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WOOD

THE WORLD'S LEADING WOODWORKING MAGAZINE

DECEMBER 1994 • ISSUE NO. 75

Please display until December 12

Make decorative joints the easy way

Page 50

CUTTING-EDGE BUYING GUIDES

- **Garbide router bits**
- **Bandsaws**
- **Saw blades**

8 great tips from your shop (and ours)

7 SANTA-APPROVED CHRISTMAS PROJECTS

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WOOD®

THE WORLD'S LEADING WOODWORKING MAGAZINE

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THE EDITOR'S ANGLE

HOW ELMER WERNER BECAME THE WORLD'S MOST-POPULAR GREAT-GRANDPA



Elmer Werner in his shop with four of his six great-grandchildren (from left) Tucker Zeleny and Kelsey, Brady, and Nathan Werner.

It all started mid-October last year when Elmer Werner, a 75-year-old retiree from Carleton, Nebraska, pulled the December '93 issue of **WOOD**® magazine out of his mailbox. He'd been looking for a project to build for his six great-grandchildren for Christmas. And when he saw the Teddy Bear Rocker on the cover, he knew he'd found the perfect gift.

So Elmer, who took up woodworking about 15 years ago when he retired, went to the shop and started building. It took him a fair amount of time to construct all six rockers, but they were ready in plenty of time for Christmas Eve.

Every year on December 24th—just like clockwork—the Werner children, grandchildren, and great-grandchildren gather at the folks' place to celebrate. (Marjorie Werner, Elmer's wife of 52 years, passed away this past summer.) They go to church first, then eat a light snack and open their gifts.

Elmer's great-grandchildren (four of them are shown with him

above) may not be very old, but they know their great-grandpa pretty well. He makes them something special every year.

Like all children, Elmer's great-grandkids have a hard time waiting to receive their presents on Christmas Eve. In fact, this past year, Nathan, the good-looking guy at right in the photo, took things into his own hands. While the rest of the family members were eating, he wandered off in search of great-grandpa's presents. Sure enough, when Nathan's mom found him, he was sitting in the bedroom in one of the rockers having a grand old time.

Hey Elmer, I think the kids are on to you. Maybe in a couple of years you will have some helping hands out in your shop. Now that would be great.

Happy Holidays everybody, and have a terrific New Year!

Larry Clayton

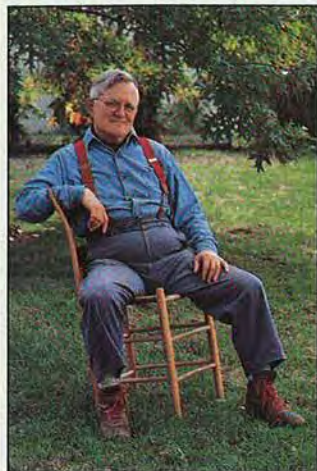
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Better Homes and Gardens®

WOOD®

THE WORLD'S LEADING WOODWORKING MAGAZINE

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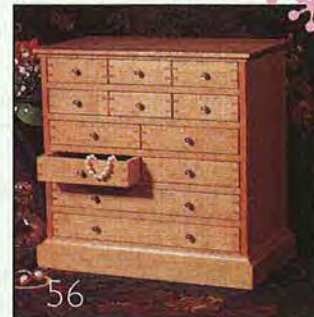
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This issue's cover wood grain: Buckeye

New

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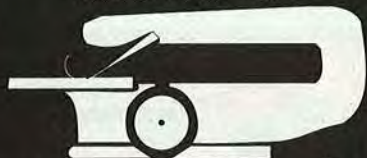
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"I believe they are the best blades that money can buy. You can see it has a sharper, smoother, micro-fine finish. This creates less drag...while providing the smoothest, most sand-free finish possible". Frank Pozsgai, Pozsgai's Designs

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SIMPLE SETUPS FOR RAISED-PANEL ROUTER BITS

Raised-panel router bits help you create raised panels for cabinet and passage doors. But the size of these bits—up to 3½" in diameter—makes them dangerous in a hand-held router. For safety, you should put raised-panel bits in a variable-speed router mounted to a router table.

But there is one hitch. Most router-table openings measure under 2" in diameter. What do you do when your bit is bigger than the opening in your table? Here, we offer two solutions.

Metal router tables: Make your cuts above

On a metal router table, you may be able to operate a raised-panel bit above the surface of the table. Drop the bit in from the top and lower it until the bottom of the cutter is ¼"-⅛" above the top of the table. The one qualifier is that no more than ½" of the shank should be exposed above the collet. Raising the bit too far out of the collet may cause a big bit to

vibrate excessively, or bend the collet and lead to a dangerous accident.

To prevent your workpiece from sliding under the bit, make a ¼"-thick tempered hardboard auxiliary surface for the top of your table. Bore a hole in the auxiliary surface about ¼" larger than the diameter of your bit, and center the hole over the bit as shown in the drawing *below left*. Clamp the auxiliary surface to the router table, and add a fence as shown.

Wooden router tables: Best for plunge routers

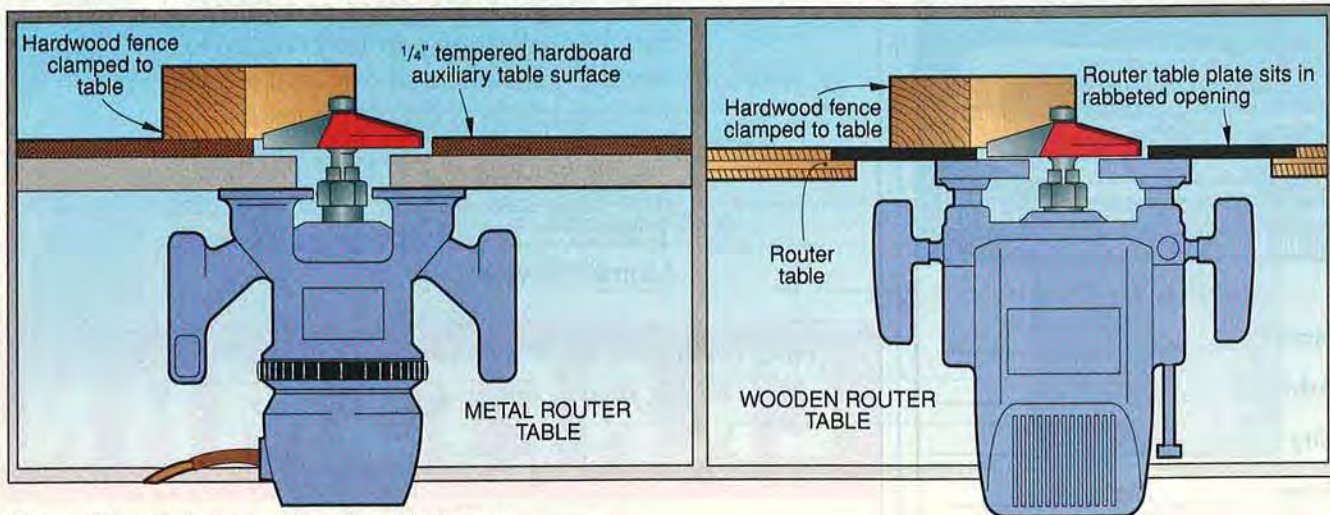
With many plunge routers you can't raise the collet high enough to position a raised-panel bit above the table safely. If that's the case with your router, you'll need to use a plywood or particleboard router table with a plastic laminate surface and a router-table plate that sits in a rabbeted opening in the top. These plates allow



When your router bit doesn't fit in a metal table, you can run it above the tabletop. In a wooden table, use a router-table plate with inserts like those held *above* at right.

you to set the bottom of the cutters below the surface of the table, as shown in the drawing *below right*.

Some plates have doughnut-shaped inserts that pop in and out to more closely match the diameters of various bits. The plate shown in the photo comes from Rousseau Co., 1712 13th St., Clarkston, WA 99403; call 800/635-3416. You also can buy inserts and router accessories from Woodhaven, 5323 W. Kimberly, Davenport, IA 52806; call 800/344-6657. ♣



Photograph: John Hetherington Illustrations: Kim Downing

INTRODUCING THE WOODWORKING EQUIVALENT TO DENTAL FLOSS.

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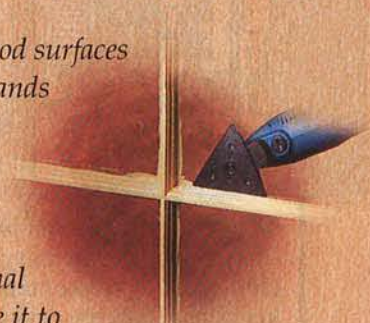
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The new Ryobi Detail Sander 2000. You might say it's the best thing to happen to woodworking since, well, the original Ryobi Detail Sander.

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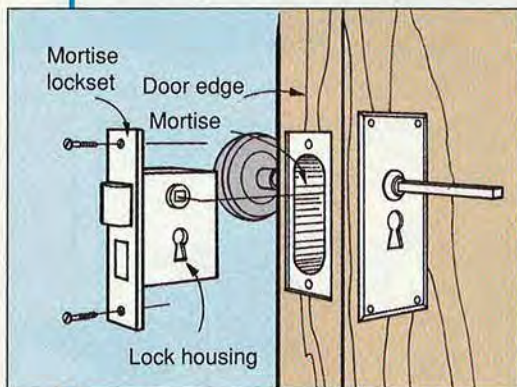
YESTERDAY'S TOOLS

THE DOOR-MORTISING CHAMPION

Latching onto one of these made lock installation faster

By boring just two holes, you can install a modern tubular lockset in a new door. The entire job usually takes only a few minutes. Back around the turn of the century though, carpenters invested considerably more time and effort in preparing a door for a lock. That's because the locksets in vogue then fit into mortises cut into the solid-wood door edges, as shown in the illustration below.

The most demanding of the many steps involved in installing one of those mortise locks was cutting the deep mortise for the lock housing. After boring a series



of overlapping holes into the edge of the door, the carpenter chiseled out the waste, taking pains to keep the recess centered on the door edge and parallel to the sides. This accounted for many hours' work in an average house.



In 1912, the Colgan Machinery and Supply Co. of Columbus, Ohio, offered relief from tedious manual mortising with the Champion Mortiser, shown above. It looked daunting with its gears, worm screw, trip levers, brass knobs, ratchets, and rods. But it proved relatively easy to use. Indeed, the original instructions cover set-up and operation in only six steps.

The large bit visible at the left side of the machine cuts the mortise. Though it resembles a twist drill, you'll understand the machine easily if you think of it as a router bit.

To mortise a door for a lock, the carpenter clamped the Champion to the door, which was already hung. Then he centered the machine's index marks on the door edge, tightened the clamp screws, and wedged a board between the machine and the floor for support.

Next, he set the mortise length and depth, selected one of the three cutting speeds, and tightened the bit (the instructions warn repeatedly to do this). Then, turning the crank, the carpenter became the conductor of a symphony of mechanical effects.

The bit not only rotated, it swung up and down in an arc to form a slot. And after each vertical cycle, it advanced a little farther into the wood. The rate at which all this happened depended on the speed setting. At any speed, a chorus of clicks and whirs accompanied the action. Until factory-mortised doors became available in the 1930s, the Champion Mortiser helped build many homes a little bit faster. ♣

Tool from the collection of Leo F. Rockenstein, O'Fallon, Missouri
Photograph: John Hetherington
Illustration: Mike Henry
Written by Larry Johnston

**BEFORE YOU FACE THE CROWDS,
THE SALES AND THE SANTAS, MAYBE YOU
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Old tools often fascinate woodworkers as much as new ones.

"Who owned it?"

"What does it, or did it, do?"

"When and where was it made?"

Questions like these form the mystique shrouding the tools, obsolete trades, and industries of long ago that have been the focus of the Early American Industries

Association (EAIA) for over 60 years.

More than 3,000 members from 50 states and 12 countries join under the EAIA charter "to encourage the study and better understanding of early American industries in the home, in the shop, on the farm, and on the sea; also, to discover, identify, classify, preserve, and exhibit obsolete tools, implements, and mechanical devices which were used in early America."

Membership in EAIA is open to any individual or institution sharing this interest and purpose, and includes collectors, curators, conservators, researchers, writers, teachers, and institutions such as libraries, museums, and restoration groups.

You'd expect such a diverse group to have varied interests. Try picking an area to explore from these identifiable EAIA specialties: farm implements and dairy equipment; woodworking, metalworking, and leatherworking tools; textile machines; lighting devices; domestic utensils; hunting, fishing, trapping, or nautical equipment; medical and dental equipment; scientific instruments; weighing and measuring devices; industrial equipment; and vehicles. Whew!

At EAIA annual meetings, held each spring, members have the chance to exhibit and view collections, add to them at tool sales and exchanges, and learn of bygone techniques and domestic industries through demonstrations, exhibits, and interestingly focused seminars.



Antique woodworking tools, like these planes from the collection of member Vern Ward, reflect only one aspect of the Early American Industries Association's broad interests.

Researching the old ways, and sharing that research through publications, has been a primary activity of the EAIA. In *The Chronicle*, the association's quarterly magazine, members describe past technology, current collecting, preservation techniques, and other related subjects. *Shavings*, the bimonthly newsletter, reports on meetings and activities.

Films and books for research and study are available through the EAIA library located in the Spruance Library of the Mercer Museum in Doylestown, Pennsylvania. Discounts on books published by the association, affiliated organizations, and trade and university presses, are available.

Organizations with ties to the EAIA include EAIA West, Midwest Tool Collectors Association, South West Tool Collectors Association, and the Three Rivers Tool Collectors Association.

Individual membership is \$25 per calendar year, and includes the publications plus an annual membership directory.

For more information and membership application, write: John S. Watson, Early American Industries Association, P.O. Box 2128, Empire State Plaza Station, Albany, NY 12220. ♣

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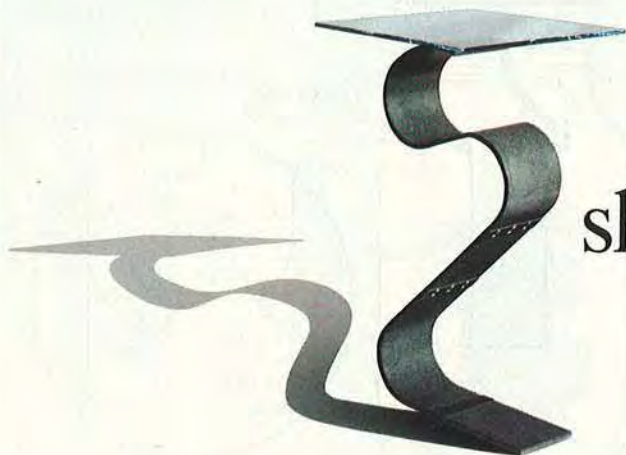


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DUPONT

TALKING BACK

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Some time ago, I installed a dust-collection system in my workshop using about 70' of 4" plastic pipe and flexible hose. I used ideas from "Central Dust Collection" in your June 1991 issue, and modified them to fit my circumstances.

However, I did make a major change in the static-electricity-removal system. The internal-ground-wire system, as described in your article, has drawbacks that include difficulty in installing and connecting the wire inside the pipe, and the potential to cause clogs as chips catch on the wire or joints.

I know that plastic, though it functions as an insulator for generated AC and DC current, does not block static electricity. So, rather than installing the ground wire inside the piping as suggested in your article, I spirally wrapped a piece of insulated wire along pipes and hoses, and grounded the wire at each machine.

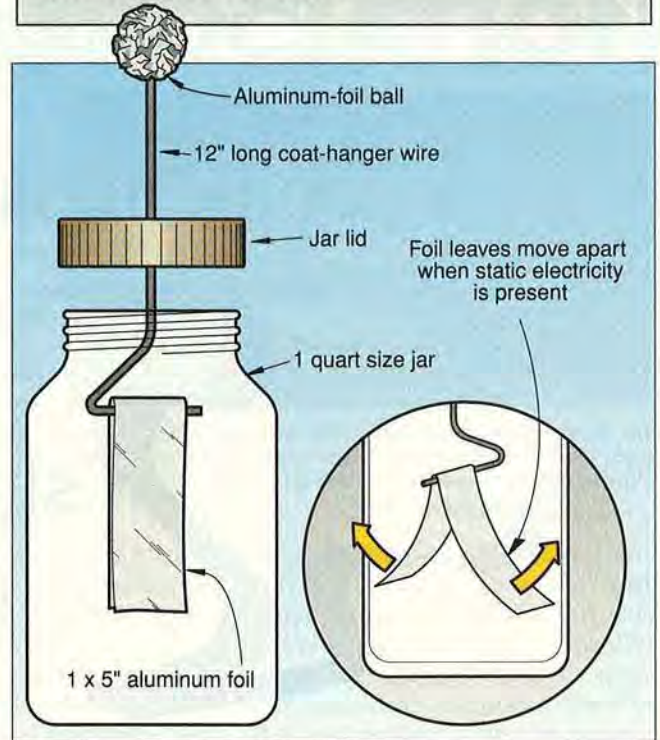
—R.J. King, Boerne, Texas

R.J., we have heard from several readers looking for an alternative means of grounding PVC pipe in a dust-collection system. After receiving your letter, we looked further into how to best go about removing static electricity.

Our research confirms your statement that static electricity does not obey the same laws as generated current. We also tested your spirally wrapped ground-wire system, as well as another exterior-grounding system composed of pop-rivets fastened into holes drilled in the side of the PVC piping and connected by a bare copper wire. We found that both systems work equally well in removing static electricity, and both offer their own advantages.

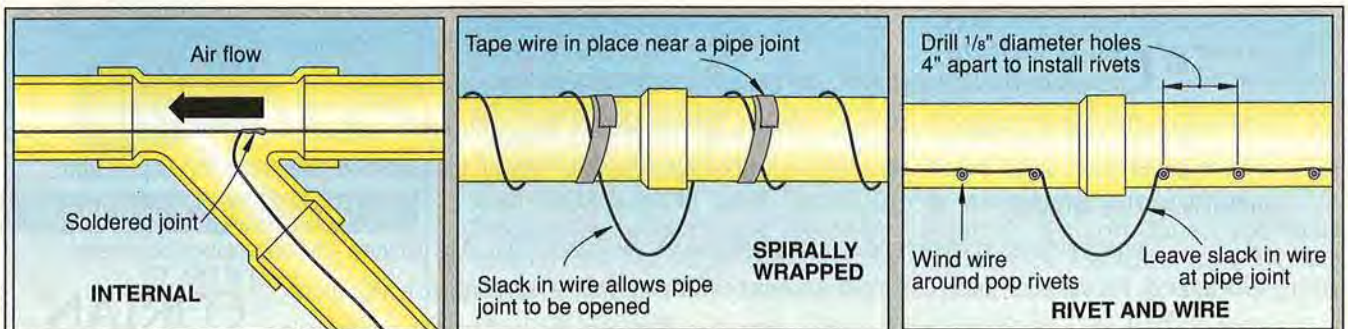
The spiral-wrap system is easy to install to a new system, but the rivet and wire setup is easier to retro-fit to an existing system, and it also requires less wire than the spiral wrap. We prefer the rivet-and-wire system because of its easier modification, simple and secure installation, and neater appearance. In either case, leave some slack wire at the joints in case you need to disconnect the pipes to dislodge a clog.

We welcome comments, criticisms, suggestions, and even compliments. Send your correspondence to: Talking Back, Better Homes and Gardens® WOOD® Magazine, 1912 Grand Ave., Des Moines, IA 50309-3379.



We also found a simple device for testing for the presence of static electricity. It consists of a coat-hanger wire with a 90° hook on one end, a jar, the jar lid, and two pieces of aluminum foil, as shown above. Slide the wire through a hole in the lid, with the hooked end placed inside the jar. Place a narrow strip of aluminum foil across the hook. Form the second piece of aluminum foil into a ball and install this ball on the straight end of the wire.

This device works on the principle that like charges repel each other. Moving the foil ball near a static charge produces an equal charge in both sides of the strip, and the ends of the strip move away from each other. Use this tester to check for the presence of static electricity at several points in your dust-collection system.



Continued on page 12

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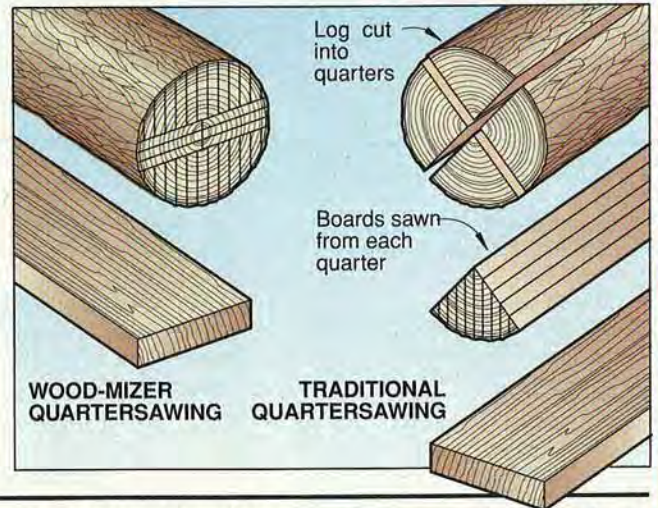
Continued from page 10

A different quartersawing technique

I was under the impression that quartersawn lumber was cut differently than shown in the cutting diagrams published in "The *WOOD*® Gang Goes Logging" in the December 1993 issue.

—James W. Turney, Bemus Point, N.Y.

The diagram you refer to, Jim, illustrates a variation of the quartersawing technique recommended by Wood-Mizer representatives for use with their machine. The more traditional approach to quartersawing involves first cutting the log into quarters and then sawing these quarters into boards (as shown far right). Both techniques yield edge-grained lumber, with greater dimensional stability than flatsawn wood.



Router-turning six- and eight-sided handles

How can I adapt the router-table turning technique from the April 1994 issue for making six- and eight-sided chisel handles?

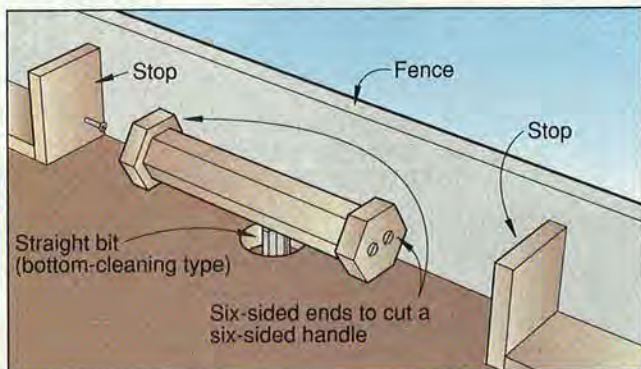
—Charles L. Levine, San Francisco

Charles, use the following technique to make six- or eight-sided chisel handles:

1) Cut and square the piece of wood you wish to make into a chisel handle. These handles typically measure between 1" and 1½" in diameter, depending on the size of the chisel blade.

2) Cut two six- or eight-sided end pieces from plywood, using the layout process as shown in the "Router-Table Turning" article from the April 1994 issue. To determine the diameter of the circle used in this procedure, measure the diagonal across one end of your turning square, and add ¼" to this measurement. Cut the hexagonal or octagonal end pieces to shape with a bandsaw, and sand to the lines with a disc sander.

3) Mount the six- or eight-sided end pieces on your turning square, using one screw centered on each end. Place this unit on the worktable, and rotate the square so that one flat face of the square is aligned with a flat on the end pieces. Lock the ends in place with a second, off-center screw.



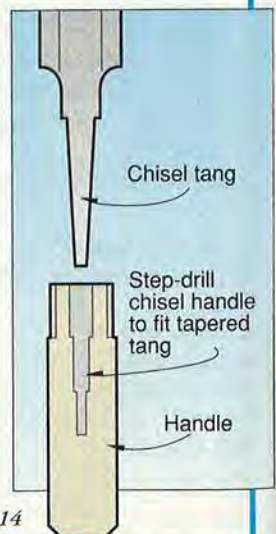
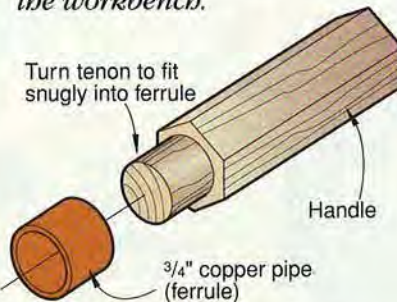
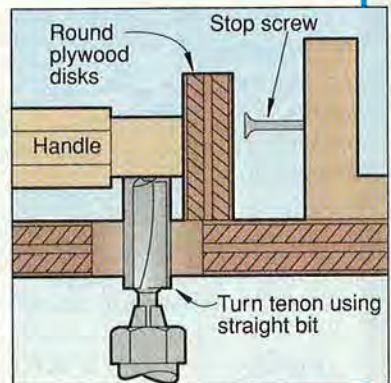
4) Cut the sides of the handle using a bottom-cleaning bit in the router table. You can remove between ⅛" and ¼" of material per pass, but for a clean surface, remove only ⅛" of material on the final pass.

5) To cut a tenon to fit a ¾" copper ferrule, first replace the six- or eight-sided ends with circular ends. Then, raise the router bit until it touches a side of the handle. Cut the tenon on one end, as shown right. Raise the router bit as needed to reduce the tenon size to fit the ferrule.

6) Remove the handle from the ends, and press-fit the ferrule into place.

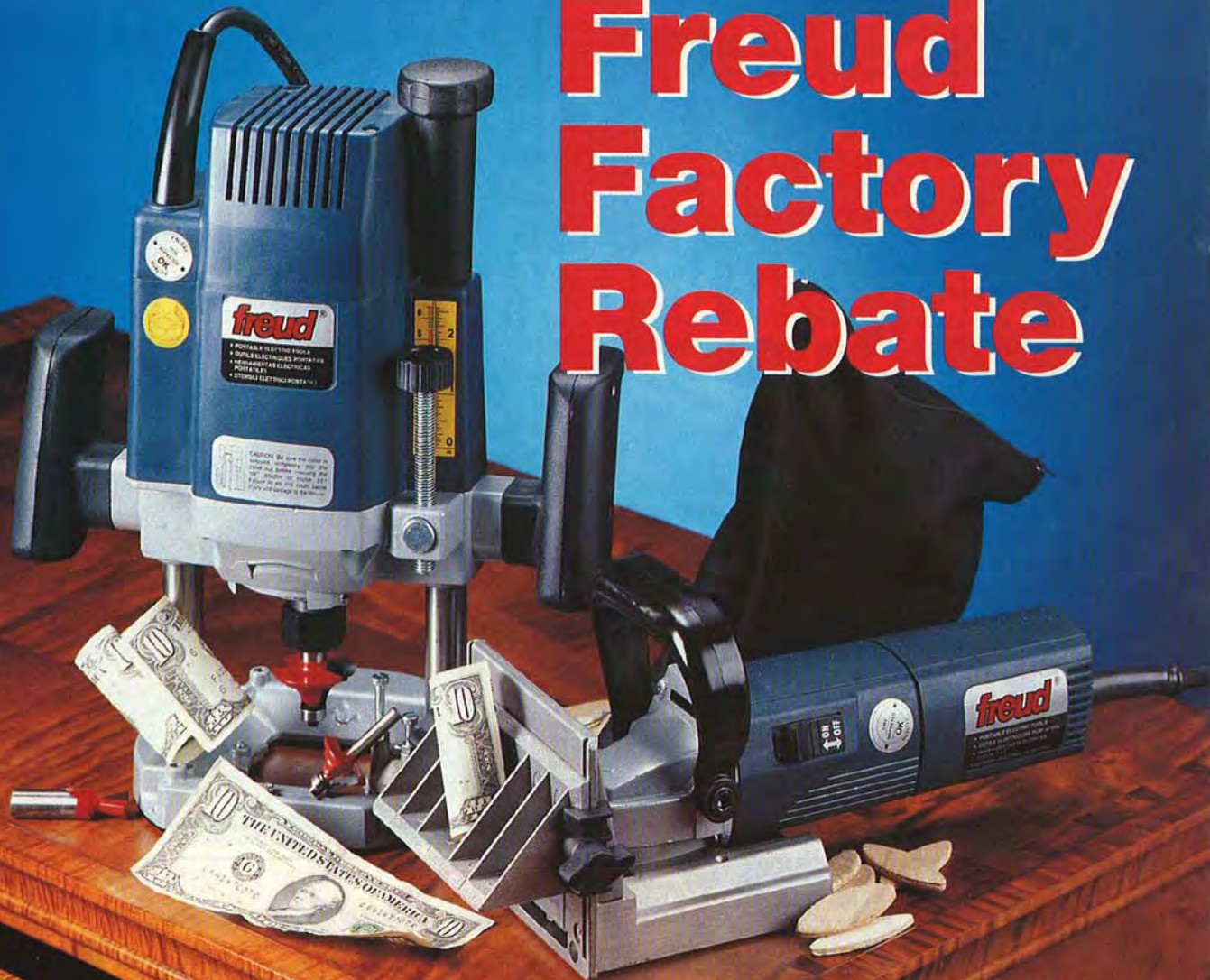
7) Step-drill a hole in the ferrule end of the handle to fit the chisel tang. Use three or four sizes of drill bits, with each smaller bit going deeper into the handle, as shown right.

8) Place the chisel tang in the tapered hole in the handle. Set the blade in place by tapping the butt end of the handle on the workbench.



Continued on page 14

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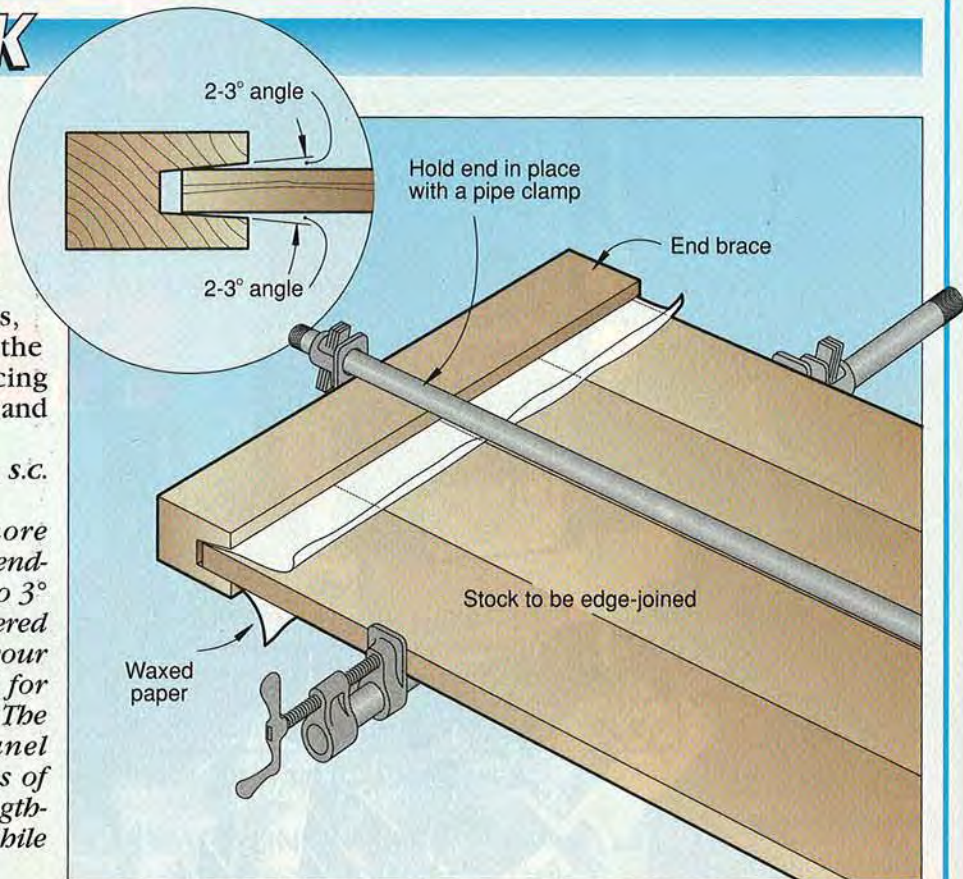
Continued from page 12

End brace revisited

I liked Allen Formby's shop tip about the glue-up end brace in the April 1994 issue. However, I feel this end brace could be made more versatile by eliminating the glue squeeze-out clearance holes, cutting the dado $\frac{1}{16}$ " wider than the thickness of the boards, and placing waxed paper between the boards and the end brace.

—Greg Carroll, Abbeville, S.C.

Good ideas seem to generate more good ideas, Greg. Why not cut the end-brace groove with the sides at a 2 to 3° angle? An end brace with this tapered groove, used in conjunction with your waxed-paper idea, could be used for more than one thickness of wood. The wedge-fit of the brace to the panel edges also will help align the edges of the boards. Apply a pipe clamp length-wise to hold the braces in place while the glue dries.



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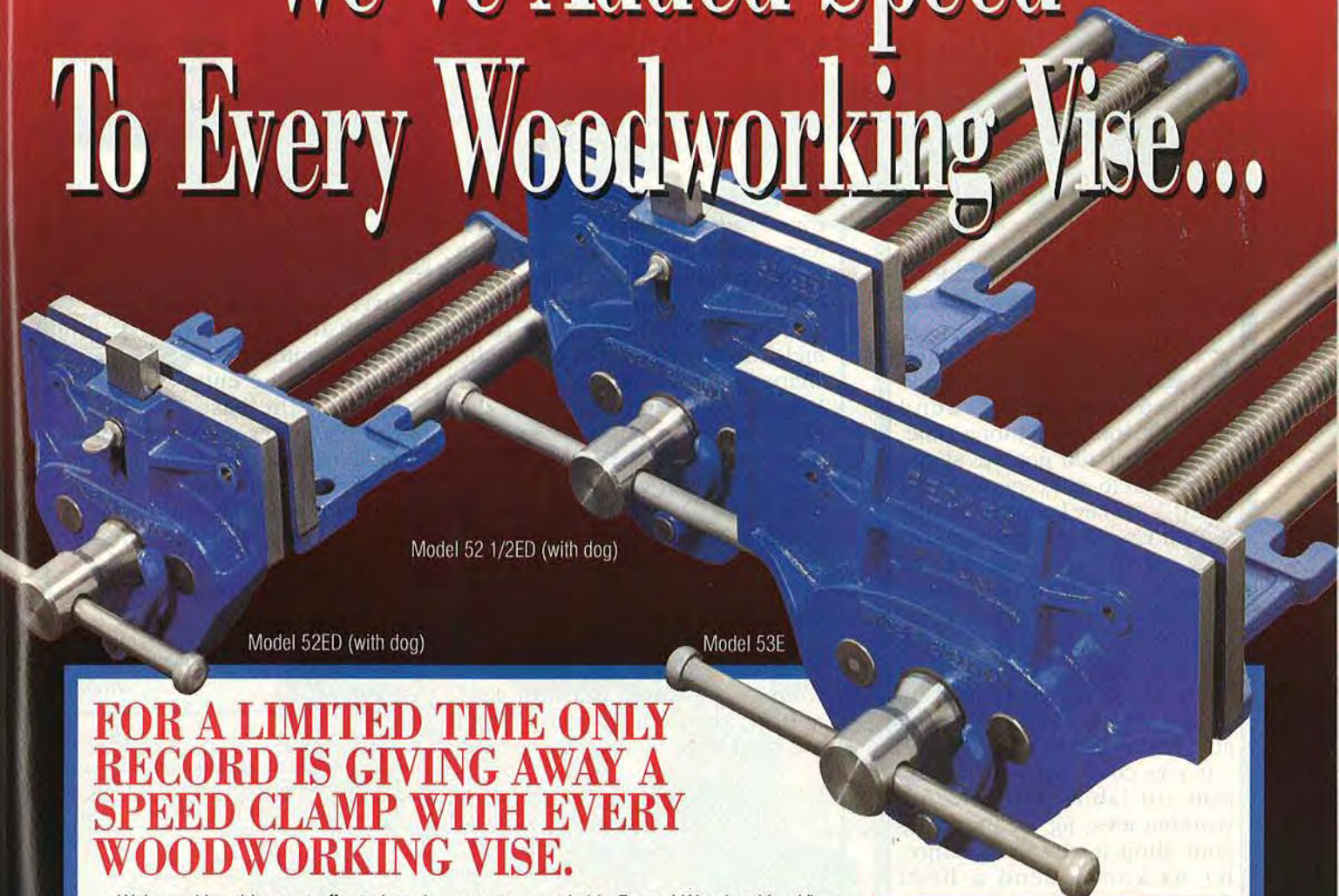
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TIPS FROM YOUR SHOP (AND OURS)



Several years ago, I tried sanding a rough-cut circle into a perfectly round shape. It took me a long time, and I never did get the shape of the circle quite perfect. If I would have known about Wilton Elwick's router-trammel idea, at right, I would have saved myself a lot of trouble. Like most good shop tips, Wilton's jig takes an hour or so to build, but it will save you many more hours of effort by giving you accurate, dependable results in just minutes.

If you come up with a new time- or labor-saving woodworking idea, jig, or fixture in your shop in the near future, let us know. Send a brief description of the idea and a drawing or photo to:

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If we choose your tip, we'll pay you \$40, plus you'll get a shot at winning a new tool for the top shop tip. We try to avoid shop tips that have appeared in other magazines, so please send yours to only one. Also note that we cannot return submissions. Thanks, and keep sending those tips.

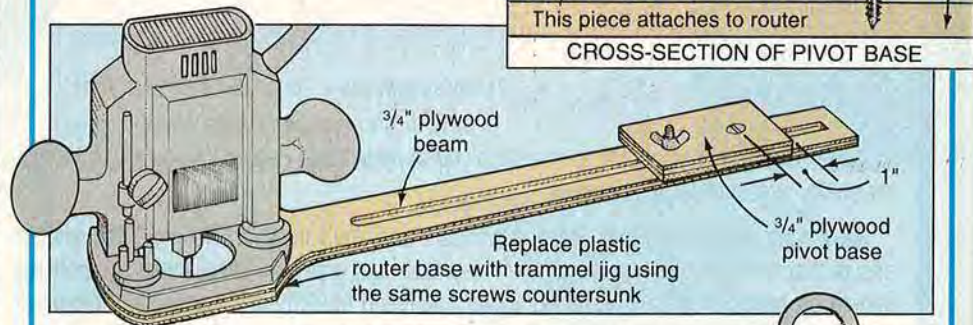
Tom Jackson
 General Interest Editor

Cut perfect circles with a router trammel

You need to cut a big arc or wheel out of a sheet of plywood, but you know that a hand-held jigsaw will leave a less-than-perfect circle.

TIP: Make a trammel for your router, and you can whip out perfect circles or rings anytime. The pivot base and beam allow a wide range of size adjustments.

Using $\frac{3}{4}$ " plywood for the trammel, cut out one end to match the shape of your router's base. For length, construct the jig so the beam measures about 12" longer than the radius of the largest circle you wish to cut. Make the narrow part of the beam 4" wide, and cut a $\frac{3}{8}$ " slot through it as shown in the drawing below. On the bottom surface of the beam, use your router to cut a 1"-wide groove $\frac{3}{8}$ "-deep for the head of the bolt to slide in. Next, cut the pivot base from $\frac{3}{4}$ " plywood and drill a $\frac{3}{8}$ " hole for the carriage bolt 1" from the front edge.



Wilton will receive a DeWalt DW444 random-orbit sander with a 6" pad for his top shop tip.



Drive a screw through the base into the center of the circle to be cut and adjust the base until your router is correctly positioned. Tighten the wing nut on the carriage bolt, and rout your circle with a straight bit. If you're cutting a ring, cut the outside diameter first.

—Wilton Elwick, Texarkana, Texas

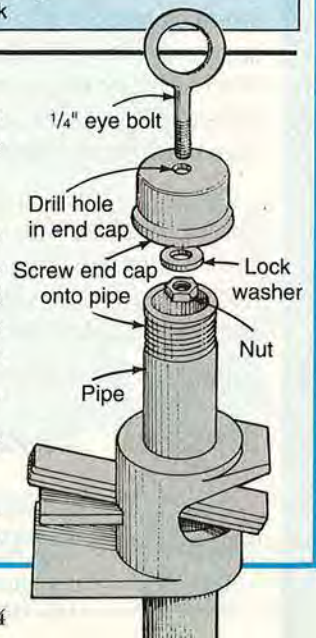
End pipe-clamp storage problems

Not all of us have a lot of room in our shops to put in a big rack for pipe clamps. Isn't there another way to store these handy helpers?

TIP: Top your pipe clamps with an end cap and eye bolt, and you can hang the clamps anywhere you put a nail or hook. You'll find end caps in the plumbing-supply bins in the hardware store. Simply drill a hole through the top of the cap, insert a $\frac{1}{4}$ " eye bolt in the hole, and secure it with a nut and lock washer. Screw this assembly onto the threaded end of your pipe clamps and hang 'em high.

—Ernest W. Stewart, Sanford, Fla.

Continued on page 18



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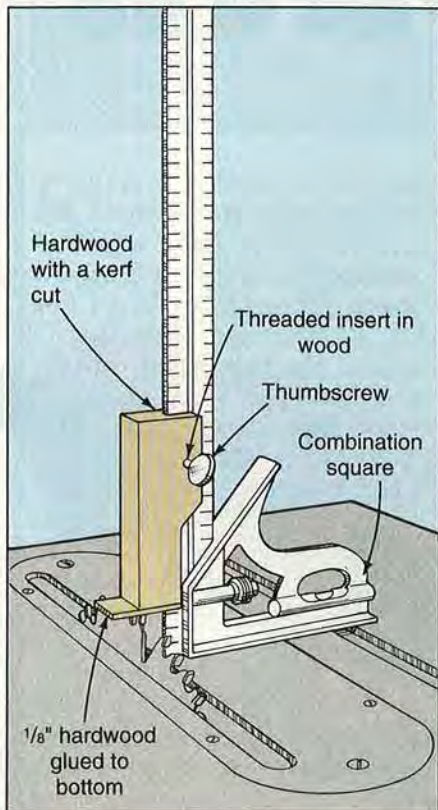
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Continued from page 16

Convert a combination square to a depth gauge

Using a ruler or tape measure to set the depth of cut on a tablesaw or router table often proves inaccurate. Isn't there a better way to make these measurements, short of buying a special tool?



TIP: Turn your combination square into an accurate depth gauge with two small pieces of wood, a thumbscrew, and a threaded insert. First, cut a 3/4"-thick block of hardwood about 3" long, and cut a kerf down the middle just wide enough to fit over the edge of the blade on your square. Then, saw out the notch in the lower half of the block to fit around the head of the square.

Glue a piece of 1/8"-thick hardwood to the bottom, as shown above. With epoxy, secure a threaded insert into the upper half of the block, put in a thumbscrew, and you're ready to quickly gauge the blade height.

—Mark Albrecht, Houston

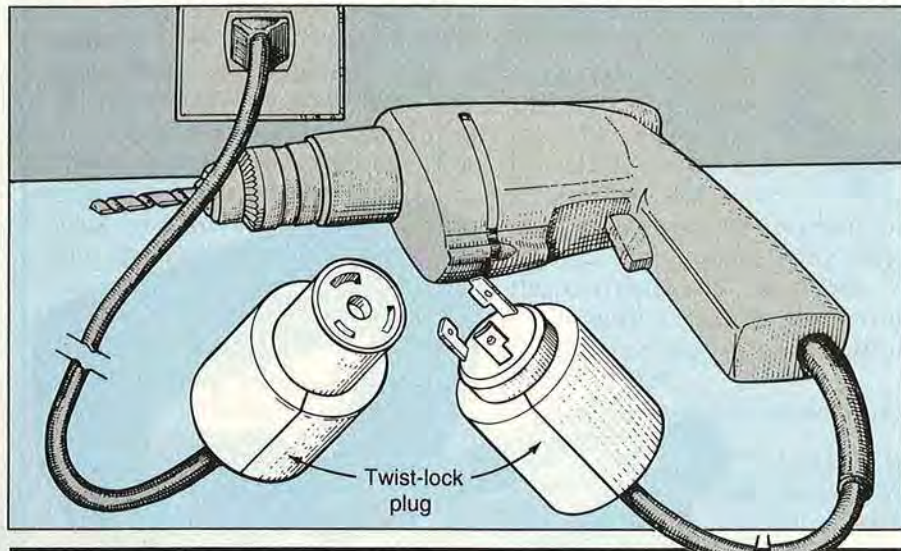
Twist-lock plugs help childproof your power tools

Kids imitate their parents, and that makes power tools a source of danger. How do you childproof the shop without locking it up?

TIP: Attach twist-lock plugs to all your tools and then make a special twist-lock extension cord that you can hide. Cut the plug end of

the cord on the tools you want to childproof and install a twist-lock plug, available at most hardware stores. Then, install a twist-lock receptacle on your extension cord. When you're done working, put away the adapted extension cord, and all your tools are safe.

—Mike Stockford, Milton-Freewater, Ore.



Tapered handle puts a new spin on allen wrenches

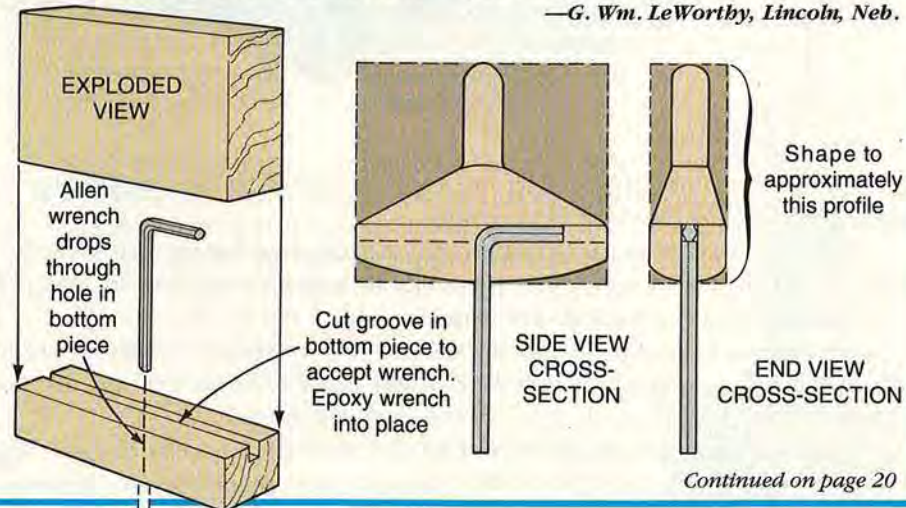
Applying the last few pounds of torque on an allen wrench sometimes puts a dent in your fingers. And if you make a large handle, you can't spin the wrench for speedy screw removal.

TIP: Make a handle for each of your wrenches and then taper one end into the shape of a knob. With epoxy, anchor the allen wrench in a groove in a 3/4x3/4x3"

block of wood, as shown below. Then, glue on a top piece that measures about 3/4x2x3".

After the glue dries, cut the block to the approximate shape shown with a bandsaw or coping saw. Then, use a rasp, router, or sandpaper to round over the edges. Now you have a long handle for leverage and a narrow grip on the end that you can spin rapidly with your fingers.

—G. Wm. LeWorthy, Lincoln, Neb.



Continued on page 20

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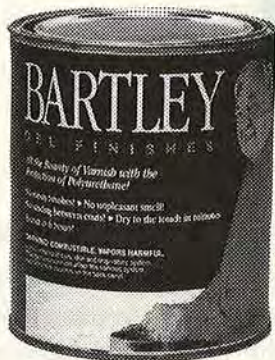
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TIPS FROM YOUR SHOP (AND OURS)

Continued from page 18

Benchtop machines won't walk with this hold-down

Clamping and unclamping benchtop machines sure eats up a lot of time. But if you don't secure them, many will walk all over your bench, making work difficult and unsafe.

TIP: Attach a clamping plate to the base of your machine, and secure it to the bench with a carriage bolt and adjustable fixture handle. (You can get fixture handles of various sizes from The Woodworkers' Store, 21801 Industrial Blvd., Rogers, MN 55374-9514. Call 800/279-4441.) From a piece of $\frac{3}{16}$ "-thick aluminum, cut out a clamping plate that will fit inside the base of the machine you want to secure. For this Dremel Disc/Belt sander, a 3×3 " plate works fine.

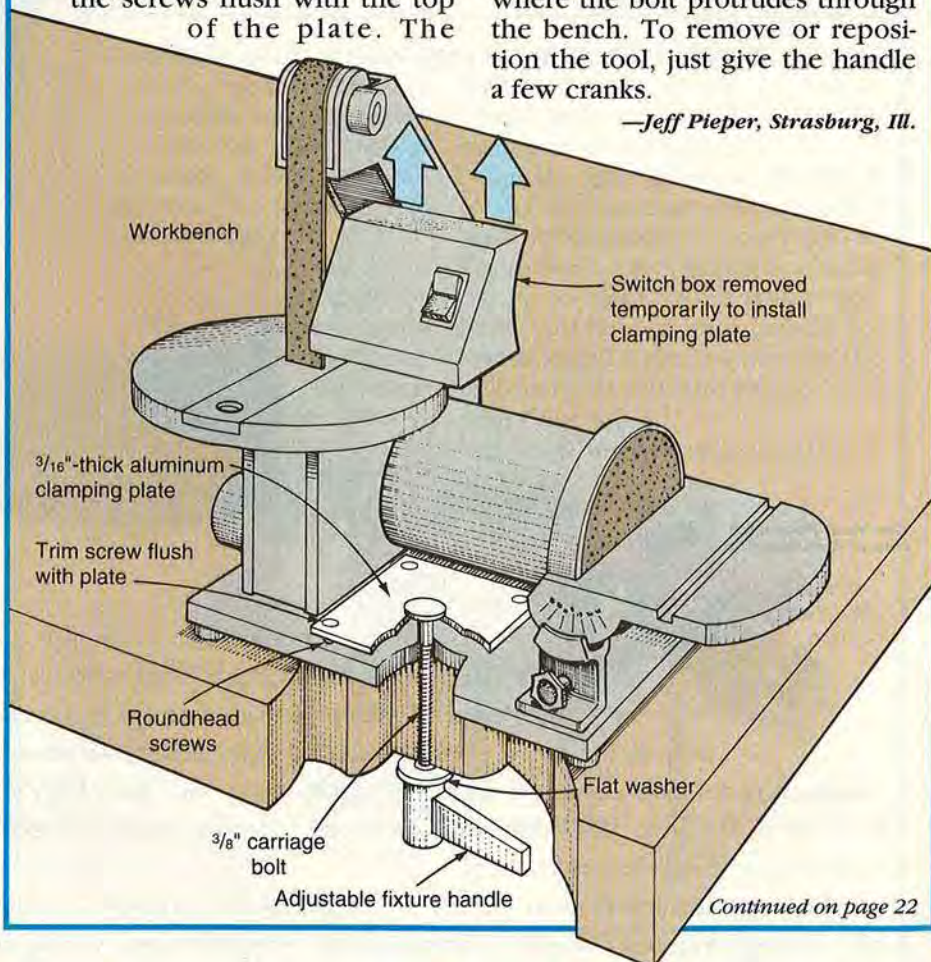
Drill and tap all four corners of the plate, install four $\frac{1}{4}$ " round-head screws with the heads down, and cut off the shanks of the screws flush with the top of the plate. The

heads of the screws distribute the clamping force and prevent the tool base from bowing in the middle. (If you don't own a tap-and-die set, your local hardware store usually will thread the holes for you.) Next, drill a $\frac{1}{2}$ " hole in the middle of the plate for the carriage bolt.

Now, drill a hole through the base of the machine and drop a $\frac{3}{8}$ " carriage bolt through the clamping plate and tool base. (On some machines you may need to partially disassemble the housing to position the clamping plate.) Use a carriage bolt that is long enough to protrude through the clamping plate, your tool, and the benchtop.

Drill a $\frac{3}{8}$ " hole in your benchtop in a suitable location, and mount the tool and clamping base with the carriage bolt in the hole. Secure this assembly by tightening the adjustable fixture handle where the bolt protrudes through the bench. To remove or reposition the tool, just give the handle a few cranks.

—Jeff Pieper, Strasburg, Ill.



Continued on page 22

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DW935
14.4V CORDLESS SAW

The Most Powerful Line of Cordless Tools.



There's never been a Cordless Saw with the performance and durability of DeWalt's new Cordless Saw. With 3,000 rpm's of power and a 5 3/8" blade, DeWalt's new 14.4 volt saw cuts everything from trim and moulding to 1/2" plywood. And its 1 1/2" cutting depth allows it to go through 75 or more 2x4's on a single charge.

This lightweight saw also features left side blade placement for better visibility and ease of use. And its thin-kerf, carbide-tipped blade yields more cuts per charge and a cleaner cut.

Once you try the new 14.4 or 12.0 volt DeWalt Cordless Saw, every other Cordless Saw will seem like a toy. For more information, call 1-800-4-DEWALT.



GUARANTEED TOUGH.

Continued from page 20

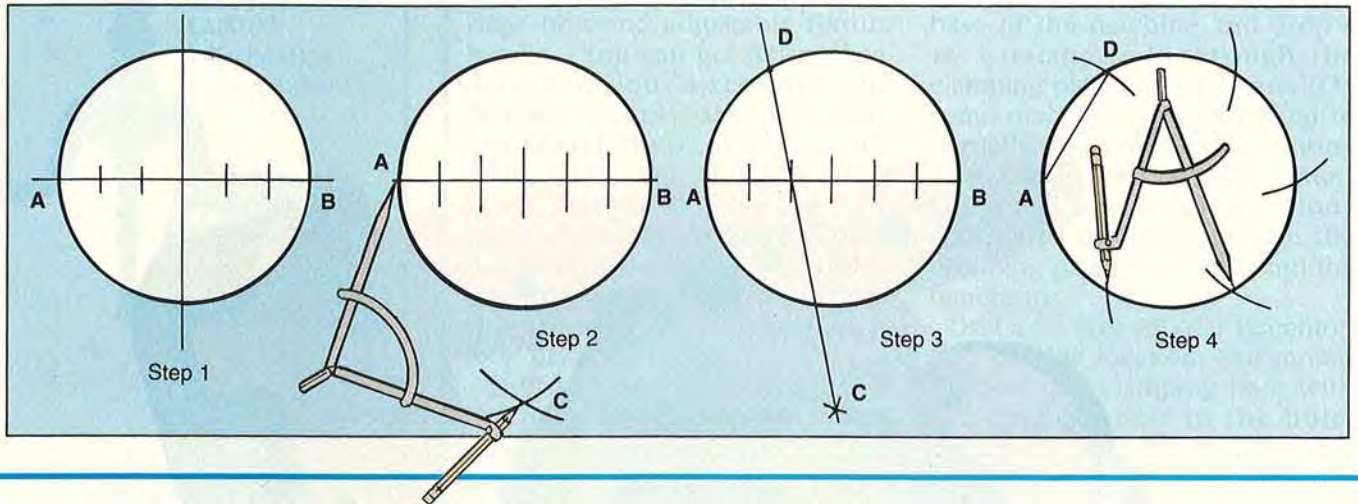
Divide circles into any number of segments

It's easy to divide a circle into four equal parts. Just draw two perpendicular lines through the middle. But when you want to put five, six, or seven spokes in a wheel, how do you divide the circle into equal segments without making a lot of complicated measurements?


TIP: Call your high school geometry teacher, or follow along with this four-part procedure. **1.** Draw line AB through the center of your circle and divide it equally into the number of parts you want. (In the example shown, it's six.) **2.** Set a compass at points A and B, scribe the two arcs as

shown, and label their intersection as point C. **3.** Draw a line from point C through the second mark on line AB and on through the outer edge of the circle, creating point D. **4.** Set your compass to the distance AD, and mark off equally spaced segments.

—Vernon Raaen, Oak Ridge, Tenn.



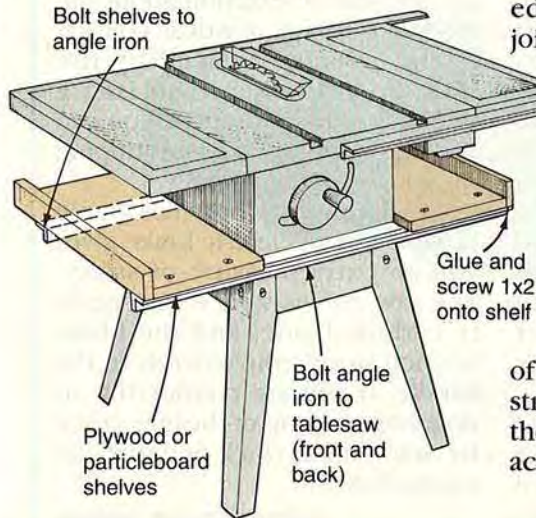
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Angle-iron rails support tablesaw shelves

Every time you switch from the miter gauge to the rip fence you have to walk across the shop to put one or the other down. And then there's the problem of where to store the pushstick and other tablesaw accessories.



TIP: Build a pair of shelves below your tablesaw top, using two pieces of angle iron and some $\frac{3}{4}$ " plywood or particleboard. Cut two pieces of $\frac{1}{8} \times 1 \times 1$ " angle iron as long as the total length of your tablesaw top, extensions included. Mount these just above the joint where the legs and the saw enclosure meet, using three equally spaced $\frac{5}{16} \times 2$ " machine bolts. (If the saw's switch or handle interferes, bolt the angle-iron to the saw legs.)

Attach the shelves to the angle iron using $\frac{1}{4}$ " machine screws, lock washers and nuts. Countersink the heads of the screws into the shelves. A strip of 1×2 glued and screwed on the edge of the shelves will keep accessories from falling off.

—Marvin Ring, Corvallis, Ore.

A FEW MORE TIPS FROM OUR WOODWORKING PROS

- If you would like to modify your shop-made router table to accept sliding table jigs and fixtures, check out the process we came up with for routing parallel slots into tabletops as described on *page 51*.
- Need a pattern for a Yuletide star with long points? Look no further than *page 71*. Not only do you get a pattern, but we show you the angles so you can draw a star of any size.
- Looking for a standup Santa to brighten your home? Try bandsawing just the outside pattern line for the Santa puzzle on *page 65*. ♣



DW421
PALM GRIP ROS

DEWALT
High Performance Industrial Tools

GUARANTEED TOUGH.



Lightweight saw offers woodworkers new levels of convenience

Porter-Cable calls this newly designed 7¼" circular saw the Framer's Saw, but it has a lot to offer woodworkers, too. It incorporates almost every user-friendly feature a woodworker could think of.

For starters, this saw won't wear out your arm during an extended work session. It weighs just 10¼ pounds, about two pounds lighter than most other comparable saws. The company uses magnesium alloys in the baseplate

and gear chamber to keep the weight down.

Dust collection matters when you work inside a shop, and this tool's 1"-diameter dust-collection chute works well when hooked up to a shop vacuum. The optional dust-collection bag, however, sometimes causes the chute to clog on beveled cuts.

To change the tilt and elevation settings, big, easy-to-grasp knobs give you a positive hold so you don't bust your knuckles. And the tilt settings roll over to 48° and 93°—nice for ripping hard-to-fit bevels. Positive stops at 45° and 90° mean you don't have to reset angles with a try-square or by other means.

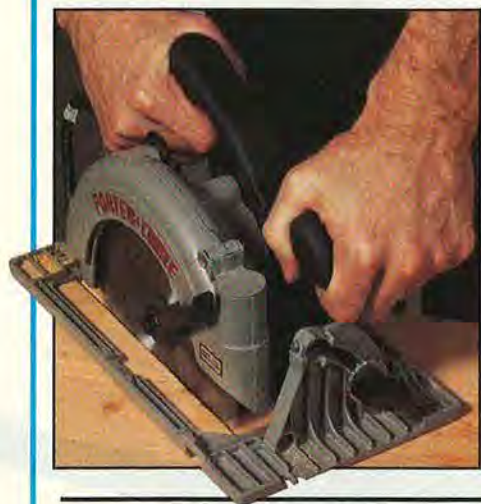
On the baseplate, a small concave thumb rest near the front left corner makes it easier to control and guide the saw, especially when you're trying to keep the baseplate snug against a straight-edge. And the right-side edge of the baseplate measures 1½" from the kerf—perfect for ripping matching pieces of 2× material.

I had doubts about the durability of the metal-alloy baseplate. So I put it in a vise and tried to bend it. With a lot of pressure, the baseplate will flex, but it returns to its original shape as soon as you let up. My only reservation about the baseplate is that sawdust collects in the pockets formed by the ribbed construction. This isn't a serious problem, though. You can get rid of the sawdust by tipping the saw over occasionally.

A 15-amp motor provides ample power, and an electric brake gives you an extra measure of safety. The saw comes with a high-quality carbide blade, and the blade wrench stores conveniently in the handle. If you are considering an upgrade to a top-of-the-line circular saw, I think you'll find this one a good buy.

—Tested by Tom Jackson

Porter-Cable Framer's Saw, model 447, about \$170. Porter-Cable Corp., P.O. Box 2468, Jackson, TN 38302-2468. Call 800/487-8665.



Clamp collars and bracket eliminate need for an assembly table

Gluing up large panels requires that you find the space to lay out boards and clamps. Most benches can't accommodate large panels, and an assembly table eats up a lot of room. To alleviate this space crunch, the Adjustable Clamp Company introduced Pony Mounted Clamp Collars for woodworkers who use ¾" pipe clamps.

To set up this system, you screw the 3'-long steel bracket at waist-level to your wall studs, using the 2" lag screws supplied. Then, you slide the pipe-clamp collars onto the bracket, insert the ends of your pipe clamps into the collars, and secure the pipe ends with the thumbscrews provided. At this point you can clamp your panels.

The ½" steel mounting bracket holds loads of up to 200 pounds

using 3'-long clamps. The collars slide easily and lock to your pipe clamps securely. For stud spacing, the pre-drilled holes in the bracket are set on 16" centers, but you can drill through the bracket if you have studs spaced other than 16" on center. The company does not recommend attaching this system to a concrete, brick, or block wall. If that's what you have in your shop, you can mount a wooden frame on your wall and screw the bracket to that.

The collars sell for about \$13 each and the bracket goes for about \$19. You can also buy the two as a set, two collars and a bracket for about \$40. If

you don't have an assembly table or frequently struggle to find a space to glue up large panels, these Pony Mounted Clamp Collars will make a world of difference in your shop.

—Tested by Bob McFarlin

Pony Mounted Clamp Collars. Adjustable Clamp Co., 417 N. Ashland Ave., Chicago, IL 60622. Call 312/666-0640.



Continued on page 26

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Continued from page 24

Coated sandpaper cuts clogging and sawdust problems

Many sandpapers load up with pitch or resin long before they wear out, and changing the paper takes up valuable time. DeWalt recently introduced this bright-yellow sandpaper to solve the loading problem and to reduce dust accumulation in the shop.

A zinc-stearate coating on the paper has a slippery quality to it, which means that pitch or resin won't stick to the paper. The coating also reduces the static charge on sawdust. Without a static charge, the dust won't cling to your tools and work surfaces, and this enables your dust collector to pull in more dust.

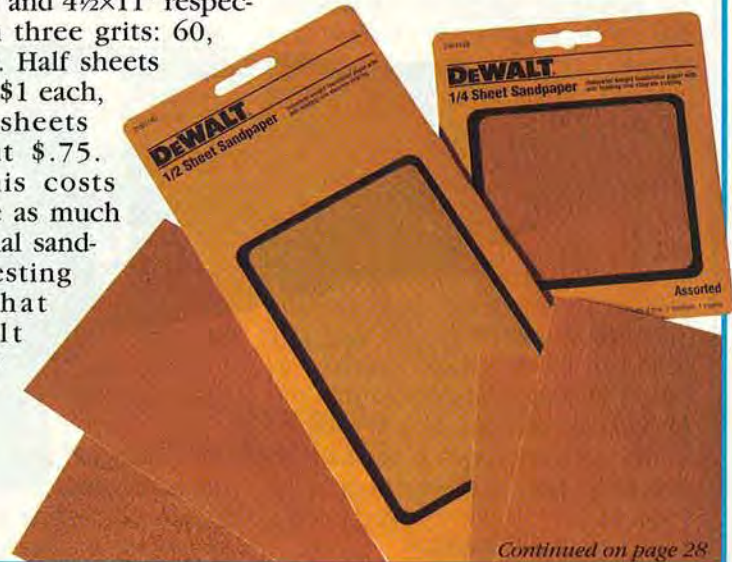
I tried the sandpaper on a few pieces of pine—one of the worst paper cloggers around. Even after several minutes of hard pressure with a palm sander, the paper showed no evidence of clogging

or build-up. The lack of a static charge on the dust particles also made it easier for me to clean up and keep the shop dust free.

DeWalt sells this sandpaper in packs of half- and quarter-sheet sizes, $4\frac{1}{2}\times 5\frac{1}{2}$ " and $4\frac{1}{2}\times 11$ " respectively, and in three grits: 60, 100, and 150. Half sheets sell for about \$1 each, and quarter-sheets go for about \$.75. Although this costs roughly twice as much as conventional sandpaper, my testing indicated that this DeWalt sandpaper lasted at least twice as long.

—Tested by
Bob McFarlin

DeWalt Industrial-Grade Coated Sandpaper. DeWalt Industrial Tool Company, P.O. Box 158 Hampstead, MD 21074. Call 800/433-9258.



Continued on page 28

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10 Pc. General Purpose Set

C1638 — 1/4" Shank

C1639 — 1/2" Shank

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Set includes: C1001, C1003, & C1004 Double Fluted Straight, C1044 Rabbeting, C1069 Dovetail, C1080 Flush Trimming, C1129 Chamfer, C1143 Cove, C1154 Roman Ogee & C1179 Roundover



Classical Cutter Set

C1645 — 1/2" Shank

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5 Pc. Straight Bit Set

C1700 — 1/4" Shank

C1701 — 1/2" Shank

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PRODUCTS THAT PERFORM

Continued from page 26

For big or unusual situations, this clamp "can-do"

Most miter clamps work fine for small moldings and stock of equal thicknesses. But the Can-Do Clamp's swiveling lead screw and clamping head give it the ability to secure two boards of different thicknesses. And the clamp's 6" jaw width opens up possibilities beyond the size limitations of most picture-frame clamps.

I used the Can-Do Clamp to hold two unequal-width sash pieces for a storm-window frame. The clamp held both pieces firmly during my glue-up, even when I was driving screws in one end. If you use these clamps on finer projects, however, I recommend clamp pads—the painted steel surfaces of the clamping head and fences felt a bit rough.

Before I found this clamp, I usually built a jig whenever I needed to hold workpieces larger than a picture-frame molding. The Can-Do Clamp takes less time, and holds boards as well or better than any jig I've built.

—Tested by Tom Jackson

Can-Do Clamp, 24.95 ppd., from MLCS, P.O. Box 4053, Rydal, PA 19046. Call 800/533-9298.



Continued on page 30

CUT, GRIND, SAND, SHARPEN, DRILL, POLISH, DEBURR, BUFF, CARVE, ROUT, ETC, ETC.

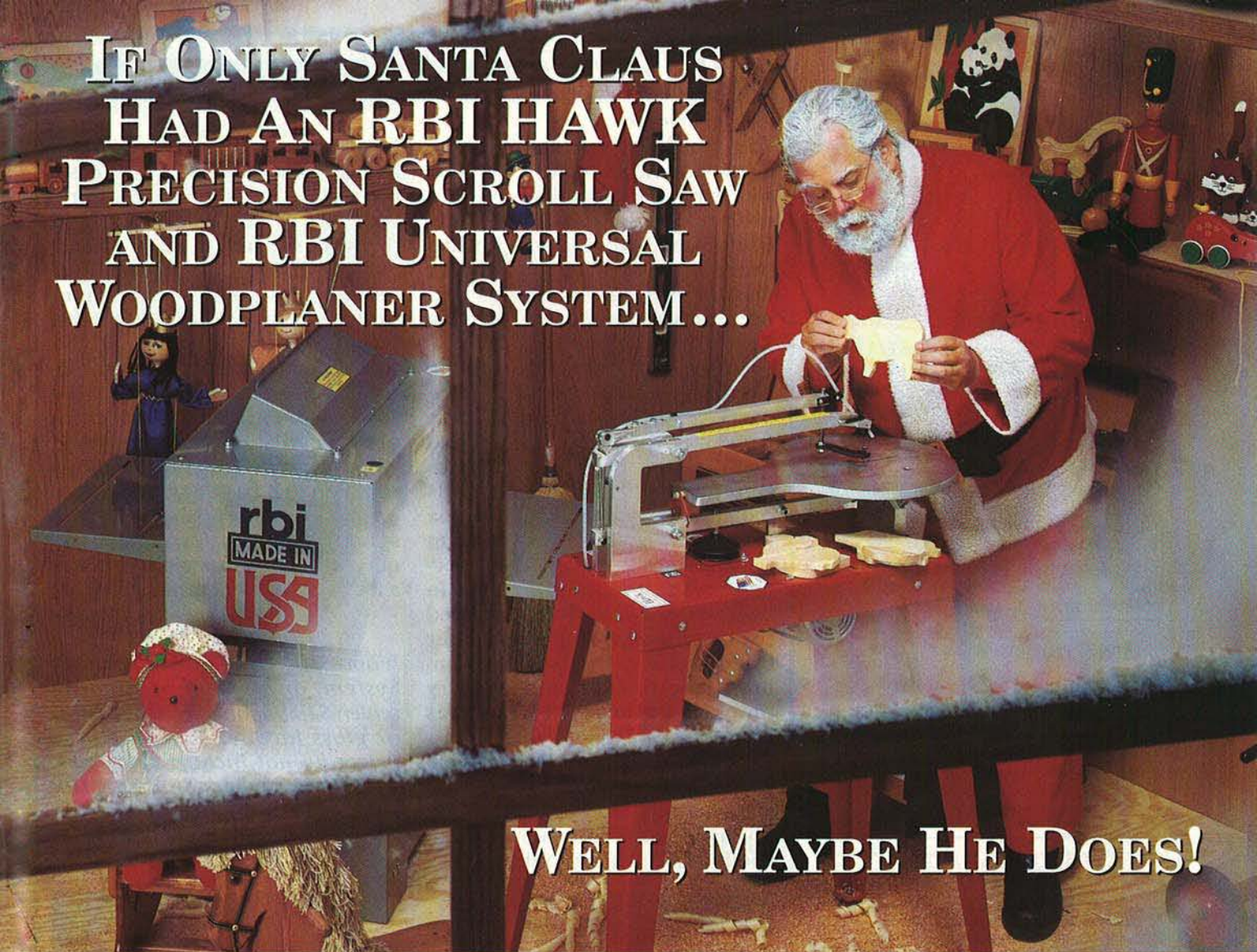


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PRODUCTS THAT PERFORM



Continued from page 28

You can brush or spray this water-borne lacquer

Many woodworkers love the look and durability of lacquer, but not everybody can afford the spray equipment it requires. With this water-borne formula, Wood-TeX washes away the problems that prevent amateurs from enjoying this professional finish.

The Wood-TeX Water-Borne Lacquer System contains two parts: a sanding sealer for bare wood, and the clear finish. I found that one coat of the sealer works fine on hardwoods. Softwoods required two coats—the first one to raise the grain so that you can sand it smooth again, and a second coat to even out the first. In my tests, the grain raising proved to be minimal, and the sealer dried quickly, in about 20 minutes. The finish coats also dry quickly. I allowed 15 minutes between coats using a spray gun.

What makes this product valuable to the home woodworker is that you can apply it with a brush. My brush-applied coats took about twice as long to dry

because of their greater thickness, but that's still fast enough to prevent a lot of dust from settling on the work surface.

The product gives off a slight odor, but it's not bothersome. And everything cleans up with soap and water. If you spray, you still need a respirator and ventilation, but there's no need for toxic solvents and explosion-proof ventilation fans. For home woodworkers, I recommend this finish on that basis alone. Even for guys like me who have all the spray equipment for regular lacquer, this new formula still offers a lot of convenience and speed.

—Tested by Bob McFarlin

Wood-TeX Water-Borne Lacquer System, one gallon of sanding sealer \$19.95; one gallon of satin or gloss lacquer \$26.34 (these prices do not include shipping).

Woodworkers Supply, 1108 North Glenn Road., Casper, WY 82601. Call 800/645-9292.



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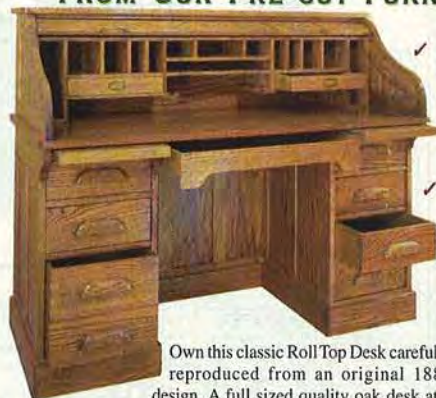
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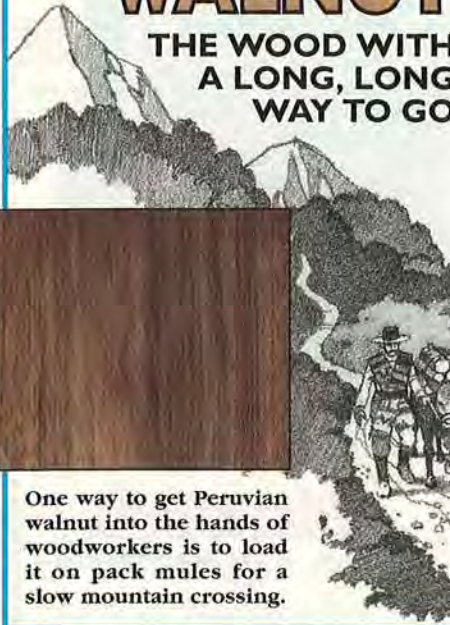
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WOOD ANECDOTE

 Print this article

PERUVIAN WALNUT

THE WOOD WITH A LONG, LONG WAY TO GO



One way to get Peruvian walnut into the hands of woodworkers is to load it on pack mules for a slow mountain crossing.

When North American woodworkers yearn to work a lovely wood, they frequently turn to black walnut (*Juglans nigra*). At around \$4 or more per board foot, it's pricey but worth the cost.

Peruvian woodworkers like working walnut, too, but they have a different species in mind. For cabinets, fine furniture, and musical instruments, they think of *Juglans neotropica*, or *tocte*. It looks and works very much like its northern cousin, yet its cost in *sols* (the Peruvian monetary unit) can be as much as 10 times more. That's because very little *tocte* ever finds its way to town.

Tocte, it seems, grows best at elevations of 5,000-8,000 feet above sea level. And in Peru, that describes some nearly inaccessible mountain valleys. In fact, this tropical walnut can be brought to woodworkers' shops by only two means. The first—and easiest—involves rafting logs down dangerous river rapids from the mountains to the coast.

The second method, although safer, requires stowing short lengths of *tocte* on pack animals and hauling it at a snail's pace across part of the Andes Mountains to a city that has rail or highway connections. This tedious journey accounts for *tocte*'s cost and limited availability. So don't ever count on it showing up at your favorite hardwood supplier, unless the business happens to be in Peru. 🌲

Illustration: Jim Stevenson

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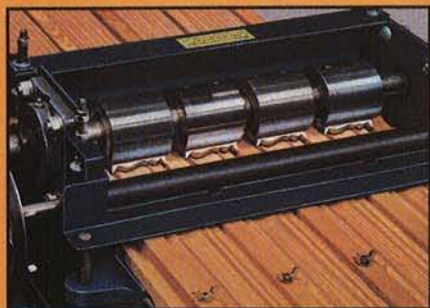
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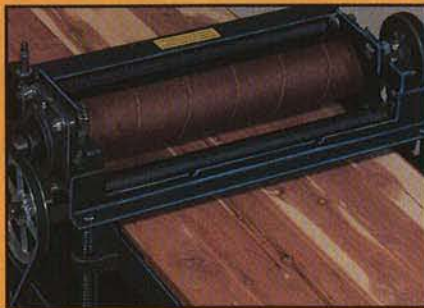
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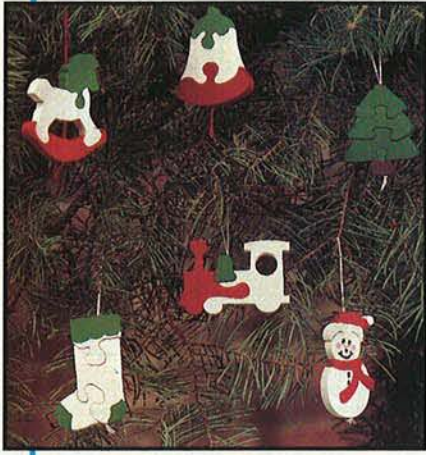
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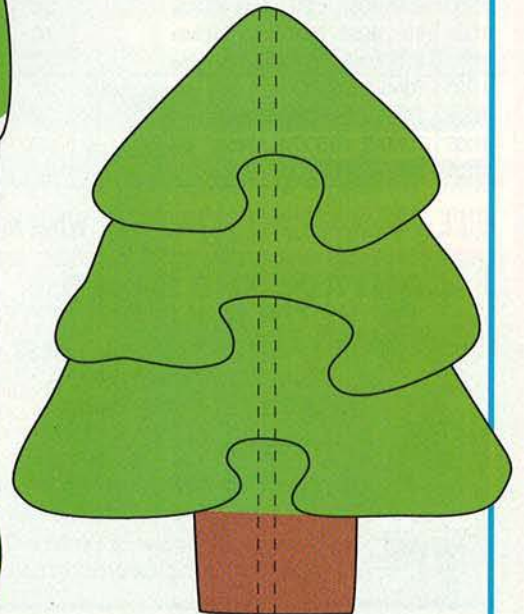
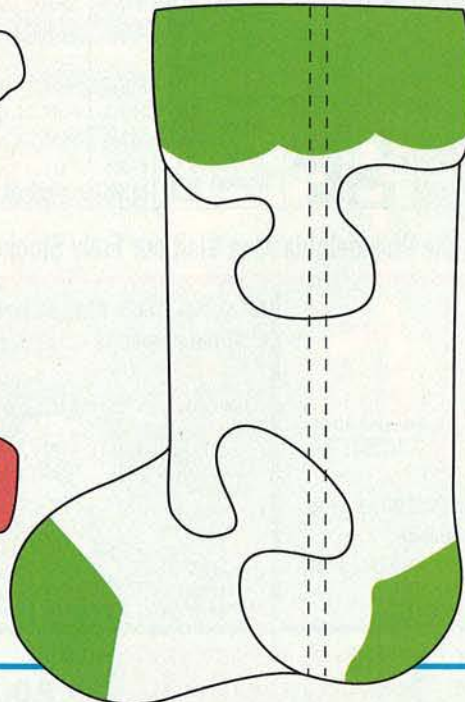
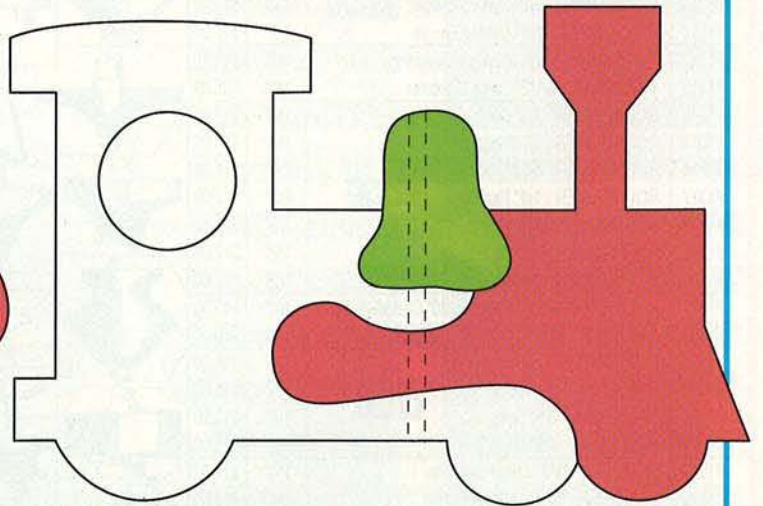
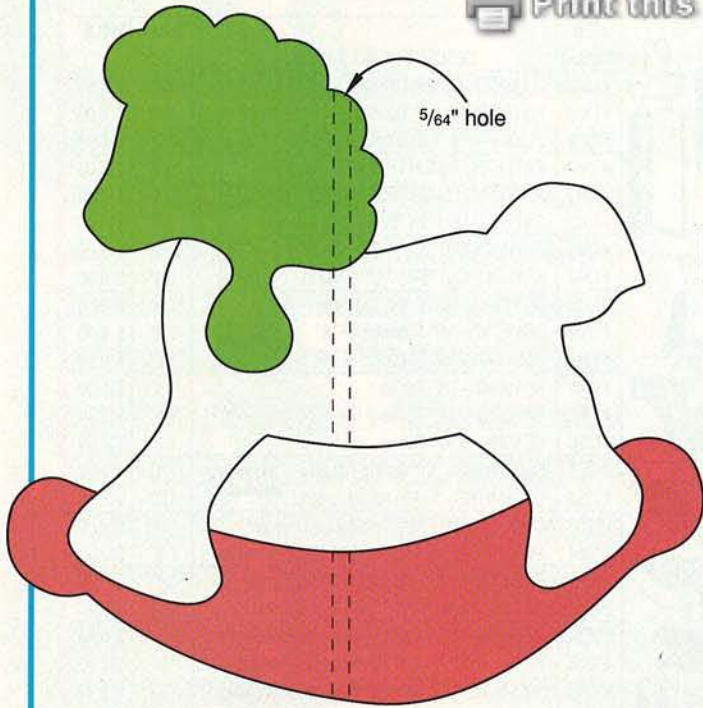
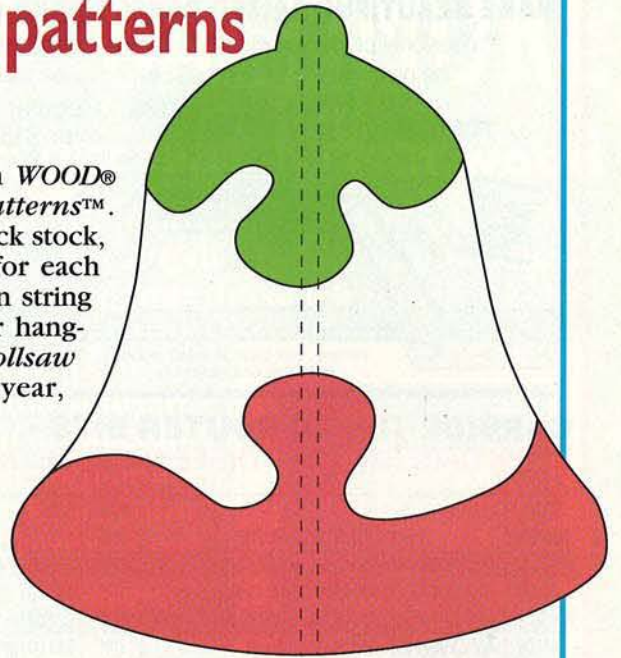
E. D. Holtz, North Carolina



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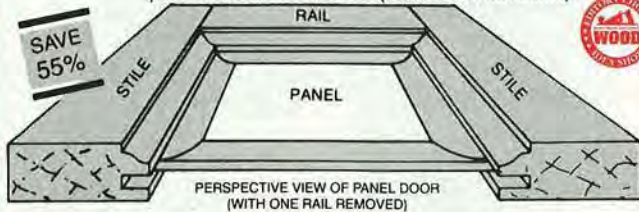
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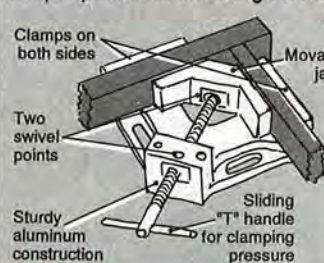


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THE BODGER OF BALTIMORE

He builds chairs from green wood

Back before the invention of power tools, woodworkers used their wits and well-sharpened hand tools to make furniture. In England, those who made chairs were called bodgers, and over the last 100 years or so, their methods almost disappeared. With an archaeologist's gift for research and a love of woodworking, John Alexander has resurrected their craft.

Continues



The chair in the *top* photograph is one of John Alexander's. The one *below* was built by an unknown 19th-century American craftsman.



THE BODGER OF BALTIMORE

Except for the occasional clash of a mallet and froe, this kind of chairmaking—called bodging—proceeds quietly. You won't hear any howling power tools. John's chairs spring to life from the edges of a few simple hand tools. In his backyard, John and his co-worker Peter Follansbee work hard, but you can still hear birds chirping, kids laughing, and the Saturday morning hubbub of this Baltimore neighborhood. Conversations flow easily. And John—a lawyer by day and a weekend bodger, teacher, and researcher of chairmaking and 17th-Century joinery—has a lot to say.

A teacher (and a student) of the old hand ways

Each summer John and Peter teach classes at Drew Langsner's Country Workshops in North Carolina for people who want to learn traditional chairmaking and joinery. "We usually get two kinds of students," says John. "There's the Connecticut cabinetmaker who thinks he has to turn everything on a lathe and measure it with dial calipers. Then there's the little old lady in tennis shoes who has never done any wood-working in her life. But by the end of the course, the little old lady is having a blast, and the Connecticut cabinetmaker—unless we've broken him of his perfectionist mentality—is a nervous wreck."

Teaching comes easily to John. He combines a teddy-bear-like friendliness with a trial-lawyer's instinct for holding his audience. At the same time his students are learning how to hand-craft a slat-back chair, John also throws in a liberal dose of traditional-wood-working history.

The original bodgers, as John explains, wandered from town to town across the English countryside. They would camp on the outskirts of a town, fell some trees, split out posts, and turn legs

and spindles. The turned parts were then sold to craftsmen who used them to build Windsor chairs. Unlike his predecessors, John does not turn the chair parts. He uses a simpler and faster technique of shaping the parts with a drawknife and spokeshave.

John has studied traditional woodworking, he calls it green woodworking, for the better part of 20 years. In doing so, he has gained a rare knowledge of how wood works when it's wet, how it moves as it dries, and how to exploit its natural strength. This same knowledge enabled the craftsmen of old to create a lot of furniture in a hurry without glue or power tools. It also can help any craftsman today understand and appreciate the character of the wood they work.

John discovered that you can work green wood freshly split from a log without hours of back-breaking labor. The key is understanding how the grain direction serves as a guide and blueprint for the parts you need. When John makes a chair, knowledge replaces electric power.

Start with straight grain

John's chairs start out as bolts of oak or hickory about 3-4' tall and 12-24" in diameter. To get straight, warp-free pieces John must harvest the wood from a straight tree trunk.

"Branches and trees that lean grow in tension," explains John. "To keep a leaning tree or branch upright, the wood fibers push on one side and pull on the other. When the tree is split or run through the sawmill, this hidden tension springs back, causing the boards to warp and twist." Such a piece of wood is of no use to a bodger, who needs straight grain.

Once he's found a good straight bolt, John usually starts to work immediately. If not, he'll seal the ends with latex paint or store the bolt underwater to retain the wood's moisture. "Green wood cuts just like cheese," says John.

Splitting a chair from a tree with a mallet and froe

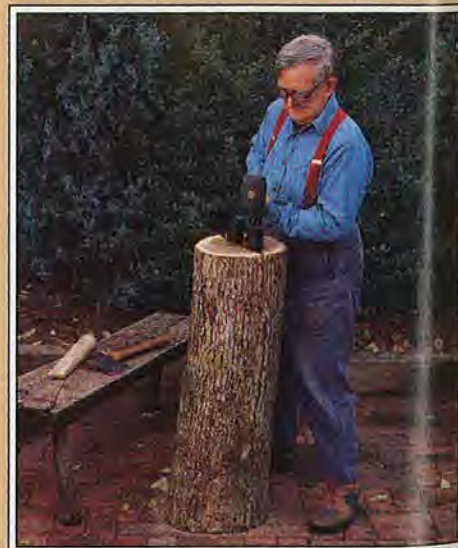
The chairmaking process starts when John splits the bolt open with a wedge and then quarters it. John examines the grain carefully, and with a mallet and froe (a long piece of iron with a wedge-shaped profile) splits out one or two chair posts from the heartwood of each quartered section of log.

With the posts split out, it's time to saddle up the shaving horse. This trademark tool of the bodger serves as a combination bench and vise. To use the shaving horse, John sits on one end and pushes with his foot on the treadle, which forces a clamping head down on the workpiece. This gives him two free hands for wielding a drawknife.

Shavings fly as John shapes the the four-sided billet into an octagonal post with his drawknife. The work requires a rapid-fire coordination of hands and feet—clamp, carve, unclamp, turn, clamp, and carve again. Later John will continue shaping the octagonal post with a spokeshave and turn it into

Bodging by the Numbers...

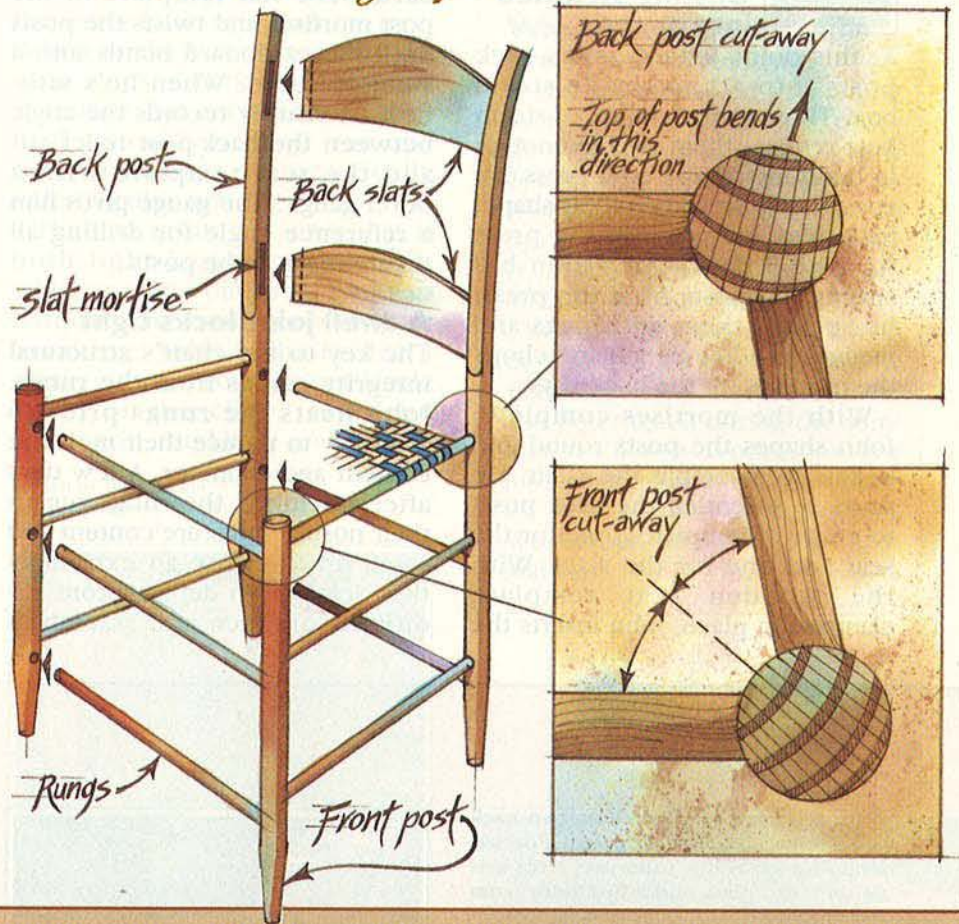
John fires the opening salvo on a pair of wedges that will split open this bolt of oak.



Grain orientation can make or literally break a chair. In the cut-away drawing shown right, the straight lines on the posts represent the medullary rays on an oak post. The slash lines show growth rings.

On the front post cutaway the medullary rays align so that they receive the thrust from the rungs equally, thus reducing the possibility that the rungs can split the post. On the back post cutaway, you must turn the medullary rays slightly to the rear to avoid splaying the tops too far to the right and left.

Anatomy of a Chair



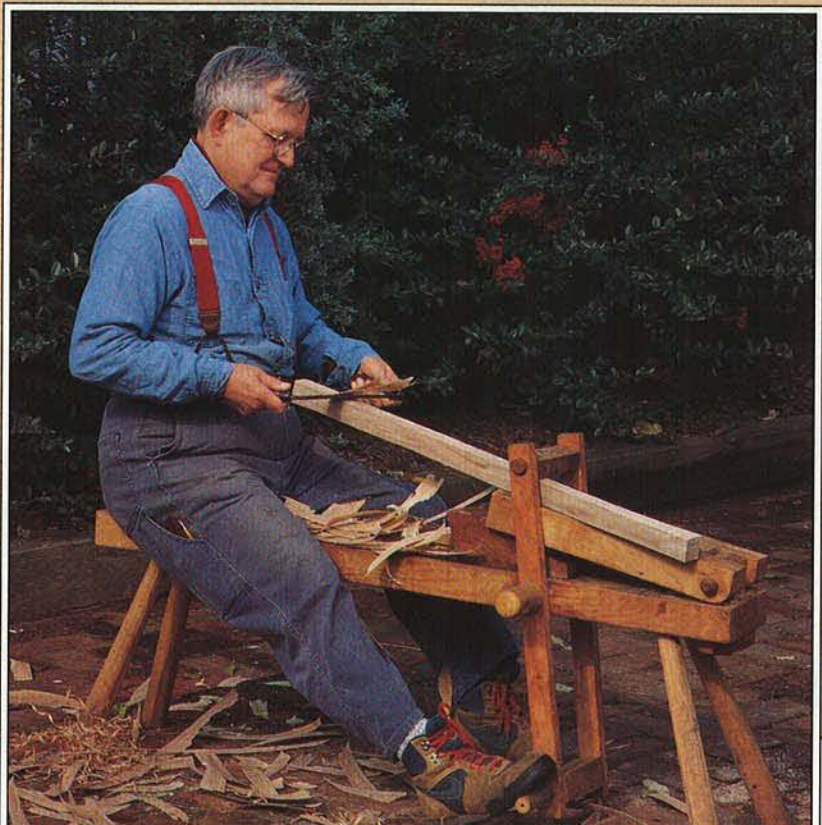
a round chair post about 1-1½" in diameter. John also shaves a flat relief cut onto the tops of the back posts to make them easier to bend later.

In a similar sequence, he shapes shorter, smaller pieces for rungs. The shaping stops with the spokeshave, and the use of sandpaper or any further tooling is forbidden. "You don't want to waste a lot of time trying to make it perfect," says John, a bit out of breath. "In the 17th-century, they had more important things to do than make perfect furniture. The eye is very forgiving."



2 After quartering the bolt, John rives the billets for the posts with a froe.

3 The shaving horse enables a bodger to clamp and release the post with foot pressure on the treadle bar. This leaves two hands free to wield a drawknife or spokeshave.





THE BODGER OF BALTIMORE

Getting steamed into shape

At this point John puts his back posts into a homemade steam box. Three to four hours of steam heat renders them pliable enough to bend into shape on a press. To ensure that they keep their shape, he leaves the posts in the press for 4 to 5 days. Once John has sprung the posts from the press, he secures them with pegs and wedges to a low bench and chops the mortises for the back slats.

With the mortises complete, John shapes the posts round and begins to assemble the chair. He starts by orienting the back posts to a pair of templates, one for the seat and one for the slats. With the wooden seat template clamped in place, John inserts the

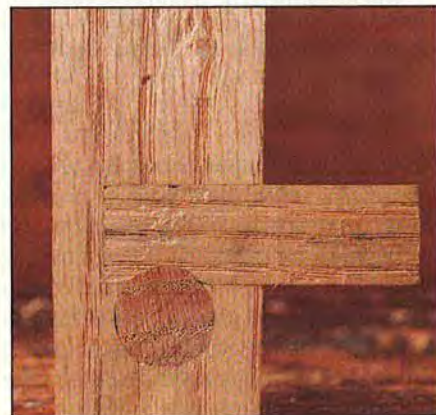
cardboard slat template in the post mortises and twists the posts until the cardboard bends into a suitable curve. When he's satisfied, he visually records the angle between the back-post relief cut and the seat template with a bevel gauge. The gauge gives him a reference angle for drilling all the mortises in the posts.

A swell joint locks tight

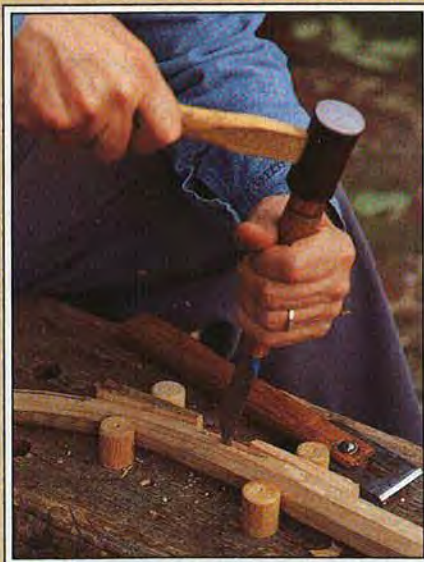
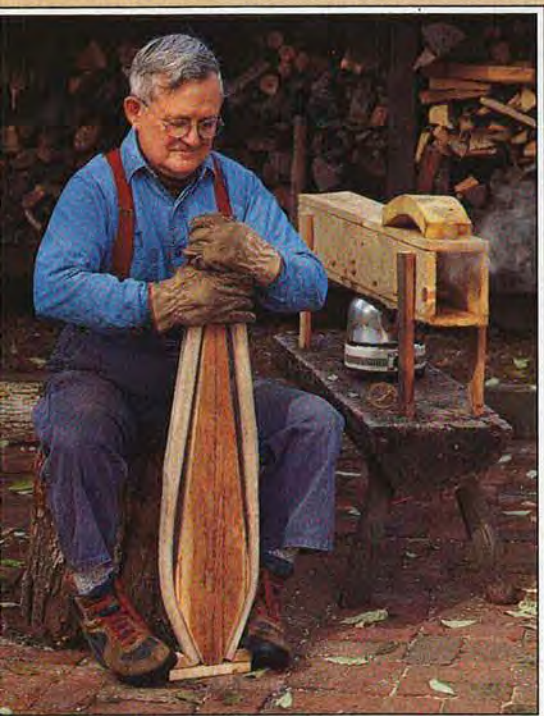
The key to the chair's structural integrity comes from the rungs. John heats the rungs prior to assembly to reduce their moisture content and diameter. A few days after assembly, the rungs regain their normal moisture content and swell up to create an extremely tight joint. John departs from traditional practice and assembles

the sides of the chair first. Then he drills the mortise holes for the front and rear rungs so that they cut into the side rungs to create an interlocking joint.

This cross section of a chair post shows how the side and front rungs interlock.

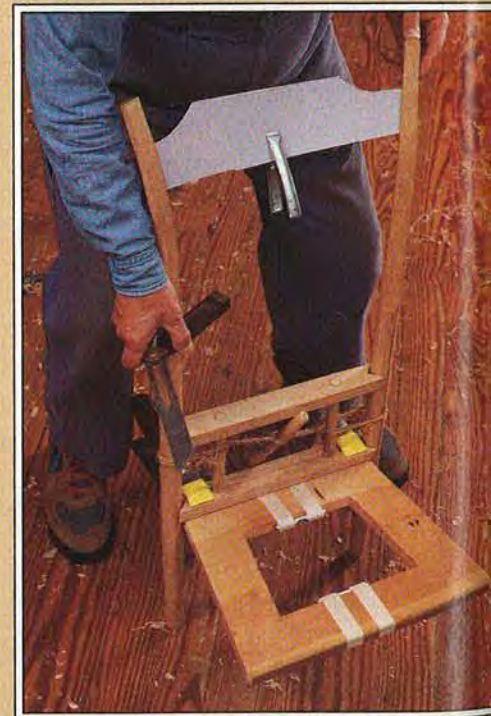


4 Fresh from the steam box, two back posts take shape on a press. For his steaming apparatus John uses a tea kettle on a hot plate and a box built from 1x6" lumber.



5 Wooden pegs and wedges enable John to secure the post for chopping the slat mortises. The octagonal post is easy to hold in place at this stage—before it's shaped round.

6 John orients the two back posts with templates for the seat and slats. The goal: align the relief cuts on the back posts so that the back slat conforms to a comfortable curve.



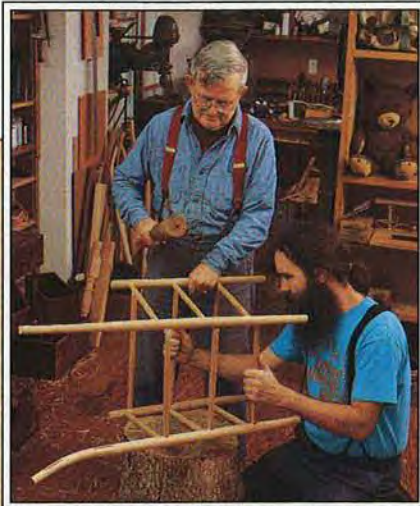
With the posts and rungs assembled, John turns his attention to the back slats. These he splits out of a short bolt of oak and shaves down to between $\frac{1}{8}$ - $\frac{3}{16}$ " thick while they're still green. Once the slats are shaped, he boils them so that they will bend to fit the curvature of the back of the person who will use the chair. The slats lose their pliability quickly, and it may take several boilings to get the slats of a chair to feel just right. Both John and Peter test-sit each chair slat. When in doubt about the fit or feel, John calls in his wife Joyce for a test-sitting. John finishes his chairs by burnishing the wood with a handful of shavings, and then applying a light coat of tung oil or Danish oil.

The seats he saves for last, and

these he weaves out of strips of the inner bark of a hickory tree. When soaked in water, the 1"-wide strips of bark work as easily as leather. But once they dry, they turn as tough as band iron and make a flexible yet practically indestructible seat.

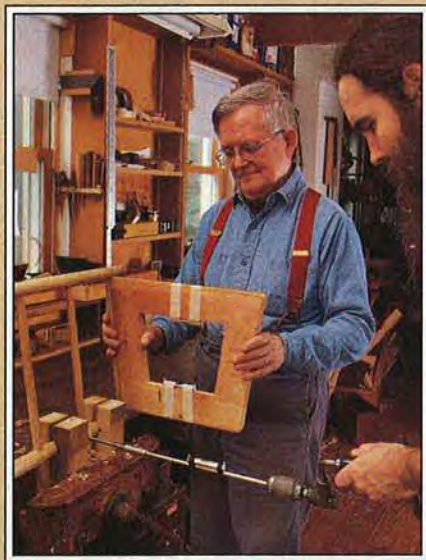
The end result is a chair that is both light and strong, one in which you can tilt up on two legs without the joints loosening or breaking. John's chairs don't creak, either. "You can put Uncle Tubby on this chair," says John with a grin, "and have no fear." 🌲

Written by Tom Jackson
Photographs: Steve Uzzell
Illustrations: Jim Stevenson

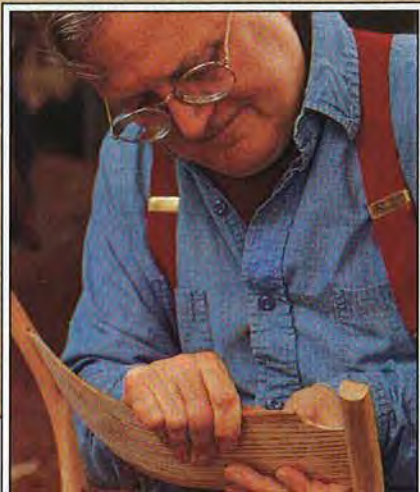


8 With the chair rungs fresh out of the oven, John and Peter quickly assemble the chair. As the rungs regain their moisture, they swell up and lock tight in their mortises.

9 John uses hand pressure to pop a back slat into its mortise.



7 Peter Follansbee, John's co-worker drills the mortises for the rungs while John holds the seat template. Spirit levels taped to the seat template and the drill bit extender ensure that the mortises are drilled at the correct angle and line up with each other.



Want to try traditional green woodworking?

If you are interested in learning more about chairmaking, order the book *Make a Chair from a Tree: An Introduction to Working Green Wood*, \$22.45 ppd., from John D. Alexander Jr., 1406 Light St., Baltimore, MD 21230. Call 410/685-4375.

You also can sign up for a five-day course on chairmaking or 17th-Century joinery that John and Peter teach during the summer at Country Workshops. For more information on the courses, write to John or to Country Workshops, 90 Mill Creek Road, Marshall, NC 28753.



10 Peter weaves the seat out of moistened strips of the inner bark of hickory. The wet bark works like leather. Once dry, it's as tough as band iron.

CARBIDE ROUTER

Spinning at 22,000 rpm, a two-flute router bit takes 733 bites of wood every second—much more punishment than you dish out to the cutting edges of most other tools. In order to survive such abuse, router bits are manufactured to exacting specifications. But if you check the prices on two seemingly identical bits from different manufacturers, you may find that one costs twice as much as the other. Why?

To answer that question, we rounded up four bits each from 18 manufacturers—a straight bit, a core-box bit, a round-over bit, and a panel-raising bit. We looked at the sharpening and grinding quality of each bit and routed hundreds of lineal feet of oak, pine, and plywood. In the end, we found a lot of little differences that can make a big difference in your woodworking. And we came up with a list of 10 questions you should ask when shopping for router bits.

1. Does the bit have a shear angle?

The forward tilt of the cutting edge on the round-over bit at *right* is what manufacturers call a shear angle. Shear angles allow the cutting edge to slice rather than chop the wood. This produces a smoother cut with less effort from the router motor. Look for shear angles on larger bits and edge-cutting bits such as round-overs.

In a plunge cut, a bit with a shear angle routing across the grain may cause some tear-out at the top of a groove or dado as the cutter lifts up and away from the edge. But the alternative, a completely vertical cutter, may leave a bit of fuzzing. All the straight bits we tested have vertical cutters since the fuzzing is easier to sand off than the tear-out that an angled cutter would cause. Routing with the grain, however, you'll get neither fuzzing or chipping. And since core-box



The shear angle on the cutting edge of the round-over bit, right, helps it slice through wood. The lack of shear angle on the straight bit, left, makes the router work harder, but prevents chipping on the top of a dado or groove.

bits are used primarily in fluting operations with the grain, all of these bits, except Porter-Cable's, have a slight shear angle.

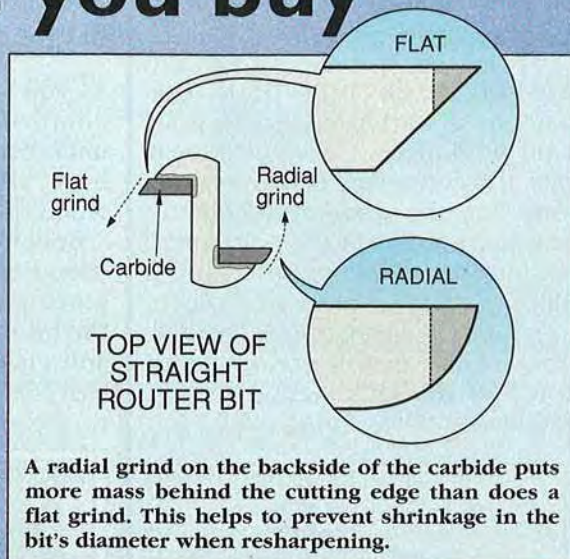
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BITS 10 questions you should ask before you buy

2. (For straight bits) Is the relief angle flat or radial ground?

To prevent burning, the carbide directly behind the cutting edge of a bit must be ground or "relieved" so that it doesn't rub against the wood. On straight bits, this relief is ground either flat or radial, as shown in the drawing *right*.

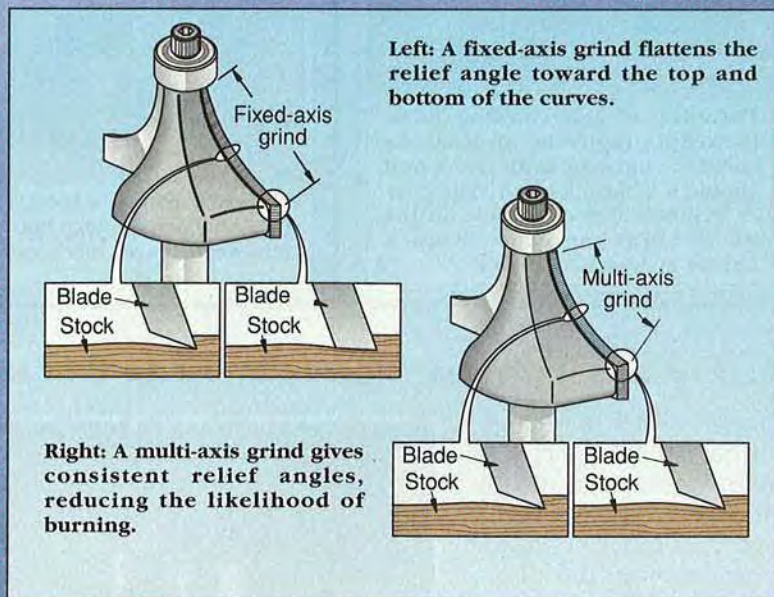
The radial grind leaves more carbide behind the cutting edge, and manufacturers who offer this type of grind claim the extra mass reduces chatter and keeps the edge sharp longer. In our tests, we did not detect any difference in performance or quality of cut between flat- and radial-grind bits. But, the extra carbide on radial-grind bits will reduce the slight shrinkage in diameter you get when you have your bits resharpened. The straight bits that have a radial grind include Amana, Bosch, CMT, DML, Eagle America, DeWalt, Oldham, Sears, Vermont America, and Whiteside.



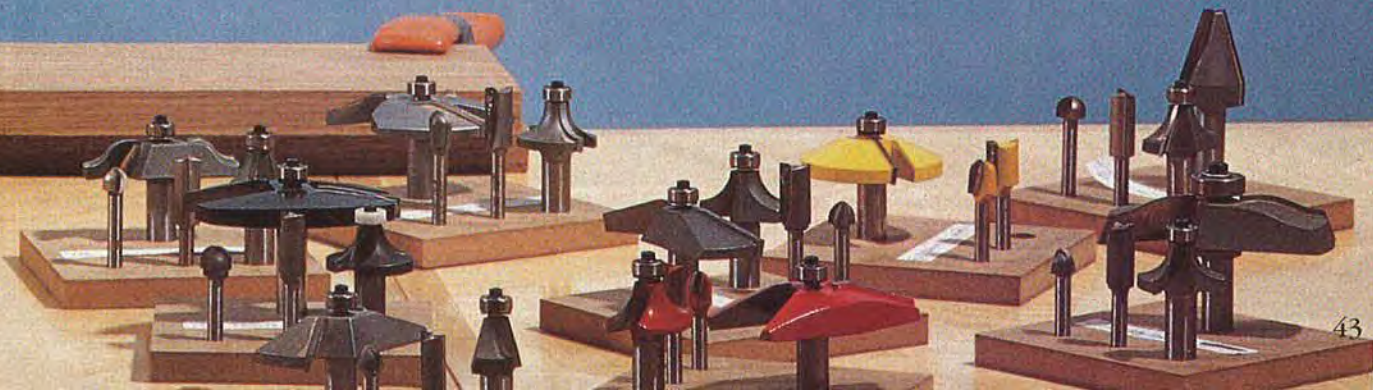
3. (For curved-profile bits) Is the relief angle fixed-axis or multi-axis?

Grinding the relief angles on curved-profile bits (like ogees and round-overs) gets more complicated. If manufacturers use a fixed-axis grinding stone, the relief angles flatten out near the top and bottom of the curves, as shown in the drawing *right*. These flat relief angles can compress the wood and increase the likelihood of burning, especially after the cutting edge dulls.

The solution: a multi-axis grinding machine tilts the grinding stone to follow the curved profile of the bit. This gives the bit a consistent relief angle across the back edge of the carbide. We observed a multi-axis grind on the round-over bits from Amana, Bosch, CMT, DeWalt, DML, Eagle America, Freud, Porter-Cable, Sears, Vermont America, and Whiteside.



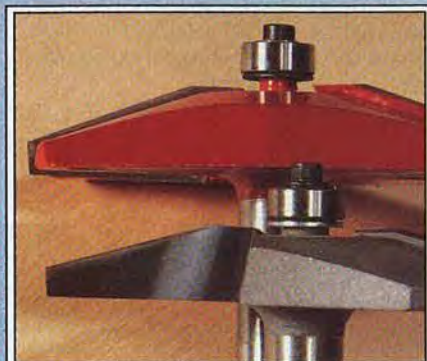
Continued



CARBIDE ROUTER BITS

4. Are anti-kickback bits worth the cost?

Anti-kickback bits limit the amount of carbide that can grab your workpiece. On conventional bits, the entire face of a cutter can slam into the wood and violently jerk the router out of your hands. Anti-kickback bits expose only a sliver of carbide to the workpiece, as shown in the photo *below*. These bits can still grab, but the force of the kickback is greatly reduced and less dangerous.



The sliver of gray showing above the red on the Freud bit is all the carbide that can grab the wood should a kickback occur. The larger exposed area of carbide on the bit in front can cause a much harder kickback.

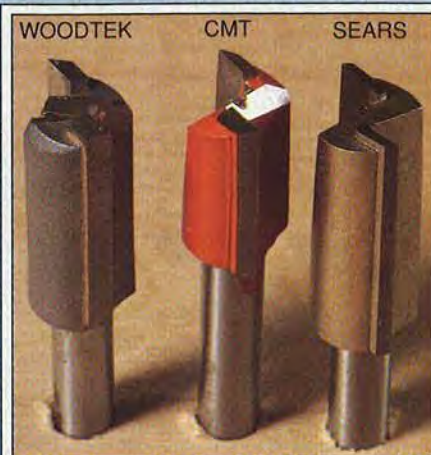
5. (For plunge cutting) How steep is the relief angle on the bottom of the bit?

As you start a plunge cut, the bit compresses the wood directly underneath it. To prevent burning here, the bit must remove this wood quickly and cleanly.

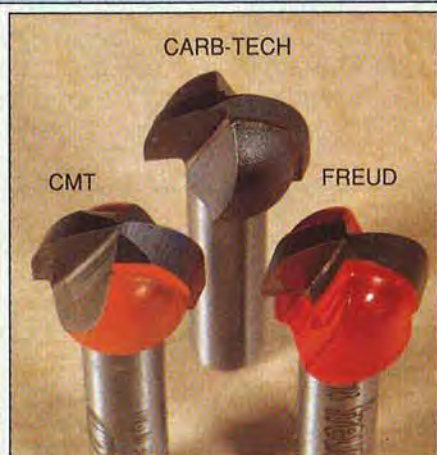
Bosch, Carb-Tech, DML, and Woodtek braze an extra carbide cutting tooth on the bottom of the bit to help smooth the bottom and clear debris. CMT and Freud sharpen the bottom axis of the bit to a V-shape, and the rest leave

the area flat or unsharpened, as shown in the photo *below left*. We found that the carbide-tooth design and the V-bottoms produced smoother plunging action, although the quality of cut stayed the same for all the bits.

On core-box bits look for a cleanly ground point on the bottom tip of the bit. The bits with steeper angles plunge smoothly and leave a cleaner cut.



Woodtek offers a tooth on bottom. CMT sharpens a ridge between the cutters. Sears leaves this area flat.



CMT grinds an extra relief angle on its core-box bit. Freud's bit comes to a more distinct point than Carb-Tech's.

6. (For bits with bearings) Is there a relief angle ground under the bearing?

On bits with bearings, some manufacturers grind a relief angle on that portion of the carbide that hides under the bearing, as in the photo at *near right*. With the bearing in place, this edge will never see any cutting action. But if you want to change to a smaller bearing to change the profile of the bit, you must have the relief grind under the bearing. Otherwise, the unrelieved carbide will burn when you switch to the smaller bearing.



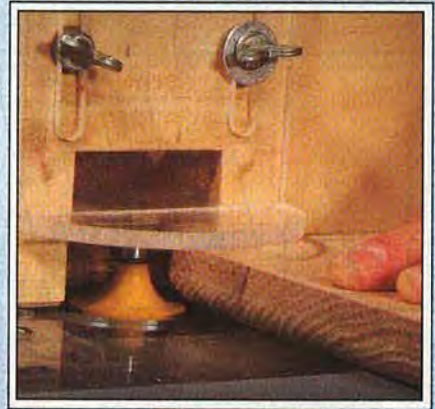
The Bosch bit, left, offers a dust shield and a relief grind under the bearing. The Grizzly bit, right, typical of the Taiwanese bits tested, keeps costs low by offering neither.

7. Does a colored coating make a router bit better?

Several manufacturers add a colored coating to the bodies of the bits. These bright colors show up clearly in use and add an extra margin of safety to your routing. Many of the coatings also help keep pitch and resin off the bit. CMT's patented orange Teflon coating makes its bits easier to clean. Oldham also coats its bits with an anti-stick coating. On

Porter-Cable's bits, a black-oxide coating prevents rust. Freud paints its bits red. This paint doesn't offer any anti-stick properties, and the paint tends to deteriorate near the carbide where the most heat is generated.

A bit with a brightly colored coating shows up much better than an ordinary bit and serves as a reminder to keep your fingers away.



8. Are thicker carbide cutters better than thin?

If you have your router bits resharpened frequently, look for thick carbide cutters. You can resharpen router bits with a lot of carbide 10 to 12 times, but you may only get 4 to 5 resharpenings out of the thinner carbide cutters. We found a wide variety of carbide thicknesses within every manufacturer's line, so we suggest you compare the same bits from different manufacturers side by side to see which bits offer the most carbide. Also see the comparison of carbide thickness in our chart on *page 46*.

9. How can I tell if a bit will burn the wood?

Any router bit will burn wood if it's left in one place long enough. But in normal operation, none of the new bits we tested left burn marks. Burning usually won't occur until the cutting edge of the carbide loses its factory sharpness.

The type of wood you are working and the feed rate also play a roll in burning. If you've had a problem with burning in the past, especially with woods such as maple or cherry, we suggest you choose from the router bits that we rated excellent in the edge-quality column in the chart.

10. Which bits are right for me?

Buy higher-quality bits if you use your router often, machine hard or highly figured woods, or rout difficult-to-sand profiles. Good bits also make sense for frequently-used profiles like round-overs.

You can, however, save money by choosing the lower-cost bits if you only use your router occasionally, or if you're a beginning woodworker and want to acquire a lot of tools on a limited budget. It's also a smart idea to choose a lower-cost bit for special projects where you need a profile that you may only use once.

Our recommendations

We found that the bits fell into three categories with CMT and Freud at the top. The sharpening and finishing quality of these bits set them apart from the competition. Even after our tests, when every other bit showed (under 30X magnification) some edge deterioration, CMT's edges looked brand new, and Freud's edges showed only a fraction of the wear we saw on all the rest. In our overall ratings we gave CMT a slight edge over Freud, mostly for the little details like the extra relief grind on the tip of the core-box bit, thicker carbide, and a more-durable coating.

The next category includes Amana, Bosch, DeWalt, DML,

Eagle America, Oldham, Porter-Cable, Sears Industrial, Vermont American Industrial, and Whiteside. These gave us excellent results as well. As a group, they don't exhibit all the extra refinements we found in CMT and Freud. But the consistent high quality in the manufacturing of these bits ensure that they will withstand many years of hard use in any home or professional shop.

Our third group of bits—Carb-Tech, Cascade, Enlon, Grizzly, MLCs, and Woodtek—come from Taiwan and offer excellent value for the money. Our visual inspection of the carbide edges showed the sharpening quality in the fair-to-good range. Even so, these bits

cut just about as well as the best bits in the test. Over time, however, these bits will dull sooner, and as a result may tend to burn a little quicker than those with better sharpening quality.

On some Taiwanese bits we also noted a lack of concentricity. This means that one cutter measures slightly larger than its opposite, thus causing the larger cutter to dull sooner. You can usually spot this defect immediately—you'll feel some chatter or see scalloping on the workpiece. Since this was an infrequent problem, you can eliminate the risk and get a bargain with these bits by ordering from a company with a good return policy.

Continued

CARBIDE ROUTER BITS

RATING CARBIDE ROUTER BITS																			
COMPANY AND BIT NUMBER	BIT TYPE (1)	CHIPPING			FUZZING			CONTROL		CARBIDE EDGE QUALITY (2)		CARBIDE THICKNESS (3)	OVERALL RATING (4)	COUNTRY OF ORIGIN (5)	PRICE RANGE (6)	SUGGESTED RETAIL PRICE (7)	COMMENTS		
		OAK	PINE	PLYWOOD	OAK	PINE	PLYWOOD	FEED RATE	VIBRATION, CHATTER	SHARPENING QUALITY	EDGE QUALITY AFTER TEST								
AMANA	45910	CB	E	E	E	G	E	G	E	E	E	E	E	E	9.7	I	H	\$ 24	No-frills bits with excellent overall quality and performance.
	45224	S	E	E	E	E	E	E	E	E	E	E	E	E				14	
	49518	RO	E	E	--	E	E	--	E	E	E	E	E	E				35	
	54117	P - 3 ³ / ₈	E	E	--	G	G	--	F	G	E	E	E	--				135	
BOSCH	85446M	CB	E	E	E	F	G	G	E	E	E	G	G	E	9.6	U	H	24	Overall good to excellent quality.
	85680M	S	E	E	E	E	E	E	E	E	E	G	E	E				15	
	85595M	RO	E	E	--	E	E	--	E	E	E	G	G	E				37	
	85639M	P - 3 ¹ / ₂	E	E	--	G	G	--	G	G	E	G	--	E				95	
CARB-TECH	CT1032	CB	E	E	F	F	G	F	E	E	G	F	G	E	7.8	T	M	9"	A carbide tooth on the bottom of the straight bit gave smooth plunge cuts. Good value for the money.
	CT1008	S	E	E	G	G	G	G	E	E	G	F	G	E				6"	
	CT1074	RO	E	E	--	E	G	--	E	E	G	F	G	E				18"	
	AY44	P - 3 ³ / ₈	E	E	--	G	G	--	F	G	G	F	--	E				60"	
CASCADE	C1231	CB	E	E	E	F	G	G	E	G	F	F	G	E	7.8	T	L	11"	Bits come in a convenient plastic case that protects carbide edges. Good value for the money.
	C1004	S	G	G	F	P	G	F	G	G	F	F	G	E				8"	
	C1187	RO	E	E	--	E	E	--	E	E	F	F	G	E				15"	
	C1400	P - 2 ⁵ / ₈	E	E	--	F	F	--	F	F	F	F	--	E				30"	
CMT	814-127	CB	E	E	E	G	E	E	E	E	E	E	E	E	10	IT	H	26"	Attention to detail resulted in flawless performance, even after heavy use. Anti-kickback profiles on larger bits.
	812-127	S	E	E	E	E	E	E	E	E	E	E	E	E				17"	
	838-880	RO	E	E	--	E	E	--	E	E	E	E	E	E				38"	
	890-502	P - 3 ¹ / ₄	E	E	--	E	E	--	E	E	E	E	--	E				82"	
DeWALT	DW6604	CB	E	E	E	F	G	G	E	E	F	F	F	E	8.5	I	H	25	Limited number of raised-panel bits, carbide sharpening only fair. Otherwise, good overall quality.
	DW6120	S	E	E	E	E	E	E	E	E	G	F	F	G				23	
	DW6522	RO	E	E	--	E	E	--	G	G	F	F	G	E				37	
	DW6592	P - 2 ⁵ / ₈	E	E	--	F	F	--	F	F	F	F	--	E				82	
DML	01129	CB	E	E	E	G	G	G	E	E	E	G	G	E	9.5	U	H	22	Thin carbide on straight bit, but otherwise excellent quality.
	00209	S	E	E	E	E	E	E	E	E	E	G	G	E				14	
	01334	RO	E	E	--	E	G	--	E	E	E	G	G	E				35	
	02058	P - 3 ¹ / ₂	E	E	--	G	G	--	G	F	E	G	--	E				109	
EAGLE AMERICA	130-0802	CB	E	E	E	F	G	G	E	E	G	G	E	E	9.5	U	MH	18"	Three-wing panel raiser lacks shear angle which makes cutting difficult and slow. Otherwise, good to excellent quality and value.
	102-0832	S	E	E	E	E	E	E	E	E	E	G	G	E				13"	
	156-0805	RO	E	E	--	E	E	--	E	E	G	G	E	E				26"	
	186-5835	P - 3 ³ / ₈	E	E	--	E	E	--	P	P	G	G	--	E				85"	
ENLON	R038	CB	E	E	G	F	G	G	E	E	F	F	E	E	7.8	T	L	13"	Bits come in a convenient plastic case that protects carbide edges. Best prices in the test.
	R008	S	E	E	F	G	G	G	G	G	F	F	G	E				6"	
	R024	RO	E	E	--	E	G	--	E	E	F	F	G	E				16"	
	R066	P - 1 ⁹ / ₁₆	E	E	--	G	G	--	E	G	F	F	--	E				21"	

NOTES:

- E** Excellent
- G** Good
- F** Fair
- P** Poor
- Not applicable

1. (CB) Core box
(S) Straight
(RO) Round-over
(P) Panel - Number indicates cutting diameter of bit.
(*) Vertical design
2. As observed with a 30x magnifier.

3. No measurement taken on panel raising bits due to dissimilarities in bit size.
4. Scale of 1-10, with 10 as the best.
5. (I) Israel
(IT) Italy
(T) Taiwan
(U) United States

6. Based on average of all four bits.
(H) High
(MH) Medium-high
(M) Medium
(L) Low
7. (*) Indicates catalog price.

RATING CARBIDE ROUTER BITS

COMPANY AND BIT NUMBER	BIT TYPE (1)	CHIPPING			FUZZING			CONTROL	CARBIDE EDGE QUALITY (2)		CARBIDE THICKNESS (3)	OVERALL RATING (4)	COUNTRY OF ORIGIN (5)	PRICE RANGE (6)	SUGGESTED RETAIL PRICE (7)	COMMENTS
		OAK	PINE	PLYWOOD	OAK	PINE	PLYWOOD	FEED RATE	VIBRATION, CHATTER	SHARPENING QUALITY						
FREUD	18-108	CB	E	E	E	G	E	E	E	E	E	9.8	IT	H	\$ 24	Excellent performance and edge quality. Anti-kickback profiles on larger bits.
	04-130	S	E	E	E	E	E	E	E	E	E				16	
	34-126	RO	E	E	--	E	E	--	E	E	E				44	
	99-215	P - 3 1/2	E	E	--	G	E	--	E	E	E				109	
GRIZZLY	G1683	CB	E	E	G	F	G	G	E	E	F	7.8	T	L	14*	Bits come in a durable plastic case that protects carbide edges. Good value for the money.
	G1668	S	E	E	G	G	G	G	G	G	F				6*	
	G1422	RO	E	E	--	E	G	--	E	E	F				19*	
	G2937	P - 2 5/8	E	E	--	G	G	--	G	E	F				30*	
MLCS	417	CB	E	E	G	F	G	F	G	G	F	7.8	T	M	14*	Only Taiwanese source to offer a line of anti-kickback bits. Price includes shipping. Good value for the money.
	474	S	E	E	F	G	G	G	G	G	F				7*	
	8655	RO	E	E	--	E	G	--	E	E	F				24*	
	686	P - 3 1/4	E	E	--	F	F	--	F	F	F				45*	
OLDHAM	140-4-RO	CB	E	E	E	E	E	E	P	F	F	8.2	U	H	45	Lack of relief on the bottom of the core-box bit caused it to walk up and out of the cut. Anti-kickback profiles on larger bits.
	121-4-DFS	S	E	E	F	G	G	G	E	E	F				15	
	120-2-ROV	RO	E	E	--	E	G	--	E	E	F				34	
	250-2-RPSI	P - 2 5/8	E	E	--	F	F	--	E	G	F				88	
PORTER-CABLE	43145	CB	E	E	E	F	F	F	E	G	E	9.6	U	H	22	Core-box bit has no shear angle. This produces minor fuzzing, but prevents chipping on cross-grain routing. Anti-kickback profiles on larger bits.
	43318	S	E	E	E	E	E	E	E	E	E				14	
	43931	RO	E	E	--	E	G	--	E	E	E				52	
	43527	P - 3 1/2	E	E	--	G	G	--	E	E	E				125	
SEARS INDUSTRIAL	25546	CB	E	E	E	F	G	G	E	E	G	9	U	M	14	Vertical raised-panel bit fits in regular router table opening, but cuts with some difficulty. Otherwise, a good value for the money.
	25827	S	E	E	G	F	G	G	E	G	G				12	
	25538	RO	E	E	--	E	E	--	E	E	G				28	
	25397	P - 1 5/8	E	F	--	G	G	--	P	F	G				40	
VERMONT AMERICAN	22722	CB	E	E	G	F	G	G	E	E	G	9.2	U	MH	17	No dust shield on the round-over bit, but good consistent high quality on all bits.
	22446	S	E	E	E	G	G	G	E	G	G				16	
	22829	RO	E	E	--	E	E	--	E	E	G				47	
	22838	P - 2 5/8	E	E	--	G	G	--	G	E	G				58	
WHITESIDE	24B34	CB	E	E	E	F	G	G	E	E	G	9.5	U	H	23*	Three-wing panel raiser lacks shear angle which makes cutting difficult and slow. Otherwise, excellent quality and good value.
	24A10	S	E	E	E	E	E	E	E	E	E				15*	
	24C25	RO	E	E	--	E	E	--	E	E	G				31*	
	24F37	P - 3 3/8	E	E	--	E	E	--	P	P	G				100*	
WOODTEK	819-089	CB	E	E	E	G	G	G	E	E	G	8	T	M	11*	Bottom-cleaning carbide tooth on the straight bit gave super-smooth results. Overall good quality and prices.
	818-788	S	E	E	G	G	G	G	E	E	G				9*	
	820-074	RO	E	E	--	E	G	--	E	E	G				15*	
	820-382	P - 3 9/16	E	E	--	G	G	--	E	E	G				50*	

SOURCES:

AMANA TOOL CORP.
800/445-0077

BOSCH
S-B POWER TOOL CO.
312/794-7597

CARB-TECH (Trend-lines)
800/767-9999

CASCADE TOOLS, INC.
800/235-0272

CMT
813/886-1819
DeWALT INDUSTRIAL TOOL CO.
800/433-9258

DML
800/242-7003

EAGLE AMERICA CORP.
800/872-2511

ENLON IMPORT CORP.
800/888-9697
FREUD USA, INC.
800/334-4107

GRIZZLY IMPORTS
206/647-0801

MLCS
800/533-9298

OLDHAM UNITED STATES SAW
800/828-9000

PORTER-CABLE
901/668-8600

SEARS
800/377-7414

VERMONT AMERICAN
704/735-7464

WHITESIDE (Woodcraft)
800/225-1153

WOODTEK (Woodworker's Supply)
800/645-9292

SPOTLIGHT ON



These woodshop workhorses won't kick back and have guards aplenty, but if you saw unprepared, it's still quite possible to stray into an accident.

Believe it or not, every year over 7,000 accidents involving bandsaws occur in American workshops—three times the number reported for routers! Few of these mishaps result in hospitalization, though, according to national statistics compiled by the U.S. Consumer

Products Safety Commission. That's probably because today's bandsaws have loads of safety features built in.

Nevertheless, what woodworker's heart hasn't skipped a beat or two operating one of these powerful sawing machines when the blade suddenly snapped? To help you maintain a regular heartbeat, we've gathered a bunch of sound safety advice from the *WOOD*® magazine staff as well as tool-industry experts.

Set up for safety

Built-in safety guards on your bandsaw don't eliminate the need for shatterproof safety glasses, approved hearing protection, and even a dust mask if your stock produces fine dust particles. You'll also want to heed the following advice.

- Don't operate a bandsaw while wearing gloves, loose clothing (especially at the wrists), dangling jewelry, or long hair that could catch on moving parts.

- Keep a clean saw table and work area. Remove all tools, debris, and other objects not directly involved with sawing. Clear the floor space around the saw to prevent slipping.

- Install the correct-width blade for the work you intend to do (see the table, *above right*). To prevent blade overheating and binding, you should select the widest blade that will cut the smallest radius in the pattern you're sawing. Also, be sure the blade is the right length for your machine, or you won't be able to properly tension it. (Check your owner's manual for blade length and tensioning procedure).

 [Print this article](#)



BANDSAW SAFETY

Bandsaw blade radius limits

Blade Width (inches)	Min. Radius (inches)
3/4.....	1 3/4
1/2.....	1 1/2
3/8.....	1
1/4.....	3/4
3/16.....	1/2
1/8.....	1/4

- Properly set the blade guard and guide before you begin sawing. For greater control and less chance of accidental contact with your fingers, you want as little as possible of the blade exposed above the wood you're sawing (see drawing below). About 1/4" allows you to safely view the pattern line and maintain control of the workpiece. And don't forget to reset the blade guide if you change wood thicknesses.
- To prevent blade breakage and ensure a smooth cut, follow the steps to properly adjust the thrust bearing supporting the blade, as

instructed in the owner's manual and explained, below.

- Be sure to securely close both the upper and lower wheel guards to retain the blade should it break during use.
- Carefully inspect the stock you want to saw for nails and foreign matter that can break a blade.

Sawing with confidence

Now that you have adjusted the blade and set the guides, checked your stock, and otherwise prepared yourself, you're ready to saw. For an accident-free experience, follow these guidelines:

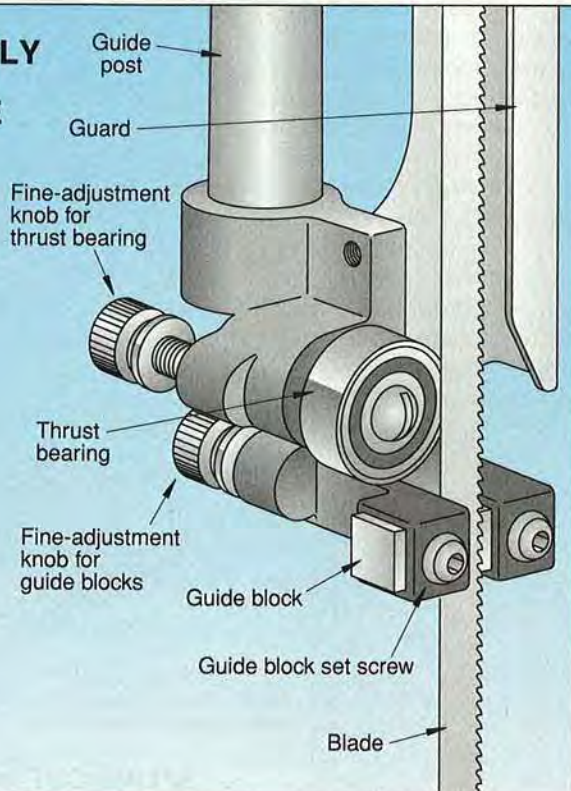
- Provide adequate viewing light on the cutline.
- Keep your hands to either side of the blade (never in line with it) when sawing. In straight-sawing, move the stock against the fence.
- Never run a bandsaw with a cracked blade. A clicking blade probably has a crack and should be replaced.
- Don't back the work away from the running blade if binding

occurs. Instead, turn off the saw, allow the blade to stop, then back the workpiece out. To avoid binding, make relief cuts on tight-radius patterns (see below).

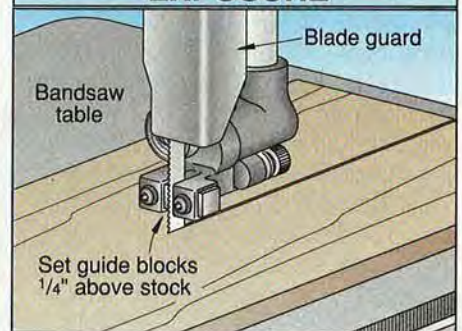
- If a blade breaks while you're sawing, immediately turn off the machine and wait for it to come to a complete stop. Then, untangle and remove the broken blade.
- Don't attempt to stop the bandsaw's motion after you have turned off power.
- Never attempt to remove scrap stock from the table while the saw blade is moving.
- Watch for thin, cutoff pieces that can jam in the saw-slot insert. These can deflect the blade off the cutting line or suddenly direct your fingers too close to the moving saw blade.
- Do not force material through the saw. This causes binding and unnecessary blade tension.
- Use a holding device for small or odd-shaped pieces. Add an auxiliary table to support oversized workpieces as you saw. ♣

HOW TO PROPERLY SUPPORT A BANDSAW BLADE

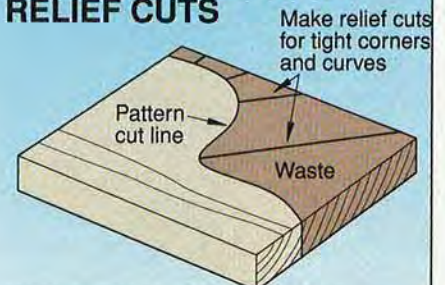
1. With the saw off, set the blade's tracking so that the bottoms of the gullets between teeth line up with the front of the guide blocks.
2. Turn on the saw, then slowly slide the thrust bearing to the back of the blade. When the blade turns off until it no longer rotates. Next, tighten the setting.



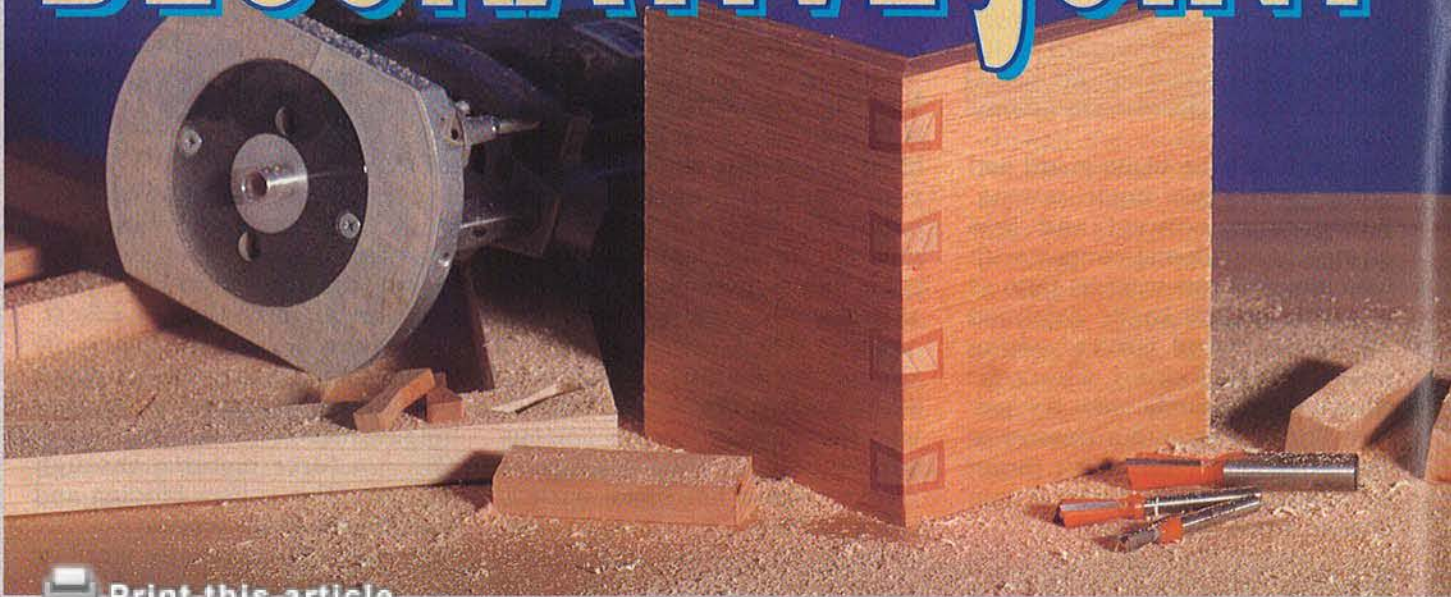
ADJUST GUARDS FOR MINIMUM BLADE EXPOSURE



AVOID BINDING WITH RELIEF CUTS



STRENGTH AND GOOD LOOKS ROLLED INTO ONE DECORATIVE JOINT



 Print this article

CORNER KEYS UNLOCK THE BEAUTY IN YOUR MITERED BOXES

Although any of us can beam with pride over tight-fitting miters, these plain-looking joints rank low on the list of strongest joints. The good news is that you can beautify miters and make them much stronger in one fell swoop. The answer: *corner keys*. These consist of small pieces of wood in various shapes that fit tightly into slots (called *key ways*) cut diagonally through the miter joint. Viewed from either side of the

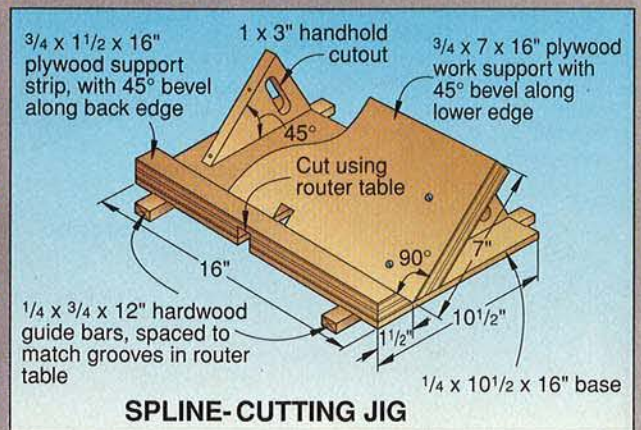
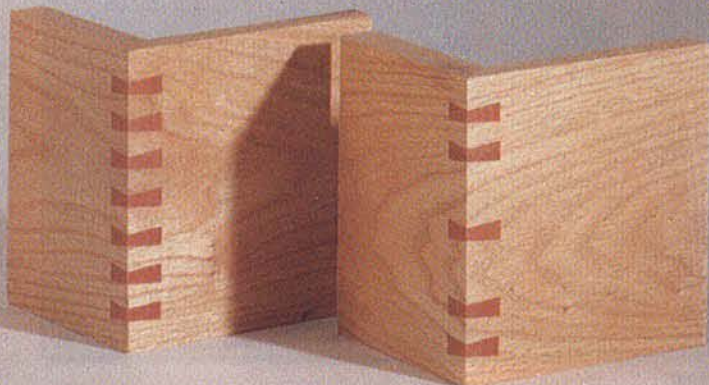
joint, corner keys of different shapes give the appearance of dovetail, box, or finger joints. In this section we'll show you how to make a variety of corner keys useful for projects ranging from jewelry boxes to hope chests.

First, you'll need a simple jig and a few router bits

To help you cut the key ways, you need to build the spline-cutting jig shown *below*. This handy device holds a mitered corner at a 45° angle as you pass the joint through a

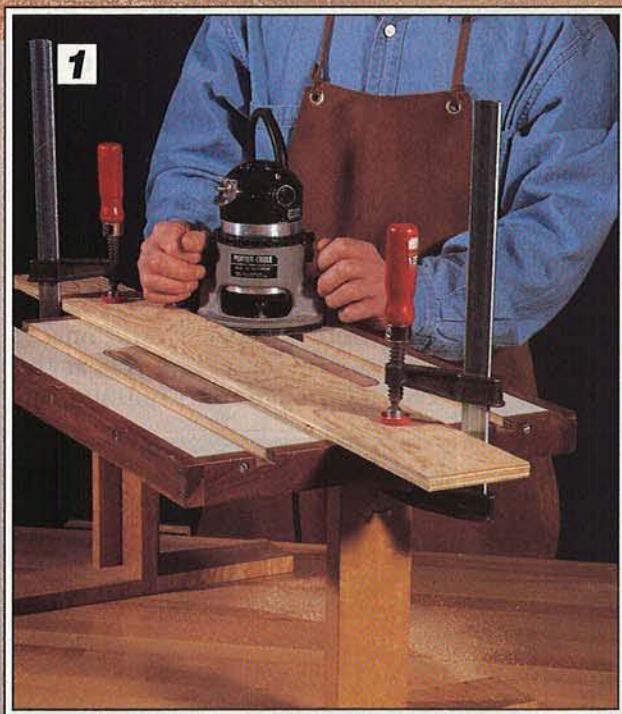
router bit. Building it requires only a few scraps of wood and about 10 minutes of your time. It should be at least twice as wide as your longest miter joint (our version handles miters up to 8" long).

Unless your router table already has twin miter-gauge slots, you'll need to add these for accepting the guide strips on the underside of the jig. We modified our router table by clamping a board of the necessary width to it and routing the slots as shown in *Photo 1*.



REINFORCEMENTS

If you're sitting there thinking, "Boy, those joints sure are great-looking; I wish I could do that," get ready for a happy surprise. Armed with the information we've developed for this article—and with a little practice—you can produce equally impressive results. So if you're ready to take your project-building skills to a new, higher level (and amaze your family and friends with your special talent), read on. We'll have you up and running in nothing flat.

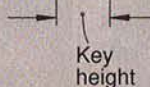
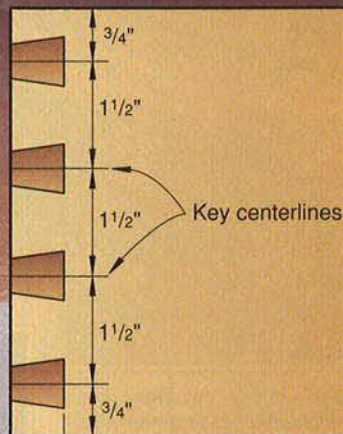


1 If your router table doesn't have two parallel slots, rout them for receiving the spline-cutting jig.

Make sure the board you use as the straightedge has two perfectly parallel edges. Cut the guide strips so they fit the slots snugly, and attach the strips after cutting the

slots. Apply paraffin wax to the strips and slots so the jig glides smoothly.

As you can see from the examples shown on the *first four pages* of this article, you can make various keyed joints using dovetail, round nose, or straight router bits. The examples on the *following page* with keys within keys require two router bits, one about $\frac{1}{4}$ " to $\frac{3}{8}$ " smaller in diameter than the other. If you decide to make a dovetail within a dovetail, the bits should have the same cutting angle. (Dovetail bits vary from 7° to 14° in cutting angle. We used 8° bits in $\frac{3}{4}$ " and $\frac{3}{8}$ " diameters for the workpieces shown here.)



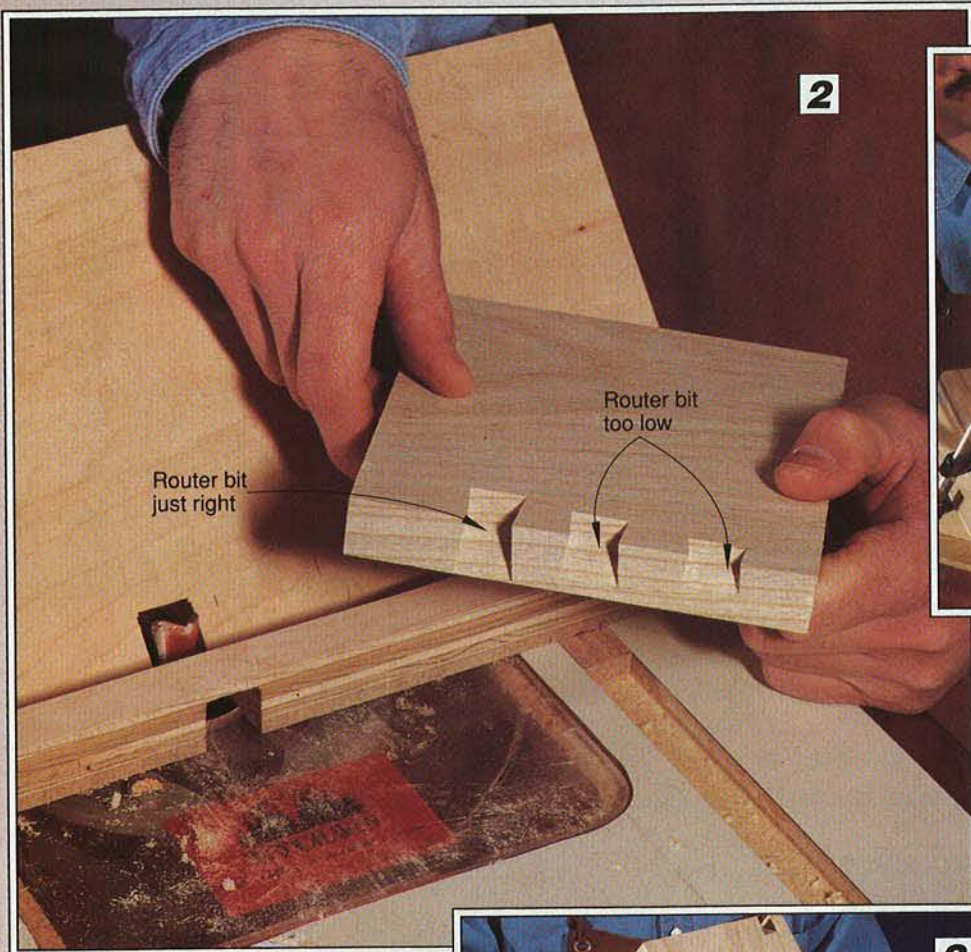
PLANNING KEY LOCATIONS

Take a minute to do some simple planning

You can space the keys evenly or unevenly, but in either case you need to determine their center-to-center spacing as shown in the drawing *above*. The height of the keys should equal the thickness of your workpieces.

Let's put the jig into action

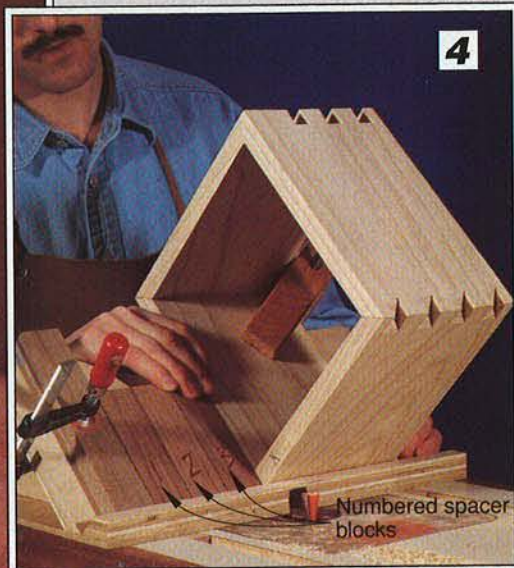
Using the center-to-center spacings, cut blocks of wood in widths that match your spacings. For the example shown *above*, we cut three identical blocks, $1\frac{1}{2}$ " wide. (You don't need blocks for the edge-to-center spacings.) The blocks should be as thick as your workpieces and 4-6" long. Slightly



2

Router bit just right

Router bit too low



4

Numbered spacer blocks

To make other cuts, add spacer blocks as wide as the center-to-center spacing of your keys.

should cut across the full width of the edge, but no more.

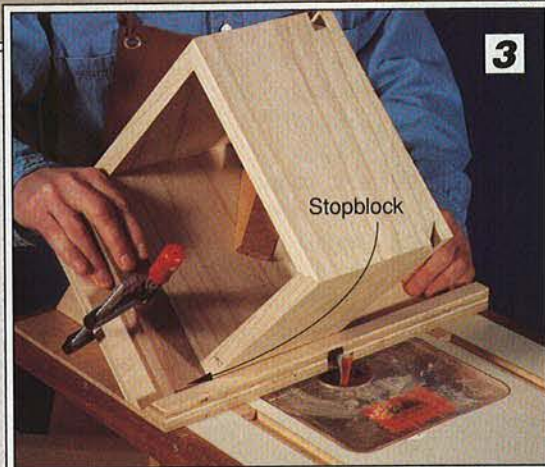
On your workpiece (a mitered box in this case), mark the center of either end key. Align this mark with the center of the router bit and clamp a stopblock onto the jig as shown in *Photo 3*. Measure the position of the cut, and re-adjust the stopblock if necessary. Mark an "X" on the end of your box that goes against the stopblock. Clamp your box to the jig.

After making the first cut, rotate the box to make the same cut in each mitered corner. Add one of the spacer blocks and repeat the cutting procedure. Continue this

Adjust the router bit to cut through the thickness of the workpiece and no more.

chamfer all of the block edges to help ensure that debris does not prevent them from solidly contacting each other. Number the blocks and set them aside.

Now, with a scrap piece of the same thickness as your workpieces, determine the correct router-bit height. Do this by making test cuts like those in *Photo 2*. The bit



3

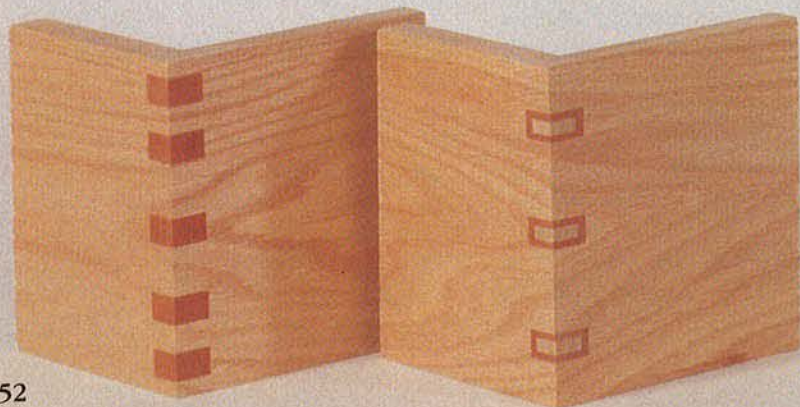
Stopblock

Position a stopblock to make your first router cut of an end key.



5

Use an adjustable triangle to accurately set the blade angle before ripping the key stock as shown. Complete this cut using a pushstick.



way until you cut slots for all of the keys as shown in *Photo 4*.

How to make your keys

It's simple to make keys for box and finger joints. Just cut rectangular pieces of a contrasting wood that fit snugly into the slots. However, dovetail and rounded-finger keys require extra effort. Here's some advice for each type:

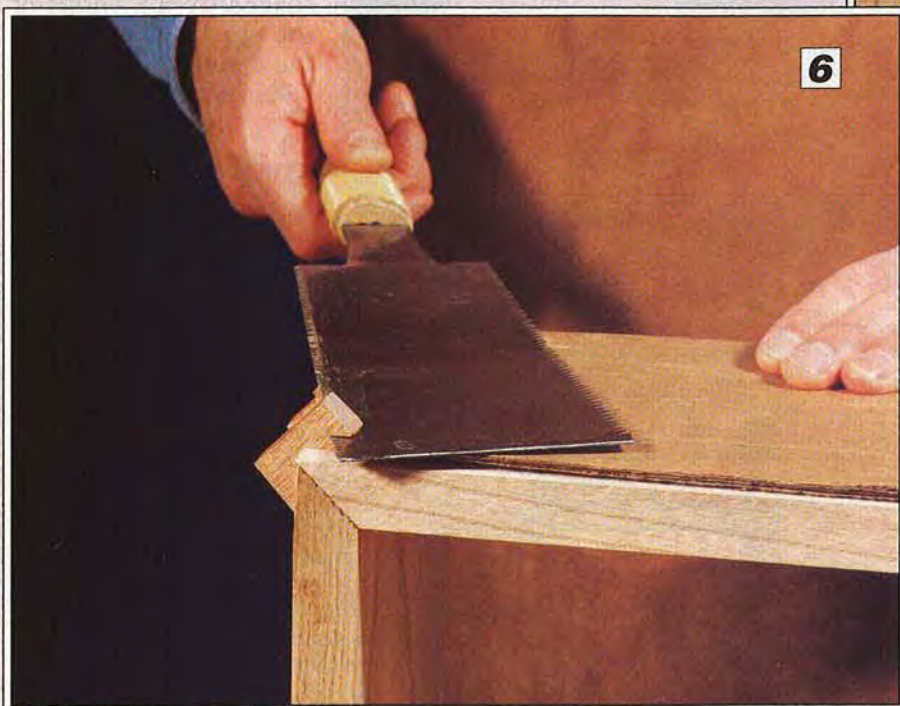
•To make **dovetail keys**, use an

Install the keys

Cut the key stock to lengths just longer than the key slots, apply glue to the mating surfaces, and gently tap them into the slots. After the glue dries, saw off as much of the key stock as possible without marring the surrounding surfaces. We used a protective piece of cardboard and a Japanese-style



Working with scrap stock, adjust the height of the cut for the second key as shown here.



A piece of cardboard protects workpieces as you cut away excess key stock.

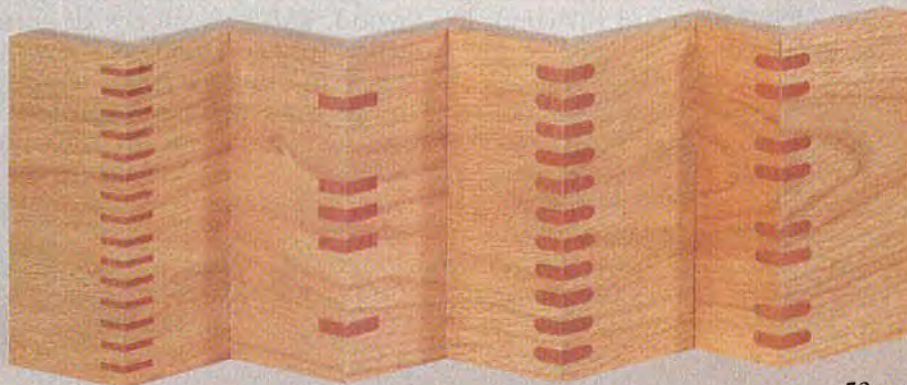
adjustable triangle to set your tablesaw blade to the same angle as the router bit's cutting edge. Rip one edge of your key stock at this angle, then readjust the fence and cut the tapered key as shown in *Photo 5*.

•Like finger and box keys, **rounded-finger keys** require that you cut rectangular pieces of wood that exactly fit the slots. Then, you round over both corners of one edge with a round-over bit. (Use a fence to make the second round-over cut.) The radius of the round-over bit should match the radius of the roundnose bit used to cut the slot.

handsaw with teeth that have little set as shown in *Photo 6*. Other saws will work, just be careful not to damage the surrounding wood surfaces. Finally, remove the remaining excess key stock with a stationary belt sander.

How to make key-within-key reinforcements

It's easy to place one key within another. First, you install keys in all of the corners of your project as already described. Then, you make an extra corner from scrapwood that also has the first keys already in place. Next, you install a smaller router bit and adjust its height by making test cuts in the scrap piece as shown in *Photo 7*. Cut the slots by using the same stopblock and spacer blocks in the same order used to cut the larger key slots. Once you're satisfied with the results, repeat the steps for the second dovetail cuts in your actual project.

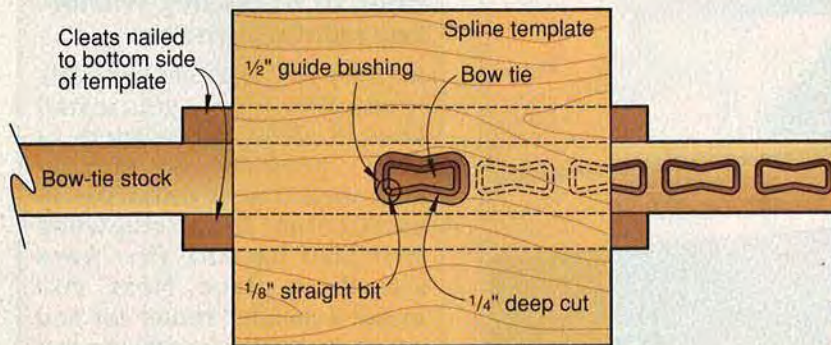


DRESS UP YOUR PROJECTS WITH BOW TIES

Like keys, surface splines in the shape of bow ties add strength and good looks to butted surfaces. You can add them to mitered frame corners or to panels such as the example *below*. Here, we'll show you how to add such a spline to a mitered frame corner.

You'll need these items

We prefer to use a plunge router for this procedure, but any router will work. You'll also need a 1/2"-outside-diameter guide bushing for the base of your router, 1/4"- and 1/8"-diameter straight bits, and two 8x10" pieces of 3/8" or 1/2" plywood.



CUTTING THE BOW TIES TO SHAPE

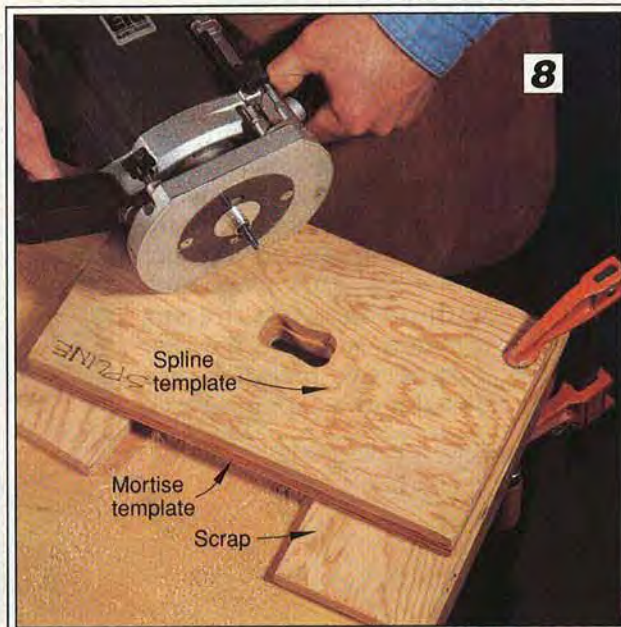
In addition, you'll need a pattern for cutting the spline template—we've provided three choices in *WOOD PATTERNS™*. The shaded portions of these patterns show the finished size of the bow tie.

First, make your templates

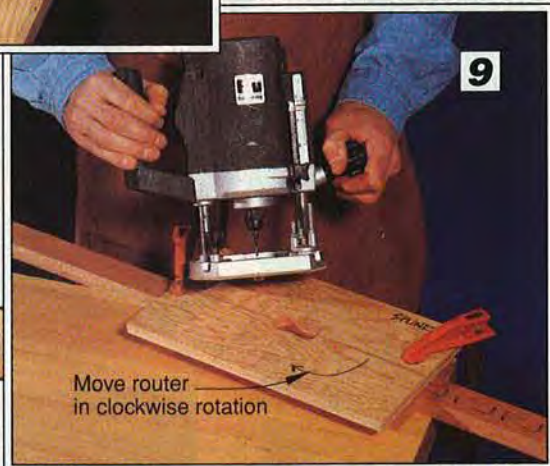
Create the spline template from one of the pieces of plywood. In its center, cut

a hole in the shape of one of the spline templates. A scrollsaw works best for this. Mark "spline" on this template.

To make the mortise template, mount a 1/2" O.D. guide bushing and 1/4" straight bit into your router. Then, clamp the spline template, your other piece of plywood, and two pieces of scrap wood to your bench as shown in *Photo 8*. Using the spline template as a guide, cut completely through the mortise



Use the spline template to cut the mortise template.



Keep the guide bushing firmly against the wall of the spline template to cut well-shaped bow ties.

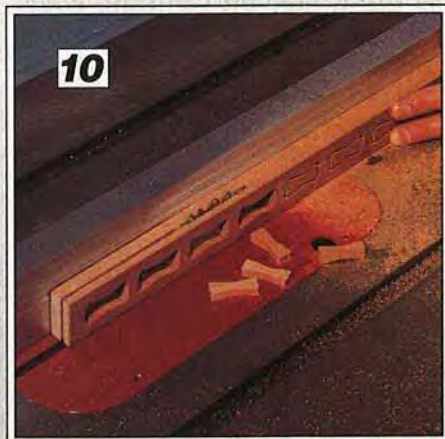
template. (The scrap keeps the bit away from your bench.)

Cut the bow ties

Replace the 1/4" straight bit with an 1/8" straight bit. Then, nail two cleats of the same thickness as your bow-tie stock to the bottom side of the spline template, spaced by the width of the stock as shown in the drawing *left*.

Set the straight bit for a 1/4"-deep cut, and

clamp the spline template and bow-tie stock to your workbench as shown in *Photo 9*. Moving the router in a clockwise motion,



Cut the 1/4"-thick splines (bow ties) on the outboard side of your table saw blade.

with the guide bushing against the spline-template wall, cut the bow ties to shape.

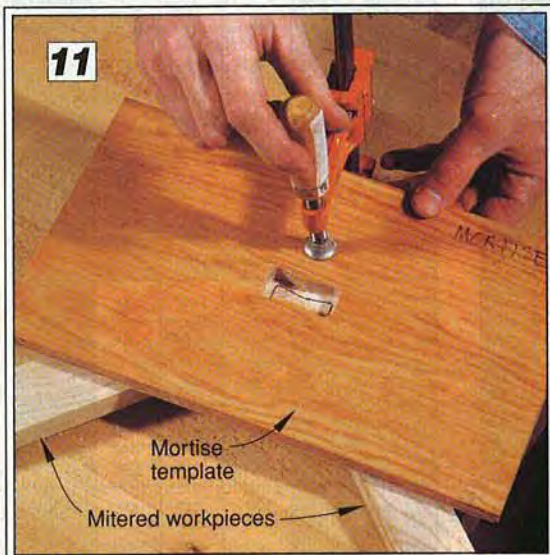
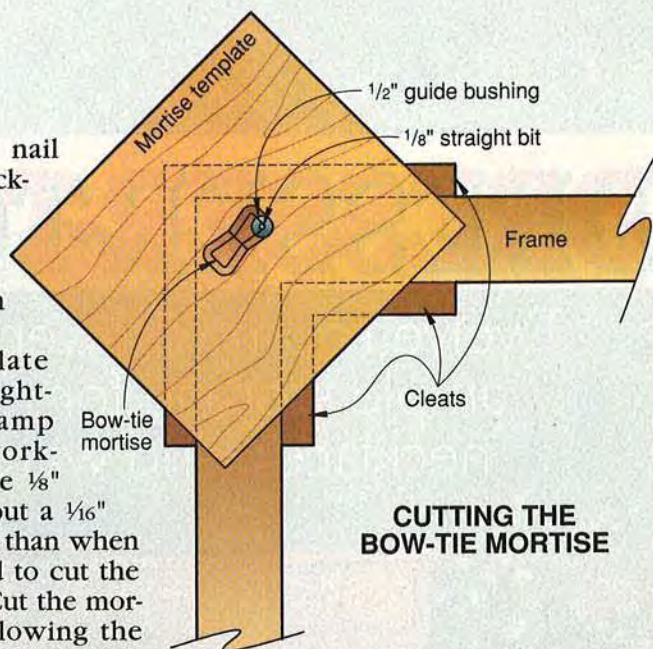
Adjust your tablesaw fence for cutting $\frac{1}{4}$ "-thick bow ties on the outboard side of the blade (the side opposite the fence). Cut the splines as shown in *Photo 10*.

How to install your splines

Visually center a bow tie on the joint of your project, and trace its outline with a pencil. Center this

upside down, and nail cleats the same thickness as the workpieces to the bottom of the template as shown in *Photo 12*.

Turn the template and workpiece right-side up, and clamp these to your workbench. Adjust the $\frac{1}{8}$ " straight bit for about a $\frac{1}{16}$ " deeper cut than when it was used to cut the bow ties. Cut the mortise by following the wall of the template

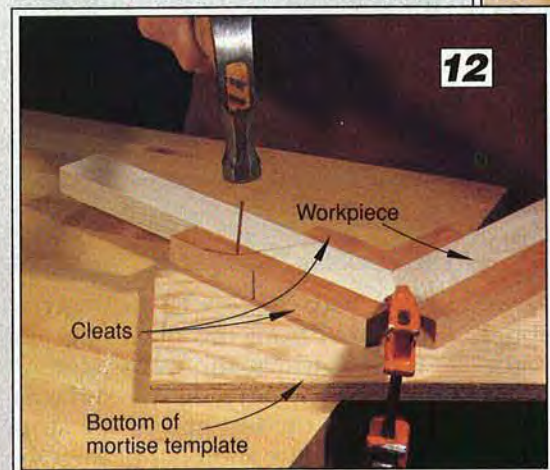


Center and clamp the mortise template over the marked outline of the bow tie on your mitered workpiece.

outline inside the hole in the mortise template, and clamp the template to the workpiece as shown in *Photo 11*. Turn this assembly



Occasionally vacuum debris from the mortise as you rout it to prevent chips from interfering with the cut.



Cleats nailed to the bottom of the mortise template hold the workpiece in position.

hole, and then hogging out the field material until the hole has a flat bottom. Remove the template. Glue the bow-tie spline into the mortise, allow the glue to dry, and sand the splines flush with the surface.

Note: In the case of the splines in the mission-style panel on the opposite page, we decided to leave the bow ties about $\frac{1}{16}$ " higher than the panel surface. So, we skipped sanding them down flush, and slightly chamfered their sharp corners instead. ♣

DRESSER-TOP DELIGHT

Twelve roomy drawers offer ample storage for rings, necklaces, and watches



Show off your craftsmanship with a jewelry showcase that features drawers with handsome splined joints. To help you create this accent, we've included the plan for a simple corner-kerfing jig and instructions showing you how to put it to work.

Note: You'll need several thicknesses of solid stock for this project (we used cherry). You can plane or resaw thicker stock to the thicknesses listed in the Bill of Materials, or see the Buying Guide for our source of preplaned cherry or walnut stock.

Cut the sides and top pieces first

1 Cut the side panels (A) to 7½"×13". Now, rip a strip ¾" wide off the front edge of each side

panel. Crosscut the narrow strip to 12¹³⁄₁₆" long. See the Side Panel drawing for reference.

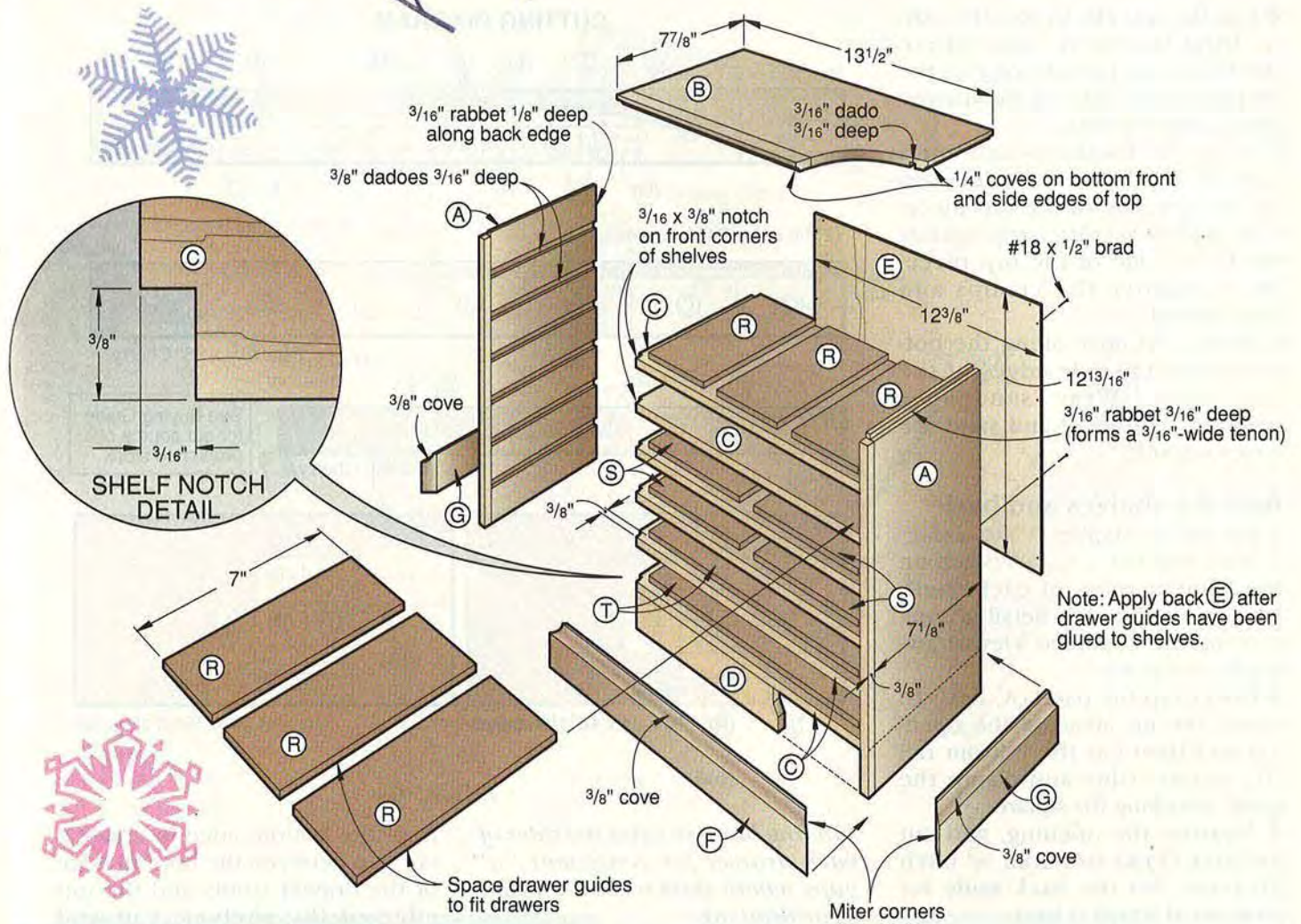
2 Lay out the locations, and cut ¾" dados ¾" deep on the inside face of each side panel where dimensioned on the Side Panel drawing. Then, cut a ¾" rabbet ¾" deep along the top outside edge of each piece. Next, cut a ¾" rabbet ⅛" deep along the back inside edge of each side panel.

3 To hide the dados showing on the front edges of each side panel,

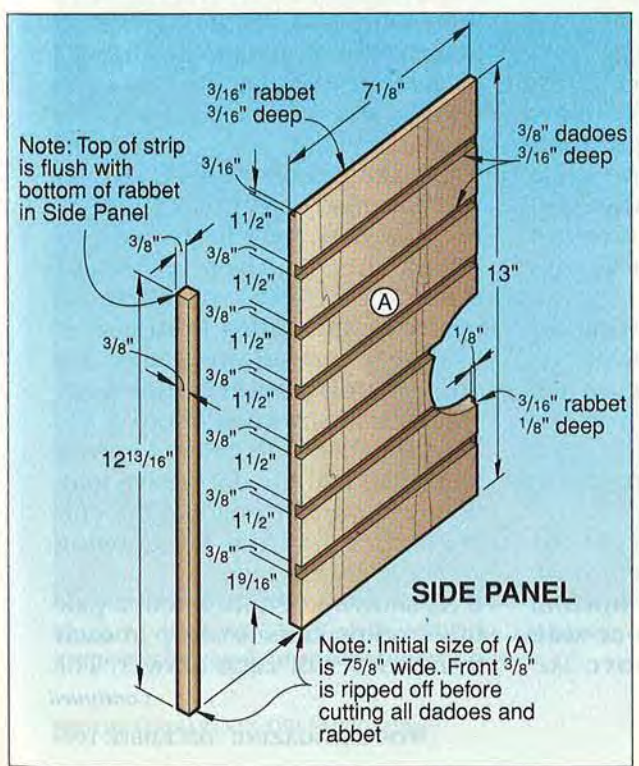
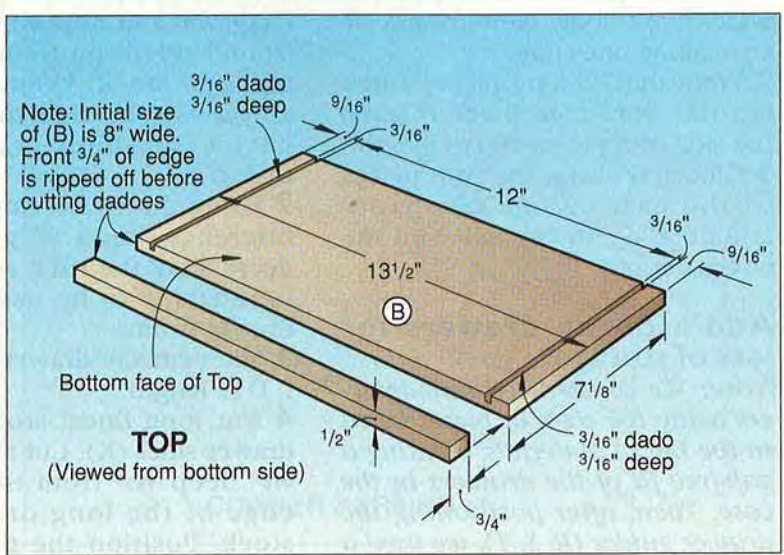
Bill of Materials					
Part	Finished Size			Matl.	Qty.
	T	W	L		
BASIC ASSEMBLY					
A* sides	¾"	7½"	13"	EC	2
B* top	½"	7½"	13½"	EC	1
C shelves	¾"	7½"	12¾"	EC	6
D bottom rail	¾"	1¼"	12"	C	1
E back	½"	12¾"	12¹⁹⁄₁₆"	BP	1
TRIM					
F* front	½"	1¾"	13¾"	C	1
G* sides	½"	1¾"	8"	C	2
DRAWERS					
H* fronts	¾"	1¼"	4"	C	6
I* fronts	¾"	1¼"	6"	C	4
J* fronts	¾"	1¼"	12"	C	2
K sides	¾"	1¼"	7½"	C	24
L backs	¾"	11"	3½"	C	6
M backs	¾"	11"	5½"	C	4
N backs	¾"	11"	11½"	C	2
O bottoms	½"	3½"	6½"	BP	6
P bottoms	½"	5½"	6½"	BP	4
Q bottoms	½"	11½"	6½"	BP	2
DRAWER GUIDES					
R top	¼"	3"	7"	H	6
S middle	¼"	5"	7"	H	4
T bottom	¼"	11"	7"	H	2
*Initially cut parts marked with an * oversized. Trim to finished size according to the instructions.					
Materials Key: EC—edge-joined cherry, C—cherry, BP—birch plywood, H—hardboard.					
Supplies: #17×¾" brads, #18×½" brads, clear finish.					

glue the ¾×¾×12¹³⁄₁₆" strip (trimmed from the front edge in Step 1) against the front edge of each panel, keeping the surfaces flush and the top end of the strip flush with the shoulder of the rabbet. Later, remove the clamps, and sand the panels.

Continued



EXPLODED VIEW



DRESSER-TOP DELIGHT

4 Cut the top (B) to $8 \times 13\frac{1}{2}$ ". Rip $\frac{3}{4}$ " from the front edge where shown on the Top drawing on the *previous* page, and set the narrow piece aside for now.

5 Mark the locations and cut a pair of $\frac{3}{16}$ " dados $\frac{3}{16}$ " deep on the bottom side of the top piece. Glue the $\frac{1}{2} \times \frac{3}{4} \times 13\frac{1}{2}$ " strip against the front edge of the top piece. Later, remove the clamps and sand smooth.

6 Rout a $\frac{1}{4}$ " cove along the bottom front and side edges of the top piece. Wrap sandpaper around a $\frac{1}{2}$ " dowel and sand the coves smooth.

Add the shelves and back

1 Cut the six shelves (C) to size.

2 Mark and cut a $\frac{3}{16} \times \frac{3}{8}$ " notch on the front corners of each shelf. See the Shelf Notch detail accompanying the Exploded View drawing for reference.

3 Dry-clamp the parts (A, B, C) to check the fit. Measure the opening and then cut the bottom rail (D) to size. Glue and clamp the parts, checking for square.

4 Measure the opening, and cut the back (E) to size from $\frac{1}{8}$ " birch plywood. Set the back aside for now, we'll attach it later.

Let's cut and attach the trim next

1 Cut a $\frac{1}{2}$ " piece of cherry to $1\frac{3}{4}$ " wide by 32" long. Now, rout a $\frac{3}{8}$ " cove along one edge.

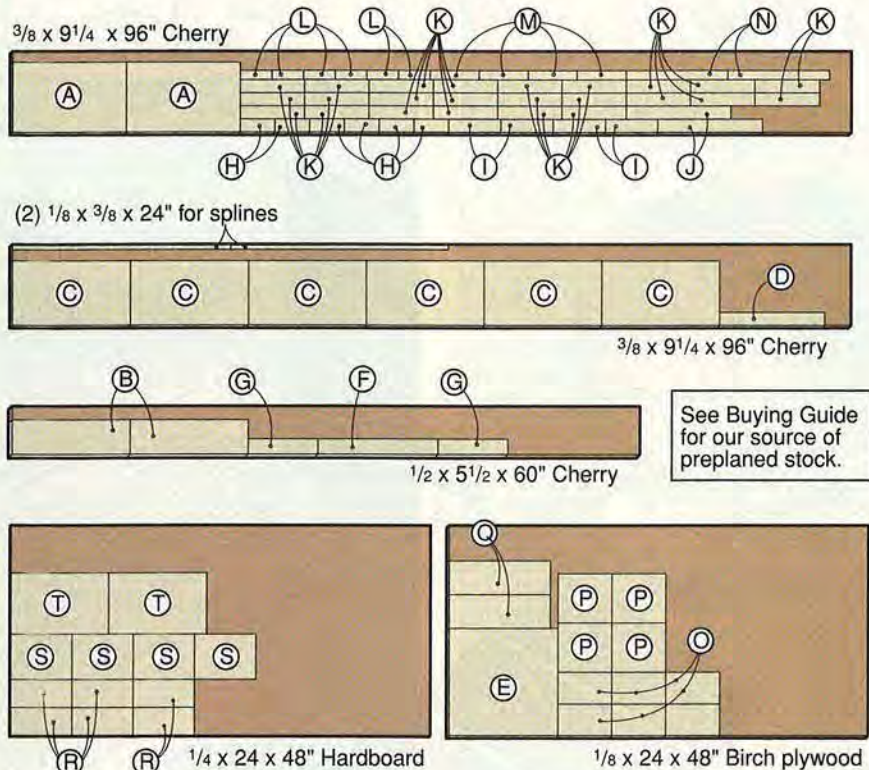
2 From the 32"-long piece, miter-cut the front trim piece (F) and the side trim pieces (G) to length.

3 Glue and clamp the trim pieces to the case. Wrap sandpaper around a $\frac{3}{4}$ " dowel and sand the coves smooth.

Add a dozen drawers for lots of storage

Note: We constructed our drawers using the sizes of pieces listed in the Bill of Materials, creating a gap-free fit of the drawers in the case. Then, after positioning the drawer guides (R, S, T), we used a

CUTTING DIAGRAM



See Buying Guide for our source of preplaned stock.

sanding block to sand the sides of each drawer for consistent $\frac{1}{32}$ " gaps where shown on the Front View drawing.

1 From $\frac{3}{8}$ "-thick stock, rip $1\frac{7}{16}$ "-wide strips for the drawer fronts (H, I, J). As shown on the Cutting Diagram, cut adjoining drawer fronts end-to-end from the same piece of stock. Doing this will allow side-by-side drawers to have continuous grain across their fronts.

2 Using the Drawer drawing for reference, cut a $\frac{1}{8}$ " groove $\frac{3}{16}$ " deep along the back edge of the long strips to be used for the drawer fronts.

3 Miter-cut the drawer fronts (H, I, J) to length.

4 Cut long lineal stock for the drawer sides (K). Cut a $\frac{1}{8}$ " groove $\frac{3}{16}$ " deep $\frac{7}{32}$ " from the bottom edge of the long drawer-side stock. Position the groove $\frac{7}{32}$ "

from the bottom edge to create a $\frac{1}{32}$ " gap between the bottom edge of the drawer fronts and the top edge of the shelves. Cut and miter-cut the drawer sides to length. For housing the drawer backs later, cut a $\frac{3}{8}$ " dado in each drawer side where dimensioned on the drawing.

5 Cut the drawer backs (L, M, N) and bottoms (O, P, Q) to size.

6 Dry-clamp each drawer to check the fit. Then, glue and clamp each drawer, checking for square by measuring from corner to corner and adjusting until the opposing diagonal measurements are equal as shown in Photo A.

7 To reinforce the mitered corner joints and add the decorative joinery look, start by building the corner-kerfing jig from the drawing on the *opposite* page.

8 As shown in Photo B, cut a pair of $\frac{1}{8}$ " spline kerfs $\frac{1}{4}$ " deep in each front corner of each drawer. For

Continued

DRESSER-TOP DELIGHT

flat bottom kerfs, you'll need to use a blade with a flat-top or triple-chip grind (see *WOOD* magazine, September '93 issue, page 40 for reference).

9 Cut two pieces of $\frac{3}{8}$ "-wide $\frac{1}{8}$ "-thick solid cherry stock to 24" long each. Now, crosscut 48 $\frac{1}{8} \times \frac{3}{8} \times \frac{3}{4}$ " cherry splines from the strips. Cut several corner blocks to the size shown on the Drawer drawing. Glue the splines in the kerfs using a corner block on the inside of the drawer as shown in photo C. (For an even distribution of pressure, we placed a small piece of scrap stock between the clamp head and the splines.) Check that the splines bottom out in the kerfs. If they don't, you'll have an unsightly glue joint later.

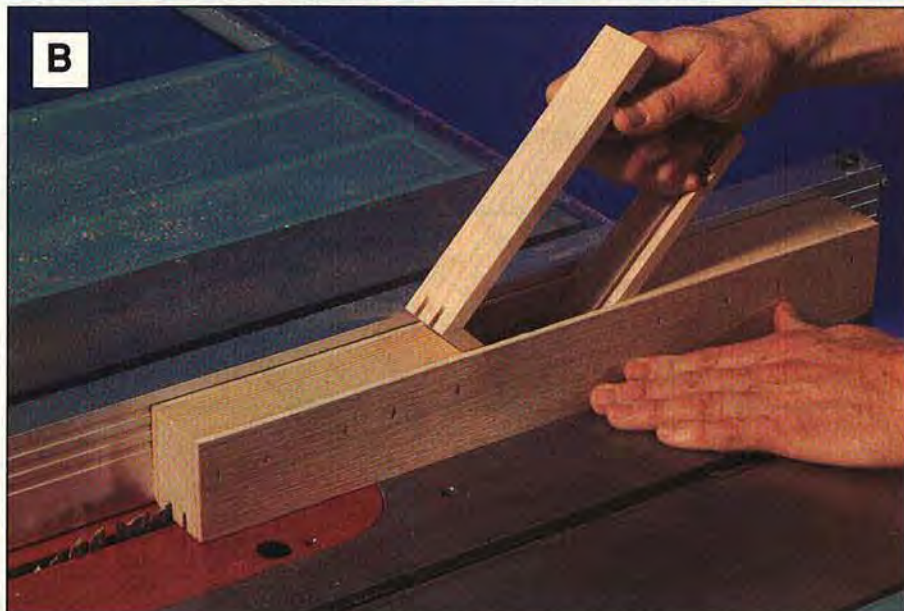
10 Trim the splines to within about $\frac{1}{16}$ " of the drawer front and sides, and then sand them flush.

Add the guides for evenly spaced drawers

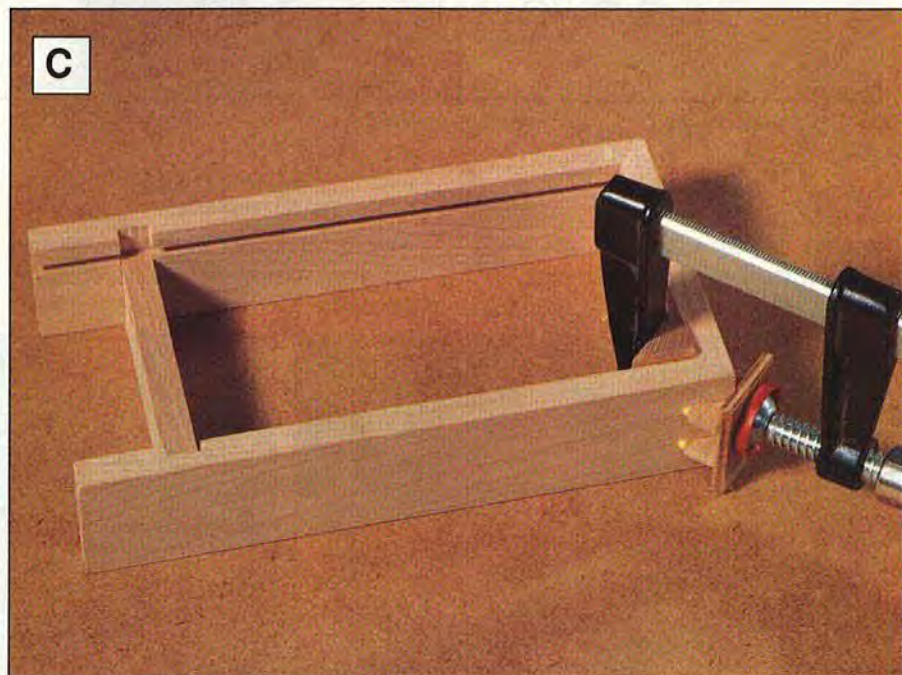
1 Cut the drawer guides (R, S, T) to size. The width of the guides needs to be equal to the distance between the drawer sides (K) minus $\frac{1}{2}$ ".

2 Slide the top three drawers into place and position the drawers so you have an equal gap between the drawers and the sides (A) and the same gap between the drawers. Since the drawers were made to fit tight, you'll have to sand the outside faces of the drawer sides to create the $\frac{1}{32}$ " gaps. (For consistent-sized gaps, we placed cereal-box cardboard between the drawers and between the drawers and jewelry box side panels. We used sandpaper wrapped around a block of wood to sand the outside surfaces of the drawers evenly.)

3 Working from the back of the case, slide the drawer guides in place. The guides should be $\frac{3}{8}$ " (the same as the thickness of the drawer fronts) from the front of the case. Check for equal gaps and that the drawer fronts are flush with each other and the



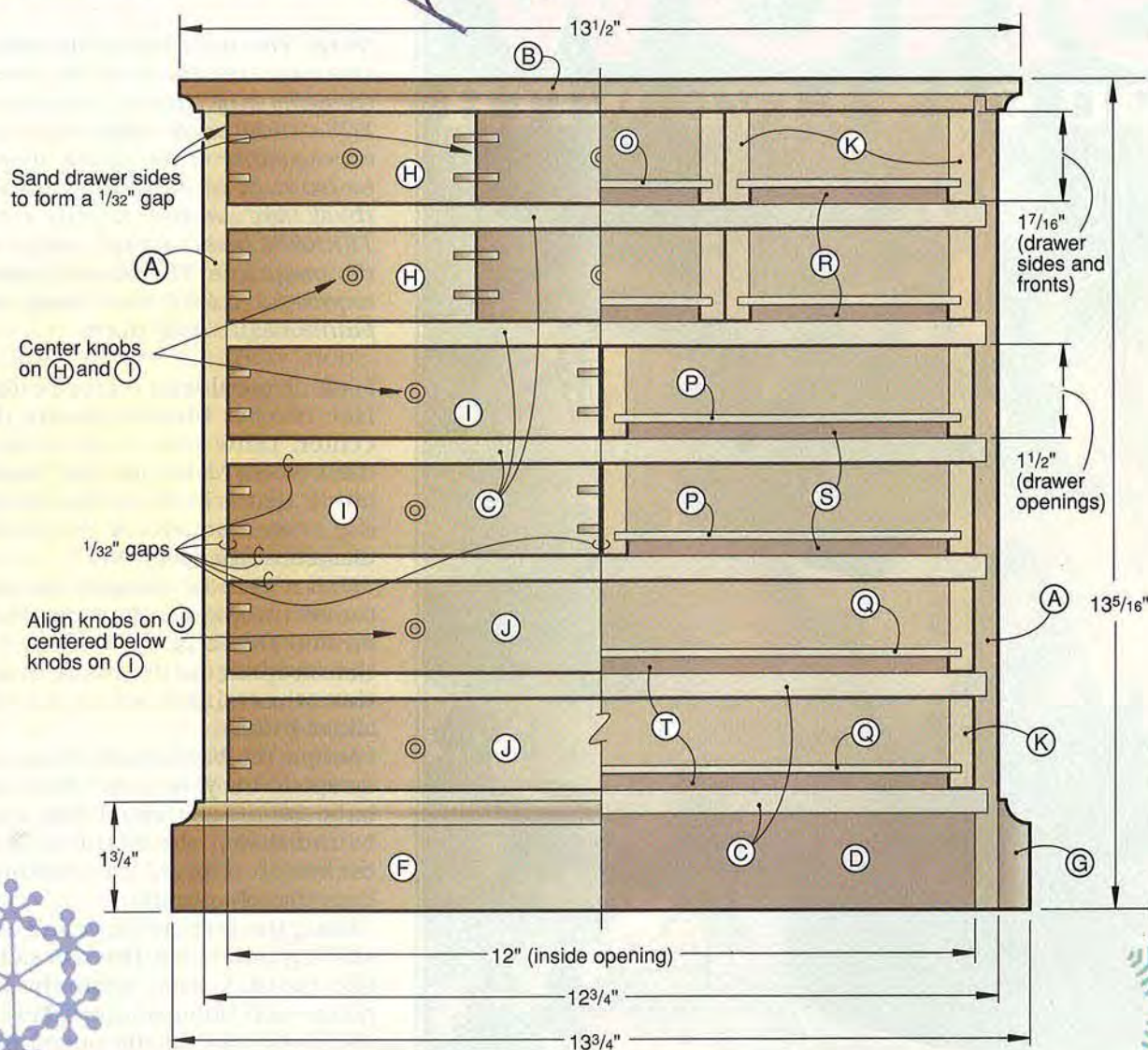
Using the corner kerfing jig for support, cut a pair of kerfs in the front corners of each drawer.



Use corner blocks to prevent denting the inside of the drawers when pulling the splines snug into the kerfs.

front of the case. Clamp (no glue) the guides in place from the back of the case. Push the drawers out the front without moving the guides. Use a sharp pencil to mark the location of the guides on the shelves. Using a few drops of glue (no need to overdo it) glue

the guides in place. *Immediately reposition the drawers and spacers to verify that the guides are correctly positioned.* Evenly spaced drawers depend on properly positioned guides, so take your time. Repeat the process to install the remaining guides.



FRONT VIEW

4 After gluing all the guides in place, install the drawers, and mark the knob-hole centerpoints where shown on the Front View drawing. Note that the holes in drawer fronts I and J align. The machine screws supplied with the knobs are a bit too long for the $\frac{3}{8}$ "-thick drawer fronts, so trim each screw accordingly.

5 Remove the drawers from the assembled jewelry box. Finish-sand as necessary and apply the finish. (We applied a coat of Minwax Natural Danish Oil and let it sit for 30 minutes. While still

wet, steel-wool the finish, and wipe dry with a clean cloth. Let this dry completely, and repeat the process with a second coat of finish to completely seal the wood. For added luster, apply a couple coats of 100% tung oil following the directions on the can.)

Buying Guide

Hardwood kit. All the individual pieces shown in the Cutting Diagram cut slightly oversized in length and width from the thicknesses listed in the Bill of Materials. Available in cherry,

stock no. W75C, \$88.95 ppd., or walnut, stock no. W75W \$99.95 ppd. Heritage Building Specialties, 205 North Cascade, Fergus Falls, MN 56537. Or call 800/524-4184 to order.

Knobs. Twelve solid-brass antique-finish knobs, stock no. 34546, \$15.95 ppd. The Woodworkers' Store, 21801 Industrial Blvd., Rogers, MN 55374-9514. Or call 800/279-4441 to order. 🌲

Written by Marlen Kemmet
Project Design: James R. Downing
Illustrations: Kim Downing; Roxanne LeMoine

SNOW

YOU CAN LIVE WITH



Create a keepsake decoration with a simple turning

Project prep

Stock: 2×6×6" or 3×6×6" bowl blank (see text).

Lathe equipment: 3-4" faceplate

Tools: 3/4", 1/2", and 1/4" bowl gouges, 1/2" bowl scraper, 1/8" or 3/16" parting tool

Lathe speeds: roughing, 800 rpm; turning and sanding, 1200-1500 rpm

Note: The tall snow globe stand shown at the back in the photo contains a music-box movement. For a snow scene without sound, choose either of the stands shown in front of it. Templates for all three are in the WOOD PATTERNS™ insert in the center of the magazine. The musical stand requires a 3×6×6" bowl blank; the plain ones, 2×6×6" stock.

Mark diagonal lines on the bottom face of your blank to locate the center. Draw two circles around the center. Make one the largest circle that will fit on the blank; the other, the size of your 3-4"-diameter lathe faceplate.

Drill a 3/8" hole through the center of the blank, then bandsaw around the largest circle. Screw the faceplate to the blank inside the other circle, using screws about 1" long.

Mount the bandsawed blank and faceplate on your lathe. With the lathe running at about 800 rpm, round down the blank to 5 1/2" diameter. The 3/4" bowl gouge does the job quickly.

Using the hole in the center as a starting point, cut the recess for the globe's base with the 1/2" gouge and bowl scraper. Test-fit the globe base in the opening as you work. Handle the snow globe carefully—if you drop it, the thin acrylic shell will burst, creating a spectacular mess with all the glitter and liquid inside.

Turn the stand to shape

Next, turn the outside profile. For the dome-shaped modern stand, form a continuous curve from the rim of the opening to the bottom of the stand. The 1/2" or 3/4" gouge will do the job nicely.

If you're making the traditional-style stand, cut in to the diameters shown with your parting tool. Form the beads at the top with a small gouge. Then, turn the curved side and foot detail.





Follow a similar sequence for the stand with the music movement.

Sand the turning with progressively finer grits from 100 to 220. Don't sand the inside of the recess too smooth—leave some tooth for the adhesive that holds the globe. Apply a clear finish.

Unscrew the turning from the faceplate. If you're making a non-musical stand, sand and finish the bottom. Mount the snow globe, following the instructions in the last paragraph of the article.

Make room for a music box

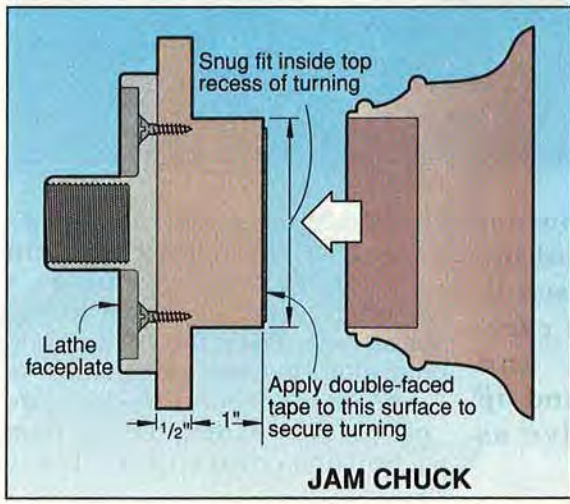
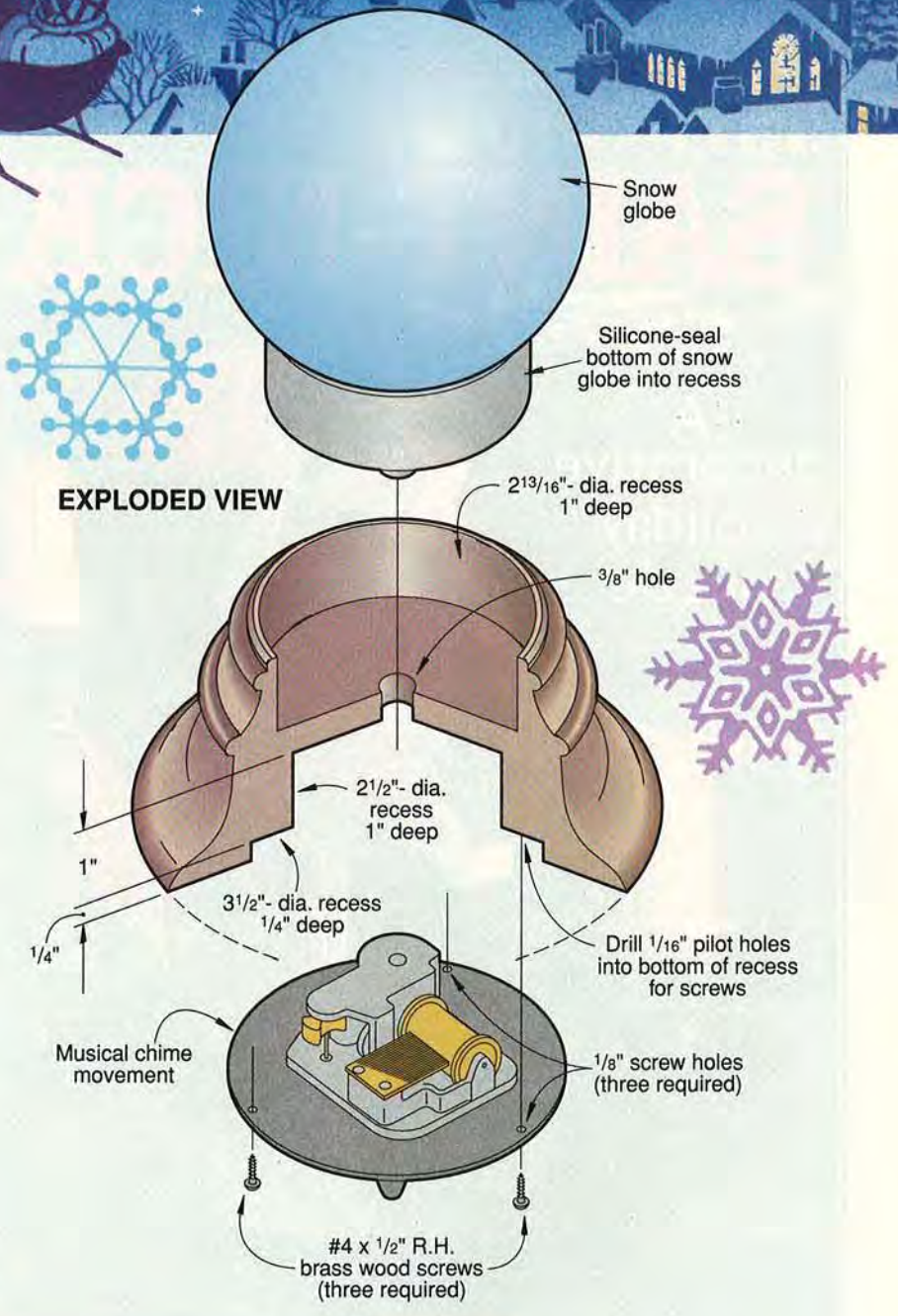
To turn the bottom recess in the music-box stand, first make a jam chuck. To do so, mount a 4"-diameter, 1½"-thick auxiliary faceplate on your lathe faceplate. Turn a tenon on it to mate snugly with the recess in the top of the stand.

Fit the stand over the tenon, securing it with double-faced tape, if necessary. With a gouge and scraper, turn the 2½"-diameter music-box recess 1¼" deep.

Cut straight into the bottom ¼" deep with a parting tool, ½" from the edge of the music-box recess. Then, with a small gouge, complete the shallower recess, forming a rabbet around the deeper hole. Test-fit the music movement and base assembly. Sand and finish the bottom.

Drill three ⅛" holes around the edge of the plastic base, spacing them approximately equally. Use the base as a template to locate ⅛" pilot holes in the bottom of the stand. Install the movement and base assembly with #4×½" roundhead brass wood screws.

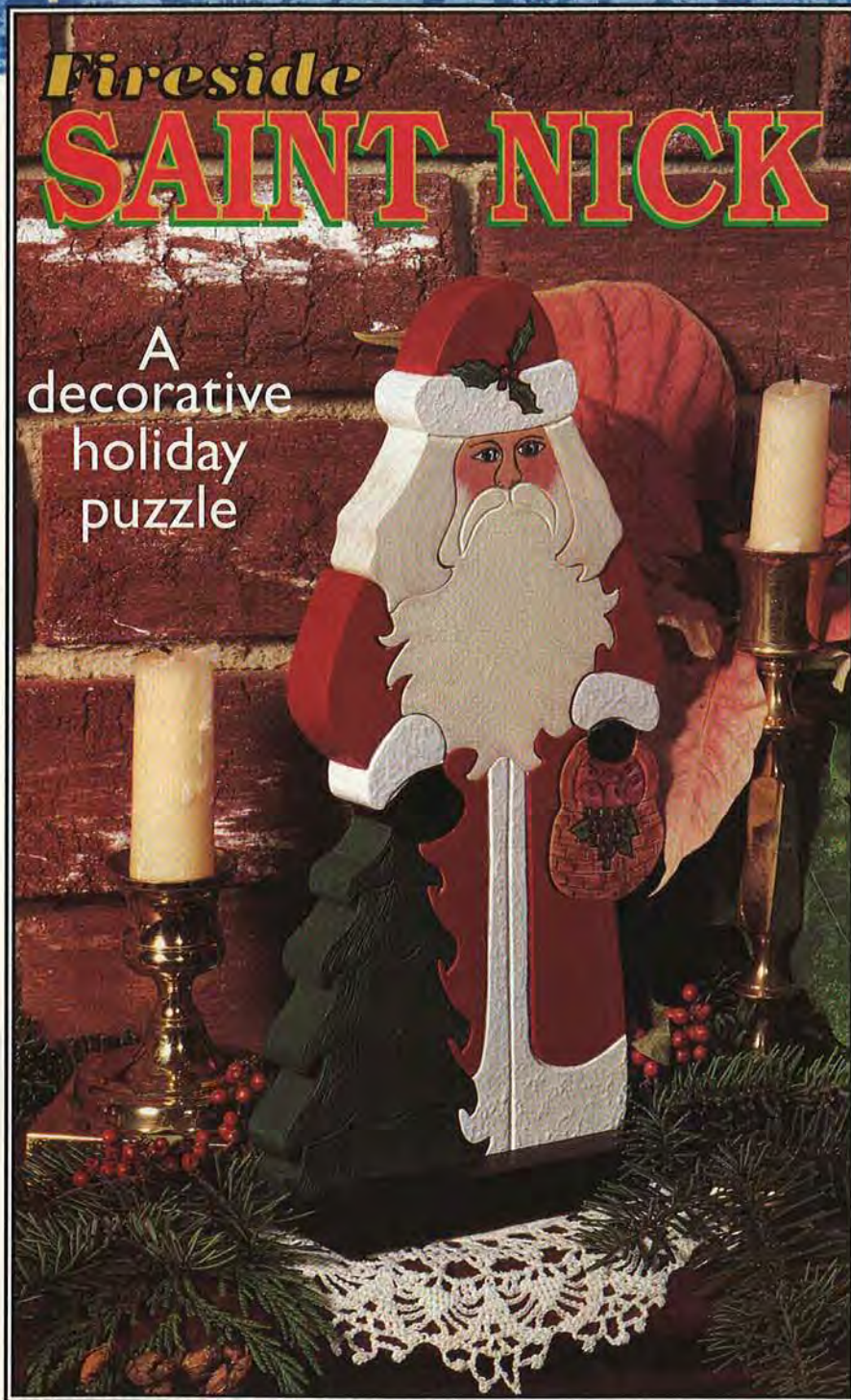
Spread silicone adhesive/sealant around the inside of the top recess. Then, press the snowball into place, seating it firmly as you twist it to spread the adhesive. Allow the silicone to cure in accordance with the package instructions. Finally, tip the snowball over, then let it snow, let it snow, let it snow. ❄️



Buying guide
Snow globe. Four-inch snow globe, choice of three scenes as shown in photograph. \$14.95 ppd. in U.S., Craft Supplies USA, 1287 E. 1120 S., Provo, UT 84606, or call 800/551-8876.
Musical movement. Mechanical movement mounted on base, plays "I'll be home for Christmas," \$3.95 ppd. in U.S., address above.

Fireside SAINT NICK

A
decorative
holiday
puzzle



'Tis the season for Santa, and here's a rendition of the jolly old gent you can scroll-saw in a jiffy. Simple carving, woodburning, and painting make this stand-up Santa puzzle as festive as yuletide itself.

Trace the *black* cutting lines from the full-sized pattern *opposite page* onto a $\frac{3}{4} \times 6 \times 10$ " piece of basswood or clear pine. Place the pattern bottom along one end of the stock.

Scrollsaw around the outside pattern line, starting the cut from a bottom corner. A #5 blade

(.038x.016" with 12.5 teeth per inch) will handle the cutting. Next, cut the pieces apart. Here's one way to proceed: Starting at the bottom of the basket, saw up the pattern line on Santa's left arm, returning to the outside at his left shoulder. From there, cut around the line separating his hair from his face, exiting at his right shoulder. Then, cut out Santa's right arm, followed by the tree. Finally, separate the lower portion along the beard line.

Sand the parts as necessary, removing any fuzz along the cuts. Trace the *blue* and *orange* detail lines from the pattern onto the cut-out pieces.

Carve a shallow groove along each *orange* line. Carve the coat hem and collar line on Santa's back. Also on the back, carve the lines on the tree, the left hand and basket, and the fur trim on the hat and sleeves. An incision about $\frac{1}{16}$ " wide made with a woodcarver's no. 12 V-tool would be ideal. The grooves don't need to meet any particular specification—they just help define features for painting.

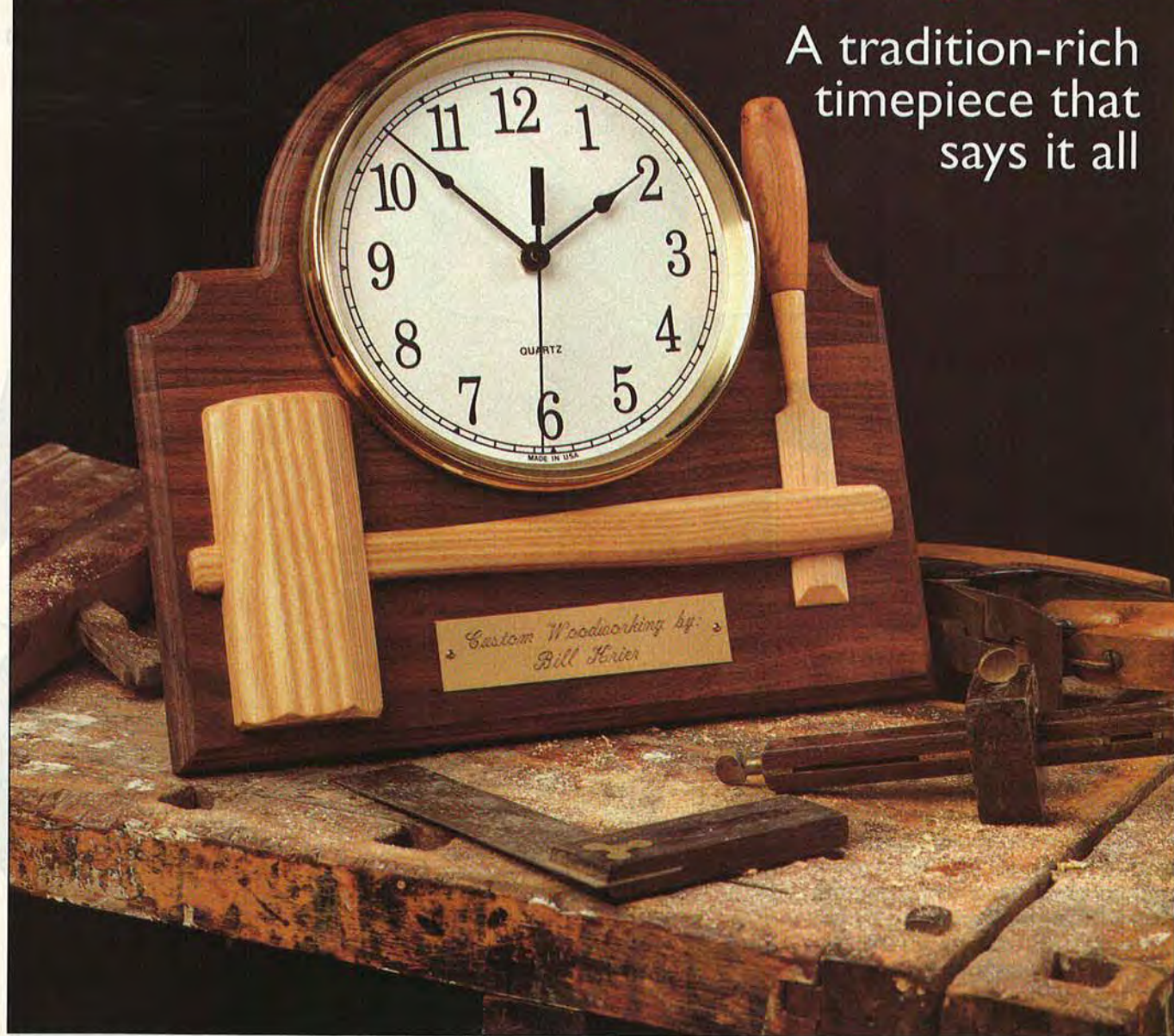
Woodburn the *blue* lines, using a skew tip on your woodburning pen. Texture the tree by woodburning fine, sweeping lines on each layer, following the style shown on the top layer on the pattern. Woodburn both sides of the tree. For Santa's basket, woodburn the basket-weave pattern on both sides and the exposed edge. Don't texture the basket handle.

Paint the completed Santa cutout with acrylic artist's colors. Paint the exposed edges, but not the joining edges. Kansas City artist Fern Weber, who designed our Santa, used these Delta Ceramcoat colors, shown on the pattern: Berry red (BR), Indiana rose (IR), Copen blue (CB), Green isle (GI), Wedgwood green (WG), Dusty purple (DP), Burnt sienna (BS), Burnt umber (BU), Light ivory (LI), White (WT).

Signature

SHOP CLOCK

A tradition-rich
timepiece that
says it all



Like all of the other projects we designed for Idea Shop™ 2, this wall-mounted clock had to meet two criteria. First, it had to perform its task well. And second, it had to be an attractive addition to our workshop. To address the first, we selected a clockface with large numerals so that you can tell time easily from anywhere in your shop. And as for the second criteria, we think you'll agree this clock is good enough to grace the wall of any workshop.

To personalize it, order your own computer-engraved plate for under \$6. See the Buying Guide for ordering details.

The backboard comes first

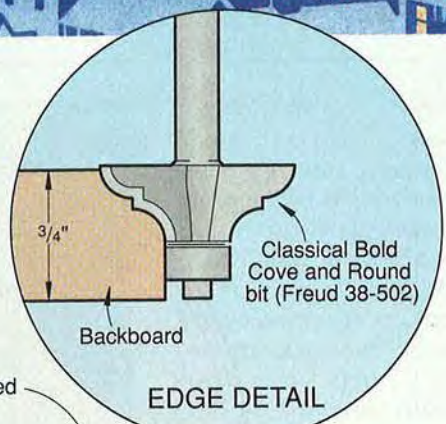
1 Edge-join enough ¾"-thick walnut to form a 13" wide by 14" long backboard blank.

2 Trim the backboard (A) to the size noted on the Backboard drawing. Transfer the backboard outline (see the dimensioned pattern on the WOOD PATTERNS™ insert in the center of the magazine), the clock-opening center-

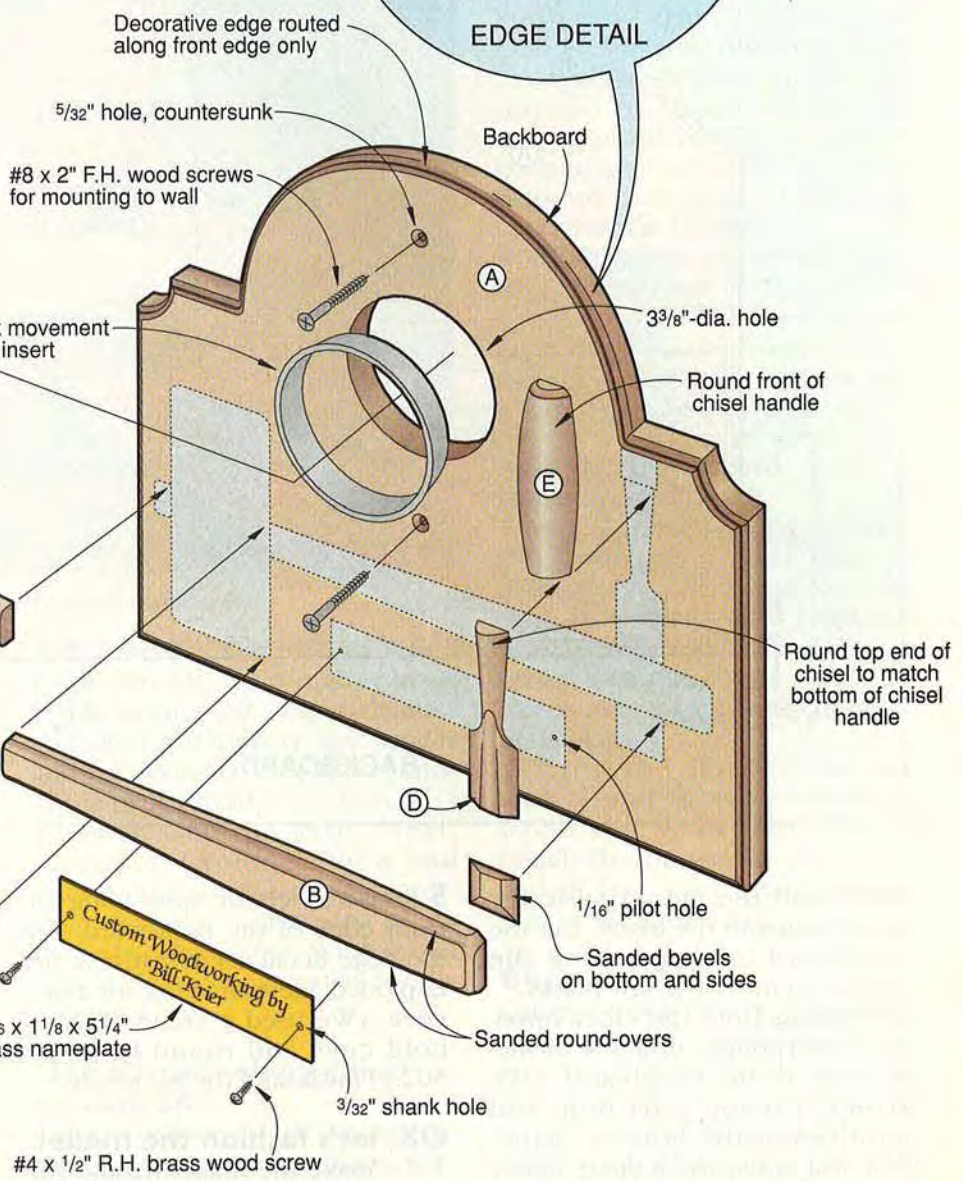
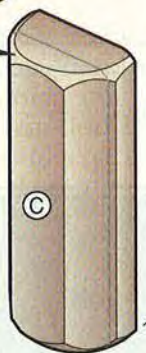




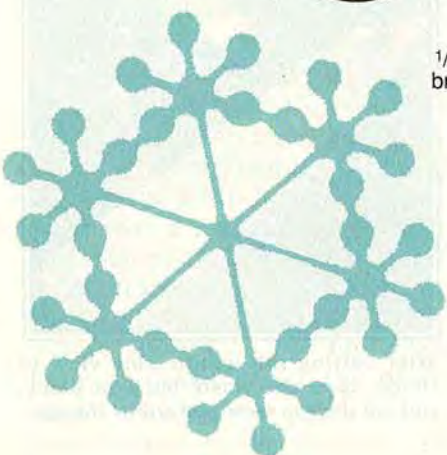
For full-sized patterns of the backboard (A), mallet handle (B), mallet head (C), chisel blade (D), and chisel handle (E), see the WOOD PATTERNS™ insert in the center of the magazine.



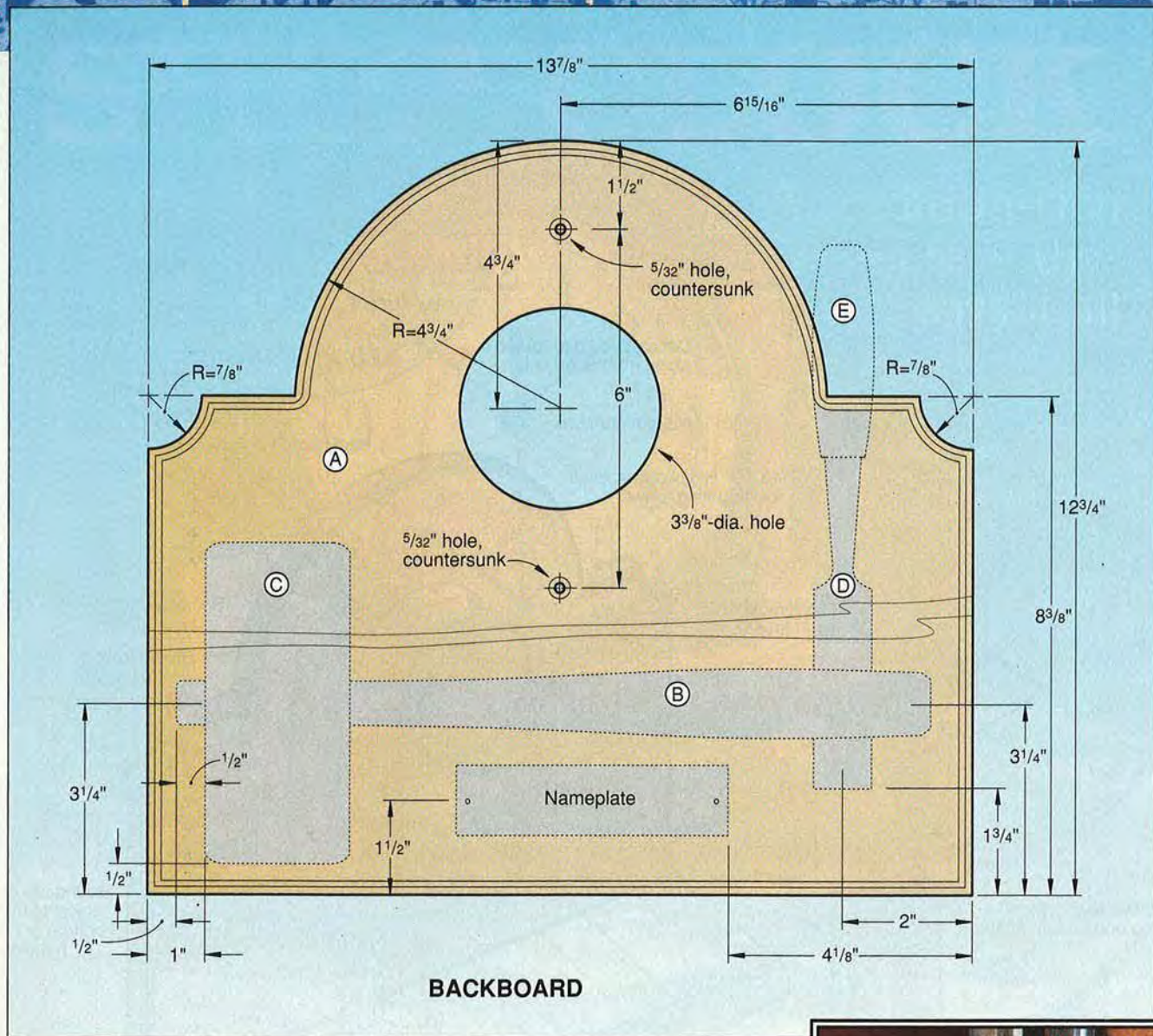
Sand a slight chamfer on top and bottom edges



EXPLODED VIEW



SHOP CLOCK



point, and the mounting-screw centerpoints to the blank. Cut the backboard to shape. Sand the edges to remove the saw marks.

3 Working from the clock-opening centerpoint, cut a 3 3/8"-diameter hole in the backboard. (We drilled a blade start hole and scrollsawed the hole to shape. You also could use a circle cutter to form the opening.)

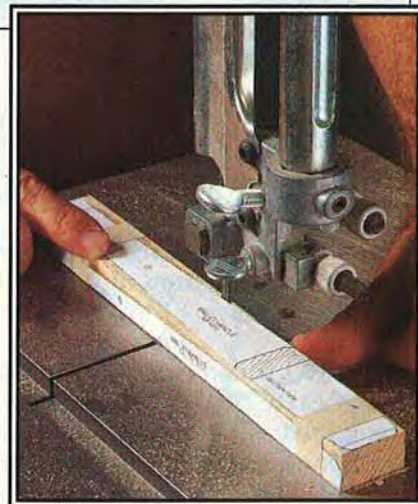
4 Using the two mounting-screw centerpoints you marked earlier, drill a pair of 5/32" countersunk holes through the backboard. Don't worry, the clockface will hide the screws later.

5 Rout a 1/4" classic cove along the front edge of the backboard. See the Edge detail accompanying the Exploded View drawing for reference. (We used a Freud classical bold cove and round bit, #38-502.) Finish-sand the backboard.

OK, let's fashion the mallet

1 To make the mallet handle (B), cut a piece of 3/4" ash to 1 1/4" x 10 3/8". Make a photocopy of the full-sized Top and Side View patterns, and attach them to the handle blank with spray adhesive.

2 Bandsaw the handle Side View to shape the top of the handle.



After cutting the handle side view to shape, tape the waste back in place, and cut the top view pattern to shape.



Bevel-rip the edges of the laminated-ash mallet-head blank at 45°.

Tape the waste stock back in place (it's got the Top View pattern attached), and then cut the Top View pattern to shape as shown in the photo *below left*.

3 Sand round-overs along the top edges of the handle where shown on the Section View portion of the full-sized Top View handle pattern. Crosscut a ½"-long piece off the end of the mallet handle, and set both pieces aside for now.

4 To form the mallet head (C), glue and clamp two pieces of ¾×3×10" ash face-to-face. (We made the mallet-head blank 10" long for safety when bevel-ripping it to shape.) Rip and plane both edges for a 2¾" finished width, and then plane or resaw for a 1½" final thickness.

5 Bevel-rip the edges at 45° where shown on the Full-Sized Patterns drawing. See the photo *above* for reference.

6 Crosscut a section 5⅞" long from the 10"-long mallet-head blank. Then, sand a slight chamfer (we used a stationary disc sander and palm sander) around the ends of the mallet head.

7 Finish-sand the parts. Next, using the Exploded View and Backboard drawings for reference, glue the mallet parts (B, C) to the backboard (A). Don't forget to add the ½"-long mallet handle end piece.

One sharp-looking chisel coming up

1 Cut a piece of ½" maple to 1×4½" for the chisel blade (D). Make a photocopy of the Side and Top View patterns and adhere them to the blank. Cut the Side View pattern to shape. Use double-faced tape to adhere the waste stock (it's got the Top View pattern on it) to the chisel blank.

2 Using the Top View pattern and Blade Section views as a reference, cut and sand the blade top surface and bevels to shape. (You might find it just as easy to use your own 1"-wide chisel as a guide when shaping the blade.)

3 Crosscut the chisel blade into two pieces where shown on the Full-Sized Patterns drawing. To ensure the glued-down chisel blade pieces appear straight (the portion of the mallet handle they're glued next to is curved), contour-sand the cut edges of the blade to butt snugly against the curved mallet handle.

4 Cut and sand the chisel handle (E) to shape from ¾"-thick cherry.

5 Finish-sand all the pieces, and glue them to the walnut backboard where shown on the Backboard drawing.

Add the finish, and hang up the clock

1 Apply the finish of your choice. (We sprayed on three coats of aerosol polyurethane; aerosol lacquer also would work.) Position and screw the brass plate in place. (See the Buying Guide for our source of custom-engraved brass plates.)

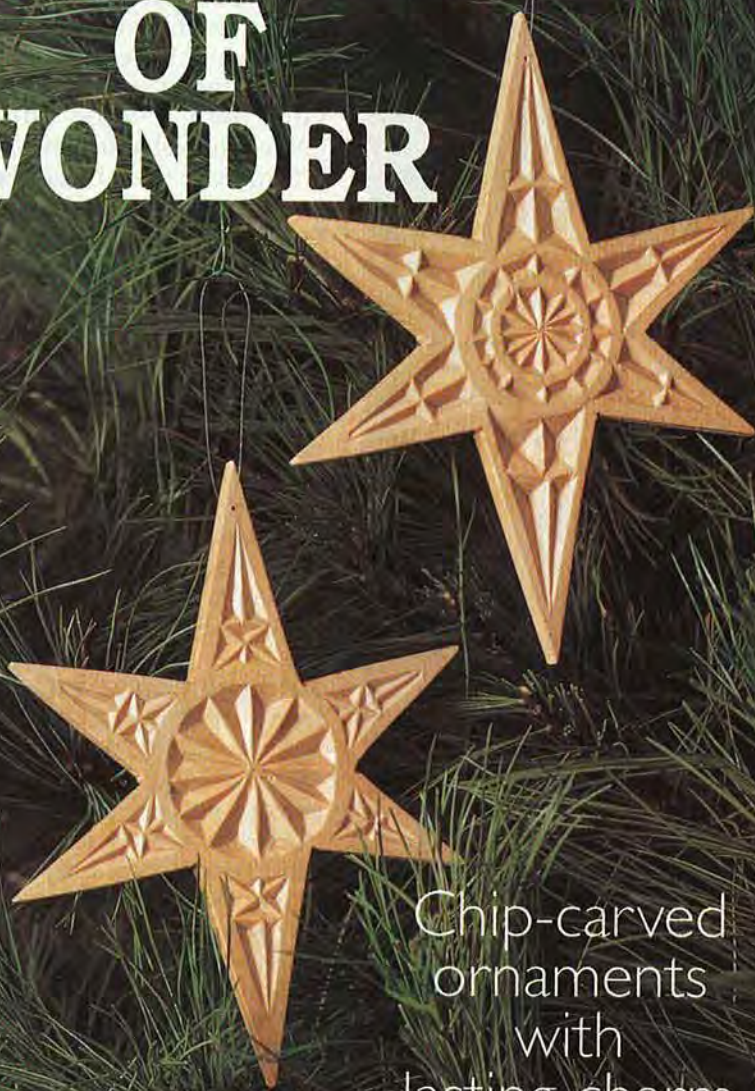
2 Screw the clock to the wall with a pair of #8×2" flathead wood screws or toggle bolts. Install the battery in the clock, and fit the movement into the hole in the backboard.

Buying Guide

Quartz clock insert. 8¼"-diameter insert with Arabic dial. Stock no. 15141. \$28.75 ppd. Klockit, P.O. Box 636, Lake Geneva, WI 53147. Or call 1-800-556-2548.

Engraved plate. 1½×5¼" satin brass with the words "Custom Woodworking by (your name)" in black double-lined letters. \$5.29 ppd. Two screws included. Custom Awards, 1425 22 Street, West Des Moines, IA 50266. No phone orders please. 🌲

STARS OF WONDER



Chip-carved
ornaments
with
lasting charm

Chip carving's old-world character lends enchantment to these yuletide stars. They're sure to shine as family favorites.

Project prep

Stock: Basswood or other carving wood, $\frac{5}{16} \times 4\frac{1}{4} \times 5\frac{3}{4}$ ".

Knife: Chip-carving knife



CHIP-CARVING KNIFE

Photocopy the ornament patterns on the *WOOD PATTERNS*[™] insert in the center of the magazine. Transfer the one you want to start with to a $\frac{5}{16} \times 4\frac{1}{4} \times 5\frac{3}{4}$ " piece of basswood, tracing both the outline and the interior carving lines.

For best results, tape the pattern's top edge to the stock. Slide a piece of graphite transfer paper or carbon paper under the pat-

tern. Trace the lines with a sharp pencil or a stylus. A French curve, compass, and straightedge will help you trace accurately.

When you're done, spray a light coat of clear wood finish over the traced lines. This will prevent them from smearing as you work.

Because you will be holding the workpiece on your lap to carve, don't cut out the star yet. The rectangle is easier to hang onto than the star shape, and it provides more hand support while carving.

One knife does the trick

In chip carving, you create geometric patterns and designs in wood by removing precise chips. Cutting those chips requires only one tool, a chip-carving knife, shown *below left*. To succeed, you must keep that knife sharp and hold it correctly.

To sharpen the knife, hone it on an ultra-fine stone. Hold the side of the blade at a 10° angle to the stone. Resharpener the knife periodically as you work to ensure clean, crisp cuts. When cutting takes more effort or when cross-grain cuts look fuzzy, it's time to hone the blade.

There are two ways to hold the knife. For the first grip, which you'll use most often, grasp the knife in your right hand (or left, if you're left-handed) with the first joint of your thumb at the blade end of the handle. Wrap your fingers around the handle so the handle's top edge runs diagonally across the palm of your hand.

Hold the workpiece in your lap. Turn your knife-hand wrist so you can rest the tip of your thumb and the knuckle of your index finger on the wood, placing the blade at about a 65° angle to the wood, shown *opposite page top*. Bring your carving-arm elbow close to your body.

For the second grip, roll the knife handle in your hand so the meaty part of your thumb presses on the blade's spine, as shown



Always keep your index-finger knuckle and thumb on the wood while carving with the first grip position.



Move your thumb to the back of the blade for the second position.

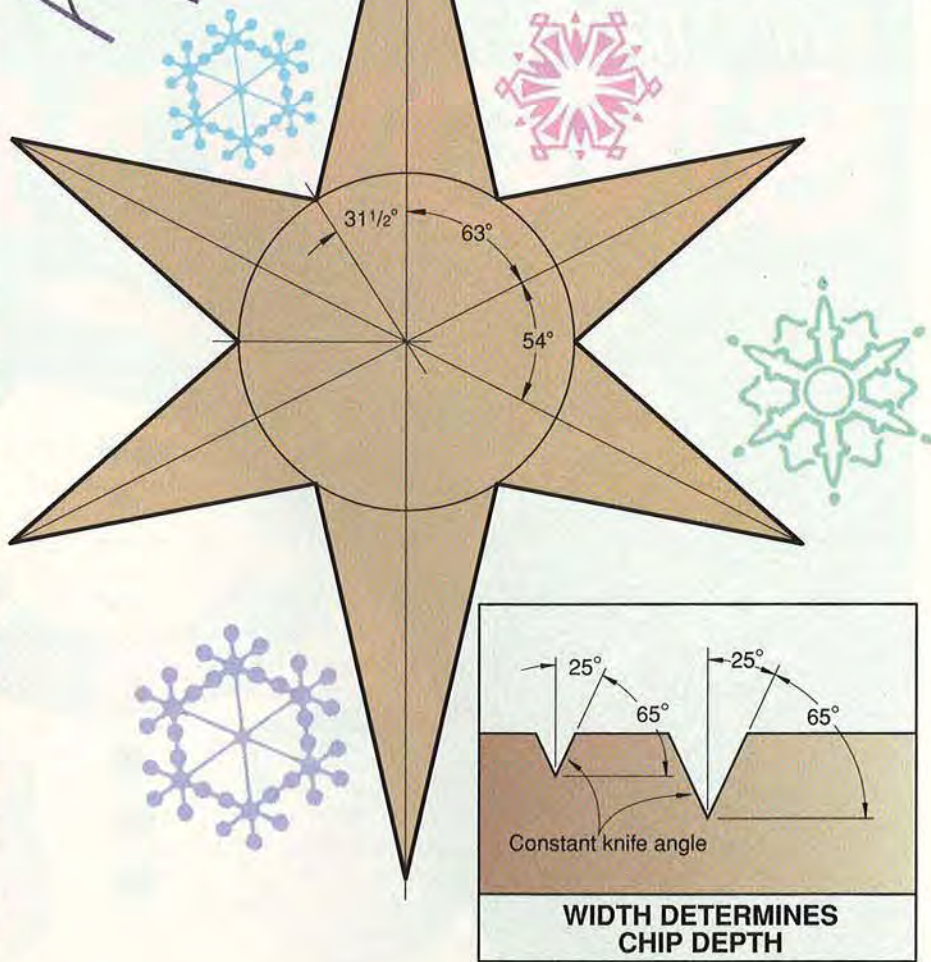
above. This position puts the other side of the blade at a 65° angle to the wood, enabling you to cut in the opposite direction.

In many cases, you'll find it easier to turn the workpiece than to be changing your knife grip constantly. But, since you should attempt to cut away from already completed work, the second grip comes in handy at times.

Let's make some chips

Begin carving with the largest chips at the outside of the pattern—the star points, in this case. Whenever you cut a chip, make the cross-grain cut or cuts first.

To begin carving your ornament, take the knife in the first grip, and place the point at the far end of your first cutting line. Slice into the wood as you draw the knife



along the line, maintaining a constant 65° angle between the blade and the wood.

This fixed knife angle means that the width of any chip determines its depth (they'll be approximately equal), shown in the illustration *above right*. As you carve, visualize where the tip of the knife is in the wood. Cut deeply enough to reach the center of the chip. In a chip with equal-length sides, the cuts will meet at a central point.

For a clean, crisp carving, strive to cut each side of every chip in one thrust. For a triangular chip, cut the first pattern line. Then, turn the wood to make the second cut, keeping the workpiece close to your body. Turn it again for the third cut. If all goes well, the chip will pop out as you complete the chip's final cut.

Move to the adjacent chip, and cut it similarly. As much as possible, avoid cutting toward completed work as you continue to carve the design.

A few final touches

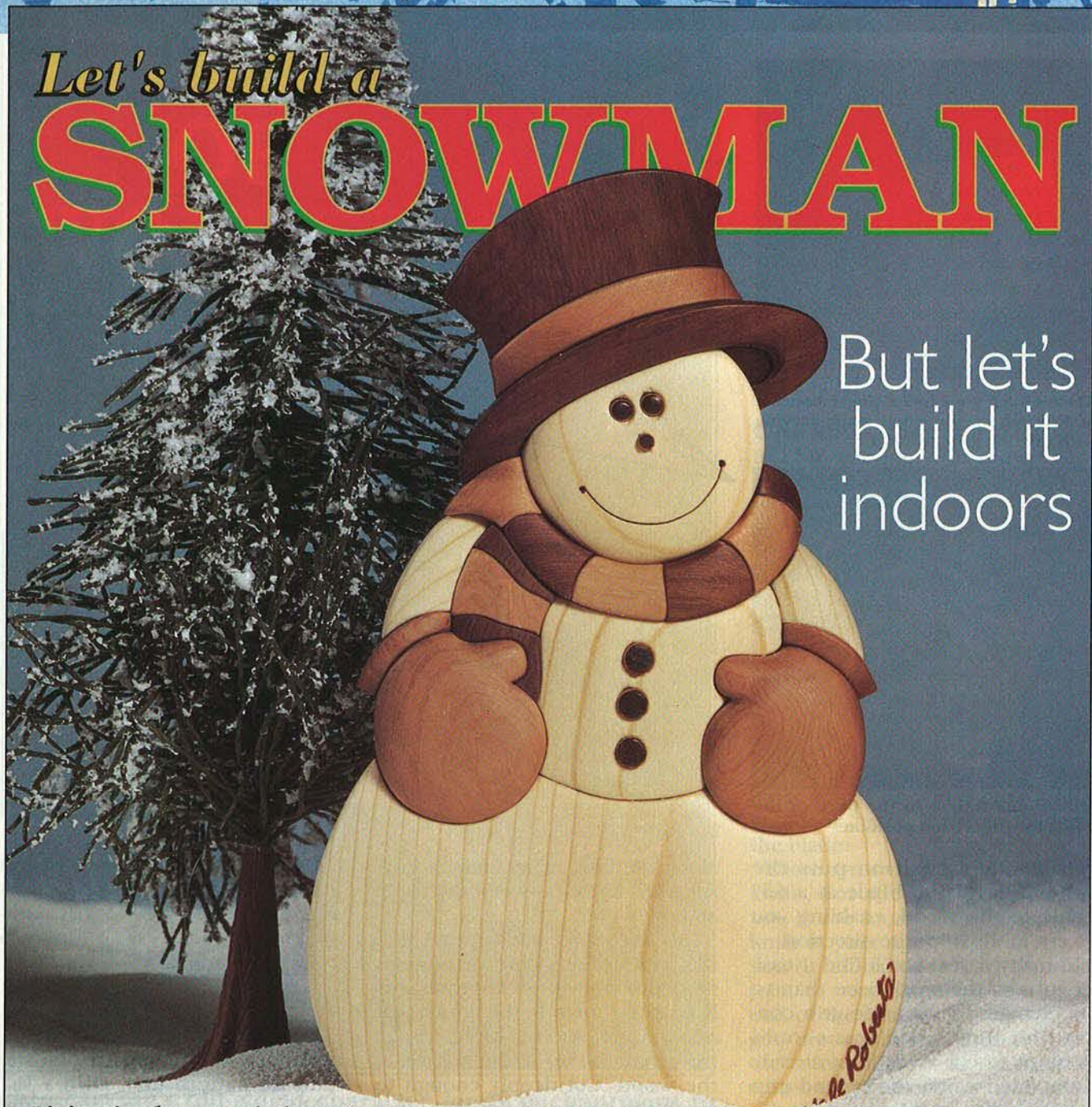
After completing the carving, scrollsaw or bandsaw along the outside pattern line. Drill a $\frac{1}{16}$ " hole near the tip of one of the long star points. Lightly sand the ornament to remove any remaining pattern lines, if necessary. Then spray on a clear finish. Tie a loop of sewing thread or fishing line through the hole for hanging.

To try your own designs, draw the star outline on a piece of paper, using the angles shown *above*. Lay out your design, then transfer it to the stock for carving as described. 🌲

Let's build a

SNOWMAN

But let's
build it
indoors

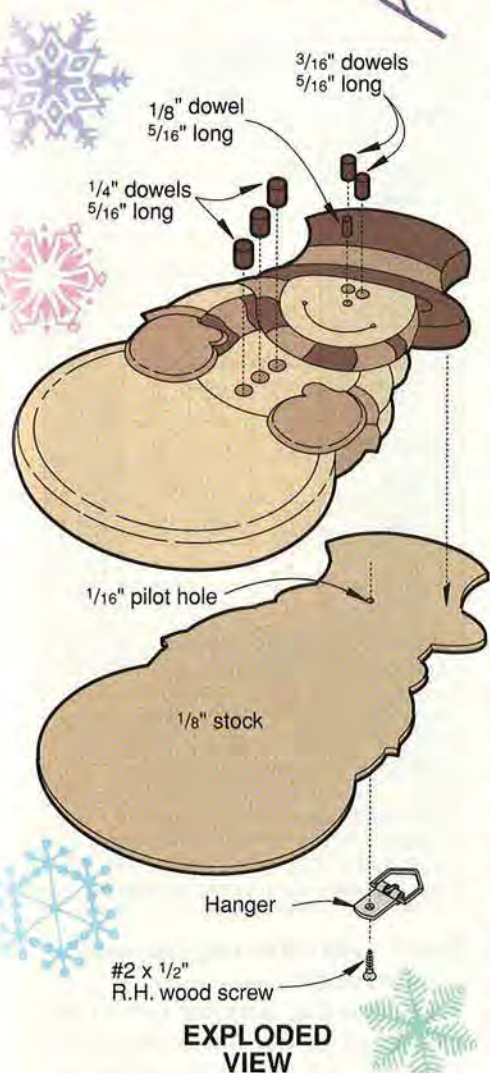


Living in the snowbelt, we've seen some great snowmen in our time, but few as charming as this wonderful wooden one from Texan Judy Gale Roberts. What's more, you can build him without freezing your fingers, and he won't melt away on the first warm day.

Note: Build the snowman from three different woods, selected by color. You'll need a $\frac{3}{4}$ " \times 5" \times 7" piece of light-colored wood, a $\frac{3}{4}$ " \times 3 $\frac{1}{2}$ " \times 6" piece of medium-colored wood, and a $\frac{3}{4}$ " \times 3" \times 6" piece of dark-

ored wood. For the snowman shown, designer Judy Gale Roberts employed light-colored white pine and two colors of western red cedar. You could use other softwoods or hardwoods.

You also could dye or stain the woods for your snowman if the natural color variations don't provide sufficient contrast. You'll need a piece of plywood $\frac{1}{8}$ " \times 5" \times 8 $\frac{1}{2}$ " for the back.



EXPLODED VIEW

Photocopy the full-sized patterns in the *WOOD PATTERNS*. Cut out the individual patterns, but do not snip the patterns for the mittens (B and D), the scarf (F and H), or the hat rim (J) into their separate pieces.

Using rubber cement or spray adhesive, adhere each pattern to an appropriate piece of stock, aligning the arrow on the pattern with the wood's grain. Stick down the pattern edges firmly so they won't flap while you cut. For the scarf (F and H), attach a $\frac{3}{4} \times 2 \times 3\frac{1}{2}$ " piece of dark stock to the top of a same-sized piece of medium-colored stock, using double-faced tape. Apply the patterns to the top of the stack.

Drill the holes in parts C and I where shown. Drill the $\frac{1}{16}$ " blade start holes all the way through; the holes for the buttons, eyes, and nose, $\frac{1}{4}$ " deep. Insert the scrollsaw blade (no. 5, .037 \times .015" with 14 teeth per inch) through one of the blade start holes, and saw the curved mouth. Saw the mouth in a smooth, fluid motion. A smooth curve gives the snowman his winning smile.

Cut and shape the parts

When you cut out the parts, saw right down the middle of the outside pattern line for each one—don't leave the pattern line on either the waste or the part. After you cut out the lettered parts, saw the mittens (B and D), the hat rim (J), and the stacked scarf parts (F and H) into their smaller pieces.

An auxiliary scrollsaw table with a zero-clearance blade hole will help you perform those small cuts. To make the table, cut a piece of $\frac{1}{8}$ " or $\frac{1}{4}$ " plywood to cover your saw's table top. Center the plywood side-to-side on the table, in front of the blade. Saw into the plywood until the edge nearest you meets the front edge of the saw table. Secure the auxiliary table with double-faced tape.

Separate the dark and medium stack-cut scarf pieces, then intermix them to assemble the scarf, following the pattern and the photograph. Sand all parts to remove fuzz or splinters from sawing. Assemble the snowman to check the fit between parts, and sand or trim as necessary.

Contour the pieces with a drum sander or disk sander (an inflatable drum sander works great). Shape the pieces, following the thickness dimensions shown on the pattern for guidance. You don't need to hew to those dimensions precisely, however.

Start with the bottom snowball (A). Shape it like a portion of a sphere, sanding it to about $\frac{5}{8}$ "

thick at the center. Next, lay the middle snowball (C) in position next to it. With a sharp pencil, mark the bottom snowball's thickness onto the middle one's edge where they meet.

Shape the middle snowball as part of a sphere, but make the mating edge at least as thick as marked. Then, place the mittens in position. Mark the thicknesses of the adjoining parts on the mittens, and sand them to shape. Contour all parts in this fashion. Treat the scarf as a single piece—don't shape the individual segments. For the hat, start with the top and work down to the brim.

Now, build your snowman

Dry-assemble the completed parts on a piece of $\frac{1}{8}$ "-thick plywood. Trace around the outside of the snowman, and scrollsaw the plywood to shape for the backing. Fill any voids, and sand the edge.

Finish the front and edges of each part before assembly to prevent building up finish in the joints. A clear wipe-on gel finish will do the job. Paint or stain the edge of the backing dark.

Glue the parts to the backing, starting with the bottom snowball. Spare the glue—a few dots of yellow woodworking glue on the back of each part will hold adequately and won't squeeze out around the edges or in the joints. Insert $\frac{5}{16}$ " lengths of dowel where shown. Dab a bit of black paint or dark stain on the end of each one. Finally, add a picture hanger on the back. ♣

Buying Guide

More designs. For a list of other Judy Gale Roberts woodworking patterns, send a self-addressed stamped envelope to Roberts Studio, 3302 Atkinson Drive, Lufkin, TX 75901.

Project Design: © Judy Gale Roberts
Photograph: John Hetherington
Illustrations: Kim Downing



For first-time golfers
PEE-WEE STARTER SET



Miniature golf takes on a whole new meaning with this kid-sized pull cart, bag, and clubs. The wheels and adjustable handle on the pull cart allow promising young Palmers to move over the grassy backyard links with ease. We recommend using hollow plastic balls with the club set, which includes a wood, an iron, and a putter.

Bill of Materials					
Part	Finished Size			Matl.	Qty.
	T	W	L		
A bag support	¾"	1½"	11¾"	P	1
B wheel spreader	¾"	2"	7"	P	1
C wheels	¾"	5" dia.		P	2
D spacer block	1½"	2"	3"	P	1
E ball holders	¾"	1½"	6"	P	2
F handle tongue	¼"	1¼"	2¾"	PL	1
G connector	¾"	1¼"	2¾"	P	1
H knob	¾"	1½" dia.		P	1
I putter	¾"	1"	2¾"	P	1
J iron	¾"	1¼"	3"	P	1
K wood	1¼"	1¼"	2½"	P	1

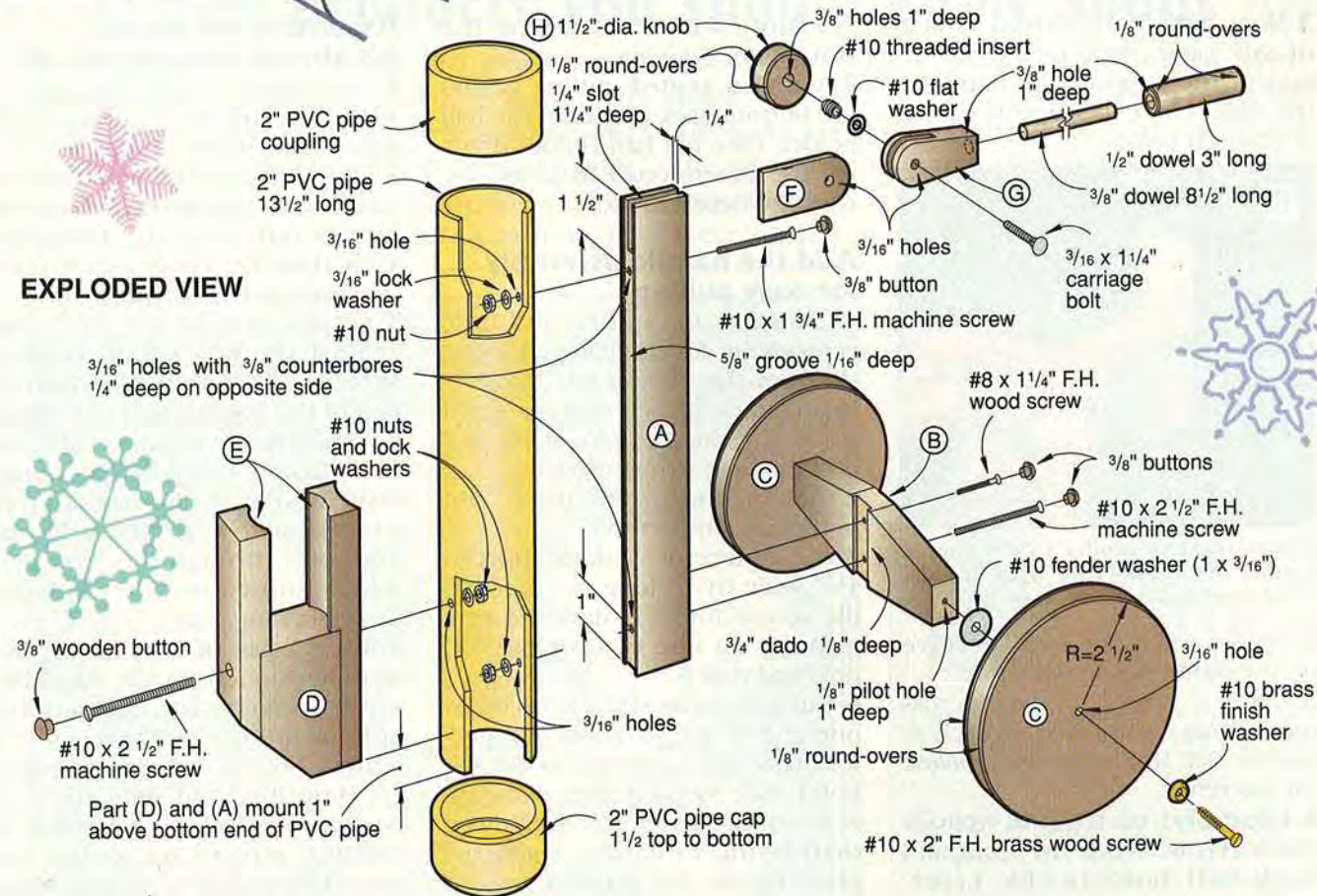
Materials Key: P—pine, PL—plywood.
Supplies: 2" PVC pipe 13½" long, 2" PVC pipe coupling, 2" PVC pipe cap, 2—#10x2" flathead brass wood screws with #10 brass finish washers and #10 (1") fender washers, 2—#10x2½" flathead machine screws with lock washers and nuts, 1—#10x1¾" flathead machine screw with lock washer and nut, #8x1¼" flathead wood screws, ¾" dowel stock, ½" dowel stock, ¾" wood buttons, 1¾x1¼" carriage bolt with #10 threaded insert and #10 flat washer, clear finish.

Start with the bag support and wheels

- 1 Cut the bag support (A) to the size listed in the Bill of Materials. Cut a ¼" slot 1¼" deep in the top end (we did this with a bandsaw).
- 2 Fit your tablesaw with a dado blade and cut a ⅝" groove ¼" deep centered along one edge of the bag support. (The groove allows for a tighter fit of the bag support against the PVC pipe.)
- 3 Drill a pair of ⅜" holes through the bag support where dimensioned on the Exploded View drawing. (During assembly, you'll run hardware through these holes for attaching the bag support to the 2" PVC pipe.)
- 4 Cut a piece of ¾" stock to 2x7" for the wheel spreader (B). Cut a ¾" dado ⅝" deep across the center of the spreader where shown on the *WOOD PATTERNS™* insert in the center of the magazine.



EXPLODED VIEW



5 Drill a $\frac{1}{8}$ " pilot hole 1" deep centered in each end of the wheel spreader. Drill two counterbored screw holes through the spreader for securing it to the bag support (A) later. The hole sizes are listed on the *WOOD PATTERNS™* insert.

6 Transfer the shape of the spreader to the 2x7" blank and cut it to shape.

7 Use a compass to mark the 5"-diameter wheels on $\frac{3}{4}$ " stock. Carefully cut the wheels to shape cutting just outside the marked line. Then, sand to the line (we used our disc sander) to finish shaping the wheels.

8 Drill a $\frac{3}{16}$ " hole through the center of each pine wheel. Then, rout or sand $\frac{1}{8}$ " round-overs along the outside edges of each wheel.

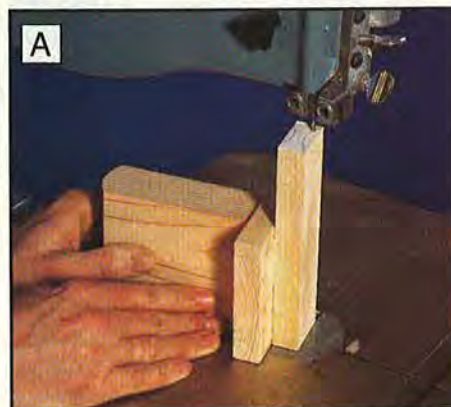
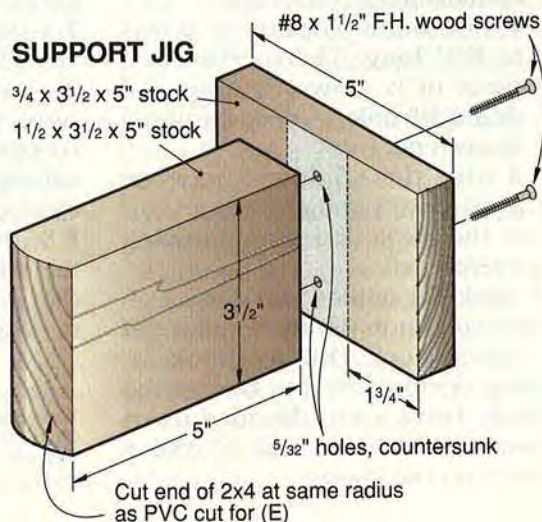
Make the golf-ball holder next

1 From $1\frac{1}{2}$ "-thick stock, cut the ball-holder spacer block (D) to size. Cut the ball-holder front and back (E) to $\frac{3}{4} \times 1\frac{1}{2} \times 6"$ each.

2 Transfer the full-sized top view pattern to the top of each E. Build

a support jig like that shown on the Support Jig drawing. Using double-faced tape, adhere one of the ball-holder pieces (E) to the flat end of the support jig. As shown in Photo A, bandsaw the curve in the opposite face.

Continued



Use a support jig to control the ball holders when bandsawing their covered surfaces to shape.

PEE-WEE STARTER SET

3 Now, adhere the curved surface of this same piece to the curved end of the support jig. Bandsaw the other curve to shape as shown in Photo B *below*.

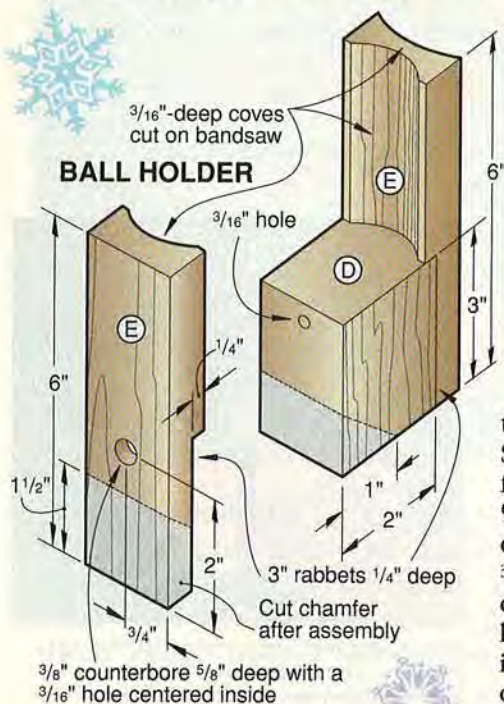


Secure the ball holder to the curved end of the support jig with double-faced tape, and cut it to shape.

4 Bandsaw just the smaller curve on the other ball-holder piece.

5 Cut a 3" rabbet $\frac{1}{4}$ " deep across the bottom inside face of each E. See the Ball Holder drawing *below* for reference.

6 Glue and clamp the spacer block (D) between the front and back ball holders (E). Later, remove the clamps, and drill a $\frac{3}{16}$ " counterbored hole through the



assembly where shown on the Ball Holder drawing.

7 Mark an angled outline across the bottom back corner of the ball holder. (See the Ball Holder drawing for dimensions.) Bandsaw the corner where marked.

Add the handle assembly for easy pulling

1 Transfer the outline and hole centerpoint for the handle tongue (F) from the *WOOD PATTERNS™* insert to $\frac{1}{4}$ " plywood or solid stock. Cut the piece to shape, and drill the hole where marked.

2 Glue the tongue into the $\frac{1}{4}$ " slot in the bag support (A).

3 Cut a piece of $\frac{3}{4}$ "-thick stock to $1\frac{1}{4}$ " wide by 6" long for the handle connector (G). Mark the centerpoint on one end for the $\frac{3}{16}$ " hole and drill it.

4 Cut a $\frac{1}{4}$ "-wide slot $1\frac{1}{4}$ " deep in one end of the $\frac{3}{4} \times 1\frac{1}{4} \times 6$ " connector blank (the same end as the $\frac{3}{16}$ " hole). (We found it safer and easier to cut the slot in a 6"-long piece than trying to handle a shorter piece on the bandsaw.) Crosscut the opposite end for a finished length of $2\frac{5}{8}$ ".

5 Mark diagonals on the end opposite the slot to find center. Holding the connector with a handscrew clamp, drill a $\frac{3}{8}$ " hole 1" deep where marked.

6 Transfer the full-sized connector pattern to the connector blank and cut it to shape.

7 Crosscut a piece of $\frac{3}{8}$ " dowel to $8\frac{1}{2}$ " long. Then, crosscut a piece of $\frac{1}{2}$ " dowel 3" long, and drill a $\frac{3}{8}$ " hole 1" deep centered in one end.

8 Glue the $\frac{3}{8}$ " dowel between the $\frac{1}{2}$ " dowel and the connector. See the Exploded View drawing for reference.

9 Mark the outline and cut a $1\frac{1}{2}$ "-diameter knob (H) from a piece of $\frac{3}{4}$ "-thick stock. Drill a $\frac{3}{8}$ " hole $\frac{1}{2}$ " deep centered in one face of the knob. Drive a #10 threaded insert into the $\frac{3}{8}$ " hole. Sand $\frac{1}{8}$ " round-overs on the knob.

Assemble the pieces; it's almost time to tee off

1 Cut a piece of 2" PVC pipe to $13\frac{1}{2}$ ". Sand off any lettering on the pipe with 320-grit sandpaper.

2 Finish-sand all the wood pieces, sanding $\frac{1}{8}$ " round-overs on the pieces noted on the Exploded View drawing. Apply a clear finish (we used polyurethane).

3 Clamp or tape the PVC pipe against the bag support/wheel spreader assembly. The bottom end of the bag support (A) should be 1" above the bottom end of the 2" PVC pipe. Using the previously drilled holes in the bag support and spreader as guides, drill mating holes through the PVC pipe where shown on the Exploded View drawing.

4 Insert a pair of machine screws, as dimensioned on the Exploded View drawing, through the top hole in the bag support and the bottom hole in the wheel spreader. Hold hexhead nuts and lock washers in place on the inside of the PVC pipe to secure the two assemblies. Glue $\frac{3}{8}$ " wooden buttons in place over the heads of the machine screws.

5 Secure the ball holder to the PVC pipe with a machine screw.

6 To prevent scratching the clubs when slipping them in and out of the bag (PVC pipe), file the exposed machine screw flush with the nut and then place duct tape over the exposed nuts.

7 Using PVC joint cement caulk adhesive, or instant glue, adhere a 2" (inside diameter) PVC pipe cap onto the bottom end of the 2" (outside diameter) PVC pipe. Also, adhere a 2" PVC pipe coupling to the top end of the PVC pipe.

8 With brass wood screws, mount the wheels to the wheel spreader (B). Fasten the handle assembly to the bag support/ tongue.

Continued on page 82

Written by Marlen Kemmet
Project Design: Joe Geyser, Antioch, Calif.
Illustrations: Jamie Downing
Photographs: Bill Hopkins, John Hetherington

BANDSAWS AND CIRCULAR BLADES: 11 new products you should know about

It never fails. As soon as we tell you everything we know about a particular new tool or product category, manufacturers come out with still newer models that deserve our attention (and yours). This happened after we published our reviews of dado cutters in

the October 1991 issue, bandsaws in April 1992, and 10" circular blades in September 1993. As soon as we could get our hands on the new products, we ran them through the same tests that the original tools endured. Here's what we discovered.



Freud's Super Dado leaps others in a single bound

In our last report on dado blades and sets, the 8" Forrest Dado King ruled the roost, but with a price tag befitting its regal standing: \$289. Other dado-blade sets performed nearly as well for less than half the price, including the Freud SD308, Amana 658030, and Delta 35-560.

Now, Freud's new 8" Super Dado, model SD508, performs as well as the Forrest, with a price of about \$180. (You also can buy a 6" version, model SD506, for about \$160.) In our

tests, the SD508 made flawless cuts in solid wood, oak-veneered plywood, and melamine-coated particleboard.

Like the Forrest set, the Super Dado features 24-tooth outside blades, four-tooth chippers, a 3/32"-thick chipper for undersized plywoods, and a set of shims.

The Super Dadoes also have teeth with anti-kickback design. Other nice touches include a sturdy plastic carrying case and an instruction book with diagrams of all the possible chipper combinations.



Two strong contenders for your bandsaw dollar: the Jet WBS-14 (left) and the Grizzly G1073.

Grizzly and Jet debut improved bandsaws

When we last examined bandsaws, the Delta 14" models 28-283 (3/4-hp motor and enclosed base) and 28-245 (the same saw with a 1/2-hp motor and an open base) were the clear winners among machines priced \$500-\$1,000. At the time, the Grizzly and Jet bandsaws in this price range were not serious challengers to the Delta units. All that has changed.

For several months we put the new Grizzly model G1073 and Jet WBS-14 bandsaws through our bandsaw-testing procedures. Both of these Taiwanese-made saws performed well enough to put them in contention with the Delta units. Here's a look at each of the machines.

At \$550 plus shipping, Grizzly's new model G1073 has more-power (1 1/2 hp), more throat capacity (16"), and more heft (395 pounds shipping weight)

Continued

than any saw in its price range. In our tests the machine ran smoothly with little vibration. We attribute the lack of vibration to the machine's well-balanced, cast-iron wheels and its immense weight. The one-piece, heavily webbed, cast-iron body showed absolutely no flexing in our tests.

This heavy-duty construction continues in the guides and guide posts. A 1"-wide, square steel post fits inside a cast-iron housing with adjustments for setting the post parallel to the blade throughout its travel. The guides have micro-adjustments and thrust bearings.

Niceties on this saw include hinged wheel covers that open and close easily and don't vibrate, a dust brush for keeping the bottom wheel clean, and a well-placed 2½" dust port. Also, the bandsaw comes with a fence that locks securely and accurately—an expensive option on most bandsaws.

With the model WBS-14, Jet has produced a saw that looks nearly identical to the Delta bandsaw. Except for the shape of some knobs, and the lack of micro-adjustment on the lower guides of the Jet, we could not find any significant differences between the machines.

Although overall fit and finish on the Jet machine was good, the Delta's is slightly better. The Jet required more time and effort on our part to get blades to track in the center of its wheels. To its advantage, Jet's entry comes with a 1-hp motor and enclosed stand. It sells for \$500-\$550. That's about \$50-\$100 less than the Delta 28-245 and \$200-\$250 less than the Delta 28-283 (Delta makes both machines in the U.S.). Optional Jet accessories, such as the riser block, fence, and miter gauge, also cost less than similar Delta components.



A bevy of new blades from four manufacturers (clockwise from lower left): Black & Decker Piranha Pro, Freud, CMT, and Integra. Both the Freud and CMT blades have sound-dampening channels laser-cut into their bodies.

MANUFACTURER	MODEL	NUMBER OF TEETH	KERF (INCHES)
BLACK & DECKER	73-579	60	.104
CMT	110-240	24	.125
	110-500	50	.127
	110-800	80	.125
	110-801	80	.110
FREUD	F410	40	.108
	F810	80	.125
INTEGRA	IP4000	40	.119

NOTES:

- (ATB) Alternate top bevel
(ATB/R) Alternate top bevel with rakers
(FT) Flat top
- Hook angles are positive except for those with minus (-) symbol which are negative.
- Bevel angles for ATB/R blades are for the beveled teeth. Raker teeth have flat (0°) tops.
- (NR) Blade not recommended or intended for this operation.

E Excellent
G Good
F Fair

A batch of new blades

Since our last report on 10" circular blades, a lot has happened in the marketplace. Black & Decker has come out with Piranha Pro blades, CMT has completely revamped its line, changing from a Canadian to an Italian manufacturer, Freud has debuted two new blades with high-bevel teeth, and a new player, Integra, has brought out a blade to challenge the Forrest 40-tooth Woodworker II. After running these blades through the same tests we conducted for our original report, we tabulated the results in the chart below.

At the conclusion of the testing, we were impressed by the improvement in the CMT line.

All of its blades performed well, including a 60-tooth radial-arm saw blade that we did not include in the chart because we did not test radial-arm saw blades in the original test.

Both of the Freud blades performed well, and the F410 blade earns our nod as the best value among today's all-purpose blades. The F810 does not leave the glass-smooth edges that we earlier experienced with another Freud 80-tooth blade, the LU85. However, the F810 excels when used to cut plywoods and melamine-coated particleboards because it does not chip the fragile top and bottom surfaces. Like the CMT 110-

800 and 110-801 blades, the F810 has a high top-of-tooth bevel angle. This severe angle helps the teeth cleanly shear delicate materials. But, keep in mind that these teeth dull more quickly than teeth with low bevel angles.

The Integra IP4000 blade comes close to matching the performance of the Forrest 40-tooth Woodworker II, the top-ranked blade in our last test. The IP4000 produces the same smooth edges as the Forrest blade does, but it tends to chip plywood edges slightly more than the Forrest product. At nearly half the cost of the Woodworker II, it's easy to overlook the minor shortcomings of the Integra blade. 🌲

Written by Bill Krier Technical consultant: Bob McFarlin Photographs: Hopkins Associates

FOLLOW-UP EVALUATION OF 8 PREMIUM SAW BLADES

TOOTH GRIND (1)	TOOTH HOOK ANGLE (DEGREES) (2)	TOP OF TOOTH BEVEL ANGLE (DEGREES) (3)	PLATE (L) LASER-CUT (S) STAMPED	QUALITY OF TABLESAW CUTS (4)										QUALITY OF MITERSAW CUTS IN 3/4" SOLID OAK (4)		NOISE LEVEL-NO CUTTING LOAD (8)	NOISE LEVEL-WITH CUTTING LOAD (8)	COUNTRY OF ORIGIN (9)	LIST PRICE	SELLING PRICE	
				SOLID STOCK (3/4" OAK)					PLYWOOD (3/4" OAK VENEER)					1 1/2" SOLID BIRCH							
				RIPPING		CROSSCUTTING			CROSSCUTTING		RIPPING		CHIPPING ON TOP OF CUT (7)	CHIPPING ON BOTTOM OF CUT (7)	JOINT QUALITY OF EDGE (5)						SMOOTHNESS OF EDGE (6)
				JOINT QUALITY OF EDGE (5)	SMOOTHNESS OF EDGE (6)	CHIPPING ON TOP OF CUT (7)	CHIPPING ON BOTTOM OF CUT (7)	SMOOTHNESS OF EDGE (6)	JOINT QUALITY OF RIPPED EDGE (5)	CHIPPING ON TOP OF CUT (7)	CHIPPING ON BOTTOM OF CUT (7)										
ATB	20	10	S	E	G	G	E	G	G	F	E	NR	NR	G	F	84	86	U	\$ 83	\$ 62	
FT	20	0	L	E	G	NR	NR	NR	NR	NR	E	G	NR	NR	NR	NR	83	86	I	--	41
ATB/R	12	15	L	E	G	G	E	G	E	G	G	E	G	G	F	NR	NR	I	--	53	
ATB	5	40	L	NR	NR	E	E	G	E	E	E	NR	NR	E	E	80	83	I	--	58	
ATB/R	-5	30	L	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	E	E	80	83	I	--	58	
ATB	13	18	L	E	G	E	E	G	E	E	E	E	G	E	G	82	84	I	95	50	
ATB	2	38	L	NR	NR	E	E	G	E	E	E	NR	NR	E	E	80	83	I	135	75	
ATB	15	15	L	E	E	E	E	E	E	G	G	E	E	E	G	83	88	U	--	70	

5. Amount of visible line at joint of two edge-joined boards.

E Barely noticeable lines on top and bottom of joint.

G Barely noticeable line on top of joint; minor line visible on bottom of joint.

6. Degree of scratching (blade marks) on edge of stock.

E No visible scratches.

G Fine scratches that remove with hand-sanding.

7. **E** Minor chipping; edge is suitable for edge-joining or edge-banding.

G Moderate chipping; edge is suitable for most applications.

F Chipped edge that requires repair.

Note: Results in plywood vary greatly according to quality of plywood being used. Test results based on high-quality, plain-sliced, oak-veneer plywood.

8. Measured in decibels from a distance of 3'.

9. (I) Italy
(U) United States

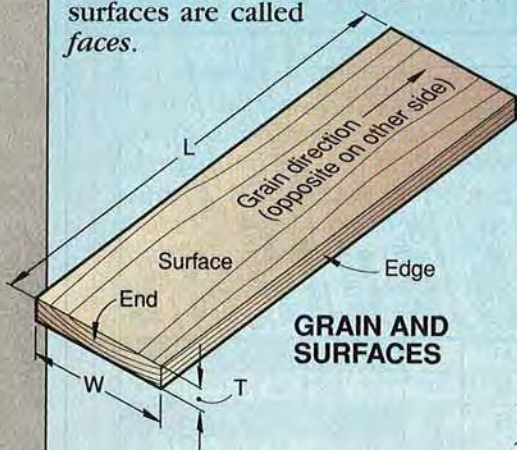
BOARD

What woodworkers need to know

When is a groove a dado? What's the difference between ripping and resawing? And why would anyone give dimensions as $\frac{1}{2} \times 4 \times 2$ " when it sounds so much more correct to say $\frac{1}{2} \times 2 \times 4$ "? The answers to these and other woodworking questions depend on one thing—which way the grain runs.

Let the grain guide you

When you start talking about grain, you have to think about the log the stock comes from. The concentric growth rings visible on the ends of the log form those stripes—often arc-shaped—that you see on the ends of a board. This distinctive *end grain* provides a convenient reference point for identifying the six planes on a board, shown *below*. When thickness equals width, all four surfaces are called *faces*.



GRAIN AND SURFACES

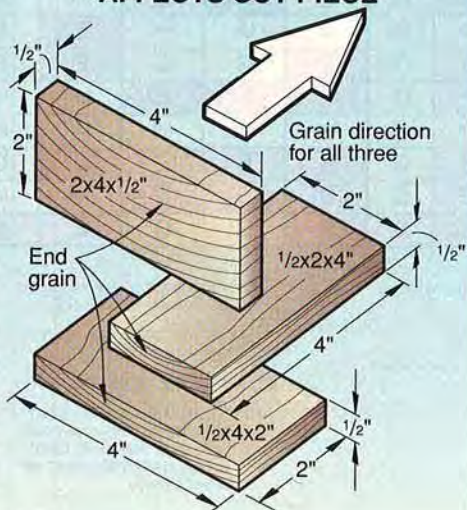
As simple as *edge*, *surface*, and *end* seem, confusion arises because these planes on the stock may not correspond to directional terms for the part. For instance, on a box with the grain running horizontally, references to the front and back edges of an end piece will indicate the ends of your stock. So, be sure you're clear whether directionals and terms such as *edge* or *end* refer to the stock or the project part.

Keep dimensions in order

Measurements can lead to confusion, too. Wood dimensions are customarily given in a specific order—thickness, width, and length (T×W×L). Thickness is normally the smallest dimension on the end of the board; width, the measurement *across* the grain; and length, the measurement *along* or *with* the grain, as shown in the drawing *left*.

If you swap given dimensions when you cut a piece for a project, the part will fit, but it might not look right. Rearranging dimensions also could affect the strength or durability of a project. The illustration *below* shows three ways a piece could be cut simply by changing the order of the dimensions.

HOW DIMENSION ORDER AFFECTS CUT PIECE



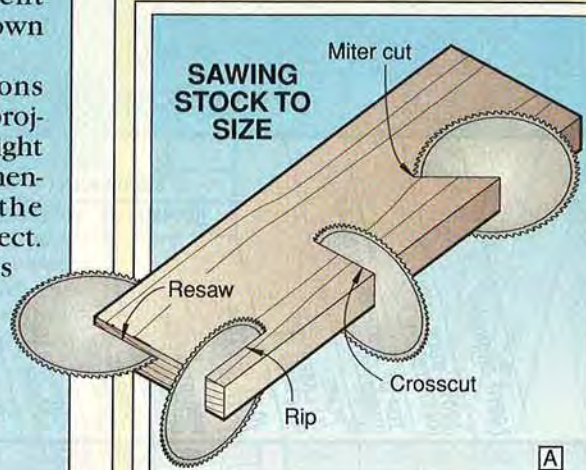
A glossary of cuts

To cut stock to size, woodworkers rely on three basic sawing operations, all defined in relation to grain direction. The sizing cuts, shown in drawing A, are:

Crosscutting: Sawing across the grain to reduce a board's length. (Also called *trimming*.) A crosscut at an angle other than 90° to the board's edge is a *miter cut*.

Ripping: Sawing in the grain direction to reduce a board's width. A surface or face will rest on the saw table.

Resawing: Sawing in the grain direction to reduce thickness. An edge of the piece being resawn will rest on the saw table.



BASICS

They're easy to learn if you follow the grain

Here are some other terms you'll run across:

Dado: A flat-bottomed channel that runs across the grain, open from edge to edge, as shown in drawing B.

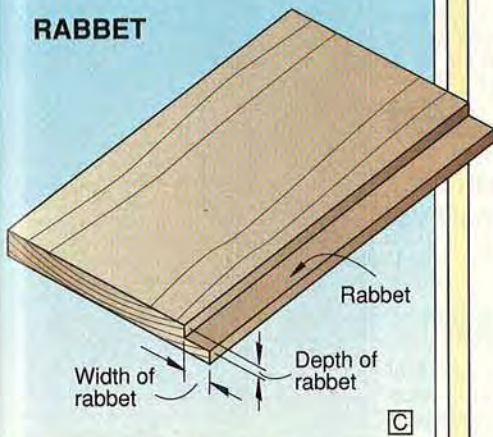
Groove: A similar channel running with the grain. Stock with a groove in it is sometimes called *plowed* or *ploughed* stock.

Rabbet: A channel along an edge or end of a piece of stock, shown in drawing C.

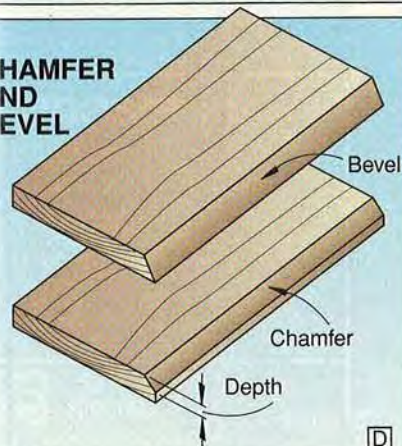
Bevel: An angled cut across an entire edge, end, or face, shown in drawing D.

Chamfer: An angle cut on a portion of an edge, end, or face.

RABBET



CHAMFER AND BEVEL



Warps and size changes

As humidity changes, so does the size of a piece of wood. Exposed to high humidity, wood swells, only to shrink when the humidity decreases. This movement, which varies in degree among species, also relates to grain.

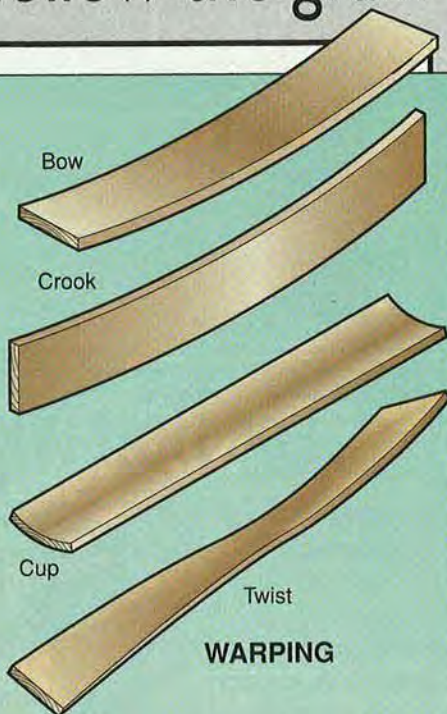
Only the slightest dimensional change occurs with the grain, or lengthwise. But thickness and width can vary considerably. Going from green to oven-dry (a testing standard, not to be confused with kiln dry), some woods shrink by almost 13 percent in width, or more than 3/4" on 6"-wide stock. Since you'll ordinarily build projects from dried stock, you won't experience such extreme variations. Also, wood once dried doesn't expand to that degree when exposed to normal humidity changes.

A look at the end grain will give you some clues as to how a piece of wood will react to humidity. Movement will be greatest in the direction of the stripes or arcs, or *tangential* to them, shown *below*.



Radial growth and shrinkage—across the arcs—will be less, probably in the range of 40–80 percent of the tangential value, depending on the species.

This uneven shrinkage can set up stresses in a piece of wood, caus-



ing it to warp. Here and shown *above* are four common warps you'll encounter:

Bow: A curve from end to end, resulting in a board that rocks from end to end on one face.

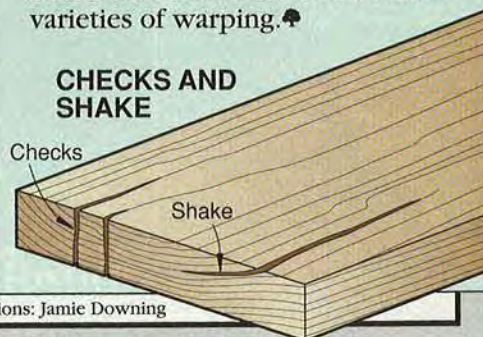
Crook: An edge curvature from end to end, resulting in a board that rocks on one edge.

Cup: Edge-to-edge curvature, resulting in a board that rocks from side to side on one face.

Twist: A warp that lifts one corner, resulting in a board with ends that aren't parallel.

Checks (cracks across growth rings) and *shakes* (cracks between growth rings), shown *below*, often accompany warping, too. And, of course, if things are going really badly, you could find a board that combines two or more varieties of warping. ♣

CHECKS AND SHAKE



Illustrations: Jamie Downing

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Continued from page 76

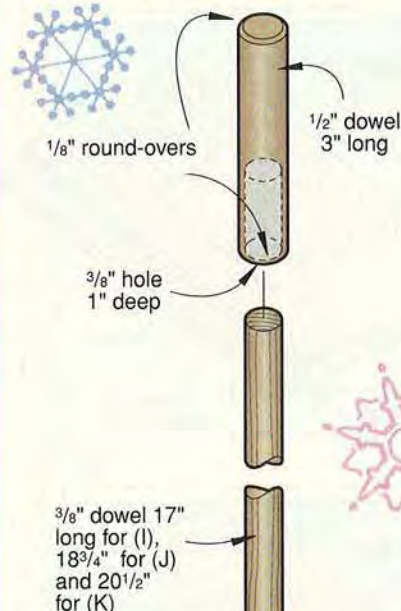
Now, let's build the putter, wood, and iron

1 Cut the putter head (I), iron (J), and wood (K) to the sizes listed in the Bill of Materials.

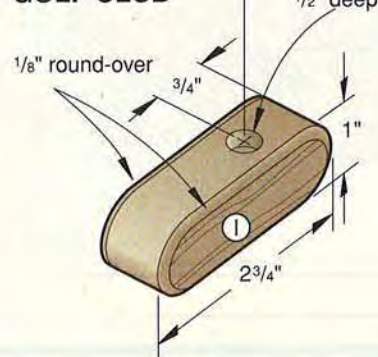
2 Transfer the shape and hole centerpoints to the pieces just cut from the *WOOD PATTERNS*TM insert. Drill the holes, and then cut the club heads to shape.

3 From 3/8" dowel stock, cut the club shafts to the lengths listed on the Golf Club drawing below.

4 Cut 3"-long club grips from 1/2" dowel stock. Drill a 3/8" hole 1" deep in one end of each grip. Glue the three pieces together to form each golf club.



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315-1	7 1/4" BUILDERS SAW	137
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330K	330 WITH CASE & 2-10 YD ROLLS PAPER	94
332	QUICKSAND 5" RNDM ORB W/STIKIT PAD	66
332K	332 W/CASE & 100 SHEETS PAPER	92
333	QUICKSAND W/HOOK & LOOP, DUSTLS	73
333K	333 W/CASE & 50 SHEETS PAPER	99
334	QUICKSAND W/STIKIT, DUSTLESS	73
334K	334 W/CASE & 100 SHEETS PAPER	99
340	14 SHEET DUSTLESS FINISHING SANDER	49
340K	340 WITH CASE & 10 SHEETS PAPER	72
345	SAW BOSS 6" CIRCULAR SAW	104
347	7 1/4" FRAMERS SAW 15 AMP, 10.25 LBS	127
351	3" X 21" BELT SANDER	148
351K	351 WITH 10 ASST BELTS & BELT CLNR	153
352	3" X 21" BELT SANDER W/DUST BAG	151
352K	352 WITH 10 ASST BELTS & BELT CLNR	161
9352V3	3" X 21" VS DSTLS BELT SANDR W/CSE	165
9352VSK	9352V3 WITH 10 ASST BELTS & CLNR	175
360	3" X 24" BELT SANDER W/DUST BAG	183
360K	360 WITH 10 ASST BELTS & BELT CLNR	200
361	3" X 24" BELT SANDER	182
361K	361 WITH 10 ASST BELTS & BELT CLNR	193
362	4" X 24" BELT SANDER W/DUST BAG	195
362K	362 WITH 10 ASST BELTS & BELT CLNR	206
363	4" X 24" BELT SANDER	191
363K	363 WITH 10 ASST BELTS & BELT CLNR	204
447	7 1/4" FRAMERS SAW W/BRAKE 15 AMP	137
505	1/2 SHT FIN SANDER	123
505K	505 W/CASE & 2-10 YD ROLLS PAPER	159
550	NEW POCKET CUTTER	178
556	BISC JOINER W/CASE & TILT FENCE	160
556K	556 WITH 1000 ASSORTED BISCUITS	193
600	1 1/2 HP ROUTER W/1 1/4" & 1 1/2" COLLETS	132
690K	690 W/CS, EDGE GUIDE, & TEMP GD KIT	179
9990	1 1/2 HP ROUTER W/CASE	144
691	1 1/2 HP "D" HANDLE ROUTER	143
691K	691 W/CASE, EDGE GD & TEMP GD KIT	204
693	PLUNGE BASE ROUTER, 1 1/2 HP	169
695	SHAPER TABLE W/ 1 1/2 HP ROUTER	216
696	SHAPER TABLE	128
2620	3.8" VSR DRILL, 0-2500 RPM W/CHUCK	88
2621	3.8" VSR DRILL, 0-2500 RPM, KEYLESS	89
5008	DOVETAIL TEMPLATE	78
5009	MORTISE & TENON JIG	47
5116	OMNI JIG	253
6931	PLUNGE ROUTER BASE	73
7116	NEW 24" OMNI JIG	293
7310	LAMINATE TRIMMER, 5.6 AMP	88
97335	5" RANDOM ORBIT SANDER, VS W/CSE	132
7335K	7335 W/CS, DUST EX SYS, 100 SHTS PPR	165
97336	6" RANDOM ORBIT SANDER, VS W/CSE	137
7336K	7336 W/CS, DUST EX SYS, 100 SHTS PPR	169
7518	3 1/4 HP FIXED BASE ROUTER-5 SPEED	267
7519	3 1/4 HP FIXED BASE ROUTER-1 SP	233
7538	3 1/4 HP PLUNGE ROUTER-1 SPEED	235
7539	3 1/4 HP PLUNGE ROUTER-5 SPEED	239
7549	TOP HANDLE BAYONET SAW	184
7549K	7549 W/CASE & 10 BLADES	152
7700	NEW 10" LASERLOC MITER SAW	338
7700K	7700 WITH BAG, VISE & EXT WINGS	377
9118	PORTA PLANE KIT W/CASE, CRBD BLD	209
9314	4 1/2" TRIM SAW KIT	152
9315	7 1/4" BUILDERS SAW KIT	139
9345	SAW BOSS 6" CIRCULAR SAW KIT	123
9347	7 1/4" FRAMERS SAW W/STEEL CASE	138
9637	TIGER SAW VAR SPD RECIP SAW KIT	144
9653S	12V CRDLS KIT W/2 BAT, CASE	169
97310	LAMNT TRIMMR KIT W/4 BASES & CS	194

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14-650	HOLLOW CHISEL MORTISER	264
22-540	12" BENCH TOP PLANER	389
22-180	BENCH TOP BAND SAW	158
31-080	1" BELT 5" DISC SANDER	93
31-460	4" BELT 6" DISC SANDER	127
34-102	TENONING JIG	84
37-070	NEW 6" VS BENCH JOINTER	248
40-560	16" SCROLL SAW, 2 SPEED	178

Milwaukee

0407-1	SAME AS ABOVE BUT 12 VOLT	173
6256	TOP HANDLE JIG SAW	144
6491	10" MITER SAW W/BAG & 80T BLADE	288
6507	VAR SPEED SAWZALL W/BLADES & CSE	144
6508	SAME AS 6507 BUT W/PERMANENT CRD	144
6523	SAME AS 6527 BUT W/PERMANENT CRD	172

DEWALT

DW100	3 8" DRILL, 0-2500 RPM, 4 AMP	68
DW318K	4.5 AMP HVY DTY JIG SAW KIT W/CS	147
DW420	5" RANDOM ORBIT SANDER, PSA	69
DW421	5" DSTLS RNDM ORB SNDR, VELCRO	79
DW430	3" X 21" DUSTLESS BELT SANDER	164
DW431	3" X 21" DSTLS BELT SANDER VAR SP	180
DW610	1 1/2 HP ROUTER, 9 AMP	147
DW615	1 1/4 HP PLUNGE ROUTER, VAR SP	158
DW625	3 HP HVY DTY PLUNGE RTR, VAR SP	269
DW675K	HEAVY DUTY PLANNER KIT	224
DW682K	BISCUIT JOINER KIT	224
DW944K2	9.6V CORDLESS KIT W/2 BATTERIES	154
DW945K2	12V CORDLESS KIT W/2 BATTERIES	169
DW972K2	NEW 12V CRDLS KIT W/2 BATTERIES	189
DW991K	14.4V CRDLS KIT W/ BATTERY & CASE	199

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1003VSR	3 8" VSR DRILL W/KEYLESS CHUCK	92
1194VSR	1 2" VSR, 2 STAGE HAMMER DRILL	139
12730V3	4" X 24" VS DUSTLESS BELT SANDER	219
1370DEV6	6" VS DSTLS RNDM ORB SNDR	224
1584VS	CLIC BARREL HANDLE JIG SAW, VS INCLUDES FREE CASE	159
1587VS	TOP HANDLE JIG SAW, VS W/CASE	159
1604	1 3/4 HP ROUTER	142
1608	LAMINATE TRIMMER	96
1609KX	DELUXE INSTALLERS KIT W/4 BASES	224
1513EVS	2 HP VAR SP PLUNGE ROUTER INCLUDES FREE EDGE GUIDE	189
1515EVS	3 1/4 HP VAR SP PLUNGE ROUTER INCLUDES FREE EDGE GUIDE!	289
3054VSR	12V CORDLESS KIT W/2 BAT, CASE INCLUDES FREE 15 PC BIT SET	178
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SLP20	BRAD NAILER W/CASE 5/8" X 1 5/8" CAP	268
SN325	STICK NAILER 1 7/8" - 3 1/4" CAPACITY	418
SCN200R	ROOFING NAILER	458

AEG

TXE150	6" VS DSTLS RANDOM ORBIT SANDER	138
BSPE100	BARREL GRIP JIG SAW, VS W/CASE	155
FSPE100	TOP HANDLE JIG SAW, VS W/CASE	155
HSE75S	3" X 21" BELT SANDER, VAR SPEED	174
EZ601	CORDLESS CAULKING GUN	159

HITACHI

DS10DVAK	12V CRDLESS DRILL KIT W/1 BATTERY	149
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C8FB2	8 1/2" SLIDE COMPOUND MITER	579
C10FC	10" COMPOUND MITER SAW	259
P20SB	3 1/4" PLANNER, 3.4 AMP	92
TR12	3 HP PLUNGE ROUTER	188
M12V	3 HP VAR SPEED PLUNGE ROUTER	235
NT45A	18 GA. FINISH NAILER W/CASE	275
N5003AA	STANDRD CRWN CONSTRCTN STAPLR	319
NV63A	FULL HEAD CONSTRCTN COIL NAILER	414

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LU82M10	10" X 60T CROSSCUT RIP BLADE	39
LU84M10	10" X 50T ATB COMBO BLADE	40
LU85M10	10" X 80 T ATB FOR MIRROR FINISH	58
LU87M10	10" X 24T RIP BLADE THIN KERF	39
LU88M10	10" X 60T CROSSCUT THIN KERF	45
LU89M10	10" X 72T TCH NON FERROUS METAL	57
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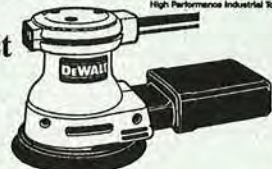
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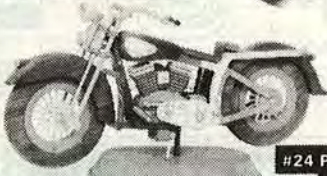


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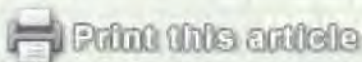
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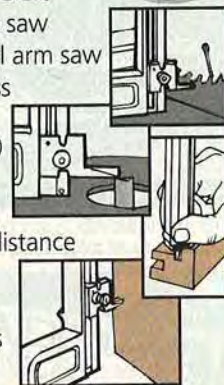
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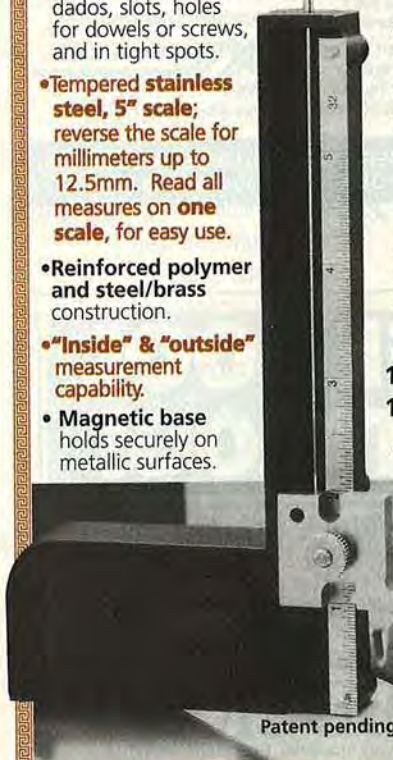
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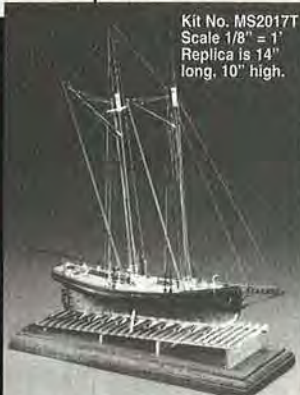
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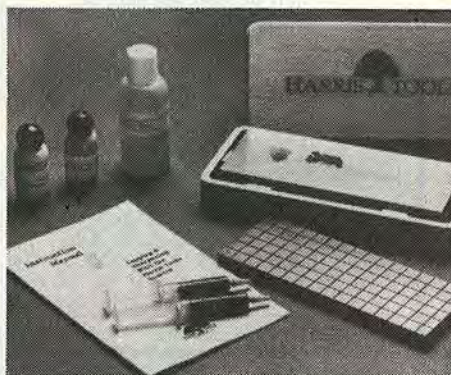
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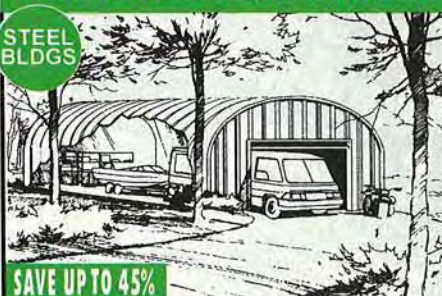
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ASK WOOD®

How to determine correct pulley size

A friend gave me an old Delta 4" jointer. It was mounted on a homemade table with an inoperative washing-machine motor. I have a replacement motor with a speed of 1725 rpm. What size pulleys will I need to use on the motor and the jointer?

—Charles Condrotte, Petaluma, Calif.

The size of the pulleys depends on the desired cutterhead speed. From specifications in manufacturers' catalogs, we determined that many 4" jointers on the market today have cutterhead speeds ranging from 4000 to 5000 rpm. We have seen jointers listed with faster speeds, but we cannot recommend running a jointer cutterhead faster than 5000 rpm without first checking the manufacturer's recommendations.

Try this procedure for determining the pulleys you need for this speed range (our example uses a desired-cutterhead speed of 4250 rpm):

Whether your woodworker's license reads "Beginner," "Intermediate," or "Advanced," you're bound to have a few questions about your favorite hobby. We can help by consulting our staff and outside experts. Send your questions to Ask WOOD®, Better Homes and Gardens® WOOD Magazine, 1912 Grand Ave., Des Moines, IA 50309-3379.

- 1) Select a pulley size for the fastest-moving part (in this case the cutterhead). Start with a pulley the same diameter as the cutterhead (probably 2" in diameter for most small jointers).
- 2) To determine the motor-pulley size, first multiply the cutterhead-pulley size by the desired speed:
(2 × 4250 = 8500)
- 3) Then, divide this figure by the motor speed:
(8500 ÷ 1725 = 4.9)
- 4) Round off the number to the nearest pulley size available (in this example, 5"). Most hardware stores stock pulleys in diameters ranging from 1½" to 6" to fit ½- and ⅝"-diameter shafts.

Help with finding the center of a half-lap

I have difficulty in determining the halfway point on the edge of a workpiece when cutting half-lap joints. When I try to cut these joints, I find myself readjusting my saw until my patience wears out. How can I make this process easier?

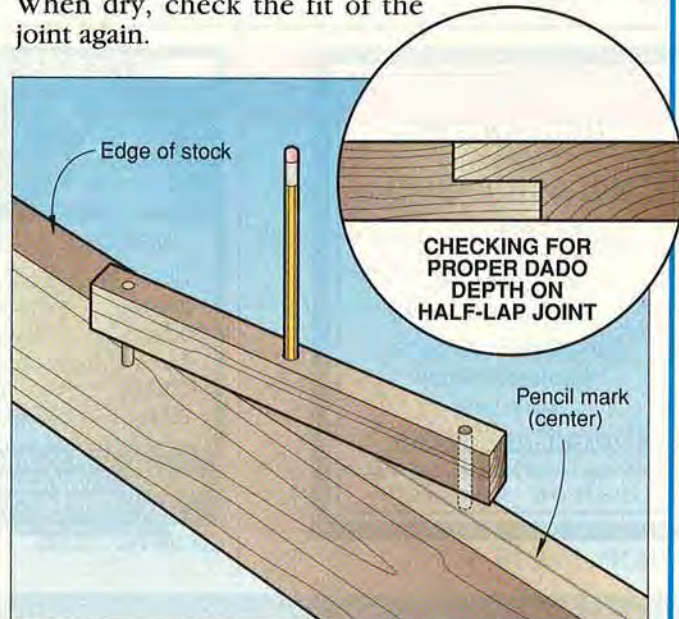
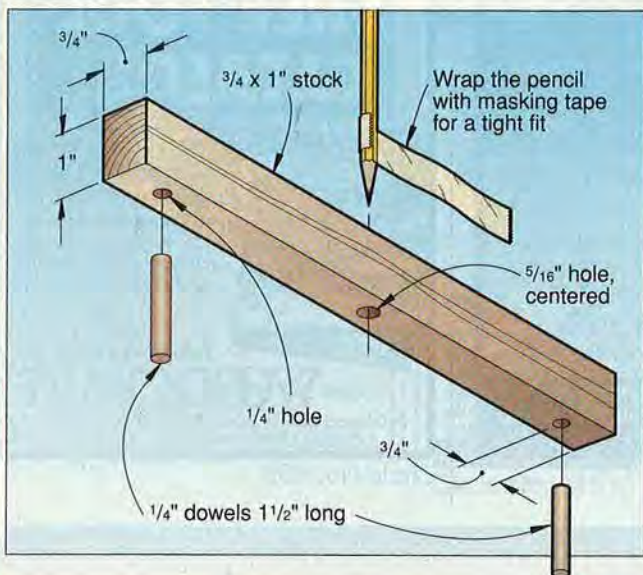
—Cal Withers, London, Ont.

Cal, use the jig shown in the drawing below. To find the exact center of a board's edge, place the jig on the board, with the end dowels touching opposite sides of the board and the pencil in contact with the edge. Pull the jig along the board to mark a centerline on the edge.

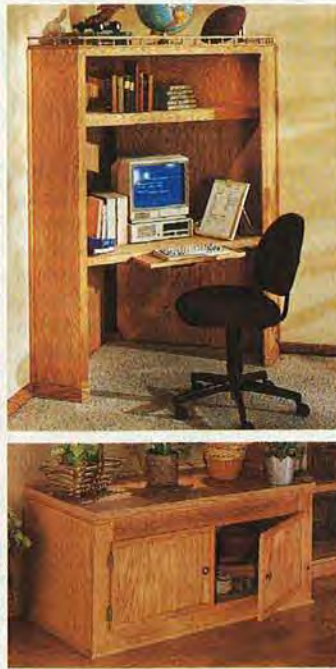
Next, follow this procedure to set the correct depth of cut for your dado blade. First, use the jig

to mark the centerline on two pieces of scrapwood that match the thickness of your project wood. Then, adjust the dado blade so the cut just touches the pencil mark. Make a test cut on this scrapwood, and place the cut faces together as shown (inset below). Adjust the sawblade height as necessary, and repeat the cuts until the outside faces of the scrapwood are flush when the dado faces are held together.

Cut the dadoes for the half-lap joint, and check the fit. If needed, re-machine the joint to bring the board faces flush. Or, where the dado is too deep, glue and clamp a piece of veneer to one joint face. When dry, check the fit of the joint again.



Continued on page 94



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ASK WOOD

Continued from page 92

Stacked and stickered is best

I recently acquired about 2,500 board feet of rough-sawn hardwood, including walnut, maple, oak, and cherry. It is 10 years old, dry, stable, and eight to ten feet in length. The stock is stacked and stickered, but this makes selection and removal difficult. Can I store the boards vertically without damaging them?

—Walter C. Koebler, Dallas

Sorry, Walt, but storing wood in a vertical position can result in the lumber developing a curve or bow toward the bottom side of the board. The ends of the boards are supported by the wall and the floor, but the middle of the board has no support and reacts to gravity.

We recommend that you continue to stack and sticker this lumber. Build a 2-3' wide stack of each species. This still will require dealing with the stickers each time you need lumber, but your wood will remain stable and straight over time.

Rays and rift-sawing

I am working with some oak that has light-colored irregularities running across the grain. Sometimes the larger areas of these irregularities will tear out when being planed or jointed. Can you identify these spots for me, and how can I prevent tear-out?

—Bruce Couture, Metamora, Mich.

Yes we can, Bruce. These irregularities are vascular rays, areas of soft tissue or parenchyma cells that extend radially from the center of the tree out toward the bark. (See photo right). These rays are most pronounced in oak species when the boards are rift-sawn, or cut at an angle to the radial plane. A lot of craftsman-style furniture and woodwork in early 20th-century houses was made using rift-sawn oak, taking advantage of the patterns caused by exposing these rays.

For best results when planing wood displaying these soft rays, follow these precautions:

- 1) Use only sharp jointer and planer knives.
- 2) Move the wood slowly across the jointer, and if possible, reduce the rate of feed of your planer while thicknessing the wood.
- 3) With both your jointer and planer, take light cuts with multiple passes.

Continued on page 96

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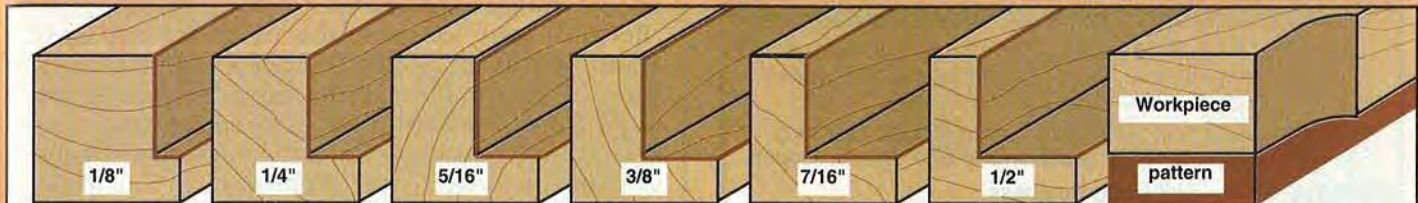
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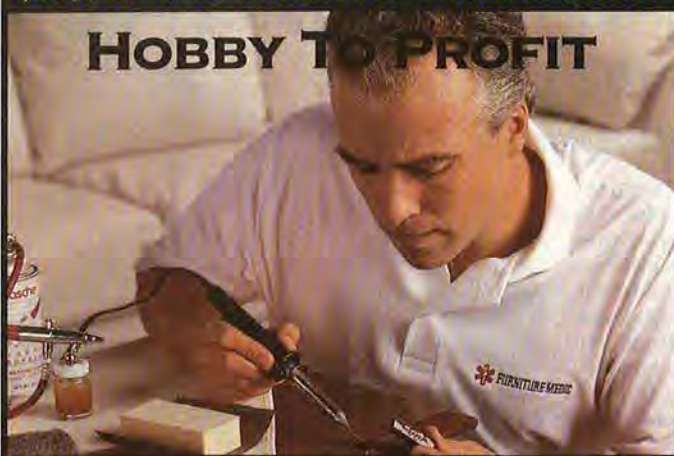
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ASK WOOD

Continued from page 94

The hunt for Taiwanese tool parts

I'm rebuilding the head on my drill press, made by Sun Machine Tools of Taiwan. Where can I get the needed parts?

—Robert Jensen, Mountain Home, Idaho

We have received many requests from readers looking for parts for Taiwanese machinery, Bob. The truth, however, is that most of these odd-brand machines have no parts or service network in place for repairing them. In addition, we know of no listing of interchangeable parts between the Taiwanese machines and North American machines. Finding these parts involves a combination of effort and good luck.

Because many of these machines are copies of equipment from North American manufacturers, some of the parts from Delta and other brands may fit your imports. Also, look for replacement bearings at machinery-supply companies. We suggest you take the broken or worn pieces to a tool dealer or machinery supplier, and ask to compare these pieces with parts they stock. If lucky, you may find a part that will work. Otherwise, you may have to cannibalize parts from a similar Taiwanese machine (if you can find one). Regardless of where you locate the missing parts, keep in mind that WOOD® magazine does not stand responsible for the failure of, or injury caused by the use of, cannibalized parts in repairing equipment.

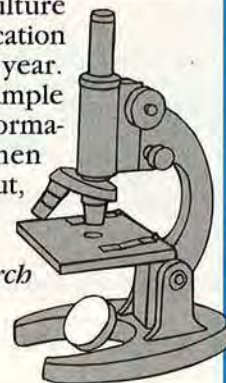
Mystery wood identification

I found a supply of an unknown lumber species at a small mill, and would like to use it in a project. The owner and I could not agree on a price because we do not know the value of the wood. If we sent a small piece of wood to your offices, would it be possible for you to determine what this wood might be?

—Jeffrey S. Boucher, St. Joseph, Mich.

We do not have a wood technologist on our staff at WOOD magazine, Jeff, so our identification would be at best a guess. The Forest Products Laboratory of the U.S. Department of Agriculture does provide a free wood-identification service, for up to five samples a year. Send a 1 × 3 × 6" nonreturnable sample of the wood, along with any information you know about the specimen (for example, where and when cut, or purchased) to:

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(From Another Customer)

In closing I would like to add that the Woodworker II blade is by far the finest saw blade that I have ever used. I also have the Forrest dado set which is without a doubt, the king of all dado sets. I work exclusively with red oak and oak veneer plywood and the dado set performs splinter free cuts as advertised.

It is a pleasure to purchase a product that does what it is advertised to do. Thanks for making such a fine product.

Dennis R. Schule, Owatonna, MN

UPGRADE YOUR CHOP AND SLIDING MITER SAWS WITH OUR CHOPMASTER



New specs, 5° Neg. Pts. & flat, dial
.001/.002 for perfect, tight, smooth,
splinter-free miter joints.
NEW AVAILABLE SIZES

		List	SALE
Delta Sidekick 6-1/2"	6-1/2" x 40T x 5/8"	\$149	\$ 89
Sears 8-1/4" & Delta	8-1/4" x 60T x 5/8"	170	99
Hitachi 8-1/2" DeWalt 8-1/2" & Ryobi	8-1/2" x 60T x 5/8"	179	109
Delta	9" x 80T x 5/8"	204	119
Ryobi-Makita & all	10" x 80T x 5/8"	207	129
DeWalt, Makita, B&D & Hitachi	12" x 80T x 1"	229	139
Ryobi-Makita	14" x 100T x 1"	266	179
Hitachi	15" x 100T x 1"	277	189

For good general purpose cuts use Woodworker II 30T & 40T or Woodworker I

Use small stiffener where possible

QUIET! Also help all your other blades to cut better.
Use our 1/8" DAMPENERS-STIFFENERS, against one side.
4" - \$21 Tryable and RETURNABLE. CUTS NOISE to 1/2 or 1/4.
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REDUCE NOISE 50%-75%

WOODWORKER I - For TABLE and RADIAL SAW

this trim and crosscut ALL PURPOSE blade gives scratch free POLISHED cuts on all materials RIP or CROSSCUT up to 2".

- All 60T and 3/32" THIN kerf 30" ATB and 5" face hook on 10" dia and under. 12" and 14" are 20" ATB 1/8" K.
- DOUBLE HARDER and 40% STRONGER carbide.
- THIN KERF:

Saves 1/3 wood loss on each cut, radial or table. Feeds easy when used for moderate rip and crosscut on table saw. Reduces "JUMP IN" greatly for better "PULL CONTROL". Practically eliminates bottom splinter on RADIAL-CROSS CUT.

- Totally stops ALL bottom and top splinter on ply veneers in push-cut mode on RADIAL.
- Our STIFFENER STRONGLY RECOMMENDED AGAINST outside of blade only for best cuts.

Made and serviced in USA for your benefit.

	List	SALE
14" x 60T x 1" 1/8"	\$224	\$159
12" x 60T x 1" or 5/8" 1/8" K	198	139
10" x 60T x 5/8" 3/32" K	162	129
9" x 60T x 5/8" 3/32" K	156	119
8" x 60T x 5/8" 3/32" K	150	109
New 8-1/4" x 60T x 5/8" 3/32" K	150	109
New 7-1/4" x 60T x 5/8" 3/32" K	150	109

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Forrest Dado King (Superior)	Froud S2008 (Excellent)	V-A 26742 (Good)	U.S. Saw 800-CR80 (Fair)	V-A 26747 (Poor)
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DURALINE HI-AT For TABLE & RADIAL SAW

(very good on chop saw too!) STOP SPLINTERING those SPLINTERY OAKS, HARDWOOD VENEERS and thin 2 SIDE LAMINATES ON PARTICLE BOARD.

FOR FASTER FEED RATES AND MORE ABSOLUTE SPLINTER CONTROL.

DURALINE HI-AT

Note: Fine Woodworking Editorial Nov./Dec. 1988 No. 73, pg. 65, S.N.

recommends high alternating top bevel (ATB) thin kerfs and large blade stiffeners for smoothest cuts on RADIAL SAW, etc.



Jim Forrest, President and designer
microscoping cutting edge.

All 5/8" holes. Boring up to 1-1/4" \$7.50 extra
Larger holes - time basis. Shipping \$4.50

	List	SALE
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8" x 80T 1/8" & 3/32"	202	\$169
9" x 80T 1/8" & 3/32"	207	\$178
10" x 80T 1/8" & 3/32"	207	\$159
SPECIAL SALE! ONLY \$159		
12" x 80T x 1" 1/8"	212	\$181
12" x 100T x 1" 1/8"	253	\$215
14" x 80T x 1"	232	\$197
14" x 80T x 1"	256	\$226
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16" x 100T x 1"	294	\$243

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"WOOD-FRIENDLY"™ L606 MOISTURE METER—uses advanced electromagnetic wave technology to accurately measure wood moisture content from 6% to 30% to a depth of 1/4". No pins to "abuse" wood and leave ugly holes. Check out boards from top to bottom in just seconds before you buy and avoid the headaches of splitting, warpage, delaminating and failed glue joints. The Wagner L606's convenient pocket size, easy-to-read analog meter, and low price make it a must for anyone working with wood. Literature. **WAGNER ELECTRONIC PRODUCTS, INC.** Free. Circle No. 1285.

BITS, BLADES, CUTTING TOOLS

ASK FOR CMT'S CATALOG AND WE'LL GIVE YOU \$5!—CMT Tools will send you our free, full-color router bit catalog and we'll give you a \$5.00 discount on your first order! CMT bits feature anti-kickback design, Teflon coatings and micrograin carbide cutting edges. Our catalog is packed with accessories, project ideas and safety tips—it's one catalog you'll want to keep! **CMT TOOLS, INC.** Free. Circle No. 1310.

CASCADE TOOLS—The 1993 Cascade Tools catalog is the finest ever. It's jammed with great buys on SY brand industrial-grade router bits, shaper cutters and an excellent assortment of hard-to-find accessories. You'll have to see it to believe it. **CASCADE TOOLS, INC.** Free. Circle No. 1315.

ENLON IMPORT CORP.—Check out n' Save. We offer a wide selection with over 100 varieties of professional quality carbide tipped router bits & shaper cutters with irresistible prices, find out yourself. Catalog. **ENLON IMPORT CORPORATION.** Free. Circle No. 1318.

1995 EAGLE AMERICA WOODWORKING CATALOG—Top Quality American Made cutting tools featuring over 850 router bits. Plus the largest selection of American Made saw blades, shaper cutters, forstners, rosettes, brad points and more. Over 2,000 unique and hard to find tools and accessories. **EAGLE AMERICA CORP.** Free. Circle No. 1320.

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MISCELLANEOUS

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SQUARE DRIVE SCREWS—Thousands agree—once you try them you will never want to use anything else! The square drive recess virtually eliminates work-damaging driver bit "cam-out," the deep threads result in exceptional holding power, and they are heat treated for strength. Sizes from #4 x 3/8" to #12 x 4", with stainless steel, solid brass, brass plated, and zinc plated available. Quantity discounts. Send for literature. **McFEELY HARDWOODS.** \$1.00. Circle No. 2450.

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Model	Description	List Sale
TOP 10	"Simply the Best"	699 538
STANDARD 10	"Professionals Choice"	499 399

MILWAUKEE TOOLS		
9068	1/2" Impact Wrench with case	447 269
9455	7 1/8" Polisher 1750 rpm	200 149
0230-1	3/8" Drill 3.5 amp	218 119
5938	Belt Sander 4 x 24 w/bag 10 amp	449 249
6747-1	Drywall Gun 0-2500 rpm 5 amp	186 109
6016	1/4 sheet Palm Grip Sander	97 54
6017	6016 Sander with dust bag	97 56
6008	1/3 sheet 12,000 orb/min 5 amp	209 124
8975	Heat Gun 570° & 1000°	98 59
8980	8975 Heat Gun with case, & access.	148 92
3102-1	Plumbers r angle Drill Kit 500 rpm	389 215
5660	Router 1-1/2 HP 10 amp	352 195
5378	8-1/4" Worm Drive Saw 15 amp	341 189
6256	Variable speed Jig Saw 3.8 amp	264 146
6527	New Super Sawzall with case	320 172
6128	above Sawzall with wired cord	316 172
6525	NEW 5" Random Orbit Sander	200 119
6126	NEW 6" Random Orbit Sander	205 124
0399-1	12 volt cordless Drill Kit complete	315 172

0402-1 above Drill w/keyless chuck & 2 batt. 320 172

0224-1	3/8" Drill 4.5 amp magnesium	227 124
0225-1	Same as 0224-1 w/keyless chuck	203 124
0234-1	1/2" 5.4 amp mag 0-850 rpm	237 128
0236-1	0234-1 drill with steel case	269 149
0235-1	Same as 0234-1 but w/keyless chuck	237 128
0244-1	1/2" Drill 5.4 amp mag 0-600 rpm	237 128
0222-1	3/8" Drill 3.5 amp 0-1000 rpm	198 109
0228-1	3/8" Drill 3.5 amp 0-1000 rpm	195 109
0375-1	3/8" close quarter Drill	237 129
0379-1	1/2" close quarter Drill	268 152
6539-1	cordless Screwdriver 190 rpm	130 75
6540-1	6539-1 with bits & case	165 95
6546-1	cordless Screwdriver 200 & 400 rpm	141 94
5399	1/2" Hammer Drill Kit	332 194
1676-1	HO Hole Hawg with case	499 268
6511	2 speed SawZall with case	249 139
6507	Original SawZall with case	264 144
6508	Above Saw with wired cord	260 144
6175	1/4" Chop Saw 15 amp	499 279
6010	Orbital Sander 1/2 sheet	214 124
8977	Variable temp. Heat Gun	131 79
5397-1	3 1/8" speed Hammer Drill Kit	255 142
5371-1	1/2" var. speed Hammer Drill Kit	340 188
5377-1	3 3/8" 1" with keyless chuck	375 198
3107-1	1/2" var. speed night angle Drill Kit	399 219
6754-1	drywall gun 0-4000 rpm 5.4 amp	196 114
3300-1	1/2" variable speed night angle Drill	356 194
5880	Router 2 HP - 12 amp	362 198
6215	1/8" Chain Saw	375 205
6145	4-1/2" Grinder 10,000 rpm	168 99
6142	6145 with case & accessories	209 124
6749-1	Drywall Gun 0-2500 rpm 5.4 amp	218 128
6755-1	Drywall Gun 0-4000 rpm 5 amp	170 99
6767-1	Score Shocker Kit	229 138
5387	Falcon 3/4" Rot. Hammer w/case	305 239
5353	Eagle 1-1/2" Rot. Hammer with case	574 525
6365	7-1/4" Circular Saw 13 amp	218 122
6367	above Saw - double insulated	213 128
6366	6365 with fence & carbide blade	228 128
6368	6365 w/fence, carbide blade & case	249 139
6377	7-1/4" Worm Drive Saw	330 189
6369	New 7-1/4" Circular Saw with brake	259 148
6490	NEW 10" Miter Saw	444 215
6491	6490 w carbide blade & bag	532 275
6494	NEW 10" Compound Miter Saw	

FREUD SAW BLADES			
5/8" bore	Industrial Grade	Carbide Tipped	
Model	Description	Teeth	List Sale
LU2M010	General Purpose 10"	40	69 39
LU1M010	General Purpose 10"	40	78 44
LU2M010	Cut-off 10"	60	93 49
LU4M011	Combo 10"	50	78 42
LU8M010	Super Cut-off 10"	80	115 59
LU7M010	Ripping 10"	24	99 38
LU7M010	Cut-off 10"	60	84 45
LU8M010	Thin Kerf 10"	24	78 39
LU8M010	Thin Kerf 10"	60	88 45
LU8M015	Mitre Saw blade 15"	108	175 99
LU9M010	Compound Miter Blade 60"	88	54
LU8M010	Ultimate 10"	80	128 68
LU8M010	Ferrous metal 10"	72	104 58
F410	New Quiet Blade - 10"	40	95 49
F810	New Quiet Blade - 10"	80	135 74
TK203	7-1/4" Framing - 40 tooth		31 18
TK303	7-1/4" Framing - 40 tooth		38 22
TK306	10" Framing - 40 tooth		47 25
TK903	7-1/4" Combo - 30 tooth		33 19
TK906	10" Combo - 30 tooth		53 29
S0306	6" Dado - Carbide		215 112
S0308	6" Dado - Carbide		230 119
S0506	6" Super Dado-carbide w/case & shims	292	155
S0508	6" Super Dado-carbide w/case & shims	344	168
F0	#0 - 1-3/4" x 5/8" Biscuit 1000 Qty		43 29
F10	#10 - 2-1/8" x 3/4" Biscuit 1000 Qty		43 29
F20	#20 - 2-3/8" x 1" Biscuit 1000 Qty		43 29
FA	Assorted Biscuits 1000 Qty		45 29
WC110	10 piece Chisel set w/cs 1/4" - 1-1/2" 143		88
FB107	7 piece Forstner bit set 1/4" - 1" 92		54
FB106	16 piece Forstner bit set with case		338 189
94-100	5 piece Router bit set system w/case		320 159
EB100	Edge Banding Machine		409 209
EDS120	12 volt cordless drill kit w/2 batt.		379 195
EDS132	13.2 volt cordless drill kit w/2 batt.		415 209
JS102	NEW Biscuit jointer w/drg. fence & cs		355 179

The following FREUD Tools have a \$50.00 Rebate!
Price shown is before rebate.

JS100	Biscuit Jointer with case	334 164
FT200CE	1-1/4 HP Plunge Router var. speed	410 205

ACCU-MITER		
Model	Description	List Sale
18-34	Professional Miter Gauge	149 145

MAKITA TOOLS		
Model	Description	List Sale
6070DW	3/8" var. spd. Reverse Drill 7.2 volt.	128 64
6172DWE	3/8" var. spd. Drill Kit w/2 batt.	220 109
5090DW	3-3/8" Saw Kit 9.6 volt.	270 145
6100DWK	3/8" cordless Drill Kit 7.2 volt.	182 105
4390DW	9.6 volt cordless Recip Saw Kit	258 148
4300DW	9.6 volt Jig Saw Kit	261 154
DL391DW3/8"	angle Drill Kit 9.6 volt.	312 175
MA990	Incandescent Flashlight 9.6 volt.	156 37
6010DL	3/8" Drill with flashlight 7.2 volt.	230 125
6891DW	Drywall Gun 0-1400 9.6 volt.	270 158
7220DW	New cordless Stapler Kit 9.6 volt.	370 198

6012HDWE	2 speed Drill with clutch-comp.	243 135
6063DW	Variable speed Drill Kit complete	283 135
6063DW	6063DW Drill Kit w/2 batteries	270 139
6063DW	6063DW Drill Kit with keyless chuck	291 135
6065DW	6065DW Drill Kit w/2 batteries	270 139
6211DWE	NEW 9.6 volt Drill Kit w/2 batteries	258 156
6210DWE	12 volt "Mac Pak" Drill Kit	330 169
6101DWE	NEW 12 volt Drill Kit w/2 batt.	330 165
632007-4	9.6 volt Battery	47 30
632002-4	7.2 volt Battery	39 28

5007NBA	7-1/4" Saw with electric brake	263 135
5008NBA	6-1/4" Saw with electric brake	344 195
804510	1/4 sheet Pad Sander	106 59
9906B	3" x 24" Belt Sander with bag	344 175
9924DB	3" x 24" Belt Sander with bag	329 184
4031BV	Orb. var. speed Jig Saw 3.5 amp.	292 158
JR300W	var. speed Recip Saw with case	252 135
LS1020	10" Miter Saw 12 amp.	360 355
9820-2	Blade Sharpener	394 205
N1900B	3-1/4" Planer with case	244 129
1911B	4-3/8" Planer 7.5 amp.	309 179
3601B	1-3/8 HP Router	288 165
804550	1/4 sheet Pad Sander with bag	98 52
DA300A	3/8" Angle Drill variable speed	314 179
HP210N	3/4" var. spd Hammer Drill w/case	335 178
2708W	8-1/4" Table Saw	585 298
2711	10" Table Saw with brake	1067 565
5008BA	5-1/2" Circular Saw	250 148
6404	3/8" Drill Rev. 0-2100 rpm 2 amp.	112 58
6510LVR	3/8" Drill Rev. 0-1050 rpm	168 93
6820V	0-4000 rpm Drywall Gun 5.2 amp.	171 99
6013BR	1-1/2" Router 6 amp.	280 149
5402A	16" Circular Saw 12 amp	743 429
9141	4" x 24" Belt Sander with bag	378 229
4302C	Variable speed Orbital Jig Saw	351 199
5077B	7-1/4" Hypoid Saw	281 155
LS1440	14" Miter Saw	969 579
LS1030	10" Miter Saw	428 225
5007NB	7-1/4" Circular Saw 13 amp.	232 124
5007NBK	5007NB w/ plastic case	248 129
50075	5007NB w/case cutting guide	283 139
2012	12" Portable Planer	959 639
LS1011	10" Slide Compound Saw	946 509
3620A	1-1/4 HP Plunge Router w/case	220 135
GV5000	5" Disc Sander	123 74
9514B	4" Grinder 4.6 amp.	111 59
N9501B	4" Grinder 4.0 amp with case	168 99
9207SPC	7" Sander/polisher var. speed	350 184
4200N	4-3/8" Circular Saw	252 145
2445	14" Cut-off Saw AC/DC.	403 225
4202	Vspd economy Jig Saw 2.9 amp.	156 98
6302	1/2" Drill 0-550 rpm 5.2 amp.	228 124
DA6300	1/2" angle Drill 300/1200 rpm	424 249
6126BA	3 HP Plunge Router w/case	524 175
BC5001	NEW 5" Random Orbit Sander	120 69
LS1211	New 12" Slide Compound Saw	1550 865

BOSTITCH AIR NAILERS		
Model	Description	List Sale
RN05-1	Stick Nailer	349
RN4S	New Col Roof Nailer 3/4" - 1-3/4"	845 409
60FN2-2	Finishing Nailer 1-1/4" - 2-1/2"	650 335
NR6FN-2K	NR6FN-2 with case, oil, & nails	647 379
7M0S-1	Decking Sheathing Stapler	619 355
MIIFS	Flooring Stapler 15 gauge	931 535
N100S	Stick Nailer 2" - 4"	931 539
T31	Brad Nailer 5/8" - 1"	281 145
CWC100	1 HP Pancake Compressor	463 289

PANASONIC CORDLESS		
Model	Description	List Sale
EY6205EQK	Same as EY6205BC but comes with Ironman battery.	368 192
EY6207EQK	12V 1/2" Drill w/keyless chuck var. spd w/15 min. charger, case & Ironman battery.	420 229
EY6282EQK	var. spd 9.6 volt Drill with 15 min. charger, case, and Ironman battery.	315 169
EY62821DKW	9.6 volt Drill Kit w/2 batteries.	395 162

NEW PREDATOR DRILLS		
EY6181CRKW	NEW 9.6V Predator Compact Drill Kit w/2 batt. - 10% more pwr than EY62821DKW.	305 158
EY6100CRKW	NEW 12 volt Predator Drill Kit with 2 batteries, 1 hour charger, & case	359 185
EY6100CKW	Same as EY6100CRKW but has 15 minute charger.	420 198
EY6100EQK	NEW 12 volt Predator Drill Kit with New Ironman battery, 15 min. charger & case	375 199
EY6100EQKW	Same as EY6100EQK but w/2 Ironman batteries.	473 225

PRAZI BEAM CUTTER		
Model	Description	List Sale
PR-7000	12" beam cutter for worm drive saws.	149 124

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FORREST BLADES

WW10407125	Woodworker I 10" Carbide Blade 40 Tooth List 156.00 Sale 99.00
WW10607100	Woodworker I 10" Carbide Blade 60 Tooth List 162.00 Sale 109.00
DK08243	Dado King 8" Carbide List 299.00 Sale 259.00

KIT SPECIALS		
Model	Description	List Sale
9853K	Porter Cable 9853 Drill Kit with extra Porter Cable battery	164
7335K	Porter Cable 5" w/psd Random Orbit Sander w/case & 1 roll 100X & 150X discs.	273 169
7336K	Porter Cable 6" w/psd Random Orbit Sander w/case & 1 roll 100X & 150X discs.	278 175

SKIL SIZZLERS		
77	7-1/4" Worm Drive Saw	257 144
77B	NEW 77 Mag Worm Saw-2 lbs lighter.	300 164
5825	6-1/2" Worm Drive Saw	257 165
2736-04	12 volt cordless Drill Kit	249 145
1605-02	NEW Biscuit Joiner with case	221 129
5510	5-1/2" Circular Saw	166 110
5860	NEW 8-1/4" 60" Worm Saw	282 174
5790	10-1/4" Circ. Saw 15 amp	478 205
5660	NEW 8-1/4" 600 Circular Saw	232 149
5657	NEW 7-1/4" Circ Saw - pivot foot	205 118
5525	NEW 6-1/2" Circ Saw - big capacity	173 115
3400	10" Table Saw - Bench Top	270 178

PORTA NAILER		
Model	Description	List Sale
401	Porta Nailer complete	265 205
501	Face Nailer complete	265 205
1000	Genuine Porta Nails 1000 Qty.	15.89
5000	Genuine Porta Nails 5000 Qty.	71.50
10,000	Genuine Porta Nails 10,000 Qty.	121.85

BIESEMEYER FENCES		
Model	Description	List Sale
B-50	50" Commer. Saw Fence	345 298
T-SQUARE 52	52" Homeshop Fence	279 238
T-SQUARE 40	40" Homeshop Fence	

DELTA BENCH TOP TOOLS

Model	Description	List Sale
23-700	Wet/Dry Grinder	234 155
23-680	6" Bench Grinder 1/4 HP	86 75
23-880	8" Bench Grinder 1/2 HP	151 115
11-950	1/2" Drill Press	199 135
28-160	10" Hobby Band Saw	210 135
31-050	1" Belt Sander 2.0 amp	104 75
31-460	4" Belt/6" Disc Sander	198 129
31-340	1" Belt/8" Disc Sander	268 204
31-080	1" Belt/5" Disc Sander	134 89
40-560	16" 2 speed Scroll Saw	266 178
11-990	1/2" Bench Drill Press	276 195
11-090	3/2" Radial Bench Drill Press	359 265
43-505	1/2" Bench Router/Shaper	399 285
22-540	1/2" Bench Top Planer	595 389
35-200	10" Compound Miter Saw	350 229
14-650	Hollow Chisel Mortiser	668 279

NEW TOOLS BY DELTA

33-060	NEW "Side Kick" Miter saw	510 375
14-070	NEW 14" Floor Drill Press	450 349
28-180	NEW Bench Band Saw	232 158
40-640	NEW 20" Bench Scroll Saw	466 295
28-190	NEW 12" Band Saw w/ stand	465 389
50-075	NEW Dust Collector/Sweeper 3/4 HP	360 254
20-150	NEW 14" Cut-off Saw	375 219
36-090	NEW 10" Sidekick Miter Saw	253 214
37-070	NEW 6" var. speed Bench Joiner	337 249
37-190	NEW 6" Deluxe Joiner	554 479
36-270	NEW 6-1/4" Builders Saw	444 265
36-210	NEW 10" Compound Miter Saw	438 255
36-070	NEW 10" Miter Saw	284 169

DELTA STATIONARY

34-444	Table Saw w/1-1/2HP motor & stand	812 619
17-900	18-1/2" Floor Drill Press	462 399
40-601	18" Scroll Saw w/stand and blades	1003 759
34-080	10" Miter Box	1715 1359
34-761	10" Unisaw 1-1/2 HP	1715 1359
33-990	10" Radial Arm Saw	818 639
37-280	6" Motorized Joiner	488 399
50-179	3/4 HP 2 stage Dust Collector	483 345
43-355	3/4" Shaper 1-1/2 HP	964 759
46-700	12" Wood Lathe	548 445
33-055	6-1/4" Sawbuck comp with legs	865 615
34-330	6-1/4" Table Saw 13 amp	343 245
36-540	10" Table saw	210 169
34-770	10" Motorized Table Saw	511 395
32-100	Stationary Plate Joiner	645 255
36-040	8-1/4" Compound Miter Saw	224 149
34-915	30" Unifence	385 225
34-897	30" Delta Unifence	525 295
36-755	10" Tri Arbor Saw	1264 969
33-890	12" Radial Arm Saw	1829 1425
14-140	4" Bench Drill Press	382 245
28-560	17" Three Wheel Band Saw	487 445
28-245	14" Band Saw w/ open stand 1/2 HP	419 585

The following Delta Tools have Rebates!
Rebates start 9-15-94

\$50 Rebate

- 28-283 14" Band Saw with enc stand 3/4 HP 910 745
- 28-283K 28-283 Saw w/ 28-843 rip fence.....Sale 769
- 34-445 34-444 Saw with 30" unifence.....1200 775
- 34-445K 34-445 Saw w/ 34-914 table board.....Sale 809

\$75 Rebate

- 22-661 13" Planer with 2 1/2 HP motor.....1513 1189
- 37-154 DJ15 6" Joiner with 3/4 HP motor.....1451 1165

DELTA Industrial Saw Blades

Model	Carbide Tipped - 5/8" bore - Lifetime guarantee	Hook Th. List Sale
35-593	Sawbuck blade 8"	5 ² 48.....52 39
35-616	Crosscut 10"	12 ² 60.....55 44
35-617	Combo 10"	15 ² 50.....54 43
35-624	Scrap Cutoff 10"	10 ² 80.....78 59

NEW DEWALT TOOLS

DW944K	3/8" 9.6V cdss drill kit w/cs & 2 batt	283 185
DW945K	3/8" 12V cdss drill kit w/cs & 2 batt	309 169
DW366A	7-1/4" Circ. Saw w/brake, 13 amp	285 154
DW360K8.0	amp Recip Saw w/cs var. spd 191 92	
DW610	1-1/2 HP 2 handle Router	274 149
DW411	1/4 sheet Palm Sander, 1.7 amp	97 58
DW705	12" Compound Miter Saw	706 379
DW704	12" Miter Saw	570 325
DW100	3/8" Drill, 4 amp, 0-2500 rpm, rev.	118 88
DW250	4.5A Drywall Gun, 0-4000 rpm, rev.	169 94
DW254	4.5A Drywall Gun, 0-2500 rpm, rev.	169 94
DW280KNEW	Screwdriver kit complete	207 119
DW462	4-1/2" Grinder 6 amp	158 89
DW682KNEW	Biscuit Joiner with case	429 219
DW615	NEW 1-1/4 HP Elec. Pipe Router	290 169
DW624	NEW 3 HP Plunge Router	441 245
DW625	NEW 3 HP Electronic Pipe Router	511 269

Above router comes with Free DW6965 Fine depth adjustment.

DW675KNEW	3-1/8" Planer with case	289 164
DW430	NEW 3 x 21" Belt Sander	291 165
DW431	NEW 3 x 21 var. speed Belt Sander	331 179
DW432	NEW Palmgrip Random Orb Sander	120 69
DW421	above Sander with dust collector	138 79
DW930KNEW	12 volt 5-3/8" Trim Saw kit	370 209
DW933KNEW	14.4 volt 5-3/8" Trim Saw kit	444 249
DW444	6" Random Orbit Sander - PSA pad	266 149
DW443	DW444 with hook & loop pad	266 149

NEW DEWALT CORDLESS DRILLS

DW952K	3/8" vspd incl. one 9.6V batt	280 159
DW953K	3/8" vspd incl. one 12V batt	306 175
DW962K	2-3/8" vspd incl. two 9.6V XR batt.	324 179
DW972K	2-3/8" vspd incl. two 12V XR batt.	352 189
DW991K	3/8" vspd incl. one 14.4V XR batt	371 199

Above drill kits come w/charger & steel case!

REMEL TOOLS

3950	Moto Tool Kit with bits & case	134 79
3952	Super Moto Tool Kit with accessories	152 95
1571	16" Scroll Saw - 2 speed "Best buy"	302 174
1695	NEW 16" var. speed Scroll Saw	408 224
290	Electric Engraver with point	25 16
8508	Cordless Moto Tool Kit with case	109 66
1731	5" Disc 1" x 30" Belt Sander	189 114

JORGENSEN ADJUSTABLE HANDSCREWS

Item#	Length	Jaw Opening	Capacity	List	Sale	Box of 6
#50	4"	2"	14.34	8.35	48.59	
#40	5"	2-1/2"	15.40	8.95	51.99	
#30	6"	3"	16.53	9.59	55.75	
#20	7"	3-1/2"	17.75	10.35	59.80	
#0	8"	4-1/2"	19.76	11.75	68.00	
#1	10"	6"	22.63	12.59	58.00	
#2	12"	8-1/2"	25.95	14.50	78.00	
#3	14"	10"	32.88	18.00	99.00	
#4	16"	12"	42.76	23.95	139.00	

JORGENSEN STYLE 37 2-1/2" Throat 1/4"x3/4"

Item#	Jaw Length	List	Sale	Box of 6
3706	6"	10.65	6.05	32.50
3712	12"	11.80	6.65	37.25
3718	18"	13.00	7.45	40.50
3724	24"	14.25	7.99	42.50
3730	30"	15.88	8.86	57.75
3736	36"	17.36	9.99	63.75

JORGENSEN STYLE 45 5" Throat 1-3/8" x 5/16"

Item	Jaw Length	List	Sale	Box of 6
4512	12"	33.17	19.95	109.99
4518	18"	34.97	21.45	116.99
4524	24"	37.02	22.75	123.99

PONY CLAMP FIXTURES

Item	List	Sale	10s
50	3/4" Black Pipe Clamps	14.87	7.80 88.95
52	1/2" Black Pipe Clamps	12.40	6.70 71.50

JORGENSEN STEEL "I" BAR CLAMPS

Model	Size	List	Sale	Box of 6
7224	24"	34.36	17.99	103.00
7236	36"	36.88	18.99	109.00
7248	48"	40.54	20.99	119.00
7272	72"	46.64	27.99	159.95

Mx5636 FEIN Triangle Sander Kit.....Sale 185

LPN672 Nylon Air Palm Nailer with glove.....Sale 94.99

BLACK & DECKER

1165	3/8" Drill 0-2500 rpm 4 amp	118 65
2600	3/8" Drill 0-1200 rpm 4.5 amp	167 95
1703-1	10" Miter Saw with 73-770 blade	344 199
4011	1/4 sheet Palm Sander	86 59
79-034	Workmate 400	184 109
1248-09	1/2" Timberwolf Drill 2 speed	551 309
1180	3/8" Drill rev. 0-1200 rpm 5 amp	207 114
2037	Drywall Gun 0-4000 5.0 amp	184 98
2038	Drywall Gun 0-2500 rpm 5 amp	184 98
3157	Orbital var spd Jig Saw 4.5 amp	263 149
2865K	NEW 3/8" cds 12V Cyclone Drill	294 168
5045K	MACHO Rotary Hammer Drill	813 439
2054	Tex Gun 0-2500 5.0 amp	287 159
2660	Drywall Gun 0-4000 4.5 amp	149 88
1321	1/2" Spade hole Drill 450 rpm 7 amp	320 188
2750	4-1/2" Grinder 10,000 rpm 6 amp	156 83
2694	7-1/4" Super Sawcut Circ Saw w/cs	295 185
2695	7-1/4" Super Sawcut Circ Saw w/cs	282 168
BD5200	Quantum New 5" Rand Orb Sander	160 88
BD5900	Quantum New 1/2" Belt Sander	121 69

Piranha by Black & Decker Carbide Tooth Saw Blades

Model #	Diameter	# Teeth	List	Sale
73-715	5-1/2"	16	14.39	7.99
73-716	6-1/2"	18	14.39	7.55
73-717	7-1/4"	18	14.60	7.99
73-737	7-1/4"	24	18.06	9.29
73-757	7-1/4"	40	32.87	16.89
73-718	8"	22	20.95	10.95
73-759	8-1/4"	40	46.88	24.99
73-719	8-1/4"	22	20.53	11.95
73-740	10"	32	34.63	17.95
73-770	10"	60	70.37	33.95
73-711	10"	50	68.33	33.95

DURA III-ADJUSTABLE STILTS

Model	Description	List Sale
DI422	14" 22" extension	258 189
DI630	18" 30" extension	274 205
D2440	24" 40" extension	269 219

Above models include strap adapter kits

SIoux TOOLS

8030	New 3/8" variable speed Drill	250 145
8000	3/8" vspd close quarter Drill 0-1300rpm	125 69
8005	Same as 8000 but is 0-2500 rpm	200 134
690	5" Air Random Orbit Sander	139 132
658	5" Air Random Sander - dual action	261 155

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ALUMINUM LADDER JACKS
Must be installed on Type 1 or Type 1A ladders only

Model	Width	Spans to Rung	Attaches to Rung	Sale
10-14-02	14"	2 rung	2 rungs	68.95
20-20-02	20"	3 rung	2 rungs	81.95
10-20-03	20"	3 rung	3 rungs	89.95

ALUMINUM ARTICULATED LADDERS TYPE II - 225# RATING

Model	Size	Weight(lbs)	Sale
M2-6-12	6"	34	125.00
M2-7-14	7"	38	135.00
M2-8-16	8"	41	145.00

ALUMINUM ARTICULATED LADDERS TYPE IA - 300# RATING

Model	Size	Weight(lbs)	Sale
M7-14	7"	43	129.00
M7-16	7"	43	145.00
M8-16	8"	46	159.00

FIBERGLASS STEP - TYPE 1 - 250# RATING

6004	4"	13A	53.95
6005	5"	15A	64.95
6006	6"	18A	67.95

FIBERGLASS STEP - TYPE 1A - 300# RATING

6004-S	w/step shell	4"	15A	59.95
6005-S	w/step shell	5"	18A	69.95
6006-S	w/step shell	6"	20A	73.95

ALUMINUM FLAT STEP TYPE 11 - 225# RATED EXTENSION

Model	Size	Working Length	Weight(lbs)	Sale
D120-2	16"	13"	22	117.95
D120-2	20"	17"	27	135.95
D124-2	24"	21"	33	159.95
D128-2	28"	25"	42	185.95
D132-2	32"	29"	53	209.95
D136-2	36"	32"	62	239.95
D140-2	40"	35"	73	289.95

ALUMINUM FLAT STEP TYPE 1 - 250# RATED EXTENSION

D1316-2	16"	13"	26	127.95
D1320-2	20"	17"	32	152.95
D1324-2	24"	21"	39	169.95
D1328-2	28"	25"	50	199.95
D1332-2	32"	29"	62	229.95
D1336-2	36"	32"	77	299.95
D1340-2	40"	35"	85	329.95

ALUMINUM FLAT STEP TYPE 1A - 300# RATED EXTENSION

D1516-2	16"	13"	31	159.95
D1520-2	20"	17"	37	169.95
D1524-2	24"	21"	45	199.95
D1528-2	28"	25"	56	219.95
D1532-2	32"	29"	66	259.95
D1536-2	36"	32"(250# rating)	79	309.95
D1540-2	40"	35"(250# rating)	89	349.95

FIBERGLASS FLAT STEP TYPE 1A - 300# RATING EXTENSION

D6116-2	16"	13"	34	179.95
D6120-2	20"	17"	40	199.95
D6124-2	24"	21"	53	239.95
D6128-2	28"	25"	60	269.95
D6132-2	32"	29"	74	309.95

FIBERGLASS FLAT STEP TYPE 1A - 300# XTRA HEAVY DUTY EXTENSION

D7116-2	16"	13"	37	209.95
D7120-2	20"	17"	43	245.95
D7124-2	24"	21"	58	279.95
D7128-2	28"	25"	68	309.95
D7132-2	32"	29"	79	369.95

Buy any 3 ladders (can be asst) deduct additional 5% Prepaid Freight and best prices too!

FINISHING TOUCHES

HOLLYWOOD HOT-ROD PIONEER SHIFTS GEARS TO WOODWORKING

Print this article

You won't find woodworker Norm Grabowski's name listed among Oscar-award winners of the silver screen. And his home isn't on the Hollywood stars' tour route. Nevertheless, the former California hot-rodder and film industry stunt man/actor still claims some significant credits.

In the 1950s, Norm introduced the street rod to a car-crazy generation when his flashily painted, V-8 powered, T-bucket roadster appeared as the "Kookie Car" on the popular television series "77 Sunset Strip." Then, Norm got the acting bug and appeared in several movies, including "Darby's

Rangers" and "Son of Flubber." Meanwhile, his custom hot rods appeared in *Hot Rod* magazine and other publications.

Today, a lot of things have changed, but not Norm's zeal to create the unusual. "I got tired of the freeways and all that," Norm says of his decision to move to Lead Hill, Arkansas, six years ago. Of course, Norm returns to California occasionally. But these days the trips are to deliver his new custom work—handcrafted rocking horses made of oak and figured walnut. His horses even include brass and silver trim, as shown *above right*.



Norm Grabowski's custom-crafted rocking horses boast the same detailing that made his 1950s hot rods a hit.

"I get a kick out of seeing my old friends, and selling my horses. The first one I made was for my niece," Norm explains. "I had done some woodworking on custom cars, but the rocking horses were my wife's idea. Now, they grace the sales rooms of many Southern California custom-car shops where I used to hang out."

THE FIRST "CHRISTMAS" TREE WAS AN OAK

In 2nd-century Ireland and Wales, the Celtic druids commemorated the winter solstice—the year's shortest day—by festooning oak trees with apples. By the late Middle Ages, Europeans had shifted the pagan emphasis to a more Christian one, and swapped the oak tree for an evergreen.

During the 16th century, the first retail sale of Christmas trees occurred in Strausberg, Germany, when trees from the nearby forests were sold in the marketplace. However, we owe the origin of the convenient Christmas tree lot to American Mark Carr. In the early winter of 1851, he brought two tree-laden sleds from the Catskill Mountains to New York City and sold the conifers on the streets.



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publication with all the information you'll ever need to know about treated wood, is available free from: American Wood Preservers Institute, 1945 Old Gallows Rd., Suite 550, Vienna, VA 22182.

RAIN FORESTS FOREVER?

Indonesia, a Southeast Asian country with a land area of 788,430 square miles (three times the size of Texas), has 10 percent of the world's tropical rain forests. These 350 million forest acres contain an estimated 4,000 tree species, of which about 50 are harvested and made into hardwood and softwood plywood by Indonesia's forest products industry. For instance, Indonesian plywood, made from a species named meranti, is widely available in the U.S.

In the lush, rain-forest habitat, the growth rate of some trees exceeds 10' a year, and harvested areas quickly regenerate. That doesn't mean, though, that whole forests are destroyed and left to hopefully grow again. The Indonesian government has permanently set aside 75 million acres of rain forest as areas closed to all commercial and public use. Another 47 million acres are protected as conservation areas, but open to the public.

The government allows timber harvesting in the remaining rain forest, but carefully regulates it. In fact, loggers may only fell two or three trees per acre. Then, harvesting isn't permitted for 35 years! Loggers also pay a fee based on timber volume that funds reforestation. In this way, the people of Indonesia feel that their share of the world's rain forest will last forever. 🌳

Lush Indonesian rain forests are home to thousands of animal species.



Photographs: Courtesy Norm Grabowski; Wilson/Donaldson Assoc. Illustration: Jim Stevenson

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Tablesaw

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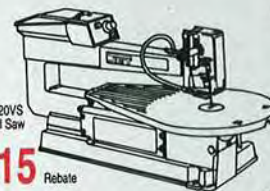
DC 650
Dust Collector

\$15
Rebate



JWL 1236
Woodworking Lathe

\$20
Rebate



JSS 20VS
Scroll Saw

\$15
Rebate

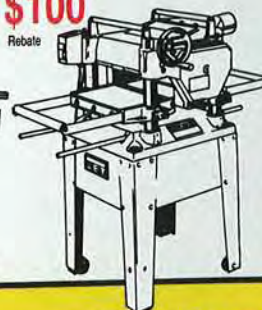
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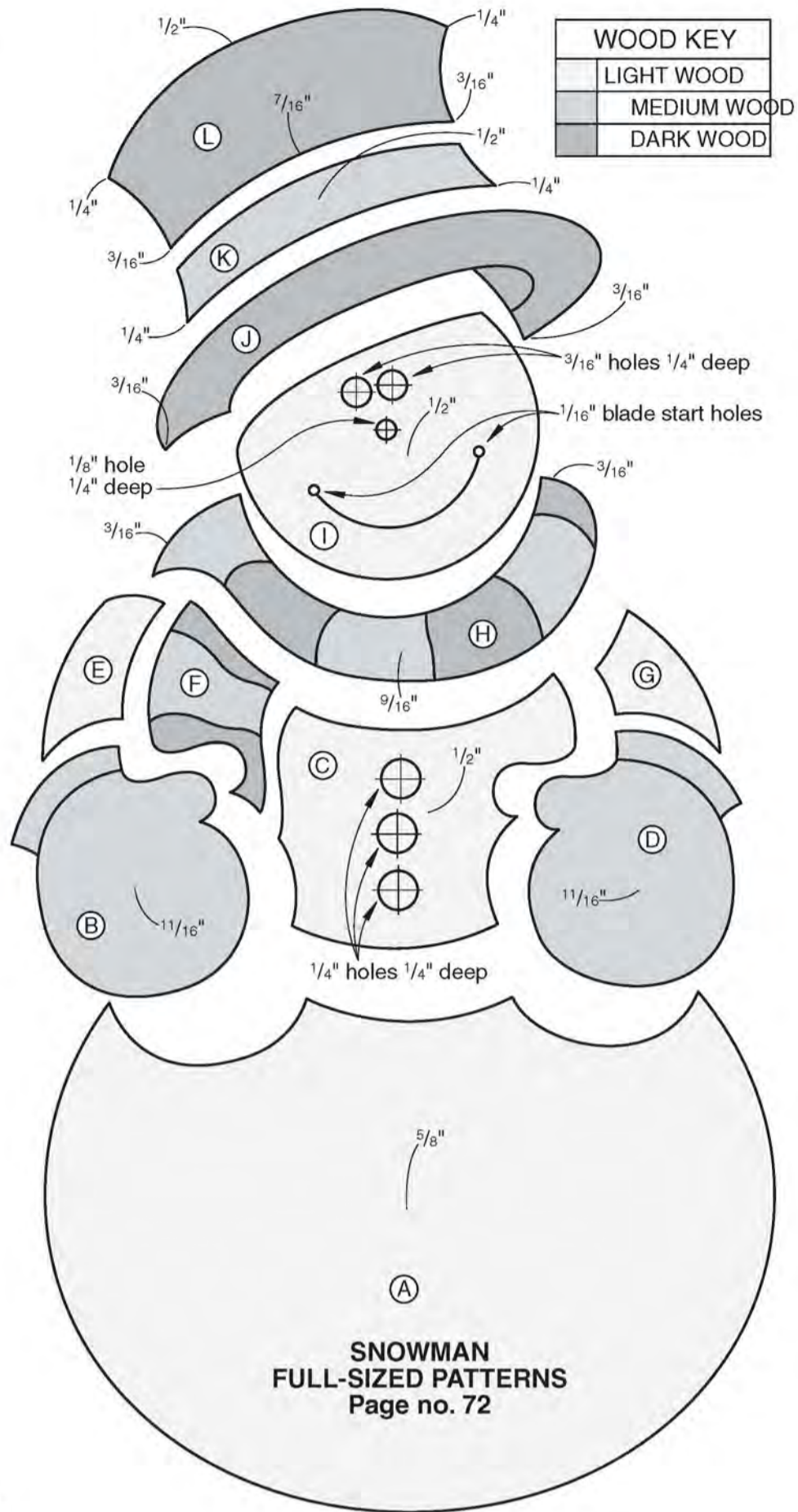
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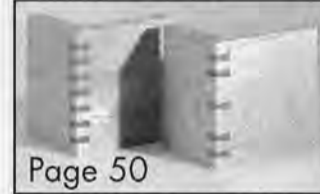
WOOD PATTERNS™

Full-sized for your woodworking convenience

DECEMBER 1994

ISSUE 75

Dear Reader: As a service to you, we've included full-sized patterns on this insert for irregular-shaped and intricate project parts. You can machine all other project parts using the Bill of Materials and the drawings accompanying the project you're building.



● **Decorative joint reinforcements**



● **Turned snowballs**

● **Shop clock**

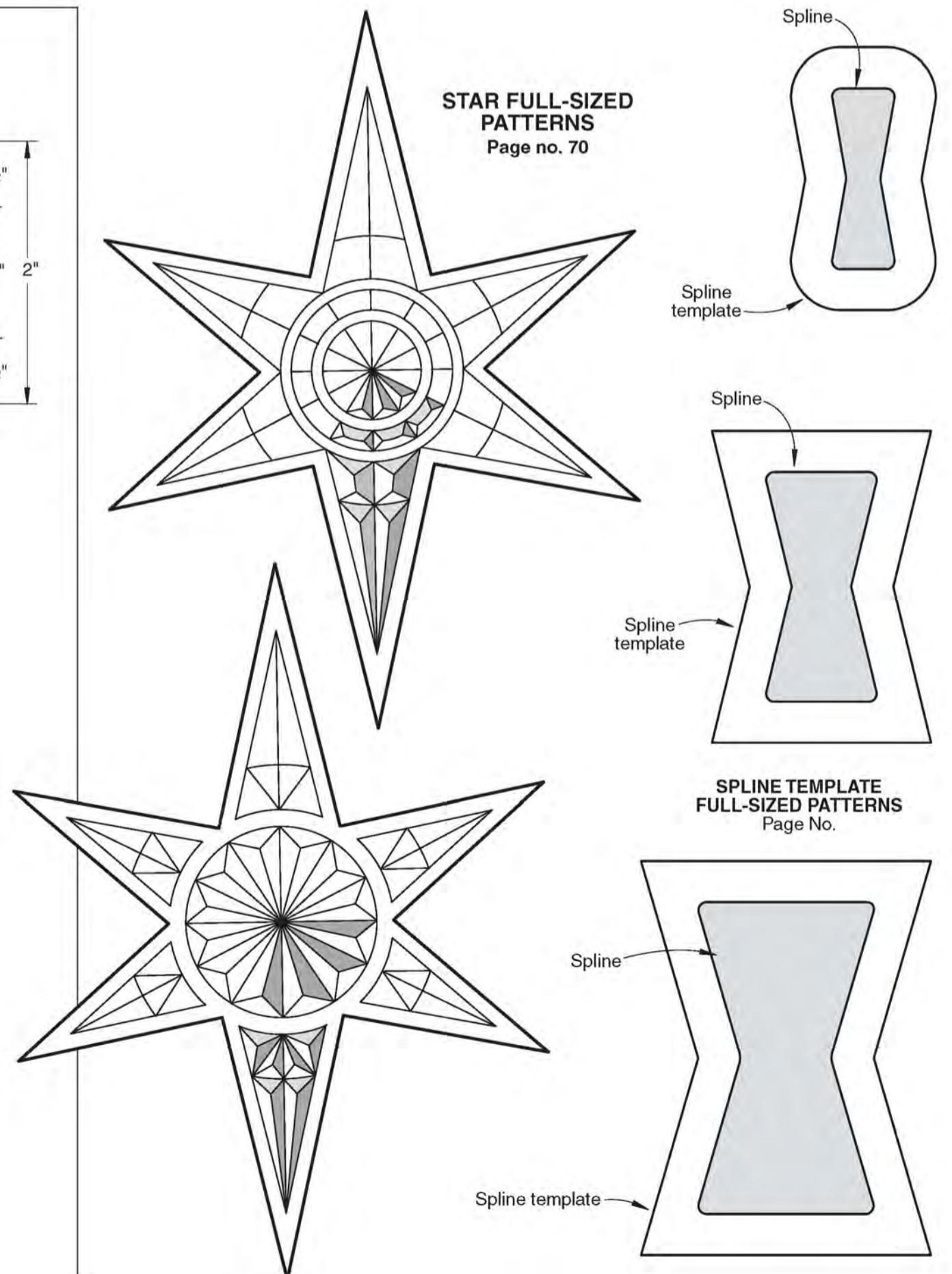
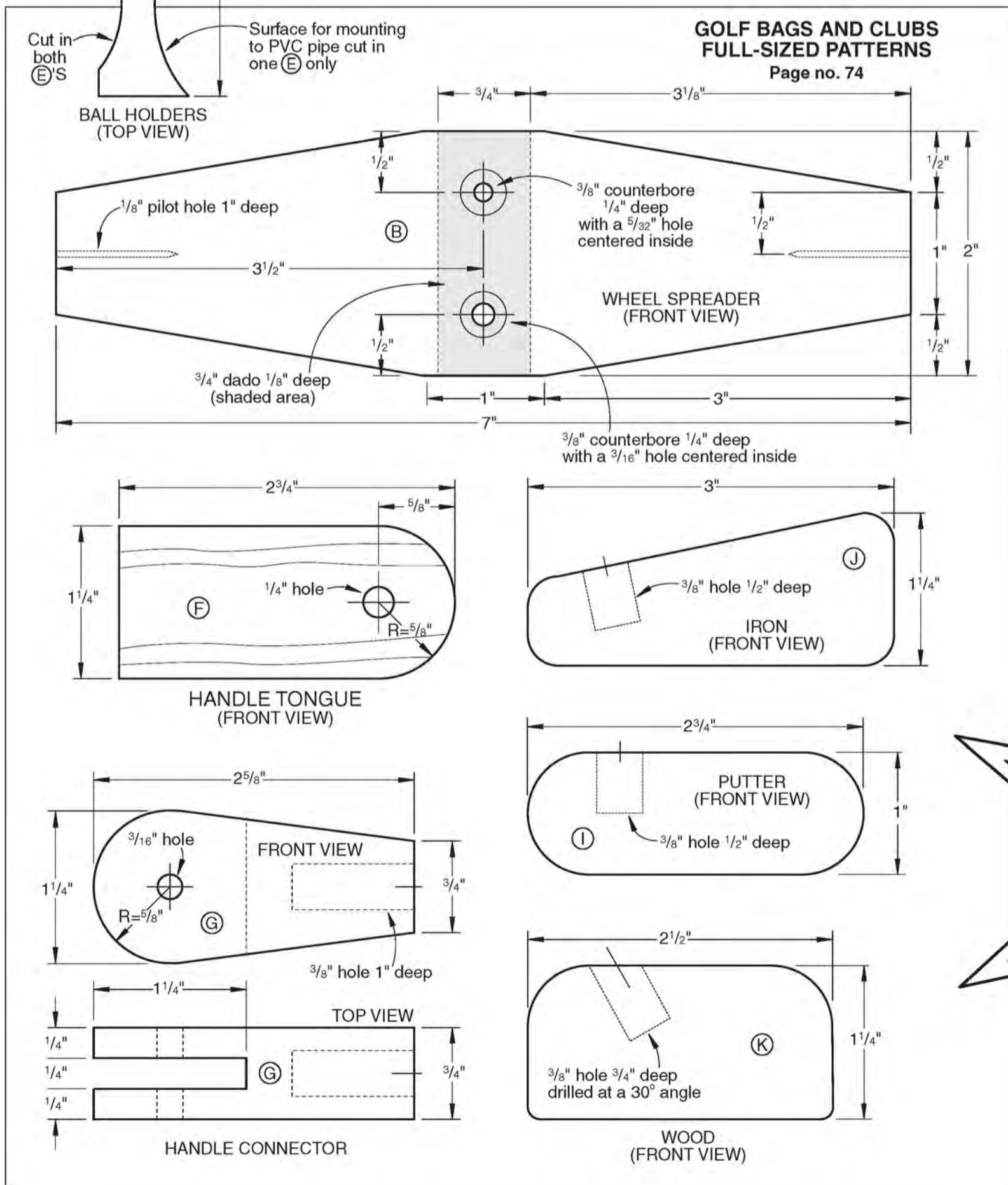
● **Chip-carved ornaments**

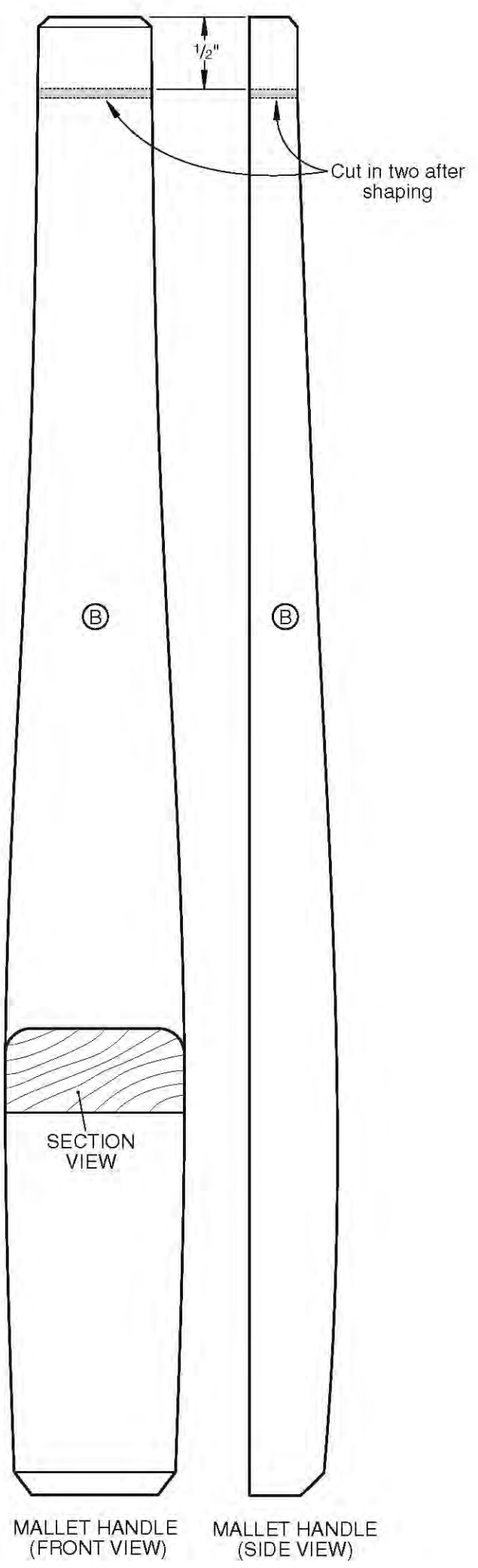
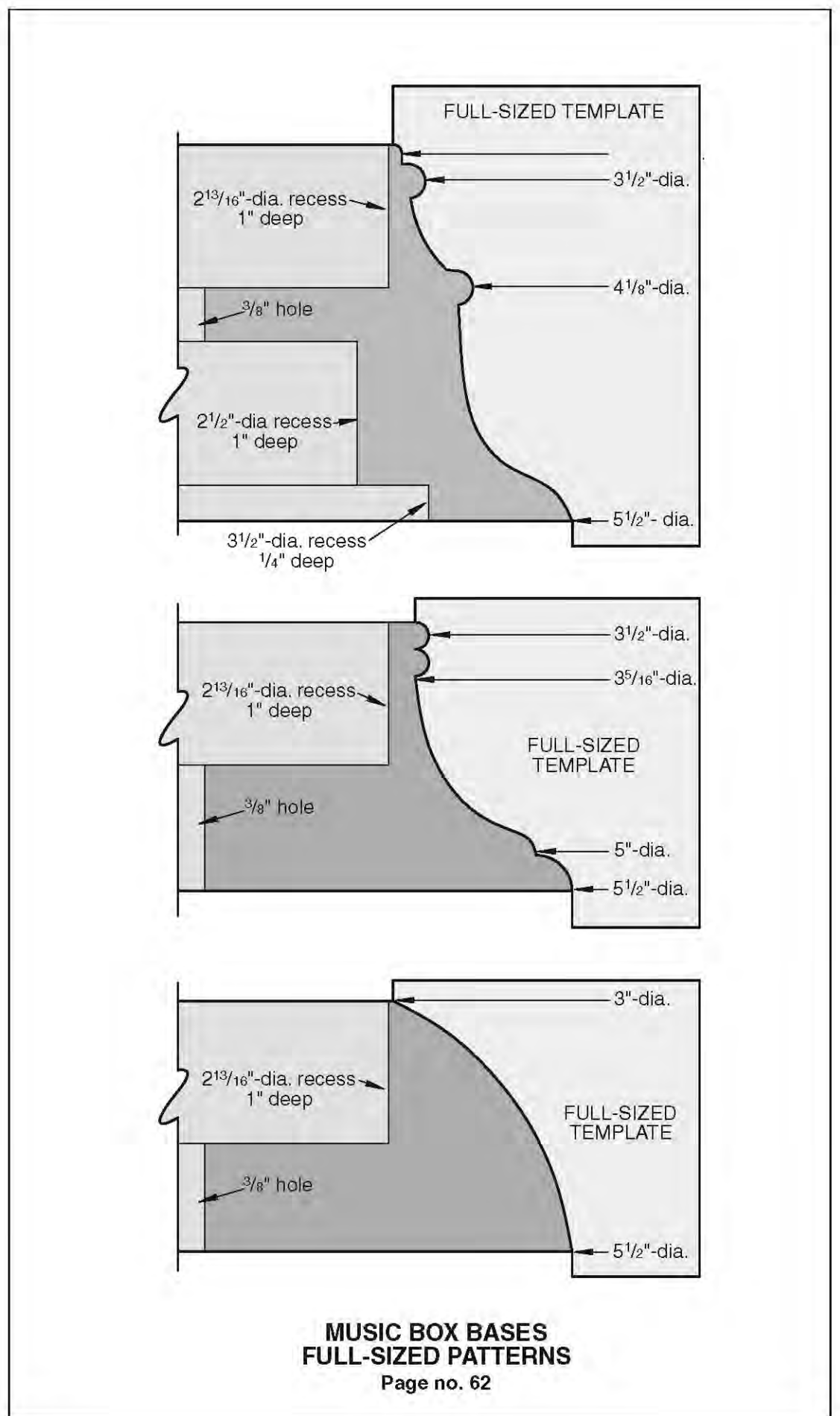
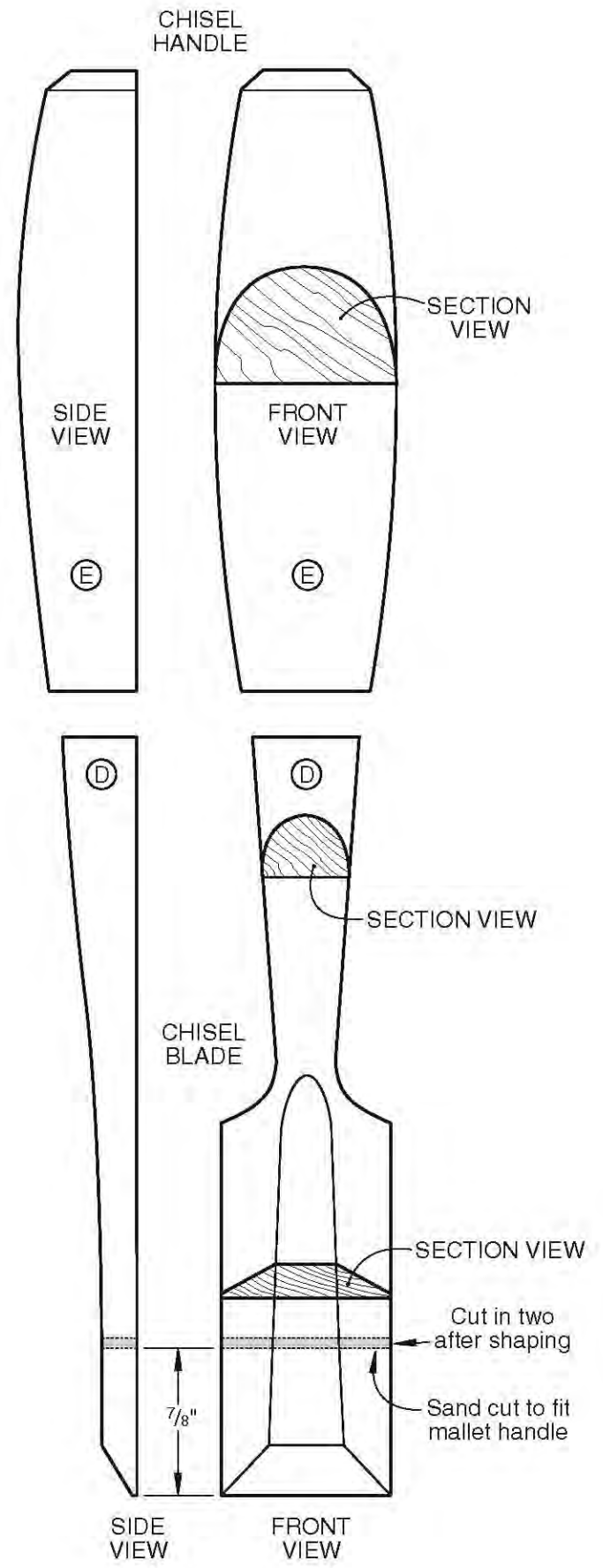
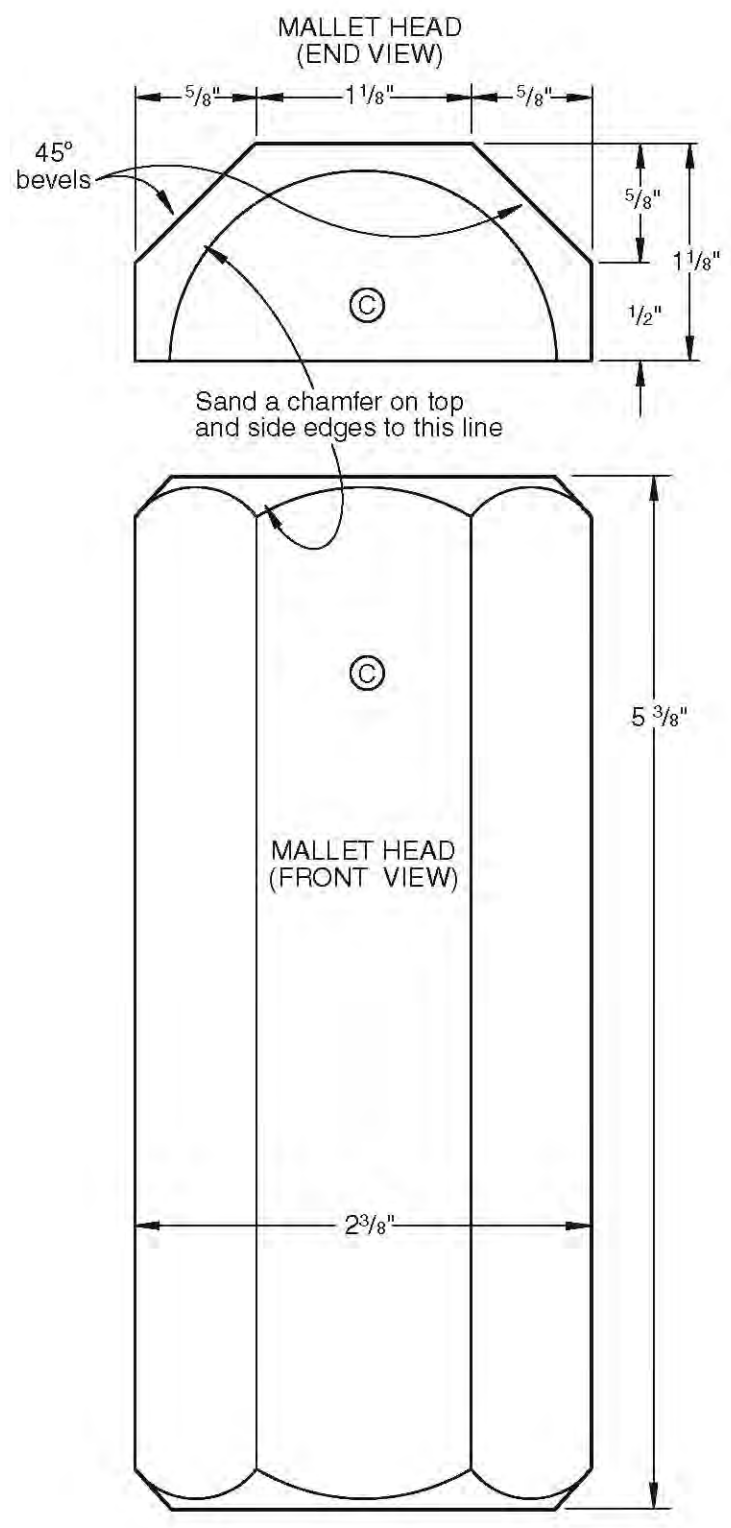
● **Intarsia snowman**

● **Kid's golf cart & clubs**



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SHOP CLOCK FULL-SIZED PATTERNS
 Page no. 66

