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Woodworker's Journal

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Three Designs

INTARSIA TROUT

Catch Ours
On Page 60



WOODWORKING 2000 —FUTURE SHOCK?

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Create This Heirloom Jenny Lind Cradle



Project: 14-Piece Jurassic Scene In a
Box • A Corner Sweep • Tablesaw Edge Jointer



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Vol. 18, No. 5

September/October 1994

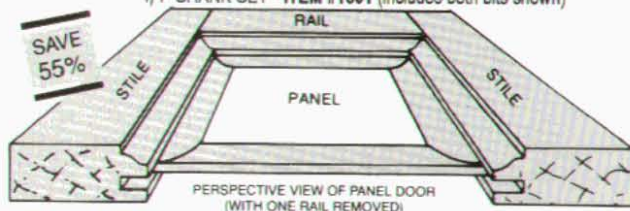
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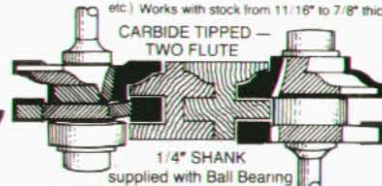
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#1307	CLASSICAL - 1/4" Radius — 3/4" Cutting Length	1/4"	\$25.00		#1338	FLUSH TRIM - 1/2" Diameter — 1" Cutting Length	1/4"	\$ 8.00
#1308	CLASSICAL - 3/16" Radius — 5/8" Cutting Length	1/2"	\$22.50		#1339	FLUSH TRIM - 1/2" Diameter — 1-3/16" Cutting Length	1/2"	\$ 8.00
#1309	45° CHAMFER - 3/8" Cutting Length	1/4"	\$13.00		#1340	PATTERN / FLUSH TRIM - 1/2" Diameter	1/4"	\$15.00
#1310	45° CHAMFER - 5/8" Cutting Length NEW !	1/4"	\$15.00		#1341	PATTERN / FLUSH TRIM - 3/4" Diameter NEW !	1/4"	\$17.00
#1311	45° CHAMFER - 5/8" Cutting Length	1/2"	\$17.00		#1342	PATTERN / FLUSH TRIM - 3/4" Diameter	1/2"	\$19.00
#1312	THUMBNAIL - 1-3/16" Large Diameter	1/4"	\$18.50		#1343	KEYHOLE CUTTER - 3/8" (bit not shown)	1/4"	\$ 8.50
#1313	THUMBNAIL - 2-1/2" Large Diameter	1/2"	\$35.00		#1344	KEYHOLE CUTTER - 1/2" shown	1/4"	\$ 9.00
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#1315	ROUND OVER - 3/16" Radius	1/4"	\$11.00		#1346	DOVETAIL - 1/2" Diameter — 14° NEW !	1/4"	\$ 6.00
#1316	ROUND OVER - 5/16" Radius	1/4"	\$14.00		#1347	DOVETAIL - 1/2" Diameter — 14°	1/2"	\$ 6.50
#1317	ROUND OVER - 1/4" Radius NEW !	1/2"	\$12.00		#1348	BEADING - 1/4" Radius	1/4"	\$13.00
#1318	ROUND OVER - 3/8" Radius	1/2"	\$15.50		#1349	BEADING - 3/8" Radius	1/4"	\$15.50
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#1321	MULTIFORM MOULDING - 15/16" Carbide Height	1/4"	\$40.00		#1352	LOCKMITRE - 1-1/8" Cutting Length	1/2"	\$45.00
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#1324	RABBETING - 1/4" Deep NEW !	1/4"	\$15.00		#1355	EDGE BEADING - 3/16" Diameter of Circle	1/4"	\$15.00
#1325	RABBETING - 3/8" Deep	1/4"	\$13.00		#1356	EDGE BEADING - 5/16" Diameter of Circle	1/4"	\$15.50
#1326	RABBETING - 3/8" Deep	1/2"	\$13.00		#1357	SPIRAL UPCUT - 1/8" Diameter (solid carbide)	1/4"	\$ 9.00
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#1330	BULL NOSE - 1/2" Diameter of Circle	1/4"	\$16.00		#1361	SPIRAL UPCUT - 1/2" Diameter (solid carbide)	1/2"	\$29.00
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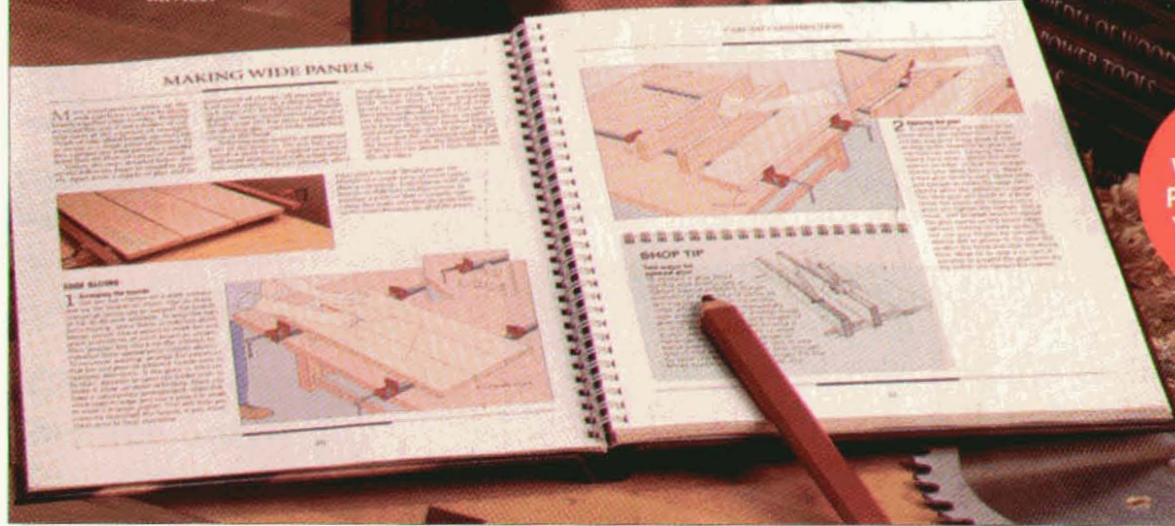
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Woodworker's Journal

SEPTEMBER/OCTOBER 1994 VOLUME 18, NUMBER 5

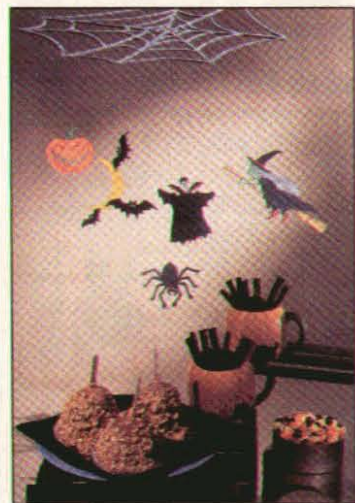
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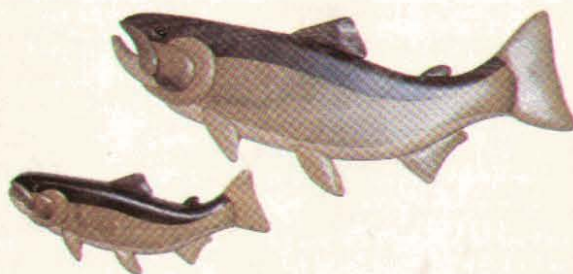
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FULL-SIZED
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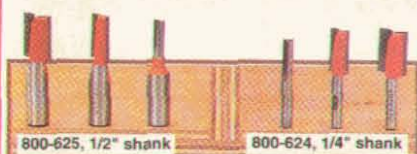
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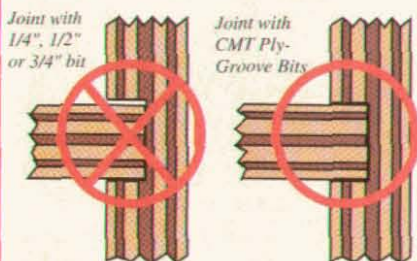


45 *Tablesaw Edge Jointer*

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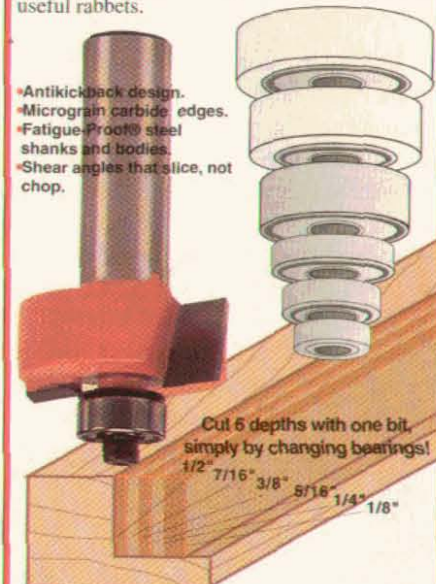
That's right, CMT promises you top-flight performance with every blade, or we'll cheerfully refund every penny of your purchase price. We don't think that'll happen, but if it does, you keep your free 5" blade stabilizers as our gift! Check our catalog, these precision machined stabilizers usually sell for **\$19.90**! More important, they improve the quality of your cuts by reducing vibration produced by the saw's motor, belts and bearings. Every CMT blade features micrograin carbide teeth, anti-kickback design and precisely-calculated angles & bevels. And all our blades now feature a new pattern of sound suppression slots for smoother, quieter cutting.

All blades 10" diameter with 5/8" arbor

Item	Primary Function	Teeth	List	SALE
110-240X	Rip wood or plywood	24	\$60.00	\$51.00
110-500X	General purpose	50	\$74.00	\$62.90
110-800X	Chip-free laminate cuts	80	\$79.00	\$67.20
110-801X	Splinter-free miter cuts	80	\$79.00	\$67.20
110-600X	All-purpose radial saw	60	\$74.00	\$62.90

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Here's a super price on the most versatile Rabbeting Kit on the market. You'll get an 1-3/8"-diameter Rabbeting Bit, 6 top-quality bearings and an allen key to cut 6 of the most useful rabbets.



800-622 1/4" Shank Set,
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800-623 1/2" Shank Set,
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Chamfer Set**

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Cutting those angles accurately on a table saw can be tedious work.

CMT's precise carbide edges relieve you of the tedium, cutting perfect angles every time!

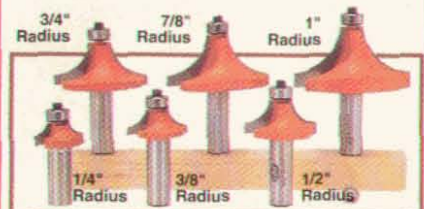


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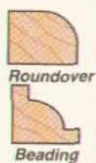


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Shoptalk

WOODWORKER'S JOURNAL MOVE COMPLETE

In May, we announced that PJS Publications had purchased *Woodworker's Journal* from its founder, Jim McQuillan. Today, I am delighted to report that we've made the transition. The magazine's physical elements—files, photographs, back issues, computers, shop equipment, and everything else associated with a magazine—have been moved to Peoria, lock, stock, and barrel. But even more important, we have a new team in place, already editing, designing, and marketing future issues of *Woodworker's Journal* magazine for you.

I believe we've assembled a strong, dedicated team to produce *Woodworker's Journal*. The individuals pictured below have the professional experience and personal dedication to publish the high-quality woodworking magazine you expect. We all look forward to this challenge. We also challenge you to help us reach this potential—to let us know what you like and what you want in your magazine!



Woodworker's Journal staff—front row, left to right: Mark Ziobro, Doug Cantwell, Marcia Sacharow, Carmen Martin; back row, left to right: Mari-Rose Minyo, Michael Copping, Art Setterlund, Charles Sommers, Dana Quiram.

NO WOODWORKING MAGAZINE WITHOUT A SHOP

After several disappointing construction delays, we've finally moved the tablesaw, jointer, drill press, and all of the other woodworking tools into a great, roomy facility. Project builder Mark Ziobro, managing editor Doug Cantwell, and I have been waiting impatiently for this. But let me warn you up front, it's a working shop, not a show shop, and we are proud of it. We will, of course, share parts of it with you from time to time through photos and the projects we build in it.

We also invite you to visit our editorial offices and woodworking shop any time you are in the Central Illinois area. We're easy to find, just two blocks from US highway 150 and the Illinois River. Look for a brown-colored building trimmed with red. We'll dust off the coffee cups, kick a few wood shavings, and share some woodworking stories.

Charles Sommers

Woodworker's Journal

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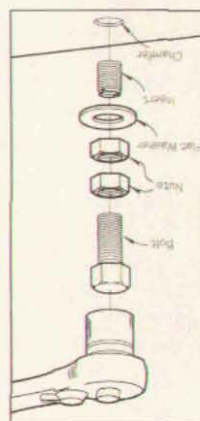


In your May/June issue you show a PRO TIP on page 42 that I take exception to. When driving wood inserts, I've found that you need a jam nut on the drive bolt. Otherwise, the insert will screw out of the workpiece hole when you remove the bolt.

Here's how I usually drive wood inserts for my projects: After sizing the bolt to the inserts, I cut off the bolt's head. Next, I chuck this bolt into my drill press, place a jam nut on the bolt, screw the insert onto the bolt with the slot down, and then tighten the jam nut against the insert.

To start the insertion process, I place the workpiece on the drill-press table, align the insert with the hole, and lower the drill quill. Next, I hand-rotate the chuck to screw the insert into the workpiece hole. After I've driven the insert to the desired depth, I loosen the jam nut, and hand rotate the bolt out of the insert.

Ron Hale, Joshua Tree, Calif.



Thanks Ron, for calling the omission in the PRO TIP illustration to our attention. And yes, a jam nut should be used—in fact we even go a step further and recommend using two jam nuts on the bolt, as shown on the revised illustration at left, and a flat washer between the bottom jam nut and the insert. If you use a washer larger than the hole, it acts as a depth stop when it contacts the wood's surface.

When using the drill press in our shop to drive inserts into workpieces, we apply just enough downward pressure to prevent the insert's threads from tearing the wood as they start into the hole. Using the drill press also ensures that the inserts will be driven in square—an occasional problem when hand-driving threaded inserts.

Your safety is important to us... We strive to present our plans and techniques as accurately and as safely as possible, and we try to point out specific areas and procedures that require extra caution. But because of the variability of local conditions, construction materials, and personal skills, we can't warn you against all potential hazards. Please remember to exercise common sense and use safety measures when operating woodworking equipment. Don't attempt any procedures you're not comfortable with or properly equipped for. Sometimes, for the sake of clarity, it's necessary for a photo or illustration to show power tools without the blade guard in place. In actual operation, though, you should always use blade guards and other safety devices on power tools that are equipped with them. Remember, an ounce of prevention really is worth a pound of cure.

We welcome your opinions and comments (both pro and con) concerning Woodworker's Journal. If you would like to write to us, please address your correspondence to: Letters Department, Woodworker's Journal, News Plaza, P.O. Box 1790, Peoria, IL 61656.

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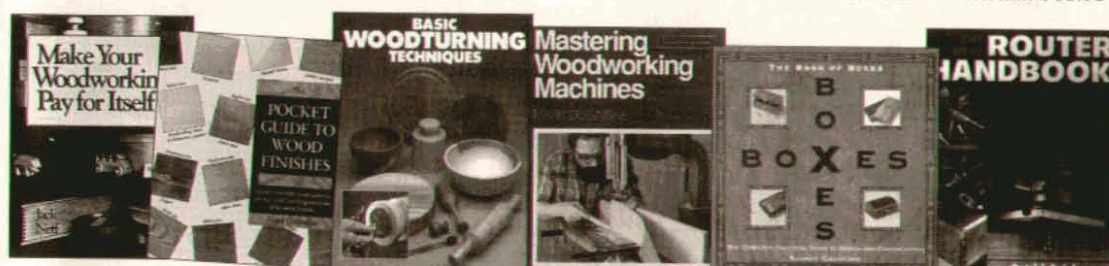
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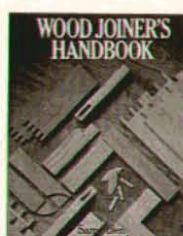
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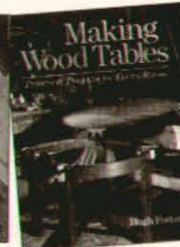
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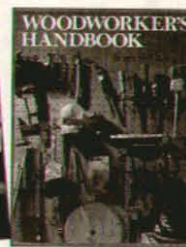
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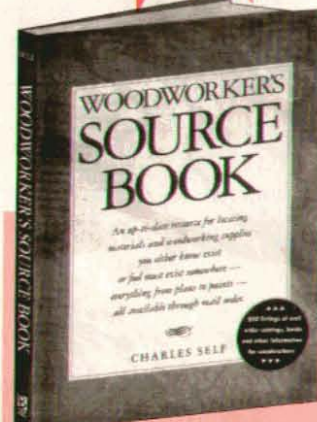
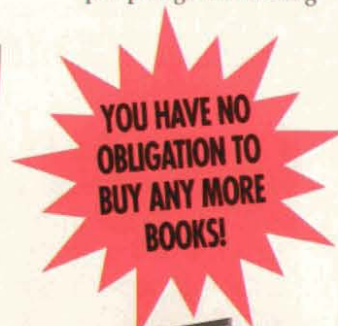
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Readers' Information Exchange

Looking for an owner's manual for an old bandsaw? Need a bearing for a hand-me-down tablesaw? Can't find a source of supply for an odd piece of hardware? Maybe our readers can help. Send along your request and we'll try to list it here—and perhaps one of our readers will have an answer for you. We'll include as many requests as space permits.

I would appreciate it if anyone that has a Craftsman radial arm saw model no. 11329501 would correspond with me. I need a copy of the owners manual and will pay for copying and postage.

Ladd Tobias
1001 Toby Run Rd.
Danville, PA 17821
717/275-3378

I need a source for foreign (German) keys and key blanks. The locks have numbers (#4, #5 etc.) stamped inside the mechanism. The house is 5-7 years old.

Paul A. Misch
139 Roan Dr.
Danville, CA 94526

I've been given a McGraw-Edison (Bersted Mfg. Co.) combination saw-lathe-power house/sand/saw/turn/finish model 76100-A. It's in excellent shape, but I'm missing all of the accessories and a manual. Can anyone help?

Jesse Sklarin
4 Pheaton Lane
Marlboro, NJ 07746

I have a Stanley model 363 "All Purpose" Saws-All. Stanley doesn't make blades for it any more. Can anyone help me find a new blade source?

C. S. Griffin
124 W. Indiana Ave.
Beach Haven, NJ 08008

I need a copy of a Mill-Route owners manual.

Margaret Boniarczyk
HCR-68 Box 43
Ft. Garland, CO 81133

I am seeking parts lists and owners manuals for the following Sears Craftsman tools: a 3-wheel bandsaw model 103.24300, manufactured by King Seely Corporation, and jointer model 149.21871.

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Product News

To keep you up-to-date, this column features brief descriptions of new tools and supplies on the market. The product descriptions are provided by the manufacturers and presented here for your information. These products have not been tested or reviewed by Woodworker's Journal editors.

Oscillating Spindle Sander Smooths Curved Workpieces

Fast, uniform sanding of just about any curved edge can be handled easily and efficiently with Sears new Craftsman oscillating spindle sander.



The sander features a 20x20" melamine tabletop and a 1/2-hp motor operating at 1725 rpm with 60 oscillating cycles per minute. A 1/2" and a 2" rubber drum, abrasive sleeves, and inserts come with the unit; 1/4", 1", and 3" sizes are optional. Available at Sears stores, product number 22590.

More Punch, Longer Run Time With 14.4-Volt Cordless Drill/Driver

If you need more driving power and longer battery life, then check out DeWalt's new line of heavy-duty 1/2"-adjustable

clutch cordless drills. This top-of-the-line, 14.4-volt model

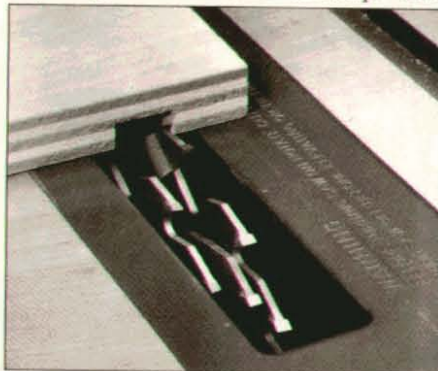
(DW991K) features dual speed range, a heavy-duty keyless chuck, a new ergonomically designed handle and anti-slip grip, and easy-to-read settings. It also comes with a steel case and one-hour charger. The manufacturer claims



the new "XR" battery pack lasts about 25 percent longer than standard batteries used on most current battery-powered models. Modified and lower-voltage versions of this new line are also available. For information, contact DeWalt Industrial Tool Company, 626 Hanover Pike, P.O. Box 58, Hampstead, MD 21074; telephone: 410/716-3544.

New Dado Delivers Flat, Clean-Bottom Grooves

If you're tired of chiseling uncut material in poorly cut dado grooves, this new Excalibur Elite dado set from Sears will excite you. In operation, this 8" unit produces square, flat, clean-bottom cuts requiring no additional cleanup. The



reduced tooth angle of the carbide-tipped scoring teeth on the outside blades also helps reduce chipping on sheet stocks. Its adjustable dial allows changing the cutting width in 1/8" increments from 1/4" to 1 1/8" without removing the unit from the saw's arbor. Sears model no. 32608.

Air Switch Gives Scrollsaw "Hands-On" Operation

Scrollsawyers will like using the new Delta Lectric Air Foot Switch. It gives convenient and safe control of the equipment, allowing saw starts and stops with hands free to hold down the workpiece. The unit can also switch a dust collector on or off at the same time, eliminating the hassle of operating two

switches. The Foot Switch employs an air-activated, alternate-action switch—pressing once turns the machine on, another press of the pedal turns the machine off.

All parts, including the controller, 10' of air tube, the foot-pedal activator, and protective shroud, assemble without tools. For more information, contact Delta International Machinery Corp., 246 Alpha Drive, Pittsburgh, PA 15238.



One-Piece Hole Saws For Those Special Projects

Black & Decker recently started marketing a new line of one-piece bimetal hole saws ideal for those occasional jobs. The manufacturer claims that their integrated-mandrel saws—made from long-lasting alloy steel bodies with hard, high-speed steel teeth—will stay



sharp longer and cut faster than most ordinary hole saws. You can buy the one-piece hole saws in 11 hole diameters ranging from 3/4" to 3". For more information, contact Black & Decker Consumer Services, P.O. Box 618, Hampstead, MD 21074.

Continued on page 15

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Readers Ask

TURNING GREEN WOOD

I have been trying to read between the lines about turning green wood. Roger Holmes wrote in your child's Windsor chair article (Sept./Oct. 1992) that spindles dry quickly and the process can be speeded up by placing them in a bucket of heated sand. If I start turning a friendly neighbor's wood pile into spindles, what do I need to know about drying green spindles?

David Eberle, Zelenople, Pa.

Roger Holmes' reply:

First, a bit of terminology. I call the thin uprights in the chair back spindles, and the heftier horizontal pieces that tie the legs together, stretchers. The spindles are so thin that they are usually dry by the time I'm ready to assemble the chair.

Stretchers, which I turn after the legs have been socketed into the seat, may need a little help in order to dry enough for assembly. To do this, I fill a 10-12" kitchen saucepan (that's roughly the same depth) with sand and heat it on a hotplate. Then, I plunge the tenoned ends of the stretchers an inch or so beyond the shoulders into the hot sand.

How fast the tenons dry depends on how hot the sand is. If the sand is too hot, it may char the wood, and if too cool, the process takes a long time. You may have to fiddle around a bit until you find the heat setting that makes the sand just right. My sand doesn't heat evenly, so I give the spindles an occasional turn. Also, the finer the sand, the better. You might be able to buy some from a store that sells eyeglasses if they still use hot sand to heat the temples.

You need to dry just the tenoned ends of the stretchers. I prefer an H-pattern for the stretchers, with the center stretcher tenoned into bulges in the two side stretchers. For that construction, you want the mortised "bulge" to be wetter than the stretcher so that it will shrink around the tenon and tighten the joint. Because the seat stock is dry, this doesn't apply to the spindle tenons and seat mortises. I usually make the spindle tenons oversized, and then let them dry. Finally, I remount them on the lathe, and turn them for a snug fit in the mortises. 

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THE AIR-MATE 3 AIR FILTERING SYSTEM

By Dennis Preston

Breathing dust used to be part of being a woodworker. You worked in a dusty shop and breathed dusty air: it went with the territory. The general unpleasantness of coughing, sneezing, sore eyes and throats, allergies, and even more serious breathing and lung problems eventually plague many of us.

For some of us, dust bags on portable power tools and larger dust collectors form our main line of defense against the hazards of prolonged wood dust exposure. These devices do capture most of the larger particles, but unfortunately miss the very fine airborne particles that pose potential health hazards. To make matters worse, these fine particles can remain suspended in our shop air for hours, extending our exposure time beyond just the period when we created the dust. For those requiring more exacting protection, here's another solution.

A Personal Protection Device

The Air-Mate 3 consists of a belt-mounted air filter, a flexible breathing tube, and a dust helmet with face shield. A fan in the belt unit draws air through an air filter and delivers the filtered air through the flexible tube to the helmet. An air duct directs the air over the user's face. A hinged Lexan shield and Tyvek seal cover and protect the user's face.

A rechargeable nickel-cadmium battery powers the blower. A charge lasts about eight hours. The helmet assembly weighs less than two pounds, and the filtering unit, battery, and breathing tube weigh 2.4 pounds. The unit has been NIOSH-approved for protection against dusts and mists. It was not designed for use in low-oxygen or explosive environments, or in atmospheres containing toxic gases or vapors.

How It Worked For Me

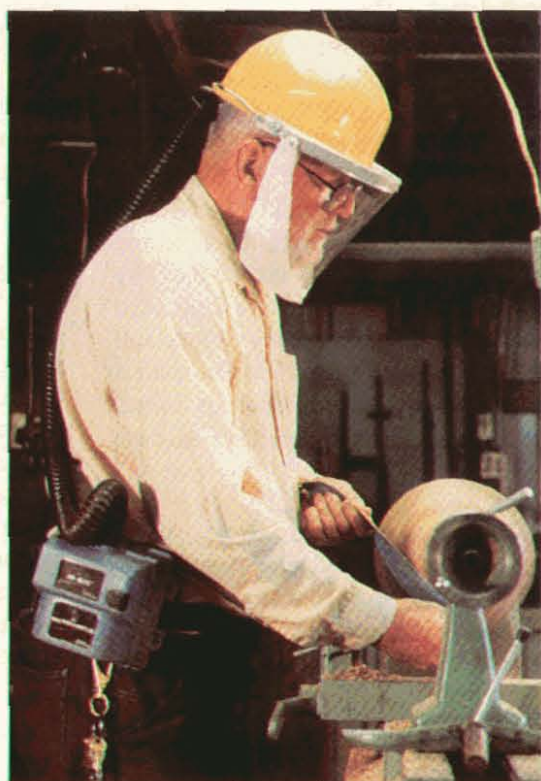
I wore the Air-Mate 3 while going about my normal shop jobs, both bench work and using power tools, including several sessions at the lathe. In a cramped shop like mine, the Air-Mate 3 required a short adjustment period. The unit worked flawlessly, but I was routinely bumping the helmet and filter unit until I got used to allowing extra space for these appendages. Once over that hurdle, I began to appreciate the cool air being directed over my face. Although the fan pushes eight cubic feet of filtered air a minute, I found the motor noise barely noticeable.

Air filtration was much more effective than the paper masks I typically use. Bearded wearers will find this especially true because the visor and Tyvek completely cover and seal around the face.

The unit uses a paper filter cartridge designed to be replaced when airflow drops below six cubic feet of air per minute. I found it generally not cleanable. The manufacturer estimates filter life at 50 to 75 hours, but this will vary depending on dust conditions. Replacement filters cost \$12.50.

The helmet resembles a standard construction hard hat and has an adjustable internal harness to fit most head sizes. It felt a little heavy for me at first. I was most aware of it on my head when I moved about the shop. However, when I focused on a task like sanding or turning, I forgot that the helmet was there.

I appreciated having the Air-Mate 3 for tasks like routing and turning that create lots of dust and chips. The

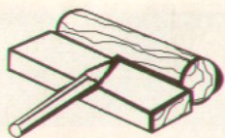


Woodturner Jim Mathias, owner of the Firewood Modification Shop in Three Rivers, California, models the Air-Mate 3. The battery-powered belt-hung unit delivers a continuous supply of filtered air across the user's face.

face shield provides great eye protection, and the forced ventilation eliminated any fogging—real pluses.

Should You Buy?

The Air-Mate 3 provides clean, filtered air and eye protection for a variety of adverse dust and chip conditions commonly encountered in many woodworking operations. The unit proved to be portable, comfortable, and quiet. While not cheap at \$329, the professional-quality unit should last a long time. Considering the cost of health care for allergies and bronchial infections, it truly may be a woodworker's ounce of prevention. Also, if you've found it necessary to curtail or discontinue woodworking due to dust-related respiratory problems, you should consider the Air-Mate 3. It may be one way for you to continue your woodworking activities. 



Shop Tips

Magnets Keep Saw Blades Handy

Reluctant to deface my scrollsaw or stand, but wanting an accessible place to "store" several blades close at hand, I placed a couple of 3/4"-round magnets about 4" apart on one leg of my scrollsaw stand at a handy-to-reach position. The magnets hold my spare blades securely out of the way until needed. Magnets like I use can be found at crafts-supply stores and many hardware stores for less than a dollar for a pack of four or more.

Jim Penkala, Calistoga, Calif.

Easy, Fast Workbench Cleanup

When I sand or rout on my workbench, the dust and chips get vacuumed away immediately, requiring little or no clean up. To do this, I simply cut a 2 1/4"-square hole in the

top of my workbench. When I'm ready to work, I connect the end of the shop vacuum hose to the underside of the hole. What little dust remains on the benchtop can be brushed into the hole before turning off the vacuum.

A. G. Cebulla, Lindstrom, Minn.

Small Containers Extend Storage Life Of Finishes

Over the years, I have saved considerable money on finishing products by following a relatively simple procedure. Once I have used half of a gallon or half a quart of product, I empty the remaining amount into a clean spare can half the original size. For example, I usually pour the remaining half-gallon into two quart cans, or the remaining portion of a quart into a pint can. This minimizes the amount

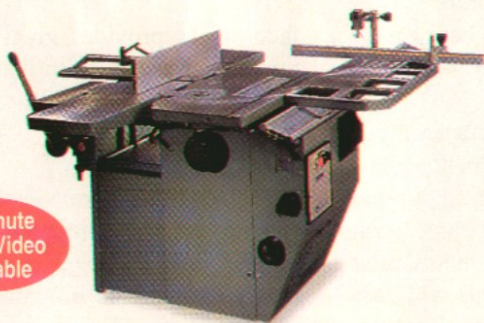
of air that can cause rapid deterioration of a finishing product.

You can buy empty metal containers of all sizes from paint stores. The pint cans I buy cost me about 80 cents, quart cans around \$1 each. These cans are not lined or coated, so you wouldn't want to store latex or other water-based materials in them.

Robert Noelle, Middletown, N.Y.

Woodworker's Journal pays \$25-\$100 for reader-submitted shop tips that are published. Send your ideas (including sketch if necessary) to: *Woodworker's Journal*, News Plaza, P.O. Box 1790, Peoria, IL 61656. Attn: Shop Tips Editor. We redraw all sketches, so they need only be clear and complete. If you would like the material returned, please include a self-addressed stamped envelope. 

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Wood Clamps Get New "Release" On Life

For that multitude of bench-top or drill-press table jobs, Sears' Craftsman quick-release 4-position bench/drill press vise



will handle most of them quickly and easily. Its 4-position versatility allows mounting the vise over the bench as shown, horizontally in front of the bench, and at 90 degrees and 45 degrees in front of the bench for easy workpiece access. The slotted holes allow quick bolting to most drill-press tables. And, a press of the quick-release button unlocks the spindle for instant jaw positioning. The vise measures 4" wide, 1 1/4" high, and accepts workpieces up to 4" thick. Sears no. 51881.

Comfortable, Low-Upkeep Respirator For Better Protection

If you want or need protection while spraying finishes or paints, put Binks' new SprayMate respirator on your "must check out" list. Molded from "Krayton",

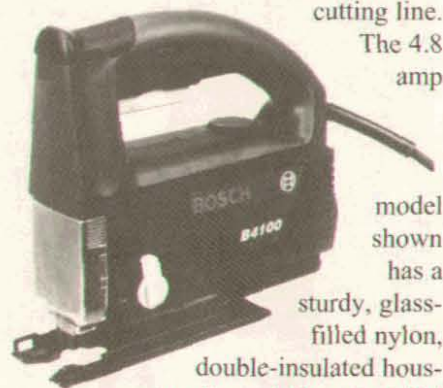


the nonmetal construction makes it both lightweight and flexible to fit your face and seal. Filter cartridges lock in place on bayonet-styled mountings. SprayMate comes in three sizes, and has adjustable elastic straps to accommodate most wearers. To maintain the respirator, you simply wash it in soap and water and replace the filters as needed.

For more information contact Binks Manufacturing Company, 9201 Belmont Ave. Franklin Park, IL 60131-2887; telephone: 708/671-3000.

Match Saw Speed To Fit The Cutting Job

New variable-speed orbital jigsaws from Bosch feature four-position orbiting action for faster cutting and a three-position chip blower to clear the cutting line.



The 4.8 amp

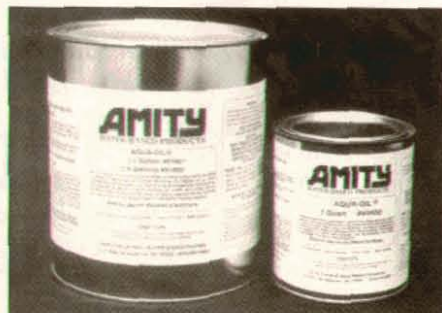
model shown has a sturdy, glass-filled nylon,

double-insulated housing. Its variable-speed dial

switch allows you to set operating speeds ranging from 300 to 3,000 cutting strokes per minute (no load) and incorporates electronic feedback circuitry to maintain blade speed. The 5/8" blade stroke allows the tool to make 2 1/8"-deep cuts in wood, 3/32" in plastic and fiberglass, 1/8" in aluminum and nonferrous metals, and 1/4" in mild steel. The footplate can be retracted for flush cutting, or tilted up to 45° for bevel cutting. For more information contact Bosch, S-B Power Tool Company, 4300 West Peterson Ave., Chicago, IL 60646; telephone: 312/286-7330.

Wipe-On Water-Base Finish Replaces Oils

Amity now offers Aqua-Oil, a water-based (modified acrylic resin base) wipe-on finish for use in place of tung oil, linseed oil, and other oil-based wipe-



on finishes. With its low-solids formula, the manufacturer claims that the product

is nonflammable and meets all current environmental standards for low emissions. It best fits applications not subjected to heavy, daily use. Applied by wiping, dipping, spraying, or brushing, it dries ready for recoating in 30 minutes. Amity recommends three coats for most applications, or top-coating with other Amity water-based finishes. The product comes in clear or natural and tints of either red oak or walnut. Custom colors can be achieved by mixing or tinting.

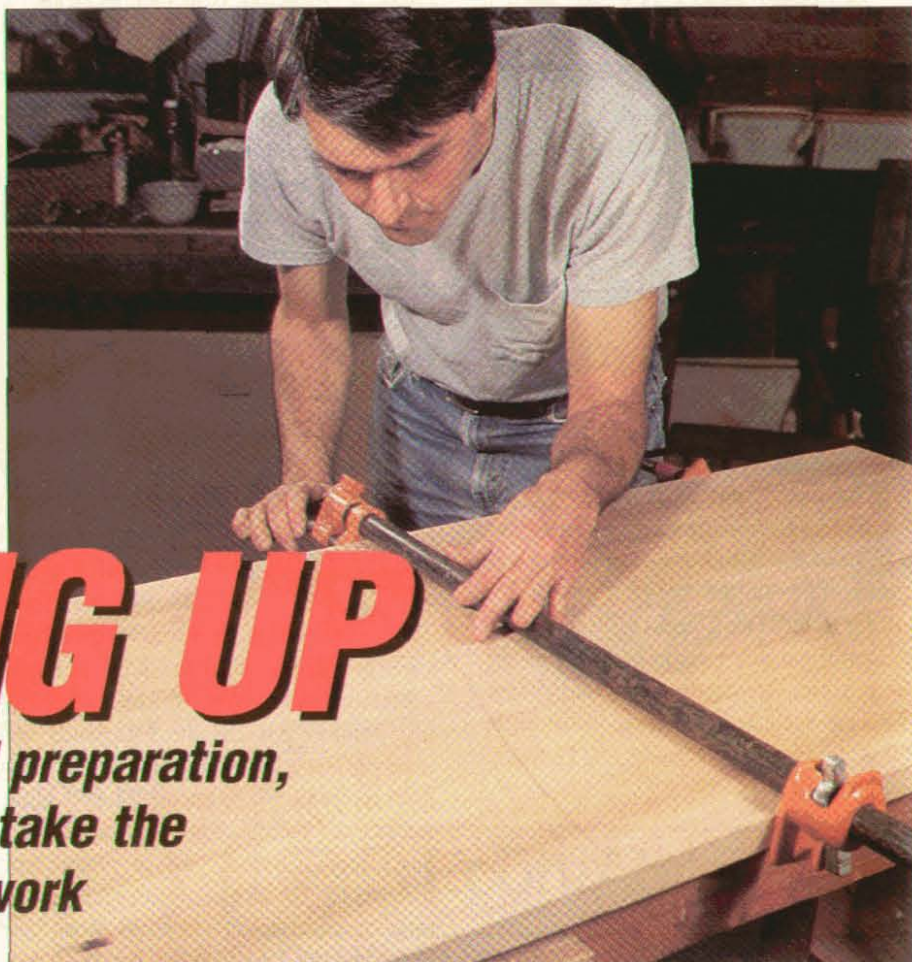
For product information, contact Amity Industrial Water-Based Finishes, Inc., P.O. Box 36, 123 S. Monroe Street, Waterloo, WI 53594; telephone: 414/478-9633.

New Coating Gives Drill Bits A New Twist

Black & Decker's newest version of its popular Bullet bits now sports a new bronze oxide coating which, says the manufacturer, improves their performance and gives them longer life. The new bits, readily identified by their distinctive gold and silver color, will be marketed in a new multipurpose case in 8-, 11-, and 14-piece sets. The tough plastic case has a hand drill/screw index gauge, a standard/metric ruler, and a 30°/45°/60° corner angle measure molded into its body. For more information, contact Black & Decker Consumer Services, P.O. Box 618, Hempstead, MD 21074, or telephone 800/762-6672.

New Scrollsaw Offers Variable Speeds

If you're looking for a variable-speed scrollsaw at a modest price, check out the new Ryobi 16" unit sometime soon. Designed to sell below \$200, model SC162VS fits in a price range where most saws typically offer just one or two operating speeds. According to the manufacturer, you can select an operating speed of 400 to 1600 strokes per minute to match the needs of your project. The saw has a 16" throat and uses a 5" blade that provides a 2" cutting depth in wood. Ryobi's saw also incorporates a blower to clear sawdust away from the cutting line, an easy-to-use, lever-type blade-tension adjustment, a tilting table, and an adjustable hold-down foot. For more information, telephone Ryobi Customer Service at 800/525-2579. 



GLUING UP

*Simple tools, careful preparation,
and a little planning take the
stress out of sticky work*

by Roger Holmes

Few woodworking operations spark more anxiety than gluing up a complex project. Weeks of preparation—surfacing, joint cutting, routing, carving—are all on the line as you apply glue and then race to assemble and pull everything together before the glue sets. For the beginner (and, truth be told, for more than a few older hands), gluing up even a simple tabletop can be a daunting prospect.

I don't know that it's possible to eliminate nerves from the process entirely. After gluing up woodworking projects for 25 years, I still get butterflies in anticipation. It is possible, however, to channel the anxiety into a useful rush of adrenalin. Also, well-machined, snug-fitting joints ease a lot of the tension. Whether you're building a three-board coffee tabletop or a Chippendale armoire, glue and clamps cannot magically cure ill-fitting joinery.

That said, choosing and correctly using the right glue and clamps, along with thorough preparation and a little planning, can make all the difference in how your projects go together. In this article, I'll outline the glues, tools, and procedures that have helped me avoid glue-up ulcers.

Glue—Making the Selection

For most of us, woodworking offers a welcome escape from an increasingly complex world. Many of the tools we use and the constructions we employ have remained virtually unchanged for hundreds, sometimes thousands, of years.

Not so woodworking glues. Although you can still get by with animal-hide glues that differ little from those used by ancient Egyptian carpenters, most of us select one of the more technologically sophisticated adhesives perfected within the last 50 years or so. These glues surpass their forebearers in strength, durability, and ease of application. Technological advancement doesn't necessarily make glues "better," however. Countless pieces of superb furniture remain soundly cemented together by hide glues.

Technology may create more choices, but this in turn makes the choices more difficult. I'd like to say that my choice of glues rests on a thorough study of all the available options. In fact, I've generally followed the examples of the masters I trained with and other woodworkers whose judgment and experience I trust.

For most of what I make, which includes household furniture and fittings, I use Elmer's Glue-All, a white polyvinyl acetate (PVA) glue (Photo A). It forms a bond stronger than the natural bond between wood fibers. At shop temperatures of 65-85°, it sets up slowly enough to let me assemble and clamp most complex constructions. (This period of workability is called "open assembly time" or "open time.") This glue cures sufficiently in an hour or so to permit unclamping (its "closed assembly time"), a real advantage in a clamp-poor shop. Squeeze-out can be wiped away with a damp cloth; the glue dries clear and won't discolor the wood.



Photo A: The author finds that a white PVA glue like Elmer's Glue-All (center) takes care of most of his needs. Yellow aliphatic resin products like Elmer's Carpenter's Glue (rear) are stronger than white PVA but also set up much faster. For outdoor projects, the author uses a urea-formaldehyde glue such as Weldwood Plastic Resin. When a waterproof joint is required, he turns to two-part Weldwood Resorcinol Glue.

Some years ago, I tried the yellow aliphatic resin glues—Franklin's Titebond and Elmer's Carpenter's Glue, among others—that most woodworkers these days look upon as the standard among woodworking adhesives. Bruce Hoadley, in *Understanding Wood*, cites their numerous attractive qualities—greater rigidity, improved heat resistance, better “grabbing” ability, greater tolerance for severe conditions (including humidity), and less tendency to clog sandpaper. For my purposes, however, their reduced open time turns the glue-up into too much of a race. Nor, in my experience, has white PVA ever failed to do the job in terms of Hoadley's criteria.

White PVA does have its limitations. Its poor water resistance makes it unsuitable for outdoor use or for indoor projects, such as cutting boards or countertops, that come in regular contact with water. And for highly complex assemblies, especially at higher temperatures, even white glue sometimes sets up too fast.

In these situations, I usually go with a urea-formaldehyde glue, such as Weldwood Plastic Resin, a powder that requires mixing with water. In addition to good water resistance, this glue affords a generous open time, which makes it ideal for complicated assemblies. It cures rock-hard, thus making it easy to sand, and it doesn't “creep” like the softer PVA and aliphatic resin glues do in some circumstances.

If it offered more convenience, I might use Weldwood's Plastic Resin for all projects. However, you have to mix up just what you need for each assembly using fairly exact proportions, and its 12-hour closed time further impedes progress. Nor does this glue offer the gap-filling capacity of the PVA and aliphatic resin products. (Note: I haven't yet had occasion to try Franklin's recently introduced water-resistant product, Titebond II.)

Only rarely do I find need for something other than a white PVA or urea-formaldehyde adhesive. If a project requires waterproof joints (a boat or outdoor furniture, for example), I turn to Weldwood's Resorcinol Glue, a two-part product which is effective but also expensive.

Oily woods, such as teak and rosewood, sometimes present gluing problems. I've had success with white, yellow, and urea-formaldehyde glues, provided I wipe the mating surfaces of these woods beforehand with a solvent such as acetone or lacquer thinner. Epoxies may offer more dependability with oily woods, but they pose more of a nuisance. Given what is at stake—expensive wood and a considerable investment of time—I suggest phoning

the glue manufacturer for advice on gluing the particular wood in question. Or, experiment on your own using scraps to find the best product and procedure.

It's worth repeating that glue is only as good as the joint to which you apply it. Cleanly cut, snug-fitting joints make it easier for any adhesive to do its job. And the smoother the mating surfaces, the better the adhesion. This is especially crucial for edge joints, which, unlike dovetails and mortise-and-tenons, have no mechanical interlock. Roughing up the surfaces of any joint to form little pockets for the glue will only weaken the joint.

Clamps—Have Enough of the Right Kind

According to an old woodworking truism, you never have enough clamps. I've worked in shops that appeared overloaded with clamps and still have run out at inopportune moments. Because they cost a lot, most of us accumulate clamps over the years. We pick up the odd bar or handscrew clamp at a garage sale, or we race down to the hardware store when we realize we're two pipe clamps short of what we need for the project at hand.

Two kinds of clamps take care of nearly all my clamping needs. **Bar** or **pipe clamps** serve where the operation requires a wide span but little depth, such as gluing up edge-joined tabletops or pulling together larger mortise-and-tenon constructions (trestles, frame-and-panel doors, or carcasses). **Quick-action** or “adjustable” clamps, on the other hand, take care of most smaller assemblies and also those that require more depth.

Bar or Pipe Clamps—Although sturdy, commercially made I-bar clamps are my preference, the only ones I own came from garage sales—they're just too expensive to buy new. Most of my “bar” clamps I assembled myself from a \$9.95 pair of cast-iron jaws that fit on standard 3/4" black pipe (Photo B), which costs

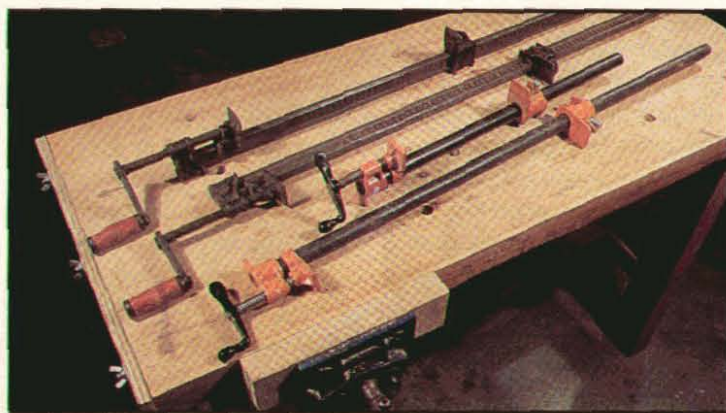


Photo B: Commercially made I-bar clamps are sturdy, durable, and expensive. Pipe clamps cost about half as much and serve nicely for the same purposes.

\$1.00 a foot at the local home center or plumbing supply. In fact, I can make two four-foot pipe clamps for what it costs to buy one I-bar clamp.

Pipe clamps can save you money another way. Since the clamps and bar are separate, you can purchase pipe in a range of lengths and interchange the jaws to fit the assembly you're working on. I commonly use 3, 4, and 5-foot lengths and recommend at least four of each as a minimum. (Two to four pipe clamps will handle many simple panels, tabletops, frames, and carcasses.) Lengths of 2 feet on up to 10 feet come in handy on occasion. Since most clamping jobs require at least two clamps, it helps to have pairs of the less often used lengths.

Quick-Action or Adjustable Bar Clamps—Quick-action clamps consist of one fixed jaw and one that slides along a rectangular steel bar (Photo C). They resemble a smaller but more versatile bar clamp. In addition to serving a wide range of assembly needs, they're invaluable for securing work to a machine or to the workbench and for use with all sorts of jigs. For years, I used heavy, cast-iron **C-clamps**, until I discovered that quick-action clamps were both less expensive and handier to use. (I still find small C-clamps indispensable for certain jobs, and, of course, I never have enough of them.)



Photo C: For a wide range of clamping operations, quick-action clamps (second from right) are hard to beat. More traditional C-clamps (at right) offer many uses but less convenience. Wooden handscrew clamps (top left) are valuable for clamping non-parallel surfaces. Spring clamps (lower left), which resemble large clothespins, come in handy for small-scale, low-pressure clamping.

With quick-action clamps, you can quickly slide one jaw to the workpiece rather than twisting a long C-clamp screw into position. Because the adjustable jaw is always close to the point of pressure, the clamp pads stay aligned under normal pressures, whereas the farther you extend a C-clamp screw beyond its supporting jaw, the more prone it is to deflection, which misaligns the two clamp pads.

Quick-action clamps come in a range of sizes and weights. Throat depths generally vary from 2 to 5", while maximum clamping width ranges from 6 to 36". The larger sizes require heavier bars, and a good measure of clamp quality is the thickness of its bar. The 1/4"-thick bars on the Jorgensen clamps that I use most often deflect very little under normal pressure. Clamps with thinner bars may be useful for assemblies requiring little pressure or for setting up jigs, but these lightweight clamps, temptingly inexpensive though they are, cannot substitute for those with 1/4" or thicker bars.

I find that Jorgensen's 12" light-duty adjustable clamp (with its 2 1/2" throat depth) gets used often in my shop. This clamp is small enough to be handy for little jobs but not too small for bigger assemblies. For heavy-duty work, I suggest the 24" Jorgensen with its 5" throat depth. Several European manufacturers—Bessey, Record, and Wetzler—produce clamps of equal or higher quality, although for the money, U.S.-made Jorgensen probably offers the best value.

Other Useful Clamps—While bar clamps and quick-action clamps do the lion's share of the work in my shop, other clamps also come in handy. Wooden **handscrew clamps** have been a woodworking staple for centuries—two heavy wooden jaws drawn together by a pair of wooden or steel screws. Quick-action

and C-clamps have supplanted handscrews for many jobs, but because the jaws can be angled with respect to each other, they still have their uses.

Spring clamps, which work like powerful clothespins of the spring-loaded variety, are handy for setting stopblocks on fences or clamping smaller glue-ups, such as bandsaw boxes. For even smaller-scale work, you can make a serviceable spring clamp by wrapping a heavy rubber band around a clothespin. I used a couple dozen of these once to glue linings into a guitar.

Basic Clamping Techniques

Although the variety of woodworking constructions is vast, certain basic procedures recur most regularly. Most projects include some form of edge-gluing; frames and carcasses turn up often as well. I'll explain how to glue up some simple examples of each of these, but first I'll outline a few basics that I've found indispensable over the years.

Clean Up the Work Area—Cutting joints on an untidy bench is inefficient; gluing up in the midst of disorder is courting disaster. If you're cutting dovetails, you can always stop and clear away the mess when the chaos finally gets on your nerves. Glue, however, like time and taxes, waits for no one. If you have to stop halfway through a glue-up to clear things out of the way, you'll likely end up with half a project.

Glue Up On a Flat Surface—Almost everything you glue needs to end up flat and/or square. It's depressing, to say the least, to discover that the tabletop or carcass for which you carefully surfaced the stock and cut the joints is twisted or out of square because the surface on which the clamps rested during glue-up was not flat.

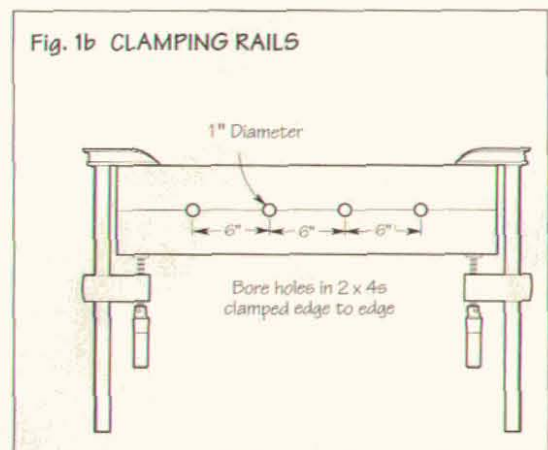
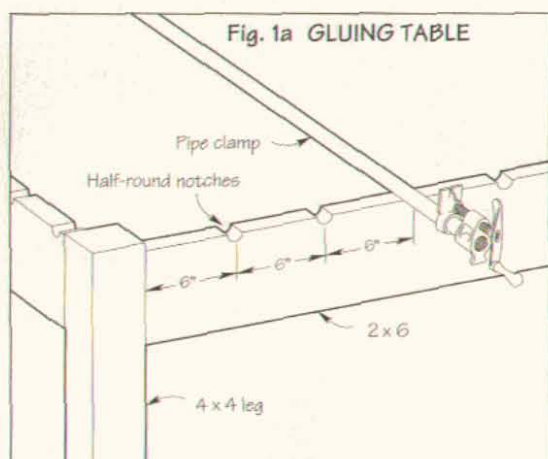
If your shop is small and space is at a premium, a saw table provides an ideal surface. If you have room, grant yourself the luxury of an assembly table. I once built a 3x6' topless glue-up frame that featured half-round notches cut in the rails to hold pipe clamps (Figure 1a). A pair of free-standing rails, notched to accept your clamps, can transform any benchtop or work table into a gluing station (Figure 1b). More versatile, but also more expensive, are commercially made clamp cradles, two of which are required for each clamp.

Organize Your Work Before You Spread Any Glue—More than any other factor, lack of planning causes glue-up fiascos. No matter how simple the assembly, you should walk through a "dry run" first. I do this even when I'm just edge-gluing a pair of boards. This gives me a chance to figure out where to place the clamps to ensure that the joints will close. Also, I need to make sure I've got everything—glue, glue spreader, wet rag for drips or gluey fingers, hammer and block to persuade the two surfaces to level up. Lastly, I have an opportunity to position all this stuff so it's ready at hand but not in the way. More complicated assemblies require more forethought: What goes together first? How do I clamp across here if I've already got a clamp across there? The minutes you spend figuring out exactly what you're going to do when will be repaid a hundredfold.

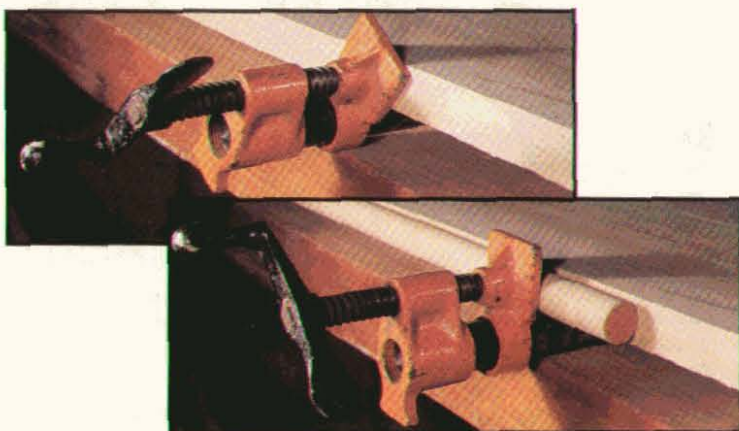
Edge-Gluing A Flat Panel

Tabletops, carcass sides, shelves, and frame panels all require edge-gluing two or more boards. If you've set up and figured out your procedure in advance, this operation will be a snap.

With well-cut joints, you can glue panels of up to four and sometimes five feet long with three bar or pipe clamps. (This is



Longer panels require more clamps. If possible, I add pairs of clamps to the original three, so that the total is always odd-numbered. This enables me to alternate clamps above and below the work and still have a clamp at each end to support the panel. Alternating clamps top and bottom in this way counters the boards' tendency to bow away from the clamp bars.



Photos E and F: To concentrate clamping pressure in the center of the board's thickness, you can rotate the clamp so the screw aligns with the edge. Or, you can use a dowel bearer of the same diameter as the board's thickness.

Theoretically, if you apply clamping pressure to the center of the edge, and the joints are perfectly square, you should end up with a panel that is dead flat. You can use a variety of means to concentrate pressure in the correct spot. The simplest is to rotate the clamp until its screw aligns with the center of the edge (Photo E). Perhaps the most effective method calls for dowels of a diameter equal to the panel's thickness. To focus the pressure exactly in the center, place the dowels between the clamp jaws and the panel edges (Photo F).

Once you've positioned the clamps and everything is ready to go, spread the glue. In theory, you should make sure that you've covered both surfaces completely with a light film of glue. Too little glue can result in a starved joint that may eventually fail. Too much glue makes a mess and causes the edges to slide around on each other, making it difficult to keep them aligned as you draw the joints together.

There is no single correct way to spread glue, and I don't always do it the same way every time. If I'm joining just two or three relatively short boards, I usually squeeze a bead of glue along one of each pair of mating edges, then rub the two surfaces together to spread the glue. Uniform squeeze-out along the length of each



Photo D: Tabletops and panels of up to four or five feet long can be assembled with as few as three clamps, one at each end and one in the middle. Placing the center clamp on top helps counter the boards' tendency to bow away from the bottom clamps.

particularly true if you "spring" the joints, that is, plane a slight concavity along the length of each edge so that the ends will make contact before the center.) The panel rests on two clamps, each one approximately 6" in from the end. The third clamp, placed in the center, rests on top of the boards (Photo D). If the joint doesn't pull together satisfactorily, use additional clamps. However, don't rely on clamps to pull poorly mated surfaces together. Take the time to go back to the bench and remachine the edges until you have a clean fit.



Photo G: Spread a thin film of glue on each mating surface. Here, the author uses an acid brush to spread a bead applied from the glue bottle.

joint (top and bottom) indicates good coverage. Now, I'm ready to clamp.

Most of the time, I find it prudent to apply a bead of glue along both mating surfaces, spreading it to cover each edge uniformly



Photo H: A sharp rap with a hammer on a hardwood block will usually force edge-joined faces into alignment.

before pressing the two together. You don't need any fancy gear to spread glue. A thin strip of wood, an acid brush (cheap, bristly, disposable brushes sold at most hardware stores), or a small paint roller works fine (Photo G). The object is to spread the glue evenly and quickly.

After placing the boards on the supporting clamps, I tighten the center clamp first and work my way outward. I crank each clamp down just enough to engage the edges, then check to see that the faces are aligned before moving to the next clamp. Sometimes I can align the faces with my fingers, but white glue "grabs" very quickly. I usually persuade the surfaces into alignment with sharp blows from a hammer on a hardwood block (Photo H). At the

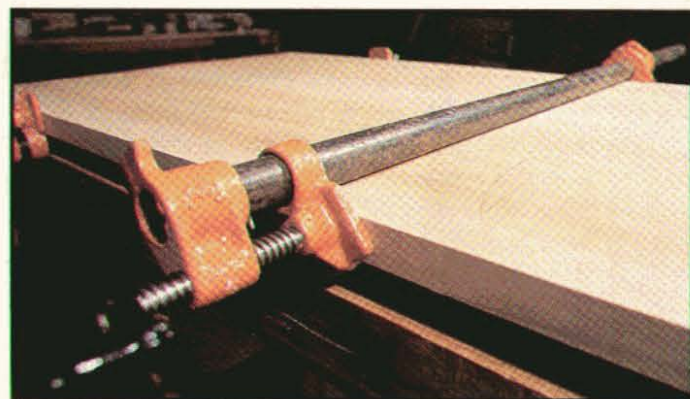


Photo I: Check to make sure that the faces of the boards rest on the pipe or bar. This will help keep the panel flat.

same time, I check to make sure that the board faces are flush with the clamp bar or pipe (Photo I). The edges frequently creep up the jaws, so I knock them down onto the bar again with hammer and block. (Don't try to drive the top clamps down onto the boards; loosen the jaws and reposition them.)

As you tighten each clamp, give the previous ones a little turn to keep them engaged. Finally, when all clamps are drawn up and the faces are aligned, tighten all the clamps to a more or less uniform pressure. Remember, it shouldn't require white-knuckle pressure to pull the joints together enough to make a virtually invisible seam. If you have to crank down with excessive force, something is wrong, which you should have discovered and corrected during your dry run. It's probably too late to fix it now.

If you're gluing up a number of panels and have enough

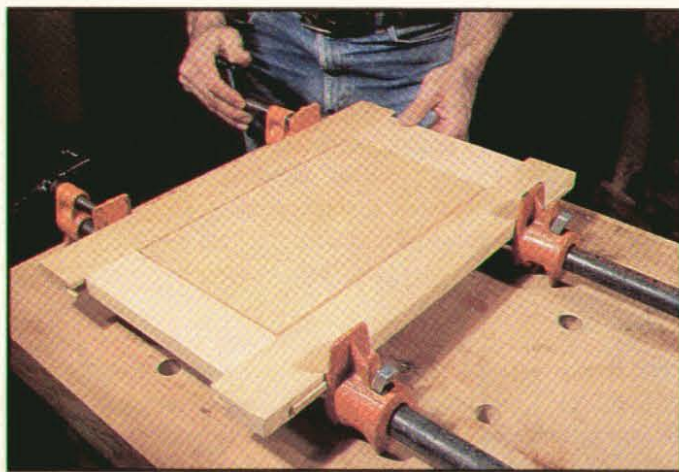
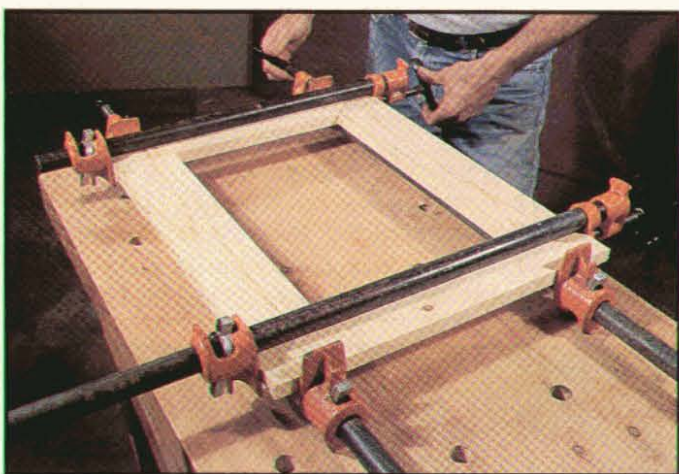
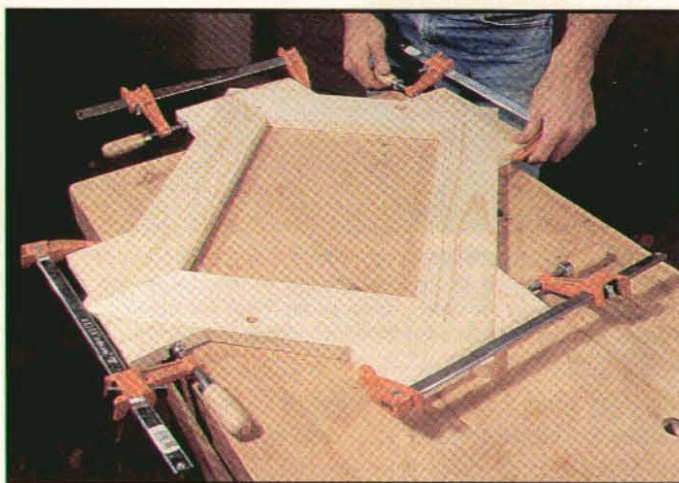


Photo J: A clamp for each rail suffices for most mortise-and-tenon frames. For through-mortised or bridle-jointed frames, position the clamp as close to the protruding tenon as possible.



Photos K and L: Two ways to clamp a mitered frame. Use perpendicular pairs of bar clamps to keep the mitered surfaces aligned (Photo K). A simpler method is to glue angled blocks (the miter offcuts usually work) to the rails and stiles and then draw the joint together with quick-action clamps (Photo L). Because the pressure is applied at right angles to the joint, slippage is minimized.



clamps to do several at a time, you can stand a clamped panel up against a wall to make room for the next one. However, take care when leaning the clamped panel that the clamps stay aligned to prevent any twisting.

Gluing A Mortise-and-Tenon Frame

The procedure and principles for gluing up a frame are essentially the same as for a panel. You'll need a clamp for each rail (assuming the rails are the tenoned members). Center the clamps under the rails for blind-mortised frames; place them parallel to the rails (with their jaws as close as possible to the protruding tenons) for through mortises (Photo J). As before, use dowels to direct the pressure to the center of the stile edges.

Spreading glue can become a problem if you're gluing frames with multiple rails. If you don't work fast, you'll use up all the glue's open time before you've had a chance to push the joints together. Usually, I squirt glue on the cheeks of both mortise and tenon and spread it with an acid brush. As an alternative, I sometimes pour an inch or two of glue into a paper cup and load the brush from there. This second approach saves time but wastes more glue. Either way, I don't bother to spread glue on the edges or bottom of the mortise or the edges or end of the tenon. These end-grain contacts, if glued, would add little if any strength to the joint.

After you've verified that the clamps and frame members are flat, you'll need to check for square, either by measuring diagonals or using a square. If the tenon shoulders are square, the frame should be square. However, clamping pressure can distort the frame. If this happens, you can realign the clamps to correct the problem (Figure 2). Sometimes,



Photo M: Pipe clamps and "sprung" wooden bearers draw together the corner joints and dadoed bottom of this small carcass.

moving one clamp will do the trick, but more often, you'll need to reposition all of them. It's easy to overcompensate, so you'll probably need to experiment before getting it right.

Simple mitered frames can be a real nuisance to clamp. Unless you apply perpendicular pressure to the mating surfaces, the joint will slip all over the place as you engage the clamps. Miters that include some kind of reinforcement—splines, biscuit joints, bridle joints—are somewhat easier to keep aligned. I use two different approaches for clamping miter joints. For the first, I apply balanced pressure using perpendicular pairs of bar clamps to draw the joint into alignment (Photo K). For the second, quick-action clamps bear on angled blocks glued to the rails and stiles (Photo L), applying perpendicular pressure to the joint surfaces. While not trouble-free, this latter method usually creates fewer headaches than the first.

Gluing a Carcase

Carcases, which are essentially boxes, range in complexity from simple, four-sided containers to complex chests with numerous internal divisions that house drawers, shelves, or doors. Most carcasses, however, share several aspects of assembly.

Many designs, for example, include corner joints and intermediate divisions that extend across the width of the sides. One challenge in assembling such carcasses is pulling these joints snugly together while ensuring the squareness of the carcass. A combination of bar or pipe clamps and stout wooden "bearers" usually does the trick for me (Photo M). (For small boxes or cabinets, quick-action clamps and bearers will suffice.)

These bearers distribute the clamping pressure so that you don't have to place a clamp every 2 or 3". I make my bearers from hardwood scraps, which I cut as long as the carcass width and to the same thickness as the parts being assembled. The width of the bearers ranges from 1" for narrow carcasses to 3" for wide ones.

I "spring" each bearer, planing a slight convexity along the edge that will contact the assembly, so that when both ends are pulled tight by clamps, it exerts pressure in the center. This has proved particularly useful for clamping intermediate divisions, where it is difficult if not impossible to apply a clamp to the center of the joint (Figure 3). The degree of convexity or spring likewise depends on carcass size; narrower carcasses require less spring. You may want to experiment to determine how much convexity works best for each assembly.

Otherwise, the same principles apply to carcass gluing that I've discussed for the other assemblies. The pressure should be applied to the surfaces making contact, not to those above or below. The pipes or bars need to be parallel to the

surfaces they span. By touching those surfaces, the pipes help prevent the work from bowing under pressure. And again, if you have to crank the screws hard to close a joint, stop and correct the flaw in the joint rather than relying on the glue to fix it.

Dovetails pose their own set of clamping problems. I agree with the old-timers who say that dovetails fit well only once, so I draw the tails only slightly into the sockets during the dry run. This adds a little uncertainty to the final glue-up; I've had a few unpleasant surprises, but the results justify the risks.

Second, because I lay out the joint so that the pins protrude slightly beyond the faces of the tails (I then plane them flush after assembly), pulling the joint together with a bearer doesn't fully seat the tails. For narrow carcasses with relatively few tails, I usually cut a slightly undersized tail or two in a piece of 1/4"-thick plywood. Placing this piece over each tail, I work my way along the row of tails with a bar clamp, forcing each one home (Figure 4a).

Fig. 2 CORRECTING AN OUT-OF-SQUARE FRAME

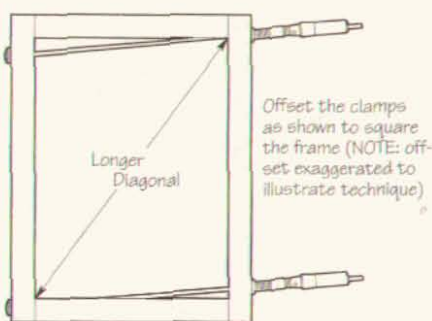
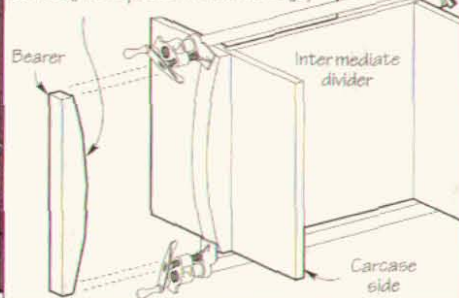


Fig. 3 USING "SPRUNG" BEARER TO EQUALIZE CLAMPING PRESSURE

Convex edge (exaggerated) exerts pressure at center of wide surface. (NOTE: Once bearer is clamped tight, convexity is displaced to outside edge)



Continued on page 23

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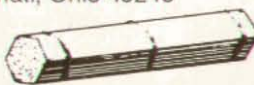
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For wider dovetailed carcasses, which require speedy assembly lest the glue set up before I have a chance to clamp, I cut a complete row of slightly undersized tails in thin plywood. In some cases, clamping this piece between a heavy, sprung bearer and the carcass side will pull all the tails home (Figure 4b). If some tails still need individual attention, I clamp the row of plywood tails in place and move quickly along it with a pipe clamp. If you cut two sets of plywood tails, you can do both sides of an assembly at once.

Organizing and planning are crucial when gluing up a carcass. Don't be tempted to omit a dry run, even on the simplest of assemblies. For complex jobs, the order in which you assemble the parts is often critical. Decide whether it makes sense to clamp parts of the assembly as you go. Consider whether it would be prudent to use a glue that offers a lengthy open time. Before spreading any glue, make sure you have the right clamps, enough bearers, and an

Fig. 4b SEATING CARCASS DOVETAILS

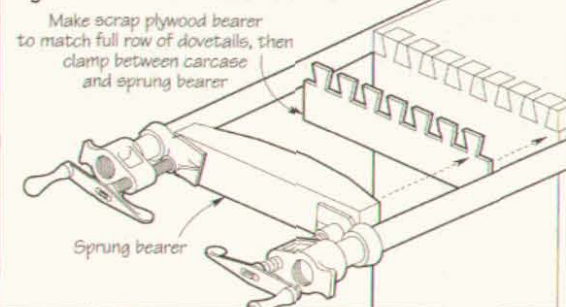


Fig. 4a SEATING CARCASS DOVETAILS (ALTERNATE METHOD)

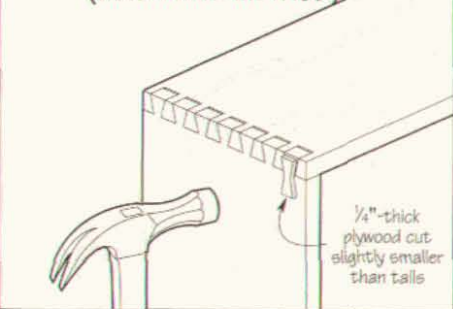
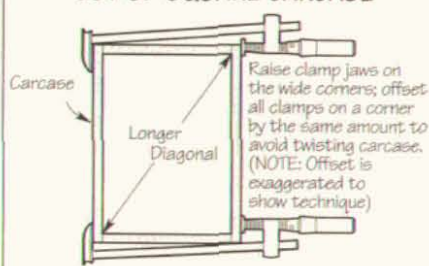


Fig. 5 CORRECTING AN OUT-OF-SQUARE CARCASS



assistant if the occasion calls for one. At this point, you should also consider prefinishing the interior surfaces of your carcass. You'll have a much easier time sanding and applying finish to pieces unencumbered by hard-to-reach corners and narrow openings. In addition, glue squeeze-out is easier to remove from finished surfaces, whether you wipe it off with a damp rag or wait until the glue has congealed—but not set—and pare it off with a sharp chisel. Once you've glued, assembled, and clamped the carcass, check for square by measuring the diagonals on both the front and back. If all four measurements are equal, the carcass is square. If not, you can usually correct it by repositioning the clamps to pull the wide pair of opposite corners closer together. To do this, raise the clamp jaws slightly on the corners that need to be drawn together (Figure 5). You'll need to offset all the jaws on a corner the same amount to avoid twisting the carcass. However, you don't necessarily have to raise the jaws on both opposite corners the same distance. It usually requires some fiddling around to work a carcass back into squareness. **WwJ**

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Special Techniques

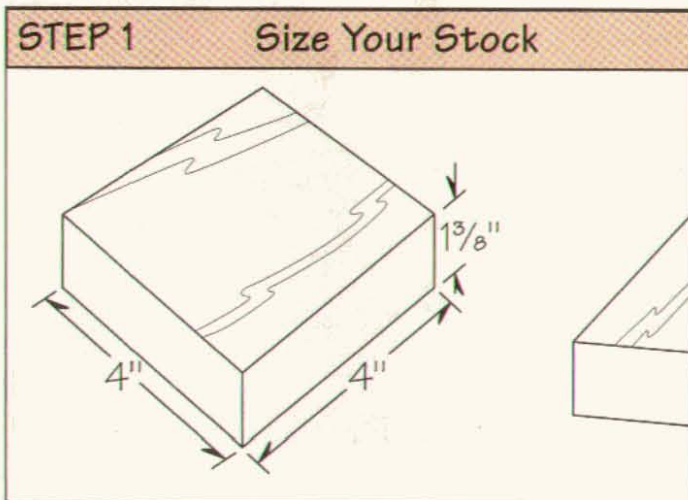
MAKING A CORNER SWEEP

Every once in a while, one comes across a project that begs the "how did they do that?" question. The corner sweep in the Jenny Lind Cradle project (pg. 38) evoked that question from us. Granted, the cradle is an unusual piece, enough so that most of you probably haven't made anything like it. But glance through most furniture catalogs, and you'll see numerous projects that employ it.

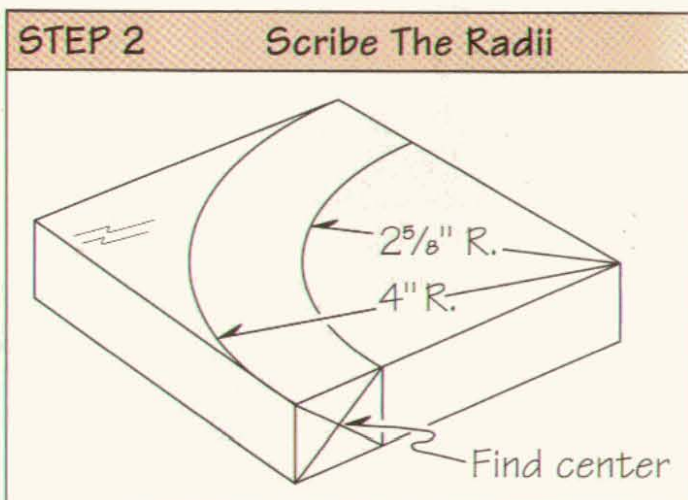
The sweep can be used in almost any project that requires joining pieces at a right angle, but which calls for a gradual radius at the corner rather than the usual sharp-cornered joint. Although we use the sweep in this cradle to join several turnings, it can be used to join almost any parts, such as stiles and rails in a shaped door, or the sides and handles of a tray.

Like many woodworking operations that at first appear difficult, you'll find making the sweep—when broken down into logical steps—actually quite simple. Keep in mind that the Step-By-Step illustrations and the dimensions shown here apply only to the Jenny Lind Cradle. Other applications of the corner sweep may require other techniques and steps. Also, we show just one method for making a sweep. Feel free to modify or change the instructions to make use of the equipment and tools you have available.

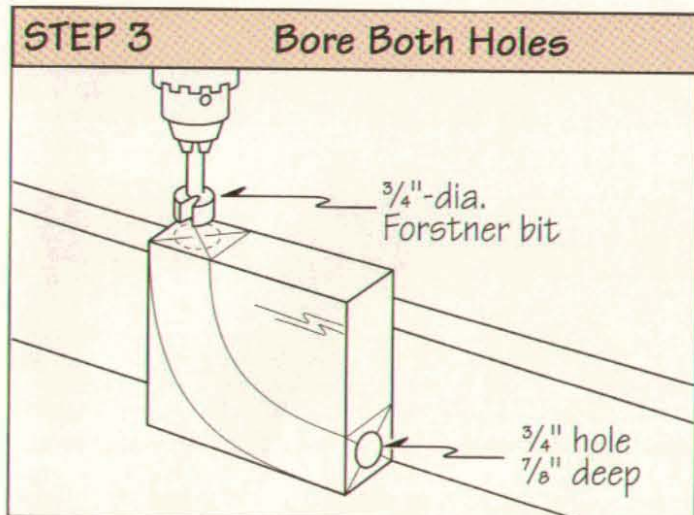
STEP-BY-STEP INSTRUCTIONS



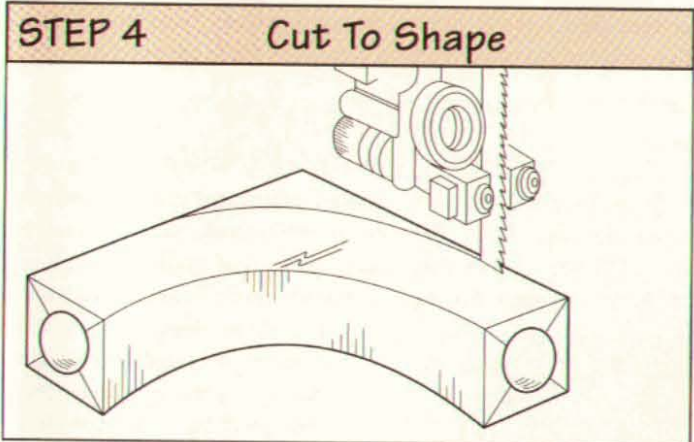
Step 1 Size your stock pieces. You'll need two pieces of $1\frac{3}{8}$ "-thick stock, 4" square. On this cradle, the pieces are relatively small, and since there's a $\frac{3}{4}$ "-long tenon on the ends of the long posts reinforcing the short grain, we won't bother aligning the boards for diagonal (corner-to-corner) grain.



Step 2 Form the radii. Using a compass, and working from a corner point, draw a 4"-radius arc to mark the outside edge of the sweep as shown. Next, using the same point, draw a $2\frac{5}{8}$ "-radius arc marking the inside edge. With a straightedge, draw diagonal lines on the edges of each piece to find the centerpoints.



Step 3 Bore the holes. Chuck a $\frac{3}{4}$ " bit in the drill press, and set the depth stop for a $\frac{7}{8}$ "-deep hole. Next, clamp a fence to the table so it centers the sweep blank under the bit. Although you can use a regular twist drill bit, we prefer the Forstner bit shown in our illustration. It cuts cleanly, with little or no tear-out, and leaves a flat-bottomed hole. The $\frac{7}{8}$ "-deep hole provides clearance so the $\frac{3}{4}$ "-long tenons on the post and cross-piece ends don't bottom out in the holes.



Step 4 Cut the sweep to shape. We sawed the part on our bandsaw, cutting just outside the line. If you don't have a bandsaw, a scrollsaw or even a coping saw will work fine. Just work slowly and carefully. The more accurately you cut the profile, the less smoothing and cleanup work will be required.

SAFETY NOTE: Step 6 requires that you handle a small piece with your hands fairly close to the bit. When you're working with shaped edges and a tight radius, there's always a chance that the router bit can catch the piece and throw it, thereby drawing your hand into the cutter. Always feed the workpiece against the rotation of the bit and into the cutting action to minimize the possibility of the bit catching and throwing the workpiece. We also recommend that you use the new "safety-type" router bits.

Consider your own safety comfort zone before proceeding with this operation. If you haven't done work like this before, or feel apprehensive or uncomfortable with this operation, you may want to fasten a scrap block "handle" to the top of the sweep using double-faced tape. The scrap piece allows you to keep your fingers well clear of the bit. After cutting the two chamfers, flip the sweep over, fasten the scrap block to the opposite side with the double-stick tape, and cut the remaining two chamfers. As an alternative, cut two 12" lengths of $\frac{3}{4}$ " dowel, insert them into the holes in the ends of each sweep, and use them as handles when routing the chamfers.

continued on page 31

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WOODWORKING IN THE YEAR 2000

by Jim Barrett

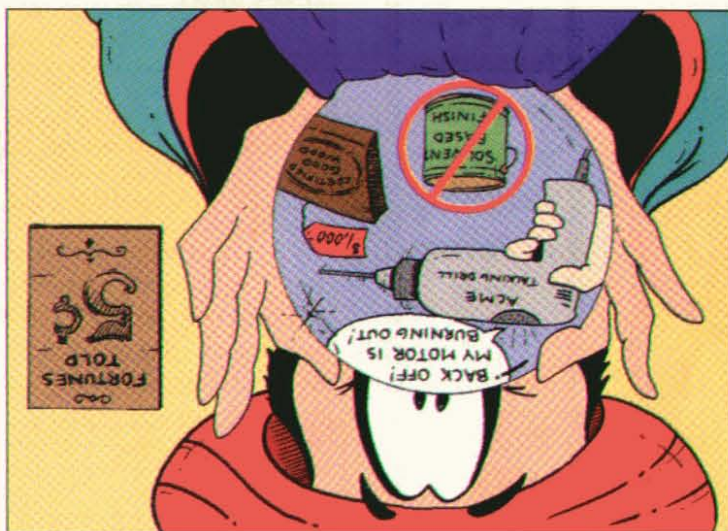
We take an insightful look at the current trends shaping the factors that will affect how you'll be doing your woodworking in the next century.

Over the years, we've all heard and read predictions of how life will be in the 21st century. In my youth, I conjured up visions of interplanetary space travel and colonies on the moon. Later, while in college, I listened in rapt attention to the environmental doomsday prophets warning of widespread natural disasters, resulting from global warming, acid rain, diminishing forests, and gaping holes in the ozone layer. Today, those predictions don't seem so fantastic nor catastrophic. After all, we're less than 6 years away from the year 2000, and we still exist on this relatively hospitable planet. So, I wasn't too surprised when *Woodworker's Journal* asked me to pull out my crystal ball and take a look at what the world of woodworking might look like by the year 2000. In researching for this article, I focused on three basic areas of woodworking: wood, tools, and finishes. What I discovered encourages and also discourages me.

WOOD: MORE PRECIOUS THAN GOLD?

Maybe not quite, but don't look for it to get cheaper in the future. Some of us would like to point the finger at the spotted

owl and various environmental activist groups for increasing wood prices and the dwindling supplies of high-quality timber. But I found the problem much more complex, involving a wide range of environmental, socioeconomic, and political issues. Decades of poor or inadequate forest management practices have taken their toll on our old-growth forests. Ongoing "slash and burn" agriculture practices in tropical rain forests in the Amazon, Central America, and Indonesia, and clear-cutting timber extraction in the Northwest, deplete our virgin timber stands at an alarming rate. The U.S. Food and Agriculture Organization estimates that the world loses almost 42 million acres of tropical rain forests this way each year—up 50 percent from a decade ago. Unfortunately, after harvesting the relatively few marketable

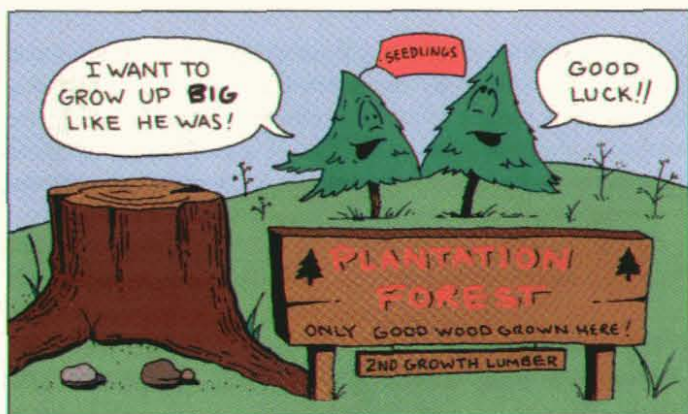


WEAKNESSES INHERENT IN CURRENT FORESTRY PRACTICES

In the Pacific Northwest, single-species tree plantations have replaced most of the native or old-growth forests on privately owned land. Timber companies claim that their monoculture reforestation programs of planting three or four trees for every one cut will maintain a sustainable inventory for future use. Unfortunately, seedlings planted today won't produce the quantity (or quality) of wood contained in one old-growth bechmoth until well into the next century. Much of our current reforestation inventory won't mature for another 20 to 50 years. Environmentalists criticize monoculture reforestation programs because single-species forests lack the biological diversity of a "healthy" natural forest. This, they say, makes the forests more susceptible to disease and insect infestations. Environmental groups continue to pressure the government to enact protection for the few remaining stands of old-growth trees in our national forests. The forest-products industry currently relies on these forests for about one-fourth of the nation's timber supplies. As time goes on, we'll likely see

timber species that exist there, settlers move in and burn off the remaining forest to create farmland. This land, only marginally capable of sustaining crops or cattle for a few years, will soon be abandoned and another section of forest cleared. Already the supply of two tropical species, Brazilian rosewood (*Dalbergia nigra*) and Cuban mahogany (*Swietenia mahagoni*), have been depleted to the point that they'll be prohibitively expensive if not virtually unobtainable in the next few years. International trade agreements now ban exports of newly cut rosewood, and strict controls have been placed on the trading of old rosewood (existing stockpiles cut before a certain date). We'll likely see similar trade bans and restrictions placed on other tropical woods as their supplies dwindle.

Environmentalists criticize monoculture reforestation programs because single-species forests lack the biological diversity of a "healthy" natural forest. This, they say, makes the forests more susceptible to disease and insect infestations. Environmental groups continue to pressure the government to enact protection for the few remaining stands of old-growth trees in our national forests. The forest-products industry currently relies on these forests for about one-fourth of the nation's timber supplies. As time goes on, we'll likely see



greater public awareness and pressure to preserve the biodiversity of old-growth forests for other uses, including wildlife refuges (including spotted owls), more recreational use, and as sources of non-timber forest products such as plants with potential medicinal uses.

By the year 2000, planners anticipate that most, if not all, of the softwood lumber logged in the Pacific Northwest will come from second-growth trees. The costs incurred by the forest-products industry for machinery to process the smaller second-growth logs will be passed along to the consumer in higher lumber prices. In short, we can expect to see smaller, lower-quality boards with higher price tags.

THE HARDWOOD PICTURE FORTUNATELY LOOKS BETTER

The native hardwood forests in the eastern United States have fared somewhat better in recent years. For one, we export fewer hardwoods than softwoods. In addition, suppliers have been augmenting domestic hardwood supplies with imported tropical woods. Rising hardwood prices also encourage southern timber producers to grow more of it, as opposed to Southern yellow pine. Currently, about 60 percent of all U.S. hardwood timber comes from southern states. There, hardwood growth now exceeds removal, and inventories continue to increase.

Hardwood prices also continue to climb. Recent price hikes for cherry and some other North American hardwoods occurred partly because of increased exports to Europe, where tropical timber imports have been banned. Expect American hardwood prices to continue upward as the demand—at home and abroad—increases and places still more pressure on existing hardwood supplies.

Global economics and international trade affect lumber prices in other ways, too. Although the spotted owl has been in the environmental spotlight since the mid-'80s, the exporting of unprocessed saw logs to Asia for processing has become the hot political issue on the socioeconomic front in the '90s. If you're a wood carver, you've already seen the price of basswood jump. Much of the increase is due to log exportation.

PRIVATE ENTERPRISE VS. THE PUBLIC INTERESTS

Up to this point, I've just scratched the surface of the many environmental and socioeconomic issues involved. The biggest battle may yet be fought: the issue of responsible forest management. Many environmentalists feel that we as consumers "need to know" if the wood we buy comes from sustainable sources, and whether the timber company has programs to maintain the biodiversity of natural forest communities.

One solution: wood certification programs. In essence, independent "third party" organizations evaluate the forest management practices of timber producers and certify them as "well managed" or "good wood" sources.

Scientific Certification Systems (SCS) of Oakland, California, already has certified three timber companies in the United States (with two pending), and two in Central America (with one pending). SCS started certifying forest management programs in 1991. They evaluate and rate forest operations on an index of 0-100 in three categories: 1) the sustainability of timber resources; 2) the maintenance (health) of the forest ecosystem; and 3) the socioeconomic benefits to the surrounding community.

SCS forestry programs director Debbie Hammel says she's noticed that the wood industry, including wood producers, manufacturers, and retailers, has started showing tremendous interest in the program in the past six months. She expects many more forest operations to be certified by the year 2000.

Another certifying firm, the Rain Forest Alliance, has certified five sources in tropical countries and a number of hardwood retailers carrying wood from these sources.

Jamison Ervin at the Forest Stewardship Council (FSC) also foresees a tremendous interest (positive and negative) in supplier certification, sustainable forests, and more effective forest management on a worldwide basis. The FSC, a nonprofit international organization, accredits the certification companies like SCS worldwide, and also sets the standards for evaluating forest

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LOOK FOR THE SEAL OF APPROVAL WHEN YOU BUY

Wood certification may become the forest industry's version of the "Good Housekeeping Seal of Approval" for lumber. You'll likely see stamps or labels such as the one shown above attached to lumber and other forest products you buy from your local lumber retailers. Tags like these can tell you at a glance how well the supplier manages its timber.

Other organizations have gotten involved too. In 1989, the Woodworker's Alliance for Rain forest Protection (WARP) began promoting sustainable forestry practices and educating wood users on forest management issues. WARP also encour-

ages wood users to ask questions of their suppliers about their forest management practices, and advises manufacturers on ways to conserve wood in the shop. New efforts just getting underway include fostering the use of a wider variety of woods, such as lesser known tropical and lesser used temperate species from well-managed forests, and recycling and/or salvaging wood products.

WARP's director Scott Landis reports that, because of the group's efforts, you're likely to see some lesser known tropical species on the shelves by 2000. Recently, WARP started testing four such woods in order to identify new applications and possibly recommend them for import. If results prove positive, you may buy chakte kok (*Sickingia salvadorensis*) from Central America; machiche (*Lonchocarpus castilloi*) from Mexico/Belize; chechem (*Metopium brownei*) from Central America; or narra (*Pterocarpus indicus*) from Papua New Guinea for future projects.

According to Landis, developing markets for lesser known tropical woods would give tropical countries more economic incentive to practice good forest management. This, he says, could actually help save the remaining rain forests.

You may see more softwoods imported from other countries as well. At present, about one-third of all softwood lumber used in the U.S. comes from Canada. By the year 2000, we may be importing woods such as spruce, larch, and red pine from Siberia, where large native stands still remain relatively untouched. Tree plantations in New Zealand and Chile produce large quantities of Monterey Pine (*Pinus radiata*), which may also find its way into the United States.

COSTS WILL BE PASSED ON TO US

Expect to pay higher prices for wood from well-managed forests. At present, the price we pay primarily covers just the cost of extraction, processing, and transportation. In the future, we will also help pay the costs of responsible forest management—the price of ensuring a continuing wood supply.

We'll also have to look more closely at the way we use wood. For example, over half of all hardwood timber harvested in the U.S. goes into pallets, skids, and packing crates, most of which eventually ends up in landfills. As woodworkers, we need to find more uses for all those pallets and shipping crates. By 2000, many of us may find ourselves searching for sources of recycled and salvaged wood. At least, I'll feel "environmentally proper" when I ask building contractors and house demolition crews if I can scrounge through their scrap piles. Of course, the desirable scrap piles will get smaller as the residential construction industry switches to more alternative building materials, such as metal studs, laminated plywood and chip-board beams, and concrete floor systems.

DOING OUR BIT TO STRETCH WOOD SUPPLIES

True, you and your fellow home woodworkers consume only a small fraction of all the wood harvested—or wasted—in our country. However, we can help do our bit to save the forests and save a few bucks in the process. Instead of building solid-wood projects with expensive or exotic hardwoods, we can, when appropriate, substitute veneers and engineered wood

products, such as plywood and particleboard, and non-wood products, such as plastic laminates. We can also plan and execute projects with a view to minimizing wood waste in the shop, keeping our own cutoff piles to a minimum. As choice lumber becomes increasingly scarce and expensive, we'll need to become more resourceful.

TOOLS: A FERTILE GROUND FOR CHANGE

If you've been reading tool reviews over the last few years, you've seen many technological advances in power tools. Electronic variable speed control, higher-voltage battery tools, longer-lasting, smoother-cutting blades and bits, quieter, smoother, more powerful machines, all have developed in the last decade. At the same time, whole new categories of wood-working tools have appeared on the market. The sliding compound miter saws, random-orbit palm sanders, and detail sanders quickly come to mind. And with every new tool catalog, I discover new and innovative accessories and attachments to make woodworking safer and easier.

These advances, combined with a more competitive marketplace, give us more tool for the buck today than 10 years ago, despite inflation. And with them, we're able to perform a greater variety of woodworking procedures, and do them more accurately, quickly, comfortably, and safely, in less space.

All indications suggest that tools and machines will get even more sophisticated and versatile by the end of the century. We'll certainly see broader applications of existing technology, especially in electronics.

ELECTRONICS TO PROTECT YOUR TOOLS AND IMPROVE PERFORMANCE

Many high-end tools already use electronic circuitry to maintain a constant speed under load. On some Metabo tools for example, an electronic sensor connected to the field winding "senses" the motor temperature and energizes an LED light to inform the operator. Ignore the light, and the sensor will automatically shut off the tool to prevent motor burnout.

Tools that Metabo sells in Europe have even more sophisticated features. One hammer drill model has an electronic keypad. Users key in the type of material being drilled and the bit size, and the tool automatically chooses the correct speed for the job. Steve Jost, marketing coordinator at the tool firm, says the company tried marketing the drill in the U.S., but it didn't sell well because of its price tag. However, Jost believes that electronic circuitry in general will become more affordable in the future, so we should expect to see it on more tools, not just high-end tools.

Other tool manufacturers with whom I spoke agreed that LED measurement scales lend themselves to use on both portable and stationary tools. They'll be used to indicate tool operating conditions such as rotation, speed, and load. Delta already uses an LED readout on a scrollsaw to report blade strokes per minute and on a tablesaw fence to show distance between the blade and the fence. Porter Cable may offer an LED readout on its routers to show the exact plunge depth of a bit beneath the router base. Although highly accurate, Porter-Cable's product manager Leslie Banduch says they haven't offered the acces-

sory yet because it adds about \$25 to the router's price tag.

Metabo's technical service manager, Rob Riley, thinks we'll see "talking tools" by the year 2000. Says Riley, "We already have talking clocks, cars, and computers. It would not take much to apply this technology to power tools. So equipped, a tool could tell you if it's overloaded or electrically starved—the two biggest destroyers of power tools—or when the motor brushes need to be replaced. Our parent company in Germany has been hinting at this (technology)."

Laser technology will likely appear on more benchtop and stationary tools such as radial arm saws, compound miter saws, and drill presses. Porter-Cable led the way in 1992, introducing a power miter box with a built-in laser beam that shows the exact location of the cut on the stock.

TOOLS TO GET MORE POWERFUL, MORE MOBILE

Expect to see more powerful tools in smaller packages. More widespread use of electronics, smaller and more powerful motors, better bearings and components, tighter tolerances, and lighter-weight components will put more punch in smaller packages on both portable and stationary tools. Metabo's Riley notes that today's portable power tool motors have shrunk 20 percent in the past five years without any power loss. Bob Hilliard at Fein Power Tools sums it up neatly: "We'll see tools with more output in relation to input." In other words, expect tools in the year 2000 to draw fewer amps to do the same amount of work.

Along the same lines, Terry Tracy at Skil sees a trend toward more benchtop tools in home woodshops: "Many woodworkers have shops in a garage or limited space, and their appetite for additional tools usually decreases when they don't have a place to put them. To help, we aim to develop benchtop tools with stationary tool performance in a compact package."

Based on recent benchtop tool reviews that I've done for *Woodworker's Journal*, manufacturers appear to be succeeding. I've seen respectable improvement in power, sophistication, and overall quality in the benchtop machines I've tested. Size reduction appears to be the trend in all power tools—portable, benchtop, and stationary.

PUTTING MEANING IN THE TERM "USER-FRIENDLY"

Most of the tool manufacturers I spoke with agree that the major advances in tool technology will be ergonomic—reducing noise and vibration and generally making tools more "user-friendly". In this case, ergonomics means more than user comfort; it extends into the areas of health and safety, as well.

Several European countries have already established noise-level standards for specific tools. By the year 2000, expect OSHA to have similar standards. In response, tool manufacturers already are making tools quieter, primarily by reducing air noise (by means of quieter fans) and tool vibration.

Lowering vibration levels (especially in power sanding tools) also reduces user fatigue and associated maladies such as carpal tunnel syndrome. Tool companies will continue to improve vibration dampening in moving components. Also, look for more tools with soft rubber or plastic grips incorporated into their handles.

Another up-and-coming ergonomic feature: easier tool and accessory changing. You won't need chuck keys and similar tools to change bits, blades, and cutters on your power tools. Keyless drill chucks have been around for years. Recently, Bosch introduced a jigsaw with a click-in blade—you simply push a couple of buttons to replace blades. Metabo angle grinders feature quick-change grinding wheels that don't require wrenches or other tools to change them. Metabo's system relies on the rotation of the grinding wheel to loosen and tighten the locking nut, making it easy to remove by hand.

BATTERY TECHNOLOGY STILL LIMITING CORDLESS TOOLS

The same technology that we'll see on corded tools will also be applied to battery-operated tools, including more efficient electronics, smaller motors, and more sophisticated ergonomic features. The batteries themselves will also be more efficient

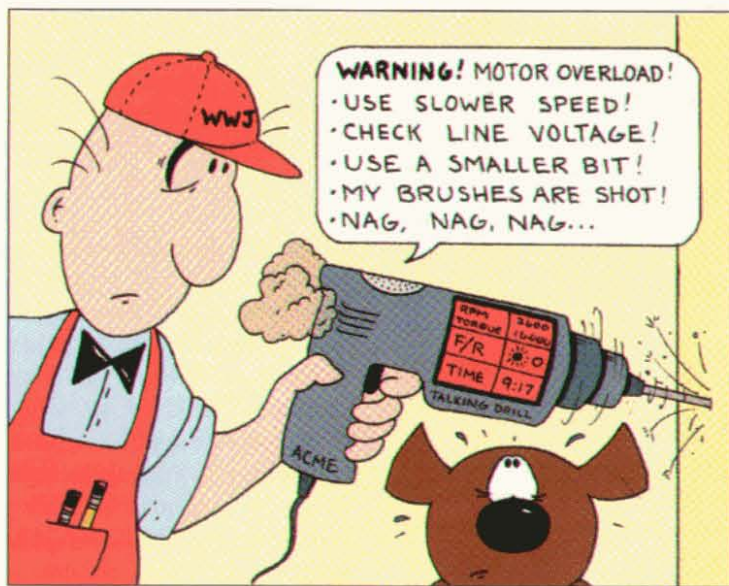
by the year 2000, but to what extent is anyone's guess.

Many users consider the more powerful battery drills currently available still too bulky and heavy to use comfortably. Leslie Banduch at Porter-Cable points out that current NiCad battery technology prevents tool companies from making the next size reduction breakthrough. He says, "We hope that current NiCad technology would be surpassed. We've been stuck there for years. New and better battery technology will enable tool companies to expand their cordless line of

tools, such as a battery-powered circular saw to rival the power of corded models."

Although the future of battery-tool technology remains uncertain, you and your fellow woodworkers will undoubtedly buy more cord-free tools. Let's face it, we're a bit lazy—who wants to be tied to a cord?

On the ecological front, many tool manufacturers have established, or will establish, recycling programs for spent NiCad batteries. In most cases, you'll return the dead battery to the dealer or manufacturer, and they'll take care of recycling or disposal. Metabo has a buy-back program: you return a spent



battery and get a 10% discount on a new one. We'll definitely see more recycling of products (such as batteries) that contain heavy metals and other environmentally hazardous materials.

BETTER BITS, BLADES, AND CUTTERS

From drill bits to router and shaper bits to saw blades, we can expect refinements to increase cutting performance, durability, and user safety. Look for "quiet" circular saw blades to become even quieter and more widely available, and safety devices, such as anti-kickback blades and router bits, to be commonplace by the year 2000. In terms of performance, expect to see improvements in carbide technology. Freud, for example, has new micro-grain carbide formulas under development to increase resistance to mechanical wear, and additives that will make its carbide binder material more resistant to chemical breakdown caused by resins, acids, and glues in wood and wood products.

"The challenge," says George Pozzi at Freud, "is to manufacture very hard carbide with elasticity and chemical resistance." He feels that these qualities will be critical for long blade life as we begin using more manufactured materials such as particle-boards (MDF), plastic laminates, and plywoods in our projects. The goal: sharper, longer-lasting carbide blades and cutters by the year 2000. Pozzi claims that, "quieter (circular saw) blades will not only reduce noise levels but also vibration. This will help blades last longer and improve cutting performance."

TOOLS CAN BE "GREEN" TOO

For the uninitiated, "green" in environmental jargon signifies environmentally friendly, low energy consumption, or recyclable products. Tool manufacturers seeking "green" certification will have to rethink tool and package design in addition to offering NiCad recycling.

European countries lead us in this area, too. If you've handled any European Bosch or Metabo tools, you may have noticed that their various components are coded with numbers. The codes indicate which recycling bin each part should be tossed in when the defunct tool gets returned for dismantling and recycling. Tool designers, more and more, will consider recycling as they design tools. For example, they'll avoid using combined materials, such as metal-and-plastic tool housings, because such parts make separating and recycling difficult. The same holds true for packaging materials, such as plastic "clamshell" packages that presently carry attached paper labels.

Expect to see a similar nationwide program in the U.S. in the future (*maybe* by the year 2000). Several U.S. tool companies report that they already offer programs to handle these requirements.

FINISHING PRODUCTS WON'T BE LEFT OUT

Even though finishes will be less toxic and we won't be using as many tropical hardwoods, some of which create very noxious sawdust, we'll still need effective respirators to protect us. I don't mean the flimsy fabric dust masks sold at your local hardware store. The well-appointed woodworker of the 21st century will more likely be wearing a powered air-purifying respirator (PAPR). (Note: See the Air-Mate 3 featured in this issue's *Shoptest*, page 13.)

PAPRs pump ambient air through a battery-operated filter unit into a sealed headpiece. You'll find breathing easier through a PAPR system than through the negative-pressure dust/mist respirators. Once you get used to PAPRs, you'll find them much more comfortable to use. The PAPR unit reviewed in this issue (the Air-Mate 3, available from Racal Health and Safety, Inc.) was designed for bearded guys like me, who've had problems getting a tight face seal with conventional dust masks. It also includes an integral hard hat for head protection and a clear shield for face and eye protection.

While PAPR respirators still cost a pretty penny (about \$320 for the Air-Mate 3), they'll probably become more affordable as the demand increases and as more economical units become available.

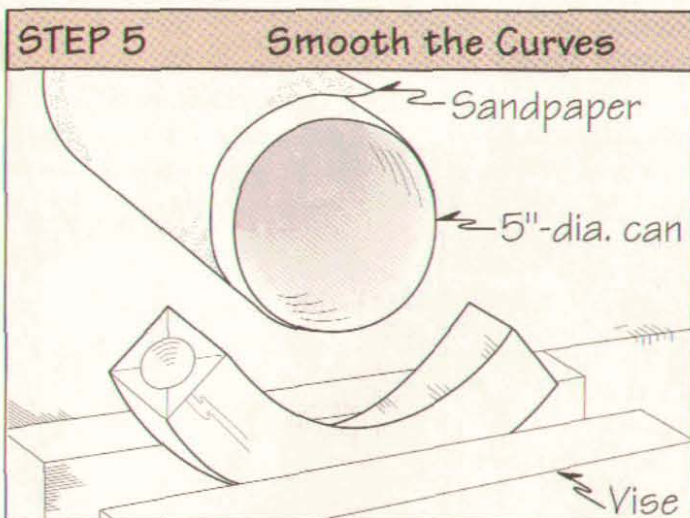
FINISHES

By the year 2000, we may have no choice but to use water-based paints, stains, sealers, clear finishes, and related finishing products. Because solvent-based paints, varnishes, polyurethanes and lacquers have much higher VOC levels than water-based finishes, you can expect them to go the way of the dinosaur. The issue: air pollution and stricter controls on the VOC (volatile organic compound) levels in finishing materials.

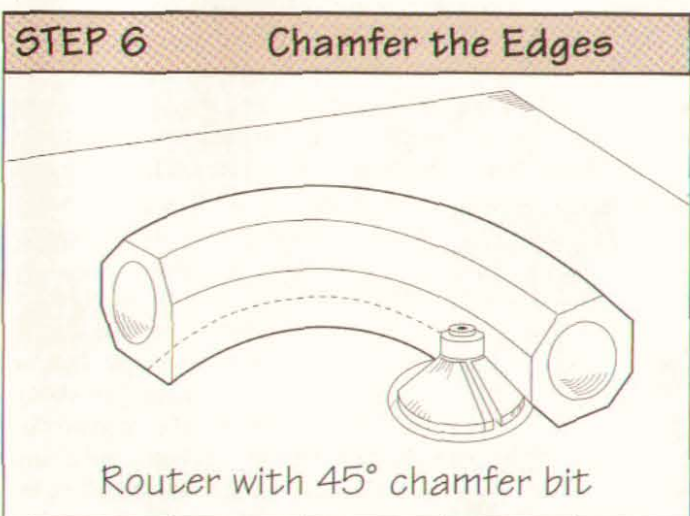
At present, VOC levels in finishes fall under the jurisdiction of state and regional air quality control agencies. The strictest laws governing VOC levels have been enacted in the metropolitan regions of California, Arizona, New Jersey, and New York. For example, the South Coast Air Quality Management District in Southern California has established that VOC levels in clear topcoats (varnishes, lacquers, and polyurethanes) cannot exceed a VOC level of 700 grams per liter after 1/1/94, 550 grams per liter after 1/1/97, and 275 grams per liter after 1/1/99. Bob Reister at Woodkote believes it will be impossible for most paint and varnish companies to produce finishes that comply with this low VOC level. "Most waterborne finishes don't comply with this standard either," he says. In the San Francisco Bay area, finishes containing high VOC levels cannot be sold in quantities larger than one quart.

continued on page 31





Step 5 Sand to the lines. Smooth the inside and outside profiles of the sweep before you proceed with Step 6 below. If you don't have a large sanding drum, try wrapping sandpaper around a 5"-diameter can. This will approximate the $2\frac{1}{2}$ " radius on the inside of the sweep. As an alternative, use the waste pieces you cut away as your sanding blocks. Sand carefully, because you need smooth surfaces for the chamfer bit's bearing to ride against. Any irregularities in these surfaces will be transferred to the chamfers.



Step 6 Chamfer the sweep edges. Chamfering the curved sweeps produces an octagonal profile when viewed in cross-section. We used a 45° chamfering bit on our table-mounted router. To ensure smooth cuts, we recommend that you make a series of small cuts, raising the bit in increments to remove the stock slowly. Cut all four chamfers on both sweeps at the same time. Then, raise the bit a hair more for a final pass. This final pass should produce a nice clean cut and will remove any burning, tearing, or roughness. The final bit height setting should produce an octagon with eight uniform sides. 

Design: Wallace Nutting Collection,
Berea College, KY

Photograph: Gerard Roy

Illustrations: Laurie Baker-McNeile

Author: David Peters

All of the finish manufacturers I interviewed agreed that the trend toward waterborne stains and finishes, and higher solids in solvent-based finishes, will continue. The challenge they face is to come up with waterborne products that perform as well as their solvent-based counterparts. Several manufacturers lament the fact that many consumers do not like water-based finishes as well as solvent-based products. As I learned when reviewing these finishes for a previous article in *Woodworker's Journal*, applying water-based lacquers and polyurethanes takes some getting used to (they tend to bubble when applied).

On the other hand, Tom Rosetti of Parks Corp. (manufacturers of Carver Tripp) sees a brighter future for water-based products. He tells me that the company already offers finishes with VOC levels below 270 grams per liter, which now meet or exceed any anticipated VOC levels required by the year 2000. He claims that, in many ways, water-based finishes are superior to solvent-based finishes—they're easier to use (water cleanup), have a faster dry time, produce less odor, have no flammability or toxicity, and go on easier—once you become familiar with the application techniques.

Obviously, we all have our own opinions on the performance characteristics of water-based versus solvent-based finishes. But again, by the year 2000, we probably won't have a choice. Manufacturers hope that eventually nationwide VOC standards will be established. At present, some areas have prohibitively strict standards, while others have no standards at all. In the meantime, you may want to acquire some water-based products and start polishing your technique.

SHOP SAFETY

By the year 2000, you, as a home woodworker, will be better informed about the health hazards associated with woodworking than ever before. Many of us already know the hazards and take steps to protect our health that we never would have thought of a decade ago. Many of us already use safety goggles, respirators, hearing protection, and dust evacuation systems in our shops.

Tool manufacturers help too by making tools safer and healthier to use: built-in dust extractors, which you can hook up to a shop vacuum, portable dust collector, or central dust collection system, for example. By the year 2000, expect to see effective dust extractors on practically all power tools, from the tiniest portable tools to the largest stationary machines. 

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Mitered Boxes:



Variations On A Theme

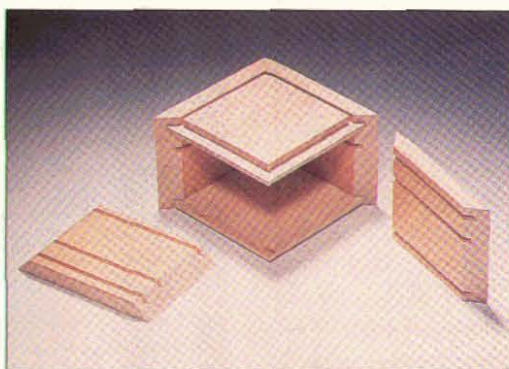
Wood artisan Ford Thomas has a successful business making and selling these cleverly designed mitered boxes. The system he's developed to produce the boxes shown on the cover and above truly qualifies as an exercise in efficiency. The key: using the same basic box design in a myriad of ways. The legged versions we feature in this article represent three such possibilities. As testimony to their appeal, Ford's boxes retail at about \$100 for the smallest and \$170 for the large box, and he can barely keep up with the orders.

Depending on their size, you'll find that the boxes make ideal decorative pieces, desk or dresser-top boxes, jewelry boxes, or presentation boxes for some very special bauble or gift. Rest assured that the lucky recipient of a box you make will consider it priceless.

Options To Make It Easy For You

You can make the boxes exactly as we've presented them here. Or better yet, use the basic design and add your own embellishments. If you don't have easy access to the same exotic woods that Ford uses or don't have a shop that's set up for resawing and thickening to the specified dimensions, don't despair. We've asked Heritage Building Specialties to supply kits that include the required stock, prethickened and ready to cut (see the Kit Source on page 36). Note that the prices of the three box kits include the wood for the boxes but not the wood for the legs or pulls. Heritage can also provide the wood for these parts if you request it (call for prices). Heritage will also cut stock kits for custom-sized boxes on request.

Our boxes include Ford's clever tapered legs and gem-like pulls. But, following our "variations on a theme" approach, you may make just the basic boxes, add pulls and legs (or feet) of your own design, or simply attach commercial hardware. Or, consider adding felt pad feet or a brass pull, hinging the lid, fitting the interior with dividers, or varying the box size. Feel free to change or modify it as you wish to suit your own tastes.



The small square box, made of bird's-eye maple and ebony, measures $2\frac{1}{4} \times 3\frac{1}{2} \times 3\frac{1}{2}$ ". The smaller rectangular box, in cocobolo, bird's-eye maple, and ebony, measures $1\frac{1}{2} \times 4\frac{1}{2} \times 6$ ". The larger rectangular box, in koa, cocobolo, and ebony, measures $2\frac{1}{4} \times 4 \times 9$ ". Note that all of the measurements refer to the actual box dimensions but do not include the feet

and pulls. Also, the box heights are the finished heights; you must start with boards at least $\frac{1}{8}$ " wider than the finished height to compensate for the saw kerf made when cutting the lid from the box.

Follow Ford Step-By-Step

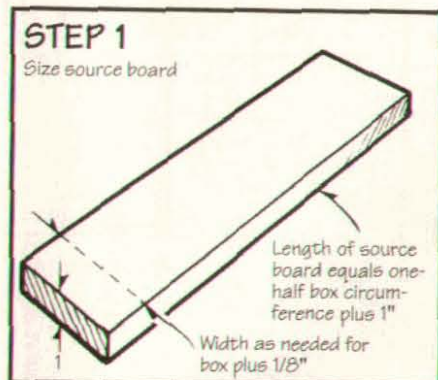
Follow the mitered box step-by-step instructions to construct the box, and the special instructions for the pull and leg. After completing the box, glue the pulls and legs in place, using only a little glue to minimize glue squeeze-out. We prefer using cyanoacrylate adhesive to attach the ebony parts. It dries clear, and provides an exceptionally strong bond on rock-hard exotic woods like ebony.

To finish-out the boxes, line them with felt over cardboard. Cut the liner for a press fit in the box, and no glue will be needed to hold it in place.

Mitered Box Step-By-Step

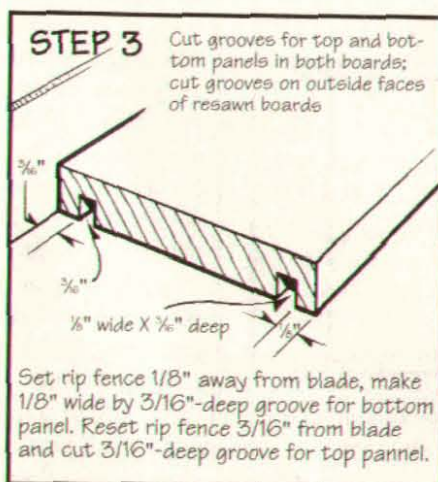
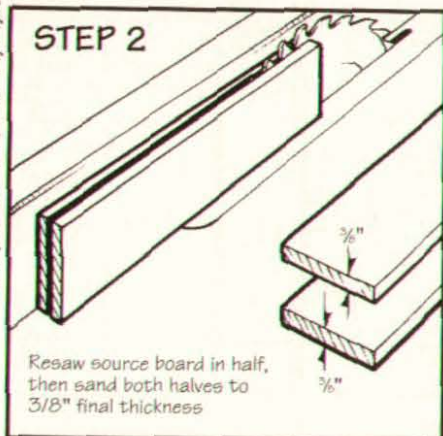
1 Size Source Board

Start by cutting a source board wide enough to produce the required box height, plus $\frac{1}{8}$ " extra for the saw kerf (if using a standard carbide blade) you'll make when cutting the lid from the box proper. For example, to make the small $2\frac{1}{4}$ "-high square box, start with a $2\frac{1}{4}$ "-wide source board. Make the length of your source board equal to box circumference plus 1" extra (for your miter cuts). Note that, you'll resaw the pieces from 1"-thick stock (next step) which doubles the total length of stock obtained from the board, for your safety, do not resaw stock shorter than 12" long.



2 Resaw Source Board

Resaw the source board into two equal thicknesses. Although our illustration doesn't show them, use featherboards to support the piece and pushsticks to keep hands clear of the saw blade. Or, if you prefer, resaw the source board on a bandsaw. Next, sand each board to $\frac{3}{8}$ " final thickness. Now, mark the outside face of each piece to avoid confusion.

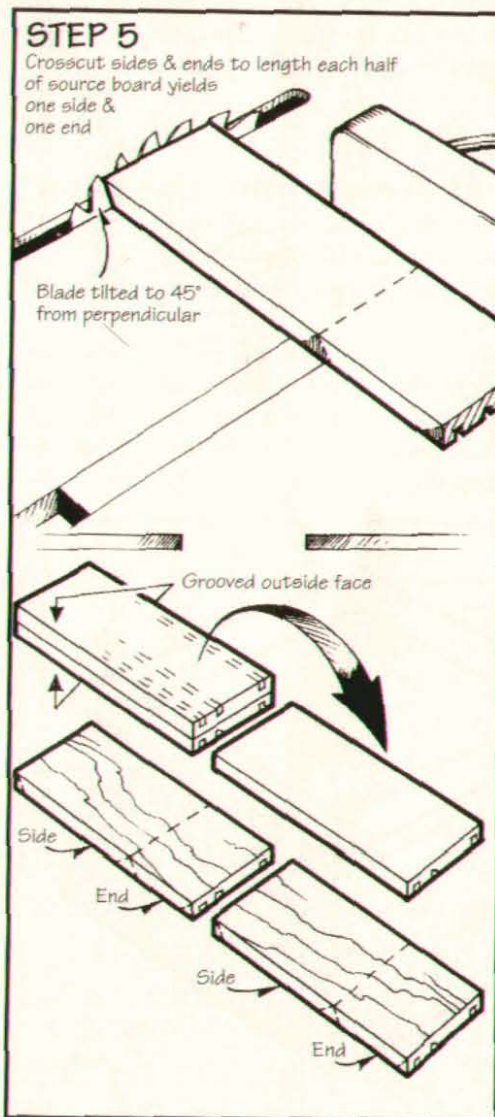
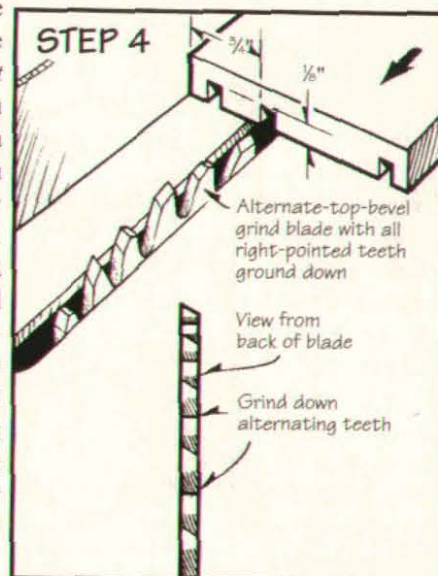


3 Cut Top and Bottom Grooves

Lay out and cut the grooves for the top and bottom panels as dimensioned on the drawing at left. Cut the grooves in the outside faces of the source board.

4 Cut Lid Groove

Cut the $\frac{1}{8}$ x $\frac{1}{8}$ " middle groove in both source boards shown at right. Actually, you need to set the blade a bit higher than $\frac{1}{8}$ ". You may use a standard saw blade for this. However, to make a better fitting lid, Ford modified an inexpensive $7\frac{1}{2}$ " non-carbide alternate-top-bevel grind blade by grinding off each right-pointed tooth, as detailed at right in the Step 4 drawing.



5 Miter Sides, Ends

Switch to a standard crosscut or combination blade and tilt it to 45° from perpendicular. Bevel-cut the box sides and ends to the required lengths, as shown at left. Clamp stop-blocks to your miter gauge extension to cut uniform lengths.

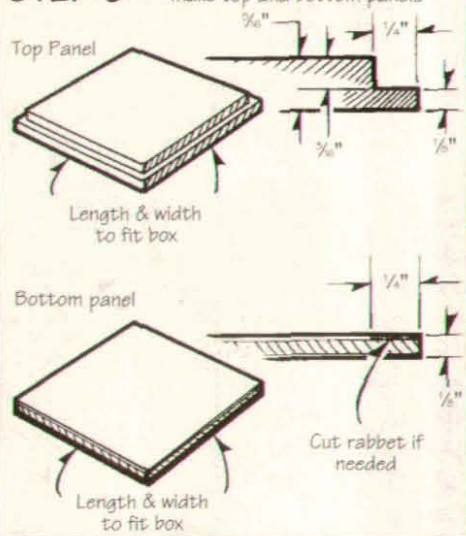
Note that each source board yields one side and one end. Lay out the boards and mark parts to avoid confusion.

6 Make Top and Bottom Panels

Cut a top and bottom to fit your box. Depending on the thickness of the bottom plywood stock, it may be necessary to cut a shallow rabbet along the edges so it will fit in the grooves. Rabbet the $\frac{3}{16}$ "-thick top as shown on the drawing at right so it fits into the top grooves you cut earlier in the side and end

pieces. Note that the rabbet depth creates a narrow reveal between the top and box sides and ends. Test-fit the parts and make adjustments if needed. Allow a little extra clearance around the top for wood movement.

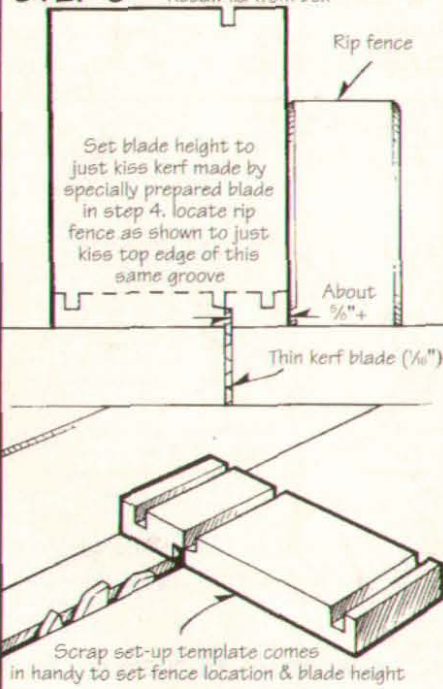
STEP 6



8 Resaw the Lid

Mount a thin-kerf blade on your table-saw, then raise the blade so that it just touches the point of the kerf you cut with the special blade shown in Step 4. Next, position the fence so that the outside face of the blade just touches the same kerf. As positioned, the fence will be a little more than $\frac{3}{8}$ " from the blade if you use a thin-kerf blade. We suggest you make a template from a bit of scrap left over from Step 5, and use it to help position the fence.

STEP 8



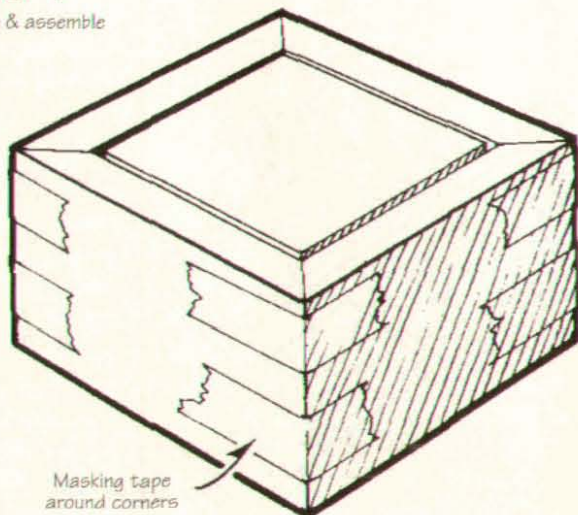
7 Glue and Assemble The Box

Apply glue sparingly to the miters, then assemble the box sides and ends with the top and bottom in place. You may add a little glue in the grooves for the bottom, but don't glue the top—let it float freely.

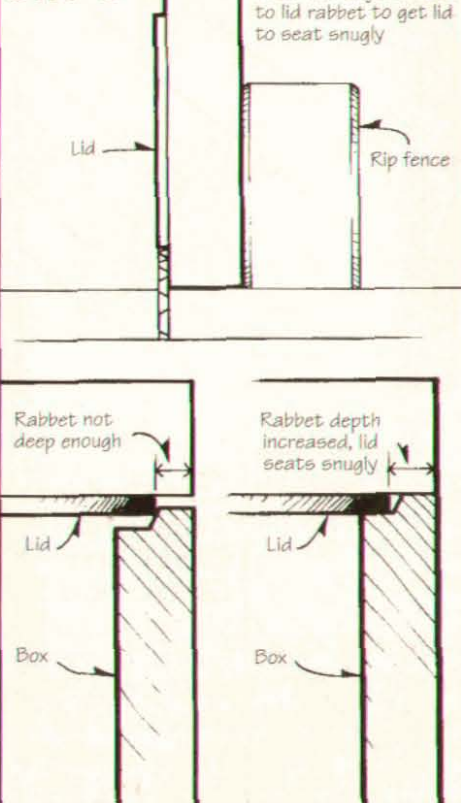
Clamp the box assembly. We've found that masking tape keeps the mitered corners from slipping out of alignment, while applying just enough pressure to hold the box together. If the miters aren't tight enough, you can place a few rubber bands around the box to apply more pressure.

STEP 7

Glue & assemble



STEP 9



9 Final-Fit the Lid

Now, fine-adjust the lid rabbet so that the lid sits flush on the box. Using the same rip fence setting you used from Step 8, raise the blade just a hair and recut the lid rabbet. Then, test the lid on the box. If necessary, repeat the process as shown at left. All three boxes share the same legs but use two different pulls—a single tab-style pull for the small square box, and a bar-type pull for the two rectangular boxes.

Follow the step-by-steps shown on the next three page to complete the desired pull. Although you'll be cutting small pieces, for your safety we recommend that you work with 12" or longer pieces.

How To Make The Bar

1 Make the Post Source Block

Starting with a $\frac{3}{4} \times 1\frac{1}{2} \times 12$ " source block, resaw into two sections as dimensioned on the Step 1 drawing at right. Cut a $\frac{1}{4} \times \frac{1}{4}$ "-wide groove in the bottom section, and then glue the two sections back together. This will give you a single source block with a $\frac{1}{4}$ "-square hole through the length of the bar. Next, using a $\frac{3}{32}$ " thin-kerf blade, trim the block so the bar hole will be perfectly centered $\frac{3}{8}$ " from each edge.

2 Crosscut the Posts

Mount a thin-kerf blade on your tablesaw. If you have two miter gauges, set one perpendicular (90°) to the rip fence and the second at 18° from perpendicular. Alternating the miter gauges, miter-cut the block to yield the individual posts as dimensioned in Step 2.

3 Remove the Waste

Trim the waste from the top end of the posts to yield a final $1\frac{1}{2}$ "-long post as dimensioned on the Step 3 drawing below right.

4 Cut the Bars and Pins

Rip bar stock sufficient for your box size, and drill for pins to secure the bar between the posts. Ford made the bars on his boxes from cocobolo, and the pins from $\frac{1}{8}$ "-diameter PVC welding rod. If you can't get PVC welding rod locally, we've included a mail-order source (see our Kit Sources below). Or, make $\frac{1}{8}$ "-diameter pins from wood dowels if you'd prefer not to use plastic.

Kit Sources

STOCK KITS FOR BOXES:

You may order kits for the three boxes. Each kit comes with the $\frac{3}{8}$ " thick stock, resawn and thickened for the wrap-around grain pattern, and enough material for the box top and bottom. Leg and pull material can be ordered separately.

Order from:

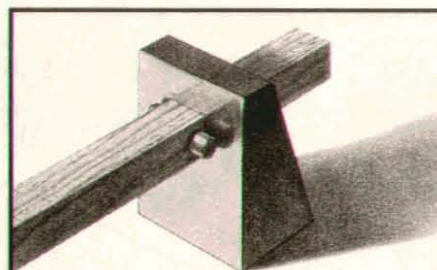
Heritage Building Specialties
205 N. Cascade
Fergus Falls, MN 56537
Telephone: 800/524-4184

Kit Prices:

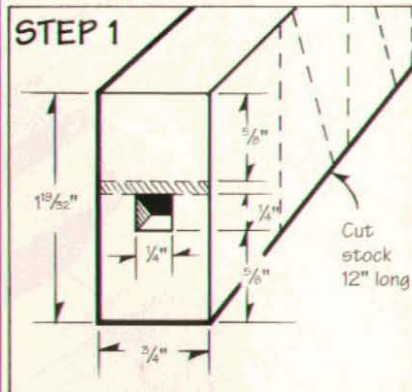
- Small square box (order box #1): \$16.95 ppd.
- Small rectangular box (order box #2): \$19.95 ppd.
- Large rectangular box (order box #3): \$27.95 ppd.
- All three boxes: \$59.95 ppd.

PVC WELDING ROD can be ordered from:

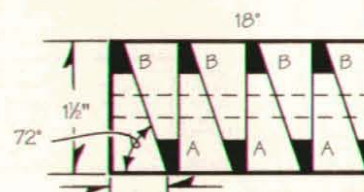
US Plastics
1390 Neubrecht Rd.,
Lima, Ohio 45801
Phone: 800/537-9724
Specify grey (fairly dark) or clear.



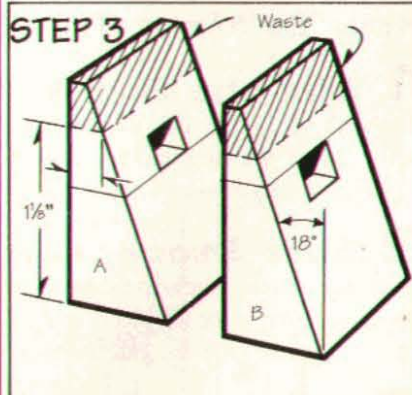
BAR PULL



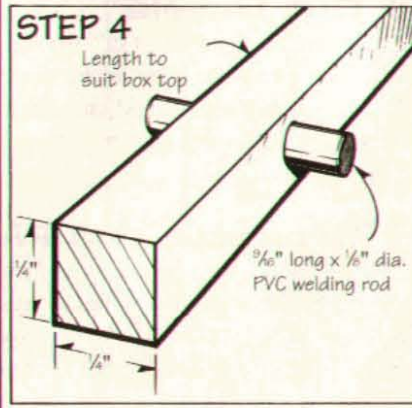
STEP 2



STEP 3



STEP 4



How to Make the Tapered Legs

1 Prepare the Stock

To make the legs, start with a pair of blocks measuring $\frac{3}{4} \times 1\frac{1}{2} \times 2\frac{5}{8}$ ". Set the rip fence on your tablesaw as shown on the Step 1 drawing at left, $\frac{3}{16}$ " from a $\frac{3}{32}$ "-thick, flat-top-grind thin-kerf blade (Ford uses Freud blades). Raise the blade to cut $\frac{3}{16}$ " deep, then make one cut on each side of the block, as shown. Leave the tablesaw as set.

2 Separate the Feet

Stand the source block on end, and bandsaw each block into two sections as shown in Step 2. When sawing, stay clear of the yet-to-be cut sections of the "L" on each leg.

3 Clean Up the Waste

Make a "zero-clearance" insert for your tablesaw so there's no gap around the blade where either the workpiece or the waste can be trapped. Next, using the same tablesaw setting as in Step 1, clean up the waste from the bandsaw cut, forming the remaining section of each "L". To do this, use a feather board as shown to keep the workpiece from falling over into the blade. You may also need a spacer block to elevate the feather board to the proper height. Also, use pushsticks to advance the stock, and keep your fingers well away from the blade.

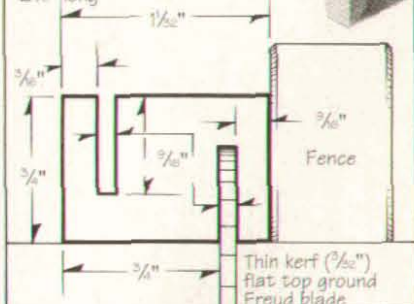
4 Cut the Tapers

Cut the leg tapers on your bandsaw using the simple taper jig shown in Step 4 below left to cradle the legs. To make the cut, clamp a fence across the bandsaw table to guide the jig and leg. You'll need to flip the fence and jig to the opposite side of the blade to cut the adjacent taper on each leg. 

TAPERED LEG

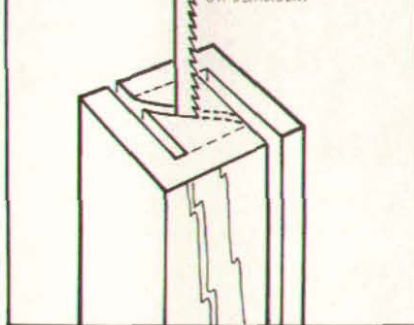
STEP 1

Prepare stock
 $2\frac{5}{8}$ " long



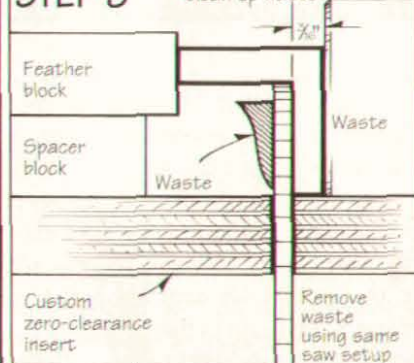
STEP 2

Separate foot pieces
on bandsaw



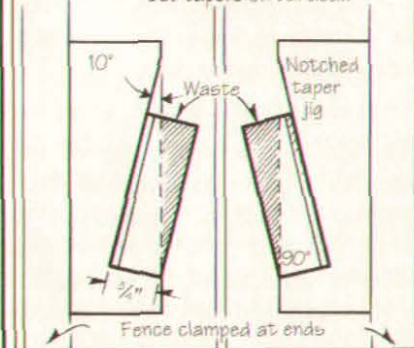
STEP 3

Clean up waste



STEP 4

Cut tapers on bandsaw



Locating Projects...

To quickly locate past projects and articles, check our annual project index in the 1994 Jan./Feb. issue. You'll find all projects and articles listed from back issues and books, categorized and alphabetically listed for your convenience.

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And It's Free, From Garrett Wade

Jenny Lind Cradle



There seems to be some near magical connection between being a woodworker and building a cradle. A cradle, no matter how crude, often became the first serious project, made perhaps of necessity but always with love. A visit to any museum of early Americana bears witness to the diversity of cradle design. You'll see crude pioneer versions, trough-like and well-worn from generations of use, but also much fancier "Cadillacs," showing little if any evidence of wear and tear.

The original of the Jenny Lind cradle featured here resides in the renowned Wallace Nutting Collection at Berea College in Kentucky. (See the Wallace Nutting and Berea College sidebar on page 41 for additional information.) Jenny Lind, from whom this furniture style took its name, was a Swedish soprano (1820-

1887) whose voice captivated first the continent of Europe and later the world. Ever the enigmatic personality, Lind considered opera immoral, refusing to sing roles that she considered evil. She eventually left the opera to tour with P. T. Barnum as the "Swedish Nightingale."

The popularity of the Jenny Lind style, essentially a modified Victorian style, continues even today. Many popular furniture catalogs still feature their own versions of Jenny Lind-styled cradles.

Don't Have A Lathe?

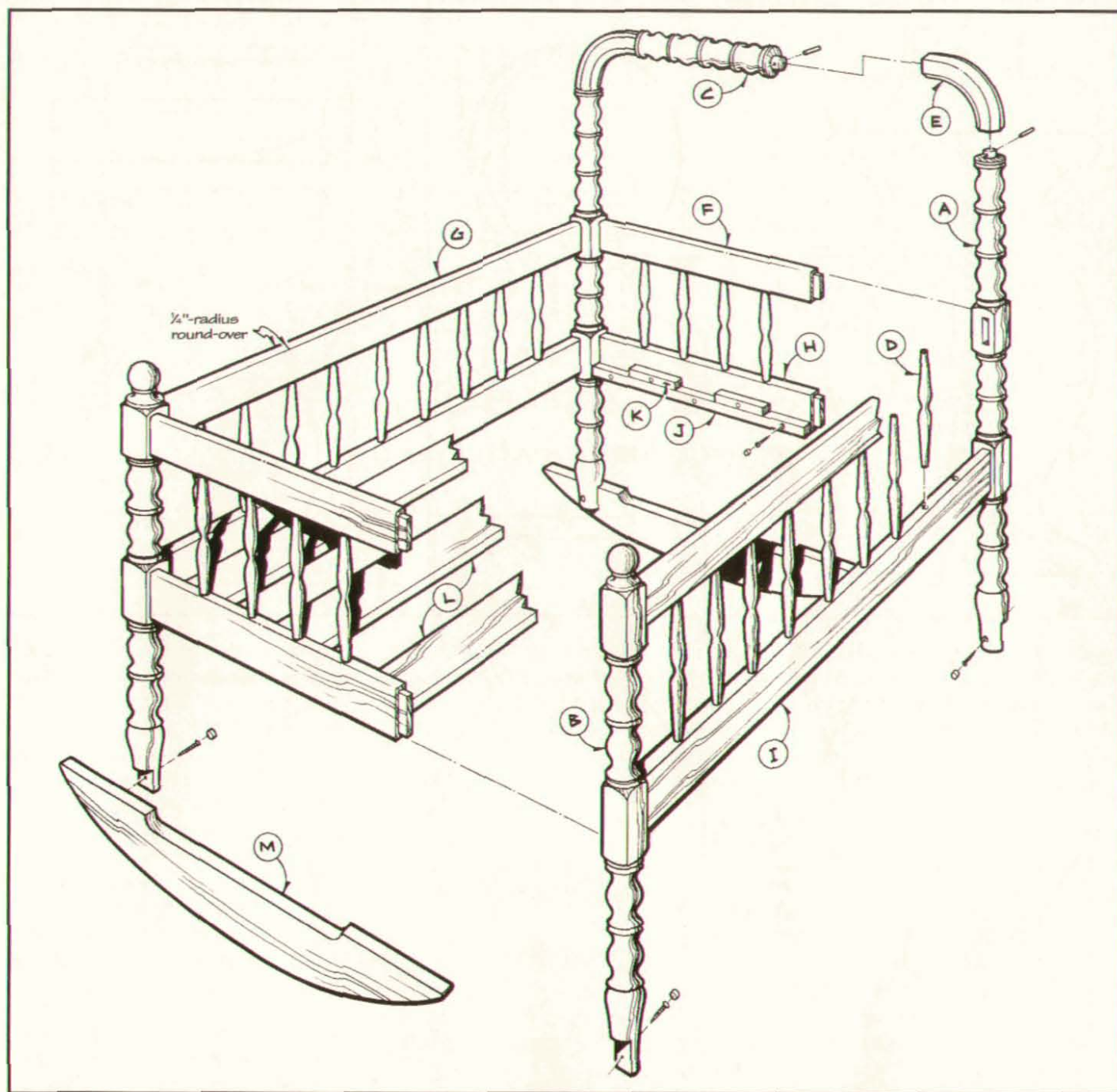
Although the Jenny Lind cradle requires several turnings, you can build the cradle even if you don't own a lathe or possess turning skills. Simply order a kit that includes the necessary turned parts from Berea's woodcraft program. (See the Kit Source page 44 for details.)

Getting Started

You'll find the cradle fairly easy to build. We suggest that you complete the turnings first. Next, form the mortised and tenoned parts, and then make the rockers and corner sweeps. (Note: If you intend to use the turning kit supplied by Berea College, keep in mind that you'll need to allow about 4-6 weeks for delivery, because each kit will be turned to order.) We sized the cradle to accept a standard 18 x 34" mattress, which you can buy at a bedding or department store.

The Turnings

The turnings include a pair of long posts (A), a pair of short posts (B), a crosspiece (C), and the spindles (D). We provide full-sized patterns of all turned profiles to help simplify the turning. The length of the turned parts (with the excep-



tion of the spindles) prevents us from showing them in their entirety. Instead, we've broken the turnings into sections. Use the Lower Section and Center Section for all four posts, the Upper Section for the two long posts, and the Ball Section for both short posts. You'll find the dimensions for the square sections of the posts where the rails join the End and Side Views. Use the full-sized half-pattern to form the crosspiece.

To turn the parts, we suggest you use the template method, for which you create mirror-image templates of the final turnings, and then compare them against your work as you progress. We've detailed this

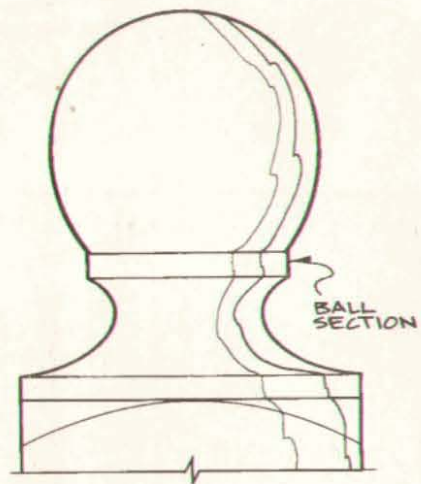
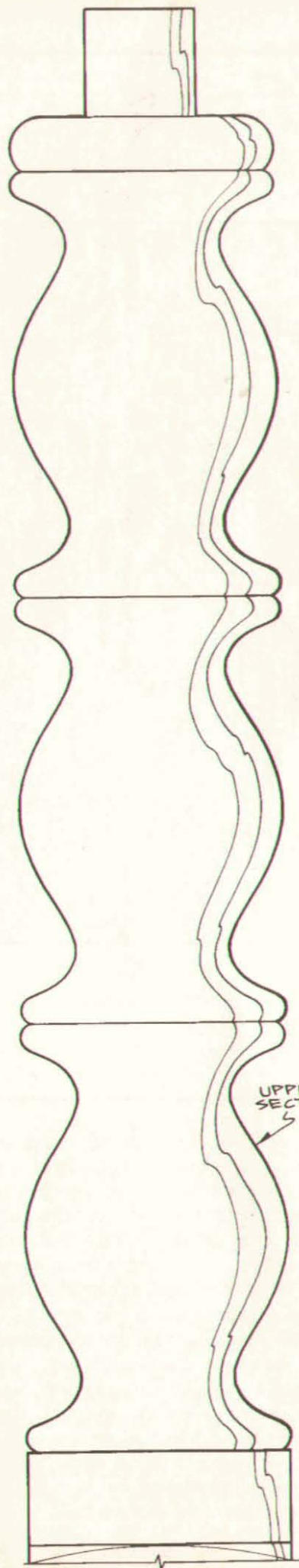
method in the Template Turning section. If you have a duplicating attachment for your lathe, use it to shape the turnings.

Once you've completed the turnings, proceed with the remaining parts. For help on making the complex-looking corner sweep (E), see the Special Techniques feature on *page 24*, which includes how-to instructions.

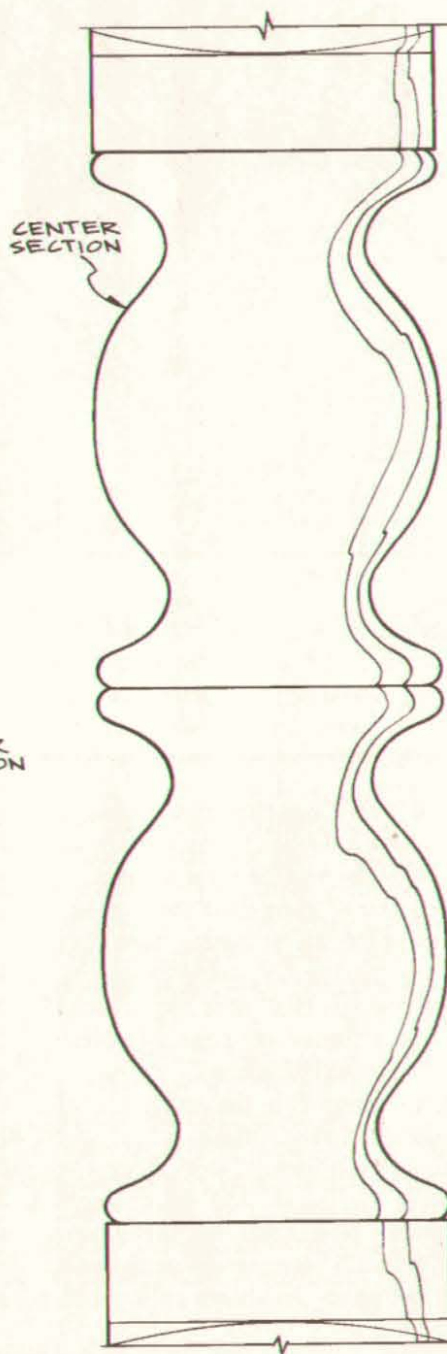
The Rails: With the exception of the corner sweep, make all of the remaining parts from $\frac{3}{4}$ "-thick stock. Cut the rails (F, G, H, and I) to length and width. Note that the dimensions allow for the $\frac{3}{4}$ "-long tenons on the ends of all rail parts. As shown on the join-

ery detail (Fig. 1 on *page 43*), the tenons have a $\frac{1}{8}$ " shoulder on the faces and $\frac{1}{4}$ " shoulders on the top and bottom edges. Cut the tenons on your tablesaw.

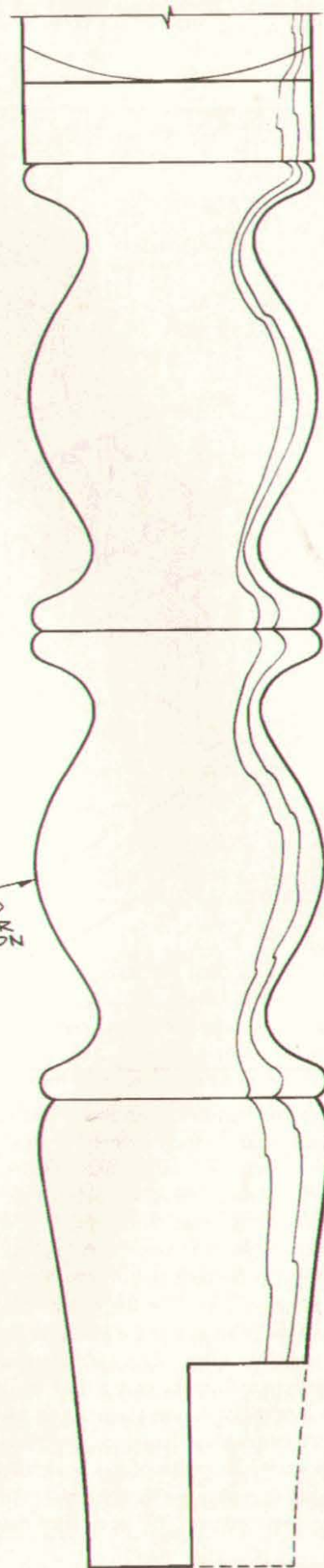
Next, lay out and drill the $\frac{1}{2}$ "-diameter spindle holes $\frac{1}{2}$ " deep. When laying out the spindle holes, be careful to keep them aligned and uniformly spaced. To ensure hole alignment, we recommend the technique described in our "For Perfect Holes" Pro Tip on *page 42*. Use this procedure for the end rails, too. After you've drilled all spindle holes, use your table-mounted router and a $\frac{1}{4}$ "-radius round-over bit to rout the upper edges of the four top rails.

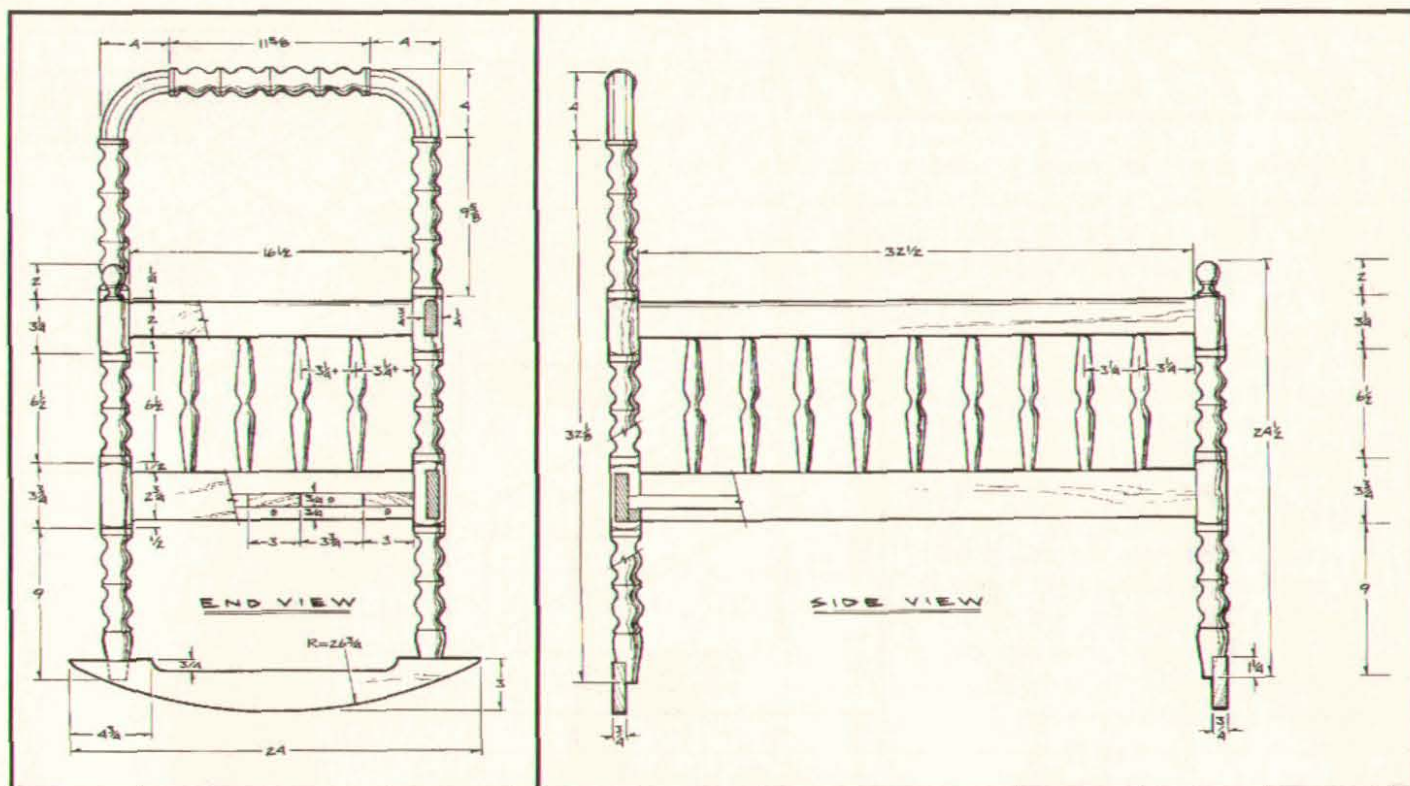


FULL-SIZED PATTERNS



LOWER SECTION





Mortise Work: Fig. 1 shows the locations of the rail mortises in the four posts. These mortises must be located on the same plane on each post. Use the technique described in the Pro Tip to mark these hole centerpoints. After marking the top and bottom shoulders of the mortises, lay out the mortise sides. Locate these mortises $\frac{3}{8}$ " in from the outside edges of the posts.

Use your drill press to rough out the mortises. Then, square up the mortise walls with a sharp chisel. If you have a mortising attachment for your drill press, use it.

Remaining Parts: Dry-assemble the posts and rails to check the fit of the mortise-and-tenon joints. Test-fit the corner sweeps at this time, too. If everything fits properly, cut the cleats (J) to fit between the posts and the spacers (K) to evenly space the three mattress support slats (L). Next, glue and screw the cleats and fillers to the bottom end rails. To do this, first counterbore the screw holes, then later plug the holes with matching plugs to hide the screws. Now, cut and fit the three mattress support boards.

Bandsaw the rockers (M) from $\frac{1}{4}$ "-thick stock. To lay out the radius on the rockers, cut a 30"-long piece of string. Tie a pencil at one end of it and a nail at the other end, spacing them $26 \frac{3}{4}$ " apart. Drive the nail into a wall as shown in Fig. 2, positioning the nail so that the pen-

cil just touches the floor. Next, place the rocker board flat against the wall, aligning the centerline of the board with the string. Then, holding the board in place, swing the pencil back and forth in an arc to mark the rocker's profile. Now, mark the second rocker board.

Saw both rockers to shape, then sand them smooth. Lay out and cut the $\frac{1}{4}$ "-deep reveal in the top edge of each rocker. Then, notch the bottom ends of the four posts as shown in Fig. 3 to half-lap over the rockers. Now, you're ready to start assembling.



Born in Boston and educated at Exeter and Harvard, Wallace Nutting was first a minister, but left the ministry in 1904 to pursue his true loves, photography and furniture. Recognized today as one of the 20th century's great eclectic personalities, Nutting first made a name for himself selling tinted photographs. Later, his appreciation of a then-neglected style—Early American—led to his opening a factory and making and selling reproductions of classic furniture pieces from the period. Nutting also authored several books, among them the famous *Furniture Treasury*, a three-volume tome considered by many to be the bible of the Early American style.

Through his friendship with Berea's president William J. Hutchins, Nutting developed an interest in the college's Woodcraft Program. He provided blueprints for many of the elegant designs that Berea's skilled craftsmen still make. In 1941, after Nutting's death, his wife bequeathed the furniture collection to Berea, where it continues to be housed today.

Berea's renowned Woodcraft Program features a learn-while-you-earn arrangement. Students work side-by-side with master craftsmen under the ageless apprenticeship system to acquire the necessary skills. The work the students produce can be purchased through the Woodcraft Catalog and at stores and galleries. To learn more about Berea College, the Woodcraft Program, or the Wallace Nutting Collection, call Berea College at (606) 986-9341.

Bill Of Materials (all dimensions actual)			
Part	Description	Size	No. Req'd
A	Long Posts	1 3/4 x 1 3/4 x 32 1/2"	2
B	Short Posts	1 3/4 x 1 3/4 x 24 1/2"	2
C	Crosspiece	1 3/4 x 1 3/4 x 13 1/2"	1
D	Spindles	1 x 1 x 9"	26
E	Corner Sweeps	1 3/8 x 4 x 4"	2
F	End Rails (top)	3/4 x 2 x 18"	2
G	Side Rails (top)	3/4 x 2 x 34"	2
H	End Rails (bottom)	3/4 x 2 3/4 x 18"	2
I	Side Rails (bottom)	3/4 x 2 3/4 x 34"	2
J	Cleats	3/4 x 3/4 x 16 1/2"	2
K	Spacers	3/4 x 3/4 x 3 3/4"	4
L	Mattress Support Slats	3/4 x 3 x 34"	3
M	Rockers	3/4 x 3 x 24"	2
*Length includes tenon(s)			

Template Turning
Spool Turnings: Examine the full-sized patterns carefully and notice how they repeat. The post and crosspiece turnings consist of two "spool" profiles—one long, the other short. On our cradle, the longer spool measures 2 3/4" long, the shorter spool 2 1/4" long. This popular spool profile appears on other items in the Wallace Nutting collection, including a handsome "spool" bed.

A fairly simple shape, the spool has a bulb-shaped center section bracketed by a narrow bead at each end. But, for your cradle to look right, the turnings

Apply the finish of your choice. We went with a four-coat, hand-rubbed, satin lacquer finish. Several coats of a good-quality penetrating oil would be an acceptable alternative. Take time to produce a quality finish, especially if you are using lacquer. And remember, working in a dust-free environment will help keep your finish blemish-free.

Finishing Touches

Final Assembly

Test-fit all joints to ensure proper fit before gluing. Adjust the fit of parts not fitting correctly. Organize assembly into two subassemblies, the first consisting of the crosspiece, a pair of end rails, four spindles, and a rocker. The two short posts, the two remaining end rails, four spindles, and the remaining rocker make up the second subassembly.

To start the first subassembly, join the top and bottom end rails to the four end spindles. Apply glue only to the mortise-and-tenon joints; do not glue the spindles. Add a long post to each end of the end rails.

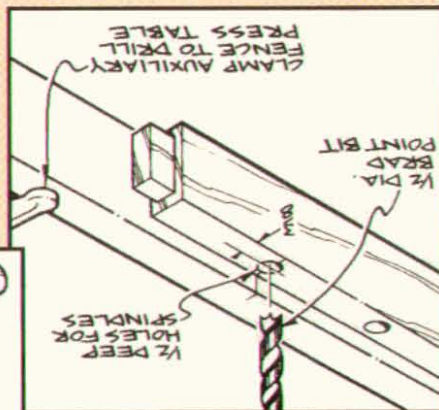
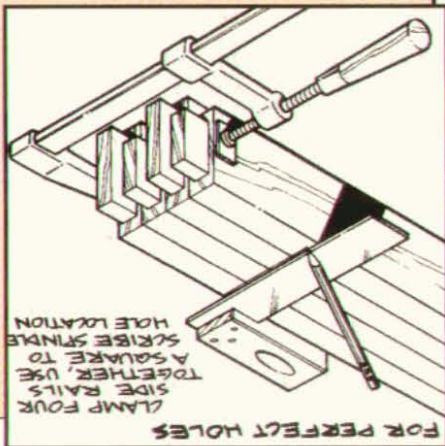
Next, glue a corner sweep onto each end of the crosspiece. Then, glue this three-piece assembly to the top ends of the long posts. Anchor the tenons on the ends of the long posts and crosspiece to the corner sweeps with 3/16"-diameter dowel pins as detailed in Fig. 4.

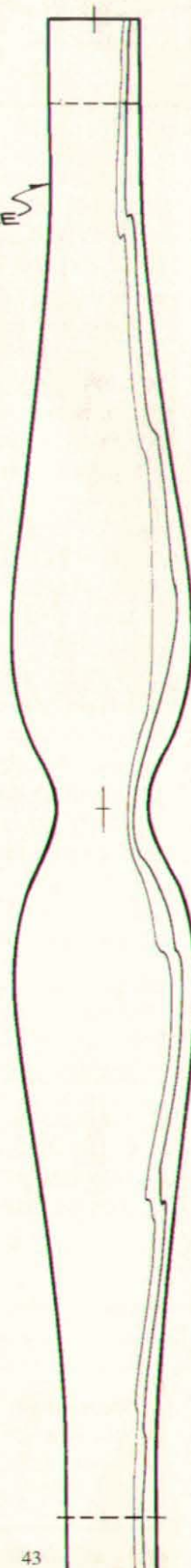
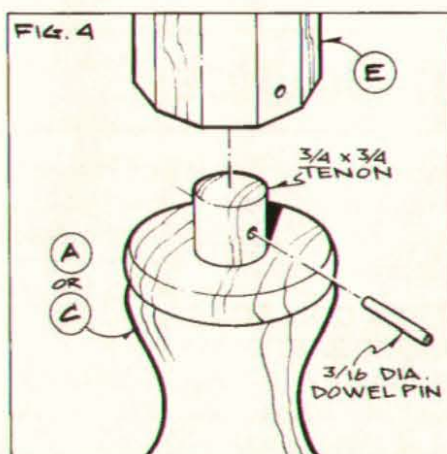
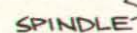
Attach the rocker the same way as the cleats, first counterboring the holes, driving the screws, and then filling the holes with matching plugs. By working quickly on a flat surface, you should be able to make the adjustments needed to square the assembly and ensure that it lays flat. Assemble the second end rail and spindle assembly, then add the pair of short posts and the rocker. Check the assembly for square, and set it aside to dry. Assemble the side rails and spindles.

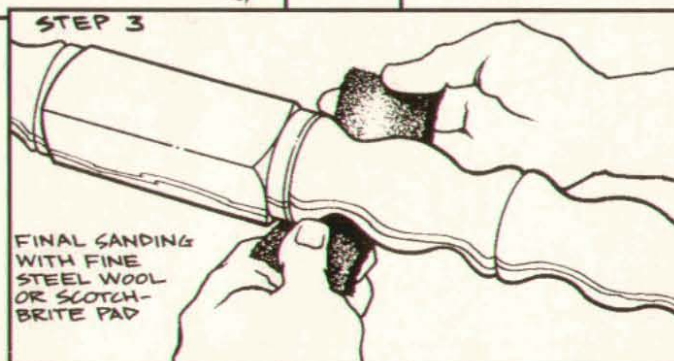
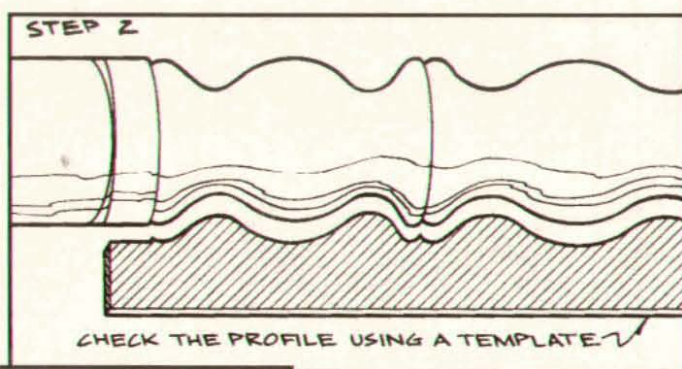
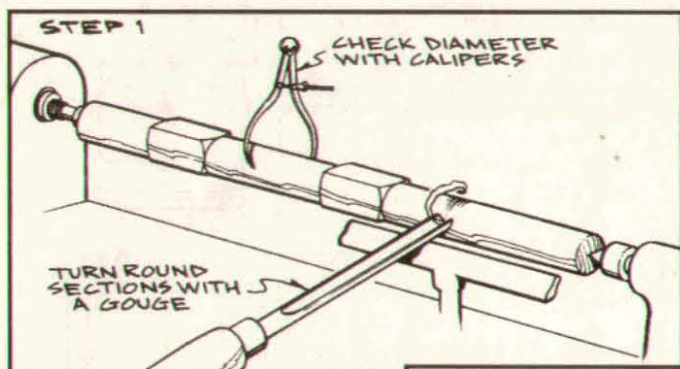
To accurately align the rail spindles, first mark the centerpoints for the spindle holes along the edge of one side rail. Space these holes 3 3/4" apart. Next, clamp the four rails together side-by-side, aligning the ends. Then, using a try-square or framing square and the centerpoints you just marked on the one rail, extend the centerlines for each spindle hole across the edge of all four rails. Use this same procedure to mark the hole centerlines on the four end rails. As shown on the End View drawing, to achieve even spacing of the four spindles at each end of the cradle, you'll need to make the spacing just a hair more than 3 3/4" apart.

To drill the spindle holes, first center the drill bit on one of the hole's centerpoints (3/8" from the face of the piece). Next, without moving the drill or the piece, place a fence against the rail, and clamp it to the drill-press table. Then, set the drill press to the appropriate depth, and bore each hole.

PRO TIP







need to be uniform. To ensure uniformity, we suggest that you use the full-sized patterns to make templates for each of the sections.

The templates can be made of thin plywood, stiff cardboard, or any other fairly rigid material. For turners of old, templates like these were an important part of the shop, and the size of a turner's template library attested to his or her experience. Only the very best were so skilled that they could rely on their eyes, instead of templates or calipers.

At the Lathe: For the posts and crosspiece, you'll need to prepare 1 1/4"-square turning blanks. Keep in mind that your turning blanks for the long posts must be long enough to allow for a 3/4"-long by 3/4"-diameter tenon to be turned on the top ends. The turning blank for the crosspiece must also be long enough for the same sized tenons on each end. (Kit buyers note: The parts in your kit will have the tenons already turned on the piece ends.)

The Posts: For the posts, start by laying out the square and the turned sections. Then, use a gouge to turn the round sections of the posts to a 1 1/4"-diameter cylinder (Step 1). Use calipers to check that the cylinder diameter stays consistent. Once you've established the cylinder sections, lay out the spool sections. The long posts have three long spools at the top, a square section, a pair of short spools, another square section, and finally a pair of short spools terminating in a tapered end.

Make the short posts identical to the long posts, but replace the three long spools with a ball top. Also, note that on all four posts, the top square section

measures 3 1/4" long while the bottom square section measures 3 3/4" long.

Most turners will rely on gouges, a spear-point, and skewers for the bulk of the turning work and a parting tool to cut the shoulders at the tenon ends. To ensure consistency, check your work regularly by comparing it

to the templates (Step 2). Use a calipers to check the diameters as you rough out the turnings.

The Crosspiece: The crosspiece has a pair of long spools at the center flanked by a short spool at each end. Again, check your work against the templates, and don't forget to turn the 3/4"-long 3/4"-diameter tenon on each end.

The Spindles: You'll also need a template of the spindle turnings. As the full-sized pattern shows, the spindles taper gently, with no shoulder marking the tenon ends. Instead, turn the end sections to a consistent 1/2" diameter. Allow at least 1/2" of length on each spindle end for the tenons.

Finishing Up: After you've completed each turning, sand away any marks left by the turning tools. Many turning books recommend holding a handful of wood chips against the turning as it spins to burnish the wood and add a deep luster. Fine steel wool or a Scotchbrite pad produces a similar effect (Step 3). Although our patterns show the high points of the post and crosspiece turnings as 1 1/4" in diameter, the actual diameter will be slightly less after turning, sanding and burnishing the surfaces. 

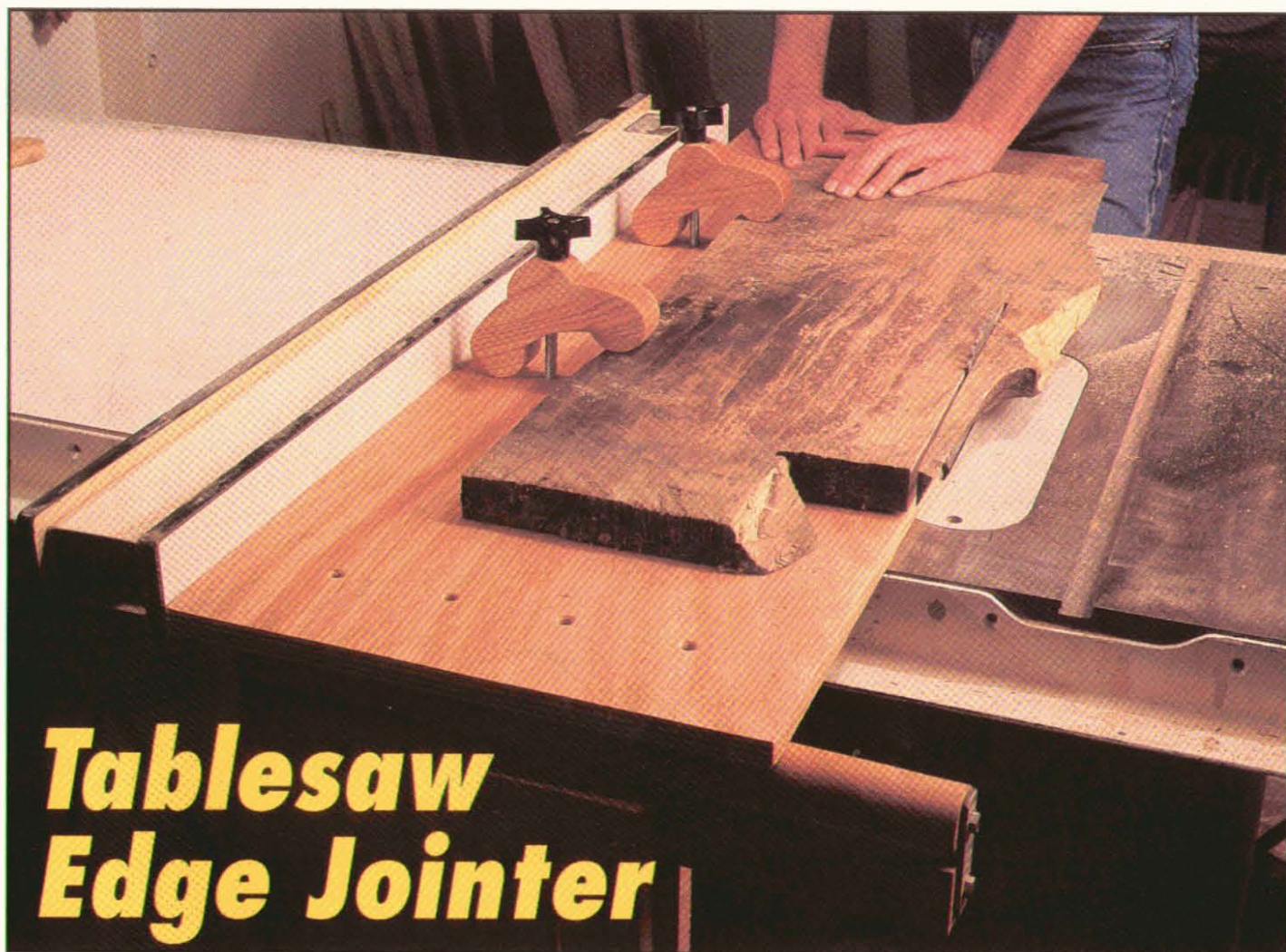
KIT SOURCE

You may order a pretuned kit consisting of the four posts (A and B), the crosspiece (C), and the 26 spindles (D), complete with all tenons. Specify the Jenny Lind Turning Kit in either black walnut or cherry. Each kit costs \$210.00 postpaid. Visa and Mastercard accepted. Please allow 4-6 weeks for delivery. Order from:

**BEREA COLLEGE
WOODCRAFTS**
CPO 2347
Berea, KY 40404
Tel. 800/347-3892

Please note: This kit contains only the turnings, not the other cradle parts. As with any kit, we suggest you wait until you have the kit on hand before cutting the remaining cradle parts. The parts in the Jenny Lind Turning Kit will be hand-turned by an experienced crafter, but dimensions may vary slightly from those shown on the Bill Of Materials.

Project design: Wallace Nutting Collection
Berea College, Berea, Ky
Illustrations: Dan Thornton
Nutting portrait: Michael Gellatly
Photograph: Gerard Roy



Tablesaw Edge Jointer

We've said it before: the best jigs typically are the simplest—both to build and to use. This simple tablesaw edge jointer serves a basic but vital need—making a straight cut along one edge of uneven stock.

Over the years, woodworkers have used a multitude of tricks to accomplish this simple task. Some nail the stock to a carrier board that has a straight edge, then guide this nailed-up assembly against the tablesaw rip fence. Others clamp a straightedge to the workpiece itself and make the cut using a portable circular saw.

But the former method usually wastes that portion of the board through which you've nailed, and the latter method can be a fussy affair, since you now have to support the assembly on sawhorses or use scrap blocks to get it off the floor. Nor can you use this method on boards that aren't wide enough to both clamp the straightedge and support the circular saw base.

A Dedicated Jig

To solve the problem of making straight-line rip cuts on uneven stock, try our solution. Clamp the workpiece securely in the jig, position the rip fence so that the tablesaw blade just kisses the edge of the jig base, and saw. We've sized the base to accommodate a wide range of workpiece dimensions. The clamp caul-hole spacing in the jig base will permit safe clamping of practically any size or shape of workpiece. Also, the slotted holes for the carriage bolts enable you to clamp stock up to about 2" thick, which should accommodate nearly every woodworking application.

What You'll Need

You can build our jig in a few hours. To construct the base, start with a 15 x 45" piece of $\frac{3}{4}$ "-thick plywood. (We used Baltic birch but any good grade of plywood will work.) A $1\frac{1}{2}$ x 4 x 12" piece of hardwood such as oak, maple or ash will yield both clamp

cauls. If you can't find the hardware at your local hardware store or home center, see our Kit Source at the end of the article for mail-order buying information.

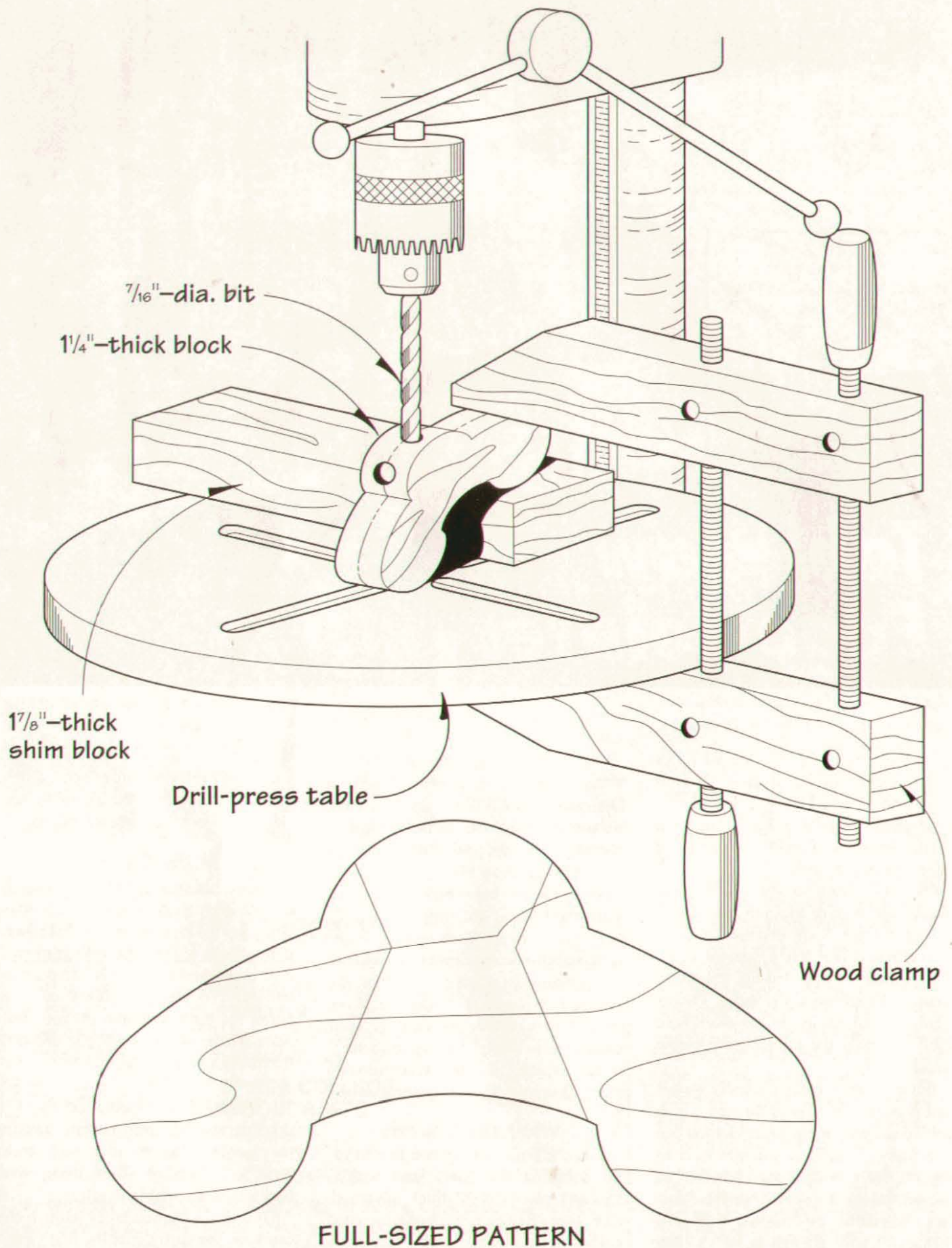
Make The Base

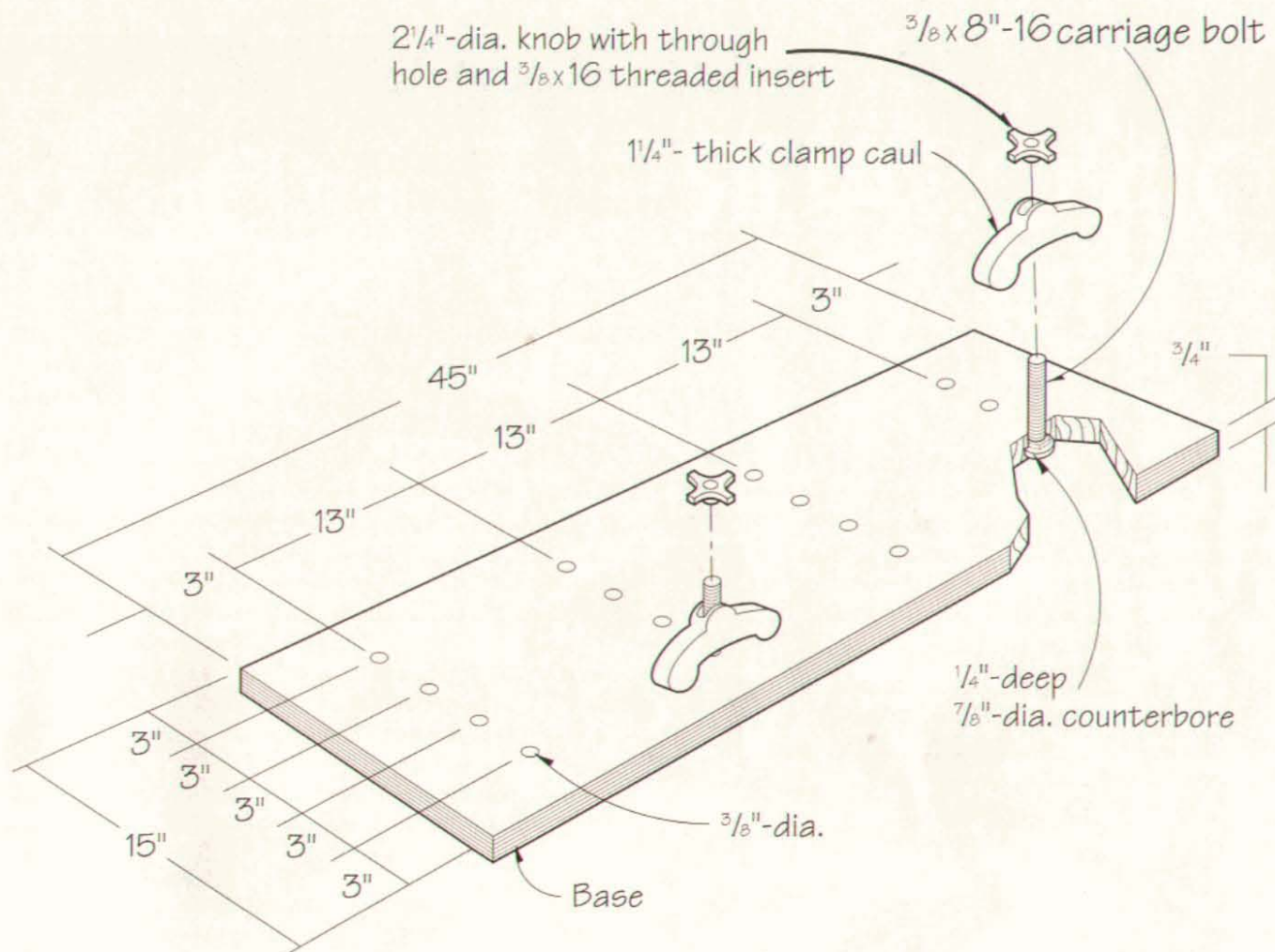
Cut the plywood base to size, then lay out the carriage-bolt hole centerpoints. Once you've penciled in the hole locations, chuck a $\frac{1}{8}$ " Forstner bit in to your drill press, and drill the $\frac{1}{4}$ "-deep counterbores. To ensure uniform counterbores, set the depth stop on your drill press. Then, switch to a $\frac{1}{8}$ " bit and drill the through holes.

Make the Clamp Cauls

Using our full-sized pattern, transfer two caul profiles to your caul stock. Next, cut them to shape using your bandsaw or a portable jigsaw.

To drill the slotted holes through the cauls for the carriage bolts, first clamp the cauls to the drill press table using a shim block, as shown in Fig. 1 *opposite*.





Drill one end of the slotted hole, then flip the caul around so the opposite end rests on the shim block, and reclamp. Then, drill the opposite end of the slot. The dotted lines on the full-sized pattern indicate the ends of the slot. Reposition the caul as necessary, then bore multiple, overlapping holes to clean out the waste between the two end holes. Now, make the second caul.

If the drill bit doesn't clean out all the waste, use a chisel to pare and smooth the walls of the carriage-bolt slots. Next, test a carriage bolt in the slots, and adjust the slots if necessary to make them fit. Then, sand the cauls to remove any splinters or sharp edges.

The Hardware

The jig requires two knobs with through holes and $\frac{3}{8}$ "-16 threaded inserts, two $\frac{3}{8}$ x 8"-16 carriage bolts, and two flat washers. You should be able to buy the hardware at a well-stocked hardware store.

How To Use The Jig

Simply position the carriage bolts and cauls as needed to securely clamp the stock you want to cut. Elevate the table-saw blade about $\frac{1}{2}$ " higher than the workpiece, then advance the assembly along the rip fence.

Once you've made one straight edge, remove the jig, and reposition the rip fence for the desired width. Next, position the just-cut straight edge of the workpiece against the rip fence, and rip the opposite edge. Voilà! You now have a board with parallel edges.

Safety Note: The combined weight of the jig and workpiece may be too heavy to hold on the saw table after clearing the blade. For safety, always use an outfeed table or support system when working with the jig. You may also need to use an infeed table or support, depending on the length of the stock being cut. 

Hardware Kit Source

Includes two large knobs with through holes, two 8"-long carriage bolts, and two washers. Order from:

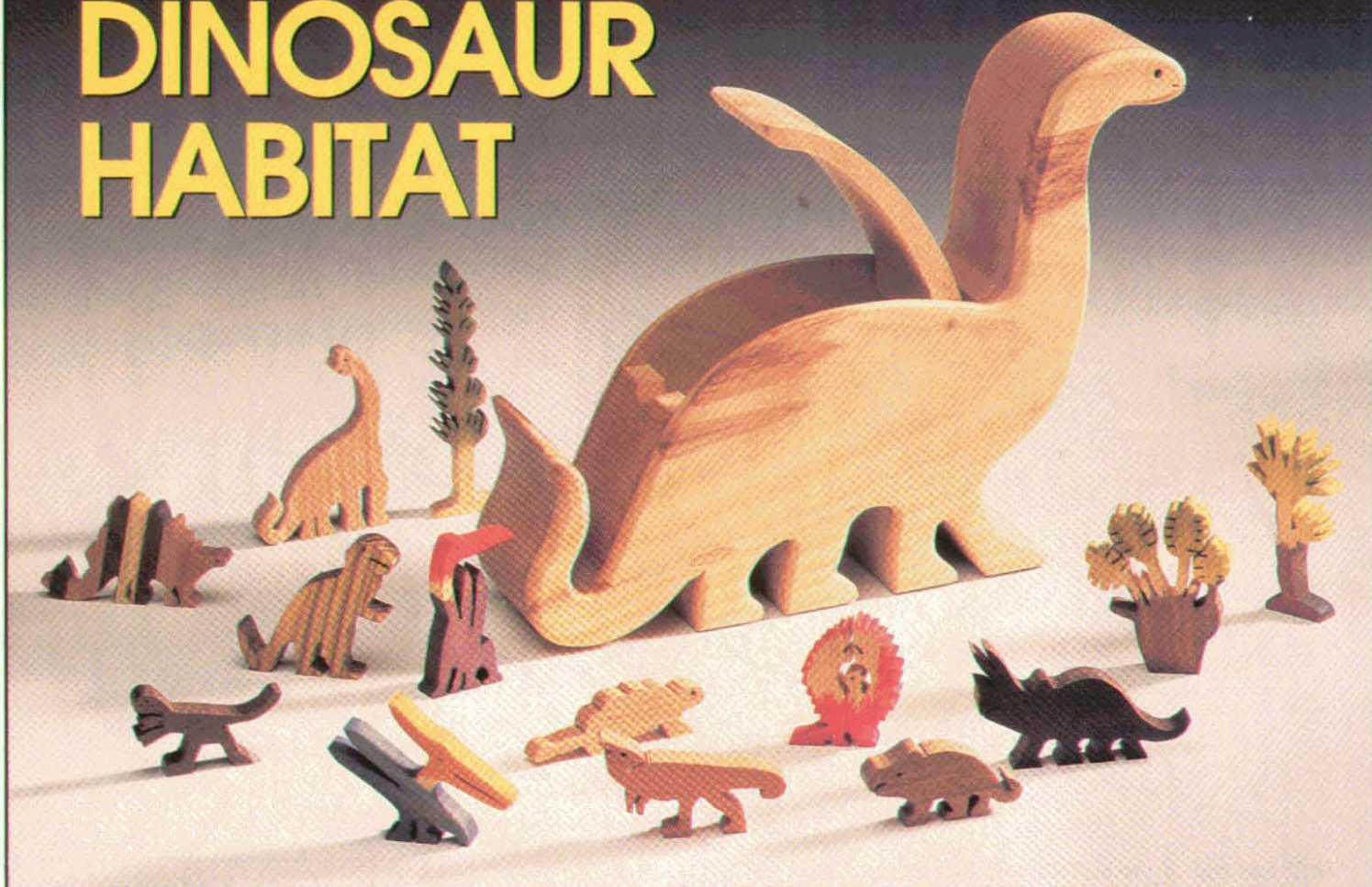
Aspen Kits

6 Hilltop Drive
Old Saybrook, CT 06475
Telephone: 203/388-6179

Kit price: \$9.95 postpaid (send check or money order only, please).

Photograph: Michael Gellatly
Illustrations: Cad-Co and John Ingles

DINOSAUR HABITAT



Some years ago, Gunther Keil discovered that his avocation—hobby woodworking—was more satisfying than his vocation, teaching German literature. Gunther made the leap from academics to crafting, and today makes his home on, and conducts business from, a 55-acre farm near Trumansburg, New York, on the west side of Lake Cayuga.

Gunther's woodworking success came about largely because of his ability to generate novel ideas. He uses mainly domestic woods, such as cherry, walnut, maple, ash, birch, and oak, and sells most of his work through several well-known national catalogs.

Gunther's greatest triumph to date: the "habitat." His habitat concept features a single large form that opens to reveal a variety of related smaller pieces. Gunther employs this concept in settings such as an African scene stored inside an elephant and our Jurassic scene, stored inside a smiling brontosaurus.

Gunther bases his work not so much on realism or exquisite detail as on a fanciful approach depicting the various elements in each habitat. You'll find his habitats easy to make, even if you don't have a world of experience or a wealth of tools in your shop. In fact, although one might suppose that Gunther does most of his work on a scrollsaw, he tells us that from a practical standpoint, he's found the bandsaw to be accurate enough and much faster.

Before you begin, we'd add one cautionary note. We recommend that you not make this project as a gift for children under three years of age. In subjecting the small pieces to the Consumer Product Safety Commission choking-hazard standards, we found that the two smallest animals failed the size test. Moreover, toddlers, who like to put just about everything in their mouths, could also break off some of the more delicate parts.

What You'll Need

Those scrap cutoffs of walnut, oak, or cherry that you've been saving will be perfect for the small pieces. The center and sides of the dinosaur can be cherry and ash—what Gunther used—or just about any other woods that you have handy.

Gunther laminates contrasting woods for some of his pieces and paints others, but feel free to use your imagination and make the pieces as colorful or fanciful as you like. Also, don't feel obligated to follow our patterns exactly. Customize your habitat with other plant and animal species from the Jurassic period. If you get the children involved, you'll find that the habitat can even be a great learning toy, as they master the names of the different creatures depicted.

Sizing The Stock

Cut the smaller pieces from $\frac{3}{8}$ "-thick stock. Don't use thicker materials if you want all of the small parts to fit inside the dinosaur. The pieces stack five across in the dinosaur's abdominal cavity, and the 2"-wide cavity allows only an extra $\frac{1}{8}$ " in the five-across arrangement.

Make the center of the brontosaurus from a 2"-thick block and the sides out of $\frac{1}{4}$ "-thick stock. Gunther resaws the $\frac{1}{4}$ "-thick sides from a piece of $\frac{3}{4}$ "-thick stock on his bandsaw. He also resaws all of the $\frac{3}{8}$ "-thick material for the small parts.

Make the Plants and Animals

This part gives the whole family a chance to get in on the fun. If they are old enough to use tools safely, the kids can even scrollsaw some of the pieces themselves.

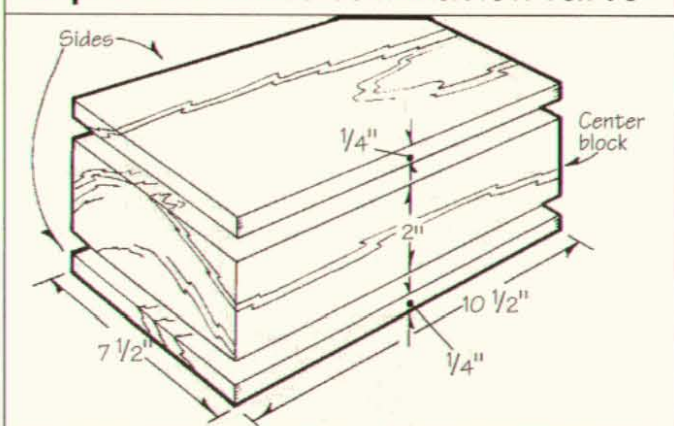
Transfer the full-sized patterns of the habitat plants and animals to the appropriate $\frac{3}{8}$ "-thick sections of stock. Take careful note of the grain direction arrows on the patterns. By positioning the patterns on the stock with respect to the indicated grain direction, the finished pieces will be less likely to break. It isn't crucial that you follow the pattern lines accurately, but make sure you orient the patterns on the source pieces so that they'll have a flat bottom edge to stand on.

As we noted earlier, Gunther uses a bandsaw—not a scrollsaw—to produce his work. He claims that a $\frac{1}{8}$ " or $\frac{1}{16}$ " blade cuts much faster than a scrollsaw and accurately enough for the type of work he does. His secret? The guide blocks. Gunther doesn't use commercial aftermarket graphite-impregnated guide blocks. Instead, He makes his own from oily, exotic woods like cocobolo. (See our Pro Tip below right.)

Project designer and builder: Gunther Keil
Illustrations: Nova Graphics
Photograph: Gerard Roy

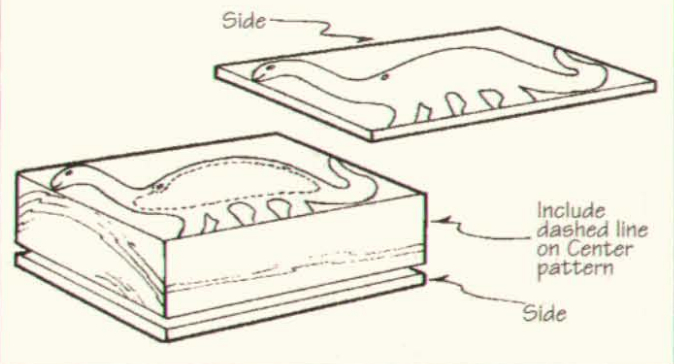
Making The Dinosaur Step-By-Step

Step 1 Cut Three Lamination Parts



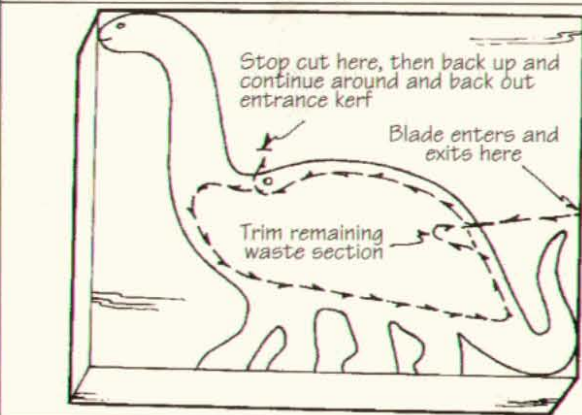
1 To make the Brontosaurus blank, prepare the three lamination parts as dimensioned above. You'll need two $\frac{1}{4}$ "-thick pieces for the sides and a 2"-thick blank for the center. Trim the three pieces to $7\frac{1}{2} \times 10\frac{1}{2}$ ".

Step 2 Transfer the Patterns

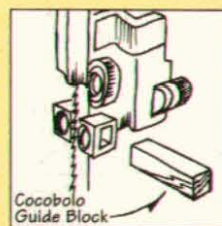


2 Transfer the full-sized dinosaur pattern to the face of the center piece and to the face of one side. On the center blank, include both the outside profile of the dinosaur and the dashed lines that indicate the cuts for the cavity and the lid. The side pattern needs to show only the outside profile and the pivot-pin hole centerpoint. Align the patterns flush with the flat bottom edge to ensure that the dinosaur will stand squarely.

Step 3 Cut the Abdominal Cavity



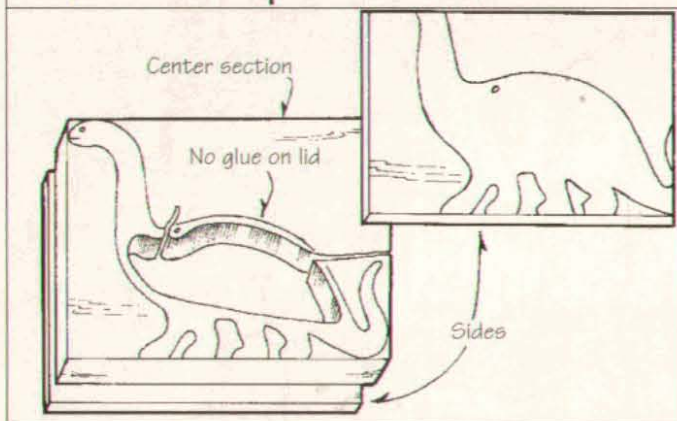
3 Using your bandsaw, cut out the abdominal cavity in the center block. Start the cut at the entry point where shown on the Step 3 drawing, then follow around the pivoting end of the lid to the waste area outside the profile. Stop the cut where indicated, back up the blade, then continue the abdominal cavity cutout, exiting through the entrance kerf. Next, trim the little section of the cavity that remains where you swung around to get the blade to exit through the entrance kerf.



PRO TIP

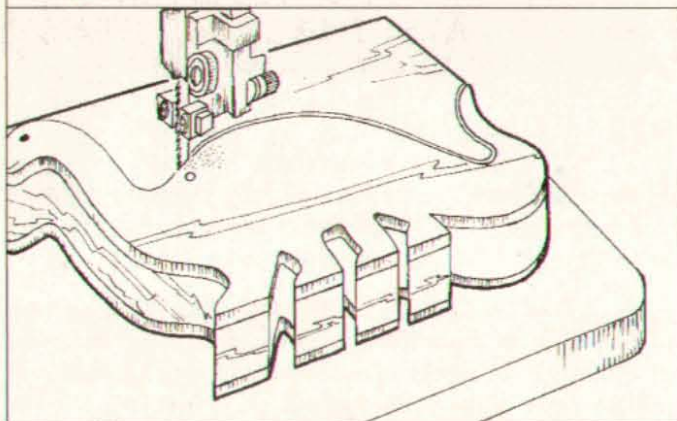
Designer Gunther Keil makes his own bandsaw blade guides rather than buying aftermarket commercial guides. He cuts the guides from cocobolo scrap to fit his saw's guide holder, buries the blade in the guide, then feeds more of the guides as the blade wears them away. The oil in the cocobolo works as a natural lubricant. Gunther notes, so there's never a problem with them burning. And, he never has to worry about running out, since with a few ripping cuts, he can have a new set of home-made guides in a jiffy.

Step 4 Glue Up the Dinosaur



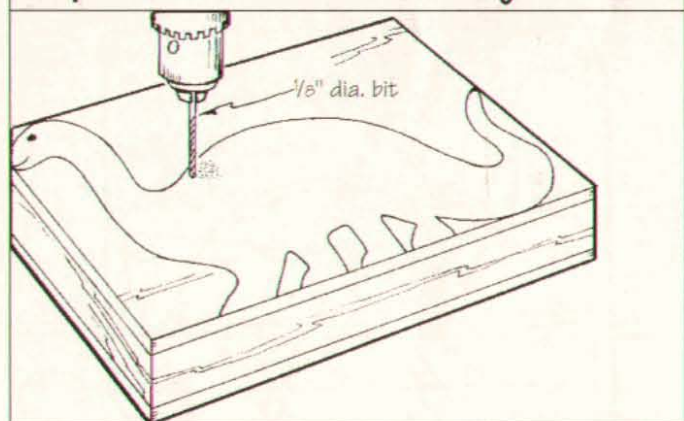
4 Apply glue to the sides of the center section but not to the lid area. Gunther rubs wax on the edges of the lid section so that even if some glue does squeeze out onto the edges of the lid, it won't stick to the dinosaur sides. Next, sandwich the sides and center block together and clamp securely, aligning all three sections perfectly. Now, allow the glue to dry.

Step 6 Cut The Outside Profile



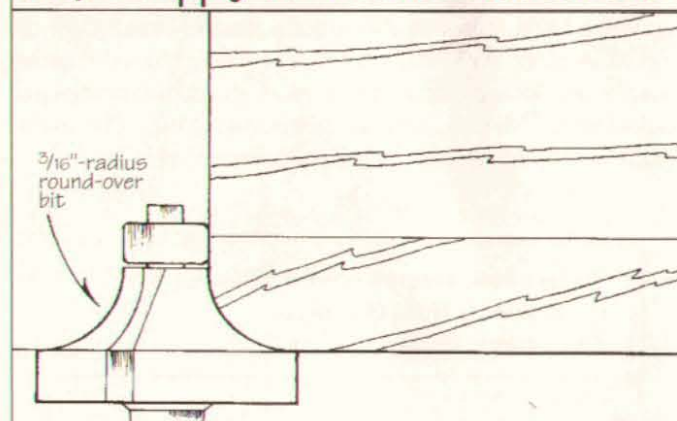
6 Cut the outside profile of the dinosaur on the bandsaw, keeping your blade a little wide of the pattern line on the lid area of the profile. Later, you'll need to file or sand the sides a bit to flush them with the lid, which will drop down by the width of the entrance/exit saw kerf. Now, cut a kerf for the mouth.

Step 5 Drill Pivot Pin and Eye Holes



5 Using a $\frac{1}{8}$ " bit, drill through the dinosaur body for the pivot pin. Next, cut a 3" length of $\frac{1}{8}$ " dowel and insert it into the hole as a pin, but do not glue it at this time. Also, drill a shallow $\frac{1}{8}$ "-diameter eye hole on both sides of the dinosaur's head.

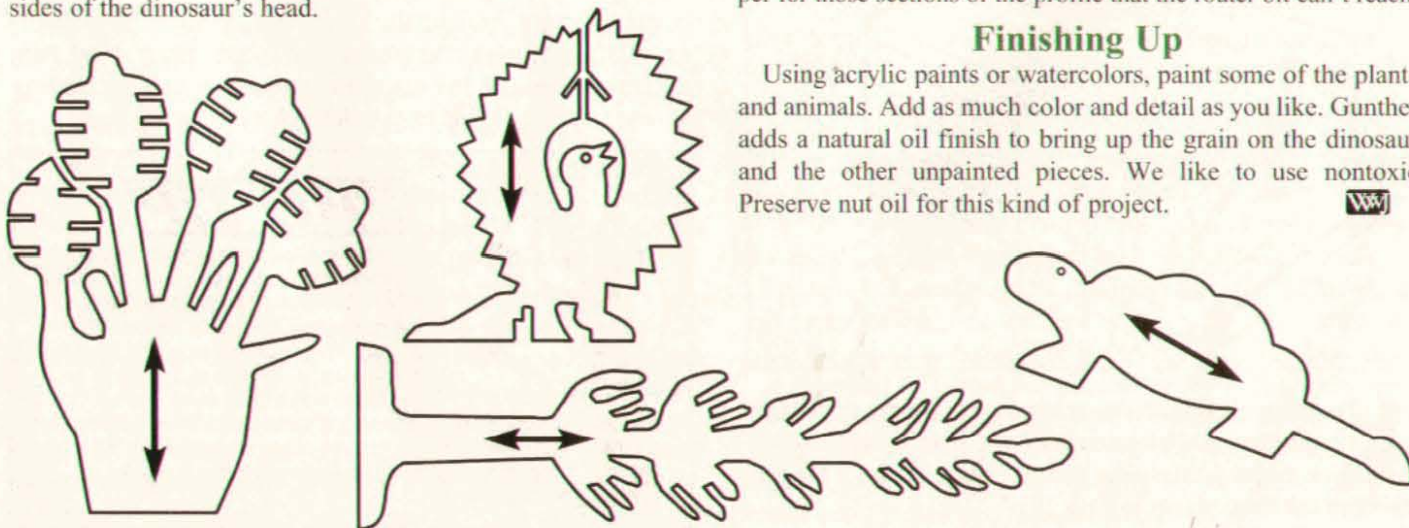
Step 7 Apply $\frac{3}{16}$ "-Radius Round-Over



7 File a thumb notch in the dinosaur's back to facilitate lifting the lid. (The photograph shows this notch clearly.) Finally, use a $\frac{3}{16}$ "-radius round-over bit in your table-mounted router to soften the profile edges. Use a file and sandpaper for those sections of the profile that the router bit can't reach.

Finishing Up

Using acrylic paints or watercolors, paint some of the plants and animals. Add as much color and detail as you like. Gunther adds a natural oil finish to bring up the grain on the dinosaur and the other unpainted pieces. We like to use nontoxic Preserve nut oil for this kind of project.



$\longleftrightarrow$ = Grain Direction





Cutting Board Combo

Tired of carrying the cutting board to the table, or out to the grill, and then finding you have to go back for the knives and utensils you'll need? Our compact cutting board solves that problem. It incorporates a heavy-duty cutting surface with an integral drawer in one handsome, portable unit. We've added a full-width knife block inside the

drawer, but you may omit the block, use a smaller one, or make up dividers to suit your own needs.

Stock Choices

We've crafted this compact cutting board mainly of maple, using hard or "rock" maple for the cutting surface, and soft "curly" maple for the case sides,

back, edging, and the drawer front. With most projects, you can substitute woods to suit your taste or decor, but for this one, we suggest you not make wholesale substitutions. Most cutting boards use rock maple for their cutting surface, because it stands up well to the type of abuse cutting boards typically encounter. When buying your wood, be

sure to specify "hard" maple for the cutting-surface stock.

Many lumber suppliers simply identify maple as maple and don't distinguish between the hard and soft varieties. However, if you compare planed stock side by side, hard maple typically shows a little more yellow or orange tint than soft maple. (You can see this color variation in the photo.) We chose curly maple to add visual interest to the piece.

Since we make several parts from $\frac{1}{2}$ "-thick stock, and specify sometimes hard-to-find curly maple, we've asked a mail-order supplier to provide kits that include these materials. Pieces in the kits will come slightly oversized, so you'll need to trim them to finished dimensions. You may also order a kit with the cutting surface already laminated. For more information, see our Kit Source at the end of the article.

A Simple Case Piece

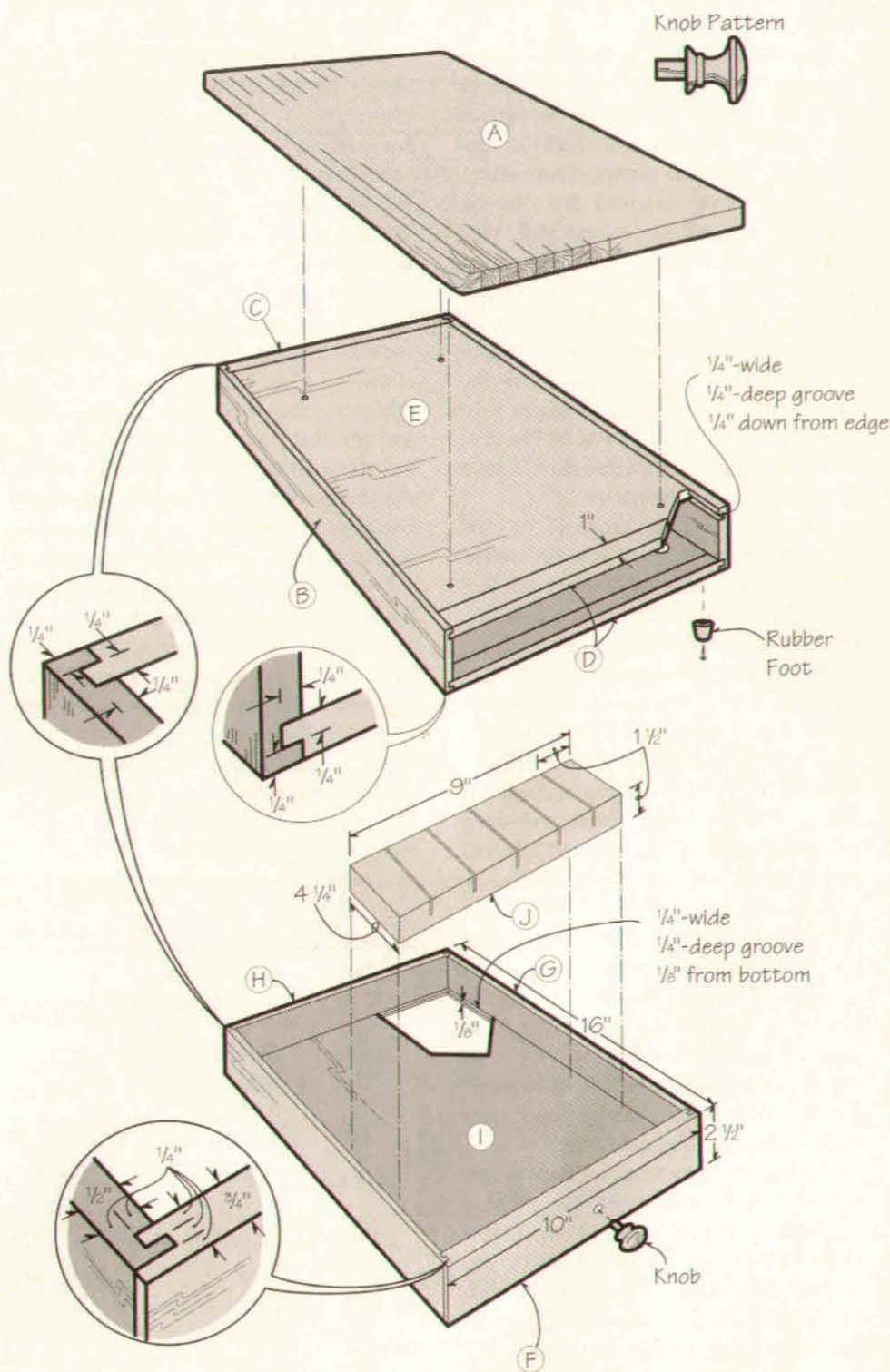
For those of you who have been polishing your basic woodworking skills but have yet to try a more advanced project, here's the perfect opportunity. You'll gain experience in laminating, get some practice building a small case, and have a shot at constructing a simple drawer. But best of all, when you've finished, you'll have a handsome project to show for your efforts.

The Cutting Surface: Although we show the cutting surface (A) as a single item on the Bill Of Materials, you'll make it up by laminating narrow strips to form a single solid surface.

Why not use just a single wide board? Wide boards tend to cup when exposed to moisture. Laminating the top from narrow strips minimizes the chances of it warping.

Books have been written about edge-gluing, suggesting everything from "radical" views—such as aligning the separate strips so as to produce a cupped surface, orienting the cup convex side up, and then relying on screws through the case to pull the cup flat—to the more traditional approach of alternating the grain direction of the strips to minimize warping. We recommend the alternating-grain method since it produces the most stable surface.

We made up the cutting surface with 16 individual $\frac{3}{4}$ "-thick strips yielding the 12"-wide top. Simply rip your stock into $\frac{1}{8}$ "-wide strips 18 $\frac{1}{2}$ " long. We started



with $\frac{1}{8}$ "-wide pieces so that after planing and sanding, the finished lamination would be about 1" thick.

Since cutting-board surfaces get wet occasionally, we recommend using a water-resistant adhesive to glue up the top. We've found that waterproof Excel polyurethane wood glue (available from Trendlines, 800/767-9999) works well. It has good gap-filling characteristics and won't stain the wood. New, water-resistant

Titebond II (also available from Trendlines) may be used too.

If you haven't done much gluing, have a look at Roger Holmes' *Woodworking Basics* feature on glues and gluing up in this issue. We like to use waxed cleats to keep the strips aligned. Many little strips tend to slide about when you apply clamp pressure. Some woodworkers just butt the strips up against the clamp bar. If you do this, slip waxed paper between

the stock and the clamp bar to avoid staining the wood.

Glue the strips face to face, align them along one end, and then apply bar clamps both top and bottom to keep the surface flat. Use a straightedge to check for flatness, and adjust the clamps if necessary.

After you've removed the clamps, simply scrape off any excess glue, then plane or belt-sand the lamination smooth. Trim the lamination to final length and width, then gently round-over all corners and edges using a $\frac{3}{16}$ " round-over bit in your router. To finish the board, rub on several applications of a natural, non-toxic oil. We used Preserve Nut Oil, but Behlen's Salad Bowl Finish would be a good alternative.

The Case: Rip and crosscut the case sides (B), back (C), and the top/bottom (E), to the dimensions listed in the Bill of Materials. We use plywood for the top and bottom because it causes fewer problems with wood movement than solid stock.

After cutting parts B, C, D, and E to size, edge-glue the edging strips (D) to one end of the plywood top and bottom pieces. Cut $\frac{1}{4}$ "-wide rabbets $\frac{1}{4}$ " deep along the ends of the top and bottom, and along both ends of the back (C).

Next, cut a $\frac{1}{4}$ "-wide $\frac{1}{4}$ "-deep dado along the back inside face of both sides (B). Next, cut $\frac{1}{4}$ " wide and $\frac{1}{4}$ "-deep grooves $\frac{1}{4}$ " in from the edges along the top inside faces of the sides. Stop these grooves at the cross-grain groove near the end; don't run the groove through, or you'll end up with a small open square in the side ends after assembly.

The rabbets, grooves, and dados can be cut on the router table using just a single setup. As shown in Figure 1, you make the rabbet cut to establish the tongue by standing the stock on end. Make the dado cut as shown in Figure 2. We suggest you always test your setup with scrap pieces of the same thickness as the stock you are using before machining your good stock.

Before assembling the case, drill the holes in the top and bottom as shown *opposite* in Figure 2. You'll drive the screws to mount the cutting board through the top holes. You need the larger holes in the bottom for screw-driver access to these screws.

Glue, assemble, and clamp the case. Check the assembly for square. When

dry, sand a slight round-over on the sharp edges and corners.

The Drawer: Size the drawer to fit inside the case, allowing just enough clearance so it slides easily. Although we used curly maple for the drawer front (F), we used pine for the drawer sides (G) and back (H), and $\frac{1}{4}$ " plywood for the bottom (I). Use hard maple for the knife block (J).

To make the drawer, we employed the same rabbet-and-dado construction that we used on the case. First, use the setups shown in Figs. 1 and 2 to establish the rabbet on the ends of the drawer back and the dado on the drawer side ends. For the joint on the drawer front, adjust the straight bit to cut $\frac{1}{2}$ "-deep, then trim back the inside lip $\frac{1}{4}$ " on the tablesaw. Again, test your setups first using scrap.

Use the router table, a straight bit, and fence settings to establish the grooves for the bottom in the sides, front, and back. Next, cut the bottom to size. Now, assemble the front, back, and sides around the bottom.

If you include the knife block, cut it to fit the drawer, and slot it as needed to accept the knives you'll store in it. Cut the slots on your tablesaw.

The Finishing Touches

Finish: As noted earlier, we used an oil finish on the cutting surface. The remaining surfaces can be finished with a good penetrating oil. Apply several coats and rub out the finish vigorously to highlight the curly maple grain figure. Once the finish dries, attach the cutting board to the box with four #8 x $\frac{1}{4}$ " flat-head wood screws.

Hardware: We used a maple knob on the drawer. If you wish to turn the knob yourself, use the full-sized pattern provided. If you use a tenon-style knob, you'll need to drill a hole in the drawer front for the knob tenon. Then, glue the knob in place (do this before applying finish to the drawer).

Install four rubber feet or bumpers to complete this project. You can buy these at most hardware stores. We used $\frac{3}{8}$ "-diameter rubber bumpers. 

Design: Mark J. Ziobro

Illustrations: Laurie Baker-McNeile

Photograph: Lynxwiler Photography

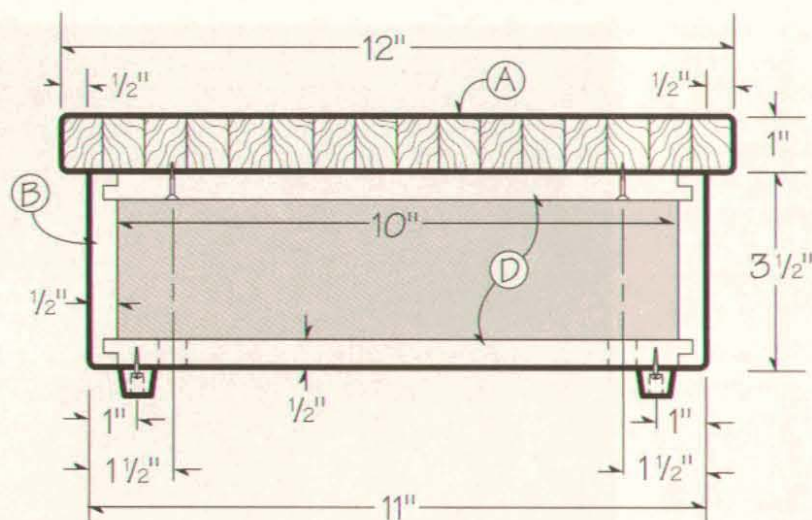
Bill Of Materials

(all dimensions actual)

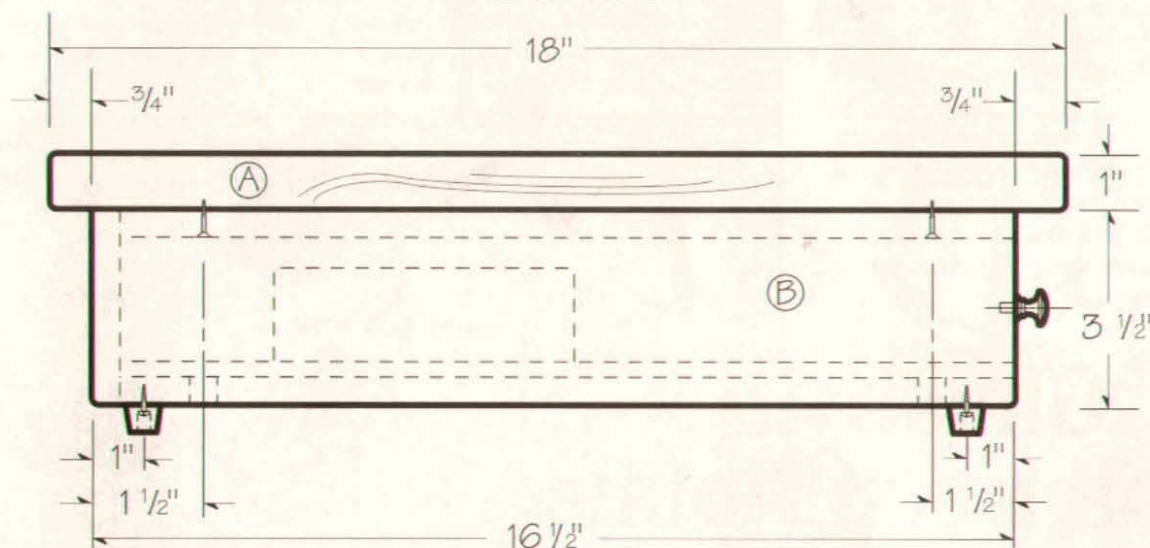
Part	Description	Size	No. Req'd
CUTTING SURFACE AND CASE			
A	Cutting Surface	1 x 12 x 18*	1
B	Side	$\frac{1}{2}$ x $3\frac{1}{2}$ x $16\frac{1}{2}$	2
C	Back	$\frac{1}{2}$ x $3\frac{1}{2}$ x $10\frac{1}{2}$ **	1
D	Edging	$\frac{1}{2}$ x 1 x $10\frac{1}{2}$ **	2
E	Top/Bottom	$\frac{1}{2}$ x 15 x $10\frac{1}{2}$ **	2
DRAWER			
F	Front	$\frac{3}{4}$ x $2\frac{1}{2}$ x 10	1
G	Side	$\frac{1}{2}$ x $2\frac{1}{2}$ x $15\frac{1}{4}$	2
H	Back	$\frac{1}{2}$ x $2\frac{1}{2}$ x $9\frac{1}{2}$ **	1
I	Bottom	$\frac{1}{4}$ x $9\frac{1}{2}$ x $15\frac{1}{4}$	1
J	Knife Block	$1\frac{1}{2}$ x $4\frac{1}{4}$ x 9	1
HARDWARE			
	Knob	$\frac{3}{4}$ dia.	1
	Foot	$\frac{3}{8}$ dia.	4

* Dimensions are finished size. Oversize the strips for the cutting surface, to allow for sanding and trimming.

** Length includes tenons/tongues.



FRONT VIEW



SIDE VIEW

KIT SOURCE

The stock kits come with all the wood you'll need, ready to cut. Kit A includes rock maple for the cutting surface and knife block, curly maple for the case sides, back, edgings and drawer front, a maple turning blank for the knob, pine for the drawer sides and back, 1/2"-thick plywood for the case top and bottom, and 1/4"-thick plywood for the drawer bottom. Kit B comes with identical parts, except that the cutting surface has already been laminated. You'll need to provide the feet or bumpers.

Order from:

HERITAGE BUILDING SPECIALTIES

205 N. Cascade
Fergus Falls, MN 56537
Telephone: 800/524-4184

For Kit option A, specify Project-PAK Stock Kit No. 5944, for the wood-only kit. \$59.95 ppd.

For Kit option B, specify Project-PAK No. 5944, with the laminated cutting board. \$69.95 ppd.

If you're tired of plastic throw-away Halloween decorations, why not get into that old spookin' spirit right in your own workshop? Our spook-inspired, scroll-sawn Halloween mobile by designer Bill Zaun could be just the ticket. It won't take long to make, and once the trick-or-treaters have gone, this decoration won't be headed straight for the trash.

What You'll Need

Saw all wooden parts of the mobile—the web, spider, pumpkin, witch, Dracula, and moon/bats—out of $\frac{1}{8}$ "-thick Baltic birch plywood. Baltic birch has exceptional strength for a thin plywood; this is especially critical for the web, which has to support the other pieces. Also, you'll find Baltic birch void-free, and it takes paint well.

Cut the web from one 16x16" Baltic birch square and the hanging elements from a second piece of the same size. If you can't buy Baltic birch locally, see our Kit Source *opposite* for a mail-order supplier.

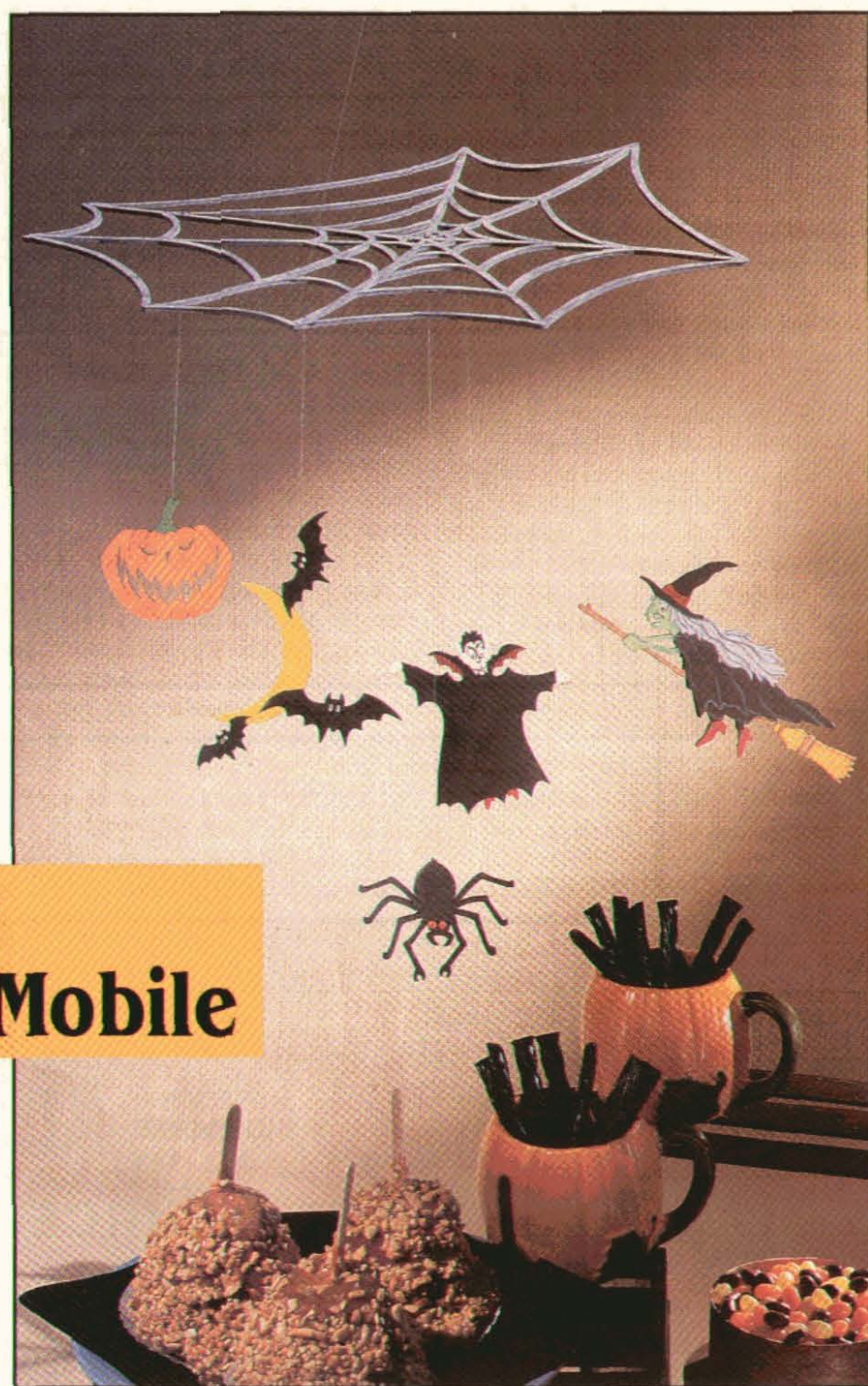
Ghostly Halloween Mobile

In addition to the Baltic birch, you'll need acrylic paints, some monofilament fishing line, and two pairs of red beads for the spider's eyes. If you can't find red beads, simply paint in the eyes.

How To Transfer Patterns

There are many ways to transfer patterns, from slipping a sheet of carbon paper between the pattern page and the stock, to fastening the pattern directly to the stock with spray adhesive. Whatever method you employ, note that the patterns have both heavy and light lines. The heavy lines represent the pattern cutlines. The lighter lines indicate the various painted sections to help make painting the parts easier.

The web was too large to fit full-sized in the magazine, so you'll need to enlarge it when copying. To do so, take it to an enlarging-type photocopy machine, and duplicate it at the percentage given. You can make the web with-

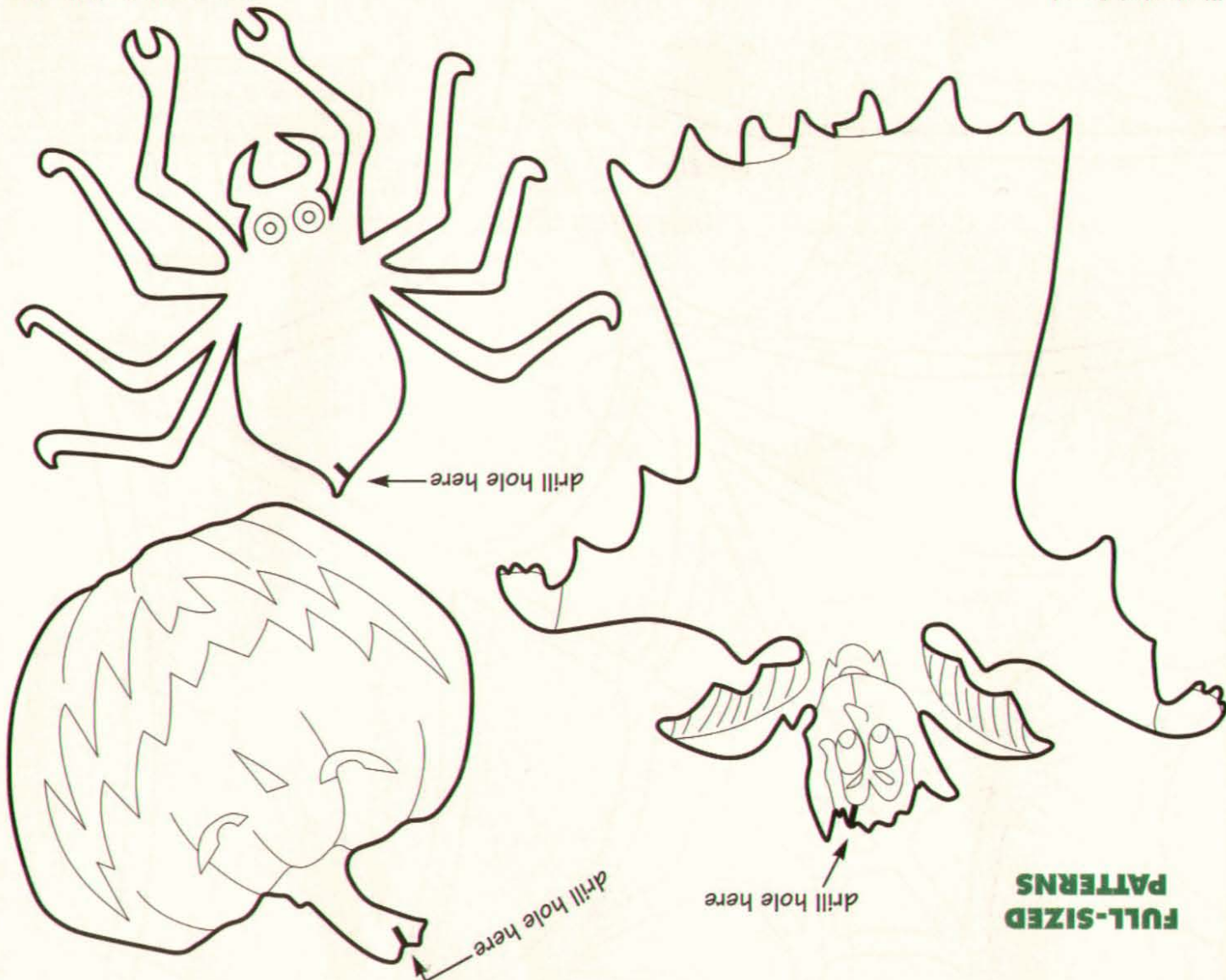


out enlargement, but the resulting mobile will look smaller than the one shown in the photo.

At The Scrollsaw

Note that the witch and the pumpkin have interior cuts. We found it best to make the interior cuts first and then cut the outside profiles. Simply drill a start-hole in the interior sections, then thread the scrollsaw blade through the hole before mounting the blade.

Take extra care when sawing the fragile parts, such as the spider's legs, so you won't break them off. (If you don't have an auxiliary table on your scrollsaw to provide maximum support close to the blade, you can make one from $\frac{1}{4}$ "- or $\frac{3}{8}$ "-thick plywood. First, bandsaw the plywood to conform to the shape of your table, then drill a $\frac{1}{8}$ " hole for the blade. Sand the top face smooth, then adhere it to the table using double-faced carpet tape.)



FULL-SIZED PATTERNS

To assemble the mobile, first drill the eight holes in the web where marked on

A Balancing Act

If you'd like to take the add-on look a bit further, cut and paste bits of cloth on Dracula and the witch, and add a little fuzz to make the spider come alive.

We've added red bead eyes to the spider and used a Dremel tool to make the web and the hanging pieces.

The photo shows the colors we used on our mobile, but feel free to use your own paint scheme. We used acrylic paints, which you can buy at most crafts-supply stores. Paint all surfaces of the web and the hanging pieces.

Painting and Decorating

If you are careful, no edge-sanding lightly to remove any remaining fuzz from the sawn edges.

Fast Sanding and Cleanup

To prepare the hanging figures, drill a small-diameter hole in the edge of each hanging piece where indicated on its pattern. Drilling at these locations will enable you to balance the figures without a lot of trial and error. Next, glue a 20" length of monofilament into each hole. After the glue has dried, thread the lines through the appropriate

To hang the mobile, first cut three 16" lengths of monofilament. Thread the lines through the web-suspending holes, then apply a little heat to create a small ball on the line ends on the underside. This will prevent the lines from pulling through the holes. Now, collect and merge the three lines above the web, then tie them together.

To hang the mobile, first cut three 16" lengths of monofilament. Thread the lines through the web-suspending holes, then apply a little heat to create a small ball on the line ends on the underside. This will prevent the lines from pulling through the holes. Now, collect and merge the three lines above the web, then tie them together.

Telephone: 800/524-4184
Fergus Falls, MN 56537
205 N. Cascade

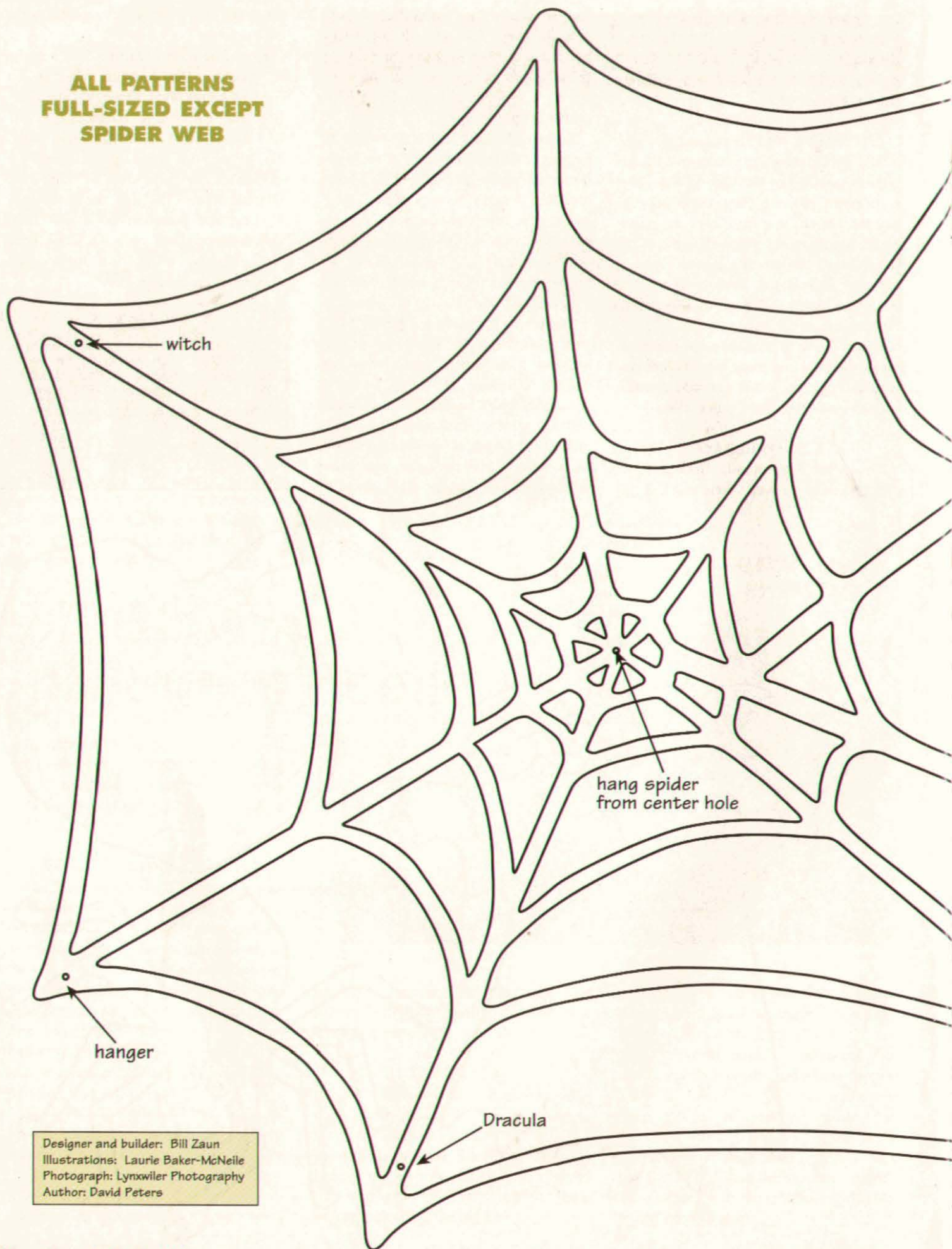
Heritage Building Specialties

The kit includes two 16"-square pieces of 1/2"-thick Baltic birch plywood (all the wood you'll need for this project). Each kit costs \$11.95 ppd. Order kit no. WJ5943 from:

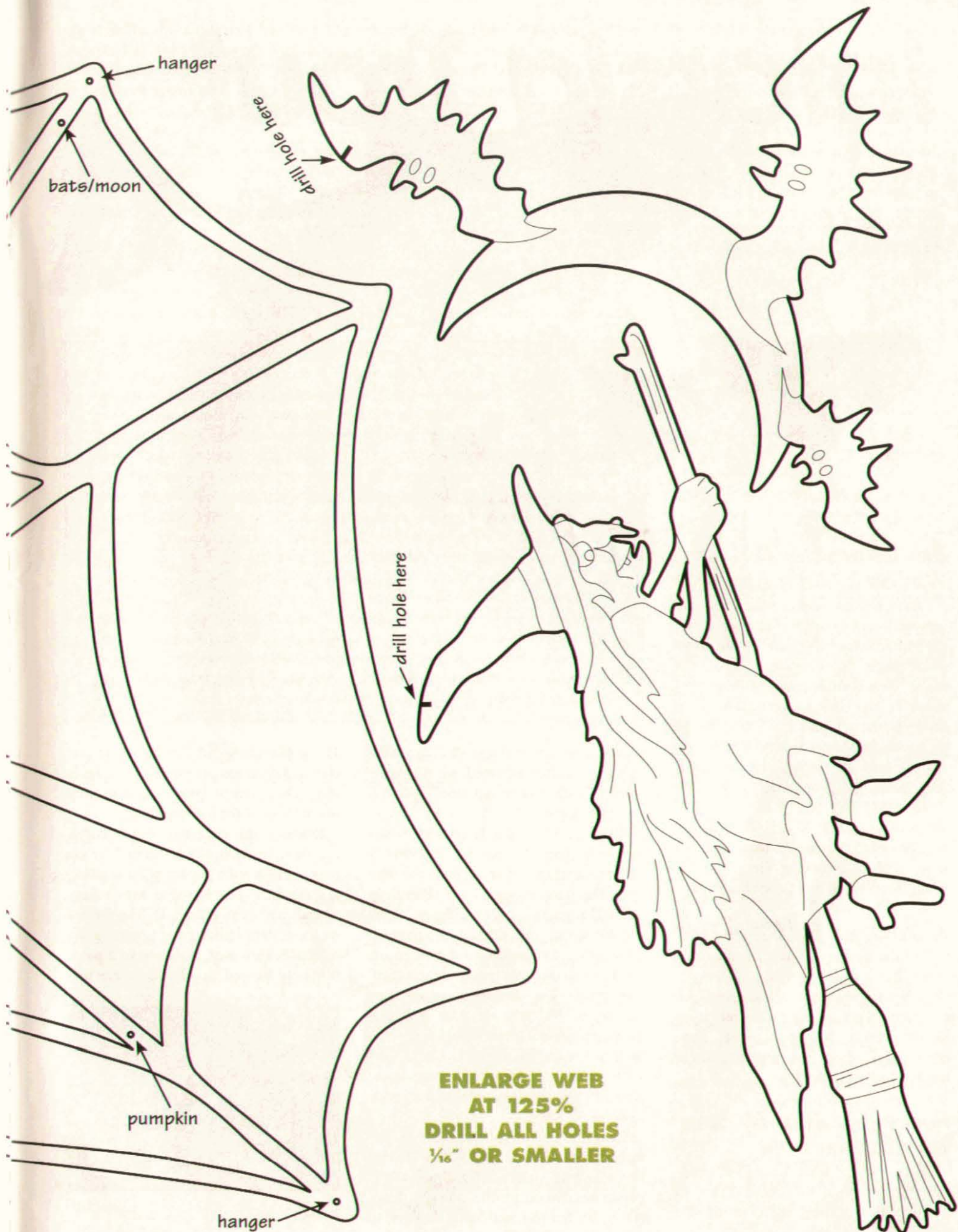
KIT SOURCE

Experiment with various line lengths to balance the hanging figures so the web hangs level. Once you are satisfied that everything balances, tie off the nylon lines and trim the ends. To give you some guidelines, we suspended the spider on a 14"-long line, Dracula on an 11 1/2"-line, the witch on a 7"-line, the pumpkin on a 6 1/2"-line, and the moon/bats on a 4 1/2"-long line. Now, choose a location that yields maximum creepiness.

**ALL PATTERNS
FULL-SIZED EXCEPT
SPIDER WEB**

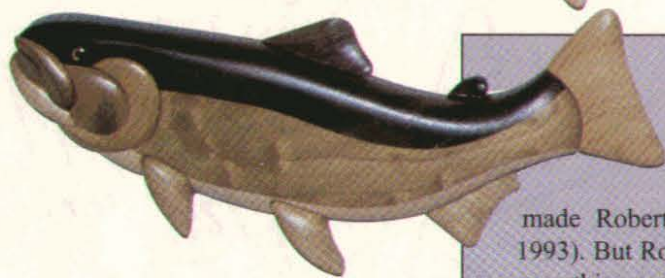


Designer and builder: Bill Zaun
Illustrations: Laurie Baker-McNeile
Photograph: Lynxwiler Photography
Author: David Peters



Intarsia Trout

by Robert J.
Hlavacek Sr.



Use Character Of Woods To Advantage

I used walnut, poplar heartwood and sapwood, and sycamore sapwood. With the poplar heartwood, look for the trademark green tint characteristic of this wood. You'll also need 1/4"-thick plywood for the backing, one glass eye, a sawtooth hanger, and finish. You'll find the sawtooth hanger and the Krylon finish at hardware stores. You can mail-order glass eyes from: Van Dyke's, 4th Avenue & 6th St., P.O. Box 278 Woonsocket, SD 57385. Telephone: 605/796-4425. Specify trout eye, no wire, gold color, either 6mm (for the small trout) or 10 mm (large trout).

A Stock Kit For Either Fish

For those of you who have difficulty buying less common woods, *Woodworker's Journal* asked a stock kit company to put together a kit including all the woods that you'll need. They offer kits for both the large and small trout (see Kit Source).

Follow My Step-By-Step Instructions

To cut out the trout, I used my band-saw fitted with a 1/16" blade. Then, to achieve the desired tight fit of the

Intarsia artist Robert Hlavacek's clever designs keep scores of *Woodworker's Journal* readers busy in their shops. We have received many stunning photos from readers who've made Robert's impressive American Eagle Intarsia Project (Sept./Oct. 1993). But Robert told us that as he gazed at the eagle hanging on his wall, something seemed to be missing. "The eagle," he said, "with its outstretched talons, appears about to grasp something, yet there's nothing there but blank space." Intent on correcting the problem, Robert decided to design a "catch" for the eagle. The result of his effort: the Intarsia Trout.

We asked Robert to make two versions of the trout. The 16"-long trout, represented in the slightly reduced pattern shown on page 63, makes an impressive stand-alone piece, perfect for the den or living room wall. If you are making the trout as the eagle's "lunch," simply reduce the pattern length to about 9". For comparison, we show both versions side-by-side, as well as the small trout in position below the outstretched talons of the eagle. Our step-by-step instructions can be used to construct either version.

pieces, I smoothed the sawn edges with sanding drums mounted in my drill press, which I have equipped with an auxiliary table.

Step 1 Copy the pattern from the magazine page by placing a sheet of tracing paper over it and tracing the outline. The tracing paper I use (Bienfang Satin Design No. 147M) allows me to see the wood grain through the pattern. This way I can position the pattern on the wood to take maximum advantage of the grain. The Bienfang paper has proved to be quite durable, and can be reused several times should you want to make more than one trout. If you wish to make the smaller trout, use a photocopy machine to reduce the pattern to about 9" long.

Step 2 Select your wood. For the trout shown above, I used walnut for the fish's back (A) and two top fins (L, M); poplar heartwood for the side (B), head (D, E, F), tail (K), and lower fins (H, I,

J); poplar sapwood for the lower jaw (G); and sycamore sapwood for the belly (C). The flecked grain of sycamore makes it ideal for the trout belly.

Position your pattern on the appropriate piece of wood, slip a sheet of carbon paper between the pattern and the stock, and trace the part's profile with a fine-tip ball point pen (Photo 1). The arrows on the pattern indicate the general grain direction. However, if you have a piece of nicely figured wood with interesting



Photo 1

grain figure, by all means use it. For projects like this, the figure and color of the wood may be more important to the final appearance of the project than simply matching the grain direction with the pattern.

After transferring the profiles to the stock, drill a $\frac{1}{4}$ "-diameter eye hole in Part A of the small trout, a $\frac{1}{32}$ " eye hole in the large trout. Because of the size difference, I use a 6mm eye for the smaller trout, a 10mm eye for the large one. The thickness of the glass eyes varies somewhat, so test-drill the hole in scrap material first to determine the best depth.

Step 3 Cut the contours where parts A, B, and C join. Start by cutting the bottom contour of Part A, then smooth the cut edge with a sanding drum in the drill press. Always use the largest diameter sanding drum possible, especially for parts like this with a long curved edge. I've found that a small-diameter drum, such as a $\frac{1}{2}$ ", tends to create ripples in the edge, making it difficult to flush-fit the pieces.



Photo 2

Once the bottom contour of Part A has been cut, position Part A on Part B, using A as a template to trace the actual cutline onto Part B (Photo 2). When making the cut on Part B, keep the saw blade on the outside edge of the line. Then, drum-sand the edge for a smooth, precise fit to the adjoining piece. Repeat this process to transfer the Part B profile to Part C.

After fitting parts A, B, and C, apply glue (I prefer carpenter's glue), then



Photo 3

clamp the three pieces together (Photo 3). To make it easier to clamp this assembly, leave the outside edges of parts A and C square.



Photo 4

Step 4 Once the glue has dried, cut the outside body contour, and then sand it smooth (Photo 4). When sawing out the areas to receive lower fins H and I, cut slowly and accurately, because you won't be able to sand these tight areas easily.

Position the body over the tracing of fins H and I. As before, redraw the cutlines (Photo 5). Although you can cut out all the parts at one time and put them together like a jigsaw puzzle, I found that doing it this way results in a rather rough-looking assembly. For the precisely fitted look of the trout shown, I recommend tracing each cut directly from the adjoining piece to the part it will mate to. Use this same procedure to get the fins (J, L, and M) and the tail (K) to fit accurately to the trout body.

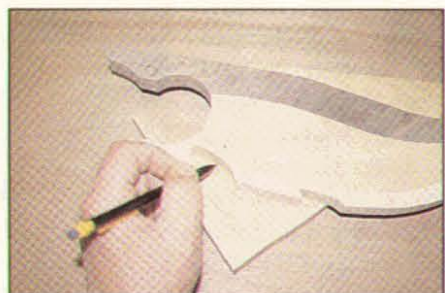


Photo 5

The fins (J, L, and M) and tail (K) should be approximately $\frac{3}{8}$ " thick. I start with $\frac{1}{4}$ "-thick stock and resaw it on the bandsaw. (To keep your fingers a safe distance from the blade, I suggest you adhere your small, $\frac{1}{4}$ "-thick workpiece

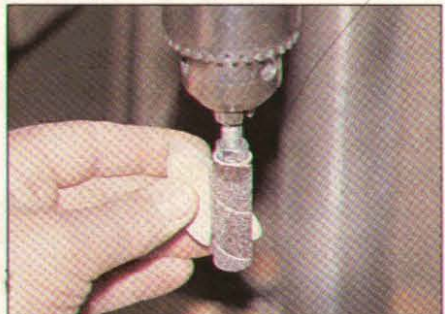


Photo 6

to a larger carrier board using double-faced carpet tape.)

Next, use a sanding drum to smooth the cut surface and to contour both the front and back edges of the fins and tail. As shown in Photo 6, use a $\frac{1}{2}$ "-diameter sanding drum to contour the underside of fins H and I. Photo 7, a shot of the finished project, shows what these fins look like after contouring. For strength,

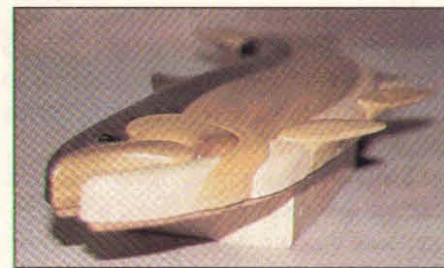


Photo 7

I vary the fins from thin at the edges to thicker near the center. Don't glue the fins or tail in place yet.

Step 5 Put the fins aside, and go to work on the head. Add the head parts to the trout's body using the same "trace, cut, and sand-to-fit procedure" detailed earlier. Start with Part D, and when you're satisfied with the fit, use masking



Photo 8

tape to hold the part in place (Photo 8). Next, fit parts E, F, and G in the order listed, temporarily taping each one in place as you work.

Step 6 Cut the $\frac{1}{8}$ "-thick scrap shims using the dashed outlines on parts E and F as the pattern. Glue the shims to the undersides of parts E and F. Note that the shim under Part F raises only the wider end of the piece. This shim tilts the piece up slightly, so you need to sand back the edge of part F where it meets parts E and G for a tight fit.

Next, round the outside edges of the body. You can use a large sanding drum or a $\frac{3}{8}$ " round-over bit in your table-mounted router for this. If you use a router, make the cut in two passes to

avoid chipping. Do not attempt to route the small forward section of Part C between parts D and H, as it will likely break off.

Next, sand the body and smooth the rounded edges. (I use a quarter-sheet pad sander.) Keep in mind that fins J, K, L, and M need to have a square edge to serve as a gluing surface, so don't sand so far over the edge of the body as to ruin the fit of these pieces. As also shown in Photo 7, you need to remove a little material from the body surface so that fins H and I as well as part D stand slightly proud.

Step 7 As noted, several pieces, among them part E, are raised a bit higher than the surrounding parts. On the edges of all raised pieces draw a pencil

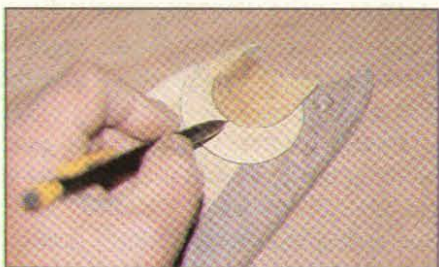


Photo 9

line as a guide for contouring (Photo 9), then gently round the edge of the piece down to the line. Contouring the raised parts so they flow into the lower parts makes the trout seem almost sculptural. This is much of the "magic" of intarsia.

Step 8 Now that you've shaped all the pieces, the ridges left by the sanding drums should be smoothed out. Hand-sanding will take care of this, but I find

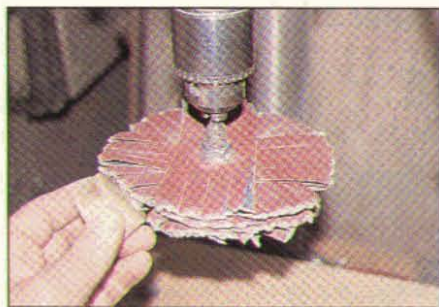


Photo 10

the work goes much more quickly using a flutter-head assembly in the drill press (Photo 10). Flutter sheets in 150-grit do a quick job of smoothing the pieces. You can order them from The Sanding Catalogue (telephone 800/228-0000).

Step 9 Dry-assemble the head parts to the body, and double-check to make

sure that everything fits nicely. Now, spread a sheet of waxed paper on a flat surface, and begin edge-gluing the parts together. I prefer 5-minute clear epoxy for this. Once the glue has set on the head parts, glue the fins in place.

Step 10 After the glue dries, peel the waxed paper off the back of your trout. Place it on a piece of 1/4"-thick backing plywood and trace the outline of the fish onto the plywood. Cut the plywood approximately 1/8" inside the traced profile, then sand to round the plywood's edge so the backing board doesn't show when you hang the project.

Step 11 Several small C-clamps come in handy for gluing the trout to the backing board. Place a block under the trout to provide clearance for the C-clamps, and use clamp pads to avoid

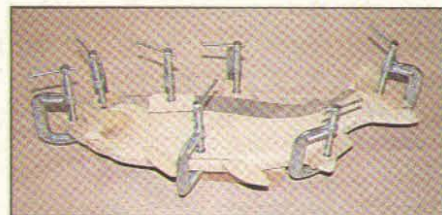


Photo 11

marring the wood surface (Photo 11). Once cut, sanded, glued, and clamped to the trout, the plywood should resemble the trout.

Step 12 Apply the finish of your choice to the trout. I prefer Krylon no. 1311 clear matte finish on most of my projects, because it dries fast in my dusty workshop. The trout shown in the photo have five coats of finish. After the third application dries, lightly sand with 320- or 400-grit paper to smooth the surface. Then, wipe away any dust, and apply the final two finish coats.

Glue the glass eye in place (I use 5-minute epoxy), and add a sawtooth hanger to the back.

Finally, sign your work. Some future relative admiring your work will no doubt marvel at your creative prowess!

Kit Source

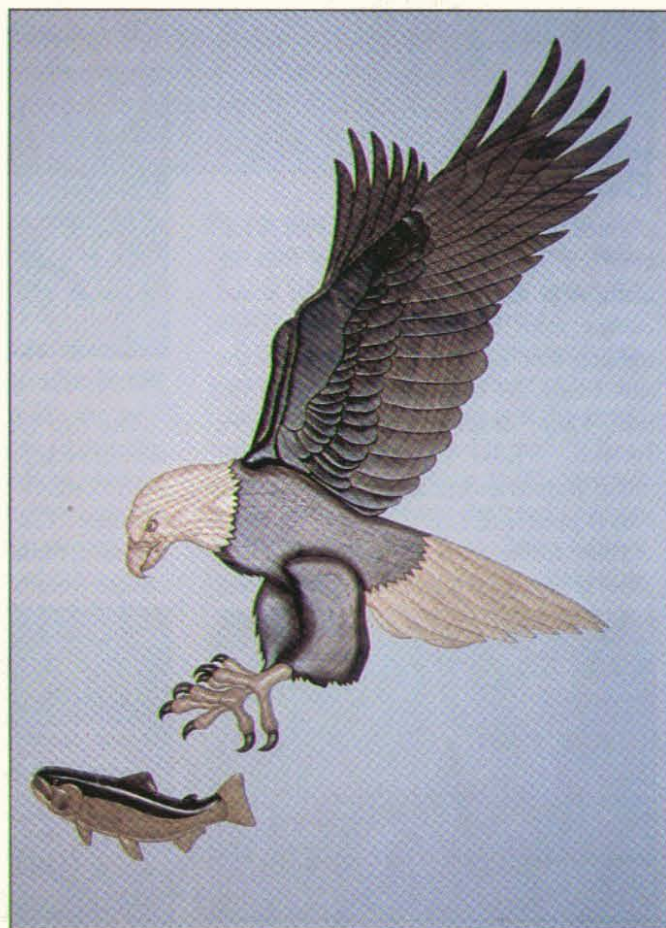
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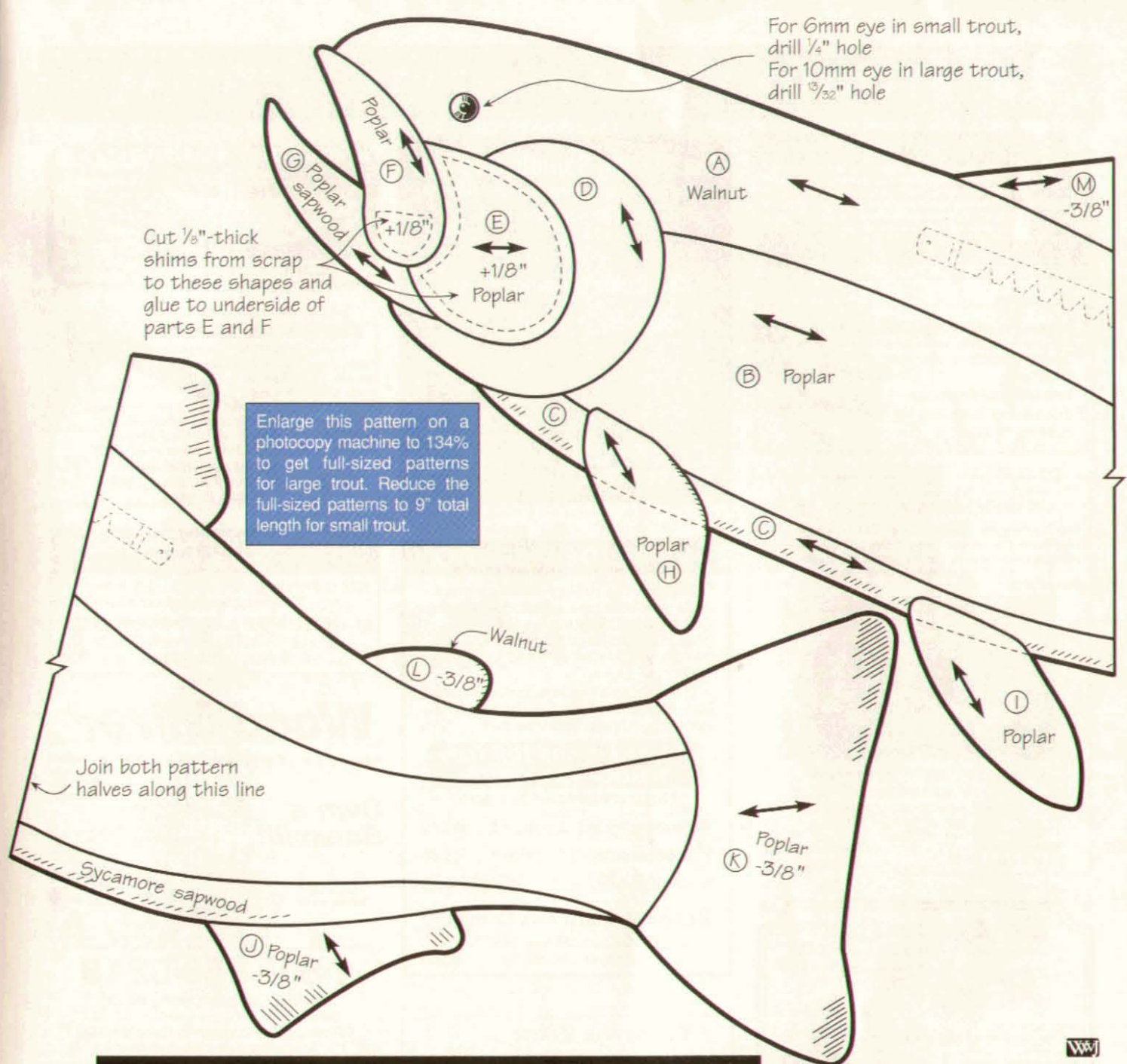
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Small trout shown with Intarsia Eagle project from Sept./Oct. 1993 issue



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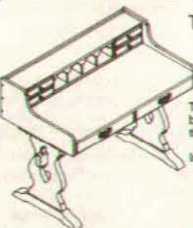
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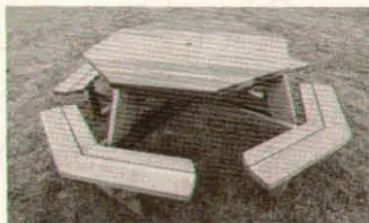
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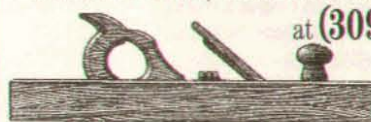
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Vol. 13 No. 4 July-Aug '89

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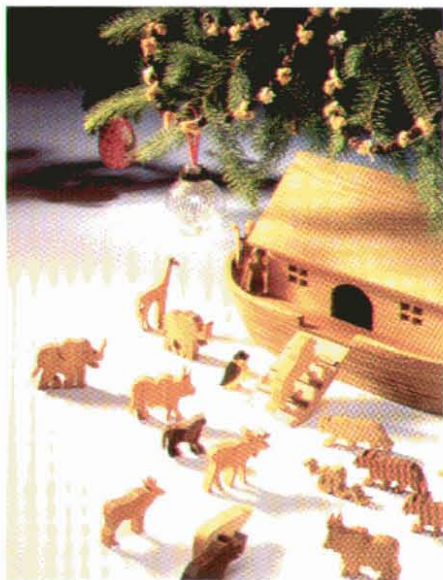
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