TRY YOUR HAND AT TURNING BETWEEN CENTERS!
Step-by-step instructions, page 35

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- turned walnut vase and pedestal table
- 3-in-1 nest of boxes
- hexagon patio table
- breakfast barstools
- two terrific kid's toy boats

BUYING A LATHE
- latest features
- comparison chart
- shopping tips

TABLE SAW HELPERS
- 6 great accessories you can build

WHEN TO USE HARDWOOD PLYWOOD
- what's available
- how it's graded
- where to buy it
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Here's one that didn't make it

For the first five years of my career at Better Homes and Gardens®, I was a copy editor in the Book Division, and most of that time was spent editing cookbooks. During that time, I recall being intrigued by how carefully the food editors and the test kitchen personnel tested each and every recipe...three times, no less. Until a recipe was thoroughly tested, it didn't make it into a cookbook. Some recipes never passed the test for one reason or another.

When WOOD magazine came to be, I finally had an opportunity to put the “test kitchen” concept to work—in the WOOD woodworking shop. It seemed like such a logical approach to project building. After all, great woodworking projects are a lot like great recipes. You put in a little of this and a dash of that, combine the ingredients in the right way, and you're going to be pleased with the results. We try to give you the right ingredients via good designs and show you how to combine them correctly.

Before we offer you any advice on a woodworking technique or present a project for you to build, you can be certain that we have spent many interesting hours in the shop wrestling with all the unforeseen situations that invariably present themselves. That's not to say we always come up with the “one and only” way to do the job. In fact, if I've learned one thing since beginning this magazine, it's that usually there are several “right” ways to solve a given problem.

What happens to projects that don't pass the test? The good-looking, traditionally styled rolltop computer desk shown above (at least that's the way we envisioned it in the beginning) now sits in an out-of-the-way corner in the basement of our building. Other less substantial projects end up in our scrap bin. You only see our very best efforts.
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Better Homes and Gardens
WOOD
THE MAGAZINE FOR HOME WOODWORKERS

August 1985

Wood Profile
Redwood 25
This towering giant from the California-Oregon coast has become synonymous with outdoor projects that are built to last and last.

Craftsman Close-Up
Band Saw Sculptures 26
Richard Rothbard didn't take to woodworking in high school shop classes. No matter. Now he's combined his late-blooming skill with sales savvy in a thriving crafts business.

Homemade Tool
$50 and One Weekend Workbench 30
Just what every shop needs—a sturdy workbench with a built-in tool tray and a handy end-vise.

Shop-Tested Techniques
Wood Turning Basics: 35
Turning Between Centers
Five full pages of step-by-step to help you get started.

Now You Can Build It
Quick and Pretty Bud Vase 40
It's a great project for the beginning turner—we did ours in just 45 minutes. You'll want to keep several on hand as gift items.

Lathe-Turned Elegance: Pedestal Display Stand 42
Even a lush fern takes a backseat to this graceful table. The black walnut brings a richness that complements the decor of any traditionally styled room.
SCRAP WOOD PROJECT

CLONE BOXES

Surprise! These beautiful little boxes-within-boxes are made from laminated scrap wood.

SHOP SAFETY

DUST MASKS AND RESPIRATORS: 

DETERMINING WHAT YOU NEED

Do you wear a mask when your workshop air clouds with sanding dust or finishing vapor? If not, you should.

OUTDOOR FURNITURE

REDWOOD PATIO TABLE

Seat six in style with this unique hexagonal table. The benches tuck away when not in use.

BUYMANSHIP BASICS

SHOULD YOU BE USING HARDWOOD PLYWOOD?

A look at this versatile woodworking material—how it's made and graded, shopping tips, what's available.

JUST FOR KIDS

FUNTIME FLEET

U.S.S. WOOD

What youngster wouldn't love playing with this battleship in the tub?

TUG-A-LUG

Want to turn out a kid's toy in a hurry? Then give this small-but-proud tugboat a try.

GETTING THE MOST FROM YOUR TOOLS

SIX HANDY TABLE SAW HELPERS

These nifty items—some tried-and-true and others brand-new—help you and your table saw do your best work.

FURNITURE PROJECT

EASY-DOES-IT BREAKFAST BARSTOOLS

Can't find ready-made bar stools that match your kitchen decor or counter height? Here's the solution.

TOOL BUYMANSHIP

WOOD LATHES:

WHAT'S BEST FOR YOUR SHOP?

Here's what's new in wood lathes and accessories.

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WOOD MAGAZINE  AUGUST 1985  7
We welcome comments, criticisms, suggestions... even an occasional compliment from readers. While the volume of mail we receive makes it impossible to answer every letter, we publish excerpts in every issue of the magazine. Send letters to:

Letters Editor
Better Homes and Gardens®
WOOD Magazine
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Des Moines, IA 50336

READER NEEDLES WOOD ABOUT CACTUS COLUMN

Perhaps it is the lingering effect of certain strong potions made of cactus juice which prompted someone on the staff to agree that Cereus giganteus is a tree, and a hardwood at that ("Saguaro," WOOD, April, 1985, page 83).

—Dick Landis, Issaquah, Wash.

Dick, we referred this prickly problem to WOOD consulting wood technologist Paul McClure, who lives and works right in the heart of saguaro country in Tempe, Ariz. Paul says there's no doubt as far as he's concerned—the saguaro is indeed a tree and a hardwood. Here's a further reference from The Complete Trees of North America by Thomas S. Elias (Van Nostrand Reinhold, New York, 1980): "Four native species of the Cereus genus—the Saguaro, the Deer horn, and Key West cephalocereus, and the organ-pipe cactus—are considered trees." All meet the criteria of a tree as a woody plant that usually grows to at least 16" and has a single trunk.

WOOD WOMAN

WOOD Editor Larry Clayton asked to hear from a few women woodworkers in his April column, so we were tickled when the mailman brought this note:

Love the magazine! I am an "intermediate" woodworker who sometimes needs reference materials, pictures, and ideas to make certain projects "click." Some publications are too sophisticated... not so with WOOD. It's down to earth.

—Mary Wesell, Cambridge, Ill.

Thanks to Mary and the other women readers who wrote! We'll do our best to keep you happy.

PLANE TALK

We're not in a position to make our "Letters" page a buy and sell column, but we'll try to spread the word occasionally in special instances such as this one:

In your October, 1984 issue on page 76 is a picture of a Stanley no. 1 bench plane that now is a collector's item valued at $400 to $650. I've had this plane for the last 40 years. It's in excellent condition. If any collectors are interested, let them contact me.

—William K. Annett, 181 Rombout Ave., Beacon, NY 12508

WILL THE REAL DISSTON PLEASE STAND UP?

(Regarding the handsaw pictured on page 100 of the February issue of WOOD and identified as a Disston): I have never seen this saw in the Disston catalog. As for the bending of the saw and its snapping back "straight as a die," we do this with our Sandvik saws every day to show the superior steel we are using.

We have manufactured the steel used in our saws in our own steel mills since 1862. What is equally important in a saw blade is the teeth, of course. We make most of our saw models with ground teeth as compared to filed and stamped teeth... I will challenge a similar saw anytime.

—Hakan Hellstrand, National Sales Manager, Sandvik Saws and Tools, Scranton, Pa.

The handsaw in the photo was indeed an Atkins, not a Disston. WOOD apologizes for the mixup.

As for Mr. Hellstrand's challenge—any takers?

VACUUM HOSE COUPLING

In our April issue we featured a router table project that requires two vacuum hose adapters. Several readers wrote to request a source for the adapters. If you had any trouble finding them, send $7 plus $2.50 for postage and handling for two adapters to: Shopsmith, Inc., 750 Center Dr., Vandalia, OH 45377. (The folks at Shopsmith refer to the adapters as ferrules.)

A GREAT IDEA!

At WOOD, we love to hear from readers who have improved on the methods we used in a project. This month we heard from several sharp readers who had suggestions about the three-ring binder jig featured in our April issue. Here's what one of them suggested:

Ten years ago I hit upon a super simple idea that gives me perfectly clean holes every time. I created a paper drill. Get a 3" piece of steel tubing ¼" in diameter (available at auto parts stores). Put it in the chuck of your electric drill (hand or press). Turn on the drill and, as it rotates, file or grind the end to form a knife edge. Remove the tube from the drill and cut a section from the sidewall of the tube to remove the paper disks out of the magazine.

To use the paper drill: Put the magazine drill back in the electric drill chuck. Identify the spot you want to drill on the magazine by tracing the holes in a piece of loose-leaf paper that was laid on top of the magazine. Hand-hold the magazine on top of a piece of scrap which acts as a backing material and drill a nice clean hole every time. The knife edge also can be created by taking material off the inside wall of the tube with a countersink.

—Michael K. Patrick, Manchester, N.H.
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Dept. 375D
As the woodworking hobby catches on, so do the learning opportunities. Woodworking workshops—offered by many public and private colleges and universities, crafts centers, companies, and individuals—flourish year-round, especially during the summer. You still have time to sign up for a summer course or two, but hurry—they fill up fast these days.

Costs vary from $20 for a two-hour seminar to $500 or more for multiweek sessions (extra charges for room and board where applicable, of course). Following is a sampling of offerings. We suggest that you contact sources directly for fees, dates, and complete course descriptions. Also check locally for seminars and workshops sponsored by retail woodworking suppliers.

- **College of the Redwoods**, Mendo- cino Coast Education Center, 440 Alger St., Fort Bragg, CA 95437 (707/964-7056). 4- to 5-week workshops covering techniques and joinery, woodworking projects. Late June through August.

- **Oregon School of Arts and Crafts**, 8245 S.W. Barnes Rd., Portland, OR 97225 (503/297-5544). Cabinetmaking, finishing, Japanese woodworking. Late June through August.

- **Woodturning Workshops**, Craft Supplies U.S.A., 1644 S. State St., Provo, UT 84601 (801/373-0917). 5-day work- shops focused on all aspects of turning. Mid-June through September.

- **The University of Akron**, Center for Wood Design and Craftsmanship, Akron, OH 44326 (216/375-7575). 2- to 4-day workshops and seminars covering power tools, jigs, furniture design and construction, boat-building. Late June and September.


- **Brookfield Craft Center, Inc.**, PO. Box 122, Brookfield, CT 06804 (203/775-4526). 2- to 5-week workshops and classes including turning, carving, chair making, various boat-building techniques. Early July through August.

- **Villa Maria Wood Workshops**, PO. Box 37051, Minneapolis, MN 55437. Up to 6-day workshops on carving techniques. Late July to early August.

- **Conover Workshops**, 18125 Madison Rd., Parkman, OH 44080 (216/548-3481). 5-day workshops on turning, hand tools and joinery, Windsor chair-making. Mid to late June.

- **Arrowmont School of Arts and Crafts**, Box 567, Gatlinburg, TN 37738 (615/436-5860). 5-day workshops covering wood construction, laminated lathe work, spindle turning, and faceplate work. July to mid-August.


- **Penland School of Crafts**, Penland, NC 28765 (704/765-2359). 2- to 3-week workshops covering materials and processes, woodturning, carving, techniques. June through September.

- **Shopsmith’s Woodworking Academy**, 2-hour lectures to 4-day workshops on turning, joinery, toy-making, raised panels, other topics. Offered year-round. Held in the below-listed cities; call number given for dates and information:
  - Foster City, California (415/572-8000)
  - Tucker, Georgia (404/939-8141)
  - Indianapolis, Indiana (317/849-0193)
  - Florence, Kentucky (606/371-2232)
  - Richfield, Minnesota (612/866-3526)
  - Colonie, New York (518/459-2201)
  - Columbus, Ohio (614/885-7200)
  - Dayton, Ohio (513/898-9325)

- **Tigard, Oregon (503/684-1428)**
- **Richardson, Texas (214/644-2615)**
- **San Antonio, Texas (512/655-3093)**
- **Virginia Beach, Virginia (804/460-5655)**
- **Renton, Washington (206/226-2500)**
- **Russ Zimmerman Turner's Workshop, RDF 3, Box 242, Putney, VT 05346. 2-day workshop including turning, tools, faceplate and spindle turning. Offered year-round.**

- **Davis & Elkins College, Augusta Heritage Arts Workshop, Elkins, WV 26241 (304/636-1903). 5-day and longer workshop classes on guitar construction, folk carving, treenware, white oak basketry. Mid-July to mid-August.**

- **Boston University, The Program in Arts and Culture, 620 Commonwealth Avenue, Boston, MA 02215 (617/353-2022). 3-week courses on furniture design and construction. July/August.**

- **Haystack Mountain School of Crafts, Box 87, Deer Isle, ME 04627 (207/348-6946). 2- to 3-week workshops covering perennials and tapers for furniture, wood sculpting. Late June through mid-August.**

- **Norwegian Craft Workshops at Vesterheim, Norwegian-American Museum, Decorah, IA 52101 (319/382-9681). 2- to 3-week workshops on Norwegian figure, chip, and relief carving, stave construction, bentwood. Late June through August.**

**ENGLAND**

- **John Sainsbury’s Studio for Woodcraft, 1, Lichfield Drive, Brixham, South Devon, England TQ5 8DL (0208/08045). 2-day workshop courses on faceplate turning, turning between centers, thin wall and wet wood turning, carving, tools, materials. All year.**

**CANADA**

- **Bert Thompson’s Canadian School of Woodturning, 1069 Southdown Road, Mississauga, Ontario, Canada L5J 2Y1 (416/823-5937). Lessons on turning between centers, tools, and sharpening; architectural turning. Year-round.**
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More Than Expected • Stephen Schultz, Orangeville, Penna.: "This machine pays for itself by making money out of scrap boards. It is a very well built machine and I confess it is more than I really expected for the price. It does everything you say it will."

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JAY HEDDEN — Editor WORKBENCH Magazine
In woodworking, as in life, no one knows it all. But through experience, we all discover—or stumble onto—better, safer, faster, or easier ways to do things. When we devise interesting tips or techniques, we'll share them with you in this column. And when you send us your favorites, we'll pay you $25 for each submission we publish. No shop tips can be returned. Mail your tips to:

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Screw center comes to the rescue
You want to cut wood, not metal, but it's sometimes difficult to avoid dinging your lathe tools against the faceplate while turning the entire profile of a piece. You also encounter this frustration when you turn small pieces such as knobs on your lathe.

TIP: Make a wooden screw center or first screw your workpiece to a wooden disc, then attach either to the faceplate. Now you have a wooden buffer plate between the workpiece and the metal faceplate to eliminate those dings. If your faceplate isn't drilled for a center screw, mount the plywood washer to the center of the project with a wood screw; attach the disc to the faceplate as usual. If your faceplate is drilled for a center screw, fasten directly through the faceplate and disc and into the project.

Sean O'Daniel, Lebanon, Ky.

Start out clean
Nozzles on paint sprayers are difficult to get thoroughly clean. Many times, dried residue clogs the nozzle and sends paint spitting around the room.

TIP: Clean the nozzle as best you can after use, then store it submerged in fresh thinner in the sprayer's container. Before you start your next spraying job, pour out the thinner, dry off and attach the nozzle, and enjoy one less frustration.

How to outsmart a nail
In a tight spot, it can be impossible to get your fingers around and start a nail or brad.

TIP: A small magnet will hold a brad or nail upright while you tap it into the wood. (Note: This tip also helps prevent black and blue fingers, sometimes referred to as "hitting the wrong nail.")

Easy does it
Taking furniture apart for regluing often requires breaking a sturdy glue bond. Improperly done, too much pressure can damage the pieces.

TIP: Pop apart glued joints by applying inside pressure with an inexpensive device you can make at home. Continuous-thread rod, sometimes called all-thread, is the key to this mechanism. Drill a hole for the rod through two blocks of wood and then line one side of each block with carpet or foam as shown. To apply even pressure and break the bond without damage, just tighten the washer and nut inside each block.

—Donald F. Kinnaman, Phoenix, Ariz.
Slick solution
Thread-on faceplates sometimes tend to lock to the live spindle of a lathe and this makes them difficult to remove.
TIP: Before you screw on the faceplate, slip on a single layer of waxed paper and tighten the faceplate to the live spindle as usual. The waxed paper “washer” will make it easier to loosen the faceplate.

Surform sharpening
The Stanley Surform and similar forming tools can remove a lot of stock, but the blades eventually dull.
TIP: Sharpen the rasp-like blades with the small stones used for pocket knives. Rows of teeth run diagonally across the length of the blade, and each row has a “lead side” with cutting edges near the top. Hold the stone firmly against the inside face of the lead side and run the stone back and forth through the groove. Repeat for each row until the entire blade is sharpened. Between sharpenings, the blade can be quickly renewed by running a stone along the length of the blade in the direction the cutting faces are pointing.
—Mary Butcher, Hacienda Heights, Calif.

Ask around. There are lots of folks still using their Dad’s old Delta machinery. And the new Delta Jointer is built to last a lifetime. At least. Its solid cast-iron construction and durable 3/4 h.p. induction motor could provide power and precision for generations to come.
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**TIPS FROM YOUR SHOP (AND OURS)**

**Clamp care tip**

Glue squeeze-out sometimes dries and adheres to the face of hand-screw clamps. Later, projects that have been clamped turn out with marred surfaces.

**TIP:** Apply a coat of paste wax to the face of each jaw of your clamps to prevent glue build-up. It's also a good idea to maintain a light coat of wax on metal clamps—this will help you prevent rust from forming and discoloring project surfaces.

—Gary Scholl, Mancelona, Mich.

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**The once-and-for-all cure for wobbly chairs**

Despite your best efforts to make a lasting repair, a troublesome screw continues to loosen on a wobbly chair.

**TIP:** Remove the screw and dip the threads in epoxy, then reinstall and allow it to dry. (Epoxy has more holding power than woodworker's glue.) If the screw hole has worn too large for a tight fit, use toothpicks or slivers of wood to help fill the opening.
Fuzz buster
How many times have you smoothly finished new wood, only to have the grain raised by stain, paint, or varnish? You've got a bad case of fuzz, friend.
TIP: Before you apply the first coat of finish, wipe down the entire project with a damp sponge or cloth. Allow the wood to dry, then remove all the fuzz with fine steel wool or sandpaper. (Be sure to use a clean tack cloth to remove dust before applying stain or finish to ensure smooth results.)

Sharp way to economize
No matter how long the jigsaw blade is, just a few of the teeth are doing the cutting for most operations. Those teeth quickly become dull.
TIP: Add an auxiliary plate to the bottom of your jigsaw to extend the life of blades. The thickness of the plate will depend on the material being cut, but the plate needs to be at least as thick as the length of the saw stroke. As a bonus, the auxiliary plate won't allow the blade to wander as much. Use wide double-sided adhesive tape to mount the plate.
—R.T. Dunnington, Centerville, Ohio

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As a free bonus, just for giving us a chance at your business, you will receive, with your order, a belt and disc restorer. It unclots your abrasives like magic just by holding it against the moving belt or disc, and, whether you keep the belts or return them, you get to keep the free bonus.

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The Garrett Wade Catalog is a new, 212-page collection of woodworking hand tools, machinery, finishing supplies and accessories that are simply the finest available anywhere.
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Beauty in the brass
If you lay out hand-sawn dovetails, you’ll enjoy using this handy little marking tool. Imported from England exclusively by Woodcraft, the gauge has solid pinned construction for years of dependable service. The manufacturer designed one end for use with softwoods, the other, steeper-angled end for hardwoods. The tool fits handily in a pocket — and in a brass tool collection. Brass Dovetail Gauge. Available for $14.95 postpaid from Woodcraft, 41 Atlantic Ave., P.O. Box 4000, Dept. W, Woburn, MA 01808.

Hide blemishes and sins
No matter how hard some of us try, we just can’t avoid an occasional “Oops!” in our projects. We’ve called on FIX Wood Patch to rescue us in several instances, and it’s risen to the occasion every time. FIX dries quickly, sands easily without clogging, and accepts stain evenly. (By the way, the lids are at the bottom of the cans to keep the ingredients mixed.) FIX Wood Patch, manufactured by the Darwood Company of Avon, Conn. Available at retail outlets in seven colors and natural; $1.79 for ½ pint.

Hone with precision
You can’t beat the accuracy of this brass bevel guide, manufactured and sold exclusively by Leichtung. Simply unscrew the three piece-unit and select the angle you want (15, 20, 25 or 30 degrees) to set your tool rest for grinding or honing. When you’ve finished, use the assembled guide to double-check the cutting angle of your chisel or plane iron, as shown in photo. Brass Bevel Guide. Available for $7.95 postpaid from Leichtung, 4944 Commerce Parkway, Dept. W, Cleveland, OH 44128.

Continued —
THE SAW THAT TURNS BEGINNERS INTO EXPERTS!

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Pocket moisture meter
Whether you dry your own wood or just want to know the moisture content of a board, Mini-Ligno tells you in a hurry. Probing pins pushed into the wood indicate moisture content between 6% and 20% by LED readout. A position switch allows you to compensate for differing densities of wood. Operating on two 9-volt batteries, this 5½"X2½"X1" pocket-size meter features rugged, high-impact plastic construction. Use it for readings in lumber, veneer, fiberboards, hardboards, and many other materials. Mini-Ligno Moisture Meter. $110, from Lignomat USA Ltd., Dept. W, PO. Box 30145, Portland, OR 97230.

Carbide-tipped hole saws
Need a dozen solid oak wheels for a toy project? With Enduro Hole Saws you can whip them out in a jiffy. We used the carbide-tipped wood saw to cut through ¼" oak effortlessly with only minor chipping. Available in diameters from 1" to 2½"; this pair takes on wood or metal. The wood saw can cut a full 1 ¼" deep in a single pass through lumber. Chips are channeled out to prevent clogging and drill burnout, and you remove the saved-out core by taking off the saw tube. Both wood and metal saws, packed together, share the same mandrel, which must be purchased separately. Enduro Hole Saws. At retail stores, for $4.70 to $7.10, depending on size. Mandrel, about $7. Credo Cutting Tool Division, Omark Industries, 2765 National Way, Woodburn, OR 97071.

Heavy-duty shop apron
Designed for protection as well as convenience, this full-length shop apron features a split-leg cut that's comfortable to wear sitting or standing. You can strap the split apron to each leg to avoid flapping. Long-wearing, 8-ounce green duck saves clothes and guards against splinters, chips, spills, and sharp objects. Waist-high pockets hold your hand tools at bench level, and pencils stay put in a small bib pocket of their own. The apron comes in a standard, one-size-fits-all length of 36". Full-Length Apron. $15.90, available from Woodworker's Supply of New Mexico, Dept. W, 5604 Alameda, NE, Albuquerque, NM 87113.
PEG: a dream come true
Until the discovery of polyethylene glycol 1000 (PEG) in the mid-1950s, it was nearly impossible to turn green wood, crotch wood, and many challenging pieces without fear of splitting and checking. Now, you can rough a piece out on the lathe, soak the wood about two weeks in a mixture of PEG and water, and then dry for six to eight weeks. The piece then can be returned to the lathe, completed, and sealed with your favorite finish. PEG. Available through various mail-order catalogs. We ordered a 10-pound block for $17.00 postpaid from General Finishes, PO. Box 14363, Dept. W, Milwaukee, WI 53214.

Space-age bits keep their point
We used and abused these drill bits and they just kept asking for more. A titanium-nitride coating has been applied to high-speed steel to reduce heat build-up and speed removal of chips. What this means to you is drill bits should stay sharper longer. The bits are recommended for wood, plastics, steel, aluminum, and cast iron. Titanium-Nitride Drill Bit Set. Available in nine-piece sets (1/4" to 3/8") for $36.85 postpaid through Sears tools catalog. Refer to stock no. 9 GT 6824.

If you think you can cut corners with an old blade, put it to the test.
Because your work demands tools of exacting and delicate precision, we make X-Acto knife blades both sharp and precise. But because our blades can't keep their accuracy forever, we also make them easily replaceable.

**THE X-ACTO TEST**
A sharp X-Acto blade will maneuver smoothly along the curves and corners of this dotted line, making the kind of clean cut you expect in your work. If, however, your blade drags, sheds, slips or catches somewhere along the line, then it's no longer giving you the precision your work demands. In which case, it's time to replace your X-Acto blade with a fresh one.

When used properly, your X-Acto knife will become indispensable. But when used frequently, remember that the blade is disposable.

Put new life in your X-Acto knife.
### Associations You Should Know About

**The Woodworking Association of North America (WANA)**

Everyone's getting into the sawdust! Not since the Fifties, say industry observers, has there been such an interest in woodworking. No wonder, then, that membership in the Woodworking Association of North America (WANA) has surged from zero to over 2,000 in less than two years.

Formed in 1983, WANA aims to provide its members from the U.S. and Canada with information about woodworking and to advance woodworking as a hobby and industry. WANA sponsors shows, hosts hands-on seminars, and directly involves the industry and its leaders in the concerns of woodworkers.

Executive Director Peter F. Engel has assembled some of the foremost names in woodworking to help direct the Association: Glen Docherty of Constantine's, Jim Forrest of Forrest Manufacturing, Bob Schwartz of The Cutting Edge, and Wally (Mr. Sawdust) Kunkel, to name a few. Master craftsman Allen Fitchett serves as WANA's technical consultant.

WANA members receive the quarterly magazine *International Woodworking* and free classified advertising privileges; half-off admission price to WANA-sponsored shows and other events; special discounts from suppliers and manufacturers; and answers to woodworking questions through the membership and corporate sponsor network. WANA soon will offer group health insurance, as well as more woodworking shows and seminars. Shows are now held in Springfield, Mass.; Washington, D.C.; Toronto; Houston; Philadelphia; and Chicago.

This year, the first hands-on seminars took place in Chicago and Toronto. Covering such topics as tablesaw technique, marquetry, chip carving, and dovetail joinery, these seminars required a full day of workshop participation. Registration fees ranged from $75 to $90 for members ($150 to $180 for non-members). For those who are unable to attend workshops, or simply want to learn at their own pace, the Association hopes to offer a videotape rental program.

Annual membership is $15 ($20 Canadian). For more information and membership application, write The Woodworking Association of North America, 35 Main St., Suite 6, Plymouth, NH 03264.
Discover the world's oldest hobby!

Build this beautiful wooden ship model.

Wouldn't you love to build this historic ship model? It's a true-to-scale, 21" replica of the 2-masted schooner Swift, a Virginia pilot boat of 1805. Well, now you can! And you don't have to be a skilled craftsman to do so.

It really isn't hard

Even if you've never built a model before, you can experience the relaxing pleasure and pride of accomplishment that is offered by this fascinating hobby. You can build the *Swift*. The secret's in our kit, designed especially for the first time modeler, with pre-cut parts that make assembly easy. Clear, large scale plans and instructions that virtually take you by the hand and guide you every step of the way through hours of the most relaxing fun you'll ever have. And when completed—a museum quality model you'll display with pride, with gleaming brass fittings, walnut planked hull, delicate rigging—life-like in every detail.

Quality you can see and feel

The materials in our kit may be better than those used in the original *Swift*. The keel section and frames are pre-cut plywood, ready for quick assembly. The *Swift*'s hull is planked twice; once with thick, flexible lime-wood for strength, then overlaid with planks of African walnut for lasting beauty.

You won't have to make the fittings—we've done that for you. Our kit contains ready-to-use blocks and deadeyes of rare, yellow boxwood. We include eyelets, bracers and belaying pins—over 70 parts of solid brass! Even the cabin door hinges are brass, as are the 250 miniature nails you'll use to fasten the planking to the hull and deck. And, since the original wooden *Swift* had no plastic parts, our kit doesn't either—anywhere!

Creative? And how! Overwhelming? Not a bit! But be prepared for hours of the most challenging, engrossing, relaxing fun you've ever had.

An "everything you'll need" special offer, with free tools and handbook.

We want to introduce you to this great hobby, now! So we've made it easy for you to get started. Our special offer includes the *Swift* kit plus all the tools you'll need to build her: pliers, hammer, knife, file, tweezers, sandpaper, glue, wood oil, and more. You'll also receive a free copy of "Ship Models from Kits," a 110 page beginner's guide. You don't have to buy anything else. The tools normally cost $17; the book retails for $7.95. But they're yours, FREE when you buy the *Swift* kit at its regular price of $39.95 (plus $4.00 for delivery).

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Complete Guide to Wood Carving
By E. J. Tangerman.

352 pages
$12.95
Paperback

Full of drawings and photos—684 in all—this superb guide covers all facets of wood carving. Tangerman, a carver for more than 50 years, liberally seasons his instructions with personal observations and amusing, pointed anecdotes. He writes in a friendly manner, so his advice to everyone from rank beginner to veteran carver sounds as if it comes from a friend.

In an easy-to-read style, Tangerman writes about sharpening tools, selecting the "right" size for a carving, choosing wood, and finishes to use. He also tells you how to carve a wide range of subjects—animals, flowers, fabled unicorns and dragons, buildings, people's faces and heads, and lettering. How to carve different materials such as ivory, bone, stone, seashells, and nuts, is another topic.

The author's knowledge of carving around the world shines through in insights such as this one about carving the human figure: "Scandinavian carvers have for many years produced angular, blocky figures that are very well done. They are almost formulaic; three creases at elbow and knee, saggy breeches, wrinkled coats, and slightly battered hats. African carvers produced lampions of the white men and women who bought them, as do modern Haitian ones."

Just for fun, read this book. Who knows? It may light your fire as a whittler.

"The most important cut for the knife is exactly that used by someone peeling a potato; the knife caught in the curve of the four fingers, the thumb on the work, and the cut made by closing the hand. That gives the greatest control because it is finger rather than arm muscle that does the work."
Our initial reaction to this book was: "Why on earth would anyone undertake writing a book on old planes and who will read it?" After leafing through Smith's book, though, we soon understood their fascination. Like thousands of collectors, we're hooked.

The author focuses on planes made and sold in the century between 1827 and 1927, which Smith reports account for only about a third of the 600 planes that have been patented in the U.S. (It seems better mousetraps and widgets aren't the only things inventors strive for...)

While researching this admittedly narrow field, the author gleaned details from old business directories, patent specifications and drawings, catalogs, trade magazines, and other sources. His chapters examine the first American metallic planes, the search for an efficient means of holding and adjusting the cutter, and specific designs and their manufacturers.

Beautifully illustrated with 41 full-color and dozens of black-and-white photographs, the book also includes nostalgic reproductions of early advertising. Many tools shown are works of hand-tooled art; others are strange curiosities.

Roger Smith has been smitten with planes and all the woodworking Americana they embody. Read this book and we suspect that you will be, too.

"Perhaps the epilogue for this entire volume is the fact that out of scores of manufacturers discussed, Stanley was the lone survivor and continues to be the only manufacturer of hand planes in America."

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(312) 824-0565
"Where the fog flows, the redwood grows," a line from a popular West Coast logging country folk song, definitely applies to the coastal, or California, redwood.

The giant of all nature's plants, the coastal redwood (Sequoia sempervirens) towers to heights of nearly 400 feet within a narrow 500-mile stretch of coastline from southern Oregon to California's Big Sur. This mountainous habitat feeds necessary moisture to its redwoods through frequent rains and blankets of fog.

While the redwood soars in stature, it's not lacking in girth. A specimen logged in 1914 measured 26' in diameter at 7' above the ground and yielded 344,000 board feet of lumber!

Capable of living 2,000 years or more, this conifer ranks among nature's eldest statesmen as well.

**Wood identification**

While there are two redwood species, coastal and sierra, only the quick-sprouting, fast-growing coastal variety is commercially harvested.

Redwood has a warm, reddish-brown color when sawn from the heart of the tree. Boards with sapwood have contrasting cream-colored accents. Left to weather, all redwood eventually turns gray.

The redwood lumber industry labels the available grain features as either flat (which actually looks wavy) when wood is cut at an angle to growth rings, or vertical (which appears straight) sawn across the rings.

Redwood grading standards include these better-quality categories:

- **Clear all-heart**, contains all heartwood with only minor surface defects;
- **Clear**, the same quality but with sapwood;
- **B grade**, mixes heart, sapwood, with knots.

Veneers, in burl figure, are extremely costly and normally for architectural purposes only.

**Working properties**

Seasoned redwood, especially when it has been kiln-dried, remains stable even in high humidity. It is comparatively strong while light in weight, and its lack of pitch or natural resins makes it highly fire resistant. Perhaps redwood's biggest asset is the organic compounds in its heartwood that retard decay and insect attack.

The wood works easily with both hand and power tools and sands and finishes extremely well.

While it does have structural strength, redwood tends to split easily, so drill pilot holes when screwing or nailing near the ends. Nuts and bolts are often used to assemble redwood projects, since the soft wood easily tears. It does glue well, though.

**Uses in woodworking**

It belongs anywhere outdoors—in patio furniture, fences, decks, and siding. Heartwood can even be used in water containers, such as vats and hot tubs.

Because it doesn’t absorb odor and has none of its own, redwood often is chosen for barbecue carts and picnic tables.

**Cost and availability**

Redwood's best grades may approach the board foot cost of walnut, except nearer the West Coast supply. All heartwood, even in lesser grades, will be priced higher than lumber including sapwood.

Unlike hardwoods, redwood lumber comes in nominal sizes, such as 2 X 4, 1 X 6, etc., and in lengths up to 20 feet.

**Sources of supply**

In its California/Oregon coastal habitat, commercial redwood usually is harvested in the upper elevations, which account for only 10 percent of the total growth area. The remaining redwood groves are protected.

Illustration: Steve Schindler
BAND SAW

Its shape suggests a huge Monterey pine or perhaps an ancient oak. Whichever it was intended to be seems of little concern to potential buyers who admire the zebra-wood piece Richard Rothbard has designed. Even from a distance, the craftsmanship is apparent—fine, intricate saw kerf divide and define its branches while the wood glows with a satin sheen. Like a sculpture, the tree fascinates from every angle.

There's more, however, to this tree than first meets the eye. A touch from Richard nudges a tiny drawer into view. Then another. And another. The intriguing tree camouflages dozens of tiny drawers and compartments within its branches.

The customers in his shop giggle, then stare and stammer as the tree comes apart before them. Richard laughs and explains their reaction.

"We call this and our other intricate ones 'Oh! Oh! Oh!' boxes, because when they're opened, that's exactly what people say.

"Next, they ask how it was done—how did I cut into the wood to make the compartments? I tell them 'with a band saw,' but they still want to know more because they don't grasp the technique. So I tell them 'We have a home study course—buy one, take it home, and study it!'

This banter with customers, coupled with the uniqueness of the intricately sawn "surprise" boxes and a businesslike approach to market-

Richard Rothbard followed a winding road to his woodworking career. And at each turn he acquired valuable experience that later helped him succeed. In his hometown of New York City, Richard admits to not having been very good in high school woodworking class. At college, he focused on finance, but preferred campus theatrical productions. After graduation, the stage led him to Broadway, where he achieved recognition for his singing and acting.

Woodworking, though, was to capture his lasting attention—first as a partner in a custom furniture shop and gallery, then as an independent craftsman. Today, Richard is based at Sugar Loaf, N.Y., a rural crafts village cuddled by the hills within commuting distance of the Big Apple. From his Beautiful Woods shop, Richard, 45, distributes his products across the nation. His wife, Joanna, shares his boundless enthusiasm for wood.

Richard Rothbard calls this zebrawood tree an "Oh! Oh! Oh!" box because of its surprising number of compartments. The most expensive in his line, it retails for $1,600.
BOXES

How Richard Rothbard succeeds with craftsmanship and selling savvy

ing, has made woodworking profitable for this ambitious and creative craftsman. He sums up his successful philosophy this way: "I believe that marketing is every bit as much of an art as woodworking."

Products that sell: woodworking’s business aide

If you’ve ever dreamed of making a living from your woodworking, pay heed to Richard’s advice: He’s among the fortunate few who have managed to make their craft their livelihood.

According to Richard, fine craftsmanship alone won’t guarantee anyone a living from woodworking. Making it in the marketplace requires the right product at the right price.

"If I had wanted to be a pure artist," Richard says, "I’d only have done what my artistic desire told me to do. I’d not have considered the marketplace. But then I would have had to settle for the relatively meager opportunities for selling that exist out there for artists."

That’s not how Richard went about it. He had always found fascination in Chinese interlocking puzzles and boxes, the kind sold in import and souvenir stores. But he knew they were too time consuming to be profitable. He chose instead simple shapes and techniques and developed ways to turn them into puzzles.

"I wasn’t really thinking in terms of mass production," Richard relates, "only of making a product that would retail in a price range that people would want and could afford. I played around in the woodshop until I realized I had some great items—my desktop zoo I called them. They were stamp dispensers, change holders, and letter organizers in animal shapes—all done with a band saw. After calculating the time for all the steps—from picking out the wood to final finishing—I suddenly discovered that I could produce them at a price where they could actually be wholesaled."

Desktop zoo puzzles pioneered the way. The fascinating boxes came next. "I designed around an image, tried to create a space inside it, then took a section of that image and worked it into a sliding or locking feature," Richard recalls. "But one thing leads to another, and I started getting involved with hidden compartments and drawers inside drawers. People liked the concept and they bought."

People still like Richard’s work. His zebrawood pieces last year alone accounted for 5,000 board feet of 10/4 thickness stock. Demand for the rest of his "Beautiful Wood" line, which incorporates pieces fashioned from cocobolo, imbuya, walnut, cherry, aromatic red cedar, manzanita, mahogany, as well as zebrawood, keeps a handful of employees busy in the workshop, retail store, and shipping.

Techniques for marketing "Beautiful Wood"

Creating a niche in the crafts world, one that paid off, wasn’t easy. But Richard knew what was needed to sell his product—and himself.

Richard believes that most craftspeople aren’t salespeople because they reject what’s involved with being commercial, such as sizing up a customer.

When someone stops by his booth at a major crafts fair, for instance, and inquires about his work, Richard wants to know immediately if they’re sincerely interested in buying or simply want to hear him talk about his work. He introduces price right away, showing the lowest priced item, a high-priced

![Manzanita root, from California, offers spectacular color and fascinating twists. Band-sawing the wood into a jewelry box breaks many a blade, so it’s not for amateurs.](image)

10 RICHARD ROTHBARD’S TIPS FOR SALES SUCCESS

1. Make what the public will accept, in design and price.
2. Most people buy simpler things. Design them that way to keep the price down.
3. Find the cost of what you’re making, then price accordingly.
4. The trick in succeeding with lower-priced items is to make them quickly.
5. Be sure you can reach your buyers. You can’t make expensive furniture way out in the boondocks unless you have a reputation.
6. Educate customers. If they don’t understand something, they won’t feel comfortable buying it.
7. Learn to sell. You can’t automatically reject what it takes to be commercial.
8. Don’t be afraid to talk money right up front. It’s realistic.
9. Work hard at presentation—new pieces, new slides, a sharp booth, nice-looking signs.
10. If you’re not selling what you make, look around and see why not.

Continued
one, and then one in between, commenting favorably about them all. That gives potential customers several comfortable buying niches. "If they don't feel comfortable," Richard emphasizes, "they won't spend."

Richard thinks it's also important to have something in a price range low enough to satisfy those who only have a few dollars to spare. "It gives you a great feeling to offer something that everyone can afford, something that those with little money can still buy and walk away happy. You're satisfying someone's need to have something of yours," Richard says.

The continually expanding Beautiful Wood line covers a broad price range. The top of the line is the multicompartimented zebrawood tree sculpture, with a $1,600 price tag. At the bottom end, at 50 cents, are animal-shaped trinkets no larger than a key ring fob, which he makes from thin scraps of exotic wood. In between are cigarette cases, jewelry boxes, pen and pencil cases, and puzzle boxes in myriad shapes retailing from just $12 to a substantial $400.

Wholesaling to gift shops and department stores in volume is a recent and successful expansion for Richard. To make it work, he developed a relatively expensive four-color, 12-page catalog displaying an assortment of his Beautiful Wood products.

Richard attributes part of the catalog's success to the story it tells about the nature and origin of the woods he uses. Educating the customer has to be part of the selling technique, he believes. This holds true whether you're talking to potential retail customers at a fair, in the store, or to long-distance buyers who order by phone.

"Few people really know anything about wood and what can be done with it," Richard says. "Even fewer can tell good work from less than good work."

"You have to tell customers that some woods—the cocobolo, imbuya, ebony, and zebrawood—are a commodity more like precious stones than soybeans. You have to point out that it's often rare, grows in exotic lands, and is expensive."

Looking to the future
Richard's success with his Beautiful Wood products sparked a desire for challenges. One is the staging and promotion of a series of crafts fairs. Under the banner "Craftmarket America," Richard showcases quality artists and craftspeople at shows open to both wholesale and retail customers. From New York and Massachusetts, Richard has expanded to major cities on both coasts.

Another deals with the village of Sugar Loaf. On the rolling, partially wooded acreage he owns across the road from his shop and retail store, Richard envisions a complete crafts complex. His plans include shops where craftspeople work, demonstrate, and sell their wares, as well as fine restaurants, an amphitheater for concerts, and country condominiums for those who want to live the rural life and commute the hour to work in New York City.

While Richard's energy is directed toward greater undertakings, he isn't
neglecting the band-saw products that make his other efforts possible. He wants to design even larger and more complex boxes and sculptures, and to add new shapes to the medium-priced range of his offerings. And, when all those dreams become reality, Richard plans to return to making custom furniture.

**BAND SAW BOXES: THE TECHNIQUE**

Richard's band saw boxes require practiced skill at the blade as well as careful advance planning for the series of cuts. If you were to inspect the finished onion box being created below, only the sharpest eye could detect the minute, practically invisible, glue lines that trace its manufacture. In such a shape, there's little opportunity to back out or use escape routes—the thin 3/4" blade driven by a powerful 5-hp. motor must sweep efficiently through the hardwood.

The unique onion-shaped jewelry box starts with the selection of a template from the dozens of stock patterns hanging on the shop wall. After laying the template atop an appropriately sized, precut piece of black walnut, Richard defines the cutting outline with flat black spray lacquer. This spray stenciling saves handwork and sharply outlines the band saw's path.

At the band saw, Richard skillfully guides the work into the blade, following the graceful lines which eventually trace the shape and the compartments within. Working from the inside of the piece outward, the blade cuts out the onion's core pieces—which will comprise the box's two main compartments.

The pieces have to be hollow, so Richard takes thin slices off the front and back, then makes a contour-following cut which removes the center of the stock. When the front and back slices are re-attached later, the hollow compartment will be ready to store items. If he chooses, additional smaller compartments are made by repeating this sequence with the leftover "centers."

Band-sawing completed, Richard now sands each piece (except gluing surfaces) on a special spindle-type sander he's devised that works perfectly on small rounded shapes. Spindles of different diameters covered with progressively finer sandpaper grits allow him to smooth even the tightest curves.

Yellow glue beaded on the joints, followed by a tight multiple-clamping, ensures that the box will stay together.

To finish the onion box, Richard sprays on a coat of oil-based urethane, lets it dry completely, then adds clear lacquer. The result is a rich, deep-looking finish that requires no maintenance. Inside, the box receives the ultimate touch—a velour-like, spray-applied flocking that pampers future contents.

Produced by Peter J. Stefano
Photographs: Jim Elder, Hopkins Associates

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1. Selecting a template. Dozens of shapes, covered with coats of black spray lacquer, represent variations.

2. Band sawing the box. A 3/4" blade follows the outline contours as the box is cut from the stock.

3. Making the compartments. Slicing off the core's front and back, then sawing out its center, creates a box.

4. Contour-sanding. Sandpaper-covered spindles of varying sizes were shop-built to conform to different shapes.

5. Gluing and assembly. With yellow glue, Richard readies a compartment for its front and back pieces.

6. Unraveling the onion. Relatively quick to make, the jewelry box features compartments within compartments.
$50 and one weekend WORKBENCH

What more could a home woodworker want? This workbench is inexpensive (we spent less than $50 for materials), sturdy, and you can tackle it in just one weekend. It's equipped with an ingenious end vise, a tool tray, and lots of other conveniences that are guaranteed to please. Best of all, this little wonder is designed to last through years of pleasurable project-building.

Building the base
1 Rip ½" from each edge of all the 2 x 4 stock for a 3" finished width. (This removes factory-rounded edges and lets you make tighter-fitting, better-looking joints.) Crosscut the legs (A), end rails (B), and cross members (C, D) to size. Cut the strut (E) to size plus 2" in length and cut the vise bar guide (F) to size.

2 Measure and mark the half-lap joint locations on the ends of the legs and rails. Using a dado blade on a radial arm saw or table saw, test-cut half-lap joints on two pieces of scrap of the same thickness as the dimensioned pine stock. Check the fit and adjust the depth of cut if necessary. Clamp a stop to the saw fence to ensure an equal 3" half lap on all parts. Cut the joints on the ends of A and B.

3 At the same depth of cut used for the half-lap joints, cut a dado in the center of the bottom rails B to house cross member D.

4 Glue and clamp the leg/rail assemblies (A, B) together, checking for square with a framing square.
Bill of Materials

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*Some parts are cut larger initially, then trimmed to finished size. Please read instructions before cutting.

Supplies: ½" walnut dowel stock, 1—#50 Jorgensen clamp fixture, ½" pipe cap, 1—3½" x 20" black pipe threaded at both ends, 2—⅞" x 24" steel bars, ¼" x 4" lag screws, #8 x 1¼" flathead wood screws, #8 x 1¼" flathead wood screws, #8 x 2½" flathead wood screws, #8 x 2½" flathead wood screws, double-faced tape, 1" oak dowel stock, ½" pine dowel stock, ½" brads, varnish, and oil finish

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Continued
5 Drill ¾" holes centered on each of the bottom half-lap joints only. You will drill the top dowel holes later when joining the cross members to the leg/rail assemblies. (To prevent splintering, we drilled with a spade bit until just the tip of the bit poked through the opposite side of the board. Then we turned the assembly over and, using the hole as a guide, finished drilling through the joint.)

6 Cut four ¾" walnut dowels 1¾" long and glue them into the holes in the bottom half-lap joints. After the glue dries, belt-sand the dowels flush. Mark and cut a 1¼" radius on the four bottom corners, then belt-sand them smooth.

7 Glue and clamp the cross members (C, D) between the leg/rail assemblies. Bore ¾" dowel holes through the upper lap joints and 1½" into the ends of the cross members. Cut ¾" walnut dowels 3" long, then glue and insert the dowels through the half-lap joints and into the ends of the cross members. After the glue dries, remove the clamps and sand the dowel ends flush.

8 Cut the angled ends of the strut (E), then glue, clamp, and dowel E into position. After the glue dries, sand the entire base assembly smooth.

Constructing the workbench top

1 Rip the plywood pieces (G) and hardboard (H) to size. (We used double-faced tape to bond the two pieces of plywood and one piece of hardboard, then cut all three pieces at once for uniformity.)

2 Glue and clamp the two pieces of plywood together, being careful to keep all four edges flush. After the glue dries, mark the location of the tool tray where shown in the exploded-view drawing. Drill a hole large enough for a jigsaw blade and cut the opening to size. [The tool tray fits snugly between two cross members (C).]
3 Rip and crosscut support pieces I and J to size. Glue and clamp them to the bottom of the plywood flush with the outside edges. Remove any glue squeeze-out from the outside edges.

4 Position the plywood top (G) on the base assembly. Drill pilot holes, then glue and screw the top to the base using #8 x 2 1/2" wood screws.

Continued
5 Rip and crosscut trim pieces K and L to size plus 1” in length. Cut M to size then set it aside for now. Miter-cut one end of each L and both ends of K to finished length.

6 Position the hardboard (H) on top of the plywood. Drill ¼” holes ½” deep for plugs along the outside edges of pieces K and L. Drill a pilot hole through the center of each plug hole for the #8 X 1¼” wood screws used to attach the trim pieces to the bench top. Glue and screw the trim pieces to the bench, flush with the top of the hardboard.

7 Cut ¾” pine plugs ½” long, then glue and insert them over the wood screws. Belt-sand the plugs flush with the trim pieces.

Building and installing the vise

**Note:** This quick-clamp end vise, first featured on page 88 of the February, 1985 issue, made a real hit with WOOD readers. It’s a simple, inexpensive device that does the job of vises costing several times more.

1 Laminate two pieces of ¾” thick pine to form the vise jaw (H). Bore two ¾” holes for the guide rods and one 1” hole for the black pipe through end trim piece M as dimensioned in the Vise Hole Alignment Drawing.

2 Clamp M to N and, using the holes you already drilled in M as a positioning guide, drill like-sized holes through N. Glue and fasten M to the workbench top using #8 X 2” wood screws covered with plugs. Drill corresponding holes through top rail B, again using M as a guide.

3 Cut two ¾” steel rods to 24” and one ¾” black pipe (outside dimension 1¼”) to 20”.

4 Cut two ¾” walnut dowels ½” long and glue them into the holes in the vise jaw (N) to cover the bar ends as shown in the Section View Drawing.

5 Bore holes in F as dimensioned in the Vise Hole Alignment Drawing. Position F under the workbench top and install the pipe and bars to align F with M. Drill two pilot holes through F and fasten it to the bottom of the workbench top with ¼” Lag screws.

6 Install the guide bars through vise parts N, M, B, and the pipe clamp tail-stop, then on through F. Fasten the pipe clamp tail-stop to rail B with a #8 X 1” wood screw, as shown in the Quick Release Detail. Attach the pipe cap to the end of the pipe under the workbench top and the crank mechanism to the other end of the pipe.

7 Using a ½” metal-cutting bit, drill a hole 1¼” deep through the bottom of N and through the center of each guide bar as shown in the Vise Hole Alignment and Section View Drawings. Now, install #8 X 1¼” screws to hold the guide bars in place.

8 Cut the lever O to size as indicated in the Clamp Release Lever Drawing, then drill the ¼” hole where indicated. Now, wiggle the bit from side to side to form a groove so that the lever can rock back and forth on the mounting screw (again, see drawing).

9 Fasten the release lever (O) so that it rocks on the inside of top rail B. The end of the lever is positioned to release the spring-loaded tail-stop as shown in the Quick Release Detail. Now drill a ¼” hole ¼” deep below the handle of the lever, then glue and install a ¼” dowel 2¼” long to keep the lever horizontal.

**Note:** To use the vise, pull the release lever toward top rail B. This releases the tail-stop, allowing you to pull the vise outward. When you reach the desired clamping distance, release the lever and give the clamp a quick jerk to set the tail-stop on the black pipe. Insert the project to be clamped and tighten the screw handle.

10 Clamp N tightly against M. Using a ½” round-over bit, rout the top outside edge of the bench top, being sure not to rout where M and N meet. Sand the round-over and pine pieces smooth.

Making the tool tray

1 Rip and crosscut the tool tray pieces (P, Q, R) to size. Glue and nail the hardboard sides (R) to the pine bottom (Q), then nail the ends (P) to the pine bottom.

2 Insert the tool tray into the hole cut in the plywood top and nail through the sides and ends to attach it to the bench top.

Final assembly

1 Apply double-faced tape to the plywood top (G) and set the hardboard in place, noting the location of the tool tray cavity. (While carpet tape worked fine for us, you may want to flush-mount a few screws to hold down the hardboard.) Don’t glue it in position—you may want to replace the board in the future. Drill a hole through the hardboard and into the cavity large enough for a flush-cutting router bit. Fit your router with a flush-cutting bit and, using the tool tray sides as a guide, rout the hardboard opening to size.

2 Bore 1” bench dogholes 1½” deep through the bench top (G, H) as spaced in the exploded view drawing. Bore corresponding holes in vise part N. Center-bore a ¾” hole through the rest of the plywood bottom (G) to allow sawdust to fall through the doghole. Cut 1” oak dowels 2¼” long for the bench dogholes, then cut a ¾” notch ½” deep in one end of each. (We clamped each dowel in our newly constructed bench vise and cut the notch with a handsaw.)

3 Finish-sand the entire assembly, then oil or varnish the pine, and oil the hardboard top.

Design: Kim Downing
Photographs: Bob Calmer
Illustrations: Bill Zahn
Do woodturners really have more fun? From everything we can tell, they certainly do. And we think we know why. It's the almost instant gratification they get as the gouge or the skew or the parting tool puts the finishing touches on what just a short time ago was an undistinguished-looking chunk of wood, but now is an object of rare beauty. It's that simple—wood turning is fast and fun. Maybe it's time you step up to the lathe and take your turn. You'll never regret it!

There's a lot to know about wood turning, a lot of territory to cover. After all, some people spend years mastering this truly artistic form of woodworking. We've decided to delve into turning between centers this time, and in an upcoming issue, we'll talk faceplate turning.

Here's what you'll need
What's a woodturner without a lathe, right? If you don't have one already, our lathe buymanship article on page 68 will help you decide which of the many options available today is right for you.

The lathe plus five turning chisels will enable you to make all the cuts necessary to turn any between-centers project. A ½" gouge and a ¼" version of the same chisel serve double duty. They do the rough cutting necessary to round-down the turning square to a cylindrical shape. And they also come in handy when you want to make a cove, or concave, cut. We use a skew that's anywhere from ½" to 1" wide to smooth the ridges left from rounding-down the stock with the gouge. And for making beads (the convex portion of turnings), we rely on a ½" diamond-point parting tool. This same tool also cuts grooves. (See page 79 for more information about these chisels.)

You'll also need the other tools and materials shown in the photo above. Note especially the face shield, which safeguards you against flying wood chips while you're operating the lathe. Wearing it is an absolute must. We'll talk about the uses of the other items later.

Continued
LAYING OUT YOUR TURNING PROJECT

As a woodturner, you need to develop the skill of making templates. Why? Because the template serves as a valuable referencing aid. It allows you to check visually on the progress of your turning. Templates also allow you to reproduce several identical pieces of a given shape.

To fashion a template, start by cutting a ¼” piece of plywood or hardboard to the length of the turning. (We use Baltic birch plywood for our templates because of its stability and light color.) Then, draw a line lengthwise down its center.

After doing this, if you don’t have a scaled drawing to work from, draw the profile of the turning as best you can. Then continue to refine the shape until you have an attractive profile. If you do have a scaled drawing, transfer the outline of the turning to graph paper and onto the template material.

Draw a line perpendicular to the center line at every point where the profile changes direction. Then, using a compass or dividers, transfer the points of intersection to the opposite side of the lengthwise line as shown in sketch 1.

Once you’re satisfied with the shape you’ve sketched, measure each diameter and transfer it to one edge of the template material as shown in sketch 2. These marks allow you to set your outside calipers easily when checking the diameter of the turning at various points.

Now cut the template along the lengthwise line, make relief cuts, and saw along the profile line as shown in sketch 3.

PREPARING THE STOCK FOR TURNING

A

With partially turned projects, it’s important that the stock be square. If you’re working with stock whose surfaces aren’t at right angles to each other, follow this procedure. Clamp the stock in a vise and plane one surface smooth. (You can also joint the surface smooth if you have a jointer.) To check the surface for true, hold the blade of a try or combination square directly on the surface and look for daylight along the blade.

B

Lay the stock on a plywood scrap so that one edge of the stock overlaps the edge of the plywood. (The opposite edge of the plywood must be straight.) Then trace the outline of the stock, cut the waste material away, and fit the stock into the jig you’ve just created. (Make sure the planed surface is on the bottom.) Now slowly and carefully pass the stock through a table saw as shown. Note that we used a featherboard to help control the cut.

C

As soon as you have two sides of the stock squared up, you can then discard the jig and square up the other two surfaces with your table saw. Next, you need to square up the ends of the stock. Doing this ensures that the turned portion will be at a right angle to the ends, and it will also help reduce vibration when you put the stock on the lathe and begin rounding down. Using your table saw miter gauge and a stop block, make both cuts.
Photo D
Clamp the stock in a vise, and—using the blade of a square—draw diagonal lines from corner to corner on both ends of the stock. An accurate centerpoint is important especially if you’re doing a partially turned project. It ensures that the turned portion will be the same distance from each edge of the unturned portion. It also lessens the amount of vibration during the rounding-down process.

Photo E
Make a starter hole at the centerpoint of each end with an awl or center punch. Want to make the rounding-down process a little less bumpy and easier on your turning tools? If so, mark the turning’s greatest diameter with a compass and mark a line just beyond the outside of the circumference line at each corner as shown. (Experienced turners don’t bother with this step, but it’s worth knowing about.)

Photo F
With the turning square held securely in a bench vise, remove the waste material with a bench plane as shown in the photo above. (Note that we’re planing the stock at an angle rather than straight on.) Or, set your saw blade at a 45° angle, adjust the rip fence as needed, and run the stock through the table saw. If you’re doing a partially turned project, you’ll want to stop the cuts short of the shoulder.

MOUNTING THE STOCK ON THE LATHE

Photo A
Begin by aligning the centerpoint of the stock with that of the drive center. Then, tap the stock with a mallet until the drive center spurs engage the stock. Don’t beat on the stock; that’s not necessary, and it’s hard on the headstock bearings. If you’d rather, you can also remove the drive center, saw shallow diagonal cuts from corner to corner with a handsaw, and tap the center into the stock.

Photo C
After tightening the tailstock and the center, move back up to the headstock. Wrap a piece of masking tape around the drive center, and mark one of the spurs and its corresponding location on the end of the turning. This is insurance—just in case you have to remove the turning from the lathe before it’s finished and have to remount it later. (If you wish, you can also permanently notch one spur with a file.)

Photo B
Move the tailstock to just shy of the point at which the tailstock center and the stock meet, tighten the tailstock, and use your lathe’s tailstock handwheel to move the center into the stock. Here again, don’t exert undue pressure; it’s not necessary. If you don’t have a ball-bearing center (a good investment if you don’t already own one of these nifty accessories), apply some paraffin wax to the stock where it meets the center to reduce friction and possible burning.

Photo D
We’ve included this photo to show you the importance of having the tool rest parallel and close to the turning at all times. The rest should also be about halfway between the top of the turning and the centerpoint. Note: Make sure that you always shut off the lathe before moving the tool rest. Also rotate the stock to make sure it and the tool rest won’t make contact.
ROUNDING DOWN AND TURNING THE STOCK

Photo A
With the lathe set on a low speed (around 800 rpm), use a sharp gouge to begin the rounding-down process. Work slowly from the headstock end down, and don't try to remove too much material at once. Notice the angle at which the gouge is being held. At this angle, you're cutting the stock rather than scraping it. See the photo at the top of the next page for an example of how the scraping action differs from the cutting action.

Photo B
You'll have to move the tool rest several times while you're rounding down. Be sure to keep it close to the stock; this gives you greater control of the tool. If you want to put a mirror-like sheen on the cylinder, hold the skew as shown, with the bevel rubbing the cylinder and the heel of the blade doing the cutting. Done correctly, this procedure all but eliminates sanding.

Photo C
Now lay your template up against the turning, and transfer the marks on the template to the turning. Make sure you do so that the end of the template aligns with the end of the stock. In the example shown, we marked the end of the shoulder using a combination square, then started the lathe and marked the other lines.

Photo D
Position the template as shown in this photo, then begin shaping the project. By sighting across the turning onto the template occasionally, you can tell when you're approaching the correct shape. This technique also keeps you from making incorrect cuts—a common occurrence, especially if you're a beginning turner.

Photo E
As you approach the finished diameter of the various segments of the turning, check your progress often with an outside calipers. Simply adjust the calipers to match the marks on the template, and keep turning until the calipers slips around the portion of the turning you're checking.

Photo F
You can make any between-centers project once you learn to make beads and coves. Be advised, though, you'll have to practice a lot to become good at making either. To make a bead, first lay your parting tool flat on the tool rest and score both lines that define the width of the bead.
Photo G
Then, make a mark at the center of the bead. Position the parting tool at a slight angle to the tool rest and a bit on edge as shown, then roll the tool toward the score mark. The tool will be almost as shown in the previous photograph at the end of the roll. Make another, deeper score line and then another roll-action cut. Repeat this process until the bead is formed.

Photo H
To make a cove, position the gouge as shown. Don't go so deeply that the gouge's edges catch the stock.

Photo I
To smooth the edges of the cove, hold the gouge at the angle shown. Work from the side in toward the center of the cove.

FINISHING YOUR TURNING PROJECT

Photo A
With most woodworking projects, preparing the surface for a finish is a drag. Not so with wood-turning projects. The lathe does the work for you—and in a big hurry. Just lay in a supply of 80-, 100-, and 150-grit sandpaper and begin sanding. By having the sandpaper beneath the turning, you can monitor your progress. Keep the paper moving.

Photo B
Once you've removed all the imperfections from the surface, stop the lathe and lightly hand-sand the turning in the direction of the grain with 150-grit. Holding your thumbs as shown allows the paper to conform to the object's shape. This light sanding removes those barely visible sanding marks left from across-the-grain sanding.

Photo C
Most turners like to finish their projects right on the lathe because it's so quick and easy. To protect your clothes and surroundings from splatters, set up some kind of a simplified finishing booth such as the one shown here. We usually use scrap cardboard. When applying the finish, be sure you hold the rag with both hands so you don't accidentally tangle it up in the lathe.

Should you scrape or cut?
Much has been written about whether or not novice woodturners can learn to use their chisels properly as cutters rather than scrapers. Professional and experienced amateur woodturners use their tools to cut because that action leaves the surface of a turned project much smoother than the scraping action. The result: less time spent sanding the project and less distortion of the desired shape. We think even beginners should take the time to learn to turn the correct way—cutting. It takes longer to master this technique, but the quality of your work will show.

How slow should you go?
As a general rule, the larger the stock you're turning, the slower the lathe speed should be, especially during the rounding-down process. We've found that a speed of 800 to 1,000 rpm works well for rounding-down stock that's 2" or less. When we reach the cylinder stage, we increase the speed to around 1,500 rpm. It's not necessary to speed up the rpm for sanding.

Practice makes perfect
In wood turning, there's no better way to learn than by making the shavings fly. So, if you're just getting started, buy some scrap stock and practice your moves before you take on a real project.

The importance of sharp tools
Sharp lathe chisels make a world of difference to you as a turner. We hollow-grind ours on a coarse grinding stone at slow speed, then whet them with a slipstone. Sharp tools held at the correct angle will yield shavings, not sawdust.

What's available in turning stock
You can purchase turning squares (typically in ash, cherry, mahogany, maple, oak, and walnut at some lumber dealers and through mail order) or make your own from up to 3"-thick stock. Or, you can laminate several pieces of thinner stock.
QUICK AND PRETTY
BUD VASE

It's the ideal project for a beginning turner—quick and easy to accomplish (we did ours in just 45 minutes, start to finish). You experienced turners will appreciate this vase if you're scouting for a distinctive gift item to keep on hand. Watch out, though—you're sure to get plenty of requests for this well-turned home accessory!

Turning the vase
1 Start with a 2½” walnut turning square or laminate thinner stock to size, then crosscut the stock to 9”. (You may or may not be able to purchase turning squares locally. We ordered ours from Bob Morgan Woodworking Supplies, 1123 Bardstown Road, Louisville, KY 40204, catalog $1.) Don't let our choice of wood limit you; use another type or even a combination.

2 Mark diagonals on each end to locate the centers, then mount the stock on the lathe. (We find it easier to mount the stock accurately if we punch a small indentation at the center point of each end.)
3 With a gouge, round down the stock to a cylindrical shape. Then, referring to the Vase Profile Drawing, lay out and turn the vase to the finished shape, forming the base at the live end of the lathe. (If this is your first turning project, refer to the preceding article, “Turning Between Centers,” for help with technique.)

4 With the vase still on the lathe, sand it with a succession of grits, starting with 80, then moving up to 100, then 150 grit.

**Boring the hole**

**Note:** Center-boring a hole in a vase of this size can be tricky on a drill press. We’ve had better results on our lathe using the process described below. You’ll have to sacrifice an auger bit for the setup, but it’s worth it in case you’re wondering if a spade bit wouldn’t work just as well, we’ve found that they tend to wander and aren’t as accurate.

1 Start by cutting off the tang end of an \(\frac{3}{8}\)" auger bit with a hacksaw. Then, using an auger bit file, file the screw threads to a point at the spur end as shown in photo A, which includes the bit before and after filing and cutting, and the auger file we used. (An auger bit file allows you to file the screw point without damaging the rest of the spur.) Filing the threads prevents the bit from being drawn into the stock too quickly and possibly splitting the wood.

2 Flip the vase around between centers so the base is now centered on the tailstock. Using a hand screw, clamp the neck of the vase as shown in photo B. (We taped scrap spacers to the jaws of the clamp and taped the neck of the vase to prevent marring, and to help prevent it from turning when boring the hole.)

3 Once the vase is firmly clamped in its horizontal position, slowly and carefully back the tailstock and vase/clamp assembly away from the lathe headstock. Now, remove the spur center from the live end of the lathe and replace it with a chuck fitted with the filed-down auger bit.

4 Move the tailstock and vase/ clamp assembly to the auger bit, and check that the point of the bit is centered with the end of the vase. (It may take a bit of adjusting and re-clamping to get the bit lined up with the exact center of the vase, but it’s worth the time. You’ll find it much easier to bore when the two are perfectly centered.)

5 With the lathe set at a slow speed (800–900 r.p.m.), begin to bore the hole by turning the tailstock-spindle feed hand wheel or crank. This will slowly push the vase into the auger bit. You’ll need to turn the lathe off periodically, crank the spindle back with the feed wheel, and move the tailstock and vase up to the bit and start over again. This resetting also gives the bit time to cool off. Bore out the center of the vase deep enough to house the glass test tube. (You can buy test tubes through scientific supply companies, medical supply outlets, and some hobby stores. We used a Pyrex No. 9800 that measures 6" long with a \(\frac{3}{4}\)" outside diameter.)

6 Remove the clamp and tape from the vase, sand off any marks that resulted from the clamping and boring. Finish-sand the vase with 220-grit paper, sanding with the grain. Finish the vase as desired; we applied several coats of Deft clear lacquer using steel wool between coats.

**Design:** Jim Boelling

**Photographs:** Bob Calmer

**Illustration:** Bill Zaun
LATHE-TURNED ELEGANCE
PEDESTAL DISPLAY STAND

Even a lush fern takes a back-seat to this graceful pedestal table. The black walnut brings a richness that complements the decor of any room. But the real joy comes from developing your turning skills on a project that yields impressive results. Be careful, though—lathe work is addictive!

Building the top
1 Rip, then crosscut enough ¾" walnut boards to make a 15" square for the top (A). Glue and clamp the boards, checking that the top surface of the boards is flush.

2 After the glue dries, remove the clamps, scrape off any excess glue, and sand smooth. Draw diagonal lines from corner to corner to find the center of the square, and use a compass to mark a 7" radius on the bottom. (If you don't have a compass large enough to mark a 7" radius, cut a piece of scrap and drive a nail through one end. Seven inches from the nail, drill a hole large enough for the lead of your pencil. Center the nail on the bottom of the table and mark the circle.) Now mark a 2½" radius for the mounting ring on the bottom of the tabletop.

3 Cut the top to shape, then sand the edge smooth. (We cut slightly outside the cutoff line with a bandsaw, then used a disc sander to finish shaping.)

4 Glue up a 6" walnut square for the mounting ring (B), then mark its center and scribe a 2½" radius. Cut and sand it to shape as you did the tabletop. Bore a 1" hole through the center point of the mounting ring. Now drill four pilot holes through it for the screws that will fasten the ring to the top.

OVERALL DIMENSIONS
Tabletop diameter — 14"
Width of base — 17"
Height — 23"

Cutting Diagram

WOOD MAGAZINE  AUGUST 1985
Turning the pedestal

1 Square up a 3" turning square, then trim it to a finished length of 15¾" for the pedestal (C). If you don't have 3"-square stock, laminate thinner stock to size.

2 Mark diagonal lines to find the center of each end, then center-punch each end and mount the square onto the lathe.

3 Scribe a pencil mark 3" from the end of the square nearest the headstock. Starting at the 3" mark, turn the pedestal to its finished shape, using the Turning Profile Drawing as a guide. (You may want to refer to “Turning Between Centers” in this issue for more information on technique.)

Building the legs

1 Enlarge the Leg Grid Pattern and lay out the shape of one leg (D) on a piece of walnut as shown. Now, cut one leg to shape, sand out the saw marks, and use it as a template to mark the remaining legs. Cut the legs to shape.

2 Using double-faced tape, tape all four legs together, edges flush. Clamp the legs together to ensure that all the pieces are firmly secured to one another.

3 Contour-sand the edges of the legs until all four legs are one uniform shape. Remove the clamps and the tape from the legs.

4 Reference-mark each leg with a numeral (1, 2, 3, or 4), then place corresponding marks on the pedestal. This will enable you later to match the dowel holes in each leg to its corresponding side of the pedestal. Scribe the vertical center of each face of the squared portion of the pedestal as shown in the exploded view drawing. Now, mark the center of the mating surface of each leg.

5 Drill two ½" dowel holes ¾" deep into each leg and insert a ½" dowel center in each hole. Align each leg with its corresponding side on the pedestal and squeeze

Continued on page 77
Now you see 'em, now you don't clone boxes

Everyone loves a nice surprise, and that's just what you get with these beautiful little boxes-within-boxes. All three are from but one block of laminated scrap wood. Use them for jewelry or as conversation pieces.

**Note:** You'll need thin stock and veneer to make this project. You can either resaw and sand thicker material or purchase stock in the appropriate thickness. (We mail-ordered ours from Constantine's, 2065 Eastchester Rd., Bronx, NY 10461.)

Also, we suggest several species in the Bill of Materials, but you can use any woods that suit you. (We used one combination for the boxes in the finish photo and another for the boxes in the how-to photos.)

1. Select an assortment of solid hardwoods and veneers that complement each other. Cut the pieces to length and width. Stack the pieces, rearranging them until the combination appeals to you. (Since this stack will eventually be cut on a jigsaw, we found it best to keep its height under 2")

2. Glue and clamp the stack of hardwoods and veneers together. (We spread a thin, even coat of glue on all surfaces and used several clamps to ensure a good lamination.)

3. Once the glue has dried, remove the clamps and trace the pattern for the three boxes onto the laminated block. Cut the exterior contour of the largest box on a band saw, working slowly to ensure that the box exterior turns out smooth and even.

4. Cut the interior shape for the first box, leaving enough wall thickness at one point to house the ¼" hinge pin (see grid drawing). Drill a hole just large enough to insert your jigsaw blade through, and cut the box interior. Cut slowly and use a sharp blade for a smooth cut and even wall thickness.
Bill of Materials

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Supplies: bubinga for finger push and dowel plug, 1/4" dowel rod, oil finish.

*These parts used as tops and bottoms on smaller boxes.

5 Sand the interior of the newly cut box (photo A) and the exterior of the stack lamination before cutting the next box. (We used a drill press fitted with a sanding drum for the interiors and a disk sander for the exteriors.)

6 Repeat steps 3 through 5 to cut and sand two more boxes from the remaining stock.

7 Drill a 1/4" hole 1" deep at the hinge point in each box (photo B). (We wrapped freezer tape 1" from the bottom of the drill bit, then drilled until the tape came in contact with the wood, ensuring a 1"-deep hole for the hinge pin.)

8 Cut and glue a bottom onto each block. Using a band saw, trim the bottom piece flush with the exterior of the box.

Note: To vary the overall heights of the three boxes, we used a 3/8" cover (A1) and a 1/4" base (F1) for the biggest box, a 1/4" cover (A2) and a 3/8" base (F2) for the intermediate size, and a 1/4" cover (A3) and a 1/8" base (F3) for the smallest box.

9 Cut slightly oversized lids for each box on a band saw or jigsaw. Insert a 1/4" dowel center in the hinge pin hole and position the cover over the box, press down slightly to mark the hinge pin location. Drill a 3/8" hole through the lid, corresponding to the hole in the box, for the dowel. Glue the dowel flush with the top of the cover.

10 After the glue has dried, clamp the covers in position and drill a 3/8" hole 3/8" deep directly above the dowel, then glue a hardwood plug in the hole. Allow glue to dry and sand the plug flush.

11 With the covers in place, sand exterior edges for a perfect fit. (We taped the covers to the boxes to keep their edges flush, and moved the tape to opposite sides of the boxes as we sanded our way around the clone boxes on the disk sander.) A belt sander clamped to your workbench would work, also.

12 Place a small amount of paraffin on the dowel for smooth movement. Form a finger push (we chose bubinga) and glue it to the lid. Sand all surfaces smooth and apply finish of your choice. We used several coats of tung oil for the finish. Apply the first coat, let it soak in momentarily and wipe off the excess with a clean rag. We waited a day and applied a second coat in the same manner, again wiping off the excess.

Design: Alan Mills
Photographs: George Ceolla, Alan Mills
Illustrations: Bill Zauverin

WOOD MAGAZINE  AUGUST 1985
In his poem, Oliver Wendell Holmes illuminated the special nature of wheelwrighting. The wheelwright, perhaps more than any other woodworker, must know how to get the most from his wood. A wagon wheel must be light enough to move easily, yet be able to transport tons of civilization's baggage.

Hubs of the toughest stuff
A wheel is no stronger than its center, and the deacon of Holmes' poem chose elm, one of the toughest woods around, to form the hub.

Elm, with its grain fibers twisted and interlocked, withstands hollowing for the axle and mortising for a dozen spokes with nary a split or crack. But the hardy elm must season for seven years before use—as long as it would take to complete an apprenticeship in this trade.

Turning and mortising
If you were a wheelwright's apprentice, you'd probably spend a lot of time cranking the huge flywheel of the lathe that turns the hub front seasoned elm. Turned true to a cylinder shape, the hub then submits to the wheelwright for mortising of the spokes.

So the Deacon inquired of the village folk
Where he could find the strongest oak,
That couldn't be split nor bent nor broke,—
That was for spokes and floor and sills;
He sent for lancewood to make the thills...

—Oliver Wendell Holmes,
The Deacon's Masterpiece

Around the outside of the hub, he spaces equally with dividers the even number of marks for the auger holes. Once the auger bores out the mortises, the wheelwright cleans away the remaining wisps of grain with a bruzz, or corner chisel. Primarily a wheelwright's tool, the L-shaped bruzz is unsurpassed for working with and across elm's grain.

Bruz chisel
With the mortising completed, the hub returns to the lathe for the final turning of the seats around, and at either end of the bored-out axle hole. These smooth, even surfaces on the hub accommodate small hoops of reinforcing iron.

Spokes and shavings
As an apprentice, you'd next split out the spoke blanks from billets of straight-grained hickory, oak, or ash. While the hub is of wood that won't split, spokes are the better for the splitting. A spoke from split wood has the benefit of continuous grain from end to end, but sawn stock might show weakness if grain switches to the diagonal.

Shaping the spokes from split and seasoned stock calls for a knowledgeable journeyman with a sharp drawknife, since only experience can decide where to shave wood without sapping its strength. Holding the spoke in a long spoke vise, he trims away, keeping strength to the spoke's back by leaving wood, and lightness in its face by removing wood. Thus, the finished spoke is strong, yet resilient enough in its thinness to absorb shock.

On the end of the spoke that will go into the hub, the wheelwright saws a tenon. The other, outer, end is left unfinished to take the blows of the maul, for now each spoke must be driven securely into its mortise in the hub. When all the spokes are forced home, the

Continued on page 76
DUST MASKS AND RESPIRATORS
determining what you need

Do you wear a mask when your workshop air clouds with sanding dust or hangs heavy with finishing vapor? If not, you should! Wood dust, and vapors or aerosols from wood finishing products, can be harmful to your health.

About wood dust, the National Institute for Occupational Safety and Health says: "It is believed that the inhalation of fine dusts from wood, especially hardwood dust, causes nasal cancer."

Concerning finishing solutions, the verdict isn't any brighter. Northern Illinois University associate professor of industrial safety, Dr. Earl Hansen, reports that woodworkers during finishing may expose themselves to hazardous aromatic hydrocarbons consisting of benzene grains. Exposure to benzene has been correlated to numerous cases of leukemia.

If these statements spur you to search for protection, well and good. But you need to know what type of masks are available before you shop the safety equipment suppliers, tool retailers, large department stores, and major hardware dealers carrying them. You can also buy masks mail order from woodworking suppliers.

The disposable dust mask
Not all woodworking operations

Partial face masks, a popular choice
Fairly common among home woodworkers, these respirators rely on replaceable cartridges and filters to trap and neutralize harmful elements. Some use a single filter or cartridge to do the job; others have two. To facilitate communication while worn, they're available with a speaking diaphragm.

Partial face masks come in three degrees of protection.

Continued on page 78
A. Redwood strip canoe
Thomas Hartford Moore of Martinez, California, built this shipshape canoe with ¾”×⅛”×16’ strips ripped from 1×6 redwood. He edge-joined them over a plywood form to the hull shape, removed the hull from the form, and sanded it smooth inside and out. Then Thomas applied fiberglass over the redwood on both sides. Mahogany splash decks help to finish off the bow and stern. Other trim includes seats with woven cane inserts, gunnels, and thwarts—all of ash. Weighing in at 60 pounds, his sleek canoe is 16′ long with a 31″ beam. After weeks of work, Thomas checked out a high-running stream to test his craft’s seaworthiness, and at last report he and the canoe were floating along in grand style.

B. Mail finds a home
The postman making his first delivery to this unique rural mailbox probably paused to knock before entering. Walter B. Rushton, of Albany, Georgia, made the scrapwood project for a local contractor’s office. He used a plywood frame; redwood for siding, roof, and “brick”; and pine for windows, shutters, and door. Brass scraps provided the door knocker and the weather vane. For the asphalt-look roof, Walter sprinkled sand on still-wet spar varnish. After it dried, he sprayed it with black exterior enamel. Inside the 15”×23”×16” “home” Walter installed a standard U.S. Postal Service-approved mailbox and attached its door plate to the hinged front of his custom model.

C. Authentic oak icebox
Did you know that white oak was the traditional wood for iceboxes because it withstood dampness without warping? That’s why Allan Kruger of New Port Richey, Florida, chose it for his reproduction. In his 32”×16”×40” high version, Allan used ⅛” oak stock, resawn to ¾” for front, back, and side panels. Allan used a multitude of joining techniques—mortise and tenons, dowels, and blind dadoes. The warm finish on his turn-of-the-century vintage piece comes from a golden stain, followed by a coat of polyurethane rubbed out with steel wool and wax. Solid brass hardware adds its accent. Allan’s icebox
now serves as a distinctive dining room liquor cabinet.

**D. Routed-to-round stool**

No lathe work? We didn't believe it either when we looked at this photograph. But not having a lathe doesn't mean you can't make things round. That's what Patrick Warner of Escondido, California, tells students in his router workshops. To prove the point, Patrick made this 30° stool from square stock, using only a router for shaping. The side assemblies are joined by exposed dowel-end tenons. Corners are radiused with consecutive router cutters—a rabbet, a flush trimmer, and a round-over. Walnut rungs were routed with a ½"-radius roundover cutter. Patrick joined the padauk-framed seat to the legs with mortise-and-tenon joints and finished the project with Danish oil. We're convinced!

**E. Basswood mountain man**

All hair, fur, and leather. Dave Rushlo's basswood figure of an early 1800s mountain man seems to glare at passersby from his base. Dave writes us from his home in Scottsdale, Arizona, that the 17" statue was carved in three pieces—

the figure, the base, and the Hawken rifle. “Mountain Man” was colored with Carver Tripps Oil Stain, then sealed with thin satin finish. Dave's figures from western history have won local and national awards. Some of his work even graces the Pro Rodeo Museum in Colorado Springs. Keep those wood chips flying, Dave!

**F. Framing a family photograph**

Robert Lancaster of Simpsonville, South Carolina, is a good son-in-law as well as a woodworker. So when his mother-in-law needed a suitable frame for a treasured photograph, she turned to him for help. Bob had been woodworking less than a year when the request came. By combining several designs, he found the one that seemed just right. He enhanced what he calls "simple" pine with duplicate turnings (his first ever), routed ornamentation, and a cherry stain. The 18"x24"x½" frame was finished with four coats of Danish oil and polyurethane mixed fifty-fifty. We sure hope Robert's mother-in-law knows what a good thing she's got going, and that Robert doesn't get swamped with more requests.

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**To submit your projects...**

Send a 35-mm color slide, with the project as the focal point and a simple background—no people. Include a capsule description—materials, special joinery, finish, and dimensions, for example. *WOOD* will pay $25 for published projects. Slides cannot be returned unless you enclose a self-addressed, stamped envelope.

*Send to:*

**Project Showcase**

Better Homes & Gardens®

WOOD Magazine

Locust at 17th

Des Moines, IA 50336
Seat six in style!

REDWOOD PATIO TABLE

Building the table

Note: Rip ¾" from each edge of all 2x6 stock for a 5" finished width. (This removes the factory-rounded edges and lets you make tighter-fitting, better-looking joints.)

1. Cut table leg parts A and B to length. Cut the 45° chamfer on one end of each A as shown in the Table Leg Drawing.

2. To cut the half-lap joints in leg parts B, start by fitting your saw with a dado blade. Now raise the blade to half the thickness of the redwood stock you are using. Test the depth of cut on scrap of the same thickness as B. Set a stop on the fence 2½" from the blade and cut the half-lap joints on each end of B.

3. Lay out and mark the stopped half-lap joints on A, 5" in from the squared end as shown in the drawing below. We marked the joints in pairs (one top part A and one base part A) for ease and uniformity.

MARKING THE STOPPED HALF-LAP

4. With your blade still set at the height used to cut the half-lap joints, set a stop on your saw so that a 2½" notch is cut into one side of A. (As shown in photo A, we clamped a stop to the carriage)

Instructions continue on page 52

around the WOOD workshop, we came to call this our "hex" table for its six-sided seating arrangement—and because it’s a real charmer. We selected redwood to withstand the sun and rain, and for its beautiful wood tones (which we preserved with a clear wood finish). Don’t let all the angle-cutting scare you off—you can do all the top and bench pieces using just a few settings on your saw.
**Bill of Materials**

<table>
<thead>
<tr>
<th>Part</th>
<th>Finished Size*</th>
<th>Material Qty.</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>1 1/8&quot; x 5&quot; x 30 1/8&quot;</td>
<td>redwood 12</td>
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<tr>
<td>B</td>
<td>1 1/8&quot; x 5&quot; x 25&quot;</td>
<td>redwood 6</td>
</tr>
<tr>
<td>C</td>
<td>2 1/4&quot; x 3 1/4&quot; x 5&quot;</td>
<td>redwood 2</td>
</tr>
<tr>
<td>D</td>
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<tr>
<td>E</td>
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<td>F</td>
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<td>G</td>
<td>1 1/8&quot; x 3 1/4&quot; x 21 1/4&quot;</td>
<td>redwood 6</td>
</tr>
<tr>
<td>H</td>
<td>1 1/8&quot; x 3 1/2&quot; x 17 1/4&quot;</td>
<td>redwood 6</td>
</tr>
<tr>
<td>I</td>
<td>1 1/8&quot; x 3 1/4&quot; x 12 1/4&quot;</td>
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<tr>
<td>J</td>
<td>1 1/8&quot; x 3 1/2&quot; x 8 1/4&quot;</td>
<td>redwood 6</td>
</tr>
<tr>
<td>K</td>
<td>1 1/8&quot; x 3 1/4&quot; x 4 1/4&quot;</td>
<td>redwood 6</td>
</tr>
<tr>
<td>L</td>
<td>3/4&quot; x 12 1/4&quot; diam.</td>
<td>exterior plywood 1</td>
</tr>
<tr>
<td>M</td>
<td>1 1/8&quot; x 5&quot; x 12 1/2&quot;</td>
<td>redwood 24</td>
</tr>
<tr>
<td>N</td>
<td>1 1/8&quot; x 5&quot; x 18&quot;</td>
<td>redwood 12</td>
</tr>
<tr>
<td>O</td>
<td>1 1/8&quot; x 3 1/2&quot; x 17 1/4&quot;</td>
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</tr>
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<td>P</td>
<td>1 1/8&quot; x 3 1/2&quot; x 15 1/2&quot;</td>
<td>redwood 6</td>
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<tr>
<td>Q</td>
<td>1 1/8&quot; x 3 1/4&quot; x 21&quot;</td>
<td>redwood 6</td>
</tr>
<tr>
<td>R</td>
<td>1 1/8&quot; x 3 1/4&quot; x 25 1/4&quot;</td>
<td>redwood 6</td>
</tr>
</tbody>
</table>

*Some parts are cut larger initially, then trimmed to finished size. Please read the instructions before cutting.

**Supplies:** epoxy, #12 x 1 1/4" flathead wood screws, #10 x 1 1/4" panhead sheet metal screws, #8 x 2 1/2" flathead wood screws, #10 x 2" flathead wood screws, #10 x 3" flathead wood screws. (Note: use all stainless steel screws for this project if available), 6-8 pieces of 1" x 1" x 1/4" aluminum angle (manufactured by Macklanburg-Duncan and available at most hardware stores), clear exterior finish.

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**Cutting Diagram**

14 pieces—2 x 4 x 8' Redwood

13 pieces—2 x 6 x 8' Redwood

3/4"—24" x 24" Exterior Plywood

---

**45° chamfer**

**2 1/4" x 5" half lap**

2 1/4" deep, 5" from the end

Cut at 30°

#10 x 1 1/4" panhead screw

Cut at 45°

Do not round-over top edges

2 1/2" x 5" stopped half lap 3/4" deep, 5" from the end

Round-over edges

1" x 1" x 1/4" aluminum angle

**TABLE LEG**

2" deep hole to fit umbrella

Core block

---

**Continued**
of our radial arm saw to cut the stopped half-lap joints. You also could use a router and jig to cut the dado.) Now set a stop on the fence and cut the stopped half-lap joint in six As, then move the stop on the fence to the other side of the blade and cut the remaining six As.

5 Using a router fitted with a straight bit and an edge guide, clean out the stopped half-lap joints as shown in photo B. (We set the edge guide so the straight bit would not cut more than 2½” in from the edge. While the guide prevents you from cutting too far in, you will need to clamp on stops for the side cuts—or just eyeball it. You can use this same routing process to cut the entire stopped half lap if you don’t want to use the radial arm saw.) Clean out the two rounded corners of each recess with a mallet and chisel. Check the fit of the half-lap joint of each B into the stopped half-lap joint of each A.

6 Mix the epoxy and brush it onto the mating surfaces of two As and one B. (When brushing epoxy onto the end grain, we applied a first coat, then did the second coat just before clamping and screwing to ensure adequate adhesion.) Clamp two As to each B and check for square. Countersink and install two #12×1¼” wood screws into each half-lap joint. The head of the screw should rest just below the surface of the redwood to avoid hitting it when sanding later. Set the assembly aside to dry and make five more legs in the same manner.

---

** CUTTING THE CORE BLOCK **

7 Sand each assembly smooth with 80-grit paper and use a ½” round-over bit to rout all the edges except the top edge of the top A.

8 With a hacksaw, cut 12 pieces of 1”×1”×1¼” aluminum angle to 29°. Cut the ends of six pieces at 30°, then cut the ends of the other six at 30° as shown in the Angle for Table Drawing. The pieces join at a 60° angle when later mounted to the bottom side of the tabletop.

Chamfer the outer ends at 45° in the same manner, to match the chamfer profile on the outside ends of part A.

9 Clamp the aluminum pieces together and lay out the screw holes as dimensioned in the Angle for Table Drawing. Drill two ½” holes through the angle for each 2×4. Now drill six ½” holes in each 2×4 to mount the angle to part A of the A/B assembly. File or sand all sharp edges and burrs from the angle pieces.

10 Using #10×1¼” panhead sheet metal screws, fasten the aluminum supports to both sides of all As. (Use a 2×4 scrap to position the aluminum the thickness of D below the top edge.)

11 Construct each core block (C) by cutting and laminating with epoxy two 12” pieces of 2×4. After the epoxy dries, cut the block to 3½”×2½” as dimensioned in the drawing below. Now, tilt the blade at 60° and set the fence 2½” away from the base of the blade as illustrated in Cutting the Core Block Drawing above. Crosscut the two 5” C blocks from the 12” lamina
tion. If you plan to outfit the table with an umbrella, bore a hole completely through the center of the top block and 2” deep into the base block.
Assembling the base
1 Working on a large, flat surface, set all six leg assemblies upside down to form a rough hexagon. Set one core block in the center of the legs. Use a band clamp to position and align the legs around the block. Repeat this with the other block.
2 Set your saw to cut a 60° angle and cut one lineal piece of scrap into six equal lengths and form a hexagon with the pieces to verify the angle. Miter all six Ds at 60° to finished length and position them as shown in the Tabletop Construction Drawing below. Slide the pieces under the aluminum and check that they true up the hexagon snugly; trim if necessary. Using #10 x 1 1/4” pan head screws, fasten each D to the aluminum angle on the A/B assembly.
3 Miter parts E to finished length. Then clamp hand screws to B to hold each flush with the top of A, drill pilot holes, and “toe-screw” each E to the A/B assembly as shown in photo C.
4 Toe-screw the base core block (C) in place (drive the screws at an angle from the bottom edge of A into the core block).
5 With a helper, turn the table right side up and miter-cut one each of F, G, H, I, J, and K to finished length. Set the pieces into position on the aluminum angle and check for a good fit at the ends and for the 1/8” gap between pieces. (We ripped scrap stock to 1/4”, then cross-cut to 2” to form the spacers. Then we positioned the tabletop pieces in one of the hexagonal sections with the spacers in place for consistent spacing.) Then miter-cut the rest of the tabletop pieces to the same lengths.
6 Fasten the tabletop pieces (F, G, H, I, J, K) to the aluminum angle, starting with F and working in. Using scrap spacers or by measuring, be careful to keep a consistent 1/4” gap between the pieces.
7 Cut a 12 1/8” diameter disk (L) from 3/8” exterior plywood to fit between the legs for additional stability in the base. Waterproof L with a coat of epoxy and position it while the epoxy is still wet. (Brushing on a coat of epoxy is a quick and simple method of sealing the plywood). Fasten L to the bottom of the tabletop center with #10 x 2” wood screws. Now epoxy the upper hexagonal block C in place and, using it as a guide, bore a hole through the plywood for the umbrella.
8 Sand the entire table assembly smooth with 100-grit paper. Remember that people will come in contact with table and bench surfaces, so be extra careful to sand any sharp edges remaining on these pieces. (We had a few gouges that we filled with a mixture of FIX Wood Patch and cherry stain to match the redwood. We belt-sanded any rough spots with 80-grit paper, then finish-sanded with a pad sander and 100-grit paper.)

Building the benches

Note: Many of the construction techniques used in building the table are repeated in the benches. Refer back if necessary.

1 Lay out and cut the half-lap joints in M and N. Chamfer the outside end of the M pieces to match those of the table legs.
2 Epoxy and screw the bench supports together, positioning the screws so that they are not in the path of the dado to be cut in step 6. After the epoxy dries, sand the assembly smooth with 80-grit paper. Then round-over all edges of the assembly except the top inside

Continued
edge of each with a router and a ¼" round-over bit.

3 Rip and crosscut stock for the rails (O) to length, plus 2".

4 Cut 12 pieces of aluminum angle to 12". Lay out the hole sequence on the angle and drill the holes as dimensioned in the Angle for Bench Drawing.

5 Cut dadoes in each leg. To do this, you'll need to make an auxiliary fence: First tilt the table saw blade to 30°, then bevel-rip one edge of a 24"-long scrap 2×4. Glue and nail the smaller of the two resulting pieces onto the other one and fasten the assembly to a miter gauge.

6 Remove the saw blade and insert a dado blade. Set the blade perpendicular with the table and raise it above the surface of the table the thickness of O. Mark the location of the dadoes in the M/N assemblies. Position one assembly against the auxiliary miter gauge fence with the inside of the assembly facing out. Nail stops to each end of the miter gauge fence to ensure a finished dado 3½" wide, then cut six of the dadoes to size as shown in photo D, making sure the screws are not in the path of the cut. Now remove the fence from the miter gauge and move it to the slot on the other side of the blade. Reposition and reattach the fence to cut the other six dadoes.

7 Attach the angle to the M/N assemblies.

8 Miter-cut bench parts P, Q, and R to size and fasten to the aluminum angle.

9 Epoxy and screw O into the dado using two #10×3" wood screws at each joint. After the epoxy dries, use a hand saw to trim the ends of O flush with the outside edge of the leg assembly.

10 File or sand all sharp edges and burrs from the aluminum, then sand the benches smooth.

Finishing

1 Apply redwood exterior finish to the table and benches. (We applied several applications of CWF Clear Wood Finish, a penetrating oil. It's made with Penetrol by the Flood Company and is available at many local lumberyards and paint stores. CWF should be renewed about every six months. For more about outdoor finishes, refer to the June, 1985 issue of WOOD.)

Design: James Downing
Produced by: Marlen Kemmet
Photographs: Hopkins Associates
Illustrations: Bill Zaun; Randall Foshee
SHOULD YOU BE USING HARDWOOD PLYWOOD?

Perhaps confusion about the quality, grading, and types of hardwood plywood has kept you from using it. If that's the case, you're unnecessarily limiting the scope of your woodworking projects. Here's advice about the pros and cons of working with this unique material.

As early as 3000 B.C., Egyptians bonded thin layers of fine exotic hardwoods to commonplace cores, then worked this ancient version of hardwood plywood into furniture. Their primary purpose in using it was to conserve the hard-to-get exotic woods the pharaoh and other wealthy customers demanded in their furnishings.

Today's material, while it still conserves fine hardwoods, has other attributes that make it ideal for cabinet doors, sides, and tops; bookshelves; drawer bottoms; and other relatively large surfaces.

Why use hardwood plywood? Hardwood plywood usually costs more than the equal quantity of solid hardwood, but it can be worth the premium. Among the advantages are:

- **Dimensional stability.** Cross-banded layers (see illustration, right) and balanced construction mean that hardwood plywood won't shrink, swell, or warp as much as lumber. Its thin plies, lying at right angles to each other, as well as the various core materials available (see table on page 56), produce uniform strength both with and across the grain.

- Baltic birch, a widely distributed product from the Soviet Union and Scandinavia, has even better strength. All of the plies in this veneer-core product (and there are as many as two more per thickness than other plywoods) are rotary-cut birch and without gaps or voids. In 60" square panels, Baltic birch comes in metric thicknesses approximating 1/8, 1/4, 1/2, and 1/4.

- **Variety in thicknesses.** Sheets in 1/8, 1/4, 1/2, and 1/4 thicknesses eliminate planing and waste.

- **Large panels.** Full 4 x 8 sheets allow you to work large pieces without edge-joining or otherwise making up width.

- **Color-matched appearance.** In premium grades, at least one side will be uniform in color and grain, making staining and finishing easier.

There are some drawbacks

Hardwood plywood does have its limitations. Keep these factors in mind so you can make the best choice:

- **Cost.** Compared to solid stock on a board foot basis, hardwood plywood definitely is more expensive.

  To compute the approximate board foot cost of any panel, first figure the number of board feet it equals. Use the formula

  \[
  \frac{\text{thickness} \times \text{width} \times \text{length} \text{ (all in inches)}}{144}
  \]

  If you worked the formula on a piece of \(\frac{3}{4}" \times 48" \times 96"\) flat-sliced red oak plywood, you'd find it equals 24 board feet. If the panel cost $67, you'd divide $67 by 24 for a board foot cost of $2.79. Now compare that to the board foot price of the best quality First and Second 1" plain-sawn solid red oak, which, let's say, is $2.31 (1" in hardwood grading is the closest you'll come to 1/4"-thick stock).

  In the above example, you'd pay 48 cents more per board foot for hardwood plywood. With its performance and working advantages, plywood at this price makes a good choice. But what if the price difference was $1 or more?

- **Limited selection.** Since dealers stock what's in demand, your supplier may only have three or four types of hardwood plywood, such as the popular oaks, birch, and mahogany. You may be able to special-order other types of hardwood veneers, but you'll still be limited to a dozen or so of the...
most common, and no exotic woods. You might approach your project by first determining the type of hardwood plywood available, then selecting the compatible solid stock. This advice also applies to the thin, solid wood edging strips applied where the panel's edge otherwise would show. It's not often carried in more than a half dozen hardwood species.

- **Unreliable stated thickness.** The tendency for hardwood plywood panels to vary in thickness from their stated dimension can be frustrating. If you buy a ¾"-thick panel, for instance, it may stray ¼" to 1⁄2" from that thickness. This often is due to the foreign origin of much of this material and the resulting metric thickness measurement, particularly in ash and birch plywood (50 percent or more comes from Taiwan, Japan, and Indonesia). But even among U.S. manufacturers, thickness may vary slightly from batch to batch and mill to mill. You can adjust your measurements, jigs, and cuts to compensate for the variance, but be sure to buy all hardwood plywood for the same project at one time to save resetting.

- **Thin face veneers.** U.S.-made hardwood plywood has face veneers averaging ¼" in thickness. Some species, such as black walnut, are sliced thinner, to 1⁄8". Foreign veneers are thinner still and can be tough to saw without splintering and sand without destroying.

**What are the veneer choices?**

Veneers, which are nothing more than scant slices off a log, vary in appearance because of the methods by which they're removed. Oak, birch, ash, and other plentiful species lend themselves to peeling by a large lathe, a process very similar to spinning paper towels from a roll. As with softwood plywood, these **rotary-cut**, continuous slices usually cover a sheet in one piece, producing an erratic grain pattern. Because of this simplified slicing procedure and the elimination of matching and other hand work, rotary-cut veneers cost less.

**Flat-sliced** veneers come off the log one flitch, or cut, at a time—just as a potato passes through a vegetable slicer. A surface covered with flat-sliced veneer—and almost all common hardwoods are available this way—resembles a series of glued-up boards. This type of veneer is moderately expensive. Once veneers (other than rotary-cut) have been removed from the

<table>
<thead>
<tr>
<th>HARDWOOD PLYWOOD CORES</th>
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</thead>
<tbody>
<tr>
<td><strong>Core type</strong></td>
</tr>
<tr>
<td>Lumber</td>
</tr>
<tr>
<td>Veneer</td>
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<tr>
<td>Particle</td>
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</tbody>
</table>
log, they must be added to the plywood core. \textit{Match} refers to their arrangement on the face and back. \textit{Slip-matched}, the most common way of applying pieces, has consecutive flitches as they come off the log butt ed up side by side. \textit{Book-matched} uses consecutive slices, too, but every other one is flipped over for a mirror image. A book-matched face resembles the right and left pages of an open book (see match illustration at left).

\textbf{Understanding grading}

Hardwood plywood grades, set by both the Hardwood Plywood Manufacturers Association (HPMA) and individual mills, cover varying degrees of quality from top of the line to bottom. But you only need to acquaint yourself with those described in the table. All retail outlets carrying hardwood plywood will be familiar with these designations.

While not actually part of the grading standards, the classification of hardwood plywood as either Type I or Type II becomes important to you if your project will be used outside. Most hardwood plywood has Type II adhesive, which creates a somewhat water-resistant bond. For outside applications, you'll have to order hardwood plywood bonded with Type I adhesive. This truly waterproof bond raises the cost of the panel, but for outside durability, it's essential.

\textbf{Shopping tips}

Smart planning and shopping pay off when you buy hardwood plywood. Follow these suggestions to get the most for your money.

\begin{table}[h]
\begin{tabular}{|c|c|c|}
\hline
\textbf{Grade} & \textbf{Veneer quality} & \textbf{Defects allowed} \\
\hline
A—Premium & If sliced, pieces are slip- or book-matched for pleasing effect of color and grain. Can also be one-piece rotary-cut & Minor, but not frequent burls, pin knots, and inconspicuous small patches \\
\hline
1—Good$^1$ & Unmatched slices permitted, but no sharp contrasts in color, grain, or figure & Burls, slight color streaks, pin knots, and inconspicuous small patches in limited amounts \\
\hline
2—Sound & No figure, color, or grain match & Smooth patches, sound knots, and discoloration or varying color \\
\hline
3—Utility & Reject material & Open knots, splits, wormholes up to 1 inch; major discoloration \\
\hline
4—Backing & Rarely found due to unlimited defects; strength is the only gradable feature & \\
\hline
G1S$^2$ & Dealer-applied designation meaning "Good 1 Side" used primarily for foreign-origin plywood of $\frac{1}{8}$ or less thickness; face can be good to premium, back with large defects or of another hardwood species & \\
\hline
Shop$^3$ & Defects downgrade these Good or Premium panels to factory seconds & \\
\hline
\end{tabular}
\end{table}

\textbf{Note:} Hardwood plywood panels typically have one side of A-Premium and a lower grade on the other, such as A-1 or A-2, which are combined designations.

$^1$Also referred to as Cabinet grade

$^2$Not an HPMA-certified grade

$^3$Dealer-determined

\begin{itemize}
\item \textbf{Select a suitable grade.} If you're building a hutch cabinet, for example, and want to make the back of hardwood plywood, only the side that will face the room needs to be of higher quality. A typical $\frac{1}{4}$" hutch back would have a "good" grade for the face and a "backing" grade for the back. Cabinet doors, where one side is seen only occasionally, require upgrading—"good" face and a "sound" back.
\item \textbf{Don't buy more than you need.} Since hardwood plywood is expensive, try to minimize leftovers from a $4 \times 8$ sheet—storing them risks gouges, scratches, and moisture damage. Often, your dealer will have half-sheets available for smaller projects. The cost will be higher, but they save money by reducing waste. Sometimes, too, you can buy "shop" grades, which can be high quality with some damage such as broken corners, at significant savings.
\item \textbf{Inspect before you pay the bill.} Broken or smashed corners can't be repaired. Voids, those sunken or hollow spots in the core, won't hold fasteners. Don't accept anything with portions of the core showing slightly through the veneer (this is caused by excess sanding during manufacture). Imperfections in the ply underlying the veneer often telegraph through as a small rise or dent, and they won't sand away. Veneers also may suffer glue failure, overlap at the joints, or even have spaces between them filled with wood putty. Reject any of these imperfections.
\end{itemize}

\textbf{Where can you buy hardwood plywood?}

Local lumberyards may have only a limited selection, but they can special-order through their lumber wholesaler. Home centers and hardwood specialty retailers carry hardwood plywood in larger metropolitan areas. Begin shopping by checking listings under "Hardwoods & Veneers" in the Yellow Pages.

Also, school shop suppliers won't sell small amounts to individuals, but you might be able to order through the school or perhaps a local cabinetmaker.
Kids love playing with floating toys in the bathtub. They'll love you, too, when you present them with either of these two terrific toy boats. If you're feeling ambitious, give the battleship a try. Or if you want to turn something out in a hurry, take on the tug.

The U.S.S. WOOD
1. Begin by transferring the hull patterns on page 60 to ¼” graph paper. (Be sure to transfer the holes as well as the outline of the hulls.) Then, using carbon paper, transfer the hull shapes and hole locations to your pine stock (A, B, C). Cut the hull pieces to shape with a band saw or portable jigsaw.

2. Drill eight holes in hull A to accommodate the ballast nuts. Clamp A, B, and C together and drill the holes for the hull pins (D). Cut the hull pins to length. Put the ballast nuts in place, then epoxy and clamp the hull pieces (A, B, C, D) together. (The hull pins will protrude ¼” above the surface of C for later mounting of the gun turrets.) Sand all surfaces smooth after the epoxy has dried.

3. Transfer the full-size patterns on page 60 to tracing paper, then use carbon paper to transfer them to pine stock. Cut the superstructure (E), the bridge (F), the launch (G, H), the turret (I), and the launch stack (J) to shape. Drill the portholes in E and F, and the gun barrel holes in I where depicted on the exploded-view drawing. (We clamped the pieces in a hand screw to hold them steady while drilling.) Now, bore a ½” hole in the bottom of the turret for later mounting onto part D. Glue E in place on the hull and when the glue dries, mark and drill all the holes in both E and F as the patterns indicate.

4. Epoxy launch parts G and H together, position them on the hull and drill the hole for J through the launch and into the hull. Epoxy the launches to the hull.

5. Cut the smokestacks (K) to length. Clamp a piece of scrap wood to your drill press table and bore a 1” hole 1” deep in it. Without moving the jig, insert K into the hole and clamp it to prevent it from turning with the bit, switch to a ½” bit and bore a hole 1¾” deep in the end of each K as shown in the photo on page 59.

   To make the crow's nest (L), insert a 1”-diameter dowel that's 1½” long in the jig and bore a ¾” hole ¾” deep. Without moving the dowel or jig, switch to a ½” bit and bore a hole through the center of the ¾” hole all the way through the remaining stock. Hand-cut the top ¾” off the dowel.

6. Cut the bridge supports (M), barrels (N), mast (O), air ducts (P), bollards (Q), crane shaft (R), crane...
Fashion a jig with hand screws and scrap wood drilled with a 1" hole. Use it to secure the 1" dowels while you bore out the centers for smokestacks with a flat-bottomed bit, as shown above.

<table>
<thead>
<tr>
<th>Bill of Materials</th>
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*Some parts are cut larger initially, then trimmed to finished size. Please read instructions before cutting.

**Supplies:** epoxy or resorcinol (waterproof glues), oil-based enamel paints (rust, gray, black), 8—5/16" nuts

Continued
FULL-SIZED PATTERNS

HULL PATTERNS
Each square = 1/8"  
Note: Part B is cut to the same outline as part C
The mighty Tug-a-Lug

1 Rip, then crosscut the hull sections (A, B, C) to the sizes listed in the Bill of Materials. Copy the patterns for A and B (shown on the grid portion of the exploded-view drawing) on 1" grid paper, then use carbon paper to transfer the patterns to the pine stock. Use the pattern for B to trace the outline for part C.

2 Rough-cut parts A, B, and C to shape. Finish-sand the stern (rear section) of A and B, and the inside of the gunwale (C).

3 To distribute the weight evenly and ensure that the tug will float, bore 2" holes 1/2" deep and 2" apart on the top of hull section A and the bottom of the hull section B. Then bore out the remaining wood between the two holes and smooth out the rough edges with a chisel to form mirror-image cavities in both the top of A and the bottom of B. Now bore two 1¼" holes through the top of B into the cavity for the pilothouse and smokestack.

4 Drill two ¾" holes 7/8" deep in the bottom of A to house the four ¾" nuts used as ballast. Space the holes 1" apart so you won't hit the nuts when you drill the hole for the bollard. Test-fit the nuts in the holes and epoxy them in place. Now drill a 5/16" hole ¾" deep in the stern of the A deck to house the bollard (I).

5 Mark the location of the four portholes on the stern of the B deck. Clamp B in a vise or a hand screw and drill ¾" portholes ¾" deep. Using epoxy, which is waterproof, glue and clamp A, B, and C together.

6 With a belt sander, sand the bow (front end) of the tug to 15° as shown in the Side View Drawing at right, contour-sand the sides, and sand the gunwale (C) so that it tapers from ¼" thick in the front to 3/8" in the back.

7 Cut the pilothouse (D) and smokestack (E) to size from 1¼" dowel stock. Using a wooden V-block to keep the pilothouse dowel in position, drill a 5/8" hole 3/8" down from the top end of the dowel for the windows. Now fashion a smokestack drilling jig like the one shown in the how-to photo on page 59. Use the jig to centerbore a 1" hole 2 ½" deep in the smokestack, and a 1" hole 1 ½" deep in the pilothouse.

8 Glue and install the pilothouse and smokestack a ¼" into the B deck.

9 Cut the roof (F) and the whistle pieces (G, H) to size. Cut the bollard (I) to size plus 1" and J to size. Drill a ¼" hole through the center of the roof for the whistle and glue the roof to the pilothouse. Cut the notch with a fine toothed saw and chamfer the top end of whistle piece G. Drill a ⅜" hole for H in G at a 45° angle and glue H in place. Now, glue the whistle to the roof, and the roof to the pilothouse.

10 Drill a 1/8" hole through the bollard (I). Chamfer the top end of I and glue J in place.

11 Finish-sand and apply several coats of exterior polyurethane.
SIX HANDY HELPERS
for your table saw

With a little help from these table saw accessories, you can greatly increase the accuracy and versatility of your workshop workhorse.

Miter gauge extension
This is an oldie but a goodie that you ought to make if you haven’t already—see photo 1. Just screw a strip of wood about the same width as your gauge is high to the face of the miter gauge. Most gauges have some holes already drilled for screwing on this simple but nifty accessory. Be sure to attach it so it will clear the blade guard. It can stick out the other side as far as you want.

Glue a strip of sandpaper (we used a piece cut from a sanding belt) to the face of the extension with contact cement to help keep the work from creeping as you pass it through the saw. Teamed up with a hold-down on the miter gauge, you’re practically guaranteed a no-slip crosscut, even with those tricky miters.

While you’re at it, make a simple, no-nonsense stop block like the one shown clipped to the end of the miter gauge extension. Drill a hole for a small screw through the corner of a spring clamp, then attach a short block of wood. When you screw the block to the clamp, leave it a bit loose so the block will self-align with the end of the workpiece when you clamp it on. P.S.—this stop block works like a charm on the fence of a radial arm saw, too.

Cutoff for short blocks
When crosscutting several short pieces to the same length, it’s often recommended that you clamp a block to the rip fence just short of the saw blade to automatically set the length of the cutoff. However, this method still can result in the block possibly getting caught between the rotating blade and the fence, sending it dangerously whizzing across the shop.

A much safer system for you to employ is to simply clamp a short length of wood to the table surface as shown in photo 2. This way the cutoff pieces can just drift away from the blade or be pulled out of the way without any danger of them binding against anything.

To make it easy on yourself, cut a handy length of wood for the stop block and mark it in some way so you won’t accidentally discard it or use it in another project. Drill a hole in one end and hang it on a nail somewhere near your saw.

Work support
When you’re working by yourself in the shop, slinging around long boards or big pieces of sheet material, you really need the kind of help a work support like the one in
photos 3 and 4 can give you. There are lots of designs around for these things, but this one is easy to build, and has several nice features.

There are two interchangeable heads—one for ripping and one for crosscutting. The roller for the ripping head is made from a length of 4-inch plastic plumbing pipe. It's inexpensive and easy to find in any hardware store or building supply center. The large diameter works well to catch the end of that droopy board, rolling it up and over, instead of just pushing over the stand.

For crosscutting, the plastic casters in the other head roll the board along without a hitch. Maybe you'll want to build two bases, so you can use both heads at once for cutting large panels.

One other nice thing about this design—the base just slots together, so when you're not using the stand, you can pull it apart and stack or hang the whole thing flat somewhere out of the way.

**An “improved” feather board**

The old feather board idea (a strip of wood with a number of closely spaced cuts in the end) works well for holding the workpiece tight against the fence when ripping, but the gadget shown in photo 5 works even better and isn't all that much more complicated to make.

The plastic casters roll the stock right along without friction, and the two coil springs flex a bit to make up for any unevenness on the edge of the board. We used some lengths of brass rod we had lying around for the guide rods, but you
could use mild steel rods from the hardware store, or even some big spikes with the heads cut off.

The push stick in use here is an improvement, too, we think, over the usual strip of wood with a notch in one end. This model, cut from a scrap of plywood, gives you some leverage to hold down the workpiece as it passes through the saw. True, your fingers are in the vicinity of the blade, but they’re high enough to be out of harm’s way.

**Note:** Whenever you employ a feather board, be sure to clamp it securely to the table, and make sure that you position it just ahead of the point at which the stock makes contact with the blade. If you accidentally place it beyond the point of cut, the pressure exerted will pinch the wood and may cause it to bind.

**Combination thin strip ripper and resawing guide**

Ripping thin strips can be a dangerous operation if you use your rip fence. You just never know when one will kick back out of the saw and shoot across the shop. The jig shown in photo 6 doesn’t rely on the rip fence at all, but rather clamps to the saw table. The workpiece bears against the jig’s adjustable fence only until it gets halfway through the saw blade, then the strip spreads away from the blade to prevent binding. And the adjustable hold-down near the rear of the jig, which adjusts up and down, keeps the strip from being forced up. The push stick gives your hand plenty of room, well clear of the blade, and it stores in its holster when not in use.
We banded the edges of the jig’s ½” plywood base with thin maple strips. Then, to cut down on friction, we added some strips of scrap plastic laminate, glued on with two coats of contact cement, to the top surface as well as to all the bearing faces of the jig. We even stuck a strip of laminate to the vertical fence, which allows you to use the jig for resawing.

After cutting a kerf in the jig’s base, we scribed a series of lines parallel to the kerf (at 1/4” intervals) to help make aligning the fence an easier task. (You’ll want to run a ball-point pen along the scratches to make the lines visible.)

To use the jig for resawing, first position the rip fence as needed, then do the same with the resawing jig, securing it in place with a clamp at either end of the jig. This setup gives you needed support on either side of the piece you’re resawing. (Be sure to run a piece of scrap through the saw first to make certain your setup is correct. Then run the stock carefully and slowly through the saw.)

**Auxiliary rip fence**

When you’re ripping wider pieces of stock, a “halfway-through” auxiliary fence like the one in photo 7 can save a lot of wear and tear on your saw blade. There’s no real need for the workpiece to bear against the fence, once it gets past the blade—it only creates more friction and the potential for binding. With this fence there’s a little relief, so the kerf can spring apart a bit. We made this fence so you can take it off, but you could accomplish the same thing by just screwing or bolting a short strip right to your saw fence. Give it a try—you’ll be surprised how well it works!

If you have a molding head cutter for your saw, you can use this fence for cutting partial profiles of any of your cutters. Crank the cutter down below the surface of the saw table, then move the fence into position so the portion of the cutter you want to use will engage the workpiece.

Now, turn on the saw and slowly crank up the cutter into the edge of the auxiliary fence. Crank it up a bit higher than you will need to make the finished cut, then make the final adjustment before cutting the profile on your workpiece.

**Safety reminder**

For the sake of photographic clarity, we have removed the blade guard in some of the photographs used in this article. We strongly recommend that whenever using a table saw or any other cutting tool for that matter that you keep all safety devices in place, even if they sometimes seem to get in the way.
Easy does it

breakfast barstools

Can't find ready-made barstools that match your kitchen decor or counter height? Then build your own! You choose the wood and fabric with this easy-to-build plan. We sized these stools for a standard 36”-high breakfast bar. But the same design adapts to wet-bar seating. Just lengthen the chair leg bottoms 4”.

1 Using a table saw with a sharp blade, preferably carbide tipped, rip the oak stock into 1½” squares as laid out in the cutting diagram. Depending on the quality of the cut of your saw blade, you may want to make the squares slightly wider initially, then joint them down to 1¾”. (Accuracy is vital in cutting this stock, so be sure your saw is properly aligned before you start.) Next, crosscut the back legs (A), front legs (B), front and rear stretchers (C), and side stretchers (D) to length.

We pencil-marked each piece so the face grain of the legs and stretchers was on the sides of the barstool and the edge grain was on the front and back, as shown in the drawing. This provides a matching grain pattern on the finished product.

2 Rout a ¼” stopped groove ½” deep and 5” long in the tops of A, as indicated in the exploded-view drawing. Square the end of each groove with a ½” chisel. Mark where the stretchers meet the legs. Next, mark the lag screw holes, offsetting the holes as shown in the Offset Hole Detail.

3 Rip and crosscut the back (E) to size, then cut a ½” rabbet ¾” deep on both ends to fit into the grooves in the back legs (A).

4 To assemble each side of the barstool, arrange one back leg (A), one front leg (B), and two stretchers (D) on your bench top. Glue and clamp the stretchers to the legs. (When joining end grain to surface grain, we rub glue into the porous end grain, wait a few moments, and apply another coat. Only one coat is necessary for the surface grain of the mating piece.)

5 To further strengthen each joint, drive a ¼”X 4” lag screw through
the leg and into the stretcher. You'll need to drill dowel plug, shank clearance, and pilot holes—in that order—as shown in the Screw Hole Detail to keep the wood from splitting. You may also want to lubricate the lag screws with paraffin wax before driving them; they'll go in easier if you do.

6 Join the two sides, using the four remaining stretchers (C) and following the same process described in steps 4 and 5. Cut pieces of 1" oak dowel to length and glue them into the plug screw holes to conceal the lag screws.

7 Test-fit the barstool back into the grooves in the legs. The fit should be snug, but not binding. Hand-sand the rabbet if it's too tight.

8 After the glue has thoroughly dried, carefully sand the plugs flush, then finish-sand the entire assembly. Attach the nylon chair glides to the bottom of each leg.

9 Apply the finish of your choice to the frame. Don't get any finish in the seat-back grooves. We finished ours with several coats of Minwax polyurethane, rubbing lightly between coats with steel wool and cleaning off any particles with a tack cloth. While we didn't stain the frames, you may want to so they match the rest of your kitchen furniture.

10 Cut the plywood seat (F) to size, then drill four 1/8" vent holes in it. Also cut a notch in each back corner to fit around the back leg. If you decide to tackle the upholstery, glue the foam rubber to the seat back and seat, then cover the foam with upholstery material. Apply glue to the rabbets on the seat back and glue the back in place. Wipe off any excess with a damp rag.

11 Cut the cleat (G) to size, position the upholstered seat on the frame, then screw the cleat to the bottom of the seat. (The cleat keeps the cushion in place.)

Design: George Granseth  Illustrations: Bill Zaun  Photograph: George Ceailla

Bill of Materials
For One Barstool

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<td>G</td>
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Supplies: 16—1/4" x 4" hex head lag screws, 18—1/4" flat washers, paraffin wax, 1—1/4" dia x 12" oak dowel, 3—46 x 1" flat-head wood screws, 4—1" nylon chair glides, 1 piece 1" thick foam 5" x 12", 1 piece 3/4" thick foam 15 1/4" x 17 3/4", 1 yard upholstery material, beading, staples, thread, finish

WOOD MAGAZINE  AUGUST 1985  67
WOOD LATHES

WHAT'S BEST FOR YOUR SHOP?

Choosing the best lathe for your needs depends on the type of projects you'll be turning, your pocketbook, and the options you want. Here's a roundup of the latest in mid-priced lathes for the home shop.

See related articles on:
Turning between centers ........ page 35
Turning tools .......... page 79
Lathe buymanship chart ........ page 70

Have you ever walked into a shop when someone had a big block of wood on a wood-turning lathe, spinning it into an intricate table leg or a magnificent wooden bowl? That chunk of wood, whipping around at 450 to 2,500 r.p.m. with shavings flying, has to be one of the most impressive sights in woodworking.

The beauty of turning is that even a novice can quickly turn a piece that looks much more difficult than it actually is. The fast, eye-pleasing results make the wood lathe just plain fun to own and use. After all, that graceful symmetry can't be duplicated readily by any other machine, or even by a skilled woodcarver.

All you need are turning stock, some finely honed chisels... and a sturdy lathe.

How the tail wags the dog
In almost all other woodworking equipment, the cutting tool spins,

Step-pulley speed control

Spindle lock
Tailstock

Headstock
Motor
Headstock spindle
Tool rest

Tool rest base
Tailstock lock clamp

Steel base
Conover and other mini-lathes are the only tools to consider.

Another alternative is a space-saving multi-use tool with a lathe as its basic component. These versatile machines are made by such manufacturers as Shopsmith, Total Shop, and Woodmaster (listed in byuanship chart).

The lathes pictured here are among the best available in mid-priced lathes (each is under $1,000). Close-ups of special features from these lathes appear on page 72; suppliers and manufacturers are listed on page 74.

A lathe for every pocketbook (almost)

Glance at the chart on page 70 and you'll find that wood lathes cluster in three broad price categories.

Prices start as low as $80-$250 for a very basic lathe. Missing from these models are conveniences such as indexing pins, Morse taper drive centers, and highly machined parts. Most lathes fall into the $650-$1,000 range, where you'll find a wide choice in features and capabilities.

The top-of-the-line lathes—Hegner, Harrison, Powermatic, and high-end Delta models—cost from $1,700-$3,000. These machines reflect superb quality and, as you'd suspect, are designed for the commercial market. But, as with many other stationary power tools, a savvy woodworker can find a good buy in a used commercial tool that still has good bearings and a true bed.

Look first at the lathe bed

The key job of any lathe bed is to securely support the head- and tailstocks, tool rest(s), and other accessories. There are as many styles of lathe beds as there are lathe manufacturers. Each has its advantages, either in function, cost, or both.

The rigid cast-iron beds of the Delta and General lathes absorb shock and wear well. Cast-iron beds also accommodate the versatile "gap bed" design. Here a recessed portion of the bed beside the headstock allows you to do faceplate turnings somewhat larger than those possible with the main bed. (No noncast lathes have this feature.)
## COMPARISON CHART FOR WOOD TURNING LATHES

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<td>Y</td>
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<td>¾</td>
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<td>NA</td>
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**Bearings**
- B = Ball bearing
- S = Sleeve
- TR = Tapered roller
- BS = Ball screw
- CI = Cast iron
- FS = Formed steel
- CA = Cast alloy
- CAL = Cast aluminum
- BB = Box beam
- CI = Cast iron
- TT = Steel twin tube
- MT = Steel mono tube
- RC = Cold rolled C-channel
- FC = Formed steel C-channel
- W = Wood

**List**
- w/m = With motor
- w/o = Without motor
- w/s = With stand
- w/o = Without stand

*Multi-tools include table saw attachment.

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70  WOOD MAGAZINE  AUGUST 1985
Tubular steel twin rails appear in all of the multi-tool lathes, such as Shopsmith and Total Shop models. The twin rail system also is used in Elektra Beckum's two models and in the smaller-scaled AMT wood lathes. Other bed styles of varying gauges and materials include C-channel beds of cold rolled or formed steel (Williams & Hussey, Emco Maier); box beams (Mini-Max, Hegner); and monorails (Myford, Sears, Duracraft).

A word of advice to the beginning turner: As your expertise grows, you'll probably want to explore special features that are designed to be attached to the lathe bed. When you do, you may have problems securing accessories to round-rail or monorail tools. In most instances, though, you can fit any homemade or manufactured jig onto the tool rest base. Or, slightly modify the design.

The headstock
This is the "business end" of the wood lathe, where the main spindle and bearings are housed. Except for minor controls and possibly a live center in the tailstock, the headstock is the only part of the lathe that has any moving parts while turning. That's why it's so vital that the headstock be sturdy and securely attached to the bed.

The headstock has to be its toughest when a workpiece is out of balance, either by the nature of the wood or by the design of the turner (as with the spoon foot of a cabriole leg). The bearings, shaft, and other head parts take the full impact of vibration, as well as the hammering and dragging of the chisel as it presses into the block.

Speeds of up to 2,500 r.p.m. combine with the stresses of turning and cutting to make ball or roller bearings the only practical choices for the wood lathe. (Conover uses tapered roller bearings in its heavy-duty unit for maximum resistance to spinning and lateral stresses.) The only other option, sleeve bearings, soon succumbs to the stresses involved.

If you like faceplate-mounted projects, check the headstock for outboard mounting capability. Without any, you'll be restricted to turning only the pieces with a radius shorter than the distance between spindle and bed. Some companies, whose lathes don't have outboard spindles, have increased that radius (see section on faceplate turning options, page 72).

Changing gears
There are several approaches to speed control on a wood lathe. The most common is the three or four step-pulley system. The Mini-Max pictured at the opening of this article is an excellent example that has the added feature of a lever belt-tightening system (see photo E, page 72).

Most belt-drive lathes that do not have built-in motors allow you to mount the motor below the lathe in order to keep the machine compact in size. However, some of the less-expensive units, such as the AMT, Sears and the Williams & Hussey, require that the motor be mounted directly behind the machine at the same level as the bed (see photo of AMT lathe, page 69).

Conover's wood-beam system also uses a behind-the-lathe motor mount, but the motor attaches to the beams and doesn't require a wide base table. Rear motor placement doesn't affect the operation of the lathe, but it does require a larger table to mount the machine—a potential problem in a small shop.

A few lathe models have mechanically operated dial- or slide-lever speed controls (see photo of General lathe, bottom of page 69). Such controls allow you to change the speed of the lathe without shutting it down. You also can change speed electrically.

We prefer the mechanical style of reducing speed through gears or belts. When a motor is slowed by cutting the voltage, horsepower drops faster than voltage. On the other hand, when you mechanically reduce speed, horsepower at the spindle increases. This is important early in a project when working at slower speeds.

The tailstock: holding up its end
To do its job, the tailstock, located logically opposite the headstock, must have two important characteristics:

First, it must lock securely to the lathe bed. Since the work piece is clamped between the head- and tailstocks, the tailstock must not move on the bed once locked or the wood will fly off the lathe. The best-engineered units have a locking nut, lever, or wheel that is easy to reach and simple to tighten. (Remember that you'll want to be able to adjust the tension on locking levers and wheels.)

Second, the dead center must drive securely into the end of the stock. There are several types of dead centers for various jobs, so being able to change them is a plus.

The entire tailstock slides on the bed to adjust for the length of your turning piece. For fine tuning, an adjustable centerpoint spindle also is included. This should move smoothly with an easy-to-use wheel and a strong locking handle. The adjustable spindle should move in and out two or more inches for use with a drill chuck.

Some lathes, such as the General and the Mini-Max, have scales mounted on the spindle in the tailstock for accurate measuring while drilling.

SPECIAL FEATURES

Options in centers
When it comes to centers, there are options besides the traditional cup-style tailstock center and the two- or four-bladed headstock center. In the tail, a ball bearing center reduces friction and drag. Grizzly Imports offers an oversized ball bearing "cone" center for previously drilled or hollowed-out workpieces (photo A, p. 72). Drill chucks, screw centers, and cutting centers also are available. Elektra Beckum and several others also offer hollow points to allow dead-center drilling in a project (photo B, p. 72). The message: When you're shopping, look for variety.

Continued
No rest for the tool rest
Also referred to as the steady rest, the tool rest is of either sheet metal or cast iron. Since the purpose is to support the cutting chisel, the main concern is rigidity. Tool rests also come in various sizes and shapes for different cutting conditions. The General cast iron double rest and the Emco Maier reinforced steel rest, both pictured, are good examples of the two types of rests and the firm locking brackets that hold them to the lathe.

Step-pulley speed control
(See “Changing gears,” page 71.)

Faceplate turning options
One of the challenges of outboard turning is using a tool rest. Several companies offer floor stands, while some (such as the Myford pictured and Harrison) include a removable outboard tool rest. But this too will restrict the size of your project because the tool rest is still attached to the lathe. Also, all lathes with threaded faceplate spindles for both inboard (counter clockwise) and outboard (clockwise) turning require two sets of plates, one with right-hand threads and one with left-hand threads.

To compensate for the lack of outboard capability, some manufacturers, such as Hegner, Elektra Beckum, and Mini-Max, have increased the spindle-to-bed distance on their models.

In another approach, the Conover lathe is designed to allow you to turn the headstock around for outboard turning on the wooden beam bed. This requires moving the motor from one side to the other as well. König-Dreschelbank uses a swiveling headstock with a built-in motor to permit outboard turning while you stand in front of the lathe (instead of at the end).

The lathe with a hollow leg
The Emco Maier wood lathe is a comparatively lightweight tool. To compensate, the unit has hollow legs that you can fill with sand once the lathe is in place in your shop. Most lathes, including this one, also have stands that can be bolted to the floor for stability.

Indexing: it’s nice
Several lathes like this Conover offer an indexing feature that has several uses. It’s a good way to lock the head spindle while removing thread-on accessories. More important, it can evenly space sectors on a turned piece. With a router or drill jig fixed over the workpiece, you can rout flutes in a spindle. Or use the indexing feature to mortise support rails into table legs, spacing them flawlessly by inserting the pin in the appropriate index hole in the pulley.

Seating capacity
As you study the chart on page 70, note that several lathe manufacturers include in their lines essentially the same lathe with different center-to-center capacity.

Instead of different models with longer turning beds, Delta came up with a unique solution. In their 11” lathe, the bed casting actually comes in two parts. You can start with the 36” gap-bed lathe, then add 16” sections to allow for longer and longer turning spindles.

Conover devised another solution by furnishing heavy cast-iron headstock, tailstock, and tool rest assemblies that you can mount on wooden beams of any length to suit your project. Either of these two extension possibilities is very useful when turning exceptionally long pieces, such as the posts for a Jenny Lind bed.

Chucks that grip
Sometimes it isn’t practical to use a faceplate. That’s when a three- or four-jaw chuck like the one on this Elektra Beckum really saves the day. Although most people think of these as metal-turning chucks, they are just as comfortable on a wood lathe turning a ball-topped spindle or a delicate cup. One of these chucks can grip either the inside or the outside of the project without requiring screws, or in any other way marring the project. A note of caution, though: Keep hands out of the way and use a chuck guard.

Getting attached
Live and dead centers and faceplates

Continued on page 74
WOOD CARVING

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TOOL BUYNEMANSHIP

Continued from page 72

WOOD LATHES

attach to the lathe in a variety of ways: setscrews, Morse tapered shaft, or thread-on centers. Faceplates use set screws or threads (either left or right hand). The best of these are thread-on faceplates and Morse taper shafts on centers. These types tend to stay the tightest and are quickest to install and remove.

Thread-on accessories aren't interchangeable from one machine to another. Morse taper points are interchangeable, however, within the limits of the three popular sizes (Morse nos. 1, 2, and 3). Units with setscrews can slip, but they will serve well if tightened carefully and checked periodically while working.

What's new in copiers

Copy attachments are another intriguing option for woodturners. Highly accurate (and expensive) commercial-style units are available (Hegner offers a power-driven automatic unit and Mini-Max has an excellent manual copier that costs almost as much as the lathe itself). Other copiers accommodate the home woodworker's budget better.

Grizzly Imports offers a copier and lathe package with a rack-and-pinion copier for less cost ($295) than most copiers alone. From the looks of this machine, it could be hard to get a better price-to-product ratio. (Unfortunately, the model was not yet available at press time, and we could not include it in the buynmanship chart on page 70.)

Several other companies including Delta, Emco Maier, and Elektra Beckum offer copiers. Although these are fairly expensive items, they may pay their way if you're planning to build beds, stair rails, or similar items with repeated spindles.

About the lathes featured in this article

When we began researching this article, we sought out the best innovations in wood lathes available today. The nine lathes shown were selected because they offer some feature(s) that make them unique among mid-priced lathes under $1,000. It's an international collection, representing America (AMT, Conover, Delta, and Williams & Hussey); Austria (Emco Maier); Canada (General); England (Myford); Germany (Elektra Beckum); and Italy (Mini-Max). Auto buyers aren't the only consumers who are benefiting from international trade these days!

Our thanks to the following manufacturers and suppliers of the wood lathes that are shown in this article:

• AMT model 373, American Machine and Tool, Fourth Avenue and Spring Street, Royersford, PA 19468
• Conover CL16-010, Conover Woodcraft Specialties, Inc. 18125 Madison Rd., Parkman, OH 44080
• Delta 46-140, Delta International Machinery Corp., 246 Alpha Dr., Pittsburgh, PA 15238
• Elektra Beckum HD-1000, Elektra Beckum USA Corp., 401-403 Kennedy Blvd., P.O. Box 24, Somerdale, NJ 08083
• Emco Maier DB-6, Emco Maier, P.O. Box 07824, Columbus, OH 43207
• Mini-Max T-100, Mini-Max USA Inc., 3642 NW. 37th Ave., Miami, FL 33142
• Myford model ML8-B (less motor). Woodcraft Supply Corp., 41 Atlantic Ave., P.O. Box 4000, Woburn, MA 01888
• Williams & Hussey L-82, Williams & Hussey, RR 101 West, Milford, NY 10355

Many of these machines and others listed in the buynmanship chart on page 70 are not generally available in retail stores in the U.S., but they are available by mail order. Check the ads in WOOD and other woodworking magazines for suppliers, or write the manufacturers.

Photographs: Hopkins Associates
HOW TO LEVEL A
WOBBLY PROJECT

You've cut and assembled your table or chair project, and it looks terrific except for one thing—the darn thing wobbles. Try this simple procedure to set things straight.

Use our technique to level a piece with four or more legs. In a three-legged piece, the single offending leg obviously is easier to identify and remedy.

First remove any glides or cushions from the bottom of the legs. Then place the piece on a level work surface and set your level on the tabletop or chair seat so that the level points toward two directly opposite legs.

Shim beneath the legs as necessary until the top surface reads level, then rotate your level 90°. Check for level again and shim as needed. Now shift your level back to the original position to make sure it's still true there.

Next measure the gap between the work surface and the bottom of the leg that's the farthest above that surface. Make a shim about \( \frac{1}{8} \)" thicker than the gap is wide and place a pencil on its side atop the shim. Mark a line along the bottom of each leg (photo A) to determine where to cut in order to level the project.

Lay the entire project on its side and cut the bottom of each offending leg(s) with a jigsaw or handsaw (we use a clamped-on piece of scrap wood as a guide—see photo B).

When your level indicates satisfactory results, touch up the project by smooth-sanding as required and applying stain or finish. Install new glides if needed.

In some instances, trimming the bottom of the offending leg(s) would ruin the looks of the piece. In these situations, you may want to build up the leg with a pad until the project is level, then shape the pad to the contour of the leg and finish as necessary.

You also can opt for adjustable glides screwed in with T-nuts, as on appliances. If all else fails—head back to the workbench to fashion a replacement leg.

---

The Joint-Matic 4200 is a new system in joinery that offers operating convenience, efficiency and accuracy that can not be compared to anything on the market. The Joint-Matic will help you produce woodworking pieces of elegance, precision and beauty more quickly and expertly than you ever thought possible. Now, in minutes make...Mortise, Tenon, Sliding and Through Dovetail, Box Finger Joint and much much more. Exclusive features of the Joint-Matic are so advanced in design and simplicity that set up time has been all but eliminated.

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Joint-Matic Machine Is Protected By U.S. Patent 4,163,465
THE OLD HAND WAYS
Continued from page 46

final length of each can be gauged outward from the hub, and the outer tenon marked and cut.

Fellies and tires
The rims of the wheels are made up of sections called fellies. They, too, demand tough wood—beech, ash, hickory, or oak—sawn out along the length of the grain. Each fellie has two mortises to take two spokes, thus a 12-spoke wheel requires six fellies. When the fellies are driven hard onto the spokes, there still may be visible gaps between them—but not for long. Everything will be drawn together by the contraction of a hot iron band called—you guessed it—a tire.

After heating the tire in an open fire until it is hot enough to ignite a hickory splint, the wheelwright drops it over the wheel. Immedi-

The iron tire, after heating in the fire, is about to be dropped over the wheel. An old millstone serves as the tiring platform.

ately dousing it with water, he bangs it with his hammer to even out the relentless contraction of the iron ring. As the iron cools and the joints draw tight, the wheel becomes one, ready for the road, as strong as it can be.

The wheelwright and his wheels were vital to life in the early-day village. So was the cooper, who fashioned and maintained the barrels and casks used to store a hundred items. Coopery is the subject of the next Old Hand Ways column.
NOW YOU CAN BUILD IT

Continued from page 43

pedestal stand

together to mark the location of the dowel holes on the pedestal. Drill \( \frac{3}{8} \)" holes \( \frac{5}{8} \)" deep in the pedestal, then sand the legs smooth.

6 Using a \( \frac{1}{4} \)"

round-over bit, rout all edges of the legs except the bottom edge where the leg meets the floor and the top edge where the leg connects to the pedestal.

7 Trial-fit the legs into their respective holes and set the table base on a perfectly flat surface. If it tilts, see the article on page 75 of this issue for how to level the legs. Once the table sits perfectly level, glue, dowel, and clamp the legs to the pedestal as shown in photo.

Final assembly

1 Using a handsaw, cut a slot in the center of the tenon end of the pedestal and a wedge to fit the slot. The wedge should just slightly expand the tenon yet firmly hold the ring (B) in position. Sand the wedge to shape.

2 Fit the ring onto the tenon, then glue and drive the wedge into position.

3 Finish-sand all the parts and screw the pedestal to the top. Finish as desired.

Photographs: Bob Calmer
Illustrations: Bill Zaun

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SHOP SAFETY
Continued from page 47

DUST MASKS AND RESPIRATORS

A dust mask respirator utilizes a mechanical filter to remove only dust from inhaled air. It won’t trap vapors of evaporating solvents or the liquid droplets called aerosols from overspray.

To remove dust and the mist of aerosols, you’ll need a dust and mist respirator. But they’re of little protection against harmful vapors.

The fume respirator guards you against vapors as well as dust and mist. It does it by the filtration of one or two special canisters equipped with a purifying element. This element reacts with the vapors and removes them from the air drawn into the mask when you breathe. A filter in front of the element catches dust and the droplets of aerosols. To keep the mask working properly, you have to change the filter(s) regularly.

Full-protection face masks
Usually found in industrial or production situations where they are worn nearly continuously, full face masks guard eyes, nose, and mouth.

These masks, while expensive, protect against dust, mist, fumes, and flying chips. You can expect them to make a better seal, too.

Shopping for protection
Before buying any type of respirator, you need to determine exactly which hazards you most frequently encounter in the shop, then choose a dust mask, a dust and mist mask, or a fume mask accordingly.

Most woodworkers can get by with a partial face mask solely for dust unless they do quite a bit of finishing and refinishing in a poorly ventilated area.

If you already experience a breathing problem, or have a heart condition, a mask with a dual cartridge filter system (two canisters) offers less resistance. Check with your doctor before you buy.

A mask must fit to be as effective as it was designed to be. Proper fit not only ensures a tight seal, but wearing comfort, too. Partial and full face masks feature adjustable straps for the back and top of your head—the more straps, the better the mask will fit.

Mask material also influences its seal. The softer and more supple the material from which it’s made, the tighter the seal to your face.

A beard or facial stubble, scars, and cheek bone structure all affect the way a mask fits your face. And if you wear dentures, you’ll obtain a better fit with them in place. It’s wise, then, to try on different styles and masks from several manufacturers to find the one best suited to your facial contours.

When trying on different masks, check them for seal with the negative pressure test: Place your hands over the filter and/or exhaust valve and inhale. Air leakage indicates a poor seal. You’ll also want to try normal and deep breathing, moving your head around, and talking.

Using a respirator mask
With any respirator, always check the seal. Inspect the mask carefully for holes, cracks, worn buckles, and fittings. Replace them as needed.

Be sure the exhaust valve works properly, and replace filters and cartridges regularly.

With fume masks, cartridges differ according to the hazard, so make sure you’re using the correct one. Old cartridges become inefficient. And because cartridges undergo a chemical reaction with the fumes, they can generate heat in a heavy concentration. If a new cartridge becomes hot during use, the fumes may be too heavy for adequate protection. Remember, none of the respirator masks we’re talking about create oxygen for breathing—they only filter it.

To clean a mask, use soap and water, but keep the solution away from filters and cartridges. Store it in a dry, clean place.

—With Roger W. Cliffe, Associate Professor, Industrial Technology, Northern Illinois University
Photographs: Scott Little
SPINDLE TURNING TOOLS

Knowing which tool to use, and when, can make turning between centers smooth as silk. Here are the basic tools you'll need and some recommendations.

THE BASIC SPINDLE TOOLS: AN EXPERT'S ADVICE

Dale L. Nishi, Professor of Industrial Education at Brigham Young University and an authority on wood turning, suggests these tools for basic spindle turning: a 1/4" gouge, a 1/8" gouge, a 1/8" skew chisel, and a 1/8"-edge-thickness, diamond-shaped parting tool. Nishi says these tools, in high-speed steel with standard length handles, will fashion spindles up to 2" in diameter. Work of this size and smaller, he advises, represents 90 percent of the spindle turning done by home woodworkers.

<table>
<thead>
<tr>
<th>TOOL</th>
<th>TYPE</th>
<th>WIDTHS</th>
<th>BEVEL</th>
<th>USES &amp; COMMENTS</th>
</tr>
</thead>
<tbody>
<tr>
<td>GOUGE</td>
<td>Cutting</td>
<td>1/4&quot; to 2&quot;</td>
<td>30-45°</td>
<td>Bevel on convex side of tool wraps around cutting edge in fingernail shape. Used for turning square stock into cylinders. Intended to be rolled during use. Can also be used for scraping when honed or at proper angle. Spindle gouges most adaptable in 1/2&quot; size; roughing gouge in 1/2&quot; or 1 1/4&quot;, Flutes shallow to deep.</td>
</tr>
<tr>
<td>SKEW CHISEL</td>
<td>Cutting</td>
<td>1/2&quot; to 1 1/2&quot;</td>
<td>20-25°</td>
<td>Cutting edge &quot;skewed&quot; 30-35° from tool end; bevel is twice as long as steel thickness. Used for smoothing tapers, cutting beads or V's, and end grain. Sizes most used are 1/2&quot; to 1&quot;. Can scrape with burr edge or by changing angle.</td>
</tr>
<tr>
<td>PARTING TOOL</td>
<td>Scraping</td>
<td>1/2&quot; to 1&quot;</td>
<td>25°</td>
<td>Cuts grooves and recesses, forms tenons and shoulders. Makes square-bottomed cuts with flat sides. Diamond shape in 1/4&quot; or 1&quot; size is most versatile. Tips can be 1/8&quot; or 1/4&quot; in edge thickness.</td>
</tr>
</tbody>
</table>

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Continued from page 58

U.S.S. WOOD

boom (S), yardarms (T), and mast (U) to length.

7 Epoxy the barrels (N) in the turret (I). Apply paraffin to each hull pin D and mount the turrets. (This lets the turrets swivel and allows you to "fire" port or starboard without having to change course.) Using a ½" drilling jig similar to the 1" jig just used, drill holes in O and P. Cut the drilled ends of P at 45°.

8 To build the jig shown below, drill the first hole the same size as the dowel being drilled, all the way through a piece of scrap. Drill the second hole perpendicular to the first, so it intersects the first hole in the exact center. Now, drill the perpendicular holes in the smokestack (K), mast (O), the bollards (Q), the crane shaft (R), boom (S), and yardarms (T). (You will need to tilt the drill press when drilling R.) Glue and install part S into R and T into K and O. Chamfer the tops of Q and glue them into the hull. Assemble and install the mast pieces (L, O, T, U).

9 Paint all parts as shown in the photo on page 58. (We wiped off the top deck right after painting to imitate the teak decks on real battleships.) When the paint has dried, glue the bridge supports (M) in place and glue the bridge (F) to the supports, 2½" above the superstructure. Install the smokestacks (K), air vents (P), and crane assembly (S, R). ■

J. Philip Humfrey Ltd.

12" FOUR SPEED WOOD LATHE

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In 1972, Japanese lumber buyers touring Virginia for wood to import spotted a very familiar-looking tree. This chance discovery of paulownia (Paulownia tomentosa), or "kiri" as it's called in Japan, sparked a boom that now keeps some lumber mills in the southeastern U.S. buzzing.

For centuries, Japanese woodworkers have prized their native paulownia for use in special furniture items and musical instruments. But reduced land availability for planting cut the supply. However, in Virginia, Tennessee, Kentucky, and Mississippi, where it was planted over a century ago as an ornamental, paulownia flourishes.

In its adopted land, paulownia often goes by the name of coffee wood, big leaf, blue bell, orプリンス tree. Mills pay landowners more for it than black walnut. In fact, during times of peak demand, buyers often scout with helicopters to locate prime specimens, since paulownia's bright violet blooms stand out amid the forest canopy.

Demand for this valuable wood sags only after a major storm rakes the islands of Japan. Then the Japanese harvest their own supply of blown-down paulownia.

Why do the Japanese cherish this wood? Lighter in weight than poplar, paulownia has a lustrous and satiny look. Its close grain machines into airtight joints, an attribute that makes it perfect for use in the traditional multi-drawer chests called tonosus, in which the Japanese bride packs her dowry.

Some exported paulownia wood even returns to the U.S. from Japan—in the form of paper-thin veneers preferred by some American executives for business cards.
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Looking for helpers in your shop that are two feet tall and have four legs? Build pairs of these sturdy sawhorses any size you want and get the help you need. Here's how:

1 To build a 30"-long x 24"-high sawhorse, begin by crosscutting a 30" top and four 30" legs. (We used a scrap construction-grade 2x6 for the top and 1x6s for the legs.)

2 Tilt the table saw blade to 15° and bevel one edge of a 12"-long scrap 2x3. Screw it to the miter gauge as shown in the Side View. Remove the saw blade and insert a dado blade. Set the blade at 0° (parallel with the miter gauge grooves), and raise it ¼" above the surface of the table.

3 To cut the dadoes in the top beam, position the miter gauge in the slot to the right of the blade and set the miter gauge 10° right of center as shown in the Compound Angle Dado Cutting Drawing. Before cutting, mark reference lines for the location of the four dadoes on the bottom side of the 2x6, then mark Xs on waste stock with a pencil to make sure you cut on the correct side of the lines. With the 2x6 positioned against the beveled fence, cut dado no. 1, then flip the 2x6 end for end and cut dado no. 2. Now, move the miter gauge to the left side of the blade and set the miter gauge to 10° left of center and cut dadoes 3 and 4 as you did 1 and 2.

4 Remove the scrap 2x3 from the miter gauge and replace the dado blade with a regular ¼" blade. Set the blade at 15° left of center and with the miter gauge 10° right of center and on the left-hand side of
the blade, cut one end of each leg. (If your saw blade tilts right from center, you will need to change the miter gauge setting to 10° left of center and make the first cut with the miter gauge on the right-hand side of the blade.) Keeping the settings the same, move the miter gauge to the opposite side of the blade, and cut the remaining ends to a finished length of 25°.

5 Attach the legs to the top, using 1 1/8" drywall screws. (We used three screws for each leg.) Do not use glue on the assembly, since you may need to replace a part if it gets cut accidentally.

6 To make the four gussets, return the blade to 0° and set the miter gauge at 15°. Crosscut the gussets to the dimensions shown in the exploded-view drawing and attach them with 1 1/8" drywall screws. If desired, lightly belt-sand all the joinery flush.

Photograph: Bob Calmer
Illustrations: Bill Zaun

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NEW-GENERATION SCREWS FOR NOW-GENERATION MATERIALS

As more and more home woodworkers adapt their cabinet and furniture projects to composition materials, they find that tried-and-true fasteners don’t always do the job. Here’s a rundown of some new fasteners that will.

Wood screws work well in wood. They always have. But they don’t always do a very good job in new “composite” wood panels made of chips, sawdust, shavings, and other particles. Traditional wood screw thread designs, and even those of the alternative sheet metal-type screw, tend to chew up the particles rather than groove them for holding power. Voids or hollow areas in the composition stock cause the close threads to lose part of their grip.

The new-type screws, first developed for particleboards used in the contract furniture industry, feature special angled threads spaced widely apart, as shown contrasted with normal wood screw threads in the illustration below. When driven into the material, the extreme angle of

Specially angled and wider spaced threads of the particleboard screw, bottom, give it greater holding power than the typical wood screw, top.

the thread doesn’t disrupt the particles, and the wider spacing allows more of the particles to remain between turns. These Grippit screws create ledges in the sheet goods, which allows them to be torqued down without splitting the material. And unlike older designs, Grippits can be removed and reset several times in the same hole and still hold. Drilling pilot holes isn’t even necessary—a sharp point configuration makes them self-tapping.

Sinkers are another type of particleboard screw. In addition to their specially angled and spaced thread design, they offer the bonus of automatic countersinking. Nibs, or protrusions, on the underside of the head, shown in the drawing below, draw the screw flush with, or slightly below, the surface as you drive it in.

Modern fasteners for traditional woods

To eliminate stripping wood from the hole, a problem with fasteners having many threads to the inch, a softwood framing screw is available with widely spaced, double threads. Rather than one lead thread spiraling off the point, the “twinfast” design has two leads coming off an exceptionally sharp point for fast entry and increased holding strength. With a flat, bugle-shaped head and a deep drive slot, this screw can be torqued down flush. As illustrated, only the lower half of the softwood framing screw has

The unthreaded portion of the softwood framing screw is drawn through by the threads in the shank for less strain on the material.

Continued on page 87
DO YOU USE OR COLLECT FINE HAND TOOLS?

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threads. The unthreaded portion is drawn through by the threads at the bottom of the shaft, so no unnecessary strain is put on the wood as the two parts are drawn together.

Hardwood framing screws, though much like their softwood cousins mentioned earlier, have auger points, called Type 17, that makes them wood-borers. The auger point extrudes wood from the side of the hole as it's driven into the wood, storing particles in a special reservoir rather than building them up around the threads. (See below.)

Auger points on hardwood framing screws bore their way in, storing wood particles as they go.

No nuts and bolts for cabinets
Used in joining two cabinets, assembly screws have an auger bit and threaded. As shown below, the screw cuts grooves in the wood during the fastening of the first cabinet. Once into the second unit, it continues boring and draws the unthreaded portion in its path and the two parts together.

Assembly screws have auger bits and unthreaded sections that draw two cabinets together faster than traditional nuts and bolts.

Unfortunately, these new-generation screws aren't as yet widely available, but you can order them direct from a manufacturer specializing in this product: Equality Screw Company, Inc., P.O. Box 1645, El Cajon, CA 92022. ■

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REPAIR GUIDE HELPS SOLVE PROBLEMS

Most people have a squeaky hinge, a leaky faucet or a crack in the ceiling in their homes that needs to be repaired. With today's labor costs, hiring a handyman could be extremely expensive. So accountants, artists and barbers have become weekend handymen. To help them, Better Homes and Gardens introduces the COMPLETE GUIDE TO HOME REPAIR, MAINTENANCE AND IMPROVEMENT.

This book is a comprehensive guide to a home's components. It tells how each part operates, how to maintain and repair it and how to make it look or function better. Four main sections — Inside Your Home, Outside Your Home, Your Home's Systems and Basics You Should Know — make it easy to locate information in this book. Page-by-page listings of subject matter start off each section. The sections break down into chapters which discuss each major topic. The book is cross referenced so readers won't miss important advice on any aspect of a particular job.

To help do-it-yourselfers understand each job, there are anatomy drawings to show just what's under a floor, behind a wall or inside a furnace. These drawings let do-it-yourselfers learn what they're getting into and why a repair needs to be made.

One of the first steps in tackling a home repair or improvement is to study the step-by-step drawings which illustrate exactly how to make repairs. Color-coded finder headings in the outer margins help readers find these sections.

Easy-to-understand charts enable readers to compare materials, choose the ones that best fit their needs and discuss the advantages and disadvantages of a variety of materials.

Beginners can build their knowledge and confidence by reading the Basics You Should Know chapter. A person can learn how to build a tool collection, which tools to use for each job and how to maintain them, which materials to use and how to work with them.

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