The Woodworker's Journal

Vol. 14, No. 5 $3.95

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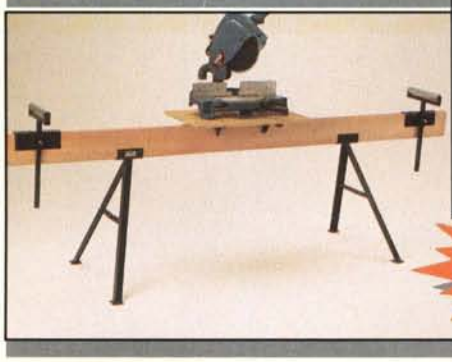

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The Woodworker's Journal

SEPTEMBER/OCTOBER 1990 VOLUME 14, NUMBER 5

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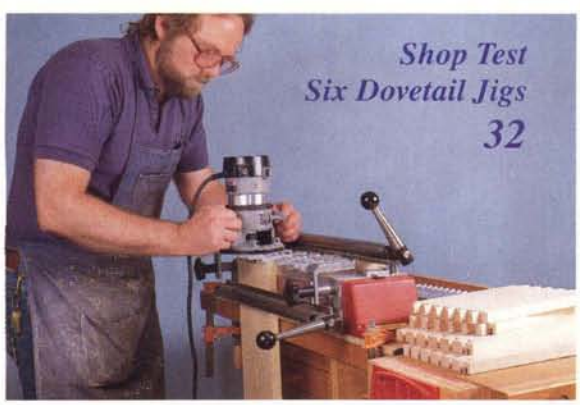

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Shoptalk

George Nakashima 1905-1990

In June a career spanning 50 years ended for George Nakashima, one of America's most respected woodworkers. A reverence for wood was always apparent in his designs, which relied on simple natural forms and traditional joinery. How many of us have admired (and imitated) his two-legged chairs and plank-top tables with their untrimmed wavy edges flowing with the grain?

The Master is gone now, but his philosophy and works remain to inspire and remind us of what an honest and unaffected craftsman can accomplish.

Readers Love Their Country

Visitors are amused by signs posted throughout the offices here that say "Do The Hard Ones First." There should be another sign that reads "Readers Love Their Country." I'm not talking about patriotism here, but rather a furniture style. You can call it Colonial, Early American or even Provincial, but I tend to think of it collectively as Country style and it's a priority here. Your letters have convinced us that no issue should go out the door without at least one major and a couple of minor Country projects.

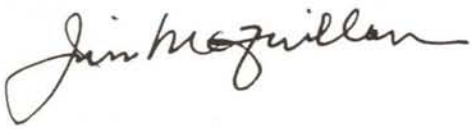
Our major piece this time is the handsome pine cabinet with punched tin door panels. If tin work doesn't turn you on, you may choose to build it with panels of wood, but whatever your preference, it's a good intermediate woodworking project and a useful storage unit.

A Bit of Olde England

The antique English Cutlery Tray was discovered in a nearby village. This little gem will give you an opportunity to break out the scroll saw, and there's a challenge in cutting the compound angle dovetails. A bit fussy perhaps, but now and then it's good to throttle back and do some close careful work. Everyday problems just fade when you're chopping out small dovetails.

Another Workbench

Dennis Preston came up with a great workbench and a tool storage unit which are included complete in this issue. A workbench is a personal thing; woodworkers do not all agree on their designs or how they are used. Some just want a large stable work surface with a vise or two, while others prefer traditional European designs which generally are narrow and have a lot of clamping capability. I think that this bench combines some of the best of both European and American concepts while remaining a realistically buildable project for most readers. If you decide to go for it, we would appreciate your letting us know how it turned out . . . and that goes for all the other projects in this issue too.



The Woodworker's Journal

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P.O. Box 1629
New Milford, CT 06776
Tel. (203) 355-2694

The Woodworker's Journal (ISSN 0199-1892) is published bi-monthly in January, March, May, July, September and November by The Madrigal Publishing Co., Inc., P.O. Box 1629, New Milford, CT 06776. Telephone: (203) 355-2694.

Second class postage paid at New Milford, CT 06776 and additional offices.

Subscription Rates: In the United States and its possessions One year (6 issues) $17.95, Two years (12 issues) $31.90. Canada One year $25.95 (CAD), Two years $44.95 (CAD). Foreign countries One year $25.00 (USD), Two years $44.00 (USD).

To subscribe, Renew or Change Address: Write to **The Woodworker's Journal,** P.O. Box 1629, New Milford, CT 06776, including mailing label for renewals and changes. For gift subscriptions, include your own name and address as well as those of gift recipients.

Postmaster: Send Change of Address to **The Woodworker's Journal,** P.O. Box 1629, New Milford, CT 06776.

Materials submitted for editorial consideration will be treated with care while in our possession, but we cannot assume responsibility for loss or damage.

U.S.A. Newsstand Distribution by Eastern News Distributors, Inc., 1130 Cleveland Rd., Sandusky, OH 44870.

Photo Credits: *John Kane/Silver Sun Studios, cover and pp. 3 (TV/VCR Cabinet, Toy Train), 38, 39, 42, 57, 62, 66; George Post, p. 49; Rick Bütz, p. 50; Props courtesy of Terston & Co., Kent, CT, p. 54; Aspetuck Nursery, Washington, CT, p. 45; Village Barn, New Preston, CT, p. 45.*

Letters

The article "Tropical Woods Under Fire," in your May/June 1990 issue was quite interesting. However, the writer has misstated the Rainforest Action Network's tropical hardwood ban policy. It is a selective ban, it has an exception. Unfortunately, the criteria needed to meet the exception is rarely found in most logging operations. An example of the exception would be a project like the Yanesha project which is included in the article. I only wish there were more examples of such logging operations.

As an environmentalist and a woodworker, I have grown to appreciate the beautiful and useful qualities of tropical hardwoods. This in one reason I am concerned about the long term viability of tropical hardwoods, not only as a resource, but also as tropical trees that are an integral and essential component to maintaining the tropical forest ecosystem. No one is trying to blame woodworkers for rainforest destruction, but we are saying that woodworkers, like other users of wood, can no longer have a blind eye to the source of their material, which also includes old growth species here in North America.

RAN's ban policy was formulated with the worldwide input of indigenous forest dwellers. After a general consensus, the World Rainforest Movement, of which RAN is a member, concluded that a ban would at this time be one of the more effective ways to save rainforests. Other members of the World Rainforest Movement include non-governmental organizations in tropical rainforest countries.

Waiting for ecologically sustainable tropical forestry to be implemented without curtailing the logging is unrealistic. It also does not address the urgency in saving some rainforests, particularly those of Sarawak and Sabah in Borneo, and Burma's last remaining teak forests (plantations on Burma disappeared a long time ago).

The author, in an attempt to show how statistics and facts can be manipulated to prove a point, has also misconstrued the facts. I would appreciate your printing of the Rainforest Action Network's ban policy in full, so your readers can decide for themselves on the merits of a "selective" ban.

Pamela Wellner
Rainforest Action Network

For a copy of RAN's two-page Tropical Hardwood Policy, write to the Rainforest Action Network, 301 Broadway, Suite A, San Francisco, CA 94133.

The Folding Deck Table project in your July/August 1990 issue was a good one. We made several and were able to sell them as fast as they were finished. We used white pine for the top and 1 by 2 fir stock for the legs. Thanks for a very good magazine.

Willard W. Harper
Tigard, Ore.

I've enjoyed your musical instrument plans, having made the Folk Harp, Dulcimer, and Folk Fiddle. The fiddle sounds a lot better than some of the violins around here.

Leonard Barr
Lanark, Ontario, Canada

Initially, I get a beautiful finish when I make a project from cherry wood and finish it with tung oil. However, after about a year, the project turns much darker and it does not show the grain nearly as well. What can I do to prevent darkening when I finish cherry?

Collen C. Burns, Woodruff, Wisc.

Cherry tends to quickly darken when exposed to light. It may be possible to minimize the darkening, but you'll probably never stop it altogether. One product that may help is a special tung oil formulated for marine use. It has an additive called a UV protector that may slow down the darkening somewhat. It's made by Sutherland Welles Ltd. and sold by Garrett Wade, 161 Avenue of the Americas, New York, NY 10013; tel. 1-800-221-2942. Ask for catalog number 99R14.01 which sells for $23.10 per quart plus $4.95 shipping and handling.

Several months ago, a friend gave us a cute little frog sign to hang near the deck of our new house. It said *The Bachand's*. I thanked her for it and immediately put it up for everyone to see. At the same time, I pointed out that the name was not written correctly. The apostrophe made the name possessive rather than plural, so that it meant something belonging to only one Bachand. It is the singular possesive of our name.

In the July/August 1990 issue of *The Woodworker's Journal* you featured a very attractive Colonial sign that immediately made me think of the one our friend gave us. It has the same problem. Is this the house that belongs to one Smith, or is this the residence of the Smiths?

If the sign is identifying the *residents*, then it should not have the apostrophe. If it is identifying the *residence*, then it might or might not be correct—correct if there is only one Smith, incorrect if there are two or more Smiths. Smiths' would be correct if it means the house belonging to more than one Smith, but then it would be proper to add the word house.

Ken Bachand, Brevard, N.C.

Your fine articles and plans, along with the enthusiasm of the Westovers ("A Conversation with Allene and Harold Westover," March/April 1990 issue) have sparked an interest in me to first make a folk harp and then complete an exact replica of a Stradivarius violin. I obtained the Stradivarius plans from a 95-year-old gentleman violin maker some 23 years ago. *The Woodworker's Journal* is my favorite. Thanks.

Eldean Weight, Bountiful, Utah

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, September 3 for the November/December 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: Woodworking World, The Southern California Show, Oct. 12-14, LA County Fairgrounds, Pomona. For more information call 1-800-521-7623.

Connecticut: Brookfield Craft Center Workshops: Sept. 15-16, 18th Century Carving Techniques, Eugene Landon; Sept. 27 - Nov. 15, Evening Woodworking in Brookfield, Larry Hendricks; Oct. 13-14, Introduction to Spindle Turning, Bill Gundling; Oct. 27-28, Introduction to Power Tools and Equipment, Bill Gundling; Nov. 3-4, 18th Century Woodworking Methods, Eugene Landon. For more information contact the center at P.O. Box 122, 286 Whisconier Road, Brookfield, CT 06804; tel. (203) 775-4526.

Illinois: Woodworking World, The Chicago Area Show, Oct. 5-7, The Metro Center, Rockford. For more information call 1-800-521-7623.

Kentucky: The Woodworking Shows, Louisville, Oct. 19-21, Commonwealth Convention Center, Louisville. For more information call 1-800-826-8257.

Maryland: The Woodworking Shows, Baltimore/Washington, Oct. 12-14, Festival Hall, Baltimore. For more information call 1-800-826-8257.

Massachusetts: Woodworking World, The New England Show, Oct. 19-21, Eastern States Exposition, West Springfield. For more information call 1-800-521-7623.

Woodworker's Alliance for Rainforest Protection (WARP), first official meeting, Nov. 16-18, University of Massachusetts, Amherst. For more information contact John Shipstad, P.O. Box 133, Coos Bay, OR 97420.

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

Missouri: Paxton Beautiful Woods First Annual Woodcraft Fair, Oct. 20-21, 6311 St. John, Kansas City, MO 64123. For more information call (816) 483-7000.

New York: The Woodworking Shows, Upstate New York, Oct. 5-7, Riverside Convention Center, Rochester. For more information call 1-800-826-8257.

Woodworking World, The Central New York State Show, Nov. 3-4, New York State Fairgrounds, Syracuse; The Albany Show, Nov. 9-11, New Scotland Ave. Armory, Albany. For more information call 1-800-521-7623.

North Carolina: Fall High Point Market, Oct. 18-26, International Home Furnishings Center, High Point. For more information call (919) 888-3700.

Woodworking World, The Carolina Show, Sept. 21-23, McBenton 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: Oct. 14, Materials and Techniques of Hollow Turning, Dan Kvitka; Nov. 10-11, Design, Production & Marketing of Fine Furniture, Thomas Moser. For more information contact the school at 8245 S.W. Barnes Road, Portland OR 97225; tel. (503) 297-5544.

The Woodworking Shows, Oregon, Oct. 26-28, Memorial Coliseum Complex, Portland. For more information call 1-800-826-8257.

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

Woodworking World, The Central Pennsylvania Show, Nov. 16-18, Pennsylvania Farm Show Complex, Harrisburg. For more information call 1-800-521-7623.

Luckenbach Mill Gallery, National Juried Exhibition of Contemporary Crafts, Oct. 6 - Nov. 4, 459 Old York Road, Bethlehem. For more information call (215) 691-0603.

Tennessee: Woodturning: Vision and Concept II, a juried exhibition, Oct. 24 - Dec. 8., Arrowmont School of Arts and Crafts, Box 567, Gatlinburg; tel. (615) 436-5860.

Smoky Mountain Artistry in Wood Show, Oct. 6-7, Rodeway Inn, Knoxville. For more information contact Gary Falin, 693 Wright Road, Alcoa, TN 37701.

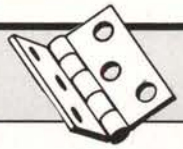
Tennessee Valley Authority, Small Dry Kiln Seminar, Sept. 21-22, Norris. For more information call William Parrish at (615) 632-1656.

Texas: Woodworker's Club of Houston, Seventh Charity Show and Fair, Oct. 26-27, Greenspoint Mall, Houston. For more information call Sam Zeisman at (713) 723-4382.

Washington: Northwest Carver's Association, 10th Annual Woodcarving Show, Nov. 10-11, Western Washington Fairgrounds Expo Hall, Puyallup. For more information call (206) 564-3278.

Washington D.C.: 1991 Washington Craft Show applications accepted until Oct. 13. Applications to the April 18-21 show must include five color slides representative of the work and a nonrefundable application fee of $25. For an application write Women's Committee of the Smithsonian Associates, Arts and Industries Building, Room 1465, Smithsonian Institution, Washington, D.C. 20560; tel. (202) 357-4000.

Wisconsin: Woodworking World, The Milwaukee Show, Oct. 26-28, MECCA Convention Center, Milwaukee. For more information call 1-800-521-7623.



Cabinetmakers' Supplies

General Woodworking Suppliers

As a service to our readers, we periodically list sources of supply for various products. In this issue we've listed companies that specialize in mail-order sales of general woodworking supplies, along with a code to indicate some of the products they carry. Code: hand tools (HT), power tools (PT), stationary equipment (SE), hardwoods (HW), veneers (V), hardware (H), clock parts (C), lamp parts (L), books (B), finishing products (F).

Albert Constantine & Son Inc. . . . . . HT, PT, SE, HW, V, H, C, L, B, F
2044 Eastchester Road — 116 page catalog, $1.00
Bronx, NY 10461

Craftsman Wood Service . . . . . HT, PT, HW, V, H, C, L, B, F
Dept. WJ9 — 144 page catalog, $2.00
1735 West Cortland Ct.
Addison, IL 60101

Frog Tool Co. Ltd. . . . . . HT, PT, H, B, F
Dept. WJ1700, W. Jackson Blvd. — 89 page catalog, $5.00
P.O. Box 8325
Chicago, IL 60606

Garrett Wade . . . . . HT, PT, SE, H, B, F
Dept. MP12-3 — 208 page catalog, $4.00
161 Ave. of the Americas
New York, NY 10013

Grizzly Imports, Inc. . . . . . HT, PT, SE, H
P.O. Box 2069 — 114 page catalog, free
Bellingham, WA 98227

Highland Hardware . . . . . HT, PT, SE, B, F
Dept. J1, 1045 N. Highland Ave. — 90 page catalog, $2.00
Atlanta, GA 30306

Lee Valley Tools Ltd. . . . . . HT, PT, SE, H, B, F
Dept WJ9, 1080 Morrison Drive — 208 page catalog, $5.00
Ottawa, Ontario
Canada K2H 8K7

Seven Corners Ace Hardware . . . . . HT, PT, SE
216 West 7th St. — 770 page catalog, free
St. Paul, MN 55102

Shopsmith Inc. . . . . . HT, PT, SE, HW, F
3931 Image Drive — 100 page catalog, $4.00
Dayton, OH 45414

The Source . . . . . HT, PT, SE, F
7305 Boudinot Drive — 48 page catalog, $2.00
Springfield, VA 22150

Trend-Lines . . . . . HT, PT, SE, H, B, F
Dept. WWJKR — 68 page catalog, $2.00
375 Beacham St.
Chelsea, MA 02150

Woodcraft Supply Corp . . . . . HT, PT, SE, H, C, B, F
Dept. WJ90 — 119 page catalog, free
210 Wood County Industrial Park
Parkersburg, WV 26102

Woodworker's Supply Inc. . . . . . HT, PT, SE, V, H, C, B, F
Dept. WJ1 — 63 page catalog, $2.00
5604 Alameda Place, N.E.
Albuquerque, NM 87113

New! Super V-15" Scroll Saw with Variable Speed

- *Dial any speed from 400 to 1800 cuts/min !*
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- *Special introductory price...*

only **$189.95**

(item **#SVS**, UPS $10)

Cut intricate patterns in many different types of materials with this versatile machine. Purchase includes many FREE extras.

This new model features a powerful, high quality **electronically controlled universal motor that gives full power and torque at all speeds**. Similar in design to our Super-15" model, the cutting action has been re-engineered to give smoother cutting and performance equal to saws many times the price.

Dial any speed from 400 - 1800 cuts/min to set the speed specifically for the job at hand. Use slower speeds for cutting plastics, metals and hardwoods.

FREE ACCESSORIES:

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Specifications:

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- Throat : 15" deep • Stroke - 3/4"
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- Blades: accepts pin and plainend
- Construction - cast iron

Scroll Saw Products

Super 15" Scroll Saw

Our most popular model. Same specs as Super V-15 model with single speed 1650 cpm motor, dust blower optional. Same free accessories as listed above.

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

Dust Blower (option for Super 15" saw)

#BKT ..... $15.00/kit (•)

Variable Speed Motor Upgrade

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#SVM .....Only $99.00 (UPS $4)

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• UL approved
• 60 Watts Incand.

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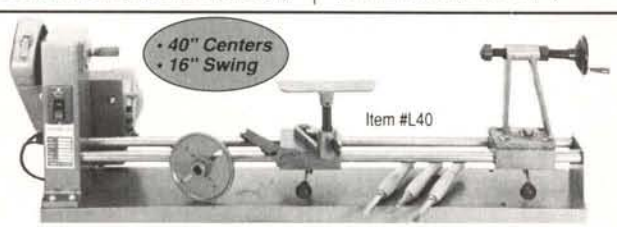
34" High - the perfect height.

#STD .. (reg $39), **On Sale $26** (UPS $4)

Foot Switch

For hands free operation. Installs in line w/power cord. Easy hook-up. 7 amp, 6 ft

#FSW ..... $20.00 (•)



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Reg $299.95, ***On Sale*** **$249.95**

Includes ***FREE*** 8 piece Wood Chisel Set ... **$34 Value**

Our new XL-40 Wood Lathe surpasses every lathe in its price range with quality & features you would expect from machines many times its price . FEATURES .....

Heavy Duty cast iron construction provides smooth turning action • **40" Centers** • **16" Swing** for turning larger bowls • Smooth toolrest movement on 1" solid steel rails • **"Live" center** on tailstock • **Motor mounted for easy positioning** and belt changes • **Sturdy 52" steel base** mounts on table top or optional stand.

PURCHASE INCLUDES:

- Lathe with Motor & Base • Toolrest
- 6" Faceplate • 8 pc wood turning chisel set

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

Heavy duty. Wt. 25Lbs
Size: 28"H X 56"L X 21" W
Item **#LST** .... **$44** /ea (UPS $6)

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. Inclues **FREE** plans for roller stand shown above.
Item **#BBR** ..... **$6.50/ea** ($3 UPS /order)

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Item #S48

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(Includes $15 ***FREE*** Hose & Fittings)
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SPECIFICATIONS:

1HP • 110/220V (pre-wired 110V)
• 610 CFM air flow • 2ea 20 gal bags
• 4" inlet •Castors on base • WT.: 75 lbs

FREE **With Purchase ($15 Value)**

Dust collection hose • 4" to 3" rigid adaptor • 4" to 2" flex adaptor • Plans for 2 stage setup • Sources for accessories

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We unconditionally guarantee your satisfaction with our fine machines. All of our machines carry a Thirty day Money Back Guarantee and One year Warranty for Parts and Labor.

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2850 Comly Road • Phila, Pa 19154

Order Toll Free **1-800-288-7297**

Visa, Master, & Discover Card accepted Pa residents add 6% Sales Tax
When ordering - Add UPS Shipping Charges as noted
(•) No freight charge for accessories ordered with a machine, add $3 if ordered separately.
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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 recently acquired a band saw that I need information on. It's made by The Frank Clement Co. in Rochester, N.Y. It's an "American" saw. That's the name cast into the base. The only I.D. number is a shop number, 105405. The distributor was Tatum-Bowen of San Francisco, Seattle and Portland.

William Littell
P.O. Box 1039, Big Timber, MT 59011

I need owner's manuals and parts lists for three tools: Craftsman table saw, model 113.27610; Craftsman shaper, model 103.23900; Craftsman belt sander, model 103.0803. I also need information on where to buy brass coin-slot escutcheons for piggy banks.

Fred Walters
Rt. 1, Box 186
Gravois Mills, MO 65037

I need an owner's manual and parts list for a Craftsman table saw, model 113.29902.

Betty Russell, Box 417
Howard, KS 67349

I'm looking for a network to supply information and parts for vintage Shopsmith units, in particular, lathe equipment for a Mark 2.

Steve Romanoski
172 S. Addison, Bensenville, IL 60106

I need a fence for a Craftsman 8 in. table saw, model 103.22160, manufactured by King Seeley.

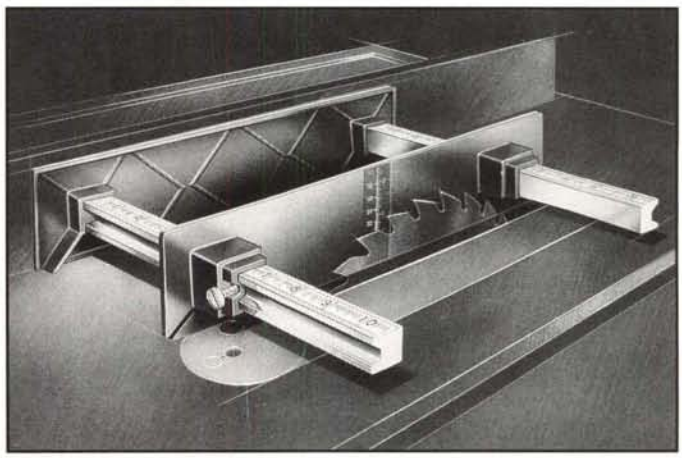
Woodrow W. Morris
6405 El Camino Drive
Redding, CA 96001

I need an owner's manual and parts list for a 12 in. Parks planer, model 21130.

Rob Roberts
P.O. Box 1404, Gilmer, TX 75644

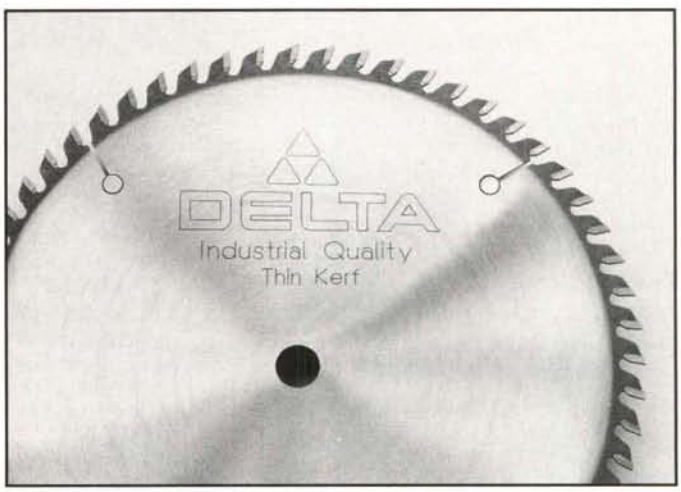
Product News

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.***



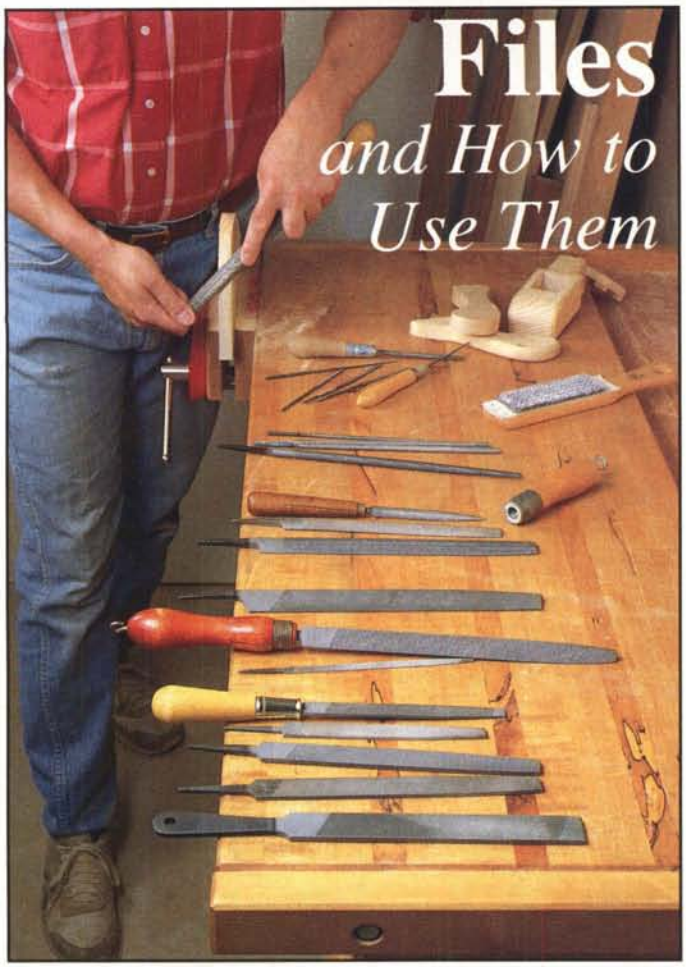
Paragauge

The woodworker's solution to accurately producing straight and parallel measurements. Paragauge has multiple uses including: aligning the table saw rip fence parallel to the saw blade, checking radial arm saw heel, duplicating measurements of an object, and setting the table saw blade parallel to miter-gauge slots. Saves the expense of costly after-market table saw fences. Paragauge costs $29.95 plus $3.50 shipping and handling. For more information contact Accuset Tool Co. Inc., P.O. Box 1088, Troy, MI 48099; tel. 1-800-343-6129.



Delta Thin Kerf Saw Blade

Delta International Machinery Corp. designed its new thin kerf carbide-tipped saw blade for optimum performance and maximum service life. Thin kerf blades—28 percent thinner than conventional blades—reduce drag on lower horsepower saws, increasing cutting power. The new blade design also makes stock feeding smoother and easier, and reduces waste by providing more accurate, clean cuts. For more information contact Delta, 246 Alpha Drive, Pittsburgh, PA 15238; tel. 1-800-438-2486.



Files and How to Use Them

It's hard to imagine a world without files. They have such varied uses that you can easily fill a fair-sized book on files alone. Woodworkers use them for smoothing and shaping wood, as well as for general shop use, tuning up drill bits and the like.

But finding the right files for woodworking can be confusing, and files are so taken for granted that many people have never learned the right way to hold and use a file.

File Types

Files are broadly classified as coarse, bastard cut, second cut and smooth, in order of increasing smoothness. Also, the longer files within the same class generally have a coarser cut. The bastard cut and second cut files are generally used on wood.

Files have two different tooth patterns, single cut and double cut. The single cut files have parallel lines, with the teeth running at an angle along the length of the file. The double cut files have a second set of lines that cross the first. Because of the crossing patterns, the double cut file has a diamond shaped tooth.

Both the single cut and double cut files are available in the coarse, bastard cut, second cut and smooth varieties. Single cut files give better results for smoothing wood, but either can be used.

Files come in an astounding variety of shapes and sizes, so many that a list can fill pages. There are, of course, flat files, round files and half-round files, as well as a variety of small shaped or bent files, called rifflers. The most common file shape is the mill file. It's the familiar rectangular file that tapers toward the point or front of the file, the end away from the tang. Mill files got their name as the principal tool for sharpening mill saws. But they are the ubiquitous file sold in every hardware store and used for such tasks as sharpening lawnmower blades. For woodworking, the mill bastard file is useful for rough shaping steel blades and removing large nicks. It's also used for filing cabinet scrapers.

Also among the basic file shapes is the cabinet file. The shape is a variation of the half-round, but the curvature is less, making them wider and thinner than the pure half-round. You should note that cabinet files are sometimes mislabeled as half-round files. They are, as you'd expect, a staple in the cabinet shops.

Still another basic file is the warding file. It's similar to the mill file in shape, but with more of a taper toward the point. It's double cut and sold in smoother versions than the mill file. Warding files were originally used by locksmiths to cut notches in keys, but they can be used for fine smoothing jobs in woodworking.

Note that file sizes are given as lengths. The listed size refers to the body of the file, not including the tang.

For general woodworking, you'll probably want a selection of files that includes a 10 in. second cut flat mill file, a 10 in. second cut cabinet file and an 8 in. second cut round file.

There are a bevy of more specialized files. Some are of particular interest to the woodworker. The log-saw file used for sharpening large crosscut saws, for example, has a knife edge on one side. The design allows you to sharpen the sides of teeth without nicking adjoining teeth, but the knife edge can also be useful for wood shaping. There are also triangular handsaw files in a variety of sizes, and needle files, which are usually sold in sets. Needle files are great for very fine work. They are small rectangular, oval and triangular files about 5 in. long that come to a point.

Also, there are small knife files that come in handy around tight spaces, as well as the rifflers. The riffler files are great for detail work, especially if you do carving. They are somewhat different than the other files in that only a small bent or shaped area on each end is cut with the file teeth. In between is the handle. Often there are slightly different profiles on each end of the riffler. They are similar to riffler rasps, but with file-cut teeth.

Another specialized file of note is the auger bit file. It can be used to touch up brad-point bits and multi-spur bits, as well as the auger bits.

File Making

Files are made much the same as rasps, which we discussed in our July/August issue. But instead of a pointed chisel, the file

teeth are formed by a chisel with an edge long enough to span the width of the file. The basics are the same, however. The metal is first forged to shape, then softened by a heat treating process called annealing. The parallel teeth are punched into the softened steel with the chisel, and the tool is hardened in a second heat-treating operation. The completed tools are then washed and treated to retard rust. Unlike most steel tools, files are left in a fully hardened state. Most tools are tempered, or softened, to remove a portion of the brittleness. But files aren't meant to absorb blows, so the steel is left fully hardened. This, of course, is crucial to their ability to cut other softer steel.

Very important in file making is the quality of the steel. Files use a steel described as "crucible carbon," sometimes also called cast steel. Until the mid 1800's crucible carbon steel used in this country was imported from Sheffield, England. Some of the best steel for files and other cutting tools is still made in Sheffield.

Handles

Having a proper handle is also very important when filing. The file needs to be controlled with authority, and that isn't possible without a properly attached handle. Wood handles are available in a variety of sizes and should be driven onto the file tangs so the handle comes well up on the shoulder of the file. Don't drive a handle on half-way; it will break off.

Using a File

Remember that files are cutting tools, they slice the wood or metal, and aren't supposed to wear it away by friction. The teeth face forward, so it's vital to only cut on the forward stroke. Repeated dragging of the file on the wood during the return stroke will quickly dull the teeth.

The filing motion should be controlled, not jerky or bumpy. Use a smooth forward stroke, adjusting the downward pressure to suit the type of wood and grain orientation. End grain will require more downward pressure to prevent chattering. Also to help prevent chattering, hold the file at an angle to the work and carry it forward and slightly to one side. Also, be aware of the natural tendency to round over edges when using a file. Make a concerted effort to keep the file perpendicular to the work.

Holding the file correctly is also important since a proper grip will facilitate a smooth cut. The Nicholson File Co. published *A Treatise on Files and Rasps* in 1878, which contains this detailed description of how to hold a file:

> The handle should be grasped in such a manner that its end will fit into, and bring up against, the fleshy part of the palm, below the joint of the little finger, with the thumb lying along the *top* of the handle, in the direction of its length; the ends of the fingers pointing upwards, or nearly in the direction of the operator's face.
>
> The point of the file should be grasped by the thumb and first two fingers, the hand being so held as will bring the thumb, as its ball presses upon the top of the file, in line with the handle, when heavy strokes are required. When a light stroke is wanted, and the pressure demanded becomes less, the thumb and fingers may change their direction, until the thumb lies at a right angle, or nearly so, with the length of the file; the positions changing more or less, as may be needed to increase the downward pressure.
>
> In holding the file with one hand, as is often necessary in filing light work, pins, etc., the handle should be grasped as already described, with the exception that the hand should be turned a quarter turn, bringing the forefinger on top, and lying along the handle nearly in the direction of its length. In this position, the freest action of the hand and wrist may be had upon light work.
>
> Amateurs will find that by following these directions, the movements of the file will be simplified, and made somewhat easier than if grasped at random and without consideration.

Cleaning the File

Files should be regularly cleaned. Special file cleaners are sold for the purpose (see Sources). They have fine spring steel teeth that quickly remove debris from file crevices. Letting dirt accumulate and remain on the files will allow moisture to settle around the teeth and encourage rust. Rust can damage a file even before it's noticeable because it will attack the thin cutting edges first. Keep the files wrapped in a cloth in such a way as to prevent them from banging against each other and your other tools. The cloth will also help prevent rust.

Sources of Supply

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

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

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210 Wood County Industrial Park
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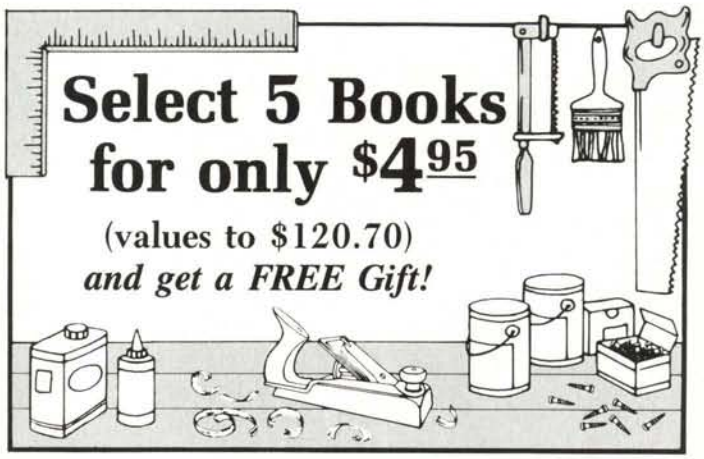

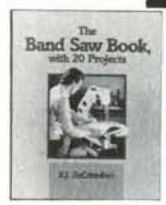

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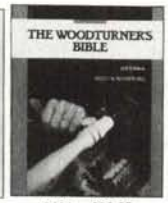

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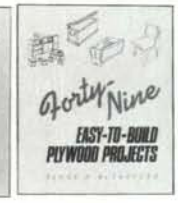

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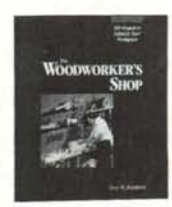

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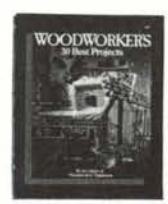

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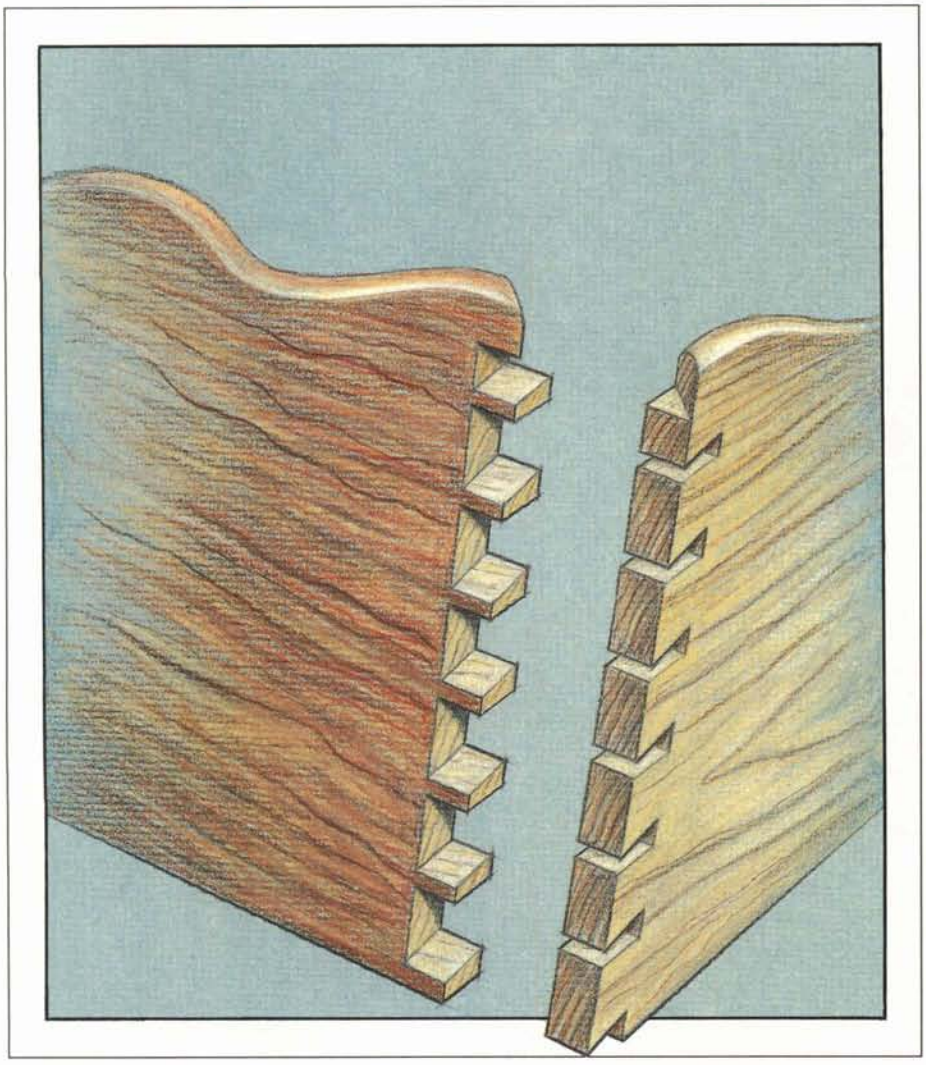
Compound Angle Dovetails



Part of the excitement of woodworking is seeing an attractive joint in use. When we discovered the lovely Cutlery Tray on page 54 at a local antique shop, we couldn't help but marvel at how well crafted the compound angle dovetails were. Although it was built some 200 years ago the tray is still in excellent condition, a testament to the strength of its dovetailed construction.

Compound angle dovetails are not a common joint, but they have several applications. The most common uses are for cutlery trays, knife boxes, and canisters, but they are also used for larger work, such as dough boxes, cradles and case construction. Although with modern dovetail fixtures and jigs it's possible to cut a compound angle dovetail by machine, machine-cut compound angle dovetails aren't cut so the dovetails parallel the edges, a situation that results in end grain and therefore a weaker joint. This is one technique where the hand tool method is definitely superior.

It's not mandatory that you have experience with 90-degree dovetails before trying the compound angle version, but it helps to have an understanding of how dovetails fit together before you start. Compound angle dovetails fit together exactly as regular dovetails. The difference is that instead of the dovetails being cut on the ends of boards that are oriented on perpendicular vertical planes, the dovetails are cut on the ends of boards that are both tilted at an angle.

There are several ways to lay out and cut compound angle dovetails. Our method simplifies the technique by keeping the layout basic, without any advanced mathematics. In addition to a table saw, you'll need a dovetail saw, fretsaw, bevel square, some needle files, a sharp knife and a 1/8 in. chisel. If you

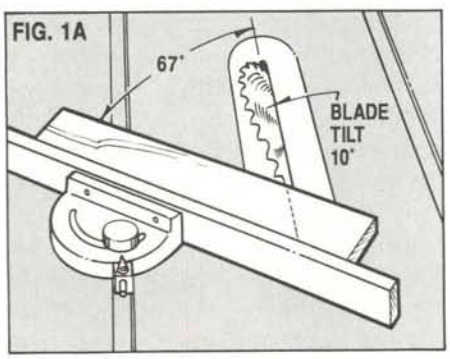
Compound Angle Chart
(Table Saw Settings*)

Tilt of Sides (from Vertical)	Table Saw Blade Tilt (from Vertical)	Miter Gauge Angle (from Saw Blade)
5	1/2	85
10	1 1/2	80 1/4
15	3 3/4	75 1/2
20	6 1/4	71 1/4
25	10	67
30	14 1/2	63 1/2
35	19 1/2	60 1/4
40	24 1/2	57 1/4
45	30	54 3/4

* All figures are in degrees

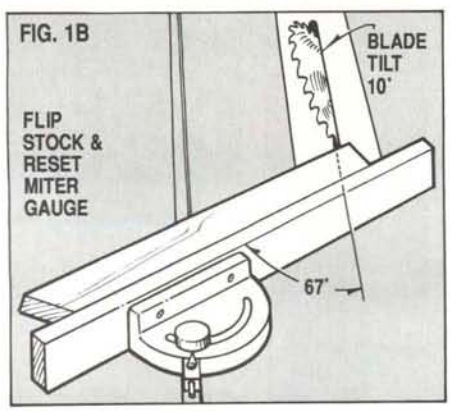
are careful, you can go to work on your actual project stock, but a better choice would be to first cut a sample joint on some scrap that's the same thickness and width as the project stock.

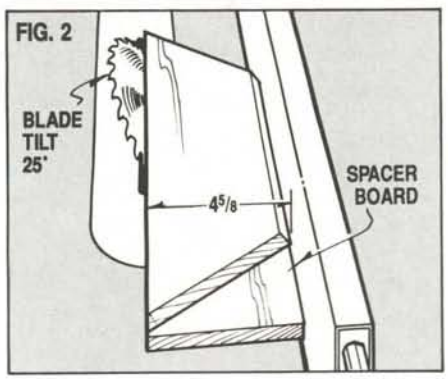
Before cutting the dovetails you'll need to determine the tilt of the sides, and cut the ends and edges of the sides to establish that angle of tilt. The Compound Angle Chart lists the blade tilt and miter gauge angles required to produce constructions with sides that tilt from 5 degrees to 45 degrees. The chart doesn't include any steeper tilt angles because it isn't practical to cut a dovetail joint on sides that exceed 45 degrees. Our illustrations show the sides of the Cutlery Tray project, which are tilted at 25 degrees, but the basic steps are the same whether the sides of the project you are working on tilt 5 or 45 degrees.



Step-by-Step

Step 1: Take the settings from the Compound Angle Chart, and make your cuts on the ends of the boards. Since the Cutlery Tray has sides tilted at 25 degrees from the vertical, the table saw blade should be tilted 10 degrees from vertical, and the miter gauge should be angled 67 degrees from the saw blade. Cut one end of each of the four sides (Fig. 1A), then reverse the miter gauge angle setting and cut the opposite ends of the sides (Fig. 1B). Be sure to first make some test cuts on scrap after you reverse the miter gauge angle setting, or you may find that the butt miters don't meet quite right.

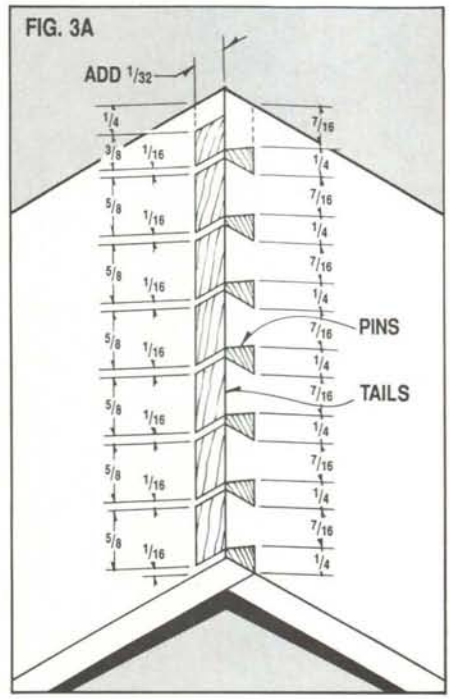




Step 2: Angle the table saw blade equal to the desired tilt of the sides (25 degrees for the Cutlery Tray) and make a ripping cut on the top and bottom edges. The second ripping cut (Fig. 2) establishes the overall width (4⅝ in. for the Cutlery Tray). As shown, you'll need to include a spacer board under the project stock for this second ripping cut. This will prevent the sharp edge created by the first ripping cut from accidently wedging under the rip fence.

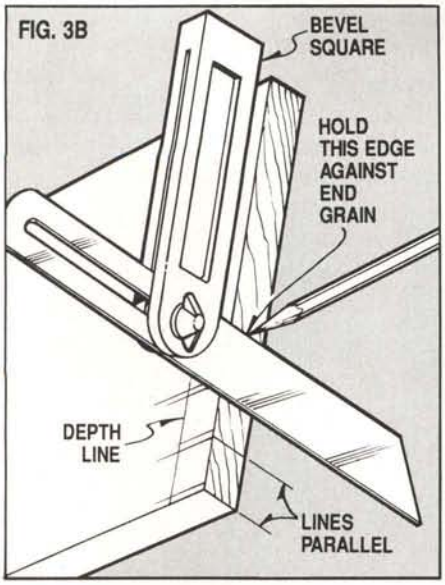
Step 3: Lay out the pin spacing. Since the Cutlery Tray dovetails have narrow pins and wider tails, we found that it was easiest to lay out and cut the pins first and then mark the tails from the pins. It's not practical to cut the tails first because you can't fit a pencil between them to then mark for the pins. The layout in Fig. 3A shows the actual pin and tail spacing as laid out on the ends of the sides. The total adds up to more than the width of the sides because the measurements are being taken along the angle. Start the layout at the top edge and work down. If you've been accurate in cutting the side width and in cutting the compound angle, you'll find that the layout leaves a little extra on the bottom pin. After assembly, this extra allows you to make adjustments along the bottom edge to get a good flush fit where the sides and ends meet the tray bottom, without the danger of ending up with a pin that's fragile.

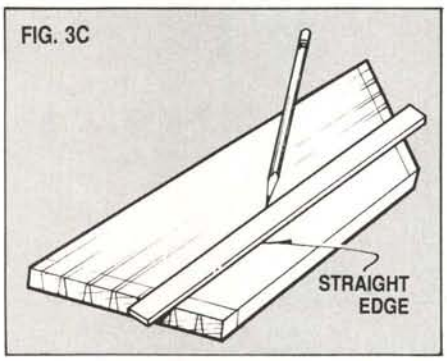
We scribed the pin depth mark to allow for the thickness of the sides as measured at the compound angle cut,



and then added an extra 1/32 in. The extra results in the pins showing a little proud after assembly and thus allows for final sanding. The pins widen from 1/16 in. on the outside face to 1/4 in. on the inside face. To carry the bottom lines of the pins from the outside face across the end grain, set your bevel square from the actual board (it should be 67 degrees), and then just move it up and mark each bottom line (Fig. 3B). *Don't make the mistake of holding the bevel square flat to the face of the board.* As shown, to scribe lines that are parallel to the top and bottom edges, you'll need to hold the bevel square so the blade is flat on the board end. If you have a craftsman's protractor with a movable arm, it's a little handier for this sort of work than the bevel square.

To scribe the top lines of the pins, just turn the sides over and tick off the measurements on the inside face so the pin width is 1/4 in. and the distance between the pins is 7/16 in. Then extend the lines across the end grain to connect

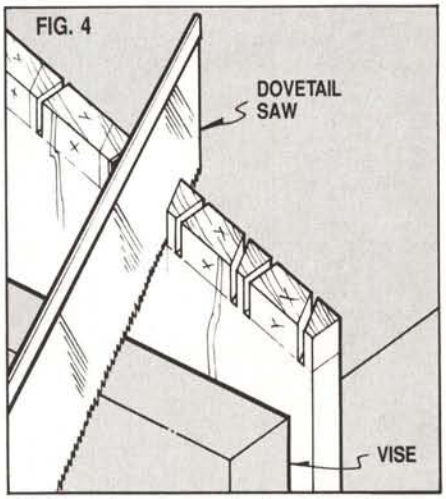




the scribed lines on the inside and outside faces. Don't forget to also mark your depth line on the inside faces of the boards. The best way to accurately transfer the depth line from the outside face is to carry the depth line on the front across at the top and bottom edges, and then scribe a line connecting the points on the inside face.

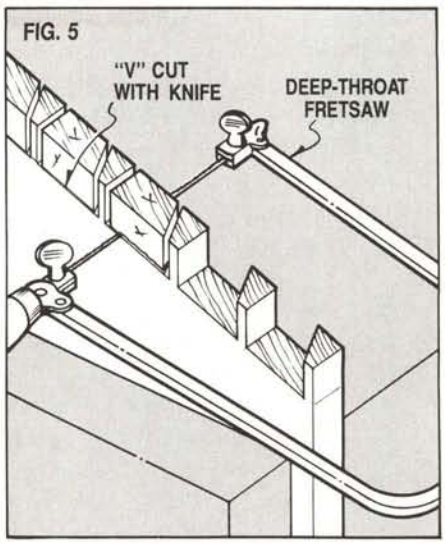
Note how the pins are parallel to the edges. More than anything else, it's important to make certain the pins are parallel if the dovetails are to fit together easily. Here's an easy way to get it right. Tick off the pencil points for the pin spacing on both ends of each board, then use a straightedge to mark the cut lines on both ends at once (Fig. 3C). After you have carried the lines for the pins across the ends to the inside face and made your pencil marks for the 1/4 in. pin width there, just repeat the straightedge technique to mark the pins on the inside faces of the boards. Once the pins are all marked, identify the waste between with an "X" so you won't make a mistake during cutting.

Step 4: Use a fine-tooth dovetail saw to establish the pins. The easiest way to get a true cut is to position the board straight up in the vise so your saw cuts are vertical. We used a Japanese dozuki dovetail saw. The advantages of the Japanese saw are its exceedingly thin

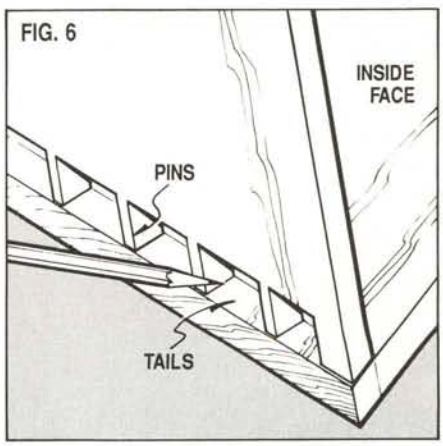


blade and razor teeth that start the cut with no slipping or wandering, even when working on a slope as we are here. Make your cuts on the waste side of the pins so the saw kerf just grazes the pencil layout lines. Check both faces of the board as your cut nears the depth line. You don't want to cut past the line. Instead of trying to cut both sides of each pin before moving on to the next pin, make all the bottom line cuts first. Then reposition yourself so your body is in line with the top line of the pins and make the top cuts (Fig. 4). After your first few cuts, you'll have the rhythm down and the work will go quickly.

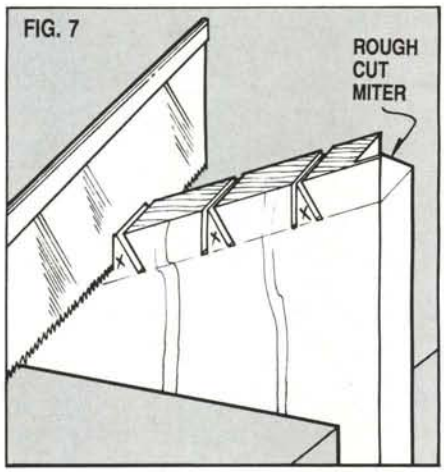
Step 5: The best way to clean the waste from between the pins is with a fretsaw. But first use a sharp knife to make a starting V-cut along the depth line between the pins on both faces. The V-cut will help guide the fretsaw cut (Fig. 5). If you are careful, there should be only minimal work with a triangular needle file and the 1/8 in. chisel to clean out the corners and level the bottom of the waste area between the pins. With a sharp chisel you should be able to just pare the fuzz from the fretsaw cut to get a smooth bottom.



Step 6: Use the pins as a template to mark for the tail cuts. First mark your depth lines on the remaining sides, adding a little extra as before so the dovetails will stand proud when assembled. Then hold the sides with pins on end and flush to the depth line, and mark the tails on the inside face (Fig. 6). A sharp pencil or scribe is important here for accuracy. Use the bevel square to carry the lines across the end grain, making certain the end grain lines are all parallel to the top and bottom edges. Finally, mark out the tails on the outside face and identify the waste area between the tails with an "X".

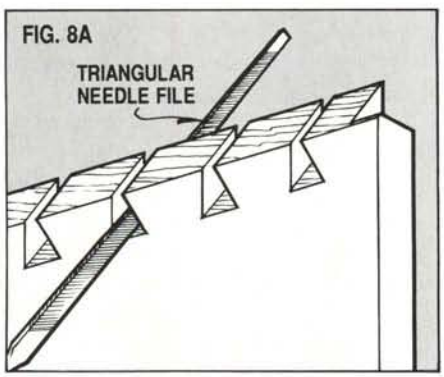


Step 7: The top cut on the tails is made with the sides held vertically in the vise. This way your saw will also be straight up and down. For the bottom cuts, reposition the workpiece in the vise so it's angled slightly but so the saw can



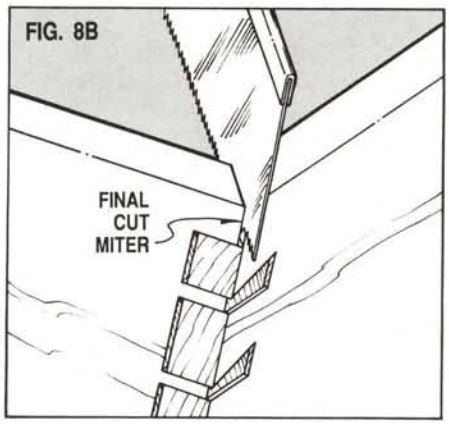
again be held vertically (Fig. 7). As before, locate the cut on the waste side of the pencil or scribe line. The fretsaw and the 1/8 in. chisel or a triangular needle file are used to clean up the waste between the tails. Be careful not to accidently cut away the stock at the top edge, though. The topmost pin and the corresponding part of the topmost tail are cut on a miter. The miter is cut a little long now and then is trimmed back for a flush fit at the same time that the dovetails are final fitted.

Step 8: It shouldn't take much fine tuning to fit the dovetails and get the miter to close up tight. Clamp the tail side in the vise and try to fit the side with pins. If your saw cuts have been accurate, you can usually make the pins fit by



just deepening the cut at the depth line between the tails. The 1/8 in. chisel or a triangular needle file is perfect for this (Fig. 8A). Try to avoid paring the pins or tails away. It's easy to mess up an otherwise carefully cut dovetail at this stage. If as you slide the dovetails together you identify an area that's binding, file or pare only a little bit away at a time. One way to find those pins that are binding is to rub some pencil lead on the sides of the tails. If a pin is binding, you'll see a lead smudge transferred to the part of the pin that needs adjusting.

In fine tuning the dovetails don't make the mistake of having them fit too snugly. The dovetails should slide together smoothly and not require force to assemble. If the fit is too tight, you'll invite a serious assembly problem come glue-up. Since the wood swells a little after the glue is applied, too tight a fit may result in the dovetails failing to fit or seat properly. It's best to use white instead of yellow glue for an assembly like this, since white glue allows a little extra assembly time. There's no sacrifice



of strength with the choice of white glue.

As the dovetails are final fitted you'll also trim back the miters at the top edge. One way to get a perfect miter joint here is to make a final miter cut with the dovetail saw positioned right on the corner, but with the dovetails not quite fully seated (Fig. 8B). When you slide the dovetails home, the miter will close up neatly, leaving no unsightly gaps. Don't worry about trying to allow just enough stock for one final miter cut. Leave a generous amount of extra length (about 1/16 in.) on each mitered end, and then just make as many cuts as are needed to fully seat the dovetails.

Assembly Notes: On the Cutlery Tray project, the V-cuts for the center divider and the scalloping on the top edges of the sides are cut after the dovetails have been final fitted, but before glue-up.

Water-Based Finishes

By Jim Barrett

It's not often that there's a major change in the finishing world. For example, over the last three decades polyurethane varnishes have been the answer to the need of many woodworkers for an easy-to-use, hard, clear and durable surface coating. But necessity is often the mother of invention. The necessity, in this case, arises from recent Environmental Protection Agency (EPA) guidelines for metropolitan districts to set limits on the amount of hydrocarbons, or volatile organic compounds (VOCs) released into the atmosphere. The invention is a group of water-based clear surface finishes that have been introduced by several manufacturers over the past few years. The finishes are designed to comply with existing air quality laws, and are nontoxic and nonflammable to boot.

For those who may not yet have heard, VOCs are a broad class of substances that both individually and cumulatively have begun to take a serious toll on planet Earth—our air, land and water. As it stands today scientists know that were VOC pollution stopped entirely right now, it would still be many decades before the damage that's already been done is even in part corrected. The phasing out of solvent-based in favor of water-based finishes is but one of many steps that we'll see taken to stop—and hopefully someday reverse—the negative impact of VOCs and hydrocarbons on our environment.

The development of clear water-based finishes has followed two lines. On one hand many companies have either recently developed or are planning to soon release clear brush-on surface finishes to replace the solvent-based polyurethanes and varnishes we are all familiar with. On the other hand, for mainly commercial applications, low VOC brushing and spraying lacquers that rival or exceed the performance of conventional nitrocellulose-based lacquers are now available for the consumer.

But few hobby woodworkers have the equipment needed to spray finishes, and many seem to prefer brushing polyurethanes and varnishes to brushing lacquers. Therefore, we decided to limit our focus to those polyurethane-type water-based finishes that can be applied with a brush straight from the can.

What's Available

We found several companies that make clear, water-based polyurethane surface finishes. Some are actually marketed as water-based polyurethane substitutes, but chemically they're in a class by themselves. The ones we tried for this article include Safe & Simple Clear Finish and Super Poly (both from Carver Tripp), Wood Armor (from Deft), Clear Polyurethane Finish, Hydroshield, and Polyshield Clear Finish (all from Hydrocote), Varathane Elite Diamond Finish (from Flecto) and Fabulon Crystal Wood Finish (from Pratt and Lambert).

Introduced about 15 years ago, Deft Wood Armor was among the first water-based clear finishes on the market. The other finishes we tried have been on the market less than five years. All of the finishes have a milky appearance when wet, but dry clear. Unlike solvent-based polyurethanes and varnishes, they are non-yellowing, making them suitable for use

over previously painted or finished surfaces. Deft's Wood Armor, Carver Tripp's Clear Finish, Hydrocote's Clear Polyurethane, Pratt and Lambert's Fabulon and Flecto's Varathane Diamond Finish are interior finishes. The Carver Tripp Super Polyurethane, Hydrocote Polyshield Clear Finish and the Hydrocote Hydroshield (a self-sealing marine grade polyurethane) can be used on both interior and exterior surfaces. Nearly all the manufacturers tout their products as harder, clearer, more flexible, and faster drying than conventional polyurethanes. Carver Tripp offers a special hardener additive that increases the hardness and abrasion resistance of their Safe & Simple finishes by an additional 50 percent. Fabulon offers a similar additive, called Crystal Fortifier, which provides additional hardness to make the product suitable for use on floors and other high-wear areas.

We found the water-based finishes much easier to use than conventional solvent-based finishes. Dry time between coats ranges from 45 minutes to 3 hours but most dry to the touch within 30 minutes. And unlike solvent-based polyurethanes, which rely on a mechanical bond between coats, the water-based finishes chemically bond to themselves, so they don't need to be ''scuffed'' heavily with sandpaper between coats. Brushes and tools conveniently clean up with water.

Application Techniques

As we noted earlier, since most home woodworkers don't have the equipment required for spray application, we decided to concentrate our testing on the brushing versions of the various finishes. However, some of these, such as the Carver Tripp Safe and Simple finishes and Varathane Diamond Finish can also be sprayed. All the products are used directly from the can, and generally should not be thinned before application.

Brushing techniques for applying the various clear finishes are virtually the same. Apply in long, even strokes brushing with the grain in one direction only. Due to their fast dry times you'll need to work quickly. For large areas work on one section at a time, but keep a wet leading edge so you can feather the next section in without any visible overlap marks.

As with any finish, the surface must be clean, dry, and free from all dirt, oil, wax, or polish. If staining is desired, we recommend a quick-drying water-based stain. Be sure the stain is completely dry before applying the finish (most manufacturers recommend 2-3 hours dry time).

Apply water-based finishes directly on closed-grain hardwoods such as birch or maple. For softwoods and for open-grained hardwoods such as oak or ash, first apply one or two coats of a water-based sanding sealer suggested by the manufacturer (stearate-based sanding sealers are not recommended for most of these finishes). Apply two thin, even coats of the final finish. Because water-based finishes dry from the top down, it's best to avoid a single thick coat, which can result in an orange-peel effect.

Temperature and humidity are critical. High temperatures or low humidity will cause the finish to dry too quickly, which will affect leveling and make it hard to maintain a wet leading edge. Low temperatures and high humidity will retard drying time, which can result in orange-peeling. Most manufacturers recommend a temperature of 65–80°F. Do not apply in direct sunlight or drafty areas.

You can use a bristle brush, pad applicator or short-napped roller. On small projects you can wipe on the finish with a soft cloth. We prefer a natural bristle brush with flag or split ends. We found that foam brushes and rollers leave a lather of bubbles, which are difficult to tip off before the finish dries. Because the finishes tend to froth, they should not be over-brushed. For the same reason, most manufacturers warn against shaking the can before use.

Sand lightly between coats with 220-grit open-coat aluminum oxide paper to remove dust specks and other surface blemishes. Final coats can be rubbed out with pumice and rottenstone, or wet sanded with 400-grit wet-or-dry silicon carbide paper to control sheen, if desired.

Multiple coats of water-based finishes bond chemically one to the other, so you needn't sand heavily between coats to provide ''tooth,'' as you would with conventional polyurethanes that rely on a mechanical bond. After a light sanding, wipe off dust with a damp cloth. Do not use a tack cloth because it may contain solvents that could cause fisheyes or prevent good adhesion.

Two coats are sufficient for most projects, but if you want the look of a deep piano-top finish, apply two or three more coats. Remember, multiple light coats are always superior to one or two heavy coats. Cleanup is easy—just use water.

Compatibility with Other Products and Finishes

Most water-based clear finishes are compatible with practically all water- and oil-based stains and varnishes, provided the stain or varnish is completely dry before applying the final finish. We recommend water-based stains because they dry faster. You can apply the finish over a water-based stain in 2–3 hours, but for an oil-based stain you'll need to wait about 24 hours. It's not advisable to apply a water-based finish over a penetrating oil or tung-oil based stains or finishes—such as Watco Danish Oil—because these take too long (up to one week) to cure.

Because water-based finishes don't yellow, you can apply most of them over paints. But painted surfaces should be sanded lightly first with fine-grit sandpaper to ensure good adhesion. Some manufacturers advise against using their water-based products over shellac. Always test finishes before using them on your project, and try to use products made by the same manufacturer. Most companies offer compatible stains and clear sanding sealers for their products, but when in doubt about compatibility always check first with the manufacturer.

Is Water-based Better?

We're used to thinking that if a food is good for you it usually doesn't taste quite as good. Sadly, that thinking often carries over and affects our willingness to accept products that are environmentally safer than others. But manufacturers have invested a great deal of money and research into developing environmentally safe products that also work well, and we think that in the case of water-based finishes they have succeeded.

Finishing
Continued

If you are a hobbyist looking for an easy-to-apply, hassle-free, water clean-up substitute for the solvent-based polyurethane or varnish you've been using for years, then we think you'll find that the new water-based clear finishes are as good as if not better than the products they are replacing. Indeed, we wouldn't be surprised to see solvent-based finishes all but disappear from store shelves several years down the line (see How Safe Are They?).

What's Recommended

As for what's best, we found that all the finishes tested were easy to apply and provided good coverage. Hydrocote's Hydroshield is an obvious choice for exterior applications that will be exposed to the weather. And although it's been around far longer than the others, Deft's Wood Armor has developed a strong and devoted following among woodworkers.

In our tests, we found the Carver Tripp Safe & Simple Clear Finish, Varathane Elite Diamond Finish, Fabulon Crystal Wood Finish and Hydrocote Clear Polyurethane performed comparably in ease of application and final results. All produced crystal-clear, fairly durable finishes, and we'd recommend these for most furniture projects, paneling, and other low-wear applications. The addition of the special hardeners for the Carver Tripp and Fabulon finishes did increase their durability, making them suitable for use on floors, counters, and other high-wear interior applications. The Carver Tripp Safe & Simple Super Poly and Hydrocote Polyshield Clear Finish showed superior wear characteristics for interior and exterior use, but tended to be heavier bodied than the others. These two products required fewer coats to build up a thick surface coating, making them perfect for outdoor furniture.

Sources

For more information on water-based finishes and local distributors, write or call the following manufacturers:

Deft, Inc.
Wood Armor
17451 Von Karmen Ave.
Irvine, CA 92714
(714) 474-0400

The Flecto Company, Inc.
Varathane Diamond Finish
1000 45th St.
Oakland, CA 94608
(415) 655-2470

The Hydrocote Company
Clear Polyurethane Finish, Polyshield Clear Finish, Hydroshield
77 Mill Town Rd.
East Brunswick, NJ 08816
1-800-229-0934

Parks Corporation
Carver Tripp Safe & Simple Finishes
P.O. Box 5
Somerset, MA 02726
1-800-225-8543

Pratt & Lambert
Specialty Products Division
Fabulon
P.O. Box 1505
Buffalo, NY 14240
(716) 873-6000

How Safe Are They?

The development of water-based finishes has been partly in response to individuals—both in industry and as hobbyists—becoming more aware of the health and environmental hazards of toxic solvents. The other side of the coin is the strict new congressionally mandated Environmental Protection Agency (EPA) standards that will require some 60 cities across the country to limit Volatile Organic Compounds (VOCs) to 2.3 lbs. per gallon by 1996. In certain areas of the country, notably Southern California, that VOC limit will take effect even earlier (1994). Current legislation in southern California sets VOC limits at 4.2 lbs. per gallon, a figure all the finishes we tested complied with. For comparison purposes, the water-based finishes we tried have VOC levels from 2.1 to 2.6 lbs. per gallon, meaning that some of the finishes tested already comply with the upcoming stricter standard.

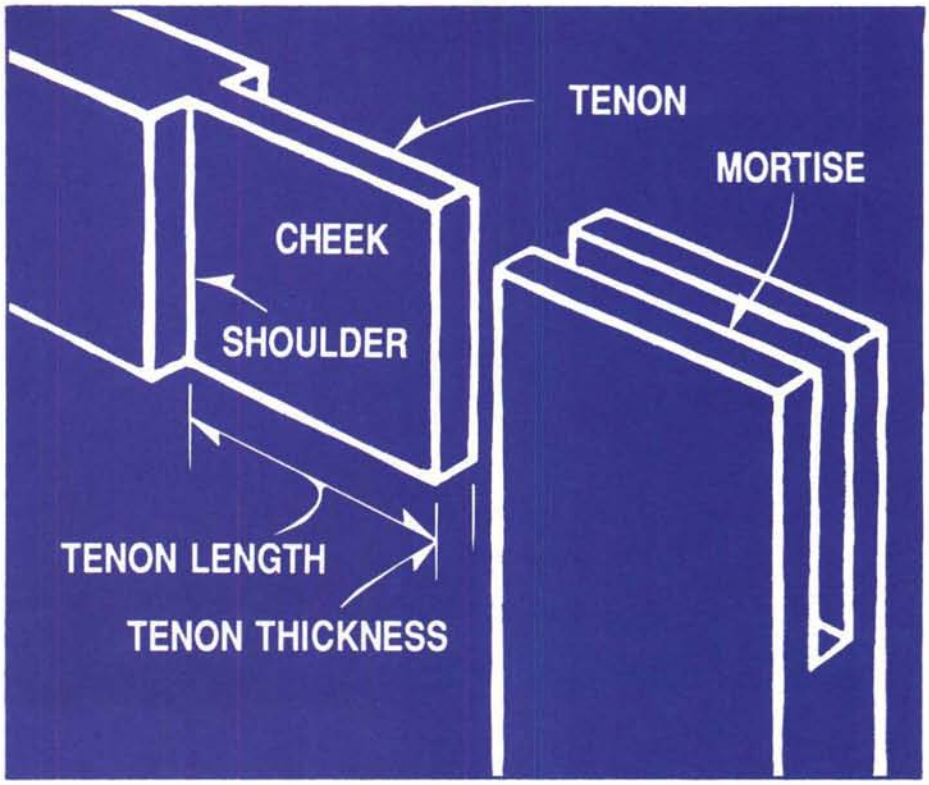
These low solvent levels are what distinguish a water-based finish from other "water soluble" finishes on the market. Although many water soluble finishes can be thinned and cleaned up with water, true water-based finishes are considered nontoxic specifically because of their low solvent levels. The so-called water soluble finishes have higher VOC levels, which make them toxic and flammable. This means that you would need to take the same safety precautions with them as you would with a conventional solvent-based finish.

Whereas the issue of meeting EPA air pollution standards applies largely to industry, the issue of health and safety applies to any woodworker who uses finishes. Conventional solvent-based finishes—nitrocellulose lacquers in particular—emit toxic fumes, which require the user to take personal protection measures such as wearing an approved respirator, gloves, and goggles, providing sufficient ventilation in the work area, and not using the finish near sparks or open flame. For more information, see "Safety: Workshop Finishes Pose Risks," in our July/August 1990 issue.

The new-generation water-based finishes don't require the same precautions that you would take for solvent-based finishes, but you should wear a respirator when spraying them, and avoid accidental skin contact. Most manufacturers recommend an approved dust/mist/organic vapor filter respirator when spraying any finish because the overspray will get in the lungs. The finish may not contain solvents in toxic concentrations, but do you really want your lungs to look like the surface of the project you just finished? A disposable paper mask is not enough.

None of the products we tested that were brushed on required the use of a respirator. But we applied the finishes in a well-ventilated area and wore goggles and latex gloves to avoid accidental skin and eye contact. Water-based finishes are nontoxic when dry, making them safe to use on children's furniture, toys, and similar projects.

Making the SLIP JOINT



If there are rites of passage in woodworking, where one moves from one level of experience to another, then that moment when the first joint is cut and fit stands as such a marker.

Not all woodworkers follow the same path. For some the first joint may be a mortise and tenon or even a hand-cut dovetail. But whatever the undertaking, a whole new world of options is discovered once joinery becomes a part of your woodworking repertoire. After a few simple joints are mastered, your project possibilities soar. Cabinets, frame-and-panel constructions, and projects with doors are all now makable.

The slip joint (also called the bridle joint or open mortise and tenon) stands as one of the easiest joints to cut. It's not much more work than the half-lap joint, yet it's considerably stronger. And there are many ways to cut a slip joint: with a bow saw, a band saw, a backsaw or with a table saw. We've opted to detail the table saw method. The table saw produces a very accurate and therefore strong joint, and there's no hand cutting or chisel work required.

Our technique assumes that you'll be working with stock that's been milled to the same thickness. The technique produces a joint that's centered on the stock thickness—an advantage from a standpoint of strength—and eliminates the need for fussy rip fence readjustments. For both the mortise and the tenon the rip fence is set and squared only once. Key to the technique is the use of a spacer that's equal in thickness to the kerf of the table saw blade that you are using. We'll explain later exactly how the spacer is used and why it's such an easy and accurate way to cut the slip joint. You'll probably want to make extra spacer stock, since it's handy for many other types of joints, including box joints, splined joints and tongue-and-groove joints.

Before starting out it's important to understand joint terminology. The illustration above identifies the various parts of the typical slip joint tenon. We show the slip joint being used in a simple frame construction, such as for a cabinet door, but the slip joint has many uses. Don't be put off by the fact that the joinery is visible. A well cut slip joint makes an interesting design detail, especially on furniture in the Scandinavian or Contemporary style.

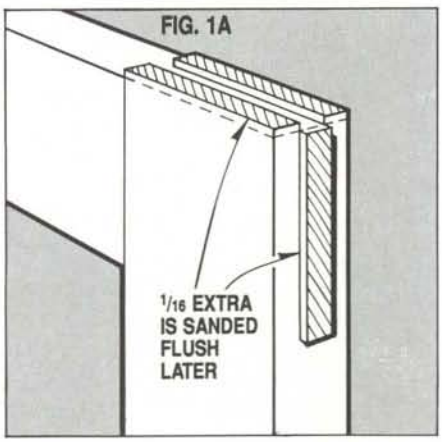
Step-by-Step

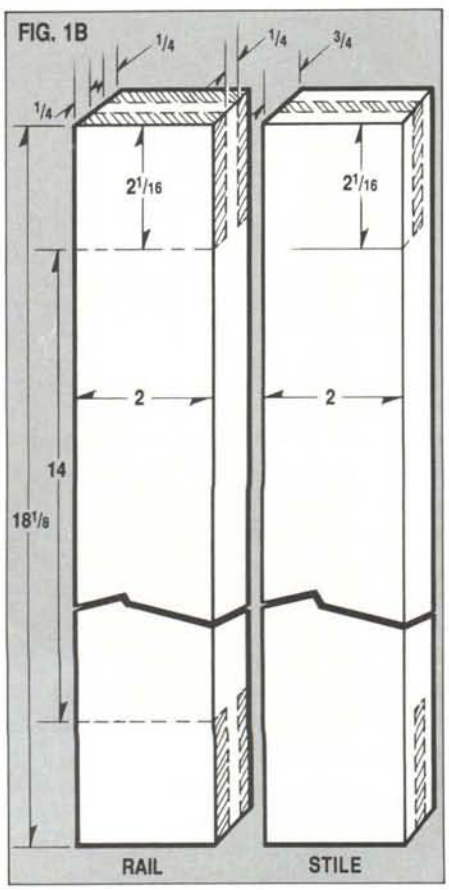
Step 1: Accurate layout is important if your slip jointed frame is to fit properly. You could just cut the frame parts to exact length, and then go to work on the slip joint, but you'll end up with a better looking joint if you allow a little extra so the tenon will stand slightly proud, and can then be sanded off flush (Fig 1A).

Let's say that you are working on a door frame that's made of 2 in. wide stock to fit an 18 in. square opening. Instead of cutting your stock to exactly 18 in. long, make the frame stiles and rails 18 1/8 in. long. When you lay out the tenon shoulders and the depth of cut for the mortise, note that the important distance to maintain is from shoulder to shoulder and mortise to mortise, or 14

in. on our sample frame. When you set up to cut the slip joint, your table saw settings will include the 1/16 in. extra on each end (Fig. 1B). You can make your layout lines with a pencil and square or with a marking gauge. Be sure to mark the waste areas with an "X" so there's no confusion later.

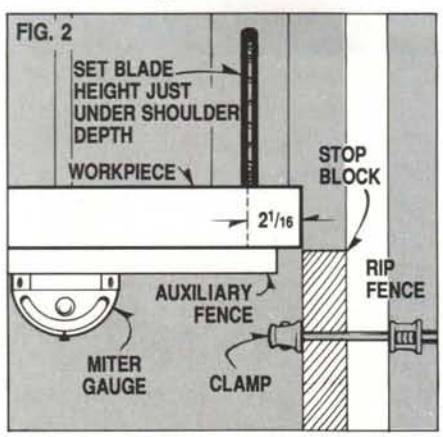
In addition to the stock width and length, you have thickness. There's no hard and fast rule for laying out the slip joint, but try to avoid making any part—either the tenon or the mortise sides—too thin. With our sample frame, which is made from 3/4 in. thick material, we've used a 1/4 in. thick tenon. For some mortise-and-tenon joints the goal is to make the tenon as thick as possible, but a 1/2 in. thick tenon here would have left only a meager 1/8 in. thickness on either side, and that would have produced a weak joint. With the slip joint, a good safe range for the tenon thickness is between one-third and one-half of the overall stock thickness.





Conventional woodworking wisdom often counsels cutting the mortise before the tenon. This is sound advise for some hand joinery techniques where it's much easier to adjust and fit the tenon than to make a similar adjustment in the mortise. But with some machine-cut joints, such as the slip joint, it's not necessary to cut the mortise first. We cut the tenon first and then the mortise. As we'll show later, this cutting sequence enabled us to make the mortise cuts immediately after the cheek cuts on the tenon without first making an adjustment to the rip fence. The technique requires a spacer that's equal in thickness to the thickness of the table saw blade, but saves much time and fuss.

Step 2: Make the shoulder cuts. The best way to make the shoulder cuts is with the miter gauge using a stopblock (Fig. 2). Set the stopblock far enough in front of the table saw blade so the stock is not touching the block as the cut is started. That way you'll avoid having the stock accidently jam between the block and the blade. On our sample frame, the stopblock setting is a little more than 2 in. in front of the blade to allow for the 2 in. stock width.

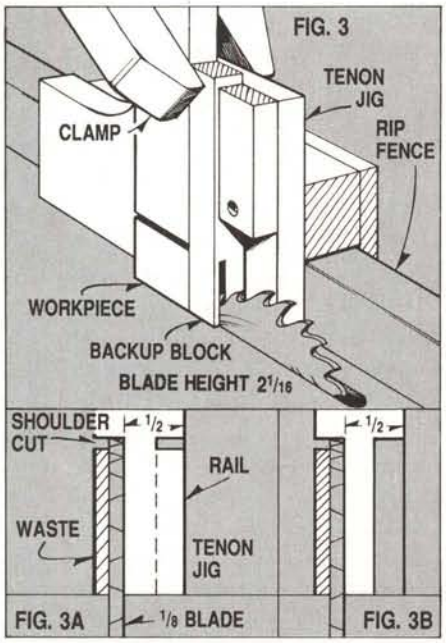


The distance of the block from the saw blade produces the tenon length. Use a stopblock that's clamped to the table saw rip fence as shown. But don't measure over from the side of the blade to the stopblock. You'll need to also include the blade thickness. Make some test cuts on scrap before committing your project stock. If you've started out with all like parts cut to the same exact length, then you can make all the shoulder cuts with the same stopblock setting. Set the blade height just under the intended shoulder depth. You'll use the cheek cuts later to establish the tenon thickness and the inside corner.

We recommend using an auxiliary fence on the miter gauge, both to provide a longer bearing surface and to provide some backing for the shoulder cuts. This reduces the chance of chip-out on the corners.

Step 3: The cheek cuts on the tenons and the mortise cuts are made with a tenoning jig. The jig we use is just two pieces of plywood fastened to a third piece of wood that's the same thickness as the table saw rip fence. Size the jig so it's a good tight fit over the rip fence, but not so tight so it can't slide back and forth easily. A length of board is then fastened straight up and down as a guide piece to index the workpiece so it's perpendicular to the saw table. Clamps anchor the workpiece while it's being cut (Fig. 3). It's a good idea to also include a length of scrap clamped in place in front of the workpiece as a backup block to prevent chip-out as the blade exits. Set the blade height directly from the shoulder cut, using the workpiece as a guide.

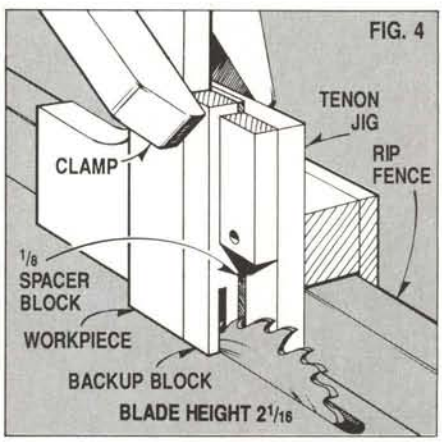
Make your first cut as shown (Fig. 3A), then reverse the workpiece so the opposite face is against the jig, and make the second cut to complete the tenon (Fig. 3B). There are two important

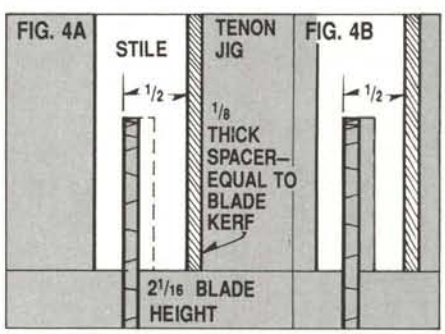


advantages to just flipping the piece, instead of repositioning the fence. First, you'll avoid having to both reset and square the rip fence, a formidable task on many older saws. And second, no matter what the stock thickness, as long as it's consistent the slip joint will end up centered perfectly. This is especially handy if you buy pre-surfaced stock, which typically measures a little more than 3/4 in. thick.

Note that although our illustrations show the procedure for cutting the tenon with the table saw blade, for some tenons you can eliminate Step 2 and just use the dado head to make the cheek cut.

Step 4: Like the cuts establishing the tenon, the mortise cuts are made with the tenon jig. Normally you'd have to move the rip fence over closer to the blade by a distance equal to the thickness of the blade. A method that avoids this fuss, and the inherent problem of having to once again square up the rip fence after each repositioning, is to just insert a spacer equal to the blade thickness between the stock and the side of the tenon jig (Fig. 4). Make a cut establishing one side of the slip joint mortise (Fig. 4A), then reverse the stock to the opposite face and cut the other side (Fig. 4B). With our joint, which uses a 1/4 in. wide slip joint mortise and tenon, the standard 1/8 in. wide table saw blade should complete the mortise with the second cut. But it's a good idea to cut a test mortise in a piece of the frame scrap first just to be sure the tenon has a snug, but not too tight fit. For a slip joint with a thicker tenon, you'll need to follow the second cut with several more clean-out cuts.





As explained earlier, our technique requires that your stock be milled to the same thickness. Where possible it's always best to work with stock that's a consistent thickness. If you are forced to work with stock that varies in thickness (the stile, for example, is a little thinner than the rail), you can still cut the tenon as shown. For the mortise, though, you'll need to gauge off one face only. Make the first cut as shown in Fig. 4A, but instead of reversing the workpiece as shown in 4B, just move the fence over for subsequent cuts until the mortise width equals the tenon thickness. Mark the inside face (the face against the jig) with an "X" to help with assembly later

on. With a door frame, for example, you'll want to keep all the "X" marked faces out. Since working with stock that's not a consistent thickness results in a joint that's not centered, you'll need to be very careful to avoid a situation where one cheek becomes too thin, compromising the joint's strength.

Note that if you have a dado head, only a single pass is usually needed to cut the slip joint mortise. Just set the dado head for the desired width and make certain the cut is centered on the stock thickness. Again, cut a test piece first. If the fit of the tenon is too tight, increase the width of the dado head cut; too loose and you'll want to reduce the width of cut slightly.

Step 5: Assembling the slip joint requires twice as many clamps as for some other frame constructions. This is because it's important to clamp both the sides of the frame and the sides of the joint. Use C-clamps and blocks of scrap wood to prevent marring and to evenly distribute the clamp pressure. Wax paper between the clamp blocks and the stock will prevent surprises if you have excess glue squeeze-out (Fig. 5). Don't skimp on the glue. The slip joint is one assembly that relies heavily on glue strength for a secure joint. Make certain the frame is square before you set it aside to dry. The excess length on the tenons and at the slip joint is sanded flush after the frame is out of clamps.

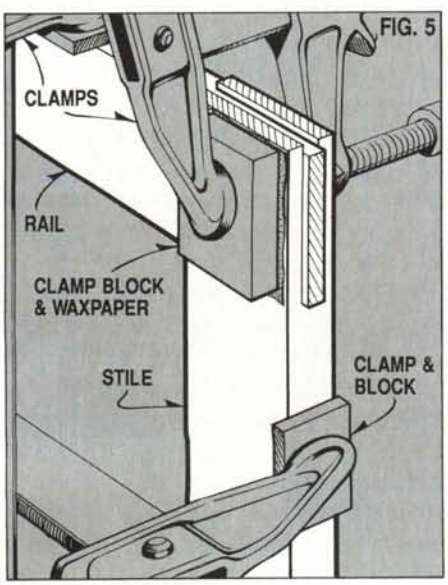


FIG. 5

Fine Points

You'll note that in our slip joint step-by-step instructions we've concentrated on the joint itself. With certain slip joint constructions—such as a drawer frame in traditional case joinery—there are no other elements to consider. But more often than not there are other things that you'll need to be aware of. In a raised panel door frame, for example, there's the groove that holds the door panel, and in a mirror frame there's the rabbet to hold the mirror glass and backing board.

Planning for grooves and rabbets, deciding when it's best to cut them, and designing the project with these things in mind is an important part of woodworking. For some applications the best approach is obvious.

That's the case with the traditional raised panel door frame. You could fit the raised panel in a rabbet cut into the back of the door and secure the panel with a molding or retainer strip, but that's not sound construction. It's far better to cut a groove in the frame for the panel, and then assemble the frame around the panel. The question is when to cut the groove.

The groove is best cut after the joint is made and the frame has been test-fitted. By taking this approach you can identify all of the outside faces of the frame parts and mark them with an "X". You can then cut the groove for the raised panel by gauging the same side of each frame part against the rip fence, insuring a uniform groove all around.

If you are cutting a rabbet in a door frame, such as for the punched-tin panel in our cabinet on page 45, the best approach is to cut the rabbet after the door frame is assembled. Use a router with a bearing-guided rabbeting bit, and square the corners with a chisel. Incidently, if you've decided to make this cabinet, the slip joint is an appropriate joint for the door construction.

SHOP TEST: Six Dovetail Jigs

Hand-cut dovetails are a signature of fine craftsmanship. But they can take more time than a lot of woodworkers can spare, especially those who depend on their work for some income.

If you like the look of dovetails, but don't have the time, the obvious alternative to handwork is to buy a dovetail jig that works with a router. But which one? Until the 1970's there wasn't much choice. The jigs available all worked much the same and were fairly limited. They used a dovetail-shaped router bit to cut the half-blind dovetails used to attach drawer fronts to sides. They're called half-blind because you can see them from one direction, the side, but not the other direction, the front. The jigs were limited by regular spacing of the dovetails, which forced the user to design the drawer size around the dovetail jig. These jigs were developed in the 1920's and remain very popular. Examples we review here are the Sears and Black & Decker models.

More recently, jigs have appeared that aren't limited to half-blind dovetails. Two of the newer jigs are multi-function dovetail jigs that can cut nearly any kind of dovetail done by hand. They are the Leigh Dovetail Jig and the Porter-Cable Omnijig. Another newer jig, the Keller Template, only cuts through-dovetails. The Keller Templates were introduced in the 1970's and grew from prototypes developed in a working cabinet shop. They're designed mostly for carcase work and allow you to cut through-dovetails easily and rapidly.

In the early 1980's the Leigh jig came on the market. It was the only jig able to infinitely vary the dovetail spacing. The Leigh also offered the capability to cut many other types of dovetails, including the through-dovetail.

The Porter-Cable Omnijig later offered much the same versatility as the Leigh, although it still won't do everything that the Leigh can do. For example, there's an attachment to vary the spacing of through-dovetails. But half-blind dovetails are cut with fixed spacing, virtually the same way as on a Sears model.

There's also now available another type of single purpose jig for cutting half-blind dovetails. The Wolfcraft jig uses a modified template design to cut down on the number of adjustments required. Also new is the Incra jig, which isn't

strictly speaking a dovetail jig, but which can be used to cut some types of dovetails on the router table. We didn't review the Incra since dovetails aren't its main function.

Different Template Types

All of the jigs use some type of template. The type that's been around the longest uses a finger template on top of a jig body that has clamps on both the top and front. Both workpieces are clamped onto the jig—one horizontal and one vertical—so both tails and pins are cut in one pass with the dovetail cutter. A guide bushing is attached to the router base. The pieces are offset so that the corresponding tails are indexed with the pins. This version works just fine, but it only cuts half-blind dovetails with fixed spacing.

The Keller overcomes the template limitation by using two templates and two router bits. You cut the pins with one template and a dovetail bit. Then you cut the matching tails with the other template and a straight cutter.

The Leigh does much the same thing, but with a single template with two sides for the two different bits. (See the individual jig descriptions for more on this.) The Porter-Cable Omnijig is very similar to the standard template design used by Sears and Black & Decker, but it has optional templates that expand its capability.

The Wolfcraft jig is a two-part affair with a template that fits over the workpiece and jig that attaches to your router or electric drill—depending on which model you buy. Virtually all the settings are built in. The Wolfcraft is the only maker we know of who makes a dovetail jig that works with an electric drill.

Sears Dovetail Template

The Sears Dovetail Template has been around for a long time. It's similar to the many others that use the same system to cut half-blind dovetails. Both the pins and tails are cut at the same time, but offset so they fit together. Other similar jigs on the market are made by Bosch, Vermont-American, and Black & Decker. We tested the Sears and Black & Decker versions as representative of the group.

The Sears and similar jigs are chiefly useful for making drawers with sides dovetailed onto the fronts. The limited jigs have some real advantages because many of the settings can be built right into the jig. This means you don't have to spend hours on fine tuning. In the case of the Sears, the built-in settings actually allow you to cut three variations of the basic half-blind dovetail. Side stops on the jigs pivot to three different settings, automatically indexing the workpieces for proper orientation of the pins and tails. You have to adjust the depth of the cutter and the position of the template to get a proper fit.

The weakness of the Sears is the weakness of the type in general. Because the template has fixed spacing, you essentially have to design drawers around the jig. If you don't, you'll get slivers of pins at the top or bottom of the drawer, instead of the proper half-pin that makes the joint look right. Also, you need to switch sides of the jig for cutting lefts and rights of the drawers. This switching of sides isn't difficult, but it does enter another variable into the jig. If left and right side stops aren't oriented perfectly with respect to the template, the half-pins will also vary in size. And since the side stop is essentially a point, it's very easy to angle the work ever so slightly against the template.

The Sears instruction manual for the jig is fairly clear. One confusing item in the Sears manual, as well as in several others, is the usage of the term "inside out" when trying to explain

Jig	Size	Dovetail Type*	Price**
Black & Decker 52331	12 in.	HB	$232
Keller 1601	16 in.	T, V	$199
Keller 2401	24 in.	T, V	$299
Keller 3600	36 in.	T, V	$399
Leigh D1258R -12	12 in.	T, HB, V, S	$329
Leigh D1258R - 24	24 in.	T, HB, V, S	$399
Porter-Cable Omnijig 5116	16 in.	T, HB, V, S***	$395
Sears 9-2579	12 in.	HB	$ 50
Wolfcraft 4250	N/A	HB	$ 29.95
Wolfcraft 4205****	N/A	HB	$ 29.95

* Key for joint types. HB = half blind; T = through; V = variable spacing; S = sliding dovetail.
** Prices are list. Substantial discounts may be available from some dealers.
*** Through, variable spaced, and sliding dovetails are options on the Omnijig.
**** Wolfcraft 4205 uses electric drill.

how to orient the workpieces in relation to the jig. For some reason the manual writers ignore the usual method of marking the faces and then using that as a reference, as in "face side toward the jig."

One very nice feature of the Sears jig is a chart mounted on the surface of the jig giving the appropriate jig and router bit settings for the three dovetail variations. It's very handy to have that information right on the jig, instead of having to hunt up the owner's manual.

By and large, the Sears jig, although the least expensive, was capable of machining excellent dovetails. For more information contact Sears, Roebuck and Co., 925 S. Homan Ave., Chicago, IL 60607; 1-800-366-3000.

Black & Decker

The Black & Decker jig works about the same as the Sears, but is a heavier duty version. It uses steel instead of the molded fiberglass in the Sears. Its clamping bars are sturdier, and it has some add-ons that make it an attractive alternative. For example, Black & Decker includes a handy little gauge to set the router depth. Also, the side stops are formed by pins that fit into holes bored into the steel jig body. The arrangement seems sturdier than the Sears plastic stops. It does have the same weakness as the Sears stops in that you gauge off a point rather than a flat surface, so it's easy to slightly tilt the workpiece.

The knobs on the Black & Decker, however, are finger killers. You have to tighten them down really tight because of the pressures involved in cutting dovetails, so the sharp edges bite into your fingers.

The dovetail bit supplied with the Black & Decker was far superior to the Sears. The Sears burned even when brand new, while the Black & Decker gave one of the cleanest cuts of all those tested. For more information contact Black & Decker, 10 North Park Drive, Hunt Valley, MD 21030; 1-800-235-2000.

Leigh Dovetail Jig

The strength of the Leigh jig is its versatility. It's capable of cutting nearly any type of dovetail imaginable. And it allows you to adjust the spacing to any configuration you desire, even random widths along the same joint. If you like, you can make dovetails that look like they're hand done.

The Leigh jig does take a lot of time and patience to set up and get working. You'll need to devote days to learning the ins and outs of this jig. But Leigh makes no bones about that. The jig isn't meant to be uncrated and set to work in an hour.

For example, setting up the jig to join a drawer side to a drawer front with a half-blind dovetail is a trial and error procedure. It took us six depth settings in 12 test pieces to get the adjustment right. But that initial setup doesn't have to be repeated every time you use the jig. Successful test pieces are saved so you can quickly adjust the jig. But you will have to go through the process whenever you change variables such as drawer-side thickness or bit size.

The instructions for the Leigh were thorough, but could

stand some minor improvements. They run you through a sample half-blind setup using an 8-degree dovetail bit. But six tries and 12 test pieces later, you'll discover that the 8-degree cutter needs a drawer front at least 7/8 in. thick. For the more common 3/4 in. thick front, you'll need another cutter, the 14-degree bit. So if you're planning, as we were, to use 3/4 in. drawer fronts, you'll have to go through the trial and error adjustment all over again.

There's just no getting around a considerable amount of head scratching when you buy this jig. Even a perfect set of instructions wouldn't eliminate that. And the instructions do cover a lot of ground and include just about everything you need to know. Especially helpful is a section on how to avoid tear-out, a problem encountered with many router operations.

The jig itself is exceedingly well made. The design is well thought out and it's easy to use once you get the hang of it. The primary usefulness for dovetail jigs is the ability to cut a number of pieces quickly after the initial setup. The Leigh fulfills that function well because the jig offers a stable surface for the router base, and the workpieces are easily clamped in place and removed.

Another point of note is the adjustable fingers. Already noted is the ability to create a hand-done look with somewhat random spacing. But the adjustable fingers also make dovetail layout easier in general. You can place the fingers directly over the work and align them to your liking, whether it be precisely spaced tails and pins or an eyeball job. Because they're infinitely adjustable, you don't need to design the work to fit the spacing of the dovetails.

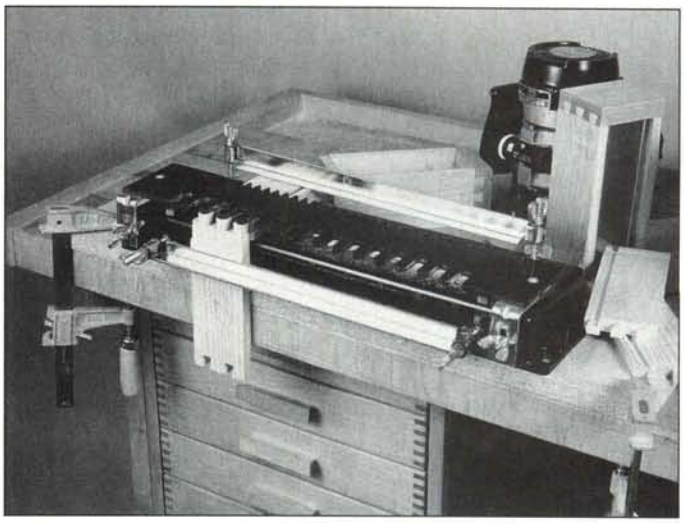
The Leigh also allows you to cut variations of dovetails such as compound dovetails often used for dough boxes, cradles and knife boxes. Unfortunately, the instructions don't support that capability very well. The section on cutting compound angles will, if you follow the instructions, give you a box with gaps on the insides of the dovetails. To prevent that, you need to use a shop-made angled shim that creates the compound angle. Leigh tells you about the shim in another section of the instructions, but doesn't tell you it's needed for the compound dovetails.

But the versatility of the Leigh isn't matched by any other jig. And you get all the capabilities without having to buy a slew of accessories. Besides the joints already mentioned, the jig will cut sliding dovetails, cogged dovetails, end-on-end dovetails, obtuse dovetails, dadoes, box joints and full-blind multiple splines. Leigh also sells a separate attachment to cut multiple mortises and tenons.

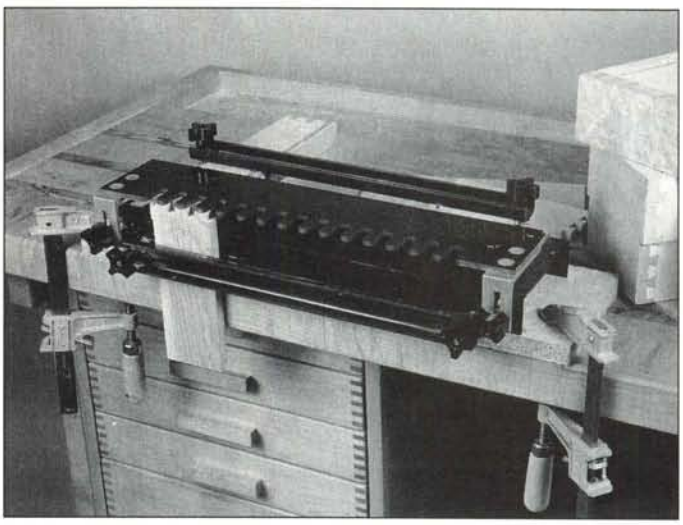
For some of those operations, such as the sliding dovetail, you're better off using a router table. But still, there are a lot of possibilities here. For more information contact Leigh Industries Ltd., P.O. Box 357, Port Coquitlum, BC V3C 4K6 Canada; (604) 464-2700.

Porter-Cable Omnijig

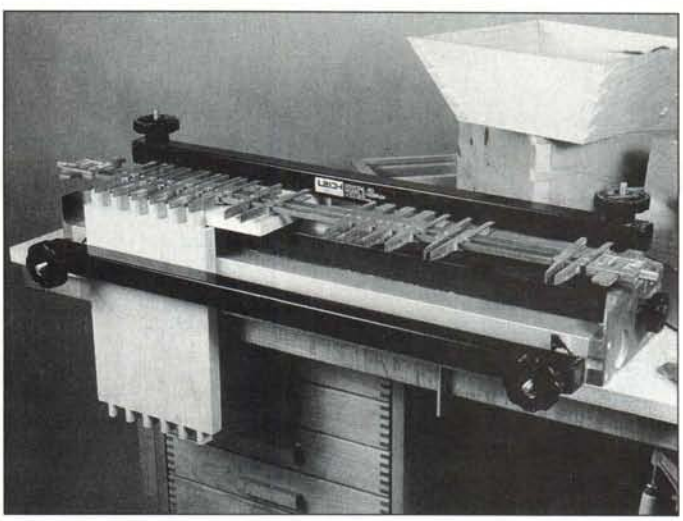
The strengths and weaknesses of the Omnijig are similar to the Leigh jig. Like the Leigh, the Omni is solidly built and well engineered. In fact it seems sturdier than the Leigh and really



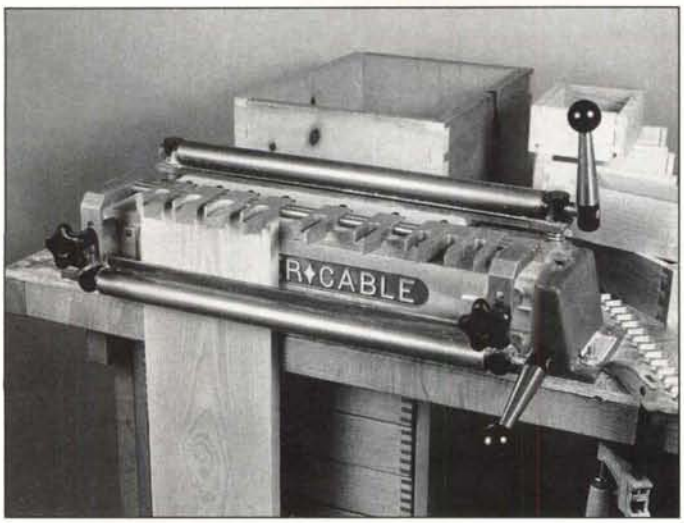
Sears 9-2579



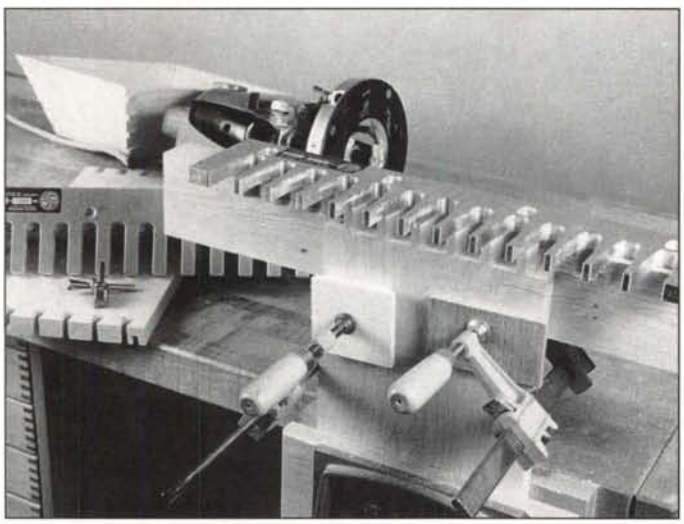
Black & Decker 52331



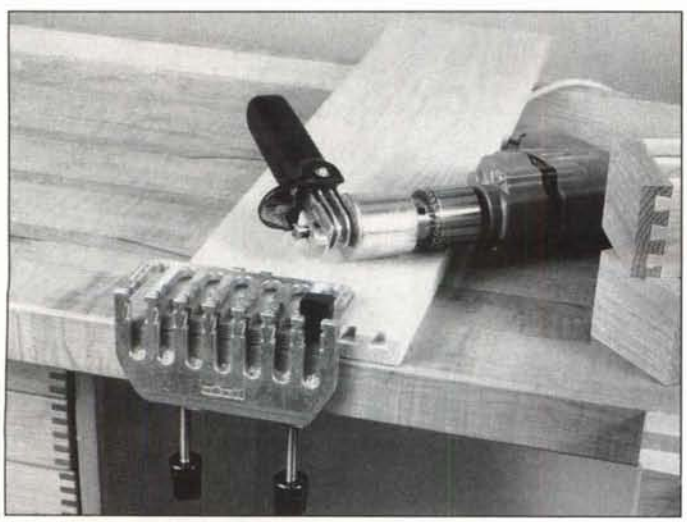
Leigh D1258R-24



Omnijig 5116



Keller 1601



Wolfcraft 4205

designed for heavy production use. But the Omni takes more setup time than the Leigh. There are more adjustment points and consequently more places to screw up. Also, once you go through the process of adjusting the jig for a particular joint, and then change the settings for a different joint type, it's harder with the Omni to re-establish those original settings.

The Omni will cut an astounding variety of different style dovetails, even box joints. But with the Omni, variety is an add-on. You have to buy the extra templates to get it to do all its tricks. The variable spacing template alone lists for over $100. There's also a hand-dovetail template (which has wider spacing to simulate the handmade look), a sliding dovetail template, a box joint template, and the standard dovetail template. There's an array of bits to go along with the different templates.

The setting mechanisms do work well once you get the hang of them. But that takes a while. Common sense tells you you're in for a bit of trouble when the instructions for the Omni tell you to adjust the template to "about" 19/32 in. from the workpiece edge. You'll search through the instructions in vain for a reference to how to adjust this particular dimension. For some reason that tidbit is left out of the instruction booklet, although it is well covered in the instructional videotape that's sold for the jig.

The instructions for the Omni generally leave much to the imagination, but there is enough there to get you through. The videotape, however, is easy to follow and covers virtually all of the ground left out of the instruction manual.

One nice feature of the Omni is the cam clamping system. A single handle is raised and lowered to lock each workpiece into place. The system eliminates much of the tedious twirling of knobs found on most of the other jigs.

Overall, the Omni jig does what it's designed to do: cut a large number of identical dovetailed pieces. It would be ideal for a production shop that makes a large number of dovetailed drawers, and rarely varies the general drawer type, sticking mainly, for example, to rabbeted drawers with a 3/4 in. thick front. Once set up for these drawers, they can be easily made in a variety of sizes and heights without changing the crucial jig settings. In such an environment, setup time is less important because the volume is so great. But if you're looking for a jig that changes easily from one joint type to another, the Omni probably isn't the best choice. For more information contact Porter-Cable, P.O. Box 2468, Jackson, TN 38301; (901) 668-8600.

Keller Templates

The Keller jig is unique in that it's the only one on the market designed specifically to cut through-dovetails. And it does that job beautifully. The setup is easy, adjustments minimal and the joints perfect. Company President David Keller claims, in fact, that there are no trial and error adjustments and that you get perfectly fitted dovetails every time no matter what the stock thickness—within the capability of the jig.

The pleasant fact is that the statement is only a slight

exaggeration. You do have to fine tune the jig when you set it up to get precisely fitted dovetails. And you will have to repeat the procedure from time to time, such as when you have the router bits sharpened or you change the mounting blocks for the jig. But the setup procedure is far easier than the other jigs.

The design simplicity of the Keller system is what makes it easy to set up and use. There are two separate templates, one with straight-sided fingers and one with angled fingers. And there are two bits, one straight and one dovetailed. Both bits have ball bearings mounted on top of the cutter so that you can place the templates over the workpiece and rout out exactly what you see between the fingers.

First you use the template with the straight fingers and the dovetail bit to establish the tails. Then you use the angled template and the straight bit to rout the corresponding pin sockets.

Because the straight bit and its ball-bearing guide have the same diameter, you cut out the precise area beneath the template fingers—what you see is what you cut. This is key to the function and ease of use of the jig. Because you see exactly what you cut, you can directly scribe the already cut tails onto the ends of the boards, the same way you do with hand-cut dovetails.

And for repeat work, you just index one workpiece, set up a stopblock and cut as many as you wish. Indexing the tails with the pins becomes a simple, foolproof operation, instead of a complex exercise in side-stop offsets.

The overall simplicity of the Keller system leads to benefits that are only fully realized once you start using the jig. It makes such a difference to be able to scribe the tails onto the pin stock and cut them essentially the same way you do with the hand version. For example, it's easy to adapt the jig for cutting compound dovetails. You'll need to make an angled shim similar to the one used for the Leigh jig. But with the Keller jig, it's much easier to position and clamp the shim as well as the backup blocks you'll need to prevent blowout. You'll find yourself doing much less head-scratching because you'll see exactly how the angles will be cut as you place the workpieces on the template.

Another important benefit of the Keller system is that the stock thickness can vary without any effect on how the joint fits. In the real world, this is a huge benefit. Having to depend on uniform stock thickness is a prescription for sloppy joints unless you thickness your own stock. Also, the Keller system allows you to easily vary the spacing of the dovetails. Because the pins are scribed directly from the tails, it's a simple matter to move the template to change the spacing when cutting the tails. Then those tails are scribed onto the pin workpiece. There's no question, however, that the Leigh jig is much quicker and easier at variable spaced dovetails. You set it up once and don't have to stop and move a template during the cutting.

The Keller jigs come in three different sizes, 16 in., 24 in., and 36 in. Each size jig comes with its own set of router bits, which are smaller or larger depending on the jig size. For more information contact Keller & Co., 1327 "I" St., Petaluma, CA 94952; (707) 763-9336.

Wolfcraft Jig

The Wolfcraft is a refreshing change of pace from the other jigs because most of the fussy setup is eliminated. The setups are essentially incorporated into the jig. All you adjust is the depth of the cutter, which is easily done with only one or two scrap pieces.

The Wolfcraft is somewhat of a different animal than the other jigs. It's a two-part fixture that attaches to the workpiece and to the router or electric drill. There are two versions—one for the electric drill and one for the router. The jig, for router or drill, works in conjunction with an L-shaped template that fits over the workpiece.

The arrangement overcomes one of the inherent limitations of a fixed template. Usually, you have to cut the workpiece at either the left or right of the jig to index the tails with the pins. But the Wolfcraft allows you to center the jig over the workpiece to cut the drawer fronts. Two indexing fingers then automatically line the front up with the drawer sides. It's easier to create symmetrical drawers without having to size them to be a multiple of the pin size.

One drawback of the drill version of the Wolfcraft is that it tears out more than the router jigs. The slower operating speed doesn't give the same finish. However, careful use of backing blocks and scribing in depth lines will eliminate much of the tear-out. Also, the jig is less precise and allows some wobbling during the cutting. This can make the joints vary in tightness. We found that with a little practice we could get consistent results. But still, you're not dealing with the absolute precision of the other jigs.

The Wolfcraft is so simple to use that the lack of readable instructions wasn't much of a bother. The instructions were apparently translated from German, with less than perfect clarity. For more information contact Wolfcraft, 1520 W. Ardmore Ave., Itasca, IL 60143; (708) 773-4777.

Conclusion

Aside from the cost, your choice of which dovetail jig to buy will depend primarily on the type of work you do.

If you're only going to use dovetails for an occasional drawer, it doesn't make sense to buy a Leigh or an Omnijig. Go with the Sears, Black & Decker or Wolfcraft. If you want to do through-dovetails, but don't need the ability to cut the half-blind version for drawers, the Keller is your best choice. It's the easiest of all the jigs to use and great for production use.

If you want to turn out dozens of drawers, you'll want the Omnijig or Leigh. The Omni is a sturdy tool and easy to use in a production environment. The cam clamps are a real plus. But the Omnijig is difficult to set up and adjust and doesn't change very readily from one type of dovetail to another.

If you want the production capability of the Omni—and the ability to change setups easily—go with the Leigh. The Leigh is the only jig that offers the variable spacing in all its modes, and you don't need to buy a slew of accessories. WWJ

TV and VCR Cabinet
with Pocket Doors

With the explosion in video technology now well entrenched in everyone's living room, we decided to design a place to contain the sprawl of electronics, tapes and wires. Our TV/VCR Cabinet has a spot for the TV, a drawer for the tapes, a shelf for the VCR, and even a spare shelf you can use for a cable-control box or remote control units. Best of all, pocket doors put all the electronics out of sight when company comes.

We used 3/4 in. thick oak plywood for the case, and a box-within-a-case construction. The interior box overcomes one of the difficulties of designing around pocket door slides, providing sturdy shelf support inside the case. The pocket doors prevent a direct connection to the case sides. Because the interior box provides plenty of support, you can place the TV on one of the adjustable shelves. That way, you can vary the height of the TV to suit your taste. If you do place the TV on an adjustable shelf, make sure to secure the shelf to the shelf supports with screws.

Start by cutting the plywood to the sizes shown in the Bill of Materials, using the cutting diagram as a guide. Note that the plywood part sizes don't include the 1/4 in. thick edging strips (N) that face the plywood. Cut the edging a tad oversize in width and glue it to the plywood. The edging goes on the side (B), box side (O), box top (P), box bottom (Q), box shelf (R) and adjustable shelf (T). Apply the edging to both front and back of the sides (B), but only the front of the other plywood parts. Also, establish the cutouts in the base of the plywood sides.

Apply the molded edging (I) to the top (A). For this it's best to apply the edging before shaping with a router, because it's easiest to clamp the edging while it's square.

Now cut to size the stock for the two internal frames and establish the mortises and tenons. The mortises in the stiles (D) and the tenons on the rails (E) are the same for both sets of frames, but the top frame will have a rabbet cut on the sides (see Top Frame Detail).

With the frame joinery complete, start on the rabbets and dadoes. First, cut the dadoes and rabbets in the case sides (B) and interior box sides (O). Note that the dadoes in the case sides are two different widths. The bottom dado is 3/4 in. wide by 3/8 in. deep, but the dado at the top is 3/8 in. wide by 3/8 in. deep.

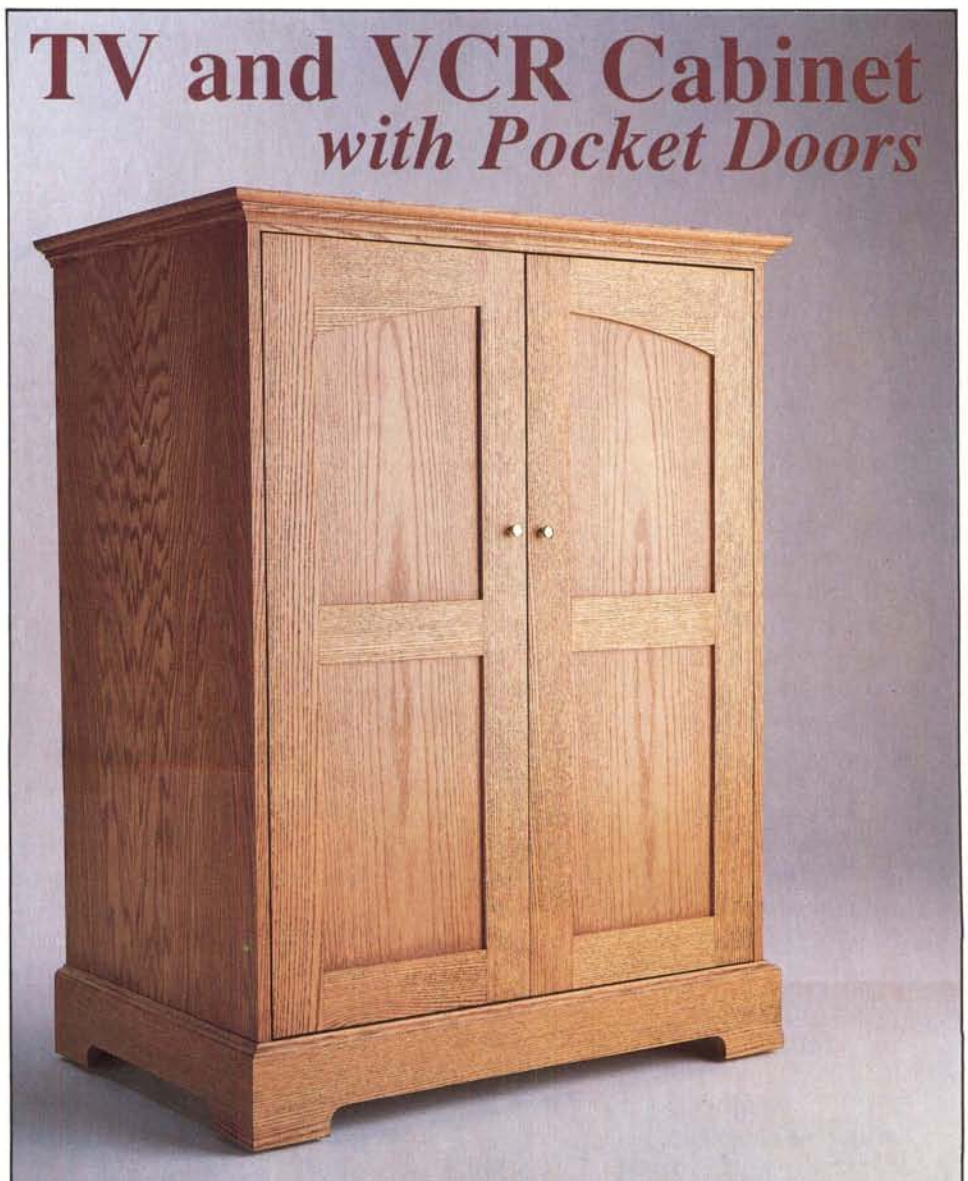
The dadoes in the box sides are all the same size, 3/8 in. wide by 3/8 in. deep. The rabbets in the case sides for the back (J) are 1/4 in. wide by 3/8 in. deep. The box sides are only rabbeted for a back (S) at the bottom behind the drawer, so the 1/4 in. wide by 3/8 in. rabbet is stopped 7 1/8 in. from the bottom. Also establish a 1/2 in. wide by 1/4 in. deep groove in the sides to accept the shelf standards (KK).

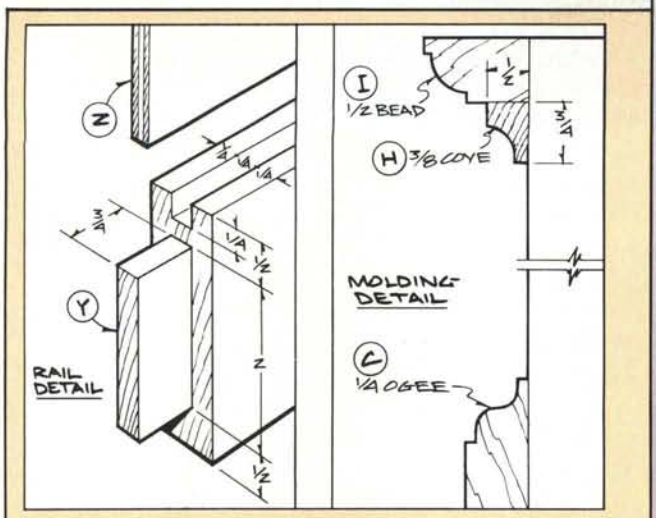
The glued-up frames, the box top (P), the box bottom (Q) and the box shelf (R) are now rabbeted on the ends to fit into the dadoes. Those rabbets are all 3/8 in. wide by 3/8 in. deep. The shelf also has the identical rabbet cut into the rear edge to receive the box back.

Once those rabbets are cut, the two cases can be dry assembled to make sure everything fits together correctly. While the case is assembled, cut the frame facing pieces (F and G) to fit. The top frame facing has 3/8 in. thick by 3/8 in. wide tenons on the ends, which fit into the dadoes at the top of the case sides (see Frame Detail).

Next, cut the two backs and the back base (K) to size and sand all the parts in preparation for assembly. The back base needs to be rabbeted where it fits into the back rabbet in the sides. Also cut the 1 in. diameter hole in the back for the wires, as well as several ventilation holes behind the television.

Assemble the outer case first, using screws and glue to hold the shelves in the dadoes, and screws to fasten the top to the frame. Those screws come from the inside as shown in the exploded




N
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MOLDING DETAIL
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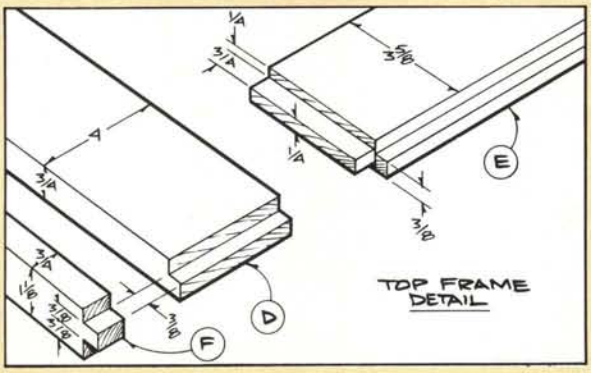
1/4
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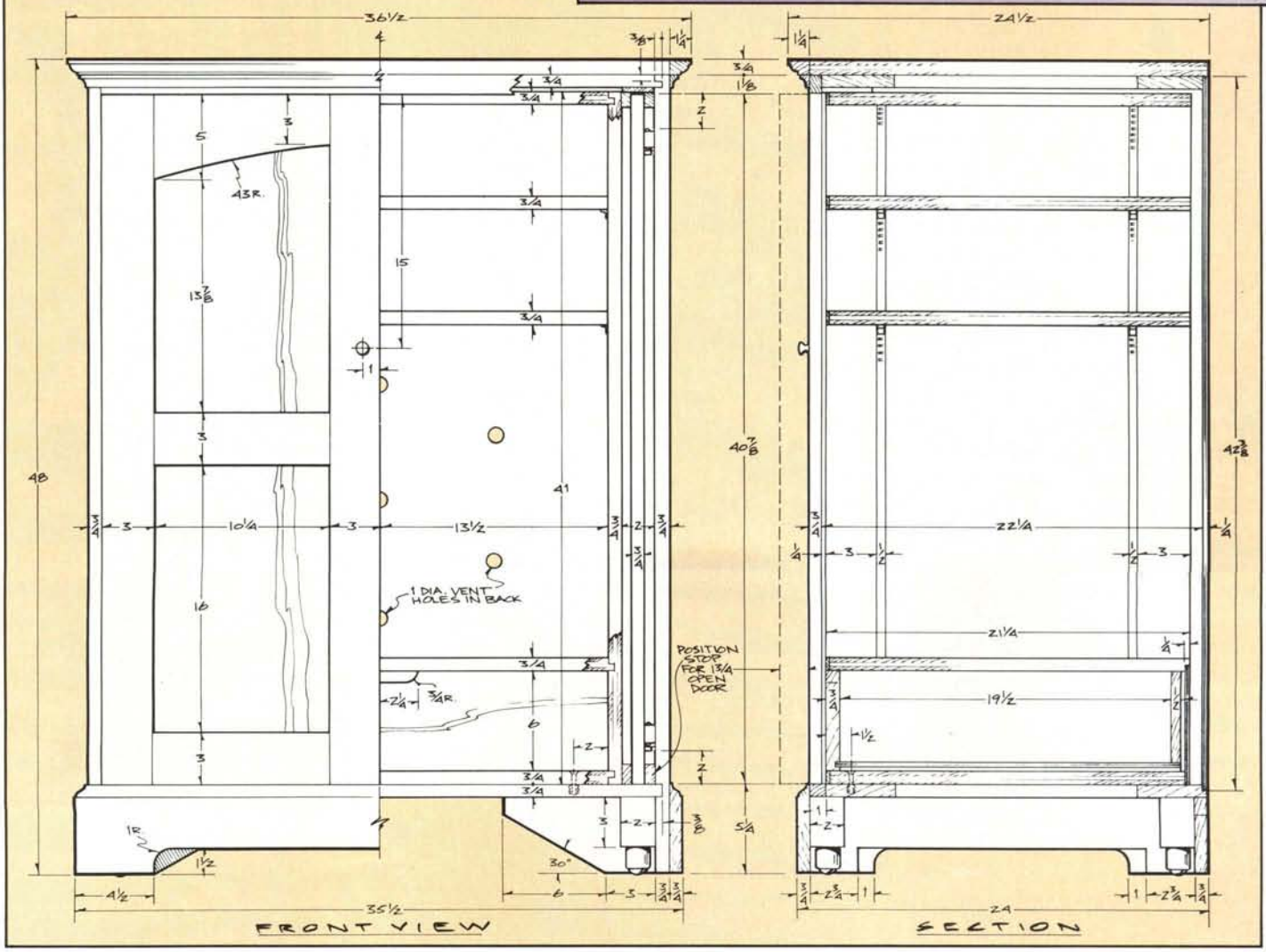
F
D
TOP FRAME DETAIL


36 1/2
24 1/2
48
40 7/8
42 3/8
41
43R.
13 7/8
15
16
10 1/4
13 1/2
22 1/4
21 1/4
19 1/2
1 DIA. VENT HOLES IN BACK
POSITION STOP FOR 1 3/4 OPEN DOOR
2 1/4
3/4R.
1R.
1 1/2
30°
4 1/2
35 1/2
24
5 1/4
FRONT VIEW
SECTION

view. Use the back to square up the carcase and temporarily screw it in place until the glue dries. You'll remove it to install the interior case.

After assembling the outside case, glue and clamp the interior box together and install the box back.

Now, cut and miter the base pieces (C) and the molding (H) to fit. The molding is shaped with a 3/8 in. radius cove cutter in a router. The base is shaped with a 1/4 in. ogee and then cut to shape (see detail). Also cut the foot blocks (L) and the glueblock (M). Glue the foot blocks inside the case and use them to help support the base. The glue block is glued in position after the base is set in place. While you're working on the base, install the four casters (HH).

Next, make the paneled door to fit the actual opening of the case, which may vary from the nominal size. First, pick out some of your best oak for the stiles and rails. Then cut the stiles (W) and rails (X and Y) to size.

The mortises in the stiles are cut first. Note that the width of the mortise for the top rail varies because of the arch. All the mortises are 1/4 in. wide by 3/4 in. deep by 2 in. long except for the wide portion of the top rails. That mortise is 4 in. long.

After cutting the mortises, move on to the tenons. Establish the shoulders with crosscuts on the table saw and use a tenon jig to remove the waste and reveal the shoulder on two sides. Then use a chisel or handsaw to establish the other two sides of the shoulder.

For the arched top rail, work with the piece as a rectangle as long as possible. Cut the tenon along the whole 5 in. width on both ends of the workpiece, then cut the arch and establish the 1/2 in. shoulders. You'll need to establish the 1/4 in. wide by 1/4 in. deep panel groove in the arch with a bearing-guided wing cutter in a router table. And since you must use that for the arch, it's best to cut all the grooves with the same setup.

Next, cut the panels (Z) to size and establish the arches on the top panels. Note that the panels should be slightly under the groove-to-groove dimension of the doors, which is given in the Bill of Materials. You need about 1/16 in. of space to be safe and insure that the panels don't prevent the joints from closing up tight.

The drawer employs a rabbet and dado to hold the sides (BB) onto the front (AA). All the drawer joinery can be cut with a 1/4 in. wide dado head in the table saw. For the 1/4 in. wide by 1 in. deep groove in the ends of the front (see Drawer Detail) the workpiece is on end, so you'll need to provide adequate support for safety. You can support the workpiece with a tenon jig.

After cutting that deep groove in the front, establish the 1/4 in. wide by 1/4 in. deep dadoes in the sides and the 1/4 in. wide by 1/4 in. deep rabbets in the back (CC). Also cut the 1/4 in. wide by 1/4 in. deep drawer-bottom grooves in the front and sides. Next, cut 3/4 in. off the inside "tongue" on each end of the drawer front. Also cut the drawer bottom (DD) to size.

For the hand-hold on the drawer front, it's easiest to rough in the shape on the band saw and clean it up with a flush cutter in the router.

The piece is now essentially complete. You just need to finish it and install the hardware and the stopblocks (U) and spacer blocks (V). The stopblocks position the interior box and serve as mounts for the plastic bumpers that stop the pocket doors as they slide back into the case. The spacer blocks serve as mounts for the plastic guide wheels that keep the doors on track as they are opened and closed. The bumpers and guide wheels are included with the hardware.

While the box is in place, also drill the two 1/4 in. diameter positioning holes in the bottom, 2 in. in from the sides and 1 1/2 in. from the front. Use a stop on the drill bit and set it just over 3/4 in. deep. The point of the drill will mark the frame underneath for the 3/8 in. diameter holes for the threaded inserts (JJ).

For a finish, we used Minwax Golden Oak Wood Finish followed by three coats of Varathane Diamond Finish, which is a transparent water-based finish that's easy to apply and dries quickly.

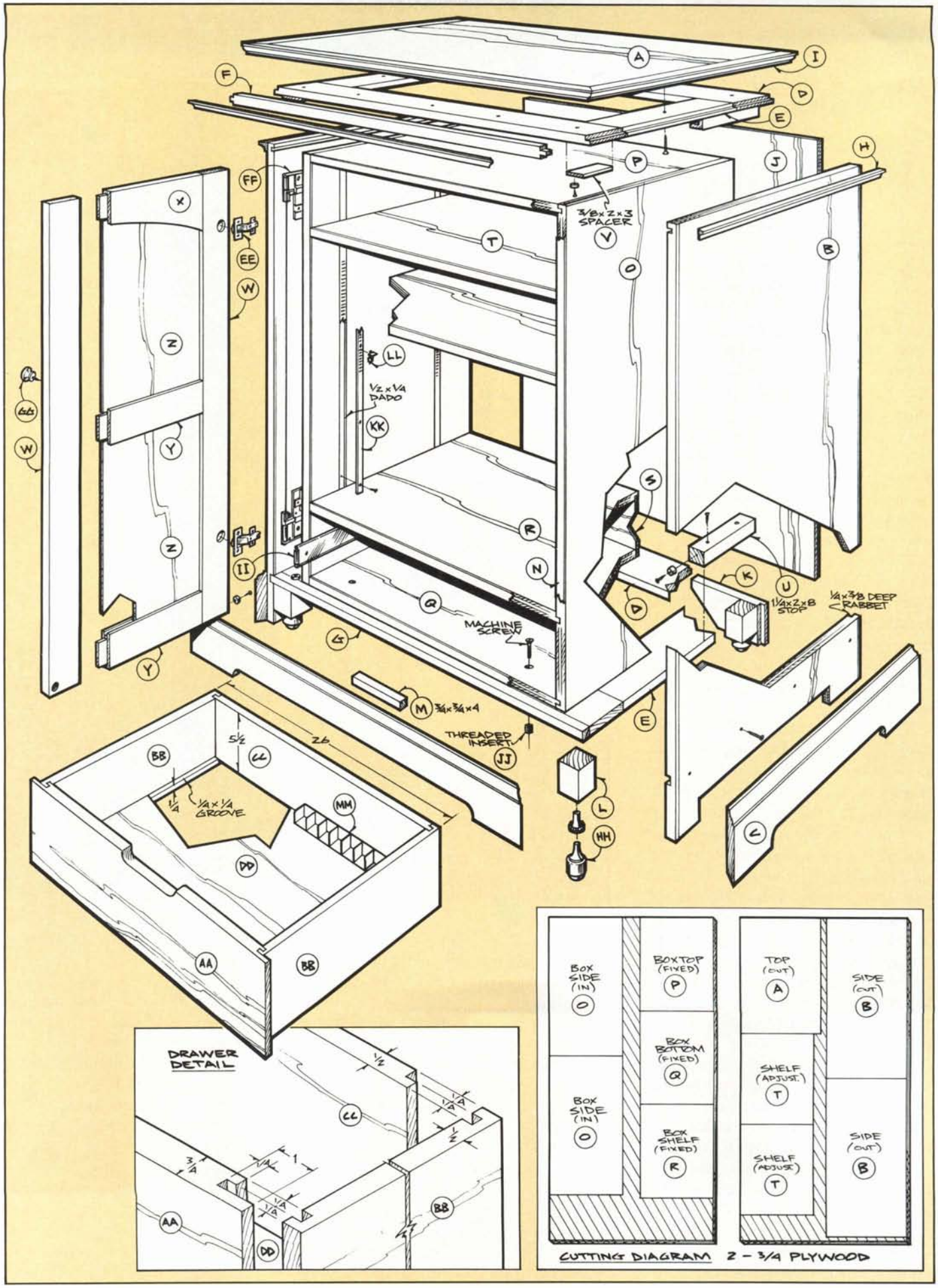
With the case finished, move on to install the hardware. The doors use the Accuride pocket door slides (FF), which employ an AntiRak cable system to prevent racking. You'll need a 32 mm drill bit to bore the holes in the doors for the European style hinges (EE), which come with the pocket door slides. Ordering information for the hardware and the drill bit is given in the Bill of Materials. Also install the full-extension drawer slides (II), the knobs (GG), shelf standards (KK), shelf supports (LL) and tape holders (MM). Position the stopblocks behind the doors so that enough of the door protrudes to easily pull them out.

Bill of Materials
(all dimensions actual)

Part	Description	Size	No. Req'd.
A	Top	3/4 x 23 1/4 x 34	1
B	Side	3/4 x 22 3/4 x 47 1/4	2
C	Base	3/4 x 5 1/4	as req'd
D	Frame Stile	3/4 x 4 x 33 1/4	4
E	Frame Rail	3/4 x 4 x 15 3/4	4
F	Frame Facing (Top)	3/4 x 1 1/8 x 33 1/4	1
G	Frame Facing (Bottom)	3/4 x 1 x 33 1/4	1
H	Molding	1/2 x 3/4	as req'd
I	Top Edging	3/4 x 1 1/4	as req'd
J	Back	1/4 x 33 1/4 x 42 3/8	1
K	Back Base	3/4 x 4 1/2 x 9 3/8	2
L	Foot Block	2 x 2 x 3	4
M	Glueblock	3/4 x 3/4 x 4	1
N	Edging	1/4 x 3/4	as req'd
O	Box Side	3/4 x 21 x 41	2
P	Box Top	3/4 x 21 x 27 3/4	1
Q	Box Bottom	3/4 x 20 3/4 x 27 3/4	1
R	Box Shelf	3/4 x 21 x 27 3/4	1
S	Box Back	1/4 x 7 1/8 x 27 3/4	1
T	Adjustable Shelf	3/4 x 21 x 27	2
U	Stopblock	1 1/4 x 2 x 8	4
V	Spacer	3/8 x 2 x 3	2
W	Door Stile	3/4 x 3 x 40 7/8	4
X	Door Upper Rail	3/4 x 5 x 11 3/4	2
Y	Door Rail	3/4 x 3 x 11 3/4	4
Z	Door Panel	1/4 x 10 3/4 x 16 1/2**	4
AA	Drawer Front	3/4 x 6 x 27	1
BB	Drawer Side	1/2 x 6 x 20 1/2	2
CC	Drawer Back	1/2 x 5 1/2 x 25 1/2	1
DD	Drawer Bottom	1/4 x 20 1/4 x 25 1/2	1
	Hardware*		
EE	Hinge	as shown	2 pair
FF	Pocket Door Slides	as shown	2 pair
GG	Knob	3/4 dia. brass	2
HH	Caster	as shown	4
II	Drawer Slide	as shown	1 pair
JJ	Threaded Insert	1/4-20	2
KK	Shelf Standard	as shown	4
LL	Shelf Support	as shown	8
MM	Tape Holders	as shown	4 pair

* Available from Constantine's, 2050 Eastchester Road, Bronx, NY 10461; tel. 1-800-223-8087. For a package including all the above parts, order catalog no. WW.1990, which sells for $164.15 postpaid. Individual catalog numbers and prices are: Pocket Door Slides, no. AS 1422, $40.75/pair, includes hinges; Drawer Slides, no. AS 4020, $21.25 pair; Shelf Standards, no. 125B4, $2 each; Shelf Supports, no. SS21B, $1.50/10; Threaded Inserts, no. 119E25, $3.45/10; Casters, no. 89T5A, $20.95/4; Knob, no. SBH13, $2.45 each; Tape Holder, no. WT7126, $5.65 per pair. The 32 mm drill bit, no. DB35, is also available from Constantine's for $9.95.

** After arch is cut, top panels will be slightly less in length.


A
I
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1¼x2x8 STOP
¼x⅜ DEEP RABBET
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CC
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AA
DD
BB
BOX SIDE (IN) O
BOX TOP (FIXED) P
BOX BOTTOM (FIXED) Q
BOX SIDE (IN) O
BOX SHELF (FIXED) R
TOP (CUT) A
SIDE (CUT) B
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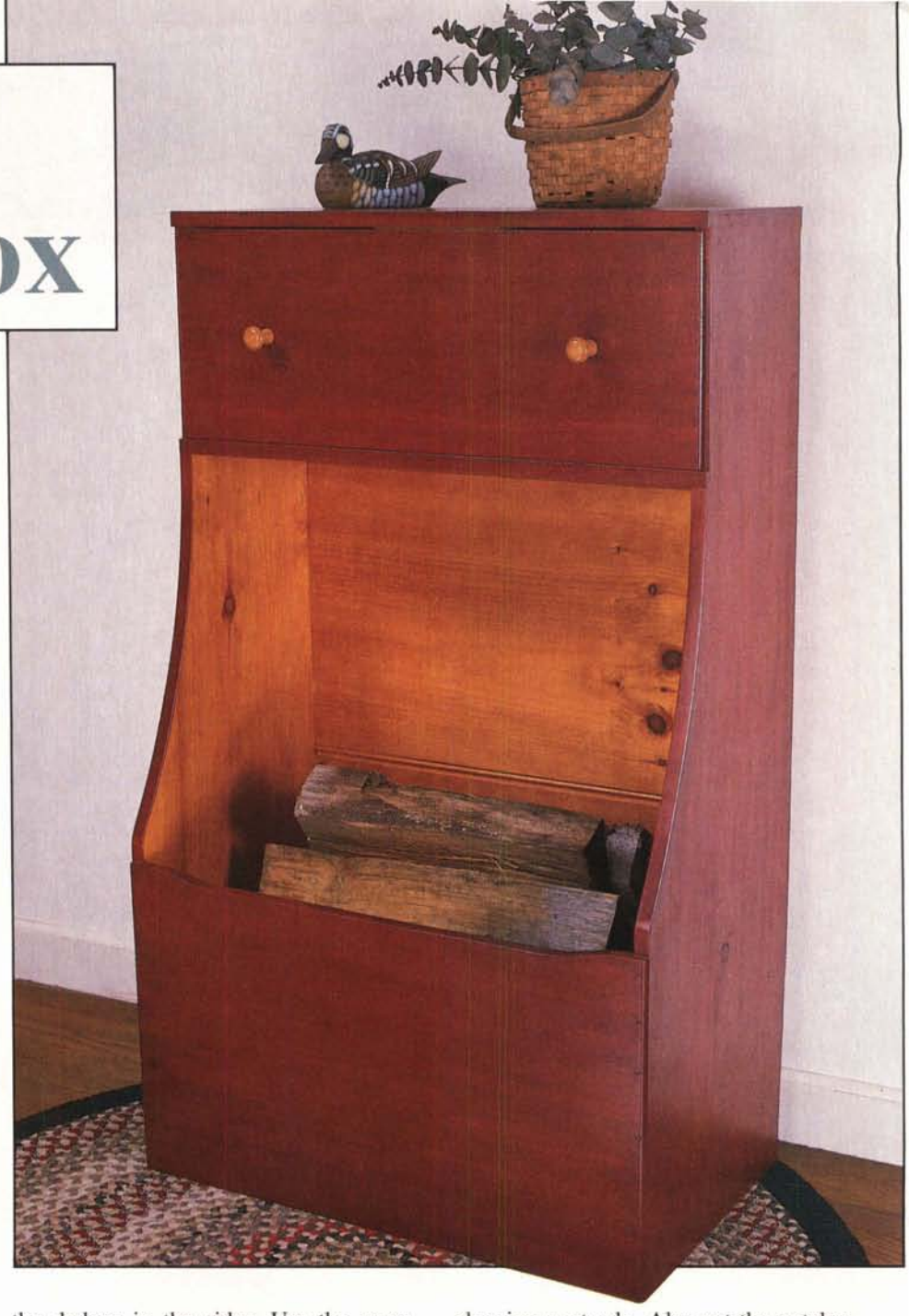
SHELF (ADJUST.) T
SIDE (CUT) B
CUTTING DIAGRAM 2 – 3/4 PLYWOOD

Shaker Woodbox



This classic Shaker Woodbox even has a drawer to hold the kindling, tinder and matches. These days we use newspaper for tinder, but who needs an unsightly stack on the floor? The Woodbox was made by Gene Cosloy of Wayland, Massachusetts, after an original from the North Union, Ohio, Shaker Community.

Dovetails are used throughout the Woodbox to make it a lasting legacy of your craftsmanship. You can cut them by hand the way the Shakers did, or use one of the dovetail jigs described in the tool review on page 32.

Cosloy used Eastern white pine for the woodbox. Make sure you use kiln-dried lumber for the woodbox to keep seasonal shrinkage to a minimum. In the dry environment near a woodstove or fireplace, even kiln-dried pine will shrink as much as 3/32 in. over a 10 in. wide board.

When these woodboxes were first made, wide pine boards were fairly easy to come by. But unless you have access to 16 1/2 in. wide boards, you'll have to edge-glue several smaller boards to get the required widths for the sides (A) and front (E). When edge-gluing 3/4 in. wide pine boards, it helps to use some system to keep them flush with each other. You can use sturdy waxed blocks clamped top and bottom across the glue-up. Or you can use dowels or splines to index the boards together during the glue-up. The dowels or splines don't add strength to the joint, but they do make it easier to line everything up.

With wide stock on hand, cut all the case parts to the dimensions shown in the Bill of Materials, but put the drawer and back stock off to one side. You'll cut that to size after completing the case. Drawers are always made to the actual case so you can take any size variations into account.

Establish the dadoes and rabbets in the sides and front next. Use a dado head set for a 3/4 in. wide by 3/8 in. deep cut for the dadoes in the sides. Use the same setting to cut the rabbets in the sides for the back boards (F and G). With the dado head still mounted, also cut the 3/4 in. wide by 1/4 in. deep rabbet on the sides and bottom of the front, as well as the 3/4 in. wide by 1/2 in. deep rabbet in the bottom (C) for the back.

Lay out the curved profiles on both sides and cut them with a handheld jigsaw or a band saw. Note that there's a 1/4 in. notch at the top of the curve. If you want, you can cut to that notch with a table saw, and only cut the actual curve with a jigsaw. Finish up the jog at the notch with a handsaw. That way you get a smoother cut and will have less cleaning up to do. Also cut the notches as shown in the shelf (D).

Next, lay out the through-dovetails that join the sides to the bottom. Scribe the 3/4 in. depth of the tails and pins onto both the sides and bottom. When scribing the depth for tails and pins, set the scriber a bit over the actual width. That way the dovetailed pieces will stand just a bit proud. You'll sand them flush after completing the case.

Use a dovetail saw to establish the tails on the sides. Then cut along the depth lines with a chisel or coping saw. Scribe the completed tails onto the end grain of the bottom. Use a square to carry those lines from the end grain to

the depth lines. Then cut the pins out with a dovetail saw or coping saw and chisel.

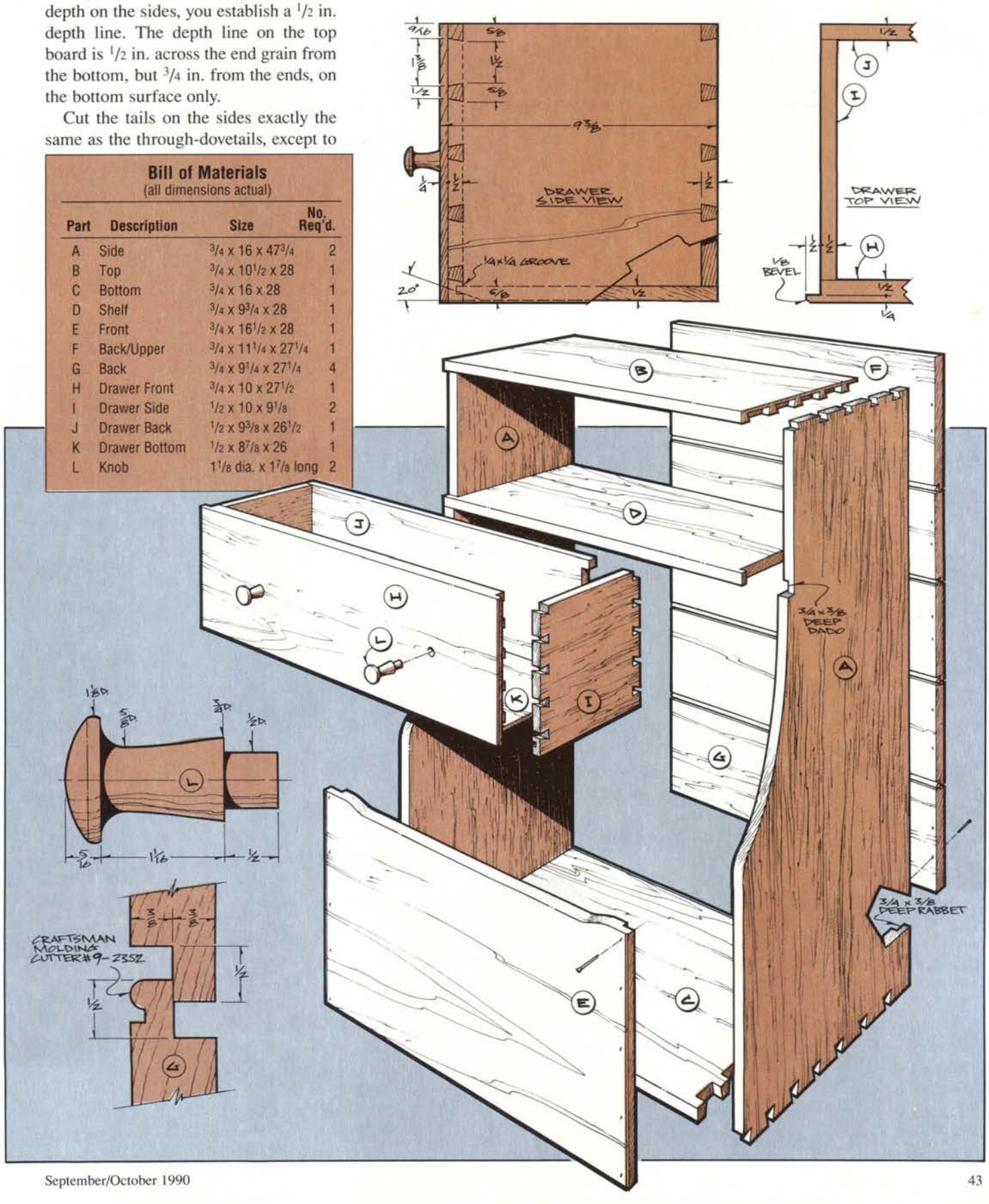
The half-blind dovetails at the top (B) are cut in much the same way as the through-dovetails. But instead of a 3/4 in. depth on the sides, you establish a 1/2 in. depth line. The depth line on the top board is 1/2 in. across the end grain from the bottom, but 3/4 in. from the ends, on the bottom surface only.

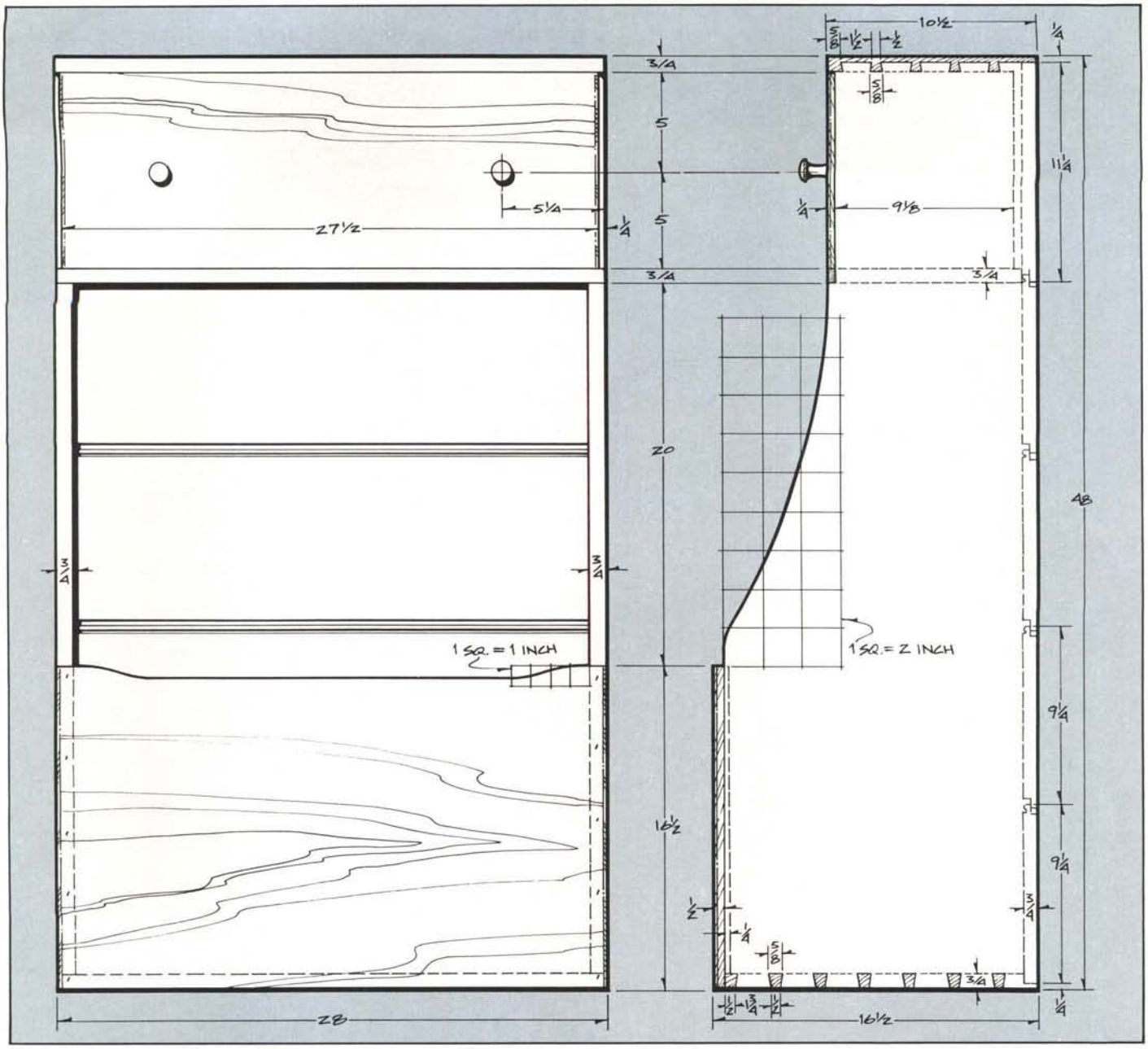
Cut the tails on the sides exactly the same as the through-dovetails, except to the shallower depth. You then scribe the completed tails onto the end grain of the top, and use a square to carry the lines across the bottom surface to your depth lines.

The only difference from through-dovetails, aside from the variance in depth lines, is that when cutting the half-blind pins you can't cut through with the dovetail saw. You'll only be

Bill of Materials
(all dimensions actual)

Part	Description	Size	No. Req'd.
A	Side	3/4 x 16 x 47 3/4	2
B	Top	3/4 x 10 1/2 x 28	1
C	Bottom	3/4 x 16 x 28	1
D	Shelf	3/4 x 9 3/4 x 28	1
E	Front	3/4 x 16 1/2 x 28	1
F	Back/Upper	3/4 x 11 1/4 x 27 1/4	1
G	Back	3/4 x 9 1/4 x 27 1/4	4
H	Drawer Front	3/4 x 10 x 27 1/2	1
I	Drawer Side	1/2 x 10 x 9 1/8	2
J	Drawer Back	1/2 x 9 3/8 x 26 1/2	1
K	Drawer Bottom	1/2 x 8 7/8 x 26	1
L	Knob	1 1/8 dia. x 1 7/8 long	2





able to make small angled cuts across the end grain down to the depth lines. The rest of the work is done with a chisel. But it goes fairly easily since those angled cuts with the dovetail saw serve to guide the chisel and reference the depths.

Next, dry assemble the case and shelf and trim the dovetails as necessary for a good fit. Also cut and half-lap the back boards. Note that we used a Sears molding head cutter 9-2352 to detail the edge of the half laps on the back boards.

When everything fits, glue the case together and nail on the front and the back boards. Put two nails toward the center of each back board to help equalize wood movement. We used old-fashioned sixpenny cut nails available from the Tremont Nail Co., P.O. Box 111, Wareham, MA 02570; tel. (508) 295-0038.

With the case complete, measure the drawer opening and make the drawer to fit. Allow about 1/16 in. on the sides and top for clearance. The dovetails for the drawer are cut nearly the same way as the case dovetails. Here, though, the drawer front (H) is first rabbeted with a 1/2 in. wide by 1/2 in. deep dado cut along both sides. The tails in the drawer sides (I) are cut in the same manner as the through-dovetails. They are then scribed onto the end grain surface of the rabbet. The 1/2 in. depth line is then measured from that surface. The actual cutting of the dovetails is much the same as the half-blind dovetails on the case.

The drawer bottom (K) is beveled from 1/2 in. stock to fit into the 1/4 in. wide groove in the sides and front of the drawer. It must be free to expand and contract with seasonal changes in humidity, so don't glue it in place. Instead, drive five 1 in. by no. 8 flathead wood screws through the drawer bottom and into the bottom edge of the drawer back. The back (J) is dovetailed into the sides.

Cosloy turned the knobs (L) to the profile shown, but you can purchase similar Shaker knobs from Woodcraft, 210 Wood County Industrial Park, P. O. Box 1686, Parkersburg, WV 26102; tel. 1-800-225-1153.

For a finish, you can leave the interior natural and paint the exterior red like the one shown, or you can vary the finish to suit your taste. You could stain the piece and apply shellac, or even leave it unfinished.

Cabinet *with Punched Tin Doors*

The punched-tin panels, black iron hinges and simple casework make this little pine cabinet a country gem you'll want to put in a prominent spot.

The pine for this piece is 3/4 in. thick stock available at most lumberyards. We used clear pine, but knotty pine would work well too. The tin panels and hardware are available by mail-order (see Bill of Materials). The tin panels come either blank or pre-punched.

Start by gluing up stock for the top (A), sides (B), bottom (H) and shelf (I). Then cut to length and width the stiles (C and D), rails (E, F and G) and cleats (J). Lay out and cut the mortises and tenons for the face frame as shown in Fig. 1. Note that the middle stile is mortised into the bottom rail and middle rail.

After cutting and fitting the mortises and tenons, move on to the sides, which should be out of clamps by now. Each side has three dadoes and two rabbets. Note that the 1/4 in. wide by 1/2 in. deep rabbets on the front edges of the sides are cut on the face side, leaving a tongue that fits into a 1/4 in. wide by 1/4 in. deep groove in the face stiles. With the dado head still on the saw, also cut the 1/4 in. wide by 1/2 in. deep rabbets on the ends of the cleats.

Next, cut the profiles on the bottom of the sides and the face frame. Also drill the holes for the shelf pins and cut up some glueblocks (Q) and corner blocks (R) that go under the bottom and help stiffen the case. Then give all the parts a thorough sanding with 120-grit paper.

Assemble and glue up the face frame first, making sure it's square. After it's out of clamps, assemble the other case parts—sides, shelf and cleats—and apply the face frame, which will help square up the case. Four bar or pipe clamps should be sufficient to hold the case together.

While that glue-up is drying, cut to size the back (K), drawer runners (M), drawer guides (N), drawer stops (O) and drawer tip stops (P). Note that the drawer runner fits into the previously cut dado in the sides, and that it's glued into the dado for only the first few inches toward the front. The drawer guide is then screwed to the case side (see Fig. 2). The screws to the case are counterbored 1 in., and the two rear screws are counterbored oversize to allow the screws to move. The size is critical here so make sure you use 1 1/4 in. by no. 8 flathead wood screws. The arrangement allows for seasonal wood movement and directs it toward the back of the case.

The tip stops are then screwed to the cleats, with slotted screw holes in the rear cleats. The slotted holes prevent the tip stops from interfering with wood movement.

Now, attach the top to the case with screws through the cleat and into the

underside of the top. Note that slotted screw holes are also used here on the rear cleat. Next, use a router and a 1/2 in. ogee bit to run off a length of molding (L) and apply it to the case. Then apply the back with nails. Note that the back profile mirrors the shape of the front feet.

The doors are made to fit the opening in the actual case, so they may vary slightly from the dimensions given in the *Bill of Materials*. Make the door slightly smaller than the actual opening, about 1/16 in., so it doesn't bind. Note that the tin panels (U) come 11 in. wide by 14 in. high, so you'll want to leave enough room for them to fit in the rabbet of the door. After cutting the mortises in the stiles (S) and tenons in the rails (T), as shown in Fig. 3, cut the bead on the stiles and glue up the doors. We used a Sears molding head cutter 9-2352 to cut the beads.

After the door is out of clamps, use a bearing-guided rabbeting bit in a router to establish the rabbets in the back for the tin. Use a chisel to square up the rabbets at the corners. Chamfer the edges of the stiles and rails as shown with a bearing-guided chamfering bit, stopping short of the corners. Cut the retainer strips (V) and test-fit the tin panels. If they fit properly, remove them and put them to one side until after the case is finished.

To punch the panels, transfer the pattern we've provided to paper. The pattern is one quarter, or a quadrant, of the symmetrical design. Use a 1/16 in. punch and a 7/16 in. lampmaker's chisel to punch the holes.

The drawer fits flush into the case and employs a rabbet and dado to attach the sides (X) to the front (W). The back (Y) also has a rabbet that fits into a dado in the sides. The bottom (Z) is 1/4 in. thick plywood and slides in from the back. The dadoes and grooves in the parts are all cut with a dado head in the table saw.

With doors, drawer and case complete, move on to the finishing touches. We first applied a coat of Minwax Puritan Pine Wood Finish. We let that dry and applied a coat of Minwax Provincial Wood Finish. We then applied two coats of orange shellac and a final coat of Minwax Antique Oil Finish, sanding with 320-grit paper between coats.

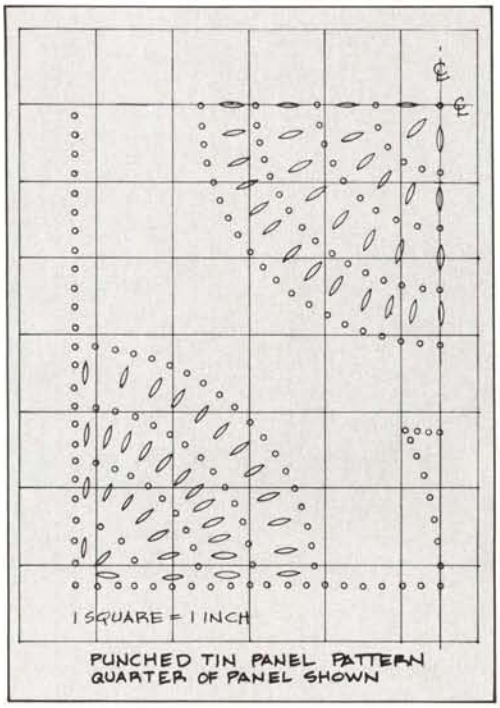
Then, install the knobs (AA), apply the hinges (BB) and hang the doors, attach the magnetic catches (CC) and put on the glides (DD).

Bill of Materials
(all dimensions actual)

Part	Description	Size	No. Req'd.
A	Top	3/4 x 17 x 36 1/2	1
B	Side	3/4 x 15 1/2 x 30	2
C	Stile	3/4 x 2 1/2 x 30	2
D	Middle Stile	3/4 x 1 1/2 x 18 1/2	1
E	Top Rail	3/4 x 2 x 31	1
F	Middle Rail	3/4 x 1 1/2 x 31	1
G	Bottom Rail	3/4 x 3 x 31	1
H	Bottom	3/4 x 15 x 33 1/2	1
I	Shelf	3/4 x 14 7/8 x 32 7/8	1
J	Cleat	3/4 x 3 x 33 1/2	2
K	Back	1/4 x 30 x 33 3/4	1
L	Molding	See Detail	as req'd
M	Drawer Runner	3/4 x 2 3/4 x 14 3/4	2
N	Drawer Guide	3/4 x 1 3/4 x 14 3/4	2
O	Drawer Stop	1/2 x 1 1/2 x 3	2
P	Drawer Tip Stop	3/4 x 1 1/4 x 14 3/4	2
Q	Glueblock	3/4 x 3/4 x 3	8
R	Corner Block	3/4 x 3/4 x 5	4
S	Door Stile	3/4 x 1 7/8 x 17	4
T	Door Rail	3/4 x 1 7/8 x 11 3/4	4
U	Tin Panel	11 x 14*	2
V	Retainer Strip	3/8 x 1/2	as req'd
W	Drawer Front	3/4 x 4 x 29 1/2	2
X	Drawer Side	1/2 x 4 x 15 1/4	2
Y	Drawer Back	1/2 x 3 3/8 x 29	2
Z	Drawer Bottom	1/4 x 15 x 29	1
AA	Knob	1 in. dia. as shown	**4
BB	Hinge	3 x 1 7/8**	4
CC	Magnetic Catch	as shown**	2
DD	Foot Glide	as shown**	4

* Available from Country Accents, P.O. Box 437, Montoursville, PA 17754; tel. (717) 478-4127. A pair of blank panels sells for $9.20 postpaid. A pre-punched set costs $36.75 postpaid. For unpunched tin specify 11 in. x 14 in. bright tin; for punched tin specify design no. RP-1057 in 11 in. x 14 in. size. The punching tools, 1/16 in. punch (catalog no. T-0159) and 7/16 in. lampmaker's chisel (no. T-0259), are $15 postpaid for both.

** Available from Paxton Hardware, 7818 Bradshaw Road, Upper Falls, MD 21156; tel. (301) 592-8505. A package that includes the knobs, hinges, catches and glides is available for $15 postpaid. Order catalog no. 8706.



PUNCHED TIN PANEL PATTERN
QUARTER OF PANEL SHOWN

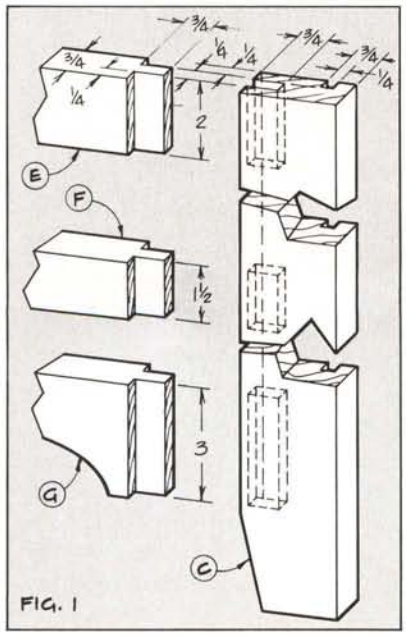
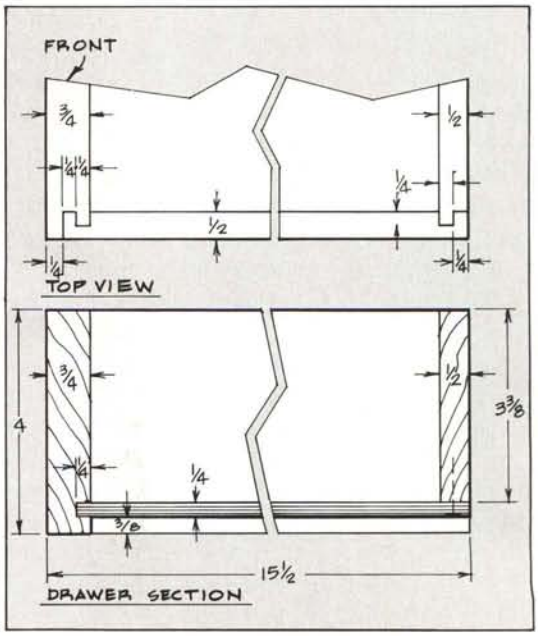
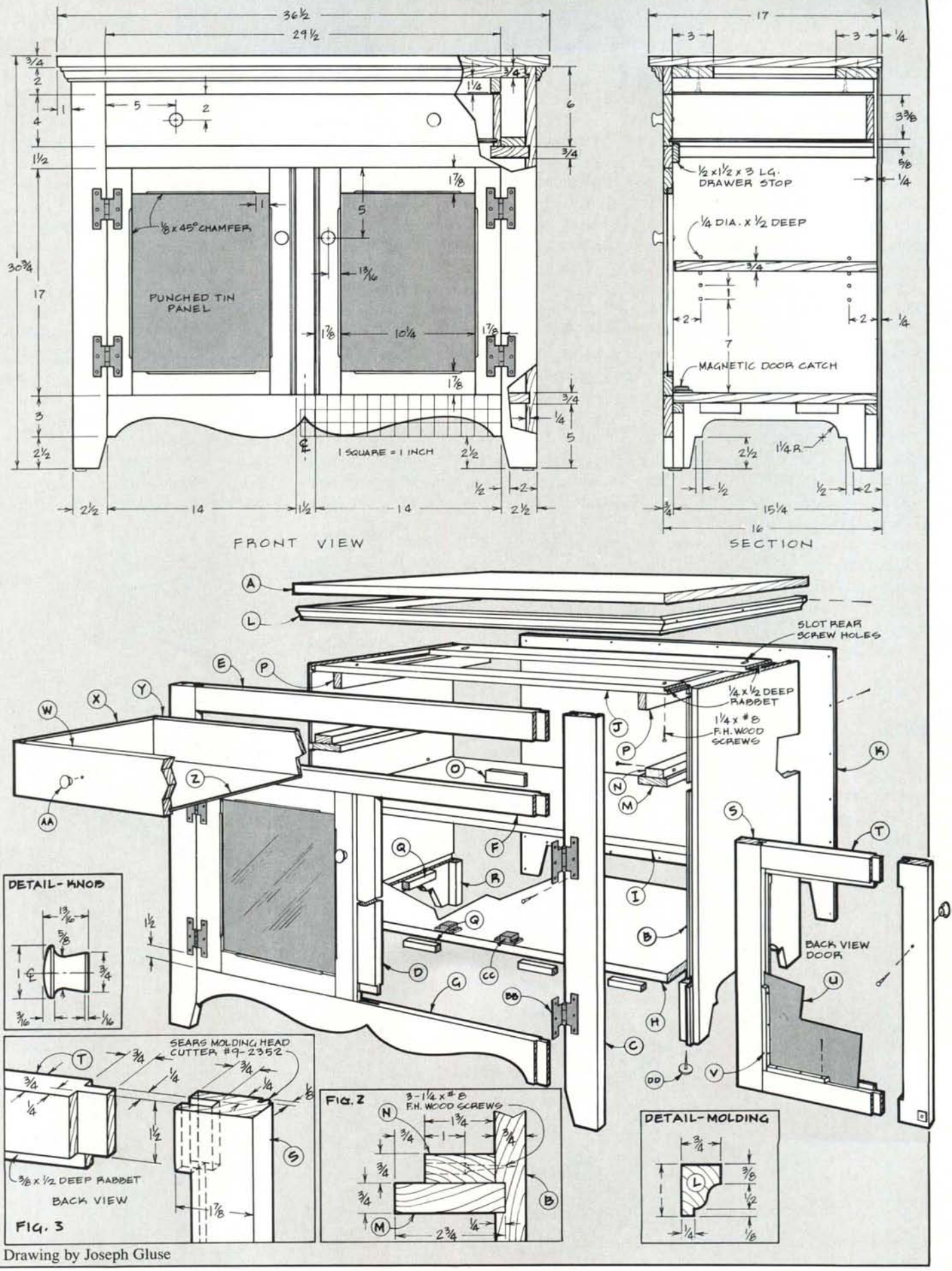


FIG. 1





Drawing by Joseph Gluse

Sushi Set

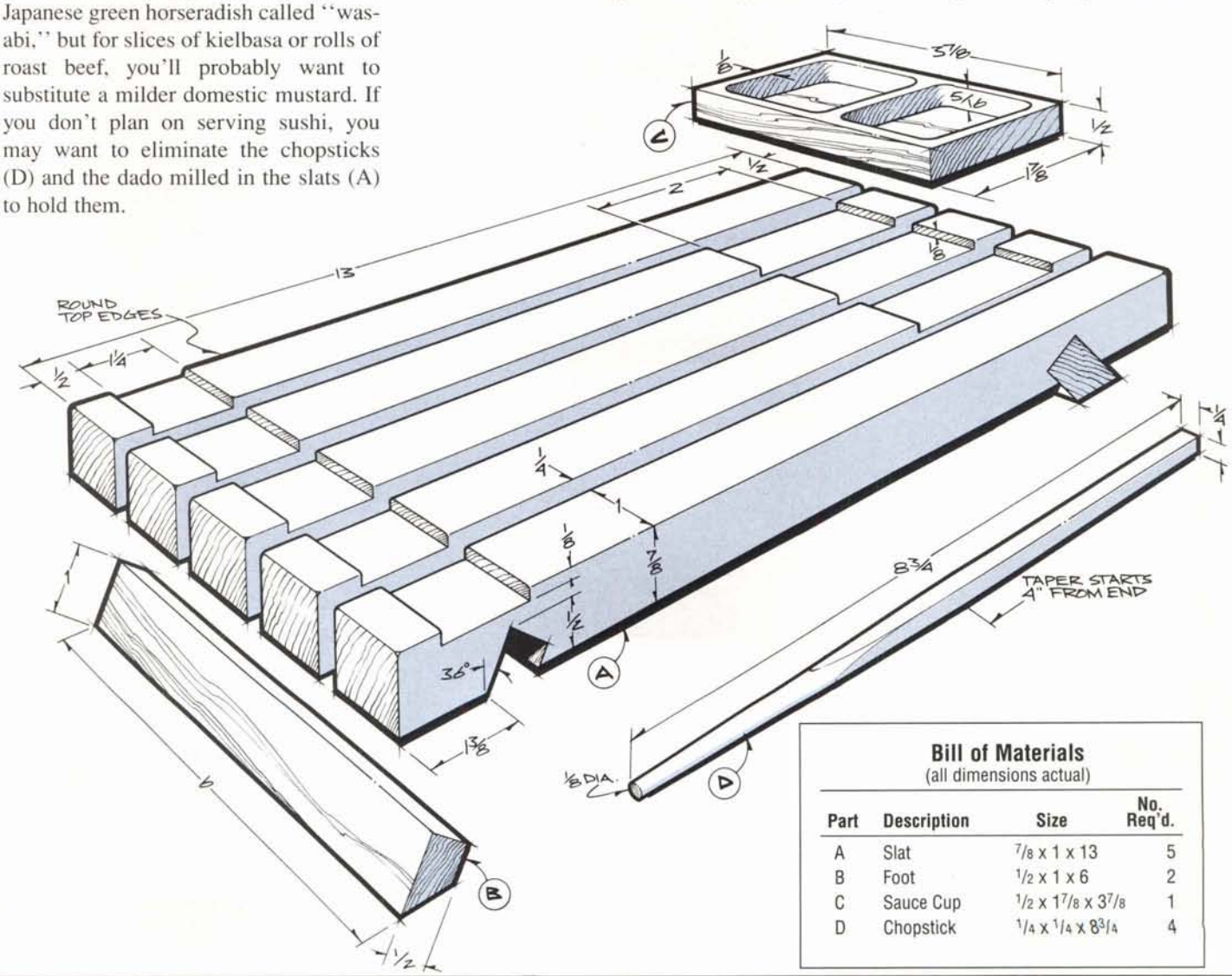
by Tony Lydgate

My Sushi Set is a big seller here on the West Coast, but if you don't like sushi the set also makes an attractive serving tray for cheese and meat. Sushi—for those who haven't tried it—is a term that covers a broad range of rice cake concoctions. These are often served wrapped in seaweed and topped with fish or vegetables. The raw fish many people associate with sushi is actually a dish called sashimi. Most sushi and sashimi are a visual as well as a gastronomic feast, as the Japanese believe that the appearance of food is as important as its taste. Contrary to what some may think, raw fish is tender and delicious, with a mild, delicate flavor. When sushi is being served, the sauce cup (C) holds a potent Japanese green horseradish called "wasabi," but for slices of kielbasa or rolls of roast beef, you'll probably want to substitute a milder domestic mustard. If you don't plan on serving sushi, you may want to eliminate the chopsticks (D) and the dado milled in the slats (A) to hold them.

The Sushi Set is easy to make. I used bird's-eye maple for the slats and one pair of chopsticks, and rosewood for the feet (B), sauce cup and the other pair of chopsticks. Start with 4/4 in. thick maple, plane or sand to reduce the thickness to 7/8 in., rip to a 5 1/2 in. width and then crosscut to exactly 13 in. long. The 5 1/2 in. width assumes that you'll be using a standard 1/8 in. thick blade for your ripping cuts, which are made after the dadoes for the feet and chopsticks are cut. This is your blank for the slats. Note that after ripping and sanding, the slats will actually measure a hair under the given dimensions.

Next, set up the dado head for a 1/2 in. wide cut, angle the blade 36 degrees, and raise it to a 1/2 in. height. Make a special table saw insert for this cut by raising the dado head up through a blank plywood insert. Using the miter gauge equipped with an auxiliary fence, now cut the dadoes for the feet.

Reposition the dado head to 90 degrees, lower it for a 1/8 in. deep cut, flip the stock over and use three passes to make the 1 1/4 in. wide chopstick dadoes. Then rip the board into five 1 in. wide slats, set up the dado head once more, and mill the 1/8 in. deep by 2 in. wide dado in the three center slats that holds the sauce cup. Try to keep the slats in the same order that they're ripped from the board. For some stock—such as the bird's-eye maple—this may not make much difference, but for woods with a pronounced grain, keeping the boards in



Bill of Materials
(all dimensions actual)

Part	Description	Size	No. Req'd.
A	Slat	7/8 x 1 x 13	5
B	Foot	1/2 x 1 x 6	2
C	Sauce Cup	1/2 x 1 7/8 x 3 7/8	1
D	Chopstick	1/4 x 1/4 x 8 3/4	4

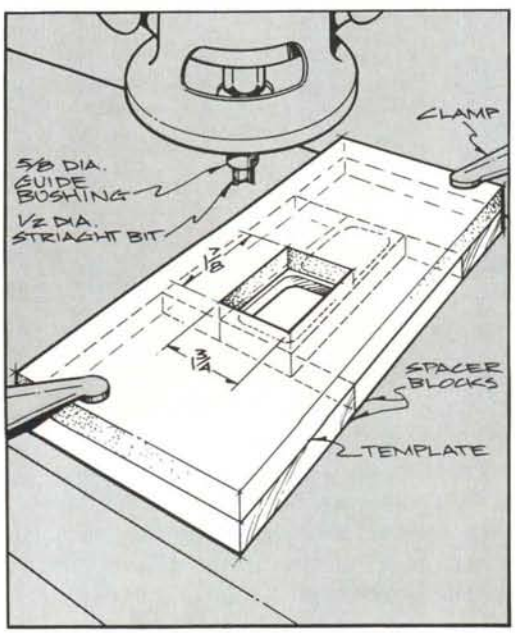
the proper order is an important design detail.

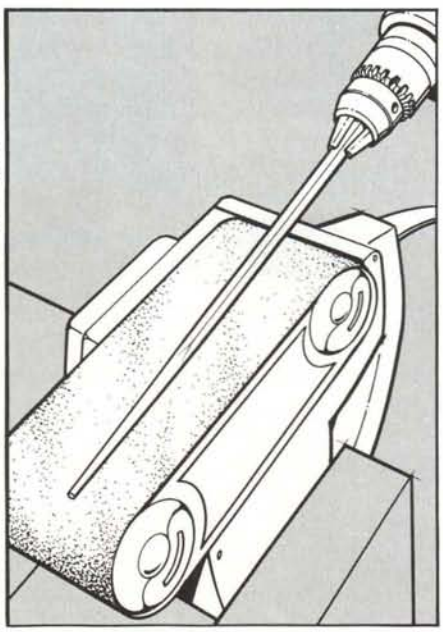
The bottom edge of the feet are milled at the same 36-degree angle as the dado cut in the slats to accept them. Sand the slat sides, round the edges and then use epoxy to glue the slats to the feet. Be sure the epoxy you select is recommended for use with exotic or oily woods. Scraps of 1/4 in. plywood serve as spacers to maintain the spacing between the slats.

I turned my chopsticks on a machinist's lathe, but an easy way to get the tapered profile is to just cut the chopsticks to 1/4 in. square, chuck one end in your 3/8 in. variable-speed drill, and use the belt sander held upside down in the bench vise (use the locking button to keep the belt sander running) to sand the round tapers. But make sure you start with the chopstick blanks cut a little long—at least 9 1/2 in.—so you can cut off the end that was chucked in the drill.

The sauce cup wells are made with a router and template, using a 1/2 in. diameter straight bit and a 5/8 in. diameter guide bushing. As shown in the routing detail, mount spacer blocks on the bottom of the template to hold the sauce cup blank in place. Note that the template cutout measures 1 3/4 in. by 1 7/8 in. to produce a 1 5/8 in. by 1 3/4 in. well. Rout one well, then reverse the blank to cut the opposite well. You'll probably need several passes to achieve the 5/16 in. depth.

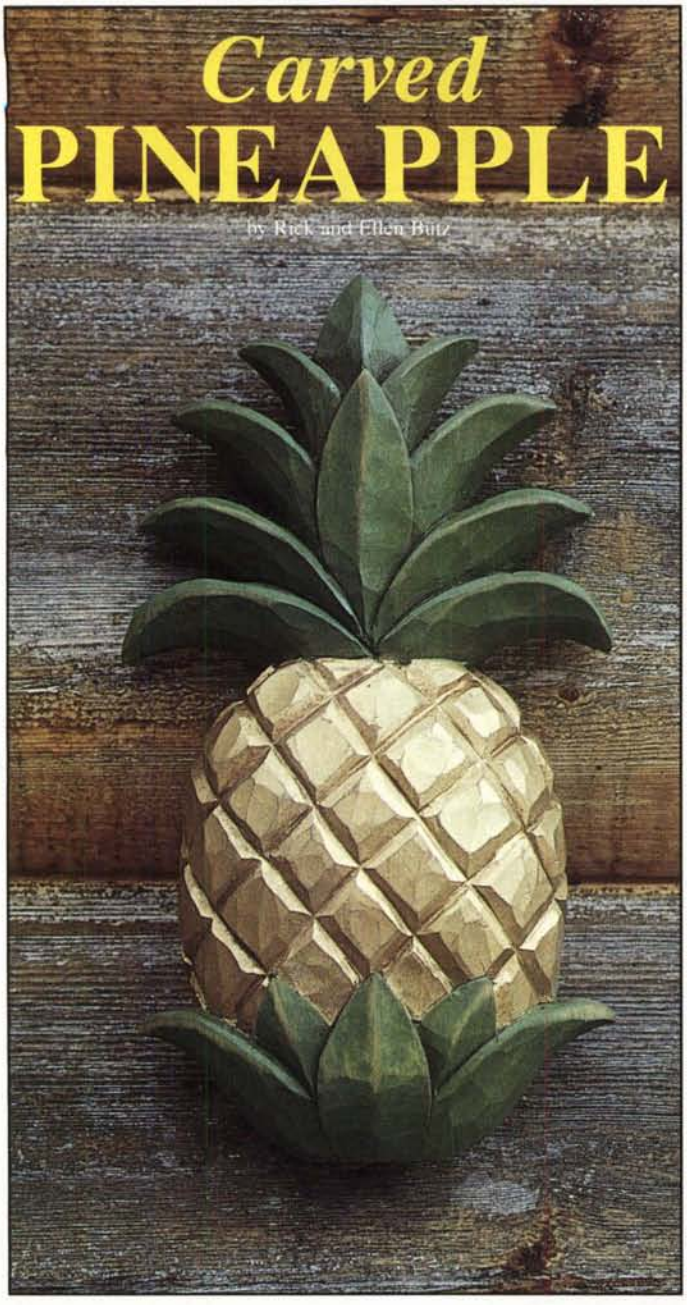
Use two coats of a food-safe penetrating oil, such as Behlen's Salad Bowl Finish or Preserve Nut Oil, to finish the Sushi Set. Flood on a generous first coat, reapplying to areas that are absorbing quickly. Let dry overnight, then rub off any excess crust with 00 steel wool, apply a second coat, let dry, and buff with 0000 steel wool.





Carved PINEAPPLE

by Rick and Ellen Butz



The pineapple is a traditional symbol of hospitality in New England. Odd as this sounds at first, there is a very good reason for it. During the 1800's New England was the hub of a vast seafaring trade network. Sea captains from the area roamed the oceans, sometimes for years at a stretch. When they returned they brought exotic gifts for their friends and families. And with its freezing winters, what could be rarer in New England than tropical fruit, especially pineapples. Some captains even placed pineapples in front of their homes as a sign that they had returned and visitors were welcome.

Eventually, carved wooden pineapples took the place of the real thing. A carved pineapple on the door is still a sign that a hearty welcome awaits within.

This pineapple is essentially a relief carving with the background completely removed. It's a good project with which to start relief carving because it requires few tools. I used only three different gouges and my whittling knife for the whole carving.

The original hospitality pineapples where carved from pine. Pine was light, easy to work, and best of all, plentiful. New England's thriving shipbuilding trade provided a nearly endless supply of scrap pine for decorative carving. In keeping with tradition, I chose pine for this carving.

To begin, trace the profile of the pineapple on a piece of air-dried white pine that is $1\frac{5}{8}$ in. thick by $5\frac{1}{2}$ in. wide by 9 in. long (Photo 1). Next, cut this profile out with a bow saw (Photo 2). You could use a band saw, but a bow saw is more traditional. When I make a historic project like this, I really enjoy using the same type of tools that the original makers used. It gives me a feeling of being in touch with the past.

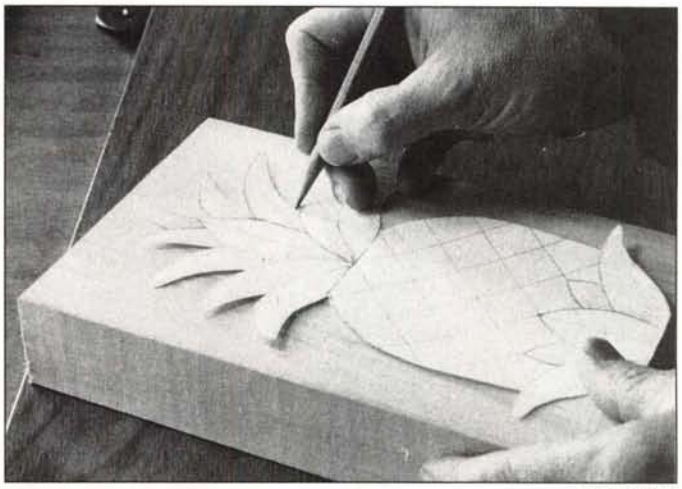


PHOTO 1

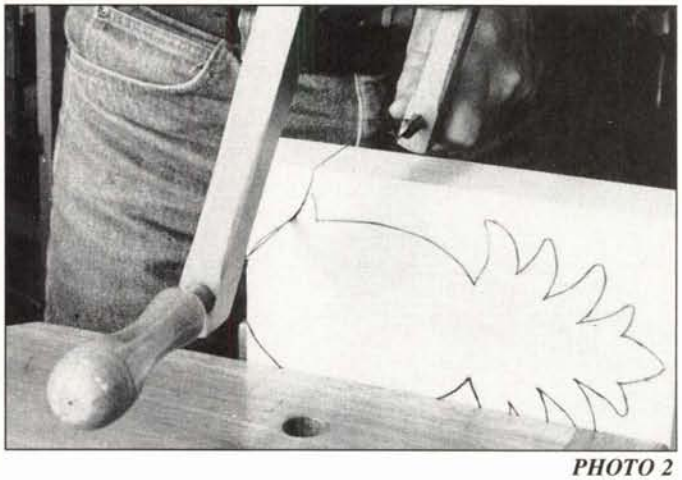


PHOTO 2

To hold the pineapple so that you can work on it, first fasten it to a flat piece of wood. I used a piece of $\frac{3}{8}$ in. thick plywood cut 14 in. square. Drill two $\frac{1}{4}$ in. diameter holes through the plywood, and screw the pineapple to it with two $1\frac{1}{4}$ in. long flathead screws. Plywood is a good choice for this because it doesn't split. Then fasten the plywood to the bench with C-clamps. This is a very efficient arrangement because you can easily turn the carving around to work on it from different directions just by loosening the clamps and repositioning the board.

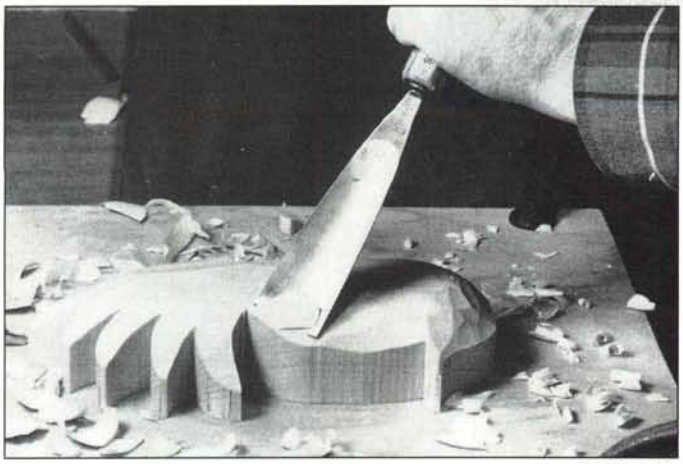


PHOTO 3

The first step in making the carving is to round over the general shapes. Use a 35 mm no. 5 gouge to rough out the pineapple (Photo 3). Be careful not to put too much pressure on the leaves as you carve. The leaf tips are cross-grained and could break off.

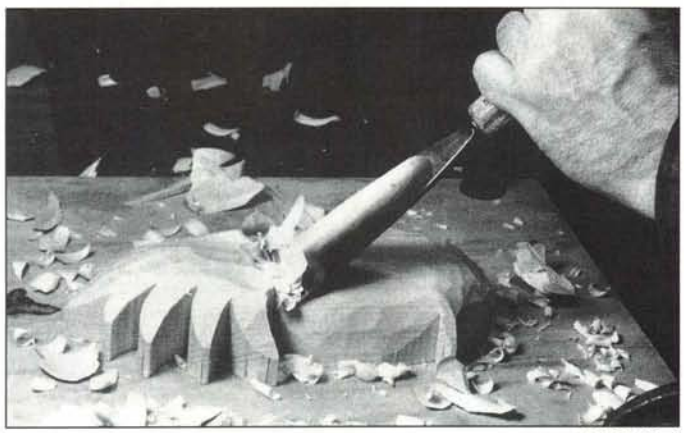


PHOTO 4

Use the same gouge to cut a large notch between the top of the pineapple and the leaves (Photo 4). Cut first from one side and then the other to remove the excess wood.

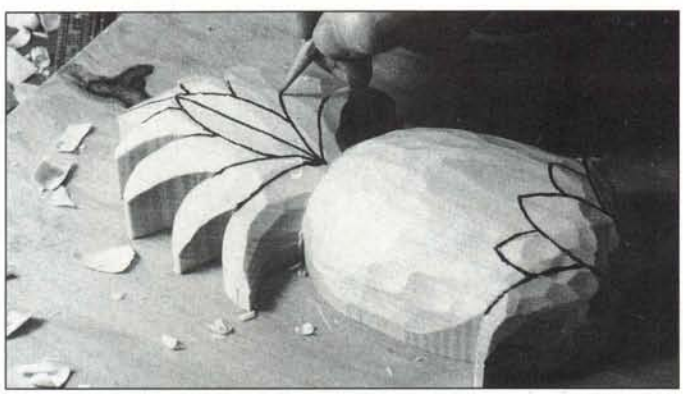


PHOTO 5

After the basic shapes are roughed out, draw the leaves (Photo 5). Don't worry about making them perfectly symmetrical. In fact, your carving will look more authentic if there are some slight irregularities in the design.

Next, make a cut straight down about 1/8 in. deep along the outline of the center leaf with the 35 mm no. 5 gouge (Photo 6). The curve of this particular gouge matches the curve of the leaf. In relief carving, this step is called "setting in."

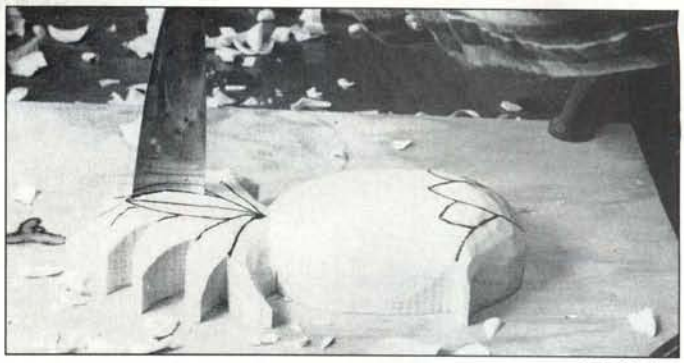


PHOTO 6

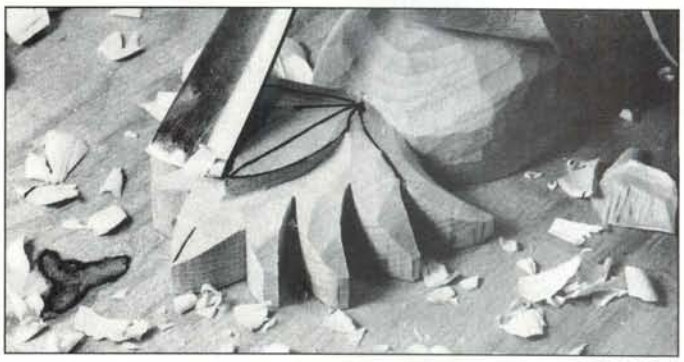


PHOTO 7

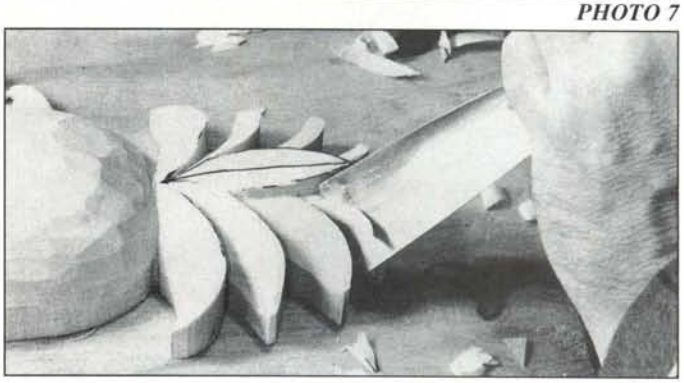


PHOTO 8

Then use the same tool to bevel down the wood on either side of the center leaf, leaving it raised (Photo 7). Set in the other leaves the same way. When all the vertical cuts are made, use the 35 mm no. 5 gouge to bevel the bottom edge of each leaf (Photo 8). This will make the leaves appear to overlap.

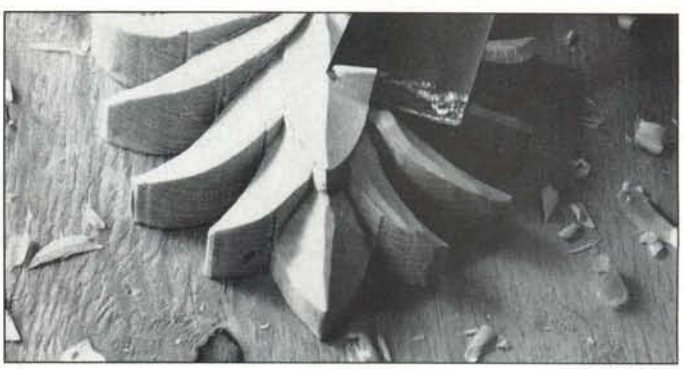
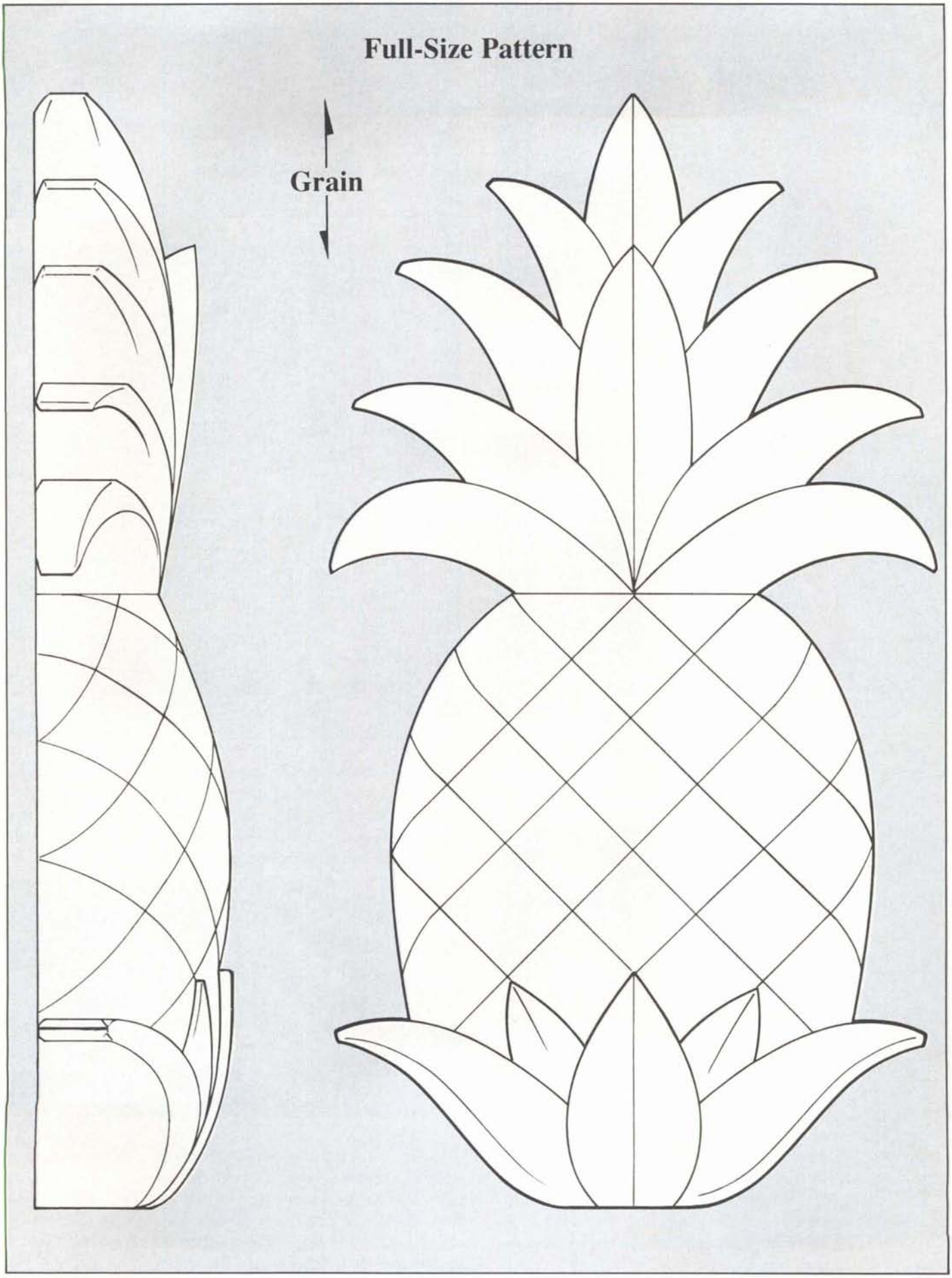


PHOTO 9

Use the same techniques to lower the base of the center leaf so that it appears to come out from behind the other leaves. It's best to shape this lower part of the leaf first, because the surrounding leaf edges are delicate and can be accidentally chipped off by too much pressure. Then finish shaping the leaf by beveling down either side of the top section (Photo 9).

Full-Size Pattern



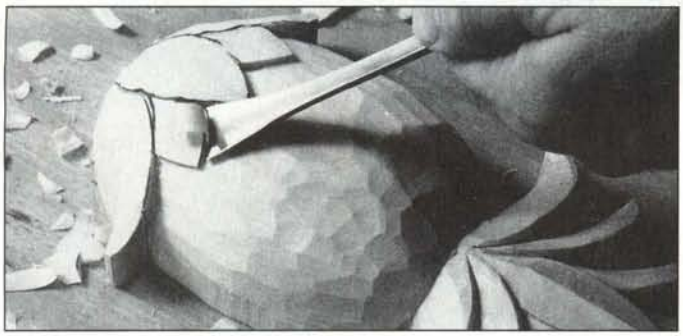


PHOTO 10

To shape the bottom leaves, first use the 35 mm no. 5 gouge to set in the center leaf and the two large side leaves, just as you did with the top leaves. Then set in the two smaller leaves with a 20 mm no. 5 fishtail gouge. When all the bottom leaves are set in, use the 20 mm no. 5 fishtail gouge to round the pineapple, leaving the leaves raised (Photo 10). The tapered edge of this gouge allows you to reach into the corners between the leaves more easily. Define the shapes of the bottom leaves the same way you did the top ones, beveling them so they appear to overlap.

PHOTO 11

There are many different ways to create the texture of the pineapple's skin, but the one I like best is a cross-hatched pattern. Its simplicity shows up well from a distance. Begin by sketching in diagonal lines about 3/4 in. apart. The lines wrap all the way around the sides of the pineapple. Once again, don't worry about making these perfect. Strict mathematical precision isn't necessary and might even detract from the overall effect.

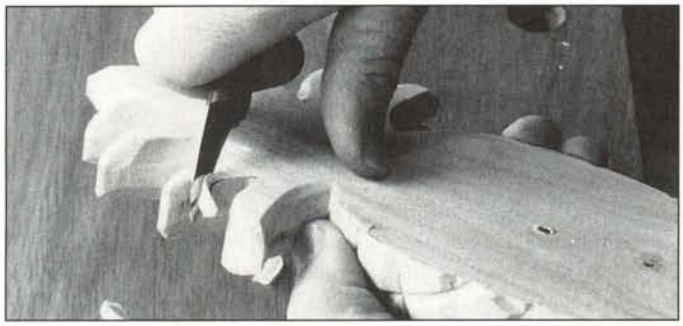


PHOTO 12

Use a 6 mm V-gouge to make cuts along the diagonal lines (Photo 11). Then remove the pineapple from the board.

If you like, you can now undercut the leaves slightly with a knife (Photo 12). Don't get carried away or you'll make the leaf tips too narrow and pointed. Remember they are cross-grained and will be fragile. A carving like this one, which may be displayed outdoors, needs to be sturdy to stand up to the elements. Remove a little wood to make the carving appear less "blocky," but not so much as to weaken it.

Carved pineapples were often painted gold. In some cases they were actually gilded with thin sheets of real gold. But this is an expensive and tricky process, so I used gold colored enamel paint instead. I selected enamel paints because I plan to display this carving outdoors. Enamels are more weather-resistant than other paints and were preferred by seafarers.

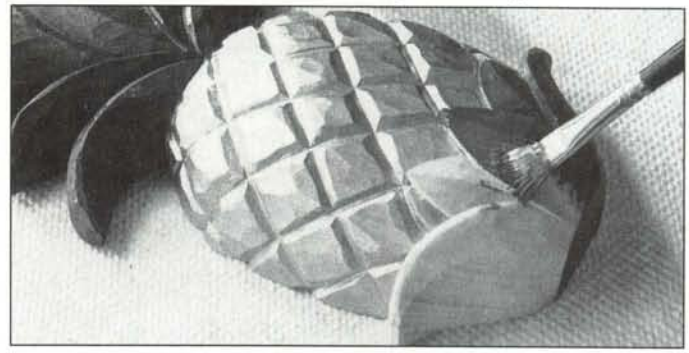


PHOTO 13

Color the leaves green, again using an enamel paint (Photo 13). Use a no. 8 flat synthetic sable brush for the large areas, and a no. 4 pointed one for the edges of the leaves. Let the paint dry thoroughly.

You can leave your pineapple like this, but if you want it to look more antique, there's a technique to speed up the aging process. First, spray a light coat of lacquer, like Deft Clear Wood Finish, on the carving. This will seal the wood and keep too much paint from rubbing off during the steps that follow.

Next, sand the pineapple very lightly with 220-grit garnet paper. This removes a bit of paint from the high spots to duplicate the effects of weathering.

PHOTO 14

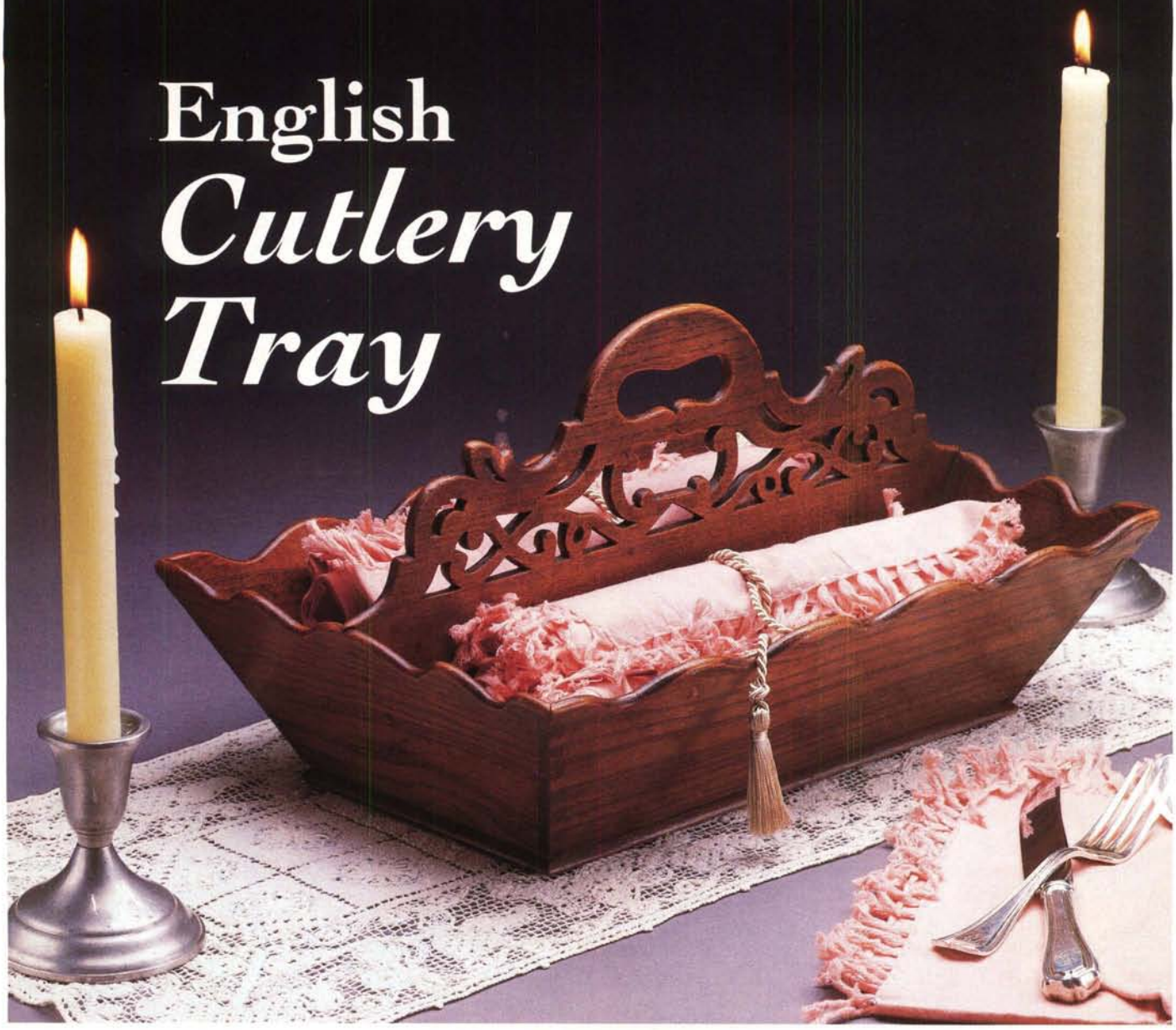
Then brush on a coat of Wood Finish by Minwax in Special Walnut. Wipe it off promptly (Photo 14). The stain will remain in the crevices of the carving and darken them. It will also tone down the brightness of the paint, making it look more aged and mellow. The undercoat of lacquer keeps the stain from penetrating too deeply into the wood and darkening it too much. It also keeps the mineral spirits in the stain from softening and removing the enamel paint.

To display the pineapple, drill a small hole in the back and hang it up on a nail. This carving adds charm indoors or out. If you hang it on your front door, the natural effects of weathering will help to enhance the antique look.

So, try carving one for your home. The sight of a cheerful pineapple on the door will warm the hearts of visitors on even the coldest winter days.

This project is excerpted from the book, ***Woodcarving with Rick Bütz,*** *by Rick and Ellen Bütz. Ordering information for this and other books can be found on the insert bound in the center of this issue.*

English *Cutlery Tray*



According to antiques dealer Weston Thorn, of Weston Thorn Antiques in Bantam, Connecticut, this cutlery tray was built of rosewood about 200 years ago and is of English origin. Although the insides of the tray bear myriad point pricks from the knives that were kept within, the tray is in remarkable condition for its age. Rosewood makes a lovely tray, but less costly domestic woods such as white oak, ash, cherry or walnut are also good choices.

Most of the work making the cutlery tray is in cutting the compound angle dovetails. Refer to our Special Techniques article (page 20) for step-by-step instructions on cutting these dovetails.

Note that the scalloping along the upper edges on the sides (A) and ends (B), and the V-groove cuts on the inside faces of the ends, are made after the dovetails are cut but before the tray is assembled. You can use the router with a V-groove bit and a straightedge to cut the grooves, but since each groove is just 1/8 in. deep several passes with a sharp knife will work as well. Make your layout lines, cut one side of the V-groove, then complete the groove by cutting the opposite side. If you've made the tray from an exceptionally hard wood, you'll need a few more passes to achieve the full groove depth.

Next, lay out the scalloping from the full-size patterns, cut the profile with a coping saw and round the edges by hand. Leave the corners square for now; you'll sand them after assembly.

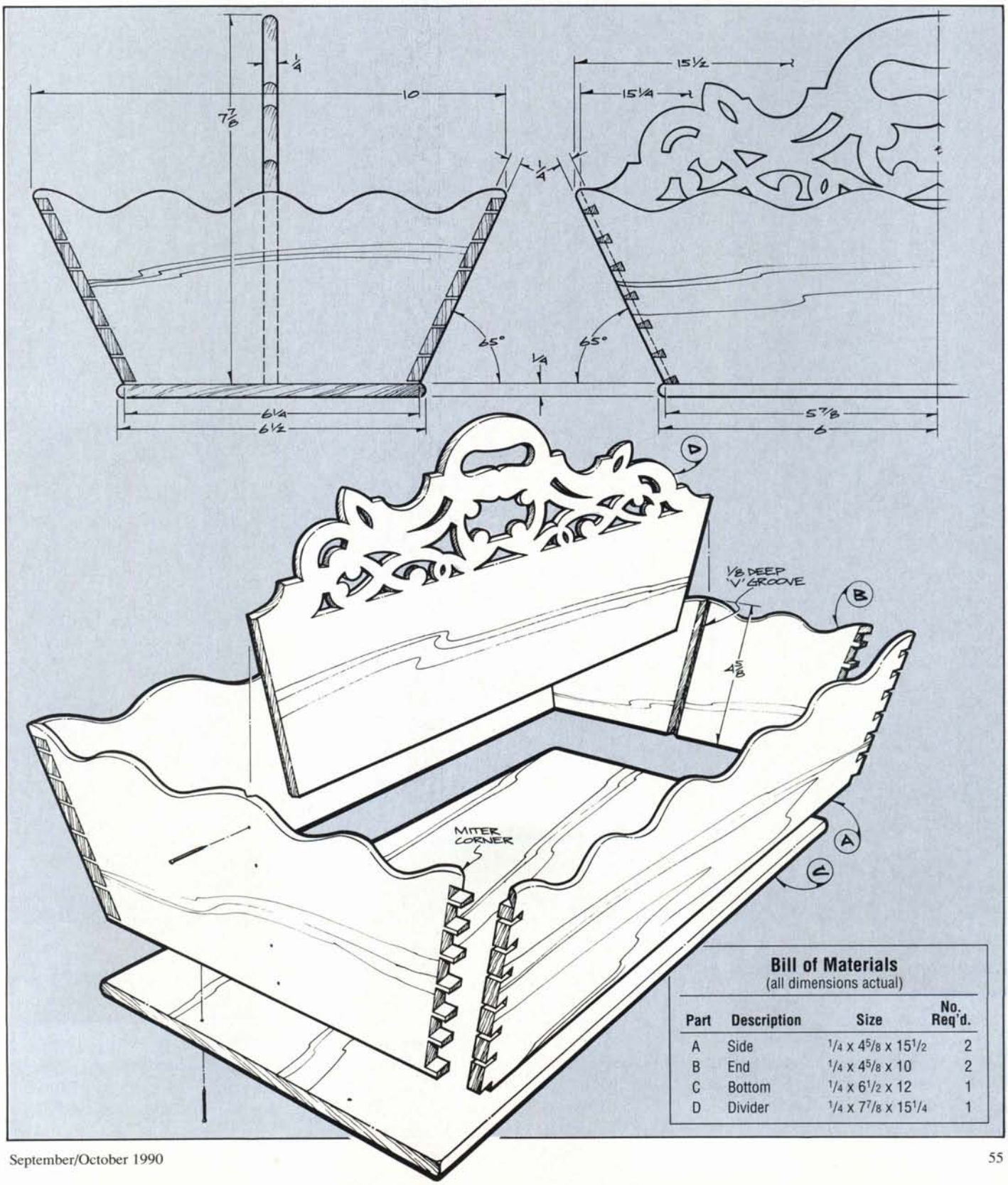
Glue and assemble the sides and ends. When dry, cut the bottom (C) to size, round the edges and nail it in place. Use finish nails, and remember to pre-drill the nail holes. You can add a little epoxy to the nails to help anchor them. The nail heads should be set slightly; later you'll fill the holes with wood putty.

For the divider (D), try to select some quartersawn stock. Our antique cutlery tray used quartersawn stock for the divider, a sure sign that the maker was well aware of the characteristics of wood and the types of grain that are best for delicate parts. The advantage of using quartersawn stock is that it's unlikely to cup or warp, conditions that often occur on thin stock, especially boards that are

elaborately cut out or carved.

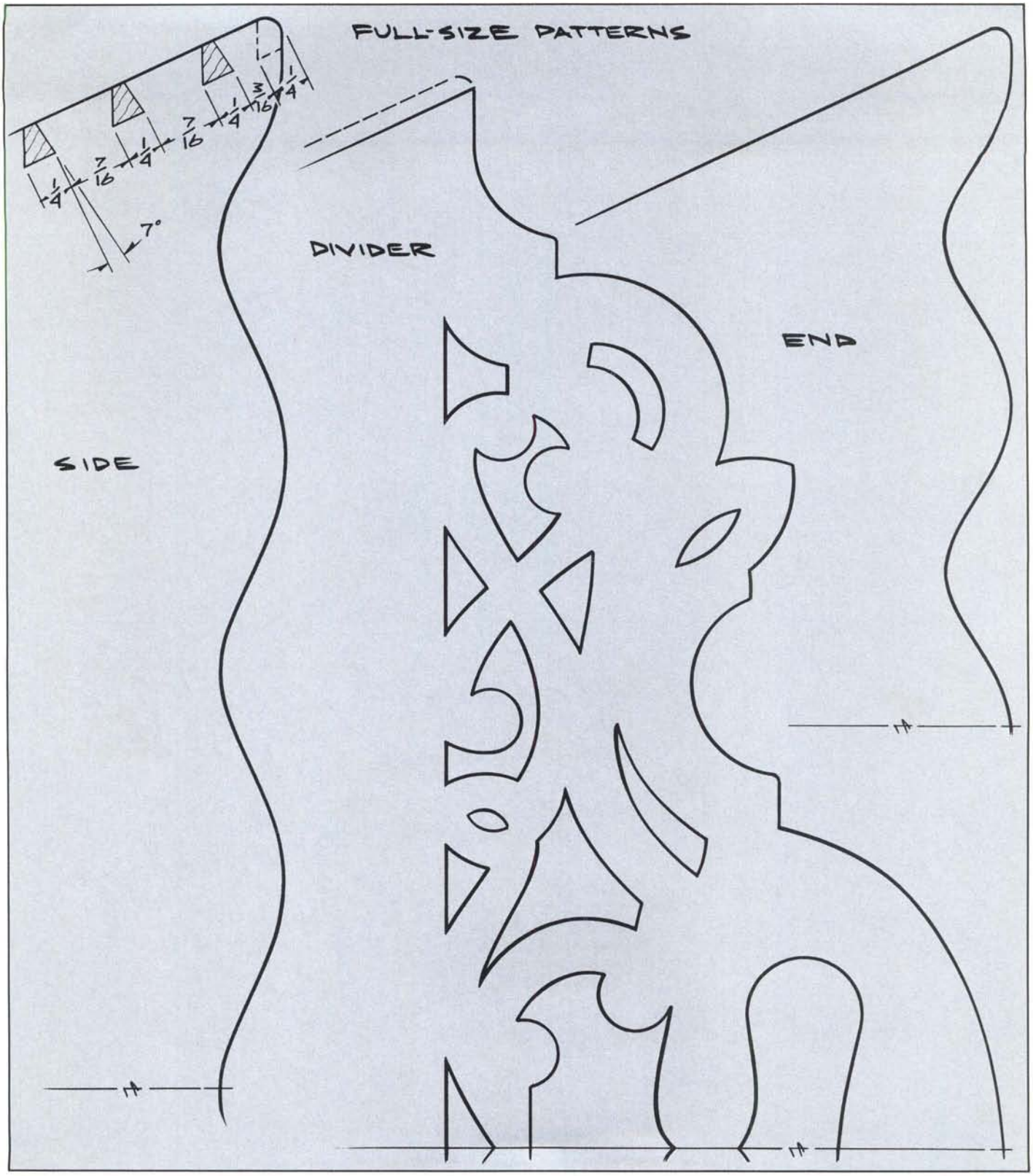
Start with a board that's a little wider than the final desired size. Crosscut a 25-degree angle on each end, then establish the V-point along the length of the angle. The cuts to establish the V-point can be made on the table saw, but it's much easier and a lot less fuss to use a block plane. Make the layout lines for the V, clamp the divider securely in the vise, and use a sharp knife to back-cut the V at the edges. This prevents chip out. Several passes with the block plane should quickly form the two faces of each V. Test-fit the divider inside the tray and trim back the bottom edge as needed until the fit is right.

Now transfer the scroll pattern to the divider using our full-size half pattern (both sides of the pattern are identical) and cut it out with a fretsaw or scroll



Bill of Materials
(all dimensions actual)

Part	Description	Size	No. Req'd.
A	Side	1/4 x 4 5/8 x 15 1/2	2
B	End	1/4 x 4 5/8 x 10	2
C	Bottom	1/4 x 6 1/2 x 12	1
D	Divider	1/4 x 7 7/8 x 15 1/4	1



saw. Drill starter holes for each of the inside cuts. A set of needle files is handy for cleaning up the blade marks that are left by the saw.

After final sanding, mount the divider. Use glue at the bottom edge of the divider where it meets the tray bottom, and finishing nails through the ends at the V-groove joint and up through the bottom into the divider. Pre-drill for the nails, add a dab of epoxy and set them as before.

Apply a little colored wood filler or putty to fill the nail holes and any gaps at the dovetailed corners. Sand lightly, then wipe on at least three coats of Watco Danish Oil. Flood on the first coat, wait about 15 minutes, then apply a generous second coat, adding extra finish to end grain and areas that are absorbing quickly. Once the wood seems saturated, wipe off the excess with a clean rag and let dry overnight. Lightly sand the surface with 360-grit wet-or-dry sandpaper, apply the third coat and buff with 0000 steel wool when dry.

Toy Train Set

Here's a train set that will inspire many young and perhaps even a few older imaginations. Our train is made mainly of oak and maple, with padauk used for the caboose and a few other parts, and fir stair rail or closet pole used for the locomotive boiler and the tank on the tanker car. Feel free to vary the combinations of woods to suit your taste and the stock you have available. Our thanks to Lynes Unlimited, of Greenleaf, Kansas, for the design.

At first glance the train set may seem like a lot of work. But don't be fooled. If you look closely you'll discover that the train is designed around a simplified common chassis system, where all the cars except the locomotive share identical undercarriages. Once you've set up your table saw you can easily knock off as many undercarriage parts as required by the number of cars you plan to build. To further simplify making the train set, we've arranged with Lynes Unlimited to offer kits that include all the wheels and turned parts. There's a single kit for the train as shown in the photo or you can order individual kits. There's one kit for the locomotive, a second kit that includes the wheels and pegs for making one undercarriage, and a third kit that includes one undercarriage parts kit plus the two vent buttons for the tanker car. This way you can order the kits separately and purchase only as many undercarriage kits as you'll need for the number of cars you decide to make. Ordering information is listed in the Bill of Materials.

Locomotive

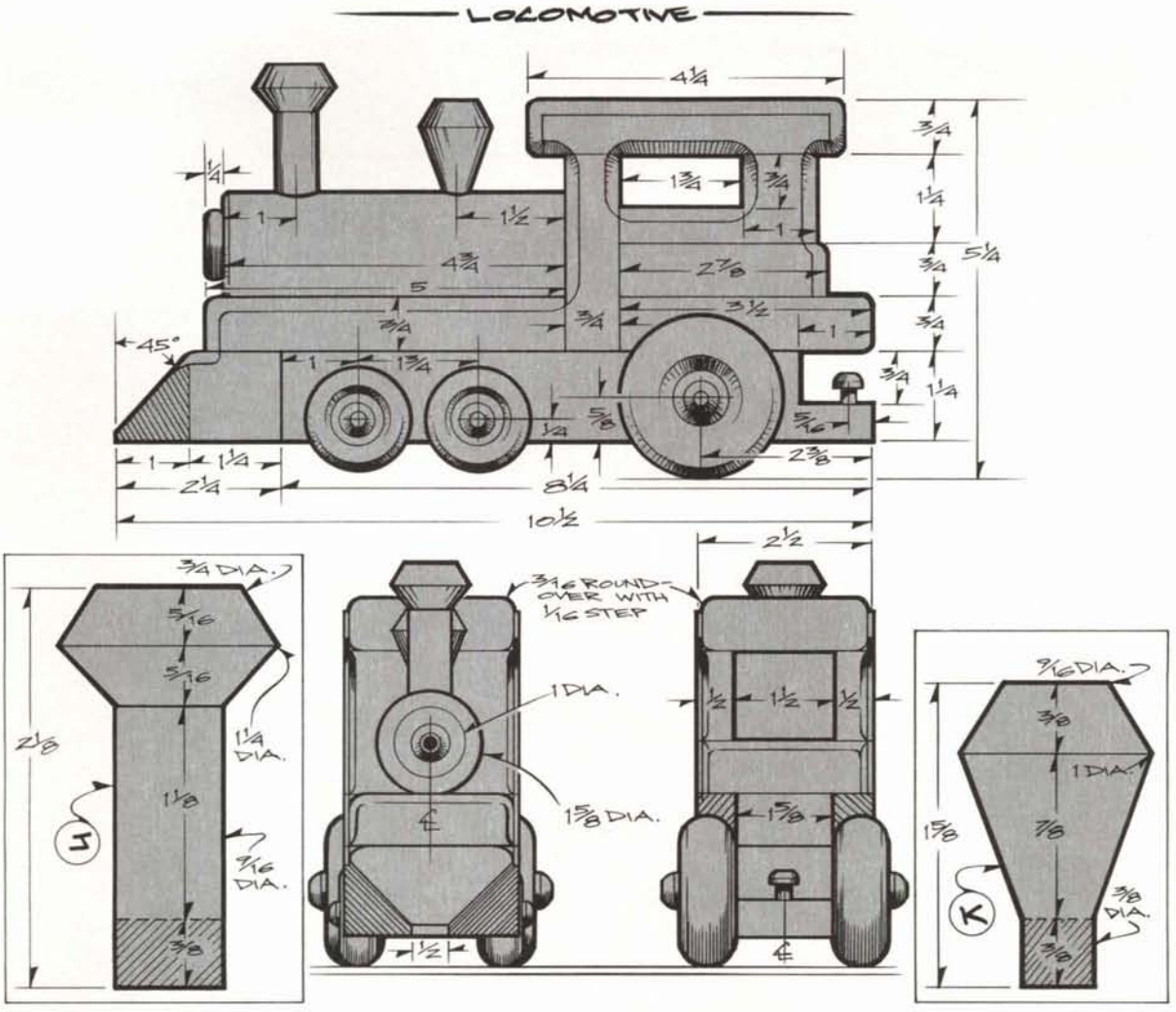
The locomotive is basically just a series of blocks. All the parts are oak except for the padauk cab sides (E), the fir boiler (I), and the wheels and turned parts, which are maple or birch. Start with the chassis block (A). Cut it to size, notch the back end, and bore the holes as shown in the side elevation for the pegs holding the wheels. Then add the cab riser (B), the various cab parts (C, D, E, F), the boiler base (G) and the cow catcher (H). The cow catcher is just a block with three 45-degree angle cuts. Glue and clamp these parts, and when dry, use a 3/16 in. radius bearing-guided roundover bit in the router table to apply the stepped roundover edge detail (see exploded view). This last step is important, since it takes away some of the blocky appearance and gives the locomotive a more detailed, sculpted shape. Now add the wheels (L, N), the boiler, the two stacks (J, K) and the headlight (P). The boiler is just a 4 3/4 in. length of 1 5/8 in. diameter stair rail, or a section of closet pole with a flat planed on the bottom (stair rail or closet pole is available at most lumberyards).

Undercarriage

You could set about making the cars individually, but since the cars all share a common undercarriage assembly, the best approach is to start by making as many undercarriage assemblies as needed for the number of cars you want to make. For the train shown make four undercarriage assemblies. The undercarriage parts are all maple, except those for the coal car and caboose, which have padauk bottom boards (Q).

Each undercarriage consists of four wheel assemblies and a bottom board mounted to a base block (R). Rip and crosscut the base block stock. Then make a 1/2 in. wide by 3/4 in. deep dado cut in one end and a 5/8 in. by 1 in. notch on the opposite end of each base block, and drill the 3/16 in. diameter holes for the medium-sized pegs (V) that mount the wheel assemblies. Each wheel assembly consists of two wheels (T) mounted to a wheel block (S) with small pegs (U). To simplify the repetitive work of drilling the various peg holes in the bases and wheel blocks, it's best to use templates.

To assemble the undercarriage, first make the wheel assemblies, then mount them to the base block. Note that the wheel assemblies are not glued to the base block, but are free to pivot on the pegs. This produces a very realistic wheel assembly action, similar to the systems used on full-size trains. Add the medium peg for the leather hitch thong, and finally mount the bottom board. The hitch thong peg is the same peg used for mounting the wheel assemblies, but it's



Bill of Materials

(all dimensions actual)

Part	Description	Size	No. Req'd.
	Locomotive		
A	Chassis	1¼ x 1⅝ x 8¼	1
B	Cab Riser	¾ x 1⅝ x 3½	1
C	Cab Bottom	¾ x 2½ x 2⅞	1
D	Cab Front	¾ x 2½ x 2¾	1
E	Cab Side	½ x 1¼ x 2¾	2
F	Cab Top	¾ x 2½ x 4¼	1
G	Boiler Base	¾ x 2½ x 5	1
H	Cow Catcher	1¼ x 2½ x 2¼	1
I	Boiler	1⅝ dia. x 4¾ long	1
J	Front Stack	See Detail*	1
K	Rear Stack	See Detail*	1
L	Back Wheel	2¼ dia. x ¾ thick*	2
M	Large Peg	See Detail*	2
N	Front Wheel	1½ dia. x ½ thick*	4
O	Medium Peg	See Detail*	5
P	Headlight	1 dia. x ¼ thick*	1
	Undercarriage (No. Req'd. is for one car)		
Q	Bottom	½ x 2¾ x 8	1
R	Base	1⅛ x 1¼ x 8	1
S	Wheel Block	½ x 1 x 2½	4
T	Wheel	1 dia. x ¼ thick**	8
U	Small Peg	See Detail**	8
V	Medium Peg	See Detail**	5
	Coal Car		
W	Side	½ x 2 x 8	2
X	End	1¼ x 1¾ x 2	1
	Tanker		
Y	Tank	1⅝ dia. x 6⅜ long	1
Z	Cap	1 dia. x 1¼ long	1
AA	Vent Button	See Detail***	2
	Livestock Car		
BB	End	⅜ x 2 x 2¾	2
CC	Slat	⅜ x ⅜ x 2⅝	16
DD	Door Post	⅝ x ⅝ x 2	4
EE	End Post	¼ x ½ x 2	4
FF	Spacer	⅜ x 2 x 1½	2
GG	Roof	¾ x 2¾ x 8	1
	Caboose		
HH	Side	½ x 1¾ x 5	2
II	End	½ x 1¾ x 2¾	1
JJ	Roof	¾ x 2¾ x 8	1
KK	Post	3/16 dia. x 2 long	2

Parts Kits Ordering Information

Locomotive, undercarriage and tanker parts kits are available either separately or as a single kit from Lynes Unlimited, Rt. 2, Greenleaf, KS 66943; tel. (913) 747-2612. Please note that if ordered separately, any combination of up to six undercarriage and tanker kits can be sent for $1.50 postage. Call first for postage on larger orders.

Separate Kit Ordering Information

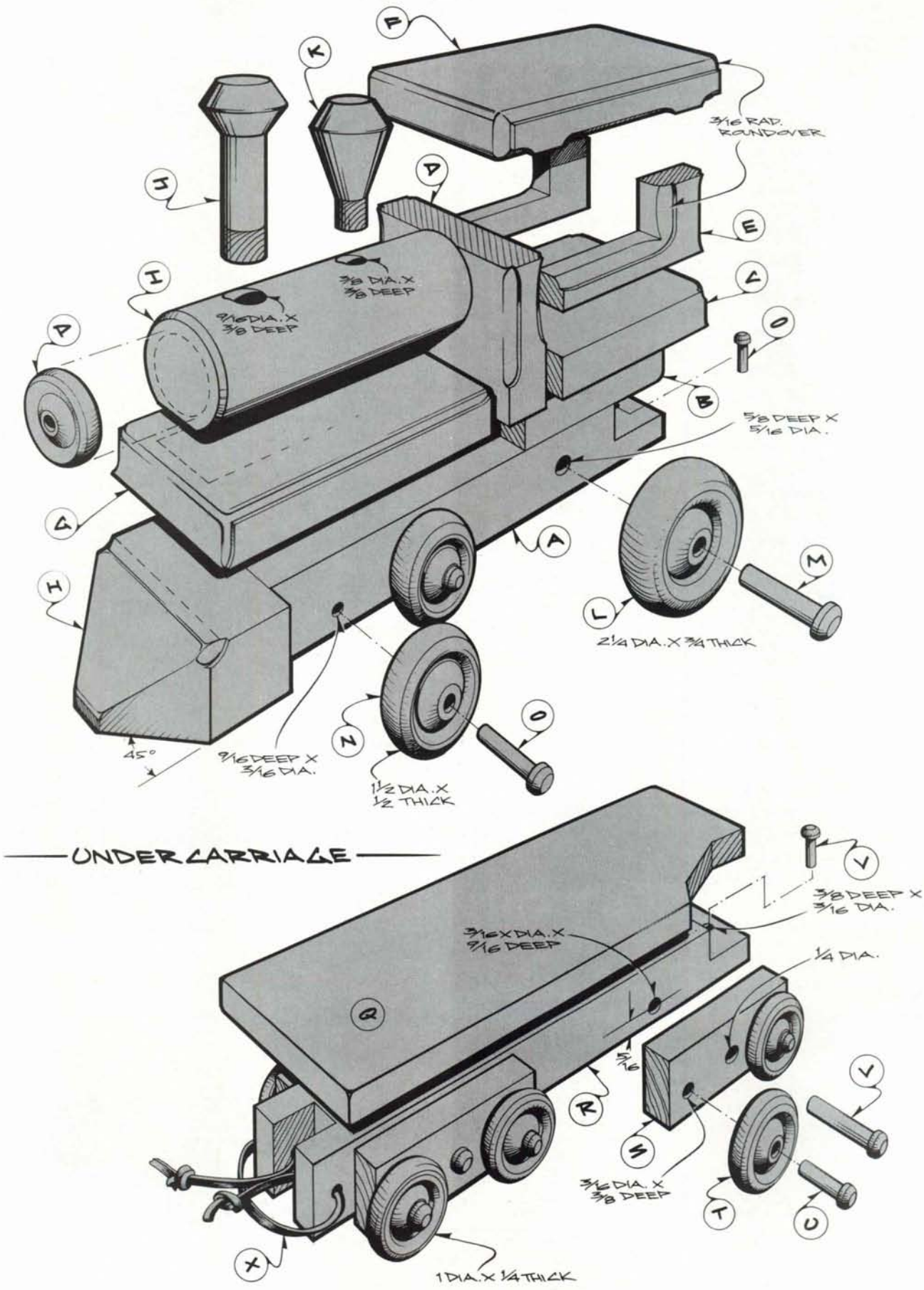
* Locomotive kit includes wheels (L, N), pegs (M, O), headlight (P) and smokestacks (J, K). Order kit no. 1. Cost is $8 per kit postpaid.

** Undercarriage kit includes wheels (T), small pegs (U) and medium pegs (V). Order kit no. 2. Cost is $3 per kit plus postage.

*** Tanker kit includes all the parts in one undercarriage kit plus the two vent buttons (AA). Order kit no. 3. Cost is $3 per kit plus postage.

Single Kit Ordering Information

Complete train set kit includes one locomotive kit, three undercarriage kits and one tanker kit. Order kit no. 4. Cost is $20 postpaid.


LOCOMOTIVE
F
K
J
D
3/16 RAD. ROUNDOVER
E
I
3/8 DIA. X 3/8 DEEP
9/16 DIA. X 3/8 DEEP
C
O
P
B
5/8 DEEP X 5/16 DIA.
G
A
M
H
L
2 1/4 DIA. X 3/4 THICK
N
O
45°
9/16 DEEP X 3/16 DIA.
1 1/2 DIA. X 1/2 THICK
UNDERCARRIAGE
V
3/8 DEEP X 3/16 DIA.
3/16 X DIA. X 9/16 DEEP
1/4 DIA.
Q
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T
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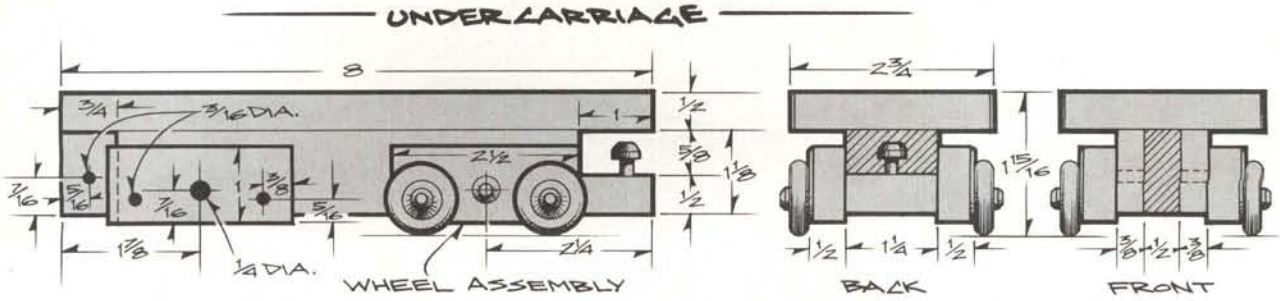
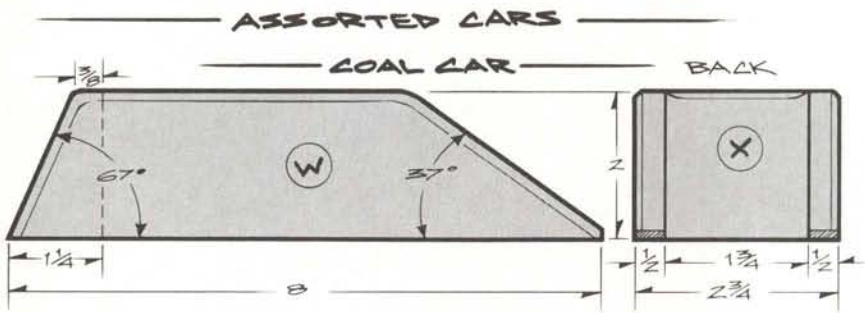
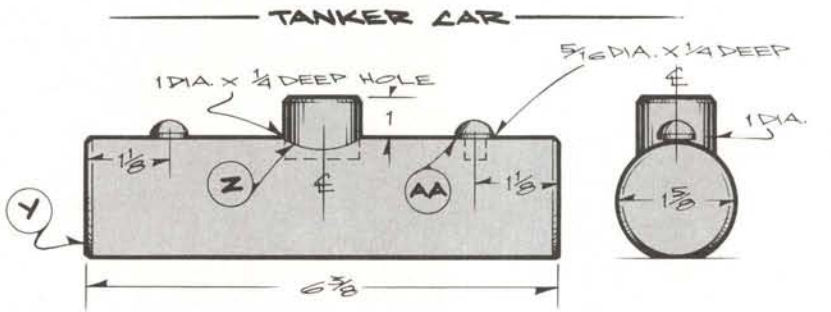
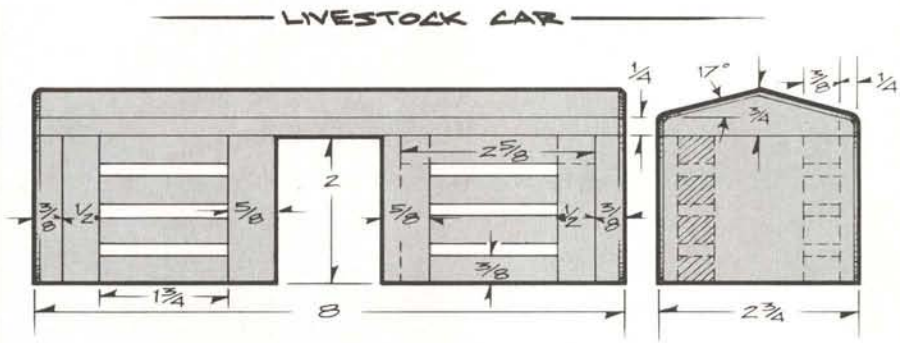
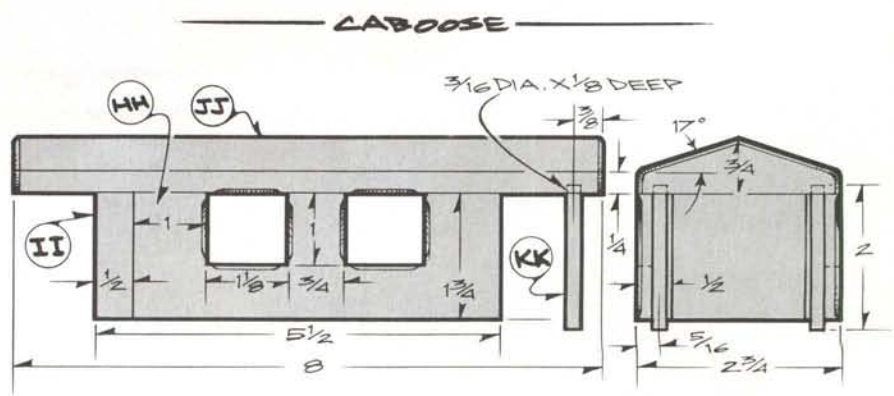










shortened up a little so the shaft portion is only 5/8 in. long. Be sure to mount the hitch thong peg before adding the bottom board.

Coal Car

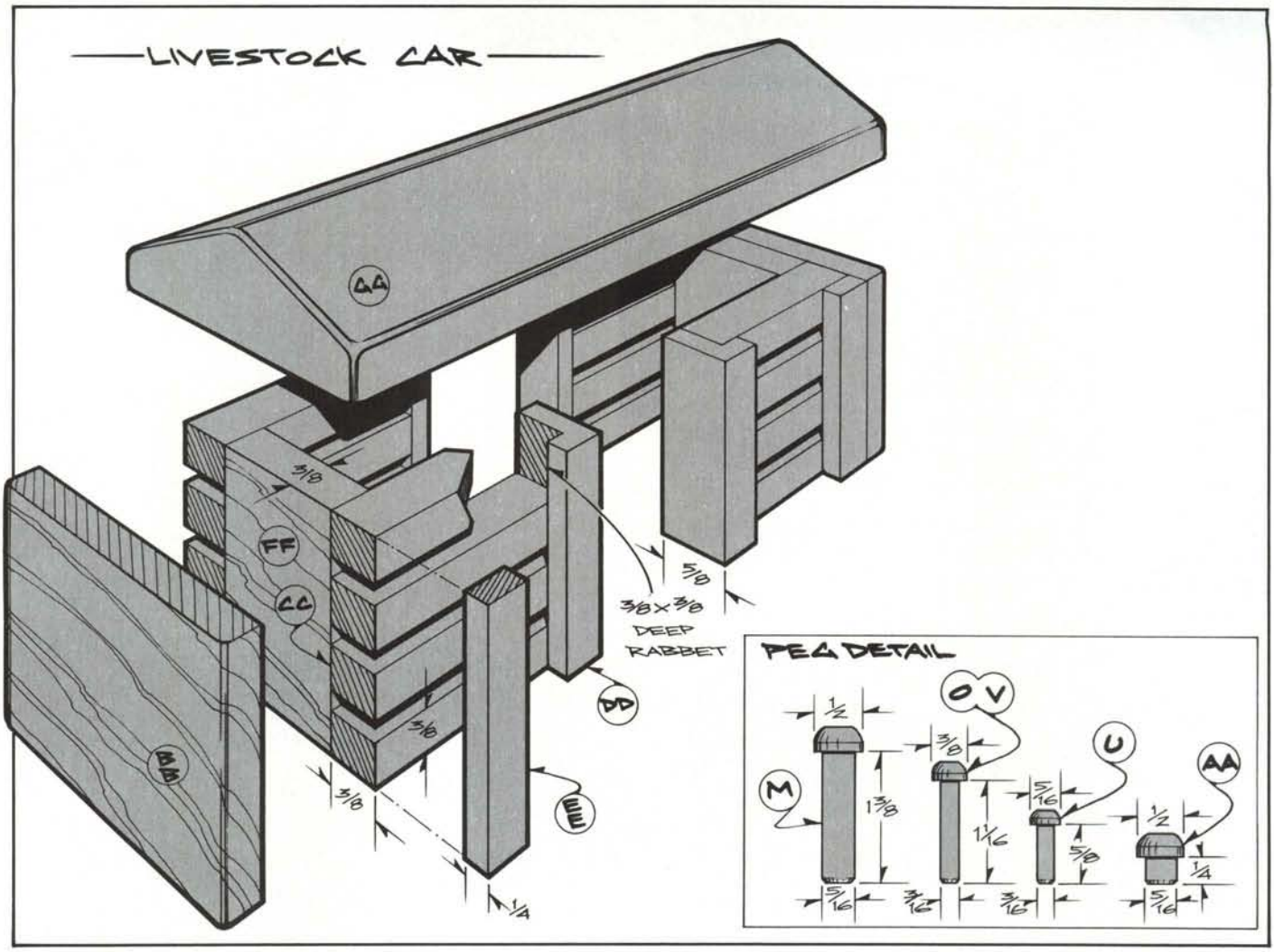
The coal car is just two oak sides (W) and an oak end (X) mounted to one of the padauk bottom board undercarriage assemblies. To get the 67-degree angle on the back end of the car, first cut the parts so the ends are square. Assemble them to the undercarriage, flip the car upside down, and use the table saw with the blade angled 23 degrees from vertical to establish the angle. Use a handsaw or a handheld jigsaw to cut the 37-degree angle on the front end, and sandpaper to remove any saw marks. Round the sharp edges as shown for a finished look.

Tanker

The tank (Y) is a 6 3/8 in. length of 1 5/8 in. diameter stair rail, or a section of closet pole planed flat on the bottom. Drill for the 1 in. diameter by 1 1/4 in. long dowel cap (Z), and for the two vent buttons (AA), and glue them in place. Then glue the tank to the undercarriage assembly.

Livestock Car

We've included an exploded view of the livestock car to help with the assembly. As shown, it's basically just two ends (BB), a series of slats (CC) held in place by posts (DD, EE) and



spacers (FF), with a roof (GG) over it all. Note that the posts on our livestock car are padauk, while the remaining parts are all oak.

The best way to make the slats and door posts is to start with lengths of stock planed to thickness and ripped to width. For the door posts you'll need about 10 in. of 5/8 in. square stock, for the end posts you'll need 10 in. of 1/4 in. thick by 1/2 in. wide stock, and for the slats you'll need about 4 ft. of 3/8 in. square stock. Cut a 3/8 in. by 3/8 in. rabbet in the door post stock. Then set up a stopblock on the table saw to facilitate crosscutting the posts to their 2 in. length. You'll need to reposition the stopblock for the 2 5/8 in. long slats.

Glue up the parts on one of your pre-assembled undercarriages, then cut and fit the roof. To get the slope on the roof, set up the rip fence on the table saw, raise the blade 1 1/2 in. high and tilt it 17 degrees from the vertical. Cut one side, then flip the roof stock end-for-end and cut the other side. Be sure to use a pushstick for all your ripping cuts.

Caboose

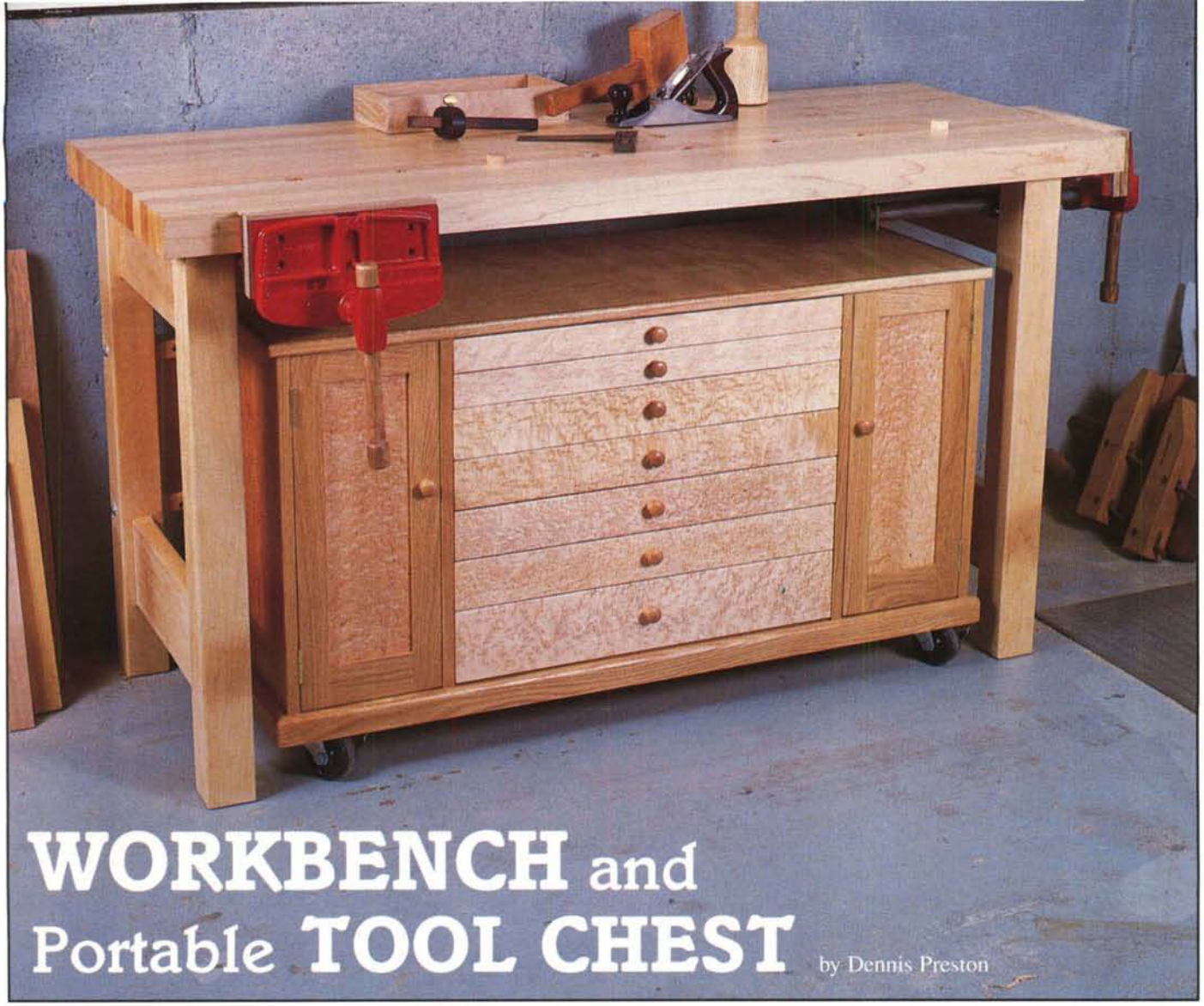
The caboose is just two padauk sides (HH) and an end (II), mounted to the remaining padauk bottom board undercarriage, and topped by a roof (JJ) that's also padauk. Two 3/16 in. diameter by 2 in. long maple or birch dowel posts (KK) complete the caboose. Cut the roof slope using the same table saw setup as for the livestock car roof. Make the window cutouts and drill for the posts before assembling the caboose on its undercarriage.

More Cars

We've shown only a locomotive and four cars, but don't let that limit you. You can easily make several tanker and cattle cars, and by adding an undercarriage by itself you've got a flatbed car. In fact, by customizing the basic undercarriage you can make just about all the cars you might find on any real train. Add some stakes to an undercarriage and you've got a car for hauling logs. It isn't much trouble to come up with hopper cars, passenger cars (just lengthen the caboose and add more windows) and car carriers. To customize the undercarriage assembly for a longer car, split an undercarriage base in half, lengthen the bottom board to 10 in., and leave a 2 in. space between the front and back base halves when you glue them to the bottom. Just be sure to order enough undercarriage parts kits.

Finishing Up

Round any sharp edges and final sand. If you like a finish, you could try one of the new water-based clear polyurethanes, or just apply a penetrating oil as we did on our train. Most of the new water-based finishes and many of the penetrating oils are safe for toys since they're nontoxic when dry. Check the can for precautions before you start. The leather hitch thongs are lengths of leather lacing, sold at most shoe and department stores. Note how the knots on the ends of the hitch thongs fit within the dado that's cut in the front end of each undercarriage base. One pair of laces yields more than enough hitch thong material for one train. WWJ



WORKBENCH and Portable TOOL CHEST

by Dennis Preston

The heart and soul of a woodshop is the workbench. A good bench is a pleasure to use. It's as steady as a rock, has large clamps, bench dogs that are centered on the clamps, and it provides a place to cut, plane, shape, sand and assemble your work. It has a flat top that is a consistent thickness throughout, which provides for convenient edge-clamping all around.

Next in importance to the workbench is tool storage. Ideally, tool storage is an arm's reach from the workbench. My mobile storage cabinet goes this concept one better; you can bring your tools right to the work, wherever it is in the shop. The tool cabinet's top also makes a handy extra work surface, set-up table, saw horse or seat to rest on.

The core of this idea was to develop a compact, robust, functional workbench that would fit into the limited space many woodworkers have available to them. Rather than build the tool storage into the bench, I opted to make the storage cabinet a separate unit, sized so it would nest conveniently under the bench. Since a good bench is like a fine piece of furniture, you'll want to take it with you when you move. The use of lag bolts and knockdown hardware makes this possible.

Key to the design of my bench is the use of a purchased top, low-cost vises and homemade bench dogs. The top I used is laminated (also called butcher block) hard maple—a full 2¼ in. thick—and measures 24 in. wide by 60 in. long. It's available from Woodcraft for $150 plus freight. For those who prefer a longer bench, Woodcraft also sells a 7 ft. long top for $199 plus freight. The metal rapid-action vises (available from Sears) have retractable dogs and are pre-drilled for wooden faces. These metal vises are more rigid and at 12 in. have twice the jaw capacity of their wooden counterparts. At about $80 each their cost also compares favorably with European style wooden-jaw vises, which cost about $125. Ordering information for the top, vises, knockdown hardware and tool cabinet casters can be found in the Bill of Materials. Hardware and material costs for both the bench and cabinet should be under $600.

The Workbench

Two problems exist for many woodworkers just starting out: limited space and the lack of a good bench. It's tempting to just go out and purchase a ready-made bench, but these have several shortcomings. First, good quality European style benches (held to be the paragon of bench design) are costly at about $900 and up, and second, the vises they use are the continuous screw type, which can be frustratingly slow to use. Also, these benches usually don't include a tool storage area below, and at typically 6 ft. to 7 ft. long they may be too large for some small shops.

For woodworkers desiring to make their own bench there's the quandary of

needing a bench to build a bench, and the daunting problem of how to get the top perfectly flat after you've ripped and glued up *all* the stock. The use of a purchased top (A) eliminates the need to plane and flatten such a massive section. And, at 2 1/4 in. thick, the purchased butcher block top this bench utilizes is thicker and heavier than most of the costly European style bench tops. Overall the bench weighs in at about 220 lbs.

If you don't have a bench now, build the bench first and then use it to build the tool cabinet. The purchased top also eliminates the requirement that you must have a bench to build a bench. Mount the vises, set the top on sawhorses and you can use it as a temporary bench to construct the frame.

I have noticed both in my own work and in looking at other bench tops that most activity is centered at or near the vises. Only about the first 12 in. of depth is actually used; the rest usually becomes a temporary storage surface. European benches, with only about 16 in. of actual top width, recognize this. The remaining width is taken up by a tool well. The problem with that design, though, is that the tool well is soon overflowing with tools, shavings and chips, a problem for those times when you need the full unobstructed width of the bench top.

With this in mind my bench eliminates the tool well and utilizes a full 24 in. wide top, which I've found sufficient for most work. Any wider and the top becomes a catchall for things that should be stored elsewhere. Unless you do a lot of work on long stock, the 5 ft. bench top length should be adequate. The two vises are located in a conventional manner for a right-handed person, but could be altered. For a left-handed person, locate the top so the 4 in. overhang is on the left end, move the tail vise to that end, and switch the front vise to the right.

Making the Frame

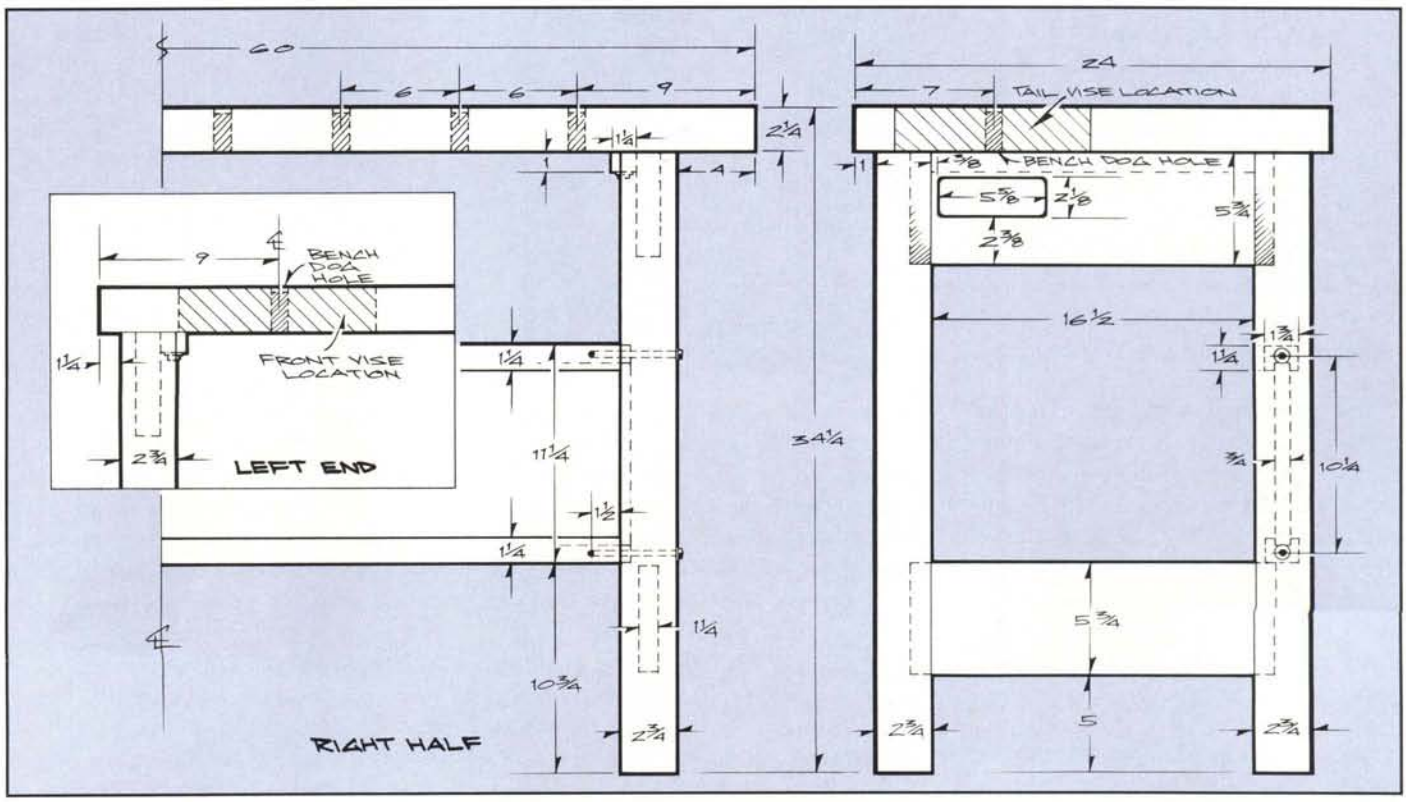
The bench frame is basically two leg assemblies (B, C) joined by a laminated back stretcher (D, E). The leg assemblies use basic mortise and tenon joinery, but the mortise and tenon joint that ties the leg assemblies together with the back stretcher uses knockdown hardware (a cross-dowel (H) and bolt) instead of glue to anchor the connection. Aprons across the front and back are not needed for strength, nor are they desired since they would prevent easy clamping of work to the top.

A good bench requires a certain amount of mass for stability. The 12/4 in. maple stock that I used for the legs is easily obtainable and provides excellent strength, but you can substitute some other hardwood, or even 4 by 4 fir construction lumber to reduce your material costs.

Before you actually cut stock for the legs, you need to determine what's a good working height for your bench. This bench is 34 1/4 in. high, which suits my 5 ft. 8 in. frame and the type of work I do. Examine your needs and set the bench height accordingly by adding to or shortening the bottom end of the legs. Note, though, that if you shorten the bench by more than 3 in., the tool cabinet may interfere with the vises (I). Crosscut the legs to length, then rip and plane to 2 3/4 in. square. Maple is very hard, so unless you've got a heavy-duty saw, you may want to use several cuts to rip the 12/4 in. stock.

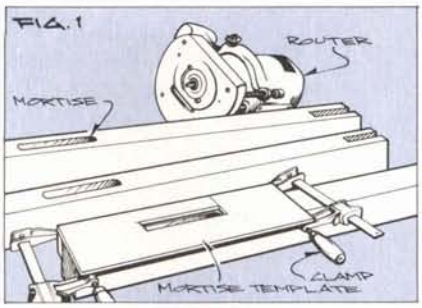
Next, rip the stretchers to 5 3/4 in. wide and crosscut them to 18 1/2 in. overall, which includes the 1 in. long tenons on each end. Mark and cut the right top stretcher for the vise. All vises are not the same, so measure carefully to check that the opening is adequate for the vise you plan to use. It's a good idea to have the vise on hand before you start on the bench.

I made jigs and used the router for both the vise cutout and all the mortise work. Use straight cutters in conjunction with template guide bushings, and size



the templates with respect to the guide bushings you select. It may seem like extra work to make up templates for the various mortises, but there are actually only four different templates required. In addition to the template for the tail vise cutout, you'll need templates to cut the mortises for the stretcher, back stretcher and bench dogs (G).

As shown in Fig. 1, the templates are just sections of 1/4 in. thick luan mahog-



any plywood. Strips of hardwood fastened to the templates are used to accurately index the mortises on the legs. Using a 1/2 in. diameter bit and a 5/8 in. diameter bushing, the template cutout for the stretcher mortises should measure 1 1/8 in. by 5 7/8 in. to yield the 1 in. wide by 5 3/4 in. long mortise. Using the same bit and bushing, a 7/8 in. by 11 3/8 in. template cutout will yield the 3/4 in. wide by 11 1/4 in. long back stretcher mortises, and a 2 1/4 in. by 5 3/4 in. template cutout will produce the 2 1/8 in. wide by 5 5/8 in. long vise cutout. For the bench dog mortises, switch to a 1/4 in. diameter bit and a 3/8 in. bushing, and make the template cutout 1 in. square to get the 7/8 in. square mortise that accepts the square upper part of the bench dogs. With all the mortises, use as many passes as are needed to get the required depth. With a large router you can easily take out 1/4 in. of stock at a time, but with a smaller router limit your depth of cut to about 1/8 in. at a time.

The advantages of the template method are twofold. First, hand cutting mortises in a hardwood like maple is a real chore, and second, the router method allows you to fine-tune the fit on scrap material before making any cuts on the actual project parts. You'll really appreciate the advantages of the template method when cutting multiple mortises, such as those for the stretchers and bench dogs.

With the mortises cut, make the back stretcher lamination. Note that if you opt for the 7 ft. long top, you'll need to increase the length of the back stretcher lamination by 2 ft. As shown, the back stretcher is a sandwich of two solid maple flanges around a plywood center. Once glued up it acts as a wooden I-beam. The 3/4 in. thick plywood center section fits into 3/4 in. wide by 3/8 in. deep grooves plowed the entire length of the 1 1/4 in. thick by 1 3/4 in. wide flanges. The reason for the I-beam assembly is that since there's only one back stretcher it must be fairly wide to withstand racking. If the back stretcher were a single solid board we would have to worry about cross-grain expansion and contraction of the board within the leg mortise. The lamination of solid stock and plywood is stronger, lighter and more stable than solid stock. The overall length of the I-beam assembly for use with the 5 ft. long top is 50 1/4 in., which includes 1/2 in. at each end for the tenons. Round the edges of the flanges and glue up the back stretcher assembly. When dry, cut 1/2 in. by 1/2 in. notches on the flange ends to create the 1/2 in. long by 3/4 in. thick tenon that runs the full 11 1/4 in. width of the back stretcher assembly. Round the corners of the tenon to match the radius of the router bit that you used for the mortises.

Test-fit the back stretcher tenons to the appropriate mortises, then locate and drill the holes for the bolts and cross dowels that anchor the joints. We purchased 1/4-20 by 4 1/2 in. long bolts at the hardware store, but the cross dowels were ordered from Woodcraft (see Bill of Materials). Cut the tenons on the stretcher ends, round the corners, test-fit the stretchers in their mortises, and if everything fits, glue and clamp the legs and stretchers. When dry, join the leg and stretcher assemblies with the I-beam back stretcher. Cleats (F) and lag bolts are used to mount the top to the frame. Cut the cleats to size and bore through for the lag bolts. Note that the two outside holes in the cleats are elongated to allow for seasonal movement in the top. The cleats are glued to the inside edge of the top stretchers, a good long grain-to-long grain glue joint. At final assembly be sure to include washers under all the bolt heads to protect the wood against gouging as the bolts are tightened.

Bill of Materials
(all dimensions actual)

Part	Description	Size	No. Req'd.
A	Top	2 1/4 x 24 x 60*	1
B	Leg	2 3/4 x 2 3/4 x 32	4
C	Stretcher	1 1/4 x 5 3/4 x 18 1/2**	4
D	Center	3/4 x 9 1/2 x 50 1/4**	1
E	Flange	1 1/4 x 1 3/4 x 50 1/4**	2
F	Cleat	1 x 1 1/4 x 16 1/2	2
G	Bench Dog	see detail	as req'd
H	Cross-dowel	3/8 dia. x 5/8 long (1/4-20)*	4
I	Vise	4 high x 10 wide***	2

* Top (A) and cross-dowels (H) are available from Woodcraft, 210 Wood County Industrial Park, Parkersburg, WV 26102. Tel. 1-800-225-1153. For the 5 ft. long top, order part no. 25T10; for the 7 ft. long top, order part no. 25T20. Prices are $150 and $199 respectively (not including freight). The cross dowels (part no. 06K15) are $4.95 postpaid for a package of 25.

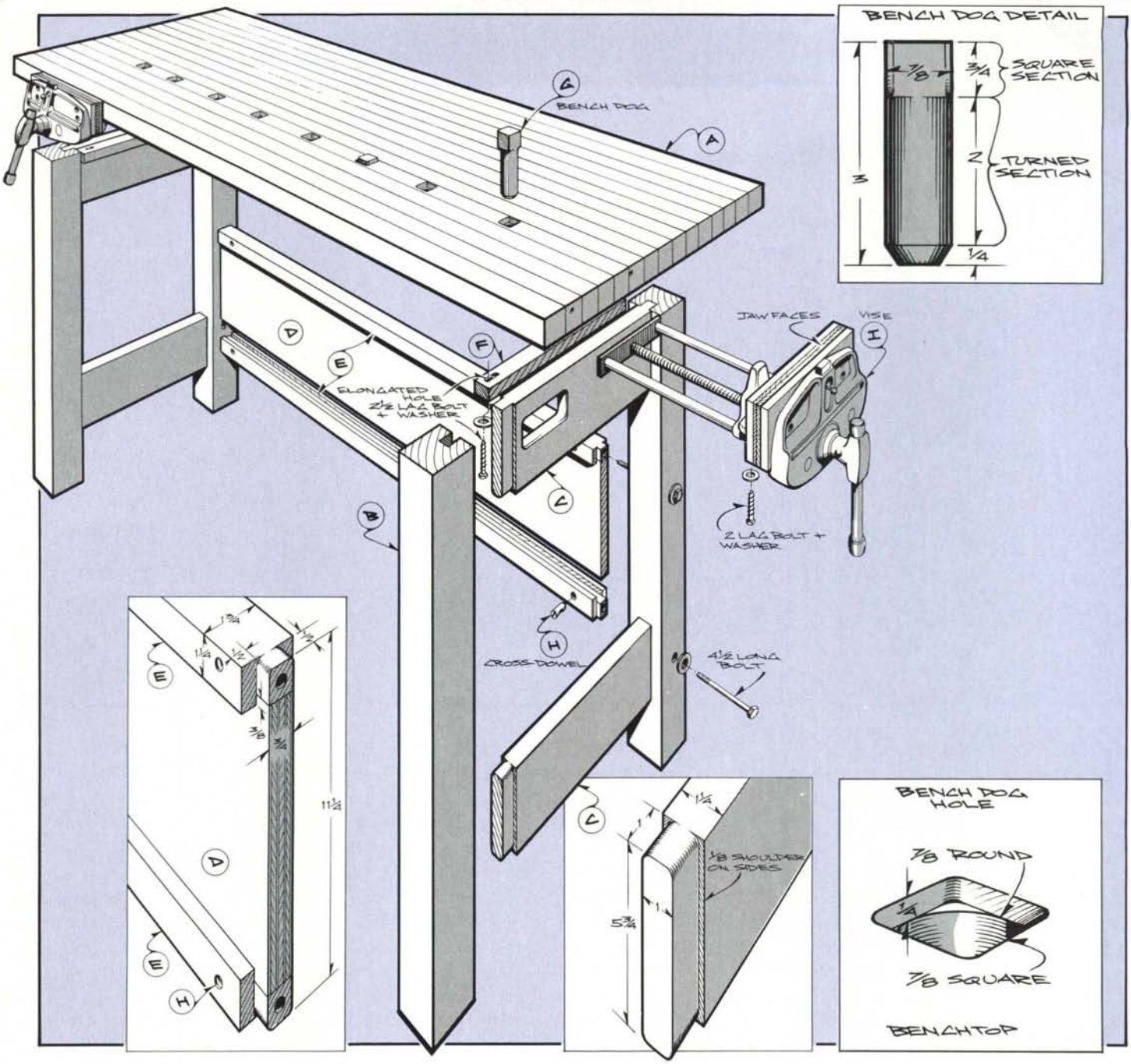
** Length include tenons.

*** Vise is available from Sears, 925 Homan Ave., Chicago, IL 60607. Tel. 1-800-366-3000. Order part no. 9BT51781C. Cost is $79.87 plus shipping.

The Bench Dogs

The bench dog system is simple and unique. It combines the ease of boring a 7/8 in. diameter hole with the non-rotating feature of the more difficult to cut rectangular through-mortise. As shown in the detail, the square mortise circumscribing the 7/8 in. diameter hole is only 1/4 in. deep. There's nothing sacred about the 7/8 in. hole diameter. I just find that size handy since I can fit my small bar clamp through the hole and use it as a holdfast when I need to clamp something in the middle of the bench. But the primary advantage of using shopmade wooden bench dogs as opposed to the purchased steel variety is that you'll never risk ruining a cutting edge should the tool accidently hit the dog.

Locate the holes for the bench dogs and carefully bore through the top. But first make certain that the line of holes is centered on the tail vise, and that the last hole in the line is centered on the front vise. This may seem like a small point, but without this on-center feature you'll find it difficult to use the bench dog system as it's intended, in conjunction with the vises for holding boards. For the 10 in. wide Sears vises I used, the bench dog holes are centered 7 in. back from the front edge of the top, spaced 6 in. apart, and the first and last holes are



located on center 9 in. from the end of the bench. I use a freshly sharpened 7/8 in. diameter spade bit chucked in my 3/8 in. variable-speed reversible drill to bore the holes, but take care to keep the drill vertical. Back up the holes to prevent chip out as the bit exits. The router and template are used to cut the 1/4 in. deep by 7/8 in. square bench dog mortises.

I turn my bench dogs on the lathe, and make them in several different heights so they can later be customized for unusual holding operations. Size the square end of the dogs for a friction fit. The dogs should be long enough so they protrude through the bottom of the bench top. That way you can just give them a little tap with your palm at the bottom to pop them free.

Mounting the Top and Vises

After final sanding all parts, turn the top upside down on the floor, with a blanket or some cardboard beneath to protect it. Locate the frame, drill the holes for the 2 1/2 in. long lag bolts, and fasten the frame to the top. Don't undersize the holes for the lag bolts. Maple is very hard and you could split the wood or twist the head off the bolt if you try to torque a lag bolt into a hole that's too small.

The Sears vises are sized to mount perfectly onto a 2 1/4 in. thick top, no shimming required. Add wooden jaw faces to the vises to protect the work that's held within.

The Finish

I finished the bench with a coat of sanding sealer followed by two coats of polyurethane varnish. The top comes pre-finished, but it's important to use the sanding sealer and polyurethane on the bench dog holes, where the wood has been exposed.

Recruit some strong friends to help you move the finished bench into place. After a brief rest you'll be ready to put the bench to good use building the accompanying tool cabinet.

Portable TOOL CHEST

I find that drawers make the most convenient tool storage. And to get maximum storage, the drawers should be fairly shallow. This cabinet's seven drawers will accommodate most common woodworking tools. The two shallow top drawers are for chisels and layout tools, the middle drawers will hold everything from bits and a brace to spokeshaves and sharpening stones, and the deep bottom drawer is for planes. The two cupboard compartments are for larger items such as electric drills and routers.

The cabinet is basically just a box made of birch veneer plywood edge-banded in oak. A hardwood plywood is recommended because it's more stable, easier to work and has fewer voids than a fir plywood. You'll need two 4 ft. by 8 ft. sheets of plywood altogether: a sheet of 3/4 in. thick plywood for the case and shelf parts, and a sheet of 1/4 in. plywood for the case back and drawer bottoms. All the remaining parts except the door panels and drawer faces are oak. I used bird's-eye maple for the panels and drawer faces to add some interest. With the bird's-eye the chest can even stand alone as a piece of furniture, perhaps a collector's case or a small credenza.

Start by making the plywood box. Cut the sides (A), top/bottom (B), and dividers (C) to length and width. Note that the overall length of the sides and dividers includes the 1/4 in. wide by 3/8 in. long tongues on each end. The dividers must be sized 1/4 in. less in width than the sides, top, and bottom, but for the moment cut parts A, B and C to the same 17 in. width. This yields greater accuracy and minimizes additional rip fence settings.

Again grouping the parts, cut the tongues and grooves. I find it best to use a piece of scrap to check the settings prior to cutting the actual pieces. Be careful to orient the tongues on the dividers so they're on the side facing the drawers. You could use a fixed shelf system, but the commercial shelf supports (F) I use allow a wide range of adjustment so you can customize the shelves to meet your needs. A source for the shelf support strips and clips is listed in the Bill of Materials.

Lay out and cut the dadoes in the sides and dividers for the shelf supports and drawer runners (E). For the drawers to operate properly, it's important that the opposing runners in the two dividers be perfectly aligned. Cut each pair of runner dadoes with the same fence setting to insure accuracy. Then reposition the fence for the shelf support dadoes, which are all located on-center 2 1/2 in. from the edge. Set up the dado head for a 5 mm deep by 14 mm wide cut. This measurement is important since the shelf support strips are press-fit into place. Like much of the furniture hardware sold today, the strips are European made and sized in millimeters. If you don't already have one, steel rules with millimeter gradations are sold at most stationery stores. Use the same fence setting for all eight shelf support dado cuts. With the dado cuts made, now reposition the rip fence, identify the left and right side dividers, and rip 1/4 in. off the back edge of both dividers. This enables the dividers to fit inside the back. Next, set up the table saw for a 1/4 in. wide by 3/8 in. deep rabbet, and cut the rabbets in the sides, top, and bottom for the back.

Assemble the carcase, consisting of the sides, dividers, top, bottom, and back. All edges are flush at the front, so the dividers will be inset 1/4 in. at the back. Once the carcase is dry and out of clamps, add the oak base front and back (G), the base sides (H), the glueblocks

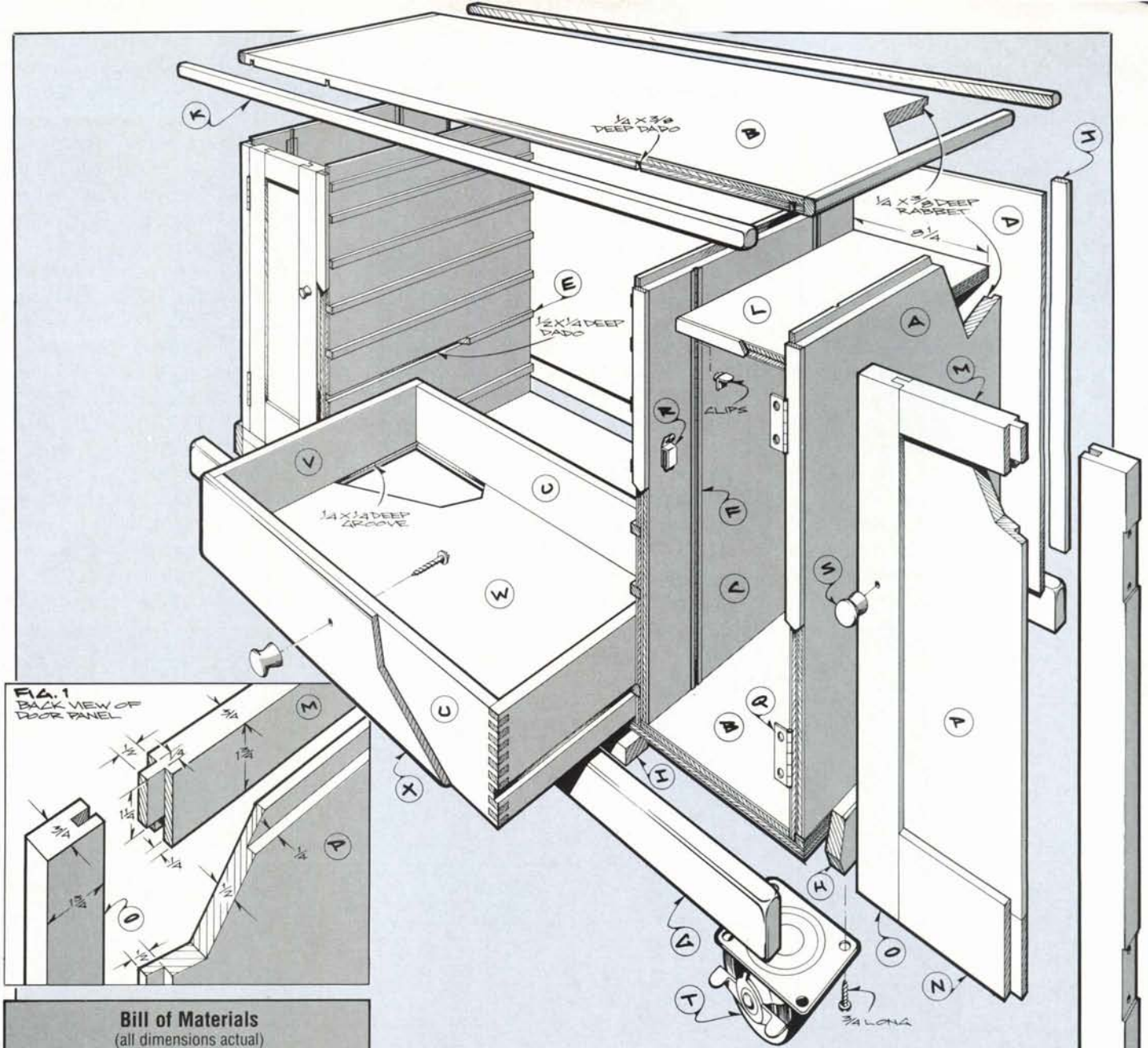


FIG. 1
BACK VIEW OF DOOR PANEL

Bill of Materials
(all dimensions actual)

Part	Description	Size	No. Req'd.
A	Side	3/4 x 17 x 21 3/4*	2
B	Top/Bottom	3/4 x 17 x 45	2
C	Divider	3/4 x 16 3/4 x 21 3/4*	2
D	Back	1/4 x 21 3/4 x 44 1/4	1
E	Drawer Runner	1/2 x 1/2 x 16 3/4	14
F	Shelf Support	21 long**	8
G	Base Front/Back	3/4 x 1 3/4 x 46 1/2	2
H	Base Side	3/4 x 1 3/4 x 17	2
I	Glueblock	3/4 x 1 3/4*	As Req'd
J	Edging	1/4 x 3/4	As Req'd
K	Top Edging	1/2 x 3/4	As Req'd
L	Shelf	3/4 x 8 1/4 x 15	As Req'd
M	Door Rail (Top)	3/4 x 1 3/4 x 6*	2
N	Door Rail (Bottom)	3/4 x 2 1/2 x 6*	2
O	Door Stile	3/4 x 1 3/4 x 21	4
P	Door Panel	1/2 x 5 7/8 x 17 5/8*	2
Q	Hinge	2 long x 1 1/2	4
R	Magnetic Catch	as shown	2
S	Knob	1 dia.	9
T	Caster	3 dia.***	2 pair

Part	Description	No. Req'd Per Drawer	Top Drawers	Middle Drawers	Bottom Drawer
U	Front/Back	2	1/2 x 2 x 25	1/2 x 3 x 25	1/2 x 5 x 25
V	Side	2	1/2 x 2 x 16 3/4	1/2 x 3 x 16 3/4	1/2 x 5 x 16 3/4
W	Bottom	1	1/4 x 16 1/4 x 24 1/2	1/4 x 16 1/4 x 24 1/2	1/4 x 16 1/4 x 24 1/2
X	Face	1	1/4 x 2 x 25	1/4 x 3 x 25	1/4 x 5 x 25

* Dimensions include tongue or tenon.

** Shelf support strips (F) and clips are available from Woodworker's Supply, 5604 Alameda Pl. NE, Albuquerque, NM 87113. Tel. (800) 645-9292. Order part no. 804-486 for the shelf support strips (cost is $2.25 per strip for an 8 ft. 3 in. long strip; order two). The clips are part no. 804-507 ($1.92 for a package of 12).

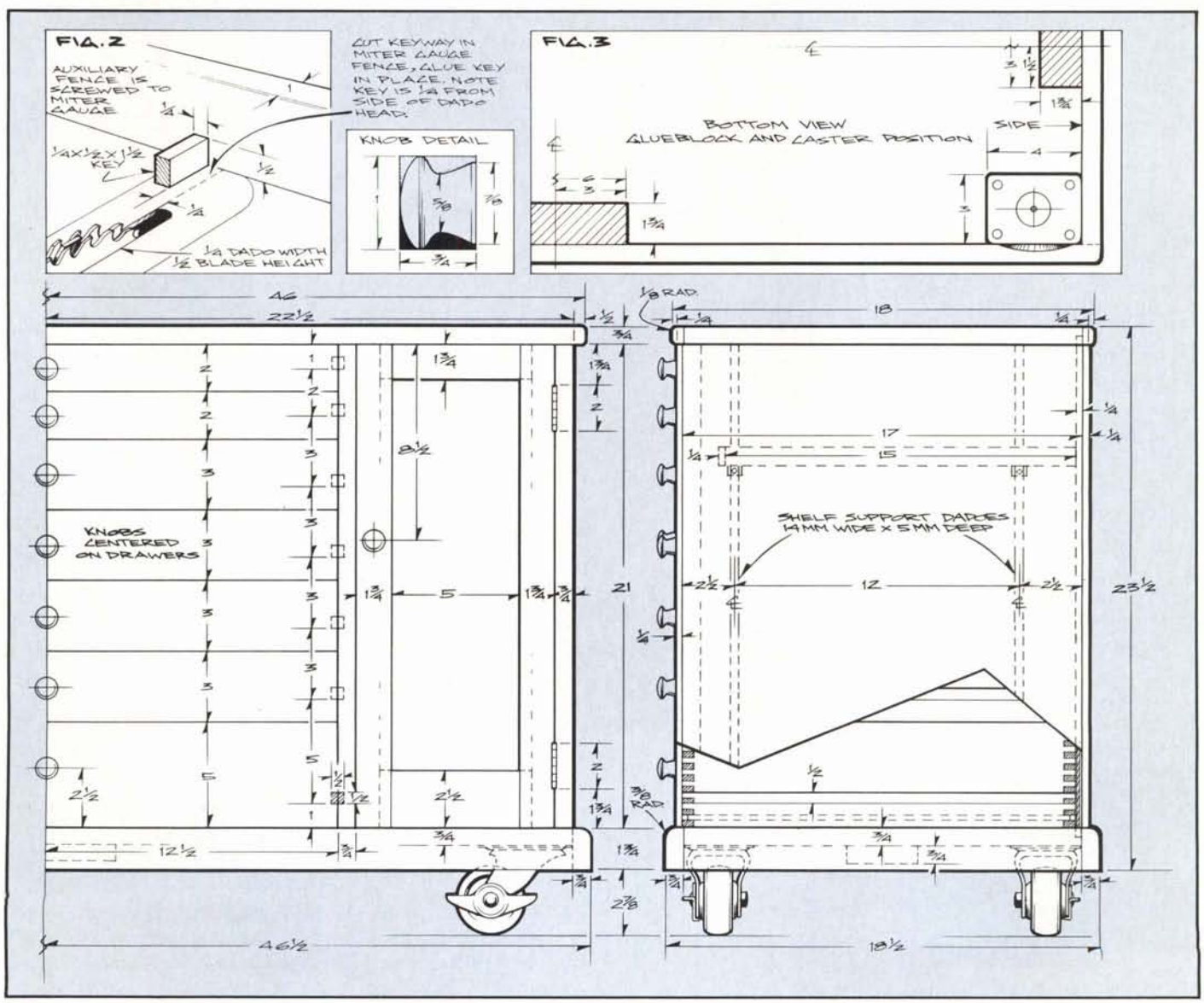
*** Casters (T) are available from Woodcraft, 210 Wood County Industrial Park, Parkersburg, WV 26102. Tel. (800) 225-1153. Order part no. 13X60 for a pair. Cost per pair is $17.50 postpaid (two pair required).

(I), and the edging (J, K). Also cut as many shelves (L) as you need, and apply 1/4 in. thick edging to the front end only. Radius the top edging and the base as shown.

The doors are a simple stile and rail construction. As shown in Fig. 1, the 1/4 in. wide by 1/2 in. deep grooves in the stiles (O) capture the tongue on the panel (P) and also serve as the mortises for the tenons on the ends of the rails (M, N). The panel is sized a little under the actual groove-to-groove dimensions, and is allowed to float within the frame. The drawers are just finger-jointed boxes with an applied face (X). A 1/4 in. wide by 1/4 in. deep groove in the front and back (U) and sides (V) holds the plywood bottom (W). The 1/4 in. pin size of the finger joints enables you to use the same jig (Fig. 2) for all three drawer sizes; the deeper drawers just have more pins. The two top drawers have 8 pins, the four middle drawers have 12 pins, and the bottom drawer has 20 pins. The grooves in the drawer sides to fit the runners are cut after the boxes are assembled but before the faces are mounted.

Mounting the drawers and getting them to operate smoothly is probably the fussiest part of the chest assembly. Cut the 1/2 in. square drawer runners, test fit them in the carcase without glue, and try each drawer. Now is the time to make any adjustments. As dimensioned in the Bill of Materials, the drawers are butted tight top to bottom and on the sides, but in practice you must allow a little space between the drawers and at the sides. A sharp hand plane or a belt sander can be used to remove a little stock from the top and bottom edges and sides of each drawer. If you take about 1/32 in. from each edge and side, you'll have 1/16 in. clearance all around. This clearance is important since you don't want the drawers rubbing against each other or jamming against the dividers. Another way to get the needed clearance is to just size your stock dimensions a little under to start. Once you've got the drawers operating smoothly, *glue the runners* into the case. Mount the drawer faces last, after the drawers are fitted.

All that remains is to mount the hardware and apply a finish. The door hinges (Q), magnetic catches (R), and knobs (S) are all hardware store items. A mail-order source for the locking casters (T) is listed in the Bill of Materials. Note that if you mount the casters flush into the corners of the base, you'll need to chamfer the inside edges of the base front and back (Fig. 3) to provide the caster wheels with needed clearance. The finish is a coat of sanding sealer followed up with two coats of polyurethane varnish and then paste wax.



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Vol. 8 No. 4 July-Aug '84

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, Wag-on-Wall Clock; *Articles:* What Sells Best?; Homemade Removers; Buying a Basic Set of Hand Tools; Kerf Bending; Caning and Wood Finishing Suppliers.

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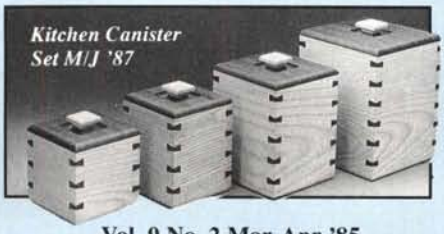
Oak Barrister's Bookcase, Parquet Table, Shaker Trestle Table, Bandsawn Wooden Scoops, Toy Biplane, Book Ends, Contemporary Candle Holders, Necktie and Belt Holder, Keyed Miter Jig, Modular Coffee Table and Bar, Magazine and Book Rack, Contemporary Chest of Drawers, Early American Step Table; *Articles:* 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.



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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, Jacobean Joint Stool; *Articles:* Product Liability: Part I; Restoring an Antique Mirror Frame; Coping with Wood Movement; Making Recessed Finger Pulls; The Jacobean Period.

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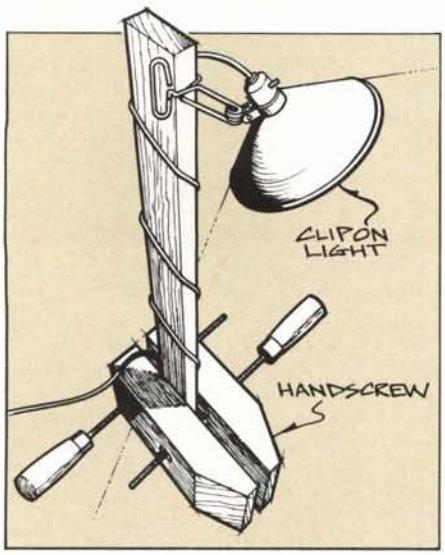
Shop Tips

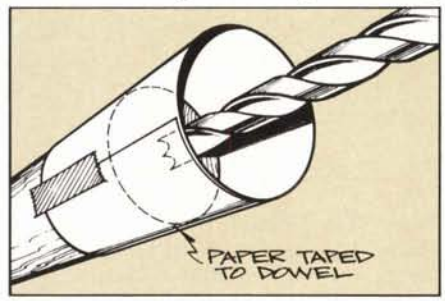
With a clip-on light, a length of 3/4 in. by 2 in. wide stock, and a 12 in. (jaw length) handscrew, you'll be able to quickly make a portable light source for the workshop. The handscrew serves as the base (clamp the stock between the handles for best support), and the lamp is clamped to the stock at a convenient



height. Once the job is done, the parts can be disassembled and put away, so you won't be using up valuable shop space when the lamp's not in use.

Respirator cartridges for gases and vapors have a limited life. You can help extend their life by keeping them in an airtight container such as the zipper-type plastic sandwich bags.

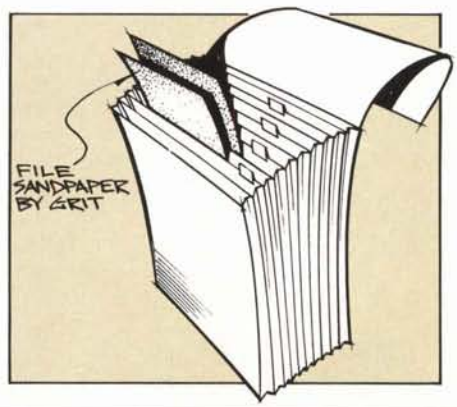
When I need to drill a straight hole lengthwise in the end of a dowel or spindle and don't have access to a drill press or boring machine, or the piece is just too long, I wrap a piece of paper around the dowel and slide it past the end an inch or two. This allows me to center the shaft of the bit in the end of the tube and get a fairly accurately



aligned hole. First, though, drill a starter hole at the center of the dowel end, since it may be difficult to see the dowel end once the paper is added.

Doug Ferree, Wilcox, Neb.

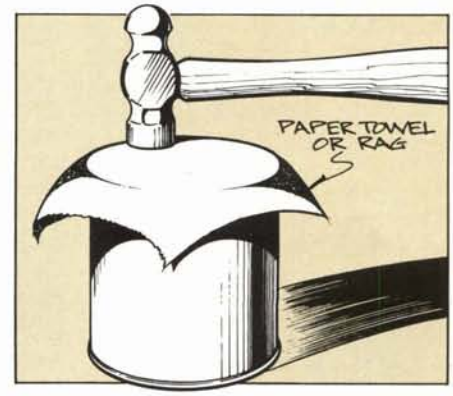
I've found that an accordion file provides a convenient means to store sandpaper. Most have nine pockets and measure about 10 in. high by 12 in. long—just right for 9 by 11 in. sheets of



sandpaper. I store the various grits in separate pockets, with each pocket labeled to make the sandpaper easy to find. The file also helps to prevent the sandpaper from curling if your workshop tends to get damp. Accordion files are sold in most office supply and department stores.

Howard E. Moody, Upper Jay, N.Y.

The lids on most paint or varnish cans won't be secure unless you tap them in with a hammer. But if you aren't careful,



any excess on the rim of the can is likely to splash all over. Next time, cover the can with a paper towel or rag before using the hammer.

The Woodworker's Journal *pays $25 for reader-submitted shop tips that are published. Send your ideas (including 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.*

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from *The Woodworker's Journal*

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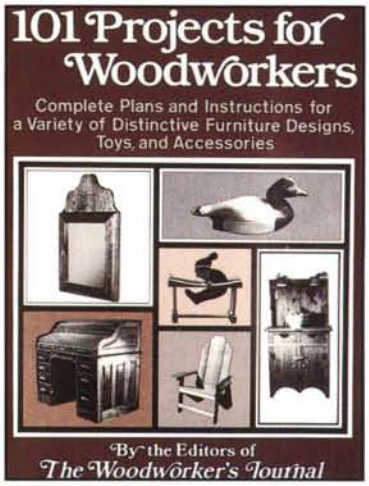
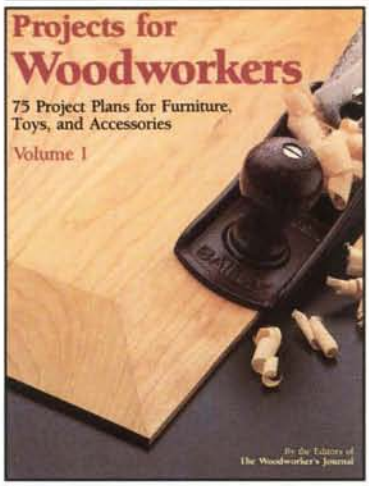
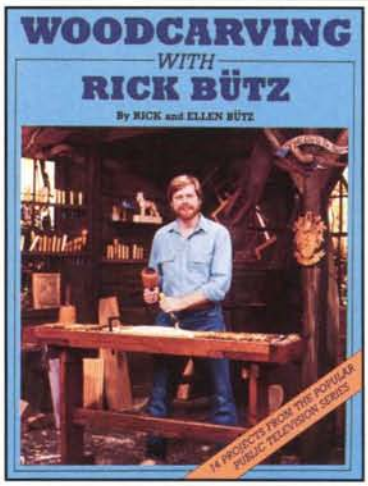


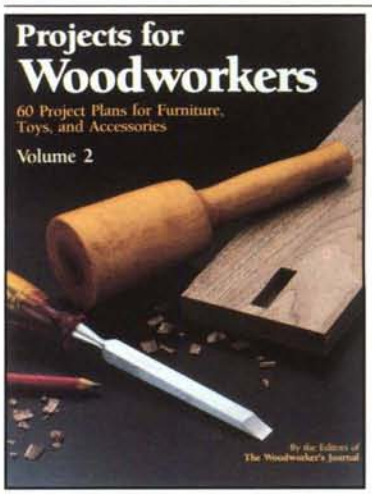
101 Projects For Woodworkers
For the eager amateur just starting out or the craftsman with a shop full of tools, **101 Projects For Woodworkers** features an unparalleled variety of classic projects for everyone. Included in this collection of plans from the 1977-80 issues of *The Woodworker's Journal* 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.



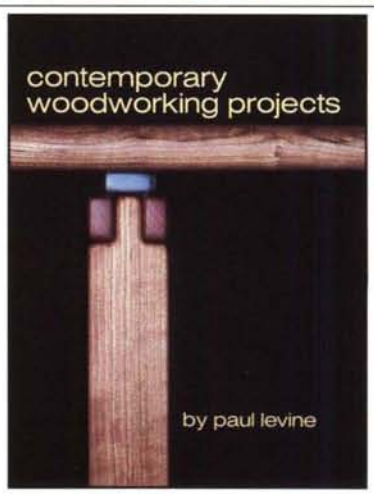
Projects For Woodworkers, Volume 1
Beginning and advanced woodworkers alike will appreciate the full range of styles in furniture, accessories, lamps, clocks, toys and gifts. Of the 75 projects selected from the 1980-81 issues of *The Woodworker's Journal* magazine, plans include a Cabinetmaker's Workbench,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



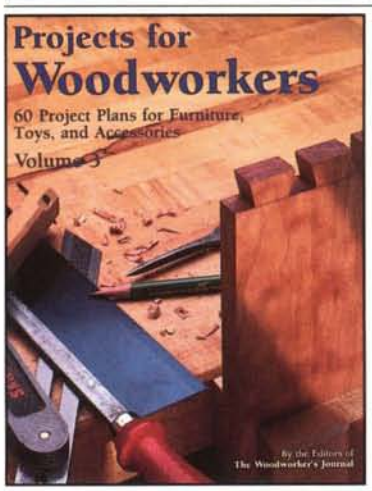
Woodcarving With Rick Butz
Learn woodcarving! With just a few tools and a few hours to spare, you can share in the simple pleasures of carving.Wander into the Black Forest of Germany with a traditional carving of St. Nick, or into a small Russian village with a Dancing Bears folk toy. You'll enjoy a 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.



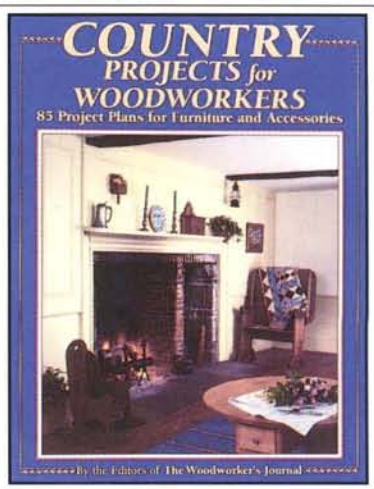
Projects For Woodworkers, Volume 2
Originally published in the 1982 issues of *The Woodworker's Journal* magazine, all 60 projects were chosen with a wide variety of styles and skill levels in mind. Each project is presented with complete instructions and thorough illustrations. You'll find household 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.



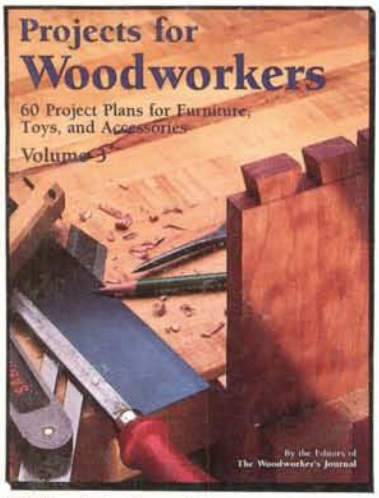
Contemporary Woodworking Projects
Paul Levine guides woodworkers of all skill levels through room-by-room chapters of coordinated furniture and accessories. The clean angles, sturdy joinery and special techniques are made easy to master with step-by-step instructions and illustrations. Among the 40 handsome 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.



VOLUME 3 IS HERE!

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The third book in our
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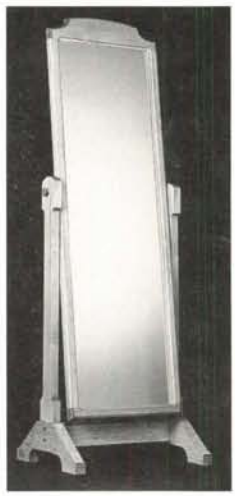
60 Complete Project Plans



Following the widespread popularity of the first two books in the series, **Projects For Woodworkers, Volume 3** adds 60 more great selections to the woodworking hobbyist's library of plans.

All 60 projects were chosen as readers' favorites from the 1983 issues of *The Woodworker's Journal*.

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Jewelry Chest

Shaker Chest

Country Pine Table