

RODALE'S

AMERICAN WOODWORKER

JUNE 1994 #38

A Jig for Perfect Miterers

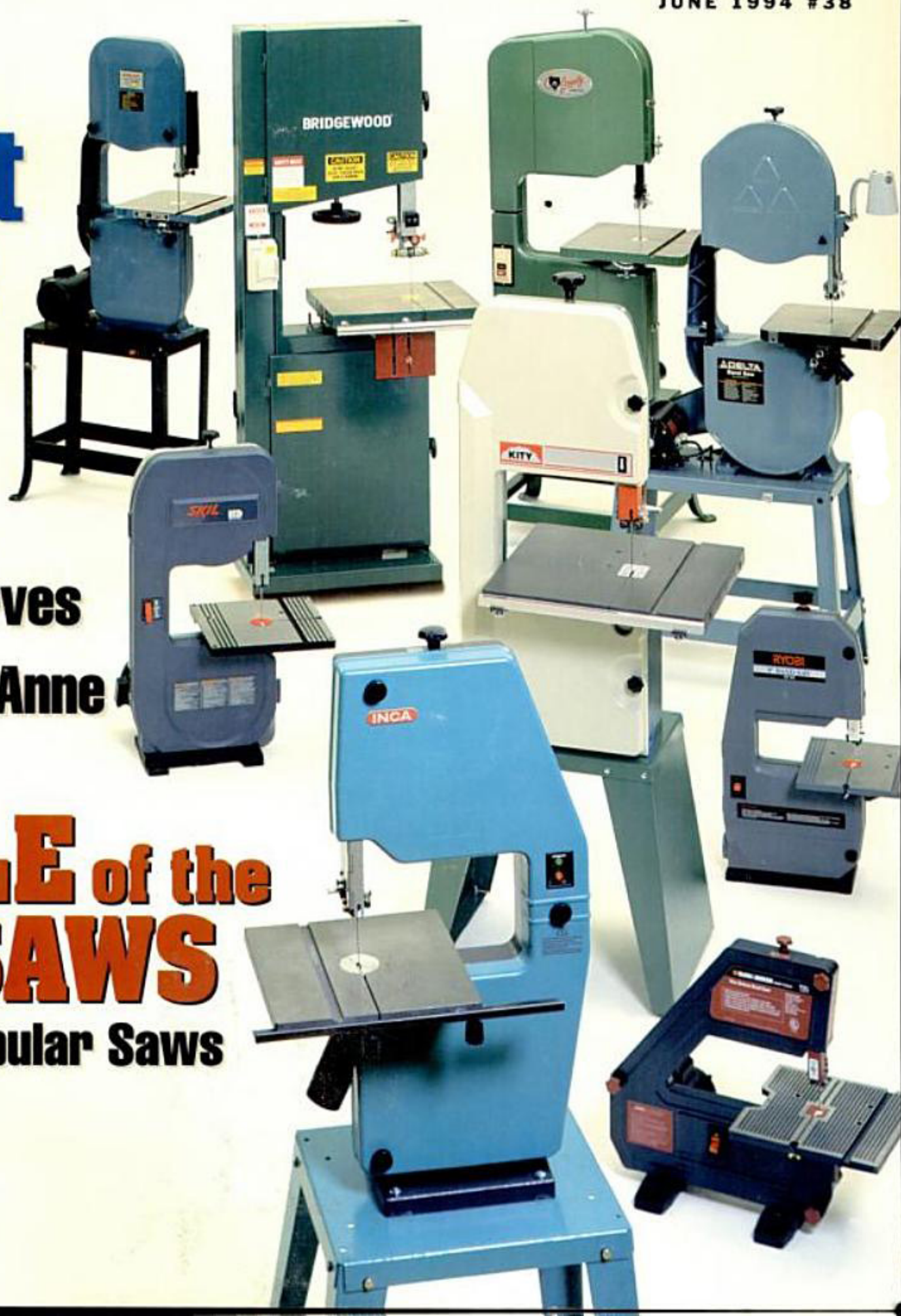
How to Finish
Like a Pro

The Easy Way
to Glue up Curves

Build a Queen Anne
Lowboy

BATTLE of the BANDSAWS

We Rate 21 Popular Saws



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RODALE'S AMERICAN WOODWORKER

Issue No. 38 May/June 1994
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A WORD FROM THE EDITOR

TOOL TESTS:

A Behind-the-Scenes Peek

"The best tool reviews in the business!" we hear people say about AMERICAN WOODWORKER's Buyer's Guides. That reputation doesn't come easy. Lots of thought, planning and effort go into making our tool tests as thorough and objective as we know how. Our goal is to give you the necessary information to pick the right tools and equipment for your woodworking needs and budget.

To give you a glimpse of the tool-review process, let's take a look at how the "Buyer's Guide to Bandsaws," in this issue, came together.

In any test, our editors first draw some parameters. For the bandsaw test, we had to ask: How many bandsaws are out there? Can we test every saw on the market? Shall we focus on one type instead? Should it be mid-size saws, three-wheelers, benchtop models, big 20-inchers?

We finally decided to test several sizes and types of bandsaws to show the broad scope of the market. Then we narrowed the field down to 21 saws—the most we could fit in our shop—and picked a couple machines in each size class to make some meaningful comparisons. Soon the saws crowded our loading dock. It took Fred Matlack, our Shop Manager, more than a week to uncrate them all and set them up in the shop.

Now comes the hard part: establishing objective criteria for testing. Sounds easy, but try defining "acceptable" performance in a way you can



measure. Should benchtop saws with hummingbird motors compete head-to-head with a big 18-incher? Should a \$400 saw be compared point-for-point with a similar saw that costs three times as much?

After devising our tests we finally put the saws to

work. Day after day of sawing, measuring, note-taking and discussion followed—a real team effort.

When the dust settles, we add up the test scores. But when all's said and done, you can't measure everything. We still have to account for the way a tool "feels." We vote on this one, and factor the votes into our ratings. (Our votes represent woodworkers of different sizes, shapes and abilities, including a couple left-handers.)

We put it all together to make our "Editors' Choice" award. This is the tool (or tools) we feel are the *best* of the ones we've tested. Our "Best Buy" award goes to the tool we feel offers the best combination of performance and price.

So, the next time you're shopping for tools and equipment, look for the AW "Editors' Choice" logo. You can buy with confidence, knowing that tool's been through the toughest tests in the business.



David Sloan
Editor & Publisher

PLAY IT SAFE

Woodworking can be dangerous. Safety equipment such as guards, hold-downs, goggles, dust masks and hearing protection can greatly reduce your risk of injury. But even the best guard won't make up for poor judgment. Use common sense and caution in the workshop. If a procedure feels dangerous, don't try it, no matter how many other folks work that way. Figure out an alternative that feels safe. Your safety is your responsibility.

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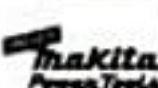


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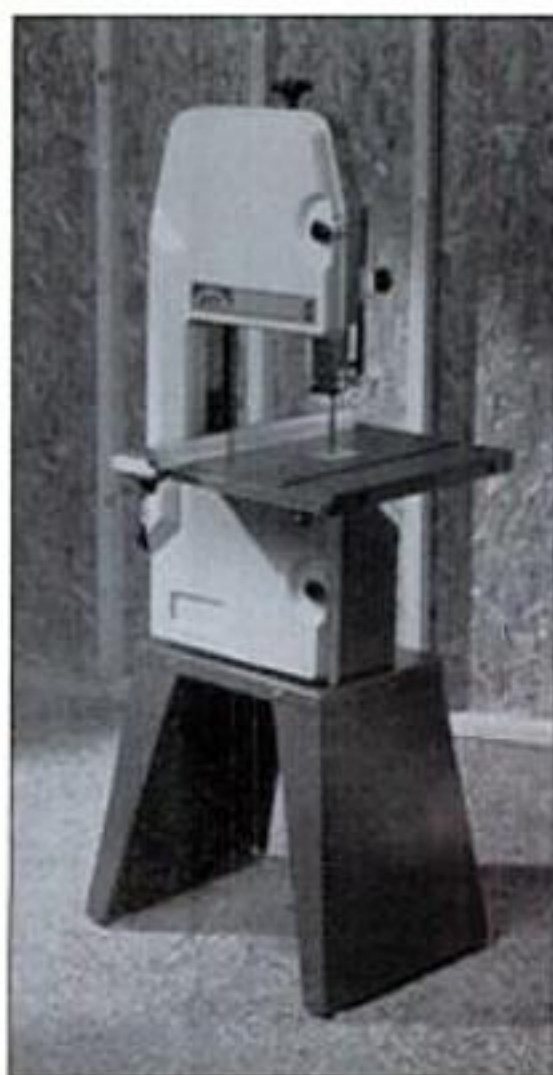
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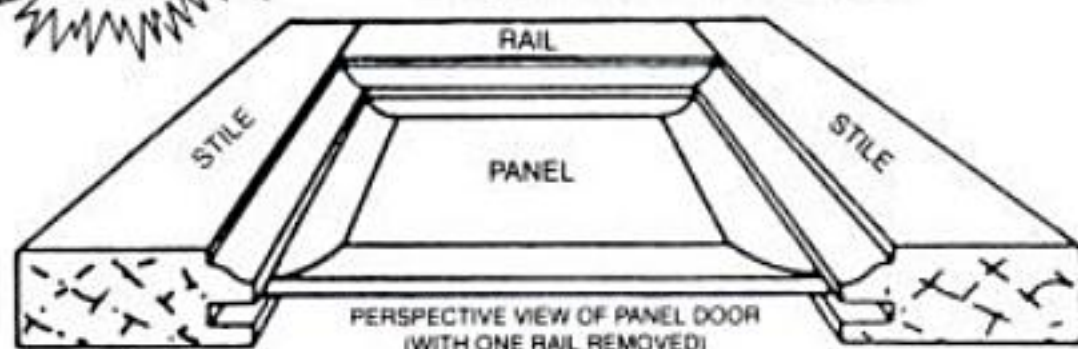
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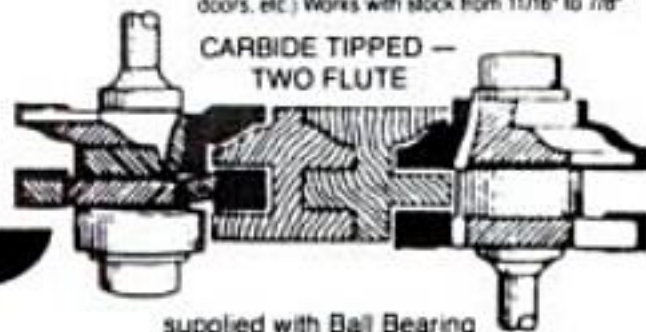
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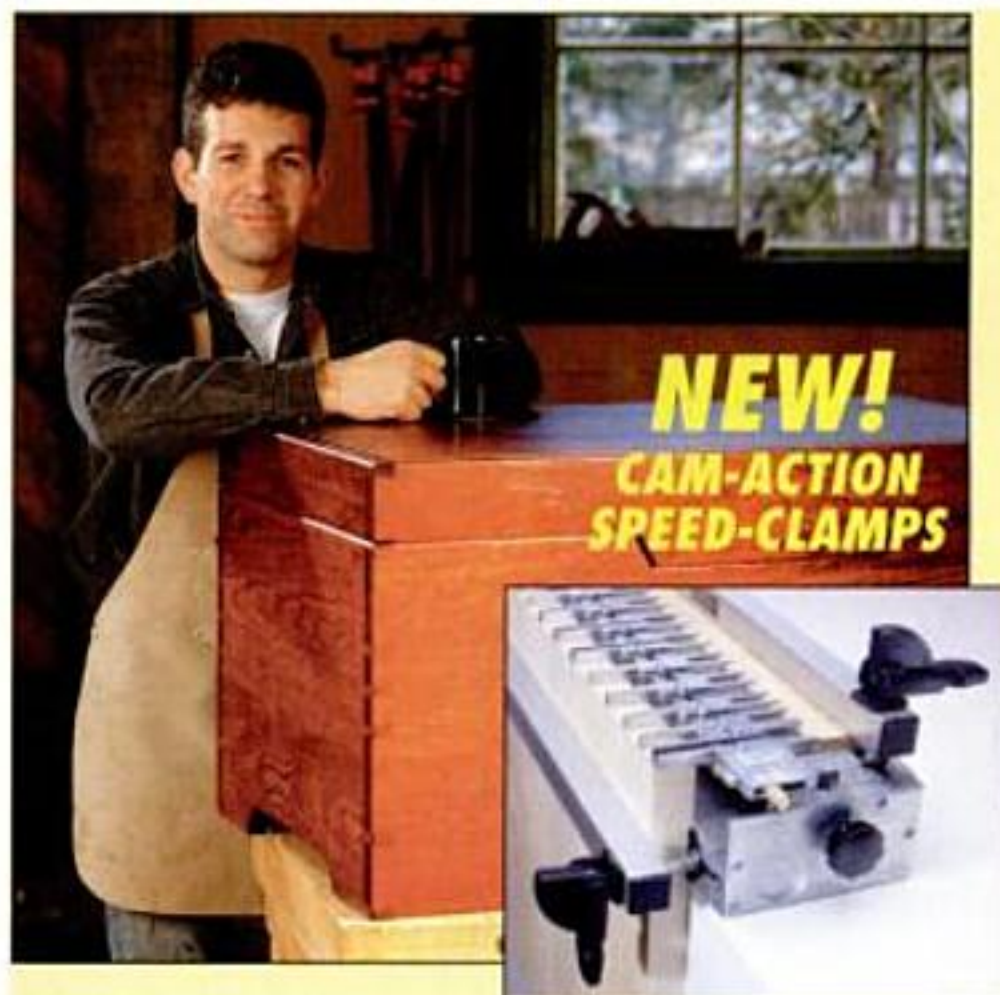


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Positioning jigs can be great for drilling holes or cutting straight slots; but remember, it is impractical and unsafe to move large, heavy workpieces over a router table to cut dovetails. Only the Leigh Dovetail Jig lets you cut true, accurate through and half blind dovetails on workpieces up to 1 1/2" thick and 24" wide, with no hand chiseling or joint-weakening gaps. And you finish your piece with one easy set-up, rather than the endless positioning movements needed with some other jigs (as a craftsman, you know that every extra set-up is just another chance to slip up—and ruin your workpiece). With the Leigh jig you make multiple joints on one set-up, not multiple set-ups for one joint.

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CIRCLE NO. 46 ON PRODUCT INFORMATION FORM

LETTERS

A Love of Woodworking

When I was a small boy I was fascinated by the woodworking my grandfather did. He made and repaired intricate clock cases, window sashes, door frames and furniture and he used old-time tools like a froe, adz, wooden planes, scorps and breast drill. He had the patience to explain tools to me and how to use them. The two points he instilled in me were quality of work and appreciation of tools. My father repaired and replaced ornate woodwork in railway passenger cars in the days when most all travel was by rail. He taught me all the woodworking basics, and like my grandfather, he emphasized quality and care of tools. I now have a son and two grandsons who are avid woodworkers. When we are together, wood is our main topic of conversation.

Dust-Collection Advice

If our article on designing a dust collection system (AW #37) just piqued your interest, you can get more in-depth information in the booklets, *Wood Dust Control and Collection Systems*, available from Delta International Machinery Corp., Marketing Dept., 246 Alpha Dr., Pittsburgh, PA 15238, (412) 963-2400, and *Dust Collection Basics*, available from Grizzly Imports, 1821 Valencia St., Bellingham, WA 98226, (800) 541-5537.



Woodwork has been most rewarding to me and I know I will never live long enough to do all the projects I have dreamed up. But, I look forward to every day as another opportunity to work with my tools and wood.

Devore O. Burch
Fort Worth, TX

Easy-Lift Collector

Your article about dust collectors (AW #37) says one of the cons of two-stage blower-and-bag collectors is you have to lift off the heavy blower housing to empty the waste drum. I devised a simple, cheap and easily used hoist system to separate my blower housing from the waste drum. This system uses a block-and-tackle scheme with one end connected to the blower housing and the other to a strong ceiling mount. This lifter lets me shake debris free by making short jerks on the rope before raising the blower, and it is a cinch to realign the blower lid gasket with the debris barrel.

H. Kent Hepworth
Flagstaff, AZ

Tung Oil Nontoxic?

Re: "Food-Safe Finishes" (AW #37). Michael Dresdner recommends using tung oil "for items that will routinely come into direct contact with food." But in the *Great All-American Wooden Toy Book*, Norm Marshall claims that tung oils are never nontoxic. Who's right?

David Sparks
Martinsville, VA

Michael Dresdner responds: Pure tung oil comes from an edible nut and in its pure form is not considered toxic. Tung oil varnishes that contain metallic driers may be more dangerous, but even here the

amount of driers is very small. If you're worried about toxicity, avoid using tung oils with metal driers.

Tablesaw Safety

Re: "A Saw Guard Is Essential" ("Letters," AW #37). We often forget a machine will grab us the first time we let down our guard. It pays to review the basic safety rules for each machine, even to the point of posting them near the machine on a 5x7 card. Also, Mr. Prusik can avail himself of shop-made safety guards, such as a feather board, which may prove better than the commercially made guard that comes with the machine. If you make the featherboard a little thicker than necessary and clamp it vertically to a fence, it can completely cover the blade and function as a guard.

Donald F. Kinnaman
Phoenix, AZ

Cleanliness Is Next To...?

Congratulations on your April issue, which included photographs of shops with *real* sawdust and wood shavings. I've always envied the shop that has a place for everything and everything in its place. After 50-plus years of enjoyable woodworking I find myself owning a home workshop with a place for everything and very little in its place—including sawdust.

Marcus F. Fechenback
Richardson, TX

Sounds like our shop, Marcus. We've still got an "all points bulletin" out on a low-angle block plane that got swallowed up by the shavings.

Quality Craftsmanship

Re: "Finding a Future in the Past" (AW #37). I was pleased to see that there is at least one other person in the world who shares my feelings for quality

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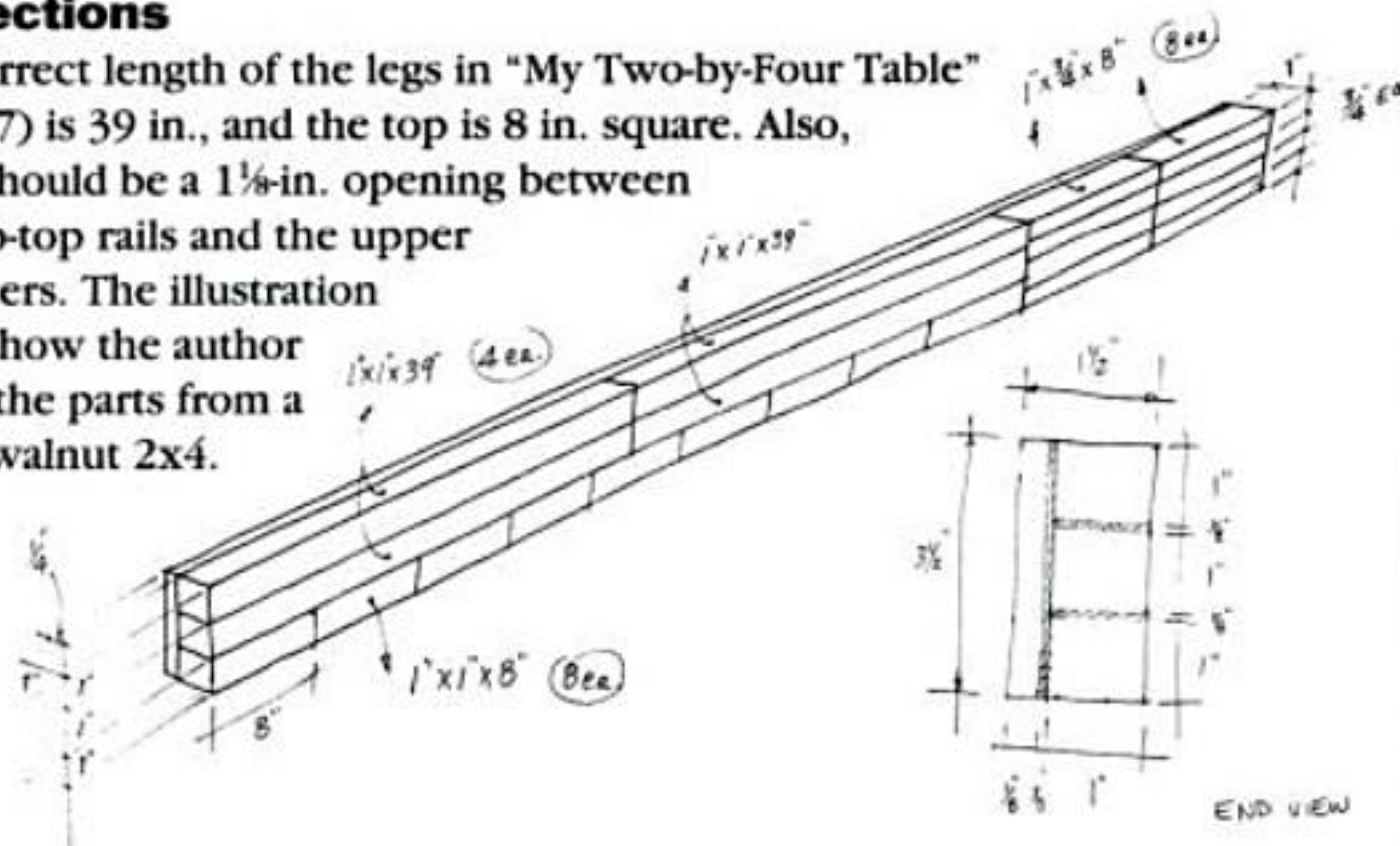
The New Yankee Workshop hosted by Norm Abram.

The American Woodshop with Scott Phillips.

CIRCLE NO. 55 ON PRODUCT INFORMATION FORM

Corrections

The correct length of the legs in "My Two-by-Four Table" (AW #37) is 39 in., and the top is 8 in. square. Also, there should be a 1½-in. opening between the sub-top rails and the upper stretchers. The illustration shows how the author cut all the parts from a single walnut 2x4.



In the "Arts and Crafts Cabinet" article (AW #32) the antique glass should be ½ by 7½ by 12½ in., and the top mortises on the side panel should be located 3 in. from the panel's top edge. A better lock for this cabinet is #F880B, available from Woodworkers Supply of Nevada, 4320 West Bell Dr., Las Vegas, NV 89118, (800) 779-7458.

craftsmanship. Mr. Hollenbeck reinforces the theory that even the simplest balusters can be individual works of art with the help of skilled hands. Mysterious "black boxes" that contain all the cold software to create intricate profiles take the human touch out of the process and, in my opinion, devalue the final product.

William D. Conkey
Belchertown, MA

Safety Gaffe

You illustrate your "Dealing with Dust" article (AW #37) with a picture of a woodworker operating a jointer with his hands on the stock *directly over the cutterhead*. An unexpected kickback could throw the stock off the machine so the user's hands contacted the cutterhead.

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CIRCLE NO. 82 ON PRODUCT INFORMATION FORM
AMERICAN WOODWORKER ▲ JUNE 1994 9

picture detracts from an otherwise excellent and much-needed article on dust collecting.

L.C. Brickner
Engineering & Product Development
Delta International Machinery Corp.

Praise for Designer

Congratulations on "An Approach to Design" and "A Tale of Two Tables" (AW #36). These are the most refreshing, entertaining articles I have seen in years. I found great enjoyment in learning how Mr. Layport's designs evolve into a finished piece that matches the best use of the available materials with the specific needs of the intended use and user. I hope you will encourage this talented man to keep writing.

S. Blair Hubbard
Knoxville, MD

Thanks, Blair. Look for Ron's article on making a secretary desk in an upcoming issue.

Assistant Art Director Wanted

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Quiet Blades Pass Test

As an engineer and a hobby-level woodworker I was interested in the article on the new "quiet" saw blades (AW #34). So I put a Freud 40-tooth blade to the test. The cuts were clean and sharp and the noise level was a hum. With magnification, the pores of the wood showed no smearing and would need little or no sanding. The results are amazing.

Paul W. Fleming
Sunrise, FL

Best Saw Guard?

Re: "Aftermarket Tablesaw Guards" (AW #36). The Biesemeyer and Delta Deluxe Uniguard [that you recommend] are fine for protecting the blade, but I question their ability to protect flesh and bone. The Brett-Guard, while requiring some effort to install, provides superior protection for users during virtually all table saw operations. It is the only guard used for training at the Occupational Safety and Health Administration's Machine Guard Training Facility.

Ben Jones
Vandalia, OH

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, or telephone your message to us at 610-967-7776. FAX: (610) 967-8956.

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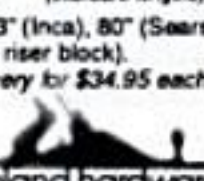
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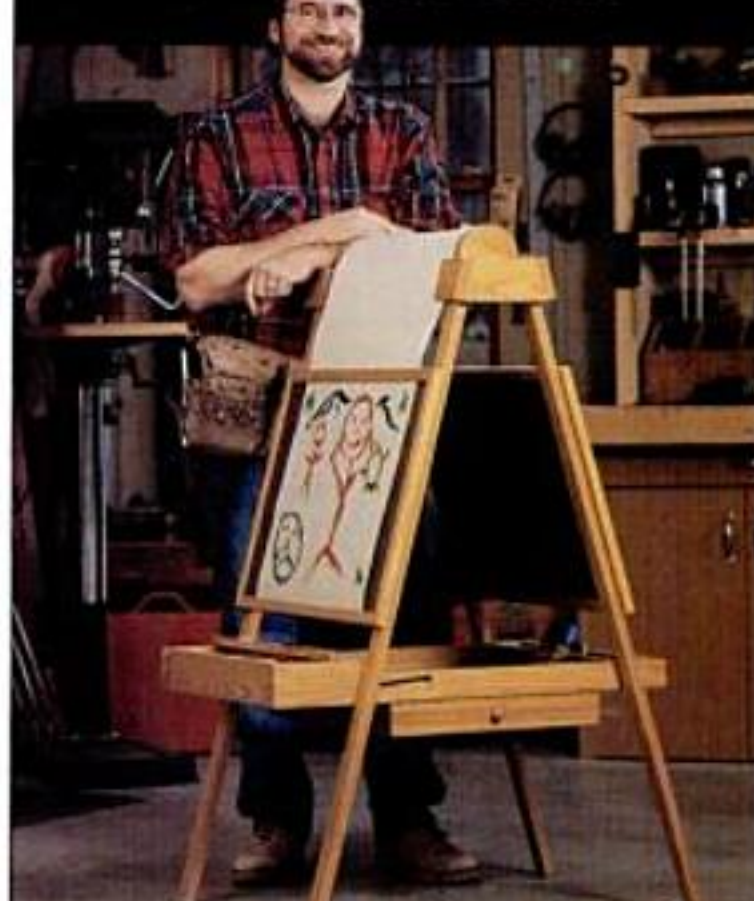


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2. What does this symbol mean when written on a board?



LARRY FREEDMAN

3. When would you be most likely to use an oval-headed wood screw?

4. What types of fires would you put out with an ABC fire extinguisher?

5. As it dries, is a green board more likely to cup away from the center of the tree, or toward it?

6. What government organization can supply information on commercially available timbers?

7. What tool was used in Colonial times for removing the bark from trees before hand-hewing?

8. What is a jack plane, and how did it get its name?

9. What is a *Schnitzelbank*?

10. How are sharks and woodworking related?

BIGGEST IVORY OUT OF AFRICA



WAYNE KNUTESON

Knuteson's gigantic pink ivory log rests on a flatbed trailer in Utah. Helper John Arseneau looks on.

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JOHN CRITCHFIELD

SCIENCE AND WOODWORKING DO MIX

At a time when schools and colleges around the country are dropping their woodworking programs, a New York City high school that's best known for its high-tech wizardry is investing heavily in the craft.

In the last two years, Stuyvesant High School, known nationwide for the top-notch science students it produces, has invested *millions* of dollars in state-of-the-art woodworking equipment for its shop. The 90-year-old high school's mission has always been to combine superior academics with industrial education. So, it was natural for the school to continue its commitment to woodworking

when it built a new building in 1992.

In keeping with the school's past, woodworking at Stuyvesant is part of the technology department. But course offerings enable students to get a good foundation in traditional building and design skills: One advanced class is making oak clocks for a term project. Experienced woodworkers can also pursue highly individualized and experimental projects, and the school encourages them to use their skills in other courses. For instance, science students have made wooden whistles to explore the properties of wind.

Stuyvesant's shop attracts about 200 students yearly.

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Robert Steffen, a retired machinist from Wisconsin, is the winner of the second AMERICAN WOODWORKER/Delta International \$5,000 Dream Workshop Sweepstakes. Steffen, who coincidentally was notified on his birthday that he'd won, enjoys making toys and dollhouse furniture as well as full-size furniture. As this year's winner he has been invited to the AW workshop for a visit after he picks out \$5,000 worth of Delta tools and equipment for his shop.

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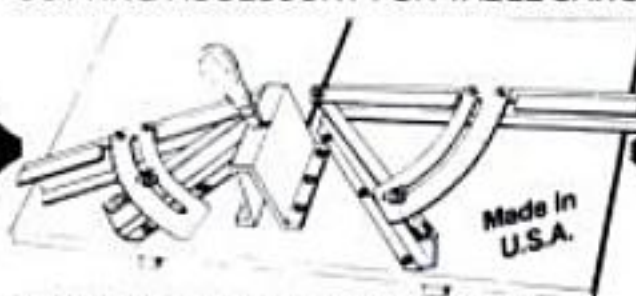
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NEEDED: WOODWORKING TEACHERS

The Boys & Girls Clubs of America need volunteers to teach underprivileged children basic woodworking skills. Volunteers will help the young people complete simple craft and carpentry projects, and according to Tom Smart, assistant director of program services, the courses will be taught at club locations around the nation. If you are willing to share some of your time and skills, please write to: Tom Smart, Boys & Girls Clubs of America, 1230 Peachtree St. NW, Atlanta, GA 30309, or call: (404) 815-5700.

BATTLE FOR THE BUTTERNUT

Woodworkers who use butternut may be in for a rude awakening in the near future. This softer relative of walnut, a



At left is the canker as it appears on bark in the spring; at right is the damage beneath the bark.

favorite of woodcarvers, is in serious danger from a fungus. Scientists say butternut could soon become an endangered species in the eastern U.S., and lum-

ber prices may be affected.

The feisty fungus is commonly called butternut canker disease; it causes cankers on the trunk which close off food and water supplies, killing the tree.

The entire growing range of the butternut—from Minnesota to Maine, to Tennessee and Arkansas—has been hard-hit by the fungus. In fact, the United States Department of Agriculture's Forest Service data show that the number of butternut trees has declined by 84 percent in some parts of the Great Lakes states over the past decade and a half.

But USDA scientists think they have found a way to fight the spread of the dis-



A healthy butternut tree.

ease. They are cloning butternut trees that seem to be naturally fungus-resistant.

Finding healthy trees for this research is difficult and time consuming, and researchers can use your help. If you have butternuts growing on your property and would like to learn more, write to: Forest Disease Project, USDA Forest Service, 1992 Folwell Ave., St. Paul, MN 55108.



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Cartwright began his woodworking career by apprenticing as a patternmaker in the furniture industry. Somewhere along the line, he met a co-worker who made Ford parts, and Cartwright got interested in antique cars. The rest, as they say, is history—or a remarkable facsimile thereof!

Hundreds of wooden pieces like these must fit precisely together in every single car. Outside right and left are a pair of window sills; in the middle are a pair of hinge pillars and a door regulator board. Above are two windshield headers.



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The builder of this bed said it best: "I've heard of tossing and turning in your sleep, but this is ridiculous!" Craig Kassan of Jacksonville, Florida, built this queen-sized original from red oak and curly cherry. Partially exposed mortise-and-tenon joinery accents the frame, and the visible sides of the side rails are twisted to match the contrasting angles of head- and footboard.

Offcuts contributors:
Susannah Hogendorn, Andy Rae,
Simon Watts

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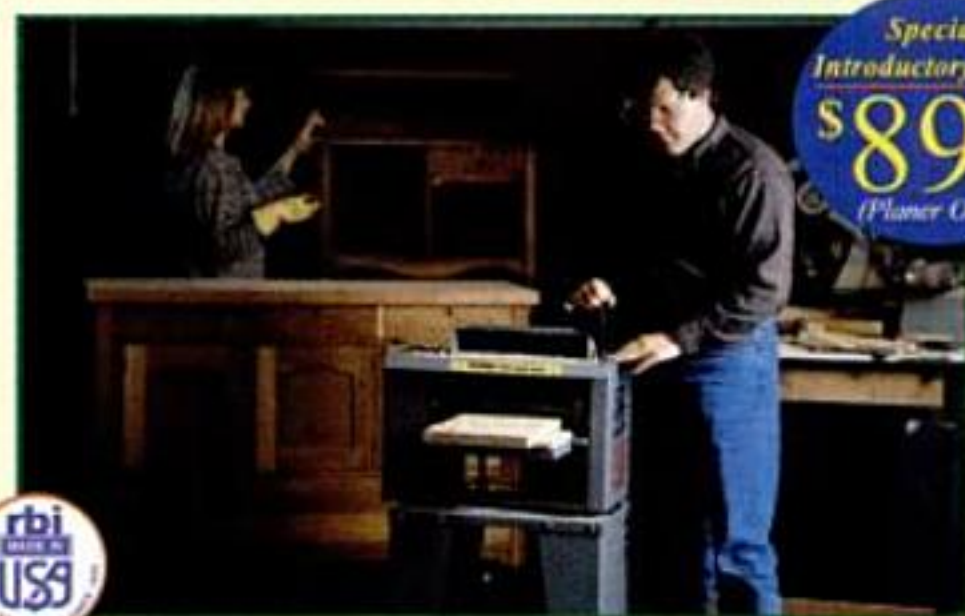
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CIRCLE NO. 5 ON PRODUCT INFORMATION FORM

Buying Your First Lathe

Q The turning bug bit me when I spent an evening watching my neighbor work at the lathe. I'd like to buy a lathe, but I'm bewildered by the different sizes, brands and prices. Can you give me some advice about buying a first lathe and accessories?

Paul Burke
Woburn, MA

A First, I suggest you look for a big, variable-speed (as opposed to stepped-pulley) lathe with lots of cast iron. A heavy lathe is less prone to vibration, and it's faster and easier to change speeds on a variable-speed lathe since you don't have to move the drive belt from pulley to pulley by hand.

After this, look for versatility: The maximum distance between the headstock and tailstock will reflect the longest spindle you can turn. The

height from the bed to the drive spur will be the maximum *radius* of a bowl that you can turn over the bed. (Manufacturers refer to the "swing" of a lathe, which is the largest *diameter* that the lathe can handle.) Some of the newer entry-level lathes have headstocks that rotate, allowing you to turn larger pieces off the bed of the lathe.

Next, look for a headstock with a common Morse taper and common spindle size so it will accept aftermarket gadgets like chucks. The most common Morse taper is a #2; spindles vary quite a bit in size and threads per inch, but you can check the Craft Supply catalog (1287 E. 1120 S., Provo, UT 84601, 801-373-0917) to see the basic ones. And don't forget to shop for power: A ¾-HP motor is a minimum for a lathe.

Expect to pay at least \$500 for a decent new machine. However, don't

overlook the want ads: Sometimes a real bargain comes up if you know what you're looking for.

Accessories should include a good set of high-speed-steel turning chisels. Also, a set of calipers will help you duplicate diameters whether you're turning spindles or bowls. If the lathe doesn't come with one, I advise buying a live center for your tailstock. And a face shield is a must for safety.

Steve Blenk
Teacher and turner
Sequim, WA

No-Drip Shellac

Q I want the warm look of a shellac finish on my mahogany wall. How can I apply it without getting runs and sags, and what kind of shellac should I use?

Larry Davis
Lacombe, LA

Headboard Joints

Q I'm making a traditional four-poster bed, and I'm concerned that the wide headboard will eventually split across the grain if I glue it into the mortises in the posts. Can I lessen the chances of splitting by making two narrow tenons with the area in between cut out?

Kristen Fuller
Budds Creek, MD

A Narrow tenons won't solve the problem, because they'll still be part of a large board that is susceptible to wood movement. Your best bet is to entirely avoid the cross-grain gluing problem by joining the headboard to the posts without glue. This is the way many Colonial poster beds were made, and furniture makers would hold a bed together by bolting the bed rails to the posts.

Typically, on a bed with straight-tapered posts, the tenon would be the full width of the headboard, and it would fit into a mortise that was slightly longer than the tenon was

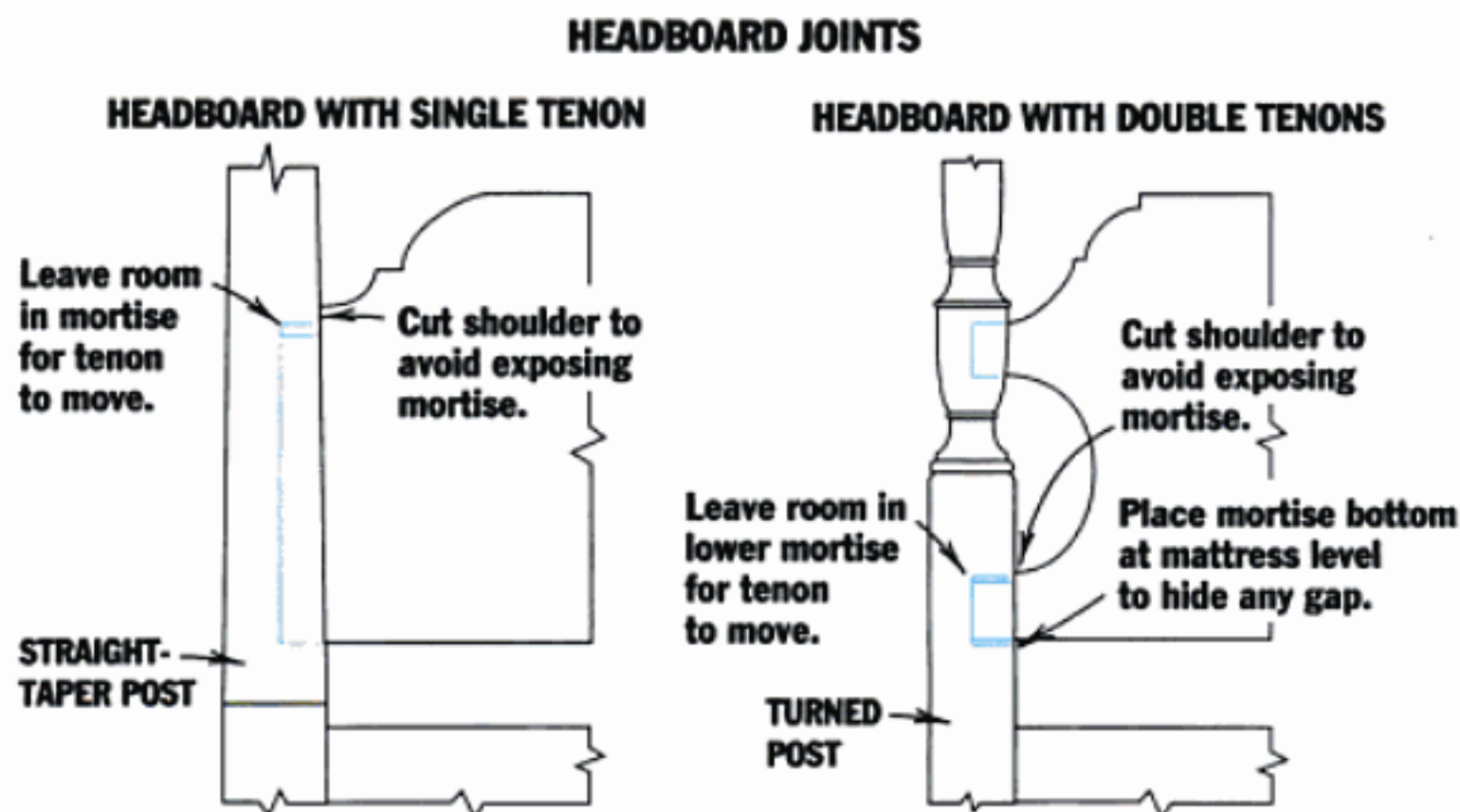
wide. (See drawing.) This would allow the headboard to expand at the wettest times of the year. A shoulder at the top of the tenon kept the mortise from showing as the headboard shrank in width during the dry season.

Narrow tenons and the cutout you describe were used on four-poster beds to minimize the length of the mortise in the post, and thereby add strength to boldly turned posts.

If you use cutouts on your head-

board, make the top tenon the full width of the top mortise. Leave room in the lower mortise so the bottom tenon can move freely, thus preventing the headboard from binding. Old-time furniture makers often located the lower mortise in line with the mattress. This way, any gaps were hidden by the mattress and pillows.

Mack Headley
Cabinetmaker
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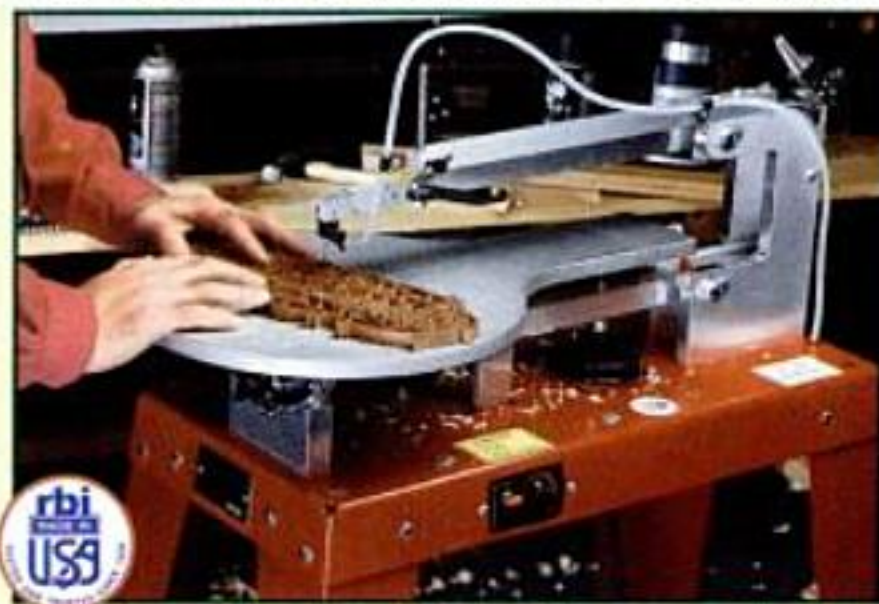
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A The key to a drip-free shellac finish is to avoid putting too much on at once. You can control shellac by brushing or wiping on multiple thin coats, and by thinning the finish so it dries so quickly it doesn't have time to sag on a vertical surface.

I suggest you buy your shellac in flake form and mix it with denatured alcohol to ensure it's fresh. Start with a 2-pound cut (2 pounds of shellac to a gallon of alcohol), then experiment to get the right viscosity: If you still get sagging, add more alcohol; for a quicker build, add more flakes.

Whether you use orange shellac or a lighter-colored, blonde shellac is strictly a matter of taste, but avoid bleached "white" shellac because its hygroscopic (water-retaining) nature makes it less durable.

Shellac won't hold up in high heat (above 120° F), so if the woodwork is close to a heat source such as a fireplace, you'd be better off using an oil-based varnish instead of shellac to get the warm tones you're after.

Michael Dresdner
Finishing consultant
Nazareth, PA

Repairing Loose Veneer

Q I just inherited an antique table that is veneered with mahogany. The veneer on the top is in very good shape except for some chips and cracks near the edges. Is there some way to repair the top without replacing all the veneer?

Kerry Gordon
Toronto, Canada

A Re-veneering the entire tabletop is a last resort and should be avoided—you risk destroying the historical value of the antique. Instead, there are two basic conservation techniques that will improve the condition of the piece and prevent further deterioration.

To repair small cracks, first clean them with a stencil knife or other small, sharp knife to remove debris and loose glue. Then fill the cracks slightly proud by melting in a single flake of shellac or an appropriately colored burn-in stick (available from Garrett

WHERE TO FIND IT

Natural dyes, mordants and various grades of shellac are available from Olde Mill Cabinet Shoppe, 1660 Camp Betty Washington Rd., York, PA 17402, (717) 755-8884.

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Wade, 161 Ave. of the Americas, New York, NY 10013, 800-221-2942). After the filler is hard (a few minutes is all it takes), level any bumps with a scraper and some 220-grit sandpaper.

For big cracks and chips, you'll need to glue a veneer patch into the damaged area. First scrape the area clean with a knife or sharp chisel, then pick a piece of veneer that matches the color and grain of the top as closely as possible. Fit the patch to the chipped area with a knife or chisel, cutting matching bevels on the cross-grain edges of the patch and the damaged area of the tabletop to make a scarf joint.

Use hot hide glue to attach the patch, coloring the glue with water-soluble aniline dyes if you suspect the glue lines will show. (The reversible nature of hide glue allows you to remove the patch with heat and moisture if you don't like the results.) Clamp the patch under a block of wood until the glue dries, then scrape

and sand the repair until it's flush with the surrounding area.

Once all the repairs are leveled, you can dab on some stain to get them close to the color of the rest of the table. However, for a final color match, you should mix aniline dyes or powdered pigments with shellac and lightly pad the repaired area.

Lance Patterson
Furniture instructor
Boston, MA

Setting a Shoulder-Plane Iron

Q I read somewhere that the side of a shoulder-plane iron should extend just a little beyond the side of the plane body. Is this true, and if so, what's the reason?

Mike O'Toole
Woodstock, NY

A How you set the blade in your shoulder plane depends upon the job. When cleaning up tenons,

keep the iron flush to the plane's side. This way, the side registers against the cheeks as you flatten the shoulders, and against the shoulders as you fit the cheeks. This keeps cheeks and shoulders square to each other.

The reason for extending the iron slightly beyond the side of the plane becomes apparent when you need to plane up to surfaces that intersect at an angle greater than 90°, such as where the bevel of a raised panel meets the tongue. The extended blade will cut to the intersection without the body of the plane gouging the tongue.

Peter Korn
Furniture maker and teacher
Rockland, ME

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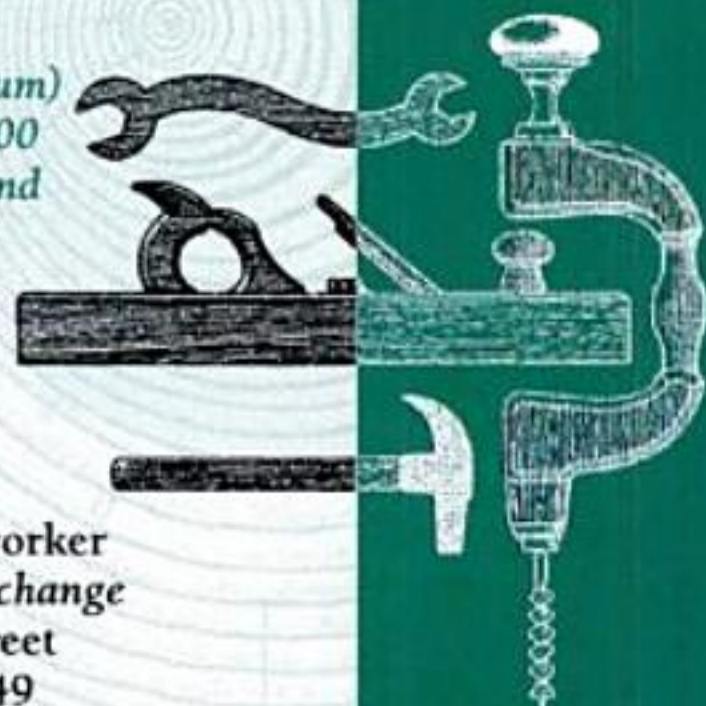
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Gillespie Paddles

I just want to throw in a few quick words here regarding the use of the Sand-Rite equipment, specifically the pneumatic drums. I bought my basic machinery about 10 years ago, and it's still with me, in use, every day. Since a canoe paddle is basically a contoured instrument, it's absolutely essential to have equipment that will not leave harsh edges when sanding, which of course flat, hard sanders will do. That's great for boards, but not for paddles. I have a variety of drum sizes that I use for smaller and larger radius, as well as the flat of the blade surface.

Well, I don't want to be too yappy here, but I highly recommend these drums for any contoured work. It's a helluva lot easier and quicker.

Brad Gillespie

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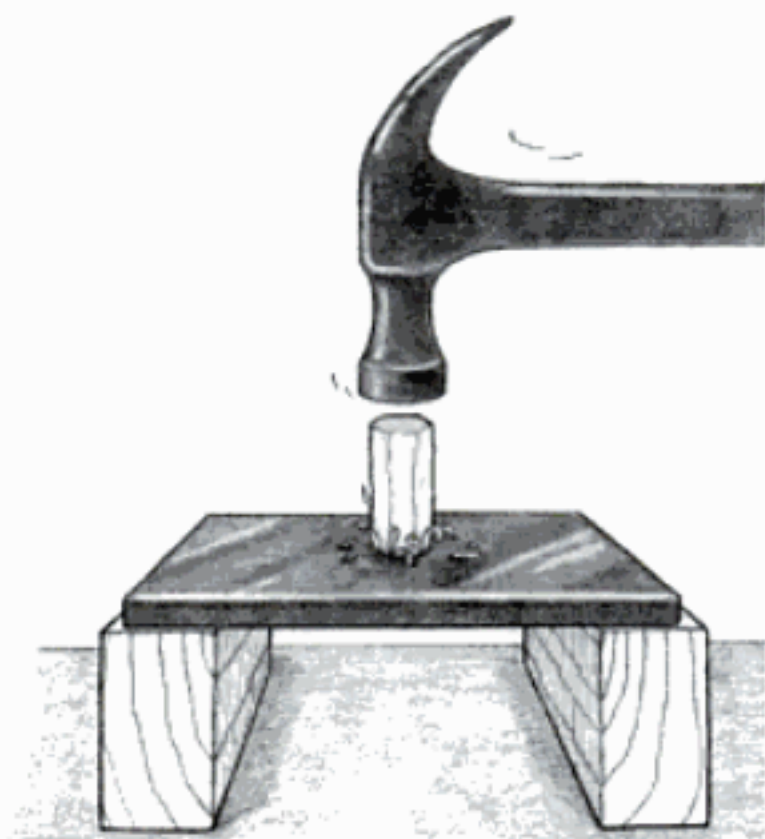
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TECH TIPS

Make Your Own Dowels

The next time you need a dowel pin in some unusual hardwood, try making your own. First drill a hole the same size as the dowel in a piece of 1/4-in. steel plate, leaving the rough edges



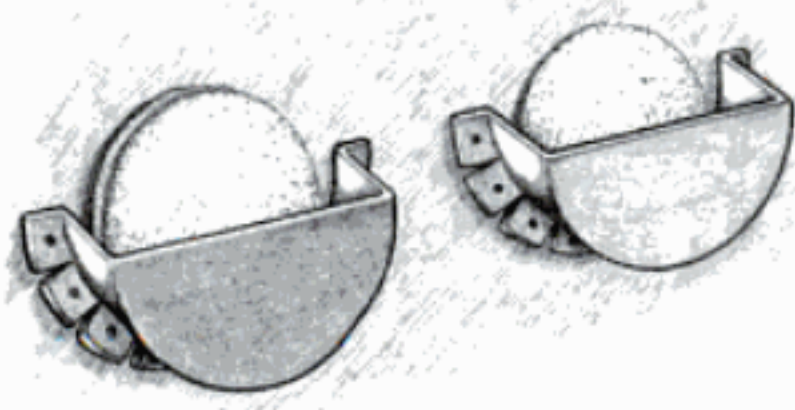
of the hole intact. Then, whittle a piece of wood to the approximate size and shape of the dowel pin. Place the plate on blocks (with the burr around the drilled hole facing up) and drive the wood through with a hammer. You can drill holes for several sizes of dowels in one plate, but you'll need to use heavier-gauge metal as the size of the dowel increases.

Danny Brumfield
LeSage, WV

After the Fruitcake

Don't throw that cake tin out! Cut in half and mounted on the wall, it makes an ideal holder for sanding discs. I color-code the tins—red and blue—so I know which holds the fine disks and which the coarse.

Howard Moody
Upper Jay, NY



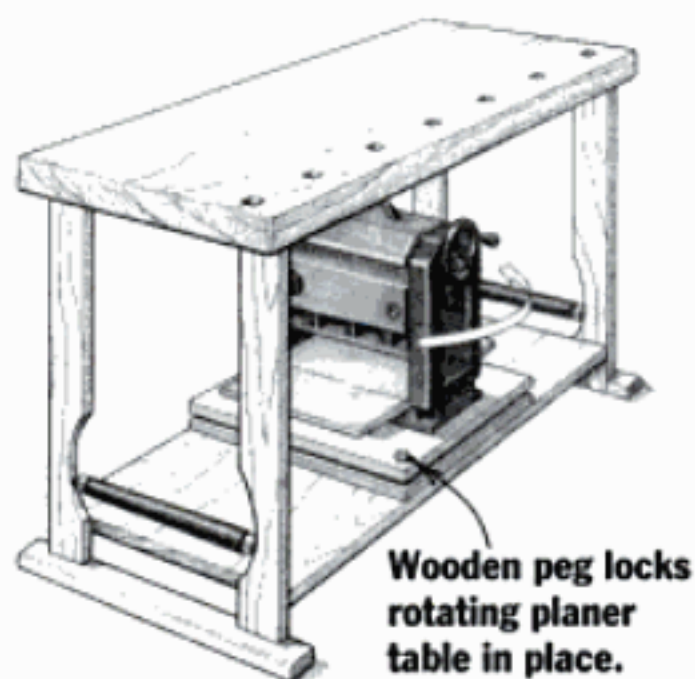
Cheap Source for Beeswax

The beeswax you find in a toilet-bowl seal is excellent as a lubricant in the shop. Sold in hardware stores, toilet-bowl seals come in the shape of a large doughnut, so when I buy one I warm it, then re-form it in a tin can or small wooden box for storage. Beeswax is especially useful for lubricating screws, because it doesn't stain the wood.

Robert Behm
New Wilmington, PA

BEST TIP

Chuck LeDoux, of Heppner, OR, wins \$200 for this labor-saving tip, judged by our editors as best of the issue. For details on how you can win cash for your favorite workshop tips, see the box on page 26.



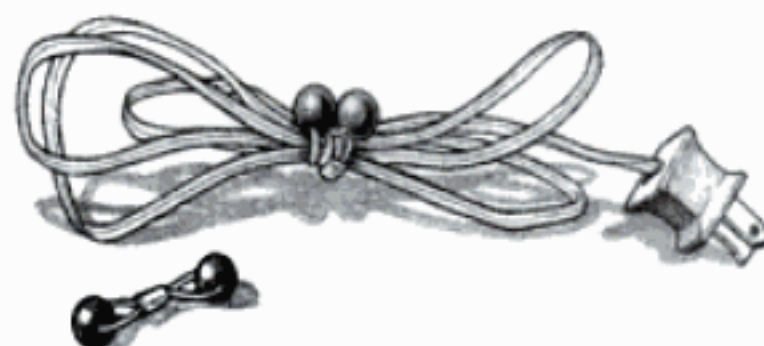
Wooden peg locks rotating planer table in place.

Turn-Around Planer

To make the best use of shop space, I mounted my portable planer under my bench and installed rollers at each end of the bench so I could plane long boards without moving the machine. This worked well, but it still meant I needed to carry all the stock from the outfeed side to the infeed when making several passes. One day I got smart and mounted the planer on a piece of plywood with a "lazy Susan" underneath. Wooden pegs keep it locked in position. Now all I have to do is pull the pins and rotate the planer 180° for the second pass.

Taming the Power Cords

Do the cords of your power tools look like a rat's nest? Try taming them with twin-bead ponytailers. These are braided elastic hair bands with a small ball at each end. Just fold the cable in

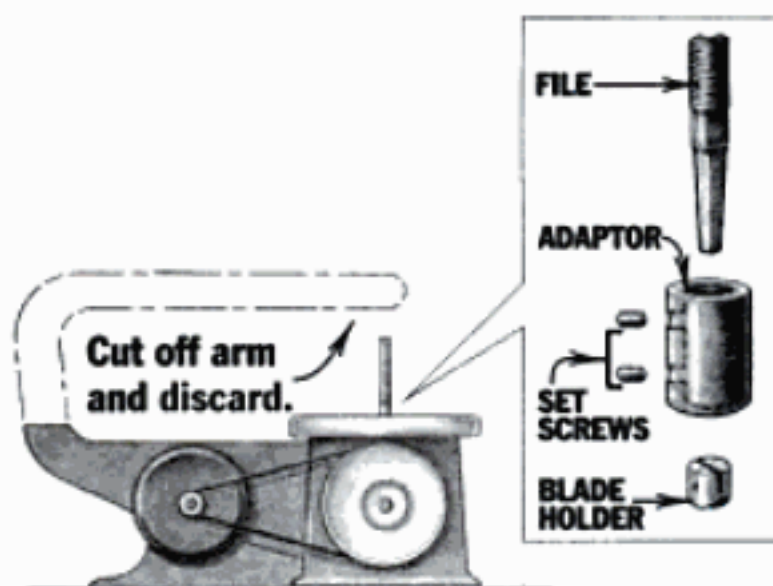


half, then in half again until you have the size you want. Wrap the ponytailer around the cord and slip the ball through the loop. Ponytailers come in various sizes and can be found in the cosmetics department along with other hair accessories.

Charles Dilks
Richland, WA

Reciprocating File

In these days of the scroll saw revolution, flea markets are chock full of old-style cast-iron jigsaws. I bought one recently and converted it to a reciprocating filing machine. I first cut off the upper arm, and then I made an adaptor which held the file in place and fit over the jigsaw blade holder. I also changed the pulleys and



found that a 1-in.-dia. pulley driving a 6-in.-dia. pulley will give the right filing speed, when driven by a 1,725-rpm motor.

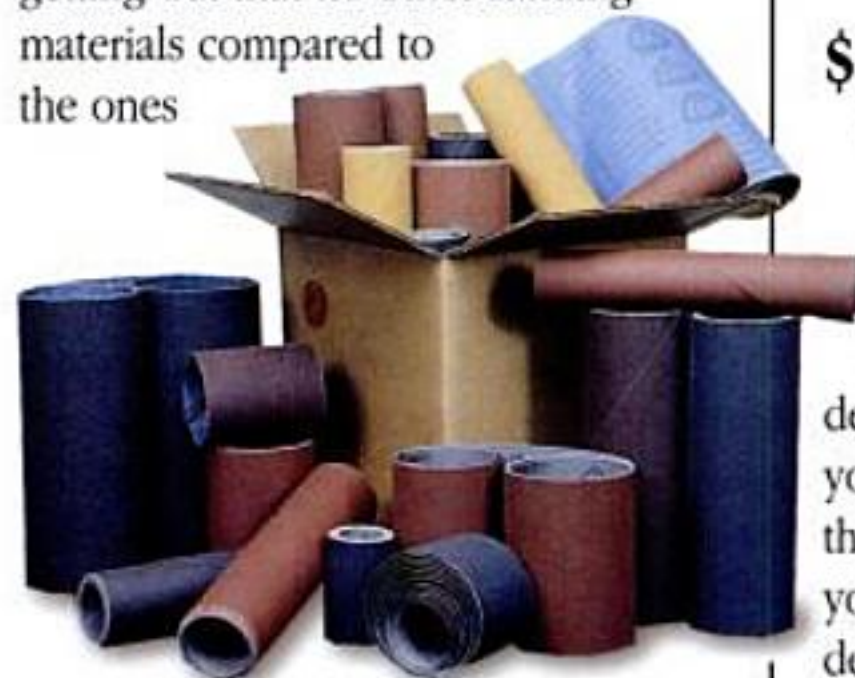
Ron Pavelka
Orange, CA

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Choose any combination of coarse, medium or fine grit.

offered in the Bargain Box. One thing lead to another and a small catalog was born. Most of you have probably seen, heard of or even ordered from

Klingspor's Sanding Catalogue over the years and the good news is the Bargain Box is still available. You simply cannot get a better deal anywhere—you choose the grits you want in any combination of C=coarse, M=medium or F=fine.



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Then to further the story, Klingspor's Sanding Catalogue developed another "Bargain" to show you, the woodworker, the quality of the materials offered and to entice you to order and get the value you deserve from your sanding products. What came about next rocked the whole woodworking industry—the "Box of Belts". How could a mail-order company possibly sell 36 sanding belts for only **\$29.00** (plus **\$3.50** shipping and handling)? That's only \$.80 per belt—totally unheard of! The most common portable belt sizes are

offered: 2½" x 16", 3" x 18", 3" x 21", 3" x 24", 4" x 21" and 4" x 24" (the 4" wide belts have 30 per box) and the best part is you choose the grits. Extra coarse, coarse, medium, medium-fine, fine and extra-fine grits make this a no-lose situation. There are six belts in each grit pack (five in the 4" wide belts); you choose six of the packs in any combination and you've got your Box of Belts.

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Instant Dowel Centers

For a quick doweling job, I drive a finish nail about halfway into the wood wherever I want a dowel. I clip

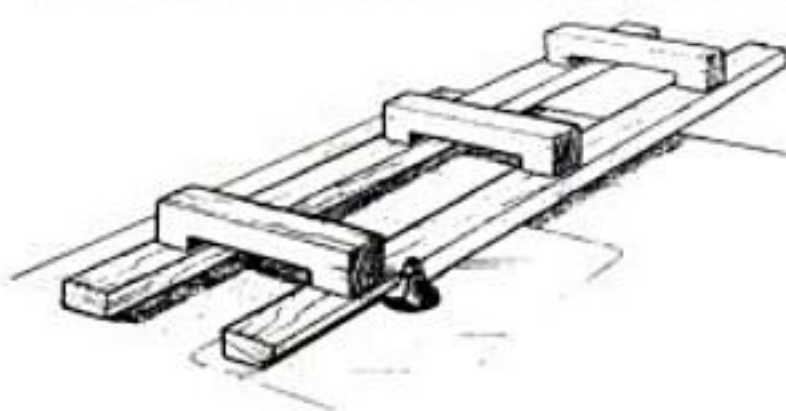


the head off, so only about 1/4 in. is left sticking out, and I press the mating piece firmly against the nails. Then I pull the nails and drill holes with a brad-point bit at all the points marked. Unlike when using dowel centers, you can use this technique for any size of dowel.

Martin Gross
Marlin, WA

Shaping Thin Stock

Shaping thin stock, such as picture-frame molding, on a router table can be awkward. It's easy to roll or lift the work, affecting the cut, and one's fingers are perilously close to the cutter. My solution is to attach an outrigger to the workpiece with hot-melt glue. I cut away the lower edge of the supports as shown so they'll clear the



bit's pilot bearing. Then I can rout both sides of a workpiece with perfect safety.

Dale Fritz
Cypress, TX

Punching Copper

I recently made a pie safe for my wife, and of course she wanted the doors decorated with punched copper panels in traditional fashion. Punching four large panels, all by hand, was going to take time, so I used my drill press. I took the handle off an ice pick, chunked the steel needle in the

drill chuck and set the copper sheet, backed with plywood, on the table underneath. By setting the drill press depth stop I could get a consistent hole in the copper sheet every time. With the drill press running, it was easy to withdraw the ice pick.

John Eiler
Riverdale, GA

Turning the Tables

Here's a good way to support a panel or door while finishing. Put one nail in one end of the panel and two nails in the other end so it can't rock.



When you've applied finish to one side, turn the panel over by lifting the end with the two nails and pivoting the panel on the single nail on the other end. Once your finish is in place, leave the panel on the sawhorse to dry.

Carl Dorsch
Pittsburgh, PA

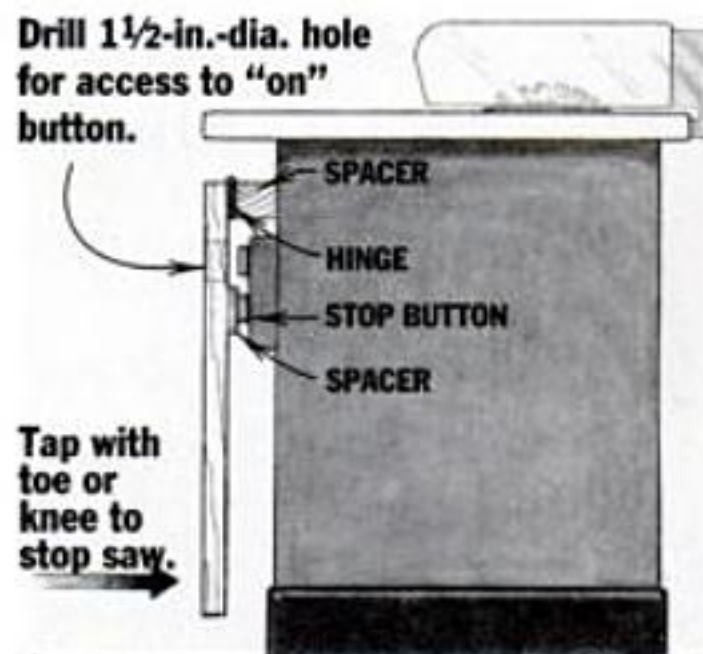
Boring the Odd Hole

I often need to drill odd-sized holes for which I don't have a standard bit. So, I make my own from spade bits. For example, recently I wanted a hole to fit 1/2-in. electrical conduit. Since the pipe was a fraction over 1 1/16 in., I started with a 3/4-in. spade bit and ground a fraction off each edge. I was careful to keep the bit symmetrical, cooling the steel frequently with water. As I got closer to the size I wanted, I chucked the bit and drilled trial holes until I had the correct diameter. The final step was to remove the burr by honing the bit flat on an oilstone.

John Matthews
Champaign, IL

No-Hands Stop Switch

"No-Grope Switches" ("Tech Tips," AW #33) was useful but required additional switches and wiring, and you also have to take one hand off the

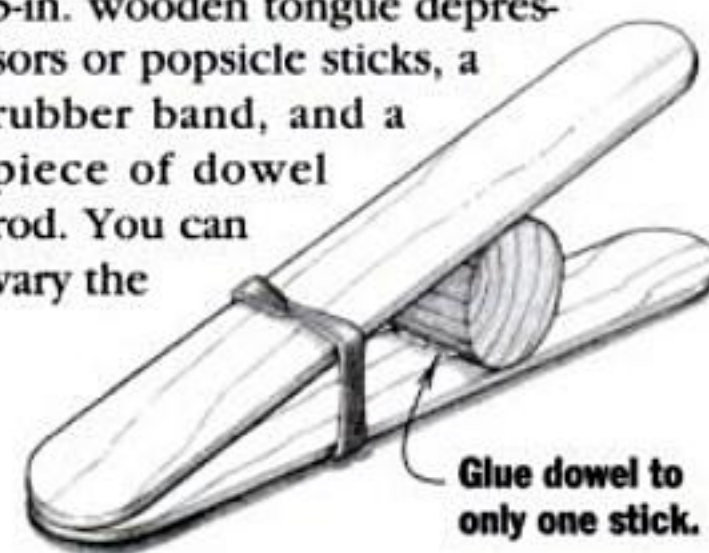


work to trip the switch—a potential safety hazard. A better solution is to modify the existing switch so it can be operated by foot. Hinge a piece of 1x4, position a block to connect with the off switch and you're in business.

George Weber
Magalia, CA

Model-Maker's Clamp

This light-duty clamp is ideal for model makers. All you need are some 5-in. wooden tongue depressors or popsicle sticks, a rubber band, and a piece of dowel rod. You can vary the



pressure by changing where you place the rubber band and how many times you wrap it around the sticks.

Jim Tite
Fayetteville, AR

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CIRCLE NO. 43 ON PRODUCT INFORMATION FORM

The Basics of Bent Lamination

Techniques for Gluing Strong, Repeatable Curves

By Peter Korn

In bygone days, when shipwrights along the coast of Maine needed curved timbers for their boats, they purchased hackmatack roots whose grain would naturally follow the curves they needed. Today, only straight stock is available to us commercially, so we woodworkers bypass nature and create curved wooden parts by either bandsawing, steam bending, or laminating.

The first two techniques have drawbacks: Bandsawing falls short when you're looking for strength, because sawing a curve in straight-grained wood creates "short grain," which weakens the part. Steam bending is better, since the grain of the wood follows the curve. But the curve can be inconsistent since the wood never loses its desire to "spring back" as crushed cells from the bending process expand in response to humidity.

Laminate bending, while more time-consuming than steam bending, yields more reliable results. The technique involves gluing thin layers of wood together to create a thicker, curved piece, usually by clamping over a curved form. Once the glue sets, the piece remains curved because the glued faces can no longer slide by each other.

Another advantage of laminate bending over steam bending is that you can create wide, curved panels using manufactured materials like thin plywood and veneer, whereas the width of steam-bent panels is limited to the width of solid timber. Also, virtually any type of wood will work for lamination, while steam-bending favors certain species of wood such as white oak or ash. And while both steam-bent and laminate-bent pieces will spring back initially, a laminate bend holds its shape more dependably over time.

That said, let's talk about the particu-

Bent lamination is the best way to create a compound curve like the chair arm in the inset photo. Here, author makes one of the curved back legs of the chair by clamping glued strips of wood to a one-part form made of medium-density fiberboard.



HAL SMYER

著作物

KIP BRUNDALE



To build up the height of a form, make a master piece, then screw slightly oversized pieces to the master and trim them flush with a router.

lars of bent lamination, starting with the types of bending forms you'll need to create curved work.

Bending Forms

There are three basic types of bending forms, and each is suited to making certain kinds of curves. I build most of my forms from scrap $\frac{3}{4}$ -in. plywood or medium-density fiber-board (MDF). (See lead photo.)

Regardless of the type of form, you'll need to design for springback by increasing the amount of curvature in your form. Although the exact amount of springback can only be gauged by trial and error, springback will generally increase as the thickness of the laminates increases. The lamination in the lead photo sprang off the form by about $\frac{1}{8}$ in. at each end.

One-part bending forms are generally used for curves that bend in only one direction. It's best to make this type of form convex, since it's easier to bend wood *around* a crowned surface (see lead photo) than to force it *into* a hollow.

To make a one-part form, bandsaw a master piece of plywood or MDF to the exact curve you want (allowing for springback), then screw additional pieces to the master and flush-trim them with a router. (See photo, top left.) Build up the thickness of the

form until the surface is at least $\frac{1}{8}$ in. wider than your laminates. Cut notches or holes in the form to give your clamps a purchase at right angles to the curve. (See drawing.)

For workpieces over 6 in., I make a wider form like the one shown in the drawing. This gives me a wide, rigid surface with a minimum of material.

Two-part forms (see drawing) are often used for reverse curves, like the S-shape in a chair back. You construct them like one-part forms, except you make two forms that mate with each other. The laminates are placed between the two parts, and only a few clamps are needed to pull the forms together and distribute the clamping pressure evenly.

The curvature of the two forms should not be identical. When laying out the forms, I match one form to my



Use pencil marks to keep the laminates in sequence, so finished lamination will appear as a solid piece of wood.

length with an elastic material such as strips of inner tube or surgical tubing. (See photo, below.) You'd be amazed how much pressure an elastic wrap can exert, though it does pull the lamination together more forcefully at the edges than in the center, making the technique better suited to narrow laminations.

Preparing Laminates

While any species of wood will work for lamination, there are some important points to consider when choosing stock.

Laminates can be as thin as veneer, but thicknesses up to $\frac{1}{4}$ in. are not uncommon for gradually curved furniture components, such

as the crest rail on a chair. One rule of thumb is to use the greatest thickness that can be bent by hand to the intended curve without breaking. That rule is often tempered by the advice that you should use thinner laminates when minimal springback is critical to your design.

The inner layers and the surface layers of a bent lamination can vary in thickness and composition. For example, you can create a $\frac{3}{8}$ -in.-thick curved door panel by sandwiching two layers of $\frac{1}{8}$ -in. plywood between two layers of $\frac{1}{16}$ -in. veneer.

To minimize breakage in solid wood, select stock that's knot-free and fairly straight grained. However, even wild-grained stock can be coaxed into



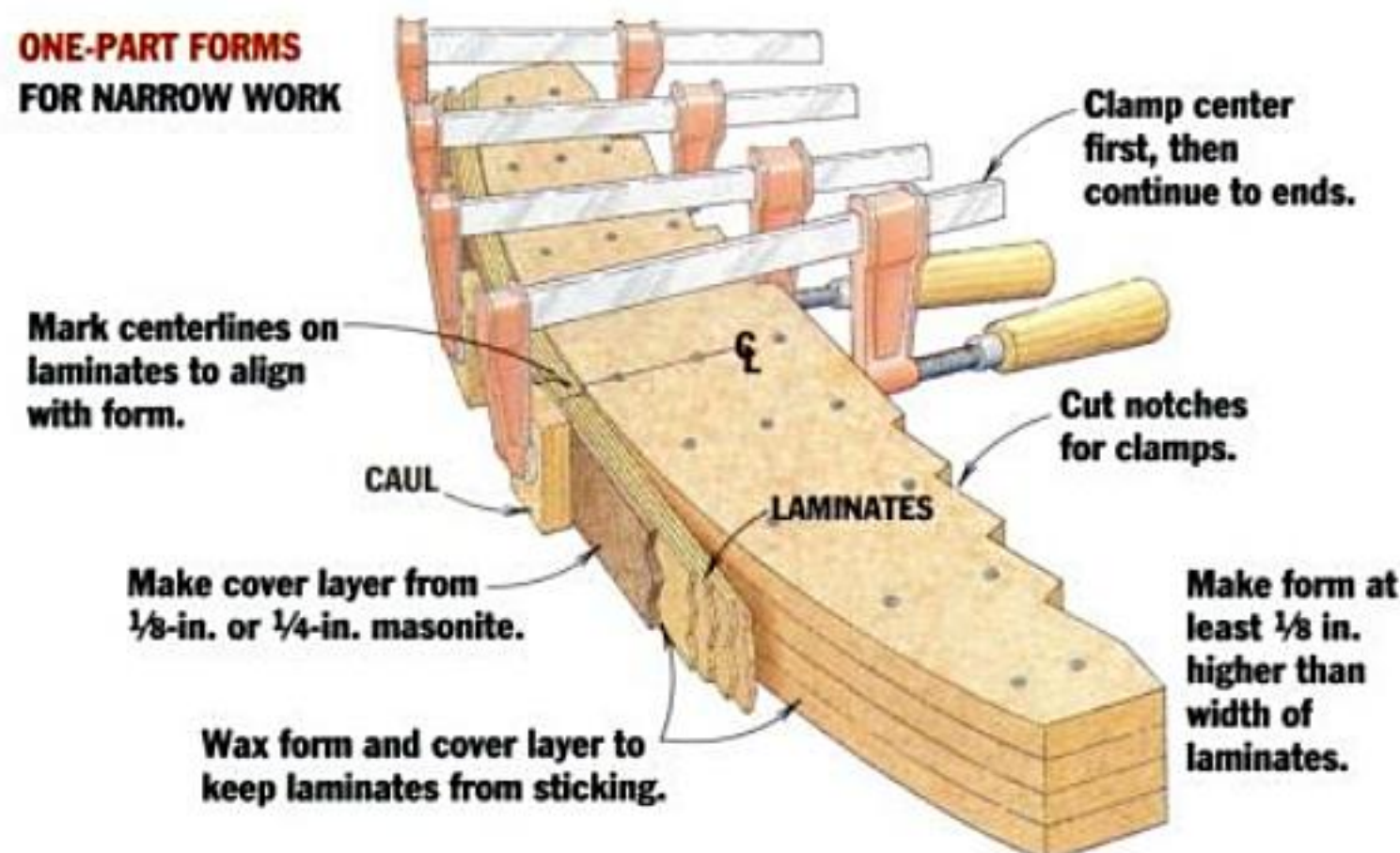
Create compound curves using a strip of rubber inner tube to clamp the laminates.

intended curve. Then I allow for the exact thickness of my laminates plus a masonite cover layer (I'll explain this later), by using dividers to lay out the curve for the outside form. It's difficult to create a perfectly matched two-part form, but you can even out clamp pressure by placing thin strips of rubber flashing or cork sheet material on the curved faces of your forms. (I scrounge rubber flashing from my local roofer.)

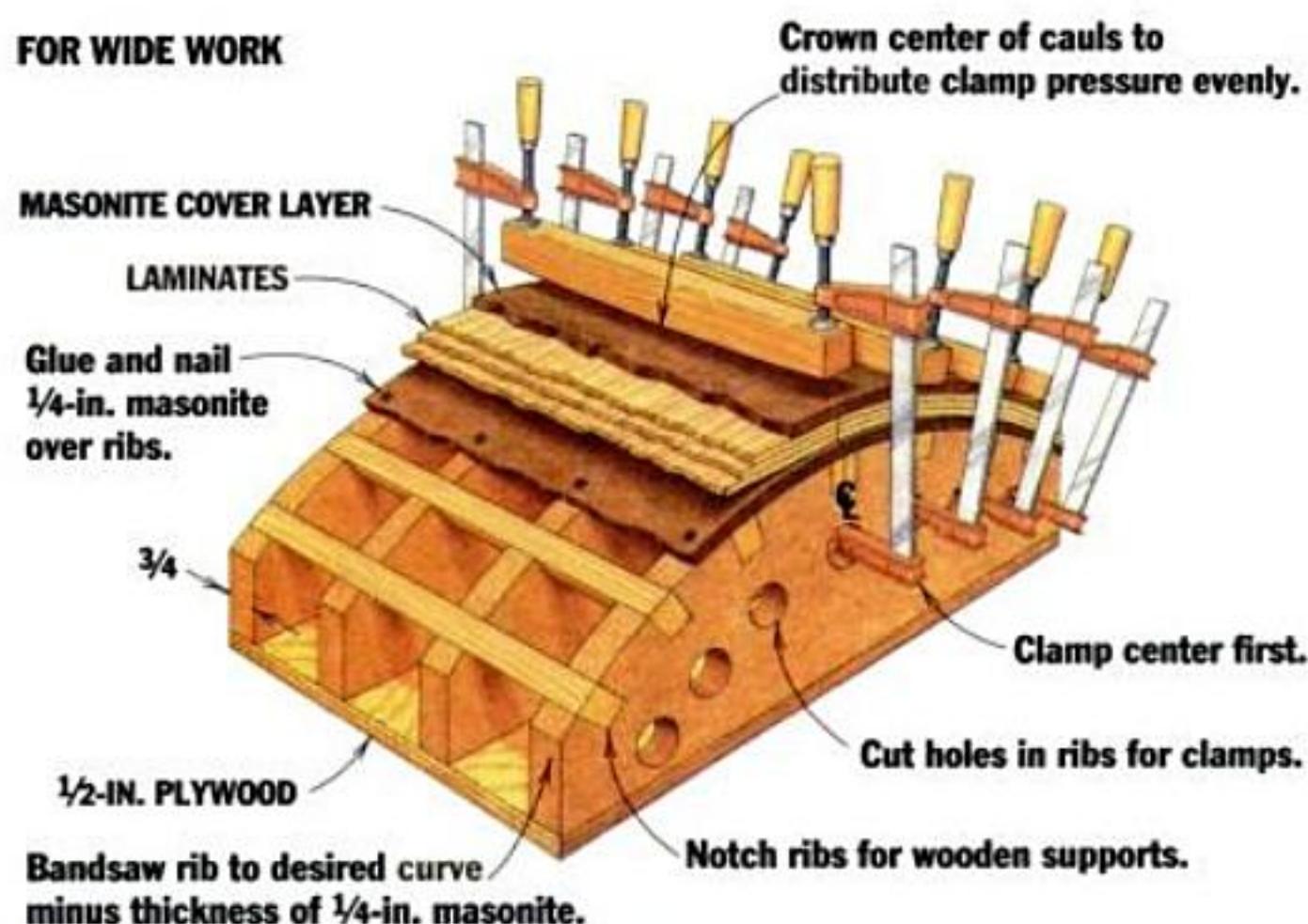
Free-form bending allows a more sculptural approach than the other two methods. It is used for compound curves like the sweep of the continuous arm of the chair shown opposite. Instead of being clamped to a continuous form, laminates are either partially or entirely bound together along their

CLAMPING FORMS

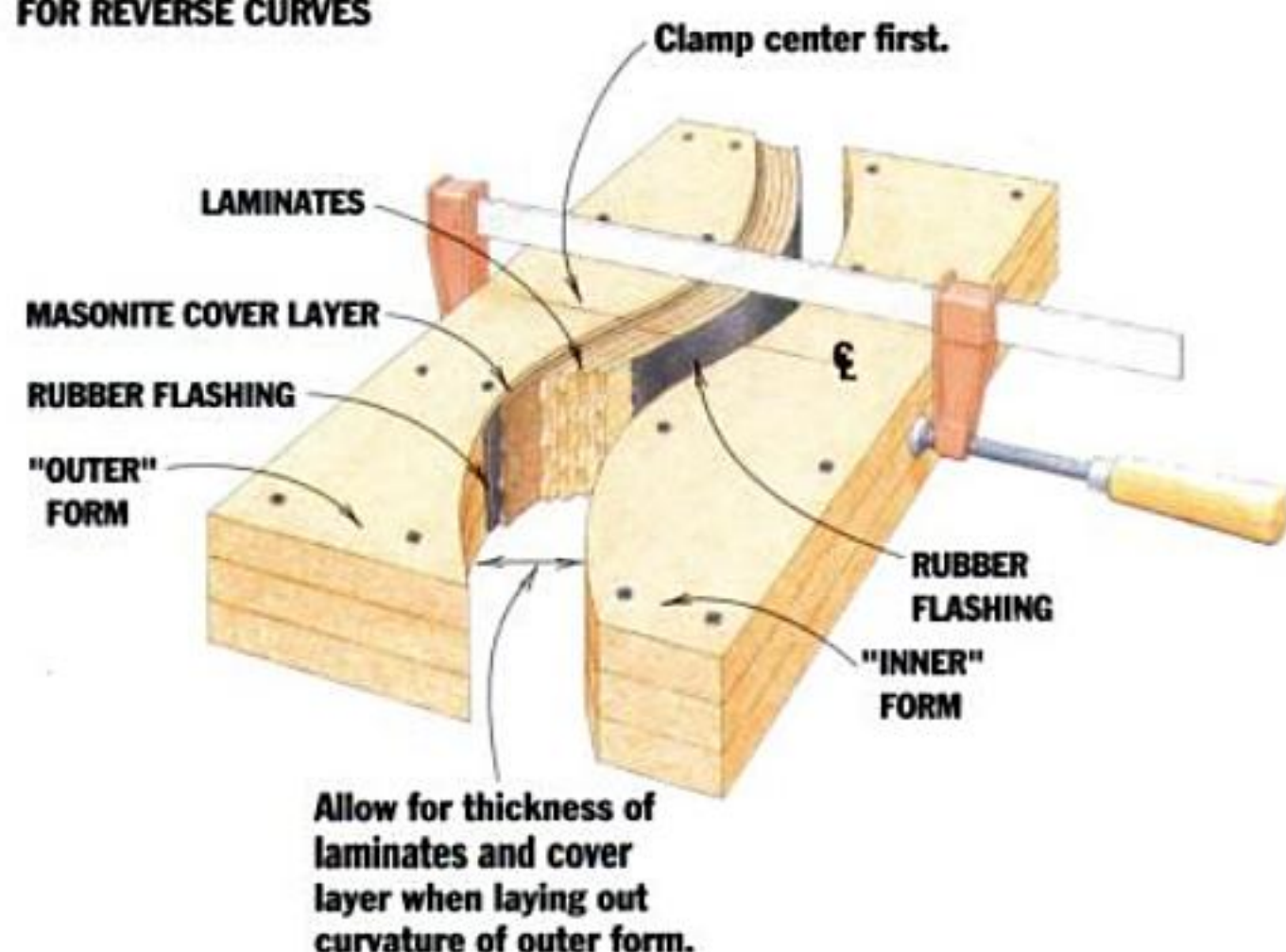
ONE-PART FORMS FOR NARROW WORK



FOR WIDE WORK



TWO-PART FORM FOR REVERSE CURVES



a curve without breaking, as long as it's thin enough.

I use the bandsaw to resaw my laminates to any thickness down to $\frac{1}{16}$ in. (See sidebar, page 31.) You can also use a tablesaw, but bandsawing is safer, wastes less wood, and produces a closer grain match between adjacent laminates. For very thin laminates, you can buy veneer and cut it into strips of the necessary width.

When sizing a blank for resawing, make it about 6 in. longer and $\frac{1}{4}$ in. wider than the finished lamination. This helps when dimensioning the thin stock, and also helps later when clamping and cutting the laminated part to final size.

Glue joints will have fewer gaps if the faces of the laminates are flat and clear of saw marks. My resaw technique produces one clean face and one sawn face. (See sidebar.) To remove the saw marks, I resaw the laminates a little thick, and then plane them to exact dimension by taking light cuts with my thickness planer.

Thickening thin stock works better on small, high-speed planers than on big monsters, but even so, your planer may chew up a few pieces, so it's a good idea to make some extra laminates. After thickening, trim any planer snipes from the ends of the laminates.

To give the appearance of a solid board in the finished lamination, glue the laminates together in the same order as they came off the saw—the way salami drops off a meat slicer at the deli. (See photo, previous page.) This helps hide glue lines and gives a more natural look to the work. If you're buying veneer for laminating, ask for "flitch-cut" veneer.

Clamping the Laminates

There are several approaches and techniques for clamping the laminates to the forms.

Prior to clamping, mark the center of the stack of laminates so you can align them with the centerline of the form when you begin clamping. (See drawing.)

On one- and two-part forms, use a cover layer of $\frac{1}{4}$ -in. masonite ($\frac{1}{8}$ in. thick if the curve is severe) over the outermost laminate to help distribute the clamping pressure and to protect

the work. On a one-part form, use cauls to further distribute clamping pressure, spacing them no more than 3 in. apart. (See lead photo.) For laminations over 5 in. wide, use clamps in pairs to hold the cauls, and crown the cauls a wee bit with a hand plane or jointer so they exert pressure at the center as the clamps pull the ends of the cauls tight. (See drawing.)

To prevent glue from sticking the wrong parts together, wax the faces of the forms and any cover layers. A coat of shellac also works, or you can insert sheets of waxed paper.

Clamping can take perseverance. With two-part forms, the amount of movement needed to pull the laminates to the form may exceed the range of the clamp screws. In this case, draw the laminates partway down with one set of clamps and the rest of the way with another set alongside the first.

An alternative method of clamping is to use a vacuum press. This is best for gentle curves, and is excellent for wide workpieces such as cabinet sides or door panels, because the clamping pressure is very uniform. In a vacuum press (see Sources, next page), the laminates and a cover layer are temporarily taped to the form (duct tape works well) and the assembly is placed in a sealed plastic bag. Air is sucked out of the bag via a vacuum pump, and atmospheric pressure presses the laminates to the form. (See photos, next page.)

Your choice of glue for bent lamination depends on the length of time you'll need for open and closed assembly, as well as any requirements for water resistance.

So far, yellow polyvinyl acetate (PVA) glue has worked well for me through a variety of situations, and I like its nontoxicity and ease of cleanup. I use a slow-set PVA (see Sources) to give me ample time to get all the parts together before the glue sets. However, many woodworkers I know prefer epoxy or plastic resin (urea-formaldehyde) glue (see Sources), both of which have a longer working time than regular PVAs. Also, PVA glues have been known to creep slightly at the glue line over time, making the edge of the work feel rough to the touch.

Resawing on the Bandsaw

Resawing boards into thinner strips on the bandsaw wastes very little wood, which makes it a good method to use when you need to saw laminates for bent lamination. (See main article.) With a shop-made straight fence and a sharp blade, you can easily resaw stock as thin as $\frac{1}{16}$ in., if you follow a few simple techniques.

I generally use a $\frac{1}{2}$ -in. four-tooth hook blade for most of my resawing, although some woodworkers use skip-tooth blades with good results. (See "Choosing Bandsaw Blades," page 45.) Regardless of the type of blade you use, make sure it's sharp.



Author saws along a straight line to determine the "drift" of the blade, and then records the angle with a bevel gauge.

I use a simple right-angled fence screwed together from scrapwood and plywood (see photo, below) that I clamp to my bandsaw table. When building the fence, make sure the face is perfectly square to the bottom so that, once clamped, the fence is square to the saw blade. Positioning the fence for resawing can be tricky because most bandsaws rarely cut parallel with the edge of the saw table. Instead, the blade persistently wanders in its own direction, a phenomenon called *drift*. To compensate for this, the fence must be angled in the direction that the blade wants to cut.



Resawing is more accurate when you use a sharp blade and a simple shop-made fence.

gauge to align the fence at the same angle, and clamp the fence at the desired distance from the blade.

To "set the drift," mark a line along the top of a straight board, parallel to the edge. Saw along the line, rotating the workpiece until you find the "angle of approach" (where the blade follows the line exactly), then stop, hold the wood in position, and record its angle to the bandsaw table with a bevel gauge. (See photo, above.) Use the bevel

To resaw, mill your stock four-square (all four sides square to each other) and make sure your blade is square to the table. Make a test cut on some scrap, then resaw the first piece, holding the work firmly against the fence. Push the board through the saw at a steady rate that doesn't slow the blade or tax the motor. Then resurface the sawn face of the stock on the jointer, and resaw again. For safety, use the thickness planer to clean up the sawn side when the stock becomes thinner than $\frac{1}{2}$ in. or so.

—P.K.



Author uses a vacuum press to clamp laminates onto a one-part form. The work is placed inside the bag (left) and the vacuum pump on the floor sucks the air from the bag. Atmospheric pressure holds the laminates (above) tightly to the form.

Before gluing the laminates, it's best to dry-clamp them to make sure you have everything in order. Then spread a thin, even coat of glue on both sides of each glue joint. I find the best tool for spreading glue is a 3-in. paint roller with a low nap.

Once you've spread the glue, clamp the work to the form as quickly as possible. With the laminations slipping around and the resistance of the wood to bending, you'll probably want an extra pair of hands around. Keep the lamination stack aligned edge-to-edge as best you can, but rest assured, you'll never keep it perfect.

Dimensioning the Lamination

The layered edges of a new lamination are uneven and usually covered with dried crusts of glue. The first

thing to do is remove as much of the surface glue as possible with a paint scraper so it won't dull your tools.

To dimension your laminated part, you'll need to create a straight edge on the part. The best method I have found is to sweep the work over a jointer. (See photo, below left.) Once you have a straight, square edge, you can rip the opposite edge parallel on the tablesaw. (See photo, below.) An alternative is to use the bandsaw: Mark the width with a flexible straightedge or a marking gauge, then bandsaw to the line, pivoting the workpiece on its curve to keep it in contact with the table at the blade. Clean up any machine marks with a hand plane.

Bent lamination is a simple technique that opens up a wide range of



To square the edge of a curved lamination, first use a jointer (left), taking light cuts and keeping the outside face against the fence near the cutterhead. Then rip it to width on a tablesaw with an auxiliary fence. Use a feather board to steady the workpiece, and a push stick at the end of the cut to keep your hands clear of the blade. The tablesaw's splitter helps prevent kickback.

design options. It combines the natural beauty of wood with modern adhesives to enhance the grace and strength of your work. ▲



PETER KORN

teaches workshops in Rockland, Maine. He is the author of *Working with Wood: The Basics of Craftsmanship* (1993, Taunton Press, Box 355, Newtown, CT 06470).

SOURCES

Glues for laminating are available from the following sources:

Garrett Wade

161 Ave. of the Americas
New York, NY 10013
(800) 221-2942
Circle #657

Gougeon Brothers Inc.

Box 908, Bay City, MI 48707
(517) 684-7286
Circle #658

Olde Mill Cabinet Shoppe

1660 Camp Betty Washington Rd.
York, PA 17402
(717) 755-8884
Circle #659

Vacuum presses are available from the following sources:

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Box 2232, Fort Bragg, CA 95437
(800) 995-4506
Circle #660

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Brunswick, ME 04011
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MAKING A MITER JACK

BY MARIO RODRIGUEZ

This Old-Fashioned Fixture
Helps You Plane Perfect
Miter Joints

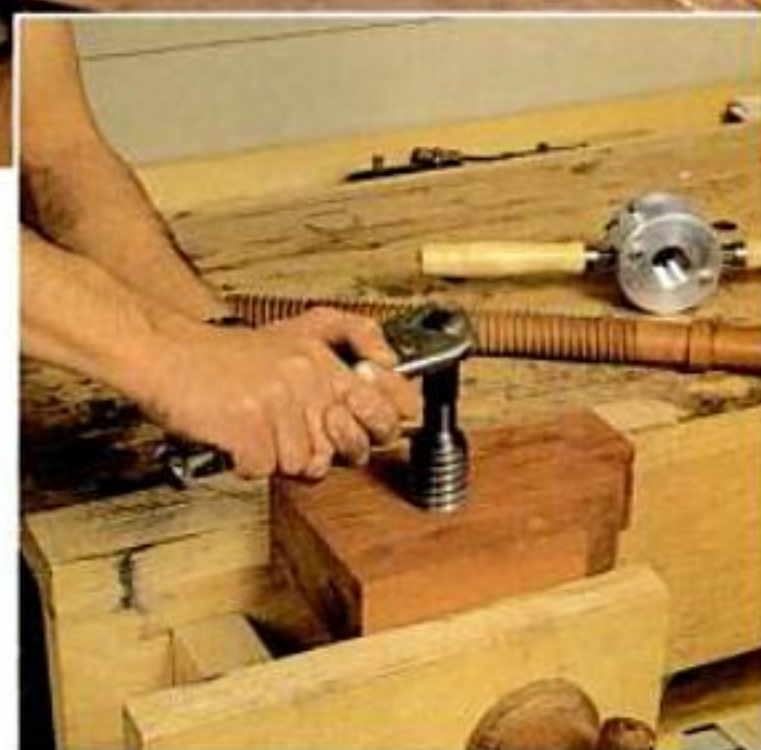
PHOTOS BY JOHN HAMMEL

To plane a perfect miter, first clamp your workpiece tightly in the miter jack, then use the fixture's massive 45° jaws to guide your plane.

When a craftsman needed to cut precision miters 150 years ago, he'd pull out a shop-made miter jack and a hand plane and shave a dead-perfect 45° angle in seconds. A century and a half later, the miter jack is still a great tool for precision work. The one shown here lets you miter any length of stock, and you can miter workpieces like box sides, up to 7 in. wide. You can also shave miters that aren't exactly 45°, such as you need when you're installing trim around a sagging doorway.

In addition to miter cuts, you can use the back side of the jack to accurately shave a workpiece to a 90° angle. Plus, the quiet process of planing a glassy-smooth miter is a satisfying experience—and a safe alternative to power tools.

This miter jack isn't complicated to make. (See drawing.) It's basically just a vise with ramped faces—the vise jaws hold the workpiece in position and the ramps provide a wide surface for your plane. However, there are some points you should keep in mind:



Author uses pliers to turn wood-threading tap into block clamped in vise. External threads on wooden screw were cut with die in background.

Construction Notes

- Make the ramps from a close-grained hardwood so they can withstand abuse from a metal-bodied plane. My ramps are mahogany, but you could use any fairly dense hardwood. If you can't find a single chunk of wood thick enough for the ramps, you can make them by laminating thinner stock together.

- Use a quartersawn hardwood for the frame. This will reduce the chance of

warping, which could cause the guide block to bind. (See drawing.)

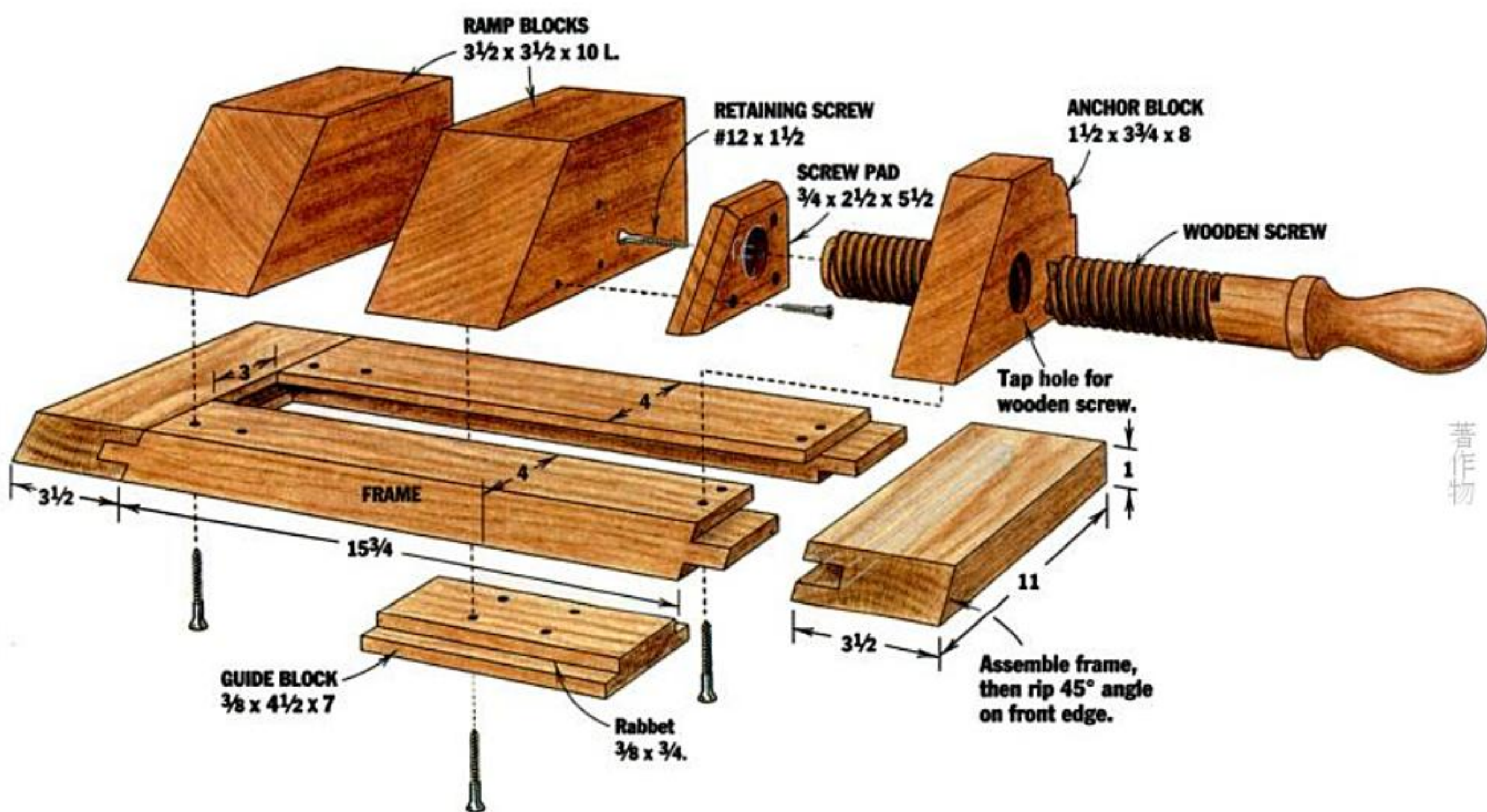
- Cut the angled ramps by marking a 45° angle on both sides of your stock and bandsawing just shy of the line. After all the other parts are made, assemble the miter jack, tighten the ramp blocks together, and use a jack plane to clean up the surface to the layout lines. Make sure the surface is flat by holding a straightedge on the ramps, then check the 45° angle with

a draftsman's triangle or a combination square. After this, plane two trial miters and assemble them. If they create a perfect 90° miter, your ramps are accurate. (See photo, opposite page.)

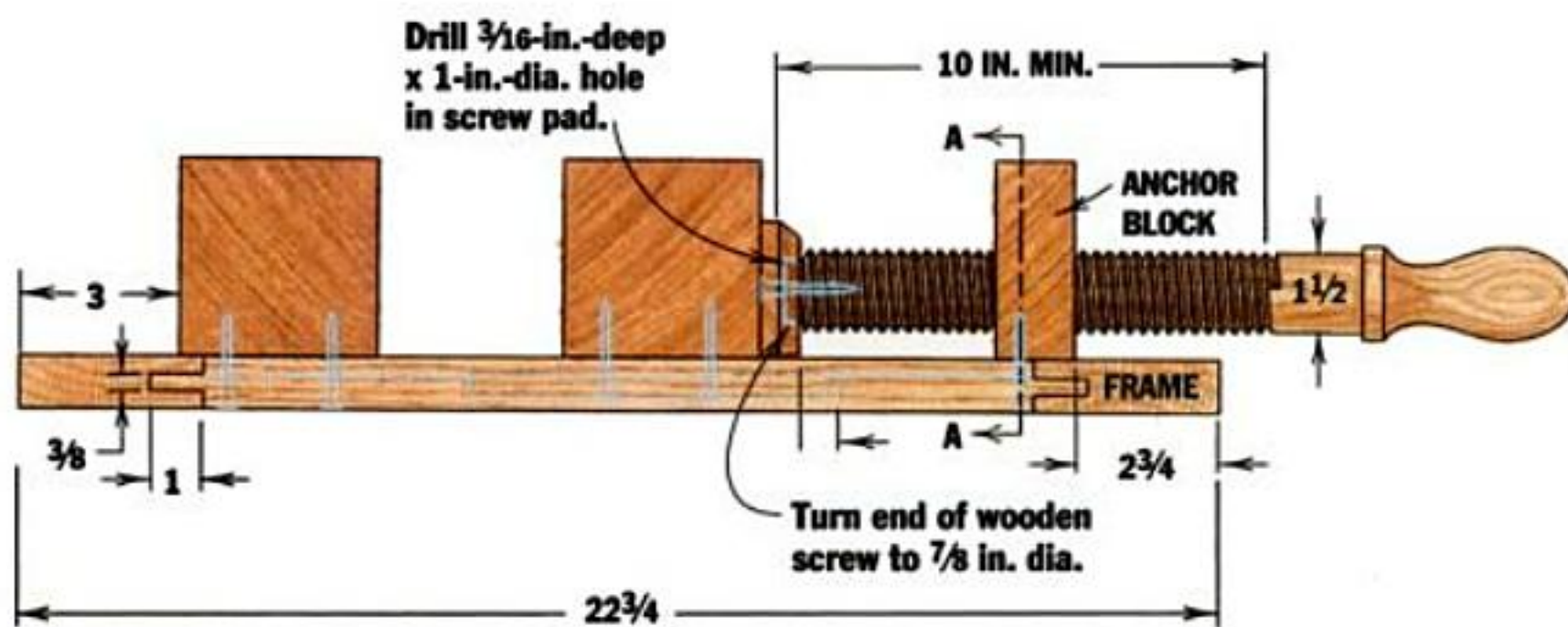
You may need to replane the ramps periodically because of wood movement.

- Make the wooden screw from a turned blank rather than from ready-made dowel stock. You need a per-

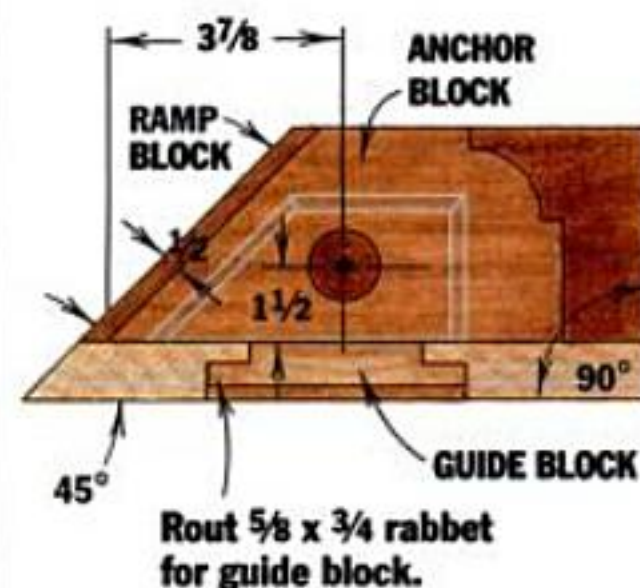
MITER JACK



FRONT VIEW



SECTION A - A





Clamp the workpiece so the bottom edge of the stock is flat against the frame and the miter edge protrudes beyond the ramps $\frac{1}{16}$ in. or so. Then plane downhill toward the face of the molding to prevent any fibers from tearing out.

fectly round, straight screw for smooth, even action. Dowels tend to be oval in cross-section and warped.

- There are several ways to cut the threads in the wooden screw and the anchor block, ranging from special router or lathe attachments to wood-threading taps and dies. I used a $1\frac{1}{2}$ -in. tap and die (see Sources), but a $\frac{3}{4}$ -in. or 1-in. tap and die will work as well. Lubricate the cutters with some lemon or linseed oil, and tap the anchor block first. Then use the die to cut threads on a test screw, checking that the threads engage the tapped hole smoothly. Once the fit is right, cut the threads on the actual screw.

Alternatively, you can substitute a

metal veneer-press screw for a wooden screw. (See Sources.) If you opt for a veneer screw, raise the miter jack by attaching a 1-in.-thick spacer under the frame so the screw's handle will clear your bench.

- Aim for a snug fit between the guide block and the rabbeted frame pieces. After assembling the miter jack, check that the guide block slides smoothly. If it's too tight, shave some material from the guide block with a rabbet plane. Waxing the block also helps.

- To prevent the #12 retaining screw from binding in the screw pad (see drawing), drive the #12 screw home, and then back off the screw a quarter-turn.

Using a Miter Jack

To use the jack, you first rough-cut your stock to 45° , then clamp the workpiece in the jack and plane diagonally across the piece until the miter is flush with the ramp surface. (See photo, above.)

The type of plane you use will depend on the size of the workpiece. For stock wider than 2 or 3 in., a plane about 14 in. long (like a jack plane) works well. Thin, narrow pieces can be planed with a low-angle block plane. In any case, the plane body must be long enough to span the gap between the ramps. My favorite plane is a Lie-Nielsen low-angle jack plane. (See Sources.) Its

low-angled blade cuts end grain cleanly, and its length and heft are perfect for most jobs.

Afterthoughts

Woodworkers often ask how I keep from damaging the ramps when planing. Mostly it's a case of having a feel for the plane I'm using, and practice. But beginners can protect the ramps by gluing heavy paper (like a grocery bag) onto them. A mixture of one-third yellow glue to two-thirds water will hold the paper in place until it needs replacing, at which time you can peel it off, scrape the surfaces of the ramps, and apply a fresh sheet. As



you gain experience, you can forgo the paper because you'll rarely cut into the ramps. ▲

MARIO RODRIGUEZ is a professional cabinetmaker who teaches woodworking in New York.

SOURCES

Wood-threading taps and dies are available from:

CONOVER WOODCRAFT
4425 Emery Industrial Pkwy.
Cleveland, OH 44128
(800) 433-5221
Circle #635

FROG TOOL
700 W. Jackson Blvd., Chicago, IL 60661
(800) 648-1270
Circle #636

WOODCRAFT SUPPLY CO.
210 Wood County Industrial Park
Box 1686, Parkersburg, WV 26102
(800) 225-1153
Circle #637

Veneer-press screws are available from:

CONSTANTINE'S
2050 Eastchester Rd., Bronx, NY 10461
(800) 223-8087
Circle #638

WETZLER CLAMP CO. INC.
Rte. 611, Mount Bethel, PA 18343
(800) 451-1852
Circle #639

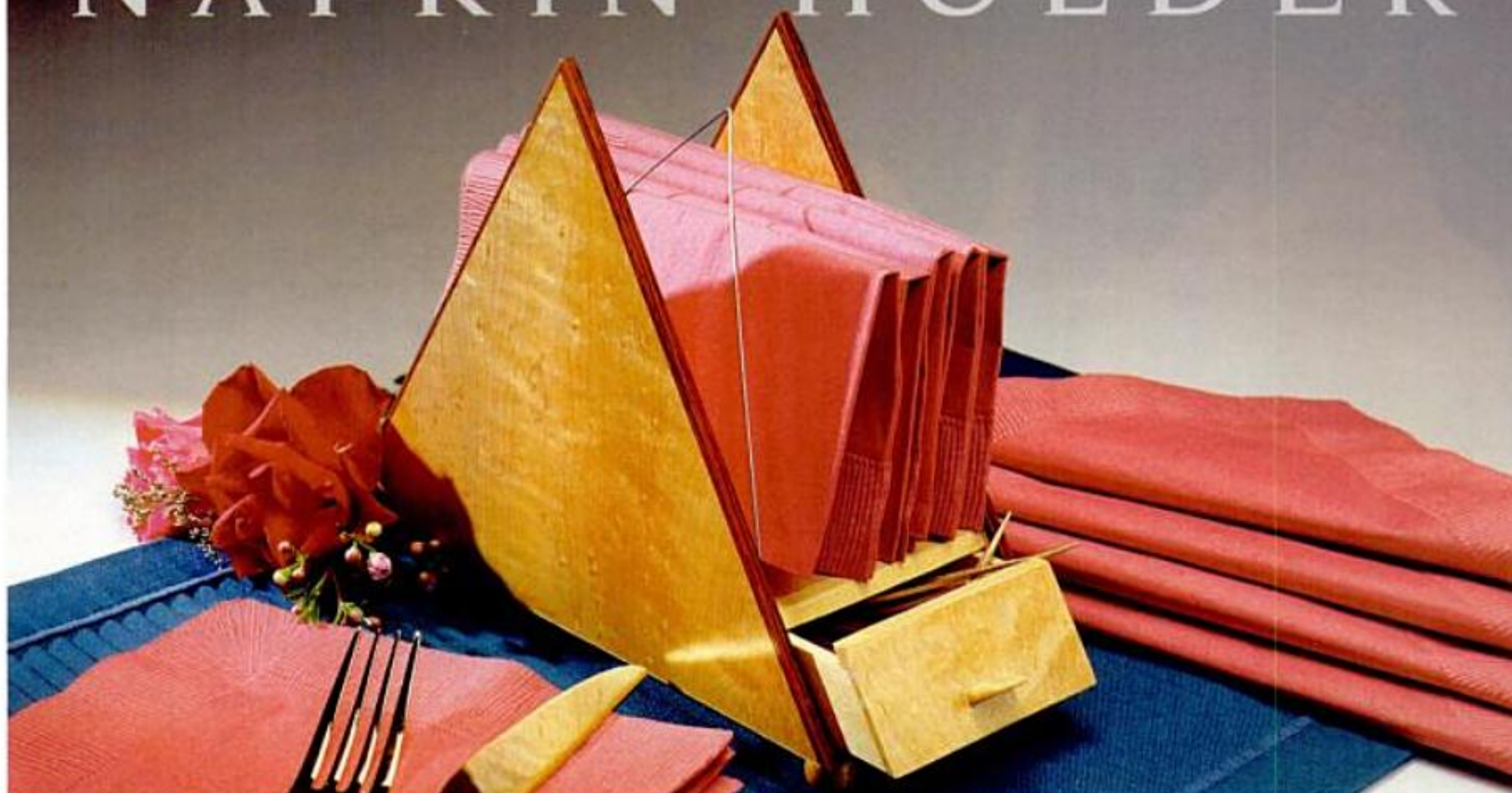
Low-angle jack planes are available from:

LIE-NIELSEN TOOLWORKS INC.
Rte. 1, Warren, ME 04864
(800) 327-2520
Circle #640



To check that each miter cut is an accurate 45° , hold two workpieces together with a square butted tightly in the corner.

DECO NAPKIN HOLDER



A study in contrasting woods, this delicate napkin holder gives you a chance to improve your hand skills.

An Elegant Project That Covers All the Angles

by Yeung Chan

Frustration can often be the source of inspiration, and that is the case with this napkin holder. I designed and built it simply because I was tired of having napkins all over the place.

Most of the parts for the holder came from my scrap pile. The triangular sides and the drawer fronts are bird's-eye maple, while the shelves and other drawer parts are plain hard maple. For contrast, I used thin strips of Brazilian rosewood for the edging that runs around the triangles and the bottom shelf. Thin strips of hard maple hide the end grain on the top shelf, on the top of the drawer front and on the bottoms of the triangles.

Only two parts came ready-made: the 1/2-in.-dia. beads I used for the feet, and the 1/8-in.-dia. dowels I used in the joinery. (Beads and dowels are available from Woodworks, 4500 Anderson Blvd., Fort Worth, TX 76117, 800-722-0311.)

This piece is not complicated, but making it will give you a chance to improve your hand skills. I found great pleasure in using a hand plane,

scraper and knife to fit each part. Here are some construction tips:

•**Joining the Parts:** I used dowels to join the triangular sides to the upper and lower shelves, and I joined the drawers with 1/16-in.-deep rabbets. All the other parts are simply glued edge-to-edge.

•**Drilling the Shelves:** The trickiest part of making the holder is accurately drilling the dowel holes in the 3/16-in.-thick shelves. I did this on the drill press. I stood the shelves on edge and backed them with a fence to keep them perpendicular to the drill-press table.

•**Making the Edging:** I ripped all the edging slightly oversize on the table-saw, using a zero-clearance throat insert and a push stick with a long bearing surface (see AW #27, page 29). Then I planed each piece to final thickness with a block plane.

•**Fine-tuning the Drawers:** Moving a drawer in its opening creates air pressure, and this can make it hard to close the drawer. To relieve the air pressure,

I drilled a series of small holes in the bottom shelf. (See drawing.)

•**Holding Up the Napkins:** Napkins set in a holder like this tend to fall over when the holder is less than one-third full. To prevent this I made a spring steel brace from 0.024-in.-dia. music wire (available at hobby and model shops). To install the brace, I drilled two 1/8-in.-deep holes at a steep angle where the shelf meets the triangular side. (See drawing detail.)

•**Wood Movement:** In making this piece I have joined side grain to long grain, and you might think that is a problem. However, the wood hasn't moved at all in the last three years. The parts are all very thin, which helps, but I also live on the West Coast in a stable climate. If you are concerned about move-

ment, you might want to make the sides and shelves from veneered plywood. ▲



YEUNG CHAN is a furniture maker in northern California.

著作物



Elephant
VBS-14



BUYER'S GUIDE TO Bandsaws

SAWS FOR ALL REASONS: WE TEST 21 MODELS

by dave sellers

Inca 340



Laguna LT-18



Sears 24393



Enlon EN-BS14



Ask a group of woodworkers what's the most valuable machine in the workshop, and you're sure to get differing opinions. But there's no doubt you'll find the bandsaw near the top of the list. The bandsaw is arguably the most versatile woodworking machine you can own. It can cut delicate curves in thick or thin stock, and it's ideal for resawing wide stock into thinner boards. Also, you can rip and cross-cut odd-shaped boards and turning blanks on a bandsaw. And it's certainly one of the safest machines to operate.

There are dozens of woodworking bandsaws on the market, many of them first-rate. To give you an idea of what's available we picked 21 saws, from benchtops to heavy-duty floor models, that represent a cross-section of the market and set them up in our shop. We installed Olson $\frac{3}{8}$ -in., 4-tooth-per-in. (tpi), skip-tooth blades on the machines so we could conduct cutting tests with consistency. (The maximum blade width on the Black & Decker and Sears 10-in. saws was $\frac{1}{4}$ in.) Then we evaluated fit and finish, the effectiveness of blade guides, the ease of blade changing, and power. The chart on page 40 shows how the saws fared, with one bullet indicating unacceptable performance and five bullets indicating excellence.

A few saws, including the two Incas, the Kity and the Delta 12-in., ran well right out of the box. But most required some tuning before they'd operate properly. Some needed more extensive work, and we had to replace defective parts on two saws, as I'll explain later. However, none of the repairs required special tools or skills, so we decided to judge each saw's performance *after* tuning and reworking. A footnote indicates which saws needed work.

What to Look For

A bandsaw is a simple machine—just a motor and a few wheels—but it will only give you peak performance if all the parts

are designed, manufactured and tuned well. Here are the points you should consider in choosing a saw:

Fit and Finish—Check for faults in the castings and for parts that are poorly machined. Then look at how well all the parts fit together, and how smoothly the moving parts operate.

Among our test saws, the Kity, the General and the two Inca bandsaws had the best fit and finish, while the Enlon and Elephant machines scored lowest because they had rough castings and poorly machined or ill-fitting parts. It took a few hours of filing, grinding and tuning to get these two saws running well.

Saw Guides—A saw's guide system, which includes the upper and lower blade guides and thrust bearings (see drawing), directly affects how well the saw cuts. When you feed a workpiece into the blade, the thrust bearings prevent the blade from shifting backward and jumping off the wheels. And the guides reduce side-to-side twist, which can produce bowed cuts or allow a blade to wander off a straight line. To assess these parts, look at how easily they adjust, how rigid they are when you apply pressure side-to-side and fore-and-aft, and whether they remain parallel to the blade as you raise and lower the guide post.

For ease of adjustment, the best performers in our test were the Delta 14-in., General, Jet, and Grizzly, all of which feature "micro-adjust" guides and thrust bearings that you set by turning a knob (see top photo, opposite page). The Kity also requires no tools to adjust, but it didn't have the micro-adjust feature. Most of the guides on the machines were easy to see and reach, though the lower guides on the Grizzly are located so close to the saw table that it was hard to visually align the guides with the blade. At the other extreme, it took three wrenches to adjust the guides on the Powermatic Artisan and the Sears 15-in.

The Kity has the simplest guide system,

partly because, unlike most other saws, you track all blades that are more than $\frac{1}{8}$ in. wide by just extending the blade teeth over the front edge of the saw's flat wheels. That means blade teeth always ride in the same place in the saw's wooden guide blocks, so you only need to adjust them for wear. The Kity also has just one thrust bearing to adjust (on top). But we didn't find that the lack of a lower thrust bearing affected the cut, even during thick resawing.

Ball-bearing guides (see photo, right), as a rule, were fussier to set than solid metal, wood or plastic guide blocks. For most cutting, ball-bearing guides and solid guides perform equally well. But with ball-bearing guides there's less friction on cuts that side load the blade, such as very sharp curves.

The best of the ball-bearing guides were the European-style units on the Bridgewood. (See photo, bottom right.) These bearings run parallel rather than perpendicular to the blade, as most ball-bearing guides do, and the European guides adjust more precisely because they move in and out on a threaded shaft, rather than on an eccentric shaft. The Laguna saw comes standard with similar European guides,

but our Laguna test saw was equipped with optional Carter ball-bearing guides (available as a retrofit for most bandsaws from Carter Products Co. Inc., 616-451-2928). The Carter guides took a bit longer to adjust, but they performed as well as the European guides, and their more compact shape gave the Laguna an extra inch of cutting height capacity.

You want a saw with a rigid guide post so it will keep the blade from twisting and flexing in the cut. The square steel posts on the General, Powermatic Artisan and Grizzly were surely the most rigid (though the Grizzly performed well only

after we eliminated excessive play by replacing the cover that held the post in the saw frame). But the round, keyed guides on the Jet and Delta 14-in. saws were also very solid.

When you raise and lower the guide post, it should remain *parallel* to the blade, both sideways and fore-and-aft. If it doesn't, you'll have to readjust the guides when the thickness of your workpiece changes.

In our test for parallelism, most saws fell within acceptable limits of about $\frac{1}{32}$ -in. deviation from the lowest guide-post position to the highest, and saws with square steel posts tended to be the most precise. The Enlon and Elephant saws had hexagonal posts with badly machined clamps that

wouldn't keep their guide posts parallel. But after some grinding and filing, they worked properly.

The guide posts on the Inca 710, Bridgewood, Laguna and Sears 15-in. saws ran on rack-and-pinion mechanisms. This made adjustment more precise and kept the guide post from crashing to the table when the lock knob was loosened.

Changing the Blade—This is a frequent task, so you want it to go quickly. We timed how long it took to change the

blade, then tension it and track it and adjust the guides. Saws that took less than 5 minutes won an excellent rating. Those in the 10-minute range we considered good, and those that took longer than 10 minutes rated fair. (Longer times were mostly due to more difficult guide adjustment.) None of the saws were unacceptable.

Power—A saw's power affects the thickness of the stock you can cut and how fast you can cut it. We tested each saw's relative power (see chart) by timing how long it took to resaw a $5\frac{1}{2}$ -in.-wide, 18-in.-long piece of hard maple. Because of height capacity on the Ryobi, Black & Decker and

TYPES OF GUIDES



Metal blocks are inexpensive and easy to adjust, but they cause greater friction than ball-bearing guides when you're cutting curves.

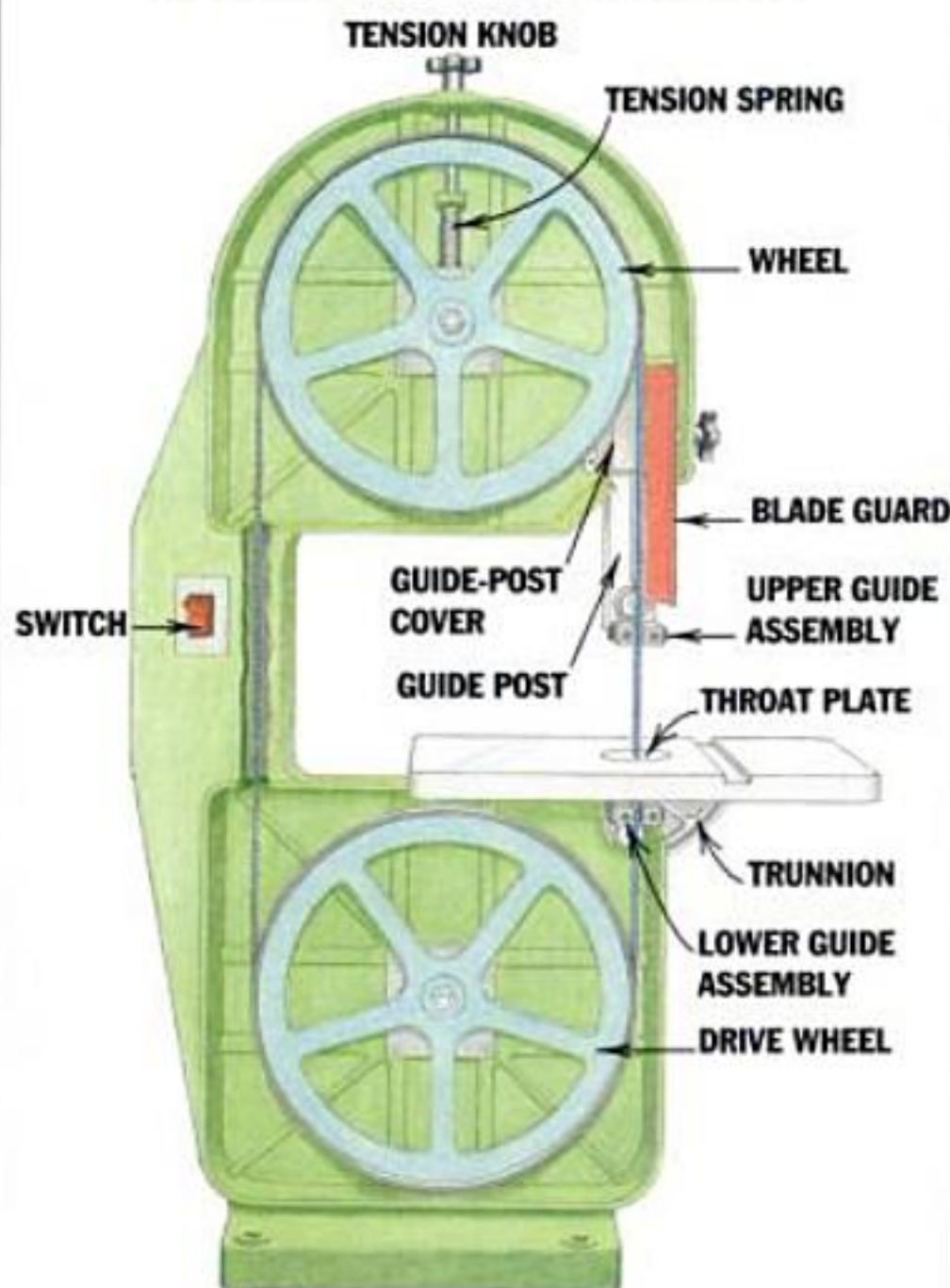


Ball-bearing guides run cooler than metal blocks, but they're fussier to adjust.



European-style ball-bearing guides are easy to adjust precisely, but their large size can affect cutting height capacity.

ANATOMY OF A BANDSAW



BANDSAWS RATED

	Name & Model	Throat Cpy. (in.)	Maximum Cutting Height (in.)	Street Price	RATINGS			Power	Specifications
					Fit & Finish	Blade Guides	Blade Changing		
BENCHTOP	Ryobi B5900 (800) 323-4615 Circle #641	9	3 ¹ / ₄	\$180	****	****	*****	*** (C)	.006/.011
	Skil HD3640 S.B. Power Tool Co. (312) 286-7330 Circle #642	10	7	\$350	****	****	*****	***	.007/.007
	Dremel 1120 (800) 437-3635 Circle #643	10	7	\$365	****	****	*****	***	.006/.005
THREE-WHEEL	Black & Decker 9443 (800) 762-6672 Circle #644	10	3 ⁷ / ₈	\$169	****	****	*****	***** (C)	.015/.011
	Sears 244530 (800) 377-7414 Circle #645	10	3	\$199	****	***	*****	***** (C)	.011/.012
	Delta 28-560 (800) 223-7278 Circle #646	16	8	\$399	***	***	***	**	.011/.007
	Inca 710 Garrett Wade (800) 221-2942 Circle #647	20	8 ¹ / ₄	\$1,495	*****	*****	***	*****	.012/.005
MEDIUM-DUTY	Inca 340 Garrett Wade (800) 221-2942 Circle #647	10 ¹ / ₂	6 ¹ / ₄	\$695	*****	****	***	***	.004/.004
	Sears 24832N (800) 377-7414 Circle #645	12	7 ³ / ₈	\$329	***	****	***	***	.007/.009
	Delta 28-190 (800) 223-7278 Circle #646	12	6	\$369	****	****	****	****	.005/.008
	Kity 613 Farris Machinery (800) 872-5489 Circle #648	12	8	\$895 (\$995 with stand)	*****	*****	*****	*****	.001/.003
	Enlon EN-BS14 (800) 888-9697 Circle #649	14	6	\$315	**	*** (B)	****	****	.019/.014
	Elephant VBS-14 Sunhill Machinery (800) 929-4321 Circle #650	14	6	\$359	**	**** (B)	****	*****	.016/.014
	Jet JBS-14CS (800) 274-6848 Circle #651	14	6	\$525	****	*****	****	****	.003/.005
	Delta 28-245 (800) 223-7278 Circle #646	14	6	\$599	****	*****	****	****	.014/.017
	Powermatic Artisan 043 (800) 248-0144 Circle #652	14	7 ¹ / ₂	\$675	***	****	***	****	.015 / .010
	Sears 24393 (800) 377-7414 Circle #645	15	8 ¹ / ₂	\$700	***	****	***	*****	.009/.005
HEAVY-DUTY	General 490-1 (819) 472-1161 Circle #653	15	6	\$972	*****	*****	****	*****	.005/.007
	Grizzly G1073 (800) 541-5537 Circle #654	16	7 ¹ / ₂	\$550	***	**** (B)	****	****	.005/.007
	Bridgewood PBS440B Wilke Machinery Co. (717) 764-5000 Circle #655	17	9	\$1,595	****	****	*****	*****	.002/.003
	Laguna LT-18 (A) (800) 234-1976 Circle #656	17 ¹ / ₄	12 / 13 (A)	\$1,695	****	**** (A)	*****	***	.005/.004

KEY

(A) Equipped with aftermarket Carter guides; (B) After reworking post clamp; (C) Based on resawing 3¹/₂-in.-thick maple; (D) For Blade Guide Type: M=Metal, B=Ball bearing, C=Cool Blocks™, P=Graphite-impregnated plastic, W=Wood; (E) With stand and motor



Delta 28-560



Jet JBS-14CS



Skil HD3640



Dremel 1120



Delta 28-190



Table Size (in.; W x D) / Table Tilt	Trunnion Type	Blade Guide Type (D)	Blade Speed(s) (fpm)	Blade Width (in.)	Motor HP	Motor Volts	Motor Amps	Net Weight (lbs.)	Comments
11 ¹ / ₂ x 11 ¹ / ₂ 45°R - 0°L	Bracket	M	2,850	1/8 - 3/8	1/3	115	2.5	30	Smallest height capacity of two-wheeled saws tested; rack-and-pinion guide post; no blade-tension scale; has wheel brush
13 ¹ / ₂ x 13 ¹ / ₂ 50°R - 5°L	Bracket	P	3,000	1/8 - 1/2	1/2	115	6.0	64	Good performance, large depth capacity for benchtop saw; guides adjust with one wrench; has wheel brush
13 ¹ / ₂ x 13 ¹ / ₂ 45°R - 6°L	Bracket	P	900/3,000	1/8 - 1/2	1/2	115	7.0	65	Good performance, large depth capacity for benchtop saw; second, low speed good for non-wood materials; has wheel brush
11 ¹ / ₂ x 11 ¹ / ₂ 45°R - 5°L	Bracket	M	2,700	1/8 - 1/4	1/3	115	2.3	33	Good power for size; low cost for 10-in. throat capacity; no blade-tension scale
11 ¹ / ₂ x 11 ¹ / ₂ 47°R - 2°L	Bracket	M	300 - 2,460 Variable	1/8 - 1/4	1/5	115	2.4	24	Variable speeds good for non-wood materials
16 x 16 45°R - 3°L	Bracket	M	450/2,400	1/8 - 3/8	1/2	115	7.4	156 (E)	Large throat capacity for price; bottom guide difficult to adjust; lacks power and sturdiness for cutting thick stock
20 ¹ / ₄ x 20 ¹ / ₄ 45°L - 0°R	Bracket	B	984/1,968/ 2,952	1/16 - 1	1 ¹ / ₂	115	17.2	135 (E)	Rack-and-pinion guide post easy to use; large throat capacity for medium-weight saw; magnetic switch; has wheel brush; has flat rubber tires; 2-in. riser block available
12 ¹ / ₂ x 12 ¹ / ₂ 45°L - 0°R	Bracket	C	3,450	1/16 - 1/2	3/4	115	8.8	60 (E)	Best-built small saw; magnetic switch; has wheel brush; has flat rubber tires
23 x 26 ¹ / ₂ 45°R - 0°L	Tilting Frame	M	1,500/3,000	1/8 - 1/2	5/8	115	7.9	125 (E)	Unique saw frame tilts for angle cuts, but frame is weak and flexes under heavy load; large table
14 x 14 45°R - 0°L	Saddle	M	2,700	1/8 - 1/2	1/2	115	7.6	120 (E)	Best buy for size; work light included; has two wheel brushes
19 ¹ / ₂ x 19 ¹ / ₂ 45°R - 0°L	Bracket	W	3,150	1/8 - 1	1 ¹ / ₂	115	13.0	150 (E)	Runs very smoothly; guide system easiest to adjust; magnetic switch; has flat rubber tires
14 x 14 45°R - 10°L	Saddle	M	2,400	1/8 - 3/4	3/4	115/ 230	12/ 6	156 (E)	Required considerable work to run well (see text); 6-in. riser block available
14 x 14 45°L - 15°R	Saddle	M	3,000	1/8 - 3/4	3/4	115/ 230	12/ 6	190 (E)	Required considerable work to run well (see text)
15 x 15 45°R - 10°L	Saddle	P	3,000	1/8 - 3/4	1	115/ 230	16/ 8	185 (E)	Micro-adjust blade guides hand-adjustable; 6-in. riser block available
14 x 14 45°R - 10°L	Saddle	M	3,000	1/8 - 3/4	1/2	115	9.0	201 (E)	Micro-adjust blade guides hand-adjustable; also available with 3/4- or 1-HP motor with enclosed stand; 6-in. riser block available
15 x 15 45°R - 15°L	Bracket	B	3,000	1/8 - 3/4	3/4	115/ 230	12/ 6	166 (E)	Guides difficult to adjust, require three wrenches
15 x 15 45°R - 0°L	Bracket	M	3,000/2,000	3/16 - 1	3/4	115/ 230	11/ 5.5	260 (E)	Rack-and-pinion guide post easy to use; three tools required to adjust guides; no blade-tension scale
15 ¹ / ₄ x 15 ¹ / ₄ 45°R - 10°L	Saddle	M	3,000	3/16 - 1	3/4	115/ 230	10.8/ 5.4	310 (E)	Square blade guide post very rigid; saw frame and stand solidly built
17 x 17 45°R - 10°L	Saddle	M	1,900/2,400/ 2,900	1/8 - 1	1 ¹ / ₂	115/ 230	16/ 8	395 (E)	Micro-adjust blade guides hand-adjustable; no tools needed to adjust guides; required work to run well (see text); no blade-tension scale
19 ¹ / ₂ x 15 ¹ / ₂ 45°R - 0°L	Saddle	B	4,174	3/16 - 1 ³ / ₁₆	2.4	230	13.4	395 (E)	Runs very smoothly; rack-and-pinion guide post easy to use; guides easy to adjust; foot brake; has flat rubber tires
23 x 19 ³ / ₄ 45°R - 8°L	Saddle	B	4,436	1/8 - 1	1.8	230	7.1	380 (E)	Rack-and-pinion guide post easy to use; large panic button for quick shutdown; foot brake

**Powermatic
Artisan 043**



10-in. Sears benchtop saws, we had to substitute 3-in.-wide maple.

The Bridgewood was the hands-down winner in the power department—it sliced through the maple in just 14 seconds with power to spare. But our resaw test pushed many of the saws to the limits of their power, and we had to nurse the cut to keep from bogging down. The Delta 16-in. three-wheeler couldn't resaw 5½-in. maple without the drive belt jumping off of the pulley under heavy load. However, the Delta three-wheeler was able to resaw 3-in.-thick maple successfully, if somewhat slowly. We also found that saws with multiple blade speeds resawed best on the fast speed.

At first the Jet's 1-HP motor bogged down badly. The company sent us a replacement motor, and on retesting the saw did just fine.

Frames, Wheels, Tables and Trunnions

We've talked about how flex in the guide post can affect the cut, but *flex in the frame* can allow the blade to twist, too. We found that saws with cast-iron frames, such as the General, Delta, and others, were the most rigid. But saws such as the 10½-in. Inca, which has a cast-aluminum frame, were also fairly solid. Two other aluminum-framed saws, the Sears 12-in. and the Inca 710 three-wheeler, flexed quite a bit under heavy load. However, the Inca's flex resulted mainly from its huge 20-in. throat.

Vibration, usually stemming from unbalanced or out-of-round wheels, is one of the biggest detriments to precise cutting. Out-of-round wheels also stress blades, sometimes leading to premature breakage. We measured the runout of each saw's wheels with the blade installed and tensioned. (See chart.) The smoothest-running saws, such as the Kity and the Bridgewood, had the least wheel runout. The Grizzly saw had a strong vibration that we traced to the motor. A replacement motor furnished by the company solved the problem.

A flat, rigid table is essential for band-sawing accuracy and a must if you plan to clamp on accessories such as shop-made fences and circle-cutting jigs. In general, we found cast-iron tables were the most solid, while aluminum tables tended to flex more under the weight of heavy stock. But table flex is also related to the mounting system, called the *trunnions*, that connect the table to the saw's frame.



Generally, saddle-type trunnions, as on the Jet (above), were more rugged than bracket-type trunnions, though the bracket-type trunnions on the Inca 340 (below) allowed the table to tilt smoothly, and the single lock lever stabilized the table securely.

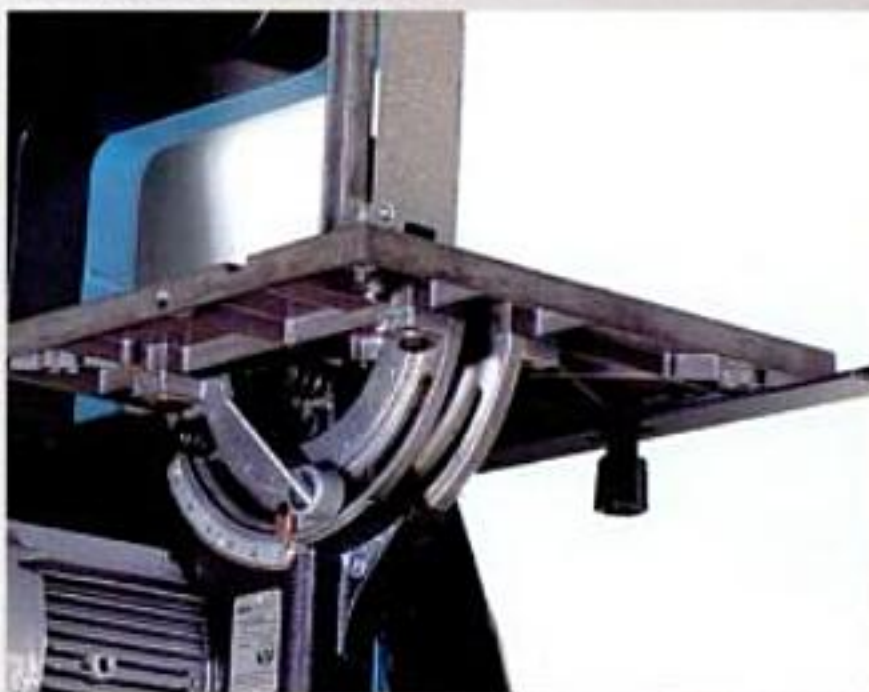


Table trunnions are protractor-shaped metal runners that let you tilt the table for angle cuts. Our test saws were equipped with either saddle-type trunnions or bracket-type. (See photos, above.) The saddle-type trunnions generally tilted smoothly, locked solidly and kept the table rigid. Most of the bracket-type trunnions, with the exception of the Kity and the two Incas, tended to stick when we tilted the table. The Powermatic Artisan and Delta 16-in. saws had the stickiest bracket-type trunnions.

The table on the Sears 12-in. saw didn't tilt at all. To make angled cuts, you turn a crank and tilt the entire saw frame. The tilt mechanism may be a slick engineering idea, but its lightweight construction caused the frame to flex during the resawing test, and the clamp that held the saw in position offered so little pressure, you could change the angle of the cut by leaning on the saw. The Sears 12-in. had the largest table among the saws we tested, but it was made of thin, cast aluminum and it didn't project beyond the saw's base, so you couldn't clamp shop-made fences or jigs to the table.



**Bridgewood
PBS440B**



Inca 710



Ryobi B5900

**Sears
244530**



**Black & Decker
9443**

Tuning a New Bandsaw

By Fred Matlack

Whether the nameplate on a new bandsaw says "Made in America" or "Made in Taiwan," it will probably need a tuneup before it runs as well as it can. But don't let that prospect scare you. As we discovered in setting up the saws for our bandsaw test (see main article), you can fix many of the minor problems you'll encounter if you have just a few basic mechanical skills and are willing to invest a little of your time.

Looking for Big Problems

The first step in fixing a bandsaw is determining whether it's worth the work. If your saw has a visible defect, such as a warped table or a cracked casting, you should send it back, or make a claim with the shipper if it appears the cause was damage during shipment. If critical parts are defective, request replacements, and if the dealer won't replace the parts, send the saw back. If your saw passes these tests, you can look for some specific problems:

Excessive Vibration—To check for vibration, mount a blade on the saw, retract the guides and turn on the saw. If the saw vibrates excessively, it could be because of out-of-round, out-of-balance or misaligned wheels, or a problem with the drive train.

There are several ways to check wheels for roundness and vertical alignment. (For more on these subjects, see "Tuning a Bandsaw," AW #25). But if the wheels appear to be more than about $\frac{1}{64}$ in. out of round, you should contact the manufacturer for a new wheel. If the upper and lower wheels aren't aligned in the same planes (co-planar), try shimming the wheels to bring them into line. (See AW #25.) If you're unable to fix the problem, return the saw.

Locating the source of drive-train vibration is a three-step process. First, check the motor by removing the drive belt and running the motor without the drive pulley attached. If the vibration persists, the motor is bad, and you should ask the manufacturer for a replacement. If the motor runs smoothly, reattach the pulley and run the motor again, but without the belt in place. If the pulley passes the test, try replacing the belt. If you still have vibration, check the pulley on the saw.

Wheel "End Play"—To test for "end play" (the amount of in/out movement on its shaft) remove the saw blade, grab the wheel with both hands and push

and pull on it. The wheel shouldn't move more than 0.003 or 0.004 in. on its shaft. If end play is greater than that, you can try adding a shim to take up the slack. (See drawing, below.)

Wheel Balance

Out-of-balance wheels can really make your saw dance across the floor. Test for balance by removing the blade and spinning each wheel by hand. (You have to remove the drive belt to let the bottom wheel spin freely.) If the wheel settles in one spot consistently, it is

out of balance. You can try to correct the imbalance by drilling shallow holes inside the rim on the heavy side of the wheel. (See photo, above.)

Guide-Post Alignment

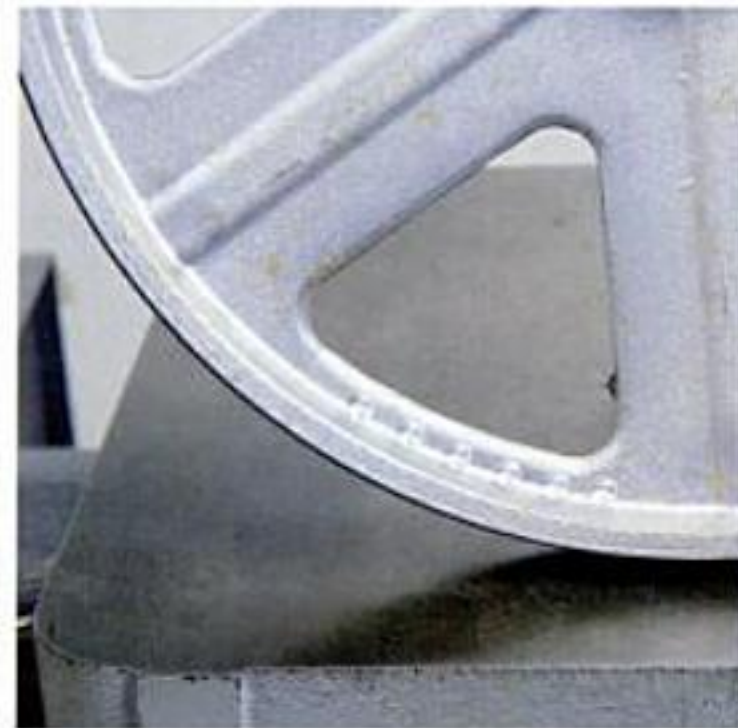


By filing the mating surface of this post clamp, we improved the guide-post alignment on one of our test saws.

posts that didn't remain parallel to the blade as we raised and lowered the guides. To check your guide post, lower the post as far as it will go, lock it in place and adjust the upper guides and thrust bearing, so that they're close to the blade. Then raise the post to the top of its range and lock it. If the position of the guides and the thrust bearing in relation to the blade has changed, the post is not parallel. We were able to fix this problem on two

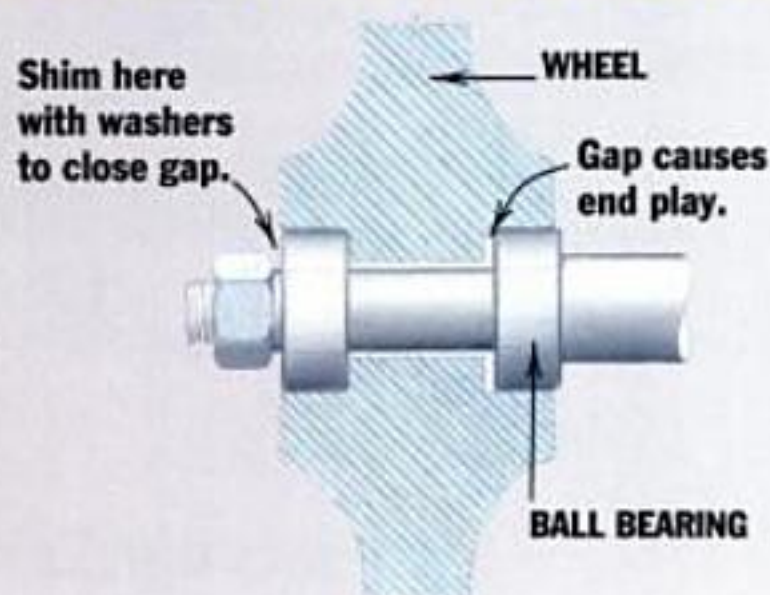
of our test saws by filing the post clamp that holds the post to the saw frame. (See photo, above.) On other saws, you might be able to shim the post clamp for a better fit.

Guide-Post Play—To check for play here, lower the post all the way, lock it and move it in all directions. If there's so much slop that you get a "clunk-clunk" as the post moves in the clamp, the play is excessive. You may be able to file the guide-post bracket so you get a better fit between the bracket and the post. Otherwise, ask the manufacturer for a replacement bracket.



To balance a bandsaw wheel, drill shallow holes inside the rim at the heavy points on the wheel.

FIXING END PLAY IN TOP WHEEL BEARINGS



FRED MATLACK heads the AW design shop.



Grizzly G1073



Kity 613



General 490-1



Sears 24832N



Delta 28-245

Other Factors

It's worth noting two other factors about bandsaws. First, most bandsaw tables tilt 45° to the outboard side, but not all tilt *toward* the column. If you want to jig up to cut dovetails on your bandsaw, make sure the table will tilt at least 8° to the left so you can cut the pins. (See chart.)

Second, don't trust blade-tension gauges. On most of the test saws that had them, the gauges were inaccurate and useful only as a rough guide. During our evaluation of the larger saws, we tensioned 3/8-in. blades to the "3/8 in." reading on the scales and then measured the tension using a Lennox blade-tension gauge. Blade manufacturers say a 3/8-in. blade should be tensioned between 10,000 to 15,000 pounds per square in. (psi) for cutting wood, but at the "3/8 in." setting, blade tension varied from a low of 7,000 psi on the Sears 12-in. to a high of 19,000 psi on the Bridgewood. Most saws fell in a range of 8,000 to 10,000 psi.

Special Features

We found a few other features worth mentioning. The Bridgewood and Laguna saws have foot brakes to stop the blade from freewheeling after you turn off the motor—a handy safety feature. A large "panic button" on the Laguna lets you turn off the saw without groping for a switch. The Inca and Kity saws are equipped with magnetic switches that prevent their motors from turning on unexpectedly if you leave the switch in the "on" position after a temporary power outage. On the other hand, we found the manual switches on the General, the Enlon and the Delta 14-in. open stand were mounted too low for easy accessibility.

Our Choices

Because the size and capacities of these bandsaws vary widely, we can't offer you a *single* recommendation. Instead, we've identified several categories of use and picked winners in each area. Keep in mind that there are many good saws worth considering that didn't make it into our test.

If you plan to use a bandsaw only for light-duty cutting and scroll work, a bench-top saw is good enough, and we liked the Dremel best for its height capacity and power. This saw is quite similar to the Skil and performed the same, but the Dremel's two speeds gave it the edge in our opinion.

If you're buying a bandsaw for all-around curve-cutting, ripping and some resawing, your best bet is a medium-size saw in the

12-in. to 15-in. range with 1/2 to 1 1/2 HP. The Kity 12-in. got our vote as best small saw because it scored higher than any other saw we tested, ran smooth as silk, had plenty of power and was very easy to adjust. Among the larger saws, the 15-in. General was a clear winner. It has a rigid, all-cast-iron frame, it ran very smoothly, and it was easy to adjust. The Delta 14-in. and the Jet also performed well, and cost considerably less.

Heavy-duty resawing or continuous production use requires heavier-duty 16-in. and 18-in. saws: Their larger frames and motors can power wider blades. The Bridgewood was our top choice in this group due to its construction quality, excellent guides, relentless power and vibration-free cutting.

If you need large throat capacity for light-duty work such as scrollsawing, your best option is a three-wheel bandsaw, and the Inca 710 was tops in this test. The fit and finish was very good, and the saw had a 20-in. throat capacity. Keep in mind, though, that it can be tricky to track a blade on a three-wheeler. Also, blade life may be shorter since the blade has to make sharper bends around smaller-diameter wheels.

Our choices for "best buy" were the most difficult, because we considered price and performance together. One of our picks, the Delta 12-in. machine, was a lighter-duty saw. It was well-made and had good power for its size. The Grizzly 16-in. saw got our vote as the best buy among heavier-duty machines, but with a caveat. This saw ran well only after we replaced the motor and the guide-post cover and installed a missing bushing to keep the upper wheel from shifting side-to-side. Still, you'd be hard-pressed to find a heavy-duty saw as good at this low price.

Our evaluations showed that, as you'd expect, the more expensive saws are manufactured to higher standards. You can figure on doing more tuning and tweaking to get optimum performance from a lower-priced saw. But if you're handy and have more time than money to spend, consider buying a cheaper saw and fixing it up yourself.

(See sidebar, page 43.) ▲

Thanks to The Olson Saw Co., (800) 634-4047, for supplying the blades, and to American Saw and Manufacturing Co.,

(413) 525-3961, for supplying the blade-tension gauge used in our testing.



DAVE SELLERS is assistant editor of AW.

Choosing Bandsaw Blades

By Jim Cummins

The bandsaw is a versatile machine, but to help it reach peak performance, you need to use the correct blade for the job you're doing. Choosing what blade to use is a matter of matching four elements to the job at hand: the tooth profile, the number of teeth, the width of the blade and the blade's thickness. Let's look at these elements and how they affect a cut.

Tooth Profile and Number of Teeth

Bandsaw blades come in the three main tooth profiles shown below. The "standard" profile has alternately set teeth (often with every third or fifth tooth ground as a

BASIC BLADES

For
Tight Curves



HOOK ANGLE
0°

1/8 in. x 14 TPI
STANDARD TOOTH

Blades with
more teeth
cut smoother.

For
General Cutting



HOOK ANGLE
5° TO 10°

1/4 in. x 6 TPI
HOOK TOOTH

Blades with hook
teeth cut faster.

For
Resawing



HOOK ANGLE
0°

3/8 in. x 4 TPI
SKIP TOOTH

Blades with skip
teeth run cooler
in thick stock.

"raker" to clear the kerf and keep the blade running straight). "Standard" blades provide the most stable cuts in thinner materials. The "skip" profile is a standard with half as many teeth. This increases gullet size and reduces clogging. The "hook" profile has a slight positive hook angle. It cuts more aggressively and requires less feed pressure.

As with any saw blade, the number of teeth in the cut will affect how smoothly and quickly you can cut. The blades shown in the drawing reflect the general rule that you want a blade with more teeth if you're cutting harder or thinner materials, and one with larger gullets for softer or thicker materials. If you want a blade that will cut faster than the ones shown and be less likely to clog, choose a blade with fewer teeth, aiming, as in the old carpenter's adage, to keep at least three teeth in the cut for stability.

Blade Width and Thickness

Cutting curves is one of the bandsaw's specialties, and cutting radius depends primarily on the blade width. (It's the back corner of the blade rubbing against the outside of the kerf that limits the curve.) As a general rule, a 1/8-in. blade will cut a curved inside corner smaller than a dime,

a 1/4-in. blade will cut to the size of a quarter, while a 3/8-in. blade will follow the outline of an old silver dollar.

Blade thickness and the diameter of the wheels on your saw contribute to the likelihood a blade will break from metal fatigue instead of just dulling to the point where it's no longer useful. Most blades break from metal fatigue—constant bending makes the steel brittle—and the smaller the wheels on your saw and the thicker the metal in the blade, the faster a blade will break. Blade thickness for 14-in., small shop saws shouldn't exceed 0.025 in. Small, three-wheel bandsaws work better with more flexible 0.014-in.-thick blades, while larger bandsaws can handle blades up to 0.035 in. thick.

Resawing (cutting thick, wide stock into thinner boards) is another bandsaw specialty. For straight, smooth resawing, wide blades resist cutting pressure and deflect less in the cut. If your blade screeches and produces dust rather than chips, try using a blade with fewer teeth, and slow the saw down. Then restart the cut from the other end of the work: Running a new blade down an old kerf quickly dulls it by overheating the sharp outside corners of the teeth.

Blade Recommendations

If you're wondering which blades you should buy, the three shown are a good starting point, but the suppliers listed below carry a wide variety of blade types if you want to experiment. Anybody's "favorite" blade depends on exactly what you're cutting and what you want to pay. AW used Olson's standard carbon-steel blades in the bandsaw test (see main article) and found they were good, low-cost, all-purpose blades. In his own woodworking business, Executive Editor Ellis Valentine has used the AS and PC Series blades from Suffolk Machinery and says they produce "unbelievably smooth cuts." For an all-around blade, I'm partial to the 1/4-in., 6-tooth bimetal blade from Lennox, which has a hook tooth and a thickness of 0.025 in. This blade costs twice as much as the other brands mentioned, but it has alloy teeth that resist wear from the pieces of particleboard, plywood, plastic and bark-covered logs that go through my saw.

JIM CUMMINS is a contributing editor of AW.

SOURCES

Bandsaw blades are available from the following mail-order sources:

American Saw Mfg. Co.

301 Chestnut St., East Longmeadow, MA 01028

(413) 525-3961 Circle #664

Carries Lennox blades.

The Olson Saw Co.

16 Stony Hill Rd., Rte. 6, Bethel, CT 06801

(800) 634-4047 Circle #665

Suffolk Machinery Corp.

12 Waverly Ave., Suite 125, Patchogue, NY 11772

(800) 234-7297 Circle #666

PHILADELPHIA LOWBOY

by *Lonnie Bird*



This graceful Queen Anne lowboy combines cabinetmaking and carving skills.

One of the most enjoyable aspects of building 18th-century furniture is studying the remarkable diversity of design during this period. In each of the major localities, craftsmen produced furniture that was distinctive in line, proportion and form, reflecting differences in the tastes and ethnic backgrounds of both builder and patron.

This lowboy, or dressing table, while not an exact reproduction, is typical of Queen Anne furniture built by Philadelphia craftsmen during the early- to mid-1700s. I based the design on Philadelphia examples because I liked the

rising line of the front apron combined with the shallow center drawer. And the space outlined by the cabriole legs, knee blocks, and apron forms a very graceful,

almost dancing line that is the essence of good Queen Anne furniture. The carved "trifid" (three-lobed) feet, the crotch-veneered drawer fronts and the general proportions are also representative of many Philadelphia pieces I have studied.

Authentic Details and Construction Grace This 18th-Century Classic

If the piece appears somewhat ambitious to you with its carved feet, you can substitute turned pad feet for the carved ones without destroying the authentic fla-

vor of the piece. (For more information on turned feet, see *Queen Anne Furniture*, by Norman Vandal (1990, Taunton Press, Box 5506, Newtown, CT 06470-5506). Some old pieces have carved feet (ball-and-claw or tri-fid) on the front legs and the simpler, pad feet on the back.

Making the Carcase

When building a reproduction I like to strive for authenticity, so I chose walnut as the primary wood (for all visible surfaces) and poplar for the secondary wood, as the original maker might have. I made the top of the lowboy from just two boards, while the sides and back are made from single wide boards. The carcase is joined by mortises and tenons, and the drawers by hand-cut dovetails. All the surfaces are hand-planed and scraped, with only minimal hand-sanding. The result is a piece of furniture that is faithful not only in design but in construction.

The first step in constructing the carcase is to make the legs. Begin by laying out a full-sized leg pattern on thin plywood. (See drawing, pages 48 and 49.) Then bandsaw the pattern and sand or spokeshave the edges until they are smooth and continuous, without flat spots or irregularities.

Next, prepare 3-in. by 3-in. walnut blanks for the legs. Use solid stock if possible; if you laminate the legs, you're likely to see unattractive glue lines on the finished shapes.

When laying out the legs, orient the blanks so that similar grain will be facing the front of the table. Trace your leg pattern onto the two adjacent outside faces of each blank. (If you plan to turn rather than carve the feet, mark the centers on both ends of the stock prior to bandsawing, and leave an extra inch of wood at the top for the lathe's drive center.)

Before cutting out the cabriole shapes, lay out and cut the leg mortises. I drilled the mortises, then squared the corners with a sharp $\frac{3}{8}$ -in. mortising chisel.

Once you've done the mortising, you can focus on cutting and shaping the legs. If you have never made a cabriole leg, I recommend you practice on some cheap, soft wood such as poplar or pine. Cabriole legs are



To cut compound curve on a cabriole leg, author saws one face, then tapes on the offcuts and cuts adjacent face.



Author holds leg in a pipe clamp held in a vise so he can shape it with a rasp prior to filing and sanding.

not difficult to make, but I'm sure you will feel more comfortable if you experiment on something other than 3-in.-thick walnut.

Cut the curved shapes of the legs with a $\frac{1}{4}$ -in. blade on the bandsaw, sawing close to the layout lines. After cutting the first side of each leg, you'll have to tape the cutoff pieces back into position with masking tape so you'll have a square block and lines to follow when you make the second cut. (See top photo.)

To refine the shape of the legs, I mount them in a pipe clamp, then mount the clamp in a vise. I use a rasp

to round the corners of the legs and to remove saw marks and irregularities left by the bandsaw. (See bottom photo.) Many colonial craftsmen used spokeshaves for this step. (See AW #35.) Work cautiously and try to produce smooth, flowing curves. Don't work on the square, top sections (called "post blocks") at this point—you'll do that after gluing up the case. When you're satisfied with the general shape of the legs, switch to a file, then to scrapers and finally sandpaper, finishing up with 220 grit.

The next step is to carve the feet. This lowboy has four carved tri-fid feet, with carved grooves, or "stockings," that extend partway up the legs. My method of carving this foot design is shown in the photos on pages 50 and 51.

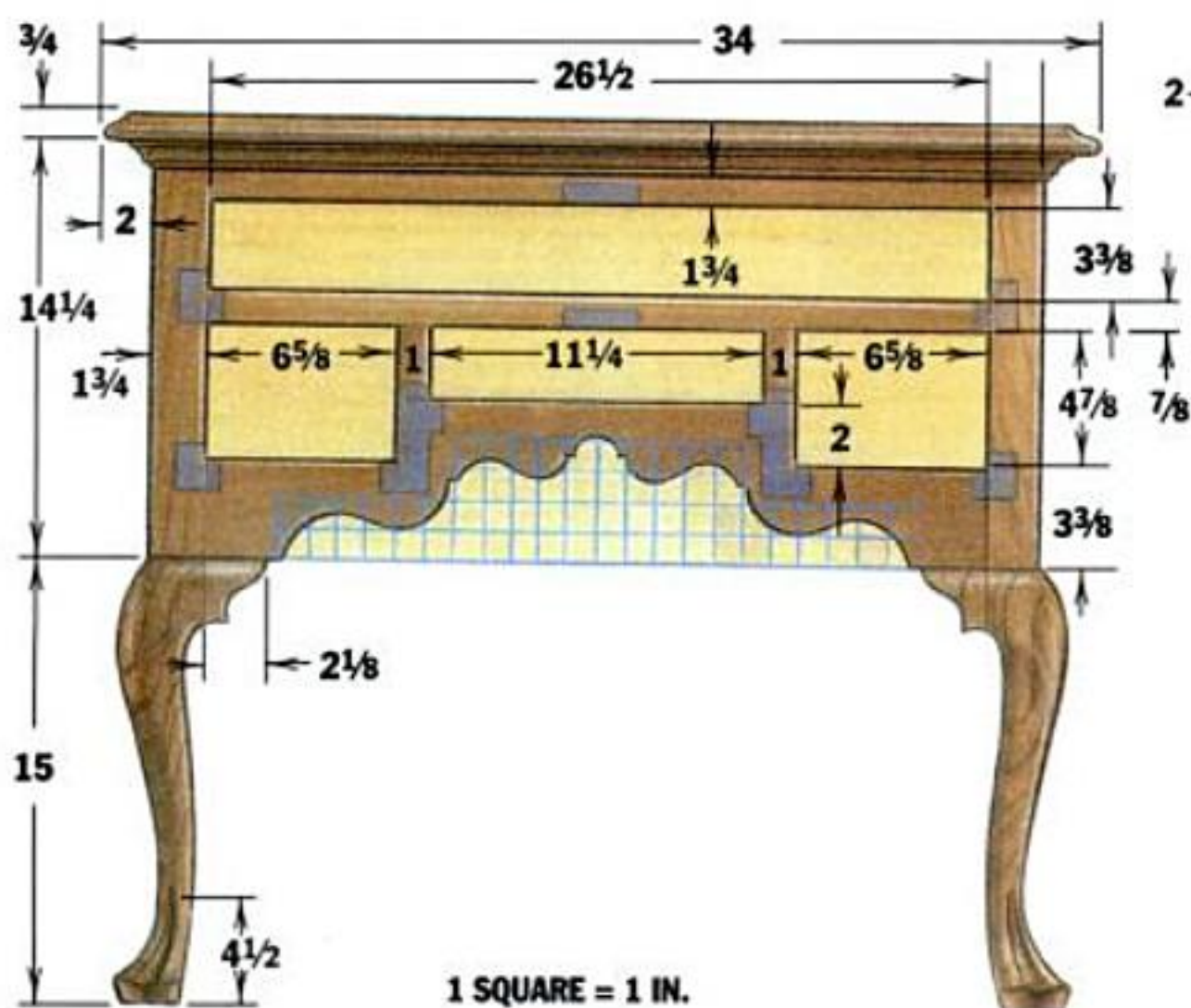
Once the legs and feet are completed, you can move on to the case joinery. Dimension the back and sides, the front rails and the front apron. Note that the center rail is $\frac{7}{8}$ in. high and $1\frac{3}{4}$ in. deep to strengthen the case. Leave the sides and front apron square at this point. You'll cut the decorative profiles later. (See drawing.) Cut tenons on these pieces to fit the mortises in the legs.

Note how the side and back joints are each divided into three separate mortises and tenons. This method is technically stronger than a single full-width tenon, because the wood remaining between the mortises helps to maintain the integrity of the leg. To allow for seasonal wood movement of the sides and back, you need to make their tenons slightly narrower than the heights of the mortises. I don't peg these joints as many colonial cabinetmakers did. Pegs inhibit wood movement, sometimes causing the boards to crack or split.

When you've finished the leg joints, the next step is to make the six drawer guides and the drawer runners. (See drawing.) You'll also need to make two "kickers" to keep the top and center drawers from tipping as you pull them out. Note that the top drawer runners also act as kickers for the left and right bottom drawers.

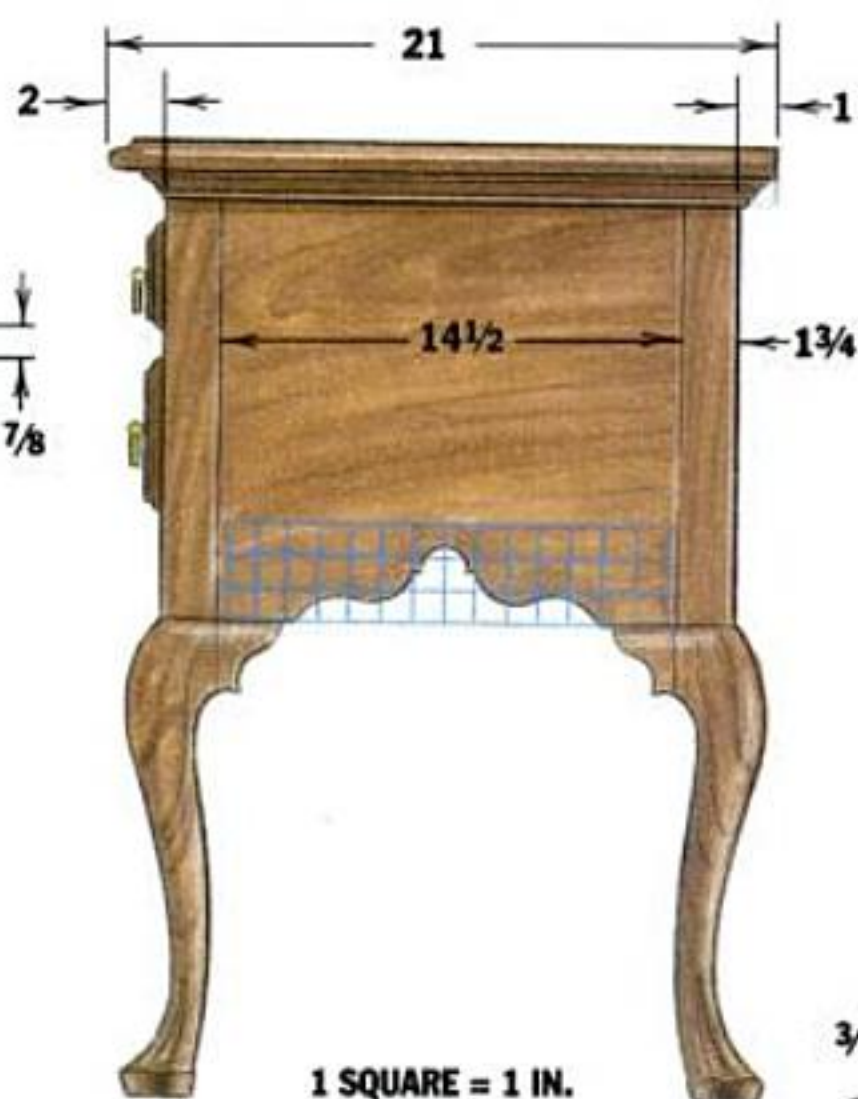
The drawer guides and runners can be made in one of two ways. The first is to rabbet thick stock to form the drawer runners. I prefer instead to

FRONT ELEVATION



1 SQUARE = 1 IN.

SIDE ELEVATION



1 SQUARE = 1 IN.

BILL OF MATERIALS

PART	QTY.	DIMENSIONS
Top	1	3/4 x 21 x 34
Front Molding	1	1 x 1 x 32
Side Moldings	2	1 x 1 x 20
Legs	4	2 3/4 x 2 3/4 x 29 1/4
Knee Blocks	8	2 1/8 x 2 3/4 x 2 3/8
Top Rail	1	7/8 x 1 3/4 x 28 1/4
Center Rail	1	1 3/4 x 7/8 x 28 1/4
Apron	1	7/8 x 5 3/8 x 28 1/4
Vertical Dividers	2	7/8 x 1 x 3 5/8
Sides	2	7/8 x 14 1/4 x 16 1/4
Back*	1	7/8 x 14 1/4 x 28 1/4
Center Drawer Guides*	2	1 x 3 3/8 x 17
Side Drawer Guides*	4	7/8 x 1 3/8 x 14 1/2
Upper Drawer Runners*	2	1/2 x 7/8 x 15 3/8
Lower Drawer Runners*	6	1/2 x 7/8 x 16 1/4
Top Drawer Kicker*	1	3/4 x 1 1/2 x 17
Center Drawer Kicker*	1	3/4 x 1 1/2 x 16 1/8
Top Drawer Front	1	13/16 x 3 5/8 x 27
Sides*	2	1/2 x 3 5/16 x 16 1/2
Back*	1	1/2 x 2 13/16 x 26 7/16
Bottom*	1	1/2 x 16 3/16 x 25 13/16
Center Drawer Front	1	13/16 x 3 1/8 x 11 3/4
Sides*	2	1/2 x 2 13/16 x 16 1/2
Back*	1	1/2 x 2 5/16 x 11 3/16
Bottom*	1	1/2 x 16 3/16 x 10 9/16
Bottom Drawers Front	2	13/16 x 5 1/8 x 7 1/8
Sides*	4	1/2 x 4 13/16 x 16 1/2
Back*	2	1/2 x 4 5/16 x 6 9/16
Bottom*	2	1/2 x 16 3/16 x 5 15/16

*Made from poplar.

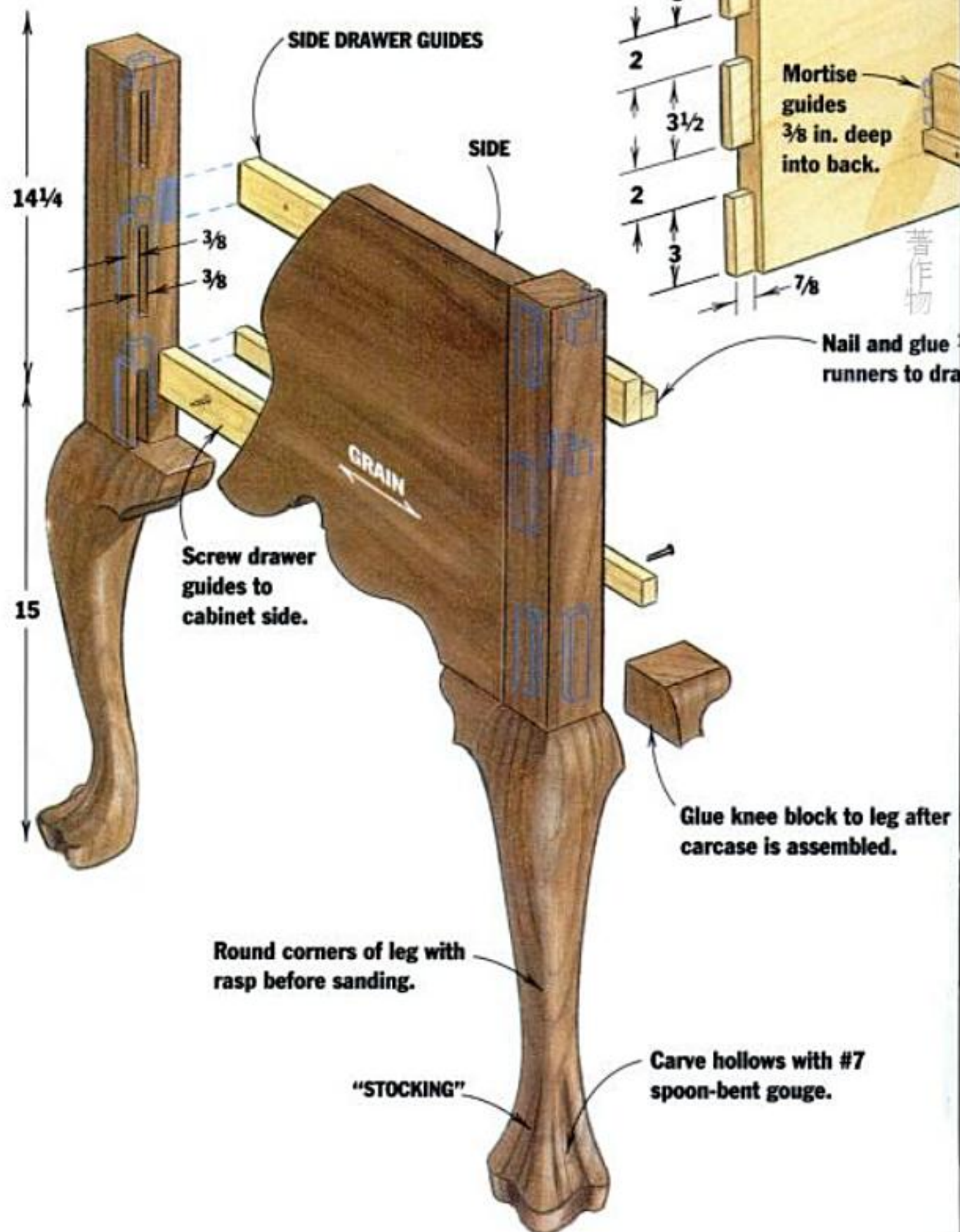
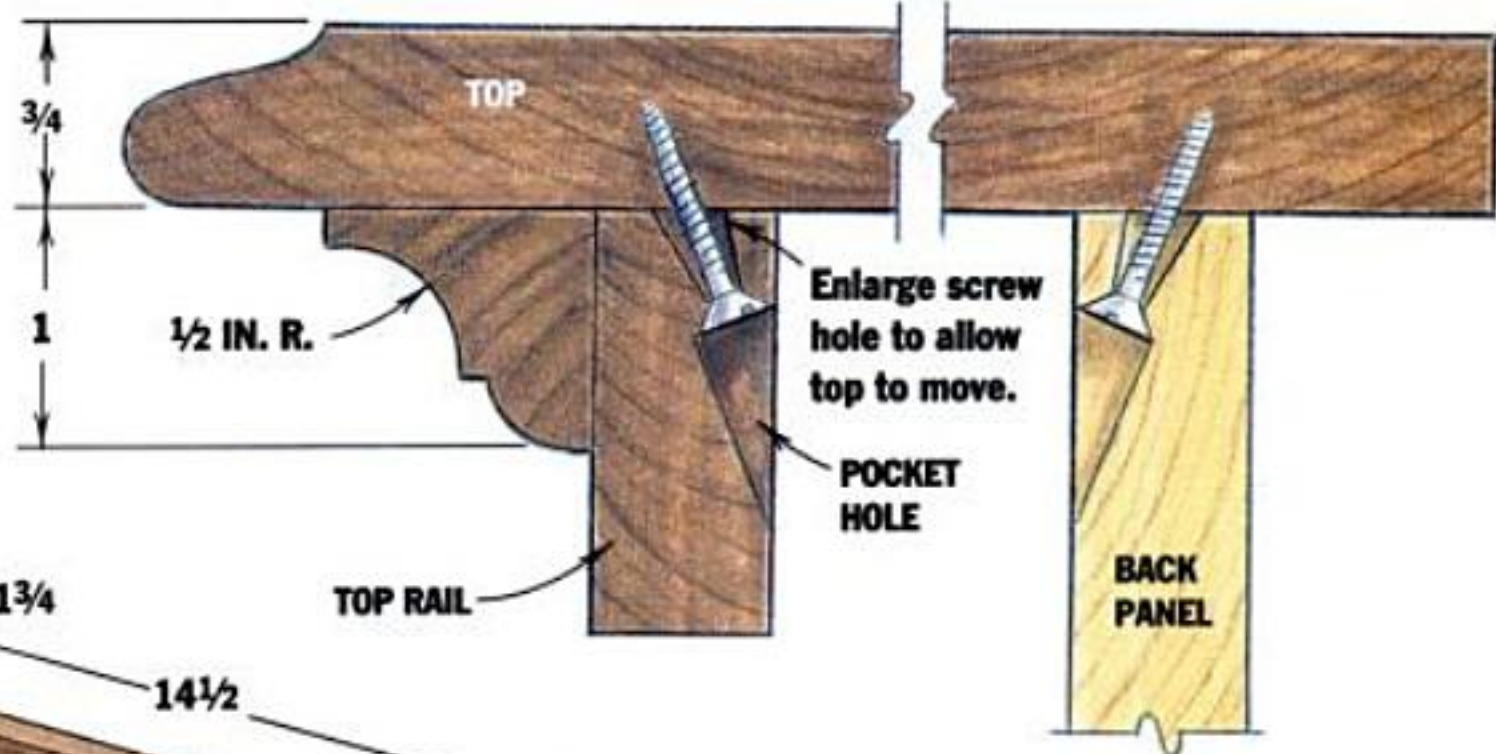
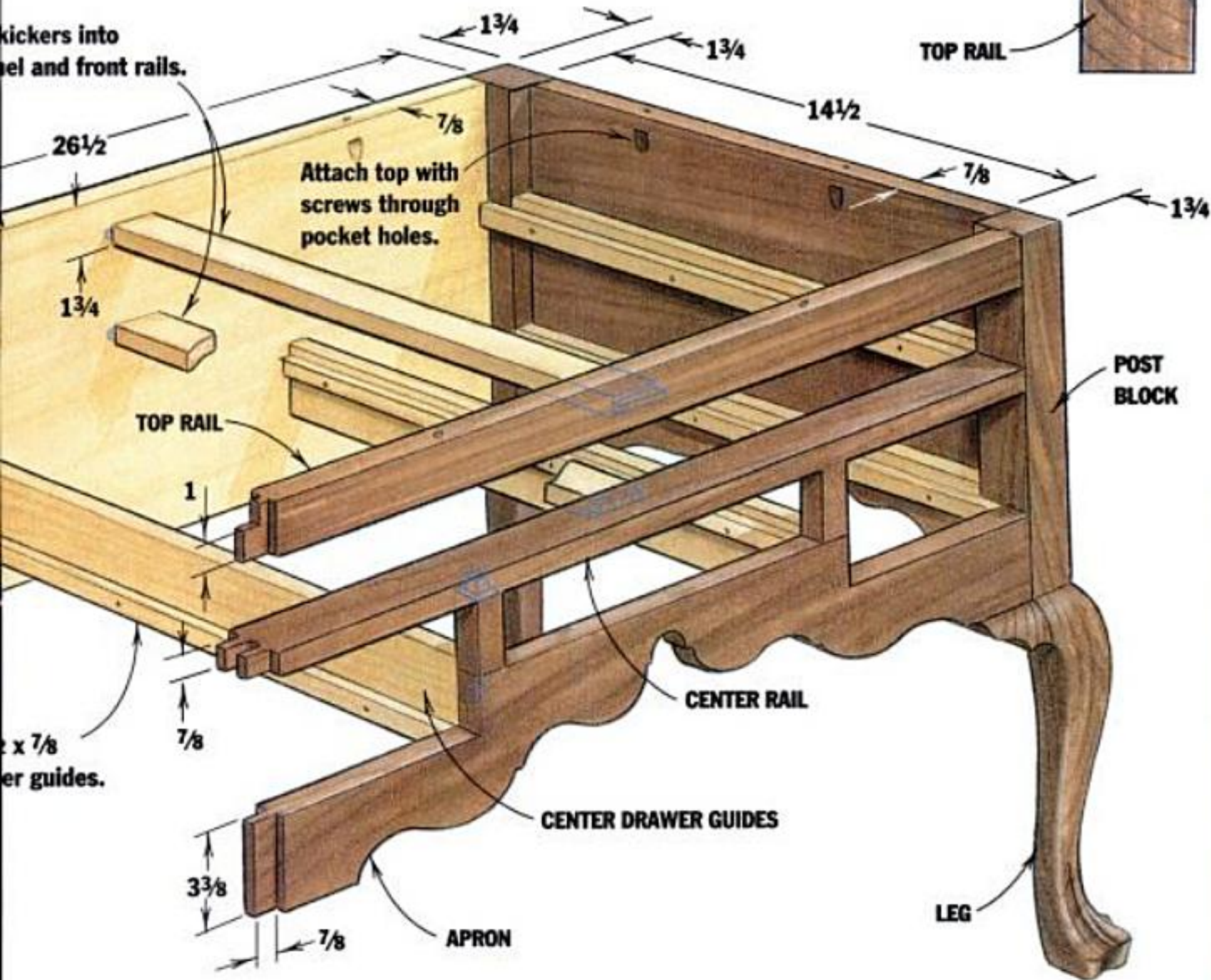


ILLUSTRATION BY BOB LAPOINTE

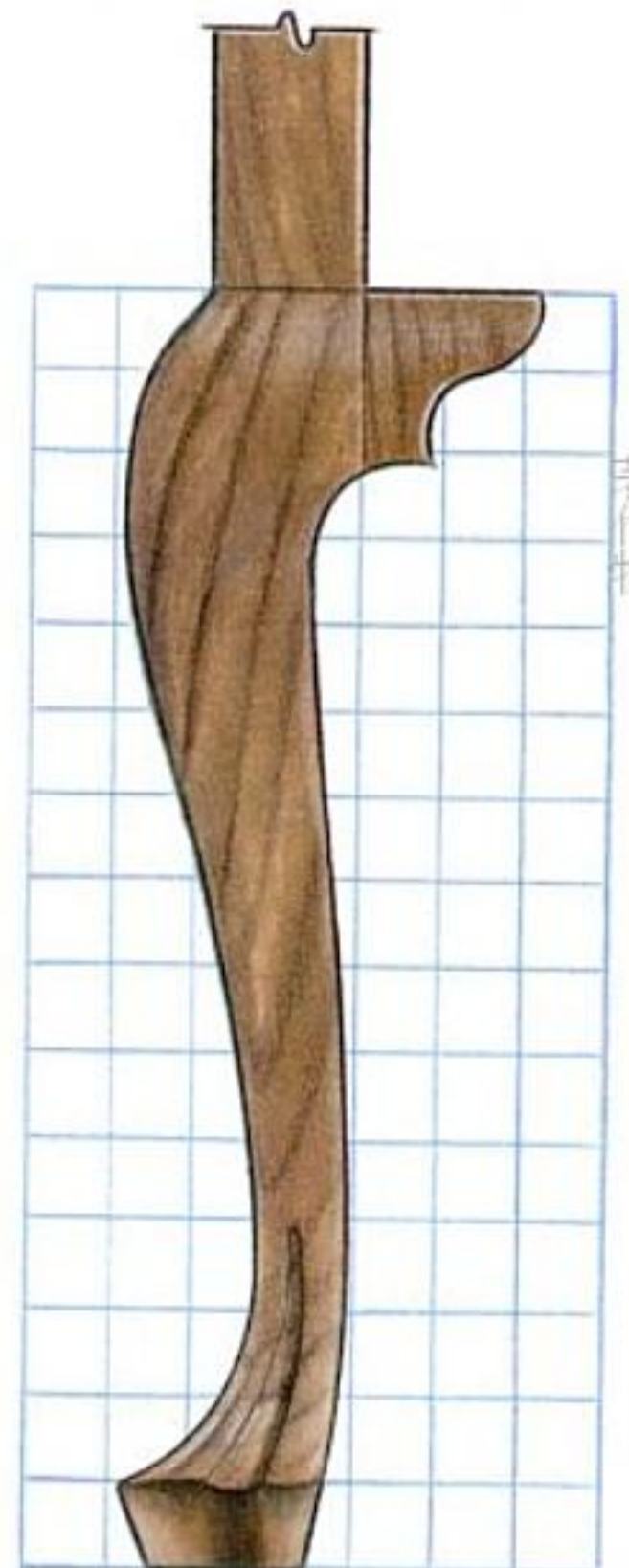
TOP EDGE AND MOLDING DETAIL



kick into
rail and front rails.



LEG AND KNEE BLOCK DETAIL

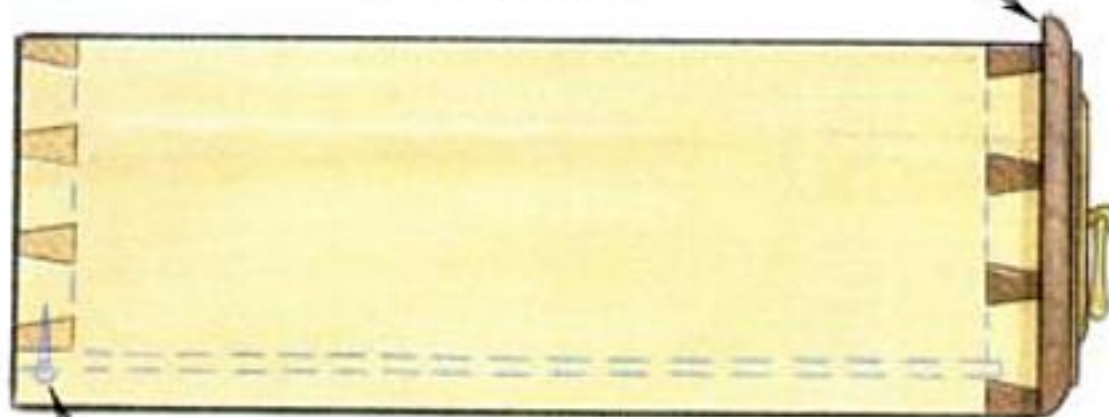


1 SQUARE = 1 IN.



TRIFID FOOTPRINT

DRAWER DETAILS



Screw bottom to back
through slotted hole.

Raise 1/4-in. lip on top
and sides of drawer front.

CARVING A TRIFID FOOT



STEP 1: Cut a cardboard footprint pattern (see drawing) with the carving gouge you plan to use—in this case a 1/2-in.-wide, #5 gouge. Trace the pattern on the end grain of the leg.



STEP 2: Carve from the top edge of the foot toward your pattern line. Make your cuts parallel to the bandsawn edges of the feet.

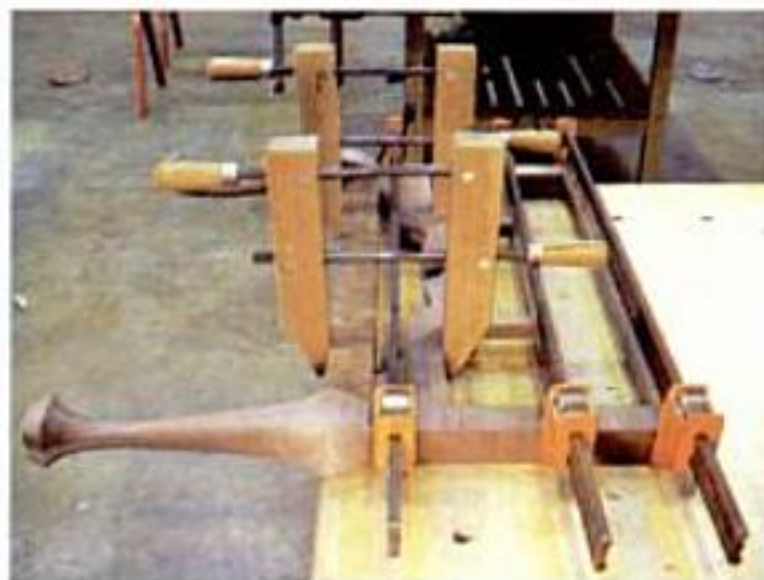


STEP 3: Lay out the hollows between the toes with a pencil. The hollows extend partway up the leg to form the "stocking."

use thinner stock and attach separate runners with brads and glue, so I can adjust them as needed. (See drawing.) In any case, make sure the tops of the drawer runners are flush with the openings in the carcass when everything is assembled. I fastened the side drawer guides to the case sides with screws, although on many old pieces these guides were nailed into place.

The center drawer guides and kickers are mortised into the inside of the back panel and front apron. (See drawing.) To locate the mortises, use one of the front legs as a "story pole" to transfer the rail locations to the back panel, then determine the runner and kicker locations. This old method is faster and less error-prone than measuring and laying out each separate mortise. Some old pieces were through-mortised, but I think it is unattractive and unnecessary. Next, mortise the front ends of the center kickers into the top and center rails as shown in the drawing.

When you've completed the case



When gluing the sub-assemblies, author uses shaped glue blocks to center clamping pressure on the joints.

joinery, make a dry run of each sub-assembly—sides, front, and back. Check for flatness, squareness and twist, and make any necessary adjustments. Then lay out and bandsaw the decorative profiles on the front apron and cabinet sides. (See drawing.)

Next, glue up the front and back sub-assemblies with yellow glue and check everything once again. Even when your joinery is neat and accurate, it's possible to clamp pieces out of square. Use glue blocks to center clamping pressure on the joints. This should keep the leg posts in the same plane, but you should check with a straightedge just to be sure.

Now you're ready to glue up the whole case. It might be wise to have someone help you with the process because of all the pieces involved. Don't overlook a dry run: It is crucial to foresee problems and locate the best positions for clamps.

For this gluing step, you may also want to use white glue instead of yellow glue. White glue is not quite as strong, but its slower setup time is usu-

ally an asset when gluing larger, more complicated assemblies.

Once the glue has dried, trim the rough, bandsawn faces of the post blocks flush with the back and sides. You can do this with a razor-sharp low-angle block plane. Adjust the plane's throat for a thin shaving and angle the plane at 45° to the grain direction. This will give you a smooth cut and prevent tear-out.

The knee blocks (sometimes called "transition blocks") connect the legs visually to the apron and sides while



Drawer fronts are joined to the sides with half-blind dovetails. Note that the bottom edges of the drawers are not lipped.



STEP 4: Carve the hollows and rounds with a 1/2-in.-wide, #7 spoon-bent gouge, and switch to a 1/4-in.-wide, #7 spoon-bent gouge as the hollows narrow at the ankle.



FINISHED FOOT: After sanding and finishing, the stocking and the tops of the toes are crisply defined, as these two views show.

adding some rigidity to the structure. You make the knee blocks like you make the legs, cutting them to approximate shape on the bandsaw, then taping the scraps from your first cuts in place before sawing the other profile.

I joined the knee blocks to the legs using an old-fashioned technique called a "rubbed" glue joint, mostly so I wouldn't have to clamp these oddly shaped pieces. I first applied glue to the side of each knee block, then rubbed the glued surface against the mating leg surface until the glue "tacked." Sometimes on old pieces, a single nail was used to reinforce this joint.

After you've glued the knee blocks into place, shape them with your rasps and carving tools so they blend seamlessly into the leg profiles.

Making the Drawers

Now, turn your attention to making the drawers. Mine are typical for the period, with half-blind dovetails in the front and through dovetails in the back. (For more on cutting half-blind dovetails, see AW #29.) Make the drawers about 1/16 in. narrower and shorter than the openings, so they won't bind in humid weather.

The drawer bottoms are solid poplar with the grain running side-to-side to allow the inevitable expansion and contraction to occur at the backs of the drawers. Fasten the bottoms to the drawer backs with screws through slotted holes. (See photo, above right.)

The drawer fronts are an ideal loca-

tion to display figured wood. You can make solid fronts, or you can resaw your fancy walnut into thick veneer and glue it to ordinary walnut, as I did here with some choice crotch walnut I'd been saving.

When resawing, I started with a thicknessed board. Then I alternated between resawing and jointing so I'd always have a smooth surface to ride against the fence and for gluing to my drawer fronts. This way, each piece had one planed face and one bandsawn face. I glued the planed faces of



Author attaches drawer bottom to back with a screw. Slotted hole permits bottom to move.

the veneers to 3/4-in.-thick walnut, then scraped and sanded the fronts to 1/16 in. to remove the bandsaw marks. (See drawing.)

There are no hard-and-fast rules for composing the grain of the drawer fronts. Whether you use matched or unmatched wood, solid stock or veneer, arrange your drawer fronts in the way that is most pleasing to you.

My drawer fronts are lipped on the

top and two sides and have a decorative thumbnail edge on the front. (See drawing.) The lip on the bottom edge was probably omitted for convenience when cutting grooves for the drawer bottoms—one plow plane setup could be used for both the fronts and sides of the drawers, saving time and decreasing the chances for error. The same holds true today, even though you're more likely to cut the grooves with a tablesaw than with a wooden plow plane.

Making the Top

I made the top last, mainly because I was concerned that it would warp if I left it lying around the shop for too long. After gluing up the two-board top and scraping it flat with a cabinet scraper, I cut the profile on the front and side edges (see drawing) with shaper knives that I ground myself (see AW #35), but you can approximate this shape with standard shaper or router cutters.

The molding under the top can also be made with either of the above methods or with wooden molding planes. Attach the moldings with screws from inside the case. Then attach the top to the case with screws mounted in pocket holes on the inside of the case. Make the clearance holes a bit sloppy so the top will be able to expand and contract with the seasons.

Finishing Up

After assembling the case, I test-mounted the drawer pulls and escutcheons (available from Ball and Ball, 463 W. Lincoln Highway, Exton, PA 19341, 215-363-7330; Item #C19-057), and then I removed them for finishing.

My finish consisted of one coat of tung oil to bring out the rich color of the air-dried walnut, followed by several thin coats of orange shellac. I rubbed the final coat to a satin sheen with mineral oil and pumice before completing the job with a thin coat of brown shoe polish. ▲



LONNIE BIRD makes reproduction furniture and teaches woodworking at the University of Rio Grande in Ohio.

DESIGNING BEYOND

By Albert LeCoff

Webster's dictionary defines a turner as "a person who shapes objects on the lathe." But as the pieces pictured here show, today's turners are using the lathe as just one part of the whole process of making. This work, from the latest International Lathe-Turned Objects exhibit, "Challenge V," demonstrates how turners are combining design, manipulation of the materials and machine, and finishing with traditional turning techniques to create unique objects.

The original "Challenge" show in 1987 encouraged turners to make objects irrespective of their marketability. The results were mostly decorative versions of traditional objects. Since then, the artists have responded in subsequent Challenges by stretching our understanding of what's possible on the lathe with increasingly sophisticated planning and execution.

This exhibit was organized by the Wood Turning Center of Philadelphia and opened at the Berman Museum in Collegeville, Pennsylvania, in January. It will be on display at the Fine Arts Museum of the South in Mobile, Alabama, through June 12, and will continue to tour the U.S. until February 1997. (Watch "Calendar" for show dates and places.) ▲

ALBERT LECOFF is Executive Director of the Wood Turning Center in Philadelphia.

"Evolving Eggs III"

Stephen Hughes of Aspendale Gardens, Australia, turned and carved this 2-ft.-tall egg from Huon pine, then embellished it with dog hair and linen thread.

PHOTO BY KEN HATTON



"And Tomorrow Weeps In a Blind Cage"

To achieve the cagelike effect in this turning, John Wooller, a native of Victoria, Australia, turned a piece of jarrah burl from both sides, relocating its axis between turnings.

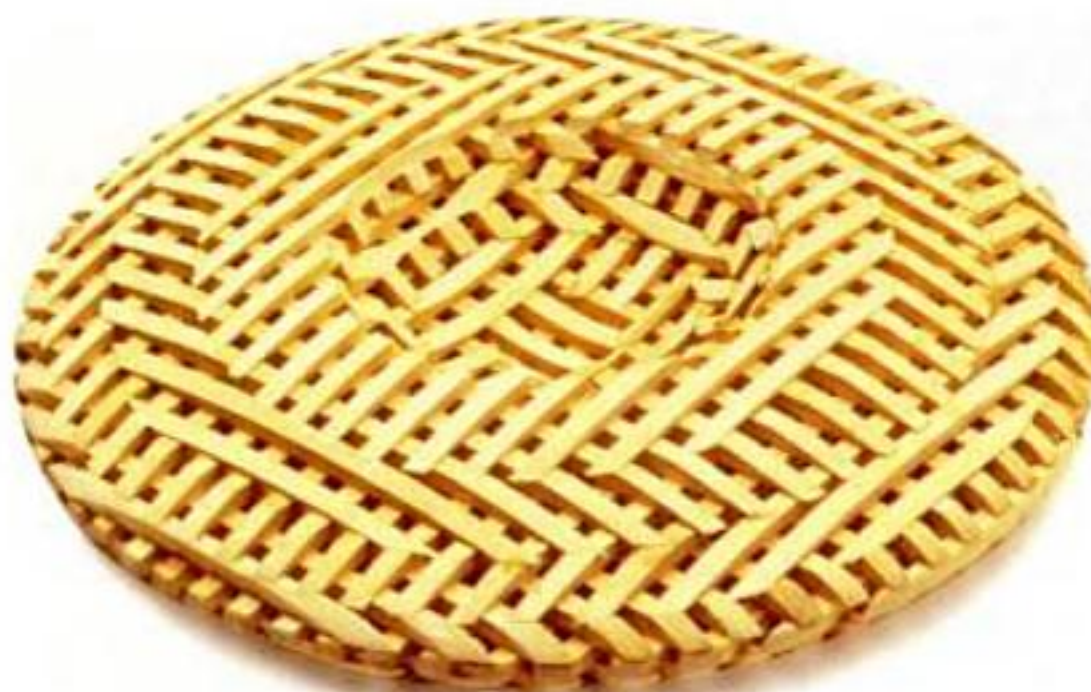
PHOTO BY DAVID STALEY



"Matrix 1"

To prevent splintering, Richard Hooper of Liverpool, England, glued together the crisscrossed ramin-wood sticks in this piece, then froze the blank and turned it while it was still an iced block.

PHOTO BY JOHN CARLANO



THE LATHE

Challenging the Limits of Turned Work



"Earth Offering"

Ron Fleming of Tulsa, Oklahoma, first turned off center to rough out most of the bowl shape on this piece of buckeye burl. Then he hand-carved the leaf work. Thin walls on the bowl prevent the piece from tipping over.

PHOTO BY RON FLEMING

"Suspended Sphere Variation"

Todd Hoyer of Bisbee, Arizona, turned this shape between centers from a single cedar log. First, he mounted the log horizontally to texture the exterior. Then he shaped the ball by mounting the log on two vertical axes and wasting the area between the "legs."

PHOTO BY TODD HOYER



"White Pine Mosaic Bowl"

Phil Moulthrop of Marietta, Georgia, created this 21 1/2-in.-dia. turning by epoxying sections of pine onto the outside of a turned bowl. He then turned the interior to waste the initial bowl, leaving an epoxy-inlaid vessel.

PHOTO BY PHIL MOULTHROP

"Passion Fire"

Frank Cummings III of Long Beach, California, turned this piece of pink ivory wood, then sliced off the top section and carved the lacework. He used gold posts adorned with garnets and pearls to reattach the top to the vessel.

PHOTO BY FRANK CUMMINGS



"Mix Master"

Johannes Michelsen of Manchester Center, Vermont, made this functional spalted-maple hat by turning it green and bending it to shape over a form. Tangential shrinkage helped create the hat's oval, head-fitting shape.

PHOTO BY JOHANNES MICHELSEN

"Broken Wave Pattern"

After turning this birch dish, Alan Stirt of Enosburg, Vermont, ebonized the rim and then carved through to reveal the wood's natural color.

PHOTO BY ALAN STIRT



Multi-Step FINISHES

These Professional Techniques Give Your Work Warmth, Depth and Character That Stain Alone Can't Match

by Michael Dresdner

"Can you match this finish?" asked the overdressed matron as she handed my partner, Gary, a drawer from a buffet. She wanted the same finish on her dining table, which was, at that moment, sitting in the center of our finishing shop.

"Sure!" he answered brightly, "We'll call you when it's done." The drawer had one of those multi-layered commercial finishes you often see in furniture stores.

"Do you know how to match this finish?" I asked Gary, somewhat incredulous. "No," he answered calmly, "but I'm sure we can figure it out. After all, how tough can it be?"

Gary and I were young and eager at that time, and we needed all the work we could get. In the end, the job turned out to be tougher than expected, as I'll explain later. But it was well worth it, because it introduced us to the world of what I call "multi-step finishes."

Multi-step finishes are wood treatments that go beyond merely staining and sealing. They are a bit more difficult than standard finishes, but they also yield more distinctive and gratifying results.

What sets them apart is a group of techniques that allow you to "layer on" the color. You use color very selectively, putting it between coats of finish, or only in the wood pores, or perhaps only in certain areas to add more depth and character to the wood. It's similar to the way a four-color printing press would print a picture of a walnut board. The press would lay down a pattern of yellow, then a pattern of cyan, then magenta, then black. The end result would be a picture of brown wood, even though no brown ink was used. Similarly, a layered wood finish might be brown, but it will look very different from one with just a simple brown stain. (See photos, opposite.)

In this article I'll introduce you to ground staining, pore filling, dry brushing (shown here) and wet glazing—four techniques that you can use in various combinations to create a surprising array of multi-layer finishes. Then I'll share three of my favorite multi-layer finishes with you.

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PHOTOS BY MITCH MANDEL



The techniques of ground staining, pore filling, dry brushing (shown here) and wet glazing can add character to your finishes.

Ground Staining

A "ground stain" is any stain you apply to add background color prior to other coloring steps. Often, this ground stain will bear little resemblance to the intended final color but instead will add highlights, depth or contrast under later "glaze" (stain) coats.

For example, I use bright yellow stain on mahogany to kill the natural pinkish cast of the wood. (See sidebar, "Cordovan Mahogany Finish," page 57.) Later, when I glaze the mahogany with reddish-brown stain, the yellow will work with the glaze to make the wood look deeper and more translucent. Similarly, a reddish-orange ground stain will eliminate the gray cast that is common to black walnut. (See sidebar, "Classic Walnut Finish," page 56.)

A ground stain can also make a piece of furniture appear more uniform by blending the colors of dissimilar boards. I frequently use an amber ground stain on oak, birch, poplar and cherry pieces to blend and brighten the wood below the glaze coat.

I prefer dye stains to pigmented oil stains for ground staining, because they tint the wood without hiding or muddying it. And although any dye stain will work as a ground stain, I prefer water-soluble dyes. They rarely fade, they penetrate deeply, and they give me ample working time. I find that oil-soluble dyes fade too fast, and alcohol-soluble dyes dry too quickly. (For more on dye stains, see "Just Finishing," AW #25.)

Pore Filling

Pore filler, usually known as "paste wood filler," is a thick, semi-paste material used for filling the large pores of woods such as mahogany and walnut. (See "Just Finishing," AW #27.) Normally, pore fillers contain colored pigments. On raw wood, these pigments act like a weak, pigmented stain, tinting the wood's sur-

face in addition to filling the pores with color.

But you may want to color *only* the pores, especially if you've just gone to the effort of ground staining the wood. To do this, seal the wood after the ground stain dries with a thin wash coat of a sealer that's compatible with your intended top coat. I usually use shellac. Since it dries quickly, it "seals in" most dyes (alcohol dyes may bleed), and it's compatible with most finishes. Start with a very thin (1-pound-cut) shellac mixture, and either spray or wipe it on. To wipe it, I dip a cotton rag into the mixture, wet the surface of the

piece of coarse burlap, and allow it to dry completely.

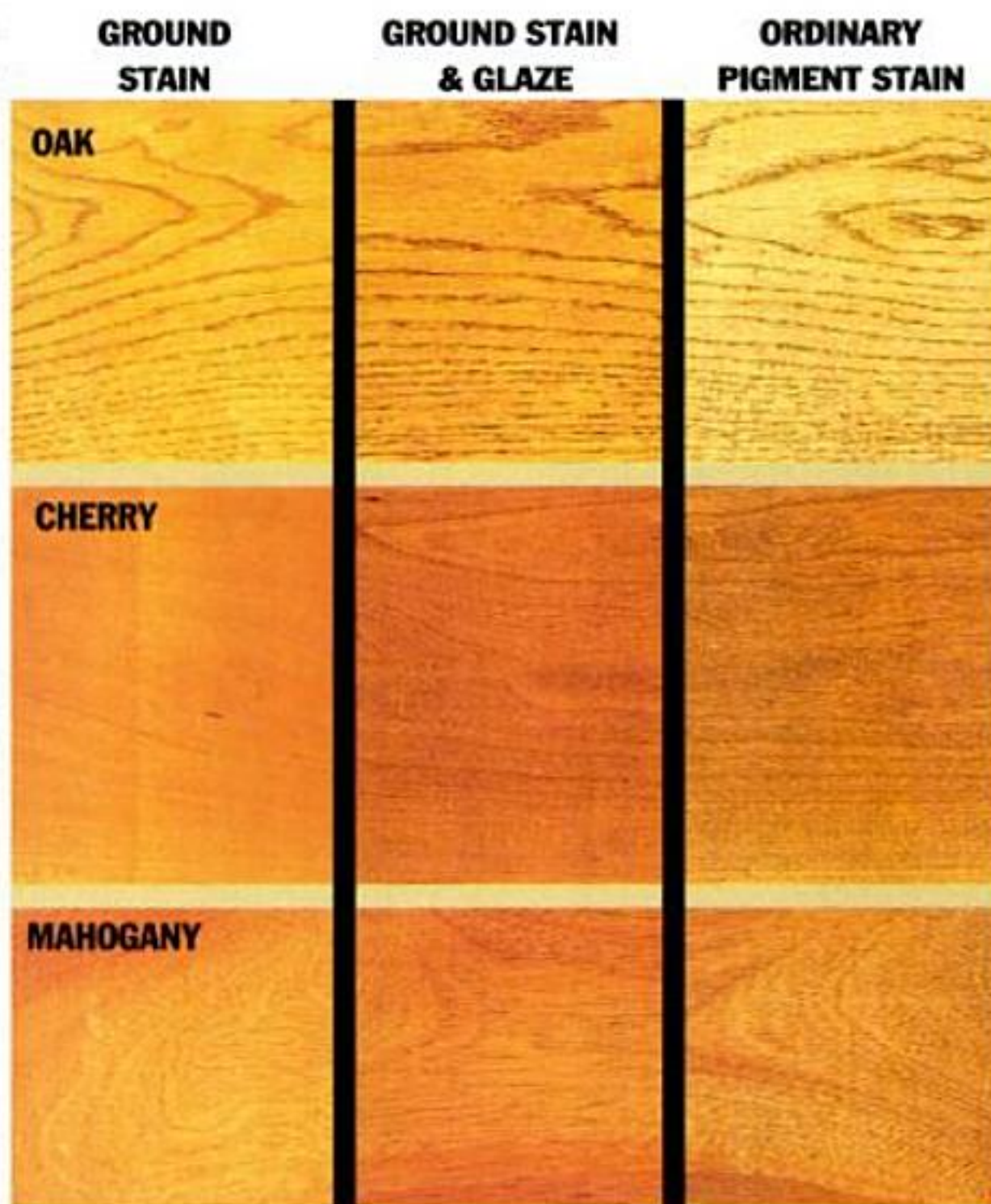
In two or three days, when the pore filler is completely dry, scuff the surface lightly with 320-grit paper to remove any filler residue from atop the sealer. If you cut through your ground stain, touch it up before you go on. Water-soluble dye stains are especially easy to repair. Since they don't stain through shellac, you can simply wipe the original ground stain over the spot and wipe off the excess immediately. The dye will stain the abraded area without affecting the surrounding, sealed wood.

Dry Brushing

Dry brushing is a technique used by finishers to selectively add "dirt" to a piece of furniture, to simulate age or simply enhance the character of a piece. The dry brush can highlight carvings, flutes or raised panels by leaving dark lines on the sharp edges of such details. I also use dry brushing to create shadowy "cathedral" patterns (like the growth rings of flatsawn wood) (see lead photo) on wood that nature has left just a little too plain. I can even coax a bland piece of lauan to masquerade as rich mahogany.

The basic technique in dry brushing is to lightly load a brush with almost-dry pigmented stain, then drag it across a less-than-smooth surface such as raw wood or a heavily pigmented undercoater such as flat paint. As the bristles catch on edges, high spots or pore openings, a random pattern of pigment is deposited.

Your choice of color depends on the effect you want. For natural-looking cathedral patterns, for example, use a color you'd expect to find there—usually a darker shade of the overall wood color. For special effects, use whatever color suits you. I prefer to use Japan colors (see Sources) for dry brushing because they are much more concentrated than regular pigmented stains.



A ground stain (left) followed by a glaze (center) produces a richer looking finish than ordinary pigment stain (right) on wood.

wood, then immediately wipe off the excess. The small amount of shellac that soaks in will prevent the pigment from adding too much color to the wood.

After the shellac has dried for at least an hour or two, thin the filler to the consistency of heavy cream and brush a coat onto the sealed wood. Wait until the solvent flashes off and the filler loses its wet look. Then wipe off the filler across the grain with a

CLASSIC WALNUT FINISH

Every now and then you come across a piece of walnut that just sings with color. The highlights glow with an undertone of warm reddish browns, and each sweeping cathedral pattern defines itself with a slight change in hue. Of course, the rest of the time you are forced to make do with black walnut that is gray and monochromatic. When that happens, try evening the odds with this finishing technique.

The trick is to tint the “cathedrals” of your walnut to simulate the varied hues of air-dried wood. For this you’ll need to mix two alcohol-soluble dyes, one reddish brown and the other with a greenish-brown tint. (Note: If you’ve sealed with shellac, mix the dye powder in a minimum of alcohol, and after you’ve dissolved and strained the dye mix, add an equal part of water to prevent the alcohol from completely redissolving the shellac sealer.)

STEP 1: Ground stain the gray walnut with a weak orange dye.



STEP 2: Seal the wood with a coat of shellac, lacquer or varnish.

STEP 3: Dip a Q-tip or a small cotton cloth pad into the reddish dye. Carefully color several of the “cathedrals,” skipping some in between. The dye will dry almost immediately.



STEP 4: Color some of the undyed cathedrals with the greenish dye. Don’t do every other one—it will look too contrived. You can also try coloring some with both red and green. If you put on too much color, lighten it by gently rubbing it with steel wool. Make sure you blow off all the steel-wool fibers before you put on the next coat of finish.

STEP 5: Apply one or two top coats of the same finish you used for sealing. The finished result is shown below. —M.D.



When dry brushing, author first “loads” his brush by scrubbing the bristles through the stain (left). Then he lightly brushes the desired patterns onto the surface of the work-piece (below).



Mixing the stain for dry brushing is simple. Just thin the Japan color with naphtha until it is the consistency of heavy cream. Then, put a dollop of color onto a scrap board with a small brush.

For the dry brush itself, I prefer a 2-in. double-thick China bristle. The hog’s hair in a China-bristle brush offers just the right amount of spring for dry brushing. To load your brush, scrub the tips of the bristles through the stain in a circular motion until the surface of the blob looks dry. (See top photo.) Now the brush is “loaded.”

To apply the color, pass the brush in a gentle sweeping motion over the areas you want to darken. (See above photo.) Work the flat areas first, saving the sharp edges for when the brush is almost ready to reload. If you get harsh streaks, your brush is too wet. Scrub off the offending streaks with steel wool, then go back to the scrap board and scrub the bristles a bit more, until the stain is dryer, before trying again.

Wet Glazing

Wet glazing is the process of wiping a dark stain onto sealed wood and then selectively wiping off some of the color. The stain (called “glaze” when used this way) cannot penetrate through the sealer. Instead, it sits on top, where it can be manipulated into whatever patterns you desire. You can also “float” the color between layers of lacquer or varnish. This lets each glaze layer act as a transparent color “filter,” producing a deeper, livelier appearance than a single-color stain coat. ([See photo, page 55.](#))

While dry brushing darkens raised or sharp edges on furniture, wet glazing highlights by adding color to the recesses. You've probably seen the classic "antique white" finish, produced by wiping a raw umber glaze over white paint. When the glaze is wiped off, the low areas and inside corners are left darkened. The same technique works with wood-tone finishes; in this case, a dark glaze is applied over a lighter wood or stain. You can also add a uniform film of color over an entire surface by wiping on an even coat of glaze.

Almost any type of pigmented or dye stain may be used for glazing, but certain materials work better than others. In general, a glaze should have a moderately long "open" (working) time, so you can work it before it dries, and its color should be fairly intense so that it will color well, even in a very thin layer. It also helps if it is thin enough to flow, but not so thin that it runs when you want it to stay put. Here are the formulas for some of my favorite glazes:

•**Japan or oil glaze:** Use Japan pigments or artists' oil colors, and start with any color or combination of colors. Mix with an equal amount of boiled (not raw) linseed oil, and reduce the mixture with mineral spirits until it is the consistency of light cream.

Depending on how large or complicated a piece you are glazing, you might want to change the drying time of the glaze. To slow it down, use more oil and less mineral spirits. To speed it up, use naphtha instead of mineral spirits and reduce the amount of linseed oil. For a really fast glaze, omit the oil entirely. Remember, the longer the open time, the more drying time it will need before you can apply a top coat over it.

•**Asphaltum:** By far my favorite glaze, asphaltum is made of either gilsonite, petroleum "bottoms," or both. Gilsonite is a dark brown mineral that comes from one mine in Utah. Petroleum bottoms are the remains from the petroleum distillation process. Since both these substances are hard to find, your best bet is to buy some fiber-free roofing tar (it's the same as asphaltum) at your local hardware store or building supply center. Asphaltum makes a rich brown, semitransparent glaze with overtones of both green and red. It always reminds me of the rainbows that show up on oily puddles after a hard rain.

Asphaltum glaze is made and modified just like Japan glaze, but I usually start with two parts asphaltum to one part linseed oil.



Author adds a wood-grain effect by lightly wiping fine steel wool through a thin coat of wet glaze.

CORDOVAN MAHOGANY FINISH

For an elegant Old-World look on mahogany, this high-gloss, filled-pore finish is just the ticket. "Cordovan Mahogany" involves a stain, a pore filler, dry brushing and one or two glaze coats. The secret is the yellow ground stain that makes an otherwise dark and foreboding finish glow with inner highlights, even on rather unexciting wood.

STEP 1: Ground stain your wood with a light yellow dye stain.



STEP 2: Dry brush some character into the wood with some VanDyke brown, adding "cathedrals," "ribbons" (the appearance of interlocking grain) or highlights. (See photo, opposite page.)

STEP 3: Seal the wood with a coat of lacquer or 2-pound-cut shellac, and allow it to dry.

STEP 4: Fill the pores with a dark purplish-brown filler.



STEP 5: Seal the wood again.

STEP 6: Glaze with two thin coats of burnt umber Japan glaze (if you're using shellac) or asphaltum glaze (if you're using lacquer).



STEP 7: Build on several coats of finish until the pores are filled level, then buff to a high gloss. —M.D.

GOLDEN OAK FINISH

"Golden Oak" is a low-luster, open-pore finish I produce with one stain and one glaze. This finish brings out the best qualities of oak by reproducing the timeless look of rich, aged shellac. I learned about Golden Oak when I first started finishing down in South Florida. At the time, it was wildly popular among the many transplanted Northerners who had grown weary of the dark, "sophisticated" woodwork of their sunless New York City digs.

You can use either lacquer or varnish for your sealer and top coat. Ironically, shellac does not work well as a sealer here, because it's incompatible with the asphaltum glaze.

STEP 1: Ground stain the wood with a water- or alcohol-soluble dye in a sunny golden color. I use Clearwater's "Golden Oak."



STEP 2: When the ground stain is dry, seal the wood with a sprayed coat of lacquer or a brushed coat of varnish and let it dry completely.

STEP 3: Apply a thin, even coat of asphaltum glaze. Allow it to dry overnight.



STEP 4: Topcoat with the same finish you used in Step 2.

STEP 5: Rub the finish to a satin luster. (See "Just Finishing," page 76.)
—M.D.

SOURCES

Dye stains, brushes, pore fillers, Japan colors, Clearwater Color stains and other finishing supplies are available from:

GARRETT WADE

161 Avenue of the Americas
New York, NY 10013
(800) 221-2942
Circle #633

WOODWORKER'S SUPPLY OF NEW MEXICO

5604 Alameda Place NE
Albuquerque, NM 87113
(800) 645-9292
Circle #634

•**Dye glazes:** To make a dye glaze, dissolve oil-soluble dye powder in mineral spirits, then add it to boiled linseed oil. My favorite dye glaze, though, is Clearwater Color Co. water-based stain, straight out of the container.

The easiest way to apply a glaze is to simply wipe it on and wipe it off. The small amount of dye or pigment that remains will add a thin layer of color. For more of a wood-grain effect, try running a piece of steel wool or nylon abrasive pad lightly through the glaze while it is still wet. (See photo, page 57.) This works well on flat surfaces, but carved legs, fluted columns and raised panels will end up with more color in the low areas. If you want to make the color even, use a brush to move the glaze out of the recesses and distribute it on the lighter areas. I like to work with a clean, 2-in. China-bristle brush (the same type I use for dry brushing). Brush from the darker areas to the lighter, and the bristles will lift off glaze and move it around. When the brush gets so loaded with color that it adds glaze instead of removing it, wipe off the bristles into a dry cotton rag.

You can continue to "work" the glaze until it is even—or uneven—enough to suit you. If the glaze starts to dry while you're working it, simply re-wet the surface with more glaze. The beauty of glazing is that you can redo it as many times as you like, and if you're not satisfied with the result, you can wipe it all off and start over.

It's important to keep each coat of glaze color thin. Leaving too thick a layer of glaze can cause subsequent finishes to peel or delaminate. When in doubt, apply your glaze in two or more layers, with a thin coat of your chosen finish after each one.

Be sure to allow plenty of drying time for your glaze. I always allow the oil-based glazes to dry overnight before I topcoat. The water-based Clearwater gels dry in about an hour. After topcoating, scuff the surface very lightly with 320-grit self-lubricating (stearted) sandpaper before applying the final coat of finish. This will remove any dust nibs that may have settled into the glaze.

Incidentally, this wet glaze method is how Gary and I solved the problem of the dining-room table I mentioned at the beginning of the article. It wasn't tough to do, but to tell the truth, we never did figure it out ourselves. The next morning, another local finisher—one with many more

years of experience—stopped by and showed us how to glaze that table. In finishing, good brushes and good materials are important, but they don't hold a candle to good friends. ▲



MICHAEL DRESDNER is a finishing consultant and a contributing editor of *AW*.

GET A GRIP

Hold-Downs Secure Your Work Where Vises & Clamps Can't Reach

By Kevin Ireland



For dovetailing, mortising, planing or carving, a hold-down is often the fastest and best way to grab your work.

In Rob Tarule's shop, the bench hold-down reigns supreme. Whether he's chopping mortises on one of his 17th-century reproductions, planing wavy boards or even cutting dovetails, Tarule relies on the power of a crook-necked iron hold-down to clamp the wood tightly to the bench. No vise needed here.

"For the type of work I do, the hold-down is fast," he explains. "And for chopping rough mortises as the 17th-century joiners did, no question, holding a workpiece to the benchtop with a hold-down gives me more support than a vise would."

While you might not be tempted to abandon your modern vise for the simplicity of Rob's ancient woodworking system, there are still plenty of good reasons to mount a hold-down on your workbench. A hold-down can grip a workpiece at the center of the bench where it's hard to apply force with a standard vise or bar clamp. It can hold a wide board so you can run molding on the outside edge. It can grasp an odd-shaped carving blank or cabriole leg so you can work it from several locations on the bench. And many hold-downs are

quicker to adjust than a clamp or a bench vise.

An Ancient Tool

Hold-downs have been around since the time of the Romans, and they pre-date vises. The traditional hold-down was just an iron bar formed in the shape of a shepherd's crook. (See photo, page 62.) To use it, you dropped the shank in a hole in your bench and put the workpiece under the crooked end. Rapping the crook with a mallet caused the shank to jam in the hole and clamp the workpiece. Piece of cake.

In fact, the design worked so well that many of today's dozen-plus bench hold-downs are simply variations of this old device. But there have been some ingenious improvements, too. To see how the old and new hold-downs compare, I tested a group in our workshop. I checked how easy each is to mount to a 2-in.-thick benchtop, how well each grips stock of varying thickness and shape, and how quickly each clamps and disengages. Then, to see how well each resisted shock, lateral pressure and rotational pressure, I planed, carved and

chopped dovetails, including working parallel to the bench to chop out the end grain. Specific comments appear on pages 60 to 62, but first let me offer a few overall observations:

- In general, I found hold-downs that apply clamping pressure directly over the workpiece, such as the Jorgensen (see page 60), provide more force than those with long lever arms, like the Record on page 61.

- A hold-down's profile will affect how easy it is to use. You can't use hold-downs with long shafts if you have shallow drawers directly below your benchtop, while models that extend far above the bench may get in the way when you're planing or carving.

- If you plan to use the hold-down in several locations, you'll want to consider how badly you'll scar your benchtop when you mount it. Some,



KEVIN IRELAND is managing editor of *AW*.

like the Record, require you to counterbore large holes and install permanent sleeves. Now let's look at the field:

JORGENSEN BENCH HOLD-DOWN



Jorgensen Clamp Co.
(312) 666-0640
Circle #601

Max. Reach: 1¾ in.
Max. Height: 3 in.

Mounts in ¾-in. counterbored hole in benchtop.

List Price: \$13.85
Extra Bolts: \$1.45

As you'd expect from a company that makes high-quality clamps, this cast-iron hold-down (Model 1623) is a solid performer. It grips tightly, and the base is slotted so you can easily slide it off the head of a mounting bolt and remove the hold-down from the bench when it's not in use. (The bolt head then falls into a counterbored hole in the benchtop so it's out of the way.) Jorgensen also makes an industrial version of this hold-down (Model 1834) that sells for \$81.11 and has a maximum reach of 2½ in. and a maximum height of 4¼ in.

Bottom Line

This hold-down is a good choice for small workpieces, although its long screw takes longer to adjust to different thicknesses than other clamps I tested. It resists shock and lateral and rotational pressure, but its reach and height limit its use for large or wide work. It is also useful for drill-press applications.

LEVERCLAMP



MapleTek Engineering
(800) 425-2677
Circle #602

Max. Reach: 3¾ in.
Max. Height: 4 in.

Mounts in ¾-in. hole in benchtop, or in T-channel screwed into slot routed into benchtop. May also be screwed to surface.

List Price: \$39.95
Optional 16-in. T-channel: \$10

A new addition to the market, this hold-down is easy to operate, instantly adjusts to grip workpieces up to 4 in. thick, and clamps with a simple snap of the lever handle.

The Leverclamp is made of heavy stamped steel and comes with a replaceable wooden jaw that won't mar workpieces. You can mount it to your bench with a bolt and wing nut, or rout a slot in your workbench, install the optional T-channel and use the hold-down anywhere along the length of the channel. A thumbscrew on the jaw allows you to repeat clamping settings for production work. Plus, you can regulate the clamping pressure with a single adjustment screw.

Bottom Line

With its instant adjustability, this hold-down is particularly useful if you're clamping a series of workpieces that vary in thickness or height. It resists shock and lateral pressure, but it tends to give under heavy rotational pressure. The Leverclamp would also work well as a quick clamp on the radial arm saw, on the drill press, and on jigs.

QUICK-GRIP HOLD-DOWN



American Tool Co.
(800) 767-6297
Circle #603

Max. Reach: 2¾ in.
Max. Height: 4 in.

Mounts in ¾-in. hole in benchtop, with support bracket screwed to underside of benchtop.

List Price: \$30
Additional Mounting Brackets: \$8 for 2

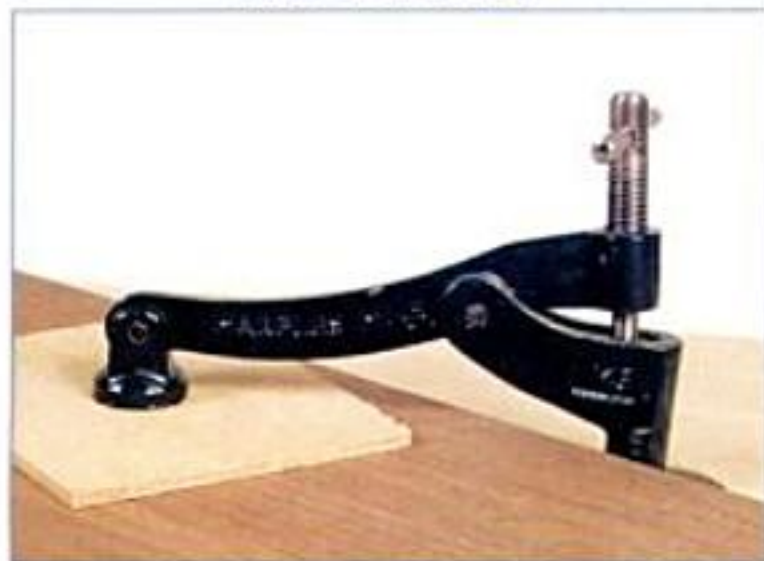
This steel and plastic hold-down is built around the popular Quick-Grip mini-bar clamp and shares both the virtues and failings of that clamp. It's lightweight and easy to adjust; however, it doesn't produce enough clamping pressure for heavy work.

The hold-down fits through a ¾-in.-dia. hole and into a support bracket screwed to the underside of your work surface. This means you'd need to buy additional brackets, or move the one that comes with the hold-down, to use it in more than one location on your bench. A soft plastic pad keeps the metal jaw from marring the workpiece, but in my tests the pad frequently came loose.

Bottom Line

The Quick-Grip hold-down is built for light-duty work, particularly where you need the flexibility to quickly clamp workpieces of varying thickness. It doesn't withstand shock, nor does it hold well under lateral or rotational pressure. It lacks the reach needed for large or heavy work.

RECORD BENCH HOLDFAST



Record Tools
(905) 428-1077
Circle #604

Max. Reach: 5½ in.
Max. Height: 6¾ in.

Mounts in ¾-in. hole in benchtop with 2½-in. stepped counterbore for cast-iron sleeve.

List Price: \$44.70
Additional Collars: \$9.95

Record has updated the traditional hold-down design by adding an adjustable lever arm and a pivoting jaw. The result is a hold-down with more clamping finesse than a traditional hold-down, but less raw clamping pressure.

If you want to move this hold-down (Model M145) around your bench, you'll have to drill several 2½-in.-dia. stepped holes and install more than one cast-iron collar—something woodworkers who own fine benches may be reluctant to do.

The hold-down comes with a swiveling jaw that has a rough, waffle-like pad. The jaw tended to swivel and release when I carved an odd-shaped piece, and the pad grips well but mars the workpiece. Record also makes a larger version of this hold-down (Model M146), which has a 6¾-in. reach and a maximum height of 8¼ in. It sells for \$58.30.

Bottom Line

The Record hold-down is easy to adjust and a good choice for small and large workpieces, provided they're flat or square. It resists shock as well as lateral pressure, but it gives way under heavy rotational pressure. Woodworkers who treasure their benches may have a hard time boring the large stepped hole required to mount this hold-down.

SJOBERGS SWIVELING HOLD-DOWN



Distributed by Garrett Wade Co.
(800) 221-2942
Circle #605

Max. Reach: 4 in.
Max. Height: 6 in.

Mounts in 1½-in. hole in benchtop.

List Price: \$59.95
Additional Sleeve: \$2.95

This cast-iron and steel hold-down combines the simplicity of a bar clamp with the ease of use of a traditional hold-down. For rough height adjustments, you just move the bar up and down in a steel sleeve that's counterbored into the bench. Once the hold-down is in place, you crank a screw to apply pressure.

The hold-down comes with a 2¾-in.-wide nylon ball-and-socket jaw that will swivel to grip objects of any shape—and grip them tightly. The only downside is mounting and relocating the hold-down. You need to drill a 1½-in.-dia. hole in your benchtop wherever you use it.

Bottom Line

This hold-down was my favorite. It adjusts easily and resists shock as well as rotational and lateral pressure. The wide, swiveling nylon pad makes it especially useful for carving. However, the large mounting hole may discourage some people from installing it in a fine workbench.

T CLAMP



Distributed by Grizzly Imports
(800) 523-4777
Circle #606

Max. Reach: 3 in.
Max. Height: 3 in.

Mounts in ¾-in. hole in benchtop, or in T-channel screwed into slot routed into benchtop.

List Price: \$12.95
Optional 24-in. Aluminum T-channel: \$19.95

The greatest attribute of this anodized aluminum hold-down is size. It mounts in a ¾-in. hole, and the body and bolt only protrude 4 in. above the table.

You can mount the T Clamp in a dog hole, so it's easy to relocate if your bench is set up that way. Or, as with the Leverclamp, you can rout a slot in your benchtop, install an optional T-channel and use the T Clamp anywhere along the length of the channel. You spin a wing nut to adjust it vertically, which makes it slower than some of the other hold-downs.

Bottom Line

This inexpensive hold-down would work well for small and thin work, but it doesn't have the capacity to handle thick workpieces. It resists shock, but the jaw's small bearing surface allows workpieces to shift under heavy lateral and rotational pressure. The T-Clamp would also work well on the radial arm saw and on jigs.

TRADITIONAL HOLD-DOWN



Distributed by Garrett Wade Co.
(800) 221-2942

Circle #607

Max. Reach: 6 $\frac{1}{4}$ in.

Max. Height: 12 in.

Mounts in 1 $\frac{1}{8}$ -in. hole
in benchtop.

List Price: \$35.95

VERITAS DELUXE BENCH HOLD-DOWN



Veritas Tools Inc.
(800) 667-2986

Circle #608

Max. Reach: 7 $\frac{1}{4}$ in.

Max. Height: 9 in.

Mounts in $\frac{3}{4}$ -in. hole
in benchtop.

List Price: \$49.95

WISE-GRIP HOLD-DOWN



American Tool Co.
(800) 767-6297

Circle #609

Max. Reach: 2 $\frac{3}{4}$ in.

Max. Height: 4 in.

Mounts in $\frac{5}{8}$ -in. hole
in benchtop.

List Price: \$27

This forged steel hold-down's design was old when George Washington was woodworking on a cherry tree, but it still proves remarkably useful. With the tap of a mallet you can quickly adjust it to handle thick or thin workpieces. And varying clamping pressure is simply a matter of varying how hard you rap it with your mallet.

On the downside, the long bar means you can only use it on a bench with a good deal of clearance under the work surface. Also, setting and removing the hold-down can damage the holes in the benchtop, particularly if your benchtop is less than a couple of inches thick.

Bottom Line

This hold-down shows it's not always easy to improve on the old ways. It can handle workpieces of widely varying thickness. It also resists shock and rotational and lateral pressure.

When Veritas Tools designs a product it likes to improve on what's already on the market, and its hold-down is no exception. This steel and aluminum alloy hold-down works much like the Record version does—it has a traditional hold-down body with an adjustable lever arm. But unlike the Record, you can mount the Veritas in a simple $\frac{3}{4}$ -in.-dia. dog hole, so it's easy to move around the bench.

This hold-down is easy to adjust, but I found it difficult to apply heavy clamping pressure because the sharp-edged brass knob was hard to grip.

Bottom Line

The Veritas hold-down is a good choice for flat or square workpieces of any size. It resists shock as well as lateral pressure, but it gives way under heavy rotational pressure. It requires less clearance below the benchtop than the other hold-downs that are based on the traditional design.

Anyone familiar with a pair of Vise-Grip pliers will understand how this hold-down works. Made by the same company that makes the pliers, this stamped steel hold-down is held to the bench with a wing nut, so it's easy to relocate if you have dog holes on your bench. And the jaw is covered with a nylon pad, so it won't mar the workpiece. On the downside, this hold-down is slower to adjust than some of the other models, and it only has a 2-in.-long mounting shaft, which means you can't fasten it to a thick benchtop.

Bottom Line

The Vise-Grip hold-down is good for small workpieces. It resists shock and lateral pressure but tends to give way under heavy rotational pressure. It would work well as a clamp on the radial arm saw, on a drill-press table and on jigs. ▲

SEATING MADE SIMPLE

A Comfortable Combination of Wood and Canvas

by Simon Watts

Carolyn and John Grew-Sheridan are furniture makers who live and work in San Francisco's Mission district. They've made a large number of chairs over the years, but this design remains one of their favorites. "We like it," says Carolyn, "because it's straightforward and can be made with simple tools and materials."

It's one of my favorite chairs, too. I find the canvas seat and back very comfortable, and it gives my lower

back plenty of support. And since the canvas "gives" when you lean against it, you're less likely to tip the chair back on two legs, which might strain the joints.

The rectilinear design (every piece except the back supports meets at a right angle) has two advantages: It greatly simplifies the joinery, and allows you to easily change the dimensions. "You shouldn't have any qualms about modifying this chair to fit your own special needs," says Carolyn. "For example, you can make it wider or raise the height of the arm rests."

What you should not do, the Grew-Sheridans emphasize, is reduce the cross-sections of the components, which

might weaken the structure.

Whether or not you modify the dimensions, the Grew-Sheridans recommend that you make an extra piece for each element—for example, three side rails instead of two. Then you can make all the trial cuts on the spares and keep them as patterns in case you want to build more chairs.

Making the Chair

Since the joinery is basic, I won't describe every step. Instead, I'll offer some tips the Grew-Sheridans suggest for the tricky parts of construction.

The chair in the photo is made of red birch, but you could use walnut, cherry or any strong, stable wood. The seat and back are made from two layers of 10-oz. cotton canvas (available from local tent or awning supply stores) stitched together around the perimeter. (See Fig. 2.) To stiffen the seat, a piece of 1/2-in. high-density foam is stitched between the layers. Both seat and back are locked in place with wooden dowels as shown in the detail photos and Fig. 1.

Start by making up the two side frames as sub-assemblies. Each of these consists of a front and back leg, an arm rest and a side rail. (See Fig. 1.) To cut the bridle joints, you can use a handsaw or work on the table-saw with a sharp carbide blade. For safety, be sure to use some kind of tenoning jig on the table-saw. Cut the mortises first, then make trial cuts on scrap until you can create a tenon that fits snugly.

You'll need a plunge router and 7/16-in. straight bit to rout the through slots in the side rails. One way to guide the slanted cut is to make a tapered wedge and temporarily hot-glue it to the edge of the rail. Then use the wedge to guide your plunge router's fence. After routing, smooth

This chair's rectilinear design keeps the joinery simple and lets you change the dimensions to suit your needs.



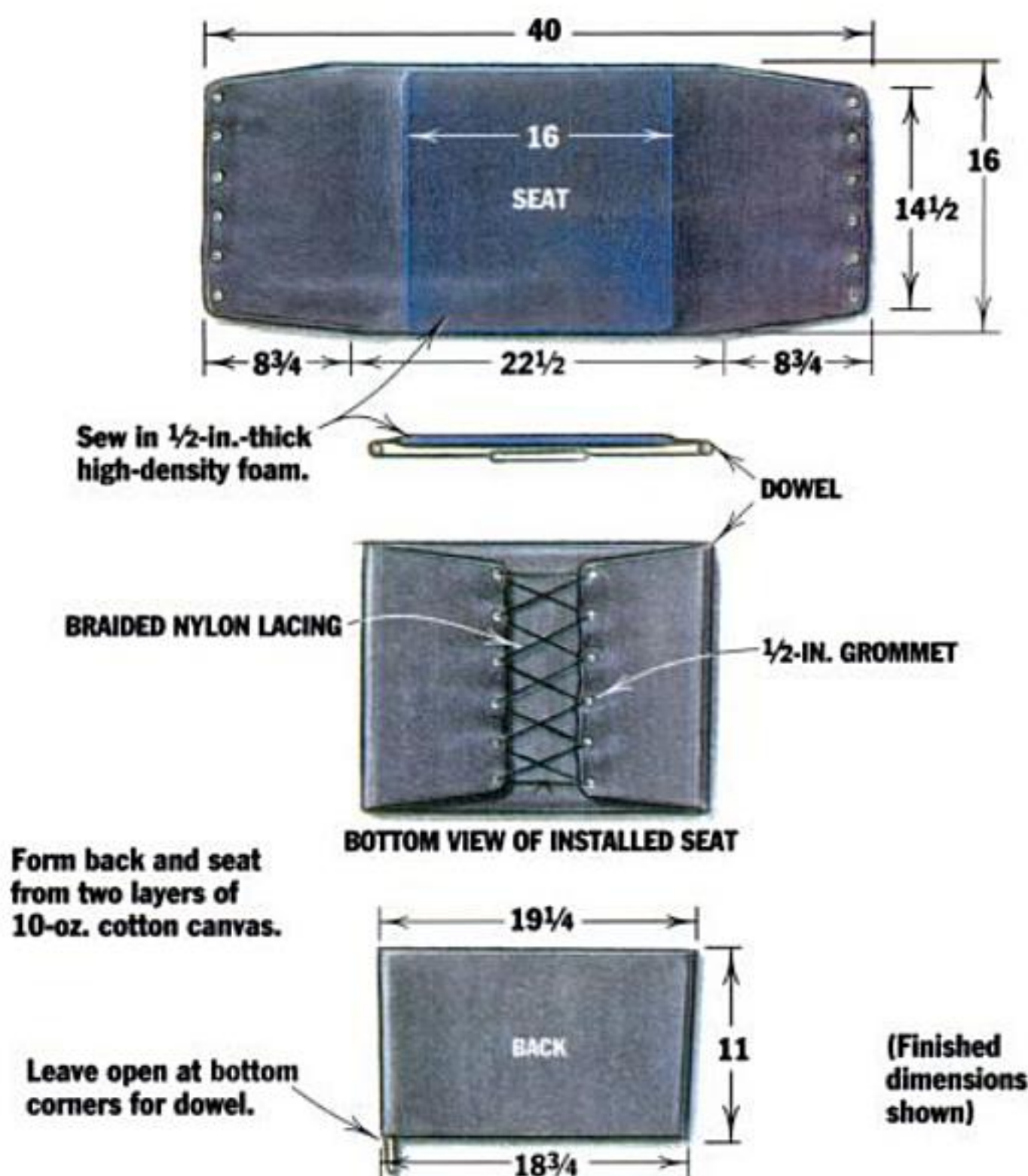
Route slot and enlarge center with rotary rasp to receive dowel and canvas.

**5/16-in.-dia. dowel
holds canvas.**



ILLUSTRATIONS BY BOB LAPORTE

FIG. 2: CANVAS SEAT & BACK



The ends of the seat fit through slots in the side rails. A dowel slips into a pocket at each end to hold the seat in place.



Dowels slip into pockets sewn in the ends of the seat back, then the canvas and dowel slide into a slot in each back support.

the edges of the grooves so they won't cut into the canvas.

Next, cut mortises in the legs for the side, front and back rails. (For tips on mortising by machine, see AW #26.)

Now dry clamp the side frames and ease the edges with a 3/8-in. round-over bit, leaving the stock square where the front and back rails will join the legs, and where the back supports meet the arm rests and side rails. The outer edges of the side rails aren't flush with the legs, so you'll have to remove the rails to finish rounding them. If you'd rather work by hand, you can round all the edges with a block plane and sandpaper affixed to a cork block.

After gluing up each side frame you can make the two back supports. You will have to cut a keyhole-shaped stopped groove (see above right photo and Fig. 1) in each back support to accept the dowel that holds the canvas back in place. The Grew-Sheridans do this in two steps: They first rout slots with a 5/16-in. straight bit; then they use a 7/16-in.-dia. ball-shaped rotary

rasp (available from S&W Tool, 1014 Liberty St., Allentown, PA 18102, 215-434-5457) in the router to enlarge the slots to the correct profile. Use a double fence and a stop so that you can withdraw the bit safely.

You could also make each back support in two halves, rout a semicircular channel in the pieces with a 1/2-in.-dia. core-box bit, then glue the two halves together. If you choose to do this, be sure to clean any glue squeeze-out from the inside of the groove.

Next, you'll need to notch the arm rests to receive the back supports and notch the lower end of the back supports to fit around the side rails. (See Fig. 1.) The easiest way to do this is to hold the back support in the position indicated in the detail in Fig. 1, then scribe marks to indicate the notch locations. You can cut the notches by making multiple saw kerfs and removing the waste with a chisel, or you can set up a template and waste the notches with a straight bit in a router. Glue and screw the side

supports in place, then plug the screw holes with 3/8-in. plugs.

To finish up, glue the front and back rails into the side frame assemblies.

The chair shown here is finished with a mixture of linseed oil and varnish thinned with turpentine. Tung oil varnish or Watco oil finish would do equally well.

Fig. 2 shows how the canvas for the seat and back are cut and sewn together, but unless you have an industrial sewing machine and know how to sew, it's best to find a sail maker or tent and awning business to do this work and install the grommets. I'd suggest you provide them with full-size patterns of the chair back and seat, along with a completed chair frame. ▲



SIMON WATTS is AW's West Coast editor. He teaches wooden boatbuilding at the San Francisco Maritime Museum.

TURNING FI

Easy to Work With Simple Tools, This Soft Stone Holds a Surprise at Every Turn

By William E. Sargent

When people first see small vessels like these that I've turned from dendritic talc, they assume the beautiful fernlike patterns must be painted on. Not so: The patterns are actually part of the soft stone itself—flower jewels created by nature at her finest.

Dendritic talc is much like the common white talc from which we

through as grayish "clouds," adding a mysterious effect to a finished piece.

Properties of Talc

Talc has a hardness of 1 on Mohs' scale (diamond is 10), so it saws and turns quickly. It is friable, meaning it's likely to crumble, but if you employ a

Supplies USA, 1287 E. 1120 S., Provo, UT 84606, 801-373-0917, and Blue Gem Agate Shop, 7315 10th Ave. SW, Alexandria, MN 56308, 612-762-1973). It is sold by the pound, and since it is mined by blasting, pieces weighing over 10 pounds are rarely available. Pieces large enough to turn bowls 10 to 12 in. in dia. are extremely rare. Besides, the material is so dense (with a specific gravity of 2.6 to 2.9) that a cubic ft. weighs between 162 and 180 pounds—a mite heavy for an average-size lathe. I prefer to start with rough pieces between 4 and 10 pounds—enough to produce small turnings. A 4-pound block may yield a bowl about 4 in. in dia. by 2 in. deep.

Talc is subject to fractures, both natural and resulting from the mining process. You can try sealing clean cracks with cyanoacrylate glue (available from Craft Supplies USA, 801-373-0917), but I don't recommend it. If there is any talc dust in the crack you won't get a good bond, and even if the glue holds, it will show as a brown line when the turning is finished. Since fractures are usually visible on the surface, I eliminate these areas when I lay out and saw my blanks from the rough stone.

Black line fractures, like the one shown at the top of the opposite page, pose the greatest problem. These occur when the manganese dioxide forms in a layer. The talc is sure to come apart at this line, so you're best off breaking apart the block before that happens and making smaller bowls.

I recommend wearing a dust mask during turning, because the talcum powder which comes off the turning has a drying effect on the nose tissues and skin. Also be aware that talc has an annoying trait of producing a high static electrical charge when passing through a shop vacuum or dust collector.



Figured talc vessels like these can be turned on the lathe with scrapers.

Because large blocks of this soft stone are rare and extremely dense, it's most often used for small turnings. These vessels are shown at three-quarters actual size.

get talcum powder. In fact, it is mined from pockets within larger deposits of regular white talc. But this figured talc has an added element, manganese dioxide, which forms the fernlike patterns that are called dendrites. (See photo, above.) The patterns run throughout the talc, so new dendrites appear with each slice of your turning tool. Also, dendritic talc is translucent enough that the patterns below the surface show

gentle touch when turning it, you can master the substance. My success rate initially was 45 percent, but now my yield is better than 98 percent.

I do most of my turning with small detail scrapers (set available from Woodcraft, Box 1686, Parkersburg, WV 26102, 800-225-1153), but I sometimes use a 1½-in. round-nose scraper for the initial shaping of a large block.

Dendritic talc comes in irregular shapes and sizes (available from Craft

TURNED TALC

Working With Talc

I prepare the material for turning by sawing out the blank on a bandsaw equipped with a skip-tooth blade. (Talc dust will find its way into every nook and cranny in your shop, so it's best to saw outside.) Then I square both ends of a blank with the saw, and sand one end flat with a belt sander and 50-grit emery paper, again outside the shop.

To mount the blank on the lathe, I glue the talc to an auxiliary wooden faceplate with Devcon 5-Minute Epoxy. Talc has a slippery feel, and no adhesive will bond to it if any dust remains on the surface. So, before applying epoxy I wipe the surface of the talc with a slightly dampened paper towel. (Don't try to substitute another adhesive for the epoxy. I've found that two-sided tape won't bond to talc, and cyanoacrylate glue doesn't have sufficient holding power.)

After the epoxy hardens I mount the faceplate to my special chuck/faceplate combination. (See middle photo at right.) This consists of a 2-in.-long piece of steel with male threads on one end that mate with the female threads in my faceplate. I mount the other end of the round stock in a four-jaw chuck. This allows me to move the faceplate in any direction so I can precisely center a blank after it's mounted, reducing waste.

Turning Talc

I turn the outside of the bowl first and support the talc block with the tailstock while roughing out. (*Caution:* If you use a center that has a sharp point, insert a small piece of wood between its point and your blank. Otherwise, the pressure focused at the point will consistently break the blank.)

I turn at the slowest possible speed—450 rpm on my lathe—because this gives me greater control when using my scrapers. It's also much

safer to turn at this speed, since high speed can cause a blank to come apart.

To turn the inside, I part off the bowl, cut an $\frac{1}{8}$ -in. recess in the wooden faceplate and glue the bowl in the recess. (See bottom photo.) I use hot-melt glue here because it doesn't make a permanent bond to the talc and won't damage the finished surface. To get a good bond, I apply several layers of glue to build up a fillet. Note that it's important to keep the glue out of the recess; otherwise it will be impossible to remove the bowl.

After remounting the bowl blank, I hollow the interior. Don't be tempted to drill the interior; it's likely to crack. Also, don't lever against the bowl when removing it from the faceplate, as this, too, is likely to crack it. Instead, catch the edge of the glue bead with a knife blade and pull it away from the perimeter of the bowl.

I sand and polish the surfaces as I turn. I go over the exterior lightly with a well-worn piece of 220-grit stearated sandpaper—new paper will cut too deeply in the soft stone. Then I wet-sand the surface with 600-grit wet-or-dry paper and water to produce a satin finish. For a high shine I use Novus II liquid polish (available from Craft Supplies, 801-373-0917). No additional surface treatment is necessary, although I may apply a coating of carnauba wax for a higher luster.

Once you've tried turning dendritic talc, I think you'll see why I'm so enthralled with it. It's versatile, easy to work and absolutely beautiful. Best of all, it challenges you as a turner to make artwork that's so beautiful, no one can resist admiring it. ▲



WILLIAM E. SARGENT is a retired research and development engineer who turns talc and wood in Arizona.



When a turning blank has a black line fracture like this one, it is sure to break. Author splits blanks like these into smaller chunks to turn miniature pots.



Author screws faceplate to a 2-in. piece of steel and then mounts this in a four-jaw chuck whose jaws move independently. This allows him to precisely center a blank after it is mounted.



After the outside is turned, the bowl is reversed and then glued to a recess cut in a wooden faceplate. To get a good bond, author builds up layers of hot-melt glue.

FORESTS IN CRISIS

1.3 Acres
of Tropical Forest
Are Cleared Every Second.
Buying "Certified Wood"
From Sustainable Forests
May Help Slow
the Destruction

by Scott Landis

Until recently, I only considered three factors when buying wood: How does it work? How does it look and how much does it cost? Lately, I've added two more factors to the equation: Where does the wood come from, and how well managed is the forest in which it is grown?

Ecological aspects of wood use are much more difficult to assess than functional or aesthetic qualities. They plunge us into the unfamiliar waters of forest management and environmental politics. For those of us who turned to woodworking as an escape from such frustrations, their intrusion on our precious refuge is unwelcome indeed.

Still, the threats to forests all over the world are real. In Siberia, the Amazon, Indonesia and our own Pacific Northwest, old-growth forests are rapidly being destroyed. Commercial supplies of prized species such as Brazilian rosewood (*Dalbergia nigra*) and Cuban

mahogany (*Swietenia mahagoni*) have simply been exhausted.

What does this mean to woodworkers? Higher prices, declining quality and shortages of species such as rosewood and ebony. But it's not just exotic imports that are affected. Recent increases in the price of domestic wood products—from framing studs to cherry lumber—are directly related to forest management problems at home and abroad.

Less tangible, "quality-of-life" issues associated with forest destruction, including global warming, species extinction and the loss of wilderness or animal habitat are of concern as well, but their relationship to woodworkers is less immediate and less clear.

My interest in sustainable forestry was kindled in 1989, when I joined John Curtis of The Luthier's Mercantile—a California firm that sells instrument-making supplies—on a

scouting trip to Peru. Curtis was about to oversee the company's first importation of tropical hardwoods from the Yanesha Cooperative, a group of native Peruvians which was pioneering methods of natural forest management. (See sidebar, page 70.) Exotic-sounding species like *almen-dro*, *chontaquiro amarillo* and *turupay* were intriguing, but so was Curtis's suggestion that buying these unfamiliar woods might actually help save the rain forest.

If that sounds illogical, consider this: Roughly half of the world's wood is burned for fuel. In the tropics, the vast majority of forested land is converted to cattle pasture or farmland that is capable of supporting marginal agriculture for only a few years. Valuable furniture-wood species such as rosewood and mahogany act as catalysts in a chain reaction. The roads that are built for their extraction provide access to settlers who have no

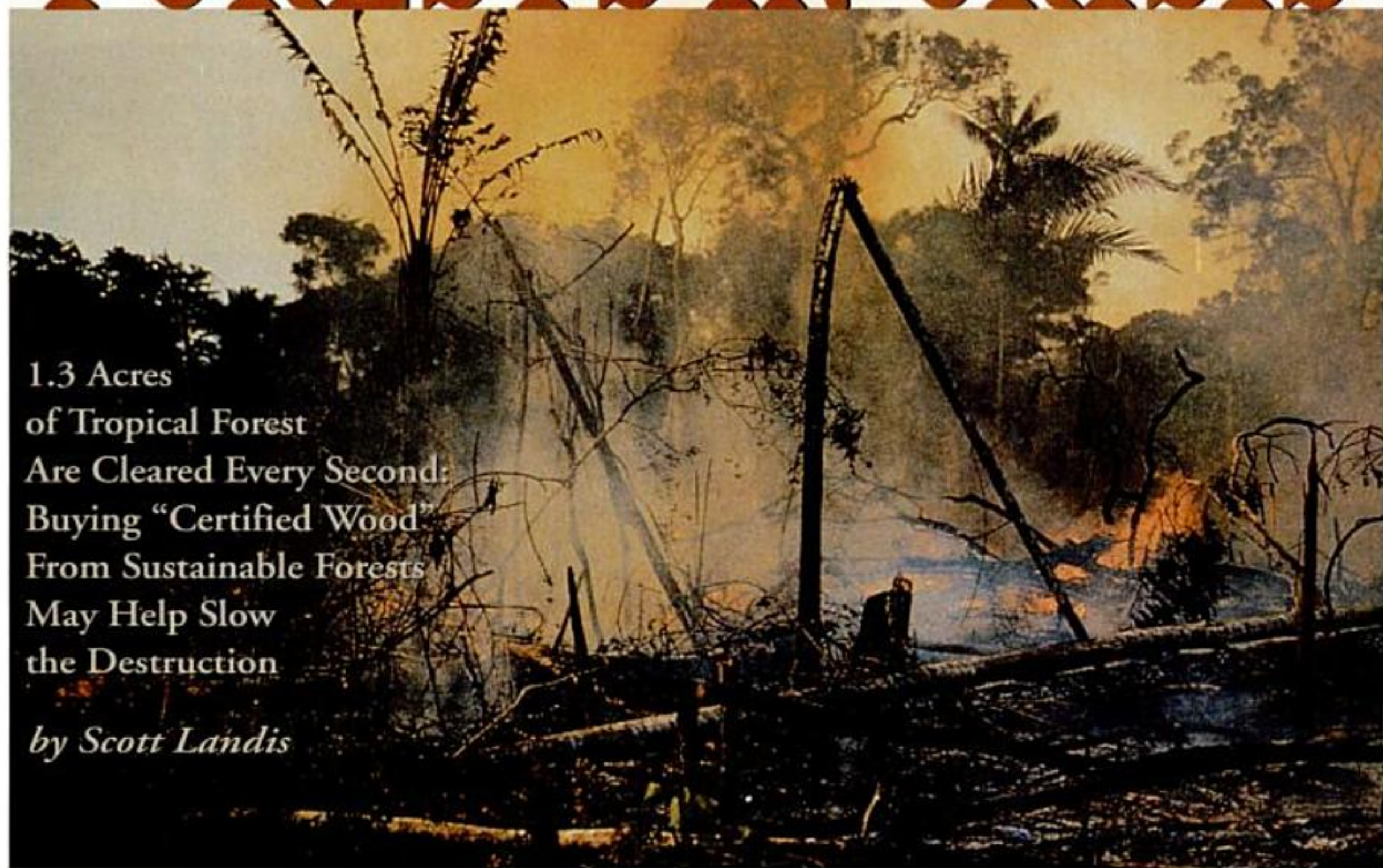


PHOTO COURTESY OF GIMAS PROJECT

reason to preserve the forest once the relatively few marketable trees have been removed.

Curtis was betting that if markets could be developed for a wider range of tree species, rain-forest dwellers and tropical governments would have an economic incentive to manage forests for the long haul instead of cutting them down for quick, short-term profit.

In other words, even though North American woodworkers—and small shops, in particular—consume very little of the world's tropical timber, woodworkers might be able to play a central role in the rain forest's preservation by creating a market for more types of trees.

When I returned from Peru I realized how confused North American woodworkers and wood retailers were about the state of the forests and the best course of action to take. Polarizing tactics, such as tropical-wood boycotts and tree spiking in the Pacific Northwest, were promoted by the more radical environmental organizations. Many in the timber industry were clinging to business as usual. Some woodworkers had stopped using tropical wood, while others were hoarding it. Most recognized a problem, but few understood the complex relationship between wood use, economics, and forest destruction. Fewer still had a constructive plan of action.



Certification:

Know Your Source

Out of this confusion emerged a number of organizations supporting responsible forest management. Several sponsor wood-certification programs that make it possible for woodworkers to identify and purchase wood from "well-managed" forestry operations.

The Rainforest Alliance launched its "Smart Wood" program in 1990 by certifying two sources of tropical woods in Java and Honduras. Today, the Smart Wood program certifies five different "good wood" sources in five tropical countries, and 20 or more retail companies that carry wood products from these sources.

Scientific Certification Systems (SCS) of Oakland, California, was the first to certify North American production forests in Wisconsin and northeastern California.

The SCS "life-cycle" analysis traces wood products through their entire

Rain-forest destruction. Once marketable trees have been harvested, the remaining growth is felled and burned to clear land for farming or cattle grazing. Once cleared, rain-forest soil can support agriculture for only a few years before the soil is exhausted and another patch of forest must be cleared.



chain of harvest, manufacture, distribution and disposal. SCS evaluates forest producers according to their performance in three categories: sustainability of timber resources, maintenance of the forest ecosystem, and socioeconomic benefits to the surrounding community. The best commercial forests—such as the Collins-Almanor Forest in California—are designated "state-of-the-art."

Beginning in the fall of 1993, the Home Depot home-center chain started marketing SCS-certified Collins-Pine wood in its Phoenix, Arizona, stores. Other wood dealers such as Sea Star Trading of Newport, Oregon, and EcoTimber International of San Francisco, are importing wood and veneer from well-managed sources in

Conserving Wood: What You Can Do Right Now

- ◆ **Choose your wood carefully.** Ask your supplier for "certified" wood products from tropical and domestic sources that practice sustainable forest management. Responsible resource management isn't just a tropical problem. Experiment with lesser-known tropical woods and lesser-used domestic species. Look for alternatives to seriously depleted species.
- ◆ **Use recycled or salvaged woods.** You can find good wood in packing crates and pallets as well as in old buildings slated for demolition. Also consider the exciting prospects in your own backyard. Large quantities of "junk" wood are trimmed from parks and city streets all over the country. A small bandsaw or chain-saw mill can convert a gnarly old front-yard maple into perfectly good lumber; knotty crotch wood can make wild-looking bowls.
- ◆ **Get the most from the woods you use.** Veneers, resawn solid woods and engineered wood products such as plywood and particleboard can greatly extend the application of precious species. Save wood in the kerf by using thinner saw blades. Use a bandsaw for resawing instead of a tablesaw (it's also less dangerous) and minimize planing waste by sawing your stock as close to finished dimensions as possible (which also saves wear and tear on your equipment).
- ◆ **Think beyond your workshop.** Eighty percent of all domestic softwood lumber is used in construction, and the average American house has increased in size by nearly 30 percent in the last 20 years. Consider smaller, more efficient approaches to house construction and renovation, using recycled or reconstituted materials wherever possible.
- ◆ **You get what you pay for.** Responsible forest management, like quality furniture, costs more. Expect to pay more for wood from "well-managed" forests. You can't expect producers to shoulder the burden alone.
- ◆ **Quality lasts.** Finely crafted wood products add the greatest value to a precious resource.

—S.L.



PHOTOS COURTESY OF SEA STAR TRADING CO.

Natural regeneration is one form of sustainable forestry. The photo at left shows where a rain-forest tree was harvested. The forest around the tree remains intact to naturally reseed the area damaged by the falling tree (center). The photo at right shows the site where a tree was harvested two years ago. You can see the amount of regrowth that has occurred naturally.

Mexico, Belize, Papua New Guinea and the Solomon Islands. These woods are distributed through a small but growing network of retail suppliers across the country. (See sidebar, page 71.)

Many of these certifiers, wood

dealers and manufacturers were represented at the founding conference of the Woodworkers Alliance for Rainforest Protection (WARP), which was held in 1990. Since its founding, WARP has played a prominent role in educating wood users about forest

management issues.

WARP's membership includes woodworkers, wood and tool dealers, architects, biologists, environmentalists and consumers. Knitting together these diverse interests, WARP promotes sustainable forestry using the "carrots" of positive market incentives instead of the punitive "sticks" of boycotts or tariffs.

But you can't promote "sustainable forestry" until you can define it. There's a lot more to sustainability than simply growing more trees than you cut. It involves a complex balance of environmental, social and economic considerations.

The Forest Stewardship Council (FSC) recently established nine principles that lay the groundwork for defining sustainable forest management. Addressing a range of issues—from legal land tenure to forest management plans—these FSC principles are designed to help certifiers evaluate lumber producers' management practices and their impact on the local environment and community. The FSC aims to set a universal standard for consistent, sustainable forest management.

Supply and Demand: Lies, Damned Lies and Statistics

As promising as these ventures are, certification alone won't put an end to the world forest crisis. The issue is not only where we buy the wood, but how much we use and how well we replace it. If we don't reduce the overall volume of the wood we consume—at home and abroad—no amount of certification or well-intentioned "green

Trail Blazers

Two hardwood producers have gained a reputation for responsible forest management. A continent apart, with radically different terrain and tree species, the Menominee Reservation in central Wisconsin and the Yanesha Cooperative in the Amazon rain forest of Peru provide two different models of "sustainable" forestry.

The Menominee forest produces roughly 30 million bd. ft. of hardwood and softwood timber per year—more than 2 billion bd. ft. since cutting began in 1865. What's more, this carefully managed operation produces a higher volume and better quality of timber now than when the land was first surveyed in the last century.

Menominee is no wilderness. Roads everywhere lead to skidder tracks and stumps. Tree harvesting is managed intensively through regular inventories and data collected on hundreds of test plots. Only about 25 percent of the reservation is managed in small clearcuts or in plantations. The rest is "natural" forest, allowed to regenerate on its own. The secret, as Menominee forester Steve Arnold told me, is simple: "Instead of cutting the best, we cut the worst."

The Menominee forest was the first in North America to be certified as "well managed" by Scientific Certification Systems, a not-for-profit environmental assessment company based in Oakland, California.

The Yanesha Cooperative in Peru follows a "strip-shelterbelt" system of harvesting in which narrow strips, roughly 50 meters wide, are clearcut in the forest. The strips simulate what occurs naturally when a giant tree topples in the rain forest, clearing a path as it falls. The area adjacent to the clearcuts is left untouched to maintain the forest habitat and promote natural regeneration within each strip.

The Yanesha make use of all wood harvested. Limbs and tops are converted to charcoal, small trees are sold for utility poles and construction posts, and the best sawlogs are milled for lumber. Although it is still experimental in nature—and much smaller in scale than the Menominee operation—the Yanesha cooperative has exported several containers of lesser-known tropical hardwoods to the U.S. and England.

—S.L.

marketing" will prevent the world's forests from being depleted.

According to the United Nations Food and Agriculture Organization, the world is losing its tropical forests at the rate of almost 42 million acres per year—up 50 percent from a decade ago. The greatest deforestation occurs in Latin America (20.5 million acres per year) with Africa (12.4 million acres per year) and Asia (8.9 million acres per year) close behind.

The outlook seems brighter in North America. According to the U.S. Industrial Outlook 1993, domestic timber inventories in the United States are growing at a faster rate than they're being cut.

But as good as that sounds for the country as a whole, on closer inspection the picture is not so rosy. This is especially true in parts of the country that rely heavily on softwood production, such as the Pacific Northwest, where more than 100 mills have closed since 1991.

Statistics can also be misleading. When a timber company boasts of planting two or three trees for every one they cut, you don't need a calculator to figure out that it will take an army of seedlings (and many decades) to replace the volume of wood—not to mention the quality of lumber—contained in one old giant.

According to the Center for Resourceful Building Technology in Billings, Montana, the extensive timber inventories often cited by industry representatives won't reach maturity for another 10 to 20 years in the South and 30 to 50 years in the West. What's more, industrial forestry practices too often replace diverse and dynamic forest systems with single-species tree plantations.

Plantations have their purpose—especially where they replace land that has been severely degraded—but they are much more vulnerable to disease than natural forests, and they severely limit the range of available biological resources. A cure for cancer or AIDS is more likely to be discovered among the vast diversity of plants and insects in the tropical rain forest than on the lushest tree farm.

Domestic hardwood inventories are much stronger than softwood, mainly because we've been exporting more

softwood than hardwood and supplementing our own hardwood requirements with tropical timber. But we've depleted many stands of the best hardwood specimens. Less than 5 percent of the original old-growth forest remains in the lower 48 states.

On the consumption side, a lot of wood is just wasted. The pallet industry, for example, accounts for roughly half of all hardwood timber cut down in the U.S. each year. Fully half of these pallets, skids and packing crates are used once and discarded, accounting for an estimated 40 percent of the country's total wood waste.

Hope for the Future

A lot has happened in the few short years since WARP's founding conference in 1990. The task that remains is daunting. But of all the causes for hope, the greatest may be found in the new collaborations between wood users and conservationists. Old barriers between industry, environmentalists and producers are breaking down. The very notion of "sustainable" forest management has begun to take root in popular culture. If we woodworkers hope to



preserve our craft—as well as our forests—for our children, we must nurture these roots. ▲

SCOTT LANDIS is a writer and photographer in Maine. He is the director of the Woodworkers Alliance for Rainforest Protection.

For More Information

For more information about wood certification and sustainable sources, contact:

Forest Stewardship Council
P.O. Box 849, Richmond, VT 05477
(802) 434-3101

Rainforest Alliance
65 Bleecker St., New York, NY 10012-2420
(212) 677-1900

Scientific Certification Systems
One Kaiser Plaza, Suite 901
Oakland, CA 94612
(510) 832-1415

Woodworkers Alliance for Rainforest Protection (WARP)
One Cottage St., Easthampton, MA 01027
(413) 586-8156

Tropical "Good Wood" Suppliers

The following dealers sell tropical wood from certified "well-managed" sources. Many also carry wood from uncertified sources; be sure to ask.

A & M Wood Specialty Cambridge, Ontario, Canada	(519) 653-9322 Circle #610
Almquist Lumber Blue Lake, CA	(707) 668-5652 Circle #611
Appalachian Interiors Maryville, TN	(615) 984-4989 Circle #612
Berea Hardwoods Brook Park, OH	(216) 234-7949 Circle #613
Buchner Design Studios San Francisco, CA	(415) 822-7300 Circle #614
Crosscut Hardwoods Portland, OR	(503) 224-9663 Circle #615
Cut & Dried Hardwoods Solana Beach, CA	(619) 481-0442 Circle #616
EcoTimber International San Francisco, CA	(415) 864-4900 Circle #617
Edensaw Woods Port Townsend, WA	(800) 745-3336 Circle #618
EnviResource Bainbridge Island, WA	(206) 842-9785 Circle #619
Handloggers Hardwood Larkspur, CA	(415) 461-1180 Circle #620
Larson Wood Products Eugene, OR	(503) 343-5229 Circle #621
Northern Hardwood Lumber Santa Clara, CA	(408) 727-2211 Circle #622
Pittsford Lumber Pittsford, NY	(716) 586-1877 Circle #623
Rio Rivuma Boston, MA	(617) 451-2549 Circle #624
Sea Star Trading Newport, OR	(503) 265-9616 Circle #625
Tree Products Hardwoods Eugene, OR	(503) 689-8515 Circle #626
Wild Woods Co. Arcata, CA	(707) 822-9541 Circle #627
Wilson Woodworks Stafford, CT	(203) 684-9112 Circle #628
Wise Wood McHenry, IL	(815) 344-4943 Circle #629
Woodcastle Forest Products Corvallis, OR	(503) 926-5488 Circle #630
Wooden Workbench Fort Collins, CO	(303) 484-2423 Circle #631
Woodworkers Source Phoenix, AZ	(800) 423-2450 Circle #632

This list was compiled by the Woodworkers Alliance for Rainforest Protection (WARP), which does not guarantee any sources or endorse any specific suppliers.

WOODWORKERS! ENTER THE

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CRAFTSMANSHIP
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It's time to enter your best work in the 1994 AMERICAN WOODWORKER Excellence in Craftsmanship Awards Competition.

Send us photos of a project you've built, and you could win one of nine awards - including a cash prize of up to \$1000. All types of woodworking projects are eligible: furniture, turnings, carving, sculpture, musical instruments, toys, etc. You may enter up to three pieces. Entries will be judged for craftsmanship and design, but designs need not be original to win.

Amateurs, professionals, and students* will be judged separately.

**To qualify as a student you must be enrolled in a woodworking school or furniture design school in 1994.*

TO ENTER:

Fill out the form on this page (or a photocopy) and mail it with:

1) A color photograph(s) or slide(s) of the piece(s) you want to enter (up to three pieces). Label photos and slides with your name and address.

2) A description of each piece including dimensions and materials (100 words or less).

3) Include a self-addressed, stamped envelope for return of slides. (Sorry, prints cannot be returned.)

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WOOD FACTS

TEAK

By Dick Boak

Species

Tectona grandis (Southeast Asia, including India, Thailand, Burma, Java, and Indonesia)

Trade Names

Commonly traded throughout the Western world as teak, this hardwood is known in local growing regions by such names as sagun, kyun, tegina, mai sak, djati, gia thi, jati sak, tekku, pahi, and tadi. True teak should not be confused with the many unrelated look-alikes, such as afrormosia, iroko and ovankol (shedua or amazakoue), which are often marketed as varieties of "African teak."

Appearance

When freshly cut, teak has a pale yellow color that darkens with exposure to air and light. In Burmese and Thai varieties, the heartwood develops an even golden-brown color with hints of olive green. Other varieties, including plantation growth, may be deeper brown in color with chocolate-brown markings. Grain lines are straight to wavy with occasional mottled figure. Freshly planed teak is oily or waxy to the touch, and has a pleasant musky odor similar to leather. The texture is dull and lusterless, and the surface is rough and coarse.

Workability

Because teak is hard, it's best to drill pilot holes for screws or dowels. Though the wood will machine with only moderate resistance, it has a severe blunting effect on cutters, making carbide-tipped cutters a necessity. In spite of its high oil content, teak can be glued effectively, but this should be done immediately after planing. Oil-based finishes produce the best results. In outdoor applications, the sun will bleach the wood surface white. However, teak's color

can be rejuvenated by reoiling, and there are a number of special teak cleaners and finishes available.

Technical Properties

With an average specific gravity of 0.65 (40 pounds per cubic ft.), teak is a medium-density wood, but it is quite hard. Live trees are so heavy, they will sink in water. Because of this, the bark and sapwood are generally "girdled" or stripped three years prior to felling. Deprived of nourishment, the standing tree dies and the leaves utilize all the sap stored in the trunk.



Common teak, at left, has straight to wavy grain markings, but some pieces will have a mottled figure, or dark lines like the piece at right.

This yields a trunk light enough to be hauled (often by elephant) to the river's edge, where it can be floated to port. When correctly dried, teak is stable and moves little in service.

Uses

Because of its durability and resistance to decay, teak is extremely suitable for outdoor use. It is utilized extensively in the marine industry for docks, boat hulls, decks, hatches, rails and trim. It is used widely for high-priced deck or garden furniture, cabinetry, flooring, interior and exterior joinery, woodturning, decorative veneers and cabinet-grade plywood. So-called "Danish" furniture is often made from solid teak and teak veneers. Since it is not harmed by acids or alkalis, teak is used for chemical vats and laboratory benches.

Sizes

As an inhabitant of the monsoon rain forest, the teak tree can attain sizes up to 40 ft. in circumference and 150 ft. in height. Teak is typically sold in sizes 6 in. or wider and 6 ft. or longer, in thicknesses of 4/4 through 8/4, with occasional 10/4 and 12/4 sizes sold at premium prices.

Sustainability

Initial harvesting of Burmese teak in the late 1800s served as a forestry model for half a century. Today, while plantation-grown teak is helping pre-

serve the species, virgin timber is being illegally cut and smuggled, which could jeopardize the future sustainability and availability of teak.

Availability

Though the market for teak is extremely large, the wood is primarily available through large specialty wood dealers, teak brokers or larger lumber yards only.

Cost

The wholesale cost for "First European Quality"-grade teak (the usual grade of good lumber) in 500-bd.-ft. quantities is around \$6 per bd. ft. This translates to a retail price of \$9 to \$10 per bd. ft. Discounts are offered for shorts and narrows, and premiums are charged for wide or fixed widths or long lengths. ▲

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10"	40	3/32"	5/8"	156	119
10"	30	3/32"	5/8"	135	99
9"	40	3/32"	5/8"	146	109
9"	30	3/32"	5/8"	125	99
8 1/4"	40	3/32"	5/8"	136	99
8"	40	3/32"	5/8"	136	99
8"	30	3/32"	5/8"	115	89
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10"	60	3/32"	5/8"	162	129
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JUST FINISHING

RUBBING OUT A SATIN FINISH

A Final Treatment That Leaves Your Finish Feeling as Good as It Looks

By Michael Dresdner



It's all well and good for a finish to look great, but if you want a finish that will *feel* as good as it looks, you'll need to rub it out.

Rubbing out a finish means working it with a mild abrasive such as pumice or steel wool. The abrasive produces extremely fine, uniform "scratches" that go in the direction of the wood grain, helping to hide both brush marks and the "orange peel" texture common to sprayed finishes. And, while the result will not *appear* much different from satin lacquer or varnish, it will make the finish *feel* satin-smooth.

Rubbing to satin is easier than rubbing to gloss. A rubbed satin finish hides a multitude of sins, while a rubbed gloss finish shows every minute flaw. Although you use some sort of abrasive in both cases, the materials and methods for a gloss rub are very different. Rather than "gloss over" this important area of finishing, I'll deal with it in a future column.

Virtually any film-forming finish can be rubbed, as long as the dried film is thick enough to prevent cutting through to the wood. A good rule of thumb is that the film should be at least 4 mils (0.004 in.) thick for even a light rub. That's roughly equivalent to four coats of sprayed lacquer, or two coats of brushed varnish, shellac or polyurethane. Wipe-on finishes, such as drying oils, Danish oil, and French polish, don't need to be rubbed, since they usually go on very smoothly. Waxes and nondrying oils do not form films, so they don't get rubbed either.

For rubbing out, it doesn't matter whether you start with a satin or a gloss finish. But you will get a *clearer* satin-rubbed finish if you use gloss lac-

quer or varnish. This is because satin lacquers and varnishes contain "flattening agents"—ultrafine particles of sand or wax that diffract light. If you build up several layers of finish containing these particles, the clear film will start to look cloudy. A gloss finish rubbed to satin will retain more of its original clarity.

Abrasives and Lubricants

There are two common methods used to rub a finish. The more traditional way is to mix FFFF pumice (see Sources) with water to make an abra-



To rub out a satin finish, you work the surface with a mild abrasive such as pumice or steel wool, using soap, oil or wax as a lubricant.

sive slurry. You rub the slurry across the surface with a felt block, replenishing it with more slurry when it stops working, or with water if it gets too dry and crusty. For a higher sheen, you can follow up with another slurry of mineral oil or paraffin oil mixed with rottenstone, an even finer abrasive powder.

I prefer the more modern method, using 0000 steel wool or ultrafine nylon abrasive pads along with a rubbing lubricant, such as soapy water or liquid wax. Finish supply catalogs sell jelled soap-type lubricants with names like Wool-Lube (see

Sources), which are meant to be mixed with water. But any pure soap, such as Murphy's Oil Soap, works just as well. Personally, I like to use paste wax thinned with mineral spirits. Although soapy water cuts a bit faster and leaves your hands sparkling clean, wax adds a layer of protection and leaves the finish feeling slicker.

Rubbing Out

Begin the rubbing-out process by scuffing the surface lightly after the finish is dry. Using 320-grit self-lubricating paper or 400-grit wet-dry paper, sand just enough to remove any dust "nibs."

When the surface feels smooth you are ready to rub. Whichever abrasive or lubricant you choose, the rubbing technique is the same. For a flat surface, such as a tabletop, hit the edges first with short back-and-forth strokes. Then rub in long, even strokes, the length of the entire top if possible, gradually working from one edge to the other. Keep your hand flat as you

When rubbing, keep your fingers flat on the surface and work with your hand perpendicular to the grain of the wood. This will give you a more even surface and reduce the chances you will cut through the finish, especially at the edges.



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JUST FINISHING

go over the ends of the board to avoid rubbing through the sharp edges. (See bottom photo, page 76.) Your rubbing pattern should cover the entire top evenly. I like to repeat this pattern at least six times to make sure that every square inch is uniformly abraded. Don't be afraid to put some pressure on the pad; rubbing out should be a good aerobic workout.

On frame-and-panel pieces, start with the raised panel, then move out to the frame. To avoid cross-grain scratches where the frame members meet, lay a piece of masking tape along the joint line when you rub the rails, then reverse it when you rub the stiles.

When you think you've rubbed enough, squeegee an area with your thumb and then feel the surface. If it is as smooth as you want it, wipe off the lubricant or slurry with a soft rag.

If you used wax as your lubricant, you may find that wiping does not remove all the excess wax. Simply

sprinkle the surface with cold water and rub the surface again with a clean piece of steel wool. Press gently this time, and wipe once up the surface and once back. When you're done, the pad should be covered with the excess wax.

An Unusual Alternative

The rubbing method I've described calls for rubbing *with* the grain, so that the small scratches you create blend in. But I would be remiss if I didn't tell you about the method my best friend uses to rub out brushed varnish. After sanding the last coat of dried varnish, he applies a thin coat of paste wax but does not wipe it off. He then goes over the entire surface with a piece of ultrafine Scotch-Brite attached to the pad of a finishing sander. Rather than worry about the direction of the scratches, he lets the high speed of the palm sander (10,000 to 15,000 rpm) hide them.

The ultrafine Scotch-Brite produces a matte finish. For semi-gloss, he substitutes #8440 "Doodlebug" white cleaning pads (available from janitorial supply houses). When he is finished, he simply buffs off the excess wax with a clean, dry cloth. He says it's less work than rubbing by hand, and to tell the truth, he gets darn good results. ▲

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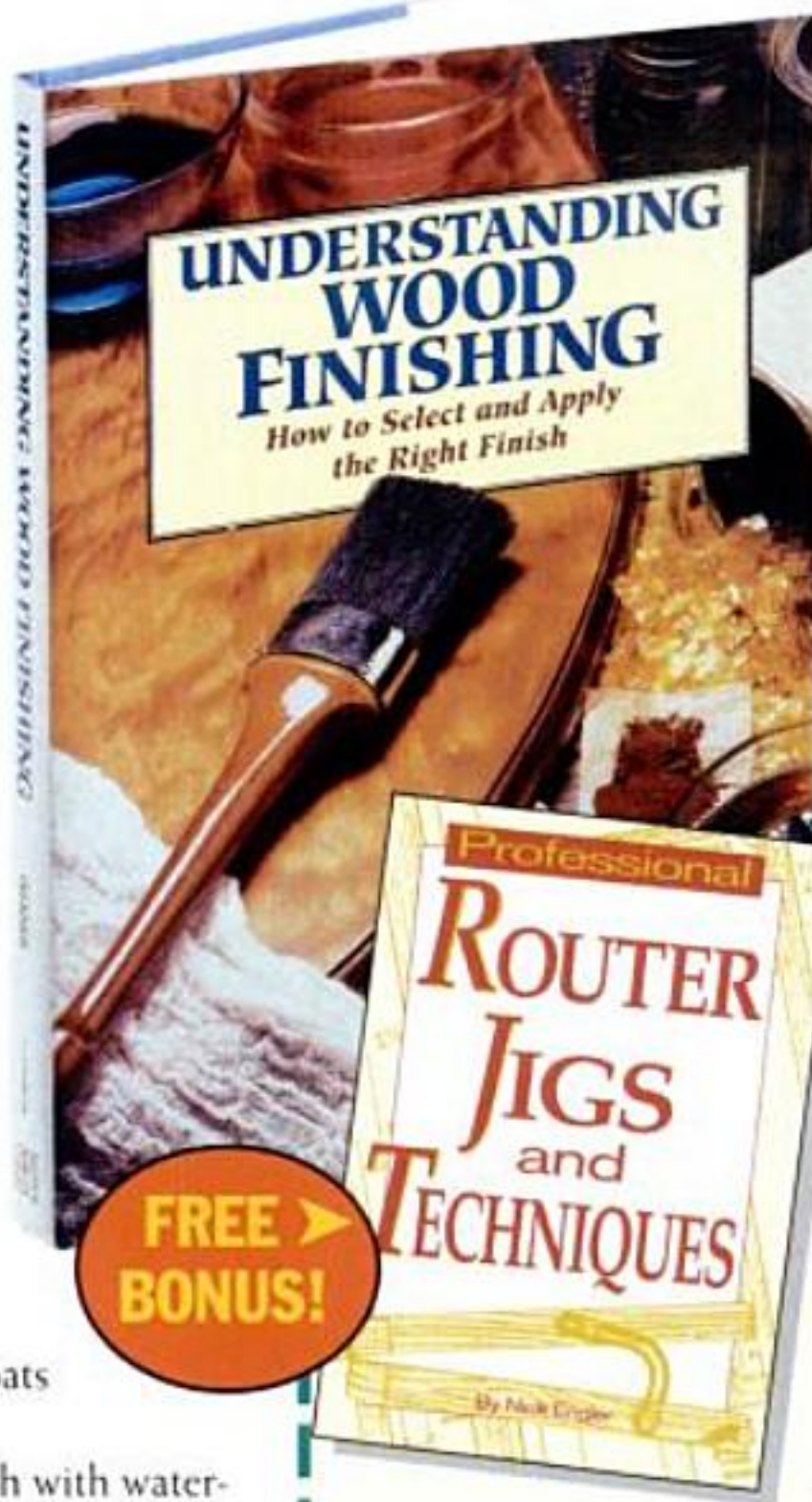
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grit and 6,000-grit water stones.

You begin sharpening with a fast-cutting mixture of silicon carbide grains and oil on the lapping plate with gridded grooves. Then, for surgically sharp edges, use the diamond paste on the smooth lapping plate. Both the silicon-carbide and diamond abrasives imbed themselves in the lapping plates, so you only occasionally add minute amounts of the abrasives to maintain cutting action. (Price: \$192.50)

Garrett Wade, Dept. AWT, 161 Ave. of the Americas, New York, NY 10013, (800) 221-2942. Circle #670

IN THE WORKS

New Tool From Makita

Makita is set to introduce a new Wood Surfer that machines wood glass-smooth. This unique machine does the same job as a stationary planer, but it shears off paper-thin slivers of wood with a single stationary knife instead of a rotating cutterhead. The machine feeds the stock under the blade with a fast slicing motion. We were impressed with the cuts the Wood Surfer produced—it lets you bypass sandpaper altogether.

It handles stock up to 6⅝ in. thick, 7⅝ in. wide, and 78¼ in. long. You can rotate the blade for skewed cuts, just as you would a hand plane. Look for the Wood Surfer in U.S. woodworking stores and mail-order catalogs by early summer.

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AEG's new FIXTEC orbital-action jigsaw offers more features than any jigsaw we've seen. To change blades, you just flip a lever, locking the Bosch-type blade in place.

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helps stabilize the blade. The saw's 5.7-amp motor is the most powerful in the retail market and includes electronic speed control. A non-marring plastic shoe cover and an anti-splintering insert are standard. (Price: \$299)

Chicago Pneumatic, Electric Tools Division, Dept. AWT, 2220 Bleecker St., Utica, NY 13501, (800) 243-0870. Circle #671



CFW Tilting Router Table

TESTED BY PATRICK SPIELMAN



With its new tilting router table, CFW is continuing a tradition of developing innovative products for woodworkers. The table lets you tilt a router and bit (like a tilting-arbor shaper), so you can rout profiles and make cuts that you otherwise couldn't do without special jigs.

The keys to this versatility lie in the hinged table and the sliding mount for the router. The hinged rear section of the table will tilt and lock at any angle from 0° to 90°. When the tilting rear table is horizontal (0°), the router bit sticks straight up, just as on an ordinary router table. When the rear table is tilted to vertical (90°), the bit projects horizontally as it would on a slot-mortising machine. Or you can set the table at any angle in between, opening up almost unlimited possibilities for cuts such as picture-frame moldings.

The sliding mount for the router runs on a lead screw, letting you precisely move the bit back and forth when the table is horizontal, or move the bit up and down when the table is tilted.

I found the unit required minimal setup time, and it was well built and surprisingly solid, though it weighed just 28 pounds. The table consists of 1/4-in.-thick phenolic plastic laminated to 3/4-in. medium-density fiberboard. The top surface is smooth and strong, but since there is no laminate on the underside of the MDF, the table could warp with changes in moisture. In fact, I noticed a slight dip in the top surface near the bit opening. The table has a



miter-gauge slot in the top (not shown in photo).

The manufacturer recommends you install a 1½- to 2-HP fixed-base router, with a base no more than 6 5/8 in. in dia. Most plunge routers won't fit in the 9 3/4-in.-high space under the table, though you could mount one if you blocked the unit up for more clearance.

Unlike on other router tables, the two-piece aluminum fence on this unit cannot be adjusted fore-and-aft. (Instead, you use the sliding router mount to move the router and bit.) However, you can adjust the fence opening from 1 in. to 3 1/2 in. wide to accommodate different bits, and you can offset the fences 1/16 in. for jointing work. I discovered that fence alignment became difficult after sawdust worked its way into the table recess where the fence is attached. (I had to use a blast of compressed air to clean out the recess.) Another problem was that the aluminum fence made black marks on my workpieces, especially after multiple passes.

With the router in the horizontal position (and the table vertical at 90°) I found I could rout rabbets, dados and tongue-and-groove joints, and even make tenons up to about 2 in. long and mortises 2 in. deep. I also routed raised panels using a vertical-style panel-raising bit with the workpiece flat on the table.

With the table tilted, I was able to rout one-of-a kind moldings or edge profiles. It's also easy to repeat settings if you want to reproduce a custom molding or joint later. Simply record the bit depth, sliding router mount position (shown on a calibrated scale) and table angle for reference.

On the downside, I found it difficult to clamp stops, hold-downs or feather boards to the tilting table section, though I could clamp them to the front, stationary table. With the table tilted vertically, the combination Lexan guard and dust-collection box limits the height of stock you can work. Also, when using the unit like an ordinary router table, you can't move the bit any more than about 2 in. from the fence. This could limit access to the bit for freehand routing with pilot-bearing bits.

As a standard flat router table or a joint-making machine alone, the CFW machine is adequate but unexceptional. But when you add the versatility afforded by the tilting table, there's nothing around to beat it. (Price: \$399.95)

CFW, Dept. AWT, Box 85565, Tucson, AZ 85745-5565, (602) 623-4065. Circle #672

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GALLERY

Great-Lookin' Legs

Everyone likes a well-shaped leg, whether it's a sawn-and-carved cabriole or a scrap of metal resurrected from the town dump. Here are nine examples of work that stands above the crowd.



▲ Highboy by Lonnie Bird, Rio Grande, Ohio. Walnut, poplar. Dimensions: W: 44 in., D: 24 in., H: 78 in.

PHOTO BY JOHN HAMEL

▲ "Tonalá Chair" by Estela Cruz, Holland, Pennsylvania. Maple, rush, paint, dye. Dimensions: W: 20½ in., D: 21 in., H: 31½ in.

PHOTO BY MARK SFIRRI



▲ Coffee table by Jake, Ben Lomond, California. English sycamore, ebonized mahogany. Dimensions: L: 45 in., W: 20 in., H: 17 in.

PHOTO BY TONY GRANT

Want to see your work in "Gallery?" Send color slides or color transparencies to: "Gallery," AMERICAN WOODWORKER, 33 E. Minor St., Emmaus, PA 18098. Please include materials, dimensions, name of photographer, your name, address, and phone number. We'll pay you \$35 if we publish your work. If you want your photos returned, enclose a self-addressed stamped envelope.



▲ "Sculptural Buffet" by Frank Lutz, Milwaukee, Wisconsin. Hemlock, maple burl, birch, butternut, spruce, steel. Dimensions: L: 120 in., W: 23½ in., H: 33 in.

PHOTO BY FRANK LUTZ



▲ Pembroke tables by Grover Floyd II, Knoxville, Tennessee. Satinwood, pine, tiger maple, purpleheart, holly, ebony, vermillion. Dimensions: W: 39 in., D: 31 in., H: 28 in.

PHOTO BY GORDON HODGE

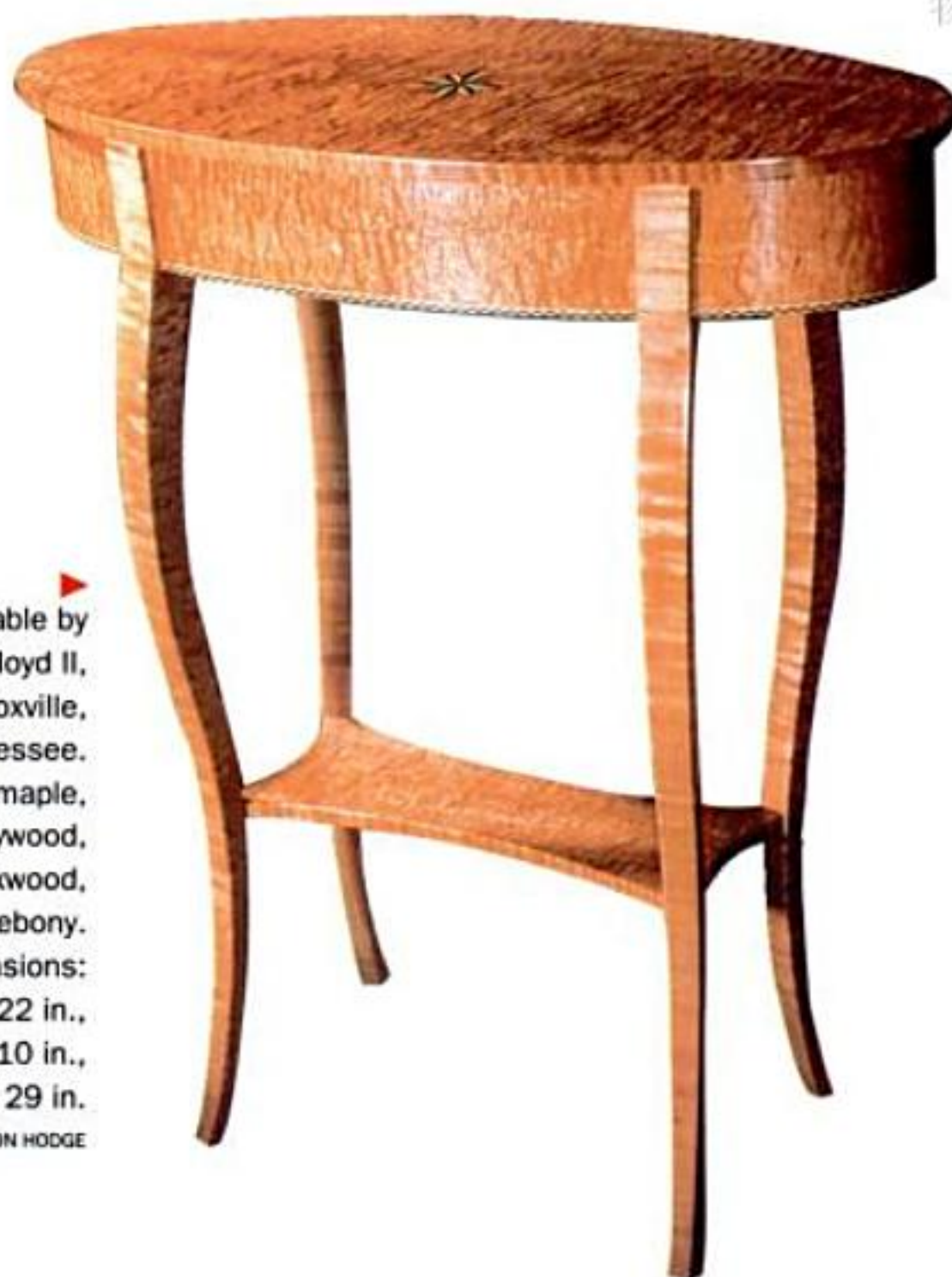
▼ Table by John G. Hatlestad, Grayslake, Illinois. Tamo ash, walnut, purpleheart, radiator fins, aircraft cable. Dimensions: L: 82 in., W: 32 in., H: 30 in.

PHOTO BY STEVE EWERT



▲ "Banquet" by Kit Wilson, San Marcos, California. Cocobolo, dyed maple. Dimensions: L: 160 in., W: 54 in., H: 30 in.

PHOTO BY WILL GIBSON



▲ Table by Grover Floyd II, Knoxville, Tennessee. Quilted maple, birch plywood, boxwood, holly, ebony. Dimensions: W: 22 in., D: 10 in., H: 29 in.

PHOTO BY GORDON HODGE

CALENDAR

CALIFORNIA

EXHIBITION

Mendocino: May 14-June 6. College of the Redwoods Fine Woodworking Program's Annual Student Exhibition. Highlight Gallery, 45052 Main St. (707) 937-3132.

LECTURES

San Francisco: May 10. Frame Design in America, 1820-1920. **June 14.** Classical Taste in America, 1800-1840. Trustee's Auditorium, M.H. de Young Museum, Golden Gate Park. (415) 456-8177.

WORKSHOPS

Mendocino: May 7-9. Making Stools and Benches. **May 14-15.** Basic Blacksmithing. **May 21-22.** More Toolmaking for the Woodworker. **May 23-27.** Chair From a Tree. **June 4-6.** Make a Pole Lathe. All taught by Don Weber. (707) 937-0920.

COLORADO

SYMPOSIUM

Fort Collins: June 23-25. American Association of Woodturners Eighth National Symposium. Colorado State University. (612) 484-9094.

CONNECTICUT

EXHIBITIONS

New Canaan: Through May 10. "Andrew Peklo III: Architect/Joiner." Curtis Gallery, New Canaan Library, 151 Main St. (203) 966-8133.

New London: Through May 29. "Child's Play: Furniture for Children." Lyman Allyn Art Museum, 245 Williams St. (203) 443-2545.

SHOW

Hartford: June 10-12. Wadsworth Atheneum Craft Show. 600 Main St. (203) 523-2666.

DELAWARE

EXHIBITIONS

Wilmington: June 10-September 4. "Common Ground/Uncommon Vision: The Michael and Julie Hall Collection of American Folk Art." Delaware Art Museum, 2301 Kentmere Pkwy. (302) 571-9590.

Yorklyn: Through May 28. "Dennis Elliott: Turned Wood Sculptures." Solo show. Creations Gallery, Garrett Snuff Mills, 2890 Creek Rd. (302) 234-2350.

IOWA

SHOW

Davenport: June 23-26. International Woodcarvers Congress. Open and free to public. Putnam Museum, 1717 W. 12th St. (319) 359-9684.

KENTUCKY

WORKSHOPS

Pleasant Hill: June 24-25, 25-26 and 26-27. Shaker Oval Boxes: John Wilson. Shaker Village, 3501 Lexington Rd. (606) 734-5411.

MAINE

CLASS

Deer Isle: June 5-17. Woodworking, Planning and Creative Vision: Michael Hurwitz. Haystack Mountain School of Crafts, (207) 348-2306.

WORKSHOPS

Rockland: June 6-17. Basic Woodworking: Peter Korn and Skip Benson. **June 20-July 1.** Basic Woodworking: Peter Korn and John McAlevey. Center for Furniture Craftsmanship. (207) 594-5611.

MASSACHUSETTS

SHOW

West Springfield: June 17-19. American Craft Council Craft Fair. Eastern States Exposition, 1305 Memorial Ave. (800) 836-3470.

WORKSHOPS

Easthampton: May 1. Japanese Woodworking Tools: Their Use, Care and Spirit. **May 7-8.** Turning Wooden Vessels: The Inside Story. **May 14.** Chair Design and Construction. **May 22.** The Art and Science of Wood Joinery. **June 12.** The Art of Finishing Fine Furniture. (413) 527-8480.

Washington: May 23-27. Finish Carpentry. **June 20-24.** Cabinetmaking. **June 27-July 1.** Timber Framing. Heartwood Owner-Builder School. (413) 623-6677.

Williamsburg: May 14-16. The Adirondack Chair: Josh Markel. **June 26-July 16.** High School Summer Program: Wood Sculpture and Furniture Design. Horizons Craft Program. (413) 665-0300.

MICHIGAN

WORKSHOP

Holland: June 10-11. Shaker Oval Boxes: John Wilson. Shaker Messenger. (616) 396-4588.

NEW HAMPSHIRE

MEETING

Wilton: May 21. Guild of New Hampshire Woodworkers meeting, and demonstration of veneering techniques by Jere Osgood. (603) 654-2960.

SHOW

Canterbury: May 7. Wood Day at Shaker Village. Turning, cabinetmaking, boatbuilding and timber-frame restoration demonstrations; antique tool dealers; craft displays. Canterbury Shaker Village, 288 Shaker Rd. (603) 783-9511.

NEW YORK

SHOWS

Hamburg: May 7-8. 17th Annual Woodcarving Show. Sponsored by Southtowns Woodcarvers. Erie County Fairgrounds. (716) 937-3228.

New York City: May 15-18. International Contemporary Furniture Fair. Jacob K. Javits Convention Center, 36th St. and 11th Ave. (800) 272-7469.

Tarrytown: May 13-15. Crafts Fair at Lyndhurst. Lyndhurst Estate, 635 S. Broadway. (914) 679-7277.

WORKSHOPS

Warwick: May 28. Sharpening Hand Saws. **May 26-27.** Planecraft. **June 2-3.** 18th-Century Millwork. **June 4.** Steambending. **June 9-10.** Basic Sharpening. **June 11.** Sharpening Hand Saws. **June 13-14.** Planecraft. **June 15-16.** Carving for Chairmakers. **June 17-18.** Cutting Dovetails. **June 23-25.** Making a Molding Plane. **June 30-July 2.** Making a Bench Plane. All taught by Mario Rodriguez. Special packages also available. Warwick Country Workshops, 1 East Ridge Rd. (914) 986-6636.

NORTH CAROLINA

SHOW

Winston-Salem: May 13-15. The Country Peddler Show. Dixie Classic Fairgrounds, 421 W. 27th St. (616) 423-8367.

WORKSHOPS

Brasstown: May 8-14. Making a Mountain Dulcimer: Bill Smith. **May 15-21.** Turning Wood for Useful Objects of Art: Fred Yaxley Jr. Basic Carving: "Red" Rainey. **May 22-28.** Woodturning/Toolmaking: Darrell L. Rhudy. **June 5-11.** Carving Holiday Figures: Jack Phillips. **June 12-18.** Turning Wood for Useful Objects of Art: Fred Yaxley Jr. **June 19-25.** Basic Wood Carving: John Hillyer. **June 26-July 2.** Turned Bowls and Vessels: Marcus Collier. Carving a St. Francis Figure: Helen Gibson. Campbell Folk School. (704) 837-2775. **Marshall: June 20-25.** Welsh Spindleback Chairmaking: Don Weber. **June 27-July 2.** Ladderback Chairmaking: Drew Langsner. Country Workshops. (704) 656-2280.

Penland: May 30-June 10. Furniture: Techniques, Design and Construction: Tage Frid, Skip Johnson and Doug Sigler. **June 27-July 8.** Carving for Furniture and Sculpture: Bob Trotman. Penland School of Crafts. (704) 765-2359.

OHIO

SHOW

Columbus: June 3-6. American Craft Council Craft Fair. Columbus Convention Center, 400 North High St. (800) 836-3470.

OREGON

SHOW

Portland: June 17-19. The View From Our Window: 21st Annual Western Woodcarvers Association Show. At the World Forestry Center. Write World Forestry Center, 4033 SW Canyon Rd., Portland, 97223.

PENNSYLVANIA

CALL FOR ENTRIES

Paoli: Through July 15. First Annual Wharton Esherick Museum Woodworking Competition/Exhibition. Seeking imaginative birdhouse designs for upcoming competition in September. Slides and applications due by above date. For more information, call: Wharton Esherick Museum, (610) 644-5822.

EXHIBITION

Philadelphia: Through May 21. "Howard Werner: Solo Exhibition of Contemporary Furniture." Snyderman Gallery, 303 Cherry St. (215) 238-9576.

WORKSHOPS

York: May 14-15. Period Restoration and Touch-Up: Eli Rios. **May 21-22.** 18th-Century Joinery: Eugene Landon. **June 18-19.** Wood Finishing: Bob Flexner. Olde Mill Cabinet Shoppe. (717) 755-8884.

SOUTH CAROLINA

SHOW

Greenville: May 20-22. The Country Peddler Show. Palmetto Expo Center, Exposition Ave. (616) 423-8367.

TENNESSEE

EXHIBITION

Gatlinburg: Through May 14. "Myths: New Form, New Function," a national juried exhibition of artworks about myths and contemporary society. Arrowmont School of Arts and Crafts, 556 Parkway St. (615) 436-5860.

WORKSHOPS

Smithville: June 6-10. The Art of Woodturning: John Jordan. Bas-Relief Woodcarving: Paul Pitts. **June 13-17.** Windsor Chairmaking: Paul Pitts. Appalachian Center for Crafts. (615) 597-6801.

VIRGINIA

EXHIBITION

Williamsburg: Through June 1995. "Tools: Working Wood in 18th-Century America." DeWitt Wallace Decorative Arts Gallery. (800) 447-8679, or (804) 220-7724.

WASHINGTON

SEMINAR

Port Townsend: June 20-25. Small Boat Construction. Northwest School of Wooden Boatbuilding. (206) 385-4948.

CANADA

WORKSHOPS

Blenheim, Ontario: May 20-21. Shaker Oval Boxes: John Wilson. The Tole Shed, 26 Talbot St. W. (519) 676-5121.

Halifax, Nova Scotia: May 13-14 and 14-15. Shaker Oval Boxes: John Wilson. Atlantic Woodworkers, (902) 425-6422.

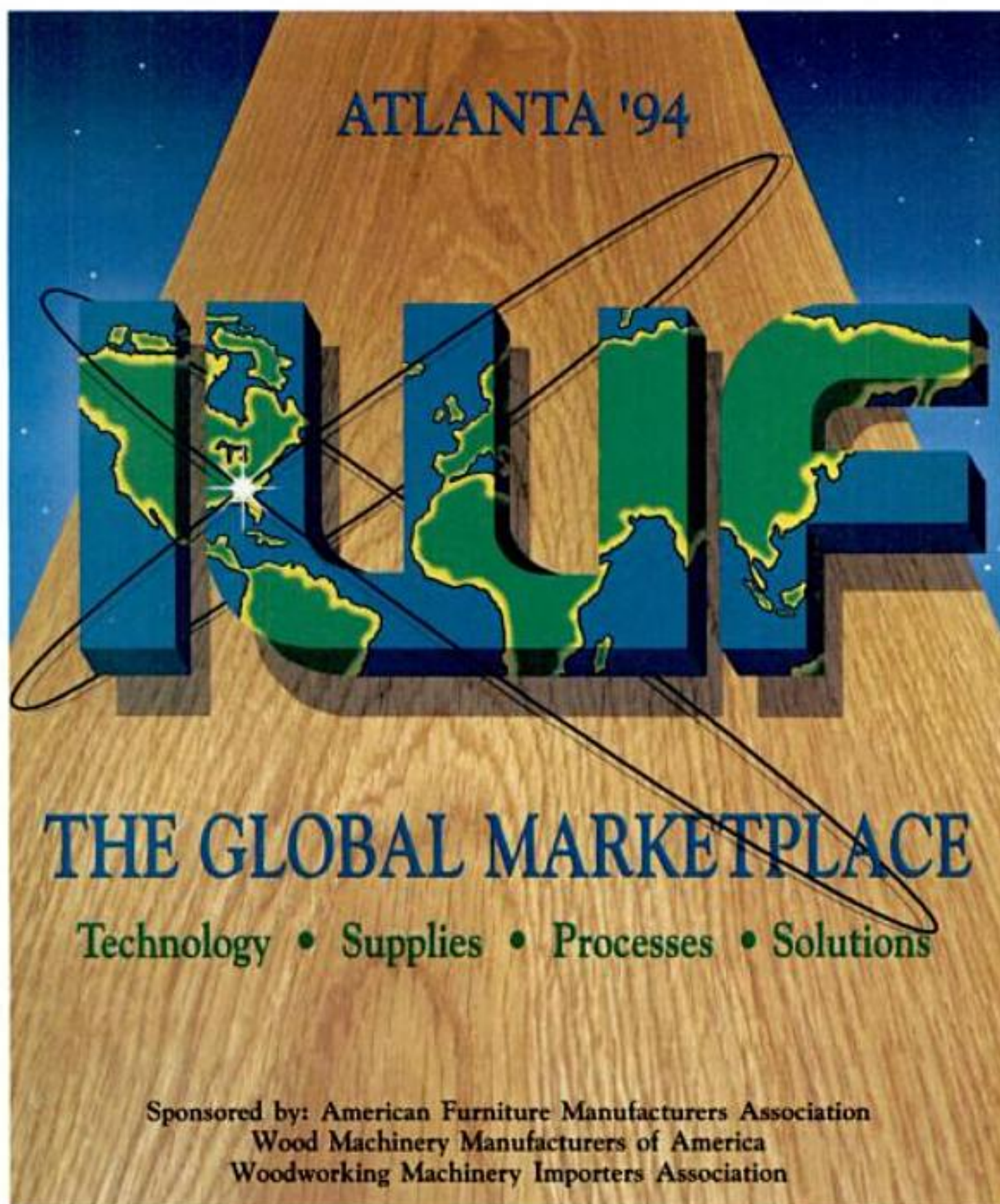
EUROPE

Through July 25. "George Frank's Homecoming." Join famous finisher George Frank from October 3 to 13 for a tour of woodworking ateliers and museum restoration facilities in Paris, the Loire Valley, and London. Reservations accepted through July 25. Contact: Horizon Travel. (800) 352-1036.

"Calendar" listing is free and restricted to woodworking workshops, seminars, trade show, etc. Please include address of event and a contact phone number. Send listing at least two months prior to date of event to: "Calendar," AMERICAN WOODWORKER, 33 E. Minor St., Emmaus, PA 18098.

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CIRCLE NO. 60 ON PRODUCT INFORMATION FORM

SHOP SOLUTIONS

DOUBLE-DUTY SAWHORSES

By Ellis Walentine

Sawhorses are among the most useful shop accessories, and this design is one of the nicest we've seen. Sturdy yet easy to stow away

when not in use, a pair will hold a sizeable stack of lumber or a cabinet chassis—wherever you want it and without tying up valuable bench

space. And, when they're used with notched beams like the one shown here, the horses provide a solid bed for a clamping rack.

You can make the horses from any hardwood you have handy. For maximum rigidity, the mortise-and-tenon joints at the bottom of the legs should be as tight as possible.

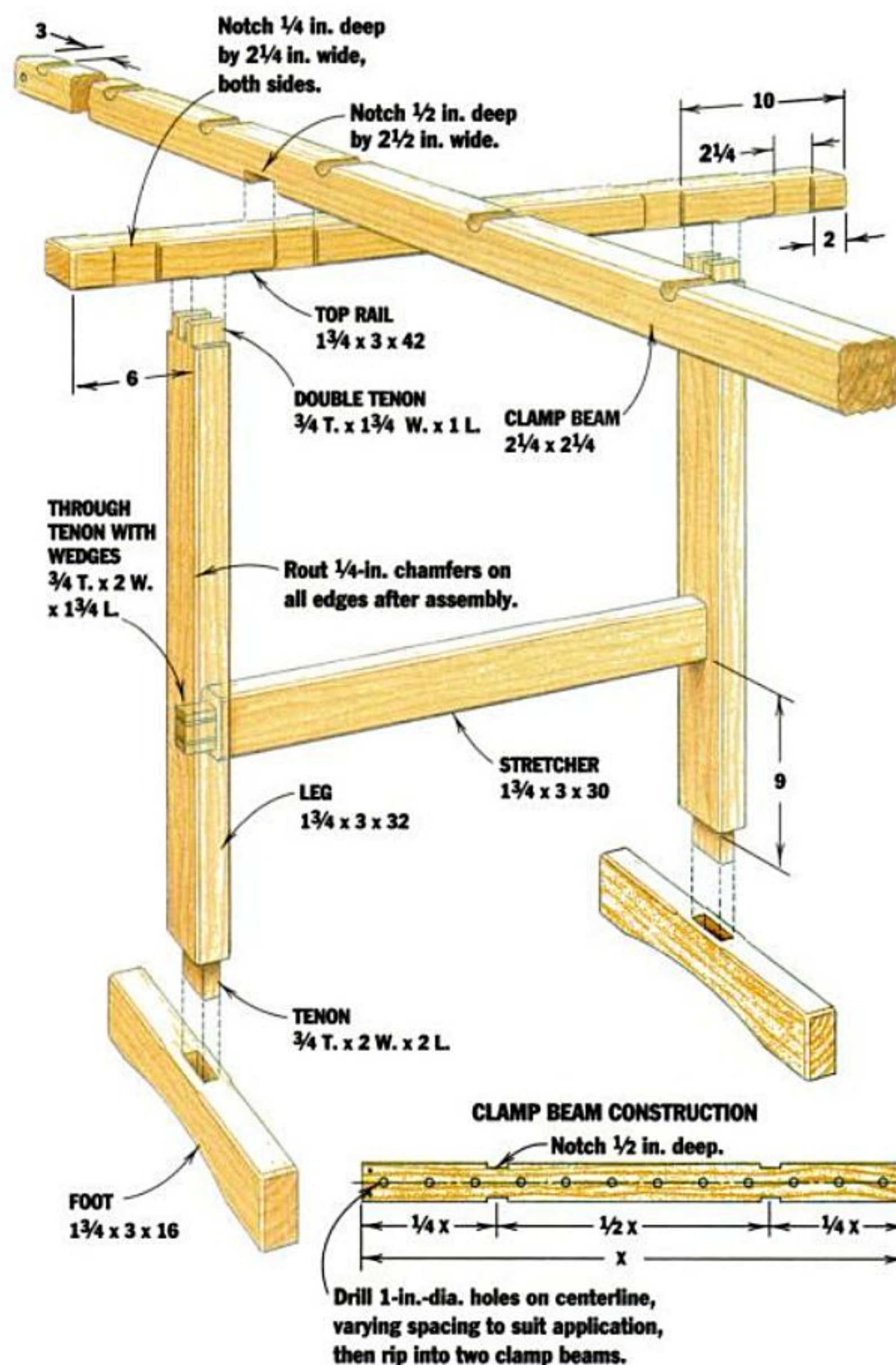
Make the clamping beams in pairs as shown in the drawing, using poplar or another utility hardwood. To create the semicircular notches for your pipe clamps, drill 1-in.-dia. holes 6 in. apart on the centerlines of your planks, beginning about 3 in. from one end. (Note: If you'll be gluing many different-height door frames, space the holes closer together—or at random intervals—so you'll always be able to position clamps at each stile-and-rail joint.)

Ripping the planks down the middle creates your pairs of beams, although you'll need to clean up the sawn surfaces on the jointer. Finally, chamfer the edges and drill a hole through one end of each beam, so you can hang it on a nail when it's not in use.

For a durable, glue-resistant finish on both horses and beams, brush on a coat of varnish or polyurethane. A follow-up coat of paste wax will make it easier to clean off dried glue after each use. ▲

Do you have a favorite shop fixture you'd like to share? Send a drawing or sketch with a full explanation to: AMERICAN WOODWORKER, 33 E.

Minor St., Emmaus, PA 18098. If we publish your "Shop Solution" we'll send you this Forrest 8-in. dado set, worth \$321.





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