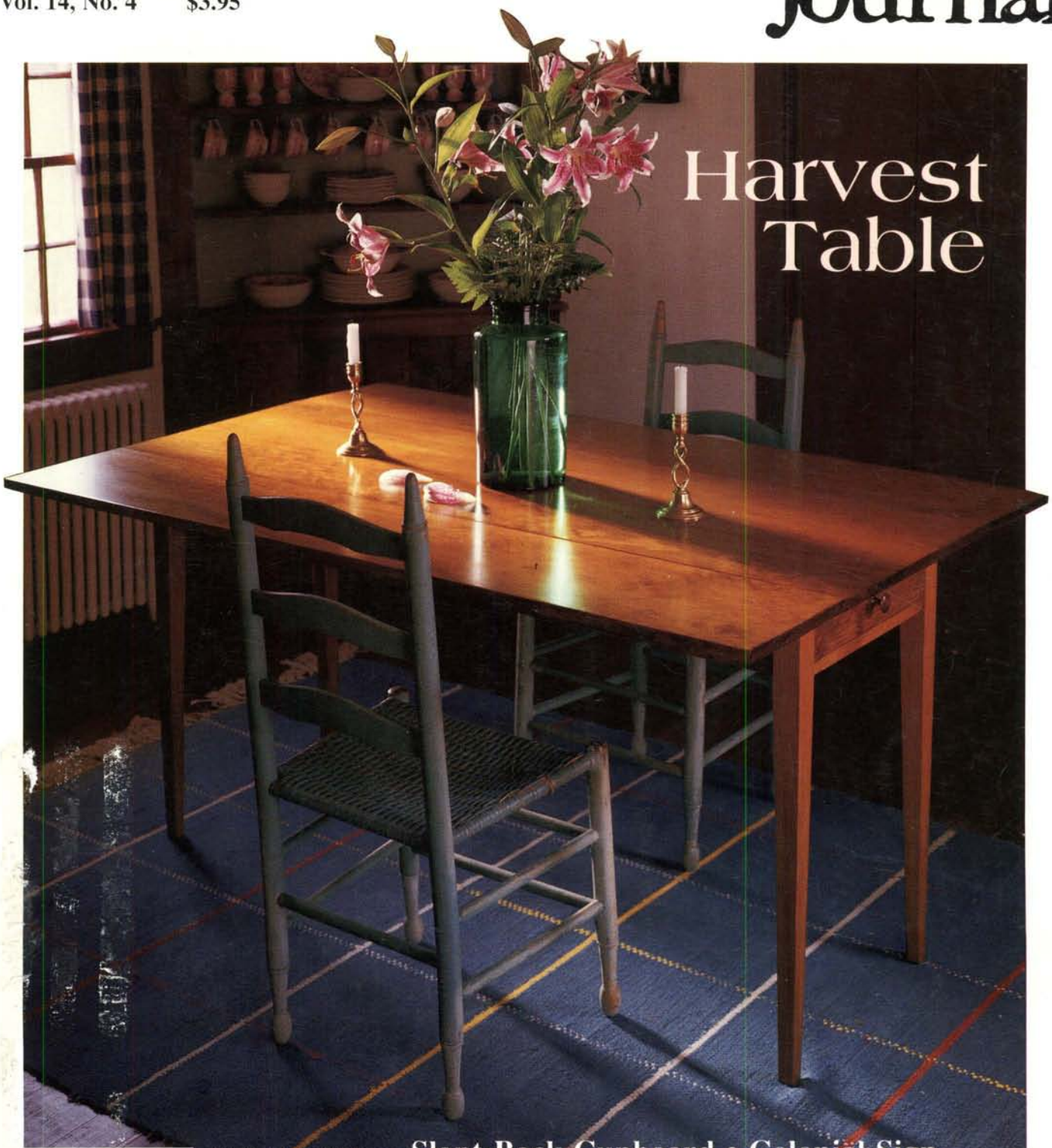
The Woodworker's Journal

Vol. 14, No. 4 $3.95



Harvest Table

Included in this issue: Slant-Back Cupboard • Colonial Sign
Folding Deck Table • Oak Plate Rack • Toy Dragsters
Sunburst Mirror • Barbecue Tray • Workbench Helper

July/August 1990

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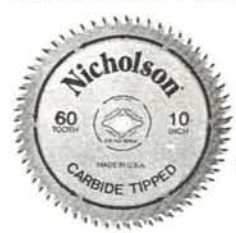

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The Woodworker's Journal

JULY/AUGUST 1990 VOLUME 14, NUMBER 4

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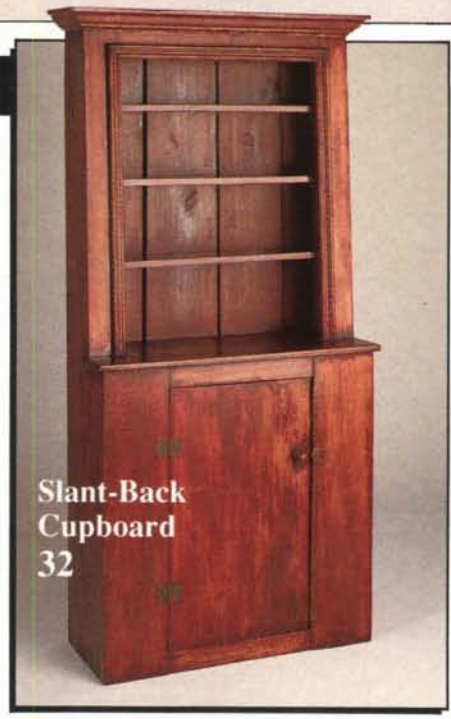
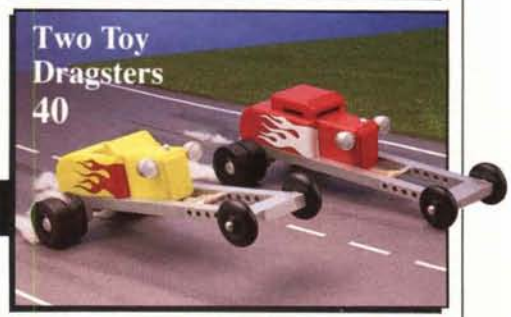
DEPARTMENTS

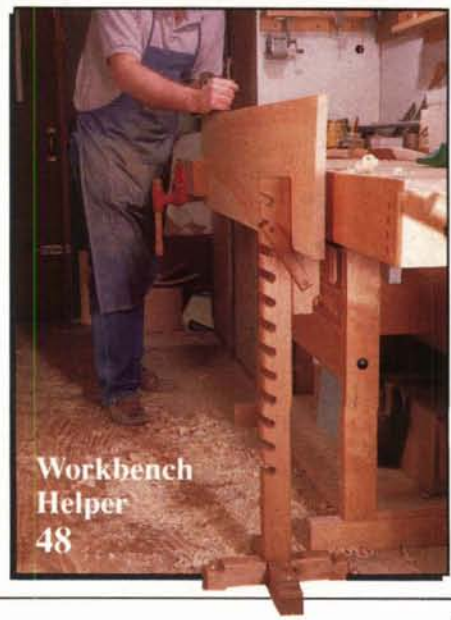
PROJECTS



Slant-Back Cupboard 32



Two Toy Dragsters 40



Workbench Helper 48

Shoptalk

July and August are well into the doldrums of our woodworking year, but there are always rainy days when the woodshop seems like the best place to be. Mindful of the fact that many of our readers are spending more time on outdoor activities, we've included a few "quickie" projects in this issue to help keep your saw table from rusting. The Barbecue Tray and clever Folding Deck Table are appropriate for the season and a good way to pass the time on inclement days.

Those Thrilling Days of Yesteryear

In 1950, my high school pals and I used to engage in impromptu (and illegal) drag races at night on deserted Long Island roads. The uniform of the day was a leather jacket, low-slung jeans and a white T-shirt. And *the* car to have was a stripped-down 1932 Ford roadster with a jazzed-up flathead V-8 engine.

I managed to survive that perilous period of teenage rebellion, but I still stop to gape at a classic hot rod. When the idea came up at a staff meeting to build a couple of toy dragsters, how could I resist? I suspect that there will be many "demonstrations" of these toys by former hot rodder grandpas before the kids finally get to play with them.

A Little Bit of Country

I really like the Harvest Table in this issue. Maybe it's because I'm the one who suggested we do it. Anyway, it's a fine country-style piece, and a good choice for that first major project. Don't worry about the rule joint. The trickiest part is the hinge location. Just take it slow and easy and try to be as precise as possible when starting the holes for the hinge screws.

After the artwork was completed on this project, I had second thoughts about the silverware drawer and would like to offer a suggestion for a small improvement. If you cut the two drawer sides about 6 in. longer than the dimensions given (keeping the drawer back in its original location), the extended sides will prevent the drawer from sagging or falling out if you pull it out too far. You'll also need to extend the runners and guides to accommodate the new length. This idea works well with any small, heavily laden drawer fitted to a deep case.

Mirror Mirror on the Wall

Richard Wonderlich has contributed exceptional projects going all the way back to our early newsprint days when he did his classic roll-top desk. When he suggested his Sunburst Mirror as a project, we went for it immediately. It's as interesting to build as it is lovely to look at.

His account of restoring the trim work of his great-grandfather is fascinating for the sense of genetic continuity that few of us have experienced. It's also a warm reminder that, as woodworkers, our creations may endure for generations. That thought alone should encourage you to do your very best. Have a great summer!

Jim McQuillan

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Super 15" Scroll Saw

On Sale ... **$119.95**
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Cut intricate wood patterns with this versatile machine. Features:

- **Parallel rocker arm cutting system** - eliminates blade breakage & sanding.
- **E-Z set blade change system** - permenant, upper arm blade holder plus **new** E-Z Jig for standard holders.
- **FREE Accessories** - 1 dz blades, extra blade holders, E-Z set system, Plastic lettering guide set .. a $52 Value

SPECIFICATIONS:
• Cast iron construction • 15" throat • Motor: 1/8 HP, TEFC, 1650 RPM, 110V, UL Listed • 3/4" stroke • 2" depth of cut • Table tilts to 45º • 43 Lbs.

Item #SAW .....$119.95 (UPS $10)

Scroll Saw Accessories

Dust Blower
Installs between lower arm and base - keeps your pattern line visible at all times. Installation instructions included.
#BKT .... **$15.00/Kit** (•)

Saw Stand *(On Sale)*
34" High -perfect height & a great convenience.
#STD ... (Reg $39)
On Sale .. $26
(UPS $4)

Neptune 1-1/2" Lettering Guides

(**Free** w/purchase of Saw). Includes upper & lower case alphabet + numbers + free patterns. **#LN1** ..... **$12**/set (•)

Scroll Saw Blades (5")
#BPK - 4dz asst. (2dz Pin, 2dz #9)...**$14**(•)
#BPS - 2dz Spiral blades (size #2)...**$10**(•)

"E-Z Set Plus" Blade Holder System
(**Free** w/purchase of Saw). Includes permenant pivoting blade clamp that mounts to the top arm (Simplifies attaching blades for internal cuts).
Plus our NEW E-Z Jig that makes inserting blades into standard blade holder (in lower arm) simple.
Item #EZ2.....**$17** /kit (•)

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#SML (reg 29.95) **On Sale ...$22.95**
(UPS $3)

Foot Switch
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#FSW ..... **$ 20.00** (•)

Super 125 Planer

On Sale **$349.95**

This machine will pay for itself time and again by planing your own wood. Finishes wood like machines many times its price.

• **Portable** at 65 lbs • **Power feed** •12 1/2" wide High Speed Steel Knives Shipped assembled and ready to run.

SPECIFICATIONS:
Motor: 16Amp, 115V, 8000RPM, 2HP• 26.2 fpm auto feed rate • 16,000 Cuts/min • Thickness of stock: 3/16" - 6" • 1/8" Max depth of cut • 2 HSS knives
Item #PLA ..... $349.95 (UPS $15)

Planer Accessories

Free plans for Roller Stand with purchase of rollers

Extra Set of 2 Knives
High Speed steel, 12-1/2" long.
Item #PKN .....$25.00/set (•)

Dust Chute
For vacuum takeoff of wood chips.
#PDS ..(reg $24), **On Sale....$15** (UPS $3)

Planer Stand (Heavy duty)
Drilled for Super 125 Planer. 27-1/4"High.
#PST ...(Reg $44), **On Sale...$39/ea** (UPS $6)

Roller Stand
HTC brand support stand w/heavy duty ball bearing roller. Height adjusts from 25" - 44".
#PRS ...(reg $40), **On Sale** ...**$35** (UPS $4)

Ball Bearing Rollers
(Minimum purchase 2 rollers). Build a roller stand, infeed/outfeed table etc. with these 13" X 2" Heavy Duty rollers. Includes **FREE** plans for roller stand shown above.
Item **#BBR** ..... **$6.50/ea** ($3 UPS /order)

Conveyer Section (4'x12")

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#BCS ..(reg. $99) , **On Sale $69.00** (UPS $8)

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Two way 4"x 8" Sander

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(Includes **$14 FREE** Belts & Discs)

Item #S48

Here's a machine that adds true versatility to your shop.
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(Includes $15 ***FREE*** Hose & Fittings)
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(UPS $20)

Item #DC1

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• 610 CFM air flow • 2ea 20 gal bags
• 4" inlet •Castors on base • WT.: 75 lbs

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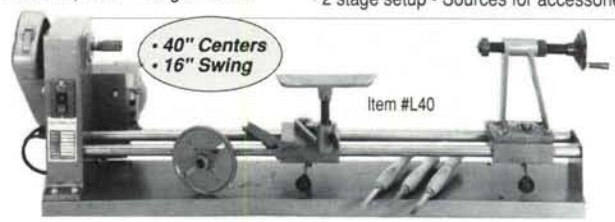

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PURCHASE INCLUDES:
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SPECIFICATIONS:
• MOTOR: 1720 RPM, 1/2HP, 8AMP, 110V
• 3 Speeds: 660, 1500, 2850 RPM
• Headstock thread - 3/4" x 10 tpi
• Overall length: 60" - Weight : 100lbs

Item **# L40** .....***On Sale*** **$249.95**
(UPS $20)

Lathe Stand
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Item #LST ..... $59/ea (UPS $6)

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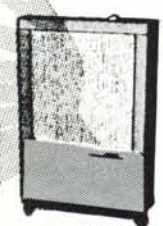

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Letters

In the "Letters" section of your May/June 1990 issue, I read with interest the suggestion by reader John Branch of Chicago, Illinois. Mr. Branch made the Band-Sawn Napkin Holder project from your January/February 1990 issue and pointed out a problem he had with leather that was too thick to fit in the 1/8 in. dado groove. He had to set up his router table a second time to widen the dado.

I, too, enjoyed making this project, and I also encountered the same problem. However, leather is quite pliable. Therefore, after the leather was glued, I used a vise to squeeze down each end. Presto, it fit perfectly into the dado.

Jim Carpenter
Tucson, Ariz.

Your March/April 1990 issue had a Shop Tip (page 66) that suggested using household ammonia to clean table saw blades. That works, but it's an unnecessary irritation to the sinuses. Instead, soak the blades in a solution of hot water and a powdered detergent like Tide or Fab. After soaking for a while, you'll be able to scrub away the accumulated pitch with an old toothbrush.

Tom Lester
Meadows of Dan, Va.

A couple of years ago I started making some jewelry cases with marquetry lids. I used patterned veneer inlay and applied it according to the instructions that accompanied the project. The instructions specified contact cement and did not suggest crossbanding the underside of the veneer. The project remained half completed in my shop until recently when I began to finish it.

To my dismay, I discovered the inlay has developed two problems—small raised areas (much like bubbles), and long cracks through the pattern, some about 1/16 in. wide. Can you suggest a way to repair these defects?

Berry J. Conway, Woodbury, Minn.

Editor's Note: We asked marquetarian Nicholas Mariana to help us with this one.

The instructions should have directed you to use a crossband veneer under the marquetry. Crossbanding is an underlayer of veneer glued at right angles to the finish veneer. It greatly reduces the chance of splitting and warping. Also, no matter what you read or hear, contact cement does not provide a permanent bond for veneer. Yellow glue does a better job, although it requires more careful sanding because it tends to penetrate the grain. The contact cement is the main reason for bubbles in the veneer. The problem was probably compounded by the two-year wait. Veneer that has been glued does not like to sit around unfinished. It dries out and shrinks, and that movement will cause bubbles and cracks.

The bubbles can sometimes be pressed out with a fairly warm iron. Use cloth to protect the veneer. You want to heat the

glue, soften it, and hopefully cause it to rebond. However, considering the time that has passed, you may need to work some yellow glue under the bubble and then apply clamp pressure. The glue may be injected with a small hypodermic needle or by using a razor knife to make a small incision in the same direction as the grain. This cut should allow you to coax a little glue into the bubble.

For the cracks you'll need some matching veneer. Cut the veneer to the same shape as the cracks, then glue and clamp. You may first have to carefully clean out the cracks so the veneer will fit smoothly. Good luck.

The Woodcrafters Club of Tampa has met on the third Thursday of each month for 10 years. Activities include co-sponsoring a handcrafted furniture show at the Florida State Fair. For information about joining, contact Vernon Blackadar, 11451 Browning Road, Lithia, FL 33547.

Is there a way to calculate the moisture content of wood by drying it in an oven and then measuring the weight change?

Gary Benjamin, Tomah, Wis.

It can be done, but for the average home woodworker, the procedure isn't very practical. You'll need a section of wood measuring about 1 in. thick by 3 in. wide by 1 in. long. (Cutting the sample this way creates a good deal of end grain, which helps speed up the drying process.) Avoid cutting the sample from near the end of the board as that area tends to be drier than the rest of the stock. Also, the sample should be free from any knots or other defects.

Once cut, carefully weigh the sample and record this as the original weight. You'll need a laboratory (gram) scale or the equivalent in order to get an accurate measurement. Now, place the sample in an oven set to a temperature of 210 to 220°F. Reweigh the piece about every 8 hours, or until it no longer loses weight. Don't let the wood scorch as it dries. At this point the wood is completely free of water, which means it has 0 percent moisture content. (It sometimes takes as long as 24 hours for a sample to completely dry.)

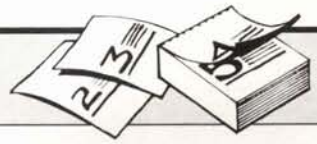
Now, to calculate the moisture content, use the formula:

$$\frac{\text{Original Weight} - \text{Oven-Dry Weight}}{\text{Oven-Dry Weight}} \times 100$$

For example, if the original weight was 12 grams and the oven-dry weight was 10 grams, the moisture content would be:

$$\frac{12 \text{ grams} - 10 \text{ grams}}{10 \text{ grams}} \times 100 = 20 \text{ percent}$$

This means that when the sample was cut from the board, it had a moisture content of 20 percent. It's a safe bet that the rest of the board, except for the very ends, would have just about the same moisture content.



Events

We will gladly list as many events of interest to woodworkers as space permits. Listings are free and may include shows, fairs, competitions, workshops and demonstrations. The deadline is eight weeks before publication, July 2 for the September/October issue. Please address announcements to the Events Department. Readers planning on attending events should call ahead if possible. Scheduled dates and locations sometimes change between publication and the date of the event.

California: ACC Craft Fair, San Francisco, Aug. 8-12, Fort Mason Center, San Francisco; (914) 255-0039.

So. California Woodworking Conference, Aug. 8-12, Harvey Mudd College, Claremont; (213) 679-2485.

College of the Redwoods, Fine Woodworking Program: July 13, Tools & Techniques, Jim Budlong; July 23–Aug. 10, Tools & Techniques, Michael Burns; July 21-22, Weekend Seminar, James Krenov. Contact the college at 440 Alger St., Fort Bragg, CA 95437; (707) 964-7056.

Colorado: Anderson Ranch Arts Center, Summer Workshops: July 2-20, Furniture Making, Stephen Proctor; July 9-13, Willow Furniture, Michael Emmons; July 16-20, Marquetry, Veneering and Inlay, Silas Kopf; July 21-22, Furniture, Sam Maloof; July 23–Aug. 3, Chair Design and Development, Robert Defuccio; July 23-27, Classic European Carving, Nora Hall; July 30–Aug. 3, Advanced Carving, Nora Hall; Aug. 6-10, Stool Construction, Gary Rogowski; Aug. 6-10, Upholstery, Jim Barefoot; Aug. 13-24, Wood Sculpture, Ellen Driscoll. Contact the center at P.O. Box 5598, Snowmass Village, CO 81615; (303) 923-3181.

Connecticut: Brookfield Craft Center Workshops: July 9-13, Cedar and Canvas Canoe Making, Horace Strong; Aug. 4, Tool Sharpening, Bill Gundling; Aug. 5, Swedish Woodcarving, Willi Sundquist; Aug. 11-12, Advanced European Cabinetmaking, Paul Levine; Aug. 18-19, Turning Wood Bowls, an Introduction, Bill Gundling; Aug. 20-25, Adirondack Guide Boat, Steve Kaulback. At South Norwalk: Aug. 25-26, Making a Table, Richard Tanner. Contact the center at P.O. Box 122, 286 Whisconier Road, Brookfield, CT 06804; (203) 775-4526.

Minnesota: The Woodworking Shows, Twin Cities, Sept. 28-30, Minnesota State Fairgrounds, St. Paul; 1-800-826-8257.

New Hampshire: Woodworking Association of North America: Woodworking Retreat, July 22-26, Waterville Valley Resort and Conference Center; 1-800-521-7623.

New Jersey: Peters Valley Craft Center, 20th Annual Craft Fair, July 28-29. Summer Woodworking Workshops: July 6-11, Cabinetmaking, David Van Hoff; July 14-18, Cedar Canvas Canoe Building, Horace W. Strong; July 20-22, Hand Carved Signs, Ray Halacy; Aug. 3-7, Making and Using Wooden Planes, David Finck; Aug. 10-12, Gilding, June Fette; Aug. 15-21, 18th Century Chairmaking, Eugene E. Landon; Aug. 24-31, Making an Acoustic Guitar, Dick Boak. Contact the Center at Layton, NJ 07851; (201) 948-5200.

New York: Sagamore Lodge and Conference Center, Weekend Woodcarving Workshops with Rick Butz, July 13-15 and Aug. 17-19. Contact the Center at Racquette Lake, NY 13436; (315) 354-5311.

North Carolina: Penland School Wood Classes: June 25–July 6, Woodworking, C.R. ''Skip'' Johnson; July 9-20, Furniture from the Source, Brad Smith; July 23–Aug. 8, Furniture, Lauren McDermott; Aug. 13-24, Design in Wood, Leo Doyle. Contact Penland School, Penland, NC 28765; (704) 765-2359.

Country Workshops, 1990 Classes: July 9-13, Scandinavian Woodcraft, Willi Sundquist; July 16-20, Advanced Scandinavian Woodcraft; July 30–Aug. 4, Windsor Chairmaking, Peter Murkett; Aug. 13-18, Swiss Cooperage, Drew Langsner; Sept. 8-16, A Craft Tour of Switzerland, Drew Langsner. Contact Country Workshops, 90 Mill Creek Road, Marshall NC 28743; (704) 656-2280.

The Carolina Woodworking Show, Sept. 21-23, M.C. Benton Convention Center, Winston-Salem; 1-800-521-7623.

Ohio: The Woodworking Shows, Greater Columbus, Sept. 14-16, Ohio Exposition Center, Columbus; 1-800-826-8257.

Oregon: Oregon School of Arts and Crafts, Wood Workshops: July 23-27, Woodcarving with Rick Butz. Contact the school at 8245 SW Barnes Road, Portland, OR 97225; (503) 297-5544.

Pennsylvania: The Woodworking Shows, Pittsburgh Tri-State, Sept. 21-23, Pittsburgh ExpoMart, Monroeville; 1-800-826-8257.

Tennessee: Arrowmont School of Arts and Crafts, Summer Workshops: July 9-13, Bowl Turning, Rich Sullivan; July 16-27, Furniture—Off the Lathe, Christopher Weiland; July 30–Aug. 3, Woodturning—Sculptural Vessels, Bruce Mitchell; Aug. 6-10, Woodturning—Hollow Vessels, David Ellsworth. Contact the school at P.O. Box 567, Gatlinburg, TN 37738; (615) 436-5860.

Vermont: Vermont State Craft Center at Frog Hollow, Summer Weekend Workshops: July 21-22, Joinery Workshop, Mortise & Tenon, Chris Bretschneider; Aug. 11-12, Joinery Workshop, Dovetail, Chris Bretschneider; Sept 5-6, Shaker Oval Boxes, John Wilson; (802) 388-3177.

West Virginia: Augusta Heritage Center Workshops: July 8-13, Treenware Carving, Joe Wack; July 8-20, Guitar Construction, Wayne Henderson; July 15-20, Bark and Vine Basketry, Doug Elliott; July 22–Aug. 3, Traditional Log Construction, Peter Gott; July 29–Aug. 3, Swiss Chip Carving, Linda Foley; Aug. 5-10, Dulcimer Construction, Keith Young; Aug. 5-10, Whittling and Folk Carving, the Rev. Herman Hayes. David & Elkins College, Box WW, Elkins, WV 26241; (304) 636-1903. WW

Cabinetmakers' Supplies

Hard-to-Find Woodworking Items

As a service to our readers, we periodically list sources of supply for various products. In this issue we've included several categories of hard-to-find items: luthier's supplies; measuring and marking tools; nuts, bolts and screws; router bits; sanding supplies; specialty glass; specialty hardware and project supplies.

Luthier's Supplies

Folkcraft Instruments
P.O. Box 807
Dept. W-1
High Street
Winsted, CT 06098
Catalog free

The Luthier's Mercantile
P.O. Box 774
412 Moore Lane
Healdsburg, CA 95448
Catalog $6.40

The Martin Guitar Co.
(The Woodworker's Dream)
P.O. Box 329W
10 West North St.
Nazareth, PA 18064
Catalog $2

Stewart MacDonald's Guitar Shop Supply
21 N. Shafer St.
Box 900
Athens, OH 45701
Catalog free

Marking and Measuring Tools

Bridge City Tool Works
1104 N.E. 28th Ave.
Dept. WJ7/90
Portland, OR 97232
Catalog $1

Nuts, Bolts and Screws

Elwick Supply Co.
230 Woods Lane
Somerdale, NJ 08083
Catalog free

The Nutty Co.
P.O. Box 473
Dept WJ
Derby, CT 06418
Catalog $1

Router Bits

Cascade Tools
P.O. Box 3110
Bellingham, WA 98227
Catalog free

Eagle America
P.O. Box 1099, WWJ
Chardon, OH 44024
Catalog $3, refundable on first order

MLCS Ltd.
P.O. Box 4053J
Rydal, PA 19046
Catalog free

Sanding Supplies

Econ-Abrasives
P.O. Box 865021, Dept WJ
Plano, TX 75086
Catalog free

Industrial Abrasives Co.
P.O. Box 14955
642 N. 8th St.
Reading, PA 19612
Catalog free

The Sanding Catalogue
P.O. Box 5069, Dept. W007
Hickory, NC 28603
Catalog free

Specialty Glass

Floral Glass & Mirror
Mirrora Division
895 Motor Pkwy.
Hauppauge, NY 11788
Catalog free

Specialty Hardware and Project Supplies

Accents
P.O. Box 7387
Gonic, NH 03867
Catalog $1

Armor Products
Box 445, Dept. H2
East Northport, NY 11731
Catalog $1

Meisel Hardware Specialties
P.O. Box 70, Dept. J6
Mound, MN 55364
Catalog $1

Steebar
P.O. Box 463E
Andover, NJ 07821
Catalog $3, refundable on first order

Readers' Information Exchange

Looking for an owner's manual for an old band saw? Need a bearing for a hand-me-down table saw? 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. Due to space limitations, we'll be unable to list all requests, but we'll include as many as we can.

I would like some help finding back issues of *The Woodworker's Journal*, starting with Vol. 1, No. 1 through Vol. 9, No. 5. I wish to complete my library and build some of the back-issue projects.

John Crow
27 Fallstone Drive
Streamwood, IL 60107

I'm looking for a parts source for my Dayton in-line electric screwdriver, model 2Z218. I'm also willing to buy new or used units, functioning or not.

Chuck Albamont
Box 46, Esopus Ave.
Ulster Park, NY 12487

I'm looking for a single phase motor for a Delta 10 in. Unisaw. I'd prefer the 3 h.p., but will consider the 1½ h.p. Please send price, age and condition.

George Kurho
432 N. 5th St.
Martins Ferry, OH 43935

I'm looking for an owner's manual for a 10 in. Walker-Turner table saw, model 16-546.

Richard E. Peterson
196 Park Land Drive
Lake Placid, FL 33852

I'm looking for an owner's manual and parts list for a Toolcraft Corp. jointer, model 650.

Richard W. Starke
875 Reed Road
Smyrna, GA 30082

I need an owner's manual and parts list for a Tomlee Tool & Engineering Co. jointer, model 55.

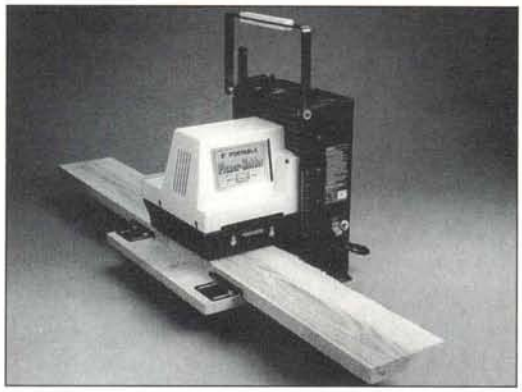
John Chilkewitz
25442 Dartmouth St.
Dearborn Heights, MI 48125

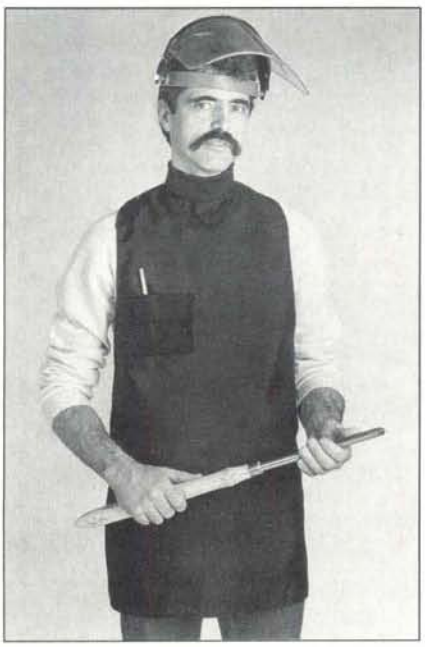
Product News

To keep our readers up-to-date, this column features brief descriptions of new tools and supplies on the market. The product descriptions are provided by the manufacturer and are not a result of tests or reviews by the editors of ***The Woodworker's Journal.***

Portable Planer

Now available from Foley-Belsaw is a new Portable Planer that also makes molding. A unique open side design allows this 6 in. planer to plane boards 12 in. wide in two passes. Priced at $399.95. For more information contact Foley-Belsaw Co., 6301 Equitable Road, Dept. 91556, Kansas City, MO 64120; 1-800-468-4449.



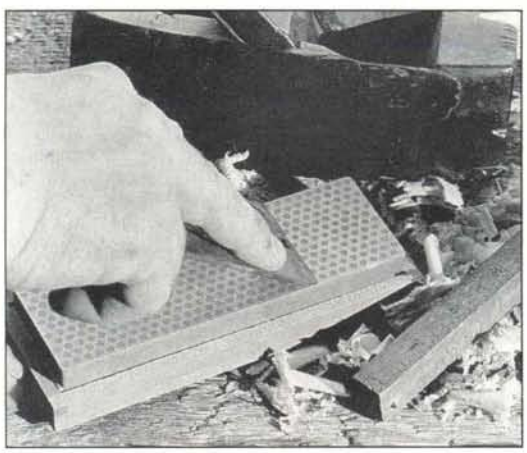


Dustblocker Apron

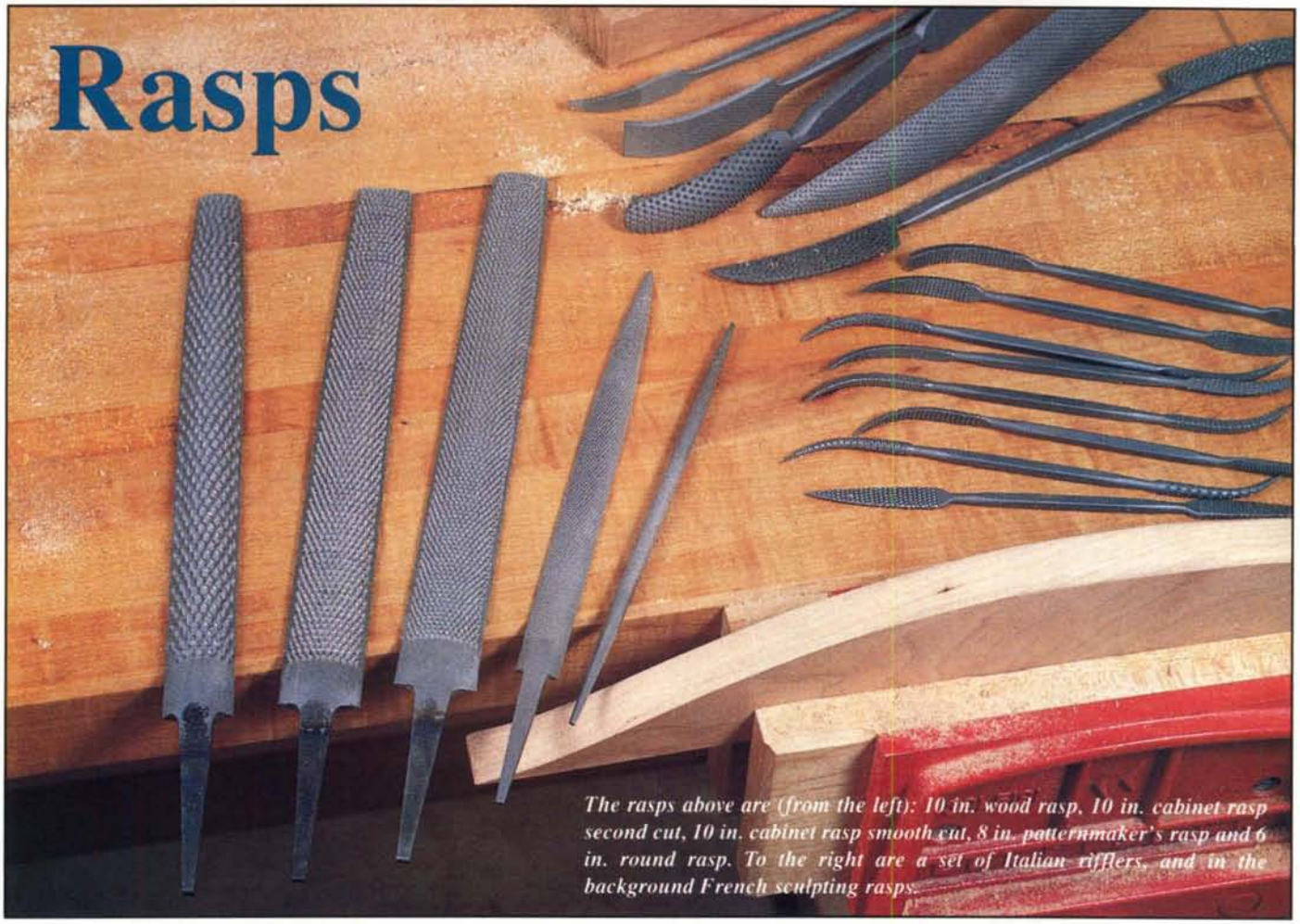
The world is a dusty, dirty, sloppy, grimy, messy place. That's why the Dustblocker apron was created. It blocks wood chips clear up to your chin and keeps them out of your clothes. The nylon shell is durable and water resistant. For more information contact National Decks, Inc., P.O. Box 1125, Alfred, NY 14802; (607) 587-9558.

Diamond Whetstone Sharpener from DMT

A 6 in. whetstone in a cedar case sharpens tools fast. Industrial diamonds cut any metal, even carbide, and the stones don't wear out. The stones come in fine, coarse and extra coarse. For more information contact DMT, 85 Hayes Memorial Drive, Marlborough, MA 01752; (212) 421-5220.



Rasps



The rasps above are (from the left): 10 in. wood rasp, 10 in. cabinet rasp second cut, 10 in. cabinet rasp smooth cut, 8 in. patternmaker's rasp and 6 in. round rasp. To the right are a set of Italian rifflers, and in the background French sculpting rasps.

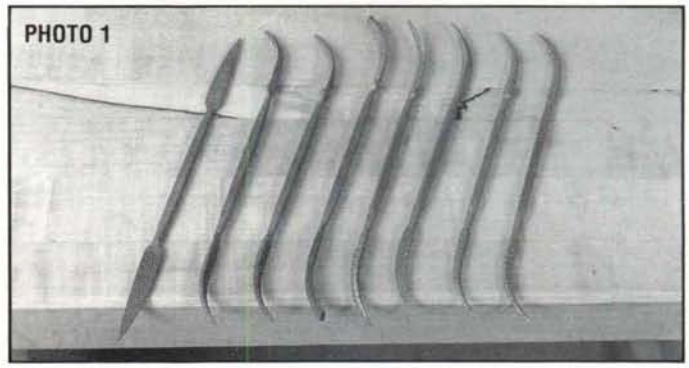
Rasps have been around so long that the word itself has taken on a meaning that has little to do with shaping wood. A man with a raspy voice probably won't make it as a radio announcer. The negative meaning comes from the grating noise and the coarse cut. And certainly some rasps do live up to that billing. In the wrong application, a wood rasp can leave behind a path of destruction. But the wood rasp is only one of many available types, which vary according to shape and smoothness of cut. Another rasp—such as the patternmaker's rasp—leaves a smooth, even surface nearly ready for finishing. If you follow the fine rasp with a good file and a cabinet scraper, the wood will fairly glow.

Once you own a few rasps with progressively finer teeth, you may never want a drum sander, which does much the same job with a lot more dust. In fact, rasps, used with files and scrapers, can largely replace sandpaper in most edge-shaping and smoothing chores. The extensive use of sandpaper is a relatively recent innovation in woodworking. Before sandpaper became widely available, the job was done by rasps, files, and scrapers. Rasps excel at shaping chores where the grain changes direction, such as in a cabriole leg. Some also prefer rasps because they don't consume electrical power, don't use up a lot of sandpaper and don't create a lot of fine dust. And the rasp sounds rather pleasant after turning off a belt sander.

Types of Rasps

There are innumerable types of rasps. They vary in shape, size and smoothness of cut. Some of the rasps are used for general woodworking, and others are used for carving or sculpting. A sample of the usually available types is shown above.

They range from the everyday half-round rasps found in most tool boxes to the specialized carver's rifflers. Rifflers are essentially small rasps shaped and bent for a variety of delicate tasks. Rifflers typically come in a set with round, oval, square, rectangular and triangular cross sections and with curved or



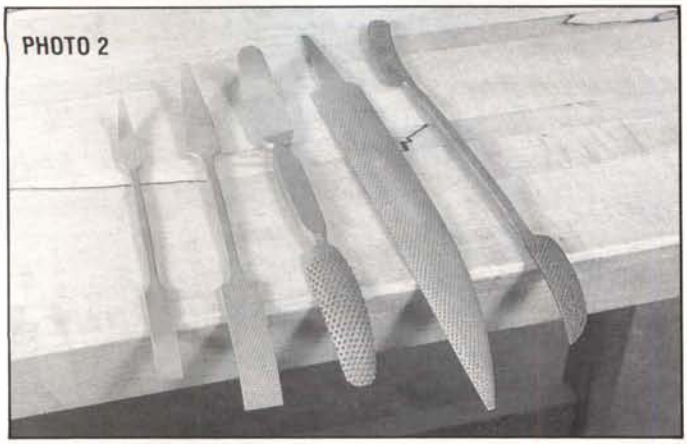


PHOTO 2

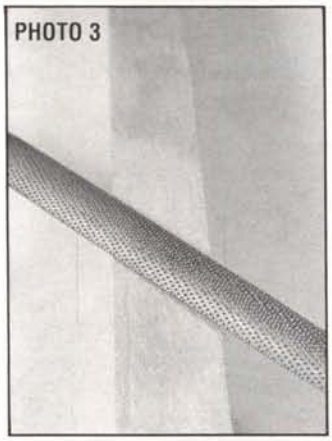


PHOTO 3

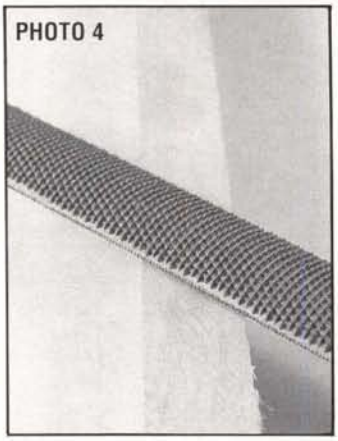


PHOTO 4

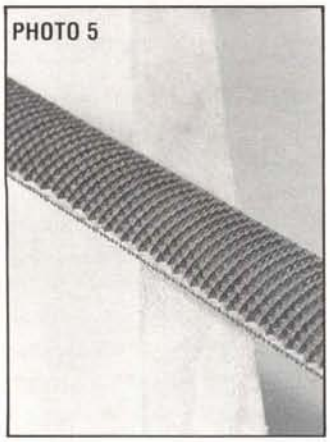


PHOTO 5

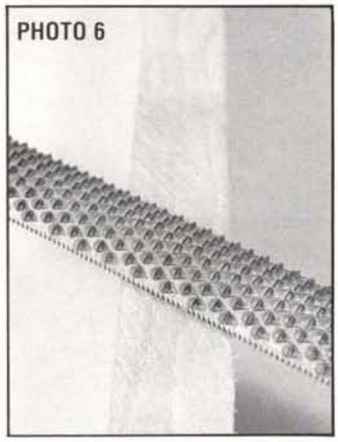


PHOTO 6

straight cutting surfaces (Photo 1). They are often sold with a riffler on one end and a file of the same shape on the other end. Rifflers are about 7 in. long, with the teeth cut at each end for about 2 in. There are also micro-rifflers with similar shapes but with extremely fine teeth cut into the very tips, about $^1/_2$ in. at each end. The sculptors's rasps and rifflers (Photo 2) are bigger than rifflers but also shaped. They are (from the left) small and large parallel bent rasps, half-round bent rasp, convex sculpting rasp, and giant riffler. The giant riffler is $11^1/_2$ in. long.

The rasps commonly available are round, half-round, flat, needle rasp, sculpting rasp, riffler, giant riffler, micro-riffler and four-in-one. This last is sold in most hardware stores and is actually a combination rasp and file. There are half-round and flat surfaces at either end. Note that the half-round rasps come with one flat side.

There is a wide variety of more obscure rasps, such as the stairbuilder's rasp (a half-round bent into an oval for shaping railings), the saddletree maker's rasp, the gunstocker's rasp and the bread rasp. The bread rasp was used by bakers to remove the burnt crust at the bottom of a loaf. Most of these rasps aren't available except from antique tool dealers. The stairbuilder's rasp is an exception. It's available from the Frog Tool Co. (see Sources).

There are tools similar to rasps, such as Stanley's Surform tool, which has a replaceable cutting surface and comes in several sizes and shapes. There's also a Japanese tool with replaceable cutters.

Even the common rasps will have to be ordered through the mail unless you're lucky enough to live near one of the few stores to carry a full selection.

Classification

Rasp classification can be confusing. In general, they are grouped into three divisions according to smoothness of cut. In order of increasing smoothness they are wood rasps, cabinet rasps and patternmaker's rasps. Within the broad classes, rasps are further subdivided. The cabinet rasps are bastard cut, second cut and smooth cut, again in order of increasing smoothness. The patternmaker's rasps are further classified by number: the higher the number, the finer the cut. But different makers use different numbering systems. Within all the various classifications, the smoothness of cut also varies because smaller rasps of the same type generally have finer teeth than the larger rasps. For example, an 8 in. smooth cut cabinet rasp will give a finer cut that a 10 in. smooth cut cabinet rasp.

The difference in cut among the various rasps can be quite dramatic. An 8 in. French patternmaker's rasp (Photo 3) leaves a surface with a fine even texture. But the wood rasp (Photo 6) produces ragged crevices and splintered edges. Used successively like grades of sandpaper, a set of rasps is remarkably quick and efficient at shaping wood. The wood rasp is a real animal and will hog off wood in a shower of shavings. If you follow that with a second cut cabinet rasp (Photo 5) and then a smooth cut cabinet rasp (Photo 4), you'll have a fairly smooth surface. If you follow the smooth cut cabinet rasp with a patternmaker's rasp and then a file, you'll have a surface nearly ready for finishing. Several strokes with a cabinet scraper are all you'll need to get the surface ready for a finish.

Manufacturing

Rasps differ from files in that individual teeth are raised from a smooth surface. These cone-shaped teeth cut the wood surface as you use the tool. In a file, the surface is machined into a series of parallel lines. The file surface shears the wood fibers.

A rasp starts out as a bar of high carbon steel that's forged to the desired shape. After forging, the rasps are put through the

first of several heat-treating steps. The first is annealing, to soften the metal and make it malleable. In annealing, the steel is heated to about 1,450°F, where it turns cherry red, and is then slowly cooled to room temperature. After annealing, the tool is polished and straightened to true it.

This initial procedure prepares the rasp for the critical process of stitching. In stitching, the bits of metal that form the teeth are raised on the soft surface of the polished metal. A special pointed punch striking the surface at an angle forms a furrow and pushes up a tooth ahead of it. Although the rasp is cold during this process, the metal is soft enough to be easily worked with a machine tool. The polishing prior to stitching is very important, because rasp teeth aren't sharpened, but wholly formed in this stitching process. A rough surface will form rough teeth.

Most rasps today are machine-stitched, although hand-stitched rasps are available. (The rasp in Photo 3 and the sculpting rasps in Photo 2 are hand cut by the French company Auriou and sold in the U.S. by Garrett Wade.) The hand-stitched variety is said to give a smoother cut because the tooth pattern can be more random. Neat even rows of teeth on rasps tend to make them chatter. The random spacing, however, is closely emulated in machine-cut patternmaker's rasps available from The Nicholson File Co.

After stitching, the edges of the rasp are also cut or scored with grooves much like those on a file. This process is called "cutting of angles."

Next, the rasp is hardened and tempered. In hardening, steel is again heated cherry red, and then rapidly cooled in a water or oil bath. That makes the steel as hard as possible, but too brittle for woodworking. To give the steel some flexibility, it's tempered. The steel is again heated, but only to about 500°F. This removes some of the hardness, but makes the steel ductile enough to absorb some shock without shattering. Hardness and toughness in steel are a trade off. The harder the steel, the longer it will hold an edge. The softer the steel, the better it will hold up to sharp blows. Rasps are tempered to a hardness of about R-62, and are relatively brittle.

Once tempered, the rasps are cleaned and dipped in an anti-rust solution. Because rasps are brittle, it's especially important to handle them carefully. Don't let them rattle around in your toolbox and hit against other tools. The teeth will quickly become chipped. Also, clean them regularly with a file card and don't let them rust. File cards are available at most hardware stores or through the mail (see Sources). The rust will attack the tips of the teeth first.

Machine-stitched vs. Hand-stitched

The best rasps available are the hand-stitched variety. They are made in Europe and come in the full range of types. The hand-stitched rasps generally have finer teeth, and teeth that more completely cover the surface than a machine-stitched rasp. The slight randomness of the hand-stitched rasps also really does seem to make a difference in reducing chatter and lessening score marks. The hand-stitched rasps also have teeth that extend right down to the point. That can be a great advantage in tight spaces.

The hand-stitched rasps are about twice as expensive as the machine-stitched variety. For example, a 10 in. Nicholson patternmaker's rasp, with machine-stitched "random" spacing, sells for about $30. A hand-stitched French rasp the same size goes for about $60.

Using a Rasp

Like any other fine tool, a well-made rasp is a pleasure to use. Like most hand skills, rasping takes practice to develop the right stroke. Remember, though, that a rasp should cut into the wood, not wear it away with friction. Hold the rasp with two hands, one firmly gripping the handle (which you should always use) and the other hand gripping the front. The hand holding the handle should have the thumb on top, pointing in the direction of your stroke. Make sure the work is clamped down securely and apply light pressure as you stroke.

Cut only on the forward stroke, lifting the rasp for the return. It helps to angle the rasp to the work, carrying it forward and to one side as you complete the stroke.

Two common mistakes are taking too heavy a cut and using too coarse a rasp. The coarsest rasp, the wood rasp, probably isn't needed for the kind of work done by a woodworking hobbyist. Usually you're working with an edge shaped on a band saw or a scroll saw, so you don't need the coarse teeth of a wood rasp to remove the saw marks. A file used alone will work, but it cuts too slowly. For general shop use, the two finer grades of cabinet rasps—second cut and smooth cut—and one of the patternmaker's rasps are probably sufficient. A round rasp and a set of needle rasps will also get their share of use should you have them. The round rasp is especially useful as it lets you get into tight radii, and cuts faster than the round file.

One new innovation in rasps is a kit to sharpen them. The teeth on rasps are too small and brittle to sharpen with a file or stone. Dull rasps are often discarded. But the sharpening kit employs an acid etch process to chemically remove a portion of the steel. In effect, it smooths out the dented and abraded surface of a dull rasp, leaving behind sharper cutting surfaces. The kit sells for about $100, but might be worthwhile if you use rasps often. It's also used for sharpening files and is available from Garrett Wade (see Sources).

Sources of Supply

(All sell a variety of rasps)

Garrett Wade
161 Ave. of the Americas
New York, NY 10013
1-800-221-2942

Woodcraft
210 Wood County
Industrial Park
P.O. Box 1686
Parkersburg, WV 26102
1-800-225-1153

Frog Tool Co.
700 W. Jackson Blvd.
Chicago, IL 60606
(312) 648-1270

SAFETY: *Workshop Finishes Pose Risks*

by Jim Barrett

As woodworkers, we respect the dangers of working with tools and machinery. Most of us perform operations on them in a safe manner, taking steps to protect ourselves from whirring blades and flying chips.

But how many of us take sufficient precautions when working with finishes, solvents, and adhesives? Not many, judging by the magazine and advertising photos I've seen. The models are usually not wearing safety gear—gloves, goggles, and a respirator—to protect their skin, eyes, and lungs from the toxic chemicals in these products. And make no mistake, nearly all finishing products contain harmful chemicals, as do many adhesives, wood fillers, paint and varnish strippers, waxes, and similar products used in woodworking. Without taking precautions it's all too easy to be exposed to toxic levels of these chemicals, either in a single dose (called acute exposure), or by repeated or prolonged contact (chronic exposure).

Know What You're Working With

The first step in protecting yourself when using a potentially hazardous finishing product is to identify the toxic ingredients in it. Some finishing products are more toxic than others, depending on the relative toxicity and amounts of chemicals or solvents found in them. But all of the chemicals listed below produce harmful effects including skin, eye, and nose irritation, and damage to the central nervous system, respiratory tract and lungs. Some also affect the liver, kidney, and blood.

You should take measures to protect yourself from all chemicals; none are safe. But because some chemicals are less toxic than others—requiring longer exposure times or higher concentrations to produce harmful effects—avoid products with highly toxic chemicals when those with "safer" ones will do the job.

Most toxic chemicals found in adhesives and finishing products fall under the general category of *organic solvents.* These are further broken down into five basic groups: *alcohols, aliphatic hydrocarbons, aromatic hydrocarbons, chlorinated hydrocarbons,* and *ketones.*

Alcohols include ethanol (grain alcohol, least toxic) isopropanol (isopropyl rubbing alcohol), and methanol (wood alcohol, most toxic). As a group, alcohols are the least toxic solvents, but prolonged exposure to high levels can cause drowsiness or fatigue, which can impair your judgment. Take extra care with products containing methanol, because exposure to high levels can cause optic nerve damage. A respirator won't help because there are no effective filters for methanol.

Aliphatic Hydrocarbons include petroleum naptha, varnish-maker's and painter's naptha, mineral spirits, n-Hexane, and kerosene. These chemicals are often used in paint and lacquer thinners, waxes, varnishes, brush cleaners and degreasers. Along with aromatic hydrocarbons, they are often referred to simply as "petroleum distillates" on container labels. To find out precisely what chemicals are in the product, you'll need to get a Material Safety Data Sheet (more about this later) from the finish distributor or manufacturer. Some retailers will also provide the data sheets upon request. Sample data sheets are shown on page 19.

Aromatic Hydrocarbons include benzene (benzol, cyclohexatriene), toulene (toluol, methyl benzene) and xylene (xylol, dimethyl-benzene). Benzene is the most toxic in this group and is known to attack the blood cells and cause leukemia. Fortunately, you probably won't find it in today's products, due to governmental restrictions on its use. Discard old products that contain benzene (see Discarding Liquids, page 20).

Toulene and xylene are less toxic, but can still cause serious health problems. These two solvents are used in paint and lacquer thinners, tung oils, furniture strippers, adhesives, spray paints, wood fillers, and other products. The so-called odorless paint thinners do not contain aromatic hydrocarbons, thus are safer to use than ordinary thinners.

Chlorinated Hydrocarbons include most chemicals identified

as chlorides. Methylene chloride is the most common one; it's used in paint strippers, furniture refinishers, adhesives, and some paints. Although nonflammable, this solvent is volatile and highly toxic. Vapors can enter the body through the skin as well as the lungs. As with methanol, there are no respirator cartridges that will effectively filter out methylene chloride. We strongly recommend that you avoid all products containing it. The 3M company has recently introduced a "safe" paint stripper called Safest Stripper that is methylene chloride-free.

Ketones include acetone (dimethyl ketone), methyl-ethyl ketone (MEK) and methyl-isobutyl ketone. You'll find these in a wide variety of products, especially fast-dry finishes, plastic cements, lacquer thinners, and plastic wood fillers. Acetone is the least toxic of the ketones, but is highly flammable. Another member of this group, methyl n-butyl ketone (MBK) is extremely toxic and has been banned, but you may find it in older products.

Other organic solvents you're likely to find in finishing products include gum (wood) turpentine, diglycidyl ether (DGE, or 2-epoxypropyl ether, found in epoxies) and methyl cellosolve (under various chemical names).

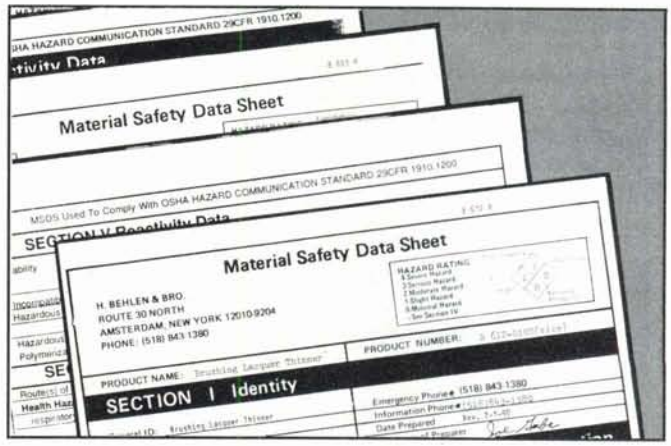
The chart on page 21 categorizes the above mentioned chemicals by toxicity (highly toxic, moderately toxic, mildly toxic). Use it to help you choose the least toxic products. The numbers following each chemical indicate the *threshold limit value* (TLV) of each solvent. The TLV is assigned and updated annually by the American Conference of Governmental Industrial Hygienists, and represents the maximum airborne contaminant levels, in parts per million, that most healthy adults may be exposed to over a 40-hour workweek without risk to their health. The lower the TLV, the more toxic the chemical. Of course, few home and small-shop woodworkers work with solvents eight hours a day, five days a week. The chart shows these figures as a means of indicating relative toxicity only.

Numbers expressed for flammability, or combustibility, indicate the flash point of the chemical, or the temperature in degrees Fahrenheit at which the the chemical can be ignited by a spark or open flame. The lower the flash point, the more flammable the substance: extremely flammable solvents have a flash point of 21°F or less; flammable solvents 21°F to 99°F, combustible solvents 100°F to 150°F.

Note that flash points apply to the substance, and not the vapors or fumes. If vapors are present in sufficient concentration, they can be ignited at a lower ambient temperature than the liquid. For example the vapors from methylene chloride, a non-flammable solvent, can be ignited when the vapor level reaches about 20 percent of the total air volume at temperatures over 75°F.

What Labels Do and Don't Tell You

Label warnings are more explicit than ever before. Read them thoroughly before using the product. The label precautions indicate whether the product is combustible, flammable, or extremely flammable. They also include precautionary



Material Safety Data Sheets provide detailed information on the products and their safe use.

statements regarding health hazards and symptoms, safe use, personal protection measures, and first aid instructions. If highly toxic solvents are used in the product, the manufacturer is required to list these ingredients, along with a "Danger: Poison" warning. On products that are moderately or mildly toxic, the word "Caution:" usually precedes the safety hazard information on the label. Many products, though, do not list specific toxic ingredients. For instance, as we noted earlier, aliphatic and aromatic hydrocarbons are often identified simply as petroleum distillates. For more information on the product, you'll need a Material Safety Data Sheet.

Material Safety Data Sheets

The Occupational Safety and Health Administration (OSHA) requires that employers provide workers with Material Safety Data Sheets on products that contain hazardous ingredients. The sheets provide detailed information on the products and their safe use, organized into an OSHA-specified format that includes the following sections:

Section I: Identity. Includes the product name, general identity of the product, hazard class (flammability), emergency phone number, and general information phone number. The manufacturer's name and address may also be included here, if not shown on the top of the form.

Section II: Hazardous Ingredients. Lists all toxic or hazardous ingredients comprising more than one percent of the total product (or more than one-tenth of one percent if a suspected carcinogen). Other information includes exposure limits—threshold limit values, OSHA-permissible exposure limits (PEL) and short-term exposure limits (STEL). Some manufacturers also include the percentage of each hazardous component in the product.

Section III: Physical, Chemical Characteristics. Lists boiling point, vapor pressure, evaporation rate, specific gravity, appearance and odor, solubility in water, and melting point. Vapor pressure is a major consideration, because it indicates volatility. Measured in millimeters of mercury (mm Hg), vapor pressure is the force exerted by vapors against the atmosphere

directly above the substance.

Section IV: Fire and Explosion Hazard Data. Lists flash point; covers fire-fighting procedures and any unusual fire or explosion hazards.

Section V: Reactivity Data. Indicates stability, incompatibility (adverse reaction) with other chemicals, and any hazardous by-products formed by decomposition, combustion, or polymerization.

Section VI: Health Hazard Data. Indicates possible routes of entry of hazardous chemicals into the body (eyes, skin, inhalation, ingestion). Also indicates symptoms, parts of body affected (skin, organs, nervous system, etc.), medical conditions aggravated by exposure, and emergency first aid procedures.

Section VII: Precautions for Safe Handling and Use. Includes information on steps to be taken if material is released or spilled, proper waste disposal, handling, storage and miscellaneous precautions.

Section VIII: Control Measures. Provides information on protective clothing and equipment (gloves, goggles, required cartridge type for respirator), proper ventilation, and recommended work/hygiene practices when using the product.

As you can see, these data sheets provide details about the toxicity of a product and safe ways to work with it. Some of the information applies primarily to industrial situations, and figures such as exposure limit values won't apply to occasional use by hobby woodworkers. Even so, we strongly recommend that you obtain a sheet for each of the products you work with frequently, and for highly toxic products such as paint strippers, lacquers, lacquer thinners, contact cements and aerosols. As noted earlier, Material Safety Data Sheets are available from the distributor or manufacturer.

Personal Protection

When working with organic solvents, the most important safety equipment is a respirator. A wide variety of types are available, from inexpensive disposable masks to full face masks with a self-contained breathing apparatus.

For home and small woodshop use, we recommend a reusable half-face air-purifying respirator with replaceable cartridges. The respirator faceplate should be durable, seal tightly against the face, and be comfortable to wear.

Before buying a respirator, check for a good, tight fit. Those of you with beards or prominent cheekbones may have a harder time finding a respirator that fits properly. The respirator you buy should be approved by NIOSH (National Institute for Occupational Safety and Health) and MSHA (Mine Safety and Health Administration).

Respirator cartridges are classified according to the specific chemicals and concentrations they're designed to filter. Particulate filters trap dust and mist (such as from spray paints). Gas and vapor filters contain *sorbents* that soak up airborne vapors from organic solvents. When choosing a filter cartridge, check the package label or with the manufacturer to make sure the cartridge will effectively filter the solvents you're working with. As mentioned earlier, there are no approved filters for certain chemicals, such as methylene chloride or methanol. When spraying paints and finishes, you'll need a gas and vapor filter cartridge equipped with a particulate prefilter to protect you against dust, mist and particulate fumes.

Cartridges have a limited life; follow manufacturer's instructions on replacement, and keep a record of the time the cartridge is in service. To extend the life of gas and vapor cartridges, store them in an airtight container, such as a zipper-type sandwich bag.

You'll find the best selection of respirators at a local safety supply store. Look in the Yellow Pages under the heading Safety Equipment. If there are no safety supply stores near you, many home centers, paint and hardware stores are now providing a wider range from which to choose. Keep in mind that no respirator provides 100 percent protection against toxic fumes; you'll also need ventilation to keep vapor concentrations at low levels.

Some solvents are absorbed into the body through the skin; many cause skin irritation. Wear gloves and don't use solvents such as mineral spirits, acetone, or lacquer thinner to clean your hands. Lightweight latex gloves don't provide adequate protection; use gloves specified by the finish manufactuer or Material Safety Data Sheet for the product you're using. Heavy-duty chemical-resistant gloves are available at most home centers and paint/hardware dealers.

In addition to gloves and a respirator, wear long-sleeve coveralls or similar clothing to protect your skin from accidental splashes. Also wear safety glasses or goggles to protect your eyes.

Discarding Liquids

All finishing products containing toxic chemicals require proper disposal. Proper disposal does not mean tossing a half-empty can of finish in the trash, or dumping dirty paint thinner in the bushes or down the drain. It doesn't matter that the can is tightly capped, it will eventually be broken open. And it doesn't matter that the bushes are 100 yards from your well, or that the waste treatment plant is miles from your home. Sometime, somehow, somewhere, those toxic ingredients will leach into the soil and water.

But the big question for most woodworkers isn't whether or not they want to do the right thing. The question asked is usually "What do I do with the stuff?" And the answer isn't always obvious. Larger cities may have a separate hazardous waste disposal area at the landfill, but many communities are just beginning to come to grips with the problem. One common solution is an annual hazardous waste disposal day where residents bring everything from paint and finishing products to pesticides to a central area for collection and proper disposal. If your community doesn't have a place to bring such substances, approach the local government about organizing such a day. If you aren't sure how to dispose of your finishing products, write or call the local board of health, department of sanitation or your state department of environmental protection.

Air-purifying respirator with replaceable cartridges.

Safe Working Environment

The ideal place to work with finishes and other volatile products is outdoors, preferably with a light breeze blowing. This isn't always practical, but it points out that the better ventilated your workspace is, the fewer toxic vapors you're likely to inhale, and the lower the chance of fire or explosion. If you do most of your finishing in your workshop, install an exhaust fan with a sparkproof motor, vented directly to the outside. When doing finishing projects in other rooms of the house, open all windows and doors, then place a fan to one side of the work, so it blows the fumes away from the work area toward an open window or door (do not stand directly in front of the fan while working).

You've probably seen this warning on flammable products hundreds of times: Do not use or store near heat, sparks or flame. Obviously, you wouldn't work in the same room that houses your furnace or hot water heater, nor would you light a cigarette while working. But flammable vapors can also be ignited by a spark from a power tool, electric appliance, or even a light switch. Make sure all fumes are evacuated from the shop before operating electric tools and equipment. Some toxic or flammable fumes are heavier than air, and may travel considerable distances to a source of ignition. When working with these, place a fan at floor level to vent the fumes.

Store all finishes and other toxic products in a locked cabinet, out of the reach of children. Make sure containers are tightly capped to prevent accidental spills and release of vapors into the air. Finally, do not allow solvent-soaked rags to accumulate in the shop; they can ignite by spontaneous combustion. Spread them outside to dry, then discard in an outdoor metal garbage can. Liquids should only be disposed of in an environmentally safe manner (see Discarding Liquids).

Other Precautions

Exercise safe hygiene and work practices when handling and using toxic substances. Don't eat, drink or smoke in the shop; this increases the risk of accidental ingestion. To avoid spills, don't work from a full can; decant material into a larger container. Keep lids on containers when not in use.

Pregnant women should not expose themselves to any toxic substances, including organic solvents. Medical research indicates that the fetus is at greatest risk during the first trimester, but women should not work with toxic substances until after the cessation of breast feeding.

Likewise, children under 13 and elderly persons (over 65) should not use finishes containing organic solvents. If you have a health problem, such as heart disease, respiratory problems, or allergies, you should take special precautions, or avoid using toxic finishes entirely. Woodworkers with health problems should consult their physicians before using these products.

Toxicity and Flammability of Common Organic Solvents

Solvent	Toxicity* Threshold Limit Values (TLV) in ppm	Flammability** (Flash Point)
Highly Toxic		
Benzene	10	12°F
Methylene chloride	50	n/a
n-Hexane	50	-7°F
Methyl isobutyl ketone	50	73F
Petroleum naptha	100	-50°F
Toulene	100	40°F
Xylene	100	81°F
Gum turpentine	100	95°F
Moderately Toxic		
Mineral spirits	200	85-105°F
Methanol	200	52°F
Methyl-ethyl ketone	200	21°F
Varnish maker's and painter's naptha	300	20-55°F
Isopropanol	400	53°F
Mildly Toxic		
Acetone	750	1.4°F
Ethanol	1000	55°F

*The lower the TLV, the more toxic the chemical.
**The lower the flash point, the more flammable the substance.

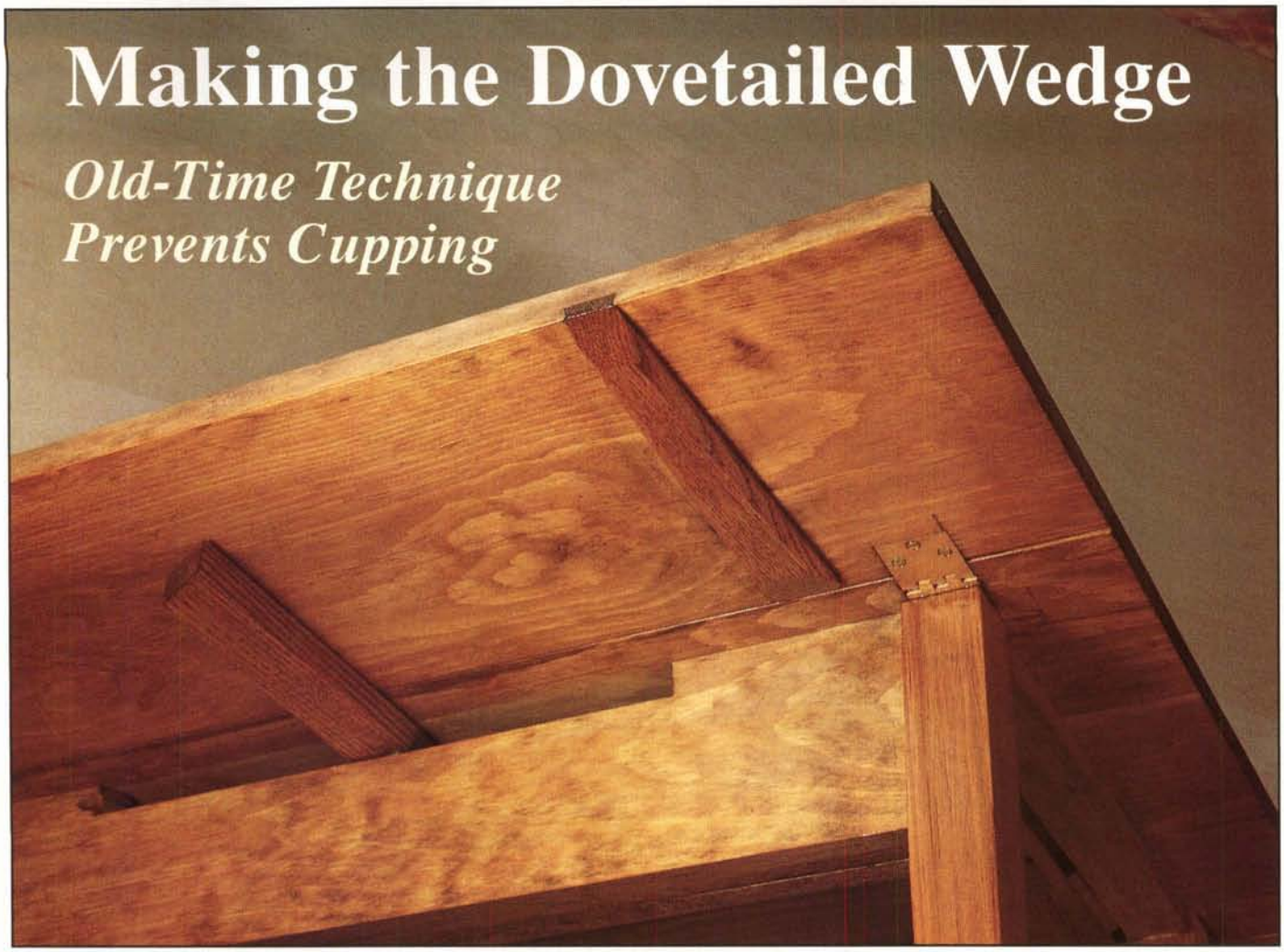
A Few Words On Nontoxic Finishes

No finishing product—other than pure mineral, nut, or vegetable oil—is 100 percent nontoxic. Practically all commercial finishing products contain some toxic substances. When a finish—such as water-based lacquer—is labeled nontoxic, this usually only means it is safe to use without a respirator. The nontoxic label notwithstanding, many such finishes contain skin-and eye-irritants, or are toxic when ingested. Others, such as nontoxic paints, varnishes, and penetrating oils formulated for children's toys and salad bowls are nontoxic only after they're dry. Many contain toxic solvents (as driers), just as most other finishes.

Don't assume that because a finish is labeled nontoxic that you don't have to take protective measures when applying it. Read and follow the label precautions.

Making the Dovetailed Wedge

Old-Time Technique Prevents Cupping



Tapered dovetail wedges are often found on antiques, but they seem to have fallen from favor in modern construction. That's a shame. These simple devices help resolve a common problem, the cupping of an unsupported board such as a table leaf or a solid door.

Dovetail wedges act the same way as a cleat screwed to the back of the board, but they allow for seasonal wood movement because they're typically anchored to the board at only one point, the middle or at one end. The board can expand and contract slightly in relation to the cleat, but the dovetail wedge is locked in place and prevents cupping.

If you look under a Moravian or fiddle-back chair, you're likely to also find these wedges. On the chairs, the wedges are thick stock and serve to anchor the legs as well as to stiffen the seat.

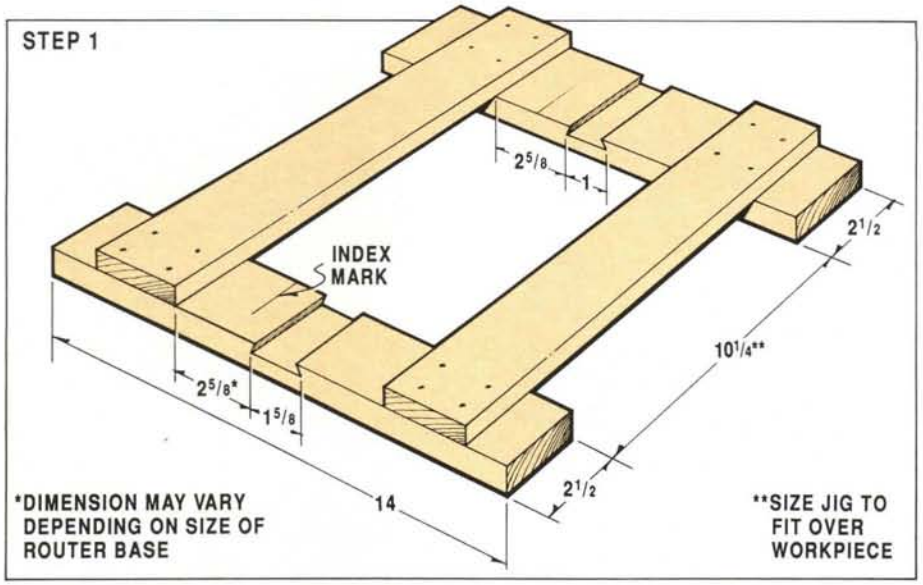
There are many common variations of these dovetailed wedges. Our technique employs wedges that are tapered and dovetailed on both sides. But they can also be made with the taper and dovetail on one side only. The other side remains straight and square. That version is somewhat easier to make, but also does the job because the dovetail and taper still lock the piece in place.

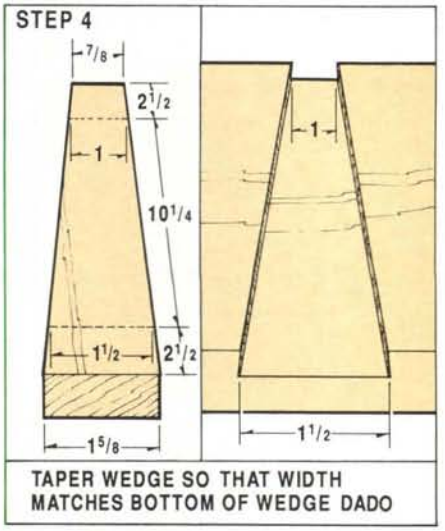
It's also possible to taper both sides, but cut the dovetail on one side only. Another possible variation is to make a rectangular cleat with the dovetails cut on the sides. That also works well, but must be cut more accurately than the tapered version. The cleat must fit perfectly or it will be too loose, or so tight it won't fit.

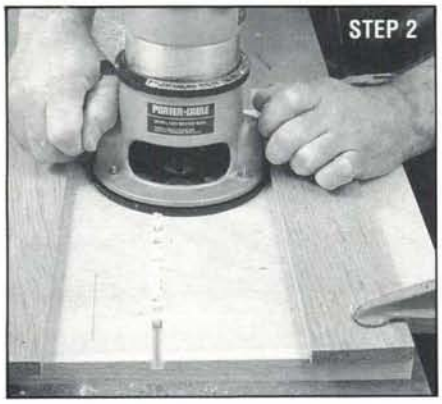
The chief virtue of the tapered version is that it allows a margin for error. The wedges are cut long and easily adjusted to fit. They are simply trimmed and pushed in a bit farther if they don't fit just right.

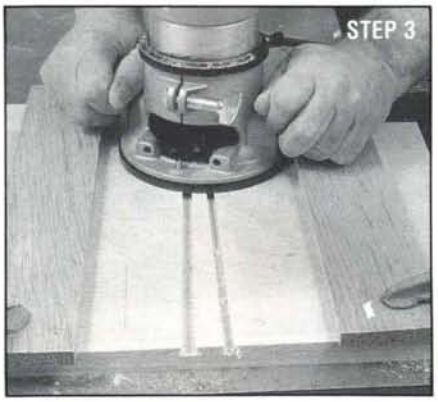
We used the wedges for the two leaves on our Harvest Table on page 49. The technique explained here uses the Harvest Table as an example, but the method is easily adapted to other projects.

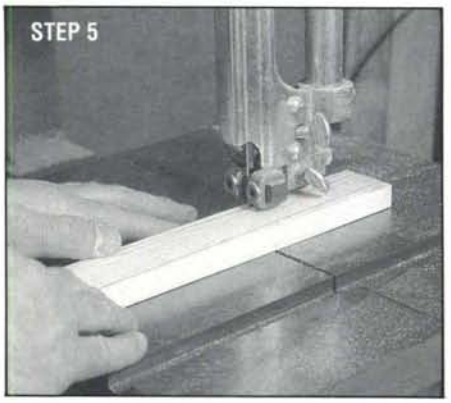
Our method employs a router and router table in conjunction with a 14-degree dovetail bit with a 1/4 in. shank. The technique also calls for making two simple jigs, one single-purpose jig for cutting the tapered slots, and another common jig, called a shooting board, for smoothing the wedges. The first jig fits the specific workpiece, but the shooting











board can be any size that seems convenient.

We sized the single-purpose jig for the Harvest Table leaves, but it's a simple matter to change it for another application. There's nothing critical about the precise angle of the jig because the wedges are cut to match the actual slots, which we'll call wedge dadoes. The angle of our jig works out to be about 1 1/2 degrees, but it could easily have been 2 or 3 degrees without any significant difference.

Step 1: Make the jig to rout the wedge dadoes. The jig is simply two cleats that support two guide strips, which the router base rides against. The jig cuts a wedge dado that tapers from 1 1/2 in. to 1 in. across the width of the leaf (see Step 4). Note that the precise location of the guide strips depends on the size of your router base. The distance from the bottom point of the wedge dado to the wood guide strips (shown as 2 5/8 in.) should correspond to the distance from the dovetail bit to the outside of your router base. Measure that distance and substitute it for the 2 5/8 in. we used for our Porter Cable router.

Step 2: Lay out the wedge dadoes on the leaves and line the jig up with the layout (see Harvest Table on page 49 for the wedge locations). Clamp the jig and leaf to your workbench. Also strike an index mark (see Step 1 above) across the jig and workpiece. Put a 1/4 in. diameter straight cutter in the router set to a 3/16 in. depth of cut. Then rout straight-sided dadoes on both sides of the wedge dado. Repeat the procedure for each of the wedge dadoes, as well as on a piece of scrap the same width as the leaf.

This step removes much of the waste and prevents the router from bogging down when cutting the dovetails. The extra piece is needed for adjusting the router table in Step 7.

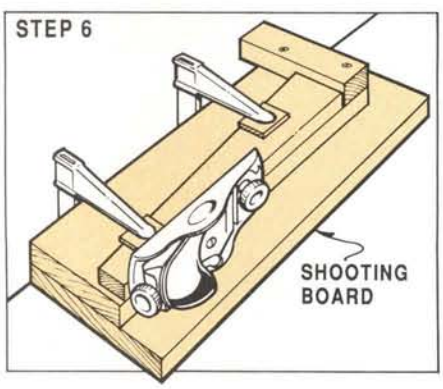
Step 3: Put the dovetail bit in the router and set it for a 1/4 in. deep cut. Line the jig up to the leaf using the index marks. Clamp the jig and leaf down to the bench and rout out the wedge dadoes. Rout the sides first and then clear out the middle. Repeat the procedure for all four wedges, as well as the extra piece.

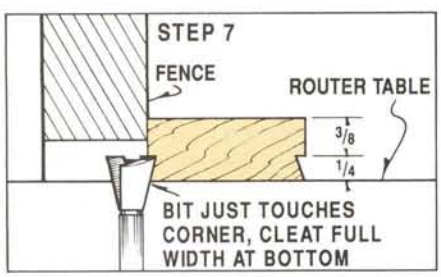
Step 4: Lay out a test wedge as shown. The width of the wedge matches the width at the bottom of the wedge dado. For the sake of simplicity, measure the wedge dadoes from the jig. You'll need to make the wedges long to allow for fitting, so measure the wedge dadoes at the outsides of the jig and make the wedges so they're as long as the total width of the jig. In the example, that's 5 in. longer than the finished wedge, so you have plenty of room for fitting.

Step 5: Cut out the test wedge with a band saw, staying outside the layout lines. Note that the success of this

procedure depends on the wedge being at least as wide as the wedge dado. It's all right to make them a little fat and cut the dovetail a tad deeper in Step 7; but if you make them too skinny, you'll be out of luck.

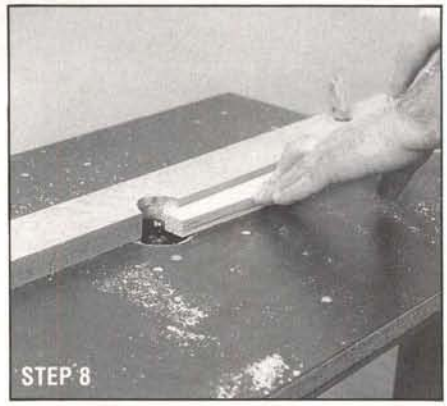
Step 6: Use a block plane and shooting board as shown to clean up the cuts and meet the layout lines. You'll be better off if you're as precise as possible in this operation. More care now will save time in final fitting. The shooting board is easy to make and will come in handy for many other operations. It needn't be any precise size. Note that it's *not* a good idea to use a jointer for this operation; the workpieces are too short for safety.

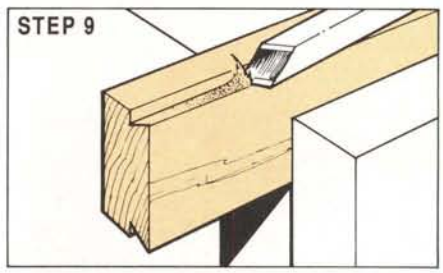




Step 7: Put the dovetail bit in the router table and set the height from the extra piece you made when cutting the wedge dadoes. Set the bit in a fence as shown and adjust it so it takes the minimum cut. The bottom of the bit should just touch the corner, leaving the wedge full width at the bottom.

Note that making a wider cut here will make the wedge slide farther into the wedge dado, but the wedges are cut long so you should have some room for error.



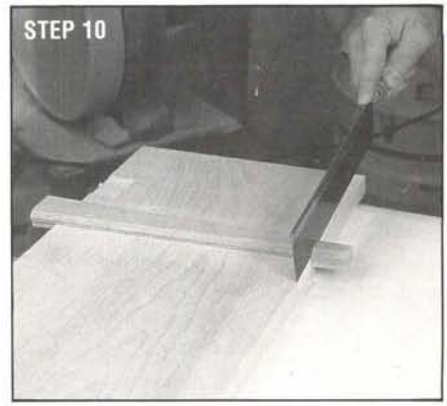


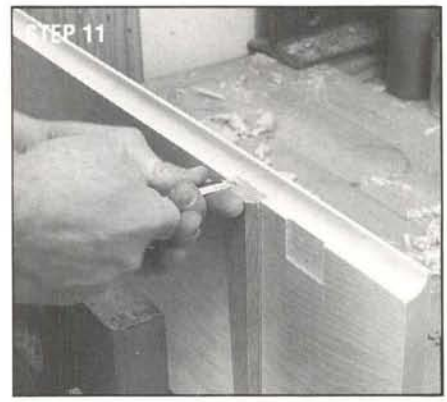
Step 8: Run the test wedge in the router-table setup. Feed the work from right to left. After routing both sides, try the test wedge in the wedge dado. If it fits, cut out the four wedges, plane them smooth, and establish the dovetails. If it doesn't fit, adjust the router table setup as needed.

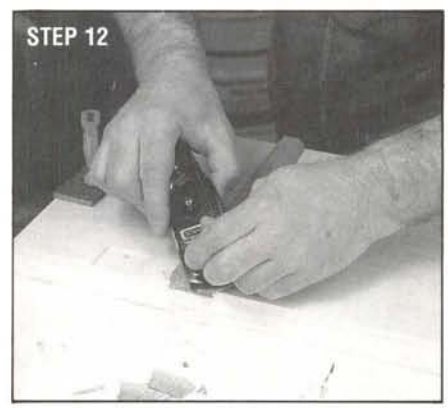
Step 9: Each wedge will require some final fitting to eliminate binding. Blue or red carpenter's chalk helps with the fitting. Sprinkle some inside the wedge dado and test the wedge. The binding points will take up the chalk. Gently pare away the chalked areas with a sharp chisel.

Once the wedges fit properly, glue them with a dab of glue only on the inside or wide part of the wedge. Tap them in with a mallet so they're snug, but don't bang on them too much or you'll split out the pine on the leaf. The glue is applied only at one end to allow for seasonal wood movement.

Step 10: Use a dovetail saw to cut off the wedges. You'll need to be careful cutting off the wedge near the rule joint. Work slowly and leave the wedge a little proud of the cove of the joint.

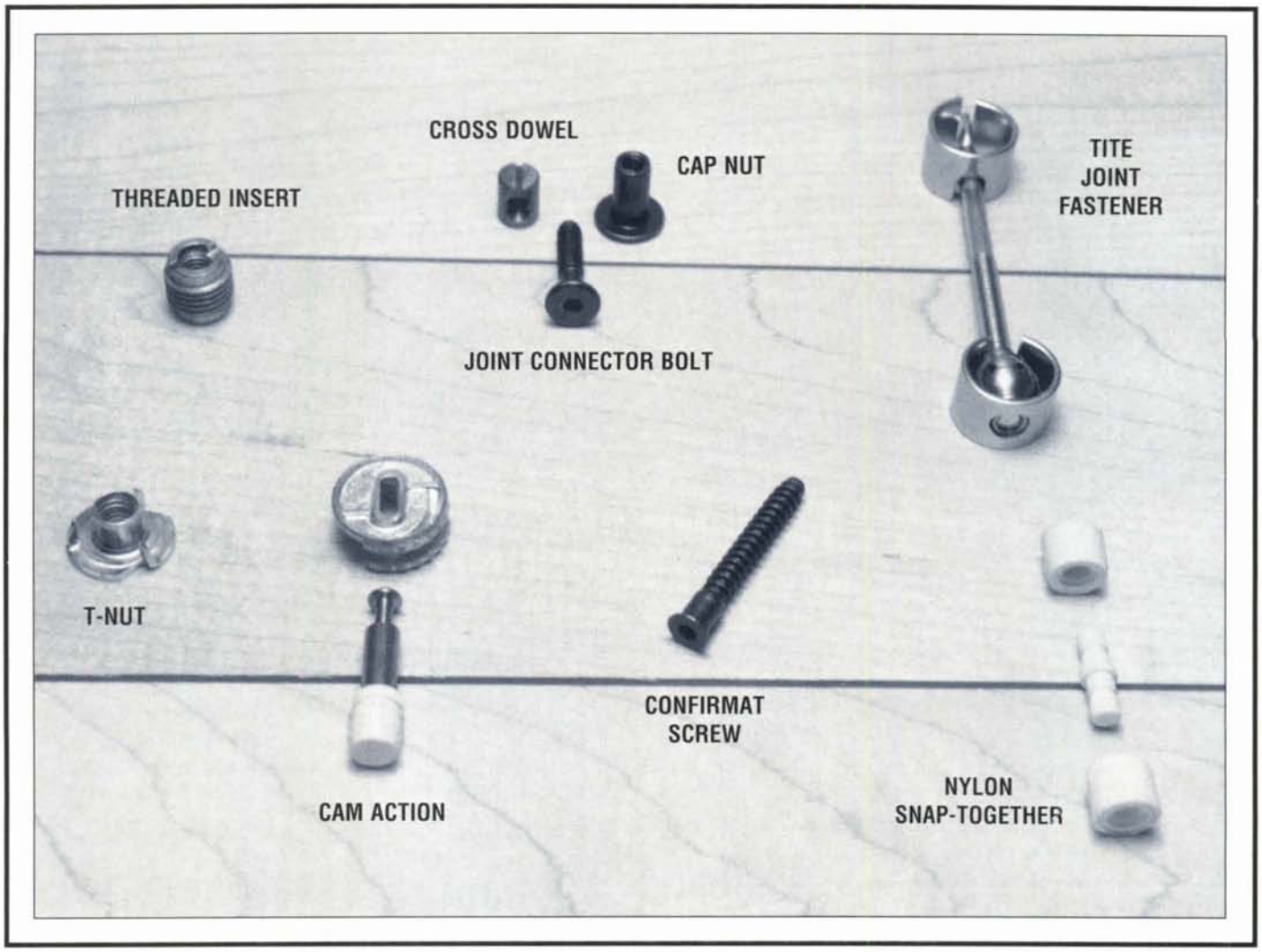






Step 11: Use a chisel to pare the wedges to the curve of the rule joint. Make sure your chisel is sharp and work slowly, peeling the end grain away. With a sharp chisel this is fairly easy; with a dull chisel it's nearly impossible. You can, of course, also sand the wedge flush with the cove of the rule joint. It helps to wrap sandpaper around a dowel.

Step 12: Taper the wedges toward the leaf edge with a block plane. Be careful near the edge. You don't want to tear out the grain of the leaf.



KNOCKDOWN HARDWARE

Knockdown (KD) fittings are a subject that could include just about any fitting that permits disassembly, from bed rail fasteners to keyhole hangers. But we'll exclude the special-purpose items, and concentrate on mechanical fasteners that are intended to substitute for traditional methods of joining parts and still permit later disassembly.

KD hardware today is a more sophisticated and less visible method of joining parts or sections that traditionally would have been fastened together with a cleat, brace, angle iron, hook-and-eye or strap. That's not to say that these and similar items don't have applications today. There is a wide variety of stamped steel wedge- or taper-fit connectors available at most hardware and building supply centers. And for the most part, these connectors are as strong or stronger than the hardware featured. But on the negative side, they usually don't look very attractive. If you are looking for a connection that's both easily taken apart and nearly invisible, then your options are limited.

Don't assume that because a fitting is designed for easy disassembly that it can be used in an application where this is done on a regular basis. The KD fittings featured here enable you to knock down an item occasionally for moving or storage. Most of the fittings that we looked at just aren't designed to stand up to daily disassembly.

Manufacturers use KD hardware primarily because it makes shipping an item easier and cheaper. For certain applications, the right KD hardware can provide a reasonably strong connection while cutting down your production time. But, if you are making something that need not be taken apart later, it's usually best *to avoid* KD hardware entirely and stay with traditional joinery.

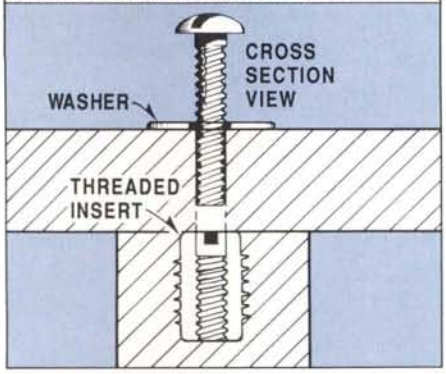
Because each of the KD fittings profiled here is a different design, comparing the fittings from a strength standpoint is like comparing apples to

oranges. Each fitting has advantages and disadvantages. You'll need to decide whether a fitting might be appropriate for a particular application. As you'll see in our What's Best section (page 28), we only recommend four of the seven types of fittings profiled.

The Choices

Threaded Insert *(Fig. 1):* This is the type of KD fitting that we use most

FIG. 1 THREADED INSERT



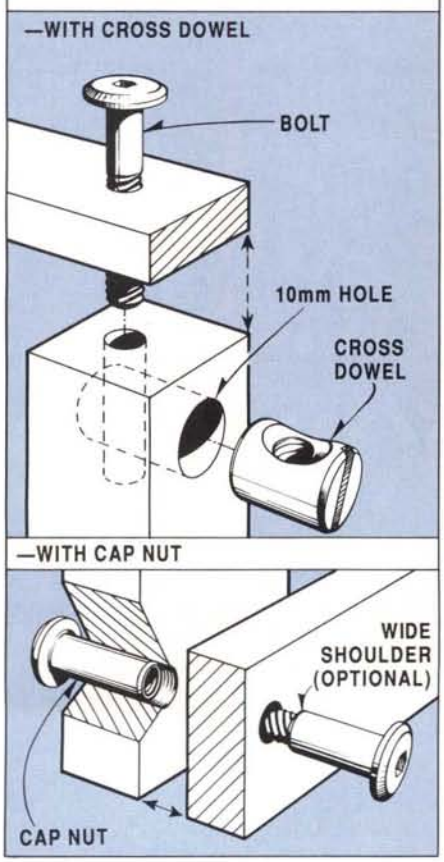
often. There are two variations, but both work on the same principle. As shown, a threaded insert is mounted into a hole drilled into one piece, and a machine screw or bolt is inserted through a hole in the piece to be joined to provide the mechanical connection. The inserts have a wood-holding thread on the outside and a machine-screw thread on the inside.

Threaded inserts are available in a cast version—where the threads that bite into the wood are cast instead of cut—and in brass or steel with knife-cut threads. A broad variety of both types of threaded inserts is available, with special applications for use in particleboard, composites, plywood, or end-grain. Other inserts may be plastic and designed for use with adhesives, and still others are press-fit and slit, so as the screw is inserted it spreads the insert and locks it in place. We prefer the brass insert with knife-cut threads. Brass provides plenty of strength, looks good, and rust is never a problem. The cast version usually mounts with a hex key wrench, while the brass or steel variety is either slotted for a screwdriver or has a hex drive for the hex key wrench. Some suppliers (see Sources, page 28) also sell a special T-wrench or drill-driver tips for mounting the inserts. Be sure to purchase a driver that matches the insert you select.

One advantage of threaded inserts is that they work in just about any application, whether you are joining parallel pieces or components that are at right angles to each other. If you are inserting the threaded insert into end grain, use a dab of epoxy to help anchor the insert. Countersinking for the flathead machine screw or for the bolt head will produce a flush connection with no protruding hardware. Add a washer to stop the bolt or machine screwhead from tearing into the wood as it's tightened.

Joint Connector Bolt *(Fig. 2):* You'll use these connector bolts either with a

FIG. 2 JOINT CONNECTOR BOLT



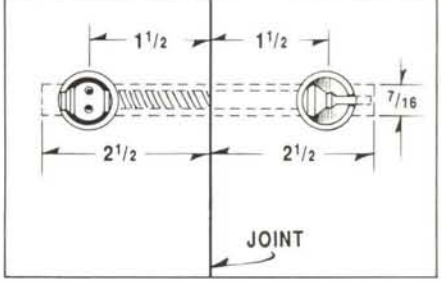
cap nut or cross dowel, depending on whether you are joining parallel surfaces or parts at a right angle. The cap nut is useful for connecting cabinets, cases, or modular components. Drill through both parts and screw the cap nut and connector bolt together. The visible part of the bronze-finish fitting has a clean look that doesn't detract from the appearance of most projects.

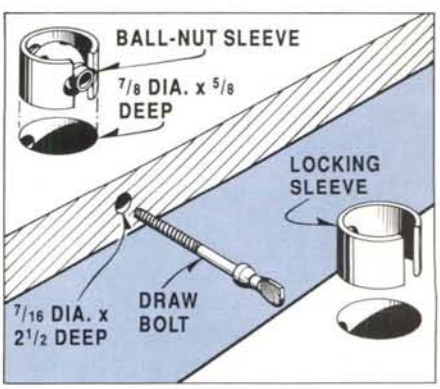
Drilling for the cross dowel is a little more critical than drilling for the cap nut application. You'll need to drill intersecting holes for the cross dowel and joint connector bolt. Use a 10 mm diameter drill bit for the cross dowel. Insert the cross dowel, then mount the connector bolt through a hole in the piece to be joined. The connector bolt is tightened with a hex key wrench.

Connector bolts are available with various head sizes, and in either a shouldered or straight shank. The shouldered shank provides superior rigidity to racking stresses. The cross dowels are available in an offset short version (13 mm) for thin stock, and several longer versions (16 mm, 30 mm) for heavy-duty applications, such as workbench assembly.

Tite Joint Fastener *(Fig. 3):* This is one of those fasteners that you've probably wished you had at one time, but just

FIG. 3
TITE JOINT FASTENER





couldn't find. It's perfect for securely joining two edges where you need something more than an indexing dowel.

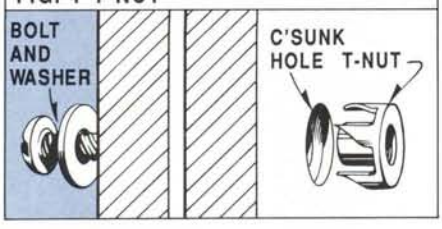
Applications include joining stacking sections of bookcases or edge-joining table sections that you may want to take apart later.

Like all the fasteners shown, this KD fitting works in 3/4 in. thick stock. As shown, drill 7/8 in. diameter by 5/8 in. deep holes in each piece, 1 1/2 in. from the edge. Then drill 7/16 in. diameter by 2 1/2 in. long holes in each edge. The 7/16 in. diameter holes must intersect with the 7/8 in. diameter holes.

To mount the hardware, first insert the ball-nut sleeve end of the fitting, then screw the draw bolt into it. Add the piece to be joined, and finally slip the locking sleeve in place. Note how the locking sleeve fits over the draw bolt, preventing its accidental release. A nail or nail set is used to tighten the ball nut. A special drill guide is also available to simplify drilling the intersecting holes for this fitting.

T-Nut *(Fig. 4):* The venerable T-nut is the generic factory-fastener for everything from casters to legs, and any inspection of low cost factory-made furniture is sure to turn them up. For applications where appearance isn't important but strength and simplicity are, the T-nut offers an important option. It's similar to the threaded insert in design, but requires less work to mount.

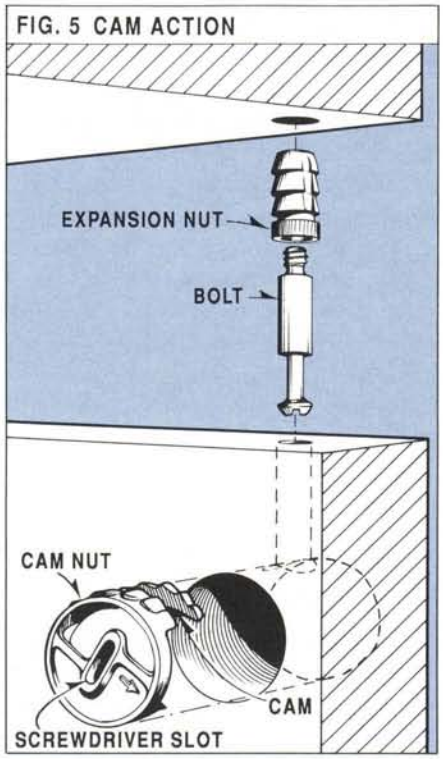
FIG. 4 T-NUT



For an application where a flush look isn't needed, all you need is a hole for the machine screw or bolt. Tap the threaded insert into place and add the screw or bolt to fasten the parts together. For a flush fit, counterbore a larger hole for the insert. Take note that unlike a threaded insert, though, the T-nut design accepts stress in one direction only. Stress in the opposite direction will force the shallow points of the insert out, and your connection will have no strength. A variation of the T-nut offered by some suppliers uses a ribbed shank instead of points to provide the holding power. A nut can be added for extra strength and to lock the bolt or screw.

Cam Action *(Fig. 5):* This is the type of fitting that usually comes to mind first when the term knockdown hardware is mentioned. It's the style of KD hardware that's often used on particleboard or plywood factory-made furniture, and for many buyers of such furniture, it's an element they'd like to see improved. Two of our editors own furniture that uses these fasteners, and in both cases the hardware failed not long after purchase. Once the hardware has been mounted, all that's usually required for assembly is a screwdriver.

FIG. 5 CAM ACTION

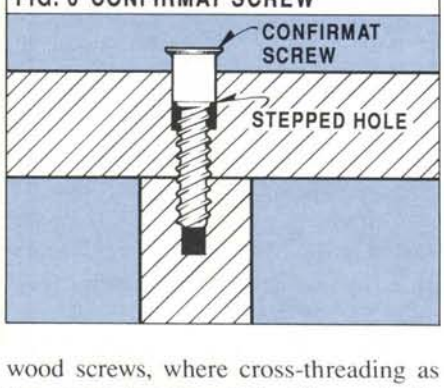


The term cam action refers to the way the joint is tightened. As the cam nut section of the fitting is turned, its built-in cam draws the bolt portion of the fitting tight. Cam action hardware is usually used to mount parts that are at a right angle to each other but can also join parts edge to edge.

Three holes are required to mount most cam action hardware. A hole in one of the parts accepts a pressure-fit expansion nut that is locked in place as the bolt is screwed into it. Two holes are then drilled in the piece being joined—a large diameter hole for the cam nut part of the fitting, and a smaller intersecting hole for the bolt. Another version of the cam action KD fitting requires only two holes. But regardless of the number of holes required to mount the hardware, most cam action KD hardware is of European design, and requires drill bits that are sized in millimeters to bore the correct sized holes for the various parts. Hole sizes are critical for the hardware to work as intended. Hardware catalogs typically list the special bit sizes with the hardware that requires them, and most cam action KD hardware also offers color-coded snap-in plastic caps that cover the exposed cam nut.

Confirmat Screw *(Fig. 6):* These fasteners aren't much more than a slightly more efficient wood screw. An undersized hole is bored, and as the screw is inserted, the threads cut a path into the hole perimeter. The threads cut a little deeper than a regular screw, so that after disassembly the threads reset easily into the original path. This eliminates the problem with most standard wood screws, where cross-threading as the screw is reinserted will eventually weaken the joint.

FIG. 6 CONFIRMAT SCREW

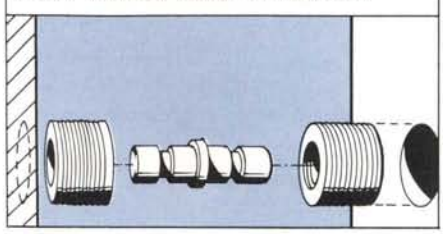


Confirmat screws require a stepped hole, with the clear shank section of the hole being a little larger than the threaded section. You can make the stepped hole by using two separate bits, but a better choice is to buy the special stepped bit that's designed for drilling Confirmat screw holes. The hex or Phillips head of the Confirmat screw looks fine as it is, but if you wish to hide

the screw head, plastic cover caps are available. If you aren't too fussy, lag bolts provide much the same holding power.

Nylon Snap-Together *(Fig. 7):* Unlike the previous KD hardware, these fittings are not adjustable. There are several styles available. Some are three-part fittings, where a double-ended nylon pin locks into two nylon bushings, one inserted into each of the sections being joined. Others are two-part fittings, where one of the parts includes a nylon pin that locks into a nylon snap-fit bushing when the parts are pressed together. The three-part fitting requires that like-sized holes be drilled in each of the pieces being joined, while the two-part fitting requires two different sized holes. Because these snap-together fittings can't be tightened, their use is limited to light-duty applications where two parts are held together, but a tight joint and strength aren't important.

FIG. 7 NYLON SNAP-TOGETHER



What's Best

We haven't subjected the KD hardware featured here to any scientific stress tests or laboratory analysis. But we can offer some conclusions based on experience. Although the cam action KD hardware is the type you are most likely to find on factory-made furniture, it's the poorest choice for most woodworking applications. The low cost and easy assembly are well suited for mass production, but the joint produced is usually weak. When racked, right-angle joints fastened with cam action KD hardware typically pull the anchoring nut out. On particleboard furniture, the particleboard often tears or breaks around the hardware.

We also don't recommend the light-duty nylon snap-together fittings for any woodworking joint, and while the Confirmat screws provide a strong and secure joint, like any joint where a metal fitting is wearing against wood, repeated use will take its toll. That leaves only four knockdown fittings that we suggest: joint connector bolts, threaded inserts, Tite Joint fasteners and T-nuts. All four types of connectors use a design where the stress and wear points are metal-to-metal, instead of metal-on-wood. Where a right-angle butt joint is needed with a knockdown capability, consider using threaded inserts or joint connector bolts and cross dowels. And where two parts or sections must be joined edge-to-edge, and knockdown capability is still needed, we recommend the Tite Joint fastener. For flush joining two parallel surfaces in a knockdown format, use either threaded inserts, joint connector bolts and cap nuts, or T-nuts.

For any joints that will see repeated disassembly, it's best to use a hardwood, since it will be more resistant to stress and deflection than a softwood. Also, if a bolt or screwhead is tightened directly against a wood surface, add a washer to eliminate wear. Given the choice of screw or bolt drives, a hex head bolt or a head that accepts a hex key is a superior choice to a straight slot or Phillips head drive.

Suggested Applications

Once you've decided that you want to use a KD fitting for a particular connection, the next logical question is which fitting to select. We've used KD hardware in a number of recent projects. In the Stackable Shoe Rack (May/June 1990) we chose joint connector bolts and cross dowels to fasten sides to stretchers. A through wedged tenon was an option here, but the joint connector bolts were our choice for several reasons. First, drilling for the joint connector bolts and cross dowels was a big time-saver. If the racks ever got rickety, a few turns on the connector bolts would quickly restore rigidity, and come moving day, the shoe racks could be broken down for transport. In the English Garden Table (May/June 1990) the use of threaded inserts allowed easy disassembly.

Other appropriate but less obvious uses for KD hardware are in jigs and fixtures. T-nuts and threaded inserts are an effective way to fasten a jig in place, and they're also useful *in jig and* shop-built tool construction. For example, in our Table Saw Crosscut Box (November/December 1988), T-nuts were used to mount fence extensions. But uses for KD fittings need not be limited to situations where disassembly is a consideration. We used threaded inserts to anchor the blade-mount bolt in our Bow Saw (January/February 1986), and for the set and locking screws on our popular Marking Gauge project (November/December 1985).

Sources

Armor Products
Box 445
East Northport, NY 11731
(516) 462-6228
(T-nuts, threaded inserts, nylon snap-together)

Constantine's
2050 Eastchester Rd.
Bronx, NY 10461
(800) 223-8087
(T-nuts, threaded inserts, cam action fittings)

Garrett Wade
161 Ave. of the Americas
New York, NY 10013
(800) 221-2942
(threaded inserts, joint connector bolts, cross dowels and cap nuts)

Rensen Products
6307 E. Mile 18 Mile Rd.
Sterling Heights, MI 48078
(800) 521-6318
(threaded inserts)

The Source
7305 Boudinot Drive
Springfield, VA 22150
(800) 452-9999
(T-nuts, Confirmat screws)

Woodcraft
210 Wood County
Industrial Park
Parkersburg, WV 26102
(800) 225-1153
(threaded inserts, joint connector bolts and cross dowels)

Sunburst Mirror

Builder Richard Wonderlich, of Mt. Pleasant, Iowa, says the inspiration for this sunburst mirror came from the shutters on an historic home that he helped restore in his hometown. Coincidentally, Mr. Wonderlich adds that it was his great-grandfather who, back in 1854, did the original trim work on the house. Wonderlich says the position of the shutters above the window gave him the idea of substituting a mirror and frame for the window sash and frame.

Start by making the mirror frame. The stiles (A) and rails (B) employ a slip joint at the four corners (see Slip Joint detail). The most accurate way to cut this joint is with the table saw using the dado head and a tenoning jig. Use two fence settings, one to establish the 1/2 in. wide slot in the stile ends, and the second setting for the cheek cuts on the rails. The dado head height for both cuts is 1 1/2 in. Note that if your stile and rail stock are both exactly the same thickness you can cut the opposite cheek on the tenon by just reversing the rail so the opposite face is out. Be sure to use a tenoning jig equipped with a backup block, or you'll likely have tear-out as the blade exits the cut.

The 3/8 in. wide by 1/2 in. deep rabbet in the frame (see Back View detail) is cut with a bearing-guided rabbeting bit in the router. The bit won't get into the corners, so you'll need to square these by hand with a chisel.

The arched top is the challenging part of this piece. In practice, though, the work can be done almost exactly as it was over 100 years ago, except for the substitution of an electric drill for the brace. Start with two 7/8 in. thick boards, each one at least 4 in. wide and 16 in. long. Cut a 45-degree miter on one end of each piece, make a clamp notch adjacent to the miter, and establish a clamping flat on the opposite end as shown in Figure 1.

Cut a 1/4 in. wide by 9/16 in. deep spline groove in the two mitered ends, add a spline (note that the grain direction of the spline is perpendicular to the joint line) and then glue and clamp as shown. When dry, use the band saw or a jigsaw to cut the arch (C). Files and sandpaper will final smooth the profile.

The ends of the 1/4 in. wide by 5/16 in. deep mortises for the shutter blades (D) are established with a drill and the waste between is cleaned out with a chisel. First, though, you'll need to lay out for these mortises. Start by dividing your arch along the inside radius into 13 equal 1 13/16 in. segments. The layout illustration (Fig. 2A) shows how the mortises are spaced and how the holes are positioned. Note the 10-degree angle of the mortises. To simplify the layout, you may want to make a cardboard template (see page 31 for full-size pattern). As shown in Fig. 2B, with the cardboard template all that's required for the layout is to position the template even with the 1 13/16 in. segment lines. Use the vise to hold the arch while you drill and then clean out the mortises. You'll find it helpful to reposition the arch in the vise for each mortise, so that you are always working vertically (Fig. 2C).

With the mortises cut, join the arch to the frame. If the bottom ends of the arch aren't fitting flush, use a sheet of sandpaper on a flat surface such as your saw table to true the ends. A 3/8 in. diameter dowel in each end (see Slip

Joint Detail) anchors the arch to the frame. Use dowel centers to get the alignment right and be careful to drill the holes perpendicular to the joint line.

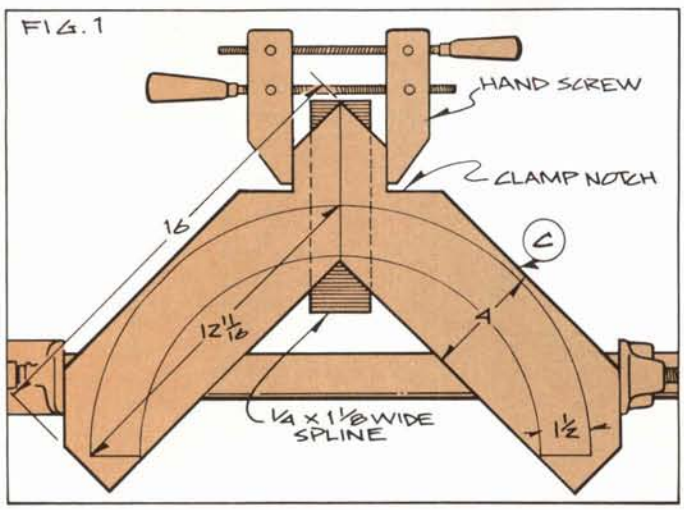
Next, cut the shutter blades (Fig. 3), hub ends (E) and hub (F). The shutter blades are cut to shape with the band saw and then smoothed, or you can just use a hand plane for the tapers. If you have one, a disk sander comes in handy for thinning the blades at the narrow end and rounding the edges. The hubs are just half-circle disks. Mount the front hub end and the hub with a dab of glue (Fig. 4), then insert the shutter blades. The mirror frame should be face down and lying flat during this operation. The two end blades may need fitting where they butt to the top of the mirror frame. After the blades are properly fanned out, lay in a generous bead of epoxy—which has good gap-filling properties—to anchor them where they butt to the hub. Add the remaining hub end to conceal the bead of epoxy. Then bring the mirror to your local glass shop and have the mirror glass (G) cut to fit.

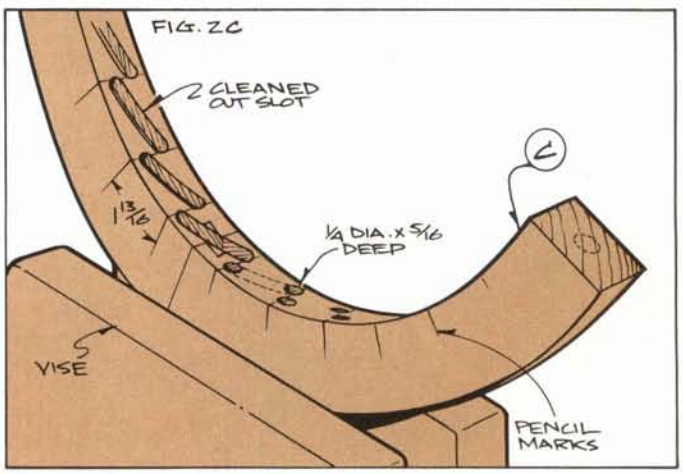
Our mirror, which is made of oak, has an oak stain and a lacquer finish. Apply the finish before mounting the mirror glass. We added a hardboard backing (H) to protect the silvered surface. Glazier's points hold the backing and mirror glass in place.

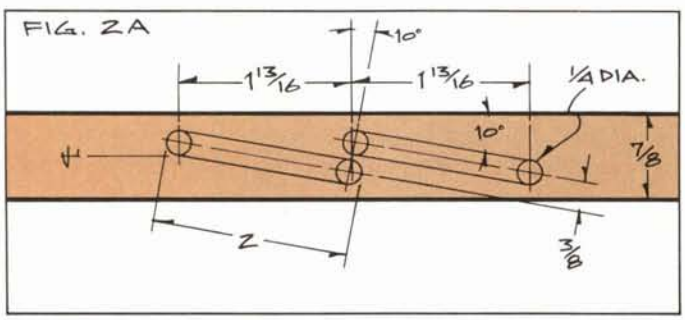
Bill of Materials
(all dimensions actual)

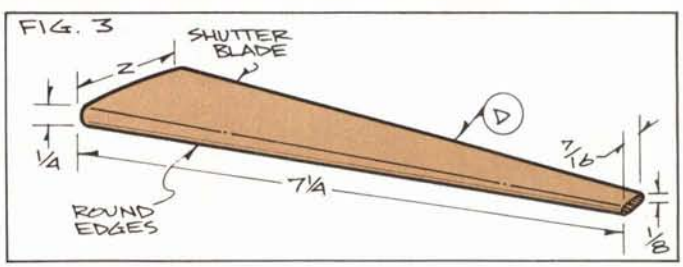
Part	Description	Size	No. Req'd.
A	Stile	7/8 x 1 1/2 x 23 3/4	2
B	Rail	7/8 x 1 1/2 x 18*	2
C	Arch	see Detail	1
D	Shutter Blade	see Detail	13
E	Hub End	1/4 x 1 1/2 x 3	2
F	Hub	3/8 x 1/2 x 1	1
G	Mirror Glass	1/8 x 15 3/4 x 21 1/2	1
H	Backing	1/8 x 15 3/4 x 21 1/2	1

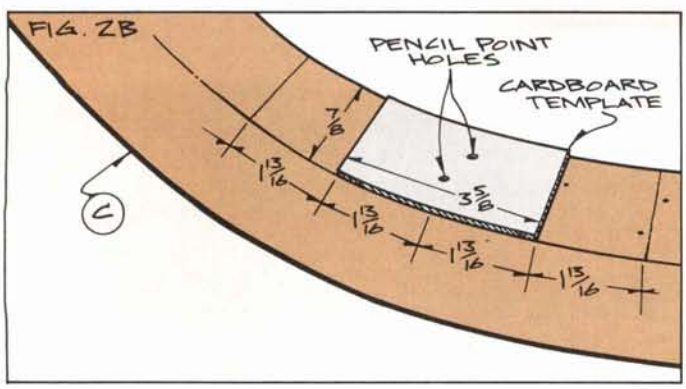
* Length includes tenons.

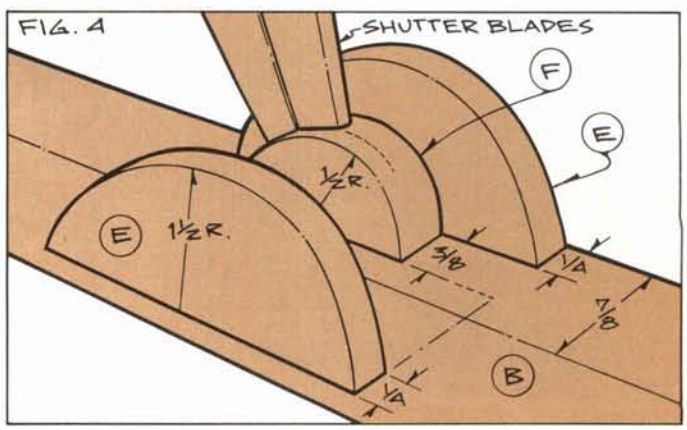


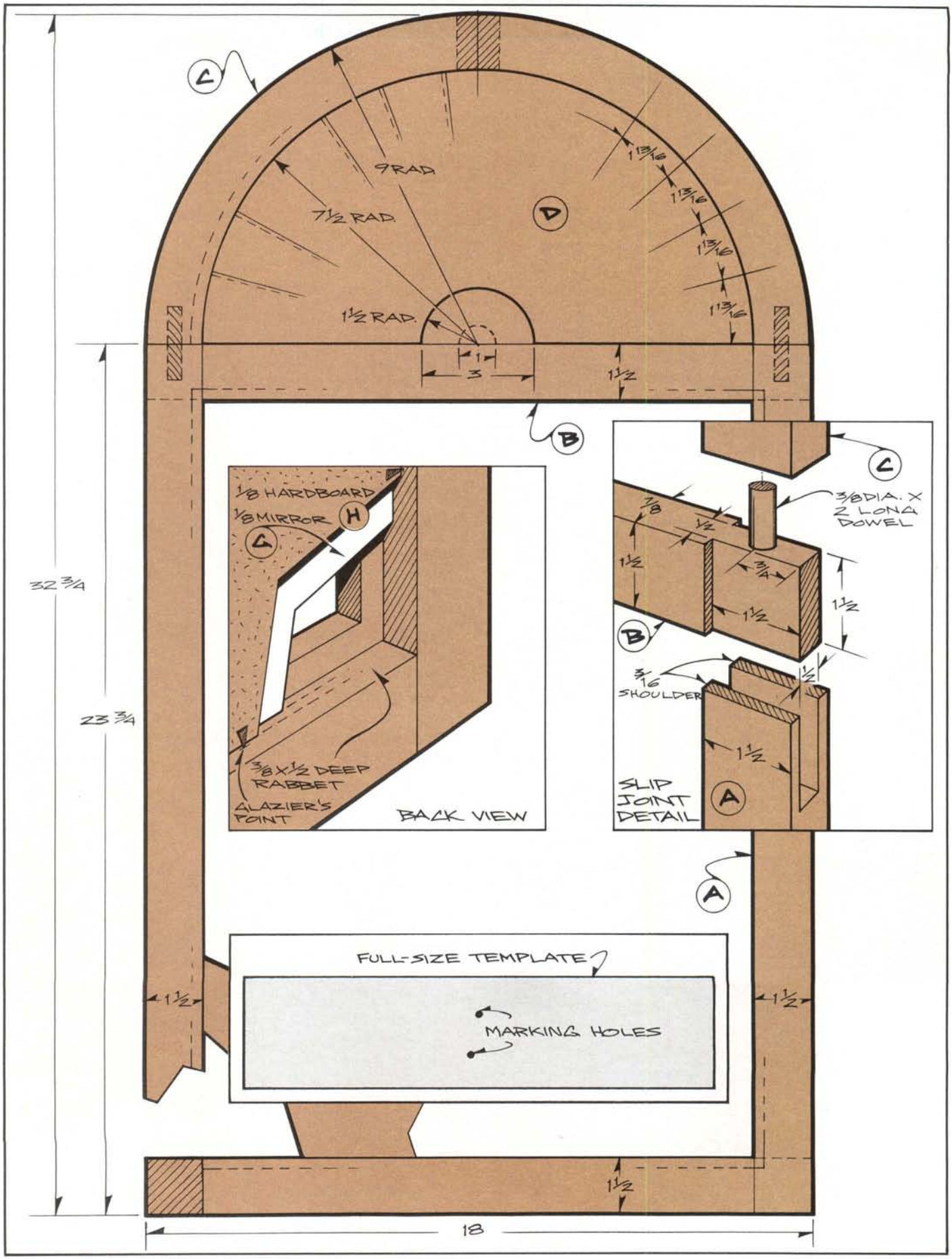











C
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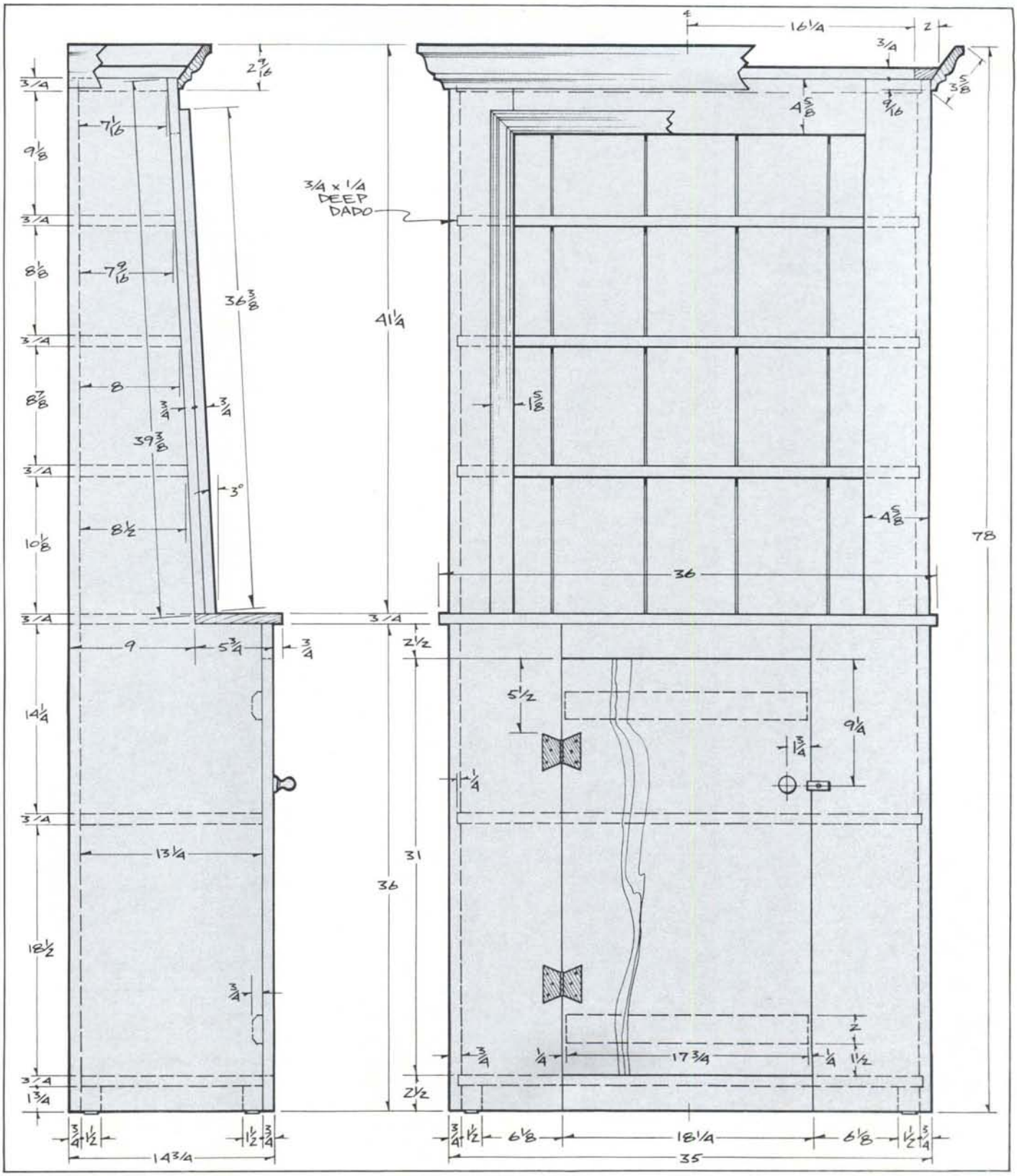
3
1½
B
32 3/4
23 3/4
1/8 HARDBOARD
1/8 MIRROR
H
G
3/8 X 1/2 DEEP RABBET
GLAZIER'S POINT
BACK VIEW
C
3/8 DIA. X 2 LONG DOWEL
1/8
1/2
1½
3/4
1½
1½
B
3/16 SHOULDER
1/2
1½
SLIP JOINT DETAIL
A
A
FULL-SIZE TEMPLATE
MARKING HOLES
1½
1½
1½
18

Slant-Back Cupboard

The cupboard in our photo is an antique—but the country craftsman who made it many years ago would not likely recognize it today. It was discovered in the cellar of an 18th-century New Haven, Connecticut house, and the piece was in much need of repair. That early cabinetmaker didn't use any moldings, and the sides were made square, not slant-back. When it was restored several years ago, the sides were reworked to make it a slant-back cupboard. The moldings were also added, including some that came from an antique house that was under restoration.

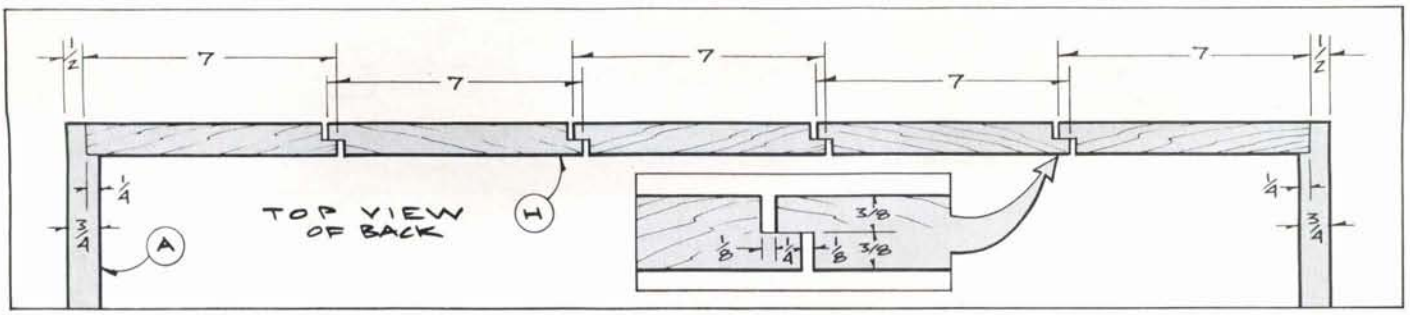
We think the cupboard captures the essence of a primitive slant-back cupboard without being pretentious. Best of all, though, you don't need to have a supply of old wood or moldings on hand to make the piece. As illustrated, the cupboard can be constructed entirely of 3/4 in. thick pine boards and stock molding available at your local lumberyard.

Planning your material purchases is an important prerequisite to building most projects. There are many combinations of common pine boards that you can use to get the specified widths of the wider cupboard parts, but you may find our suggestions helpful. For the sides (A), edge-glue a 1 by 10 and a 1 by 6 board. Since a 1 by 10 actually measures 9 1/4 in., and a 1 by 6 actually measures 5 1/2 in., together they will give you more than the needed 14 in. width. But before you edge-glue these two boards you'll want to cut the taper that establishes the slanted sides. Begin by jointing and ripping the 9 1/4 in. wide board to get the 9 in. width that's needed for the slant-



back upper section. The usual procedure here is to first joint one edge of the board to get a straight edge and then move to the table saw to rip away any excess from the opposite edge. With the jointed edge against the table saw rip fence, rip the opposite edge to establish the width, leaving about 1/16 in. extra. This 1/16 in. is then cleaned up with one or two passes over the jointer.

Next, lay out the 3-degree taper. The taper starts 36 in. up from the bottom end of the board. You can use a tapering jig and make the taper cut on the table saw, but working with a board this long can be awkward. You may need to rig a special jig just for this cut, given the length of the sides. It's much easier to use a band saw or handheld circular saw to rough cut the taper, and then clean down to the pencil line with a hand

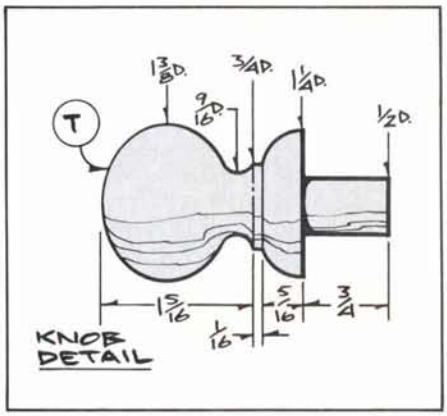


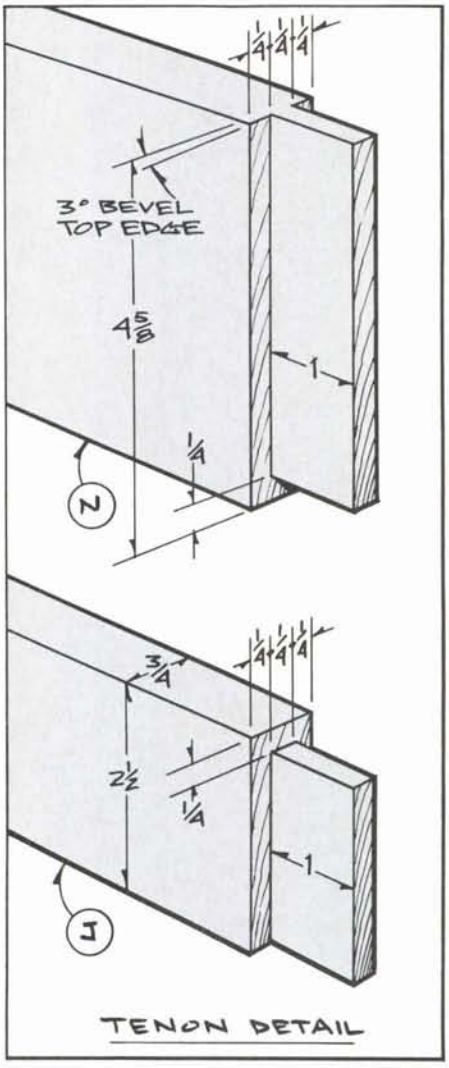
Bill of Materials
(all dimensions actual)

Part	Description	Size	No. Req'd.
A	Side	3/4 x 14 x 76	2
B	Bottom Shelf	3/4 x 13 1/4 x 34	2
C	Middle Shelf	3/4 x 14 3/4 x 36	1
D	Open Shelf (lower)	3/4 x 8 1/2 x 34	1
E	Open Shelf (middle)	3/4 x 8 x 34	1
F	Open Shelf (upper)	3/4 x 7 9/16 x 34	1
G	Top	3/4 x 7 1/16 x 34	1
H	Back	see Detail	as req'd
I	Bottom Stile	3/4 x 8 3/8 x 36	2
J	Bottom Rail	3/4 x 2 1/2 x 20 1/4*	2
K	Door	3/4 x 18 1/4 x 31	1
L	Cleat	3/4 x 2 x 17 3/4	2
M	Upper Stile	3/4 x 4 5/8 x 39 3/8	2
N	Upper Rail	3/4 x 4 5/8 x 27 3/4*	1
O	Molding Cleat	3/4 x 2 in. stock	6 ft.
P	Crown Molding	3 5/8 in.	6 ft.
Q	Trim Molding	see Detail	9 ft.
R	Foot	1 1/2 x 1 1/2 x 1 3/4	4
S	Leveler	as shown	4
T	Knob	as shown	1
U	Turnbutton	1/2 x 5/8 x 1 1/2	1
V	Butterfly Hinge	3 1/2 x 2 1/2**	2

* Length includes tenons.

** Forged iron butterfly hinges similar to the handmade hinge shown are available from Paxton Hardware, 7818 Bradshaw Rd., Upper Falls, MD 21156. Tel. (301) 592-8505. Order part no. 8705; cost is $7.25 per pair postpaid. Hinge size is smaller (2 3/8 in. by 1 7/8 in.) than hinge in photo. The hand-forged hinge shown, measuring 3 1/2 in. by 2 1/2 in., is available from Woodbury Blacksmith & Forge Co., P.O. Box 268, Woodbury CT 06789. Tel. (203) 263-5737. Order part no. 1112. Cost is $50 per pair plus $2 postage.





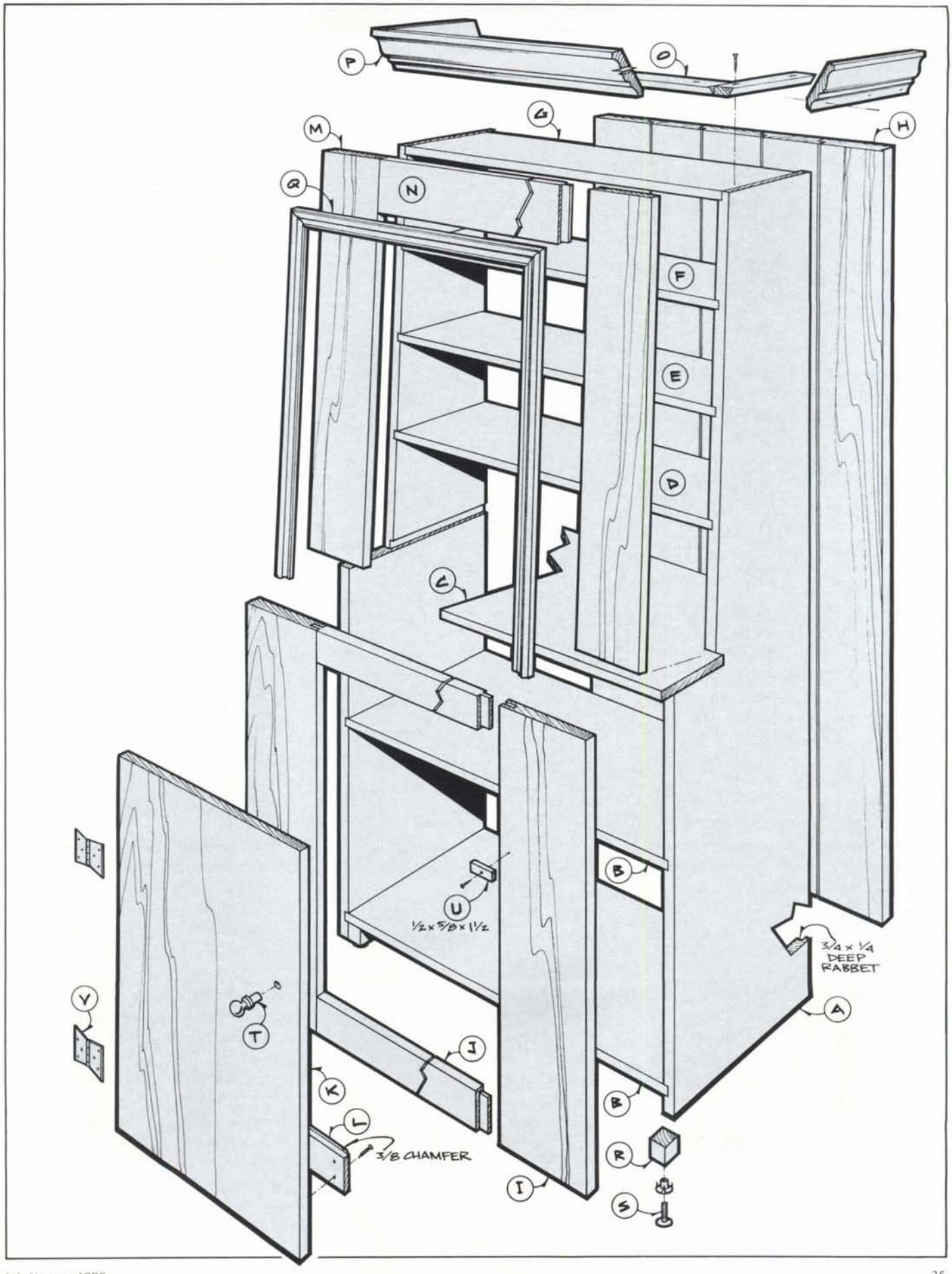
plane. Don't forget that you'll need two boards, since the cabinet has two sides.

Now reduce the 5 1/2 in. wide board to a 5 in. width, ripping and jointing as before. Then cut the 5 in. wide board to a 36 in. length, edge-glue it to the 9 in. wide board so the bottom edges are flush, and repeat the procedure for the opposite side. There are other ways to make the sides, but this way simplifies cutting the taper and results in almost no waste.

Your next job is cutting the 3/4 in. wide by 1/4 in. deep shelf dadoes. You could make these cuts with the dado head, but again it's awkward to work with pieces this large on the average table saw. A better choice is the router. Butt the two sides along their back edges, make sure they are flush at the bottom, then lay out the dadoes. Use a 3/4 in. diameter straight cutter in the router, and a straightedge as a guide, and make the dado cuts. For the 3/4 in. wide by 1/4 in. deep rabbets at the top end and along the back edge of both sides, switch to an edge-guide for the router. Use two passes, removing 1/8 in. of stock with each pass.

Next, cut the shelves (B, C, D, E and F) and the top (G). You'll need to edge-glue boards to get the width needed for the bottom and middle shelves. Two 1 by 8's will yield the bottom shelf and a 1 by 6 and 1 by 10 will yield the middle shelf. Note that the short leg of the notch in the middle shelf is cut at a 3-degree angle to match the slope of the slant-back sides. Don't worry about cutting the widths of the top and the three open shelves to the exact dimensions listed in our Bill of Materials. In practice, it's best to start with boards that are a little wider than needed. Rip one edge of the three open shelves and the top to establish the 3-degree bevel. You'll make a ripping cut along the back edges of these parts to establish the final width after dry-fitting them to the case.

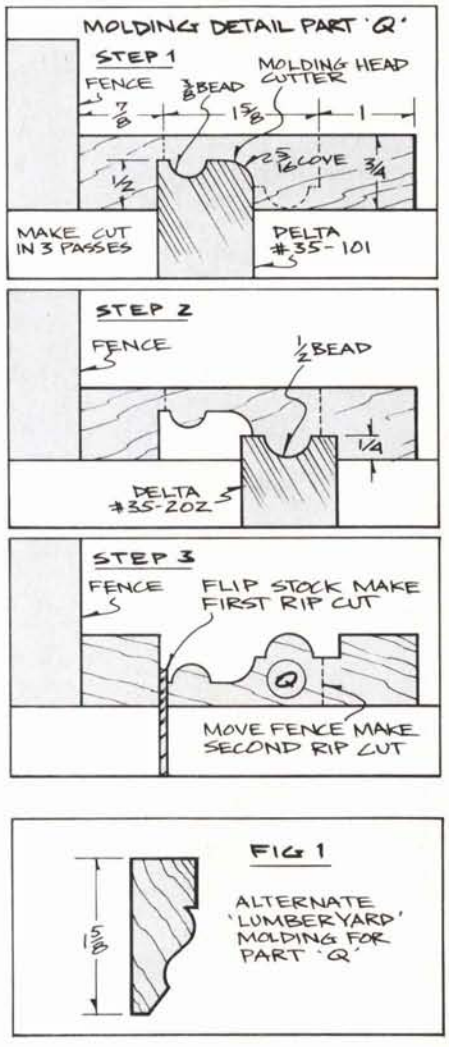
The cupboard should be laying on its back as you assemble it. Lay the 3/4 in. thick boards for the back (H) under the back edge of the shelves and top. That way the shelves and top will be properly located with respect to the rabbets for the back parts, which are added later. Test-fit the top and three upper shelves, then adjust if needed. Glue up the case parts, assemble and clamp securely. Use a framing square to check for squareness, adjust if needed and set aside to dry.


P
O
M
G
H
Q
N
F
E
D
C
U
1/2 x 5/8 x 1 1/2
B
3/4 x 1/4 DEEP RABBET
A
V
T
J
K
L
3/8 CHAMFER
B
R
S
I

While the case is drying, make the two face frame assemblies. The bottom face frame consists of two stiles (I) and two rails (J), while the upper face frame has two stiles (M) but only one rail (N). Refer to the Tenon Detail for the dimensions of the face frame mortise and tenon joints. When making the upper face frame, note that the Bill of Materials length dimension for the stiles is point-to-point. The best way to get the upper face frame right is to cut a 3-degree angle on the bottom end of both stiles, but leave the top end of the stiles and the top edge of the upper rail square. Then use a hand plane to flush the top of the upper face frame with the case after assembly. Leave a little extra on the width of both face frames. That way a few passes with the hand plane will flush the face frame edges with the case sides. The face frames are glued in place, but if you like the primitive look you can add old-fashioned cut nails here and through the sides into the shelves. Cut nails are available from the Tremont Nail Company, P.O. Box 111, Wareham, MA 02571.

Now is a good time to add the back. The back boards are cut from 1 by 8 stock, which results in almost no waste. Use a dado head with the table saw or a rabbeting bit in the router to shiplap all the edges except those on the two outside back boards. Note that when mounting the back you'll want to maintain a 1/8 in. space between the boards, as shown in the back detail. This allows for any wood movement that may occur. The two outside back boards can be glued into the rabbets in the sides, but use screws for the remaining back board assembly. Screws through the back boards into the top and the various shelves should provide plenty of holding power.

Also make the door (K). Note that a single board door will have a greater tendency to cup than a door that's glued up from several boards. If you can find some stock that has quartersawn grain, use it. Quartersawn grain will produce the most stable door. Add two cleats (L) as stiffeners against cup. Our Special Techniques article on page 22 shows an *interesting dovetailed* cleat system that would also be suitable here. Size the door for a tight fit; chances are the pine will shrink a bit. If the door sticks, a few strokes with the hand plane along the edge will solve the problem. Turn the knob (T) to the dimensions shown in the Knob Detail and add the turnbutton (U). Sources for either factory-made reproduction butterfly hinges or the hand-forged butterfly hinges (V) we used are listed in the Bill of Materials. Black iron H-hinges, available at most hardware stores, would be a good alternate choice.



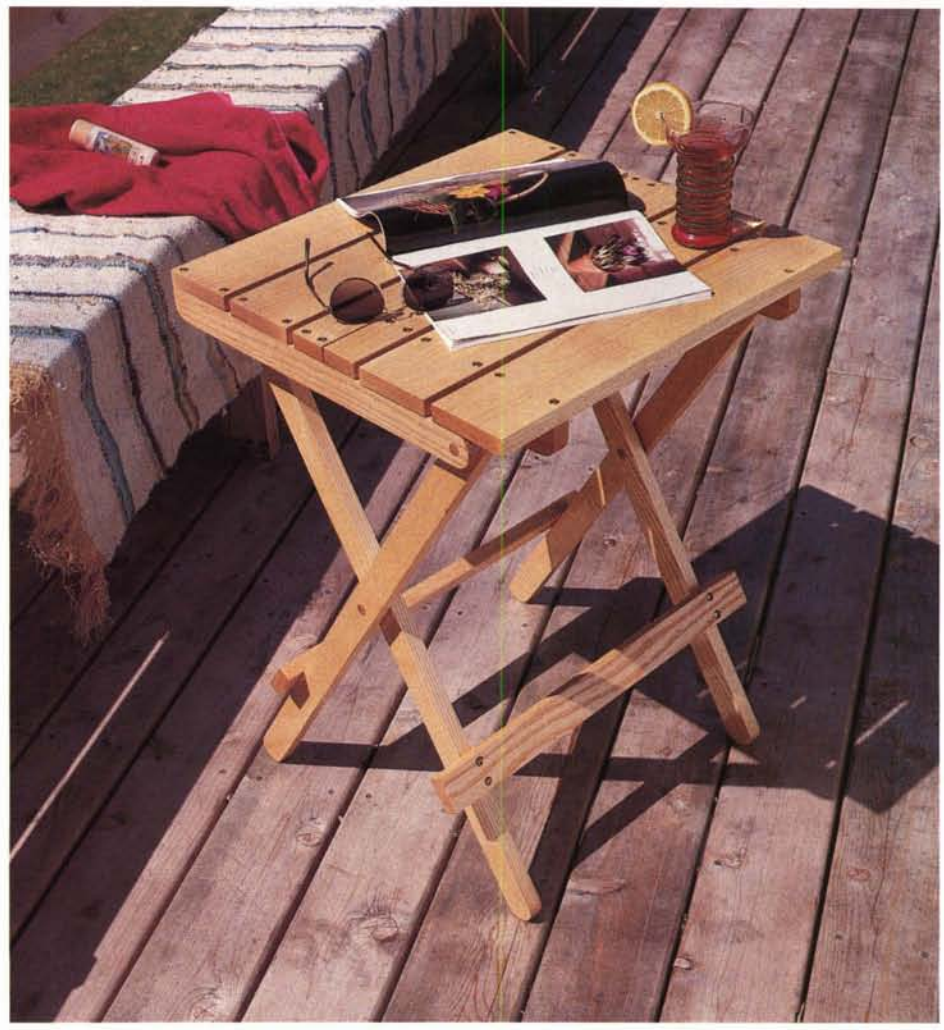
The crown molding (P) around the top of the cupboard is a lumberyard variety crown molding. Our molding measured 3 5/8 in. wide, which when mounted at a 45-degree angle translated into a 2 9/16 in. height. As shown in the exploded view, we used a molding cleat (O) to securely fasten the molding to the cupboard. You could simply glue the molding at the front and use finishing nails at the sides, but finishing nails don't provide much strength. Also, with most crown moldings, just gluing the front and nailing the sides leaves a large portion of the molding unsupported. The cleats provide needed support. To make the cleats, take a 3 ft. length of 1 by 4 pine, rip at a 45-degree angle down the middle to get your 6 ft. of cleat stock, then cut to length. The side cleats and molding pieces are glued together, but be careful not to glue the molding to the sides. The slotted holes in the side cleats allow wood movement in the cupboard sides as they adjust to changes in humidity.

The trim molding (Q) is made with a Delta molding head, as shown in the Molding Detail. You'll need two cutters: a combination 5/16 in. cove and 3/8 in. bead cutter, and a 1/2 in. bead cutter. Start with a wide piece of stock, make the molding head cuts as shown in Steps 1 and 2, then flip the stock over and rip away the excess as shown in Step 3 to produce the final 1 5/8 in. molding width. If you don't have a Delta molding head, or would rather buy a stock molding, your local lumberyard should carry a variety of moldings that would look good here. Ask to see their base and band moldings, and select a profile that you like. Fig. 1 shows a suitable 1 5/8 in. wide band molding that we found at a local yard.

Because the bottom of this cupboard has a flush edge all around, it presents a problem of unsteadiness on floors that aren't perfectly flat. We've solved the problem by adding a foot (R) and leveler (S) at each corner. The levelers should be available from your local hardware store.

For an antique look, try distressing the piece before applying a finish. To finish, wipe on a brown stain—such as Minwax no. 230 Early American—followed by some barn-red latex paint, then wipe off most of the paint while still wet. If you like the protection that polyurethane provides, but don't like the fussy application procedure or the plastic look that brushing polyurethanes produce, try one of the new wiping polyurethane gels. They give much of that famous polyurethane protection, while looking more like a penetrating finish than a surface coating. Before applying any finish to your cupboard, though, first try the technique on some scrap that's left over from the construction. You wouldn't want to be surprised at this stage of the game.

folding DECK TABLE

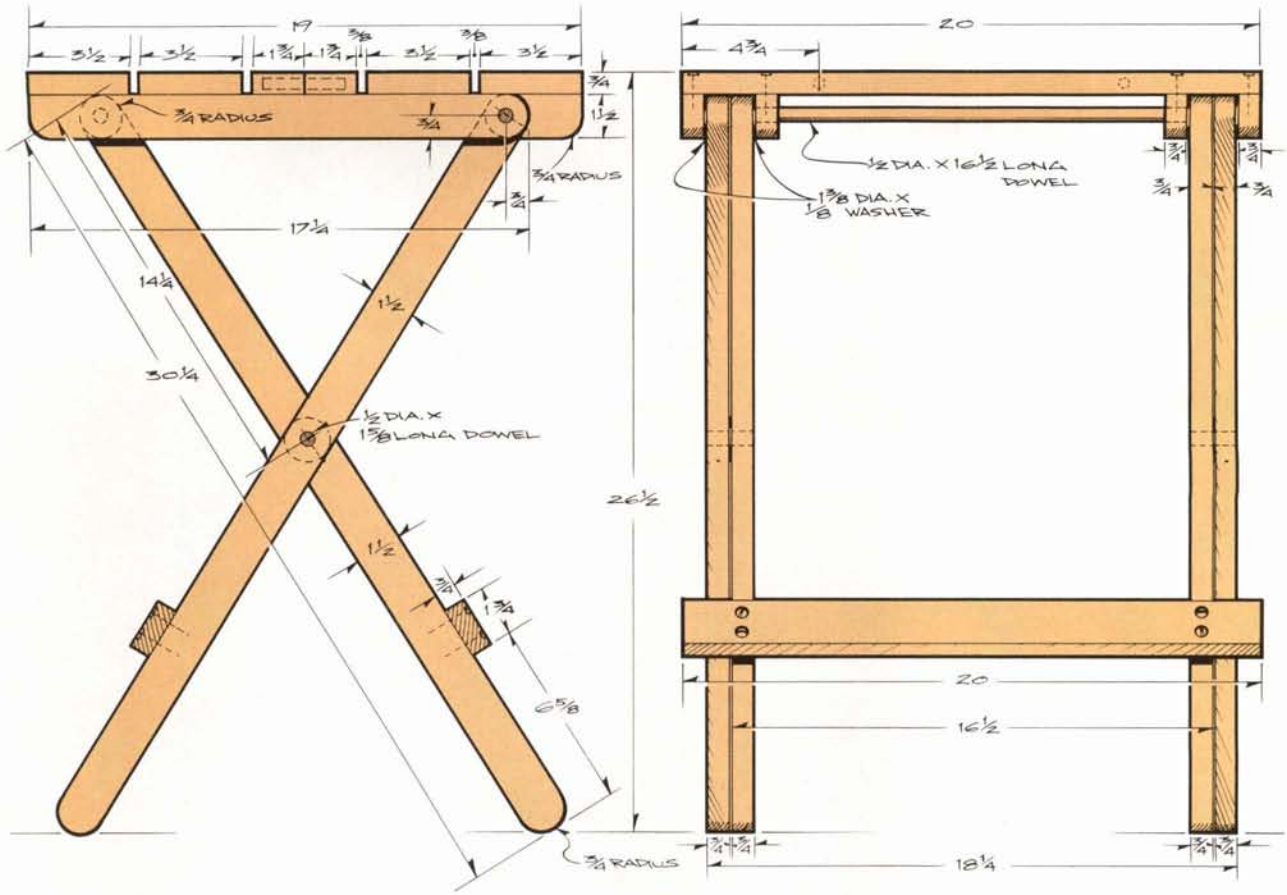


The design of this deck table is based on an idea that's been used for everything from stools to small tables. As a side table for your barbecue grill, an extra serving table in the dining room, or in some other capacity, this little fold-away table will find many uses.

But beyond its functional side this table is fun to build. The way the table collapses will probably have you setting it up and breaking it down just to see how cleverly everything nests together.

All the board stock for the table is 3/4 in. thick. Our table was constructed of ash, but almost any hardwood can be used. If you like knowing just how much material is needed before you start a project, check our cutting diagram. As shown, all the wood parts except the dowel stock can be cut from a 3/4 in. thick by 8 in. wide by 9 ft. long board. Make an initial rip cut as shown, then rip and crosscut to separate the parts. The 9 ft. length only includes an allowance of 1/8 in. for each of the four crosscuts, so you'll need to be accurate if you want to get all your parts from a board this long. Don't worry if you've lost a little length after sanding; it won't make any difference come assembly.

The top consists of four slats (A) and two half slats (B). The slats mount to the cleats (C), which are then attached to the legs (D). The four cleats are identical, as are the four legs, but when the table is assembled one set of legs and cleats is assembled so it fits inboard of the other set. This is the secret to the table folding flat.



The most important part of the table construction is the layout of the various dowel holes. Make sure that the 1/2 in. diameter dowel holes at the ends of the cleats are located 3/4 in. on center and 3/4 in. from the end. Use a drill press if you have one and set up a jig to speed the work and insure accuracy. Note the location of the dowel holes at the point the legs cross, 14 1/4 in. from the top end. After the dowel holes have been drilled, round both ends of the legs, the dowel end of the cleats, and the lower corner on the opposite end of the cleats. A disk sander comes in handy for this rounding, but rasps and files will also make short work of this task. Just scribe pencil lines to serve as your guide for the 3/4 in. radii.

The best way to get everything properly located during assembly is to start at the outside and work in. The dimensions on our front elevation allow 1/8 in. for each washer separating the sections, which works out just right if you buy the 1/8 in. thick washers we used. The 1 3/8 in. diameter washers are a little smaller than the stock width so they won't show at the edge.

Start by mounting two slats and one of the half slats to the two outer cleats.

Bill of Materials
(all dimensions actual)

Part	Description	Size	No. Req'd.
A	Slat	3/4 x 3 1/2 x 20	4
B	Half Slat	3/4 x 1 3/4 x 20	2
C	Cleat	3/4 x 1 1/2 x 17 1/4	4
D	Leg	3/4 x 1 1/2 x 30 1/4	4
E	Stretcher	3/4 x 1 3/4 x 20	2
F	Handle	1/2 dia. x 16 1/2 long	1

Position the slats so the ends are flush with the outside edges of the cleats. Use ovalhead 1 1/2 in. long brass screws and countersink so the screw heads are slightly recessed. Now add the two outermost legs, with a washer at each joint between the cleats and legs. Use glue and a 1 1/4 in. long brad to anchor the pivot dowel and cleat connection, but be careful not to get any glue on the leg end of the dowel. The leg must be free to pivot. Then add the two inside legs, again with a washer between the adjoining parts. As shown, glue and reinforce the outside half of the joint with a brad, but leave the inside section free to pivot.

Now mount the remaining slats and half slat to the two inside cleats and join that assembly to the rest of the table with the long dowel handle (F). Be sure to allow for the washers that will separate the cleats and legs when mounting the slats to the cleats. It's a good idea to just lay the parts in their correct orientation—as they would be with the table folded up—to check alignment. The washers provide much needed insurance against too tight a fit, but it's important to check everything to be sure. When you are certain the parts have proper clearance, screw the slats in place and then add the handle. Note that a brad and glue anchors the ends of the handle where it fits into the legs, but that the cleats must be allowed to pivot freely. Be careful not to make too tight a fit of the dowels through the parts that must pivot, or you'll find the joints binding in humid weather. One tip to insure smooth pivoting action and keep excess glue squeeze-out from affecting the joint is to wax the pivoting sections of the joints before assembly.

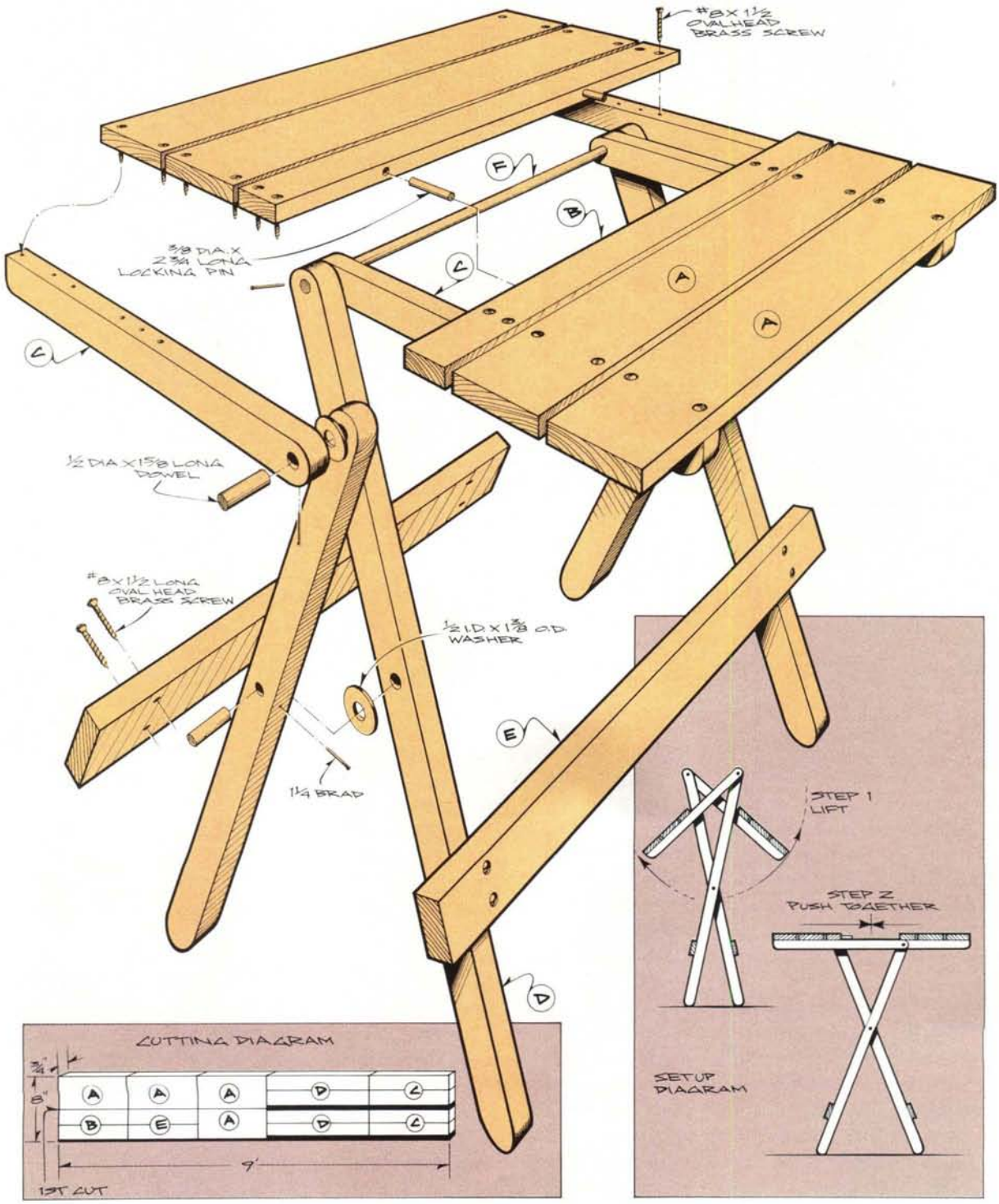
Mount the stretchers (E) with the table folded flat. That way you can be sure the leg position is accurate. Maintain the 1/8 in. washer space along the full length of

the legs in the nested position to prevent binding. Flip the table over to mount the other stretcher.

It's important that the locking pins be aligned. The easiest way to both drill the pin holes and get the alignment right is to open the table up, scribe index lines across the half cleats with a T-square, then unscrew the cleats and use a drill press to establish the holes. Chamfer the inside edge of the holes with a countersink and taper the exposed ends of the pins to help ease their entry during setup.

To set up the table from the folded position (see Setup Diagram), lift the slat and cleat sections, then slide the two sections together on a horizontal plane, scissoring open the legs. The locking pins anchor the table while in the open position.

We finished the table with three coats of spar varnish. Multiple light coats are always better than one or two heavy coats. Let each coat dry overnight.



two toy DRAGSTERS

These rubber-band powered dragsters make a relaxing weekend project. And they're toys that will be used and abused, not neglected on the shelf. Our thanks to Paul Meisel of Meisel Hardware Specialties for providing the dragster designs.

Start by preparing stock for the cars. For the engine cowling (A) and trunk (C) you'll need pine that's 1 1/2 in. thick. If you don't have stock that hefty, glue up two 3/4 in. thick pieces. Cut two pieces of 3/4 in. thick pine to 2 3/4 in. wide and 10 in. long, and face-glue them. That will be enough for the two cars.

Next, use the table saw to resaw some pine to 1/2 in. thick for the frame parts. The stock here only needs to be 2 in. wide, so nearly any table saw can do the resaw job. First cut a section of 3/4 in. pine to 2 1/8 in. wide and 3 ft. long. Then set the table saw for a 9/16 in. wide cut and resaw the workpiece. When resawing, you should make sure that the stock stays tight against the rip fence. Also, use a pushstick to keep your fingers away from the blade. Then remove the saw cuts with a hand plane or jointer, and achieve the 1/2 in. thickness and 2 in. width. You should have plenty of 1/2 in. thick stock for the two cars.

Also cut a strip of pine that's 1/4 in. thick by 1/4 in. wide by about 18 in. long. This strip is for the roof pillars (S and T) for the Deuce Coupe. You don't need nearly that much stock, but it's not safe to work with thin strips shorter than about 18 in. You'll also need to have three sizes of dowel (1/8 in., 1/4 in., and 3/8 in.), and the wheels and other parts.

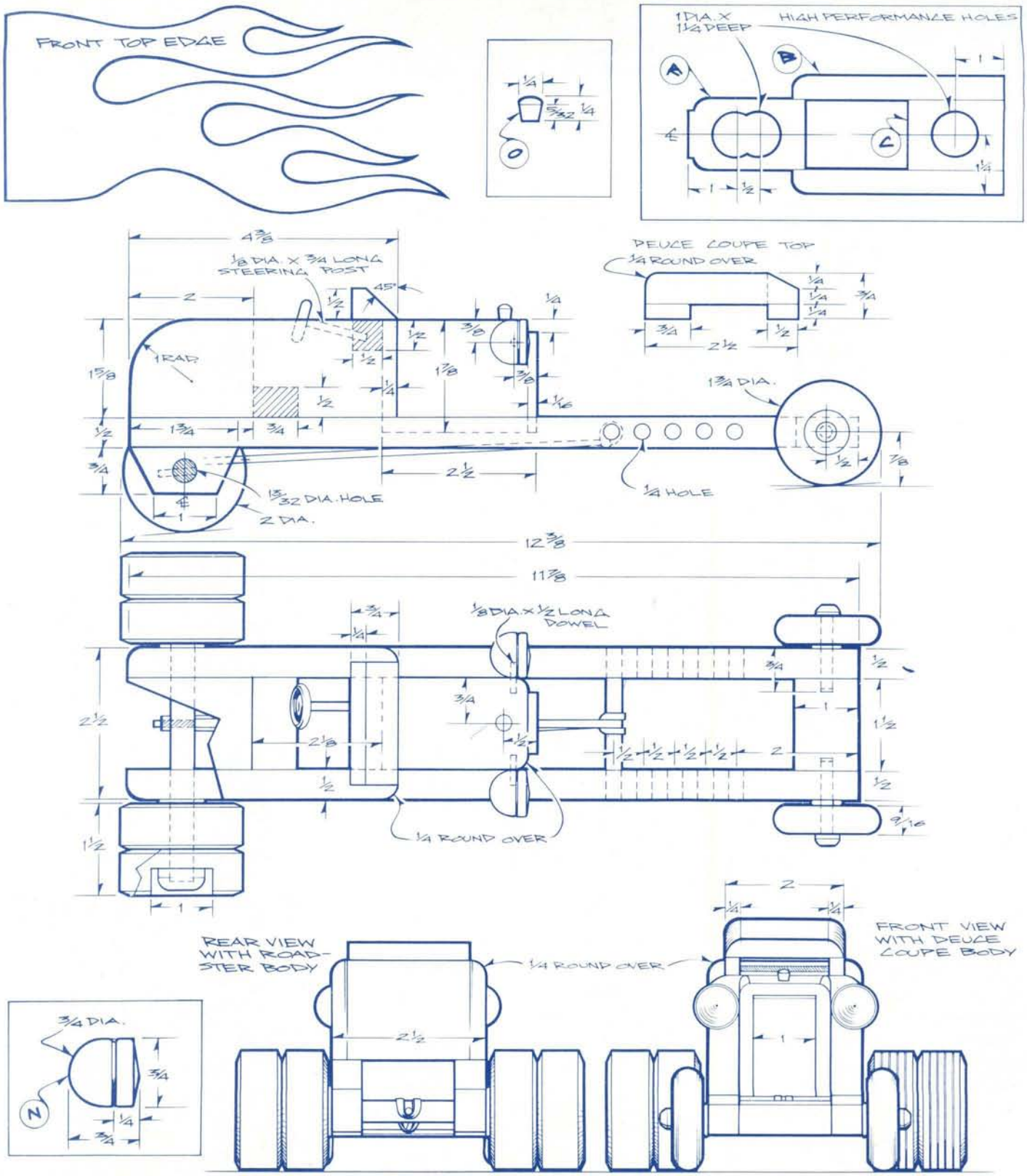
If you order the parts package listed in the Bill of Materials, all the miscellaneous parts will be on hand. That package includes the front axle pegs (G), wheels (J and K), rear wheel covers (M), headlights (N), radiator caps (O), rubber traction bands (P) for the wheels, motor drive bands (Q) and steering wheels (W). Also included with the parts package is enough dowel stock for the rear axles (H), rear axle pins (I) and rubber band dowels (L), as well as the steering wheel and headlight dowels.

With the stock ready, move on to cutting the parts to the sizes and length shown in the Bill of Materials. You'll cut all the common parts for the two cars at the same setting, but place the parts in two groups, one for each car.

Next, glue together the fenders (B) and trunks (C), using white or yellow glue. After the glue dries, use a band saw to shape the 1 in. radius on the rear of the sections. If you don't have a band saw, you can also do the shaping with a rasp and file.

Now, cut the angles on the rear axle supports (F) and on the front of the roof (R) and the windshield (U). These parts are small, so work with hand tools. A dovetail saw will work best for the axle supports; a block plane for the roof and windshield.

Then stack the four rails (D) together and bore the five 1/4 in. diameter holes for the rubber band dowels (L). Next,

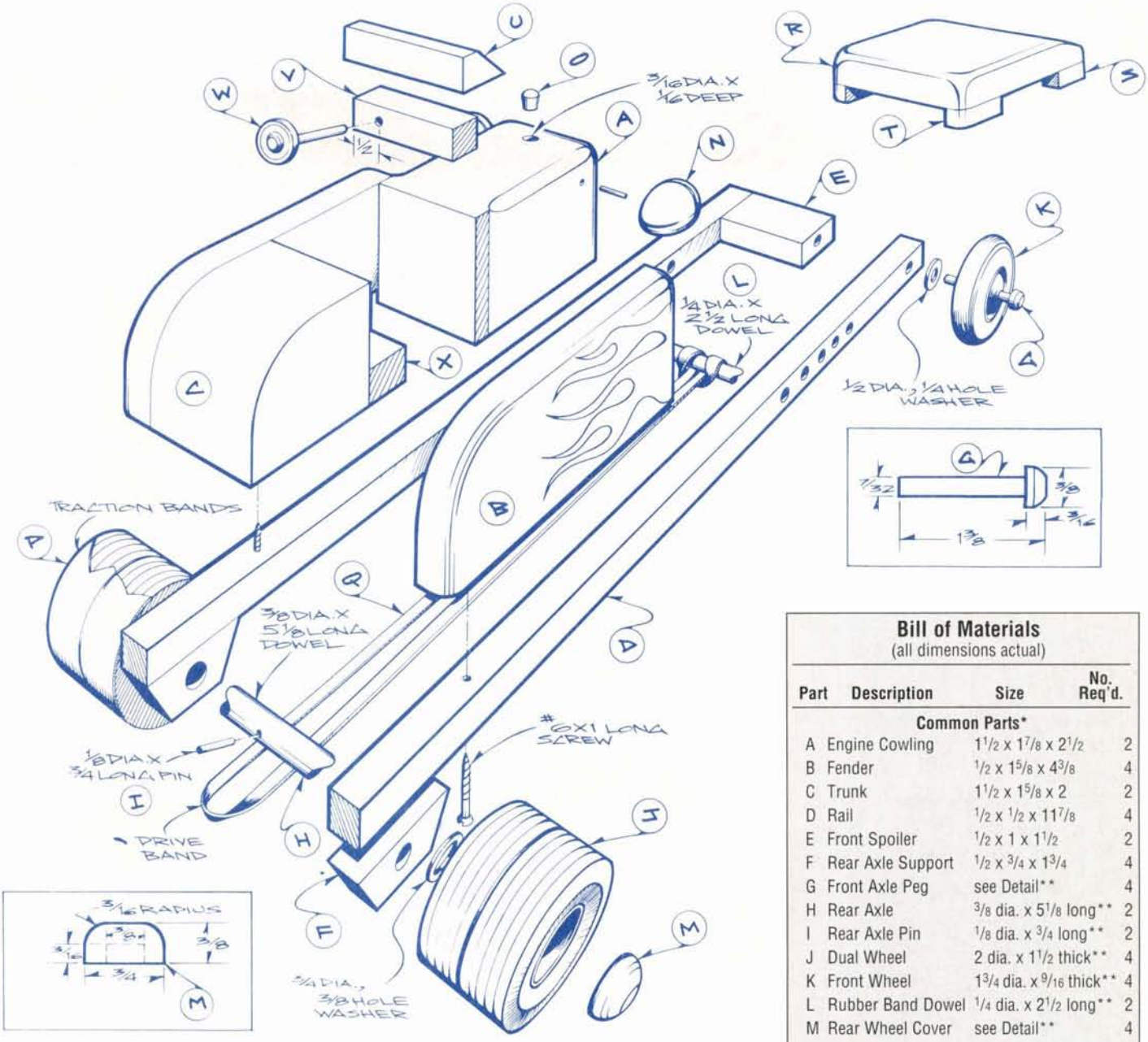


glue the rear axle supports to the rails and the rails to the front spoilers (E). For the glue-up, make a spacer block the same length as the front spoiler so the rails stay parallel and you have support for the drilling operation done next.

After the glue dries, drill the 13/32 in. diameter holes for the rear axles (H) and the 7/32 in. diameter by 3/4 in. deep holes for the front axle pegs (G). Use a drill press and a stopblock for this drilling operation so all the holes line up.

Next, use a router and 1/4 in. radius beading bit to establish the radiator profile on the front of the engine cowlings (A). Also use the beading bit to round over the edges at the top of the engine cowling and on the chassis and roof. These are small parts, so put them in a vise and keep your fingers clear. Note that the roundover on the top of the cowling stops 1/4 in. from the end, where it meets the chassis.

Now, glue the cowlings between the fenders. Also, drill the high performance holes in the underside of the body (see detail). The holes lighten the cars which



makes them go faster.

Next, glue the roof pillars and roof in place for the Deuce Coupe, as well as the windshield, dash (V) and seat (X) for the Roadster. Drill holes to mount the steering wheel, headlights, rear axle pins, and radiator caps, but dry-fit them only. They are painted separately from the car itself.

Give the cars and the parts a good sanding. We used spray enamels in a matte finish. First apply a coat of gray primer to the cars and parts. Carefully sand that with 220-grit paper and apply silver to the rail assemblies, rubber band dowel, wheel covers, axle pegs, headlights and radiator caps. Paint the car bodies yellow and red and paint the wheels black. You may need two or three coats of the colors; be sure to sand thoroughly between coats.

Use our full-size pattern to paint in the white and red flames. You can make a stencil from the full-size pattern and spray on the flames.

After all the paint dries, attach the wheels, rear axle pin (I), the steering wheel on the Roadster, and the silver parts. Don't forget to put the washers between the wheels and the rails. The washers are a hardware store item and aren't included with the parts package. Screw the bodies onto the rail assemblies. The rubber band dowel is adjustable in the five holes for different sizes of rubber bands. The motor drive band loops around that dowel and is wound around the rear axle. To power up, catch the drive band on the axle peg and wind the wheels in reverse. WWJ

Bill of Materials
(all dimensions actual)

Part	Description	Size	No. Req'd.
	Common Parts*		
A	Engine Cowling	1 1/2 x 1 7/8 x 2 1/2	2
B	Fender	1/2 x 1 5/8 x 4 3/8	4
C	Trunk	1 1/2 x 1 5/8 x 2	2
D	Rail	1/2 x 1/2 x 11 7/8	4
E	Front Spoiler	1/2 x 1 x 1 1/2	2
F	Rear Axle Support	1/2 x 3/4 x 1 3/4	4
G	Front Axle Peg	see Detail**	4
H	Rear Axle	3/8 dia. x 5 1/8 long**	2
I	Rear Axle Pin	1/8 dia. x 3/4 long**	2
J	Dual Wheel	2 dia. x 1 1/2 thick**	4
K	Front Wheel	1 3/4 dia. x 9/16 thick**	4
L	Rubber Band Dowel	1/4 dia. x 2 1/2 long**	2
M	Rear Wheel Cover	see Detail**	4
N	Headlight	see Detail**	4
O	Radiator Cap	see Detail**	2
P	Traction Band	as shown**	4
Q	Motor Drive Band	as shown**	2
	Duece Coupe Parts		
R	Roof	1/2 x 2 x 2 1/2	1
S	Roof Pillar (front)	1/4 x 1/4 x 1/2	2
T	Roof Pillar (rear)	1/4 x 1/4 x 3/4	2
	Roadster Parts		
U	Windshield	1/2 x 3/4 x 2	1
V	Dash	1/2 x 1/2 x 1 1/2	1
W	Steering Wheel	3/4 dia. x 3/16 thick**	1
X	Seat	1/2 x 3/4 x 1 1/2	1

* Bill of Materials includes enough parts for one of each car shown.

** Parts available from Meisel Hardware Specialties, P.O. Box 70, Mound, MN 55364. Order catalog number 7469, which costs $16.94 postpaid. The parts package includes enough parts for four cars. Full-size plans for more dragsters are also available from Meisel (send $1 for a catalog.)

Colonial Sign

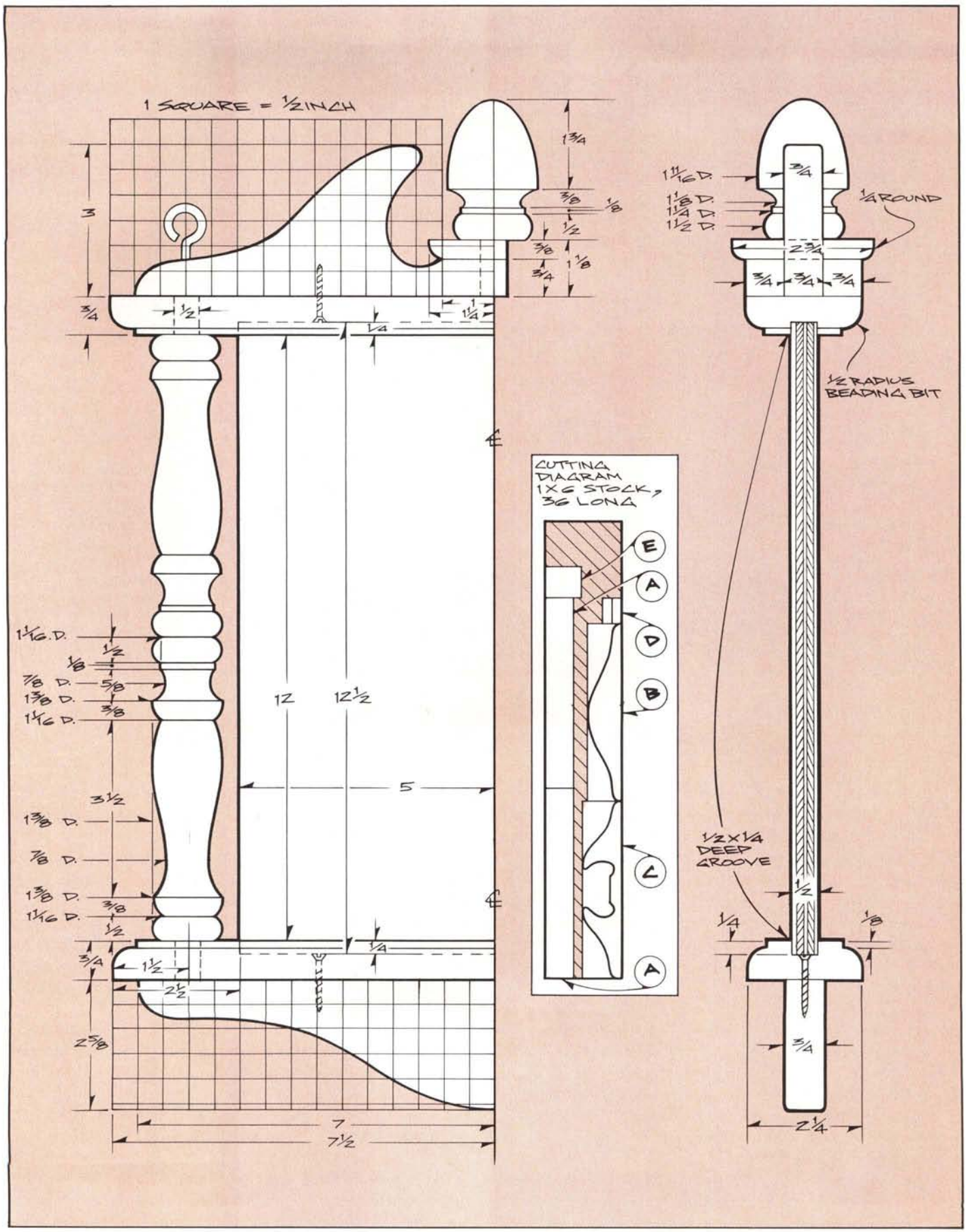
A handsome sign always seems to add a little charm to the family homestead. As shown, our sign is compact enough to mount just about anywhere. Hanging from a post by the driveway entrance or mounted on the porch near the front door, it will proudly proclaim who dwells within. With the 1 1/2 in. high letters (I) shown you should also have room for the house number. A source for the letters and numbers is listed in the Bill of Materials, but since many hardware stores now carry wood letter and number packages you may also find them locally.

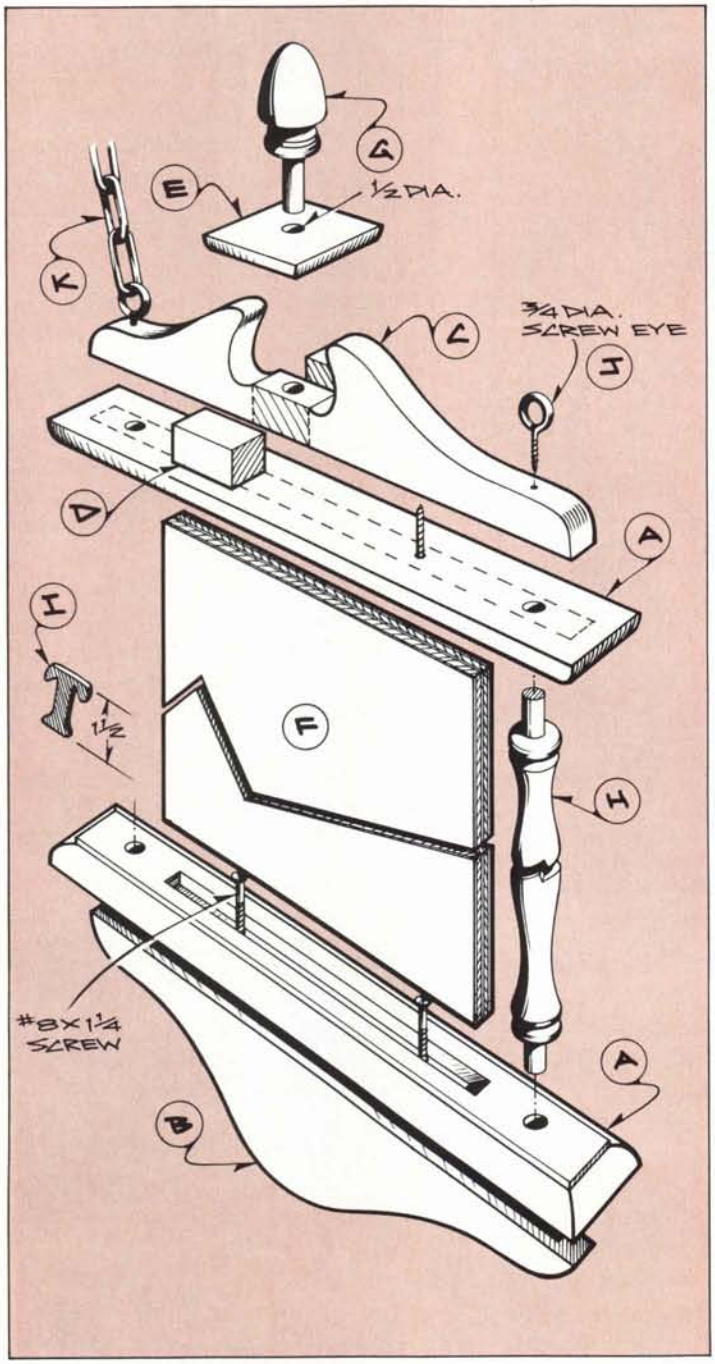
The sign doesn't require much stock. As shown in the cutting diagram, the top and base (A), bottom (B), crest (C), blocks (D) and cap (E) can all be cut from a 1 x 6 board that's about 3 ft. long. All these parts—except for the cap—are 3/4 in. thick. A hand plane will quickly reduce a small section of stock to the 3/8 in. thickness the cap requires. We used pine for our sign, but almost any wood that turns easily will do since it will be painted.

Cut the top and base to length and width, then cut the groove for the signboard (F), drill the column (H) holes, and establish the 1/2 in. radius stepped roundover all around. The router and a 1/2 in. diameter straight cutter are the best way to cut the groove, but you'll need to use a chisel to square the groove ends.

Transfer the profiles for the bottom and crest to the stock for these parts, using the grid patterns as a guide. Cut them out with a band saw or jigsaw, then sand smooth. Cut the blocks and cap to the sizes shown and use a 1/4 in. roundover bit in the router table to radius the edges of the cap. The signboard is a section of 1/2 in. thick plywood. We used exterior construction plywood, but if you have some marine-grade plywood, that's even a better choice.

You'll need turning blocks for the finial (G) and columns. Start with 1 1/2 in. square turning blocks for the column turnings, and a 1 3/4 in. square turning block for the finial. Note that the top and bottom halves of the column turning are symmetrical. We used a combination of gouges, a roundnose, and a skew chisel for the turning work. Don't forget to include the tenon lengths plus a little extra when you cut your turning stock to length. Final sand the column turnings while still mounted in the lathe. For the finial, you'll need to trim the extra stock and then smooth the top end after removal from the lathe.


1 SQUARE = ½ INCH
CUTTING DIAGRAM 1X6 STOCK, 36 LONG
E
A
D
B
C
A
½ ROUND
½ RADIUS BEADING BIT
½ x ¼ DEEP GROOVE



We used a waterproof epoxy for the sign assembly. Your local hardware store should have a good selection of epoxies to choose from. First glue the crest and bottom to the top and base. This is a good long grain glue joint, but to reinforce the joint we added screws inserted through countersunk holes drilled in the groove bottoms (see exploded view). Then glue the two blocks on either side of the crest as shown. Add the cap, and drill for the 1/2 in. diameter tenon on the finial end. Finally, add the signboard and columns, sandwiched between the top and bottom assemblies.

We painted our sign with a primer coat and then a top coat of white exterior enamel. Make sure all surfaces are well-sanded, especially the exposed edges of the plywood. If the plywood edges have voids, use auto-body filler or an exterior-rated caulk to fill them. You can add a bead of white silicone caulk to fill gaps at the plywood-in-groove joint after painting, or use a paintable caulk before applying the finish.

Bill of Materials
(all dimensions actual)

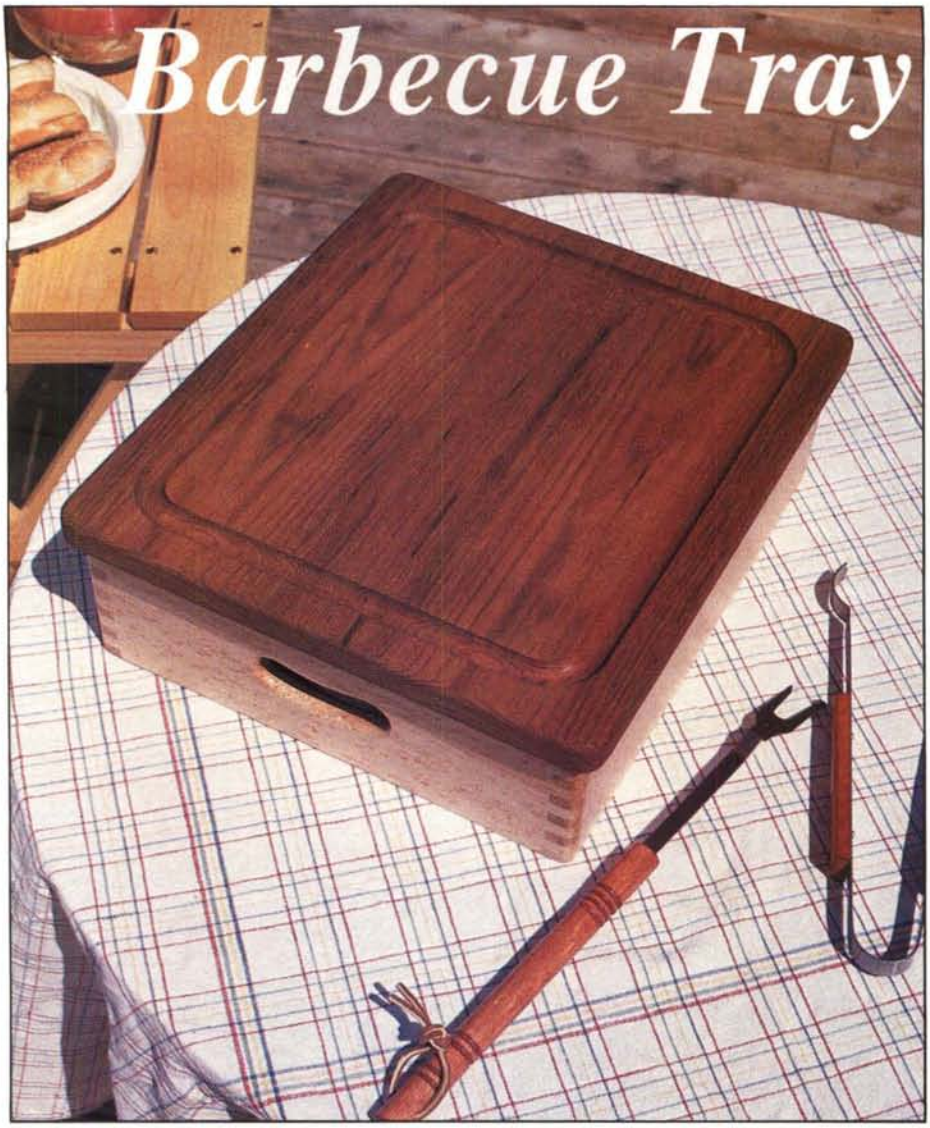
Part	Description	Size	No. Req'd.
A	Top/Base	3/4 x 2 1/4 x 15	2
B	Bottom	3/4 x 2 5/8 x 14	1
C	Crest	3/4 x 3 x 14	1
D	Block	3/4 x 3/4 x 2	2
E	Cap	3/8 x 2 3/4 x 2 1/2	1
F	Signboard	1/2 x 10 x 12 1/2	1
G	Finial	as shown	1
H	Column	as shown	2
I	Letter/Number*	1 1/2 high	as req'd
J	Screw Eye	3/4 dia.	as req'd
K	Chain	as shown	as req'd

* Letters and numbers are available from Meisel Hardware Specialties, P.O. Box 70, Mound, MN 55364; Tel. 1-800-441-9870. Individual letter and number packs (four in a pack) are $.49 each. An apostrophe pack (four in the pack) is also available for $.49. A complete alphabet set (four of each letter, A-Z) is $12; order part no. 601-AZ. A complete number set (four of each number, 0-9) is $4.75; order part no. 601-09. Include $2.50 per order for shipping and handling.

The letters and numbers are painted separately before mounting. With a short name you can just run the letters across the sign board, but with a longer name you may need to use a diagonal placement. Mount the letters and numbers with brads and add some paint over the brad heads to protect them from rust.

The best way to mount the sign is with screw eyes (J) and chain (K). The chain shown in the photo is an electrical fixture swag chain, but galvanized chain is a better choice if the sign will be exposed to weather. Your local hardware store should carry galvanized chain, which is typically sold by the foot. Try to keep the chain as short as possible to avoid damage should the sign whip about in a windstorm. The best protection against windstorm damage is a mount that also anchors the sign with a screw eye and chain at the bottom, but you'll need a double rail support for this.

Barbecue Tray



This Barbecue Tray doubles as a handy tote box to transport food and utensils to and from the backyard or deck. It certainly cuts down on the number of trips required to get the cookout under way.

If you cook outdoors and eat inside, the platter and box are attractive enough to adorn the dinner table. The box is bird's-eye maple and the top is teak. We used teak for the top because it's very resistant to warping, a common problem for platters that must endure hot juices and frequent dips in the sink.

Start construction with the box. Cut the sides (B) and ends (C) to the sizes in the Bill of Materials. Then use a dado head and the table saw to cut the box joints. For accurate fingers, you'll need to make a simple jig with a pin to index the cuts. (For more information on cutting box joints, see the May/June 1989 Woodworking Basics.)

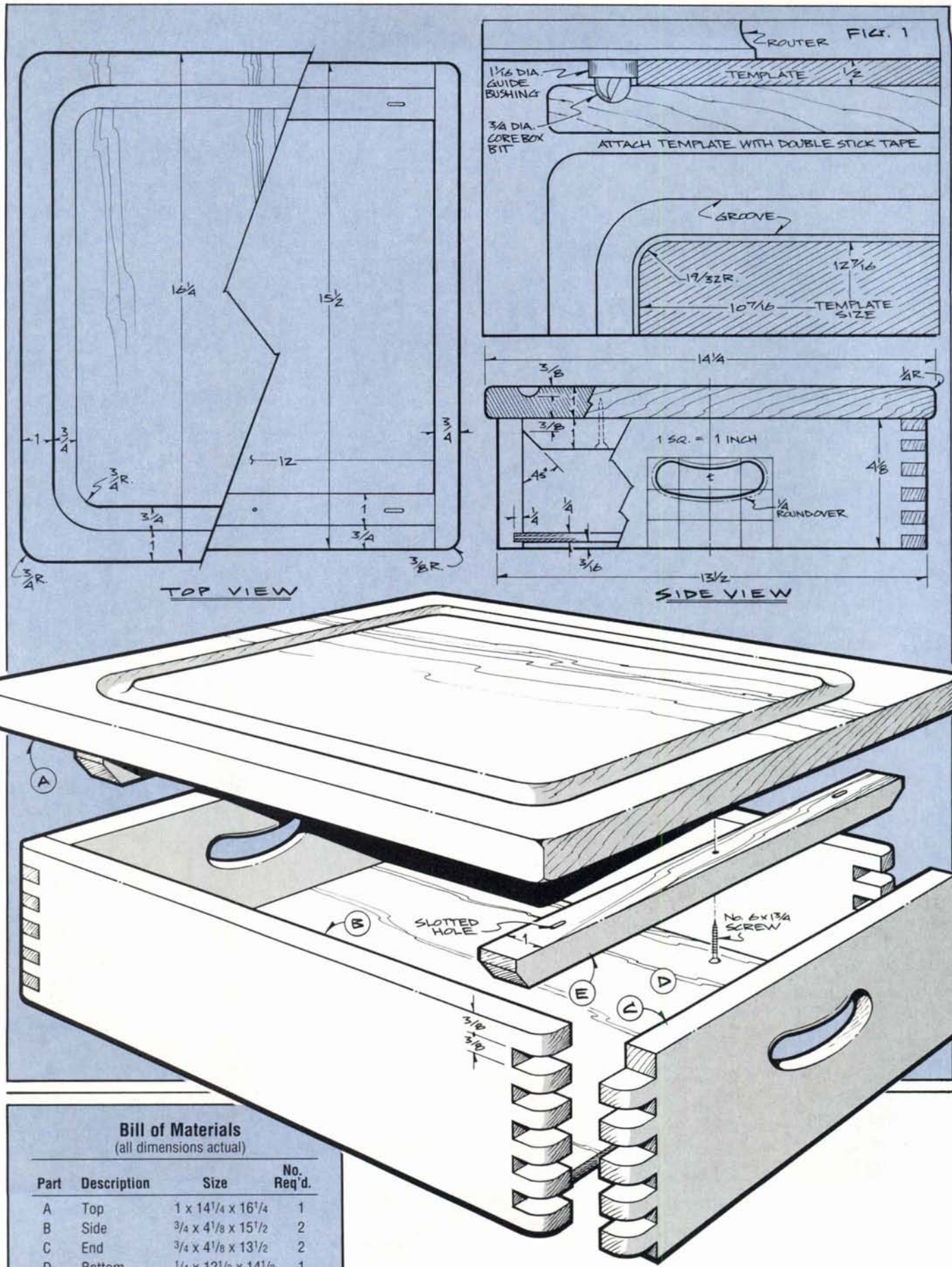
After making the box joints, establish the handle cutouts and cut the 1/4 in. by 1/4 in. groove for the bottom (D). Then cut the bottom to size from 1/4 in. thick plywood and glue up the box.

For the teak top (A), you'll need to glue up two or three boards to achieve the 14 1/4 in. width. The top will be subjected to hot juices and immersion in water so you should use a waterproof glue. We recommend T-88 epoxy, which is specially formulated for teak. It's available from Berea Hardwoods Co., 125 Jacqueline Drive, Berea, OH 44017; tel. (216) 243-4452. An alternative is resorcinol glue, which can be found in good hardware stores. Both are two-part glues. Teak can be tricky to glue, so make sure you joint the edges just before glue-up. That removes the oils, which tend to collect on the surface and prevent a good bond.

After gluing up the top, trim it to size and use a 3/4 in. diameter core box bit to rout the 3/8 in. deep groove. Use a template made from 1/2 in. plywood, and a guide bushing (Fig. 1). We show a Sears Craftsman 1 1/16 in. diameter guide bushing, but you can substitute another size and adjust the dimensions of the template. There's nothing too critical about the precise radius or location of the groove.

Next, use a scroll saw to cut the radius on the corners of the top. Then round over the top edges and handle cutouts with a 1/4 in. radius roundover bit. Also round over the box corners with a 3/8 in. radius roundover bit. Then apply the cleats (E) with slotted screw holes as shown. The slots allow for wood movement.

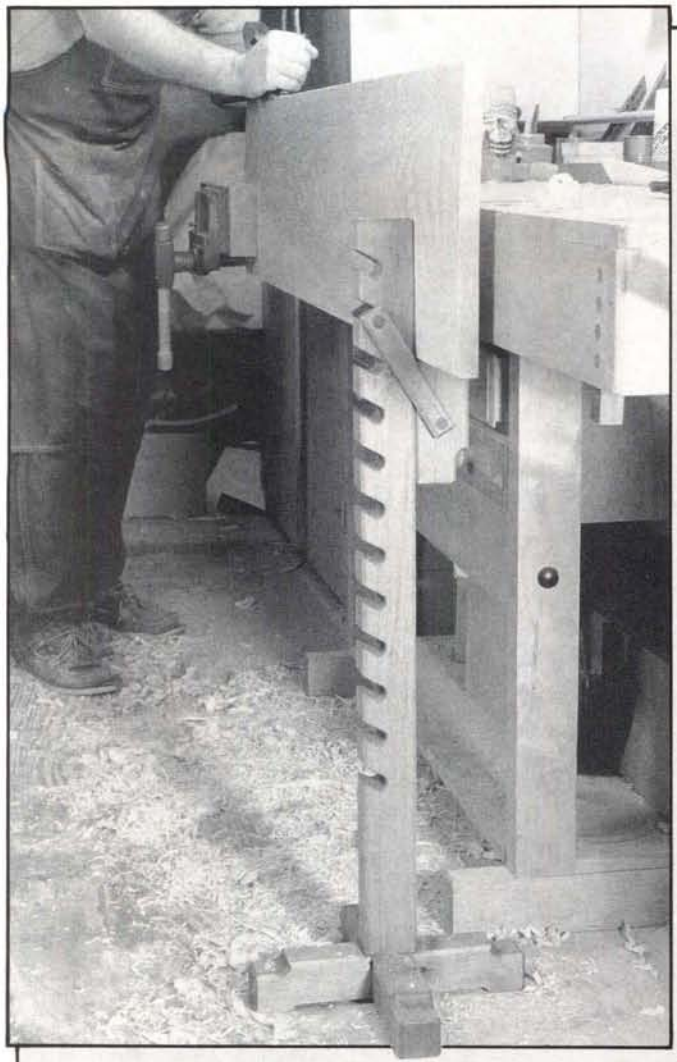
Give the top and box a thorough sanding, and break all sharp edges with sandpaper. Because the Barbecue Tray will be in contact with food, you should use a nontoxic finish, such as Behlen's Salad Bowl Finish. Behlen's is available from Garrett Wade, 161 Ave. of the Americas, New York, NY 10013; tel. 1-800-221-2942.



Bill of Materials
(all dimensions actual)

Part	Description	Size	No. Req'd.
A	Top	1 x 14¼ x 16¼	1
B	Side	¾ x 4⅛ x 15½	2
C	End	¾ x 4⅛ x 13½	2
D	Bottom	¼ x 12½ x 14½	1
E	Cleat	1 x 1 x 12	2

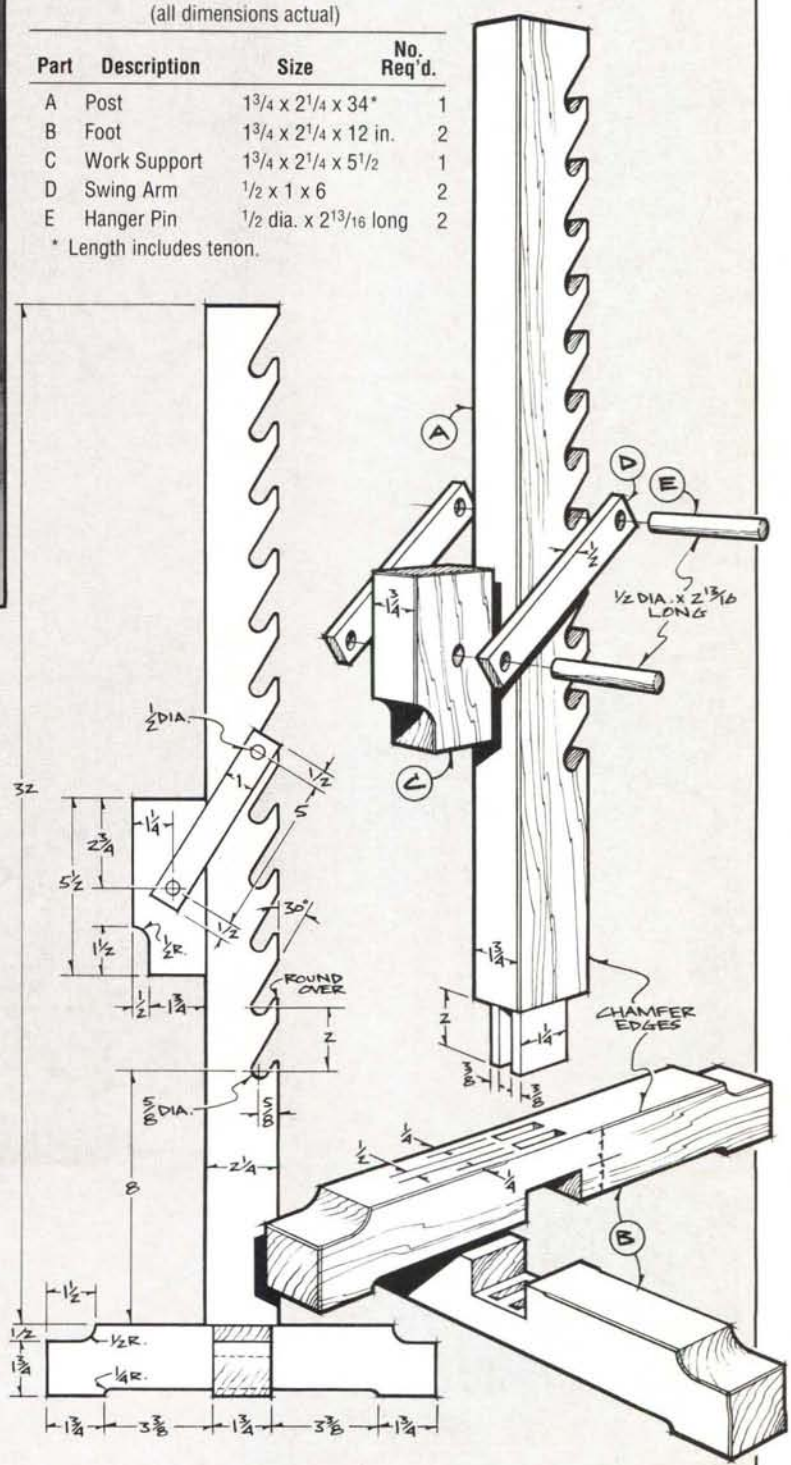
Workbench Helper



Bill of Materials
(all dimensions actual)

Part	Description	Size	No. Req'd.
A	Post	1 3/4 x 2 1/4 x 34*	1
B	Foot	1 3/4 x 2 1/4 x 12 in.	2
C	Work Support	1 3/4 x 2 1/4 x 5 1/2	1
D	Swing Arm	1/2 x 1 x 6	2
E	Hanger Pin	1/2 dia. x 2 13/16 long	2

* Length includes tenon.



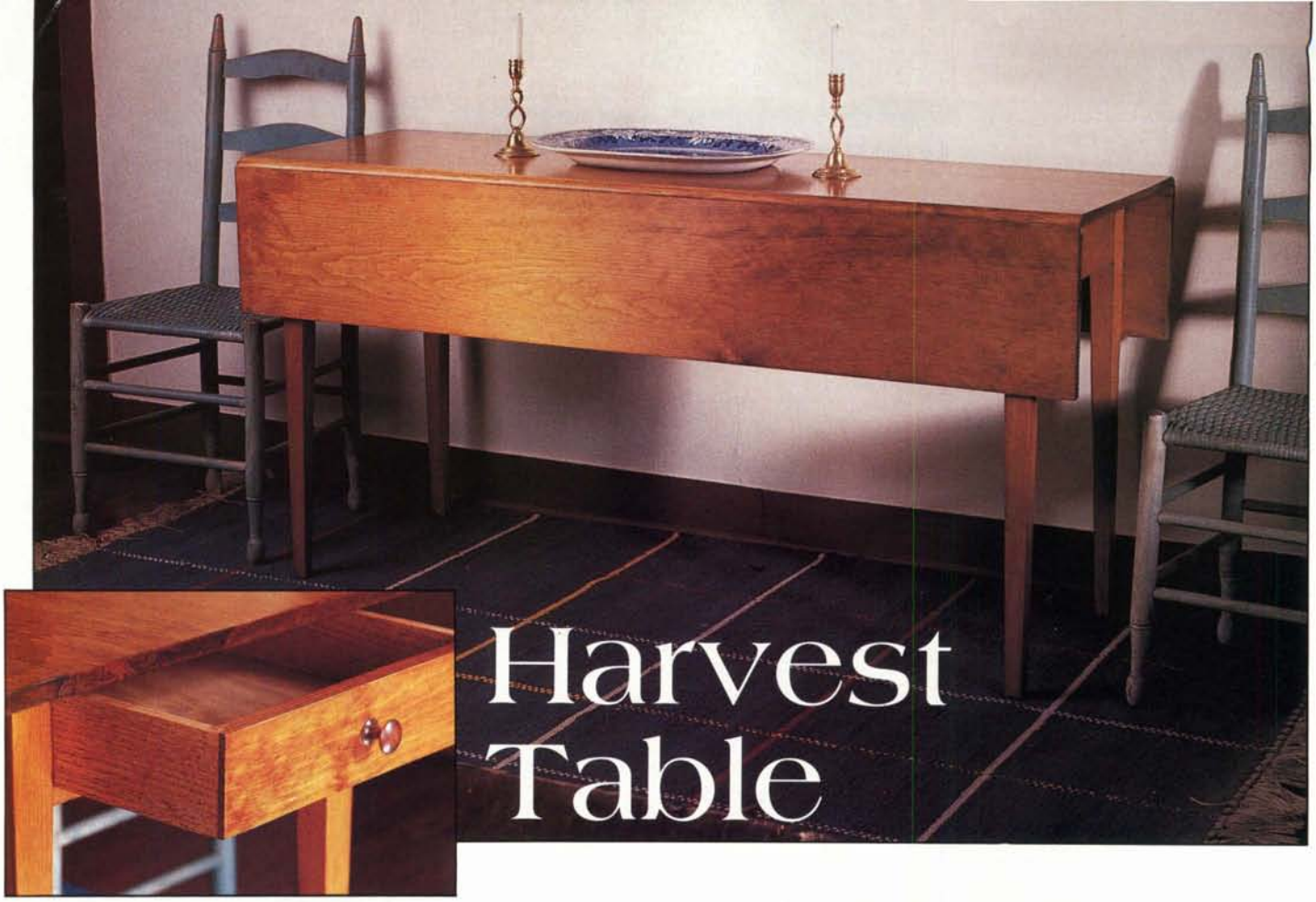
Generations of craftsmen have used these handy helpers to hold the other end of the board. They're especially useful for hand planing or jointing boards too long for a vise to support. Once you make this shop project, you'll wonder how you got along without it.

The inspiration for this helper has a cracked and blackened surface that bears witness to untold years of service. There's no telling how many craftsmen the ancient device has outlived.

We used rock maple salvaged from a pallet for our helper. The maple wears like iron. But the helper dimensions are hefty enough to allow use of a softwood for all but the swing arms (D) and hanger pins (E).

A double mortise and tenon is used to set the post (A) into the half-lapped feet (B). A tenon jig will be needed to support the post while cutting the 2 in. tenon length. You can also use a single tenon. The work support (C) moves freely on the swing arm and hanger pin, so bore a 9/16 in. diameter hole for the 1/2 in. diameter support pin. Make the angled slots in the post 5/8 in. wide so the pins move easily. To make the slots, use the drill press to bore 5/8 in. diameter holes located as shown, then make the 30-degree angled cutouts with the band saw.

A finish isn't necessary for the Workbench Helper, although we chose to seal the wood with a coat of Minwax Early American stain. The stain keeps it looking new a bit longer.



Harvest Table

The Harvest Table invokes the simple charm that makes Early American furniture so appealing. And its precision joinery makes it a woodworking project worthy of the finest craftsman.

One unusual detail we've incorporated is the dovetail wedges under the leaves. The wedges stiffen the leaves and prevent warping. For details on making the dovetail wedges, see Special Techniques on page 22. The table uses simple turnouts to support the two leaves. You lift the leaf, reach under, and pivot the turnouts into the open position.

We made the table mostly from pine. The only hardwood parts are the wedges (N), drawer runner (K), drawer guide (L), drawer stop (M), drawer side (P) and drawer back (Q). The drawer bottom (R) is 1/4 in. thick oak plywood. The knob (S) is maple. But the drawer front (O) is pine.

Start by cutting and planing the legs (C) to the size shown in the Bill of Materials. The legs taper from 1 3/4 in. to 1 in., but the taper is on the two inside faces only. The taper starts 5 1/4 in. from the top.

After cutting the tapers, use a block plane to gradually chamfer the inside corners of the legs. Start it at the same location as the taper, and make it widen to about 3/8 in. at the bottom of the leg, as shown in the exploded view.

Next, cut the mortises and tenons for the side aprons (D) and rear apron (E) as shown in the detail. We used a double tenon to make the joints as strong as possible. Lay out and cut the mortises first, then cut the tenons to fit. Note that the rear apron is set in 1/8 in. from the face of the leg, but the side aprons are set in 3/8 in. (see Top View Leg Detail). The extra clearance allows room for the wedges when the leaves are closed.

Also cut the mortises for the bottom stretcher (F) (see detail) and the double tenons. The top stretcher (G) is dovetailed in place. Use a dovetail saw to establish the dovetail on the ends of the stretcher, then scribe the profile onto the top of the leg. Use a square to carry the layout down onto the leg side. Cut out the dovetail housing with the dovetail saw and chisel.

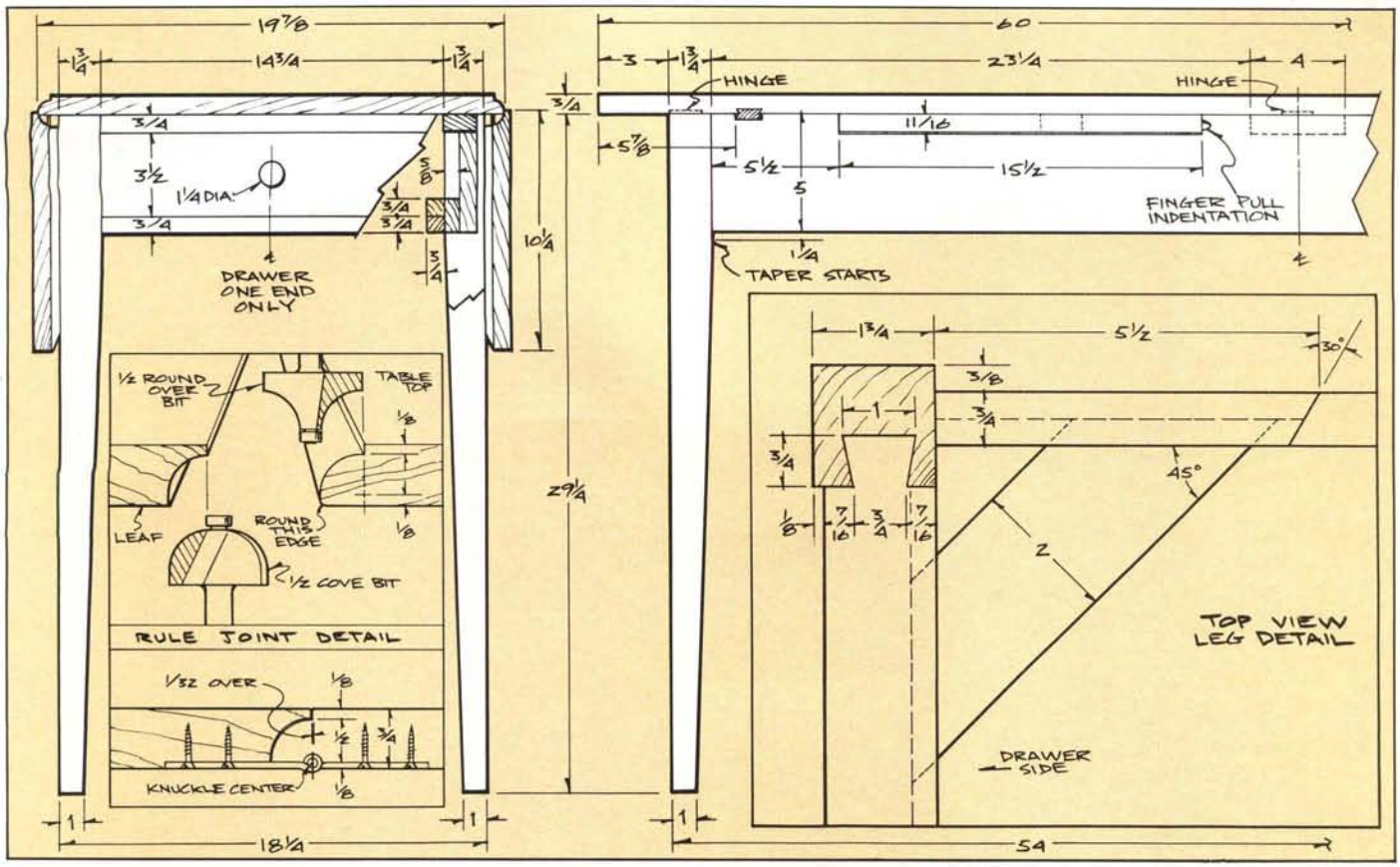
Next, cut out the notches and grooves for the turnouts (H), corner blocks (I) and the cleat (J). The turnout notch can be started with the band saw and finished with a hand saw. The ends of the notches are angled 30 degrees.

The 1/4 in. wide by 3/8 in. deep grooves for the cleat and the corner blocks are 1/4 in. from the top edge of the aprons and top stretcher. You can cut them with a router and 1/4 in. diameter straight bit or a dado head.

Cut the corner blocks and cleat to fit and form the tongues on the ends. Also establish the slotted holes as shown, which will serve to mount the top (A). The slots allow for seasonal wood movement. The turnouts will need to be planed down to 11/16 in. thick to allow for the washer that serves as a pivot point. Cut the angle on the turnouts, screw them in place, and test them to make sure they fit correctly. Use a round file to establish the finger-pull indentations in the aprons.

Now assemble the table frame. First glue the front two legs onto the stretchers and the rear two legs onto the rear apron. When the glue dries, glue those two assemblies onto the side aprons, with the cleat in between. Put the corner blocks in during the glue-up; that helps keep everything square.

After the table frame is complete, glue



up stock for the top and leaves (B). Make sure the stock is exactly 3/4 in. thick. The rule joint requires precision. The glue-ups should be slightly oversized to allow for squaring and cleaning up the edges. Take extra care when gluing up the stock so that you don't have to plane down the top to get it flat. You may want to insert splines or dowels to help keep the boards flush as you glue them together. Or you can clamp several sturdy cleats across the top during glue-up. Just make sure that the cleats are waxed so they don't become a permanent part of the table.

Once the glue dries, remove the clamps and cut the top and leaves to size, leaving them 1/16 in. wider than the width in the Bill of Materials so you can pass them over a jointer, taking 1/32 in. off each edge. If you do have to plane the top a bit, stay away from the edges that will form the rule joint.

For the rule joint, cut a roundover on the top and a cove on the leaf (see Rule Joint Detail). The joint is fussy, so it's a good idea to make a practice joint before risking your workpieces. Before you begin, you'll need a 1/2 in. radius roundover bit and a 1/2 in. radius cove cutter, both with ball-bearing guides. Also before you start, joint all four edges you'll be working with, making sure they're square and true.

Cut the roundovers on the top first. Set the cutter to leave the 1/8 in. step as shown, and cut a test piece to make sure the setting is right on. When you're satisfied the setting is correct, cut the roundovers on the top.

Next, cut the coves, setting the bit so it leaves the 1/8 in. thick edge as shown. Again test your setup on scrap and then cut the workpieces. The test piece for the coves should match the roundover test piece cut earlier. They should be perfectly flush. If they are, cut the coves in the leaves.

Next, you need to adjust for the fact that the radius of the top roundover should be slightly less than the radius of the leaf cove. Glue some 120-grit sandpaper to the cove test piece and remove about 1/32 in. from the roundovers. But be careful to sand the roundovers only, not the 1/8 in. flat area. Also with sandpaper, slightly round the edges at the underside of the roundovers.

Next, locate the wedges on the leaves and make them as described in Special Techniques on page 22.

While you're working on the leaves, mortise for and mount the hinges (T) so you can make any final adjustments needed. Mortise for the hinges and cut a notch to make room for the knuckle as shown in the Rule Joint Detail. Note that

Bill of Materials
(all dimensions actual)

Part	Description	Size	No. Req'd.
A	Top	3/4 x 19 7/8 x 60	1
B	Leaf	3/4 x 10 1/4 x 60	2
C	Leg	1 3/4 x 1 3/4 x 29 1/4	4
D	Side Apron	3/4 x 5 x 52*	2
E	Rear Apron	3/4 x 5 x 16 1/4*	1
F	Bottom Stretcher	3/4 x 1 5/8 x 16 1/4*	1
G	Top Stetcher	3/4 x 1 5/8 x 16 1/4**	1
H	Turnout	11/16 x 1 1/2 x 16 3/8	4
I	Corner Block	3/4 x 2 x 7 1/2*	4
J	Cleat	3/4 x 4 x 16 3/4*	1
K	Drawer Runner	3/4 x 3/4 x 18	2
L	Drawer Guide	5/8 x 1 1/2 x 18	2
M	Drawer Stop	3/4 x 3/4 x 1 5/8	2
N	Wedge	5/8 x 1 1/2 x 9/8	4
O	Drawer Front	3/4 x 3 1/2 x 14 3/4	1
P	Drawer Side	1/2 x 3 1/2 x 17 3/4	2
Q	Drawer Back	1/2 x 2 7/8 x 14 1/4	1
R	Drawer Bottom	1/4 x 14 1/4 x 17 1/2	1
S	Knob	1 1/4 dia.***	1
T	Table hinge	1 1/2 x 2 7/8***	6
U	Turnout Stop	11/16 x 2 x 4	4

* Length includes tenon or tongue.
** Length includes dovetail.
*** Available from Woodcraft, 210 Wood County Industrial Park, P.O. Box 1686, Parkersburg, WV 26102-1686; 1-800-225-1153. For the hinge, order part number 16R42, which sells for $9.20 a pair postpaid. For the knob, order part number 50L51, which sells for $10 for 10 postpaid.

the knuckle center is shifted slightly (1/32 in.) toward the leaf from the theoretical center. Also note that the special table hinges used here are made so that the swing arc works out just right when the hinges are mortised in. The center of the knuckle barrel is inset precisely 1/8 in. from the bottom surface.

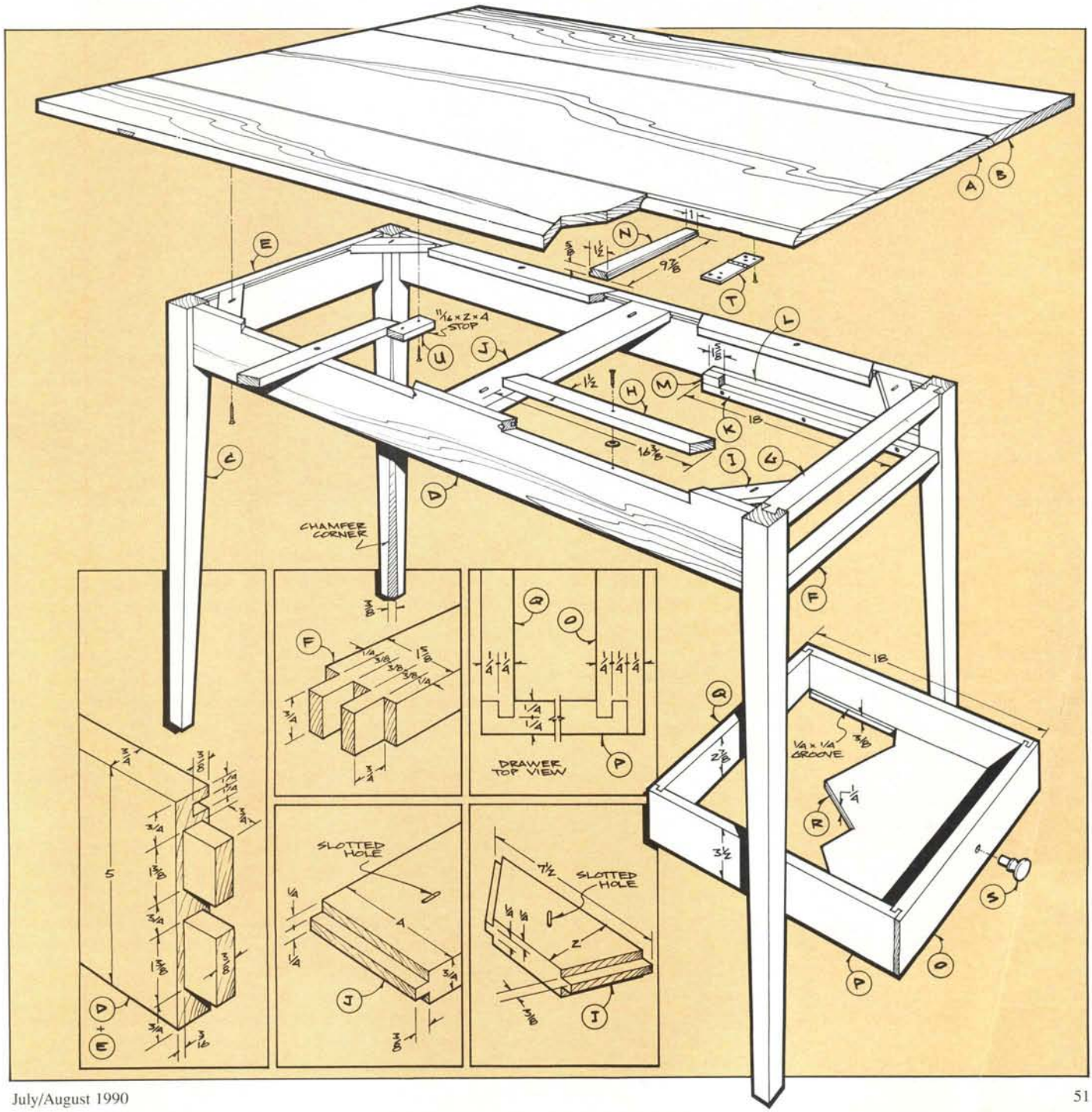
The drawer is made slightly smaller than the actual opening, so the dimensions will vary slightly from those given in the Bill of Materials. The drawer fits flush, so size the front (O) about 1/16 in. less in width and length than the opening. The drawer parts are made on the table saw with a dado head. Set the dado for a 1/4 in. wide cut and establish the 1/2 in. deep groove in the ends of the front and the 1/4 in. deep dado at each end of the sides (P) (see Drawer Top View).

Note that you'll need a tenon jig to support the drawer front when cutting it on end. Also form the 1/4 in. wide by 1/4 in. deep rabbet at the ends of the back (Q), as well as the 1/4 in. wide by 1/4 in. deep groove in the sides and front. Then cut back the inside tongue of the drawer front to 1/4 in. Cut the drawer bottom (R) to fit and assemble the drawer. The drawer knob (S) fits into the 1/2 in. diameter hole drilled in the drawer front.

With the drawer complete, use screws to install the drawer runners (K), drawer guides (L) and drawer stops (M). Adjust the drawer stops so that the drawer front is just flush with the stretchers. Also add the turnout stops (U).

Next, remove the table hinges and turnouts mounted earlier for fitting, and sand all the parts.

For a finish, we used Minwax Puritan Pine stain followed by Minwax Provincial. We then applied two coats of shellac and two coats of varnish. Make sure you varnish the underside of the top and leaves to help prevent warping. Rub out the varnish with 000 steel wool between coats.



Oak Plate Rack

Our Mission-style oak rack is the perfect place to display those prized plates and cups or collectibles. A 10 ft. length of 3/4 in. thick by 6 1/4 in. wide stock will provide all the wood parts. A source for the hand-forged cup hooks (F) we used is listed in the Bill of Materials.

Start by laying out and cutting the sides (A) and shelves (B, C) to length and width. Then cut the mortises and tenons. Use a drill to remove most of the mortise waste, and square the mortises with a chisel. The tenons on the top end of the sides and on the bottom shelf are all 3 in. wide, so you can use the same table saw setup for the shoulder cuts. Raise your blade to a 1 1/8 in. height and use the miter gauge to make one shoulder cut, then flip the stock and cut the opposite shoulder. Use a stopblock to insure accuracy.

Use a sharp handsaw to make the ripping cuts that complete the tenon. An easy way to get a square cut is to clamp a length of scrap on the tenon side of the cut as a guide. Make your cut just off the line, then clean up the cut with a chisel. The 3/16 in. radius plate grooves in the two shelves are cut with a 3/8 in. diameter core box bit using the router and an edge guide.

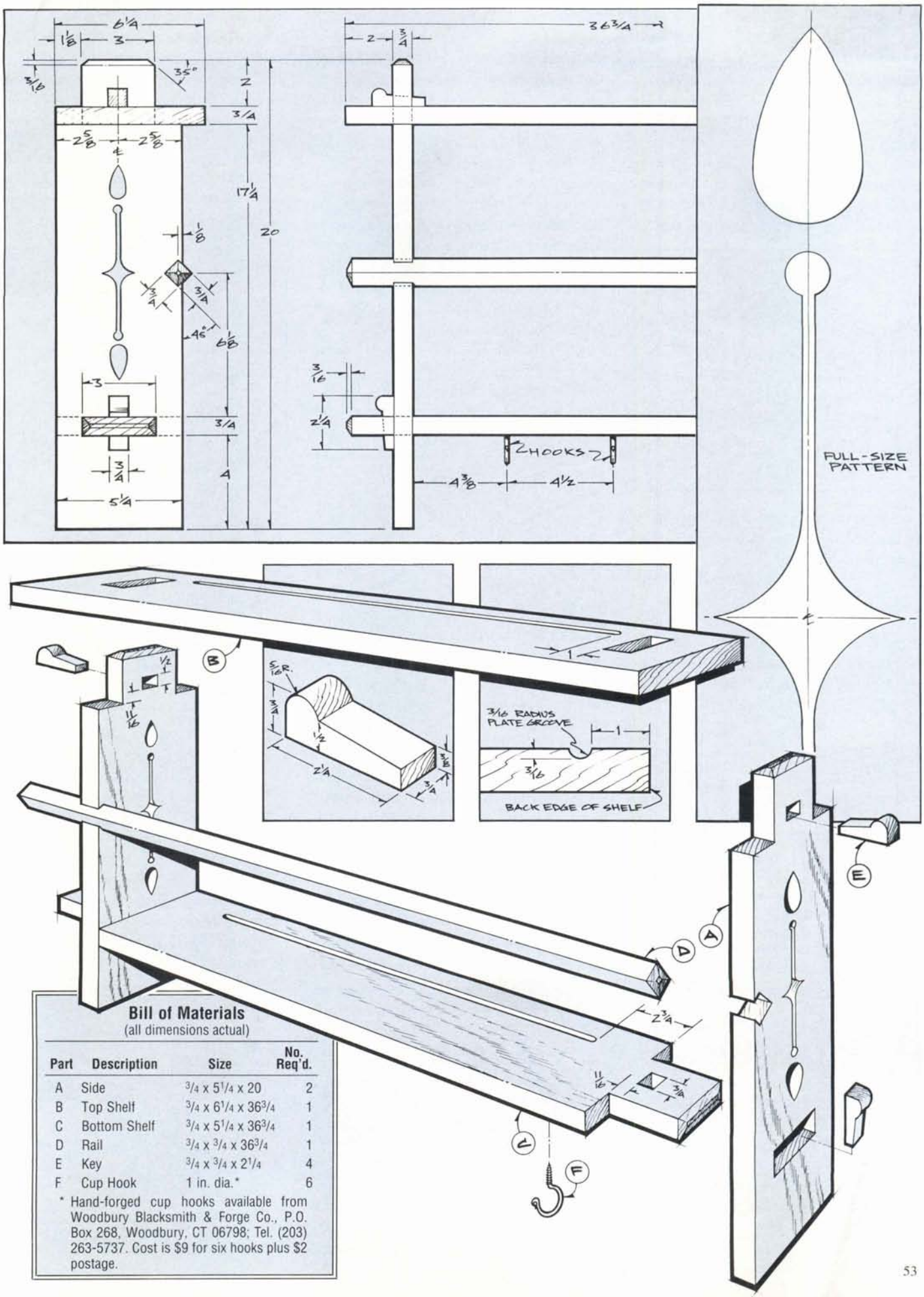
Use the full-size pattern to lay out the decorative cutouts in the sides. A 3/8 in. diameter drill bit will produce the circles at the ends of the center cutouts, and a 7/8 in. diameter bit will cut the round end of the teardrops, but the rest of the cuts will require either a scroll or coping saw. Use files to clean up any roughness.

The remaining details are mostly handwork. A dovetail saw and a chisel will cut the notches in the sides for the rail (D), which slides in and out to allow access for the plates on the bottom shelf. The keys (E) are cut to size and then shaped with rasps and files. Cut the 1/2 in. by 3/4 in. key mortises so they are 11/16 in. from the tenon shoulders. Since the side and shelf stock is 3/4 in. thick, the 1/16 in. offset that results will allow the keys to apply pressure as they're inserted.

Chamfer the ends of the tenons and rail and final sand all parts. Then apply an oak stain and lacquer topcoat and, when dry, assemble the shelf.

The hand-forged cup hooks add an authentic look, and we like their large diameter, which easily accepts the big handles found on coffee mugs. However, to save a little money, you can always substitute a hardware store variety cup hook.

The shelf is sized to mount on studs that are 16 in. on-center. Keyhole hangers mortised into the back edge of the sides are the best way to mount the shelf securely.



Bill of Materials

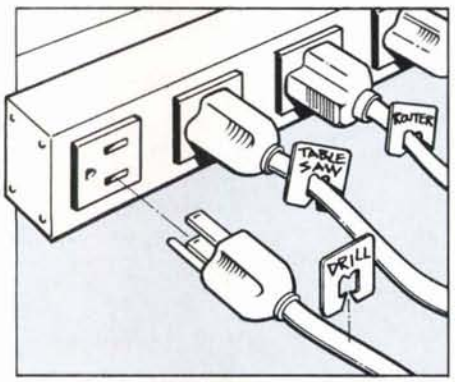
(all dimensions actual)

Part	Description	Size	No. Req'd.
A	Side	3/4 x 5¼ x 20	2
B	Top Shelf	3/4 x 6¼ x 36¾	1
C	Bottom Shelf	3/4 x 5¼ x 36¾	1
D	Rail	3/4 x 3/4 x 36¾	1
E	Key	3/4 x 3/4 x 2¼	4
F	Cup Hook	1 in. dia.*	6

* Hand-forged cup hooks available from Woodbury Blacksmith & Forge Co., P.O. Box 268, Woodbury, CT 06798; Tel. (203) 263-5737. Cost is $9 for six hooks plus $2 postage.

Shop Tips

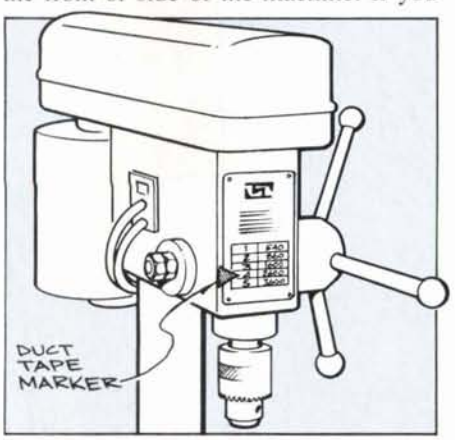
I have one of those multiple outlet *power strips* behind my workbench. It's handy, but when several power tools are plugged in at once, it can be hard to remember which plug goes to which tool. I solved the problem with the help of those little plastic tabs that are used to



reclose bread wrappers. I write the name of the tool on the tab, then attach it to the cord at the plug end.

David Forster, Riverside, Calif.

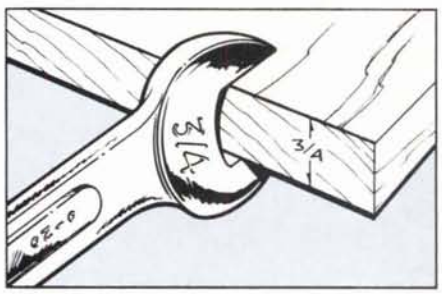
Most drill presses have anywhere from 4 to 16 speeds. Usually the speeds are marked on a plate that is secured to the front or side of the machine. If you



are like me, though, you don't use the machine everyday, so it's easy to forget the speed setting the next time you go to use it. To check the setting is a bit of a nuisance because you need to remove the top housing and study the arrangement of the belts and pulleys. So, to make things easier, I've found it helpful to cut a small wedge-shaped piece of duct tape and stick it on the plate next to the current setting. Now, when I'm ready to use the drill press, a quick glance tells me the speed setting. And on those occasions when I change the speed, I also change the location of the tape to match the new setting.

Warren W. Cole, Orange, Conn.

When thickness planing stock to 3/4 in., I find that a 3/4 in. open-end wrench comes in handy as a gauge. When the



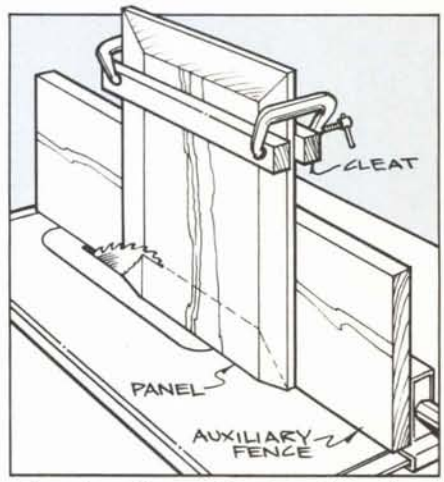
wrench just fits over the stock, I know it's planed to exactly 3/4 in. thick. Other wrench sizes can be used to gauge other thicknesses.

Bill Walworth, Akron, N.Y.

Most light-duty bar clamps have small handles, so woodworkers who suffer from arthritis sometimes have trouble getting a tight grip on them. Here's an idea that may help. Cut a piece of 1/8 in. thick leather to fit the length and circumference of your clamp handle. Now, glue the leather around the handle (keep the rough side out for more friction) and tack the edges with 1/2 in. brads. The leather surface makes the handle much easier to grip—and that sure helps when a little extra clamp pressure is needed.

Gary Gaither, San Antonio, Tex.

Raised panels are often made from wide stock, so it's not uncommon for the panel to be cupped a little. However,

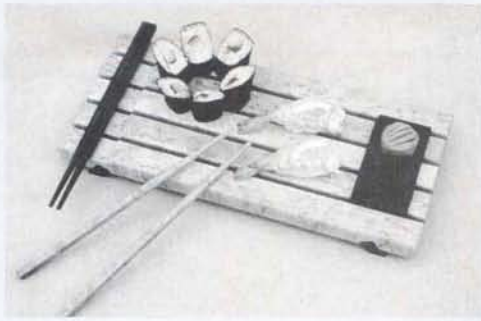


when the table saw bevel cut is made on cupped stock, the bevel cut won't be straight. To keep the stock flat, it helps to clamp a pair of cleats across the panel before making the bevel cut. (To keep the panel square to the table, note that we attach a high auxiliary fence to the saw's rip fence).

The Woodworker's Journal *pays $25 for reader-submitted shop tips that are published. Send your ideas (and sketch if necessary) to:* ***The Woodworker's Journal,*** *P.O. Box 1629, New Milford, CT 06776, Attn: Shop Tip 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.*

Next Issue ...

You'll get complete plans and instructions for the Shaker Wood Box and the Sushi Set—just two of the many new projects from ***The Woodworker's Journal.*** Also, you won't want to miss the Dovetail Jig Review.



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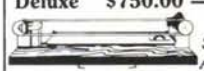

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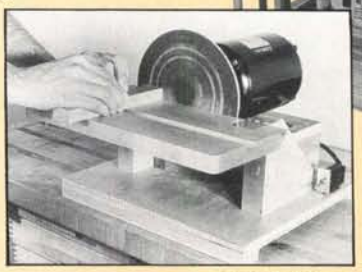

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Vol. 8 No. 3 May-June '84

Country Vegetable Bin, Folding Deck Chair, Shaker Pedestal Table, Wall Hung Display Cabinets, Wooden Coat Hanger, Toy Car and Trailer, Paper Towel Holder, Carved Hand-Mirror, Writing Desk, Carved Walking Stick, Laminated Clock, Oak and Glass End Table. *Articles:* Lay Out and Make Circular Cuts; Mail Order Selling; Stripping Old Finishes; Carving the Ball-and-Claw Foot.

Vol. 8 No. 4 July-Aug '84

Wag-on-Wall Clock, Oak Swing, Candy Dispenser, Coffee and End Tables, Tugboat and Barge, Lazy Susan, Early American Mirror, Colonial Pipe Box, Sewing Machine Cabinet, Cam Clamp, Hamper. *Articles:* What Sells Best?; Homemade Removers; Buying a Basic Set of Hand Tools; Kerf Bending; Caning and Wood Finishing Suppliers.

Vol. 8 No. 6 Nov-Dec '84

Stickley Chair, Tool Cabinet, Shaker Sewing Stand, Lighted Display Pedestal, Teardrop Clock, Pierced Tin Cabinet, Toy Hook and Ladder Fire Truck, Busy Bee Toy, Colonial Doll House, Kitchen Organizer, Wine Server, Grandfather Clock: Part II (Part I available by request). *Articles:* Starting a Business: Part II; Applying the Final Finish; The Fundamentals of Wood; Inlays and Inserts; Gustav Stickley and American Mission Furniture.

Vol. 9 No. 1 Jan-Feb '85

Early American Step Table, Oak Barrister's Bookcase, Parquet Table, Shaker Trestle Table, Bandsawn Wooden Scoops, Toy Biplane, Book Ends, Contemporary Candle Holders, Necktie and Belt Holder, Keyed Miter Jig, Modular Coffee Table and Bar, Magazine and Book Rack, Contemporary Chest of Drawers. *Articles:* Toys and Children's Articles: An Outline of The Consumer Product Safety Commission Standards; Shellac; Truing and Squaring Lumber; The Fingerjoint Spline; Furniture Kit Suppliers; The Shakers; *Special Section:* Back Issue Index.

Vol. 9 No. 2 Mar-Apr '85

Queen Anne Lowboy, Television/VCR Stand, Early American Pine Corner Cupboard, Toy Tool Set, Windspinner, Woodchopper Whirligig, Chinese Puzzle, Cut-Off Jig, Blanket Chest, Shaker Harvest Table, Blacksmith's Tool Tray. *Articles:* A Guide to Photographing Your Work; Applying Shellac and Lacquer; Sharpening Plane Blades and Chisels; Installing Machine Woven Cane; American Queen Anne, 1715-1755; General Woodworking Suppliers.

Vol. 9 No. 3 May-June '85

Jacobean Joint Stool, Wall Cabinet with Recessed Finger Pulls, Shaker Desk, Kitchen Cart, Contemporary Wall Clock, Colonial Wall Sconce, Card Box, Towel Bar with Glass Shelf, Marble Race Toy, Cradle, Vanity Mirror, Miter Clamping Jig. *Articles:* Product Liability: Part I; Restoring an Antique Mirror Frame; Coping with Wood Movement; Making Recessed Finger Pulls; The Jacobean Period.

Vol. 9 No. 4 July-Aug '85

Gate-Leg Table, Computer Desk, Shaving Horse, Stamp Dispenser, Crumb Collecting Breadboard, Toy Trucks, Early American Wall Shelf, Pivot-Top Game/Coffee Table, Settle Bench, Shaker Single-Drawer Cupboard, Fold-up Workbench. *Articles:* Product Liability: Part II; Spray Finishing; Table Saw Basics; Making the Rule Joint; The William and Mary Period; Caning and Wood Finishing Suppliers.

Vol. 9 No. 5 Sept-Oct '85

Colonial Schoolmaster's Desk, Contemporary Sideboard, Mahogany End Table, Victorian Hall Tree, Cutlery Wall Cabinet, Swing-out Plant Hanger, Prancing Horse Silhouette, Block Puzzle, Iron Caddy, Toy Ironing Board, Early American Water Bench, Wooden Smooth Plane, Shaker Sewing Box. *Articles:* A Craft Fair Visit; How to Use Stick Shellac; A Guide to Circular Saw Blades; Making Bent Laminations; Country Colonial Furniture.

Vol. 9 No. 6 Nov-Dec '85

Moravian Chair, Dulcimer, Oak Dining Table, Shaker Washstand, Marking Gauge, Veneered Wall Clock, 4 x 4 Off-Roader, Teddy Bear Puzzle, Duck Pull-Toy, Landscape Cutting Boards, Early American Tall Clock, Pine Desk Organizer. *Articles:* Secrets of Success; Weaving a Fiber Rush Seat, Part I; Table Saw Ripping Problems and Their Solutions; 4-Piece Book Match Veneering; Pennsylvania Dutch Furniture.

Vol. 10 No. 1 Jan-Feb '86

Freestanding Shelf System, Chippendale Bachelor's Chest, Oriental Serving Tray, Country Bench, Antique Knife Tray, Tape Dispenser, Valentine Box, Toy Tow Truck & Car, Shaker Drop-Leaf Table, Shop-Made Bow Saw, Child's Settle Bench, Plate Shelves. *Articles:* On Getting Paid for Your Work; Weaving a Fiber Rush Seat, Part II; Table Saw Crosscutting: Techniques & Tips; Router-Lathe Fluting: A Shop-Made Approach; Chippendale Furniture; *Special Section:* Back Issue Index.

Vol. 10 No. 3 May-June '86

Victorian Whatnot Shelf, Contemporary Lamp, Early American Bench, Steam-Bent Clock, Pine Hutch/Cupboard, Canada Goose Basket, Toy Crane, Condiment Holder, Shop Workstation, Parsons Table, Shaker Lap Desk. *Articles:* An Interview with Toymaker Clare Maginley; How to Flatten a Warped Board; A Guide for Choosing Your First Router; Supported Steam Bending; Victorian Period.

Vol. 10 No. 4 July-Aug '86

Shaker Slat-Back Side Chair, Wall-Hung Display Cabinet;, Latticework Planter, Country Bucket Bench, Adirondack Chair, Coffee Mill, Clamdigger's Basket, Box of Shapes Toy, Disk Clock, Tenon Jig, Dictionary Stand. *Articles:* Selecting the Right Project for Production; More About Warped Boards; All About Router Bits; The Sliding Dovetail Joint; Furniture Kits Suppliers.

Vol. 10 No. 5 Sept-Oct '86

Desk with Tambour Top, Vanity Case, Stool, Coffee Table, Blanket Chest, Mortar and Pestle, Whale Folk Art Silhouette, Toy Wagon, Cranberry Rake, Router Bit Box, Shaker Drop-Leaf Table. *Articles:* Are Your Prices Competitive?; Restoring a Rosewood Chair; Basic Router Operations; Making Tambour Doors; General Woodworking Suppliers.

Vol. 10 No. 6 Nov-Dec '86

Early American Hamper, Cube Table, Rabbit Pull Toy, Old-Time Sled Wall Shelf, Cassette Tape Holder, Dog/Cat Bed, Vanity Mirror, Early American Washstand, Router Table, Victorian Sleigh. *Articles:* Wholesale and Discount Sources of Supply; Sandpaper Abrasives; Using the Router Table; The Mitered Bead Frame and Panel; Clock Parts Suppliers.

Vol. 11 No. 1 Jan-Feb '87

Shaker Blanket Chest, Glass-Top Dining Table, Dovetailed Stool, Jewelry Box, Door Harp, Toy Firetruck, Canada Goose Mobile, Balancing Sawyer Folk Toy, Early American Style End Table, Jointer Push Board. *Articles:* Direct Mail Promotions—Defining the Market for Your Work; Old Wood; The Mortise and Tenon, Part I; Combination Hand/Router Dovetailing; *Special Section:* Back Issue Index.

Vol. 11 No. 2 Mar-Apr '87

Shaker Sewing Desk, Garden Bench and Table, Mirrored Wall Shelf, Rhombohedron Puzzle, Wood Sawyer Whirligig, Folk Art Door Stop, Kangaroo Pull Toy, Colonial Pine Wall Shelf, Contemporary Hall Table. *Articles:* How to Create a Direct Mail Promotion; Types of Finish—An Overview; The Mortise and Tenon, Part II; Making Bevel-Edged Drawer Bottoms.

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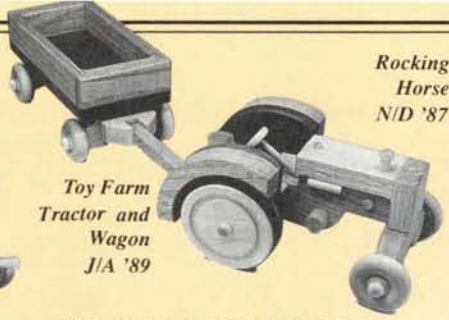

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Vol. 11 No. 3 May-June '87

Display Pedestal, Kitchen Canister Set, Riding Biplane, Contemporary Serving Cart, Napkin Holder, Decorative Planter, Country Vegetable Bin, Pine Medicine Cabinet, Shop Drum Sander, Vienna Regulator Clock. *Articles:* Penetrating Oils and How to Use Them; The Jointer; Veneer, Part I; Decorative Joinery: Dovetail Key Butt-Miter; Caning and Wood Finishing Suppliers.

Vol. 11 No. 4 July-Aug '87

TV/VCR Cabinet, Early American Style Bookcase, Pine Trash Container, Sturdy Low-Cost Workbench, Country Basket, Desk Calendar with Pen & Pencil, Butterfly Pull Toy, Vanity Mirror with Drawer, Apothecary Chest. *Articles:* Shellac; The Hand Plane; Veneer, Part II; Incised Carving; Hardwoods Suppliers.

Vol. 11 No. 5 Sept-Oct '87

Pine Woodbox, Contemporary Love Seat, Two-Drawer Oak Platform Bed, Snail Pull Toy, Routed Trivets, Spice Rack with Chip Carving, Joiner's Tool Chest, Shaker-Style Step Stool, Turned Shop Mallets. *Articles:* French Polishing Made Easy; Plane Iron Sharpening; Making a Splayed Leg Drill Guideblock; Traditional Chip Carving; Shop-Tested: 12 Jigsaws.

Vol. 11 No. 6 Nov-Dec '87

Curio Cabinet, Rocking Horse, Three-Drawer Jewelry Chest, Tapering Jig, Rolling Toy, Folk Art Silhouette, Two Towel Racks, Early American Style Wall Shelf, Corner Cupboard, Stacking Wine Racks. *Articles:* On Glues and Gluing; Band Saw Setup; Making the Continuous Bracket Foot; Step-By-Step To a Flawless Finish On Pine (Or Any Other Wood); Hardware Suppliers.

Vol. 12 No. 1 Jan-Feb '88

Early American Pierced Tin Cabinet, Contemporary Coffee Table, Puss 'n Books Bookends, Cookbook Holder, Wooden Jewelry, Child's Duck Puzzle, Shaker Wall Clock, Stereo Cabinet and Speakers, Country Occasional Table, Drill Press Jig. *Articles:* Edge-Gluing; The Drill Press; Pierced Tin; Four Shopmade Finishes; General Woodworking Suppliers.

Vol. 12 No. 2 Mar-Apr '88

Folk Harp, Oak & Glass Tier Table, Crystal Regulator Clock, Early American Candlesticks, Arrow Wall Decoration, Three-Drawer Country Wall Box, Key Cabinet, Contemporary Box, Shaker Carrier. *Articles:* Use and Sharpening of the Hand Scraper; The Lathe: Basic Setup; Quartered Turnings; Lacquer; Stationary Tool Suppliers.

Vol. 12 No. 3 May-June '88

Hunt Table, Loon Carving, Early American Dry Sink, Contemporary Dresser, Old-Time Pipe Box, Antique Knife & Fork Tray, Dutch Tulip Folk-Art Silhouette, Colonial Salt Box, Bud Vase, Miter Gauge Stop. *Articles:* Spindle Turning; Selecting and Sharpening Lathe Tools; Recessed Finger Pull Step-by-Step; Types of Stain; Clock Part Suppliers.

Vol. 12 No. 4 July-Aug '88

Four-Drawer Lamp, Oak Magazine Rack, Occasional Table, Mitered-Corner Box, Heart Stool, Decorative Cutting Boards, Kids' Piggy Bank, Turned Bowl, Country Cupboard. *Articles:* Faceplate Turning; Workshop Layout; Cutting Dovetails on the Table Saw; Staining Basics; Schools and Craft Centers.

Vol. 12 No. 5 Sept-Oct '88

Oak Bookcase Desk, Miter Cutting Jig, Captain's Clock, Country Coffee Table, Rooster Folk-Art Silhouette, Harvest Basket, Bird Push Toy, Pencil Post Nightstand, 18th-Century Pencil Post Bed. *Articles:* Why Worry About Wood Movement?; Joining Ring Segments; Drill Bits and Boring: The Hole Story; Filling Open-Grained Woods; Hardwood Suppliers.

Vol. 12 No. 6 Nov-Dec '88

Child's Carousel Lamp, Shaker High Chest, Table Saw Crosscut Box, Country Vegetable Bin, Whale Pull Toy, Colonial Wall Sconce, Treetop Christmas Ornament, Classic Pickup Truck, Contemporary Cradle. *Articles:* Flattening Wide Surfaces with the Hand Plane; Making a Cove-Edged Raised Panel: Core-Box Bit Method; Polyurethane; A Sander For Large Surfaces; Caning and Wood Finishing Suppliers.

Vol. 13 No. 1 Jan-Feb '89

Shaker Wall Cabinet, Shop-Built Disk Sander, Cherry Table, Pine Wall Clock, Rock and Roll Toy, Contemporary Candlesticks, Merganser Decoy, Child's Table and Chairs. *Articles:* Buying Hardwood Lumber: What You Need to Know; The Thickness Planer; Making Breadboard Ends; Ebonizing; Hardware Suppliers; *Special Section:* Back Issue Index.

Vol. 13 No. 2 Mar-Apr '89

Oriental Mirror, Adirondack Settee, Country Village, 18th-Century Tilt-Top Table, Toy Fishing Trawler, Two Trivets, Folk-Art Cow, Greek Revival Birdhouse, Pine Armoire. *Articles:* Transferring and Enlarging Patterns; Making Tripod Legs; Three Easy Finishes for Pine; The Portable Circular Saw; Schools and Craft Centers.

Vol. 13 No. 3 May-June '89

Jewelry Chest, Storage Seats, Table Saw Gauge, Oval Extension Table, Nessie Pull Toy, Back Massager, Decorative Wall Key, Country Wall Shelf, Contemporary Mirror. *Articles:* Panel Retainer Disk System; Understanding Circular Saw Blades; Cutting Box Joints; Non-Toxic Finishes; Massachusetts Woodworker Paula Garbarino; General Woodworking Suppliers.

Vol. 13 No. 4 July-Aug '89

Country Pie Safe, Shaker Long Bench, Folk-Art Sign, Toy Farm Tractor and Wagon, Miniature Flower Cart, Kitchen Tongs, Pine Wall Cabinet with Tinsel Art, Stacking Bookshelves. *Articles:* Dealing with Uneven Wood; Tinsel Art; Coping with Your Radial-Arm Saw; Brushing Lacquer; Tools on Display: A Visit to a Woodworking Show; Stationary Equipment Suppliers.

Vol. 13 No. 5 Sept-Oct '89

Oak Globe Stand, Country Bake-Room Table, Chippendale Small Chest, Stacking Desk Trays, Pencil Box, Apple Doorstop, Space Shuttle Toy, Marquetry Coasters, Ice Chest with Marbleized Top. *Articles:* The Table Saw: Basic Adjustments; Cutting Full-Blind Dovetails; Marquetry: The Pad Method; Marbleizing: Creating a Faux-Marble Finish on Wood; Mount Lebanon Shaker Village: A Museum in the Making; Tool Review: Shop Test:Four Portable Planers; Clock Parts Suppliers.

Vol. 13 No. 6 Nov-Dec '89

Bed-and-Breakfast Tray, Mission Style Trestle Table, Jewelry Box, Kids' Bobsled, St. Nicklaus Carving, Carousel Toy, Box Drum, Dancing Man Folk Toy, One-Board Towel Rack, Secretary Desk. *Articles:* Mortising Butt Hinges; Dado Heads; Marquetry: The Empty Window Method; Aniline Dyes; Lynes Unlimited: Making Toys in a Kansas Chicken Coop; Hardwood Suppliers.

Vol. 14 No. 1 Jan-Feb '90

Tavern Table, Mortise & Tenon Mirror, Weaver's Chest of Drawers, Tissue Box Cover, Band-Sawn Napkin Holder, Grasshopper Pull Toy, Compact Disc Holder, Shop-Built Spindle Sander, Wall-Hung Ironing Board. *Articles:* Clamps: One Shop Tool You Can't Do Without; How to Hang Wall Cabinets; Marquetry: The Direct Method; Protecting a New Finish: A Guide to Waxes and Polishes; Caning and Finishing Suppliers; Special Section: Back Issue Index.

Vol. 14 No. 2 Mar-Apr '90

Santa Fe Bench, Small Early American Mirror, Shop-Built Sanding Blocks, Cookie Jar Holder, Hourglass, Candle Holder, Toddler Cart, Folk Fiddle, Plant Stand. *Articles:* Making Drawers; Using Router Bits in the Drill Press; Finishing Outdoor Projects; Making Curved Instrument Sides; Furniture Kit Suppliers; A Conversation with Allene and Harold Westover.

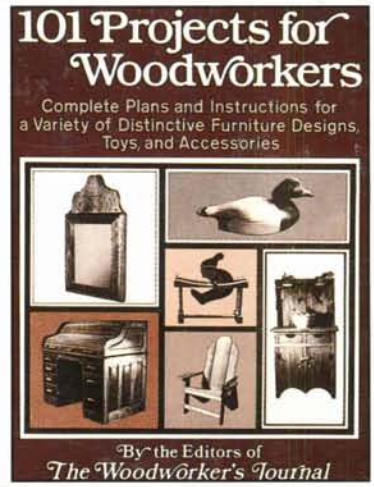
Vol. 14 No. 3 May-June '90

Shaker Tall Clock, Garden Table, Garden Chair, Planter Box, Stackable Shoe Rack, Victorian Wall Shelf, Child's Stepped-Back Cupboard, Cat Push Toy, Tabletop Armoire. *Articles:* Japanese Saws; Gluing Oily Woods; Tung Oil; Making a Tombstone Frame-and-Panel Door; Hardware Suppliers; Are Woodworkers Killing Our Rain Forests?

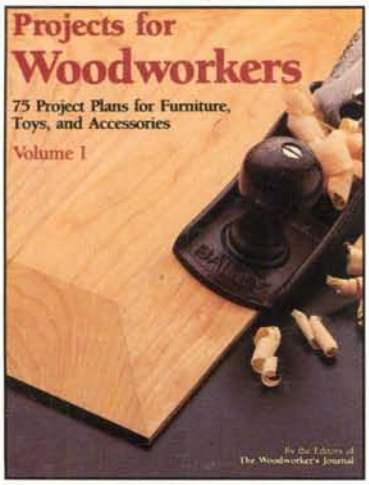
BOOKS

from *The Woodworker's Journal*

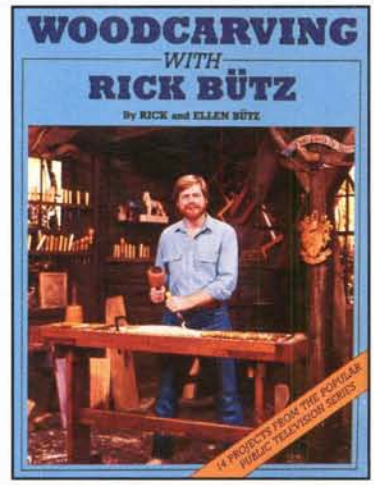
You'll find the order form for these books bound in the center of this issue.



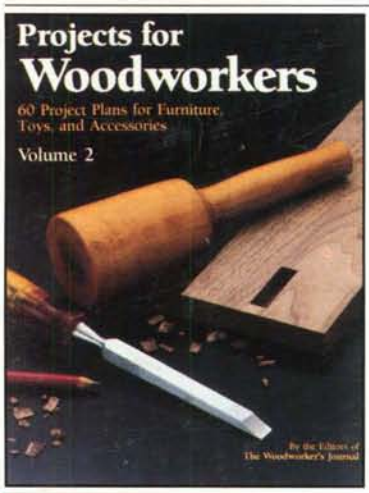
101 Projects For Woodworkers
For the eager amateur just starting out or the craftsman with a shop full of tools, **101 Projects For Woodworkers** features an unparalleled variety of classic projects for everyone. Included in this collection of plans from the 1977-80 issues of *The Woodworker's Journal* magazine are a classic Rolltop Desk, an old-fashioned Porch Swing, traditional and contemporary furniture, clocks, mirrors, home accessories, toys and novelties. Complete instructions and illustrations.



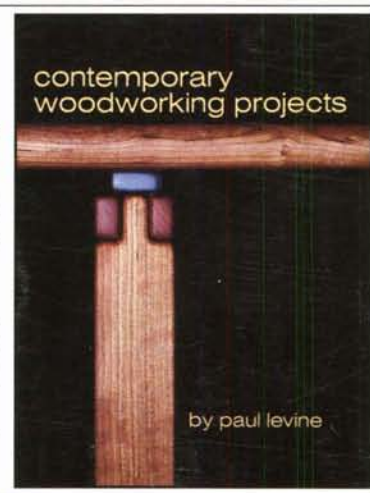
Projects For Woodworkers, Volume 1
Beginning and advanced woodworkers alike will appreciate the full range of styles in furniture, accessories, lamps, clocks, toys and gifts. Of the 75 projects selected from the 1980-81 issues of *The Woodworker's Journal* magazine, plans include a Cabinetmaker's Workbench, Pine Shaker Cupboard, Old-time Icebox, a Cobbler's Bench Coffee Table and a Child's Victorian Sled. Fully detailed instructions, illustrations, and photos.



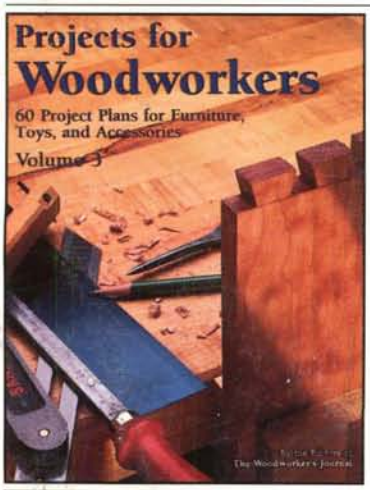
Woodcarving With Rick Butz
Learn woodcarving! With just a few tools and a few hours to spare, you can share in the simple pleasures of carving.Wander into the Black Forest of Germany with a traditional carving of St. Nick, or into a small Russian village with a Dancing Bears folk toy. You'll enjoy a chip-carved Quilt Rack, wildlife carvings, and a Tobacconist's Indian. All 14 projects are fully detailed with step-by-step photos. There are also chapters on tool selection, sharpening, whittling, chip and relief carving.



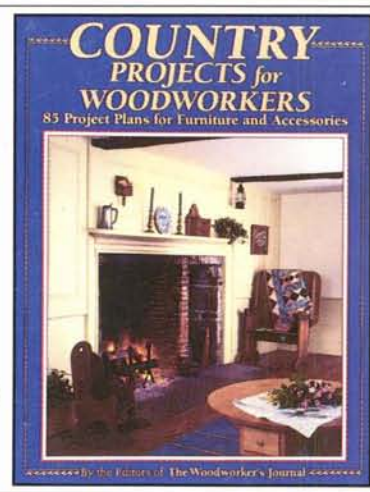
Projects For Woodworkers, Volume 2
Originally published in the 1982 issues of *The Woodworker's Journal* magazine, all 60 projects were chosen with a wide variety of styles and skill levels in mind. Each project is presented with complete instructions and thorough illustrations. You'll find household accessories like the Desk Caddy, Casserole Dish Holder, and Breakfast Tray easy to build. And you're sure to enjoy the reward of completing more involved projects like the Tambour Desk, Old Danish Chest of Drawers and Swinging Cradle.



Contemporary Woodworking Projects
Paul Levine guides woodworkers of all skill levels through room-by-room chapters of coordinated furniture and accessories. The clean angles, sturdy joinery and special techniques are made easy to master with step-by-step instructions and illustrations. Among the 40 handsome projects are a matching Love Seat, Chair and Ottoman set, an Oak Credenza, a Platform Bed, and a Japanese Shoji Lamp. Children will enjoy their own table and chair set, puzzles and a great box of dominoes.



Projects For Woodworkers, Volume 3
The best projects from the 1983 issues of *The Woodworker's Journal* magazine–toys, lamps, cupboards, chests, cabinets, tables, planters, mirrors, and much more. Clear illustrations and thorough written instructions make each project easy to understand and fun to build. A book you'll want to keep within easy reach of your workbench.



Country Projects For Woodworkers
If building the simple, sturdy furniture of the old cabinetmakers appeals to you, then you'll want this collection of the best country projects from the 1980-84 issues of *The Woodworker's Journal* magazine. 85 complete plans range from weekend projects like Colonial Candlesticks and Fireplace Bellows to more challenging projects such as a Shaker Chest of Drawers, a Stepped-Back Hutch, and an 18th Century Trestle Table. Some plans are also found in *Projects for Woodworkers*, Volumes 1, 2 or 3.