

The Woodworker's Journal

Vol. 12, No. 5 \$3.50



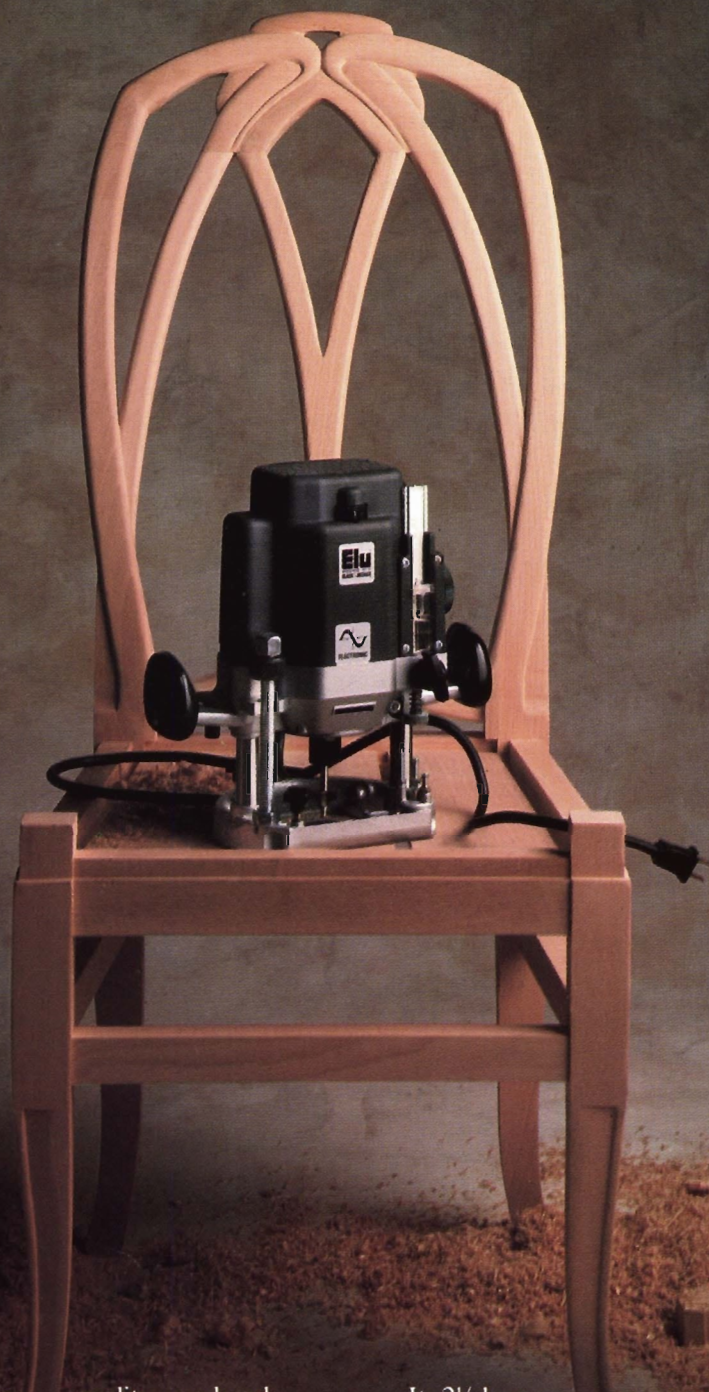
18th-Century
Pencil
Post Bed

Included in this issue: **Pencil Post Nightstand • Oak Bookcase Desk
Captain's Clock • Bird Push Toy • Harvest Basket
Rooster Silhouette • Coffee Table • Miter Cutting Jig**



September/October 1988

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The Woodworker's Journal

SEPTEMBER/OCTOBER 1988 VOLUME 12, NUMBER 5

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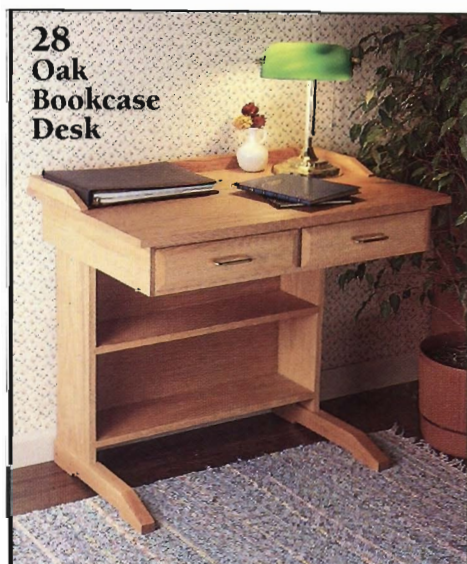
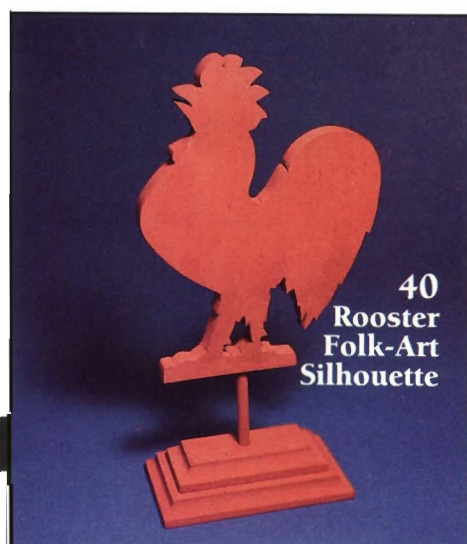
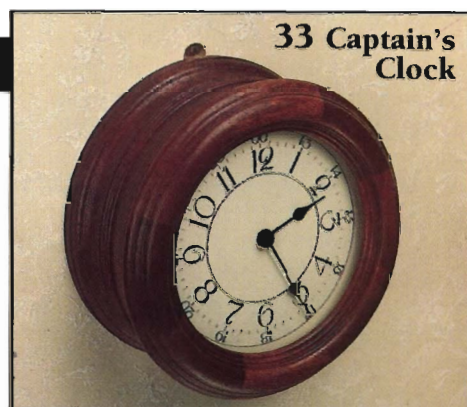
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Shoptalk

Woodbine and sumac are turning scarlet now and the afternoons are vibrant with the buzz of cicadas in the treetops. Another summer is coming to an end, and I expect that the passing of this one with its widespread drought and record heat will not be greatly mourned.

Make An Heirloom

This issue launches the Fall season with a great group of projects that I hope will keep you happily occupied for many weeks. The outstanding jewel in the crown, so to speak, is the Pencil Post Bed shown on the cover and detailed on page 50. This elegant adaptation of an 18th-century classic is one of the very few tall-post beds that can be built without the need of a large-capacity lathe.

It's also one of the few heirloom quality reproductions that can be built by woodworkers with limited equipment and experience. Careful layout of the posts, attention to grain direction, and the use of a sharp plane are the main requirements for the successful completion of this fine piece. What a wedding present this and its companion nightstand would make!

Trouble In River City

I love old woodworking books, especially the ones which date back to the late 19th or early 20th century. There's a certain no-nonsense quality to most of them that, although appropriate to that time, comes across as a bit droll in our present so-called enlightened age.

I have in hand a nice little volume called *Hand Craft Projects* by F. Solar that was written for the use of young shop students. It was published in 1921 and addresses itself only to boys, it being inconceivable at the time that girls would engage in such an unladylike activity as woodworking.

The preface states that "parents who can interest their boys in tools and let them have a shop at home, will know where to find them evenings, and many hours of worry will be saved, as the boys might be out in the streets or in the pool room."

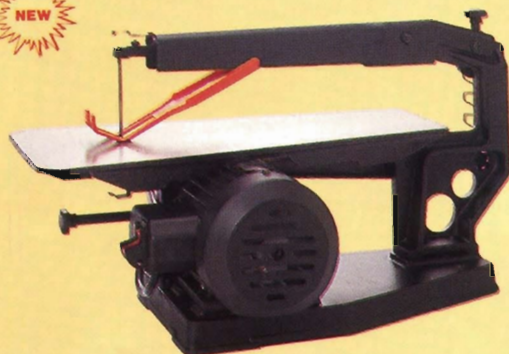
Reading this, I couldn't help but think of Robert Preston in his great portrayal of "The Music Man," expounding to the residents of River City on the evils of pool. The reasons may be different today, but encouraging boys . . . and girls . . . to develop woodworking skills is still a very fine idea.

Country Style Projects

One of the greatest collections of Country style woodworking projects ever assembled is now available in our newest book, *Country Projects for Woodworkers*. There are 85 projects, from candlesticks to a hutch, selected from the 1980-84 issues of *The Woodworker's Journal*. The price for this handsome softcover book is only \$16.95, plus \$1.45 shipping and handling. A convenient order form can be found on page 16 of this issue.

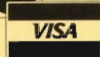
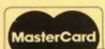
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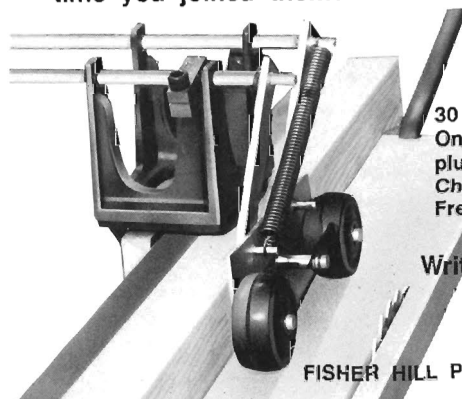
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Letters

The Miter Gauge Stop in your May/June 1988 issue was an excellent idea. There is, however, another good use for it. By shortening it to 3½ in., I found that it can be used as a fence stop on my radial-arm saw.

Wilson E. Ayers, Norfolk, Va.

In the "Letters" section (page 6) of your July/August 1988 issue, a reader wrote saying "... the best book that's available today for puzzle enthusiasts is *Puzzles Old And New, How To Make And Solve Them* by Jerry Slocum (University of Washington Press, \$19.95)." However, you didn't tell us where to order it.

R.W. Terrell, Branford, Conn.

The book can be ordered through your local bookstore. Just tell them the title, author, and publisher.

The May/June 1988 issue featured plans for a Bud Vase. One reader (see "Letters", July/August 1988 issue) modified it to accept PVC tubing and a

rubber stopper so that the vase could be filled with water without affecting the wood. Back about 1935, when I took a high school woodturning class, we found glass test tubes worked nicely for this same application.

R.L. Rosecrans, Miami, Fla.

If you make the Bud Vase slightly bigger, and bore a 7/16 in. diameter center hole, a 3/8 in. diameter test tube will work just fine. There was a time when you could buy a test tube at just about any pharmacy, but not so any more it seems. Some hobby shops carry them, but it may take some searching. Perhaps our readers can tell us of a mail-order source?

I recently completed the Oak Magazine Rack project on page 30 of your July/August 1988 issue. I'm very happy with the results and plan to make a couple more as gifts. However, I did notice a mistake. On the Bill of Materials, the bottom (part E) is

shown as ¾ in. thick. It should be ¼ in. thick.

Bill Phares, San Diego, Calif.

The Kansas City Woodworkers' Guild, 3023 Holmes Street, Kansas City, MO 64109 meets the second Wednesday of each month. All interested are welcome to attend. Call Bob Hoffman (816) 756-0128 for more information.

I'd like to use eastern white pine for many of my projects, but living in Texas I can only get western ponderosa pine. Can you give me the name of a supplier?

James R. Woehr, Richardson, Tex.

The Craftsman Lumber Company, Box 222, Groton, MA 01450 sells eastern white pine and will ship anywhere in the country. Unfortunately, we don't know of a source that's closer to Texas. You might try writing to a few of the hardwood dealers we've listed in our Cabinetmakers' Supplies

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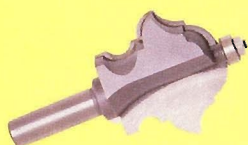
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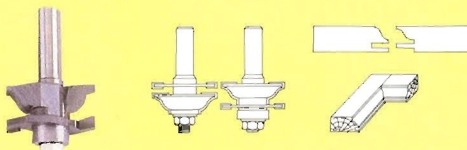
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column on page 10. Some of them carry softwoods, so with a little luck you may be able to find a source closer to home.

Thanks for the Workshop Layout article in your July/August 1988 issue. As a newcomer to woodworking, I was afraid a subject as basic as this would be old hat to your magazine.

Everett G. Sillers, Catonsville, Md.

I bought a Porter Cable 7548 jigsaw based on the glowing recommendation you gave it in your shop test in the September/October 1987 issue. What a mistake! Those clever side bearings don't even come close to the blade and, according to Porter Cable, they aren't supposed to. The ram shaft fits in its bushing with all the tolerance of a broom stick in a toilet paper roll. Even with a fence it will not cut a straight line, and the slightest side pressure causes an angled cut. I can only conclude that: 1. You were paid hand-

somely to do the test; 2. You never saw the jigsaw, but relied on Porter Cable's public relations for your information instead; or 3. Porter Cable gave you the only one that worked.

Wayne Kytola, Wright, Minn.

We can understand your disappointment, although we are at a loss to explain why your saw did not measure up to the one we tested. We still feel the Porter Cable 7548 is an excellent jigsaw. We've had other readers tell us that the article prompted them to buy this saw and they are very satisfied with the tool. Like most jigsaws, the Porter Cable works best when used for what it's designed to do, and that's to cut freehand curves. This may explain why it did not cut a particularly good straight line for you, even with a fence. If a perfectly straight line is what you want, a table saw, radial-arm saw, or circular saw will do a better job.

Neither Porter Cable nor any other manufacturer has ever paid us to do a

product test. Although the jigsaws were provided to us free of charge by each of the manufacturers, it was with the clear understanding that — good or bad — we would "call them as we saw them" based on our tests. And that's what we did. Some saws, like the Porter Cable 7548, got good marks, others not so good.

Every jigsaw was tested. We did not base our decisions on any manufacturer's public relations information. The tests were done in our workshop by associate editor David Peters and designer/craftsman Phil Bacon.

As far as getting the only one that worked goes . . . well, we just aren't that lucky. However, it is possible that you were unlucky enough to get a defective saw. If that's the case, you could expect that Porter Cable would repair or replace it. We suggest you contact your nearest Porter Cable dealer. If the dealer can't or won't help you, then write directly to Porter Cable.



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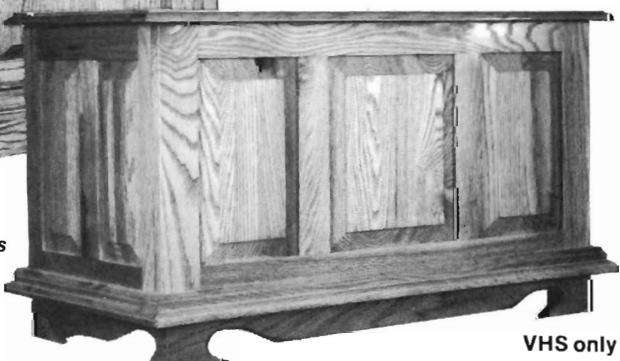
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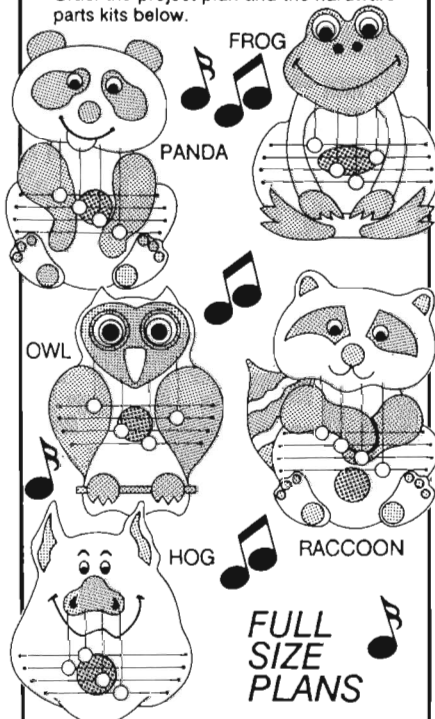
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Looking for an owner's manual for an old band saw? Need a bearing for a hand-me-down table saw? Can't find a source of supply for an odd piece of hardware? Maybe our readers can help. Send along your request and we'll try to list it here — and perhaps one of our readers will have an answer for you. Due to space limitations, we'll be unable to list all requests, but we'll include as many as we can.

I have been looking for several years for a Dremel Motosaw — the motorized coping saw which Dremel manufactured — and would appreciate hearing from anyone having one in working order which they would sell to me.

Stacy E. Dolby
1113 South Fifth St.
DeKalb, IL 60115

I need a 6 in. power disk sander accessory for a Shopcraft 14 in. commercial band saw.

Joe Lyons
204 University Blvd., West
Silver Springs, MD 20901

I would like to purchase a wood 5-foot frame ladder that comes apart and has a back section that can be extended something like a five-way ladder. I would like to know where I can find one.

John Marzano
100 N. Kensico Ave.
White Plains, NY 10604

I'm writing to see if anyone knows where I can get plans or information on a two-passenger paddle boat. Any help would be appreciated.

Jerry Billings
2560 N.E. 52nd St.
Des Moines, IA 50317

My father, a lifetime carpenter, has a set of books that I'd like to find for myself. The books are a four-volume set titled *Audel's Carpenter's and Builder's Guide*, copyright 1923, 1939, 1945, 1951 by Teo. Audel and Co., New York, N.Y.

Kevin Preston
346 Drury Lane
Huntsville, AL 35802

I need a front trunnion for a Delta 10 in. table saw, model TCS.204. Any help will be appreciated.

Andy D. Miller
R. 2, 17528 Kinsman Road
Middlefield, OH 44062

Owner's Manuals and Parts Lists

Power King 12 1/4 in. band saw, model 912R. Parker Kuhn, Jr.
RFD 2, Box 250, Bedford, NY 10506

Craftsman table saw, model 113.298051John J. Orlando
650 Jones Road, Rivervale, NJ 07675

Craftsman piston sprayer, model 283.1431Keith Peters
3353 Eden Way Place, Carmel, IN 46032

Sears 12 in. scroll saw, model 103.21790Darrell Caddell
P.O. Box 102, Star, NC 27356

Craftsman 10 in. table saw, model 113.27520
Craftsman shaper, model 103.23921
Craftsman radial arm saw, model 113.29411
Rockwell (Delta) jointer, model BF2180Howard E. Wood
R.R. 3, Box 896, Randleman, NC 27317

Montgomery Ward Powr-Kraft lathe, model FD2002AGarth Buchholz
614 N. Lawson Dr., Green Lake, WI 54941

Craftsman 10 in. radial arm saw, model 113.23100Mark Aldridge
P.O. Box 10222, Portland, OR 97210

Craftsman 10 in. radial arm saw, model 113.63165James J. Kasten
P.O. Box 452, Hallstead, PA 18822



The Woodworker's Journal



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 60 days before publication, Sept. 1 for the Nov./Dec. issue; Nov. 1 for the Jan./Feb. '89 issue. Please address announcements to the Events Department.

Arkansas:

2nd Annual Turned Wood Objects Show, Oct. 1-Nov. 6, Gallery B, 11121 Rodney Parkham Road, Little Rock.

California:

National Working with Wood Show, Sept. 9-11, San Mateo Fairgrounds, San Mateo.

San Diego Woodworking Show, Sept. 23-25, Del Mar Fairgrounds, Crosby Hall, 2260 Durante Blvd., Del Mar.

North California Woodworking Show, Oct. 7-9, Brooks Hall, 99 Grove St., San Francisco.

Southern California Woodworking Show, Oct. 28-30, Los Angeles County Fairgrounds, Building 5, Pomona.

Connecticut:

Brookfield Craft Center, P.O. Box 122, 286 Whisconier Road, Brookfield. Fall programs: Woodturning Workshop, Sept. 19-21; Hand Joinery, Oct. 1-2; Furniture from the Lathe, Oct. 15-16; Solid Wood Furniture Construction, Oct. 22-23; Turned and Carved Bowls, Nov. 5-6; Design for Furniture, Nov. 12-13.

Georgia:

The Creative Arts Guild of Dalton Festival '88, Sept. 24-25, 520 West Waugh St., Dalton.

Illinois:

Woodworking World — The Chicago Show, Oct. 7-9, The Metro Center, Rockford.

Indiana:

National Working with Wood Show, Oct. 21-23, Indiana State Fairgrounds, Indianapolis.

Louisiana:

13th Annual Fall Crafts Festival, Oct. 21-23, North Blvd., Baton Rouge.

Maryland:

Baltimore-Washington Woodworking Show, Sept. 16-18, Baltimore Convention Center, Festival Hall, Baltimore.

Massachusetts:

Woodworking World — The New England Show, Oct. 21-23, Eastern States Exposition Center, Springfield.

The Greater Boston Woodworking Show, Sept. 30-Oct. 2, Royal Plaza Trade Center, 181 Boston Post Road West, Marlborough.

September/October 1988

Michigan:

National Working with Wood Show, Oct. 7-9, Michigan State Fairgrounds, Detroit.

Minnesota:

The Twin Cities Woodworking Show, Sept. 9-11, St. Paul Civic Center, St. Paul.

New York:

Woodworking World — The New York Show, Sept. 23-25, Westchester County Center, White Plains.

Constantine's Woodworking Classes, 2050 Eastchester Road, Bronx: Veneering, Sept. 7, 10, 14, 17; Basic Woodcarving, Oct. 1, 8, 15; Wood Finishing and Refinishing, Oct. 5, 12; Intermediate Woodcarving, Oct. 12, 19, 26; Chair Caning and Rush Seating, Oct. 22, 29.

North Carolina:

Woodworking World — The Carolina Show, Sept. 30-Oct. 2, The Merchandise Mart, Charlotte.

John C. Campbell Folk School, Brasstown. Fall courses: Woodworking, Sept. 18-24; Woodcarving, Oct. 7-9; Log Cabin Building, Oct. 30-Nov. 12.

Southern Highland Handcraft Guild, 41st Annual Guild Fairs, 1988, Oct. 21-23, Asheville Civic Center, Asheville.

The Penland School, Penland. Fall courses: Timber Frame Construction, Sept. 19-30; Focus on the Table, Oct. 3-14; From Concept to Completion, Oct. 17-28.

Ohio:

Woodworking World — The Cleveland Show, Oct. 28-30, International Exposition Center, Cleveland.

Pennsylvania:

The International Turned Objects Show, Sept. 17-Nov. 13, Port History Museum, Philadelphia.

Pittsburgh Tri-State Woodworking Show, Oct. 14-16, Expo Mart, East Hall, 105 Mall Blvd., Monroeville.

Olde Mill Cabinet Shoppe, RD 3, Box 547, Camp Betty Washington Road, York. Fall workshops: Tage Frid on design and woodworking, Sept. 9-11; Michael Dunbar on making a continuous arm Windsor chair, Sept. 24-25.

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National Working with Wood Show, Oct. 28-30, Mecca Center, Milwaukee.

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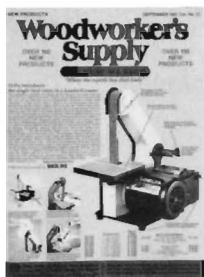
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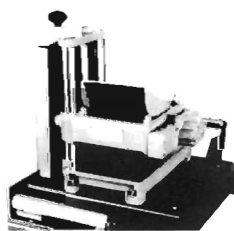
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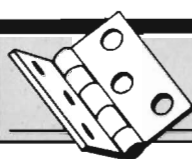
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Hardwood Suppliers

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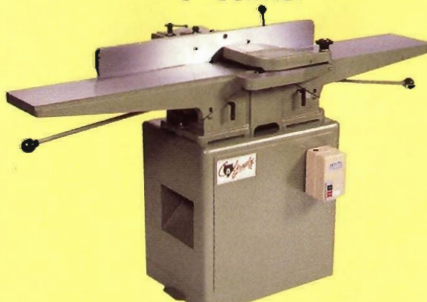
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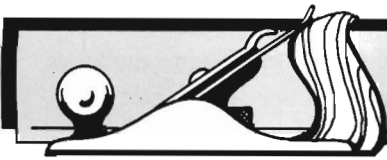
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Woodworking Basics

Why Worry About Wood Movement?



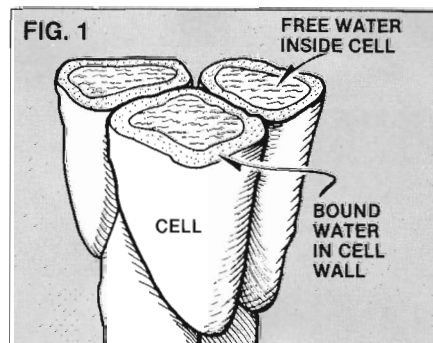
Panel sized too small has contracted, opening gaps.

As we observe the way things constructed of solid wood are built, a certain pattern emerges. We note that wide doors are usually constructed using a frame and panel, rather than a single board; we see that case pieces, such as chests of drawers, are constructed with the grain of the sides and top all running in the same direction; and we observe that backs and drawer bottoms are often made of plywood.

The chief reason things of wood are built in specific ways is wood movement. Unlike some other mediums, wood is not stable. It expands and contracts as it responds to the relative humidity. Understanding how wood moves, how much it moves, and the relationship of this movement to geographic location and season is essential if you want the things you build to last.

Free Water and Bound Water

Wood is sensitive to changes in humidity because of its cellular structure. If you compared a piece of wood to a sponge, you would see that wood is made up of vessels, or cells (Fig. 1). When the wood is green, as in a living tree, the cells are filled with the liquid sap of the tree. The water that fills the cell cavities is known as free water.



Once the tree has been cut, and the kiln or air drying begins, the free water begins to evaporate. The wood is like a sponge that has been wrung out; it remains damp, and retains its shape. The water that had filled the cell cavities is gone, but the water within the cell walls, called bound water, remains. Just as a damp sponge shrinks as it dries out, wood shrinks when the bound water is removed through further kiln or air drying. All but about 6 to 8 percent of the moisture content of the wood is removed through kiln drying, which results in a fairly stable material for cabinetmaking. If you compare the rigidity of a dried out sponge to one that is damp and flexible, it is easy to see why woodworkers prefer well-dried wood. Conversely,

for bending, moisture must be added to the wood to make it flexible.

Bound water is lost or gained as a consequence of the surrounding environment. When wood is stickered and left to dry for several years in a shed, bound water is lost, though not as quickly as when dried in the artificial environment of the kiln. Similarly, wood that has been kiln or air dried (and perhaps by now built into furniture) can also gain moisture. During the summer in New England, for example, when the relative humidity outdoors may be 70 percent or more, the equilibrium moisture content (EMC) of wood may increase to 14 percent from its 6 or 7 percent EMC during the winter months, when indoor relative humidity is much lower.

Equilibrium moisture content is important to understand, because it is the cause of wood movement. Basically, the EMC is the moisture content of a given piece of wood when it has acclimated to the environment in which it is placed. In an area where the relative humidity is high, the EMC will be correspondingly high, whereas in the desert, or another place of relatively low humidity, the EMC will be low. EMC is not so much a factor in areas where the relative humidity is stable

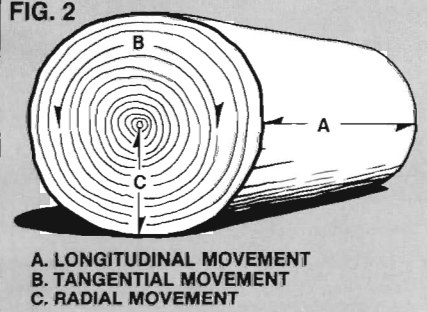
year-round, but it does become a concern in places where there are wide swings in the relative humidity during the summer and winter. Since it takes wood time to come into equilibrium with changes in the relative humidity, the wood movement will be most pronounced at the end of summer or winter. Immediately after the relative humidity changes, there will be only a minimal reaction in the wood, mostly on the surface, since several months are required before the entire piece attains EMC with the new relative humidity in the surrounding atmosphere.

While this may sound somewhat technical, a little further along, after we look into how wood moves, we'll provide examples of exactly how these theories apply to woodworking.

The Way Wood Moves

The section of a tree trunk (Fig. 2) illustrates the three directions of wood movement. First, there is longitudinal movement (with the grain). In kiln dried wood, such movement is considered negligible, so we need not allow for it. Next there is tangential movement, which occurs around the concentric circles that make up the trunk, parallel to the growth rings. This is the direction of maximum movement and

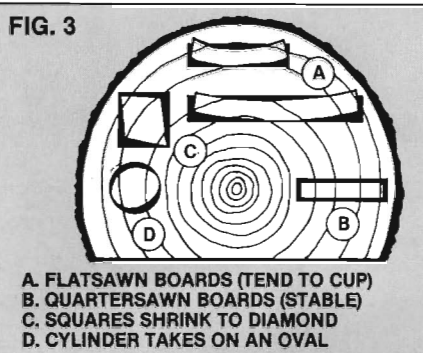
FIG. 2



has the greatest affect on boards that are flatsawn (Fig. 3). Finally, there is radial movement, which occurs perpendicular to the growth rings and is usually no more than one-half the tangential movement.

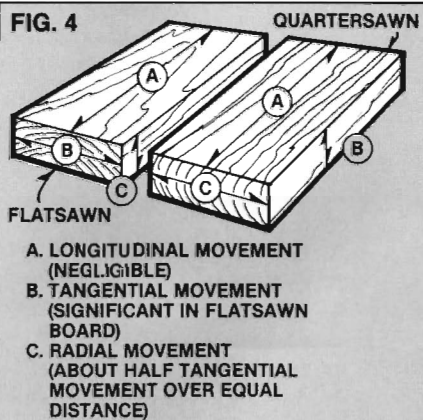
Fig. 4 illustrates a flatsawn board and a quartersawn board. As you can see, the flatsawn board has its maximum movement across the width. If you need a piece of wood where the movement across the width must be kept to a minimum, you could use a

FIG. 3



quartersawn board. In special situations, where movement across the width is critical, we often see quartersawn stock specified. Soundboards on stringed instruments are often made of quartersawn Sitka spruce, which has very little radial movement.

FIG. 4



Wood movement affects all wood, no matter what the shape. For example, in Fig. 3, a square changes to a slightly diamond shape as the wood moves, and a circle becomes slightly oblong. We've probably all seen dowels that had once fit tightly in their holes, but now have gaps on the sides. It is for this reason that we rarely specify dowel joinery. Over the years, as the dowels change in shape, the glue around them fails, and the piece weakens. Though the effect may be negligible at the start, as time goes by, the weakening of the joints is cumulative and can lead to the rickety old pieces that we've all seen.

Practical Applications

We've established that wood moves, and we understand the why and how of it. But what does this mean to the woodworker?

FIG. 5A

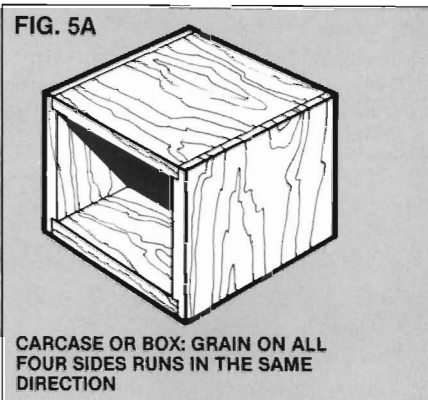
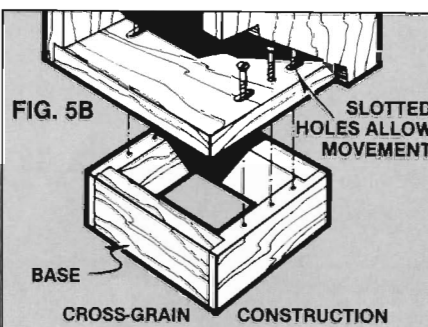


FIG. 5B



First, it means that construction must always allow for wood movement. For example, in a four-sided carcase, the sides will usually be oriented so the grain is running in the same direction (Fig. 5A). If a base is added

FIG. 5C

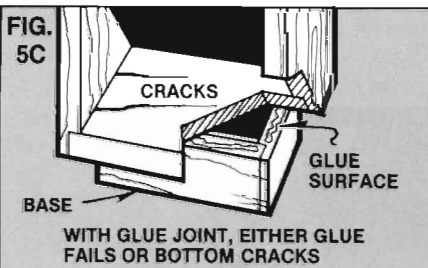
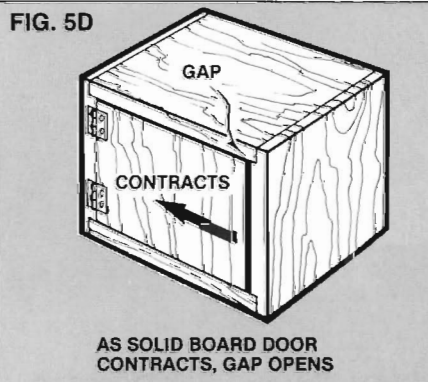


FIG. 5D



(continued on page 15)

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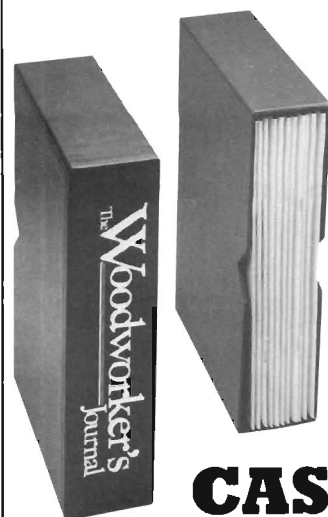
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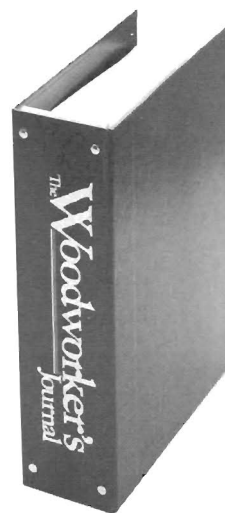


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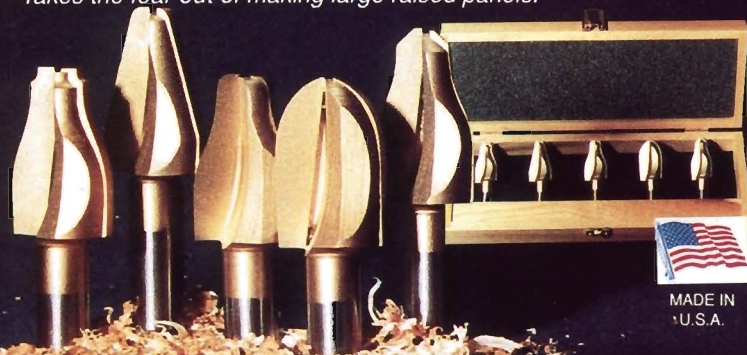
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Woodworking Basics

Continued

to the carcass, it should be attached with slotted holes and screws (Fig. 5B), so that it does not restrict the movement of the bottom. If glue were used instead of slotted holes, then as the bottom of the carcass contracted, it would probably split, or the glue joint would fail (Fig. 5C). If a single board were used for the door, it could contract across its width in relation to the carcass and leave a gap (Fig. 5D), or it could expand and jam against the sides (Fig. 5E).

A properly constructed frame and panel (Fig. 6) takes several factors into

account, including the season, the moisture content of the wood, and the geographic location, and therefore accommodates whatever movement might occur across the width of the panel. If we look closely at a typical frame and panel, which utilizes a groove in the stiles and rails in which the panel is free to "float," we'll see that these three variables are what will determine how the panel is sized.

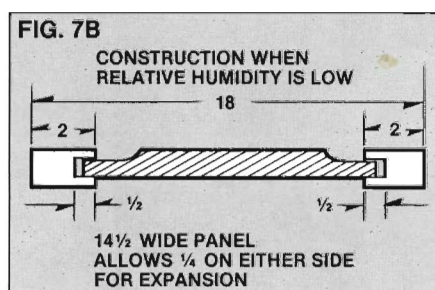
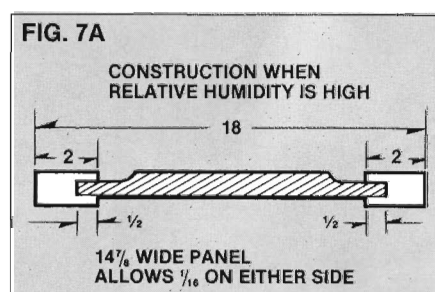
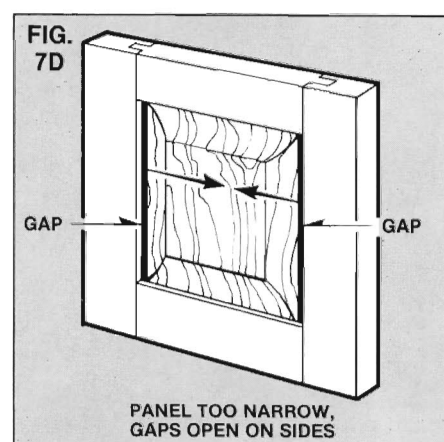
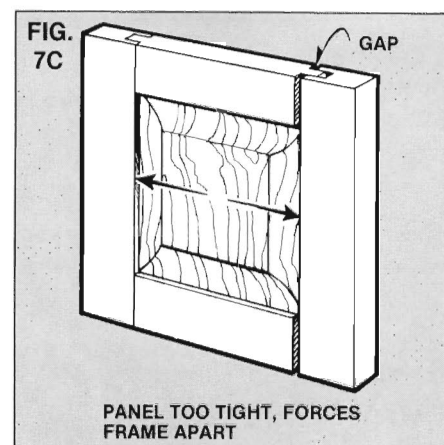
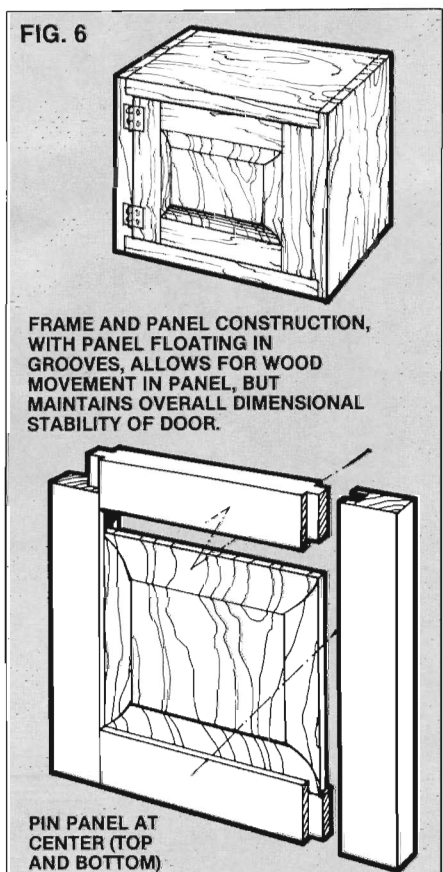
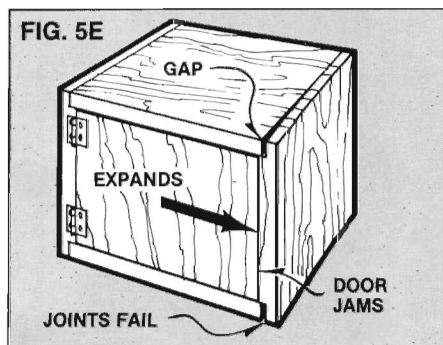
First, we'll assume that the wood used to build the frame and panel has been kiln dried, and then allowed to acclimate in the workshop and reach the EMC of the surrounding air. In the summer in New England, this moisture content will be about double what it is in the winter, meaning that the board selected for the panel would probably be as wide as it would ever be.

In constructing the frame and panel in New England during the summer, the panel would be sized so that it is almost the actual groove-to-groove dimension across the width of the frame. In the example shown in Fig. 7A, the stiles and rails of the frame are 2 in. wide, with $\frac{1}{2}$ in. deep grooves for the panel, which means that the panel should be about $14\frac{1}{8}$ in. wide.

If the same frame and panel were built in New England during the winter, the panel would probably be as narrow as it would ever be. Therefore it should be sized to allow for the ex-

pansion that will occur during the summer. Over a panel that is roughly 14 in. wide, an increase of as much as $\frac{3}{8}$ in. in the panel width can be anticipated. As illustrated in Fig. 7B, the panel is $14\frac{1}{2}$ in. wide, which will allow $\frac{1}{4}$ in. on either side for expansion.

You'll note that the panel is pinned at the center to the rails, top and bottom, so the movement is equalized to both sides. If the panel were not pinned, all the movement might occur to one side, creating a gap on the other side.



If the seasons were not taken into account, and a panel were sized for an exact fit in the winter, then it could force the frame apart come summer (Fig. 7C). Or, building the piece in the summer with the panel sized $14\frac{1}{2}$ in. could result in gaps opening on either side during the winter (Fig. 7D).

In anything you build, think about the possibilities for wood movement before you begin, and be sure to allow for it.

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3/8" \$26.95 1" \$35.95

SY-1223-3
1/2" \$28.95

Bead



SY-1224-1 SY-1224-4
1/4" \$24.95 3/4" \$32.95

SY-1224-2 SY-1224-5
3/8" \$26.95 1" \$35.95

SY-1224-3
1/2" \$28.95

Dovetail



PART NO.	D	PRICE
804	1/2	\$6
*804 1/2	1/2	\$6
806	9/16	\$8
810	3/4	\$8
*810 1/2	3/4	\$8
*812 1/2	1	\$10



Flush Trimming

PART NO.	A	PRICE
S8012Y	3/8	\$7
S8016Y	1/2	\$8
*S8016Y 1/2	1/2	\$8
S8020	5/8	\$10
*S8020 1/2	5/8	\$10



Vee Groove Bits

PART NO.	A	PRICE
S112	3/8	\$10
S114	1/2	\$10
S126	3/4	\$12
*S126 1/2	3/4	\$18
S130	1	\$20
*S130 1/2	1	\$24

Corner Round



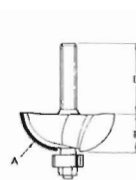
SY-1225-1 SY-1225-4
1/4" R \$24.95 3/4" R \$35.95

SY-1225-2 SY-1225-5
3/8" R \$26.95 1" R \$49.95

SY-1225-3 SY-1225-6
1/2" R \$28.95 1 1/4" R \$49.95

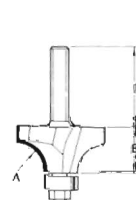
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Cove Bits



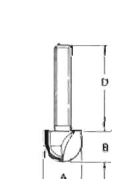
PART NO.	A	PRICE
S702Y	1/16	\$11
S704Y	1/8	\$11
S706Y	3/16	\$11
S708Y	1/4	\$12
S710Y	5/16	\$12
S712Y	3/8	\$12
S716Y	1/2	\$13
*S716Y 1/2	1/2	\$14

Roundover



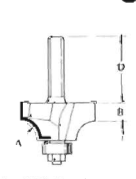
PART NO.	A	PRICE
S502Y	1/16R	\$10
S504Y	1/8R	\$10
S506Y	3/16R	\$10
S508Y	1/4R	\$10
S510Y	5/16R	\$11
S512Y	3/8R	\$13
S516Y	1/2R	\$15
*S516Y 1/2	1/2R	\$15
*S520Y 1/2	5/8R	\$18
*S524Y 1/2	3/4R	\$18
*S528Y 1/2	7/8R	\$30
*S532Y 1/2	1R	\$30
*S536Y 1/2	1-1/4R	\$38

Core Box



PART NO.	A	PRICE
S406	1/4	\$9
S412	3/8	\$10
S416	1/2	\$11
S420	5/8	\$12
S424	3/4	\$14
*S424 1/2	3/4	\$14
*S432 1/2	1	\$15

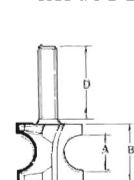
Beading



PART NO.	A	PRICE
S602Y	1/16R	\$11
S604Y	1/8R	\$11
S606Y	3/16R	\$11
S608Y	1/4R	\$12
S610Y	5/16R	\$13
S612Y	3/8R	\$15
S616Y	1/2R	\$15
*S616Y 1/2	1/2R	\$15
*S624Y 1/2	3/4R	\$18

* Indicates 1/2" shank.

Bull Nose



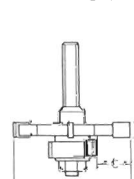
PART NO.	A	PRICE
SY9-1	1/4	\$12
*SY9-1 1/2	1/4	\$12
SY9-3	3/8	\$14
*SY9-3 1/2	3/8	\$14
SY9-4	1/2	\$14
*SY9-4 1/2	1/2	\$14
SY9-5	5/8	\$15
*SY9-5 1/2	5/8	\$15
SY9-6	3/4	\$16
*SY9-6 1/2	3/4	\$15
*SY9-6 1/2	1	\$17
*SY9-9 1/2	1-1/8	\$25
*SY9-16 1/2	1-3/4	\$30
*SY9-11 1/2	1-1/2	\$38

Roman Ogee



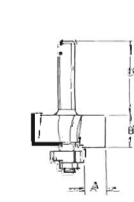
PART NO.	A	PRICE
S5702Y	5/32	\$15
*S5705Y 1/2	5/32	\$15
S5708Y	1/4	\$16
*S5708Y 1/2	1/4	\$16

Slot Cutter - 4 Flutes



PART NO.	A	PRICE
SY7002	1/8	\$20
SY7002 1/2	1/8	\$20
SY7004	5/32" (4mm)	\$20
SY7004 1/2	5/32" (4mm)	\$20
SY7006	3/16	\$20
SY7006 1/2	3/16	\$20
SY7008	1/4	\$20
SY7008 1/2	1/4	\$20

Slot Cutters/ Rabbeting Bit



PART NO.	B	PRICE
S1702Y	1/16	\$10
S1704Y	1/8	\$10
*S1704Y 1/2	1/8	\$10
S1706Y	1/4	\$11
*S1706Y 1/2	1/4	\$11
S1708Y	3/8	\$11
*S1708Y 1/2	3/8	\$11
S1712Y	1/2	\$12
*S1712Y 1/2	1/2	\$12



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Special Techniques

Variations of the segmented ring technique appear in everything from whiskey kegs to jewelry boxes, and from ships' wheels to picture frames. The basic technique also goes under several names. It's called stave construction when used for coopered barrels, and segmented ring construction when used to build up a turning blank for a bowl or vessel. But no matter what you call it, you're joining equal segments at a set angle to make a box or frame with a particular number of sides.

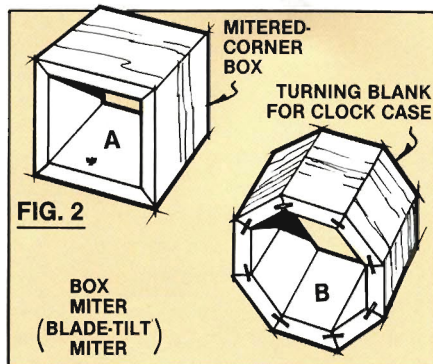
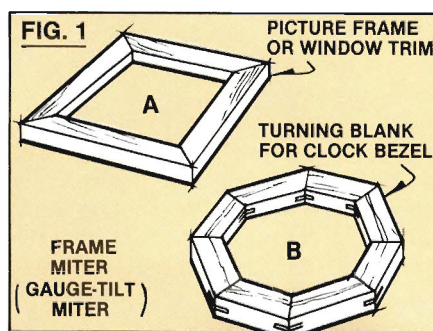
One main advantage of the technique is the phenomenal number of shapes possible with segments: pentagons and octagons and circles; cylinders and barrels; even cones and spheres. The segments can be joined side-to-side as in barrels or end-to-end as in frames and wheels. They can also be joined in flat sections, and then laminated with other sections to make three-dimensional forms such as cones and spheres.

The technique of joining ring segments is often used to make turning blanks for large containers. We used it to make the blanks for the case and bezel of the Captain's Clock on page 33.

Crucial for all the ring techniques is the basic joinery involved in making a multi-sided object from straight sections of wood. Once you've mastered that, it's relatively easy to build up complex shapes.

Two Miters

There are basically two types of operations used to join sections: one where the sections are joined with the angle running across the width of a board, and one where the angle runs across the thickness of a board. Examples of the first — using a 45-degree miter for illustration — are simple picture frames or the trim around windows (Fig. 1A). Another example is the eight-sided turning blank for the bezel (sometimes called the face) of the Captain's Clock project (Fig. 1B). Examples of the second are containers and boxes with mitered corners (Fig. 2A) or the turning blank for the case of the Captain's Clock (Fig. 2B). The terms for these operations can be confusing, however, and include such vague nomenclature as bevel-miter, edge-miter and flat-miter. For clarity



we'll simply describe them by the table saw operations used to make them.

In the first, or frame miter, you cut with the saw blade vertical and the miter gauge set an angle. We'll call it a gauge-tilt miter. In the second, or box miter, you cut with the saw blade at an angle and the miter gauge at 90 degrees. We'll call that a blade-tilt miter.

We used both techniques for our Captain's Clock project. The gauge-tilt miter is used for the bezel, and the

blade-tilt miter is used for the case.

Different cutting techniques are used simply because of the shape of the end product, not the grain orientation. In the clock, the case is made with the blade-tilt cut made in stave construction, but with the grain running side-to-side around the outside of the case. (The design equalizes the wood movement between the case and the bezel.) The bezel is cut like a miter around a door, with the gauge-tilt cut. The grain runs the same directions as in the case.

The end grain-to-end grain joints create a container and matching bezel that have stable diameters. That's essential for a clock where a metal dial is joined to the case. In cases that are edge-joined, the diameter will change as the wood expands and contracts with changes in relative humidity. The movement often doesn't matter. Barrels, for example, can change size slightly without affecting the strength.

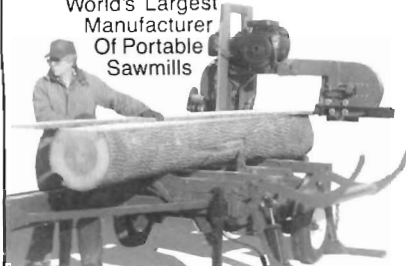
The blade-tilt miter generally cuts pieces for cases or objects with depth; the gauge-tilt cuts pieces for flat objects that are essentially two-dimensional. A container can have the grain running up and down, as in a barrel, or side to side, as in our clock case. The cutting operation remains essentially the same.

Finding the Angle

Joining segments to make objects with varying numbers of sides is a matter of getting the right angle for the
(continued on next page)

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Special Techniques Continued

particular number of sides. That angle stays the same regardless of the length of the sides, whether they frame a clock bezel or enclose the Defense Department in the Pentagon. Luckily, the angle for any regular polygon is easy to calculate. The more common ones are included in our Finding Segment Lengths table.

Length of Segments

Finding the exact length of the segments becomes critical when you're trying to fit a geometric shape inside a specific area, or match it to another shape. In clocks, the bezels are usually circles, but cases are often octagons or pentagons. In the Captain's Clock, the case and bezel are both cylinders, but the turning blanks are octagons. So you need to start with the size of the bezel and find a segment length that will form an octagon the right size for a turning blank. The radius for the Captain's Clock worked out to 4½ in.

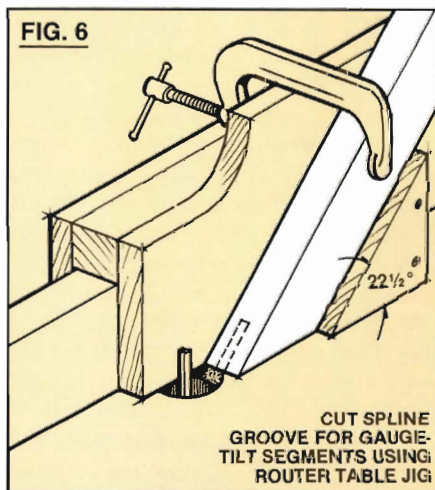
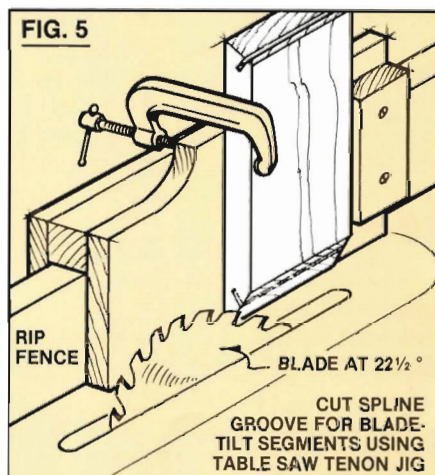
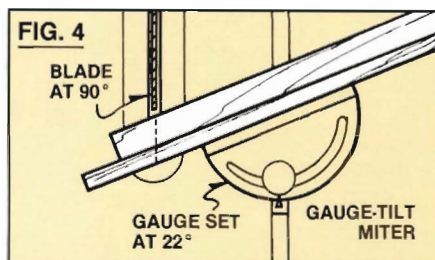
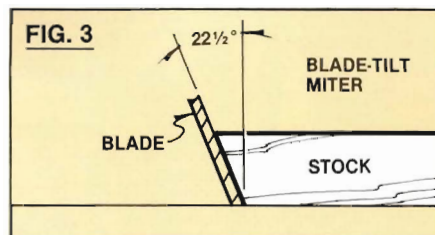
The segment length, the circle radius and the number of segments have a specific geometrical relationship. You can find the segment length, which is the side of a triangle, if you know the radius and the angle. However, that requires a table of trigonometric functions. To simplify matters, we've supplied values for common woodworking angles. Given a radius for a container with three, four, five, six or eight sides, you can find the segment length by multiplying the radius in inches times the constant in our Finding Segment Lengths table.

Or you can simply find the lengths by drawing a full-sized view of the project. Usually you're starting with a given circle size, so you can just draw the circle and fit the object inside. For example, for an octagon you can draw out the circle, divide it into eight sections, and run lines tangent to the circle.

Cutting the Segments

Once you know the angles and the length of the segments, cutting the pieces is an easy table saw operation. However, the angles must be exact, so it's a good idea to make test cuts in scrap pieces to insure your saw is accurately set. You can also help insure accuracy by building our miter jig on page 31.

Blade-tilt segments are cut either with a rip fence or with the miter



gauge. Fig. 3 shows pieces being cut for the case of our Captain's Clock. The cut is cross-grain so the miter gauge is set at 90 degrees and the blade tilted to 22½ degrees.

Fig. 4 shows a miter on a bezel piece being cut with the gauge-tilt method. The workpiece is flipped end-over-end

The Woodworker's Journal

To find the length of a side: first find the angle of the miter that corresponds to the number of sides in the object (see table). Then just multiply the radius by the constant for the angle in the table.

$$\text{Side} = \text{Radius} \times \text{Constant}$$

The examples below are for an eight-sided object, so the constant from the table is .828.*

Example 1 finds the length of the outside of each segment (Side A). Example 2 finds the length of the inside of each segment (Side B). For most projects, you'll only need to find the outside lengths. You'll usually need to convert eighths and sixteenths to the decimal equivalents, i.e. $\frac{1}{8}$ in. = .125 in.

For the formula to work, the circle must intersect with the middle of a side, as in X.

Example 1) Side A = unknown

Radius A = 4.5 in.

Constant = .828

Side A = 4.5 in. $\times$.828 = 3.726 in.
(Round to $3\frac{3}{4}$ in.)

Example 2) Side B = unknown

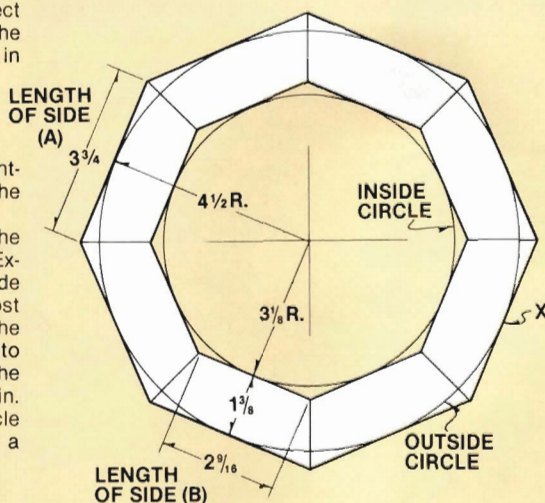
Radius B = 3.125 in.

Constant = .828

Side B = 3.125 in. $\times$.828 = 2.587
(Round to $2\frac{9}{16}$ in.)

*The dimensions are those in the Captain's Clock project on page 33.

FINDING SEGMENT LENGTHS



Ring Segment Angles and Constants

Angle (# Sides)	Constant
22.5 (8 sides)	.828
30 (6 sides)	1.155
36 (5 sides)	1.453
45 (4 sides)	2.0
60 (3 sides)	3.464

for the second cut. When completed, the bezel pieces make a frame shape that fits flat against the clock case. The operation is sometimes called a flat miter.

Cutting Splines

End grain-to-end grain miters, as we have in the Captain's Clock, are relatively weak joints, so you'll frequently strengthen them with splines. The groove for the spline is cut perpendicular to the original miter angle, so you can easily cut the groove by rotating the piece on the saw. For small pieces, however, we use a jig to hold the segments. On the Captain's Clock we used a table saw tenon jig to hold the blade-tilt segments (Fig. 5) and a special router jig to hold the gauge-tilt segments (Fig. 6).

Both jigs are made from scrap stock, and are essentially three-sided boxes that fit over and slide along the fence for a controlled cut. The tenon jig slides on the table saw rip fence; the router jig slides on the router table fence. The workpiece is clamped to the jig for safety and control. This method insures safe, accurate cuts even in small pieces. The router jig's angled block just serves to keep each piece at the

same $22\frac{1}{2}$ -degree angle. Raise the cutter gradually when using the router jig, taking several passes to reach the final depth.

Once the segments are cut, you need to glue them together. It's sometimes a tricky operation because of the number of pieces. The splines, however, make the job much easier. They keep the sections together during assembly and glue up. You can just fit the pieces together and then clamp them with a band clamp. The procedure is the same if you don't use splines, but it's sometimes difficult to keep the segments aligned properly while positioning the clamps.

Another method often used is to glue the segments together in pairs using a fast setting glue that only requires hand pressure, such as polyvinyl acetate. The pairs can be glued together, and then the resulting subassemblies glued together again. This method allows some adjustment for inaccurately cut pieces. The two halves can each be trimmed so they fit together. One method is to sand the edges on a piece of sandpaper taped to a flat surface, such as a table saw top.



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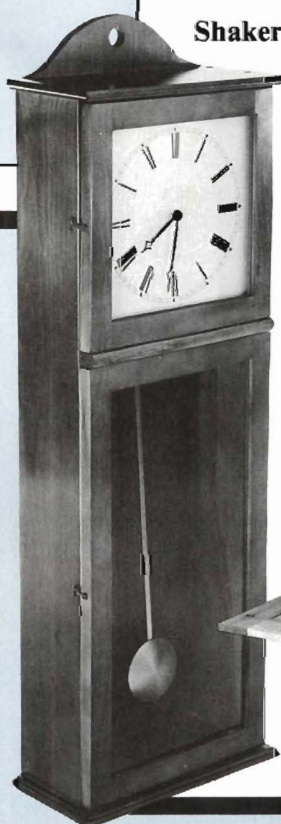
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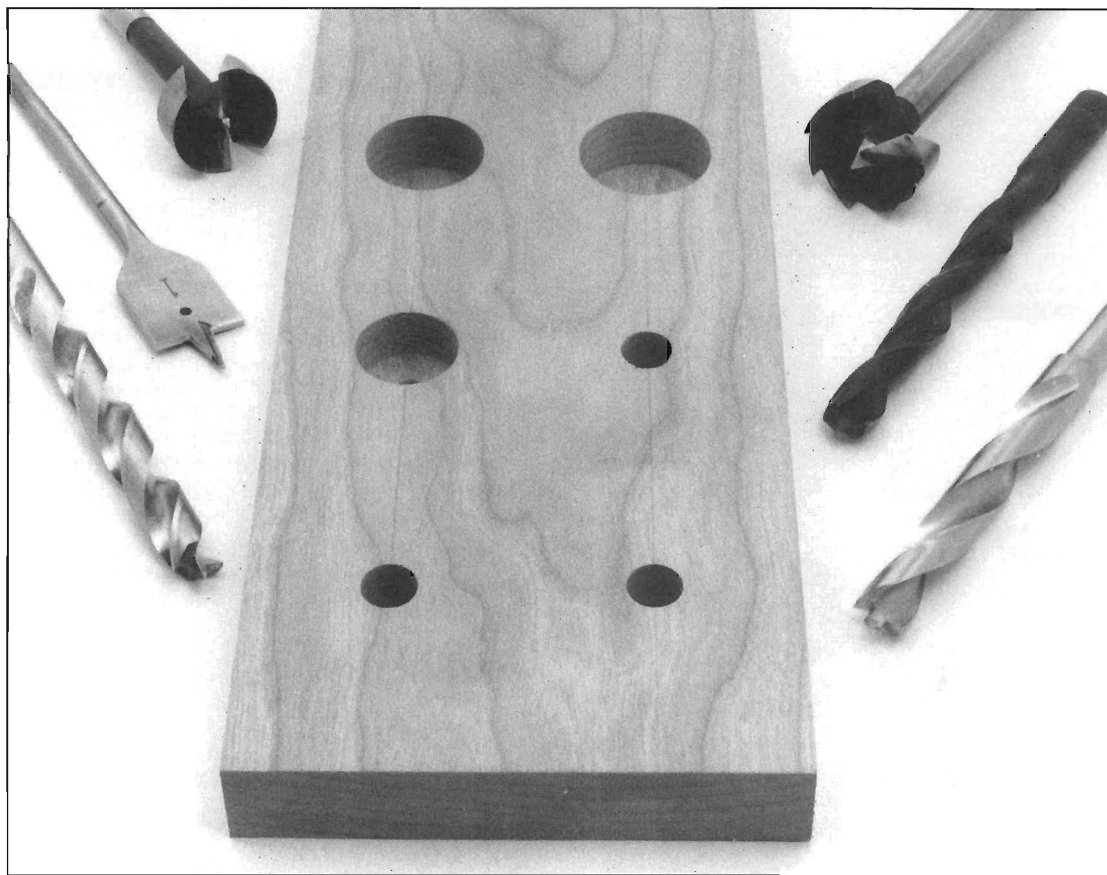
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Drill Bits and Boring: The Hole Story

Most of us don't spend a great deal of time deciding what bit to use or the best way to bore a particular hole. We chuck a twist drill bit in the hand drill or drill press and go to work. Yet boring a clean hole can be as much the mark of fine cabinetmaking as the selection of wood and the execution of joinery.

While there are many ways to get the job done, the quality and precision of the hole will largely depend on the selection of the right bit for the job, and the proper use of that tool.

The Best Tool for the Job

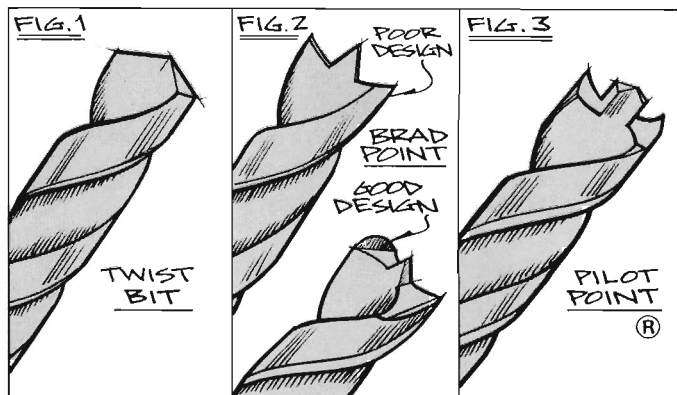
Many competent woodworkers spend too little time with details, and often compromise attractive pieces with faults that are more the result of the wrong tool than the wrong technique. Perhaps the best example of this is in the boring of holes for dowels or plugs. Tear-out around the perimeter of the hole usually indicates that a twist drill bit, rather than a brad-point bit, was used to establish the hole. With this in mind, let's look closely at the advantages, and disadvantages of the various types of bits.

Twist Drill Bits: Twist drill bits (Fig. 1) are the cheapest general-purpose bit that will drill holes in both wood and metal. They are not the best choice for boring holes in either material, but because of their low cost and different uses, we

recommend that every shop include a set. Where a fine, clean hole is not essential, or where there could be possible damage to a more costly bit, twist drill bits are the obvious choice.

Brad-Point Bits: There is no better bit for woodworking than a top-quality brad-point bit (Fig. 2). There are two distinct designs though, and the buyer should be aware of what he is buying before putting his money down. The best brad-point bits feature two scoring points that sever fibers around the

(continued on page 23)



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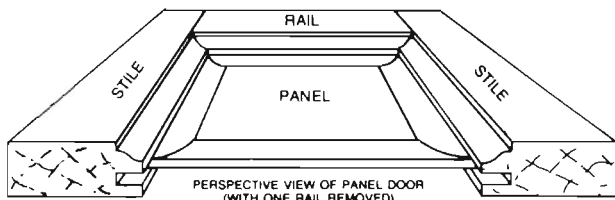
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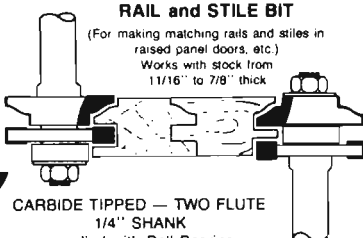
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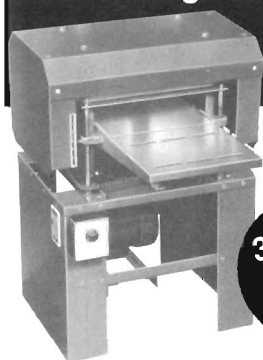
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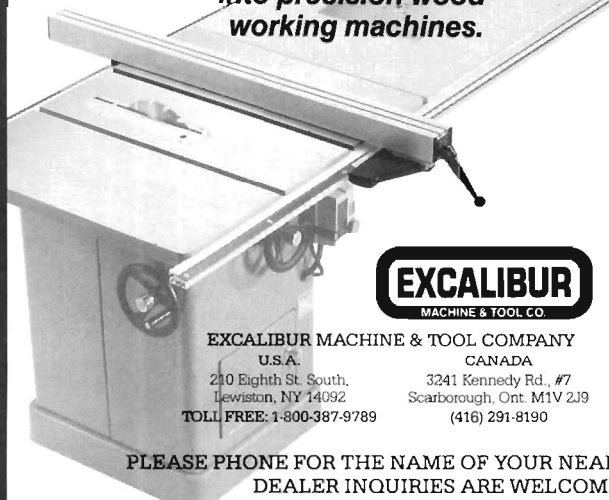
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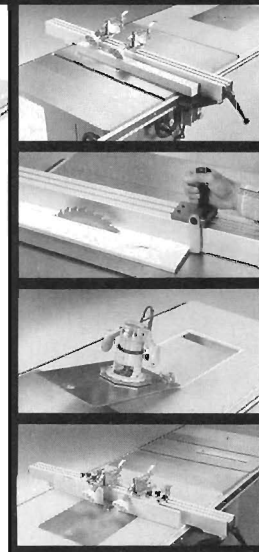
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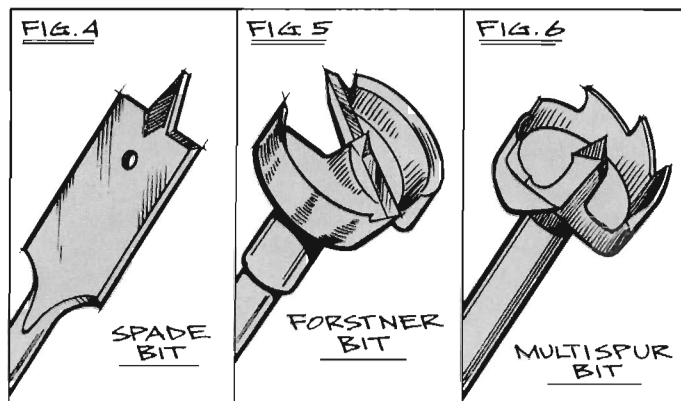
In The Shop

Continued

perimeter and result in an exceptionally clean hole. The less costly variety of brad-point bits do not have scoring points. These bits are cheaper to produce because of the less complicated machining they require. Our experience has been that even at their best they do not measure up to the high-end brad-point bits, while at their worst they are not as effective as a good twist drill bit. One set that we ordered from a major retailer was so poorly ground that nearly all the edges contained burrs. Since the set in question was of German origin, one should remember that a European trademark is not necessarily a guarantee of quality.

Pilot Point Bits: Pilot Point bits (Fig. 3), marketed exclusively by Black & Decker under their "Bullet" trademark, are an innovation that combines the best features of both brad-point and twist drill bits. The Pilot Point design is basically a brad-point bit grind tapered slightly toward the center, combined with a pilot centering section that has a relief-ground cutting edge. The bit features more acute cutting angles than twist drill bits, and enlarged flute chambers to facilitate chip clearance. The Pilot Point bits are available only in sizes from 1/8 in. to 1/2 in. Smaller bits do not include the pilot feature.

These piloted bits will not cut quite as cleanly in wood as the best brad-point bits, but they are superior to less expensive brad-point bits, and are better than twist drill bits. They are self-centering, will not "skate," and are able to bore a hole in a round piece of pipe without a center punch.



Spade Bits: Though not your best choice for drilling a clean hole, the spade bit (Fig. 4) is still an option where a large hole is required, and you do not have a Forstner or multispur bit. Most spade bits cut with a scraping action, although the bit manufacturer Irwin now makes one with a relief grind that they claim actually shears the wood, similar to the action of a conventional drill bit. Never use a spade bit in the drill press, since the excessive torque that the drill press generates may shatter the shaft or bit.

Forstner Bits: Forstner bits (Fig. 5) are the choice for boring holes larger than 1/2 in. diameter. They will not cut as quickly (continued on page 25)

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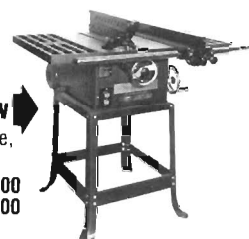
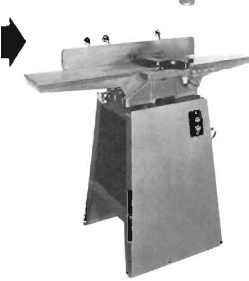
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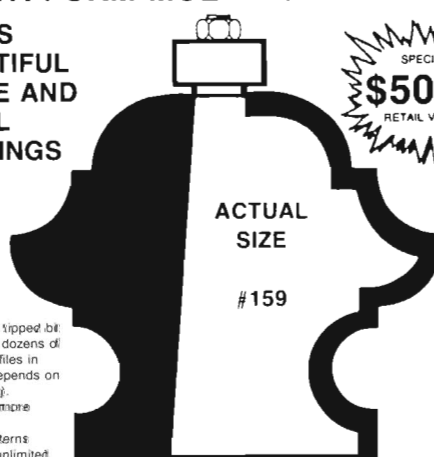
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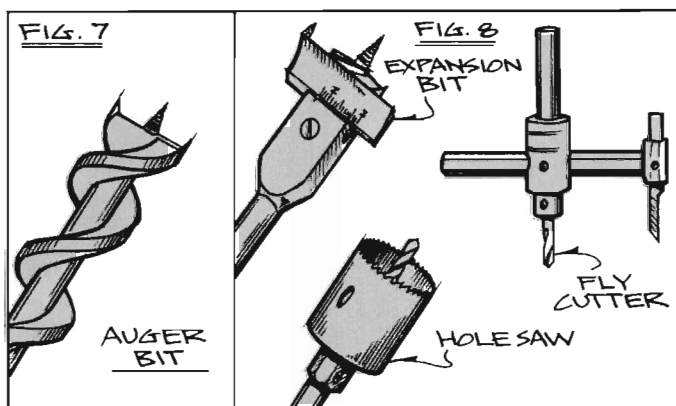
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as brad-point bits, but they are exceptionally clean cutting, and are useful for special situations such as boring into stock at an angle, or cutting recessed half-circle drawer pulls into the edge of a board. Remember to use slow speeds with these bits.

Multispur Bits: Similar to Forstner bits, the multispur bit (Fig. 6) will cut faster with less tendency to burn, due to the cutting action of the spurs as opposed to the shearing action of the edge on the Forstner bit. Again, keep to your slowest speeds.

Auger Bits: While we generally associate auger bits (Fig. 7) with the hand brace, today auger bits are also made for power tools, and enable the woodworker to bore deep holes without having to stop and clear chips periodically. They're especially handy for boring holes through lamps and bases. We might also add that they're an option when you're working late at night and noise is a consideration. These bits also should be used at low speeds.

Specialty Bits: Expansion bits, fly cutters, and hole saws (Fig. 8) are other choices you may wish to consider when you have a large hole to bore. There are better options for boring large holes, such as Forstner or multi-spur bits, but if you are on a limited budget, these cutters will get the job done and not put a hole in your wallet.



We Recommend

If you want the very best, we suggest a set of high-quality brad-point bits up to 1/2 in. for furniture making, a set of Pilot Point bits up to 1/2 in. for general-purpose work including both wood and metal, a set of Forstner bits from 1/2 in. up through 3 in., and a set of twist drill and spade bits for those times when you might damage your better bits.

Metallurgy

Although much is made of metallurgy, your best choice with drill bits used for woodworking is a high quality high-speed steel. If you are looking for a top quality metalworking bit, select titanium-coated bits; for stainless steel you'll need cobalt. Stay away from chrome vanadium bits. They dull quickly, and are not nearly the equal of good quality high-speed steel.

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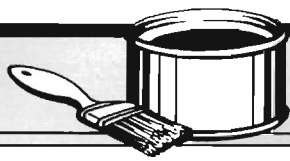
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Finishing

Filling Open-Grained Woods

Eight slabs of oak treated with various combinations of wood filler and stain.

With natural finishes now so much in vogue, many woodworkers may never have occasion to resort to the can of wood filler. It's fashionable to let finish coats sink into oak or mahogany's open pores, and so retain the natural texture.

But some woodworkers still prefer a perfectly smooth surface for table and bar tops. And open-pored woods will just never get a perfectly flat finish without some sort of filler.

The open-grained woods are hardwoods. Softwoods such as pine, fir and hemlock are anatomically different and don't have the large specialized vessels, or pores. Hardwoods, or deciduous trees, evolved later than softwoods, coniferous trees, and generally have more specialized systems. In conifers the same long and thin cell provides both strength and conduction of fluids. In hardwoods those functions are divided up, and the wood is generally stronger. Thick-walled cells provide the strength, and thin-walled vessel cells allow conduction.

The vessels are tubular cells which grow very long and thin. After formation, the end walls of the cells disappear and the cells hook up end to end. In some wood species such as red oak, you can even use a straight-grained section of wood as a straw.

Looking at an end-grain section, the pores appear as round openings, but on a long-grain section the vessels appear as grooves. When the boards are cut and surfaced, the vessels are ruptured lengthwise.

When to Fill

If you want a mirror-smooth surface on open-pored woods, you need to fill. Woods that are usually filled include oak, walnut, mahogany, chestnut, hickory and ash. In those woods the pores are easily seen with the naked eye.

But not all hardwoods require filling for a smooth surface.

In some the pores are so small that the surface finish itself will fill them. Birch, maple and cherry are examples of woods with very small pores. Some woodworkers even fill these small pores, using a liquid filler instead of the usual paste.

The softwoods don't require filling.

What is Wood Filler

The fillers are composed of ground silica and an oil and petroleum derived solvent. They harden when the solvent evaporates, leaving behind the clay-like filler. The silica is ground very fine so it can penetrate very small pores. Don't try and use sawdust and glue as a filler. It's suitable for filling large defects, but isn't fine enough to uniformly penetrate the pores.

Although you can make your own filler from the various components, it's much easier to buy one of the varieties sold commercially. They come in a natural shade and many colors, including white and black for specialized applications. The filler is a thick paste, which you have to thin to a working consistency.

A Choice of Methods

Wood filling techniques aren't difficult, but they can add several more steps to an already lengthy finishing process. The fastest way to go about filling is to combine it with the staining process: just mix stain and filler, paint it on, and wipe it off when it's dry. This technique may do the job, but it doesn't provide much control. The filler takes stain differently from the wood, so a second application of stain will go on unevenly. And the filler may bleed into the surface finish.

Getting better control means taking more time and adding several steps. The stain is applied first, and then sealed with a thin coat of shellac after the desired color is achieved. The

filler is then mixed with stain to get the same color as the already stained wood. After filling, the surface is sealed with shellac again to prevent the surface finish from dissolving the filler.

You can also buy colored fillers that eliminate the need to mix stain and filler. Although the stain and filler are premixed, you'll still have to do some experimenting and testing to get your initial stain coat the same color as the fill. When you're working with commercial stains, it's easier to get a match if you use the same brand of filler and stain.

Filling Steps

Before filling, make sure the wood is well sanded. If you use a sealer, the proportions of the sealer should be seven parts alcohol to one part shellac. The shellac should be 4-pound cut. If you're filling over stain, rub the surface down with 000 steel wool. If working with bare wood, sand with 220-grit paper.

The filler should generally be the consistency of heavy cream. For really large pores, such as in red oak, mix the filler to a sludge-like consistency. Use turpentine or paint thinner to cut the paste wood filler. If you're mixing stain with the filler, first add the stain to get the color you want, and then thin to the desired thickness. If you're not too picky about the final shade, you can just add enough stain to get the right mix and let the color fall where it may.

Apply the filler with a stiff brush, working both with and across the grain. Some woodworkers even use the brush in a stabbing action to force the filler into the pores. On end grain, take extra care to force the filler into the pores.

After the filler dries to a dull surface, generally 10 to 30 minutes, rub it off with a coarse cloth. First rub against the grain, removing most of the filler. Then, to get off the last traces, rub more gently with the grain.

Let the filler dry overnight. You may need a second application if the filler shrinks too much.

If you're brave, you can apply varnish directly over the filler. But it's possible the surface can turn gray when the two compounds interact. It's safest to use the shellac sealer again.

Although filler is used most often on woods like oak with very pronounced pores, you can also use it on maple or birch to get a mirror finish. The process is the same, but you need to thin the filler more so you can squeeze it into the smaller pores.

Filler can also highlight wood pores. A black filler on a light wood — or a white filler on a dark wood — provides stark contrasts that can have an interesting effect.

Potential Problems (And Remedies)

- *Pin holes form in the filler.* It isn't completely squeezed into the pores. When dry, sand and apply more filler
- *The filler flows out of the pores before it's dry.* The surface isn't adequately sealed. Sand and reseal before adding more filler.
- *The filler bleeds into the sealer.* You didn't wait long enough after sealing. Thoroughly sand the surface and start over.
- *The surface finish takes on a gray cast.* Some varnishes react with the fillers. Sand off the surface finish, seal with shellac and revarnish.

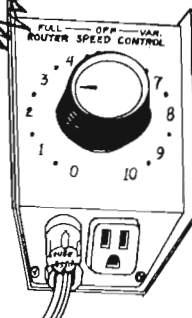


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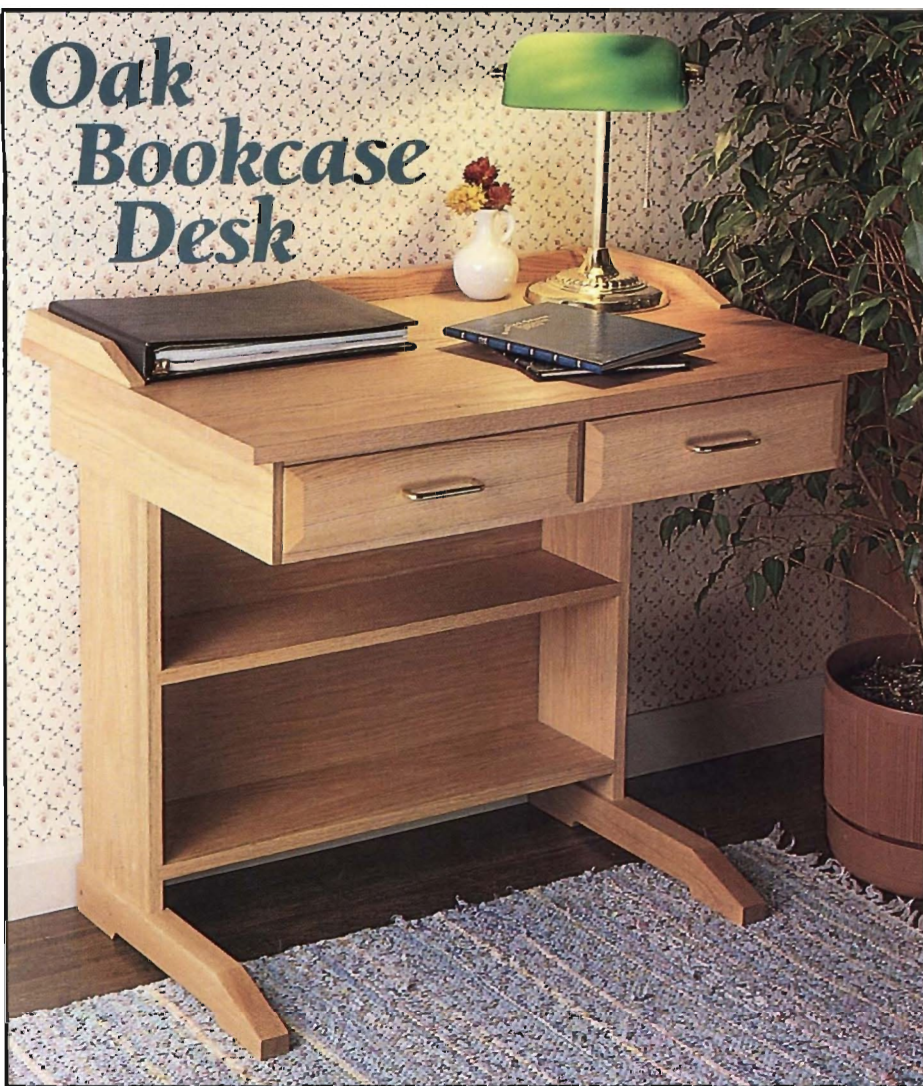
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Atung oil finish on red oak gives our Bookcase Desk warm colors and a rich texture. The clean lines and simple bevels lend it a contemporary flavor.

Designed for today's small spaces, the desk offers plenty of storage space, with two ample drawers and the bookcase underneath.

As with most contemporary pieces, the crisp look depends on clean cuts and sharp edges. Take extra care in the joinery and any saw cuts for finished edges. Oak splinters relatively easily, especially when crosscutting.

Start by cutting the lumber to size. Make the stock for the top (A) and frame members (B and C) slightly oversize. You'll want to trim the top and frames to final size after joining. Also cut the two shelves (H and I) a little long. That way you can cut them to size from the actual groove-to-groove distance between the legs (F). Leave the stock for the drawer parts off to the side for now. Drawers are always made to fit the actual openings.

Next, join the boards for the top. Glue the jointed edges together without splines or dowels, which don't

add any strength to long grain-to-long grain joints like this. Use blocks lightly clamped across the top to keep the boards lined up. An application of paste wax prevents glue from sticking to the blocks.

Also join the frame sections, using $\frac{1}{4}$ in. splines. Cut the grooves with a $\frac{1}{4}$ in. diameter straight cutter in the router table and use $\frac{1}{4}$ in. plywood for the splines. The splines are easier to cut than dowels, as the router-table fence keeps all the grooves lined up. Just be careful to always cut with the same face of matching boards against the fence. After the glue on the top and two frames has cured, trim them to final size. As they're rather wide, they may be too big to fit on your table saw. In that case, carefully trim them with a portable circular saw riding against a straight edge. To prevent chip-out, run a sharp knife along the line of cut before starting the saw. You don't have to cut deeply with the knife, just far enough to sever the top fibers.

Also use the knife to start the cuts on the front of the frames where they will show.

Next, lay out the sliding dovetails, which join the legs (F) to the lower frame and feet (G). The $\frac{3}{8}$ in. deep grooves are centered on the feet and also centered $1\frac{1}{8}$ in. from the edge of the lower frame end. Use a $\frac{1}{2}$ in. dovetail cutter. The groove is stopped $\frac{1}{4}$ in. short of the 7 in. leg width. That way you can hide the dovetail joint and allow room for the leg to expand with changes in humidity. The matching "tail" that fits into the groove is cut back $\frac{1}{8}$ in. shorter than the groove. Use a chisel to cut it back.

The tails are cut on the router table to just shy of $\frac{3}{8}$ in. deep. To make sure each of the four tails is the same width, don't just set the table fence once and flip the pieces over for successive cuts. That method depends on perfectly accurate stock thickness to achieve a uniform tail. Instead, for uniform tails, change the fence setting for successive cuts and always gauge off the same face of the workpiece (Fig. 1). Note that you'll need to recess the dovetail bit into the fence for the first cut.

Because you need to move the fence, make all four cuts at the first setting before moving the fence and making the final cuts. The second cut is crucial for a tight fit in the groove. If you cut some scrap at the first setting, you can use it for test cuts at the second setting.

Also to insure accurate cuts, use a high fence on the router table and a feather board to securely guide the pieces past the dovetail cutter. Feed from right to left for the first cut (Fig. 1), and from left to right for the second cut.

Next, cut the $\frac{3}{8}$ in. deep by $\frac{3}{4}$ in. wide dadoes in the legs for the shelves (H, I), as well as the dadoes in the upper and lower frames for the divider (E). Adjust the width of the cut to match the thickness of your lumber. Before cutting, make sure to orient the parts the way you'll want them during assembly. Also cut the $\frac{1}{4}$ in. deep by $\frac{3}{4}$ in. wide rabbets in the sides (D) to accept the frames.

Then, cut the $\frac{1}{4}$ in. deep by $\frac{3}{8}$ in. wide rabbets for the lower back (M) in the legs, lower shelf (I) and lower frame. Also cut the $\frac{1}{4}$ in. deep by $\frac{1}{4}$ in. wide rabbets for the upper back (L) in the sides (D), and upper and lower frames, as shown in the Rear Detail. The lower frame will have rabbets cut on both edges, leaving $\frac{1}{8}$ in. of wood in the center.

Now, with the parts sized and the joints fabricated, cut the details on the feet and rails (J and K). To get the $\frac{1}{2}$ in.

radius on the feet, clamp the two together and bore two holes with a 1 in. Forstner bit. You can then separate the feet and use the band saw to finish the cuts.

Next, cut the miters on the rail strips. Also, with the router, cut the $\frac{1}{8}$ in. wide stopped spline grooves into the miters.

For the angled cuts on the feet and the rails, use a taper jig. If you don't have a jig, you can cut a scrap board to the desired angle and use that for support. Just make sure there's a block to hold the piece in place.

Before assembly, thoroughly sand all the parts, especially any interior surfaces you'll be unable to reach easily after assembly.

Assemble the desk in three steps. First, assemble the lower bookcase section. But before getting out the glue bottle, dry fit the sliding dovetails to get the exact length of the shelves, and then cut them. You can then glue and clamp the lower section, which includes the feet, the legs, the shelves, the lower frame and the lower back. The shelves are glued and screwed in place, with plugs covering the screwheads.

Next, assemble the upper section, which includes the top, rails and upper frame. The top and rails are joined with screws as shown, using slotted screw holes to allow for wood movement. Glue and clamp the miter joints. The upper frame is then screwed into

the top, also through slotted holes.

Finish assembly by joining the top and bookcase sections. The two sides

Bill of Materials

(all dimensions actual)

Part	Description	Size	No. Req'd.
A	Top	$\frac{3}{4} \times 22 \times 34$	1
B	Frame (front/back)	$\frac{3}{4} \times 2\frac{3}{4} \times 30$	4
C	Frame (crosspieces)	$\frac{3}{4} \times 2\frac{3}{4} \times 15\frac{1}{4}$	6
D	Side	$\frac{3}{4} \times 4\frac{3}{4} \times 20\frac{3}{4}$	2
E	Divider	$\frac{3}{4} \times 3\frac{3}{4} \times 20\frac{1}{2}$	1
F	Leg	$\frac{3}{4} \times 7 \times 22\frac{1}{4}$	2
G	Feet	$1\frac{1}{2} \times 2\frac{1}{2} \times 18$	2
H	Upper Shelf	$\frac{3}{4} \times 6\frac{3}{4} \times 27\frac{1}{4}$	1
I	Lower Shelf	$\frac{3}{4} \times 7 \times 27\frac{1}{4}$	1
J	Back Rail	$\frac{3}{4} \times 1\frac{1}{2} \times 33\frac{1}{2}$	1
K	Side Rail	$\frac{3}{4} \times 1\frac{1}{2} \times 11$	2
L	Upper Back	$\frac{1}{4} \times 3\frac{3}{4} \times 30$	1
M	Lower Back	$\frac{1}{4} \times 20 \times 27\frac{1}{4}$	1
N	Drawer Front	$\frac{3}{4} \times 3\frac{3}{4} \times 14\frac{7}{8}$	2
O	Drawer Side	$\frac{1}{2} \times 3\frac{3}{4} \times 20\frac{1}{4}$	4
P	Drawer Back	$\frac{1}{2} \times 2\frac{3}{4} \times 13\frac{7}{8}$	2
Q	Drawer Bottom	$\frac{1}{4} \times 13\frac{7}{8} \times 20\frac{1}{8}$	2
R	Drawer Pull	$3\frac{1}{2}$ in. brass*	2

*Order from The Woodworkers' Store, 21801 Industrial Blvd., Rogers, MN 55374. Part no. D2191.

and the drawer divider are glued and clamped in place between the sections. Finally, nail or screw the upper back in place.

The drawers are made to the size of the actual opening, which often varies slightly from the plans. The bevels on the drawer fronts (N) can be cut on the table saw or with a panel raising bit in the router. We cut ours on the table saw and cleaned up the cut with a sanding block. First, set the saw blade for a 15-degree cut, then adjust the fence so you're removing $\frac{3}{16}$ in. from the front of the panel. When cutting the bevels, use a tenon jig for safety and cut the ends first to eliminate any chip-out on the finished surfaces.

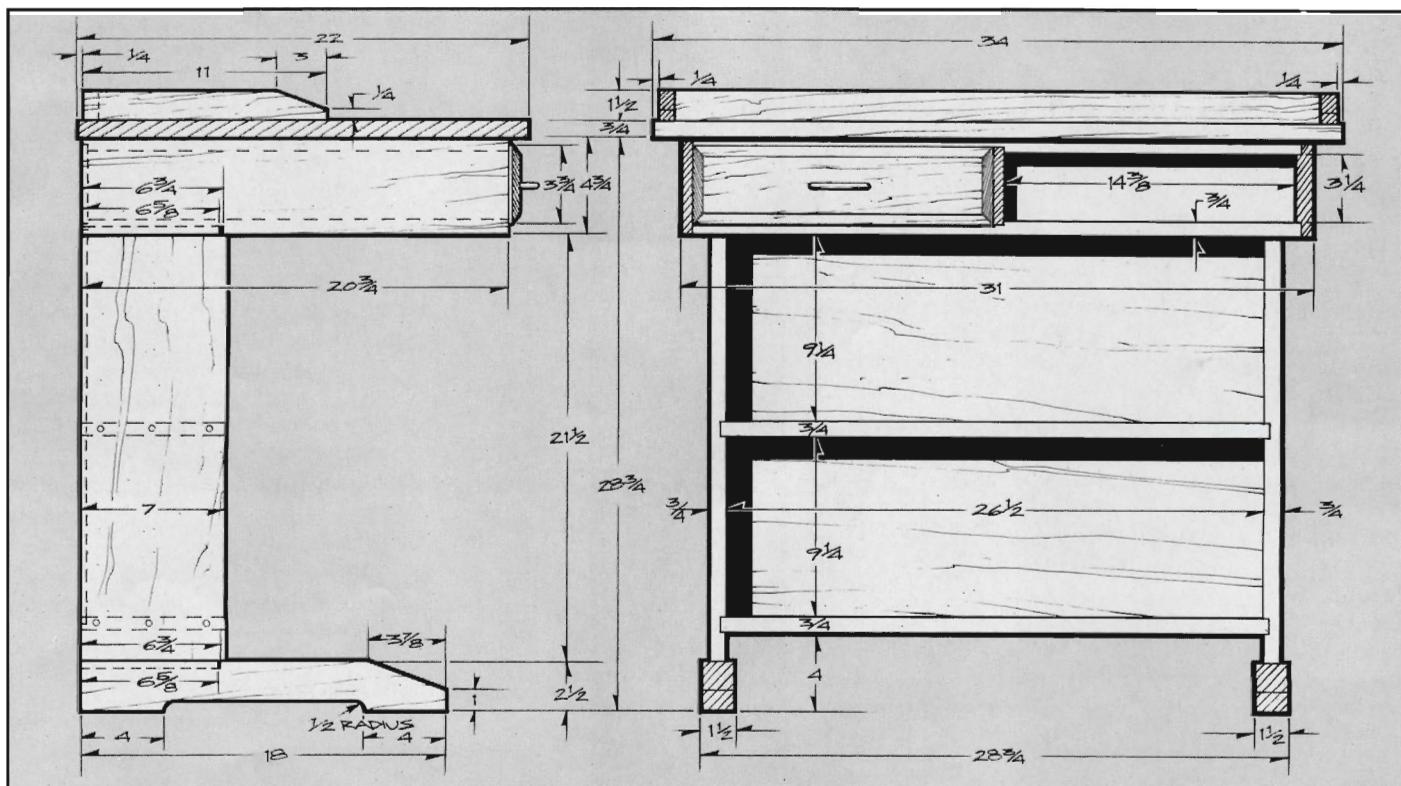
Next, use the $\frac{1}{4}$ in. straight cutter in the router table to establish the rabbets around the drawer face. The rabbet is $\frac{1}{4}$ in. top and bottom, but $\frac{3}{4}$ in. on each side.

Also use the $\frac{1}{4}$ in. cutter for the drawer bottom (Q) grooves cut into the sides (O) and the front. Use a $\frac{1}{2}$ in. straight cutter to establish the dado in the sides for the back (P), which fits on top of the bottom. Cut the $\frac{1}{4}$ in. plywood for the bottoms after measuring the actual groove bottom-to-groove bottom distance on the drawers. Cut them a little shy to allow some room for wood movement.

Sand the bevels thoroughly to remove the saw marks and sand the drawer parts prior to assembly.

Apply three coats of tung oil, rubbing with 000 steel wool between coats. Let each coat dry overnight. 

(continued on next page)





For those who frequently cut angles, our jig should save hours spent fine tuning the miter gauge. Truly accurate cuts often require more time for adjustments than for making parts. The obvious solution is a miter gauge that's set once for a specific angle, and put aside until needed.

We liked the idea so much we made two for our shop, one for 45 degrees and one for 22½ degrees. The 22½-degree jig described here is used for cutting octagon segments for the bezel of our Captain's Clock project on page 33. The jig remains basically the same for any angle, you just change the locating holes for the guide pieces. You may wish to change the overall dimensions, however, to fit your saw. Ours is made to fit a 10 in. Delta Unisaw table saw.

The jigs also allow cuts from both sides of the saw blade, an operation that often requires readjusting the conventional miter gauge.

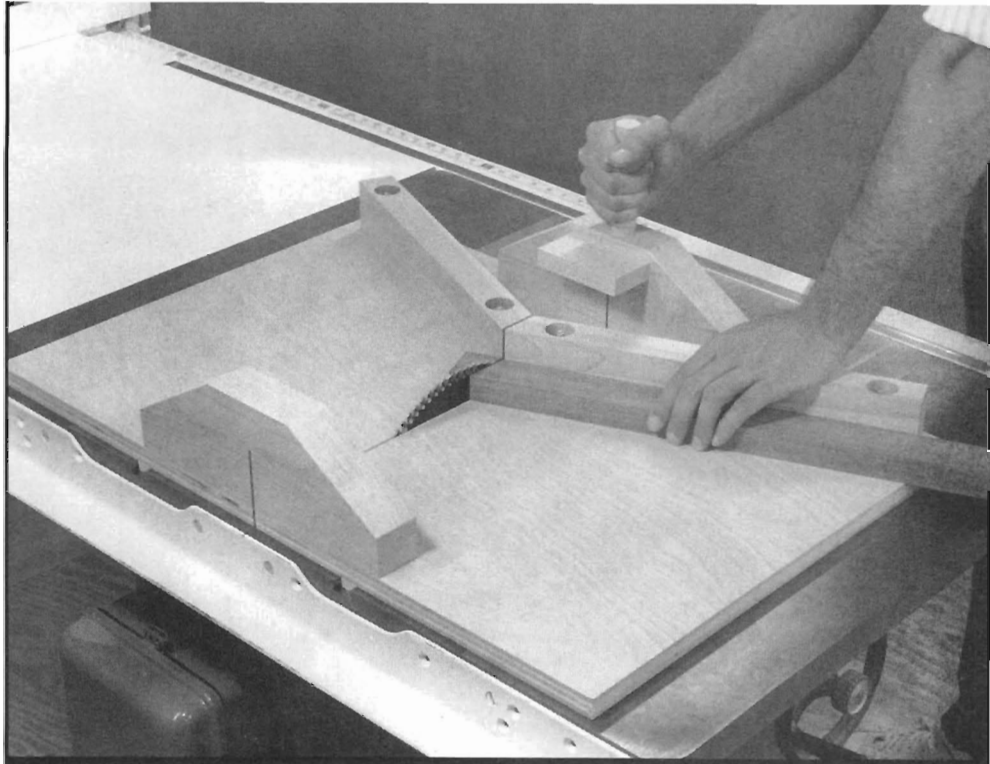
First, cut the stock to the sizes shown in the Bill of Materials. We used maple for the solid stock and birch plywood for the base (A). Note that the base is two pieces of wood in the finished jig, but one during construction. The kerf along the entire jig width splits the plywood, but it's cut after assembly. When cutting the runners (B), carefully match them to the width of the miter-gauge slots in your saw table. They should slide easily and move side-to-side just enough for an audible click. Also note that the distance between runners may vary from saw to saw.

If you wish, you can glue strips of wood together to build up stock for the 1½ in. thick guide pieces (C), as well as the 1¼ in. thick cleat blocks (D).

Next, taper the cleat blocks. They're higher at the center to allow for as deep a saw kerf as possible, while still providing enough strength to hold the jig together. Use the band saw or a tapering jig in the table saw to cut the four tapered shoulders. Be sure to cut the angles on the ends of the guide pieces with the table saw for a smooth cut.

Now drill all the holes except those for the runners, which are drilled while test-fitting the jig on the saw.

First, counterbore for the carriage bolts (G) in the guide pieces. We used a 1½ in. Forstner bit and drilled ¾ in. deep. Also drill the 1 in. diameter hole in the front cleat block for the dowel handle (E), and the ⅞ in. diameter by ¼ in. deep counterbore in the plywood for the carriage bolt heads. Finally, drill the shank holes for the carriage



Miter Cutting Jig

bolts. Note that two of the four holes in the guide pieces are drilled ⅛ in. oversize to allow for adjustment, but all the shank holes in the plywood are drilled to the ⅞ in. diameter of the bolt.

The next step, aligning and screwing the runners to the base, is a bit tricky because the strips are too thin to allow you to screw them in place from the top. But proper alignment is important so that the jig slides smoothly and lines up squarely to the saw blade. The second consideration is less important, however, because you cut the kerf after building the jig, and it's that kerf that serves as the reference line for adjusting the jig. (We used a protractor to roughly set the jig, and then fine tuned it by cutting a series of test octagons.)

The procedure we used is: Mark a center line on the plywood base and set it on the table saw. Line up the center line with the center of the saw blade. (You may have to scribe a line from the saw blade to the front edge of the table saw.) Mark the slot locations on the base (A), both at the front and back. Remove the plywood and use a square to connect the marks.

Clamp the two runners in place on one end, test the jig in the slots and drive two screws in near the edge. Remove the clamps. Slide the jig so the

unsecured ends of the runners hang over the table edge, clamp the ends again and screw them in. Now remove the jig and set the rest of the screws, but just tighten them snug, not fast. Test the jig in the slots and tap the runners for adjustment. When it slides smoothly, tighten the screws.

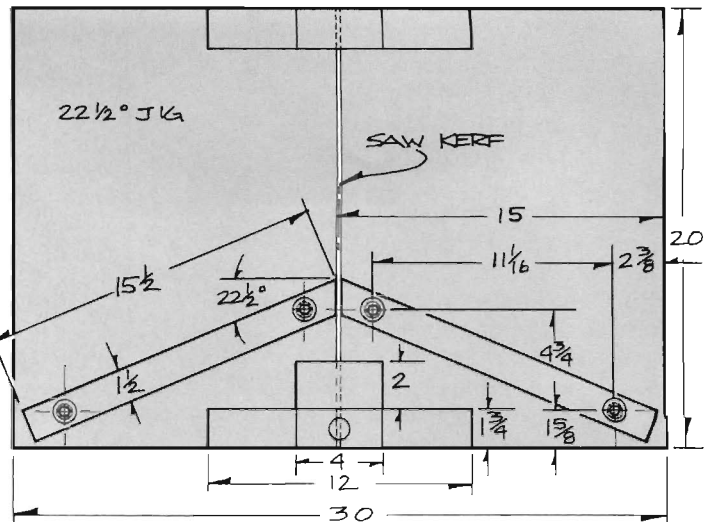
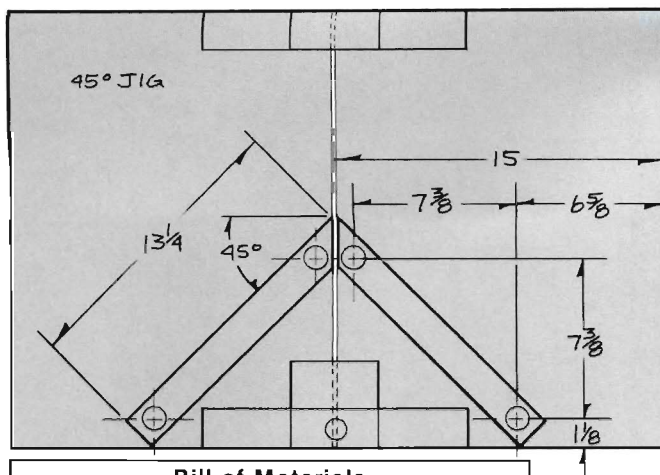
Note that the screws may spread the strips slightly, so you may have to sand them lightly to get them to slide easily again.

With the strips in place, complete assembly by bolting the guide pieces in place, screwing on the cleat blocks and gluing on the handle and guard (F). The handle is a safety feature that allows you to operate the jig without putting a hand on the cleat block, where a careless move could cost you a finger. The guard also helps keep fingers out of harm's way.

Set the saw blade for a 2½ in. high cut and establish the kerf. Adjust the guide pieces by snugging up the bolts and tapping the sides lightly with a hammer. To be sure the miter gauge jig is set accurately, cut all eight sides of an octagon and fit them together. Adjust the guide pieces as needed until you get a test octagon where the miters are perfect, and then tighten the bolts.



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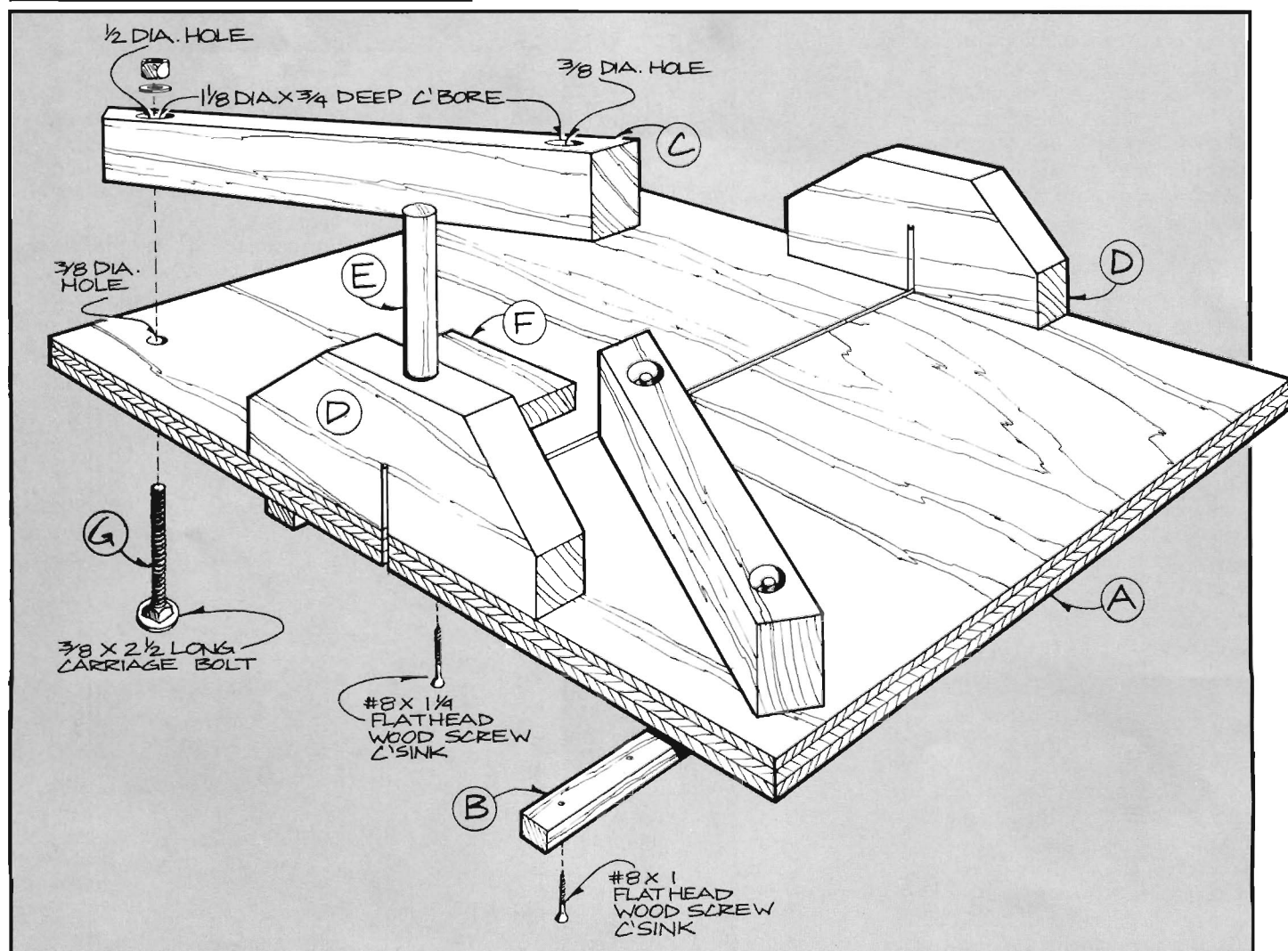
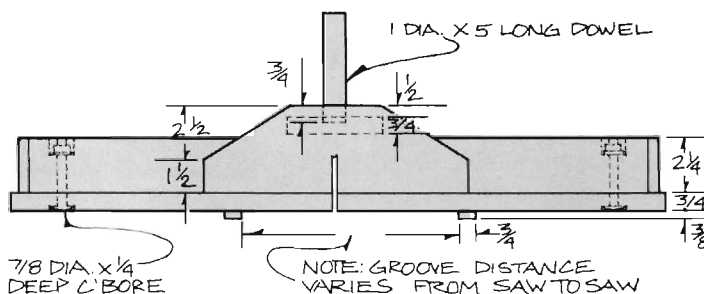


Bill of Materials

Part	Description	Size	No. Req'd.
A	Base	3/4 x 20 x 30	1
B	Runner	3/8 [3/4 x 20*	2
C	Guide Piece	1 1/2 x 2 1/4 x **	2
D	Cleat Block	1 3/4 x 4 x 12	2
E	Handle	1 in. dia. x 5 in. dowel	1
F	Guard	3/4 x 2 x 4	1
G	Bolt	3/8 in. x 2 1/2 carriage bolt, nut, and washer	4

*Size runner to your miter gauge slot.

**13 1/4 long for 45° jig; 15 1/2 long for 22 1/2° jig.





Captain's Clock

A clock at the Mystic Seaport Museum inspired Connecticut woodworker Dennis Preston to take measurements and build this reproduction.

The clock typically hung in the officers' dining quarters, or wardroom, of 19th-century ships. The original was built by Connecticut clockmaker Seth Thomas about 1880. Preston's clock substitutes a quartz movement for the original key-wound mechanism, but the clock still sounds out the watches. On ships the day was divided into six four-hour watches, and the bells sounded every half hour. Seafarers knew the time by counting the chimes. Eight bells sounded at noon, 4 p.m., 8 p.m., midnight, 4 a.m. and 8 a.m.

Construction of the clock is fairly straightforward. The clock case (A) and bezel (B) are each made from eight

sections of mahogany. The sections are joined with splines and then turned on the lathe. Rabbits on the inside edges of the case and bezel hold the back (C), glass (D), and dial face (F).

The eight-sided mahogany rings are joined according to the instructions in our "Joining Ring Segments" Special Techniques article on page 17. The grain on the eight segments in each ring runs tangent to the edge of the clock for both the case and bezel. The grain arrangement keeps the clock stable. All wood movement is directed to the front or back, rather than side to side, where the metal dial face would constrict it.

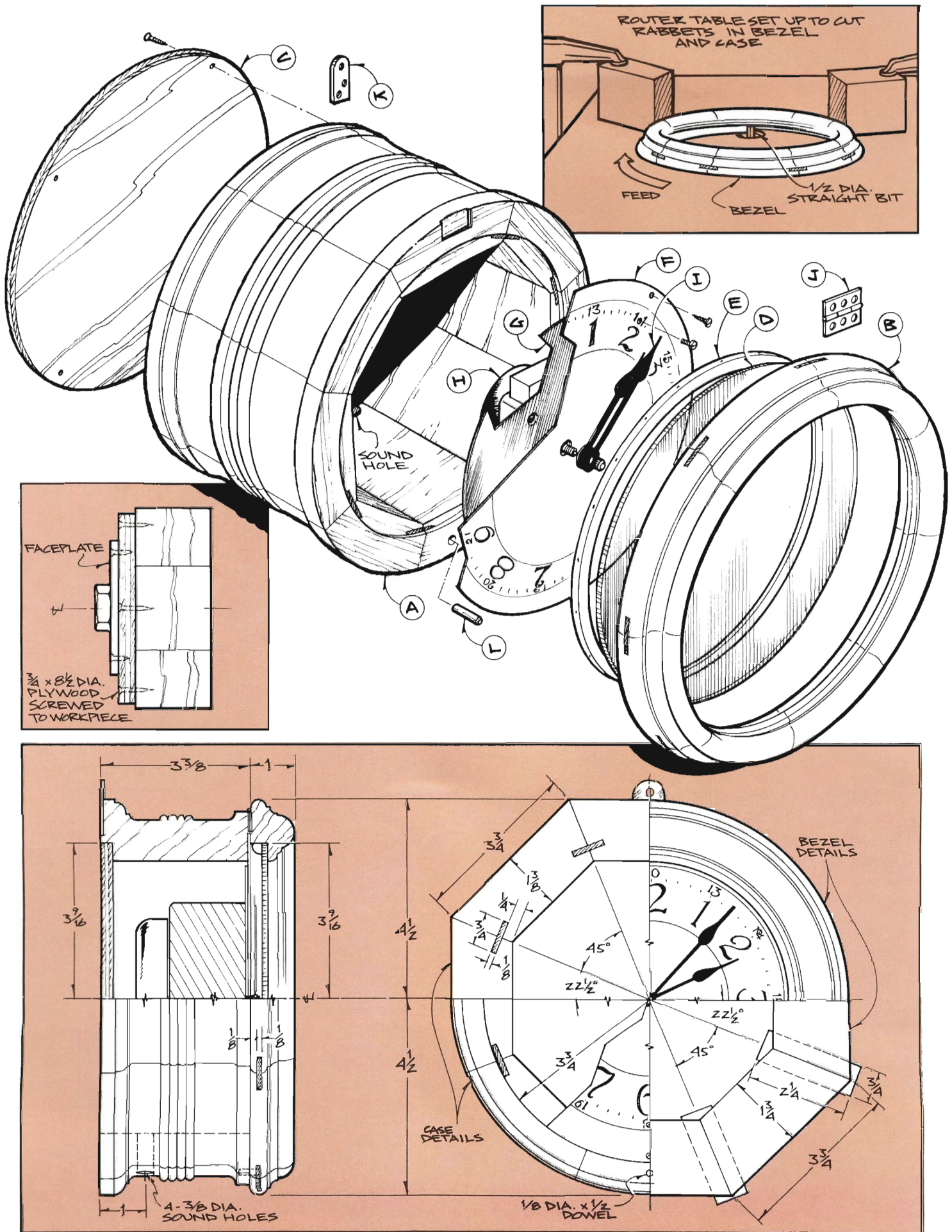
The segment lengths in both octagons are $3\frac{3}{4}$ in. The stock is $1\frac{3}{8}$ in. thick for the case, $1\frac{1}{4}$ in. thick for the bezel. Both parts are turned to a 9 in. diameter.

Once the two octagons are ready, mount them on $\frac{3}{4}$ in. plywood backs (see Detail). Use eight $1\frac{1}{4}$ in. by no. 8 screws for attaching each mahogany octagon to the plywood, one screw for each segment. Keep the screws well away from the outer edges so they don't interfere with the turning. File any protruding splines flush with the case and bezel.

The actual turning of the case is similar to that for the outside of a bowl. You can transfer our full-sized pattern to plywood and use it as a guide or template.

The turning job can be tricky because the changing grain direction tends to grab the chisel and make it chatter, especially when roughing out the case. Be careful and use your slowest lathe speed, both for the chat-

(continued on next page)



tering and because you're turning a large diameter. When starting, use a heavy gouge and let the bevel ride against the case before you raise the handle and gently engage the cutting edge. Work with the gouge angled slightly away from you, toward the direction of cut.

You may need to use a scraping rather than a cutting action of the gouge, with the tool edge angled slightly down. The scraping cut is often used in difficult situations where the grain grabs the cutting edge. Angling the tool down makes the edge tear off small fragments, rather than slicing into the wood. It's not as smooth as cutting, but it's easier.

After roughing the cylinder, cut the bead details with the skew chisel. Use a small gouge or roundnose to cut the concave sections. Again, if you have trouble handling the tools, you may need to use a scraping action. After rough-shaping the outside of the case, sand it thoroughly. Start with 120-grit paper and finish with 220-grit.

Next, remove the case from the faceplate and mount the bezel. The bezel is turned much the same as the case, except that the tool rest is angled across the front of the faceplate for most of the work. You'll probably need to cut into the plywood mounting block to get the fully rounded profile on the bezel.

Now, cut the two case rabbets and the bezel rabbet on the router table as shown in the Detail. The case rabbets hold the dial face (F) and back (C). The bezel rabbet holds the glass (D). The two blocks ride against the outside edge of the turnings and keep them aligned with the 1/2 in. diameter straight cutter. The bezel and back rabbet are cut to the same width, but to the depths shown. You'll have to move the guide blocks and readjust the depth for the wider rabbet for the dial face.

After cutting the rabbets, drill the four 3/8 in. diameter sound holes and the 1/8 in. diameter by 1/4 in. deep holes in the case and bezel for the 1/2 in. long dowel locating pin (L). The pin is glued into the case and fits into the face hole when the bezel is closed.

The bezel swings on the single hinge (J) mounted on top. Mortise the hinge carefully into the case and bezel using a sharp chisel. Also mortise the brass hanger (K) into the back. The hanger is cut and drilled from a piece of 1/16 in.

thick brass. If you can't find brass locally, you can also mount the clock by drilling a 3/8 in. hole in the back of the case.

The plywood back and the glass are both cut after the clock is completed. That insures that they match the actual openings. You can have the glass cut at any glass shop. Have them make it slightly smaller than the actual opening. Although we've used flat glass, a convex glass crystal to fit the bezel is available from Mason & Sullivan (see Bill of Materials for address). Order their part no. 2778G, which lists for \$3.95. The flat glass is held into the bezel with a keeper strip (E) and wire brads. For the convex glass crystal you'll need to use glazier's points and glazing compound instead.

Finally, oil the case and face with tung oil for a close-to-the-wood finish. You could also use spar varnish for a marine flavor. If you use the spar varnish, apply several coats to give the surface a good thick finish. Sand well between coats.

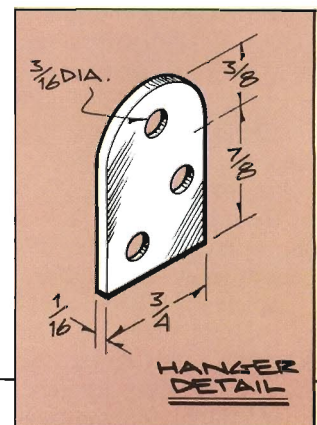
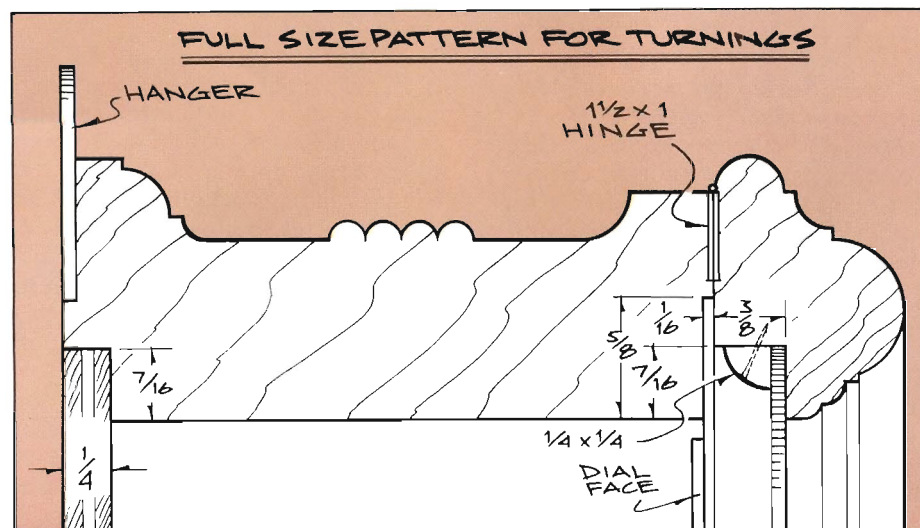
The movement (H), hands (I), brass hinge (J), dial face (F), and keeper strip (E) are available in a kit Mason & Sullivan has prepared for the project (see Bill of Materials).

Installing the movement itself only takes a few minutes. Drill three holes in the case to match those on the dial face, and use the brass screws provided to attach the face to the case. Then screw the movement onto the mounting plate (G) with the self-tapping screws, and the mounting plate to the dial face with the black machine screws. The hands are added next.

Finally, secure the back to the case with brass flathead wood screws and install the battery, not included with the kit.

Bill of Materials (all dimensions actual)			
Part	Description	Size	No. Req'd.
A	Case	9 in. dia. as shown	1
B	Bezel	9 in. dia. as shown	1
C	Back	1/4 x 7 7/8 in. dia.	1
D	Glass	1/8 x 7 7/8 in. dia.	1
E	Keeper Strip*	1/4 x 22	1
F	Dial Face*	as shown	1
G	Mounting Plate*	as shown	1
H	Movement*	as shown	1
I	Hands*	as shown	1
J	Hinge*	1 1/2 x 1	1
K	Hanger	as shown	1
L	Locating Pin	1/8 x 1/2 dowel	1

*Hardware available in kit from Mason & Sullivan, Dept. 3974, 586 Higgins Crowell Rd., West Yarmouth, MA 02673. Order part no. C-3629X for the ship's bell quartz movement, \$82, or part no. C-3609X-14 for the alternate movement \$19.95. The alternate movement doesn't include chimes. Each kit includes movement (H), face (F), hands (I), mounting plate (G), hinge (J), keeper strip (E) and wire brads. The shipping charge for the ship's bell movement is \$3.25; for the alternate movement it's \$2.39.





C O U N T R Y COFFEE TABLE

To the Shakers, function and form were as surely linked as the spoke and rim of a wheel. Every line of every board took its measure from its use.

Our Country Coffee Table would have been a puzzle to the Shakers. It's too short for a decent bench, too low to eat on, too big for a stool.

But the Shakers didn't sit on couches and they took no time for sipping coffee. If they had, they might have created this simple table, because its form also matches its function. The table top has ample room for coffee cups, nut bowls, and cheese platters. The large drawer easily holds the clutter

swept off the top moments before the guests arrive.

Massachusetts woodworker Gene Cosloy designed and built the Country Coffee Table along traditional Shaker lines. He used cherry, but with walnut drawer pulls and pegs.

Start by joining several boards for the top (A). Leave them a little long and make the panel slightly wide. You'll trim it to exact size after the glue dries. Keep the boards aligned during glue-up by lightly clamping waxed blocks across the assembly. Another way to insure proper alignment is to use splines or dowels in the joints.

Next, cut stock to size for the front apron (B), the side aprons (C) and the rear apron (D), as well as the drawer guides (E) and drawer runners (F). Cut the 12 mounting blocks (G) from a $\frac{3}{4}$ in. by $1\frac{1}{2}$ in. strip with a rabbet notched into the side (See Detail). Make the strip about 14 in. long and crosscut it into the blocks. You can make the cutout for the drawers in the front apron with the hand-held jigsaw, or with hand saws.

Now, prepare the thick stock for the legs (H), truing and planing a plank before ripping it into four legs. Clean up the legs with a plane or a jointer.

Leave the lumber for the drawer parts off to the side. Drawers are always made to fit the actual opening.

Next, assemble all the parts the way you want them, paying close attention to the way the wood grains meet. When you have a pleasing arrangement, label the parts. Now, carefully lay out the location of the mortises and tenons, as well as the dados for the drawer guides, and the slot for the mounting blocks.

The mortises are open at the top, so you can cut them easily by hand. Use a dovetail saw to cut with the grain along each shoulder of the mortises. You'll only be able to cut a slanted kerf along the mortise shoulder (Fig. 1A). But the

triangular cut serves as a guide for the chisel while removing the rest of the wood (Fig. 1B).

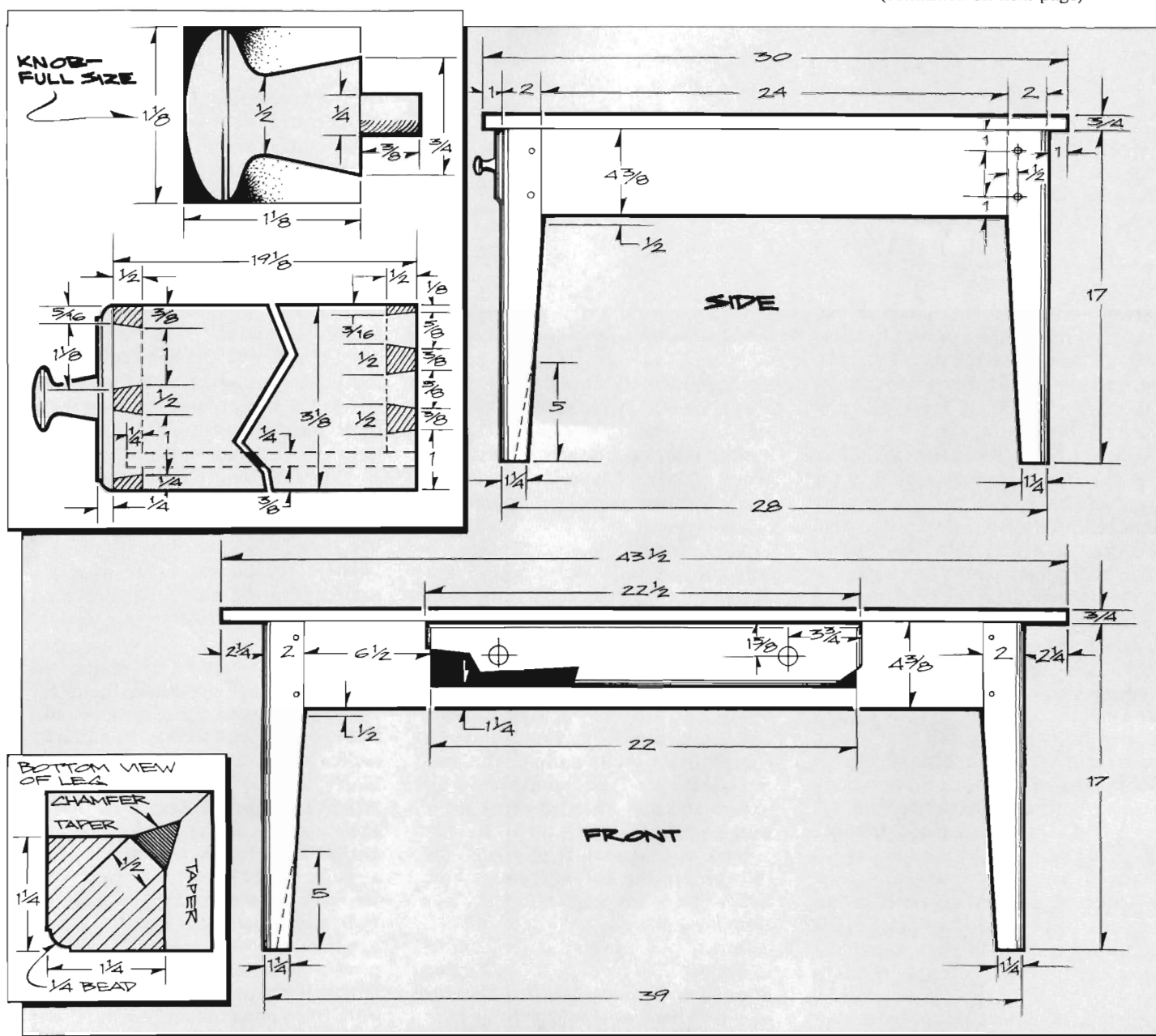
The tenons can also be cut by hand. First, use a handsaw to cut the $\frac{3}{16}$ in. deep shoulders on all the apron ends. Then cut into the end grain with a backsaw, carefully halving the line down to the shoulder (Fig. 2). If you're tentative about the cut, stay off the line and pare the tenon to size with a file. The tenon should slide easily into the mortise. If you have to force it in, it's too tight.

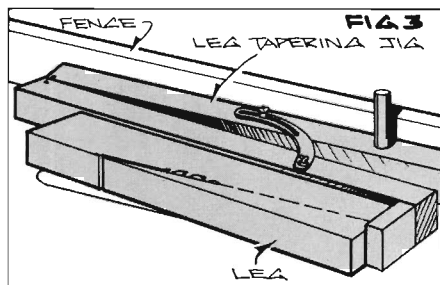
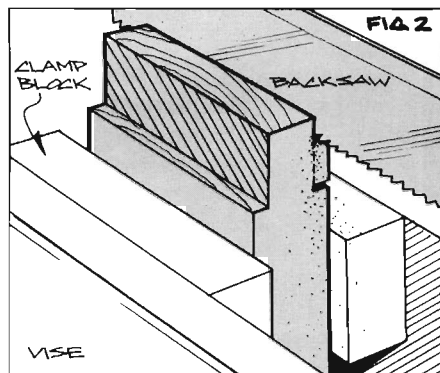
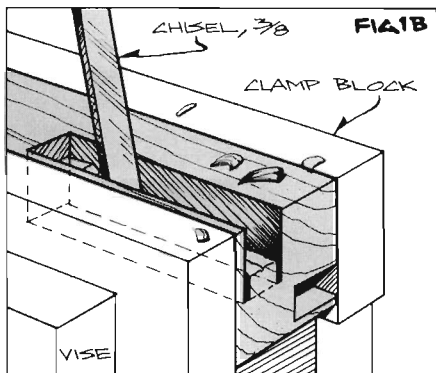
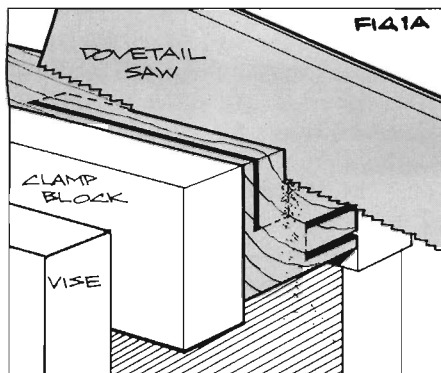
Next, drill the holes for the walnut pegs. Bore all the holes in the legs first, and then mark the matching holes in the tenons while dry-fitting the parts.

Note that the mortise in the legs only leaves a $\frac{3}{16}$ in. shoulder. The thin stock requires extra care when drilling the holes and clamping the legs to the aprons. You might want to drill for the pegs while dry-fitting the mortises. That way the tenon backs up the cut and prevents vibration while boring.

Cut the leg tapers next. Each leg has its two inside edges tapered from just below the apron. These can be cut on the table saw with a tapering jig (Fig. 3). But for the secondary taper toward the bottom, use a block plane. That taper, or chamfer, is cut along the inside corner. Lay out the taper, and cut down to the line with the plane (Fig. 4). Make sure you clamp the leg into the

(continued on next page)





V-block for stability.

Next, cut the beads into the outside corner of each leg. Use a $\frac{1}{4}$ in. beading bit in the router table.

Also using the router, cut the dados in the aprons for the drawer guides, and plough the grooves for the mounting blocks.

Now, assemble the table. When clamping the legs, be careful to apply pressure so each clamp pulls the tenon into the mortise. If the clamps squeeze the mortise, or apply cross pressure, they will distort the joint. It's best to work with two gluing sessions. First, glue the front and back aprons to the legs, and then glue the whole piece together. Use screws as shown to hold the drawer guides into the aprons. Glue the runners onto the guides.

The drawer is traditional dovetail construction. There are half-blind dovetails where the sides meet the front, and open dovetails where the sides meet the back. But you should note that the drawer front (I) only has a lip on the two sides. All four edges, however, have a $\frac{1}{4}$ in. bead detail.

To start, cut all the drawer parts except the bottom to size, then orient the parts and label them. Next, establish the $\frac{1}{4}$ in. deep lips on the sides of the drawer front.

Scribe the depth of cut for both tails and pins with a marking gauge. (The tails are the portion that resemble a dove's tail; the pins are the matching beveled shoulders.) Set the gauge a hair over $\frac{1}{2}$ in., the thickness of the drawer sides (J). Scribe lines on the inside of

Bill of Materials (all dimensions actual)				
Part	Description	Size	No. Req'd.	
A	Top	$\frac{3}{4} \times 30 \times 43\frac{1}{2}$	1	
B	Front Apron	$\frac{3}{4} \times 4\frac{3}{8} \times 37$	1	
C	Side Apron	$\frac{3}{4} \times 4\frac{3}{8} \times 26$	2	
D	Rear Apron	$\frac{3}{4} \times 4\frac{3}{8} \times 37$	1	
E	Drawer Guide	$\frac{3}{4} \times 4\frac{3}{8} \times 27$	2	
F	Drawer Runner	$\frac{3}{4} \times \frac{5}{8} \times 23\frac{1}{2}$	2	
G	Mounting Blocks	See Detail	12	
H	Leg	$2 \times 2 \times 17$	4	
I	Drawer Front	$\frac{3}{4} \times 3\frac{1}{8} \times 22\frac{1}{2}$	1	
J	Drawer Side	$\frac{1}{2} \times 3\frac{1}{8} \times 19\frac{1}{8}$	2	
K	Drawer Back	$\frac{1}{2} \times 2\frac{1}{2} \times 22$	1	
L	Drawer Bottom	$\frac{1}{4} \times 18\frac{7}{8} \times 21\frac{1}{2}$	1	
M	Drawer Pull	See Detail	2	

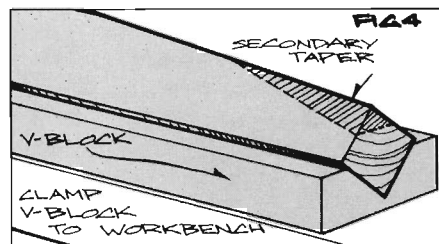
the drawer front, on both ends of the drawer back (K), and on both ends of each side. When marking the sides and back, run the lines on all four surfaces. When marking the front, be sure to gauge off the inside of the lip, not the outside edge of the drawer.

After scribing the depths, mark the tails on the sides as shown in the dovetail layout. Extend those lines across the end grain. Use a sharp knife or similar implement for marking. Mark the waste sections with an "X."

Use a dovetail saw to cut the tails to depth. Stay on the waste side of the line. Use a chisel to cut along the depth line. But, for the first chisel cut, stay just off the line. The chisel creeps a bit toward the line when you first hit it with a mallet.

Next, trace the tail profiles onto the end grain of the drawer front and the back. Use a try square to run lines from the end grain to the depth marks.

Also use the dovetail saw and chisel to cut out the pins. For the half-blind dovetail in the front, you won't be able to cut all the way through with a saw. However, you can make a triangular



cut from the inside. Hollow out the remainder of the cut with a chisel.

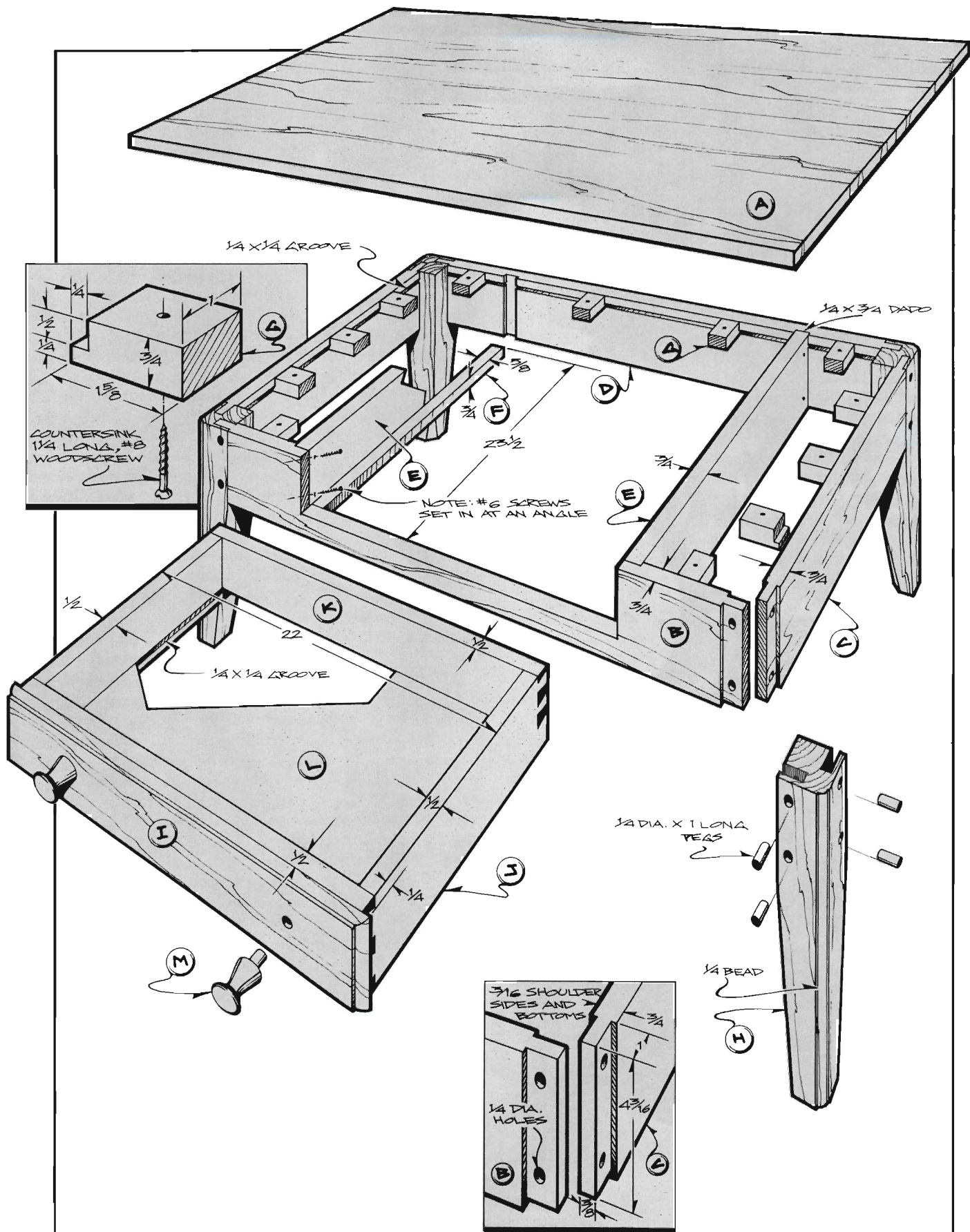
You may need some final chisel work to get the dovetails to fit correctly. They should go together snugly. If you have to bang on them, they'll split after gluing. The glue swells the wood.

After cutting the dovetails, make the $\frac{1}{4}$ in. deep by $\frac{1}{4}$ in. wide groove in the drawer sides and front to accept the bottom (L) and the $\frac{1}{4}$ in. bead on the drawer face. The drawer back fits on top of the bottom, which runs to the end of the side grooves. This arrangement allowed traditional drawer bottoms to expand toward the rear without distorting the drawer. You'll probably use plywood for the bottom, eliminating expansion problems, but it's still an elegant way to build a drawer. The bottom is cut after the drawer parts are dry-fit together to get the actual groove-to-groove dimensions.

Finish construction by gluing the drawer together and drilling holes for the pulls. You can either turn the pulls to the dimensions shown, or purchase similar ones. Pulls are available in maple from Woodcraft Supply, 41 Atlantic Ave., P.O. Box 4000, Woburn, MA 01888. Order part no. 50L41, \$3.25 for 10, postpaid.

To finish the Country Coffee Table we recommend two coats of tung oil over a well-sanded surface. You should use at least 220-grit paper. The tung oil gives a nice close-to-the-wood finish, although it's not as durable as a varnish. Use a polyurethane varnish if you anticipate plenty of spills.





Our rooster adds a slice of barnyard to your windowsill, but comes without the predawn wake-up call. Don't be surprised, however, if the house cat resents the intruder on the perch.

We made the rooster from $\frac{3}{4}$ in. maple, but almost any wood will do. Softwoods work more easily, so you may choose to use pine, at least for the silhouette.

First transfer the full-size profile to the wood. Rough cut the rooster, preferably with a scroll saw. You can also use a band saw or jigsaw, although it will be harder to form all the facets. The inside details must be cut with a coping saw or scroll saw.

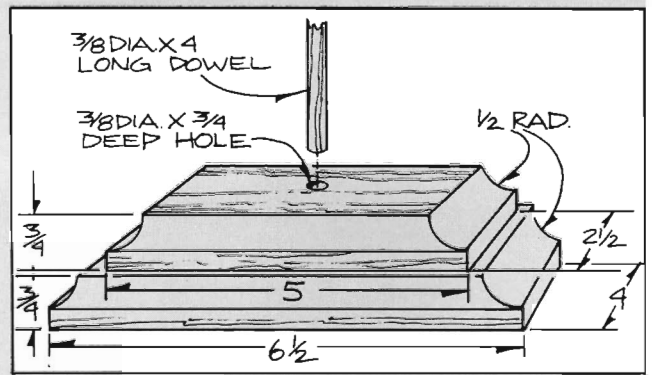
The most time-consuming part of the project is cleaning up the cuts. You'll need several shapes of small wood files to get into the corners. We used two sizes of half-round files, a round file, and a small triangular file. For sanding the edges, we used a dowel and some small slips of scrap wood wrapped with sandpaper to get into the facets.

Use a $\frac{1}{2}$ in. half-round bit in the router table to cut the details on the base, which is built up with two $\frac{3}{4}$ in. boards.

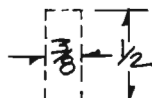
We painted the silhouette with barn red milk paint. The paint, which covers in one coat, is available from The Old Fashioned Milk Paint Co., P.O. Box 222, Groton, MA 01450. 

Rooster Folk-Art Silhouette





FULL-SIZE PATTERN



Harvest Basket



Those who have a backyard garden will find a basket like this handy for collecting the daily harvest. It's an easy weekend project that also doubles as a picnic basket.

We used $\frac{3}{4}$ in. pine for the pumpkin cutouts and birch dowels to connect them. The handle is $\frac{3}{8}$ in. dowel, and the basket is $\frac{3}{8}$ in. dowel.

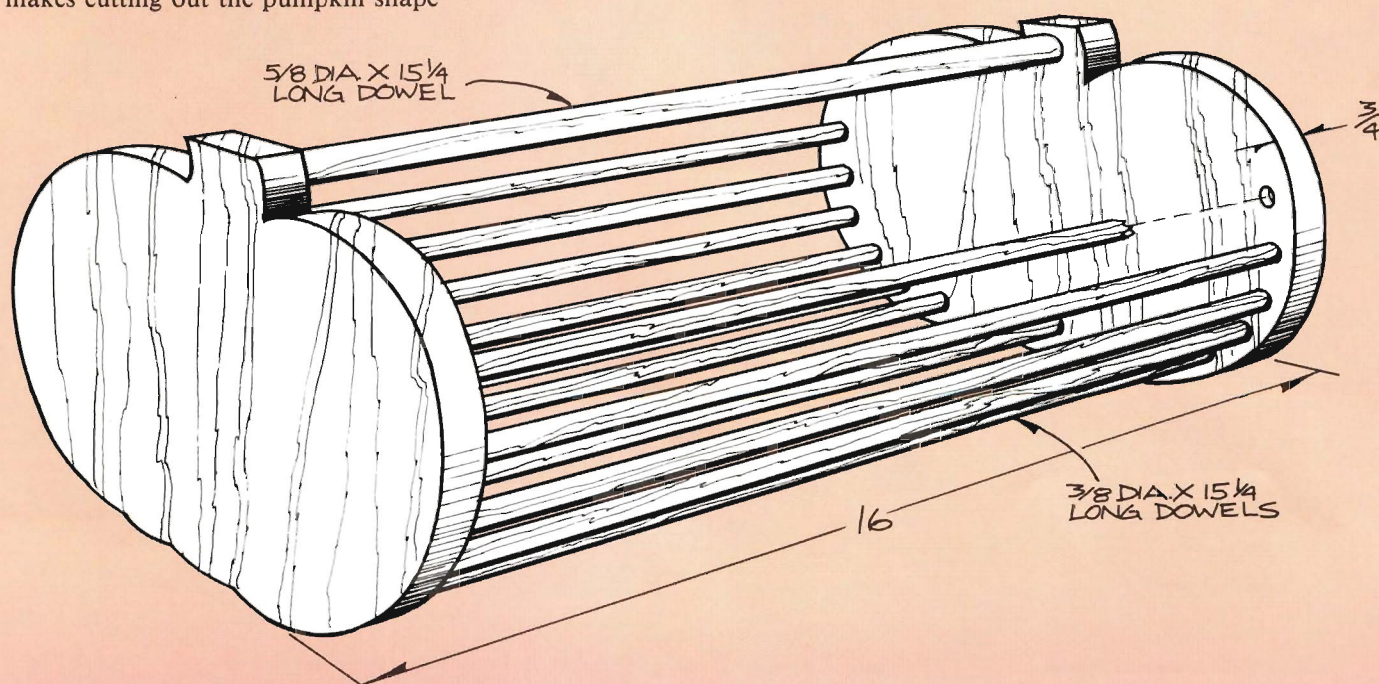
The full-size pattern we provide makes cutting out the pumpkin shape

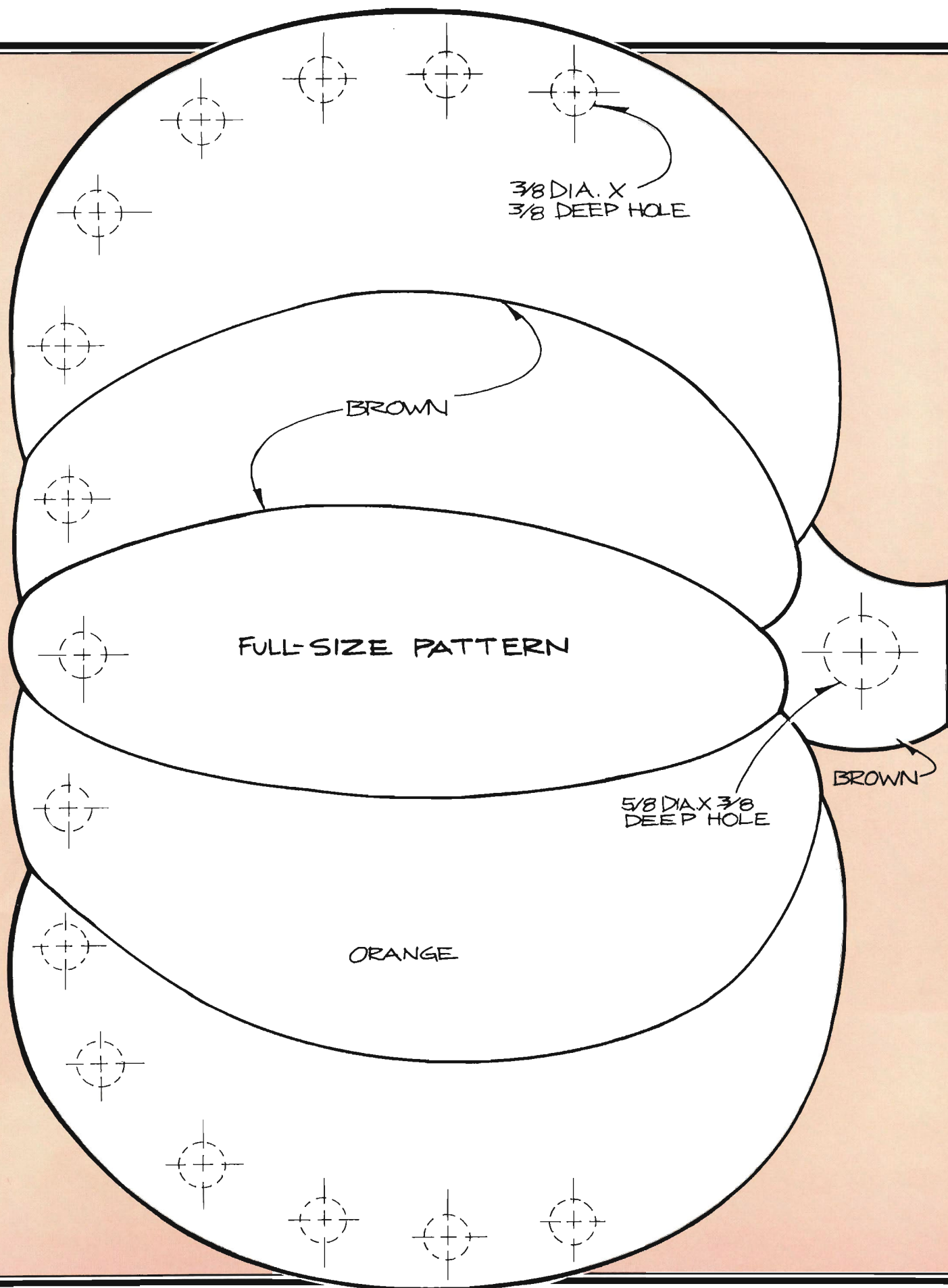
easy. Just transfer the shape to tracing paper, mark it onto the wood and cut it out with a coping saw or band saw. Clean up the rough edges with wood files and sandpaper.

You'll need eight 36 in. lengths of $\frac{3}{8}$ in. dowel and one length of $\frac{3}{4}$ in. dowel. You can buy the dowels locally or order them from Craftsman Wood Service Co., 1735 W. Cortland Court,

Addison, IL 60101.

We used oil paints on the pumpkin. First we applied a coat of flat paint to make a good base, then we used semi-gloss colors: orange for the pumpkin body, brown for the stem and green for the handle. Sand with 150-grit paper between coats of paint.





This bird is one of toymaker Skip Arthur's most popular designs, and is also one of the easiest to make. A cam on the wheels generates a flapping motion of the wings. Although he builds these birds of birch, with mahogany wings, you may want to try other woods.

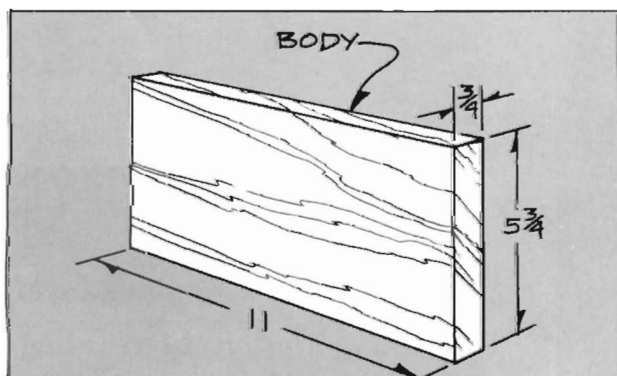
The construction is very straightforward. After sizing the stock for the body (Step 1), you'll lay out the body profile, the eye, axle, wing screw holes, and the wing-pin slot (Step 2). Drill out the various holes and rout the wing-pin slot (Step 3) before you cut the body profile on the band saw (Step 4). The wing-pin slot is routed freehand and need not be precise, since it only provides a stop for the dowel pin mounted in the wing. Note that a scrap block protects the piece from being marred by the clamp. Next, round over the body profile using a $\frac{3}{8}$ in. diameter round-over bit (Step 5). Note that the bit depth should be set slightly less than the full $\frac{3}{8}$ in., so you'll have a small flat for the bearing to ride on.

Resaw stock for the wings using a pivot point guide on the band saw (Step 6). The pivot point enables you to accurately follow a line for resawing if your blade does not track absolutely parallel to the fence. After hand-planing the resawed stock for the wings, transfer the wing profile, the wing pin

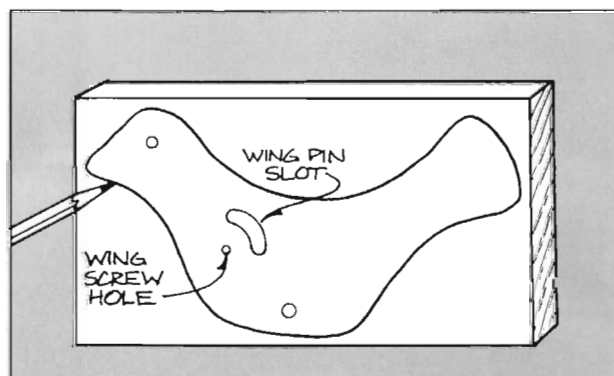
and the wing screw holes, and drill these holes out. Don't forget that you'll be working with mirror images on the wings, so get the wing-pin hole and the wing-screw counter-sink on the proper side of each wing relative to whether it is the left-side or right-side wing. Next, cut the wings on the band saw (Step 7).

You'll need $1\frac{1}{4}$ in. thick stock for the two wheels. Although you could lathe-turn the blanks for the wheels, it's just as easy to rough out the blanks with the band saw, and then sand them on the disk sander. Lay out the cam profile using the full-size pattern as a guide, and then use the dovetail saw and chisel to shape the cam (Step 8). Drill out the $\frac{5}{16}$ in. diameter axle hole, and round the outside edge of the wheels (Step 9) before final assembling the bird (Step 10). Note that the dowel pin riding in the wing pin slot prevents the wings from pivoting too far. The wing movement depends on how you align the cams on the opposing wheels when the wheels are glued to the axle dowel. The cams aligned together will make the wings move in unison; 180-degree opposition of the cams will result in alternating wing movement. As with most wooden things for small children, no finish is always the best choice. 

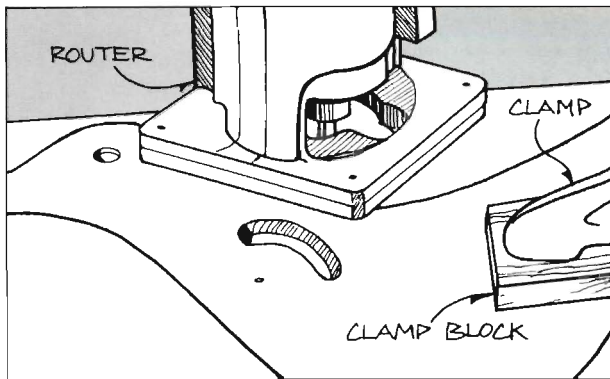
The Gift Shop



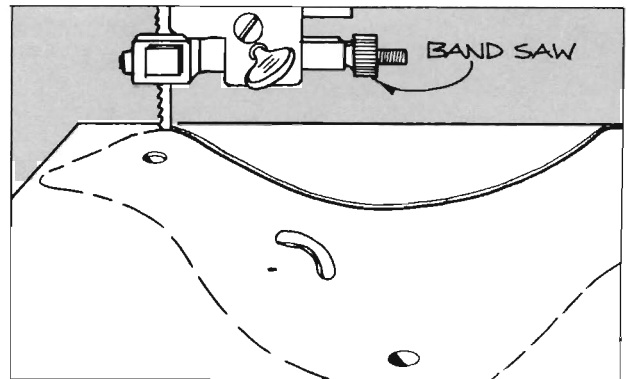
Step 1: Size stock for bird body.



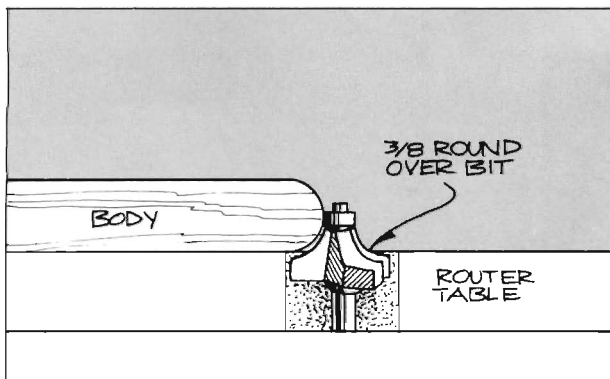
Step 2: Transfer bird profile, including eyehole, axle hole, wing screw hole, and wing-pin slot.



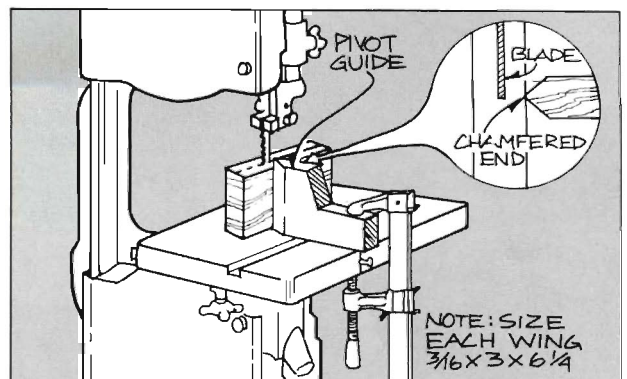
Step 3: Drill eye and axle holes; rout wing-pin slot.



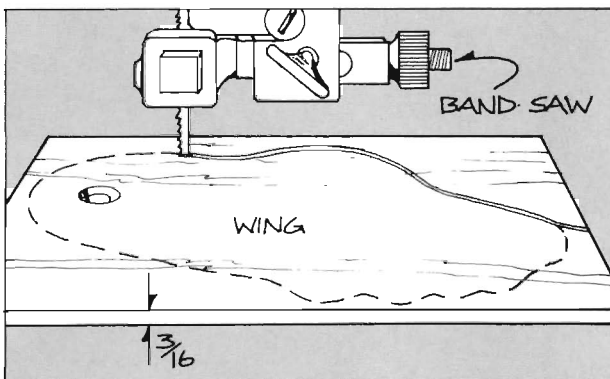
Step 4: Cut out bird profile on band saw.



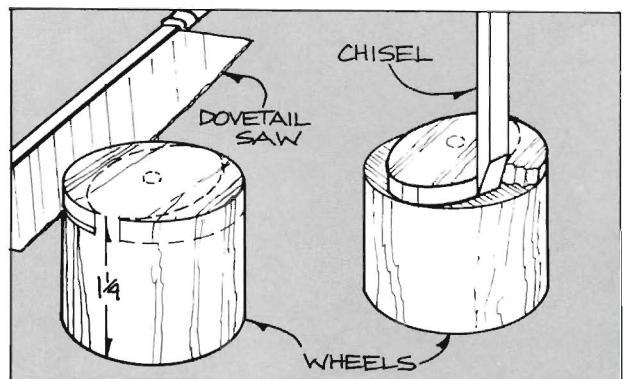
Step 5: Round over edges with $\frac{3}{8}$ in. radius round-over bit in router table.



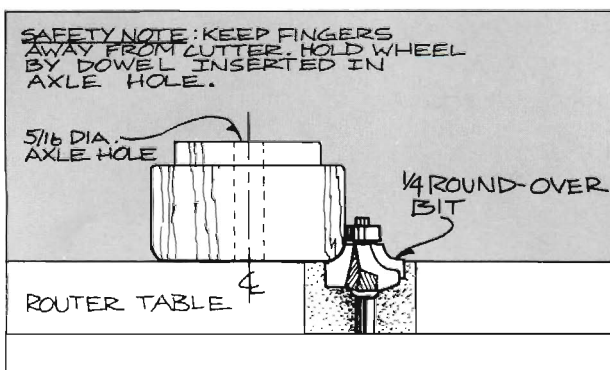
Step 6: Resaw stock for wings.



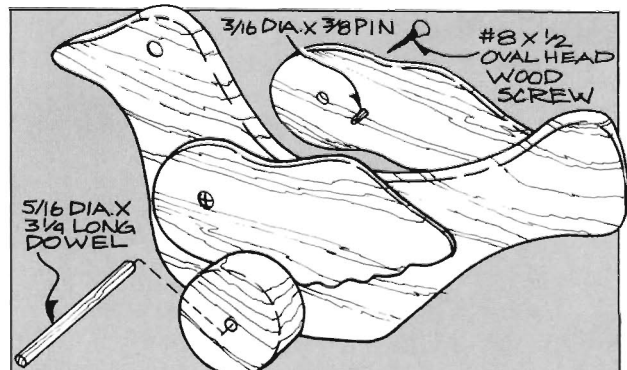
Step 7: Lay out wing profile, drill screw and pin holes in wing, then cut to shape on band saw.



Step 8: Lay out, cut and shape wheels, using dovetail saw and chisel to shape cam.

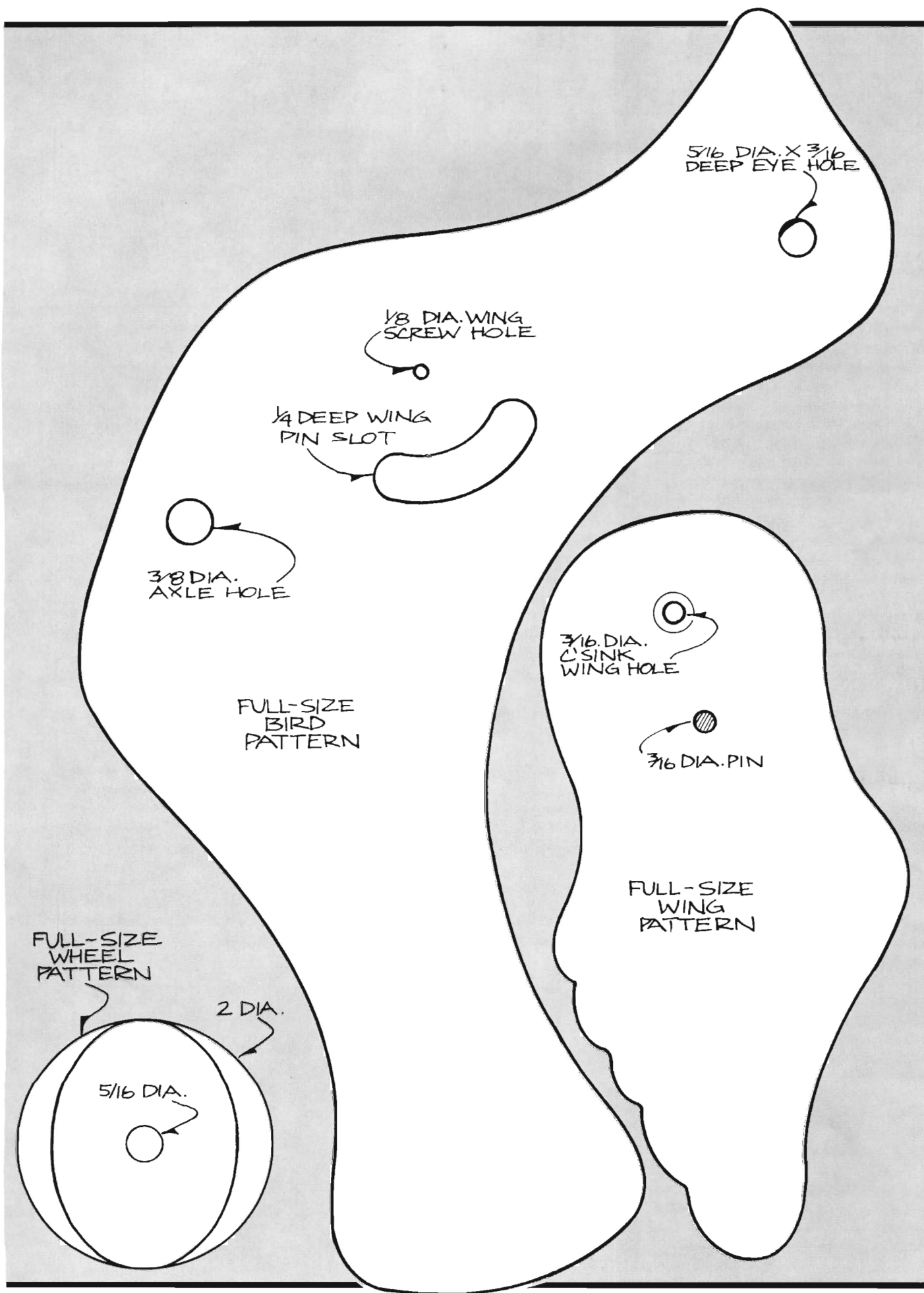


Step 9: Drill axle hole in wheels; round outside edge to $\frac{1}{4}$ in. radius.

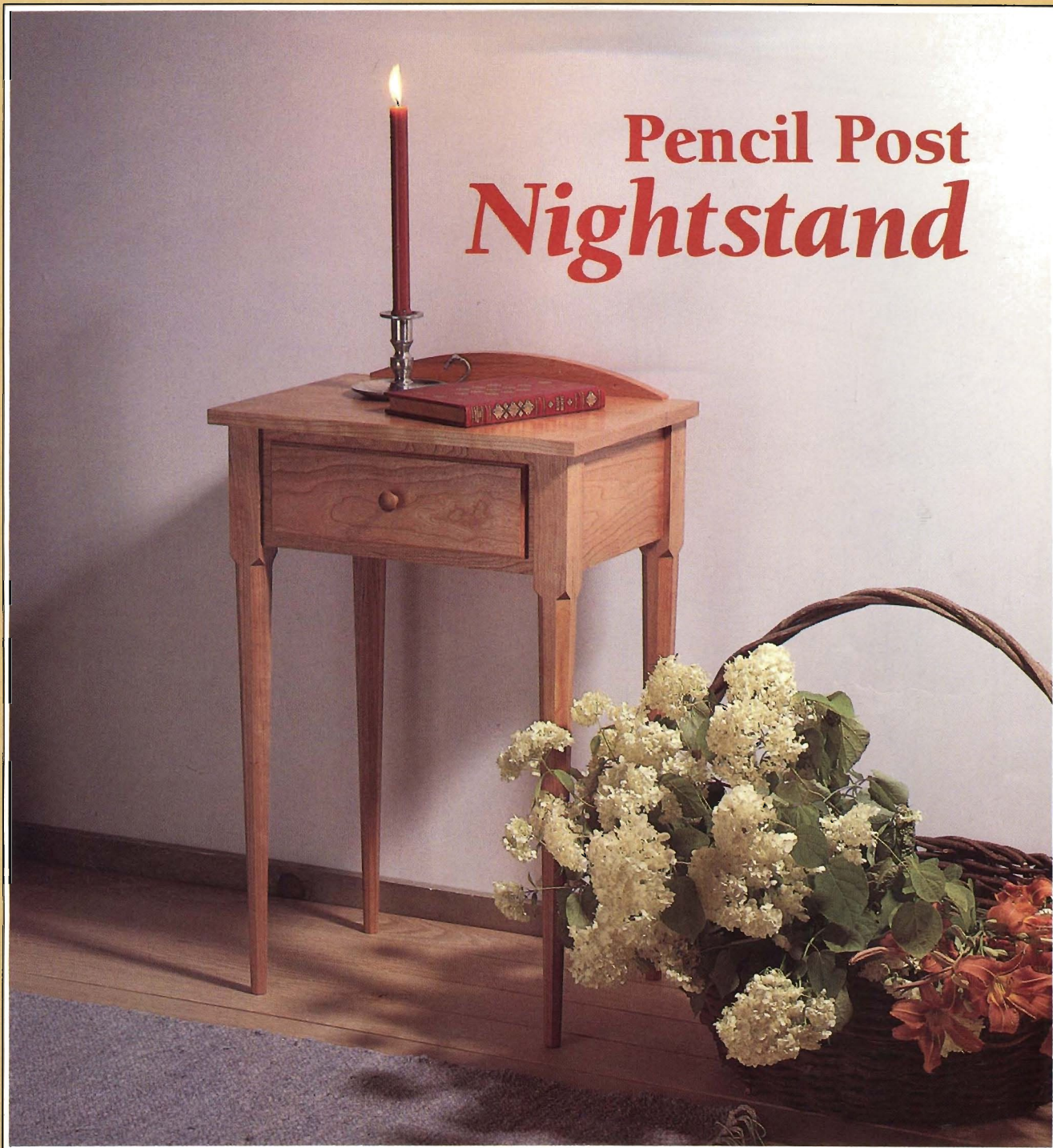


Step 10: Assemble bird.

(continued on next page)



Pencil Post *Nightstand*



This nightstand was designed as a companion piece to the Pencil Post Bed on page 50, but it also works well on its own. You'll note how the tapered legs and the arched backsplash of the nightstand reflect the posts and headboard on the bed. Both projects are crafted in cherry, which darkens naturally to a deep, rich hue.

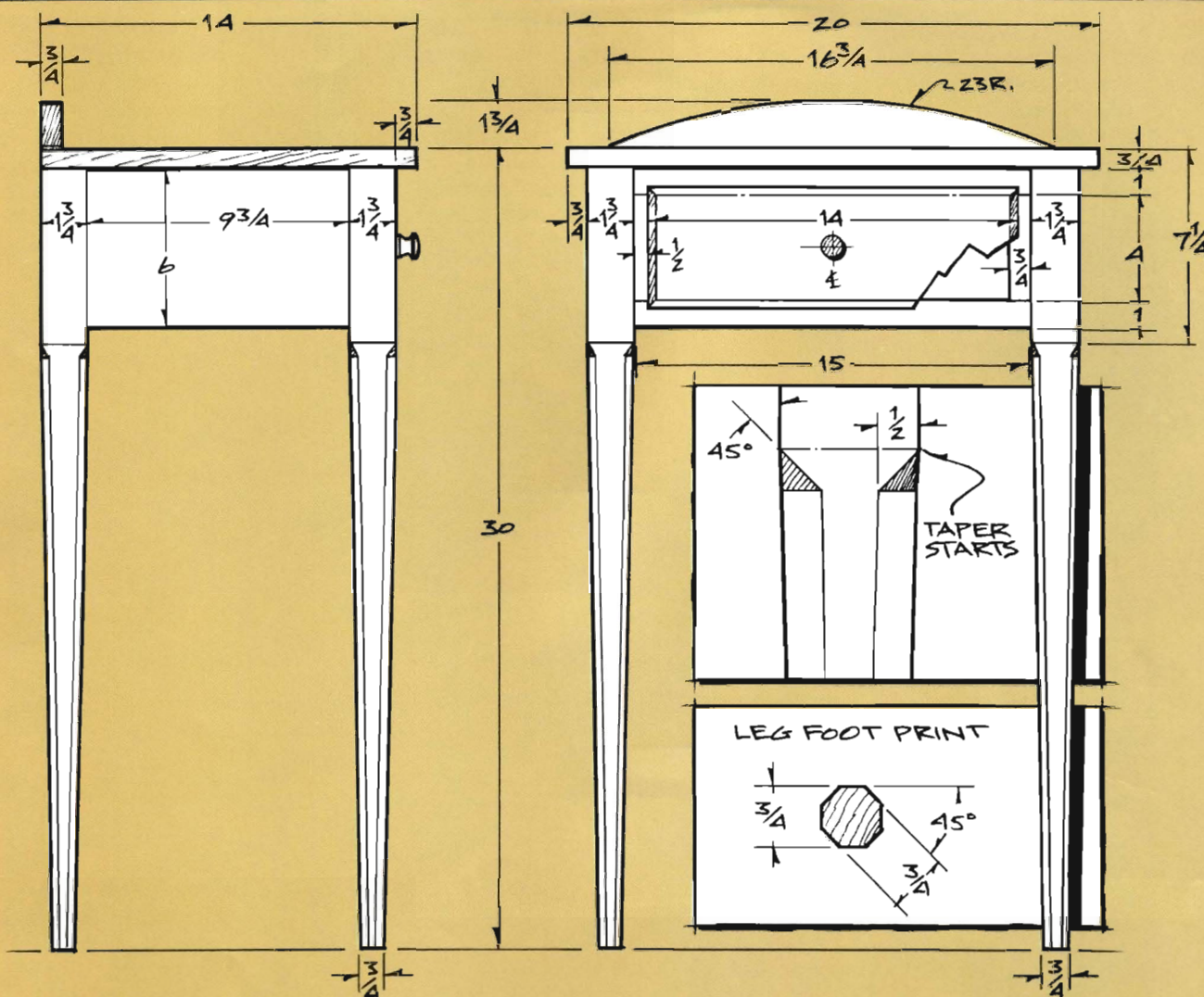
Begin by preparing and gluing up stock for the legs (A) and top (H). While you're waiting for these parts to

dry, dress material for all the remaining parts, including the aprons (B, C, and D), cleats (E, I), drawer guides (F), backsplash (G), and drawer (J, K, L, and M). Note that the front apron part, long cleats, and drawer guides are oversize, since they are cut to fit later. Also, all the drawer parts should be oversize, since the drawer must be made to fit the actual opening after the stand has been constructed.

The front apron is cut from a single

board. Rip a 1 in. wide strip, a 4 in. wide strip, and a 1 in. wide strip in that order, then crosscut the ends of the center section to create the drawer opening. If you are careful to match the grain when assembling the front apron, glue lines should be undetectable.

The mortises in the legs to accept the apron tenons are cut before the legs are tapered. Cut the matching tenons on
(continued on next page)



Bill of Materials (all dimensions actual)

Part	Description	Size	No. Req'd.
A	Leg	1 3/4 x 1 3/4 x 29 1/4	4
B	Front Apron	3/4 x 6 x 16 1/2	1
C	Side Apron	3/4 x 6 x 11 1/4	2
D	Back Apron	3/4 x 6 x 16 1/2	1
E	Long Cleat	1 x 1 3/4 x 11	4
F	Drawer Guide	3/4 x 3/4 x 11	2
G	Backsplash	3/4 x 1 3/4 x 16 3/4	1
H	Top	3/4 x 14 x 20	1
I	Short Cleat	3/4 x 3/4 x 3	1
J	Drawer End	1/2 x 4 x 13 1/2	2
K	Drawer Side	1/2 x 4 x 11 1/2	2
L	Drawer Bottom	1/4 x 11 x 13	1
M	Drawer Face	3/8 x 4 1/2 x 14	1
N	Knob	See Detail	1

*Width of stock for front apron must be wider before machining to allow for ripping cuts during apron assembly.

the aprons, and test-assemble the legs and aprons. If everything fits, you can establish the leg tapers now. This process is the same outlined in the instructions for making the tapered pencil posts for the bed. Finish sand the legs and aprons before gluing and assembling them. This assembly should be done upside down, and on a flat surface such as your saw table, to keep the legs and aprons square.

Now cut and fit the long cleats and drawer guides. The slotted holes in these cleats will direct any movement in the top toward the back. Cut out the backsplash, and glue it to the top with

several locating dowels, as shown. The dowels aren't needed for strength, but prevent the pieces from slipping as clamp pressure is applied. Add the short cleat along the front apron, and mount the top.

We chose to make a dovetailed drawer box with an applied face. The use of an applied face makes it easier to cut the dovetails. Note the chamfer around the face, softening the edge. You could lathe-turn the knob (N), or a similar knob, made of maple, can be ordered from Shaker Workshops, P.O. Box 1028, Concord, MA 01742. Specify their part no. 531. 

Our photo of the Pencil Post Bed speaks far more eloquently of it than any description we might attempt. Suffice it to say that as handsome as it is in the photo, it is this and much more in person. With its companion piece, the nightstand, the bed makes an impressive statement in any bedroom.

The design is versatile enough to complement and fit comfortably with many different styles, from country and traditional to contemporary.

We selected cherry for this piece, because of its strength, workability, and the rich warmth of the wood. Traditionally, pencil post beds were

made of maple with wide pine stock for the headboard. Rope served both to hold the parts of the bed frame together and to support the mattress. Bed bolts, which became common around 1750, kept the bed frame rigid, even when the rope spring supports stretched and sagged. Noted bed-

18th Century Pencil Post Bed



Thibeau also tells us that many of the original pencil post beds were finished with milk paint, although we shudder to think that anyone would consider covering a cherry bed with

We started by gluing up 8/4 stock to get the required thickness for the four posts (A). If you have access to 12/4 stock, you'll save some time here. You'll also need to edge-glue material to get the needed width for the headboard (D). Dimension stock for the rails (B, C) and tester frame (E, F) while you are waiting for the other parts to dry. Next, lay out the mortise locations on the posts. Note that you'll need to identify the left and right posts, and mark out the mortises for the headboard. As shown in the detail, the headboard mortises are $\frac{1}{4}$ in. longer than the ends of the headboard, which allows for possible expansion of the headboard as equilibrium moisture content changes (see *Woodworking Basics*, page 12). The top of the mortise starts 38 in. from the bottom end of the leg. Once these mortises are cut, drill the hole for the dowel pin at the top of the mortise. The dowel pin anchors the headboard flush with the top

You could establish the leg tapers now, but we found that it's best to first drill the bed bolt holes in the rails, cut all the tenons, and test-assemble the bed, since it's easier to make adjustments on the legs while they are square. Use a $\frac{3}{4}$ in. diameter Forstner bit to drill the $1\frac{1}{8}$ in. deep bed-bolt nut recess in the rails, then use a chisel to square the half of the recess closest to

(continued on next page)



the leg so it will accept the nut. Next, drill the bolt holes through from the ends using the jig shown. You'll need to make the guideblock $1\frac{1}{2}$ in. square, and drill a $\frac{13}{32}$ in. diameter hole through the center. This same type of jig, made with a $2\frac{1}{2}$ in. square block, could be used to drill the tester-pin holes. Finally, cut the tenons on the rail ends.

We outlined this sequence of steps since some woodworkers may not have a set of auger bits, but an auger bit will simplify drilling the bolt holes into the rail ends. Cut the tenons on the rail ends first, dry assemble the bed, and using the shank holes through the posts as a guide, continue these shank holes into the rails.

To establish the tapers on the posts, first lay out an octagon on the top end, and mark the point 29 in. from the bottom where the tapers end. Mark the first four tapers, which are on the same plane as the four sides of each post, and rough them in with the band saw. You'll need to shim under the end with one of your waste pieces to make the last band saw cut. Now, using a sharp jack or jointing plane, smooth these tapers down to the line. The next four tapers are cut on the corners. After laying the tapers out, mount the post in the jig as shown, establish a saw kerf, chisel out an area until you can use the plane, and plane and smooth these tapers until you are satisfied with the results. Then establish the 45-degree beveled shoulder with the chisel, as indicated, and very lightly bevel the top and bottom ends of the posts.

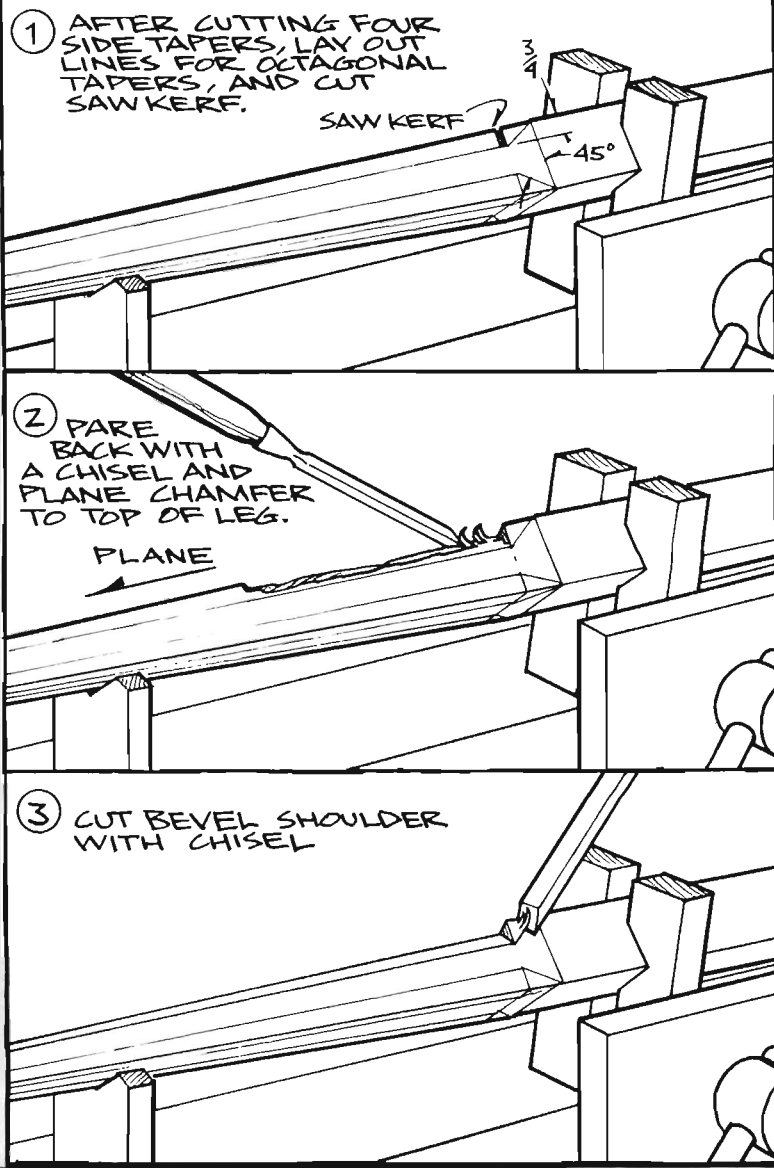
The easiest way to lay out the radius on the headboard is to mark the center point at the top edge, and points on either side 6 in. down, and $\frac{7}{8}$ in. from the ends. Then, with a pencil tied to a long string anchored with a nail, scribe the radius so you'll hit all three points. Our string was about 78 in. long, but you may need to adjust the length slightly to hit the three points. After shaping the headboard, drill the dowel-pin holes, and glue these pins into the posts.

If you decide to make the tester frame, select good straight quarter-sawn stock for the greatest strength. Half-lap the ends, and drill through for the $\frac{3}{8}$ in. diameter steel pins (I) that anchor the tester frame to the bedstead.

After sanding all parts up through 220-grit, finish with three coats of tung

oil. Locate for the hardware, and drill pilot holes for all screws and brads before mounting the angle-iron boxspring supports (J) and the bed-bolt covers (H).

We've arranged with the mail-order supplier, Paxton Hardware, to offer a package deal on all the hardware (except the tester frame pins) required to make one bed, at a substantial savings off the same parts ordered separately. Ordering information is provided in the Bill of Materials. The tester frame pins are cut from $\frac{3}{8}$ in. steel rod, sold at most hardware stores. Our bed is sized to accept a queen-size mattress and boxspring. No glue is used in the assembly of the bed, since all parts, including the headboard, should have knock-down capability to facilitate moving.



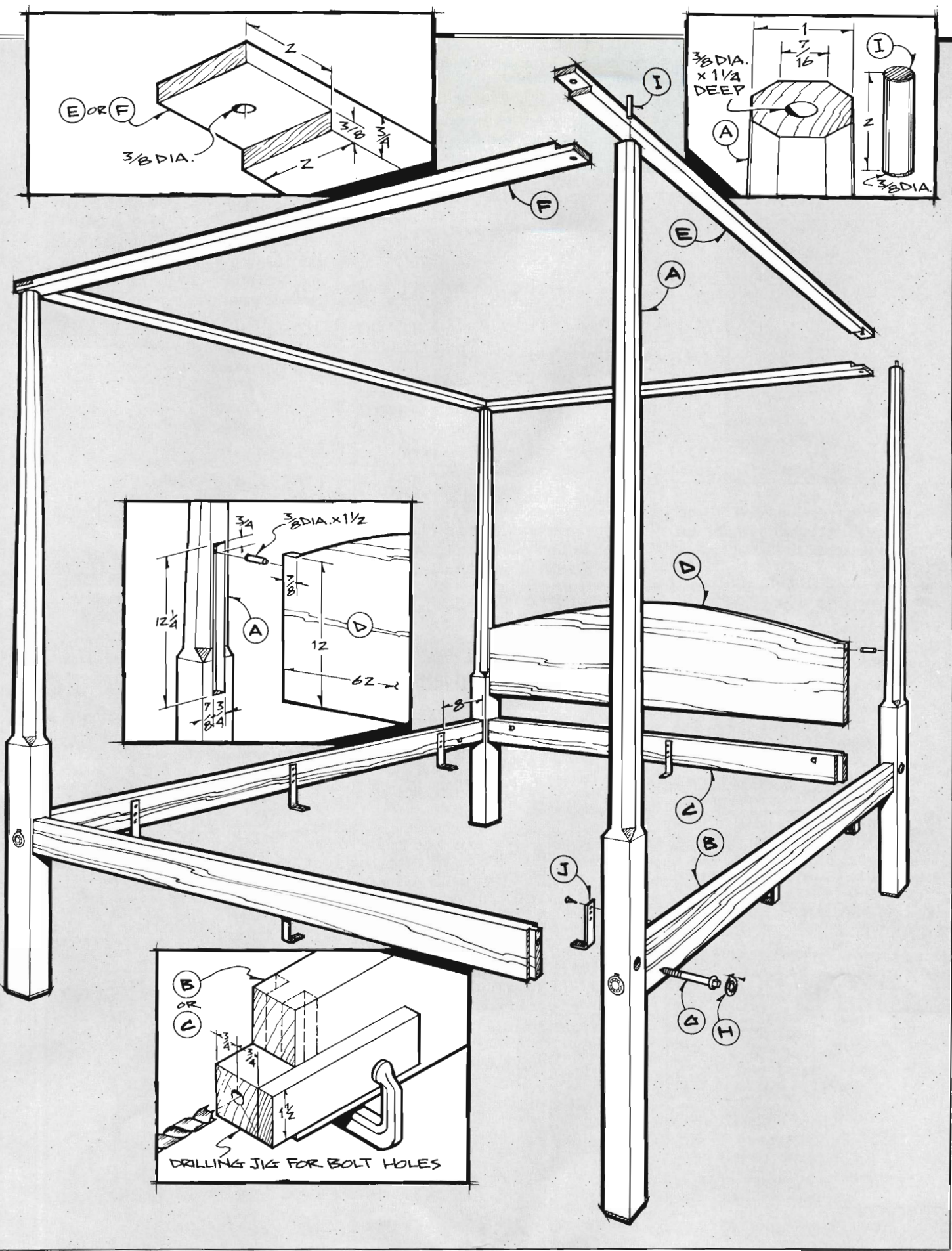
Bill of Materials

(all dimensions actual)

Part	Description	Size	No. Req'd.
A	Post	$2\frac{1}{2} \times 2\frac{1}{2} \times 80$	4
B	Side Rail	$1\frac{1}{2} \times 4 \times 81$	2
C	End Rail	$1\frac{1}{2} \times 4 \times 61$	2
D	Headboard	$\frac{3}{4} \times 18 \times 62$	1
E	Tester Frame Side	$\frac{3}{4} \times 2 \times 84\frac{1}{2}$	2
F	Tester Frame End	$\frac{3}{4} \times 2 \times 64\frac{1}{2}$	2
G	Bed Bolt	6 in. long*	8
H	Bed Bolt Cover	$1\frac{7}{8}$ in. dia. brass*	8
I	Tester Frame Pin	$\frac{3}{8}$ in. dia. $\times$ 2 long	4
J	Spring Support	$3 \times 8^*$	8

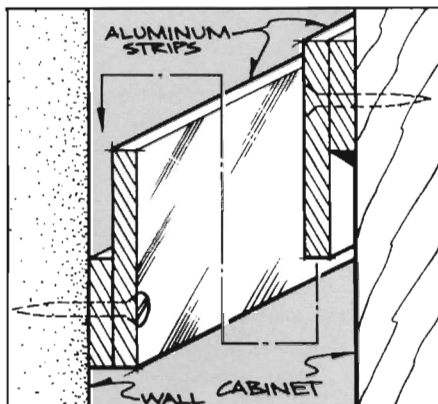
*Included in bed hardware package.

Available from: Paxton Hardware, 7818 Bradshaw Rd., Upper Falls, MD 21156. Order part no. 8700. Cost is \$88.50 postpaid. If you don't have a 12-point mechanic's socket set, you'll need a special cast bronze bed-bolt wrench, also available from Paxton Hardware. Order part no. 6012. Cost is \$15.82 plus shipping if ordered separately.



Shop Tips

An inexpensive yet sturdy cabinet hanger can be made from $\frac{1}{8}$ in. thick by $\frac{3}{4}$ in. wide aluminum. Many hard-

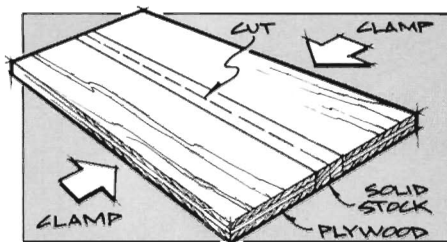


ware stores carry aluminum in that size. If the cabinet is heavy, make sure the hanger attached to the wall is well secured.

It's usually difficult to find a small part once it falls on the shop floor — especially if the floor is covered with sawdust and woodchips. However, if the part is made of steel (or contains iron), try this trick before giving up. Carefully sweep the floor and collect the sweepings in a shallow box. Now run a strong magnet through the sweeping. You'll be surprised at how often you find the lost part sticking to the magnet.

Myron Magsig, Marysville, Ohio

For the sake of appearance, I often apply a solid stock edging to the front of a plywood shelf. And when several



shelves are needed, I find it's easier and faster to apply the edging to two at once. To do it, cut the edging a bit

wider than necessary, then glue and clamp it between a pair of shelves. Once the glue dries, remove the clamps and rip the edging down the middle. It results in two shelves with an identical edging along the front.

*Brian J. O'Connor
Wolverine, Mich.*

When applying stain or paint with a small, round artist's or modelmaker's brush, I first slide an appropriately sized nut down the handle until it wedges near the brush end. This allows me to put the brush down without getting stain or paint on anything.

D. Harrison, Trenton, N.J.

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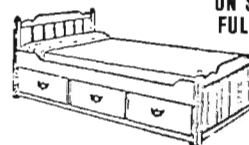
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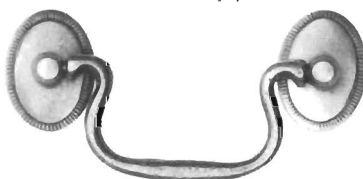
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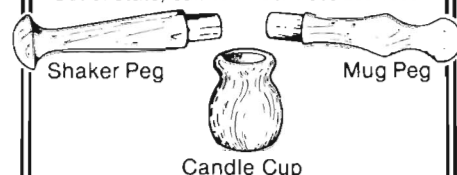
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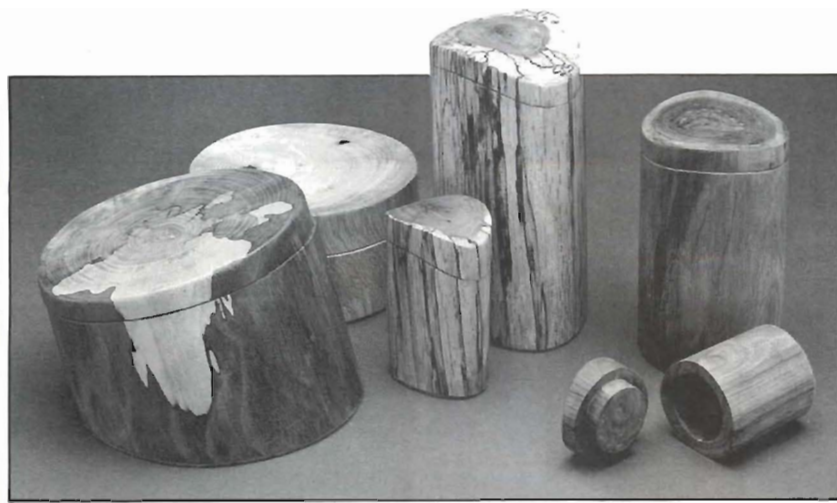
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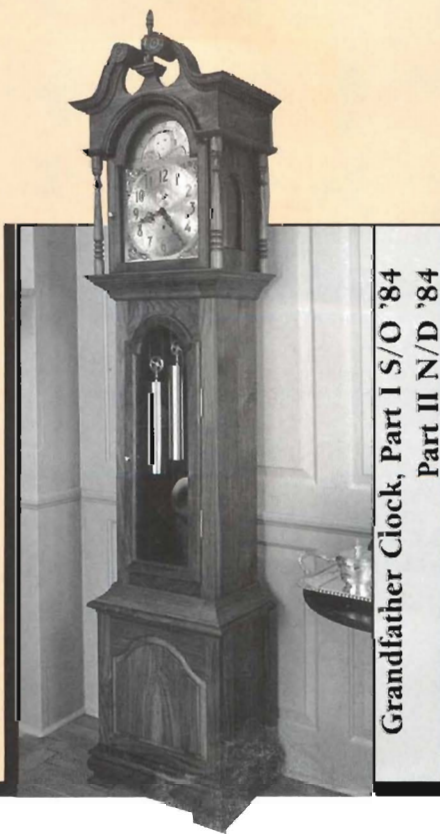
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Moravian Chair, Dulcimer, Oak Dining Table, Shaker Washstand, Marking Gauge, Veneered Wall Clock, 4 x 4 Off-Roader, Teddy Bear Puzzle, Duck Pull-toy, Landscape Cutting Boards, Early American Tall Clock, Pine Desk Organizer, *Articles*: Secrets of Success;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

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Freestanding Shelf System, Chippendale Bachelor's Chest, Oriental Serving Tray, Country Bench, Antique Knife Tray, Tape Dispenser, Valentine Box, Toy Tow Truck & Car, Shaker Drop-leaf Table, Shop-made Bow Saw, Child's Settle Bench, Plate Shelves, *Articles*: On Getting

**Pine Woodbox S/O '87**

Paid for Your Work; Weaving a Fiber Rush Seat, Part II; Table Saw Crosscutting: Techniques & Tips; Router-Lathe Fluting: A Shop-made Approach; Chippendale Furniture; Special Section: Back Issue Index.

Vol. 10 No. 2 Mar-Apr '86

Not Available

Vol. 10 No. 3 May-June '86

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

Vol. 10 No. 4 July-Aug '86

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

Vol. 10 No. 5 Sept-Oct '86

Desk with Tambour Top, Vanity Case, Stool, Coffee Table, Blanket Chest, Mortar and Pestle, Whale Folk Art Silhouette, Toy Wagon,

Cranberry Rake, Router Bit Box, Shaker Drop-leaf Table, *Articles*: Are Your Prices Competitive?; Restoring a Rosewood Chair; Basic Router Operations; Making Tambour Doors; General Woodworking Suppliers.

Vol. 10 No. 6 Nov-Dec '86

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

Vol. 11 No. 1 Jan-Feb '87

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

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

Vol. 11 No. 3 May-June '87

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

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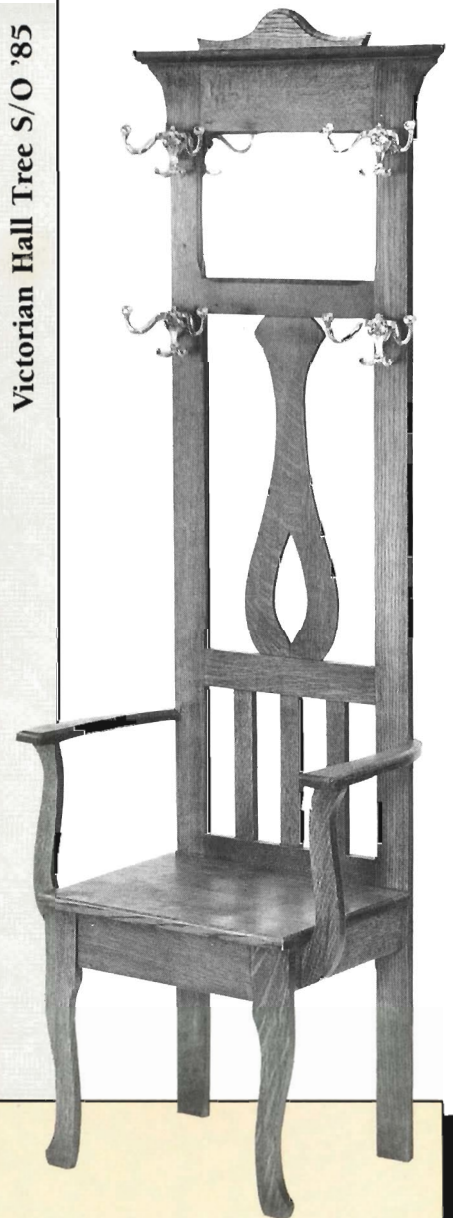
Pine Woodbox, Contemporary Love Seat, Two-Drawer Oak Platform Bed, Snail Pull Toy, Routed Trivets, Spice Rack with Chip Carving, Joiner's Tool Chest, Shaker-style Step Stool, Turned Shop Mallets, *Articles*: French Polishing Made Easy; Plane Iron Sharpening; Making a Splayed Leg Drill Guideblock; Traditional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

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

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Victorian Hall Tree S/O '85**Vol. 12 No. 2 Mar-Apr '88**

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75 Project Plans for Furniture, Toys, and Accessories

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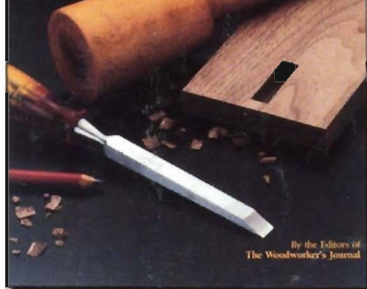
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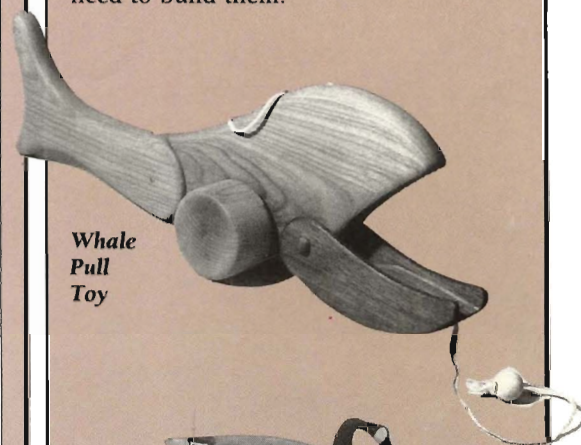
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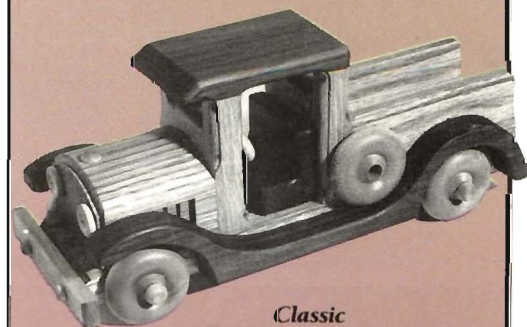
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