AMERICAN WOODWORKER

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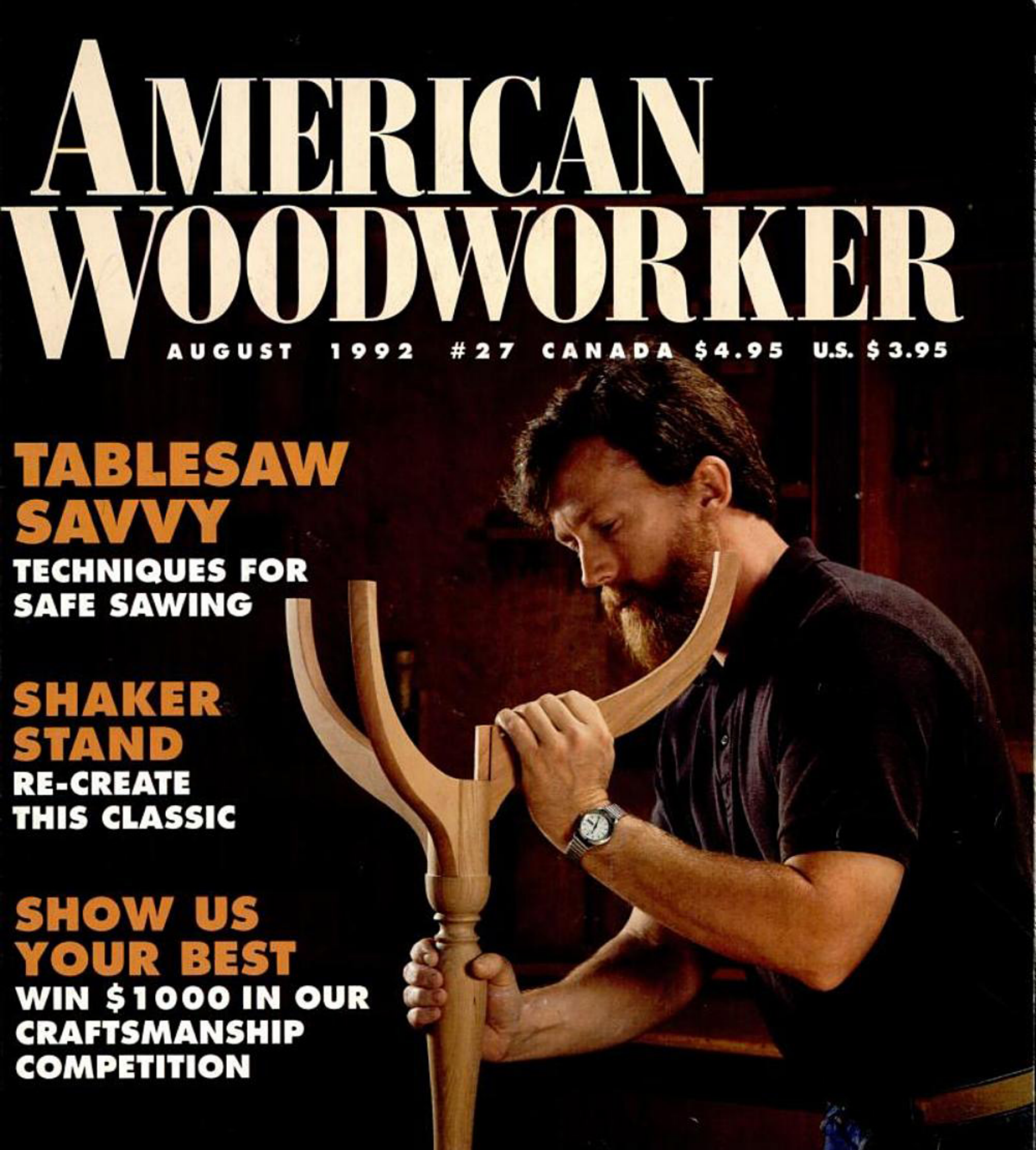

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A WORD FROM THE EDITOR

The best way to learn anything is by watching someone who knows what he's doing. I learned this lesson early, when I was just a kid. I went out of my way to find old-timers who would tolerate a young boy's questions, and I spent countless hours just watching them work.

Notable among the many characters I adopted was Jake Brubaker. Jake was an elderly woodturner who lived in the village of Landisville, Pennsylvania. Every Saturday, Jake would hold court in his workshop, spinning outrageous yarns as the shavings flew off his lathe.

And what a workshop it was! The clutter was unbelievable. Tools, wood, and shavings were everywhere, even banked around the base of the wood stove that glowed in a corner. We marveled that providence had kept the place from going up in flames.

AT THE MASTER'S KNEE

Jake liked to turn saffron boxes—lidded boxes traditionally used for storing the spice. He'd turned so many during his lifetime that he knew the moves by heart.

As I grew older, I followed my heart to Arizona, but I thought a lot about my old friend Jake. Then one day I heard Jake's luck had run out. The wood stove had started a blaze that destroyed the shop. I called Jake a few days later and found him optimistic. "I'm going to set up some lathes in a school bus," he told me, "and travel around teaching kids how to turn."

Too bad for the kids that Jake never accomplished his dream. He simply ran out of time. But his knowledge lives on in the hearts and the hands of those, like me, who spent a little time at the master's knee.

David Sloan
Editor and Publisher

LETTERS

Banter on Bandsaws

The article "Tuning a Bandsaw" (AW, #25) was worth more than a year's subscription cost to me. I had been looking for a new bandsaw, being so dissatisfied with the present one's performance. But after reading your article, I cleaned, lubricated, aligned, and reassembled my monster into a very usable machine. Thanks for a great magazine.

John Souders
Richmond, KY

I found the article "Tuning a Bandsaw" (AW, #25) interesting because it was very similar to the technique I described in my book, the *Band Saw Handbook*. In fact, the term "coplanar alignment" is a term that I used first.

I also found aspects of the article to be of questionable value:

1. You don't have to take the covers off the saw to tune it.

2. You can easily check for wheel twist by just checking the diagonals with a straightedge, that is checking across the opposite corners of the bottom and top wheel (with the correct blade tensioned). You don't have to clamp pieces of wood to the wheels.

3. Straightedges should be thin and wide rectangular sections because of the ability of that shape to resist deflection. A straight piece of ¼-in. plywood 3 in. wide is good.

Mark Duginske
Wausau, WI

Mark Duginske is the author of the Band Saw Handbook *and* Band saw Basics *(Sterling Publishing Co. Inc., New York, NY).*

No Role Model

In AW, #24 you show Secretary of the Interior Manuel Lujan using a tablesaw in the Interior Department's carpentry shop. He isn't wearing a shield over his glasses. The saw has no guard. He's using the guide fence for measuring the pieces to be cut, and he's pushing them through with the miter gauge. (That's a no-no.)

I'm a supervisor in a larger carpentry shop, and we're under constant pressure from the government to go by the rules, yet [this shows] the secretary of the interior is no better than I am. What's good for one, should be good for the other.

Heyburn Huff
Lanett, AL

Wrong-Way Woodworkers

I hope your bike riders, Aspinwall and Thompson, have a better sense of direction in their businesses than they do in cross-country cycling. ("Final Pass," AW, #26) . . . start in Los Angeles, *head west* to Texas. . ." Come on, now.

B. Jack McDaniel
Leander, TX

The wrong directions were our fault, not theirs. But hey, who can blame them for trying to postpone a visit to Texas as long as possible?

How About A Tool Exchange?

I believe it would enhance your great magazine if you would include a page or two of "for sale" or "wanted" items. I think there are many of us who drool over woodworker aids but just cannot afford to buy all that we may need.

Bill Davis
White Haven, PA

We already have such a department in our Classified section. It's called the Wood and Tool Exchange. (See page 69.) Ads in the Exchange are available only *to private individuals looking to sell or buy woodworking equipment or supplies. It's a cheap way to reach hundreds of thousands of woodworkers: $5 a line with a three-line minimum.*

Tame That Sander

I have one of those direct-drive combination disc/belt sanders that's manufactured in Taiwan. It's a well-made machine, but the 5,000-ft.-per-minute belt speed and the 3,600 rpm in a 12-in. disc are so fast you burn rather than sand the wood. I have modified my machine so I can run it at 1,800 rpm, using a separate ¾-HP motor.

I cut out the back of the disc guard, turned a hardwood pulley—4 in. dia.—and epoxied it to the back of the sanding disc. I then ran a drive belt to a motor I mounted on a table at the bottom of my stand. This gives me about 2,400-ft.-per-minute belt speed. The sander works beautifully. The belt no longer bumps on the splice, and in fact it tracks better.

Bill DeLorme
Ft. Worth, TX

Homely Hutch Revisited

Art Gibson's comment in your "Letters" column (Homely Hutch, AW, #25) just proves beauty is in the eye of the beholder. My wife and I both liked David Donnelly's oak china cabinet so much that I am planning to build it as soon as possible.

Lee Busbee
Asheboro, NC

I had to laugh when I read Art Gibson's letter about the homely hutch, as I

LETTERS

thought the same thing when I saw the project. An object does not have to be aesthetically pleasing to the eye to be art, but it should if it is to be a piece of everyday furniture. The hutch was definitely a poor design in my mind, and the Pennsylvania tall clock in the same issue looks out of proportion, too.

Don J. Reuter
Columbus, OH

Although I defend Art Gibson's right to express his strong dislike for the oak china cabinet in AW, #24, I feel asking the magazine to ban a particular furniture style is a bit much.

If we readers only read those project articles that conform to our favorite furniture styles, we will miss a great deal of valuable information and construction techniques. The source for curved glass and the technique for bandsawing curved rails found in this article were well worth the price of the magazine. I have no plans to build this particular piece, but no doubt down the road I'll make use of the information.

Bob Colpetzer
Clinton, TN

Crazy About Color

As a lifelong woodworker, former workshop editor at HOME MECHANIX magazine, and former managing editor of PRACTICAL HOMEOWNER magazine, I should know a fine woodworking magazine when I see one. After admiring your new four-color issue, I couldn't think of a better example.

What has always made your publication special is its focus on the people who work wood. Often they're as interesting as the projects they build or the tips and techniques they share. I take their insights with me every time I enter my own shop. Keep up the good work, and don't change the formula now that you're flush with color.

Tom Sweeney
Trumbull, CT

Wow. You did a bit more than just go color. I think the result is superb—very energizing and inviting to the reader. More than ever, people will feel like they are participating in an animated forum by reading the magazine, and good things happen in those kinds of settings.

William Tandy Young
Stow, MA

LETTERS

Hot-Roasted Martins

The martin house (AW, #25) is a piece of work. Looks good, but in a hot summer, unless you want a lot of dead little martins, you would be well advised to add some ventilation to your martin mansion.

John V. Matthews Jr.
Chesapeake, VA

Off-the-Wall Offset

The article on drawboring in the April issue (AW, #25) was well done, but I must take exception with the recommended amount of offset for the hole in the tenon. "A scant 1/16 in." offset is too much for a 1/4-in. dia. pin in dry hardwood. This is one-quarter the diameter of the peg. A large offset in the hole usually results in a split or shattered peg when you try to drive it in place.

For dry hardwoods, a rule of thumb I have found successful is making the offset equal one-eighth the diameter of the peg.

Dennis R. Preston
Brookfield, CT

Leave Forest Issue Alone

You are absolutely right that some old-growth forests should be preserved ("A Word from the Editor," AW, #24) But why do you have to touch on such a controversial subject? I thought your purpose was to teach and inform people who love to work with wood.

I work in the timber industry, and I go to work every day wondering if my mill will be the next to shut down because so much timber has been locked up.

You're right that old growth should be protected. But how much and at what cost is up to the courts, politicians and lawyers.

Please stick to your editorial mission as stated in your April issue (AW, #25).

Tracy W. Buhler
Dallas, OR

Correction

Re: "Build a Router Table" (AW, #24). The height of the third and fourth drawers shown in Fig. 1 should be 4 in., not 3½ in.

What's on your mind? We value your comments, complaints, and corrections. Send your letters to: "Editor," AMERICAN WOODWORKER, 33 E. Minor St., Emmaus, PA 18098.

Q & A

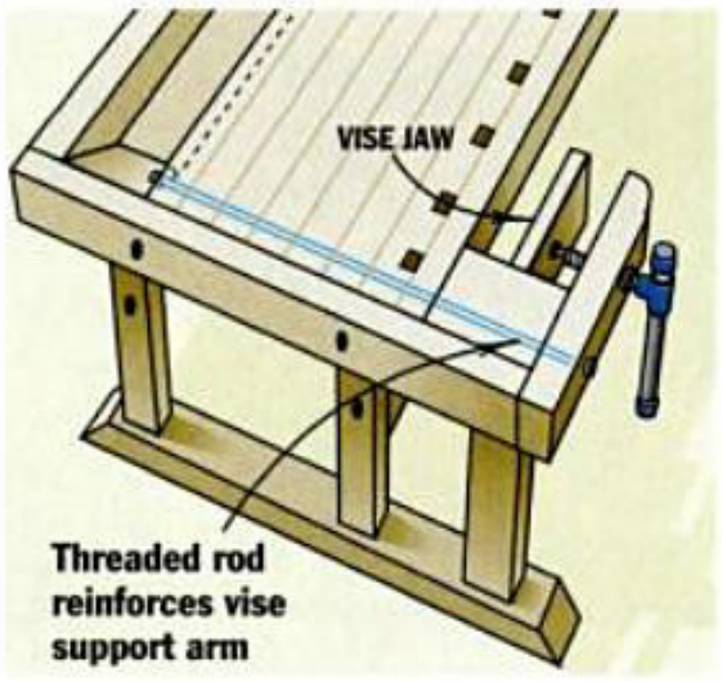
Reinforcing a Shoulder Vise

***Q** I'm building a European-style workbench with a shoulder vise, and I'm afraid the supporting arm won't handle the force from clamping a workpiece tightly. If I reinforce the vise with a metal rod through the entire top of the bench, how will seasonal wood movement affect this?*

Bruce Wilding
Berwyn, IL

A I shared your concern about wood movement when I built a bench with a shoulder vise some years ago. I had seen old shoulder vises reinforced with bolts, but these bolts went only a few inches into the benchtop. The result was the top was often split or the vise needed repair.

For my bench, I decided to put a threaded rod through the entire width of the top and secure it with big nuts and flat washers. (See drawing.) This



DRAWING BY GLEN HUGHES

shoulder vise has proven to be plenty strong, and I have not had any trouble with wood movement. At the most, seasonal expansion and contraction cause the nut to get a bit loose or the washer to press into the wood. Now I build all my benches this way, including the bench featured in *The Workbench Book* (1987, The Taunton Press, Box 5506, Newtown, CT 06470, 800-243-7252).

To minimize wood movement, I recommend constructing the benchtop from quartersawn wood and applying at least two coats of Waterlox Marine Finish (available from Woodworker's Supply, 1108 N. Glenn Rd., Casper, WY 82601, 800-645-9292) on the bottom and top surfaces. Then install a ½-in. threaded rod through the benchtop from the front of the vise arm to the tool well along the back.

Frank Klausz
Cabinetmaker
Pluckemin, NJ

Loosening Glue Joints

***Q** I repair furniture as a part-time job. Sometimes I have trouble getting a piece of furniture apart to reglue the joints. What's the best way to loosen glue joints when you can't tell what glue was used?*

W.E. Felts
Indianola, MS

A All furniture made before the 1950s was glued with animal hide glue. You can usually break a hide-glue bond by inserting some alcohol into the joint with a syringe. The alcohol crystallizes old hide glue, so you can knock the joint apart. I'd suggest using denatured alcohol, though methyl alcohol or 90 percent isopropyl alcohol will also work to crystallize the glue.

All other glues are difficult if not impossible to loosen. Using water to soften white or yellow glue is usually ineffective and destructive. Water swells the wood so much you usually make a mess of the joint before the glue breaks down. Acetone will break down white or yellow glue without excessively swelling the wood, and it can soften Super Glue (cyanoacrylate glue), contact cement, and hot-melt glue. But it's difficult to get enough acetone into the joint to do the job because it evaporates quickly. It will also remove any finish.

If a joint has been glued or reglued since the 1950s and the alcohol hasn't worked, I suggest you try to do the repair without taking the joints apart.

Bob Flexner
Finishing consultant
Norman, OK

Cupping on Pine Boards

***Q** I make a lot of children's toys and other small-saw projects, using common pine 1 x 12 boards I buy at the local lumberyard. I'm careful to choose straight boards, and I store the stock in my basement. But after a week or so, the boards start to curl at the edges. How can I minimize the warping?*

Ken Kern
Brooklyn, NY

A The only reason wood changes its size or shape is because changes in the relative humidity (RH) of the air around the wood affects the wood's moisture content. Depending on species and grain direction, wood shrinks from 4 percent to 14 percent in size going from wet to oven dry (or swells the same amount going from dry to wet). Teak, for example, is low in shrinkage, while oak is high. Pine is moderately low in shrinkage. Paint and other finishes will slow, but not stop, the moisture change.

Your boards warp (called cup when the boards curl from edge to edge) because the relative humidity of the air in your basement is different from the RH at the lumberyard. An unheated garage or warehouse in most of the U.S. averages about 65 percent RH year round. Your basement probably averages about 80 percent. The RH in a heated area is typically 30 percent or less.

My advice is to buy dry wood (6 percent to 8 percent moisture content) when you're project will be used in a dry, heated environment. Always store this wood in a dry environment (about 30 percent to 35 percent RH). Try using a dehumidifier in your basement to maintain the required RH. If you can't dehumidify the basement, build a small plastic-walled room with a humidifier inside where you can store lumber and unfinished projects.

Dr. Gene Wengert
Professor of wood technology
Virginia Polytechnic Institute
Blacksburg, VA

Q&A

Bubbles in Finish

Q *I've tried one of the new water-based clear finishes. It has a tendency to bubble when I apply it. I work at the recommended temperature (70° to 75°) and filter the finish before application. I've tried a nylon brush as well as a foam brush and a paint pad. But it still bubbles. What am I doing wrong?*

Duncan G. Pairman
Watsonville, CA

A The bubbling you refer to is known as foaming, and it's one of the biggest problems with brushable water-based finishes. Some brands formulated to be sprayable and brushable are more likely to foam. Start by choosing a water-based brand designed only for brushing.

You're correct to use a nylon brush, but pick one with bristles that are blunt or tapered on the end. Flagged (split) ends are best for oil-based finishes, but they tend to exacerbate foaming with water-based finishes. (See AW, #26, page 62.) Don't load the brush with finish. Instead, apply a meager coat. If you're used to an oil-based finish, it will feel as if you are working too dry. This goes for paint pads too, since they hold even more finish than a brush does.

Stir the finish carefully instead of shaking it. Then apply the finish as smoothly as possible *once* and avoid going back over it. Rebrushing the wet area might help to even out an oil-based finish, but this technique just causes more foaming with a water-based finish.

If all else fails, stir in about 1 ounce of half-and-half coffee cream to a gallon of the finish. As unlikely as this sounds, the half-and-half is chemically similar to some of the defoamers used in paint, and because it's an emulsion of fat in water, it will mix readily and dry clear.

Michael Dresdner
Finishing consultant
Zion Hill, PA

READER'S NETWORK

Want some feedback on a problem? Want to cast out a topic and reel in some comments from fellow woodworkers? Here's the place to do it.

AW's new "Reader's Network" lets you tap into the experience and opinions of other woodworkers to get responses to your problems or points of view. Every issue, we'll tackle one letter and throw it open for answers and discussion. The best responses we get will appear in the next AW. If you have a question or response for "Reader's Network," send it to: "Reader's Network," AMERICAN WOODWORKER, 33 E. Minor St., Emmaus, PA 18098.

Here's this month's letter:

I grew up around a shop where we always stressed safety. In fact, my dad was such a fanatic he installed floor pedal switches on the tablesaw, bandsaw, drill press, and other potentially dangerous machines to make them easy to shut down in an emergency. You didn't have to grope for the poorly designed push buttons or toggle switches manufacturers install. You'd just take your foot off the pedal and the machine stopped. I'd like to know what other readers have done to make their machines safe. I'd also like to know why manufacturers haven't done more.

Kerry Dewell
Miller Place, NY

WHERE TO FIND IT

Hand-forged drawknives, scorps, and wood-carving knives are available from North Bay Forge, Waldron Island, WA 98297.

Custom glass panels for doors made with leaded, stained, beveled, etched, or curved glass are available from Abraxis Art Glass, 1724 E. Lincoln Ave., Fort Collins, CO 80524, (303) 493-7604.

Heating a Workshop

Q *My workshop is in my unattached garage that gets cold in winter. I can heat my shop with a portable kerosene heater, but I don't want to leave it unattended. Would I have problems with wood and materials if I only heat the shop when I'm working in it? Any other suggestions to heat my shop?*

Peter A. LaPlaca
E. Hartford, CT

A You can safely heat your shop with wood, gas, oil, or electricity, but you're right not to leave a portable kerosene heater—or any open flame—unattended. No matter what the source of heat, it's a good idea to insulate the work space. It will help keep the shop and its contents at a constant temperature, reduce condensation on cold walls, and make it more comfortable for you, too.

If the temperature drops below freezing, it won't harm most solvent-based finishes, but water-based finishes and adhesives should not be stored below 40° F. You can safely keep most water-based finishes in your house. Glue and water-based finishes cure by water absorption and evaporation, so you should heat your shop and materials to at least 70° F. and maintain that temperature until the glue or finish has fully cured.

If you don't want to keep the whole garage heated, consider building a small, heated, insulated chamber to store projects while glue or finishes dry. Depending on the size of the chamber and the thickness of insulation, you might be able to heat with a single electric baseboard heater.

Scott Landis
Woodworker and author
Coatesville, PA

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

Tiny Turning

Pushing the Limits of Size on the Lathe

BY STEPHEN H. BLENK

Tiny turned goblets with their wispy stems are mystifying. Even turners have to wonder how something smaller than a thumbnail can hang together on a lathe chuck spinning at high speed.

In fact, it's not as hard as you might expect to turn a delicate goblet like the one shown here. Yes, you are going to break many pieces in the beginning. Turnings averaging less than ¼ in. dia. are unforgiving when you catch a cutting edge. But with a little patience and some common sense, any reasonably accomplished woodturner can master small-diameter turning and open up a whole new world of projects.

Choosing Your Tools

Though there are miniature lathes and down-sized tools on the market, you don't need special equipment for tiny turnings. Your regular lathe will do fine if set at a high enough speed. And you can work with some of the same smaller gouges and chisels you use for spindle turning, or you can make tools from old files, high-speed steel, and the like.

Patience and practice are all it takes to turn a delicate, diminutive goblet like this one made of fossilized ivory.

MITCH MANDEL

Small turnings *do* pose a special set of problems, though. Tool control is crucial. The spindle components are miniscule compared to the size of your finger or even a tiny gouge. You need a light touch and razor-sharp tools. Also, it's important to plan your work so the thinnest part of the turning is as close to the headstock as possible and the last section to be cut. To further minimize chances of the piece flying apart, take care in choosing your wood.

Selecting Wood For Miniatures

You can use North American hardwoods for small turning, but you'll probably find the results disappointing. Woods such as walnut and maple are bland looking in small pieces. Grain patterns that look great across a tabletop disappear on a ½-in. spindle.

My favorites for miniatures are the various rosewoods, though other exotics such as ebony, lignum vitae, padauk, and cocobolo work well. All offer beauty and colorful grain patterns that are much more suited to small-scale work. Also, exotics are close grained and dense and have consistent working characteristics. They don't often present those unfortunate surprises so common in softer, more open-grained woods, which may snag an edge for a split second and break.

Small-diameter turning is also a cost-effective and environmentally sensitive way to use exotics because you don't need that much wood. You can turn many gems out of pieces culled from another woodworker's scrap pile, and suppliers often discount prices on small pieces of exotic wood.

Other, more unusual materials can be turned, too. I have been experimenting with fossilized ivory. (See photo, opposite page.) Some turners use tagua nuts, also called vegetable ivory (available from Craft Supplies USA, 1287 E. 1120 S., Provo, UT 84601, 801-373-0917).

Preparing Stock

Preparing small-scale stock is very much like preparing material for regular turning. I first rip ⅜-in. square lengths of stock on the bandsaw. The saw's thin blade "gives away" less of the expensive material as sawdust than a tablesaw blade would. I find an eight-tooth-per-inch raker-type blade stays sharper longer than other blades when cutting hard materials.

After cutting out all the squares, I tilt the bandsaw table to 45° and rerip the corners to make the stock roughly octagonal, then crosscut to whatever lengths are appropriate for the planned turnings. By knocking off the corners, I can avoid shocking the stock in the early stages of turning. This early work is traditionally called roughing out, but that's a misnomer with miniatures. You must make light cuts from start to finish since the piece does not have a great deal of strength. Subjecting it to unnecessary stresses could snap the turning or loosen it in the chuck.

With a little patience and some common sense, any reasonably accomplished woodturner can master small-diameter turning and open up a whole new world of projects.

Once the blanks are sawn, I sort through them for the best pieces. While figure lines and irregular grain are desirable in larger work, they make life difficult in small pieces. Generally, the straighter the grain, the better the piece is for small turning. I avoid material with too many irregularities.

Chucking Small Pieces

Small-diameter pieces can be mounted on the lathe in a number of ways. The best technique for a beginner may be to simply mount the workpiece to a waste block on a faceplate. You can do this with a cyanoacrylate adhesive such as Hot Stuff, which is available from many woodworking-supply stores.

One of my favorite mounting methods is to use a small (4-in. dia.) machinist's three-jaw or four-jaw chuck. These chucks, available from many turning suppliers, grip the stock firmly enough on one end to allow you to work the piece with the tailstock removed, which is necessary to hollow the bowl of a goblet. It is important to exercise *extreme care* while using these chucks, as the spinning jaws are exposed and will do *very* uncomfortable things to chisels and fingers alike. Allow enough material in the setup to avoid working close to the chuck.

If you use the three-jaw variety, you'll get a better grip if you round your stock before putting it in the chuck. A four-jaw chuck will hold square and/or octagonal stock, making preturning unnecessary. (Tip: If you will be turning a lot of the same sized stock with the four-jaw, mark two of the jaws to eliminate recentering each time.) Whichever chuck you choose, remember that wood is softer than the metals these chucks usually grasp, so do not overtighten them. Too much pressure will cause cracking.

Other options for gripping small pieces include tapered Jacobs-type chucks and miniature spur centers, which are available for full-sized lathes. Jacobs chucks work well, but I've found the miniature spur centers tend to split small workpieces.

The tailstock choice is less varied. As with most spindle work, a good live center is invaluable. I have one with interchangeable points, and I prefer the 60° point for small work. The tailstock pressure should be sufficient to keep the bearing spinning, but *nothing more* or you risk splitting the blank.

Small Diameters, High Speeds

Most turners have learned to use slower spindle speeds with large turnings because the speed of the wood at the cutting edge of the chisel goes up in proportion to the diameter of the workpiece. But for some reason, most turners ignore the other side of this rule. It *is* important to raise the speed of your lathe for small turning.

Most lathes will approach 2,500 to 3,000 rpm, which is sufficient for small turnings. I've mounted a 3,450-rpm motor on the lathe I use for this work. If you use cutting techniques that are

best for producing crisp, glistening surfaces, slower speeds will work well. Scrapers will produce better results at higher rpm. I generally rough out my small turnings at about 1,500 to 2,000 rpm, and then finish out the turning at 2,500 to 3,000 rpm. For extremely fine work, the faster the better.

If you find the chisels are catching and causing the turning to climb the tool and break, odds are the lathe is too slow.

PHOTOS BY ROSS HAMILTON

Author's index finger supports the work from behind to dampen vibrations that can cause the tool to catch.

Avoiding Big-Bite Syndrome

Another mistake turners unfamiliar with small work make is the "big-bite syndrome." The amount of material you take off with each pass has to be in proportion to the size (and strength) of the turning. If you remove ⅛ in. of material in each pass on a 4-in. dia. turning, 1/64 in. should satisfy you on a ½-in. piece. You can get an idea of how little material you should cut by gauging the shavings on the gouge.

Keep your cuts light, and listen to the sounds the chisels make. If they start to vibrate or chatter, odds are you're taking off too much material. Back out and try again with a less aggressive cut.

One of my rules when making a small turning is to work each section *to completion* and then stay away from it! By working from tailstock to headstock and not returning to rework a section, you can avoid breaking thin sections from torque stress. As I said before, you should set up your turning so that the thinnest part of the work is done last and closest to the headstock. This will help eliminate both flex and torque stress.

Another good technique for small turning is to use your index finger to steady the work. I hold the chisel in my left hand, guide the tool on the rest with my right thumb, and use my right index finger like a steady rest behind the turning. (See photo.) The trick here is not to apply force with your finger, but rather to dampen potential vibrations before they start. If you have to push on the turning to keep it from flexing, you're cutting too aggressively.

Also, there is one safety note worth mentioning. Because of the diminutive size of this work, you tend to get your face close to the turning (especially if your eyes aren't what they once were). Be sure to wear a face shield to prevent injury and to keep your hair and facial hair clear of the equipment. There's nothing enjoyable about having your beard plucked by a turning.

Tooling Up for Miniatures

One thing that might help the beginner get started is a set of turning tools proportionate to the size of the work. Making miniature tools is not difficult, and there are several good sets available commercially (for those who don't mind spending the money). I have miniature tools made by Sorby that I use in tight spots (available from Craft Supplies USA). There's also a set of tools on the market from turner Bonnie Klein (available from Klein Design Inc., 17910 S.E. 100th St., Renton, WA 98059, 206-226-5937).

You can make specialized tools from hardened nails and old chain-saw files set into handles. And you can buy small, high-speed steel tool bits that work well from industrial-supply houses. These bits are designed for metalwork, but they can be ground down to make excellent small chisels for woodturning. High-speed steel is easier to keep sharp than carbon steel, and you can work with fewer worries about overheating it and ruining its temper.

Miniature tools are not essential, but they are helpful. The key is tool control; if you can keep your cuts light and don't use too big a chisel in a small spot, you can probably get by with just a couple of small gouges and a skew.

Another good addition to your lathe setup would be a series of miniature tool rests. I have several rests ranging from 1 in. to 3 in. in width that a local machine shop made from angle iron. The miniature rests don't have to be overly rugged since the force exerted by the smaller turnings is so small, but they can be invaluable in tight spots where a regular tool rest won't fit. Having a rest that you can keep close to the turning at all times will help you eliminate some of the "oops" factor that results from overreaching the tool rest.

Recently, a number of miniature lathes made their debut. If you intend to limit your turning to small work, these lathes are good because of their portability and relatively low cost. But remember, you can turn small objects on a big lathe, you can't turn big ones on a mini lathe. If you're buying one lathe, make it as capable as possible.

The last bit of advice is a statement of fact: If you work small, you will break turnings. The trick is to learn something each time. As you begin to recognize the mistakes that cause the breaks, you will avoid repeating them. By process of elimination, you will become more successful. Just keep trying! ▲

STEPHEN BLENK

is a turner in Washington state and founder of the Olympic Peninsula chapter of the American Association of Woodturners.

TURNING A TINY ROSEWOOD GOBLET

BY STEPHEN H. BLENK

Turning small is simple if you maintain a light touch. Here, author delicately sands the cup before applying a finish.

Rosewood is a good choice for your first goblet because it's very hard and dense. To start, rip out an octagonal piece of straight-grained rosewood with no visible defects. The piece should be large enough to make a goblet about ¾ in. high with enough extra length to grip in the chuck and allow clearance between the chuck and goblet so you can work on the base of the turning.

After roughing the blank into a cylinder, face off the end with a skew.

For this goblet, I held the wood with a three-jaw chuck, but you can use any of the methods discussed in the accompanying article. The thinnest part of the goblet, in this case the stem, should be closest to the headstock. Make sure your mounting technique keeps the wood secure and allows you to remove the tailstock once the piece is rounded. You won't be able to turn the interior of the cup with the tailstock in place.

With the tailstock center against the wood, take a ¼-in. wide gouge and carefully turn the octagonal workpiece to a cylinder about 1/16 in. greater in diameter than the desired goblet. Remove the tailstock and face off the end of the blank with a skew.

Now begin to shape the piece. Turn the exterior of the upper bowl first, then the interior, the stem, and finally the base. Remember to completely finish the bowl before moving on to the other parts. If you try to go back to the bowl after turning the more delicate components, you're liable to break the piece.

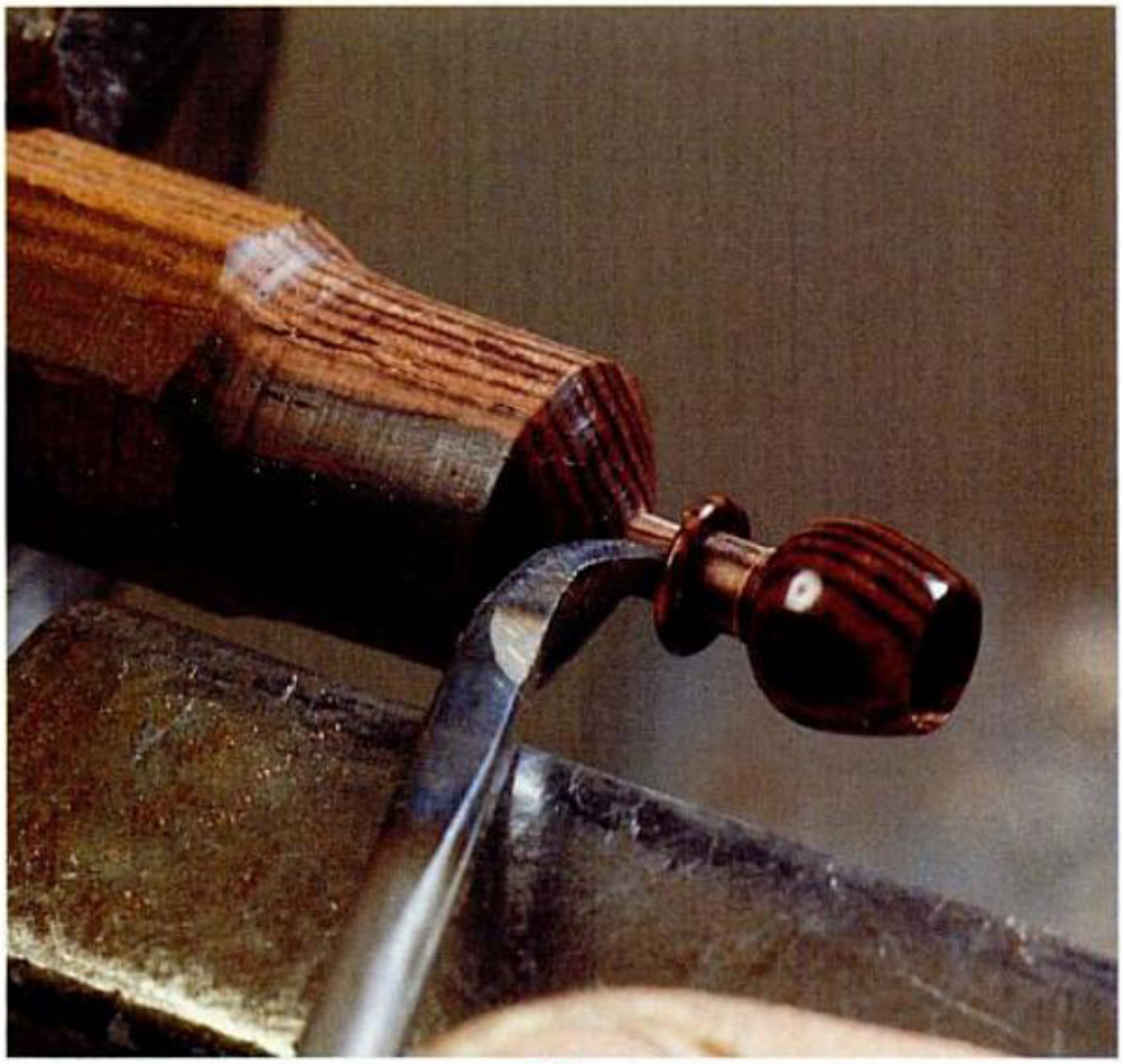
Shape the outside of the cup with the short point of the skew. (Note the dimple from the tailstock center.)

One design note: Look at a few goblets or perhaps a stemware catalog to get an idea of styles and proportions. Work on approximating a desirable shape rather than using exact measurements. You will find many different

Chuck a drill in the tailstock and remove most of the waste from the interior of the bowl.

Shape the inside of the cup with a tiny gouge or scraper. Sand and finish the cup, inside and out.

To turn a ring on the stem, first form a bead with a small parting tool.



Apply a finish to the bead, then undercut the bead with the point of a skew or a hook-shaped tool to free the ring.

styles and forms to try. As your skills increase, you can try your own design ideas and move on to more difficult examples.

For your first goblet, I'd recommend allowing for an inside diameter of about ¼ in. and a depth of ⅜ in. The goblet shown here is ¾ in. high and ⅜ in. in dia. I shaped the outside with a ¼-in. skew, which left a very polished finish, but you could also use a gouge or a scraper. Make sure you dress the front edge, which will be the rim of the goblet. I used the tip of the skew for this procedure.

During shaping, *do not* take the bottom edge of the goblet down to final diameter where it connects to the stem! If you do, the cup will separate from the turning when stressed as you hollow out the interior.

I cheated a bit to hollow out the cup by using a drill bit of appropriate size chucked in the tailstock to remove the bulk of the material. (See photo.) If you do this, be sure not to exceed the depth of the cup. With the hole drilled, you can turn the walls and bottom of the goblet to final dimension with either a miniature gouge or a round-nosed scraper. Try for consistent wall thickness, and don't leave a high spot in the center of the bottom. Sand and then finish the goblet cup with oil or a shellac French polish. Once you are done, *stay away from the cup!* If you attempt to work on the cup after you thin the stem, the turning will probably break.

The stem is the touchy part. To remain in proportion, it must be about 1/16 in. or less in diameter. This is where the denser tropical woods really pay off. Exotics are strong enough to work at this reduced diameter. Remove the waste gradually, using a small gouge. Final cuts can be made with a miniature skew chisel. Work from the cup end in sections, finishing any design details as you go.

One nice touch is to create a free ring on the stem of the goblet as shown in the photo. This is done by turning a thin bead on the stem with a small parting tool and then undercutting it with the point of a skew or a hook-shaped tool made from a flooring nail. (See photo.) You must finish the

duck for the sling, walnut for the wedges, and cherry for the cradle itself. If you'd prefer dark red or blue canvas, a lighter wood such as ash or maple would look good.

Building the Cradle

Start by making a full-sized half pattern of the headboard and footboard from ⅛-in. plywood. (See Fig. 1.) Mark, but do not cut out, the mortises and the handholds.

Unless you have 17-in. wide stock, join up 4/4 boards, using dowels or biscuits for strength. Try to minimize any differences in grain and color. If you have a planer that's wide enough, smooth down the glued-up boards to a final thickness of ¾ in. Otherwise, finish the boards with a cabinet scraper and sandpaper.

Mark centerlines on both sides of the headboard and footboard. Next, on the outside only, lay the pattern along the centerline and draw around it. Prick through the pattern with an awl to mark the corners of the mortises. Mark also the center of the ⅞-in. hole for the handhold. Flip the pattern over to draw and mark the other half of the headboard and footboard.

Bandsaw the end pieces to shape, and then clean up their edges on a disc sander. You can round over the edges with a router and pilot bit, or use a combination of round-soled and flat-soled spokeshaves.

With this done, you can cut the handholds and mortises. First, draw the outline of the handhold and drill ⅞-in. holes at the centers you marked. Cut out the waste with a coping saw, then shape the edges with wood files and sandpaper until the opening feels comfortable to the hand.

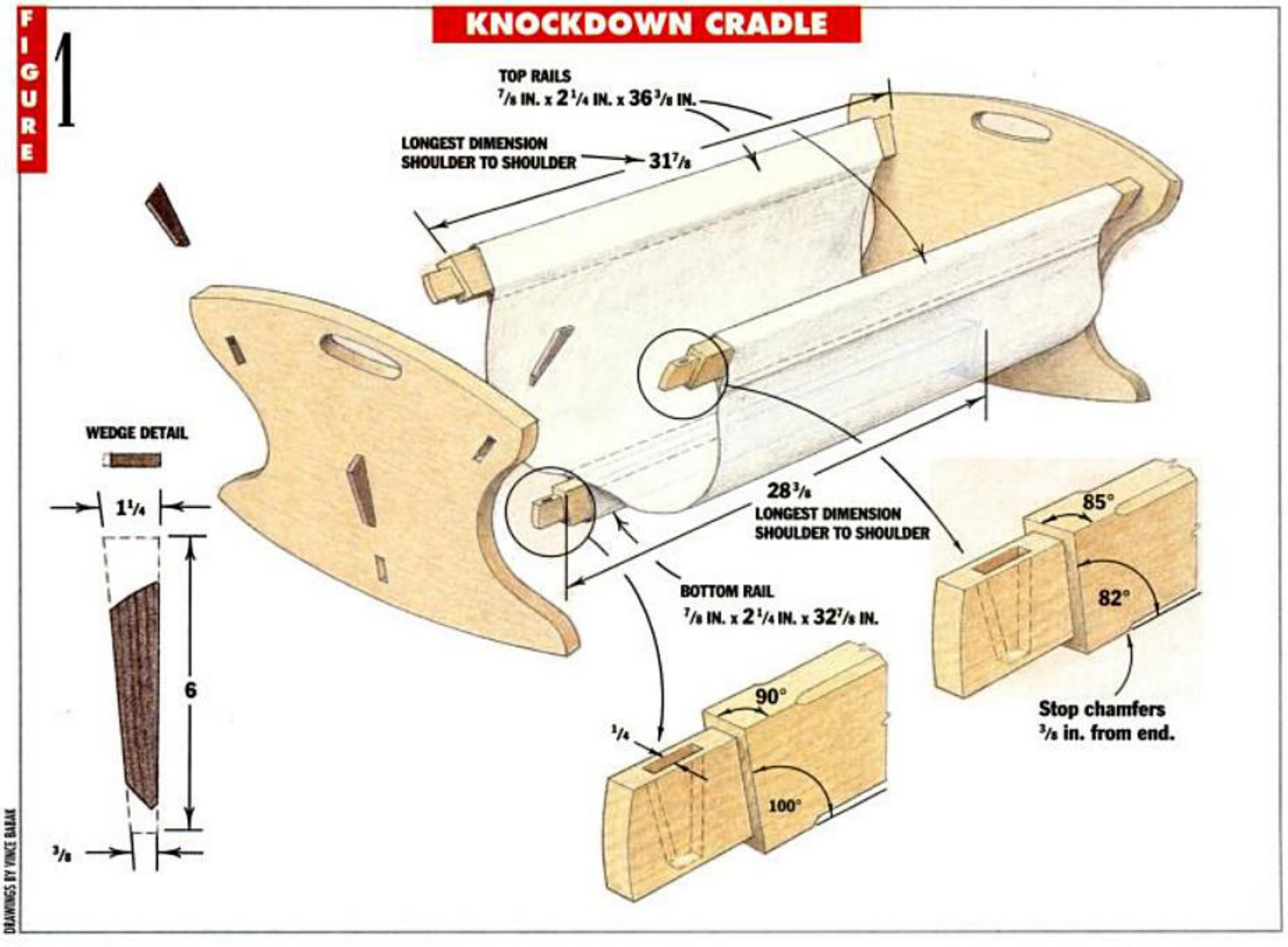
The through mortises in the headboard and footboard are not square to the surface, but instead are slanted. Tilt your drill-press table 10° to the horizontal to drill them. If your table doesn't tilt, you can make an inclined table from plywood. Drill through the corners of each mortise with a 1/16-in. dia. bit, making sure the centerline of the headboard or footboard is aligned with the line of slope of the inclined table. Joining these holes with knife marks gives you the exact position of the mortise on the opposite face.

If you don't have a drill press, approximate the angle by sighting across the drill bit to a bevel gauge or make a small, 10° drill guide. You might want to practice on a piece of scrap stock if you go this route, but if your mortise is off a bit, the shoulders will cover the gap.

No matter how you establish the location of the mortise, the final step is to drill out the waste and chisel to the lines, working in from both sides to prevent tear-out.

There are three rails in the cradle—two long and one short—but my practice is always to make one more than needed. I use the extra rail for all the trial cuts, and I keep it as a full-sized pattern in case I want to repeat

FIGURE 1



DRAWINGS BY VINCE BABAK

Author saws around rails' tenon shoulders so they'll seat firmly against the headboard and footboard.

the design some time. After ripping out and planing the rails, cut each one to the exact length. (See Fig. 1.)

You can cut the cheeks of the tenons with a tenoning jig on the tablesaw, but it's best to cut the shoulders by hand because of the compound angle. Set a bevel gauge to the angles shown in Fig. 1 and mark the shoulders. After sawing them, clean up the tenons and fit them to their repective mortises in the headboard and footboard. Do not worry about the final fit; you'll adjust the tenons shortly. Chamfer each edge the entire length of the rail, stopping ⅜ in. short of the shoulder.

Next, make the wedges for the tenons by planing your stock to a shade under ¼ in. thick and tracing the shape from the pattern. You'll want to leave the wedges long until you have fit the shoulders of the three tenons.

The ¼-in. mortises the wedges fit into are best cut with a drill-press mortising attachment. (See AW, #26.) You can make the part of the mortise that will fall inside the headboard and footboard square to the rail since this will be hidden. For the outside of the mortise, make the slanting cuts by setting the drill-press table at an angle to match the wedge. (See Fig. 1.)

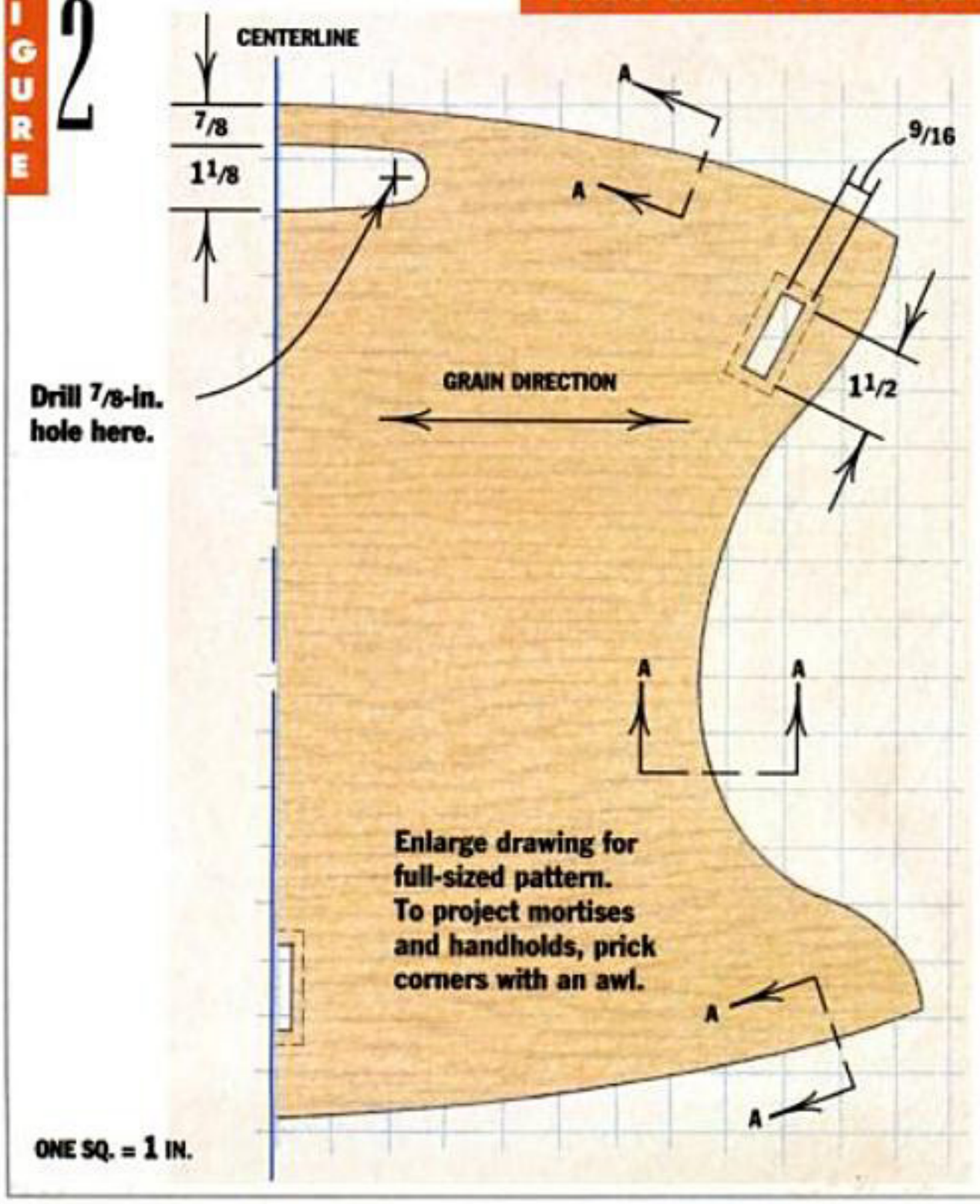
If you don't own a drill press, remove the waste with a 5/16-in. brad-point bit, working from both sides. Clean up the inside with a chisel. Test fit a wedge, and adjust the outside angle of the mortise if necessary.

To fit the tenon shoulders, I use a 265-mm Japanese joinery saw. (See sidebar, The Saw That Does It All.) I first assemble the cradle, tap the wedges into place, and check the angles between the top of the bottom rail and the centerlines of the headboard and footboard. If they are not the same, I clamp opposite corners of the headboard and footboard. I then tighten the clamps until the angles are equal.

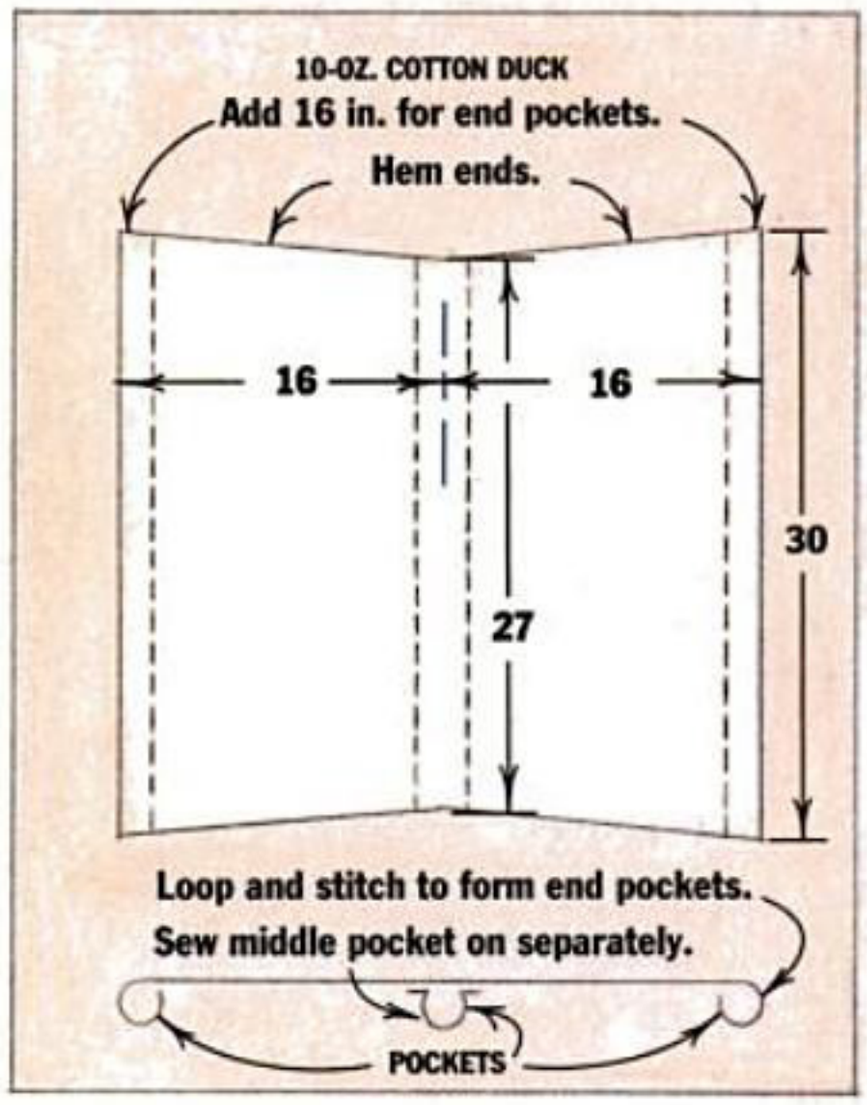
I then gently saw around each shoulder down to the tenon, being careful not to cut the tenon. (See photo.) As I drive the wedges farther in, the gaps close by an amount equal

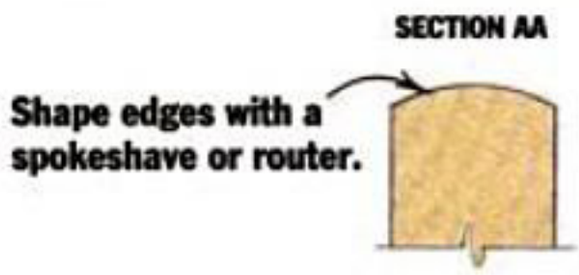
FIGURE 2

KNOCKDOWN-CRADLE DETAILS



DUCK DETAILS





to the thickness of the saw blade. I repeat this entire process until the rails' tenon shoulders seat firmly against the inside surface of the headboard and footboard.

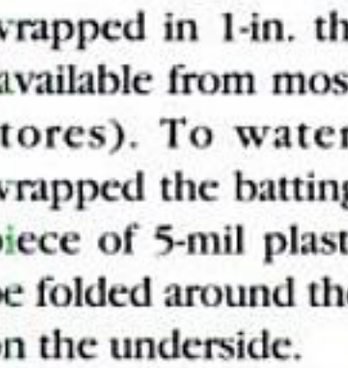
With the tenon fitting complete, I remove the wedges and trim them to their final shape. An equal amount of wedge should show above and below the tenon.

You can use a cabinet scraper to remove the slight scratches left by the Japanese saw on the inside of the headboard and footboard. Don't attempt this saw-fitting technique with a blade that has teeth prominently set. You will inflict scars on the wood that are difficult to remove.

Make the canvas sling to the size and shape shown in Fig. 2. The two end pockets are part of the sling, but the middle pocket is made up separately and then sewn on to reduce stress on the seam. If you don't have a sewing machine that can handle 10-oz. cotton duck, you can order the sling ready-made (available from the Reinhardt Awning Co., 550 Dalton St., Emmaus, PA 18049, 215-965-2544). The company made the canvas sling shown in the photo and kept a pattern for future use.

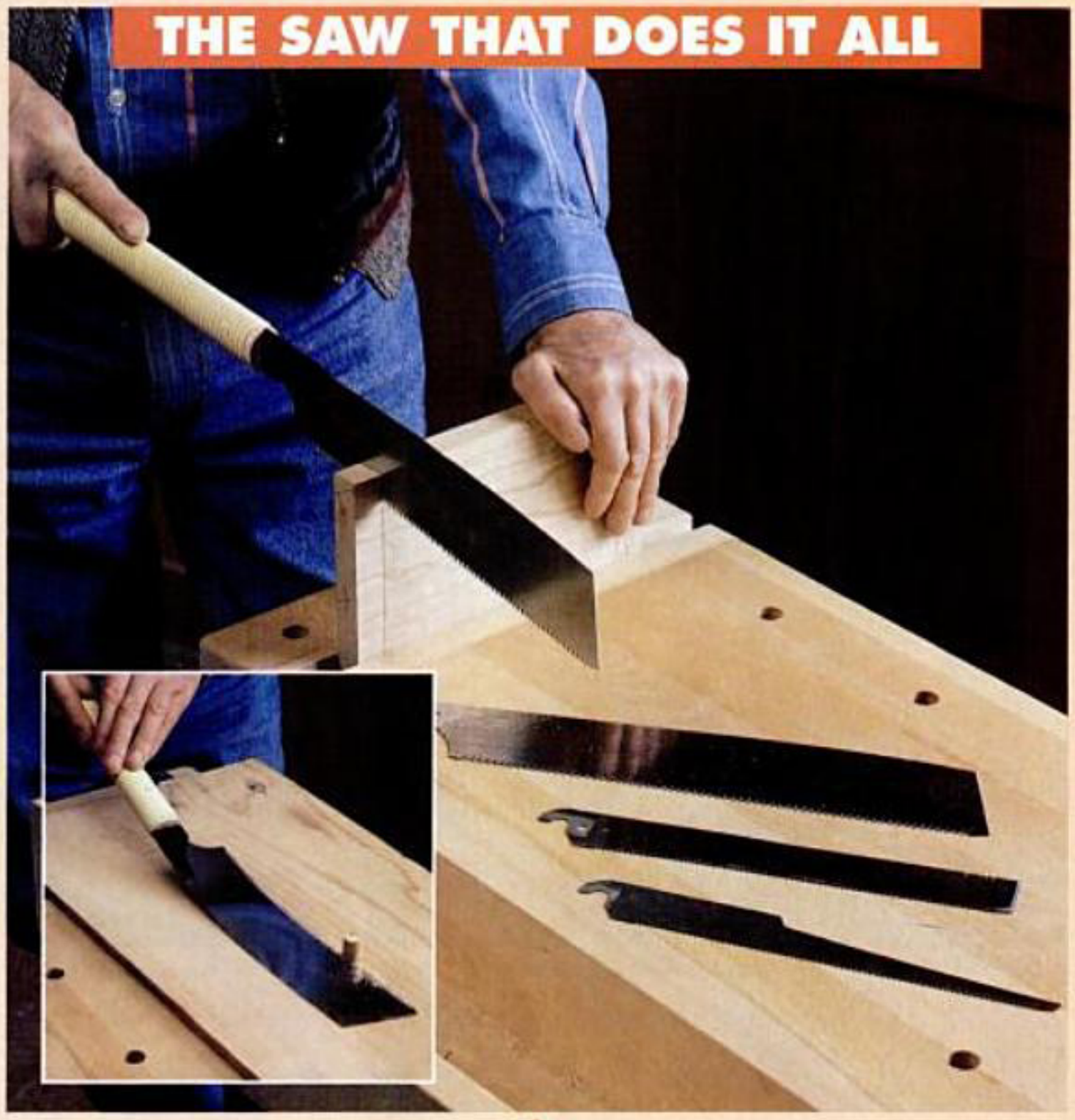
The mattress pad is simply a piece of ¼-in. fir plywood, 12 in. by 27 in., wrapped in 1-in. thick Dacron batting (available from most upholstery-supply stores). To waterproof the pad, I wrapped the batting and plywood in a piece of 5-mil plastic large enough to be folded around the edges and stapled on the underside.

I finished the cradle with a tung-oil varnish. After the first application, I put on a second coat and wet sanded it with 600-grit wet/dry abrasive paper. Before the oil could get tacky, I wiped all the surfaces with a cotton rag to remove any surplus . ▲



SIMON WATTS
teaches wooden boatbuilding around the United States and in Canada. He is contributing editor of AW.

THE SAW THAT DOES IT ALL



The Zeta saw features spineless interchangeable blades for ripping and crosscutting. The flexible crosscut blades have practically no set, making them ideal for flush cutting (inset photo.)

I am a recent convert to Japanese saws, which have teeth made to cut on the pull stroke and not the push. This maintains tension in the blade during the cutting stroke, eliminating the tendency for it to buckle. It also allows for a blade thinner than on our Western saws, and it doesn't need a metal stiffener or spline along the top edge.

Of all the Japanese saws that I've tried, I like the Zeta system best.

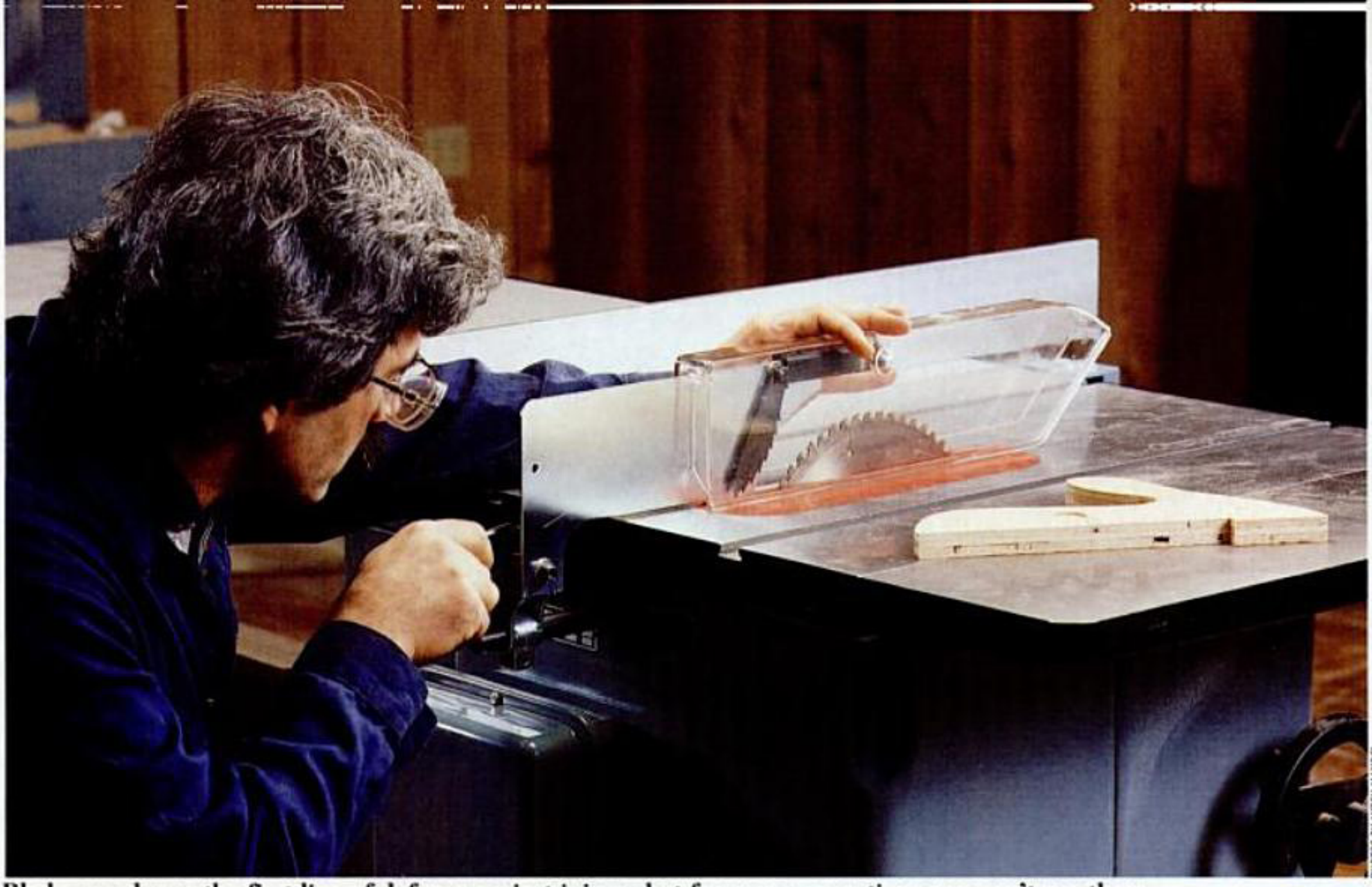
Five interchangeable blades—three crosscut blades, a rip blade, and a compass-saw blade—all fit the same comfortable, rattan-covered handle. Changing a blade takes only a few seconds, or you could buy a separate handle for each blade. Blades cost from $3 to $11.50, and handles sell for $12.50.

The impulse-hardened teeth of these blades are too hard to file—they have a hardness of Rockwell C 68, and an average file is 61. The teeth keep their edge for a long time, but when a blade dulls, your only option is to replace it. When one of my blades loses its bite, I simply assign it less critical work—sawing painted wood, Sheetrock, gummy glue lines, or where I suspect hidden fastenings.

The blade I use most is the medium crosscut—the 265-mm joinery blade pictured above. I like it because it's stiff enough to saw straight yet flexible enough to be sprung down when cutting off plugs or tenons flush with a surface. (See inset photo.)

I use the joinery blade for general woodworking as well as for cutting dovetails and for other close-tolerance work. It is also ideal for saw-fitting the shoulders of tenons, for miters, and scarf and butt joints.

Zeta saws are available by mail from Tashiro's (2939 4th Ave. S., Suite 101, Seattle, WA 98134, 206-621-0199).—*S.W.*



PHOTOS BY MITCH MANDEL

Blade guards are the first line of defense against injury, but for many operations you can't use them.

TABLESAW SAFETY

Common-Sense Guidelines for Staying Out of Trouble

When Fred Matlack, AW's resident woodworking genius, started ripping a piece of oak on the tablesaw last summer, he never dreamed he'd be at the emergency room 20 minutes later. Before he could react, Fred found his finger impaled by a 6-in. splinter of wood. A shaky, long-grain piece had fallen out of a freshly cut edge, wedged in the blade, and rocketed back with the force of a crossbow.

He's recovered now, quite a bit wiser for the experience, and he has a new respect for the machine. Some tablesaw victims aren't as lucky.

Whether you're an amateur or a professional woodworker, odds are you've had a close call, or worse, on the tablesaw. It's something you have to expect when working with a machine that generates incredible force on an unpredictable material such as wood. Still, you might avoid accidents by being aware of the forces and variables at work in each operation, and by practicing safe sawing techniques every time you use the tablesaw.

CAUTION

Blade guards and anti-kickback devices, such as those required by law on new machinery, are useful for typical ripping setups where there is enough room to push the work through without dangerous interference. These devices, however, often become useless or even dangerous when used on smaller stock because they can interfere with hold-downs, rip fences, and push sticks. If in doubt about using the manufacturer's original equipment guards and accessories, consult your owner's manual or the manufacturer.

Why a Tablesaw Is Dangerous

In one respect, all operations on the tablesaw are alike: They involve remov-

BY ELLIS WALENTINE

When cutting dadoes, use a feather board to keep the stock flat on the table.

This is why you *never* use the rip fence in conjunction with a miter gauge when crosscutting. Instead, clamp a gauge block to the rip fence well in advance of the blade. (See photo, preceding page.)

The risk of an accident in crosscutting increases if the workpiece is odd shaped (round, for example) or supported poorly by the miter gauge. Most miter gauges, whether original equipment or aftermarket additions, have removable hold-downs that work well for small pieces.

Round stock is particularly tricky because the teeth of the blade strike the surface tangentially and tend to spin it. You'll need to hold the stock tightly and feed it slowly enough to overcome this tendency. Using a V-block screwed to the miter gauge will double the area of contact. A strip of coarse sandpaper glued to the miter gauge also will increase the friction.

If you plan to make compound miters by tilting the work and setting the miter gauge at 45°, be sure to support the piece so it can't shift during the cut. (See photo.)

Dadoes, Grooves, and Rabbets

Woodworkers often cut dadoes, grooves, and rabbets on the tablesaw, using either a set of dado blades stacked to the desired width or a wobble-dado cutterhead adjusted to width. Since most dado work is fairly shallow, dado sets for a given saw are smaller in diameter than blades for the same saw. At the same time, dado sets remove more material than a single blade does and can produce several times the feed resistance.

The danger in dadoing is the resistance tends to raise the work off the table, especially if the wood is dense or the blades are not sharp enough. If this happens, you could lose control and the piece might kick back. At the least, you will have an irregular bottom in the groove. Also, since you are using increased hand pressure to move the work through the blade, you are in a more compromising position if the work shifts. Your hand could go into the blade before you know what's happening. (See sidebar, When Machines Bite: A First-Aid Primer, page 32.) To be safe, use a feather board to hold the work down.

Molding

Molding on the tablesaw is accomplished with a molding head, usually about 5 in. in diameter, that accepts either one or three pattern cutters. These heads are handy to use in lieu of a shaper for certain molding operations, especially on the face of a workpiece. Properly sharpened, a three-knife head can quickly and safely produce a profile as deep as ⅜ in. with an acceptable surface.

The danger when molding varies with the profile being cut. If removing stock creates an off-balance profile, the wood could tilt into the blade, particularly at the end of a pass, and result in a nasty snipe or even a kickback. Also, as with dadoing, there is more resistance in cutting than with a saw blade, so you have to maintain adequate pressure and feed the work deliberately.

Tenoning

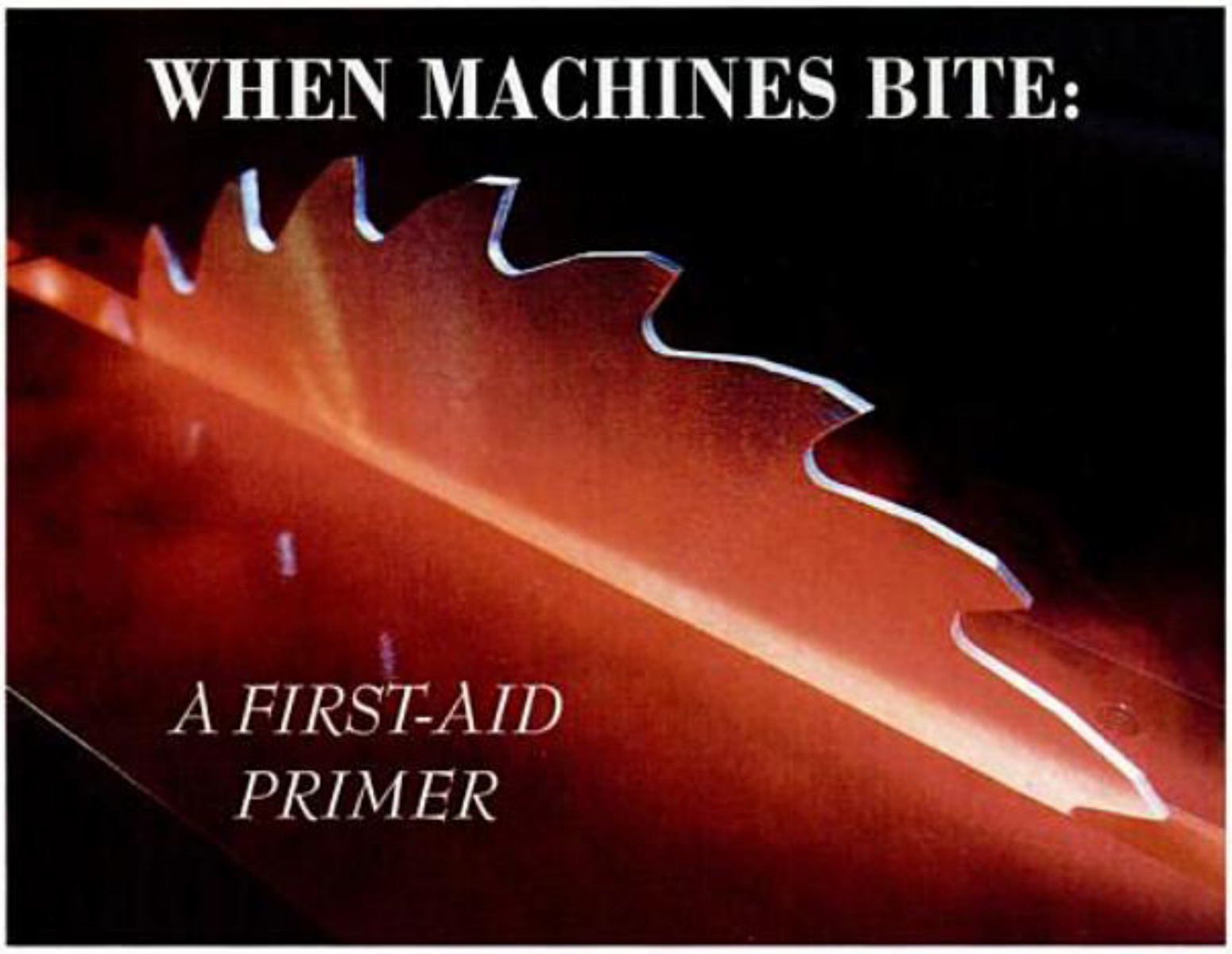
Tenoning is one of the safer operations on the tablesaw, assuming you're using a solid tenoning jig with adequate clamping power. The work is held firmly, and your hands and body are not in the path of danger. Remember, however, that the feed resistance increases with the density of the wood and the amount of material you remove.

If you prefer a double-bladed setup (see AW, #24, page 59), you should use two matched ripping blades with at most 24 teeth. This cuts down the friction caused by the two blades and lessens the resistance to feed pressure. Even so, if you allow the jig to rock slightly, your blade could bind and kick. Also, when the saw blade exits the work, the sudden release of resistance could knock you off balance, throwing an elbow or forearm toward the blade. A balanced stance is the best insurance against this type of accident.

Like any other learned technique, tablesaw safety becomes reflexive after awhile. In the meantime, you owe it to yourself to be conscious of as many dangers as possible. Odds are, you'll have more fingers to count your blessings.▲

ELLIS WALENTINE
is assistant editor of AW.

WHEN MACHINES BITE:



A FIRST-AID PRIMER

No one likes to contemplate an injury in the workshop, but knowing what to do in an emergency is every woodworker's responsibility. This primer gives you a plan for action if you or someone in your shop is injured. If you suffer an injury while alone in the shop, call for assistance immediately; some first-aid procedures cannot be self-administered.

Bleeding

The first objective is to *stop the flow of blood.* Rapid loss of blood can be fatal. (Note: Because of the risk of AIDS transmission, treat other people's blood as if it were infectious. Wear latex gloves if possible, and wash off all blood with soap and water as soon as possible.)

To stop bleeding from an open wound, apply *direct pressure* to the wound and *elevate* the affected limb above the level of the heart without relaxing the pressure. Place a clean cloth, a sterile gauze pad if available, or even your bare hand directly on the wound and press firmly. Apply more cloths if the blood soaks through. When the bleeding slows, wrap the wound tightly with another cloth or bandage and tie the ends in a knot over the wound. This will maintain the pressure and keep the dressing from moving and disturbing any clots.

If you can't stop the bleeding with these methods, apply pressure to the nearest pressure point. Assuming the injury is to the hand or forearm, locate the pressure point on the inside of the upper arm and compress the artery against the bone.

Don't use a tourniquet unless there is imminent danger of bleeding to death. There is a risk of permanent damage from lack of circulation.

An *avulsion injury* is one in which a flap of skin has been pinched or pulled back from the body. Restore the flap to its proper location before applying direct pressure on the wound, then proceed as described above.

In case of *amputation*, control bleeding first by applying direct pressure. Next, find the amputated part, wrap it in dry, sterile gauze or a clean cloth, and place it in a plastic bag. Chill the bag with ice or ice water, and be sure to take it with you to the nearest emergency room. Amputated parts often can be reattached to the body.

If an *object penetrates* the body, remove it only if it is a small, accessible splinter, or if it is blocking the airway. Control bleeding by applying direct pressure, but don't move the object. Wrap the area with bandages to keep the object stationary until you can get emergency treatment.

An *eye injury* is treated a bit differently from other types of wounds because you should never apply heavy pressure to the eye. If a particle gets into the eye, flush it out with a saline eye wash or running lukewarm tap water. If there is a cut on the eyelid, use gentle pressure on a bandage to stop the bleeding. If the eyeball itself is cut, simply wrap the area in a damp cloth. If there is something impaled in the eye, stabilize the object with bandages, trying not to move it. Cover the other eye to limit all eye movement.

Treating Shock

When the body loses a significant amount of blood in a hurry, it can result in *hypovolemic* (low-volume) shock. Shock is life threatening and requires immediate medical attention.

The symptoms of shock include:

- Anxiety or restlessness
- Cold, clammy, pale or bluish skin
- Sweating
- Dilation of the pupils
- Weak and rapid pulse
- Irregular breathing
- Thirst
- Loss of consciousness

If you observe these symptoms in someone who has been injured, start treatment for shock immediately:

- Have a conscious victim lie on his or her back, or if the victim is unconscious, roll the victim onto his or her side to prevent choking.
- Check for breathing problems and clear the victim's airway if it is obstructed.
- Control external bleeding (see prior instructions).
- Raise the lower part of the body about 12 in.
- Warm the victim with blankets but don't overheat.
- Call for emergency help and instructions.

First-Aid Kit

Every woodworking shop should have a first- aid kit with fingertip bandages, knuckle bandages, large gauze pads, roller gauze, finger splints, antiseptic, and tape. Latex gloves are recommended. You can buy or order a first-aid kit at most drug stores or by mail (available from Direct Safety Co., 7815 S. 46th St., Phoenix, AZ 85044, 800-528-7405, and Seven Corners Hardware Inc., 216 W. Seventh St., St. Paul, MN 55102, 800-328-0457).—*E.W.*

CANDLE BOX

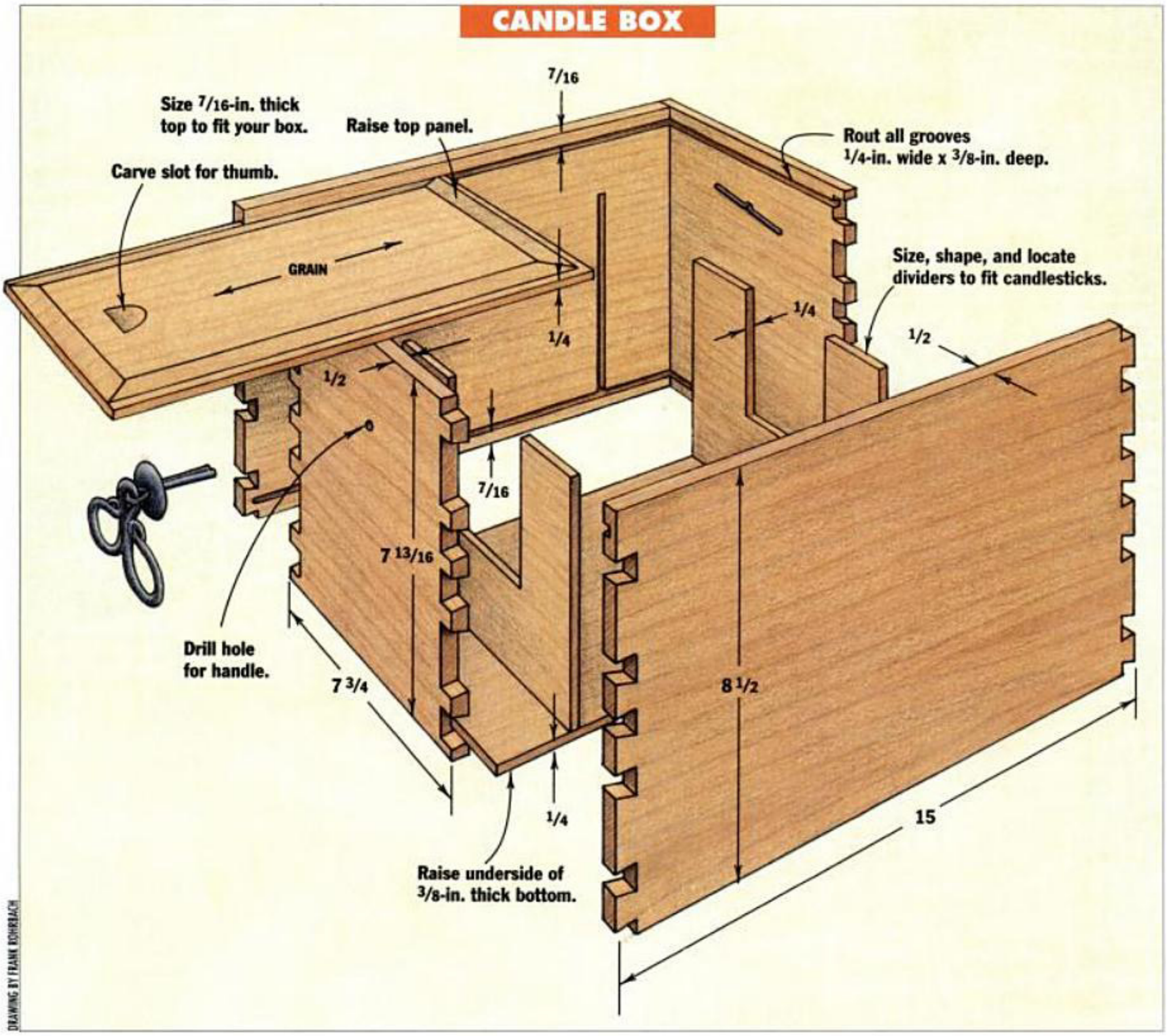
With Room for the Holders

BY FIONA A. WILSON

I've known El since we were 16. We went to camp together, hung out after school together, weathered the storms of adolescence together. She and I are kindred souls with lives that overlap in the most curious ways. Last spring, when she called to tell me she was getting married, neither of us was surprised I had the same news to tell her.

For such a fine friend, I wasn't about to consult a bridal registry and buy her a gift. No, it had to be something exclusive. I finally decided to make El and Mark a candle box, containing candles and a pair of forged-iron "courting" candlesticks (available from Sturbridge Yankee Workshop, Box 4000, Westbrook, ME 04098, 800-343-1144). These adjustable

PHOTOS BY MITCH MANDEL



candlesticks were reputedly used during a daughter's courtship—suitors were allowed to stay until the candle burned down to the metal. If a father liked a prospective suitor, he'd set the candle in the highest position so it would burn longer. If, however, the father found the visitor lacking, he would set the candle down low, bringing the visit to a hastier conclusion.

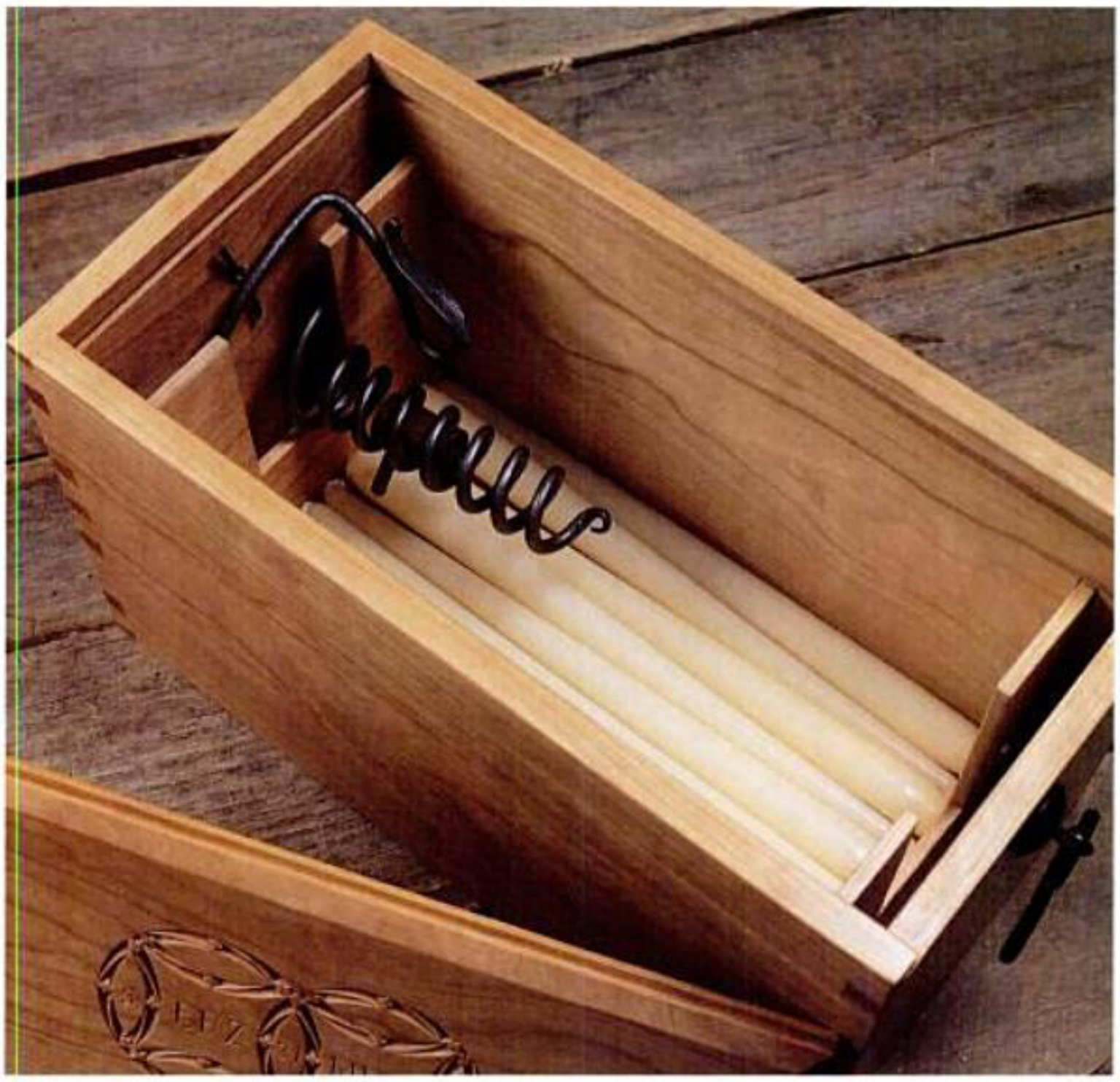
The box I made is similar to traditional folk-art candle boxes, though deeper to accommodate the candlesticks. It has two forged-iron handles (to match the candlesticks) and a sliding lid with El's and Mark's initials and wedding date chip carved into the top—(handles and backing plates available from Artesanos Imports, Drawer G, Santa Fe, NM 87501, 505-983-5563). It's the idea that counts—modify the plans to suit your needs.

These adjustable candlesticks were reputedly used during a daughter's courtship. If the father found the prospective suitor lacking, he would set the candle down low, bringing the visit to a hastier conclusion.

Building the Box

I used cherry for my box. If you plan to carve the lid, you might want to choose a lighter-colored wood so the carving stands out even more.

Thickness your stock to ½ in. (see drawing), then lay out the dovetails. You will want to space them to accommodate the different heights of the end pieces and grooves you'll cut to hold the lid. Also, on a simple project like this box, you can use details like the spacing and sizing of the dovetails to give the piece added character. I cut my dovetails by hand (see AW, #19),



Interior dividers secure the candlesticks horizontally.

Forged-iron handles match the design of the candlesticks.

though you could also use a router and dovetail jig.

Once the dovetails are done, rout the grooves for the lid and bottom. I recommend doing this on a router table. Note: The grooves should extend out one end for the sliding lid but stop short of the other end so the gap doesn't show through the dovetails. Also, use stopped grooves for the bottom. (See drawing.) After you've finished the grooves, saw 11/16 in. off the top of the end piece where the lid will enter.

This is also a good time to cut the grooves for the interior dividers (if you choose to include any). Rout these grooves into the front and back panels but not the bottom, locating them according to the dimensions of your candlesticks.

The top and bottom panels come next. Dry assemble the box, and size the top and bottom to fit. Leave some room across the grain for the panels to expand and contract during the seasonal changes in humidity.

Raise the panels on the tablesaw. I chose a simple bevel, but you could do a more elaborate profile.

Next, dimension the interior dividers to fit your box (again allowing room for the dividers to shrink and expand), and bandsaw the slots for the candlesticks.

If you want handles on your box, drill the holes at this time.

Now you can dry assemble all parts to check the fit. When everything is right, wax the interior surfaces and the underside of the bottom panel (tape up the joints so you don't get any wax in them). Finally, glue up the box, leaving the bottom panel and the dividers free to move.

Carving the Lid

If you choose to carve the lid, I recommend consulting Wayne Barton's books, *Chip Carving: Techniques and Patterns* and *Chip Carving Patterns* (Sterling Publishing Co. Inc., 387 Park Ave. S., New York, NY 10016). These books are full of excellent chip-carving tips and numerous motifs and patterns. I incorporated a border motif from Barton's second book with a pattern I have seen many times on quilts—the double marriage ring.

Whatever pattern and motif you select, make sure you start the carving process with a good drawing. Chip carving is done with two knives that you must keep very sharp. I used Barton's recommended chip-carving knives (available from Woodcraft, 210 Wood County Industrial Park, Box 1686, Parkersburg, WV 26102).

This is the first chip carving I've done, and I found it very accessible. With a little practice, I believe you'll find the results just as rewarding. (See AW, #2, May/June 1988 for more on chip carving.)

Don't forget to carve the thumb hold at the end of the lid, using regular carving gouges.

Finishing

Once you've completed the carving, clean up the outer surfaces of the box and apply your choice of finish. I chose a tung-oil finish. Make sure the finish doesn't pool in the carved areas. One way to avoid this is to apply the finish with the lid upside down and let it dry this way. ▲

FIONA WILSON
is AW's field editor in Ohio.

ROGER HOLMES

Looking a little like a covered bridge, the picturesque Wight sawmill at Old Sturbridge Village straddles a branch of the Quinepaug river.

THE WIGHT SAWMILL

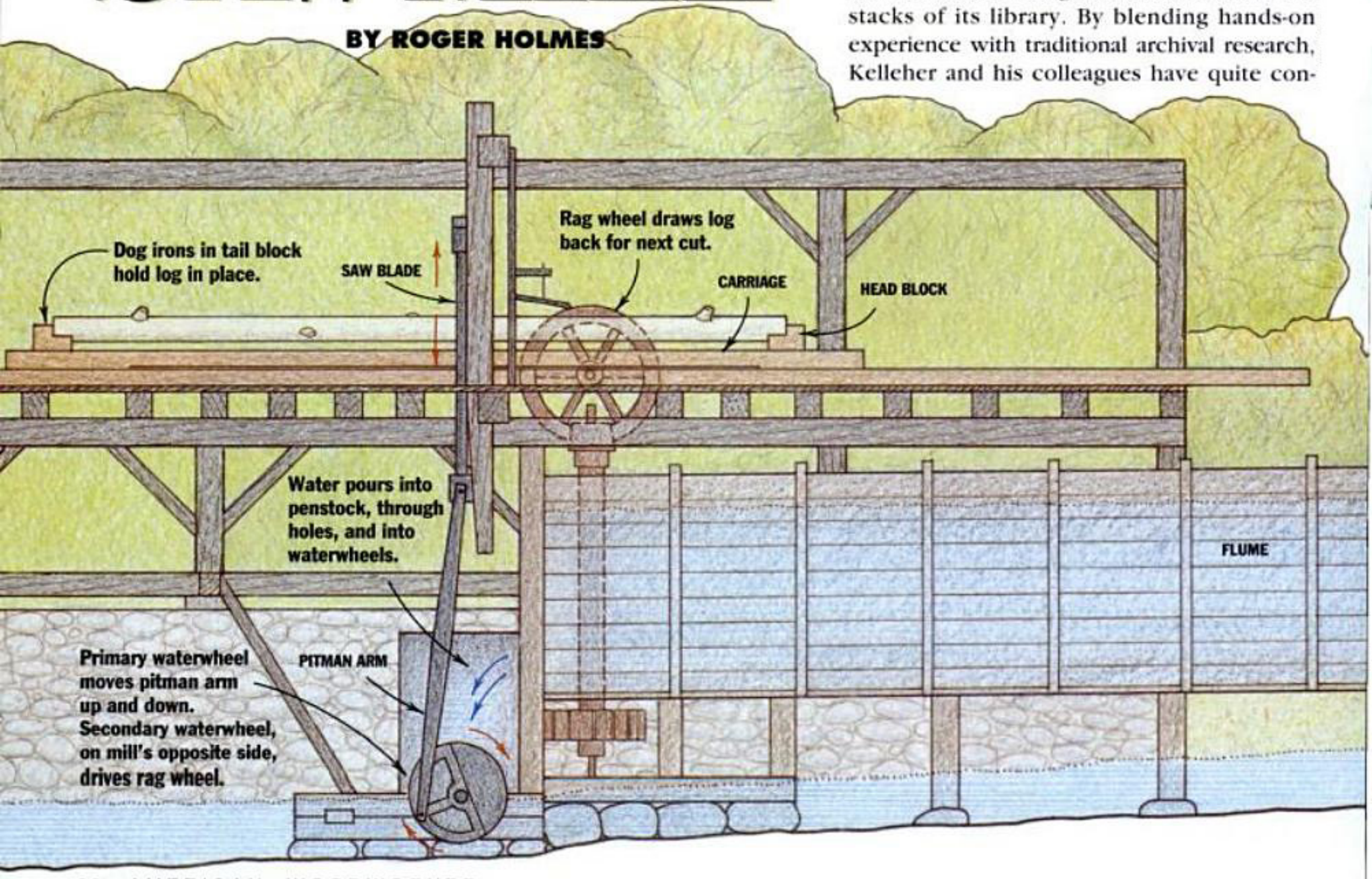
BY ROGER HOLMES

"Of all the contraptions mankind has ever conjured up for his own bedevilment, nothing can so infinitely exasperate as a sawmill," says Tom Kelleher as he emerges from beneath the floorboards of the Wight sawmill at Old Sturbridge Village in Massachusetts. "No other machine has quite such a perverse and malignant spirit."

Kelleher, a burly, bearded man in well-worn 19th-century breeches and blouse, has loosened the overheated bottom bearings on the re-created mill's 500-lb. saw frame once too often this morning. Still, he smiles as he delivers this appraisal of sawmills written 50 years ago by George Woodbury, the operator of another anachronistic waterpowered mill.

After further ministrations to the saw frame's iron ways, Kelleher shifts a large wooden lever and engages the mill's dual waterwheels. In seconds, the frame is pounding away, up and down, 120 strokes to the minute, its single blade rasping through a 15-in. dia. pine log. Dogged to a massive, rack-and-pinion-driven carriage, the log's dismemberment proceeds at a stately pace.

It is emblematic of Old Sturbridge Village that you're as likely to find Kelleher, the coordinator of historic trades, emerging from the bowels of the village sawmill as from the stacks of its library. By blending hands-on experience with traditional archival research, Kelleher and his colleagues have quite con-



vincingly re-created life in a rural New England community of the 1830s.

Opened to the public in 1946, Old Sturbridge Village boasts more than 40 buildings on 200 acres near present-day Sturbridge. The village employs 300 to 400 people, 120 of whom are "interpreters" in period costume. They work on the village farm, serve at counters at the shops and tavern, occupy the houses, and attend town meetings, church dinners, and dances. Despite the presence of 20th-century interlopers, village life seems palpable.

Like the village, the sawmill embodies an earlier, less frenzied era. "The top speed is 3 ft. per minute," Kelleher says as we watch the pine creep along. "But we never do that. We saw oak at about 12 in. a minute, pine at about 1½ ft. to 2 ft. a minute." While this doesn't approach the speed of a contemporary circular-saw mill, it certainly beat the 1830s alternatives like pit sawing.

"I've done some pit sawing," says Damon Cooke, the mill's lead interpreter. "You go about 6 in. in the first minute, but then it drops off." Cooke and Kelleher figure that two pit sawyers with a double-handled saw (one stands on top of the log, one below it) would take five days to saw what a single man could mill in one.

Although far more productive than pit sawing, this sawmill is a very close

Waterpowered Replica Keeps History Alive

cousin to it. Early mechanizers, Kelleher explains, "attempted to apply power at the spot where a man would apply it." Sawmill terminology reflects this simple substitution of mechanical for muscle power—the shafts that transform the rotary motion of the waterwheels to the up-and-down motion of the saw frame are called pitman arms. (See drawing and sidebar.)

From the perspective of our complex age, the village mill is reassuringly direct and self-contained. Standing on the bank opposite the mill, I can see the whole process: Water from the impounded Quinepaug River roars down a wooden flume, driving heavy, cast-iron waterwheels. Rising from the foaming maelstrom, the pitman arms jerk up and down like the legs of an ungainly grasshopper doomed to jump forever in the same spot. On the floor above, Cooke stands at the open side of the vibrating building, poised to slide a freshly sawn board down a pole ramp. In the background, the saw frame thumps away.

Such a sight was common in the 1830s, when 13 sawmills served the 2,000 citizens of Sturbridge. Demand for lumber was great, and it was far too expensive to ship overland. (Kelleher says someone at Sturbridge calculated that it would have cost $1,800 in 1800 to ship a five-cent 2 x 4 overland from Oregon to Sturbridge.)

Rural mills were often family run,

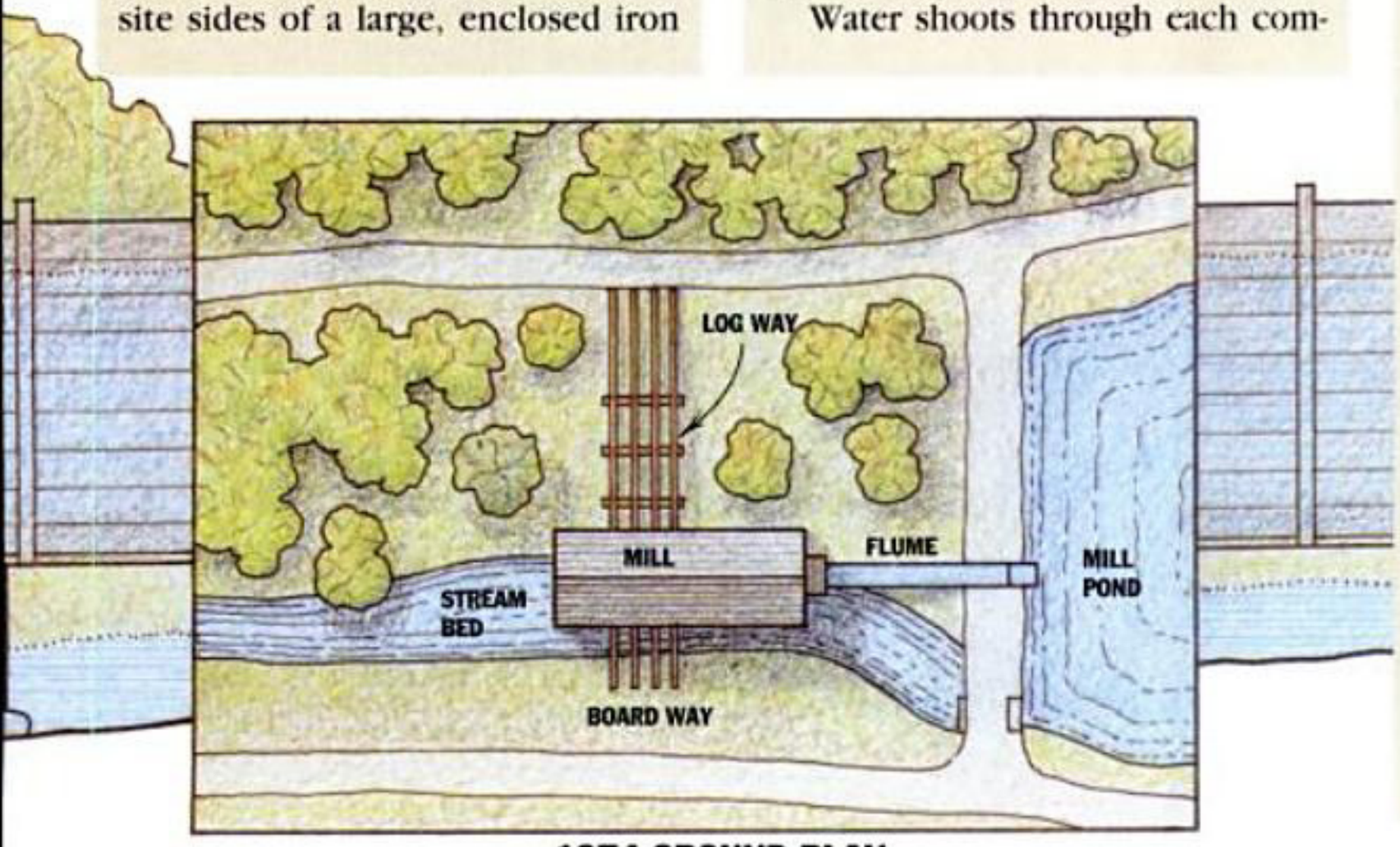
1830S HIGH TECH

The Old Sturbridge sawmill, like many early machines, is engagingly simple. The drawing shows it all, from power source to cutting edge, but for those of us who think of large, picturesque paddle wheels when we think of waterpower, the mill's wheels come as a surprise. Propelled by jets of water, these wheels were high tech in the 1830s.

The two cast-iron wheels, each 4 ft. in diameter, are attached to opposite sides of a large, enclosed iron box, called the penstock, which abuts the end of the wooden flume. Opening a butterfly gate in the penstock fills the box almost instantly with water. Forced through holes in the penstock wall, the pressurized water enters the center of each enclosed wheel where it is channeled into six interior compartments with vanes configured like a pinwheel.

Water shoots through each compartment and out nozzles on the rim of the wheel, spinning it like a giant lawn sprinkler. Bathed in a churning, frothy cloak, both wheels transform 8 ft. of head (the distance the water drops from the dam to the penstock) into 4 HP to 8 HP.

Heavy, cast-iron balance wheels attached to the waterwheel arbor drive the pitman arms and the massive oak saw frame. In the 1830s, the mill's double-pitman design was less common than a single-pitman setup—and much fussier. Even today, any irregularity of movement between the two sides will rack the saw frame. Occasionally worse can happen. In February 1991, one of the lower pitman bearings eroded and the arm came off the wheel. The saw frame racked immediately, the other arm snapped and jammed up through the floorboards, while both balance wheels shattered. "It happened in a second," explains Tom Kelleher, Old Sturbridge's coordinator of historic trades. "Visitors in the building asked if it would be running by the afternoon." Two months later the mill resumed operation.—*R.H.*



1974 GROUND PLAN

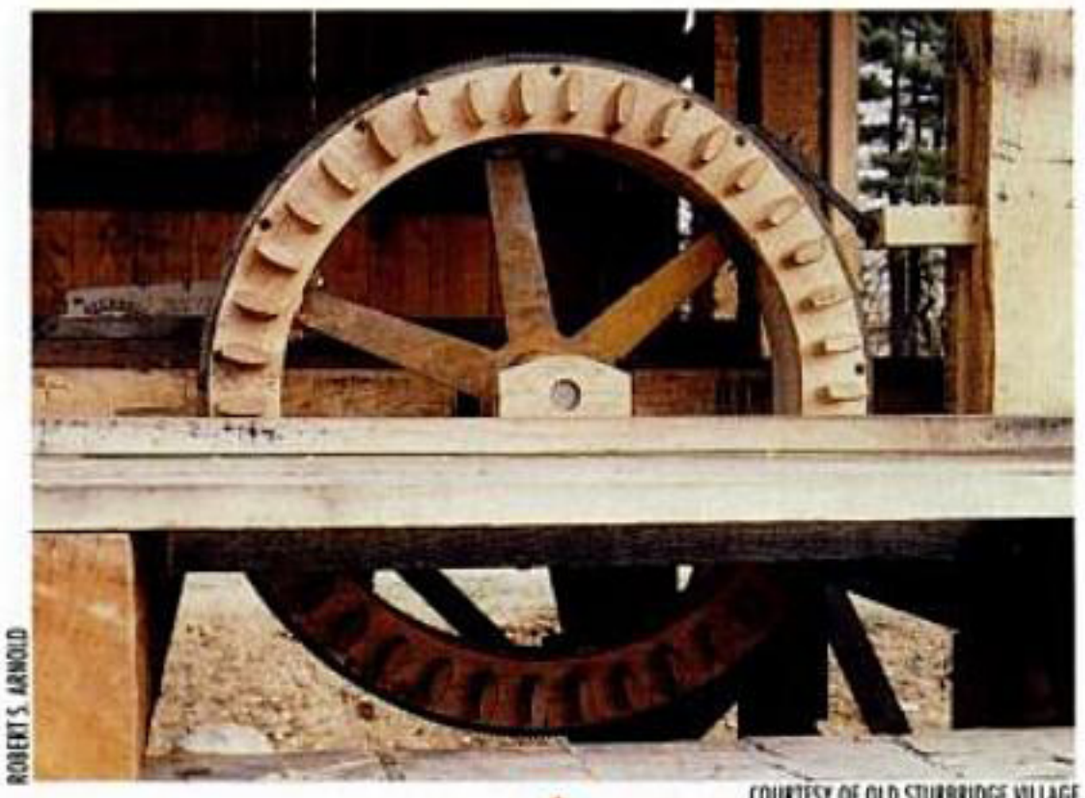
ROBERT S. ARNOLD

COURTESY OF OLD STURBRIDGE VILLAGE

Bringing history to life, two Old Sturbridge Village sawyers prepare a log for the next pass through a re-created 1830s waterpowered up-and-down saw.

ROGER HOLMES

Though it's slow, the sawmill's 6½-ft. long, 7-in. wide blade has massive 1-in. long teeth that cut deeply on each pass.



ROBERT S. ARNOLD

COURTESY OF OLD STURBRIDGE VILLAGE

The cogged rag wheel advances the log through the saw blade by means of a rack-and-pinion mechanism.

usually in conjunction with a farm. Many were winter operations; you can't plow frozen ground, but you can skid logs over it. Sawing began in mid-February and continued relentlessly, often 18 to 24 hours a day to mid-April.

Sawyers milled wood for homes, barns, and sheds, according to cutting lists supplied by local carpenters. Kelleher says that a mill like this, running smoothly, could cut 1,000 board ft. a day, grossing the sawyer $2.50—10 times the daily wage of a farm laborer. But account books of the period record the downside. "The mills broke down all the time," says Kelleher. "Entries note time spent mending the frame, the flume, or the sweep [the pitman], or days when there was too much water or not enough."

Accounts were often paid in kind—a bushel of apples, a plowed field—and this credit economy also had its risks. "The idea," explains Kelleher, "was to try to get someone slightly more in debt to you than you to them. A lot of people failed." Indeed, by the mid-19th century, when railroads made overland shipping cheaper, local sawmills were in decline.

The Wight sawmill was completed in 1984 and is a reproduction of one built in the 1830s in Bow, New Hampshire. It sits on a site that served as home to a series of mills built by the David Wight family in the 19th century. This 20th-century re-creation is picturesque with its weathered gray-brown siding complementing the stone dam and clear, rushing water. But it is a working mill, not a picture postcard. In addition to bringing a part of the 19th century to life for visitors, the 300 logs it saws each year provide material for village projects—farm gates, sheathing, fences, and all sorts of building repairs.

The work is strenuous—Kelleher and Cooke joke that they were hired as much for their brawn as brains. Nineteenth-century mills were quite often one-man operations, so to save their backs, sawyers developed considerable finesse with bars and cant hooks. As I watch, Cooke and an assistant lever a 12-footer from the millstream bank, then across a bridge of hefty logs and onto temporary bearers spanning the carriage's wooden rails.

With an ax, the assistant cuts shallow notches into both ends of the log where it will rest on the carriage's head and tail blocks. He eyeballs the notches, which must be in the same plane or the log will rock and bind the blade. Then engaging the carriage's rack-and-pinion mechanism, Cooke brings the log, which slides on top of the carriage rails, up to meet the blade and the head block. (The rails are long enough to handle a 25-ft. log.) Rolling the log to position, its notches on the head and tail blocks, the two men remove the temporary bearers.

Cooke moves between the carriage rails and behind the blade to position the log for the first cut, which will slab off a side. Envisioning the largest square he can get out of the tapering

of interest (the scroll and turnover) linked by a smoothly flowing stem and leaf lobes give the carving a vigorous sense of movement.

This kind of carving—done on a solid block and appearing to float on the surface—is called bas-relief work. It's a good training exercise because the skill needed to produce a clean, uniform background is nearly as great as that needed to carve the leaf.

Getting Started

The most important step in any carving is the drawing. Get this right and the carving will be right. (See drawing.) There's no need to produce an elaborate drawing—after all, you want to work with wood, not pencil and paper—but you need to produce something you can work from and that serves as a guide when carving. A simple line drawing is often enough. If you can't get a good enough sense of what the carving will look like from a plan view, try drawing an end view or side view. You'll be surprised how much it can help. Try to achieve the qualities I mentioned earlier—good flow, a strong sense of movement, and good proportions.

The leaf in the photos is carved from lime, a European species similar to American basswood. Any tight-grained wood would be suitable. Try not to work in woods that are too soft—poor-quality pine, for example—because they'll shred and tear. Avoid hardwoods, like walnut, cherry, and maple. They're difficult to carve and may discourage you.

The main tools you'll need to carve this leaf are gouges (#2 to #8 sweeps, 3 mm to 24 mm) and fluters (#11, 4 mm and 16 mm). For information on the basics of carving, see my other articles (AW, #5, November/December 1988; #8, May/June 1989; and #13).

Carve the leaf from a block 2 in. thick, 5½ in. wide, and 12 in. long. When the carving is finished, the leaf will be 1 in. high and the background 1 in. thick. (A ½-in. background would serve just as well, but I prefer to use a 1-in. background to reduce the risk of running my carving tools into the screw tips that secure the workpiece.)

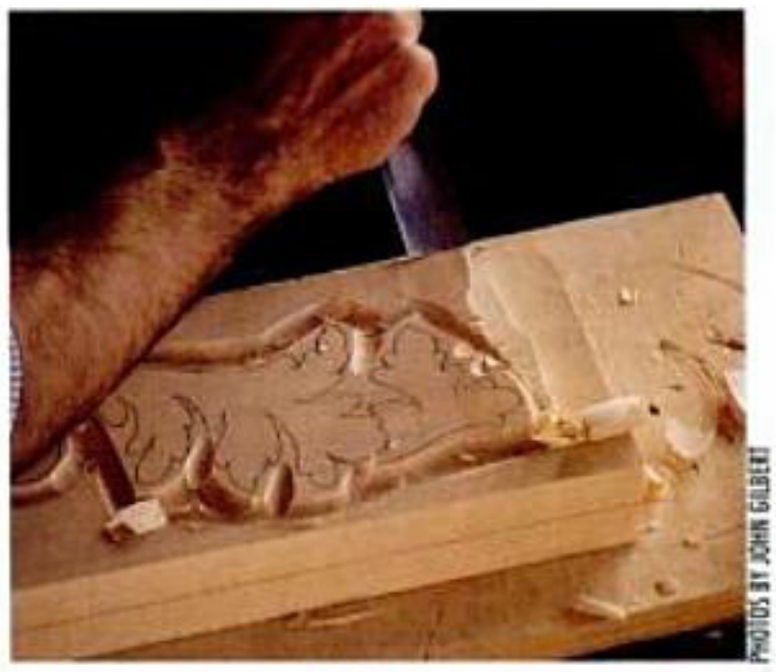
After sketching the leaf full size on paper, use carbon paper to transfer the outline of your drawing to the wood block. On the four edges of the block, draw a line 1 in. from the bottom all the way around to act as a guide when carving away the background, or ground (the flat area around the leaf). (See photos.) Secure the workpiece to a scrap piece of plywood with three #10 screws drilled in from the back. Clamp the plywood to your bench.

Lowering the Background

The first step is to carve away the background around the leaf. This is referred to as *lowering* the background. Using a mallet and a large fluter (#11, 16 mm), carve a channel approximately ⅜ in. deep around the outline of the leaf, leaving about ⅛ in. extra wood outside the line of the drawing. (See photo 1.) Be careful to cut with the grain to avoid tearing out the wood. Also, be careful not to undercut the pencil line of the leaf.

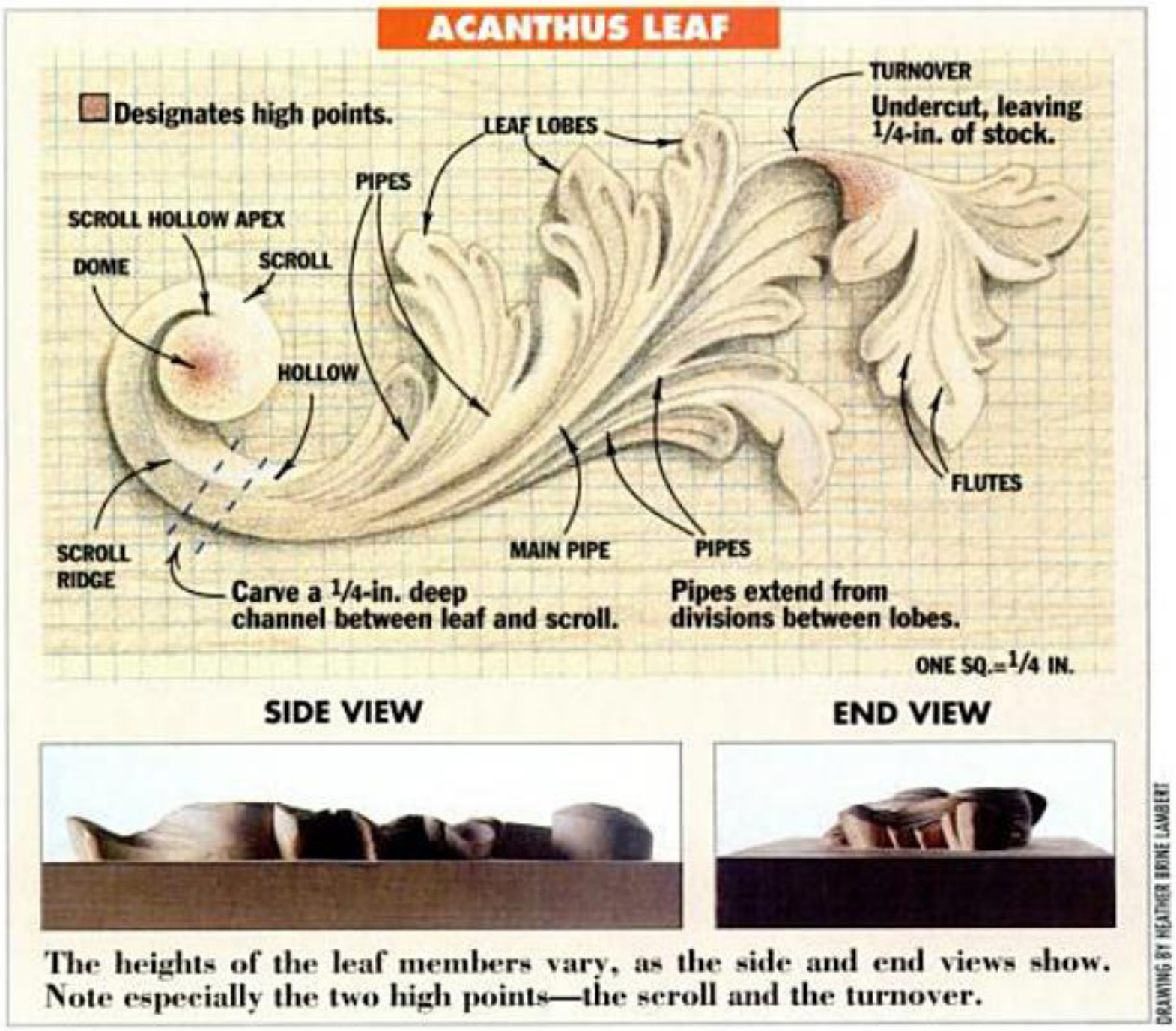
Once you've gone completely around the leaf with the fluter, use a wide gouge (#2 or #3, 3 mm) to lower the background to the depth of the channel. (See photo 1.) With the wide gouge, it's easier to cut *across* the grain than with it.

Once you've lowered the background to the depth of the ⅜-in. channel, take up the fluter again and recarve the channel approximately ⅜ in. deeper. Again, use the gouge to lower the background down to the bottom of the channel. You'll probably need to repeat this procedure about three times to lower the ground until it's just slightly above the pencil line that marks the background depth of your carving.



PHOTOS BY JOHN GILBERT

1. Lower the background in steps by first carving a channel around the perimeter of the leaf and then carving the rest of the background to the same depth as the channel. Continue carving out channels and the background until you are slightly above the ground line.



DRAWING BY HEATHER BRINE LAMBERT

The heights of the leaf members vary, as the side and end views show. Note especially the two high points—the scroll and the turnover.

2. Establishing the vertical edge of the leaf is called setting in. This procedure is done by slicing down 90° to the workpiece with a gouge until you reach the pencil line of the leaf drawing.

3. After outlining the leaf, mark the two highest points of the carving (the scroll and turnover). Next, to establish the lowest point along the scroll's ridge, carve a channel between the scroll and the leaf.

Outlining the Leaf

When your leaf is roughly outlined and the background is reasonably smooth and flat, it's time to start outlining the leaf more precisely. This procedure is referred to as *setting in*. Setting in establishes the vertical profile of the carving. In this first outlining, you'll set in by holding the carving tool at a 90° angle to the wood and cutting straight down, shaving wood away until you reach the pencil line of the leaf drawing. (See photo 2.)

You'll notice the line of the leaf drawing has parts that are smooth (around the scroll, above the turnover, and on the lower stretch between leaf and scroll) and parts that are jagged (along the leaf's lobes). You only need to set in along the smooth parts for now. Don't try to set in the very fine divisions between the lobes yet. The wood is still too thick. It will be easier to set in along the fine divisions of the jagged parts later, after you've modeled the lobes. For now, merely set in broadly around these lobes.

To set in along the smooth areas of the leaf mentioned above, use gouges. (See photo 2.) Match the sweep (or curve) of the gouge to the outline of the curve (I used #2, #3, and #5, 10 mm to 20 mm). It's very important that you don't undercut the pencil line, and it's equally important that you don't set in too deeply into the background. Go gently when your gouge nears the background level, and try to stop cutting exactly at the background level. As you set in, you'll also need to lower the background to the setting-in line with a gouge (#2, 16 mm to 20 mm) or a wide, flat chisel. The setting-in line and background should meet evenly and cleanly.

Next, set in the broad outline of the lobes. Roughly outline the leaf lobes with a large fluter (#11, 16 mm) and gouges (#3, #5, and #7, 20 mm). Remember not to undercut the pencil line—this could be disastrous later on. (Photo 3 shows how the leaf should look after this initial outlining.)

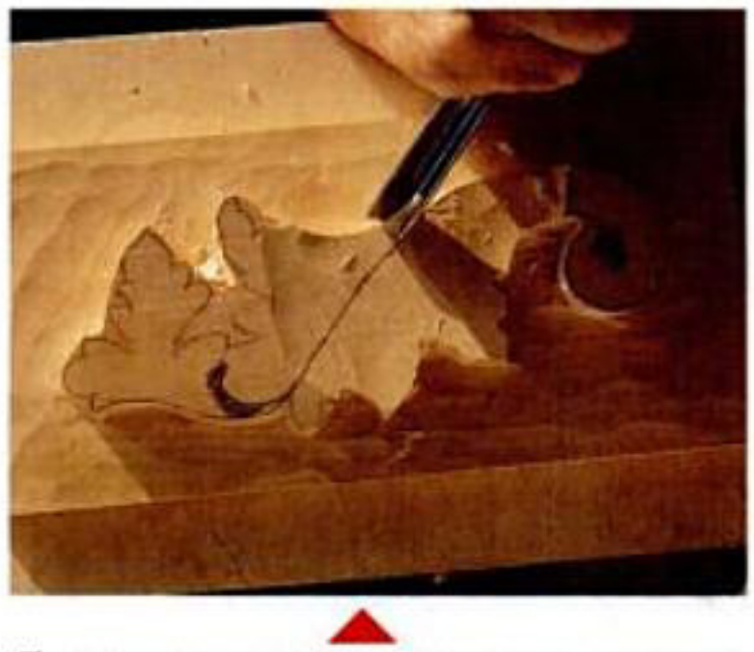
Modeling the Leaf

With the leaf outlined and the overall shape defined, it's time to start sculpting the leaf. Remember that the leaf lobes vary in height. This movement from high to low is referred to as *modeling* and gives as much movement and life to the leaf as the outline does. Modeling is critical to the overall success of the carving.

The leaf has two high points: the scroll dome and the turnover peak. (See drawing.) Mark them with a pencil so you don't cut them away.

Now comes a critical step in the modeling process—*blocking out*. Blocking out simply means establishing the general planes of the carving. It's a technique that applies to all relief carving, and it makes the entire carving process much easier.

4. To establish the slope between the turnover and the scroll, carve a ramp with a gouge from the highest point on the turnover, sloping down to meet the channel.



5. To model the main pipe, carve a ½-in. deep groove just below the main-pipe line with a fluter. Slightly undercut the ridge along the top of the pipe.

First, block out the central section of the leaf (the part between the scroll and the turnover). To do this, use a fluter to carve a channel about ¼ in. deep, separating the scroll and the leaf. (See drawing and photo 3.) Next, with a #2, 20-mm gouge, carve a ramp from the high point you marked on the turnover down to this channel. (See photo 4.) This ramp establishes the high points of the lobes in the central part of the leaf. The channel bottom establishes the lowest point along the scroll ridge that runs between the scroll and the leaf. The channel also serves as a stopping point for the ramp, preventing your gouge from biting into the scroll. Carving the ramp obliterates a large piece of the original drawing. You'll redraw it later.

The leaf has several pipes, or ridges, that flow from the divisions between leaf lobes. (See drawing.) Pipes, along with turnovers and scrolls, are important building blocks in leaf work. To work effectively, each pipe must flow cleanly, without bumps, tapering evenly toward the scroll. Now if you look at the drawing, you'll see that the *main pipe* that runs from the turnover, left to the bottom edge of the carving is the largest and visually strongest. This pipe is a continuation of the curve of the scroll (a cyma curve). It gives the whole leaf its sense of motion.

Draw the main pipe carefully on the ramp you just carved away. Use a fluter (#11, 10 mm) to carve a groove that defines the lower edge of the main pipe (see photo 5), slightly undercutting the ridge along the top of the pipe. Make this groove approximately ½ in. deep.

At this point, it's convenient to set in the inside curve of the turnover with gouges (#8 and #9, 10 to 12 mm). Undercut this curve so the groove you just carved begins to run under the turnover. Be careful when you do this—don't set in all the way to the background. Model the lower leaves so there is about ¼ in. of stock for the lobe that folds under the turnover. (Photo 6 shows how the leaf should look when you've finished setting in at the turnover and modeling the lower leaves.) Be sure to work gently to avoid breaking out the side of the leaf,

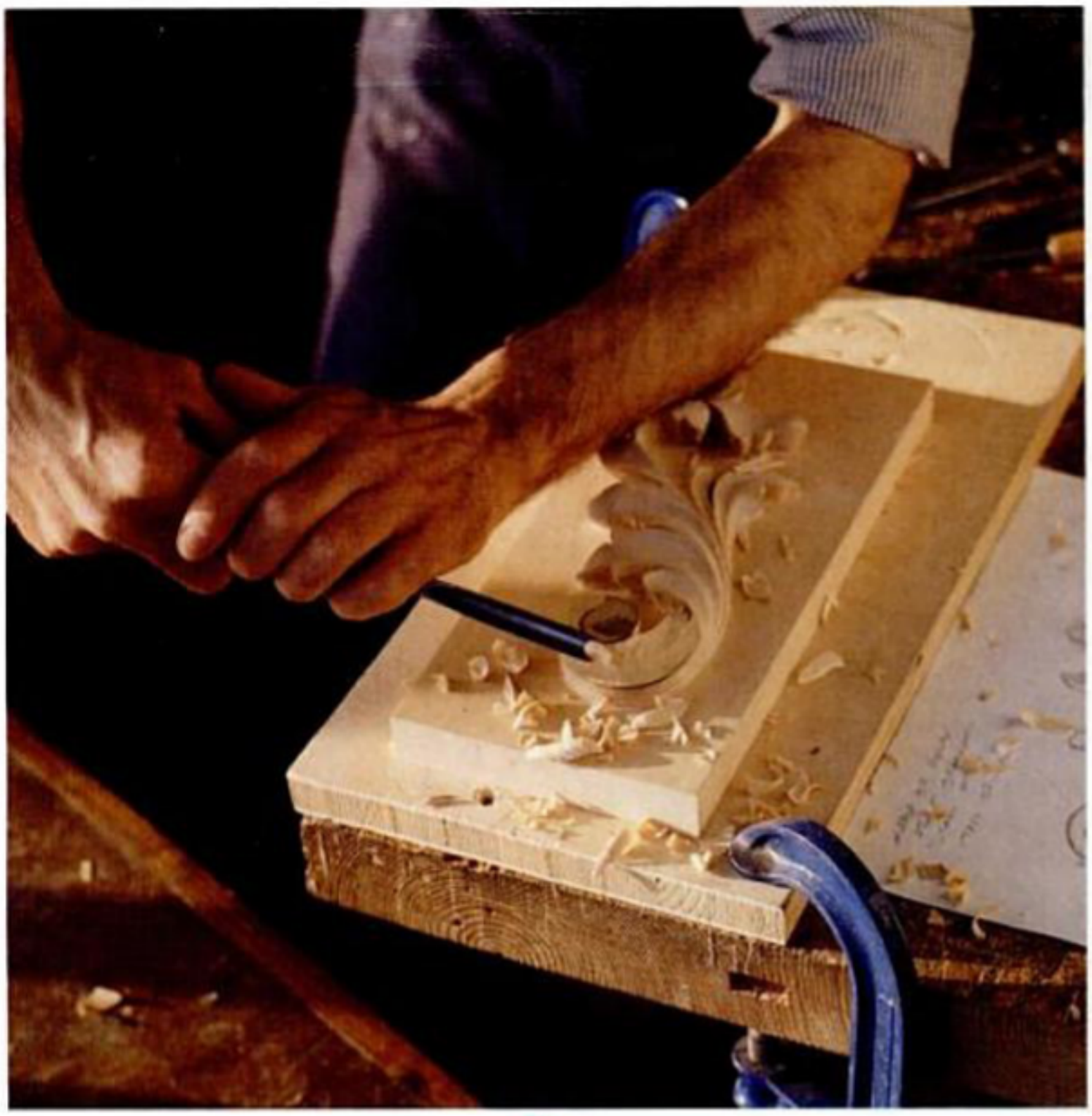
6. Set in along the inside curve of the turnover with gouges. Undercut this curve and block out the lower lobes so that the main-pipe groove and lower lobe run under the turnover.

7. Round over the main stem of the leaf with a wide gouge held upside down, following the ridge of the main pipe. Work from the scroll toward the middle of the leaf.

8. To model the lobes, use gouges and fluters to hollow out the areas between the pipes. This will create ridges that form the pipes and valleys that make up the lobes.

9. Model the turnover with fluters and gouges. The outer two lobes are hollowed along their centers and curl up at their tips, while the lobe at the high spot is convex and curls down at the tip.

10. Set in along the fine, deep divisions between the lobes, using small gouges with long, thin bevels. Slightly undercut the lobes so they appear light, airy, and separate from the background.



11. To form the scroll, start by carving the general slope of the scroll ridge, ending the slope at the channel carved earlier.

12. To model the convex portion of the scroll, carve down around the slope with a gouge held upside down.

13. Hollow out the concave portion with a gouge held right-side up.

which is extremely thin at this point—about ⅛ in.

You'll notice in the drawing that the main pipe extends from the highest point of the leaf (the turnover) down almost to the background at the bottom left-hand edge below the scroll. Working with a wide #3 gouge (16 mm to 20 mm) held upside down, round over the midsection of the leaf, following the ridge of the main pipe. (See photo 7.) Work from the scroll toward the middle of the leaf.

The next step is to model the lobes of the leaf. First, you'll need to redraw the lobes and the pipes that extend from the divisions between the lobes. (See drawing.) A key to good modeling is to draw these pipes in so that they flow smoothly, tapering evenly toward the scroll.

The ramp you carved earlier established the highest points of the lobes above the main pipe. At their tips, these lobes dip down to about ⅜ in. below the main pipe are carved in lower relief. The high point of these lower lobes is ⅝ in. above the background. At their lowest points, the lobes are about ⅛ in. above the background. This contrast in height makes the leaf interesting and creates deep shadows. One mistake beginning carvers frequently make is to spend a lot of time on the outline of the leaf and much less time on the modeling. Remember that good modeling is the key to a lively carving.

Note that the lobes aren't flat—one side is always higher than the other, and the centers are deeply fluted. Use gouges to model the lobes (#7, #8, and #9, 12 mm to 25 mm). Remember that you'll need wide gouges for the fattest parts of the lobes and narrower gouges where the pipes and hollows start to run closer together. Use gouges and fluters to hollow out the areas between the pipes (see photo 8) so that the pipes become ridges and between the pipes.

Next, model the leaf's turnover. The dramatic dive of the turnover is what makes it interesting. Two of the lobes curl up at their tips, and the centers of these lobes are hollowed out. The third lobe curls down at the tip. (See photo 9.)

Refining the outline of the leaf comes next. Redraw any pencil lines you carved away while modeling, and sketch in the fine divisions between the lobes. Set in around the lobes with gouges (#2 to #7, 4 mm to 16 mm), cutting down toward the background. (See photo 10.)

ground to the setting-in line.
ow that the entire outline of the is complete, concentrate on get-

In the photo, page 42 that the scroll is convex on the outer curve and concave on the inner curve. First, carve the convex portion with an upside-

You'll find it a bit difficult to carve the carving a good brushing with a nylon-bristle brush to get rid of the loose particles of grit and dust. The sanding will blur some of the leaf out-

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PLYWOOD LATHE

BY CARL DORSCH

Scrounged Parts Get You Turning for a Song

Inspired by Rude Osolnik, I recently decided to make some spindle-turning projects. Nothing fancy. Just simple, small bud vases, weed pots, and other display items. Problem was, I didn't own a lathe or want to spend hundreds of dollars on one.

The solution? I challenged myself to design and make a shop-built lathe, using only a 4 x 4 sheet of plywood and inexpensive hardware-store parts. The plywood cost me $9.99 when I built the lathe three years ago, and I already had the motor, so I call the creation my $10 lathe. Sure, I had to buy a few other parts, but the final price of about $30 was still much less than the cheapest store-bought lathe.

I won't make outrageous claims for my $10 wonder, but it works. Yes, it vibrates, but no worse than some old lathes I've used. And although it lacks multiple speeds, the 1,725-rpm motor is close to the 1,800-rpm speed that Rude Osolnik claims he uses for most spindle turning.

On the plus side, my lathe is portable and can be stored easily. It works fine for the small objects I wanted to turn, and the 18-in. center-to-center capacity makes it useful for knocking out things like short table legs.

The bottom line is, if you want to get a taste of turning, this lathe will get you started for very little investment. There'll be time enough to shop for a "real" lathe later.

MITCH MANDEL

For the occasional spindle-turning job, this shop-built lathe will get you through in a pinch.

Parts of the Lathe

The body of the lathe is made from pieces of ½-in. poplar plywood. The plywood is glued and screwed together, forming laminated parts that are strong and rigid. (See drawing.)

For power, I used a ¼-HP induction motor. This type is so common you should be able to find a secondhand motor for a few dollars. Just make sure it turns at 1,725 rpm, not 3,450 rpm.

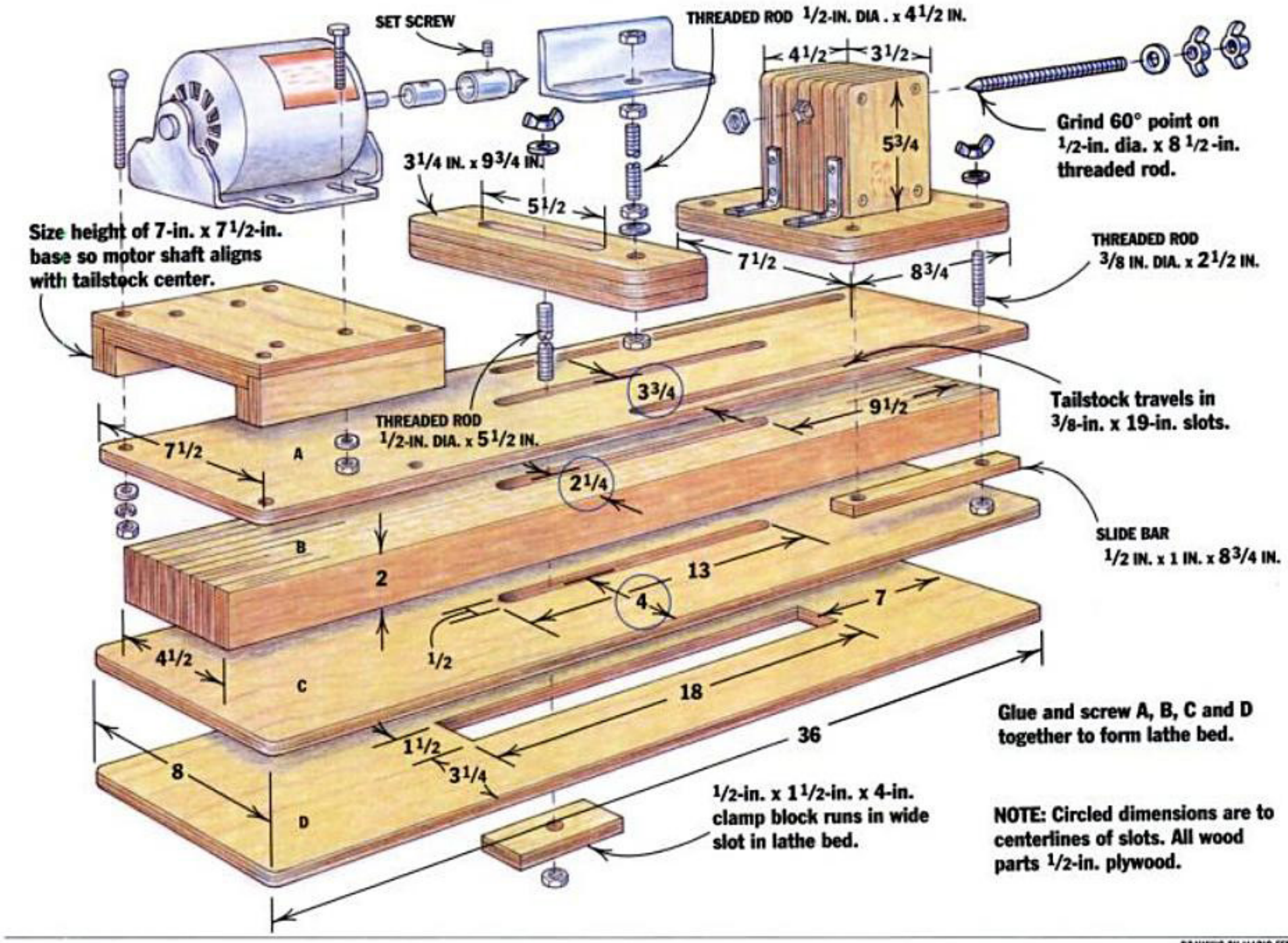
You'll need a drive center that fits the motor's shaft. Most centers mount with a morse taper or screw thread. Mine slips over a ⅝-in. dia. shaft and is held in place by a setscrew (part #89510 available from Total Shop, Box 25429, Greenville, SC 29616, 800-845-9356). To adapt the drive center to the ½-in. dia. motor shaft, I bought a ½-in. i.d. by ⅝-in. o.d. bronze bushing from the local hardware store.

The plywood parts of the lathe consist of four subassemblies: a lathe bed, a tailstock assembly, a motor base, and a tool-rest assembly.

Making the Lathe

Make the lathe bed first. It has four 36-in. long parts labeled A, B, C, and D in the drawing. Start with part B, which consists of nine strips of plywood glued together. A ½-in. by 13-in. slot runs down the middle to accommodate the tool-rest rod. The easiest way to make this part is to glue up two, four-piece laminations that form the outside halves, cut 13 in. from the remaining piece, and glue it between the outside halves.

SHOP-BUILT LATHE



DRAWING BY MARIO FERRO

Next, cut the slots in the other parts of the bed with a plunge router. Note that the slot in part D is 1½ in. wide to accommodate a clamp block for the tool rest. Now glue and screw together all four bed pieces, putting a couple of ½-in. dia. bolts in the center slot to keep the parts aligned.

Now make the tailstock assembly. Cut and glue up the laminated parts for the tailstock block and base that make up the assembly, using the dimensions shown in the drawing. Drill a ½-in. dia. hole through the block for the threaded rod that forms the tailstock center. Cut a mortise for a ½-in. nut where the hole comes through the inside face of the block, and epoxy the nut in place.

Next, epoxy a wing nut on the outer end of the threaded rod to act as a handle. Make a "center" by grinding a 60° point on the inner end of the threaded rod. A second wing nut will lock the rod in place after the tailstock is adjusted to grip a turning blank.

The tailstock assembly is secured to the lathe bed with four ⅜-in. threaded rods that pass through slots in it and into two slide bars. Make mortises on the underside of the slide bars for ½-in. nuts, and epoxy the nuts in place. Also, epoxy wing nuts on the top ends of the four threaded rods. A quick turn of these wing nuts will secure the tailstock assembly.

Make the motor base, as shown in the drawing, adjusting the height to ensure the point of the drive center on the motor aligns with the tailstock center. You can mount an electrical box with an on/off switch on the motor base for easy access.

To make the tool rest, cut a piece of 2½-in. angle iron to length, then cut the horizontal leg of the angle iron to a width of 1½ in. and round over all the sharp edges. Move the tool rest up or down by adjusting the nuts on the ½-in. threaded rod that holds the angle iron to the tool-rest base.

A second length of ½-in. threaded rod holds the tool-rest assembly to the lathe bed. This rod passes through the slot in the lathe-bed pieces and into a wooden clamp block. Mortise and epoxy a nut into the bottom of the clamp block, and epoxy the nut to the bottom of the rod.

That's it. Just chuck up a blank, and try out your new shop-built lathe. But for safety's sake, don't turn any stock larger than 5 in. in dia. at the motor's 1,725-rpm speed. ▲

CARL DORSCH
is a tool-steels research engineer and a woodworker in Pennsylvania.

SHAKER SEWING STAND

BY ROBERT TREANOR

KAZ TSUBOUCHI

Double-Ended Drawers Open From Both Sides

Next to the slat-backed chair, the most recognizable form of Shaker furniture is the round stand, or candle stand. Found in most Shaker sitting rooms, it was typically small, portable, utilitarian, and designed to fit within the simplistic lifestyle dictated by Shaker faith.

This rectangular version is a sewing stand, inspired by one found in *The Book of Shaker Furniture*, by John Kassay, (1980, University of Massachusetts Press, Box 429, Amherst, MA 01003). It's a variation of the round stand, and it could serve well as an end table, side table, or bedside table in a modern home.

Both the round table and sewing stand have legs dovetailed into a turned pedestal. But the Shaker craftsman who designed the original sewing stand made it more useful by substituting a rectangular top for the round one and adding one or two drawers. The underslung drawers, which open from either end, permitted two Shaker sisters to work simultaneously.

Sometimes the corners of the tabletops were rounded or scalloped—a compromise of the Shaker's simple design aesthetic. This example has a slightly elaborate shape in the pedestal, suggesting the brother who made the original was trained as a cabinetmaker in the "world" and brought this influence with him when he joined the Shaker community.

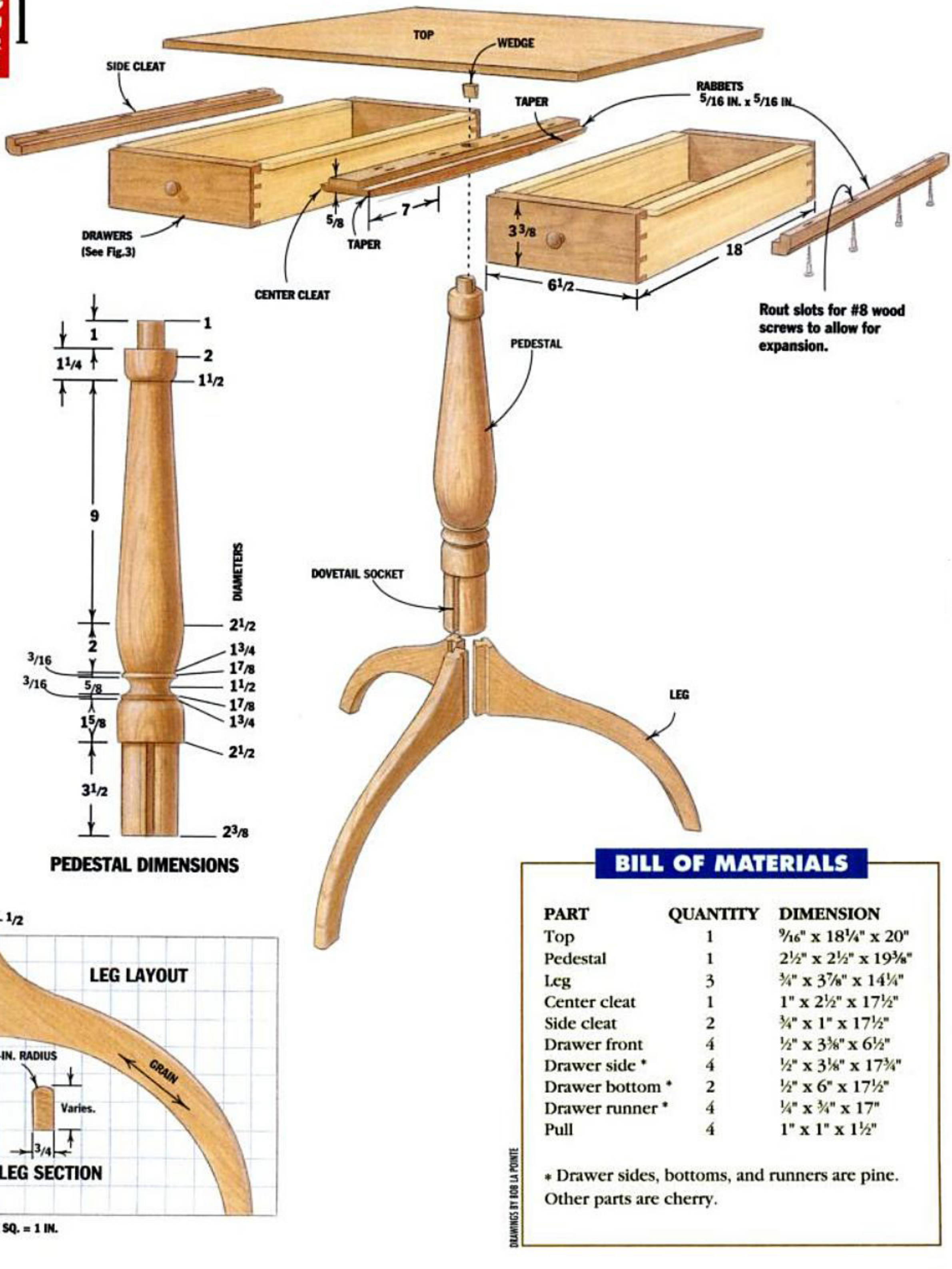
I made my table from cherry, in keeping with the Shaker original, although such pieces were sometimes made of maple or pine. When choosing boards for your table, make sure they have a pleasing figure and a grain pattern that flows together seamlessly when glued up. The legs should be cut from one board, if possible, to make the color and grain patterns consistent. Similarly, the drawer fronts should be cut in sequence from a single board.

Making the Pedestal

Begin construction by turning the pedestal from a block of cherry at least

FIGURE 1

SHAKER SEWING STAND



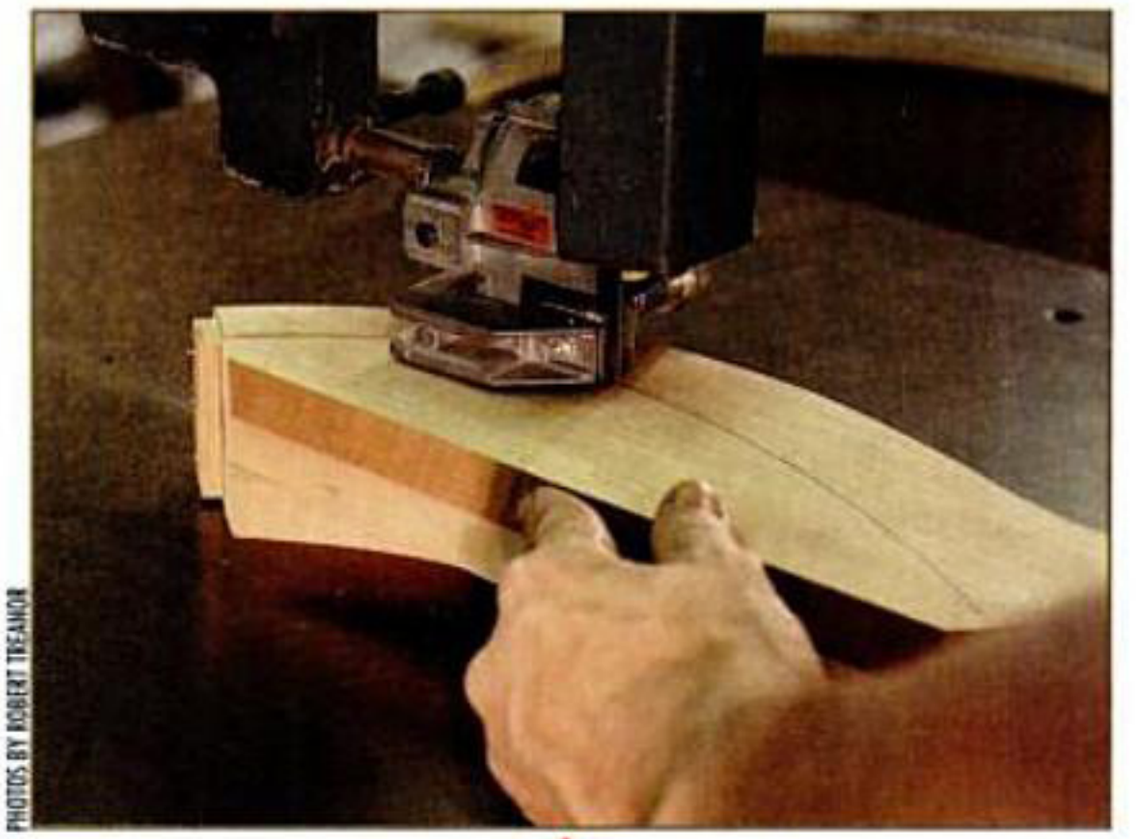
BILL OF MATERIALS

PART	QUANTITY	DIMENSION
Top	1	9/16" x 18¼" x 20"
Pedestal	1	2½" x 2½" x 19⅜"
Leg	3	¾" x 3⅞" x 14¼"
Center cleat	1	1" x 2½" x 17½"
Side cleat	2	¾" x 1" x 17½"
Drawer front	4	½" x 3⅜" x 6½"
Drawer side *	4	½" x 3⅛" x 17¾"
Drawer bottom *	2	½" x 6" x 17½"
Drawer runner *	4	¼" x ¾" x 17"
Pull	4	1" x 1" x 1½"

* Drawer sides, bottoms, and runners are pine. Other parts are cherry.

DRAWINGS BY BOB LA POINTE

2½ in. square and 20 in. long. (See Fig. 1.) Try to keep the diameter of the 3½-in. long lower section consistent; any irregularity here will show up as a gap when the legs are attached. To minimize finish sanding, which can soften the details, use shearing cuts as much as possible. (See AW, #11, November/December, 1989, page 25.) After turning, sand the pedestal to its final smoothness while it's still on the lathe. Switch off the lathe, and remove any remaining scratches by sanding in the direction of the grain with 220-grit sandpaper.



PHOTOS BY ROBERT TREANOR

Stack the legs and tack plywood scraps to the ends, then bandsaw all three legs at once.

Making the Legs

Once the pedestal is complete, you are ready to begin the legs. The leg design used here is based on Sheraton examples popular during this period and is typical of Shaker originals. The graceful curves nicely complement the shape of the pedestal.

Working from the grid layout in Fig. 1, make a full-sized leg template of thin plywood or cardboard. Use the template to mark out three legs on ¾-in. stock, orienting them to the long grain, as shown in Fig. 1. Rough cut the legs on the bandsaw, then carefully trim both ends of each leg to the layout lines. Sandwich the legs together by tacking a thin, plywood scrap to each end of the stack. With the legs assembled as one unit, bandsaw them to their final shape. (See photo.) While the legs are still together, scrape and sand off the bandsaw marks.

Next, take the stack of legs apart, and lay out the sliding dovetails on their upper ends, using a marking gauge to scribe the shoulders. I recommend a rake angle of about 12° for maximum strength because downward force on the table will exert considerable leverage on the dovetails. (See Fig. 2.) You can cut the dovetails on the router table with a ½-in. dovetail bit, using a fence to guide the cut (see AW, #6, January/February 1989), or with a dovetail saw and chisels. Another alternative is to make the dovetails with a tablesaw by first cutting the shallow shoulders and then tilting the blade to about 12° for the dovetail cheeks. Remove any remaining waste with a sharp chisel.

The dovetail sockets on the pedestal require some patience and sharp tools to make. Select the most attractive grain pattern on the pedestal to orient toward the front. The first leg will be located here. Centering on this figure, lay out a chord (a line that intersects a circle at two points and does not pass through the center of the circle) on the bottom of the pedestal to indicate where the shoulders of the leg will meet the curve of the pedestal. (See Fig. 2.) The length of the chord corresponds to the thickness of the leg, in this case ¾ in. Lay out similar chords for the other two legs, 120° apart. It may be helpful to make a full-sized paper template of the leg layout and then transfer the chord locations to the bottom of the pedestal.

Using a combination square, extend lines 3½ in. up the pedestal, connecting the end points of the chords to the ⅛-in. shoulder established during the turning process.

It takes two steps to flatten the faces where the legs join the pedestal. Begin by cutting a series of closely spaced saw kerfs between the lines you just drew. (See Fig. 2.) Don't saw past the pencil lines or your cuts will show as gaps after you install the legs. Next, use a sharp chisel to pare away the waste. You should be left with three flat surfaces as wide as the legs are thick and 3½ in. long, ending at the shoulder.

Now you are ready to cut the dovetail sockets. I use hand tools, but you could as easily use a router. (See AW, #11, November/December 1989, page 47.) To lay out a socket, use a sliding dovetail from one of the legs as your pattern. Hold the leg against the bottom of the pedestal in line with one of the flats you created. Scribe the outline of the dovetail on the bottom of the pedestal with a knife or a sharp pencil.

Now extend parallel lines down the flat, starting where the dovetail cheeks intersect it. Draw a centerline to mark where you'll drill. Repeat this procedure for each flat.

Bore out the waste with your drill press, using the largest Forstner or spur bit that will fit between the two parallel lines. Hold the pedestal in a V-block and start drilling, positioning the bit on the centerline. You could also use a brace and bit.

Next, cut out the dovetail sockets with very sharp chisels. I recommend a butt chisel about 1 in. wide for the cheeks and a ½-in. butt chisel to flatten the bottom of each dovetail socket. The narrow chisel should have beveled sides so you can get into the acute corners at the bottom of the sockets.

Clean out each joint a little at a time, working from the bottom of the pedestal toward the shoulder. Using only hand pressure on the chisel, pare each cheek to the dovetail angle scribed on the bottom of the pedestal. Flatten the bottom of the socket with the narrow chisel.

As you complete a section, check how the dovetail fits. The leg should slip into the socket with only slight resistance to hand pressure. Continue working, section by section, until you reach the shoulder, then repeat the process for the other two sockets.

Once the legs are fitted, shape them with spokeshaves, files, scrapers, and sandpaper. The top edges of the legs are crowned, as shown in Fig. 1, and the bottom edges are simply softened with sandpaper.

Making the Top and Cleats

As noted earlier, make sure the boards for the top have a pleasing

appearance since the top is the most visible part of the piece. If you have a bandsaw with enough height clearance, you might want to resaw pieces from a thick board and book-match them. (See aw, #4, September/October, 1988, page 42.) The Shaker craftsman's tool of choice would have been a large bow saw with a wide ripping blade.

Glue up the top, and plane it to finished thickness. If you're using a hand plane to surface a resawn book-matched top, remember, the grain will switch direction at the glue line.

Joint one long edge of the top square to the face and rip it to its final 18¼-in. width on the tablesaw. Crosscut the ends square to the sides, using a cutoff box on the tablesaw. (See AW, #14.) You can dress the edges with a hand plane (low-angle block planes work well on end grain), then sand them. Scrape and sand the top to its finish smoothness. If you like, leave the marks from the hand plane as evidence of hand craftsmanship.

There are three cleats screwed to the underside of the top. (See Fig. 1.) The cleats serve two functions: They prevent the top from cupping, and provide runners for the hanging drawers. Make the cleats from cherry, rabbeting them with a router or tablesaw. Notice the taper on both ends of the center cleat. Use a rasp and files to round over the ends. At the middle of the center cleat, drill a 1-in. dia. hole for the round tenon on the top of the pedestal.

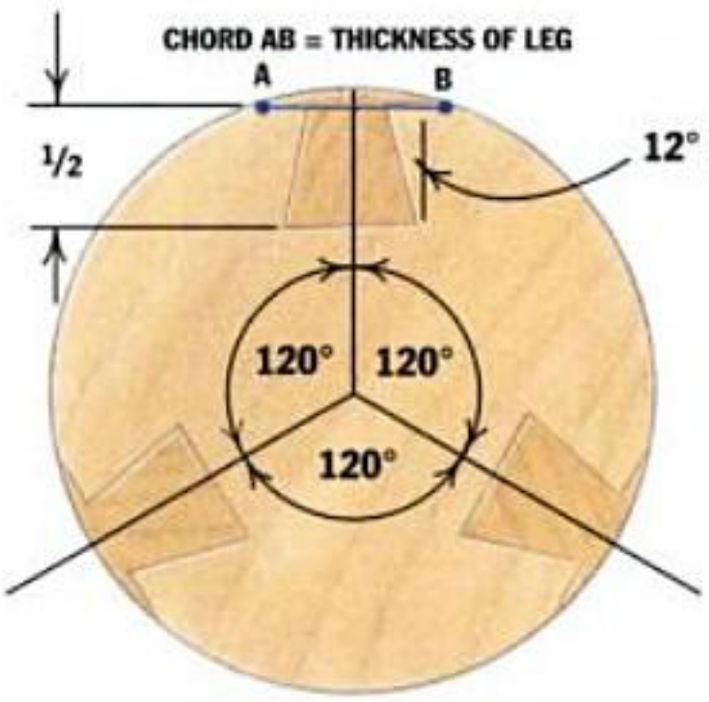
Next, drill clearance holes for the #8 wood screws that will hold the cleats to the underside of the top. You can slot the holes to allow for expansion and contraction of the top, or you can drill oversized holes and use round-head screws and washers. Set the cleats aside until final assembly.

Making the Drawers

Because the drawers open from each side of the table, I made the fronts from cherry. The sides and bottoms are pine, a wood often found in Shaker furniture. Cut adjacent drawer fronts from one board. Note in the bill of materials that the sides are ¼ in. narrower than the fronts and backs. This allows room for the ¼-in. drawer runners added after drawer assembly.

FIGURE 2

LEG-DOVETAIL LAYOUT



Use a fine-toothed saw to kerf the pedestal where the legs will be attached. If you saw past the lines, gaps will show after assembly.

Use a sharp paring chisel to remove the waste and provide a smooth flat for the dovetail shoulders.

Remove as much material as possible from the sockets with a Forstner or spur bit in the drill press.

Working upward from the end of the pedestal, chisel the sockets, one section at a time, checking the fit with the actual leg as you go.

Construct the drawers with half-blind dovetails. When you trial fit your dovetails, flush up the bottom edges of the drawers with a plane if necessary. This will insure that the grooves you cut for the bottom will align.

The bottom is let into a ¼-in. x ¼-in. groove cut on the inside surfaces of the drawer fronts and sides. The groove is positioned to fall within the bottom dovetail, so it can be cut with a tablesaw. (See Fig. 3.)

Make the bottoms from ½-in. thick pine. Because the drawers are long and narrow, run the grain the long way so any expansion or contraction is across the short dimension.

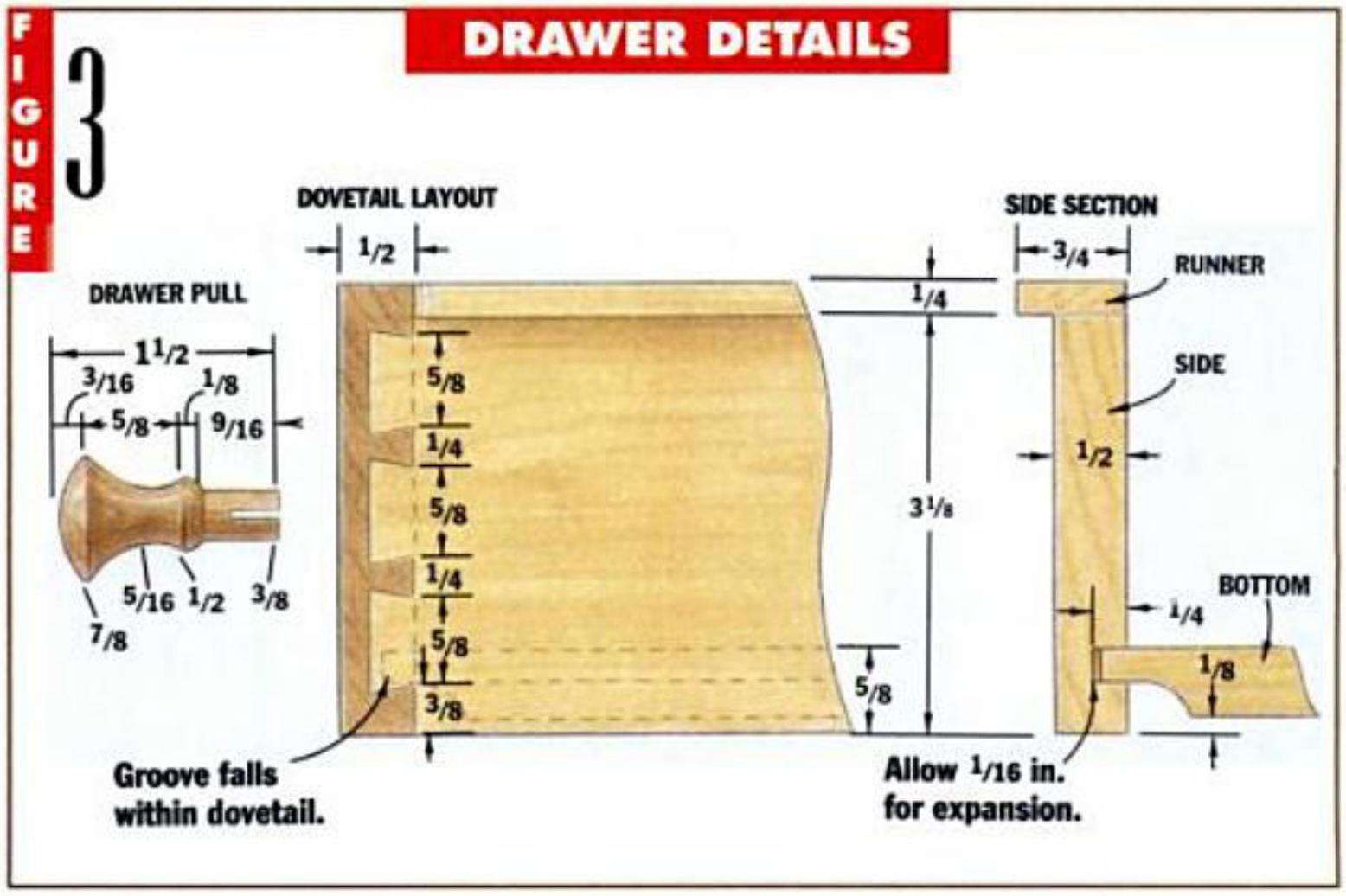
I coved the bottoms to create the tongue; a rabbet would work as well. You can create a cove by using a convex panel-raising shaper cutter or a diagonal fence on the tablesaw. (See AW, #25, page 43.) Be sure to use a push block if you cove on the tablesaw. Now adjust the finished width of the bottom to allow about 1/16-in. clearance in the side grooves. This will accommodate any expansion.

Finish sand the interior surfaces of the drawer parts and glue them up, checking for square.

Make the drawer runners next. I used ¼-in. thick pine, but you could use cherry for greater strength. Carefully trim the runners to length so they fit snugly between the opposing fronts. Glue and clamp the runners in place, making sure their inside edges are flush with the inside faces of the sides.

Turn the drawer pulls on a lathe, two at a time, from 1-in. by 1-in. cherry blanks. I used the profile for this process, as shown in Fig. 3, but you might want to vary it. After turning the pulls, remove them from the lathe, cut them apart, and finish turn the ends, mounting the tenons in a chuck in the headstock. Sand to finish smoothness. Cut a saw kerf for a wedge in each tenon. Using a backing block to eliminate any tear-out, drill a ⅜-in. dia. hole through each drawer front at the center point, and fasten each pull with a bit of glue and a hardwood wedge. When the glue has completely dried, trim the ends of the tenons and pare them flush with the inside of the drawer.

FIGURE 3



KAZ TSUKUJA

The simple grace of the Shaker style is reflected in the pleasing proportions of the drawers.

Assembling the Stand

Begin the final assembly by gluing the legs to the pedestal. Brush some glue in the dovetail sockets on the pedestal and sparingly on the dovetails themselves. Install the legs, and wipe off any glue that has squeezed out. You can fabricate a simple fixture to hold the legs in the correct position by attaching scraps to a plywood base at 120° intervals.

To attach the pedestal to the center cleat, first saw a kerf in the tenon on the pedestal's end perpendicular to the axis of the front leg. Make a tapered wedge slightly thicker than the width of the kerf. Next, spread a thin layer of glue on the tenon and in the hole in the center cleat. Assemble the joint, carefully aligning the front leg with the cleat. Put some glue in the kerf on top of the tenon, and then drive the wedge home, checking to see that the cleat is exactly perpendicular to the pedestal.

To attach this understructure to the top, place the top upside down on your workbench. Center the pedestal assembly on the top with the center cleat running from front to back. Mark out and drill pilot holes for the #8 screws that you will use to attach the base. These holes should be centered in the slotted clearance holes to allow for expansion and contraction.

Next, with the table still inverted on the workbench, place the drawers in position and attach the side cleats. Use strips of paper between the cleats and runners to create clearance so the drawers operate smoothly. Remove the drawers, stand the assembled piece upright, reinsert the drawers, and check for fit.

You may choose to finish the stand in a variety of ways. The original was probably varnished, but a modern oil finish is acceptable. Rub a little paraffin on the drawer runners to improve drawer operation. ▲

ROBERT TREANOR
works wood in San Francisco. His specialties are Shaker and Windsor furniture.

PLANNING AN ENTERTAINMENT CABINET

BY ROSS DAY

Thanks to the audio/video industry, we now have a new furniture form—the entertainment cabinet. The only problem is, unlike beds, tables, and chairs, it's difficult to assign even general standards to this type of cabinet design because entertainment systems differ widely. Further, it's not just a question of various television sizes. The constant stream of new technology poses a real challenge to the designer of an entertainment cabinet.

In this article, I'll cover some considerations for designing your own entertainment cabinet. During the past few years, I have built several freestanding entertainment cabinets. (See photos.) In each case, I've tried to produce fine pieces of furniture that combine pleasing design and ease of use. My cabinets include such features as hand-sawn veneers and dovetailed drawers.

When designing an entertainment cabinet, the main considerations are: 1. Sizing the cabinet so it will hold the items you wish it to house and fit within a given space; 2. Organizing the spaces within the cabinet to allow easy access to each piece of equipment; 3. Choosing a door/drawer arrangement that is attractive and efficient; 4. Designing the back panel(s) so the wires and heat can exit the cabinet. I'll discuss each of these.

Design Guidelines for Housing Your Audio and Video Equipment

PHOTOS BY KAZ TSURUTA

This vertical cabinet allowed the author to place cassettes, tapes, and CDs on each side of the television.

CAREL ROBERGE

This cabinet is strictly for audio gear. The author tucked the amplifier behind a false drawer front, below. Because of space restrictions, a whisper fan was added to cool the amplifier. (See photo, page 58.)

When a component requires a door but the cabinet needs a drawer, a false drawer front may be the answer.

Sizing the Cabinet

Before you begin to design a cabinet, take a look at the items you want to put in it. If you plan to buy audio/video equipment in the near future, I recommend you do it *before* you design the cabinet. Having the equipment dimensions isn't enough. Each piece of equipment has its own set of requirements for space and ventilation, which can affect the overall cabinet design.

Once you have the equipment, you need to decide how much floor space you will dedicate to the cabinet. Do you want it to be freestanding or built in? Would you prefer a longer, lower cabinet or a more vertical one? Make a list of all the items you want to put in the cabinet, and be sure to allow a reasonable amount of room. Include a bit of extra room for future additions.

Once you have a general idea of the space you'll need for the equipment and accessories, you're ready to move on to fine-tuning the design.

Placement of Equipment

I like to make a scaled-down outline of the front view of each electronics item. I do the same for tapes, records, compact discs, and laser discs I might want to store. Once I have these outlines, I cut them out and arrange them on a piece of paper as if I were looking at the front of a cabinet.

There are two things to keep in mind when arranging the items: visibility (of a television set, specifically) and accessibility of each item.

If you plan to put a television into your entertainment cabinet, start the arrangement by first choosing the television location. You might try experimenting with your actual television to find the viewing height and position that works with your seating. Place the television at eye level or a bit lower. For the most comfortable viewing, your neck should be relaxed. You can then mark this location on your drawing and arrange other equipment around this fixed item.

Accessibility is just as important as visibility. For example, if you enjoy listening to music but you place the stereo so low you have to stoop to use it, you may find you're using it less frequently. The same goes for placement of tapes and compact discs. Try to locate them so they will be easy to read and retrieve. Place items you use less frequently down low, and group the electronic items that work in conjunction with each other.

Once you are generally satisfied with the cabinet arrangement, draw lines around the items to signify the carcase, shelves, and dividers. This will give you a rough sketch.

Now for the specific dimensions of the cabinet. Draw it to scale as viewed from the front and side. I then recommend you move to a full-sized drawing or mock-up to give you a good

idea of how the cabinet will look and to determine more exact proportions and dimensions.

Leave a bit of extra room around each item you're housing. This will enable you to get your hands around the equipment when you're installing or removing it. You'll also need this extra space for ventilation, and it allows you the flexibility of replacing old equipment.

Under ideal circumstances, I like to leave a couple of inches of space around the top and sides of each piece (except those that are stackable). Since ventilation requirements differ, I recommend you consult the owner's manuals on the items you're housing.

Because of their covers, turntables will require more room above to open the cover. Experiment with your turntable to see how much room is needed to put on a record.

Many audio items can be stacked, but you may need to add shelves within the cabinet for some items. In such cases, I recommend designing the cabinet with adjustable shelves, because this allows you to arrange the space vertically as your needs change.

Designing the Cabinet Front

After you've drawn the basic front-view outlines, showing each piece of equipment in its niche, design the face of the cabinet. Enclose the contents within doors and drawers. You may choose to leave certain sections open. I prefer a closed cabinet. It cuts down on dust; hides what can sometimes be quite a jumble of lights, knobs, and wires; and presents a cleaner-looking appearance.

Doors are a nice addition, but when left open, typical cabinet doors become obstacles for people to bump into, and they block access to other parts of the cabinet. That's why I prefer to slide the doors into hidden pockets at the sides of the cabinet. (See photos, pages 55 and 56.)

You can purchase hardware for hidden pocket doors (see Sources), but some commercial pocket-door hardware can be bulky and contrary to the spirit of a fine cabinet. I've designed a wooden version that's smooth-running and unobtrusive. (See sidebar, Hidden Pocket Doors, page 58.)

Drawers are a good solution for storing tapes and CDs. They take up little vertical space and make use of the full depth of the compartment.

PHOTOS BY KAZ TSURUTA

I recommend drawers for storing tapes, compact discs, and miscellaneous accessories because they allow you to take advantage of small spaces efficiently. (See photo.) You can create dividers to separate tapes or compact discs into sections, or if you prefer, you can purchase racks that fit within drawers, enabling you to conveniently flip through your collection. (See Sources.)

False drawer fronts are another design option. The photo on the preceding page shows a situation in which a component required a door, but for it to look right, the cabinet needed a drawer. I resolved this problem by designing a false drawer.

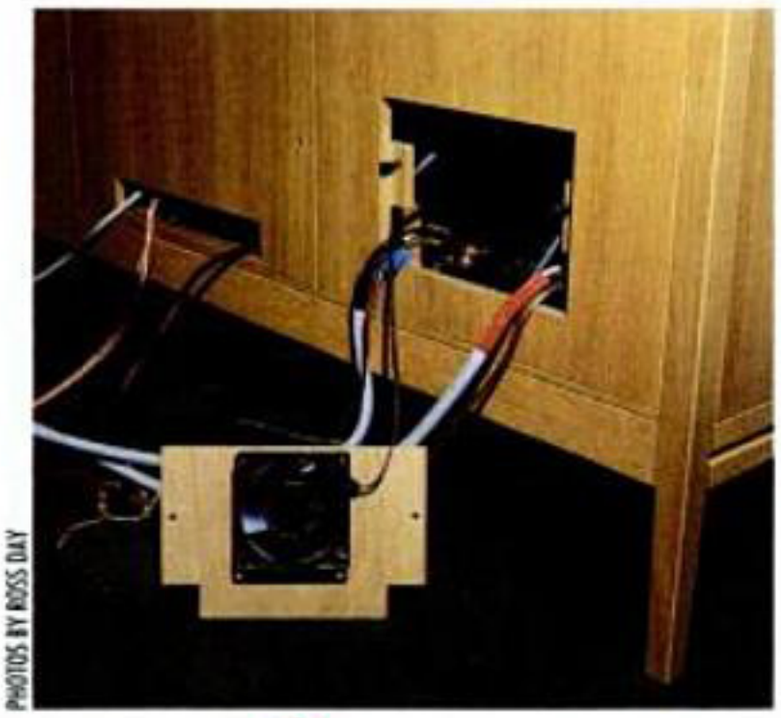
Adding the Cabinet Back

Because some pieces of equipment get quite warm, you need to allow adequate ventilation through the back. As you know, hot air rises, so the higher you put the ventilation slots, the better. I usually cut slots at the top of the back and drill holes in the bottom of the cabinet. (See photos.) This creates a chimney effect, drawing in cool air at the bottom and exhausting warm air out the top.

In one instance, I had space restrictions on an amplifier that required good ventilation. I took care of this by adding a 55-cfm (cubic feet

SOURCES

- **Audio/video racks, TV/stereo pullout hardware (with swivel capabilities), piano hinges, pocket-door hardware, joint connector bolts, threaded inserts and more:** The Woodworker's Store, 21801 Industrial Blvd., Rogers, MN 55374, (612) 428-2199.
- **Pop-up hardware for television and audio equipment:** The Auton Co., Box 1129, Sun Valley, CA 91353, (818) 367-4340.
- **Fiber Track (#801):** Engineered Products Co./EPCO, Box 108, Flint, MI 48501, (313) 767-2050.
- **Whisper fan (#W2S107-AB07-39):** Westlake Electronics Supply, 415 Westlake N., Seattle, WA 98109, (206) 622-6600.



PHOTOS BY ROSS DAY

For ventilation, drill holes in the cabinet bottom and cut slots in the top of the back. This lets cool air enter the bottom of the cabinet and warm air exit the top. In tight spaces, you may want to add a whisper fan, above left.

per minute) whisper fan at the back of the cabinet. (See photo.) Consult your owner's manuals to see if a fan is recommended. As a general rule, if the stereo equipment has more than 50 watts per channel and will be housed in a tight space, consider installing a whisper fan. (See Sources.) You'll also need to design slots at the bottom of the back panel to allow the cords to exit the cabinet. (See photo.) You may also need slots between components to allow wires to pass from one component to another. For easy access to components, I recommend you design the back with removable sections or panels. ▲

ROSS DAY

is a professional furniture maker and an instructor of furniture making at Seattle Central Community College in Washington.

HIDDEN POCKET DOORS

There is something unruly about a cabinet door left hanging open, but on television cabinets where the doors must remain open for long periods of time, this untidy look is hard to avoid. There is a good solution though—the hidden pocket door.

I prefer to keep metal to a minimum on finely made cabinets, so I designed pocket-door hardware with mainly wooden parts. The drawing on the next page shows how it works.

A door hinged to a follower panel opens and then glides in and out of a pocket in the cabinet side. The door and follower are grooved at top and bottom to ride on tracks concealed in the pocket.

To prevent the handle from hitting the cabinet side when the door is pushed into the pocket, I stop the grooves short of the door's front edge.

A bolt screwed through the false side protrudes into the pocket to prevent the door and follower from sliding out completely. They meet at the exact point where the door is extended enough to be shut.

Construction Tips

Constructing a hidden pocket door is pretty straightforward. The drawing

With the door/follower assembly removed, the fiber track is visible in the pocket. Note the joint connector bolt in the false side.

The metal stop, screwed and epoxied to the back of the follower, is seen when the door/follower assembly is removed from its pocket.

BY MICHAEL DRESDNER

POREFILLER

Unraveling the Mystery

PHOTO BY MITCH MANDEL

Wait until the surface of the oil-based filler turns hazy (right) before scrubbing it with burlap or Scotch-Brite pad.

After scrubbing water-based filler into the pores, immediately remove the excess with a credit card.

By morning, what had started out as a smoothly sanded mahogany tabletop resembled the mud flats of a dried riverbed. It looked like another crime against good woodworking, and this time the culprit had left his mark all over the victim. It was a clear-cut case of pore filler gone bad ...
(with apologies to Mickey Spillane)

If pore filler seems like a mystery to be solved, then it is time to haul it in for questioning and judge its true value.

"Open-pore" finishes, where the finish is applied directly to the raw wood and leaves the wood's porous appearance intact, are very natural looking and quite popular. But if what you seek is a smooth, glossy surface—one that looks more like a piece of glass than a piece of wood—you'll want to use filler.

As its name implies, the point of pore filler is to fill wood pores, preferably with a material that will not shrink or dissolve under subsequent top coats. It is only necessary on woods that have very large, prominent pores, like walnut, mahogany, and rosewood, and if you're looking for that dead-smooth appearance.

There are really two ways to fill pores. Some finishers apply extra coats of clear finish until they've filled the pores, insisting it's worth the additional time, energy, finish, and sandpaper. They frequently point out that their method loads the pores with clear, not opaque, material. Unfortunately, almost all clear finishes shrink over time, and since the shrinkage is proportional to the depth of the finish, the pores will eventually reappear as dimples in the surface.

Handling Filler

Pore filler is a thick liquid or paste that's oil based or water based. The common oil-based variety is usually sold as semipaste or paste filler. Some water-based fillers are quite thick and can be used as putty to fill larger voids, but they can also be thinned for use as pore fillers. Consult the manufacturer's instructions for thinning.

Fillers are available in a variety of colors as well as in neutral—a sort of light beige. If you don't find the shade you want, you can customize neutral or precolored filler by adding concentrated tinting pigments. I usually opt for a darker-colored filler to make the wood pores contrast with the background. Unless you are going for special effects, lighter-colored filler usually looks like a mistake.

Japan colors work well for tinting oil-based fillers, while universal tinting colors (UTCs) will work with both oil-based and water-based products. You can find both at your local paint store. UTCs are the same tinting colors (in the carousel) used to mix custom-colored house paints.

Whichever tint you use, add a little at a time and stir the mixture thoroughly. Since a color can appear different when dry, test it by wiping a bit on scrap wood, letting it sit for a few minutes, then wiping it off. Once it has dried, check the color and adjust it if necessary.

Prestaining the Wood

Your sample will show the effect of the colored filler on the surface of the wood. A strongly colored filler acts as a weak stain on raw wood. If the color is acceptable, you can omit further staining. If you find additional staining is necessary, do it *before* filling since the oil or water base of the filler may affect stain absorption later.

I like water-based dye stains because they stain woods more thoroughly and evenly, they penetrate deeper than pigment stains, they won't sand through as easily when you level the filler later, and they are easier to repair if you should happen to sand through.

JUST FINISHING

Sealing

Whether you stain or not, you may wish to seal the wood with a thin coat, or wash coat, of sealer before filling. Use the sealer recommended by the manufacturer of the top coat you plan to use. A wash coat makes it easier to remove the excess filler and prevents further absorption of filler colorants by surrounding the wood fibers.

Filling the Wood

Oil-based filler should be brushed on and allowed to partially dry before the excess is removed. Coat a small area first to find out how quickly the filler dries. Timing is important. If you allow the filler to sit too long, you will have immovable mud flats instead of nicely filled wood. When the filler starts to get hazy (see photo), scrub with burlap, jute, or Scotch-Brite abrasive pads, packing the filler into the pores with a circular motion as you remove the bulk of it. Follow up with a clean pad, wiping *across* the grain to avoid pulling the filler back out. If you can find it, excelsior is ideal for this cleanup operation. In two or three days, the filler will be dry enough to *lightly* scuff sand with 220-grit or 320-grit sandpaper to remove any residue prior to sealing and finishing.

Water-based filler, a newcomer to the field, dries faster than its oil-based cousin and offers more handling options. My favorite technique with mahogany or walnut is to stain the raw wood with an amber water-based dye stain and then apply a dark water-based filler as soon as the wood is dry—about 20 minutes. I immediately pack it into the pores as described above, then squeegee off the excess with a credit card before it starts to dry. (See photo.) (It's one of the few ways to use a credit card legally without getting billed later.) The filler will dry in two or three hours (not days). Then you can scuff sand with 220-grit paper and restain with the same dye where necessary. Unlike oils, water-based dyes will restain "sand-throughs" invisibly. Once the dye dries, the wood is ready for sealer and finish.

SOURCES

Oil-based pore fillers, UTCs, and japan colors are widely available at paint stores. Water-based fillers and other finishing supplies are available from many major mail-order suppliers including:

LEE VALLEY TOOLS LTD., 1080 Morrison Dr., Ottawa, Ontario, Canada K2H 8K7, (800) 461-5053.

HIGHLAND HARDWARE, 1045 N. Highland Ave. N.E., Atlanta, GA 30306, (800) 241-6748.

TOOLBOX

Modulus Scoring Saw

Ordinary saw blades will chip laminated panels of Formica, melamine, or veneer. With the Modulus Scoring Saw, you can cut laminates up to 1⅛ in. thick on a standard 10-in. tablesaw—with no chipping. The Modulus system's secret is the two carbide-tipped blades set in one assembly. A small counter-rotating blade scores the laminate, then a large main blade completes the cut. The main blade mounts on the saw's arbor, and the blade-support assembly attaches to the saw's splitter guard bracket. Once you've mounted the Modulus, you can tilt it, raise it, and lower it just like any blade. (Price: $442.95)

Sisco Supply Inc., Dept. AWT, Box 9499, S. Burlington, VT 05407, (802) 863-9036.

CIRCLE NO. 602 ON PRODUCT LITERATURE CARD.

Permanent Sandpaper

Tired of changing sandpaper? Perma-Sand's tungsten-carbide grit particles bonded to a thin metal backing form abrasive discs and sheets that last up to 100 times longer than conventional sandpaper, according to the manufacturer. A Velcro-like system fastens the disc or sheet to your sander, so you can take it off, and reuse it. When it clogs, clean the super-hard abrasive with a wire brush, and water or paint thinner—the backing won't rip, tear, or deteriorate. Use Perma-Sand to smooth wood, glass, tile, paint, cement, porcelain, metal—just about any material. It's available in 11 different grits from 24 to 360. (Price: $10, ¼ sheet for palm sander; $12.95, 5-in. disc)

ProblemSolvers, Dept. AWT, 48 Purnell Place, Manchester, CT 06040, (800) 397-6980.

CIRCLE NO. 605 ON PRODUCT LITERATURE CARD

Freud's Performance System

During the years, I've tried a number of shaper cutters for making stile-and-rail raised-panel doors, but they'd only cut one profile, which means I had to buy a new set for every shape I wanted. Then I checked out two new sets made by Freud that promised to be easy to use and cut a variety of profiles. I wasn't disappointed.

Freud dubs the sets a "performance system," but they're sold separately and have separate cutterheads—one for stile-and-rail profiles and the other for raised panels.

Each cutterhead holds interchangeable solid-carbide knives that last much longer than high-speed steel knives and can be resharpened when they *do* get dull. The interchangeability means you get a variety of cutter profiles for a lot less than it would cost to buy the same number of individual shaper cutters.

The stackable steel cutterheads and knives in Freud's stile-and-rail shaper system sell for $744 and includes the knives to produce nine profiles. Grooving cutters and glass rabbet cutters are also included. The raised-panel system, with its aircraft-aluminum cutterhead and knives, costs $396 and cuts five profiles. You can also buy the cutterheads and knives individually.

With three of the profiles, you can go *directly* from cutting the stile-and-rail profile to making the coping cut on the rails. You merely change the height of the shaper's spindle, and then flip over the stock. Also, you can make clean panel grooves or rabbets for glass because the cutters reduce tear-out by forming tiny chamfers along the edge of the panel groove. Special rub collars will soon be available for shaping curved stock with a template.

DAVE SELLERS

TESTED BY FRED MATLACK

Freud's cutters are designed for stock between ¾ in. and ⅞ in. thick. They fit a 1¼-in. dia. shaper spindle, but with bushings (included) they'll fit ¾in. spindles, too. One nice touch is a gib-and-screw system that holds the knives firmly in place. In conjunction with indexing pins, this provides a positive lock under centrifugal force.

These cutters are a delight to use, though with multiple heads, knives, cutters, gibs, screws, and shims, there's a lot to keep straight as you set up the system. You've got to study the instructions, make test cuts, and use hold-downs and push blocks to prevent dips and snipes.

I'd recommend the Freud cutters to anyone who wants an accurate, long-lasting, and versatile tool for making a variety of stile-and-rail cabinet doors. (Price: $744, stile-and-rail set with nine profiles; $396, raised-panel set with five profiles)

Freud, Dept. AWT, Box 7187, High Point, NC 27264, (919) 434-5468.

CIRCLE NO. 601 ON PRODUCT LITERATURE CARD

TOOLBOX

Affordable Dust Collector

Powermatic's new Model 73 dust collector is designed to deliver the most airflow possible on a 115-volt circuit (20-amp breaker). Its 1½-HP motor pulls 900 cfm into the collector's two 4-in. inlet ports. That's enough to handle dust and chips from two ordinary woodworking machines running simultaneously. The clear-plastic lower bag holds 3½ cubic ft. of debris and comes off easily with quick-release clamps. The dust collector coasts along on four casters, so it can also serve as a floor sweeper. (Price: $399)

Powermatic, Dept. AWT, Morrison Rd., McMinnville, TN 37110, (800) 248-0144.

CIRCLE NO. 604 ON PRODUCT LITERATURE CARD

Water-Based Gel Stains

Smooth & Simple Wood Stain is a new line of penetrating aniline-dye stains in a water-based gel that colors with more depth and clarity than pigmented oil stains. The stain is *thixotropic* (variable viscosity), so it appears thick and creamy in the container, liquefies when you apply it, then thickens up again on the wood, eliminating runs or drips. Smooth & Simple wood stains are non-toxic, non-flammable, biodegradable, and compatible with any clear finish. Apply the stains with a brush, rag, or Scotch-Brite pad, and clean up with water. The stains come in 14 different colors in bright "paint-box" hues and common wood-tone colors. For interior use only. (Price: half pint, $4.95; quart, $9.95)

Highland Hardware, Dept. AWT, (800) 241-6748, or write: Clearwater Color Co., Dept. AWT, Box 197, Nazareth, PA 18064.

CIRCLE NO. 603 ON PRODUCT LITERATURE CARD