Brusso's hinges are precisely machined from bar stock, the pivots and bushings milled on a computer-controlled lathe. Unlike the pins of



OFFSET HINGES (See Sources: C, D, E) (FOR LIPPED DOORS)

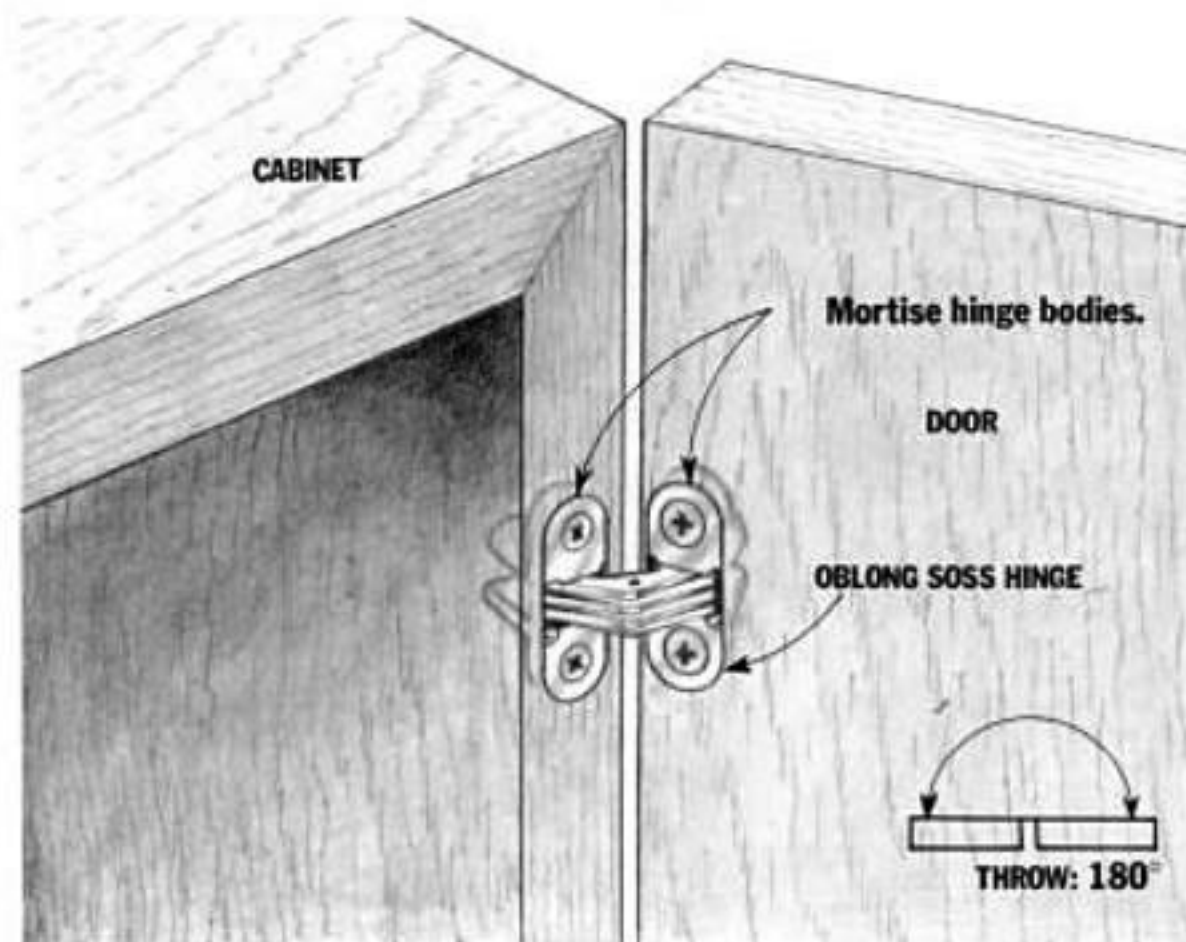
Hardware stores are full of surface-mounted and "kitchen-cabinet" hinges for lipped doors; unfortunately, there are far fewer high-quality hinges of this type available. Those shown here are all I could find. The extruded "H" hinge, offset to accommodate the lip, is handsome but highly visible. The cast offset strap hinge has a lot of play, and is too large for my taste. The pressed-brass version of the classic kitchen-cabinet hinge is presentable if you mortise it. But I'm still searching for an alternative to that lozenge-shaped leaf, which speckled every suburban kitchen in my youth. Surely, someone makes a nice extruded hinge for lipped doors that only displays the barrel when installed?



HIDDEN HINGES (See Sources: C, D, G, H)

If you want to see as little hinge as possible, try a Soss hinge. Developed around the turn-of-the-century by a European immigrant named Joseph Soss, and currently manufactured by Universal Industrial Products, these hinges incorporate several innovations. Rather than pivoting two leaves on a single pin, Soss hinges pivot a stack of thin, steel leaves (or links) on five steel pins. When closed, the links are folded in grooves in the two die-cast zinc hinge bodies. As the hinge opens, two of the pivot pins slide in slots in the bodies and the links extend.

The smallest of these Soss hinges are called *cylinder* hinges, because the hinge bodies are shaped like a small cylinder. The cylindrical bodies mount in accurately bored holes in the door and cabinet. Larger, oblong Soss hinge bodies (shown in drawing) support bigger, heavier doors and fit in a two-tier recess, easily cut with a plunge router. (You can also do it by hand.) The wider or heavier the door, the more hinges re-



produced. Finally, if it's a hinge you've never used before, hang a scrap-wood door as a final check.

A Word About Price

Prices for quality brass hinges are all over the place. Take extruded brass butts, for example. A pair of 2-in. x 1/4-in. hinges ranges from \$4.95 to \$13.95. I ordered a sample of each, and didn't see anything approaching that difference in quality—both were good hinges. Neither had any discernable play in the knuckles. The pricier one was polished. Interestingly, both suppliers—and all others I spoke to—said they imported their extruded hinges from England. (I was told there are 14 or 15 hinge manufacturers there.) My advice: Shop around. ▲



Roger Holmes works wood in western Connecticut.

Roger Holmes works wood in western Connecticut.



**OFFSET KNIFE HINGE
(BRUSSO)**

**STRAIGHT
KNIFE HINGE
(BRUSSO)**

other knife hinges, which protrude through the leaf, Brusso's hinge pins finish flush with the leaves, which is much more suitable for situations where that end of the hinge must be visible.



**KITCHEN-CABINET
HINGE**



"H" HINGE



**CYLINDER
HINGES**



quired. (Soss or a distributor can provide a chart to aid selection. Each hinge comes with paper templates for installation.)

Soss holds international patents for this type of multi-leaf invisible hinges, but a number of similar hinges are available, and prices vary considerably.

SOURCES

High-quality cabinet hinges are available from:

A • BALDWIN HARDWARE

841 Wyomissing Blvd.
Reading, PA 19612
(215) 777-7811

B • BALL AND BALL

463 West Lincoln Hwy.
Exton, PA 19341
(215) 363-7330

C • GARRETT WADE CLASSIC HARDWARE

161 Ave. of the Americas
New York, NY 10013
(800) 221-2942

D • PAXTON HARDWARE

7818 Bradshaw Rd.
Upper Falls, MD 21156
(301) 592-8505

E • PERIOD FURNITURE HARDWARE CO., INC.

123 Charles St.
Boston, MA 02114
(617) 227-0758

F • WHITECHAPEL BRASSES

P.O. Box 136
3650 W. Highway 22
Wilson, WY 83014
(307) 739-9478

G • WOODCRAFT

210 Wood County Industrial Park
P.O. Box 1686
Parkersburg, WV 26102
(800) 225-1153

H • WOODWORKER'S EMPORIUM

4320 W. Bell Dr.
Las Vegas, NV 89118
(702) 871-0722

DRAFTING TABLE

Your Best Designs Start Here

BY BONNIE SCHMAUS

If you like to design, you know how hard it is to find the right place to do your drawing. Kitchen and dining-room tables may do in a pinch, but over the long haul you need space where your masterpieces won't be buried under bills and newspapers. That's why I decided to design and build a proper drawing table. The slanted top and narrow pencil ledge are ideal for drawing, and the slope prevents household debris from accumulating on my work.

I decided to make my drawing table out of cherry, which glues well, works well, remains stable, and is quite attractive. If you make the same choice, remember that cherry also burns easily when you saw it, so

keep your blades sharp and clean, especially when making the many angled cuts. I found that the Teflon coating on my carbide-tipped blade helped in preventing burns.

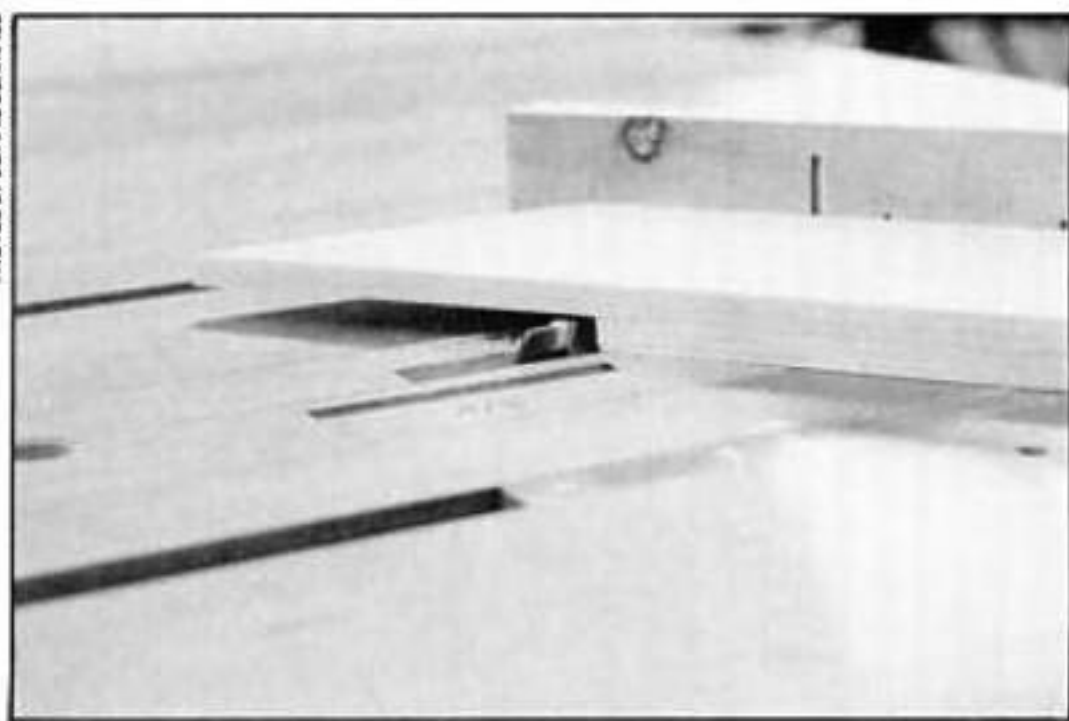
The joinery in the base of the drawing board is an adaptation of an open mortise-and-tenon joint. It's a fairly simple joint but requires accuracy. You can see in the drawing how half of each mortise is cut in each of two pieces that are then glued together to form the complete mortise. The tenon is made up of two halves in the same way. The joint is easily cut with a dado head if you adjust the height of the cut accurately. Since two dado cuts come together to form a single mortise, any error in the depth of the dado will be doubled in the width of the final mortise. The same doubling of error can affect the tenon on the front of the end stretcher.

Making the Drawing Table

When you begin to prepare your stock for the drawing table, there are a couple of things to keep in mind. First, for this type of joinery it is especially important that your stock be perfectly flat. When you're cutting these joints with a dado head, the wood must lie flat on the saw table. If the wood isn't flat it can't lie tightly against the table, causing the depth-of-cut to be off, so be sure to joint the surfaces carefully.

The second thing to keep in mind is that all of the material for the project must be the same thickness. The mortises and tenons in the base require the joining parts to be cut exactly half of their original thickness. If they aren't the same thickness to begin with, nothing will fit right. The safest procedure will be to thickness all of the parts at the same time at the same

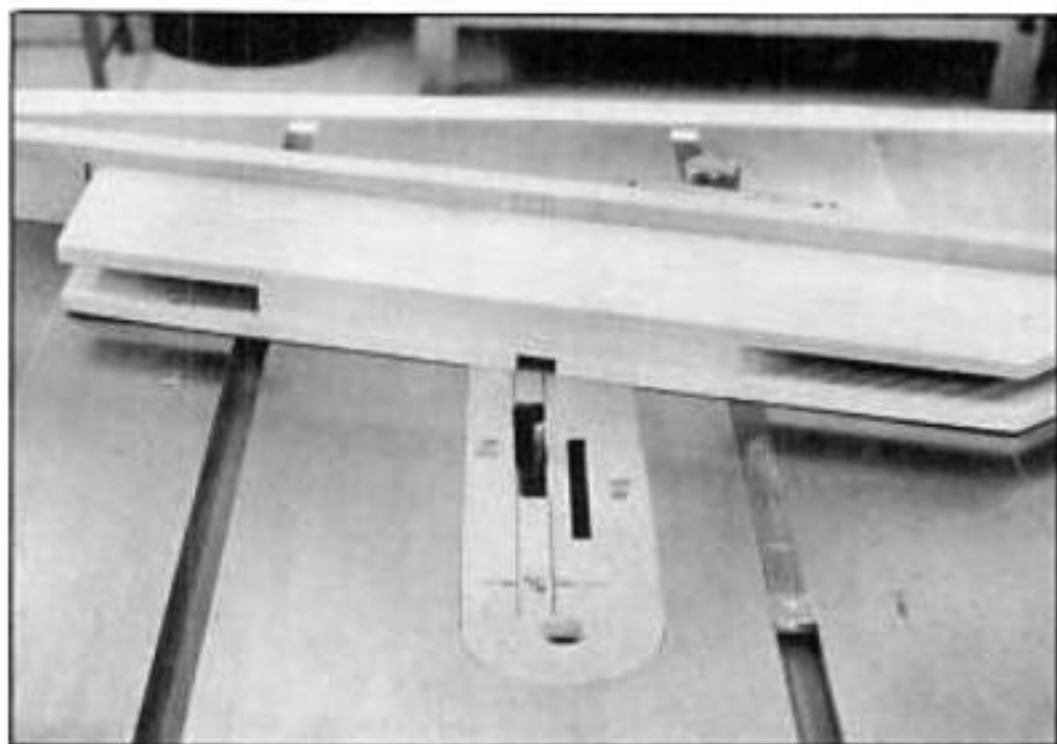
PHOTOS BY BONNIE SCHMAUS



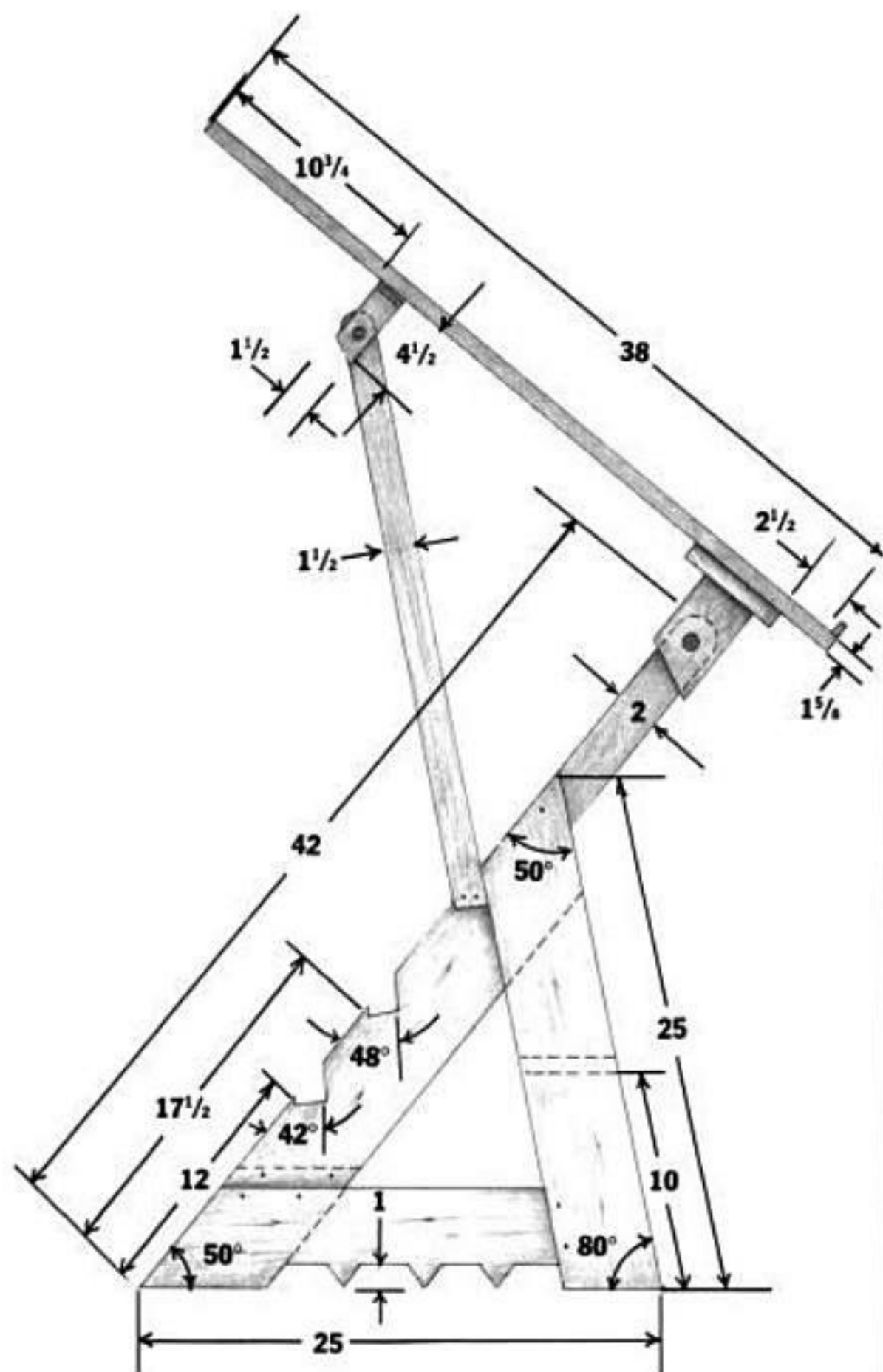
Remove waste with a dado head to halve the thickness of parts for the joints. Two pieces like this one, glued together, form a mortise.



A proper drawing table makes the design process a pleasure. Here's one you can build that you won't have to hide away when company comes.



To position stock for a dado cut, line up a marked cut on the stock with aligning marks on the table insert. Here, more than one pass makes up the needed width.



metrical, not identical. Mark the cuts and double check them with the drawing before making them.

To remove the waste, change to a dado head and adjust it to cut exactly half the thickness of the stock. Make test cuts on four scrap pieces of the same thickness as the leg material. Test the accuracy of the adjustment by assembling the four test pieces into a mortise and a tenon, the way the front leg joins the end stretchers in the drawing.

Keep a firm grip on the stock, and don't fall into a mechanized trance as you go back and forth, removing all of the stock for these 16 half laps.

When the dado-head work is done, clean up the cuts as necessary, and glue together the two halves of each front leg and the two halves of each end stretcher. Be patient and careful in lining up the halves and clamping them, and be sure to remove any squeeze-out in the "mortises."

When the glue has cured, dry assemble the front legs, the end stretchers and the rear legs, and mark the rear legs for the final cuts on their upper ends. Then lay out the notches on the rear legs and the detail cuts on the bottom edges of the end stretchers. I use the bandsaw to make all of these cuts. Cut the dados in the front legs to receive the front stretcher.

When you've finished these cuts, assemble the legs to the end stretchers with glue. When these assemblies are dry, put together the base by gluing and screwing the end assemblies to the front and rear stretchers.

While the glue in this whole base assembly is drying, lay out and drill the holes in the parts that attach the base to the underside of the drawing table's top. I use hand screws clamped to the drill-press table as stops to line up identical parts for perfectly matching holes. Glue and screw the subassemblies together, then screw them to the tabletop. Now attach the tabletop to the base with the two long dowels. I've found that the dowels stay in place without any fastening.

The edging around the tabletop should project $\frac{1}{16}$ in. above the surface of the table on the sides and top edge to hold a drawing-board cover. The bottom edging is wider for a pencil ledge. Glue the edging to the tabletop, holding it in place with masking tape while you drill and screw it, then plug the counterbores.

After cleaning up the joints and finish sanding, you can apply the finish. I mixed one part boiled linseed oil, one part raw tung oil and one part semi-gloss urethane varnish (I use Varathane brand) for my finish. I generously coated the cherry with the mixture, and after 15 minutes, I removed the excess with a soft cloth and let it dry overnight. I applied another coat, removed any excess, and let it dry. For the third coat, I applied the mix with 400-grit wet-or-dry sandpaper and moved up to 600-grit wet-or-dry sandpaper for the final coat. When the drawing table was thoroughly dry, I finished with a coat of paste wax.

Lay the drawing-board cover on the tabletop. It will remain flatter if it is left unattached. ▲



Bonnie Schmaus is an artist and designer living in British Columbia.

AMERICAN WOODWORKER

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KEAR STUDIOS



"A Rare Beast,"
by William Rogers Jennings,
Buffalo, Wyoming. Basswood, walnut.
Dimensions: H: 48 in., W: 12 in., L: 42 in.

We recently sent out a survey to a sampling of our subscribers to find out just who reads our magazine. The answer ... all kinds of woodworkers. We learned that your interests run the full range of the craft—from furniture to carving to turning. So, we decided to show you a cross section of what our readers are up to. Cast a glance at these pages. You'll see that variety is the spice of *AW*.



Windsor Writing-arm, by Jim Rendi, Earlville, Pennsylvania. Red oak, poplar, maple. Dimensions: H: 42 in, Seat W: 20 in.

CHUCK CRAWFORD



Vase, by Kip Christensen, Orem, Utah. Spalted pecan. Dimensions: H: 9 in., Dia: 5 in.

PAUL BOWEN

Windsor Cradle, by Wayne Dustman, South Euclid, Ohio. Red oak, poplar, leather. Dimensions: H: 23 in., W: 28 1/2 in., L: 41 1/2 in.



RON DUSTMAN

GALLERY

JONAH ELLIOTT



"Open Tribal Bowl,"
by Dennis Elliott, Sherman,
Connecticut. Box elder burl.
Dimensions: H: 11 in., Dia: 18 in.

"Wall Sculpture II,"
by Dennis Elliott,
Sherman, Connecticut.
Bigleaf maple burl.
Dimensions:
H: 13 in., W: 1½ in.,
L: 22 in.



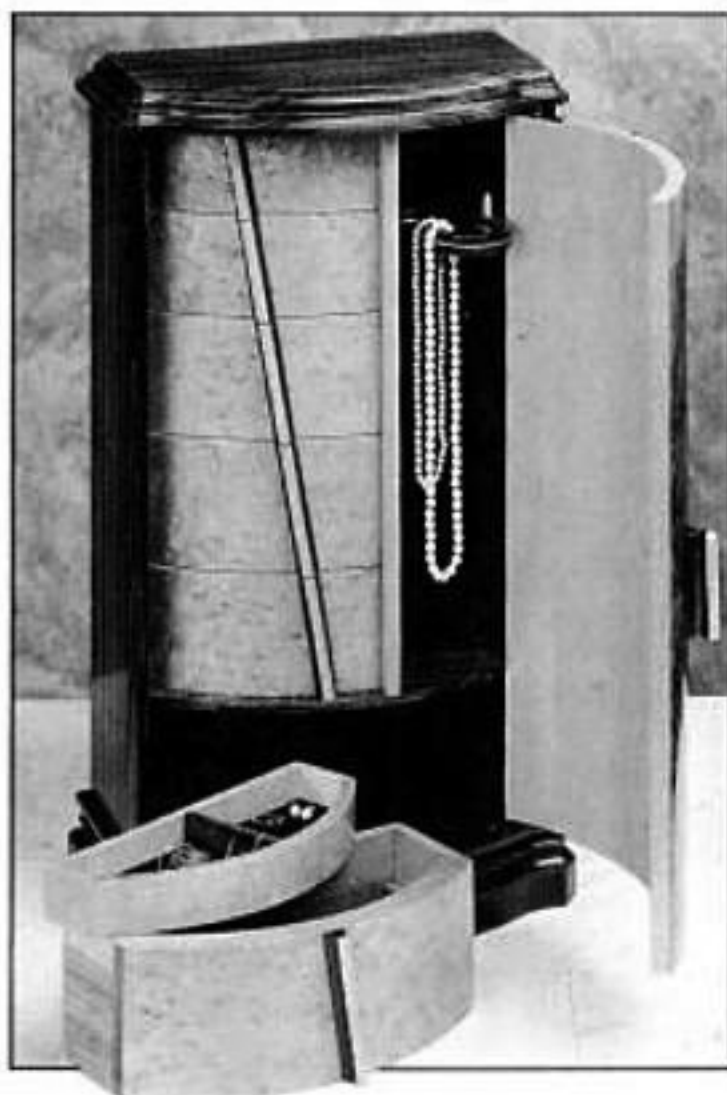
JONAH ELLIOTT

Jewelry Cabinet,
by Sean Moran, Lombard,
Illinois. Moradillo,
carpathian elm burl,
hard maple, bird's-eye
maple, velvet.
Dimensions: H: 20 in.,
W: 11 in., D: 6 in.



PHOTOS BY LARRY FRITZ

Jewelry Cabinet,
by Sean Moran
(open).



STEVE PETERSEN

Box with Legs,
by Steve Petersen,
Arcata, California.
Macassar ebony,
mahogany, ash,
aspen, tulipwood,
purpleheart, rose-
wood, koa, bubinga.
Dimensions:
H: 6½ in., W: 9 in.,
L: 11½ in.

Want to see your work in Gallery? Send photographs and a description of the piece to: AMERICAN WOODWORKER, 33 E. Minor St., Emmaus, PA 18098. Only black-and-white prints (4 in. x 5 in. or larger) or color slides will be accepted. Please do not send color prints or snapshots. Enclose a self-addressed envelope for return of photos.

Heartwood

A day like this, when the sky clears
Sunlight pausing on my fingertips
I am 5 years old
And with my grandfather in the old
tool shed,
The smell of rusty nails, linseed oil,
and wood chips
Making my head swim from its
richness—
The same smell, fainter
Mixed with the sweat on his clothes
In the evening when I sat on his lap
And he sang Ukrainian folk songs,
His hands smoothing and rubbing
my arms,
Indelibly imprinting the beat
Of the music on my skin.
In the shed, I would watch
As he worked a piece of wood over
and over
Planing and sanding, rubbing and
smoothing.
The sun would shine through the
small window,
Filtered by a thin layer of sawdust
On the glass that would soften the
light,
Temper its glare, and round its heat.
By late afternoon, the light would
illuminate
His wood in the vice.
I would drowse on my stool
From the warmth, the scent,
The sound of the plane—*shoonk,*
shoonk
And the scratching of the sandpaper;
And all the while, his low humming
In time with his movement across
the wood.
Through the haze and sound,
Moving in and out of the light,
First the tip of his fingers,
then his fingers,
Then his entire hands would glow
And take on the color of the wood
he was working:
A golden yellow of pine on



warm days,
A ruddy hue of cherry when it
was cooler.
His hands became part of the wood,
Veins merging with the grain.
At times, he would stop humming
And speak softly to me, continuing
to work:
"Always go this way. Remember the
grain. This is the skin.
Look at it. It breathes."
I wouldn't see its breath,
But I would see his knotted arms,
back and legs
Returning to the wood, molding it,
And calling from it other arms, and
legs, and backs.
Now my hands, becoming more
open-grained,
Moist and full like sapwood,
Work this, a different kind of wood.
Sitting in a chair that has supported
The hard seat of 20 years,
I touch heartwood beneath the worn
varnish
And feel the grain rise, solid,
Pressing against the tips of my
warmed fingers.

ROBERT NAGEL

A Block-buster Video

Maybe there's no such thing as a free lunch, but there is free woodworking information. For the mere cost of a blank video tape, more than two hours of techniques on kiln drying wood can be yours.

The movie was mostly made from film footage taken at the small dry-kiln seminar sponsored by the Tennessee Valley Authority last September in Norris, Tennessee.

Bill Parrish, novice filmmaker and wood products engineer for the TVA, doesn't promise it will be pretty and you won't recognize any Hollywood stars. In fact, he's the first to admit the picture tends to the fuzzy side at times. What he does promise is a good soundtrack and plenty of useful tips on drying wood and operating a kiln.

If you'd like a copy, send a blank VHS, T-120 tape to: Bill Parrish, 13 Ridgeway Rd., Forestry Building, Norris, TN 37828.

A Call to Woodworking Clubs

Woodworking clubs and guilds are a great way for woodworkers to get together and share ideas. *AMERICAN WOODWORKER* wants to encourage such groups in any way we can. For openers, we're going to help woodworkers get connected by publishing a list of existing clubs and guilds. We're in touch with a lot of groups, but we don't want to leave anyone out.

If you're a member of a woodworking club or guild, we want to know about it. Call or write Bob Moran, Assistant Editor, *AMERICAN WOODWORKER*, 33 E. Minor St., Emmaus, PA 18098, (215) 967-8790. We look forward to hearing from you.

Helping Hand for Habitat



Habitat for Humanity International

A home, sweet home has long been part of the American dream. Stanley Tools, the largest maker of hand tools in the U.S., is trying to make this dream come true for many of the homeless in America.

Since April, Stanley has been contributing 25 cents for every purchase of its tools to Habitat for Humanity.

This promotion will continue through July. The donation is based on each UPC symbol received from consumers.

Habitat for Humanity, a non-profit, grass-roots organization, rehabs or builds homes for those who would otherwise be homeless. To accomplish this undertaking, the organiza-

tion depends on volunteer labor and expertise, and donations of money, land and materials.

Look for the "Help Stanley Build the American Dream" promotions. Tool buyers can do their part to aid this effort by redeeming UPC symbols through the mail, or depositing them in collection boxes at stores that sell Stanley products.

For information, write: Stanley Tools, Division of The Stanley Works, Reader Response Service, P.O. Box 1146, Bellmore, NY 11710.