The Woodworker's Journal

Vol. 15, No. 4 $3.95 (Canada $4.50)

Making Picture Frames

- Turning Small Boxes
- Using Gel Stains
- Shaping on a Table Saw

Tool Review: Thin Kerf Saw Blades

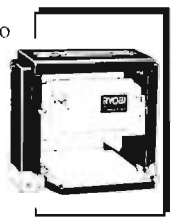
0 73361 64856 3 07

Plus! *8 Project Plans:* Drop-Leaf Table • Whirligig Dulcimer • Horse & Cart Toy • Gumball Machine Lathe Chuck • Picture Frames • Napkin Holder

July/August 1991

LOWEST PRICES! FREE SHIPPING

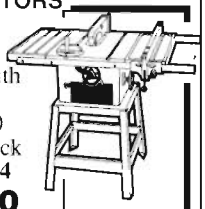
RYOBI 10" PLANER



Plane boards to 5" thick. Cut 1/8" per pass. Portable, weighs 58 lbs.

AP10
$345.00

DELTA 10" CONTRACTORS SAW



Large 40" x 27" table with 1-1/2" H.P. motor. 5500 RPM. Jet lock fence. **34444**
$597.00

freud BISCUIT JOINER

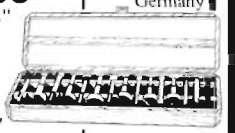
Super strong joints. Eliminates dowels.

JS100
$157.00

15 PC. FORSTNER BIT SET

$99.00

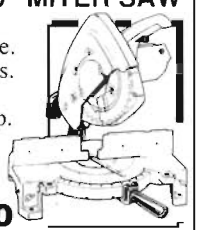
Made in Germany



Sizes 1/4" to 2".

7 PC. SET: 1/4" to 1"
$47.00

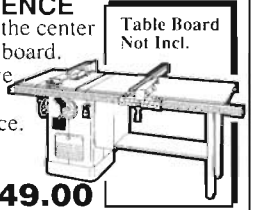
RYOBI 10" MITER SAW



Electric brake. Positive stops. Superior workmanship.

TS251U
$167.00

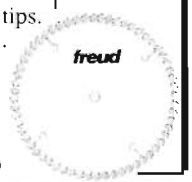
DELTA UNISAW WITH 52" FENCE



Cut to the center of 60" board. Positive lock unifence.

34782
$1649.00

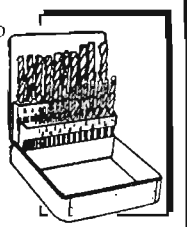
freud 10" 60 TOOTH BLADE



Big carbide tips. Grind: ATB.

LU73M10
$36.00

29 PC. BRAD POINT SET



Sizes 1/16" to 1/2" in 64ths. Won't walk. Long lasting. With steel case.

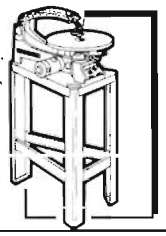
$19.00

RYOBI CORDLESS DRIVER/DRILL

Torque force. Electric brake. One hour charge.

TFD150VR	7.2V	**$ 99.00**
TFD170VR	9.6V	**137.00**
TFD220VR	12V	**165.00**

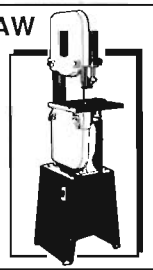
DELTA 18" SCROLL SAW



Variable speed. Cut to 2" thick. 7/8" stroke. 36 blades included.

40601
$687.00

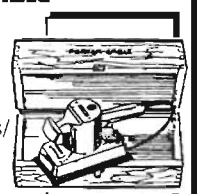
14" BAND SAW



3/4 H.P. motor. 4 speeds. Enclosed base.

$229.00

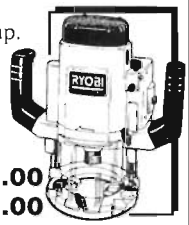
PORTER-CABLE DELUXE SANDER



1/2 sheet. Includes wood case. 10,000 orbits/minute.

9505
$134.00

RYOBI 3 H.P. ROUTERS



3 H.P., 15 amp. Accepts 1/4", 3/8", 1/2" bits. Includes guides.

R600 **$187.00**
RE600 **$215.00**

DELTA 15" SCROLL SAW

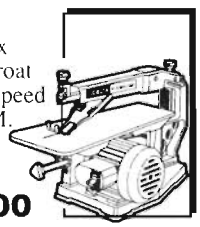
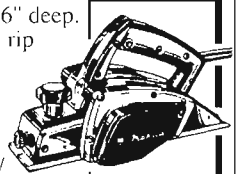


Table 17" x 7-7/8". Throat 15" x 2". Speed 1725 CS/M.

40150
$117.00

Makita 3-1/4" PLANER



Cuts 1/16" deep. Includes rip fence.

1900BW
$109.00

Makita CORDLESS DRIVER/DRILL

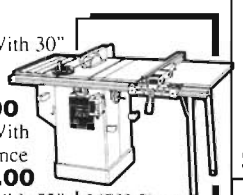
9.6 volts. Variable speed. One hour charge.

6093DW
$125.00

MORE RYOBI

SC160	16" Scroll Saw	**$137.00**
E3800	Drywall Driver	**69.00**
TR30U	Laminate Trimmer	**79.00**
BT2500	Table Saw	**279.00**
DCU65	Drywall Cutout	**69.00**
JSE60	Jig Saw	**125.00**
W660	7-1/4" Circular Saw	**89.00**
R331	2 H.P. Router	**153.00**

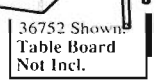
DELTA CABINET SAWS



36755 With 30" Jet Lock fence
$869.00

36751 With 30" Unifence
$1049.00

36752 With 52" Unifence
$1165.00

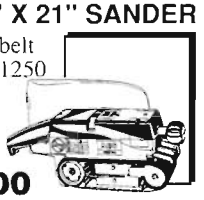


66" ROLLER TABLE

15" wide. 9 ball bearing rollers. Fully adjustable. Folds for storage.

$99.00

AEG 3" X 21" SANDER



Electronic belt speed 660-1250 FPM. 7.8 amps.

HBSE75S
$127.00

Makita

6404	3/8" VSR Drill	**$ 63.00**
5090DW	Cordless 9.6V Saw	**135.00**
2708	8" Table Saw	**269.00**

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The Woodworker's Journal

JULY/AUGUST 1991 VOLUME 15, NUMBER 4

CONTENTS

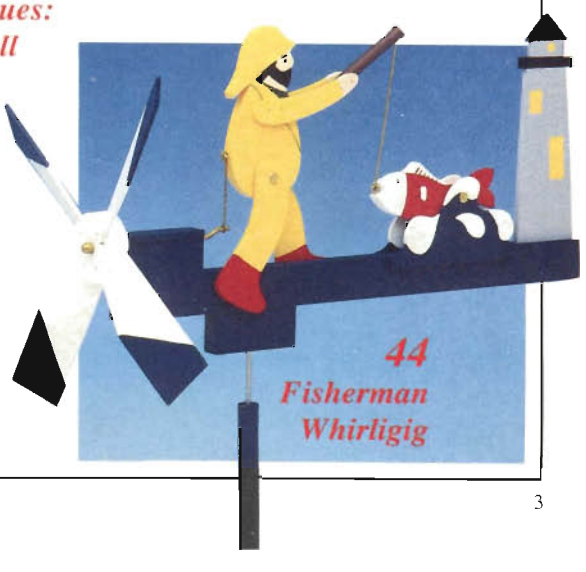
DEPARTMENTS

TECHNIQUES

PROJECTS

FEATURE

Special Techniques:
Turning Small
Boxes
15



Shoptalk

Summertime

Summer has finally settled on the Berkshire Hills and it's often difficult to remain indoors. I've noticed that some of our projects receive more than the usual care in sanding and finishing at this time of the year. A pair of sawhorses set up outside allows the prevailing breeze to carry off dust and fumes but also provides the chance to "catch a few rays" in the process.

When it's possible, backyard woodworking can be a double delight. My uniform consists of work shoes (to fend off dropped hammers), an old pair of cutoff jeans, a leather carpenter's belt (which still contains galvanized nails from a siding job done 18 years ago), and plenty of sunblock.

Apart from the occasional biting insects, my only annoyance is extension cords. A carpenter friend once told me that if he ever tripped and fell out a window, the one thing he would grab for would be an extension cord because they always hang up on something. If we can put satellites into space, why can't we design a truly streamlined and snag-proof power cord connection?

In This Issue

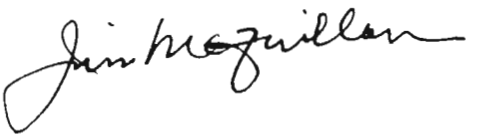
In the past we've featured picture frames that could be made using common lumberyard moldings but I've always wanted to do a few distinctive moldings that could be made from scratch. The four frames in this issue are attractive and fun to make, and Roger Holmes' article on Framing Basics should help get you off to a good start. I warn you that designing and making picture frames can be addictive so you better start building a bigger box to hold all those router bits you'll want to try.

Dan Thornton, our Art Director was intrigued by the Spigot Chuck—enough so that he made one for himself and tried it out on his own lathe. At last word, his wife has told him that they have enough of "those little boxes" and will he please make something else. I know how it is, Dan. Turning those lids so they pull off with that satisfying "pop" can also be addictive.

Stork News

While this issue's projects had their conception in 1990, some of the staff were busy with conceptions of their own. Last year I was informed by four staffers that they were pregnant. To have four out of eight female employees become pregnant within six months had me checking the well water for traces of a fertility drug.

At this time, I'm happy to announce that Kim Gellatly and daughter Kylie, Patty Malumphy and daughter Mikaela, Jane Manley and son Matthew, and Maureen Murphy-Gereg and son Johnny are all doing just fine. Kim has returned as our Copy Editor and Patty has resumed her Circulation duties. Jane and Maureen hope to be back soon. Congratulations, gals!



The Woodworker's Journal

Editor and Publisher **James J. McQuillan**

Managing Editor **Thomas G. Begnal**
Associate Editor **David F. Peters**
Copy Editor **Kimberly Gellatly**
Contributing Editors **Jim Barrett, Rick and Ellen Bütz, R.J. DeCristoforo, Dennis Preston**

Art Director **Dan Thornton**
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Production Manager **Jane Manley**

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Advertising Sales
Dan Ramage, Carolyn Ray, Renee Jaunsem
Pattis/3M
7161 North Cicero Avenue
Lincolnwood, IL 60646
Tel. (708) 679-1100; Fax (708) 679-5926

Subscription Department
The Woodworker's Journal
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.

Printed in the United States of America

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.

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

Photo Credits: *John Kane/Silver Sun Studios, pp. 3,33 and Back Cover; Tom Barrett, pp. 53, 58-59.*

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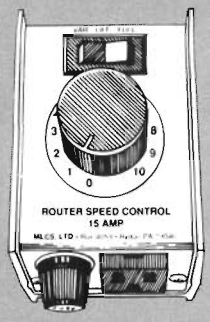

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ITEM NO.	BEST CUT BEST PRICE	DESCRIPTION	ANGLE/DEPTH/RADIUS CIRCLE DIAMETER	LARGE DIA.	CUTTING LENGTH	SHANK SIZE	PRICE
#601	Solid Carbide	1/8" Spiral Cutter	*Proper Adaptor Will Be Supplied	1/8"	1/2"	1/4" *	$ 9.00
#602		3/16" Spiral Cutter		3/16"	5/8"	1/4" *	$12.00
#603		1/4" Spiral Cutter		1/4"	3/4"	1/4"	$12.00
#903		1/4" Spiral Cutter		1/4"	3/4"	1/2" *	$12.00
#904		3/8" Spiral Cutter		3/8"	1"	1/2" *	$24.00
#905		1/2" Spiral Cutter		1/2"	1 1/2"	1/2"	$29.00
#350		1/8" Round Over	1/8" R	3/4"	3/8"	1/4"	$11.00
#351		3/16" Round Over	3/16" R	7/8"	1/2"	1/4"	$11.00
#230		1/4" Round Over	1/4" R	1"	1/2"	1/4"	$12.00
#353		5/16" Round Over	5/16" R	1 1/8"	1/2"	1/4"	$14.00
#209		3/8" Round Over	3/8" R	1 1/4"	5/8"	1/4"	$15.00
#355		1/2" Round Over	1/2" R	1 1/2"	3/4"	1/4"	$17.00
#656		3/4" Round Over	3/4" R	2"	7/8"	1/2"	$21.00
#199		Multiform Moulding	Unlimited Patterns	2 1/4"	2"	1/2"	$40.00
#340		1/8" Cove	1/8" R	5/8"	3/8"	1/4"	$12.00
#205		1/4" Cove	1/4" R	1"	1/2"	1/4"	$12.00
#206		3/8" Cove	3/8" R	1 1/4"	9/16"	1/4"	$13.00
#207		1/2" Cove	1/2" R	1 1/2"	5/8"	1/4"	$14.00
#208		3/4" Cove	3/4" R	1 7/8"	3/4"	1/2"	$26.00
#460		1/4" Bull Nose	1/4" Dia. of Circle		3/8"	1/4"	$14.00
#461		3/8" Bull Nose	3/8" Dia. of Circle		3/4"	1/4"	$15.00
#462		1/2" Bull Nose	1/2" Dia. of Circle		7/8"	1/4"	$16.00
#464		3/4" Bull Nose	3/4" Dia. of Circle		1 1/8"	1/4"	$21.00
#506		1/2" Pattern	Flush Trim	1/2"	1"	1/4"	$15.00
#507		5/8" Pattern	Flush Trim	5/8"	1"	1/4"	$16.00
#508		3/4" Pattern	Flush Trim	3/4"	1"	1/4"	$17.00
#366		1/8" Slot Cutter	3/8" Deep	1 1/4"	1/8"	1/4"	$14.00
#368		1/4" Slot Cutter	3/8" Deep	1 1/4"	1/4"	1/4"	$14.00
#204		3/8" Rabbeting	3/8" Deep	1 1/4"	1/2"	1/4"	$13.00

ITEM NO.	BEST CUT BEST PRICE	DESCRIPTION	ANGLE/DEPTH/RADIUS CIRCLE DIAMETER	LARGE DIA.	CUTTING LENGTH	SHANK SIZE	PRICE
#210		1/4" Core Box	round nose	1/4"	1/4"	1/4"	$ 9.00
#211		3/8" Core Box	round nose	3/8"	3/8"	1/4"	$10.00
#212		1/2" Core Box	round nose	1/2"	11/32"	1/4"	$13.00
#418		3/4" Core Box	round nose	3/4"	5/8"	1/4"	$15.00
#213		1" Core Box	round nose	1"	3/4"	1/2"	$17.00
#214		1/4" Straight	plunge cutting	1/4"	3/4"	1/4"	$ 6.50
#215		5/16" Straight	plunge cutting	5/16"	1"	1/4"	$ 6.50
#216		3/8" Straight	plunge cutting	3/8"	1"	1/4"	$ 6.50
#217		7/16" Straight	plunge cutting	7/16"	1"	1/4"	$ 6.50
#474		1/2" Straight	plunge cutting	1/2"	1"	1/4"	$ 7.00
#775		1/2" Straight	plunge cutting	1/2"	2"	1/2"	$14.00
#218		5/8" Straight	plunge cutting	5/8"	1"	1/4"	$ 7.00
#219		3/4" Straight	plunge cutting	3/4"	1"	1/4"	$ 9.50
#220		1" Straight	plunge cutting	1"	1 1/2"	1/2"	$11.00
#500		3/8" Flush Trimming		3/8"	1/2"	1/4"	$ 7.00
#502		1/2" Flush Trimming		1/2"	1/2"	1/4"	$ 7.50
#503		1/2" Flush Trimming		1/2"	1"	1/4"	$ 8.50
#221		1/2" Flush Trimming		1/2"	1 3/16"	1/2"	$ 8.00
#545		Tongue & Groove	Straight	1 5/8"	1"	1/4"	$29.00
#845		Tongue & Groove	Straight	1 5/8"	1"	1/2"	$29.00
#546		Tongue & Groove	Wedge	1 3/16"	1"	1/4"	$29.00
#846		Tongue & Groove	Wedge	1 5/8"	1"	1/2"	$29.00
#450		1/8" Beading	1/8" R	3/4"	3/8"	1/4"	$11.00
#451		3/16" Beading	3/16" R	7/8"	1/2"	1/4"	$11.00
#233		1/4" Beading	1/4" R	1"	1/2"	1/4"	$13.00
#453		5/16" Beading	5/16" R	1 1/8"	1/2"	1/4"	$14.00
#454		3/8" Beading	3/8" R	1 1/4"	5/8"	1/4"	$15.50
#455		1/2" Beading	1/2" R	1 1/2"	3/4"	1/4"	$17.00
#530		3/16" Edge Beading	3/16" Dia. of Circle		1/2"	1/4"	$15.00
#531		5/16" Edge Beading	5/16" Dia. of Circle		1/2"	1/4"	$15.50

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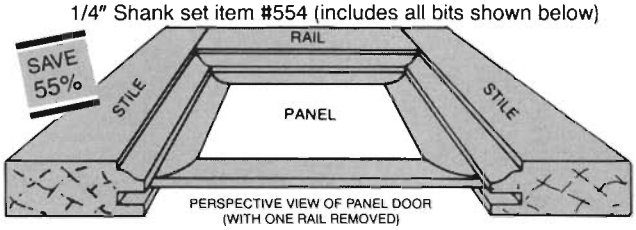
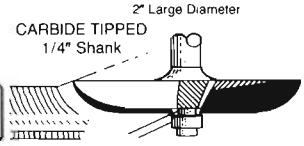
Shaper Cutters set: Item #1059 SAVE! only $99.95 Set: Rail & Stile & Raised Panel Cutters



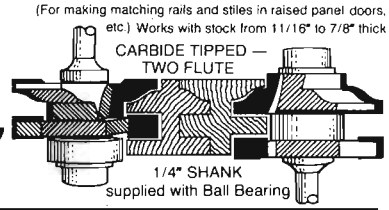
PERSPECTIVE VIEW OF PANEL DOOR (WITH ONE RAIL REMOVED)

RAISED PANEL BIT SUPPLIED WITH BALL BEARING



REVERSIBLE COMBINATION RAIL and STILE BIT

(For making matching rails and stiles in raised panel doors, etc.) Works with stock from 11/16" to 7/8" thick



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Letters

We welcome opions and comments (both pro and con) from our readers. Address correspondence to: Letters Department, ***The Woodworker's Journal,*** *P.O. Box 1629, New Milford, CT 06776.*

I'm sure your model for the Oak Music Stand project (May/June 1991) is a much better woodworker than he is a saxophone player. The mouthpiece on the saxophone is upside down.

In all fairness, I am a much better saxophone player than I am a woodworker. Nevertheless, they are both very enjoyable hobbies and *The Woodworker's Journal* is a very enjoyable publication.

Robert W. Carrow, Orchard Park, N.Y.

I'd like to try selling some of my woodworking projects on a part-time basis. Can you suggest any books that might help me market what I make?

Ed Lynch, Framingham, Mass.

A few come to mind. How To Sell What You Make, *by Paul Gerhards (Stackpole Books);* Profitable Crafts Marketing, *by Brian T. Jefferson (Timber Press); and* You Can Make Money From Your Arts and Crafts, *by Steve and Cindy Long (Mark Publishing). Another good one is* The Law (In Plain English) For Craftspeople, *by Leonard D. DuBoff (Madrona Publishers).*

I appreciate that you list woodworking club information in your Letters section. It has enabled us to contact several other clubs to exchange newsletters and other information.

Woodworkers who live in and around Raleigh, Durham, and Chapel Hill, North Carolina, may be interested to learn that our club meets monthly. The nearly 200 members represent a wide range of interests and experience. Some are just getting started, others are leading woodworkers in the area. A basic objective of the club is the exchange of ideas and techniques. The only qualification for membership is an interest in working with wood. For information, write to the Triangle Area Woodworker's Club, 8504 Smith Road, Apex, NC 27502, or call either Ed Karolak at (919) 383-4233 or Ed Walker at (919) 362-4617.

Ed Walker, Apex, N.C.

I need a source of supply for 3/4 in. and 1 1/2 in. diameter wooden balls.

John Allen, Tampa, Fla.

You can get 3/4, 1, 1 1/2, 2, 2 1/2 and 3 in. diameter wooden balls from Woodworks, P.O. Box 14507, Ft. Worth, TX 76117; tel. 1-800-722-0311.

When I did the story on low cost dust collectors in the May/June 1991 issue, I had initially planned to include Wilke Machinery in the chart on page 30 as a reliable source for low-cost Taiwanese-made dust collectors. According to com-

(continued on page 8)

pany president David Wilke, their two most popular models (sold under the Bridgewood label) are the BW-015A (1 hp, 610 CFM) at $199 and the BW-002A (2 hp, 1,182 CFM) at $399. Three other models are also available. So, if you're still shopping for a dust collector, you might want to check these out. To order their latest 52-page catalog, send $1 to the Wilke Machinery Company, 3230 Susquehanna Trail, York, PA 17402; tel. (717) 764-5000.

Jim Barrett, Pacific Grove, Calif.

Editors Note: The Compact Disc Holder project in our January/February 1990 issue listed P & D Wood Designs as a source for both the 3 in. swivel and the plastic inserts. However, P & D no longer can supply the parts. A new source for similar parts (the swivel diameter is 4 in. and the plastic insert must be trimmed to fit) is Woodworker's Supply, 5604 Alameda Place NE, Albuquerque, NM 87113; tel. 1-800-645-9292. Order part no. 240-001 for the swivel ($1.55 each), part no. 804-844 for the inserts ($2.95 each, $1.85 each if you order 10 or more). For orders up to $25, add $4.50 shipping and handling.

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

—The Editors

New Product Review

by Dennis Preston

Offset Router Sub-Base

Many beginning woodworkers are frustrated by the effort and concentration required to smoothly guide a router along the edge of the work. The router tends to be tippy since less than half of the base is on the work. There's also uncertainty as to what's happening under that black sub-base. It's always been a mystery to me why router manufacturers continue to supply those small opaque bases when transparent bases allow viewing of layout lines and the cutting action. Also, larger bases greatly improve stability when working edges. The solution is to replace that small black plastic base with something better.

Replacement Sub-Base

The offset router sub-base that I tried is a clear acrylic replacement for the factory supplied base. It's a teardrop shape rather than round. The long edges of the teardrop are straight so that it can be used against a straight edge. Your router is fastened to the large end. A wrench and longer screws are provided. A generously sized hand knob is mounted on the small end. The offset sub-base is sized and bored for all the popular makes of routers, and custom borings are available.

The base is available in either of two standard center hole borings: a plain $1\frac{5}{8}$ in. center hole or pre-bored for Porter Cable guide bushings. Aside from the unusual shape, the most noticeable thing is it's a hefty $\frac{1}{2}$ in. thick.

To assemble, remove your current base and attach the new base with the wrench and screws provided. Remove the router knob nearest the new offset knob to provide adequate hand space. This base is not recommended for plunge routers because of the need to use both router handles for proper plunge operation.

How it Works

For edge shaping, the offset knob is held in the left hand so that the smaller end of the base is always on the work. The longer span between the offset knob and the arbor means less downward force is required to keep the router on the work. This results in less tendency to tip when edge shaping.

The offset base makes edge shaping easier than the standard base. The thick base easily supports the overhung weight of the router with no discernible deflection. Since the base is twice as thick as my standard base, I was concerned that it would affect normal operations. There was no effect when

using piloted bits since there was adequate clearance for the collet nut in the center hole. But the increased thickness could reduce full depth routing by $\frac{1}{4}$ in., depending upon the bit. Caution: If you need that additional depth, either use your old base or get a longer bit. Don't be tempted to reduce the length of bit shank in the collet.

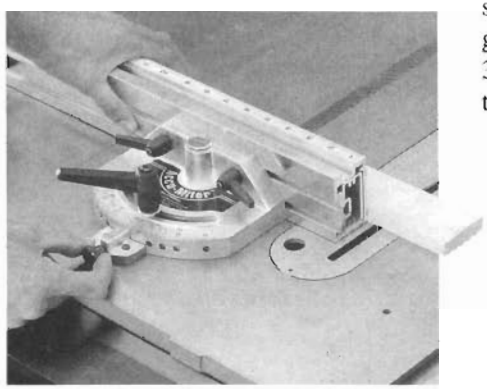
The price is $24.95 (plus $4.95 shipping and handling), and it's available from Trend-lines, 375 Beacham St., Chelsea, MA 02150; tel. (800) 767-9999.

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 the result of tests or reviews by the editors of ***The Woodworker's Journal.***

Accu-Miter

The Accu-Miter, manufactured by JDS Company, is a miter gauge that was designed to eliminate the time-consuming procedures of most miter gauges and assure shot-pin accuracy for angles of 90, 45, 30, 22½ and 15



degrees. There is a precise protractor scale for less frequently used angles. The Accu-Miter has a rigid front fence with telescopic extension, durable non-metallic wear surface for less friction, adjustable end stops for repetitive cross-cuts, and multi-position locking handles. It is easily retrofitted to your existing miter bar or to the optional 3/8 in. x 3/4 in. bar. You can safely secure your work with the optional manual clamp or pneumatic clamp. For more information, contact JDS Company, 800 Dutch Square Blvd., Suite 200, Columbia, SC 29210; tel. 1-800-382-2637, or in South Carolina, call (803) 798-1600.

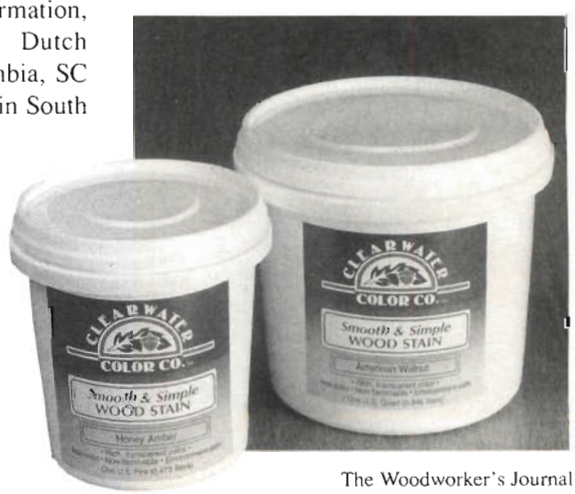
Sure-Splice Band Saw Blade Splicer

This splicer, manufactured by J.K. Woodcraft, of Rochester, Michigan, can be used to repair broken blades or to make new blades from 100 ft. rolls of coil stock. Sure-Splice will make blades for both metal and woodworking, and its unique adjustment feature allows you to splice blades from 1/16 in. to 3/4 in. width. Use basic soldering techniques to splice the blade together with high-strength silver solder. All you need is a propane torch and a grinder or sander.

Sure-Splice, priced at $29.95, comes complete with solder and flux for 30 splices, and plans to make your own grinding jig. Write to J.K. Woodcraft, 3395 Aquinas Dr., Rochester, MI 48309; tel. (313) 375-1141.

Smooth & Simple Wood Stains

The Clearwater Color Company has developed a new line of creamy, thixotropic aniline dye stains that are non-toxic, non-flammable, odorless, non-grain-raising, and contain no oils, solvents or VOC's. The Smooth & Simple Wood Stains provide deep, translucent color without streaking, dry in one hour, are compatible under any clear top coat finish, and are available in bright colors and wood tones. Cleanup is with soap and water. For more information, contact Clearwater Color Co., 217 S. 5th St., Perkasie, PA 18944; tel. (215) 453-8663.



Events

We will gladly list as many events of interest to woodworkers as space permits. Listings are free and may include shows, fairs, competitions, workshops and demonstrations. The deadline is eight weeks before publication—July 1 for the September/October 1991 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: College of the Redwoods' 3rd Annual WoodFair, July 12–14, Eureka campus. For info: (707) 445-6966.

ACC Craft Fair, Aug. 9–11, Fort Mason Center, Herbst Pavilion, Festival Pavilion, San Francisco. For info: (914) 255-0039.

The Summer Woodworking Conference, sponsored by the producers of The Woodworking Shows, Aug. 1–4, Biola University, La Mirada. For info: (213) 477-8521 or 1-800-826-8257.

Colorado: For information on the Anderson Ranch Arts Center woodworking workshops, write to P.O. Box 5598, Snowmass Village, CO 81615, or call (303) 923-3181.

Connecticut: 34th Annual Guilford Handcrafts Exposition, July 18–20, Town Green, Guilford. For info: call (203) 453-5947.

Brookfield Craft Center workshops: Cedar & Canvas Canoe Making, Jul. 22–26; Building a Norwegian Pram, Aug. 12–17; Adirondack Guideboat Building, Aug. 19–24; Ultralight Canoe Building, Aug. 26–30. For info: (203) 775-4526.

Indiana: International Wood Collectors Society Annual Meeting, including a wood auction, demonstrations, woodcraft displays, Aug. 4–9, Terre Haute. For info: (317) 569-5704 (evenings).

Michigan: 6th Annual Gegebic Range Carvers & Woodworkers Show, Jul. 27–28, Oddonnel Civic Center, Ironwood. For info: (906) 932-0343.

Minnesota: The 9th Annual Upper Midwest Woodcarvers' Exhibition, Jul. 22–26. For info: (507) 526-2777.

New Jersey: 21st Annual Peters Valley Craft Fair, Jul. 27–28; numerous woodcraft courses in July and August. For info: (201) 948-5200.

New York: Chautauqua Crafts Festival, Jul. 5–7 and Aug. 9–11, Bestor Plaza, Chautauqua Institution, Chautauqua.

North Carolina: Country Workshops' July and August classes include 17th Century Joinery, Making Your Shaving Horse, Green Woodworking with Kids, Ladderback Chairmaking, Windsor Chairmaking. For info: (704) 656-2280.

Ohio: The Conover Workshops' July and August courses include Woodturning/Carved Bowls, Appalachian Dulcimers, Woodturning/Hollow Form Vessels, Sack-Back Windsor Chairmaking, Turning for Windsor Chair Makers, Continuous Arm Windsor, General Woodturning Techniques, Shaker Box Making, Hand Tool Joinery and more. For info: (216) 548-3491.

Oklahoma: The Eastern Oklahoma Woodcarvers Association's 15th Annual Woodcarving Show, Jul. 12–14, Kensington Galleria Shopping Mall, Tulsa. For info: (918) 242-3621.

Oregon: Special English and French Wood Finishing, Jul. 15–19, Oregon School of Arts and Crafts. For info: (503) 297-5544.

Pennsylvania: 1991 Sawmill Woodcarving Show and All-Wood Festival, Jul. 13–14; Week-long woodcarving workshops in July/August, The Cook Forest Sawmill Center for the Arts, Cooksburg. For info: (814) 677-3707.

Washington: Whatcom Museum of History and Art, "From the Woods" exhibition, May 25–Aug. 18, Bellingham. For info: (206) 676-6981.

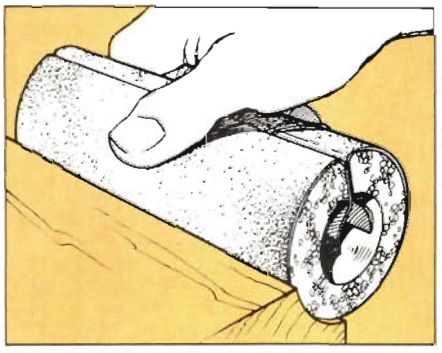
Wisconsin: Furniture Restoration Free 2-day Workshop, Minuteman Institute, Waterloo. For info: 1-800-733-1776.

Shop Tips

Pencil marks can be quickly wiped off wood, smudge free, using a clean cloth soaked in denatured alcohol. It's much easier than erasing or sanding, and the denatured alcohol won't raise the grain.

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

A piece of foam rubber pipe insulation makes a handy contour sander. It readily conforms to concave, convex,



and irregular surfaces. Cut the sandpaper to fit, wrap it around the insulation, and insert the ends into the factory-cut slit. I find a 5 in. length useful for most jobs, but just about any length can be used.

John P. Sabo, New Milford, Conn.

Don't throw away the little plastic bag closure tab that comes with most loaves of bread these days. Since the tab can easily be cut to shape with scissors, it makes an excellent glue spreader when

you need to get into a small hole or a tight spot. I've even used it when filling nail holes with wood filler.

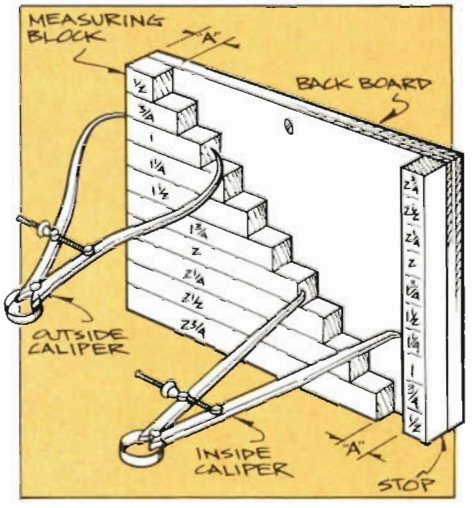
C.J. Nowak, Rocky River, Ohio

Most standard Peg-Board hangers don't fit odd-shaped hand tools very well. However, I've found you can use coat hangers to custom-make Peg-Board hangers. Just bend the coat hanger wire to the needed shape and cut it to length with a hacksaw.

Kenneth Sullivan, Sterling, Va.

With this "Caliper Board" close to your lathe, you'll be able to quickly and accurately set distances on both inside and outside calipers. The one illustrated measures 1/4 in. increments, starting at 1/2 in. and continuing through 2 3/4 in., but the board can be made in any variation.

The outside caliper distances are taken directly from the measuring blocks. Each block is cut to exact length from 3/8 in. by 3/8 in. stock, then it is



glued to the plywood backboard as shown. To avoid cross-grain movement problems, be sure to use plywood for the backboard.

Once all the measuring blocks are added, the stop (also made from 3/8 in. by 3/8 in. stock) is glued to the right hand side as shown. By making the "A" dimensions the same (in our case 1/2 in.), you can use the board to take measurements with the inside calipers. To complete the Caliper Board, mark each dimension (use waterproof ink) on the measuring blocks and the stop, then finish with a couple of coats of varnish. Ours is mounted to a wall right next to the lathe.

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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#PRS ...(reg $40), **On Sale** ...$35 (UPS $4)

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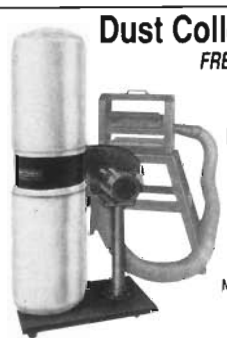
Dust Collectors



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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 possible.

I would appreciate any information on finding the ShopCraft Company or parts for my ShopCraft 10 in. radial-arm saw.

Robert Roby
5501 Ponderosa Rd., Lanesville, IN 47136

I have a Miller's Falls Model A power hand saw (catalog no. SP 2075) that requires a replacement part. I've been unable to locate the current manufacturer.

David Hunt
4 Dunleer Lane
Hendersonville, NC 28739

I need part no. 51331 gearset for my Mall 31 model belt sander, assembly no. 51320-1.

R.W. Bellamy
HCR 68, Box 1080, Vian, OK 74962

Can anyone help me find a saw guide holder for a Craftsman 24 in. jigsaw, model no. 103.23440?

N.R. Finelli
3067 Oliver St. NW
Washington, DC 20015

I need an adaptor, catalog no. 201261, to use for boring and routing on the AMF De Walt radial saw, model 925 purchased in the early 1960's. The adaptor is to be used with 1/4 in. R.H. straight shank bits. I believe the size is 7/16 with no. 20 thread.

George Adams
104 Highland Ave., Raymond, NH 03077

Does anyone know of a company that sells 3-dimensional plans for animals, whales and sharks?

Ray Giannini
33 E. Greenfield Ave.
Pleasantville, NJ 08232

I'm in dire need of a new or used saw fence for a [Craftsman] 10 in. table saw, model 113.29991.

Jim Broich
524 33rd St., West Des Moines, IA 50265

I need blades (part no. U-1801) for a Black & Decker 8 1/4 in. circular saw, circa 1959.

Rick Mickunas
11212 McCracken Rd.
Garfield Heights, OH 44125

I'm looking for fretwork plans produced by H.L. Wild & Co. of New York City. They went out of business in the 1940's or 1950's.

Richard L. Mewhinney
33 Carlton Ave., Washington, NJ 07882

Owner's Manuals and Parts Lists

DeWalt 10 in. radial-arm saw, model no. GW-1 . . . . . *John R. Hope*
425 West Ave., Northvale, NJ 07647

Montgomery Ward Powr Kraft wood lathe, model no. FD2002A; Powr Kraft 9 in. band saw, model no. 94TTN2316; Sears Craftsman 12 in. surface planer, model no. 103.23700; Craftsman 6 in. jointer, model no. 103.23900; Craftsman 24 in. scroll saw, model no. 103.20770
Anthony Glaser, Jr., 7 Drohan St., Huntington, NY 11743

Craftsman radial-arm saw, model 113.29401 . . . . . *Rex B. Anderson*
Rt. 1 Box 22, Georgetown, TX 78626

Sears jigsaw, model no. 103.0402 . . . . . *Phil Tralongo*
119 Watchoque Rd., Staten Island, NY 10314

Porter Cable dovetail attachment, model 5008 . . . . . *David H. Wright*
618 W. Oak St., Union City, IN 47390

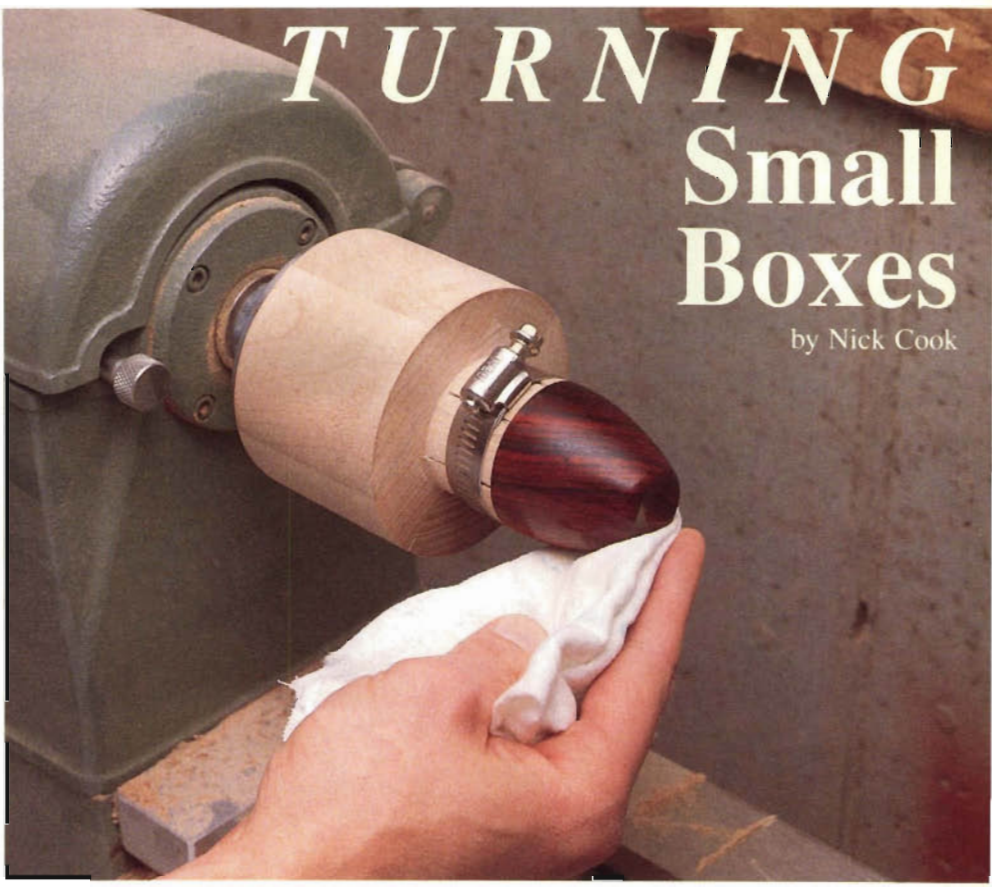
Montgomery Ward bench saw, model 692D . . . . . *D.J. Stewart*
3222 E. Danbury Dr., Janesville, WI 53546

Craftsman planer, model 103.1801 . . . . . *Pete Rescorla*
1125 Beech St., Cleveland, WI 53081

Craftsman radial-arm saw, model 113.29003 and table saw, model 103.22130
Michael Grosso 56 Olcott Dr., Manchester, CT 06040

TURNING Small Boxes

by Nick Cook



Many woodturners seem to think that turning a wood box with a fitted lid is a challenge beyond the level of basic turning skills. The mere thought of fitting two pieces of wood together is enough to intimidate the novice woodturner. If, however, you take one of these box projects and follow my step-by-step procedures, the results may surprise you. The entire process is just a series of basic turning techniques that in combination produce some very attractive small boxes.

As you progress, you'll discover the importance of sharp tools and attention to details. You'll also develop a new sense of tool control. Patience and care provide rewarding results.

It's best to start with a very simple box, just a basic cylinder about 2 in. in diameter and 3 to 4 in. tall, with a flat top and bottom. Once you have mastered the basic techniques, then you can start working on other designs and added decoration. There are countless shapes and details that will allow you to individualize your boxes.

Stock Selection and Preparation

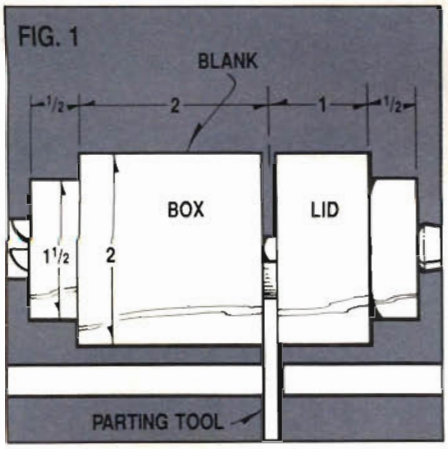
Most any hardwood can be used for turning boxes, but the more color and figure in the grain the more dramatic the results. My personal favorite is cocobolo, a rosewood from Mexico. It is highly figured and the color ranges from yellow sapwood to rusty brown and deep purple heartwood. It is, however, quite expensive in some areas, so it may not be the best choice for your first box. Hard rock maple is readily available and fairly inexpensive in most areas and is ideal for the learning process. Select a piece that is well seasoned and relatively free of obvious defects such as checks and knots.

Start with a piece approximately 2 in. square and at least 12 to 14 in. long with the grain running end to end. This should give you three blanks, or enough for three boxes. Before cutting to length, trim the corners to create an octagon. You can do this on a band saw, table saw or with the jointer. Trimming the corners helps to make roughing out a little easier.

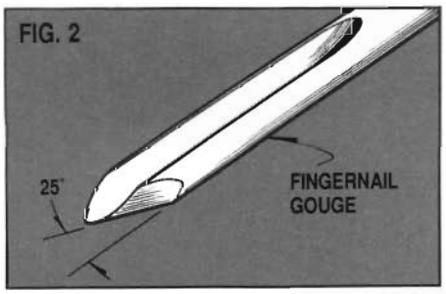
Cut your blanks to about 4 in. lengths, locate and mark the centers on the ends. If you will be using a standard spur center on your lathe, you may wish to make two intersecting saw cuts through the center of one end of each piece to help engage the spurs. The mini-spur center available from Craft Supplies USA (see Sources), eliminates this step.

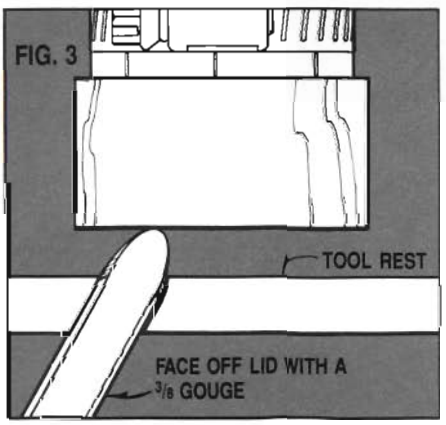
Mount the blank between centers using a ball bearing or live center in the tailstock. Set the lathe speed at 1200 to 1500 rpm and rough turn to a cylinder about 2 in. in diameter, using a standard roughing gouge.

Next you will need a square scraper or small skew to turn down a 1/2 in. long by 1 1/2 in. diameter tenon on each end of the blank (Fig. 1). This tenon will fit into the spigot chuck (refer to page 40 for instructions on how to make your own spigot chuck) to hold the pieces for final turning. Measure carefully using calipers or even stop the lathe and test-fit the tenon in your spigot chuck to ensure a good fit. A turning gate or sizing tool fitted to a 3/8 in. parting tool will provide consistent results and make this step less tedious.



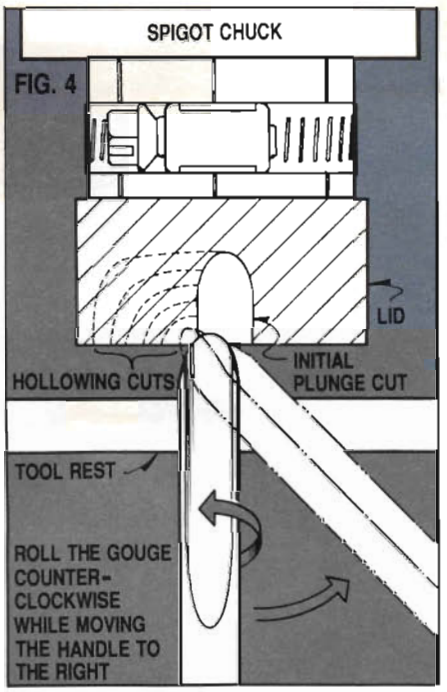
Stop the lathe, measure and lay out the dimensions for the box. As also shown in Fig. 1, one-third for the lid and two-thirds for the box body will be good proportions to start. Mark with a pencil and restart the lathe. Cut through the pencil line with a narrow parting tool, stopping just short of the center. Use a hand saw to finish the cut.

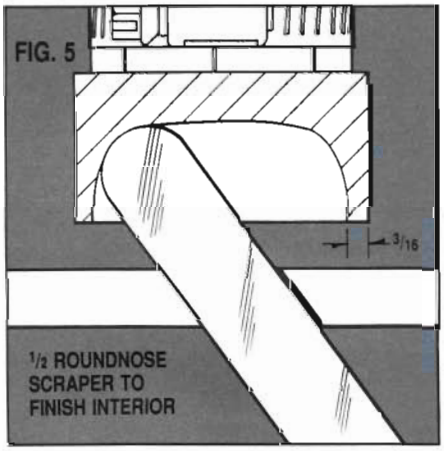




You now have two sections—a lid section and a box section—each with a tenon for mounting in the spigot chuck. Mount the smaller part (the lid section) in your chuck with the shoulder snug against the face of the chuck, and firmly tighten the clamp. If the blank tends to slip within the chuck, try rubbing a bit of chalk on the interior of the chuck jaws.

The next step is to face off the blank (make the end perpendicular to the



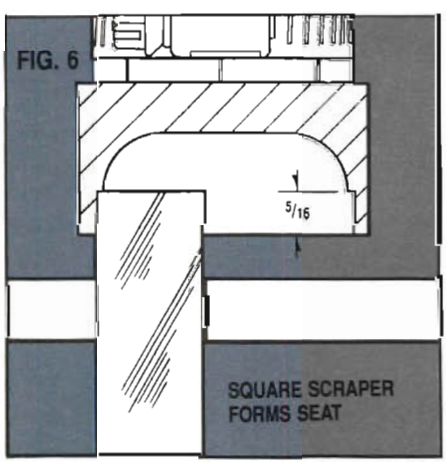


sides) and eliminate any tearout left from the parting cut. Move the tool rest to just in front of the blank at a right angle to the axis of the lathe and position it just below the center. Use a 3/8 in. spindle gouge ground to a long fingernail. I purchased a standard 3/8 in. spindle gouge and reground it to the steep bevel shown in Fig. 2. Start at the rim with the bevel parallel to the face of the blank and make a very light shearing cut to remove as little material as possible. Work toward the center and repeat as necessary to leave a clean surface that requires no sanding (Fig. 3). The less you take off at this point, the closer the grain will align on the finished box. The only critical area here is about a 1/8 in. band at the rim, all that remains once the lid is completed. I usually just face off about 1/4 in. from the edge.

Next up is hollowing the center of the lid. Using the same 3/8 in. gouge (with the tool resting on the tool rest), place the point at the center of the spinning blank and make a plunge cut by pushing straight in, stopping at the appropriate depth. The gouge acts as a drill bit. Next, roll the tool counterclockwise while moving the handle slightly to the right towards the outer rim. This should give you a scraping cut across the bottom followed by a shearing cut up the side of the lid (Fig. 4). Next use a 1/2 in. roundnose scraper and very light cuts to clean up and refine the interior (Fig. 5). Be careful and leave about 3/16 in. of material at the rim.

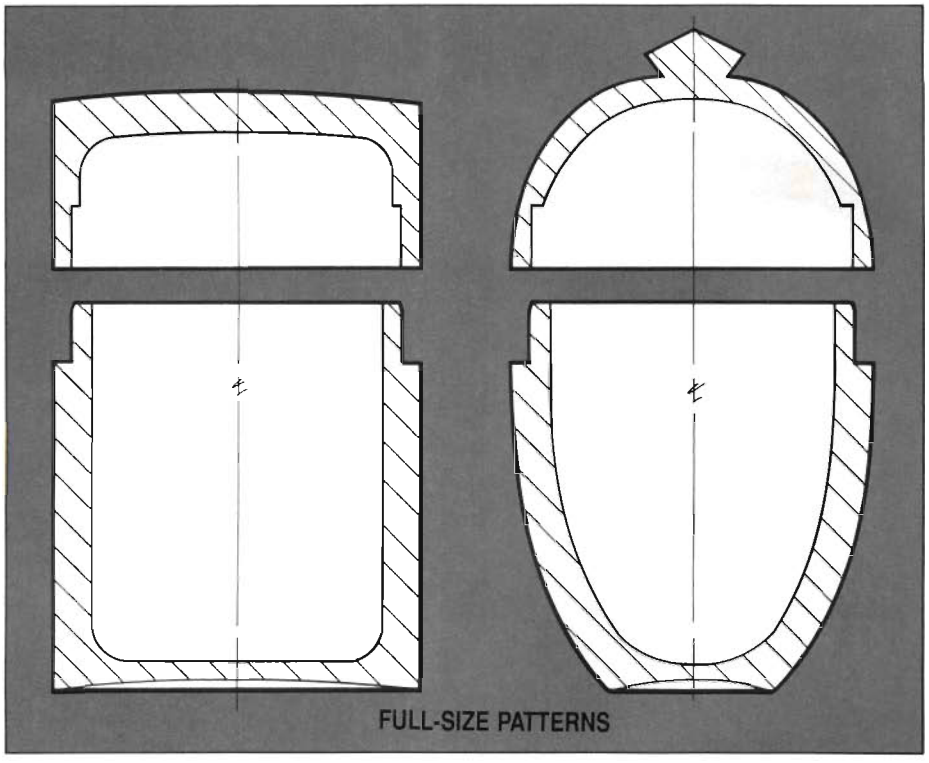
Now establish the seat portion of the lid. You'll need a square scraper with the corner ground to exactly 90 degrees. Hold the tool square to the face of the lid, and leaving approximately 1/8 in. at the edge, push the tool straight in to make a shoulder about 5/16 in. deep (Fig. 6). Use calipers to make sure the shoulder sides are square, as they will have to mate with the spigot on the body of the box.

Starting with 180-grit sandpaper, sand the interior of your box lid while it is turning on the lathe. Work through



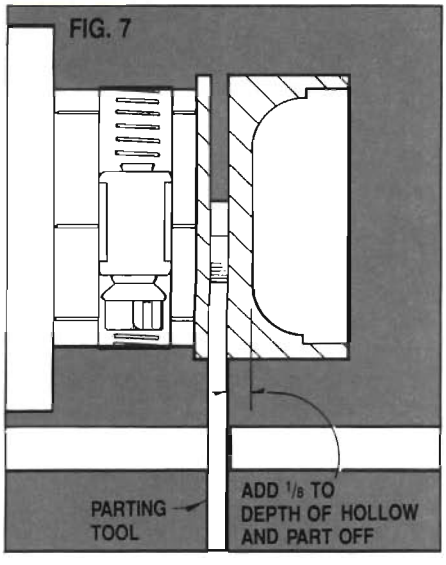
220-grit and finish with 320- or 400-grit. To ensure a proper fit, avoid sanding the sides of the seat. Use wax applied with 0000 steel wool to finish the interior and buff with a soft cloth.

Measure the depth of your lid, add 1/8 in. for the thickness of the top and mark on the exterior with a pencil. Use a parting tool to separate the lid from the waste in the chuck (Fig. 7). Be careful not to hold on to the lid. Rather, catch it

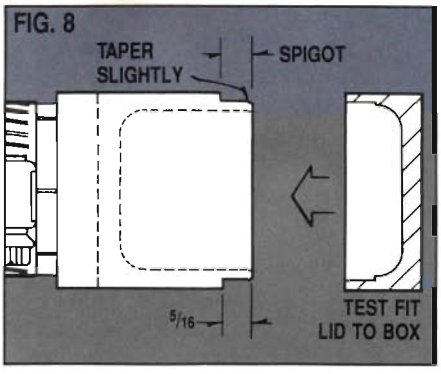


as it falls off to avoid spinning a hole in the top. If you wish to add a finial to the top, rough turn to reduce waste and remove from the chuck with the excess intact.

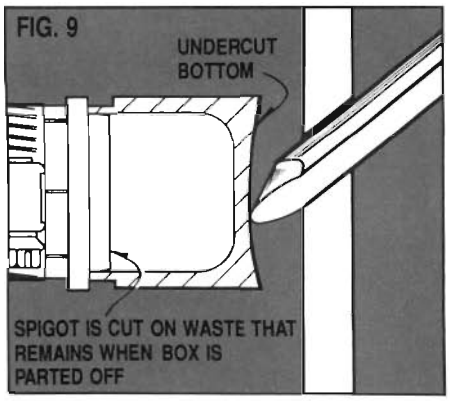
The larger blank, which yields the box body, is installed in the chuck and faced off in the same manner as the lid. Next, you will need to turn a spigot on the body of the box to fit the recess in the



lid. Set the tool rest parallel to the blank and use a square scraper or skew to cut a spigot on the end of the blank. Make very light cuts and taper the end ever so slightly, just so the lid will fit on the end. Then cut it back to a length of just under 5/16 in. and square up the spigot so the lid fits against the shoulder (Fig. 8). The lid must fit tightly at this point so you will be able to finish turning, and sand the exterior. Stop the lathe often and check the fit to avoid overcutting.



Press the lid on and finish turning the exterior of your box. You may use the 3/8 in. spindle gouge or a skew to true up the sides of the box with the lid attached. Use the gouge and *very* light cuts to finish the top of the lid. Remember, the slightest catch could ruin the project. If the lid has some slippage on the box, a little chalk in the spigot should produce a tighter fit. If the fit still isn't tight enough, use masking tape to hold the lid on. Sand the exterior as before and apply a wax finish.



Remove the lid and hollow the body of the box using the same techniques as before. As you sand and finish the interior, avoid sanding the spigot or you could lose the fine fit you have worked so hard to get. Apply wax and buff with a soft cloth.

As with the lid, check the depth of the body, add 1/8 in. and transfer the measure to the outside. Use a parting tool and separate from the waste block. To finish the bottom of the box, cut a spigot on the waste left in the chuck, invert the body and remount it just as you mounted the lid. If the fit isn't snug, use some masking tape to prevent slippage. The 3/8 in. spindle gouge, with several shearing cuts, is used to undercut the bottom so the box rests on the outer rim rather than on a flat bottom surface (Fig. 9).

Once completed, the lid should fit with little resistance, but should create enough vacuum to pop when pulled open.

Sand and finish with wax. Always sign your completed work and date it using either a pen and India ink or a woodburning tool.

Sources

Tropical Exotic Hardwoods of Latin America
P.O. Box 1806
Carlsbad, CA 92008-0300
Tel. (619) 434-3030
Rosewood; Cocobolo

Craft Supplies USA
1287 E. 1120 S
Provo, UT 84601
Tel. (801) 373-0917
Mini-spur center; Spindle gouge; Live center

Low-Tech Picture Frames

Use Simple Hand Tools For a Professional Job

With a simple homemade miter box and a backsaw you can cut miters for most picture frames.

by Roger Holmes

From time to time, I swap work with several artist friends—a landscape painting for a rosewood paint box, a dining table for a couple of prints and so on. Years ago, after my first swap, I stopped by the local picture-framing shop to see about framing my friend's work. I was stunned by the quote. They wanted almost as much to frame his print as he would have charged me to buy it. I couldn't understand how it could cost so much to cut and stick together a few pieces of wood, mat board and glass. It looked easy; I decided to try it myself.

I was half right. Cutting and assembling the pieces is easy. Anyone with a few rudimentary tools and a steady hand can do it. The difficult thing, I discovered, is making all these pieces work together to display the artwork to best advantage: selecting molding of appropriate material and size, determining the number, color, width and position of the mats. I've framed a number of my friends' pictures over the years, and have yet to develop an eye for these things. A good picture framer, I learned, earns his or her fee not merely for knowing how to assemble bits of wood and paper, but for knowing how to enhance a painting or print with them. For special pictures, I still consult a professional.

But most of what hangs on my walls—photographs, posters, cheap prints—just needs simple frames, and these I happily tackle myself. I cut the molding on the table saw or with a backsaw in a homemade miter box. I trim the miters to fit with a handplane on a homemade shooting board. Then I hold the pieces in the bench vise while I glue and nail them together.

That's right—nails. When I started framing, the cabinetmaker in me cringed at the thought of those mitered corners. I hated cutting and assembling miters on pieces of furniture—complicated tenons or splines to fit, endless fiddling with a tangle of clamps trying to pull all four slippery joints tight and square at the

same time. Fortunately, a professional framer set me straight. Picture frames aren't furniture. They support very little weight and suffer no racking stresses. Glue and nails are sufficient for all but very large pictures. The nails pull the joint tight, the glue holds it together. Freed from complicated joinery, making picture frames really is easy. Here's how you can do it.

Anatomy of a Framed Picture

Figs. 1 and 2 show the basics of framing a print, watercolor or other artwork on paper and of framing an oil painting on canvas.

Works on paper are held in a sandwich of materials toenailed to a rabbet in the back of the frame. Many works on paper are difficult to clean and some smudge easily, so they're protected by a thin pane of glass. A piece of thick, high quality paperboard, called a mat, may come next, its center cut out to display the artwork. One or more mats effectively increase the width of the frame and help to focus attention on the artwork. The print or watercolor is itself mounted on another piece of paperboard or similar material, which is taped to the back of the mat. A cardboard backing completes the sandwich. To seal out dust, a sheet of paper is sometimes taped to the back edge of the frame.

As the other sketch shows, framing an oil painting can be as simple as toenailing the frame on which the canvas is stretched to the rabbet of the picture frame. Oil paintings are more durable than most artwork on paper, so they're seldom protected by glass.

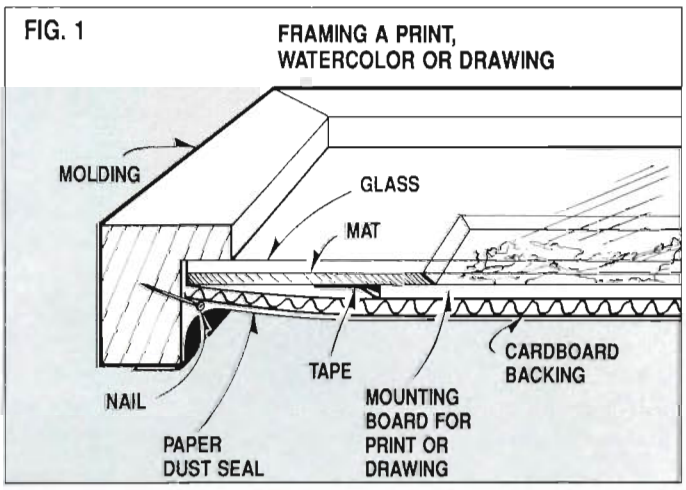
Frame Dimensions

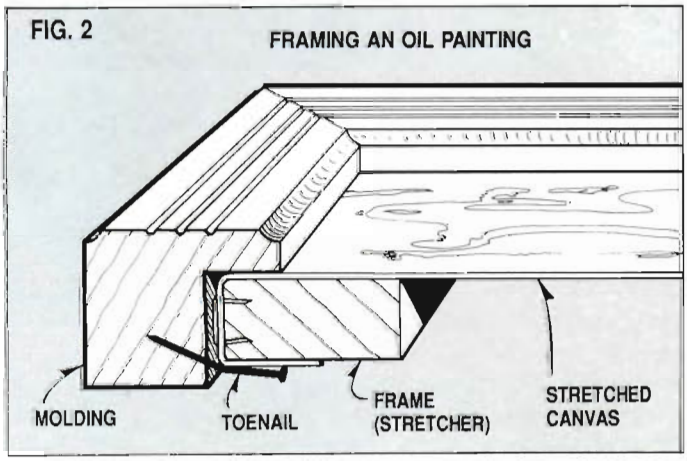
The critical dimensions for a picture frame are those of the rabbeted opening. For a work on paper, the opening should be about 1/16 in. larger overall than the glass (Fig. 3). Glass, mats and backing board are all cut to the same size. For an oil painting, the opening should be about 1/4 in. larger overall than the canvas-covered frame.

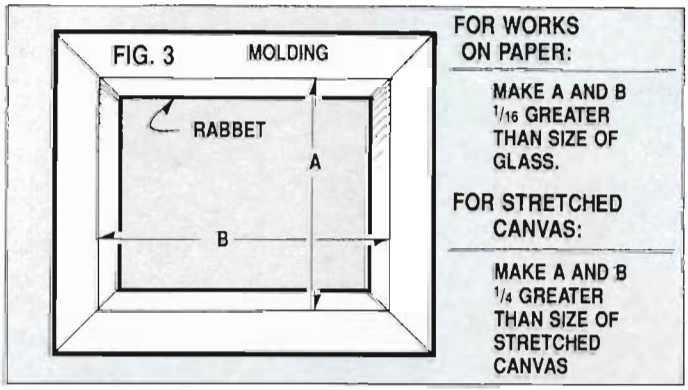
You can calculate the lengths of each mitered piece precisely and add them up to determine how much molding to buy or make, but I find it easier to make a rough estimate and accept a little extra waste. I double the length and width of the rabbeted opening then add eight times the molding's width to allow for the miters. For a frame of 2 in. wide molding with a rabbeted opening 15 in. long and 10 in. wide, I'd start with 66 in. of molding ([2 x 15] + [2 x 10] + [8 x 2]). It doesn't hurt to have a few extra inches of molding so you won't be caught short if you make a wrong cut.

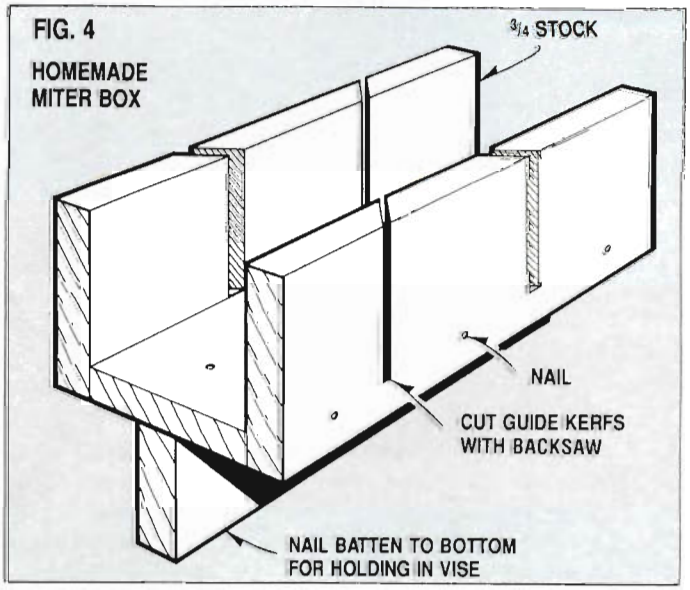
An Instant Miter Box

There are all kinds of methods for cutting picture-frame miters. Chop saws or guillotines like the Lion trimmer are









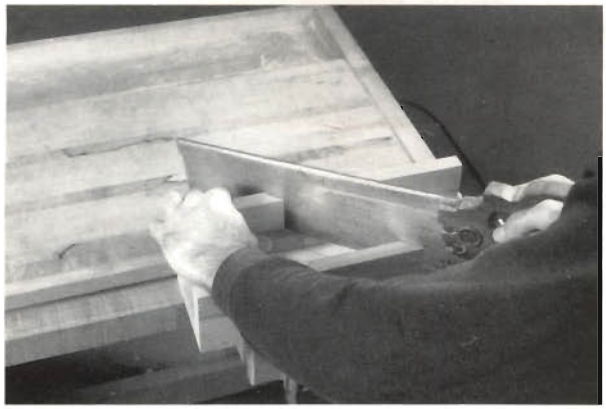


Photo 1: *Start by cutting the first miter on one end of the molding. Hold the stock firmly against the miter box and saw with even strokes.*

Photo 2: *Measure in the rabbet to mark the length of the sides.*

purpose-built for such tasks, but they're expensive. Table saws and radial-arm saws work fine, but can be a nuisance to set up accurately. (See "Framing at the Table Saw," page 22.) I find the simplest and quickest way to cut miters is with a miter box. Years ago I bought a terrific Ulmia miter box. It had a precisely milled cast-iron bed and fence, and its lightweight, tensioned frame saw slid effortlessly in bushed guides. It cost about $100 at the time and worked like a charm. But then it went missing during a move.

In a hurry one day to frame a picture, I cobbled up a replacement in about 10 minutes (Fig. 4). I nailed three boards together to form a U-shaped trough, then carefully cut two opposing 45-degree slots across the upright pieces with a 13-point backsaw. A batten nailed to the bottom made it easy to hold in a bench vise. I've used this instant miter box ever since. It doesn't produce miters of exactly 45 degrees, but it takes only a few seconds to trim them to fit on the shooting board.

Laying Out and Cutting the Miters

A little organization goes a long way toward preventing irritating errors—cutting right-hand (or left-hand) miters on both ends of one piece or cutting three short sides and only one long. Here's the method that has worked for me: For a rectangular frame, cut the long sides first, then the short—you can always salvage a short side from a miscut long side. Start by cutting a miter at one end of the strip of molding (Photo 1).

You can position the molding in the box in a variety of ways to produce the same cut. It can go face down against the box bottom or face up. If you have a trough box like mine, you can hold the piece against the near or the far side of the box. Finally, you can select either 45-degree slot for the saw. Choose the position that combines good contact with the box and ease of holding and sawing. If the shape of the molding doesn't provide enough flat surface for the piece to make firm contact with the box, cut some scrap wood to fit in the contours to steady the molding. A little experimentation with some scrap molding will give you a feel for all the positioning options. When you make a cut, just make sure the miter is correctly oriented on the piece.

To cut a miter, hold the strip firmly against the side of the miter box. Finger pressure should be enough, but you can add a clamp if the piece slides around. Start the cut slowly and continue with even strokes. Use a sharp saw and let the teeth do the work—don't push down hard or try to cut too fast. Go easy at the end of the cut to avoid breaking fibers.

With the first miter cut, lay out the length of a long side. Remember that the frame's critical dimensions are those of its rabbeted opening, which must accommodate the glass (or canvas). Starting from where the corner of the rabbet meets the miter, measure the length of the glass plus $^1/_{16}$ in. and make a mark in the corner of the rabbet (Photo 2). (If you already have the glass, just lay it in the rabbet and mark the length from it.)

Sometimes you don't have to make any other layout marks to be able to cut the second miter. Slide the piece into the box and position the mark in the rabbet by eye so the saw blade is just to the waste side of it (Photo 3). Then cut the miter as before. If the profile of the molding makes it difficult to use this method or if the position of the molding in the box is awkward, you can make additional layout marks with a try square, extending them onto other faces of the molding as necessary.

Next, cut the first miter for the second long side and mark the sides's length.

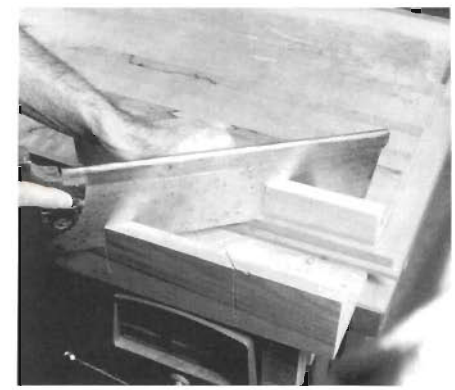


Photo 3: *Sometimes you can position the molding for the second cut by eye, sighting over the saw to align it with the mark in the rabbet.*

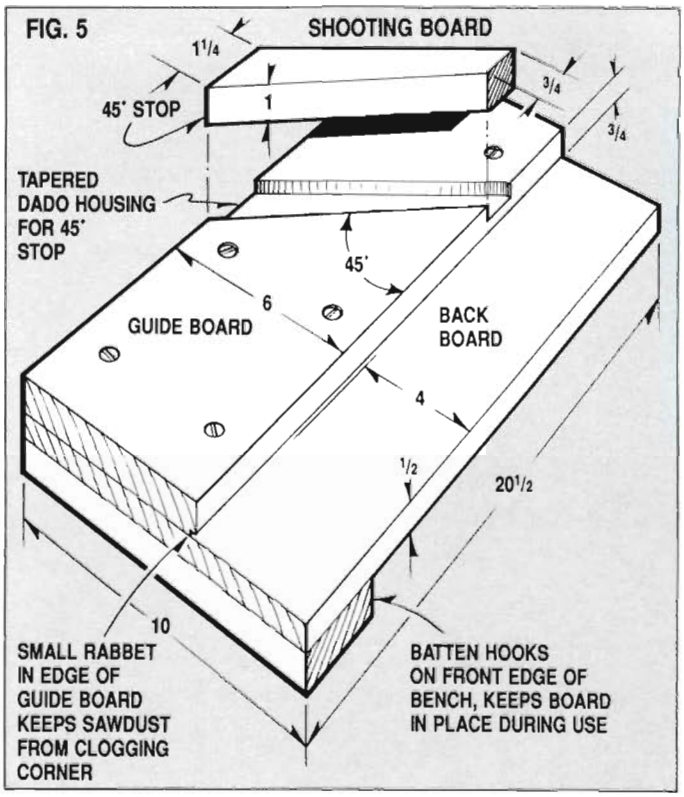
Photo 4: *For identical sides, cut the first, then mark the length of the second from it.*

You can measure as before, but you'll avoid possible measuring errors by marking it directly from the first side (Photo 4). You can place the two pieces together back-to-back or rabbet-to-rabbet to make the mark. Choose the one that puts the mark where it's most convenient for positioning the piece in the box. Lay out and cut a pair of short sides in the same way.

Trimming and Fitting the Miters

Miters straight from the saw are seldom ready to assemble. Any deviation from a true 45-degree angle doubles at every corner, gapping the joints. Even if the angles are perfect, the saw-roughened surfaces can produce a ragged, unsightly joint. I fit the angles and clean up the surfaces with a hand plane and shooting board (Photo 5).

I made my board (Fig. 5) out of scraps of solid cherry and cheap plywood, but high quality, stable material, such as Baltic-birch ply, would be better. The 45-degree stop is held by friction in a carefully laid out and cut tapered dado. (I scribed the dado with a knife, routed out most of the waste, then trimmed to the scribes with a wide, sharp chisel.) I prefer to trim miters with my jointer plane because of its length and weight, but any sharp hand plane with sides perpendicular to its sole will work.



Experiment on miters cut in scrap wood first. You'll be surprised by the amount of control you have. By making slight changes in the hand pressure you exert on the molding and plane, you can slice just a wisp of a shaving off the top portion of a steep miter or off the edge of a miter that isn't square to the face of the molding. Like any hand skill, this one takes practice to master, but when you get the hang of it, trimming eight miters for a frame will take only minutes.

Lay out the frame on a bench top and trim each pair of miters in turn. I check each miter against an accurate try square as I proceed. I also check to make sure that the pairs of long and short sides remain equal in length.

Assembling the Frame

Assembly couldn't be more straightforward: First you join the sides to form L's, then you stick the L's together. There are clamps and vises made specially for miter joints, but all you need for most frames is a bench vise or a machinist's vise. An electric hand drill and tack hammer complete the tool kit.

Take a long and a short side, and fix the long side in the vise. Coat the mating miters with glue (Elmer's white glue works fine for me). Push the miters

(continued on page 23)

Photo 5: *You can trim miters to fit precisely with a homemade shooting board and a sharp handplane.*

Photo 6: *Hold the glued miter joint together with one hand while you bore pilot holes for the nails with the other.*

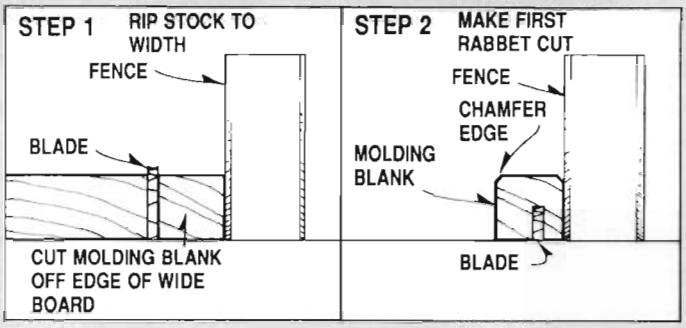
Framing at the Table Saw

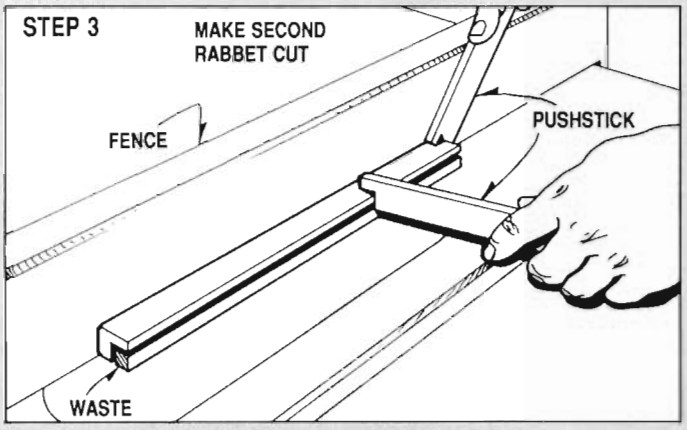
If I had to select one common workshop machine to use for picture framing, it would be a table saw. In addition to cutting accurate miters, you can make a variety of moldings on a table saw.

Cutting Miters

The secret, if there is one, to cutting miters on a table saw is in the miter-gauge setup. I attach a long auxiliary fence to the gauge to provide firm backing for the moldings. A length of Baltic-birch plywood is ideal. If you use solid wood, make sure it's stable (a quartersawn piece is best) and square to the surface of the table. A strip of fine sandpaper glued to the auxiliary fence will help keep the molding firmly in place during the cut.

I have yet to see a truly accurate angle indicator on a miter gauge. It's safer to set the gauge directly to the blade with a simple template. Start with a piece of stable material about 18 in. long and 8 in. or 9 in. wide. Plane one edge dead straight and from it knife an accurate 45-degree angle across the face. Saw as close to this line as possible, then trim right to it with a handplane.





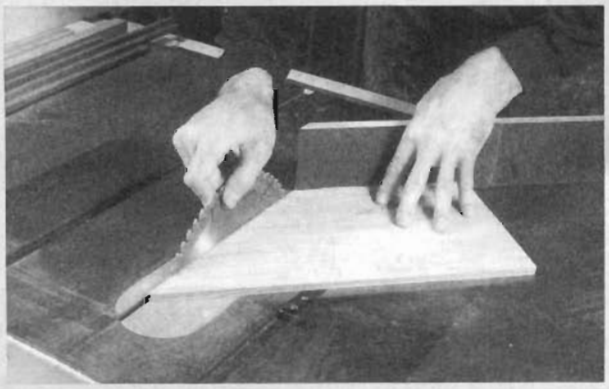


Photo A: *Set the miter-gauge angle with a wide template. The template should be flush against the fence and make contact with saw teeth at the front and back of the fully extended blade.*

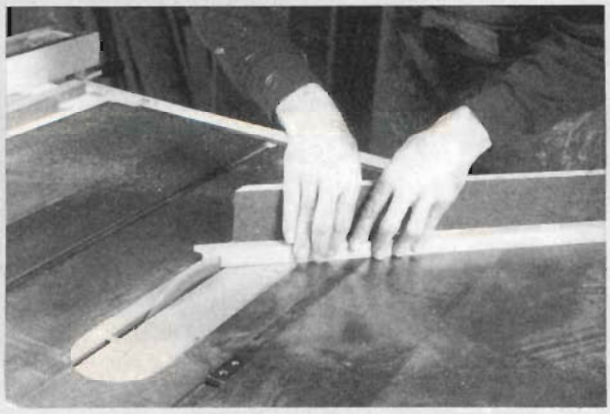


Photo B: *Hold the molding firmly as you cut to prevent the force of the saw from pushing the piece back slightly.*

To set the miter gauge, raise the blade to its full height above the table. Holding the template firmly against the gauge fence, slide the template up to the blade (Photo A). Adjust the gauge until the template contacts teeth at the front and back of the blade, then lock the fence in position. Reverse the template to set the gauge on the other side of the blade. I prefer to set the fence at 135 degrees to the blade, as shown in the photo, so the cut is made before my hands draw even with the sawblade. But I don't think it's less safe to set the gauge at a 45-degree angle, and you may find you prefer that angle.

After setting up, it's easy to cut the miters. Hold the molding firmly against the fence and saw table and feed the cut slowly (Photo B). If you have two miter gauges, you can set up one for each side of the blade and cut the ends of each piece in turn. If you have only one gauge, you might make all the right-handed cuts, then reset the gauge and make all the left-handed cuts. When you cut the second miter on

the pieces, you can clamp a stop to the fence (if the fence is long enough) to make pairs of identical length.

An accurate setup and sharp saw can produce clean, crisp, exact miters ready for assembly, but don't count on it. If they're off slightly, it's little trouble to shape them up with a plane and shooting board.

Table Sawn Moldings

As the photo on page 39 shows, you can use a table saw and router to make picture-frame moldings with complicated profiles. I've never tried anything that ambitious, but I have made simple, narrow moldings that I think show modern prints, photos, watercolors and posters to best advantage. Because they only require cutting a rabbet from a rectangular blank, making them on the table saw is a piece of cake.

Thickness a long, wide board to the narrow cross-sectional dimension of the molding. (A board 4 ft. or 5 ft. long and 6 in. wide is manageable on the jointer and yields enough narrow molding for several pictures.) Plane one edge straight, set the rip fence on the table saw to the other cross-sectional dimension and cut a strip off the edge (Step 1). Use a pushstick. Continue to plane and rip until you run out of board.

I hand plane all four faces of each strip to remove saw and planer marks, and chamfer the edges of the molding's face. Then I make two cuts to clear the rabbet. With the rip fence positioned as shown in the drawing (Step 2), the waste piece can't get trapped between the fence and blade and kick back at you. The first cut is well supported, even for pieces of small cross section. But the second cut can be a little tricky at the end of the cut—with the waste freed, only the molding's thin edge supports it on the saw table. Since the blanks are narrow, I use two pushsticks to make both rabbet cuts and to keep my hands well away from the blade. One pushes the piece against the fence, the other pushes it through the cut (Step 3).

together; sliding the top piece around a little will create some suction. Hold the joint together with one hand while you bore the pilot holes for the nails with the other (Photo 6). Sides for a large frame may require the additional support of a box or block of wood on the bench; plan ahead. While still holding the joint together, drive in the nails (Photo 7) and set them, then remove the L carefully from the vise. Keep supporting the joint until it's flat on the bench. When you have two L's, join them in the same way (Photo 8). If the frame is large, you may want to block up underneath the unsupported sides so their weight won't open the joints. Lay the assembled frame on a flat surface and allow the glue to dry thoroughly.

The number and position of the nails depends on the size and profile of the molding. Some small moldings draw tight with only one nail, wide ones may require two or three of different lengths and diameters. If you can avoid it, don't nail across the corner from two sides. Driving from the second side may dislodge an already tight joint. But, if the joint hasn't drawn up, I'll add a nail wherever I think it will do some good. Instead of using a drill bit for the pilot holes, I snip off the head of one of the finish nails and chuck it in the drill. This works well for all but the hardest woods, and the resulting pilot hole is exactly the right size.

Photo 7: *Continue holding the joint together and drive in the nails.*

Photo 8: *Glue, bore pilot holes and nail the two L's together. Handle the pieces carefully as you work to avoid breaking the glue joints.*

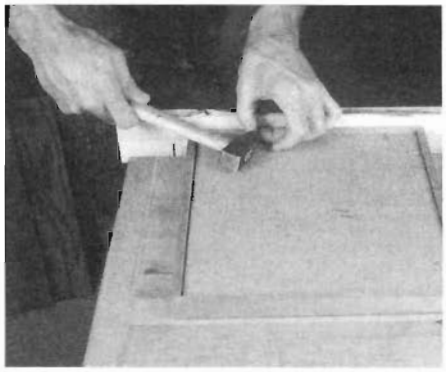
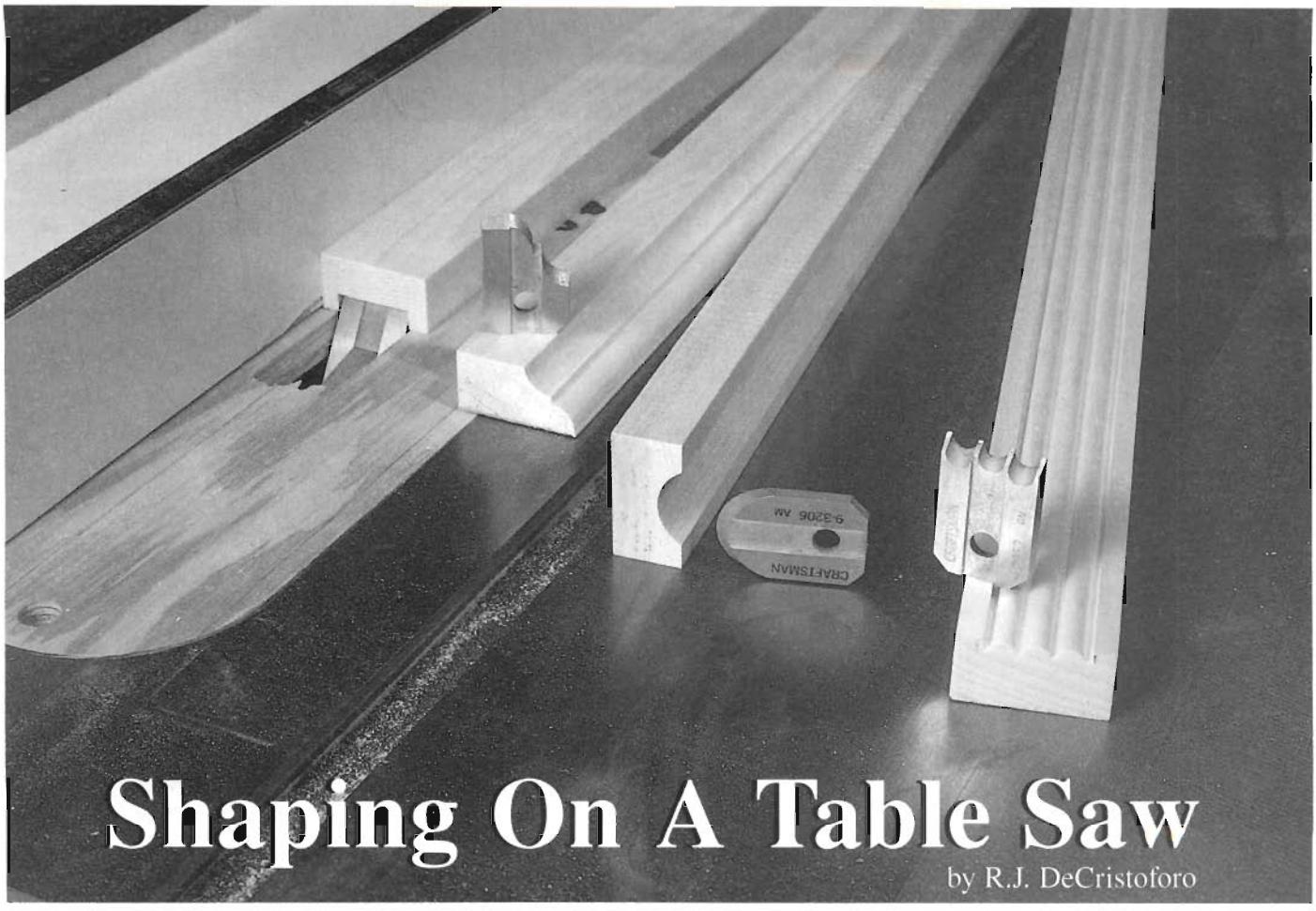


Photo 9: *Secure the sandwich of glass, mats and artwork to the frame with small brads.*

Finishing Up

Make sure there are no lumps of glue in the rabbet before you drop the glass in place. Fix the sandwich of glass, mats, artwork and backing boards in the frame with small brads driven at a slight angle into the rabbet (Photo 9). Back up the frame sides with something solid when you drive the brads so the blows don't fracture the glue joints. Picture wire twisted around screw eyes is sufficient to hang most frames. Bore pilot holes to keep the screw eyes from splitting the frame.

As I said earlier, making a picture frame is easy. Framing a picture effectively is a lot tougher. If you're a confident woodworker, but an uncertain artist, pay a professional for his or her advice on moldings, matting and proportions. Remember, it's the work of art you're displaying, not the frame.



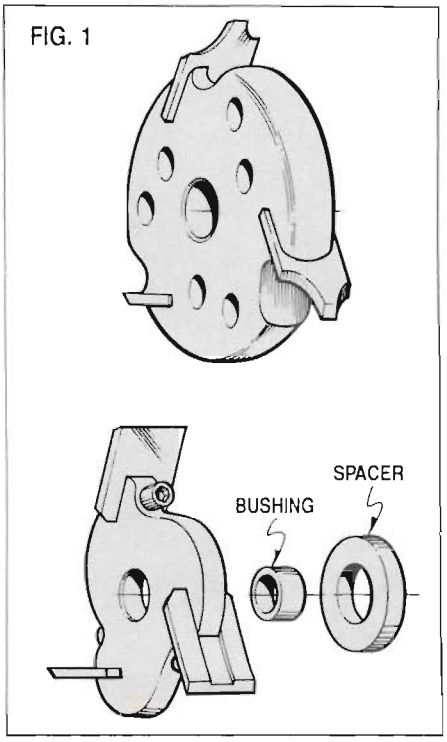
Shaping On A Table Saw

by R.J. DeCristoforo

It may sound strange to suggest table saw "shaping," but special accessories allow many decorative and practical applications that are usually attributed to an individual shaping machine. The tools, usually called molding heads, but often referred to as shaper heads or molding cutter heads, are essentially heavy disks with slots equally spaced about the perimeter. The slots are designed to mate with sets of knives which are secured in a manner that is peculiar to the accessory. Knives and heads of various brands are not interchangeable.

Two common molding-head designs are shown in Fig. 1. They may be heavy or light and can differ in configuration, but they mount on the saw's arbor in similar fashion and are employed the same way. Some molding heads require a bushing or spacer in order to properly mount to the arbor. Be attentive to molding-head information in the machine's owner's manual and to instructions that are supplied with the accessory. A pertinent factor, for example, is the length of the arbor. This may dictate how thick the head can be. There must be enough threaded length for the lock nut to seat securely. Accept as bible the methods described for seating and securing the knives. There will be, or should be, much emphasis on keeping head, slots, and knives in pristine condition. Stop and think anytime the knives don't move smoothly into place or if the lock screws don't turn as they should. Being cautious in this area has to do with safety and the knife alignment necessary for accuracy.

FIG. 1



Knives

There are as many knife shapes available as there are bits for routers or cutters for shapers. Those shown in Fig. 2 are typical, but not the complete library. Some catalogs show as many as 30 to 40 profiles. This is nice but can also pose a problem in terms of where to start. The

following information will help.

There are three classifications of molding knives (Fig. 3). *Combination knives* are designed so that a portion of the profile is used to create a particular form. *Single-purpose knives* are meant for full-profile cuts. *Knife sets* produce complementary shapes. While the basic function of a profile is specific, it is not mandatory that you restrict any knife to a particular task. You can utilize any portion of any profile if the result suits your purpose. Many operators maintain a library of sample cuts. This is good practice since shapes can be previewed and the samples can often be used to organize molding-head setups.

Special Inserts

Obviously, the regular table saw insert can't be used for molding head operations. But you certainly don't want to work without an insert. Any saw manufacturer offering a molding head will also list a suitable insert, like the one in Photo 1. It will serve adequately for general use but there will be times when, in order to minimize feathering, it's a good idea to make an insert that will have zero clearance around the knives.

You can make your own blank inserts using the regular insert as a pattern. The blanks must be a tight fit and should be secured with as many screws as were part of the original insert. You don't want the insert to dance to the tune of any vibration caused by the molding head. Note that the Delta saw shown in the photos uses a special locking mechanism, and not screws, to hold the insert. The screws shown are actually set screws, the function of which is to level the insert with the saw table.

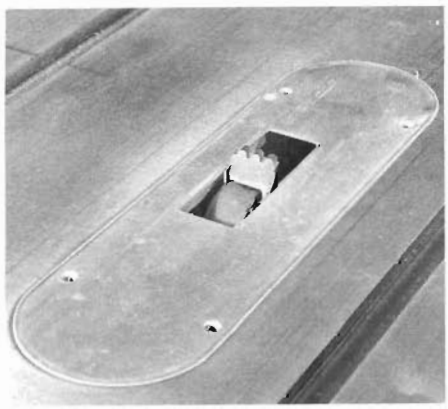
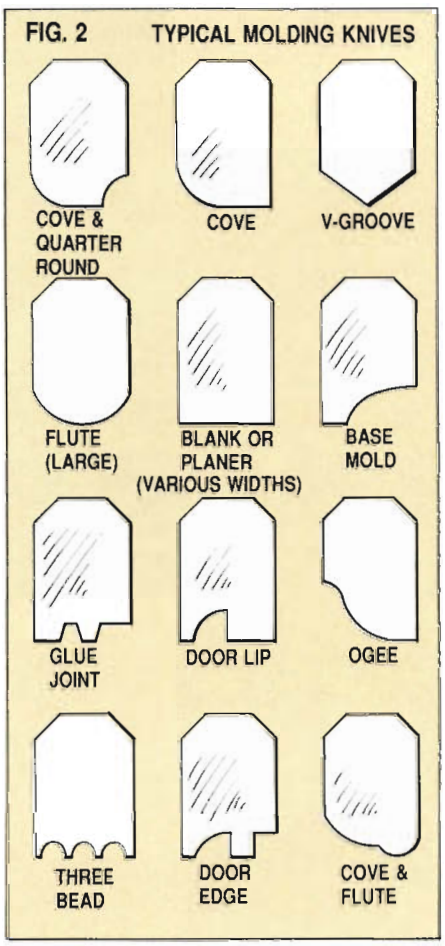


Photo 1



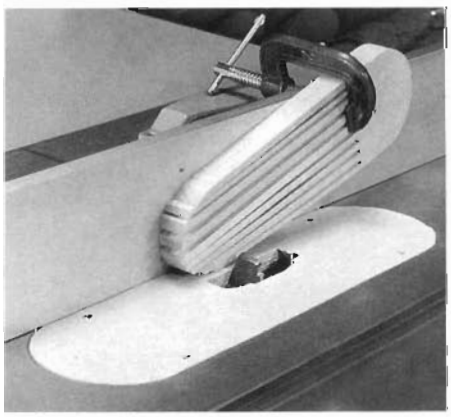
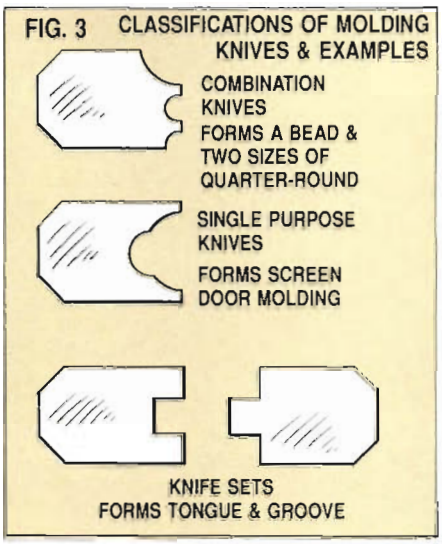
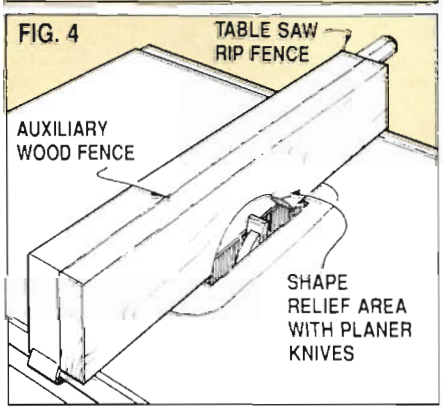


Photo 2

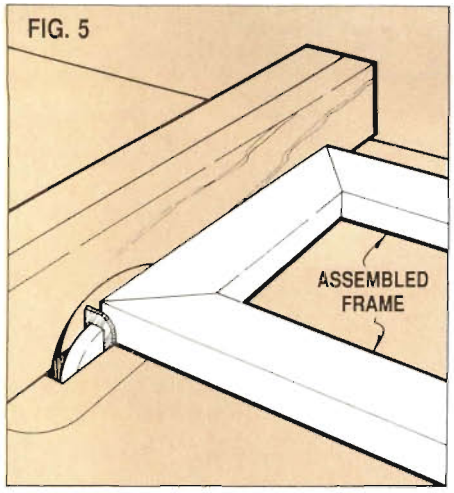
Set the new insert in place after lowering the head so the knives are below the table's surface. Then, using a security system like the fingerboard shown in Photo 2, very slowly raise the head until the knives poke through to the depth-of-cut you need. The idea is to be sure that the insert stays put as the knives cut through. Incidentally, you can order blank plastic inserts for Delta Unisaws from Woodworker's Supply, 5604 Alameda Place N.E., Albuquerque, NM 87113.

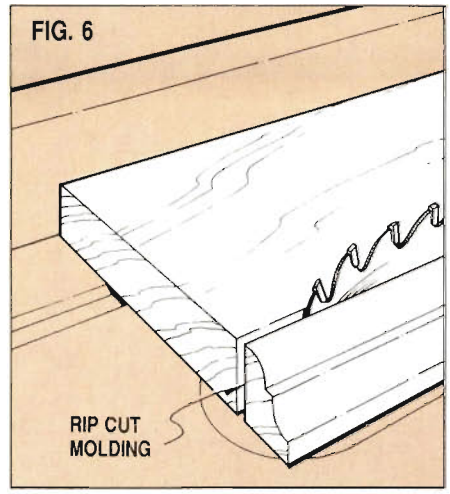


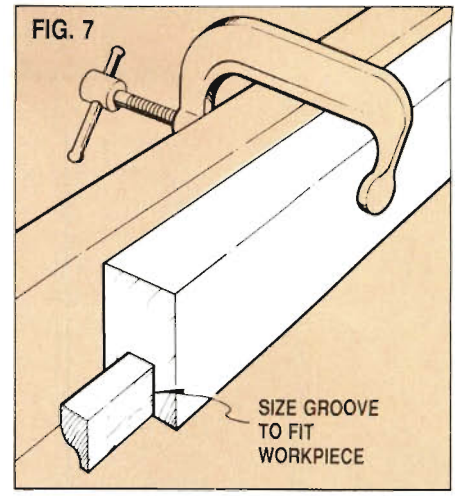


Rip Fence Facing

Most molding operations, especially those that utilize only part of a knife's profile, are done by using the rip fence as a guide. Thus it's necessary to install an auxiliary wood fence or "facing" like the one shown in Fig. 4. Use a select piece of 1 in. thick hardwood, sizing it to suit the rip fence and attaching it, preferably, with screws through the fence. The relief area, formed by following the method used to cut the blank inserts, should be about half the facing's thickness and 3/4 in. to 1 in. high.







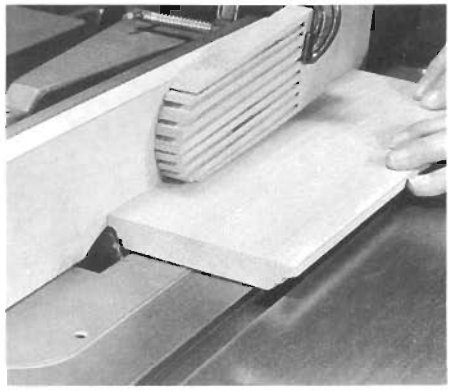


Photo 3

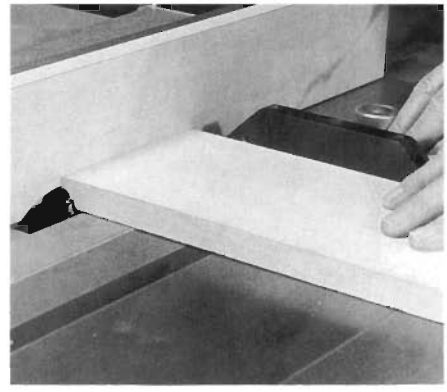


Photo 4

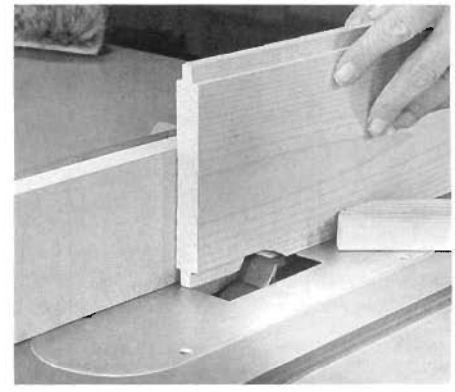


Photo 5

Working

Molding cuts remove much more material than a saw blade, so feed should be relatively slower to allow the knives to cut efficiently. Forcing is poor practice and will result in rough cuts and burn marks on work and knives. If you feel there is much resistance, it may be time to achieve full depth-of-cut by making repeat passes, raising the knives enough each time for smooth work passage.

Keep the work flat on the table and snug against the fence throughout the pass. Using a fingerboard, as shown in Photo 3, will provide good hold-down action. Cuts are smoothest when they are made with the grain, as in planing. When you can't work with the grain, rely on a slow feed and repeat passes to avoid tear-out.

Always make end cuts, especially on narrow stock, by using a miter gauge to move the work (Photo 4). Inevitably, as in any shaping operation, there will be some tear-out at the end of the cut, so it's a good idea to shape a piece that's a bit wider than you need so the imperfection can be removed by ripping or by a pass on a jointer.

Make the end cut first when shaping adjacent edges. The following with-the-grain cut will remove any flaw.

Shaping can also be done with the stock on edge, as shown in Photo 5, where blank knives are being used to form a tongue. Note the use of a fingerboard to help keep the work against the fence.

We usually think of shaping individual pieces, but there are times when it's perfectly feasible to work on an assembled frame (Fig. 5). Just be sure any fasteners you have used in the joints won't be contacted by the knives.

Slim Moldings

One way to produce slim moldings is to shape the edge of stock that is wide enough for safe handling and then rip off the target piece (Fig. 6). Repeating the procedure to produce a number of moldings can be time consuming, but there are other, more productive techniques. One of them is demonstrated in Photo 6.

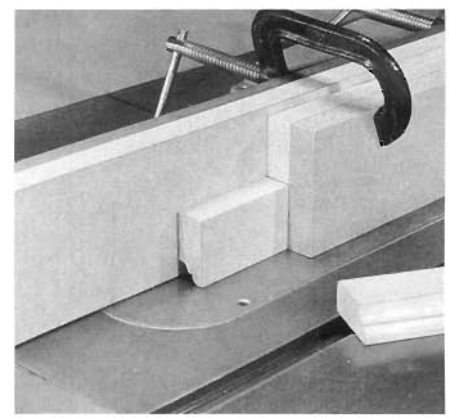


Photo 6

Start by ripping stock to the width of the moldings required. You'll want to rip enough stock to take care of the

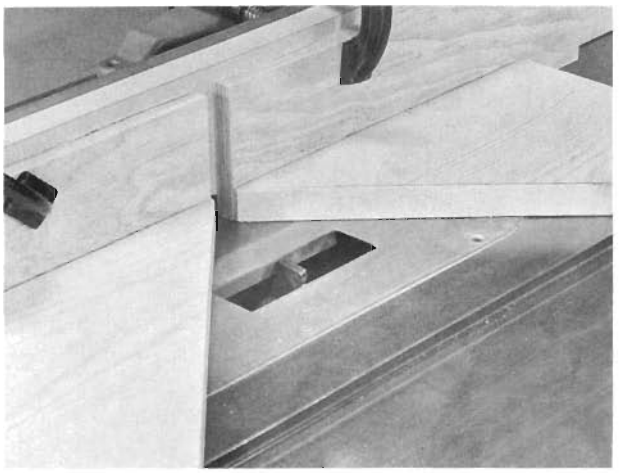


Photo 7

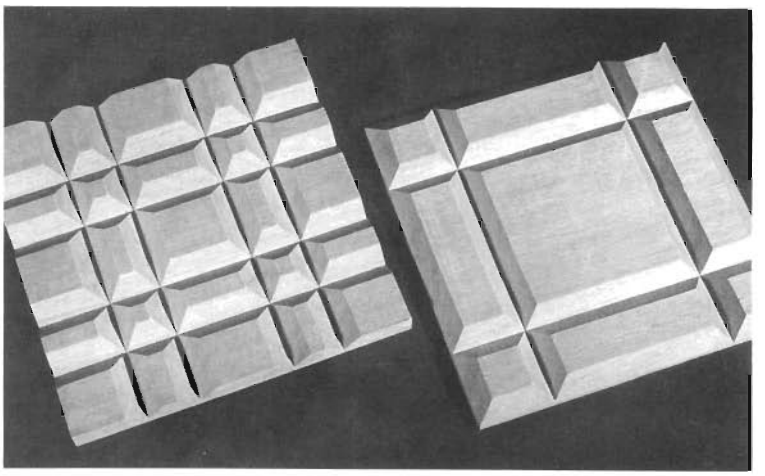


Photo 9

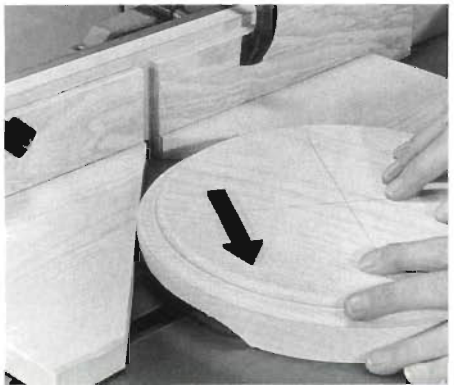


Photo 8

entire job. Then establish a jig with a pass-through for the work. The opening (pass-through) in the jig can be made as shown in Photo 6 or it can be a groove as shown in Fig. 7. In either case, size the opening precisely so that work can move without chatter. Start the cut by feeding from the front; end it by pulling from the back.

Circular Work

Shaping the perimeter of circular pieces is feasible if you follow the technique that is shown in Photos 7 and 8. The V-guide is composed of two pieces that are clamped to the fence to accommodate the work. Start the job by bracing the work firmly against the right leg of the V and then swinging it slowly until it is snugly seated. Shaping is accomplished by rotating the work counterclockwise. Be sure the work is round and has smooth edges. Any flaw in either area will result in less than perfect results.

Basic Safety

- Obey manufacturer's installation instructions.
- Pay heed to allowable RPM.
- After setting up, stand aside and allow the molding head to run free for about a minute.
- Be sure the knives will turn without hitting the insert.
- Don't try to shape pieces that are too small for safe handling.
- Edges to be shaped must be true and smooth to begin with.
- Regular or homemade inserts must fit tightly.
- Be sure the auxiliary wood facing is smooth; apply an occasional coating of paste wax.
- Always use the miter gauge for end cuts, especially when the stock is narrow.
- Use a miter gauge hold-down if one is available.
- Don't force-feed.
- Something is wrong if you must use excessive force to get the job done.
- Burn marks, excessive slowing up of the cutter, chatter, poor results, indicate that you are feeding too fast or too deep.

Surface "Carving"

The effects created by making parallel or crossing cuts of limited depth into the surface of stock depend, of course, on the knives that are used. The example panels shown in Photo 9 were done with V-groove knives.

The workpiece must be flat to begin with. Be sure that the work stays snugly on the table throughout the pass by working with a combination pusher/hold-down (Photo 10). Don't make cuts

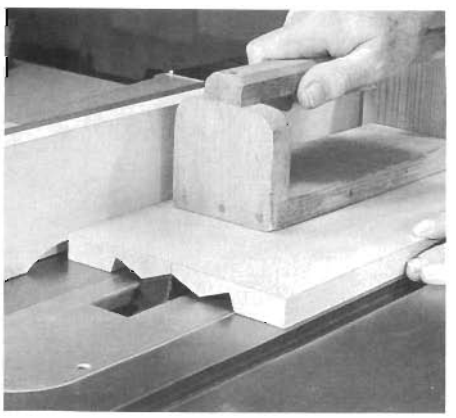
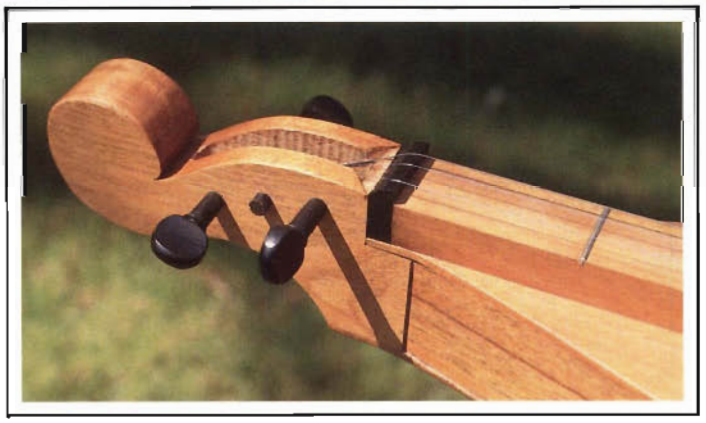


Photo 10

so deep that the stock will be thinned to the point of weakness. If it becomes too flexible it will not be safe to handle and will result in a weak component. Do cross-grain cuts first when making passes that intersect. Careful setups are necessary when making cuts that must match, as in the case of V-cuts, or those that require a particular spacing.

Mountain Dulcimer



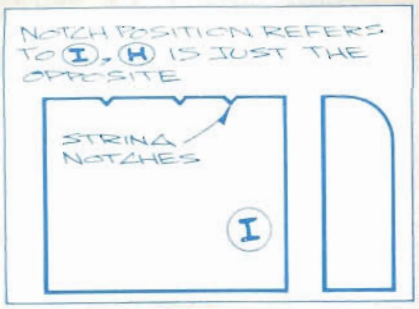
Our thanks to Jim Silliman of Pippa Passes, Kentucky, for this lovely mountain dulcimer. Jim not only designs and builds dulcimers, but also shares his knowledge with others. For those who might think that building a musical instrument is a *daunting undertaking*, consider this: Jim tells us that more than 90 folks, most with no woodworking experience, have successfully built their own dulcimers in the dulcimer building workshop that he conducts in conjunction with the Elder Hostel Appalachian Awareness Program at Alice Lloyd College in Pippa Passes.

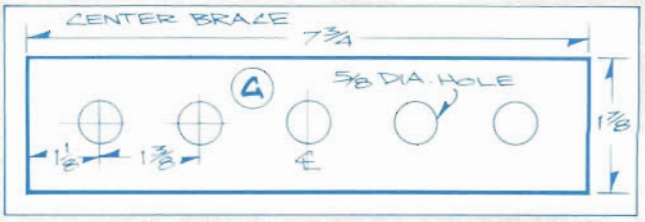
The mountain or lap dulcimer is a simple-to-build, easy-to-play stringed instrument. First mention of the dulcimer is in biblical texts, and although the exact origin of the mountain dulcimer is obscure, in design, style and string placement it resembles the German zither and the Scandinavian hummel. Depending on the tuning and manner of play, the dulcimer's sound can be made to resemble the bagpipes, guitar or harpsichord.

Start by getting together the wood and parts that you'll need. The Bill of Materials lists a mail-order source for the dulcimer parts—specifically the fret wire (K), tuning pegs (L) and strings (M)—that must be purchased. Many music stores also carry these parts. The Bill of Materials also lists a source for the thin wood parts—the soundboard (C), back (D) and sides (E), and for the ebony that's used for the bridge (H) and nut (I).

Though many woods are acceptable for dulcimer building, our instrument was crafted mainly in mahogany, a wood that is easy to work, finishes nicely and renders a good, consistent musical tone. Other popular woods are walnut, yellow poplar, cherry and maple. Note that a much harder wood, such as ebony, is recommended for the bridge and nut, two parts that must bear considerable pressure from the strings.

The dulcimer shown uses traditional wooden 4/4 violin pegs, friction-fit into tapered holes. A peg reamer, available from Stewart-MacDonald Guitar Shop Supply (see Bill Of Materials for address; order their part no. 344, cost is $29.99) is the ideal tool for establishing the proper taper in the peg holes. However, low-cost tuning machines


NOTCH POSITION REFERS TO (I), (H) IS JUST THE OPPOSITE
STRING NOTCHES
I


CENTER BRACE
7¾
G
⅝ DIA. HOLE
1⅞
1⅛
1⅜
E

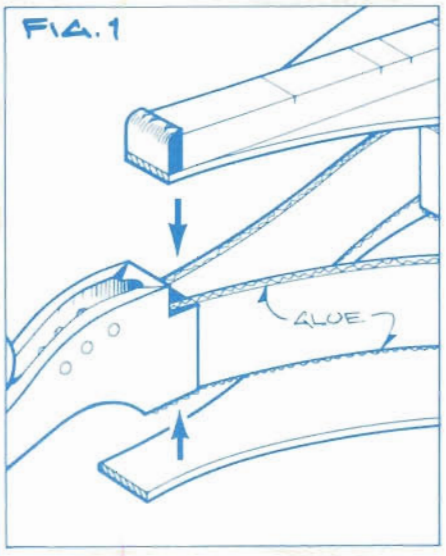
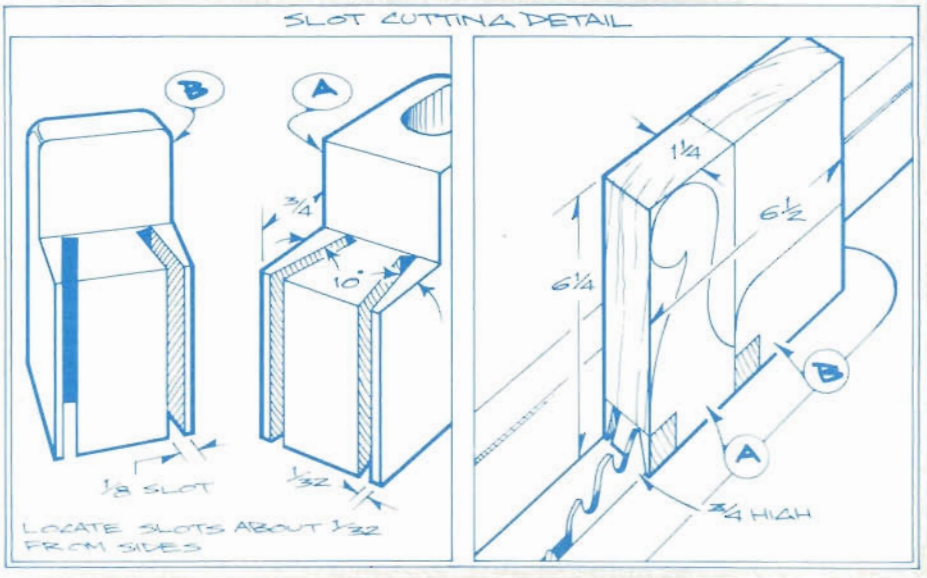
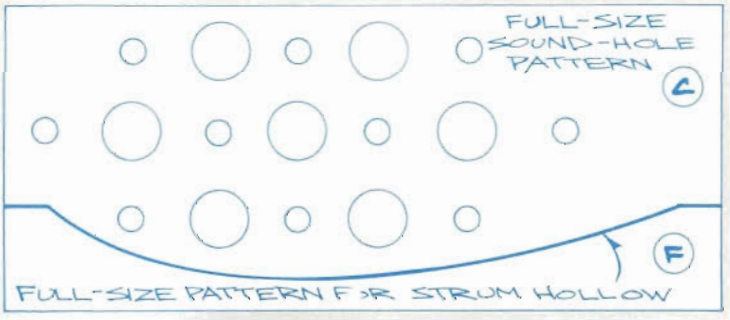
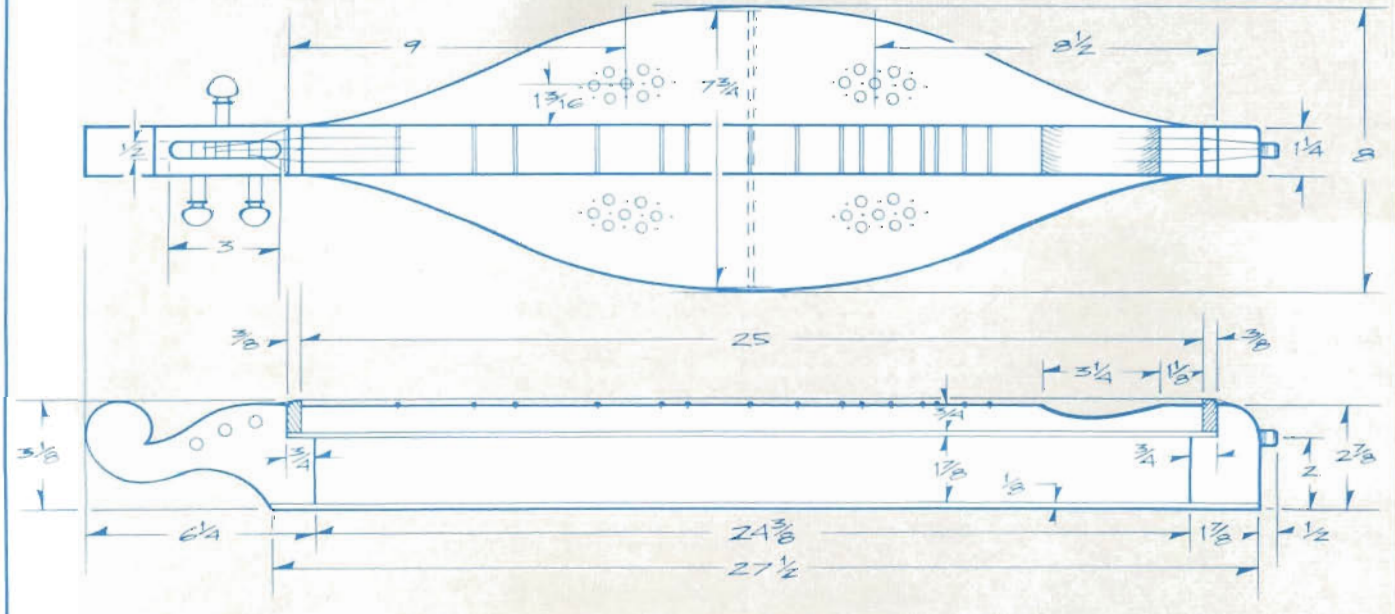


FIG. 1
GLUE


SLOT CUTTING DETAIL
B
A
¾
10°
⅛ SLOT
1/32
LOCATE SLOTS ABOUT 1/32 FROM SIDES
1¼
6½
6¼
B
A
¾ HIGH


FULL-SIZE SOUND-HOLE PATTERN
C
F
FULL-SIZE PATTERN FOR STRUM HOLLOW


9
8½
1 3/16
7¾
1½
1¼
8
3
⅜
25
⅜
3¼
1⅛
3/4
3⅛
¾
1⅞
⅛
¾
2
2⅞
6¼
24⅜
1⅞
½
27½

(available from Stewart-MacDonald or your local music store) can be substituted for the pegs. If you order the tuning machines from Stewart-MacDonald, ask for their part no. 936; cost is $6.28. You'll receive a set of six tuning machines, three left and three right side, but you'll only need two of the left and one of the right side for the dulcimer.

Using the full-size patterns provided, lay out the peghead (A) and tailpiece (B) profiles on 1 1/4 in. thick stock. We suggest that you start with a piece about 6 1/2 in. wide (see Slot Cutting Detail), lay out both profiles, cut the two slots, and then separate the two pieces. The table saw with the blade angled 10 degrees is used to establish the 3/4 in. deep slots (a standard saw blade should produce the 1/8 in. wide slot). Lay out the peg hole locations on the peghead, then use the drill press with a 1/4 in. diameter drill bit to establish the initial peg holes (the final hole size is established later with a reamer, if you opt for the wooden tuning pegs). Also use the drill press, with a 1/2 in. diameter bit, to rough out the string recess in the peghead. Then square the sides of the recess with a chisel. The chisel is also used to cut the transition bevel for the strings at the end of the recess. Finally, cut the scroll shape and notch the peghead, and notch and round the tailpiece. If you plan on doing some ornamental carving on the peghead, this is probably the best time.

Now cut the soundboard (C), back (D), sides (E), fretboard (F), center brace (G), bridge (H) and nut (I) to size. All these parts, except for the soundboard and back, should be cut to the sizes listed in the Bill of Materials. The soundboard and back are cut slightly oversize for now, and are trimmed to final size later, after assembly. This is a good time to lay out and cut the decorative sound hole pattern in the soundboard. Using the full-size pattern as a guide, bore a series of 1/8 in. and 5/16 in. diameter holes to create the pattern. Also bore the 5/8 in. diameter holes in the center brace, which are necessary for good resonance throughout the sound box.

Next up is the fretboard. Lay out the strum hollow using our full-size pattern, cut and smooth the shape, then measure and mark for the fret slots. Refer to the Fret Position Chart (page 32) for the distance of each fret (K) from the nut. Note that the distances are expressed in both decimals and in fractions up to 1/32 in. The decimal dimension is carried out in thousandths, and if you can use these numbers they are the most accurate way to locate the fret slots. We've also included the same dimension rounded off to the nearest 1/32 in. A steel rule or a tape measure with 1/32 in. markings can be used to lay out the frets. If your rule or tape measure only has the 1/16 in. markings, just split the distance between each 1/16 in. mark to arrive at a 1/32 in. location. Use a square to insure that the location line for each fret is at a perfect right angle to the side of the fretboard.

The fret slots can be cut with a fine backsaw, or a special fret slotting saw (available from Stewart-MacDonald, their part no. 660, $9.95). We used a Japanese backsaw, which has a narrow blade and exceedingly fine teeth, producing just the right width slot. If you plan on using a thicker backsaw, check the fret wire in a test slot first. Since the fret wire relies on small teeth on the tongue to hold it in place, a too wide slot won't hold the wire securely. The slot depth should be just a little under 1/8 in., which leaves a deep enough slot to accept the fret wire without danger of it bottoming. Once all the fret slots have been cut, use a metal nipper or a jeweler's saw to cut the frets to length (about 1 3/8 in.). Use a block of wood and a hammer to seat the frets, then file the excess fret length flush with the edges of the fretboard. Glue usually isn't required to hold the frets in place, but for an extra measure of strength, a little epoxy in each of the slots can't hurt.

Now glue the nut and bridge on the ends of the fretboard. On our dulcimer, both the nut and bridge are identical, just blocks with a roundover on one edge. Position the nut and bridge so the high point of each faces the fretboard, then file three shallow V-notches in each for the strings. Use the full-size pattern to properly size and locate the notches.

You are now ready to assemble the dulcimer. First, glue the fretboard/nut/bridge assembly to the soundboard. Place the soundboard on a perfectly flat surface and weigh the fretboard down with books. When dry, trim the soundboard ends flush with the nut and bridge.

Next, insert the sides into the slots in the peghead and tailpiece, and use the center brace to spread the sides apart. The tension of the sides holds the center brace in place. Test-fit the soundboard/fretboard assembly between the notches in the peghead and tailpiece. If the assembly doesn't fit between the notches, adjust the seating of the sides in the peghead and tailpiece slots. If the sides are fully seated in the slots, but there's a gap between one of the notches and the nut or bridge, you'll need to shorten the sides a bit.

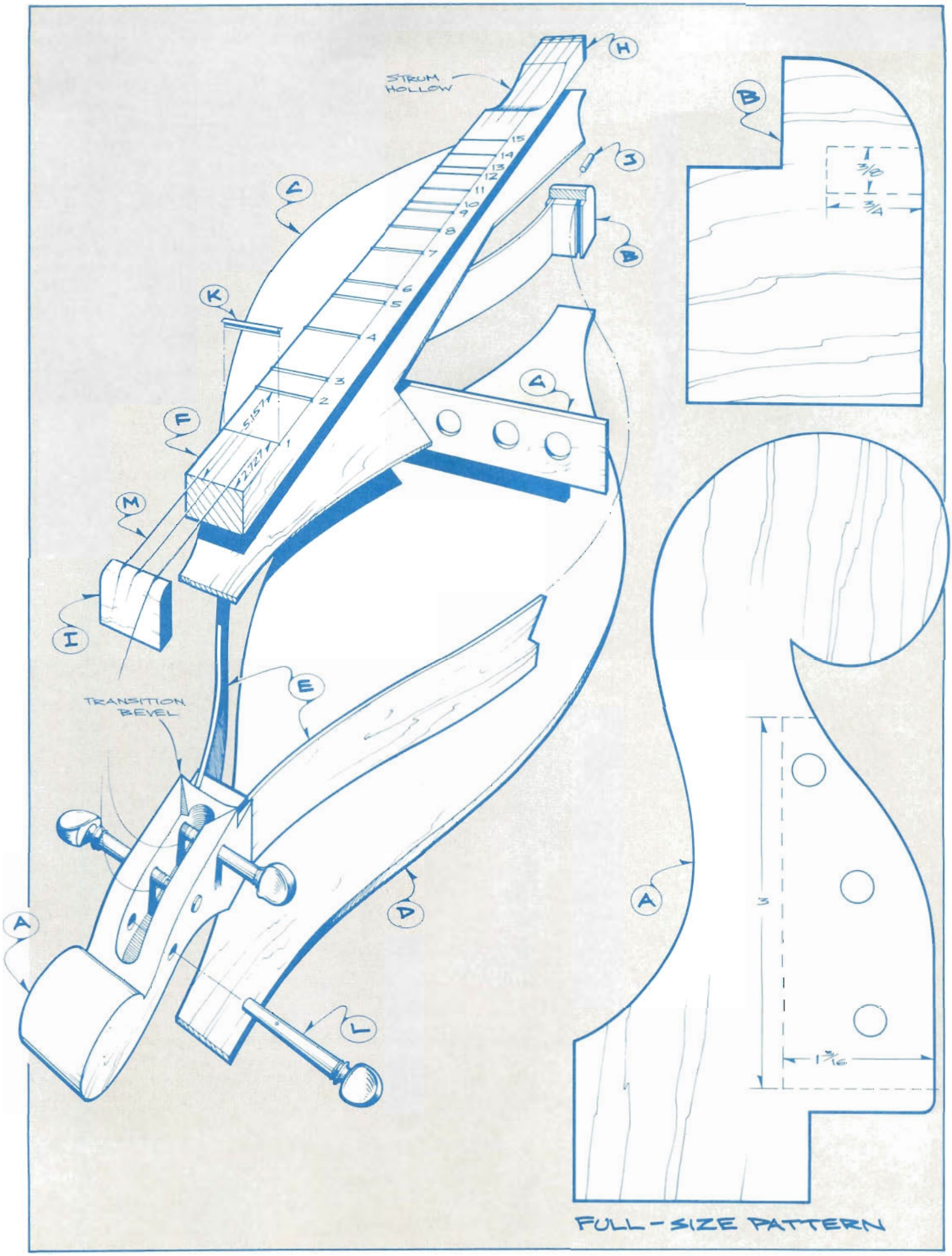
Use a pencil to trace the outline of the sides on the soundboard and back, then cut just outside the line with the band saw. Run a bead of glue on the bottom of the peghead, sides, center brace and tailpiece and place that assembly on the

Bill of Materials
(all dimensions actual)

Part	Description	Size	No. Req'd.
A	Peghead	1 1/4 x 3 x 6 1/4	1
B	Tailpiece	1 1/4 x 2 3/4 x 1 7/8	1
C	Soundboard	1/8 x 8 x 25 3/4*	1
D	Back	1/8 x 8 x 27 1/2*	1
E	Side	1/8 x 1 7/8 x 26 3/4*	2
F	Fretboard	3/4 x 1 1/4 x 25	1
G	Center Brace	1/8 x 1 7/8 x 7 3/4	1
H	Bridge	3/8 x 1 x 1 1/4*	1
I	Nut	3/8 x 1 x 1 1/4*	1
J	Tailpin	3/8 dia. x 1 1/4 long	1
K	Fret	as shown**	15
L	Tuning Peg	4/4 Violin Peg**	3
M	String	as shown**	3

* Length and width dimensions of soundboard and back are after shaping. Our dulcimer was constructed from plainsawn mahogany, but quartersawn stock is often preferred for the soundboard. If you can't find it locally, quartersawn, bookmatched soundboard stock (in Sitka spruce, red cedar, or redwood) can be purchased from The Luthier's Mercantile, P.O. Box 774, 412 Moore Lane, Healdsburg, CA 95448; tel. (707) 433-1823. Luthier's Mercantile also sells bookmatched stock for the back and sides (available in rosewood, walnut, mahogoany, cherry and rock maple), and ebony for the bridge and nut. Call for prices.

** These parts can be ordered from Stewart-MacDonald Guitar Shop Supply, 21 N. Shafer St., Box 900, Athens, OH 45701; tel. 1-800-848-2273. The frets are sold as 1 ft. long lengths of 18 percent nickel silver fret wire (you'll need 2 ft. to yield the 15 frets), which you must then cut into 1 3/8 in. lengths. Order part no. 147; cost is 79¢ per foot. The tuning pegs are part no. 356 ($2.99 per peg). The strings are sold as a 4-string set, which includes one extra .012 gauge steel string. Order part no. 1447 ($2.52 for the set). The extra string comes in handy, since the thin strings are the ones most likely to break. Include $3.99 for shipping and handling on orders under $30, and $6.25 for shipping and handling on orders between $30 and $75.


STRUM HOLLOW
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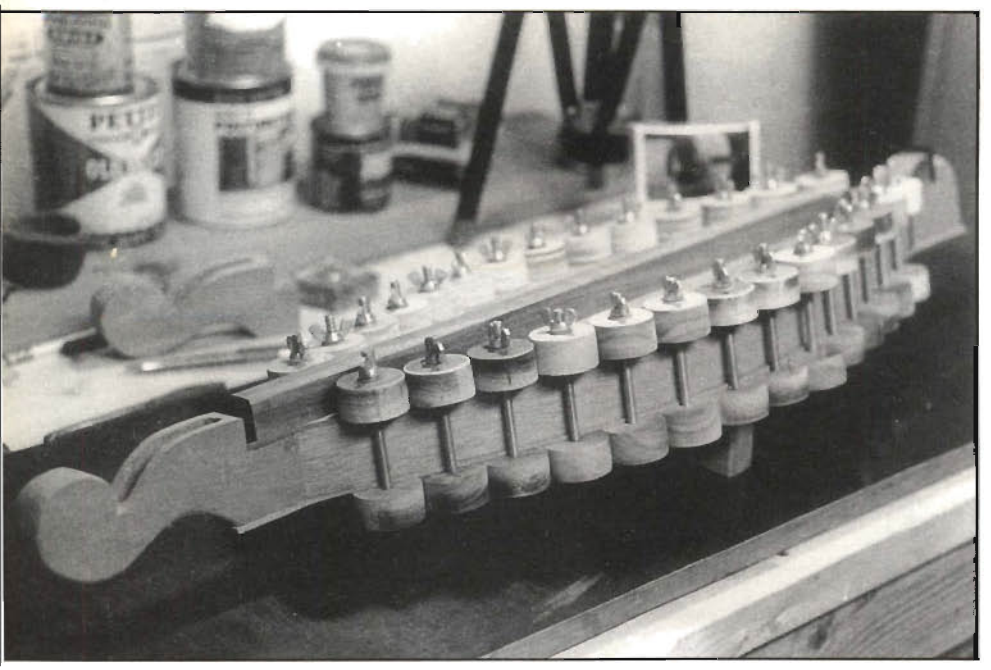
FULL-SIZE PATTERN



Fret Position Chart

Fret No.	Position (measured in inches from the nut)
1	2.727 or $2\frac{23}{32}$
2	5.157 or $5\frac{5}{32}$
3	6.271 or $6\frac{9}{32}$
4	8.315 or $8\frac{5}{16}$
5	10.135 or $10\frac{1}{8}$
6	10.969 or $10\frac{31}{32}$
7	12.500 or $12\frac{1}{2}$
8	13.864 or $13\frac{7}{8}$
9	15.079 or $15\frac{3}{32}$
10	15.636 or $15\frac{5}{8}$
11	16.657 or $16\frac{21}{32}$
12	17.567 or $17\frac{9}{16}$
13	17.985 or 18
14	18.750 or $18\frac{3}{4}$
15	19.432 or $19\frac{7}{16}$

back. Next, run a bead of glue on the top of the sides, center brace and into the notches in the peghead and tailpiece, and add the soundboard/fretboard assembly (Fig. 1).

If you have enough C-clamps, you can use them for clamping the soundboard and back to the sides. But you can also make your own spool clamps, which work especially well for this type of assembly. To make spool clamps, just use a hole saw to cut a series of disks from $\frac{3}{4}$ in. thick solid stock or plywood and drill a $\frac{1}{4}$ in. hole through the center of each disk. By combining a pair of disks with a carriage bolt, washer and wing nut, you'll make an effective, low-cost spool clamp. If you don't have a hole saw, you can slice off $\frac{3}{4}$ in. lengths of closet rod (available at any lumberyard) to make the disks. You'll need about 20–30 of these spool clamps for the typical dulcimer assembly (see photo above).

When the dulcimer is out of clamps, trim and sand the soundboard and back flush with the sides. Drill the $\frac{3}{8}$ in. diameter by $\frac{3}{4}$ in. deep tailpin hole, and glue the $\frac{3}{8}$ in. diameter by $1\frac{1}{4}$ in. long tailpin dowel (J) into the tailpiece. The dulcimer is now ready for a finish.

Start with a sanding sealer, let dry, rub with no. 0 or 00 steel wool, then wipe off with a clean, soft, cotton cloth. Next apply several coats of a clear finish—such as lacquer or polyurethane—rubbing between coats with no. 000 steel wool.

All that's left is to mount the tuning pegs and strings. Use the reamer to ream the holes for the tuning pegs, checking progress carefully with the pegs to insure that you don't ream out too much. Note that two peg holes are reamed out from the left side, and one from the right.

Seating the pegs is important. Good contact area between the peghead and pegs is needed to provide the constant string tension that insures the dulcimer will remain in tune. Don't sand the stem surface of the pegs. Once the pegs are properly seated, drill a single $\frac{1}{16}$ in. hole through each peg stem.

The first two strings on the dulcimer are .012 gauge single-strand stainless steel, the third string is a .020 or .022 gauge wound nickel string. Loop the strings over the tailpin, then thread the string ends through the $\frac{1}{16}$ in. holes in the pegs. Tighten the strings by rotating the pegs away from the sound box, a direction that carries the string over each peg. Make sure the strings are in the proper notches in the nut and bridge as the pegs are tightened. To tighten the peg in the peghead—and hold the string at the desired tension—push in while turning. If the pegs have a tendency to loosen during tuning or playing, a little violin rosin on the peg stems should solve the problem.

Playing The Dulcimer

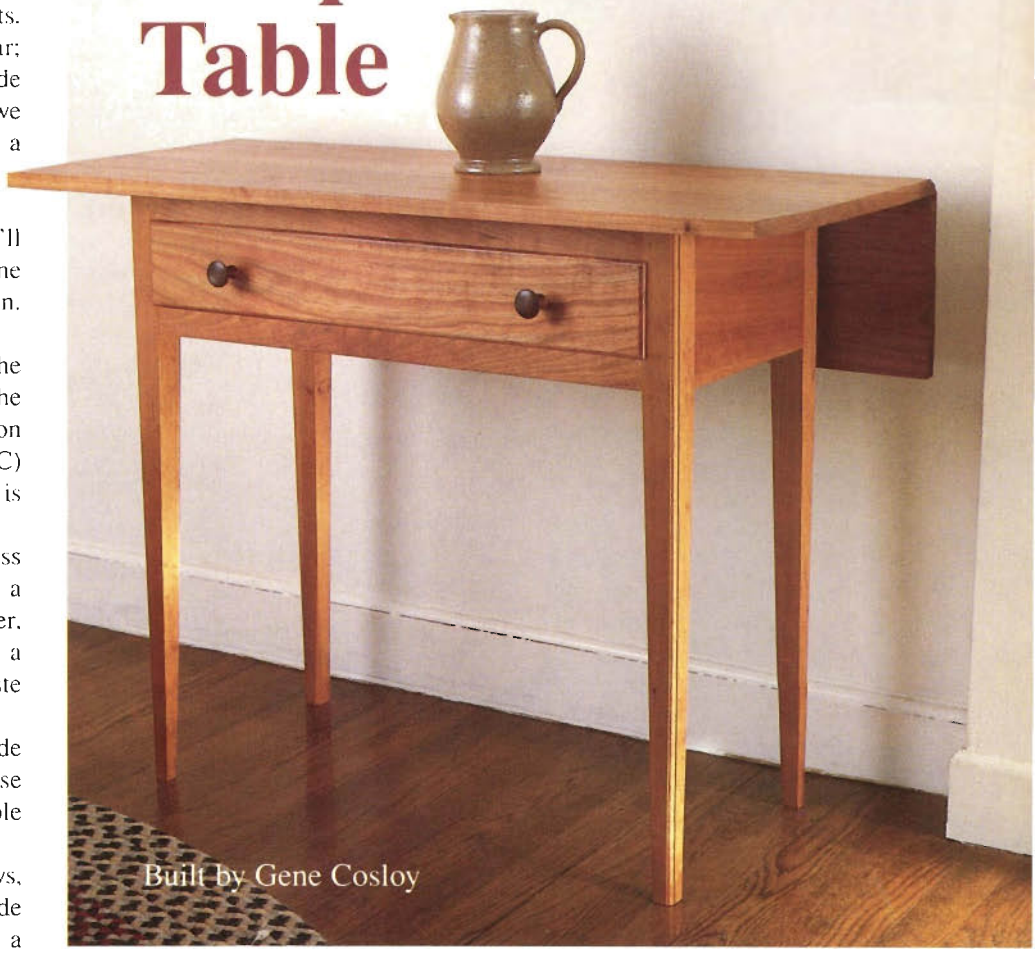
There are many ways to play the dulcimer, and no single way is the best. One common method is with the instrument placed across the lap, angled slightly so the peghead extends beyond the left knee and the tailpiece rests close to the hip. The first string (the one closest to the player) is used to note the melody; the two remaining strings are called drone strings. Tune the first string to G and the two drone strings to low C.

Strum the dulcimer with the thumb on the right hand, using a sweeping motion across the strings, or use the same strumming motion with a pick. The melody is noted on the first string with the middle finger of the left hand, or with a scrap of $\frac{5}{16}$ in. diameter by 3 in. long dowel (called a noter). Slide the finger along the fretboard to change notes; later on, once some dexterity is gained, you'll find it handy to use the index finger for quick note changes on the frets ahead of the middle finger. For beginners with no callouses, the use of the noter and pick saves wear and tear on the fingers. Sliding the noter up and down the fretboard also yields the distinct twanging sound that many associate with the dulcimer.

For more on dulcimer building and playing, including books of songs, styles of play (such as fanning and chording), videos, compact discs and music tapes, contact Jean's Dulcimer Shop, P.O. Box 8, Highway 32 South, Cosby, TN 37722; tel. (615) 487-5543. Proprietor Jean Schilling tells us that if it's in print or on tape, and it's to do with dulcimers, they've got it. WWJ

SHAKER

Drop-Leaf Table



This lovely piece is a reproduction of a table from a private collection. It's a versatile design that lends itself to any number of uses. We think it works especially well as a serving side table in the dining room. It's also nicely sized for a sewing table.

Cherry is used for most of the parts. The drawer sides and back are poplar; the knobs are walnut. The Shakers made drawer bottoms from solid stock, but we show birch plywood, a concession to a modern product that is ideal for such use.

The legs (A) can be made first. You'll need four pieces of stock, each one measuring 1 1/2 in. square and 27 1/2 in. long.

Lay out and mark the location of the various leg mortises. Size them to fit the tenon dimensions shown in the Tenon Detail. Although the back apron (C) tenon is not shown in the Detail, it is identical to the end apron (B) tenon.

Cut the mortises using the drill press and a 3/8 in. diameter drill bit. Bore a series of holes, one alongside the other, to remove most of the stock, then use a chisel to clean up the remaining waste material.

A bead is now added to the outside corner of each leg (see Bead Detail). Use a 3/16 in. beading bit and the router table to make the cut.

As shown in the side and front views, the legs are tapered on the two outside surfaces. Note that the taper starts at a point 6 3/4 in. from the top end of the leg. If you have one, a table saw tapering jig will come in handy here. If not, lay out and mark the tapers on each leg, then hand plane the stock to the marked line. After the tapers are cut, use a hand plane to add a 6 in. long chamfer to the inside corner of each leg as shown in the Chamfer Detail.

Next, make the two end aprons (B), the back apron (C), the upper stretcher (E) and the lower stretcher (F). Begin by cutting each of the parts to the length and width shown in the Bill of Materials.

A tenon jig can be used to cut the tenons. As always, it's a good idea to make a test cut with a scrap piece—just make sure the scrap is the same thickness as your project stock. A properly fit tenon should fit snugly in the mortise. Avoid making it too tight at this point. If you do, you may have some trouble later on when you add glue. The glue will swell the joint a bit, making assembly difficult, if not impossible.

The back apron has a long notch cut in it to accept the leaf support (D). Mark the notch location before cutting it out with a band or saber saw. Use a file and sandpaper to smooth the saw marks. A scraper will also help here.

After a thorough sanding, the legs, aprons and stretchers can be assembled. Before starting, though, dry-assemble all the parts to make sure everything fits to your satisfaction.

You'll probably find the assembly easier if it is done in two steps. In the first step, the legs are joined to the two end aprons. Add glue to the mortises and tenons, then apply pressure with bar or pipe clamps. Check for squareness and make any necessary adjustments. Set aside to dry. In step two, the back apron and the upper and lower stretchers are joined to the leg/end apron assemblies. The procedure for gluing and clamping is the same.

Now, lay out and mark the center line location of the 1/4 in. diameter tenon dowel pegs before boring 1 in. deep holes to accept them. Cut the pegs slightly on the long side, then add a thin coat of glue and tap them in place. Trim the protruding ends flush to the surface with a sharp chisel.

The four cleats (G) are made from stock measuring 3/4 in. thick by 1 3/4 in. wide. Cut them to length so that they fit snugly between the stretchers and the back apron, then notch the corners to fit around the legs.

The cleats are attached to the end aprons with glue and 1 1/4 in. by number 10 roundhead woodscrews, but you'll first need to counterbore a 1/2 in. diameter by 1 in. deep hole for each screw. Then, at the base of each counterbore, bore a 1/8 in. diameter hole to accept the shank of the screw.

Since the two upper cleats are used to attach the top, you'll need to bore three

1/8 in. diameter holes in each one to accept 1 1/4 in. long by number 10 woodscrews. As shown in the exploded view, the two end holes are elongated to allow the top to expand and contract with changes in moisture content.

The two spacers (H) are added next. Start with 3/4 in. thick stock that's a bit wider than necessary and cut it to a length that allows a snug fit between the legs. Now, rip the stock to final width, keeping in mind that for the drawer to operate smoothly, the inside edge of the spacers must be flush with the inside edges of the legs. Once you are satisfied with the fit, glue the spacers in place.

The leaf support (D) is cut from 11/16 in. thick stock to allow room for a 1/16 in. thick washer at the pivot point. Trim the support ends to 45 degrees as shown, then bore a 1/8 in. diameter shank hole at the center to accept a 1 1/4 in. long by number 10 flathead wood screw.

You're not likely to find a 17 in. wide board for the top (I), so you'll probably need to edge-glue two or three narrower boards in order to get enough width. It's best to cut the boards so that the glued-up stock will be slightly wider and longer than necessary. Apply a thin coat of glue to the mating edges, then clamp firmly with bar or pipe clamps. Once dry, remove the clamps and rip the top to its final width of 17 in., but don't trim it to final length yet. You'll do that after the rule joint is cut.

The leaf (J) is made in the same manner as the top. And, like the top, the extra length is not trimmed now. The leaf can, however, be ripped to its final width of 8 in.

Next, the rule joint is cut on the top and leaf (see Rule Joint Detail). Since the router is used here, the two mating edges need to be smooth and true. It's a good idea to joint each one before starting. A single, light pass on each edge should be all that's required.

As shown in the Rule Joint Detail, you'll need two router bits to make the joint, a 1/2 in. radius ball-bearing guided cove bit and a 1/2 in. radius ball-bearing guided roundover bit. Many hardware stores carry these bits, or they can be mail-ordered from Eagle America, 124 Parker Court, Chardon, OH 44024, tel. 1-800-872-2511.

Work on the top first. You'll need the roundover bit, setting it to a depth that will create a 1/8 in. step, as shown. Accuracy is important here, so make test cuts in scrap stock until you are satisfied the depth setting is right. Once the test piece looks okay, clamp the top securely in place and make the cut.

The leaf is next. Replace the roundover bit with the cove bit, then make test cuts on scrap stock until you get the 1/8 in. edge shown in the detail. Check the cut against the one made in the top. When put together, they should be perfectly flush. Once all looks okay, make the cove cut in your leaf stock.

For the joint to operate smoothly, the 1/2 in. roundover radius must be reduced ever so slightly. About 1/32 in. is all that will need to be removed. Perhaps the easiest way to do it is to glue 120-grit sandpaper to the cove in one of your test pieces, then use the test piece to sand the roundover. Be careful to only sand the roundover, not the 1/8 in. step. Also, at this time, sand the bottom edge of the roundover so that it is slightly rounded. Both the top and the leaf can now be trimmed to their final length of 36 in..

Bill of Materials
(all dimensions actual)

Part	Description	Size	No. Req'd.
A	Leg	1 1/2 x 1 1/2 x 27 1/2	4
B	End Apron	3/4 x 6 1/2 x 11 1/2 *	2
C	Back Apron	3/4 x 6 1/2 x 25 1/2 *	1
D	Leaf Support	11/16 x 1 1/2 x 16	1
E	Upper Stretcher	3/4 x 1 1/2 x 25 1/2 *	1
F	Lower Stretcher	3/4 x 1 1/4 x 25 1/2 *	1
G	Cleat	3/4 x 1 3/4 x 11 1/2	4
H	Spacer	3/4 x 3/4 x 10	2
I	Top	3/4 x 17 x 36	1
J	Leaf	3/4 x 8 x 36	1
K	Hinge	2 7/8 x 1 1/2 **	2
L	Drawer Front	3/4 x 4 x 24 1/2	1
M	Drawer Side	1/2 x 3 3/4 x 12	2
N	Drawer Back	1/2 x 3 1/4 x 24	1
O	Drawer Bottom	1/4 x 11 3/4 x 23 1/2	1
P	Drawer Knob	see Knob Detail **	2

* Length includes tenons

** Available from Woodcraft, 210 Wood County Industrial Park, P.O. Box 1686, Parkersburg, WV 26102; tel. 1-800-225-1153. For the solid brass hinge, order p/n 16R42, which sells for $8.50 per pair. For a cherry knob (not walnut) order p/n 50R41, which sells for $6.25 for a package of 10. The knob, which is similar in shape to the one in the drawing, measures approximately 1 1/4 in. dia. by 1 1/4 in. long, not including the tenon. Add $4.00 shipping and handling to all orders.

To open and close properly, the rule joint requires a special hinge called a drop-leaf hinge (K). It's made like any other hinge except one of the hinge leaves is extra long so that it can span the cove on the table leaf. A source of supply for the hinges (a pair is needed) is listed in the Bill of Materials.

Begin by laying out and marking for the locations of the hinges. Note, as shown in the Rule Joint Detail, that the short leaf of the hinge is attached to the table top, while the long leaf of the hinge is attached to the table leaf. Also note that each hinge is mortised in place and that a shallow groove must be cut in the underside of the table top to accept the knuckle of the hinge.

The location of the hinge knuckle is important. If it's too far from the edge, the joint will bind before the top fully opens, if it's too close, an unsightly gap will result. Ideally, the center of the hinge barrel should be 1/32 in. in front (toward the edge) of the 1/8 in. step. This means, when viewing the Rule Joint Detail, that the knuckle center line is 1/32 in. to the left of the step.

A sharp pencil or scratch awl will help you to accurately lay out the hinges. The mortises are cut with a chisel. Use number 6 screws to attach the hinges, then check for smooth operation of the leaf.

The drawer is made next. The front (L) is made from 3/4 in. thick stock, while the two sides (M) and the back (N) use 1/2 in. thick stock. The bottom (O) is 1/4 in. plywood.

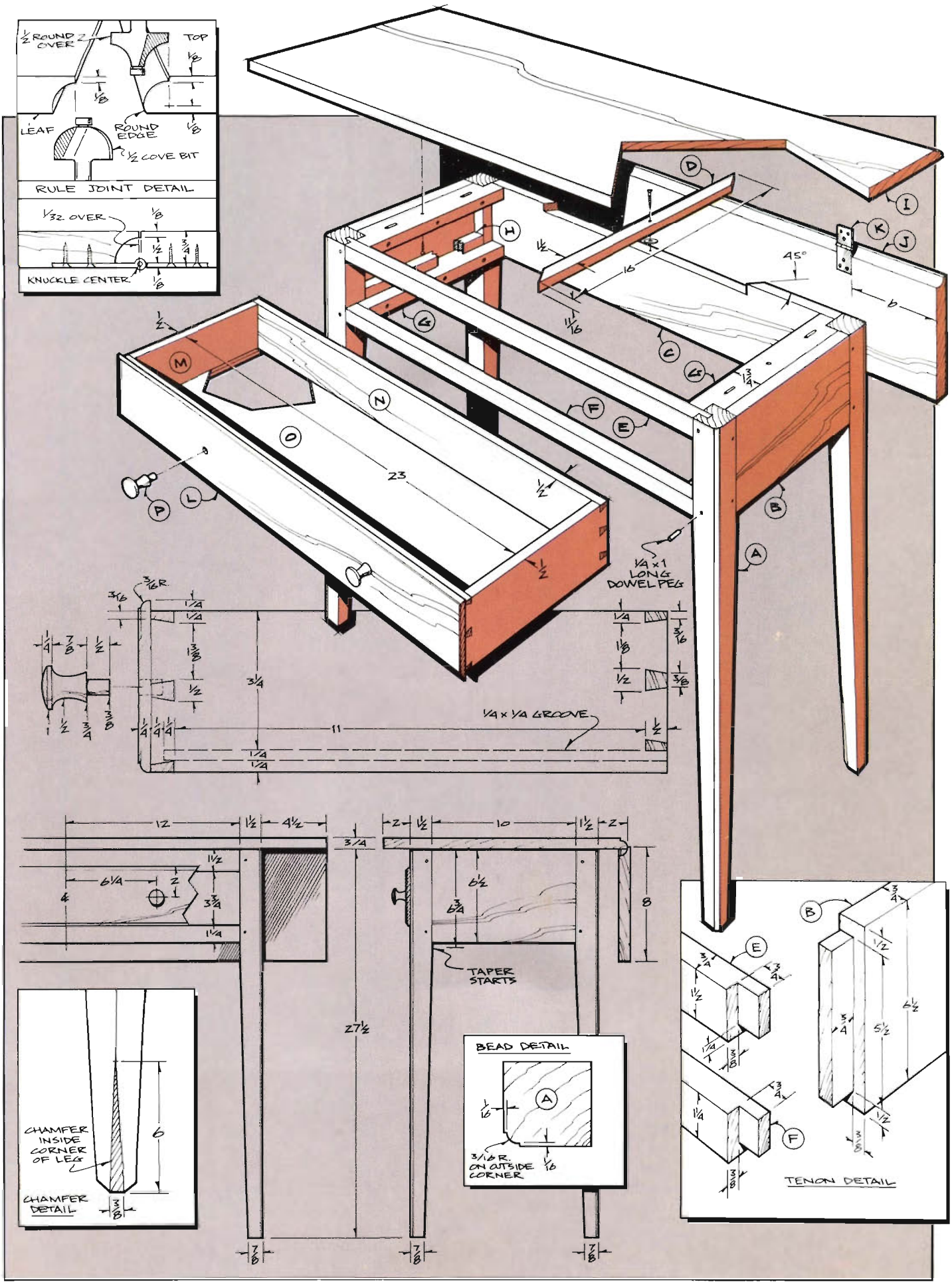
Cut the front to overall length and width, then use the table saw and dado head to cut the 1/4 in. wide by 1/2 in. deep rabbet on the top and side edges. The router table and a 3/16 in. beading bit is then used to add the decorative bead.

The dovetail layout is shown in the side view of the drawer. Once cut, assemble the drawer as shown. The bottom is secured to the lower edge of the back with four or five 1/2 in. long by number 6 flathead wood screws.

You can turn the walnut knob to the dimensions shown in the knob detail or purchase a ready-made Shaker knob. A mail-order source for a similar knob, made from cherry (not walnut), is listed in the Bill of Materials.

Give all parts a thorough final sanding. Final finish is a matter of choice, but we think cherry looks best with just a clear penetrating oil finish.

Mount the top to the base by driving 1 1/4 in. long by number 10 roundhead wood screws up through the holes in upper cleats. A thin coat of paste wax applied to each of the lower cleats will help the drawer slide smoothly.


½ ROUND OVER
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KNUCKLE CENTER
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¼ x ¼ GROOVE
TAPER STARTS
27½
CHAMFER INSIDE CORNER OF LEG
CHAMFER DETAIL
BEAD DETAIL
3/16 R. ON OUTSIDE CORNER
TENON DETAIL

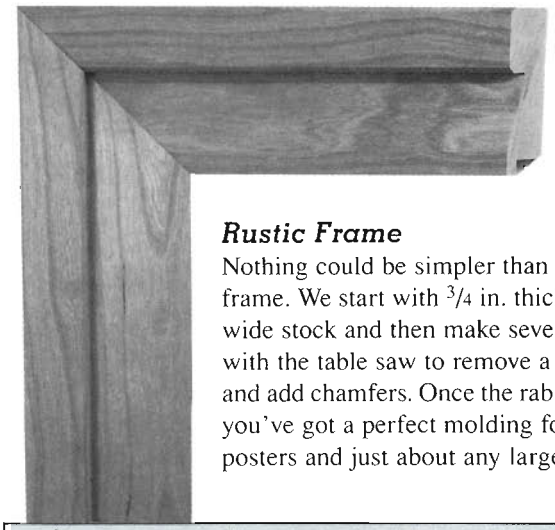
4 Easy Picture Frames

If you've ever been to a professional framing shop, then you've got a good idea of just how expensive picture frame molding can be. Cost alone is ample justification for making frames yourself. Of course, not all picture frame moldings are easily reproduced in a home shop. If you're in need of a plaster and gilt frame for that old Gauguin, then be prepared to pay for it. But for frames to house less precious subjects, consider one or more of our four easy-to-make picture frames.

Whatever your tastes—or skill level—one of these four frames should suit your needs. There's a simple Rustic Frame that's nothing more than a cherry board with a table saw cut for effect; there's a Built-Up Frame, made by assembling several standard lumberyard moldings; there's a Burl Veneer Frame, for that simple but elegant look; and there's a Cove & Bead Frame, for a more classic appearance. All of these frames are easily made with a minimum of equipment. Even the most complex molding—the Cove & Bead—requires only the table saw molding head and a core box bit.

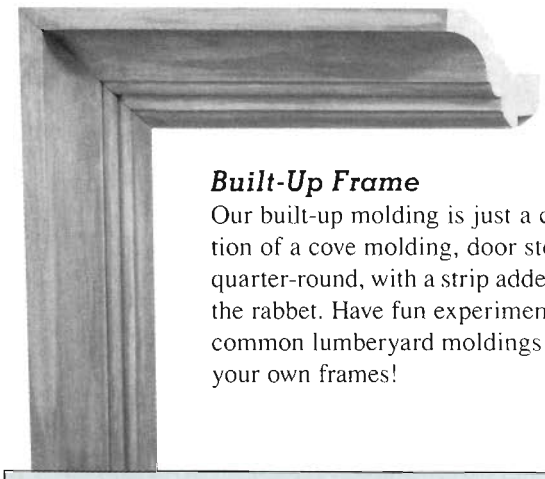
We've included step-by-step drawings to help you make all four moldings. Also, don't miss our Woodworking Basics article on page 18. It details a simple low-tech method for cutting miters and putting those frames together.

As for a choice of finish, you should select a finish for your frame that best complements the work being displayed. Our sample frames show Minwax Antique Oil on the rustic cherry frame, Minwax Wood-Sheen Frosted Stain & Finish (their slate blue) on the built-up frame, and spray lacquer on the burl veneer frame. For the cove and bead frame, we started with an application of Minwax Colonial Maple stain, followed by their Dark Walnut, then two coats of orange shellac and finally a dark paste wax, buffed up with a soft cloth.



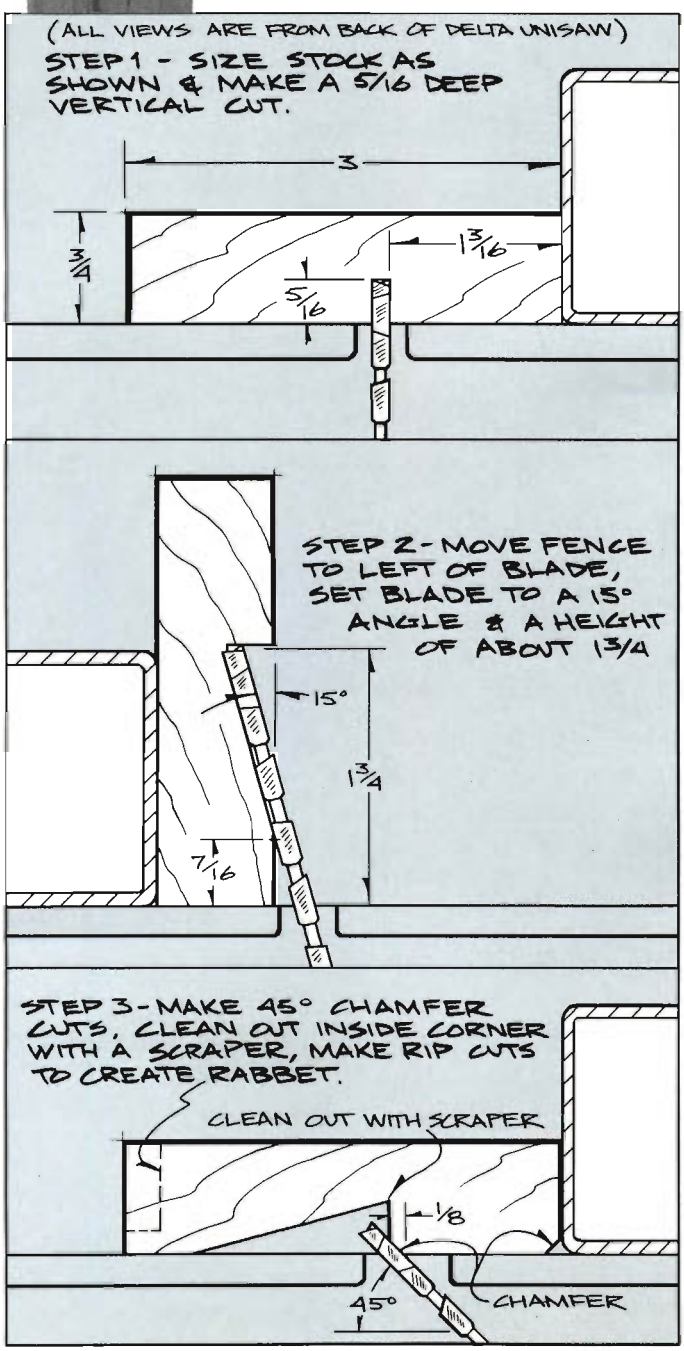
Rustic Frame

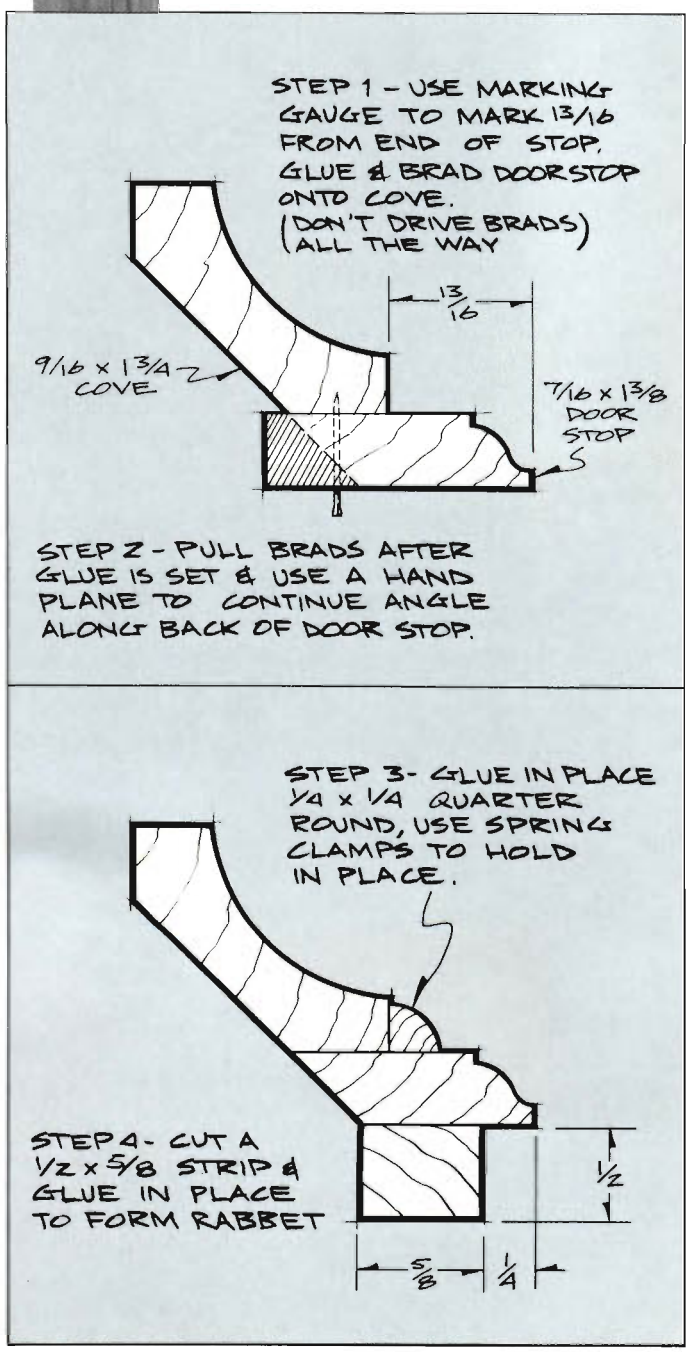
Nothing could be simpler than this frame. We start with 3/4 in. thick by 3 in. wide stock and then make several cuts with the table saw to remove a wedge and add chamfers. Once the rabbet is cut, you've got a perfect molding for prints, posters and just about any large subject.

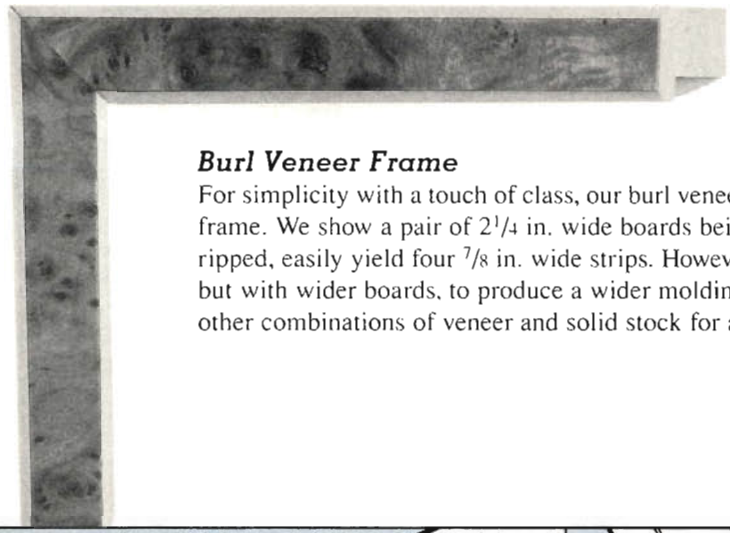


Built-Up Frame

Our built-up molding is just a combination of a cove molding, door stop and quarter-round, with a strip added to form the rabbet. Have fun experimenting with common lumberyard moldings to create your own frames!

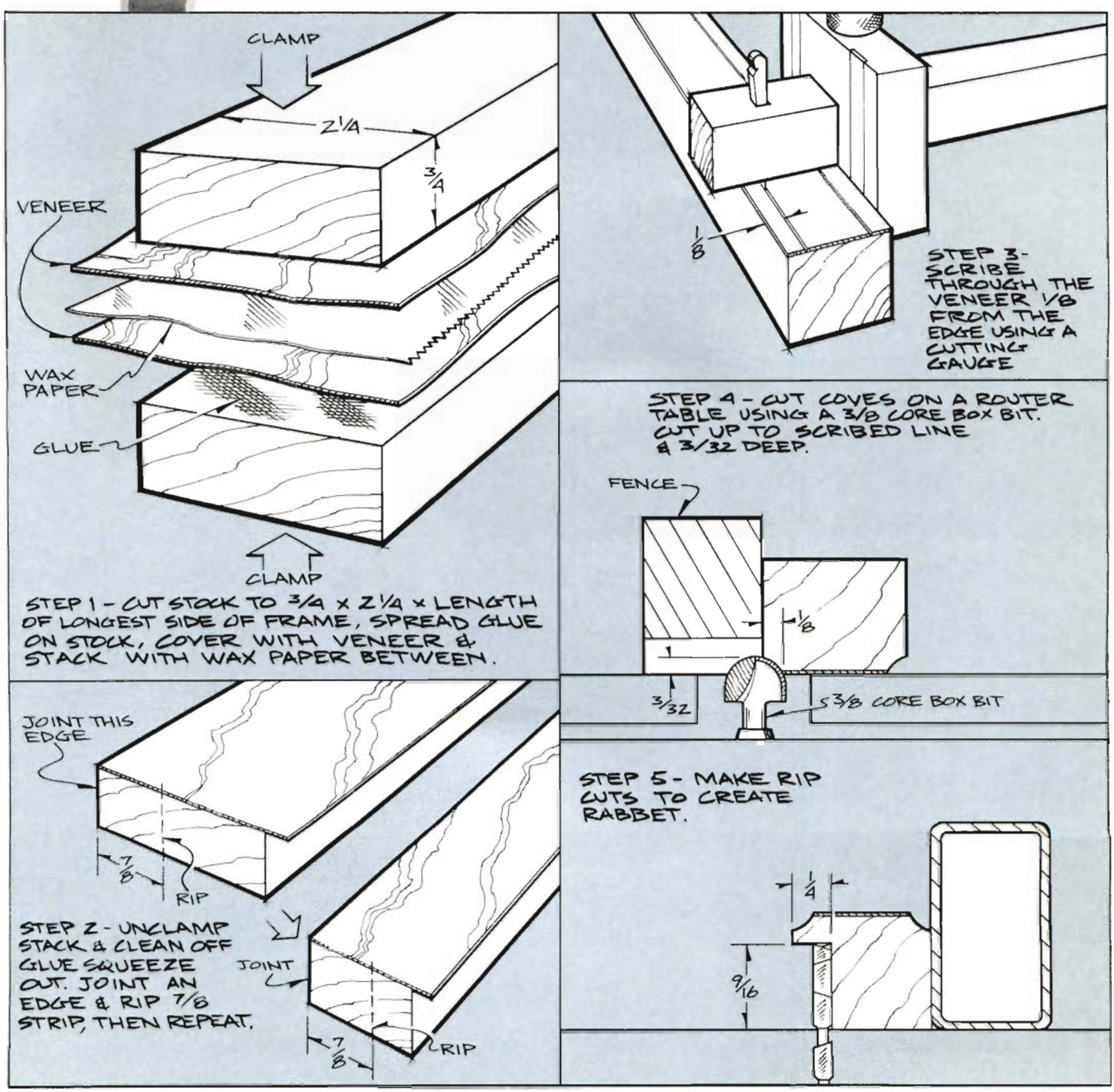


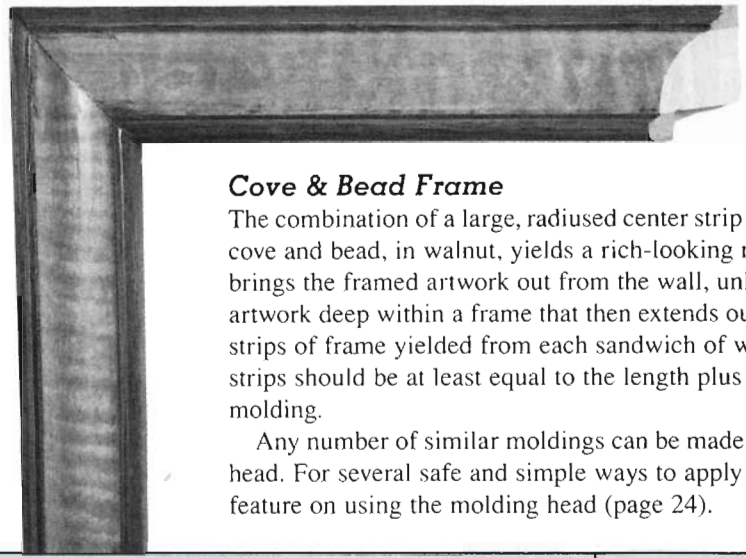




Burl Veneer Frame

For simplicity with a touch of class, our burl veneer-over-maple molding makes a stunning frame. We show a pair of 2 1/4 in. wide boards being used, which when glued, jointed and ripped, easily yield four 7/8 in. wide strips. However, you can also use the same technique, but with wider boards, to produce a wider molding. Don't be afraid to experiment with other combinations of veneer and solid stock for a different effect.

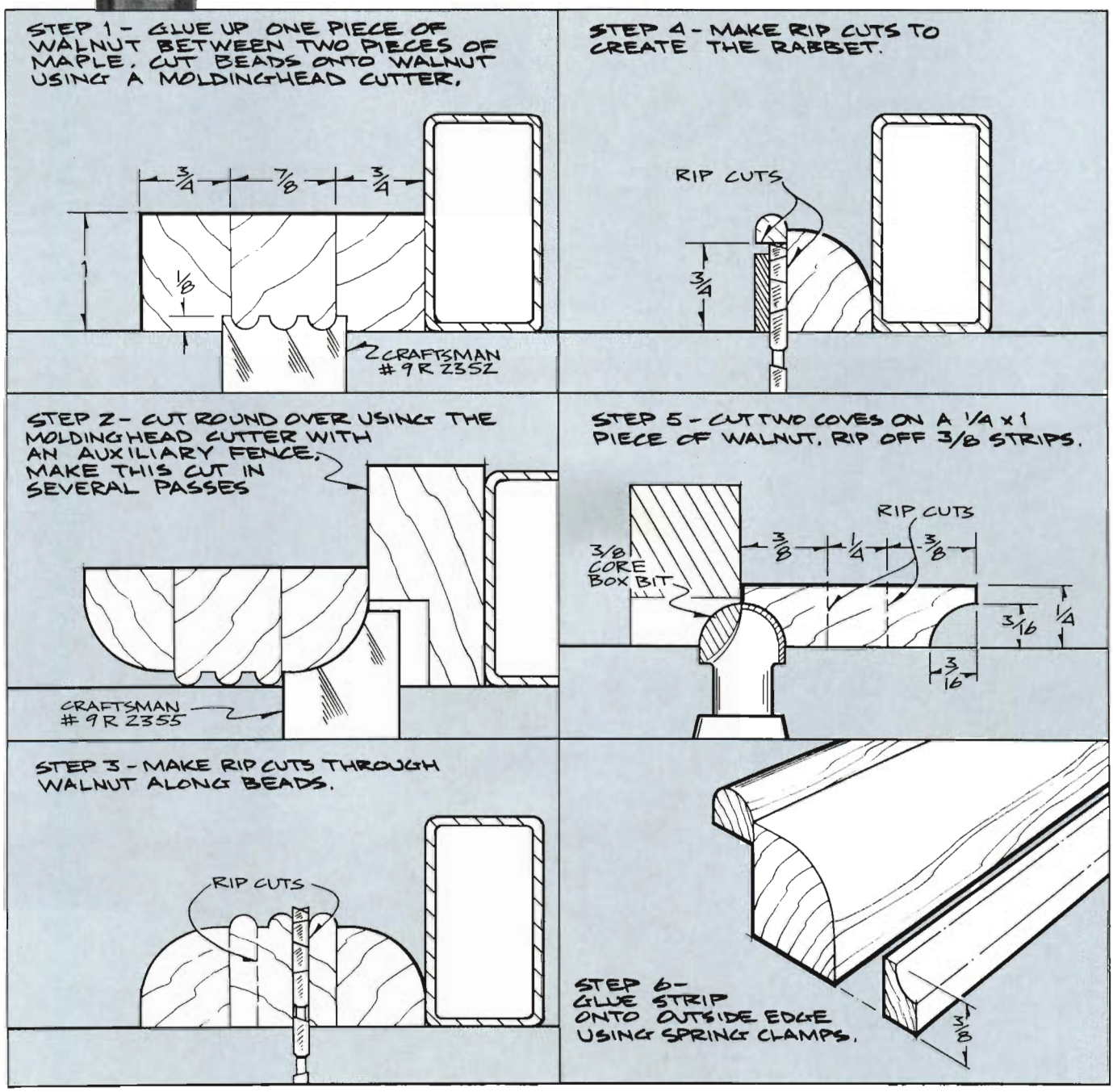




Cove & Bead Frame

The combination of a large, radiused center strip (ours is curly maple) edged with a smaller cove and bead, in walnut, yields a rich-looking medium-sized molding. This molding brings the framed artwork out from the wall, unlike more traditional frames that place the artwork deep within a frame that then extends out. Our step-by-step instructions show two strips of frame yielded from each sandwich of walnut-over-maple, so the length of the strips should be at least equal to the length plus width of your frame to provide sufficient molding.

Any number of similar moldings can be made with your router or the table saw molding head. For several safe and simple ways to apply a molded edge to narrow strips, see our feature on using the molding head (page 24).



Shop-Made Lathe Tool: A Spigot Chuck

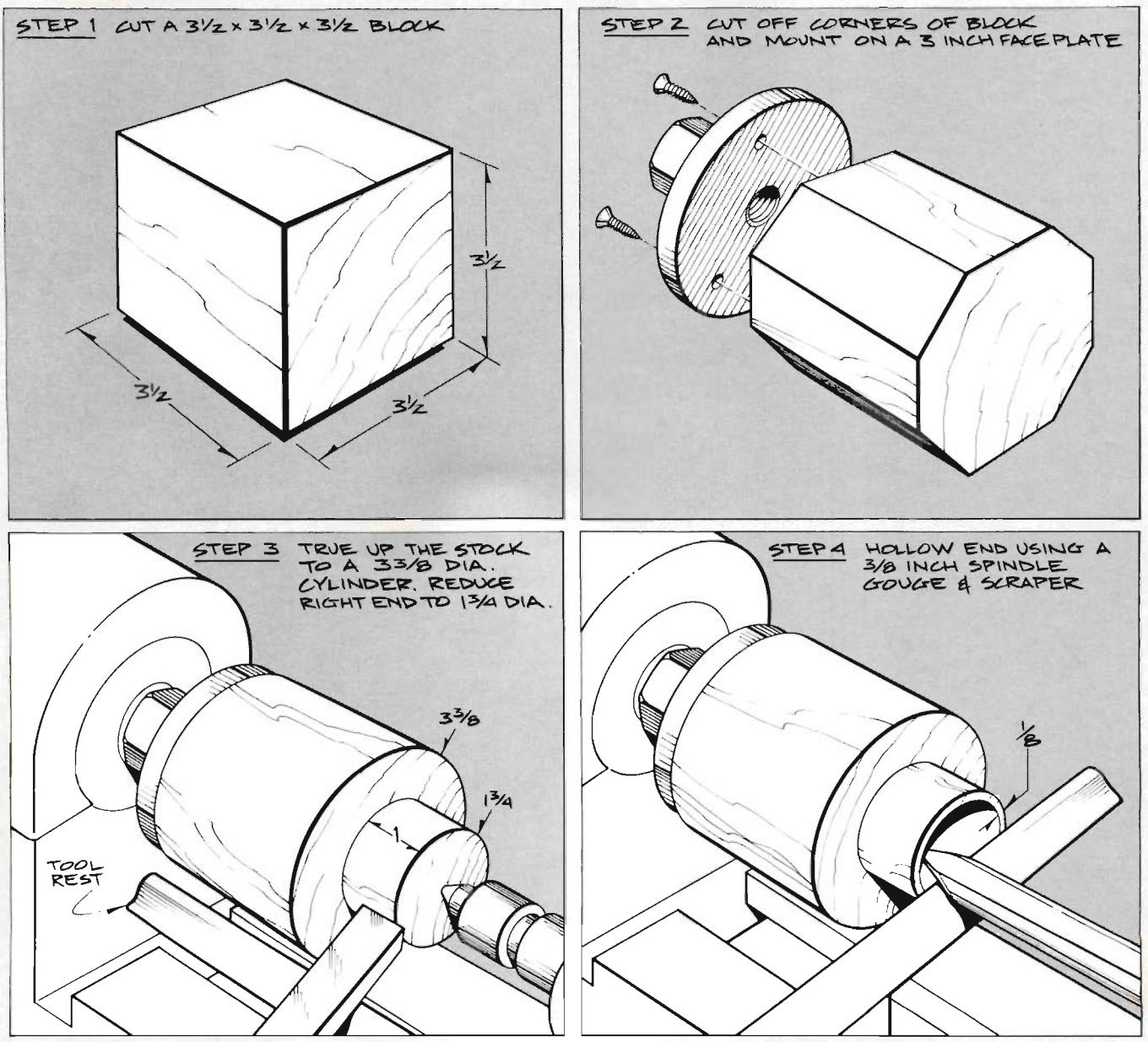
by Nick Cook

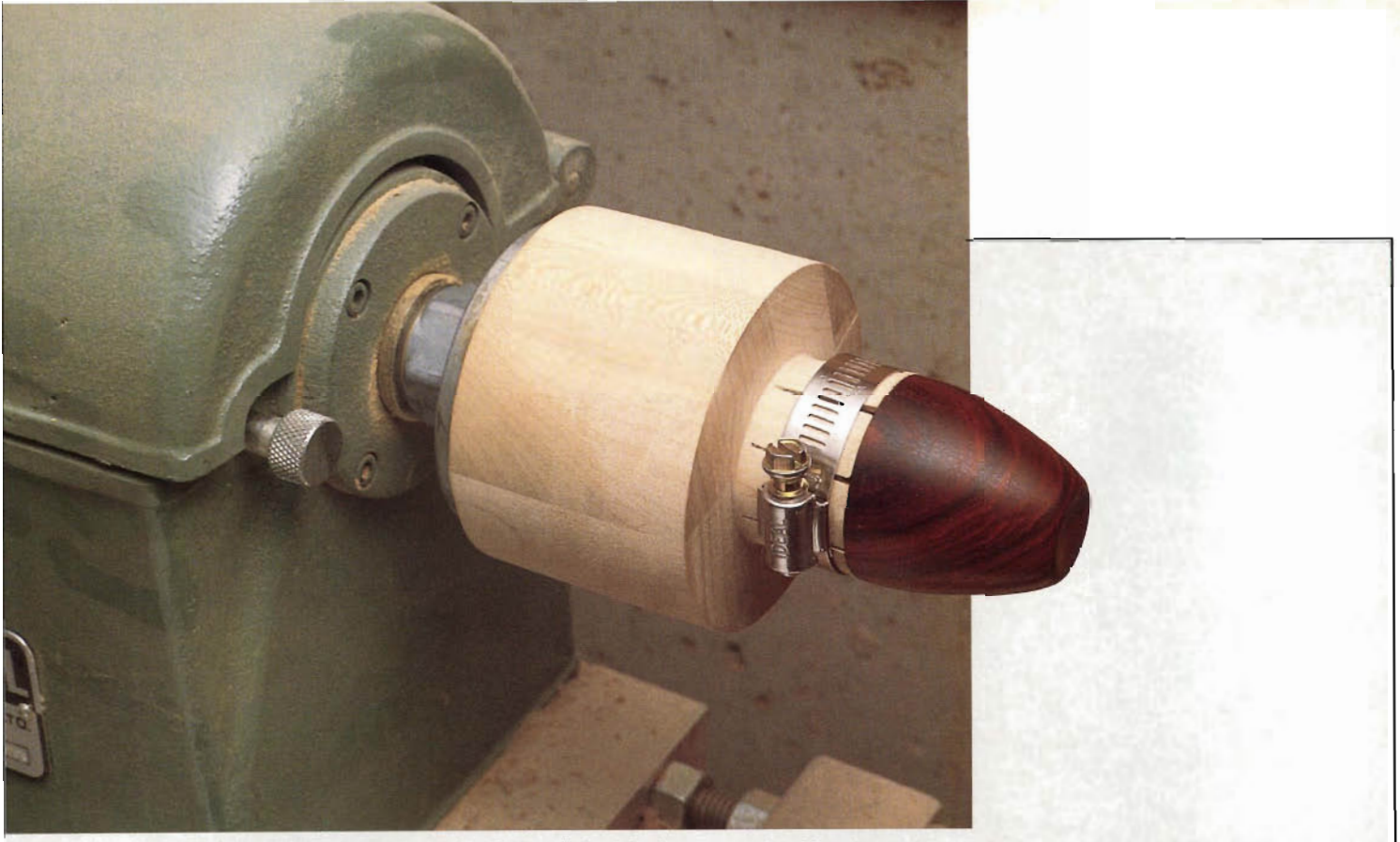
I like to use the spigot chuck to support blanks for a variety of turning projects, including lidded boxes (see Special Techniques, page 15). But as I travel around the country doing workshops and hands-on turning classes, I find most facilities don't have enough spigot chucks for all the students. To make it possible for everyone to turn the various projects requiring such a chuck, I have students make one their own. It's easy to make, and the only cost involved—other than the wood—is the hose clamp (about $1 at most auto supply stores). This compares favorably with the purchased price of similar commercially made chucks, which can run as high as $125.

Making your spigot chuck requires the same tools and techniques as turning a lidded box, so it will provide a little practice before moving up to the box itself. You will need a lathe faceplate (the smaller the better), a few screws, a block of wood and the radiator hose clamp. Chances are you already have the lathe faceplate.

Start with a block of hard maple 3 1/2 in. x 3 1/2 in. x 3 1/2 in. (Step 1). Cut the corners off with a band saw to produce a rough cylinder 3 1/2 in. in diameter with the grain running end to end. Attach the block to your faceplate using no. 12 sheet metal screws about 1 1/4 in. long (Step 2). Drill pilot holes to prevent the screws from splitting the wood.

Mount the piece on the lathe and bring the tailstock with a live center up for extra support. Position the tool rest parallel to the workpiece and true the block using a roughing gouge. Use a square scraper to reduce the right end of the cylinder to 1 3/4 in. diameter approximately 1 in. long (Step 3). Remove the





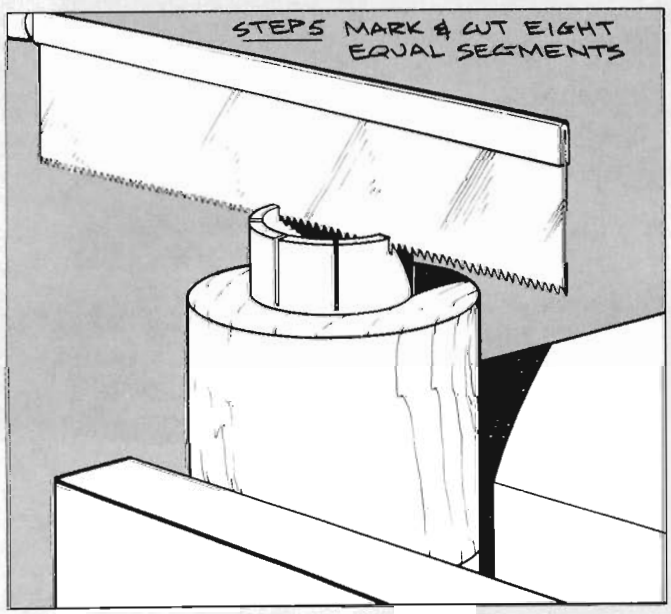
tailstock and reposition the tool rest in front of the blank at a right angle to the axis of the lathe. Use a 3/8 in. spindle gouge to true up the face of the blank with a light shearing cut.

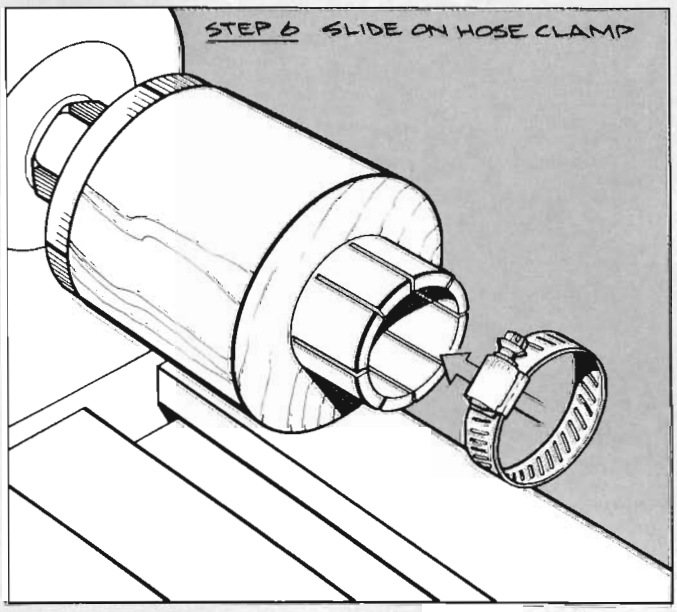
Next up is hollowing the center. Place the point of the spindle gouge at the center of the blank and push straight in to produce a hole 1 in. deep. Withdraw the tool and proceed to hollow the opening with the same gouge, making sure to leave the walls about 1/8 in. thick and parallel to the outside (Step 4). You may need to true it up with a scraper.

Remove the piece from the lathe and clamp it upright in a bench vise. Use dividers to mark eight equal segments on the top of the rim. With a backsaw, make a cut down each mark to the shoulder of your chuck, creating eight flexible fingers. Take care to keep the cuts straight up and down. Clean up the interior with 80-grit sandpaper. Slide on the hose clamp and your chuck is ready to use.

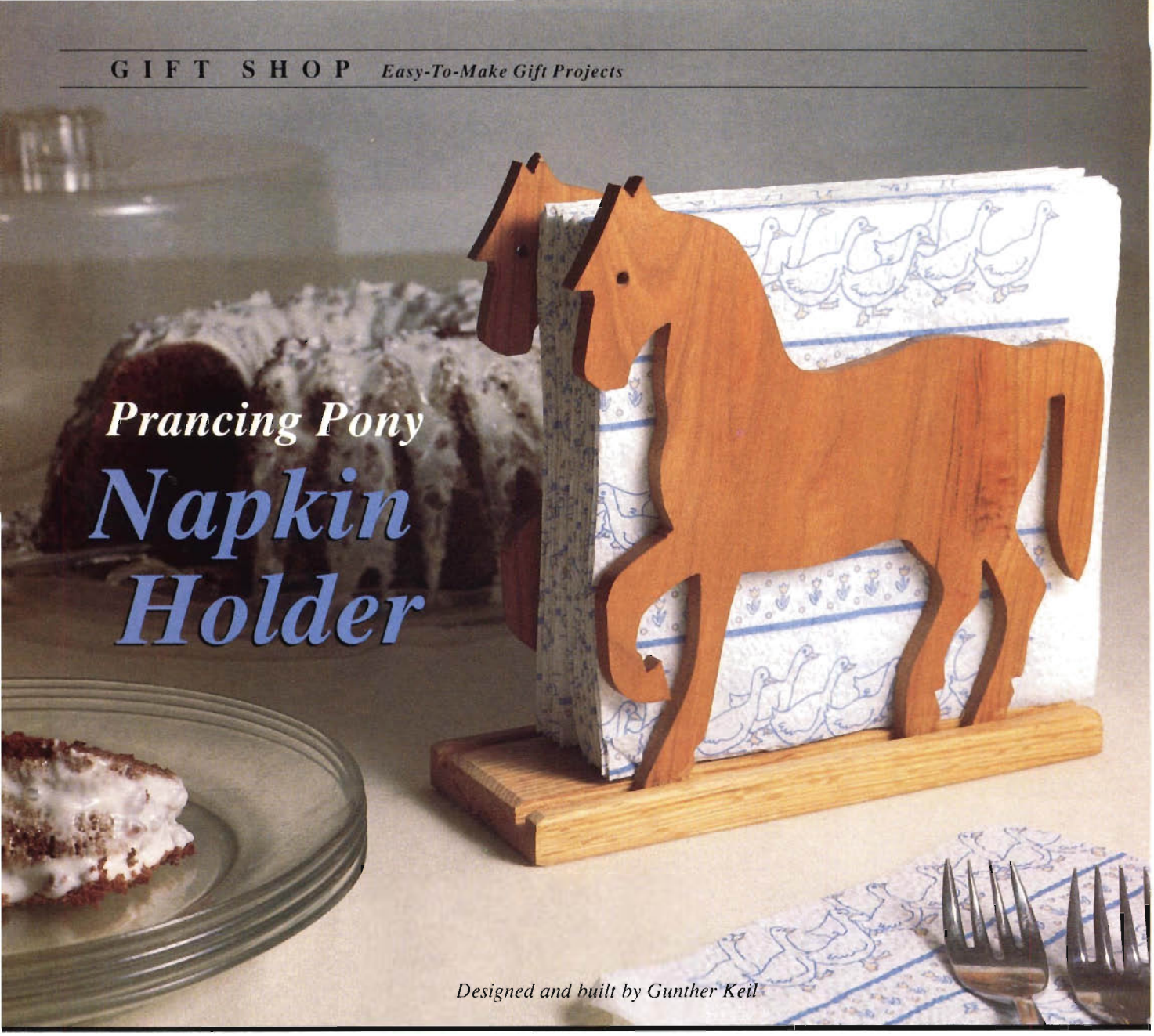
The tenons on your box blanks should be approximately 1/2 in. long and sized to accurately fit your chuck. If they are too large, you could break the flexible fingers; too small and you will not be able to grip the tenon and hold your stock for turning. Tighten the clamp and test the fit before turning. If you can still twist the blank in the chuck, remove it and rub chalk around the tenon. This should provide enough friction to keep it from spinning.

Cut the excess metal from the hose clamp and position it so it will not catch on anything. For added safety, once the box blank is mounted, you can wrap several layers of duct tape around the hose clamp to avoid catching your knuckles.





Prancing Pony Napkin Holder



Designed and built by Gunther Keil

A few hours in the workshop should be all that's needed to make this fanciful napkin holder. We've also found that it doubles nicely as a letter rack. It's a great project for scroll saw enthusiasts, although the band or saber saw can also be used. The horses are made from cherry, and the base is oak, but just about any combination of woods can be used.

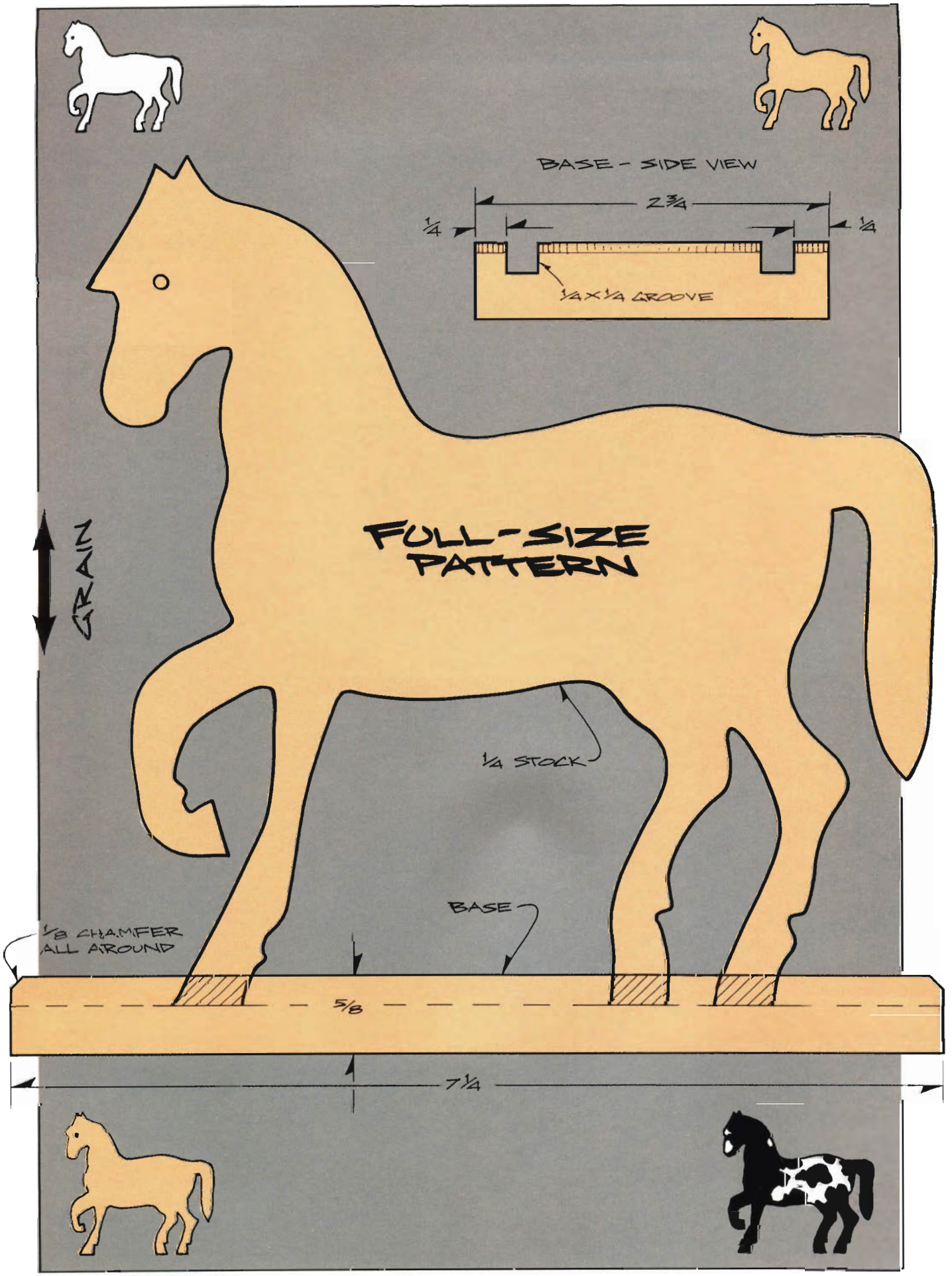
The two horses are made from 1/4 in. thick stock. If you don't have a thickness planer, check with your local lumberyard or millwork shop as they will often plane down thicker stock for a nominal charge. Usually, we can suggest resawing as another option, but in this case the 7 in. wide stock is a bit too wide for most band saws. However, you could resaw 3 1/2 in. wide stock, then edge-glue it to get the 7 in. width. And, of course, there is another method for thinning stock that cabinetmakers have used for generations — a few minutes work with a sharp hand plane.

You'll need enough 1/4 in. thick stock to yield two pieces, each one measuring at least 7 in. square. Transfer the full-size horse profile from the drawing to one of the pieces, then stack one piece upon the other using double-face tape to temporarily join them. Stacking the two pieces will enable you to cut both at the same time. For greatest strength, the grain direction on both pieces should run vertically (see illustration).

Now, bore the 1/8 in. diameter eye holes, then cut out the horse profile using the scroll saw, band saw, or saber saw. Once cut, use files, scrapers, and sandpaper to smooth the edges. Areas of short grain can easily break, so use care here. After the edges have been smoothed, you can separate the two pieces and remove the tape.

Cut the 5/8 in. thick base to 2 3/4 in. wide and 7 1/4 in. long. The chamfer can be added with a file or block plane. Use the table saw and rip fence to cut the two grooves as shown in the drawing. The grooves should be just wide enough to create a snug fit for the feet of each horse.

Glue the horses in the grooves as shown, then set aside to dry. Once dry, use a chisel to remove any glue squeeze-out before adding a clear finish. We used a penetrating oil, but a varnish or shellac will also work fine. WWJ


BASE - SIDE VIEW
2 3/4
1/4
1/4
1/4 X 1/4 GROOVE
FULL-SIZE PATTERN
GRAIN
1/4 STOCK
BASE
1/8 CHAMFER ALL AROUND
5/8
7 1/4

We're not sure what makes a great candidate for enshrinement in the whirligig hall of fame. But over the years we've seen just about every subject covered, from the sublime to the ridiculous. Suffice it to say that this fisherman whirligig stands in good company with the many other subjects whose stilted, predictable motion captivates passerby and maker alike.

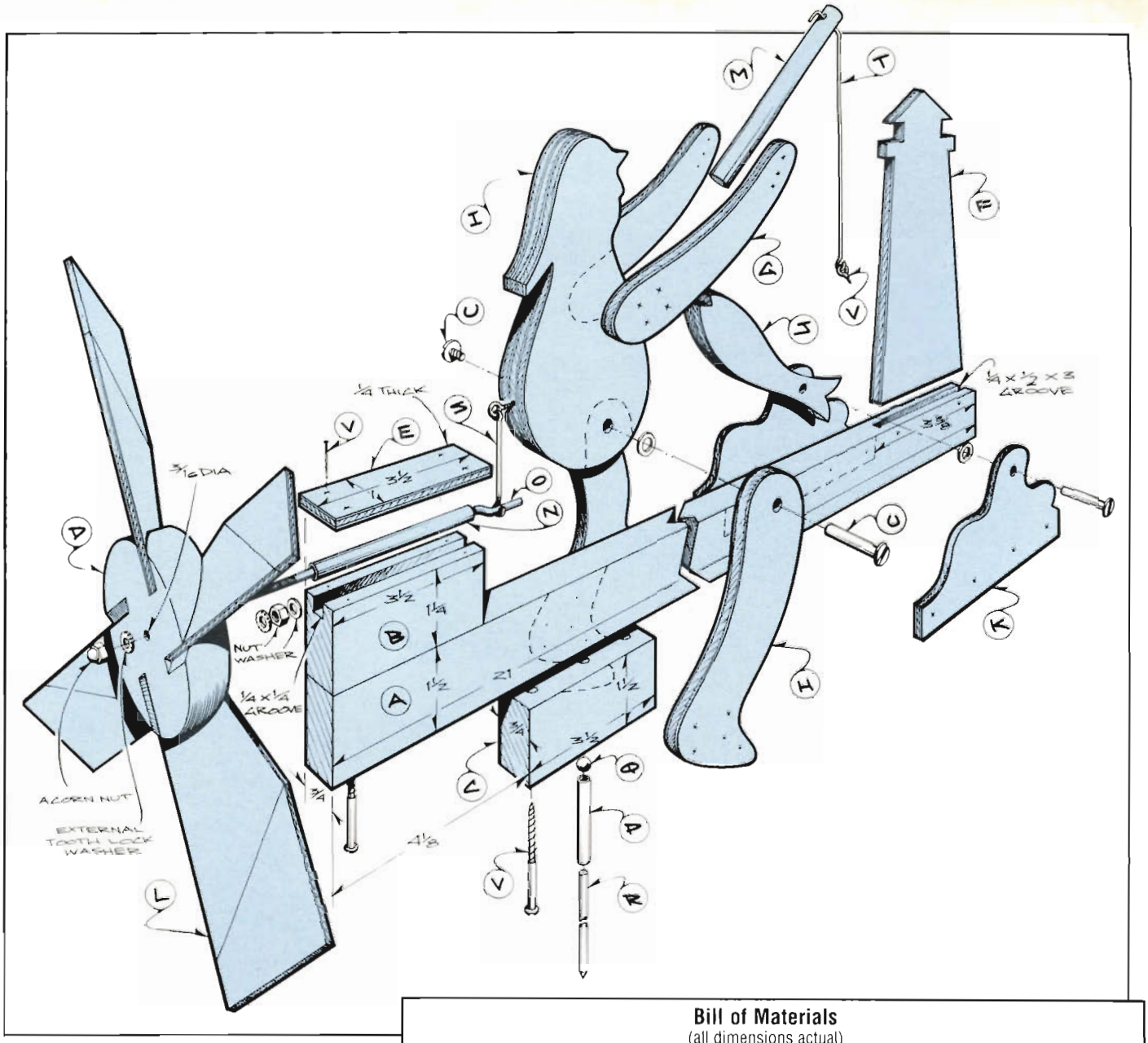
Perhaps part of the fascination with whirligigs is that they do a lot for a little. Given a few scraps of wood and the appropriate hardware parts, most anyone can put a whirligig together. To help make your job easier, we've arranged for Cherry Tree Toys to supply a kit that includes plywood blanks for all the plywood parts, plus all the hardware—right down to the screws and brads—that you'll need (see *Bill of Materials* for ordering information). The plywood is high-grade marine quality, which insures years of troublefree operation, even in the harshest weather. We recommend that you use a waterproof epoxy, available at most hardware stores, for the parts that are glued.

Start by cutting the base (A), shaft block (B), pivot block (C) and propeller hub (D) to size from 3/4 in. thick stock (cedar or redwood are best). Note that the base has a 1/4 in. wide by 1/2 in. deep by 3 in. long groove at the back for the lighthouse (F), while the shaft block has a 1/4 in. by 1/4 in. groove for the drive shaft sleeve (N). Also drill a 1/4 in. diameter hole through the pivot block for the pivot tube (P) and ball (Q).

Screw parts A, B and C together as shown, epoxy the drive shaft sleeve into the shaft block, and add the shaft cap (E). Insert the pivot ball into the pivot block hole, then epoxy the pivot tube in place. Now make the propeller hub. Start with a 2 1/2 in. square block, cut the grooves for the blades (see full-size pattern for correct angle), then cut the round shape and drill the 3/16 in. diameter drive shaft hole. A pre-cut propeller hub can also be purchased (see Bill of Materials for ordering information).

Now lay out the full-size patterns on the plywood stock. The lighthouse (F), arms (G) and legs (H) are 1/4 in. thick; the body (I) and fish (J) are 1/2 in. thick; the waves ((K) and propeller blades (L) are 5/32 in. thick. Drill the holes as shown through the legs, body, fish and waves for the post and screw (U), and drill through the fishing pole (M) for the long wire (T). The propeller hub and blades are assembled before painting.

All that's left is to paint the various parts as shown (see photo) and assemble the whirligig. Insert the drive shaft (O) through the sleeve, then mount a washer, nut, external tooth lock washer, followed



Bill of Materials
(all dimensions actual)

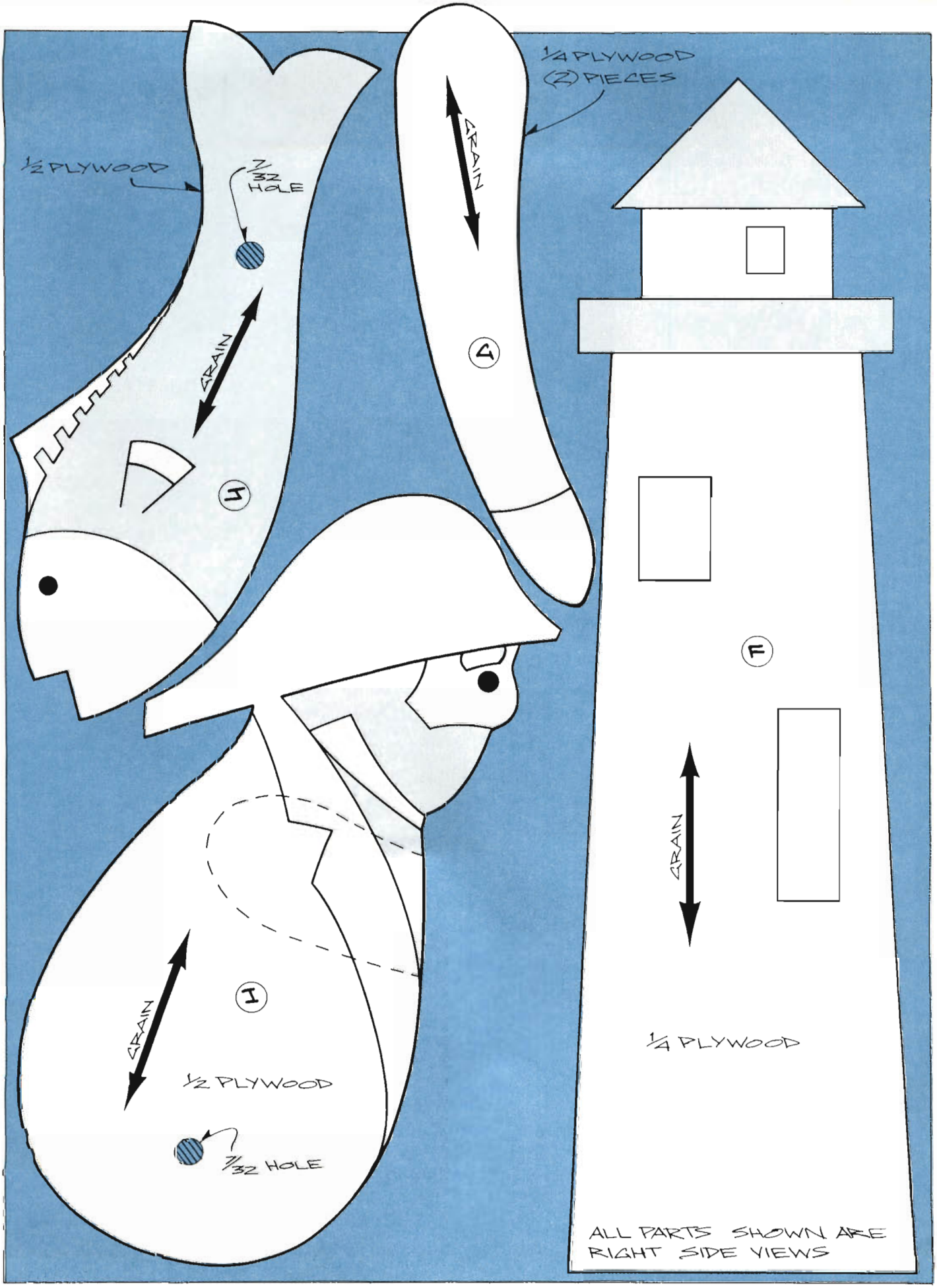
Part	Description	Size	No. Req'd.
A	Base	3/4 x 1 1/2 x 21	1
B	Shaft Block	3/4 x 1 1/4 x 3 1/2	1
C	Pivot Block	3/4 x 1 1/2 x 3 1/2	1
D	Propeller Hub	2 1/2 dia. x 3/4 thick*	1
E	Shaft Cap	1/4 x 1 x 3 1/2**	1
F	Lighthouse	See Full-size Pattern**	1
G	Arm	See Full-size Pattern**	2
H	Leg	See Full-size Pattern**	2
I	Body	See Full-size Pattern**	1
J	Fish	See Full-size Pattern**	1
K	Wave	See Full-size Pattern**	2
L	Propeller Blade	See Full-size Pattern**	4
M	Fishing Pole	1/2 dia. x 4 long**	1
N	Drive Shaft Sleeve	1/4 dia. x 3 3/4 long**	1
O	Drive Shaft	3/16 dia. x 6 long**	1
P	Pivot Tube	1/4 dia. x 1 1/2 long**	1
Q	Pivot Ball	1/4 dia.**	1
R	Pivot Nail	3/16 dia. x 5 long**	1
S	Short Wire	3 5/8 long**	1
T	Long Wire	7 1/8 long**	1
U	Post & Screw	1 1/8 long**	2
V	Misc. Hardware	Nuts/Washers/Screws/ Eyes/Brads**	As Req'd

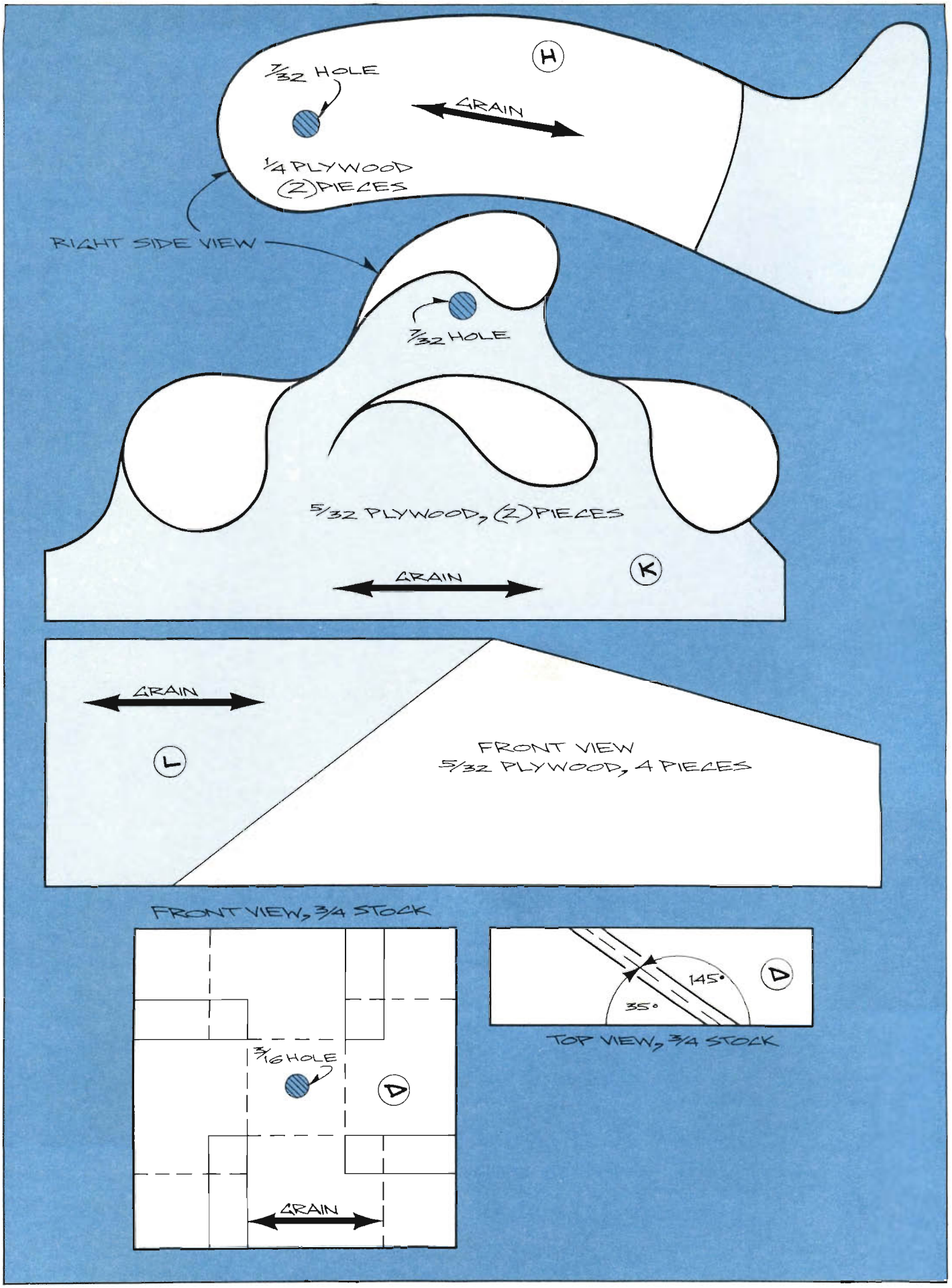
* This part (slotted to fit the 5/32 in. thick propeller blades) can be ordered pre-cut. Ask for part no. 930, cost is $1.80 (see below for source and address).

** These parts included in a parts kit available from Cherry Tree Toys, P.O. Box 369, Belmont, OH 43718; tel. (614) 484-4363. The kit (ask for part no. A-982-WWJ1, cost is $14.95 plus $3.95 shipping and handling) includes plywood blanks for parts E, F, G, H, I, J, K and L, the dowel for part M and a hardware package including parts N, O, P, Q, R, S, T, U and V. Note that the 3/4 in. thick parts (A, B, C and D) are not included in the kit, though a pre-cut propeller hub (D) can be ordered separately (see above).

by the propeller, a second external tooth lock washer and the acorn cap nut. All these hardware parts are included in the miscellaneous hardware (V). Locate the screw eyes in the fish's mouth and the fisherman's posterior, adjust the wire lengths as needed to get a smooth action as the propeller turns, and bend the ends of the short wire (S) and long wire to hold their positions.

To mount the whirligig, hammer the pivot nail (R) into the end of a post set into the ground, into a porch railing or into any sturdy wood surface. Then slide the pivot tube down over the nail. The flat end of the nail rides on the ball bearing, insuring the effortless turning of the whirligig to face the wind. A little machine oil on the ball and pivot nail should help prevent rust.


1/4 PLYWOOD
(2) PIECES
GRAIN
4
1/2 PLYWOOD
7/32 HOLE
GRAIN
H
F
GRAIN
I
GRAIN
1/2 PLYWOOD
7/32 HOLE
1/4 PLYWOOD
ALL PARTS SHOWN ARE
RIGHT SIDE VIEWS


3/32 HOLE
H
GRAIN
1/4 PLYWOOD
(2) PIECES
RIGHT SIDE VIEW
3/32 HOLE
5/32 PLYWOOD, (2) PIECES
GRAIN
K
GRAIN
L
FRONT VIEW
5/32 PLYWOOD, 4 PIECES
FRONT VIEW, 3/4 STOCK
3/16 HOLE
D
GRAIN
145°
35°
D
TOP VIEW, 3/4 STOCK

Horse & Cart Toy

This whimsical Horse and Cart, by Trumansburg, New York, woodworker Gunther Keil, is always a big hit with the little folk. It's a project you can easily complete in an afternoon, and best of all it doesn't require any special woodworking equipment. You'll probably find most of the wood needed for this project in your scrap bin.

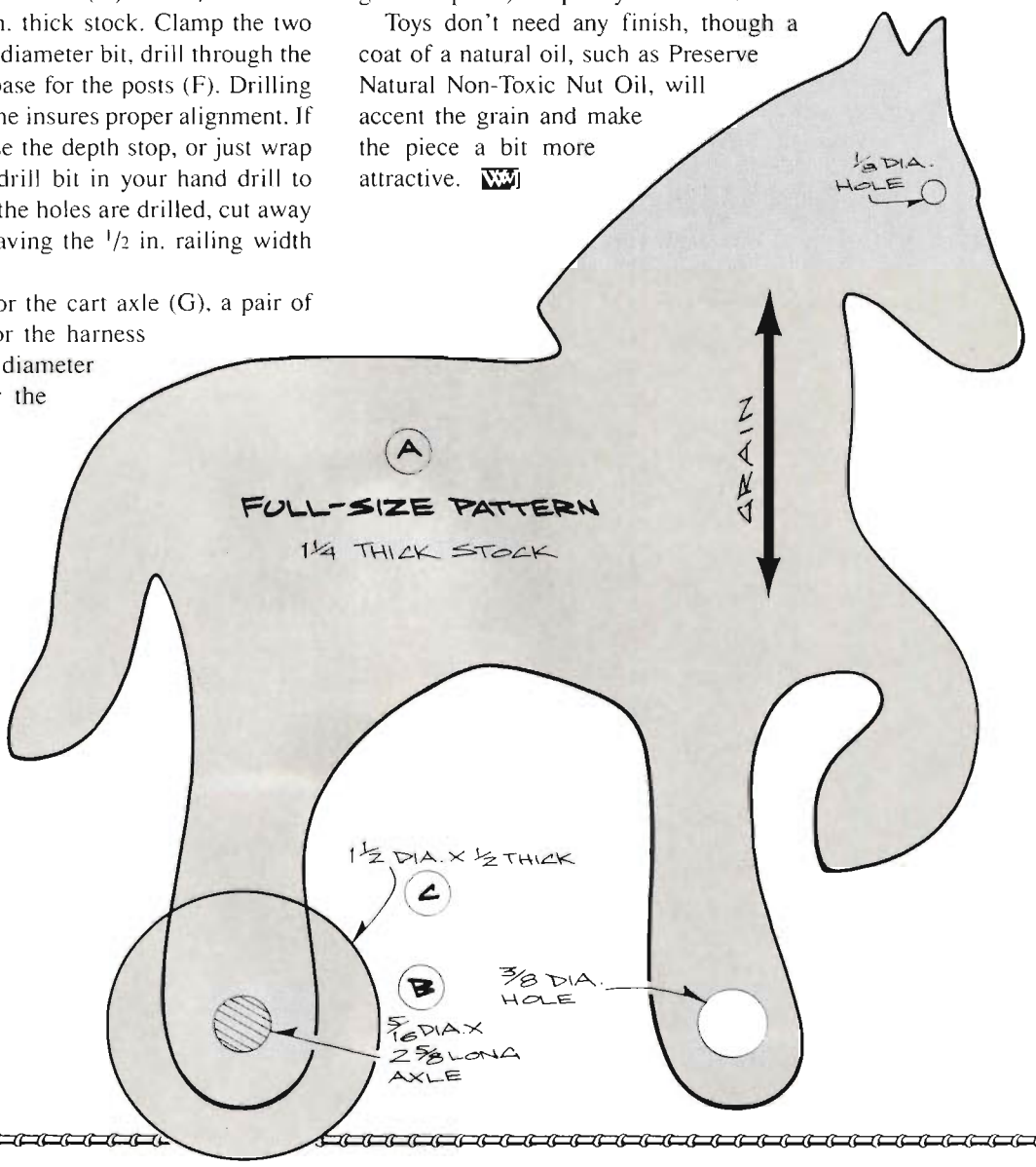
A good place to start is with the horse (A). Trace the shape from our full-size pattern directly to your stock, bore the two 3/8 in. diameter axle holes and the 1/8 in. diameter eye hole, then cut the profile. A band saw, scroll saw, or even a saber saw will make short work of cutting the profile. Use files and sandpaper to smooth any roughness. The horse axles (B) are just lengths of 5/16 in. diameter dowel stock, and the wheels (C) can be made by slicing off 1/2 in. thick sections of 1 1/2 in. diameter dowel rod or closet pole.

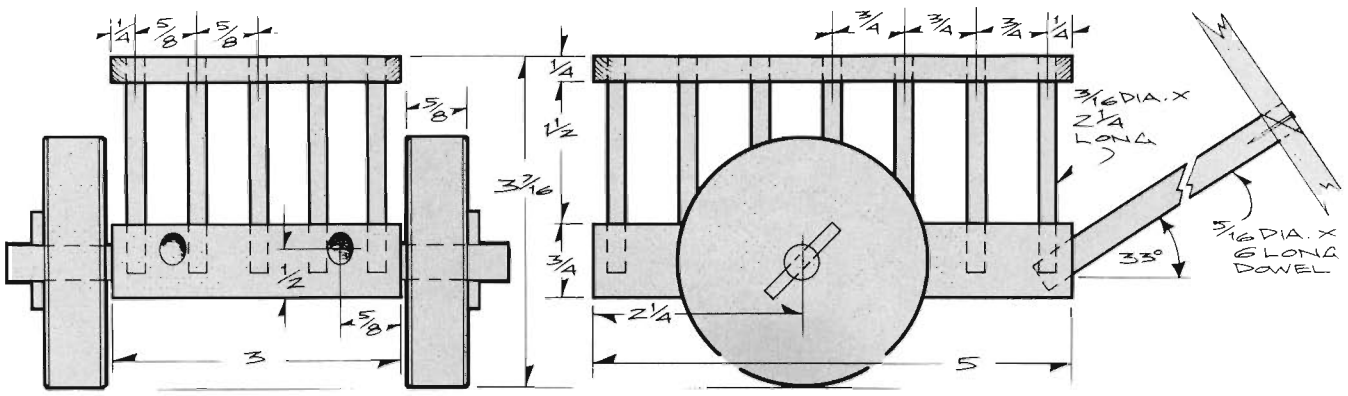
For the cart, start by cutting the base (D) from 3/4 in. thick stock, and railing (E) from 1/4 in. thick stock. Clamp the two parts together, and with a 3/16 in. diameter bit, drill through the railing and 1/2 in. deep into the base for the posts (F). Drilling through both parts at the same time insures proper alignment. If you have a drill press you can use the depth stop, or just wrap some masking tape around the drill bit in your hand drill to serve as a depth gauge. Once all the holes are drilled, cut away the center of the railing slab, leaving the 1/2 in. railing width shown in the exploded view.

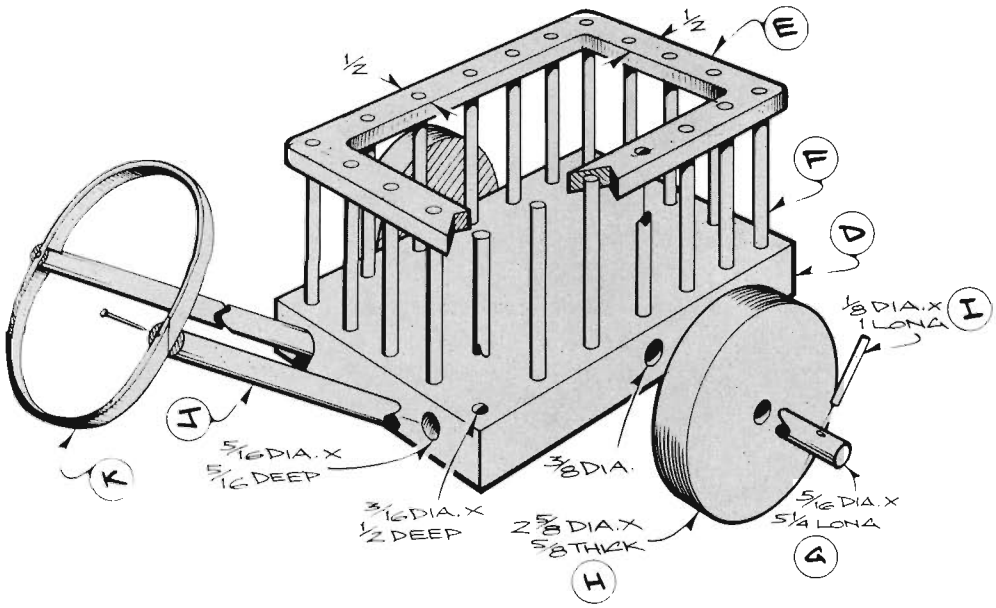
Drill a 3/8 in. diameter hole for the cart axle (G), a pair of angled 5/16 in. diameter holes for the harness poles (J), and a pair of 1/8 in. diameter holes through the cart axle for the locking pins (I). Also, slot the front ends of the harness poles to accept the harness (K), which is just a 7 in. length of leather thong. If you don't have some scrap leather available, a pair of leather boot laces will yield the harness thong. Scarf the ends of the thong, glue the ends together in one of the harness pole slots, then use a pair of brads to anchor the thong in the slots.

Glue the posts into the cart base, add the railing, sand any protruding post lengths flush, then glue the harness poles into the base. To make the large cart wheels (H), use a compass to scribe the 2 5/8 in. diameters, rough-cut to just outside the scribed line, then final sand to the line by mounting the wheels on a length of scrap dowel and rotating the wheels against a sandpaper surface, such as a disk sander, or a portable belt sander clamped upside down in the bench vise. The wheels are mounted and glued onto the cart axle, so the locking pins (also glued in place) are purely a decorative item.

Toys don't need any finish, though a coat of a natural oil, such as Preserve Natural Non-Toxic Nut Oil, will accent the grain and make the piece a bit more attractive.

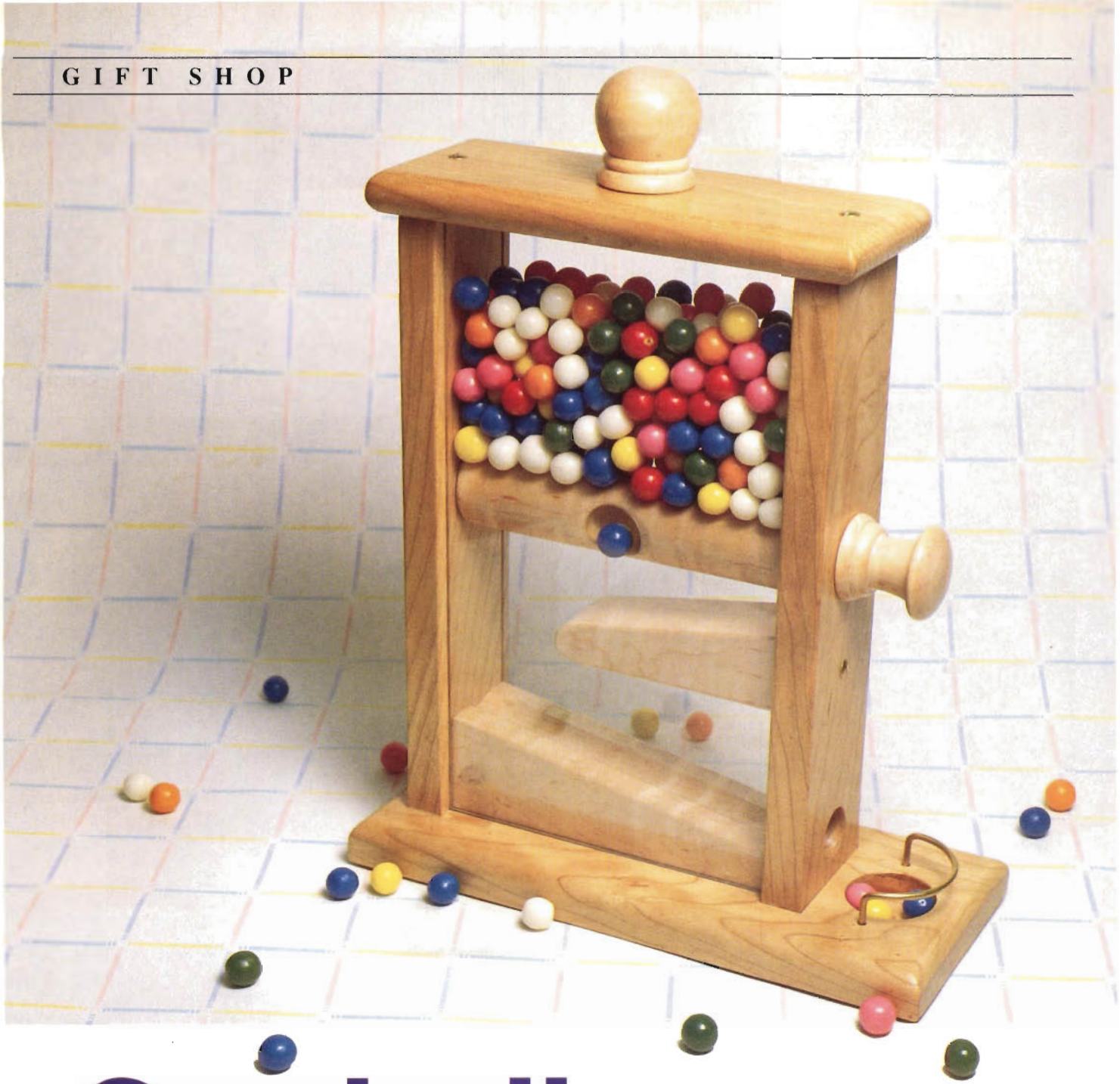






Bill of Materials
(all dimensions actual)

Part	Description	Size	No. Req'd.
A	Horse	See Full-size Pattern	1
B	Horse Axle	5/16 dia. x 2 5/8 long	2
C	Horse Wheel	1 1/2 dia. x 1/2 thick	4
D	Cart Base	3/4 x 3 x 5	1
E	Railing	1/4 x 3 x 5	1
F	Post	3/16 dia. x 2 1/4 long	20
G	Cart Axle	5/16 dia. x 5 1/4 long	1
H	Cart Wheel	2 5/8 dia. x 5/8 thick	2
I	Locking Pin	1/8 dia. x 1 long	2
J	Harness Pole	5/16 dia. x 6 long	2
K	Harness	7 in. leather thong	1



Gumball Machine

When Connecticut woodworker David Moretti first sent this handsome Gumball Machine along to us for consideration as a project, it was filled to the top with gumballs—and he generously included a spare bag of gumballs should we run out. But only a few days later we were out shopping for more. Somehow, no one here seemed able to resist the urge to give the knob a turn and watch as the gumball was captured in the cylinder hole, dropped from there to the wedge, bounced down and into the chute, and out to a waiting hand—and mouth. The continuing popularity of the gumball machine in *The Woodworker's Journal* offices insured that it wouldn't be long before we shared with you the plans for how to build it.

As woodworking plans go, this is one that invites creativity. To keep the plan simple, designer Moretti included just the simple wedge and chute along the gumball path, but don't hesitate to innovate. By making the gumball machine taller, you can install any number of chutes, wedges and other devices to give the gumball's pathway a true Rube Goldberg character. You can even drill through the Plexiglas sides (C) to mount spinners, bumpers and other gateways to

channel the obliging gumball on its way.

Before starting work on your gumball machine, obtain the Plexiglas that you'll use for the sides. Most building supply centers sell Plexiglas that's about 1/8 in. thick, but it's a good idea to check the Plexiglas thickness first.

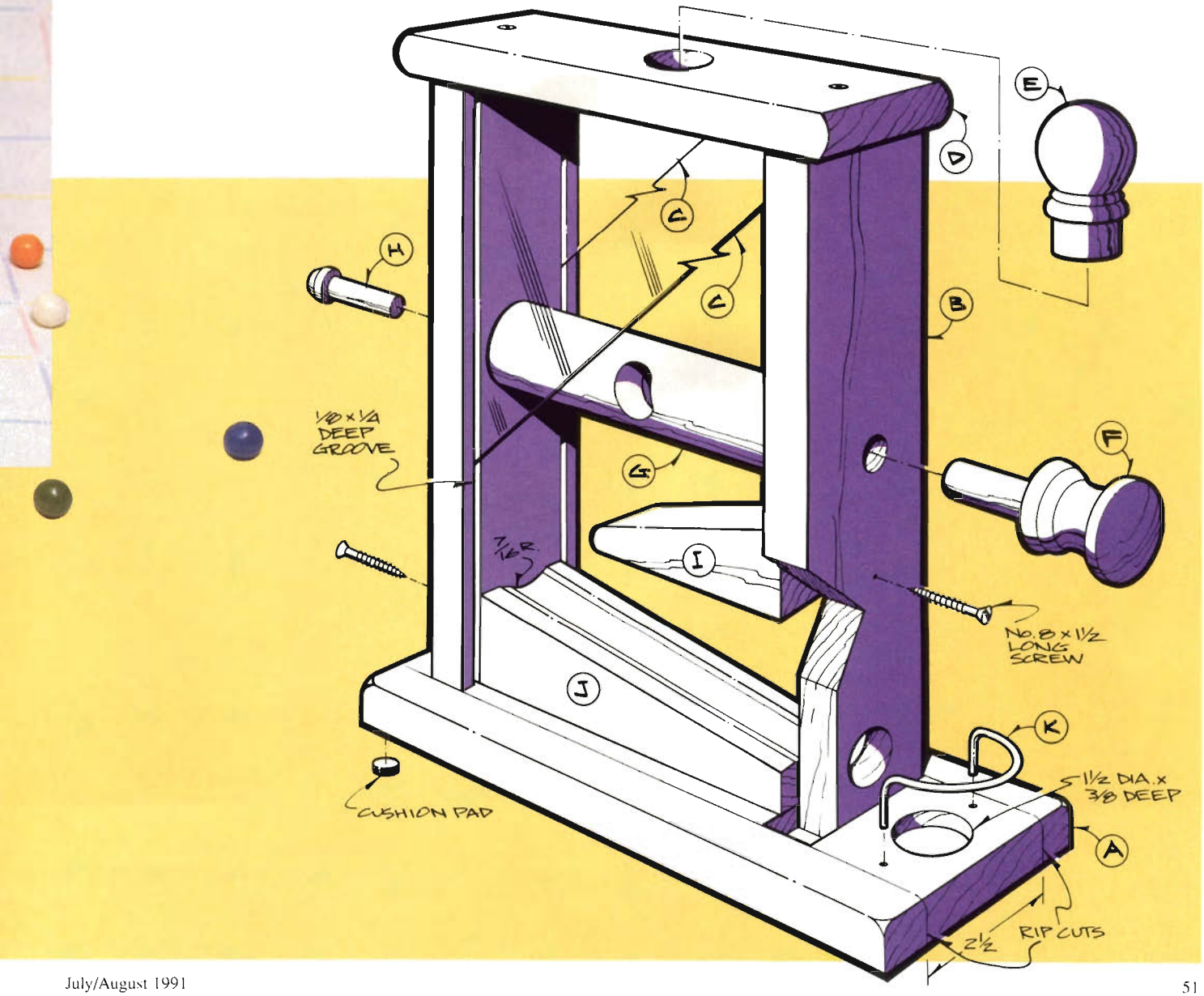
Since this project will likely be placed in some high-visibility location, such as the coffee table or the kitchen counter, it should look good. Cherry—used for the base (A), ends (B) and top (D)—has a nice tone and a pleasing grain. To lend the piece extra interest, curly maple is used for the filler plug (E), knob (F), cylinder (G), peg (H), wedge (I) and chute (J).

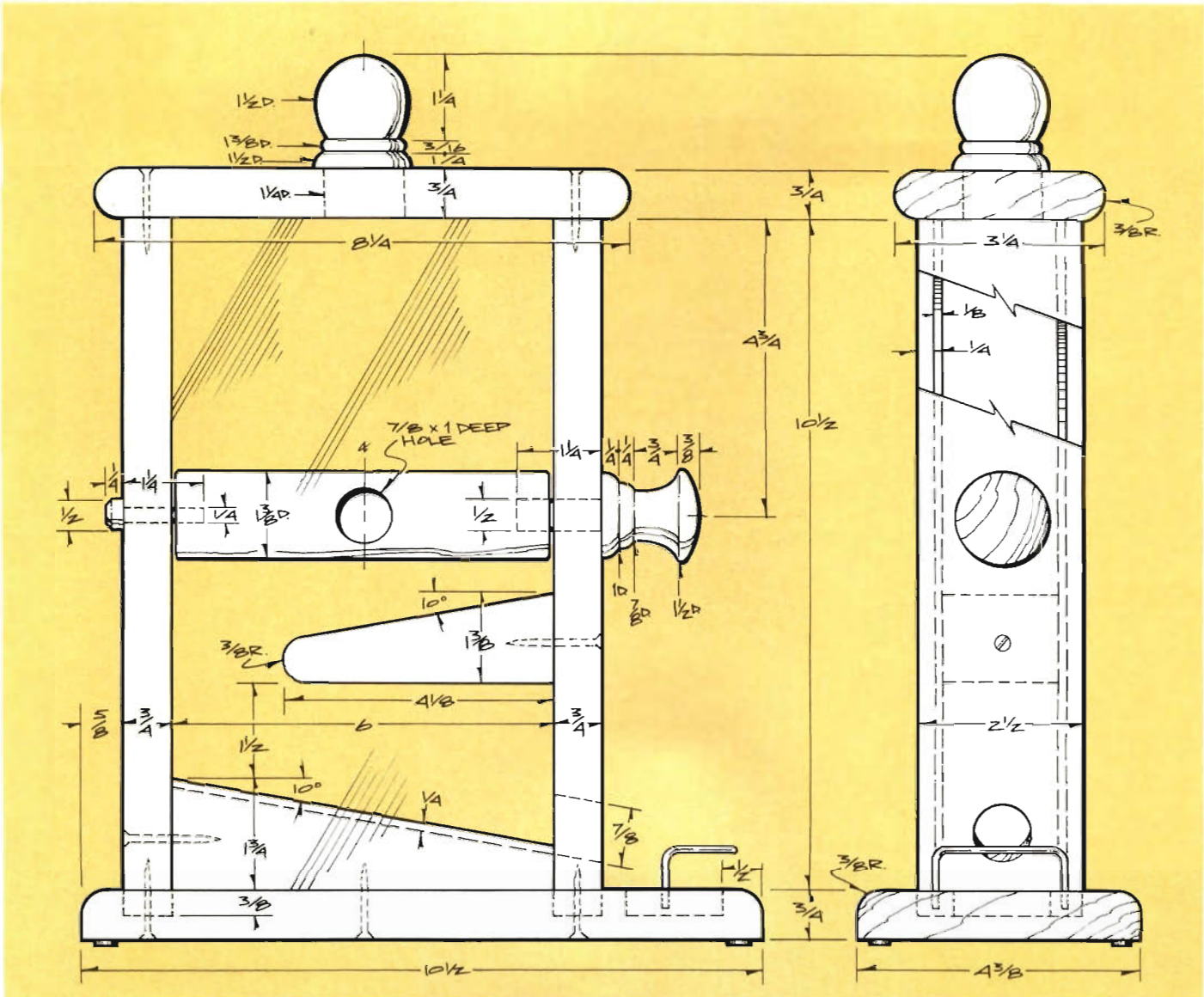
First up is making the base. As shown in the exploded view, we ripped and jointed the base stock to 2 1/2 in. wide, cut the 3/8 in. deep by 3/4 in. wide dadoes that house the bottom of the two ends, and then glued the two rippings back on. You'll need to start with a piece about 5 in. wide to allow for ripping and then jointing the edges. However, to simplify this project you can also just eliminate those steps, size the ends 3/8 in. shorter, and use a butt joint and screws—as is done with the joinery at the top. Use a 1 1/2 in. diameter Forstner bit to drill the 3/8 in. deep gumball well in the base.

With the base complete, now make the ends and the top. Use the table saw, with the blade set at a 1/4 in. height, to establish the grooves in the ends for the Plexiglas sides. Radius the edges of the top, then bore the 1 1/4 in. diameter filler plug hole in the top, and the 1/2 in. and 1/4 in. diameter holes in the respective ends for the knob and peg. But don't bore the angled gumball exit hole in the end yet—that isn't done until after a test assembly.

Now make the filler plug, knob, cylinder and peg. We show the plug, knob, cylinder and peg as lathe-turned, but the turning details on the plug and knob can be eliminated if you don't have a lathe. An axle peg (such as those used for toy construction) can easily substitute for the peg, and you can use closet pole (available at most building supply centers) for the cylinder. Drill a 7/8 in. diameter by 1 in. deep hole in the cylinder as shown to capture the gumballs. The 7/8 in. diameter hole will accommodate the largest gumballs we could find, and it also works fine for the more common smaller size gumballs.

Next make the wedge and the chute. Both parts show a 10-degree slope, but the chute includes a trough to guide the gumball to the exit hole. The trough is cut on the router table using a 7/8 in. diameter core-box bit, set for a 1/4 in.





deep cut. You'll probably need two passes to achieve the full 1/4 in. depth. Or, if you happen to number among your tools an old Stanley No. 100 1/2 hollowing plane (or one of the many reproductions now available), just make cutting the trough a hand-tool operation. The Stanley 100 1/2 hollowing plane featured a 7/8 in. cross-radius sole, so the trough radius will be greater, but the effect of the trough on the gumball will be the same—a swift and certain exit. A slight bevel—applied with a few quick strokes of the block plane—is recommended on either side of the trough to eliminate any flats that might capture the gumball in the corner where the side and chute meet.

And that brings us to the exit hole. To insure a trouble-free exit, it's best to test-assemble the gumball machine, mark for the exit hole and then drill it.

Bill of Materials
(all dimensions actual)

Part	Description	Size	No. Req'd.
A	Base	3/4 x 4 3/8 x 10 1/2*	1
B	End	3/4 x 2 1/2 x 10 7/8	2
C	Plexiglas Side	1/8 x 6 1/2 x 10 1/2	2
D	Top	3/4 x 3 1/4 x 8 1/4	1
E	Filler Plug	1 1/2 dia. x 2 7/16 long	1
F	Knob	1 1/2 dia. x 2 7/8 long	1
G	Cylinder	1 3/8 dia. x 5 15/16 long	1
H	Peg	1/2 dia. x 1 1/2 long	1
I	Wedge	1 3/8 x 1 3/4 x 4 1/8	1
J	Chute	1 3/4 x 1 3/4 x 6	1
K	Retainer Wire	1/8 dia. x 5 1/2 long	1

* Width dimension is after ripping and reassembly.

The hole should be drilled at the same 10-degree angle as the slope of the chute, to make for a smooth transition down the chute and out. Once the test assembly has been done and the hole drilled, all parts should be final finished. A food-safe penetrating oil, such as Behlen's Salad Bowl Finish, followed by a good buffing with 0000 steel wool, should bring up the grain nicely.

Final assemble the gumball machine, using glue where the knob and peg mate to the cylinder, and screws—but no glue—at all the other joints. Lastly, drill for the retainer wire (K), bend the wire as shown, and epoxy the ends in the holes. Brass wire can be used, if you have it, or just take the wire from a heavy coat hanger. Add a cushion pad foot at each of the four corners of the base so the gumball machine rests squarely and doesn't scratch whatever surface it's placed on. Gumballs, in case you wondered, are still available in department stores and pharmacies, such as CVS.

Working with Gel Stains

by Jim Barrett

Working with conventional pigmented wood stains can be tricky. Most of the ones I've tried over the years are watery solutions that require thorough mixing before use and frequent stirring during use to keep the pigment suspended in the solvent. When applied with a brush, they're prone to running, dripping and spattering. They're also hard to control. Achieving uniform color penetration without splotches or lap marks requires practice, especially on woods such as pine, fir, and maple, which have contrasting grain patterns of porous and nonporous wood. On such woods, you usually need to first apply some sort of clear sealer or wood conditioner to control penetration. Most liquid stains also require a waiting period between the time you brush them on and wipe them off. Because penetration times can vary depending on temperature, wood density, and other factors, you can never be quite sure what the final color will be, even if you follow the label instructions. And there's always an almost criminal waste factor—more stain seems to end up in your wiping cloths than on the wood. All in all, a messy, time-consuming process, involving a lot of experimentation.

If this sounds like the stain you're now using, it would be worth your while to take a closer look at gel stains (also called gelled stains, wiping stains or rubbing oil stains). I first encountered this type of stain—Behlen Master Gel Stain and Minwax WoodSheen Rubbing Oil Stain—when trying out the clear gel-type finishes from these companies for the finishing column, "Three Easy Finishes For Oak" in the January/February 1991 issue. A search of the market turned up four other brands: Bartley's Gel Finish, Formby's Hand-Rubbed Wiping Stain, Varathane X-3D, and Wood-Kote Gelled Wood Stain.

While working with these stains, I was quite impressed with their ease of application. Unlike liquid stains that must first be brushed on, then wiped off, these gelatinous stains are wiped—or more appropriately, rubbed—into the wood with a cloth, much as you would apply a penetrating oil or soft paste wax.

Because application is virtually mess-free (no drips or spatters), gel stains are perfect for staining such projects as built-in cabinets and other previously installed woodwork (or any situation where you want to keep the finish from staining the floor and adjacent surfaces). And due to their gel-like consistency, less stain is absorbed into the wood and into the applicator, so less material is wasted. According to the manufacturer's literature, gel stains give about twice the coverage of a conventional pigmented stain. I also found that the method of application provided much greater control over the amount of stain applied to the wood, hence greater control over the color intensity.

Besides ease of application, gels have several other advantages. High on my list is the fact that they're compatible with practically all solvent-based topcoats: penetrating oils, oil varnishes, lacquer, and polyurethane (allow 24 hours dry-time before applying any topcoat). Minwax WoodSheen is a one-step stain/finish and requires no topcoat, although one can

be used to provide additional protection or to change the surface sheen, if desired. As with all finishes, though, you should test compatibility on scrap wood first. All of the companies recommend suitable topcoats in their line for use over their stains.

While all gels discussed here are solvent-based finishes and require mineral spirits for cleanup, they have lower VOC (solvent) levels than most liquid solvent-based stains, so they're less volatile and a bit kinder on the environment. Gels are combustible, though, and should not be used or stored near open flames. You'll need to follow the same safety precautions as with other solvent-based finishes: provide adequate ventilation, avoid skin contact (wear gloves), and avoid prolonged breathing of vapors (wear an appropriate respirator if working in an enclosed area).

If Gels Are So Great, Why Aren't There More?

The six brands mentioned all have the above advantages, and then some. So, I was somewhat surprised that my search didn't turn up more companies offering gels. Several manufacturers and distributors that do carry them told me that the stains were "slow sellers." When I asked why, I got several answers—each related to the other. First, most companies that make pigmented stains are already set up to manufacture, distribute and promote their conventional liquid types, and are reluctant to expand their line or switch to gels for economic reasons. Some feel that the market would be limited to do-it-yourselfers and weekend warriors because the stains are limited to small or individual projects only. They point out—somewhat justifiably—that staining large areas, such as floors, with a wiping stain involves too much work. Also, with the exception of Wood-Kote and Varathane, gel stains aren't formulated for spraying, which is the preferred method used in mass-produced furniture (a sizable market for most stain manufacturers).

If we don't try out a new product once in a while, we may miss out on a better mousetrap.

The main reason cited, though, is customer resistance to new products, plain and simple. Because all stains on the market require slightly different application techniques and give different finished results, most woodworkers stick with the familiar, using one or two brands and colors that have worked well for them in the past. That is to say, we're creatures of habit. After learning how a particular stain performs on various types of wood with consistent, proven results, most of us are reluctant to experiment with the unknown or to learn new techniques, especially after investing a lot of time and material into a project. Go with what works. On the other hand, if we don't try out a new product once in a while, we may miss out on a better mousetrap. Gels may not be the best type of stain for all projects, but they're certainly worth a try.

Application Techniques—Easy!

While all of these brands are considered gels, the actual consistency varies between them—from that of a thick latex paint or hand lotion (Behlen Master Gel) to tooth paste (Formby's, Minwax) to a semi-solid consistency like cold cream or tub margarine (Bartley, Varathane, Wood-Kote).

The Behlen, Formby's and Minwax WoodSheen stains come in 8-ounce squeeze bottles only; the Bartley, Varathane and Wood-Kote stains come in cans, ranging in size from half-pint to 1 gallon. Because the latter three have the thickest consistency, they also help fill the pores of open-grained woods.

As mentioned, all can be rubbed into the finish with a cloth, although several manufacturers suggest other application techniques (see comments under Product Rundown).

Use one cloth to apply the stain in an overlapping circular motion; a second clean cloth to remove the excess, wiping first across the grain, then with it. I found that a foam-backed paint pad applicator works well for quickly applying an even coat of stain to large, flat surfaces, and for cutting into tight inside corners—much like you'd use a sponge mop to wax your floor. The Varathane and Wood-Kote stains can be thinned with mineral spirits for spray application.

With the Bartley, Behlen and Wood-Kote stains, excess stain can be wiped off immediately after application, so you can see the finished results as you work. The Formby's, Minwax and the Varathane stains require a waiting period of 2 to 10 minutes for complete penetration.

To intensify the color, all you need do is apply additional coats, allowing several hours dry-time between each (check label instructions for specifics). With all the stains, I noticed that excess stain could be left on the wood surface for 15 to 20 minutes with no appreciable deepening of color, which virtually eliminates the possibility of lap marks.

Although penetration is much easier to control than with liquid stains, you may need to first apply a commercial stain controller (wood conditioner or grain tamer), or light sealer coat of shellac or tung oil to woods such as pine or fir, to ensure even coloring. Minwax recommends their Wood Conditioner for this purpose. While the manufacturers of the Wood-Kote and Varathane products claim that no stain controller is needed for their gels, I'd suggest testing out the stains on a scrap of the wood you're staining to make sure. Because the grain characteristics vary widely between individual pieces of stock, I wouldn't feel comfortable making a blanket statement that you will or won't need to use a stain controller on a particular species, such as pine or fir.

Performance Results

All manufacturers agree that gel stains provide much greater control over color penetration than other types, but I wanted to find out for myself. I also wanted to see how they measured up on several other important counts: Would the colors be clear and bright, or muddy-looking like some other pigmented stains? Were the wood tones realistic-looking? Would they be

able to tame woods with contrasty grain without hiding the grain altogether?

I decided to try out the stains on some especially hard-to-stain woods: pine, maple and fir plywood. For the most part, the colors were clear and allowed the natural grain pattern to show through on the fir and maple samples. Additional coats intensified the color without turning muddy. While gels don't offer the clarity of an aniline dye, they're not as muddy as many of the liquid pigmented stains I've used over the years.

Some of the darker colors I tried did tend to be a bit splotchy on the pine samples, but I was able to even out the color by adding more stain to the denser grain and, in extreme cases, removing stain from the softer grain with a rag dipped in mineral spirits. With all the stains, I found that I could play around, making the color as dark or light as I wanted in different areas until the stains started setting up (about 15 minutes after application). I was also able to make the end grain match the face grain on the woods I tried by applying just a small amount of stain into the end grain and rubbing it in thoroughly, then applying a heavier coat to the face grain and not wiping it off so vigorously (leaving more stain on the surface until dry). As you might already know, a liquid stain would be wicked up into the end grain immediately, with the irreversible results being a much darker shade than the face grain. In this respect, any of the gels beat liquid pigmented stains hands-down.

Because you can see the final color of these stains as soon as you apply them, start by applying just a tiny bit of stain to the wood, then rubbing it in well. Then, keep rubbing more in until the wood reaches the desired color intensity. After awhile, you'll get a feel for how much stain to apply and how much excess to wipe off.

Colors

While you won't find as broad a color selection in gels as you would in conventional pigmented stains, the choice is still respectable. Within each brand, you can mix their standard colors in various proportions to come up with colors of your own. The Varathane and Wood-Kote stains can be mixed with universal tinting colors (available at paint stores) to provide an infinite selection of colors.

Bear in mind that, like other stains, wood tone colors will vary between brands; that is, one manufacturer's maple, walnut, or mahogany stain won't be the same color as another's. For example, the Behlen Master Gel mahogany is a dark purplish color; Formby's mahogany is a light reddish brown—the two don't even come close in appearance. So, it would be smart to look at actual color swatches before you buy the product.

Product Rundown

Bartley Gel Finishes

Bartley Gel Finishes come in 12 woodtone colors, ten accent colors, and clear. Although the stains dry to the touch in five minutes or so, you should wait six hours between coats and before applying their clear finish or other topcoat.

Something New: Water-Based Gel Stains

Just about the time I thought I had this article wrapped up, WWJ associate editor Dave Peters called to tell me about a newly introduced line of water-based gel stains under the Hallmark Home Decor label from Delta Technical Finishes. Fortunately, I was able to get some samples in for testing and report on them before the article went to press.

These nontoxic, environmentally safe, water-based stains come in eight woodtone colors (wood stain gel), six pastel colors (pickling gel) four "antiquing" glazes, and a neutral acrylic varnish gel that can be tinted with opaque acrylic craft paints (available at art supply stores). The antiquing gels can be applied over the other stains or a solid color base coat (available in six colors) to produce an antique effect. Hallmark Home Decor stains come in 2 ounce squeeze bottles, pint cans and quart cans.

These stains have a consistency much like toothpaste. They are applied with a brush or rag, then wiped with a clean cloth while still wet. If you want a deeper color, repeat the procedure.

While the manufacturer recommends using a clear water-based acrylic topcoat over these stains as part of a complete non-toxic finishing system, the stains are also compatible with most solvent-based clear finishes. When using the stains I noticed that they dry more quickly than solvent-based gel stains, but I had no problem with grain-raising or lap marks. However, it's best to first test, since grain-raising is often a problem with water-based stains. The finishes dry in 15–20 minutes, after which time you can apply a topcoat.

For more information write to:

Hallmark Home Decor Gel Stains and Finishes
Delta Technical Coatings, Inc.
2550 Pellissier Place
Whittier, CA 90601
1-800-423-4135

The stains were easy to apply, especially on vertical surfaces, and produced clear, natural-looking colors. After applying the stain you can wipe it off immediately. The thick consistency helps fill the grain of open-pored woods, although Bartley also offers paste wood fillers. Bartley stains have a higher percentage of polyurethane than the others, so the stain itself offers some protection against water and alcohol (the manufacturer recommends applying six coats of stain and/or clear finish to provide 48-hour water and alcohol resistance). Prices are $5.95 half-pint; $14.95 quart; $39.95 gallon.

Behlen Master Gel

Behlen combines pigment-type stains and penetrating dye stains to enhance the grain pattern while providing a rich, even color. While not quite as thick as the other stains I tried, the Behlen stains were easy to apply and provided uniform penetration. Excess stain can be wiped off immediately; additional coats can be applied after one hour. The manufacturer recommends a 4-hour dry-time before applying a topcoat of their clear gel finish; 24 hours dry time for other solvent-based topcoats.

The stains come in six woodtone colors plus pickling white,

and they're packaged in 8 ounce squeeze bottles with handy flip-up spouts ($5–7). The clear gel finish comes in a 12 ounce squeeze bottle ($6–8), both products are sold primarily through catalogs such as Garrett Wade, Woodcraft Supply and Constantine's.

Formby's Hand Rubbed Wiping Stain

Formby offers their easy-to-use wiping stain in ten woodtone colors, four of which are different shades of walnut. The colors can be intermixed to produce additional shades. The stains performed as well as the others, with natural-looking colors; not too bright, not too muddy. Formby recommends using one of their steel wood finishing pads, or fine steel wool for application. The steel finishing pads work well, as does a soft cloth. But, I would caution against using ordinary steel wool—such as that sold in most hardware stores—because it breaks down quickly, leaving bits of wool stuck to the finish.

Allow several minutes penetration before wiping off excess. Additional coats can be applied immediately to darken the color. Wait 24 hours before applying the topcoat; longer if staining exceptionally hard woods such as birch or maple. Available in 8-ounce squeeze bottles for about $3.50 to $4 where Formby's products are sold.

Minwax WoodSheen Rubbing Oil Stain & Finish

This unique one-step product is a combination sealer/stain/finish that contains, among other things, Danish oil and polyurethane. If you want to finish a piece quickly without too much fuss and bother, this is the one to go with.

The label instructions recommend a minimum of two coats, waiting two hours between each. Two coats produce an attractive low-luster satin finish.

Additional coats increase both color intensity and sheen. If you want additional protection without deepening the color, you can apply one or two coats of the stain/finish, followed by several coats of WoodSheen's Natural (clear) finish. However, you can never attain a high gloss, no matter how many coats you apply.

In addition to seven woodtone colors and clear, WoodSheen comes in six "frosted" pastel colors, popular with contemporary Southwestern furniture. Comes in 8-ounce squeeze bottles for about $5.

Varathane X-3D Wood Stain

These stains are offered in nine woodtone colors plus natural (clear), in half-pint, pint, quart and gallon cans. All colors can be mixed or tinted with universal colorants to provide an infinite range of colors. Their heavy, paste-like consistency provides good pore-filling properties, but a paste wood filler may be required on open grained woods such as oak or mahogany.

Apply the stain with a cloth or a brush; after waiting two to five minutes, wipe off the excess across the grain to ensure that the pores are completely filled with stain, then wipe lightly with the grain. Dry-time between coats is 6–8 hours; wait at least 24 hours before applying the topcoat of your choice. Suggested list prices are: half-pint $4.40; pint $6.92; quart $10.38; gallon $28.34.

Wood-Kote Gelled Wood Stain

Wood-Kote gel stains have been on the market for over 20 years, and are still the most versatile of the gel products. Stains are available in 21 colors, including white and seven pastel Southwestern colors. All can be modified with universal tinting colorants.

Like the Varathane stains, Wood-Kote has a paste-like consistency, and can be applied with a cloth or brush. It is commonly available in quarter-pint, half-pint, pint, quart and gallon cans (for you production woodworkers, it's also

Source List:

Bartley Gel Finishes
The Bartley Collection
3 Airpark Drive
Easton, MD 21601
1-800-Bartley

Behlen Master Gel
H. Behlen & Bro.
Rt. 30 N
Amsterdam, NY 12010
(518) 843-1380

Formby's Wiping Stain
Thompson & Formby, Inc.
825 Crossover Lane
Memphis, TN 38117
1-800-443-WOOD

Minwax WoodSheen
Minwax Company, Inc.
102 Chestnut Ridge Plaza
Montvale, NJ 07645
(201) 391-0253

Varathane X-3D Wood Stain
Flecto Co.
1000 45th St.
Oakland, CA 94608
(716) 873-6000

Wood-Kote Gelled Wood Stain
Wood-Kote Products Co., Inc.
8000 NE 14th Place
Portland, OR 97211
1-800-843-7666

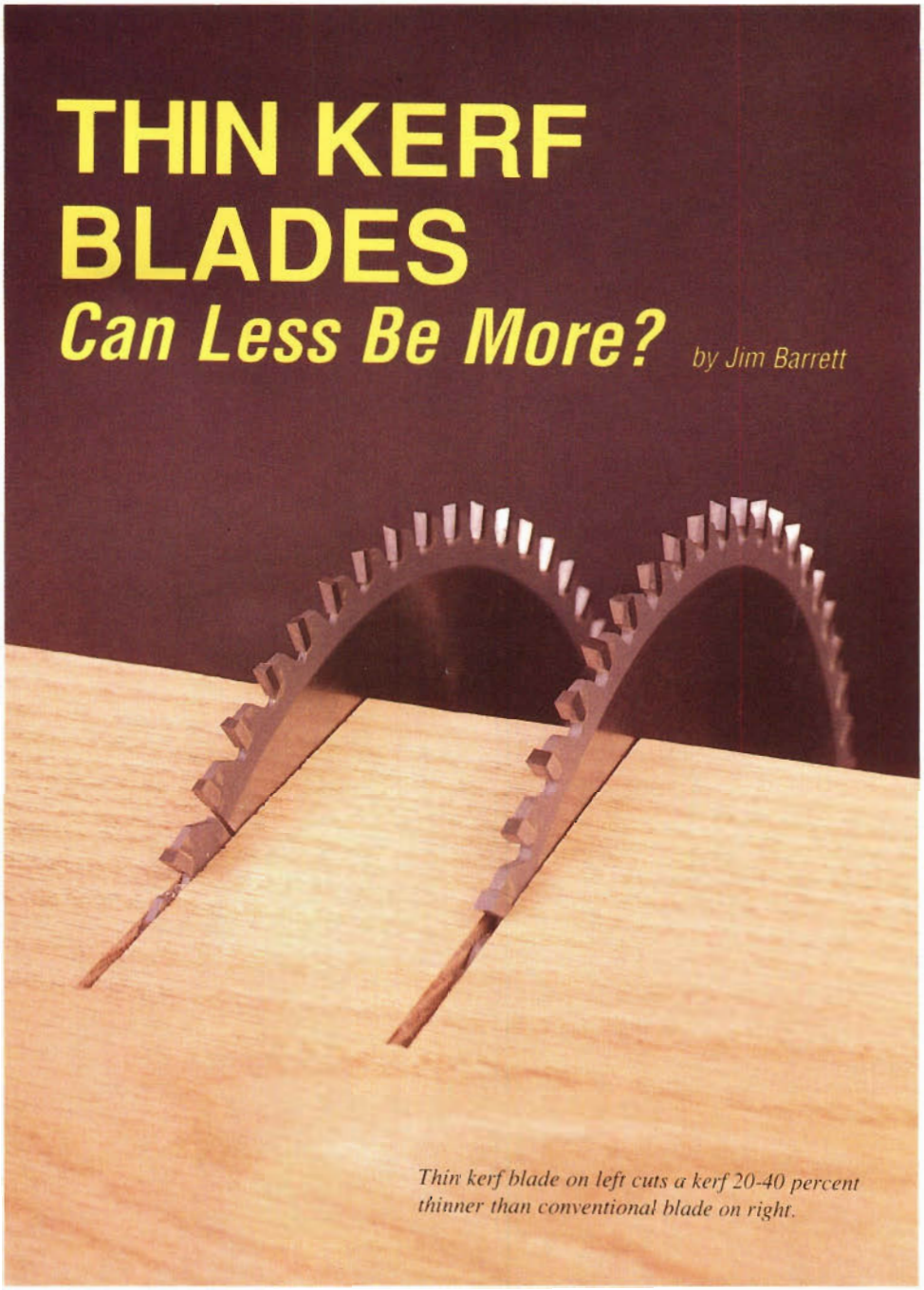
available in 5-gallon cans and 55-gallon drums). Prices range from $2.50 for a quarter-pint to $31.25 for a gallon. The stains can be thinned up to 50 per cent for spraying; 15–20 percent is recommended for most spray applications. Company representative Walt Thoulion says that Wood-Kote gel stains are big sellers in the prefab door and window industry because they also work on metals, composite and synthetic materials, such as fiberglass, vinyl, and polystyrene, which are commonly used in entry door systems and window frames. He also notes that the stain is easily applied with a brush or other applicator to large areas, such as floors.

In my tests, Wood-Kote worked a bit better than the others on porous woods such as pine, and on end grain. Excess stain can be wiped off immediately after application, and the dry-time is only 2–4 hours (before applying a topcoat). Suggested list prices are: half-pint $4.85; pint $6.99; quart $10.50; gallon $36.79. Now, if the prices of these and the other gel stains seem a bit steep, remember that gels give at least twice the coverage of conventional liquid stains. For instance, typical coverage for a half-pint of Wood-Kote is 80–90 square feet, as opposed to 30–50 square feet for a liquid stain. WWJ

THIN KERF BLADES

Can Less Be More?

by Jim Barrett



Thin kerf blade on left cuts a kerf 20-40 percent thinner than conventional blade on right.

It's common knowledge that carbide-tipped circular saw blades stay sharp much longer than traditional steel-toothed blades. And, they can cut materials that steel blades won't. But, as most woodworkers quickly learn, conventional carbide blades cut a wider kerf than many steel blades. This means that they remove more material and thus require more power to run, which is bad news for those of us with small or underpowered saws. Conventional carbide blades bog down such saws, wearing out saw bearings and burning up motors, not to mention making the stock harder to feed through the blade. I became painfully aware of this when I replaced the steel blade that came with my Ryobi benchtop table saw with a conventional carbide blade.

Now, the good news: Most saw blade manufacturers have since addressed this problem by adding thin kerf carbide blades to their line. The difference in performance is readily noticeable on low-power consumer saws and benchtop saws such as mine. And thin kerf is almost a must if you own a benchtop power miter saw or chopsaw.

Today, there's a larger selection of thin kerf blades than ever before. And they're available in a variety of tooth styles and price ranges to fit every pocketbook. In this article, I've focused on 10 in. blades, such as those used for home-shop table saws, power miter saws, and radial-arm saws. I called in a sampling from various manufacturers and tried them out on my Ryobi saw.

How Thin Is Thin?

There is no industry-wide definition of how thin a blade must be to be considered thin kerf. Most manufacturers state that their thin blades cut a kerf about 20 percent to 40 percent thinner than conventional blades in their line, but the actual width varies from one manufacturer to the next. In their specifications, the companies usually list tooth width in thousandths of an inch. If both the blade and the saw it's mounted in run fairly true (no runout), the blade will cut a kerf about *.001 in. to .003 in. wider than* the tooth width (acceptable "runout" tolerances in the industry).

Conventional 10 in. blades cut kerfs from about .115 in. to .145 in. wide, depending on tooth design (rip blades usually cut a wider kerf than crosscut blades). The "thin kerf" blades from various manufacturers ranged from about .085 in. to .102 in. (see chart). Several manufacturers I spoke with mentioned that they've thinned down most or all of the blades in their line—not quite thin kerf, but not as thick as conventional blades. For example, Black & Decker's 10 in. Piranha blades have a kerf of about .100 in. to .105 in.; all Nicholson 10 in. carbide blades cut a .100 in. kerf. These blades were not included in this feature, though, since they are not marketed as thin kerf.

Pros and Cons of Thin Kerf

While the primary reason for going thin was to accommodate lower horsepower saws, manufacturers often point out in

their advertising that thin kerf blades also save material, run quieter, and chip less. In most cutting chores performed by the home woodworkers or small cabinet shop, the amount of material saved is insignificant; certainly not justification in itself for switching. But there are several exceptions: In a high-volume production setup, the tiny bit of material saved on each cut can add up to big savings; also a thin kerf blade can sometimes yield an extra usable piece or two, such as when ripping many thin strips or cutting small pieces from an expensive hardwood or veneered plywood.

Other than saving material, there's little reason to equip a large (2–5 hp) saw with a thin kerf blade. Granted, the blade will make it easier to pass material through a large saw, and lower the saw's amperage draw, shaving a few cents off each monthly electricity bill. But thin-kerf blades do have some limitations: First, their thinner plates (bodies) tend to deflect, especially when used to cut hard or thick materials, or when you feed the stock too quickly. This deflection can result in rough cuts and wider kerfs, resulting in overheating or even permanent warping of the blade.

Besides using a thinner plate, manufacturers also reduce the side clearance between the top of the tooth and the plate in order to achieve a thinner kerf. But any deflection of the blade, or runout on the saw (due to worn bearings or misadjustment) can cause the plate to rub in the cut, burning the wood and overheating the blade. Therefore, thin kerf blades are much less forgiving on a worn or poorly adjusted saw. Also, the teeth on thin kerf blades are usually smaller than on conventional carbide blades, and thus will take fewer sharpenings and are more prone to damage.

Because of the above factors, thin kerf blades must be manufactured to much tighter tolerances than their standard-kerf counterparts; this extra care involved costs money. So you won't necessarily pay less for a thin kerf blade than you would for a conventional blade of comparable quality, even if less steel and carbide are used to make it.

Choosing a Blade

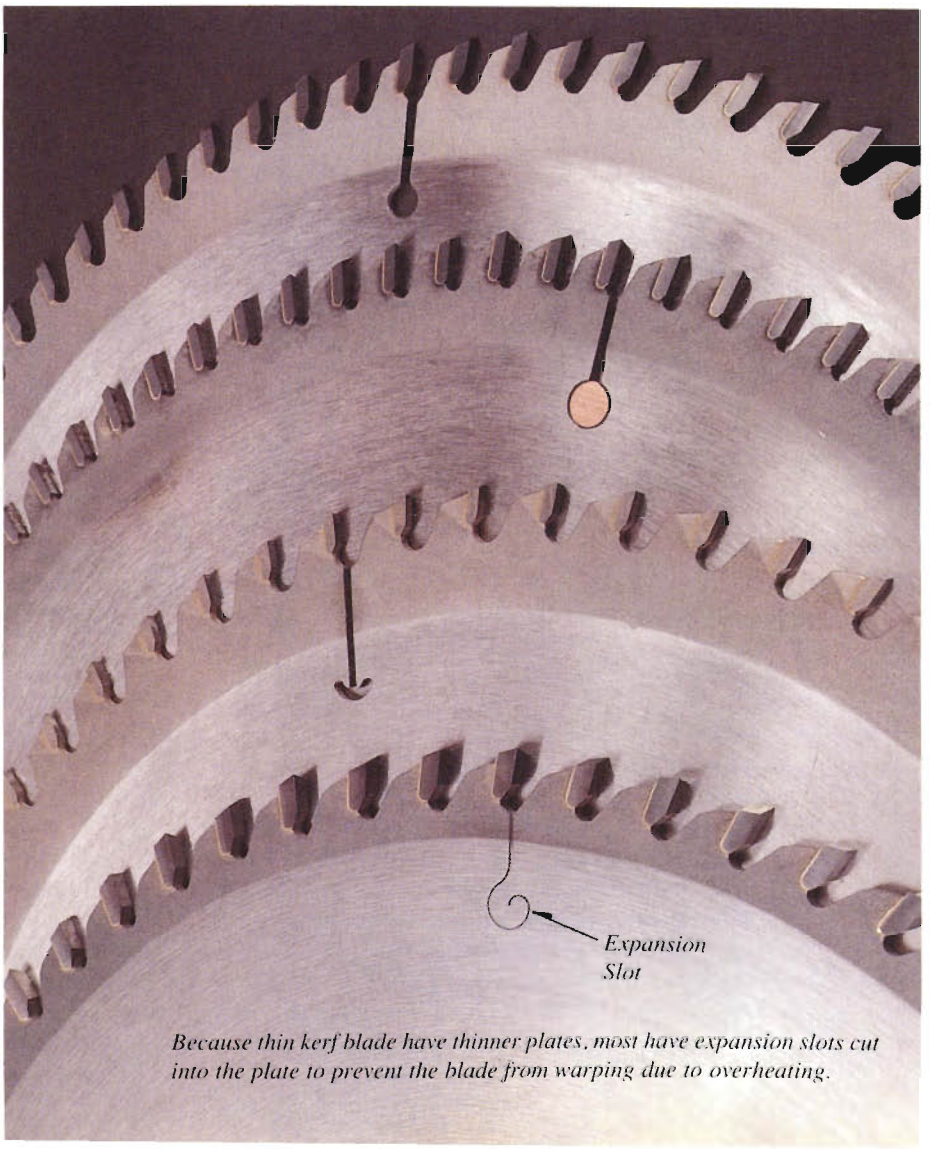
Despite the shortcomings just mentioned, today's thin kerf blades are much more durable than those of just a few years ago. Manufacturers are using new steel formulas that make the plates harder so they deflect less, yet at the same time more resilient, so they're less likely to become permanently warped when they do deflect. These and other technological advances such as laser-cut plates and expansion slots, improved fine-grain carbide formulas, Teflon coatings, and other design features, have increased performance considerably.

Generally, more expensive blades of any given type will cut smoother and last longer. This is simply due to the quality of materials and workmanship that goes into them.

Better blades usually have expansion slots cut into them to help prevent distortion due to overheating (see Photo).

Blade Styles

Other than choosing the best blade you can afford, you'll also need to choose the correct blade or blades for the application. The important elements to consider are tooth design, number of teeth, and carbide hardness. These factors in concert determine whether a blade is used primarily for ripping, crosscutting, or both. Also, carbide blades are available not only for cutting wood and plywood, but also for acrylics and plastics, soft metals, and abrasive materials such as particleboard, tempered hardboard, Corian, and plastic laminates. Check manufacturer's literature and catalogs for

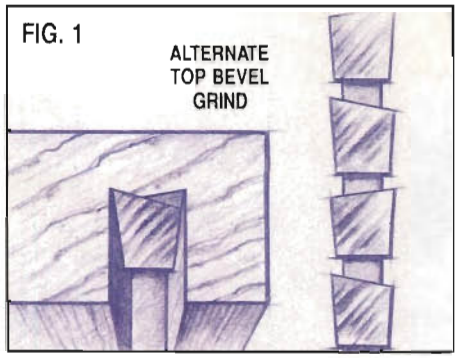


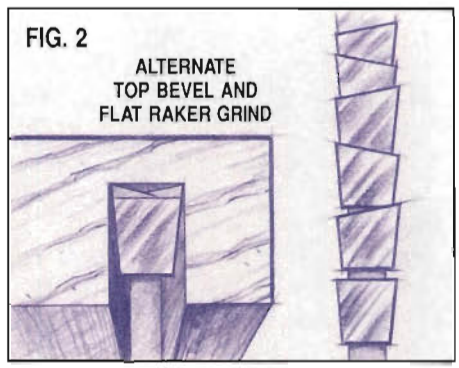
Because thin kerf blade have thinner plates, most have expansion slots cut into the plate to prevent the blade from warping due to overheating.

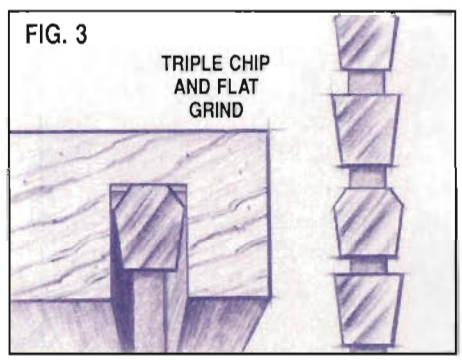
Specifications Thin Kerf Saw Blades

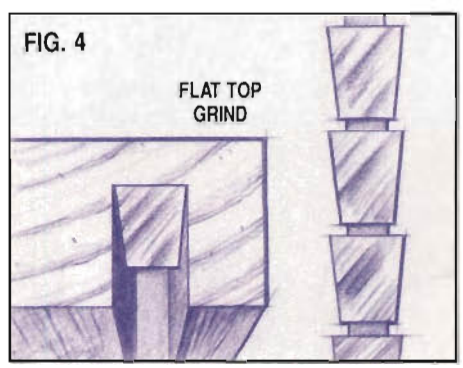
Manufacturer	Model[1]	Tooth Grind[2]	No. of Teeth	Use[3]	Kerf Width[4]	Suggested List[5]
Delta*	35-752	ATB	40	Crosscut/Trim	.094	$82.30
Delta*	35-753	ATB	60	Crosscut/Trim	.094	88.40
Delta*	35-754	ATB	80	Crosscut/Trim	.094	113.90
Disston*	VT40-1000	ATB	40	Combination	.102	29.00
DML*	DT-1000	ATB	80	Crosscut/Trim	.093	111.35
Everlast*	TK1080A	ATB	80	Crosscut/Trim	.102	97.80
Everlast*	TK1080T	TC	80	Crosscut/Trim	.102	100.75
Forrest*	WW-55446	ATB	40	Combination	.100	109.00
Forrest*	WW-58210	ATB	30	Combination	.100	89.00
Freud*	LU88M	ATB	60	Crosscut/Trim	.090	86.55
Freud*	LU87M	ATB	24	Rip	.094	70.80
Freud*	LU74M	ATB	80	Crosscut/Trim	.090	103.35
Freud*	TK906	FT	50	Combination	.094	50.00
General*	TV10605	ATB	60	Crosscut/Trim	.092	99.00
General*	TV10247	ATB & R	24	Rip	.092	79.00
Systi-Matic	1235	ATB	80	Crosscut/Trim	.099	125.70
Systi-Matic	1420	TC	80	Crosscut/Trim	.099	125.70
Systi-Matic*	2230	ATB	60	Crosscut/Trim	.093	94.70
Systi-Matic	1400	TC	60	Crosscut/Trim	.099	105.10
Systi-Matic	2035	ATB & R	50	Combination	.093	84.20
Systi-Matic*	2220	ATB	40	Combination	.093	78.90
Systi-Matic*	2565	ATB	24	Rip	.093	58.90
Vermont America*	27816	ATB	28	Combination	.085	27.00

[1]All models are 10 in. blades with 5/8 arbor; other sizes available.
[2]ATB = Alternate Top Bevel.
TC = Triple Chip (with one flat raker).
ATB&R = Alternate Top Bevel and Raker
FT = Flat Top
[3]Crosscut/Trim blades also referred to as cutoff blades; combination blades are designed to both rip and crosscut (see text).
[4]Figures provided by manufacturer; blades may cut a wider kerf depending on blade runout tolerances and saw condition (see text).
[5]Blades often discounted 10-40 percent off suggested list prices.
*Blades *tested by Jim Barrett*









specific uses.

Crosscut and trim blades have an alternate-top bevel (ATB) tooth design (Fig. 1). This design cuts with a shearing action to make a smooth cut across the grain. Usually, the steeper the bevel angle, the smoother the cut.

Combination blades (Fig. 2) have sets of alternate top bevel teeth plus a flat raker tooth (ATB&R). Each set is usually (but not always) separated by a deep gullet for fast chip removal. These blades can be used for ripping and crosscutting. If you want just one all-purpose blade for your saw, this would be it.

Triple-chip blades (Fig. 3) consist of alternating chamfered and flat teeth, and are used for cutting wood, plywood, particleboard, plastics, and other abrasive materials. They won't crosscut wood as smoothly as the blades just mentioned, but they do make respectable trim blades when cutting with the grain. Also, they don't dull as quickly as ATB or ATB&R blades, making them perfect for abrasive materials such as particleboard, tempered hardboard, plastic laminated countertops, and the like.

Most conventional carbide rip blades (Fig. 4) have a flat-top (FT) tooth grind—the top edge of each tooth is flat, rather than beveled when you look at the blade head-on. Most of these have 10 to 30 teeth. But thin kerf blades break this rule in two respects. First, most of the

SAFETY NOTE

Some thin kerf blades might be thinner than the splitter, or the splitter portion of the guard on your table saw. That is, the kerf cut by the blade will be too narrow to clear the splitter behind it. (As a responsible journalist, I'm obligated to warn readers not to remove the guards or splitter attachments from their table saws for safety reasons). I had no such problem with my Ryobi 10 in. benchtop saw (model BT-2500); the splitter/guard assembly accommodated even the thinnest blades I tried (.085 kerf width). However, if you run into this problem, you should consult the saw manufacturer for the recommended modification to the guard/splitter assembly to accommodate thinner blades.

thin-kerf rip blades I found have an ATB or ATB&R tooth grind such as the 24 tooth General no. TV10247; they're considered rip blades because they have fewer teeth than ATB crosscut blades. The other exception is the new Tradesman line from Freud: All have a flat-top tooth grind, but can be used for both ripping and crosscutting. We tested one of these new blades, a 50-tooth FT combination blade (see chart).

Within any given tooth design, manufacturers make blades with various numbers of teeth: typically 40, 60 or 80 teeth for crosscut and triple-chip blades, 40 or 50 teeth for combination blades, and 24 to 30 teeth for rip blades. Usually, the more teeth a blade has, the smoother the cut. For fast cutting where smoothness isn't important, choose a blade with fewer teeth; for smoother cuts, choose a blade with more teeth. Keep in mind that the more teeth a blade has, the more it will cost, and the slower you must feed the stock through the saw to avoid burning the wood (toothier blades generally require more feed pressure).

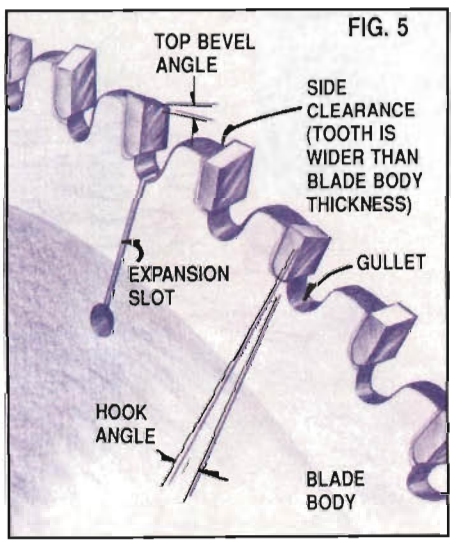


FIG. 5

Other geometric factors such as tooth angle (hook or rake), top angle, gullet size, and side clearance (Fig. 5) determine how smoothly and how fast a blade will cut.

Manufacturers also match carbide hardness (C-1 to C-4) to various cutting applications. Harder carbides are used for cutting hard or brittle materials; softer, more resilient carbides for cutting wood. Harder carbides aren't necessarily better, as some manufacturers might suggest—the teeth are prone to chipping, thus the blade must be handled more carefully. Most woodcutting blades have a hardness of C-2 or C-3.

The specifications chart shows a sampling of thin-kerf blades offered by several major sawblade manufacturers. The blades marked with an asterisk (*) were ones that I tried out myself. All the ones I tried produced exceptionally good cuts without bogging down my little Ryobi saw. Generally, the more expensive blades made smoother cuts, ran quieter, and performed better overall. Several blades I tried surprised me: The Forrest blades were among the smoothest cutting blades of the lot, despite their low number of teeth; the Freud TK 906 Tradesman blade made respectable cross-grain cuts with very little splintering—something a blade with a flat-top tooth grind isn't supposed to do. The newly introduced blades from Disston (Tiger Force) and Vermont American performed quite well, given their low price.

Sources

Delta International Machinery Corp.
246 Alpha Drive
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Disston Corp.
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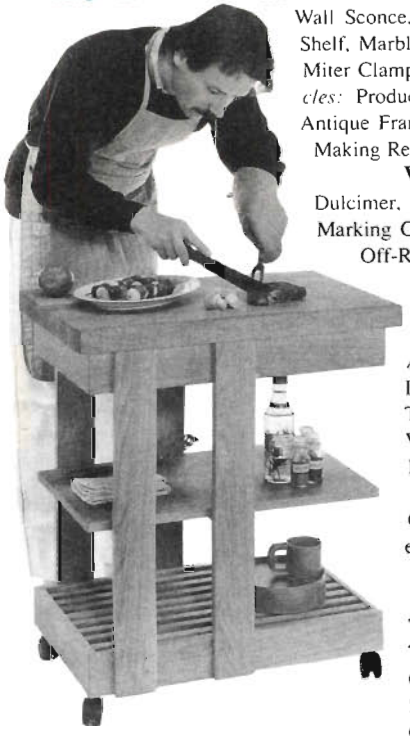

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Table Saw Gauge M/J '89

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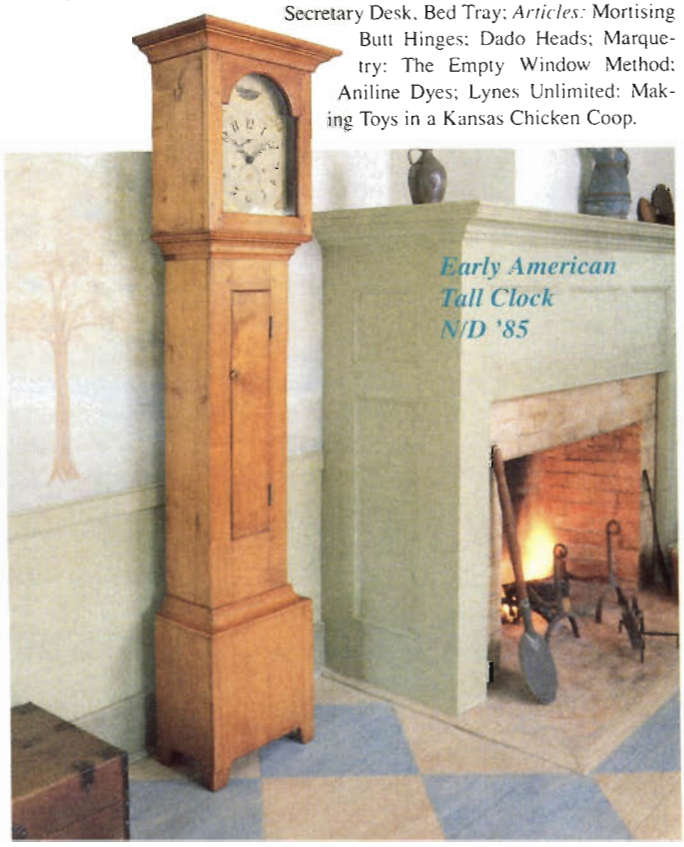
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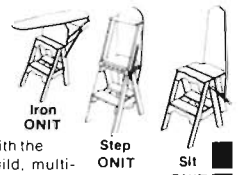

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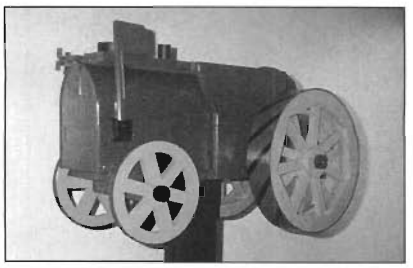

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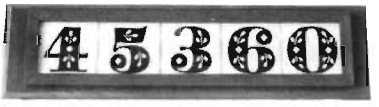

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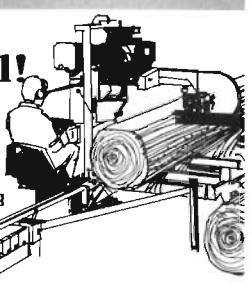

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The Classified rate is $2.00 per word, payable with order. Minimum ad length is 15 words, and the deadline date is the 25th of the third month preceding the issue (6/25 for the September/October issue). Count each word and initial; phone number counts as one word; state and zip count as one word. Send copy and check to ***The Woodworker's Journal,*** *Classified Department, P.O. Box 1629, New Milford, CT 06776.*

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Simplified Woodworking: A Monthly How-to Guide for Woodworkers. First issue free. Write Benitz, Ltd., P.O. Box 43233, Austin, TX 78745.

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Free Catalog—Woodworking Plans. To get yours send self-addressed, stamped envelope to: Wooden Design Co., P.O. Box 140, Dept. 61, DeForest, WI 53532.

1991 Leathercraft Catalog. 100 pages. Largest selection available of genuine leathers, tools, kits, books, supplies. Fine tooling, utility garment leathers, suedes, exotics. Belt, wallet, moccasin kits and more! Low prices, quantity discounts. Send $2.00 pstg/hdlg to: Tandy Leather Company, Dept. WJ791C, P.O. Box 2934, Fort Worth, TX 76113.

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Exciting Wooden Toy Plans. Plans for eye-catching toys with super realistic wheels described in free catalog. ToyPrO, Dept. WJ, P.O. Box 773810, Steamboat Springs, CO 80477.

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Custom Turning—Have turnings made to your exact specifications. Furniture reproduction, porch railings and stairway balusters a specialty. For free brochure send to: River Bend Turnings, Box 364, Dept. WJ, R.D. #1, River Road, Wellsville, NY 14895.

Mesquite Lumber, Kiln Dried and Bowl Blanks: Mesquite Unlimited, Rt. #4, Box 322, Wichita Falls, TX 76301; (817) 544-2262.

Adirondack, Country, and Original outdoor furniture plans. Chairs, loveseat, picnic table, benches, swings, etc. New designs, attractive and easy to build. Catalog $2.00 (credited). Plancraft, Box H1779, Hernando, FL 32642.

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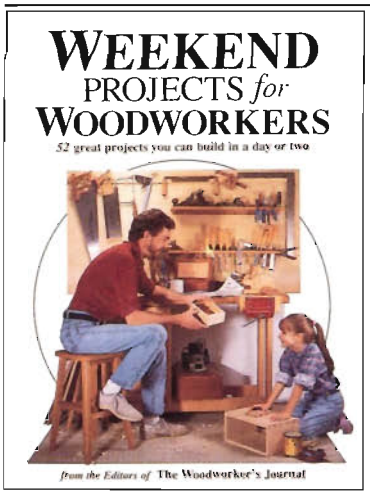
INDEX TO ADVERTISERS

BOOKS

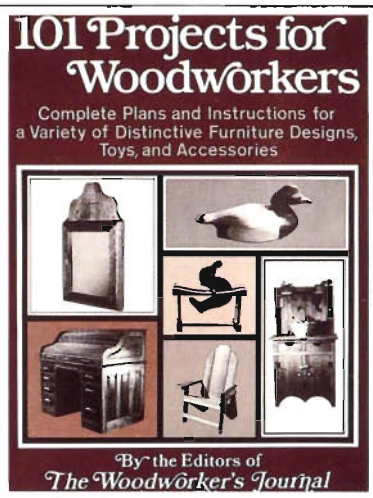
from *The Woodworker's Journal*

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



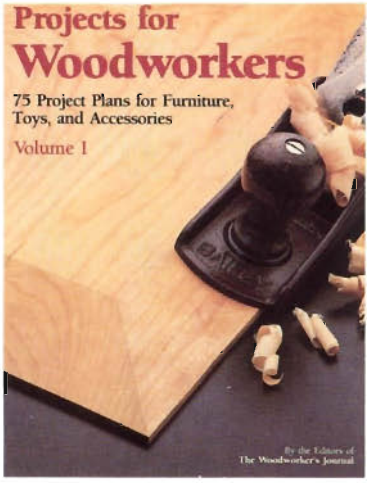
Weekend Projects For Woodworkers

This is the book for the craftsman long on enthusiasm and short on time. Selected from the 1986-87 issues of *The Woodworker's Journal*, all 52 projects are quick, easy and attractive. Each plan is presented clearly with fully detailed instructions and drawings. Whether scrambling for a break or enjoying lots of spare time, woodworkers of all skill levels will appreciate the satisfaction of seeing a project through to completion in just an evening or weekend.



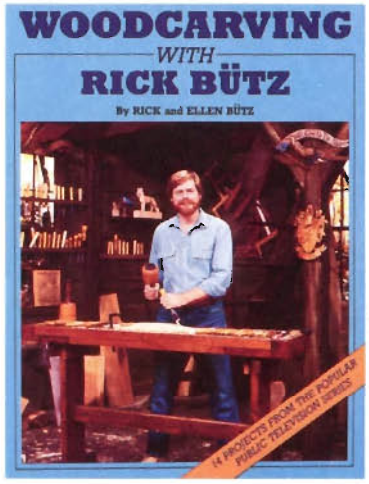
101 Projects For Woodworkers

For the amateur just starting out or the craftsman with a shop full of tools, **101 Projects For Woodworkers** features an 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.



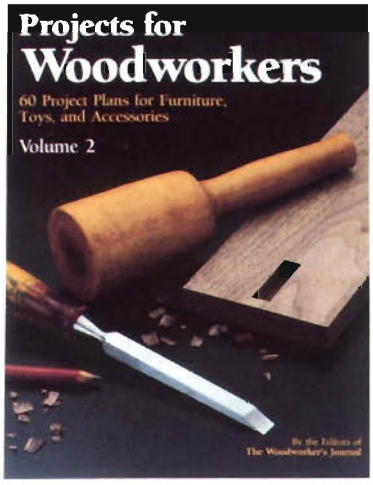
Projects For Woodworkers, Volume 1

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.



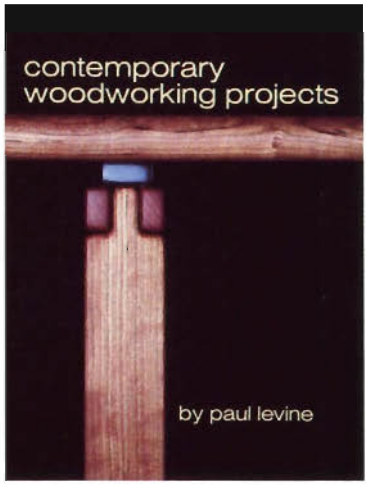
Woodcarving With Rick Butz

With just a few tools and a few hours to spare, you can share in the pleasures of carving. Wander into the Black Forest of Germany with a carving of St. Nick, or into a Russian village with a Dancing Bears folk toy. 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 chapters on tool selection, sharpening, whittling, chip and relief carving.



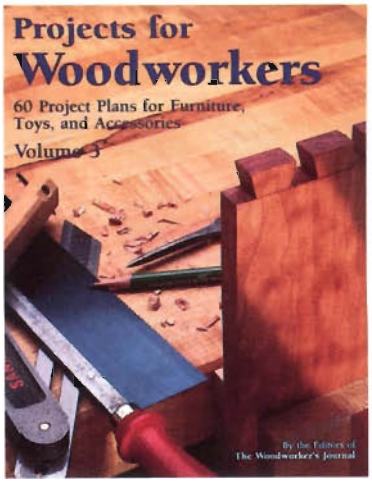
Projects For Woodworkers, Volume 2

Originally published in the 1982 issues of *The Woodworker's Journal* magazine, all 60 projects were chosen with a variety of styles and skill levels in mind. Each project has complete instructions and 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 completing more involved projects like the Tambour Desk, Old Danish Chest of Drawers and Swinging Cradle.



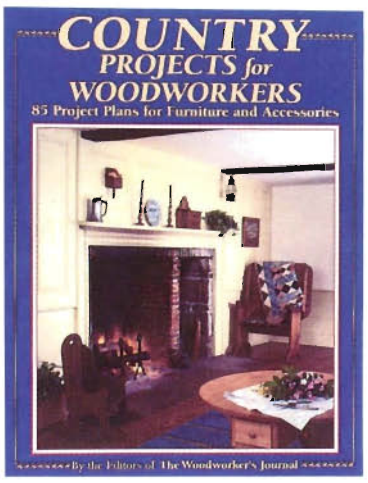
Contemporary Woodworking Projects

Paul Levine guides woodworkers of all skill levels through room-by-room chapters of coordinated furniture and accessories. The clean angles and sturdy joinery are made easy with step-by-step instructions and illustrations. Among the 40 handsome projects are a 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, puzzles and a great box of dominoes.



Projects For Woodworkers, Volume 3

The best projects from the 1983 issues of *The Woodworkers 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.



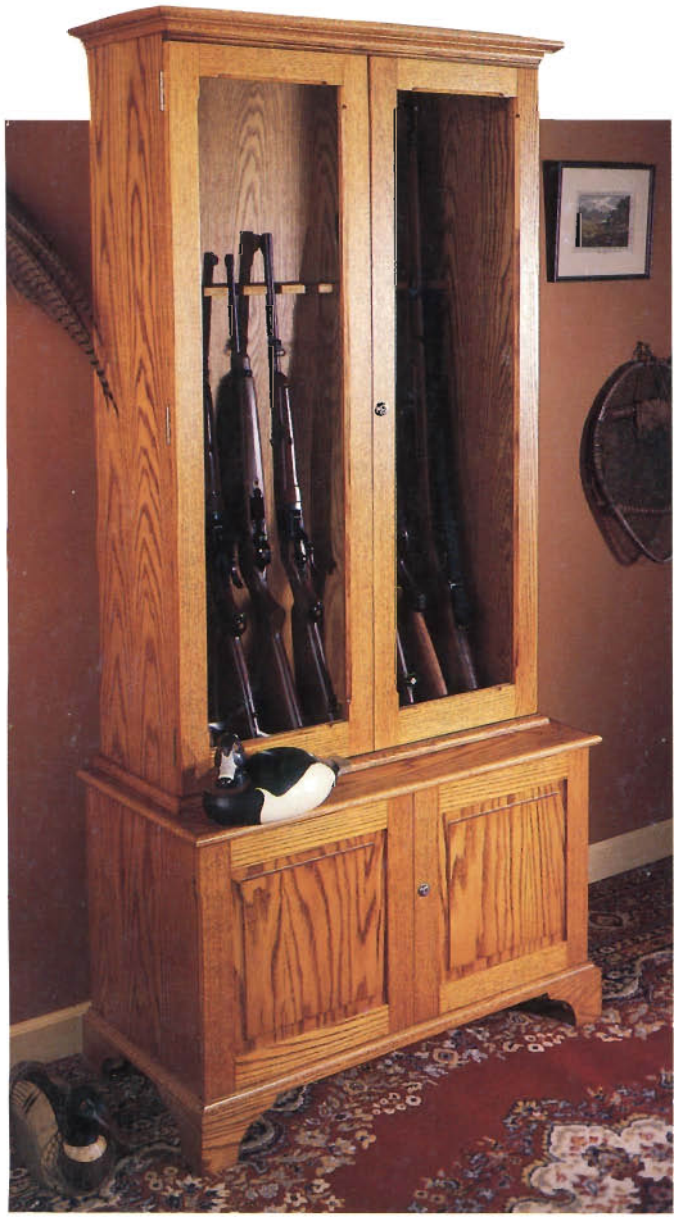
Country Projects For Woodworkers

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

Next Issue . . .

There's a hint of red and gold in the trees, the breeze is picking up, and summer's coming to a close. Time to stow away the mower and rev up the table saw as the big woodworking season approaches.

We've got some great ideas for craft sales or gifts with our four easy kitchen projects—a serving board, cooling rack, salad tongs and a clever recipe box. Make one or all four pieces in an evening (or two) for a guaranteed crowd pleaser.



Have you ever seen a beautiful dump truck? Doesn't seem possible, does it? Wait'll you get a load of this one! A classic model A . . . the kids (of all ages) will love it.

By popular demand, we've designed and built this handsome gun cabinet for all you collectors. As an important and special feature, it includes a secret key compartment on the top well out of youngsters' reach. Substitute shelves for the gunrack to hold books or any other collection you might enjoy.

In addition to these and six other projects, you'll find plans for a shop-built mortising table for the router by R.J. de Cristoforo, and important articles including a review of scroll saws, and a shop test of the new "safer" strippers . . . what's safe, what isn't, what works and what doesn't.

Oh, and don't forget to drain the gas and oil from that mower.