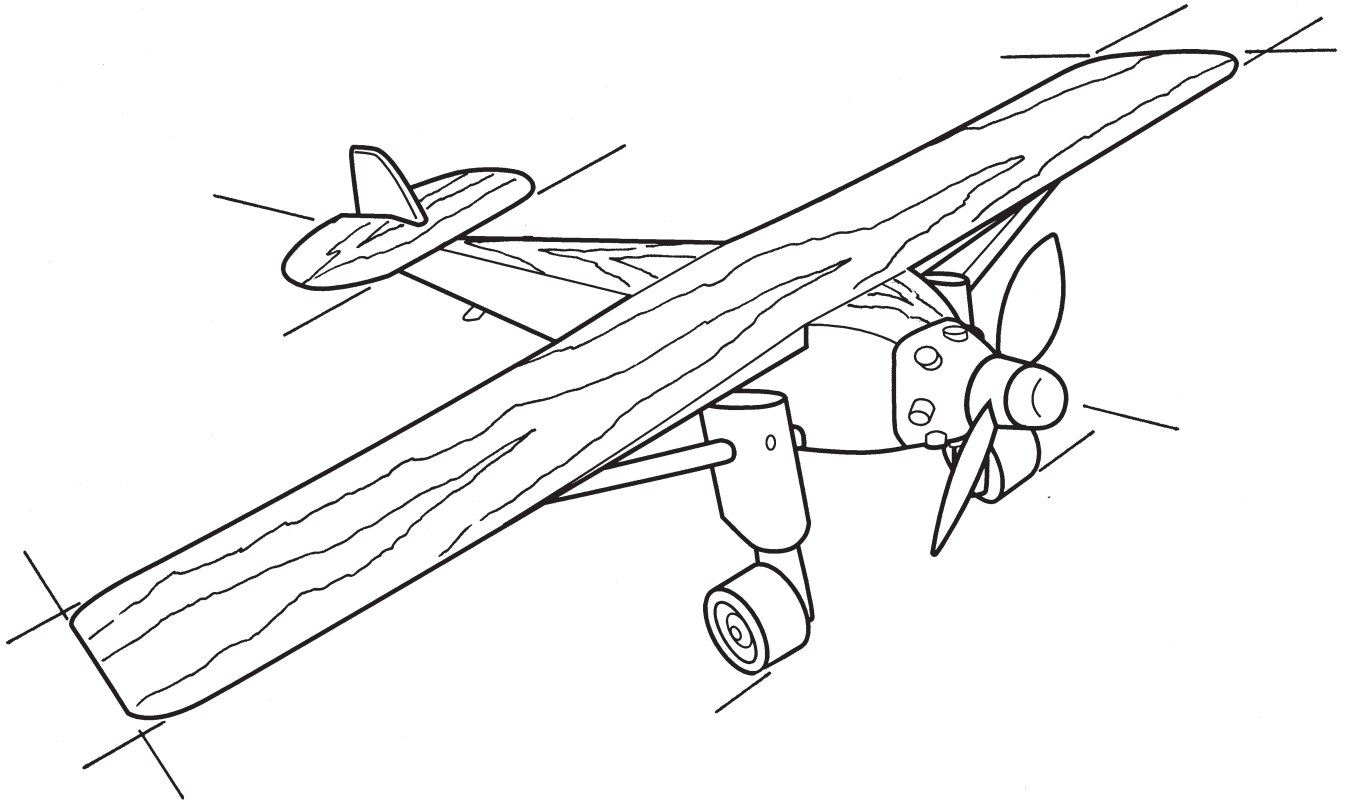


# Vintage Model Airplane



Inspired by Charles Lindbergh's "Spirit of St. Louis," which made the legendary first transatlantic crossing from New York to Paris in 1927, this model recalls the exciting challenges of the early days of American aviation. With all the different steps and tasks involved, from bandsawing to precision cutting and drilling to using a traditional spokeshave, completing this airplane will surely advance your skills. And after you build it, you'll learn how to apply and use finishes to protect the wood and keep it looking beautiful.

## TOOLS REQUIRED

### Hand Tools

- Spokeshave
- Hand plane
- Wood file
- Clamps
- Chisel

### Power Tools

- Table saw
- Thickness planer
- Bandsaw
- Orbital sander
- Drill

### Miscellaneous

- Pencil
- Safety glasses
- Carpenter's glue
- Sandpaper
- Masking tape
- Clean, lint-free cloths
- Respirator
- Gloves for finishing
- Mineral spirits
- Water-filled metal container with tight-fitting lid
- Minwax® Wood Finish Stain Brush, Minwax® Polyurethane Brush or other good quality, natural bristle brush (for oil-based stains and finishes)
- Minwax® Polycrylic® Brush or other good quality, synthetic bristle brush (for water-based stains and finishes)
- Small artist-style brushes

## SHOPPING LIST

Item	Quantity
1" x 7-1/2" x 24" clear, knot-free board	1
7/16"-dia. dowel, 1-5/8" long	2
1/8"-dia. dowel, 1" long	1
1/4"-dia. dowel, 24" long	1
1/4"x 1" fluted dowel	8

Recommended Wood: Pine

Alternate Wood: Poplar or Alder

## CUTTING LIST

Key	Pcs.	Part	Size
A	1	Body	1-7/8" x 3-3/8" x 10-1/2"
B	1	Engine	3/4" x 1-1/2" hexagon
C	1	Wing	1/4" x 2-5/8" x 19"
D	1	Elevator	1/4" x 2-1/8" x 4-1/4"
E	2	Shock absorbers	3/4" x 1-1/4" x 1-3/4"
F	2	Wheel posts	7/16"-dia. dowel, 1-5/8" long
G	2	Shock absorber pins	1/8"-dia. dowel, 1/2" long
H	2	Wheels	5/8" x 1-1/8"-dia. disc
I	2	Wheel axles	ready-made; see Source
J	1	Propeller	1/4" x 1" x 4"
K	1	Nose cone	5/8" x 1" disc mounted on 1/4" dia. dowel, 3/4" long
L	4	Struts	1/4"-dia. dowel, 5-1/2" long
M	8	Mufflers	1/4" fluted dowels
N	1	Skid	1/4"-dia. dowel, 1" long

## WOOD FINISHING PRODUCTS

**Finishing Note:** If you chose more than one color to stain the plane (such as the Recommended Finish), you will find it easier to prep and stain the individual pieces prior to assembly. Be sure to avoid staining areas that will receive glue since that can weaken the glue bond.

### Recommended Finish

Prep: Minwax® Water-Based Pre-Stain Wood Conditioner

Stain: Minwax® Water-Based Wood Stain

Body– River Stone\*

Nose– Harvest Grain\*

Propeller and Wheels– Onyx\*

Finish: Minwax® Polycrylic® Protective Finish Semi-Gloss

### Alternate Finish

Prep: Minwax® Pre-Stain Wood Conditioner (if using soft or porous wood)

Stain: Minwax® Wood Finish™

Body– Golden Pecan\*\*

Nose– Golden Pecan\*\*

Propeller and Wheels– Ebony\*\*

Finish: Minwax® Fast-Drying Polyurethane Semi-Gloss

\*Or a Minwax® Water-Based Wood Stain of your choice, available in 6 wood tones and 60 custom colors.

\*\*Or your choice of 20 Minwax® Wood Finish™ Stain colors.



## BEFORE YOU BEGIN

Good craftsmanship begins and ends with good work habits, so make the following steps part of your routine workshop practice. If you have any doubts or questions about how to proceed with a project, always discuss them with your shop instructor.

- Carefully and fully review plans and instructions before putting a tool to the project lumber.
- Work sensibly and safely. Wear safety goggles when doing work that creates flying chips and sawdust; wear the appropriate respirator whenever making sawdust or working with thinners or other solvents.
- At the end of every work session, clean up your shop area and put away all portable tools.

## CUTTING AND ASSEMBLY PROCEDURE

**NOTE TO TEACHERS:** This project includes scaled drawings of the plane parts. Photocopy the drawings to 250%, glue them to 1/4" hardboard, and cut them out to produce templates you can use over and over.

### Prepare the Pieces

1. After familiarizing yourself with all the parts as shown in Fig. A, prepare and glue together two 1" x 3-1/2" x 11" pieces to make a block for the body (A). Allow the glue to dry.

2. Plane pieces for the wing (C), elevator (D) and propeller (J) to thickness slightly greater than dimensions shown on Cutting List. This will allow for planing, shaving and finish sanding to the exact thickness.

### Make the Body and Engine

3. To start shaping the body, machine the body block to 1-7/8" x 3-1/4" x 11"

4. Using the templates found in Fig. B, trace the outlines of the side and top on to the body. Mark the hole locations for the struts and skid.

5. Cut the body shape with a bandsaw. Cut the side profiles first, tape the parts back together using masking tape, then cut the top and bottom profiles.

6. Draw the 1/4"-deep by 2-5/8"-wide wing notch on the top of the body. Turn the body on its side and use a bandsaw to make several 1/4"-deep cuts, one about every 1/8" across the width of the notch. Clamp the body in a vise and clean out the remaining waste with a chisel. Make sure the base of the notch is flat.

7. Locate, mark and drill a 1/4" hole in the center of the front end of the plane body for later mounting of the engine (B).

8. Lay out the engine (B) by drawing a hexagon measuring 1-1/2" between opposite corners. Cut the shape out carefully with a bandsaw. Draw the octagon on one end of a narrow board so you can keep your hands away from the blade while making the cuts. Or clamp the board in a vise and use a jigsaw.

9. Drill 1/4" holes centered in each side of the octagon as shown in Fig. C to prepare for the mufflers.

10. Drill a 1/4" hole through the center of the octagon.

11. Glue the engine (B) to the front end of the body (A), using a 1/4" dowel to align the parts. Allow the glue to dry.

12. Drill the holes for the struts (L) and the skid (N).

13. File and sand the body to remove any saw marks and sharp corners. Also file the engine (B) to make it flush with the body (A).

14. Glue the mufflers (M) into the holes in the engine hub. Allow the glue to dry, and trim the dowels so they project 1/4".

### Make the Wing and Elevator

15. Rip (saw wood along the grain) the wing (C) to width to fit the notch in the plane body. Cut it to length. Trace and cut the wing shape.

16. Center the wing in the notch in the plane body and mark on the wing the outline of the body.

17. Shape the wing with a spokeshave, plane, file and sandpaper. Work from the body outline marks outward. Use the setup shown in Fig. D.

18. Trace and cut the elevator (D). File and sand it to shape.

### Make the Shock Absorbers, Wheel Posts and Wheels

19. Make two shock absorber blanks each 3/4" x 4" x 4". Mark out the shock absorbers (E) and drill the 1/4" strut hole and the 1/8" hole for the shock absorber pin (G) as shown in Fig. B. Large pieces are easier to work with than small pieces at this stage.

20. Round over the front corners of the shock absorber blank with a file.

21. Cut the shock absorber teardrop shape using the bandsaw. Sand out the saw marks.

22. Cut the shock absorbers to finish length, (1-3/4") and drill the hole for the wheel post (F).

23. Cut the wheel post from 7/16"-dia. dowel and glue it into the shock absorber. Wait for the glue to dry and then drill a 7/32" hole through the wheel post for the ready-made wheel axle (I).

24. Counterbore a 1/8"-deep hole in the wheel (H), then use a 1-3/8" hole saw to cut the wheels out. Sand the edges and corners. (Besides the wheel axles, you can also buy ready-made wheels from the Source listed at the end of this project.)

25. Slip the wheel axles through the wheels and glue the axles into the wheel posts. Make sure the wheels spin freely. Sand the protruding ends of the axles flush with the wheel posts.

### Make the Propeller and Nose Cone

26. Trace and cut the propeller (J), and drill the 5/16" center hole.

27. Pitch the propeller blades by filing and sanding from front to back corners. See the photo of the finished model.

28. Cut a 1" disc for the nose cone (K) and drill a 1/4" hole, 1/4" deep in the center. Glue in a 1/4" dowel. Allow glue to dry.

29. Secure the nose cone dowel in a drill chuck and use a file and sandpaper to shape the nose cone while the drill is running as shown in Fig. E. Test it against the propeller. The diameter of the nose cone and the circular center of the propeller should match.

### Make the Struts and Skid

30. Working with one strut at a time, set each strut in its hole in the body. Use a ruler as a straight edge to strike a line on the dowel as shown in Fig. F. It should be 4-3/4" from the body to the inside edge of the dowel. Carefully cut and sand the dowel to this line so it fits to the wing bottom.

31. Glue the skid (N) into the hole at the rear underside of the body.

## FINAL ASSEMBLY

**Woodworker's Tip:** *With the range of colors and detail in this model, it is recommended that you do the prep and staining before the final assembly. Avoid staining areas that will receive glue.*

32. Glue and clamp the wing into the notch of the body, the elevator to the tail, and the nose cone through the propeller and into the body. Be sure the propeller spins freely. Allow glue to dry.

33. Set the rear struts by gluing them into the body and to the bottom of the wing. Allow glue to dry.

34. Slide the shock absorbers onto the front struts. Glue the struts into the body and onto the wing. Allow glue to dry.

35. Locate each shock absorber 1/2" from the body and hold it perpendicular to the wing. Using the 1/8" hole as a guide, drill the hole deeper into and through the strut. Glue and insert the shock absorber mounting pin (G) into the hole as shown in Fig. A. Allow glue to dry. Sand the pin flush with the shock absorber.

## STAINING AND FINISHING

**Woodworker's Tip:** *Though you may be tempted to cut short your sanding, preparation and application, don't do it. These tasks are very important steps in obtaining a high-quality finish. Remember, it is the finish, just as much as the fit and smoothness of the parts, that will determine how people judge your craftsmanship. To ensure an excellent result, follow the steps listed below and also the instructions the manufacturers put on their products.*

### FINISHING TIPS

- Test the stains and finishes you are planning to use on scraps of wood. On the back of the scrap, mark the stain/finish combination and the type of wood. Allow all samples to dry thoroughly before making your final finish selection. Save your samples for quick reference on future projects.

- All stains and finishes must be allowed to dry thoroughly between coats. Remember that drying times can vary due to humidity and other climatic conditions.
- If you have some leftover stain or finish, wipe the can rim so that stain or finish in the rim won't dry out and prevent the lid from forming a tight seal.
- Given the number of small pieces in this project, you may find it helpful to use small artist-style brushes when staining and finishing the individual pieces.
- Brushes used for oil-based finishes must be cleaned with mineral spirits; for water-based products, such as Minwax® Water-Based Wood Stains or Minwax® Polycrylic® Protective Finish, clean brushes with warm water and soap.

36. Before staining and finishing, finish-sand all surfaces and ease all the edges. Wipe the piece down with a cloth dampened with mineral spirits. If you're building the airplane with a softwood such as pine or a porous hardwood like maple, you'll need to prepare it for staining with a coat of Minwax® Pre-Stain Wood Conditioner if you are using an oil-based stain or Minwax® Water-Based Pre-Stain Wood Conditioner if you're using a water-based stain. Generously apply the conditioner, this will help to ensure even absorption of stain and prevent blotchiness that can occur with some soft or porous woods. Simply brush the conditioner over all the wood parts and allow it to penetrate for 1 to 5 minutes. Then remove excess conditioner with a clean, dry cloth.

### Recommended Finish

37. Using a nylon/polyester brush, apply a generous coat of Minwax® Pre-Stain Water-Based Wood Conditioner following the directions on the can. After 1 to 5 minutes, wipe off all excess conditioner using a clean, lint-free cloth. Wait 15 to 30 minutes and then use fine-grade sandpaper to sand off any "whiskers" raised by the conditioner. Proceed to the staining within 2 hours.

**Woodworker's Tip:** *Minwax® Water-Based Wood Stain is available in 6 wood tones, a White Wash Pickling Stain and 60 custom-mixed colors. This means that you are not limited to just traditional wood tones (pine, oak, walnut, etc.), so look over the entire range of the Minwax® stain colors before making your selection.*

38. Apply the Minwax® Water-Based Wood Stain you've chosen using either a nylon/polyester brush or soft cloth. Be sure to work one piece or area at a time and allow stain to penetrate no longer than 3 minutes. While stain is still wet, wipe off excess with a clean cloth that's been lightly dampened with stain. If a second coat is desired, allow the piece to dry for 2 hours before applying stain. Set the piece aside to dry thoroughly before applying the protective clear finish.

39. Apply Minwax® Polycrylic® Protective Finish following the directions on the can. Stir the can contents thoroughly before starting and periodically repeat the stirring during your work session.

40. Working a small area at a time to maintain a wet edge, apply the first coat using a nylon/polyester brush. Work quickly and make the final strokes in each newly finished section using with-the-grain brushstrokes.

41. Allow the finish to dry a minimum of 2 hours. Then lightly sand with 220-grit sandpaper. Thoroughly wipe off all surfaces with a clean soft cloth.

42. Repeat steps 39 and 40 to apply the second coat. Allow the finish to cure overnight before handling the airplane.

#### **Alternate Finish**

43. Using a natural bristle brush or a soft cloth, apply a generous coat of Minwax® Pre-Stain Wood Conditioner following the directions on the can. After 1 to 5 minutes, wipe off all excess conditioner using a clean, lint-free cloth. Proceed to the staining within 2 hours.

44. Apply Minwax® Wood Finish™ using a natural bristle brush or a clean, lint-free cloth. Allow the stain to set for about 5 to 15 minutes, then wipe off any excess using a clean cloth lightly dampened with stain. Allow the stain to dry overnight before applying the protective clear finish.

***Woodworker's Tip:** When wiping off stain, make certain that your last wipe with the cloth goes with the grain of the wood.*

45. Apply Minwax® Fast-Drying Polyurethane following the directions on the can. Use a good quality, natural bristle brush intended for use with polyurethane. Allow the first coat to dry overnight.

46. The next day, lightly sand all surfaces with 220-grit sandpaper using with-the-grain strokes. Wipe off all surfaces with a clean soft cloth. Apply a second coat of polyurethane and set the piece aside to dry.

47. When completely dry repeat step 46, applying the third and final coat of polyurethane. Allow the finish to cure overnight before handling the airplane.

#### **PRODUCT SAFETY**

For your safety and the safety of those you work with, always read the safety warnings, which manufacturers print on their labels, and follow them to the letter. Typical safety advice and instructions will contain information such as the following:

**WARNING!** Removal of old paint by sanding, scraping or other means may generate dust or fumes that contain lead. Exposure to lead dust or fumes may cause brain damage or other adverse health effects, especially in children or pregnant women. Controlling exposure to lead or other hazardous substances requires the use of proper protective equipment, such as properly fitted respirator (NIOSH approved) and proper containment and cleanup. For more information, call the National Lead Information Center at 1-800-424-LEAD (in US) or contact your local health authority.

#### **When using oil-based wood finishing products:**

**CAUTIONS: CONTAINS ALIPHATIC HYDROCARBONS. Contents are COMBUSTIBLE.** Keep away from heat and open flame. **VAPOR HARMFUL.** Use only with adequate ventilation. To avoid overexposure, open windows and doors or use other means to ensure fresh air entry during application and drying. If you experience eye watering, headaches, or dizziness, increase fresh air, or wear respiratory protection (NIOSH approved) or leave the area. Avoid contact with eyes and skin. Wash hands after using. Keep container closed when not in use. Do not transfer contents to other containers for storage.

**FIRST AID:** In case of eye contact, flush thoroughly with large amounts of water for 15 minutes and get medical attention. For skin contact, wash thoroughly with soap and water. In case of respiratory difficulty, provide fresh air and call physician. If swallowed, call Poison Control Center, hospital emergency room, or physician immediately.

**NOTICE:** Reports have associated repeated and prolonged occupational exposure to solvents with permanent brain and nervous system damage. Intentional misuse by deliberately concentrating and inhaling contents may be harmful or fatal.

**WARNING:** This product contains a chemical known to the State of California to cause cancer and birth defects or other reproductive harm.

**DO NOT TAKE INTERNALLY. KEEP OUT OF REACH OF CHILDREN.**

#### **When using water-based wood finishing products:**

**CAUTIONS:** Use Only With Adequate Ventilation. To avoid overexposure, open windows and doors or use other means to ensure fresh air entry during application and drying. If you experience eye watering, headaches, or dizziness, increase fresh air, or wear respiratory protection (NIOSH approved), or leave the area. Avoid contact with eyes and skin. Wash hands after using. Keep container closed when not in use. Do not transfer contents to other containers for storage.

**FIRST AID:** In case of eye contact, flush thoroughly with large amounts of water. Get medical attention if irritation persists. If swallowed, get medical attention immediately.

**WARNING:** Contains Alkyl propanols, ethylene glycol, n-methyl pyrrolidone. **VAPOR HARMFUL.** Use only with adequate ventilation. To avoid overexposure, open windows and doors or use other means to ensure fresh air entry during application and drying. If you experience eye watering, headaches, or dizziness, increase fresh air, or wear respiratory protection (NIOSH approved) or leave the area. Avoid contact with eyes and skin. Wash hands after using. Keep container closed when not in use. Do not transfer contents to other containers for storage.

**DO NOT TAKE INTERNALLY.**

**FIRST AID:** In case of eye contact, flush thoroughly with large amounts of water for 15 minutes and get medical attention. For skin contact, wash thoroughly with soap and water. In case of respiratory difficulty, provide fresh air and call physician. If swallowed, call Poison Control Center, hospital emergency room, or physician immediately.

**DELAYED EFFECTS FROM LONG-TERM OVEREXPOSURE.**

Contains solvents which can cause permanent brain and nervous system damage. Intentional misuse by deliberately concentrating and inhaling contents may be harmful or fatal.

**WARNING:** This product contains a chemical known to the State of California to cause cancer and birth defects or other reproductive harm.

**KEEP OUT OF REACH OF CHILDREN.**

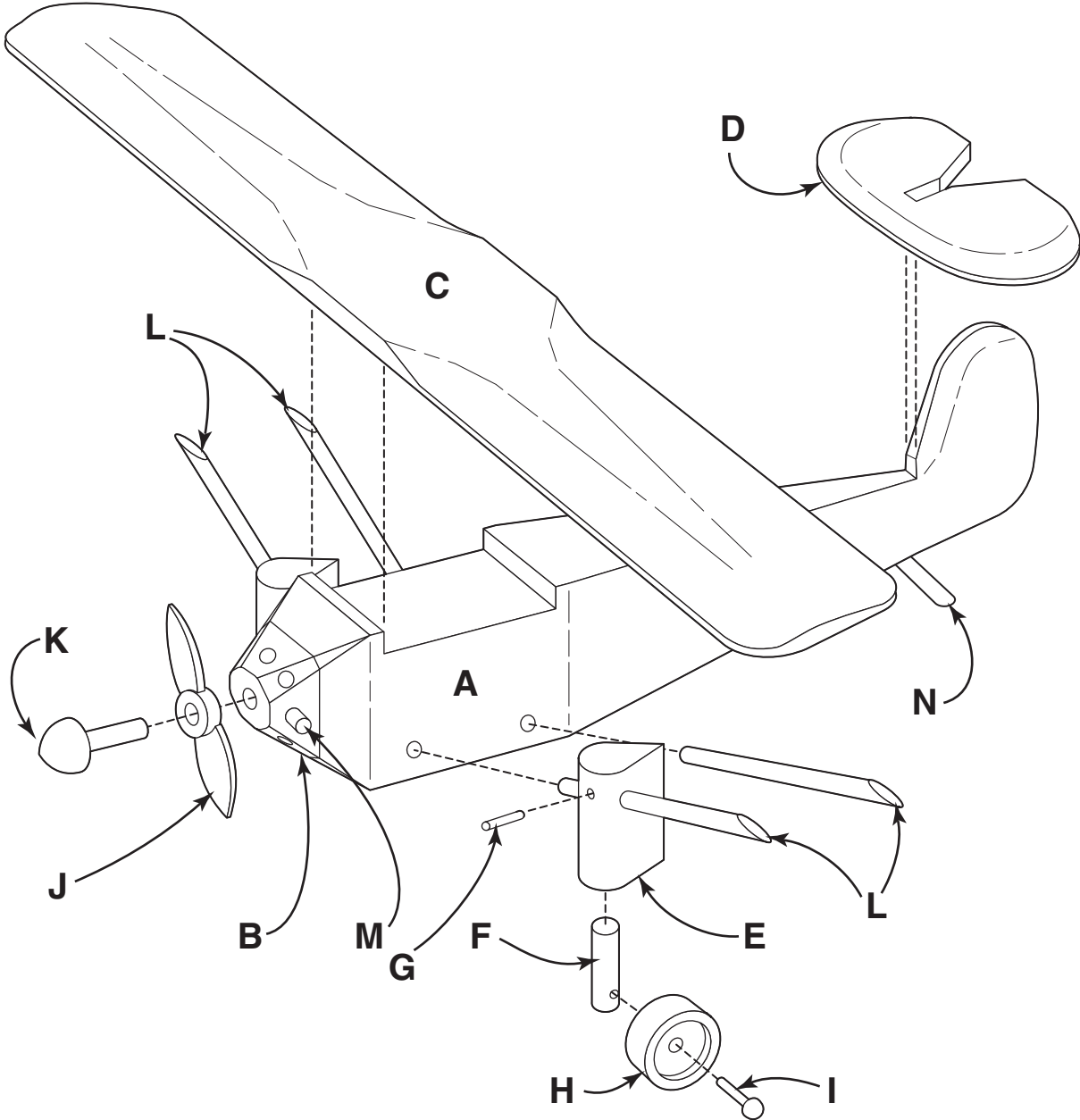
**SAFE DISPOSAL OF RAGS AND WASTE.**

Please be mindful of the safe way to dispose of rags and other waste. Rags, steel wool and other waste products soaked with oil finishes or solvents may spontaneously catch fire if improperly discarded. Place rags, steel wool and other waste immediately after use in a water-filled metal container. Tightly seal and dispose of the waste materials in accordance with local trash removal regulations. Be sure to keep the waste out of reach of children.

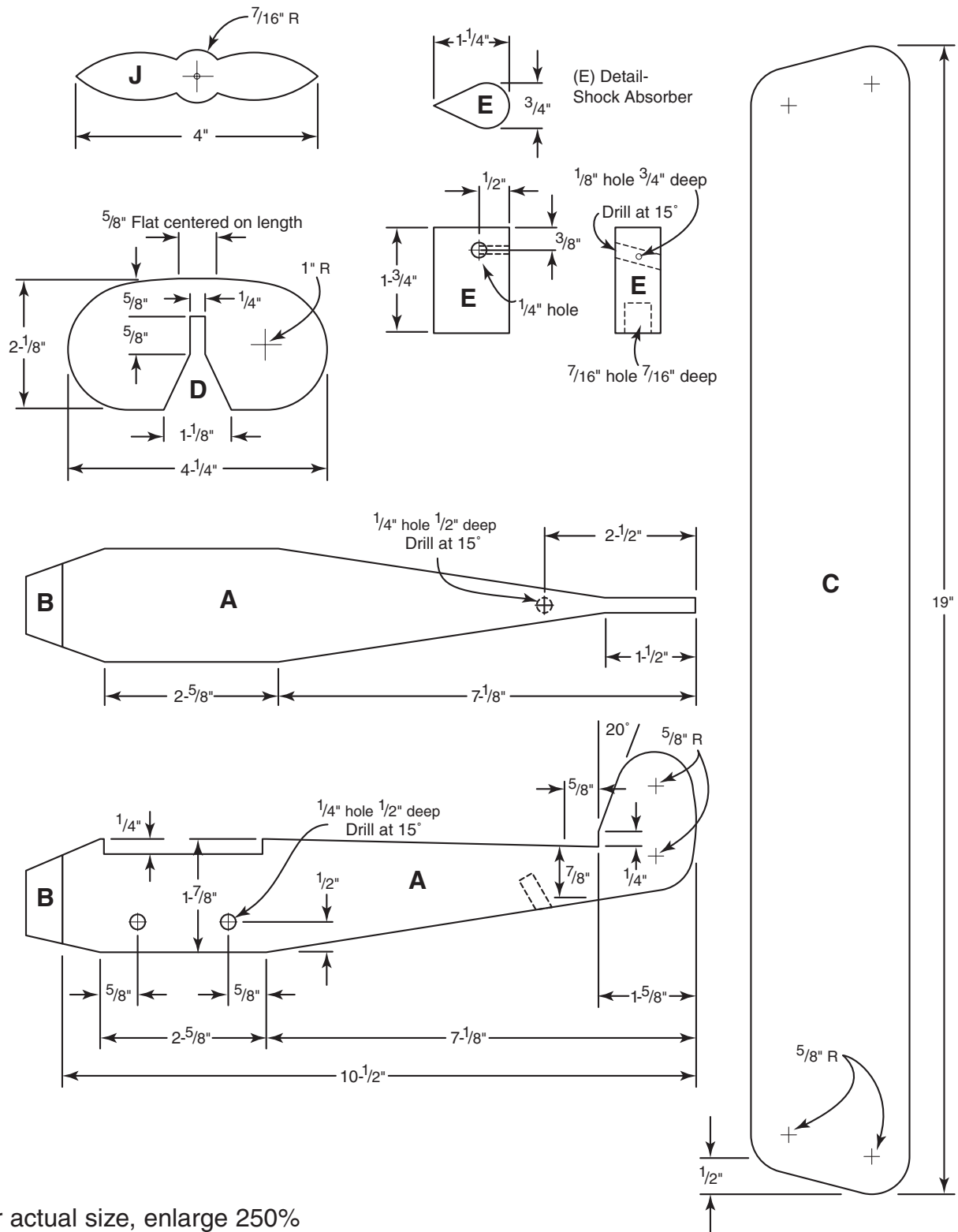
**Source**

Commercially made wheels and axles are available from  
Woodcraft Supply  
www.woodcraft.com  
(800) 225-1153  
1-1/4" wheels; part #50S41; 12 wheels \$3.25  
Axle pegs, part # 50Q31; 12 axles \$1.50  
Also available at local hobby stores

**FIG A. VINTAGE MODEL AIRPLANE**

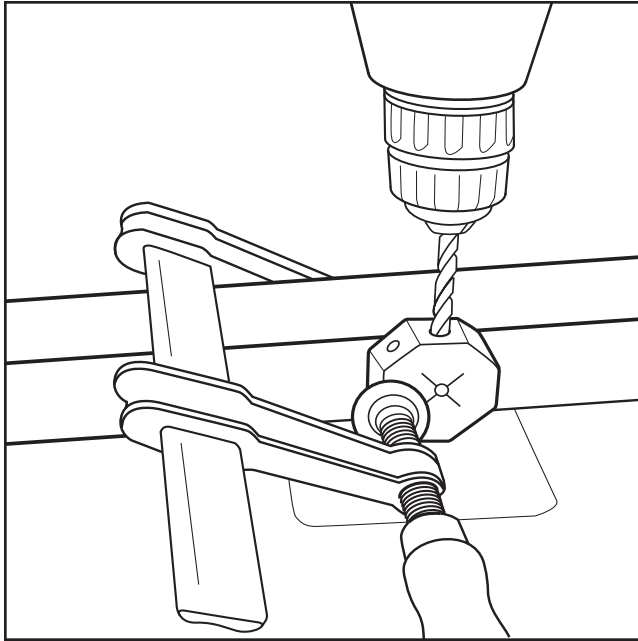


**FIG B. VINTAGE MODEL AIRPLANE DIMENSIONS**

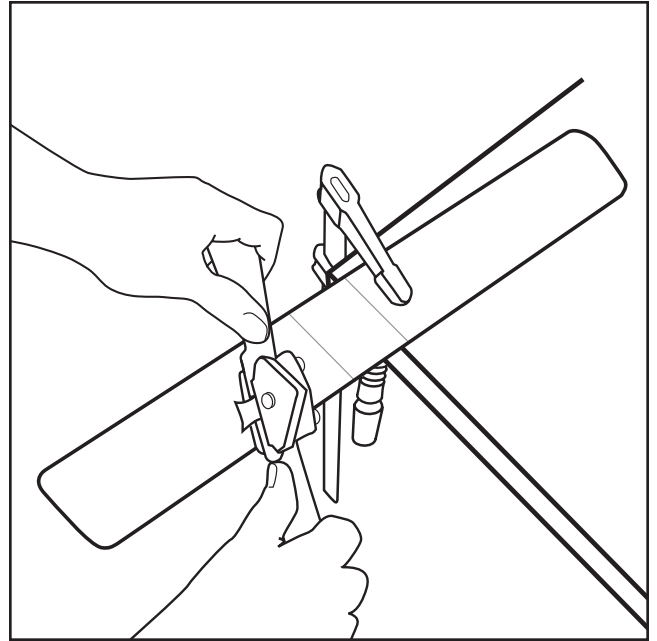


For actual size, enlarge 250%

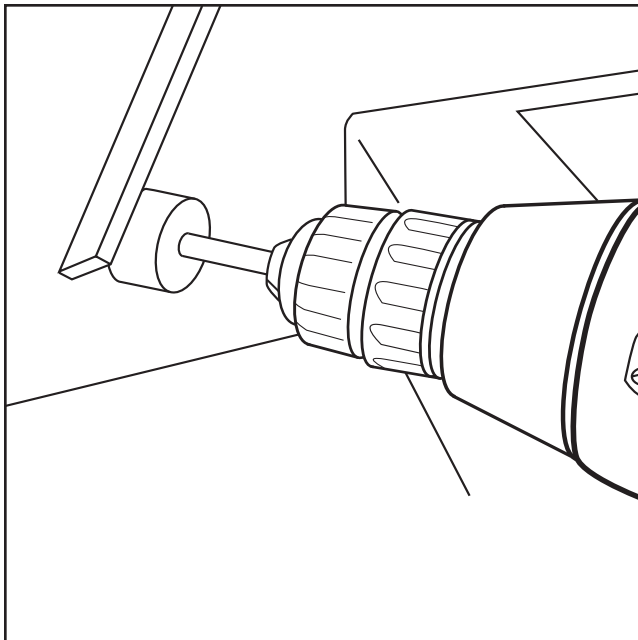
**FIG C. DRILLING THE ENGINE**



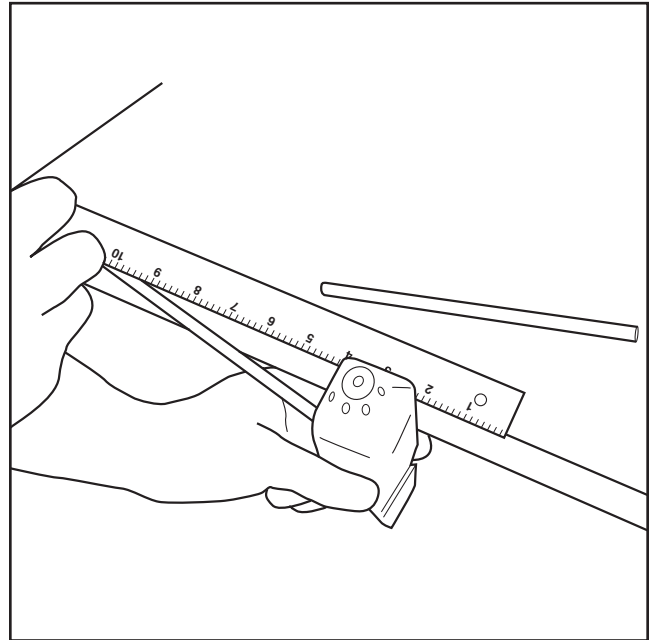
**FIG D. SHAPING THE WING**



**FIG E. SHAPING THE NOSE CONE**



**FIG F. MAKING THE STRUTS**





# TV Cabinet With Swivel Tray

Don't let the clean, handsome lines of this very functional piece fool you into thinking that building it is beyond your skills. In fact, it is an excellent project choice for a woodworking student starting his or her second year of workshop. Built from walnut cabinet-grade plywood, this handsome TV/VCR Cabinet with its swiveling tray top is an attractive entertainment center designed to house your television, VCR, video cassettes, or even a SEGA GENESIS or NINTENDO video game system.

The project presents the opportunity for woodworkers to practice and polish such skills as measuring precise layouts, routing, using stationary and portable power tools, installing swivel or "Lazy Susan" type hardware, and achieving a fine finish where stain and topcoat are applied together to bring out the beauty of the wood grain.

## TOOLS REQUIRED:

- Pencil
- Ruler (zigzag or tape)
- Square (framing, try and 4 ft. T)
- Assorted files
- Phillips screw driver
- Sandpaper (80-grit through 220-grit)
- Hammer
- 11/32" nail set
- Mallet
- Block plane
- Assorted clamps (C, bar, spring-type)
- Table saw with dado head set
- Jointer
- Radial arm saw
- Sanders (stationary belt and portable belt, random orbit, pad)
- Drill press
- Cordless drill-driver with Phillips bit
- Router (3/4" diameter straight bit)
- Safety glasses
- Assorted bits
- Countersinking drill bits

## MATERIALS REQUIRED:

See Shopping and Cutting Lists

## FINISHING PRODUCTS:

### Finish Recommended For This Project

- MINWAX® Pre-Stain Wood Conditioner
- MINWAX® WOOD FINISH™
- MINWAX® Fast-Drying Polyurethane
- MINWAX® Paste Finishing Wax

### Alternate finish choices (Choose one)

- MINWAX® POLYSHADES® One-Step Stain & Polyurethane
- MINWAX® WOODSHEEN® Gel Stain & Finish

### Miscellaneous

- Minwax® Blend-Fil® Pencils
- Minwax® Stain Markers™
- MINWAX® Professional Strength Wood Glue
- Tack Cloth
- Synthetic bristle brushes
- Clean rags
- Paint thinner, if required
- Water-filled metal container with cover

## PROCEDURE:

### I. Cabinet - Layout and Cutting

**Builder's Tip:** When building quality furniture, remember all wood grains should "run" in a certain direction. For this project: sides and back - vertical; top and bottom - left to right.

1. After checking direction of wood grain, rough cut all members (slightly oversized). Note: The easiest way to work a large sheet of plywood initially is by placing it on top of three lengths of 2x3s laid across a pair of sawhorses. This improvised "table" puts the material at a convenient height.
2. Using a securely-clamped 4-ft. T-square as the straightedge, carefully trim the top, shelf, bottom and side pieces to size. Note: Back and tray piece will be trimmed later.

**Builder's Tip:** Whether you use a table, radial arm, or portable circular saw, a fine tooth, plywood veneer blade should be installed to ensure perfectly clean cuts. Always cut wood with the veneer side down when using a portable circular saw, and with the veneer side up when cutting with table and radial arm saws.

3. Mark locations for ploughing all dados and rabbets on sides, top and bottom pieces.

**Builder's Tip:** No edge rabbet is required at back edge of the top piece to accommodate the back piece because the back is installed with a 2" space between its top edge and the cabinet top. This space ensures ventilation for the VCR, plus easy ingress/egress for the cords.

4. Plough grooves and rabbets using a 3/4" straight bit in the router guided by a securely-clamped straightedge. If necessary, set up dado heads in the table saw to make these cuts.



**Builder's Tip:** Cut edge rabbets for bottom piece in veneer side of plywood, so "good" side will face up into the cabinet. All other rabbets should be cut into the non-veneer or "lesser" side of the plywood panels.

## II. Cabinet Assembly

1. Temporarily assemble cabinet by tack-nailing parts together with partially driven 1-1/4" finishing nails; if necessary, use several bar clamps as well. Note: Try to position nails where 1-5/8" drywall screws will eventually be driven, so nail holes will not be visible in veneer.
2. With piece assembled, bore screw holes using a counterbore bit, which makes the pilot, shank, countersink and counterbore holes in one step. Note: Drive home several strategically-placed screws to secure the piece until all the holes are bored.
3. With piece assembled, measure and trim back piece to size; temporarily install with veneer side out.
4. Lightly sand cabinet using 150-grit paper in the pad sander; always use with-the-grain strokes. Thoroughly dust all surfaces and disassemble.
5. Reassemble cabinet using carpenter's glue and 1-5/8" drywall screws. Immediately install back piece to ensure that cabinet remains square during glue drying period. Note: Since you may want access to cabinet from the back in the future, install back using screws only - no glue.
6. Use flexible veneer tape to cover exposed plywood edges:
  - a) Cut tape slightly overlength for each edge.
  - b) Work one edge at a time; apply contact cement to back of tape and mating surface, allowing adhesive to dry until it can be touched with a piece of clean brown paper without sticking.
  - c) Carefully position first end of tape and guide along edge. Trim off any overlap.
  - d) Allow entire assembly to rest for at least four hours.

## III. TV Tray

1. Trim TV tray to size.
2. Install turntable (swivel) hardware. Note: Select and install turntable hardware that will accommodate the size and weight of the television it will support.
  - a) Center "blind" side of turntable on tray's underside and mark screw holes.
  - b) Remove turntable and bore holes for four No. 6 (1" long) self-tapping screws. On top side of tray, bore countersink holes (about 1/4" deep) using drill and countersink bit, so screw heads will be slightly below the wood surface when turned home.
  - c) To make certain that self-tapping screws are correct length and won't interfere with turntable operation, temporarily attach the tray to the turntable by driving at least two of the screws into the turntable's small holes.
  - d) Remove turntable from tray.
  - e) Center turntable on top of cabinet; "blind" side up, mark and bore pilot screw holes for bottom plate.

- f) Lubricate turntable's ball bearings with a light to heavy oil, depending on the degree of rotating action wanted.
  - g) Mount turntable on cabinet using four 1" No. 8 roundhead wood screws.
  - h) Place the tray on the turntable using 6d finishing nails as guide pins to position the pre-drilled holes over the small turntable holes. Remove nails one at a time and drive home four self-tapping screws.
3. Cut the required number of 1/4" long dowel plugs from a length of 3/8" dowel to conceal screws holding cabinet together. To keep sanding on veneer surface to a minimum, do not cut plugs too long. Squirt glue into each hole and press plugs into place. Immediately remove excess glue from surface with clean, damp rag. Allow glue to dry overnight if possible.
  4. Position plate casters on underside of bottom piece; mark for screws and bore pilot holes.
  5. Fasten casters to cabinet bottom using screws that come with the hardware.
  6. Inspect cabinet inside and out for smoothness. Sand lightly where necessary and wipe clean.

## IV. Staining and Finishing

1. Wipe all surfaces with a tack cloth to remove dust.
2. Apply MINWAX® Pre-Stain Wood Conditioner according to label instructions. Wait 15 minutes, and wipe away excess using a clean rag. Apply stain within two hours.
3. Sand again lightly with 220-grit sandpaper and remove dust with the tack cloth.
4. Stir the stain well; apply the MINWAX® WOOD FINISH™ of your choice with a clean brush and with-the-grain strokes. Allow to set for 5 to 15 minutes, depending on desired tone. Wipe off excess with clean, lint-free rag. Apply second coat if desired. Note: For stain and polyurethane protection in one easy step, use any MINWAX® Polyshades® or MINWAX® WOODSHEEN® color according to label instructions.
5. Allow piece to dry for at least 8 hours, or, preferably, overnight.
6. To achieve a tough finish with a soft luster, apply a coat of MINWAX® Fast-Drying Polyurethane following the label instructions. Allow to dry overnight.
7. Allow piece to cure for at least two weeks.

## V. Clean Up

- If you have product left over, wipe the can rim so that product in the rim won't dry out and prevent the lid from forming a tight seal.
- Clean brushes used for oil-based finishes with mineral spirits; soap and water is all that is needed for brushes used for water clean-up products.

## PRODUCT SAFETY

**DANGER! HARMFUL OR FATAL IF SWALLOWED. SKIN IRRITANT. COMBUSTIBLE. KEEP OUT OF REACH OF CHILDREN.**

**DANGER:** Contains mineral spirits. Harmful or fatal if swallowed. Do not take internally. Skin irritant. Avoid contact with skin and eyes. Wear rubber gloves and safety glasses when handling. Combustible. Do not use or store near heat, sparks, flame or other source of ignition. Close container after each use. Avoid inhalation and use only with adequate ventilation. If using indoors, open all windows and doors to make sure there is fresh air movement. If adequate ventilation cannot be maintained, wear respiratory protection (NIOSH / MSHA TC23C or equivalent) or leave area. Keep out of reach of children.

**FIRST AID:** If swallowed: Do not induce vomiting. Call physician immediately.

**FOR SKIN CONTACT:** Wash thoroughly with soap and water. If irritation persists, get medical attention.

**FOR EYE CONTACT:** IMMEDIATELY flush eyes thoroughly with water, then remove any contact lenses. Continue to flush eyes with water for at least 15 minutes. If irritation persists, get medical attention.

**IF AFFECTED BY INHALATION:** Immediately remove to fresh air. If symptoms persist, call physician.

#### VI. Safe Disposal of Rags & Waste

Please be mindful of the safe way to dispose of used rags and other waste. Remember that rags, steel wool and other waste soaked with oil finishes may spontaneously catch fire if improperly discarded. Place these items in a water-filled metal container immediately after use. Tightly seal the container and then dispose of it in accordance with local fire regulations. Be sure to keep the container out of reach of children.

#### FINISHER'S TIPS

- Stain and finish all exposed surfaces including the cabinet's interior and bottom surfaces to help prevent warping.
- If additional surface protection is desired, apply a coat of MINWAX® Paste Finishing Wax over all exposed surfaces. Let stand for 10 minutes, then buff with a clean fiber brush (scrub brush). Finish buffing with a clean, lint-free rag.
- If you spot any minor imperfections in the wood (e.g. pinholes, surface scratches) resist the urge to use a wood filler before applying any stain. Conventional wood fillers may not absorb stain in exactly the same manner as adjacent wood, so the spot will become even more evident. Instead, wait until finish has dried completely and then use MINWAX® Blend-Fil® Pencils or Minwax® Stain Markers™ for touch-ups.
- It's critical that all stains and finishes be allowed to dry thoroughly between coats. Remember, drying times may vary due to humidity and other climatic conditions.

#### Materials Shopping List, nominal dimensions

A	TV tray	3/4 x 12 x 18"	pine (1 pc.)
B,C,D	Top, Shelf	3/4 x 4 x 8'	cabinet-grade plywood,
E,F	Bottom, Sides, Back		walnut veneer(1 pc.)

#### Cutting List, actual dimensions

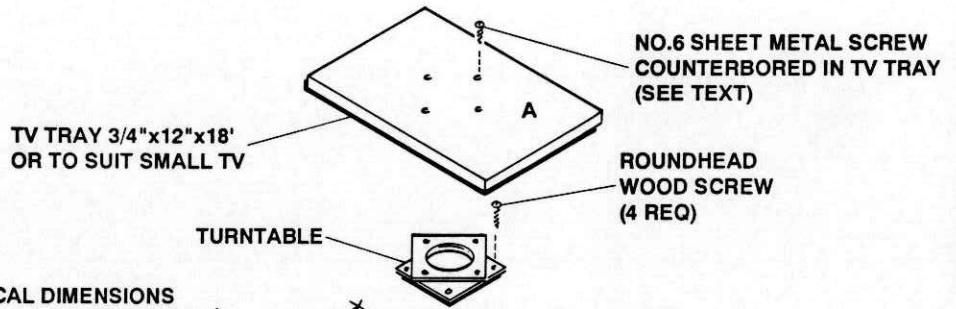
A	TV tray	3/4 x 12 x 18"	1 required
B,D	Top, Bottom	3/4 x 18 x 25"	1 each required
C	Shelf	3/4 x 17-1/4 x 24-1/4"	1 required
E	Sides	3/4 x 18 x 23-1/4"	2 required
F	Back	3/4 x 21-1/4" x 24-1/4"	1 required

#### Miscellaneous:

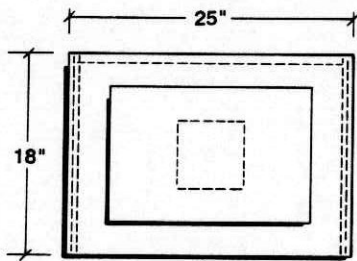
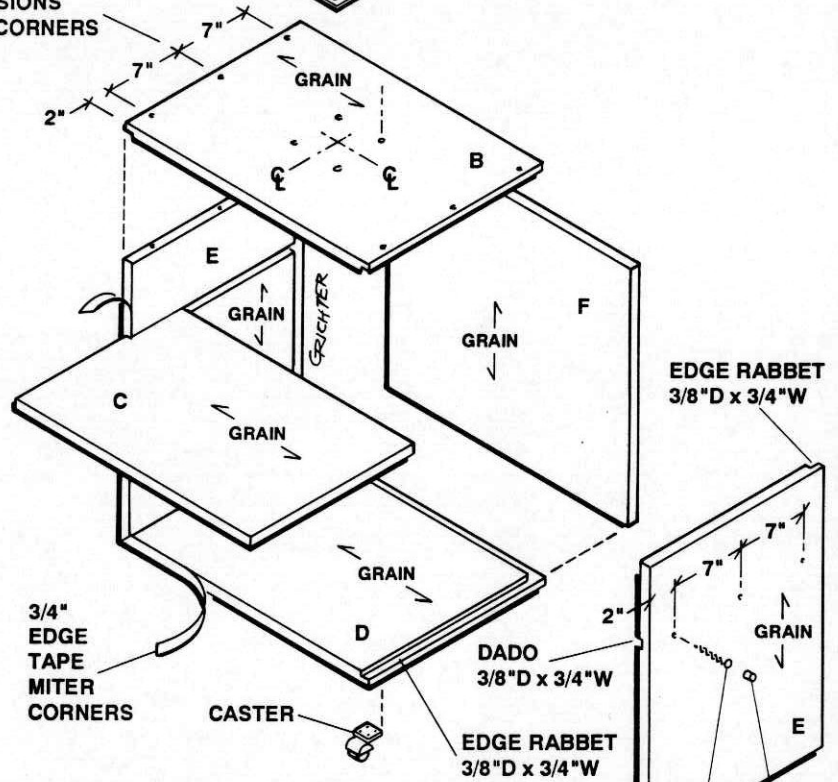
MINWAX® Professional Strength Wood Glue, 1-5/8" drywall screws, 1-1/4" brads, assorted nails, length of 3/8" dowel, flexible wood tape, contact cement, machine oil for lazy Susan.

#### Hardware:

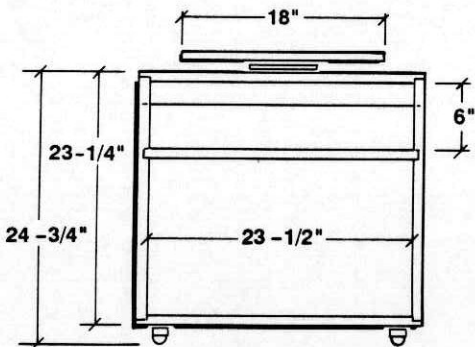
Four 1" no 6 panhead sheet metal screws, four 1" no. 8 round head wood screws, Lazy Susan swivel (No. 9548, Shepherd Hardware), 30mm plate casters (No. 27144, Woodcraft).



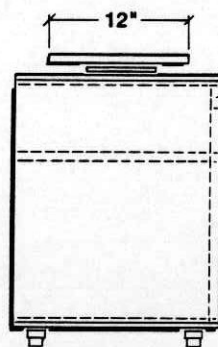
TYPICAL DIMENSIONS  
FOR ALL FOUR CORNERS



TOP VIEW

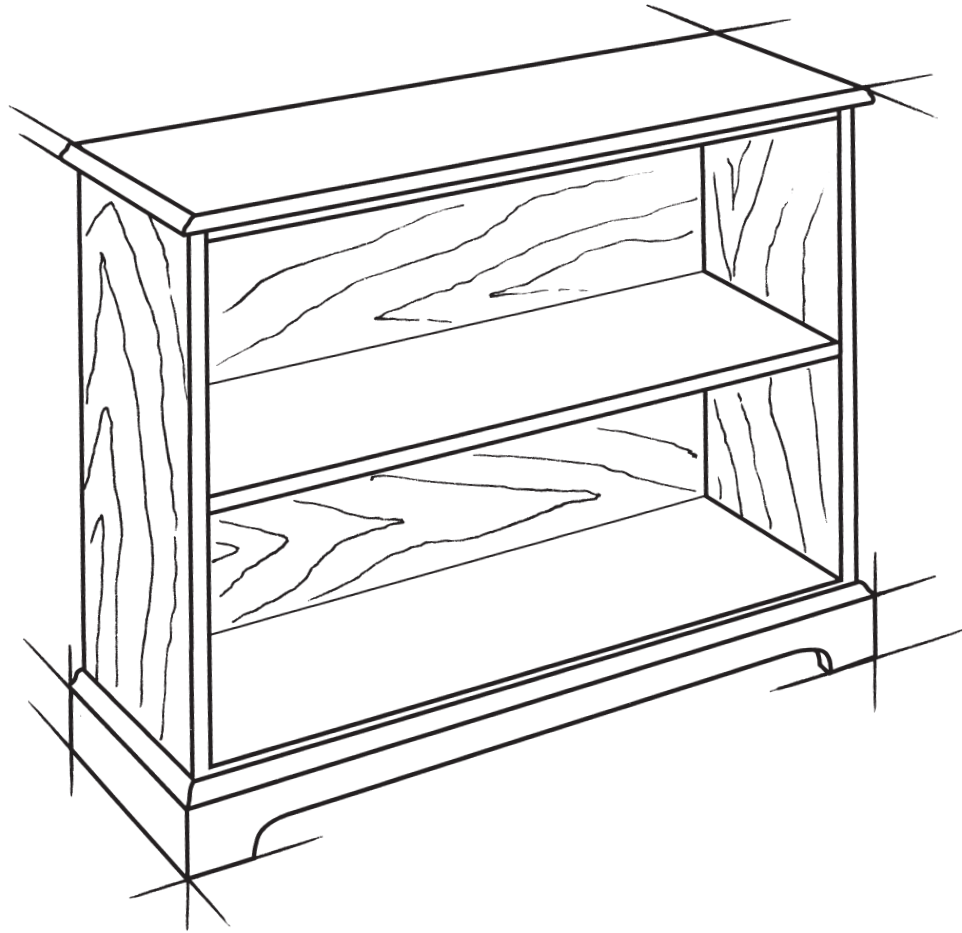


FRONT VIEW



RIGHT SIDE VIEW

# Traditional Bookcase



Here's a project that's a lot easier than it may look and when completed provides a sturdy, great-looking place for your favorite books.

- It's simple to build because all the pieces are screwed together, and store-bought moldings artfully cover the screwheads. There are no dado or dowel joints.
- After studying the measured drawing, you can adjust the length, depth or height to suit your specific needs. You can also use a different wood besides the oak or pine recommended in this project.

This bookcase gives intermediate woodworking students the opportunity to learn a number of important, basic skills, including measuring, cutting, marking, drilling, gluing, clamping and mitering. And after you build the bookcase, you'll learn how to apply stains and finishes to protect the wood and keep it looking beautiful.



## TOOLS REQUIRED

### Hand tools

- Small crosscut saw
- Block plane
- Pipe or bar clamps at least 4' long
- Combination square
- Carpenter's square
- Screwdriver
- Nail set

### Power tools

- Table or radial arm saw
- Router
- Belt sander
- Saber saw
- Electric drill
- Power screwdriver or screwdriver bits for drill

### Miscellaneous

- Pencil
- Carpenter's glue
- Safety glasses
- Utility knife

## SHOPPING LIST

Item	Quantity
3/4" x 4' x 8' oak- or pine-veneer plywood	1 sht.
1/4" x 4' x 4' oak- or pine-veneer plywood	1 pc.
4/4 oak or pine lumber	1 pc. 6" x 48", 1 pc. 4" x 48"
1/2" x 1/2" oak or pine cove molding	12 ft.
#6 x 2" drywall screws	12
#6 x 1-1/4" drywall screws	20
1" brads	40
1/4" brass shelf pins*	4

\*Available at home centers and hardware stores or from Rockler Woodworking and Hardware, Dept. HW, 4365 Willow Dr., Medina, MN 55340; (800) 279-4441. Stock #30437.

## CUTTING LIST

A	1	3/4" x 11-1/2" x 36" oak- or pine-veneer plywood (top)
B	2	3/4" x 11-3/8" x 27-1/4" oak- or pine-veneer plywood (sides)
C	3	3/4" x 11-1/8" x 34-1/2" oak- or pine-veneer plywood (top, bottom, shelf)
D	1	1/4" x 35-1/2" x 24-1/4" oak- or pine-veneer plywood (back)
E	1	3/4" x 3" x 37-1/2" oak or pine (base front)
F	2	3/4" x 3" x 12-1/4" oak or pine (base sides)
G	1	3/4" x 2" x 34-1/2" oak or pine (edging strips)
H	1	3/4" x 3/4" x 37-1/2" oak or pine (top front edging)
J	1	3/4" x 3/4" x 34-1/2" oak or pine (base cleat)
K	2	3/4" x 3/4" x 12-1/4" oak or pine (top side edging)

## WOOD FINISHING PRODUCTS

(Choose the recommended stain/finish or create your own combination)

### Recommended Finish

Prep: Minwax® Pre-Stain Water-Based Wood Conditioner

Stain: Minwax® Water-Based Wood Stain Rosewood (or a Minwax® Water-Based Custom Mixed Stain chosen from more than 60 colors)

Finish: Minwax® Polycrylic® Protective Finish Semi-Gloss

### Alternate Finishes

Minwax® Wood Conditioner (if using pine)  
Minwax® Gel Stain Mahogany (or any of the seven other wood-tone colors)

Minwax® Fast-Drying Polyurethane  
Or, a one-step finish: Minwax® Polyshades® Pecan (or any of the eight other wood-tone colors)

### Miscellaneous

Sandpaper  
Gloves  
Clean, lint-free rags  
Mineral spirits (for oil-based finishes)  
Minwax® Wood Putty  
Minwax® Finishing Brushes  
Water-filled metal container with tight-fitting lid

## BEFORE YOU BEGIN

Good craftsmanship begins and ends with good work habits, so make the following steps part of your routine workshop practice. If you have any doubts or questions about how to proceed with a project, always discuss them with your shop instructor.

- Carefully and fully review plans and instructions before putting a tool to the project lumber.
- Work sensibly and safely. Wear safety goggles when doing work that creates flying chips and sawdust; wear the appropriate mask or respirator whenever making sawdust or working with thinners or other solvents.
- At the end of every work session, clean up your shop area and put away all portable tools.

## CUTTING AND ASSEMBLY PROCEDURE

Refer to the project illustration shown on page 6.

1. Cut the 3/4" plywood pieces (A, B and C) to the sizes given in the Cutting List.

**Woodworker's Tips:** Many people have trouble cutting hardwood plywood cleanly, especially across the grain. For this bookcase, you'll have to master this skill, because some of the cuts will show on the finished piece. Here are a few tricks:

- Be aware of which side of your plywood is the good side, and keep it facing up while cutting on the table saw.
- Adjust your saw so the fence is exactly parallel to the blade, and the miter gauge slots are exactly perpendicular to it. If not, the blade will tear up fibers where it touches the wood behind the cut.
- For the smoothest cuts, use a 10" carbide-tipped saw blade with 60 to 100 teeth.
- If you're still not getting clean cuts, score the cutting line deeply with a sharp utility knife before you saw.

2. Cut the solid wood pieces (E, F, G, H, and K) a couple of inches longer than the dimensions given, so they can be trimmed to exact size later. Part J can be cut to the specified size now.

3. Rip part G into 1/8" strips for gluing to the front edge of pieces B and C. Your saw blade will be close to the fence, so use a push stick to guide the wood.

4. Glue the strips (G) to the front edges of pieces B and C using yellow carpenter's glue. After the glue is dry, cut or sand the strips so they're flush with the plywood. You can do this with a block plane or belt sander. If you use a sander, be careful not to cut or sand through the thin veneer of the plywood. If you've never tried this operation before, you may want to experiment on some scrap plywood first. When the strips are flush with the veneer, trim the ends with a small handsaw.

**Woodworker's Tip:** Use strips of masking tape as clamps for the edge strips. Tape is strong enough for this job and less cumbersome than bar clamps. Apply a tape strip about every 3-4".

5. Cut mitered ends on the 3/4" edging (H, K) that is used for the top (A). Cut the front piece (H) first, so that the miters are exactly flush with the corners of the plywood, then cut the side pieces (K). Clamp them to be sure they fit, then glue. The sides can be long in back and trimmed after the glue is dry. When the glue has dried, sand the edging flush with the plywood.

6. Cut the profile on the edge of the top with a router, using a 1/2" round-over bit with a pilot bearing.

7. Mark where the screws will go into the sides of the case, the top and the cleats. Drill the countersinks, then the clearance holes for the screws. Note that these holes are slightly off-center (about 1/16"), so the cove molding you add later will completely cover them.

**Woodworker's Tip:** Drilling first and countersinking second can result in a rough, chatter-marked hole, especially on oak plywood, which tears easily. Drill the countersink first, or use a combination drill/countersink bit.

8. Carefully lay out and then drill the shelf pin holes into the inside face of the sides (B).

**Woodworker's Tip:** A common mistake is to drill the shelf-pin holes inaccurately, resulting in a shelf that wobbles because it's not sitting on all four corners. To avoid this, mark out the holes very carefully; use an awl to prick the surface where you want the drill bit to start; and use a brad-point drill bit, which won't easily wander off the mark.

9. Cut the rabbets on the back edges of the sides (B). The easiest way to do this is with your table or radial arm saw, making two cuts and adjusting the fence after the first cut. Or, install a dado blade and set up the saw to make the rabbets in one pass.

10. Finish-sand all the pieces you've made so far. Start with 120-grit paper and finish with 220-grit.

**Woodworker's Tip:** It's a good idea to do as much of your sanding as you can before any pieces are assembled. That way, you eliminate having to sand inside corners. The same goes for finishing: If you can finish parts separately and then assemble them, do it. Remember, however, that glue won't stick to a finished surface, so don't put finish on the surfaces of glue joints.

11. Dry-clamp the pieces to be joined with screws and drill the pilot holes, using the countersunk clearance holes as your guide.

12. Screw the bookcase together. Start by screwing the top and bottom shelves (C) to the sides (B). Then screw the base cleat (J) to the bottom shelf (C). Next, screw the top (A) to the case.

13. Hold the base front piece (E) to the front of the bookcase and mark on its inside surface where the miters should be cut. Cut these miters, then cut the miters on the base sides (F).

**Woodworker's Tip:** Test your miter cuts on a couple of pieces of scrap (plywood works fine) before making the final cuts.

14. When the three base pieces (E and F) fit well, cut the curved opening at the bottom of the base front (E). Give all the base pieces a final sanding, then screw them onto the case. Use yellow carpenter's glue on the miter joints and other surfaces that meet. Trim the ends of the side pieces (F).

15. Mark the cove moldings for cutting the miter joints, and fit them on as you did with the edging and base pieces—the front first and then the sides. Drill pilot holes for the brads, not just into the cove molding, but into the bookcase as well. Nail on the molding, sink the nailheads

slightly with a nail set, push putty into the nail holes. When the glue is dry, trim the ends of the molding and sand them smooth.

16. Cut the back (D) to size and sand it, but don't nail it on until you've completed the finishing.

17. To prepare for finishing, slightly break all sharp edges on the bookcase with sandpaper.

## STAINING AND FINISHING

**Woodworker's Tip:** *Though you may be tempted to cut short your sanding and wiping time, don't do it. Both of these tasks are very important steps in obtaining a high-quality finish. Remember, it is the finish, just as much as the fit and smoothness of the parts, that will have great bearing on how people judge your craftsmanship. To ensure an excellent result, follow the steps listed below and also the instructions the finish manufacturer puts on its products.*

### FINISHING TIPS

- Use scraps of wood to test the stains and finishes you are planning to use. On the back of the scrap, mark the stain/finish combination and the type of wood. Allow all samples to dry thoroughly before making your final finish selection. Save your samples for quick reference on future projects.
- All stains and finishes must be allowed to dry thoroughly between coats. Remember that drying times can vary due to humidity and other climate conditions.
- If you have some leftover stain or finish, wipe the can rim so that stain or finish in the rim won't dry out and prevent the lid from forming a tight seal.
- Brushes used for oil-based finishes must be cleaned with mineral spirits; for water-based products such as Minwax® Polycrylic® Protective Finish, clean brushes with warm water and soap.

1. For this bookcase, you have the option of finish-sanding and applying stain and finish to some pieces before they're assembled. Whenever you do the sanding, sand with the grain to remove any marks or scratches that may have occurred during assembly. Start with 150-grit paper and finish with 220-grit. Dust off the piece and wipe it carefully with a water-dampened rag.

2. Apply Minwax® Water-Based Pre-Stain Wood Conditioner following the directions on the label. After 5 minutes, wipe off all excess Conditioner using a clean, lint-free rag. Use 150-grit paper to sand off any "whiskers" raised by the Conditioner. Proceed to the staining within 2 hours.

3. Apply the Minwax® Water-Based Wood Stain you've chosen, using either a rag or a nylon/polyester brush. Allow stain to penetrate no longer than 3 minutes. While stain is still wet, wipe off all excess with a clean cloth that's been lightly dampened with stain. Allow the piece to dry for 2 hours before applying a second coat, if desired. Allow the piece to dry overnight before applying the clear finish.

**Woodworker's Tip:** *Minwax® Water-Based Wood Stain is available in six factory (wood-tone) colors, a White Wash Pickling Stain and 60 custom colors. This means that you are not limited to just wood colors (pine, oak, walnut, etc.). Instead, you can actually pick and apply a color to complement the décor of the*

*room in which the bookcase will stand. For this reason, make sure you look over all of the Minwax® color charts before making your final selection.*

4. Apply Minwax® Polycrylic® Protective Finish following the directions on the can. Stir the can contents thoroughly before starting and periodically repeat the stirring during your work session.

5. Working a small area at a time to maintain a wet edge, apply the first coat. Work quickly and finish each newly coated section using with-the-grain brushstrokes.

6. Allow the finish to dry a minimum of 2 hours. Then sand lightly with 220-grit sandpaper wrapped around a soft backup block.

Thoroughly dust off and wipe all surfaces with a water-dampened rag.

7. Repeat steps 4, 5 and 6 to apply the second coat.

8. Repeat these steps to apply a third and final coat of Polycrylic® Protective Finish. Allow the bookcase to rest for about a week before using it.

### If you opt for an oil-based finish:

1. If using pine, apply Minwax® Pre-Stain Wood Conditioner, which evens out surfaces to be stained and assures that the wood will accept stain evenly (i.e., prevents blotching). Follow the directions on the label. After 15 minutes, wipe off all excess Conditioner using a clean, lint-free rag. Proceed to the staining within 2 hours.

2. Apply the Minwax® Gel Stain you've chosen, using a clean, lint-free rag. Allow the stain to set for about 10 to 15 minutes then wipe off any excess. Allow the stain to dry for 24 hours before applying the finish.

**Woodworker's Tip:** *When wiping off stain, make certain that your last wipe with the cloth goes with the grain of the wood. This way, any stain you might miss during wipe-off will be visually minimized by the wood grain.*

3. Apply Minwax® Fast-Drying Polyurethane following the directions on the can. To obtain the look of hand rubbing, use Satin finish. If more shine is desired, use Semi-Gloss or Gloss, and make sure you use a brush intended for use with Polyurethane. Allow the first coat to dry overnight.

4. The next day, sand all surfaces lightly with 220-grit paper using with-the-grain strokes. Dust off and wipe all surfaces with a rag dampened with mineral spirits. Apply a second coat of Polyurethane and set the piece aside to cure overnight.

5. The next day, sand all surfaces lightly with 220-grit paper. Dust off and wipe the piece with a rag dampened with mineral spirits and apply the third and final coat of Polyurethane. Allow the piece to cure for several days before using the bookcase.

### If you opt for a one-step finish:

A one-step finish such as Minwax® Polychades® can speed up your finishing process. This product allows for staining and finishing in one step. When you have a project with multiple surfaces, this product requires less drying time. Two coats are recommended for maximum beauty and finish durability.

1. After sanding wood smooth, to the 150-grit stage, dust off and carefully wipe with a rag dampened with mineral spirits to remove all traces of dust.

2. For superior results, treat softwoods like pine with Minwax® Pre-Stain Wood Conditioner, which evens out surfaces to be stained and assures that the wood will accept stain evenly (i.e., prevents blotching).
3. Brush on the Wood Conditioner, wait 15 minutes, then wipe with a clean, lint-free rag to remove any excess remaining on any surface. Proceed to the next step within 2 hours.
4. Brush on a thin even coat of Polyshades®. As you work each section, make certain your final brushstroke is in a with-the-grain direction.
5. Once you begin the staining process, do not stop. It is especially important with this product that you maintain a wet edge at all times. You do not want to have visible brush or “lap” marks on your project.
6. Allow the finish to dry at least 8 hours or overnight, if possible.
7. The next day, rub the surface lightly with steel wool, taking care to keep the steel wool in the shape of a flat pad. If you press too hard you not only will cut through the finish, but you also run the risk of rubbing in very obvious finger marks. Dust off the piece and wipe carefully with a rag dampened with mineral spirits to remove every particle of dust or steel wool.
8. Apply a second, thin coat of Polyshades® as you did the first coat. Allow the finish to dry for several days before putting the piece into service.

#### **PRODUCT SAFETY**

For your safety and the safety of those you work with, always read the safety warnings, which manufacturers print on their labels, and follow them to the letter. Typical safety advice and instructions will contain information such as the following:

**DANGER! MINERAL-BASED PRODUCTS ARE HARMFUL OR FATAL IF SWALLOWED. SKIN IRRITANT. COMBUSTIBLE. KEEP OUT OF REACH OF CHILDREN. DANGER:** Contains mineral spirits. Harmful or fatal if swallowed. Do not take internally. Skin irritant. Avoid contact with skin and eyes. Wear rubber gloves and safety glasses when handling. Combustible. Do not use or store near heat, sparks, flame or other source of ignition. Close container after each use. Avoid inhalation and use only with adequate ventilation. If using indoors, open all windows and doors to make sure there is fresh air movement. If you experience light-headedness, dizziness or headaches, increase fresh air movement or leave the area. Reports have associated repeated and prolonged occupational overexposure to solvents with permanent brain and nervous system damage. Intentional misuse by deliberately concentrating and inhaling the contents may be harmful or fatal.

**FIRST AID:** If swallowed: Do not induce vomiting. Call physician immediately.

**FOR SKIN CONTACT:** Wash thoroughly with soap and water. If irritation persists, get medical attention.

**FOR EYE CONTACT:** IMMEDIATELY flush eyes thoroughly with water, then remove any contact lenses. Continue to flush eyes with water for at least 15 minutes. If irritation persists, get medical attention.

**IF AFFECTED BY INHALATION:** Immediately move to fresh air. If symptoms persist, call physician.

#### **When using Minwax® Polycrylic® Protective Finish:**

**VAPOR HARMFUL.** Use only with adequate ventilation. To avoid overexposure, open windows and doors or use other means to ensure fresh air entry during application and drying. If you experience eye watering, headaches or dizziness, increase fresh air supply or wear NIOSH-

approved respiratory protection or leave the area. Avoid contact with eyes and skin. Wash hands after using. Keep container closed when not in use. Do not transfer contents to other containers for storage.

#### **DO NOT TAKE INTERNALLY.**

**FIRST AID.** In case of eye contact, flush thoroughly with large amounts of water for 15 minutes and get medical attention. For skin contact, wash thoroughly with soap and water. In case of respiratory difficulty, provide fresh air and call physician. If swallowed, get medical attention immediately.

#### **DELAYED EFFECTS FROM LONG-TERM OCCUPATIONAL OVEREXPOSURE.**

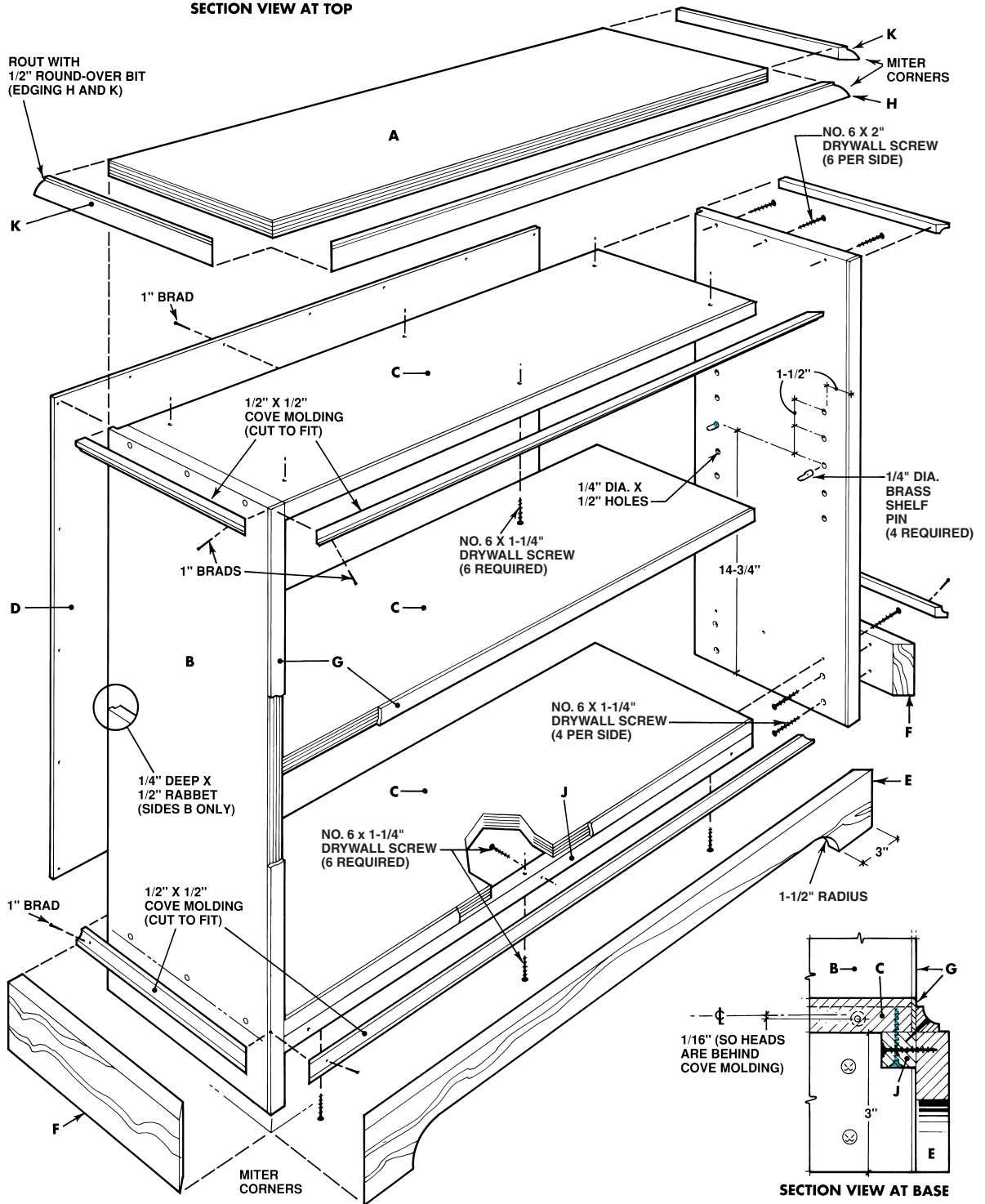
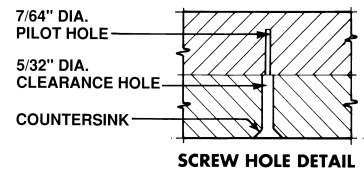
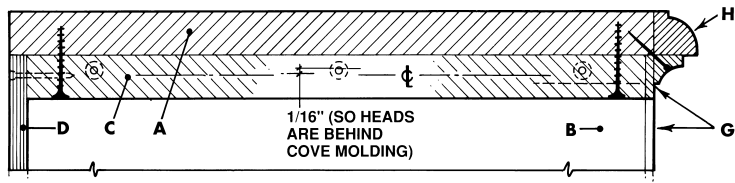
Contains solvents that can cause permanent brain and nervous system damage. Intentional misuse by deliberately concentrating and inhaling the contents may be harmful or fatal.

#### **SAFE DISPOSAL OF RAGS AND WASTE.**

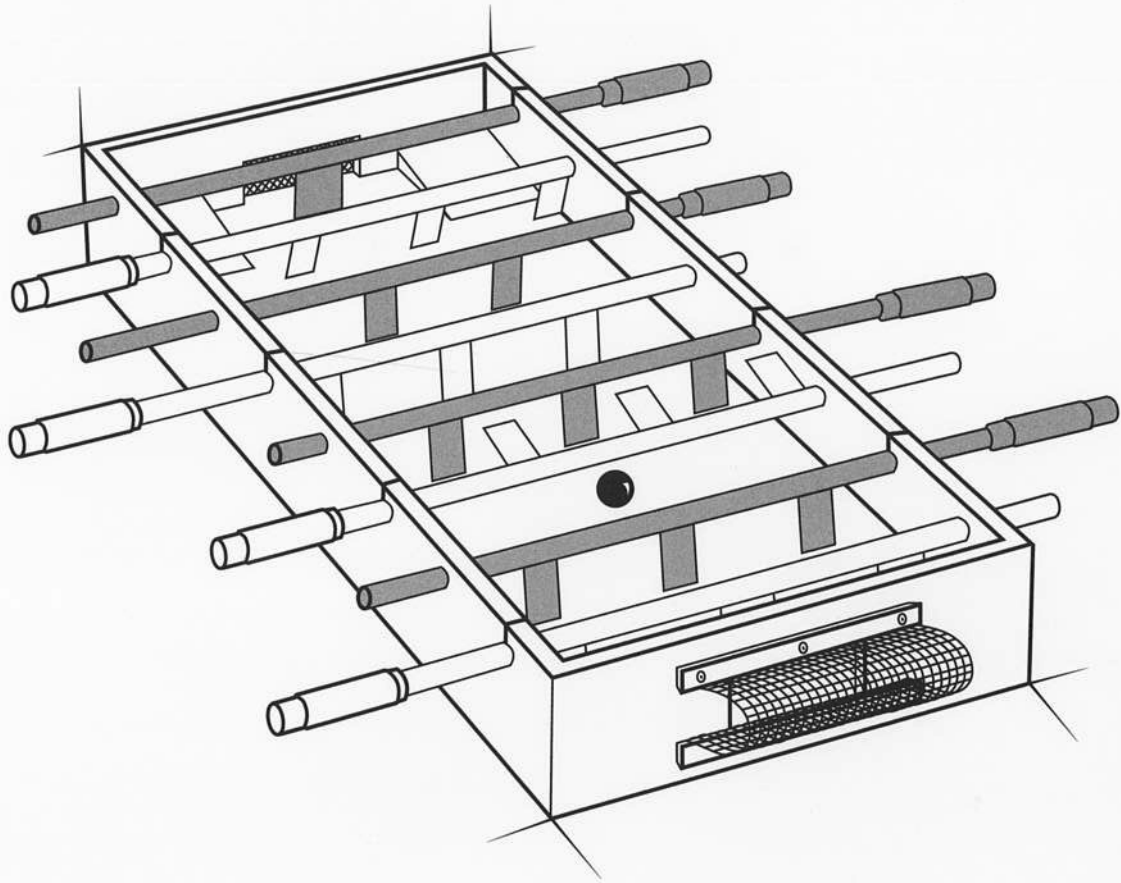
Please be mindful of the safe way to dispose of rags and other waste. Rags, steel wool and other waste products soaked with oil finishes or solvents may spontaneously catch fire if improperly discarded. Place rags, steel wool and other waste immediately after use in a water-filled metal container. Tightly seal and dispose of the waste materials in accordance with local trash removal regulations. Be sure to keep the waste out of reach of children.



# TRADITIONAL BOOKCASE



# Tabletop Soccer



If you like fast-action fun, here's a homemade foosball game that'll give everyone hours of enjoyment.

- Its hardwood construction is tough enough for lots of overtimes, and when the game is finally over, it stores compactly. Just slip out the dowel rods, put them inside the box, and set the game on a shelf.
- To make the game easier to build, you can devise a jig that simplifies the difficult task of attaching the rectangular players and goalies to the dowel rods.
- To save you some legwork, the Shopping List tells where to get some of the harder-to-find pieces, but you'll find almost everything else you need at a home center or lumberyard.

This game gives intermediate woodworking students the opportunity to learn a number of important, basic skills, including measuring, cutting, marking, drilling, routing, gluing, clamping and mitering. And after you build it, you'll learn how to apply and use finishes to protect the wood and keep it looking beautiful.

## TOOLS REQUIRED

### Hand Tools

- Two 4' bar clamps
- Two 6" C- or other small clamps
- Screwdriver
- Combination square

### Power Tools

- Table saw and dado blade
- Scroll or saber saw
- Router with a 1/4" straight bit
- Belt sander with a 60-grit or coarser sanding belt
- Electric drill, 13/16" spade bit, and a 3/8"-dia. plug cutter
- Hot-glue gun

### Miscellaneous

- Pencil
- Safety glasses
- Carpenter's glue
- Gloves for finishing
- Sandpaper
- Clean, lint-free cloths
- Mineral spirits (for oil-based finishes)
- Water-filled metal container with tight-fitting lid
- Minwax® Polycrylic® Brush, or good quality synthetic bristle brush for Water-Based Stains and Finish, or Minwax® Wood Finish™ Stain Brush, Minwax® Polyurethane Brush or good quality natural bristle brush for oil-based stains and finishes.

## SHOPPING LIST

Item	Quantity
1" x 6" x 8' oak	2
3/4" x 24" x 48" oak plywood	1
3/4" dia. x 36" birch or maple dowels	4
3/4" dia. x 36" walnut dowels	4
1/4" dia. x 9-1/2" birch dowel	1
1-1/4"-dia. birch ball	1
No. 6 x 1-1/4" drywall screws	12
No. 6 x 3/4" brass flathead screws	12
non-skid rubber feet with screws	6
rubber hand grips	8
12" x 24" nylon mesh netting	1

**Note on Materials:** Look for the hardwood dowels and ball at woodworking specialty store. Non-skid rubber feet and nylon mesh netting are available at home centers and hardware stores, and a local bicycle store will have the hand grips.

## CUTTING LIST

Key	Pcs.	Size & Description
A	2	3/4" x 5-1/2" x 41" oak (sides)
B	2	3/4" x 5-1/2" x 18" oak (ends)
C	4	3/4" x 4" x 5" oak (ramps)
D	2	1/4" x 2" x 2-1/2" oak (goalies)
E	18	1/4" x 1-1/4" x 2/1/2" oak (players)
F	4	1/4" x 3/4" x 9" oak (net supports)
G	4	3/4" dia. x 29" birch dowels (player/goalie rods)
H	4	3/4" dia. x 29" walnut dowels (player/goalie rods)
J	4	1/4" dia. x 1" birch dowels (goalie rod stops)
K	1	3/4" x 17" x 41" oak plywood (playing field)
L	1	3/4" x 7" x 20" scrap plywood (routing jig base)
M	1	3/4" x 4-5/16" x 20" scrap plywood (routing jig rear support)
N	1	3/4" x 2-1/8" x 20" scrap plywood (routing jig front support)
P	1	3/4" x 1-1/2" x 20" scrap plywood (routing jig fence)
Q	2	7" x 9" nylon mesh (goal nets; see Shopping List)

## WOOD FINISHING PRODUCTS

### Recommended Finish

Prep: Minwax® Water-Based Pre-Stain Wood Conditioner

Stain: Minwax® Water-Based Wood Stain\*

Sides and Ends: in Honeydew

Base & Ramps: in Green Tea

Walnut Rods, Players & Goalie: in Wild Berry

Birch or Maple Rods, Players & Goalie: in Natural Beige

Ball: White Oak (or any color you prefer)

\* (or a Minwax® Water-Based Wood Stain of your choice, available in six wood tones and 60 custom colors)

Finish: Minwax® Polycrylic® Protective Finish Satin

### Alternate Finish

Stain: Minwax® Wood Finish™ \*\*

Sides and Ends: Golden Oak

Base & Ramps: Golden Oak

Walnut Rods, Players & Goalie: Special Walnut

Birch or Maple Rods, Players & Goalie: Ipswich Pine

Ball: Minwax® Wood Finish™ Pickled Oak

\*\* (or your choice of 18 Minwax® Wood Finish™ Stain colors)

Finish: Minwax® Fast-Drying Polyurethane Satin

## BEFORE YOU BEGIN

Good craftsmanship begins and ends with good work habits, so make the following steps part of your routine workshop practice. If you have any doubts or questions about how to proceed with a project, always discuss them with your shop instructor.

- Carefully and fully review plans and instructions before putting a tool to the project lumber.
- Work sensibly and safely. Wear safety goggles when doing work that creates flying chips and sawdust; wear the appropriate respirator whenever making sawdust or working with thinners or other solvents.
- At the end of every work session, clean up your shop area and put away all portable tools.

## CUTTING AND ASSEMBLY PROCEDURE

1. Cut pieces A through C and pieces F through Q to the dimensions given in the Cutting List. The goalies (D) and players (E) will be cut to fit into the goalie/player dowel-rod grooves later. When you cut the goal nets (Q), follow the weave of the mesh to help cut square pieces.

2. Lay out and drill the rod holes in the sides (A). Counterbore and drill the drywall screw holes in the ends (B), and drill the screw holes in the net supports (F).

3. Using a table saw fitted with a dado blade, cut the grooves in the side and end pieces (A and B), then cut the rabbets on the outside edges of the end pieces. Set the fence so the rabbets will be 3/4" wide.

### How To Cut A Wedge

Here's a fast and simple way to cut the plywood routing jig wedge using your table saw. Clamp a 50" auxiliary fence to the table saw's fence. Make a 1/2" x 3/4" x 2" riser block to hold the plywood piece at an angle to the fence. Set the auxiliary fence 3-11/16" away from the saw blade (use a blade with a 1/8" kerf blade). Tape the riser block to the plywood so it holds the plywood 1/2" away from the auxiliary fence and cut off the wedge.

4. Assemble (without glue) the sides, ends and playing field (A, B and K). Take a close look at Figure A, then lay out the 5/16"-wide player/goalie slots for inserting the rods once everything is assembled. Note that the layout is different on each side. To avoid splitting the wood later when you insert the screws, drill pilot holes for the drywall screws that attach the ends to the sides. Then disassemble the parts, and cut the slots with a jigsaw.

5. Lay out and cut the goal holes on the ends (B) with a jigsaw. Start by drilling a 3/8"-dia. hole inside the cutout to insert the jigsaw blade. Smooth the sawn edges with a file.

6. Make the player/goalie groove routing jig next. Start by cutting the sliding wedge off part M, the routing jig rear support (Fig. B). Then glue and clamp the routing jig pieces I through P together as shown in Figure C. This jig is set for a router with a 6"-dia. base. If your router has a different diameter base, glue the routing jig fence (P)

to the routing jig rear support (M) so the router bit is centered over the rods (half the diameter of your router's base). We devised this jig to make simple work of cutting straight grooves in dowel rods. It'll not only save frustration, but ensures that the grooves line up straight along the dowel rod. The rod is held tight in the jig by tapping on the wide end of the sliding wedge. Then the base of the router is held against the jig's fence as the router bit is plunged into the rod and the groove is cut. A regular router works fine but a plunge router makes this job easier.

7. Measure and mark the jig routing guidelines relative to the right end of the jig using the dimensions and layout shown in Figure C. Use a combination square to draw the lines across the jig's front support (N).

8. Set a player rod (G) into the routing jig and align the right end of the rod flush with the right end of the jig. Tap the wedge in place with a hammer to hold the rod securely in the jig. Using a combination square, transfer the routing guidelines from the jig to the rod. Rout the three player grooves using a 1/4" straight router bit. Cut the grooves slightly past the marks drawn on the rod. Do three of the birch rods (G) and three of the walnut rods (H) this way.

9. Using the routing jig again, cut the goalie grooves in the two remaining rods (one groove per rod). Because the goalies are wider than the players, mark the routing end points 3/8" wider on each side of the center player guidelines. Next, drill the rod stop (J) holes before you remove the goalie rods from the jig.

10. Using a table saw with a regular rip blade, cut the goalies (D) and players (E) to the dimensions given in the Cutting List, and so they fit tight in the grooves cut in the rods.

11. Taper the ramps (C) using a 60-grit or coarser sanding belt in your belt sander as shown in Figure D. Apply a couple of dabs of hot glue to the underside of the ramp pieces to temporarily hold them to a scrap board. Clamp the scrap board to a worktable and sand the tapers. Use a putty knife to "pop" off the tapered pieces from the scrap board.

12. Sand the surfaces of all the parts smooth except the outsides of the sides (A) and ends (B); this will be done later. Start with 120-grit sandpaper, and finish with 180-grit sandpaper.

13. Glue and clamp one side to the playing field (K) and let the glue dry. Then glue and clamp the other side to the playing field. Before the glue dries, glue and screw the ends (B) in place. You may need to loosen the clamps near the edges of the sides in order to get the ends to go on.

14. Cut 12 oak screw cover plugs using a 3/8"-dia. plug cutter. Glue and hammer the plugs into the counterbored drywall screw holes. Now finish-sand the outsides of the side and end pieces.

15. Glue the players, goalies and goalie rod stops (J) into their rod slots. Also glue the ramps into the corners of the playing field. Sand smooth all the sharp edges of all the parts.



16. Attach the net supports (F) and goal nets (Q) over the goals. Pre-drill the screw holes, then insert the screws through holes in the cloth mesh before fastening the supports to the ends. Then remove the goal nets prior to finishing (see "Staining and Finishing" below).

## STAINING AND FINISHING

**Woodworker's Tip:** *Though you may be tempted to cut short your sanding, preparation and application, don't do it. These tasks are very important steps in obtaining a high-quality finish. Remember, it is the finish, just as much as the fit and smoothness of the parts that will have great bearing on how people judge your craftsmanship. To ensure an excellent result, follow the steps listed below and also the instructions the finish manufacturer puts on its products.*

### FINISHING TIPS

- Use scraps of wood to test the stains and finishes you are planning to use. On the back of the scrap, mark the stain/finish combination and the type of wood. Allow all samples to dry thoroughly before making your final finish selection. Save your samples for quick reference on future projects.
- All stains and finishes must be allowed to dry thoroughly between coats. Remember that drying times can vary due to humidity and other climatic conditions.
- To get additional surface protection, after finishing apply two or three coats of Minwax® Paste Wax. Buff each coat with a clean, stiff fiber brush; after the last wax application and buffing, rub all surfaces with a clean, lint-free cloth.
- If you have some leftover stain or finish, wipe the can rim so that stain or finish in the rim won't dry out and prevent the lid from forming a tight seal.
- Brushes used for oil-based finishes must be cleaned with mineral spirits; for water-based products, such as Minwax® Water-Based Stain and Minwax® Polycrylic® Protective Finish, clean brushes with warm water and soap.

17. For this project, you have the option of finish-sanding and applying stain and finish to some pieces before they're assembled. Whenever you do the sanding, use a pad sander and with-the-grain sanding strokes to remove any marks or scratches that may have occurred during assembly. Start with 120-grit paper and finish with 220-grit. Dust off the piece and wipe it carefully with a cloth lightly dampened with water.

### Recommended Finish

18. Apply Minwax® Pre-Stain Water-Based Wood Conditioner, following the directions on the can. After 1 to 5 minutes, wipe off all excess conditioner using a clean, lint-free cloth. Wait 15 to 30 minutes and then use fine-grade paper to sand off any "whiskers" raised by the conditioner. Proceed to the staining within 2 hours.

19. Do the staining in two steps, starting on the interior surfaces and then moving to the exterior surfaces. Apply the Minwax® Water-Based Wood Stain you've chosen to the interior surfaces using either a cloth or a nylon/polyester brush. Allow stain to penetrate no longer than 3 minutes. While stain is still wet, wipe off all excess with a clean cloth that's been lightly dampened with stain. Allow the piece to dry

for 2 hours before applying a second coat, if desired. Allow the piece to dry overnight before applying the clear finish.

### Woodworker's Tip:

*Minwax® Water-Based Wood Stain is available in six factory (wood-tone) colors, a White Wash Pickling Stain and 60 custom colors. This means that you are not limited to just wood colors (pine, oak, walnut, etc.). We chose the colors to replicate the look of a soccer stadium, but you can actually pick and apply your favorite "team" or school colors. For this reason, look over all of the Minwax® color charts before making your final selection.*

20. Apply Minwax® Polycrylic® Protective Finish following the directions on the can. Stir the can contents thoroughly before starting and periodically repeat the stirring during your work session.

21. Working a small area at a time to maintain a wet edge, apply the first coat. Work quickly and make the final strokes in each newly finished section using with-the-grain brushstrokes.

22. Allow the finish to dry a minimum of 2 hours. Then sand lightly with 220-grit sandpaper wrapped around a soft backup block. Thoroughly dust off and wipe all surfaces with a cloth lightly dampened with water.

23. Repeat steps 20, 21 and 22 to apply the second coat.

24. Repeat the above steps to apply a third and final coat of protective finish.

### Alternate Finish

25. Do the staining in two steps, starting on the interior surfaces and then moving to the exterior surfaces. Apply the Minwax® Wood Finish you've chosen to the interior surfaces using a clean, lint-free cloth. Allow the stain to set for about 5 to 15 minutes then wipe off any remaining excess. Repeat for the exterior surfaces. Allow the stain to dry for 24 hours before applying the finish.

### Woodworker's Tip:

*When wiping off stain, make certain that your last wipe with the cloth goes with the grain of the wood. This way, any stain you might miss during wipe-off will be visually minimized by the wood grain.*

26. Apply Minwax® Fast-Drying Polyurethane following the directions on the can. Use a good quality natural bristle brush intended for use with polyurethane. Allow the first coat to dry overnight.

27. The next day, sand all surfaces lightly with 220-grit paper using with-the-grain strokes. Dust off and wipe all surfaces with a cloth lightly dampened with mineral spirits. Apply a second coat of polyurethane and set the piece aside to cure overnight.

28. The following day, sand all surfaces lightly with 220-grit paper. Dust off and wipe the piece with a cloth lightly dampened with mineral spirits and apply the third and final coat of polyurethane.

29. After the staining and finishing is done, and the piece has cured for several days, screw the rubber feet to the bottom edges of the sides, reattach the goal nets, and hammer the hand grips onto the player/goalie rods. Wrap electrical tape around any dowels that need it to tighten the grips. Slide the player/goalie rods in place, and you're done. Let the games begin!

#### **PRODUCT SAFETY**

For your safety and the safety of those you work with, always read the safety warnings, which manufacturers print on their labels, and follow them to the letter. Typical safety advice and instructions will contain information such as the following:

**DANGER! MINERAL-BASED PRODUCTS ARE HARMFUL OR FATAL IF SWALLOWED. SKIN IRRITANT. COMBUSTIBLE. KEEP OUT OF REACH OF CHILDREN. DANGER:** Contains mineral spirits. Harmful or fatal if swallowed. Do not take internally. Skin irritant. Avoid contact with skin and eyes. Wear rubber gloves and safety glasses when handling. Combustible. Do not use or store near heat, sparks, flame or other source of ignition. Close container after each use. Avoid inhalation and use only with adequate ventilation. If using indoors, open all windows and doors to make sure there is fresh air movement. If you experience lightheadedness, dizziness or headaches, increase fresh air movement or leave the area. Reports have associated repeated and prolonged occupational overexposure to solvents with permanent brain and nervous system damage. Intentional misuse by deliberately concentrating and inhaling the contents may be harmful or fatal.

**FIRST AID:** If swallowed: Do not induce vomiting. Call physician immediately.

**FOR SKIN CONTACT:** Wash thoroughly with soap and water. If irritation persists, get medical attention.

**FOR EYE CONTACT: IMMEDIATELY** flush eyes thoroughly with water, then remove any contact lenses. Continue to flush eyes with water for at least 15 minutes. If irritation persists, get medical attention.

**IF AFFECTED BY INHALATION:** Immediately remove to fresh air. If symptoms persist, call physician.

#### **When using Minwax® Polycrylic® Protective Finish:**

**VAPOR HARMFUL.** Use only with adequate ventilation. To avoid overexposure, open windows and doors or use other means to ensure fresh air entry during application and drying. If you experience eye watering, headaches or dizziness, increase fresh air supply or wear respiratory protection (NIOSH/MSHATC23C or equivalent) or leave the area. Avoid contact with eyes and skin. Wash hands after using. Keep container closed when not in use. Do not transfer contents to other containers for storage.

#### **DO NOT TAKE INTERNALLY.**

**FIRST AID.** In case of eye contact, flush thoroughly with large amounts of water for 15 minutes and get medical attention. For skin contact, wash thoroughly with soap and water. In case of respiratory difficulty, provide fresh air and call physician. If swallowed, get medical attention immediately.

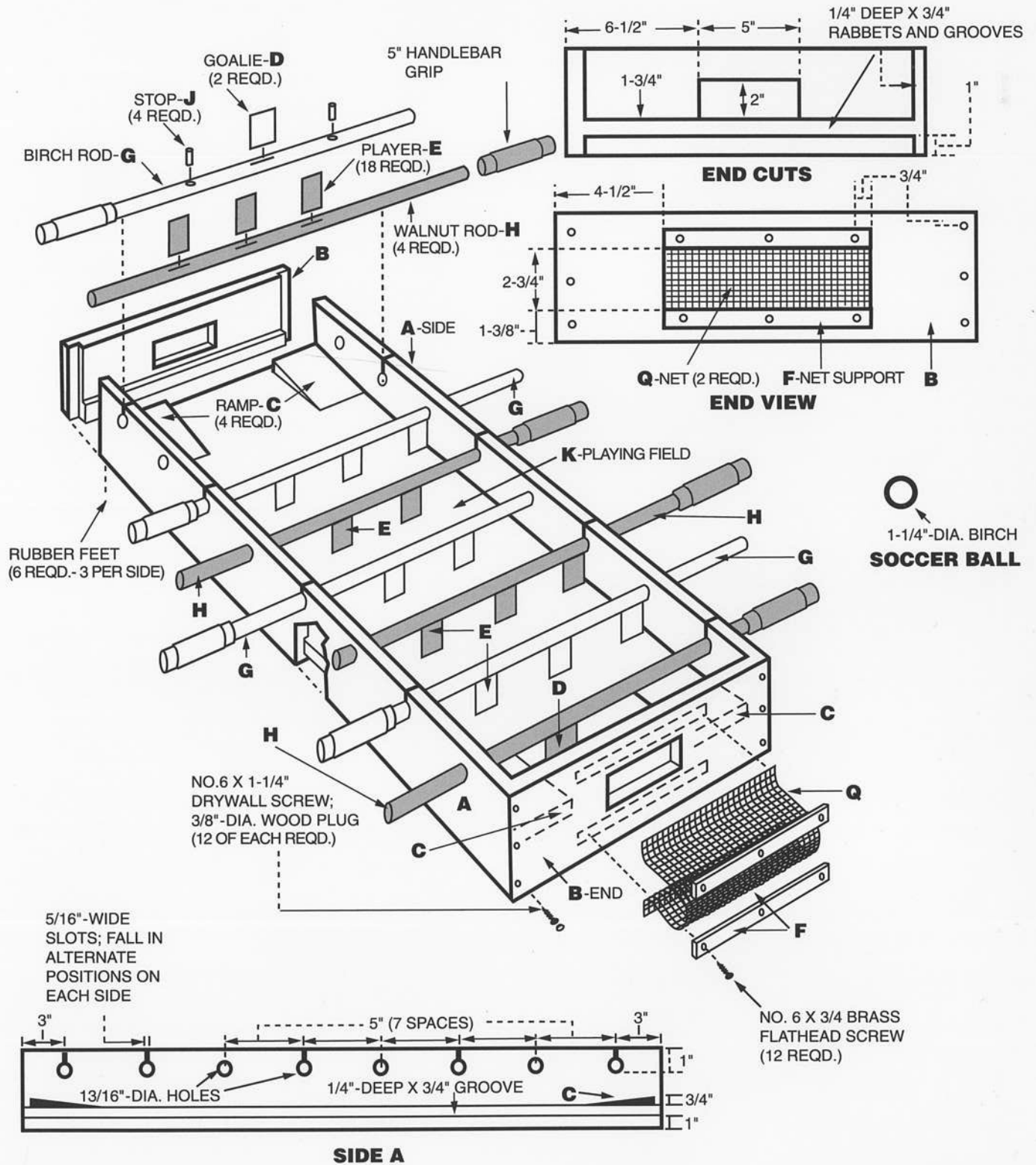
#### **DELAYED EFFECTS FROM LONG-TERM OCCUPATIONAL OVEREXPOSURE.**

Contains solvents that can cause permanent brain and nervous system damage. Intentional misuse by deliberately concentrating and inhaling the contents may be harmful or fatal.

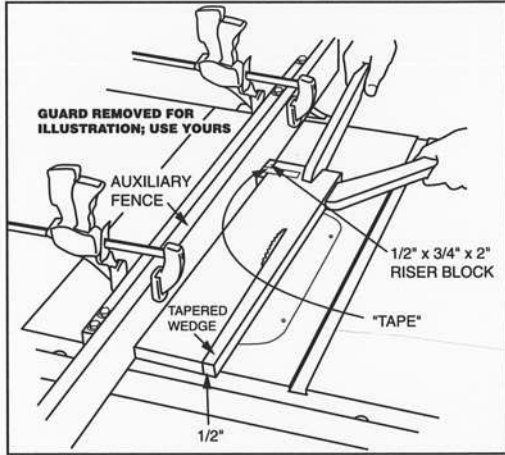
#### **SAFE DISPOSAL OF RAGS AND WASTE.**

Please be mindful of the safe way to dispose of rags and other waste. Rags, steel wool and other waste products soaked with oil finishes or solvents may spontaneously catch fire if improperly discarded. Place rags, steel wool and other waste immediately after use in a water-filled metal container. Tightly seal and dispose of the waste materials in accordance with local trash removal regulations. Be sure to keep the waste out of reach of children.

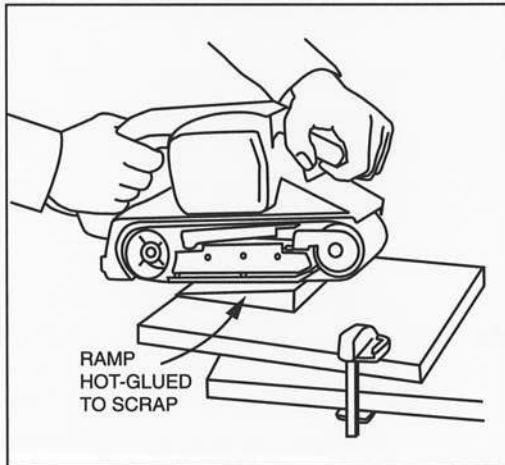
# FIG A. TABLETOP SOCCER ASSEMBLY



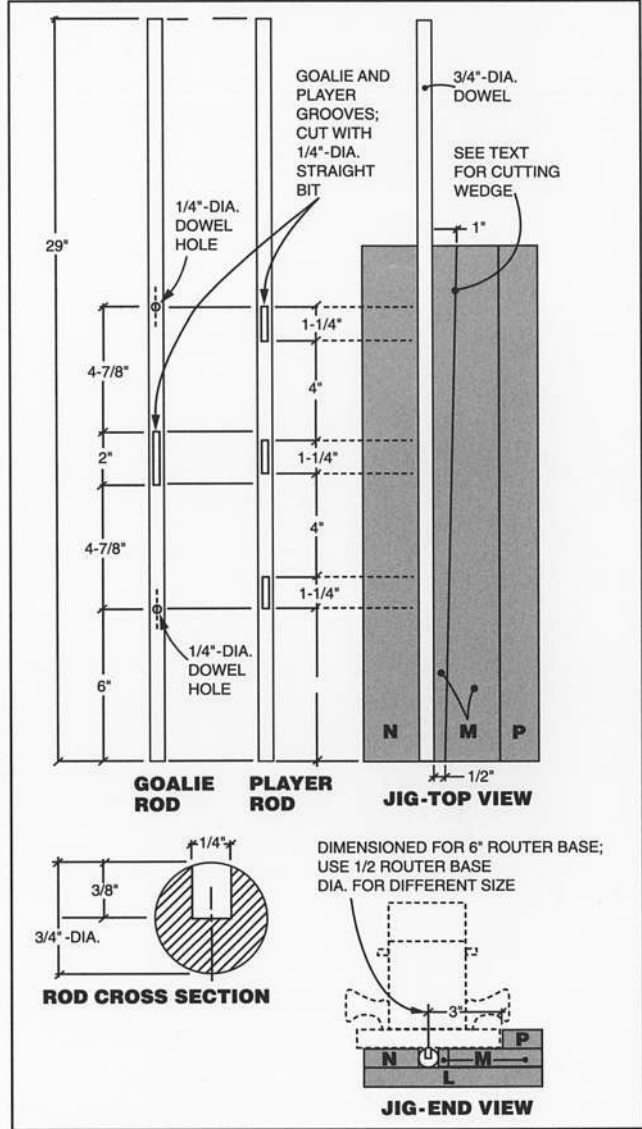
**FIG B. CUTTING THE WEDGE FOR THE ROUTING JIG**



**FIG D. MAKING THE RAMPS**

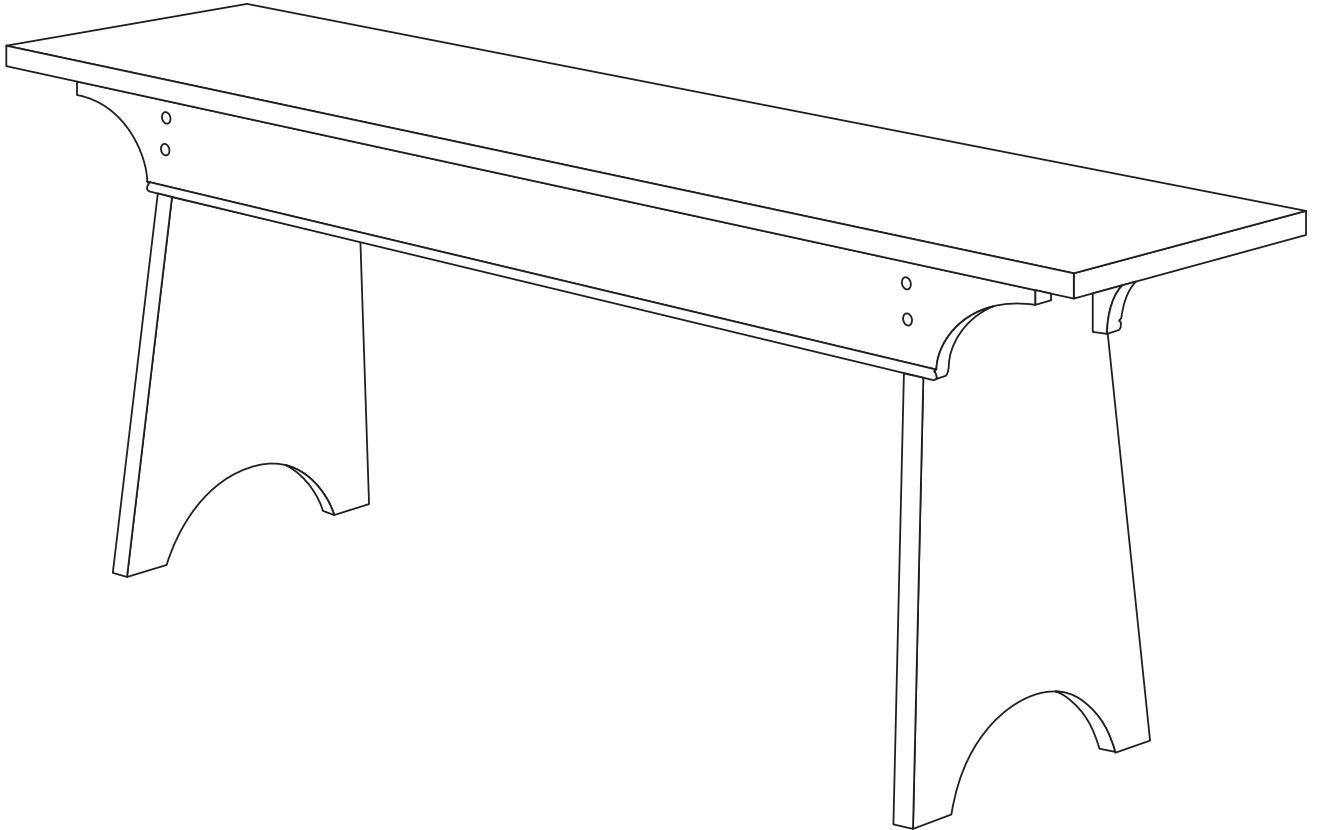


**FIG C. THE ROUTING JIG**





# Stowaway Bench



This country-style bench will cut the clutter by the door and serve as a resting spot to put on your shoes. The lid opens to reveal a handy storage area. At only 11" deep by 44" long, it neatly fits in an entryway or mudroom.

You will add to your intermediate-level skills by learning how to use a table saw sled for making extra-wide crosscuts. You'll learn how to make repeatable cuts by setting up the saw miter gauge with a tall, wide fence and a stop block. You'll also gain experience in making angle and radius cuts in a project that shouldn't take you more than a day to build. After it's assembled, you'll learn more about applying stains and finishes to protect the wood and keep it looking beautiful.

## TOOLS REQUIRED

### Hand Tools

- Chisel
- Hand plane or sanding block
- Bar clamps

### Power Tools

- Table saw with regular and dado blades
- Jigsaw
- Router with a beading bit

### Miscellaneous

- Tape measure
- Pencil
- Safety glasses
- 120-, 150- and 220-grit sandpaper
- Clean, lint-free cloths
- Tape
- Respirator
- Gloves for finishing
- Mineral spirits (for oil-based stains and finishes)

- Water-filled metal container with tight-fitting lid (for oil-based stains and finishes)
- Minwax™ Polycrylic™ Brush or other good quality, synthetic bristle brush (for water-based stains and finishes)
- Minwax™ Wood Finish™ Stain Brush and Minwax™ Polyurethane Brush or other good quality, natural bristle brush (for oil-based stains and finishes)

## SHOPPING LIST

Item	Quantity
1 x 12 x 8' pine	1
1 x 8 x 6' pine	1
1-1/2" x 3" brass butt hinges	2
3/8" dowel rod	1

Recommended wood - Pine (stain grade)

Alternate wood selections - Oak or Douglas Fir

## CUTTING LIST

Overall Dimensions: 17"H x 44"W x 11"D			
Key	Part	Pcs.	Dimensions
A	Lid	1	3/4" x 11" x 44"
B	Legs	2	3/4" x 11" x 16-1/4"
C	Rails	2	3/4" x 3-1/2" x 39-3/4"
D	Bottom	1	3/4" x 7" x 30-3/4"
E	Pegs	8	3/8" x 1-3/4"

## WOOD FINISHING PRODUCTS

### Recommended Finish

- Prep: Minwax® Water-Based Pre-Stain Wood Conditioner
- Stain: Minwax® Water-Based Wood Stain  
Lid - Lemongrass\*  
Rails and legs - Island Water\*
- Finish: Minwax® Polycrylic® Protective Finish Semi-Gloss

### Alternate Finish

- Prep: Minwax® Pre-Stain Wood Conditioner
- Stain: Minwax® Gel Stain Antique Maple  
(or your choice of 8 Minwax® Gel Stain colors)
- Finish: Minwax® Wipe-On Poly Satin or Gloss

\*Or a Minwax® Water-Based Stain of your choice, available in 6 wood tones, a White Wash Pickling Stain, 60 custom colors, and 8 bold Accents™ colors.

## BEFORE YOU BEGIN

Good craftsmanship begins and ends with good work habits, so make the following steps part of your routine workshop practice. If you have any doubts or questions about how to proceed with a project, always discuss them with your instructor.

- Carefully and fully review plans and instructions before putting a tool to the project lumber.
- Work sensibly and safely. Wear safety goggles and the appropriate respirator whenever making sawdust or working with thinners or other solvents.
- At the end of every work session, clean up your shop area and put away all portable tools.

## CUTTING AND ASSEMBLY PROCEDURE

**Woodworker's Tip:** *It's important that the lid (A) be as flat as possible. Since it's common for wide boards to be slightly warped, pick the flattest one for the lid before cutting out any other parts.*

1. Rip and crosscut the lid (A), legs (B) and rails (C) to final dimensions. The legs and lid are too wide to crosscut with a standard table saw miter gauge, but a simple shop-made crosscut sled solves this problem. Or, make the cuts with a power miter saw or a radial arm saw. Cut the bottom (D) to final length, but don't rip it to width. It will be custom fit later on.
2. Cut a dado in each of the two legs (B) as shown in Figs. 1 and 2. Then cut the notches in the upper corners of the legs. This is a three-step process that's illustrated in Fig. 2. Each step requires clamping the leg to a tall, miter gauge fence, as shown in Fig. 4.
3. First, make two vertical cuts in the top of each leg. Most table saws won't be able to cut the full 3-1/2" depth that's required for this cut. This is not a problem and has the benefit of preventing the scrap from falling out during the final cuts.
4. Second, set the miter gauge 95 degrees to the left of the blade and crosscut the left-hand notches (when facing the dado) on each leg.
5. Third, set the miter gauge 95 degrees to the right and crosscut the right-hand notches. Break off the waste with your hand, and clean up any remaining wood with a chisel. Now test fit the rails into the notches. The tops of the rails and the tops of the legs should be flush. If either is proud, trim or sand them flush. Next, cut the angle on the sides of the legs with a jigsaw and smooth the cut with a hand plane or sanding block.
6. The arcs at the bottom of the legs come next. Start by drawing a 4" radius circle on a piece of cardboard. Cut it out and use it as a template. Position it according to the dimensions in Fig. 2 and draw the arc. Then cut the arc with a jigsaw. Clean up the rough edges with sandpaper.
7. Rout a bead on the bottom edge of the rails (C). A beading bit creates this classic profile.

8. Draw the arc at the ends of the rails, as shown in Fig. 3, using a cardboard circle template. Cut out each arc with a jigsaw. Clean up the rough edges by sanding as you did before.

9. Cut mortises for the hinges in the back rail. The depth of the mortise should equal the thickness of the hinge when it is closed. Mark the locations of the hinges (Fig. 1) and use the table saw and a dado blade to remove the waste (Fig. 5). Test fit the hinges in the mortises and drill pilot holes for the screws.

### Custom Fit the Bottom

10. The bottom (D) needs to be exactly the same width as the length of the dado in the legs. Place the bottom in the dado, flush-up the edge of the bottom with one side of the dado and mark the exact width on the other side (Fig. 6). Now cut the bottom to final width.

### Assemble the Parts

**NOTE:** If you plan to do a two-tone stain, apply the stain colors before the piece is assembled. See "STAINING AND FINISHING."

11. Begin by building an assembly jig to hold the legs upright during the glue-up. A 2' x 4' sheet of plywood works fine for the base and some scrap 2x2 material is all that's needed for the supports. Rip the edges of the 2x2s on the table saw with the blade set at a 5-degree angle. Then crosscut them so you get four 12"-long pieces. Orient the supports so they hold the legs angled toward each other. Double-faced tape works well to fasten the four angled scraps to the plywood. Position the supports so the bottom inside edges of the legs are 32-1/2" apart. The sides are now held at the right distance from each other, angled at 5 degrees, and with no hands!

12. Dry-fit the rails in the leg notches to make sure they extend 1/2" beyond each end, as shown in Fig 3. Adjust the 2x2 supports if needed.

13. Sand all the parts before gluing. Start with 120-grit sandpaper and work your way up to 220-grit. Also round over any sharp edges on the lid or legs that will be exposed after final assembly.

## FINAL ASSEMBLY

14. To assemble, start by gluing the bottom into the leg dadoes. You'll notice that the dadoes are at a slight angle because the legs are angled in. It's nothing to be concerned about and the bottom will still fit fine. Clamp across the top of the legs to pull the bottom securely into the dadoes. Apply glue to the rails and set them in place. Clamp along the bottom of the rails and at the ends. Clean up any glue squeeze-out with a putty knife after the glue becomes semi-dry. Allow the glue to completely dry before proceeding.

### Peg the Rails to the Legs

15. When the glue is dry, remove the clamps and drill the holes for the pegs (E) that help hold the rails to the legs (Figs. 1 and 3). Drill the holes 1-3/4" deep. Store-bought 3/8" dowel rod will work fine for the pegs, but making your own from the same wood as the bench adds a nice touch.

16. To make your own pegs, rip some scraps into 3/8" x 3/8" square rods and round them with a rasp or chisel. Next, cut the rods into 2" lengths. Slightly taper one end of the pegs to make them easier to drive in. Then use a small dowel or stick to smear glue inside the peg hole. Insert the peg and tap it in with a hammer. Trim off the remaining dowel with a handsaw and sand it flush. Be careful you don't damage the rail when trimming the dowels.

**Woodworker's Tip:** *To prevent scratching the rails when flush-trimming the pegs, use a flat piece cut out from a yogurt lid and put a hole in the middle to keep the saw away from the wood. A piece of cardboard or a playing card will also work. Sand off the small amount of dowel that remains.*

### Hinge the Lid

17. Screw the hinges into mortises in the back rail. Then mark lines on the underside of the lid for the hinges. Position these lines so when the lid is attached to the bench it is centered from side to side and front to back. Drill holes for the hinge screws. Be careful not to drill through the lid. Now snip the tips off the screws to make them 5/8" long. This keeps them from poking through the top of the lid. Screw the hinges to the lid.

## STAINING AND FINISHING

**Woodworker's Tip:** *Though you may be tempted to cut short your sanding, preparation and application time, don't do it. These tasks are very important steps in obtaining a high-quality finish. Remember, it is the finish, just as much as the fit and smoothness of the parts that will have great bearing on how people judge your craftsmanship. To ensure an excellent result, follow the steps listed in this section and also the instructions the finish manufacturer puts on its products.*

### FINISHING TIPS

- Test the stains and finishes you are planning to use on scraps of wood. On the back of the scrap, mark the stain/finish combination and the type of wood. Allow all samples to dry thoroughly before making your final finish selection. Save your samples for quick reference on future projects.
- All stains and finishes must be allowed to dry thoroughly between coats. Remember that drying times can vary due to humidity and other climatic conditions.
- If you have some leftover stain or finish, wipe the can rim so that stain or finish in the rim won't dry out and prevent the lid from forming a tight seal.
- Brushes used for water-based products, such as Minwax® Water-Based Wood Stains or Minwax® Polycrylic® Protective Finish, should be cleaned with soap and water; oil-based finishes must be cleaned with mineral spirits.

18. Sand all pieces with 120-grit paper, then move up to 220-grit to complete the pre-finish smoothing. Use an orbital sander to remove any marks or scratches, then lightly sand by hand using with-the-grain sanding strokes. Wipe the piece carefully with a clean, lint-free cloth lightly dampened with mineral spirits.

### Recommended Finish

Before applying Minwax® Water-Based Wood Stain to a hardwood or softwood, apply Minwax® Water-Based Pre-Stain Wood Conditioner following the directions on the can. After 1 to 5 minutes, wipe off all excess conditioner using a clean, lint-free cloth. Wait 15 to 30 minutes then use fine-grade paper to sand off any "whiskers" raised by the conditioner. Proceed to the staining within 2 hours.

19. For two-tone staining, apply the stain prior to assembly. After assembly, you'll only have to dab on and wipe off stain at the ends of the pegs. Apply the Minwax® Water-Based Wood Stain you've chosen using either a nylon/polyester brush or soft cloth. Allow stain to penetrate no longer than 3 minutes. While stain is still wet, wipe off all excess with a clean cloth that's been lightly dampened with stain. Allow the piece to dry for 2 hours before applying a second coat, if desired. Allow the pieces to dry overnight before assembling the bench and applying the protective clear finish.

**Woodworker's Tip:** *Minwax® Water-Based Wood Stain is available in 6 wood tones, a White Wash Pickling Stain, 60 custom-mixed colors, and 8 bold Accents™ colors. This means that you are not limited to just traditional wood colors (pine, oak, walnut, etc.). Instead, you can pick and apply a color to complement the décor of the room in which the bench will be placed. For this reason, make sure you look over all of the Minwax® color charts or check [minwax.com](http://minwax.com) before making your final selection.*

20. After allowing the assembled piece to dry overnight, apply Minwax® Polycrylic® Protective Finish following the directions on the can. Stir the can contents thoroughly before starting and periodically repeat the stirring during your work session.

21. Working a small area at a time to maintain a wet edge, apply the first coat. Work quickly and make the final strokes in each newly finished section using with-the-grain brushstrokes.

22. Allow the finish to dry a minimum of 2 hours. Then sand lightly with 220-grit or finer sandpaper wrapped around a soft backup block. Thoroughly wipe all surfaces with a cloth lightly dampened with water.

23. Repeat steps 20 and 21 to apply the second and final coat. For additional protection, you may choose to apply a third coat to the top of the bench.

### Alternate Finish

After the bench is assembled, apply the Minwax® Gel Stain you've chosen to the interior surfaces using a clean, lint-free cloth or natural bristle brush. Allow the Gel Stain to set for about 3 minutes, then wipe off any excess. Repeat for the exterior surfaces. To achieve a deeper color, you may apply a second coat after 8 to 10 hours, repeating the application directions for the first coat. Allow the stain to dry for 24 hours before applying the finish.

**Woodworker's Tip:** *When wiping off stain, make certain that your last wipe with the cloth goes with the grain of the wood. This way, any stain you might miss during wipe-off will be visually minimized by the wood grain.*

24. Apply Minwax® Wipe-On Poly following the directions on the can. Shake the can thoroughly. Apply a liberal amount of Wipe-On Poly on a clean, soft, lint-free cloth into the wood. It can be brushed on or wiped on with a cloth. Allow the first coat to dry for at least 4 hours.

25. Once completely dry, sand all surfaces very lightly with 220-grit or finer sandpaper or very fine (000) steel wool using with-the-grain strokes. Thoroughly wipe off all surfaces with a soft cloth. Apply a second coat of Minwax® Wipe-On Poly and set the piece aside to dry for at least 4 hours.

26. Once completely dry, sand all surfaces lightly with 220-grit or finer sandpaper or very fine (000) steel wool. Thoroughly wipe off the piece with a soft cloth and apply a third and final coat of Wipe-On Poly. Allow the bench to cure for several days before using it.

#### **PRODUCT SAFETY**

For your safety and the safety of those you work with, always read the safety warnings, which manufacturers print on their labels, and follow them to the letter. Typical safety advice and instructions will contain information such as the following:

**WARNING!** Removal of old paint by sanding, scraping or other means may generate dust or fumes that contain lead. Exposure to lead dust or fumes may cause brain damage or other adverse health effects, especially in children or pregnant women. Controlling exposure to lead or other hazardous substances requires the use of proper protective equipment, such as properly fitted respirator (NIOSH approved) and proper containment and cleanup. For more information, call the National Lead Informations Center at 1-800-424-LEAD (in US) or contact your local health authority.

#### **When using oil-based wood finishing products:**

**CAUTIONS: CONTAINS ALIPHATIC HYDROCARBONS. Contents are COMBUSTIBLE.** Keep away from heat and open flame. **VAPOR HARMFUL.** Use only with adequate ventilation. To avoid overexposure, open windows and doors or use other means to ensure fresh air entry during application and drying. If you experience eye watering, headaches, or dizziness, increase fresh air, or wear respiratory protection (NIOSH approved) or leave the area. Avoid contact with eyes and skin. Wash hands after using. Keep container closed when not in use. Do not transfer contents to other containers for storage.

**FIRST AID:** In case of eye contact, flush thoroughly with large amounts of water for 15 minutes and get medical attention. For skin contact, wash thoroughly with soap and water. In case of respiratory difficulty, provide fresh air and call physician. If swallowed, call Poison Control Center, hospital emergency room, or physician immediately.

**NOTICE:** Reports have associated repeated and prolonged occupational exposure to solvents with permanent brain and nervous system damage. Intentional misuse by deliberately concentrating and inhaling contents may be harmful or fatal.

**WARNING:** This product contains a chemical known to the State of California to cause cancer and birth defects or other reproductive harm.

**DO NOT TAKE INTERNALLY. KEEP OUT OF REACH OF CHILDREN.**

#### **When using water-based wood finishing products:**

**CAUTIONS:** Use Only With Adequate Ventilation. To avoid overexposure, open windows and doors or use other means to ensure fresh air entry during application and drying. If you experience eye watering, headaches, or dizziness, increase fresh air, or wear respiratory protection (NIOSH approved), or leave the area. Avoid contact with eyes and skin. Wash hands after using. Keep container closed when not in use. Do not transfer contents to other containers for storage.

**FIRST AID:** In case of eye contact, flush thoroughly with large amounts of water. Get medical attention if irritation persists. If swallowed, get medical attention immediately.

**WARNING:** Contains Alkyl propanols, ethylene glycol, n-methyl pyrrolidone. **VAPOR HARMFUL.** Use only with adequate ventilation. To avoid overexposure, open windows and doors or use other means to ensure fresh air entry during application and drying. If you experience eye watering, headaches, or dizziness, increase fresh air, or wear respiratory protection (NIOSH approved) or leave the area. Avoid contact with eyes and skin. Wash hands after using. Keep container closed when not in use. Do not transfer contents to other containers for storage.

#### **DO NOT TAKE INTERNALLY.**

**FIRST AID:** In case of eye contact, flush thoroughly with large amounts of water for 15 minutes and get medical attention. For skin contact, wash thoroughly with soap and water. In case of respiratory difficulty, provide fresh air and call physician. If swallowed, call Poison Control Center, hospital emergency room, or physician immediately.

#### **DELAYED EFFECTS FROM LONG-TERM OVEREXPOSURE.**

Contains solvents which can cause permanent brain and nervous system damage. Intentional misuse by deliberately concentrating and inhaling contents may be harmful or fatal.

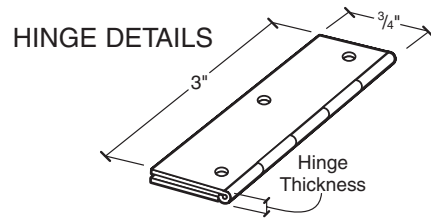
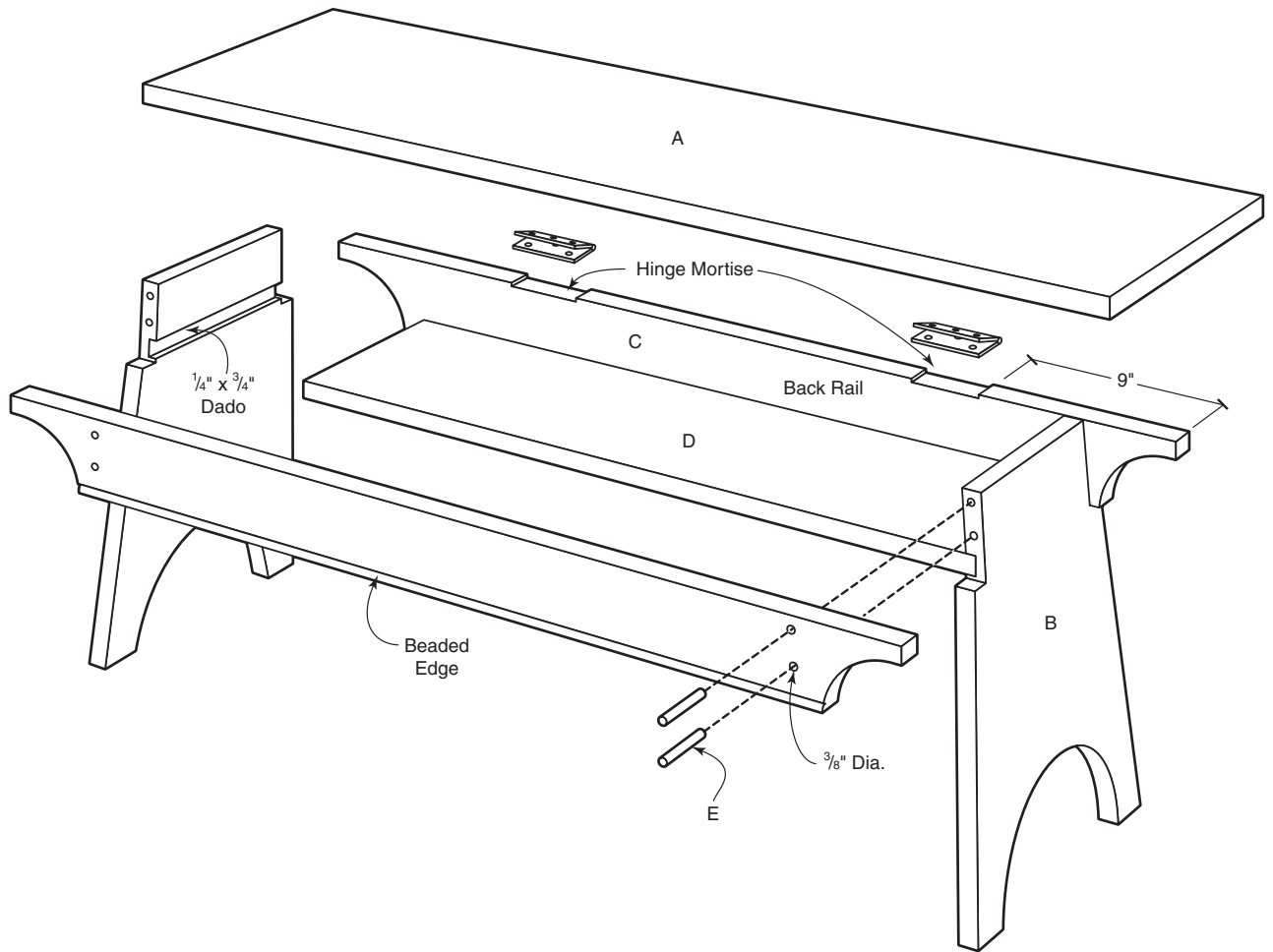
**WARNING:** This product contains a chemical known to the State of California to cause cancer and birth defects or other reproductive harm.

**KEEP OUT OF REACH OF CHILDREN.**

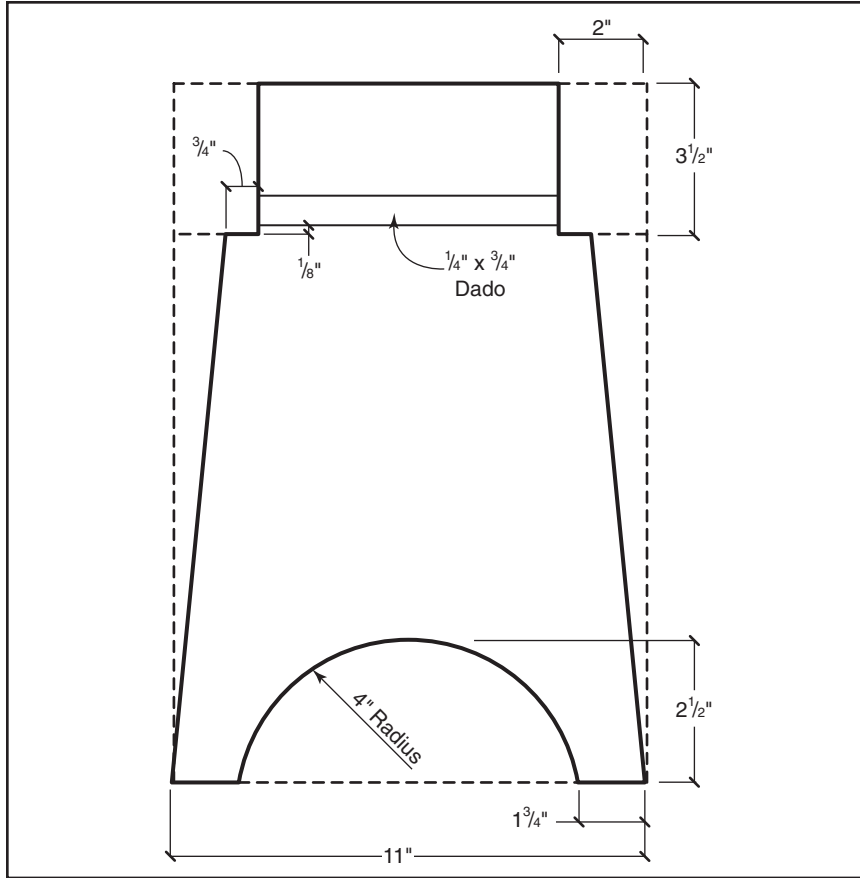
#### **SAFE DISPOSAL OF RAGS AND WASTE.**

**DANGER:** Rags, steel wool, other waste soaked with this product, and sanding residue may spontaneously catch fire if improperly discarded. Immediately place rags, steel wool, other waste soaked with this product, and sanding residue in a sealed, water-filled, metal container. Dispose of in accordance with local fire regulations.

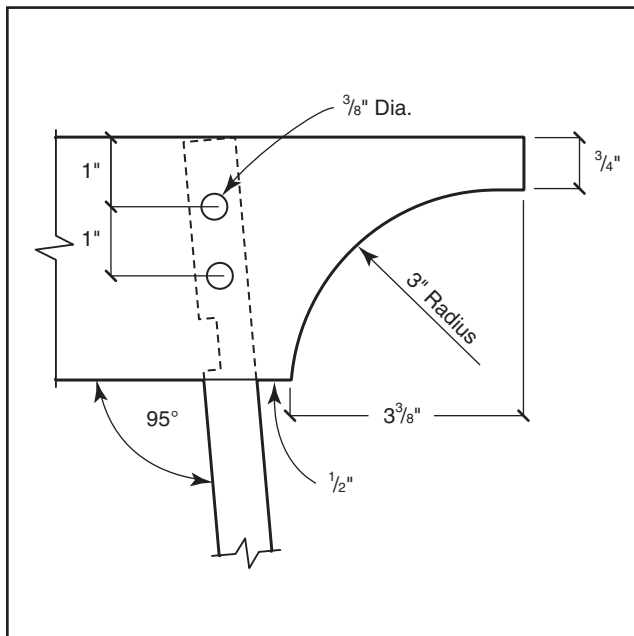
**FIG 1. BENCH DETAILS**



**FIG 2. CUTTING DIMENSIONS FOR LEGS**

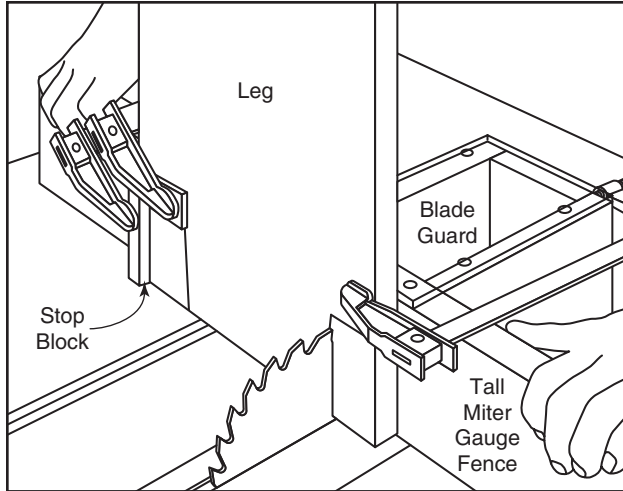


**FIG 3. RAIL DETAIL**

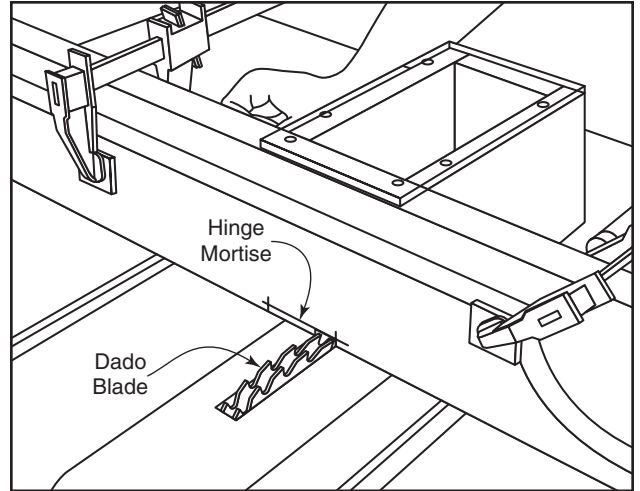




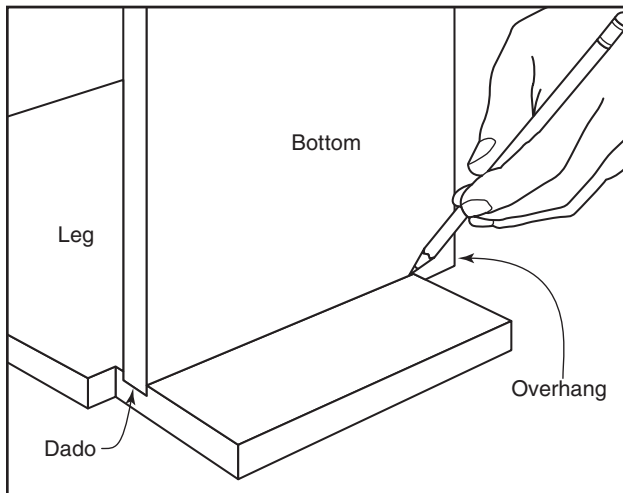
**FIG 4. CUTTING THE LEGS**



**FIG 5. CUTTING THE BACK RAIL**



**FIG 6. CUSTOM FIT THE BOTTOM**





# Storage Cabinet

Building this attractive storage cabinet will challenge the intermediate-level student, thus increasing his or her woodworking knowledge and skills. While the construction details are straightforward, you will learn techniques such as rabbeting, mortise and tenon joinery and how to make and install doors.

The finished piece is functional and can be used in any room of the house. Its design blends with all types of home décor.

A final word before starting. Carefully read through the entire set of plan instructions. Study the drawings for building this cabinet before going to work on the project and discuss and resolve with your teacher any questions you may have. These steps will eliminate any chance of confusion and wasted materials.

## TOOLS AND MATERIALS REQUIRED

### Hand Tools

- Pencil
- Ruler (zigzag or tape)
- Hammer and 1/32" nailset
- Square (combination or try)
- Drill bits assortment
- Phillips and slotted screwdriver (medium)
- Block plane
- Clamps, Hand screw and bar
- Safety glasses
- Respirator (for sanding step)

### Power Tools

- Jointer
- Plate joiner with no. 20 biscuits
- Planer, if necessary
- Sanders: belts, random orbit, pad; with appropriate sanding papers in 80, 120, 150 grits, plus, 220-grit for pad sander
- Saws (radial and table)
- Mortising jig
- Electric drill (with screwdriver bit)
- Router, with cutters: 3/4" straight and 1/4" rounding over, 3/8" rabbet
- Molding Cutterhead Set
- Router table

## BUILDING MATERIALS REQUIRED

See Buying and Cutting lists

## WOOD FINISHING PRODUCTS

### Finish recommended for this project

- Minwax® Pre-Stain Water-Based Wood Conditioner
- Minwax® Water-Based Wood Stain, Blue Hawaii\*\*
- Minwax® Polycrylic® Protective Finish

### Alternate Finishes

- Minwax® Wood Conditioner
- Minwax® Gel Stain\*\*\*
- Minwax® Fast-Drying Polyurethane

### Or, this one-step finish

- Minwax® Polyshades®††

### Miscellaneous

- Minwax® Wood Putty
- Assorted rags, or use inexpensive brushes for applying stain
- Minwax® Finishing Brushes
- Tack cloths
- Clean, lint-free rags for wiping
- Water-filled metal container with airtight lid, if necessary

\*\*Blue Hawaii was used on the prototype cabinet; you can select your Water-Based Stain color from a collection of more than 60 colors and hues to suit the décor of the room in which the cabinet will reside.

\*\*\*Pick from 8 wood-tone color stains

††Available in 9 wood-tone colors

## STEPS FOR BUILDING THE STORAGE CABINET

1. Initially cut all parts slightly oversize making certain all boards which are to be edge-joined with biscuits are cut slightly over-length. However, cut the legs to exact width, thickness and length.
2. Arrange the boards for the top to achieve the most pleasing visual arrangement of wood grain. Before moving the boards, lightly with soft pencil, draw a cabinetmaker's triangle on the top surface (see drawing). This mark permits accurate, fast realignment of the boards to the selected arrangement later after ploughing grooves. Then carefully make the tick marks along abutted board edges marking the biscuit locations.

3. Cut these grooves using the plate joiner; join the boards using glue and number 20 biscuits. After aligning the boards, apply pressure with bar clamps and put the setup aside to dry overnight.
4. Lay out all of the carcass stiles and rails and mark the parts with identifying marks to ensure minimal waste of material.
5. Cut all carcass stiles and rails to size and set aside in orderly piles.
6. Lay out the tenons on the horizontal members; cut them using the mortise and tenon jig on the table saw.
7. Using the tenons as a guide, lay out and bore the mortises in all four legs. If your shop has a mortising tool use it to bore the mortises in the legs. Otherwise, create the mortises the old-fashioned way—by boring overlapping 1/4-in. dia. holes and cleaning the holes square with a sharp, narrow chisel.
8. Next, lay out the legs, rails and stiles for the grooves that will receive the panels. Plough the grooves using a straight 1/4-in. cutter chucked in a table-mounted router.

**Cabinetmaker's Tip:** *Before you plough any of the grooves, temporarily lay out the cabinet sides and front members as they will go together. Mark the inside surface of each member with a light pencil "X." Do this as an orientation reminder—that is, to remind you of which surface should bear against the fence when routing. This way, if there is any slight variation of shoulder widths (both sides of groove), it will be repeated on the same side of the groove **on every piece**—and it will not matter.*

9. After all routing is completed, dry-assemble (i.e., without glue) the carcass frame to check for fit; make adjustments if necessary.
10. With the side panels temporarily assembled, measure to determine the width and length of the panels and cut the panels.
11. After any adjustments have been made, assemble the first end panel. Use glue in the mortise and tenon joints but do not apply glue to the panel edges; the latter should "float" in the stile and rail grooves to allow for expansion and contraction.
12. Work quickly and carefully and try to avoid smearing any glue on the wood surfaces. With the first side assembled on the workbench, apply clamping pressure with a pair of bar clamps. Apply firm pressure—just enough to see some glue squeeze out along joint lines, no more. Resist the urge to use brute strength; it is unnecessary and, in fact, may cause damage to your workpiece.
13. Before setting the glued-up section aside, make certain to recheck its corners with a framing square; be aware that it is possible for clamp pressure to pull the setup out-of-square. You want to be sure your section is square before allowing the glue to dry.
14. Repeat the procedure to assemble the second side. Allow the glue to dry at least 4 hours before proceeding to the next step.
15. Next day, remove the clamps and bore the holes through the legs for the dowels through the tenons, as shown in the drawing. Glue-in the dowels, to lock all corners.
16. Since it is much easier to install the shelf cleats on both side panels before assembling the carcass, do so now. Make certain that they are accurately located.
17. Assemble the two sides with the top and bottom rails at front and back. Again, use glue in the joints and, after checking all for square, apply clamping pressure to hold all securely while the glue dries. Wait at least 4 hours before removing the clamps.
18. After removing the clamps, immediately bore the holes and install the dowels through legs and rail tenons (as you did for the sides).

19. Install the cabinet bottom. Measure for the notches that must be cut in all four corners; cut them out using a band or scroll saw. Test for fit and when satisfied, install the bottom using glue and 1-1/2 in. finishing nails.
20. Finally, install the stiffener cleat, centered between top rails using glue and 2-in. finishing nails.
21. Note: Set all nails slightly below surface and fill holes using Minwax® Wood Putty.
22. Measure for, and cut the two shelves to fit.
23. Measure for, and cut the top; then cut and attach the two bread-board ends. Attach these to the top using glue and 1-1/2 in. finishing nails. Set the nails and fill the depressions with Minwax® Wood Putty.
24. Position the top on the cabinet. Check the overhang on both ends and align the top flush with the back. Use a pair of clamps to hold the top securely in place while you lay out and bore the pilot holes for the screws. Notice that these lead holes are counterbored to receive the dowel plugs that cover the screw heads.
25. Secure top with 1-1/2 in. no. 8 flathead wood screws; glue dowel plugs in to conceal screw heads. (Allow 24 hours before sanding dowels flush with top.)
26. Since it makes the job much easier, install the shelf cleats from the back using glue and 1-1/4 in. flathead screws, turned into countersunk lead holes.
27. Measure for, cut and install the plywood back. Use 1-1/4 in. nails (no glue).

## MAKING THE DOORS

The cabinet doors, rails and stiles are assembled using half-lap joints, which is an excellent exercise in woodworking joinery for the second-year student. The corners on the prototype cabinet are held fast with dowels and glue. (If preferred, you can simply drive 5/8-in. screws through the laps, from the back. If you opt for this method, make sure the screw heads are seated in countersunk holes.)

In order to create the wainscot pattern on the door panels, you must use the molding cutterhead on the table saw. See step 5 on page 3. To do this, first install a wooden auxiliary fence on the rip fence. The auxiliary fence's purpose is to ensure that the spinning cutter head will not make contact with the metal fence. If you have never worked with an auxiliary fence or do not know the reason for using one, discuss this technique with your instructor. Your instructor will explain the fence and its use, and explain how to make and install it on the table saw.

1. Start by ripping all stiles and rails to width; notice that the bottom rail is slightly wider than the top rail and stiles. At this time, it is a good idea to rip two pieces of scrap stock to width for use as test pieces when setting up the half-lap joints and grooves for the panels.
2. The safest, most accurate way to cut the half-lap joints is on the table saw, with the mortising jig securely holding the workpiece. Lay out the half-lap cuts on the scrap pieces; when satisfied with their fit, cut the project wood.
3. The first cut is with the board clamped vertically in the tenoning jig. Cut all required tenons before resetting the saw to make the lap-joint width cuts. Lower the blade so it protrudes exactly 3/8 in. and set up your miter gauge to make the crosscut. Make a test cut in your scrap piece and, when satisfied, cut all boards to complete the tenon step.
4. Dry-assemble the two "doors" and lightly pencil an "X" on the inside surfaces of all eight pieces. This is *very important* because the half-lap

joints can make it confusing as to which side of the board to hold against the router fence when ploughing the groove (i.e., the stiles are one way, the rails 180 degrees opposite). The job will be error free when the “X” side of every piece is held against the fence when ploughing grooves. Plough the grooves in all stiles and rails.

5. Dry-assemble the two doors (e.g., no glue yet) so you can measure the width and length to which the panel inserts must be cut. Cut them to size.

6. Install the appropriate cutters in the molding head cutter and install the cutterhead on the table saw. Crank it to position the cutters at the desired elevation for the light cut to be made in the panel faces.

7. Install the wooden auxiliary fence and position it for the first pass. Using a piece of scrap plywood, make a test cut. If necessary, adjust cutterhead or fence then proceed with cutting the grooves in the project wood.

8. Cutting the “wainscot” grooves requires three passes on each panel.

9. After ploughing these decorative surface grooves, sand the panel faces, if necessary, using 150-grit sandpaper wrapped around a sanding block.

10. Assemble the doors in this manner:

- Apply glue to both ends of one stile and to one end only on both the top and bottom rails. (NOTE: Make sure all those “X” surfaces are facing the same plane.) Install the panel in the stile groove and position the rails. Apply glue to the third and fourth joints and completely assemble the door. Check for square and, when satisfied, apply light clamping pressure; set aside to dry. Repeat procedure for second door.
- Next day, remove the clamps and, as shown in the drawing, bore 1/4-in. dia. holes 5/8-in. deep through tenons. Apply glue and install dowels.

11. Install the doors on the cabinet trimming and fitting with a block plane as needed. When satisfied with the door installation, install the magnetic catches and the door pulls in the cabinet.

Construction is now complete and you can move onto the fun part of your project—the finishing.

## SANDING, STAINING AND FINISHING

For this project, we picked a user-friendly finish system that produces high-quality results. It is one of the latest finish techniques on the scene—and, no solvents are required because all steps use water-based product.

Other good reasons for choosing a water-based system include:

- a) Water-based finishes are low odor.
- b) They are fast drying.
- c) All cleanup is with water.

- If you choose to use Minwax® Wood Finish and Fast-Dry Polyurethane, follow all instructions on the can labels, including those for disposing of oil-soaked rags, steel wool, etc. Also, carefully read the label for all safety and first aid information.
- Before starting the finishing steps, remove the doors from the cabinet and the hardware from the doors.

### Before Staining

1. Run the palms of your hands over the cabinet surfaces to check them for smoothness; sand where necessary using 150-grit paper wrapped around a soft backup block. Dust off the piece and wipe thoroughly with a tack rag. (Do not use steel wool to “sand.”)

2. Apply Minwax® Pre-Stain Water-Based Wood Conditioner; take care to brush it on evenly. Work quickly, maintaining a “wet edge” to avoid streaks or overlaps. Allow it to penetrate for about 5 minutes.

3. After 5 minutes, use a clean, lint-free cloth to remove any excess Conditioner remaining on the surface. Wait 15-30 minutes before proceeding.

4. Check the surface for “whiskers” that may have been raised; smooth them off using 180-grit (or finer) sandpaper wrapped around a soft backup block. Rub lightly, then remove all sanding dust with brush and tack cloth.

### STAINING

5. Open the Minwax® Water-Based Wood Stain and stir contents thoroughly with a clean stick. Note: To avoid any chance of pigment settling during your staining operation, it is recommended that the stirring be repeated every so often during the staining step.

6. Apply the Stain using a nylon/synthetic brush, foam brush, staining pad or rag. The Stain should be left on the surface for a relatively short period—about 3 minutes—so work a small area at a time. While the Stain is still wet, remove any excess with a clean, lint-free cloth lightly dampened with Stain. Make the final wipe-off parallel to grain direction. Use light to medium pressure to achieve even color penetration.

7. **NOTE:** If there is any uneven color penetration, immediately re-wet the surface with additional Stain and work it into the surface using either a rag or brush. Use light pressure over the dark and light areas until they blend in.

8. To increase color intensity, allow the first coat to dry 2 hours, then repeat steps 6 and 7.

***Finisher’s Tip:** No matter what clear finish you are working with, the job is certain to turn out better when you use a strong light. An inexpensive photo lamp is ideal. To ensure finding any missed spots, position the lamp so its beam of light strikes the surface at a 45-degree angle to your line of vision. A missed spot will be flat, there will be no reflection. Move the lamp about as you move from one surface to the next to maintain the strong reflecting angle.*

### Final Step: Applying Clear Finish

1. Open the can of Minwax® Polycrylic® Protective Finish and stir well. Do not shake Polycrylic. Note: Periodically repeat the stirring during the finish application. The finish appears milky in the can but will dry crystal clear.

2. Apply Polycrylic with a high-quality synthetic bristle brush. For best results, apply a thin first coat in the direction of the grain. Do not overbrush.

3. Allow the first coat to dry at least 2 hours, then sand smooth with 220-grit paper. Remove all dust with a tack rag.

4. Apply the next coat, repeating steps 2 and 3.

5. Apply the final coat. Do not sand.

Although the surface will be ready for light handling in 3 hours, allow the cabinet to cure for several days before reinstalling the doors and hardware and putting the cabinet into service. Maximum durability will develop after 4 days.

## ALTERNATE FINISHES

You may want to try working with a Gel Stain, thereby increasing your staining and finishing knowledge. The instructions for applying it and a compatible clear finish follow.

### Working with Gel Stain

1. A Gel Stain is a smart choice for this project because it provides a rich, even color and does not drip or run on vertical surfaces. That makes a Gel Stain a logical choice for a project like this one, which you will stain with the cabinet standing upright.
2. Check all surfaces for smoothness and sand lightly with 150-grit paper where necessary. Thoroughly dust and wipe with a tack cloth to remove all dust.
3. Start with the cabinet's top surface. Apply Stain liberally with a clean, lint-free application cloth. Saturate the cloth with Stain and wipe on using a circular motion.
4. When the entire top surface is covered with Stain, use a second, clean, lint-free cloth to remove excess product. Wipe with strokes parallel to the wood grain.
5. Repeat the above steps for the balance of your cabinet, staining just a manageable area at a time.
6. Set the entire unit aside to dry overnight.
7. If you should want a darker appearance than what one coat provides, simply repeat the Gel Stain application step.

### Now Apply the Clear Finish

1. Open the can of Minwax® Fast-Drying Polyurethane and stir contents thoroughly before and during use to avoid settling on the can bottom. Stir with a motion that brings the solids up from can bottom to mix thoroughly with liquid above. Never shake Polyurethane.
2. With a good quality natural or foam brush, apply a thin coat of Minwax® Fast-Drying Polyurethane. Do not overbrush.
3. Let dry for overnight then sand lightly with 220-grit paper wrapped around a soft backup block. Dust off and wipe thoroughly with a tack cloth to remove all dust.
4. Repeat steps 2 and 3 to apply the second coat.
5. After the third coat, allow 24 hours before subjecting the cabinet to light use. It is better to permit the finish to cure for several days before putting the cabinet into full service.

## A ONE-STEP FINISH

A one-step finish such as Minwax® Polyshades® can speed up your finishing process. This product allows for staining and finishing in one step. When you have a project with multiple surfaces, this product requires less drying time. The choice is yours. It is strictly a matter of personal preference since both finishes described in these instructions give beautiful results.

Two coats are recommended for maximum beauty and finish durability.

1. After sanding wood smooth, to the 150-grit stage, dust off and carefully wipe with a tack cloth to remove all traces of dust.
2. For superior results, treat softwoods like pine, with a Pre-Stain Wood Conditioner. This liquid evens out surfaces to be stained and assures that the wood will accept stain evenly (i.e., prevents blotching).
3. Brush on the Wood Conditioner, then after 15 minutes, wipe with a clean, lint-free rag to remove any excess liquid remaining on any surface. Important: Within 2 hours, proceed to the next step.

4. Brush on a thin even coat of Polyshades® one-step stain and finish. As you work each section, make certain your final brush stroke is in a with-the-grain direction.
5. Once you begin the staining process, do not stop. It is especially important with this product that you maintain a wet edge at all times. You do not want to have visible brush or "lap" marks on your project.
6. Allow the finish to dry at least 8 hours, or overnight, if possible.
7. Next day, rub the surface lightly using 000 steel wool; take care to keep the steel wool in the shape of a flat pad; i.e., if you press too hard you not only will cut through the finish, but you also run the risk of rubbing-in very obvious finger marks. Dust off the piece and wipe carefully with a tack rag to remove every particle of dust or steel wool.
8. Apply a second, thin coat of Polyshades® as you did the first coat. Allow the finish to dry for several days before putting the piece into service.

### USEFUL FINISHER'S TIPS

- You can slightly round or "break" sharp edges on raw wood by using 100-grit paper in the pad sander. For a more pronounced rounding over, round the edges with the router and a 1/4-in. rounding-over bit.
- To achieve an "antique" look when using a Minwax® Polycrylic® Protective Finish stain, don't break the edges until after the stain has been applied and dried. This will allow small amounts of wood to show through, creating the appearance of worn spots.
- Sand raw wood to at least the 150-grit level; use even higher grits for hardwoods such as walnut and birch.
- Allow all stains and finishes to dry thoroughly between coats. Sanding between coats is done with 180-grit to 220-grit sandpaper, the grit getting finer after each succeeding coat.
- Apply water-based finishes, such as Minwax® Polycrylic®, with quick with-the-grain strokes.

### Cleanup

- Clean all brushes used for water-based finishes immediately after use with warm soapy water.
- If you have product left over, wipe the can rim to remove all product in the rim. Liquids left in the rim can dry out and prevent the lid from forming a tight seal.

Clean all brushes used for oil-based finishes with mineral spirits.

### PRODUCT SAFETY

Use only with adequate ventilation.

VAPOR HARMFUL. Use only with adequate ventilation. To avoid overexposure, open windows and doors or use other means to ensure fresh air entry during application and drying. If you experience eye watering, headaches or dizziness, increase fresh air supply or wear respiratory protection (NIOSH/MSHA TC23C or equivalent), or leave the area. Avoid contact with eyes and skin. Wash hands after using. Keep container closed when not in use. Do not transfer contents to other containers for storage.

### DO NOT TAKE INTERNALLY.

**FIRST AID.** In case of eye contact, flush eyes thoroughly with large amounts of water for 15 minutes and get medical attention. For skin contact, wash thoroughly with soap and water. In case of respiratory

difficulty, provide fresh air and call physician. If swallowed, get medical attention immediately.

**DELAYED EFFECTS FROM LONG-TERM OCCUPATIONAL OVER-EXPOSURE.** Contains solvents that can cause permanent brain and nervous system damage. Intentional misuse by deliberately concentrating and inhaling the contents may be harmful or fatal.

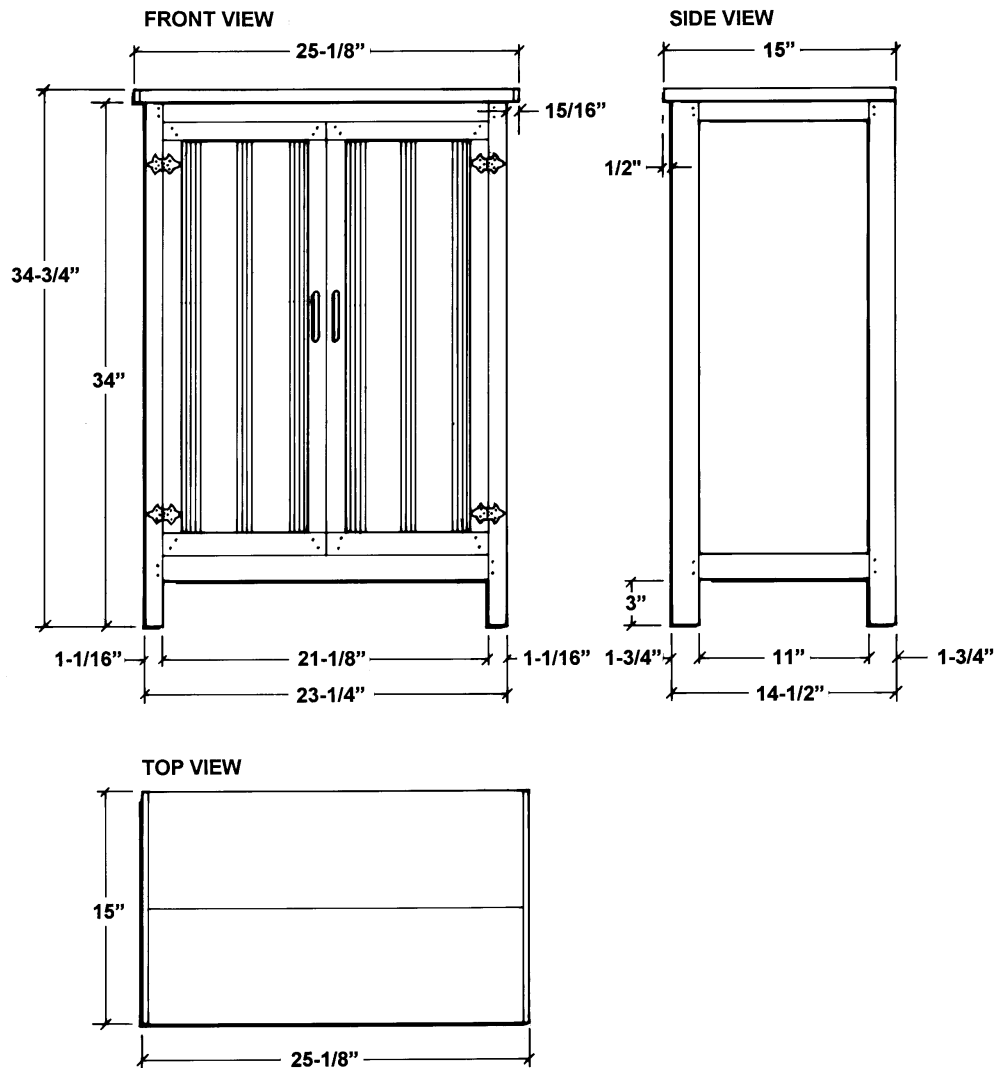
**Safe Disposal of Rags & Waste**

Please be mindful of the safe way to dispose of used rags and other waste. Remember that rags, steel wool and other waste soaked with oil finishes, mineral spirits, turpentine and the like may spontaneously catch fire if improperly discarded.

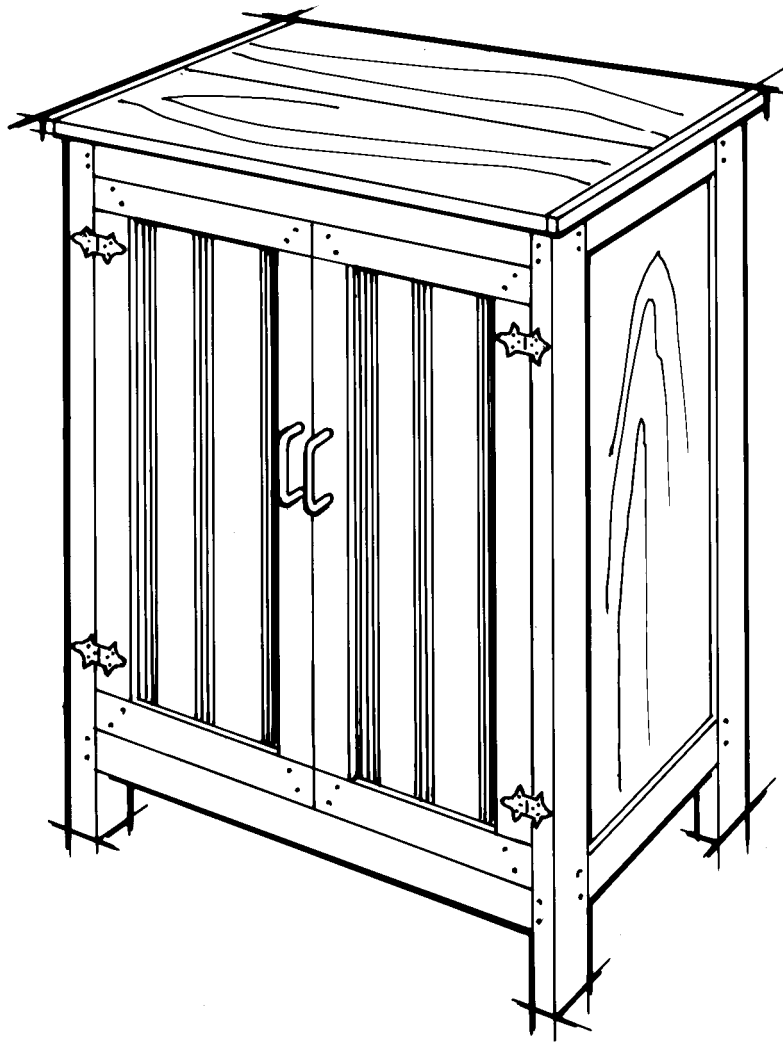
Always place these items in a water-filled metal container immediately after use. Tightly seal the container and then dispose of it in accordance with local fire regulations. Be sure to keep the container out of reach of children.

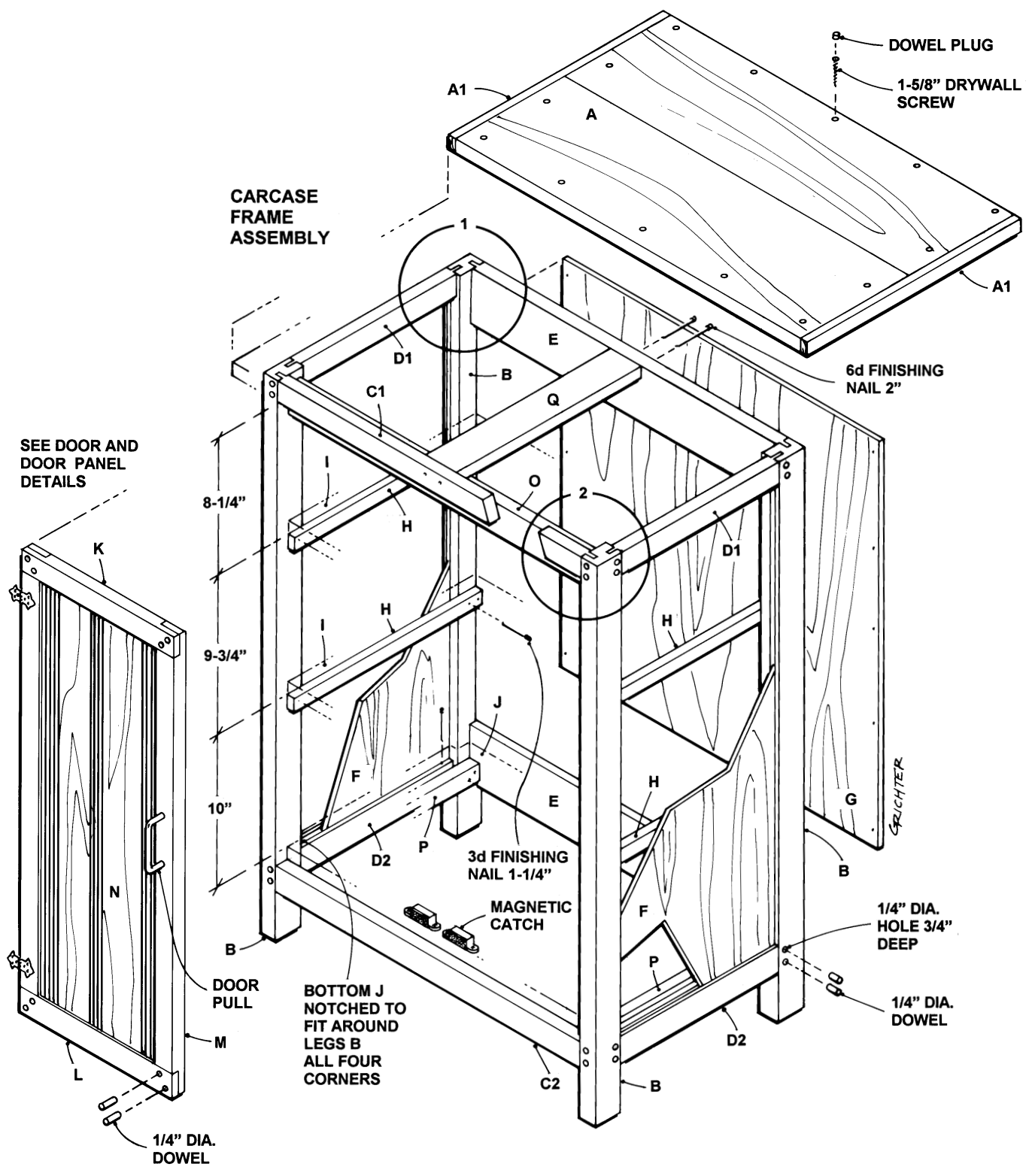
Created for GW&J and Minwax  
by Harry Wicks Woodworks, Cutchogue NY 11935 ©March 2000

## STORAGE CABINET









**CARCASS  
FRAME  
ASSEMBLY**

DOWEL PLUG

1-5/8" DRYWALL  
SCREW

6d FINISHING  
NAIL 2"

SEE DOOR AND  
DOOR PANEL  
DETAILS

8-1/4"

9-3/4"

10"

3d FINISHING  
NAIL 1-1/4"

MAGNETIC  
CATCH

1/4" DIA.  
HOLE 3/4"  
DEEP

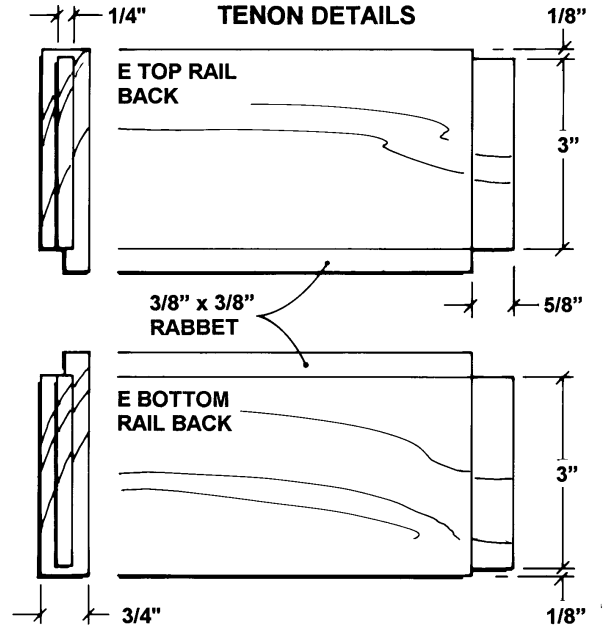
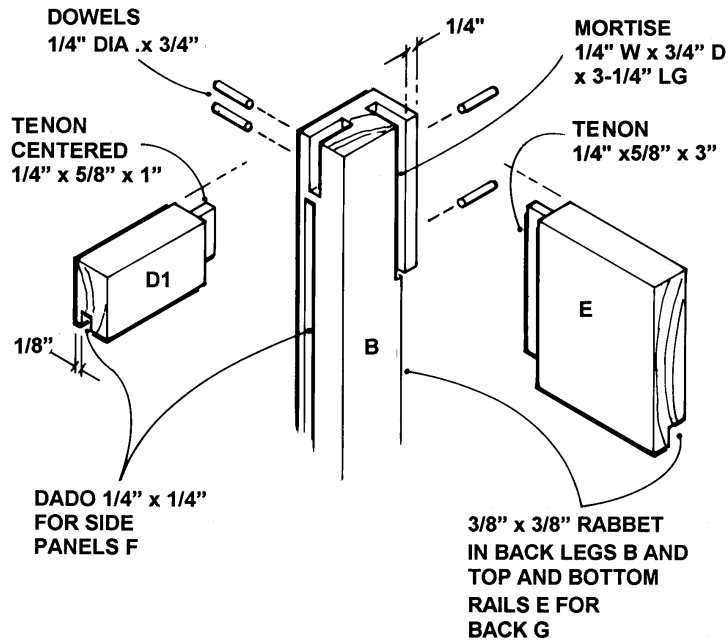
BOTTOM J  
NOTCHED TO  
FIT AROUND  
LEGS B  
ALL FOUR  
CORNERS

1/4" DIA.  
DOWEL

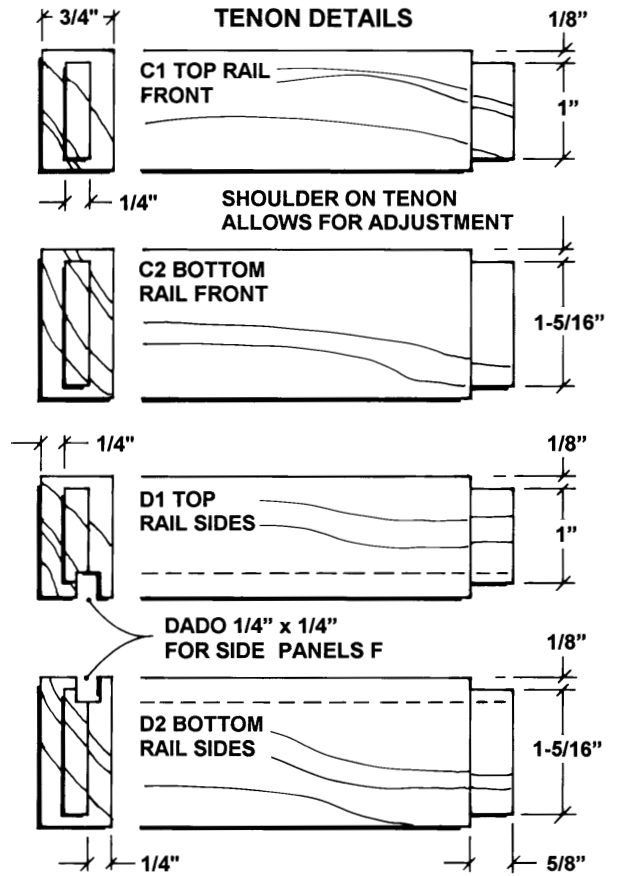
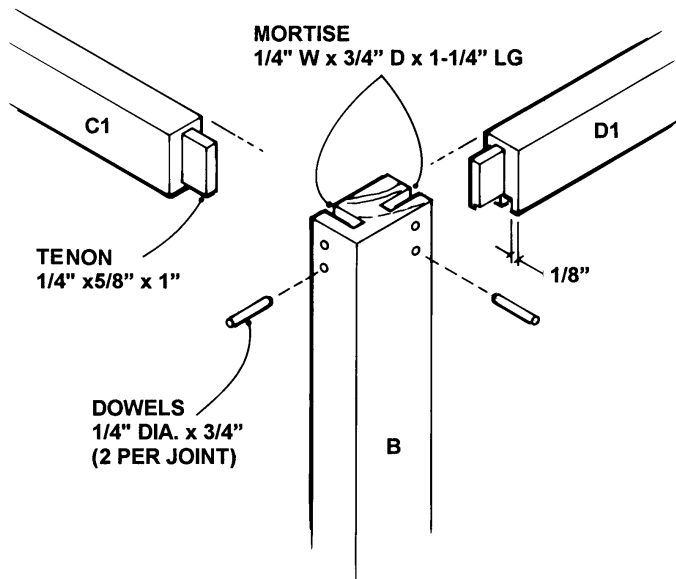
1/4" DIA.  
DOWEL

GRICHTER

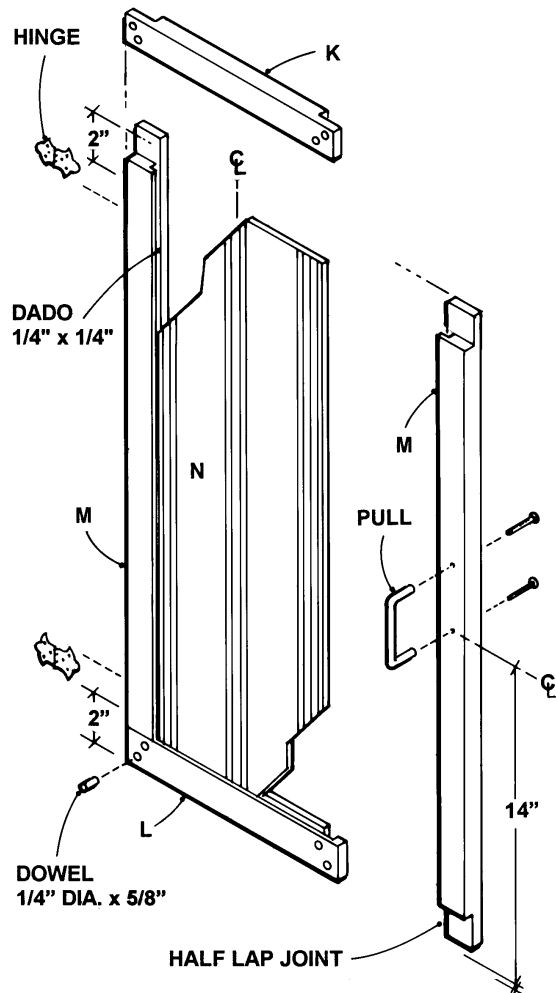
**DETAIL NO. 1**



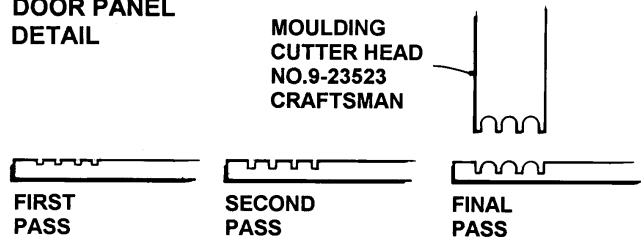
**DETAIL NO. 2**



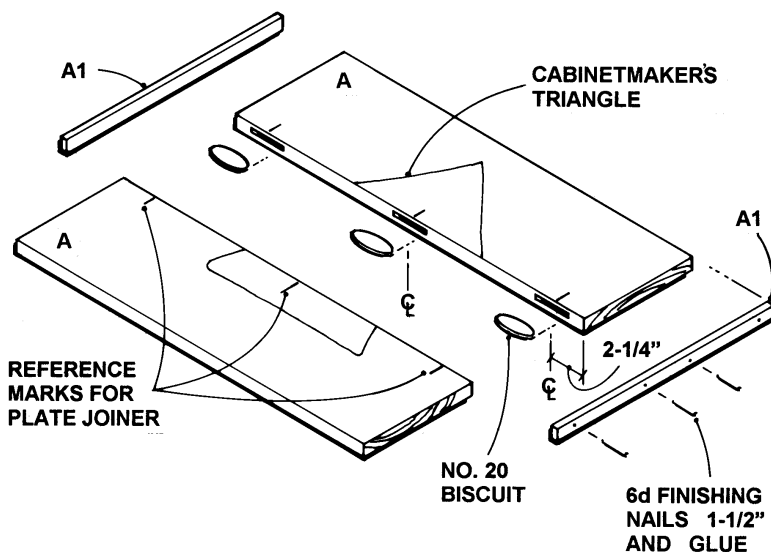
**DOOR CONSTRUCTION**  
LEFT DOOR SHOWN



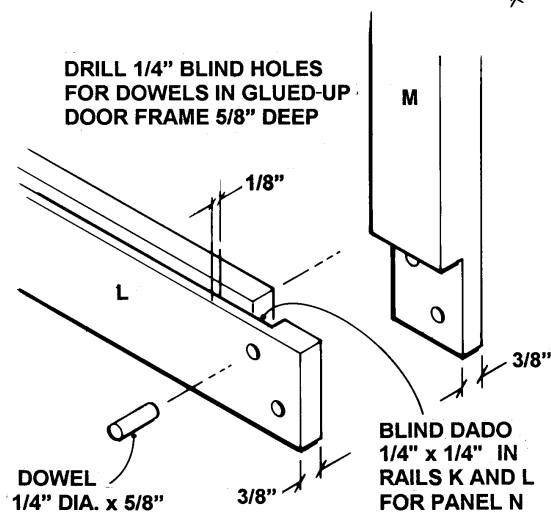
**DOOR PANEL DETAIL**



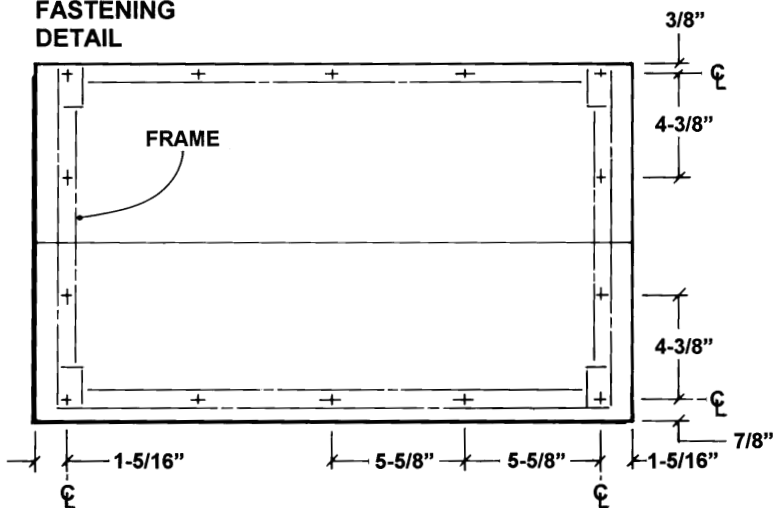
**EDGE JOINING DETAIL**



DRILL 1/4" BLIND HOLES FOR DOWELS IN GLUED-UP DOOR FRAME 5/8" DEEP



**FASTENING DETAIL**



## MATERIALS LISTS

### BUYING

Key	No. Pcs/Length*	Nominal Dimensions**	Material
A	1/5'	1 x 8	Pine
A1	1/3'	1 x 2	"
B	2/6'	5/4 x 3	"
C & D	1/5'	1 x 4	"
E	1/4'	1 x 4	"
F	1/4 x 4'	1/4" plywood	Cabinet-grade pine or birch
G	1/4 x 4'	1/4" plywood	A-C grade
H	From shop scrap		Pine
I	1/4'	1 x 8	"
	1/4'	1 x 6	"
J	1/4'	1 x 8	"

### Doors

K,L,M	1/5'	1 x 4	Pine
N	1/4 x 4' sheet	1/4" plywood	A-C cabinet-grade pine or birch See Note

\*Listed in the fashion in which professionals order lumber. The number to the left of the slash mark is the number of pieces desired; the number to the right is the length of the board in feet (i.e., 1/5' means one 5-footer).

\*\*All lumber is ordered/specified using *nominal* dimensions. Make sure you know the *actual* dimensions your job requires, then convert to nominal to order. For example, if you want a board measuring 3/4-in. thick by 3-1/2 in. wide actual, you would order a 1 x 4, *nominal*.

### Misc.:

Carpenter's glue, 1-1/2 and 2-in. finishing nails, 1/4-in. and 3/8-in. dowels, 14 1-1/2 in. no. 8 flathead wood screws, approximately 30 no. 20 biscuits.

### Hardware

- Two pair of hinges, Model No. 76XC by Brainerd Mfg. Co., E. Rochester, NY 14445;
- Two door pulls, no model no. on package, just SKU # 7-22233-33701-1 by Laurey;
- Two magnetic catches by Amerock Corp., Rockford, IL

**Note:** The lumberyard may not sell plywood by the half-sheet (4 x 4'). This means you have to buy a full (4 x 8') sheet, so carefully lay out all of the panels before doing any cutting to both minimize waste and to ensure getting maximum use from the leftover piece on future projects. Discuss the laying out aspect with your shop instructor.

First, lay out the carcass (F) and door panels (N), then, the back (G). Make certain that the panels for the doors and carcass are laid out and cut so that the grain on these sheets will run vertically when installed on the cabinet.



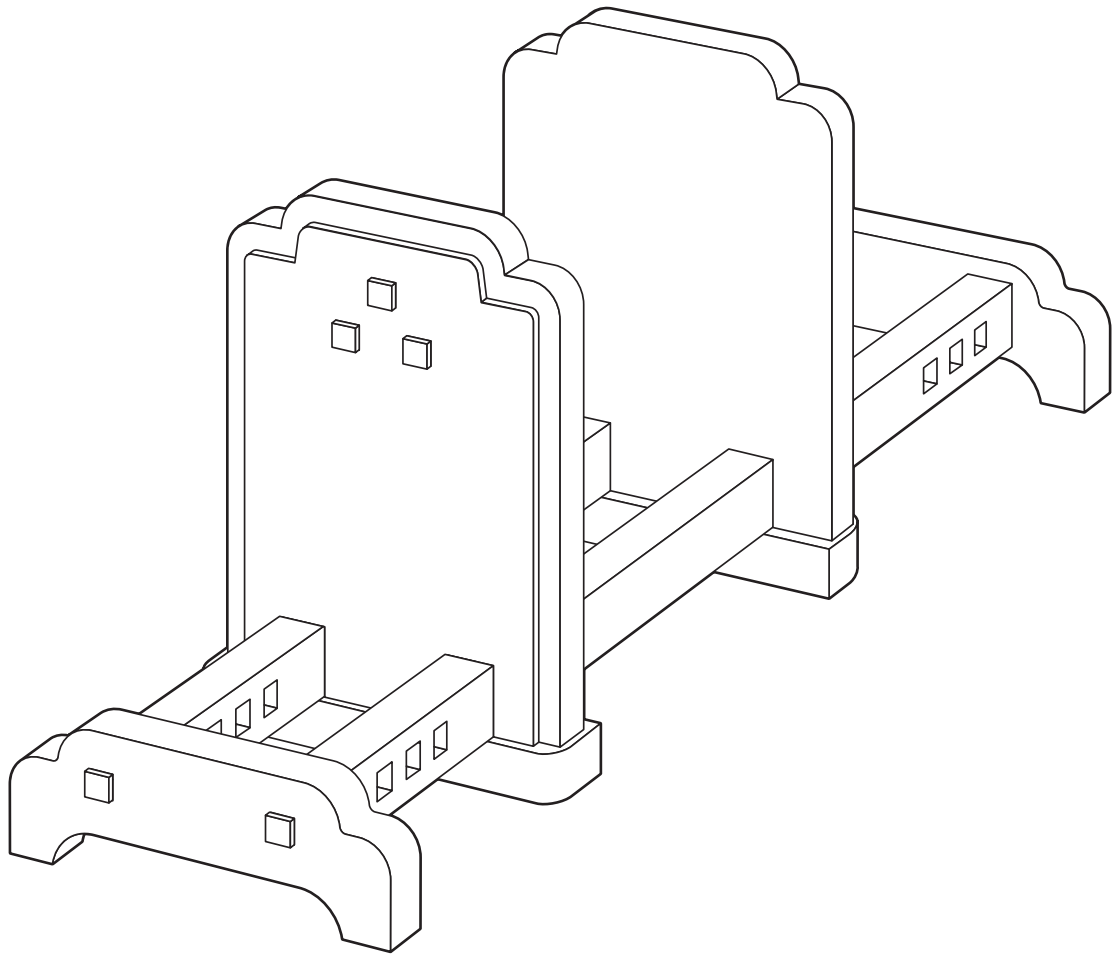
**CUTTING****Cabinet**

Key	Part	Pcs.	Actual Dimensions
A	Top	1	$\frac{3}{4}$ x 15 x $24\text{-}\frac{3}{8}$ "
A1	Top, breadboard ends	2	$\frac{3}{8}$ x $\frac{3}{4}$ x 15"
B	Legs	4	$1\text{-}\frac{1}{16}$ x $1\text{-}\frac{3}{4}$ x $3\frac{1}{4}$ "
C1	Top Rail, Front	1	$\frac{3}{4}$ x $1\text{-}\frac{1}{4}$ x $22\text{-}\frac{3}{8}$ "
C2	Btm Rail, Front	1	$\frac{3}{4}$ x $1\text{-}\frac{9}{16}$ x $22\text{-}\frac{3}{8}$ "
D1	Top Rail, Sides	2	$\frac{3}{4}$ x $1\text{-}\frac{1}{4}$ x $12\text{-}\frac{1}{4}$ "
D2	Btm Rail, Sides	2	$\frac{3}{4}$ x $1\text{-}\frac{9}{16}$ x $12\text{-}\frac{1}{4}$ "
E	Top and Btm Rails, Back	2	$\frac{3}{4}$ x $3\text{-}\frac{1}{2}$ x $20\text{-}\frac{1}{4}$ "
F	Panels, Sides	2	$\frac{1}{4}$ x $11\text{-}\frac{1}{2}$ x $29\text{-}\frac{1}{2}$ "
G	Back	1	$\frac{1}{4}$ x $21\text{-}\frac{3}{4}$ x $31$ "
H	Shelf cleats	4	$\frac{1}{2}$ x $\frac{3}{4}$ x $13\text{-}\frac{1}{2}$ "
I	Shelves	2	$\frac{3}{4}$ x 12 x 21"
J	Bottom	1	$\frac{3}{4}$ x $12\text{-}\frac{1}{2}$ x $22\text{-}\frac{7}{8}$ " *Notched @ corners, see drawing
O	Stop	1	$\frac{3}{4}$ x $1\text{-}\frac{1}{2}$ x $21\text{-}\frac{1}{8}$ "
P	Shelf cleat	2	$\frac{3}{4}$ x $\frac{7}{8}$ x $12\text{-}\frac{1}{2}$ " (+ or -)
Q	Top stiffener	1	$\frac{3}{4}$ x $2\text{-}\frac{3}{4}$ x $12\text{-}\frac{1}{2}$ " (+ or -)

**Doors**

K	Top Rails	2	$\frac{3}{4}$ x $1\text{-}\frac{1}{4}$ x $10\text{-}\frac{1}{2}$ "
L	Bottom Rails	2	$\frac{3}{4}$ x $1\text{-}\frac{1}{2}$ x $10\text{-}\frac{1}{2}$ "
M	Stiles	4	$\frac{3}{4}$ x $1\text{-}\frac{1}{4}$ x 28"
N	Panels	2	$\frac{1}{4}$ x $8\text{-}\frac{1}{2}$ x $25\text{-}\frac{7}{8}$ "

# Sliding Bookrack



The design of this ingenious book holder was inspired by the work of Greene & Greene, two architects who designed Arts & Crafts homes and furnishings in the early 20th century. Their detailing was exquisite yet they were also quite practical, as with this bookrack, which works simply on friction. The bookends slide on two rails to keep any number of books upright.

In this intermediate-level project you'll be cutting and shaping with a band saw, router, table saw and other tools to create a machine-perfect piece. And when it's all done, you'll learn more about applying and using stains and finishes to protect the wood and keep it looking beautiful.

## TOOLS REQUIRED

### Hand Tools

- Mallet
- Screwdriver

### Power Tools

- Random-orbit sander
- Router
- Router table with rabbeting bit
- Table saw with dado set
- Band saw or scroll saw
- Mortising machine
- Power planer

### Miscellaneous

- Pencil
- Tape measure
- Double-stick tape
- Safety glasses
- Carpenter's glue
- 120-, 150- and 220-grit sandpaper
- Clean, lint-free cloths
- Respirator
- Gloves for finishing
- Mineral spirits (for oil-based stains and finishes)
- Water-filled metal container with tight-fitting lid (for oil-based stains and finishes)
- Minwax® Wood Finish™ Stain Brush or other good quality, natural-bristle brush (for oil-based stains and finishes)

## WOOD FINISHING PRODUCTS

### Recommended Finish

- Prep: Minwax® Pre-Stain Wood Conditioner
- Stain/  
Finish: Minwax® Polyshades® Bombay Mahogany
- Optional  
added  
finish: Minwax® Fast-Drying Polyurethane or  
Minwax® Wipe-On Poly
- Wax: Minwax® Paste Finishing Wax

## SHOPPING LIST

**Recommended wood:** Oak

**Alternate wood:** Pine

1' x 8' oak:	3 lin. ft.
Walnut:	Scrap
#8 x 1-1/2" flat-head screws	

## CUTTING LIST

Overall Dimensions: 7-13/16"h x 6-1/8"w x 23-1/2"l			
Key	Part	Pcs.	Dimensions
A	Bookend	2	3/4" x 5-1/2" x 7"
B	Endcap	2	3/4" x 2-1/8" x 6-1/8"
C	Base	2	3/4" x 5-3/4" x 1-1/4"
D	Rail	2	3/4" x 15/16" x 23"
E	Pegs, Walnut	10	3/8" x 3/8" x 1/4"

### Alternate Finish

- Prep: Minwax® Pre-Stain Wood Conditioner
- Stain: Minwax® Gel Stain Aged Oak
- Finish: Minwax® Fast-Drying Polyurethane semi-gloss
- Wax: Minwax® Paste Finishing Wax

## BEFORE YOU BEGIN

Good craftsmanship begins and ends with good work habits, so make the following steps part of your routine workshop practice. If you have any doubts or questions about how to proceed with a project, always discuss them with your shop instructor.

- Carefully and fully review plans and instructions before putting a tool to the project lumber.
- Work sensibly and safely. Wear safety goggles when doing work that creates flying chips and sawdust; wear the appropriate respirator whenever making sawdust or working with thinners or other solvents.
- At the end of every work session, clean up your shop area and put away all portable tools.

## CUTTING AND ASSEMBLY PROCEDURE

### Make the Parts

1. Cut the bookends (A), endcaps (B) and bases (C) to their final size. Cut the rails (D) an extra 1/8" thick. You can cut paired pieces at the same time by holding them together with double-stick tape.

2. Cut the shapes of the bookends, endcaps and bases on the band saw (Fig. 1). Sand the sawn edges progressively using 100-, 120- and 150-grit sandpaper.

3. Rout the bookend profile with a 3/8" rabbeting bit (Figs. 2 and 5). Raise the bit in 1/16" increments to avoid tear-out. Use a chisel to square the rabbet's inside corners. To safely begin the cut, pivot the work piece against a starting pin. Once started, you can ride on the bit's bearing.

4. Cut shallow mortises into the bookends using a mortising machine (Fig. 2). Cut through mortises in the endcaps and rails (Figs. 3 and 4). Some tear-out on the back is inevitable, even with a sacrificial board under the rail, but you'll remove it in the next step.

5. Plane the rails to their final thickness using a power planer. Place the torn-out sides facing up; they'll come out perfectly smooth.

6. Cut tenons on the rails using a dado set (Fig. 4).

7. Make the walnut pegs (E) from 3/8"-thick square blank. Cut the pegs to length with a band saw, Japanese pull saw or dovetail saw.

### Assemble the Bookrack

8. Glue and clamp the rails and endcaps. Work on a flat surface. Check the assembly for wobble before you set it aside to dry.

9. Glue pegs (E) into the bookends and endcaps. Leave the pegs proud by at least 1/16". Scrape excess glue from around the pegs before it dries.

10. After the glue is dry, round over the pegs' sharp corners with 180-grit sandpaper in a random-orbit sander.

11. Mark the positions of the bookend slots directly from the rail and endcap assembly. Cut the slots using your miter gauge and a tall auxiliary fence (Fig. 6). Make multiple passes, raising the blade 1/4" with each cut.

12. Pre-drill the bases and bookends. Screw these parts together on the rail and endcap assembly and test their fit. There should be a little play so the bookends will slide. Disassemble the bases and bookends for finishing.

13. Sand with 180- and 220-grit sandpaper to gently round the edges of the bookends, endcaps, rails and bases. Don't sand the bookends' bottom edges. Proceed to the staining and finishing.

14. After the finishing is done, screw the bases to the bookends and load in your books.

## STAINING AND FINISHING

*Woodworker's Tip: Though you may be tempted to cut short your sanding, preparation and application time, don't do it. These tasks are very important steps in obtaining a high-quality finish. Remember, it is the finish, just as much as the fit and smoothness of the parts that will have great bearing on how people judge your craftsmanship. To ensure an excellent result, follow the steps listed in this section and also the instructions the finish manufacturer puts on its products.*

### FINISHING TIPS

- Test the stains and finishes you are planning to use on scraps of wood. On the back of the scrap, mark the stain/finish combination and the type of wood. Allow all samples to dry thoroughly before making your final finish selection. Save your samples for quick reference on future projects.
- All stains and finishes must be allowed to dry thoroughly between coats. Remember that drying times can vary due to humidity and other climatic conditions.
- If you have some leftover stain or finish, wipe the can rim so that stain or finish in the rim won't dry out and prevent the lid from forming a tight seal.
- Brushes used for oil-based products, such as Minwax® Polyshades® or Minwax® Fast-Drying Polyurethane must be cleaned with mineral spirits.

15. Dust off the piece and wipe it carefully with a clean, lint-free cloth lightly dampened with mineral spirits.

### Recommended Finish

16. Apply Minwax® Polyshades® following the directions on the can. Use a good quality, natural-bristle brush suitable for use with polyurethane. Stir the can contents thoroughly before starting and periodically repeat stirring during your work session. Allow the first coat to dry overnight.

17. The next day, sand all surfaces lightly with 220-grit sandpaper or very fine (000) steel wool using with-the-grain strokes. Dust off and wipe all surfaces with a cloth dampened with mineral spirits. Apply a second coat of Polyshades® and set the rack aside to cure overnight. To achieve a deeper color, you may apply a third coat after 4-6 hours, repeating the application directions. Allow the project to cure for several days before using it.

18. After the finish is dry, apply a coat of Minwax® Paste Finishing Wax over every surface and rub it out with #0000 steel wool to an even sheen. This is an essential step. The wax lubricates the rails, allowing the bookends to slide smoothly.

**Woodworker's Tip:** *If you achieve the desired color on the first or second coats of Polysbades®, apply a clear coat of Minwax® Fast-Drying Polyurethane or Minwax® Wipe-On Poly for added protection.*

#### Alternate Finish

19. Apply the Minwax® Gel Stain you've chosen using a clean, lint-free cloth or natural-bristle brush. Allow the Gel Stain to set for about 3 minutes, then wipe off any excess with a clean, lint-free cloth. To achieve a deeper color, you may apply a second coat after 8 to 10 hours, repeating the application directions for the first coat. Allow the stain to dry for 24 hours before applying the finish.

**Woodworker's Tip:** *When wiping off stain, make certain that your last wipe with the cloth goes with the grain of the wood. This way, any stain you might miss during wipe-off will be visually minimized by the wood grain.*

20. Apply Minwax® Fast-Drying Polyurethane following the directions on the can. Use a good quality, natural-bristle brush. Allow the first coat to dry overnight.

21. The next day, sand all surfaces lightly with 220-grit or finer sandpaper using with-the-grain strokes. Dust off and wipe all surfaces with a cloth lightly dampened with mineral spirits. Apply a second coat of polyurethane and set the piece aside to cure overnight.

22. The following day, sand all surfaces lightly with 220-grit sandpaper. Dust off and wipe the piece with a cloth lightly dampened with mineral spirits and apply the third and final coat of polyurethane.

23. After the finish is dry, apply a coat of Minwax® Paste Finishing Wax over every surface and rub it out with #0000 steel wool to an even sheen. This is an essential step. The wax lubricates the rails, allowing the bookends to slide smoothly.

#### PRODUCT SAFETY

For your safety and the safety of those you work with, always read the safety warnings, which manufacturers print on their labels, and follow them to the letter.

**WARNING!** Removal of old paint by sanding, scraping or other means may generate dust or fumes that contain lead. Exposure to lead dust or fumes may cause brain damage or other adverse health effects, especially in children or pregnant women. Controlling exposure to lead or other hazardous substances requires the use of proper protective equipment, such as properly fitted respirator (NIOSH approved) and proper containment and cleanup. For more information, call the National Lead Information Center at 1-800-424-LEAD (in U.S.) or contact your local health authority.

**DANGER:** Rags, steel wool, other waste soaked with oil-based stains and clear finishes, and sanding residue may spontaneously catch fire if improperly discarded. Immediately place rags, steel wool, other waste soaked with this product, and sanding residue in a sealed, water-filled metal container. Dispose of in accordance with local fire regulations.

#### When using oil-based wood finishing products:

##### **CAUTIONS: CONTAINS ALIPHATIC HYDROCARBONS.**

Contents are **COMBUSTIBLE**. Keep away from heat and open flame. **VAPOR HARMFUL**. Use only with adequate ventilation. To avoid over-exposure, open windows and doors or use other means to ensure fresh air entry during application and drying. If you experience eye watering, headaches, or dizziness, increase fresh air, or wear respiratory protection (NIOSH approved), or leave the area. Avoid contact with eyes and skin. Wash hands after using. Keep container closed when not in use. Do not transfer contents to other containers for storage.

**FIRST AID:** In case of eye contact, flush thoroughly with large amounts of water for 15 minutes and get medical attention. For skin contact, wash thoroughly with soap and water. In case of respiratory difficulty, provide fresh air and call physician. If swallowed, call Poison Control Center, hospital emergency room, or physician immediately.

##### **DELAYED EFFECTS FROM LONG-TERM OVEREXPOSURE.**

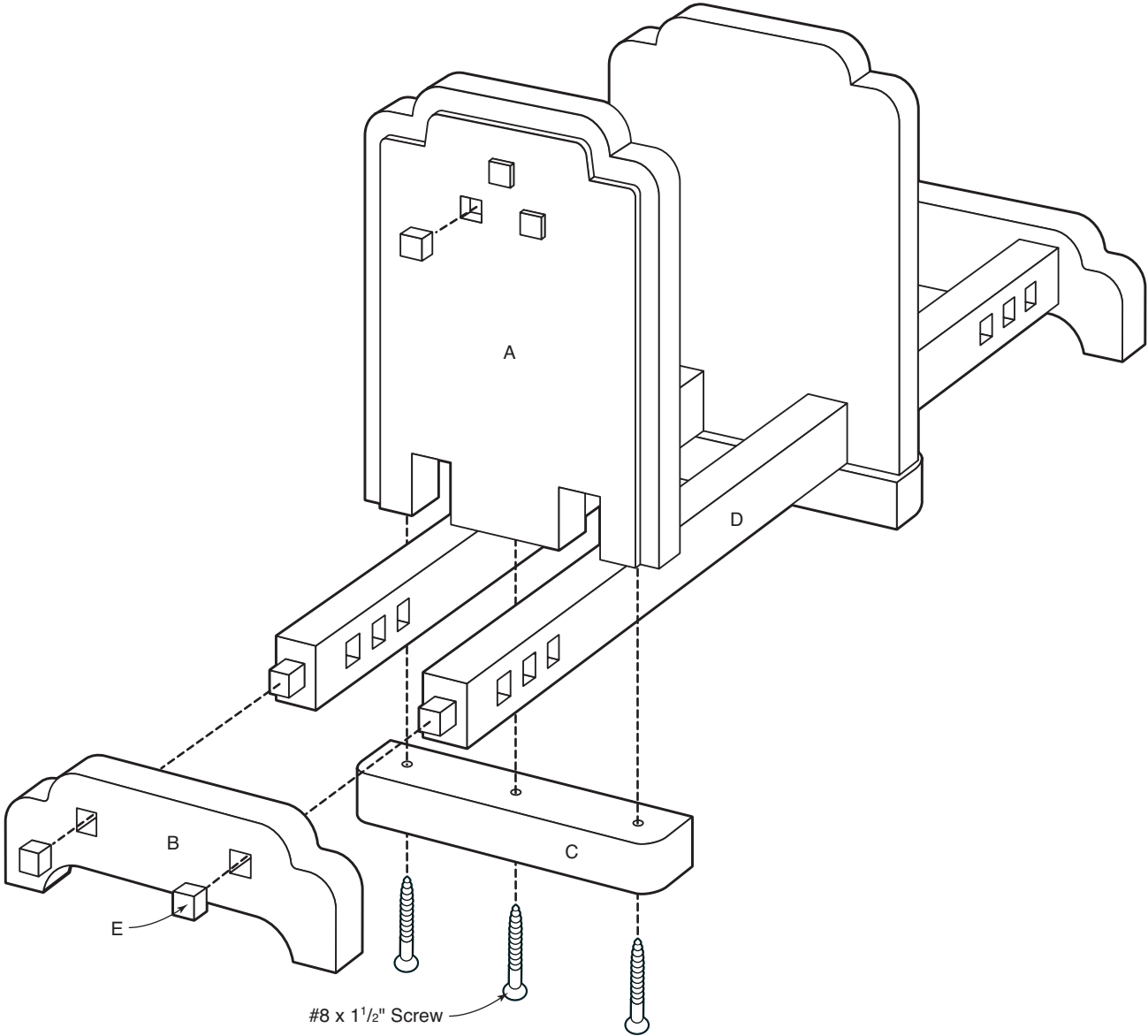
Contains solvents which can cause permanent brain and nervous system damage. Intentional misuse by deliberately concentrating and inhaling contents may be harmful or fatal.

**WARNING:** This product contains a chemical known to the State of California to cause cancer and birth defects or other reproductive harm.

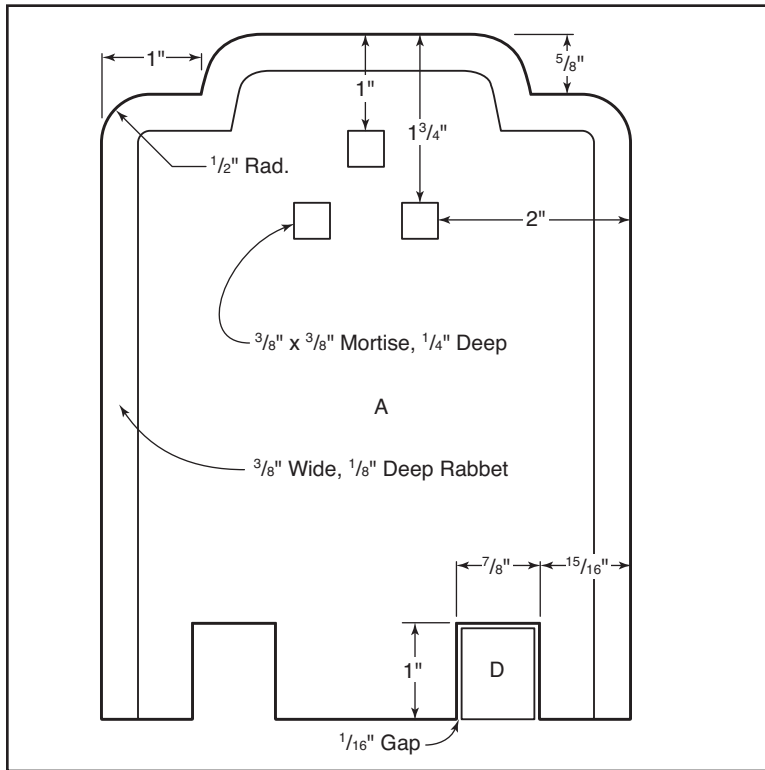
**DO NOT TAKE INTERNALLY. KEEP OUT OF REACH OF CHILDREN.** CONFORMS TO ASTM D-4326. Contact a physician for more health information.



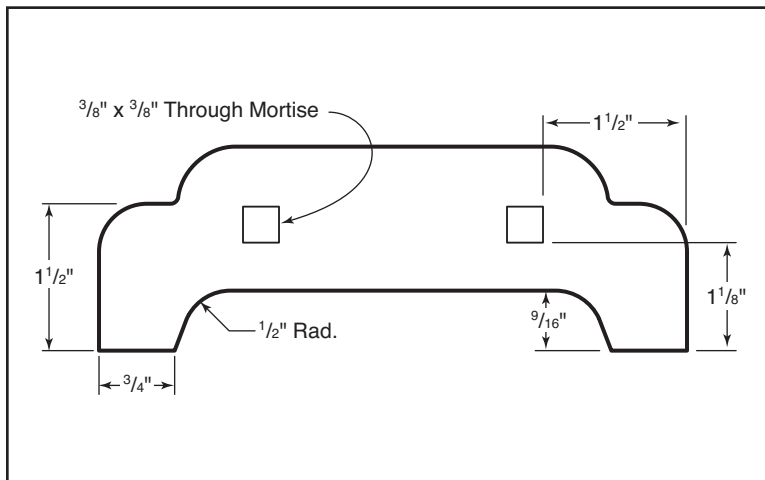
**FIG 1. BOOKRACK DETAILS**



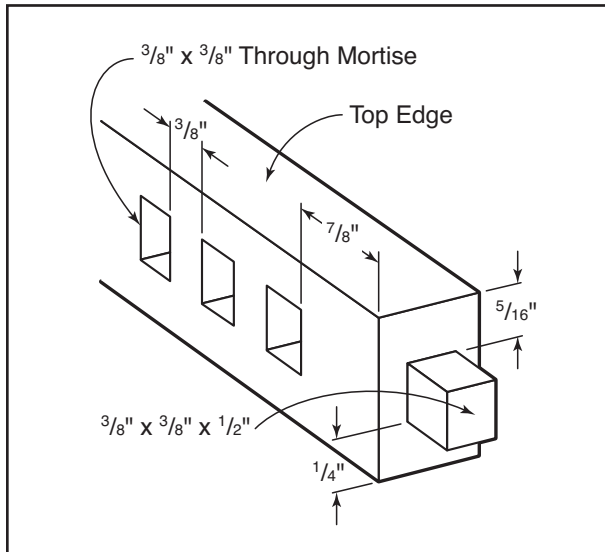
**FIG 2. BOOKEND DETAILS**



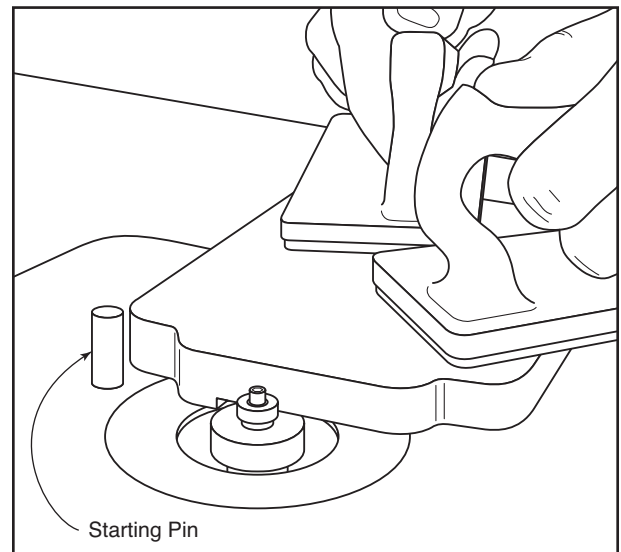
**FIG. 3. END CAP DETAILS**



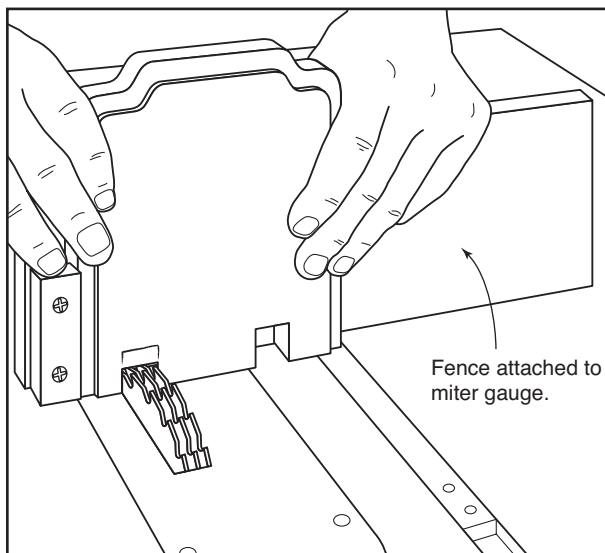
**FIG 4. RAIL DETAIL**



**FIG 5. ROUT STEP**



**FIG 6. CUT BOOKEND SLOTS**





# Side Table



Here's a perfect table for use in a front hall, behind a living-room sofa or in your bedroom for showcasing your favorite knickknacks. Besides being narrow enough to fit in a variety of locations, its two drawers provide convenient storage for small items. For intermediate woodworkers, the tapered legs, doweled joints and close tolerances throughout will present a challenge but also produce great satisfaction when properly executed. And when it's all assembled, you'll learn more about applying and using stains and finishes to protect the wood and keep it looking beautiful.



## TOOLS REQUIRED

### Hand Tools

- Hammer
- Nail set
- 4' pipe clamp
- 18" pipe clamps (4)
- Doweling jig

### Power Tools

- Tablesaw with combination rip/crosscut blade and dado blade
- Saber saw
- Router, 3/8" roundover bit
- Jigsaw
- Electric drill

### Miscellaneous

- Pencil
- Tape measure
- Safety glasses
- Carpenter's glue
- 120, 150 and 220-grit sandpaper
- Clean, lint-free cloths
- Respirator
- Gloves for finishing
- Mineral spirits (for oil-based stains and finishes)
- Water-filled metal container with tight-fitting lid (for oil-based stains and finishes waste products)
- Minwax® Wood Finish™ Stain Brush or other good quality, natural-bristle brush (for oil-based stains and finishes)
- Minwax® Polycrylic® Brush or other good quality, synthetic-bristle brush (for water-based stains and finishes)

## SHOPPING LIST

Item	Quantity
1x8 oak	1 @ 9', 2 @ 6'
2x4 birch	1 @ 6'
1x6 birch	2 @ 6'
1x4 birch	2 @ 6'
1/4" birch plywood	1 @ 12" x 36"
4d finish nails	50
3/8" x 2" dowel pins	16
#8 x 3/4" pan-head screws with washers	2
Oak drawer knobs	2
Tabletop fasteners	6

## CUTTING LIST

Overall Dimensions: 32"H x 48"W x 14"D				
Key	Part	Pcs.	Material	Dimensions
A	Table top	1	oak	3/4" x 14" x 48"
B	Legs	4	birch	1-1/2" x 1-1/2" x 31-1/4"
C	Front & back aprons	2	birch	3/4" x 4-1/2" x 37"
D	Side aprons	2	birch	3/4" x 4-1/2" x 10"
E	Drawer fronts	2	birch	3/4" x 3-5/8" x 15-1/2"
F	Drawer sides	4	birch	3/4" x 2-7/8" x 11"
G	Drawer backs	2	birch	3/4" x 2-3/8" x 13-3/4"
H	Upper drawer runners	2	birch	3/4" x 2" x 10-3/4"
J	Drawer runners	4	birch	3/4" x 1-1/2" x 10-3/4"
K	Drawer runners	4	birch	3/4" x 3/4" x 10-3/4"
L	Stop blocks	2	birch	3/4" x 3/4" x 6"
M	Drawer bottoms	2	birch plywood	1/4" x 10-3/4" x 13-3/4"
N	Drawer stops	2	birch plywood	1/4" x 1" x 3"

Recommended Wood: Oak/Birch  
Alternate Wood: Pine (stain grade)

## WOOD FINISHING PRODUCTS

### Recommended Finish

Prep: Minwax® Pre-Stain Wood Conditioner  
Stain: Minwax® Wood Finish™ English Chestnut (or your choice of any of the 22 Minwax® Wood Finish™ Stain colors)  
Finish: Minwax® Wipe-On Poly Satin or Gloss

### Alternate Finish

Prep: Minwax® Water-Based Pre-Stain Wood Conditioner  
Stain: Minwax® Water-Based Wood Stain Verdigris (or a Minwax® Water-Based Stain of your choice, available in 6 wood tones, 60 custom colors and 8 bold Accents™ colors)  
Finish: Minwax® Polycrylic® Protective Finish Semi-Gloss

## BEFORE YOU BEGIN

Good craftsmanship begins and ends with good work habits, so make the following steps part of your routine workshop practice. If you have any doubts or questions about how to proceed with a project, always discuss them with your shop instructor.

- Carefully and fully review plans and instructions before putting a tool to the project lumber.
- Work sensibly and safely. Wear safety goggles when doing work that creates flying chips and sawdust; wear the appropriate respirator whenever making sawdust or working with thinners or other solvents.
- At the end of every work session, clean up your shop area and put away all portable tools.

## CUTTING AND ASSEMBLY PROCEDURE

### Glue the Top

1. To make the top (A), edge-glue together two 1 x 8 boards that are 49" long. Alternate the direction of the growth rings in the end grain of the boards to prevent the top from warping. After the glue has dried, cut the top to its finished dimension.

### Make the Initial Cuts

2. Cut all the pieces, (B) through (N), to the dimensions given in the CUTTING LIST. Glue the drawer runner pieces, (J) and (K), together.

### Taper the Legs

The legs are made of solid birch stock 1-1/2" thick. If you have trouble finding birch that thick, glue together two 3/4" pieces. The taper on two sides of each leg is easy to cut with a homemade tapering jig. The drawers are boxes assembled with nails—very easy to make and align—and they ride on wooden runners.

3. Make the leg-tapering jig by cutting a 3/4"-thick piece of scrap plywood 5" wide by 33" long (Fig. 4). Draw the angled side as shown in the diagram and cut out the notch with a saber saw.

4. To cut the legs, set the tablesaw fence 5" from the saw blade and set the blade slightly higher than 1-1/2". You must cut a taper on two adjacent sides of each leg and leave the sides that fit against the aprons uncut. Place a leg (B) in the notch of the taper jig and slide the jig across the table, holding it tight to the fence (Fig. 5). Use a push stick to hold the leg tight against the side of the notch as you cut the taper. Rotate the leg 90 degrees in the jig so the tapered side you just cut is facing up, then cut the other tapered side of the leg. Repeat these steps for the remaining three legs.

### Drill the Dowel Holes

5. Drilling the dowel holes can be confusing unless you first mark which sides of the legs (B) and ends of the apron pieces (C) go together. The easiest way to do this is to place all the legs and apron pieces upside down on your worktable in the relative positions they'll assume when the base is assembled. Label each joint with a different identifying mark so you can assemble it the same way later.

**Woodworker's Tip:** *Drilling the dowel holes in the legs and aprons is simpler and more accurate if you use a dowel-drilling jig. Place a piece of masking tape on the drill bit for a depth stop flat.*

6. Mark the positions of the dowel holes in the sides of the legs and the ends of the apron pieces (Fig. 3). Offset the dowels slightly on each side of the legs so they won't interfere with each other. Drill the 3/8"-diameter dowel holes.

7. With the tablesaw blade set 1/4" high, cut the grooves for the tabletop fasteners 1/2" from the top edge of the front and back aprons (C, Figs. 3 and 6).

### Assembling the Table

There are three stages in assembling the table. First, construct the frame from the legs and apron pieces. Second, make the drawers. Third, complete the top, which has already been glued together and cut to size.

### Construct the Frame

8. Lay out and cut the two drawer openings in one of the long apron pieces (C). To do this, drill 3/8" holes within the cutout area of each opening. Then use a saber saw to cut along each line. Proceed slowly and carefully to ensure straight cuts and square corners. After the cutting, file and sand all edges smooth.

9. Sand the legs and aprons with 120-grit paper, then smooth them all with 180-grit paper. Dowel, glue and clamp the front legs to the front apron and the back legs to the back apron. Then dowel, glue and clamp the side aprons to the assembled front and back. Quickly wipe away excess glue with a damp cloth.

### Make the Drawers

10. Drill the holes for the knobs in the drawer fronts (E, Fig. 1). Shape the drawer front edges with a router and 3/8" roundover bit.

11. Cut rabbets 1-1/8" wide by 3/8" deep on the inside ends of the drawer fronts, using a dado blade on the tablesaw. Use the tablesaw miter gauge to ensure square cuts. Clamp a stop block to the fence to hold the piece the correct distance from the blade. Cut rabbets 3/4" wide x 1/4" deep on the back ends of the drawer sides (F) in the same way (Fig. 2). Cut the grooves for the drawer bottoms (M) in the drawer fronts and sides.

12. Sand all the drawer pieces, then glue and clamp all the pieces together except for the drawer bottoms. Push the bottoms into their grooves after finishing, to avoid having to wipe the stain and topcoat out of the corners.

13. Drill pilot holes, and then drive finish nails through the drawer sides into the drawer fronts and backs. To make nailing easier, clamp the drawer front or back in a vise so that the drawer side is supported on the top edge of the vise jaw. Use a nail set to finish driving the nails into the drawer fronts past the lips of the fronts.

14. Align the upper drawer runners (H, Fig. 1) between the front and back aprons. Use a clamp to hold them in place, then drill pilot holes and drive finish nails. Use a nail set to drive the heads below the surface. Fill the nail holes with wood putty. Then glue the stop block (L) in place at the bottom of each drawer opening in the front apron.

### Affix the Lower Runners

15. To mount the runners (J, K) that guide the sides and bottoms of the drawers, set the table base on its back and align the drawers in their openings. Set them tight to the bottom edge of the opening in the apron, with an even gap on each side.

16. Set the drawer runners in place and mark their outside edges on the front and back aprons (Fig. 6). Mark where the ends of the drawer runners join the front and back apron pieces. Leave a 1/32" gap between the runners and the sides of the drawers. Hammer finish nails through the aprons and into the drawer runners to hold them in place. Use a nail set to drive the nailheads slightly below the surface. Fill the nail holes with wood putty.

17. Finish the drawer assembly after the final topcoat is dry. Slide the drawer bottoms (M) into their grooves and then fasten them with two 4d finish nails driven into the drawer backs.

18. Attach the knobs to the drawer fronts and pivoted stops to the backs of the drawers. The stops are 1"x 3" pieces of 1/4" plywood. Attach them with a single pan-head screw and a washer (see Drawer Section View, Fig. 2).

19. Reattach the top to the base with table fastener brackets (Fig 6). Leave a 1/16" space between the fasteners and the aprons to allow the top to expand. Turn the rear drawer stops horizontal so you can slide the drawers in place. Then turn the stops downward so the drawers won't fall out when you open them.

## STAINING AND FINISHING

**Woodworker's Tip:** *Though you may be tempted to cut short your sanding, preparation and application time, don't do it. These tasks are very important steps in obtaining a high-quality finish. Remember, it is the finish, just as much as the fit and smoothness of the parts that will have great bearing on how people judge your craftsmanship. To ensure an excellent result, follow the steps listed in this section and also the instructions the finish manufacturer puts on its products.*

### FINISHING TIPS

- Test the stains and finishes you are planning to use on scraps of wood. On the back of the scrap, mark the stain/finish combination and the type of wood. Allow all samples to dry thoroughly before making your final finish selection. Save your samples for quick reference on future projects.
- All stains and finishes must be allowed to dry thoroughly between coats. Remember that drying times can vary due to humidity and other climatic conditions.
- If you have some leftover stain or finish, wipe the can rim so that stain or finish in the rim won't dry out and prevent the lid from forming a tight seal.
- Brushes used for water-based products, such as Minwax® Water-Based Wood Stains or Minwax® Polycrylic® Protective Finish, must be cleaned with soap and water; oil-based finishes must be cleaned with mineral spirits.

20. Sand all pieces starting with 120-grit paper, then move up to 220-grit to complete the pre-finish smoothing. Use an orbital sander to

remove any marks or scratches, then lightly sand by hand using with-the-grain sanding strokes. Dust off the piece and wipe it carefully with a clean, lint-free cloth lightly dampened with mineral spirits.

### Recommended Finish

21. Apply the Minwax® Wood Finish™ you've chosen to the interior surfaces using a natural-bristle brush and a clean, lint-free cloth following the directions on the can. The brush will help you get the stain into the many inside corners and other tight spots. Allow the Wood Finish™ to set for about 5 to 15 minutes, then wipe off any excess. To achieve a deeper color, you may apply a second coat after 4-6 hours, repeating the application directions for the first coat. Allow the stain to dry for 24 hours before applying the protective clear finish.

**Woodworker's Tip:** *Different species of wood take to stain differently. When using a combination of woods like oak and birch, you may need to apply a second or third coat to birch to achieve a uniform finish. When wiping off stain, make certain that your last wipe with the cloth goes with the grain of the wood. This way, any stain you might miss during wipe-off will be visually minimized by the wood grain.*

22. Apply Minwax® Wipe-On Poly following the directions on the can. Shake the can thoroughly. Apply a liberal amount of Wipe-On Poly on a clean, soft, lint-free cloth into the wood. It can be brushed on or wiped on with a cloth. Allow the first coat to dry for at least 4 hours.

23. Once completely dry, sand all surfaces very lightly with 220-grit or finer sandpaper or very fine (000) steel wool using with-the-grain strokes. Thoroughly wipe off all surfaces with a soft cloth. Apply a second coat of Minwax® Wipe-On Poly and set the piece aside to dry for at least 4 hours.

24. Once completely dry, sand all surfaces lightly with 220-grit or finer sandpaper or very fine (000) steel wool. Thoroughly wipe off the piece with a soft cloth and apply a third and final coat of Wipe-On Poly. Allow the table to cure for several days before using it.

**Woodworker's Tip:** *For an ultrasmooth finish, use 400-grit sandpaper to apply the final coat of Minwax® Wipe-On Poly.*

### Alternate Finish

25. Before applying Minwax® Water-Based Wood Stain to a hardwood or softwood, apply Minwax® Pre-Stain Water-Based Wood Conditioner following the directions on the can. This will help to ensure even absorption of stain and prevent blotchiness that can occur with some woods. After 1 to 5 minutes, wipe off all excess conditioner using a clean, soft cloth. Wait 15 to 30 minutes then use 220-grit or finer sandpaper to sand off any "whiskers" raised by the conditioner. Proceed to the staining within 2 hours.

26. Do the staining in two steps, starting on the interior surfaces and then do to the exterior surfaces. Apply the Minwax® Water-Based Wood Stain you've chosen to the table using either a nylon/polyester brush or a cloth. Allow stain to penetrate no longer than 3 minutes. While stain is still wet, wipe off all excess with a clean cloth that's been lightly dampened with stain. Allow the piece to dry for 2 hours before

applying a second coat, if desired. Allow the piece to dry overnight before applying the protective clear finish.

**NOTE:** Minwax® Water-Based Wood Stain is available in 6 wood tones, 60 custom-mixed colors and 8 bold Accent™ colors. This means that you are not limited to just traditional wood colors (pine, oak, walnut, etc.). Instead, you can actually pick and apply a color to complement the décor of the room in which the table will be placed. For this reason, make sure you look over all of the Minwax® color charts or go to [minwax.com](http://minwax.com) before making your final selection.

27. After allowing the piece to dry overnight, apply Minwax® Polycrylic® Protective Finish following the directions on the can. Stir the can contents thoroughly before starting and periodically repeat the stirring during your work session.

28. Working a small area at a time to maintain a wet edge, apply the first coat. Work quickly and make the final strokes in each newly finished section using with-the-grain brushstrokes.

29. Allow the finish to dry a minimum of 2 hours. Then sand lightly with 220-grit or finer sandpaper wrapped around a flexible sanding block. Thoroughly dust off and wipe all surfaces with a cloth lightly dampened with water.

30. Repeat steps 28 and 29 to apply the second and final coat.

#### **PRODUCT SAFETY**

For your safety and the safety of those you work with, always read the safety warnings, which manufacturers print on their labels, and follow them to the letter.

**WARNING!** Removal of old paint by sanding, scraping or other means may generate dust or fumes that contain lead. Exposure to lead dust or fumes may cause brain damage or other adverse health effects, especially in children or pregnant women. Controlling exposure to lead or other hazardous substances requires the use of proper protective equipment, such as properly fitted respirator (NIOSH approved) and proper containment and cleanup. For more information, call the National Lead Information Center at 1-800-424-LEAD (in US) or contact your local health authority.

**DANGER:** Rags, steel wool, other waste soaked with oil-based stains and clear finishes, and sanding residue may spontaneously catch fire if improperly discarded. Immediately place rags, steel wool, other waste soaked with these products, and sanding residue in a sealed, water-filled metal container. Dispose of in accordance with local fire regulations.

#### **When using oil-based wood finishing products:**

**CAUTIONS: CONTAINS ALIPHATIC HYDROCARBONS.** Contents are **COMBUSTIBLE**. Keep away from heat and open flame. **VAPOR HARMFUL.** Use only with adequate ventilation. To avoid overexposure, open windows and doors or use other means to ensure fresh air entry during application and drying. If you experience eye watering, headaches, or dizziness, increase fresh air, or wear respiratory protection (NIOSH approved) or leave the area. Avoid contact with eyes and skin. Wash hands after using. Keep container closed when not in use. Do not transfer contents to other containers for storage.

**FIRST AID:** In case of eye contact, flush thoroughly with large amounts of water for 15 minutes and get medical attention. For skin contact, wash thoroughly with soap and water. In case of respiratory difficulty, provide fresh air and call physician. If swallowed, call Poison Control Center, hospital emergency room, or physician immediately.

#### **DELAYED EFFECTS FROM LONG-TERM OVEREXPOSURE.**

Contains solvents which can cause permanent brain and nervous system damage. Intentional misuse by deliberately concentrating and inhaling contents may be harmful or fatal.

**WARNING:** This product contains chemicals known to the State of California to cause cancer and birth defects or other reproductive harm. **DO NOT TAKE INTERNALLY. KEEP OUT OF REACH OF CHILDREN.** CONFORMS TO ASTM D-4326. Contact a physician for more health information.

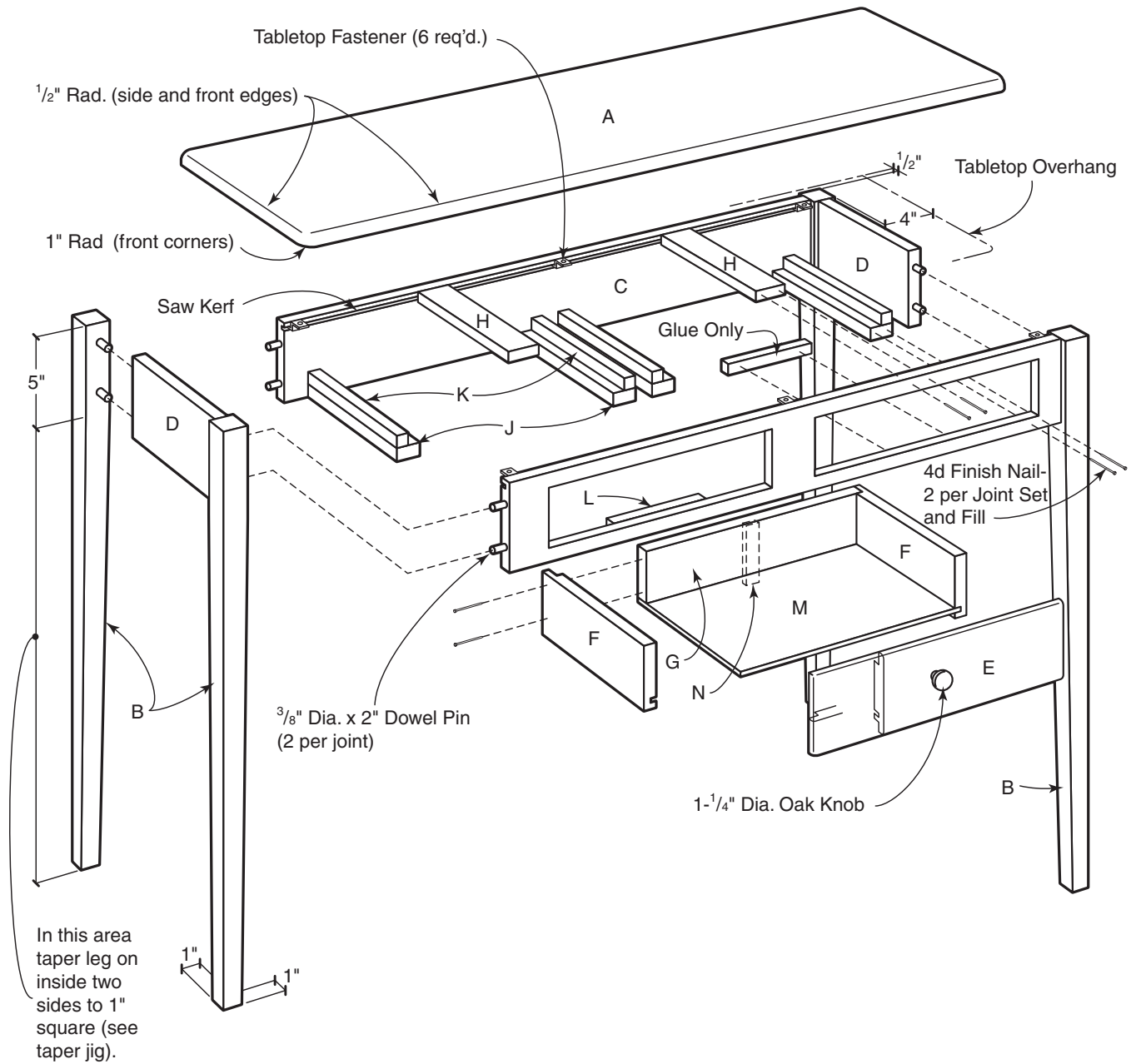
#### **When using water-based wood finishing products:**

**CAUTIONS:** Use Only With Adequate Ventilation. To avoid overexposure, open windows and doors or use other means to ensure fresh air entry during application and drying. If you experience eye watering, headaches, or dizziness, increase fresh air, or wear respiratory protection (NIOSH approved), or leave the area. Avoid contact with eyes and skin. Wash hands after using. Keep container closed when not in use. Do not transfer contents to other containers for storage.

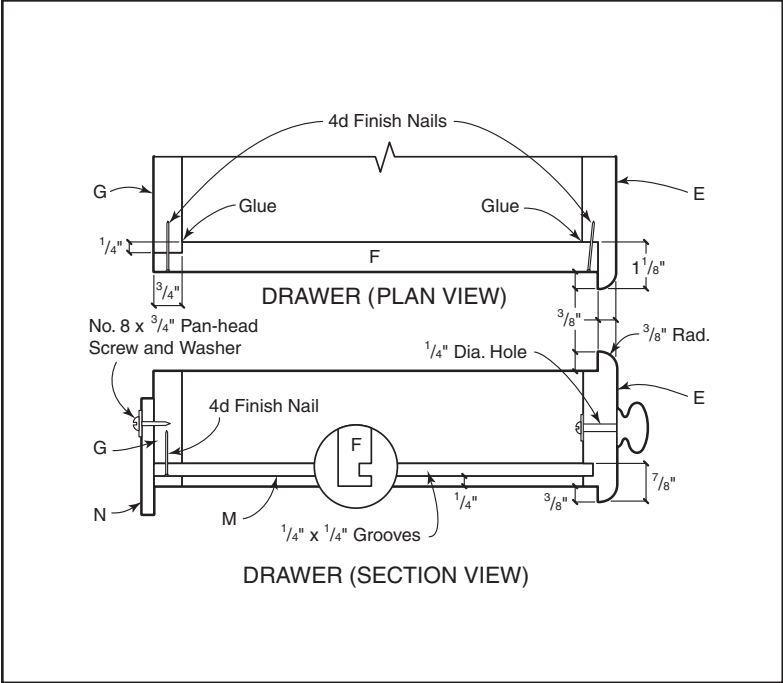
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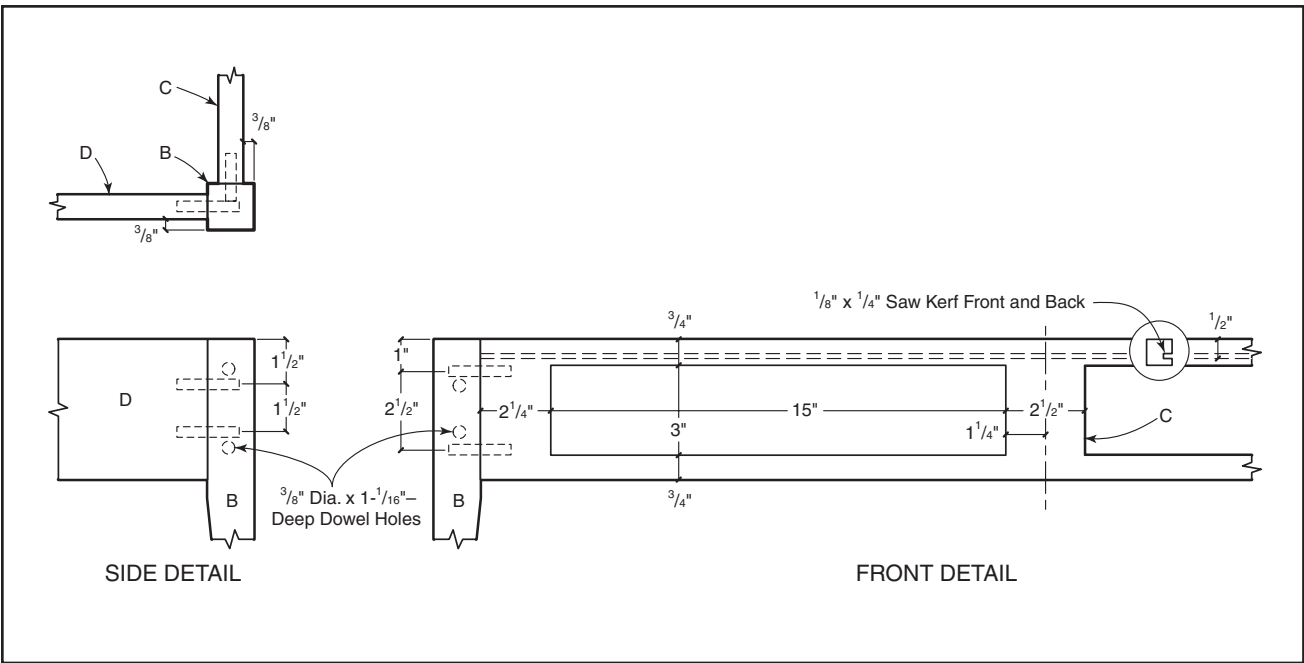
**FIG 1. TABLE DETAILS**



**FIG 2. DRAWER DETAILS**

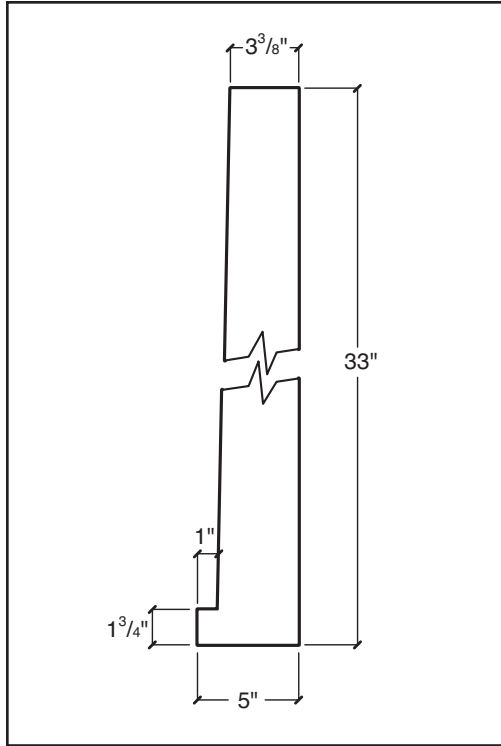


**FIG 3. LEG AND APRON DETAILS**

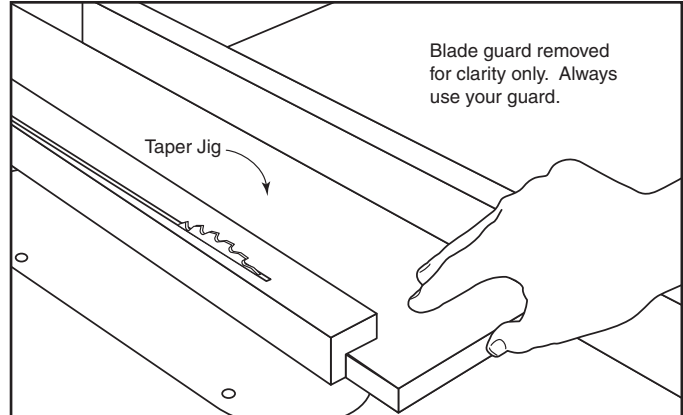




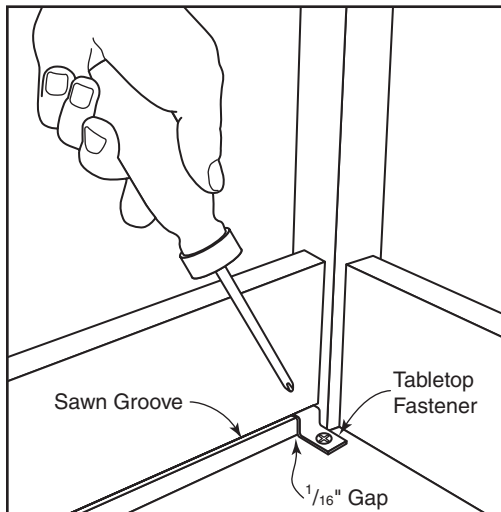
**FIG 4. TAPERING JIG**



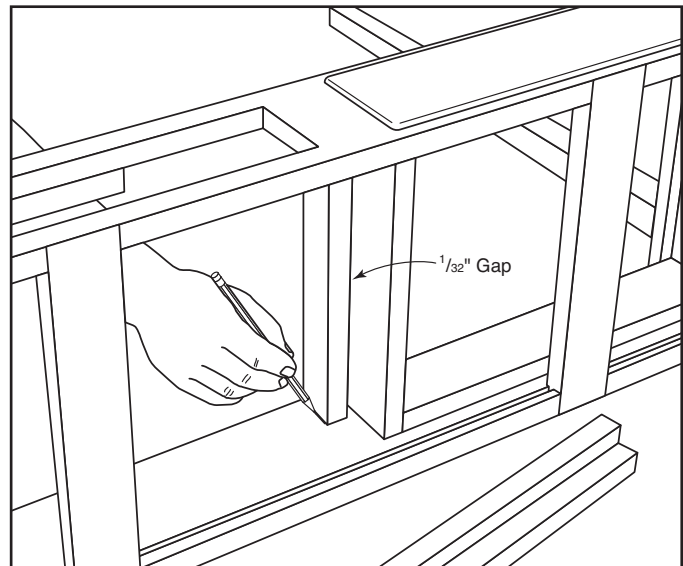
**FIG 5. CUTTING THE LEGS**



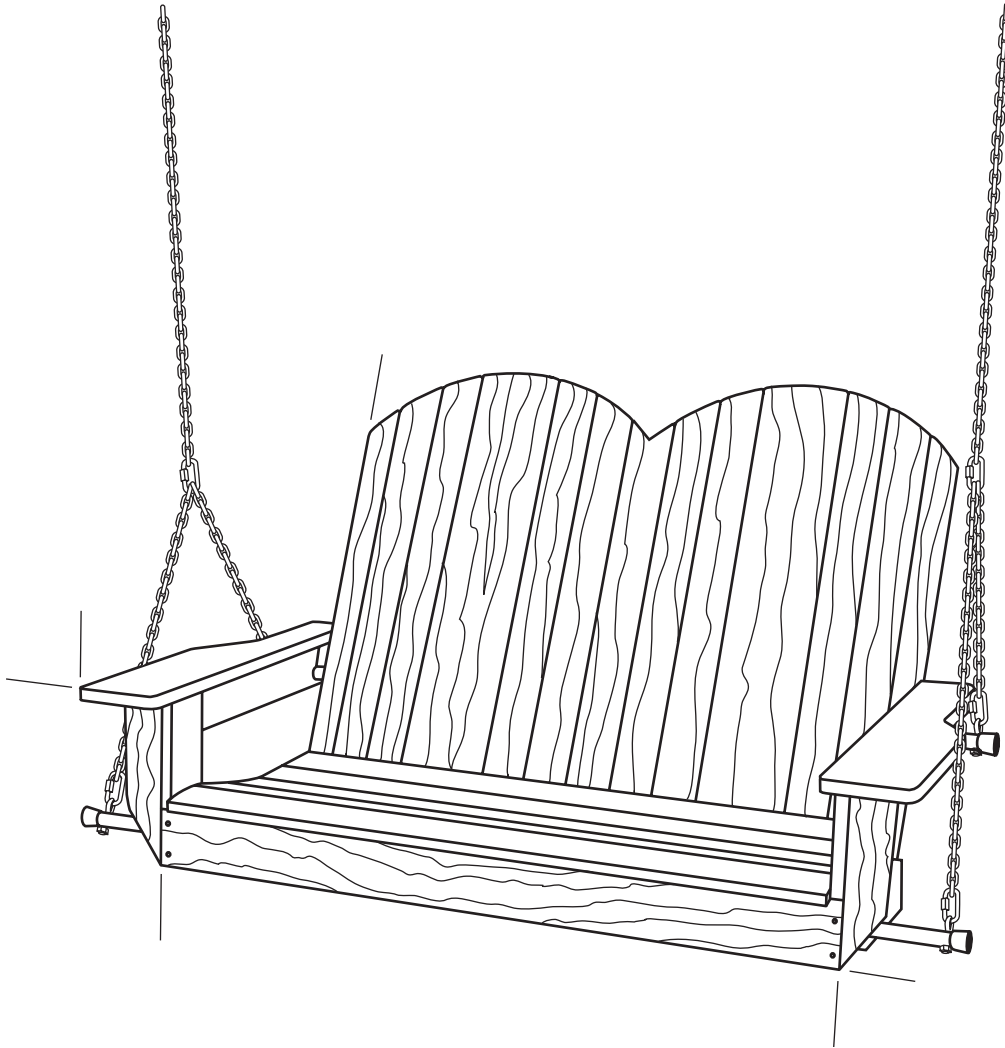
**FIG 6. REATTACH TO BASE**



**FIG 7. MARK THE DRAWER RUNNERS**



# Porch Swing



Kick back and relax with this fun-to-build weekend project. The smooth, gentle glide of the porch swing will keep you daydreaming for hours.

This project is designed with a unique suspension system made from ordinary 1/2" black steel pipe (commonly used for gas piping). It slips through the swing frame to act as a cradle and to eliminate stress on wood joints. Eyebolts are fastened through the steel pipe and covered by soft rubber caps to prevent accidental scrapes. The swing assembly is then supported with a welded steel chain that is securely fastened to solid framing in the porch roof.

In this intermediate-level project, you'll gain experience in working with templates to make shaped pieces and doing some complex and precise assembly. And after you build it, you'll learn more about applying and using finishes to protect the wood and keep it looking beautiful.

**Caution:** Swings are inherently dangerous for small children. This swing moves slowly, but it has hard edges that can give a nasty bump. Kids will love this swing, but never let small children play around it unattended.

## TOOLS REQUIRED

### Hand Tools

- Hacksaw
- Adjustable wrench
- Block plane
- Bar clamps

### Power Tools

- Miter saw or circular saw
- Drill with bits and screw-driver attachment
- Jigsaw
- Table saw
- Orbital sander

### Miscellaneous

- Tape measure
- Safety glasses
- 120-, 150- and 220-grit sandpaper
- Clean, lint-free cloths
- Respirator
- 4" roller
- Gloves for finishing
- Mineral spirits (for oil-based finishes)
- Water-filled metal container with tight-fitting lid
- Minwax® Wood Finish™ Stain Brush or other good quality, natural bristle brush (for oil-based stains and finishes)
- Minwax® Stainable Wood Filler
- Construction adhesive
- Thread-locking compound
- Exterior spray primer
- Black or brown spray paint

## SHOPPING LIST

**NOTE:** The wood for this project is cedar, a naturally rot resistant species. White oak, cypress, and poplar are also good alternative dense woods that won't mar easily and stain beautifully.

Item	Quantity
1"x 6" x 8' boards	7
1"x 4" x 8' boards	3
1-1/4" galvanized deck screws	2 lbs.
1-5/8" galvanized deck screws	2 lbs.
1/2" unthreaded black pipe 56" long	1
1/2" unthreaded black pipe 51" long	1
Pilot hole/countersink drill bit	1
3/16" welded, zinc-plated chain	17'
1/4" threaded eyebolts	4
2-1/4" quick-link eyes	8
3/4" rubber caps	4

**Woodworker's Tip:** Knots can weaken a board and spell disaster, especially on furniture, so be sure to select knot-free boards.

## WOOD FINISHING PRODUCTS

### Recommended Finish

Thompson's® WaterSeal® Waterproof PLUS Tinted Wood Protector Honey Gold (or your choice of Natural Cedar, Nutmeg Brown, Rustic Red, or Coastal Gray).

### Alternate Finish

Thompson's® WaterSeal™ Deck & House Semi-Transparent Latex Stain – Cedartone (for a cedar appearance), Briarwood (for a brownish tone), Woodland (for a reddish tone), or Superwhite (for a white appearance).

## CUTTING LIST

Key	Pcs.	Size & Description
A1	2	3/4" x 5-1/2" x 17-1/2" (side seat braces)
A2	1	3/4" x 5-1/2" x 14-1/2" (center seat brace)
B	2	3/4" x 3-1/2" x 10-1/2" (front arm braces)
C	1	3/4" x 3-1/2" x 43" (front stringer)
D	1	3/4" x 3-1/2" x 40" (rear stringer)
E	1	3/4" x 3-1/2" x 40" (lower back brace)
F	1	3/4" x 2-5/16" x 43" (center back brace)
G	1	3/4" x 1-1/2" x 40-1/2" (top back brace)
H	2	3/4" x 5-1/2" x 35" (center back slats)
J	9	3/4" x 2-11/16" x 35" (back slats)
K	2	3/4" x 1-13/16" x 35" (tapered back slats)
L	2	3/4" x 2-1/2" x 10-1/2" (arm supports, waste from parts P)
M	2	3/4" x 3" x 22-1/4" (horizontal arm supports)
N	6	3/4" x 2-11/16" x 41-1/2" (seat slats)
P	2	3/4" x 5-1/2" x 27" (arms)
Q	1	1/2" (13/16" outside diameter) x 56" black steel pipe
R	1	1/2" (13/16" outside diameter) x 51" black steel pipe

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- Work sensibly and safely. Wear safety goggles when doing work that creates flying chips and sawdust; wear the appropriate respirator whenever making sawdust or working with thinners or other solvents.
- At the end of every work session, clean up your shop area and put away all portable tools.

## CUTTING AND ASSEMBLY PROCEDURE

1. Cut all the parts to the dimensions shown in the CUTTING LIST. Using a table saw, make 1x3s from the 1x6s.

2. Notch the front arm braces (B) with a jigsaw to accept the front stringer (C) as shown in Fig. 1. Fasten C to both parts B with 1-5/8" deck screws. Drill pilot and countersink holes and apply a dab of construction adhesive at each joint.

**Woodworker's Tip:** *Why use construction adhesive instead of carpenter's glue? We used Liquid Nails brand LN-600 because it's waterproof and resilient. Construction adhesive will help your porch swing stand up to both weather and stress. Apply a small bead at every joint. If the glue oozes slightly, let the excess harden and then cut it off with a sharp putty knife or wood chisel.*

3. Draw the curved shapes for parts A1, A2 and P onto hardboard templates, shown in Fig. 1, cut them out and trace them onto boards. To cut them out with a jigsaw, clamp them to the workbench to keep them from wandering while you cut the curves. Sand the curves smooth with 100-grit sandpaper. Drill 7/8"-dia. holes with a sharp spade bit into parts A1 and A2 as shown in Fig. 2 for the front pipe hanger.

4. Trace the angle of the center seat brace (A2) onto each side brace (A1) to locate the holes for attaching the rear stringer (D). Again, drill pilot holes and glue and screw the seat braces to the front stringer and the front arm braces. Next, glue and screw the rear stringer to the seat braces.

**Woodworker's Tip:** *You'll need to pre-drill holes for every screw so you won't split the wood or break off the screw head. To make this process easier, buy a special combination bit that can drill and countersink in one operation.*

5. Drill through the front arm braces (B) with a 7/8" spade bit after you've glued and screwed the side seat braces to them. These two holes will complete the pathway for the front pipe support (Q).

6. After you assemble the arm braces, stringers and seat braces, glue and screw the curved front arm supports (L) to the sides of B as shown in Fig. 1.

7. Use a table saw to cut the center and top horizontal back braces (F and G) from 1x4s. Set the blade at 27-1/2 degrees for the bevel cuts.

8. Mark a diagonal taper onto a 1x3 as shown in Fig. 1 to make the two outer slats (K) from this single piece. Cut along the line with your jigsaw, then use a block plane to smooth the cut edge.

9. Assemble the back as shown in Figs. 1 and 4. Lay all the back slats (H, J, K) face down on a flat surface and slip temporary 1/4" spacers between them to help maintain consistent spacing. Fasten the bottom brace (E) to the middle slat, using a framing square to make sure they're joined at 90 degrees. Start at the center and work out to the sides. When you get to the fourth slat on each side, check your spacing; you may need to adjust it so the outer edge of the tapered slat (K) is flush with the end of the lower back brace.

10. Cut the curves on the back assembly. Make a simple beam compass from a scrap of wood as shown in Fig. 5. Flip the backrest assembly over and nail one end of the compass 14 inches from the top and in the center of the 1x6 back slat. Insert your pencil into the 1/4" hole drilled in the other end of the compass and draw the curve. Cut along the mark with your jigsaw. With the backrest assembly in this position, measure and mark a 2-1/2" line parallel to the bottom edge.

11. Hang the lower part of the back assembly over the edge of the work surface and slide the seat assembly onto it. Place the seat frame assembly you built earlier onto the backrest assembly. It's crucial to align the rear seat frame stringer (D) to the 2-1/2" line on the backrest so the remainder of the assembly will fit together. Glue the joint, then clamp and screw the assemblies together.

12. Drill 7/8" holes in the horizontal arm supports (M) to the exact dimensions shown in Fig. 1. Then glue and screw these pieces to the front arm braces (B) and the center back brace (F).

13. Glue and screw the seat slats to the seat braces. Start in the back and leave approximately a 3/16" space between each piece. Trim the last slat to overhang the front stringer by 1/2". Plane the transition piece on the curve of the seat and at the leading edge of the front seat slat for maximum comfort. Also shave off any high spots in the seat slats with a block plane.

14. Test-fit the pipe, chain and connecting links in the wooden assembly. This is a good time to discover any glitches and correct them before you do any finishing. Slide the pipes through the holes in the seat frame and along the back, leaving an equal amount exposed on each side.

15. Drill a 3/16" hole in the center of the rear support pipe, then screw a 2" No. 8 sheet metal screw (use a 1/8" pilot hole) up into the center back support. This connection will keep the pipe from sliding to one side while the swing is in motion.

16. Drill 9/32"-dia. holes for the eyebolts. Angle the eyebolts slightly toward the center of the swing to minimize the torque on the pipe and prevent the lock-screw from breaking.

17. Hang the swing using the quick-link eyes to join the lengths of chain. This swing could be holding 400 pounds or more, so you must anchor the swing's chain with 1/2" screw eyes screwed at least 2" into solid framing as shown in Fig. 6. Also, distribute the weight to more than one joist or rafter by screwing a pair of 2x4s 54" apart and then inserting the screw eyes into the 2x4s. The swing should tip back slightly at the arms (about 1" from back to front) when it is at rest. During the final assembly after finishing, squirt thread-locking compound on the eyebolt threads. Be sure to cut the ends of the eyebolts flush with the nuts for safety. When the installation is complete and secure, remove the swing for finishing.

18. Before applying the finish, remove the chains and pipes. Sand the pipes with 100-grit sandpaper, then wipe them down thoroughly with a rag dampened with mineral spirits. Let the mineral spirits evaporate off the surface, then spray-paint the pipes with exterior primer followed by a brown or black exterior enamel.

19. Sand the wood parts with 100-grit sandpaper, paying particular attention to the arms and the edges of the seat and back. Softer edges will be safer and more comfortable and hold the finish better.

20. Wipe off the dust and vacuum the swing. You'll make better time if you apply the finish with a small 4" roller and follow it up with a brush to even the coat. Use the brush to get between the slats and then look for runs and drips coming through the other side.

## PROTECTING YOUR PROJECT

Any type of wood that's used outdoors needs protection from water damage. We've chosen Thompson's® WaterSeal® Waterproofer PLUS Tinted Wood Protector to provide complete protection for your project. It not only prevents water damage, but the coating also resists mildew and U.V. (ultraviolet radiation in sunlight) damage, and it exceeds industry standards for waterproofing on wood. In addition, Tinted Wood Protector adds color without hiding natural wood grain.

**Woodworker's Tip:** Always be sure to choose a waterproofer that claims to exceed industry standards for waterproofing on wood.

### FINISHING TIPS

- When you apply Thompson's® WaterSeal® Waterproofer PLUS Clear or Tinted Wood Protector, do not mix it with other waterproofing products because variations in the final appearance of the surface being treated may result. Also, do not thin these products.
- Coverage: The approximate coverage of Clear Wood Protector on cedar is 300 to 400 square feet per gallon. A gallon of Tinted Wood Protector will cover about 250 to 300 square feet. The approximate coverage of oil or latex stain on smooth wood is 250 to 300 square feet per gallon.

### Recommended Finish

21. Before applying Thompson's® WaterSeal® Waterproofer PLUS Clear or Tinted Wood Protector, read and follow the directions found on the back of the can. Be sure that both surface and air temperature are above 50° F during application and for 48 hours after application, and if you're working outside, do not apply product if rain is forecasted within 24 hours of application.

22. The surfaces must be free of all mildew, dust, dirt, oil, soot, grease, and other contaminants. If the surface is damp or wet from cleaning or weather, allow the surface to dry thoroughly (a minimum of 48 hours) before application.

23. Cover plants and shrubs and move all objects that could come in contact with Wood Protector.

24. When you apply Clear or Tinted Wood Protector, do not mix it with other waterproofing products because variations in the final appearance of the surface being treated may result.

25. Before applying Wood Protector over the entire surface, a small trial patch is recommended to verify color.

26. In most applications, only one light coat is necessary. Apply with a brush, roller, applicator pad, or by dipping the piece into the product. Regardless of which application method is used, remove excess within 15 minutes by redistributing it to drier areas or wiping it off.

27. Use only with adequate ventilation. Oiliness and tackiness will result if over-applied or applied to wet or damp surface or if overnight temperature falls below 50° F within 48 hours of application. Excessive oiliness caused by over-application may be removed by scrubbing wood with a concentrated degreaser.

28. Allow at least 48 hours to dry before you hang the swing. Drying time will vary depending on the substrate, temperature and humidity.

29. Clean brushes and equipment with mineral spirits, then rinse with clean water.

**NOTE:** The length of protection will vary depending on environment. Perform the following splash test once a year to see whether reapplication is necessary. Sprinkle water on various sections of surface to be sealed. If water absorbs and darkens color of substrate within 5 seconds, the surface is porous and considered ready to be treated. If water beads up or otherwise sits on top of surface, then surface doesn't need protection at this time. For maximum protection from color change and other damage caused by the sun, reapplication is recommended every year. Vertical and horizontal surfaces will experience color changes at different rates.



### **Alternate Finish**

If you want more color along with excellent protection, use Thompson's® WaterSeal™ Deck & House Latex or Oil Stain, both of which come in Solid and Semi-transparent formulations and are available in 117 ready- and custom-mixed colors.

**30.** Before applying any of these stains, read and follow the directions found on the back of the can. To ensure good penetration, do not apply in direct sunlight or on hot days. Be sure that both surface and air temperature are above 50° F and below 95° F during application and for 48 hours after application. If you're working outside do not apply product if rain is forecasted within 24 hours of application.

**31.** The surfaces must be free of all mildew, dust, dirt, oil, soot, grease, and other contaminants. If the surface is damp or wet from cleaning or weather, allow the surface to dry thoroughly (a minimum of 48 hours) before application. Shake or mix thoroughly before application (mechanical shaking is recommended).

**32.** Since in-store color samples may vary slightly when actually applied to wood (based on color, texture, grain, porosity, and type of wood), apply the stain to a small test area and let it dry to determine final color before proceeding with the entire project.

**33.** Apply stain with an exterior paint pad, brush, roller, or compression-driven sprayer set for low pressure. Do not use product in a pump-up garden sprayer. When rolling be sure to go back and brush-in stain to ensure even coverage. When using a pad or brush, keep the leading edge wet and distribute stain evenly. This will help avoid lap marks and keep color uniform.

**34.** Work from top to bottom or side to side in areas small enough to allow the leading edge to remain wet at all times during application. Use natural breaks as boundaries to divide large areas into more manageable work areas.

**35.** One coat of stain is recommended, but a second coat can be added if desired. Allow the first coat to dry thoroughly (approximately 4 hours for latex, 24 hours for oil) before second application. Drying time will vary depending on the substrate, temperature and humidity.

**36.** For oil-base stain, clean brushes and equipment with mineral spirits, then rinse with clean water. For latex stain, clean brushes and equipment with soap and water.

**IMPORTANT:** Place rags, steel wool and waste immediately after use in a sealed, water-filled metal container.

### **PRODUCT SAFETY**

For your safety and the safety of those you work with, always read the safety warnings, which manufacturers print on their labels, and follow them to the letter. Typical safety advice and instructions will contain information such as the following:

**WARNING!** Removal of old paint by sanding, scraping or other means may generate dust or fumes that contain lead. Exposure to lead dust or fumes may cause brain damage or other adverse health effects, especially in children or pregnant women. Controlling exposure to lead or other hazardous substances requires the use of proper protective equipment, such as properly fitted respirator (NIOSH approved) and proper containment and cleanup. For more information, call the National Lead Information Center at 1-800-424-LEAD (in US) or contact your local health authority.

Contents are **COMBUSTIBLE**. Keep away from heat and open flame.

Contains **ALIPHATIC HYDROCARBONS**.

**VAPOR HARMFUL.** Use only with adequate ventilation. To avoid over-exposure, open windows and doors or use other means to ensure fresh air entry during application and drying. If you experience eye watering, headaches, or dizziness, increase fresh air supply, or wear respiratory protection (NIOSH/MSHATC23C or equivalent), or leave the area. Avoid contact with eyes and skin. Wash hands after using. Keep container closed when not in use. Do not transfer contents to other containers for storage.

**FIRST AID:** In case of eye contact, flush thoroughly with large amounts of water for 15 minutes and get medical attention. For skin contact, wash thoroughly with soap and water. In case of respiratory difficulty, provide fresh air and call physician. If swallowed, get medical attention immediately.

### **DELAYED EFFECTS FROM LONG-TERM OCCUPATIONAL EXPOSURE.**

Contains solvents that can cause permanent brain and nervous system damage. Intentional misuse by deliberately concentrating and inhaling the contents can be harmful or fatal.

**WARNING:** This product contains chemicals known to the State of California to cause cancer and birth defects or other reproductive harm.

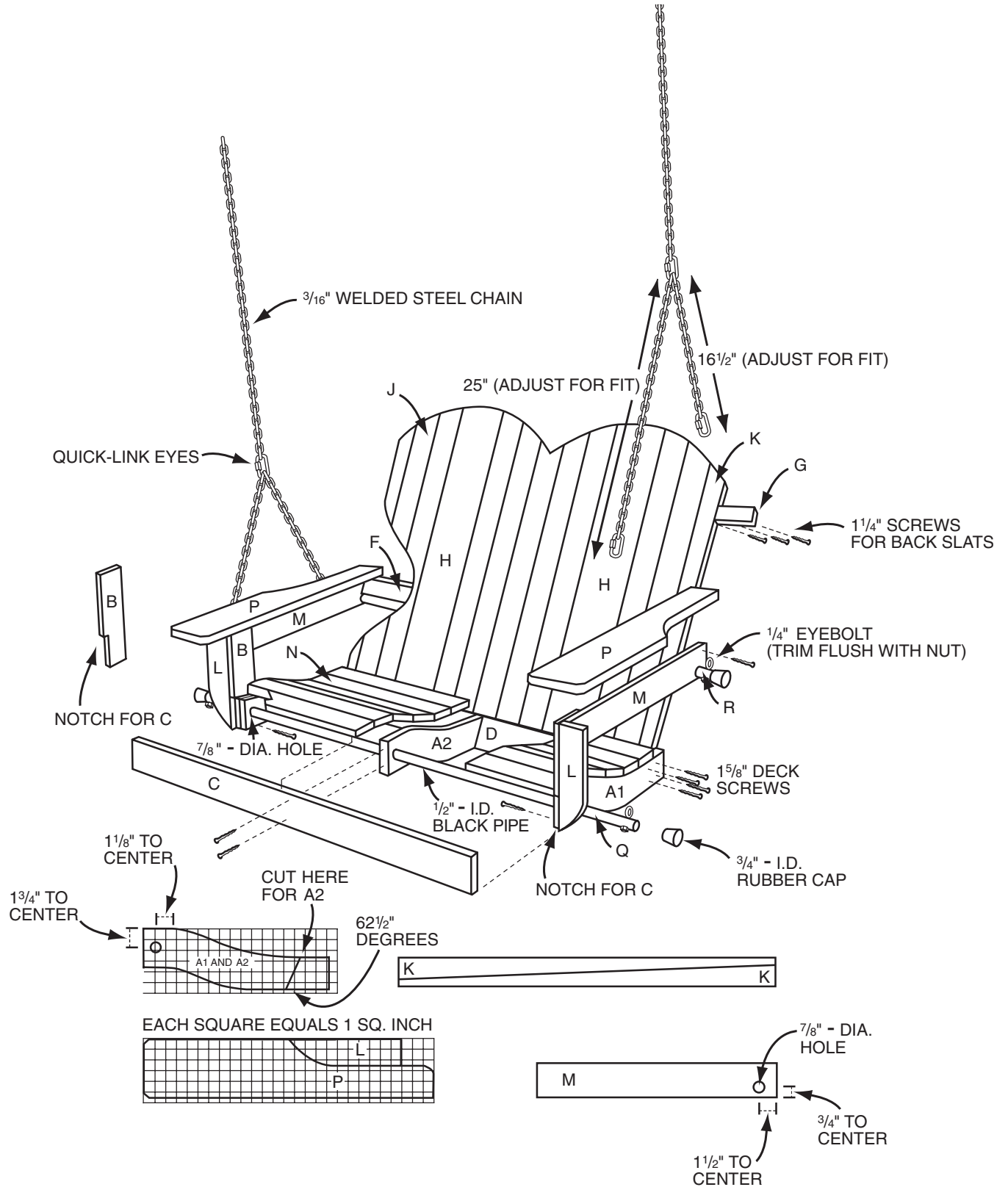
### **DO NOT TAKE INTERNALLY. KEEP OUT OF THE REACH OF CHILDREN.**

### **SAFE DISPOSAL OF RAGS AND WASTE.**

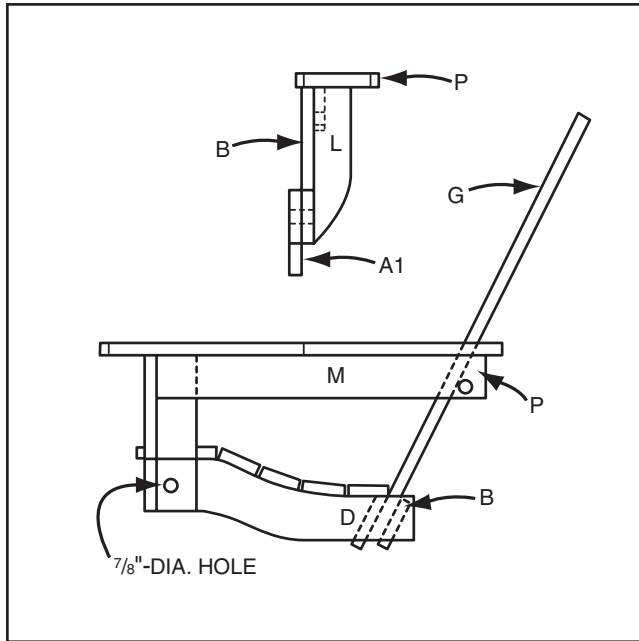
Rags, steel wool or waste soaked in Thompson's® WaterSeal® Waterproofer PLUS Tinted Wood Protector may spontaneously catch fire if improperly discarded. Immediately after use, place rags, steel wool or waste in sealed, water-filled metal container. Dispose of in accordance with local fire regulations.



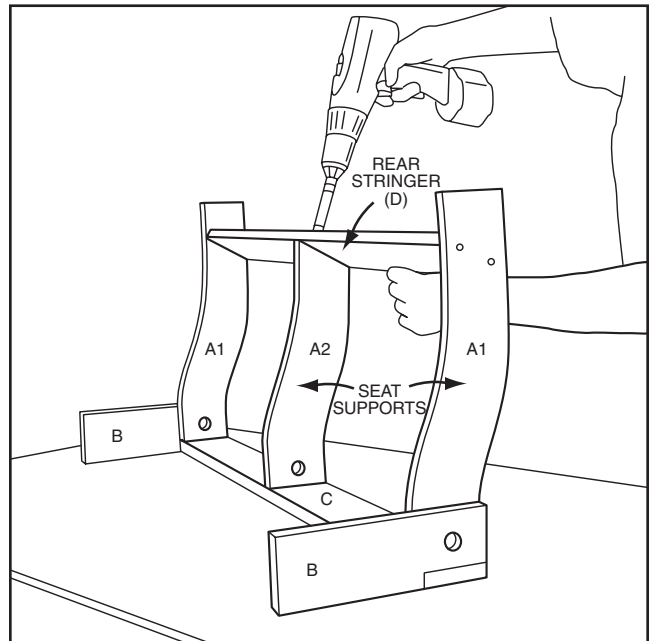
**FIG 1. PORCH SWING DETAILS**



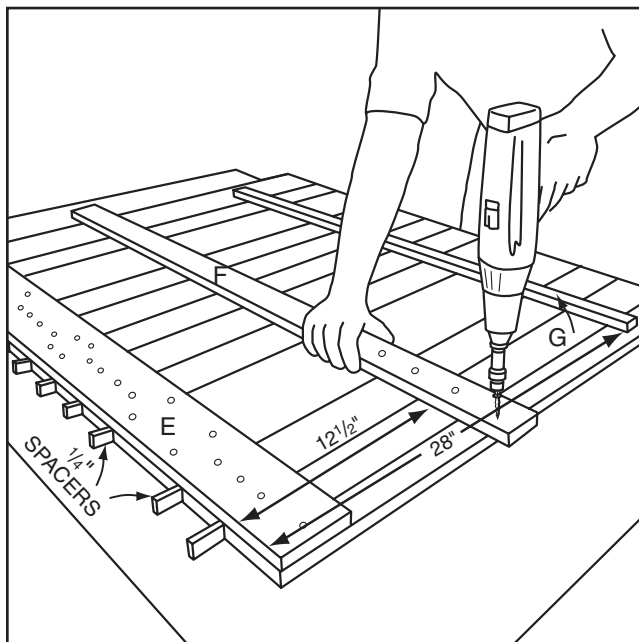
**FIG 2. PORCH SWING END VIEW**



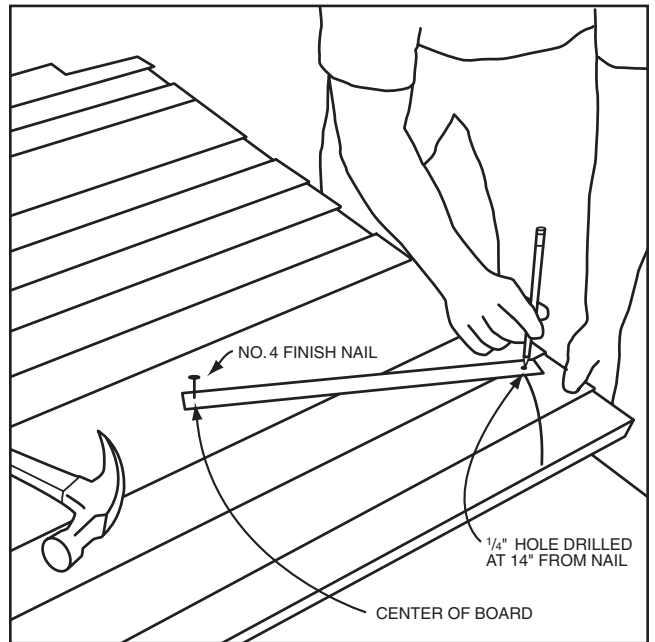
**FIG 3. SEAT FRAME ASSEMBLY**



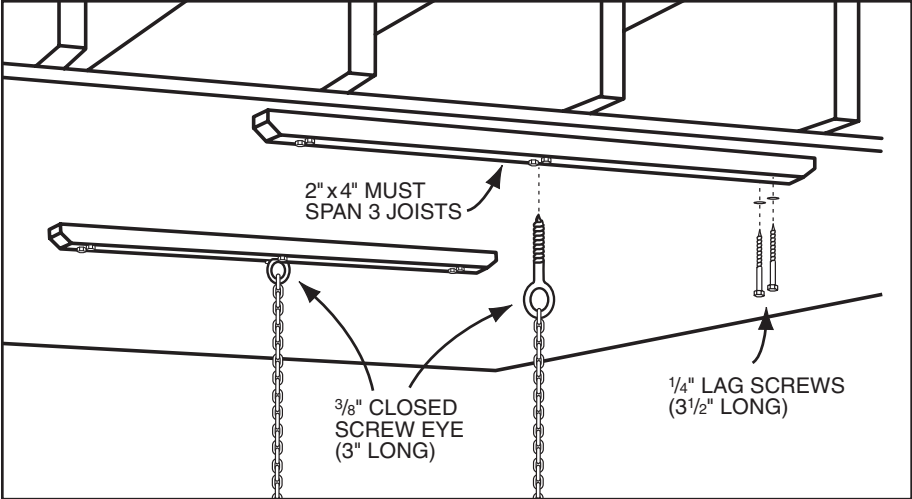
**FIG 4. ASSEMBLING THE BACK**



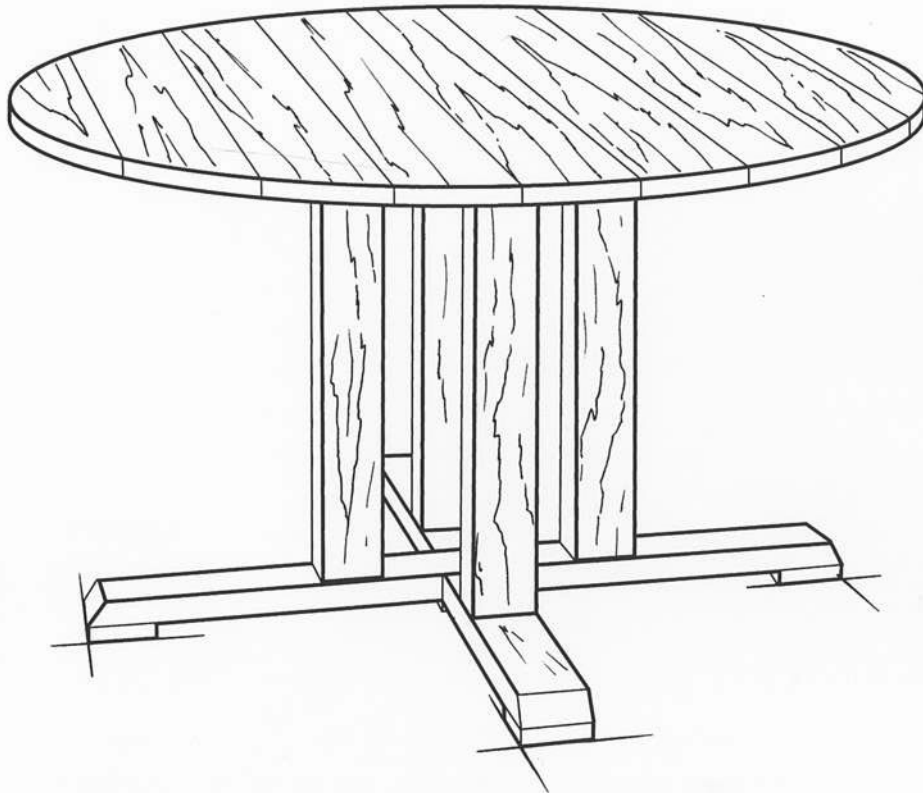
**FIG 5. CUTTING THE BACK ASSEMBLY**



**FIG 6. HANGING THE PORCH SWING**



# Pedestal Picnic Table



If you're looking for a picnic table that's simple to build but looks great on a deck or patio, here's the design for you.

- The 48"-dia. top easily accommodates six people, and with its traditional pedestal support, no one can complain about being "on the leg."
- Since the top is fastened from below, there are no screws or nails visible on the top.
- The pedestal is joined with threaded rods, which makes it very strong and simple to retighten if it ever gets a little loose.

This table gives intermediate woodworking students the opportunity to learn a number of important, basic skills, including measuring, cutting, marking, drilling and assembly of several pieces. And after you make the table, you'll learn how to protect the wood and keep it looking beautiful.

## TOOLS REQUIRED

### Hand Tools

- 1/2"-dia. x 12"-long auger bit
- Screwdriver
- Socket wrench

### Power Tools

- Drill
- Table saw
- Router
- Bandsaw or jigsaw
- Belt sander
- Orbital sander

### Miscellaneous

- Pencil
- Length of wire or chain for drawing tabletop cutout
- Sanding belt, 80-grit
- Sandpaper, 120-grit

**NOTE:** Among the tools you'll need to build this table, one is a little unusual: a 1/2"-dia. "ship auger" bit that's at least 12" long. It's needed to drill the long holes through the legs of the pedestals without wandering off course and coming out off center or, worse, through the side of the wood. An auger is available at a home center or woodworking specialty store for around \$15. Unfortunately, a spade bit with an extension just won't do the trick.

## SHOPPING LIST

Item	Quantity
2x4 x 8'	2
4x4 x 8'	1
1x4 x 12'	1
5/4 x 6" x 12'	3
1x8 x 8' pine (for clamping jig)	1
2" galvanized deck screws	22
1-5/8" galvanized deck screws	70
5/16" x 26-1/2" threaded rod	4
5/16" nuts and washers	8
Brown exterior-grade caulk	1 tube

## CUTTING LIST

Overall Dimensions: 48" dia. x 28-3/4" h		
Part	Quantity	Dimensions
A	1	2x4 x 46"
B	1	2x4 x 26"
C	2	2x4 x 41"
D	4	4x4 x 23-7/8"
E	5	1x4 x 3-1/2"
F	2	5/4 x 6" x 30"
G	2	5/4 x 6" x 42"
H	5	5/4 x 6" x 50"
J	2	1x4 x 24"
K	4	1x4 x 18"

**NOTE:** The wood for this project should be naturally rot resistant, which means choosing either redwood, cedar or cypress in anything from clear, vertical grain to construction-grade boards.

## WOOD FINISHING PRODUCTS

### Recommended Finish

Thompson's® Water Seal® Clear or Tinted Wood Protector, which is available in five colors: Honey Gold, Natural Cedar, Rustic Red, Nutmeg Brown, and Coastal Gray.

### Alternate Finish

Thompson's® Water Seal® Deck & House Latex or Oil Stain, which are available in up to 117 Solid and Semi-transparent colors in both Latex and Oil formulas.

### Miscellaneous

Gloves  
 Plastic drop cloths  
 Brush, roller, applicator pad, deck sprayer or pump-up garden sprayer  
 Mineral spirits (for cleanup)  
 Rags

## BEFORE YOU BEGIN

Good craftsmanship begins and ends with good work habits, so make the following steps part of your routine workshop practice. If you have any doubts or questions about how to proceed with a project, always discuss them with your shop instructor.

- Carefully and fully review plans and instructions before putting a tool to the project lumber.
- Work sensibly and safely. Wear safety goggles when doing work that creates flying chips and sawdust; wear the appropriate respirator whenever making sawdust or working with thinners or other solvents.
- At the end of every work session, clean up your shop area and put away all portable tools.

### Building Tips

- When you're making the boards for the top, plan your scrap. Cut the longest pieces (H) first so you can use the remaining pieces to cut the shorter parts F and G. There are few things more frustrating than sawing up a long board, only to find you need to buy more lumber for the short pieces.
- Before cutting the threaded rod for the base, screw a nut onto it. Cut the rod to the required length, file the cut end smooth and then unscrew the nut. It will clean up the threads nicely.
- It's easier to sand the base pieces before they're assembled.
- You can finish the table after it's assembled, but for maximum longevity, put a weather-repellent finish on all the parts before putting them together, making sure the finish soaks well into the end grain. The only exception is areas that will be glued; leave them unfinished.

## CUTTING AND ASSEMBLY PROCEDURE

1. Refer to the Cutting List and Figure A to cut all the pieces of the table to size.

**Woodworker's Tip:** When you're cutting the 4x4s that make the pedestal legs (D), it's more important to have the ends flat and square, and all four pieces the exact length, than to make them exactly the length given in the Cutting List. You can set their length according to how high or low you want the table. The standard height for dining tables is 30".

2. Cut dados in the four boards (A, B and C) that will form the top and bottom x's on the pedestal. Cut the dados all at once, making them half the thickness of your boards so that a lap joint is formed. Cut the dado a little undersized in width, then "sneak up" on the final width, using a scrap of the lumber to test the fit. It should be a snug, sliding fit.

**Woodworker's Tip:** Before cutting a dado, clamp a piece of scrap at the edge of the board in order to prevent the blade from "blowing out" and splintering the wood as it comes out of the cut.

3. Cut bevels on the ends of boards A, B and C. Be sure the bevels are on the same side as the dado on two of the boards, and on the opposite side from the dado on the other two. Thus, when the two x's are assembled, all the bevels will face up. Drill 1"-dia. x 3/4"-deep coun-

terbore holes in these boards on the non-beveled sides. Then drill 5/16" holes, located as shown in Figure A, for the threaded rods.

4. Drill a hole through the center of each pedestal leg, drilling in halfway from each end with the 12" auger bit. Use a guide block to help the bit go straight through the center (Fig. B). It may be hard to believe that the two holes will meet, but the special design of the drill bit prevents it from wandering off course.

5. Assemble the base on blocks so you can hold the nuts on the bottom (see Fig. C). After inserting the threaded rods through the legs (D), put on the washers and nuts. Tighten the nuts from both ends. Fill the 1" counterbores on the top with brown caulk so water can't collect in the holes. Glue and screw the small feet (E) on the ends of the base.

6. Clamp the tabletop boards (F, G, H) in a simple clamping jig (see Fig. D), bottom side up, with 1/8" spacers between them. Draw a line across the middle of each board beforehand to make them easier to align when they're clamped. To make the jig, use a piece of 3/4"-thick by 6" to 8"-wide scrap that's at least 60" long. This will be the clamp bar. Fasten a rectangular end block near one end of the bar, then lay the tabletop boards on the bar. Next, fasten a tapered block to the other end of the bar, leaving about a 2" gap between it and the outermost tabletop board. To make the clamp work, make an 8"-long stick that tapers from 2-1/2" to 1-1/2" wide and drive it between the tapered block and the tabletop, thus forcing the boards and spacers tightly together.

7. Draw a 48"-dia. circle on the tabletop using thin wire or chain and a nail in the middle of the centerboard (see Fig. E). Take the boards out of the jig, cut out the arcs with a bandsaw or jigsaw and sand the ends. Put finish on the top boards and reassemble the top, including the spacers, on the clamping jig. You'll need to reposition the end block to shorten the clamp bar, because the top is now a little smaller.

8. Attach the base to the top by setting the upside-down pedestal assembly onto the top boards and screwing it down. Cut the cleat boards (J, K) and screw them down as well. Flip the table over, remove the spacers and you're done.

## PROTECTING YOUR PROJECT

Any type of wood that's used outdoors needs protection from water damage. We've chosen Thompson's® Water Seal® Clear or Tinted Wood Protector to provide complete protection for your project. It not only prevents water damage, but the coating also resists mildew and U.V. (ultraviolet radiation in sunlight) damage, and it exceeds industry standards for waterproofing on wood. In addition, Clear Wood Protector will help maintain the wood's natural color while Tinted Wood Protector adds color without hiding natural wood grain.

**Woodworker's Tip:** Always be sure to choose a waterproofer that claims to exceed industry standards for waterproofing on wood.

9. Before applying Clear or Tinted Wood Protector, read and follow the directions found on the back of the can. Be sure that both surface and air temperature are above 50° F during application and



for 48 hours after application, and do not apply product if rain is forecasted within 24 hours of application.

**10.** The surfaces must be free of all mildew, dust, dirt, oil, soot, grease and other contaminants. If the surface is damp or wet from cleaning or weather, allow the surface to dry thoroughly (a minimum of 48 hours) before application.

**11.** Cover plants and shrubs and move all objects that could come in contact with Wood Protector. If a sprayer is used, any overspray of product onto glass should be removed immediately with paint thinner or mineral spirits.

**12.** When you apply Clear or Tinted Wood Protector, do not mix it with other waterproofing products because variations in the final appearance of the surface being treated may result. Also, do not thin this product.

**13.** Before applying Wood Protector over the entire surface, a small trial patch is recommended to verify color.

**14.** In most applications, only one light coat is necessary. Apply with a brush, roller, applicator pad or sprayer or by dipping the piece into the product. A garden "pump-up" style sprayer is the simplest method. Regardless of which application method is used, remove excess within 15 minutes by redistributing it to drier areas or wiping it off.

**15. Use only with adequate ventilation.** Oiliness and tackiness will result if over-applied or applied to wet or damp surface or if overnight temperature falls below 50° F within 48 hours of application. Excessive oiliness caused by over-application may be removed by scrubbing wood with a concentrated degreaser.

**Woodworker's Tip:** *The approximate coverage of Clear Wood Protector on cedar is 300 to 400 sq. feet per gallon. A gallon of Tinted Wood Protector will cover about 250 to 300 sq. feet.*

**16.** Allow at least 48 hours to dry. Drying time will vary depending on the substrate, temperature and humidity.

**Woodworker's Tip:** *Unsure if you need to protect? Perform the splash test. Sprinkle water on various sections of surface to be sealed. If water absorbs and darkens color of substrate within 5 seconds, the surface is porous and considered ready to be treated. If water beads up or otherwise sits on top of surface, then surface doesn't need protection at this time.*

**17.** Clean brushes and equipment with mineral spirits, then rinse with clean water.

**NOTE:** The length of protection will vary depending on environment. Perform the splash test once a year to see whether reapplication is necessary. For maximum protection from color change and other damage caused by the sun, reapplication is recommended every year. Vertical and horizontal surfaces will experience color changes at different rates.

### Alternate Finish

If you want more color along with excellent protection, use Thompson's® Water Seal® Deck & House Latex or Oil Stain, both of which come in Solid and Semi-transparent formulations and are available in 117 ready- and custom-mixed colors.

**18.** Before applying any of these stains, read and follow the directions found on the back of the can. To ensure good penetration, do not apply in direct sunlight or on hot days. Be sure that both surface and air temperature are above 50° F and below 95° F during application and for 48 hours after application, and do not apply product if rain is forecasted within 24 hours of application.

**19.** The surfaces must be free of all mildew, dust, dirt, oil, soot, grease and other contaminants. If the surface is damp or wet from cleaning or weather, allow the surface to dry thoroughly (a minimum of 48 hours) before application. Shake or mix thoroughly before application. (Mechanical shaking is recommended.)

**20.** Since in-store color samples may vary slightly when actually applied to wood (based on color, texture, grain, porosity and type of wood), apply the stain to a small test area and let it dry to determine final color before proceeding with the entire project.

**21.** Apply stain with an exterior paint pad, brush, roller or compression-driven sprayer set for low pressure. *Do not use product in a pump-up garden sprayer.* When rolling or spraying, be sure to go back and brush-in stain to ensure even coverage. When using a pad or brush, keep the leading edge wet and distribute stain evenly. This will help avoid lap marks and keep color uniform.

**22.** Work from top to bottom or side to side in areas small enough to allow the leading edge to remain wet at all times during application. Use natural breaks as boundaries to divide large areas into more manageable work areas.

**23.** One coat of stain is recommended, but a second coat can be added if desired. Allow the first coat to dry thoroughly (approximately 4 hours for latex, 24 hours for oil) before second application.

**Woodworker's Tip:** *The approximate coverage of oil or latex stain on smooth wood is 250 to 300 sq. feet per gallon.*

**24.** Allow a drying time of at least 4 hours for latex, and 24 hours for oil. Drying time will vary depending on the substrate, temperature and humidity.

**25.** For oil-base stain, clean brushes and equipment with mineral spirits, then rinse with clean water. For latex stain, clean brushes and equipment with soap and water.

**IMPORTANT:** Place rags, steel wool and waste immediately after use in a sealed, water-filled metal container.

**PRODUCT SAFETY**

Contents are COMBUSTIBLE. Keep away from heat and open flame.

Contains ALIPHATIC HYDROCARBONS.

**VAPOR HARMFUL.** Use only with adequate ventilation. To avoid overexposure, open windows and doors or use other means to ensure fresh air entry during application and drying. If you experience eye watering, headaches, or dizziness, increase fresh air supply, or wear respiratory protection (NIOSH/ MSHATC23C or equivalent) or leave the area. Avoid contact with eyes and skin. Wash hands after using. Keep container closed when not in use. Do not transfer contents to other containers for storage.

**FIRST AID:** In case of eye contact, flush thoroughly with large amounts of water for 15 minutes and get medical attention. For skin contact, wash thoroughly with soap and water. In case of respiratory difficulty, provide fresh air and call physician.

If swallowed, get medical attention immediately.

**DELAYED EFFECTS FROM LONG-TERM  
OCCUPATIONAL EXPOSURE.**

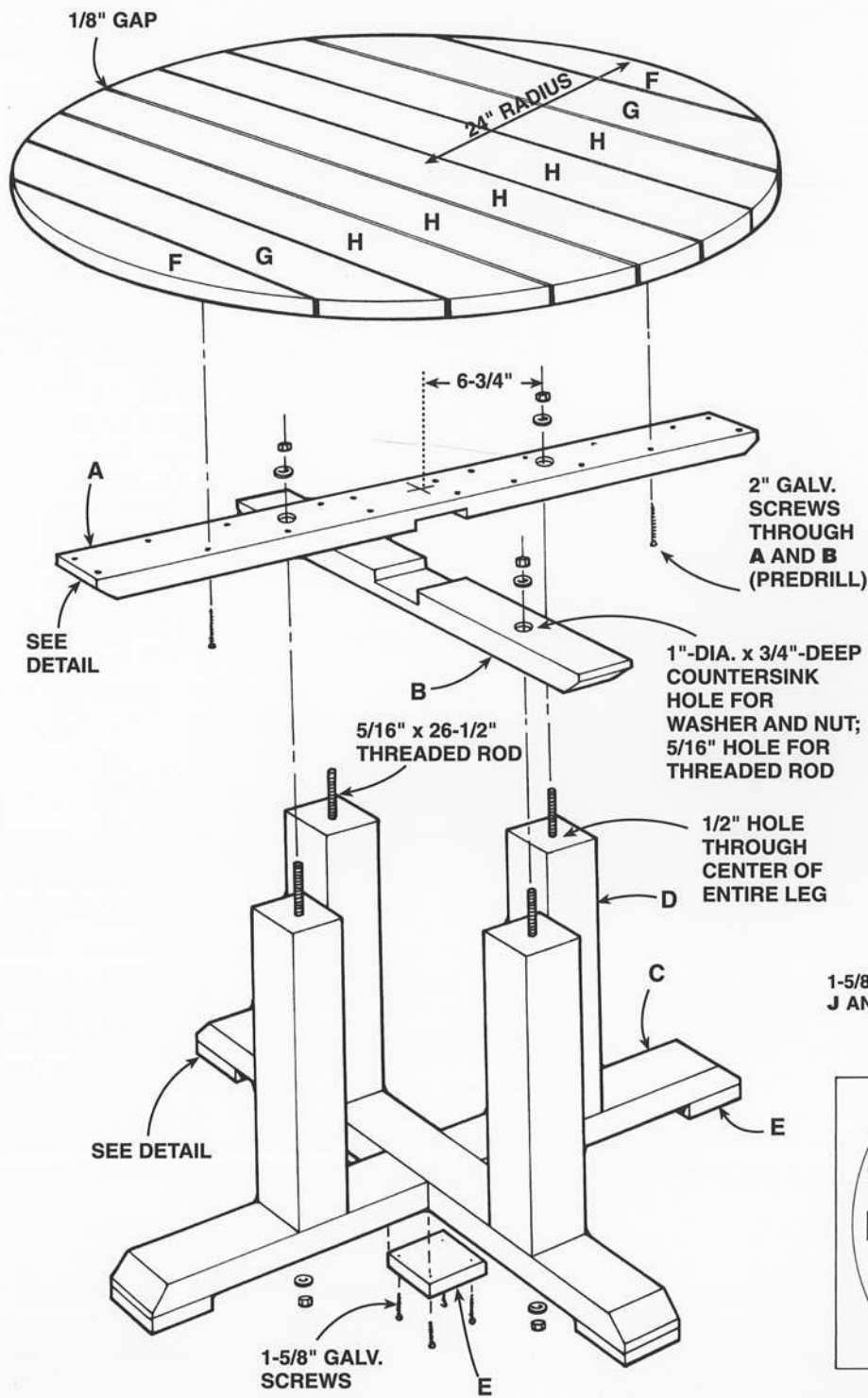
Contains solvents which can cause permanent brain and nervous system damage. Intentional misuse by deliberately concentrating and inhaling the contents can be harmful or fatal.

**WARNING:** This product contains chemicals known to the State of California to cause cancer and birth defects or other reproductive harm.

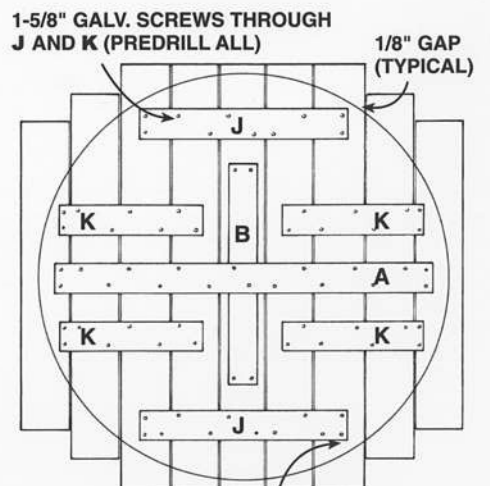
**DO NOT TAKE INTERNALLY. KEEP OUT OF THE REACH  
OF CHILDREN.****SAFE DISPOSAL OF RAGS AND WASTE.**

Rags, steel wool or waste soaked in Thompson's® Water Seal® Tinted Wood Protector may spontaneously catch fire if improperly discarded. Immediately after use, place rags, steel wool or waste in sealed, water-filled metal container. Dispose of in accordance with local fire regulations.

**FIG A. PEDESTAL PICNIC TABLE**

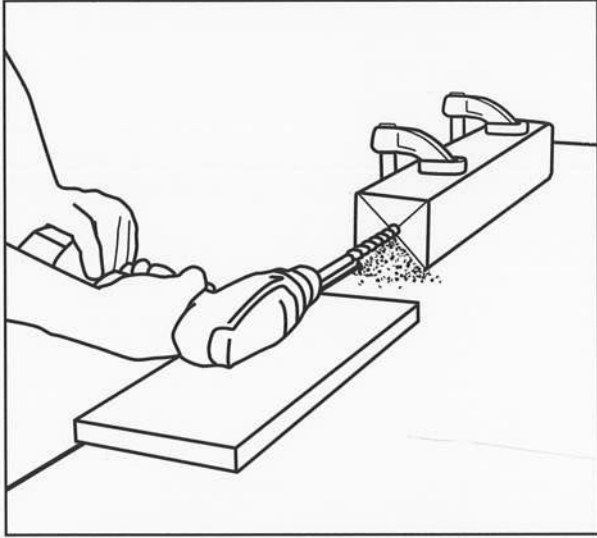


**DETAIL  
UNDERSIDE  
OF TABLE**

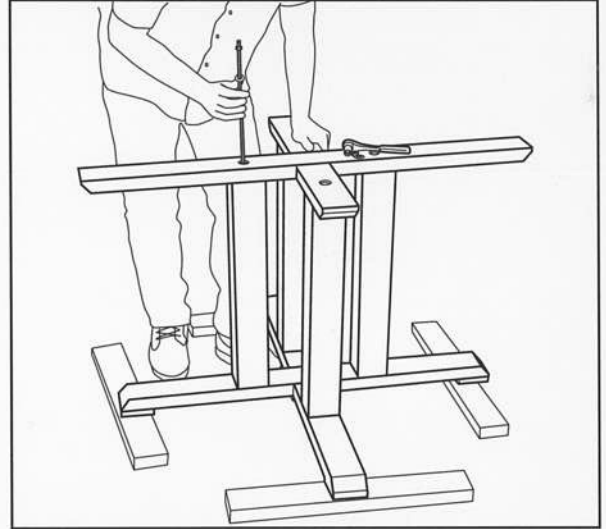


KEEP 1" BETWEEN EDGE OF TOP AND ALL SUPPORTS

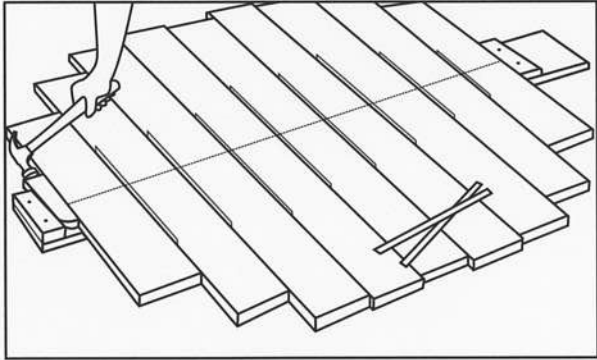
**FIG B. DRILLING THE CENTER  
OF THE TABLE LEG**



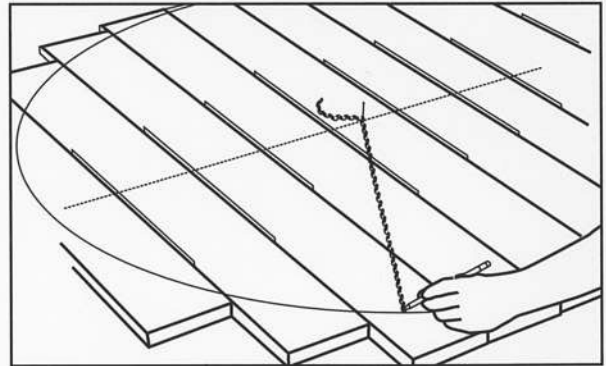
**FIG C. ASSEMBLING THE  
PEDESTAL**



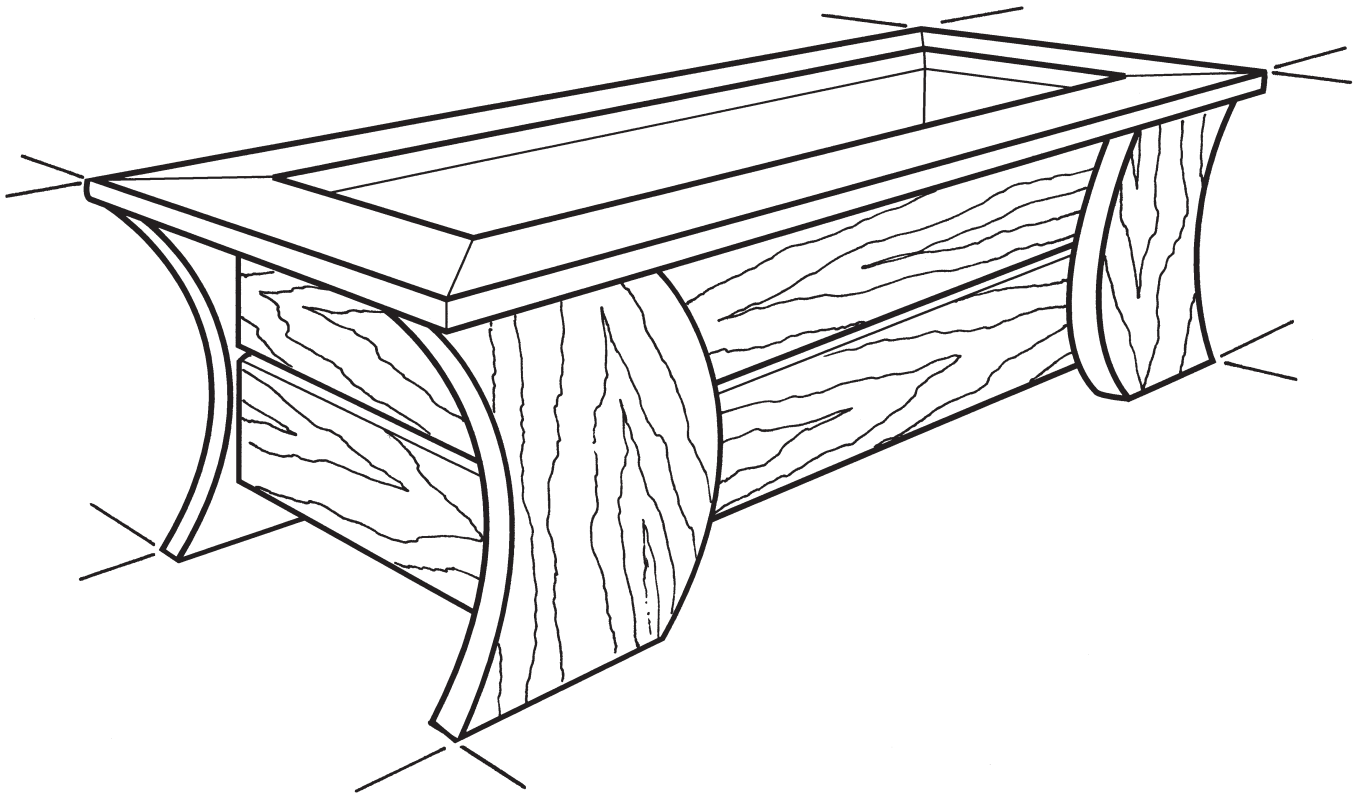
**FIG D. CLAMPING JIG FOR  
TABLETOP BOARDS**



**FIG E. LAYING OUT THE  
TABLETOP CIRCLE**



# Patio Planter



This planter is designed to make patio or deck gardening much easier. Instead of just filling the well with dirt and putting in individual flowers or plants, you can simply use pre-potted plants. That makes it easy to change plants as the seasons turn or unload the planter and move it to a new location.

- We designed this piece to hold pots up to 11" dia. and 10-1/2" high. To create the illusion of a dirt-filled planter, you can fill in around the pots with wood chips, bark or other mulch. The base or bottom of the planter has 7/8" holes drilled every 6" to drain away water. The sideboards have a 1/4" space between them to ventilate the mulch and keep it from getting soggy.
- The planters can be built in two different lengths, but you can also adapt them to meet any size requirement. You can even change the width by nailing a pressure-treated 2 x 2 to the side of the 2 x 12 base to accommodate a slightly wider pot.

This project gives intermediate woodworking students the opportunity to complete a sizeable project while employing such skills as measuring, templating, crosscutting and assembly with screws. Since these planters can be made to fit a particular space, this project is also a good exercise in custom-sizing.

## TOOLS REQUIRED

### Hand Tools

- 12" Speed Square (as cutting guide with circular saw)
- Block plane
- Bar clamps
- Hammer
- Tape measure

### Power Tools

- Jigsaw
- Circular saw or table saw
- Electric drill with pilot/countersink bit and 7/8" wood boring bit
- Power screwdriver

### Miscellaneous

- Pencil
- Safety glasses
- Exterior wood glue
- Gloves for finishing
- Sandpaper
- Masking tape
- Clean, lint-free cloths
- Mineral spirits (for oil-based finishes)
- Water-filled metal container with tight-fitting lid
- Exterior paint pad, brush or roller

## SHOPPING LIST

Large Planter	
Item	Quantity
2 x 12 pressure-treated pine	1 @ 10'
2 x 6 cedar	2 @ 8', 1 @ 6'
5/4 x 6 cedar	2 @ 8'
Small Planter	
Item	Quantity
2 x 12 pressure-treated pine	1 @ 8'
2 x 6 cedar	3 @ 6'
5/4 x 6 cedar	1 @ 12'
Either Planters	
Item	Quantity
2-1/2" deck screws	24
3" deck screws	28
8d galvanized finish nails	24

**NOTE:** The wood for this project should be a naturally rot resistant species, such as cedar or redwood, especially for the exposed parts. Hidden parts can be less expensive pressure-treated pine or construction-grade boards.

## WOOD FINISHING PRODUCTS

### Recommended Finish

Thompson's® Water Seal™ Deck & House Latex or Oil Stain. Available in 117 solid and semi-transparent colors in both latex and oil formulas for the legs and apron and Thompson's® Water Seal® Clear Wood Protector for the body.

## CUTTING LIST

Large Planter			
Key	Pcs.	Part	Size
A	4	Treated pine legs	1-1/2" x 11-1/4" x 13"
B	1	Treated pine base	1-1/2" x 11-1/4" x 47-1/2"
C	4	Cedar side panels	1-1/2" x 5-1/2" x 47-1/2"
D	4	Cedar end panels*	1-1/2" x 5-1/2" x 14-1/4"
E	2	Cedar side aprons*	1-1/16" x 4-1/2" x 56-3/4"
F	2	Cedar end aprons*	1-1/16" x 4-1/2" x 20-1/4"
Small Planter			
Key	Pcs.	Part	Size
A	4	Treated pine legs	1-1/2" x 11-1/4" x 13"
B	1	Treated pine base	1-1/2" x 11-1/4" x 35-1/2"
C	4	Cedar side panels	1-1/2" x 5-1/2" x 35-1/2"
D	4	Cedar end panels*	1-1/2" x 5-1/2" x 14-1/4"
E	2	Cedar side aprons	1-1/16" x 4-1/2" x 44-3/4"
F	2	Cedar side aprons*	1-1/16" x 4-1/2" x 20-1/4"

\*Lengths are approximate. Cut these pieces to fit.

### Alternate Finish

Thompson's® Water Seal® Tinted Wood Protector. Available in five colors: Honey Gold, Natural Cedar, Rustic Red, Nutmeg Brown and Coastal Gray.



## BEFORE YOU BEGIN

Good craftsmanship begins and ends with good work habits, so make the following steps part of your routine workshop practice. If you have any doubts or questions about how to proceed with a project, always discuss them with your shop instructor.

- Carefully and fully review plans and instructions before putting a tool to the project lumber.
- Work sensibly and safely. Wear safety goggles when doing work that creates flying chips and sawdust; wear the appropriate respirator whenever making sawdust or working with thinners or other solvents.
- At the end of every work session, clean up your shop area and put away all portable tools.

## CUTTING AND ASSEMBLY PROCEDURE

1. With a piece of cardboard, make a full-size template for the legs (A) from a 400% enlargement of Figure B. Trace the template outline onto the pressure-treated 2 x 12. Sand the edges with a finish or belt sander followed by 100-grit hand sanding to ease the edges.

2. To make the cedar side and end panels (C and D), make crosscuts with a circular saw using the Speed Square as a guide. Hold it firmly against the back of the 2 x 6.

3. Plane chamfers on the edges where the side and end panels meet, at the lower edge of the upper end panel (D) and the upper edge of the lower end panel (D). Similarly, plane chamfers at the lower edge of the upper side panel (C) and the upper edge of the lower side panel (C). These chamfers should be about 3/8" wide when completed.

**Woodworker's Tip:** *Clamp a board to the edge of your workbench to stop the work piece from drifting while you stroke the edge of the board with the block plane.*

**NOTE:** Before assembling the planter, you will get neater results with the recommended finish by staining the legs and apron pieces with the latex or oil stain first and then applying the Clear Wood Protector to the side and end panels. See FINISHING TIPS.

4. Cut the 2 x 12 base (B) to length, then screw the lower side panels to the edges aligning the base and sides so they're flush on the bottom face. Pre-drill for each screw using a pilot/countersink combination bit. Then screw the ends to the sides with 3" deck screws.

5. Shim the base up 1-3/4" on each side using scrap pieces of wood, then clamp the legs one at a time to the sides. Screw the lower sides to the legs from the inside with 2-1/2" deck screws. Use three screws per leg.

6. Clamp the upper sides flush to the tops of the legs. Be sure to align the upper and lower side ends before drilling and screwing these pieces in place. Again, use three 2-1/2" deck screws per leg. Next, screw the upper end panels (D) to the upper sides. Make sure the chamfers face each other on each side.

7. Rip (saw wood along the grain) the 5/4 x 6 deck boards to 4-1/2" wide to make the top apron frame. Use a table saw or a circular saw with a rip guide. Plane and sand the cut edge to match the factory-machined edges. Cut pieces (E) and (F) to length, making sure to miter the ends.

8. Glue and nail the side apron pieces (E) flush with the side panels. Then glue and nail the end apron pieces (F) to the end panels. You'll notice the inside edge of F will be about 1/4" out from the inside of the planter to adequately cover the tops of the legs. Drill the 7/8" drain holes in the planter bottom; space them apart about every 6 inches.

## PROTECTING YOUR PROJECT

Any type of wood that's used outdoors needs protection from water damage. The two finishing options for this project not only provide ample protection but also liven the wood with your choice of many colors. The recommended finish combines Thompson's® Water Seal™ Deck & House Latex or Oil Stain with Thompson's® Water Seal™ Clear Wood Protector; for the alternate finish you can use Thompson's® Water Seal® Tinted Wood Protector. Both exceed industry standards for waterproofing on wood and also provide optimum protection from mildew and from ultraviolet (UV) damage that comes from the sun's radiation.

**Woodworker's Tip:** *Be sure to choose a waterproofer that claims to exceed industry standards for waterproofing on wood.*

## FINISHING TIPS

- When you apply Clear or Tinted Wood Protector, do not mix it with other waterproofing products because variations in the final appearance of the surface being treated may result. Also, do not thin these products.
- Coverage: The approximate coverage of oil or latex stain on smooth wood is 250 to 300 square feet per gallon. The approximate coverage of Clear Wood Protector on cedar is 300 to 400 square feet per gallon. A gallon of Tinted Wood Protector will cover about 250 to 300 square feet.

## Recommended Finish:

If you want distinctive color along with excellent protection, use Thompson's® Water Seal™ Deck & House Latex or Oil Stain, both of which come in solid and semi-transparent formulations and are available in 117 ready- and custom-mixed colors. In this project, we chose a two-tone look by using a combination of Thompson's® Water Seal™ Deck & House Latex or Oil Stain with Thompson's® Water Seal® Clear Wood Protector, which marries color with the wood's natural beauty.

9. Before applying the latex or oil stain, read and follow the directions found on the back of the can. To ensure good penetration, do not apply in direct sunlight or on hot days. Be sure that both surface and air temperature are above 50° F and below 95° F during application and for 48 hours after application, and do not apply product if rain is forecast within 24 hours of application.

10. The surface must be free of all mildew, dust, dirt, oil, soot, grease and other contaminants. If the surface is damp or wet from cleaning or weather, allow the surface to dry completely (a minimum of 48 hours) before application. Shake or mix thoroughly before application; mechanical shaking is recommended.

11. Since in-store color samples may vary slightly when stain is applied to wood (based on color, texture, grain, porosity and type of wood), apply the stain to a small test area and let it dry to determine final color before proceeding with the entire project.

12. Apply stain with an exterior paint pad, brush or roller. When rolling, be sure to go back and brush-in stain to ensure even coverage. When using a pad or brush, keep the leading edge wet and distribute stain evenly. This will help avoid lap marks and keep color uniform.

13. Use only with adequate ventilation. Oiliness and tackiness will result if over-applied or applied to wet or damp surface or if overnight temperature falls below 50° F within 48 hours of application. Excessive oiliness caused by over-application may be removed by scrubbing wood with a concentrated degreaser.

14. Work from top to bottom or side to side in areas small enough to allow the leading edge to remain wet at all times during application. Use natural breaks as boundaries to divide large areas into more manageable work areas.

15. One coat of stain is recommended, but a second coat can be added if desired. Allow the first coat to dry thoroughly (approximately 4 hours for latex, 24 hours for oil) before second application. Drying time will vary depending on the substrate, temperature and humidity.

16. For oil-base stain, clean brushes and equipment with mineral spirits, then rinse with clean water. For latex stain, clean brushes and equipment with soap and water.

17. To apply Thompson's® Water Seal® Clear Wood Protector to the body, follow the directions given for the alternate finish.

#### **Alternate Finish:**

18. For a traditional one-tone color finish, before applying Thompson's® Water Seal® Tinted Wood Protector over the entire surface, a small trial patch is recommended to determine the desired look.

19. In most applications, only one light coat is necessary. Apply with a brush, roller or by dipping the piece into the product following directions on the can. Regardless of which application method is used, remove excess within 15 minutes by redistributing it to drier areas or wiping it off.

20. Use only with adequate ventilation. Oiliness and tackiness will result if over-applied or applied to wet or damp surface or if overnight temperature falls below 50° F within 48 hours of application. Excessive oiliness caused by over-application may be removed by scrubbing wood with a concentrated degreaser.

21. Allow at least 48 hours to dry. Drying time will vary depending on the substrate, temperature and humidity.

22. Clean brushes and equipment with mineral spirits, then rinse with clean water.

**NOTE:** The length of protection will vary depending on environment. Perform the splash test once a year to see whether reapplication is necessary. For maximum protection from color change and other damage caused by the sun, reapplication is recommended every year. Vertical and horizontal surfaces will experience color changes at different rates.

**Woodworker's Tip:** *Unsure if you need to protect? Perform the splash test. Sprinkle water on various sections of surface to be sealed. If water absorbs and darkens color of substrate within 5 seconds, the surface is porous and considered ready to be treated. If water beads up or otherwise sits on top of surface, the surface doesn't need protection at this time.*

**IMPORTANT:** Place rags, steel wool and waste immediately after use in a sealed, water-filled metal container.

#### **PRODUCT SAFETY**

For your safety and the safety of those you work with, always read the safety warnings, which manufacturers print on their labels, and follow them to the letter. Typical safety advice and instructions will contain information such as the following:

**WARNING!** Removal of old paint by sanding, scraping or other means may generate dust or fumes that contain lead. Exposure to lead dust or fumes may cause brain damage or other adverse health effects, especially in children or pregnant women. Controlling exposure to lead or other hazardous substances requires the use of proper protective equipment, such as properly fitted respirator (NIOSH approved) and proper containment and cleanup. For more information, call the National Lead Information Center at 1-800-424-LEAD (in US) or contact your local health authority.

Contents are **COMBUSTIBLE**. Keep away from heat and open flame.

Contains **ALIPHATIC HYDROCARBONS**.

**VAPOR HARMFUL.** Use Only With Adequate Ventilation. To avoid overexposure, open windows and doors or use other means to ensure fresh air entry during application and drying. If you experience eye watering, headaches, or dizziness, increase fresh air supply, or wear respiratory protection (NIOSH/ MSHATC23C or equivalent) or leave the area. Avoid contact with eyes and skin. Wash hands after using. Keep container closed when not in use. Do not transfer contents to other containers for storage.

**FIRST AID:** In case of eye contact, flush thoroughly with large amounts of water for 15 minutes and get medical attention. For skin contact, wash thoroughly with soap and water. In case of respiratory difficulty, provide fresh air and call physician. If swallowed, get medical attention immediately.

**DELAYED EFFECTS FROM LONG-TERM OCCUPATIONAL EXPOSURE.**

Contains solvents that can cause permanent brain and nervous system damage. Intentional misuse by deliberately concentrating and inhaling the contents can be harmful or fatal.

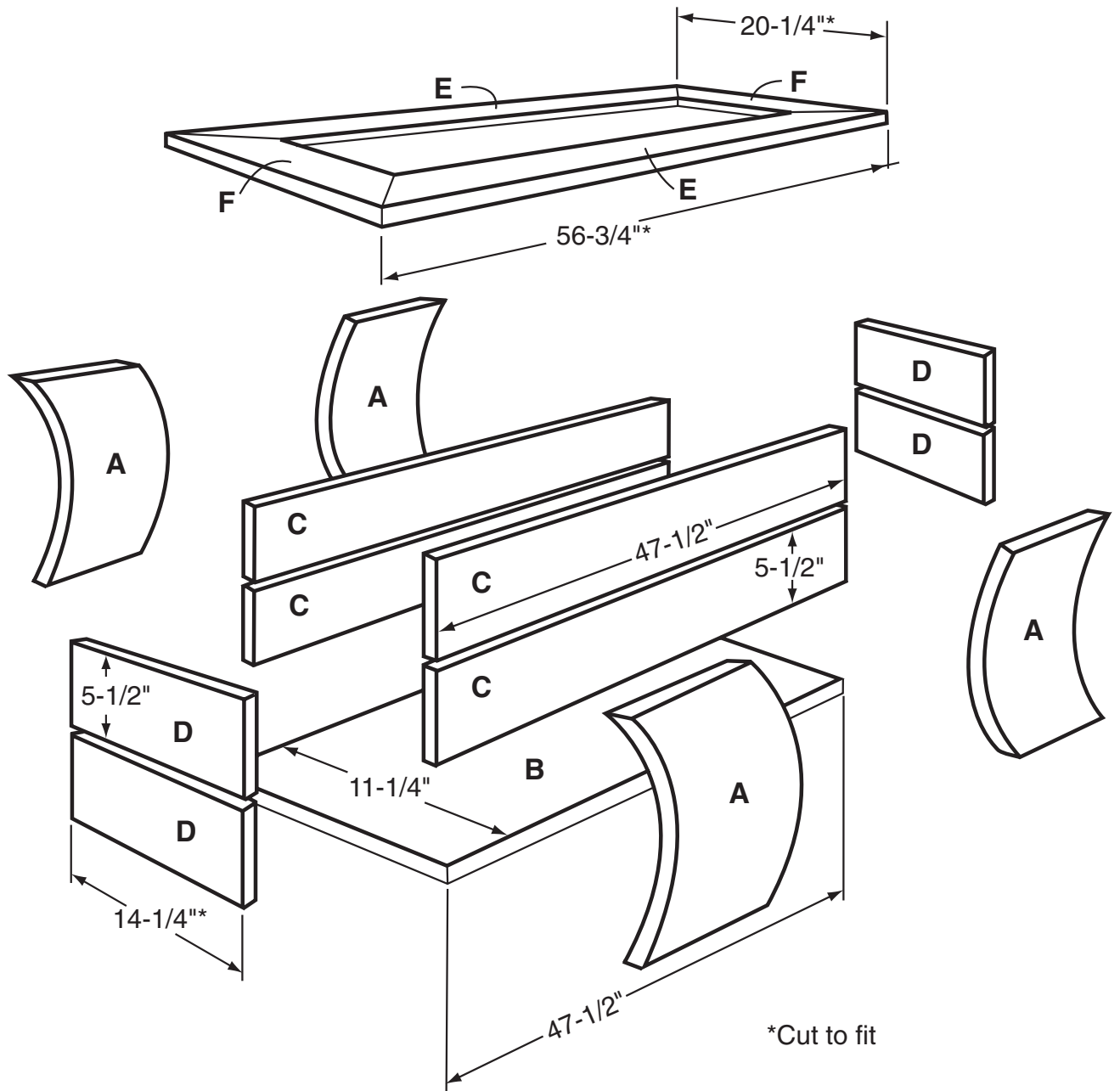
**WARNING:** This product contains chemicals known to the State of California to cause cancer and birth defects or other reproductive harm.

**DO NOT TAKE INTERNALLY. KEEP OUT OF THE REACH OF CHILDREN.**

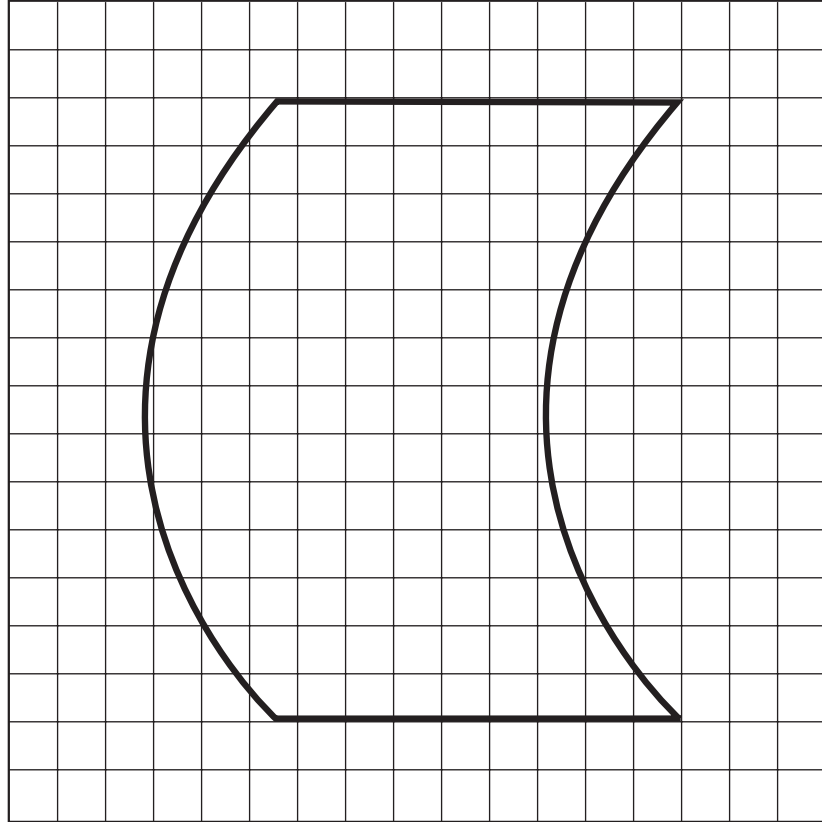
**SAFE DISPOSAL OF RAGS AND WASTE.**

Rags, steel wool or waste soaked in Thompson's® Water Seal® Tinted Wood Protector may spontaneously catch fire if improperly discarded. Immediately after use, place rags, steel wool or waste in sealed, water-filled metal container. Dispose of in accordance with local fire regulations.

**FIG A. PATIO PLANTER (LARGE)**

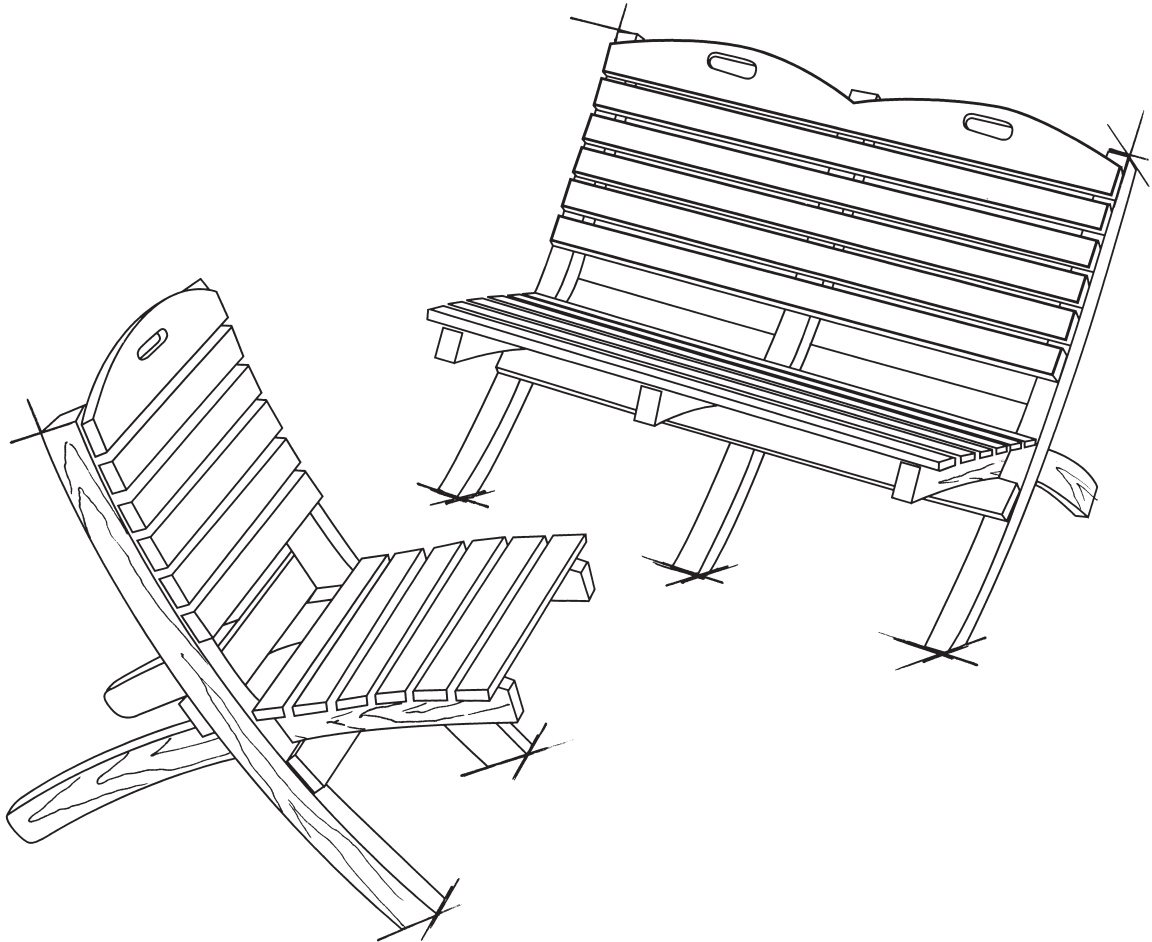


**FIG B. SCALED TEMPLATE OF THE LEG**



For actual size, enlarge 400%. One square equals 1 inch.

# Patio Chair and Love Seat



This lightweight, easy-to-build outdoor furniture can bring contemporary flair to a deck, patio or balcony. And these chairs are as easy to store as they are to relax in.

- With their interlocking legs, both the chair and the love seat can be quickly dismantled or “knocked down” for storage without tools. The seat section is simply pulled out and can be neatly tucked behind the back section. The top slat also has a handle hole for easy carrying.
- The chairs were designed to be made with Western cedar because it’s both lightweight and strong.

These chairs give intermediate woodworking students the opportunity to learn a number of important, basic skills, including templating, measuring, cutting, marking, drilling and gluing. And after you make one or both of the chairs, you’ll learn how to protect the wood and keep it looking beautiful.



## TOOLS REQUIRED

### Hand Tools

- Files
- Combination square
- Carpenter's square
- Screwdriver

### Power Tools

- Table saw
- Jigsaw
- Belt sander
- Electric drill
- Power screwdriver or screwdriver bits for drill

### Miscellaneous

- Pencil
- Permanent marker, fine point
- Safety glasses

## WOOD BUYING LIST

### Chair

2x6 x 8' D and better grade cedar	2
1x6 x 8' D and better grade cedar	2
1/8" x 24" x 48" hardboard for templates	1
2" galvanized deck screws	80

### Love seat

2x6 x 8' D and better grade cedar	3
1x6 x 8' D and better grade cedar	4
1/8" x 24" x 48" hardboard for templates	1
2" galvanized deck screws	120

## CUTTING LIST

### Chair

Key	Pcs.	Description
A	2	1-1/2" x 5-1/2" x 36" cedar (back legs)
B	2	1-1/2" x 4-15/16" x 34" cedar (seat legs)
C	1	3/4" x 4" x 20" cedar (top slat)
D	2	3/4" x 2-1/2" x 20" cedar (seat supports)
E	11	3/4" x 2" x 20" cedar (slats)

### Love seat

Key	Pcs.	Description
AA	3	1-1/2" x 5-1/2" x 36" cedar (back legs)
BB	3	1-1/2" x 4-15/16" x 34" cedar (seat legs)
CC	1	3/4" x 4" x 40" cedar (top slat)
DD	2	3/4" x 2-1/2" x 40" cedar (seat supports)
EE	11	3/4" x 2" x 40" cedar (slats)

## WOOD FINISHING PRODUCTS

### Recommended finish

Thompson's® Water Seal® Clear Wood Protector, 1 gallon\*

### Alternate finish

Thompson's® Water Seal® Tinted Wood Protector Sheer Honey Gold. Also available in Sheer Natural Cedar, Sheer Rustic Red, Sheer Nutmeg Brown and Sheer Coastal Gray\*\*

### Miscellaneous

Gloves  
Plastic drop cloths  
Brush, roller, applicator pad, deck sprayer or pump-up garden sprayer  
Mineral spirits (for cleanup)  
Rags

\* 1 gallon of Thompson's® Water Seal® Clear Wood Protector will protect a number of chairs and/or love seats, so product can be shared among several students. Figure 300-400 square feet per gallon.

\*\* 1 gallon of Thompson's® Water Seal® Tinted Wood Protector will protect a number of chairs and/or love seats, so product can be shared among several students. Figure 250-300 square feet per gallon.

## BEFORE YOU BEGIN

Good craftsmanship begins and ends with good work habits, so make the following steps part of your routine workshop practice. If you have any doubts or questions about how to proceed with a project, always discuss them with your shop instructor.

- Carefully and fully review plans and instructions before putting a tool to the project lumber.
- Work sensibly and safely. Wear safety goggles when doing work that creates flying chips and sawdust; wear the appropriate mask or respirator whenever making sawdust or working with thinners or other solvents.
- At the end of every work session, clean up your shop area and put away all portable tools.

## CUTTING AND ASSEMBLY PROCEDURE

Refer to the project illustration shown on page 6.

### Making the seat and back-leg templates

Whenever you need to use a shape for more than one piece, it's best to make a template. To start your templates for these chairs, refer to the "Top-Slat Grid" and the "Back- and Seat-Leg Grid" on the measured drawing. We've drawn half of the entire shapes on those grids because both halves are symmetrical. You'll thus be making one template for half of the shape and use it to draw the entire shape. Also, because the shape of the seat leg is so similar to the back leg, you can use the back-leg template to make the seat-leg template.

You will transfer the dimensions from the grids when you lay out the full-size templates. The shapes will become full size once you draw a grid of 1" x 1" squares on the hardboard and then transfer the shapes to it. Here's how to proceed:

1. Cut a piece of 1/8"-thick hardboard to 6" x 18".
2. Measure and mark 1" increments on both ends and along one side.
3. Draw the grid lines across the width using a combination square and the marks you just drew. It's hard to see pencil lines on hardboard, so use a fine-point permanent marker to draw the lines.
4. Draw the grid lines across the length.
5. Transfer the points where the seat and back-leg shapes intersect the grid in the measured drawing to the grid on your hardboard.
6. Draw lines connecting the points that you just drew. Use a 25-cent piece to trace the 1/2" radiuses at the bottom of the leg. Now the template is full size.
7. Cut out the template with a jigsaw and smooth the sawn edges with sandpaper.
8. Draw centerlines that divide the length on the back-leg pieces (A and AA). Align the back-leg template to the center line and the bottom corner of the cedar board. Trace around the template. Flip the template over the centerline of the board, and trace the rest of the back-leg shape.
9. Make the seat-leg template by tracing the back-leg template shape onto another piece of hardboard. Then draw the shape of the seat leg inside the back-leg shape. Cut out the shape and you'll have a separate seat-leg (B and BB) template.

10. Using the same procedures described above, make the top-slat (C and CC) template.

### Making the chair

1. Cut all the pieces (A through E) to the dimensions given in the Cutting List: Chair. For the legs and seat supports (A, B and D), avoid using any pieces of cedar containing knots, which can weaken the wood.

#### Woodworker's Tip:

*Be careful when you handle the cut pieces. Until the edges are smooth, you can easily pick up a splinter from the cedar.*

2. Using the back- and seat-leg templates and the top-slat templates, trace the shapes onto the cedar pieces.
3. Cut out the seat (A), back-leg (B) and top-slat (C) shapes with a jigsaw and sand the edges smooth and free of splinters. Sand the curved edges of the legs with a belt sander.
4. Lay out the hand-grip hole in the top slat (C). To form the ends of the hand grip, drill holes with a 1" spade bit. Drill in from both sides so you won't tear out the wood. Cut the rest of the hole with a jigsaw and smooth the inside with a file and sandpaper.
5. Lay out, countersink and drill all the screw holes for the slats and supports.
6. Finish-sand all the pieces with 120-grit paper, followed by 150-grit paper. Round over any sharp edges with the sandpaper.

#### Woodworker's Tip:

*Cedar is soft, so when screwing the pieces together, finish driving the screws by hand to avoid setting the heads too deep.*

7. Start assembling the chair by screwing the seat supports (D) to the back legs (A). Align the pieces using the dimensions given in the measured drawing. Use a carpenter's square to align the seat supports at a 90-degree angle to the back legs, then drive in the screws. Also, measure and maintain the distance between the legs as you attach each seat support. Use this method again when you attach the slats (E).
8. Align and screw the top slat (C) to the back legs (A). Then attach five slats (E) to the back legs. Attach the other six slats (E) to the seat legs (B) as shown in the measured drawing. To maintain equal spacing between the slats, use a 1/2"-thick spacer to align them. Finish driving the screws by hand to avoid setting their heads too deep.
9. **Important:** Before applying the wood protector, unscrew the seat supports (D), apply a weather-resistant glue to the joints, then screw the seat supports back onto the back legs. The glue will strengthen the joint. The chair relies primarily on the seat supports for its strength.

### Making the love seat

1. The steps for making the love seat are essentially the same as those for the chair except for a few key differences.
2. An additional back leg (AA) and seat leg (BB) must be cut out from the templates.
3. The top slat (CC), the seat supports (DD) and all the seat and back slats (EE) are all twice as long as those for the chair (parts C, D and E).

## PROTECTING YOUR PROJECT

The use of cedar for outdoor furniture requires application of waterproofing protection immediately after completion to protect the wood from water damage. We've chosen Thompson's® Water Seal® Clear Wood Protector to provide complete protection for your project. It not only prevents water damage, but the coating also resists mildew and U.V. (ultraviolet radiation in sunlight) damage, and exceeds industry standards for waterproofing on wood. In addition, Clear Wood Protector will help maintain the natural cedar color of your wood.

**Woodworker's Tip:** *Always be sure to choose a waterproofer that claims it exceeds industry standards for waterproofing on wood.*

1. Before applying Clear Wood Protector, read and follow the directions found on the back of the can. Be sure that both surface and air temperature are above 50° F. during application and for 48 hours after application, and do not apply product if rain is forecasted within 24 hours of application.
2. The surfaces must be free of all dust, dirt, oil, soot, grease and other contaminants. If the surface is damp or wet from cleaning or weather, allow the surface to dry thoroughly (a minimum of 48 hours) before application.
3. Move all objects that could come in contact with overspray. Overspray of product onto glass should be removed immediately with paint thinner or mineral spirits.
4. When you apply Clear Wood Protector, do not mix it with other waterproofing products because variations in the final appearance of the surface being treated may result. Also, do not thin this product.
5. In most applications, only one light coat is necessary. Apply with a brush, roller, applicator pad or sprayer. Regardless of which application method is used, remove excess within 15 minutes by redistributing it to drier areas or wiping it off with a rag.
6. **Use only with adequate ventilation.** Oiliness and tackiness will result if Clear Wood Protector is over-applied or applied to wet or damp surface or if overnight temperature falls below 50° F. within 48 hours of application. Excessive oiliness caused by over-application may be removed by scrubbing wood with a concentrated degreaser.
7. Allow at least 48 hours to dry. Drying time will vary depending on temperature and humidity.
8. Clean brushes and equipment with mineral spirits, then rinse with clean water.

**NOTE:** The length of protection will vary depending on environment. Perform the splash test once a year to see whether reapplication is necessary. Sprinkle water on various sections of surface to be sealed. If water absorbs and darkens color of wood within 5 seconds, the surface is porous and considered ready to be treated. If water beads up or otherwise sits on top of surface, then surface doesn't need protection at this time. For maximum protection from color change and other damage caused by the sun, reapplication is recommended every year. Vertical and horizontal surfaces will experience color changes at different rates.

## ALTERNATE FINISH

If you decide to bring more color to your project, you can use Thompson's® Water Seal® Tinted Wood Protector, which provides all the benefits of Clear Wood Protector with the addition of sheer color. We've chosen Sheer Honey Gold for this project, but you can choose from five Tinted Wood Protector colors.

1. Before applying Tinted Wood Protector, be sure that both surface and air temperature are above 50° F. during application and for 48 hours after application. Do not apply product if rain is forecasted within 24 hours of application.
2. The surfaces must be free of all dust, dirt, oil, soot, grease and other contaminants. If the surface is damp or wet from cleaning or weather, allow the surface to dry thoroughly (a minimum of 48 hours) before application.
3. Move all objects that could come in contact with overspray. Overspray of product onto glass should be removed immediately with paint thinner or mineral spirits.
4. When you apply Tinted Wood Protector, do not mix it with other waterproofing products because variations in the final appearance of the surface being treated may result. Also, do not thin this product.
5. Shake well; intermix all cans of the same color to be used to assure color uniformity.
6. Only one light coat is necessary in most applications; however, a second coat may be applied if darker color is desired (apply approximately 12 hours after completing the first coat). Apply with a brush, roller or sprayer. Regardless of which application method is used, remove excess within 15 minutes by redistributing it to drier areas or wiping it off with a rag.
7. **Use only with adequate ventilation.** Oiliness and tackiness will result if over-applied or applied to wet or damp surface or if overnight temperature falls below 50° F. within 48 hours of application.

**IMPORTANT:** Place rags, steel wool and waste immediately after use in a sealed water-filled metal container.

8. Allow at least 48 hours to dry. Drying time will vary depending on the temperature and humidity.

**NOTE:** The length of protection will vary depending on environment. Perform the splash test once a year to see whether reapplication is necessary. Sprinkle water on various sections of surface to be sealed. If water absorbs and darkens color of wood within 5 seconds, the surface is porous and considered ready to be treated. If water beads up or otherwise sits on top of surface, then surface doesn't need protection at this time. For maximum protection from color change and other damage caused by the sun, reapplication is recommended every year. Vertical and horizontal surfaces will experience color changes at different rates.

**PRODUCT SAFETY**

Contents are COMBUSTIBLE. Keep away from heat and open flame.

Contains ALIPHATIC HYDROCARBONS.

**VAPOR HARMFUL.** Use only with adequate ventilation. To avoid overexposure, open windows and doors or use other means to ensure fresh air entry during application and drying. If you experience eye watering, headaches, or dizziness, increase fresh air, or wear NIOSH-approved respiratory protection or leave the area.

Avoid contact with eyes and skin. Wash hands after using. Keep container closed when not in use. Do not transfer contents to other containers for storage.

**FIRST AID:** In case of eye contact, flush thoroughly with large amounts of water for 15 minutes and get medical attention. For skin contact, wash thoroughly with soap and water. In case of respiratory difficulty, provide fresh air and call physician.

If swallowed, get medical attention immediately.

**DELAYED EFFECTS FROM LONG-TERM EXPOSURE.**

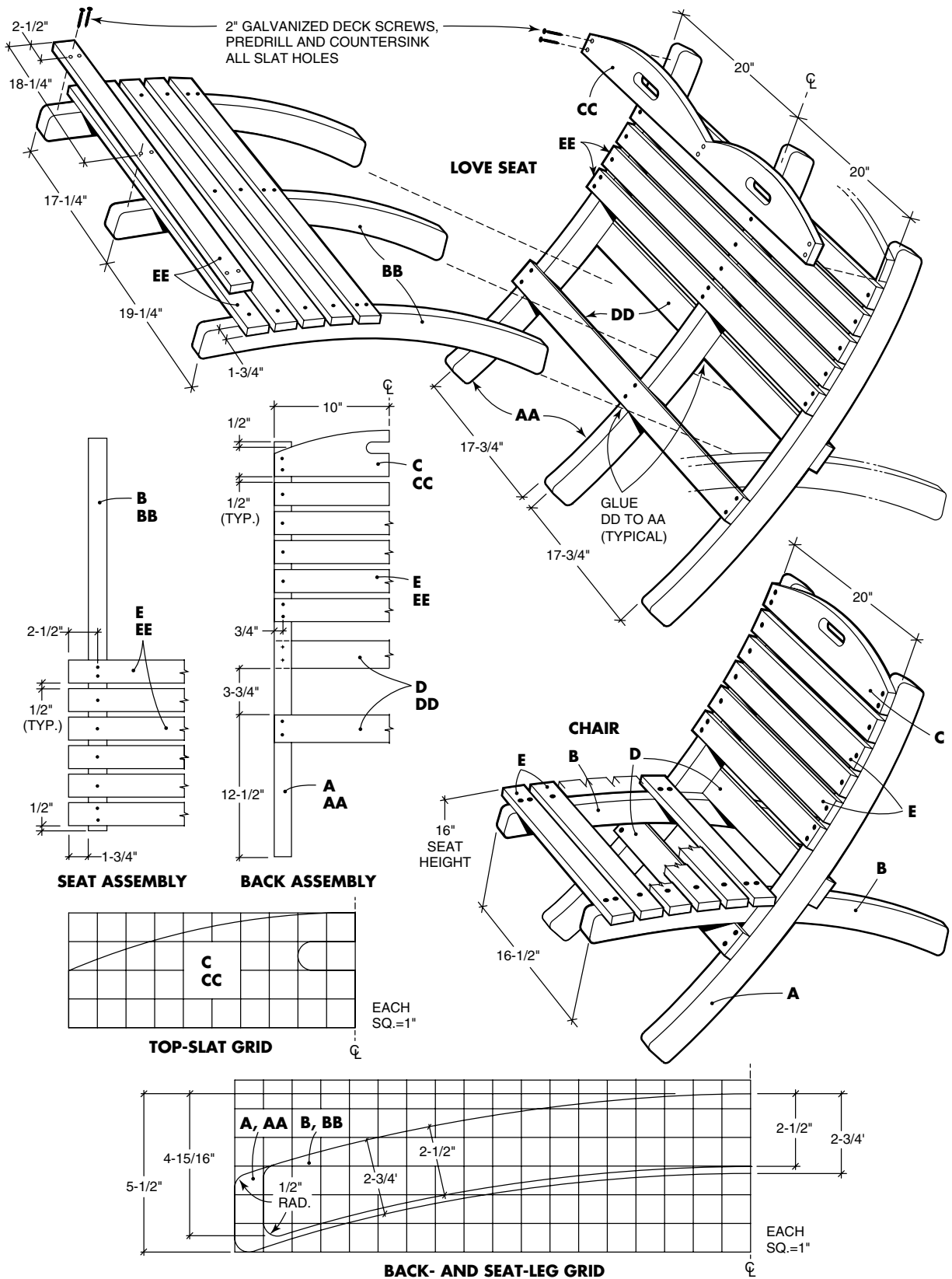
Contains solvents which can cause permanent brain and nervous system damage. Intentional misuse by deliberately concentrating and inhaling the contents can be harmful or fatal.

**WARNING:** This product contains chemicals known to the State of California to cause cancer and birth defects or other reproductive harm.

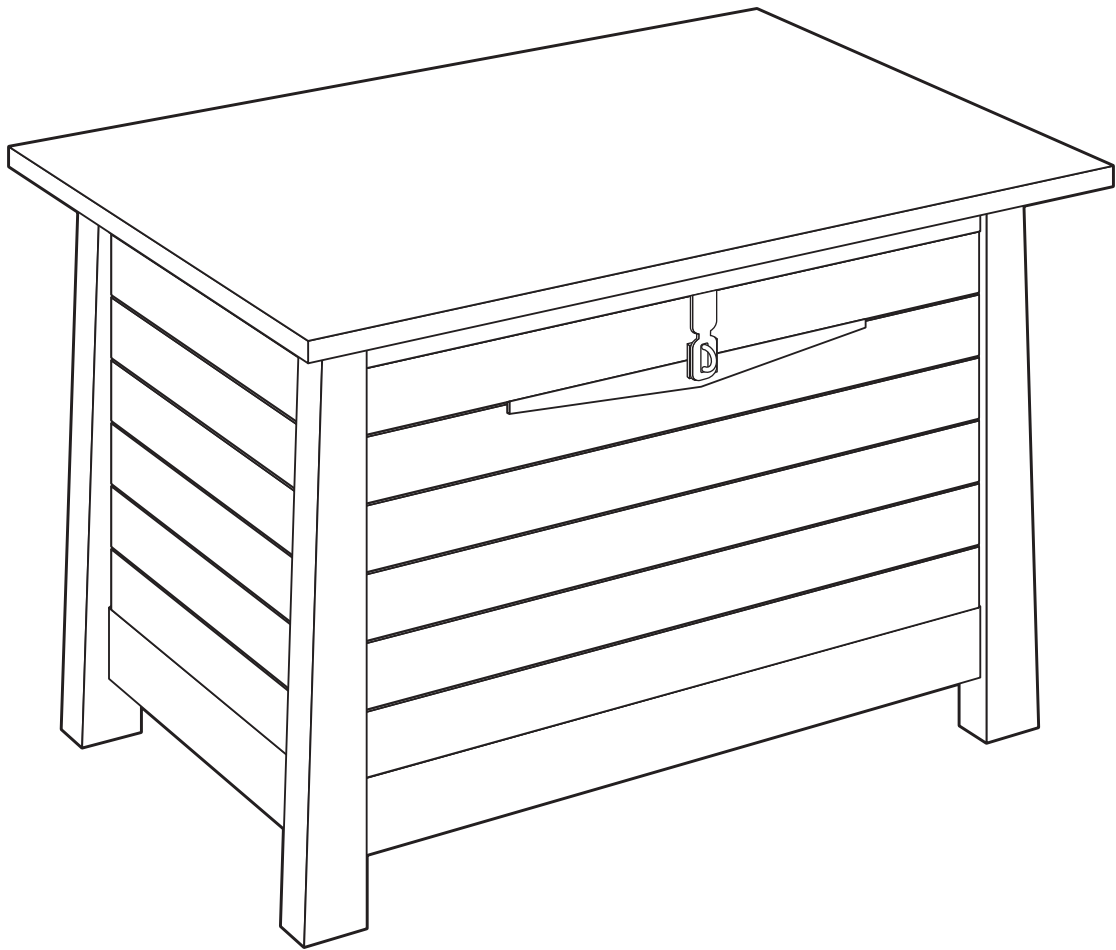
**DO NOT TAKE INTERNALLY. KEEP OUT OF THE REACH OF CHILDREN.****SAFE DISPOSAL OF RAGS AND WASTE.**

Rags, steel wool, or waste soaked in Thompson's® Water Seal® Tinted Wood Protector may spontaneously catch fire if improperly discarded. Immediately after use, place rags, steel wool, or waste in sealed, water-filled metal container. Dispose in accordance with local fire regulations.

# PATIO CHAIR AND LOVE SEAT



# Outdoor Storage Chest



Storage is like money; we never seem to have enough. Here's another truism: storage is where you find it, and a frequently underused area is outside the home. But instead of suggesting the usual toolshed, this project shows you how to make a beautiful chest for storing the smaller outdoor items that we use every day: cushions for deck furniture, pool toys or even gardening supplies. This elegant chest is a real eye-catcher, but it's also designed to keep the contents dry and clean and to last a long, long time.

In this intermediate-level project, you'll gain experience in making tongue-and-groove and mortise-and-tenon joints, tapering long pieces of wood, and making sure that water won't collect anywhere on the piece. And after you build it, you'll learn more about applying and using finishes to protect the wood and keep it looking beautiful.



## TOOLS REQUIRED

### Hand Tools

- Screwdriver
- 36" and 48" pipe clamps
- Mallet
- Block plane

### Power Tools

- Router table
- Router with a 1/4" x 3/8" tongue-and-groove router bit set
- Band saw
- Power drill with drill bits and power screwdriver
- Drill press with a mortising attachment or a mortising machine
- Table saw
- Belt sander
- Orbital or finish sander

### Miscellaneous

- Tape measure
- Pencil
- Safety glasses
- Waterproof glue
- 120-grit sanding belt
- 120-, 150- and 220-grit sandpaper
- Clean, lint-free cloths
- Respirator
- Gloves for finishing
- Mineral spirits, for oil-based waterproofer
- Good quality, natural-bristle brush (for oil-based waterproofer) or synthetic-bristle brush (for water-based waterproofer)

## SHOPPING LIST

**Recommended wood:** Pine

**Alternate wood:** Fir or any type of construction-grade lumber

1' x 4' pine:	160 lin. ft.
1' x 6' pine:	20 lin. ft.

**Woodworker's Tip:** Knots can weaken a board and spell disaster, especially on furniture, so be sure to select boards with the fewest knots and to plan your cuts around any knots.

## HARDWARE (SEE SOURCES)

- One pair of heavy-duty brass strap hinges
- One brass clasp
- Two lid supports
- Hardware cloth, enough to cover about 26" x 44"
- Stainless steel or galvanized screws, #8 x 1-1/4" flat-head, #8 x 5/8" washer-head
- Brass screws, #8 x 3/4" flat-head, #10 x 3/4" flat-head
- Space Balls, 100 pack

## CUTTING LIST

Overall Dimensions: 29"h x 44-1/2"w x 26-1/2"d			
Key	Part	Pcs.	Dimensions
A	Lid	1	3/4" x 26-3/4" x 44-3/4"
B	Tongue-and-groove panel	12	3/4" x 3-3/8" x 36-3/4"
C	Tongue-and-groove panel	12	3/4" x 3-3/8" x 19-3/4"
D	Decking	12	3/4" x 2-3/4" x 19-1/2"
E	Lid batten	3	3/4" x 2" x 18"
F	Deck cleat	2	3/4" x 1-1/2" x 60"
G	Leg	4	2-1/4" x 3-1/4" x 28-1/4"
H	Bottom rail, front and back	2	1-1/2" x 4" x 38"
J	Bottom rail side	2	1-1/2" x 4" x 21"
K	Top rail, front and back	2	1-1/2" x 3" x 38"
L	Top rail side	2	1-1/2" x 3" x 21"
M	Clasp backer	1	1/4" x 1-3/8" x 19"

## WOOD FINISHING PRODUCTS

### Recommended Finish

Thompson's® WaterSeal® Advanced Tinted Wood Protector in Honey Gold. (Also available in Natural Cedar, Rustic Red, Nutmeg Brown and Coastal Gray.)

### Alternate Finish

Thompson's® WaterSeal® Waterproofer PLUS Tinted Wood Protector with base in Clear and top in Rustic Red. (Also available in Honey Gold, Natural Cedar, Nutmeg Brown and Coastal Gray.)

## BEFORE YOU BEGIN

Good craftsmanship begins and ends with good work habits, so make the following steps part of your routine workshop practice. If you have any doubts or questions about how to proceed with a project, always discuss them with your shop instructor.

- Carefully and fully review plans and instructions before putting a tool to the project lumber.
- Work sensibly and safely. Wear safety goggles when doing work that creates flying chips and sawdust; wear the appropriate respirator whenever making sawdust or working with thinners or other solvents.
- At the end of every work session, clean up your shop area and put away all portable tools.

## CUTTING AND ASSEMBLY PROCEDURE

### Build the Legs and Rails

**Woodworker's Tip:** *If your lumber is kiln-dried and the chest will be kept outdoors, stack your lumber in a covered area outside for several weeks before you build. This will allow the moisture content to stabilize and minimize wood expansion after the chest is built.*

1. Sort your wood and select the best-looking pieces for the lid (A) and front panel (B). Rough-cut your stock according to the CUTTING LIST, but leave everything oversize by at least 1/2" in length. Parts made from glued-up stock (G through L) should initially be cut an extra 1/2" wide.
2. Use a waterproof glue to face-glue three pieces of 3/4" stock for each leg (G). Glue up two pieces for the rail stock (H through L). Make an extra leg blank and an extra rail to test your setups. Mark the best-looking face on each piece.
3. Trim the leg blanks to size after the glue has dried. Don't cut the tapers yet. The grooves and mortises are cut while the leg blank is still square.
4. Lay out the groove location and the taper (Figs. 2 and 3) on each leg. Position the legs on your bench just as they'll be on the chest to make sure you've got everything oriented correctly.
5. Cut the stopped grooves on each leg (Figs. 2 and 4). It takes two fence settings to complete the two grooves. The first groove is cut with an outside face against the fence. The other groove is cut with the newly grooved edge against the fence. Be sure both grooves are equally set back on the legs. Rout stopped grooves on the legs to house the panels and the rail tenons. The grooves are too long to use a stop block. Instead, mark where the groove ends on the edge of the leg. Make another mark on the router table across from the front of the bit, as shown in Fig. 4. When the two marks meet, stop the router and remove the leg.
6. Use a 1/2" chisel to square the corners where each routed groove ends.

7. Use the drill press to cut the mortises (Fig. 3). The mortise is really just a deeper part of the groove that accepts the tenon. Cut the mortises on the drill press with a mortising attachment fitted with a 1/2" chisel and bit. The groove guides the chisel so you don't get slightly staggered holes. A stop block ensures that each mortise is the same distance from the end.

8. To finish machining the legs, cut the taper on the band saw. This can easily be done freehand, so there's no need for a tapering jig. Use a 1/2" or wider blade and follow the line carefully. Guide the cut with a 1/2"-tall fence that will contact only the bottom board. Belt-sand the sawn surface smooth. Note: Save the offcuts to use as clamp pads during assembly.

9. Now that the legs are finished, turn your attention to the rails. Lay out the tenons (Figs. 5 and 6) on each end and cut them on the table saw. Use a test piece to check the fit of the tenons in the leg grooves. Shoot for a snug fit accomplished without a mallet.

10. Lay out and cut the tenon haunches on the band saw. The haunch fills the groove made on the router table and strengthens the joint by increasing the glue surface. After cutting the tenons on the table saw, band saw notches to create the haunches.

11. Dry-fit all the legs and rails to ensure all goes well at assembly. If a tenon bottoms out in the mortise before the joint is tight, trim 1/16" off the tenon length.

**Woodworker's Tip:** *It's a good practice to put a slight chamfer on the tenons' ends to help them slide into the mortise.*

### Machine the Panels

12. Machine the tongue-and-groove joints in all the panel pieces (Fig. 7) using a tongue-and-groove router bit set. Use a chamfer bit to ease the edges where the boards meet.

**Woodworker's Tip:** *Featherboards help to keep the stock flat and straight on the router table to ensure straight tongues and grooves.*

13. Don't forget to machine the groove in the bottom of the upper rail (Fig. 5) and to put a 30-degree bevel on each bottom panel board where it mates with the 30-degree bevel on the bottom rail (Fig. 7).

14. Using the table saw, shave 1/8" off the length of each tongue. This is necessary to make room for the Space Balls (see **Sources**) that fit between each tongue-and-groove panel board. Any wood will move with changes in temperature and humidity, and these panels are trapped in their frames. Space Balls are like little rubber blueberries that keep an even gap between the boards but allow for seasonal expansion and contraction.

15. Cut rabbets on the ends of each panel board so they fit snugly into the leg grooves (Fig. 7).

### Assemble the Chest

16. Sand all the box parts, finishing with 120-grit sandpaper.

17. Assemble the two end panels with waterproof glue and clamps. It's easiest to assemble the chest upside down. Glue the top rail into one leg. Then stack the panel boards adding three or four Space Balls in each groove. Slip the bottom rail into the leg, add the second leg and clamp the assembly.

18. After the two end panels are complete, assemble the rest of the chest in the same fashion. Set both front and back rails and panels into one end panel, add the second end panel and clamp. Be sure to check that your assembly is square.

### Build the Lid

19. While the glue dries, edge-glue the boards for the lid. Align each board flush. It's best to glue-up one board at a time for this operation.

20. Sand the top to a 120-grit sandpaper finish.

21. Cut the battens (E) and chamfer the outside edges (Fig. 1).

22. Pre-drill countersunk holes in each batten on the drill press. Note: Be sure to elongate the screw holes on the ends of each batten to allow the lid to expand and contract (Fig. 1).

23. Attach the battens to the lid with screws.

### Install the Bottom

24. Cut the hardware cloth and screw it onto the bottom of the deck cleats.

25. Cut the deck cleats (F) and install them with screws along the bottom edge of the bottom rails (Fig. 1).

26. Cut the decking (D) to fit. Pre-drill countersunk holes in the ends of each deck board and attach to the deck cleats. Use 1/4"-thick spacers to maintain even gaps between the deck boards.

### Add the Hardware

27. Mount the hinges on the chest (Fig 1). Use steel screws first then replace them with the brass screws. The steel screws pave the way, making it easier to drive the softer brass screws without breaking them.

28. Glue the clasp backer (M) to the upper panel board and add the clasp (Fig. 1, Detail).

29. Position and attach the lid closers.

## PROTECTING YOUR PROJECT

Any type of wood that's used outdoors needs protection from water damage. There are a variety of protective coatings available, including clear and tinted wood protectors and semitransparent and solid stains. Each of these finishes has a different look and maintenance requirement.

To provide complete protection for your project, use Thompson's® WaterSeal® Advanced Tinted Wood Protector or Thompson's® WaterSeal® Waterproofer PLUS Tinted Wood Protector. Both products not only prevent water damage, but also resist damage from mildew and UV (ultra-violet radiation in sunlight), and they exceed industry standards for waterproofing on wood. Plus, the transparent tint will give plain pine just the right amount of rich wood tone. These products are available in five beautiful sheer wood tones.

**Woodworker's Tip:** Always be sure to choose a waterproofer that claims to exceed industry standards for waterproofing on wood.

### FINISHING TIPS

- Coverage: The approximate coverage of Thompson's® WaterSeal® Advanced Tinted Wood Protector and Thompson's® WaterSeal® Waterproofer PLUS Tinted Wood Protector on pine is 200 square feet per gallon.
- Do not mix Thompson's® WaterSeal® Advanced Tinted Wood Protector or Thompson's® WaterSeal® Waterproofer PLUS Clear or Tinted Wood Protector with other waterproofing products, because variations in the final appearance of the surface being treated may result. Also, do not thin these products.

### Recommended Finish

For the best protection against sun and water damage, use Thompson's® WaterSeal® Advanced Tinted Wood Protector (also available in Natural).

30. Before applying Thompson's® WaterSeal® Advanced Tinted Wood Protector, the wood surface must be free of all dirt, wood dust and contaminants. This product can be applied to damp, freshly cleaned wood. Read and follow the directions found on the back of the can. Then do a trial test before full application. The surface may darken slightly with application and color appearance is different when the coating is fully dry.

31. When applying this product, do not use it with other waterproofing products, as variations in the final appearance of the wood may result. Do not thin. To ensure good penetration, do not apply in direct sunlight or on hot days. Do not apply if rain is expected within 48 hours. Also, temperature must be above 50° F and remain above freezing for 24 hours.

32. Shake or stir contents for a minimum of 2 minutes before use. Intermix all containers (of the same color) to be used to assure color uniformity.

33. Apply using a paint pad or brush. Do not apply using a roller. For small projects, a brush is the preferred applicator.

34. Apply only one thin, even coat. DO NOT APPLY A SECOND COAT. A heavier or additional coat will not improve performance or appearance. Avoid puddling. Tackiness will result if over-applied. Tackiness may also occur after application if overnight temperature falls below 50°F within 48 hours of application. Drying time will vary depending on wood surface and humidity. Allow a minimum of 12 hours before using the chest.

35. Brushes and equipment used for water-based products must be cleaned with soap and water. Dry product can be removed with mineral spirits.

#### Alternate Finish

36. Before applying Thompson's® WaterSeal® Waterproofer PLUS Clear or Tinted Wood Protector, read and follow the directions found on the back of the can. Be sure that both surface and air temperature are above 50° F during application and for 48 hours after application. And, if you're working outside, do not apply product if rain is forecasted within 24 hours of application.

37. The surface must be free of all dirt, wood dust and all other contaminants. If the surface is damp or wet from cleaning or weather, allow the surface to dry thoroughly (a minimum of 48 hours) before application.

38. Do not mix the product with other waterproofing products because variations in the final appearance of the surface being treated may result.

39. Before applying the product over the entire surface, a small trial patch is recommended.

40. In most applications, only one light coat is necessary. Apply with a brush, roller or applicator pad. Regardless of which application method is used, remove excess within 15 minutes by redistributing it to drier areas or wiping it off.

41. Oiliness and tackiness will result if over-applied, or applied to wet or damp surface or if overnight temperature falls below 50° F within 48 hours of application.

42. Allow at least 48 hours to dry before you use the chest.

43. Brushes used for oil based finishes must be cleaned with soap and water. Dry product can be removed with mineral spirits.

**NOTE:** The length of protection will vary depending on environment. Perform the following splash test once a year to see whether reapplication is necessary. Sprinkle water on various sections of surface to be sealed. If water absorbs and darkens color of substrate within 5 seconds, the surface is porous and considered ready to be treated. If water beads up or otherwise sits on top of surface, then surface doesn't need protection at this time. For maximum protection from color change and other damage caused by the sun, reapplication is recommended every year. Vertical and horizontal surfaces will experience color changes at different rates.

#### PRODUCT SAFETY

For your safety and the safety of those you work with, always read the safety warnings, which manufacturers print on their labels, and follow them to the letter. Typical safety advice and instructions will contain information such as the following:

**DANGER:** Rags, steel wool and other waste soaked in these products may spontaneously catch fire if improperly discarded. Immediately place rags, steel wool and waste after use in a sealed, watertight, water-filled metal container. Dispose of in accordance with local fire regulations.

#### When using oil-based wood protector:

**Cautions:** Contains **ALIPHATIC HYDROCARBONS**. Keep away from heat and open flame. Use only with adequate ventilation. For Exterior Use Only. To avoid overexposure, if treating enclosed exterior rooms or porches, open windows and doors or use other means to ensure fresh air entry during application and drying. If you experience eye watering, headaches, or dizziness, increase fresh air, or wear respiratory protection (NIOSH approved), or leave the area. Avoid contact with eyes and skin. Causes skin and respiratory tract irritation. Wash hands after using. Keep container closed when not in use. Do not transfer contents to other containers for storage.

**FIRST AID:** In case of eye contact, flush thoroughly with large amounts of water for 15 minutes and get medical attention. For skin contact, wash thoroughly with soap and water. In case of respiratory difficulty, provide fresh air and call physician. If swallowed, get medical attention immediately.

#### DELAYED EFFECTS FROM LONG-TERM OVEREXPOSURE.

Contains solvents which can cause permanent brain and nervous system damage. Intentional misuse by deliberately concentrating and inhaling contents may be harmful or fatal.

**WARNING:** This product contains a chemical known to the State of California to cause cancer and birth defects or other reproductive harm.

**DO NOT TAKE INTERNALLY. KEEP OUT OF REACH OF CHILDREN.**

#### When using water-based wood protector:

**CAUTIONS:** Use Only With Adequate Ventilation. To avoid overexposure, open windows and doors or use other means to ensure fresh air entry during application and drying. If you experience eye watering, headaches, or dizziness, increase fresh air, or wear respiratory protection (NIOSH approved), or leave the area. Avoid contact with eyes and skin. Wash hands after using. Keep container closed when not in use. Do not transfer contents to other containers for storage.

**FIRST AID:** In case of eye contact, flush thoroughly with large amounts of water. Get medical attention if irritation persists. If swallowed, call Poison Control Center, hospital emergency room, or physician immediately.

**WARNING:** This product contains a chemical known to the State of California to cause cancer and birth defects or other reproductive harm.

#### Sources

Lee Valley Tools

1-800-871-8158, [www.leevalley.com](http://www.leevalley.com)

Pair of 4" x 8" brass T-hinges, #01H14.30, \$37

1-1/8" x 4" brass safety hasp, #01H15.04, \$12

Two pairs of flap stays, #00U06.01, \$28.

#### Mcfely's

1-800-443-7937, [www.mcfelys.com](http://www.mcfelys.com)

Space Balls, 100 pack, #PBS-1000-C, \$5

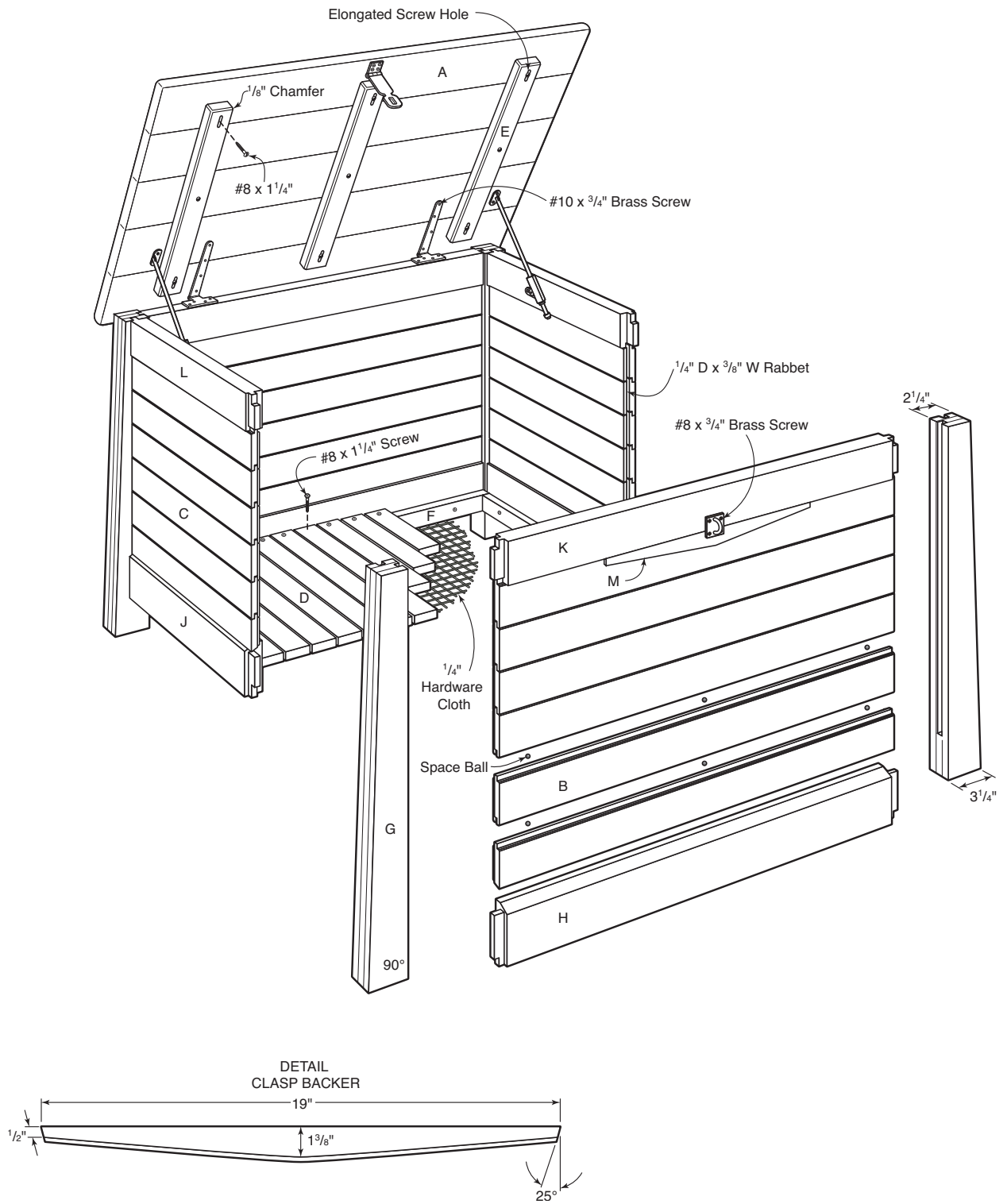
#8 x 1-1/4" No-Co-Rode flat-head screws, 100 pack, #0812-FNC, \$5

#8 x 5/8" No-Co-Rode self-drilling washer-head screws, #0805-WNC, \$5

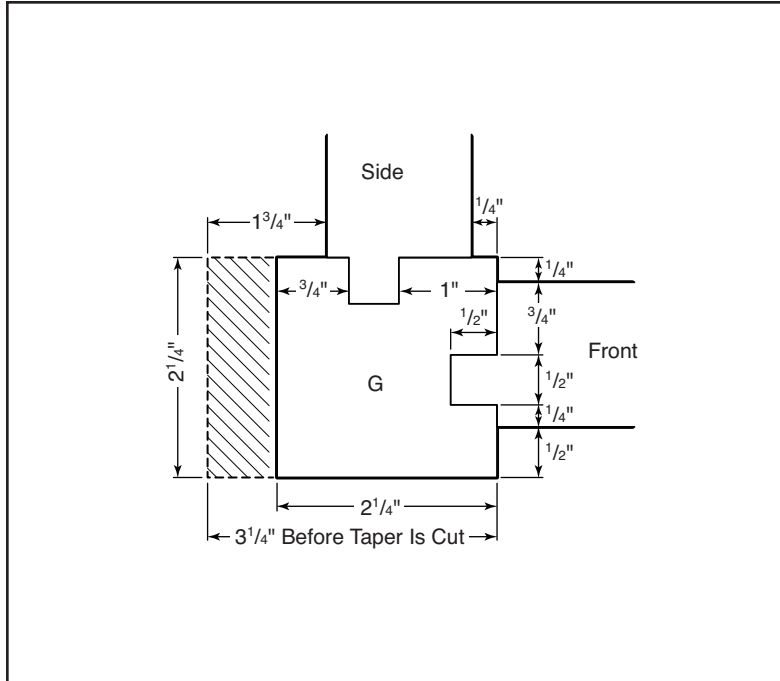
#8 x 3/4" brass flat-head screws, 25 pack, #0806-FSW, \$2

#10 x 3/4" brass flat-head screws, 25 pack, #1006-FSW, \$2.

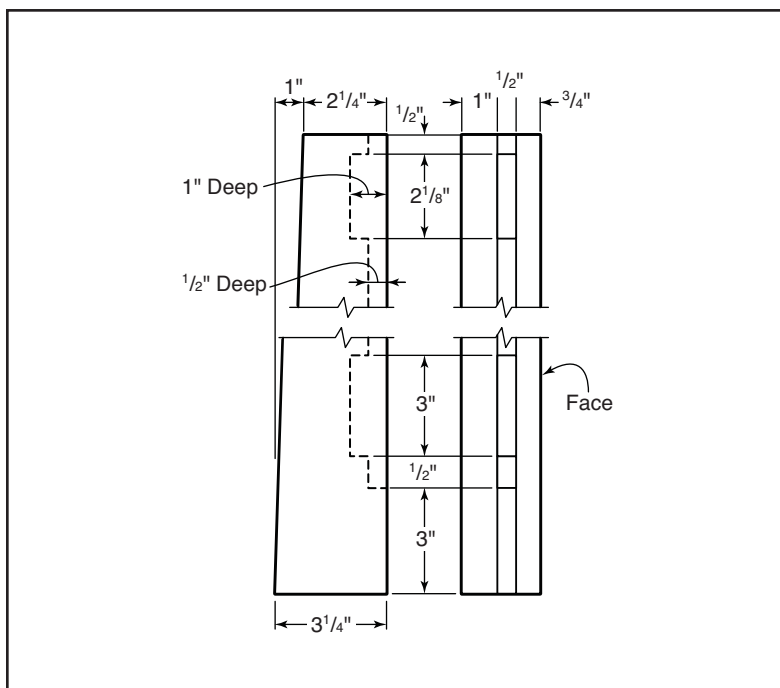
**FIG 1. CHEST DETAIL**



**FIG 2. LEG GROOVES**

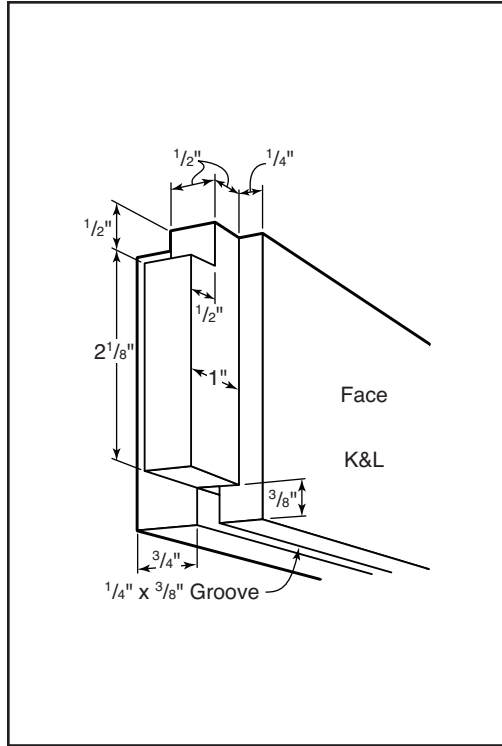


**FIG 3. MORTISE & GROOVE PLACEMENT**

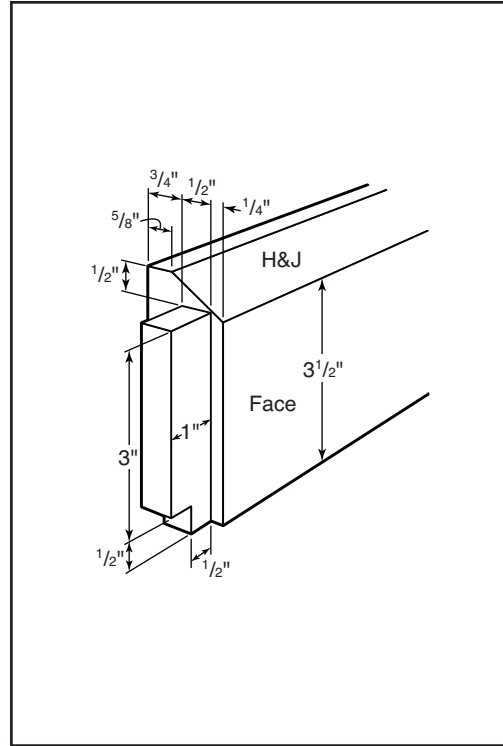




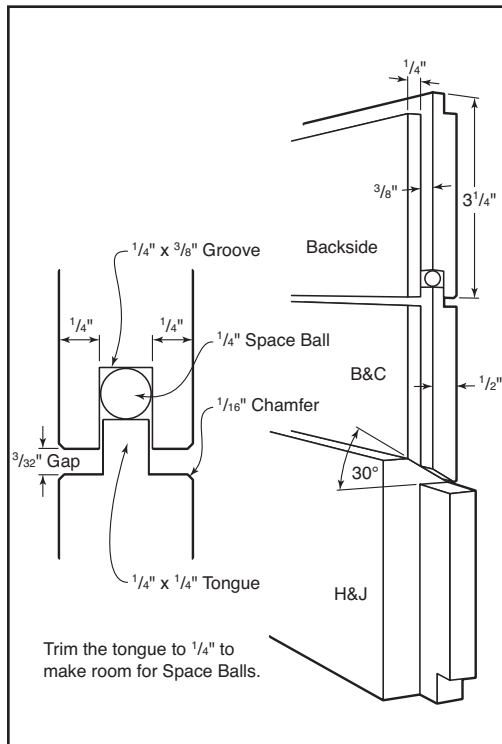
**FIG 4. STEPPED GROOVE SETUP**



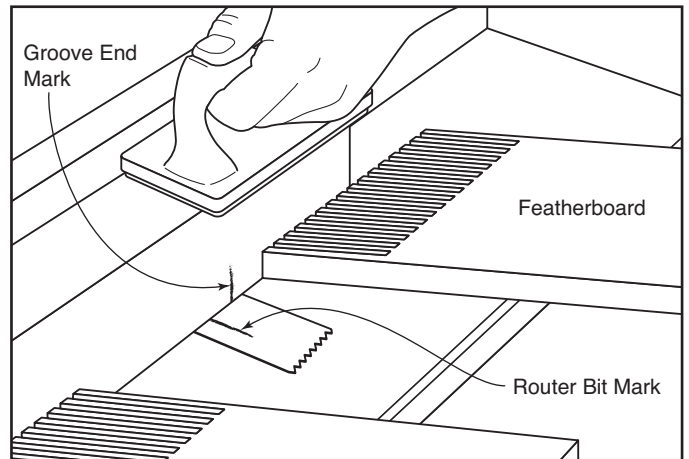
**FIG 5. TOP RAIL TENON**



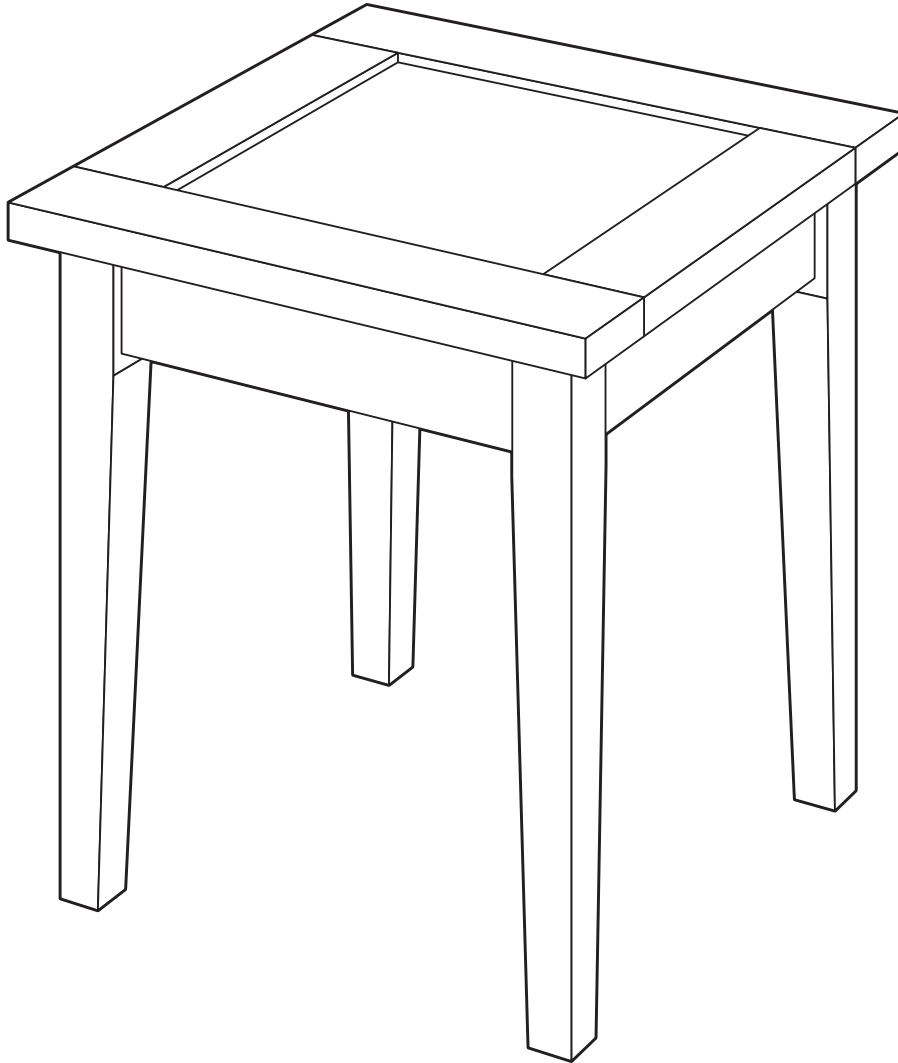
**FIG 6. BOTTOM RAIL TENON**



**FIG 7. PANEL T&G JOINT**



# Occasional Table



Here's a nice, small-sized table that can be put to good use in many rooms, from bedrooms to living and family rooms. And its traditional yet clean-lined design will help it to go well with any decorating style.

Making one of these tables will be an excellent exercise for intermediate woodworkers because it entails several techniques that will increase your skills: tapering the table legs, making single- and double-biscuit joints, making a solid wood panel, plus making grooves and rabbets. And when it's all assembled, you'll learn more about applying and using stains and finishes to protect the wood and keep it looking beautiful.

## TOOLS REQUIRED

### Hand Tools

Bar and C-clamps  
Wood or rubber mallet

### Power Tools

Table saw  
Band saw  
Jointer  
Biscuit joiner  
Random-orbit sander

### Miscellaneous

- Pencil
- Tape measure
- Safety glasses
- Carpenter's glue
- 120-, 150- and 220-grit sandpaper
- Clean, lint-free cloths
- Respirator
- Gloves for finishing
- Mineral spirits (for oil-based stains and finishes)
- Water-filled metal container with tight-fitting lid (for oil-based stains and finishes)
- Minwax® Wood Finish™ Stain Brush or other good quality, natural-bristle brush (for oil-based stains and finishes)

## SHOPPING LIST

**Wood Recommendation:** Maple and walnut (panel)

**Alternate Wood:** Oak and mahogany (panel)

4 lin. ft. 8/4x4

10 lin. ft. 5/4x4

3 lin. ft. 1x4

4 lin. ft. 1x4 walnut or mahogany

#20 biscuits, 30 pcs.

## CUTTING LIST

Overall dimensions: 18" x 18" x 19"

Item	Description	Size & Quantity
A	Leg	1-3/4" x 1-3/4" x 19", 4 pcs.
B	Apron	1" x 3" x 12-3/4", 4 pcs.
C	Long frame	1" x 3" x 18", 2 pcs.
D	Short frame	1" x 3" x 12", 2 pcs.
E	Panel	5/8" x 12-1/2" x 12-1/2", 1 pc.
F	Gluing blocks	3/4" x 3/4" x 3", 8 pcs.

## WOOD FINISHING PRODUCTS

### Recommended Finish

Prep: Minwax® Pre-Stain Wood Conditioner  
Stain: Minwax® Gel Stain Cherrywood  
Minwax® Gel Stain Brazilian Rosewood (center tile)  
Finish: Minwax® Fast-Drying Polyurethane

### Alternate Finish

Prep: Minwax® Pre-Stain Wood Conditioner  
Stain: Minwax® Polyshades® Mission Oak  
Minwax® Polyshades® Pecan (center tile)

## BEFORE YOU BEGIN

Good craftsmanship begins and ends with good work habits, so make the following steps part of your routine workshop practice. If you have any doubts or questions about how to proceed with a project, always discuss them with your shop instructor.

- Carefully and fully review plans and instructions before putting a tool to the project lumber.
- Work sensibly and safely. Wear safety goggles when doing work that creates flying chips and sawdust; wear the appropriate respirator whenever making sawdust or working with thinners or other solvents.
- At the end of every work session, clean up your shop area and put away all portable tools.

## CUTTING AND ASSEMBLY PROCEDURE

1. Saw the 8/4 material for the legs (A) 1/8" oversize. Then joint, plane and cut them to the final size.

2. Mark an X at the top of two adjacent sides on each leg. The tapers are subtle and it's possible to confuse them with the untapered outer sides. Also, where the tapered sides join the aprons, they must be untapered (see Fig. 1), so the taper cuts must stop 3-1/2" from the top of each leg.

3. Mark lines for the tapers on each leg and saw the taper on the band saw. Stay about 1/16" away from your pencil line (see Fig. 2). Always use a pushstick when cutting narrow boards. After the first taper is cut, reattach the resulting scrap with masking tape and cut the second taper. Remove band saw marks with a pass or two over the jointer.

4. To cut the double biscuit slots in the legs, use spacers as shown in Figure 3. This setup works with any biscuit joiner and the only measuring you need to do is to locate the centerline of the slots, measuring down 1-1/2" from the top of the legs. Cut the first slot using the 1/4" spacer. Then put the 3/8" spacer on top of it and cut the second slot. Each leg will thus have two pairs of slots. Make sure to cut the slots with the adjacent tapered side of the leg side down on the worktable. Use a clamp to hold the leg while you work.

5. Cut the aprons (B) to length from the 5/4 stock. To cut the double biscuit slots in the ends of the aprons, clamp the apron face-side down. Cut the first slot without the 1/4" spacer; then put the 3/8" spacer in place to cut the second slot (Fig. 4). This is a foolproof system for making the slots in the legs and aprons exactly the same distance apart.

6. Glue the legs and aprons together one side at a time. Wipe away excess glue before it dries. After the glue has dried, complete the table base by gluing and clamping the remaining two apron pieces (Fig. 5).

7. Cut the long (C) and short (D) frame pieces to the required length and width. Cut double biscuit slots into the ends of the short frame pieces and into the edges of the long frame pieces. Use the same technique described in step 5.

8. Cut 1/4"-wide x 3/8"-deep grooves into the inside edges of all the frame pieces, 1/4" down from the top face of the frame to create the

recess for the panel (see Fig. 1). The groove in the long frame pieces must be stopped so it doesn't show through the end grain.

9. Cut the panel material to the required lengths (E). Joint the edges to make them perfectly straight and square. Cut two biscuit slots into each edge (except the outside edges of the pieces that will be used for the outside edges of the panel). Glue and insert the biscuits, glue the edges and clamp all the pieces together. Wipe away excess glue before it dries.

10. When the panel glue has dried, cut the panel to the final dimensions on the table saw. Then equip the saw with a dado blade and set it to cut a 1/2" -deep x 1/2" -wide rabbet along the edges of the panel (see Fig. 1). Test the fit of the resulting lip in the grooves of the frame pieces. It should be snug but not too tight.

11. Before assembling the frame and panel pieces, finish-sand the exposed inside edges of the frame and the top face of the panel. It's easier to do this now than after the tabletop is assembled. You must also stain and finish the center panel before it is enclosed by the frame pieces.

12. Glue and insert the biscuits and the ends of the frame pieces. Assemble the frame pieces around the panel and clamp the corners tightly together. Wipe away excess glue before it dries. After the glue is dry, finish-sand the frame so that all the joints are perfectly smooth.

13. Cut the gluing blocks (F) to size and glue them to the inside faces of the apron, two per side (see Fig. 1).

14. When the glue has dried, apply glue to the top edge of the apron, and the tops of the gluing blocks and legs. Position the tabletop so that it overhangs the table base equally on all sides, and use deep C-clamps to secure the assembly. Wipe away excess glue before it dries.

## STAINING AND FINISHING

**Woodworker's Tip:** *Though you may be tempted to cut short your sanding, preparation and application time, don't do it. These tasks are very important steps in obtaining a high-quality finish. Remember, it is the finish, just as much as the fit and smoothness of the parts that will have great bearing on how people judge your craftsmanship. To ensure an excellent result, follow the steps listed in this section and also the instructions the finish manufacturer puts on its products.*

### FINISHING TIPS

- Test the stains and finishes you are planning to use on scraps of wood. On the back of the scrap, mark the stain/finish combination and the type of wood. Allow all samples to dry thoroughly before making your final finish selection. Save your samples for quick reference on future projects.
- All stains and finishes must be allowed to dry thoroughly between coats. Remember that drying times can vary due to humidity and other climatic conditions.
- If you have some leftover stain or finish, wipe the can rim so that stain or finish in the rim won't dry out and prevent the lid from forming a tight seal.
- Brushes used for oil-based finishes must be cleaned with mineral spirits.

15. Finish-sand any remaining rough spots with 220-grit paper. Dust off the piece and wipe it carefully with a clean, lint-free cloth lightly dampened with mineral spirits.

#### **Recommended Finish**

16. Apply Minwax® Gel Stain Cherrywood to the table frame and Minwax® Gel Stain Brazilian Rosewood to the center panel using a clean, lint-free cloth or natural-bristle brush. Follow the directions on the can. Allow the Gel Stain to set for about 3 minutes, then wipe off any excess with a clean, lint-free cloth. To achieve a deeper color, you may apply a second coat after 8 to 10 hours, repeating the application directions for the first coat. Allow the stain to dry for 24 hours before applying the finish.

***Woodworker's Tip:** When wiping off stain, make certain that your last wipe with the cloth goes with the grain of the wood. This way, any stain you might miss during wipe-off will be visually minimized by the wood grain.*

17. Apply Minwax® Fast-Drying Polyurethane following the directions on the can. Use a good quality, natural-bristle brush. Allow the first coat to dry overnight.

18. The next day, sand all surfaces lightly with 220-grit or finer sandpaper using with-the-grain strokes. Dust off and wipe all surfaces with a cloth lightly dampened with mineral spirits. Apply a second coat of polyurethane and set the piece aside to cure overnight.

19. The following day, sand all surfaces lightly with 220-grit paper. Dust off and wipe the piece with a cloth lightly dampened with mineral spirits and apply the third and final coat of polyurethane.

#### **Alternate Finish**

20. Apply Minwax® Polyshades® Mission Oak to the table frame and Minwax® Polyshades® Pecan to the center panel following the directions on the can. Use a good quality, natural-bristle brush suitable for use with polyurethane. Stir the can contents thoroughly before starting and periodically repeat stirring during your work session. Allow the first coat to dry overnight.

21. The next day, sand all surfaces lightly with 220-grit sandpaper or very fine (000) steel wool using with-the-grain strokes. Dust off and wipe all surfaces with a cloth dampened with mineral spirits. Apply a second coat of Polyshades® and set the rack aside to cure overnight. To achieve a deeper color, you may apply a third coat after 4 to 6 hours, repeating the application directions. Allow the table to cure for several days before using it.

***Woodworker's Tip:** If you achieve the desired color on the first or second coats of Polyshades®, apply a clear coat of Minwax® Fast-Drying Polyurethane or Minwax® Wipe-On Poly for added protection.*

#### **PRODUCT SAFETY**

For your safety and the safety of those you work with, always read the safety warnings, which manufacturers print on their labels, and follow them to the letter.

**WARNING!** Removal of old paint by sanding, scraping or other means may generate dust or fumes that contain lead. Exposure to lead dust or fumes may cause brain damage or other adverse health effects, especially in children or pregnant women. Controlling exposure to lead or other hazardous substances requires the use of proper protective equipment, such as properly fitted respirator (NIOSH approved) and proper containment and cleanup. For more information, call the National Lead Information Center at 1-800-424-LEAD (in U.S.) or contact your local health authority.

**DANGER:** Rags, steel wool, other waste soaked with oil-based stains and clear finishes, and sanding residue may spontaneously catch fire if improperly discarded. Immediately place rags, steel wool, other waste soaked with this product, and sanding residue in a sealed, water-filled metal container. Dispose of in accordance with local fire regulations.

#### **When using oil-based wood finishing products:**

##### **CAUTIONS: CONTAINS ALIPHATIC HYDROCARBONS.**

Contents are **COMBUSTIBLE**. Keep away from heat and open flame. **VAPOR HARMFUL**. Use only with adequate ventilation. To avoid over-exposure, open windows and doors or use other means to ensure fresh air entry during application and drying. If you experience eye watering, headaches, or dizziness, increase fresh air, or wear respiratory protection (NIOSH approved), or leave the area. Avoid contact with eyes and skin. Wash hands after using. Keep container closed when not in use. Do not transfer contents to other containers for storage.

**FIRST AID:** In case of eye contact, flush thoroughly with large amounts of water for 15 minutes and get medical attention. For skin contact, wash thoroughly with soap and water. In case of respiratory difficulty, provide fresh air and call physician. If swallowed, call Poison Control Center, hospital emergency room, or physician immediately.

##### **DELAYED EFFECTS FROM LONG-TERM OVEREXPOSURE.**

Contains solvents which can cause permanent brain and nervous system damage. Intentional misuse by deliberately concentrating and inhaling contents may be harmful or fatal.

**WARNING:** This product contains a chemical known to the State of California to cause cancer and birth defects or other reproductive harm.

##### **DO NOT TAKE INTERNALLY. KEEP OUT OF REACH OF CHILDREN.**

CONFORMS TO ASTM D-4326. Contact a physician for more health information.

#### **When using water-based wood finishing products:**

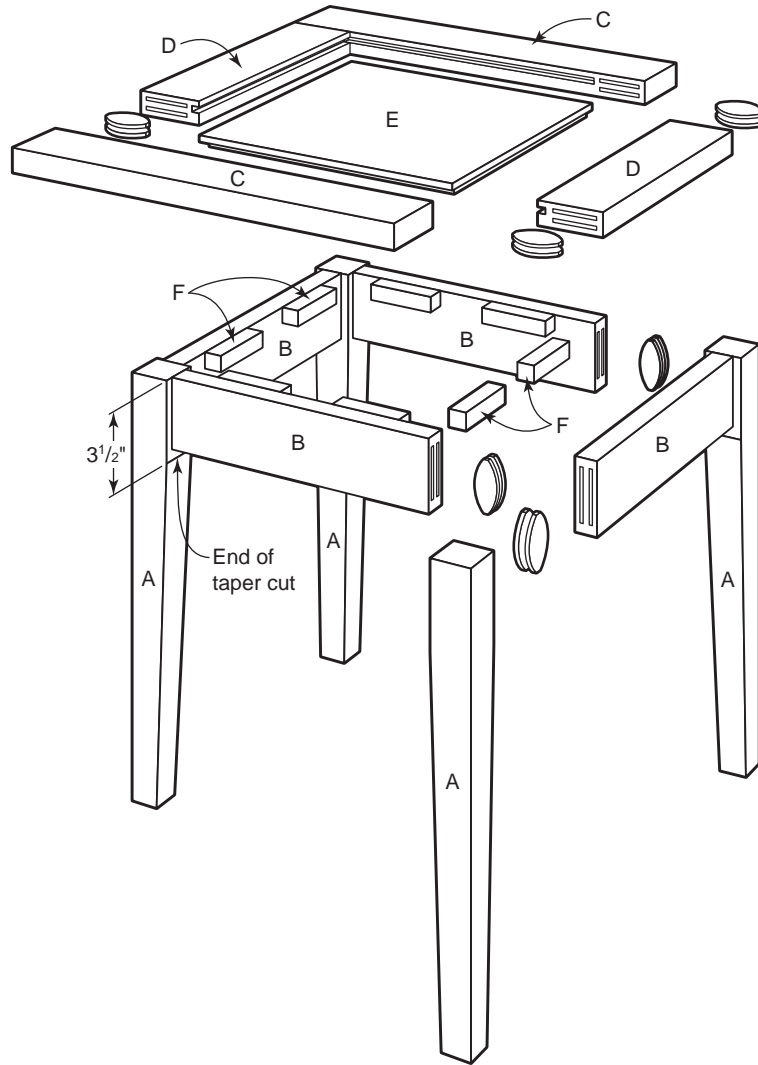
**CAUTIONS:** Use Only With Adequate Ventilation. To avoid overexposure, open windows and doors or use other means to ensure fresh air entry during application and drying. If you experience eye watering, headaches, or dizziness, increase fresh air, or wear respiratory protection (NIOSH approved), or leave the area. Avoid contact with eyes and skin. Wash hands after using. Keep container closed when not in use. Do not transfer contents to other containers for storage.

**FIRST AID:** In case of eye contact, flush thoroughly with large amounts of water. Get medical attention if irritation persists. If swallowed, get medical attention immediately.

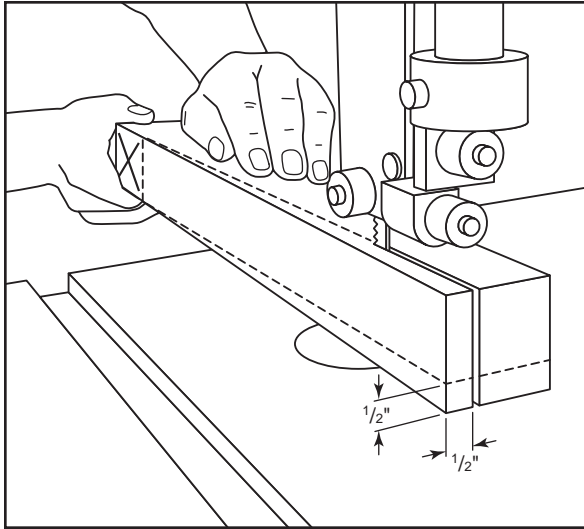
**WARNING:** This product contains a chemical known to the State of California to cause cancer and birth defects or other reproductive harm.  
**DO NOT TAKE INTERNALLY. KEEP OUT OF REACH OF CHILDREN.**  
CONFORMS TO ASTM D-4326. Contact a physician for more health information.



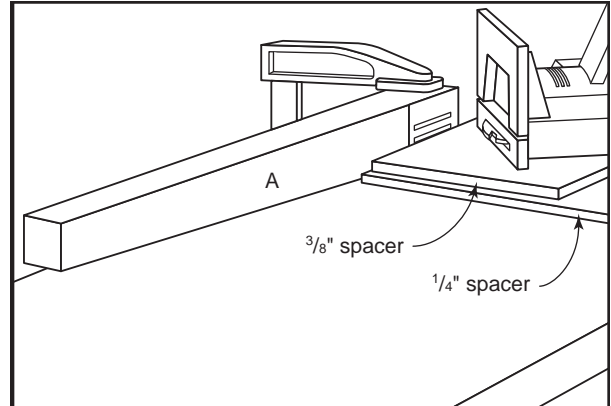
**FIG 1.**



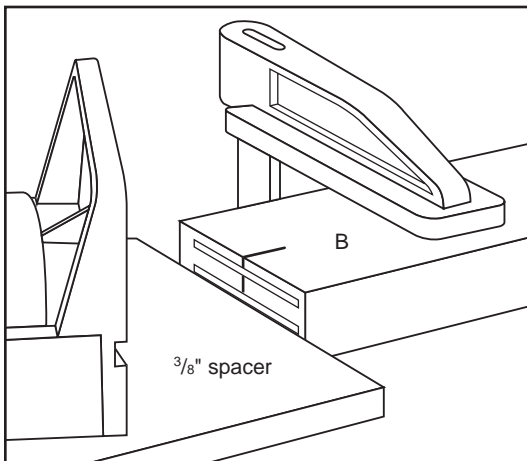
**FIG 2.**



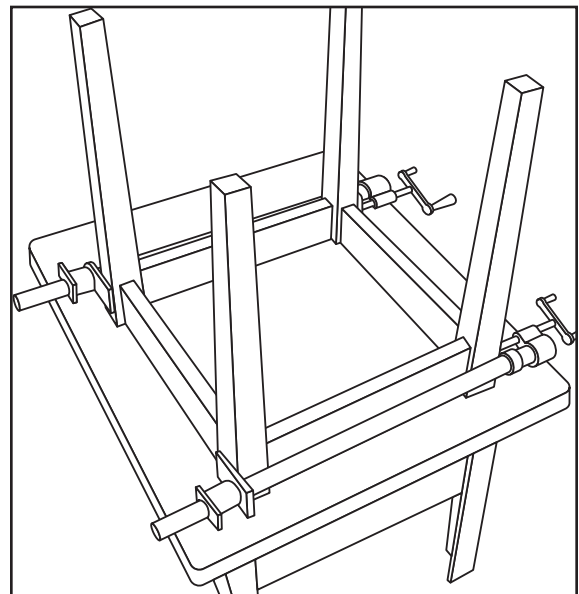
**FIG 3.**



**FIG 4.**



**FIG 5.**



# New England Pine Blanket Chest

Building this charming chest will sharpen woodworking skills in a number of ways. At the same time, it will allow students to build and finish a treasured piece of furniture. Building this chest will pose more of a challenge than a beginner project. Basic construction is simple; there are no unnecessary frills or complex joinery techniques in this project. But re-creating this antique Massachusetts chest will help you to learn and master new skills such as installing hidden dowel hinges and joining boards with biscuits.

Two more reasons for selecting the pine chest for your project:

1. The finished project is functional, and can be used as a storage piece for blankets, toys, etc.
2. Its clean lines make it a piece of furniture that blends with nearly all home decorating schemes.

A final word: Make certain you carefully read through the entire set of plans and instructions. Study the drawing before picking up a hammer or saw and discuss any questions you have about the project with your teacher. This will eliminate any chance of aggravation and wasted materials.

## TOOLS AND MATERIALS REQUIRED:

### Hand Tools

- Pencil
- Ruler (zigzag or tape)
- Hammer and 1/32" nailset
- Hammer, ball-peen
- Square, (combination or try)
- Phillips screwdriver (medium)
- Block plane
- Hand Screw
- C-type springs

### Power Tools

- Jointer
- Plate joiner with no. 20 biscuits
- Sanders: belts, random orbit, pad; with appropriate sanding papers in 80, 120, 150, 200 grits plus, 220 AND 240-grit for pad sander
- Saws (radial, band and table)
- Electric drill (with screwdriver bit)
- Assortment of drill bits
- Router, with cutters: 3/4" straight and 1/4" rounding-over

### Miscellaneous

- Clamps
- Safety glasses
- Respirator (for sanding step)

### Materials

- See shopping and cutting lists

## FINISHING PRODUCTS

### Finish recommended for this project:

- Minwax® Pre-Stain Wood Conditioner
- Minwax® Wood Finish™, Colonial Maple
- Minwax® Fast-Drying Polyurethane

### Alternate Finish Choices: (choose one)

- Minwax® Wipe-On Poly
- Minwax® Polyshades® Wood Finish
- Minwax Pastels®, Winter White

### Miscellaneous

- Assortment of clean, lint-free rags
- Wood glue
- Minwax® Wood Finish™ Brushes
- Tack cloth
- Permanent black ink marker
- Paint thinner, if necessary
- Water-filled metal container with air-tight lid (to dispose of oil-soaked rags)
- Masking tape

## BEFORE YOU BEGIN

If you intend to become a serious woodworker, your goal should be to achieve a high degree of craftsmanship in every project you attempt. Quality workmanship begins and ends with good work habits. Before starting any project, always carefully review the plans. Also, allow time at the end of work sessions to clean up your work area and return tools to their correct locations.

## PROCEDURE

Because of the width of the various planks, you will be required to edge-glue narrower boards to obtain the needed widths. Resist the urge to use single, very wide boards because, over time, wide planks are far more likely to cup and warp.

### Steps for building the Pine Blanket Chest:

1. Cut all parts to size (see the cutting list); note that Parts A, B, C and D are initially cut slightly over-length to make edge-joining easier. Using glue and no. 20 biscuits, join the boards to make up six members (front, back, ends, bottom and top): use bar clamps to keep all sections tightly joined while the glue dries. The next day, these parts can be cut to their actual sizes, as shown in the drawing.
2. Shape the front edge of top A with a cove cutter chucked in the router. Then, replace the cove cutter with a V-groove cutter to rout the shallow V-cut along the front edge as shown. Finally, switch to a 3/8-in. rounding-over bit to shape the ends and back edges of top, A.
3. Lay out the leg shape on 1/4-in. plywood or hardboard and cut it out. Sand the cut edges smooth to remove any irregularities left by the saw blade. Set the pattern aside for use in Step 5.
4. Position the end panels back-edge to back-edge with inside surfaces up. With a framing square, check across leg bottoms to make certain they are perfectly aligned. When they are, apply light pressure with a bar clamp to hold them in place. Then, lay out the location of the dado, which will receive the bottom member, on the interior surfaces. After determining the router shoe offset (i.e.; the distance from cutter edge to shoe edge) with the 3/4-in. straight cutter in its chuck, clamp or tack a straightedge to serve as a guide for ploughing the dado across both boards at one time.
5. Next, tack the two end pieces together, with inside surfaces (the planes with dados) abutting. Trace the leg pattern onto the top member. Cut out the notch at front using a band saw or handsaws (rip and crosscut). Then, cut out the leg shape using either a saber or scroll saw.
6. After all chest parts have been cut to shape and size, plane the surfaces to remove any squeezeout where boards are joined. Smooth all boards beginning with 100-grit sandpaper and finish with 120-grit.
7. Cut the parts for the Keep Box to size.
8. Then, position the chest front and back members edge-to-edge (i.e.; the front's right edge should abut the back member's left edge, with their top edges aligned) so the grooves to receive the Keep Box front and bottom panels can be laid out. Rout grooves 3/8-in. deep using a 1/2-in. straight cutter; make certain you also use tacked-on guides to prevent the router from "walking off" the cutting line when you rout. At this time, also lay out and bore the blind holes, which will receive the lid's dowel hinges.
9. Round over the front edge of the Keep Box lid and bore the dowel holes. Glue-in the dowel "hinges."
10. Final pre-assembly step; shape the cleats as shown, bore the screw pilot and countersink holes and attach cleats to the underside of the top using glue and wood screws, as shown.

**Cabinetmaker's Tip:** Notice the shape (cross-section view) of these cleats. You will find it easier to obtain this shape if you chamfer cleats before installing them on the top.

### Assembling the Pine Chest

11. Fasten the back to the chest bottom and legs using glue and 1-1/2 in. common nails. (Nail heads should be set slightly below the surface after the cabinet is fully assembled.)
12. Lay the carcass on its back and install the Keep Box bottom and front into the slots in the carcass back, without glue. If necessary, apply clamp pressure to ensure that these parts are fully seated in their slots. Nail Keep Box front to bottom front using 1-1/4 in. brads.

13. Apply glue to front edges of chest legs and bottom and install front with Keep Box parts positioned in the slots in front member and the lid dowel hinge placed in its respective hole. When all is in place, fasten front to carcass with glue and nails.

14. Stand the chest upright and put the top in place. Then, mark and cut the hinge mortises in both top and back members.

15. Locate the position for the false keyhole at front; bore a small hole, about 1/4-in. deep. Paint the hole interior black or, use a permanent black ink marker.

16. Install hinges and the keyhole escutcheon plate so you can make certain that carcass and top align. Make any necessary adjustments if they do not. When satisfied with the fit, remove the hardware so you can move on to the next step—finishing.

### Sanding, Staining & Finishing

**Finisber's Tip:** If you want your project to closely resemble an antique, you can "distress" the chest to give the appearance of wear or aging. Use an awl to replicate "worm holes" and various tools such as a rough file and ball-peen hammer to make indents and marks.

1. Sand the entire piece using 120-grit abrasive paper. Then, use 150-grit abrasive paper in a pad sander, using with-the-grain sanding strokes. Dust off the piece and wipe it with a tack cloth.
2. Apply Minwax® Pre-Stain Wood Conditioner following directions on the label. Wait 5-10 minutes, then wipe off excess using a clean, lint-free rag. Proceed to the next step within 2 hours.
3. Working on one section of the chest at a time, apply Minwax® Wood Finish™ Stain to the surface using a brush. Allow stain to set 5-15 minutes to achieve desired color, then wipe off excess stain. Allow stain to dry 24 hours.

**Finisber's Tip:** Make certain that your last wipe with the cloth is in a with-the-grain direction. This way, the wood grain will visually conceal any stain you might miss during wiping.

4. The next day, apply Minwax® Fast-Drying Polyurethane following can directions. Use a brush intended for use with polyurethane. Allow finish to dry overnight.
5. The next day, sand lightly using 220-grit paper, dust off and wipe with a tack cloth. Apply a second coat of the Polyurethane and set aside to dry overnight.
6. Finally, sand lightly with 240-grit paper, dust, wipe with a tack cloth and apply the third and final coat of Polyurethane. Allow the chest to dry for several days before putting the piece into service.

**A Final Cabinetmaker's Tip:** You may need to install the furniture glides on your chest. These are placed, one per foot, to ensure that the chest won't rock if is placed on a slightly uneven surface (floor or rug). Use nylon glides for use on carpeting; rubber glides on wood surfaces.

### Finisber's Tips:

• Use scraps of wood to test the stains and finishes you are planning to use. Label the finish used and the type of wood on each test sample chip. Allow all samples to dry thoroughly before making your final finish selection for your project. Save samples for quick reference on future projects.

- Remember to pretreat softwoods (like pine) with Minwax® Pre-Stain Wood Conditioner before staining to help ensure the even absorption of the stain.
- For a clean, sharp finish, all final passes with the brush or cloth should be made in the same direction as the wood grain.
- It is critical that all stains and finishes be allowed to dry thoroughly between coats. Remember that drying times can vary due to humidity and other climactic conditions.

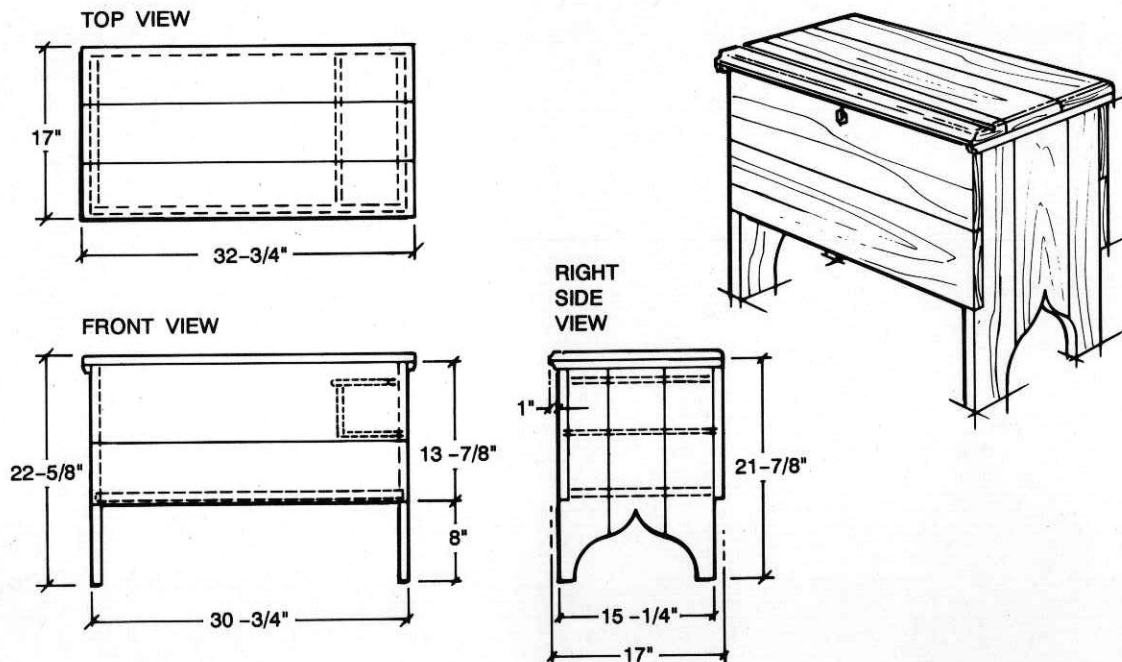
#### Cleanup

- If you have product left over, wipe the can rim so that product in the rim won't dry out and prevent the lid from forming a tight seal.
- Clean brushes used for oil-based finishes with mineral spirits; for water-cleanup products such as Minwax® Polycrylic® Protective Finish, clean brushes with soap and warm water.

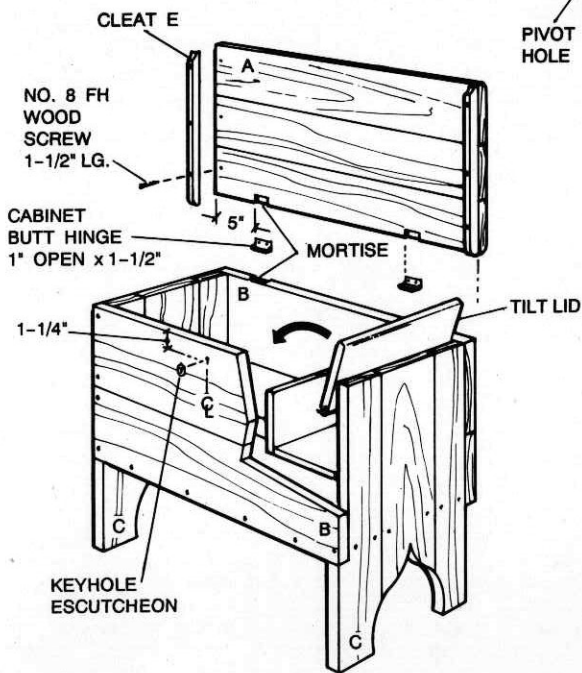
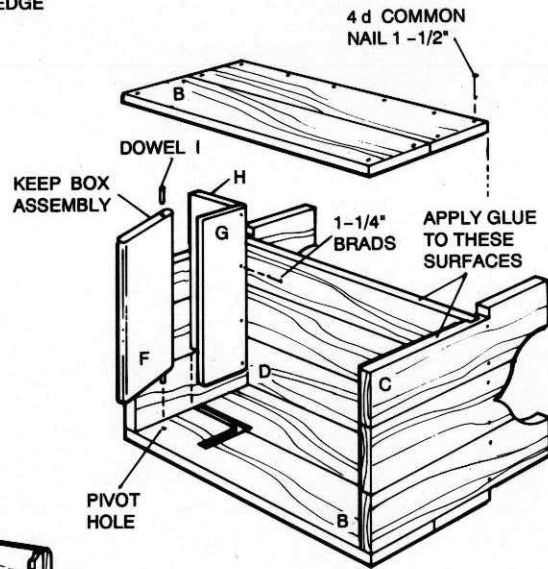
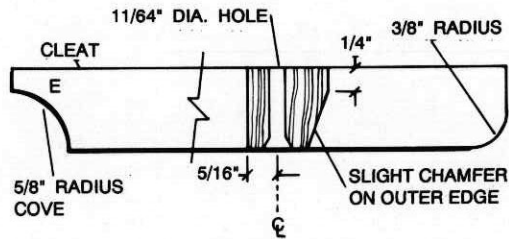
#### Safe Disposal of Rags & Waste

Please be mindful of the safe way to dispose of used rags and other waste. Rags, steel wool and other waste soaked with oil finishes, mineral spirits or the like may spontaneously catch fire if improperly discarded. Place all finishing rags, steel wool and waste immediately after use in a water-filled, metal container. Tightly seal and then dispose of such by-products in accordance with local regulations. Be sure to keep the container out of reach of children.

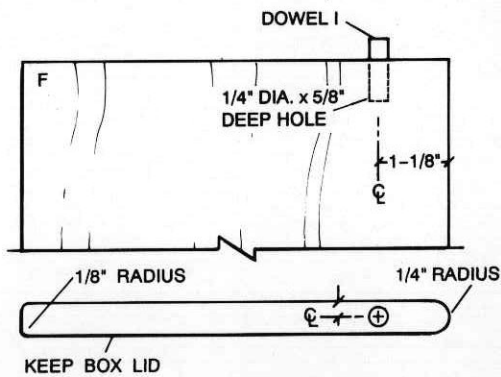
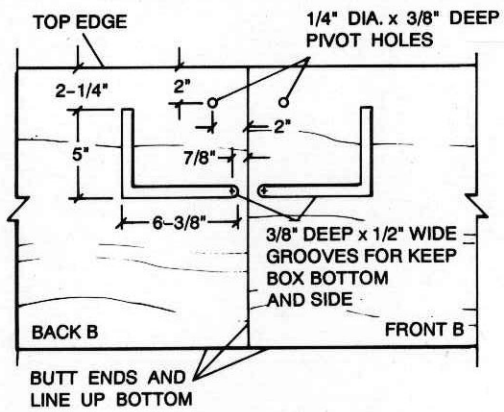
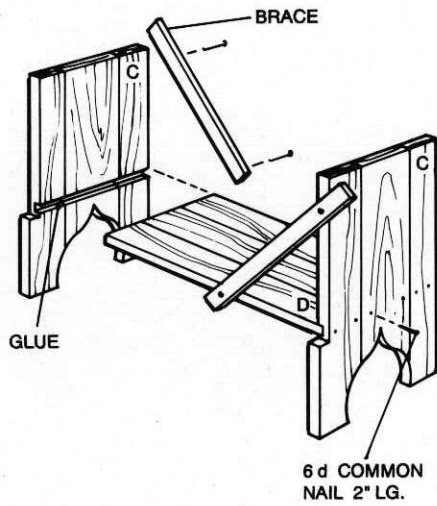
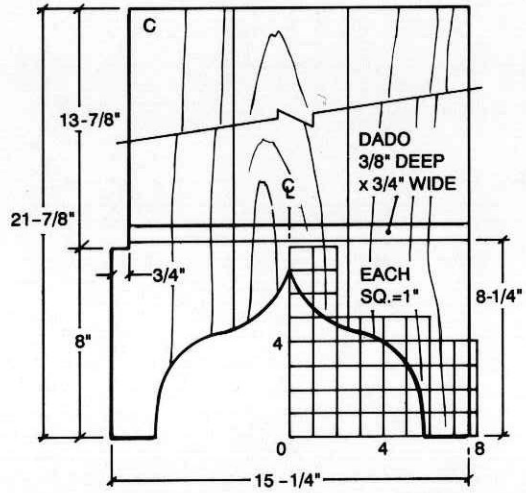
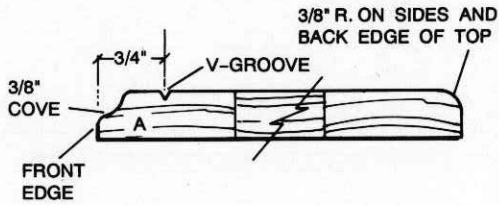
**Misc. Box Materials:** Professional strength wood glue; one pair Brainerd Hinges, 1-1/2 x 1-1/4" solid brass, no.7150XG; one keyhole escutcheon plate; 1-1/4" and 1-1/2" finishing nails; six 1-1/4" no. 8 fh screws (for affixing cleats to top); four 7/8" dia., 3-prong nylon furniture glides; 22 no. 20 biscuits; two 1-1/2" pcs. 3/8" dowel (for Keep Box hinges); assorted grits (100 through 240) sandpaper.











Key	Pcs.	Size	For	Stock	Cut From (buy) *see Notes
A	1	3/4 x 17 x 32-3/4"	Top	Pine	2/6*, 1 x 6"
B	2	3/4 x 13-3/4 x 31-3/4"	Front and Back	Pine	3/6, 1 x 6"
C	2	1-1/16 x 15-1/4 x 21-7/8"	Legs	Pine	2/6, 5/4 x 6"
D	1	3/4 x 14-1/2 x 29-3/4"	Bottom	Pine	1/9, 1 x 6"
E	2	5/8 x 7/8 x 17"	Top Cleats	Pine	From scrap box
F	1	1/2 x 6-1/4 x 14-7/16"	Keep box lid	Pine	1/2, 1 x 8"***
G	1	1/2 x 5 x 14-1/2"	Box front	Pine	1/3, 1 x 6" per K.H.
H	1	1/2 x 5-1/2 x 14-1/2"	Box bottom	Pine	G & H

**\*Notes:**

- The buying column lists the boards using "lumberyard language." You should know that lumber is purchased using nominal dimensions, which differ from the actual dimensions. For example, the listing (*nominally*) 1/5 1 x 6 indicates one 5-ft. length of 1 x 6. The *actual* dimension for this board is 3/4 x 5-1/2" by 60 inches long.
- Bring the above materials list to the lumberyard with you when you go to buy the materials.

\*\* Run 3/4" stock through the planer to obtain an exact 1/2" thickness for the Keep Box. If no planer is available, purchase 1/2" nominal stock for the Keep Box. Then, adjust the box's installation locations accordingly to suit the material's *actual dimension* of 7/16" thickness.

**Product Safety**

CAUTION: ALWAYS BE SURE TO READ ALL LABEL INSTRUCTIONS AND PRECAUTIONS BEFORE USING PRODUCT.

DANGER! HARMFUL OR FATAL IF SWALLOWED. SKIN IRRITANT. COMBUSTIBLE. KEEP OUT OF REACH OF CHILDREN.

**DANGER:** Contains mineral spirits. Do not take internally. Avoid contact with skin and eyes. Wear rubber gloves and safety glasses when handling. Do not use or store near heat, sparks, flame or other source of ignition. Close container after each use. Avoid inhalation and use only with adequate ventilation. If using indoors, open all windows and doors to make sure there is fresh air movement. If you experience lightheadedness, dizziness or headaches, increase fresh air movement or leave the area. Reports have associated repeated and prolonged occupational overexposure to solvents with permanent brain and nervous system damage. Intentional misuse by deliberately concentrating and inhaling the contents may be harmful or fatal. **FIRST AID:** If swallowed: Do not induce vomiting. Call physician immediately.

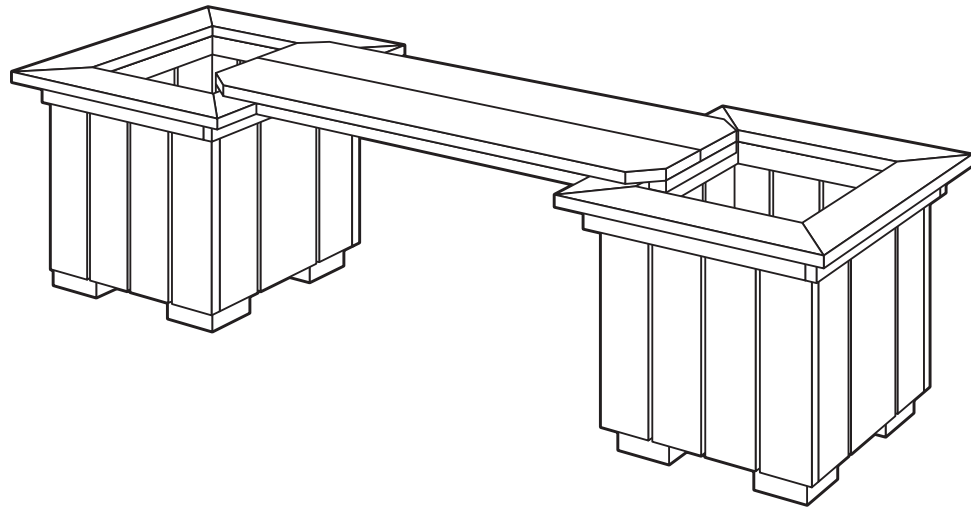
**FOR SKIN CONTACT:** Wash thoroughly with soap and water. If irritation persists, get medical attention.

**FOR EYE CONTACT:** IMMEDIATELY flush eyes thoroughly with water, then remove any contact lenses. Continue to flush eyes with water for at least 15 minutes. If irritation persists, get medical attention.

**IF AFFECTED BY INHALATION:** Immediately remove to fresh air. If symptoms persist, call physician.

Created for GW&J and Minwax Company  
by Harry Wicks Woodworks, Cutchogue NY 11935 ©1999

# Modular Planter Bench



The beauty of this modular system is that it can be as short or long as you like; it can be straight, or it can take hard lefts or rights to follow the footprint of a deck or patio. And, best of all, it's simple, quick and inexpensive to build. You'll be "up" and sitting in a few hours.

In this intermediate-level project, you'll gain experience in making precise crosscuts and miter cuts and in doing an equally precise assembly. And after you build it, you'll learn more about applying and using finishes to protect the wood and keep it looking beautiful.

## TOOLS REQUIRED

### Power Tools

Table saw  
Miter or radial-arm saw  
Power drill with drill bits,  
countersink bit and Phillips-head  
screwdriver bit  
Orbital or finish sander

### Miscellaneous

- Tape measure
- Pencil
- Safety glasses
- 120-grit sanding belt
- 120-, 150- and 220-grit sandpaper
- Clean, lint-free cloths
- Respirator
- Gloves for finishing
- Mineral spirits, for oil-based  
waterproofer
- Good quality, natural-bristle brush  
(for oil-based waterproofer) or  
synthetic-bristle brush (for water-  
based waterproofer)

## SHOPPING LIST

**Wood Recommendation:** Pressure-treated pine

**Alternate Wood:** Any other type of rot-resistant wood

For two planters and one bench:

60 lin. ft. 1x4 pressure-treated pine or alternate

6 lin. ft. 1x8 pressure-treated pine or alternate

4 lin. ft. 5/4x6 pressure-treated pine or alternate

3 lin. ft. 2x4 pressure-treated pine or alternate

Wood glue rated for exterior use

**Woodworker's Tip:** *Knots can weaken a board and spell disaster, especially on furniture, so be sure to select boards with the fewest knots and to plan your cuts around any knots.*

## HARDWARE

Use either stainless-steel or coated exterior-grade fasteners

1-1/4" screws 180

2-1/2" screws 32

6d galvanized finish nails 24

## CUTTING LIST

Overall dimensions

Planter:

Bench: 11" x 42"

Key	Part	Size & Quantity
<b>Planter boxes</b> (amounts for two boxes)		
A	Inner frames	1x2 x 12-1/2", 16 pcs.
B	Sides	1x4 x 13-1/2", 24 pcs.
		1x6 x 13-1/2", 4 pcs.
C	Floor	1x4 x 13-1/4", 6 pcs.
D	Feet	2x4 x 3-1/2", 8 pcs.
E	Top trim	1x2 x 15-1/2", 8 pcs.
F	Top frame	1x4 x 18-1/2", 8 pcs. (18-1/2" on the long side; ends are mitered at a 45° angle)
<b>Bench</b> (amounts for one 42"-long bench)		
G	Bench boards	5/4x6 x 42", 2 pcs.
H	Guide cleats	1x1 x 8", 4 pcs.
I	Trim strips	1x1 x 33", 2 pcs.

## WOOD FINISHING PRODUCTS

### Recommended Finish

Thompson's® WaterSeal® Advanced Wood

Protector Sheer Nutmeg Brown

### Alternate Finish

Thompson's® WaterSeal® Waterproofer Plus Clear

Wood Protector

## BEFORE YOU BEGIN

Good craftsmanship begins and ends with good work habits, so make the following steps part of your routine workshop practice. If you have any doubts or questions about how to proceed with a project, always discuss them with your shop instructor.

- Carefully and fully review plans and instructions before putting a tool to the project lumber.
- Work sensibly and safely. Wear safety goggles when doing work that creates flying chips and sawdust; wear the appropriate respirator whenever making sawdust or working with thinners or other solvents.
- At the end of every work session, clean up your shop area and put away all portable tools.

## CUTTING AND ASSEMBLY PROCEDURE

### Planter boxes

1. Cut parts A, B, C, and D to length. Rip part A to the required width from 1x4 stock. Rip the four wide side pieces to the required width (5-1/2") from 1x8 stock. (Note: parts H and I will also be ripped from this stock, or from scrap.) To speed the job, clamp a stop block to the fence so you can quickly make repeat cuts without measuring every piece. Rip part A to the required width. (Note: Parts dimensioned as 1x2, 1x4, etc., refer to nominal dimensions. The actual size of a 1x2 is 3/4" x 1-1/2"; a 1x4 measures 3/4" x 3-1/2".)

2. Drill and countersink pilot holes through the inner frames (A) corresponding to the spacing of the side pieces (B) and using two 1-1/4" screws for each end of the boards to minimize cupping (Fig. 2). Use scrap to cut 1/4"- and 3/8"- thick spacers to ensure even gaps between the side pieces. The 3/8" spacers go between 1x4s and 1x6s, and the 1/4" spacers are for sides that are all 1x4s. Your goal is to make each space on a given side the same. Check this dimension before cutting the spacers.

3. Start fastening the side pieces (B) to the inner frames. Apply glue to the surfaces that will meet the frames and arrange the pieces so they're square to the inner frame. Drill shallow, 1/2"-deep pilot holes into the side pieces through the existing holes in the inner frames and drive 1-1/4" screws into the holes. Fasten the sides to one frame at a time; repeat the process for the second frame.

4. Glue and fasten the floor pieces (C) to the top of the lower frame, again using four screws per board to minimize cupping. Use the 1-1/4" screws.

5. Glue and fasten the feet (D) to the underside of the box (as shown in Fig. 1). Use the 2-1/2" screws.

6. Rip the top trim pieces (E) to the required width from 1x4 stock. Cut them to the actual length required and glue and fasten them along the top edge of the box (Fig. 1).

7. Cut the top frame pieces (F) to the actual length required. Use glue and the 1-1/4" screws to join the corners and make the frame. Then glue and nail the frame onto the top of the box with 6d galvanized finish nails. Set the nail heads below the surface and fill the holes with wood filler. After the filler dries, sand the top so the miter joints are smooth (Fig. 2).

### Bench

8. Cut the bench boards (G) to length and cut the corners (as shown in Fig. 1). Rip parts H and I from stock left over from the 1x8 or from scrap. Cut them to length.

9. Position and install the guide cleats (H) (as shown in Fig. 4). Use a scrap of 1x4 plus pieces of cardboard to determine the spacing and ensure a loose fit when the bench is set on the planters. Use glue and the 1-1/4" screws to secure the cleats.

10. Position and install the trim strips (I) with glue and the 1-1/4" screws. Sand all edges to soften sharp corners.

## PROTECTING YOUR PROJECT

Any type of wood that's used outdoors needs protection from water damage. There are a variety of protective coatings available, including clear and tinted wood protectors and semitransparent and solid stains. Each of these finishes has a different look and maintenance requirement.

To provide complete protection for your project, use Thompson's® WaterSeal® Advanced Tinted Wood Protector or Thompson's® WaterSeal® Waterproofer Plus Tinted Wood Protector. Both products not only prevent water damage, but also resist damage from mildew and ultraviolet (UV) radiation in sunlight, and they exceed industry standards for waterproofing on wood. Plus, the transparent tint will give plain pine just the right amount of rich wood tone. These products are available in five beautiful sheer wood tones.

***Woodworker's Tip:** Always be sure to choose a waterproofer that claims to exceed industry standards for waterproofing on wood.*

### FINISHING TIPS

- Coverage: The approximate coverage of Thompson's® WaterSeal® Advanced Tinted Wood Protector and Thompson's® WaterSeal® Waterproofer Plus Tinted Wood Protector on pine is 200 square feet per gallon.
- When you apply Thompson's® WaterSeal® Advanced Tinted Wood Protector or Thompson's® WaterSeal® Waterproofer Plus Clear or Tinted Wood Protector, do not mix it with other waterproofing products, because variations in the final appearance of the surface being treated may result. Also, do not thin these products.

### Recommended Finish

11. Before applying Thompson's® WaterSeal® Advanced Tinted Wood Protector, the wood surface must be free of all dirt, wood dust and contaminants. This product can be applied to damp, freshly cleaned wood. If the wood needs cleaning, use Thompson's® WaterSeal® Deck Cleaner & Brightener or Thompson's® WaterSeal® Deck Wash. Read and follow the directions found on the back of the can. After the cleaning is done, read and follow the directions found on the back of the can of the Tinted Wood Protector. Then do a trial test before full application. The surface may darken slightly with application and color appearance is different when the wood is fully dry.

12. When applying this product, do not use it with other waterproofing products, as variations in the final appearance of the wood may result. Do not thin. To ensure good penetration, do not apply in direct sunlight or on hot days. Do not apply if rain is expected within 48 hours.

Also, temperature must be above 50° F. and remain above freezing for 24 hours.

**13.** Shake or stir contents for a minimum of 2 minutes before use. Intermix all containers (of the same color) to be used to assure color uniformity.

**14.** Use a paint pad or brush to apply, do not use a roller. For small projects, a brush is the preferred applicator.

**15.** Apply only one thin, even coat. **DO NOT APPLY A SECOND COAT.** A heavier or additional coat will not improve performance or appearance. Avoid puddling. Tackiness will result if overapplied. Tackiness may also occur after application if overnight temperature falls below 50°F. within 48 hours of application. Drying time will vary depending on wood surface and humidity. Allow a minimum of 12 hours before using the bench.

**16.** Brushes and equipment used for water-based products must be cleaned with soap and water; brushes used for oil-based finishes must be cleaned with mineral spirits. Dry product can be removed with mineral spirits.

#### **Alternate Finish**

**17.** Before applying Thompson's® WaterSeal® Waterproof Plus Clear Wood Protector read and follow the directions found on the back of the can. Be sure that both surface and air temperature are above 50° F. during application and for 48 hours after application. And, if you're working outside, do not apply product if rain is forecasted within 24 hours of application.

**18.** The surfaces must be free of all dirt, wood dust and all other contaminants. To clean the wood, use either Thompson's® WaterSeal® Deck Cleaner & Brightener or Thompson's® WaterSeal® Deck Wash. If the surface is damp or wet from cleaning or weather, allow the surface to dry thoroughly (a minimum of 48 hours) before application.

**19.** Do not mix the product with other waterproofing products because variations in the final appearance of the surface being treated may result.

**20.** Before applying the product over the entire surface, a small trial patch is recommended.

**21.** In most applications, only one light coat is necessary. Apply with a brush, roller or applicator pad. Regardless of which application method is used, remove excess within 15 minutes by redistributing it to drier areas or wiping it off.

**22.** Oiliness and tackiness will result if overapplied, or applied to wet or damp surface or if overnight temperature falls below 50° F. within 48 hours of application.

**23.** Allow at least 48 hours to dry before you use the bench.

**24.** Clean brushes and equipment with mineral spirits, then rinse with clean water.

**NOTE:** The length of protection will vary depending on environment. Perform the following splash test once a year to see whether reapplication is necessary. Sprinkle water on various sections of surface to be sealed. If water absorbs and darkens color of substrate within 5 seconds, the surface is porous and considered ready to be treated. If water beads up or otherwise sits on top of surface, then surface doesn't need protection at this time. For maximum protection from color change and other damage caused by the sun, reapplication is recommended every year. Vertical and horizontal surfaces will experience color changes at different rates.

#### **PRODUCT SAFETY**

For your safety and the safety of those you work with, always read the safety warnings, which manufacturers print on their labels, and follow them to the letter. Typical safety advice and instructions will contain information such as the following:

**WARNING!** Removal of old paint by sanding, scraping or other means may generate dust or fumes that contain lead. Exposure to lead dust or fumes may cause brain damage or other adverse health effects, especially in children or pregnant women. Controlling exposure to lead or other hazardous substances requires the use of proper protective equipment, such as properly fitted respirator (NIOSH approved) and proper containment and cleanup. For more information, call the National Lead Information Center at 1-800-424-LEAD (in US) or contact your local health authority.

Contents are **COMBUSTIBLE**. Keep away from heat and open flame.

Contains **ALIPHATIC HYDROCARBONS**.

**VAPOR HARMFUL.** Use Only With Adequate Ventilation. To avoid overexposure, open windows and doors or use other means to ensure fresh air entry during application and drying. If you experience eye watering, headaches or dizziness, increase fresh air supply, or wear respiratory protection (NIOSH/MSHATC23C or equivalent), or leave the area. Avoid contact with eyes and skin. Wash hands after using. Keep container closed when not in use. Do not transfer contents to other containers for storage.

**FIRST AID:** In case of eye contact, flush thoroughly with large amounts of water for 15 minutes and get medical attention. For skin contact, wash thoroughly with soap and water. In case of respiratory difficulty, provide fresh air and call physician. If swallowed, get medical attention immediately.

#### **DELAYED EFFECTS FROM LONG-TERM OVEREXPOSURE.**

Contains solvents which can cause permanent brain and nervous system damage. Intentional misuse by deliberately concentrating and inhaling contents may be harmful or fatal.

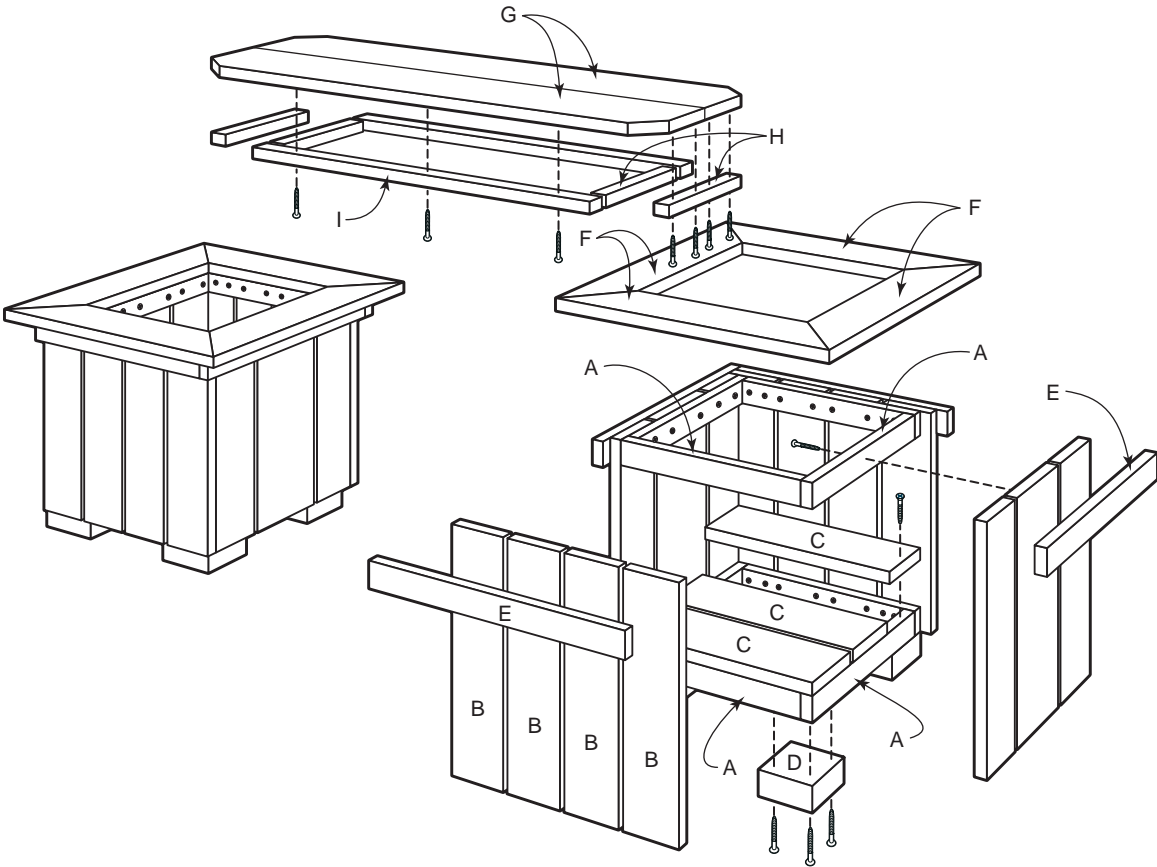
**WARNING:** This product contains a chemical known to the State of California to cause cancer and birth defects or other reproductive harm. **DO NOT TAKE INTERNALLY. KEEP OUT OF REACH OF CHILDREN.**



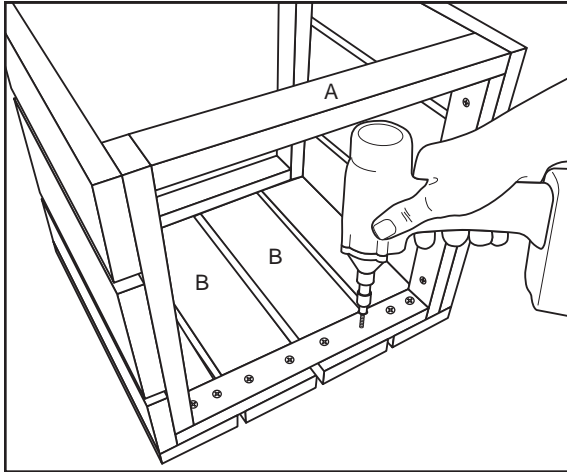
**SAFE DISPOSAL OF RAGS AND WASTE.**

**DANGER:** Rags, steel wool, other waste soaked with this product, and sanding residue may spontaneously catch fire if improperly discarded. Immediately place rags, steel wool, other waste soaked with this product, and sanding residue in a sealed, water-filled metal container. Dispose of in accordance with local fire regulations.

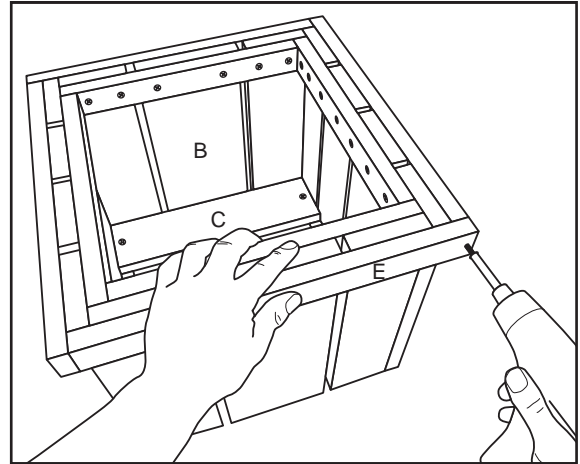
**FIG 1.**



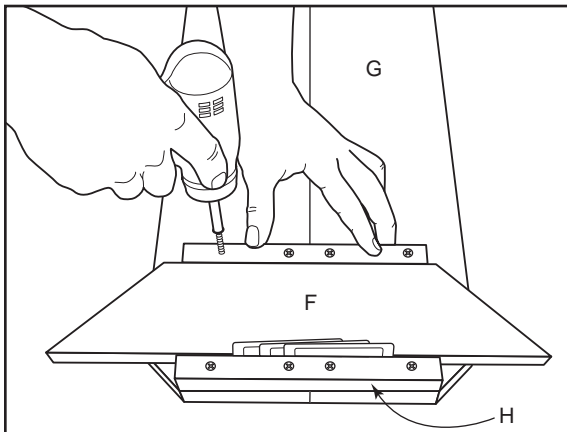
**FIG. 2**



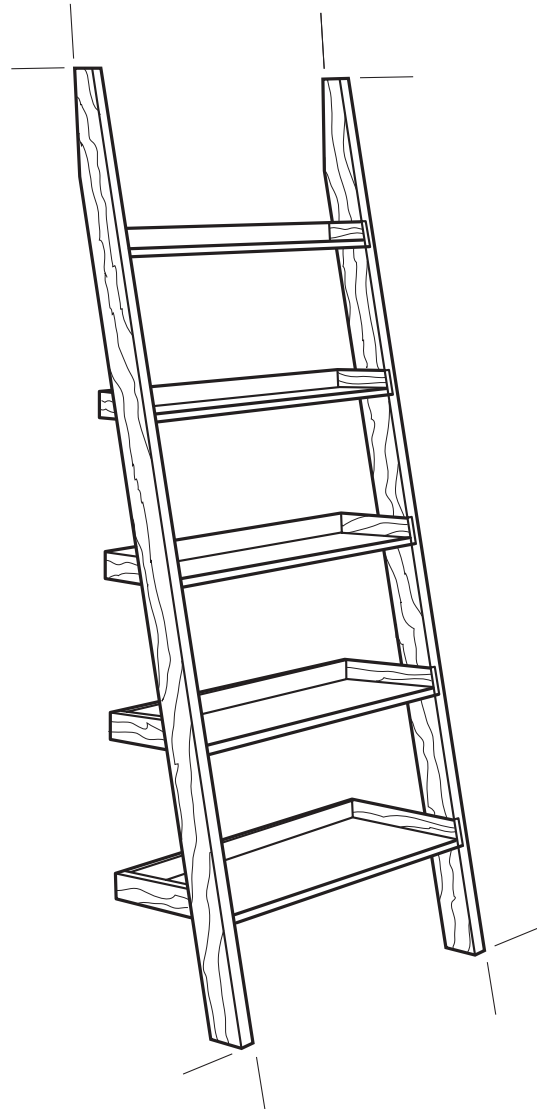
**FIG. 3**



**FIG. 4**



# Leaning Tower Of Shelves



This stylish but sturdy shelf unit will neatly hold your personal things—and you can build it in a day!

It may look lightweight and easy to topple, but don't be fooled. This shelf tower is a real workhorse. Whether you make it for holding your books or for showcasing family treasures, the basic construction is the same, and its open design won't overpower any room. All the materials can be purchased in home centers or lumberyards. The only special tools you'll need are a power miter box for crisp angle cuts and an air-powered brad nailer (or a hammer and finish nails could substitute) for quick assembly and almost invisible joints. And you'll have to rustle up an old clothes iron for applying oak edge-banding material. Once you've gathered the materials, you can build the shelf unit in an afternoon.

In this intermediate-level project, you'll gain experience in laying out and making angle cuts, fastening and finishing edge veneer, assembling a piece with several clamps, and working with an air nailer. And after you build it, you'll learn more about applying stains and finishes to enhance the wood's natural beauty and ensure that it's well protected.

## TOOLS REQUIRED

### Hand Tools

- Veneer edge trimmer
- Sanding block
- Clamps

### Power Tools

- Table saw
- Jigsaw
- Miter saw
- Orbital sander
- Air-powered brad nailer (or hammer and nails)
- Clothes iron

### Miscellaneous

- Safety glasses
- Framing square
- 120-, 150- and 220-grit sandpaper
- Clean, lint-free cloths
- Respirator
- Gloves for finishing
- Mineral spirits (for oil-based finishes)
- Water-filled metal container with tight-fitting lid
- Minwax® Wood Finish™ Stain Brush or other good quality, natural bristle brush (for oil-based stains and finishes)
- Minwax® Polycrylic® Brush or other good quality, synthetic bristle brush (for water-based stains and finishes)
- Minwax® Stainable Wood Filler
- Carpenter's glue

## SHOPPING LIST

Item	Quantity
3/4" oak plywood	1/2 sheet (4' x 4')
1" x 3" x 8' oak boards	3
1" x 4" x 8' oak boards	4
7/8" oak iron-on veneer	1 package (25')
1-1/4" finish brads	1 small box
Foot pads (3/4" round, self-adhesive, non-skid pads)	1 package

Recommended Wood – Oak

Alternate Wood – Cherry or maple

We built our unit with red oak and oak veneer plywood, but the beauty of this project is that any wood species will work. One note when buying boards: Use a tape measure to check the “standard” dimensions of 1" x 3" and 1" x 4" boards. With hardwoods, they sometimes vary in width and thickness. Also check the two full-length 1" x 4" boards you plan to use as the uprights to be sure they're straight, with no warps or twists. And always examine the ends, edges and surfaces for blemishes or rough areas that won't easily sand out.

## WOOD FINISHING PRODUCTS

### Recommended Finish

Prep: Minwax® Pre-Stain Wood Conditioner (if using soft or porous wood)

Stain: Minwax® Wood Finish™; for a unique, rich color, make a 50/50 mix of Wood Finish™ English Chestnut and Wood Finish™ Sedona Red (or choose from 20 Minwax® Wood Finish™ colors)

Finish: Minwax® Wipe-On Poly Satin

### Alternate Finish

Prep: Minwax® Water-Based Pre-Stain Wood Conditioner

Stain: Minwax® Water-Based Wood Stain Island Water (or a Minwax® Water-Based Wood Stain of your choice, available in 6 wood tones, a White Wash Pickling Stain, 60 custom-mixed colors, and 8 bold Accents™ colors)

Finish: Minwax® Polycrylic® Protective Finish Satin

## CUTTING LIST

Key	Pcs.	Size & Description
A	1	3/4" x 3-3/8" x 30-1/2" oak plywood (shelf base)
B	1	3/4" x 5-3/4" x 30-1/2" oak plywood (shelf base)
C	1	3/4" x 8-3/16" x 30-1/2" oak plywood (shelf base)
D	1	3/4" x 10-5/8" x 30-1/2" oak plywood (shelf base)
E	1	3/4" x 13" x 30-1/2" oak plywood (shelf base)
F	2	3/4" x 2-1/2" x 4-3/8" oak (shelf A sides; front end only cut at 10 degrees)
G	2	3/4" x 2-1/2" x 6-3/4" oak (shelf B sides; front end only cut at 10 degrees)
H	2	3/4" x 2-1/2" x 9-3/16" oak (shelf C sides; front end only cut at 10 degrees)
I	2	3/4" x 2-1/2" x 11-5/8" oak (shelf D sides; front end only cut at 10 degrees)
J	2	3/4" x 2-1/2" x 14" oak (shelf E sides; front end only cut at 10 degrees)
K	5	3/4" x 2-1/2" x 30-1/2" oak (shelf backs for A–E)
L	2	3/4" x 3-1/2" x 14-1/2" oak shelf cleats (cut both ends with 10-degree angles)
M	8	3/4" x 3-1/2" x 11-3/4" oak shelf cleats (cut both ends with 10-degree angles)
N	2	3/4" x 3-1/2" x 10" oak shelf cleats (cut both ends with 10-degree angles)
O	2	3/4" x 3-1/2" x 84" oak uprights (cut both ends with 10-degree angles)

## BEFORE YOU BEGIN

Good craftsmanship begins and ends with good work habits, so make the following steps part of your routine workshop practice. If you have any doubts or questions about how to proceed with a project, always discuss them with your shop instructor.

- Carefully and fully review plans and instructions before putting a tool to the project lumber.
- Work sensibly and safely. Wear safety goggles when doing work that creates flying chips and sawdust; wear the appropriate respirator whenever making sawdust or working with thinners or other solvents.
- At the end of every work session, clean up your shop area and put away all portable tools.

## CUTTING AND ASSEMBLY PROCEDURE

1. Use a table saw to cut the plywood shelves (A, B, C, D, E) from the 3/4" plywood. Note that there are five different shelf depths.
2. Clamp each shelf with the best edge facing up. Sand it lightly with 150-grit paper wrapped around a sanding block. Preheat a clothes iron to the "cotton" setting and run it over the top of the edge-banding veneer, positioning the veneer so it extends beyond all the plywood edges (Fig. 2). Immediately after adhering it to the plywood, run a smooth object, such as a chisel handle, over the tape. Let each shelf edge cool for a minute before trimming and sanding the edges.
3. Cut the 1x4 uprights (O) to the length shown in the CUTTING LIST, using a power miter saw to make the angled cuts on the ends. Use a jigsaw to taper the tops of the uprights according to the dimensions shown in Fig. 1.
4. Use the miter saw to cut the shelf sides (F, G, H, I, J) to length. Leave the saw at the 10-degree setting in order to cut the angled front ends. Then return the saw to the right-angle setting and cut the sides to length. Next, cut the shelf backs (K) to length.
5. Set the saw back to the 10-degree setting and cut the cleats (L, M, N) to length. **Note:** Leave the top cleats long and cut them to exact fit during assembly. To speed finishing, use an orbital sander with 120- and 150-grit sandpaper to sand all the pieces before assembly.
6. To begin assembly, lay out both uprights and all cleats to ensure that the angles are correct so the shelves will be level when the unit leans against a wall. Then glue and nail the first cleat flush with the base of each upright, using five or six 1-1/4" brads on each cleat. Work your way up using spacers made from a 1x3 (Fig. 3). Make sure the spacer is the exact width as the shelf sides. Set the assembled uprights aside to dry.
7. For shelf assembly, first glue and nail on the shelf backs. Next, apply the sides with glue and nails.

## FINAL ASSEMBLY

8. For final assembly, clamp the shelves to one upright as shown in Fig. 4. Apply glue to the ends of the shelves, position the second upright on top flush with the front edges of the shelves, then sink four 1-1/4" brads into each shelf from the upright side. Carefully turn the unit over and repeat the process to attach the second upright. Work quickly so

the glue doesn't set. Lift the ladder shelf and place it upright against a wall. Check it with a framing square and flex it if necessary to square it up and to make sure that the uprights rest flat against the floor and wall (assuming your floor is level). Attach and tighten three bar clamps across the unit, aligned with the top, middle and bottom shelves, until the glue dries.

9. The shelf is highly stable as designed, but once you've stained and finished it, you can add self-adhesive foam gripping pads to the bottom of the uprights. You can also fasten the top of the uprights to the wall using small angle brackets and plastic screw anchors.

## STAINING AND FINISHING

**Woodworker's Tip:** *Though you may be tempted to cut short your sanding, preparation and application time, don't do it. These tasks are very important steps in obtaining a high-quality finish. Remember, it is the finish, just as much as the fit and smoothness of the parts that will have great bearing on how people judge your craftsmanship. To ensure an excellent result, follow the steps listed in this section and also the instructions the finish manufacturer puts on its products.*

### FINISHING TIPS

- Test the stains and finishes you are planning to use on scraps of wood. On the back of the scrap, mark the stain/finish combination and the type of wood. Allow all samples to dry thoroughly before making your final finish selection. Save your samples for quick reference on future projects.
  - All stains and finishes must be allowed to dry thoroughly between coats. Remember that drying times can vary due to humidity and other climatic conditions.
  - If you have some leftover stain or finish, wipe the can rim so that stain or finish in the rim won't dry out and prevent the lid from forming a tight seal.
  - Brushes used for oil-based finishes must be cleaned with mineral spirits; for water-based products, such as Minwax® Water-Based Wood Stains or Minwax® Polycrylic® Protective Finish, clean brushes with warm water and soap.
10. Sand the shelf units with 150-grit paper, then move up to 220-grit to complete the pre-finish smoothing. Use an orbital sander to remove any marks or scratches, then lightly sand with-the-grain strokes by hand. Dust off the piece and wipe it carefully with a clean, lint-free cloth lightly dampened with mineral spirits.
  11. Do the staining in two steps, starting on the interior surfaces and then moving to the exterior surfaces.

**NOTE:** If you choose a softwood, such as pine, or a porous hardwood, like maple, you'll need to prepare it for staining with a coat of Minwax® Pre-Stain Wood Conditioner or Minwax® Water-Based Pre-Stain Wood Conditioner if you're using a water-based stain. Applying the conditioner will help to ensure even absorption of stain and prevent blotchiness that can occur with some soft or porous woods. Following the directions on the can, simply brush the conditioner over all the wood and allow it to penetrate for 5 to 15 minutes. Then remove excess conditioner with a clean, dry cloth.



### Recommended Finish

For this project, we've chosen a 50/50 mix of Wood Finish™ English Chestnut and Wood Finish™ Sedona Red for a unique, rich color. Mixing is a fun way to experiment with tones and colors. It allows you to creatively express your own personal taste and style, and is often a technique that decorators and professional contractors use.

**12.** Apply the Minwax® Wood Finish™ you've chosen to the interior surfaces using a good quality, natural bristle brush or a clean, lint-free cloth. The brush will help you get the stain into the many inside corners and other tight spots. Allow the Wood Finish™ to set for about 5 to 15 minutes, then wipe off any excess. Repeat for the exterior surfaces. To achieve a deeper color, you may apply a second coat after 4 to 6 hours, repeating the application directions for the first coat. Allow the stain to dry for 24 hours before applying the protective clear finish.

**13.** Apply Minwax® Wipe-On Poly following the directions on the can. Shake the can thoroughly. Apply a liberal amount of Wipe-On Poly to a clean, soft, lint-free cloth, and rub into the wood. Allow the first coat to dry overnight.

**14.** The following day, sand all surfaces very lightly with 220-grit or finer sandpaper or very fine (000) steel wool using with-the-grain strokes. Thoroughly wipe off all surfaces with a clean, soft cloth. Apply a second coat of Minwax® Wipe-On Poly and set the piece aside to dry overnight.

**15.** The next day, sand all surfaces lightly with 220-grit or finer sandpaper or very fine (000) steel wool. Thoroughly wipe off the piece with a soft cloth and apply a third and final coat of Wipe-On Poly. Allow the finish to cure for several days and then you'll be ready to start stacking the shelves.

### Alternate Finish

**16.** Before applying Minwax® Water-Based Wood Stain to a hardwood or softwood, apply Minwax® Water-Based Pre-Stain Wood Conditioner following the directions on the can. After 1 to 5 minutes, wipe off all excess conditioner using a clean, lint-free cloth. Wait 15 to 30 minutes, then use 220-grit or finer sandpaper to sand off any "whiskers" raised by the conditioner. Dust off the piece and wipe it down with a soft, lint-free cloth. Proceed to staining within 2 hours.

**17.** Do the staining in two steps, starting on the interior surfaces and then moving to the exterior surfaces. Apply the Minwax® Water-Based Wood Stain you've chosen to the interior surfaces using either a nylon/polyester brush or a soft cloth. Allow stain to penetrate no longer than 3 minutes. While stain is still wet, wipe off all excess with a clean cloth that's been lightly dampened with stain. To achieve a deeper color, you may apply a second coat after 4 to 6 hours, repeating the application directions for the first coat. Allow the piece to dry overnight before applying the protective clear finish.

**Woodworker's Tip:** Minwax® Water-Based Wood Stain is available in 6 wood tones, a White Wash Pickling Stain, 60 custom-mixed colors, and 8 bold Accents™ colors. This means that you are not limited to just traditional wood colors (pine, oak, walnut, etc.). Instead, you can pick and apply a color to complement the décor of the room in which the shelves will be.

*For this reason, make sure you look over all of the Minwax® color charts before making your final selection.*

**18.** After allowing the piece to dry overnight, apply Minwax® Polycrylic® Protective Finish following the directions on the can. Stir the can contents thoroughly before starting and periodically repeat the stirring during your work session.

**19.** Working a small area at a time to maintain a wet edge, apply the first coat. Work quickly and make the final strokes in each newly finished section using with-the-grain brushstrokes.

**20.** Allow the finish to dry a minimum of 2 hours. Then sand lightly with 220-grit or finer sandpaper wrapped around a soft backup block. Thoroughly dust off and wipe all surfaces with a cloth lightly dampened with water.

**21.** Repeat steps 17 and 18 to apply the second and final coat.

### PRODUCT SAFETY

For your safety and the safety of those you work with, always read the safety warnings, which manufacturers print on their labels, and follow them to the letter. Typical safety advice and instructions will contain information such as the following:

**WARNING!** Removal of old paint by sanding, scraping or other means may generate dust or fumes that contain lead. Exposure to lead dust or fumes may cause brain damage or other adverse health effects, especially in children or pregnant women. Controlling exposure to lead or other hazardous substances requires the use of proper protective equipment, such as properly fitted respirator (NIOSH approved) and proper containment and cleanup. For more information, call the National Lead Information Center at 1-800-424-LEAD (in US) or contact your local health authority.

### When using oil-based wood finishing products:

**CAUTIONS: CONTAINS ALIPHATIC HYDROCARBONS. Contents are COMBUSTIBLE.** Keep away from heat and open flame. **VAPOR HARMFUL.** Use only with adequate ventilation. To avoid overexposure, open windows and doors or use other means to ensure fresh air entry during application and drying. If you experience eye watering, headaches, or dizziness, increase fresh air, or wear respiratory protection (NIOSH approved), or leave the area. Avoid contact with eyes and skin. Wash hands after using. Keep container closed when not in use. Do not transfer contents to other containers for storage.

**FIRST AID:** In case of eye contact, flush thoroughly with large amounts of water for 15 minutes and get medical attention. For skin contact, wash thoroughly with soap and water. In case of respiratory difficulty, provide fresh air and call physician. If swallowed, do not induce vomiting. Call Poison Control Center, hospital emergency room, or physician immediately.

**NOTICE:** Reports have associated repeated and prolonged occupational exposure to solvents with permanent brain and nervous system damage. Intentional misuse by deliberately concentrating and inhaling contents may be harmful or fatal.

**WARNING:** This product contains a chemical known to the State of California to cause cancer and birth defects or other reproductive harm.

**DO NOT TAKE INTERNALLY. KEEP OUT OF REACH OF CHILDREN.**

**When using water-based wood finishing products:**

**CAUTIONS:** Use Only With Adequate Ventilation. To avoid overexposure, open windows and doors or use other means to ensure fresh air entry during application and drying. If you experience eye watering, headaches, or dizziness, increase fresh air, or wear respiratory protection (NIOSH approved), or leave the area. Avoid contact with eyes and skin. Wash hands after using. Keep container closed when not in use. Do not transfer contents to other containers for storage.

**FIRST AID:** In case of eye contact, flush thoroughly with large amounts of water. Get medical attention if irritation persists. If swallowed, get medical attention immediately.

**WARNING:** Contains Alkyl propanols, ethylene glycol, n-methyl pyrrolidone. **VAPOR HARMFUL.** Use only with adequate ventilation. To avoid overexposure, open windows and doors or use other means to ensure fresh air entry during application and drying. If you experience eye watering, headaches, or dizziness, increase fresh air, or wear respiratory protection (NIOSH approved), or leave the area. Avoid contact with eyes and skin. Wash hands after using. Keep container closed when not in use. Do not transfer contents to other containers for storage.

**DO NOT TAKE INTERNALLY.**

**FIRST AID:** In case of eye contact, flush thoroughly with large amounts of water for 15 minutes and get medical attention. For skin contact, wash thoroughly with soap and water. In case of respiratory difficulty, provide fresh air and call physician. If swallowed, call Poison Control Center, hospital emergency room, or physician immediately.

**DELAYED EFFECTS FROM LONG-TERM OVEREXPOSURE.**

Contains solvents which can cause permanent brain and nervous system damage. Intentional misuse by deliberately concentrating and inhaling contents may be harmful or fatal.

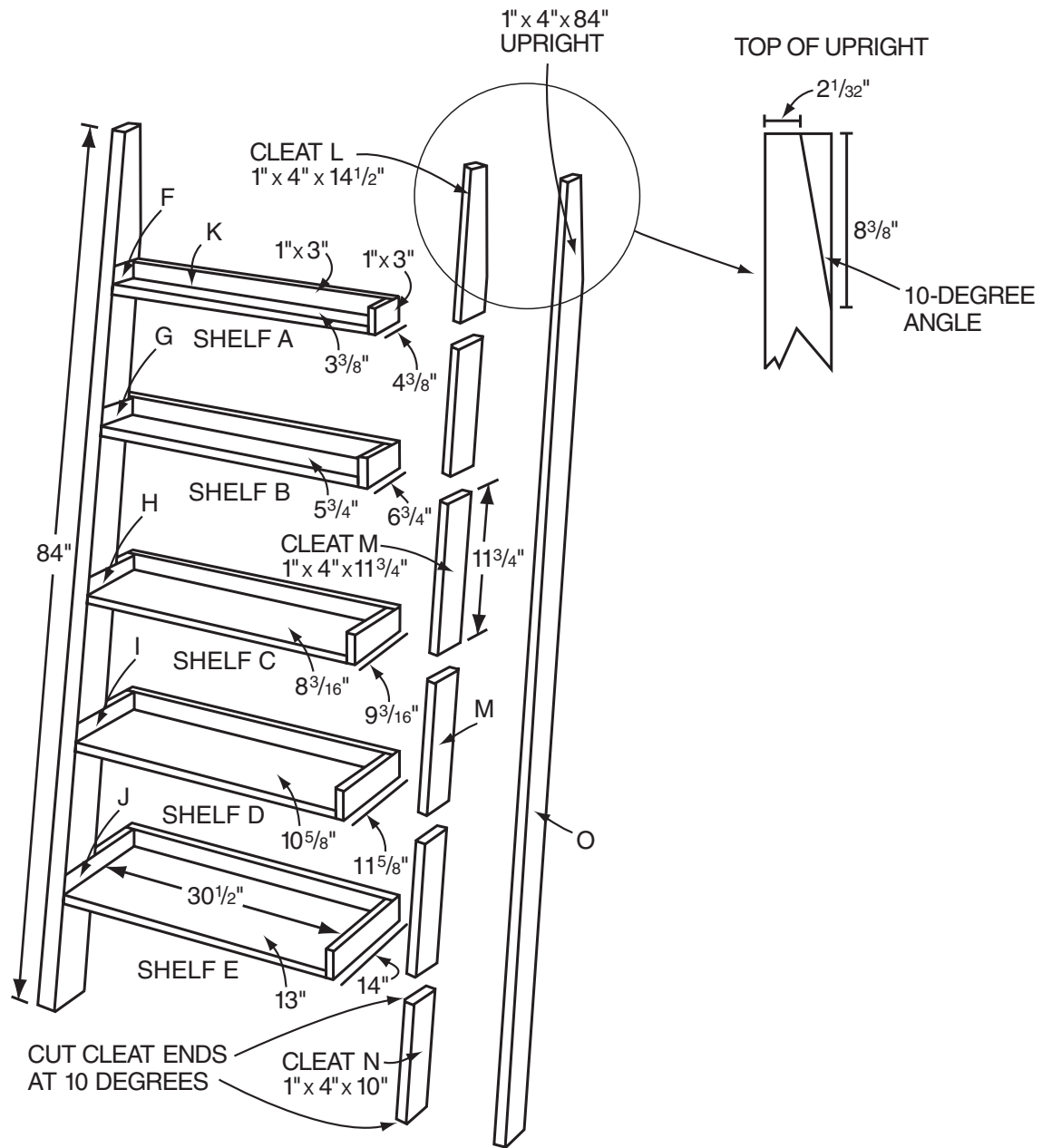
**WARNING:** This product contains a chemical known to the State of California to cause cancer and birth defects or other reproductive harm.

**KEEP OUT OF REACH OF CHILDREN.**

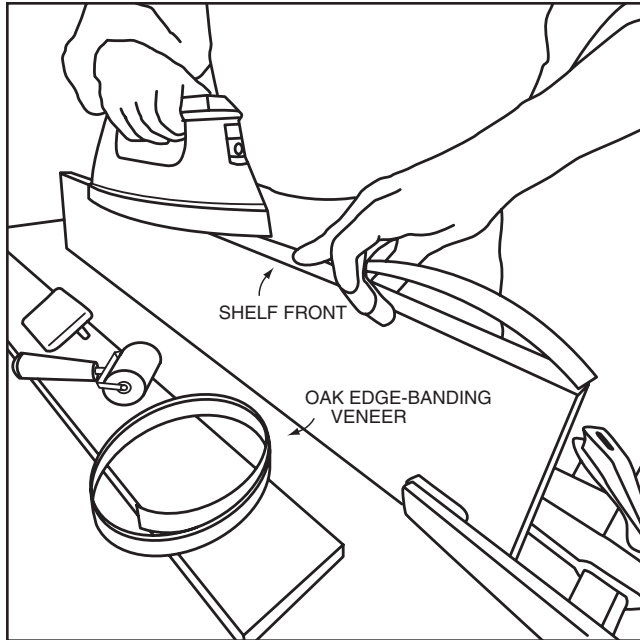
**SAFE DISPOSAL OF RAGS AND WASTE.**

Please be mindful of the safe way to dispose of rags and other waste. Rags, steel wool and other waste products soaked with oil finishes or solvents may spontaneously catch fire if improperly discarded. Place rags, steel wool and other waste immediately after use in a water-filled metal container. Tightly seal and dispose of the waste materials in accordance with local trash removal regulations. Be sure to keep the waste out of reach of children.

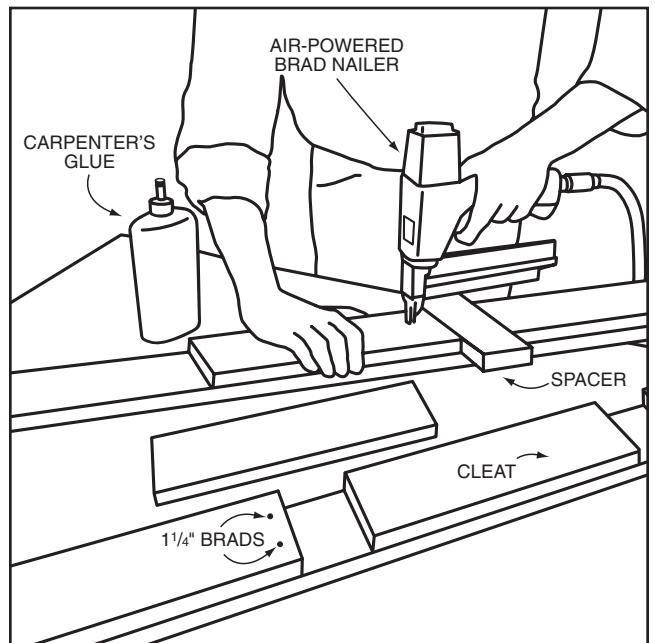
**FIG 1. SHELVES DETAILS**



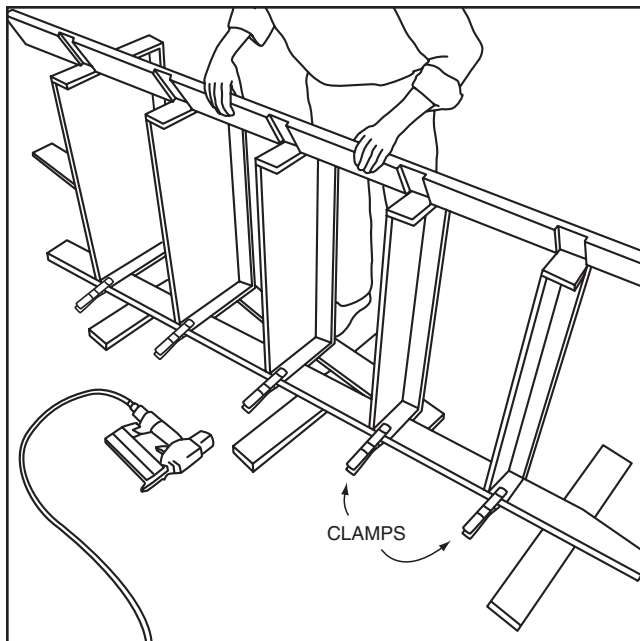
**FIG 2. APPLYING THE OAK EDGE-BANDING VENEER**



**FIG 3. GLUE AND NAIL CLEATS**

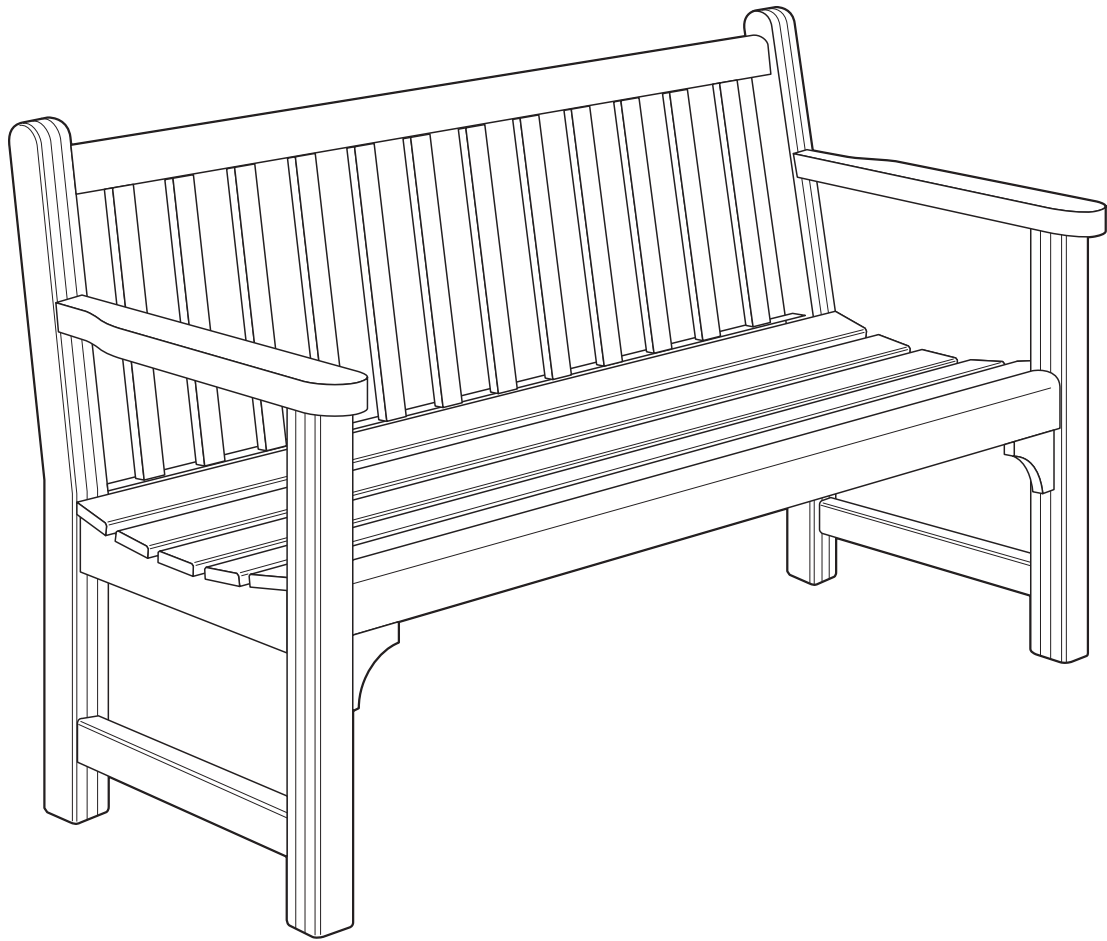


**FIG 4. FINAL ASSEMBLY**



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# Garden Bench



Traditionally made of teak, these benches have long graced English parks and gardens, aging gracefully through years of use and weather. This version is made of cedar, but you could also use white oak, redwood or cypress. Whatever wood you use, it's a good idea to finish your bench with a waterproofer. This project uses traditional mortise-and-tenon construction for extra durability. Normally, you might avoid this type of joinery in favor of easier methods, such as dowels or even drywall screws, but the superior strength of a mortise-and-tenon joint will ensure long-term sturdiness and is consistent with the bench's classic design. This project is perfect for learning this joint because cedar compresses easily, so it will fit together even if it's not perfectly cut.

Other skills you will learn are face-gluing and making dowelled joints. Face-gluing the boards that make up this bench's legs isn't difficult; just follow the instructions. Dowelling requires care and patience more than anything else. And after it's assembled, you'll learn more about applying and using finishes to enhance the wood's natural beauty and ensure that it's well-protected.

## TOOLS REQUIRED

### Hand Tools

- Pipe clamps
- Dowelling jig
- Square
- Wood files
- Sanding block
- Chisels
- Mallet
- 3/8" plug cutter
- Paintbrush and paint tray

### Power Tools

- Table saw or radial arm saw
- Router and a straight bit and 3/16" and 3/4" rounding-over bits
- Portable jigsaw or band saw
- Electric drill or drill press
- Electric sander
- Jointer (optional)

### Miscellaneous

- Tape measure
- Pencil
- Safety glasses
- 120-, 150- and 220-grit sandpaper
- Clean, lint-free cloths
- Respirator
- Gloves for finishing
- Mineral spirits (for oil-based wood protector)
- Water-filled metal container with tight-fitting lid (for oil-based wood protector)
- Minwax® Stainable Wood Filler
- Waterproof glue (resorcinol)

## SHOPPING LIST

**NOTE:** Instead of cedar, you can also use white oak, redwood or cypress, all of which are naturally rot-resistant. Whichever wood you choose, be sure to select a mostly knot-free grade.

Item	Quantity
2" x 4" x 8' clear cedar	4
1" x 6" x 8' clear cedar	6
#8 3" galvanized deck screws	16
#8 2" galvanized deck screws	4
6d galvanized finish nails	20
5/16" x 1-1/2" dowel pins	48
1/4" birch dowel rod	18"

## CUTTING LIST

Key	Part	Pcs.	Dimensions
A	back legs	2	2-1/4" x 5-1/4" x 3 3/4"
B	front legs	2	2-1/4" x 2-1/4" x 2 3/4"
C	arms	2	1-1/2" x 3-1/2" x 21"
D	back seat rail	1	1-1/2" x 3" x 58-1/2"
E	front seat rail	1	1-1/2" x 3" x 58-1/2"
F	side seat rails	2	1-1/2" x 3" x 16-1/2"
G	seat supports	2	1-1/2" x 3" x 16-1/4"
H	top rail	1	1-1/2" x 2-1/2" x 58-1/2"
J	leg braces	2	1-1/2" x 2" x 16-1/2"
K	front rail braces	2	3/4" x 3-1/2" x 3-1/2"
L	seat slats	5	3/4" x 2-1/2" x 60"
M	back slats	12	3/4" x 1-1/2" x 14-1/2"
N	tenon pins	8	1/4" - dia. x 2" birch dowels

## WOOD FINISHING PRODUCTS

### Recommended Finish

Thompson's® WaterSeal® Advanced Natural Wood Protector

### Alternate Finish

Thompson's® WaterSeal® Waterproofer PLUS Tinted Wood Protector, which is available in five colors: Honey Gold, Natural Cedar, Rustic Red, Nutmeg Brown and Coastal Gray



## BEFORE YOU BEGIN

Good craftsmanship begins and ends with good work habits, so make the following steps part of your routine workshop practice. If you have any doubts or questions about how to proceed with a project, always discuss them with your instructor.

- Carefully and fully review plans and instructions before putting a tool to the project lumber.
- Work sensibly and safely. Wear safety goggles and the appropriate respirator whenever making sawdust or working with thinners or other solvents.
- At the end of every work session, clean up your shop area and put away all portable tools.

## CUTTING AND ASSEMBLY PROCEDURE

**Woodworker's Tip:** *To have stock thick enough for the legs of the bench, you'll probably have to laminate three thicknesses of 3/4" material. (The Shopping List assumes this.) Cut the boards an inch or two longer than you need, and bond them together with waterproof glue (Fig. 2). When you're gluing, line up the edges of the boards to minimize work later. Don't use regular carpenter's glue for an outdoor project like this. It won't stand up to the weather. You can use a resorcinol glue, which comes in two parts, a liquid and a powder. This is an excellent glue that should be applied at room temperature or above.*

### Building the Legs and Frame

1. From a triple lamination of 1x6s, cut both front legs (B) to the dimensions shown on the Cutting List.
2. From another triple lamination, rip each back leg (A) to a width of 5-1/4".
3. Lay out the angle cuts on the back legs according to the dimensions shown in Fig. 3. Cut out the legs, using either a band saw, a jigsaw with a long blade, or even a handsaw to cut the angled part of the back legs. Fig. 3 also shows the dimensions for rounding the tops. Use a jigsaw for these cuts.
4. Cut out the seat supports (G) and side seat rails (F) according to the dimensions shown in Fig. 4. Cut out the arms (C) according to the dimensions shown in Fig. 5. Cut out the front rail braces (K) according to the dimensions shown in Fig. 1.

### Cutting the Mortises and Tenons

5. Lay out and cut tenons on the ends of the rails (D, E, F, and H) and leg braces (J) according to the dimensions shown in Fig. 1. You can cut these entirely with a handsaw, but you will get more accurate results by using a router to remove the waste from the "cheeks" (flat sides) of the tenon. Use the router with its fence attachment, and set it to make a 1-1/2"- wide x 1/2"- deep cut.
6. Cut the tenons to width with a small handsaw. Cut them a little oversize, then file them later to fit tightly into the mortises.

7. Pencil in the outlines of the mortises on the legs, drill 5/8" holes inside the outlines to clear out most of the waste, and then chisel out and square off the sides and ends. A drill press or dowelling jig (shown in Fig. 6) will ensure that your holes are vertical. Otherwise, you can hold a square against the wood to guide the drill.

8. Test the fit of each tenon in its corresponding mortise, and file the tenon or chisel the mortise to adjust the fit. The tenon should be snug and hard to push in by hand, but easily tapped in (not pounded) with a wood or rubber mallet.

### Assembling the Bench

9. Drill holes for the plugs and clearance holes for the screws in the arms (C), front and back seat rails (D and E), front rail braces (K), and back legs (A). Drill dowel holes for the back slats (M) using the dowelling jig.

10. Using a router and 3/16" rounding-over bit, round the edges of the legs (A and B), the leg braces (J), the bottom edges of side seat rails (F), and the exposed edges of the front rail braces (K). Also round the edges of the back slats (M), the top edges of the seat slats (L) including the ends, the bottom edges of the top rail (H), the top and bottom edges of the back seat rail (D), and all edges of the front seat rail (E) except the front top edge. Rout slowly to avoid splintering as you cut. Finish-sand all pieces with 220-grit sandpaper.

**Woodworker's Tip:** *When routing cedar, you may have trouble with the wood chipping out along the length of a cut, especially when you're rounding over the edges. You can reduce tear-out by routing slowly, using a sharp bit and cutting in a few shallow passes until you reach the desired depth.*

11. Assemble the end pieces (A, B, F, and J). Use waterproof glue and clamp the joints tightly until they are dry. Don't attach the arms yet.
12. The mortises in the legs for the back and front rails will be blocked at the bottom by the tenons of the side rail you just glued. Chisel this little piece of tenon out, along with any squeezed-out glue.
13. Glue and insert the 5/16" dowel pins into the back slats (M). Assemble the back by gluing the slats into one rail first. Test fit the other rail, then glue it on.

**NOTE:** When assembling the back of the bench all slats should be fitted to the bottom rail before the top rail is put on.

14. Using a router with a 3/4" rounding-over bit, round over the top edges of the top rail (H) and the front top edge of the front rail (E).
15. Finish-sand the remaining rails, the arms (C), the seat supports (G), and the front rail braces (K).
16. Glue and clamp together the rails, the back assembly and the end assemblies. Drill pilot holes, then screw on the seat supports (G) and braces (K).

**Woodworker's Tip:** *Your clamps might not be long enough for the final assembly of the bench. If you have some shorter pipe clamps, you can hook two together or buy a threaded plumbing coupler to screw the two pipes together. Another approach is to extend the reach of a single clamp with a long piece of plywood. Screw a block of wood onto it at one end to bear against the bench, and cut a hole in the other end of the plywood to house the "foot" end of the clamp (the one without the handle).*

17. After drilling pilot holes, nail on the seat slats (E) and set the nail heads below the surface. Drill the holes for the tenon pins (N). Glue and tap them in flush with the surface. Wipe off excess glue. Attach the arms. Cut cedar plugs with a 3/8" plug cutter and glue them over the screws attaching the arms. Sand the plugs flush with the surface.

18. Give your bench a final sanding before applying the protective finish.

## PROTECTING YOUR PROJECT

Any type of wood that's used outdoors needs protection from water damage. There are a variety of protective coatings available, including clear and tinted wood protectors and semi-transparent and solid stains. Each of these finishes has a different look and maintenance requirement.

We've chosen Thompson's® WaterSeal® Advanced Natural Wood Protector to provide complete protection for your project. It not only prevents water damage, but the coating also resists mildew and U.V. (ultraviolet radiation in sunlight) damage, and it exceeds industry standards for waterproofing on wood. This product is also available in five beautiful sheer wood tones.

### FINISHING TIPS

- Coverage: The approximate coverage of Thompson's® WaterSeal® Advanced Wood Protector on cedar is 200 square feet per gallon. For the alternate finishes we will suggest later, the approximate coverage of Clear Wood Protector is 300 to 400 square feet per gallon, and Tinted Wood Protector is 250 to 300 square feet per gallon.

### Recommended Finish

For the best protection against sun and water damage, use a Thompson's® WaterSeal® Advanced Wood Protector (in Natural or Tinted).

19. Before applying Thompson's® WaterSeal® Advanced Wood Protector, the wood surface must be free of all dirt, wood dust and contaminants. Read and follow the directions found on the back of the can. Then do a trial test before full application. The surface may darken slightly with application and color appearance is different when the wood is fully dry.

**Woodworker's Tip:** *Cedar and redwood have natural characteristics that require special treatment to enhance beauty and waterproofing performance. If you're using weathered wood that needs cleaning, the wood may require a brightener to neutralize it and restore its color after using a wash or cleaner. Wait 48 hours after application of the brightener to apply this product.*

*If you only use water for cleaning, wait at least 2 hours before applying Thompson's® WaterSeal® Advanced Wood Protector. Allow longer drying time (4 hours) on overcast or cooler days below 60° F. It isn't necessary for the surface to dry completely before applying this product.*

20. When applying this product, do not use it with other waterproofing products, as variations in the final appearance of the wood may result. Do not thin. To ensure good penetration, do not apply in direct sunlight or on hot days. Be sure that both surface and air temperature are above 50° F and below 95° F during application and for 48 hours after application. If you're working outside do not apply product if rain is forecasted within 24 hours of application.

21. Shake or stir contents for a minimum of 2 minutes before use. Intermix all containers (of the same color) to be used to assure color uniformity.

22. Apply using a paint pad or brush. Do not apply using a roller. For small projects, a brush is the preferred applicator.

23. Apply only one thin, even coat. DO NOT APPLY A SECOND COAT. A heavier, or additional coat will not improve performance nor appearance. Avoid puddling. Tackiness will result if over-applied. Tackiness may also occur if the overnight temperature falls below 50°F within 48 hours of application. Drying time will vary depending on wood surface and humidity. Allow a minimum of 12 hours before using the bench.

24. If using Thompson's® WaterSeal® Advanced, clean brushes and equipment with soap and water. If using oil-based waterproofer, clean brushes and equipment with mineral spirits. Dry product can be removed with mineral spirits.

### Alternate Finish

25. Before applying Thompson's® WaterSeal® Waterproofer PLUS Clear or Tinted Wood Protector, read and follow the directions found on the back of the can. Be sure that both surface and air temperature are above 50° F during application and for 48 hours after application, and if you're working outside, do not apply product if rain is forecasted within 24 hours of application.

26. The surfaces must be free of all dirt, wood dust and other contaminants. If the surface is damp or wet from cleaning or weather, allow the surface to dry thoroughly (a minimum of 48 hours) before application.

27. Cover plants and shrubs and move all objects that could come in contact with Wood Protector.

28. When you apply Clear or Tinted Wood Protector, do not mix it with other waterproofing products because variations in the final appearance of the surface being treated may result.

29. Before applying Wood Protector over the entire surface, a small trial patch is recommended to verify color.

**30.** In most applications, only one light coat is necessary. Apply with a brush, roller, applicator pad, or by dipping the piece into the product. Regardless of which application method is used, remove excess within 15 minutes by redistributing it to drier areas or wiping it off.

**31.** Use only with adequate ventilation. Oiliness and tackiness will result if over-applied or applied to wet or damp surface or if overnight temperature falls below 50° F within 48 hours of application. Excessive oiliness caused by over-application may be removed by scrubbing wood with a concentrated degreaser.

**32.** Allow at least 48 hours to dry before you hang the swing. Drying time will vary depending on the substrate, temperature and humidity.

**33.** Clean brushes and equipment with mineral spirits, then rinse with clean water.

**IMPORTANT:** Place rags, steel wool and waste immediately after use in a sealed, water-filled metal container.

**NOTE:** The length of protection will vary depending on environment. Perform the following splash test once a year to see whether reapplication is necessary. Sprinkle water on various sections of surface to be sealed. If water absorbs and darkens color of substrate within 5 seconds, the surface is porous and considered ready to be treated. If water beads up or otherwise sits on top of surface, then surface doesn't need protection at this time. For maximum protection from color change and other damage caused by the sun, reapplication is recommended every year. Vertical and horizontal surfaces will experience color changes at different rates.

#### **PRODUCT SAFETY**

For your safety and the safety of those you work with, always read the safety warnings, which manufacturers print on their labels, and follow them to the letter. Typical safety advice and instructions will contain information such as the following:

**WARNING!** Removal of old paint by sanding, scraping or other means may generate dust or fumes that contain lead. Exposure to lead dust or fumes may cause brain damage or other adverse health effects, especially in children or pregnant women. Controlling exposure to lead or other hazardous substances requires the use of proper protective equipment, such as properly fitted respirator (NIOSH approved) and proper containment and cleanup. For more information, call the National Lead Information Center at 1-800-424-LEAD (in US) or your local health authority.

Contents are **COMBUSTIBLE**. Keep away from heat and open flame.

Contains **ALIPHATIC HYDROCARBONS**.

**VAPOR HARMFUL.** Use only with adequate ventilation. To avoid over-exposure, open windows and doors or use other means to ensure fresh air entry during application and drying. If you experience eye watering, headaches, or dizziness, increase fresh air supply, or wear respiratory

protection (NIOSH/MSHATC23C or equivalent), or leave the area. Avoid contact with eyes and skin. Wash hands after using. Keep container closed when not in use. Do not transfer contents to other containers for storage.

**FIRST AID:** In case of eye contact, flush thoroughly with large amounts of water for 15 minutes and get medical attention. For skin contact, wash thoroughly with soap and water. In case of respiratory difficulty, provide fresh air and call physician. If swallowed, get medical attention immediately.

#### **DELAYED EFFECTS FROM LONG-TERM OCCUPATIONAL EXPOSURE.**

Contains solvents that can cause permanent brain and nervous system damage. Intentional misuse by deliberately concentrating and inhaling the contents can be harmful or fatal.

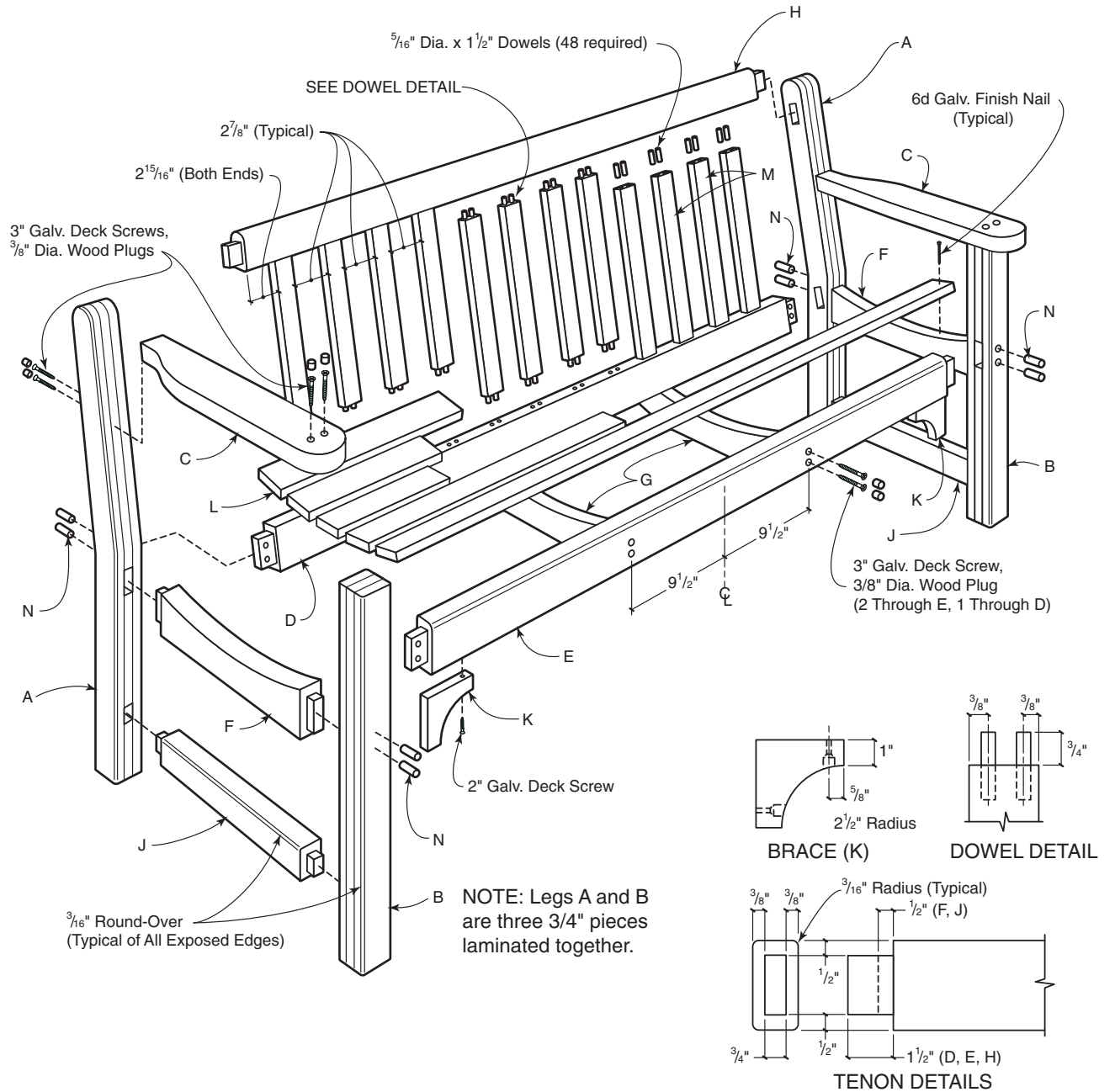
**WARNING:** This product contains chemicals known to the State of California to cause cancer and birth defects or other reproductive harm.

**DO NOT TAKE INTERNALLY. KEEP OUT OF THE REACH OF CHILDREN.**

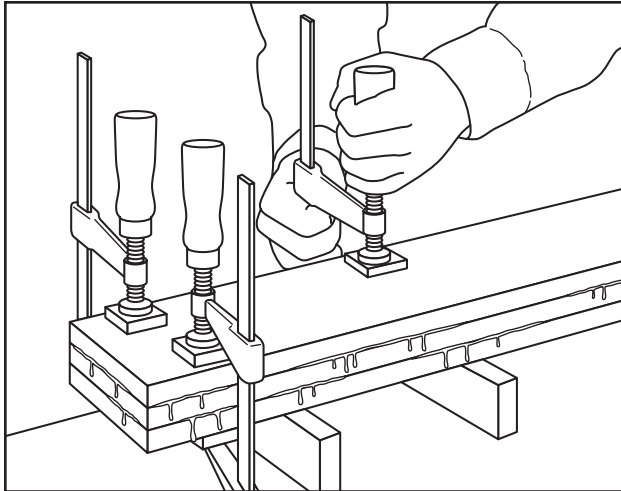
#### **SAFE DISPOSAL OF RAGS AND WASTE.**

**DANGER:** Rags, steel wool, other waste soaked with this product, and sanding residue may spontaneously catch fire if improperly discarded. Immediately place rags, steel wool, other waste soaked with this product, and sanding residue in a sealed, water-filled, metal container. Dispose of in accordance with local fire regulations.

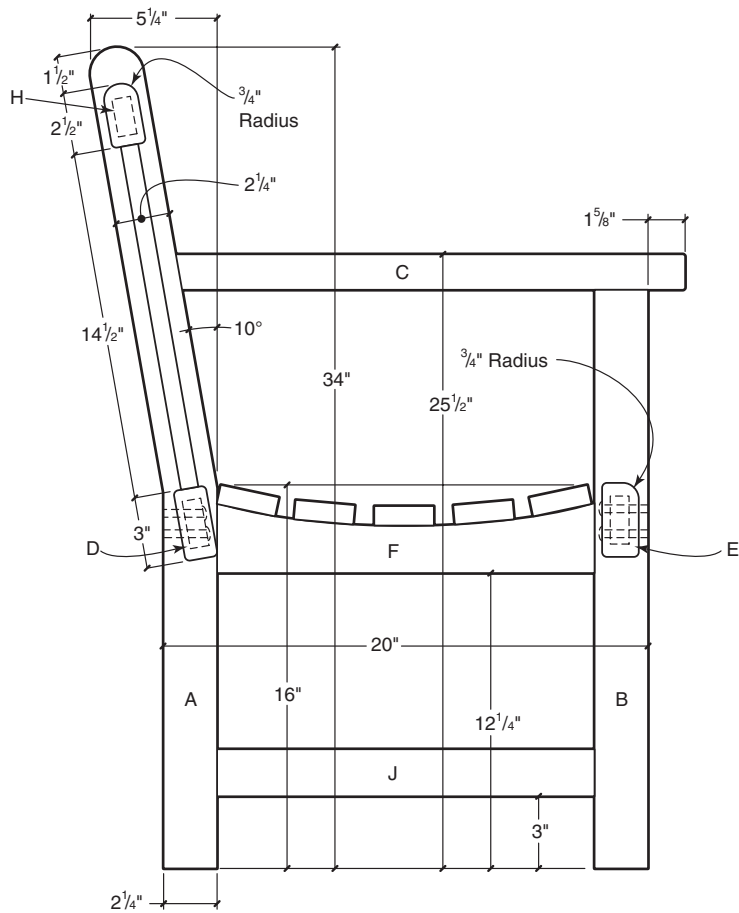
**FIG 1. BENCH DETAIL**



**FIG 2. MAKING THE BACK LEGS**

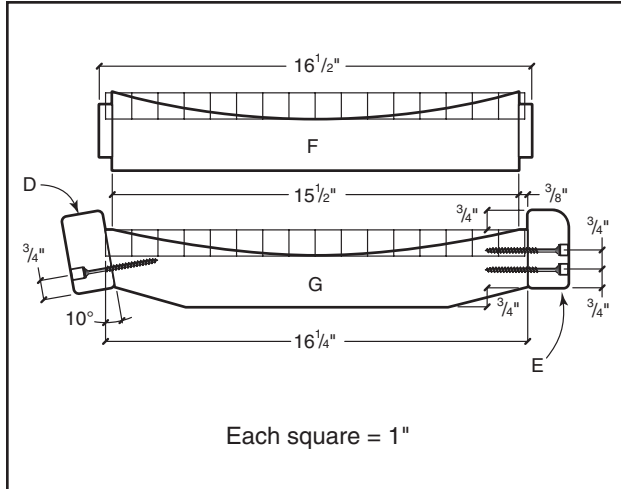


**FIG 3. SIDE SECTION VIEW**

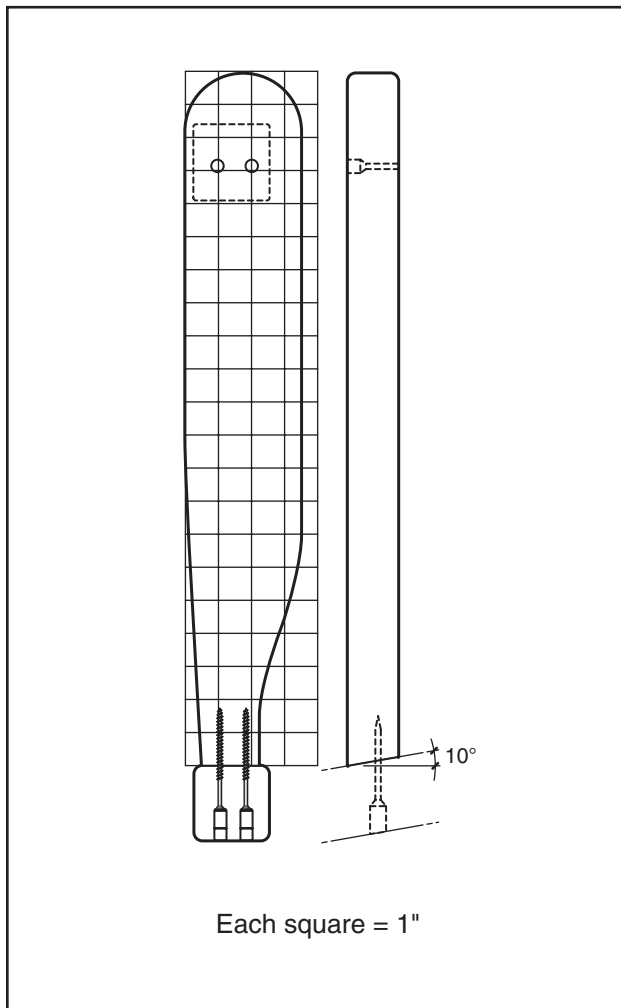


NOTE: Legs A and B are three pieces laminated together.

**FIG 4. SEAT RAIL (F) AND SUPPORT (G) DETAIL**

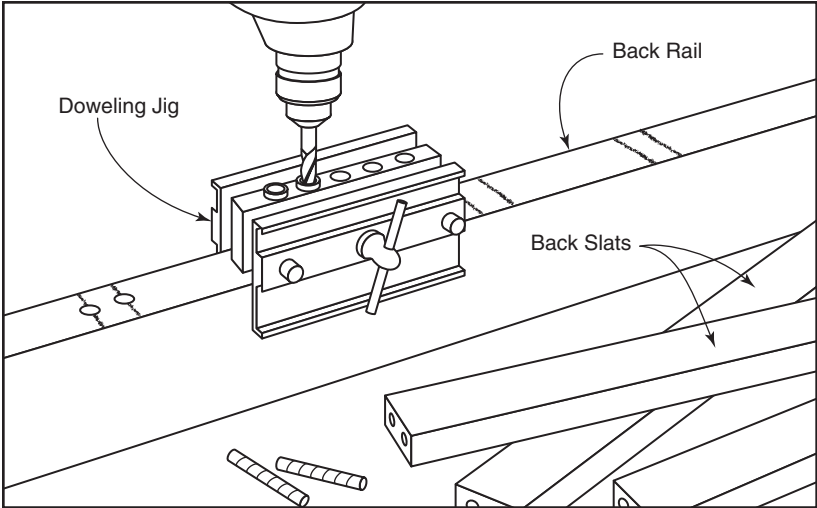


**FIG 5. ARM (C) DETAIL**





**FIG 6. DOWEL THE BACK SLATS TO THE BACK RAILS**



# Chippendale Mirror

Built from solid mahogany and ribbon stripe plywood, this framed mirror is a beautiful wall piece that is fashionable as well as functional. Stained and finished properly, it captures the Chippendale style renowned for its classic charm. It's an excellent project choice for intermediate woodworking students because it requires them to be accurate as well as patient: two qualities every polished woodworker must possess.

This project presents the opportunity not only to practice and hone basic woodworking skills, but also to learn and master such intermediate woodworking skills as measuring, laying out stock, creating and transferring a design template, cutting with a scroll saw, using stationary and portable power tools, creating and using a jig, and achieving a professional-looking finish.

## TOOLS REQUIRED:

- Pencil
- Compass and/or French curve
- Ruler (zigzag or tape)
- Combination square
- Assorted files (round and flat)
- Hammer
- Mallet
- Block plane
- Assorted clamps (C, handscrew, etc.)
- Table saw with dado head set
- Jointer
- Sanders (stationary belt, random orbit, pad)
- Router (1/2" straight cutter bit)
- Drill press
- Safety glasses
- Assorted bits

## MATERIALS REQUIRED:

See Shopping and Cutting Lists

## FINISHING PRODUCTS:

### Finish Recommended For This Project

- MINWAX® POLYSHADES® One-Step Stain & Polyurethane

### Alternate finish choices (Choose one)

- MINWAX® WOOD FINISH™
- MINWAX® Wipe-On Poly

### Miscellaneous

- MINWAX fine finishing brushes
- Clean rags
- Fine steel wool
- Paint thinner, if required
- Water-filled metal container with cover
- MINWAX™ Wood Glue
- MINWAX™ Sanding Blocks

## BEFORE YOU BEGIN

It is imperative that you select only defect-free stock for this project, since there is very little wood used and the handsome trim shape will draw attention to itself. If your local lumberyard does not stock such materials, you can order it from one of the well-established mail order houses that supply woodworking materials. Discuss this option with your instructor.

## PROCEDURE:

### I. Frame: Layout, Cutting, Assembly

**BUILDER'S TIP:** Whenever you build a piece of furniture using exotic woods, it is recommended that all individual parts be cut and installed so the surface grains "run" in the same direction. By doing so, you'll maintain the structural

*and esthetic integrity of the piece once it's assembled. This is done in this project, for example, to achieve the visual impression that the scrollwork is cut from a single piece of wood.*

1. Cut out four frame members (parts E and F; see diagram for dimensions). The easiest way to do this is to rip one 4 ft. length of stock to size. Sand the pieces smooth using 100-grit sandpaper, then plough the rabbets (1/4" deep x 3/8" wide) that will receive the mirror.
2. Trim four frame parts to exact length, with 45 degree miter cuts on each end.
3. Construct the jig for cutting the four spline grooves. Note: Make several test cuts using scrap wood to ensure accuracy of cuts.
4. When satisfied with jig, cut spline grooves on each end of frame parts E and F.

5. Using the table saw and dado head with 1/8" blade, reposition the rip fence and carefully cut the 1/4" x 1/4" grooves in parts E and F (see diagram), which will receive the scrolled pieces (Parts A, B, C and D).
6. Lay out and cut four splines (see diagram for dimensions).
7. Test assemble frame (without glue) to check for fit and square.
8. When satisfied, assemble frame using small amount of glue. Hold pieces in place with clamps positioned so that they will not interfere with the spline installation.
9. Apply small amount of glue to all surfaces of the first spline and insert into first groove. Gently tap spline into place until the shaped inside corner is flush with inside edge of rabbets. Carefully wipe away any excess glue.
10. Repeat for three remaining splines.
11. Set the clamped frame assembly aside to dry overnight.

## II. Scrollwork Pieces: Layout and Cutting

1. Create paper patterns for the four scroll pieces (parts A, B, C, D - see diagrams for design, scale and dimensions). Transfer patterns to heavy cardboard or 1/8" plywood to create the design templates. When satisfied, carefully cut out templates using a scroll saw or saber saw equipped with a fine-tooth wood cutting blade. Remember to cut the bottom corners at 45 degrees where pieces will be inserted into frame grooves.

**BUILDER'S TIP:** *Though cardboard can be easy to work with, most woodworkers prefer to make templates from thin plywood or hardboard because files and sandpaper can be used on edges to obtain perfect shape. And, they have a longer shelf life if you plan to make the pattern part of a permanent template collection.*

2. Using the templates, transfer the scroll shapes to the stock wood. Using the scroll saw and a fine-tooth blade, cut out pieces so all wood grain runs vertically.

**Reminder:** *You will need to cut two pieces each of parts C and D. Also, the templates used for parts A and B only represent one-half of each piece, so to create the complete pieces, you'll need to trace the template, flip it and trace again.*

3. Carefully sand all edges smooth, taking care not to change their shape. Next, sand surfaces smooth using the pad sander and 150-grit paper. Remember to sand with the grain to avoid cross grain scratches.

## III. Frame and Scrollwork Assembly

1. Retrieve frame. Trim any exposed spline edges flush with frame.
2. Test fit scrolled parts, making sure the frame's corner joints are tightly closed. Make final adjustments to the scroll if necessary, using a file and sandpaper.
3. When satisfied with fit, apply a small amount of glue to all mating surfaces and reassemble. Fit piece with rubberbands to hold scroll parts in place while glue dries.
4. Set assembly aside to dry overnight.

## IV. Mirror Retainer Panel

1. Lay out and cut the mirror retaining panel (see diagram for dimensions). Make certain you allow for the eight "ears" which will hold the panel and mirror in place.
2. Bore screw holes through the retaining panel's ears. Countersink screw holes for screw heads.
3. Retrieve frame/scrollwork assembly and remove rubberbands. Position retainer panel on frame assembly's back side and hold in place. Using a pencil, carefully trace the position of the panel's ears on the frame. Remove retainer panel.
4. Use a router chucked with a 1/2" diameter straight cutter to rout the eight mortises in the frame that will receive the panel ears. Prepare the router by setting the straight cutter so it projects a mere 1/8" below the shoe. Then, rest the router shoe on the frame (without cutter touching wood) and align the cutter with lines for the first mortise. Start the router and slowly feed the cutter into the wood, using the pencil lines as your guide for where to stop.

**BUILDER'S TIP:** *Make sure the frame is securely clamped to the workbench so that both hands are free to control the router and so that the piece will not shift during this critical step.*

5. Repeat for seven remaining mortises.
6. Test panel for fit. Make any necessary adjustments to mortises and/or ears using a chisel or razor knife and sandpaper.

## V. Final Assembly

1. Lay frame/scrollwork assembly flat, back side up.
2. Insert mirror. Position mirror retainer panel and secure with eight no. 6 flathead screws.
3. Install screw eyes and picture wire.

## VI. Staining and Finishing

**BUILDER'S TIP:** *When it comes to staining and finishing, you can work with a stain-and-finish-in-one product, such as MINWAX® POLYSHADES®, or use the traditional two-step method (MINWAX® WOOD FINISH™ and MINWAX® Wipe-On Poly).*

### Stain and Finish in One:

1. Sand surfaces smooth. Wipe with a tack cloth to remove dust.
2. Using quick release masking tape, carefully mask off the perimeter of the mirror so it will not be inadvertently affected by stain.
3. If using a soft wood such as pine, apply MINWAX® Pre-Stain Wood Conditioner according to label instructions. Wait 10 to 15 minutes, and wipe away excess using a clean, lint-free rag.
4. Within 2 hours apply MINWAX® POLYSHADES® color of your choice using a natural bristle brush. Stir well before and occasionally during use. Two coats are recommended for maximum beauty and protection. Brush on a thin, even coat in the direction of the grain. Be sure to maintain a "wet edge". Let dry 8 hours or more, then rub surface with fine

steel wool (grade 000 and finer). Remove all dust. Brush on a second thin coat. You may apply more than 2 coats if you want to deepen the color.

5. Allow piece to set for at least 24 hours.

#### **Two-Step Method:**

1. Sand surfaces smooth. Wipe with a tack cloth to remove dust.
2. Using quick release masking tape, carefully mask off the perimeter of the mirror so it will not be inadvertently affected by stain.
3. If using a soft wood such as pine apply MINWAX® Pre-Stain Wood Conditioner according to label instructions. Wait 10 to 15 minutes, and wipe away excess using a clean, lint-free rag.
4. Within two hours, apply the MINWAX® WOOD FINISH™ of your choice to all surfaces (even back) using a clean brush and with-the-grain strokes. Remember to stir the stain well. Allow stain to penetrate for 5 to 15 minutes, depending on desired tone. Wipe off excess with clean, lint-free rag.
5. If a darker tone is desired, let the first coat rest for four to six hours then repeat step #4 for a second coat. Allow stain to dry for eight hours before proceeding.
6. Shake MINWAX® Wipe-On Poly container before use. Put a small amount on a clean, soft, lint-free cotton cloth and rub into the wood.
7. Allow finish to dry for at least three hours (longer if conditions are humid); when dry, lightly sand again using 220-grit paper or fine steel wool and wipe clean.
8. Apply second coat and let dry.
9. Allow piece to cure for at least 24 hours.
10. Position and install picture wire.

#### **VII. Clean Up**

- If you have product left over, wipe the can rim so that product in the rim won't dry out and prevent the lid from forming a tight seal.
- Clean brushes used for oil-based finishes with mineral spirits.

#### **VIII. PRODUCT SAFETY**

**DANGER! HARMFUL OR FATAL IF SWALLOWED. SKIN IRRITANT. COMBUSTIBLE. KEEP OUT OF REACH OF CHILDREN.**

**DANGER:** Contains mineral spirits. Harmful or fatal if swallowed. Do not take internally. Skin irritant. Avoid contact with skin and eyes. Wear rubber gloves and safety glasses when handling. Combustible. Do not use or store near heat, sparks, flame or other source of ignition. Close container after each use. Avoid inhalation and use only with adequate ventilation. If using indoors, open all windows and doors to make sure there is fresh air movement. If you experience lightheadedness, dizziness or headaches, increase fresh air movement or leave the area. Reports have associated repeated and prolonged occupational overexposure to solvents with

permanent brain and nervous system damage. Intentional misuse by deliberately concentrating and inhaling the contents may be harmful or fatal.

**FIRST AID:** If swallowed: Do not induce vomiting. Call physician immediately.

**FOR SKIN CONTACT:** Wash thoroughly with soap and water. If irritation persists, get medical attention.

**FOR EYE CONTACT:** IMMEDIATELY flush eyes thoroughly with water, then remove any contact lenses. Continue to flush eyes with water for at least 15 minutes. If irritation persists, get medical attention.

**IF AFFECTED BY INHALATION:** Immediately remove to fresh air. If symptoms persist, call physician.

#### **IX. Safe Disposal of Rags & Waste**

Please be mindful of the safe way to dispose of used rags and other waste. Rags, steel wool and other waste soaked with oil finishes may spontaneously catch fire if improperly discarded. Place rags, steel wool and waste immediately after use in a water-filled metal container. Tightly seal and then dispose of in accordance with local regulations. Be sure to keep the container out of reach of children.

#### **FINISHER'S TIPS**

- For a clean, sharp finish, all final passes with the brush or cloth should be made in the same direction as the wood grain.
- If additional surface protection is desired, apply a coat of MINWAX® Paste Finishing Wax over all exposed surfaces. Let stand for 10 minutes, then buff with a clean fiber brush (scrub brush). Finish buffing with a clean, lint-free rag.
- If you spot any minor imperfections in the wood (e.g. pinholes, surface scratches) resist the urge to use a wood filler before applying any stain. Conventional wood fillers may not absorb stain in exactly the same manner as adjacent wood, so the spot will become even more evident. Instead, wait until finish has dried completely and then use MINWAX® WOOD PUTTY™ or MINWAX® WOOD FINISH™ STAIN MARKER™ for touch-ups.
- It's critical that all stains and finishes be allowed to dry thoroughly between coats. Remember, drying times may vary due to humidity and other climatic conditions

### Materials Shopping List, nominal dimensions

Note: The project prototype was constructed from ribbon stripe plywood and solid mahogany. If different woods are substituted, check for dimensional differences in stock.

A, B	Scroll, top and bottom	1/8 x 12 x 13"	1 piece
C, D	Scroll, four side pieces	1/8 x 8 x 10"	1 piece
E, F	Frame parts	1 x 2 x 48"	1 piece
G	Splines	From scrap	
H	Mirror retainer panel	1/8 x 10 x 14"	1 (plywood)
I	Mirror*	1/8 x 8-1/4 x 11-5/8"	

### Cutting List, actual dimensions

A	Scroll, top	1/8 x 6-1/2 x 9-3/4"	1 required
B	Scroll, bottom	1/8 x 5 x 9-3/4"	1 required
C	Scroll, sides (bottom)	1/8 x 2 x 6"	2 required
D	Scroll, sides (top)	1/8 x 2-1/2 x 6-1/2"	2 required
E	Frame sides	3/4 x 1-1/8 x 13-1/8"	2 required
F	Frame, top and bottom	3/4 x 1-1/8 x 9-3/4"	2 required

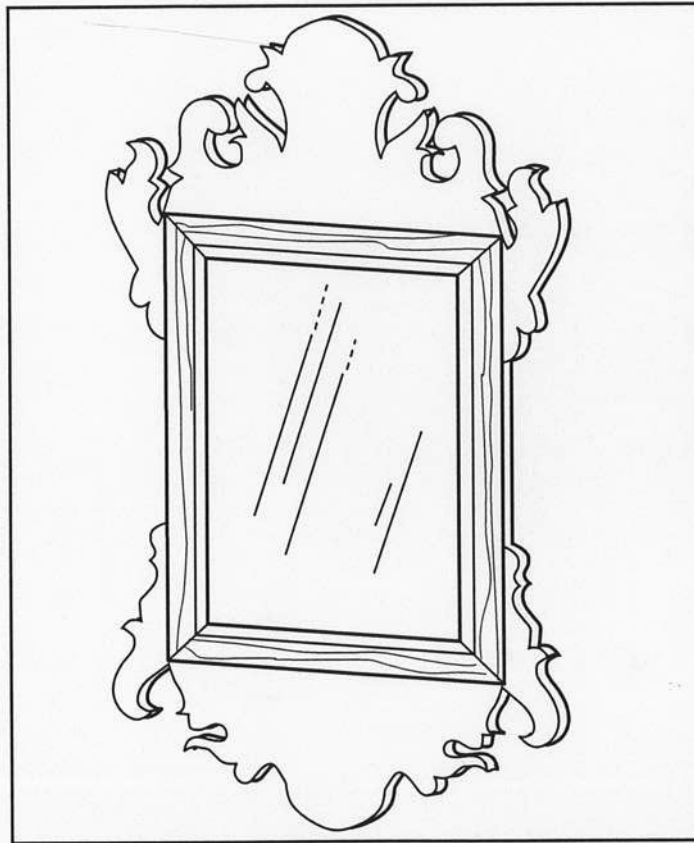
\* Double check measurements between frame rabbets after piece is assembled before cutting mirror to size.

### Miscellaneous:

MINWAX Professional Strength Wood Glue, wide quick release masking tape, sandpaper (100- through 220-grit), rubberbands ( large enough to go around assembled piece), tack cloth, MINWAX fine finishing brushes, clean rags, fine steel wool, mineral spirits, MINWAX™ WOOD FINISH™ STAIN MARKERS™, water-filled metal container with cover.

### Hardware:

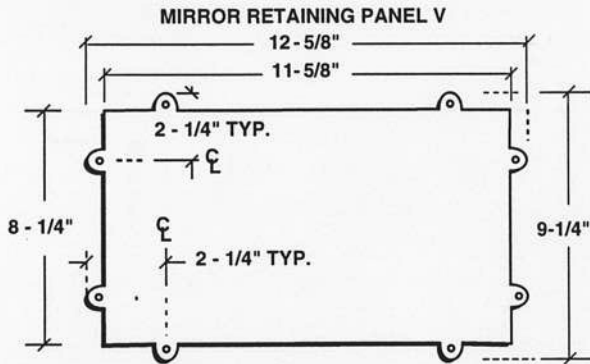
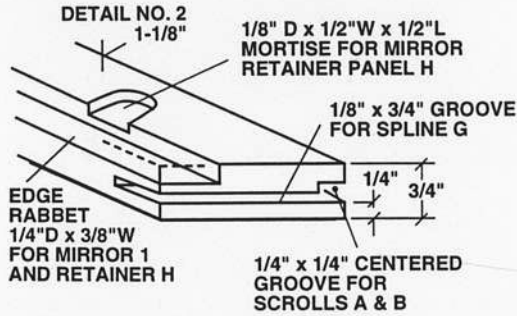
Eight no. 6 1/2" flathead screws, Two no. 16 screw eyes, picture wire.



**COMPLETED PROJECT**

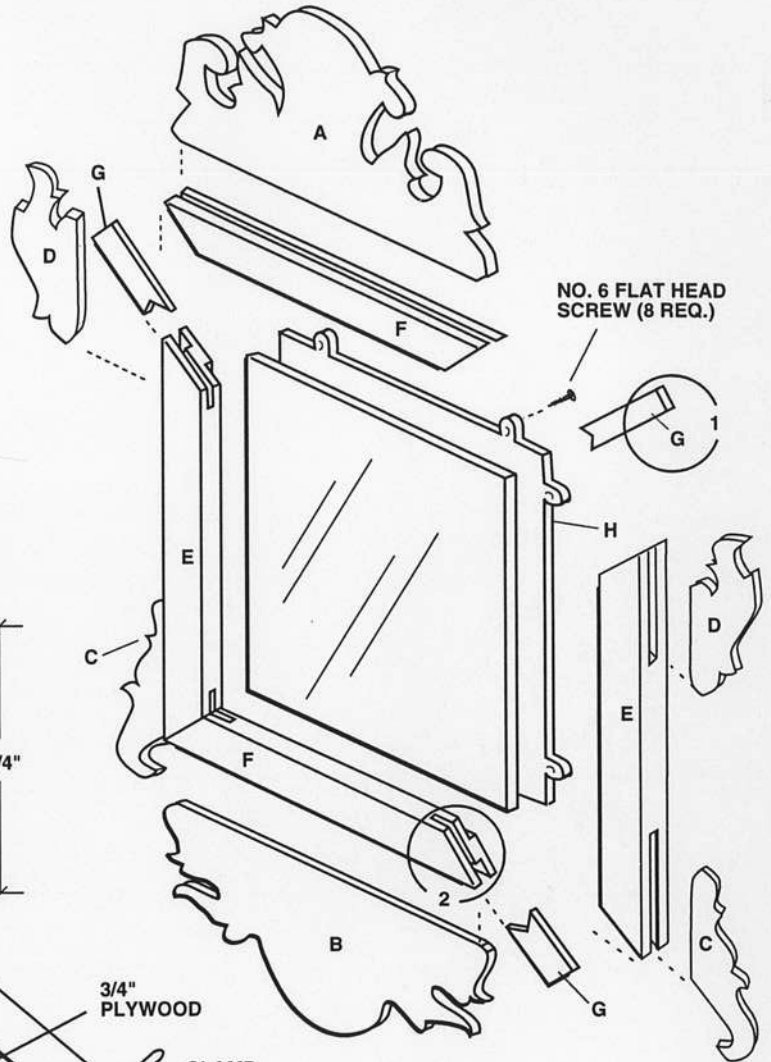
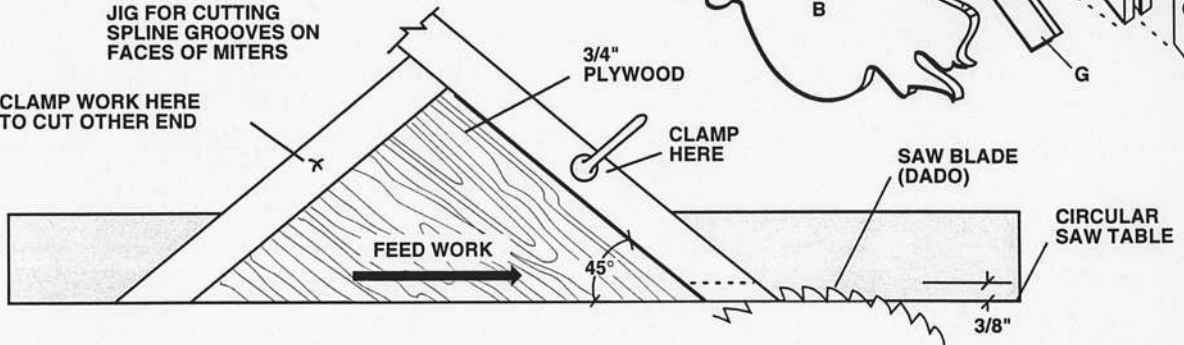


**DETAIL NO. 1**  
**MAHOGANY SPLINE G**  
 1/8" x 3/4" x 2 - 1/4" (4 REQ.)

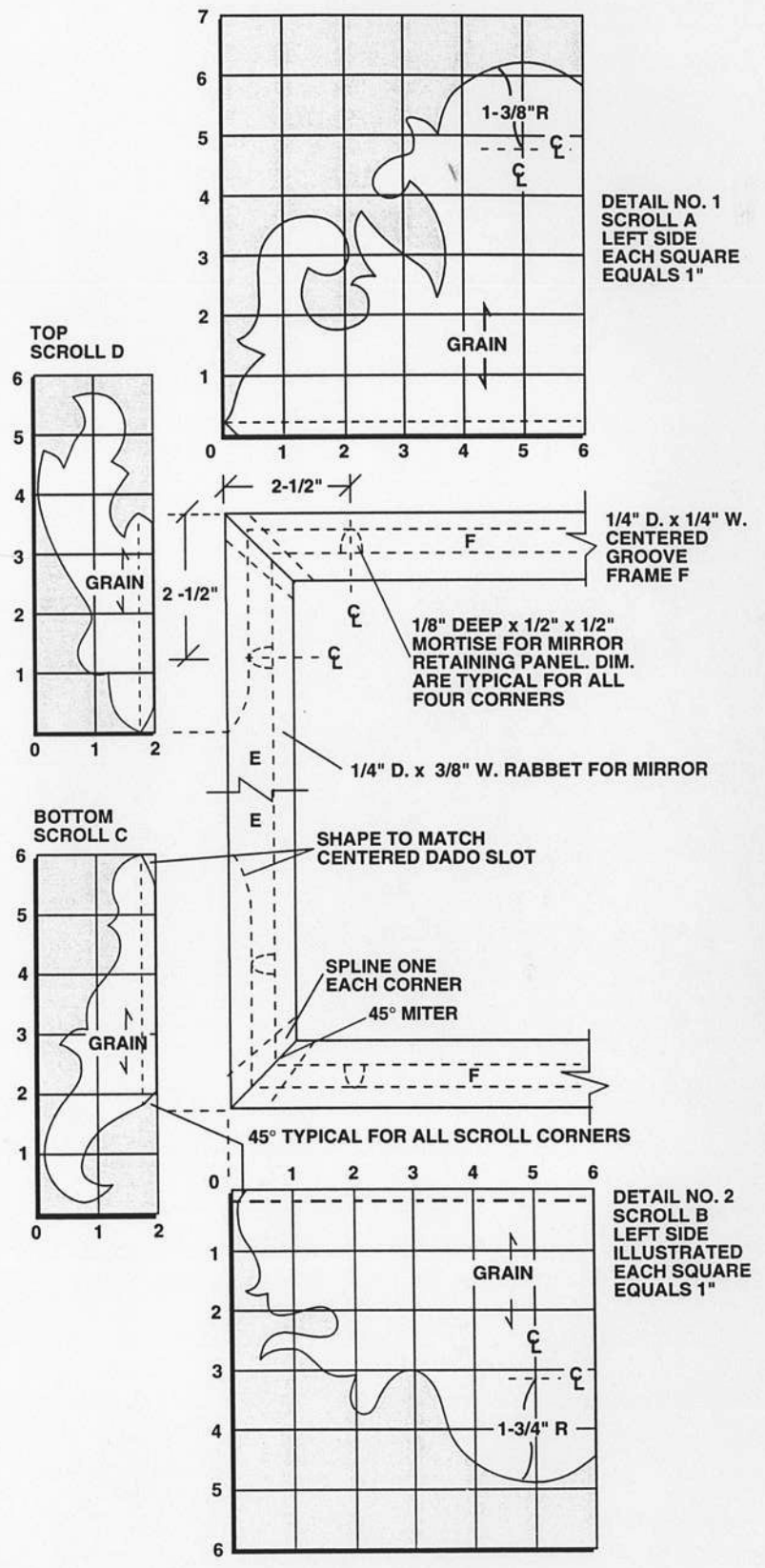
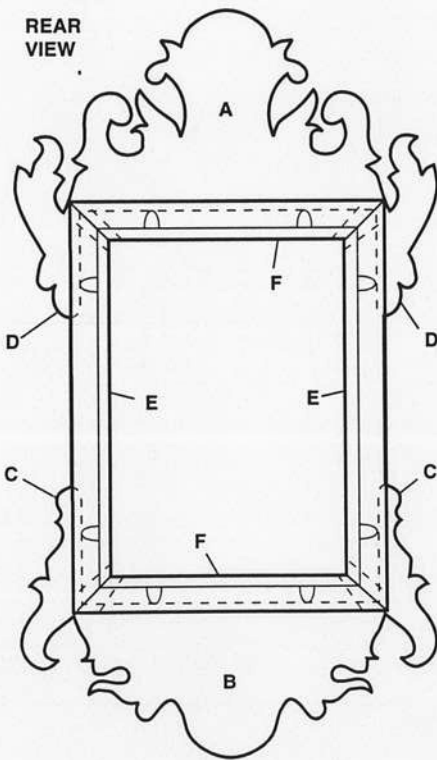
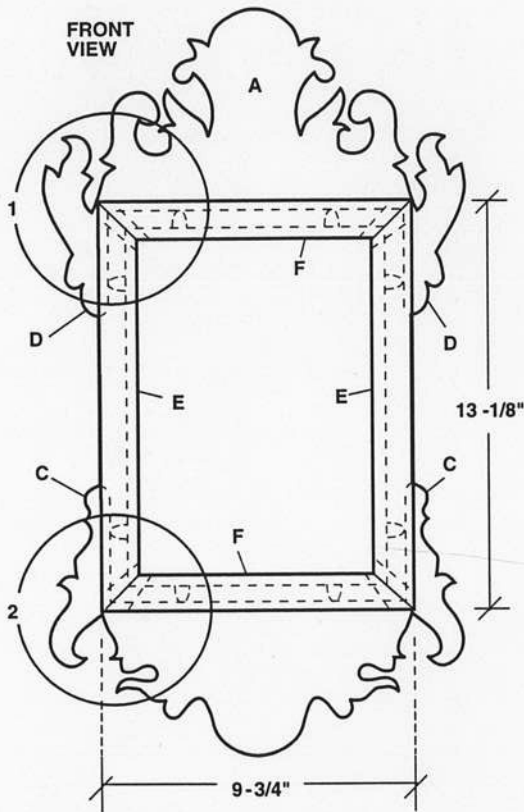


**JIG FOR CUTTING  
 SPLINE GROOVES ON  
 FACES OF MITERS**

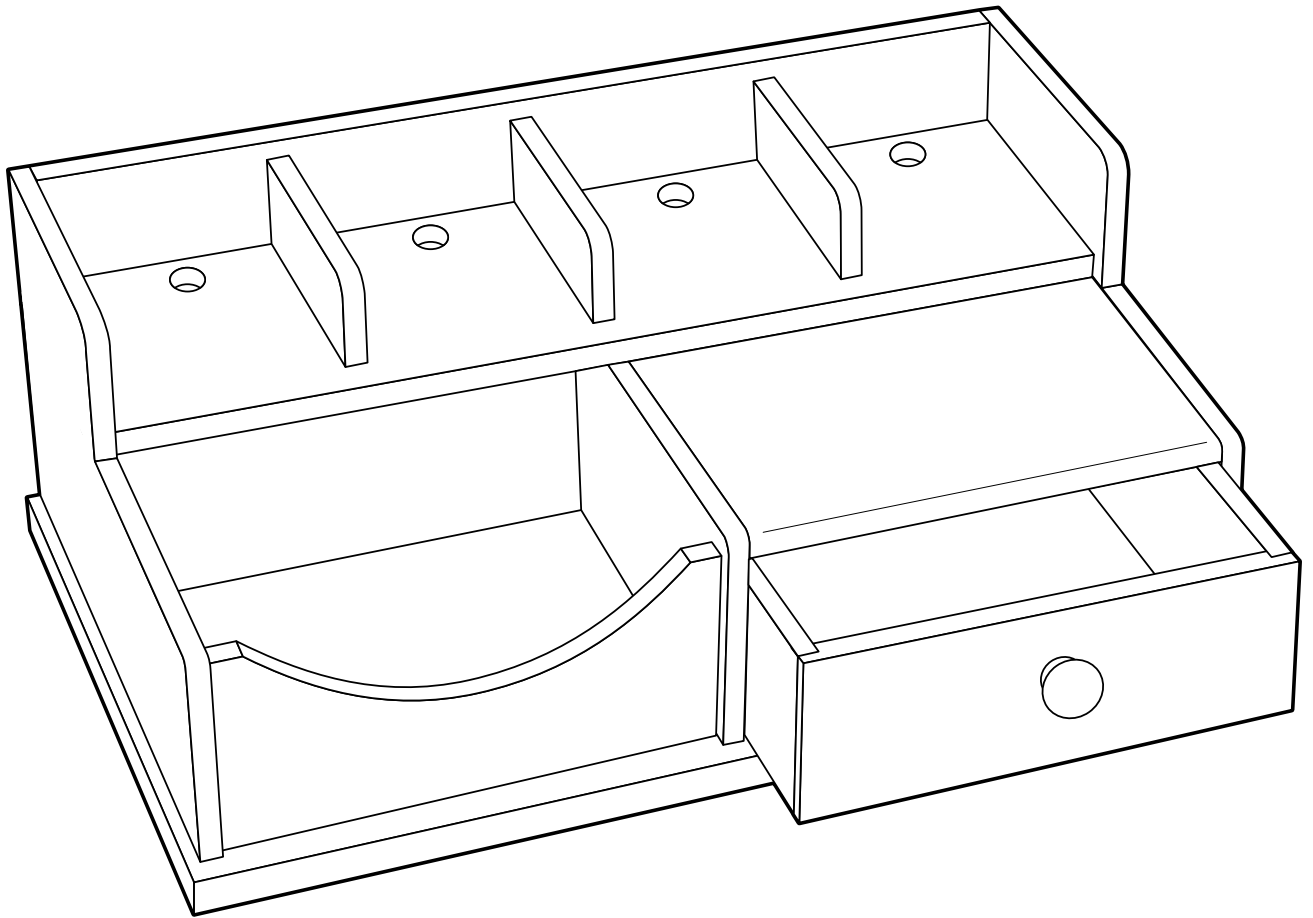
CLAMP WORK HERE  
 TO CUT OTHER END







# Charging Station



Your cell phone needs it, so does your wireless earpiece, your MP3 player, your mega mega-pixel camera and whatever other digital devices you may have: regular recharging. So that's a lot of chargers to keep track of or potentially misplace. Instead of them rattling around in your backpack, how about keeping them all in one place? To prevent loss and confusion, this charging station offers a smart and good-looking way to do that. With slots for four devices, plus a drawer and a tray for necessities like spare batteries and ear buds, this piece can stay put in your room. For intermediate woodworkers, it's an exercise in making efficient use of lumber, resawing wood to nonstandard thicknesses, precision layout, neat gluing and nailing. And after you build it, you'll learn more about applying and using finishes to protect the wood and keep it looking beautiful.

## TOOLS REQUIRED

### Hand Tools

- Combination or try square
- Block plane
- Hand screw clamp
- Bar clamps
- Spring clamps

### Power Tools

- Band saw
- Jigsaw
- Table saw
- Jointer
- Random-orbit sander
- Drill with 1" spade or Forstner bit

### Miscellaneous

- Pencil
- Tape measure
- Safety glasses
- Carpenter's glue
- 120-, 150- and 220-grit sandpaper
- Clean, lint-free cloths
- Respirator
- Gloves for finishing
- Mineral spirits (for oil based stains and finishes)
- Water-filled metal container with tight-fitting lid (for oil based stains and finishes)
- Minwax® Wood Finish™ Stain Brush or other good quality, natural-bristle brush (for oil based stains and finishes)

## SHOPPING LIST

### Wood Recommendation: Oak

### Alternate Wood: Pine

Part	Qty.	Th. x W x L
A through J, N	1	1" x 5-1/4" x 60"
K, L, M, P	1	3/4" x 10-1/4" x 24"
Q	1	1/2" x 1/2" wood knob

## CUTTING LIST

Overall Dimensions: 16-3/8" W x 5-1/2" H x 9-1/2" D			
Part	Name	Qty.	Th. x W x L
A	Shelf	1	3/8" x 4-3/4" x 15-1/8"
B	Back	1	3/8" x 1-3/4" x 15-1/8"
C	Divider	3	3/8" x 1-3/8" x 4"
D	End	2	3/8" x 5" x 9"
E	Support block	2	3/8" x 1-7/8" x 2-7/8"
F	Box back	1	3/8" x 2-7/8" x 15-1/8"
G	Drawer divider	1	3/8" x 2-7/8" x 6-3/4"
H	Drawer top	1	3/8" x 5" x 7-3/8"
J	Tray front	1	3/8" x 2-1/2" x 7-3/8"
K	Bottom	1	1/2" x 9-1/2" x 16-3/8"
L	Drawer front	1	1/2" x 2-7/16" x 7-5/16"
M	Drawer front	1	1/2" x 2-7/16" x 7-5/16"
N	Drawer side	2	3/8" x 2-7/16" x 6-1/4"
P	Drawer bottom	1	1/8" x 6" x 6-13/16"
Q	Knob	1	1/2" x 1/2" dia.

## WOOD FINISHING PRODUCTS

### Recommended Finish

Prep: Minwax® oil based Pre-Stain Wood Conditioner  
 Stain/Finish: Minwax® Wood Finish™ Cherry  
 Finish: Minwax® Fast-Drying Polyurethane Semi-Gloss

### Alternate Finish

Prep: Minwax® oil based Pre-Stain Wood Conditioner  
 Stain: Minwax® Gel Stain Mahogany  
 Finish: Minwax® Fast-Drying Polyurethane Satin

## BEFORE YOU BEGIN

Good craftsmanship begins and ends with good work habits, so make the following steps part of your routine workshop practice. If you have any doubts or questions about how to proceed with a project, always discuss them with your shop instructor.

- Carefully and fully review plans and instructions before putting a tool to the project lumber.
- Work sensibly and safely. Wear safety goggles when doing work that creates flying chips and sawdust; wear the appropriate respirator whenever making sawdust or working with thinners or other solvents.
- At the end of every work session, clean up your shop area and put away all portable tools.

## CUTTING AND ASSEMBLY PROCEDURE

1. Make a plan for resawing the 1" stock in order to get the 1/8", 3/8" and 1/2" finished thicknesses that are needed. Note that part K will be made from two pieces of 1/2" stock that are edge-joined. The goal here is to both minimize waste while using the least amount of wood.
2. Use a band saw to resaw the stock to about 1/8" thicker than the finished thicknesses.
3. Use a planer to mill the stock to its final thicknesses.
4. Cut all the parts to their final size and then finish-sand them prior to assembly. Use a tape measure or ruler to mark all brad locations. Be sure to give them equal spacing, equal distance from edges, etc.
5. Drill 1" holes in the shelf (A), according to the layout shown in Fig. 1. If some of your charging devices require larger holes, drill them accordingly.
6. Glue and nail the shelf to the back (B). If you haven't used a pin nailer before, practice on some scrap pieces.
7. Draw a 1/2" radius on the top front corners of the three dividers (C). Cut them with a jigsaw and sand them smooth.
8. Glue and nail the dividers to the shelf and the back, as shown in Fig. 3. An easy way to position the dividers is with a 3-1/2" wide spacer made from scrap. Be careful to use very little glue to minimize squeeze-out. Should any occur, wipe it away immediately and completely with a damp cloth.
9. Lay out the S-curve on the ends (D) according to the layout shown in Fig. 1. Cut the curves with a band saw or jigsaw. Sand the cut smooth; use a hand-held drum sander to smooth the inside radius.
10. Glue the support blocks (E) to the inside faces of the ends.
11. Glue and nail the back (F) to the spacers.
12. Glue and nail the A-B-C assembly to the ends and support blocks.
13. Round over the top front corner of the drawer divider (G) to the same radius as those made for the ends.

14. Glue and nail the divider to the drawer top (H).

15. Glue and nail the G-H assembly to the main assembly.

16. Draw the curve on the tray front (J), cut it with a jigsaw or band saw and sand it smooth.

17. Glue and nail the tray front to the main assembly as shown in Fig. 4.

18. Make the bottom (K) by edge-joining two 4-3/4" wide pieces of 1/2" stock. Run the joining edges through a jointer. Apply a thin bead of glue to one edge and clamp the pieces together. Wipe away any squeeze-out immediately. When the glue is dry, sand both faces smooth.

19. Glue and clamp the bottom to the main assembly as shown in Fig. 5.

20. Sand the front edge of the drawer top (H) to conform to the radius cuts on the end and drawer divider.

21. Measure the drawer opening and cut all the drawer parts (L, M, N, P) to fit. Cut rabbets in the ends of the drawer front (L) and back (M) using a table saw or router table. Cut dados in the front, sides and back to accept the drawer bottom. The rabbet and dado dimensions are shown in Fig. 1.

22. Glue and nail the drawer pieces together, assuring that the assembly is dead square.

23. Drill the drawer front for the pull. Install the pull after all the finishing has been done.

24. Finish-sand the entire piece to prepare it for finishing. Attach the drawer knob (Q; Rockler Woodworking and Hardware, www.rockler.com, (800) 279-4441, 1/2" Matte Black Knob, #1032MB, \$3.51).

## STAINING AND FINISHING

**Woodworker's Tip:** *Though you may be tempted to cut short your sanding, preparation and application time, don't do it. These tasks are very important steps in obtaining a high-quality finish. Remember, it is the finish, just as much as the fit and smoothness of the parts that will have great bearing on how people judge your craftsmanship. To ensure an excellent result, follow the steps listed in this section and also the instructions the finish manufacturer puts on its products.*

### FINISHING TIPS

- Test the stains and finishes you are planning to use on scraps of wood. On the back of the scrap, mark the stain/finish combination and the type of wood. Allow all samples to dry thoroughly before making your final finish selection. Save your samples for quick reference on future projects.
- All stains and finishes must be allowed to dry thoroughly between coats. Remember that drying times can vary due to humidity and other climatic conditions.

- If you have some leftover stain or finish, wipe the can rim so that stain or finish in the rim won't dry out and prevent the lid from forming a tight seal.
- Brushes used for oil based finishes must be cleaned with mineral spirits.

### Recommended Finish

**25.** Before applying Minwax® Wood Finish™ to a hardwood or softwood, apply Minwax® oil based Pre-Stain Wood Conditioner, following the directions on the can. Applying a pre-stain wood conditioner will help to ensure even absorption of stain and prevent blotchiness.

**26.** Apply the Minwax® Wood Finish™ you've chosen using a natural-bristle brush and a clean, lint-free cloth, following the directions on the can. The brush will help you get the stain into the inside corners. Allow the Wood Finish™ to set for about 5 to 15 minutes, then wipe off any excess. To achieve a deeper color, you may apply a second coat after 4 to 6 hours, repeating the application directions for the first coat. Allow the stain to dry for 24 hours before applying the protective clear finish.

**Woodworker's Tip:** *When wiping off stain, make certain that your last wipe with the cloth goes with the grain of the wood. This way, any stain you might miss during wipe-off will be visually minimized by the wood grain.*

**27.** Apply Minwax® Fast-Drying Polyurethane Semi-Gloss, following the directions on the can. Use a good quality, natural-bristle brush. Allow the first coat to dry overnight.

**28.** The next day, sand all surfaces lightly with 220-grit or finer sandpaper using with-the-grain strokes. Dust off and wipe all surfaces with a cloth lightly dampened with mineral spirits. Apply a second coat of polyurethane and set the piece aside to cure overnight.

**29.** The following day, sand all surfaces lightly with 220-grit sandpaper. Dust off and wipe the piece with a cloth lightly dampened with mineral spirits and apply the third and final coat of polyurethane. Allow the finish to cure for a few days before using the piece.

### Alternate Finish

**30.** Before applying Minwax® Gel Stain to softwood such as pine, apply Minwax® oil based Pre-Stain Wood Conditioner, following the directions on the can. Applying a pre-stain conditioner will help ensure even absorption of stain and prevent blotchiness.

**31.** Apply Minwax® Gel Stain using a clean, lint-free cloth or natural-bristle brush. Follow the directions on the can. Allow the Gel Stain to set for about 3 minutes, then wipe off any excess with a clean, lint-free cloth. To achieve a deeper color, you may apply a second coat after 8 to 10 hours, repeating the application directions for the first coat. Allow the stain to dry for 24 hours before applying the finish.

**32.** Apply Minwax® Fast-Drying Polyurethane Satin, following the directions on the can. Use a good quality, natural-bristle brush. Allow the first coat to dry overnight.

**33.** The next day, sand all surfaces lightly with 220-grit or finer sandpaper using with-the-grain strokes. Dust off and wipe all surfaces with

a cloth lightly dampened with mineral spirits. Apply a second coat of polyurethane and set the piece aside to cure overnight.

**34.** The following day, sand all surfaces lightly with 220-grit sandpaper. Dust off and wipe the piece with a cloth lightly dampened with mineral spirits and apply the third and final coat of polyurethane. Allow the finish to cure for a few days before using the piece.

### PRODUCT SAFETY

For your safety and the safety of those you work with, always read the safety warnings, which manufacturers print on their labels, and follow them to the letter.

**WARNING!** Removal of old paint by sanding, scraping or other means may generate dust or fumes that contain lead. Exposure to lead dust or fumes may cause brain damage or other adverse health effects, especially in children or pregnant women. Controlling exposure to lead or other hazardous substances requires the use of proper protective equipment, such as properly fitted respirator (NIOSH approved) and proper containment and cleanup. For more information, call the National Lead Information Center at 1-800-424-LEAD (in U.S.) or contact your local health authority.

**DANGER:** Rags, steel wool, other waste soaked with oil based stains and clear finishes, and sanding residue may spontaneously catch fire if improperly discarded. Immediately place rags, steel wool, other waste soaked with this product, and sanding residue in a sealed, water-filled metal container. Dispose of in accordance with local fire regulations.

When using oil based wood finishing products:

#### **CAUTIONS: CONTAINS ALIPHATIC HYDROCARBONS.**

Contents are **COMBUSTIBLE**. Keep away from heat and open flame. **VAPOR HARMFUL**. Use only with adequate ventilation. To avoid overexposure, open windows and doors or use other means to ensure fresh air entry during application and drying. If you experience eye watering, headaches, or dizziness, increase fresh air, or wear respiratory protection (NIOSH approved), or leave the area. Avoid contact with eyes and skin. Wash hands after using. Keep container closed when not in use. Do not transfer contents to other containers for storage.

**FIRST AID:** In case of eye contact, flush thoroughly with large amounts of water for 15 minutes and get medical attention. For skin contact, wash thoroughly with soap and water. In case of respiratory difficulty, provide fresh air and call physician. If swallowed, call Poison Control Center, hospital emergency room, or physician immediately.

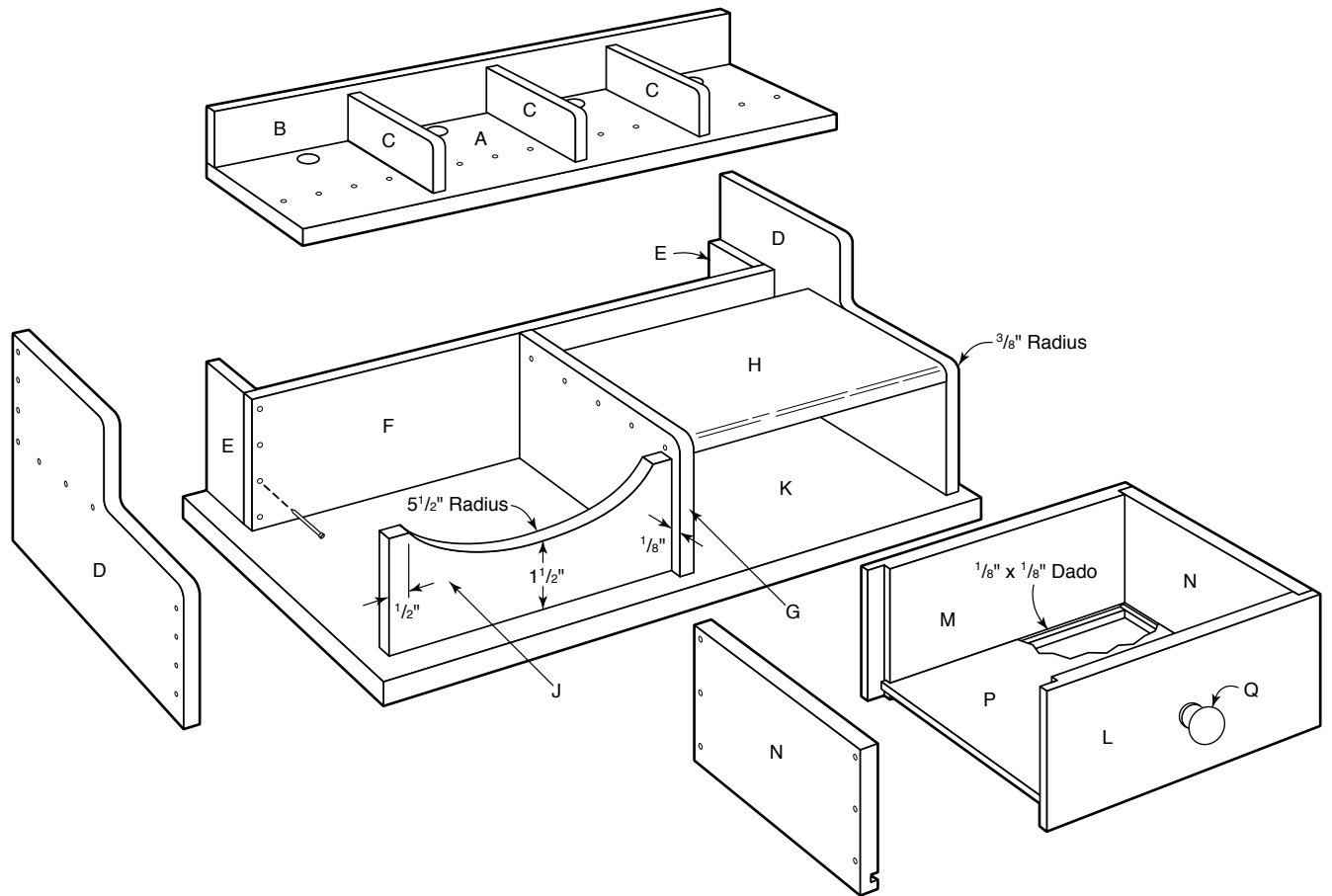
#### **DELAYED EFFECTS FROM LONG-TERM OVEREXPOSURE.**

Contains solvents which can cause permanent brain and nervous system damage. Intentional misuse by deliberately concentrating and inhaling contents may be harmful or fatal.

**WARNING:** This product contains a chemical known to the State of California to cause cancer and birth defects or other reproductive harm.

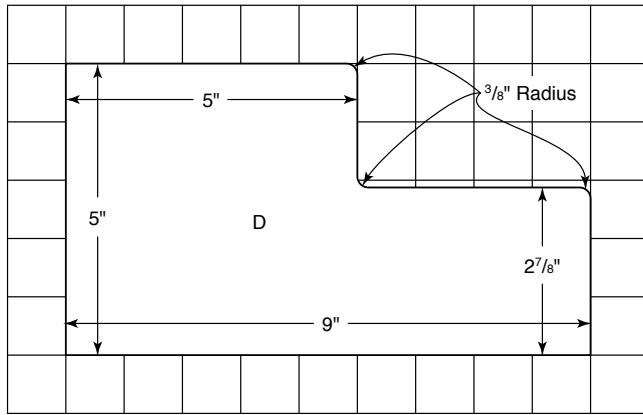
**DO NOT TAKE INTERNALLY. KEEP OUT OF REACH OF CHILDREN.** CONFORMS TO ASTM D-4326. Contact a physician for more health information.

**FIG 1.**



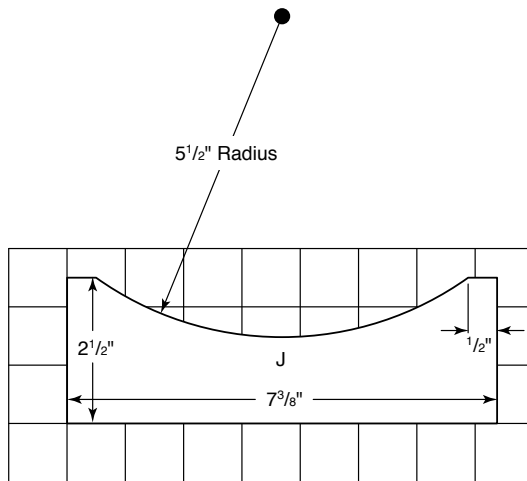
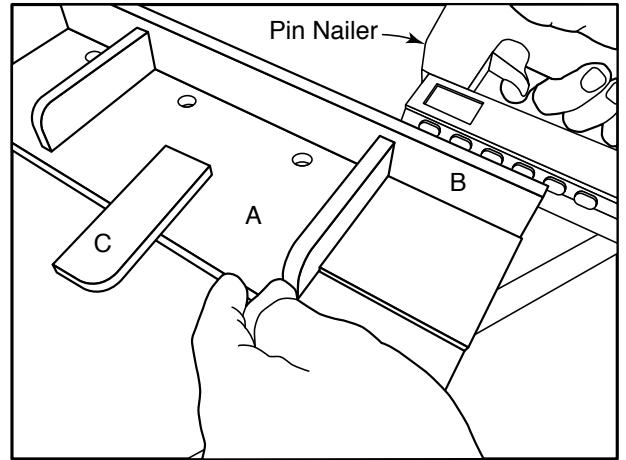


**FIG 2.**



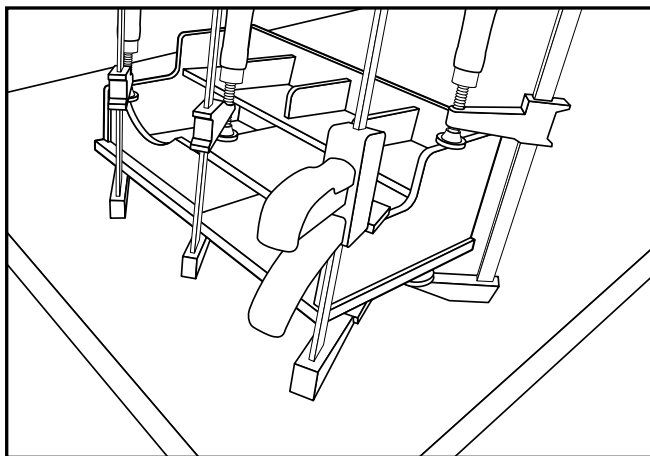
One Square = 1"

**FIG 3.**



One Square = 1"

**FIG 4.**



# Bedside Table

This bed side table is the perfect size for any bedroom, or it can be used in a living room as an end table. While it's of fairly straight forward construction, it will give you experience in design, roughing out stock, squaring, jointing and two-step finishing systems, in both traditional and contemporary decorating colors.

## TOOLS REQUIRED:

- Jointer
- Planer
- Table saw
- Band saw
- Miter box
- Router table
- Drill press
- Dado blade
- 3/8" drill bit
- 9/64" drill bit
- Doweling jig or biscuit joiner
- Pencil
- Tape measure
- 3/8" roundover bit
- Wood glue
- #6 X 1-5/8" drywall screws
- High quality brush
- Clean cloths

## MATERIALS REQUIRED:

Item	Number Required	Finish Dimensions	Rough Dimensions
Top	one	3/4" X 12" X 18"	7/8" X 13" X 19"
Shelf	one	3/4" X 10" X 16"	7/8" X 11" X 17"
Long rail	two	3/4" X 2" X 12-1/2"	7/8" x 2-1/2" X 13-1/2"
Short rail	two	3/4" X 2" X 6-1/2"*	7/8" X 2-1/4" X 7-1/2"
Leg	four	1-1/2" X 1-1/2" X 18-1/4"	N/A ***

\*Optional: Instead use one 7/8" X 2-1/4" X 17" piece and cut in half (see RAILS section of PROCEDURE, below).

\*\*Hardwood is recommended, but the project can be done with softwood.

\*\*\*3/4" thick finished stock faceglued together to make 1 1/2" thick x 1 1/2" wide legs.

## FINISHING PRODUCTS:

MINWAX® PASTELS™ Wood Stain and MINWAX POLYCRYLIC® Protective Finish  
MINWAX Wood Finish and MINWAX Fast-Drying Polyurethane

## OPTIONAL ITEM:

MINWAX Wood Conditioner

## PROCEDURE:

### I. Top and Shelf

1. Lay out rough dimensions of all parts on wood. \* All pieces are to be laid out and checked by the instructor before any cutting is done.
2. Cut pieces to rough dimension lengths. Put your name on all pieces.
3. Joint one edge of each piece.
4. Cut and glue pieces edge to edge to make the top. (Glue oversize.)
5. Cut and glue pieces edge to edge to make the shelf. (Glue oversize.)
6. Let glue cure overnight.
7. Plane to 3/4" thick. \* If you started with 3/4" stock, keep it as thick as possible.
8. Cut to finished size on the table saw.
9. Sand smooth.
10. Route the top edge of the top with whatever edgforming bit you like. \* DO NOT ROUTE THE SHELF!
11. On the shelf only, cut a 3/4" X 3/4" square off each corner to fit into the legs.

### II. Legs

1. Faceglue two 3/4" thick by 1 1/2" wide leg pieces to make four leg blanks 1-1/2" X 1-1/2" X 20". Use straight finished wood.
2. Using the router table, route a 3/8" roundover on each edge.
3. Square cut one end of each leg on the miter box.
4. Measuring from the squared end, mark and cut the other end of each leg to 18-3/4".
5. Sand smooth.

### III. Rails

1. Cut rails to 2" wide.\* You may wish to cut slightly oversized and joint to 2". Machine the two short rails together as one piece and cut into two short lengths after all machining is done. \* Make sure to use proper push blocks and safty procededure for the jointer. When jointing such narrow stock, have instructor check this operation before you begin.
2. Cut one end of each rail square on the miter box or table saw.
3. Measuring from the squared end, mark and cut two long rails at 12-1/2" and one extra long rail into two short rails at 6-1/2".
4. Drill a 3/8" hole 1" into the edge of each rail. Then drill a 9/64" pilot hole the rest of the way through. (The holes will

be used to attach the top to the table.) \* The hole should be approximately centered on each piece.

5. Elongate the hole on the upper side by coming in from the top with a drill and carefully wiggling the drill around to end up with a tapered hole. This will allow for a little movement in the table. Wood shrinks and expands with changes in temperature and humidity, and without an allowance for movement, the table could crack at some point in time.

#### IV. Assembly

1. Take the four legs and cut a 3/4" dado 3/4" deep in two adjacent edges approximately 2" in from one end. \* These dados support the shelf.
2. Finish sand all pieces.
3. Use either dowels or biscuits to attach the rails to the legs. (Your instructor will explain these processes.) \* You must insert the shelf before you glue the rails to the legs.
4. Attach the top using four #6 X 1-5/8" drywall screws. \* The screws slide through the holes that you drilled in your rails.

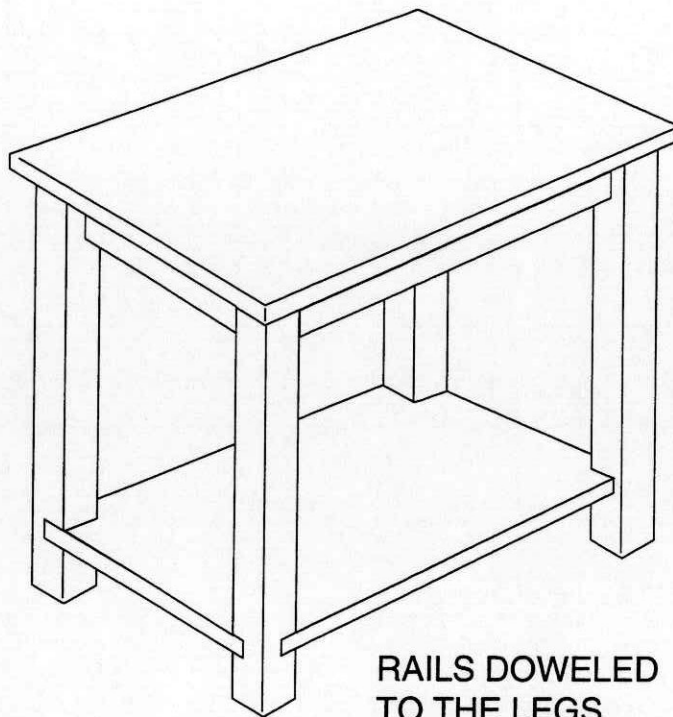
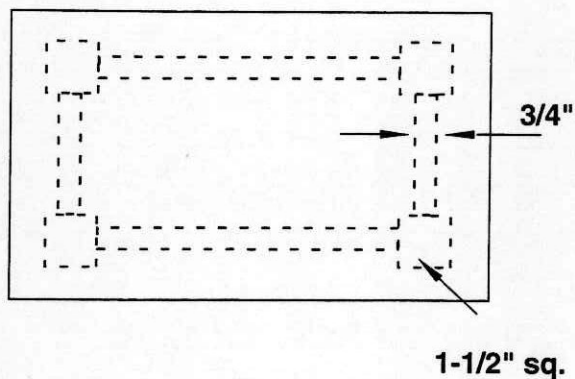
#### V. Sanding, Staining and Finishing

1. Sand all surfaces and remove all evidence of sanding dust.
2. Pretreat soft woods with MINWAX® Wood Conditioner.
- 3a. Apply stain and finish: For a traditional look, select one MINWAX Wood Finish tone, or mix several together to create a custom tone. Apply following label directions. After a minimum of 8 hours, apply your first coat of MINWAX Fast-Drying Polyurethane, brushing in the direction of the grain.
- 3b. Apply stain and finish: For a contemporary look, apply MINWAX PASTELS™ Wood Stain, following label directions. Wait at least 24 hours and then apply MINWAX POLYCRYLIC® Protective Finish. Do not use MINWAX Fast-Drying Polyurethane, since polyurethane finishes tend to amber and alter the pastel color.

#### TIPS SUMMARY

- If conditioning soft wood, don't forget the porous end grain; it may need an extra coat of wood conditioner to help the wood absorb stain evenly.
- Remove excess glue around joints before staining.
- MINWAX Wood Finish Natural can be added to lighten any of the MINWAX Wood Finish tones. To darken or shade a hue, apply additional coats of stain.
- If you're working in a cold or damp area, allow for longer drying times between coats.
- If using pastel wood stains, work in small sections and maintain a wet edge since pastel stains tend to dry quickly. If using a water clean-up finish like MINWAX POLYCRYLIC Protective Finish, do not use steel wool to smooth wood before or between coats. Strands of steel fiber caught in the wood can cause rust spots when coated with any water cleanup finish.

# BEDSIDE TABLE OR END TABLE



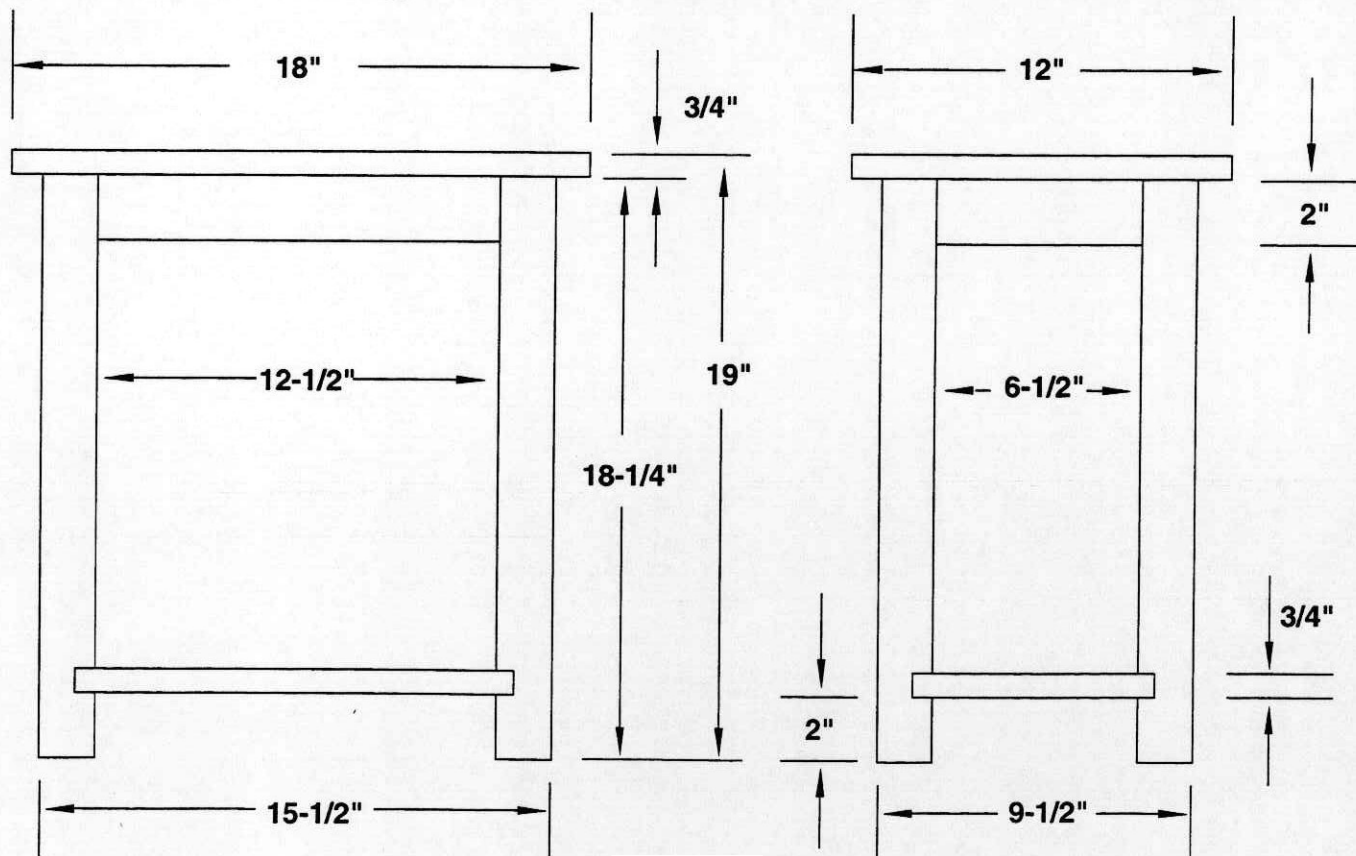
OAK  
CHERRY  
MAHOGANY

WALNUT  
WILLOW  
MAPLE

RAILS DOWELED  
TO THE LEGS

RAILS SCREWED  
TO THE TOP

SHELF FITS  
INTO DADOS  
IN THE LEGS



# Adirondack Chair



The Adirondack chair originated at the camps and resorts of New York's Adirondack mountains during the late 1800s. It was the solution to adding a little comfort while in the wilderness, and has become an outdoor classic. This version, like its forebears, is designed for maximum comfort with a deep seat, spacious arms and a slanted back. When you want to take a nap, just pull up the matching footrest. When summer's gone, you can fold up both the chair and footrest for easy moving and storage. Part of the beauty of this chair is its simple construction. You'll gain experience with cutting curves using a jigsaw or band saw and with precision assembly by making sure that the seat and back slats are identically spaced apart.



## TOOLS REQUIRED

### Hand Tools

- Clamps
- Hacksaw
- Vise flat file

### Power Tools

- Tablesaw or circular saw with rip and crosscut blades
- Electric drill with countersink bit
- Jigsaw or band saw
- Belt or drum sander
- Router with 1/8" or 3/5" roundover bit

### Miscellaneous

- Pencil
- Tape measure
- Safety glasses
- Carpenter's glue
- 120, 150 and 220-grit sandpaper
- Clean, lint-free cloths
- Respirator
- Gloves for finishing
- Mineral spirits
- Water-filled metal container with tight-fitting lid (for oil-based stains and finishes waste products)
- Paint pad or good quality, natural-bristle brush

## SHOPPING LIST

Item	Quantity
1x8 clear pine	6'
1x6 clear pine	37'
1/4" x 1-3/4" carriage bolts	6
1/4" flat washers	22
1/4" cap nuts	10
1/4" x 3" hanger bolts	4
#8 x 1-1/2" flat head wood screws (brass, bronze or stainless steel)	90
1/8" x 3/4" stainless steel or brass bar stock	12"
5/8" diameter decorative pegs	2

**NOTE:** The hardware used for your furniture can be ordinary plated steel if it will be kept indoors. But if you want a really weatherproof and handsome piece, use stainless steel, bronze or brass. These materials will enhance the look of stained furniture.

## CUTTING LIST

Overall Dimensions: 41-1/2"H x 22"W x 5-1/2"D			
Key	Part	Pcs.	Dimensions
A	Seat supports	2	3/4" x 5" x 36"
B	Arms	2	3/4" x 6-3/4" x 31"
C	Legs	2	3/4" x 4" x 20"
D	Arm braces	2	3/4" x 4" x 5"
E	Seat slats	8	3/4" x 2-1/2" x 20"
F	Back slats	2	3/4" x 2-1/2" x 27"
G	Back slats	2	3/4" x 2-1/2" x 29-1/2"
H	Back slats	2	3/4" x 2-1/2" x 32"
J	Front brace	1	3/4" x 2-1/2" x 21-5/8"
K	Middle brace	1	3/4" x 2-1/2" x 21-1/2"
L	Bottom brace	1	3/4" x 2-1/2" x 20"
M	Arm supports	2	3/4" x 2-1/2" x 23"
N	Hinge bars	2	3/4" x 1-1/2" x 6"
P	Slats	6	3/4" x 2-1/2" x 16"
Q	Sides	2	3/4" x 2-1/2" x 16"
R	Legs	2	3/4" x 2-1/2" x 9-1/2"
S	Stops	2	3/4" X 3/4" X 2"

Recommended Wood – Pine (stain grade)

Alternate Wood – Fir or any type of construction-grade lumber

## WOOD FINISHING PRODUCTS

### Recommended Finish

Thompson's® WaterSeal® Advanced Tinted Wood Protector in Natural Cedar. (Also available in Honey Gold, Rustic Red, Nutmeg Brown and Coastal Gray)

### Alternate Finish

Thompson's® WaterSeal® Waterproofer Plus Tinted Wood Protector, available in five colors: Honey Gold, Natural Cedar, Rustic Red, Nutmeg Brown and Coastal Gray.



## BEFORE YOU BEGIN

Good craftsmanship begins and ends with good work habits, so make the following steps part of your routine workshop practice. If you have any doubts or questions about how to proceed with a project, always discuss them with your instructor.

- Carefully and fully review plans and instructions before putting a tool to the project lumber.
- Work sensibly and safely. Wear safety goggles and the appropriate respirator whenever making sawdust or working with thinners or other solvents.
- At the end of every work session, clean up your shop area and put away all portable tools.

## CUTTING AND ASSEMBLY PROCEDURE

### Building the Chair

1. Rip the boards and then crosscut all the parts to length according to the plan and CUTTING LIST. With a jigsaw or band saw, cut all the curved pieces. Use a 1" grid of pencil lines to transfer the patterns to the wood.

**Woodworker's Tip:** Use a router with a roundover bit to soften selected edges for comfort and better appearance, such as the top edges of the seat and back slats and the arms.

2. Sand the curved edges with a belt sander or drum sander chucked into an electric drill. Sand all the parts.

3. Drill holes in all the parts that need them, except for the holes in the seat supports (A) where they attach to the legs (C). In each seat slat (E), drill two holes 3/8" from each end.

**Woodworker's Tip:** A combination drill and countersink, used in a drill press or drill guide, will enable you to make quick and consistent holes on the slats.

4. Screw the hanger bolts into the ends of the braces (K, L). Clamp the edges of the boards to prevent the wood from splitting (Fig. 2).

5. Screw the slats (E) to the seat supports (A). Start with the slat farthest back, then do the one at the front. Space out the remaining slats and screw them in place. You may need to file flat surfaces on the curved edges of the sides so the slats rest firmly.

6. Assemble the back. Screw the slats to the bottom brace (L), then attach the middle brace (K) 10-1/4" above the bottom brace.

7. Screw the arms (B) to the arm supports (M), and the arm braces (D) to the legs (C), being sure to leave the braces protruding above the tops of the legs (see detail in Fig. 1).

8. Bolt the hinge bars (N) to the back assembly. Use washers between the wooden pieces.

9. Bolt the arm supports (M) to the legs (C) and back, and clamp the legs to the seat assembly. Then screw the hinge bars to the seat supports.

10. Adjust the legs (C) so they are square, then drill through the holes in the leg and into the seat supports (A, Fig. 1). The peg must have a

firm fit in its hole, so be sure to make a test hole first on scrap. Bolt the legs to the seat, insert the pegs, and screw on the front brace (J).

11. Attach the front brace (J) to the legs.

### Building the Footrest

12. Cut all pieces to size, then cut and sand the curves as you did those of the chair.

13. Cut the angled ends of the legs (R). Drill screw holes in the slats, bolt holes in the sides, and chop a shallow mortise for the metal hooks (see the plan detail in Fig. 1).

14. Bend the hooks in a metal vise, cut them off with a hacksaw, and file or grind smooth. Use a slat (P) as a guide for drilling clearance holes for the screws.

15. Screw the slats and hooks to the sides (Q) and bolt on the legs (R). As with the seat, you may need to file flat surfaces on the curved edges of the sides so the slats rest firmly. Do not insert screws too close to the narrow ends of the sides.

16. Hook the footrest to the chair and adjust the legs so they are flat on the ground. Clamp them there. Screw the stops (S) to the inside so that when the legs are unfolded the stops will keep them in the correct position (see the plan detail in Fig. 1).

## PROTECTING YOUR PROJECT

Any type of wood that's used outdoors needs protection from water damage. There are a variety of protective coatings available, including clear and tinted wood protectors and semi-transparent and solid stains. Each of these finishes has a different look and maintenance requirement.

We've chosen Thompson's® WaterSeal® Advanced Tinted Wood Protector in Natural Cedar to give your project complete protection. This product provides maximum strength waterproofing in a coating that also resists mildew and U.V. (ultraviolet radiation in sunlight) damage. This product can be applied to damp, freshly cleaned wood so you can clean and treat your project in one day. Plus, the transparent tint will give plain pine just the right amount of rich wood tone. This product is also available in Honey Gold, Rustic Red, Nutmeg Brown and Coastal Gray sheer wood tones.

**Woodworker's Tip:** Always be sure to choose a waterproofer that exceeds industry standards for waterproofing on wood.

## STAINING AND FINISHING

### FINISHING TIPS

- Coverage: The approximate coverage of Thompson's® WaterSeal® Advanced Tinted Wood Protector on pine is 200 square feet per gallon. A gallon of Thomson's® WaterSeal® Waterproofer Plus Tinted Wood Protector will cover about 200 to 300 square feet.
- When you apply Thompson's® WaterSeal® Advanced Tinted Wood Protector or Thompson's® WaterSeal® Waterproofer Plus Tinted Wood Protector, do not mix it with other waterproofing products, because variations in the final appearance of the surface being treated may result. Also, do not thin these products.

### **Recommended Finish**

For maximum strength protection against water damage, use Thompson's® WaterSeal® Advanced Tinted Wood Protector.

17. Read and follow the directions found on the back of the can. Be sure that both surface and air temperature are above 50° F and remain above freezing 24 hours after application. If you're working outside do not apply product if rain is forecasted within 48 hours of application.

18. Before applying Thompson's® WaterSeal® Advanced Tinted Wood Protector, the wood surface must be free of all dirt, mildew, mold, waterproofer, wood stains and other contaminants. Then do a trial test before full application. The surface may darken slightly with application and color appearance is different when the wood is fully dry.

19. Shake or stir contents for a minimum of 2 minutes before use. Intermix all containers (of the same color) to be used to assure color uniformity.

20. Apply using a paint pad or brush. For small projects, a brush is the preferred applicator.

21. Apply only one thin, even coat. **DO NOT APPLY A SECOND COAT.** A heavier or additional coat will not improve performance or appearance. Avoid puddling. Tackiness will result if over-applied. May also occur after application if overnight temperature falls below 50°F within 48 hours of application. Drying time will vary depending on wood surface and humidity. Allow a minimum of 12 hours before using the chair.

22. Clean brushes and equipment with soap and water. Dry product can be removed with mineral spirits.

### **Alternate Finish**

23. Before applying Thompson's® WaterSeal® Waterproofer Plus Tinted Wood Protector, read and follow the directions found on the back of the can. Be sure that both surface and air temperature are above 50° F during application and for 48 hours after application, and if you're working outside, do not apply product if rain is forecasted within 24 hours of application.

24. The surface must be free of all dirt, mildew, mold, waterproofer, wood stains and other contaminants. If the surface is damp or wet from cleaning or weather, allow the surface to dry thoroughly (a minimum of 48 hours) before application.

25. Before applying this product over the entire surface, a small trial patch is recommended to verify color.

26. In most applications, only one light coat is necessary. Apply with a brush, roller, paint pad, or by dipping the piece into the product. Regardless of which application method is used, remove excess within 15 minutes by redistributing it to drier areas or wiping it off.

27. Oiliness and tackiness will result if over-applied or applied to wet or damp surface or if overnight temperature falls below 50° F within 48 hours of application.

28. Allow at least 48 hours to dry before you sit in the chair. Drying time will vary depending on the substrate, temperature and humidity.

29. Clean brushes and equipment with mineral spirits, then rinse with clean water.

**IMPORTANT:** If using oil-based Waterproofer Plus Wood Protector, place rags, steel wool and waste immediately after use in a sealed, water-filled metal container.

**NOTE:** For all waterproofing products, the length of protection will vary depending on environment. Perform the following splash test once a year to see whether reapplication is necessary. Sprinkle water on various sections of surface to be sealed. If water absorbs and darkens color of substrate within 5 seconds, the surface is porous and considered ready to be treated. If water beads up or otherwise sits on top of surface, then surface doesn't need protection at this time. For maximum protection from color change and other damage caused by the sun, reapplication is recommended every year. Vertical and horizontal surfaces will experience color changes at different rates.

### **PRODUCT SAFETY**

For your safety and the safety of those you work with, always read the safety warnings, which manufacturers print on their labels, and follow them to the letter. Typical safety advice and instructions will contain information such as the following:

**DANGER:** Rags, steel wool and other waste soaked in these products may spontaneously catch fire if improperly discarded. Immediately place rags, steel wool and waste after use in a sealed, watertight, water-filled metal container. Dispose in accordance with local fire regulations.

**When using Thompson's® WaterSeal® Waterproofer Plus Tinted Wood Protector:**

**CAUTIONS: CONTAINS ALIPHATIC HYDROCARBONS.** Keep away from heat and open flame. Use only with adequate ventilation. For Exterior Use Only. To avoid overexposure, if treating enclosed exterior rooms or porches, open windows and doors or use other means to ensure fresh air entry during application and drying. If you experience eye watering, headaches, or dizziness, increase fresh air, or wear respiratory protection (NIOSH approved), or leave the area. Avoid contact with eyes and skin. Causes skin and respiratory tract irritation. Wash hands after using. Keep container closed when not in use. Do not transfer contents to other containers for storage.

**FIRST AID:** In case of eye contact, flush thoroughly with large amounts of water for 15 minutes and get medical attention. For skin contact, wash thoroughly with soap and water. In case of respiratory difficulty, provide fresh air and call physician. If swallowed, call Poison Control Center, hospital emergency room, or physician immediately.

### **DELAYED EFFECTS FROM LONG-TERM OVEREXPOSURE.**

Contains solvents which can cause permanent brain and nervous system damage. Intentional misuse by deliberately concentrating and inhaling contents may be harmful or fatal.

**WARNING:** This product contains chemicals known to the State of California to cause cancer and birth defects or other reproductive harm. **DO NOT TAKE INTERNALLY. KEEP OUT OF REACH OF CHILDREN.**

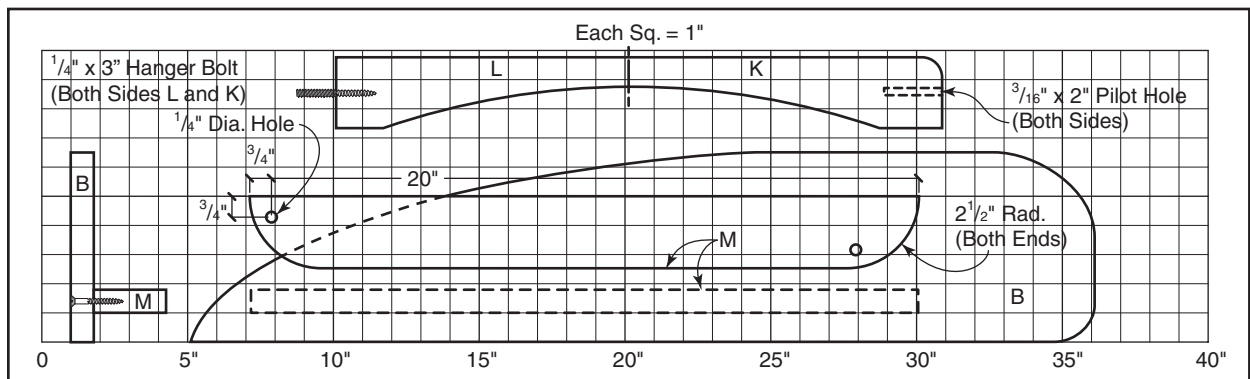
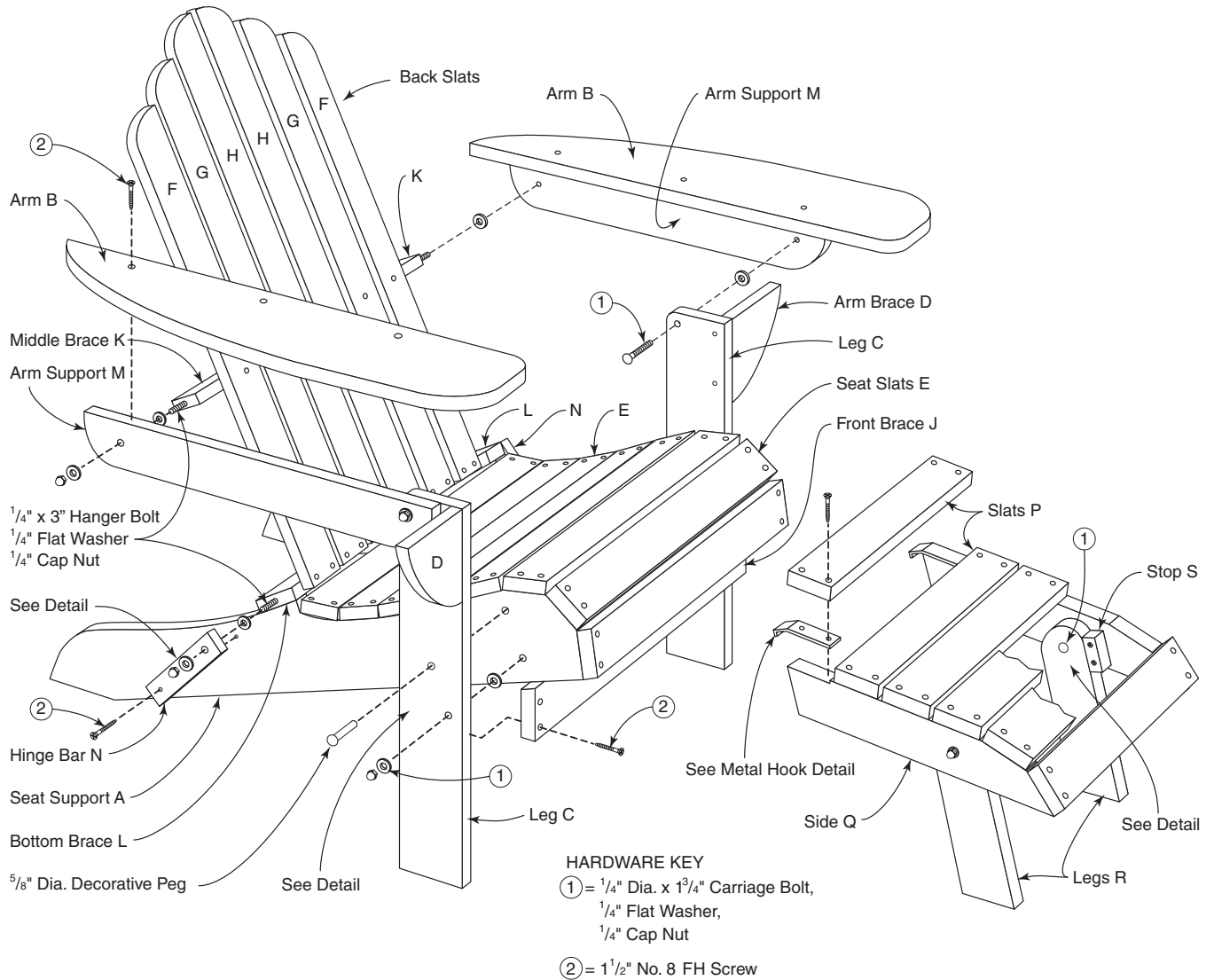
**When using Thompson's® WaterSeal® Advanced  
Tinted Wood Protector:**

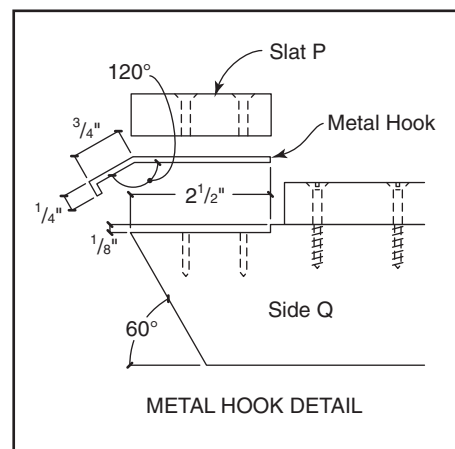
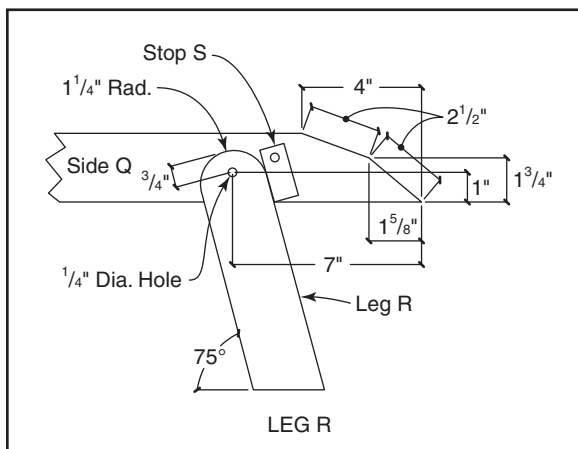
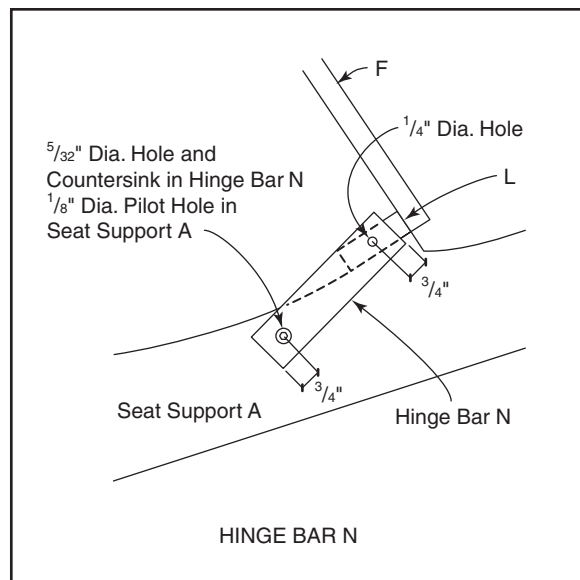
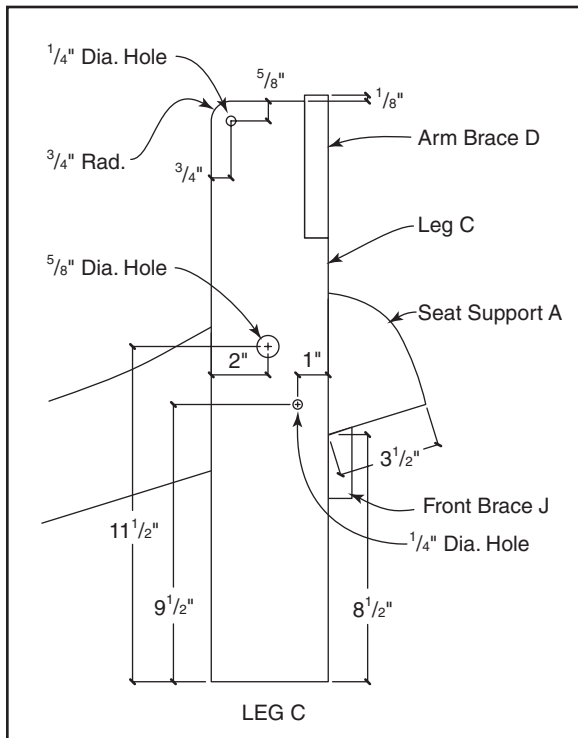
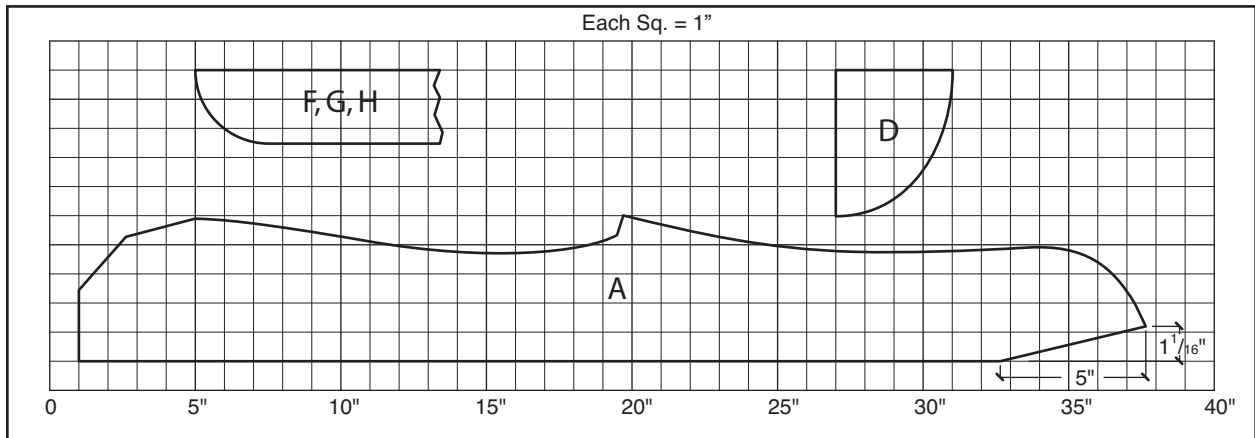
**CAUTIONS:** Use Only With Adequate Ventilation. To avoid overexposure, open windows and doors or use other means to ensure fresh air entry during application and drying. If you experience eye watering, headaches, or dizziness, increase fresh air, or wear respiratory protection (NIOSH approved), or leave the area. Avoid contact with eyes and skin. Wash hands after using. Keep container closed when not in use. Do not transfer contents to other containers for storage.

**FIRST AID:** In case of eye contact, flush thoroughly with large amounts of water. Get medical attention if irritation persists. If swallowed, call Poison Control Center, hospital emergency room, or physician immediately.

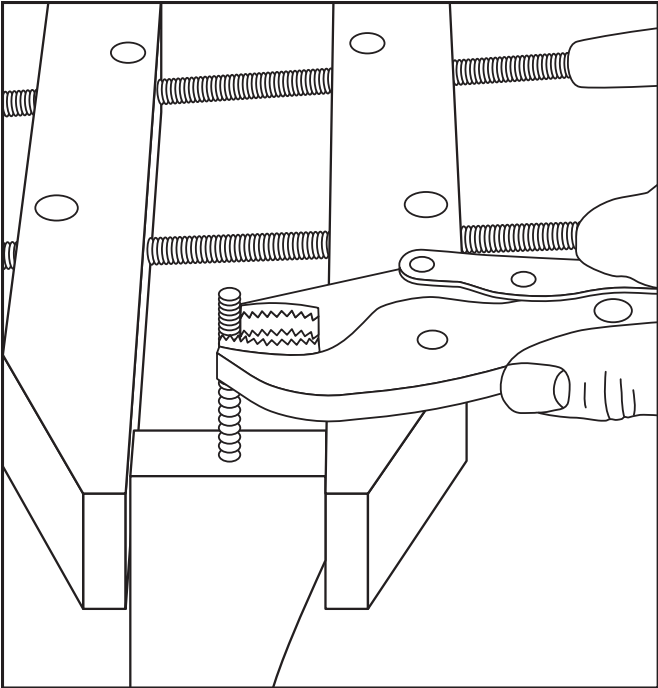
**WARNING:** This product contains chemicals known to the State of California to cause cancer and birth defects or other reproductive harm.  
**DO NOT TAKE INTERNALLY. KEEP OUT OF REACH OF CHILDREN.**

**FIG 1. ADIRONDACK CHAIR DETAIL**

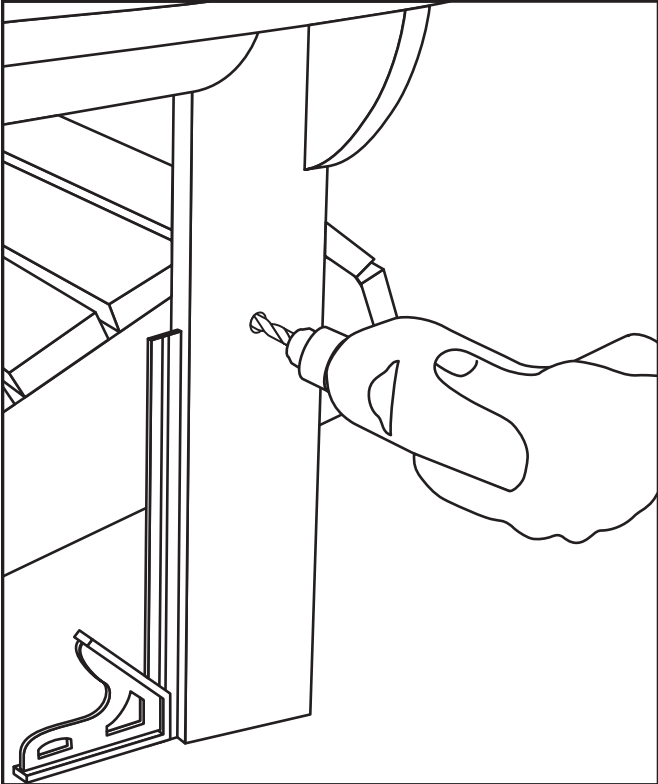




**FIG 2. SCREW IN THE HANGER BOLTS**



**FIG 3. DRILL THE BOLT HOLES**





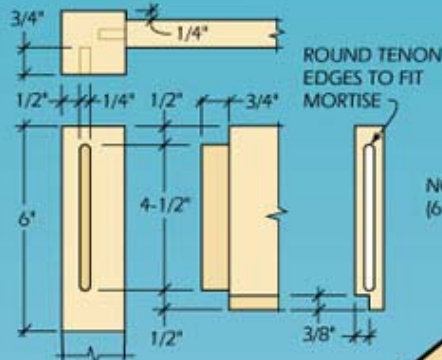
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# COFFEE TABLE

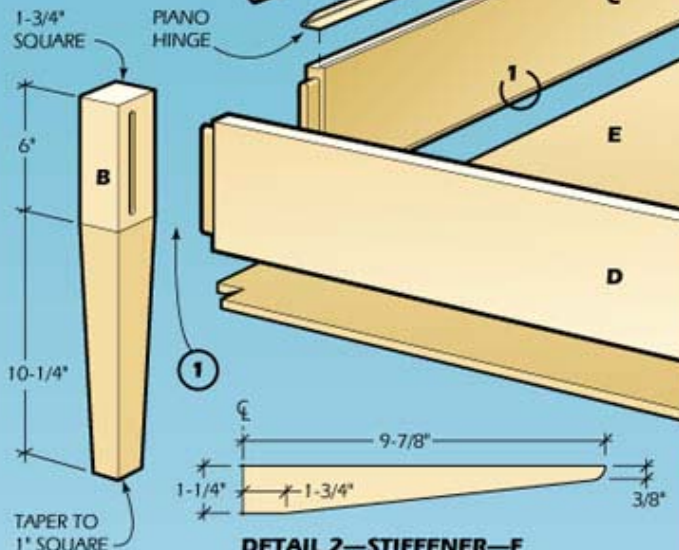
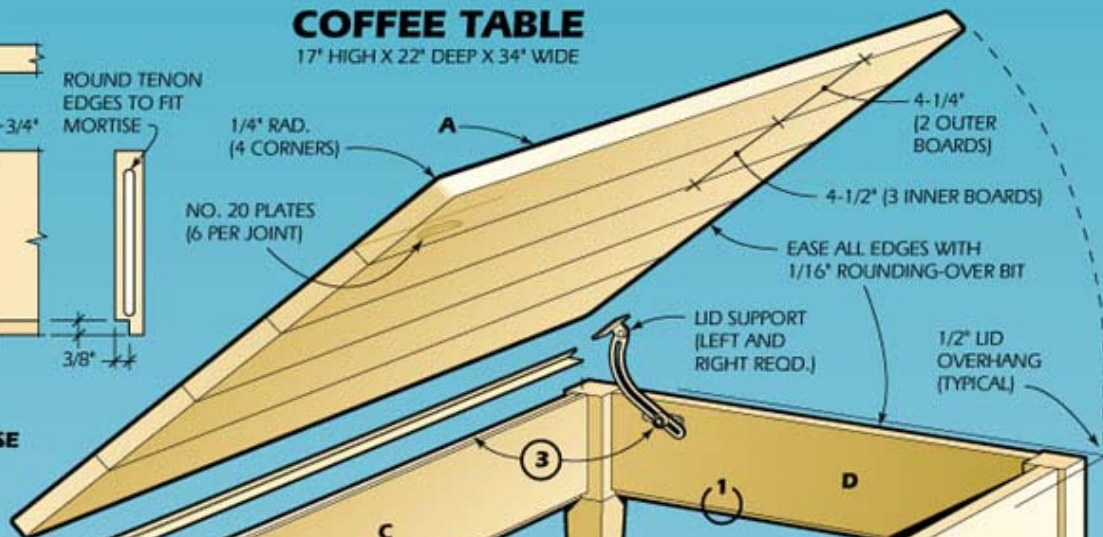


# COFFEE TABLE

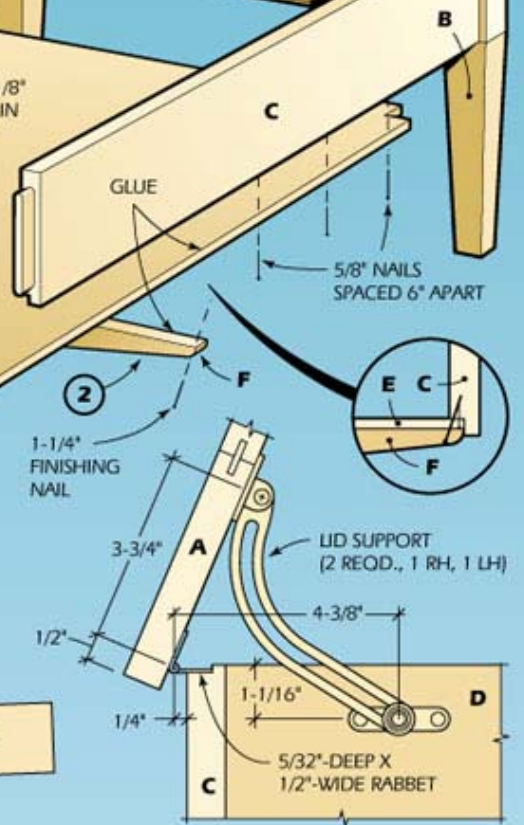
17" HIGH X 22" DEEP X 34" WIDE



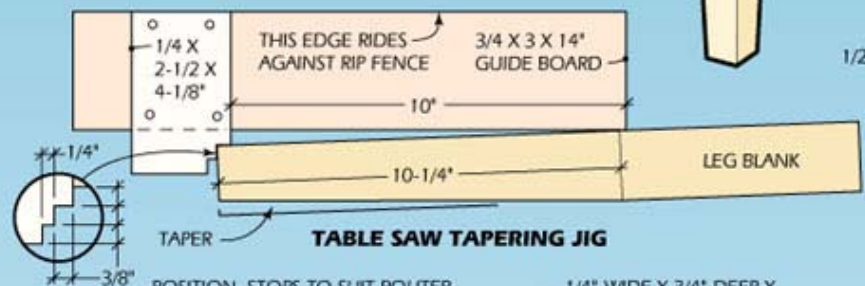
**DETAIL 1  
TENON AND MORTISE**



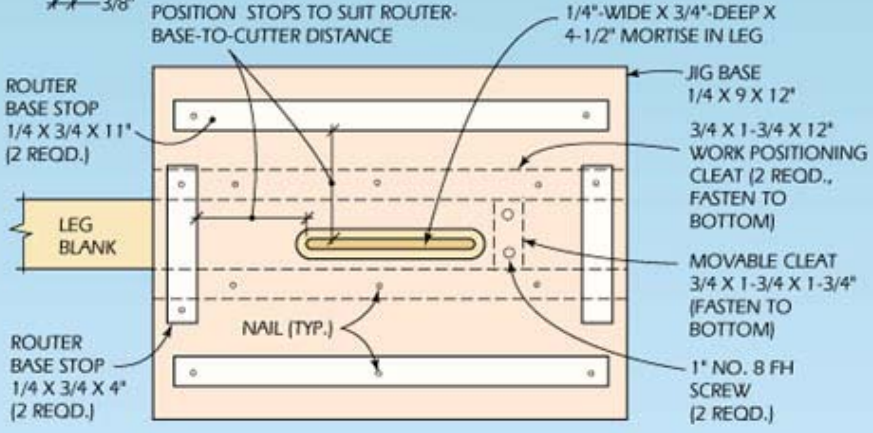
**DETAIL 2—STIFFENER—F**



**DETAIL 3—LID SUPPORT**



**TABLE SAW TAPERING JIG**



**ROUTER JIG FOR LEG MORTISE**

## MATERIALS LIST—COFFEE TABLE

Key	No.	Size and description (use)
A	1	3/4 x 22 x 34" maple (lid)
B	4	1 3/4 x 1 3/4 x 16 1/8" maple (leg)
C	2	3/4 x 5 1/2 x 31" maple (apron)
D	2	3/4 x 5 1/2 x 19" maple (apron)
E	1	1/4 x 19 3/4 x 31 3/4" lauan plywood (bottom)
F	1	3/4 x 1 1/4 x 19 3/4" maple (stiffener)

Misc: Curved friction lid supports, Part Nos. 25619 and 25627, brass 1 1/2-in.-wide x 48-in.-long piano hinge,

### The Top And Legs

The panel for the tabletop is assembled by edge gluing five boards. Begin construction by ripping and crosscutting the stock slightly oversize, 4 1/2 in. wide x 35 in. long.

If you have a plate joiner, use it to cut the slots for six joining plates for each edge joint. Arrange the boards to produce the most attractive grain pattern. And make sure the endgrain growth ring directions alternate between the boards.

Mark centerlines for the slot positions along each joint line, then clamp each board to a flat benchtop while the slots are cut (Photo 1).

Inserting the plates and applying and evenly spreading the glue on eight edges can be difficult to do before the glue begins to set. To make the job easier, preglue the plates in each board. Use a small-nozzle squeeze bottle to apply glue in the slots without getting any on the edges (Photo 2).

To assemble the panel, you'll need four or five long clamps, six smaller clamps and six cauls. This arrangement will apply even pressure across the panel to prevent it from cupping. Rub paste wax on each caul's contact surface to prevent it from sticking to the boards.

Apply glue to the edges and plates, slide the boards together, then apply pressure to the cauls and the long clamps (Photo 3).



1--Joint the edges of the boards for the tabletop and cut the slots in them to receive the joining plates.



2--Save glue application time by pregluing



Remove the hardened glue that has squeezed from the joint using a scraper, belt sander and finishing sander, in that order. Next, crosscut the panel to finished size.

Rip and crosscut the legs to size and joint their four faces so they are square to one another and smooth. Lay out the mortise positions on adjacent faces and install a 1/4-in.-dia. straight bit in your plunge router for cutting the mortises. You can use a router edge guide to make the cuts, but the simple jig shown enables you to do the job more quickly and easily. The jig is made of 1/4-in. plywood with cleats attached to the bottom to secure the leg. A removable end cleat allows the leg to be repositioned so that one jig can be used to cut the mortises on both leg faces. On top of the jig, four strips guide the router and stop its travel.

Make mortise cuts in several passes (Photo 4). When the first mortise has been cut on each leg, reposition the jig's end cleat, insert the blank from the other end and proceed to cut the mortise on the adjacent face.

The tapers are cut on the table saw with the aid of a simple step jig. The taper is cut on two adjacent faces with the leg positioned in the first step of the jig. The end of the leg is placed in the second step to cut the two remaining tapers (Photo 5).

the joining plates in their slots. A small-nozzle bottle is handy here.



3--Glue and clamp the top using cauls above and below. Wax the cauls to prevent glue from sticking to them.



4--Use a jig and a plunge router to cut the leg mortises. The stops are positioned to suit the router's base.



5--Use a stepped jig on the table saw to cut the leg tapers. Each step positions the leg to cut two tapers.

Smooth the inner leg surfaces using a sander, but sand the mortised faces gently by hand to avoid distorting the surface surrounding the mortise. The mortise surface has to remain flat and square.

To complete the legs, set up a 1/16-in.-rad. rounding-over bit in a router table and round the corners (Photo 6).

### Aprons And Assembly

Rip and crosscut the aprons, then set up a dado blade on the table saw to cut the apron tenons. Clamp a stop-block to the miter gauge fence, elevate the blade for a 1/2-in.-deep cut, and cut the tenon in four passes (Photo 7). Next, cut the rabbets for the bottom panel on the inside edges of the four aprons.

After using a chisel to round the ends of the tenons to match the mortises, the table is ready for assembly. Use four clamps and four cauls to assemble the legs and aprons (Photo 8). Apply glue sparingly to the tenons, and draw the assembly together. Check the assembly for square. If necessary, adjust the clamps to make the assembly square.

After the glue has set, use the router with a straight bit to cut the hinge rabbet. To do this, clamp two pieces of scrap flush with the apron's top edge to provide a stable surface for the router. Set the router to make a 5/32-in.-deep cut (Photo 9). Note that the rabbet's 1/2-in. width is critical. It positions the hinge so the top can tilt without striking the leg's corner.

Next, crosscut the piano hinge to fit the rabbet and install it temporarily. Do this by placing the lid on the workbench with the bottom facing up. Then place the table, bottom up, onto the lid and mark the position of the hinge on the lid. Remove the hinge, mark the screw centers, and bore the screw pilot holes. Attach the hinge to the table first, then to the lid.

Once the hinge is installed, mark and bore the screw pilot holes for lid supports. Attach the supports to the aprons first,



6--Round the bottom of the leg corners on the router table. Don't round the top of the leg where it abuts the apron.



7--Use a stopblock clamped to the miter gauge and a dado blade in the table saw to cut the apron tenons.



8--Glue and clamp the aprons and legs. Heavy cauls distribute clamping pressure across each apron.

then the lid (Photo 10).

Cut the plywood bottom to size and install it with glue and nails. Also, glue the stiffener strip to the bottom. Remove the lid to allow finishing.

We finished the table with three coats of polyurethane lightly tinted with a few drops of yellow ochre to give it a warm honey color.



9--Clamp scrap to the rear apron to provide a base for the router, then cut the hinge rabbet using a straight bit.

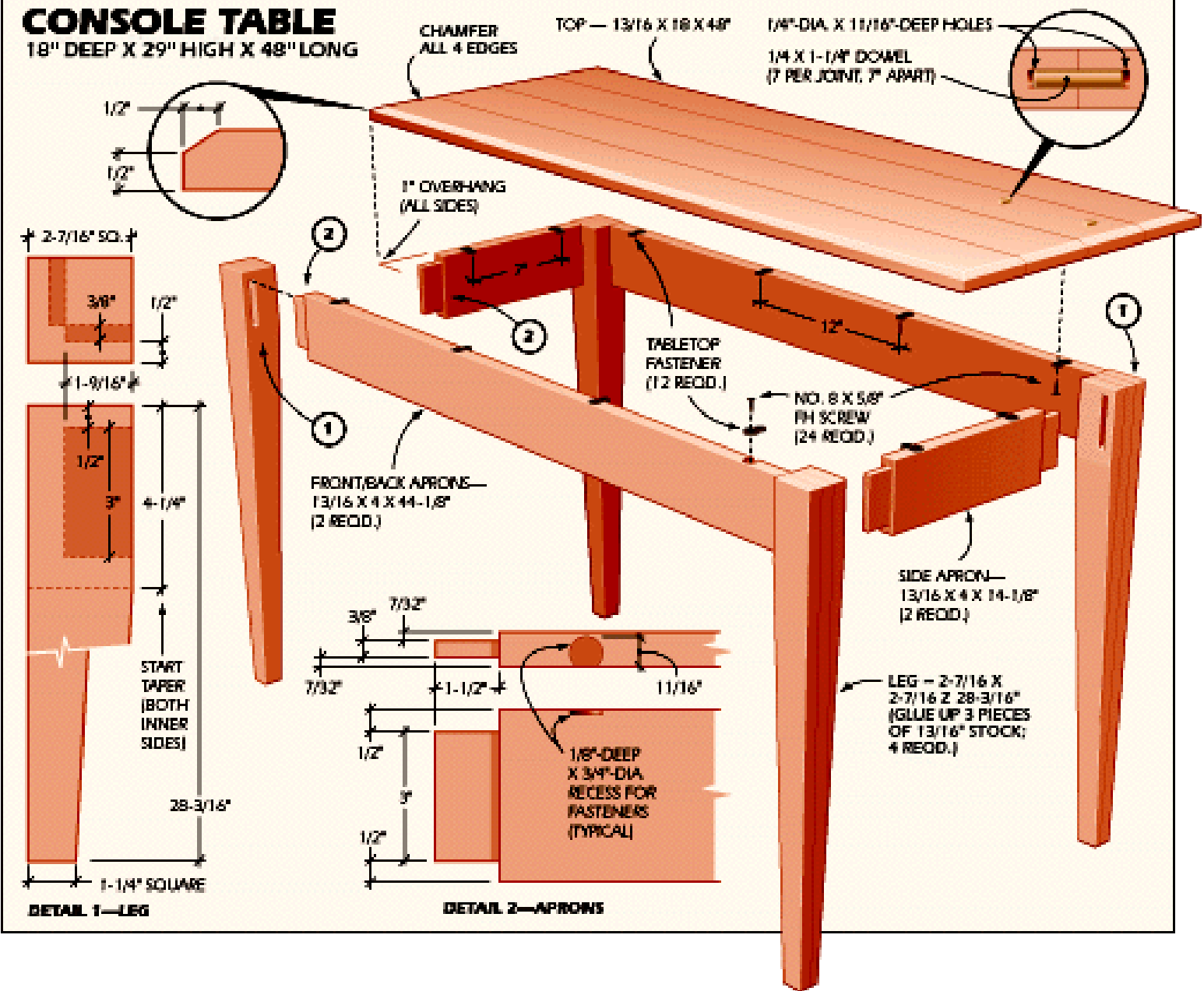


10--Sequence is important when attaching the top's support hardware. Attach it to the apron first, then the top.



# CONSOLE TABLE

## CONSOLE TABLE 18" DEEP X 29" HIGH X 48" LONG



This simple console table is a great beginner's project. Its straightforward lines are reminiscent of Shaker pieces built over 100 years ago. But simple doesn't have to mean unsophisticated. This solid cherry piece is well-tailored, crisply built and can fit just about anywhere: your front hall, behind a living room sofa, in an upstairs bedroom, or even in your bathroom if it's blessed with enough extra space.

But good design isn't the whole story. This piece is also easy for a beginner to build. It has only nine parts: four legs, four rails and a top. And we show you how to build it with nothing more than hand tools and a few portable power tools. Everything you need is described in "Beginner's Toolbox".

Perhaps the best part of this design, however, is that it puts to good use everything that comes before it in this Woodworking Guide. If you start this table now, your gratification won't be delayed much longer. You should be able to finish it up in just a few weeks of spare time—even if you just learned how to sharpen a chisel or cut a mortise-and-tenon joint.

## Cherry Stock

The material we used for this piece is solid cherry stock that we bought flattened on both sides and jointed on one edge. You'll have to pay more for this service, but it's worth the cost. The standard thickness for this type of hardwood is 13/16 in.

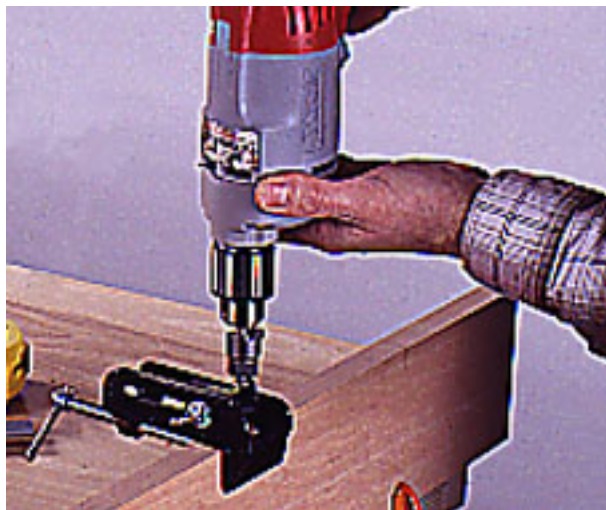
The first step in preparing the lumber is to crosscut all parts to rough length, a couple of inches longer than their finished lengths. Then check the jointed edge of each piece for flatness and square. If some refinements are required, clamp the board to the side of your worktable and use a bench plane to true the edge (Photo 1). Next, cut the boards to finished width using a circular saw with a rip guide (Photo 2). Clean up any saw marks with a bench plane.



1--Begin the top by flattening one edge of each board, using a bench plane. Make sure the edge is planed square to the face.



2--Cut each top board to width using a circular saw and rip guide. Make sure the rip guide follows the planed edge.



3--Lay out the location of the alignment dowels on the board edges. Then use a doweling jig and drill to bore the holes.



4--Cover the edges and dowel holes with glue, insert the dowels and bring the boards together with pipe clamps.



5--When the glue is dry remove any squeeze-out, then let the assembly cure. Flatten joints if necessary with a plane.



6--Mark the finished length on both ends of the top panel. Then make the cuts with a saw and straightedge guide.

## Tabletop

This tabletop was made from four smaller boards that were glued together. Using multiple boards helps keep the top flat over time. If your stock is wide enough to use only three boards, that's fine. Begin work by laying the boards on a flat surface and choosing the most attractive grain pattern by arranging the boards in several ways. Then lay out the dowel locations on all the joints and bore the dowel holes using a doweling jig and a portable drill (Photo 3).

Next, place a drop of glue in each dowel hole and gently tap the dowel in place. Then spread the glue evenly on all the mating edges and push the boards together. Tighten the joints, using pipe clamps (Photo 4), and check that the panel is flat before letting the glue set. If it's not, readjust the clamps until the surface is flat. After 20 minutes scrape off any excess glue from the joints and let the panel dry overnight.

When you remove the clamps, check the panel surface carefully. If the joints are flush, set the panel aside. If they aren't, use a bench plane to smooth the surface (Photo 5). Hold the plane at a 30 degrees angle to the wood grain and make shearing cuts.

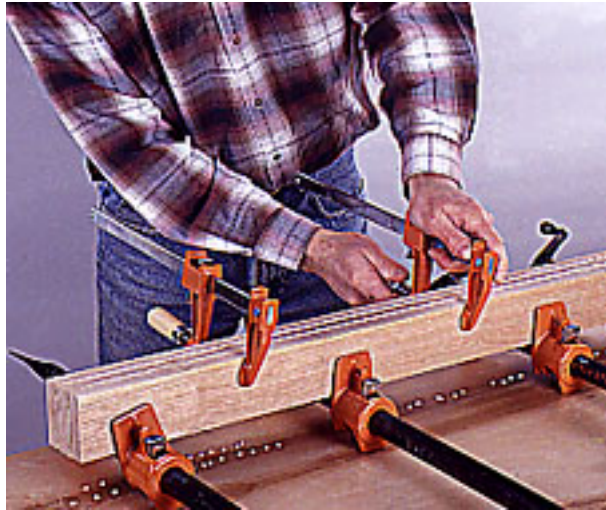


Next, cut the panel to finished length, using a circular saw and a straightedge guide (Photo 6). Make sure that both ends are square to the sides before making the cuts. Next, mark guidelines for the edge chamfer around the perimeter of the top and use a block plane to create these bevels (Photo 7). Be sure to clamp a scrap block to each long edge to keep them from splitting when you're working on the end grain.

Complete the tabletop by sanding smooth both sides and all the edges. Begin with 120-grit paper and move through a sequence of 150-, 180- and 220-grits.



7--Mark the chamfer around the top and plane the edges to this line. A scrap block keeps the side edge from splitting.



8--Cut the leg stock to size, then apply glue to the mating surfaces. Keep the board edges flush when clamping.

## Legs And Rails

Crosscut the leg stock to finished length. Note that each leg is formed from three pieces of stock that are glued together. Apply glue to the three boards that make up each leg and clamp them together (Photo 8). Scrape off the excess glue after 20 minutes, and leave each leg assembly clamped for at least an hour. Don't do any further work on these pieces until the glue has cured for 24 hours.



9--Lay out the tenons on the ends of the table rails with a marking gauge. Keep the

Lay out the mortises on the corresponding

legs with a marking gauge. Then use a doweling jig and a portable drill to remove most of the waste (Photo 12). Finish up the mortise by squaring the ends and sides with a sharp chisel.

Once the joinery is done, cut the tapers on both inside edges of each leg, as shown in the drawing below. Use a circular saw and be sure to cut on the waste side of the layout lines. Finish these tapers with a bench plane (Photo 13), making sure to check for square as you work. Before the legs and rails are assembled, it's a good idea to finish sand all the parts with the same progression of grits that was discussed earlier.

gauge base flat on the board surface.



10--Make the cheek cuts on the tenons using a backsaw. Keep the blade kerf just to the waste side of the layout lines.



11--Make the tenon shoulder cuts with a backsaw. Clamp a scrap block to the board to help guide the saw blade.



12--Remove the waste from the mortise using a drill and doweling jig. Square the ends and walls with a sharp chisel.



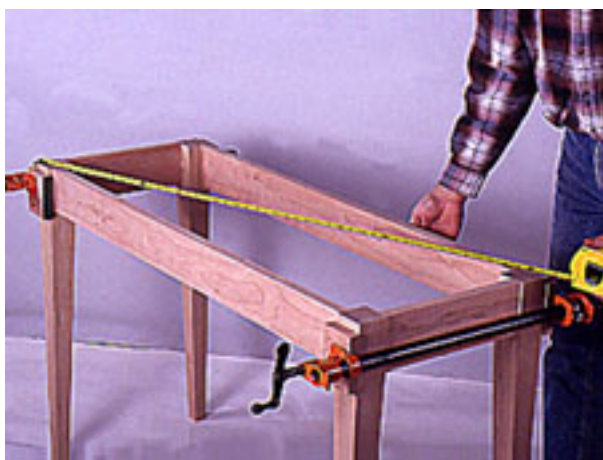
## Assembly

Begin by joining a long rail to a pair of legs. Spread the glue evenly on the tenons and mortises, and then clamp the pieces together. Do the same with the other legs and long rail. When the glue has cured on these two assemblies, join them together with the short rails. Assemble the parts on a flat surface. Once the clamps are in place, compare opposite diagonal measurements to check for square (Photo 14). If the assembly isn't square, readjust the clamps until it is.

When the base joints have cured, lay out and bore the holes in the rails for the tabletop fasteners. Then turn the top upside down on a padded table and place the inverted base assembly on the underside of the top. Adjust the base so it's centered on the top. Then mark the location of the fastener holes. Bore pilot holes and screw the base to the top (Photo 15).



13--Rough cut the leg tapers with a circular saw. Then reduce the edges to finished thickness with a bench plane.



14--Glue and clamp the legs to the rails. Then check for a square assembly by comparing diagonal measurements.



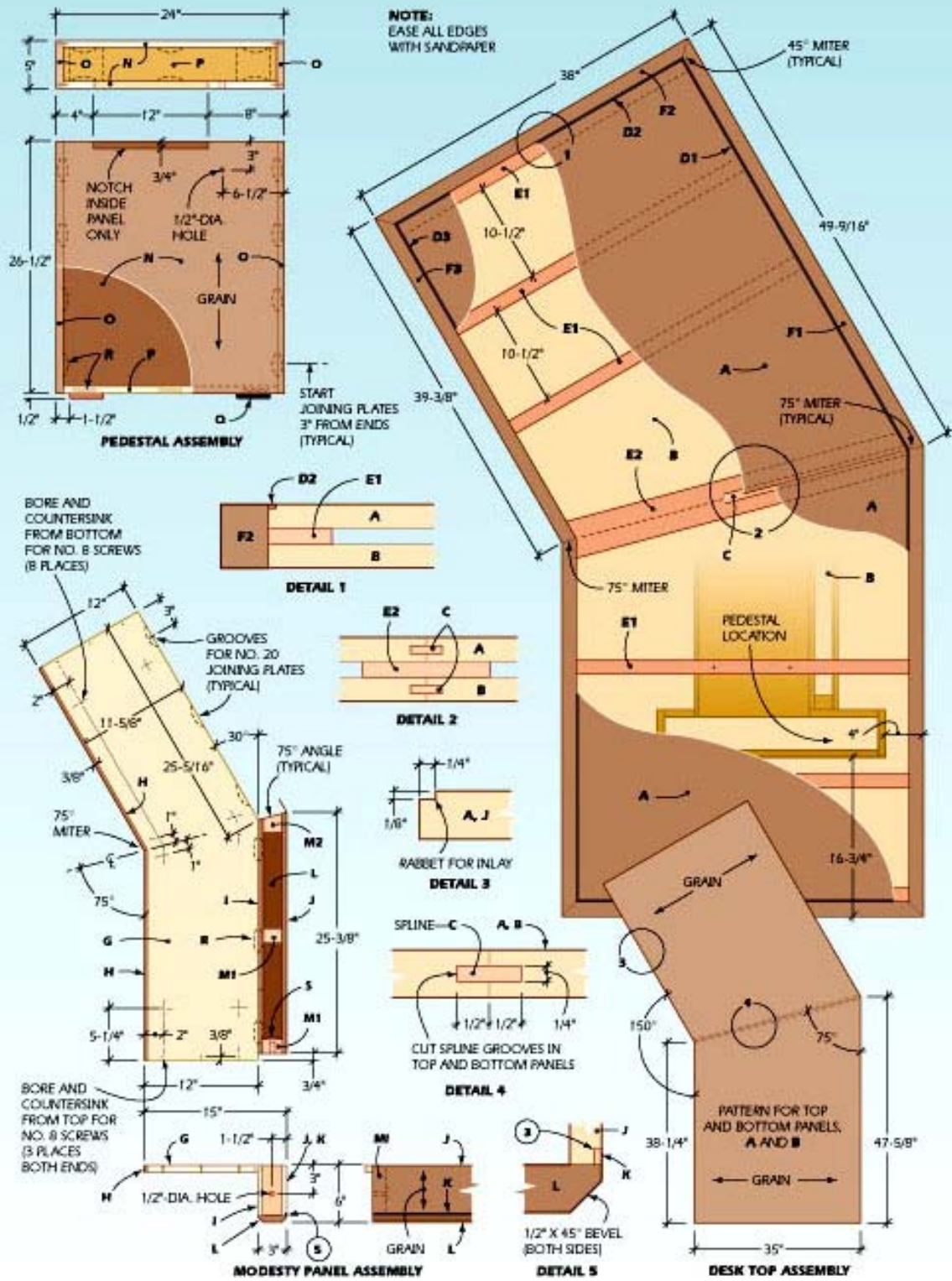
15--Attach the tabletop fasteners to the rails. Then turn the table parts over and screw the fasteners to the underside of the top.



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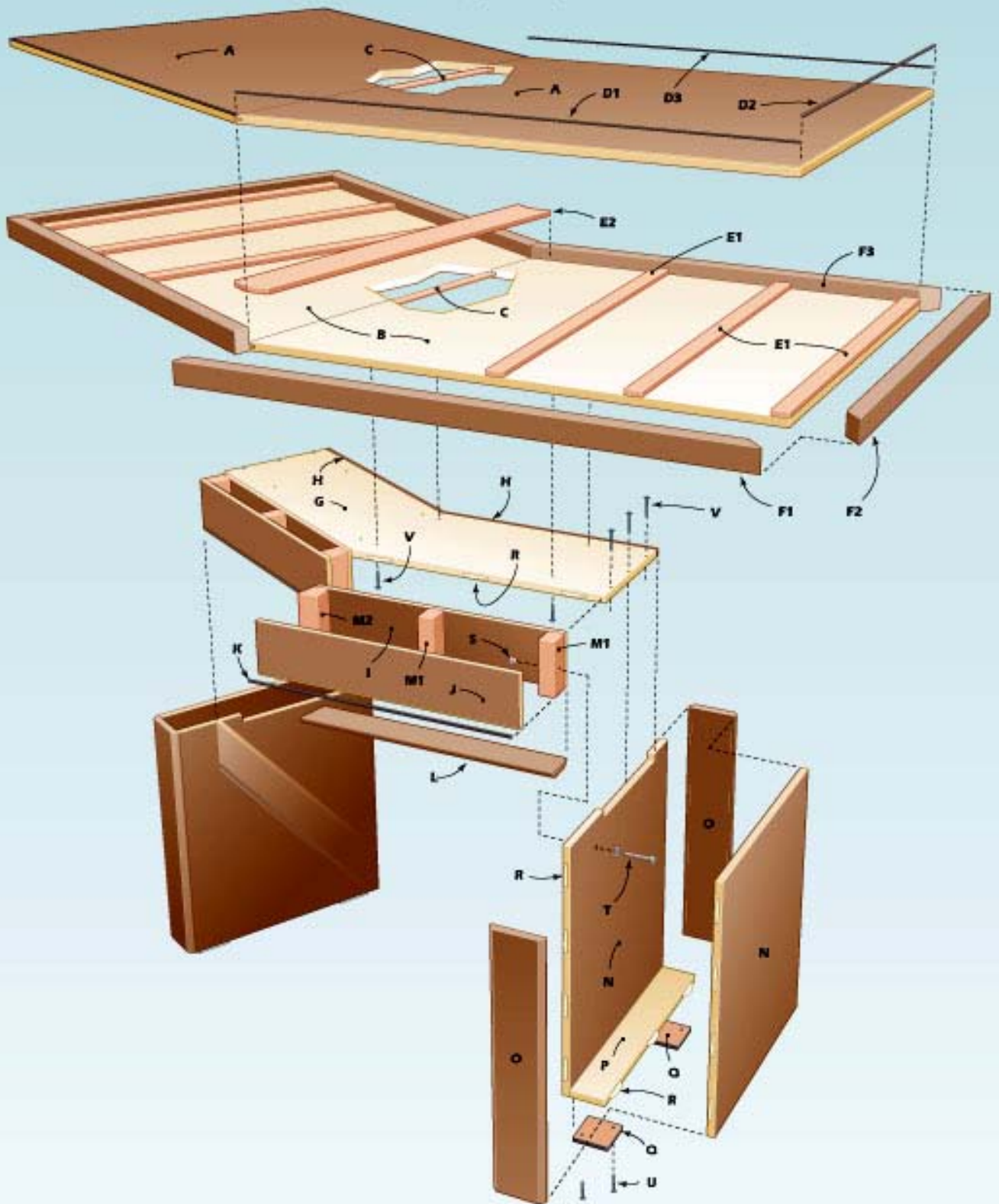
# OFFICE DESK





# DESK

29" HIGH X 49-1/2" DEEP X 95-3/4" WIDE



## **MATERIALS LIST—OFFICE DESK**

<b>Key</b>	<b>No.</b>	<b>Size and description (use)</b>
<b>A</b>	<b>2</b>	<b>3/4 X 35 X 47-5/8" walnut panel stock* (upper top)</b>
<b>B</b>	<b>2</b>	<b>3/4 X 35 X 47-5/8" panel stock** (lower top)</b>
<b>C</b>	<b>2</b>	<b>1/4 X 1 X 36-3/8" maple (spline)</b>
<b>D1</b>	<b>2</b>	<b>1/8 X 1/4 X 47-5/8" maple† (inlay)</b>
<b>D2</b>	<b>2</b>	<b>1/8 X 1/4 X 35" maple† (inlay)</b>
<b>D3</b>	<b>2</b>	<b>1/8 X 1/4 X 38-5/16" maple† (inlay)</b>
<b>E1</b>	<b>6</b>	<b>1/2 X 1-1/2 X 35" poplar (spacer)</b>
<b>E2</b>	<b>2</b>	<b>1/2 X 4 X 36-3/4" poplar (spacer)</b>
<b>F1</b>	<b>2</b>	<b>1-1/2 X 2 X 49-9/16" walnut (edge)</b>
<b>F2</b>	<b>2</b>	<b>1-1/2 X 2 X 38" walnut (edge)</b>
<b>F3</b>	<b>1</b>	<b>1-1/2 X 2 X 39-3/4" walnut (edge)</b>
<b>G</b>	<b>1</b>	<b>3/4 X 17-13/16 X 48-15/16" panel stock** (subtop)</b>
<b>H</b>	<b>2</b>	<b>3/8 X 3/4 X 22-1/4" walnut (edge band)</b>
<b>I</b>	<b>2</b>	<b>3/4 X 5-1/4 X 24-11/16" walnut panel stock (inner panel)</b>
<b>J</b>	<b>2</b>	<b>3/4 X 5-1/4 X 25-3/8" walnut panel stock (outer panel)</b>
<b>K</b>	<b>2</b>	<b>1/8 X 1/4 X 25-3/8" maple† (inlay)</b>
<b>L</b>	<b>2</b>	<b>3/4 X 3 X 25-3/8" walnut (bottom cap)</b>
<b>M1</b>	<b>4</b>	<b>1-1/2 X 2 X 5-1/2" poplar (block)</b>
<b>M2</b>	<b>2</b>	<b>2 X 2 X 5-1/2" poplar (block)</b>
<b>N</b>	<b>4</b>	<b>3/4 X 22-1/2 X 26-1/2" walnut panel stock (pedestal side)</b>
<b>O</b>	<b>4</b>	<b>3/4 X 5 X 26-1/2" walnut (pedestal endcap)</b>
<b>P</b>	<b>2</b>	<b>3/4 X 3-1/2 X 22-1/2" poplar (pedestal base)</b>
<b>Q</b>	<b>4</b>	<b>1/2 X 3-1/2 X 3-1/2" maple†† (foot)</b>
<b>R</b>	<b>50</b>	<b>No. 20 joining plate</b>
<b>S</b>	<b>2</b>	<b>3/8" T-nut</b>
<b>T</b>	<b>2</b>	<b>3/8 X 2-1/2" hexhead bolt and washer</b>
<b>U</b>	<b>8</b>	<b>1-1/4" No. 8 fh woodscrew</b>
<b>V</b>	<b>14</b>	<b>2" No. 8 fh woodscrew</b>

The modern executive office desk isn't simply a place to hold a telephone. These days, it's the launching platform for grand ideas and big decisions. It's the basic real estate for projects, proposals, plans and programs. And, like any other business commodity, the more you have, the more work you get done.

Our custom desk is designed with a generous surface area and is ideal for those who need to spread out their work. While the broad V shape imparts a strong, dynamic visual effect, it also makes the space more accessible.

Of course, a high-end desk needs to look the part, as well. Our design features matched walnut-veneer panels with a decorative black inlay. The result is an elegant surface that's as functional as it is eye-catching.

To achieve the mirrored effect of the matched veneer panels, you'll need to order stock that has walnut veneers cut sequentially from the log. When you order the panels, specify that they be "sequence matched



and numbered." The panel manufacturer will glue each veneer to its panel substrate in the same order that the veneers were cut. Each panel has a number that indicates its place in the sequence. When you plan the material for your desk, lay out your cut lines to make the best use of matching grain.

For our piece, we used walnut veneer on an MDF (medium-density fiberboard) core. These panels tend to be flatter and more stable than those with a veneer core (plywood). They also are about twice the weight of veneer-core panels, so you'll need a helper to move the parts around the shop.

## **The Pedestals**

The two pedestal bases that support the desktop are constructed of veneered side panels with solid-walnut caps, all joined over a solid-poplar base. Study the plans to be sure you understand the construction details, then cut the pedestal sides (N), endcaps (O) and bases (P) to exact size. Mark the position of the joining plate slots in these pieces and use a plate joiner to make the cuts.

Lay out the notches on the two inner pedestal panels and cut these with a sabre saw. Then lay out and bore the hole in each panel for the bolt that connects each pedestal to the modesty panel assembly.

Apply glue to the slots, plates and edges of one of the poplar base pieces (P), install the plates and join two sides to the base. Use clamps to pull the joints tight and let the glue set. Repeat the process for the second pedestal.

Next glue the endcaps to the pedestal subassemblies using plate joints as shown. When the glue has dried, use a router and chamfer bit to cut the 1/2-in. bevel along the vertical edges of the pedestal faces.

## **The Modesty Panel**

Cut the parts for the modesty panel to size. Pay close attention to the veneer on the front panels (J) so that, when assembled, one side of the modesty panel is a mirror image of the other. Begin assembly by joining the two mitered poplar blocks (M2) that form the core of the panel. Apply glue to the mating surfaces and clamp the blocks together. While the glue is drying, bore the 1/2-in.-dia. holes in the two end blocks (M1). Install a 3/8-in. T-nut on the inner surface of each block by tapping it into the hole with a hammer.

Next, glue and clamp one of the inner panels (I) to the center block assembly. Join the end and middle spacer blocks in the same way. Note that the end block must have the T-nut on its inner surface. Join the opposite inner panel to the center block and add the two spacers. When the subassembly is dry, glue the outer panels in place. Pay close attention to the quality of the miter joint at the front as this spot is quite prominent.

Use a router with straightedge guide to cut the rabbet along the bottom front edge of the modesty panel. Cut pieces of 1/8 X 1/4-in. black inlay strips (K) to size, and then apply glue to the rabbet and position the strips. Use pieces of masking tape placed about 2 in. apart to clamp the strips in place. Let the glue set for about 30 minutes, then remove the tape and scrape off any excess glue.

Apply glue to the bottom edges of the modesty panel and to the solid-walnut bottom caps (L). Then clamp the caps to the panel. After the glue sets, use a chamfer bit in the router to bevel the bottom edges of the cap.

Cut the subtop (G) to size and shape. Rip 3/8 X 3/4-in. edgeband strips of solid walnut (H) and glue them to the exposed edge of the subtop. Lay out and cut the joining-plate slots in the subtop edge and on the inside surface of the modesty panel. Then apply glue and join the parts. Bore and countersink holes in the subtop for fastening it to the pedestals and to the desktop.

## **The Desktop**

In order to guarantee accuracy in cutting the desktop parts, make a template for one-half of the assembled desktop panel. You can then use this template to first outline and then cut the panel parts to finished dimension. Use a sheet of 1/4-in. tempered hardboard for the pattern, trimming it to exact size with a router and straight bit guided by a straightedge.

Lay out the desktop panels (A, B) by tracing around the template. Pay particular attention to achieving a good veneer match across the center joint of the top panel pieces. The bottom panels can be made out of a less expensive material or you can stick to walnut for consistency.

To accurately cut the panels, first use a sabre saw to rough cut them within 1/4 in. of finished dimensions. For final trimming, clamp the template to the panel and use the router with a flush-trimming bit to make the cuts. This leaves the smoothest possible surface with the least chance of chipped veneer.

Use a slotting cutter in the router to cut the spline grooves along the central panel joints. Then cut the poplar blocking strips (E1, E2) and maple splines (C) to size. The splines should be snug in their grooves, but not so tight that they need to be forced into place.

Join the two halves of the bottom panel first, so that you can get the feel for the process before moving on to the more critical top joint. Apply glue to the spline, spline groove and mating edges. Insert the spline and bring the two halves together. Use long bar clamps to gently pull the joint tight. Place pads under the clamp jaws to be sure that the clamps don't damage the panel edges. Follow the same procedure for the top panel. Handle these panels very carefully because the joint is rather fragile until the entire top is assembled.

Apply glue to the poplar spacing blocks and position them on the top surface of the bottom panel as shown in the drawing. Use clamps to hold the blocks in place until the glue sets. Then apply glue to the top of the blocks and position the top panel. Carefully check that the top and bottom panels are perfectly aligned before clamping them together.

Use long cauls across the width of the top to distribute the clamping pressure. The cauls work best if they have a slight bow and are used with the convex side toward the work. If the cauls happen to be straight, place a veneer shim under the center of each caul to ensure adequate pressure in the middle of the panel.

Use a router and straightedge guide to cut the rabbet around the desktop. Cut the black-dyed inlay strips (D1, D2, D3) to size, then apply glue to the rabbet, position the strips and use masking tape to clamp them until the glue sets. Carefully scrape off any excess glue from the top and edge of the panel.

Cut the solid walnut edge (F1, F2, F3) for the desktop from 2-in. stock. Installing one walnut edge at a time, apply glue to the mating surfaces and clamp each piece in place. At the ends, use special edging clamps that grip the panel surfaces to apply pressure on the edge.

## **Finishing**

Sand the desktop, modesty panel and pedestals with 120-, 180- and 220-grit sandpaper, dusting off thoroughly between grits. Be sure to ease all edges and corners. Remove all sanding dust, then wipe the surfaces with a tack cloth.

In order to achieve a glass-smooth finish on the desktop, we used a paste filler on the top to fill the open grain of the walnut. These open pores are not a problem on the vertical surfaces, but on a horizontal surface, they would catch the light and be a distraction from the veneer pattern.

We used Behlen's Pore-O-Pac paste wood filler in Van Dyke Brown. Spread the filler across the grain of the top with a brush or rubber squeegee. Then, lightly reapply the filler with the grain. When the filler takes on a dull appearance, use a plastic scraper to remove the excess, and vigorously wipe the surface with burlap cloths to remove any remaining filler. Let the top dry overnight to allow any solvent to evaporate.



To provide a tough, yet attractive, finish for the desk, we used three coats of Behlen's Rockhard Table Top Varnish. Thin the first coat approximately 20% with the appropriate reducer and use a quality bristle brush to apply the finish. Allow the finish to dry at least 12 hours, then sand lightly with 400-grit paper and dust off thoroughly. Allow the second coat to dry overnight, then lightly sand before flowing on the final coat.

While you wait for the finish to dry between coats, you can cut, bore and countersink the maple feet for the pedestals. Sand the edges smooth, then use black enamel paint to finish the feet. Apply two or three coats as required for a good finish. When the paint and varnish are dry, screw the feet to the bottom of the pedestals.

To achieve a smooth, satin finish, you should rub out the varnish, especially on the desktop. Since this varnish is extremely hard, it should be rubbed and polished within 20 hours of applying the last coat. First, sand the top with 600-grit waterproof paper, using paraffin oil as a lubricant. When all dust particles and uneven spots are leveled, wipe the surface with a clean cloth and use No. 0000 steel wool to burnish the surface to an even satin glow. Polish the top with a soft cloth.

Join the modesty panel to the two pedestals. Use 3/8 X 2-1/2-in. hexhead bolts with washers to connect the parts. Then install screws through the subtop into the pedestal sides. Position the desktop over the base and fasten it with 2-in. No. 8 screws.

\*Walnut-veneer MDF or veneer-core panel

\*\* Walnut-, maple- or birch-veneer MDF or veneer-core panel

† Black-dyed inlay strips available from Dover Inlay Mfg. Co. Inc., Box 151, Williamsport, MD 21795

†† Painted black

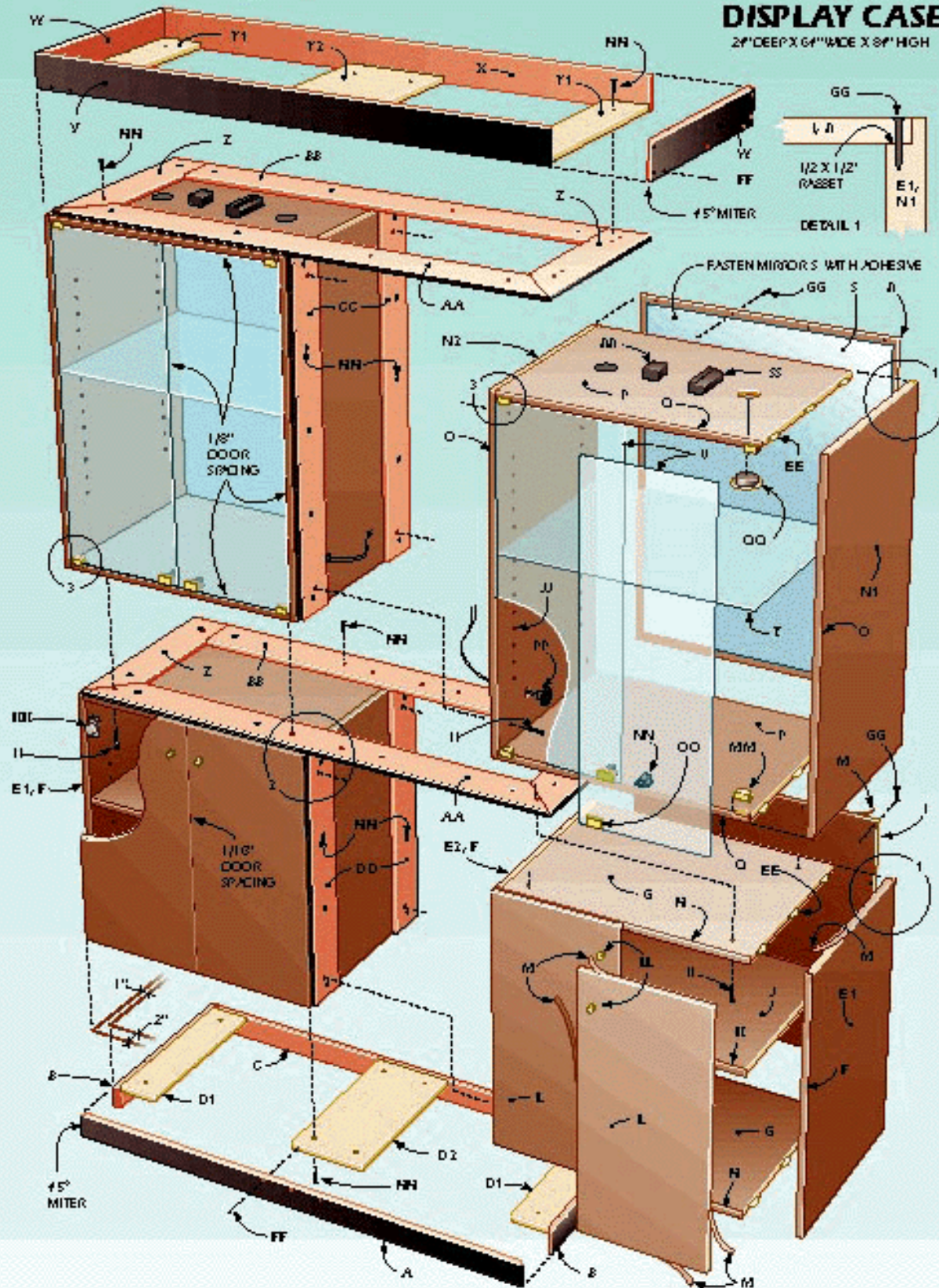
**Misc:** Glue; 120-, 180-, 220- and 400-grit sandpaper; 600-grit waterproof paper; Behlen's Pore-O-Pac paste wood filler (Van Dyke Brown) No. B744-IF346; Behlen's Rockhard Table Top Varnish No. B603-28507; Behlen's Rockhard Varnish Reducer; black satin enamel paint.

# DISPLAY CABINET

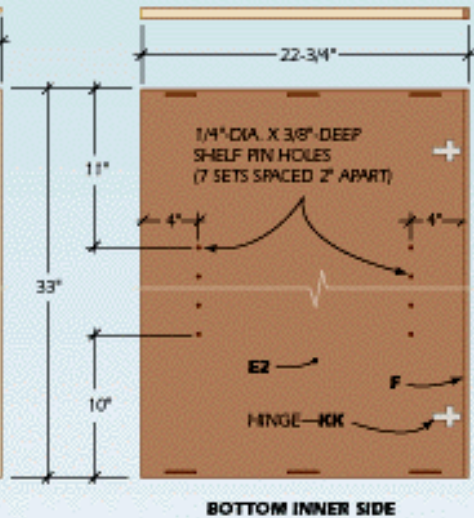
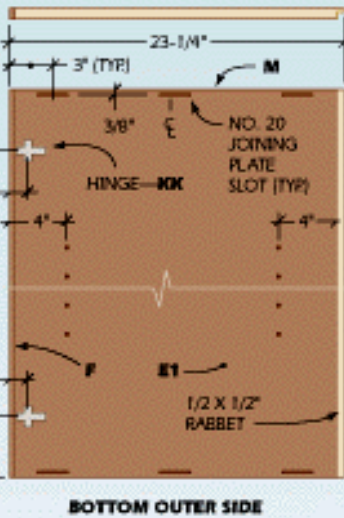
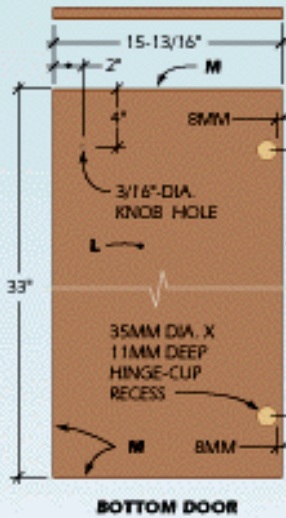
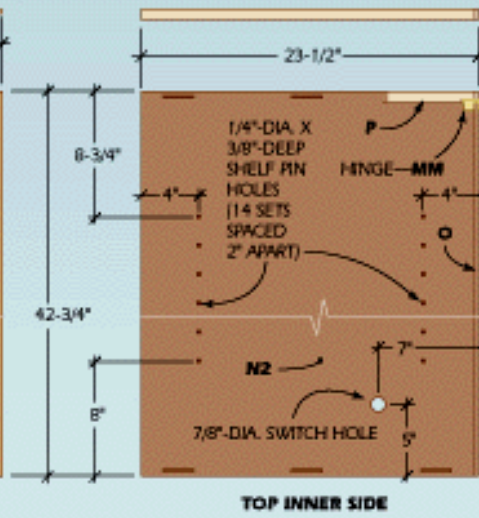
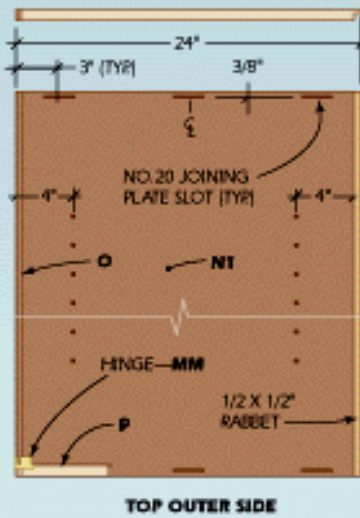
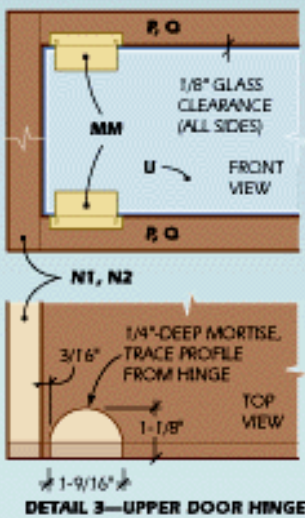
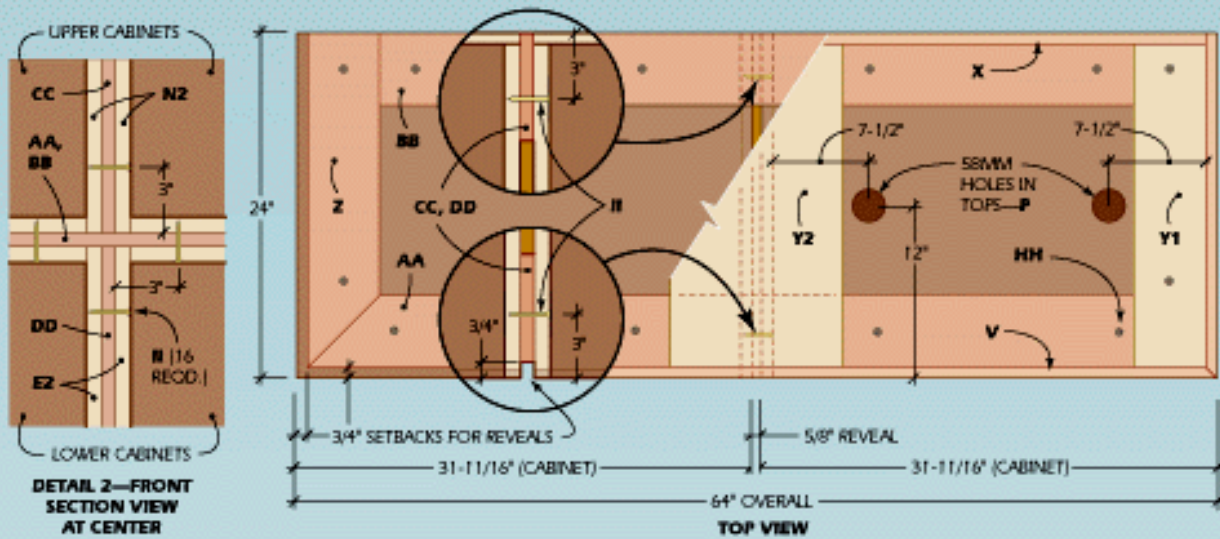


# DISPLAY CASE

2 1/2" DEEP X 6 1/2" WIDE X 8 1/2" HIGH







<b>MATERIALS LIST—OFFICE DISPLAY CABINET</b>		
Key	No.	Size and description (use)
A	1	3/4 X 3 X 62" maple† (base front)

<b>B</b>	<b>2</b>	<b>3/4 X 3 X 22" maple† (base side)</b>
<b>C</b>	<b>1</b>	<b>3/4 X 3 X 60-1/2" maple† (base back)</b>
<b>D1</b>	<b>2</b>	<b>3/4 X 5 X 20-1/2" panel stock** (side gusset)</b>
<b>D2</b>	<b>1</b>	<b>3/4 X 10 X 20-1/2" panel stock** (center gusset)</b>
<b>E1</b>	<b>2</b>	<b>3/4 X 22-7/8 X 33" walnut panel stock* †† (outer side)</b>
<b>E2</b>	<b>2</b>	<b>3/4 X 22-3/8 X 33" walnut panel stock* (inner side)</b>
<b>F</b>	<b>4</b>	<b>3/8 X 3/4 X 33" walnut (edge band)</b>
<b>G</b>	<b>4</b>	<b>3/4 X 22-3/8 X 30-3/16" walnut panel stock* (top/bottom)</b>
<b>H</b>	<b>4</b>	<b>3/8 X 3/4 X 30-3/16" walnut (edge band)</b>
<b>I</b>	<b>2</b>	<b>1/2 X 31-7/16 X 33" panel stock** †† (back)</b>
<b>J</b>	<b>4</b>	<b>3/4 X 22-5/16 X 30-1/16" walnut panel stock* (shelf)</b>
<b>K</b>	<b>4</b>	<b>3/8 X 3/4 X 30-1/16" walnut (edge band)</b>
<b>L</b>	<b>4</b>	<b>3/4 X 15-13/16 X 33" walnut panel stock* †† (door)</b>
<b>M</b>	<b>as reqd.</b>	<b>walnut-veneer tape</b>
<b>N1</b>	<b>2</b>	<b>3/4 X 23-5/8 X 42-3/4" walnut panel stock* (outer side)</b>
<b>N2</b>	<b>2</b>	<b>3/4 X 23-1/8 X 42-3/4" walnut panel stock* (inner side)</b>
<b>O</b>	<b>4</b>	<b>3/8 X 3/4 X 42-3/4" walnut (edge band)</b>
<b>P</b>	<b>4</b>	<b>3/4 X 23-1/8 X 30-3/16" walnut panel stock* (top/bottom)</b>
<b>Q</b>	<b>4</b>	<b>3/8 X 3/4 X 30-3/16" walnut (edge band)</b>
<b>R</b>	<b>2</b>	<b>1/2 X 31-7/16 X 42-3/4" panel stock** (back)</b>
<b>S</b>	<b>2</b>	<b>1/4 X 30-1/8 X 41-3/16" mirror</b>
<b>T</b>	<b>6</b>	<b>1/4 X 23-1/8 X 30-1/16" tempered glass (shelf)</b>
<b>U</b>	<b>4</b>	<b>1/4 X 14-7/8 X 41" tempered glass (door)</b>
<b>V</b>	<b>1</b>	<b>3/4 X 4 X 64" maple† (soffit front)</b>
<b>W</b>	<b>2</b>	<b>3/4 X 4 X 24" maple† (soffit side)</b>
<b>X</b>	<b>1</b>	<b>3/4 X 4 X 62-1/2" maple† (soffit back)</b>
<b>Y1</b>	<b>2</b>	<b>3/4 X 5 X 22-1/2" panel stock** (gusset)</b>
<b>Y2</b>	<b>1</b>	<b>3/4 X 12 X 22-1/2" panel stock** (gusset)</b>
<b>Z</b>	<b>4</b>	<b>5/8 X 5 X 23-1/4" maple† (side horizontal spacer)</b>
<b>AA</b>	<b>2</b>	<b>5/8 X 5 X 62-1/2" maple† (front horizontal spacer)</b>
<b>BB</b>	<b>2</b>	<b>5/8 X 5 X 52-1/2" maple† (back horizontal spacer)</b>
<b>CC</b>	<b>2</b>	<b>5/8 X 5 X 42-3/4" maple† (upper vertical spacer)</b>
<b>DD</b>	<b>2</b>	<b>5/8 X 5 X 33" maple† (lower vertical spacer)</b>
<b>EE</b>	<b>as reqd.</b>	<b>No. 20 joining plates</b>
<b>FF</b>	<b>as reqd.</b>	<b>4d finishing nails</b>
<b>GG</b>	<b>as reqd.</b>	<b>1" No. 5 fh woodscrews</b>
<b>HH</b>	<b>as reqd.</b>	<b>1-1/4" No. 8 fh woodscrews</b>
<b>II</b>	<b>as reqd.</b>	<b>2" No. 8 fh brass woodscrews</b>
<b>JJ</b>	<b>40</b>	<b>1/4" shelf pin–No. 62067†††</b>
<b>KK</b>	<b>4</b>	<b>pair bottom cabinet hinges–No. 34710†††</b>
<b>LL</b>	<b>4</b>	<b>polished brass door pull–Sugatsune No. GLA-16</b>
<b>MM</b>	<b>4</b>	<b>pair upper cabinet hinges–Hafele No. 361.49.809</b>
<b>NN</b>	<b>4</b>	<b>touch latch–Hafele No. 245.80.310</b>
<b>OO</b>	<b>4</b>	<b>touch latch strike–Hafele No. 245.63.826</b>
<b>PP</b>	<b>2</b>	<b>light switch–Hafele No. 823.78.327</b>
<b>QQ</b>	<b>4</b>	<b>halogen lamp–Hafele No. 823.29.850</b>
<b>RR</b>	<b>2</b>	<b>transformer–Hafele No. 823.24.436</b>

\*Walnut-veneer MDF or veneer-core panel

\*\*Walnut-, maple- or birch-veneer MDF or veneer-core panel (plywood)

† Painted black

†† Dimension includes walnut veneer-tape edge

††† Available from The Woodworkers' Store, 21801 Industrial Blvd., Rogers, MN 55374

## Case Construction

Begin by cutting the walnut panels for the upper and lower cases. Pay special attention to matching the veneer on the outer sides so that the grain runs continuously from the lower- to upper-case side. Cut the panels slightly oversize, add the solid-walnut edge band (O, F) to the front edges of all panels and add the walnut veneer tape (M) to the top edges of the lower-case outer sides (E1). Then cut the panels to finished size.

Use the router with straightedge guide to cut the rabbet in the outer case sides (E1, N1) that hide the cabinet backs. Lay out the joining-plate slots in sides, tops and bottoms, and cut the slots with the plate joiner.

Make a boring template for the shelf-pin holes in the lower cabinets and a second template for the pin holes in the upper cabinets. A strip of 1/2-in. plywood or MDF is perfect for the template. Clamp the appropriate template to a cabinet side, and use it as a guide in boring the holes. A stop on the drill bit ensures uniform hole depth.

Mark the locations of the glass-hinge mortises on the upper-case top and bottom panels (P). Trace the hinges for the proper mortise shape. Use a router and straight bit to remove most of the waste from the mortises and finish with a sharp chisel and gouge. Test fit the hinge bases and make any necessary adjustments.

Lay out and bore the 7/8-in.-dia. holes for the light switches in the upper-case sides (N2). Use an adjustable circle cutter to bore the 58-mm-dia. holes for the halogen lights in the upper-case tops.

Sand the interior surfaces of the cabinet parts before assembly, finishing with 220-grit paper. Then, completely dust off the parts.

To assemble one of the cases, spread glue on each plate and in its slot before inserting the plate. Join the top and bottom to one of the case sides, then position the opposite side and apply clamps to pull the joints tight. Compare opposite diagonal measurements to check that the cabinet is square and adjust the clamps if necessary. Let the glue set for at least 30 minutes before removing the clamps. Repeat the process for the remaining cases.

Cut the 1/2-in. panels for the case backs (I, R). Note that the top edge of the lower-case backs must be covered with walnut-veneer tape. Apply the tape to the edge before cutting the panel to finished size. Bore pilot holes and temporarily fasten the backs to the cases with 1-in. No. 5 fh screws.

## The Spacers, Base And Soffit

Prepare the maple spacers that fit between the cabinets and between the upper cases and the soffit. Temporarily screw the upper vertical spacers (CC) to an upper-case side and attach the lower vertical spacers (DD) to a lower case.

Cut the maple parts for the base and soffit, as well as the 3/4-in. gussets (Y1, Y2, D1, D2). Assemble the base and soffit with 4d finishing nails and glue. Set and fill the nail holes. When the filler dries, sand the assemblies.



Lay the two bottom cases on their backs and clamp them together so that they are properly aligned. Bore pilot holes and temporarily screw the two cases together. Next, temporarily screw the base to the case bottoms. Stand the assembly on the floor. If necessary, shim the base so the assembly is level and stable.

Bore and countersink pilot holes in the spacers that separate the top and bottom cases. Then temporarily screw them to the top of the lower case assembly. Position the upper cases over the lower subassembly. Screw the upper cases together and fasten the upper half to the lower half by screwing through the tops of the lower cabinets. Then, temporarily install the top spacers (Z, AA, BB), place the soffit in position and temporarily secure it.

## **The Doors And Shelves**

Select the panels for the lower cabinet doors so there will be a uniform, matching grain pattern across the lower cases. Cut the panels to size and apply walnut-veneer tape on all edges. Bore the 35mm recesses for the hinges in each door and mount the hinges on the doors. Attach the hinge mounting plates to the lower-case sides, mount the doors and adjust the hinges for proper spacing. Bore 3/16-in. holes for the door pulls and fasten the pulls to the doors.

For safety's sake, it's best to use tempered glass for the display case doors. Tempered glass must be specially ordered and cannot be altered once the tempering process is complete. Specify that the glass have polished edges and "dubbed" (slightly rounded or chamfered) corners.

Mount the glass-door hinge base plates to the cabinet, then attach the hinges to the tempered glass panels. First install the self-adhesive pressure plates to the corners of the glass doors. Then slide the hinges over the glass and gently tighten the screws. Carefully slide the door assembly into the base-plate tracks and thread in the door stops. Adjust the position of the glass doors for even spacing on all edges. Then install the strikes along the bottom edges of the glass doors. Mount the magnetic touch latches to the upper-case bottom panels.

Cut walnut panels for the lower-cabinet shelves and glue a walnut edge band to the front edge of each panel. Install shelf pins in the lower cases and test the fit of each shelf.

Use a dark pencil to outline the inside profile of each upper cabinet on the 1/2-in. backs. These marks will serve as registration guides for the mirrors. At this point, you can disassemble the cabinet for finishing. Any final adjustments and fitting can be done later. Remove all hardware, spacers, and the soffit and base. Sand all parts with 120-, 180- and 220-grit sandpaper, dusting off thoroughly between grits. When the sanding is complete, wipe all surfaces with a tack cloth.

## **Finishing**

Paint the spacers, soffit and base with three coats of black satin enamel. Sand lightly between coats to achieve a smooth, even finish.

Apply three coats of varnish to the walnut case parts. We used Behlen's Rockhard Table Top Varnish. Thin the first coat 20% with Behlen's Rockhard Varnish Reducer and sand lightly with 400-grit paper after drying for 12 hours. Apply two more coats, full strength, again sanding lightly between coats. Let the last coat cure for no longer than 20 hours. Then wet-sand with 600-grit waterproof paper and paraffin oil to remove any dust particles. Wipe dry with clean cotton cloths, then buff with No. 0000 steel wool. Polish the finish with a clean, dry and soft cotton cloth.

## **Final Assembly**

Use mirror mastic to mount the mirrors to the upper-cabinet backs. Lay the backs flat on a worktable and apply the mastic to the panels. Position the mirrors over the backs, aligning them within the registration marks. Let the mastic cure overnight before reinstalling the backs.

Reattach the spacers to the lower- and upper-cabinet sides. Join the lower cabinets together and reattach the base assembly.

Install the halogen lights in the tops of the upper cabinets and connect the wiring according to the diagrams that come with the lights. The halogen low-voltage system includes the lamps and a separate transformer, mounting block and light switch for each case. Fasten the transformers and mounting blocks to the top of each cabinet. Locate these parts so that they do not interfere with the placement of the spacers or soffit gussets. Install the switches on the case sides and route the wires up the sides and behind the vertical spacers. Use small electrical staples to hold the wires in place. Plug in the lights and check their operation before completing the cabinet assembly.

Replace the horizontal spacers on the lower-cabinet tops. Next, place the upper cabinets on the base, join them to each other and fasten them to the lower half. Reinstall the top spacers and attach the soffit. You can bore a 1-1/2-in. hole centered in the back of the soffit to allow the light cords to pass through, or you can simply let the cords drape over the top of the soffit.

Mount the hinges and mounting plates for the lower-case doors and rehang the doors. Rehang the glass doors and attach all door pulls. Finally, install the shelves.

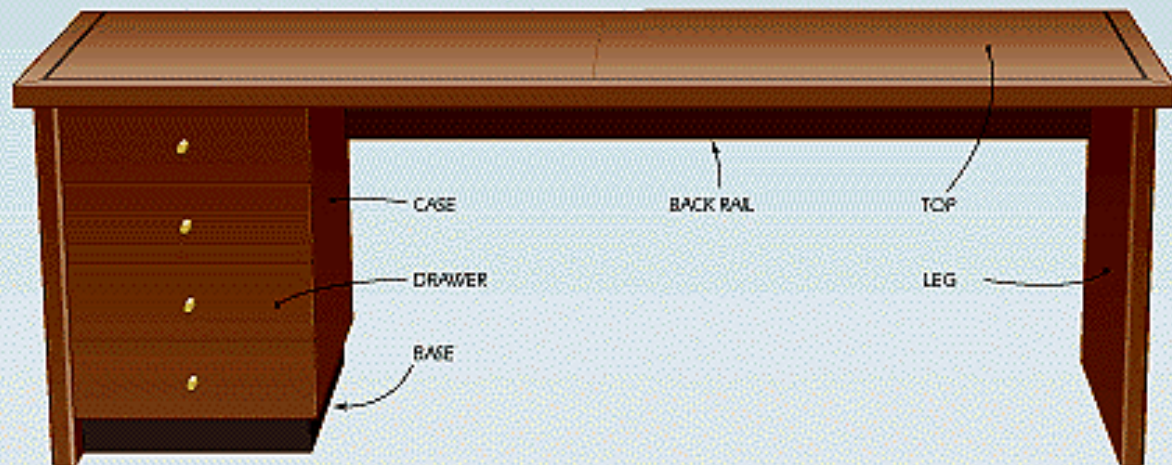
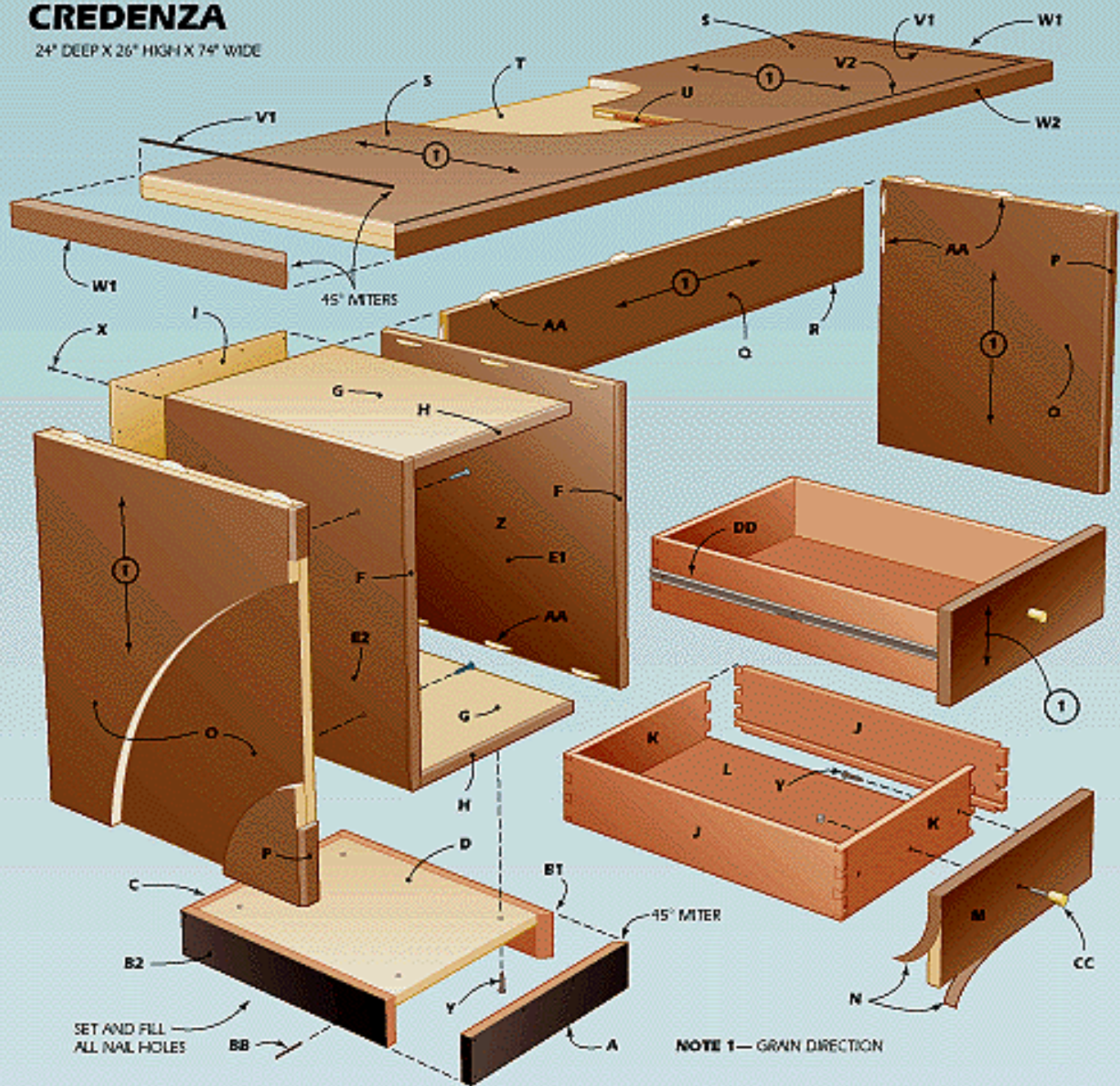
# CREDENZA

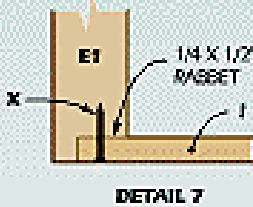
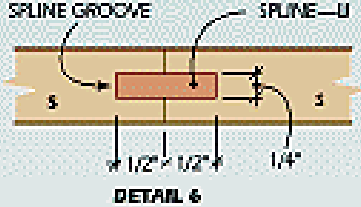
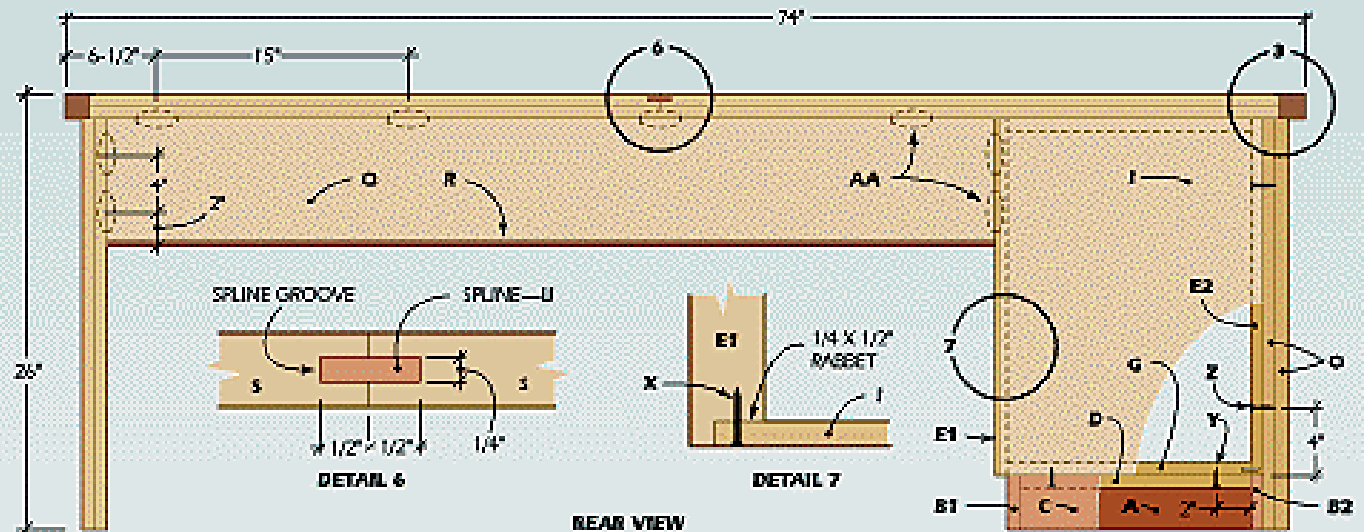
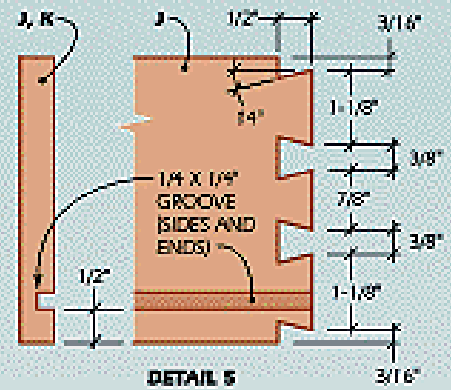
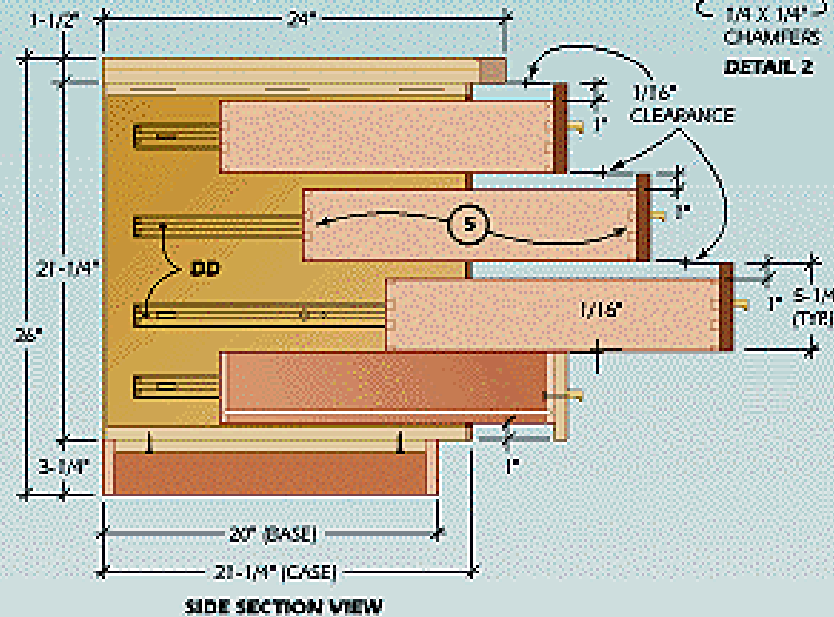
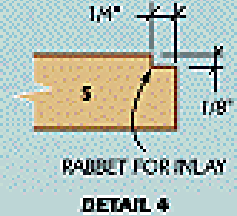
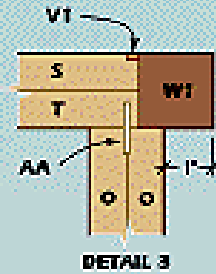
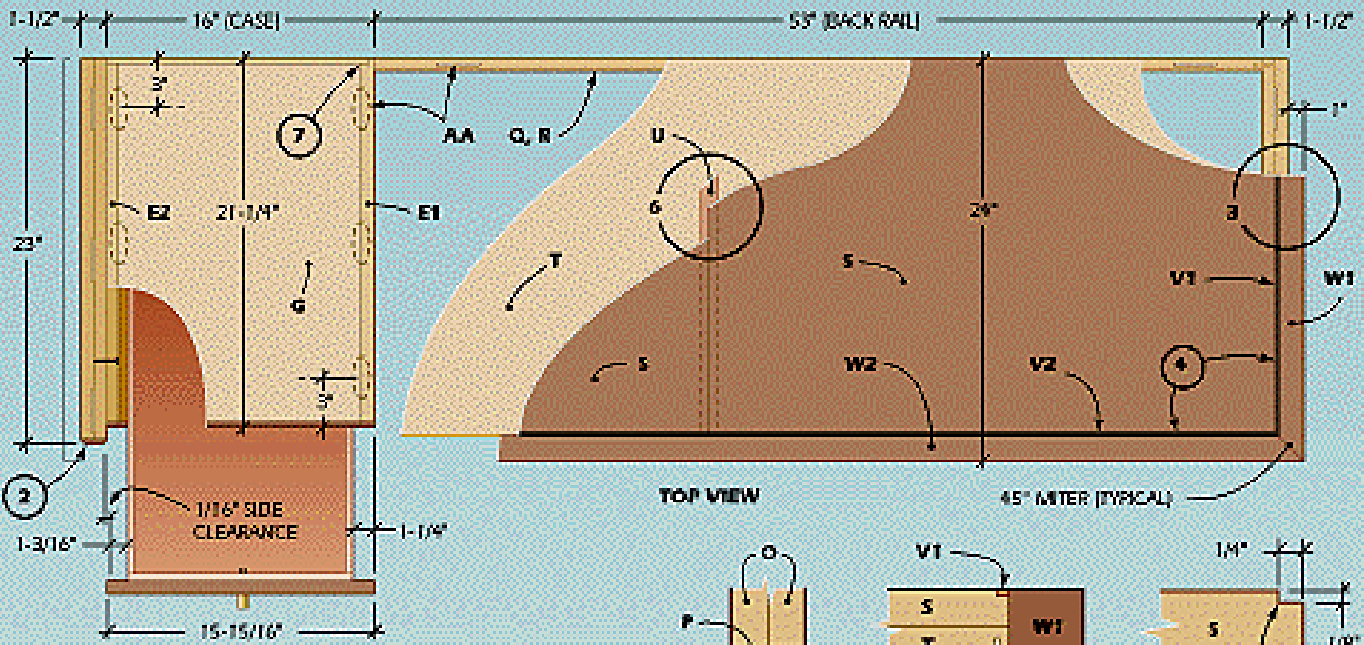




# CREDENZA

24" DEEP X 26" HIGH X 74" WIDE







## MATERIALS LIST—CREDENZA

Key	No.	Size and description (use)
A	1	3/4 X 3-1/4 X 15-1/4" maple†† (base front)
B1	1	3/4 X 3-1/4 X 20" maple†† (base right side)
B2	1	3/4 X 3-1/4 X 19-1/4" maple†† (base left side)
C	1	3/4 X 3-1/4 X 13-3/4" maple†† (base back)
D	1	3/4 X 13-3/4 X 18-1/2" panel stock** (base top)
E1	1	3/4 X 21-1/4 X 20-7/8" walnut panel stock* (case right side)
E2	1	3/4 X 21-1/4 X 20-5/8" walnut panel stock* (case left side)
F	2	3/8 X 3/4 X 21-1/4" walnut (edge band)
G	2	3/4 X 14-1/2 X 21-3/8" panel stock** (case top/bottom)
H	2	3/8 X 3/4 X 14-1/2" walnut (edge band)
I	1	1/4 X 15-3/4 X 21-1/4" plywood (case back)
J	8	1/2 X 4-1/4 X 20" maple (drawer side)
K	8	1/2 X 4-1/4 X 13-1/2" maple (drawer end)
L	4	1/4 X 13 X 19-1/2" maple plywood (drawer bottom)
M	4	3/4 X 5-1/4 X 15-15/16" walnut panel stock*††† (drawer front)
N	as reqd.	walnut veneer tape
O	4	3/4 X 22-5/8 X 24-1/2" walnut panel stock* (leg panel)
P	2	3/8 X 1-1/2 X 24-1/2" walnut (edge band)
Q	1	3/4 X 7-5/8 X 53" walnut panel stock* (rail)
R	1	3/8 X 3/4 X 53" walnut (edge band)
S	2	3/4 X 22-1/2 X 35-1/2" walnut panel stock* (upper top panel)
T	1	3/4 X 22-1/2 X 71" panel stock** (lower top panel)
U	1	1/4 X 1 X 22-1/2" maple (spline)
V1	2	1/8 X 1/4 X 22-1/2" maple† (inlay)
V2	1	1/8 X 1/4 X 71" maple† (inlay)
W1	2	1-1/2 X 1-1/2 X 24" walnut (edge)
W2	1	1-1/2 X 1-1/2 X 74" walnut (edge)
X	as reqd.	3/4" No. 5 fh wood screw**
Y	as reqd.	1-1/4" No. 8 fh wood screw**
Z	as reqd.	1-1/2" No. 8 fh wood screw**
AA	as reqd.	No. 20 joining plate**
BB	as reqd.	4d finishing nail**
CC	4	drawer pull—Sugatsune No. GLA-16, polished brass
DD	4	20" full-extension drawer slide—No. 32839 ††††

\*Walnut-veneer MDF or veneer-core panel

\*\*Walnut-, maple- or birch-veneer MDF or veneer-core panel (plywood)

† Black-dyed inlay strips available from Dover Inlay Mfg. Co. Inc., Box 151, Williamsport, MD 21795

†† Painted black

††† Dimension includes walnut veneer-tape edge

†††† Available from The Woodworkers' Store, 21801 Industrial Blvd., Rogers, MN 55374



Begin by cutting the case parts (E1, E2, G) to size. Cut edge band strips (F) from solid walnut and glue them to the front edges of the panels. Use a router with an edge guide to cut the rabbet along the back edge of the exposed side of the base.

Lay out the joining-plate slots in the case parts and use a plate joiner to cut the slots. Apply glue to the slots and joining plates, install the plates and assemble the case. Use bar or pipe clamps to pull the joints tight and check that the assembly is square by comparing opposite diagonal measurements. Adjust the clamps if necessary and allow the glue to cure for at least 30 minutes before removing the clamps. Cut the 1/4-in. back panel (I) to size, bore pilot holes and install it on the case with 3/4-in. No. 5 fh wood screws.

Cut solid-maple stock to size for the base (A, B1, B2, C), and cut the 3/4-in. plywood base top panel (D) to size. Join the maple pieces to the panel and to each other at the corners with 4d finishing nails and glue. Make sure that the miter joint on the exposed corner is tight. Set and fill the nail holes. When the filler is completely dry, sand the base smooth with 120-, 180- and 220-grit sandpaper. Bore pilot holes in the base top and fasten the base to the case.

## **The Legs And Rail**

Cut walnut panels to size for the legs (O). Apply glue to a pair of panels for each leg, then clamp them together until the glue sets. Cut a walnut edge band (F) for each leg assembly. Apply glue to one of the strips and the front edge of one of the legs, then clamp the strip in place. Repeat for the other leg. After the glue sets, scrape off any excess. Use a router and chamfer bit to cut the bevels along the front edges of the legs.

Cut the back rail to size and glue the walnut edge band (R) along its bottom edge. Lay out and cut the joining-plate slots in the ends and top edge of the rail and also in the leg panels and inner case side. Set these parts aside until the top is complete.

## **The Top**

Cut the panels to size for the desktop. The top is formed by sandwiching together two pieces of 3/4-in. stock. The grain of the top panel (S) runs across the top, so the upper panels must be joined in the center. Pay close attention to matching the grain. Since the bottom panel (T) is not visible, cut it in one piece with the grain running along its length.

Use the router with a slotting cutter to cut the spline grooves in the mating edges of the top panels. Cut a maple spline to fit the groove, apply glue to the grooves, edges and spline and assemble the panel. Pull the joint tight with clamps and allow the glue to set. Spread glue on the desktop panels and stack them together with all edges perfectly flush. Use enough clamps and cauls to distribute even pressure across the top. Let the glue set for at least 1 hour.

Use a router and edge guide to cut the rabbet around the front and ends of the top. Trim the black inlay strips (V1, V2) to size. Since the strips come in 3-ft. lengths, there will be joints along the front edge of the top. To keep these seams hidden, use 45 degree scarf joints instead of butt joints. Apply glue to the rabbet and install the inlay strips. Use masking tape spaced 2 in. apart to hold the inlay while the glue sets. After 30 minutes, remove the tape and scrape off excess glue.

Cut the solid-walnut edge (W1, W2) to size from 2-in. stock. Spread glue on both the panel edge and one of the solid edge pieces, and clamp the piece in place. Be sure to keep the top surfaces of the veneered panel and walnut edging perfectly flush. Repeat the process for each edge.

## **Assembly**

Lay out the joining-plate slots on the bottom side of the desktop and use the plate joiner to cut the slots. Sand the desk parts with 120-, 180- and 220-grit sandpaper.

Spread glue in the joining-plate slots at the ends of the back rail and in the mating slots at the case and right leg. Spread glue on the joining plates, install the plates and join the rail to the case and leg. Use bar clamps to pull the joints tight. While the glue sets, bore and countersink pilot holes through the left case side to attach the left leg and fasten the leg with screws.

Apply glue to the slots in the desktop and on the top edges of the base parts. Spread glue on the joining plates, install them and place the top on the base. Be sure to use pads under the clamp jaws when pulling the joint tight.

## **Drawer Construction**

Cut maple to size for the drawer parts. We used a Leigh dovetail jig and a router to cut the drawer joints. If you use another type of jig, or decide to cut the joints by hand, the layout may vary. Follow the directions that come with your jig for cutting the joints.

Use a dado blade in the table saw to cut the drawer-bottom grooves in the other drawer parts. Cut the bottoms from 1/4-in. maple or birch plywood. Sand the inside surfaces of each drawer part with 120-, 180- and 220-grit sandpaper, but be careful to not sand the joint surfaces or the dovetails will not fit properly.

Use a small brush to spread glue on the dovetail-joint surfaces, then assemble one of the sides to a front and back. Slide the drawer bottom into position, then join the remaining side. If the joints fit properly, you will not need to clamp the drawer together. Just compare opposite diagonal measurements to be sure that the drawer is square and set it aside until the glue sets. When the glue is fully cured, sand the exterior of all drawers.

Cut the drawer faces from a single walnut panel so the grain will run continuously when the drawers are in place. Number the faces on the back side so that you can keep them in the proper order and apply walnut-veneer tape on all edges. The tape comes with hot-melt glue applied to its back side so you can use a household iron to adhere it.

Sand the drawer faces, then attach them to the drawer boxes with 1-in. No. 8 screws. Note that the position of the bottom face, relative to the drawer box, is different from that of the other faces. Install the drawer slides according to the instructions that come with them. Bore pilot holes for the drawer pulls and install them with the appropriate screws.

Remove the drawers and sand the credenza to eliminate any scuffs and scratches and thoroughly remove all dust. Wipe all surfaces with a tack cloth.

## **Finishing**

First, finish the case base by applying two or three coats of satin black enamel. Lightly sand between coats to ensure a smooth surface.

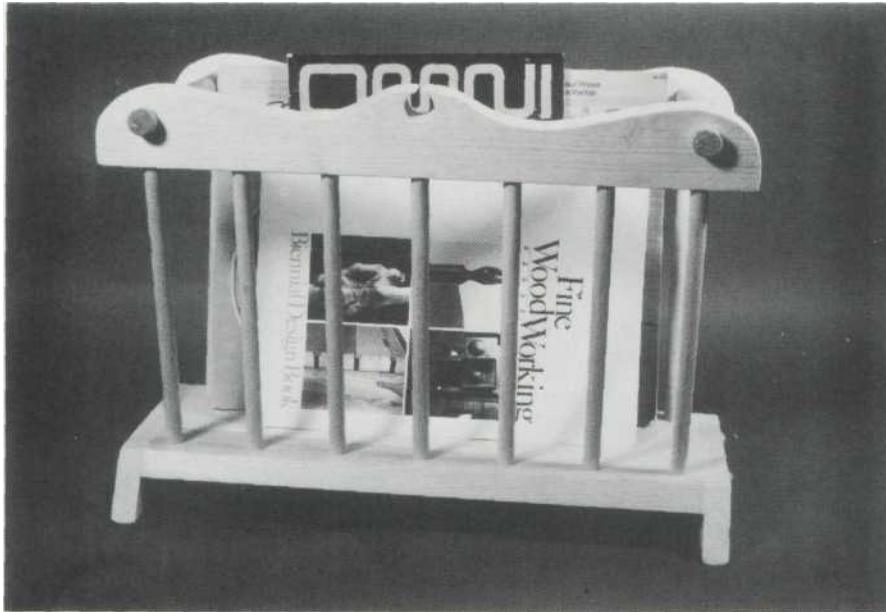
Apply Behlen's Pore-O-Pac (Van Dyke Brown) paste wood filler to the top using a brush or rubber squeegee. Spread the filler across the grain, then re-apply it with the grain. When the paste takes on a dull appearance, remove the excess with a plastic scraper, then buff the surface vigorously with burlap cloths. Let the top dry overnight before proceeding.

Use three coats of Behlen's Rockhard Table Top Varnish for the final finish. Thin the first coat 20% with Rockhard Varnish Reducer. After 12 hours drying time, lightly sand the surface with 400-grit paper and wipe with a tack cloth. Apply two more coats, allowing overnight drying and light sanding between coats.

Let the final coat cure for no longer than 20 hours, then wet-sand the surface with 600-grit paper and paraffin oil. When all dust and uneven spots are gone, wipe the surface with a soft cloth to remove the oil and slurry. Use No. 0000 steel wool to burnish the surface, then polish the desk with a soft, lint-free cloth.

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# MAGAZINE RACK



What better place to store your periodicals than in this inexpensive magazine rack? Using standard size left over from other projects, you can build it in no time at all.

1. Sand all stock with 100-grit paper to remove mill marks.

2. Mark the location of all holes to be drilled. The fourteen 1/2"-diameter column holes in the base (A) and the four 3/4"-diameter brace holes in the rails (C) must be drilled at 10° angles.

3. Change the drill press table back to 90° to drill the fourteen 1/2"-

diameter column holes and the 3/4"-diameter decorative holes in the top rails.

4. Using the patterns provided, cut the contours of the top rails and the feet (B).

5. With a handsaw or table saw, cut a 60° bevel on the edges of the base and the ends of the feet. Make sure the pieces are exactly the same width and the same angle where they join.

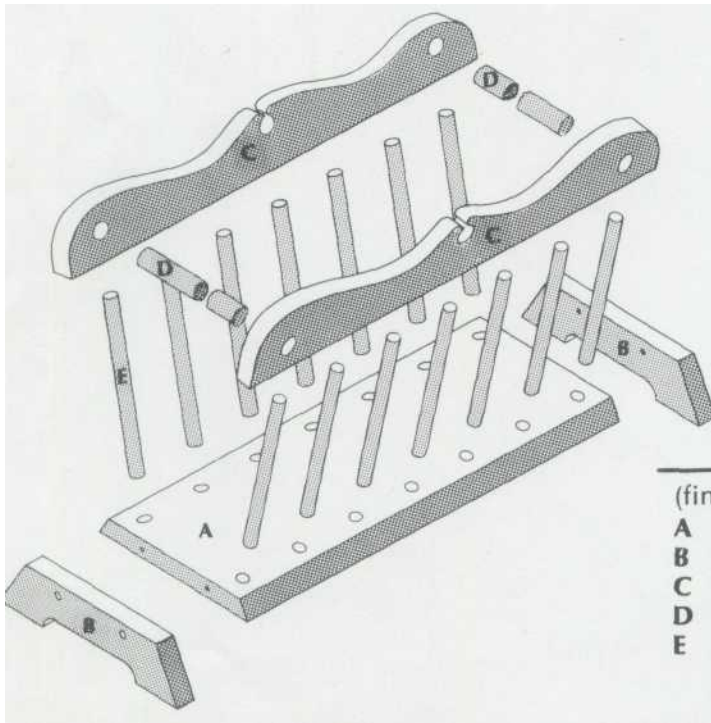
6. Cut the braces (D) and columns (E) to length, making sure to knock off any burrs on the ends.

7. To assemble, first attach the feet to the base using glue and #8 x 1-1/2" flathead wood screws. Countersink the screws.

8. To complete the rack assembly, use glue to fasten the ends of the columns and braces. Be sure to wipe off any excess glue immediately with a damp rag.

9. Use a sanding block to round over all sharp edges, including the protruding ends of the braces, and to smooth the joints between the base and legs.

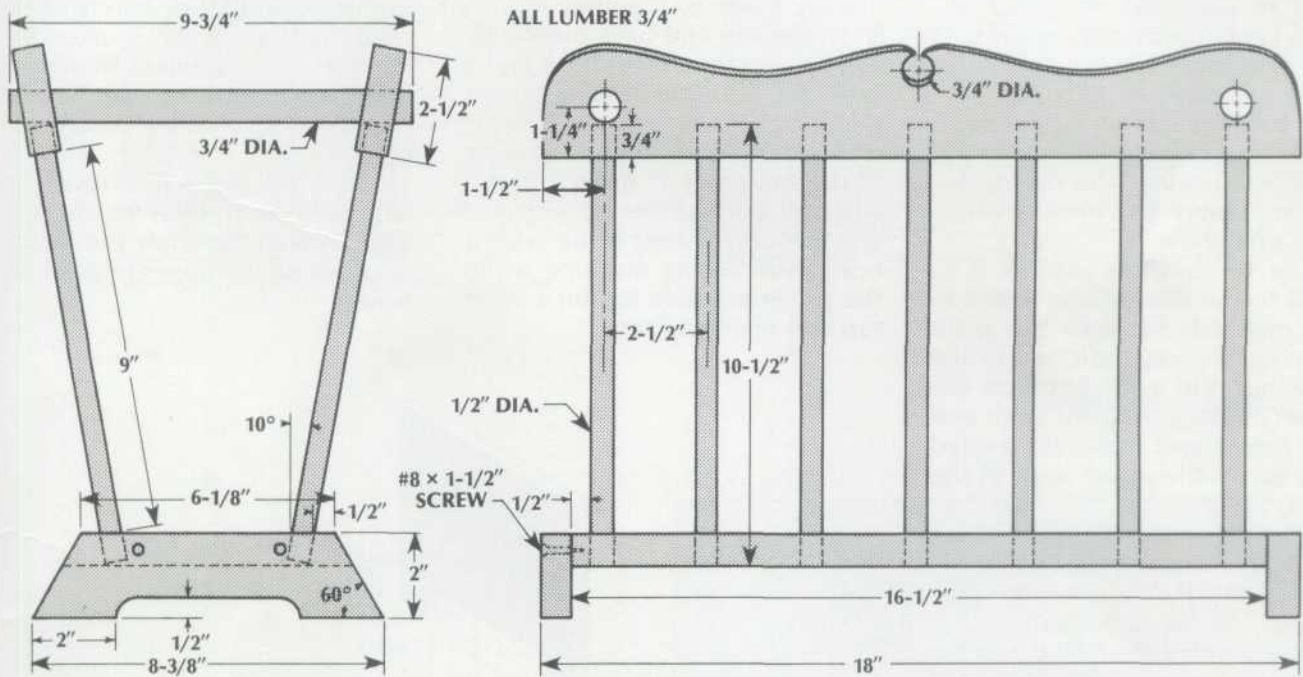
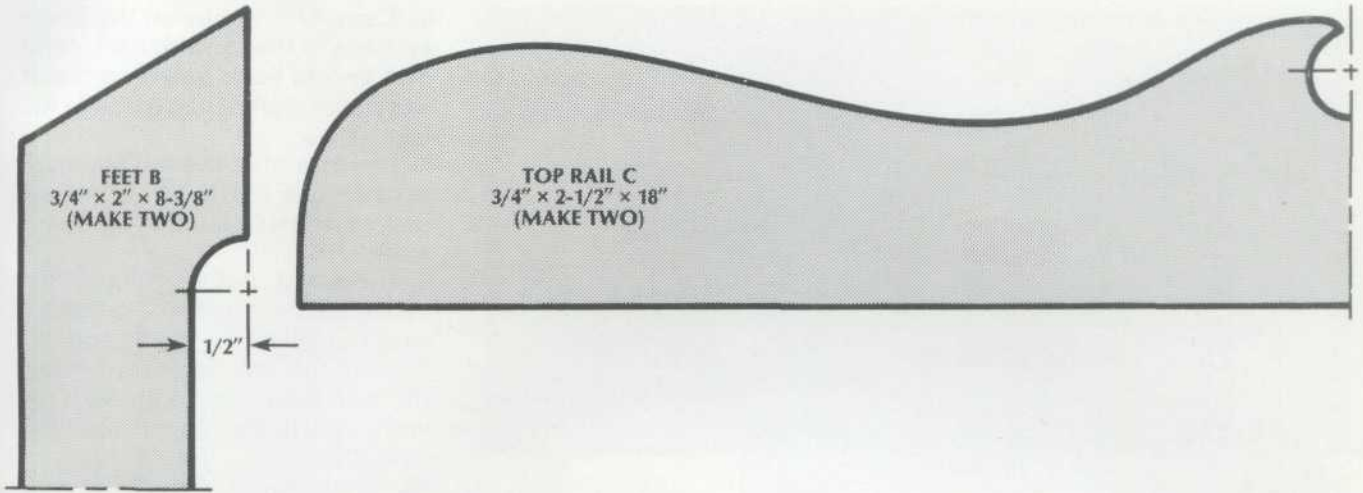
10. Stain the rack with an Early American stain. Natural oil is recommended for the finish.



### LIST OF MATERIALS

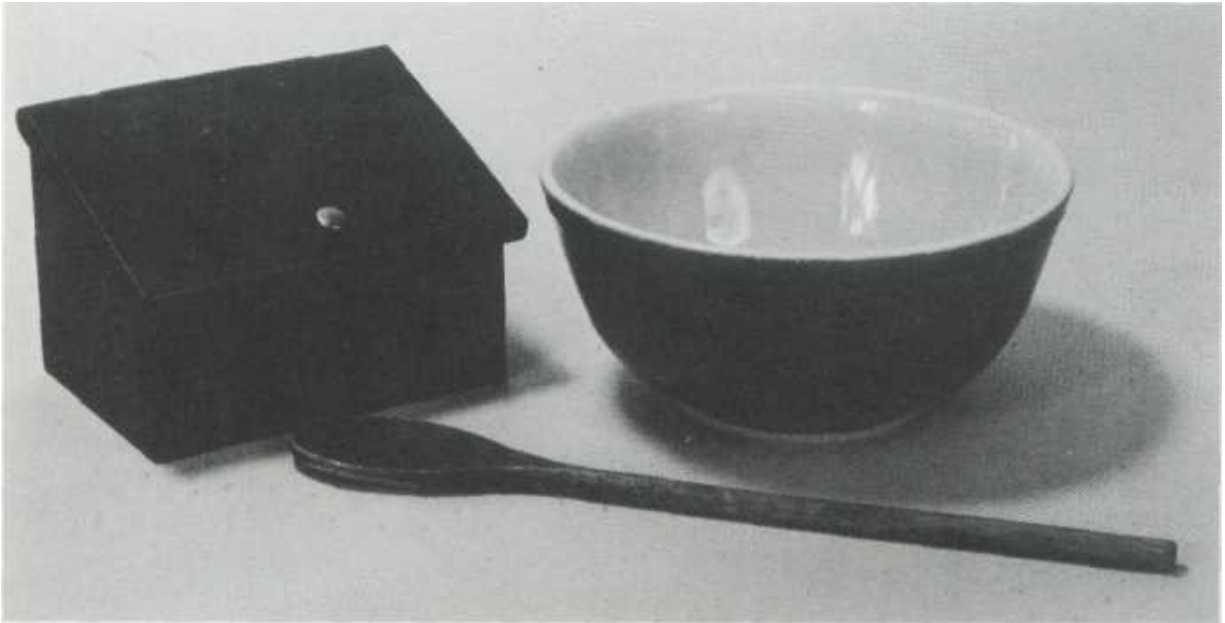
(finished dimensions in inches)

<b>A</b>	Base	$3/4 \times 7 \times 16-1/2$
<b>B</b>	Feet (2)	$3/4 \times 2 \times 8-3/8$
<b>C</b>	Rails (2)	$3/4 \times 2-1/2 \times 18$
<b>D</b>	Braces (2)	$3/4\text{-dia.} \times 9-3/4$ dowels
<b>E</b>	Columns (14)	$1/2\text{-dia.} \times 10-1/2$ dowels
	Flathead wood screws	#8 $\times$ 1-1/2
	Wood glue	



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# RECIPE BOX





This recipe box can hold more than recipe cards—buttons, address cards, candy, crayons, almost any little thing around the house can find a home in it.

1. If you are unable to purchase the 1/2" stock needed for the recipe box, custom plane the necessary amount of 3/4" stock or resaw it on a bandsaw.

2. Cut the basic box parts (A, B, C, D, E) to the dimensions found in the materials list with the grain running the way indicated in the drawings. Rip a 70° bevel on the upper edges of the front, back, and top pieces and make 70° angled cuts across the upper ends of the sides.

3. Make a simple jig to hold the top and back pieces at a 70° angle while you make the cutouts for the hinge. The jig consists of a 2 x 4 with a beveled front face (see the jig layout end view) that is fastened to a table saw miter gauge with counterbored carriage bolts and wing nuts. The jig must be long enough to be used on either side of the saw blade. (A 12" length should suffice for most saws.)

4. Cut the notches on the top and back pieces with your saw blade (or dado blades, if you have them) set to a height of 9/16". Hold each piece firmly against the jig and keep its beveled edge flush with the table top while cutting. Make the notch at the center of the top piece wide enough to create 1/64" of clearance on either side where the two pieces fit together.

Fit the top and back pieces together with their faces flush and a 1/16"-thick spacer holding them slightly apart. Center and drill 1/4"-diameter holes through each wing of the top piece 1" deep into the adjacent part of the back piece. This process is best done with a horizontal boring machine while the pieces are held flat on a table top and against a fence.

6. Cut a 1/2" radius on the hinge sections of the top and back. Sand one end of each dowel so that it will rotate easily when fit inside the back.

6. Dry assemble the top and back to make sure the dowels fit and the hinge operates properly. Sand parts as needed.

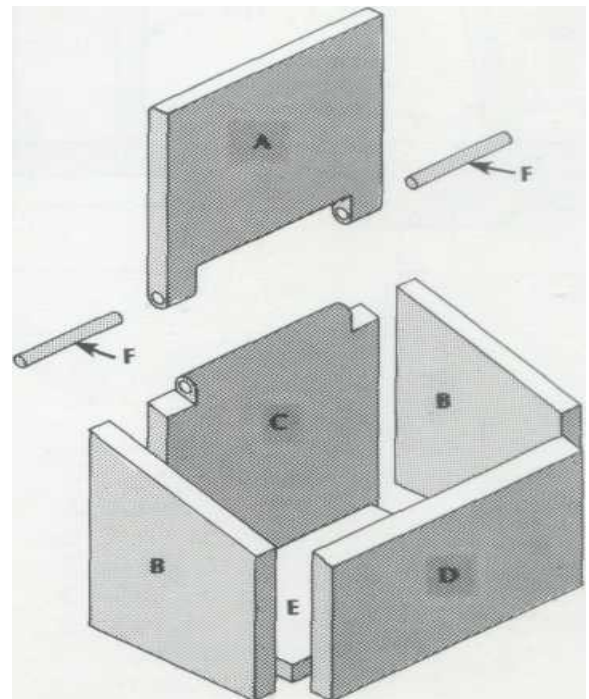
7. If desired, cut a scallop in the inside edge of the front to make it easier to get to the front cards.

8. Glue the box together without the top. Keep excess glue off the visible parts and clamp until the glue dries.

10. Set the top in place lining up its dowel holes with those of the back. Push the dowels through the holes

in the top until they barely penetrate the back. Apply glue on the last 3/4" of each dowel, then push them the rest of the way in until they are flush with the sides of the top.

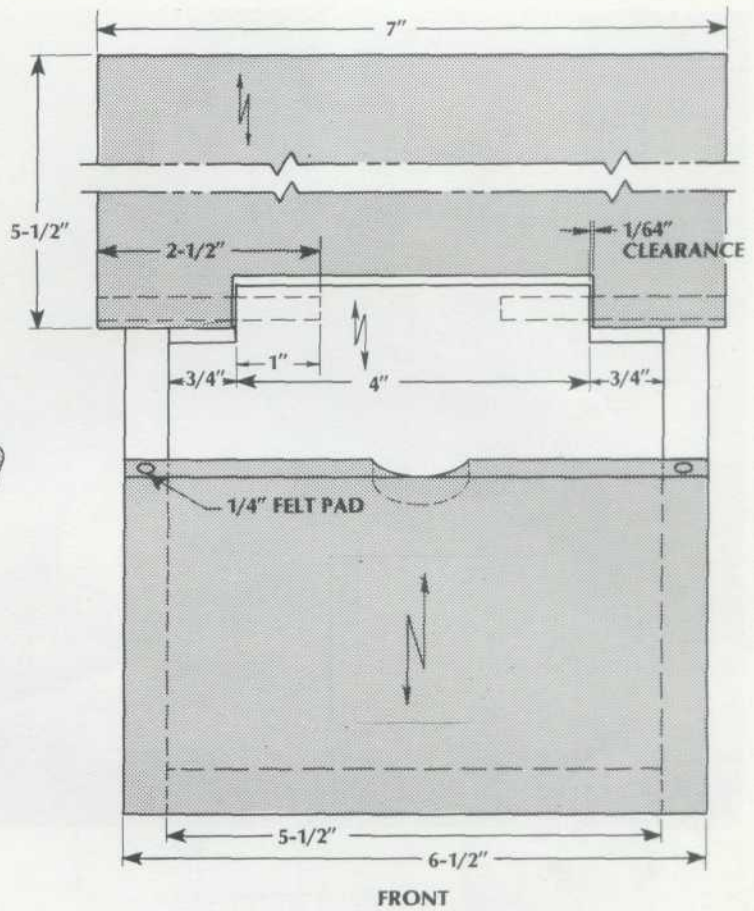
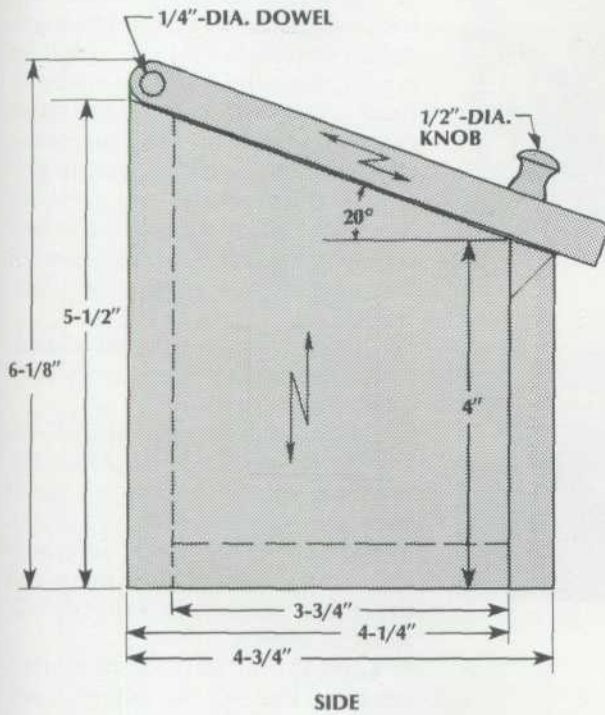
11. Give the box a final touch up with sandpaper, then finish as desired. Attach the knob and mount felt pads on the upper edge of the front.



DENOTES GRAIN DIRECTION



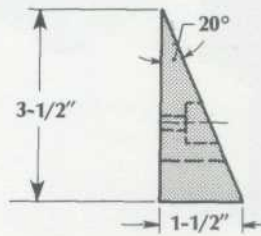
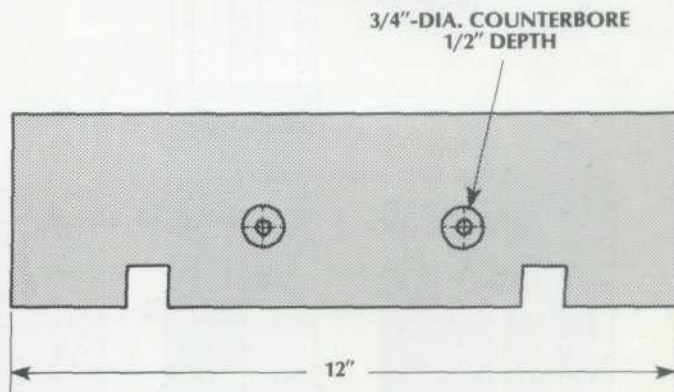
NOTE: ALL STOCK 1/2"



### LIST OF MATERIALS

(finished dimensions in inches)

<b>A</b> Top	1/2 × 7 × 5-1/2
<b>B</b> Sides (2)	1/2 × 4-1/4 × 5-1/2
<b>C</b> Back	1/2 × 5-1/2 × 6-1/8
<b>D</b> Front	1/2 × 6-1/2 × 4
<b>E</b> Bottom	1/2 × 3-3/4 × 5-1/2
<b>F</b> Dowels (2)	1/4 dia. × 2-1/2
Felt pad (2)	
Knob (optional)	
Carriage bolts	
Wing nuts	
Wood glue	



SAWING JIG LAYOUT

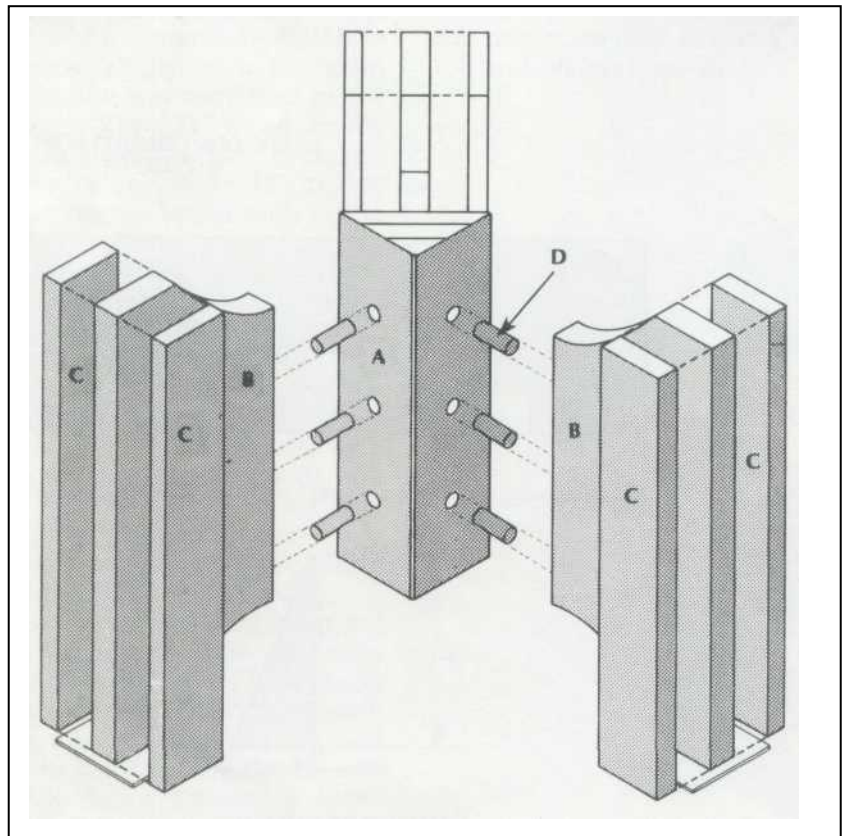
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# CANDELABRA

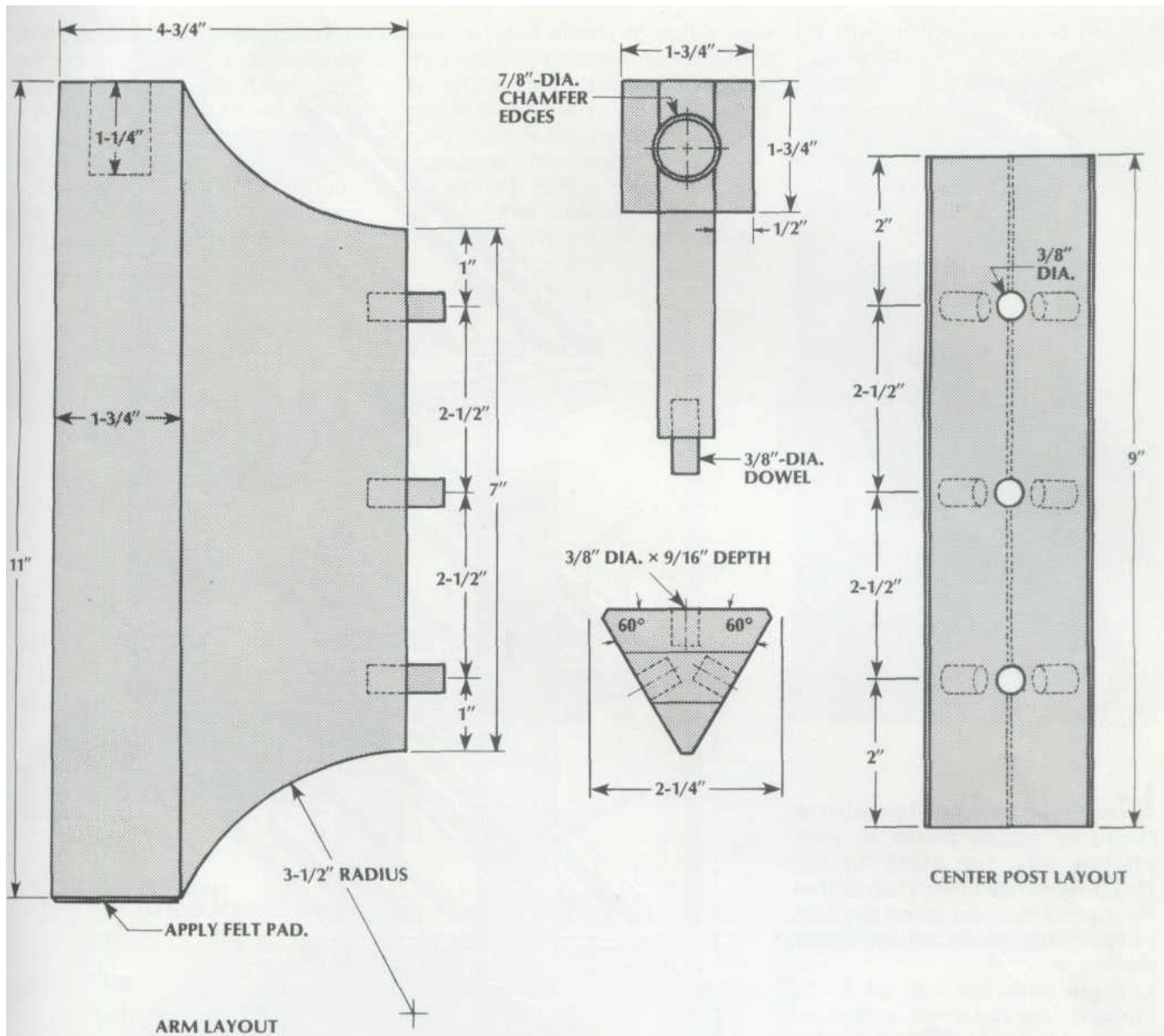


This candelabra will add a touch of elegance to most any table or room. The attractive centerpiece holds three candles, making it just right for a quiet candlelight dinner or for emergency lighting.

1. Cut all pieces to size according to the dimensions given. The triangular center post (A) can either be cut from a solid piece of wood or from glued-up stock. In the latter case, it is a good idea to make some of the 60° beveled cuts prior to gluing up the material and finishing the job with a hand plane and belt sander. Flatten the sharp corners of the post with a sander or block plane.
2. Cut out the arms (B) on a band-saw, then sand the edges smooth with a drum sander.
3. Drill matching sets of 3/8"-diameter holes 9/16" deep into the center post and the inside edge of each arm for doweling the pieces together. Center the middle hole along the length of each piece and space the remaining holes 2-1/2" apart as shown.
4. Glue the sides (C) to the arms, keeping their outer edges flush. After the glue has dried, sand the assembled arms.
5. Center and drill a 7/8"-diameter hole 1-1/4" deep in the top of each arm to hold a candle. Chamfer the edges of the holes with a 1"-diameter countersink or by hand sanding; this will allow the candles to fit in more easily.
6. Attach the arms to the center post using glue and dowels (D). Clamp until the glue has dried. Finish the candelabra as desired. Glue felt pads to the bottoms of the arms to prevent furniture from being scratched.







### LIST OF MATERIALS

(finished dimensions in inches)

<b>A</b>	Center post	$2\text{-}1/4 \times 2\text{-}1/4 \times 2\text{-}1/4 \times 9$
<b>B</b>	Arms (3)	$3/4 \times 4\text{-}3/4 \times 11$
<b>C</b>	Sides (6)	$1/2 \times 1\text{-}3/4 \times 11$
<b>D</b>	Dowels (9)	$3/8\text{ dia.} \times 1$
	Felt pads (3)	$1\text{-}3/4 \times 1\text{-}3/4$
	Wood glue	

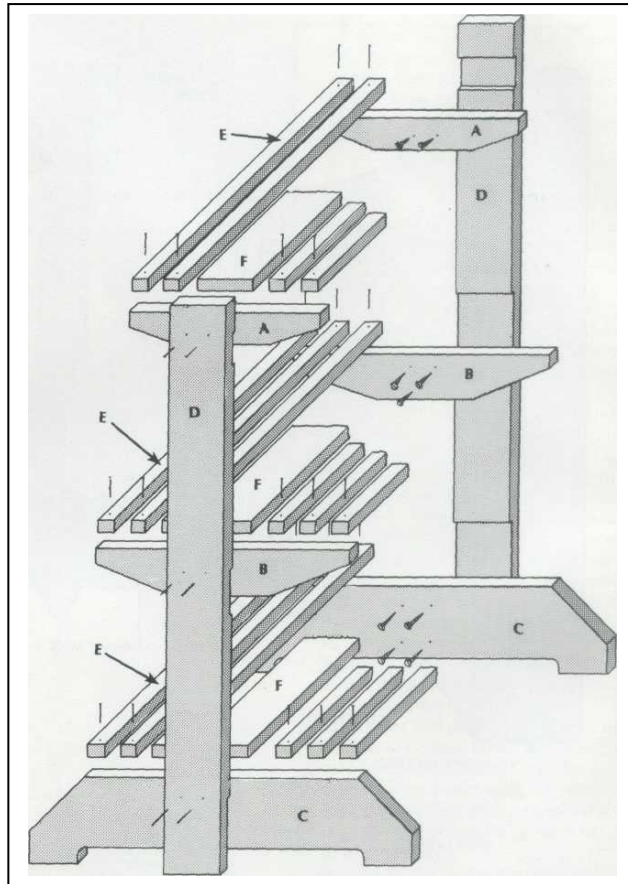
# PLANT DISPLAY





Here's the perfect alternative to crowding potted plants in your window sills: the plant display. This project has three shelves that are slatted to allow more sunlight to reach the plants on the lower shelves.

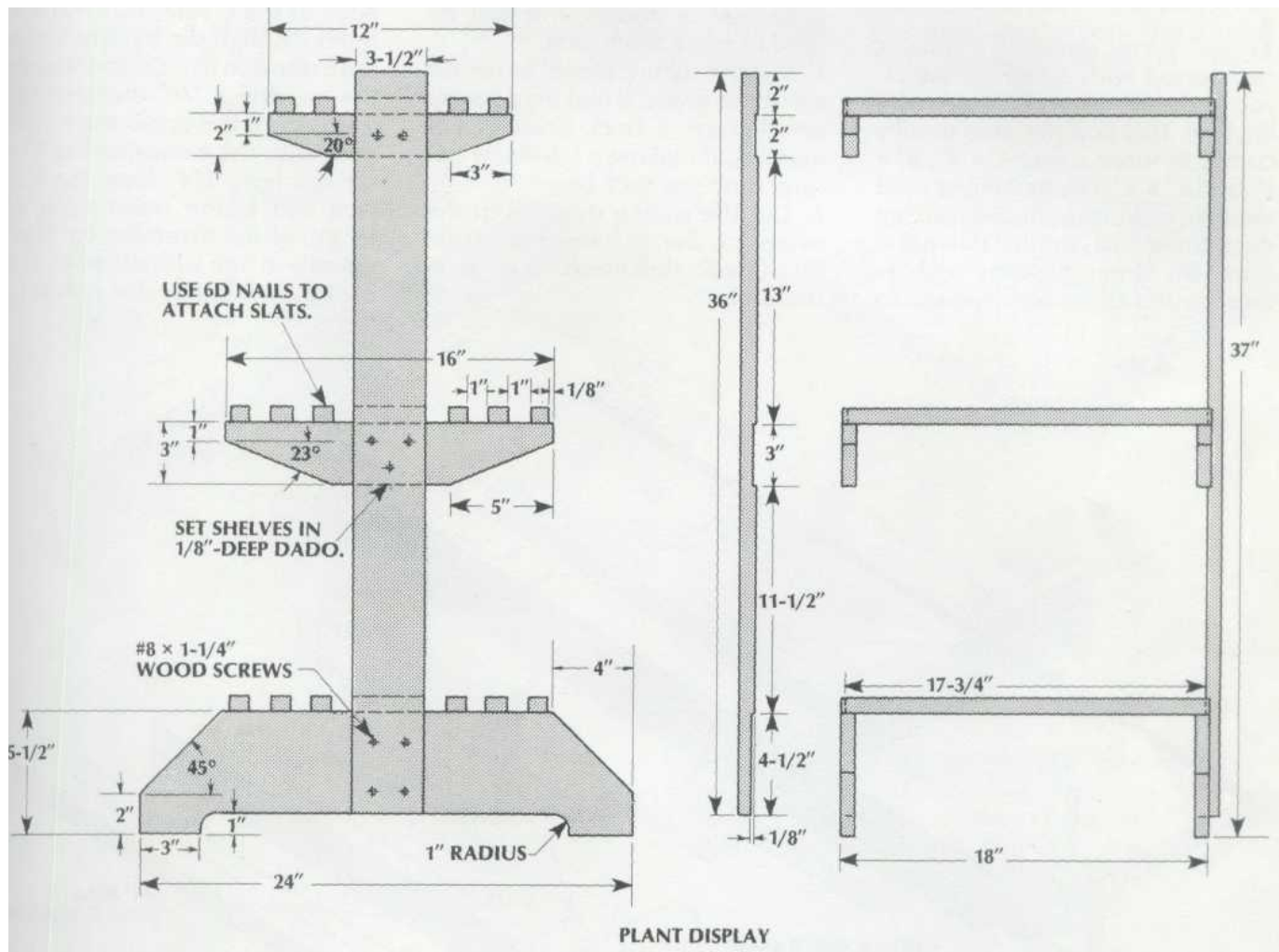
1. Begin with ten feet of 1 x 12 lumber. Use redwood, cedar, or pressure-treated lumber if the display is intended for outdoor use.
2. Cut all pieces to size on a table saw.
3. Lay out and mark the various angles on the ends of the top shelf sides (A), middle shelf sides (B), and the base pieces (C). Cut these angles using a bandsaw and 1/4" blade.
4. Using a router or a saw fitted with dado blades, cut 1/8"-deep dados and rabbets in the posts (D) for the shelf sides and base pieces.
5. Drill screw holes in the shelf sides and the base pieces, and corresponding pilot holes in the posts. Drill pilot holes in the shelf slats (E) and center pieces (F) to accommodate 6d finishing nails. (Use one of the nails as a drill bit to assure that the diameter of the pilot holes is drilled accurately.)
6. Sand all of the pieces smooth. The sawed edges should be given an extra sanding, or be touched up with a hand plane, to make sure they are sufficiently smooth.
7. Attach the slats and shelf center pieces to the sides with 6d finishing nails. Attach the centers first, and then install the slats at 1" intervals. Set all nails below the surface and fill the holes with wood putty that matches the finish you plan to use.
8. Attach the shelves to the posts using #8 x 1-1/4" flathead wood screws.
9. Finish the plant display with polyurethane or some other water-resistant finish if it is not made of redwood, cedar, or pressure-treated lumber.



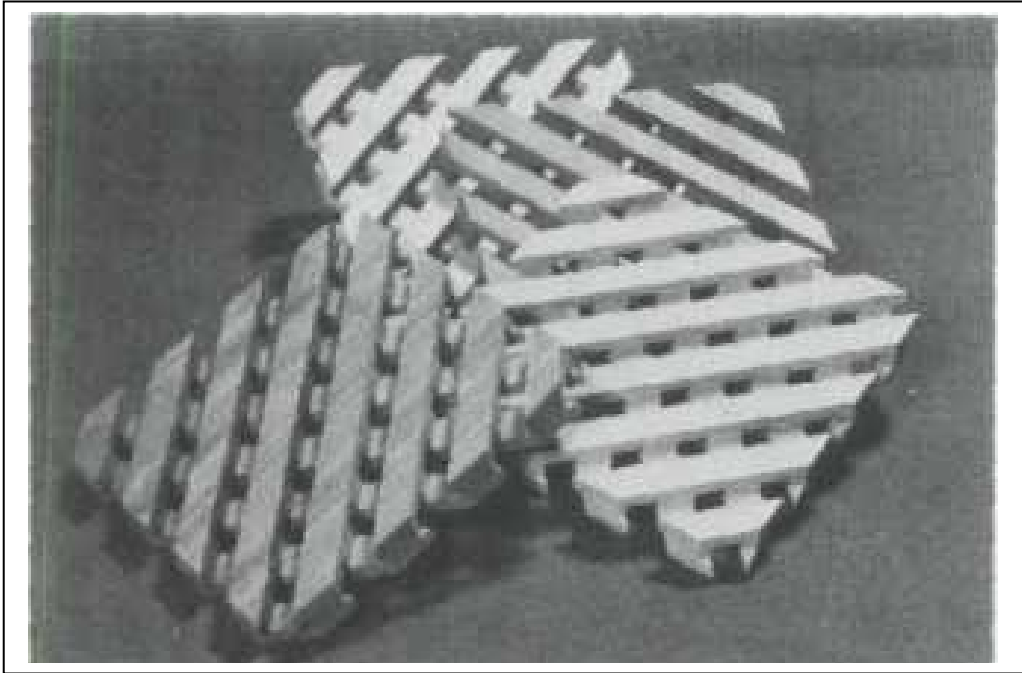
### LIST OF MATERIALS

(finished dimensions in inches)

<b>A</b>	Top shelf sides (2)	3/4 x 2 x 12
<b>B</b>	Middle shelf sides (2)	3/4 x 3 x 16
<b>C</b>	Base pieces (2)	3/4 x 5-1/2 x 24
<b>D</b>	Posts (2)	3/4 x 3-1/2 x 36
<b>E</b>	Shelf slats (16)	3/4 x 1 x 18
<b>F</b>	Shelf center pieces (3)	3/4 x 3-1/2 x 17-3/4
	Flathead wood screws	#8 x 1-1/4
	6d finishing nails	



# TRIVETS



If you've ever scorched a table or countertop with a hot container, you know the value of trivets in the kitchen. This popular item usually comes in three sizes: 4" x 4", 6" x 6", and 8" x 8". The technique used involves making multi-intersecting decorative cuts, similar to what is done on larger projects such as door panels and room dividers. To do this, you will need a simple fixture and a table saw or router arm, such as the homeowner model made by Shopsmith.

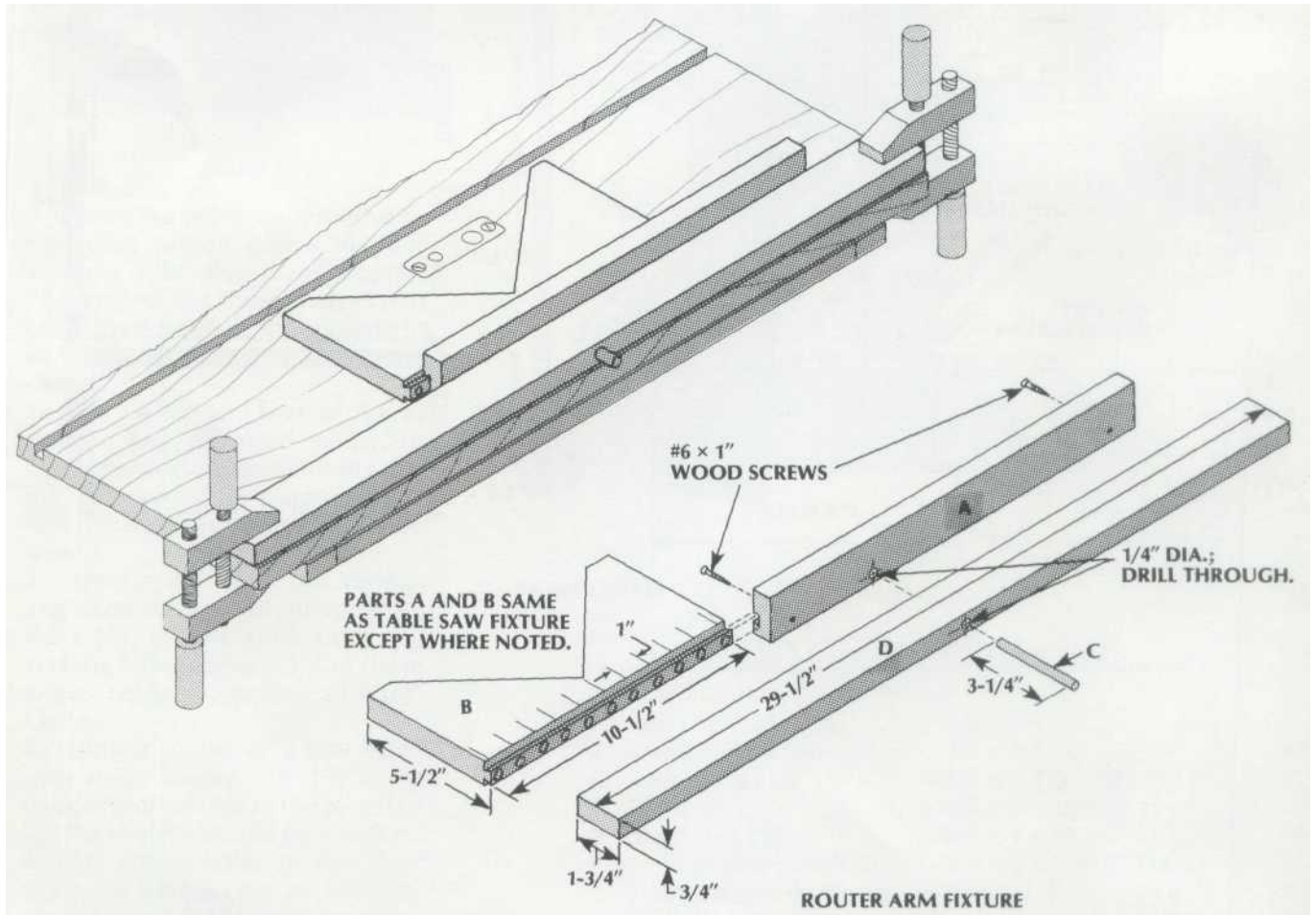
## MAKING THE FIXTURE

The purpose of the fixture is to make straight, accurate cuts while holding the blanks securely in place. Construction of the fixture varies, depending on whether a table saw or router arm will be used to make the trivets.

1. Cut the fixture pieces to the dimensions given. If making a router arm fixture, a back brace (D) is needed; if making a table saw fixture, omit the back brace.  
 2. Cut the sliding dovetail in the extension bar (A) and the cradle (B). Check the fit—it must slide smoothly.

3. Place the extension bar and cradle on the table saw or router arm table, lining up the center of the cradle V-notch with the cutter. Mark a centerline on the cradle and extension bar, then mark one inch increments on both sides of the centerline.

4. On the router arm fixture, center and drill 1/4"-diameter indexing holes 3/8" deep into the back edge of the cradle; drill matching holes through the back brace and the extension bar. On the table saw fixture, drill a 1/4"-diameter hole down from the upper edge 2-1/4" deep into the extension bar. Center the hole 1/4" from the front face and at the point along the length of the extension bar that is directly in line with the saw's dado blades. Make indexing notches in





the back edge of the cradle by sliding it along the slot in the extension bar and drilling through the hole in the bar.

5. Clamp the router arm fixture on the saw table. For the table saw fixture, drill two holes in the extension bar and attach it to the miter gauge with carriage bolts and wing nuts.

### MAKING THE TRIVETS

Trivets utilize 3/4"-thick stock cut into blanks of 4" x 4", 6" x 6",

and 8" x 8". Only one blank at a time can be inserted into the fixture and cut.

1. If using a table saw, set dado blades to cut a 1/2" kerf. If using a router arm, use a carbide-tipped straight router bit or any decorative bit without a pilot.

2. All cuts are 1/2" deep. Start at one corner, make the first cut, then rotate the blank 180° and cut across the other corner.

3. Remove the stop pin (C), then slide in the cradle and blank one

inch. Reinsert the pin and cut the next groove. As before, turn the blank 180° and cut the second groove on the other side. Continue in this manner until you reach the middle of the blank and the top is completed.

4. Turn the blank over, rotate it 90°, and begin the same cutting procedure from corner to middle.

5. Sand the edges of the trivets with a disc sander. For overall sanding, use flutter sheets. Use a good heat- and water-resistant finish.

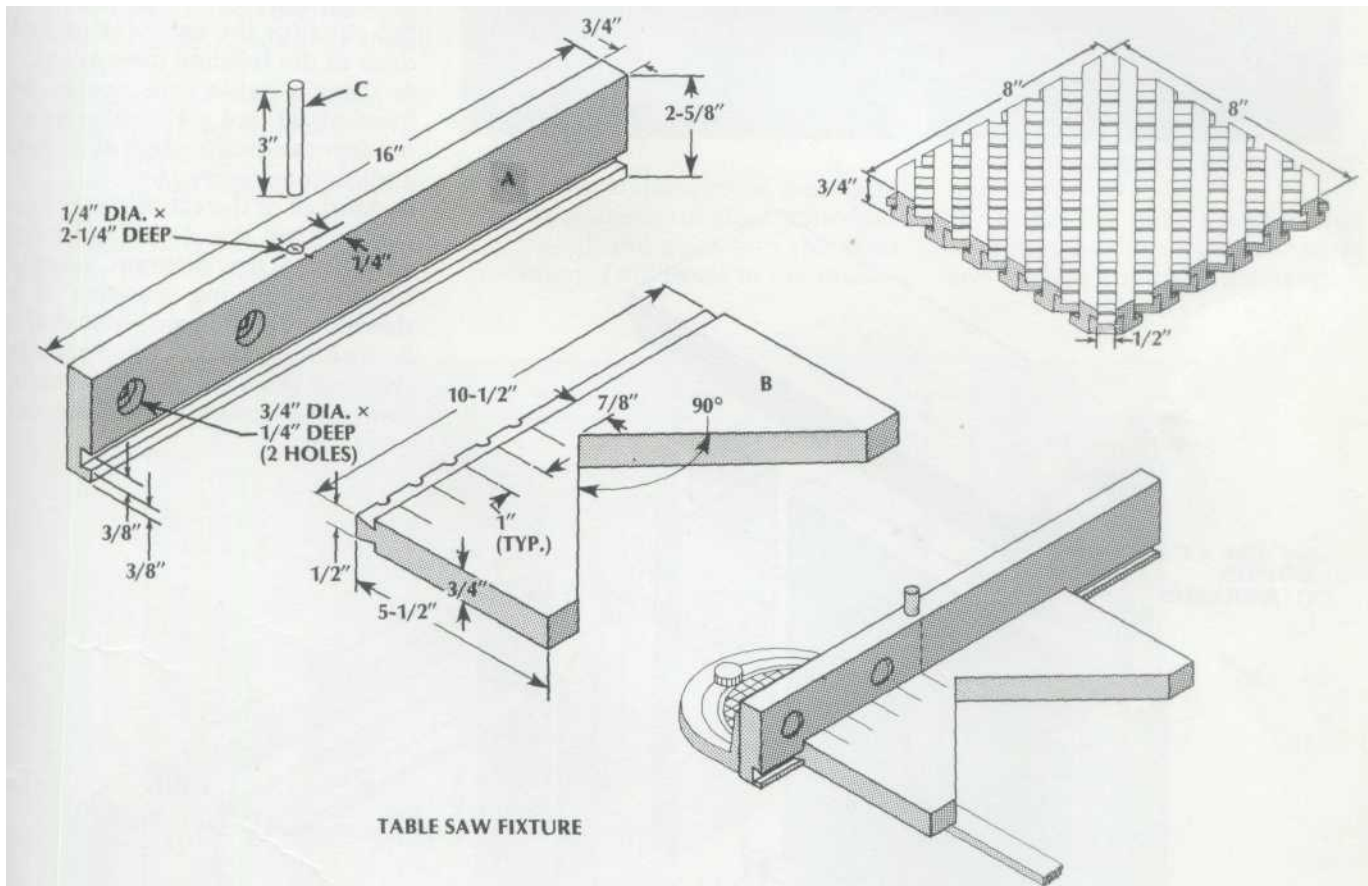


TABLE SAW FIXTURE

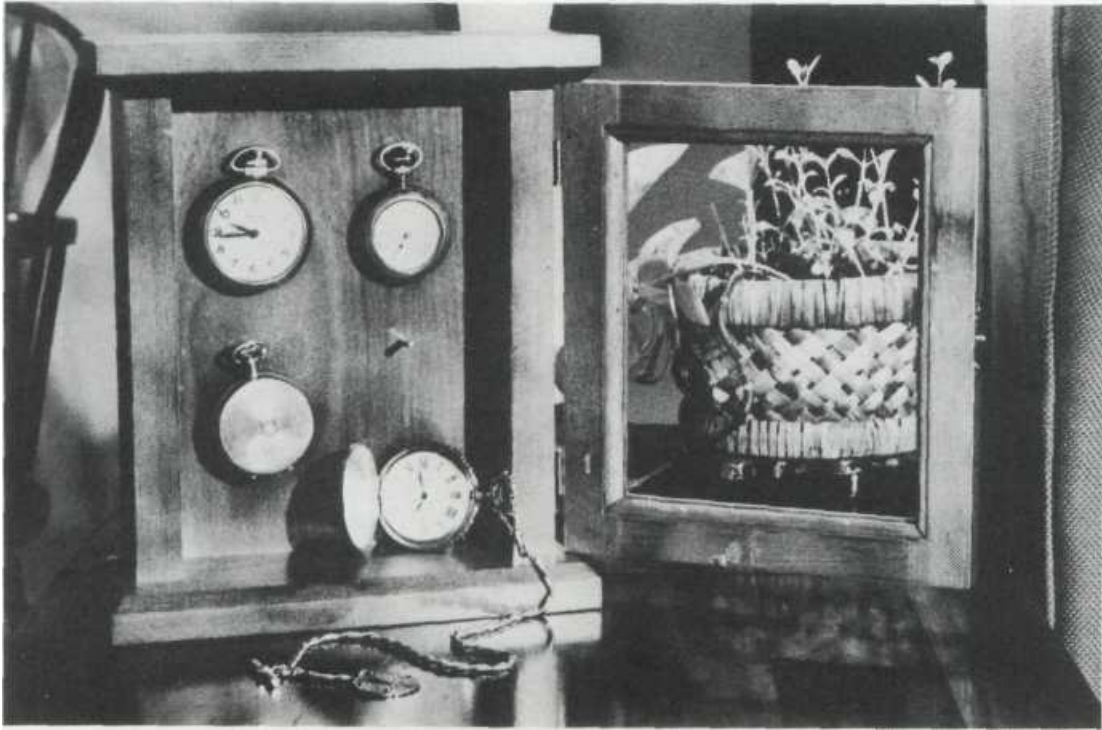
#### LIST OF MATERIALS (Router Arm Fixture)

(finished dimensions in inches)	
A	Extension bar 3/4 x 1-3/4 x 16
B	Cradle 3/4 x 5-1/2 x 10-1/2
C	Stop pin 1/4 dia. x 3-1/4
D	Back brace 3/4 x 1-3/4 x 29-1/2
	Flathead wood screws #6 x 1

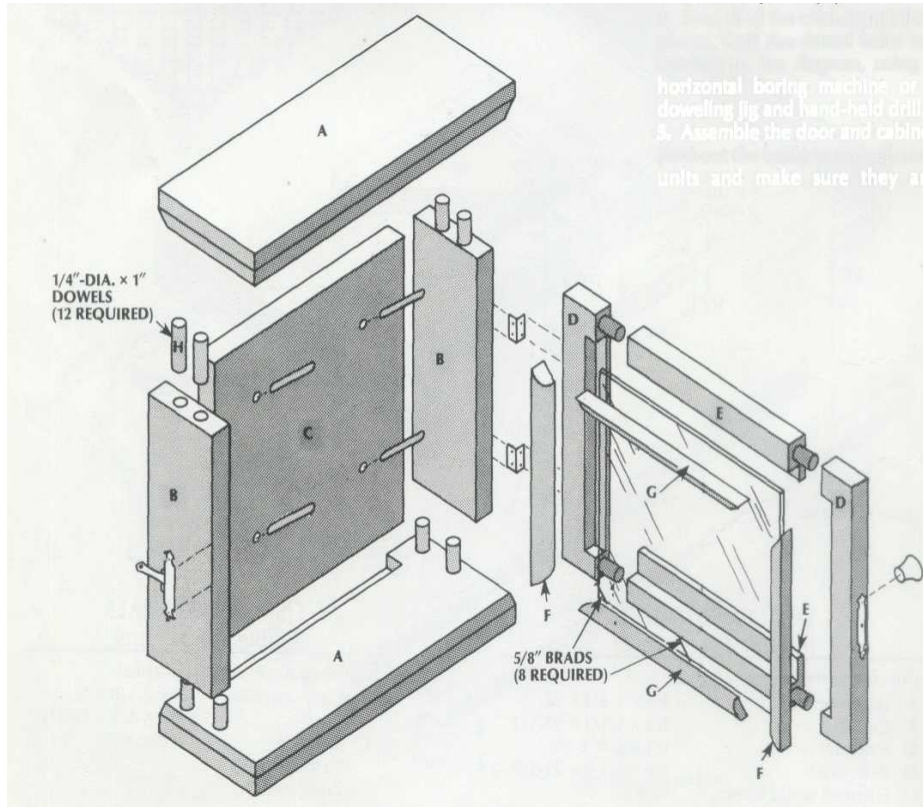
#### LIST OF MATERIALS (Table Saw Fixture)

(finished dimensions in inches)	
A	Extension bar 3/4 x 2-5/8 x 16
B	Cradle 3/4 x 5-1/2 x 10-1/2
C	Stop pin 1/4 dia. x 3
	Carriage bolts
	Wing nuts

# WATCH KEEP







horizontal boring machine or a doweling jig and hand-held drill.  
 5. Assemble the door and cabinet units and make sure they are

Pocket watches are a beautiful link to the past, and this watch case is ideal for displaying these old treasures.

1. This project is constructed of 1 x 4 stock and 1/4"-radius quarter-round molding. The material used for the cabinet sides (B) and back (C) and the door stiles (D) and rails (E) must be planed or resawn and sanded down to 1/2" thickness.
2. Begin by edge-gluing two 9" lengths of 3/4" stock to serve as the basis for the back panel. After the glue has dried on the panel, cut all the parts for the cabinet case and door to the finished dimensions.
3. Using a table saw, router, or hand plane, cut a 45° chamfer on the front and side edges of the top and bottom pieces (A).
4. Sand all of the cabinet and door pieces. Drill the dowel holes according to the diagram, using a horizontal boring machine or a doweling jig and hand-held drill.
5. Assemble the door and cabinet (without the back) as two separate units and make sure they are

square. Clamp them together until the glue dries.

6. Rout a 1/4"-wide x 1/4"-deep rabbet in the back of the door, using a straight router bit. Square the corners using a hand chisel.

7. Cut a 1/4"-deep x 1/2"-wide x 6"-long stop rabbet in the back edge of both the top and bottom cabinet pieces.

8. Prior to installing the back, drill 1/8"-diameter holes in the back for the hanging pegs. Drill the holes at a 5° slant to the depth of 3/8". If using wooden pegs, install them; if using brass rods, wait until after finishing the watch keep to install them.

9. Nail and glue the back into the cabinet. Miter the ends of the glass retainer molding (F, G) for the door while you wait for the glue to dry.

10. If necessary, sand the top and bottom of the door to prevent

them from rubbing or binding. Sand the sides so they fit flush with the cabinet.

11. Finish all the pieces, including the quarter-round glass retainers.

12. Install the glass with the glass retainers. Drill holes in the retain-

## LIST OF MATERIALS

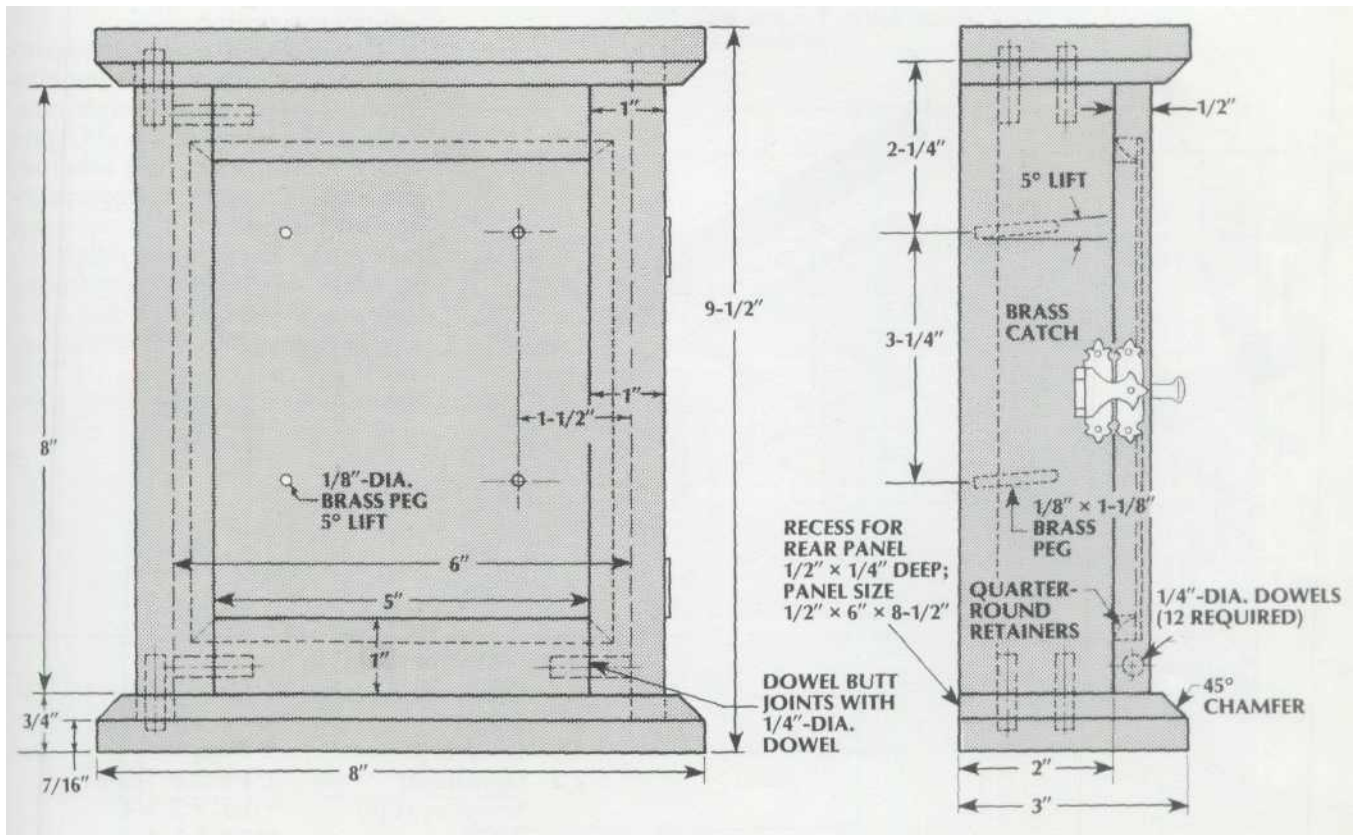
(finished dimensions in inches)

<b>A</b>	Top and bottom (2)	3/4 × 3 × 8
<b>B</b>	Sides (2)	1/2 × 2 × 8
<b>C</b>	Back	1/2 × 6 × 8-1/2
<b>D</b>	Door stiles (2)	1/2 × 1 × 8
<b>E</b>	Door rails (2)	1/2 × 1 × 5
<b>F</b>	Side glass retainers (2)	1/4 × 1/4 × 6-1/2
<b>G</b>	Top & bottom glass retainers (2)	1/4 × 1/4 × 5-1/2
<b>H</b>	Dowels (12)	1-1/4 dia. × 1
	Knob	1/2 dia.
	Hanging pegs (4)	1/8 dia. × 1-1/8
	Glass	1/8 × 5-3/8 × 6-3/8
	Brads	#18 × 5/8
	Hinge with screws (pair)	
	Door latch	
	Wood glue	

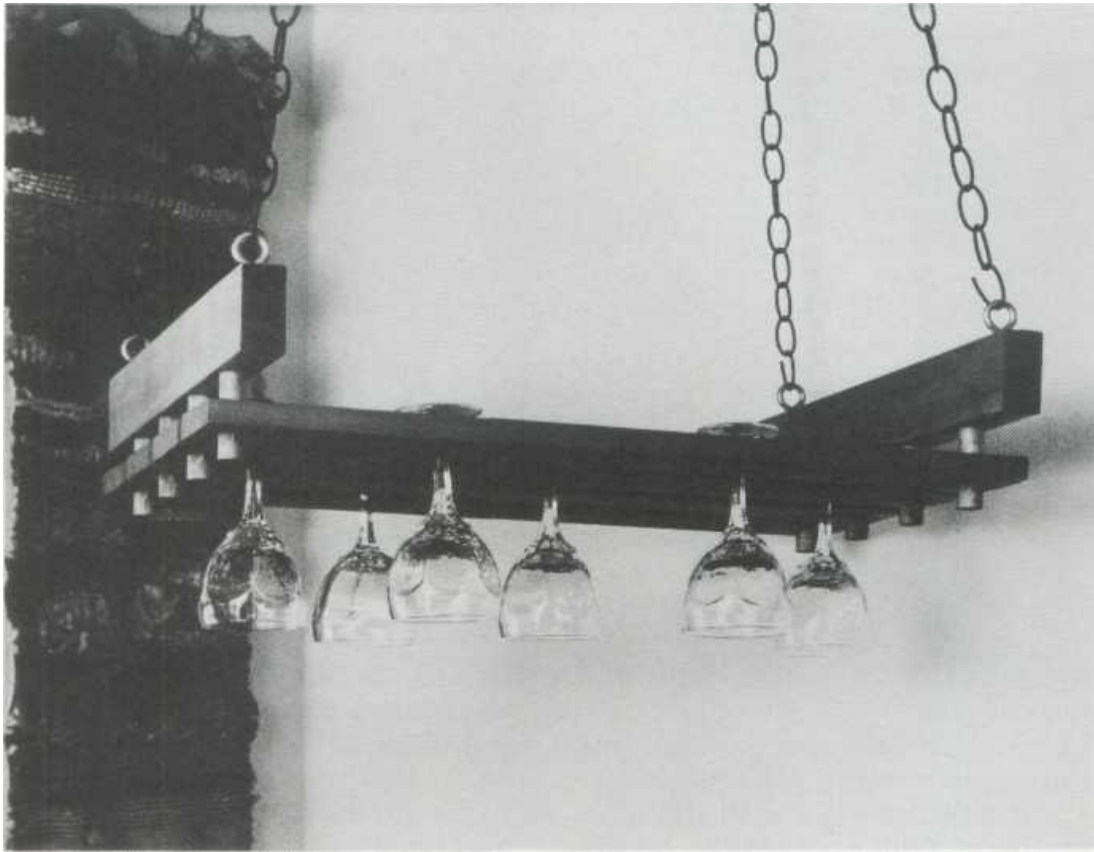
ers for brads, then attach the retainers with brads.

13. If using brass hanging pegs, install them now.

14. Install the hinges with screws to mount the door. Install the knob and latch to complete the keep.



# HANGING WINE GLASS RACK

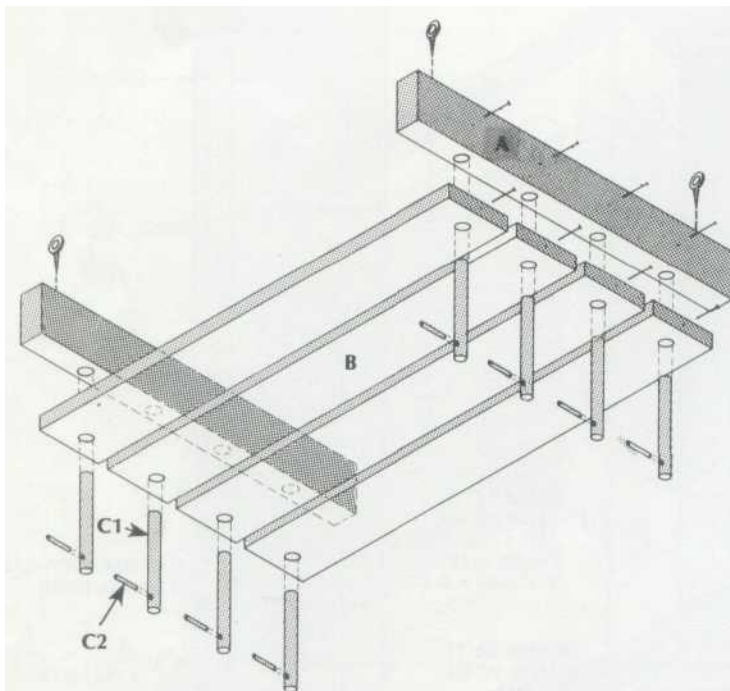


With this decorative hanging rack you can show off your fine wine glasses. It's useful in any kitchen or above any bar; it is attractive, and also helps solve your storage problems.

1. To make the wine glass rack, start with a 38" length of 2 x 4, a 49" length of 1 x 8, and two dowel rods (one 1/4" in diameter and one 3/4" in diameter).
2. Crosscut the 2 x 4 into two 18-1/2"-long pieces. Rip, then plane or sand these pieces to a thickness of 1-1/4" and a width of 2-1/2" to make the crosspieces (A).
3. Crosscut the 3/4"-thick stock into 24"-long boards, then rip these boards into 3-1/2"-wide pieces for the rails (B).

4. Cut the 3/4"-diameter dowel rod (C1) into eight 5"-long pieces. Cut the 1/4"-diameter dowel rod (C2) into eight 1-1/4"-long pieces. To make sure that the pieces are the same length, use a stop block when crosscutting.

5. Clamp the adjacent rails together two at a time to drill the glass stem recesses. From the ends, measure in 3" and mark a point. From these marks, space the other recesses 4-1/2" apart. Using a countersink bit, drill a 1/4"-deep recess where the edges of the rails meet.
6. Mark the centerpoints for the screw eye and dowel holes in the upper edge of the crosspieces. Center the screw eye holes 1-1/2" in from each end and the dowel holes



#### 5. Clamp the adjacent rails together

to drill the glass stem recesses. From the ends, measure in 3" and mark a point. From these marks, space the other recesses 4-1/2" apart. Using a countersink bit, drill a 1/4"-deep recess where the edges of the rails meet.

#### LIST OF MATERIALS

(finished dimensions in inches)

<b>A</b>	Crosspieces (2)	1-1/4 x 2-1/2 x 18-1/2
<b>B</b>	Rails (4)	3/4 x 3-1/2 x 24
<b>C1</b>	Dowels (8)	3/4 dia. x 5
<b>C2</b>	Dowels (8)	1/4 dia. x 1-1/4
	Screw eyes (4)	1 dia. x 2-1/4
	Brads	#16 x 1-1/4
	Wood glue	



3-1/4" in from the ends and 4" apart. Mark the dowel hole centers 1" from the ends and midway across the lower faces on the rails.

7. Drill pilot holes for the screw eyes 1" deep into the crosspieces. Drill 3/4"-diameter dowel holes completely through the crosspieces and the rails. To avoid tear-out when drilling the dowel holes, drill only until the tip of the bit penetrates the far side of each piece, then flip the piece over to complete the hole.

8. Center and drill a 1/4"-diameter hole through each 3/4"-diameter dowel 5/8" from one end. Hold the dowels steady for drilling by placing them in a V-groove plowed down the middle of a block of scrap lumber. Position the block so that the drill bit will strike the center of the groove, then clamp it to

the table or hold it firmly against a fence.

9. Sand all pieces before assembling.

10. Drive the 1/4"-diameter dowels through the ends of the larger dowels so that their ends extend the same distance to either side. Then fit the rails onto the larger dowels and push them down until they are stopped by the smaller dowels.

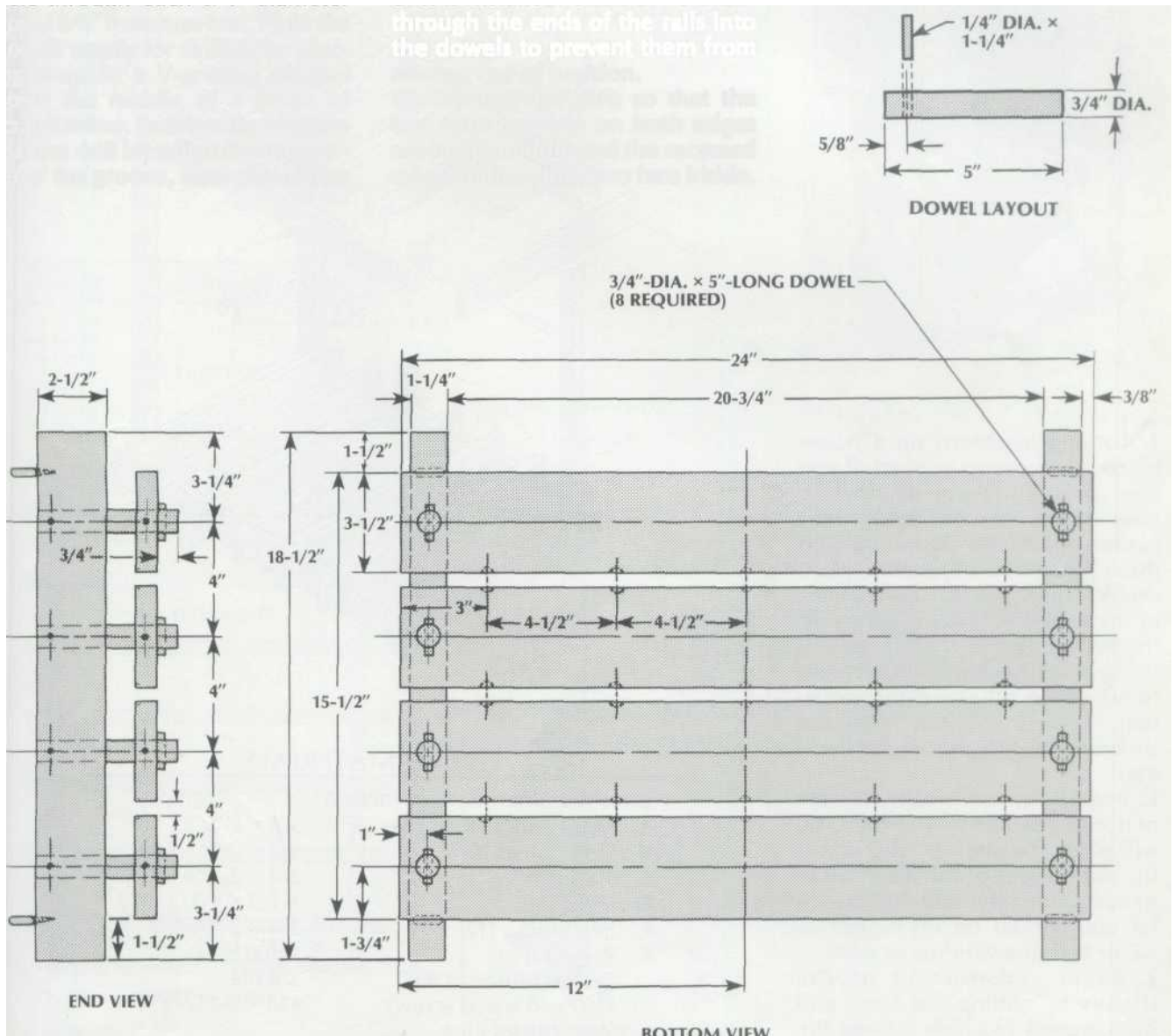
11. Make sure the rails are turned so that the tapered recesses on their edges will face up when the unit is installed. Then drive brads through the ends of the rails into the dowels to prevent them from moving out of position.

12. Arrange the rails so that the two with recesses on both edges are in the middle and the recessed edges of the other two face inside.

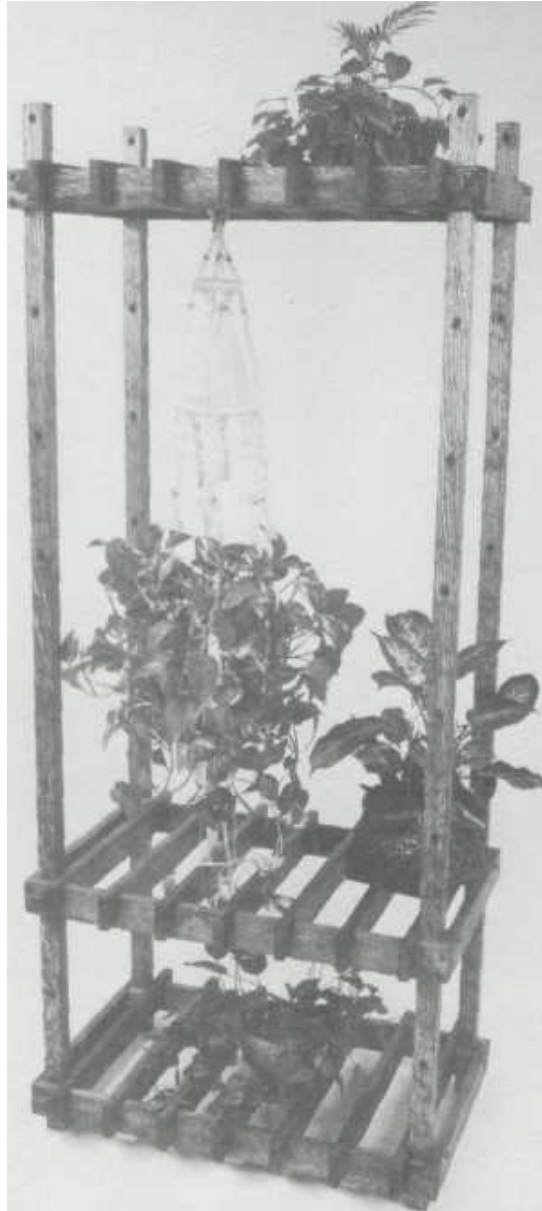
Spread glue inside the dowel holes in the crosspieces and the upper ends of the dowels. Then insert the dowels into the underside of the crosspieces, pushing them up until their upper ends barely emerge from the crosspieces. After the glue dries, sand the dowel ends flush with the crosspieces.

13. If you want to stain the assembly, do it at this time, then rub with steel wool.

14. Finally, install the screw eyes and hang the rack.



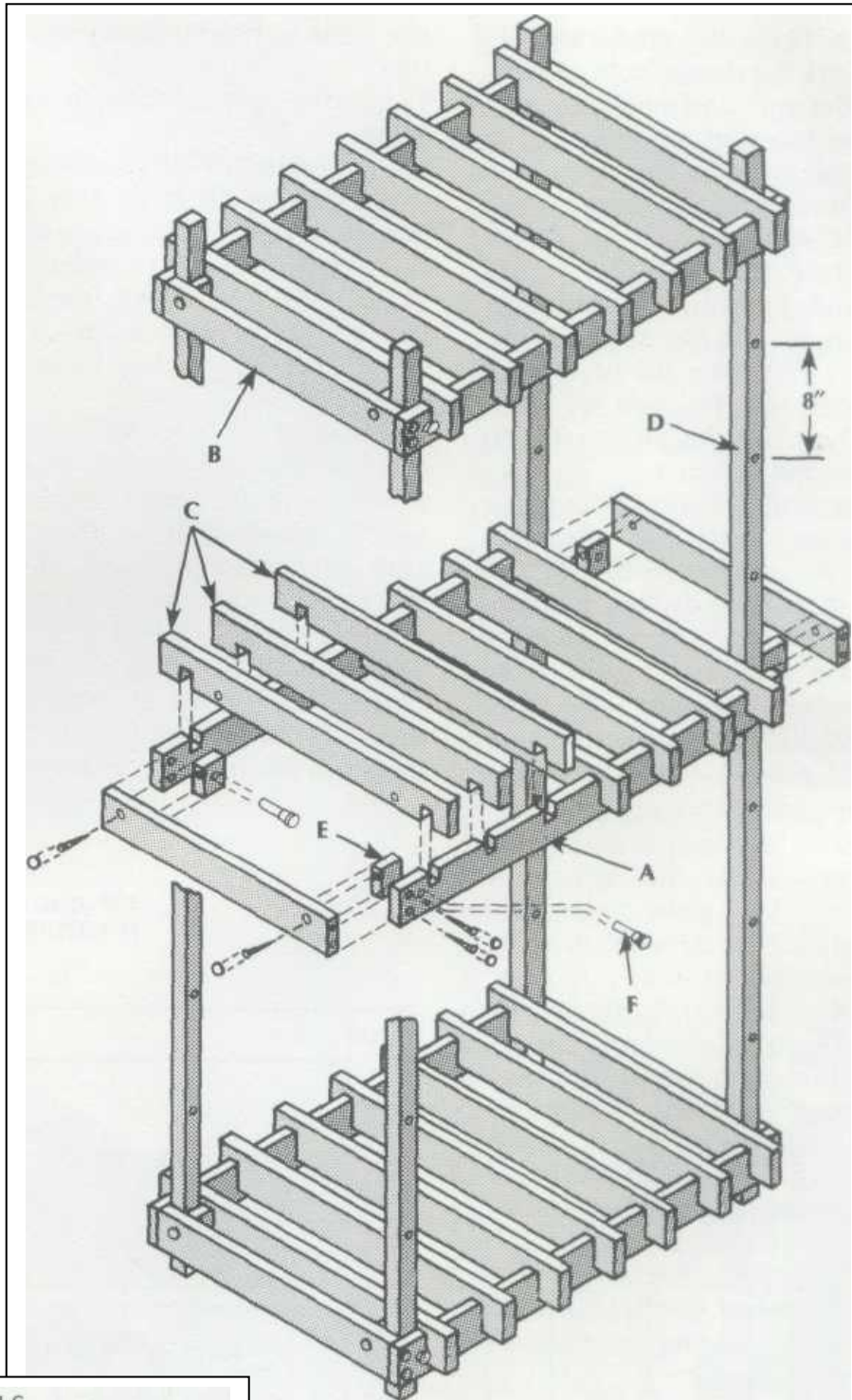
# ADJUSTABLE PLANT SHELVES





Nothing brightens up a home better than a hanging plant. If you have a south-facing window or glass doors, you can bring your garden indoors for the winter with these attractive adjustable plant shelves. The shelves are slatted rather than solid so that the plants on the bottom can receive more light. If you build the shelves with cedar, redwood, or other weather-resistant lumber, you can keep the shelves outdoors during the summer.

1. Begin by measuring the window or door opening next to which you will place the shelves, and adjust the dimensions of the materials as needed. Keep in mind that the total unit should be no higher or wider than the window or door.
2. Begin construction of the shelves by cutting the front and back frames (A), side frames (B),
- 3.



#### LIST OF MATERIALS

(finished dimensions in inches)

<b>A</b>	Front and back frames (6)	$3/4 \times 2-1/2 \times 30$
<b>B</b>	Side frames (6)	$3/4 \times 2-1/2 \times 17$
<b>C</b>	Slats (21)	$3/4 \times 2-1/2 \times 21-1/2$
<b>D</b>	Stiles (4)	$1-1/2 \times 1-1/2 \times 72$
<b>E</b>	Peg blocks (12)	$3/4 \times 2 \times 1-1/2$
<b>F</b>	Pegs (12)	1 dia. $\times$ 2-1/2
	Dowel buttons (36)	3/8 dia.
	Flathead wood screws	#10 $\times$ 1-1/2
	Waterproof glue	

slats (C), and peg blocks (E) to size from 1 x 3 stock.

3. The slats and the front and back frame members are joined together using cross lap joints as shown in the exploded-view drawing. These joints are formed by cutting 3/4"-wide dados 1" deep in both sets of pieces.

4. Lay out and cut the dados on the front and back frames as shown

in the front frame and shelf layout drawings. Note that the middle dado is centered along the length of the frames and that all dados are 3-3/8" apart.

5. Lay out and cut a pair of dados on each slat as shown in the slat detail drawing. Note that these dados are set 1-1/2" from the ends of the pieces.

6. Drill 1/2"-diameter peg holes through the front frames and back peg blocks. The holes in the front frames are centered 1" below the upper edge and 1-1/2" from each end. The holes in the blocks are centered on both width and length. Counterbore screw holes in the front and back frames, side frames, and the outermost slats of each shelf. Then sand all the shelf pieces.

7. Assemble the frames, using weatherproof glue and #10 x 1-1/2" flat-head wood screws. Do not glue in the five middle slats of the top shelf; with these slats left unglued and detachable it is much easier to put up and take down your plants.

8. Cover the counterbored screws with 3/8"-diameter dowel buttons.

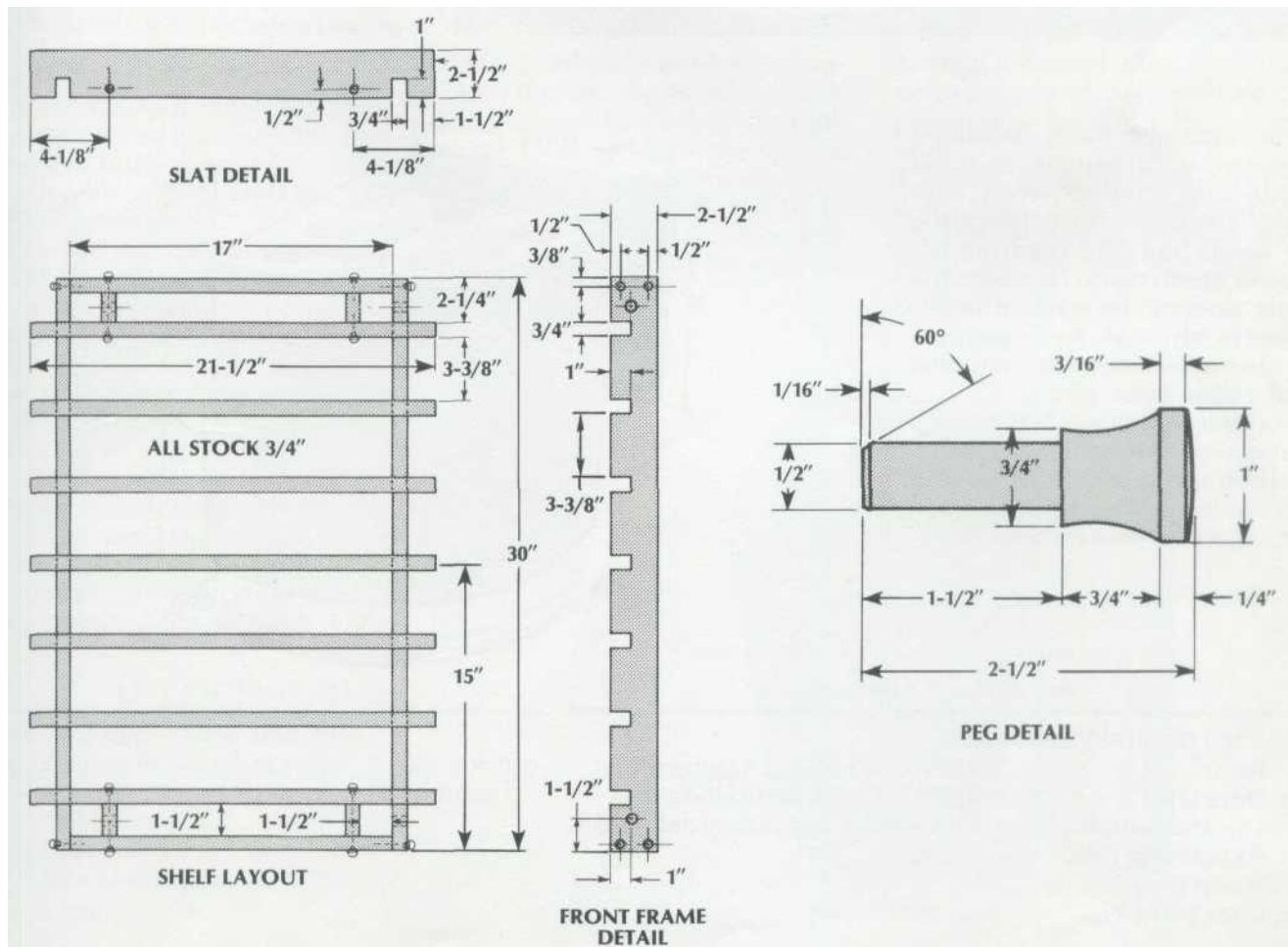
9. Cut the four stiles (D) from 2 x 2 stock. Center and drill 1/2"-diameter peg holes at 8" intervals along the length of each stile, beginning 4" from either end. Sand the stiles.

10. Turn the pegs (F) on a lathe from scrap 2 x 2 stock to the profile

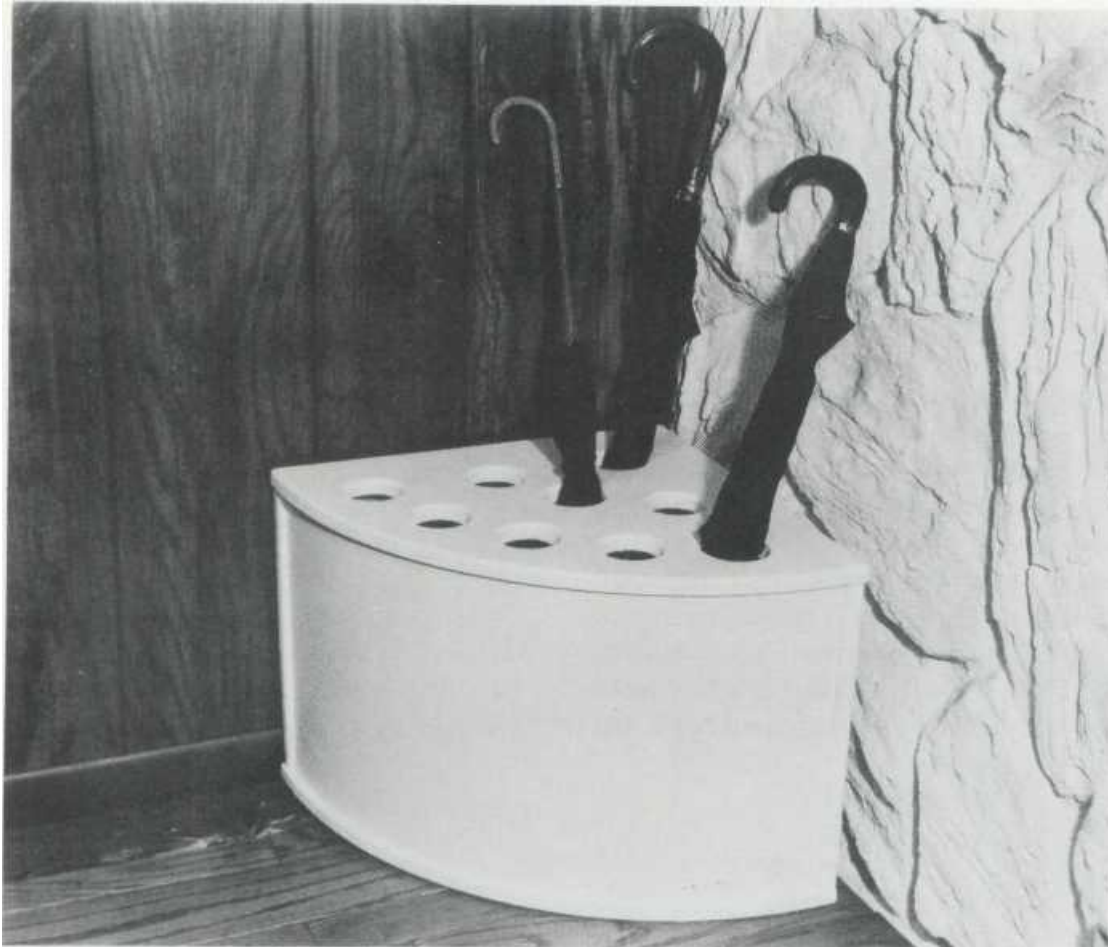
shown in the peg detail. Sand and finish the pegs on the lathe.

11. If you are planning to use the shelves outdoors, finish with a good outdoor finish such as spar varnish or polyurethane. (If you used cedar, redwood, or weather-resistant lumber, no finish is necessary.)

12. Finish the assembly by sliding the shelves over the ends of the stiles. Position the shelves and secure them with the pegs.



# CORNER UMBRELLA STAND



The umbrella stand described here was built of particleboard and hardboard, then covered with white latex paint. The hardboard is the ideal choice for the front because it bends easily. However, the other parts can be made of waferboard or plywood, if you prefer.

1. Cut the pieces to size according to the dimensions given.
2. Lay out and cut an 18-1/2" radius across the front corner of the top and bottom pieces (C). Then rout a 1/8"-wide x 1/4"-deep groove in each piece to receive the front (A). Set the grooves 1/2" back of the radiused edges of the pieces.
3. Rout a 1/8"-wide x 1/4"-deep dado across each side piece (B) 3/8" in from the front edge to receive the ends of the front panel.
4. Lay out and cut nine 2-1/2"-diameter holes in the top, arranged as shown in the drawing. Sand the edges of the holes and any other rough edges on any of the pieces.
5. Dry assemble the stand to check the fit. Keep the outside faces of

the sides flush with the straight edges of the top and bottom. Trim one end of the front panel if necessary to get a good fit.

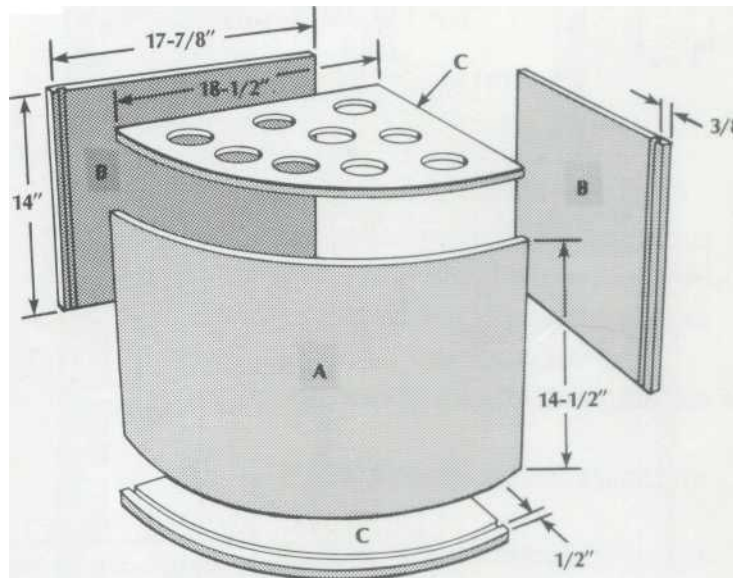
6. Run a bead of glue inside the grooves and dados and along all edges where parts will join. Assemble the stand, using 4d finishing nails to fasten the top and bottom to the sides while the glue dries.

7. Finish the stand with two coats of latex paint.

### LIST OF MATERIALS

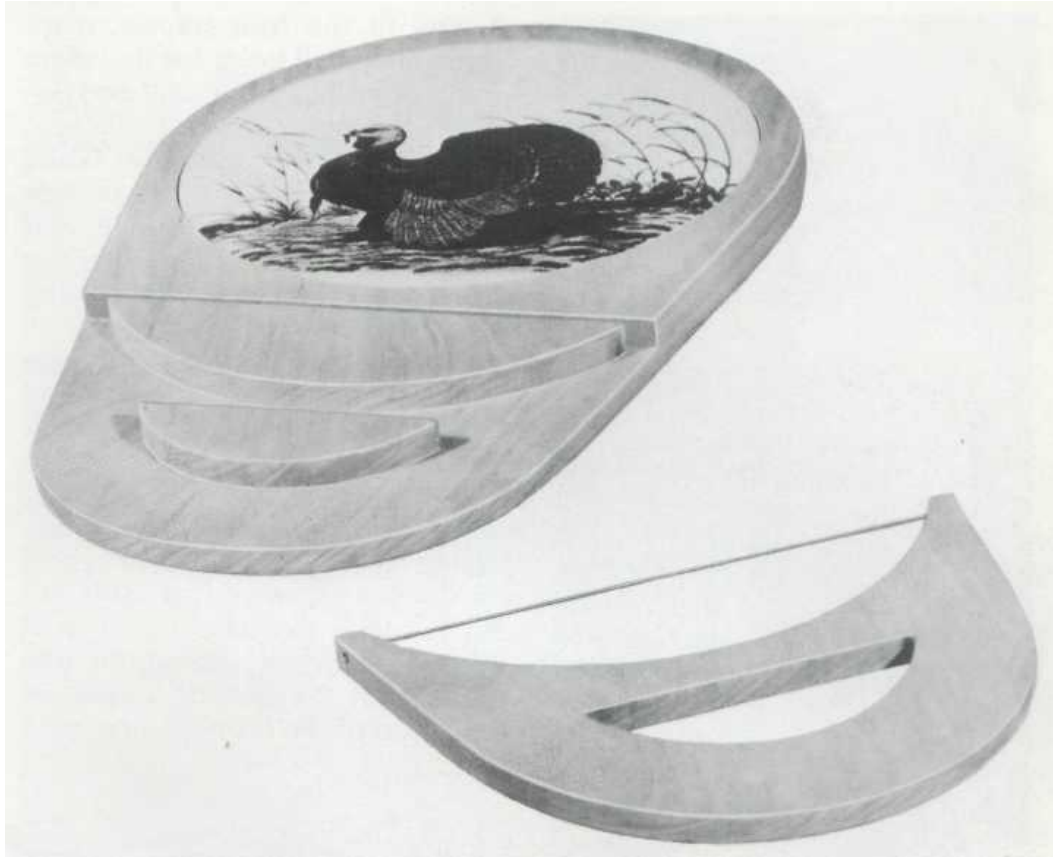
(finished dimensions in inches)

<b>A</b> Front	1/8 × 14-1/2 × 28-1/2 hardboard
<b>B</b> Sides (2)	1/2 × 14 × 17-7/8 particleboard
<b>C</b> Top and bottom	1/2 × 18-1/2 × 18-1/2 particleboard
	4d finishing nails
	Wood glue
	Latex paint





# CUTTING BOARD



A brightly colored, round ceramic tile makes the perfect working surface for this wooden cutting board. As an added attraction, the wire bladed knife is designed to fit right into the board, so it's at your fingertips when you need it.

1. The cutting board is made from two 7" x 11" pieces of maple or cherry. Begin the project by resawing or planing both boards to 5/16" in thickness and trimming them to the overall shape shown in the drawing.

2. Leave one board whole to serve as the base. Cut the knife handle, the two knife holders, and the opening for the tile out of the other piece following the instructions given in the drawings. Adapt the dimensions as needed to fit the precise dimensions of your ceramic tile.

3. Since the pieces cut out of the knife handle are used as the knife holders, the cuts must be made with minimal waste. Begin by drilling a tiny hole through the piece on one cutting line and slipping a jeweler's blade through. Then fasten the blade in a scroll saw and complete the cut.

4. Use glue to fasten the tile holder and knife holder pieces to the cutting board base, clamping the pieces until the glue dries. Use the knife handle to properly position the knife holder pieces, but be careful not to accidentally glue it in place.

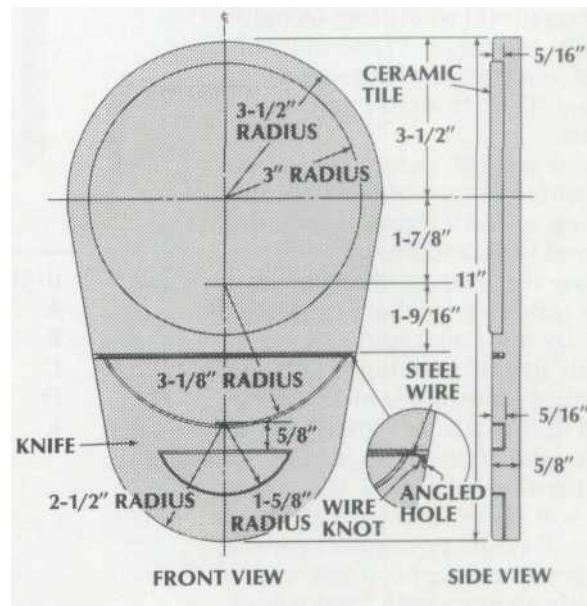
5. When the glue has set, sand the cutting board and knife handle with fine sandpaper to round all sharp corners.

6. Use an unwound steel musical instrument string for the knife

blade. Drill holes for the wire diagonally through the tips of the knife handle to minimize chances of the wood splitting when the wire is tensioned. Counterbore the outside ends of the holes slightly to make room for the anchor on one end of the string and the knot on the other end.

7. Stain if desired, then apply one or two coats of polyurethane or penetrating oil finish for protection.

8. Attach three small tack feet to the bottom of the cutting board to prevent it from sliding when in use. Install the tile, and the board is ready for use.



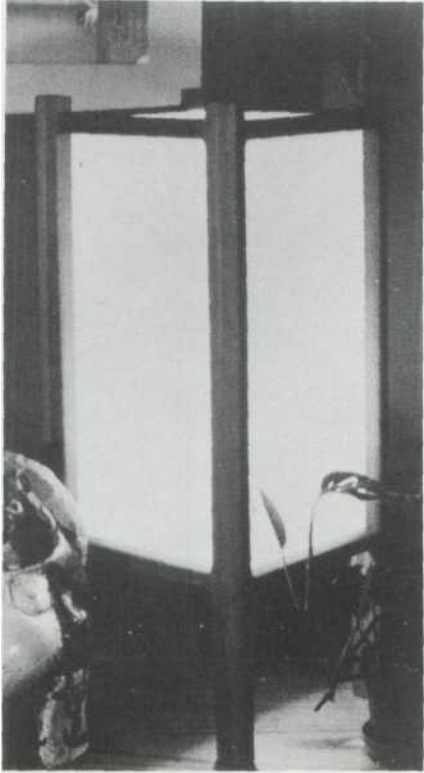
### LIST OF MATERIALS

(finished dimensions in inches)

- A Cutting board blanks (2) 5/16 x 7 x 11
- Ceramic tile 3/8 x 6 dia.
- Steel wire
- Tack feet
- Fine sandpaper
- Wood glue



# SHOJI LAMP



This lantern-style lamp and shoji screen can be used indoors or out. It's constructed easily with glue and small brads; however, remember to nail carefully to avoid splitting the wood.

1. After cutting all the pieces to size, assemble the frames by attaching the rails (B) to the legs (A) with dowels and glue. Place the rails 3/4" down from the tops of the legs and 6-3/8" up from the bottoms as shown.

2. Rout a 6-1/4"-long channel up the center of one of the legs, beginning at the bottom. Make the channel wide and deep enough to enclose the lamp cord and place it on an outside edge that can be covered by an overlapping frame as shown in the drawing. Then, on the adjacent inside face of the leg, drill a hole that intersects the upper end of the channel to provide an exit for the cord. Pick the frame that will cover the cord channel and drill a hole through it near the bottom of the appropriate leg to provide an entry path for the cord.

3. Dry fit the four frames, mark them, and drill holes for doweling them together. Then sand and finish the frames as desired.

4. Cut a piece of fiberglass fabric large enough to cover the rectangular opening in each frame. Fasten the fiberglass panels to the inner face of each frame using small wire nails.

5. Drill a hole through the base (C), centered along its length and 1-1/2" from one side. Size the hole to accept the pipe nipple found in the lamp socket kit.

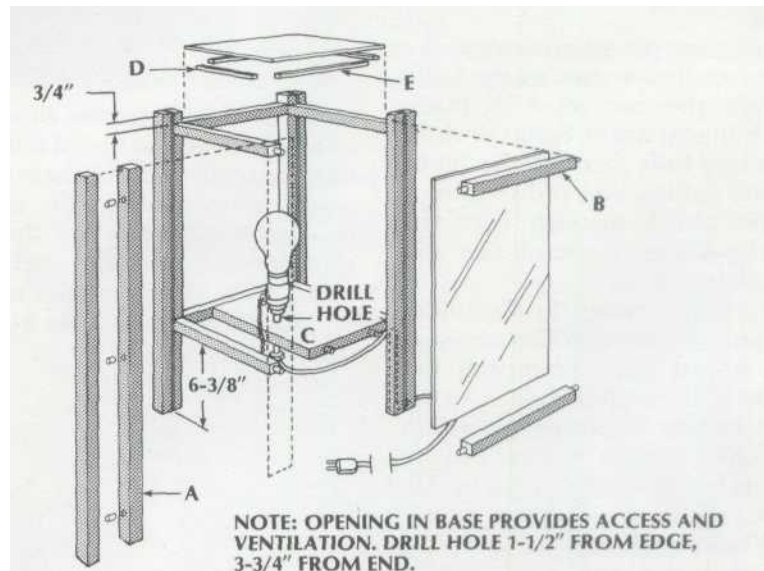
6. Fasten the base between the frame with the cord channel and one other frame using dowels and glue. Make the base side that is farthest from the pipe nipple hole flush with the outside edges on one side of the frames to create a

ventilation and access space on the other side.

7. Lace the lamp cord through the holes and channel in the two frames, pulling enough out the upper end for connecting with the socket. Fasten the four frames together using glue and dowels. Then glue and tack the support strips (D, E) to the backs of the upper rails, keeping their lower edges flush.

8. Insert the pipe nipple into the base, keeping the nut on the lower end. Run the cord up through the nipple and fasten it to the socket, then mount the socket on the nipple. Rotate the socket to place the pull chain side next to the ventilation hole, then tighten the nut.

9. Cut a piece of fiberglass to serve as the top of the lamp. Glue and tack it to the top edges of the support strips.



### LIST OF MATERIALS

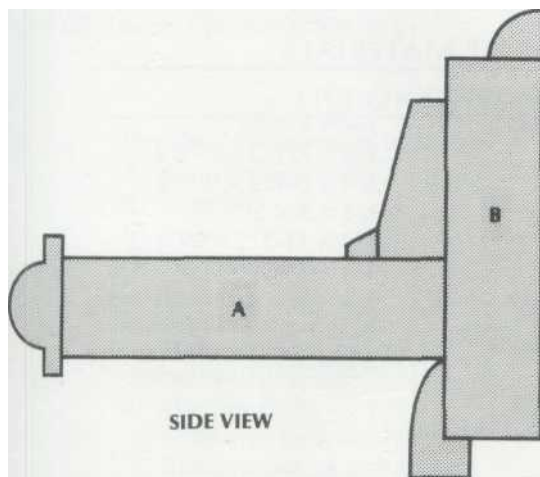
(finished dimensions in inches)

<b>A</b>	Legs (8)	3/4 x 3/4 x 24
<b>B</b>	Rails (8)	3/4 x 3/4 x 7-1/2
<b>C</b>	Base	3/4 x 6 x 7-1/2
<b>D</b>	Support strips (2)	5/16 x 1/2 x 7-1/2
<b>E</b>	Support strips (2)	5/16 x 1/2 x 8-3/8
	Dowels	3/8 dia. x 1-1/2
	Wire nails	
	Lamp socket kit	
	(socket, pull chain, cord, pipe nipple, and nut)	
	Fiberglass fabric	
	Wood glue	

# UTENSIL HOLDER

kitchen utensils have a way of getting lost just when you need them. Such confusion can be avoided by building this special holder for them.

1. Cut the rack (A) and base (B) to size.
2. Drill appropriately sized holes in the rack to accommodate large spoons and other utensils.
3. Glue and tack a piece of decorative molding to the front of the rack as shown.
4. Butt the rack against the base, or rout a shallow groove for it. Fasten them together using glue and screws inserted from behind.
5. Dress up the holder by nailing various moldings to the front, top, and bottom edges of the base. The ones used on the original are profiled below, but choose moldings to suit your own taste.
6. Finish the holder as desired, then mount it on the wall or the side of a cabinet.



## LIST OF MATERIALS

(finished dimensions in inches)

<b>A</b>	Rack	$3/4 \times 3-1/2 \times 12$
<b>B</b>	Base	$3/4 \times 3-1/2 \times 12$
	Wood screws	
	Finishing nails	
	Decorative moldings	
	Wood glue	

# PLANT STAND



Here's a handsome pedestal to display your favorite plant. The original was made of clear grade redwood. The wider pieces were glued up from narrower stock and custom cut to the dimensions listed.

1. Cut all of the pieces to size according to the dimensions given.

2. Cut three plug holes in each column side (A) as shown. Locate the holes 2-1/2" from each end, with the remaining hole in between. All of the holes should be centered 3/8" from one edge of the piece.

3. Drill pilot holes for the wood screws in the center of the plug holes.

4. Assemble the column by gluing and screwing one corner at a time. Be sure that the assembly is square.

5. Round the edges of the column by sanding or routing with a 1/4" radius bit.

6. Cut 45° miters at the corners of the apron pieces (G).

7. Round or bead the upper edges of the top (E), then center the apron pieces on the underside of the top. Glue and screw through the apron into the top.

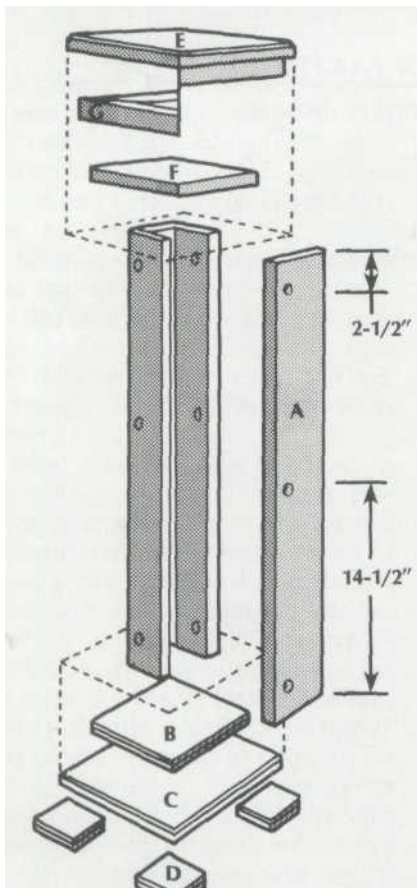
8. Center the bracket (F) on the column; then glue and screw it in place. Center the top/apron assembly on the bracket; glue and screw through the bracket into the apron.

9. Round or bead the upper edges of the base pieces (B, C) and feet (D); then sand.

10. Center the small base piece on the bottom of the column. Glue and screw it in place from underneath. Repeat with the large base piece.

11. Position the feet so they extend beyond the corners of the base as shown; secure with glue and screws.

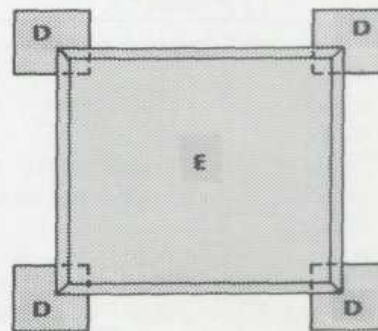
12. Sand the completed plant stand; finish as desired.



### LIST OF MATERIALS

(finished dimensions in inches)

<b>A</b>	Column sides (4)	3/4 × 4 × 29
<b>B</b>	Base piece	3/4 × 7-1/2 × 7-1/2
<b>C</b>	Base piece	3/4 × 9-1/2 × 9-1/2
<b>D</b>	Feet (4)	3/4 × 3 × 3
<b>E</b>	Top	3/4 × 11-1/2 × 11-1/2
<b>F</b>	Bracket	3/4 × 7 × 7
<b>G</b>	Apron pieces (4)	3/4 × 3/4 × 10-1/2
	Flathead wood screws	#6 × 1-1/4
	Wood plugs	3/8 dia.
	Wood glue	



FOOT DETAIL



# HALL TREE

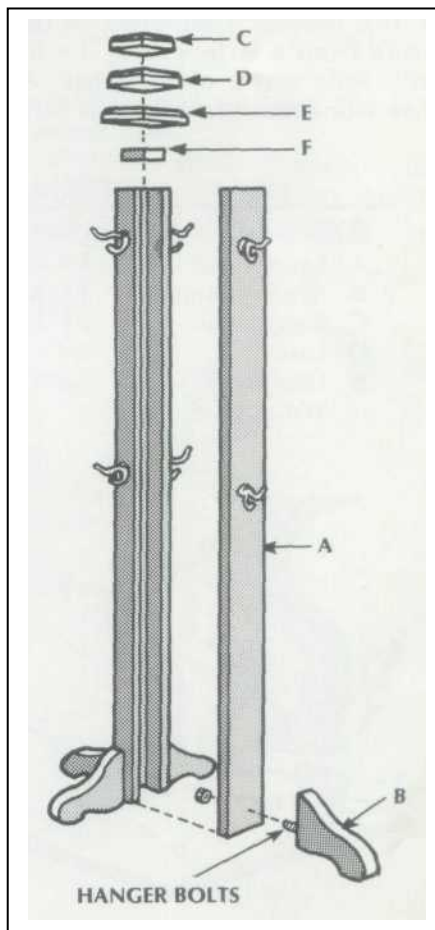


You'll always have a place to hang your hat with this easy-to-build hall tree. And by replacing the brass hooks with pot clips, you can turn it into a plant pole that is perfect for hanging vines. Either way, it's a useful addition to any home.

1. Begin by cutting all pieces to the listed dimensions.
2. Arrange the column sides (A) so their edges chase one another, creating a square column. Counterbore pilot holes and fasten the column sides together using wood glue and flathead wood screws. Fill the holes with wood plugs. (To avoid counterboring and plugging, use finishing nails instead of screws.) Sand the column, making the plugs flush with the other surfaces.
3. Center and drill a 5/16"-diameter hole through each column side 1-1/2" from the bottom to allow insertion of hanger bolts.
4. Lay out the final shape for the feet (B) using the template provided.

Drill 7/32"-diameter pilot holes for the hanger bolts in the back edge, then cut out the feet. Round over all edges except those that will meet the column.

5. Chamfer the upper edges on each of the three top pieces (C, D, E), then attach them to the bracket (F) using wood glue and finishing nails. Begin by fastening D to C, then E to D, and finally F to E. Make sure the smaller pieces are centered on the larger ones.
6. Round over the corners of the column and the sharp lower edges on the largest top piece. Spread glue on the bracket edges and fit it inside the upper end of the column.
7. Finish the tree and the feet as desired.
8. Screw the hanger bolts into the feet, then mount them on the tree, securing them with lock washers and nuts.
9. Install brass hooks and the tree is ready for your hats and coats.



### LIST OF MATERIALS

(finished dimensions in inches)

<b>A</b> Column sides (4)	3/4 × 4 × 63
<b>B</b> Feet (4)	1-1/2 × 5-1/2 × 8-1/2
<b>C</b> Top	3/4 × 4-1/4 × 4-1/4
<b>D</b> Top	3/4 × 5-3/4 × 5-3/4
<b>E</b> Top	3/4 × 7-1/4 × 7-1/4
<b>F</b> Bracket	3/4 × 3-1/4 × 3-1/4
Flathead wood screws	#8 × 1-1/4
3d finishing nails	
Hanger bolts	1/4 dia. × 2-1/2
Nuts and lock washers	
Brass hooks or pot clips	
Wood plugs	3/8 dia.
Wood glue	

**HANGER BOLT LOCATION**

ONE SQUARE = 1"

**TEMPLATE FOR FEET**

**COLUMN TOP VIEW**

# CANDLE STANDS



Candles lend elegance and beauty to any occasion, and these attractive wooden candle stands will enhance all your candlelit moments.

1. This project is designed to be made from a 6' length of 1 x 10 with little waste of materials. A dark wood, such as walnut, is particularly nice, but pick the material you prefer.

2. Begin by cutting off a 12-1/2" length for the base (D). To minimize cupping, rip this piece into two or three pieces, square the edges, then glue the pieces back together, alternating the direction of the growth rings from piece to piece.

3. Next, cut a 33" length from the board. Rip the piece down the middle, then cut each half into three equal lengths. Face laminate the six pieces to create a blank for the large stand (A).

4. Rip a 2-1/4"-wide piece off the remainder of the board. Cut it into three equal lengths. Face laminate the three pieces to create a blank for the small stand (C).

5. Rip the rest of the board down the middle, then cut two equal lengths out of each half. Face laminate the four pieces to create a blank for the medium stand (B).

6. After the glue has dried, square up the four sides of each block. Cut the blocks to the finished dimensions in the list, then sand both

ends smooth on each. Center and drill 3/8"-diameter holes 3/4" deep into the bottom of each for later mounting on the base.

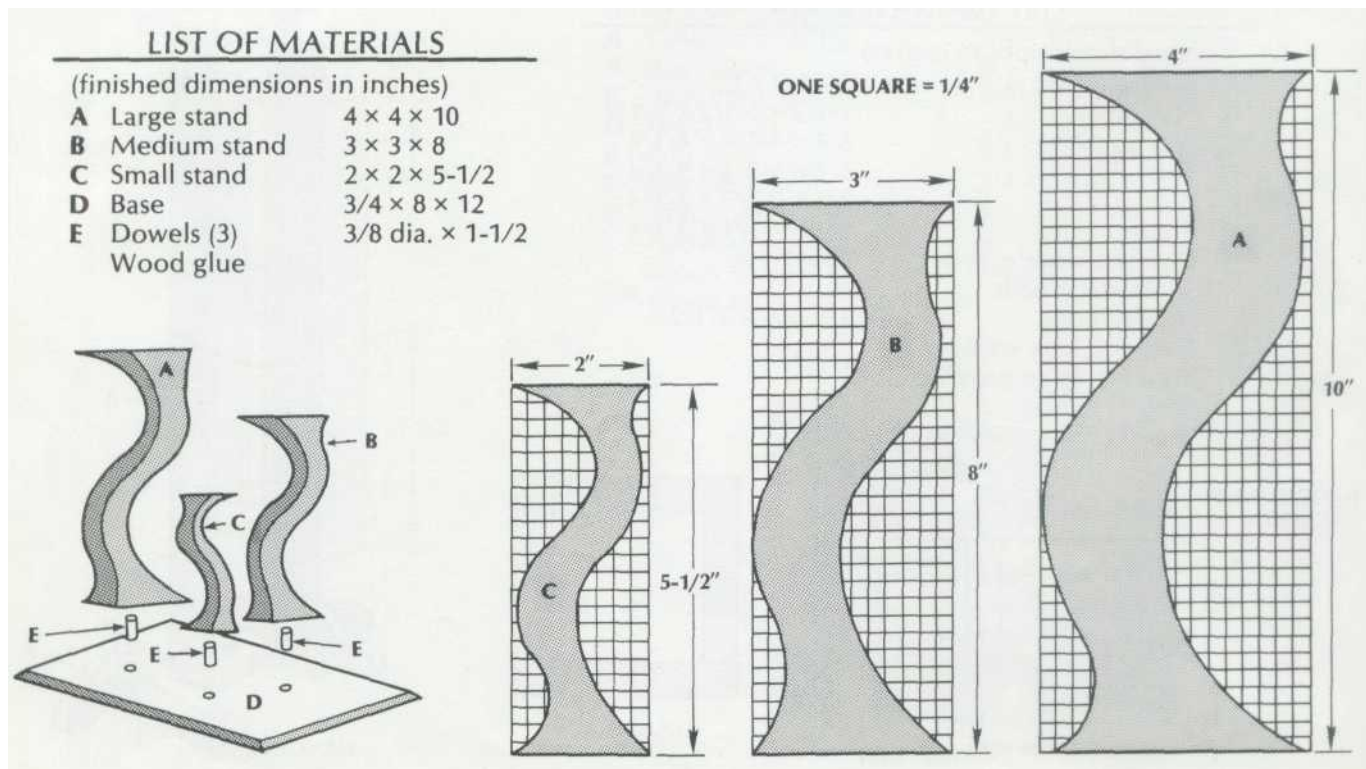
7. Make full-size templates for the blocks out of stiff cardboard or thin plywood. Trace the pattern onto two adjacent sides of each block.

8. Cut the blocks to their final shape on a bandsaw. Cut carefully along the lines on one face, then tape the waste back in place, flip the block 90°, and cut along the lines on the other marked face.

9. Cut the base to its final width and length, beveling the edges in about 15° toward the upper face.

10. Arrange the stands on the base and mark their position. Center and drill 3/8"-diameter holes through the base at the appropriate points for inserting the mounting dowels (E).

11. Sand the stands and base smooth, then assemble using glue and 3/8"-diameter dowels. After the glue dries, remove any dowel protruding through the bottom of the base. Apply your choice of finish.



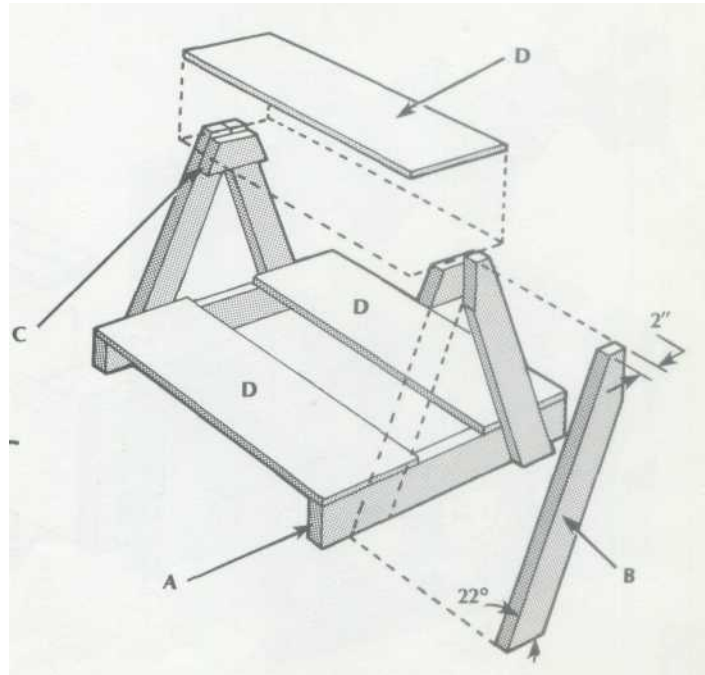
# STEPLADDER PLANT STAND





If space is a problem around your home, this handy little plant stand could be the answer. The two bottom shelves provide ample space for small and medium size plants, while the top shelf can accommodate plants of slightly larger size.

1. Cut all the pieces to size according to the dimensions given.
2. Cut a 22° bevel on each end of each leg (B) so that, when installed, the legs will slant in but their ends will remain parallel.
3. Measure from the outside edge 2" across the beveled end at the top of each leg and square a line down from that point. Cut along those lines to create the joints between legs shown in the drawing.
4. Place a pair of legs together on a flat surface and lay a brace (C) across their upper ends. Adjust the brace so that its upper edge is parallel to and 3/4" below the upper ends of the legs. Mark and trim the ends of the brace so they will be flush with the outside edges of the legs. Repeat with the other brace and pair of legs.
5. Begin the assembly of the stand by laying each pair of legs across its brace and base piece (A). Make sure the bottom edges of the legs and base are flush and that the base extends an equal distance to either side. Fasten the legs to the base and brace using water-resistant wood glue and 10d galvanized nails. If working with redwood, blunt the ends of the nails before using.
6. Set the two leg units upright and fit the shelves (D) between them. Make sure the outer edge of each lower shelf is flush with the ends of the base and that the upper shelf is centered over the braces. Fasten the shelves in place using water-resistant wood glue and 10d galvanized nails.
7. Blunt any penetrating nail ends and break over all sharp edges. Apply a water-resistant finish.

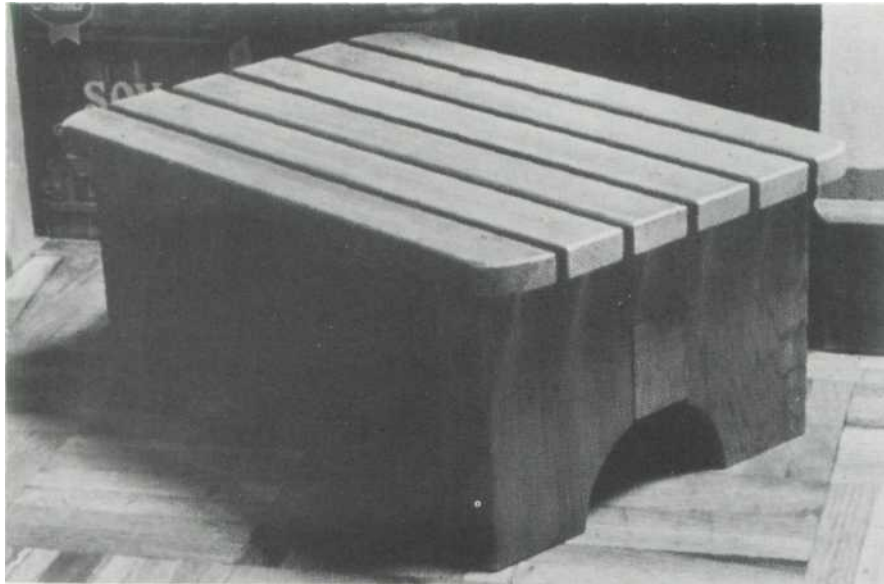


#### LIST OF MATERIALS

(finished dimensions in inches)

<b>A</b>	Base pieces (2)	1-1/2 × 3-1/2 × 22
<b>B</b>	Legs (4)	1-1/2 × 3-1/2 × 20
<b>C</b>	Braces (2)	1-1/2 × 3-1/2 × 7-1/2
<b>D</b>	Shelves (3)	3/4 × 7-1/4 × 30
	10d galvanized nails	
	Water-resistant wood glue	

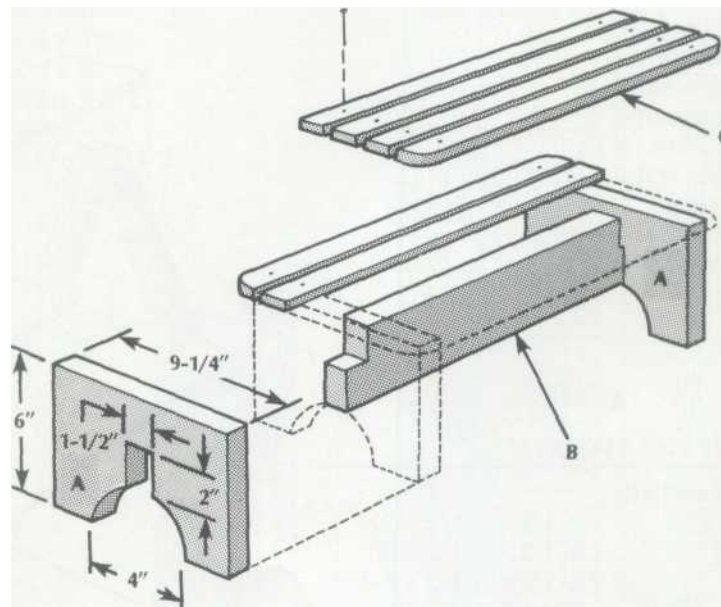
# GARDENING BENCH



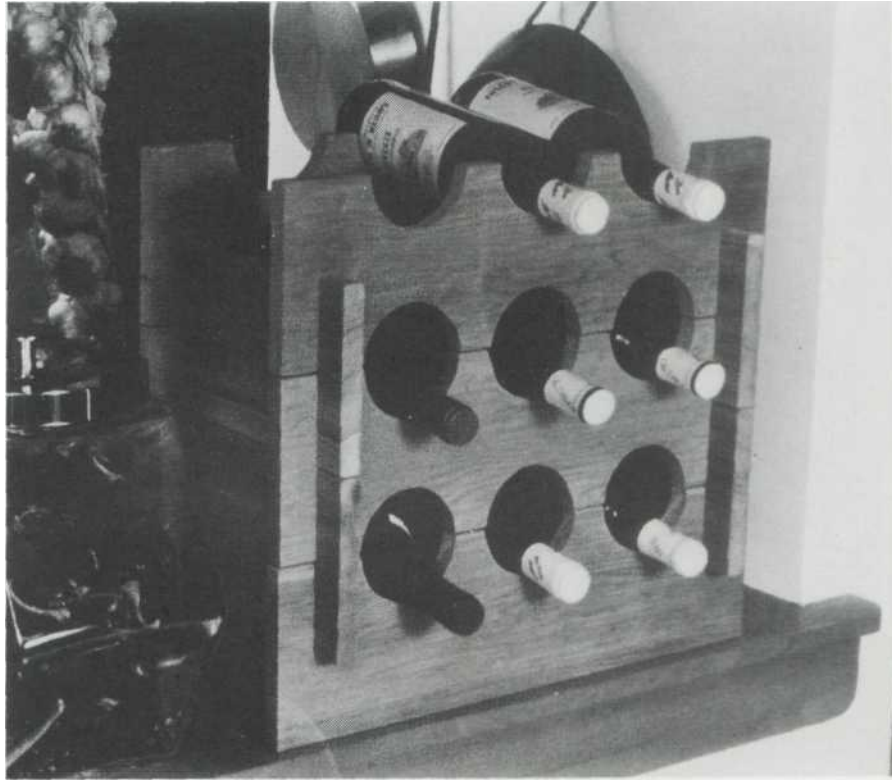
The functional design of this simple bench provides comfortable seating close to the ground, so you won't have to stoop or kneel. Besides being ideal for the garden or patio, it's also a natural in the bath or shower, if redwood or special-treated wood is used.

1. After cutting all of the pieces to size, round off the ends of the two outside top pieces (C).
2. Cut a 1-1/2" x 1-1/2" notch on each end of the cross brace (B) as shown to accommodate the legs (A).
3. Cut a 4"-diameter opening and 1-1/2" x 2" slot in the bottom of each leg as shown.
4. Glue and nail the legs to the cross brace. If working with red wood, blunt the ends of the nails before using.
5. Evenly space the top pieces on the legs, and secure them with glue and nails.
6. Sand and apply the water-resistant finish of your choice.

LIST OF MATERIALS		
(finished dimensions in inches)		
<b>A</b>	Legs (2)	1-1/2 × 9-1/4 × 6
<b>B</b>	Cross brace	1-1/2 × 3-1/2 × 12
<b>C</b>	Top (6)	3/4 × 1-1/2 × 15
	Galvanized nails	
	Wood glue	



# WINE BOTTLE RACK



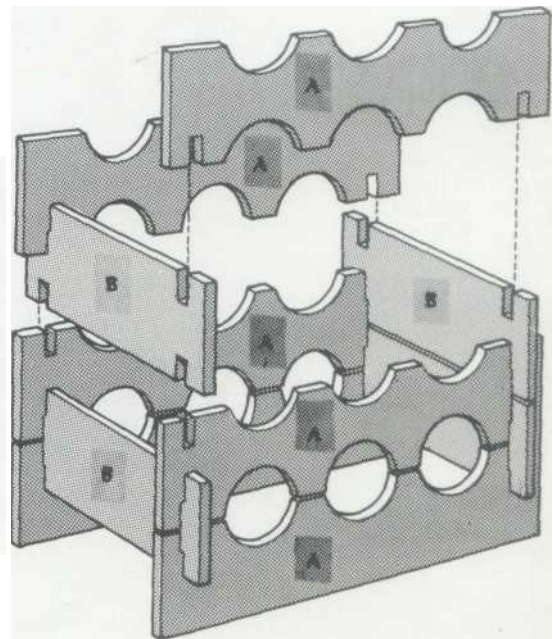
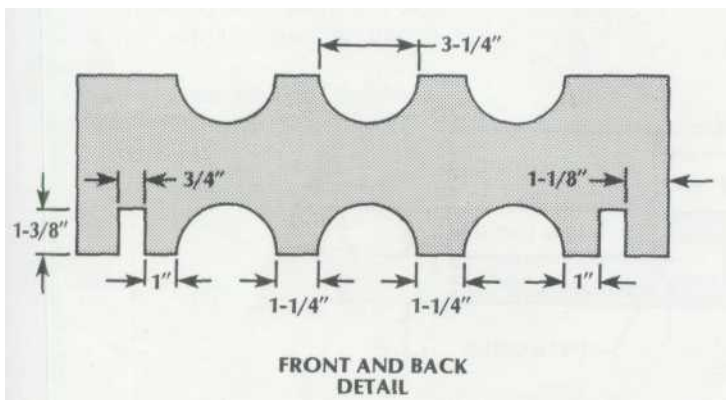
This wine bottle rack is expandable, so you can build the original three-tier module and add on later as your wine collection grows. Slotted construction enables it to go together quickly and be disassembled just as fast when it must be moved.

1. Make cardboard patterns of the front and back (A) and side pieces (B). Note that the front and back pieces have a  $3/4"$  x  $1-3/8"$  slot cut in each end, and three evenly spaced  $3-1/4"$ -diameter cutouts as shown. The side pieces also have  $3/4"$  x  $1-3/8"$  slots cut in their ends.
2. Transfer the patterns to red wood (or any other wood of your choice), and cut as many pieces as needed for the number of tiers desired. Clamp the side pieces together to assure a uniform fit, and cut the slots on a table saw or radial arm saw. Note that the bottom edges of the bottom tier pieces and the upper edges of the top tier pieces need no slots.
3. Use a saber saw to make the round cuts on the front and back pieces. No round cuts are needed on the bottom edges of the bottom tier pieces.
4. Assemble the rack by fitting the slots together as shown. No glue or nails are required.

## LIST OF MATERIALS

(finished dimensions in inches)

<b>A</b>	Front and back pieces (6)	$3/4 \times 5-1/2 \times 18$
<b>B</b>	Side pieces (4)	$3/4 \times 5-1/2 \times 10-1/2$





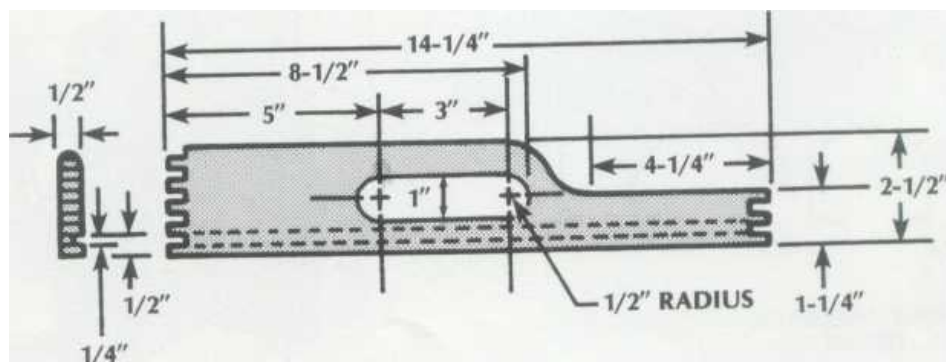
# LAP TRAY AND COASTERS

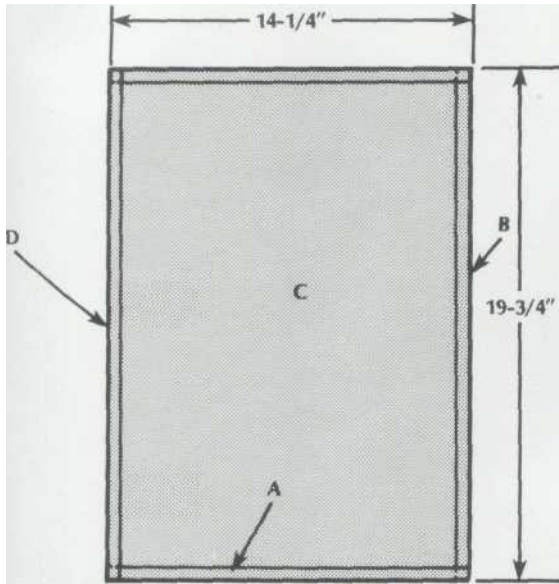


For serving everything from snacks to meals, this handsome lap tray will be a welcome addition to your kitchen. And, to complement the tray, the easy-to-make coasters are perfect. Once the coaster project is properly set up, you can make numerous sets to give as gifts.

## LAP TRAY

1. Cut the various parts to size using the dimensions given.
2. Make a template for the sides (A) using the pattern provided. Use a scroll saw, bandsaw, or jigsaw to cut out the sides, then cut out the handle holes.
3. Smooth the curved surfaces with a small drum sander.
4. Using a router with a  $\frac{1}{4}$ " rounding over bit, shape the top edge of the sides and the handle holes. Shape the top edge of the front (B) and back (D) as well.
5. Using a  $\frac{1}{4}$ " dado head set to a depth of  $\frac{1}{2}$ ", cut the fingers for the box joint corners on both ends of the sides, bottom, and back.
6. Reset the dado head to a depth of  $\frac{7}{32}$ ", then cut the  $\frac{1}{4}$ "-wide grooves in the sides, front, and back to accept the bottom (C).
7. Assemble the tray using glue in the corner joints, but leaving the bottom free to respond to movement of the other parts.
8. Sand the tray and finish as desired.





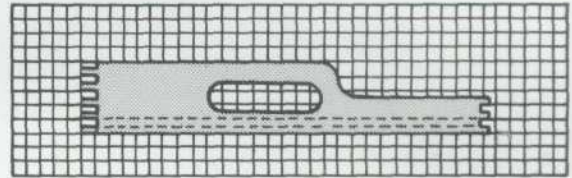
### LIST OF MATERIALS (Lap Tray)

(finished dimensions in inches)

<b>A</b>	Sides (2)	$1/2 \times 2-1/2 \times 14-1/4$
<b>B</b>	Front	$1/2 \times 1-1/4 \times 19-3/4$
<b>C</b>	Bottom	$1/4 \times 13-5/8 \times 19-1/8$ plywood
<b>D</b>	Back	$1/2 \times 2-1/2 \times 19-3/4$

Wood glue

ONE SQUARE =  $1/2''$



SIDE PATTERN

### COASTERS

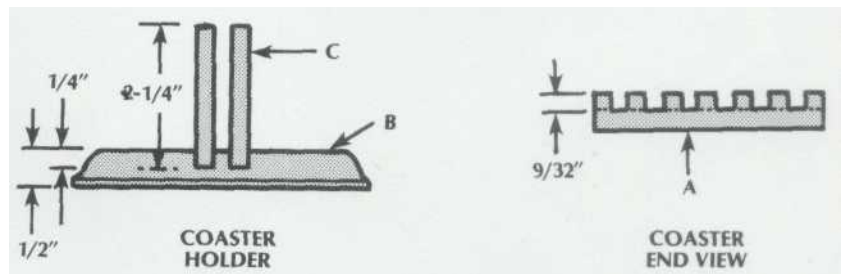
1. Cut the parts to size using the dimensions given, then sand smooth. Cut the coasters (A) so that the grain runs diagonally to all four edges.
2. Shape the edges of the base (B) using a hand-held router equipped with a roman ogee bit.
3. Use a  $1/4''$ -inch dado head set to a depth of  $9/32''$  to cut the grooves in the coasters. Cut grooves  $1/4''$  apart on one side of each piece, flip the piece over, rotate it  $90^\circ$ , and cut a second set of grooves.
4. Drill  $1/4''$ -diameter holes  $1/4''$  deep in the base to accommodate the dowels (C).
5. Glue the holders in place and check for squareness. Finish as desired.
6. Finish the coasters and holder as desired.

### LIST OF MATERIALS (Coasters)

(finished dimensions in inches)

<b>A</b>	Coasters (4)	$1/2 \times 3-1/4 \times 3-1/4$
<b>B</b>	Base	$1/2 \times 4-1/4 \times 4-1/4$
<b>C</b>	Dowels (2)	$1/4$ -dia. $\times 2-1/4$

Wood glue



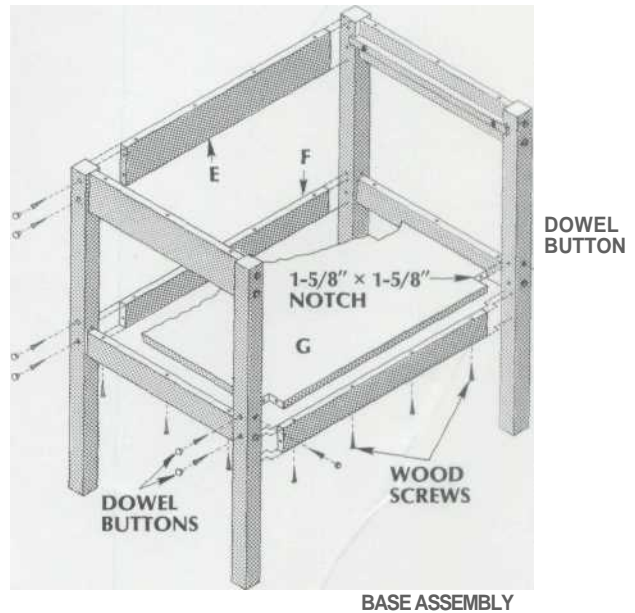
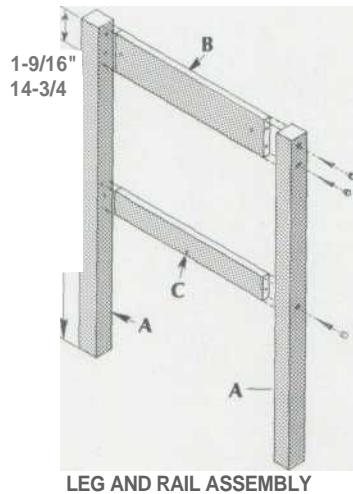
# **BUTCHER BLOCK MICROWAVE OVEN STAND**



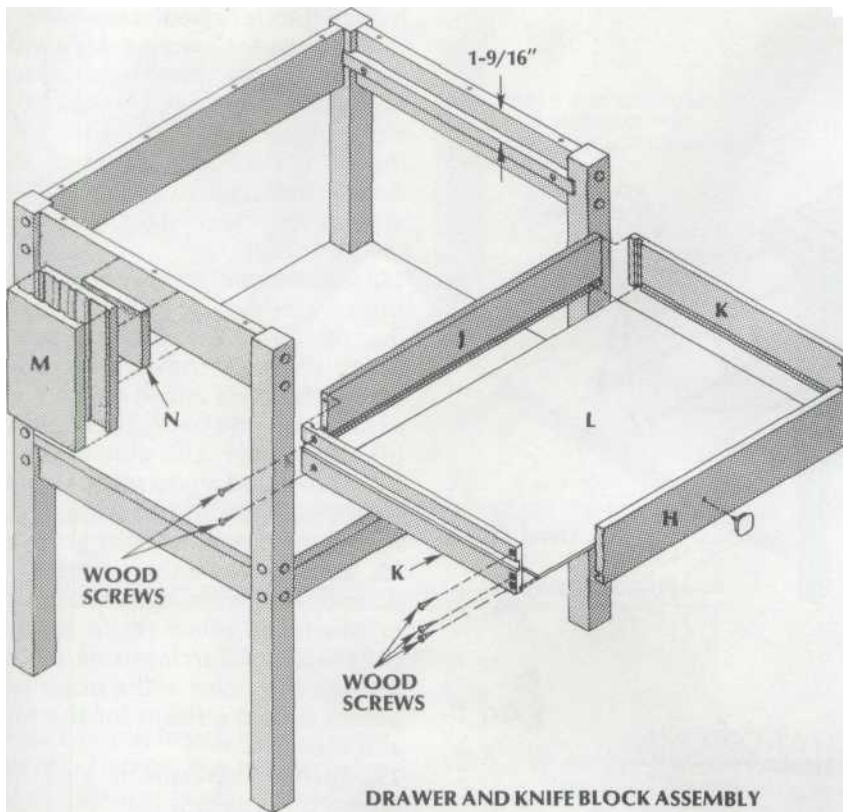
The butcher block has fallen out of favor in recent years, replaced by the countertop cutting board in an attempt to save space. This design, however, makes the butcher block a useful part of the kitchen once again. It has a drawer and shelves for storage, it can be moved to provide a cutting surface or extra counter space wherever needed, and it even has space for a microwave oven. In addition to the stand, plans are included for building a storage unit on the lower shelf in place of the oven.

### MAKING THE STAND

1. Cut all pieces to size according to the dimensions given.
2. If you want to make the stand mobile and add casters to the legs (A), cut 2" off the length of the legs and drill a center hole in the bottom of each one to accept the caster shaft.
3. Lay out the positions of the rail joints on the legs as indicated in the drawings. Note that all rails are centered on the width of the legs and that the tops of the upper rails (B, E) and legs are flush. The lower rails (C, F) should be set 14-3/4"







1-5/8" x 1-5/8" notches on each corner of the shelf for fitting it between the legs.

7. Fasten the legs and rails together using wood glue and #8 x 1-3/4" wood screws. Then fasten the shelf in place, running #8 x 1-3/4" screws through the rails into its underside.

8. Position the drawer guides against the inside faces and 1-9/16" below the upper edges of the upper end rails. Fasten the guides to the rails using wood glue and #6 x 1-1/4" wood screws. Countersink the screws so their heads will not interfere with the operation of the drawers.

9. Cut a 3/4"-wide x 1/4"-deep groove 1" below the upper edge along the outside face of each drawer side (K). Check the fit between these grooves and the drawer guides. If necessary, widen the grooves to allow the drawer sides to slide smoothly back and forth on the guides.

10. Cut 1/2"-wide x 1/2"-deep rabbets across the ends of the drawer

above the bottoms of the legs, unless the shelf (G) will house a microwave oven. In that case, drop the lower rails 4".

4. Drill, countersink, and counterbore pilot holes for a pair of #8 wood screws at each joint between rails and legs. Drill through the legs into the ends of the rails and make the counterbores 3/8" in diameter and 3/4" deep.

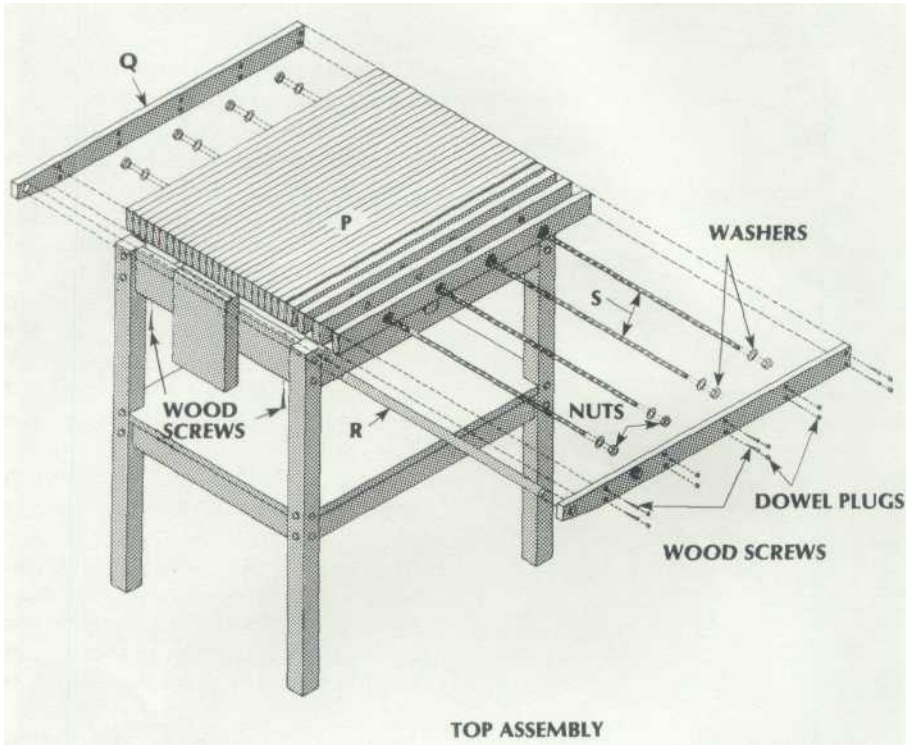
5. Drill another set of counterbored pilot holes for #8 screws through each of the lower rails—three holes in each end rail and four in each front and back rail. Run the holes through the width of the rails, from the lower to the upper edges, and make the counterbores 1-3/8" deep. It might help to drill the counterbores first, then use a long, thin bit to complete the pilot holes.

6. Cut 3/8"-wide x 1/2"-deep rabbets across the rear ends and 1" x 1/2" rabbets across the front ends of the drawer guides (D). Also, cut

#### LIST OF MATERIALS (Stand)

(finished dimensions in inches)

<b>A</b>	Legs (4)	1-3/4 x 1-3/4 x 34
<b>B</b>	Upper end rails (2)	3/4 x 4 x 18-3/4
<b>C</b>	Lower end rails (2)	3/4 x 2-1/2 x 18-3/4
<b>D</b>	Drawer guides (2)	3/4 x 3/4 x 20-1/8
<b>E</b>	Upper back rail (2)	3/4 x 4 x 24-3/4
<b>F</b>	Lower back and front rails (2)	3/4 x 2-1/2 x 24-3/4
<b>G</b>	Shelf	3/4 x 22 x 28
<b>H</b>	Drawer front	3/4 x 4 x 24-5/8
<b>J</b>	Drawer back	1/2 x 3-1/2 x 24-1/8
<b>K</b>	Drawer sides (2)	1/2 x 3-1/2 x 18
<b>L</b>	Drawer bottom	1/4 x 17-1/2 x 24-1/8 plywood
<b>M</b>	Knife block (2)	3/4 x 6 x 9
<b>N</b>	Spacer block	5/8 x 5 x 4
<b>P</b>	Butcher block top pieces (28)	3/4 x 2 x 28-1/2
<b>Q</b>	Top facings (2)	3/4 x 2 x 32-1/2
<b>R</b>	Handle	1 dia. x 22-1/2
	Threaded metal rods (4)	3/8 dia. x 20-7/8
	Flathead wood screws	#6 x 1-1/4
	Flathead wood screws	#8 x 1-1/2
	Flathead wood screws	#8 x 1-3/4
	Washers and nuts	
	Dowel buttons and dowel plugs	3/8 dia.
	Drawer pull	
	Wood glue	

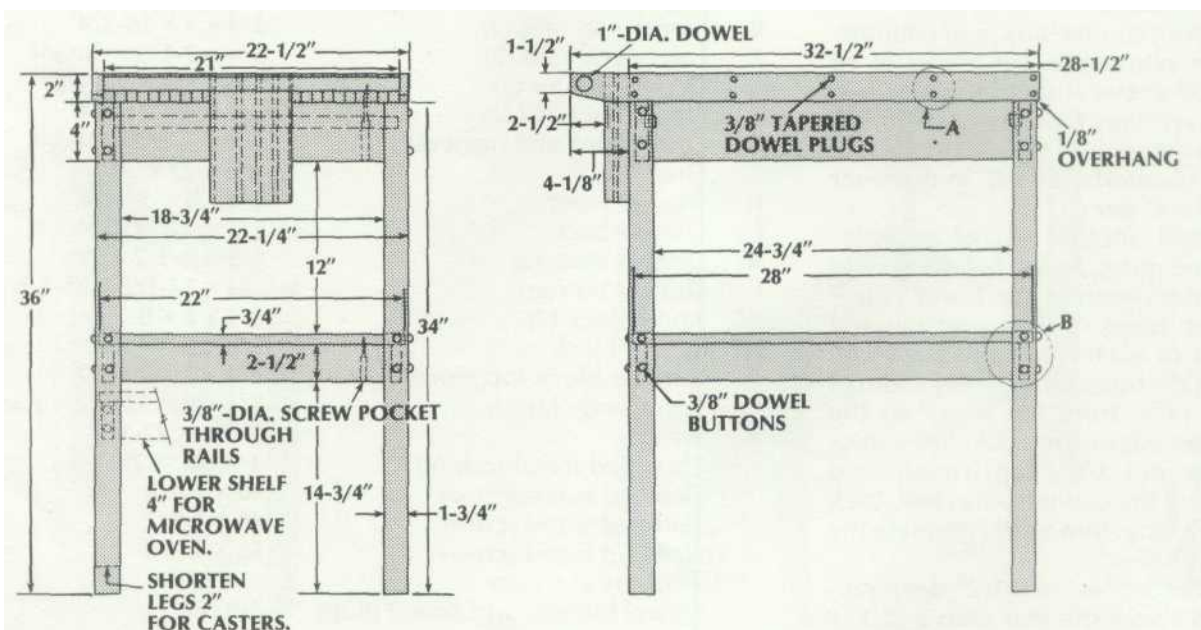


front (H) to receive the ends of the sides. Cut 1/4"-deep x 1/2"-wide dadoes across the drawer sides, 1/2" in from the rear, to receive the ends of the back (J). Cut 1/4"-deep x 1/4"-wide grooves in the drawer front, back, and sides, 1/4" above their lower edges, to receive the bottom (L).

11. Center and drill a screw hole through the drawer front for attaching the pull. Countersink screw holes through the drawer sides where they will attach to the ends of the front and back. Then assemble the drawer. Use glue and #6 x 1-1/4" flathead wood screws to join the sides, front, and back, but leave the bottom unglued in the grooves.

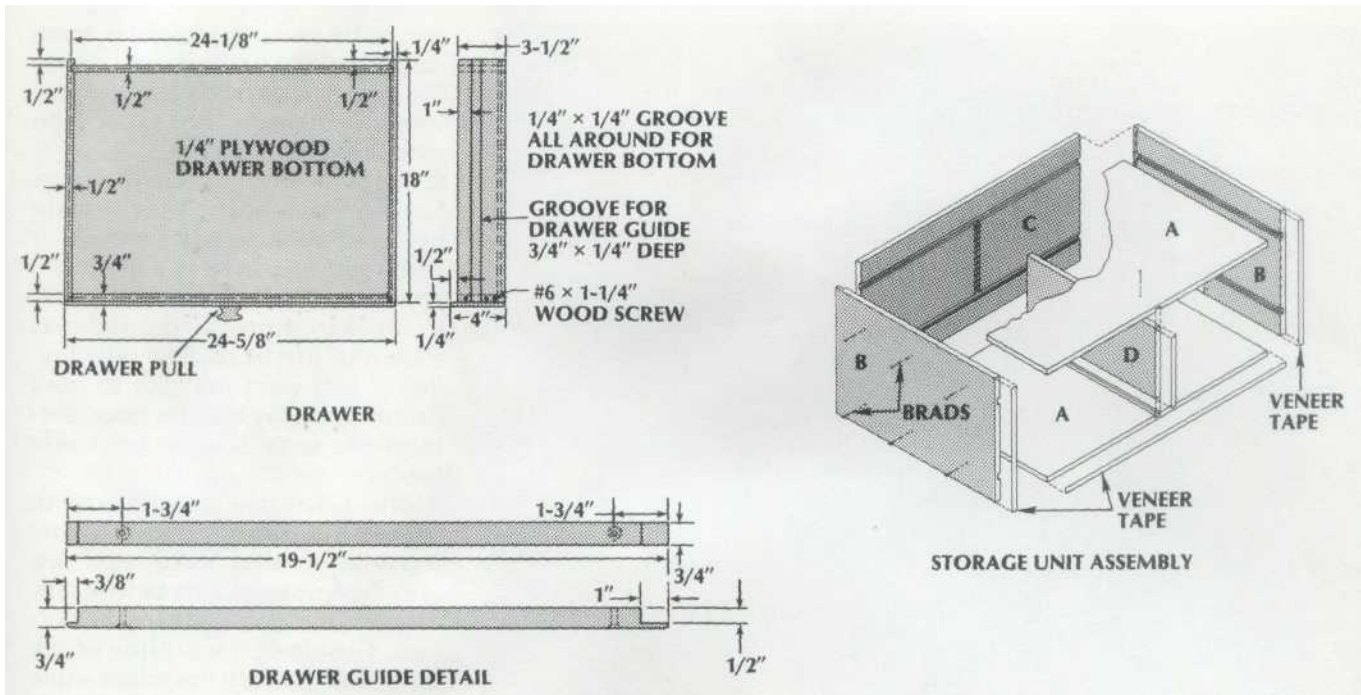
12. Drill four evenly spaced 3/8"-diameter holes through each butcher block top piece (P) to receive the metal reinforcing rods. Counterbore the holes in the outer two pieces to make room for the nuts and washers.

13. Spread waterproof glue between all adjacent butcher block top pieces. Thread the rods through



BUTCHER BLOCK MICROWAVE STAND LAYOUT





the pieces and install the nuts and washers. Tighten the nuts to align and clamp the pieces while the glue dries.

14. Trim one end of each facing (Q) to the profile shown in the stand layout drawing and drill holes for the ends of the handle (R). Begin the tapers 3" from the ends and center the holes 1-1/4" from the ends of the facing pieces.

15. Fasten the facings to the top using waterproof glue and #8 x 1-1/2" flathead wood screws, making their right ends and upper edges flush. Glue the handle in place at the same time. Position the screw holes where you will not hit the metal rods. Counterbore the holes and fill them with 3/8"-diameter plugs.

16. Sand the top and facings flush, then finish them with mineral oil or a similar non toxic finish. Sand the rest of the stand, fill the counterbored holes with wood buttons, then apply polyurethane or another finish of choice.

17. Center the top on the frame and mark the position of the screw holes in the upper edges of the rails. Drill pilot holes into the un-

#### LIST OF MATERIALS (Storage Unit)

(finished dimensions in inches)

A	Top and bottom (2)	1/2 x 16-3/4 x 24 plywood
B	Sides (2)	1/2 x 11-1/2 x 17 plywood
C	Back	1/2 x 11-1/2 x 24 plywood
D	Divider	1/2 x 7 x 16-3/4 plywood
	Wire brads	#17 x 1
	Veneer tape	
	Wood filler	
	Wood glue	

derside of the block top, then fasten it to the rails using #8 x 1-3/4" flathead wood screws. 18. Cut matching 1/16"-deep grooves in the two halves of the knife block (M). Then glue the pieces together, aligning the grooves. Nail or screw the 5/8"-thick spacer block (N) to the left end rail, then glue the knife block to the spacer, making its top flush with the upper surface of the butcher block.

#### MAKING THE STORAGE UNIT

1. Cut all pieces to size from 1/2"-thick veneer plywood.

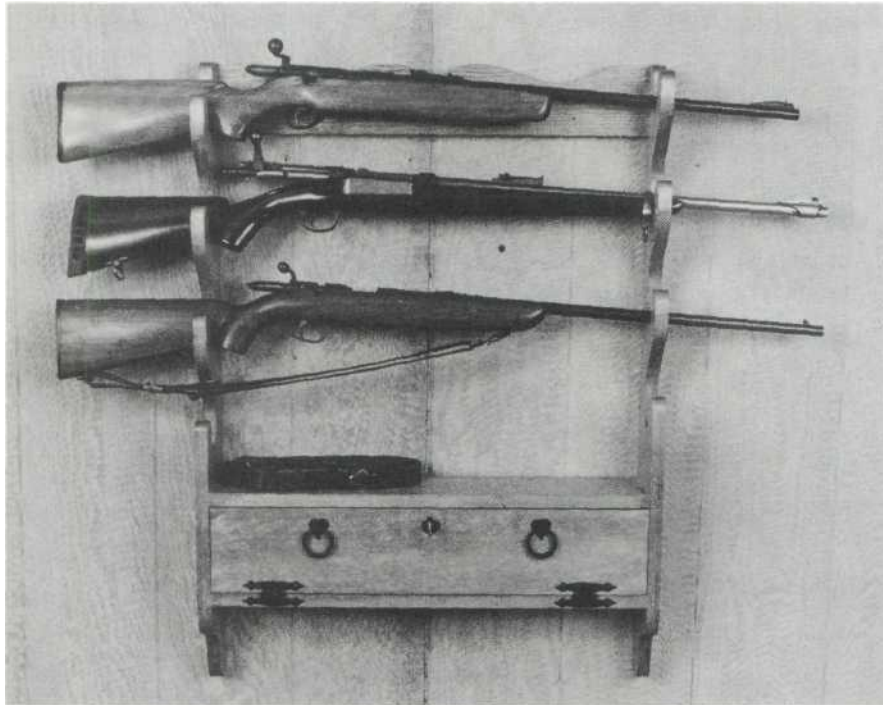
2. Cut 1/2"-wide x 1/4"-deep rabbets across the rear ends of the sides (B) and 1/2" x 1/4" grooves, spaced 6-1/2" apart, along the length of the sides and back (C). Also, cut 1/2" x 1/4" dados across the center of the top and bottom (A) and back. The dado on the back should only connect the two grooves.

3. Assemble the unit with glue and #17 x 1" wire brads. Set the brads and fill with a wood filler that matches the finish you will be using.

4. Cover all exposed edges of the plywood with veneer tape.

5. Finish the drawer to match the stand and storage unit, then install.

# SPORTSMAN'S RACK



Here's the ideal method of storing those prized rifles and fishing rods—the sportsman's rack. Not only does it make an eye-catching display, but it also has a locking compartment for storing shells, lures, and other items.

1. Select two 8' lengths of good quality 1 x 6 lumber, hardwood or softwood. Cut the top (A), sides (B), shelves (C), and door (E) to length, then rip them to width. Rip the pieces 1/16" wide at first, then use a jointer or hand plane to clean up the ripped edges.
2. Cut a pair of 1/2"-wide x 1/4"-deep dadoes across the inner face of each side piece to receive the ends of the shelves. Space the dadoes 5" apart and set the lower one 5-1/2" above the bottom end of each board, as shown in the front view drawing.
3. Cut a 1/4"-wide x 1/4"-deep rabbet along the back edge of each side piece in the area between the dadoes to make room for the ends of the plywood back panel.
4. Cut 1/4"-wide x 1/4"-deep rabbets along what will become the inside rear edges of the shelves to

accept the upper and lower edges of the back panel.

5. Cut a 4"-long notch 3/4" deep into the rear edge at the upper end of each side piece to make room for the ends of the rack's top rail (A).
6. Dry assemble the pieces to make sure everything fits correctly. Fine tune the joinery as needed.
7. Begin the layout of the curved shapes on the top rail and side

pieces by making templates from cardboard or heavy paper using the patterns provided as guides. Then use the templates to trace the patterns onto the boards.

8. Before laying out the hook patterns on the side pieces, decide how you want to use the rack. If you want it to serve as a gun rack, set the hooks on the left side 1-1/2" lower than those on the right, as shown in the front view drawing. But, if you want the rack to hold fishing gear, lay out the hook patterns the same way on both side pieces.

9. Use a bandsaw or saber saw to cut out the patterns traced on the top rail and sides. Make relief cuts into the hook pockets before cutting around the tight inside corners. Cut along the outside of the lines, then smooth the edges while sanding down to the lines.

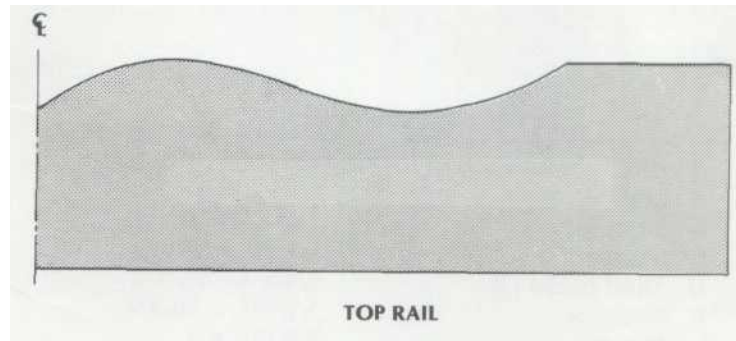
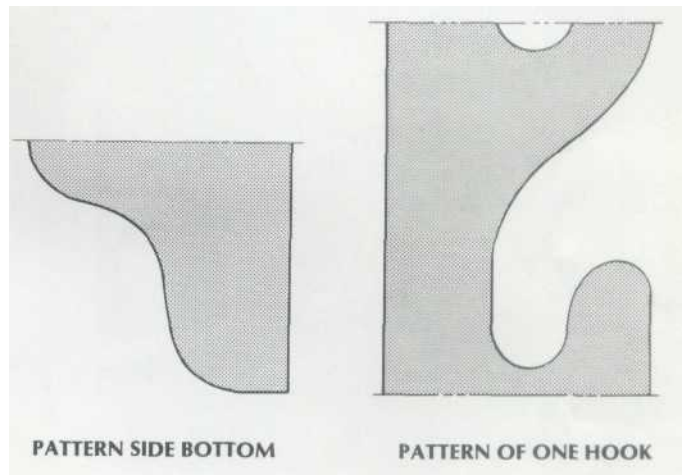
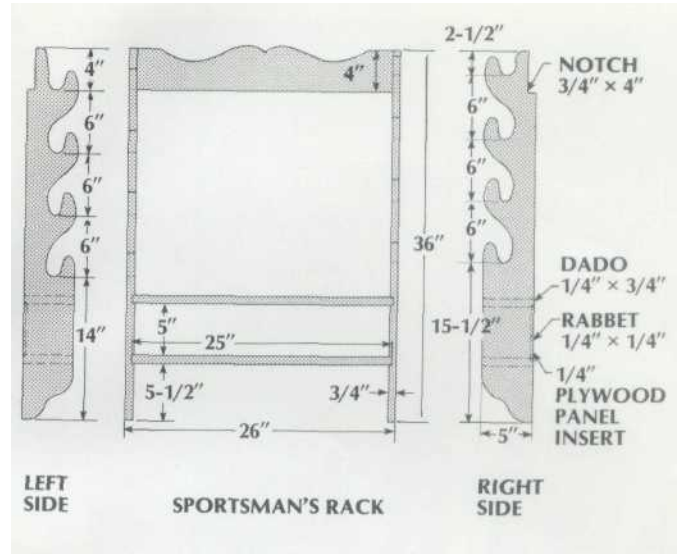
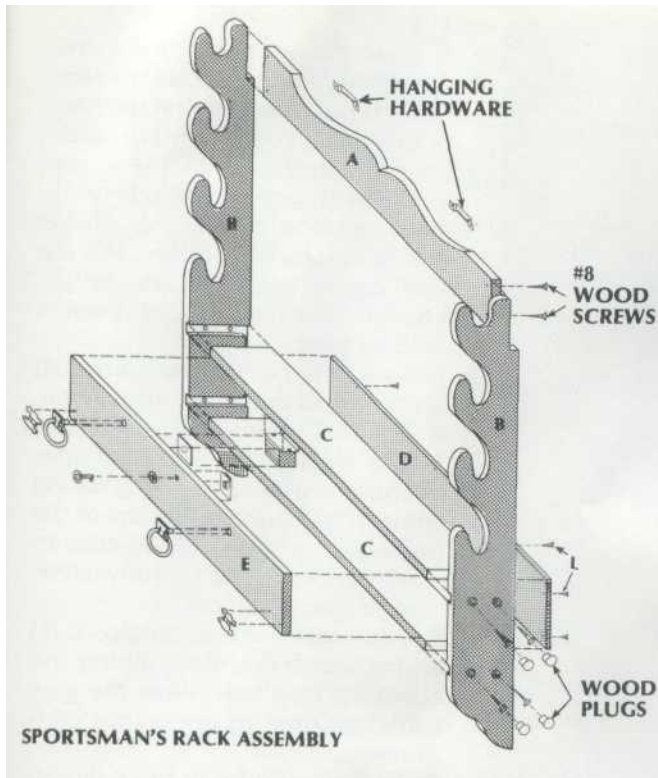
10. Center the latch plate part of the lock next to the front edge on the underside of the top shelf. Mark around it, then chisel out the shelf as needed for mounting the plate.

11. Clamp the top rail, sides, and shelves together while drilling pilot holes for #8 wood screws. Drill 3/8"-diameter x 1/4"-deep counterbore holes over the pilot holes in the sides and countersink the holes that run through the back of the top rail.

### LIST OF MATERIALS

(finished dimensions in inches)

<b>A</b> Top	3/4 × 4 × 26
<b>B</b> Sides (2)	3/4 × 5 × 36
<b>C</b> Shelves (2)	3/4 × 5 × 25
<b>D</b> Back	1/4 × 5-1/2 × 25
<b>E</b> Door	3/4 × 4-15/16 × 24-7/16
Dowel buttons or plugs	3/8 dia. × 1/4
Flathead wood screws	#8 × 1-1/4
Wire nails	
Hinges with screws (2 sets)	
Magnetic catch and plate	
Lock and key	
Door pulls	
Hanging hardware	
Wood glue	



12. Disassemble the rack and sand all the parts. Lightly round over all sharp edges that will be exposed after assembly. Then, reassemble the shelves, sides, and top rail using wood glue and #8 x 1-1/4" flat-head wood screws.

13. Cut a piece of 1/4" plywood to size for the back (D). Fasten the back to the shelves and sides using glue and wire nails.

14. Glue 3/8"-diameter wood plugs in the counterbored screw holes. After the glue dries, sand the plugs flush with the sides.

15. Temporarily mount the hinges on the door, then fit the door in place and fasten the hinges to the bottom shelf. Check to see that the door operates properly, then mark the location for the lock keyhole.

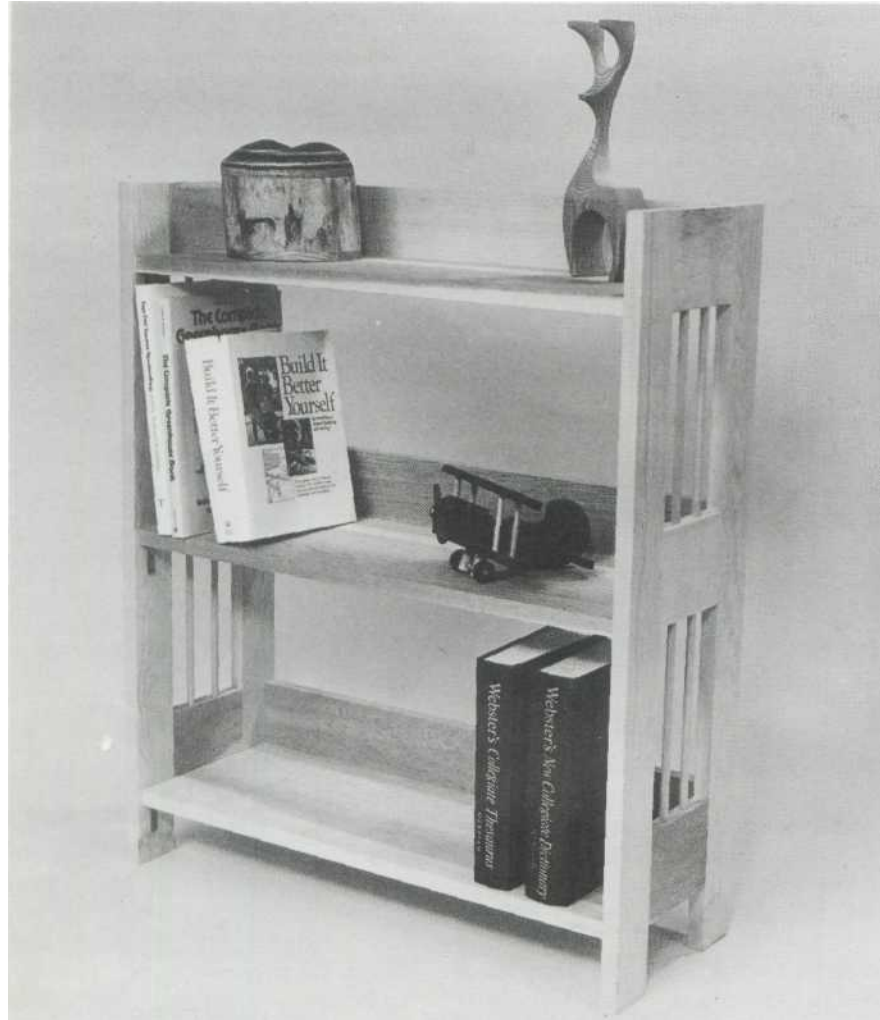
16. Remove the hinges from the door and shelf. Drill the keyhole in the door, as well as holes for the door pulls.

17. Sand the door, breaking all sharp edges. Apply the desired finish

to the door and the rest of the rack. After the finish has dried, mount all the hardware on the door and rack, including your choice of hardware for hanging the rack on the wall.



# CHAIRSIDE BOOKCASE



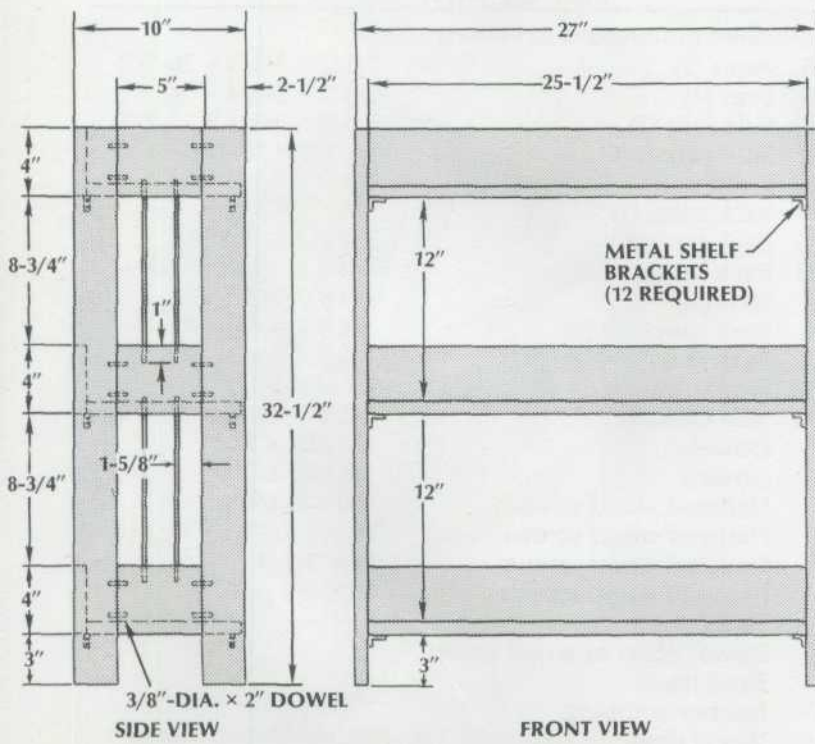
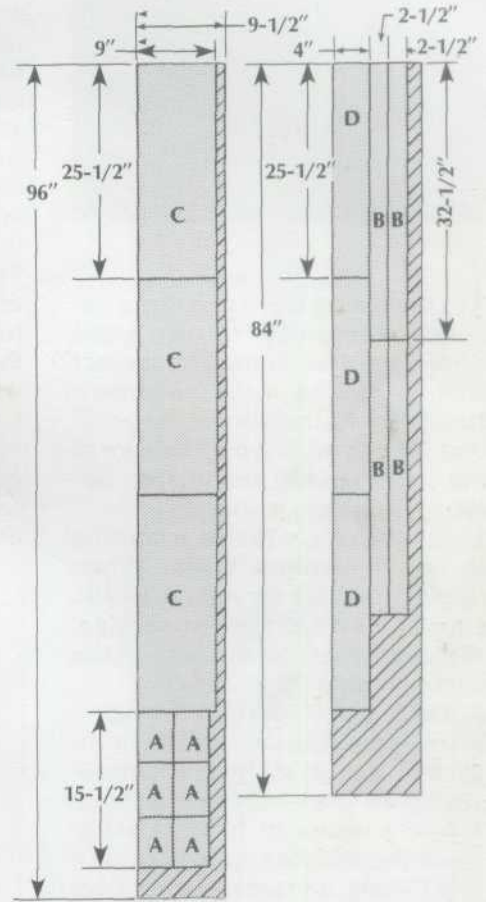
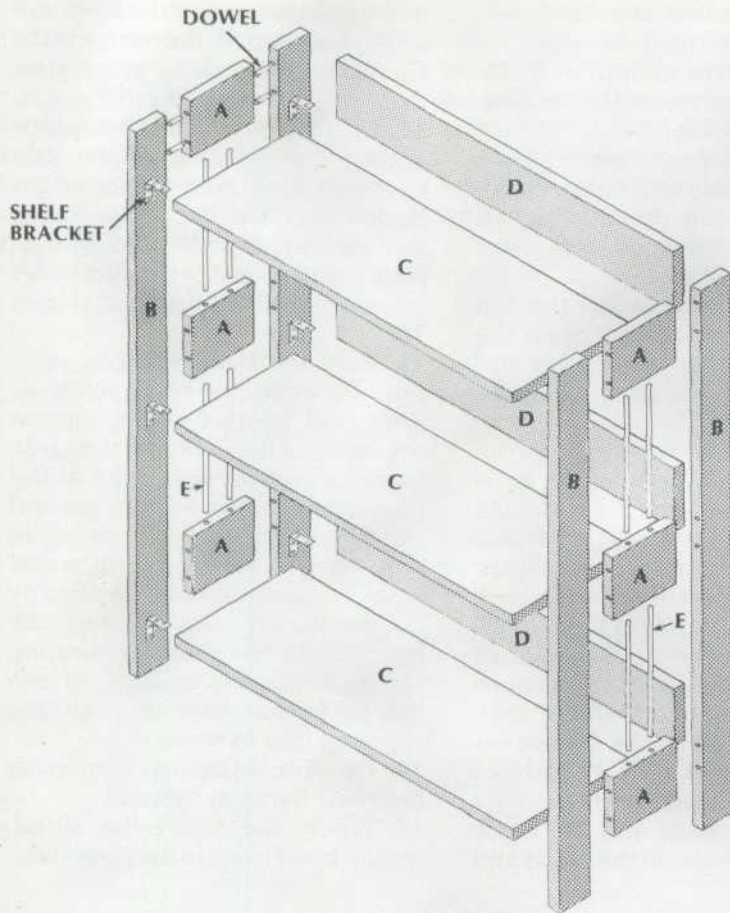
## LIST OF MATERIALS

(finished dimensions in inches)

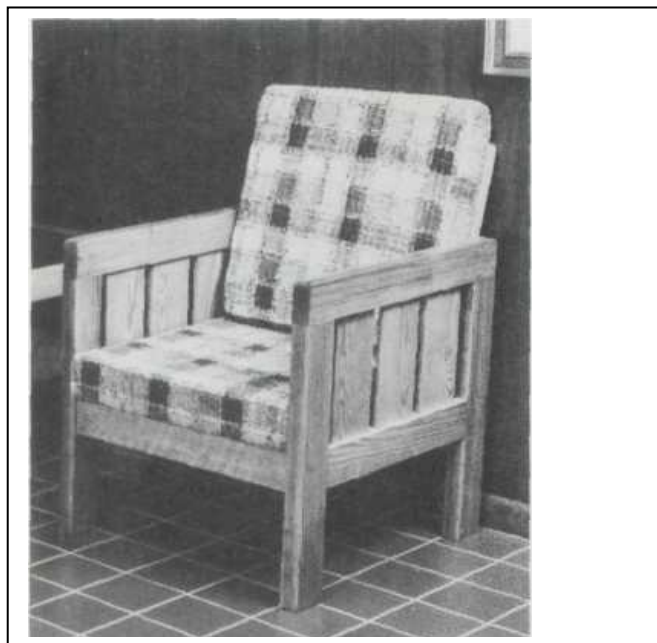
<b>A</b>	End rails (6)	$3/4 \times 4 \times 5$
<b>B</b>	Stiles (4)	$3/4 \times 2-1/2 \times 32-1/2$
<b>C</b>	Shelves (3)	$3/4 \times 9 \times 25-1/2$
<b>D</b>	Shelf backs (3)	$3/4 \times 4 \times 25-1/2$
<b>E</b>	Rods (8)	$3/8 \text{ dia.} \times 10-3/4$
	Dowels	$3/8 \text{ dia.} \times 2$
	Metal shelf brackets (12)	$3/8 \times 1-1/2 \times 1-1/2$
	6d finishing nails	
	Wood glue	

How many times have you stretched out on your favorite easy chair, only to realize that the book or magazine you wanted to read is on the other side of the room? With this attractive chairside bookcase, reading material is always within reach. In addition, the top shelf can be used to display knickknacks, small plants, or even a reading lamp.

1. To begin, cut the pieces to size according to the dimensions given.
2. Drill  $3/8$ "-diameter dowel holes  $1-1/16$ " deep in the ends and sides of the end rails (A). Using dowel centers, transfer the centers of the holes to the stiles (B). Be sure to mark the centers accurately to ensure proper assembly.
3. Assemble the end rails, rods (E) and rails with dowels by gluing and clamping in place. Allow the glue sufficient time to dry before continuing.
4. Drill pilot holes in the rails and shelves (C) for the bracket screws, and attach the brackets to the stiles.
5. Attach the shelf backs (D) to the stiles with 6d finishing nails.
6. To complete the assembly, attach the shelves to the brackets with screws.
7. Sand with 150-grit paper, followed by 180-grit. Finish as desired.



# ~~ARMCHAIR~~



It's becoming more and more expensive these days to own good handcrafted furniture. This project enables you to make your own armchair at a fraction of the retail cost. What's more, you'll be sure of the craftsmanship and quality, because you made it yourself.

1. Cut the pieces to size according to the dimensions given. When ripping the back cleat (L) to width, cut a 16° bevel on the ripped edge. Also, cut tapers on the ends of the back supports (K) as shown.
2. Drill 1-3/8"-deep x 1"-wide x 2-1/4"-long mortises in the arms (A) and legs (B) as shown. Remove any excess stock with a hand chisel.
3. Use a router or hand chisel to make the 1/2"-deep x 3/8"-wide x 2-1/2"-long mortises in the edges of the back rails (G, H). Leave the corners round.
4. Mark the locations for cutting tenons in the ends of the side rails (C), front rail (E), and back rails. To mark, score the wood with a knife to prevent splintering.
5. Use a dado blade to cut the 1"-thick x 2-1/4"-wide x 1-1/4"-long tenons.
6. Drill dowel holes in the arms, side rails, side panels (D), and back stiles (F), and rails. Drill these holes 1" deep.
7. Round the side edges of the slats (J) with a router and rounding

over bit. This will enable them to fit the mortises in the back rails.

8. Sand all pieces smooth with 150-grit paper. Dry-assemble the arm chair to check for fit.
9. Assemble the side frames. Begin by fitting the side rails between the legs, then install the side panels and the arms. Use glue in all joints and clamp until dry.
10. Fit the slats between the top and bottom back rails. Fasten the rails to the stiles using glue and dowels. Clamp and set aside for the glue to dry.
11. Assemble the front rail and the side frames using glue in the mortise and tenon joints. Clamp the assembly, then immediately install the front (M) and side (N) cleats. Butt the side cleats against the back of the front rail and set them 1/16" to 1/8" below the upper edges of the side rails. Drill pilot holes counterbored at least 1/4" deep, then fasten the cleats to the frames using glue and #10 x 2-1/4" flathead wood screws. If you prefer, dry assemble the frames and rail while drilling pilot holes in the cleats and

frames, then remove the front rail while you install the side cleats. Glue the front rail in place after that.

12. Fit the back cleat in place against the tail ends of the side cleats, making their upper edges flush. Fasten the back cleat to the side cleats using #10 x 2-1/4" flathead wood screws set in pilot holes counterbored to a depth of at least 1/2".
13. Hold the back frame in position between the sides with its lower rail pressed firmly against the back cleat. Mark the side frames along the rear edge of the back. Remove the back frame and install the back supports using glue and #8x1-1/4" flathead wood screws, countersunk or slightly counterbored. Then fasten the back frame in place by running screws through its bottom rail into the back cleat and through the supports into its stiles.
14. Do all final sanding, then finish the chair frame as desired.
15. When the finish has dried, mount band irons to the cleats with

### LIST OF MATERIALS

(finished dimensions in inches)

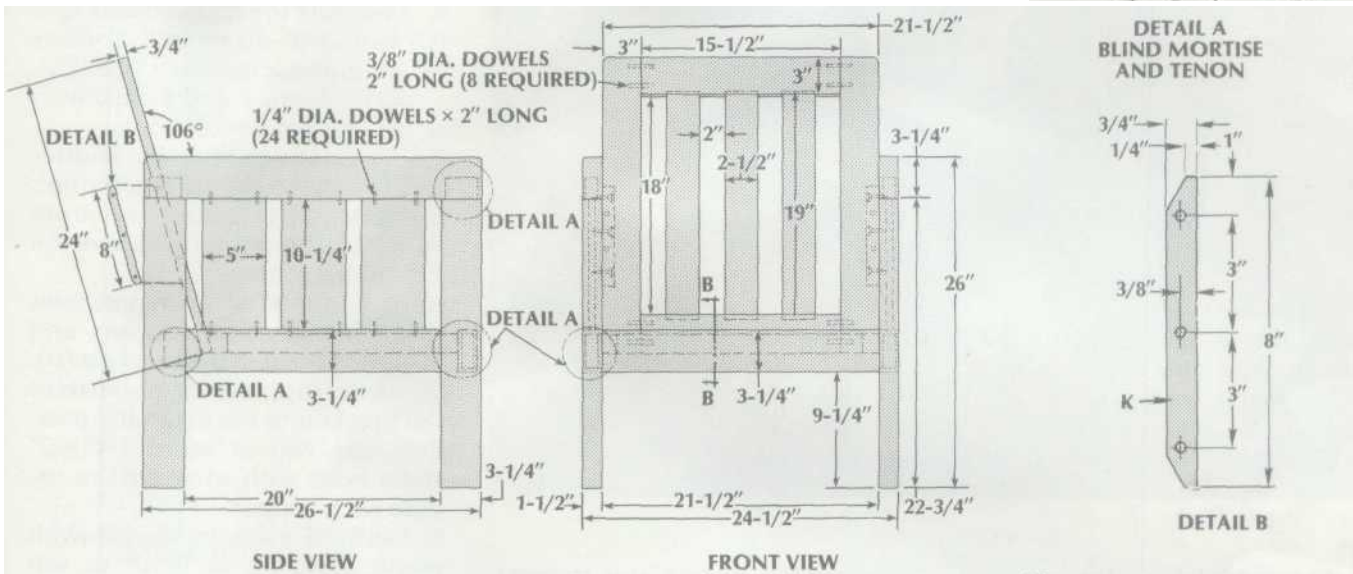
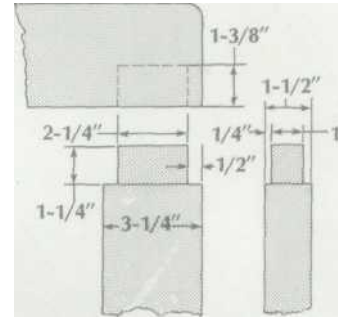
<b>A</b> Arms (2)	1-1/2 x 3-1/4 x 26-1/2
<b>B</b> Legs (4)	1-1/2 x 3-1/4 x 24
<b>C</b> Side rails (2)	1-1/2 x 3-1/4 x 22-1/2
<b>D</b> Side panels (6)	1/2 x 5 x 10-1/4
<b>E</b> Front rail	1-1/2 x 3-1/4 x 24
<b>F</b> Back stiles (2)	3/4 x 3 x 24
<b>G</b> Back top rail	3/4 x 3 x 15-1/2
<b>H</b> Back bottom rail	3/4 x 3 x 15-1/2
<b>J</b> Slats (3)	3/8 x 2-1/2 x 19
<b>K</b> Back supports (2)	3/4 x 3/4 x 8
<b>L</b> Back cleat	1-1/4 x 2 x 21-1/2
<b>M</b> Front cleat	1-1/4 x 1-1/2 x 19
<b>N</b> Side cleats (2)	1-1/4 x 1-1/2 x 17-1/2
Dowels	1/4 dia. x 2
Dowels	3/8 dia. x 2
Flathead wood screws	#10 x 2-1/4
Flathead wood screws	#8 x 1-3/4
Flathead wood screws	#8 x 1-1/4
Panhead wood screws	#6 x 3/4
Tacks	
Dowel plugs or wood putty	
Band irons	
Rubber webbing	
Wood glue	



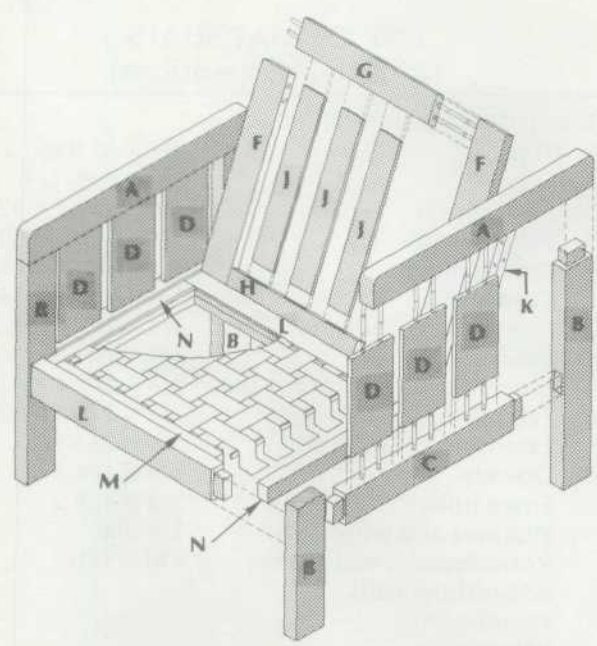
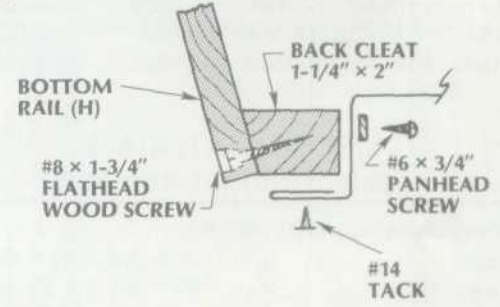
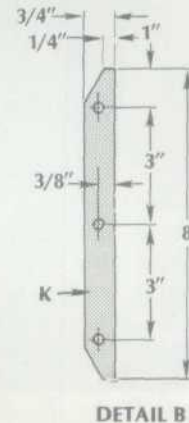
#6 x 3/4" panhead screws. Do not screw the irons tight against the cleats; leave a 1/16" gap to pull the rubber webbing through. 16. Mark the proper spacing of the rubber webbing strips. Starting on one side, pull one strip through, double the end over, and tack fast. Repeat for each strip.

17. Stretch the strips across to the other side, and feed the end between the iron and cleat. Pull tight, then double the ends over and tack. Repeat this procedure for stretching the strips from front to back. Remember to interweave the webbing as shown.

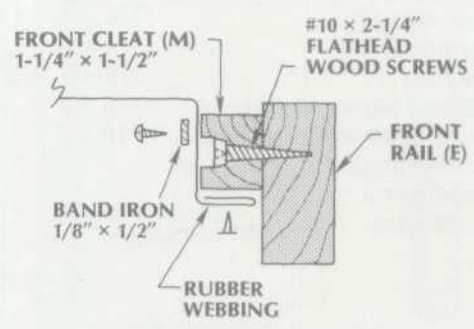
18. Buy or make cushions to fit the armchair.



DETAIL A  
BLIND MORTISE  
AND TENON



ARMCHAIR ASSEMBLY



SECTION B-B  
INNER FRAME DETAIL

# PARSONS TABLE



This parsons table offers a surface area of 19-1/4 square feet. By adding two table extensions, you can increase the surface area to more than 32 square feet. Either way you choose to build it, the table is sure to be a welcome addition to your dining room or kitchen.

1. Cut all pieces to size according to the dimensions given.
2. Drill 3/8"-diameter dowel holes in the legs, side rails (D) and end rails (C), as shown.

3. Construct the frame (C,E,F) using 6d finishing nails, then nail and glue the top (A) in place. Be sure to fill all nail holes with wood putty.

4. Assemble the legs and side rails (D) with 3/8"-diameter x 2" dowels, glue, and screws (see Detail A).

NOTE: Steps 5 and 6 deal with tables that have extensions.

5. The extension table has shorter end rails (C) to allow the extension supports (G) to extend out from the ends. The supports receive the

extensions as shown.

6. Drill four 9/16"-diameter holes in each extension support and matching holes in the brackets (H). When the supports are mounted to the brackets in the extended position, use two or more 1/4" x 2" stove bolts with wing nuts to secure each support.

7. Sand all surfaces. Cover with plastic laminate or finish to suit your taste.

### LIST OF MATERIALS (Table without Extensions)

(finished dimensions in inches)

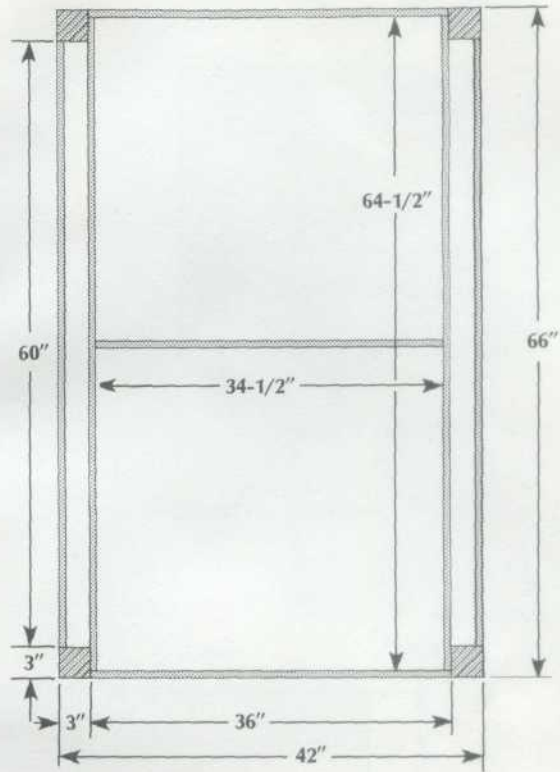
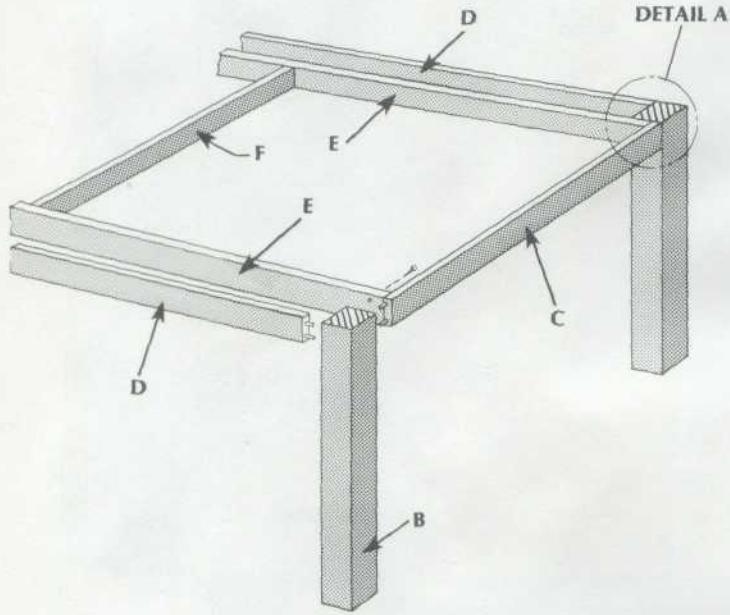
<b>A</b> Top	3/4 x 42 x 66
<b>B</b> Legs (4)	3 x 3 x 28-1/4
<b>C</b> End rails (2)	3/4 x 2-1/4 x 36
<b>D</b> Side rails (2)	3/4 x 2-1/4 x 60
<b>E</b> Inner rails (2)	3/4 x 2-1/4 x 64-1/2
<b>F</b> Center rail	3/4 x 2-1/4 x 34-1/2
Dowels	3/8 dia. x 2
Flathead wood screws	#10 x 2
Roundhead wood screws	#10 x 2
6d finishing nails	
Wood putty	
Wood glue	

### LIST OF MATERIALS (Table with Extensions)

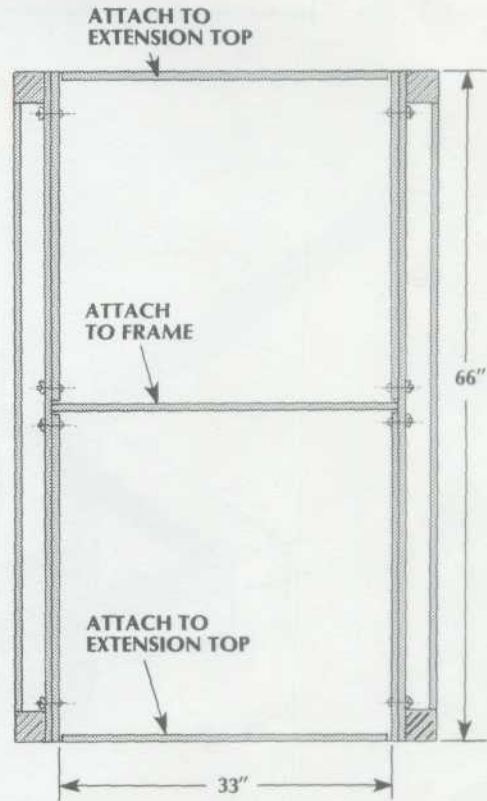
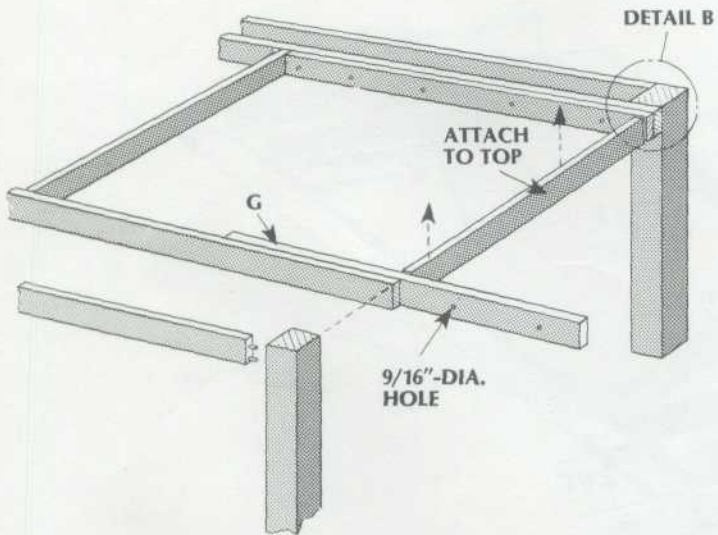
(finished dimensions in inches)

<b>A</b> Top	3/4 x 42 x 66
<b>B</b> Legs (4)	3 x 3 x 28-1/4
<b>C</b> End rails (2)	3/4 x 2-1/4 x 32-7/8
<b>D</b> Side rails (2)	3/4 x 2-1/4 x 60
<b>E</b> Inner rails (2)	3/4 x 2-1/4 x 66
<b>F</b> Center rail	3/4 x 2-1/4 x 34-1/2
<b>G</b> Extension supports (4)	3/4 x 2-1/4 x 32-3/4
<b>H</b> Brackets (8)	3/4 x 2 x 16
<b>J</b> Extension side rails (2)	3/4 x 2-1/4 x 42
<b>K</b> Extension end rails (4)	3/4 x 2-1/4 x 22-1/4
<b>L</b> Extension tops (2)	3/4 x 23 x 42
Dowels	3/8 dia. x 2
Stove bolts	1/4 dia. x 2
Washers and wing nuts	1/4 dia.
Roundhead wood screws	#10 x 1-1/2
6d finishing nails	
Wood putty	
Wood glue	

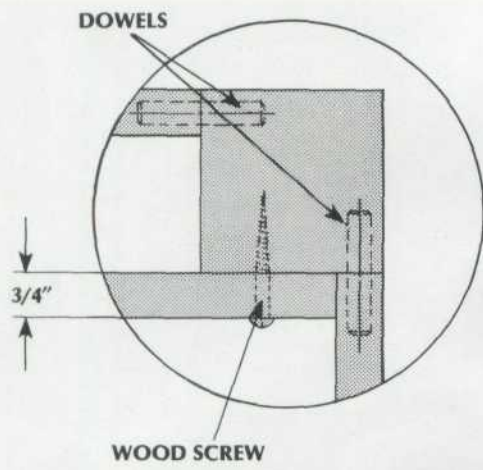
**FRAME ASSEMBLY DIAGRAM  
(WITHOUT EXTENSION)**



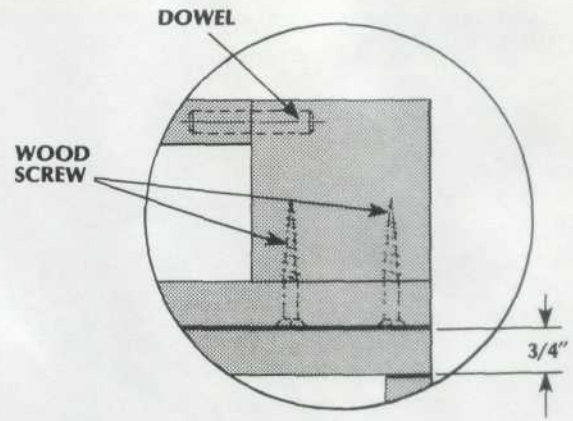
**FRAME ASSEMBLY DIAGRAM  
(WITH EXTENSION)**



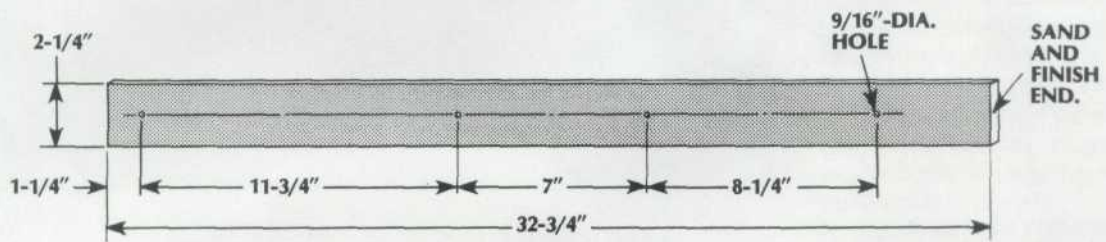




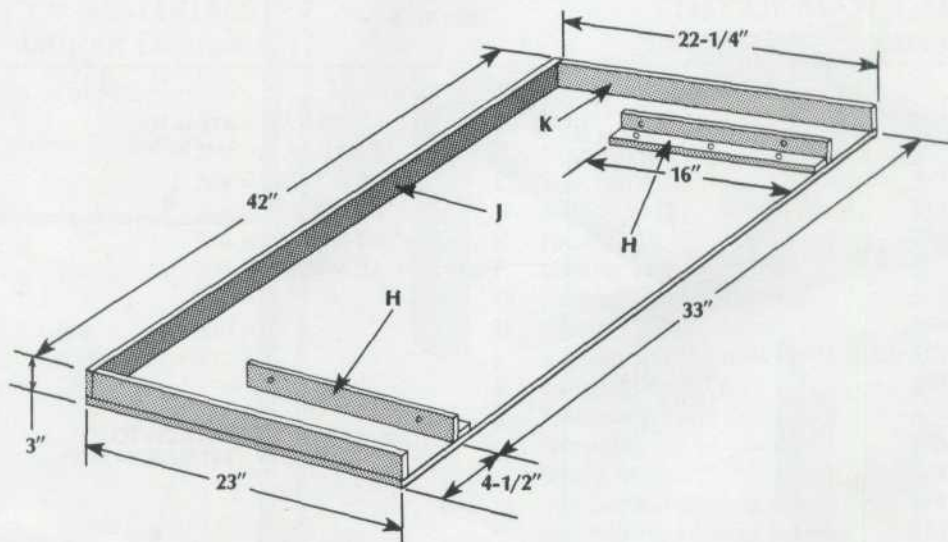
**DETAIL A  
(WITHOUT EXTENSION)**



**DETAIL B  
(WITH EXTENSION)**

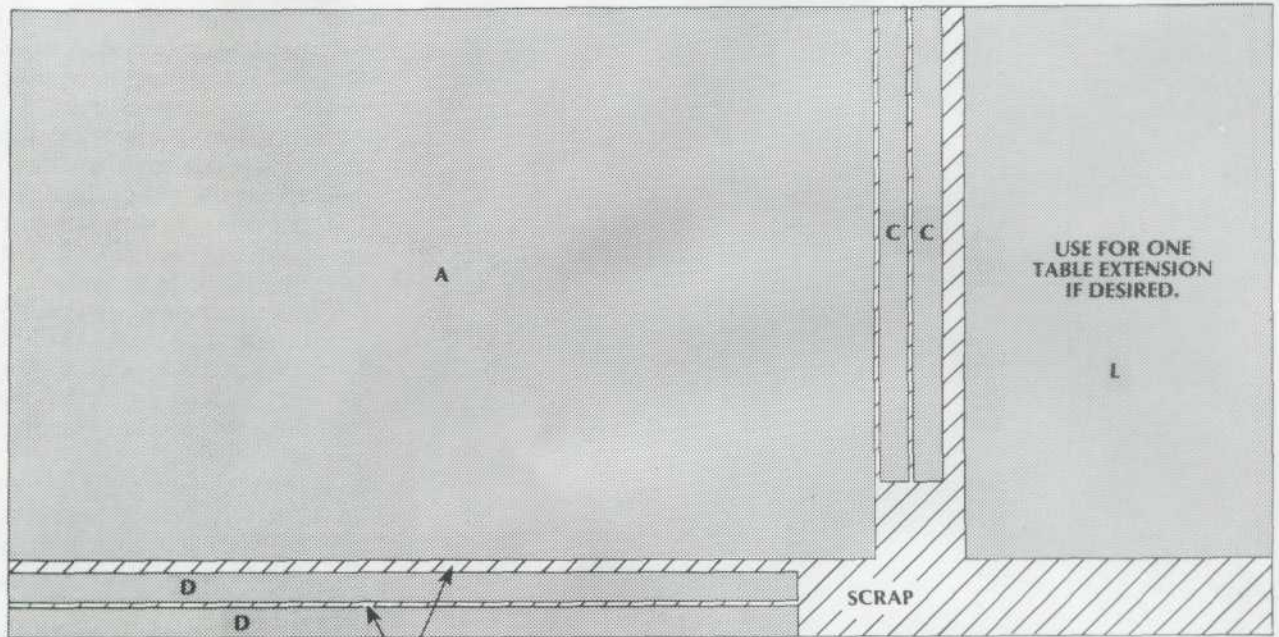


**EXTENSION  
SUPPORT (G)**



**EXTENSION DETAIL**





NOTE: AMPLE ALLOWANCE NEEDED FOR SAW KERF.

3/4" x 4' x 8' PLYWOOD CUTTING LAYOUT

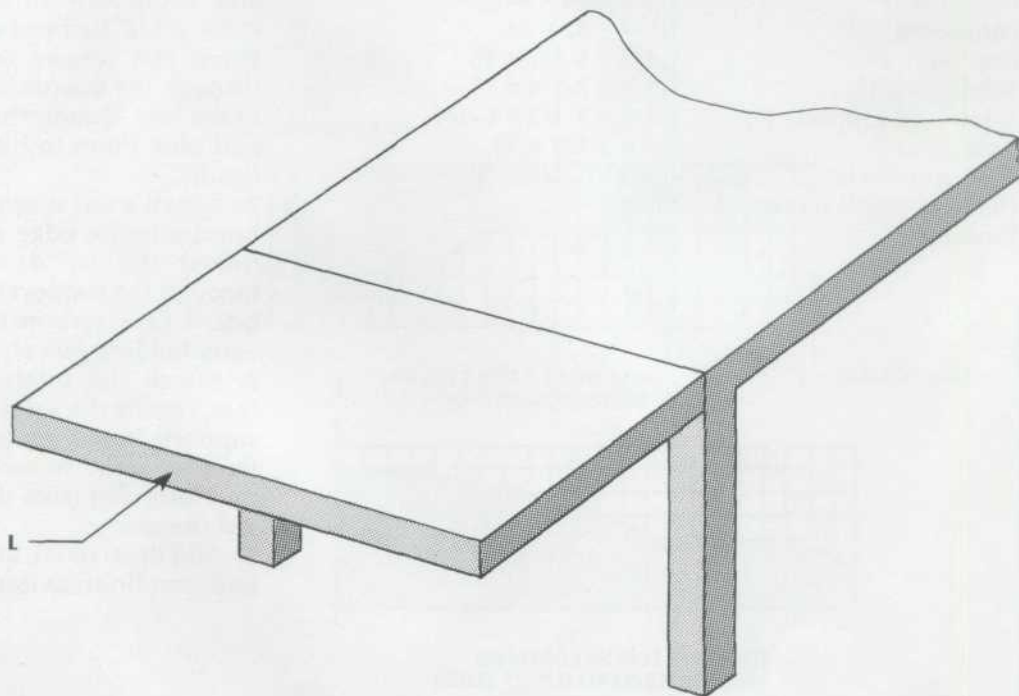


TABLE EXTENSION IN MOUNTED POSITION

# TWIN BED



## LIST OF MATERIALS

(finished dimensions in inches)

<b>A</b>	Headboard	1-1/2 × 38 × 44
<b>B</b>	Footboard	1-1/2 × 32 × 44
<b>C</b>	Feet (4)	1-1/2 × 5-1/2 × 16
<b>D</b>	Sideboards (2)	1-1/2 × 7-1/4 × 75
<b>E</b>	Sideboard supports (4)	1-1/2 × 3-1/2 × 6-3/4
<b>F</b>	Slats (5)	3/4 × 3-1/2 × 38
<b>G</b>	Slat supports (2)	1-1/2 × 1-1/2 × 75
	Flathead wood screws	#10 × 2-1/2
	Wood glue	

The basic design of this twin bed is very simple and sturdy. While templates are provided for the headboard and footboard, you can create your own pattern if you prefer. In fact, it might be a good idea to select a mattress first and then adjust the dimensions to fit.

1. Make full-size templates for the headboard (A) and footboard (B) using the patterns provided.

2. Glue up a pair of panels for the headboard and footboard from 2 x 6 and/or 2 x 8 stock. When the glue has dried, sand the panels smooth and cut them to the dimensions given.

3. Transfer the template designs to the panels. Cut out the headboard and footboard pieces, then sand their edges smooth.

4. Cut the remaining pieces to size using the dimensions provided.

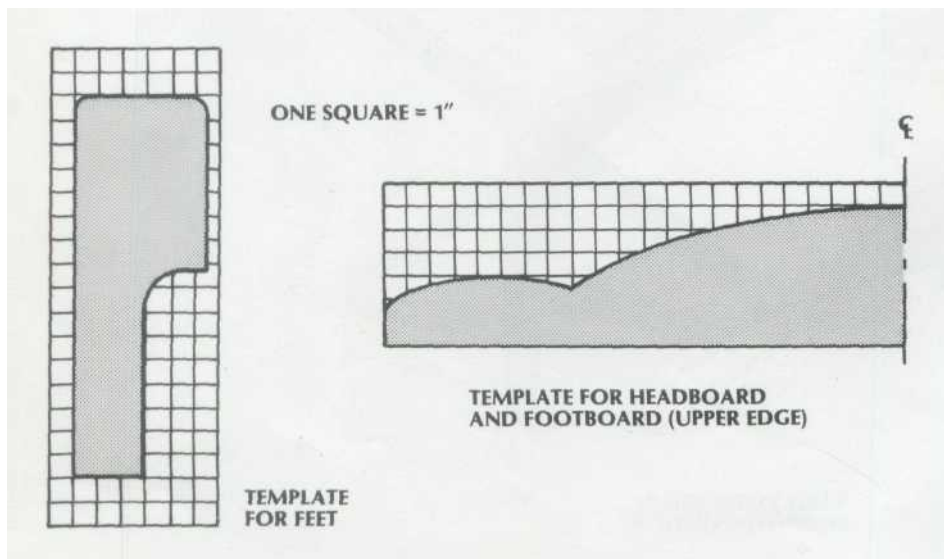
5. Attach a sideboard support (E) to each foot (C) using flathead wood screws. Make two right-facing feet and two left-facing feet.

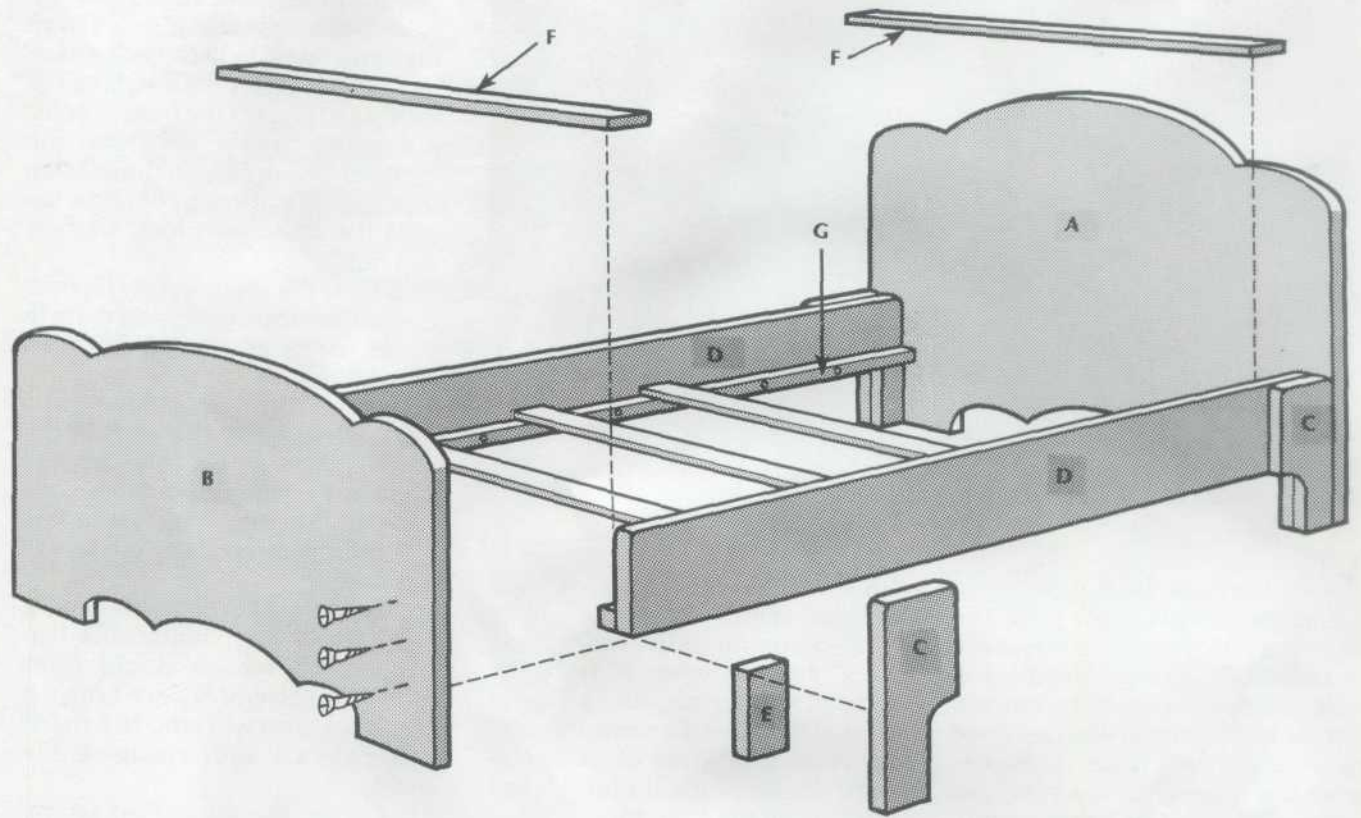
6. Fasten the feet to the headboard and footboard using glue and #10 x 2-1/2" flathead wood screws. Drive the screws counterbored through the boards into the edges of the feet. Counterbore the holes and plug them to hide the screw heads.

7. Attach a slat support (G) to the bottom inside edge of each sideboard (D) by driving screws through the support into the sideboard. Counterbore the screws for extra holding power.

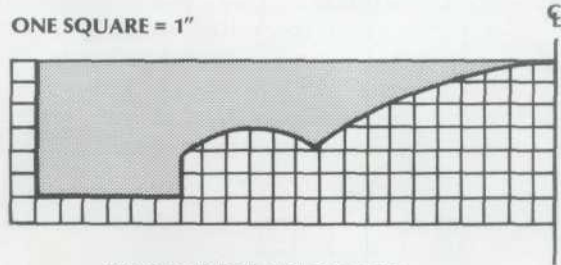
8. Attach the sideboards to the feet, resting the sideboards on the supports inside the feet. Use four flathead wood screws at each corner, fastening from the inside. Do not use glue.

9. Add the slats (F), sand the entire bed, and finish as desired.





ONE SQUARE = 1"



TEMPLATE FOR HEADBOARD AND FOOTBOARD (LOWER EDGE)



# READING TABLE





Here is a basic table design that can accommodate many uses. The table shown in the photo was made of redwood and assembled using waterproof glue and galvanized fasteners. Because it was designed to serve as a deck table, it is somewhat low in height. However, you can easily substitute other woods, use standard glue and fasteners, and raise the column height a few inches to create a handsome reading or dining table for the interior of your home.

1. Use the pattern provided to make a template for the feet (B), then lay them out on the lumber. By alternating directions and overlapping the feet, you can cut them out of 2 x 8 stock with minimal waste.
2. Form the top (D) by edge-gluing three pieces of 2 x 8 stock (or more numerous pieces of narrower stock). After the glue dries, sand the panel flat and trim it to the finished dimensions given in the list. Round overall edges with a router.
3. Cut the remaining parts to the dimensions provided.
4. Arrange the column sides (A) with their edges chasing each other, then fasten them into square columns using wood glue and 3d finishing nails. Set the nails just below the surface.

5. On the stretcher face of each column, center and drill a pair of 5/16"-diameter pilot holes, one 2-1/2" and the other 5" from the bottom. Center and drill a pair of holes of the same diameter through the remaining faces of each column; locate these holes 1" and 3-1/2" from the bottom.

6. Center and drill a pair of 7/32"-diameter pilot holes into each end of the stretcher(C) and into the back of each foot, using the same 2-1/2" center-to-center spacing used on the columns. Set the lower holes in the feet 1" above the bottom edge of their backs as indicated in the template pattern. Lo-

cate the holes in the stretcher 1" up from the bottom and 1" down from the top edges. Drill these holes as deep as necessary for installing the lag-thread ends of the hanger bolts.

7. Lag the hanger bolts into the feet and the stretcher, then fasten these parts to the two columns. Secure the bolts with lock washers and nuts.

8. Center the top brackets (E) over the column tops and fasten them in place using #8x1-1/2 flathead wood screws.

9. Lay the top upside down on a flat surface. Miter the ends of the apron pieces (F, G), then arrange them in a rectangle on the underside of the top. Make sure the apron is centered along the length and width.

10. Fasten the apron to the top using #10 x 2-1/2" countersunk flat-head wood screws. Avoid using glue in this assembly since both the top and apron will tend to expand and contract with changing humidity.

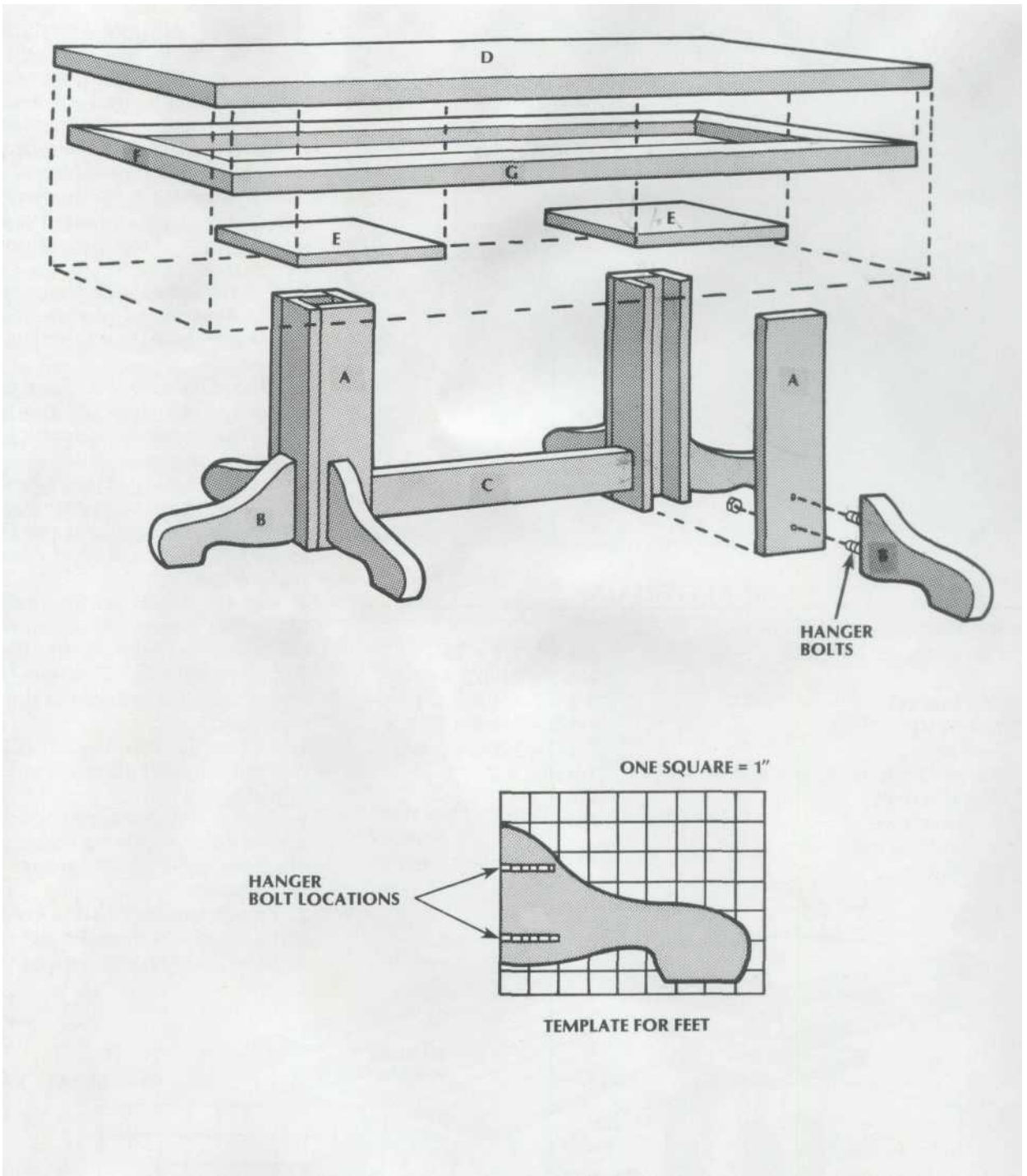
11. Center the apron/top assembly over the leg/column assembly. Fasten them together by driving #8 x 1-1/2" flathead wood screws through the brackets into the top. (You will find this easier to do with the entire assembly turned upside down.)

12. Sand the table and finish according to taste.

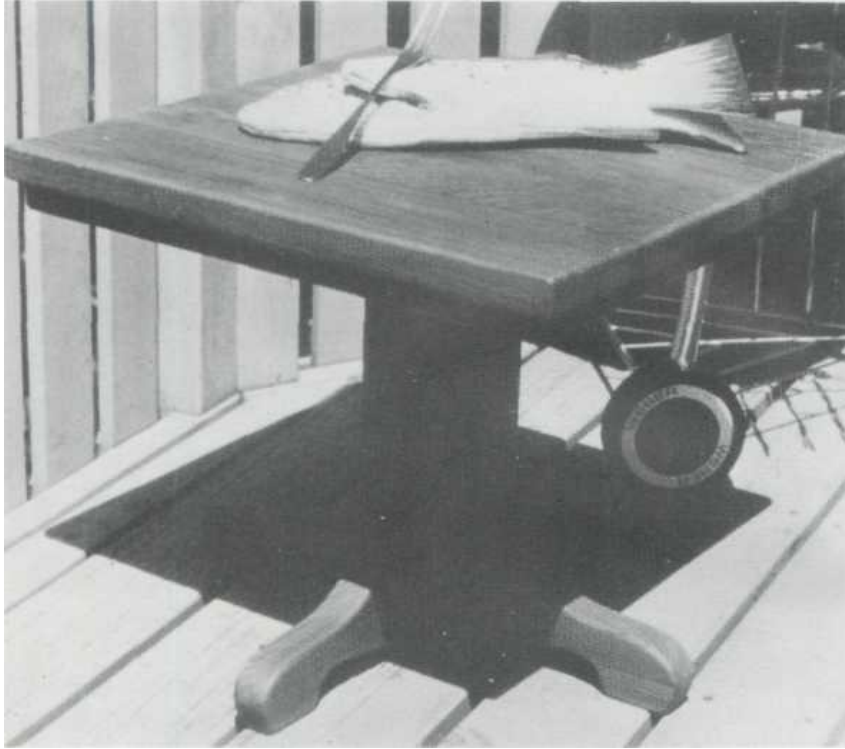
### LIST OF MATERIALS

(finished dimensions in inches)

<b>A</b> Column sides (8)	3/4 x 3-1/2 x 14
<b>B</b> Feet (6)	1-1/2 x 5-1/2 x 8-1/2
<b>C</b> Stretcher	1-1/2 x 3-1/2 x 19
<b>D</b> Top	1-1/2 x 21-1/2 x 44
<b>E</b> Top brackets (2)	3/4 x 7-1/4 x 7-1/4
<b>F</b> End aprons (2)	1-1/2 x 3-1/2 x 18-1/2
<b>G</b> Side aprons (2)	1-1/2 x 3-1/2 x 41
Hanger bolts (with nuts and lock washers)	1/4 dia. x 2-1/2
Wood screws	#8 x 1-1/2
Wood screws	#10 x 2-1/2
3d finishing nails	
Wood glue	



# END TABLE



This table will add beauty and convenience to any setting, indoors or out. The one shown here was made of redwood and assembled with waterproof fasteners. However, you can use the wood of your choice with conventional fasteners to create a lovely piece of indoor furniture. Adjust the column height and top dimensions to suit your tastes.

1. Cut the pieces to size according to the dimensions provided. Use the pattern to make a template for the feet (E).

2. Glue and screw or nail one edge of the column sides (A) at a time until the column is complete. Check for squareness.

3. Glue up the top (B) from 2 x 8 or narrower stock. After the glue dries, sand the panel flat and cut it to 21-1/2" square. Round over all sharp edges.

4. Cut 45° miters on the ends of the apron pieces (D). Center the pieces on the underside of the top, and drive #10 x 2-1/2" screws from underneath the apron into the top to secure.

5. Center the top bracket (C) on the column, and glue and screw it in place.

6. Center the top/apron assembly on the column, gluing and screwing from underneath through the top bracket.

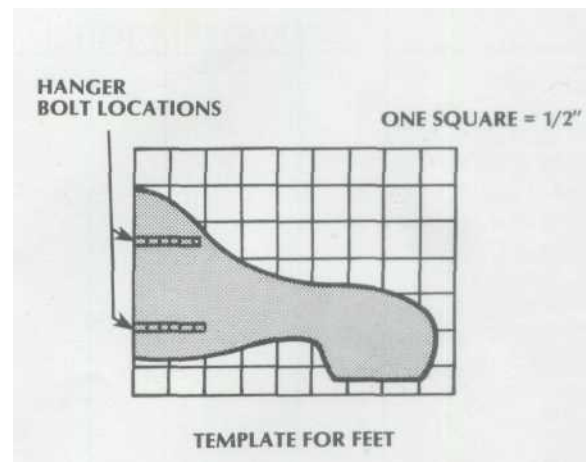
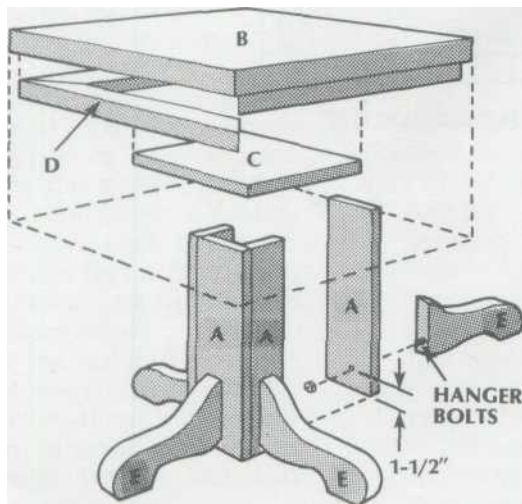
7. Attach the feet to the column using hanger bolts and nuts.

8. Sand and finish as desired.

### LIST OF MATERIALS

(finished dimensions in inches)

<b>A</b>	Column sides (4)	3/4 x 3-1/2 x 16
<b>B</b>	Top	1-1/2 x 21-1/2 x 21-1/2
<b>C</b>	Top bracket	3/4 x 7-1/4 x 7-1/4
<b>D</b>	Apron (4)	1-1/2 x 3-1/2 x 20-1/4
<b>E</b>	Feet (4)	1-1/2 x 5-1/2 x 8-1/2
	Hanger bolts, nuts, and lock washers	1/4 dia. x 2-1/2
	Wood screws	#10 x 2-1/2
	Wood screws	#8 x 1-1/2
	3d finishing nails	
	Wood glue	



# DROP TABLE





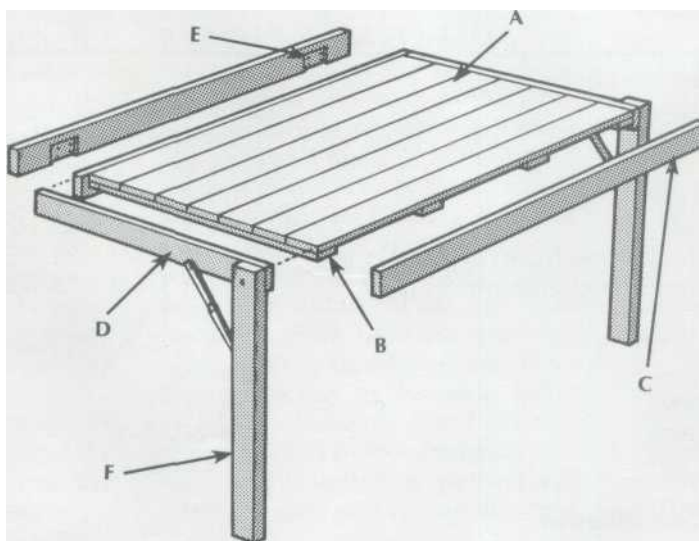
This multi-purpose table drops flush to the wall when not in use. The hinged legs fold out of sight when the table is down, and you can even mount it on a wall to use it as a serving table.

1. Cut the pieces to size according to the dimensions given.
2. Nail the top pieces (A) to the top supports (B), then add the sides (C) and ends (D).
3. Attach the legs (F) with carriage bolts. Use a washer between the leg and the table at the pivot point so the leg can swing up properly for storage.
4. Mount hinges to the table and hinge piece (E). Attach the hinge piece to the wall at the proper leg height as shown.
5. Finish the table according to individual preference.

### LIST OF MATERIALS

(finished dimensions in inches)

<b>A</b>	Top pieces (7)	$3/4 \times 3-1/2 \times 46-1/2$
<b>B</b>	Top supports (4)	$3/4 \times 3-1/2 \times 24-1/2$
<b>C</b>	Sides (2)	$3/4 \times 3-1/2 \times 48$
<b>D</b>	Ends (2)	$3/4 \times 3-1/2 \times 24-1/2$
<b>E</b>	Hinge piece	$3/4 \times 3-1/2 \times 48$
<b>F</b>	Legs (2)	$3/4 \times 3-1/2 \times 30$
	Carriage bolts and washers	$1/4$ dia. $\times$ $3-1/4$
	3d finishing nails	
	Collapsible leg supports	



# WORKBENCH



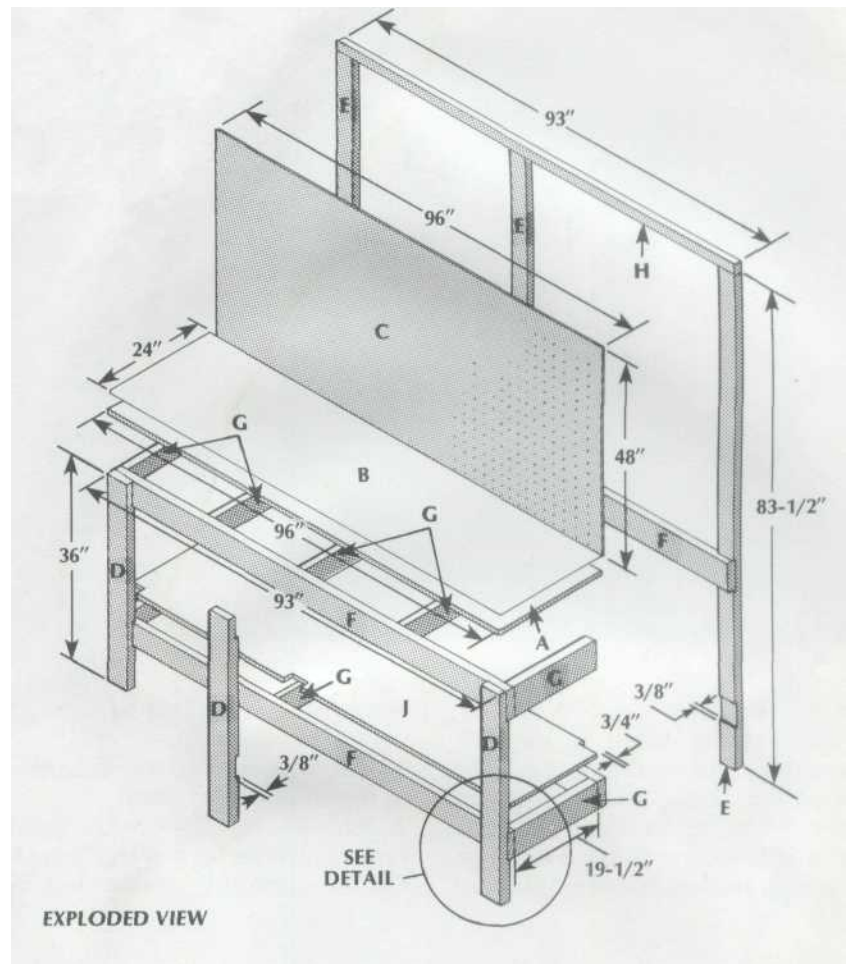
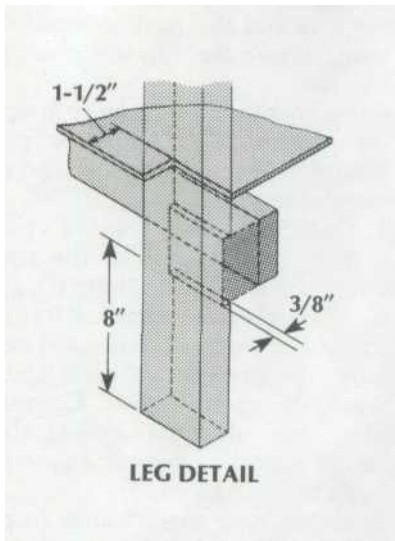
Any home handyman knows the value of a workbench. This one provides plenty of work space, a large shelf, and a perforated peg-board backing for hanging tools. The tabletop is made of 3/4" waferboard covered with 1/4" hardboard. The workbench shown here is 8' long, but you can make it any length to fit your work space.

1. Cut all pieces to size according to the dimensions given.
2. Assemble the support frames (F) for the tabletop (B) and the shelf (J) by fastening the fronts and backs to the crosspieces (G) using 12d nails. In both cases, position one crosspiece at each end and one across the middle. Add two more crosspieces to the top frame to help stiffen the tabletop work surface.
3. Cut a 3-1/2"-wide x 3/8"-deep rabbet across the top of each front leg (D) for fitting the top frame on the legs. Then cut dados of the same dimensions at a parallel location across each of the back legs (E). Also, cut parallel dados across each leg about 8" above the bottom for fitting the shelf frame between the legs.
4. Fasten the legs to the frames using #8x2-1/2" flathead wood screws countersunk flush with the leg surface. Use at least two screws per joint and offset them for increased frame stability.

### LIST OF MATERIALS

*(finished dimensions in inches)*

<b>A</b>	Tabletop base	3/4 × 24 × 96 waferboard
<b>B</b>	Tabletop	1/4 × 24 × 96 hardboard
<b>C</b>	Backing	1/4 × 48 × 96 perforated hardboard
<b>D</b>	Front legs (3)	1-1/2 × 3-1/2 × 36
<b>E</b>	Back legs (3)	1-1/2 × 3-1/2 × 83-1/2
<b>F</b>	Top and shelf frame fronts and backs (4)	1-1/2 × 3-1/2 × 93
<b>G</b>	Top and shelf frame crosspieces (8)	1-1/2 × 3-1/2 × 19-1/2
<b>H</b>	Crossbar	1-1/2 × 1-1/2 × 93
<b>J</b>	Shelf	3/4 × 23-7/8 × 93 waferboard
	Wood screws	#6 × 7/8
	Wood screws	#8 × 1-1/2
	Wood screws	#8 × 2-1/2
	Angle irons	1-1/2 or 2
	12d nails	
	Construction adhesive	



5. Cut 3-1/2"-wide x 1-1/2"-deep notches in the front edge of the shelf, one at each end and one in the middle, in order to fit the shelf around the front legs. Cut parallel notches of the same width, but 3/4" in depth, on the back edge of the shelf for fitting around the back legs.

6. Insert the shelf between the legs and fasten it to the support frame using #8 x 1-1/2" flathead wood screws, countersunk flush or driven slightly below the shelf surface. If you like, run a bead of construction adhesive along the upper edge of the frame before installing the shelf.

7. Set the tabletop base (A) on the top frame. Push the top against the back legs and center it along the length of the support frame.

8. Clamp or tack the top in place while drilling countersunk pilot holes for #8 screws through it into the frame. Space the holes about 12" apart. If you want to use construction adhesive, remove the top and spread a bead of adhesive on the top of the frame. Then reposition the top and fasten it in place using #8 x 1-1/2" flathead wood screws. Drive all the screws slightly below the surface of the tabletop.

9. Position the tabletop over the base, making all edges flush. Then fasten the top to the base using #6 x 7/8" flathead wood screws, driven slightly below the outer surface. This installation method will allow for periodic replacement of

the tabletop. For permanent installation, apply construction adhesive to the base, position the tabletop over it, and press it flat, then tack it in place.

10. Place the bench in the desired location and shim the legs as needed to make the top completely level and to stabilize the bench. Then use angle irons to fasten the legs to the floor, or run fasteners through the back legs into the wall, or do both.

11. Set the backing (C) on the tabletop. Center it along the length of the bench, then fasten it to the upper section of the back legs and to the crossbar (H) using #6 x 7/8" flathead wood screws.

# GATELEG TABLE





stationary frame so it will not interfere with the movement of the gate leg.

This gateleg table is elegant enough for indoor dining, yet light enough to be carried outdoors when the occasion arises. It opens up to a surface area large enough to accommodate four people and is the perfect project to show off your craftsmanship.

1. Cut the pieces to size according to the dimensions given.

2. Cut 1/2"-deep x 3-1/2"-wide rabbets on the tops of the legs (A). On the same side of each leg, cut 1/2"-deep x 2-1/2"-wide dados 3" up from the bottom.

3. Round and sand the edges of the legs and the back sides of the long bottom and top stretchers (B, C).

4. Assemble the two large frames using glue and wood screws. Round over the edges and sand the faces of the frames.

5. Cut 3/4"-deep x 1-1/2"-wide rabbets in the ends of the short bottom and top stretchers (D, E).

6. Assemble the four small frames, using glue and two screws at each joint. The stretchers should lap the legs and protrude 1/4". Counter-bore and plug the holes; then round over the edges and sand the faces of the frames.

7. Fasten one small frame to the left side of each large frame. The leg on the small frame should sit against the leg on the large frame as shown. To do this, drive two screws from the back through the stretcher into the top and bottom of each leg.

8. Cut 3/4"-deep x 1-1/2"-wide laps in the ends of the bottom and top side stretchers (F, G). Sand the stretchers; then attach them to the frames using glue and screws. Plug the screw holes.

9. Attach the two remaining small frames to the base using butt hinges. This completes the base of the table.

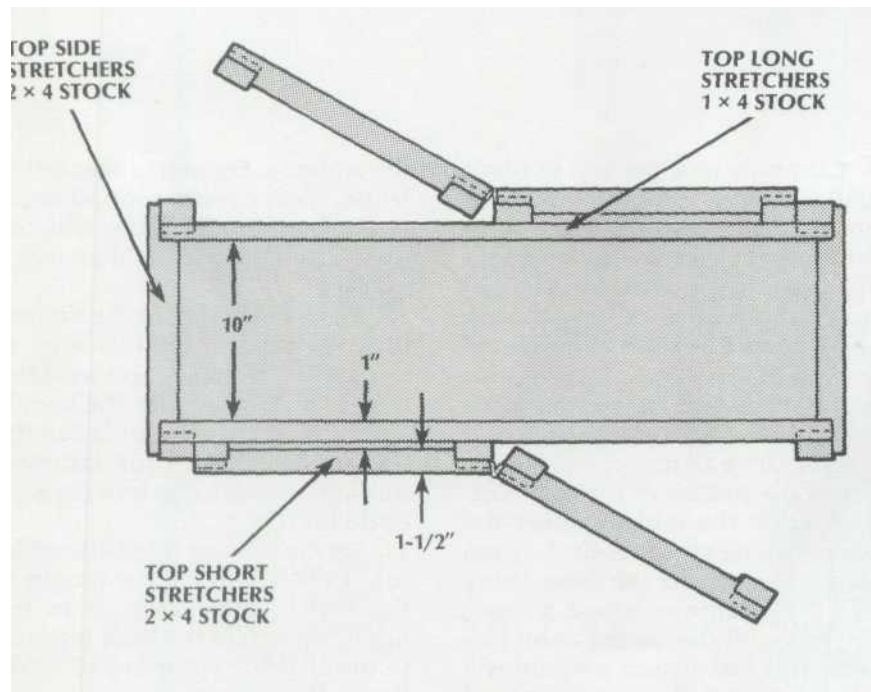
10. Glue up stock for the top and leaf pieces (H, J). The top will overhang the base 1-1/4" on each side to accommodate the hinges.

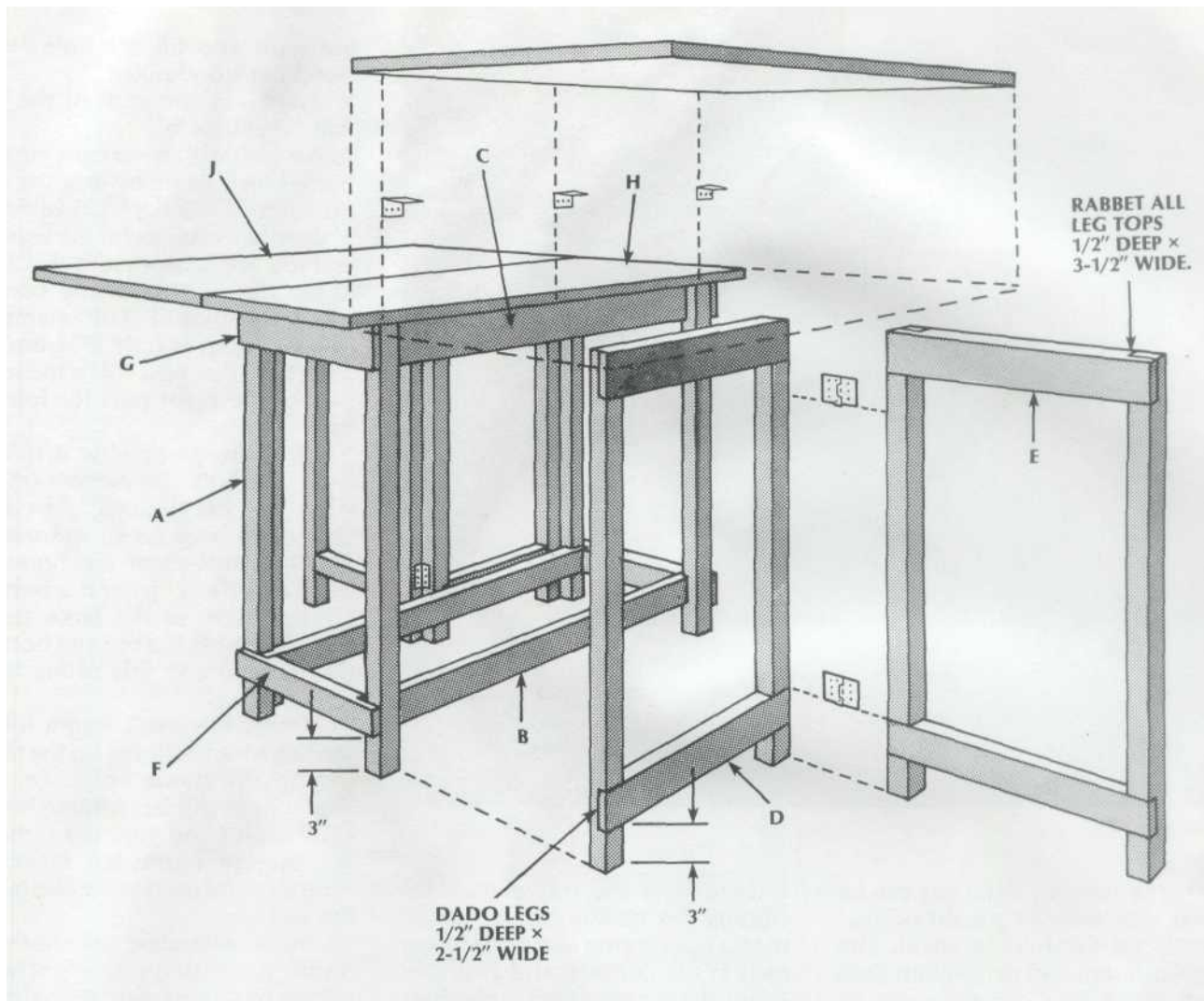
11. Mount the top to the base by screwing and plugging through the top into the stretchers.

12 Use three hinges to attach each

leaf to the top, making sure that the center hinge is in front of the

13 Sand the entire table and finish as desired.





### LIST OF MATERIALS

(finished dimensions in inches)

<b>A</b>	Legs (12)	1-1/2 × 1-1/2 × 28-1/2
<b>B</b>	Bottom long stretchers (2)	3/4 × 2-1/2 × 38-1/4
<b>C</b>	Top long stretchers (2)	3/4 × 3-1/2 × 38-1/4
<b>D</b>	Bottom short stretchers (4)	1-1/2 × 2-1/2 × 17-1/2
<b>E</b>	Top short stretchers (4)	1-1/2 × 3-1/2 × 17-1/2
<b>F</b>	Bottom side stretchers (2)	1-1/2 × 2-1/2 × 13
<b>G</b>	Top side stretchers (2)	1-1/2 × 3-1/2 × 13
<b>H</b>	Top	3/4 × 17-1/2 × 47-1/2
<b>J</b>	Leaves (2)	3/4 × 18-1/2 × 47-1/2
	Wood screws	#8 × 1
	Tabletop fasteners	
	Brass butt hinges (7)	1-1/2 × 2
	Wood plugs	
	Wood glue	

# FOLDING TRAY



This generously sized tray can be used separately or placed permanently on the folding stand. The classic design and rich walnut goes well with either contemporary or country furnishings.

1. Cut all stock to size according to the dimensions provided.
2. Glue up random width stock to make the tray bottom (C) slightly oversized. When the glue has dried, sand on both sides and trim the bottom to final size.
3. Miter the corners for connecting the back (A) and the tray sides (B). Cut 1/4"-wide x 1/2"-deep rabbets on the lower inside edges of the back and sides. Taper the inner face on each piece down to 3/8" thickness, beginning the taper at the top of the rabbet as shown.
4. Drill and cut out the handholes on the tray sides as shown.

5. Final sand the tray pieces, including the handholes. Assemble the tray using glue and 4d finishing nails at the corners, and glue and 2d finishing nails through the bottom into the sides. Pre-drill all nail holes for easier construction; set

the nails and fill the holes with matching wood putty.

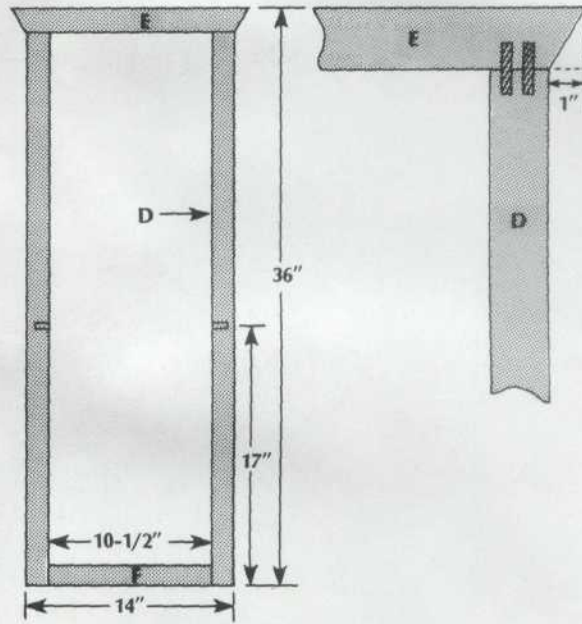
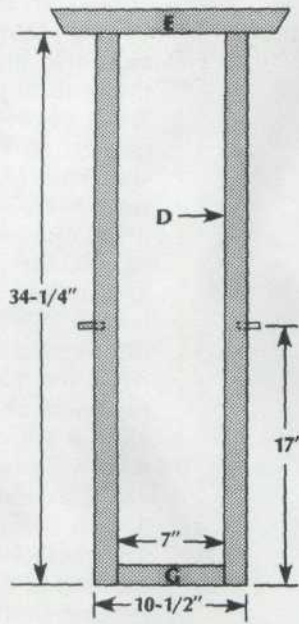
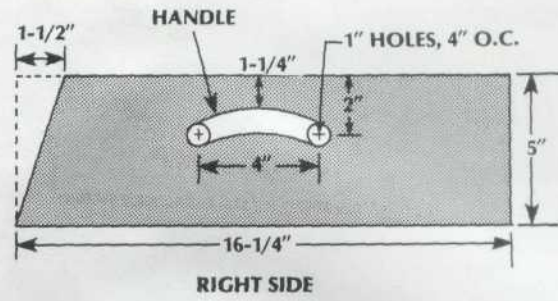
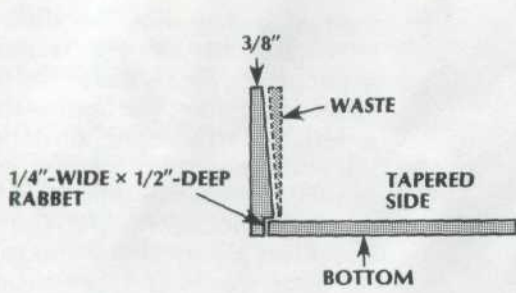
6. Angle-cut the ends of the top rails (E) as shown.
7. Assemble the narrow inside frames first. Begin by locating and drilling 1/4"-diameter dowel holes 1" deep at the joints for the legs (D) and top and bottom rails (E, G).
8. On the outside of the narrow frame legs, drill 1/4"-diameter holes 1" deep exactly 17" from the bottom of the legs. This is the location of the pivot pins for folding the stand.
9. Glue the pivot pins in place, then assemble the narrow frame. Glue the dowel joints and clamp until dry. Check for squareness.
10. Drill 1/4"-diameter holes 1" deep exactly 17" from the bottom of the inside of the large frame legs. Assemble the top and bottom (F) rails and one side of the large frame.
11. Insert the small frame inside the large frame, lining up the pivot pins in the frame holes. Do not glue pins in the large frame legs.
12. Position and glue the remaining outside frame leg in place. Sand all stand parts at the joints and the surface.
13. Finish with clear polyurethane finish. When dry, you might want to tack or staple fabric strapping to the underside of the top rails so the frame opens up to 24" in width.

### LIST OF MATERIALS

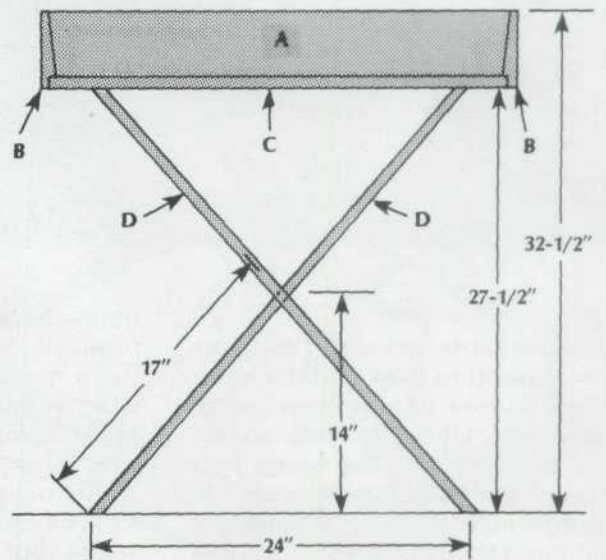
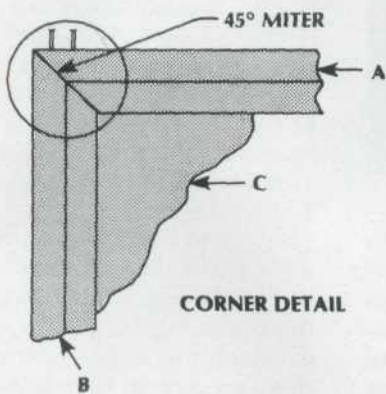
(finished dimensions in inches)

<b>A</b> Back	3/4 × 5 × 30
<b>B</b> Tray sides (2)	3/4 × 5 × 16-1/4
<b>C</b> Tray bottom	1/2 × 16 × 29
<b>D</b> Legs (4)	3/4 × 1-3/4 × 34-1/4
<b>E</b> Top rails (2)	3/4 × 1-3/4 × 16
<b>F</b> Bottom rail	3/4 × 1-3/4 × 10-1/2
<b>G</b> Bottom rail	3/4 × 1-3/4 × 7
Grooved dowel pivot pins	1/4 dia. × 2
Fabric strapping	1-1/2 × 2 × 32
2d finishing nails	
4d finishing nails	
Wood putty	
Wood glue	





LEG ASSEMBLIES





# PLANT SHELF



Smart gardeners don't wait for the ground to thaw and the air to warm before starting their spring gardening. The first seeds are always sown inside the house in a spot that gets plenty of sunshine. Unfortunately, space is usually a limiting factor in most seed starting operations. Only a few windows normally get sufficient sunshine to produce healthy seedlings, and there never seems to be enough window ledge to satisfy your aspirations. However, you can expand your pre-season gardening space with the suspended seed starter shown here.

This four-tiered shelf unit is designed to be mounted into a standard window frame. The shelves, which are removable to facilitate larger plants, are supported by two metal side frames. The bottom shelf is designed to rest on the window sill; consequently, this and all other shelf dimensions must be sized

to your particular window. The unit receives plenty of light, takes up no floor space, and can be dis-mounted easily when not in use.

Tools, soil, and miscellaneous gardening materials are conveniently stored in the two drawers under the bottom shelf.

1. To begin building your indoor garden, start by cutting the bottom shelf back (A) to length. Cut a 1/2"-wide x 3/8"-deep groove in the back, one inch from the top edge, to hold the plywood bottom.

2. Cut the bottom shelf sides (B) to length. Cut a 1/2"-wide x 3/8"-deep groove in each side, one inch from the top edge, to hold the plywood shelf. Machine a 3/4"-wide x 3/8"-deep rabbet on the back inside end of each side piece. Make a right and left piece.

3. Cut a blind rabbet 3/4" wide x 3/8" deep x 1-1/2" long on the uncut end of each side to accept the bottom shelf front (D).

4. Cut the middle drawer support (C) and the drawer glides (E) to length. Glue and nail the drawer glides to the middle drawer support and the side pieces.

5. Cut the bottom shelf front to length. Cut a 1/2"-high x 3/8"-deep rabbet in the bottom inside edge to accept the plywood shelf.

6. Cut the bottom shelf (F) to size. Assemble the shelf unit parts using glue and 5d finishing nails.

7. Cut the drawer fronts (G) and sides (H) to length. Machine a 3/4"-wide x 3/8"-deep rabbet on each end of the drawer fronts to accept the drawer sides.

8. Machine a 1/4"-wide x 3/8"-deep groove on each drawer front to accept the drawer bottom, 1/4" from the bottom edge.

9. Machine the same 1/4" x 3/8" groove on each side piece. Cut a

## LIST OF MATERIALS

(finished dimensions in inches)

<b>A</b>	Bottom shelf back	$3/4 \times 5-1/2 \times 35-1/4$
<b>B</b>	Bottom shelf sides (2)	$3/4 \times 5-1/2 \times 18$
<b>C</b>	Middle drawer support	$3/4 \times 4 \times 17-1/4$
<b>D</b>	Bottom shelf front	$3/4 \times 1-1/2 \times 35-1/4$
<b>E</b>	Drawer glides (4)	$3/8 \times 3/4 \times 16-7/8$
<b>F</b>	Bottom shelf	$1/2 \times 17-1/4 \times 35-1/4$ plywood
<b>G</b>	Drawer fronts (2)	$3/4 \times 4 \times 16-7/8$
<b>H</b>	Drawer sides (4)	$3/4 \times 4 \times 16-7/8$
<b>J</b>	Drawer backs (2)	$3/4 \times 3-1/2 \times 16-1/8$
<b>K</b>	Drawer bottoms (2)	$1/4 \times 16-1/8 \times 16-7/8$ plywood
<b>L</b>	Shelf fronts and backs (6)	$3/4 \times 1-1/2 \times 35-1/4$
<b>M</b>	Top shelf ends (2)	$3/4 \times 1-1/2 \times 7$
<b>N</b>	Middle shelf ends (2)	$3/4 \times 1-1/2 \times 10-1/2$
<b>P</b>	Lower shelf ends (2)	$3/4 \times 1-1/2 \times 14$
<b>Q</b>	Top shelf	$1/4 \times 6-1/4 \times 35-1/4$ plywood
<b>R</b>	Middle shelf	$1/4 \times 9-3/4 \times 35-1/4$ plywood
<b>S</b>	Lower shelf	$1/4 \times 13-1/4 \times 35-1/4$

1/4"-dia. steel rod  
 Finishing nails  
 Roundhead wood screws  
 Clear silicone caulk  
 Wood glue

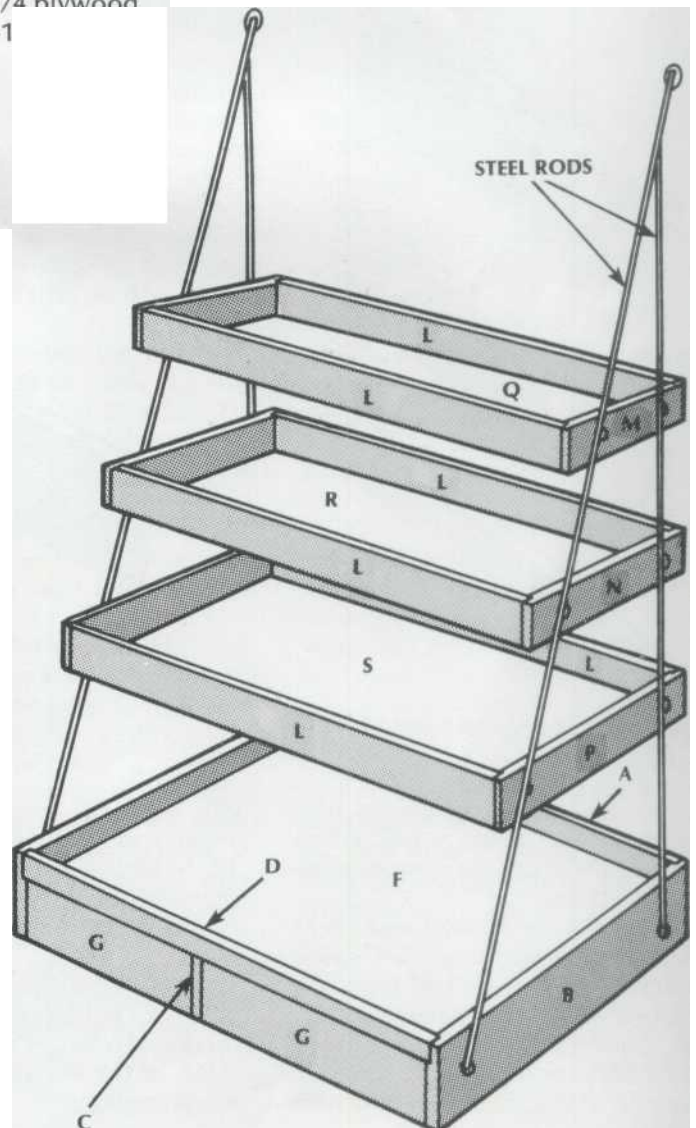
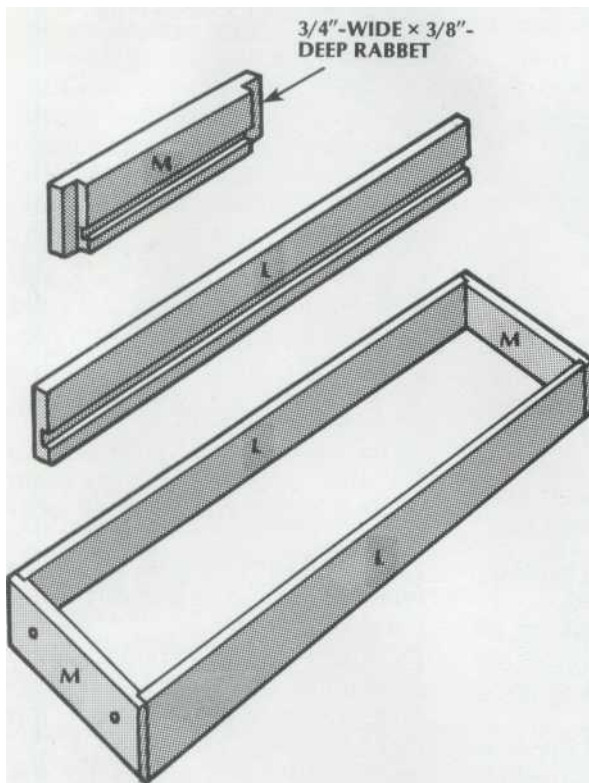
3/4"-wide x 3/8"-deep groove on the outside face of each drawer side for the drawer glides.

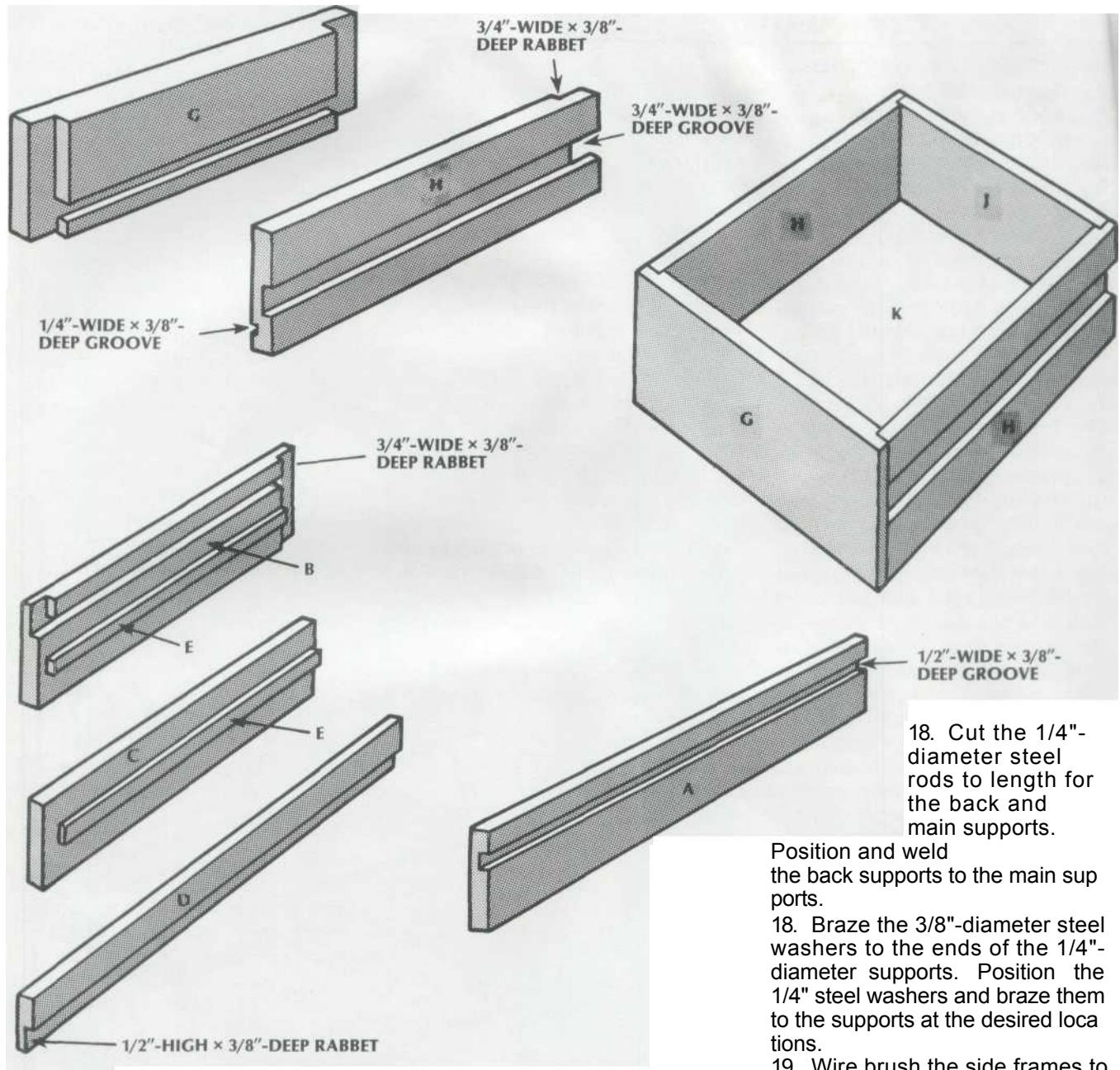
10. Machine a 3/4"-wide x 3/8"-deep rabbet on the end of each side piece to accept the back panel.

11. Cut the drawer backs (j) and drawer bottoms (K) to size.

12. Assemble the drawer sides, front, back, and bottom with glue and nails. Note that the back must be installed flush at the top; also, the bottom cannot be glued; it must always be nailed.

13. Cut the top, middle, and lower shelf ends (M, N, P) to length. Machine a 3/4"-wide x 3/8"-deep rabbet





18. Cut the 1/4"-diameter steel rods to length for the back and main supports.

Position and weld the back supports to the main supports.

18. Braze the 3/8"-diameter steel washers to the ends of the 1/4"-diameter supports. Position the 1/4" steel washers and braze them to the supports at the desired locations.

19. Wire brush the side frames to remove loose scale and dirt. Paint the side frames.

20. Attach the side frames to the shelf units. Use #12 x 3/4" round head wood screws for the top three shelves and #12x1-1/4" roundhead wood screws for the shelf with drawers.

21. Mount the unit to the window with #14 x 2-1/2" wood screws.

bet on each end of the pieces. Machine a 1/4"-wide x 3/8"-deep groove 1/4" from the bottom edge of each piece.  
 14. Cut the shelf fronts and backs (L) to length. Machine a 1/4"-wide x 3/8"-deep groove 1/4" from the bottom edge of each piece.  
 14. Cut the top, middle, and lower shelf bottoms (Q, R, S) to size. Assemble all the shelf elements with

glue and nails, except the bottom, which should not be glued.  
 16. Machine a 1/4" radius on all sharp edges of the shelf frames, or round them over with a sanding block.  
 16. Sand all surfaces and finish as desired; polyurethane varnish is recommended. Caulk the inside joints of the shelves with clear silicone caulking.



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# Teddy Bear Bank



When I was a kid about six years old or so, I was obsessed with money! Or as my brothers would have said—still say—I was a "Mr. Mean," a scrooge, a **tightwad**, a hoarder, a miser. Whenever my relatives came around for a visit, I would smile and give kisses, and generally do all the things most kids of that age hate to do, in the hope that my oh-so-wonderful behavior would put me in line for a monetary handout.

It rarely failed! When the moment came to say goodbye, my sycophantic behavior usually paid off, with my dotting uncles and aunts vying with each other to give me all their loose change. The funny thing was, I didn't really care about the money as such, I simply enjoyed putting coins in my automated money box!

This project draws its inspiration from my long-gone toy—when the lever is pushed down, it causes the coin

to fall through the slot, and causes the bear to raise his arm and nod his head.

## MAKING THE TEDDY BEAR BANK

Having studied the working drawings for making the box and carefully selected your wood, set out the various dimensions and cut out the ten component parts—the four sides, the base, the top and the four inside-corner fillets. Cut the rabbets at the corners and glue up. Round over the edges of the base and lid with a quarter-curve profile and fit with countersunk screws.

Trace the side-view profile of the bear through to your chosen wood—best if it's a soft easy-to-carve timber like lime, jelutong or basswood—and cut it out on the scroll saw. Rerun this procedure for the front views. You should finish up with six parts—the head, the body, two arms



and two legs. Drill 1/2"-diameter holes down through the body, up into the head, through the shoulder and into the arm, and fit stubs of 1/2"-dowel for the neck and for the jointed arm.

When you have made the basic parts for the bear, use a knife to swiftly whittle the cutouts to shape. Don't try for anything fancy, just go for uncomplicated and stylized chunky forms.

Finally, having first used a scalpel and sandpaper to tidy up and create a good finish, use a dash of black acrylic paint to detail the nose, eyes and mouth.

## PUTTING IT TOGETHER

Once you have made the box and all the parts that go to make the bear, then comes the difficult task of putting the whole thing together. It's not so much that any single

stage is difficult, but that everything has got to be just right. If one of the control strings is too slack, or the shaft is too tight, or whatever, then the movement won't work.

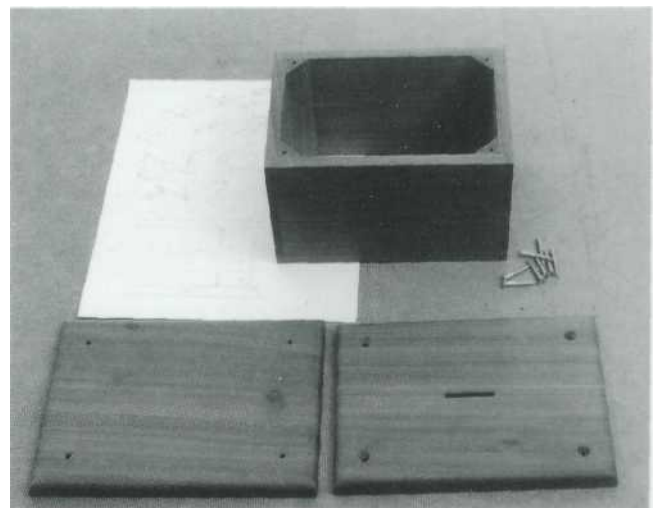
Start by running 1/16"-diameter holes through the neck and arm stubs. The neck needs a side-to-side hole for the pivot and a front-to-back hole for the control cords, while the arm needs a single front-to-back through-hole for both the control cords and the pivot strings. In essence, the controls are beautifully simple. There are four cords—one to pull the head down, one to pull the head up, one to pull the arm down and one to pull the arm up. And of course, depending upon how you want the action to go, fix either the "up" or the "down" cords to a lightweight tension "pulling" spring so the lever action becomes the positive movement.

Finally, when you are happy with the movement, cut two slots in the box (one for the lever and one for the coins), fit the shaft with its dowels and end plates, glue-fix the bear to the top of the box, run the control cords down into the box and then variously tie the cords to the spring or shaft.

## SPECIAL TIP: GLUING

For swiftly fitting and fixing all the control cords, you can't do better than a cyanoacrylate. It's good for holding the knots tight, for little trial-and-error holds, for fixing the bear to the top of the box. In fact, it's just about perfect for everything.

## STEP-BY-STEP STAGES



The finished box, with the bottom and top slabs ready to fit. Note how the fixing screws are placed so they run into the corner fillets.

## MATERIALS LIST—

### TEDDY BEAR

A Head (1)	2" × 2" × 2"
B Body (1)	2" × 2" × 3"
C Arms (2)	1" × 3/4" × 3"
D Legs (2)	3/4" × 2" × 3"

*Note that all the above pieces are oversize and allow for cutting waste.*

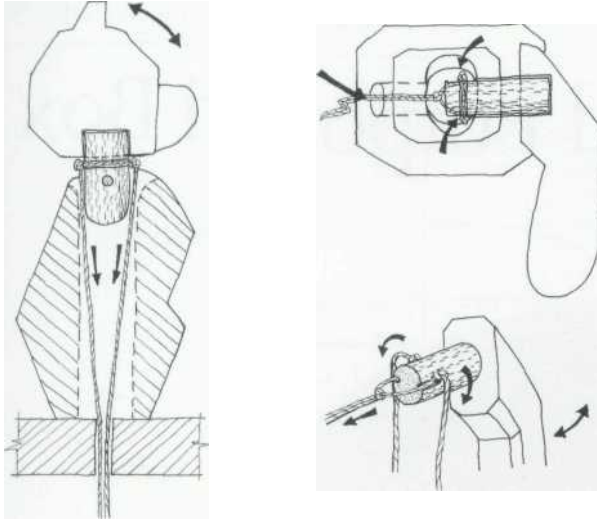
### BOX

E Front (2)	3" × 4 1/4" × 6 1/2"
F Shaft plates (2)	1/4" × 2" × 2"
G Top (1)	1/2" × 5 1/2" × 7 1/2"
H Bottom (1)	1/2" × 5 3/4" × 7 3/4"
I End (2)	3/8" × 5" × 4 1/4"
J Corner fillets (4)	5/8" triangular section at 4 1/2" long

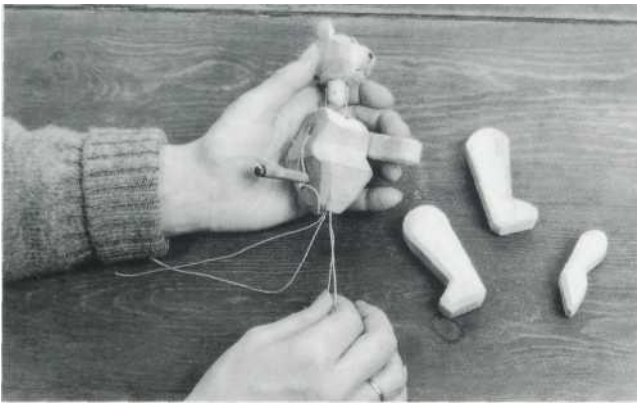
### HARDWARE AND EXTRAS

- K Drive shaft (1) broomstick dowel—cut to fit
- L Slot and lever bars (2) 1/4" dowel—cut to fit
- M Strong cord—to fit
- N Brass screws—various
- O Small quantity of black acrylic paint

*Note that all box measurements are to size.*



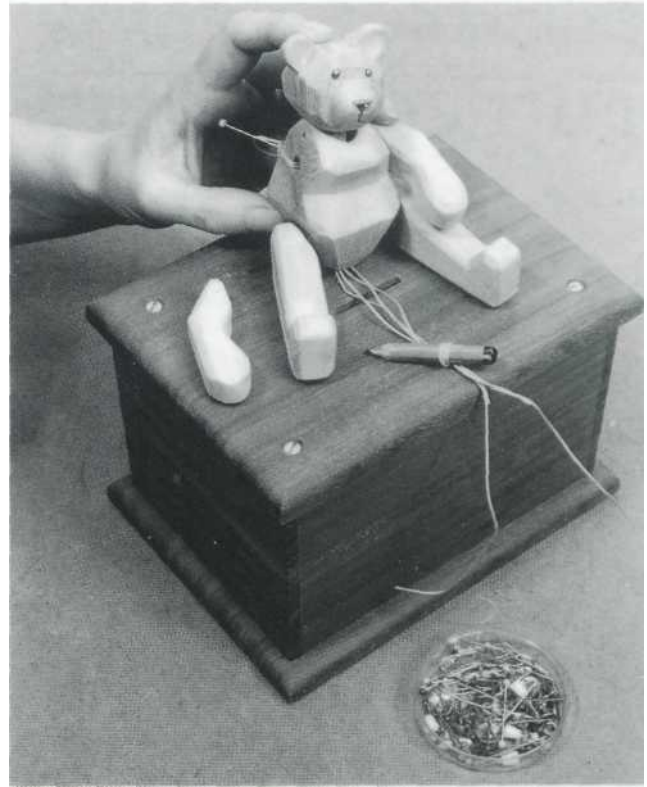
2. Next we string the bear. This cross section shows how the control cords operate the up-and-down movement of the head on the pivot. Be sure to use strong twine and nonslip knots. Notice the plan view at top right, showing how the arm is both pivoted and controlled by the cords. A detail of the cord is shown at bottom right. See how one cord pulls and pivots the arm, while the other two cords operate the up-and-down movement.



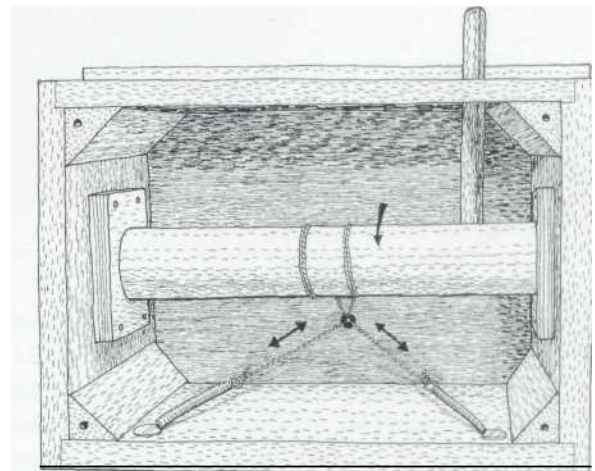
3 Have a **dry** run before you start gluing and fixing. Notice how I have left plenty of length to the cords.

### SPECIAL TIP: MODELS

If you can't figure out how the movement works, make a working model with a card, pins and rubber bands. Make a card cutout of a bear, fix it to a board with thumbtacks at the joints, and then run cords from the various limbs in such a way that a pull-down on the cord results in the limb flipping up. If you now have rubber bands to pull the limbs back into the original position, then you have achieved an archetypal string-and-spring movement.



**Sit** the bear in place on top of the box and establish the position of the cord hole. If necessary, sand the various mating faces of the limbs and the body, so as to adjust the pose.



5 A view into the underside of the box shows the fixing of the four cords. One cord each from the arm and the head run down to the springs, while the other two cords are wrapped and glued around the shaft. In action, the lever turns the shaft, with the effect that the strings pull down on the arm and head.

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# Turned and Pierced Potpourri Box



**W**ood turning, cutting delicate frets with a scroll saw, and whittling are three of my favorite wood-working activities. The problem, when I first started thinking about this project, was how could I incorporate the three techniques to create a single unique item? After a good deal of thought I came up with the notion for this project—a turned box with a pierced lid, with a small amount of knife work in and around the piercing.

The design draws its inspiration from two of my **friends**, one a wood turner and the other a general wood-worker. However, they both needed a fresh angle to spark off their talents. Well, to cut a long story short, Gill came up with this great idea that they combine their talents so as to halve their workshop expenses and double their money-making potential. The good news is that they now

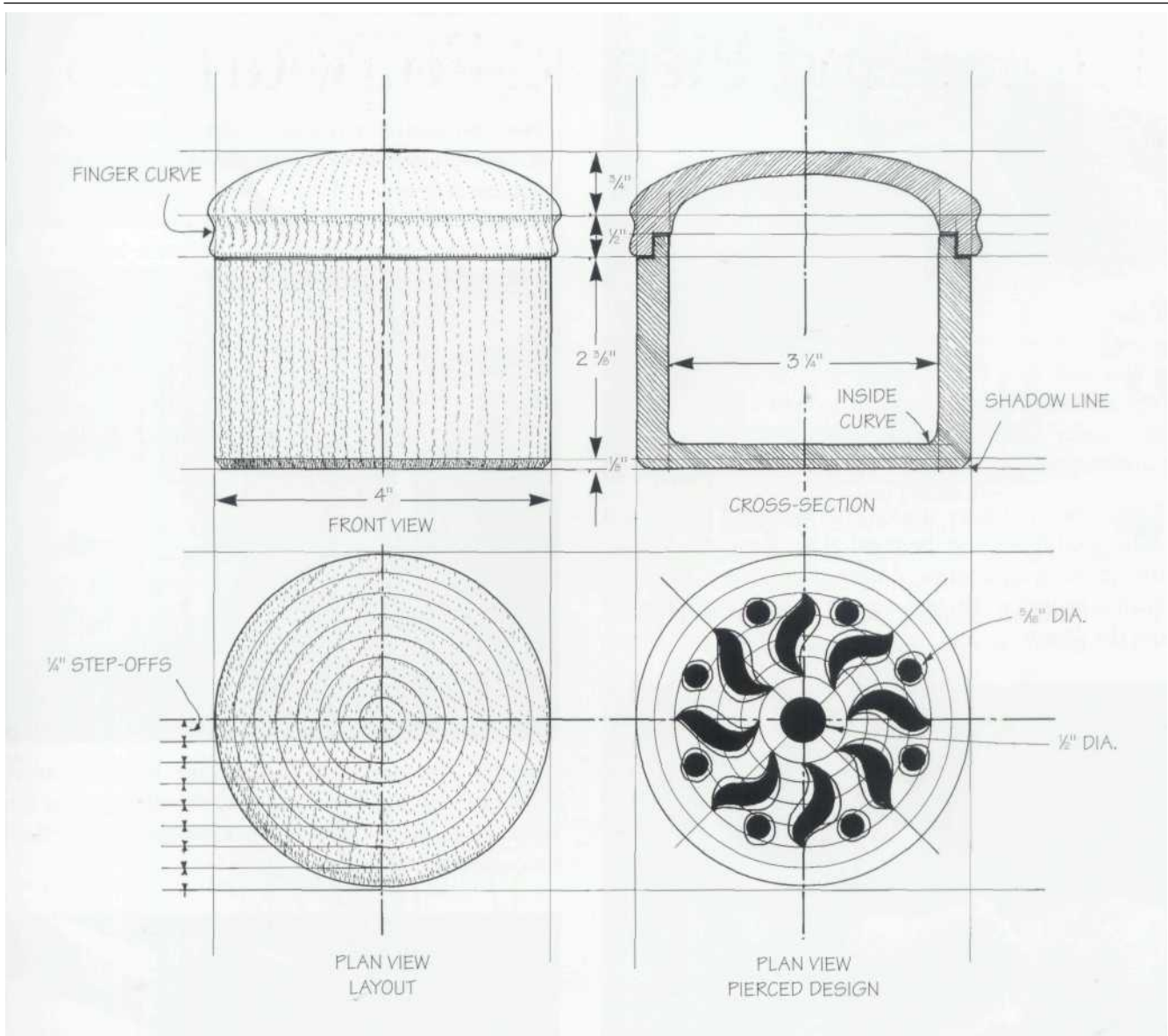
make the most beautiful turned and pierced containers, and they are both scooping up the rewards!

## **TURNING THE BOX**

Though there are any number of ways of turning a small lidded box of this type and character, the best way is to use the four-jaw chuck technique. The procedure is wonderfully simple and direct. Having mounted the wood in the chuck, you start by turning the wood down to a 4"-diameter cylinder, and parting off the tailstock end of the cylinder for the lid. This done, you hollow turn the box and cut the step on the rim, then take the surface to a good finish and part off.

The next step is perhaps slightly tricky. You remount the lid section on the lathe and start by hollowing out the





lid and cutting the rim to fit the base. Then you remove the lid from the chuck, turn it over so that the expanding jaws of the chuck fit the **inside** of the rim, and finish up by turning the top of the lid. Don't forget to set the **lid** out with the 1/4" step-off lines to help later when you set **out the** design.

### SPECIAL TIP: SCROLL SAW LIMITS

If you like the idea of this project but are planning to change the shape of the turned box, or even change the placing of the pierced holes, be mindful that the overall design is more or less governed by the use of the electric scroll saw. For example: As the saw is unable to cut wood thicker than about 1/4", the lid can't be high and/or domed. Also, the saw can't be used to fret a pierced design

around the box.

All that said, if you are keen to change the pierced design and/or the shape of the lid, you could possibly use a jeweler's piercing saw or perhaps a fine-blade hand fretsaw. It needs a bit of thinking about.

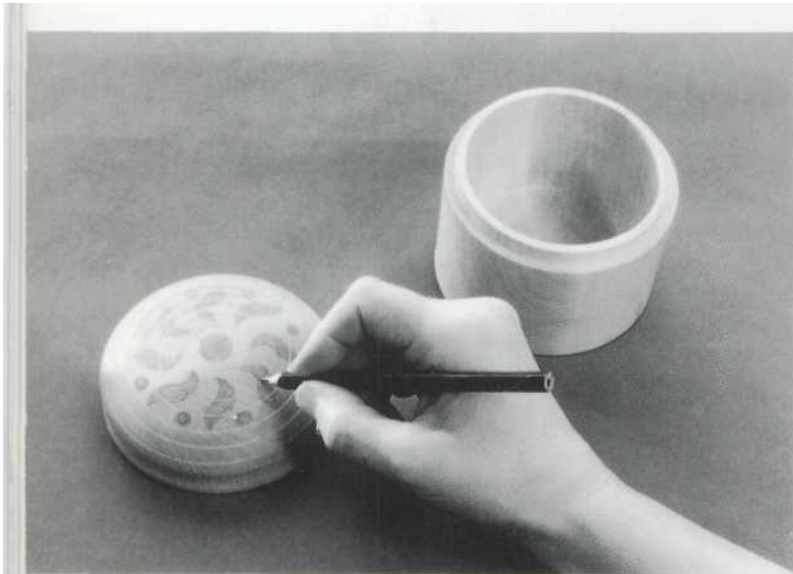
### FRETTING, PIERCING AND WHITTLING THE LID

When you have made the turned box, with the lid nicely set out with the 1/4" guidelines, it's time to fret out the design. Pencil-press transfer the design through **to** the wood, bore out round holes with appropriate size bits, drill small **pilot** holes through the "windows" of the design, and fret out the shapes on the scroll saw. Finally, use the point of the knife to trim back the sharp edges of the piercings.

1 When you have sanded and smoothed the lid to a



good finish, use the point of the skew chisel to set the lid out with a series of rings. Space them about 1/4" apart. The idea is that you can use them as a guide to lay out the design.

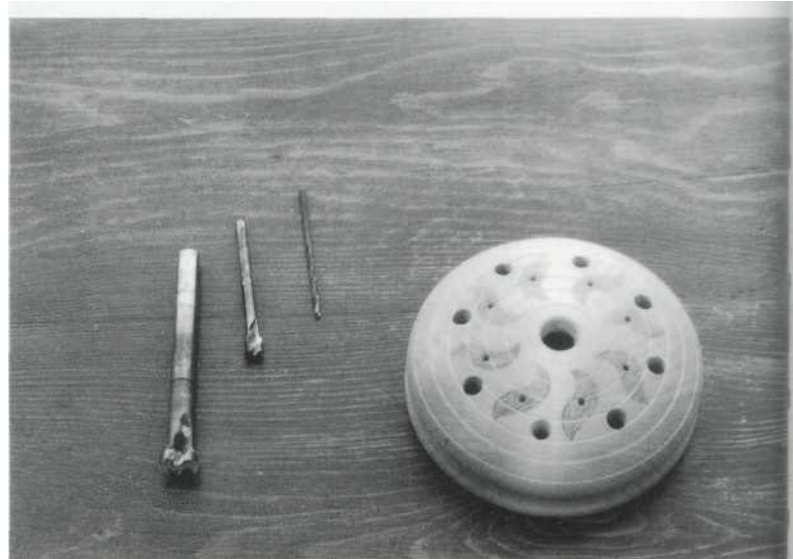


2 Shade in the pierced areas so that there is no doubt about the line of cut. If you are worried about the pencil smudging, then it's a good idea to give the whole lid a quick spray with pencil fixative as used by illustrators.

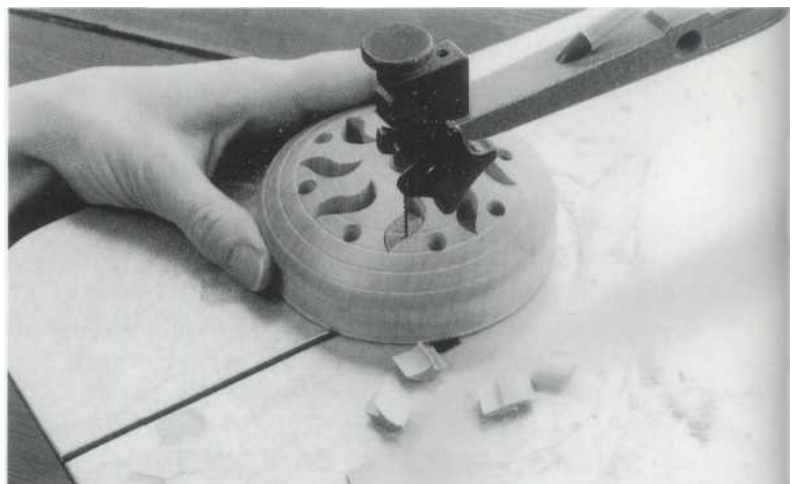
## MATERIALS LIST

A Board (1)  $4\frac{1}{2}'' \times 4\frac{1}{2}'' \times 6''$

*Note: Because we were a bit short of wood, we decided to laminate two pieces to make the  $4\frac{1}{2}'' \times 4\frac{1}{2}'' \times 6''$  section.*



3 It's most important that you use Forstner bits for the large holes that make up the design. I say this because they are the only bit types that guarantee **perfect-every-time** holes.



Take two cuts for each end of the little curved shape. Work from the central pilot hole and down toward the point so that the point is crisp and sharp.



## USING THE LATHE AND THE FOUR-JAW CHUCK

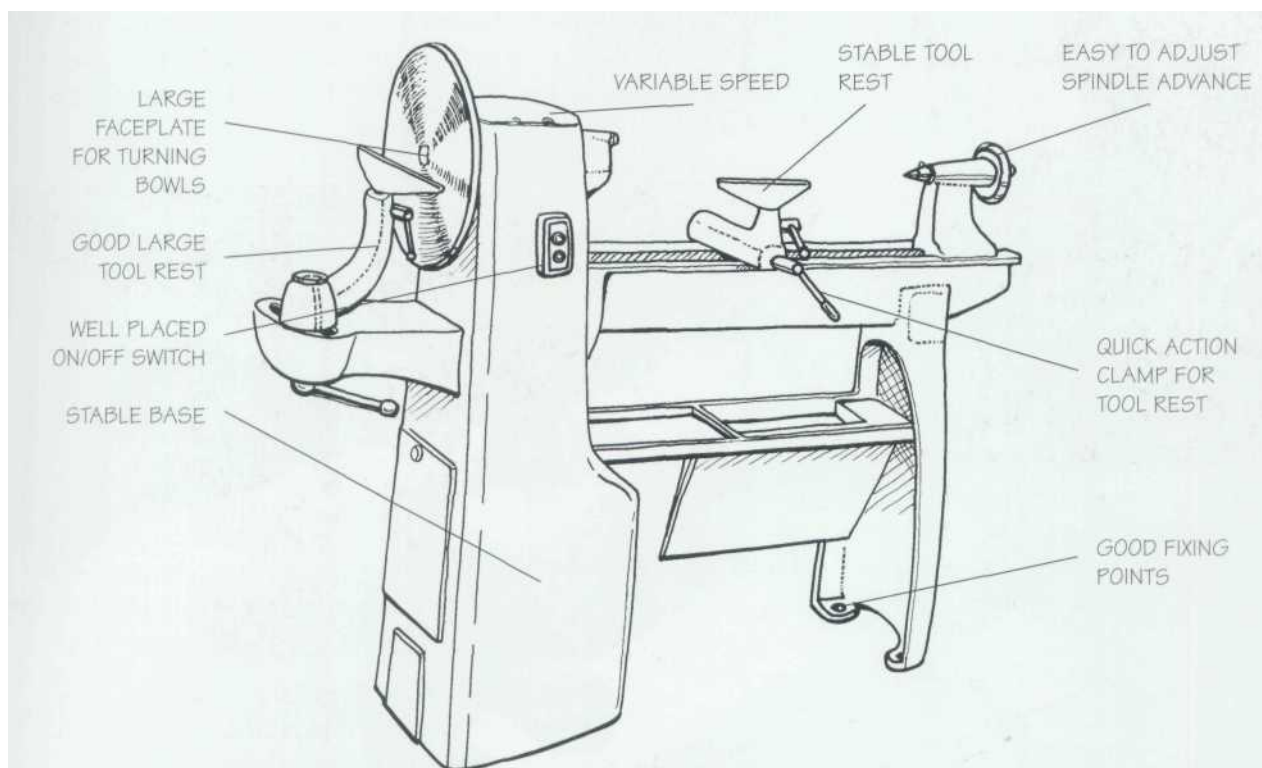
Though wood turning is one of the most important wood-working activities—vital for making just about everything from chair legs, stair balustrades, and bedposts, to boxes, candlesticks and bowls—it is also one of the most misunderstood of all the woodworking techniques. What happens **with** most beginners is that they purchase an "amateur" machine and a set of "starter" tools, and then become disenchanted when they can't make anything more exciting than small spindles. The problem, of course, is that small machines tend to wobble and shake, and the pronged center and the fixed tailstock center that are supplied **with** most small machines are totally inadequate and almost useless. As a result, many beginners soon get disillusioned and decide to give up wood turning. The **pity of it is** that the majority of these disillusioned beginners heap blame on themselves. Of course, what these beginners simply can't know is that turning is the one area of woodworking where the old adage "a poor workman always blames his tools" is a load of bunk! In the context of wood turning, the boring old adage ought more rightly read "poor results are nearly *always* the result of poor tools." All this adds up to the inescapable fact that exciting and varied wood turning can only really be

achieved if you have top quality tools and equipment.

So there you go. If you are a beginner looking to get started, the following pointers will show you the way.

### Lathe

In essence, a lathe is a woodworking machine used for cutting and shaping wood into a round section. The wood is pivoted and spun between centers and/or held **in** a chuck, while at the same time handheld chisels or gouges are used **to** make the cuts. Though there are many lathe types—small ones, large ones, very long ones, some dedicated to making spindles, some dedicated to making bowls, some with fancy multispeed controls, and so on—experience tells me that a large traditional lathe, with a big motor and a heavy cast-iron frame, is by far the best option. I say this because while a miniature lathe might well be superb for making small items like lace bobbins, it can't be used to make larger pieces like bowls and chair legs. A large lathe, on the other hand, can be used to make everything from lace bobbins to bedposts. As for the cast-iron frame of a large lathe, there's no rust, no vibration, no nothing—it just sits there and does the job! I have a large old English lathe called a Harrison Jubilee, made about 1940. It is a wonderful machine.



### LATHE ANATOMY

*If the notion of wood turning appeals to you, then be sure to invest in the biggest, best quality lathe that you can afford.*

### **HEADSTOCK AND TAILSTOCK**

The headstock, the power-driven unit at the left-hand side of the lathe, carries the bearings in which the spindle revolves. The spindle has an external screw for chucks and **faceplates** and an internal taper for the pronged center. The tailstock, the movable unit at the right-hand side of the lathe, holds a pointed center. The distance between **the** headstock and the tailstock can be adjusted by winding the tailstock center in or out.

### **TOOL REST**

The tool rest, sometimes called T-rest, is the unit that moves left or right along the bed on which the tools—meaning the gouges and chisels—are rested. Being mindful that the rest is a fulcrum for the levering action of the tools, it is essential that it can be swiftly and easily moved and put in place.

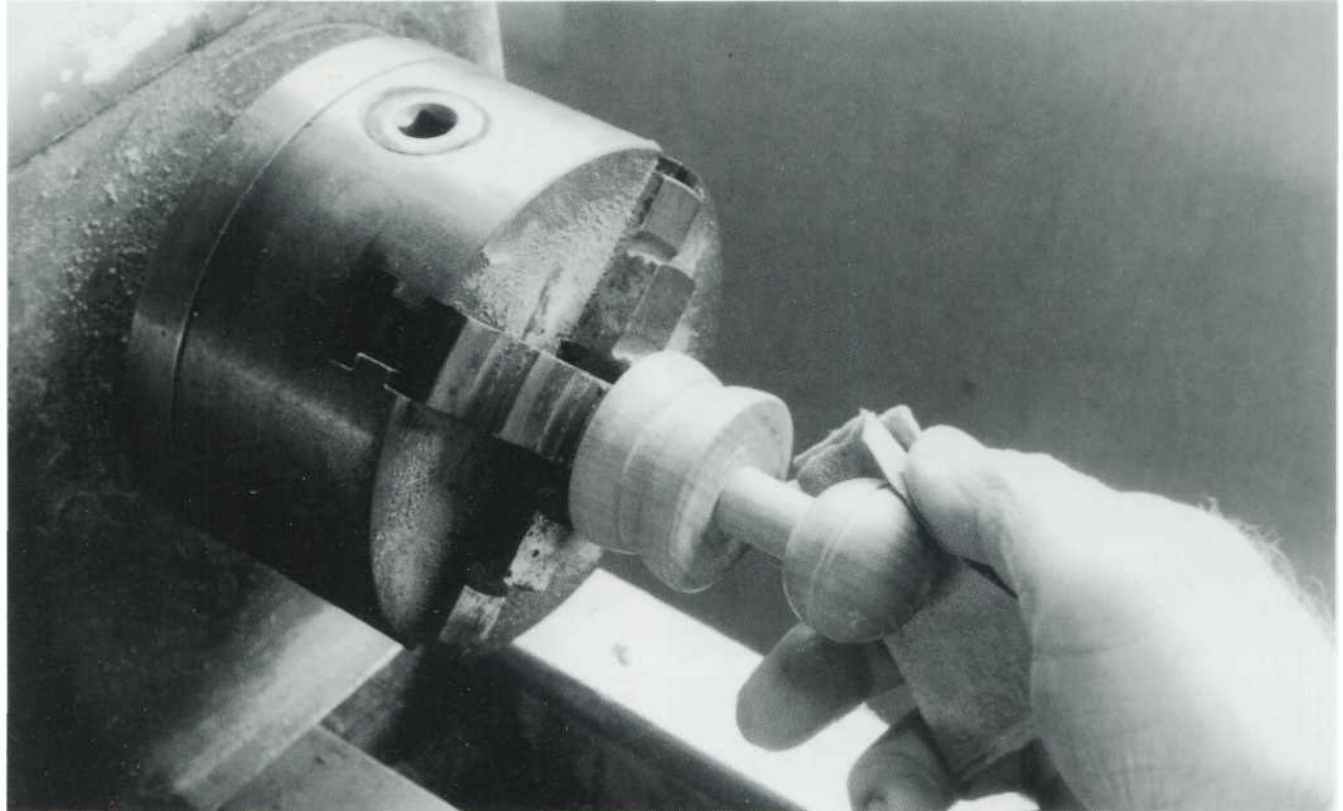
### **THE BED**

The bed is the metal track, rods or rails that link the headstock to the tailstock, upon which the tool rest slides. Since it is vital that you are able to swiftly and easily move the tool rest, it is best to avoid narrow-slot, round-section bar beds that easily get clogged up with dust and shavings.

### **Four-Jaw Chuck**

The four-jaw chuck is a mechanism used to hold the workpiece; it is a device that replaces the pronged center and all manner of other centers. Operated by a chuck key, the four jaws can be opened and closed in unison in such a way that they grip square sections. To my way of thinking the four-jaw chuck is essential. Okay, so four-jaw chucks are expensive—mine cost one-quarter the price of my secondhand lathe—and they do need to be fitted with a guard. But they grip wood without the need to turn it down to a round section—a huge time-saver—and once the wood is in the chuck, you can be confident that it's going to stay put.

When I said at the beginning that you can make just about everything you care to imagine on a large lathe, I should really have added the proviso: but only if you use a four-jaw chuck. You should see me at my lathe. I don't mess around with pronged centers or faceplates. I threw them away long since. I simply mount everything on the four-jaw chuck and get straight into the job. As well as holding square sections without the need for preparation, the jaws are good for other uses, such as holding rings and containers, holding a large screw—instead of using a screw center—and gripping round sections.



### **FOUR-JAW CHUCK**

The *advantage* of the *four-jaw chuck* is that you can draw the tailstock center out of the way and approach the workpiece head-on.

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# Heart-Shaped Cheese Board



This project had its beginnings in our ever-pressing need to tidy up our workshop. The problem was, of course, what to do with the mountain of offcuts? I'm sure you know what I mean. The chair, table, box or whatever is finished, and you are left with great heaps of wood. Okay, maybe the longer lengths can be used for the next **job** in line, and the shavings can be used as fuel or as bedding for your chickens, and the dust can be swept up and put in the trash, but what to do with the medium-size bits and pieces that look too good to throw away? Well, after a deal of thought, we came up with the

super-brilliant idea of cutting all our small offcuts down to a uniform size, and then laminating the resultant blocks to make cutting boards and surfaces that needed to show end grain. Okay, so it is a solution that involves a **lot** of time, sweat and effort, but then again, the finished boards can be presented or marketed as choice handcrafted items.

So there you go. If you are up to your knees in offcuts, or you are short of cash and maybe know of a sawmill operator who is looking to give away his trimmings free, then perhaps this is the project for you!

## MAKING THE BOARD

Collect all your waste wood and cut it down to the best overall section size. I went for a square section 1 3/4" X 1 3/4", but you can just as well go for 1" X 1" or 1" X 1 1/2", or whatever size best suits your material. And, of course, if **you** want to use a mix of sizes, then no matter, as long as the grain is running along the length and the corners are true at 90°. Having achieved your sawed size, plane the wood down to a smooth finish. When you are happy with the finish, saw it down to 1 1/8" slices. When you have a stockpile of 1 1/8" slices, pencil label the end-grain face, arrange the slices side by side in rows of about 12" long, and spend time working out how best to clamp them together. You can use a couple of G-clamps and a bar clamp, or a jig and wedges; no matter, as long as the arrangement is such that you can apply end pressure without the strips bending or bowing along their length.

Do the gluing-up in two stages: first the blocks side by side **to** make the strips, and then the strips side by side **to** make the slabs. Draw the design of the board on the slab, cut out the profile and sand the end-grain surfaces to a good finish. Fit the whittled feet and the cutting wire, give the whole works a coat of matte varnish and the **project** is finished.

### SPECIAL TIP: DRY FIT FIRST

As the success of this project hinges on your being able to glue and clamp dozens of the little blocks together, it is important that you plan out the procedure. The best way is to have a trial dry run, with everything in place

#### MATERIALS LIST

A Board	1 3/4" X 1 3/4" offcuts—enough to suit the size of your board
B Feet (1)	1 1/2" X 1/2" X 6" 1/2" dowel X 4" long
C Toggle handle (1)	fancy hardwood 1/2" X 1" X 4"

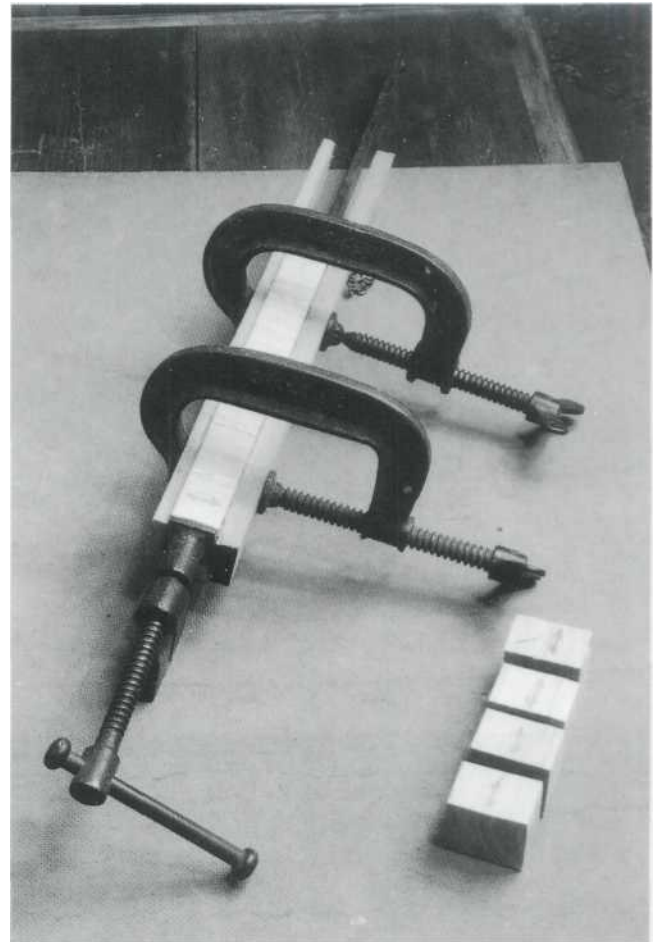
#### HARDWARE AND EXTRAS

D Cheese wire (1)	15" long
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*Note that all measurements allow for a small amount of cutting waste.*

except the glue. You need to check out the glue type and make sure that it's suitable, clear an area and make sure that there is room to maneuver, have cloths and newspaper handy, and so on. And then you have to actually clamp-up the wood and see how your arrangement works out. Okay, so maybe my way of working does sound a bit fussy, but the horrible alternative is to have glue smeared all over the place, only to find that the clamp isn't long enough, or you have glued the wrong surfaces, or you are missing some vital piece of equipment.

### STEP-BY-STEP STAGES

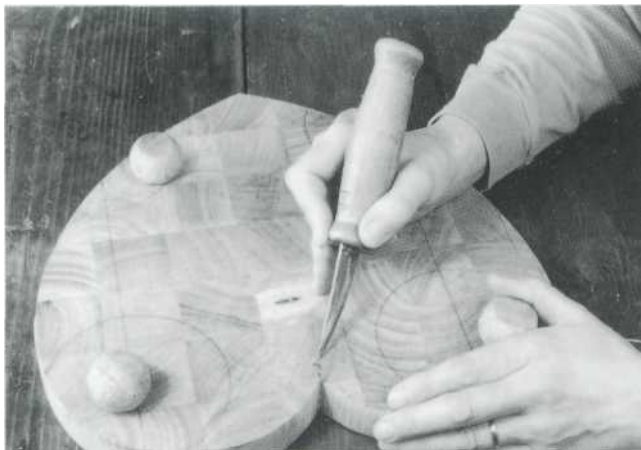


Saw the 1 3/4" X 1 3/4" square section of wood down into 1 1/8" thick slices—like slices off a loaf of bread—and then clamp up. With the arrows indicating the run of the grain, you can see how the slices of wood need to be realigned when it comes to gluing.

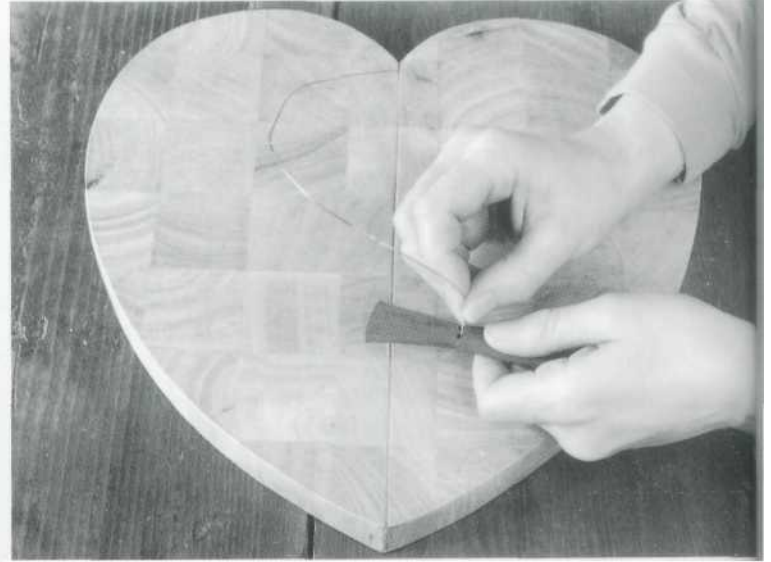




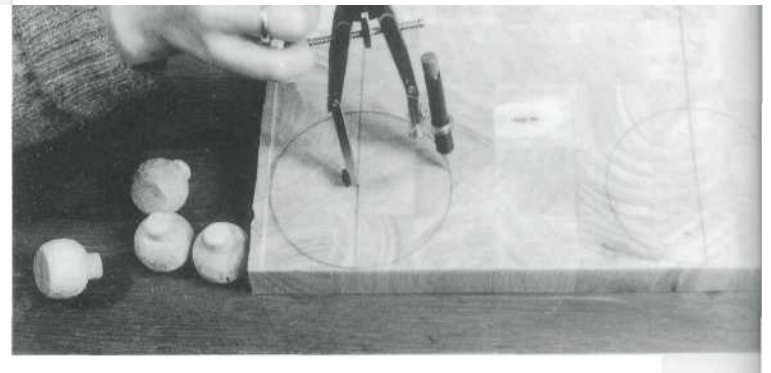
The best way of ensuring that the little ball feet stay in keeping with the total design is to whittle them to shape. I drilled and doweled four little square blocks, cut the corners off the blocks to make rough octagonals, and used a largish sloyd knife for the whittling.



3 To fix the wire, drill a 1/8"-diameter hole, set the wire in the hole and then follow it up with a glued dowel. Make a saw cut between the cheeks, wrap the wire over and around in the cut and follow it up with a glued sliver wedge.



Having whittled a small piece of hardwood to a butterfly shape and sanded it to a super smooth finish run two side-by-side 1/16"-diameter holes through the center of the bow, and knot the wire in place.



And just in case you have an aversion to heart shapes, there is no reason at all why you can't go for just about any shape that takes your fancy. For example, you can simply round the corners of a rectangular board.



## DEBRIS COLLECTION AND WOODSHOP SAFETY

Woodshop debris, in the form of offcuts, shavings and sawdust scattered around on the floor and over the surfaces, is a dangerous nuisance. The shavings make the floor slippery and the loose offcuts are potential ankle-breakers. And of course, the wood dust not only clogs the machines, it is a fire risk, it creeps into the home, and it also harms the lungs.

Just how much dust is considered to be dangerous? The Occupational Safety and Health Administration (OSHA) suggests that if you can see wood dust floating around in the atmosphere when a shaft of sunlight shines across the workshop, then you have a problem that needs solving.

We tackle the problem in several ways: We cut the amount of dust down at the source by using filtered machines and by producing shavings rather than dust, and we have a large mobile vacuum system that we move around to service the various machines. We also wear a rubber dust/vapor mask for most tasks—like sawing, drilling, and when we are using varnish and such—and a full-face electric visor-helmet respirator when we are working at the lathe. As to which mask does the better job, the rubber mask is silent but uncomfortable and sweaty, while the electric full-face respirator is a bit heavy and noisy.

In the context of sawdust being bad for your lungs, I reckon that tried-and-trusted traditional American and European woods like ash, oak, beech, maple, willow, pear and pine are generally much safer than exotic species such as mahogany, obeche and iroko. All that said, if you find yourself sneezing, or your nose is running, or your skin develops a rash, then you best go for another wood type.

So what to do if you are really worried about dust and allergic reactions and such? Well, I think that for safety's sake, you need to stay with the following rules of thumb:

- Whenever possible use hand tool techniques that produce shavings rather than dust.
- Use traditional white-wood species that are non-oily to the touch.
- Use a vacuum machine to suck up the dust as it is produced—before it gets a chance to puff around the workshop.
- Wear a full-face mask, and always wash your hands and lace alter work.
- Always have a thorough sweep-up at the end of the day.
- If you have a health problem, then ask the advice of your doctor.



### ELECTRIC VISOR-HELMET RESPIRATOR

*Though the choice of mask does in many ways depend upon your personal preference—they both have **their plus** points—/ usually wear the full-face respirator when I am working at the lathe, for the plain, simple reason that the **full-face** visor offers additional protection from flying debris.*

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# Laminated Keepsake Box



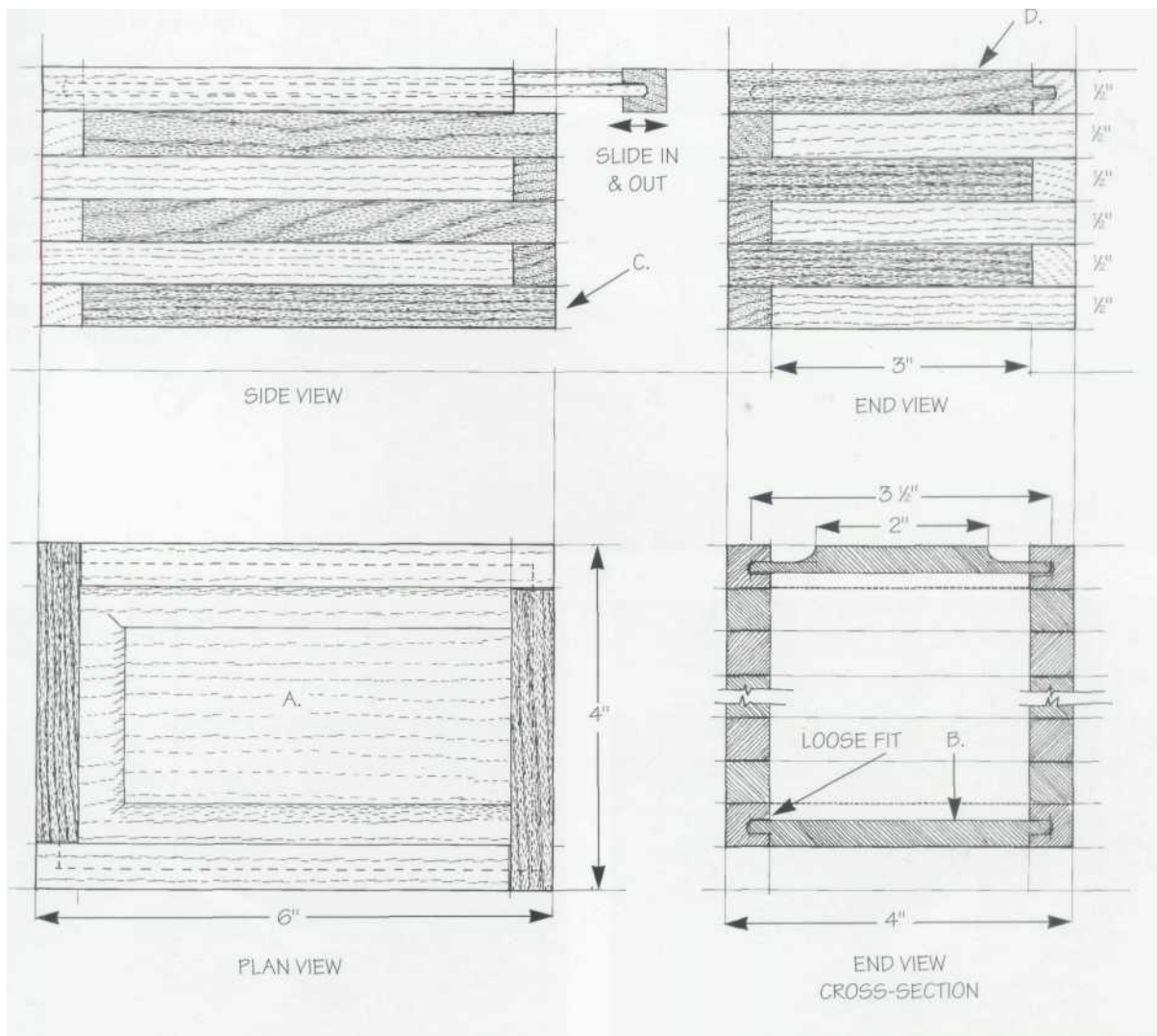
Though you might think that a box is a box is a box and not very exciting, this particular little box is rather special. Not only does it use wood that might otherwise be thrown away, but better yet, the layering technique allows you to very easily modify the length, width and height to suit your own needs. You could call it a "log cabin" box. This refers to the way the sections are layered one on top of another with the ends staggered, just the way the old timers built their log cabins.

## MAKING THE BOX

When you have studied the working drawings and seen how the lid and the base boards are set into slots—with the lid being able to slide in and out—then make decisions as to the size of your box, and size and plane the wood accordingly.

If you are going to stay with our design, you need twenty-four  $1/2" \times 1/2"$ -square sections in all, twelve long and twelve short. All I did was search through my pile of offcuts, select two colors that went together to make a pleasant counterchange, and then pushed the wood through my portable surface planer. Having planed the wood to a crisp  $1/2" \times 1/2"$ -square section, cut the wood to length so that it is perfectly square-ended and slightly oversize. As the long pieces need to end up at  $5 1/2"$ —meaning when they are built into the finished 6"-long box—it's best to cut them at about  $5 5/8"$ , so you can plane and sand them back to a good fit and finish.

When you have made the twenty-four lengths, pile them up in a dry-run arrangement, in the order they are going to be in the finished box, and pencil mark the top and bottom layers of the stack. Draw in registration marks



so there is no doubting the layered order.

Being very careful that you don't make a mistake, take the eight lengths that go to make the top and the bottom layers and use either a router or a grooving plane to cut the channels. Aim to have the grooves at about  $3/16$ " wide,  $1/4$ " deep, and centered in the  $1/2$ " thickness of the wood.

With the channels crisply worked, take the wood that you have chosen for the base and the lid and use a router or a plane to cut the rabbeted edges. While you are at it, use a router or a "round" moulding plane, or even a gouge, to cut the beautiful scooped convex curve that runs down from the top face of the lid through to the rabbet.

Starting at the base and working up, glue the four base lengths together so that the base board is nicely contained, and then layer up in log cabin fashion until the box is complete. Don't forget to leave one of the top-end pieces

unglued. This done, test to make sure that the lid is a good fit and leave the box until the glue is set. Glue the short length on the end of the lid board.

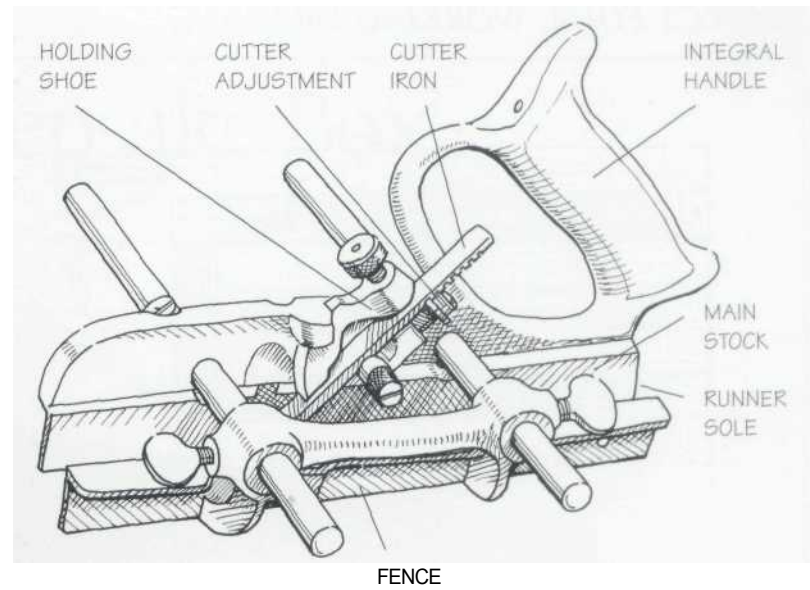
Finally, plane and sand the box down to a flush-sided smooth finish, make sure that the lid is a nice easy fit in the grooves, and then wax and burnish to a high sheen.

#### MATERIALS LIST

A Lid (1)	$3/8" \times 3 1/2" \times 5 1/2"$
B Base (1)	$3/8" \times 3 1/2" \times 5 1/2"$
C Long lengths (12)	$1/2" \times 1/2" \times 5 5/8"$
D Short lengths (12)	$1/2" \times 1/2" \times 3 5/8"$

### SPECIAL TIP: USING OLD PLANES

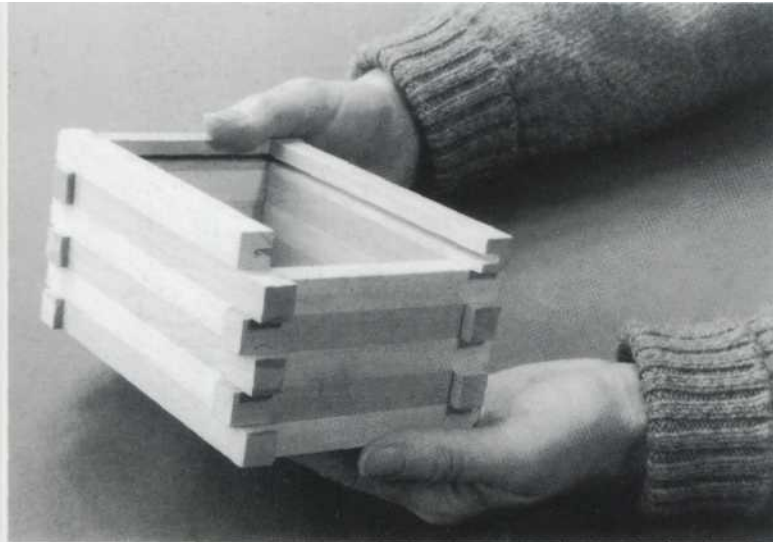
Though there are any number of ways of cutting tongues, grooves and rabbets, I think that the old metal grooving plane takes a bit of beating, meaning one of the old metal Stanley or Record planes. I use a Record 043 and 044, both made sometime before 1950. It's true they are no longer made, but I picked mine up at a flea market for no more than the cost of a new router bit. The Record 044 has eight blades that range in size from 1/8" to 9/16".



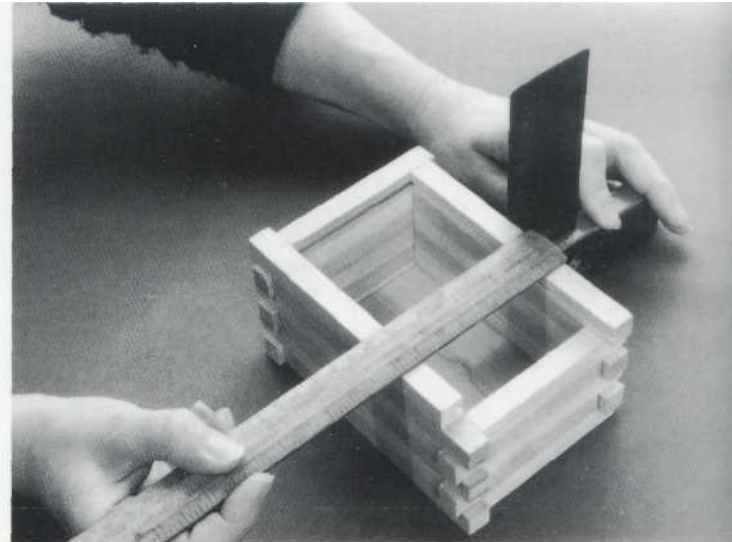
### USING OLD PLANES

*The classic Record 044 grooving plane is a beauty, easy to tune and pretty foolproof to use.*

### STEP-BY-STEP STAGES



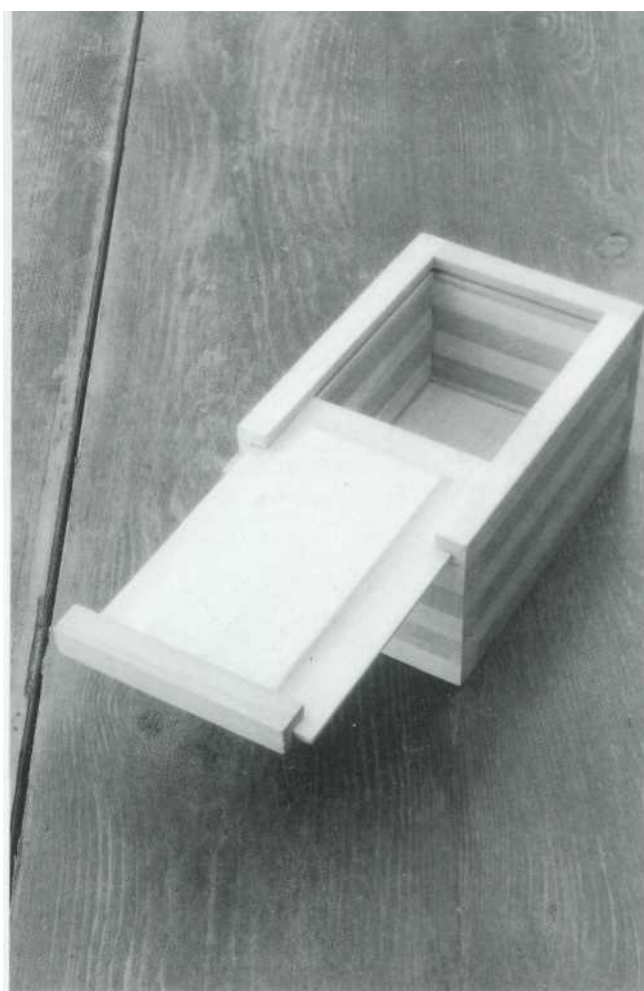
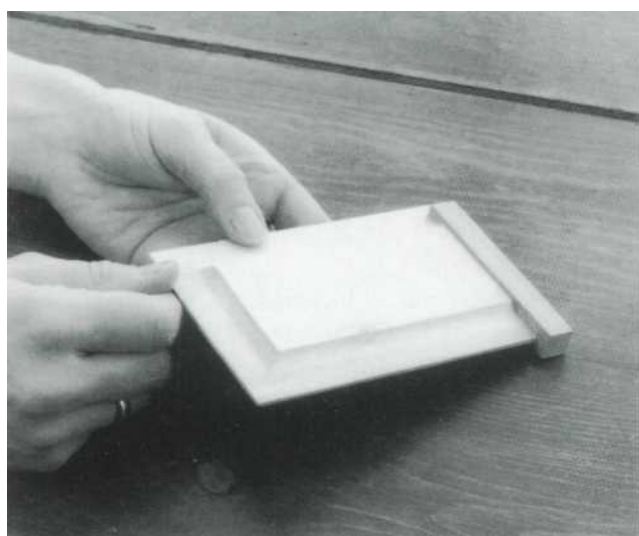
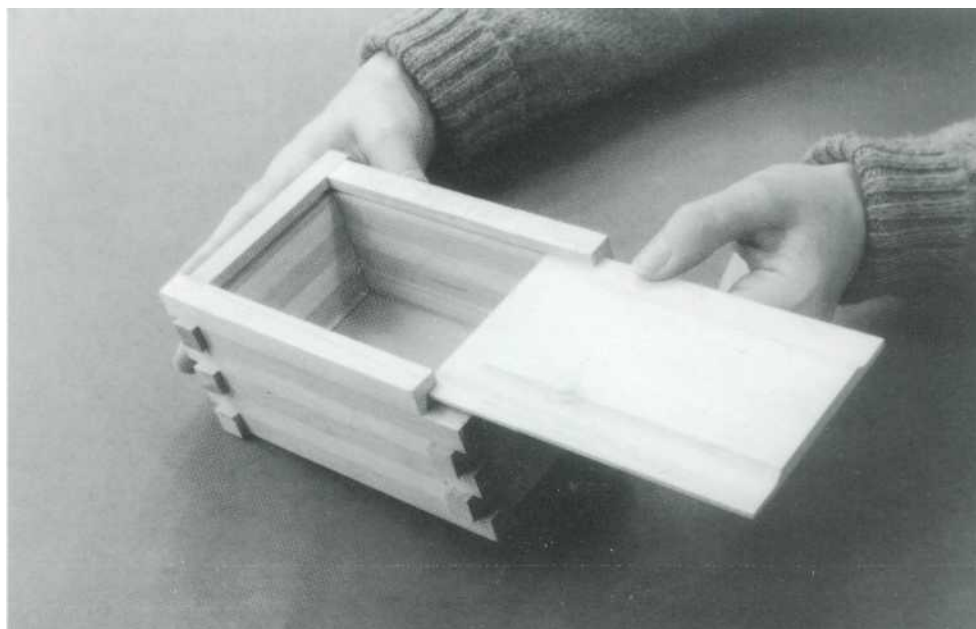
1 With the base dry fitted in place—meaning no glue—layer the square sections up log-cabin style so that the ends stick out beyond the corners. Pay particular attention to the alignment of the grooves.



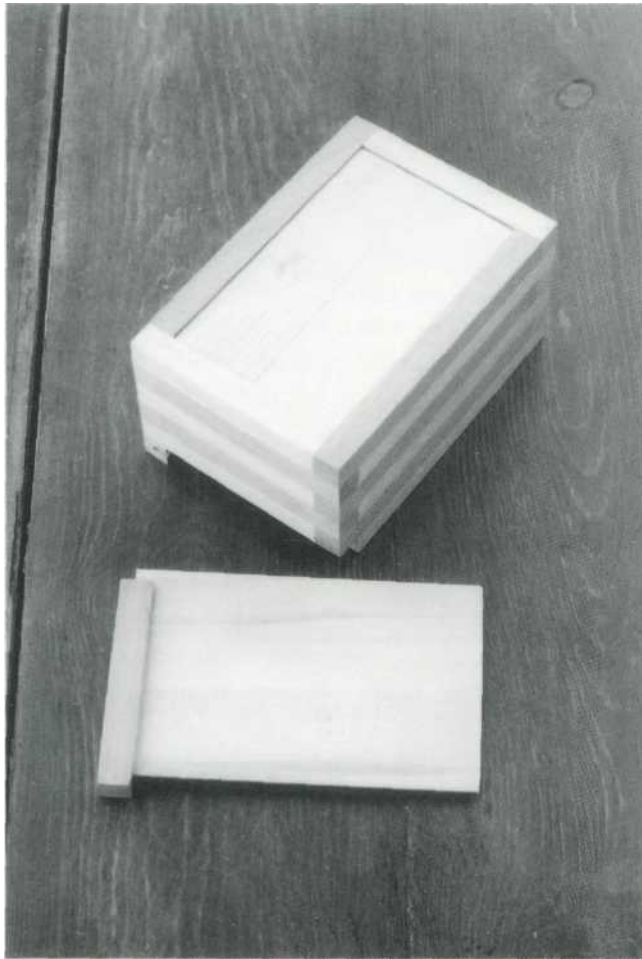
2 When you are happy with the overall shape and alignment of the box, use a ruler and square to check for squareness.



3 Before you leave the glue to set, make sure that the lid is an easy but snug fit and that it runs right through to the end of the box, so that the end runs into the groove.







6 If all is correct, the base slab should be well con-  
unncd, but should fit loosely, so that the box side can  
move without splitting the base.



*The portable surface planer is a great bench machine. All you do is  
feed the wood in one side, between the cutter blades and the bed, and  
it comes out **the** other side nearly finished!*

## PORTABLE SURFACE PLANER VS. HAND PLANES

If you are a beginner to woodworking, then sooner or later you will have to make decisions about your overall approach to the subject, or your "working philosophy." One of the main questions that you have to ask **yourself** is, do you want the emphasis to be on the bench power tools—meaning routers, press drills, planers and all **the** rest—or do you want to focus on using hand tools? Most woodworkers I know fit in one of four groups:

- Will not use power tools at any price.
- Will grudgingly use the occasional power tool, but much prefers hand tools.
- Enjoys using power tools for most of the work, and tidies up with the hand tools.
- Very much enjoys using power tools and is reluctant to use hand tools.

I reckon that Gill and I fit into group two. We much prefer working with hand tools but will sometimes use a power tool to speed things up.

Okay, so you must surely have gathered by now, that we're not very keen on power **tools**. It's not so much that we can't afford to power up, but rather that we both dislike all the dust, debris and noise that power tools generate. To our way of thinking, there is nothing quite so unpleasant as being covered with fine dust and blasted with noise.

All that said, I was so tuckered out one day last summer—when I was heavily involved in the strenuous and sweat-making procedure of hand planing a massive rough-sawn oak plank—that I decided, against my better judgment, to invest in a portable planer thicknesser. To cut a long story short—or you could say to plane a fat story thinner (ha!)—when I first saw this machine, I was firmly convinced that it was the beginning of the end of my way of working. My thinking was that it would somehow or other weaken my belief that slow-and-quiet is beautiful. However, there is no denying that it has changed the way I work. For example, where I once struggled and strained with a jointer plane, and then a smoothing plane, I now pass the wood a few times through the surface planer. In fact, I have to admit that it's a beautifully efficient machine that gets a lot of use. Of course, it is noisy, and I do have to house it in its own shed, and I did have to get myself a dust sucker and a full-face respirator mask, but against that, I can now spend much more time playing around with my various grooving, moulding and combination hand planes.

Most experts would agree that the best way is to start with hand tool techniques and then power up when you fully understand your needs.

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# Miniature Mantle Clock



Sometimes, when I am sitting alone in my workshop, I take up one or more pieces of choice wood and feast my eyes on the various colors that make up the character of the grain. To hold the wood up to the light and see the way the grain shimmers and glows, to see how two pieces of wood look when they are held side by side—and then to imagine how the wood might be used for a special project—these are unique quality-time experiences that should not be missed.

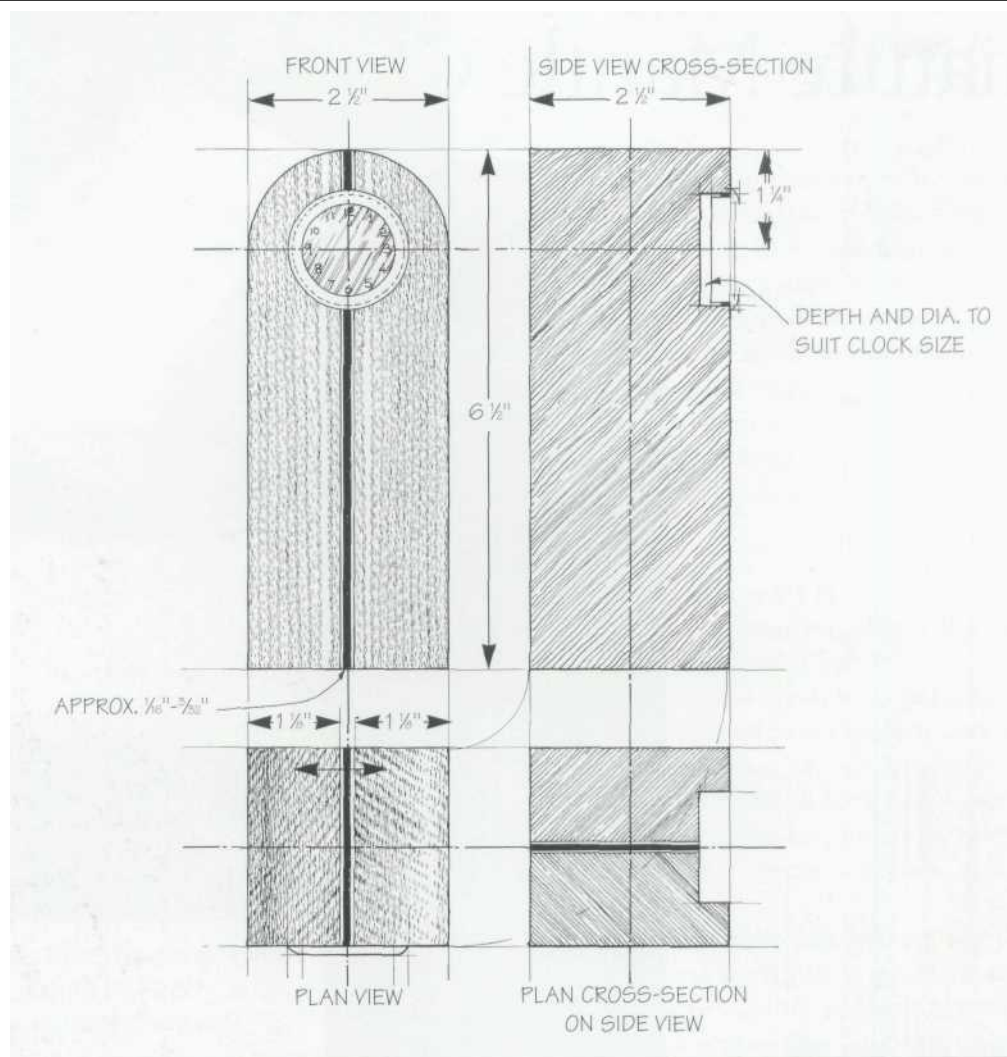
This project draws its inspiration from one of my alone-in-the-workshop musings. The problem was how to bring together three relatively small pieces of choice exotic wood—a scrap of ebony salvaged from an old long-gone piece of furniture, a sliver of silver sycamore veneer left over from a marquetry project, and a short length of dark wood that I've been using to prop open the door. Anyway,

I tossed all sorts of ideas around in my head—a small piece of laminated jewelry? a turning? a handle for a knife? a drawer pull? And then it came to me . . . why not make a small clock case!

## MAKING THE CLOCK CASE

First things first. Before you do anything else, you need to search out a miniature watch-clock and a Forstner drill bit sized to fit. For example, as my clock (described in the catalog as a "watch-clock miniature suitable for block and drilled recess mounting") measures slightly under 1 5/16" diameter across the span of the back and about 1/4" in depth, I reckoned that I needed a drill size of 1 3/8".

When you have obtained the clock-watch and the drill size to suit, take your chosen pieces of wood and plane and sand the mating faces down to a true finish. This



done, smear white PVA glue on the mating faces and clamp up.

Having waited for the glue to cure, set the compass to a radius of  $1 \frac{1}{4}$ " , spike it on the center veneer at a point about  $1 \frac{3}{8}$ " down from top-center, and then strike off a  $2 \frac{1}{2}$ "-diameter half-circle. When you are happy with the way the lines of the design are set out on the wood, move to the band saw and cut out the curve that makes the top of the case.

Use a square to mark out the baseline, double-check that it is absolutely true, and then cut off the waste with a small-toothed backsaw. It's important that the baseline is square to the center line of the block, so spend time getting it right.

When you are sure that the block sits square and true, move to the drill press and bore out the recess for the clock. Bore down to a depth of about  $\frac{3}{8}$ " .

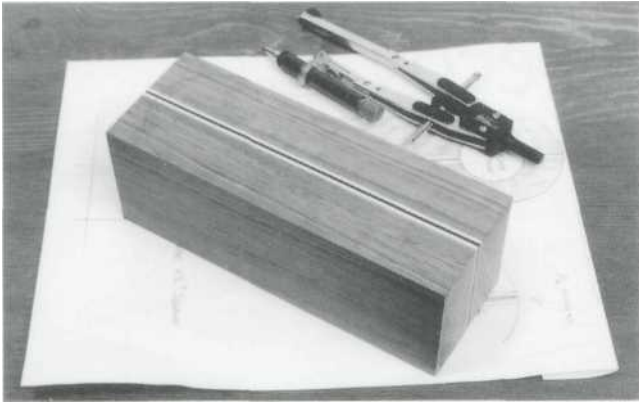
Having bored out the recess, take a scrap of sandpaper

and rub down the inside of the recess, so that the clock-watch is a tight push fit. If necessary, use a straight gouge to cut a little scoop for the hand-setting knob that sticks out at the side of clock case. When you have achieved a good fit of the clock-watch in the recess, rub the whole block down on a sheet of fine-grade abrasive paper. Finally, burnish the block with beeswax, slide the clock-watch mechanism in place, and the project is finished.

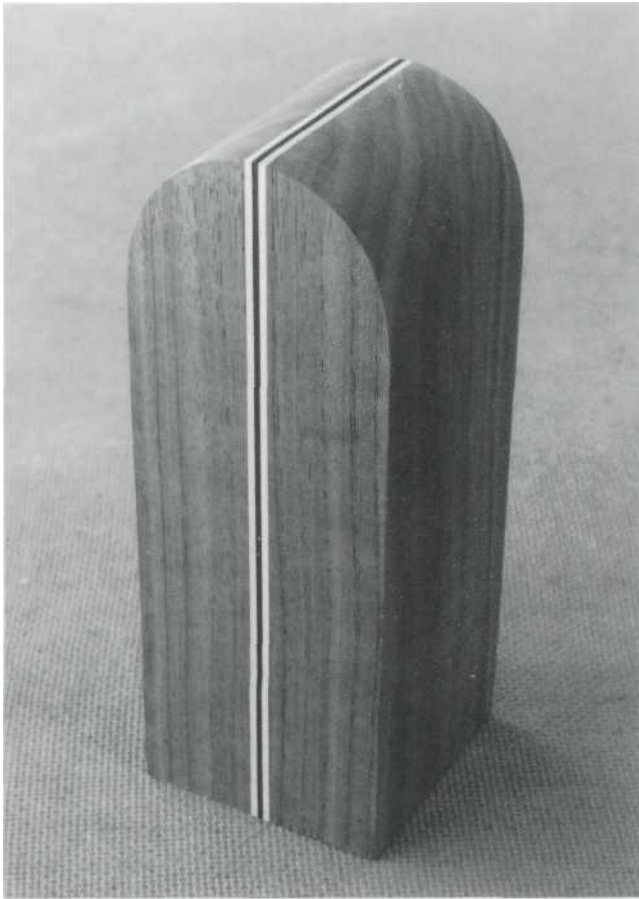
### SPECIAL TIP: LAPPING

The best way of rubbing the faces of the block down to a smooth, true finish is to use a technique known as lapping. All you do is mount a sheet of medium-grade abrasive paper to a slab of  $\frac{1}{2}$ "-thick plywood so that the grit side is uppermost. Then clamp the slab in place on the bench. In use, the workpiece is rubbed in the direction of the grain, backwards and forwards. The procedure is rerun with finer and finer grades of paper.

## STEP-BY-STEP STAGES



1. pass radius to 1 1/4" and strike off the arc that makes the top of the case. Make sure that you spike the compass point on the middle of the fine black laminate.



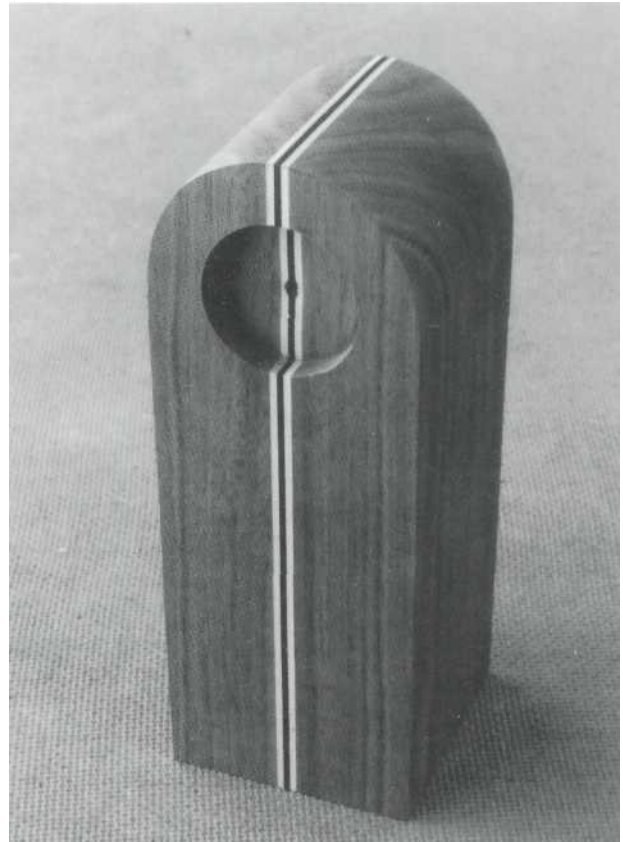
2. Having cut the curve on the band saw, run the faces of the block down on a series of lapping boards. Work through the grit sizes, from a medium-fine through a super-line flour grade. Only work in the direction of the grain, and be careful that you don't blur the sharp corners.

## MATERIALS LIST

- |                                  |                             |
|----------------------------------|-----------------------------|
| A Outer faces (2)                | 1 1/8" x 2 1/2" x 7"        |
| B Central lamination (1)         | 1/16" - 3/32" x 2 1/2" x 7" |
| C Side-of-center laminations (2) | 1/16" - 3/16" x 2 1/2" x 7" |

## HARDWARE AND EXTRAS

- D Quartz clock-watch, 1 7/16" diameter—best if it has a push-fit rubber band friction fitting



3. Having selected a Forstner bit sized to fit the diameter of your clock, sink a recess to the appropriate depth. The success of the project hinges on the hole being perfectly placed, so spend time getting it right.



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# Swivel-Head Duck Decoy



Duck decoys are no more than carved and whittled imitations of the real thing. The word *decoy* comes from the Dutch words *kooj* and *koye* meaning to lure or entice. Though old accounts suggest that decoys were first used by Native Americans, the notion was soon taken up by the white American settlers. It's a wonderfully simple idea: The carved wooden ducks are anchored out in the water, along comes a flock of ducks attracted by the decoys, they circle with a view to settling down on the water, and—Bang!—the hunter is provided with easy targets. Okay, so it's not very sporting, but when one must. . . . Though once upon a time duck decoys were swiftly carved and whittled by the hunters to their own design and then thrown in a corner for next season, they are now

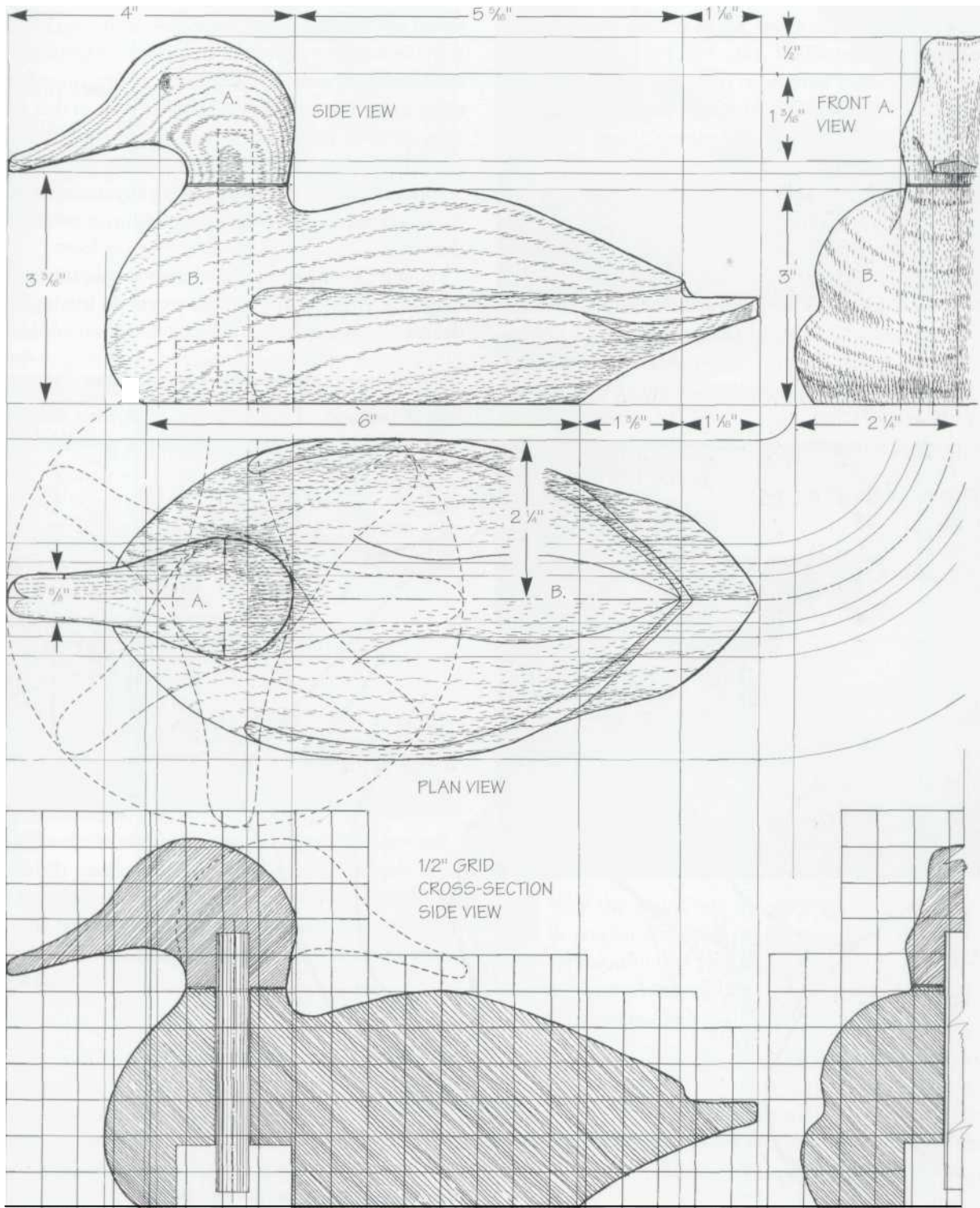
considered to be extremely valuable and very collectible examples of American folk art.

## MAKING THE DUCK

Having first studied the working drawings, and variously looked at pictures of ducks, collected magazine clippings, made sketches and drawings, and maybe even used a lump of Plasticine to make a model, take your two carefully selected blocks of wood and draw out the profiles as seen in side view. Make sure that the grain runs from head to tail through both the head and the body.

When you are happy with the imagery, use the tools of your choice to clear the waste. I used a band saw, but you can just as well use a bow saw, a straight saw and a





rasp, a large coping saw, a gouge and a drawknife, or whatever gets the job done. Next, set the two parts down on the bench—so that you can see them in plain view—and draw the top views out on the partially worked surfaces. Don't fuss around with the details, just go for the big broad shapes. Once again, when you are pleased with the imagery, use the tools of your choice to clear the waste.

When the shapes have been roughed out, then comes the fun of whittling and modeling the details. Having noticed that this is the point in the project when most raw beginners lose their cool and start to panic, I should point out that there are no hard-and-fast rules. If you want to stand up or sit down, or work out on the porch, or work in the kitchen, or whatever, then that's fine. That said, your wits and your knives need to be sharp, you do have to avoid cutting directly into end grain, and you do have to work with small controlled paring cuts.

Of course, much depends upon the wood and your strength, but I find that I tend to work either with a small thumb-braced paring cut—in much the same way as when peeling an apple—or with a thumb-pushing cut

that is managed by holding and pivoting the **knife** in one hand, while at the same time pushing against the back of the blade with the other hand. Either way, you do have to refrain from making slashing strokes.

When you come to the final modeling, start by sitting down and having a good long look at the duck. Compare it to the working drawings and any photographs that you have collected along the way. If necessary, rework selected areas until it feels right. When you reckon that the form is as good as it's going to get, use a rasp and a pack of graded sandpapers to rub the whole work down to a smooth finish. Avoid overworking any one spot; it is better to keep the rasp/sandpaper and the wood moving, all the while aiming to work on the whole form.

Finally, fit the neck dowel, run a hole down through the duck, drill out the washer recess on the underside of the base and the fixing hole on the front of the breast. Block in the imagery with watercolor **paint**, **give the** whole works a rubdown with the graded sandpapers, lay on a coat of beeswax or maybe a coat of varnish, and the duck is ready . . . not for shooting, but for showing!

## STEP-BY-STEP STAGES



If you are looking to make a strong but controlled cut, you cannot do better than go for the thumb-pushing paring approach. In action, the cut is managed by holding and pivoting the knife in one hand, while at the same time pushing against the back of the knife with the thumb of the other hand. Notice how the direction of cuts runs at a slicing angle to the run of the grain.

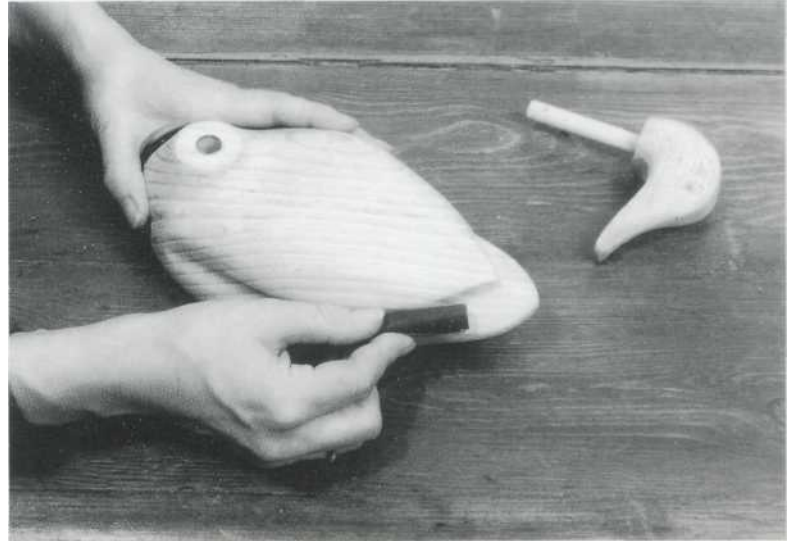
## MATERIALS LIST

A Head (1)	$1\frac{1}{4}'' \times 2\frac{1}{2}'' \times 4\frac{1}{2}''$
B Body (1)	$3\frac{1}{2}'' \times 5\frac{1}{2}'' \times 10''$
C Neck pivot (1)	$\frac{1}{2}''$ dowel $\times 4''$ long

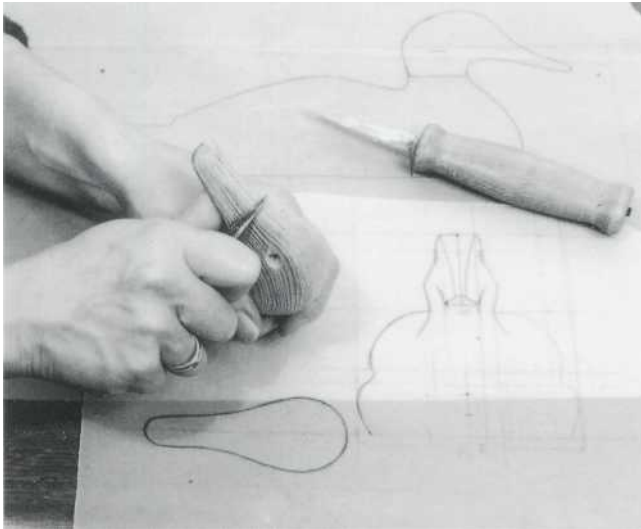
## HARDWARE AND EXTRAS

- D Glass/plastic eyes (2)
- E Plastic washers to fit the dowel (2)
- F Watercolor paint as used by artists: gold-yellow, red-brown, dark green, white, gray, blue and black

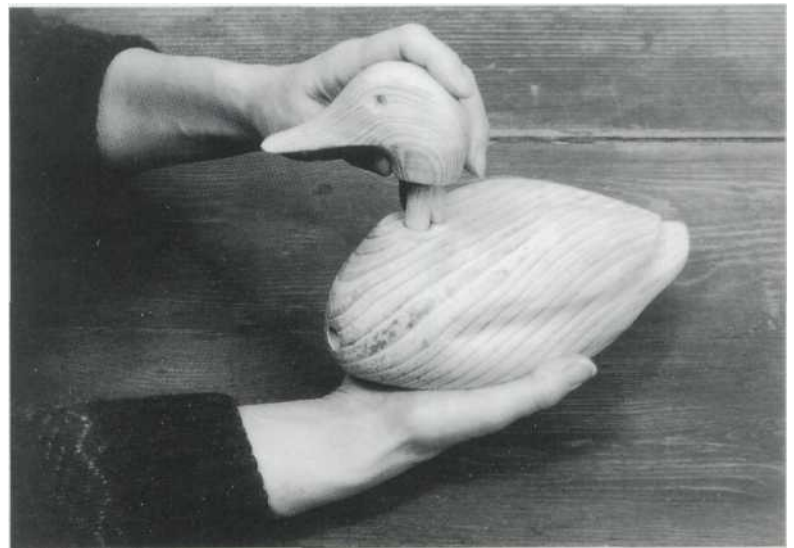
*Note that all measurements allow for a small amount of cutting waste.*



3 Use the graded abrasive papers to achieve a smooth finish. In this instance the paper is wrapped around a dowel that nicely fits the long scooped shape.



2 Use the thumb-braced paring cut to shape the characteristic cluck bill. This cut uses the thumb as a lever to increase the efficiency of the stroke. Always be ready to change knives to suit the cut—a small penknife blade for details, and a large sloyd knife when you want to move a lot of wood.



4 Slide the dowel into the neck socket and adjust the fit so that the head profile runs smoothly into the body. Be mindful that you might well need to modify the head and/or the body so that the two parts come together for a close-mating fit.





5 Now, with the washer in place, ease the pin/peg through the breast hole and push it into the dowel hole. Use plastic or leather washers to ensure a good tight-turning fit.

#### **SPECIAL TIP: SAFETY WITH A KNIFE**

The degree of safety when using a knife will depend to a great extent on your stance and concentration. Okay, so there is no denying that a knife is potentially a very dangerous tool, and it's not a tool to use when you are tired or stressed, but that said, if the knife is sharp and the wood easy to cut, then you shouldn't have problems.

If you have doubts, then have a try out on a piece of scrap wood. And don't forget . . . a good sharp knife is much safer than a blunt one that needs to be worried and bullied into action.

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# Matching Letter Opener and Desk Set

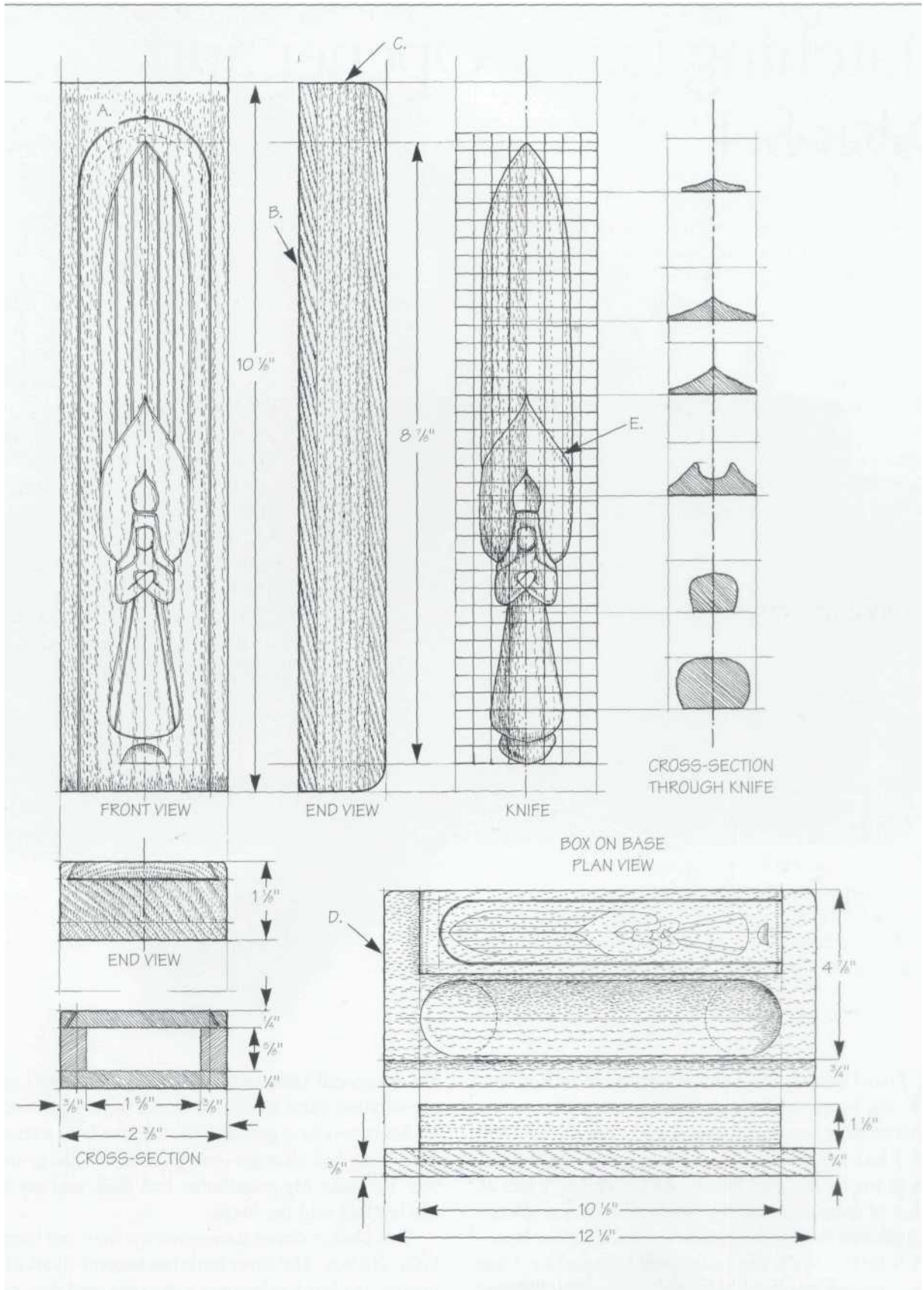


When I was a school kid, I was obsessed with collecting knives and boxes. I had a box with a secret compartment, a box with a swivel-and-twist lid, and best of all, I had a beautiful old pen case dated about 1880, given to me by my grandfather. As for knives, I had all manner of dirks and daggers. My favorite was a stiletto-type knife that had a silver handle and a red leather case—really beautiful! Well, you know what kids are like, I was forever making up games and adventures that involved hiding things. Anyway, to cut a long, sad story short, I

hid my special knife and box in my grandfather's garden, my vacation came to an end, and I went to school. And no doubt you have guessed when I came back a year later, everything had changed—no grandfather, no garden, no box, no knife. My grandfather had died, and my grandmother had sold the house.

This project draws its inspiration from my long-gone knife and box. The silver knife has become a carved letter opener, the box has become a pen case, and they both go together to make the perfect desk set.





## MAKING THE BOX

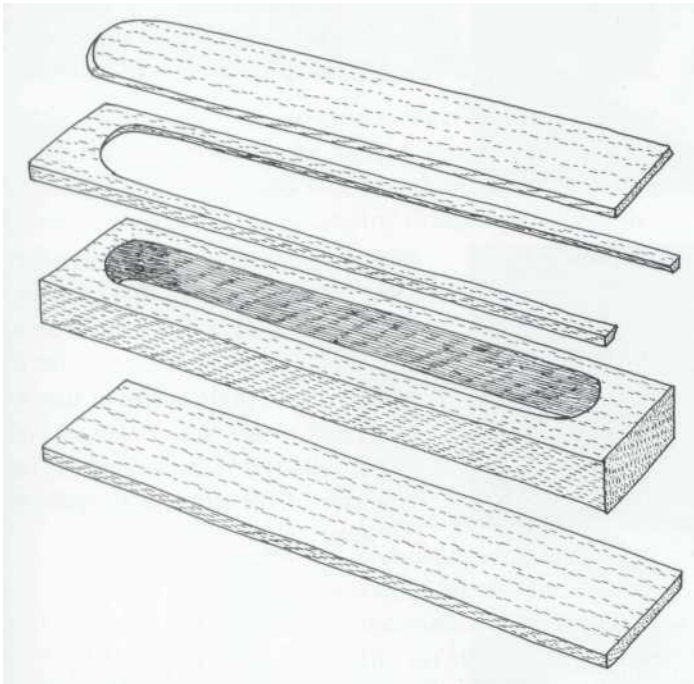
Having studied the working drawings and seen how the box is laminated up from three layers, take your three pieces of carefully chosen wood and pencil label them "lid," "middle" and "base." Set the middle section out with a center line, and use the 1 5/8"-diameter Forstner drill bit and the scroll saw to clear the waste. Clean out the cavity and take it to a good finish.

Take the lid piece and use a pencil, ruler and compass to draw out the design—meaning the shape of the sliding lid. This done, move to the scroll saw, set the table to "tilt," and fret out the lid. You should finish up with a lid edge miter that undercuts the lip of the frame.

When the four component parts for the project—the base, the hollowed-out middle section, the top frame and the lid—are all nicely finished, smear glue on the mating faces, sandwich them together and clamp up. Be sure to wipe up any glue that oozes into the inside of the box, or between the top of the middle section and the undercut lip of the frame.

Finally, the box is glue mounted on a simple pen tray base. Then the whole works is cleaned up with the plane and rubbed down to a smooth, round-cornered finish.

## STEP-BY-STEP STAGES



## CARVING THE BOX AND THE KNIFE

Carefully draw out the angel design, make a tracing, and then pencil-press transfer the imagery through to both the top of the sliding lid of the box, and the piece of wood that you have chosen for the knife. This done, take the tools of your choice and swiftly set in the lines of the lid design with a V-section trench. I prefer to use the knife to cut the incised lines, but you might well prefer to use a small V-tool.

When you work with the paper knife, start by fretting out the profile on the scroll saw. This done, take a small low-angled shoulder plane and clear the bulk of the waste from the blade. When you are happy with the basic form, use a knife to whittle the details. All you do is set the primary lines in with stop-cuts and then shave the wood down to the level of the cuts, so that selected areas are left standing in relief. For example: When you come to the skirt, slice a stop-cut around the line of the waist, and then shave the wood from the hem through to the waist, until the skirt takes on the characteristic conical and rounded shape. And so you continue, working here and there over the design, all the while setting in stop-cuts and cutting in towards the stop-cuts until you **achieve** what you consider to be a good form.

Finally, rub all the surfaces down to a smooth finish, give the whole works a thin coat of Danish oil, and then use beeswax to burnish to a sheen finish.

- 1 When you have made the four component parts for the box—the base, the hollowed-out middle section, the lid, and the frame into which the lid slides—take the finest graded sandpaper and rub the mating faces down to a good finish. Pay particular attention to the inside of the hollow and the mitered edge of the lid frame.

## MATERIALS LIST

### BOX

A Lid (1)	$\frac{3}{8}'' \times 2\frac{1}{2}'' \times 12''$
B Box center (1)	$\frac{3}{8}'' \times 2\frac{1}{2}'' \times 12''$
C Middle section (1)	$\frac{3}{4}'' \times 2\frac{1}{2}'' \times 12''$
D Base (1)	$\frac{3}{4}'' \times 5\frac{5}{8}'' \times 12\frac{1}{4}''$
E Knife (1)	$\frac{3}{4}'' \times 1\frac{1}{2}'' \times 9\frac{1}{2}''$

*Note—I used American cherry throughout.*

## SPECIAL TIP: CARVING THE DETAILS

If you have any doubts at all as to how the carving ought to go—meaning the shape and the modeling of the details—the best way is to make a full-size Plasticine working model. All you do is roll out the Plasticine to the required  $\frac{3}{4}''$  thickness, cut out the profile as seen in the plan view, and then whittle and model the form in much the same way as you would with the wood. Making and using a model is a winner on many counts. You can easily replace the Plasticine if you make a mistake, you can use the Plasticine to make trial cuts and, best of all, you can use dividers to take step-off measurements directly from the model through to the wood.



2 Transfer the angel design through to the top of the lid, and to the knife. Be mindful that in both instances it's important that the design be perfectly aligned with the center line. Use a hard pencil so that the lines are firmly indented.



3 Use a small penknife to cut the incised lines that make up the design of the lid. Work each V section incision or trench with three cuts—first a single stop-cut down the center of the V to establish the depth, followed by an angled cut to each side of the stop-cut to remove the waste.





4 Having made a Plasticine model to help figure out the intricacies of the design, take a small nosing shoulder-type plane and swiftly reduce the bulk of the waste. Shape the blade by angling down each side of the center line.

6 The broad modeling is best achieved by using a small-bladed penknife to make thumb-braced paring cuts. The technique wins on at least two counts—the thumb increases the efficiency of the stroke, while at the same time giving you maximum control. The cone shape of the skirt is achieved by first running a stop-cut around the waist, and then paring down at an angle toward the stop-cut.

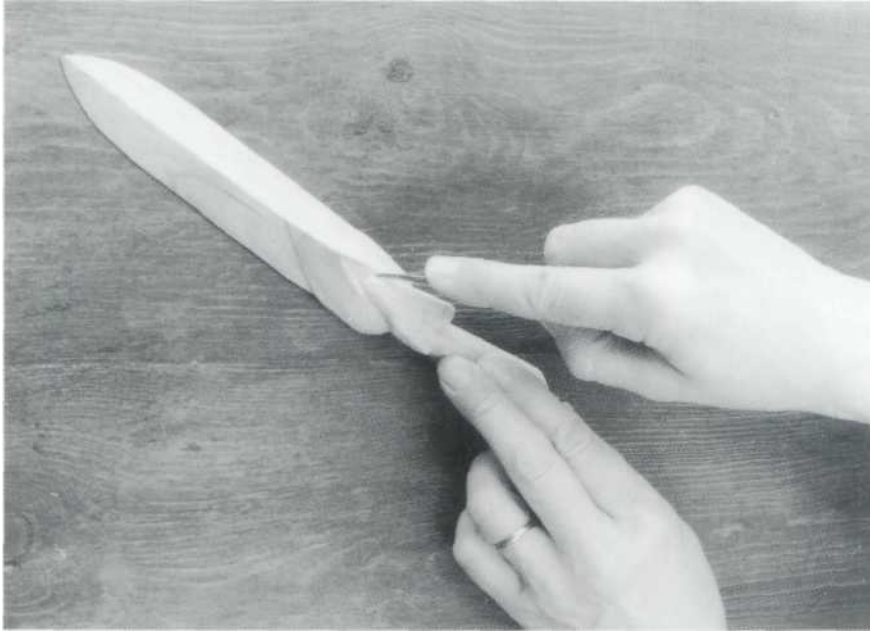


5 Use the three-stroke whittling method to block out and partially model the various basic forms.

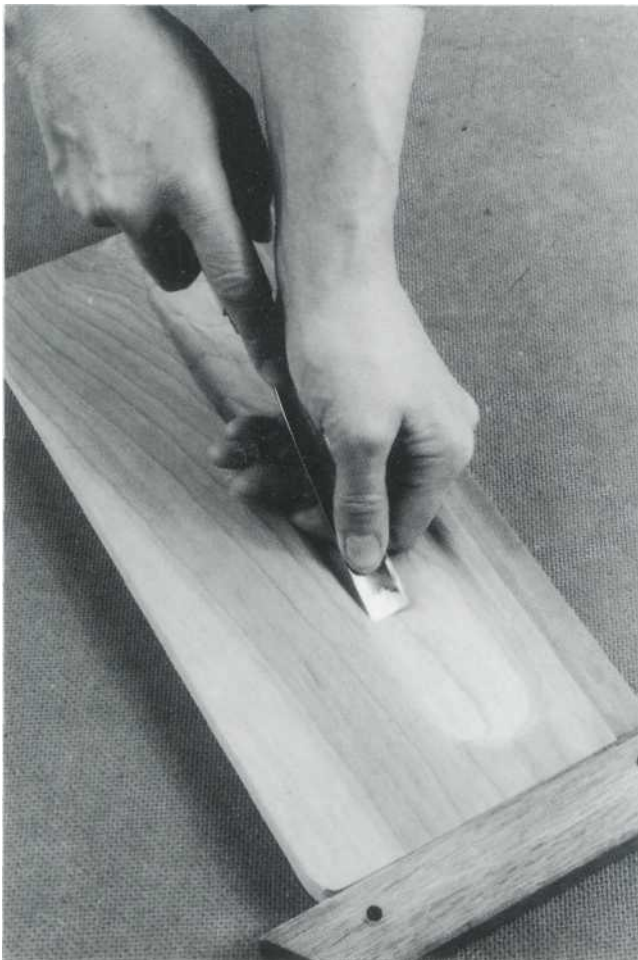
The working order is:

- Define the perimeter of the form—the skirt, head or whatever—by making stop-cuts straight down into the wood.
- Make angled cuts down into the stop-cuts to define the length and breadth of the form.
- Use restrained easing and paring cuts to rough out the details as seen in the plan side and end views.





**7** The V section that goes around the top of the head is achieved by repeatedly making a sequence of three cuts—a deep straight-down stop-cut to establish the depth of the V, followed by two cuts that angle down and in towards the bottom of the stop-cut.



**8** Once you have drawn out the shape and position of the pen tray, use a shallow sweep gouge to carve out a smooth-sided dip or depression.



## USING THE SCROLL SAW

If you are new to woodworking and maybe a bit nervous, and you plan to make small fancy items like boxes, push-along, toys, chair backs or pieces of marquetry—meaning items using thin sections of wood that have a lot of delicately curved (fretworked profiles and pierced holes—then you can't do better than getting an electric scroll saw.

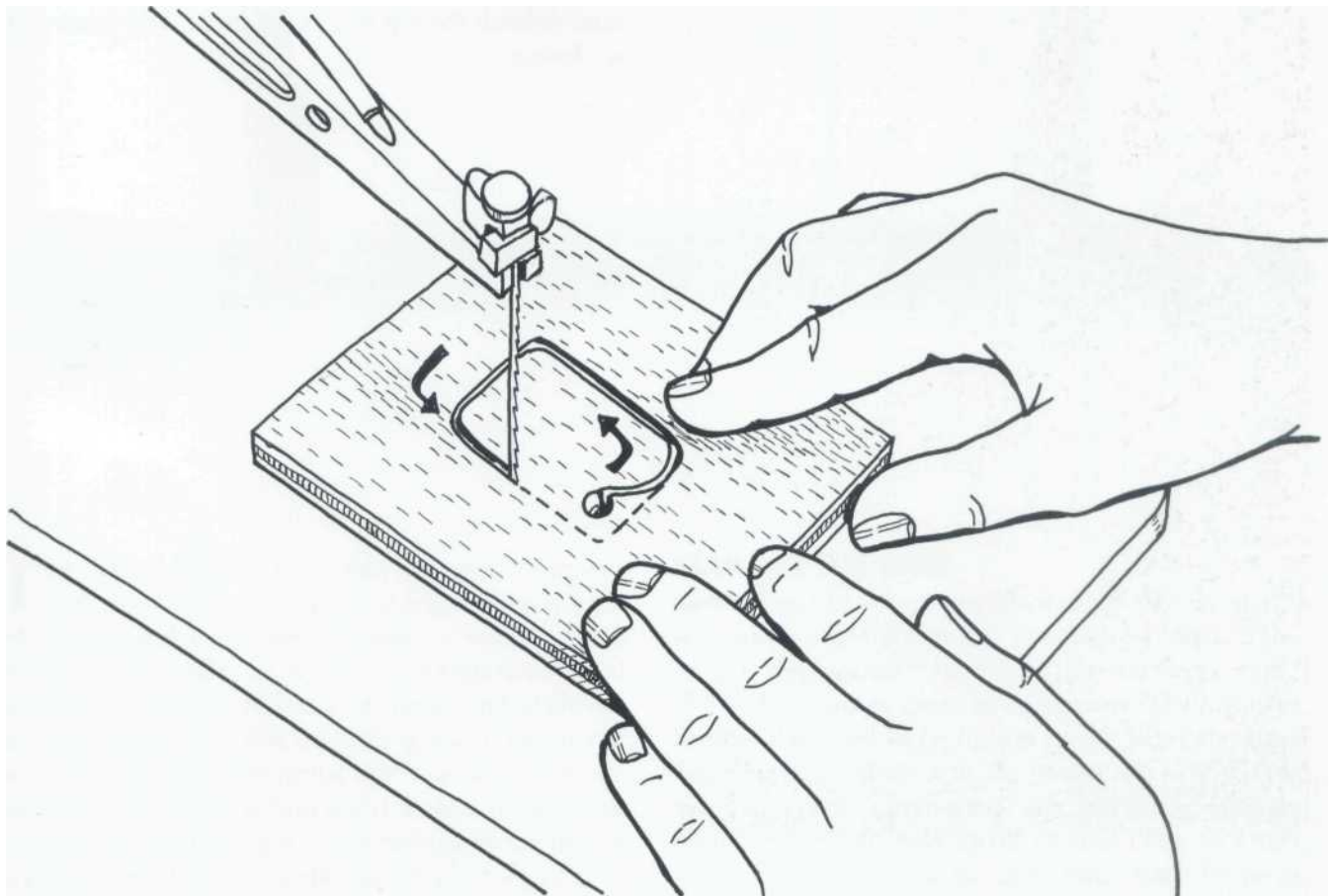
This machine, sometimes called an electric fretsaw or an electric jigsaw, is just about as safe as you can get. In truth, it is so safe that it is one of the few woodworking machines allowed in schools for young kids. In fact, I first saw one of these machines being used in a school by a ten-year-old—to make a jigsaw puzzle. Okay, so they can nip and worry fingers, but the working action is such that anything more than a grazed finger is almost impossible.

The scroll saw has a reciprocating blade, meaning a blade that joggles up and down as if to imitate the movement of a hand fret or coping saw. The bottom end of the blade is clamped in a chuck that is driven by the crankshaft, while the top end of the blade is clamped to the end of a spring-loaded arm. The blade is fitted with the teeth pointing downward, so that it cuts on the downstroke. In

use, the workpiece is advanced across the worktable toward the joggling blade, and maneuvered so that the moving blade is always presented with the line of the next cut. The wonderful thing about these saws is that the resultant cut edge is so clean that it hardly needs sanding. If you are thinking about buying and using an electric scroll saw, the following tips and pointers will help you on your way.

**Saw Table**—There are about six machines currently on the market—German, British, Canadian and American. Though they are all pretty good, it is most important that you get an up-to-date machine that has a table-tilt option. This feature allows you to tilt the worktable so you can make a cut that is variously angled to the working face, as in this project. A good tip is to rub over the work surface with a white candle before use. It lowers the wood-to-table friction so that the workpiece glides rather than staggers.

**Blade Clamp**—From one machine to another, there are all manner of weird and wonderful mechanisms used to clamp the blade. For example, one machine has a clamping block that is tightened by means of an Allen wrench/



### CUTTING A PIERCED WINDOW

*In use, the workpiece is maneuvered and advanced so that the moving blade is presented with the line of the next cut.*

key, another has a pronged finger that supports pin-end blades, and yet another has a clamping block that is tightened by means of a large thumbscrew/wing nut. While each system has its good and bad points, I think overall the large thumb-screw is the best option. I say this because the Allen wrench option soon distorts, and the pin-holding mechanism on some machines is made of butter-soft, easy-to-bend metal.

**Blades**—The standard scroll saw blade is 5" long and flat-ended. Coming in a whole range of tooth sizes, from coarse through super fine, the blades are designed variously to cut everything from solid wood, plywood and plastic, to thin mild steel, brass and aluminum. If you find that the blade bends and drifts or burns the wood, then chances are it is badly tensioned and/or blunt and needs replacing.

**Dust-Blowing Mechanism**—When the saw is in use, the sawdust piles up and covers the line of cut so that you can't see where you are going. Though most scroll saws have a bellows and tube mechanism that blows the dust away from the drawn line, the pity of it is that the dust is blown directly into the user's face—all good fun! If this is a worry to you, then it's best to wear a face mask.

## CUTTING AN INTERIOR PIERCED "WINDOW"

A good part of the pleasure of using a scroll saw is its ability to cut a perfect hole or "window" in the middle of a piece of sheet wood. For example, it is perfect for fretting out models, and for making pierced chair back slats—anything that is relatively small and intricate.

The working procedure for piercing enclosed "windows" is:

- Drill a pilot hole through the area of waste big enough to take the blade.
- With the machine unplugged, ease off the tension until the blade goes slack.
- Unhitch the top end of the blade from its clamping block.
- Pass the end of the blade up through the pilot hole and rehitch it to the top block.
- Retension the blade until it "pings" when plucked.
- Hold the workpiece firmly down on the table so that the blade is clear of the sides of the pilot hole, and then switch on the power.
- Fret out the "window" until the waste falls free.
- Finally, switch off the power and then release the tension, unhitch the top end of the blade, and remove the workpiece.

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# Classic Bow Saw



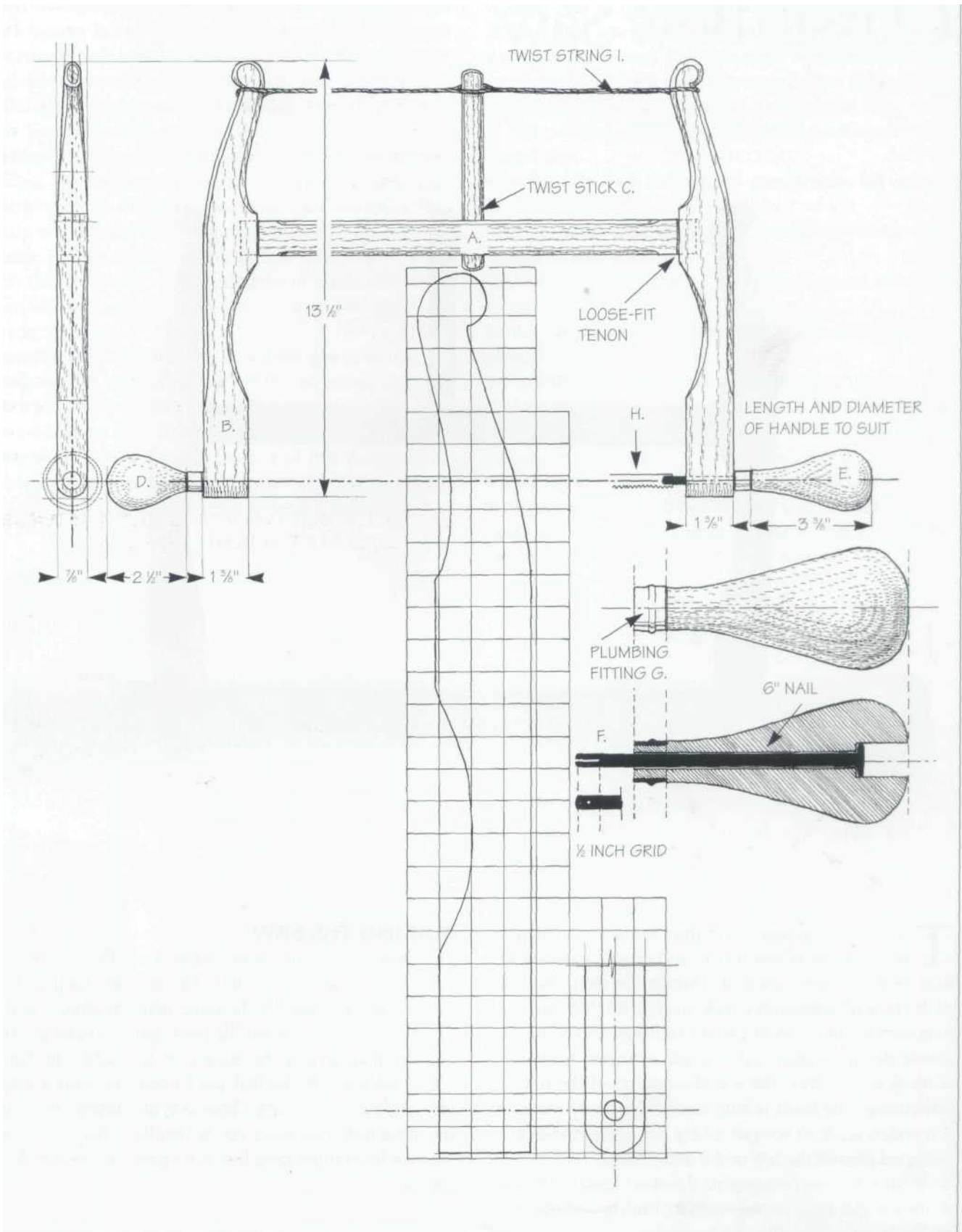
The classic bow saw, sometimes known as a Turner's saw, is a tool whose design and origins go way back into the dim and distant past. Though I've seen bow saws of this type illustrated on Greek vases, in English medieval manuscripts, in Albrecht Durer's etchings, and so on, the classic design is such that it is still as useful for curved work as it ever was. The actual workings of the saw are fascinating: The blade is held under tension by means of a wooden stick or tongue and a twisted twine that is wrapped around the top of the side cheeks.

What else to say, except that if you are looking to make a unique gift for a woodworking buddy—something really special—then this is a beauty!

## MAKING THE SAW

First things first—buy your blade. I say this because, if your blade is a different size than the one used in this project, you can modify the other material sizes to suit.

The bow saw is made in three parts. There are the handles that need to be turned on the lathe; the fancy frame sides or cheeks that are fretted out with a scroll saw, coping saw or even a bow saw; and finally, there are the metal parts that make up the handles. Okay, so it does sound a bit complicated, but don't panic, it's as simple as can be.



## SHAPING THE FRAME

Having pencil-press transferred the designs through to the wood, fretted out the shaped ends, and used a straight saw to cut out the crossbar, use a small spokeshave and a plane to skim the three component parts down to a good finish. Cut chamfered edges on the crossbar and the cheeks and generally round over the curved shapes, all as shown in the working drawings.

When you come to cutting the mortise and tenon joints—meaning where the crossbar fits into the end cheeks—all you have to remember is that the joints both need to be a loose fit. The best procedure is to cut the joint for a good push fit, and then trim the ends of the tenon to a rounded finish so that they are an easy rocking fit in the mortise.

Establish the handle centers on the bottom ends of the cheeks. Then run them through with a hole that is a loose fit for your 6" nails. Finally, use a piece of offcut to make the twist stick, sometimes called a toggle or a tongue.

## TURNING THE HANDLES

Having studied the working drawings and seen how the two handles are quite different in length, take your chosen piece of wood—we used maple—and turn the two handles in one piece. Make sure the stubs or spigots fit your metal ferrules, and then rub them down on the lathe and part off.

As to how you drill the holes through the handles, it really depends on your workshop and equipment. I found that the best way was to grip and support the handle in the four-jaw chuck—meaning the chuck on the lathe—and then use a drill chuck mounted on the tailstock end of the lathe. The good thing about this method is that it is a foolproof way of making sure that the holes are perfectly centered. All I did was drill the larger diameter recess hole and then follow through with a smaller diameter hole.

When you have made the handles, all nicely smooth and drilled, then comes the tricky business of fitting the metal parts. It's best to start by fitting the ferrules. Take your metal tube (I used two copper plumbing fittings, but you can just as well use a slice off the end of a brass tube) and cut it off so that you have two 1/2" lengths or rings. Use a file and steel wool to polish the rings to a smooth, shiny finish, and then tap them in place on the turned handle stubs.

Finally, pass the 6" nails through the handles and the ends of the frame, cut them to length with a hacksaw, and cut slots into the ends of the nails so that they fit your chosen bow saw blades. Mark the position of the blade-end holes. Then run 3/32"-diameter holes through the nail ends, so that you can secure the blade ends with small nails or split pins.

## PUTTING IT TOGETHER

When you have made all six component parts—the two scrolled cheeks, the crossbar, the two handles and the twist stick—then comes the fun of putting the saw together. Start by fitting the H-frame together. This done, pass the slotted nail ends through the bottom ends of the cheeks and fit the blade with the pins. Make sure that the teeth are looking away from the largest of the two handles. Wrap three or four turns of strong twine/cord around the fancy ends of the cheeks and knot the ends of the cords together to make a loop. Finally, slide the twist stick in place between the turns of twine and twist it over and over so that the cheeks pull apart and the blade is held under tension.

## SPECIAL TIP

Since the bow saw cheeks are put under a lot of tension and stress, it's vital that you choose the best possible wood. I've checked around and seen that the handles are usually made from beech, maple or ebony, and the H-frame made from beech or ash. We have gone for an ash frame and maple handles.

## MATERIALS LIST

### FRAME

- A Crossbar (1)  $\frac{1}{2}'' \times \frac{7}{8}'' \times 12''$
- B Frame cheeks (2)  $\frac{7}{8}'' \times 2'' \times 14''$
- C Twist stick (1)  $\frac{1}{4}'' \times \frac{3}{8}'' \times 6\frac{1}{2}''$

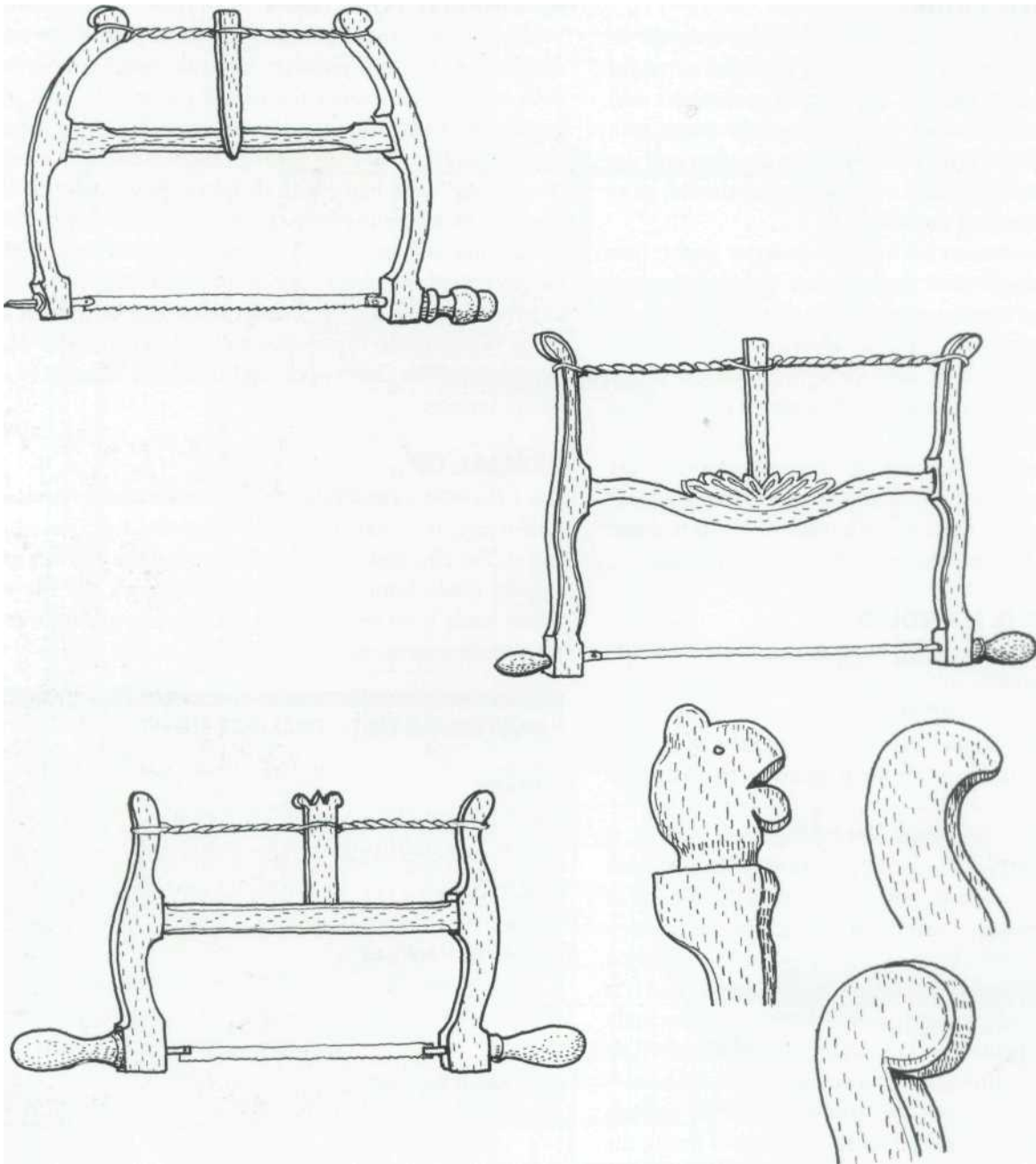
### TURNED HANDLES

- D Large handle  $2'' \times 2'' \times 14''$ —this length allows for a good amount of turning waste
- E Small support handle (1)

### HARDWARE AND EXTRAS

- F Metal rods to hold the blade 6" nails (2)
- G Metal ferrules  $\frac{1}{2}''$ -diameter tube (2)
- H Bow saw blade 12" blade  
twist cord, 60" long
- I Strong waxed twine 8' long
- J Split pin

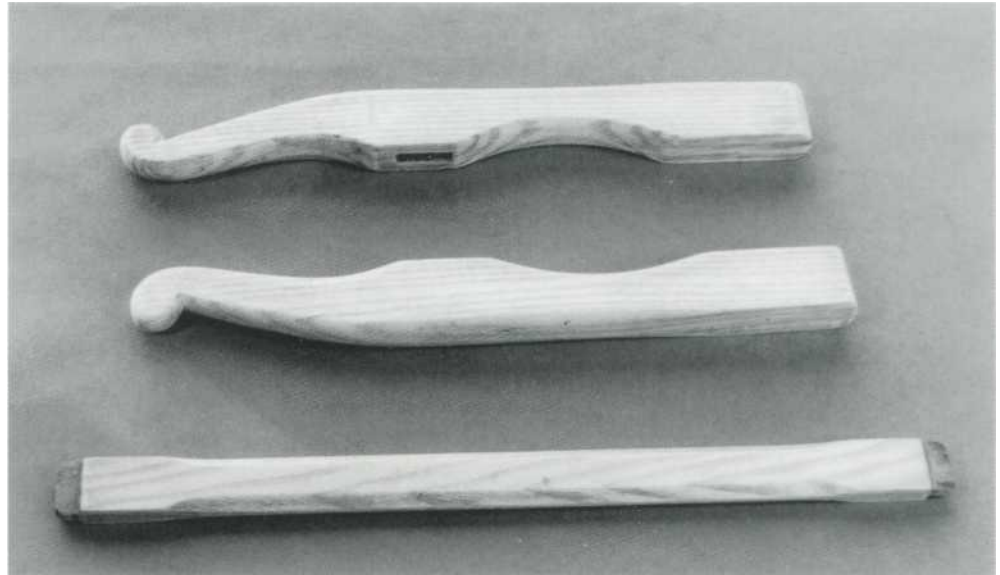




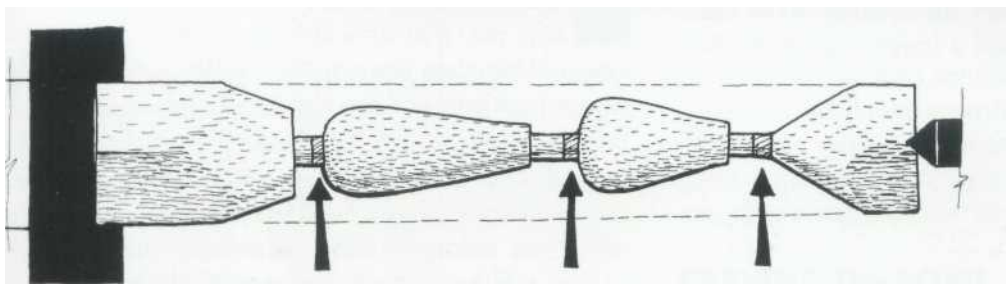
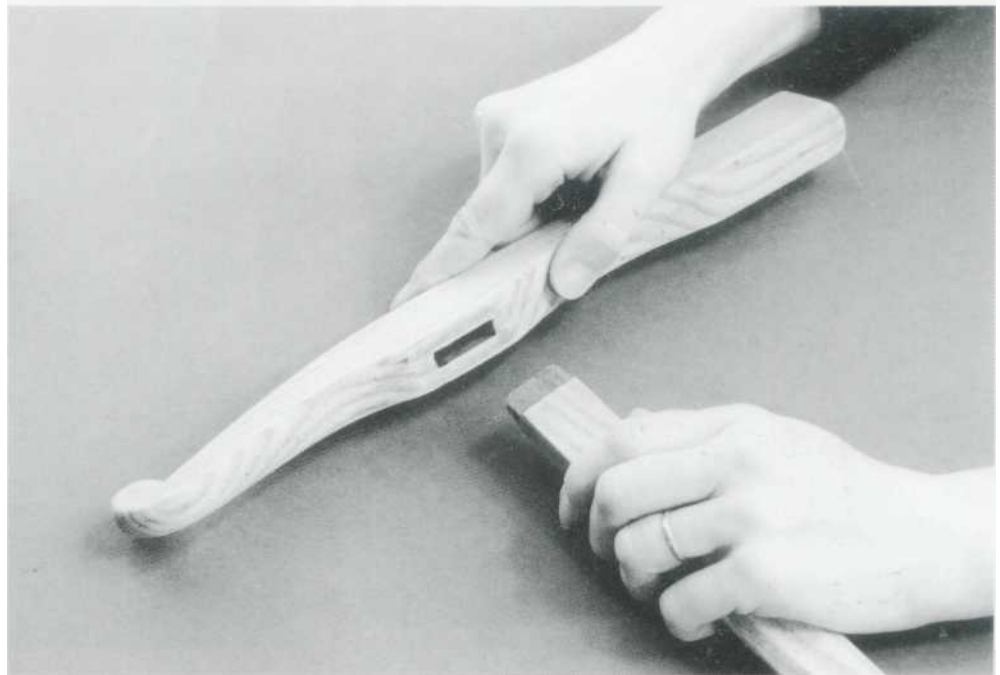
### STEP-BY-STEP STAGES

1 An old English bow saw with curved cheeks and stop-chamfered details is shown at top left; an old English bow saw with unusual carved detail at top right. An English bow saw with a whittled twist stick is shown at center left; a selection of carved cheek scroll designs at center right. Shown at bottom, a European bow saw tends to be bigger, with straight cheeks and a much wider blade.

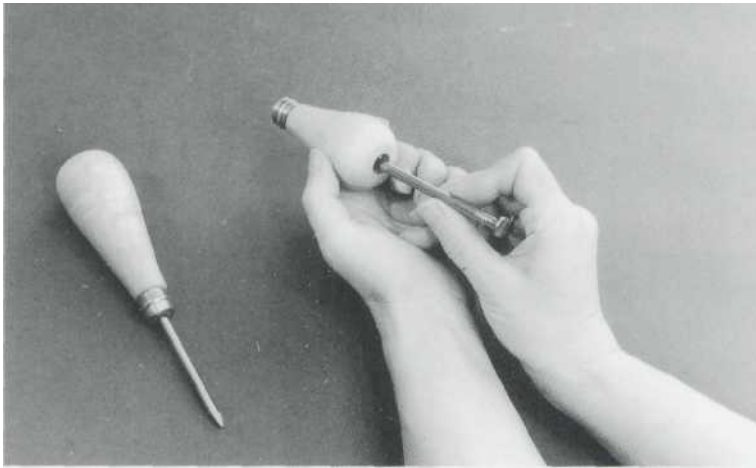
2 The three parts that go to make the H frame: the two scrolled cheeks and the crossbar. If you look closely at this photograph and compare it to the finished project, you will notice that I had to shorten the crossbar to fit the only available blade.



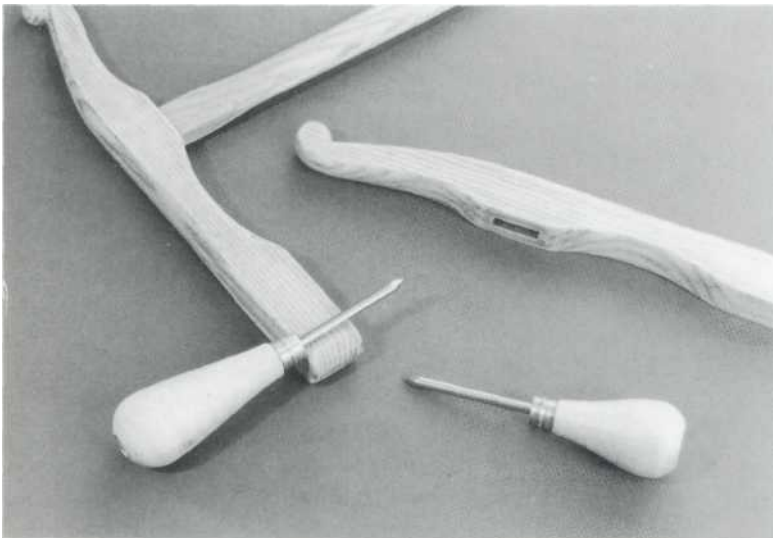
3 Trim and adjust the tenon so that it is a loose rocking fit in the mortise. Notice how the corners of the mortise need to be nipped off at an angle.



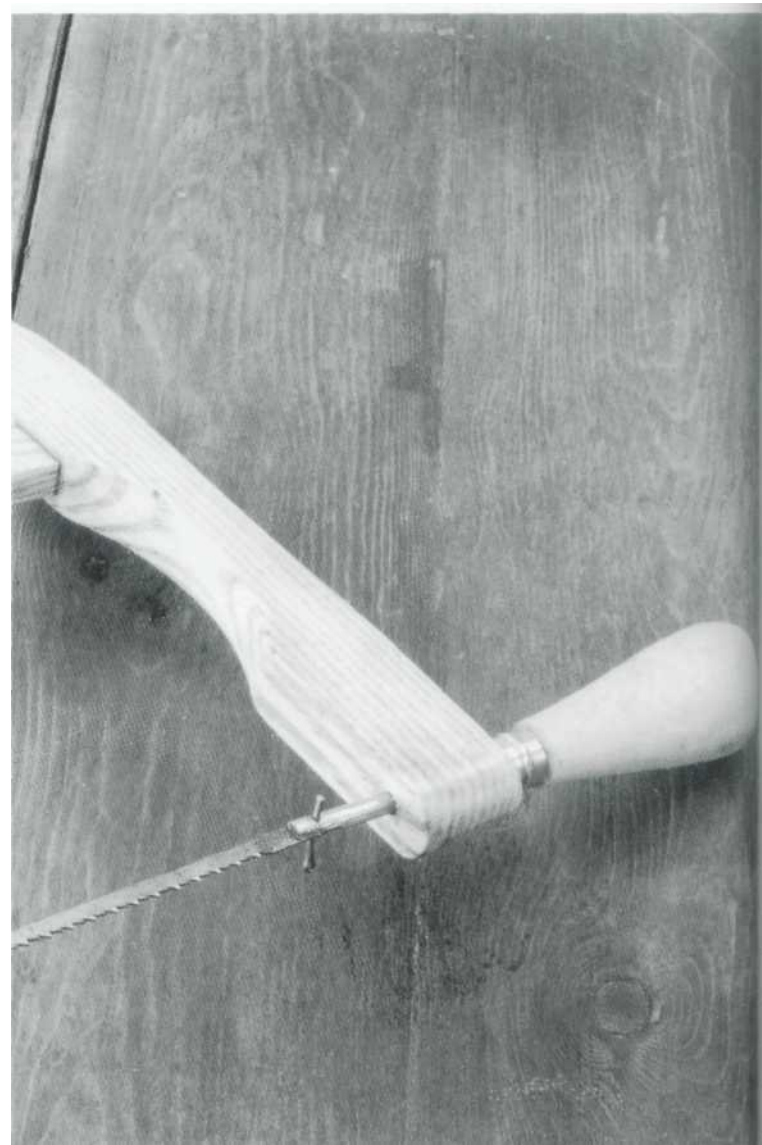
4 The on-lathe sequence—from left to right—the headstock waste, the parting waste, the large handle, the ferrule stub, the parting waste, the small handle, the ferrule stub, and finally the parting and tailstock waste. Note that the arrows indicate the parting waste.



5 Bend the nail slightly and pass it through the handle for a tight captured fit. See how the nail head fits snug and flush in the recess.



6 Check the length of the nail against the width of the frame and then mark the position of the blade slot accordingly. If you need a longer nail stub, then deepen the recess hole.



7 Slide the blade in the slot and fix it in place with a split pin. If at some time you need to fit a slightly longer blade, then you can slide washers on the nail between the ferrule and the cheek.

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# Carved Fruit Bowl



There is something magical about carving bowls. Do you know what I mean? One moment you have a slab of wood—nothing very special, just a piece of wood that might or might not end up on the fire—and the next moment you have a carved bowl that is a useful part and parcel of your life. We have this bowl that my Welsh grandfather made. It wouldn't win prizes and it isn't so beautiful, and it is a bit stained and has somehow been slightly scorched on one side, but for all that, it has always been with me. When I was a kid with chicken pox, the bowl was filled with apples and placed beside the bed; it was beside me when I was studying for my exams; it was given to me when I got married, and no doubt I will give

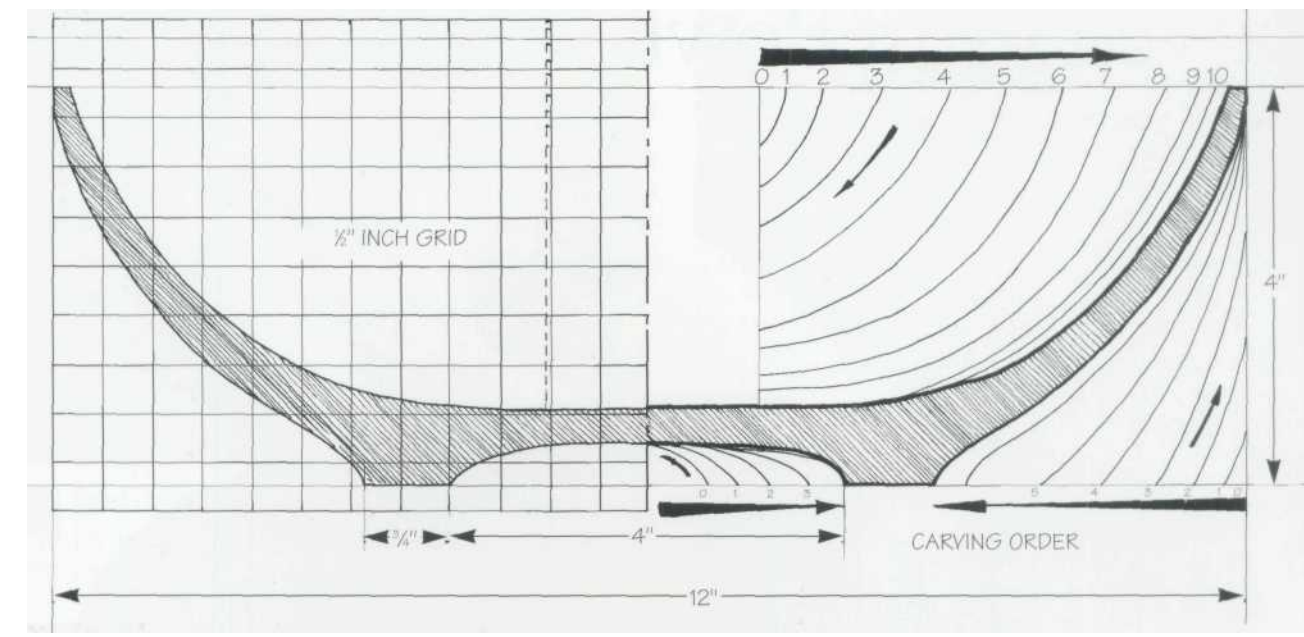
it to one of my sons somewhere along the line. It has become an heirloom, something precious!

So there you go, if you are looking to make a special gift, one that might well see the next millennium in and out, then perhaps this is the project for you.

## **CARVING THE BOWL**

Before you do anything else, you need to search out a block of easy-to-carve wood about 4" thick, 12" wide, and 12" along the run of the grain. You could use a wood like lime, a fruit wood, a piece of yellow pine, or whatever, as long as it's relatively easy to carve and free from splits and knots.





Pencil label the two 12" X 12" faces, one "top rim" and the other "foot rim." Now, with the slab set "top rim" face uppermost, first draw crossed diagonals to establish top-center; then use the compass or dividers to scribe out two circles, one with a radius of 6" and one with a radius of 5 1/2". Rerun this procedure on the "foot rim" side of the slab, only this time have the two circles at 2 3/4" radius and 2" radius. When you're happy with the way the wood has been set out, use a band saw to cut out the blank. This done, move to the drill press and run a good size pilot hole into the center of the "top rim" side of the wood. Drill down to a depth of exactly 3 1/4". I used a 2"-diameter Forstner bit, but a 1"-diameter would be fine. Being mindful that the bottom of the hole marks both the level of the inside bowl and the thickness of the base, it is vital that you don't go deeper than 3 1/4".

With the workpiece set down on the bench so that the "top rim" face is uppermost, take a mallet and a straight, shallow sweep gouge and work around the rim of the drilled hole cutting back the waste. The working procedure should go something like this: Work once around the hole scooping out a ring of waste, work around this initial ring scooping out another ring of waste, and so on, all the while backing up until you reach what will become the inside rim of the bowl. When you have cleared one level of waste, return to the edge of the drilled hole and

start over. So you continue, clearing the waste level by level until you begin to establish the beautiful shape of the inside of the bowl.

Use whatever tools best do the job. For example, I started with the straight gouge and the mallet, then changed to a front-bent gouge, and finally I switched to using a small hooked knife for tidying up.

When the shape of the inside of the bowl is well established, turn the workpiece over so that the base is uppermost, and set to work carving and shaping in much the same way as already described. The carving procedure for the outside of the bowl is pretty straightforward, only this time you need to work in two directions—from the inside edge of the foot ring and in toward the center of the base, and from the outside edge of the foot ring and out and down towards the rim.

And so you resume, carving the inside of the foot ring a little, carving the bold convex shape of the outside of bowl profile, carving the inside of the bowl a tad more, and so on and on, until the wall thickness ranges between about 3/8" at the rim to 5/8" outside the foot ring. And of course, all along the way, you have to keep your tools razor sharp so that each and every cut is clean, crisp and controlled. As you get nearer to the beautiful bowl shape that is hidden just below the surface of the wood, you have to be more and more cautious with your cuts.



## SPECIAL TIPS AND RULES OF THUMB

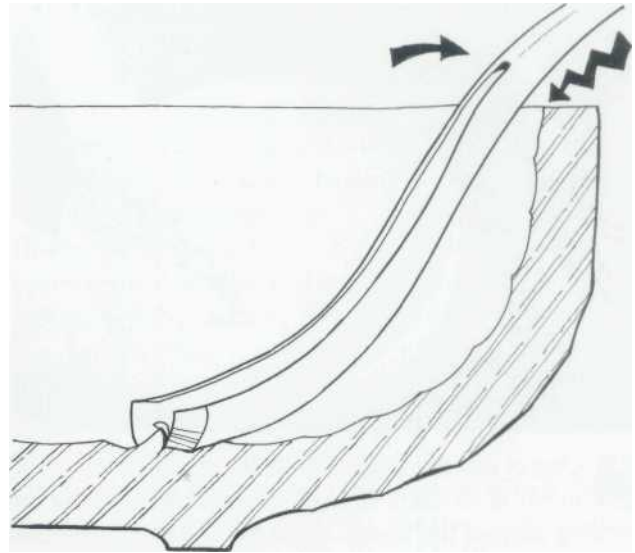
It's all straight forward, as long as you stay with the following guidelines:

- Try to set up a work rhythm—carve for a few minutes, then stroke the tool on the stone and strop, then stand back and be critical, and then go back to a few minutes of carving, and so on. You will find that this way of working ensures that everything is controlled . . . the tools stay sharp, you have time to assess your progress, and you don't get tired.

- As the bowl nears completion, you will find that it is more difficult to grip and hold the bowl. The best way is to either cradle it in your lap or nestle it on a pile of rags.

- When you are carving the inside of the bowl—when it's nearly finished—you have to be extra careful that you don't lever on and break the relatively fragile rim. To prevent this end, you might need to use one of the bent gouges rather than a straight gouge. I would recommend either a no. 5 bent gouge at about 3/4" wide, or perhaps a no. 7 spoon gouge at about the same width. Be mindful that the flatter the sweep (meaning the shape of the blade in cross section) the greater the chance that the corners of the blade will cut and tear the wood.

## STEP-BY-STEP STAGES

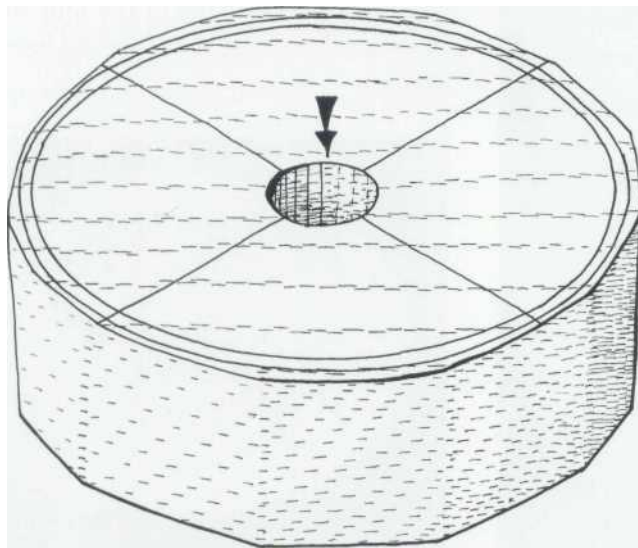


### CARVING THE BOWL INTERIOR

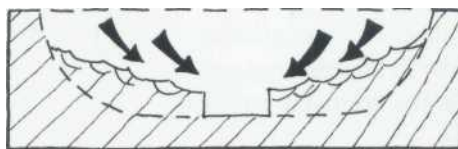
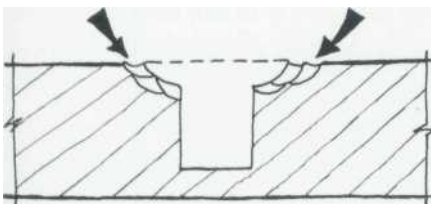
The swooping shape of the bent **gouge** lets you carve the concave curve without levering the shaft of the tool on the **fragile** rim.

### MATERIALS LIST

A Piece of wood (1)	4"×12"×12"—with the grain running along the length, meaning across the bowl
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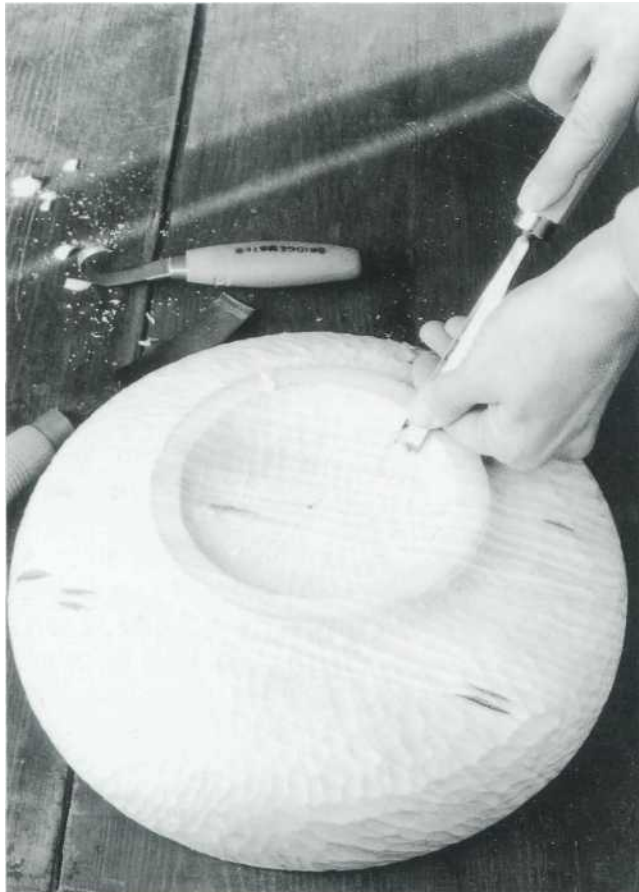


1 Having established the center of the square slab by drawing crossed diagonals and cutting the circular blank, use the 2" diameter Forstner bit to run a 3 1/4"-deep pilot hole down into the center (top). Work around the hole clearing the waste (bottom left). Clear the waste level by level, all the while backing up from the pilot hole through to the rim (bottom right).





2 One of the easiest ways to bring the bowl to a good finish is to use a hooked sloyd knife. As you are working around the inside of the bowl, be mindful that all along the way you will need to adjust your angle of cut to suit the ever-changing run of the grain.



3 When you come to carve the inside of the foot—meaning the inside of the base ring—use small, controlled cuts, with one hand pushing and the other guiding and being ready to break. Notice how in this instance you can lever the shank of the tool on the relatively strong foot rim.



4 The beautiful concave curve shape that runs down from the outside of the foot rim is achieved by thrusting down with the blade and levering back with the handle.



5 All along the way you will have to make repeated checks with the caliper. Try to aim for a section that starts relatively thick at the base and gradually tapers up to a thin rim.

## A GOOD WOOD GUIDE FOR CARVING

Wood carving is a wonderfully fulfilling and exciting area of woodworking, but only, if you choose the right wood. When I first started carving, I had in mind to carve a female torso, a Venus. I'm sure you know what I mean, a bit like Marilyn Monroe, but more so. Though my teacher told me to use lime, when I arrived at the wood yard and saw the astronomical prices, I was swiftly talked into buying—at a quarter of the price of lime—a massive piece of I-don't-know-what.

Well, when I got my "bargain" wood back to the workshop, it was a nightmare. The wood was green and wet, it was lull of iron-hard knots, it started to warp and split the moment I started carving, it made my tools rusty, the grain was wild and twisted—I could continue listing its terrible qualities. Yes, I did manage to finish my carving, but at what cost to my strength and sanity? It was truly awful, a sort of mad mix-up between Marilyn Monroe and a glandular Guernsey!

The moral of this sad little tale from my teenage years is there are no shortcuts, and there are very few bargains. You *must* use a piece of good wood. The following listing will help you on your way:

**Alder**—A sapwood tree common in low-lying areas. A wood traditionally used by North American Indians and early settlers, it is especially good for bowls and general kitchenwares.

**American Whitewood**—Known variously as tulipwood, basswood, canary wood, and many other names besides, this is a soft, easy-to-carve wood.

**Apple**—A hard dense, close-grained fruitwood, it comes in small sizes, carves well and takes a good polish. Apple is traditionally used for small items of treen (woodenware), and for kitchenwares.

**Beech**—A heavy, relatively easy-to-carve wood that has a yellow-gold sapwood and a reddish heart. Beech is particular! good for carved furniture.

**Boxwood**—A beautiful, pleasant-smelling, butter-smooth wood that is extremely hard and close-grained. If you want to carve items like jewelry, hair combs, small dishes and boxes, then boxwood is a good choice.

**Cedar**—Pencil Cedar is a favorite wood for carving. It cuts to a clear pink-brown finish.

**Cherry**—American cherry is a close-grained, hard-to-work, reddish brown wood that comes in relatively small widths. It carves well and can be brought to a wonderful high-shine finish.

**Hickory**—Straight-grained with a white sapwood and reddish brown heartwood, hickory is often the first choice for large sculptural carvings.

**Horse Chestnut**—White if it is felled in winter, and yellow-brown if it is felled later in the year, this wood is especially good for carved furniture details and for dairy and kitchenwares.

**Holly**—A close-grained, ivory-white wood that carves well and takes fine details, it is a good wood for small desktop toys, and kitchenwares.

**Lime**—English lime is one of my favorite woods. Butter-colored, close-grained and easy to carve, it is the traditional choice for architectural work, like mirror surrounds, coats-of-arms, small sculptures and interior trim. Though linden or basswood are often described as being the same as lime, they are to my way of thinking quite different.

**Maple**—Soft maple is the traditional choice for general carvers—used for making such things as furniture, domestic wares and musical instruments—while rock maple is preferred for heavier items like sports gear and some laundry wares.

**Pear**—A pink-brown wood that has a close-grained, satiny finish. It's really good for kitchenwares.

**Plum**—One of my favorite woods. Though it is certainly very difficult to carve, the color and texture are special—especially good for small presentation pieces.

**Sycamore**—A hard, light-colored wood, it carves and finishes well. Sycamore is a top choice for dairy and kitchenwares, where it is important that the wood leave no smell or taint.

**Yellow Pine**—White to reddish light brown, it is good for large sculptural carvings and interior details. It has been used traditionally in shipbuilding and interior joinery. If you order the wood unseen, be sure to specify "smooth first growth." If you don't, there is a good chance that you will be given poor-grade, coarse and knotty second growth.

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# Gilded Scroll Shelf



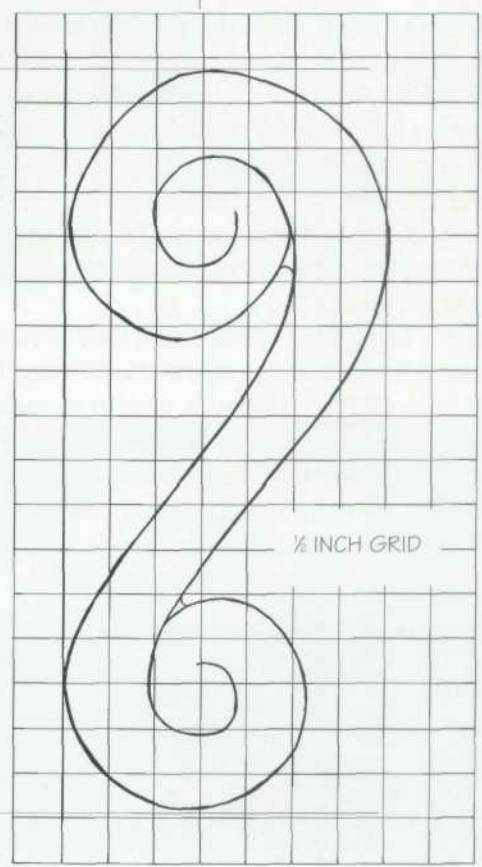
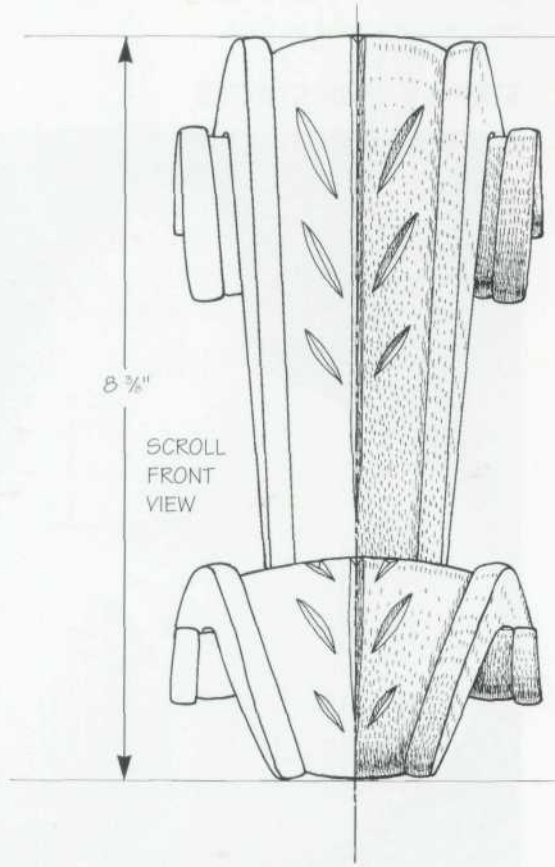
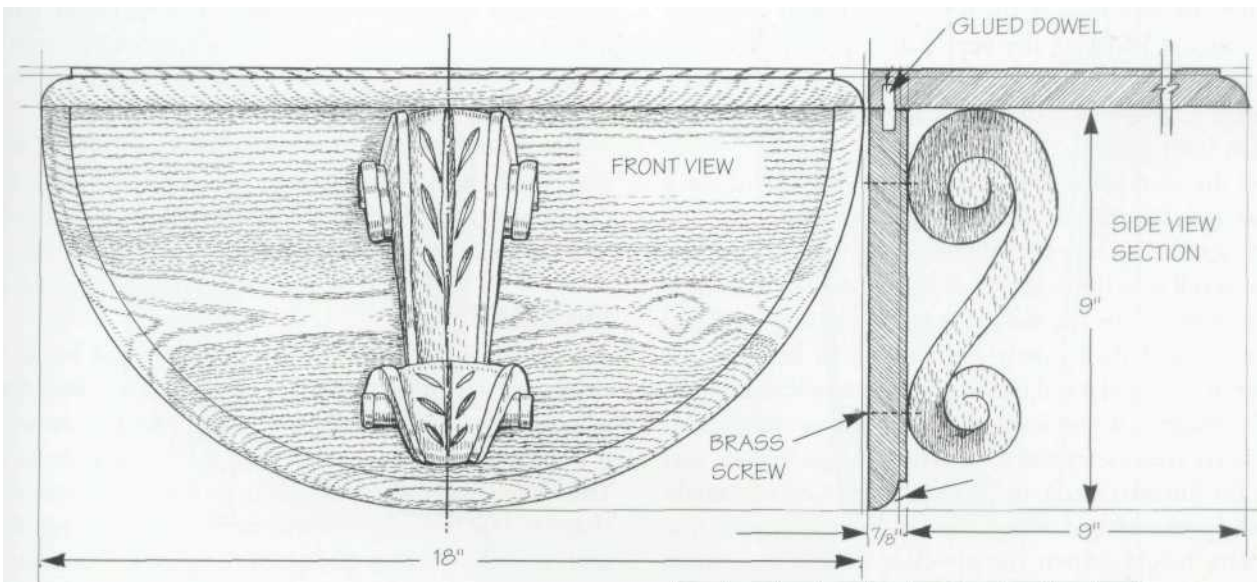
**M**y dictionary defines a console shelf as being an ornamental bracket—especially one used to support a bust—while a scroll is described as being a decorative carving in the form of a stylized roll of parchment. Okay, not very exciting you might think, just a shelf and a bracket. But give the shelf a semicircular form and an ogee-type lip profile, embellish the scroll with a wee bit of carving and coat of gold paint, and then put the two together, and suddenly—Pow!—you have a really special eye-catching item, a truly unique and dynamic piece of woodwork.

## **MAKING THE SHELF**

The actual shelf is very straightforward—really no more than two half-circles butted and dowelled at right angles. That said, you do have to be mindful at the layout stage that the top board—the one that will become the shelf surface—needs to measure the radius of the circle from front to back, plus the thickness of the wood.

Use a compass, ruler and square to set out the wood: Fret the two forms out with a band saw. Use a router or moulding plane to cut the lip profile. Then use glue and hidden dowels to butt the forms together at right angles.







## MAKING THE BRACKET

Having chosen your block of easy-to-carve wood, press transfer the side view of the scroll through to the wood and then cut it out on the band saw. Then run a center line down the front face. Next, take some masking tape and use it to establish the tapered shape of the scroll as seen in front view.

Set the workpiece side-down on the bench and use a mallet and shallow-sweep straight gouge to lower the side of the scroll. The best way of visualizing the lowered side of the scroll is to think of it as a mountain road that starts at the center of the big end of the scroll, curls around and downhill, and then slowly back uphill to finish at the center of the small scroll. Staying with this mountain-and-roads imagery, if you leave the scroll on its side, and if you lower your viewpoint to bench level, you will see that with the finished scroll, the scroll centers—or you might say the peaks around which the roads curl—are both at the same height. When you are clear in your own mind as to the shape of the scroll, carve down to the level of the "road" on one side of the scroll, then flip the scroll over and work the other side in identical mirror-image reverse. The best way of ensuring that the scroll is symmetrical as seen in front view is to slightly lower the "road" on one side and then the other, and then back to the other side, and so on. You will find that this little-by-little approach—with constant reference to the center line—is the easiest way to proceed.

Having made the sides of the scroll, turn it over so you can see it front-on. Use the masking tape and a soft pencil to establish the 1/4"-wide track that runs parallel to each side edge. When you are happy with the guidelines, use a knife and gouge to work and model the central area until it is lowered by about 3/16" and is slightly convex.

When you have what you consider is a well-formed and modeled scroll, use the graded sandpapers to rub it

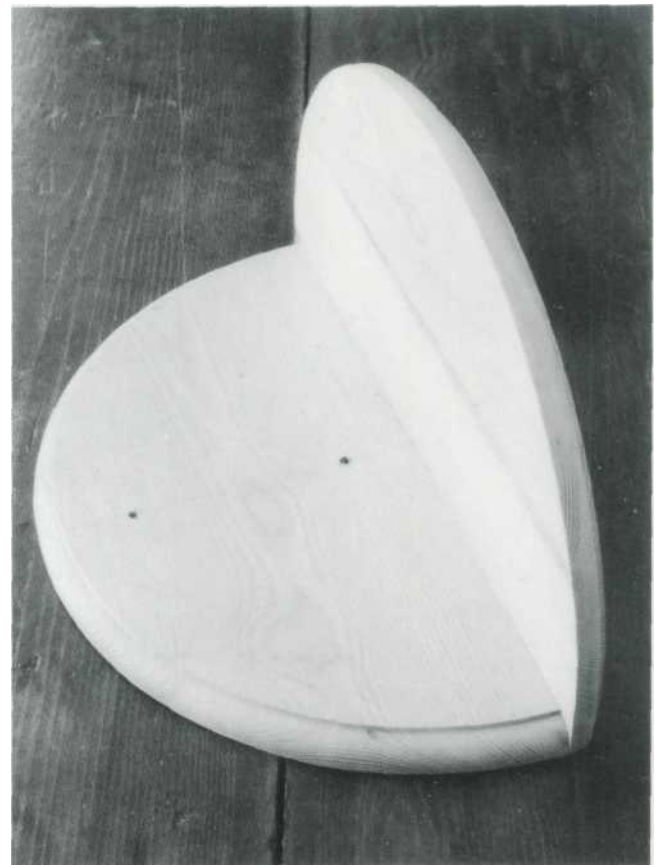
down to a smooth finish. Make sure that all the nooks and creases are crisp and clean. This done, draw the stylized foliage imagery on the front face of the scroll, incise it with the knife, and then give the whole works a coat of matte white undercoat paint, followed by a coat of best-quality gold paint.

Run a couple holes in from the back of the shelf support, use brass screws to fix the bracket to the shelf, and finally give the whole works a coat of thin varnish and/or a burnishing with beeswax polish.

## SPECIAL TIP

Though generally in woodcarving your wood has to be attractive, straight-grained, free from splits and knots and relatively easy to carve, there are times when, as the wood is to be painted, you don't have to worry about its looks. This being the case, you could go for an inexpensive, characterless but easy-to-carve variety like jelutong. That said, if you relish the notion of the project but want to go for a uniform plain wood blond look, then I think your best choice would be lime.

## STEP-BY-STEP STAGES



1 Butt the two halves of the shelf together and fit with glue and secret dowels.

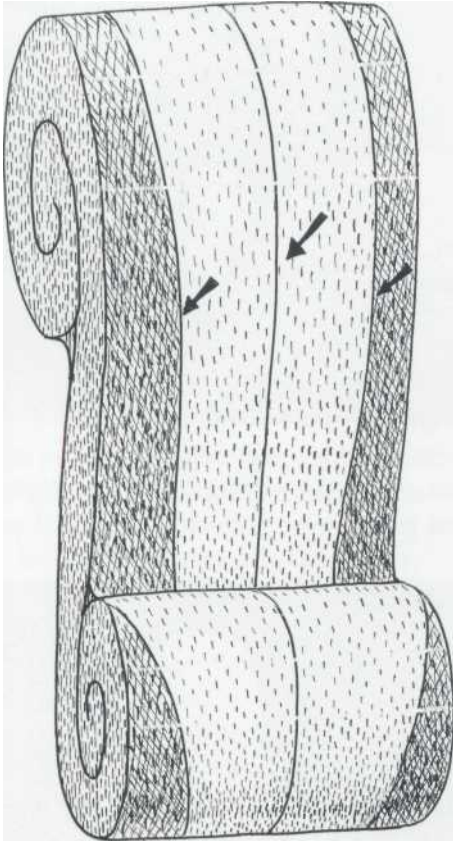
## MATERIALS LIST

### SHELF BRACKET

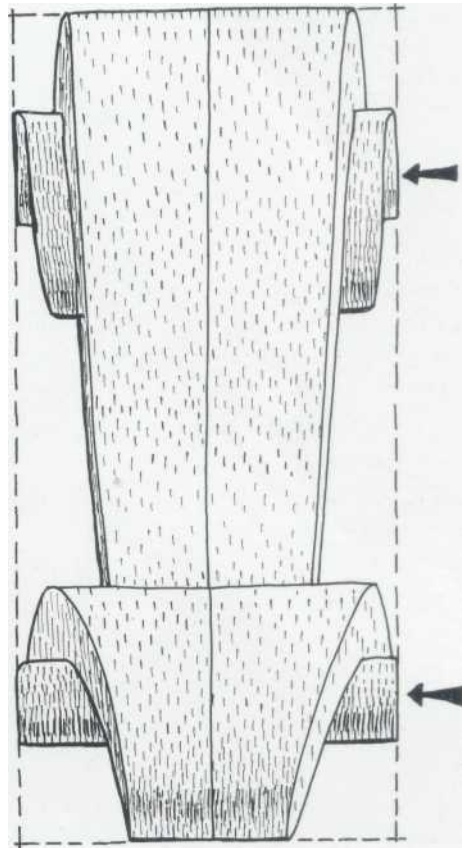
- A Top of shelf (1)  $7/8" \times 9 7/8" \times 18"$
- B Back board (1)  $7/8" \times 9" \times 18"$
- C Carved bracket (1)  $4" \times 5" \times 10"$

### HARDWARE AND EXTRAS

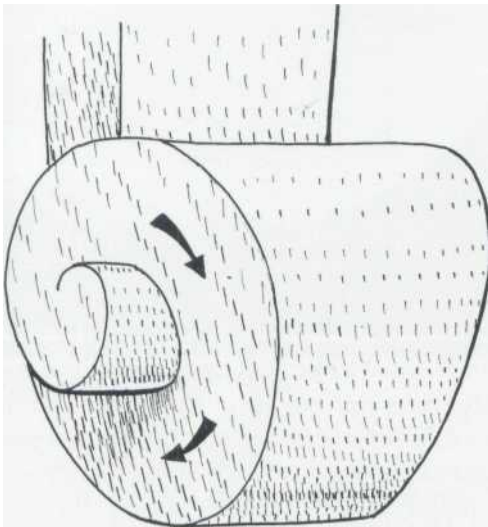
- D 2" brass countersunk screws (2)
- E White matte undercoat paint
- F Best-quality yellow-gold paint or gilding paste



2 When you have made the blank and used the masking tape to establish the shape of the bracket as seen in front view, shade in the waste that needs to be cut away. Note that the arrows indicate the center line and the sides.



3 If you have carved it correctly, you will see that the scroll peaks are at the same level.



4 The mountain road analogy perfectly describes how the side-face curls down, around and up. Be watchful as you lower the "road" that the "cliff face—meaning the face that in this view goes vertically up from the road and through to the peak—is cleanly worked.



5 Use a knife to clean up the sides and to deepen the stop-cut that defines the depth and shape of the camber.



6 The incised cuts are best worked with three strokes: one stop-cut to set in the center line and to establish the depth of the incision, followed up by an angled cut at each side to establish the width of the incision and to remove the waste.



7 Be careful when you are working the top of the small scroll that you don't dig too deeply into what will be end grain.



8 Having used a ruler and square to draw in the center line, do a dry-run fit of the scroll. Establish the position of the screw holes by taking your eye-level down to the face of the wood and identifying the scroll-to-shelf contact points.



## GILDING THE SCROLL BRACKET

Woodworkers are forever coming up with new and exciting ideas. I'm sure you know what I mean. One moment you are half way through a project, and the next . . . Eureka! A new idea or variation springs to mind. And so it was with this project. The moment I had finished describing how to carve the bracket and give it a lick of gold paint, it suddenly occurred to me that perhaps it would be more in keeping with the wood carving tradition to gild the bracket.

Though gilding is a technique that requires a good deal of time and patience, the end result is stunning, well worth the effort. There are two methods of gilding: oil and water. I have opted for what is best described as the shortcut oil technique. That is to say, I follow the whole procedure for the gold painting, and then finish up with the gilding.

## THE GILDING PROCEDURE

Give the finished carving a couple of coats of matte white undercoat paint followed by a coat of gold paint, and wait for the paint to dry. Then take a piece of fine-grade sandpaper and rub the carving down to a smooth-to-the-touch finish—the smoother the better.

Being mindful that the oil gold size dries in about 25 minutes, give a small area at the back of the bracket a swift thin coat. When the size is tacky—almost dry—slide one of the gold leaf sheets out onto the plywood and cut it into small postage-stamp pieces. Press straight down with the lull length of the blade.

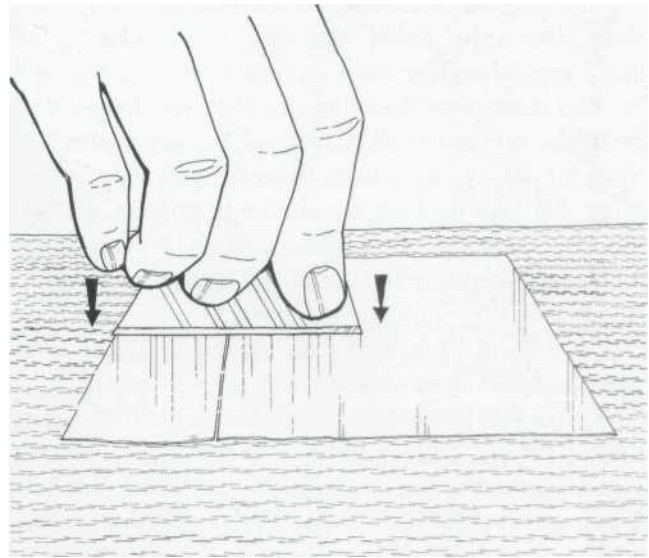
Now for the tricky part! Take the brush or tip, pass it a couple of times over your hair to increase the static, and then touch it down so that it picks up a small piece of gold leaf. Lay the gold leaf down onto the tacky size and dab it into place with a pad of lint-free cotton cloth. Take up the second piece of gold leaf and lay it down alongside the first so that there is a slight overlap. Continue until the whole surface of the bracket is covered in gold.

Finally, dust the surface with a dry brush to remove loose pieces of gold, and the job is done.

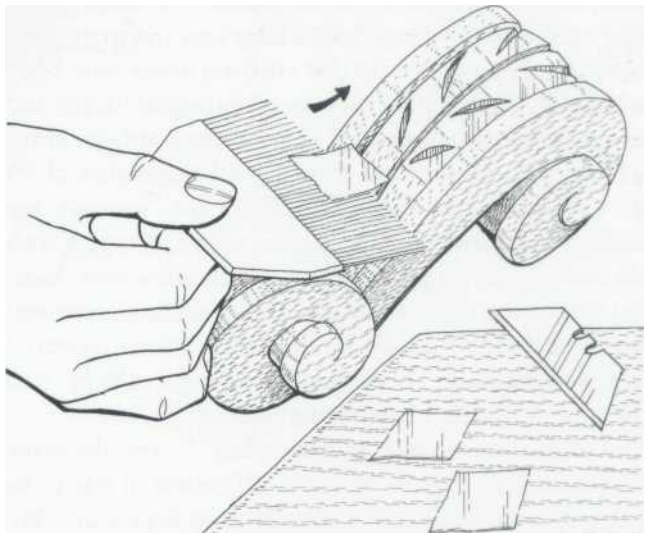
### MATERIALS LIST: OPTION

- A Quick-drying oil gold size
- B 25-leaf book of gold leaf—or metal leaf (imitation gold) at a quarter of the price
- C Gilder's brush or tip
- D Craft knife blade
- E Piece of easy-to-hold plywood (12"×12")

## STEP-BY-STEP STAGES



- 1 Having made sure that everything is clean, dry and free from dust—your hands, the blade and the plywood—take the blade and press the whole length of the cutting edge down hard on the gold leaf. Make the cut by slightly rocking the blade.



- 2 Wipe the brush over your hair to increase the static, then swiftly pick up the gold leaf and lay it down on the tacky gold size. Press the leaf down with a clean cotton pad.

## COMBINATION AND MULTIPLANES

I don't like routers. Okay, so maybe they are the best thing since sliced bread. Yes, they do a wonderful job, and I agree that they aren't as expensive as they used to be, and there is no doubting that they get the job done in almost no time at all. I know all the arguments. The thing is, I don't like routers because of all the dust and noise. But how do I cut my moldings, grooves, tongues, rounds, hollows and all the other profiles? Well, the beautifully simple answer is, I use an old Stanley 45 combination plane.

The Stanley 45 is, to my way of thinking, one of the most beautiful woodworking tools ever invented.

It came into being at the end of the nineteenth century, when there was a huge push by the iron plane manufacturers to come up with a single do-it-all plane. You have to remember that up until that time, every type and size of slot, tongue, fillet and fancy profile needed to be worked with a dedicated plane. Can you imagine? If you were a keen woodworker in the nineteenth century, it's likely you would have needed 40 to 50 or more different wooden moulding planes!

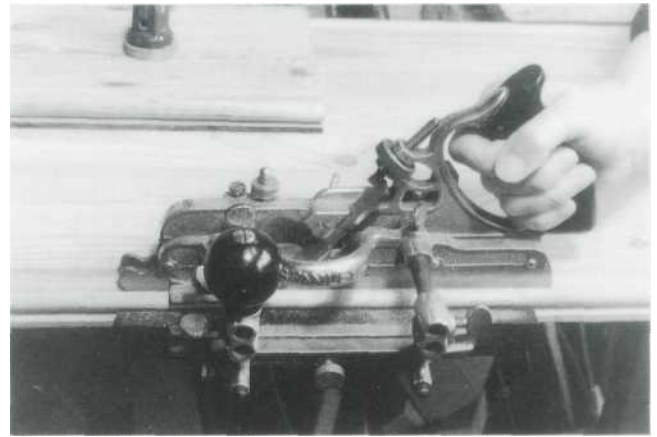
The Stanley 45 is a quality tool, more like a hand-built gun than a plane. It has a main body piece with a sledge-skate sole runner and a rosewood handle; a cutter clamp and integral depth gauge with a large knurled wheel; two nickel steel outrigger arms that are fixed to the main body with screws; a middle section with an integral handle and sledge-skate sole runner that fits onto the outrigger arms; a fence with a rosewood runner; and a selection of 45 plus cutting irons. And as if all that isn't enough, my Stanley 45 is covered in fancy cast metal motifs; dripping with chrome and nickel plate; heavy with thumbscrews, locking nuts, wing nuts, adjusting screws, cutting spurs and knobs; and supplied with the set of cutting irons packaged in a wooden wallet. Better yet, the whole works fits into the most attractive tin presentation box.

And just in case you are wondering . . . yes, the plane does indeed live up to its looks. Of course, it has to be carefully tuned and the irons need to be kept sharp, but that said, it is a most efficient tool.

### Setting up the Plane

As to why Stanley stopped making the "45" way back in the 1960s, who can say. They are still being sought by today's woodworkers, and though they are relatively easy to obtain, the main problem is that most secondhand 45's come disassembled and without the necessary setting, tuning and using instructions.

And just in case you are one of the growing army of avid user-collectors who have a secondhand Stanley 45, and would dearly like to know how it needs to be sorted



**STANLEY COMBINATION PLANE**

*The legendary Stanley 45 in action.*

and tuned, then help is at hand.

The order of setting up or tuning—the way I do it—is as follows. I first select a cutting iron and check that the edge is clean and well honed. If necessary, I wipe it on the oilstone and use a slipstone and a strop to bring the cutter bevel to a razor-sharp, 35° edge. This done, I fit the cutting iron into the groove and adjust the wing nut so that the iron is held in position. Next, I slide the middle sole runner on the outrigger arms and slide it up to the body of the plane so that the blade has a runner at each side edge. If I am going to cut across the run of the grain, I set the spurs so that the little cutter or nicker blade is in the down position. Lastly, I measure and set the fence and the plane is ready for action.

Okay, the plane is well set up and tuned, you have a nice straight-grained piece of wood in the vise, and you are ready to go. The first thing to do is get a household candle and wipe it over the sole and fence of the plane. Certainly it sounds a bit strange, but a couple strokes with the candle will dramatically reduce the friction—it will just about cut your sweat by half. And just in case you don't believe me, try it without the candle—ha!

When you are ready to go, with the depth gauge set, set the runners down on the workpiece so that the fence is hanging over the side edge of the workpiece. Clench that fence hard up against the side edge, and then take repeated passes until the groove, tongue or profile is cut. The best procedure is to start at the end of the wood furthest away from you, and then gradually back up. Of course, you might need to adjust the depth of cut, but if you have it all together, with the plane nicely tuned and set up, the rest is easy.

As I said at the beginning, the Stanley 45 is a beautiful tool: no dust, no deafening noise, no need for a mask or ear plugs, no motors or dangling cables. Just a sweet slickkk . . . slickkk . . . as the paper-thin shavings curl up.



CUTTER BOLT

CUTTER PIN

CUTTER ADJUSTMENT

ROSEWOOD  
HANDLE

CUTTER IRON

SLIDING SOLE

CUTTER NUT

SOLE  
RUNNER

MAIN STOCK

FENCE

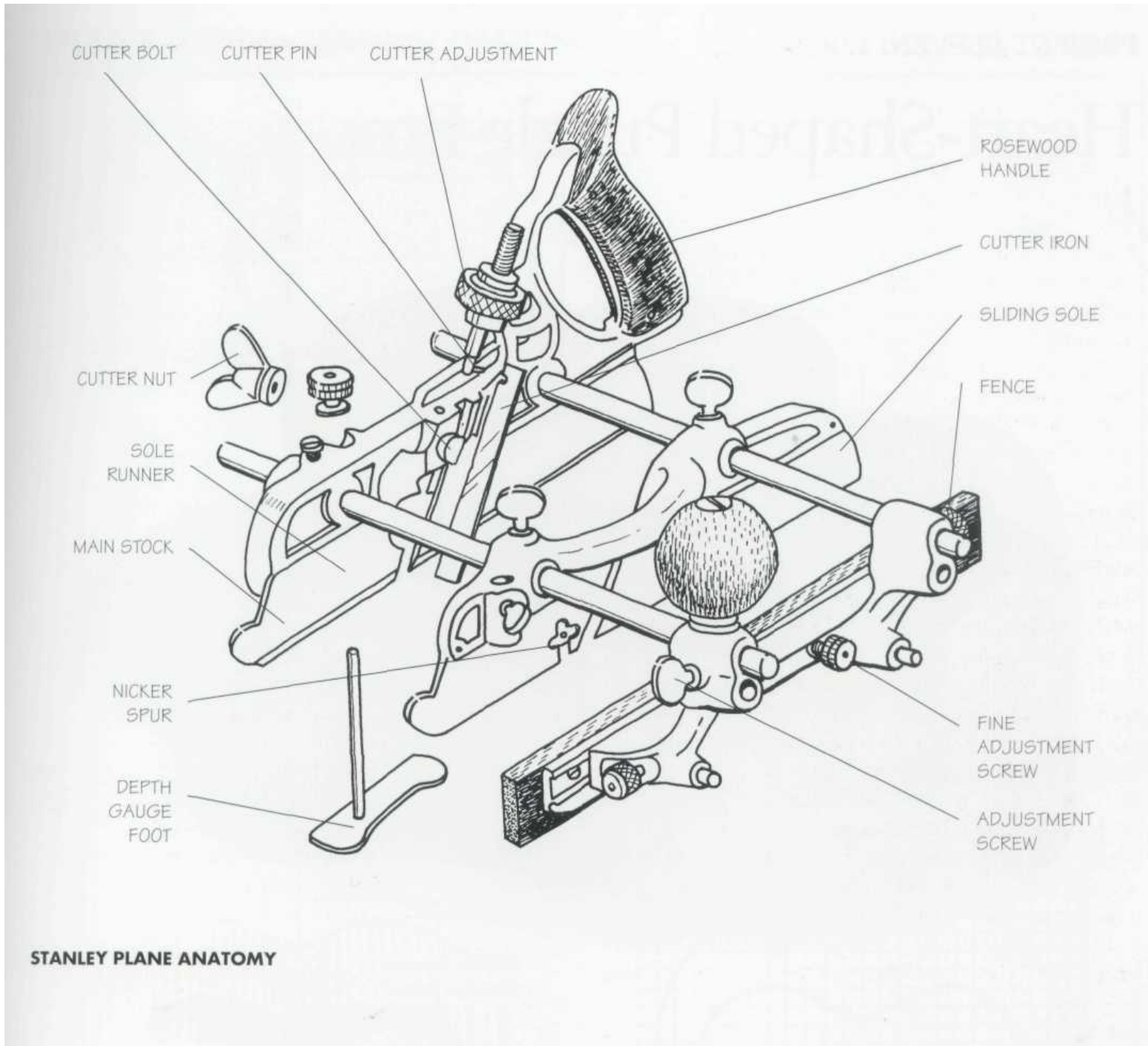
NICKER  
SPUR

DEPTH  
GAUGE  
FOOT

FINE  
ADJUSTMENT  
SCREW

ADJUSTMENT  
SCREW

**STANLEY PLANE ANATOMY**



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# Heart-Shaped Puzzle Box



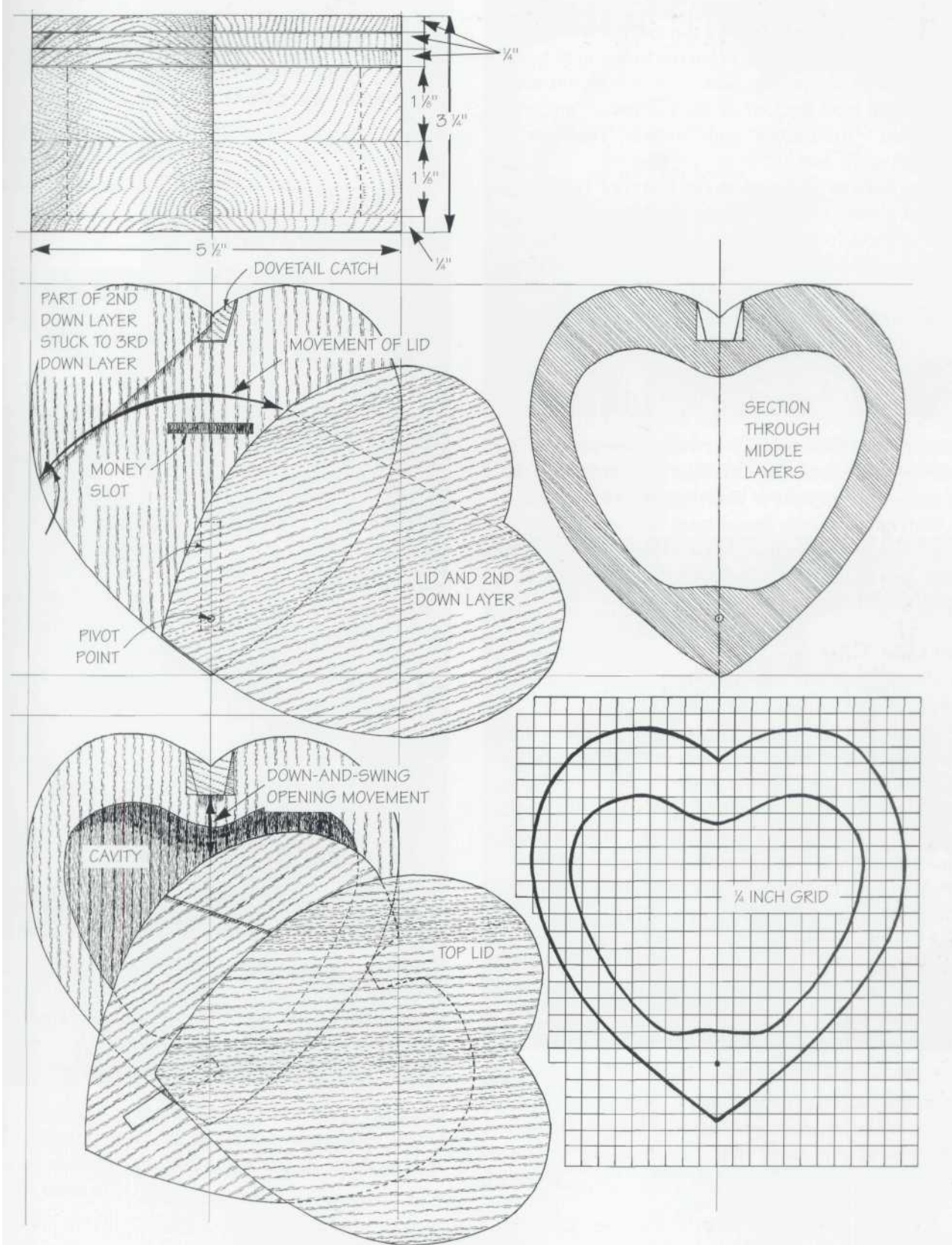
When I was a kid, an old woman left me a small wooden box in her will. The funny thing was that, although it appeared to be just an ordinary empty box with a small division to one side, when I shook it, it rattled. After variously pushing, pressing and sliding the sides and base of the box, I discovered that it had a secret compartment! It was very exciting. When I pressed down on one side of the bottom inside of the box, I was able to slide up one side of the little division to reveal a secret space. As for the rattling noise, it was a solid gold half sovereign!

This project draws its inspiration from that old wooden box. It has all the same elements: a secret area, a sliding lid, and a part that swivels open.

## MAKING THE BOX

First things first, you must have a good long look at the working drawings and see how the box works. Of course, like all such boxes, it's pretty easy when you know how. To open the box, swivel the lid to the right to reveal the coin slot and the top of the dovetail key. Then, at the same time, slide and swivel the coin slot face of the box down and around to reveal the inside compartment.

When you have studied the design, draw out the heart shape. Make a tracing. Pencil press transfer the traced lines through to the layers of wood that go to make up the box. You need six layers in all: four at 1/4" thick and two at 1 1/8". Fret the shapes out on the scroll saw, so that they are all slightly oversize—meaning that the line of cut





is about 1/8" to the waste side of the drawn line. While you are at it, cut out the inside-box area.

Glue the two 1 1/8" layers together and use a gouge to pare the inside of the box to a clean finish. Next, use a fine saw and chisel to pare a channel from top to bottom of the box (at top-middle, where the two cheeks meet). Now, pencil label the four 1/4"-thick cutouts: "top," "second down," "third down" and "bottom." Then glue the "bottom" to the box.

Glue the rod of wood in the channel and cut the dovetail shape. This done, take the "third down" layer and cut the two slots and the dovetail location notch. When you are happy with the fit, take the "second down" layer, set the scroll saw cutting table at an angle, and run the wood through the saw to cut the miter across the top-left cheek.

When you have made all the component parts, then comes the not-so-easy part of putting the box together. The best procedure is to first fix the slotted layer and the bottom half of the mitered layer with a swivel screw. Then glue the two halves of the mitered layer together. Finish by gluing the lop layer to cover up the swivel screw.

Certainly it sounds complicated but, in fact, you will have it worked out in much less time than it takes to tell. Finally, you rub it down with the graded sandpapers and seal with Danish oil.

### SPECIAL TIP

The secret of getting this box right has to do with the standard of the finishing and fitting. All the surfaces must be rubbed down to a super-smooth finish, especially the mating faces that are to be glued and the laces that are to slide over each other. As to the final gluing, the best procedure is to start off using double-sided sticky tape, and then use the glue for real when you know how it all goes together. I say this because it is the easiest thing in the world to make a complete mess-up by gluing the wrong two parts together. Be warned!

### MATERIALS LIST

A Board (6)	1/4" x 6" x 7"—I used English yew throughout
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### HARDWARE AND EXTRAS

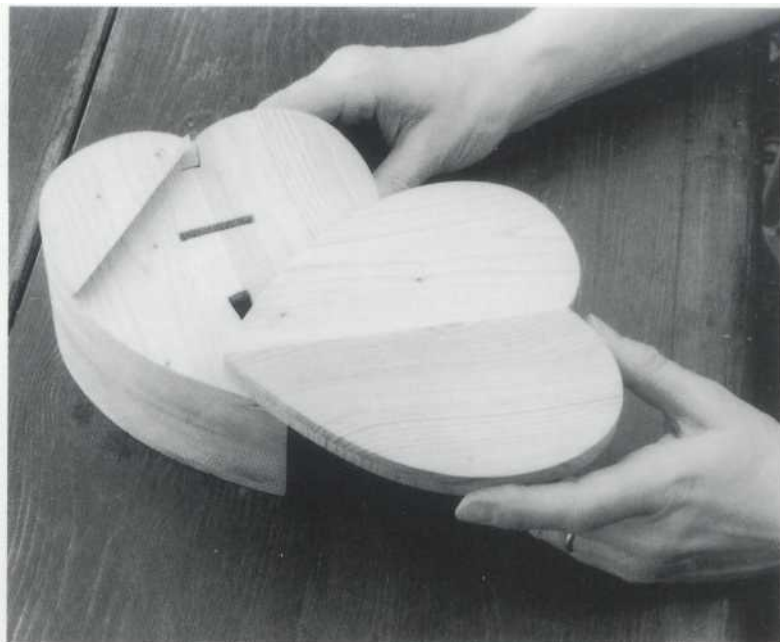
Swivel screw (1)	1/4"-long brass countersunk screw
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### STEP-BY-STEP STAGES

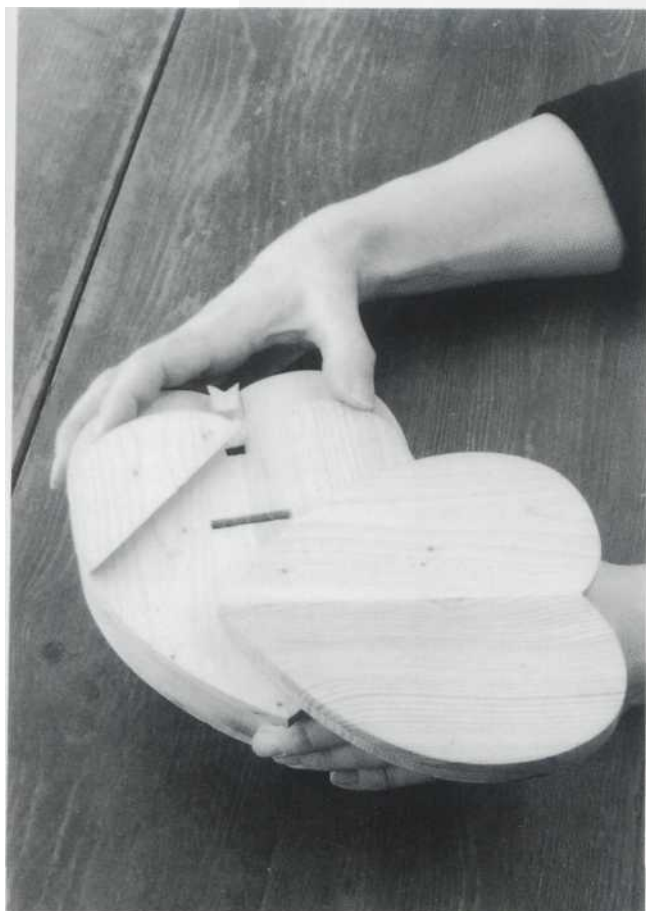


1 Detail showing how the square rod fits in the channel so that the dovetail at the top locates in the slotted layer. The procedure is to first glue and fit the rod, then cut the dovetail.

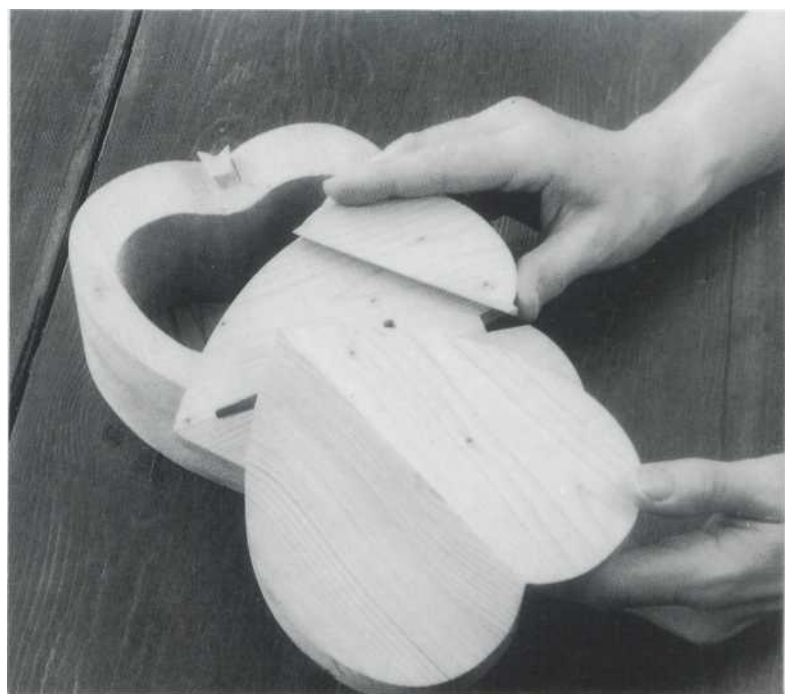
2 The miter cut on the second layer needs to be angled so that it looks toward the bottom of the heart. Be mindful that the finer the saw used to make the cut, the better the fit.



3 See how the top-left part of the mitered layer needs to be glued to the slotted layer, so that the topmost part of the miter hangs clear of the dovetail.

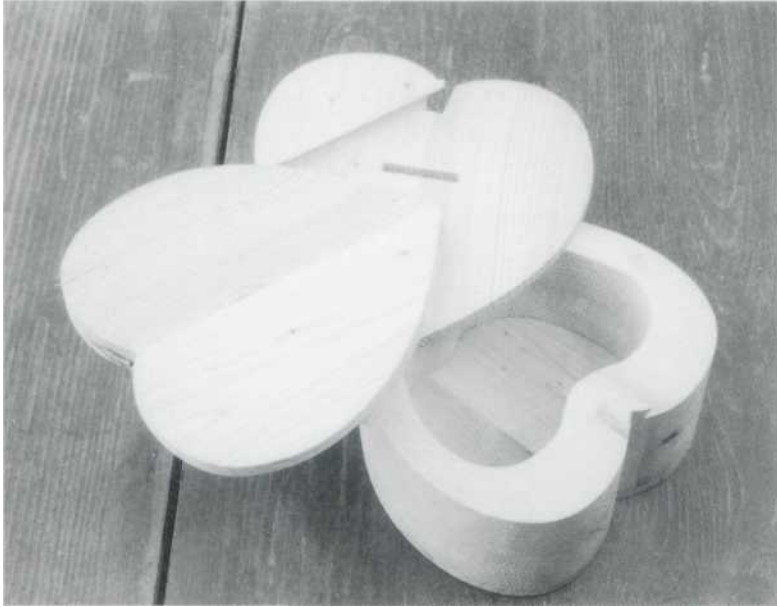


4 The pivot slot on the third layer needs to be adjusted so that the layer can be slid down and then swung over—so that the "cheeks" at the top of the heart just clear the dovetail.



5 In my design, the slotted layer is able to swing to the left or right. If you want to make the box more of a puzzle, a good modification would be to build in a little "stop" peg so that the layer could only be swung to the left.

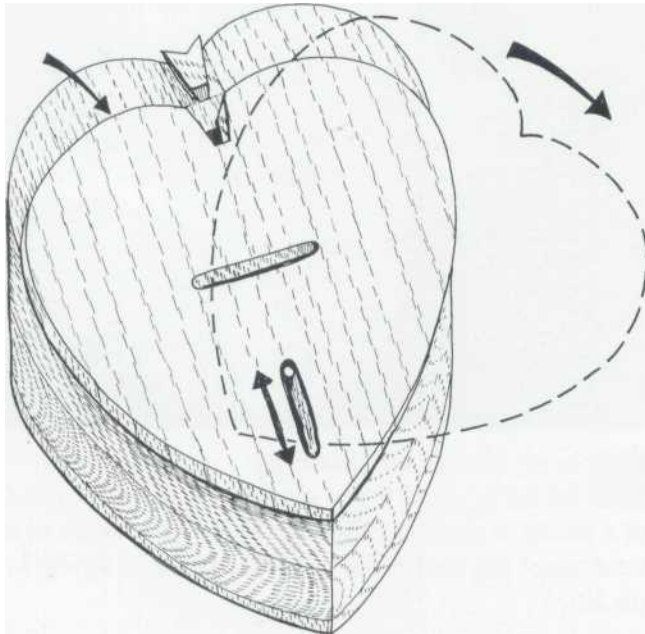




### TWEAKING THE DESIGN

*When you are fixing the swivel point and the slot, make sure that the slot is long enough for the cheeks to clear the underside of the dovetail.*

6 Because I had quite a lot of trouble cutting out the center of the box—first with the drills and then with a gouge I think the next time around I will redesign the dovetail post so that it cuts right through the wall of the box. Then I can more easily clear the inside-box waste on my fine-bladed band saw.



## PROTOTYPES

A prototype is a full-size working model that is made prior to the project. The idea is to use inexpensive materials to work out all the problems before you start using your precious materials.

As you can imagine, this heart-shaped box didn't drop from the sky perfect and ready-made—no way! In **fact**, it was rather difficult to sort out. Although the various views and cross sections looked fine on paper, I just couldn't figure out how the three layers that make the top of the box fit great together. In the end, after a deal of swearing and messing about, I decided that the best way was to make a full-size prototype from three pieces of 1/4"-thick hardboard.

The working procedure went as follows: First I cut out the three heart shapes and pencil labelled them "1," "2" and "3." Then I drew the heart shape out on the bench. Next, I took cutout number 3 and played around on the drawn-out heart with various placings of the swivel point and the sliding slot.

The main difficulty I found was positioning the miter in such a way that there was enough room for the "cheeks" of the heart to slide open.

When I had established the precise position of the swivel point and the length of the slot, I then tried out board number 2 and fixed the position of the miter slot. And, of course, when it came to making the box for real, I had the hardboard cutouts to use as templates.

And just in case you are thinking that you are so skilled that you can go straight in and make the toy, the table or whatever, without making a working model, yes, you might well be lucky once or even twice. But sooner or later you are going to make a mistake with one or all parts getting incorrectly cut and/or glued.

For example: I once designed the most beautiful chair. It looked wonderful on paper; the drawn elevations were a work of art! But when it was built, it was unstable, it was grossly uncomfortable, and it started to pull apart. Another time, I made a moving toy that looked good on paper, but when I made it full size, the friction between the wheels and the floor was so great that it simply didn't work.

All this is to say that the only sure way of knowing that a design is going to work is to make a full-size working model.

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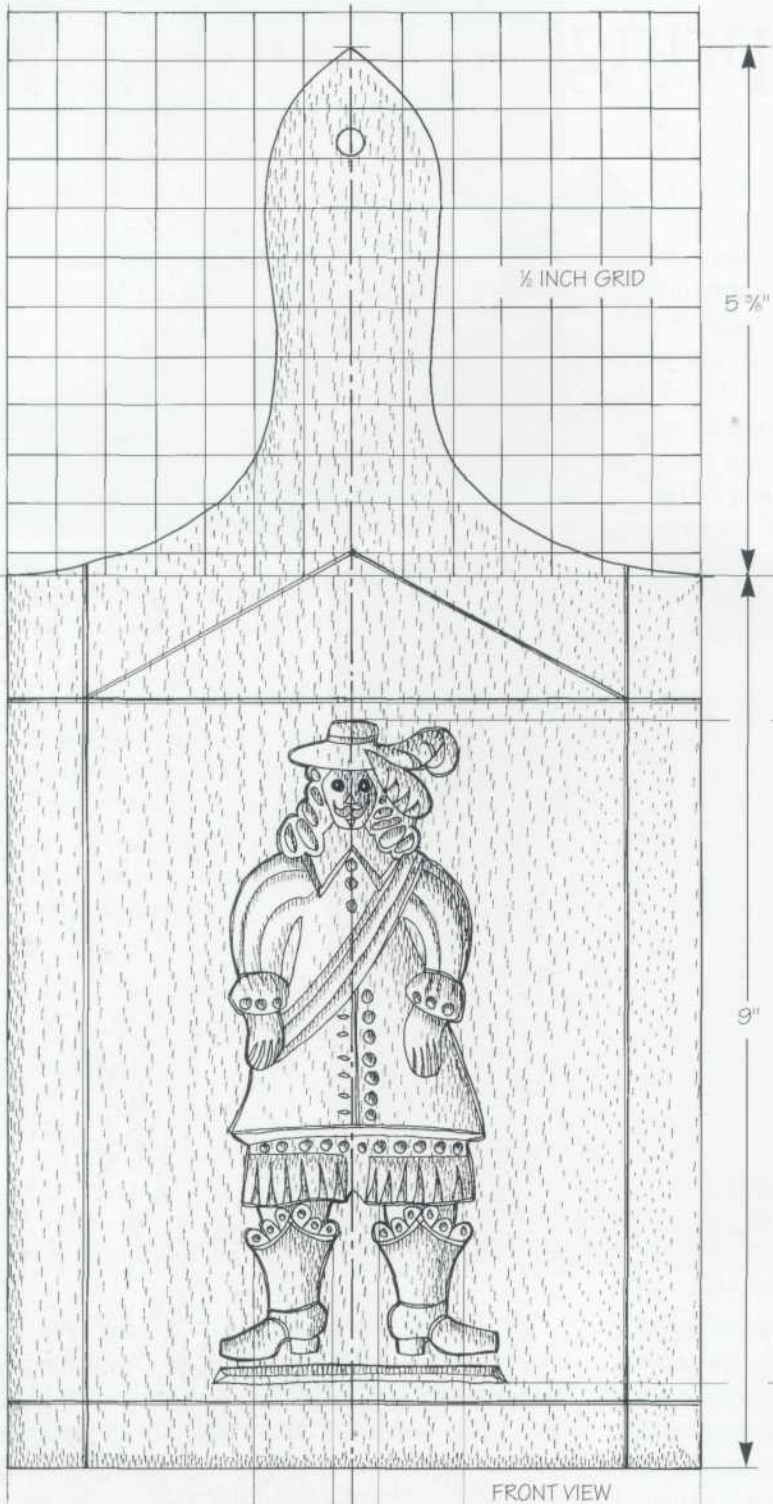
# Traditional Springerle Board



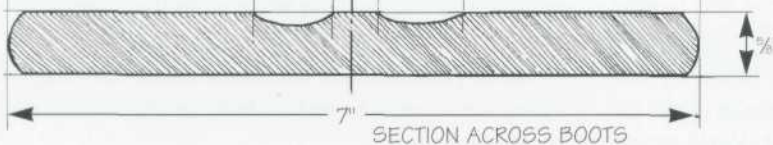
The American Colonial kitchen or "keeping room" was an absolute treasury of fine woodwork. There were butter bowls and salt trays, boxes and knife racks, pipe-shelves, cutting boards, tables and chairs, all of them variously carved, pierced and detailed. Of course, they are all exciting in some way or other, but for my money, I particularly like the beautifully carved biscuit and cookie boards. There were shortcake molds made by the English and Scottish communities, breadboards made by the Swedish communities, little stamps and presses made by the Polish immigrants. Just about every Old World group had a unique style, form and tradition of carved boards.

Of all these "mother country" woodenwares, the German American Springerle cookie boards are perhaps the most delicate and fanciful. Every early Pennsylvania German home had them. The cookie dough was rolled thin and the carved hardwood board was pressed onto it to imprint the designs. When the cookies were baked, the resultant raised designs and motifs made an attractive table arrangement.

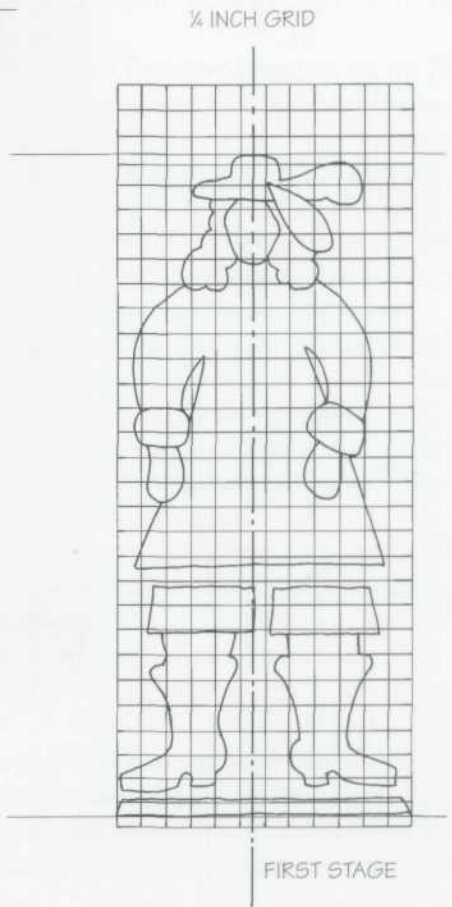
So if you like the notion of basic carving, and you know someone who enjoys baking, then this could be the project for you.



FRONT VIEW



SECTION ACROSS BOOTS



FIRST STAGE

## MAKING THE SPRINGERLE BOARD

This is the perfect project for nervous beginners who are looking for an easy way into the craft of woodcarving. All you need is a flat board, a bench clamp or holdfast, a V-section gouge, a straight gouge, a small spoon gouge, a sharp knife and a steel safety ruler, and you are ready to begin.

Trace the design on a slab of well-prepared, close-grained hardwood. We have chosen beech, but you could just as well go for plum, pear, sycamore or maple. Then carefully pencil-press transfer the primary lines of the design through to the wood. Next, cut out the shape of the board on a scroll saw and rub the edges down to a good finish. This done, secure the workpiece flat-down with the clamps or holdfast and use the spoon bit tool to scoop out the primary elements of the design. Don't try for any great depth, just settle for nice round depressions. It's all pretty easy, as long as you are careful that the tool doesn't dig too deeply into the grain and/or skid across the wood. Continue working with a controlled action, holding and guiding the tool with one hand and pushing, scooping and maneuvering with the other until you have achieved what you consider is a good strong design. You need to dish out the hat, the hair, the face, the coat and cuffs, and the boots. Being mindful that the design is in reverse, try to judge the depth of the carving so that the fullest part of the design has the deepest hollows. Aim to scoop out the little dips and hollows to a depth of about 1/4". Don't dig the tool too deep or try to lever the tool, but rather work with a delicate scooping and paring action. Cut across the grain wherever possible. Remove only small curls of wood and try to keep the carving crisp and controlled. If you feel at any time that the tool is cutting roughly, then approach the grain from another angle or sharpen the tool with a few strokes on the stone and leather. Bear in mind that each and every hollow needs to be worked smoothly—no rough surfaces or undercuts. It's a good idea from time to time to test out your carving

### MATERIALS LIST

A Board (1)  $\frac{3}{8}$ " $\times$ 7" $\times$ 15"—a piece of prepared wood like beech is best

*Note that all measurements allow for a small amount of cutting waste.*

by taking a piece of Plasticine and pressing it into the cut shapes, just as if you were pressing dough on the board. Once you have considered the shape and detail of the pressing, you can adjust your work accordingly. Ask yourself as you are working, could the little dips be deeper? are the shapes nicely rounded? and so on.

With the basic pattern in place, take the very smallest spoon gouge and scoop out the little dips that go to make up the small dot and dash details of the buttons and eyes.

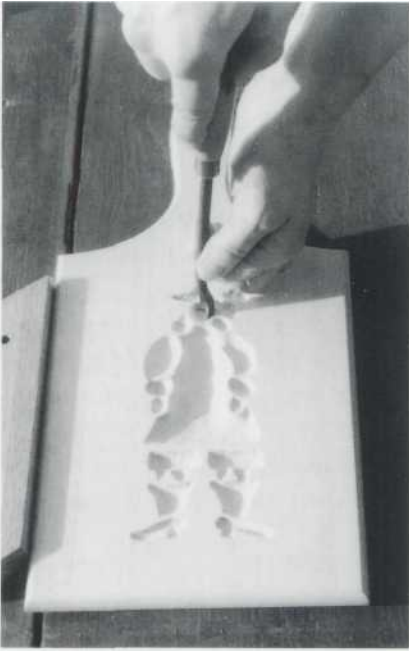
Next, use your knives to cut in the fine details. For example, you need to cut in the features, the sash and belt, the tassels around the top of the boots, and so on. And of course, if at any time along the way you want to cut in pockets or bigger plumes or other details, then follow your fancies. Finally, use the knife *or* V-tool to cut in the simple frame shape.

## STEP-BY-STEP STAGES

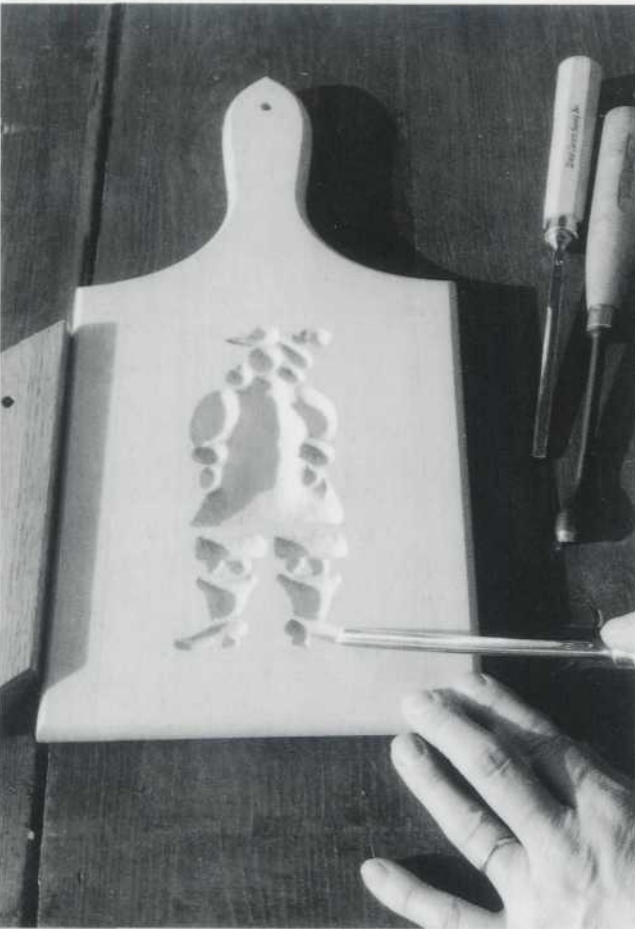


1 Go over the transferred lines with a soft pencil and then spray with pencil fixative to prevent





2 Use one of your spoon bent gouges to scoop out all the little hollows and depressions that will make up the design.



3 If the shape of the depression permits, cease with the spoon bit and change to using the straight gouge. You will find that the straight tool allows you to get a bit more weight behind the thrust.

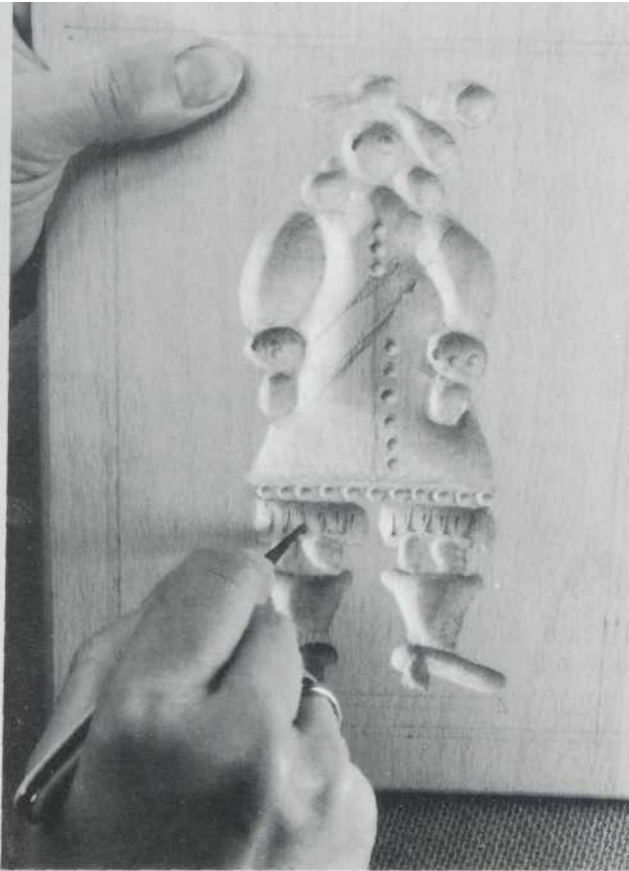


4 Use the smallest spoon bit gouge to "winkle" out the small dot-and-dash details of the eyes and trim. Stab the tool down vertically and twist it on the spot so that it "drills" out a pocket of waste.

#### **SPECIAL TIP**

If you find that your tools are cutting roughly, the chances are that the wood is damp or unsuitable or the tools are blunt and need sharpening. The best way to work is to set yourself a rhythm. That is, spend a few minutes carving and a few minutes standing back and assessing your progress, and then a few minutes rubbing the bevel of the knife or chisel on the fine stone, and so on. If you do this, the work will move along smoothly, with the carving being nicely considered and the tools kept at maximum sharpness.





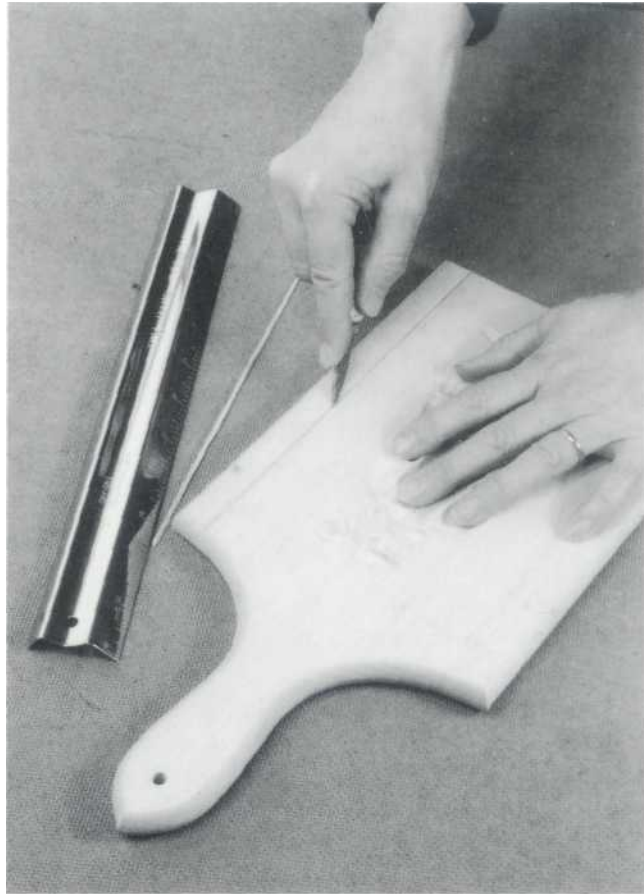
5 Use the knife to cut the tassel details. Make three cuts for each tassel—a deep stabbing horizontal stop-cut to define the width of the tassel, followed by two downstrokes to clear the waste from the triangular pocket.

## CHOOSING AND USING WOODCARVING TOOLS

There are so many woodcarving tools on the market that beginners are often bewildered when it comes to buying gouges and chisels. For example, I have just looked through a handful of current catalogs and I see hundreds of slightly different tools to choose from. Maybe you aren't going to need more than a handful of tools, but the big problem is which ones to buy.

The first question you have to ask yourself is what do you have in mind to carve? Are you excited about the notion of carving huge sculptural pieces? Or do you fancy caning intricate little birds? Or do you just want to try your hand at traditional flatwork like chip or relief carving, the sort of carving that you see on furniture?

When you decide on your area of woodcarving—sculptural, relief designs, miniatures or whatever—it's best to buy a modest starter kit of, say, four tools. For



6 Use the steel safety ruler and the knife to cut the V-section frame detail. Each line is made with three cuts—a single straight-down stop-cut to define the depth of the V, followed by two angled cuts to clear the waste.

example, you might get a couple of straight gouges, a V-tool and a bent gouge. Of course, once you actually start carving, the whole problem sorts itself out. You will soon discover that certain tricky details simply cannot be worked, or that you can't carve an undercut or some other detail with any one of your four tools. Then you have enough knowledge to buy a tool of a shape and size to suit. When I first started carving, my favorite tool was a medium-size, shallow-curve straight gouge—it still gets used more than any other tool. So you might start out with the four tools, and everything will be fine and dandy, until the time comes when you need to use a fishtail or a smaller spoon gouge, or yet another size straight gouge . . . and so the fun begins.

All that said, the single thing that bothers most beginners is that they are confused when it comes to the names and the numbers of woodcarving tools. If you don't know what I mean, look at various woodcarving tool catalogs.

From one manufacturer to another, there are all manner of descriptions that relate to the same tool types. Some manufacturers use letters and numbers, some use their own prefix codes, and so forth.

If you are a beginner and still undecided as to the correct gouges for your starter kit, then try the following method—it may help. Start by determining the width of blade you need. Let's say that you have chosen a 1/2" width. Next, consider the hollow or sweep of the blade. Ask yourself, do you want a shallow sweep or do you want a deep U-section sweep for bowls and such? Finally, decide on the profile or shape of the blade along its length. For example, do you want a straight blade or a curved or spoon bent? Once you have sorted out the blade width, the shape of the sweep and the profile of the blade, then all you do is walk into the store and point a finger.

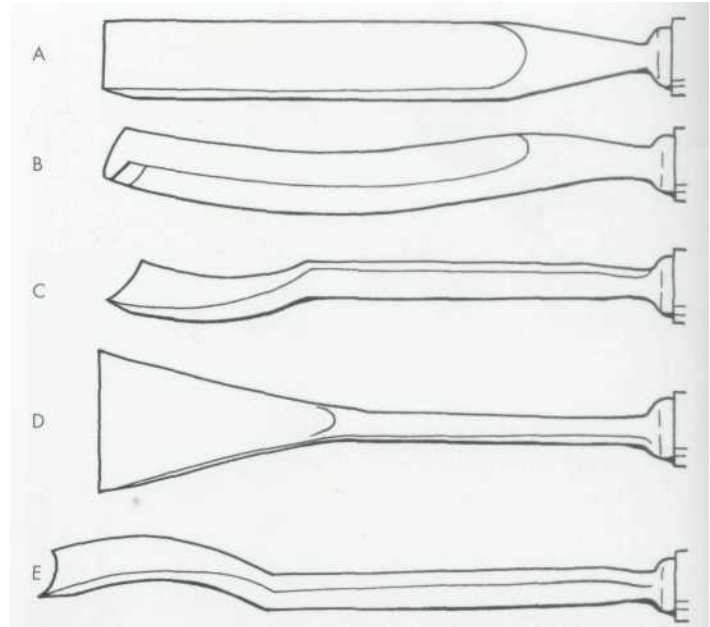
### STRAIGHT CHISELS AND GOUGES

If you are still confused as to terms, the following glossary will show you the way.

**Straight Chisel**—A straight chisel is a flat-bladed tool that has a straight cutting edge. If you jab the cutting edge into the wood, it will leave a straight cut, like a dash. The term "straight" relates to the shape of the blade along its length. The size of the chisel is determined by the width of the cutting edge. In use, the chisel is held in one hand and then either pushed or struck with a mallet. **Straight Gouge**—Though the straight gouge is straight along its length—just like the straight chisel—the blade is hollow-curved in cross section. If you stab a gouge into the wood, it makes a curved cut, like a C or U. The shape of the curve is termed the "sweep." So when you are ordering a gouge, you need to know the width of the blade and the shape of the sweep. In use, the straight gouge is either pushed by hand or struck with a mallet.

### CURVED OR BENT CHISELS AND GOUGES

Having established that the term "straight" describes the shape of the blade along its length, it follows that the terms "curved" or "bent" also describe the blade along its length. For example, you might have two gouges that make identical cuts, the only difference being that one is straight along its length and the other curved or bent. They make the same cut, but the bent tool allows you to



### CURVED OR BENT CHISELS AND GOUGES

(A) Straight chisel; (B) deep sweep curved gouge; (C) shallow sweep spoon bent gouge; (D) shallow sweep fishtail gouge; (E) shallow sweep backbent gouge.

hook and scoop into hollows that the straight tool is unable to reach. Spoon bent, fishtail and back-bent tools are simply gouges that are more extremely shaped along their length. So, if you want the cutting edge of your gouge to be a certain width and sweep, you have to make a decision as to the shape of the blade along its length. Do you want a straight blade for heavy pushing or mallet work, a bent one for digging out a shallow bowl, a spoon shape for scooping out deep hollows, or a fishtail for cleaning out tight corners?

**Handles**—Once you have decided on the width of the blade, the size of the sweep—meaning the shape of the C section—and the shape of the blade along its length, then comes the choice of the handle. There are turned hardwood handles, plastic handles, handles with and without ferrules, and so on. I personally prefer the "London" pattern of turned and shaped octagonal boxwood handles on three counts. They are comfortable to hold, they look good, and best of all, the octagonal section prevents the tool rolling about or falling off the bench and doing damage.

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# Nautical Clock and Weather Station



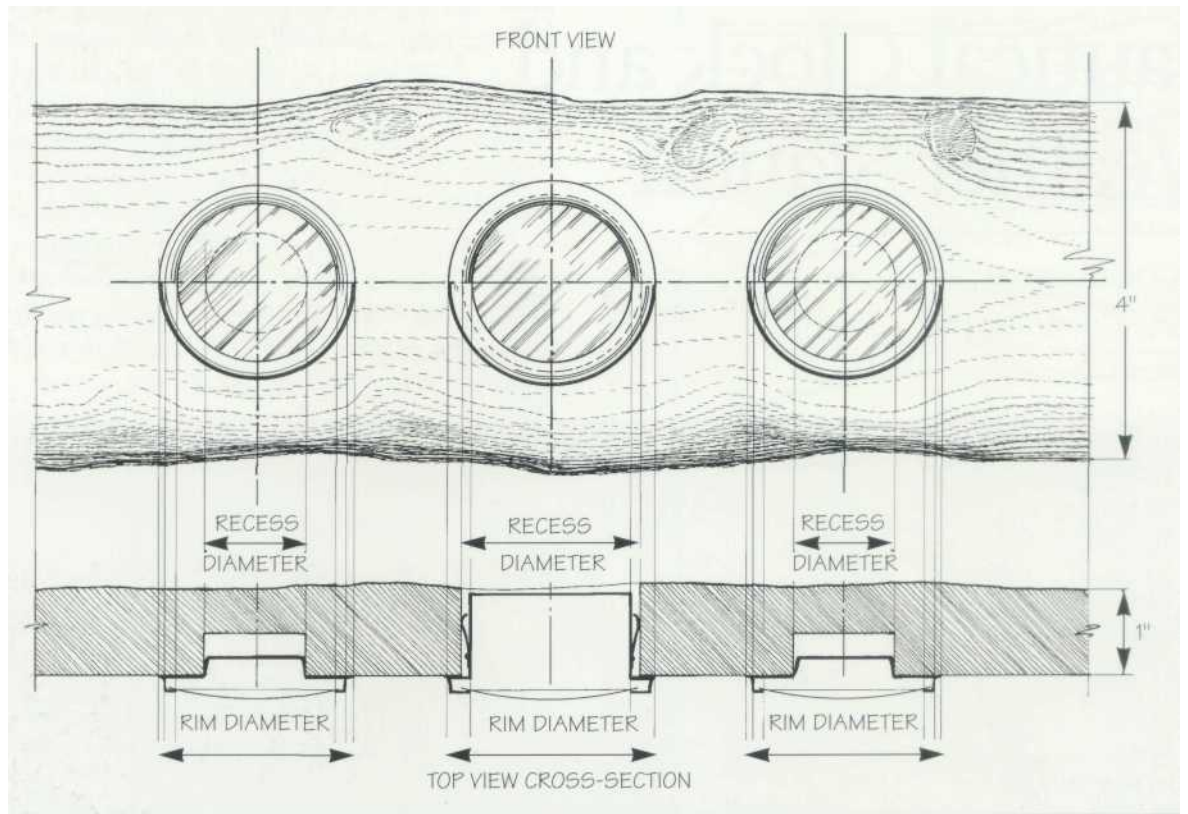
When we decided to move from a wild and windy part of the coast to a relatively mild hills-and- dales part of the country, we felt that we wanted to take a lasting memento with us. As we both love the sea, we felt that we wanted a reminder of our wonderful walks along the rugged cliffs, of the picnics on the lonely beaches, and of the exciting times we had with our many boats. After a great deal of thought that took in such notions as collecting sea shells and the like, it suddenly came to us. Why not take a piece of driftwood—perhaps part of an old boat—and turn it into a nautical clock and weather station? To our way of thinking, the whole project would be a lasting memento . . . of the beaches, the storms that smashed up the boats, and the constant need to keep one eye on the time, tide and weather.

So if you, too, want to make a memento gift that uses a piece of found wood, then this is a great project.

The wonderful thing about a design of this size, type and character is its flexibility. There are any number of amazingly exciting options. I say this because, as soon as I had made the sculpted and weathered board, Gill came up with the beautiful idea of using one of our old moulding planes to create a classic moulded board. Her thinking was that there must be thousands of woodworkers out there who own an old plane and are just looking for an excuse to tune it up and get started! She also had the bright idea that with a more formal board, the various instruments could be arranged so that the board could be mounted vertically or horizontally.

## **MAKING THE FOUND WOOD BOARD**

This project is slightly unusual in that your found wood needs the minimum of preparation. Okay, it needs to be clean and the like, but that's about it—no jointing, no



extensive marking out, just three drilled holes and a small amount of planing and sanding. And, of course, there's no reason why your piece of found wood can't be a branch from a special tree, a part of an old house, a piece of wood found in the desert or mountains, or by a river, as long as it has some particular significance.

When you have found your piece of wood, set it down on the bench and consider how the instruments might best be placed. Are you going to settle for the clock, the thermometer and the hygrometer, (see page 73), or are you going to go for additional instruments like a tube barometer or maybe a special tide-time clock? Of course, much depends on the size of your piece of found wood.

Though I wanted three matching brass dials, with a clock having Arabic numerals, I found it impossible to get a good match-up. As you can see, I had to settle for a slightly nasty white-face clock with Roman numerals. Make sure that the instruments you choose are designed to fit into a shallow recess or hole, with the brass surround or rim overlapping the edge of the hole.

When you have decided where the instruments are going to be placed, use a wire brush to scour the grit and grime from the workpiece. If you see some part of the found wood that could be modified in some way, then so

much the better. For example, I knocked out two rusty old nails and wire brushed the resultant iron-stained holes so that they were big enough to take a piece of found rigging cordage, so that the clock and weather station could be hung on the wall.

Use the wire brush to sculpt the form, to extend and exaggerate the actions of nature. You can make contours that are rounded and rippled, much the same way as the wind, rain, sand and sea scour out the soft part of the grain, so that the hard grain and knots are left standing in relief.

When you have achieved what you consider is a good form, use a plane and sandpaper to prepare a level seating big enough for the instruments. Aim for a flat smooth surface that is slightly bigger than the instruments. Make sure that there are no nails, grit or other matter in the areas that are going to be drilled.

Having cleaned up the seating for the instruments so that it resembles a level plateau, bore the recess holes out with the Forstner bits. Then seal with a coat of varnish and use beeswax to burnish the whole works to a rich sheen finish. Finally, push fit the instruments in the holes, fit the rope or chain, and the project is finished and ready for hanging.

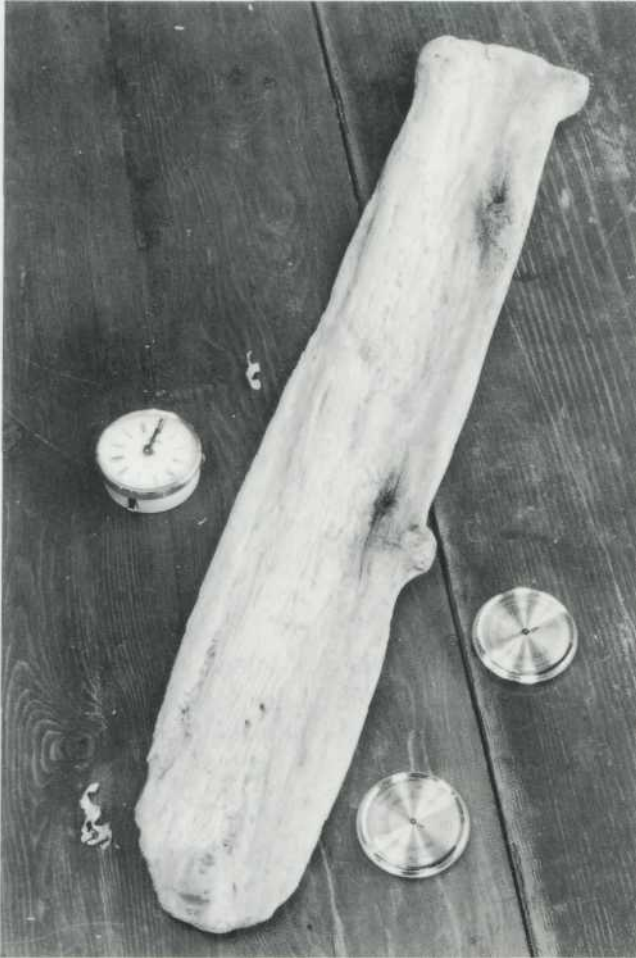


## MATERIALS LIST

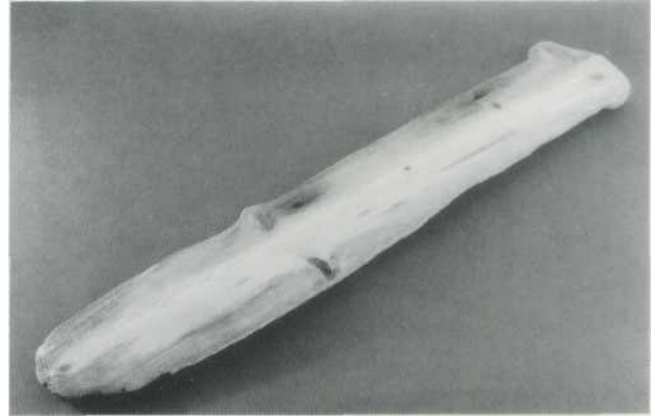
A Board (1)

A piece of found wood of a size and thickness to suit your instruments.

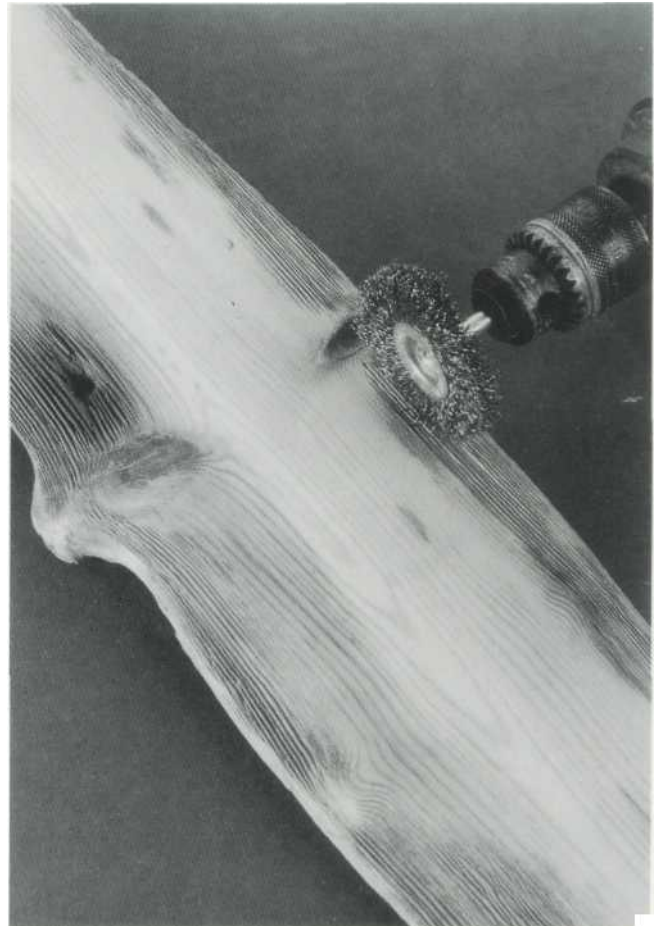
## STEP-BY-STEP STAGES



1 Having found your piece of wood, select a set of instruments to fit.

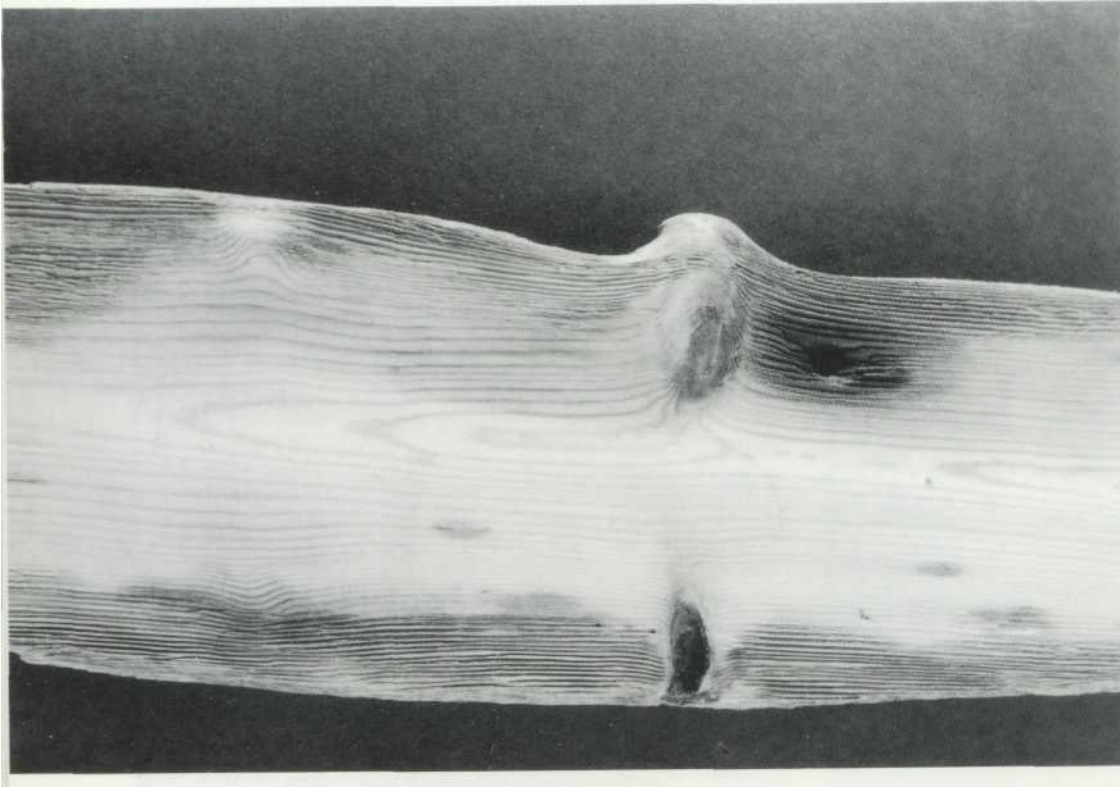


2 Remove the more obvious bits of rubbish—old nails, bits of tar, embedded grit and such. Wipe the wood with a damp cloth and leave it until it is good and dry.

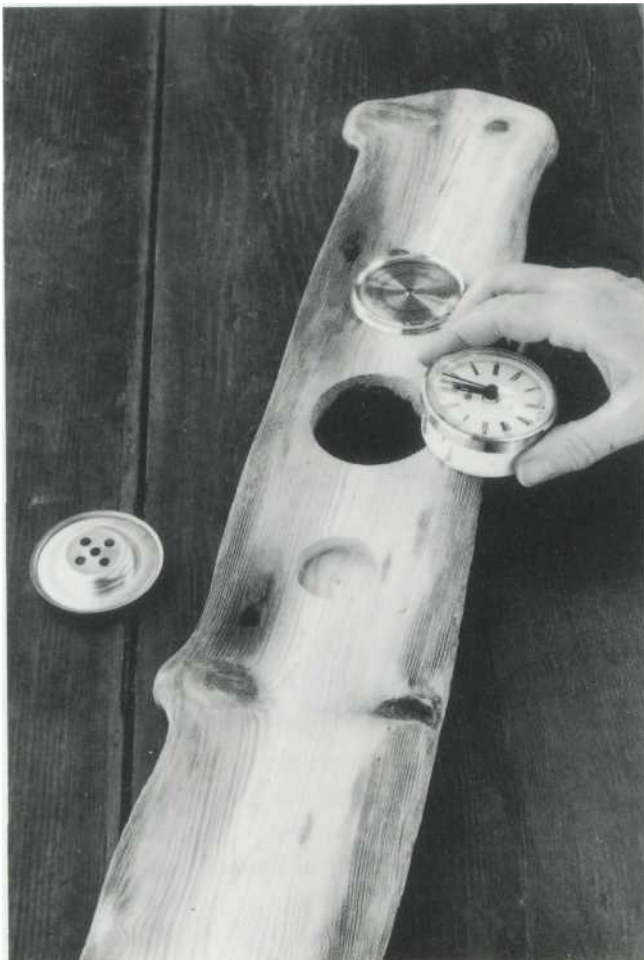


3 Not forgetting to wear gloves and goggles, use a power drill fitted with a wire brush attachment to scour out the loose grain. The safest procedure is to have the workpiece either screwed or clamped to the bench.





4 A close-up showing how I have concentrated use of the wire brush along the edges and around the knots, so that there is a smooth, level central area.



5 If you have a drill bit size that fits the instrument, then so much the better; otherwise, you have to drill the nearest size hole. After drilling the hole, painstakingly file it to fit. I needed to remove an all-round strip about 1/8" wide.

Note—as I said earlier in the project, I don't much like the clock as shown. On consideration, I would much prefer the little watch-clock as shown in the miniature mantle clock case project.

## MAKING A TRADITIONAL BEAD-MOULDED BOARD

Having measured and marked out the board and cut it to size, use the bench plane to bring it to a smooth finish. When you are happy that the board is square and true, secure it to the bench so that one long side is hanging over the edge.

Set your moulding plane up with  $\frac{3}{8}$ "-wide beading iron. If like me, you are using a single-bead cutter to plane two beads side by side—a double reed—then adjust the fence to the position for the bead that is furthest in from the edge. The procedure is: First cut the bead that is furthest in from the edge. Then reset the fence and cut the bead nearest the edge. You repeat the procedure for the other edge of the board.

Finally, having used a block plane to chamfer the ends of the board, drill out the three large-diameter holes as already described in step 5.

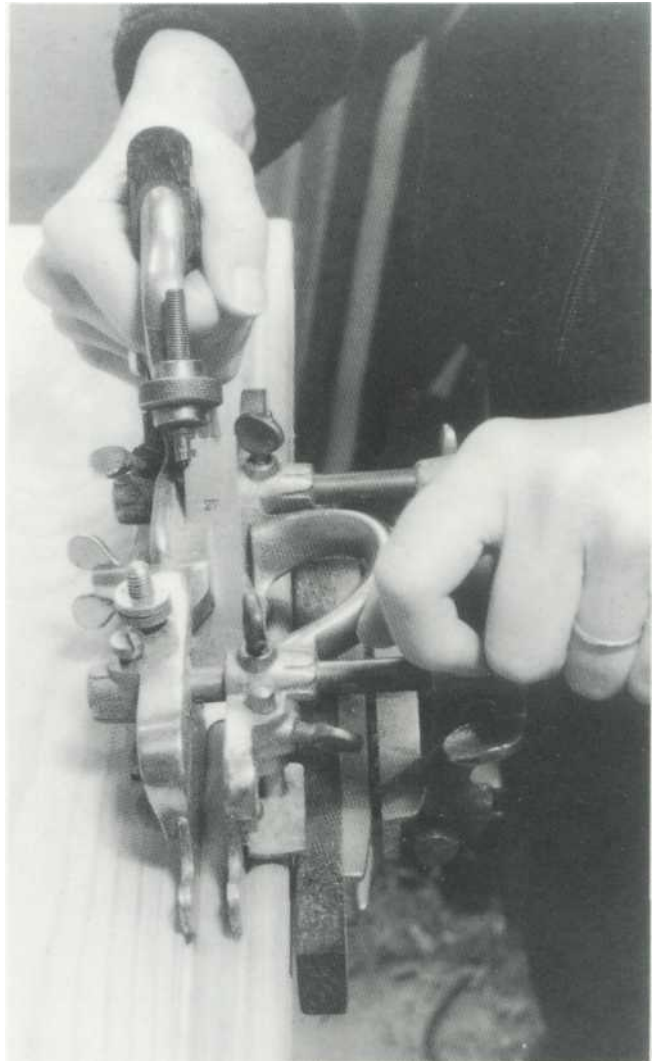
### SPECIAL TIP

If you are looking to bore out clean-sided, flat-bottomed holes—relatively shallow holes as in this project—then you can't do better than using Forstner drill bits in conjunction with a drill press. We use a large Delta bench drill press. It doesn't wobble, or make odd noises, or require a great deal of attention. It just gets on with the job. As for the drill bits, we have a set of Forstner bits made by Freud. They do a beautiful job every single time. They bore down through end grain and hard knots, and just about anything we care to throw at them. Best of all, we like the fact that we can use them to bore out overlapping holes. Yes, they do cost about twice as much as most bits, but they last longer, stay sharp and are a pleasure to use.

### MATERIALS LIST: OPTION

Board (1)  $\frac{3}{4}$ "  $\times$   $5\frac{1}{4}$ "  $\times$  15"—cherry

## STEP-BY-STEP STAGES



1 When you have used the plane to cut the two beads side by side, reset the blade to the very finest of skimming cuts and burnish the surface of the wood to a sheen finish. Be careful not to force the pace. Just let the weight of the plane do the work.

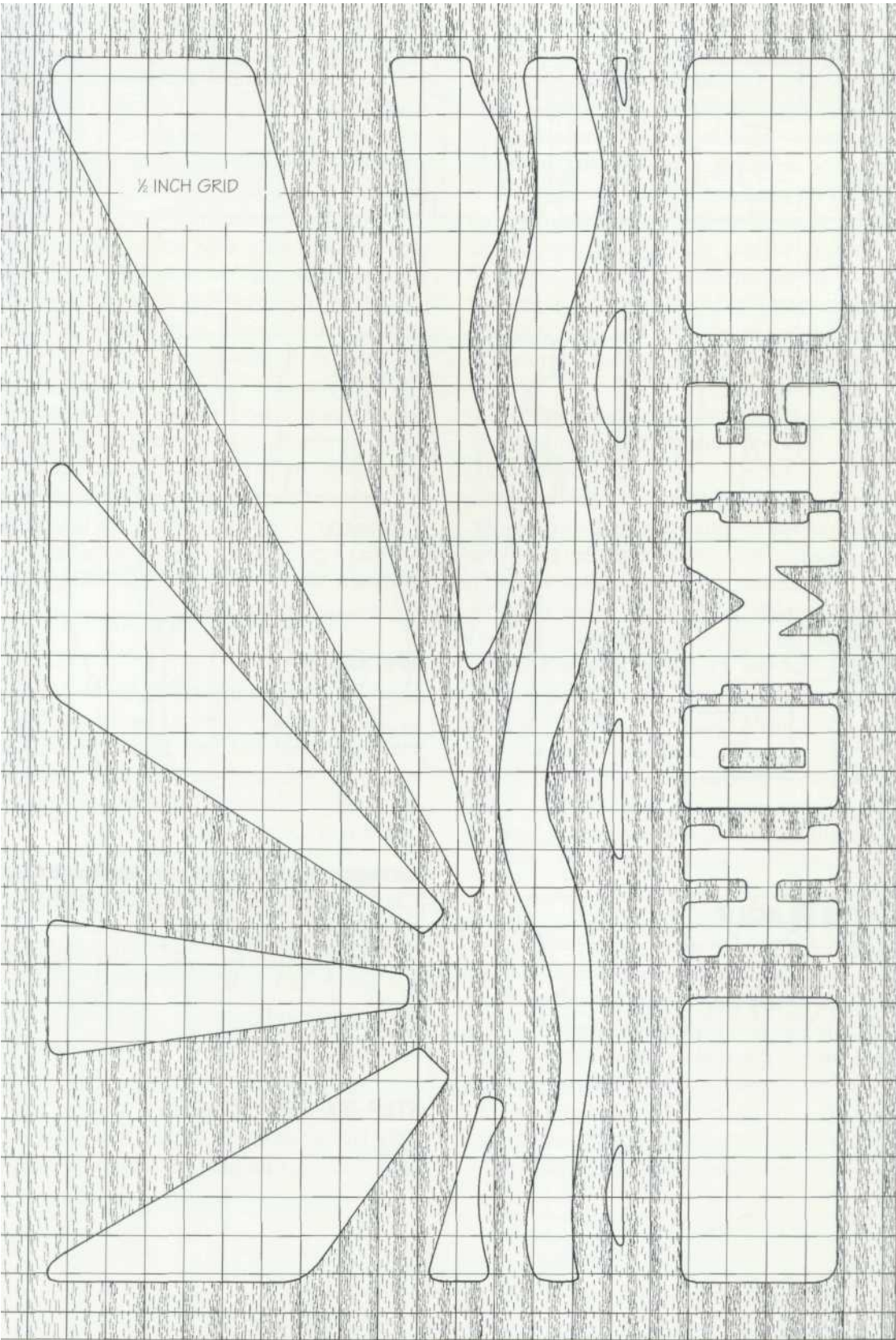
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# Raised Letter Address Plaque



When we first got married, one of the joys and pleasures was having our own home. Some of the first things we did when we moved into our infinitesimally minute cottage were to paint the front door bright red and design an address plaque. The red door didn't go down too well, but the plaque was a huge success! The neighbors admired it, the mailman said it added a touch of class—in fact the whole street made comments. So, if you want to make someone a unique gift, one that will beautify their home—be it ever so humble a house, cottage, bungalow, farm, ranch or riverboat—then a fretted address plaque is a great idea.





## THOUGHTS ON DESIGN

Of all the projects in the book, the name board is perhaps both the easiest and the most complex. I say this because, while the fretting techniques are truly easy—**just** about as simple and direct as can be—the design is something again. The problem is, of course, how to achieve a good visual effect—meaning a balance between the solid wood and the pierced areas—while at the same time getting the message across and achieving a structure that is sound. For example, it's no good at all having a design that is so complex that it needs to be viewed closeup with a magnifying glass, or a house name that is more an epic saga than one or two words. Also, the shape of the pierced areas needs to be carefully thought through so that the imagery is rounded and easy to cut. You don't want lots of spiky, sharp-angled imagery that is almost impossible to cut.

We are not suggesting that you necessarily use the sunburst image and the word "Home." After all, it would be more than a little bit strange if you, your neighbors and all our readers had identical boards. What we have in mind is that you use our imagery as an inspirational guide. In fact, you can use just about any imagery that takes your fancy—birds, horses, cattle, mountains, trees or whatever. The chief design problem is being able to link the name and the imagery so that the total message gets across. Let's say, for example, that you are giving this board to your grandmother who lives by the sea in a cottage called "Harbor View." You might well have a galleon riding the waves, or seashells, or a crab, or an anchor, or gulls, or a steamer, or whatever sea-salt-and-briny imagery that suits. And your great aunt—the one who lives in the mountains—could have a plaque with peaks, or bears, or **fir** trees. So let your imagination run wild!

## MAKING THE PLAQUE

First things first, you need to decide on the wood. I say this because in many ways the choice of the wood is essential to the design. While the wood must withstand the wind and the rain and be relatively easy to work, it must also be fitting for the task. For example, while oak is a good choice for our plaque which is to remain unpainted and mounted on a cottage near the sea, if you live in a pine forest or you plan to have the board painted, then you might as well use an inexpensive wood like pine.

When you have chosen your wood, and once you have achieved what you consider is a good design—with the spelling of the name double-checked—trace off the design, press transfer the imagery through to the wood, and shade in the areas of waste that need to be cut away. This done, take your drill and run pilot holes through the shaded areas. How you fret out the waste areas depends on your particular tool kit. I used an electric scroll saw, but you could just as well use a coping saw, a bow saw or even a large fretsaw.

No matter your choice of tool, the procedure is much the same. Make the pilot holes. Unhitch the saw blade and enter it through the hole. Refit the blade and adjust the tension. Then variously move and maneuver both the workpiece and the saw, so as to run the line of cut to the waste side of the drawn line.

When you have fretted out the design and used the graded sandpapers to rub the rough edges to a smooth finish, cut out the base board and bring it to a good finish. Use waterproof glue to bond the two boards together.

Finally, having first protected the wood with oil, paint or whatever seems appropriate, it's time to present the board as a gift. And if you really want to make it special, you could offer to mount the board on the wall, gate, post or other appropriate place.

## SPECIAL TIP

If you are going to mount the board directly on a wall, say beside the front door, it's best to use brass or bronze screws and have the board distanced from the wall by an inch or so. That way, when the rain runs down the wall and dribbles behind the board, there is space enough for a good flow of drying air.

## MATERIALS LIST

A Front pierced board (1)	$\frac{1}{2}$ " $\times$ $11\frac{3}{4}$ " $\times$ 18"—we used oak
B Base board (1)	$\frac{1}{2}$ " to $\frac{3}{4}$ " $\times$ $11\frac{3}{4}$ " $\times$ 18"

## STEP-BY-STEP STAGES

- 1 Having settled on a good, easy-to-work style of lettering, spend time drawing the letters up to size.



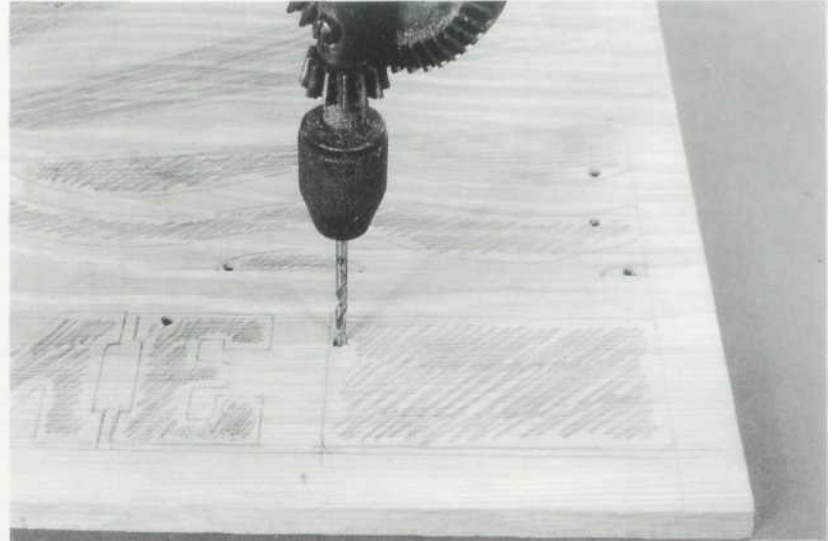
A B C D E F G

H I J K L M

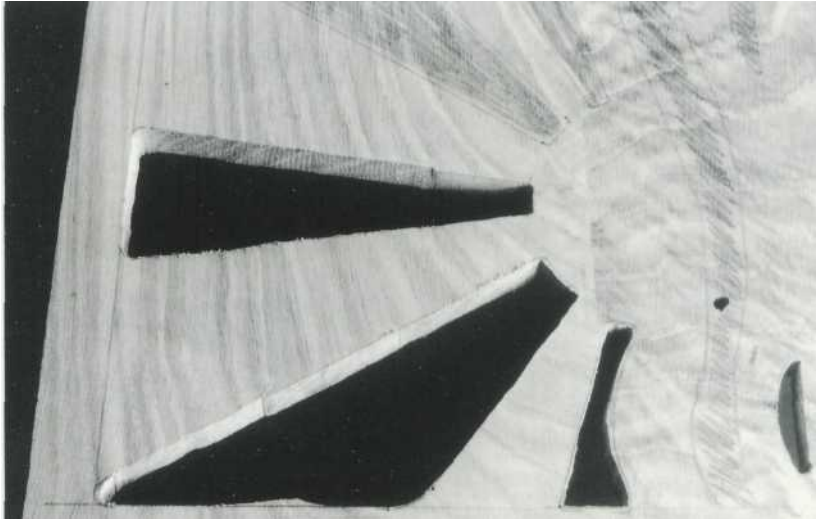
N O P Q R S T

U V W X Y Z

2 Run small pilot holes through the areas that need to be cut away. Be mindful if you are using a hand saw, that as some blades have pin fixings, you will have to choose a larger bit size.



3 As you can see, I had a bit of trouble keeping the line of cut on course. The problem was that the blade needed changing, the wood was amazingly tough and stringy, and I needed a rest. The only good thing you can say is that the bad cuts occur well to the waste side of the drawn line.



4 If you find that the workpiece doesn't want to move smoothly, then it's a good idea to rub a wax candle over both the surface of the cutting table and the underside of the workpiece. And don't be stingy with the blades. If the blade looks saggy or burns the wood, then change it!



## FRETTED LETTERS IN RELIEF

If your workshop is anything like mine, you are forever wondering what you can do with the offcuts. Well, there we were fretting out the letter shapes when one of the kids next door, Michelle Edwards, asked me if she could have the "M" and "E" waste cutouts from the word "HOME," so that she could stick them on her bedroom door. And so it was that the idea came to us that we could design a house board that used the cutouts rather than the holes, if you see what I mean.

## PROCEDURE

First, you need to draw the letter and/or number forms up to size—ours are 1 1/2" high—and trace them off. Arrange the tracing on the 1/4" wood so that the grain runs from side to side through the letters. Pencil press transfer the traced lines through to the wood.

As for the fretting out procedure, it's much the same as already described (see page 80), only easier. If you think about it, you will see that you only have to run the pilot holes through the enclosed forms—like the O and A—and you don't have to worry about saving the ground around the letters. All you do is run the line of cut in from the edge of the wood, travel around the letter and then move on to the next form.

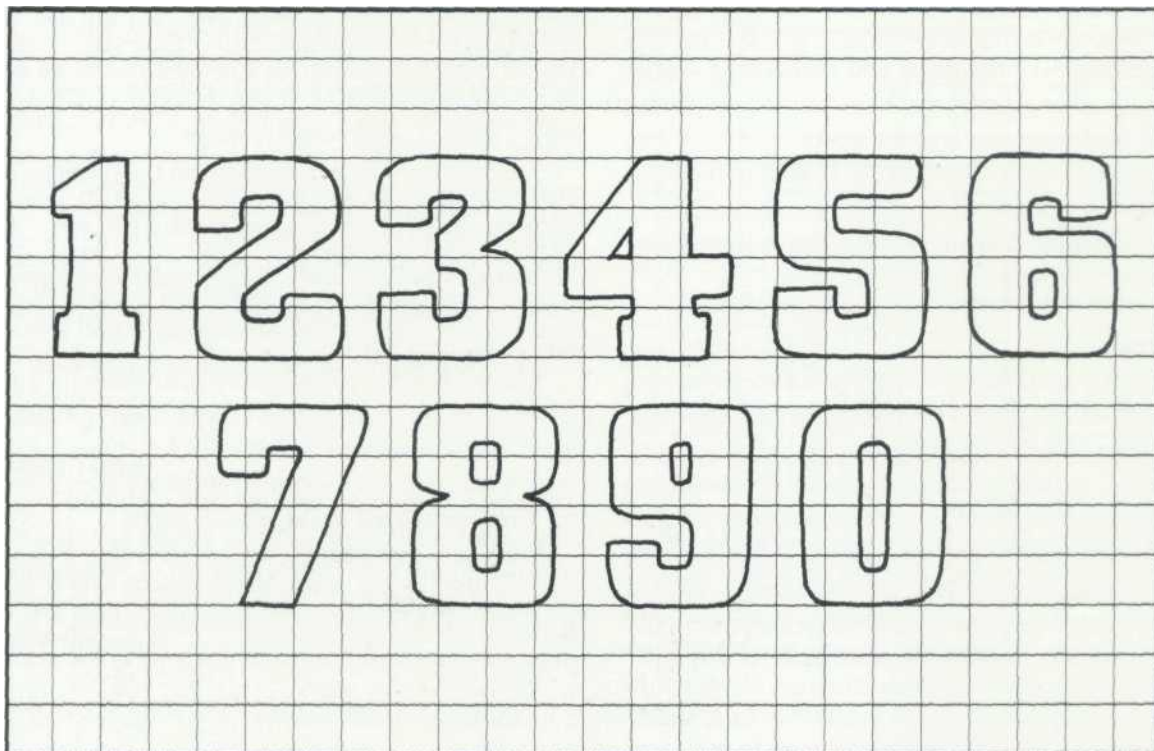
Once you have beveled off the edges of the ground board, then comes the tricky task of setting out the various

guidelines. I use the word *tricky* advisedly, because if the spacing between the letters is wrong, or the baseline on which the letters sit is crooked, or whatever, then the whole thing will be messed-up. The best procedure is to work the spacing out on tracing paper, and then use a square and straight edge to very carefully mark the base board with all the guidelines.

When you are happy with the guidelines and the spacing, smear the back of the letters with the PVA glue and dab them down on a piece of scrap wood to remove the excess. Then position them on the board and press down firmly. With all the letters/numbers in place, stand back to check the alignment and then leave them be until the glue has set. Finally, drill the four fixing holes and give the whole works a generous coat of yacht/spar varnish.

### MATERIALS LIST: OPTION

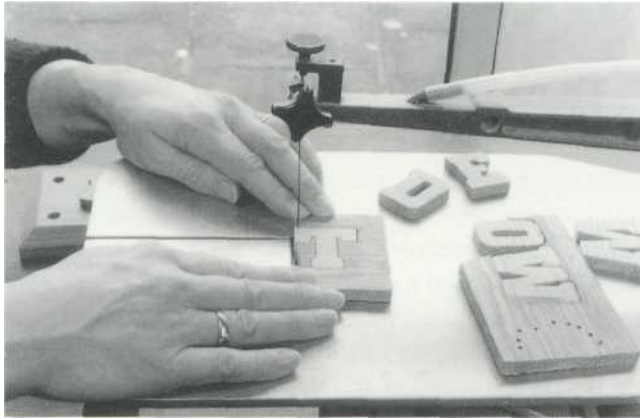
- A Board (1) prepared 7/8" x 4" piece of American oak at a length to suit the name of your house
- B Board (1) 1/4"-thick piece of American oak—enough for all your letters
- C Exterior PVA glue
- D Yacht varnish



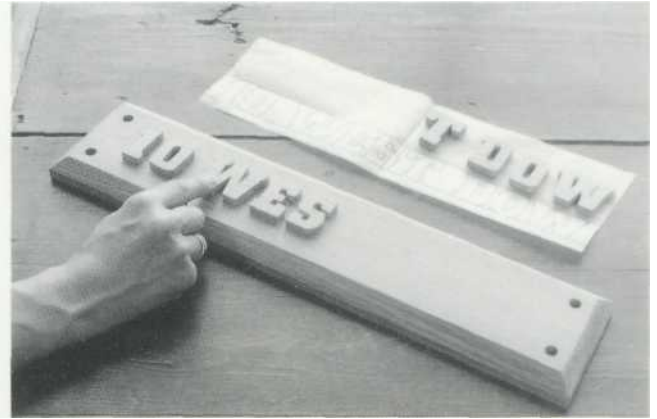
NUMBER PATTERNS



## STEP-BY-STEP STAGES



1 Press transfer the various letters and numbers through to the 1/4"-thick wood. Shade in the waste so that there is no doubting the line of cut. Then fret out the letters and numbers on the scroll saw. Work at a very steady, easy pace, all the while making sure that the line of cut is fractionally to the waste side of the drawn line.



2 Check and double-check the spacing. Label the back of each letter "glue side," and then very carefully glue them in place. Do your best **to** avoid using so much glue that it oozes out.

## DESIGNING AND TRANSFERRING

One of the chief difficulties for many woodworking beginners is that they make mistakes when it comes to designing and transferring. They make the first mistake when they draw the designs up to size, and the second when they transfer the designs through to the wood. The pity of it is that, by the very nature of things, the designing and transferring mistakes occur in the early stages. What invariably happens is that the beginners get so frustrated with the techniques of designing and transferring—what with using the wrong paper and with pencil lead getting smeared all over the paper and the wood—that they give up on the project before they ever get around to the wondrously exciting woodwork.

If you are having difficulties, then the following tips will help you sort out your problems.

### Designing

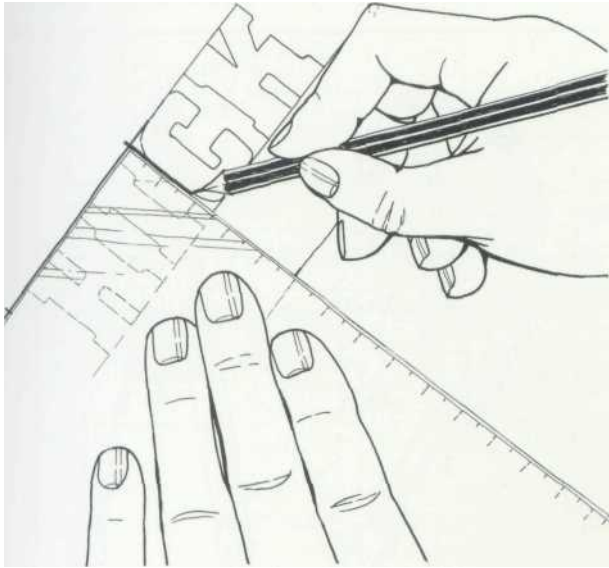
Designing is the procedure of working out the structure, pattern and form of a project by making various drawings, taking photographs and making models or prototypes. For example, with this address plaque the lettering needed a lot of thought. The problem was that while I personally prefer what might be described as classic Greek and Roman letter forms—with serifs and thick and thin strokes—it was pretty plain to see that such a style would be totally unsuitable in terms of wood and fretsaw work.

So we searched around in books until we came up with a strong, bold letter style, one that looked as if it might lend itself to being fretted out with a scroll saw. Then we modified the style slightly so that all the little angles became curves. We used a ruler and square to draw the letters to size on thin layout paper, and then, using tracing paper with ruled guidelines and a square, we played around with the spacing of the letters until the word looked right. Be warned that you must always use a square **in** all lettering projects. If you don't, you will finish up with a badly spaced, wobbly mess!

We did much the same thing with the sunburst design. Having settled on the idea of the sunburst, we drew the elements of the design on scraps of layout paper. We fiddled around with the placing and the size and then drew up a master design on white illustration board. Then we took a final tracing.

It sounds a bit complicated, but the whole idea of working in this way is that all the many roughs, ideas, alternatives, variations, scribbles and sketches are worked out on the relatively inexpensive layout paper, before they are ever transferred to the quality paper.

We take a tracing from the master drawing so that we can use the tracing in the workshop—where it generally gets creased, damaged and used to destruction. The master drawings, however, are stored safely away for next time.



### DESIGN TOOLS

*A set square is an essential piece of drawing equipment. It's best to get the see-through type so you can see what's going on under the square.*

### Paper, Illustration Board, Layout and Tracing Paper

We use layout paper for the initial scribbles and sketches, good-quality glazed white illustration board for drawing out the master designs, and best-grade tracing paper for the transferring. It's not that we are fussy or faddish, and it's certainly not that we can afford to splash our money around. It's just that over the years we have learned that using the choice papers generally gets the job done faster and with fewer mistakes. Certainly you might think that we could use a flimsy-grade tracing paper for transferring, but again, experience has taught us that using a cheap-grade paper is a bad bet. It tears easily, it bleeds when used with ink and it doesn't take kindly to being scratched and scraped. And the same could be said about the pencils, the illustration board and all the other designing materials—the best is cheapest in the end! All that said, you can cut costs by visiting a printer and buying offcuts and ends of rolls/packs.

### Masking Tape

We use an all-purpose paper, low-tack sticky tape to secure the card and tracing paper to the drawing board, and the tracing paper to the wood. We never use transparent tape simply because it is too sticky and damages both the paper and the wood.

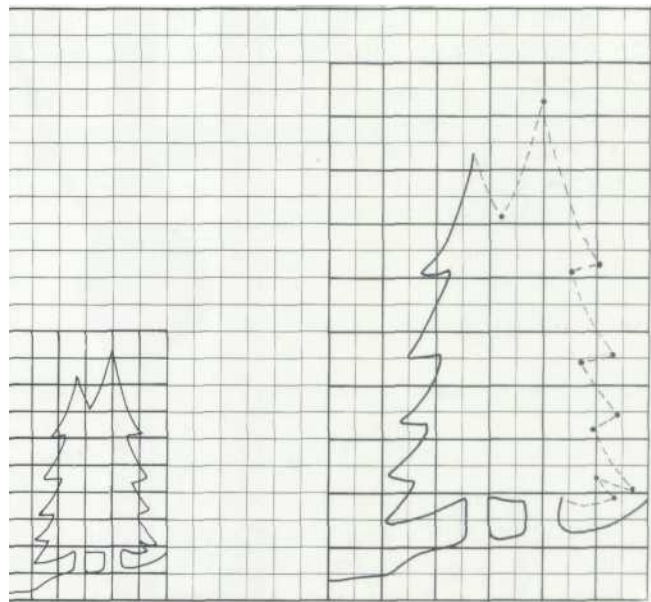
### Gridded Working Drawings

A scaled square grid can be placed over a working drawing so that the object illustrated can be reduced or enlarged simply by changing the size of the grid. For example, if the grid is described as a "1" grid" or "one grid square to 1"" and the object is 6" long, and you want to finish up with an item 12" long, then all you do is double the scale and read each square off as being 2". And, of course, when you come to drawing the design up to size, you simply draw up a grid of the suggested size and transfer the contents of each square in the design through to your drawn grid.

### Tracing and Pencil-Press Transferring

I usually describe the procedure of taking a tracing from the master design and then transferring the design through to the surface of the wood as "pencil-press transferring."

The procedure is: Work up the design on layout paper, make the master drawing with a hard pencil and take a tracing with a hard pencil. Next, pencil in the back of the tracing with a soft 2B pencil. Turn the tracing right side up, fix it to the wood with tabs of masking tape, and then rework the traced lines with a hard pencil or ball-point pen. This done, remove the tracing and rework the transferred lines on the wood. Finally, spray the surface of the wood with artist's fixative to prevent the pencil from smudging.



### TRANSFERRING SCALED DRAWINGS

*Having drawn a grid over the original design and another grid at a scale to suit—in this case I wanted to double up, so it is twice the size—then all you do is painstakingly transfer the contents of **each** square.*

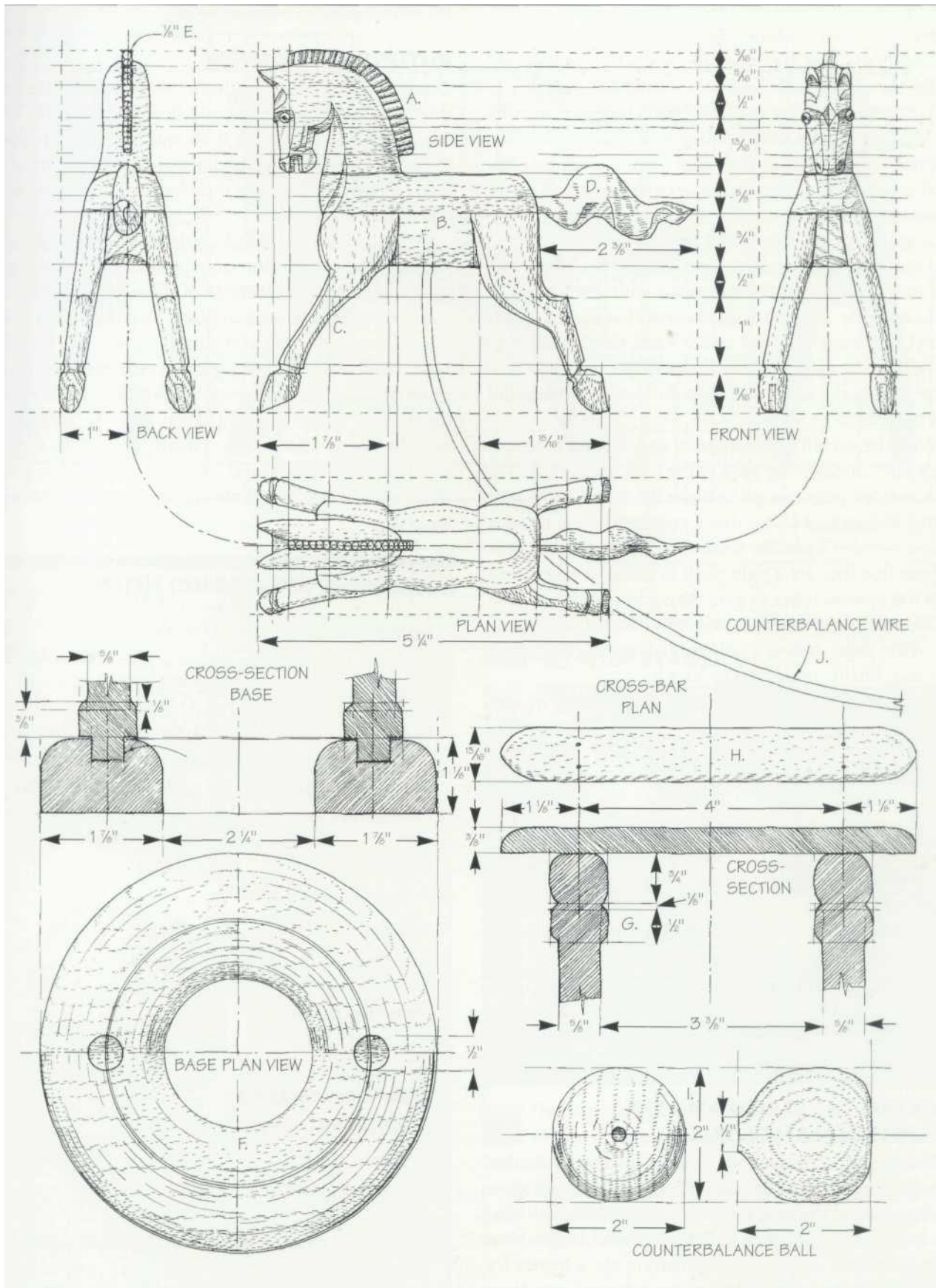


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# Counterbalance Horse Toy



One of the pleasures of making a traditional toy of this size, type and character is the fact that you can change the specifications, the working drawings, the imagery, and the techniques to suit your own needs and fancies. For example, you might prefer to go for an elephant or a tiger rather than the horse, or you might want a straight-sided slab rather than the turned base. Our advice is to have a good long look at the working drawings and the various photographs, and then either copy our design directly or go your own way and adjust the designs to suit.



## MAKING THE HORSE

Having roughly fretted out the shape of the head and the four legs, begin by taking the seven component parts—the head, the four legs and the two body pieces—and gluing them together to make the blank. The best procedure is to first glue the two body parts together, then fix the legs to the body and finish with the head.

Once you have made the blank, then comes the pleasurable task of whittling the horse to shape. It's all pretty straightforward. All you do is round over the back of the neck and body, swiftly model the face and the hooves, trim the legs and so on. Of course, the degree of modeling **will** to a great extent depend upon your knowledge of horse anatomy. But that said, I believe that in the context of toys, the imagery is best stylized and simplified. Or to put it another way, yes, the horse needs to look like a horse, but at the same time you do have to be mindful that it needs to be strong.

With the overall horse whittled and sanded to shape, run a saw cut down the back of the neck and glue fix the little wooden pegs that go to make the mane. After a lot of trial and error, I found that a good method is to cut a couple wooden barbecue sticks into 1" lengths, slice the ends so that they are a tight push fit in the saw kerf, and then use cyanoacrylate to glue the sticks one at a time in the slots. When you are pleased with the shape and placing of the pegs, dribble a tad more glue along the whole row and, finally, trim them to length.

When you come to the tail, whittle it to shape as seen in the side view, and then whittle the shape as seen in the top **view**. It is a little bit tricky because the pine is relatively hard and grainy, but you don't have to get too fussed about the precise shape. Lastly, drill two holes in the horse—one for the tail and one for the wire. Then glue the tail into place.

Making the horse is pretty easy, but if you look closely at the photographs, you will see that I needed to correct various mistakes. For example, I needed to inset strips to strengthen the hooves, and I had to glue and dowel-pin one of the legs so as to strengthen the short grain. All I am saying is don't get in a sweat if a leg splits off or something else breaks. Just make a glue-and-peg repair and start over.

## MAKING THE STAND AND THE COUNTERBALANCE BALL

The stand can be as plain or as fancy as the mood takes you. As long as the height and placing of the posts allow for the swing of the wire and the counterbalance ball, and the horizontal crossbar is level and parallel to the base, then the actual shape and construction are a matter for personal choice. I decided to go for a turned ring base,

and whittled posts, crossbar and ball, but you could go for turned posts or other changes.

## PUTTING IT TOGETHER

Once you have made the horse, the stand and the ball, then comes the frustrating and finger-twisting, but very enjoyable, task of putting it all together. Start by gluing the posts in the base and gluing and pinning the crossbar. Don't forget that the posts must be parallel and the crossbar level.

Now, having first drilled a hole in the horse's belly and flattened one end of the counterbalance wire, dribble glue in the hole on the underside of the horse and push the flattened end of the wire in place. This done, drill a hole right through the ball and thread the ball on the wire. Next, bend the wire into a gentle curve and position the horse on the crossbar. Try out various curves of wire until the horse is nicely balanced. Then glue the ball in place and clip off the excess wire. Finally, give all the **surfaces** a thin coat of varnish and let it dry. Burnish the whole thing with beeswax, and the horse is finished and ready for action.

### MATERIALS LIST—

#### HORSE

A Head (1)	1"×2"×2¼"
B Body (2)	1½"×¾"×3½"
C Legs (4)	½"×2"×3"
D Tail (1)	¾"×1"×3"
E Wooden barbecue sticks (2)	⅛" diameter

#### STAND

F Base (1)	1½"×6"×6"
G Posts (2)	1"×1"×14"
H Crossbar (1)	½"×7⁄8"×6½"

#### COUNTERBALANCE

I Ball (1)	2"×2"×2" cube
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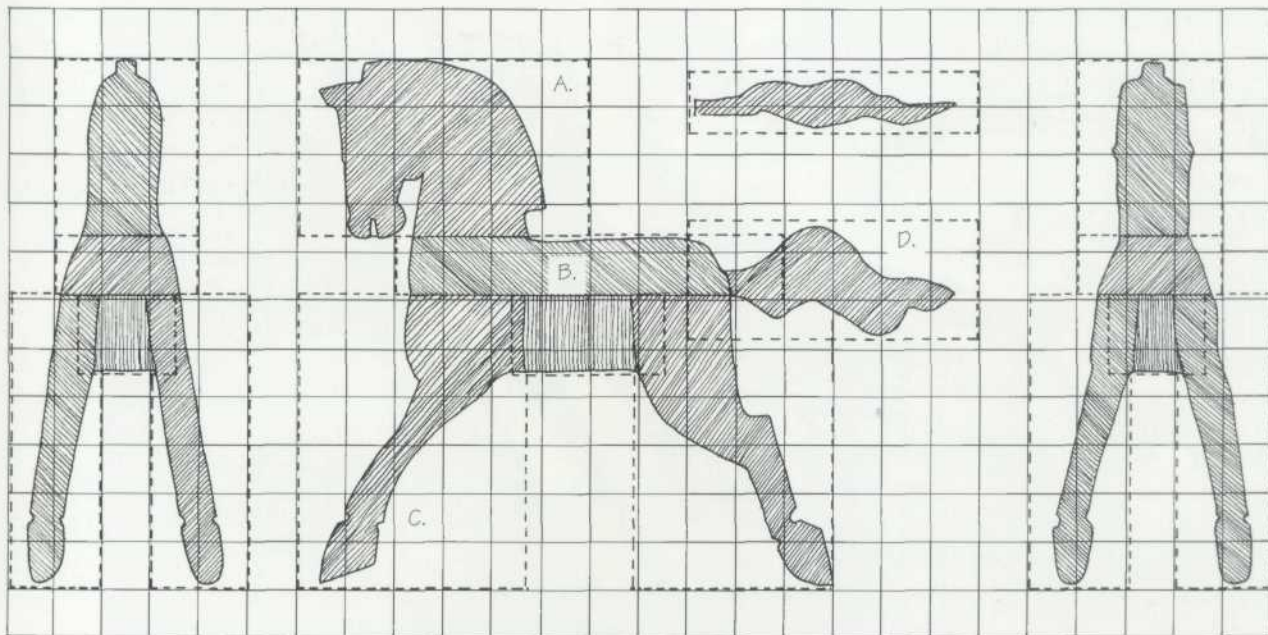
#### HARDWARE AND EXTRAS

J Wire coathanger (1)	16"
K Screws and nails	various
L Cyanoacrylate	

*Note that all measurements allow for a small amount of cutting waste.*



CUTTING DIAGRAM—½-INCH GRID



BACK VIEW

SIDE VIEW

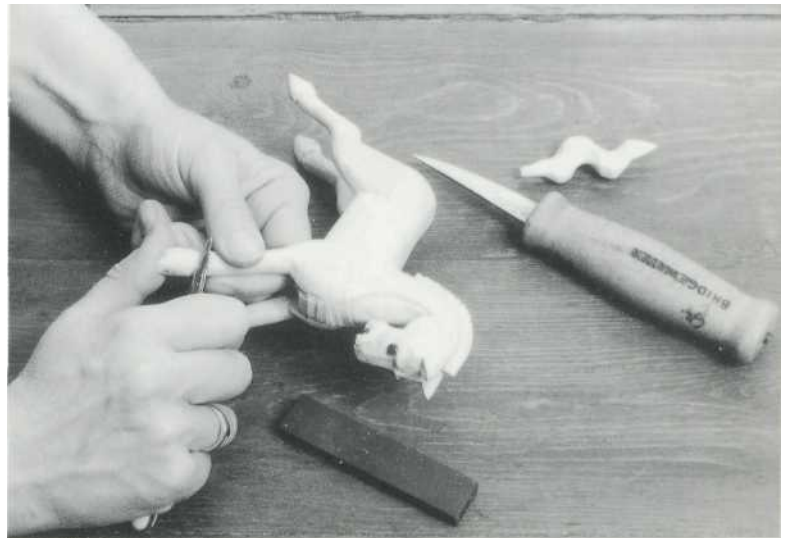
FRONT VIEW

## WORKING DRAWING B

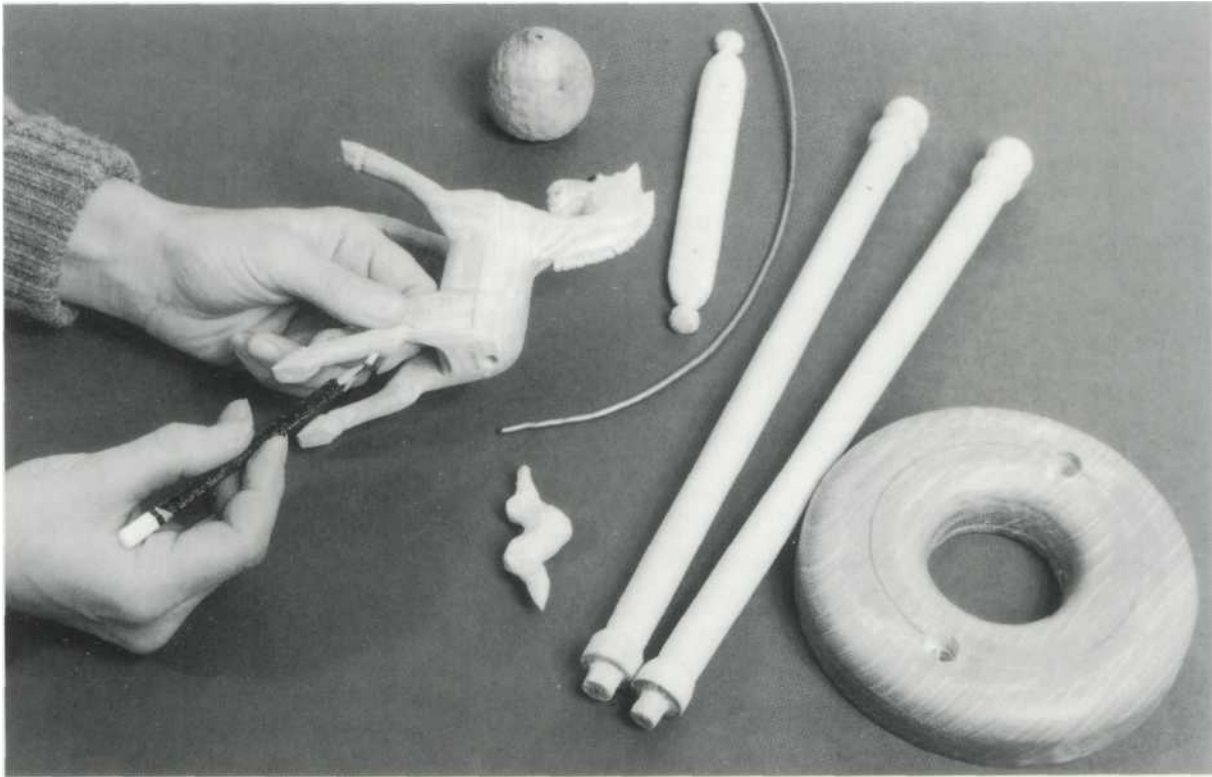
### SPECIAL TIP

Gill—my wife and better half—has just pointed out that there are toys for babies, toys for toddlers and toys for adults. She says that while the balancing horse is the perfect toy for an adult—you know the sort of thing, a toy that can be played with at the dinner table when kids, friends and family are looking on—it's not the sort of toy that you give to a boisterous five-year-old!

## STEP-BY-STEP STAGES

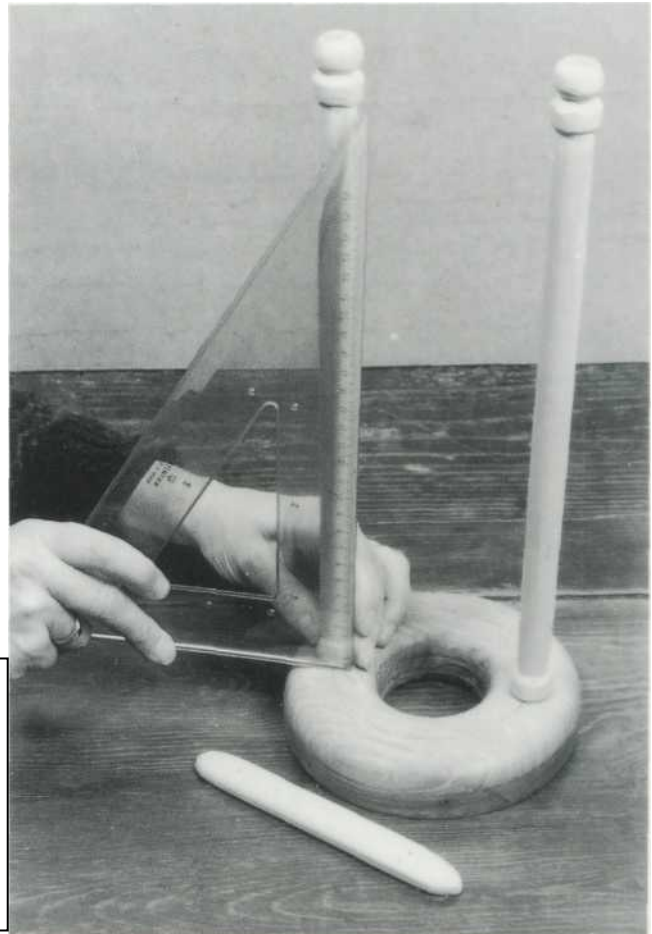


1 Having glued up the blank, use your knives to model the details. Use tightly controlled paring cuts, all the while being careful not to damage the relatively fragile short-grain areas like the ears. Note that I had a trial fitting of the eyes at this stage—I was eager to see how the overall image looked.

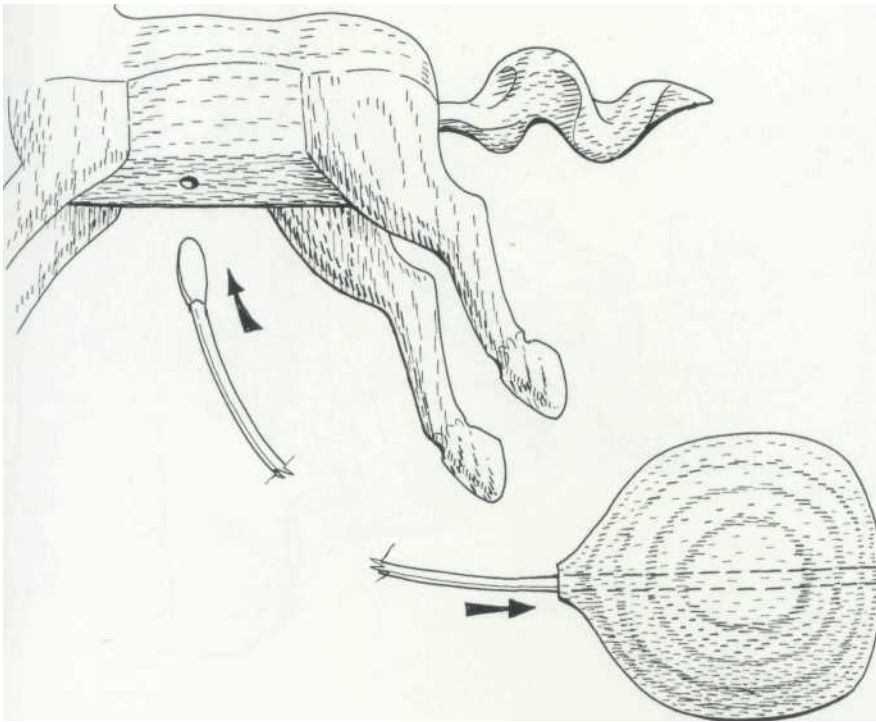


2 I had a bit of trouble when it came to the short grain on the back legs, so much so that I needed to reinforce one of them with a glued dowel. All I did was drill a hole across the run of the grain, dip a cocktail stick in glue and run it in the hole.

3 When you are gluing up, make sure that the posts are square to the base and parallel to each other. The good thing about using the PVA glue is that the long setting period allows you plenty of time to fiddle and fuss to get it right.



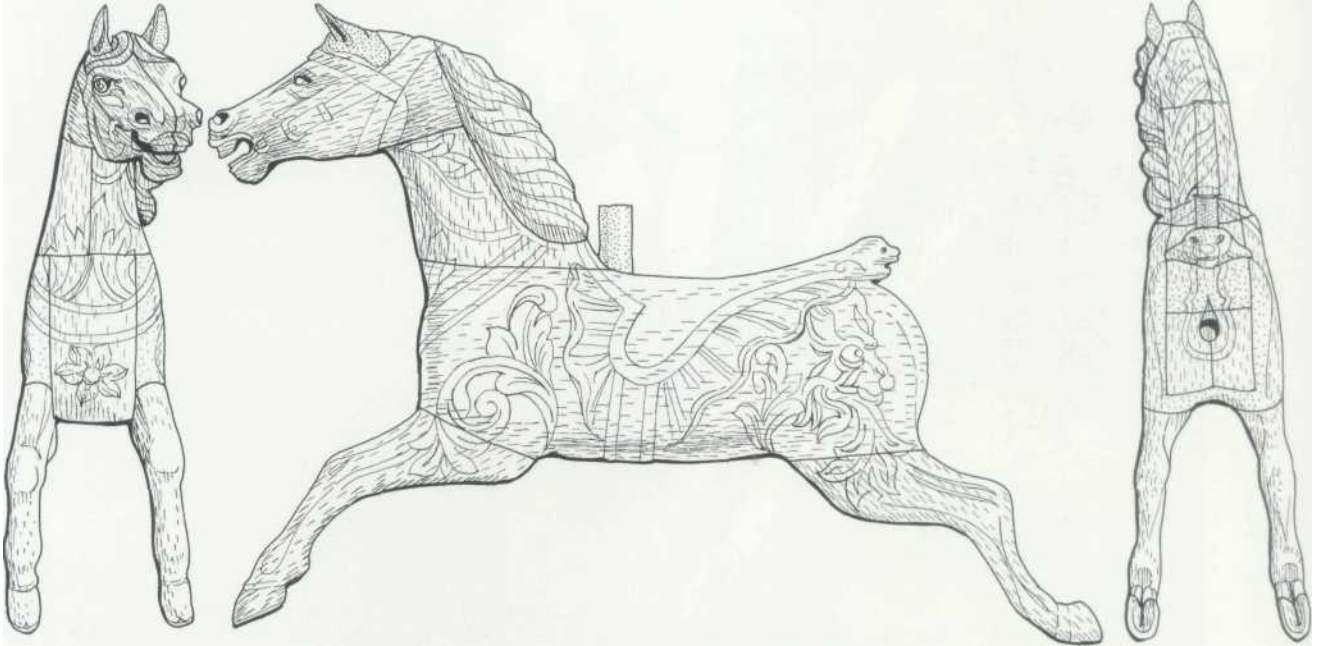




Flatten the end of the wire, smear it with glue, and then force it into the drilled hole (top). Having played around until the horse is more or less balanced, thread, glue and wedge the ball in place (bottom).



Finally, tweak the curve of the wire until the horse is perfectly posed.



**DESIGN OPTION**

*Design for a single-seater galloper, circa 1895-1905, by J.R. Anderson. We drew a good part of our inspiration for this project from this design.*



**DESIGN OPTION**

*Here's a head detail from a carousel horse circa 1926, Circus World, Orlando, Florida (top), and a horse from the Crescent Park carousel, circa 1895, Riverside, East Providence (bottom).*

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# Old-Fashioned Push-Along Toys



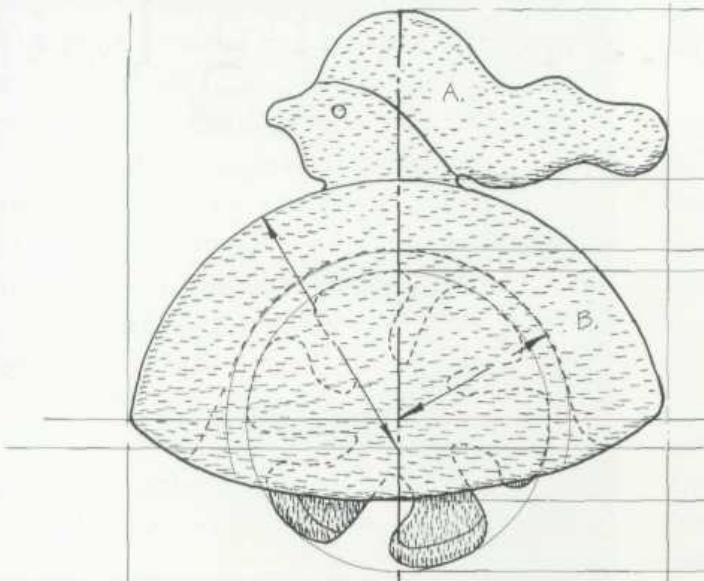
## **RUNNING ROSY**

A doll to kiss, a doll to cuddle—at some time or other, most of us have sought the cozy, clinging comfort of a toy doll. Running Rosy is something more than a doll. She's a sort of doll in a hurry, the perfect push-along-the-carpet plaything for younger kids. This is a beautiful plaything, a real delight for kids and adults alike. She's strong, easy to make, nicely rounded for "learning" hands, but best of all, her wheel-turning movement is just right for active toddlers who like to push toys along the floor. If you are looking to make a unique toy for a unique kid, then this is the one.

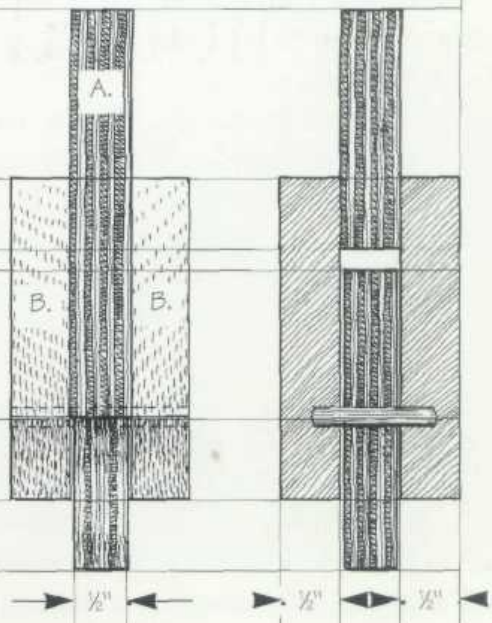
## **MAKING THE TOY**

When you have carefully studied the working drawings, take the tracing paper, a pencil, ruler and compass, and carefully set out the design on the wood. If you are going to stay with my choice of materials—plywood sandwiched between solid wood—then you need six cutouts in all: two solid wood outside body parts, two plywood head and body spacers, and two plywood foot-wheels. If you are wondering about my choice of materials, it's pretty straightforward and logical. While the head-and-body spacer and the wheel need to be strong in all directions across the grain, they also need to be safe for kids,



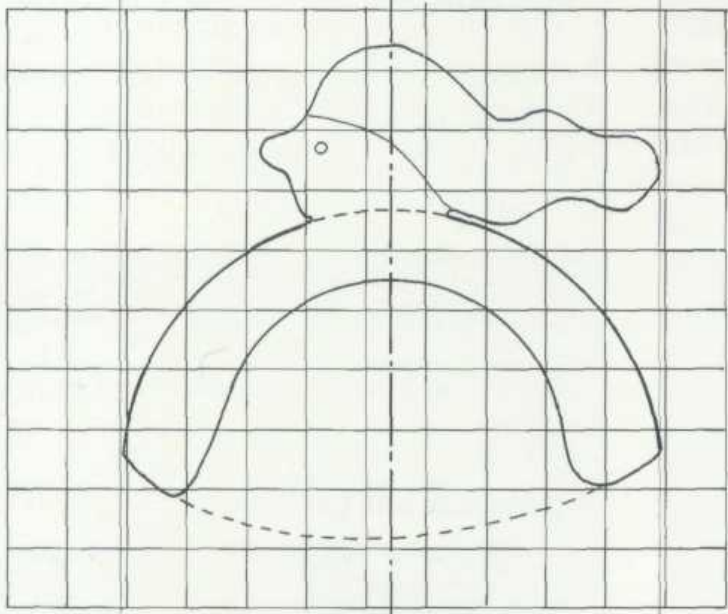


SIDE VIEW

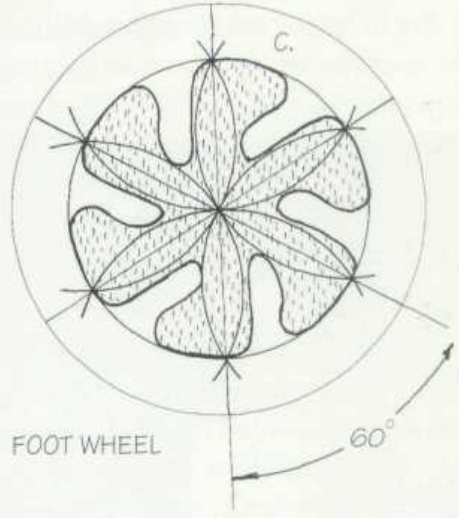


FRONT VIEW

SECTION VIEW

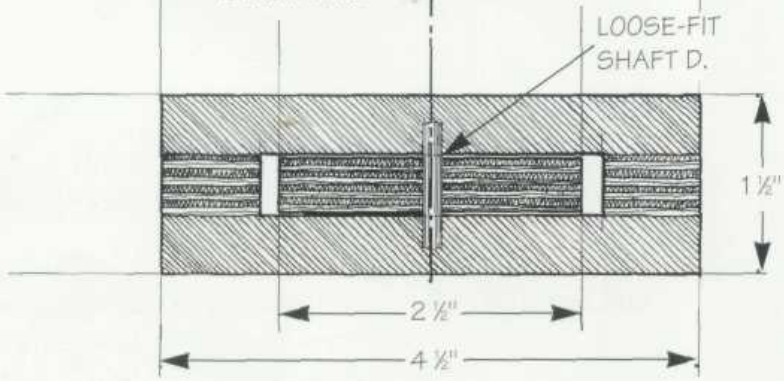


1/2-INCH GRID



FOOT WHEEL

60°



PLAN VIEW  
CROSS-SECTION

LOOSE-FIT  
SHAFT D.

1 1/2"

2 1/2"

4 1/2"



as well as relatively easy to work with a coping saw. All things considered, we thought that best-quality 1/4"-thick multi-layer plywood was a winner on many counts. It's strong, it's stable, it's easy to cut, and it's easy to bond layers together to give extra strength.

When you have made all the cutouts, rub the two foot-wheels down to a smooth, round-edged finish—so that they are smooth to the touch and the total two-wheel thickness is something less than 1/2". Next, establish the position of the pivotal dowel holes through the wheel and into the inside face of each solid wood body part. Then drill them out with a bit size that gives you a slightly loose fit for your chosen dowel.

To assemble: Glue one body part to one side of the central head-body spacer. Set the two foot-wheels in the cavity so that the feet are facing in the correct direction. Slide the dowel in place, and, lastly, glue the other body part in place so that the foot-wheels and pivotal dowel are nicely contained.

When the glue is dry, rub the whole works down so that the corners are rounded and good to hold. Aim for a form that is going to be safe and comfortable in a toddler's hands. Finally, use watercolors to tint in the imagery, give the whole works one or more coats of clear varnish, and the toy is finished.

### SPECIAL TIP

Wooden toys must be childproof! Being mindful that toddlers are, at the very least, going to stick the toy in their mouths, it's most important that all the fixtures, fittings and materials be totally secure and nontoxic. Perhaps most important of all, the wood must be splinter resistant. With all this in mind, we chose to use multi-ply for the central layer and for the wheels, for the simple reason that

it's easy to work, good to touch, strong across short grain "necks," and it glues and finishes well.

Don't think you can cut costs by using the coarse-centered plywood that goes by such names as "block ply," "stout heart" and "Malaysian." I say this because plywood of this type and character tends to be difficult to work, soft, almost impossible to sand to a good finish, and prone to splintering. No, when we say "multi-ply," we are specifically referring to the type of plywood that is built up in thin 1/16" layers or veneers. A plywood of this character has a smooth, white, close-grained face, it's tremendously strong and it's great to work. Ask for "best-quality, multi-ply, multilayer or multi-core plywood," and don't be talked into anything else.

Note, a sheet of 1/4"-thick multilayer plywood should be made up of four or five thin veneer layers.

### MATERIALS LIST

A Head-body spacer (2)	1/4" × 5" × 5" plywood
B Outside body parts (2)	1/2" × 3" × 5" solid wood
C Foot-wheels (2)	1/4" × 3" × 3" plywood
D Pivotal dowel (1)	1/4" dowel × 1 1/4" long

*Note that all measurements allow for a small amount of cutting waste.*

### HARDWARE AND EXTRAS

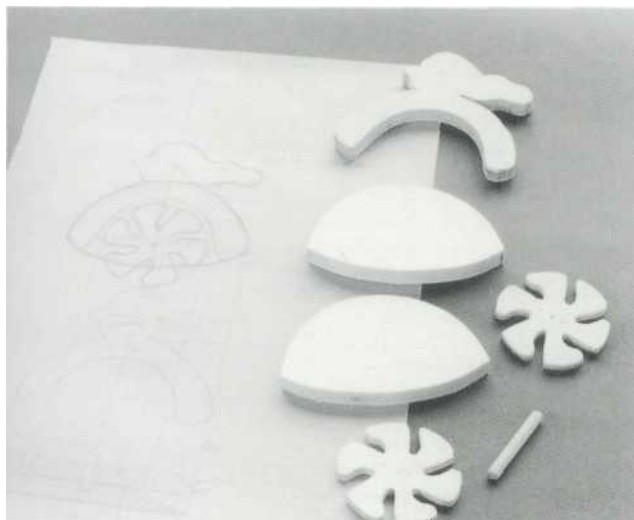
- E Artist's watercolor paints—colors to suit
- F Clear varnish

### USING PLYWOOD

*Best quality multi-ply is a first choice material for small cutout type toys. It is amazingly strong and it rubs down to a good smooth-to-touch finish.*



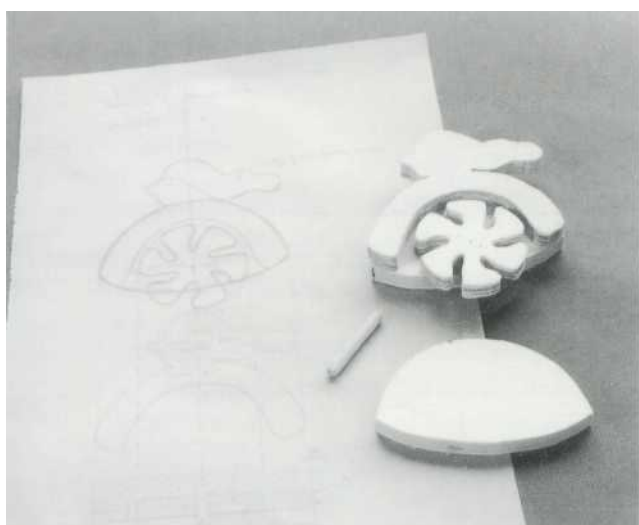
## STEP-BY-STEP STAGES



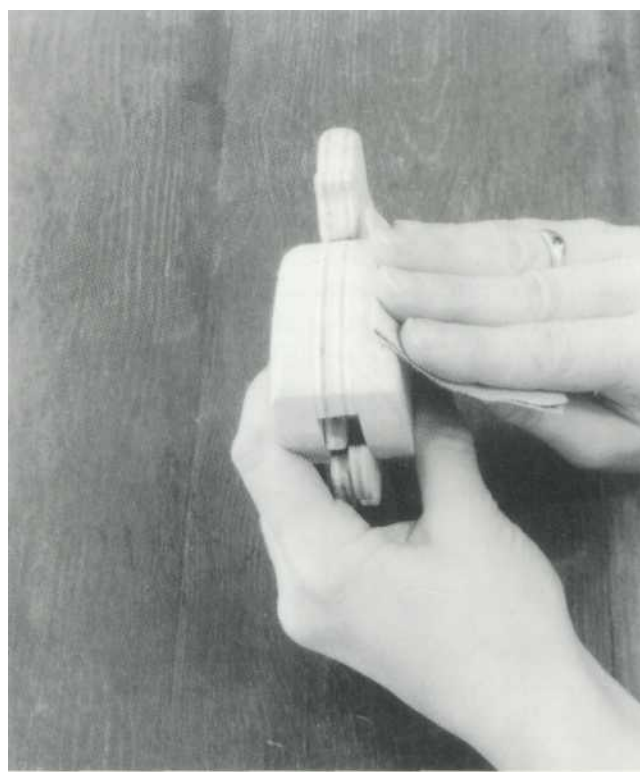
1 Check the component parts against the working drawings. And just in case you are wondering why I opted to use two 1/4" thicknesses to make up the 1/2"-thick spacer—rather than a single 1/2" thickness—the simple answer is that I had lots of pieces of 1/4" ply that needed to be used up.



2 Fix the two wheels together with a piece of double-sided sticky tape and rub them down so that they are slightly less than 1/2" in total thickness. The use of the tape not only ensures that both wheels are identical, it also makes them easier to handle.



3 Test the wheels in the body cavity. They need to be an easy loose-turning fit. Note that in this test run I have the feet running in the wrong direction!



4 Rub the whole works down to a smooth finish. Close your eyes to test the finish—it's vital that every surface, edge and angle be supersmooth to the touch.

## RUNNING REG IN HARDWOOD

Kids are so perceptive! When our Rosy toy was finished and up and running, I took it around to the 5-year-old girl next door for a bit of no-nonsense, in-depth criticism. Of course I was expecting a little bit of praise, but, oh no. All she said was, "But. . . where is running Reg?" So there you go, we had no other option but to make a Running Reg toy.

## COUNTERCHANGE CUTTING

The clever thing about this project is not so much the design, but rather the way the two contrasting thicknesses of wood are cut and then counterchanged. It's an amazingly simple but subtle technique. All you do is sandwich two contrasting sheets of wood together, fret the design through both layers, and then swap the cutouts around so that the cutouts are contrasting.

## PROCEDURE

Take the four pieces of wood—the sycamore, the mahogany, and the two pieces of plywood—and use the double-sided sticky tape to make a sandwich that has the plywood as the filling. When you are happy with the arrangement, carefully press transfer the traced imagery through to the sycamore side of the sandwich. Use the scroll saw to fret out the outside profile. This done, ease off the outside layers—the sycamore and the mahogany—and stick them together.

Cut out the **plywood** inner shape and the wheels. Then comes the very clever procedure of counterchange cutting. The method is beautifully simple. All you do is take the two profiles—the sycamore and the mahogany, all nicely stuck together with the double-sided tape—and saw them down into all the little parts that go to make up the design. For example, with this design I ran cuts through at either side of the hat band and under the chin. All you then do is swap the cutouts around and put the toy together in much the same way as already described.

2 Ease the layers apart, remove the double-sided tape and counter-change the parts. Note the little cut that goes to make the design of the mouth.

## MATERIALS LIST: OPTION

- A (1) Prepared sycamore or maple wood— $\frac{1}{2}'' \times 5'' \times 6''$
- B (1) Prepared thick dark wood—I used a piece of salvaged mahogany— $\frac{1}{2}'' \times 5'' \times 6''$
- C (2) Pieces of plywood— $\frac{1}{4}'' \times 5'' \times 5''$

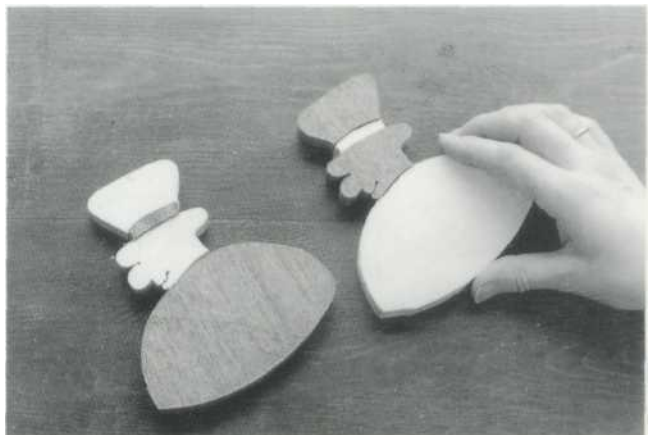
## HARDWARE AND EXTRAS

- D PVA glue
- E Yacht varnish
- F Double-sided sticky tape

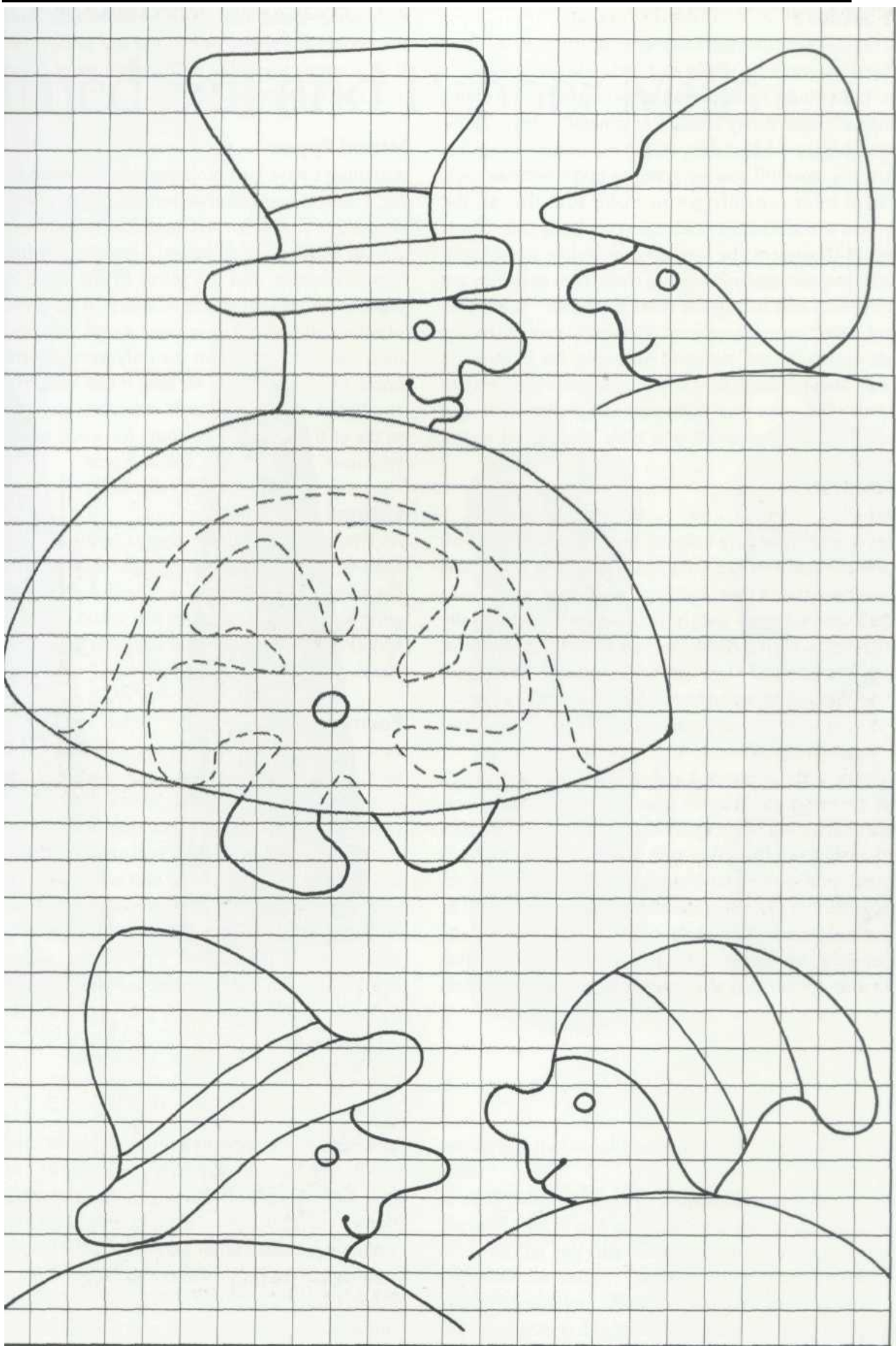
## STEP-BY-STEP STAGES



1 Having fitted the very finest blade in the scroll saw, very carefully cut the design down into its component parts. It's important that you use a new, well-tensioned blade and go at it slowly, so that each and every cut is well placed and square to the wood.







DESIGN OPTIONS

## **TOY SAFETY**

Traditional wooden toys are enormous fun! Woodworkers like making them and kids like playing with them. But you do have to bear in mind that the average, intelligent finger-sticky toddler is generally going to do his level best to push the toy in his mouth and/or up his nose, if not worse! If you are going to make wooden toys, you have most certainly got to make sure that all the structures and all the materials are completely safe. If you are going to present the toys as gifts and/or make them for sale, you are legally bound to make sure that they are "safe, sound and fitting for their purpose." What this means is that you must ensure that every part of the toy is safe—no splinters, no toxic materials, no loose parts that can be swallowed. Be warned, ignorance is no excuse under the law—*you must make sure that everything is safe!* The following will provide you with some good sound guidelines.

### **Paint**

Since kids like brightly colored toys, it's vital that you make sure that you use paints that are completely safe and nontoxic. Yes, your dad's old paint might still be in good condition, and, yes, it would give a wonderfully glossy, hard-wearing finish, but then again, it is almost certainly poisonous! Most old paints contain all manner of toxic mixes, everything from lead and antimony to arsenic. You must set out on the assumption that all old paints are dangerous.

When I asked around, I was assured that all modern paints are required by law to meet certain nontoxic, lead-free standards. But when I took it a bit further and phoned a paint manufacturer, they said that though their paints do most certainly come within safe standards, they don't necessarily come up to the standards required by the "Toy Safety" laws. As you can see, the whole area of paints and toy safety is somewhat difficult. I personally think that the best advice is either to use water stains and cover them

with water-based varnish or to use acrylic paints. If you are concerned about paints and toy safety, then it's best if you write to various well-known paint manufacturers and ask their advice.

### **Wood Types**

Although I have had no personal experience in this matter, I do understand that certain exotic wood types are dangerous if they are chewed. For example, I read of a case in which a child chewed a wooden toy from a Third World country, and the juices in the wood caused the child to go into some sort of shock. If we err on the side of safety and take it that some wood varieties are toxic, then the best advice is to use only wood varieties that we know to be safe. So, if we take it that modern American and British toymakers know what they are doing, it looks to me as if we should be going for wood types like lime, sycamore, beech, birch, oak and pine.

### **Fittings**

As I remember, kids are always trying to pry their toys apart in an effort to find out how they work. This being the case, it's a good idea to avoid nails, small pieces of wire, and component parts that could in any way crack, splinter or shatter. The best advice is to use brass screws, glued dowels and glued layers.

### **Form**

In many ways, the form a toy takes is as important as its substance and structure. For example, if a toy has a component part that is long, thin and spiky, or a part that could be swallowed, or a part that could be inserted into the ear or nose, then it follows that the toy in question has been badly designed. If and when you are designing your toys, or if you decide to modify this one, you must make sure that it's safe. For example, it might be a good idea to extend the walking girl's hair so as to make more of a handle, but the question is—would it be safe?



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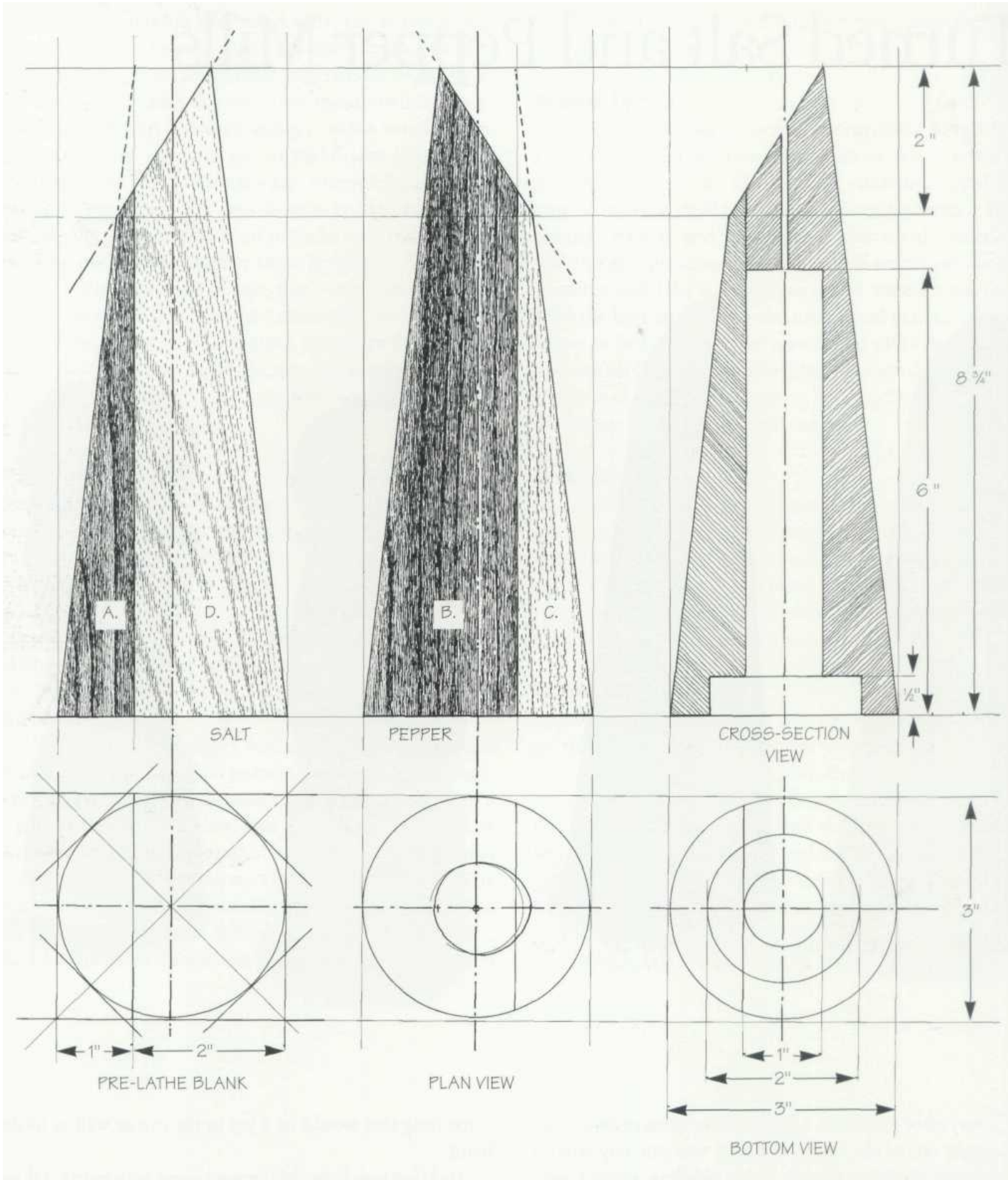
# Turned Salt and Pepper Mills



Every once in awhile, a good project idea comes to me right out of the blue. And so it was one day when I was sitting down to dinner. I was fiddling around with our horrible diminutive, pressed plastic, difficult-to-hold salt and pepper mills, and trying to fill them for the umpteenth time, when the idea suddenly came to me—Eureka! I could make a couple of cone-shaped mills on the lathe—something really big, bold and sculptural, something that wouldn't need filling every ten minutes or so,

something that would be a joy to the eye as well as to the hand.

And that was how this project came into being. Okay, perhaps they aren't to everyone's taste and, yes, they are a bit on the big side—but they are certainly a unique conversation piece. The over-coffee chat usually goes something like, "Where did you get those er . . . big/strange/terrible/unusual/beautiful salt and pepper mills?"—ha!



## MAKING THE SALT AND PEPPER MILLS

When you have studied the project and generally brought your lathe and tools to order, take your chosen wood and cut it to size. You need four 10" lengths in all: one dark and one light 1 1/4" X 3", and one dark and one light 2 1/4" X 3".

Plane the mating faces and glue and clamp them together so that you have two 3" X 3"-square sections. If you have done it right, the two blocks will be color counter-changed, so that one is predominantly dark with a light strip and the other visa versa. You can, of course, glue the wood up from larger section material—so that you have a single large lump—and then slice it down to size.

First establish the end centers of the blocks. Scribe out 3"-diameter circles and clear the bulk of the waste so that you more or less have octagonal sections. Then mount the wood on the lathe and swiftly turn it down to a 3"-diameter smooth, round section. With the workpiece held securely in the four-jaw chuck and pivoted on the tailstock center, take the dividers and mark off the total 8 3/4" length. Take the parting tool and sink a tool-width channel at each end. Run the tool in to a depth of 1" so that you are left with a 1"-diameter core at each end of the turning. Now, with the narrow end of the cone nearest the chuck, take the gouge and make repeated passes from right through to left.

When you have made the cone shape, carefully part the waste off at the tailstock end. With the drill chuck mounted in the tailstock, run two holes into the wide end of the cone—first a 2"-diameter hole at about 1/2" deep, followed up by a 1"-diameter hole at about 5" to 6" deep.

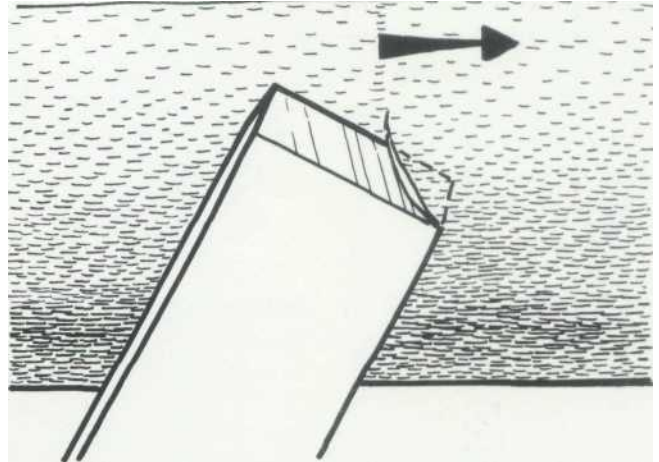
Finally, part the cone off from the lathe, run a 5/2"-diameter hole down into the top of the cone at top center, and saw off the top of the cone so that it is truncated at an angle. Rub down to a smooth finish and then burnish with a small amount of vegetable oil.

### MATERIALS LIST

A	Dark wood (1)	1 1/4" X 3" X 10"—we used American Walnut
B	Dark wood (1)	2 1/4" X 3" X 10"
C	Light wood (1)	1 1/4" X 3" X 10"—we used English Hornbeam
D	Light wood (1)	2 1/4" X 3" X 10"

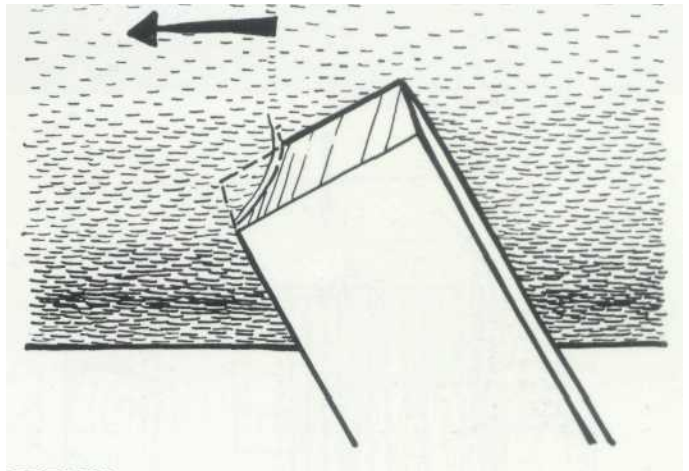
### HARDWARE AND EXTRAS

E	Corks or plastic stoppers to fit the 1"-diameter holes
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#### TOOL TIP

*When you are using a turning chisel, the procedure is to lift the*

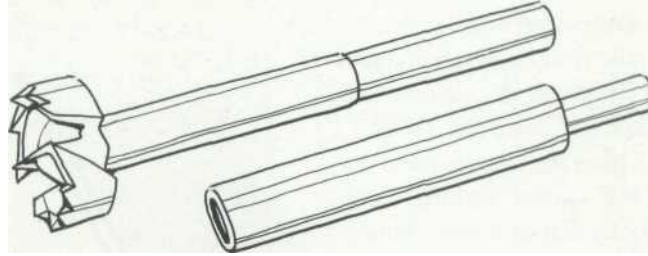


*handle up until the lower end of the cutting edge begins to bite, then advance the cut in the direction of the blade. If you work in this way, you will find that the skewed approach greatly minimizes tool pressure and consequent flexing of the workpiece.*



## SPECIAL TIP

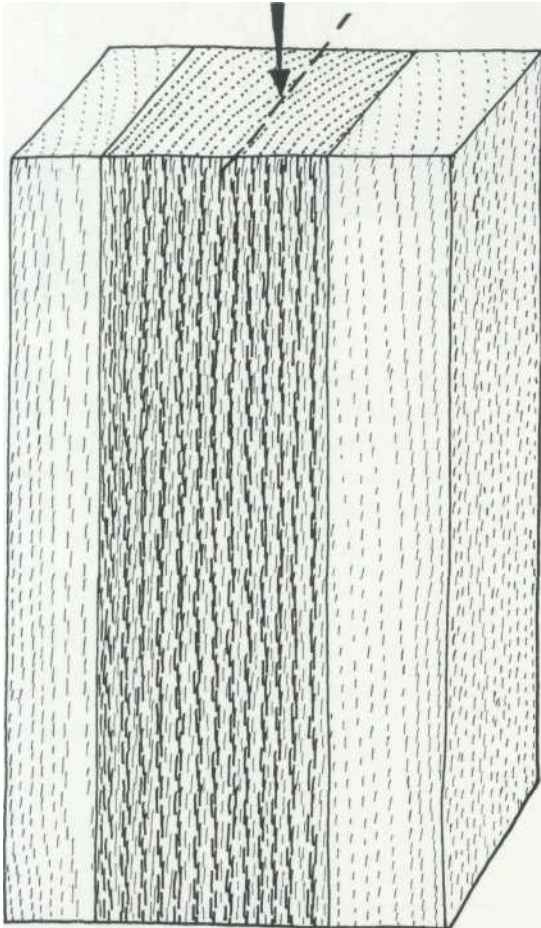
Because the gist of this project has to do with being able to drill deep, accurate, smooth-sided holes, I would always advise using either a Forstner bit or a saw tooth multi-spur-type bit. As to the actual drilling procedure, if you have to do it off the lathe—say on a drill press—then be warned, if you go off center, there is a big chance that you might break through the walls of the cone.



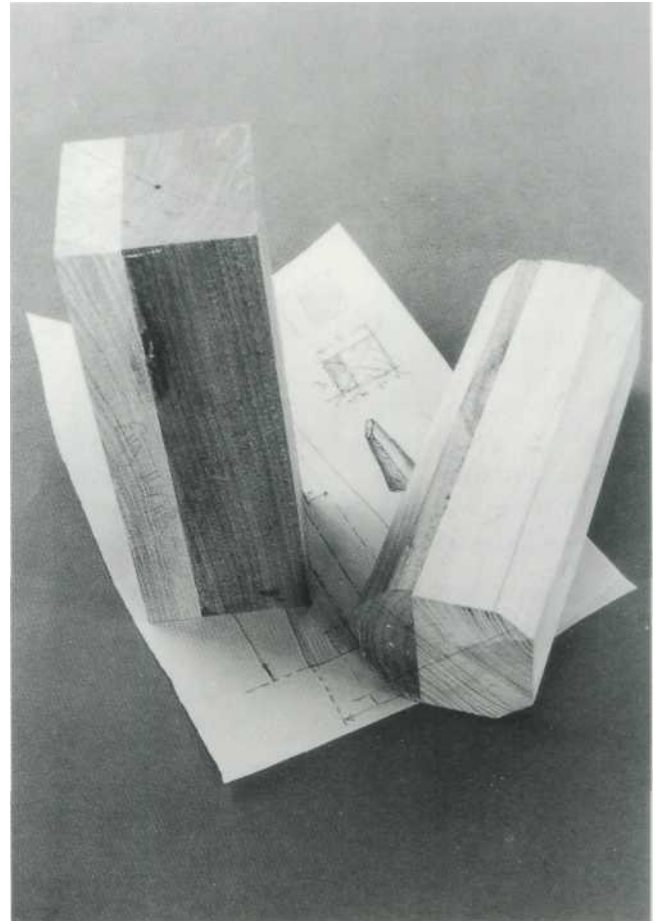
## DRILLING HOLES ON THE LATHE

*If you need to drill holes on the lathe, then it's best to get a Forstner or multi-spur bit with an extension bar.*

## STEP-BY-STEP STAGES

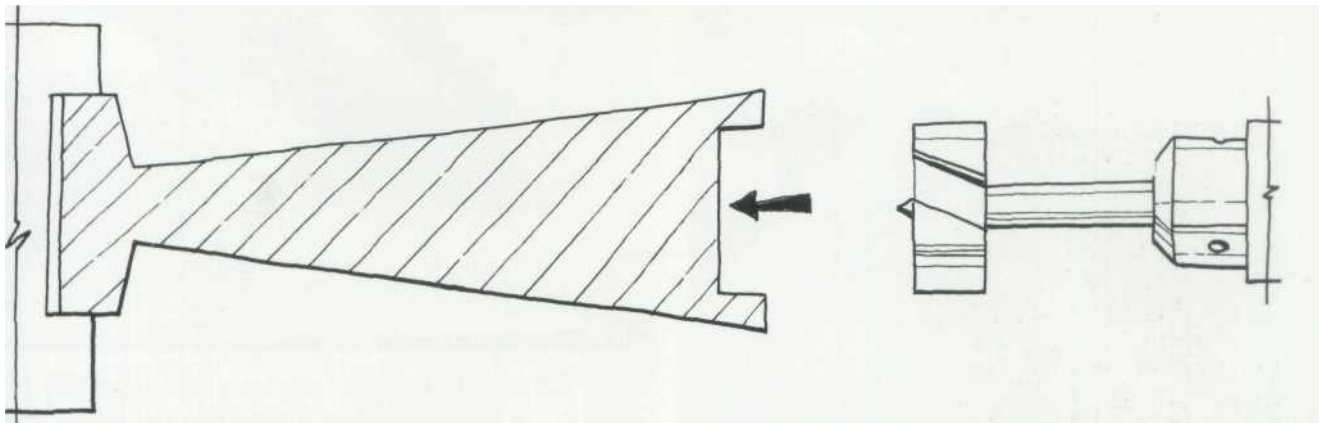
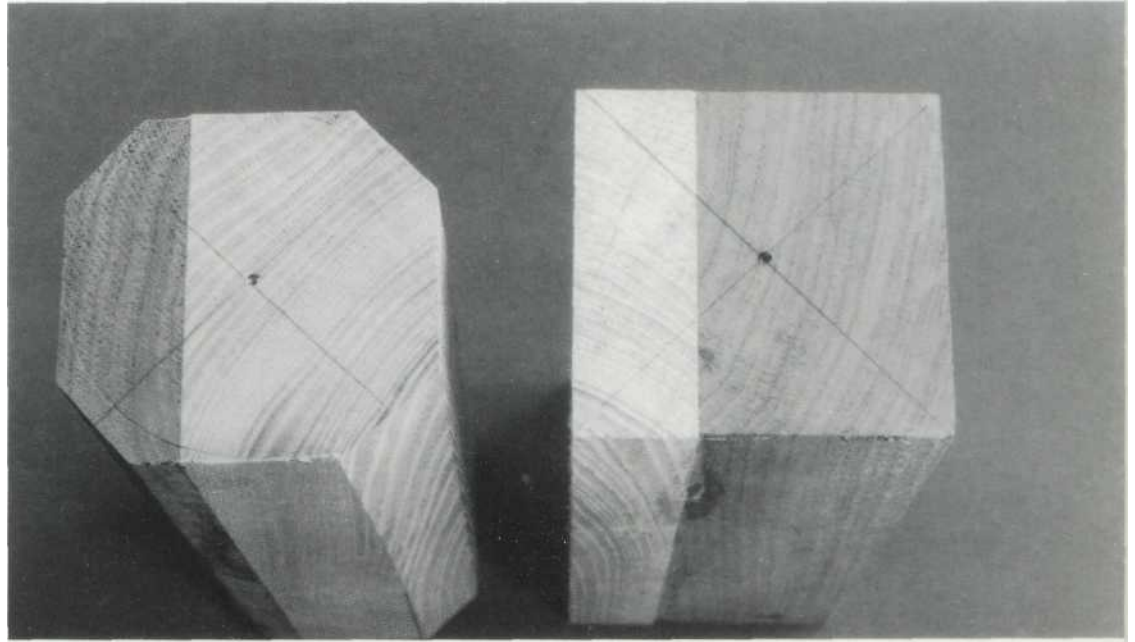


1 If you don't like the notion of gluing up small individual strips of wood or you are working with bigger pieces, a very economical method is to glue up the three blocks as shown, and then saw the resultant piece through from end to end.



2 If you are working on a small lathe, it's always a good idea to clear the bulk of the waste by planing the wood to an octagonal section. You need to finish up with two blanks, one predominantly light and the other predominantly dark.

3 In the interest of safety, you must make absolutely sure that the laminations are sound and well glued. If you have any doubts at all, it's best to start over. Be warned, if ever you should decide to modify this project and go for different light-dark proportions—meaning a different gluing-up arrangement—you must make sure that the lamination line occurs well clear of the center of spin. If you don't, there is a danger that the tailstock point will force the wood apart.



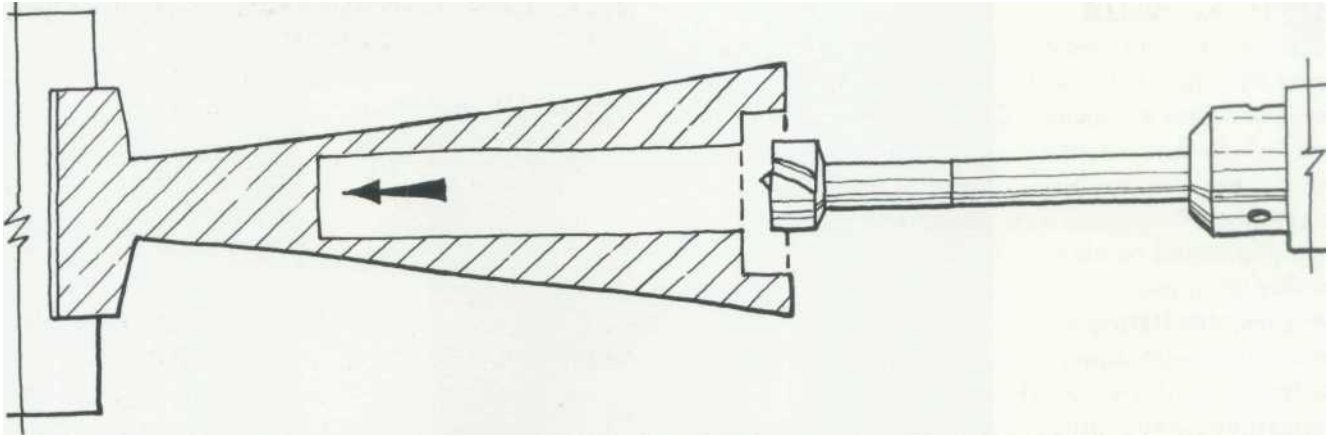
#### THE FACE PLATE

*Using a faceplate is a good, sound means of securing a large blank.*

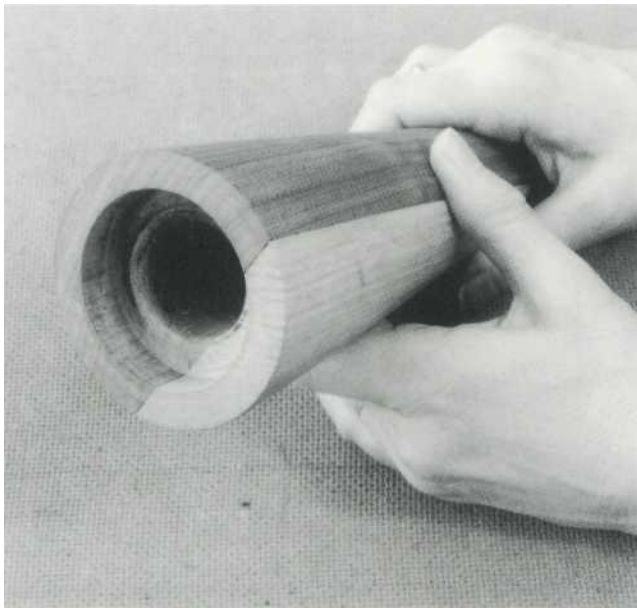
*Notice the use of short, fat screws for maximum holding efficiency.*

4 With the workpiece held secure in the jaws of the chuck, lit a 2"-diameter Forstner bit in the tailstock chuck and run a 1/2"-deep hole into the end of the cone.





5 Having made the 2"-diameter hole, follow up with a 1" bit and sink a hole to a depth of about 5", 1/2" at a time. The procedure is, run the bit in 1/2" and then back out, and then back in another 1/2", and so on, so that you remove the waste little by little and give the bit a chance to cool off.



6 The drilled and recessed base allows you to fit all manner of corks and plugs. If you like the idea of the project but want to go for something a little more sophisticated, then many specialist suppliers stock small brass screw-stopper-and-collar units that can easily be fitted into the recess.



7 Having drilled the  $\frac{3}{32}$ "-diameter hole down into the top of the cone—right through to the cavity—and used a fine-tooth backsaw to truncate the cone, use the graded sandpapers to achieve a smooth finish.

## GRINDING MILLS

Traditional Colonial-style salt and pepper mills are fascinating! It's not so much the way they fit together and operate—although this is very interesting in itself—but the way they are made. There is something really exciting about the procedure. One moment you have a couple of lumps of wood and the next you have two little machines. Really good fun!

## THE PROCEDURE

Having first made sure that the wood is free from splits and cavities, mount it on the lathe and swiftly turn the greater part of the length down to a 2 1/4"-diameter cylinder. Run guidelines around the cylinder so that the top part of the mill is nearest to the tailstock end of the lathe.

Turn the top of the mill—called a capstan—to shape and very carefully part off. Fit the tailstock drill chuck, set the 1 1/8"-diameter Forstner bit in the chuck, and run a hole into the end of the cylinder. Sink the hole in to a depth of about 3". Part off the 5 1/5"-long cylinder.

Wind the tailstock up so that the remaining short

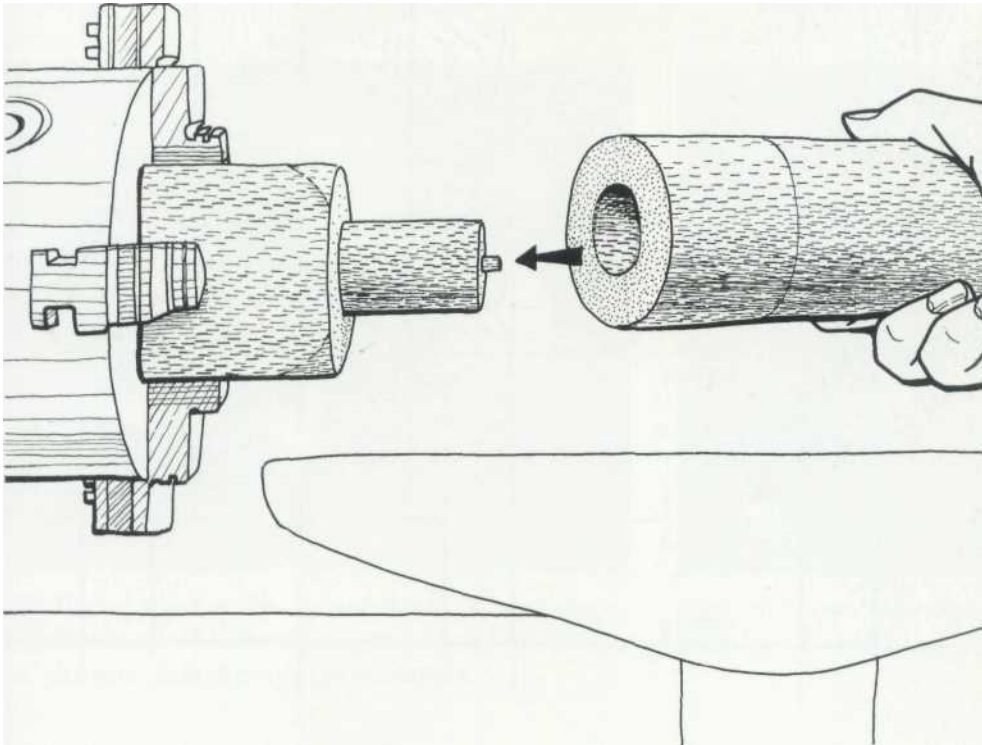
## MATERIALS LIST: OPTION

- A (2) 2 1/2" × 2 1/2" × 12" pieces of beech
- B (2) 7 1/2"-long mechanisms—one for salt and the other for pepper

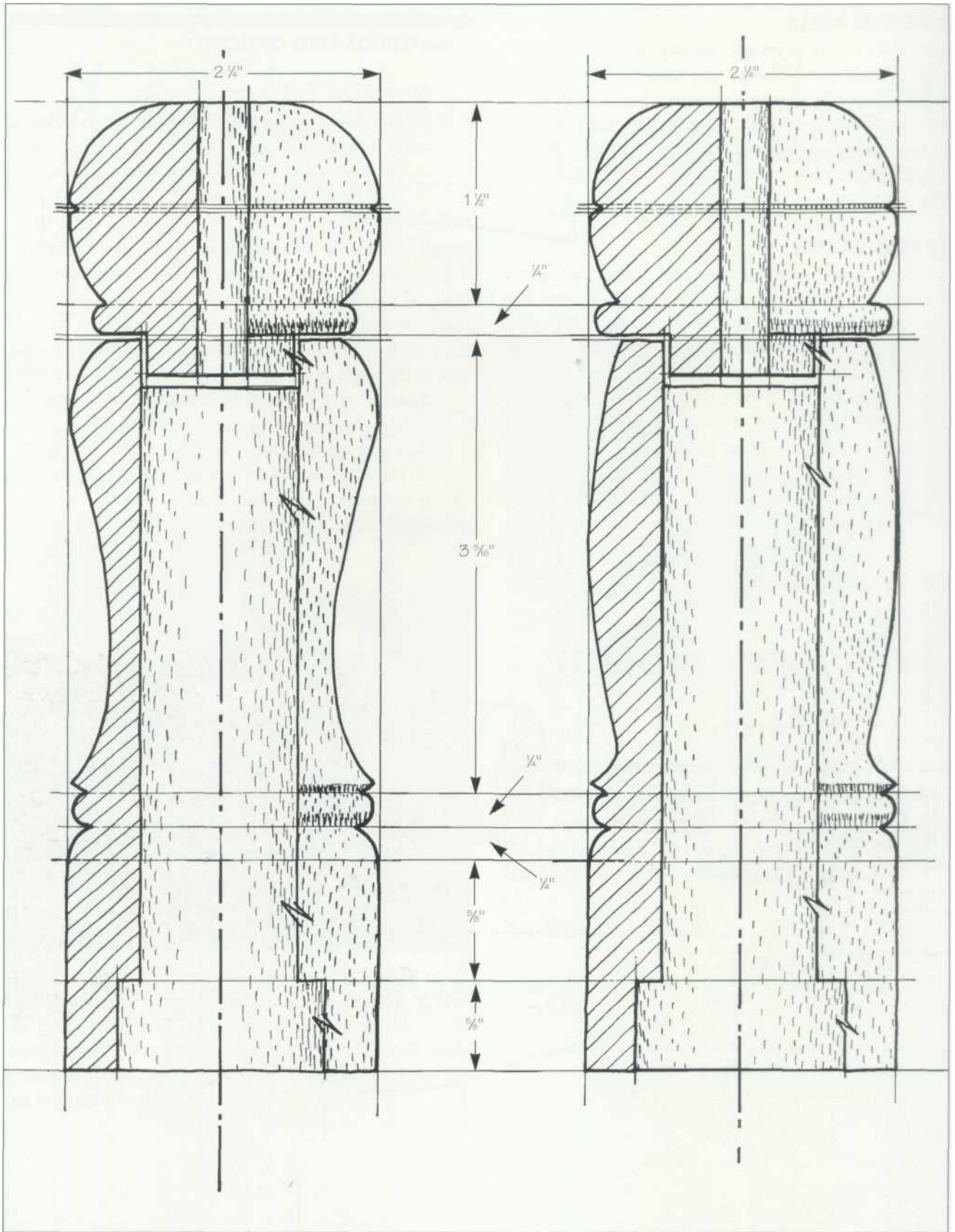
length of wood is well supported. Turn off a spigot that is going to be a tight push fit in the 1 1/8"-diameter hole that you have drilled into what will be the top end of the body. Now, slide the body onto the spigot, refit the tailstock drill chuck and bore different size holes into what will be the base of the mill body. Bore the first hole at 1 1/2"-diameter and 1/2" deep, followed up by the second hole at 1 1/8"-diameter and as deep as it will go.

When you are this far, the rest is easy. You simply reverse the body of the mill in the chuck—so that the base is in the chuck—fit the capstan on the mill, and then wind up the tailstock and turn the mill to shape.

## STEP-BY-STEP STAGES

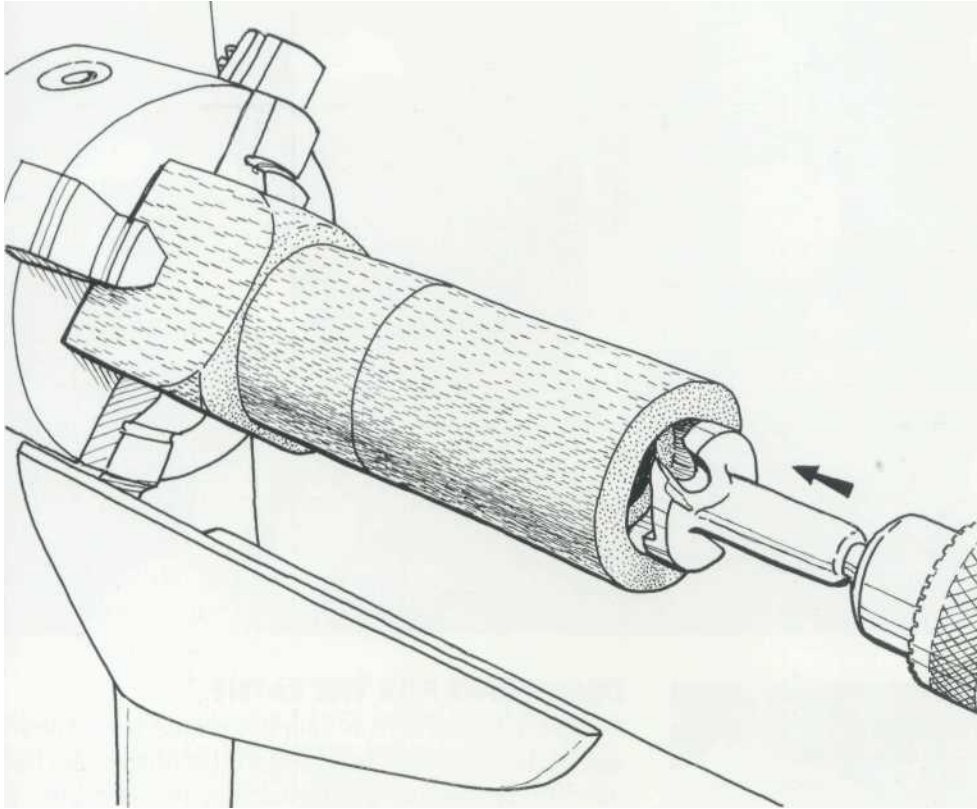


1 Having turned the capstan to shape and parted off, drill a 1 1/8"-diameter hole into what will be the top of the body. Then push the cylinder onto the spigot.



WORKING DRAWING B





2 Bore two holes into the bottom of the mill—the first hole at 1/2" in diameter and 1/2" deep, followed by the second hole at 1 1/8" in diameter and as deep as it goes.

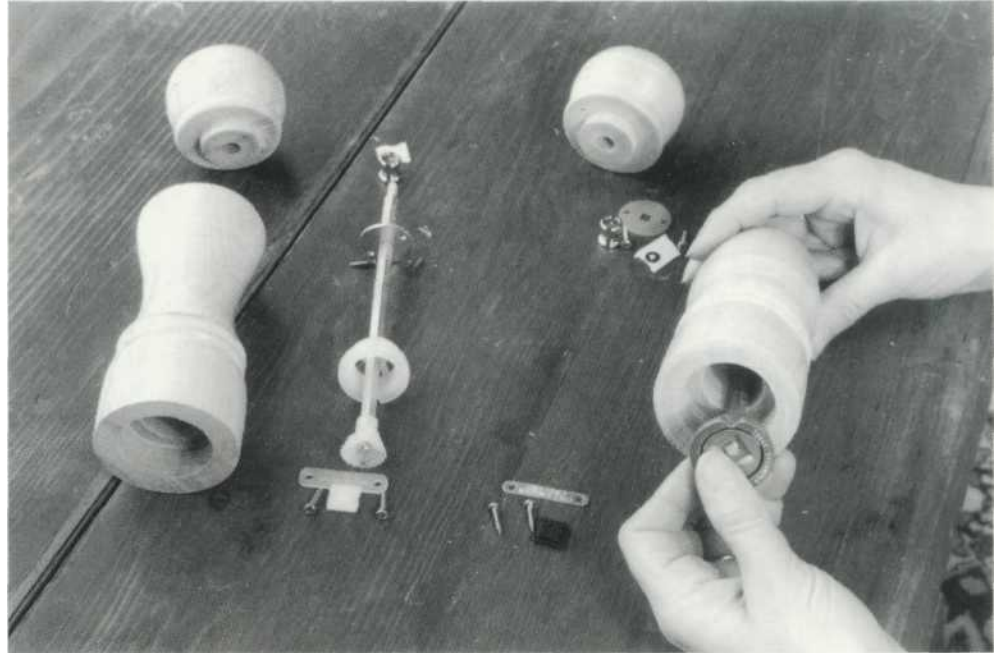


3 Having more or less turned the capstan to shape, fit it in the chuck and bring it to a good finish. Run a 3/8"-diameter hole through the workpiece.



4 Fit the whole works back on the lathe and sand and burnish to a good smooth finish.

5 Slide the mill mechanism up through the body and fix with the little bar and a couple of screws.



6 Having screwed the ring washer on the capstan spigot, slide the capstan on the threaded rod and fit with the fancy head screw.

## DESIGNING FOR THE LATHE

Designing for the lathe is uniquely problematic. The success of the design not only hinges on aesthetics and function but also on the turning techniques. Of course, the same goes when you are designing a chair or whatever—you still have to make decisions about the tools and the techniques—but with turning, the tools and the techniques are paramount. Also, the design solution is very closely related to method. In chairmaking, the balance of concern is perhaps equally distributed between aesthetics, function and technique; with wood turning, the technique concerns far outweigh all others. In fact, when I'm designing for the lathe, my big worry is not whether it looks good or if it functions. Rather, I'm concerned with how I will hold, secure and approach the workpiece while it is being turned, and whether it is safe.

When I'm designing for wood turning, I always run through the following little how-will-I-do-it checklist:

- Is the lathe powerful enough? Will the motor size happily shift the weight of the wood?
- Is the distance between centers long enough to accommodate the design?
- Is the radius of swing big enough? (Meaning, is the distance between the center of spin and the top of the bed great enough?)
- How am I going to hold the wood? Am I going to use the four-jaw chuck, the face plate, the screw chuck, the pronged center, or what?
- Will I turn multiples in one piece to be cut apart or as individual units?

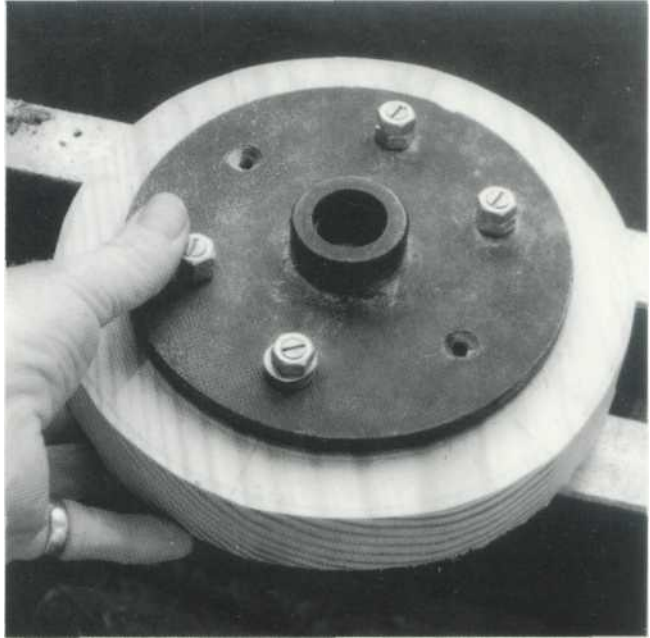


- Will I need to use a drill chuck in the tailstock mandrel?
- Will I need to use special drill bits with extension pieces?
- Will I turn the item over the bed of the lathe? Or will I use the outboard bowl-turning option on the back of the lathe?
- Is the chosen wood type available in the size and quality I need? Will I need to laminate up?
- Is the wood the traditional choice for a turning of this size and character?
- Will I need to use special tools other than the usual scrapers, chisels and gouges?

As you can see, at least half of the design procedure has to do with the lathe and related tooling. Of course, just about all your questions are answered if you want to turn something like a baseball bat—your only worry is length—but if the turning is more complex with maybe two component parts that fit together, then it's not so easy and needs thinking about.

Let's say, for example, that you have set yourself the design problem of turning a large lidded container—the biggest diameter possible on your lathe—a form about as high as it is round. The first thing you do is measure the radius of swing and double it. If your lathe measures 3" from the center of the headstock down to the top face of the bed, you can reckon on a diameter of no more than 6". So, you are turning a container about 6" in diameter and 6" high.

Next, you have to decide how the block of wood is to be held and the order of work. Though there are many



ways of proceeding, I usually turn the wood down between centers—meaning the outside profile—then hold the wood in the four-jaw chuck while I hollow-turn the center. When I have cleared the waste from inside the container and maybe turned the rim, I then change the container around on the chuck—so that it is held by its rim—and finish up by turning the base.

What else to say, except that you must always think well ahead before you put tools to wood. And of course, as with all potentially dangerous machinery, you must always be wide awake and ready for the unexpected.

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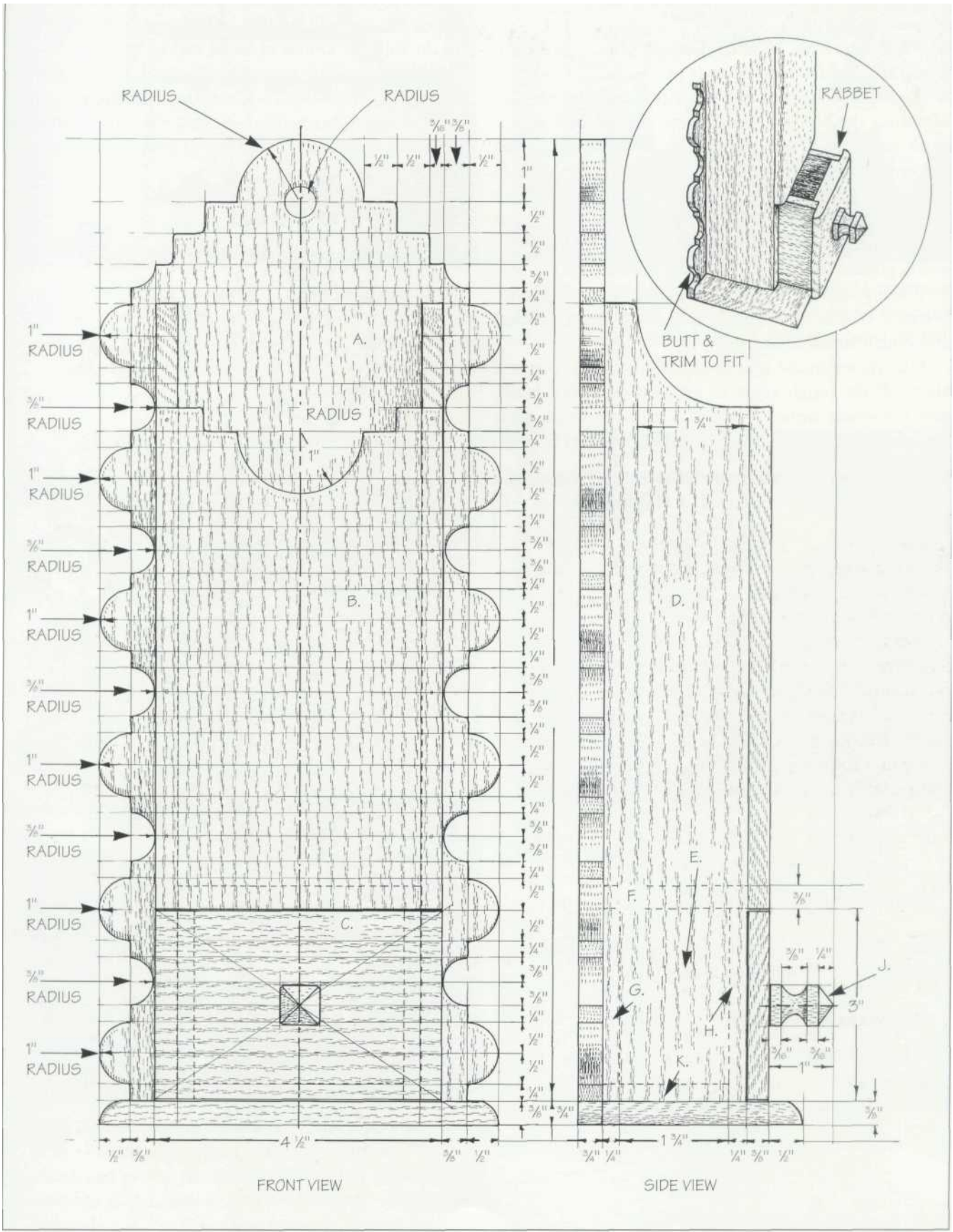
# Folk Art Pipe Box

I wonder why our great-great-great-grandparents put such a huge amount of energy and enthusiasm into making pieces of woodwork that were used for everyday chores. Okay, so they had to have such functional items as dough troughs, candle boxes and flour bins. But remembering that every stick of wood had to be laboriously cut, planed, fretted and finished by hand, why did they put extra time and trouble into decorating their woodwork with so many fancy curlicues?

If you want to try your hand at a piece of woodwork that perfectly illustrates this point, then this pipe box is for you. Inspired by an English eighteenth-century folk art original, boxes of a similar type, design and construction can be found all over—in England, in Wales, in Scotland, in America—in fact, just about anyplace people smoked long-stemmed clay pipes. The design of the box is beautifully fitting for its task. The pipes fit in the top half of the box, the "makings" fit in the little drawer, and the whole works hangs on the wall alongside the fireplace.

As to the fancy compass-worked edge design, it can be found on all kinds of eighteenth- and nineteenth-century woodwork—on everything from overmantel and cupboard shelves to bench trim, door surrounds and plate racks.







## MAKING THE PIPE BOX

Having set the wood out with all the dip-and-arch curves, fret out the design.

When you have made all the component parts and pencil labelled them so there is no doubting what goes where and how, then comes the tricky, sticky-finger task of putting the box together. I found that the best way to work was to drill, pin and glue the components in the following order: (1) the main backing board to the main baseboard; (2) the side boards to the backing board; (3) the inside-box piece that forms the bottom to the pipe part of the box; (4) the front to the box. And lastly, I glued, pinned and adjusted the little drawer to fit the box.

When you come to the little drawer knob, all you do is trim a  $\frac{3}{4}$ " X  $\frac{3}{4}$ "-square section of wood down to shape and plug it into a drilled hole.

Finally, when the glue is completely dry, trim and shape all the rough edges to a slightly rounded finish, give the whole works a rubdown with the finest-grade sandpaper, and then lay on a thin coat of wax or varnish.

### MATERIALS LIST

#### BOX

A Back board (1)	$\frac{3}{8}$ " $\times$ $6\frac{1}{4}$ " $\times$ $15\frac{1}{2}$ "—we used English oak throughout
B Front board (1)	$\frac{3}{8}$ " $\times$ $4\frac{1}{2}$ " $\times$ $7\frac{7}{8}$ "
C Side boards (2)	$\frac{3}{8}$ " $\times$ $2\frac{1}{4}$ " $\times$ $12\frac{1}{2}$ "
D Drawer sides (2)	$\frac{1}{4}$ " $\times$ $3$ " $\times$ $2\frac{1}{4}$ "
E Inside-box bottom (1)	$\frac{3}{8}$ " $\times$ $2\frac{1}{4}$ " $\times$ $3\frac{3}{4}$ "
F Drawer back (1)	$\frac{1}{4}$ " $\times$ $3$ " $\times$ $3\frac{1}{4}$ "
G Drawer front (1)	$\frac{5}{8}$ " $\times$ $3$ " $\times$ $4\frac{1}{2}$ "
H Box base (1)	$\frac{3}{8}$ " $\times$ $3\frac{1}{8}$ " $\times$ $6\frac{1}{4}$ "
I Knob (1)	$\frac{5}{8}$ " $\times$ $\frac{5}{8}$ " $\times$ $1\frac{3}{8}$ "
J Drawer base (1)	$\frac{1}{4}$ " $\times$ $2$ " $\times$ $3\frac{1}{4}$ "

*Note that all measurements are to the mark—meaning they make no allowance for cutting waste.*

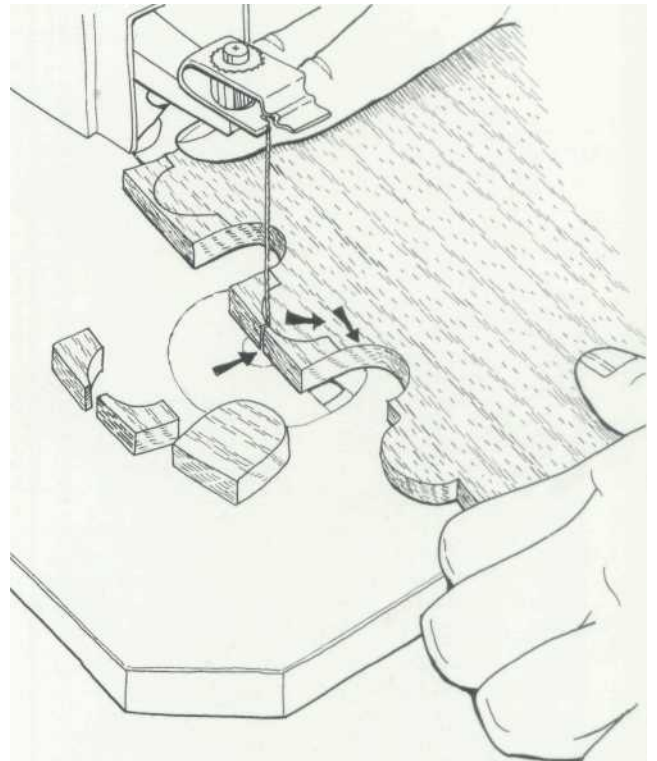
#### HARDWARE AND EXTRAS

- K Copper panel pins
- L PVA glue

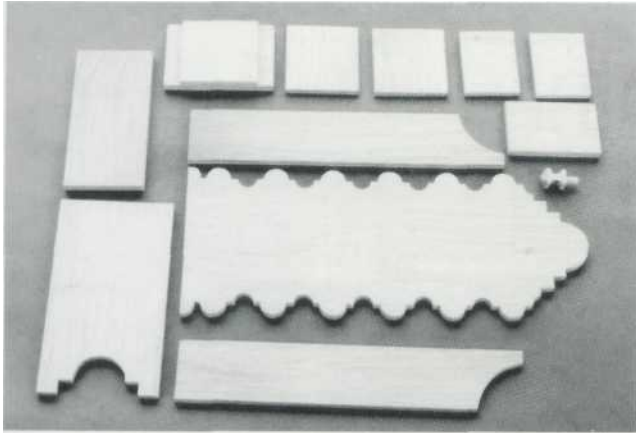
## SPECIAL TIP

If you have a good close-up look at museum boxes of this character, you will see that a good part of the charm has to do with the choice of wood and the degree of finish. For example, while a good native wood looks beautifully fresh and understated—something like cherry, maple, pine or oak is just perfect—a fancy wood like mahogany or one of the exotic African woods tends to look too precious or "overdressed."

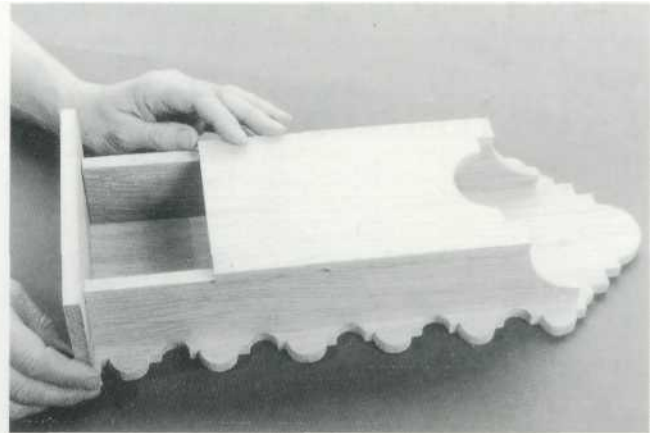
## STEP-BY-STEP STAGES



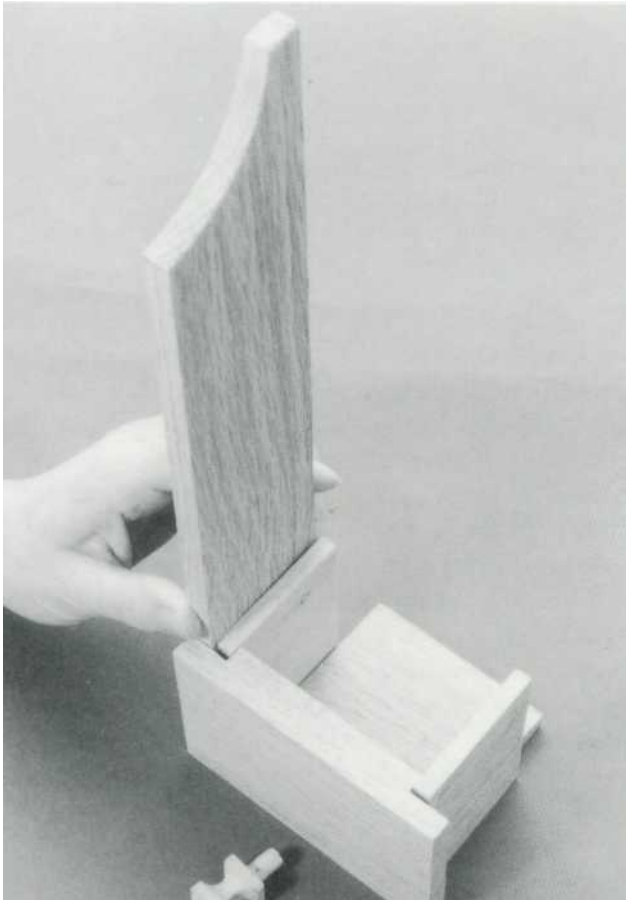
To work the fancy edge, start by cutting out all the deep concave U shapes—along the whole length of the wood—and then fret out the remaining convex forms. If you look at the arrows, you will notice that I always work in the direction of the grain—that is, two cuts that run down-and-out from the peak of the little bridge shape.



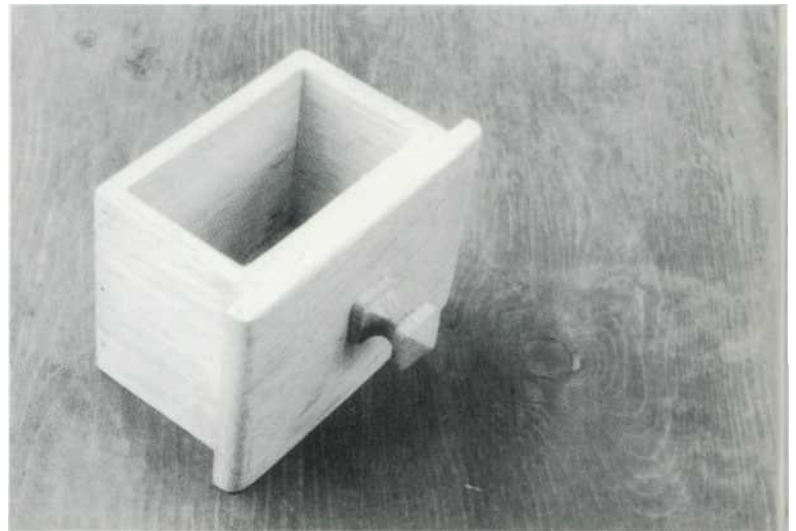
2 Having made all the component parts, pencil label them so that you know precisely how they fit one to another. If one side of a part is more attractive, or damaged, then now is the time to make decisions as to its placing.



3 Do a trial fitting to make sure that you haven't made any mistakes. Test for the squareness of the butting edges and mark in the position of the nail/panel pin holes.



4 Do a trial fitting of the sides of the box and the sides of the drawer. If necessary, you can trim back the rabbet and/or the thickness of the wood. Establish the position of the drawer pull by marking with crossed



5 Here's the finished drawer—all glued, pinned and rubbed down. Putting the drawer together is a little bit tricky, not because any single cut is complicated, but because the total form needs to be true, square and a good fit.



# Laminated Jewelry Box



This project draws its inspiration from the English decorative woodworking technique known as Tunbridgeware. This ware is characterized by small items that give the appearance of being worked with delicate tessera inlay. The technique involves gluing colored sticks of wood together in bundles and then repeatedly slicing, repositioning and re-gluing.

With this little box, the slicing and laminating technique is used in conjunction with what has come to be called "band saw joinery."

## MAKING THE LAMINATED BOX

First and foremost, you have to understand that with this project there are several steps along the way where there is a high risk of the whole thing falling to pieces. This being so, we decided at the outset to work on two boxes at the same time, just in case of mistakes. Well, as you can see in the photographs, we got so far with one box and—Splap!—it came to grief.

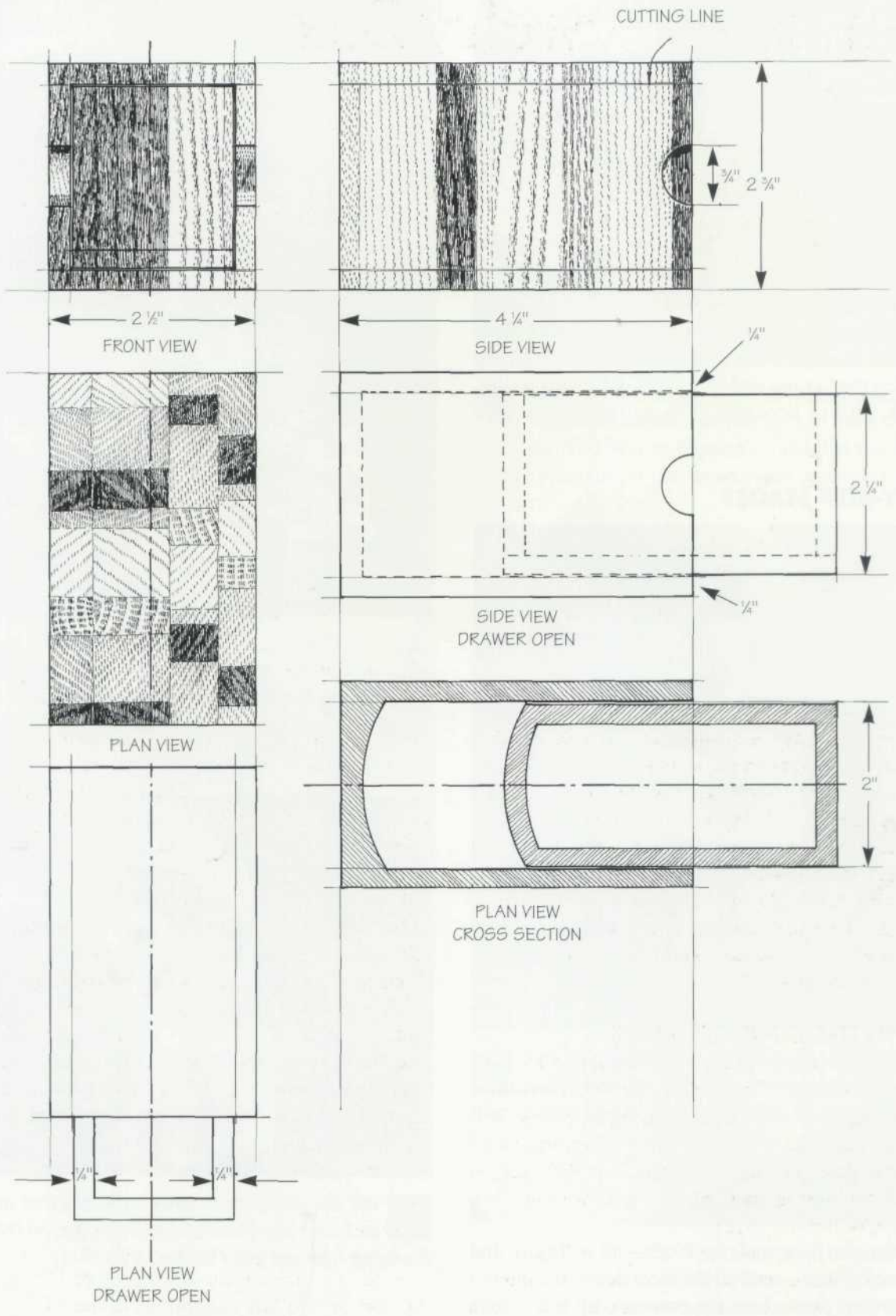
When you have studied the working drawings, gather your chosen offcuts, and plane them down to smooth-sided sections. Stick them together side by side, like a long fence. When the glue is dry, plane both sides of

the fence, cut it into short lengths, and then re-glue the resultant lengths into a layered sandwich. Continue slicing, planing, gluing and laminating, until you have what you consider an interesting multicolored brick. And of course, the more you slice and laminate, the smaller the design and the greater the complexity of the pattern.

Plane your brick to size so that it is  $2\frac{1}{2}$ " X  $2\frac{3}{4}$ " in section and 4" long, with all six sides being smooth and at right angles to each other. Pencil label the various sides "top," "bottom," "back," "front," "left side" and "right side."

Use the band saw to cut a  $\frac{1}{4}$ " slice from the "top" and "bottom," label the slices and put them carefully to one side. This done, set the shape of the drawer out on the rough face of the block, and use either a fine-bladed band saw or a scroll saw to cut it out. Next, slice the bottom off the drawer, label it and put it to one side. Then use the scroll saw to clear away the waste from what will be the inside of the drawer. While the saw is handy, cut away the two finger holes and run a cut straight down back-center of the shell-like piece that wraps around the drawer.

When you have made all six component parts—the top and bottom slabs of the brick, the all-in-one-piece back and sides that has been cut into two halves, the



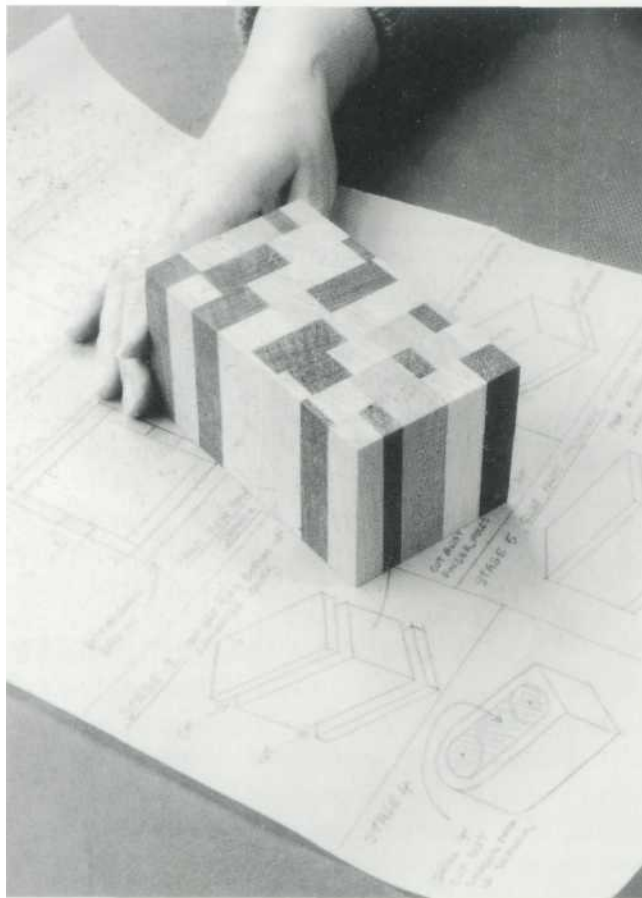
drawer with the inside cut away, and the bottom to the drawer—take the finest-grade sandpaper and rub all the sides and faces down to a smooth finish. Be careful that you don't blur the corners.

To put the little box together, start by gluing the base onto the drawer. Then smear glue on mating faces and reconstruct the block so that the drawer is nicely and closely contained. Finally, when the glue is dry, sand and finish the box.

### SPECIAL TIP

If you like the idea of this project and want to try something a little more complex, you could experiment with cross-laminating. For example, you could turn the slices around at the sandwiching steps so that all faces of the brick show end grain. Then again, you could try swapping and turning the bottom and side slices of the box so that the block pattern becomes even more complex and staggered.

### STEP-BY-STEP STAGES

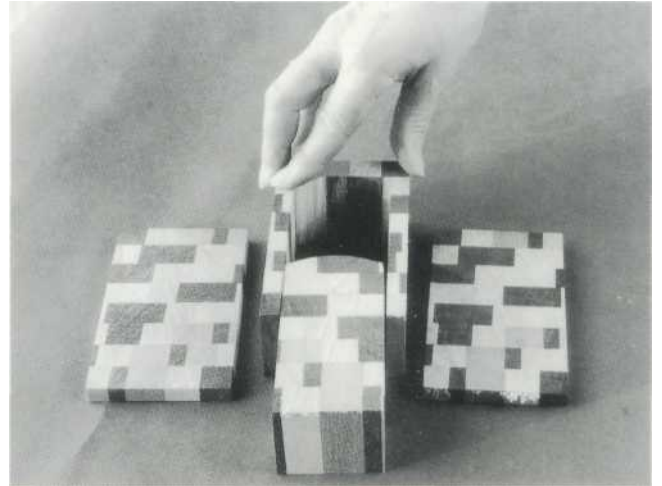


**1** When you have made the block—all well glued and sawed to size—sand all the faces down to a smooth finish. Do your best to keep the corners crisp and at right angles.

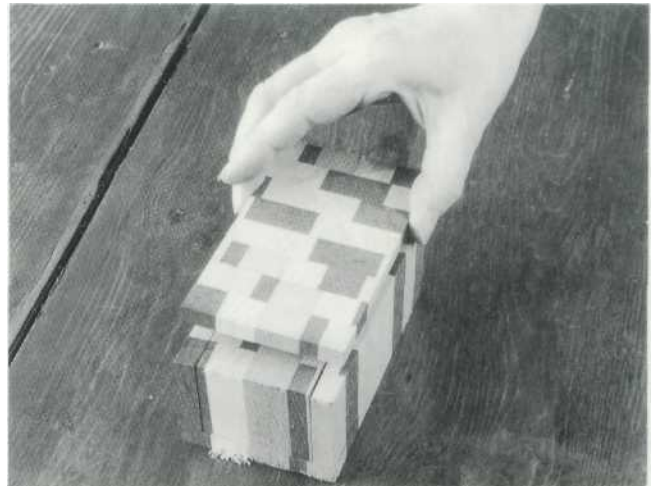
### MATERIALS LIST

Box

A selection of contrasting offcuts all sawed and planed—we used American walnut, oak, cherry and tulipwood—at about  $\frac{1}{2}$ " thick and at various widths.

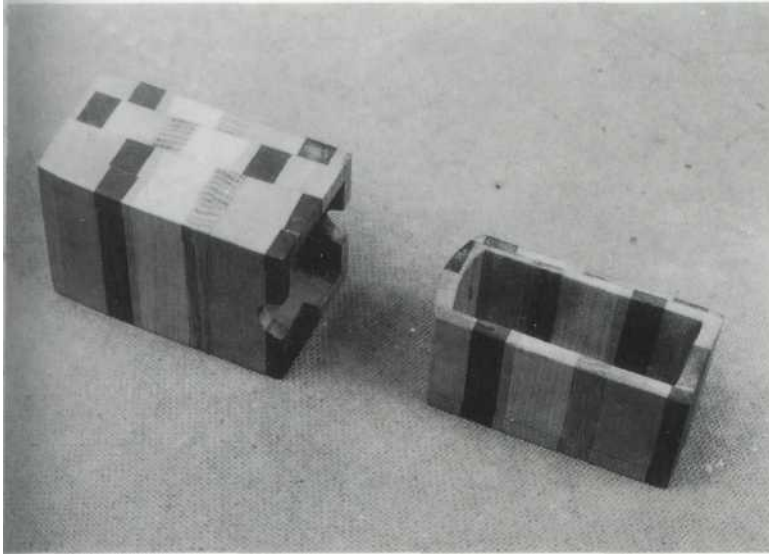


**2** Saw slices off the top and bottom of the block and cut out the shape that goes to make the drawer. Be mindful that the drawer surround—meaning the piece that you see me holding—is very fragile at this stage and liable to break apart at the corners.

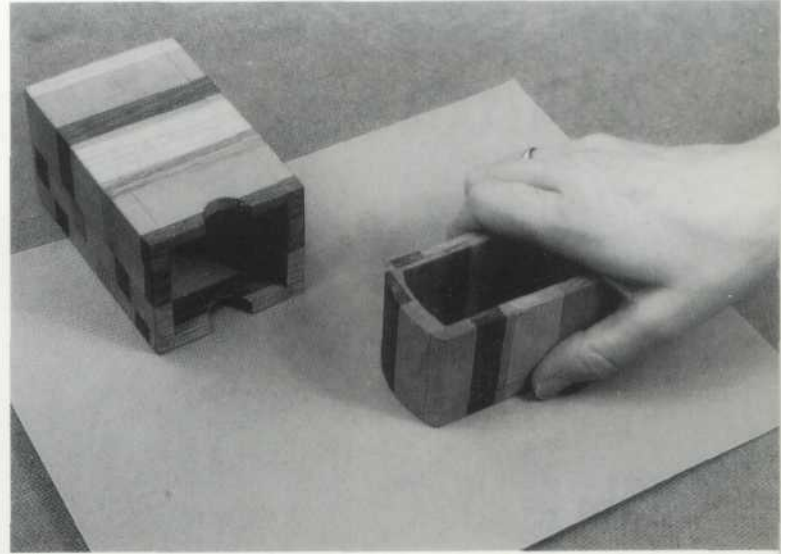


**3** Put the component parts back together and label each and every face and mating edge, so there is no doubting how the parts fit one to another.

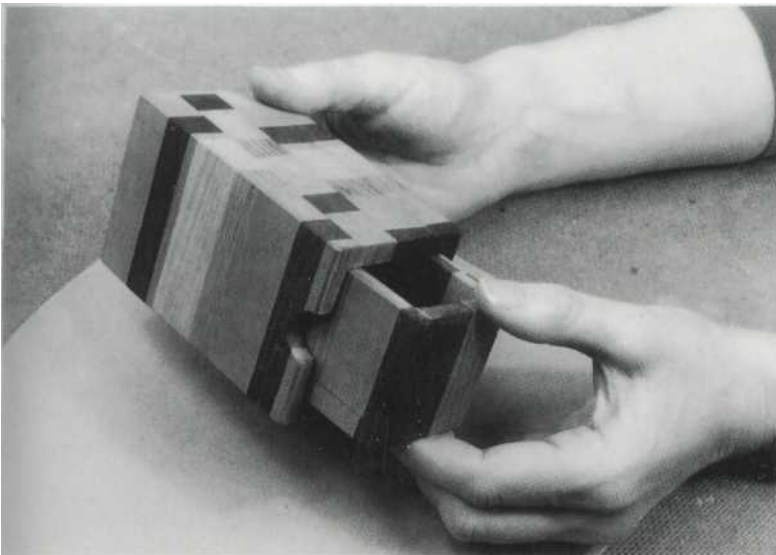




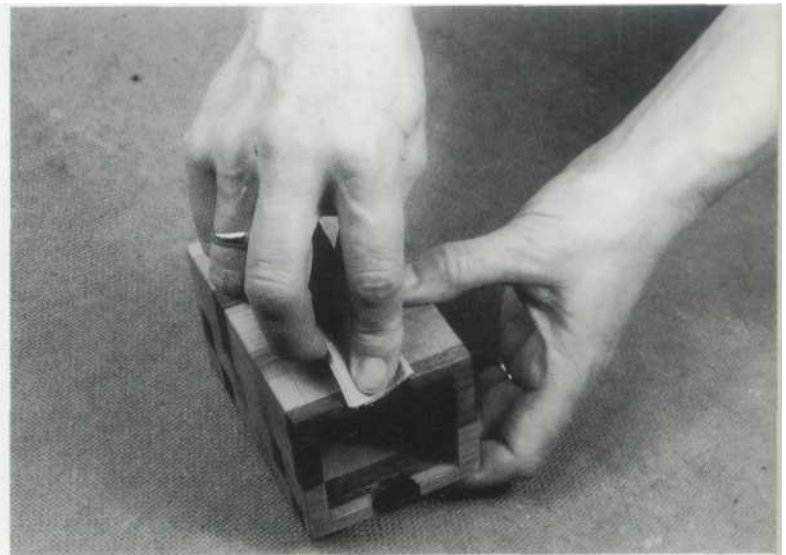
4 Having sliced off the bottom of the drawer block, saw out the inside-drawer waste and then glue the base back on the drawer. And just in case you have noticed that this photograph shows another block, the sad truth is the original block fell to bits when I was cutting the drawer. I think the problem was that I was a bit anxious and heavy-handed, and the glue hadn't quite cured.



Sanding the various faces is a very slow business for the simple reason that you have to work slowly and with care. You have to be most careful that you don't put undue pressure on the drawer—no squeezing the sides together.



6 If you find that the drawer is a somewhat loose fit, it's a good idea to give the inside of the box a couple of coats of sealer and then sand back to a nice push fit. The best procedure is to sand a little and test the fit, then sand some more, and so on until you are satisfied.



Sand the finger holes to a rounded finish. You have a choice at this stage . . . do you want to round and blur all the corners, or do you want to keep them sharp?

# Marquetry Mirror

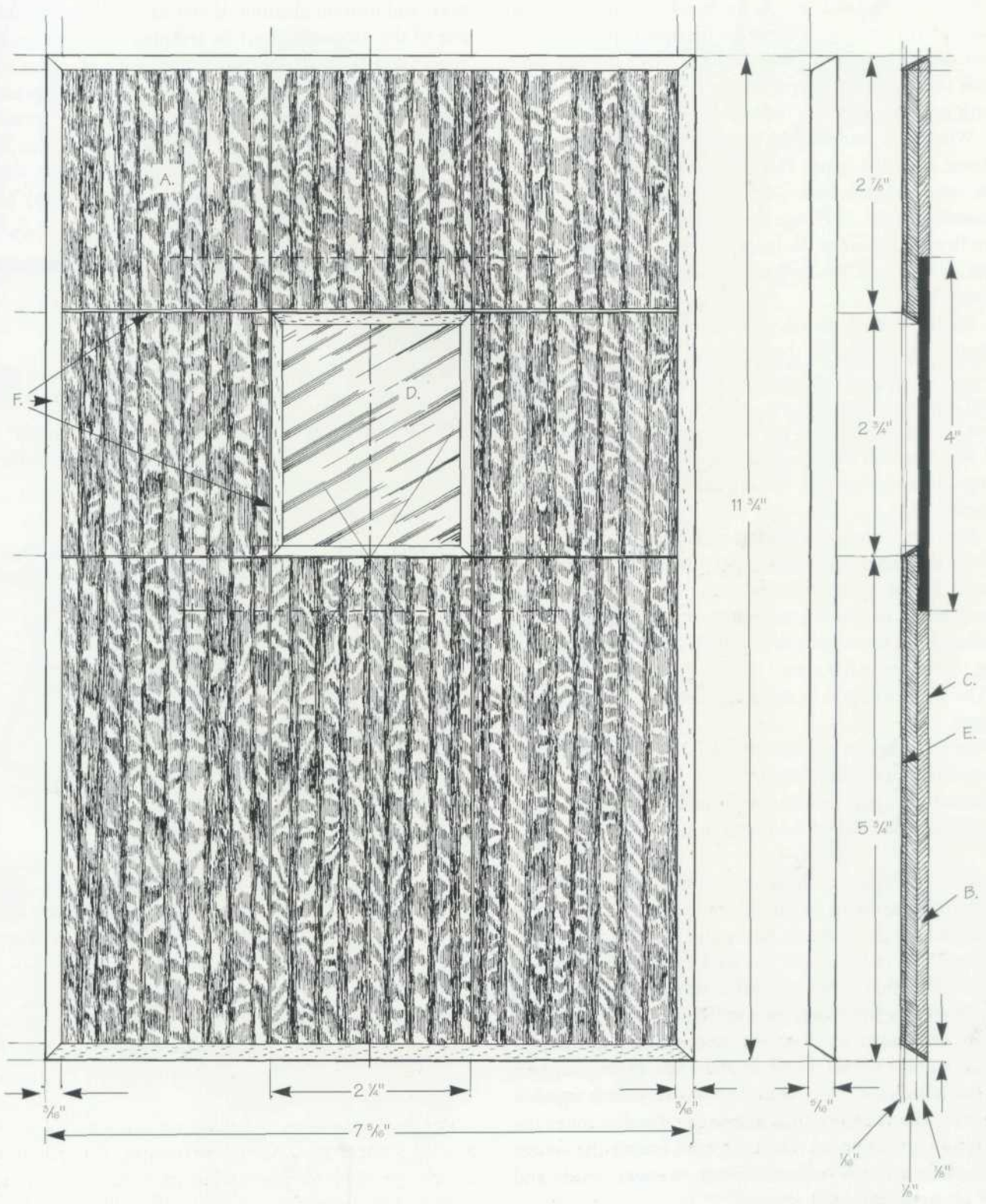


About five years ago, my son Glyn made a marquetry mirror for an English magazine called the *Woodworker*. It was a real success and there was lots of interest. This mirror draws its inspiration from that project. At first glance, this mirror appears to involve an incredibly complex and fine marquetry technique—very fine hairline inlays and a multitude of cuts. Certainly it is a most delicate and exquisite item, but appearances are not always what they seem! The marquetry surface is, in fact, made up from a sheet of specially printed and

pressed flexible veneer, while the hairline inlay is made from strips of sycamore veneer glued to the kerf face. As to the technique, it's no more than a few saw cuts and a bit of ironing.

For the actual shape and character of the mirror, there are any number of exciting possibilities. You can chop and change the veneer around to create different effects; you can rearrange the saw cuts so that the little "window" is triangular, hexagonal or star-shaped. In fact, you can go for just about any shape that takes your fancy.





## MAKING THE MIRROR

Before you do anything else, you need to play around with the materials—the flexible veneer and the gluefilm. The gluefilm is wonderfully easy to use. All you do is position it paper-side up on the baseboard and iron it in place with a hot iron; remove the backing paper and position the marquetry on the gluefilm; cover the assembly with the backing paper and run the hot iron back and forth until the glue has melted.

When you understand how the gluefilm technique works, clear the bench ready for action. Start by cutting the two boards to size—the top board and the mirror thickness board. Then use the gluefilm to bond your chosen flexible veneer to the front face of the top board. And just in case you are wondering, yes, it is as easy as it sounds!

Having used a pencil, ruler and square to draw the lines of the design on the veneered surface so that they run off the edge of the board, sit awhile and consider your next move. As you can see, all you need to do is make four cuts straight across the board and at a mitered angle of 30°. Then fill the resultant saw-cut kerfs with a glued strip of veneer so that the angled veneer becomes the beveled edge.

Now there are two ways forward. You can either do as we do and make one cut straight down the length of the board, fill the cut up with the veneer strip and move onto the next cut, or you can make all four cuts and then fiddle about gluing up the whole assembly. Either way, the gluing procedure is the same.

- Use the scroll saw to make the beveled cut across the board.

- Use the gluefilm to bond the strip of sycamore veneer to one face of the kerf bevel.

- Smear PVA glue on the face of the sycamore strip and push the other side of the board in place.

Then continue making beveled cuts with the scroll saw, sticking veneer strip to one side of the bevel, sticking the other side of the board in place, and then on to the next cut until the task is done. The trick is to finish up with a mirror hole that is nicely beveled on all four edges.

When the glue is dry, use a small plane and the finest-grade sandpaper to clean the whole works down to a smooth finish so that the edges of the veneer strips appear as fine inlay lines. This done, glue the two boards together to make the recess for the mirror tile. Finally, miter the edge of the two-board thickness, trim it with the veneer strip, burnish the whole works with beeswax polish, and the project is finished.

## SPECIAL TIP

To my way of thinking, the whole art and craft of working with veneers has been revolutionized by the introduction of two miracle products: printed and pressed flexible veneer, and iron-on gluefilm. If you have trouble obtaining one of the products, don't be tempted to use traditional veneer and hot-melt glue, but rather visit a specialist supplier and ask specifically for the products by generic name. You need "thermoplastic gluefilm," and "pressed and printed flexible veneer." Flexible veneers come in a whole range of designs and colors, everything from imitations of exotic veneers to designs that look as if they have been woven.

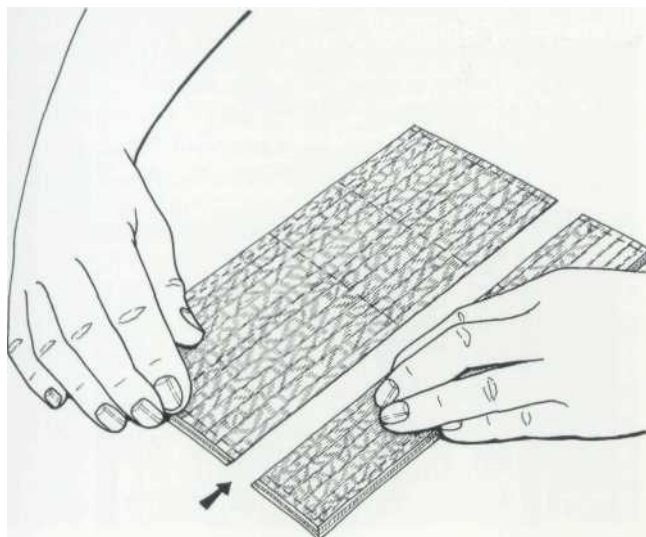
### MATERIALS LIST

A Front board (1)	1/8" ply × 7 3/16" × 11 3/4"
B Mirror thickness board (1)	1/8" ply (same thickness as the mirror tile) × 7 3/16" × 11 3/4"
C Backing paper (1)	6" × 6"—sticky-back paper or plastic to hold the mirror secure
D Mirror tile (1)	4" × 4"-square tile
E Veneer (1)	printed and pressed flexible veneer 12" × 12"—this allows for cutting waste
F Inlay (1)	sycamore veneer 14" × 10"—this allows for a good amount of cutting waste

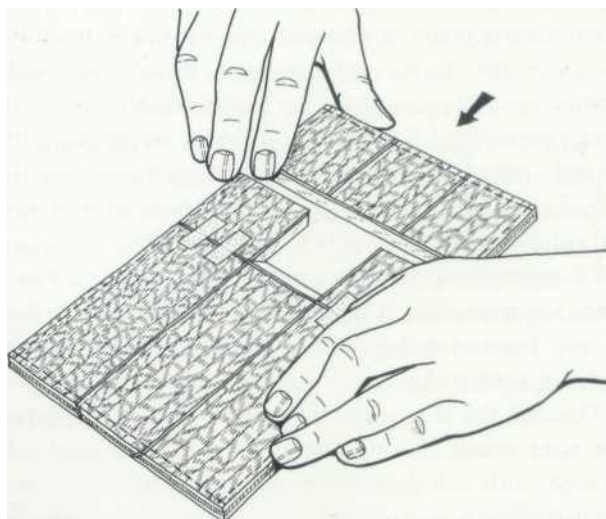
### HARDWARE AND EXTRAS

G Thermoplastic gluefilm (1)	18" × 18"
H PVA glue	

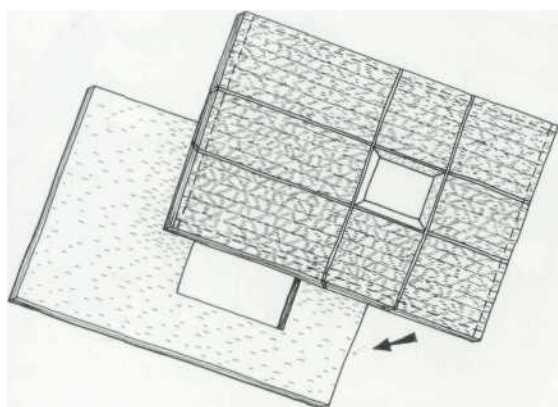
## STEP-BY-STEP STAGES



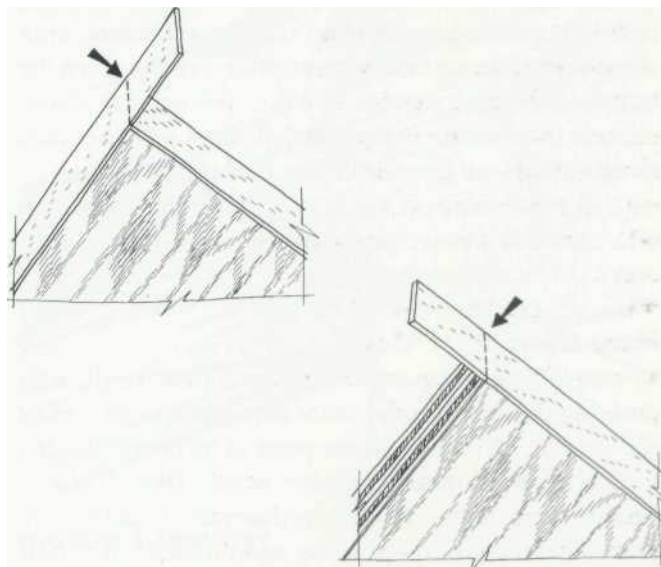
1 Set the saw table to a tilt angle of  $30^\circ$  and run a saw cut right across the length of the board. Then, glue a strip of veneer on the sawed edge and glue the two parts of the board back together.



2 Continue running straight saw cuts across the board and filling the kerf with veneer until the design is complete. If you do it right, the procedure will automatically result in the mitered edges of the mirror hole or window being veneered with the strip.



3 Glue the backing board in place so that you have the thickness of two boards. Then run a beveled cut around all four sides of the frame.



4 Glue the strips around the mitered edges and trim and sand the corners to a crisp finish.



## MORE ABOUT THE CRAFT OF MARQUETRY AND INLAY

If you have enjoyed this project and want to know more about the craft of inlay and marquetry, then the following brief history will give you some useful leads.

Marquetry and inlay were originally inspired by the ancient craft of "intarsia"—the making of mosaics by the inlaying of precious and exotic materials into and/or onto a groundwork of solid wood. The Egyptians decorated much of their woodworking with inlay. In fact, in the tomb of the Egyptian king Tutankhamen, just about all the furniture is covered with an inlay made up of little briquettes of wood, gold and ivory.

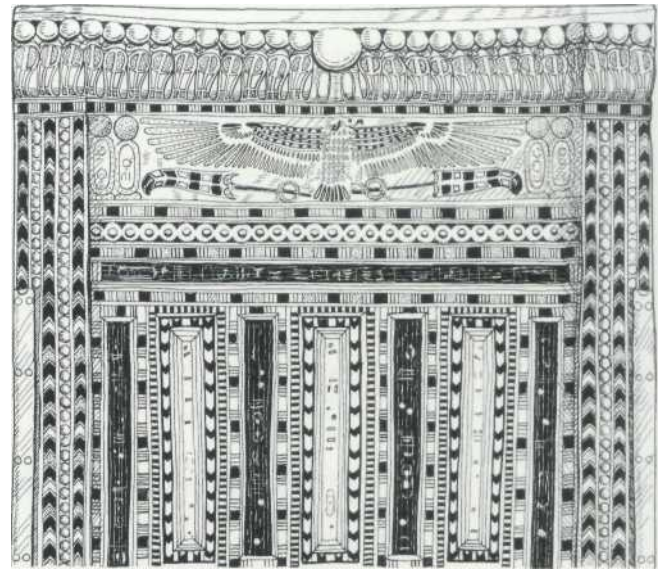
Through the centuries, in Egypt, Rome, Persia, Japan and right across Europe, the craft of inlaying gradually evolved, with rich patrons employing craftsmen to painstakingly cover base woods with rare and exotic woods. The craft involved importing rare woods, slicing the wood into little chunks, and then setting the chunks or briquettes one at a time into the base wood. The process of inlay was massively expensive in time and materials.

And so it might have continued had not some tired and weary woodworker—sometime toward the end of the sixteenth century—invented the jigsaw. From then on, the whole process became swifter and more efficient, until about the beginning of the seventeenth century, when the technique became so improved and refined that woodworkers were using thin sheets of wood—by this time called veneer—to glue directly to the base wood.

The craft as we now know it can be divided into four areas of study—veneering, parquetry, boule marquetry and window marquetry.

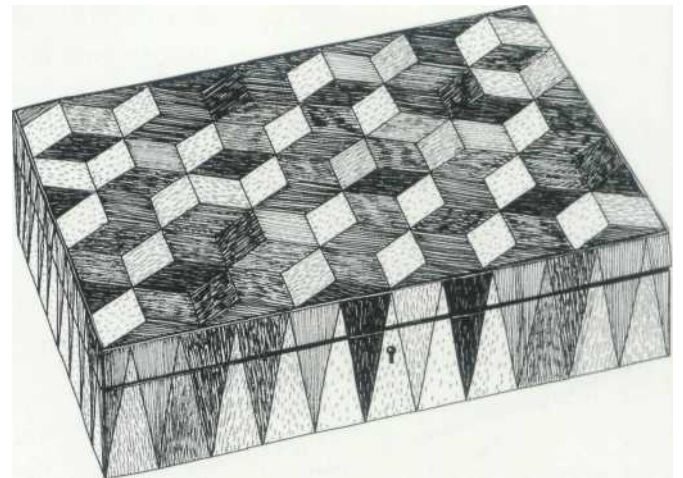
### Veneering

In simple terms, the craft of veneering has to do with covering base wood with a more attractive species, to fool the eye into believing that the piece of furniture or other item is made of more expensive wood. Though at one time this area of the craft fell into disrepute, with the term "veneer" coming to mean tricky and/or cheap, it is now seeing a revival. Current thinking is that one way of saving rare and precious tree species is to make a little go a long way. For example, it is now possible to build a whole piece of furniture from a man-made sheet-wood material like MDF (medium density fiberboard), and then cover it with a pressed-and-painted flexible veneer—as in this project—or with plastic veneers or thin sheets of rare wood. One look through a batch of current woodworking magazines will bear out the fact that the time is fast coming when some woods will be so rare and costly that woodworkers will have no choice but to use thin decorative veneers on base-wood grounds. Interesting isn't it!



### EGYPTIAN INLAY

*Detail from the back of Tutankhamen's ceremonial chair—inlaid with exotic woods and precious stones.*



### NINETEENTH-CENTURY PARQUETRY

*A classic example of a parquetry box—made in Tunbridge Wells, England, in the middle of the nineteenth century.*

## Parquetry

Squares, checkerboards, counterchanges, triangles, diamonds and zigzags—parquetry is the art and craft of math, geometry and the straight line. While marquetry involves pictures, patterns and all manner of wavy-line imagery, parquetry concentrates on straight lines and geometrical patterns.

Many American marquetry craftsmen think of parquetry as being similar to fabric patchwork. It's a good comparison. If you think of the geometrical patterns that make up a quilt, and if you go on to think of this same pattern in terms of tiles of veneer spread out over a piece of furniture, or maybe over a floor, then you have a parquetry. If you enjoy playing around with rulers and set squares, and if you enjoy logic, order and straight, crisp lines, then you will enjoy parquetry.

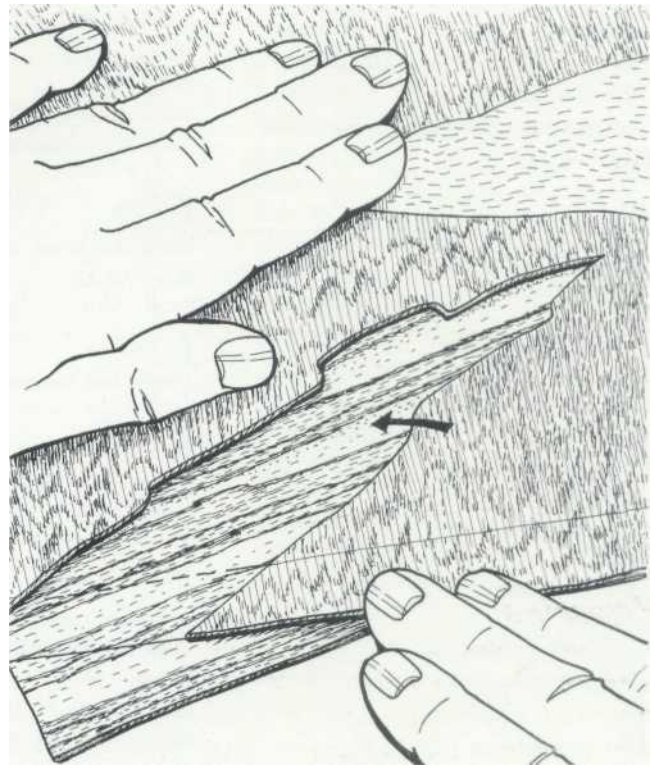
## Boule Marquetry

Boule is a type of marquetry that was popular in France in the seventeenth and eighteenth centuries. The technique was named after Andre Charles Boule, a French marquetry craftsman under King Louis XIV. Now known as boule, boule, or even, buhl, the technique might best be described as getting two designs for the price of one. Traditionally, the boule technique involves setting two thin sheets of contrasting material together—usually brass and an exotic wood—and then cutting through both sheets at the same time to create a number of pairs of identical cutouts. For example, if you have two sheets of veneer sandwiched together—one black and the other white—and you cut a circle shape through both sheets and then swap the cutouts around, you will have a black sheet with a white circle at its center and a white sheet with a black circle. If you were to continue cutting out more complex shapes and swapping them around, you would finish up with two identical counterchanged designs—one white on black and the other black on white. If you sandwich four sheets of veneer together, then the technique really begins to lift off. If you enjoy intricate sawing, and exquisite pattern work—say on small boxes and the like—and if you like the notion of using up every last piece of veneer, then perhaps this is a technique that you need to explore.

## Window Marquetry

Window marquetry, sometimes called picture marquetry, involves pencil-press, transferring the design through to a sheet of scrap veneer, then cutting out the elements of the design one step at a time and replacing them with more decorative veneers.

For example, if you draw a picture of an old sailing ship on the scrap veneer and cut out, say, one of the sails so that you have a hole, then you can slide the hole over your choice veneer and try out various grain patterns. When you have selected the veneer, you cut a piece to fill the hole. Then, you repeat the procedure with all the other elements that go to make the design—the sails, the masts, the hull, the clouds, and so on. Of course, if you continue in this manner, you will eventually finish up with a situation where just about all the base veneer has been replaced by little cutouts of contrasting veneer. When this point is reached, the resultant design can be mounted like a picture or built into something like a coffee table. Great fun!

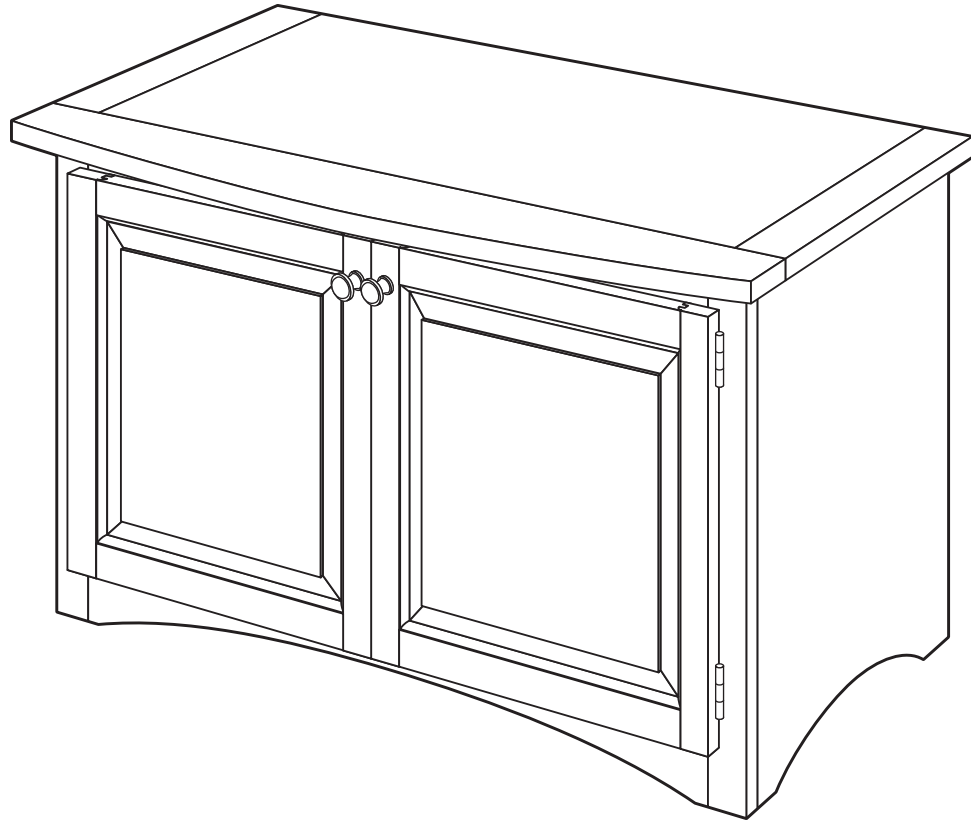


### WINDOW MARQUETRY

*The technique is beautifully simple and direct. All you do is cut out an element of the design and then fill it with choice veneer.*



# TV Stand



For advanced woodworkers, this project is a great exercise in typical cabinet construction. The case, face-frame, doors and drawer are great small-scale samples of how kitchen cabinets and many other kinds of freestanding cabinets are typically built. So once you learn these techniques, you'll be able to apply them to many other kinds of projects involving casework. Besides the basics of making dead-accurate panel cuts, rabbets and dados on the table saw, this project also requires precision drilling, radius cuts, and making and installing drawers, face-frames and doors with solid-wood panels. And when it's all done, you'll learn more about applying and using stains and finishes to protect the wood and keep it looking beautiful.

## TOOLS REQUIRED

### Hand Tools

Bar clamps  
Wood or rubber mallet

### Power Tools

Table saw  
Band saw or jigsaw  
Jointer  
Biscuit joiner  
Shaper or table-mounted router  
Table-mounted belt sander  
Random-orbit sander

### Miscellaneous

- Pencil
- Tape measure
- Safety glasses
- Carpenter's glue
- 120-, 150- and 220-grit sandpaper
- Clean, lint-free cloths
- Respirator
- Gloves for finishing
- Mineral spirits (for oil-based stains and finishes)
- Water-filled metal container with tight-fitting lid (for oil-based stains and finishes)
- Minwax® Wood Finish™ Stain Brush or other good quality, natural-bristle brush (for oil-based stains and finishes)

## SHOPPING LIST

### Wood Recommendation: Oak

**Alternate wood:** Maple  
3/4" red oak plywood, 1/2 sheet  
1x6 red oak, 18 lineal feet  
1/4" birch or maple plywood, 1/2 sheet

### Hardware

1-1/4" pocket screws, 8  
14" full-extension drawer glides, 2  
1/2" overlay partial wrap face-frame hinges, 2 pair

## CUTTING LIST

Overall dimensions:

Item	Description	Size & Quantity	Material
A	Case sides	14-1/4" x 18", 2 pcs.	3/4" plywood
B	Case bottom	14" x 29", 1 pc.	3/4" plywood
C	Case rails	4" x 29", 2pcs.	3/4" plywood
D	Face-frame rail, top	1-1/2" x 27", 1 pc.	red oak
E	Face-frame rail, bottom	2-1/2" x 27", 1 pc.	red oak
F	Face-frame stiles	1-1/2" x 18", 1 pc.	red oak
G	Door rails	1-1/2" x 11-11/16", 4 pcs.	red oak
H	Door stiles	1-1/2" x 15", 4 pcs.	red oak
I	Door panels	11-9/16" x 12-5/8", 2 pcs.	red oak
J	Top	14" x 28", 1 pc.	3/4" plywood
K	End bands	2" x 14", 2 pcs.	red oak
L	Front band	4" x 32", 1 pc.	red oak
M	Adjustable shelf	13" x 28-3/8", 1 pc.	3/4" plywood
N	Shelf band	3/4" x 28-3/8", 1 pc.	red oak
O	Filler strip	2" x 14", 2 pcs.	red oak
P	Drawer sides	3" x 14", 2 pcs.	red oak
Q	Drawer front and back	3" x 25-1/8", 2 pcs.	red oak
R	Drawer bottom	12-3/4" x 25-3/8", 1 pc.	1/4" plywood
S	Cabinet back		1/4" plywood

## WOOD FINISHING PRODUCTS

### Recommended Finish

Prep: Minwax® Pre-Stain Wood Conditioner  
Stain: Minwax® Wood Finish™ English Chestnut  
Finish: Minwax® Fast-Drying Polyurethane semi-gloss or  
Minwax® Clear Brushing Lacquer semi-gloss

### Alternate Finish

Prep: Minwax® Pre-Stain Wood Conditioner  
Finish: Minwax® Polyshades® Classic Black or  
Honey Pine

## BEFORE YOU BEGIN

Good craftsmanship begins and ends with good work habits, so make the following steps part of your routine workshop practice. If you have any doubts or questions about how to proceed with a project, always discuss them with your shop instructor.

- Carefully and fully review plans and instructions before putting a tool to the project lumber.
- Work sensibly and safely. Wear safety goggles when doing work that creates flying chips and sawdust; wear the appropriate respirator whenever making sawdust or working with thinners or other solvents.
- At the end of every work session, clean up your shop area and put away all portable tools.

## CUTTING AND ASSEMBLY PROCEDURE

1. Before cutting the plywood components, lay out all the pieces on a scaled sketch in order to minimize waste. When you have the puzzle figured out, cut all the plywood pieces—A, B, C, J, M—to their finished size.
2. Set up a dado head in the table saw. Cut the rabbet at the top of each side (A) and the dado near the bottom. Both are  $\frac{3}{4}$ " wide x  $\frac{1}{4}$ " deep. The bottom of the dado is  $1\frac{3}{4}$ " from the bottom edge of the plywood (Fig. 1).
3. Cut a  $\frac{3}{8}$ "-wide x  $\frac{1}{4}$ "-deep rabbet along the rear edges of A, B and C to receive the back.
4. Drill the adjustable shelf holes inside the case, located 1" apart as shown in Figure 1.
5. Lay out, cut and sand the curve in the bottom of the case sides. Use the template in Grid 3. The curve starts 2" in from the back,  $1\frac{1}{4}$ " in from the front and is  $1\frac{3}{4}$ " high.
6. After sanding the interior faces of the case pieces, glue and assemble the case, making sure it's perfectly square after all the clamps are in place.
7. Rough-cut face-frame pieces—D, E, F—and then mill them to their finished size. A jointer can both work the pieces down to their required sizes while also making all edges smooth and dead-square.
8. Drill screw pockets in the ends of the face-frame rails, D and E. Cut the curve in the bottom of the lower rail, using the template shown in Grid 2. The curve originates  $\frac{1}{2}$ " in from the ends and is  $1\frac{3}{4}$ " high.
9. Assemble the face-frame with glue and pocket screws. Then glue and clamp the assembled face-frame to the front of the case.
10. Cut the plywood for the top—J—to the correct length, but leave it at least 1" too wide. Cut the end bands—K—about an inch longer than their required dimension. Prep them and the field top for joining by cutting slots for three biscuits on each end. Also cut three slots into the front edge and into the front band (L).
11. Glue the end bands to the top. The end bands can project past only one edge, but both bands must be short of the other edge so there is one straight edge to go against the rip fence in the next step.
12. Allow the end band glue to dry. Set the rip fence on the table saw to a dimension greater than the finished depth of the top, but small enough to cut through both end bands and the edge of the top. Rip the top.
13. Set the rip fence to the finished width of the top. Put the edge cut in the previous step against the fence and make the final cut. This will make the end bands perfectly flush with the front and back edges of the top.
14. Cut the front band—L—to finished length, but leave it wider than the finished width.
15. Lay out, cut and sand the curve in the front band, using the template in Grid 1. The front band is 4" wide at the center, 2" wide at each end.
16. Cut biscuit slots into the straight edge of the front band, aligned with the slots cut into the front edge of the top. Cut slots into the front ends of each end band (K) and corresponding slots into straight edge of L. Glue and clamp the front band to the top. Allow glue to dry.
17. Sand the bands and top to create a perfectly smooth surface, while being very careful not to oversand; it's easy to sand through the thin plywood veneer.
18. Round over the top and bottom corners of the top with router fitted with a  $\frac{1}{4}$ " roundover bit.
19. Carefully measure the opening in the face-frame and calculate the door rail and stile sizes. The doors should be 1" taller than the opening. Plan for a gap of  $\frac{3}{32}$ " between the two doors.
20. Cut the door rails and stiles—G and H—to size and machine them for door joinery. Start by cutting  $\frac{9}{32}$ "-wide x  $\frac{3}{8}$ "-deep grooves along the centers of the inside edges to receive the panels. The best way to center a groove is to run the piece over a dado head, flip the piece end for end and run it through again. Use scrap to get the proper setup of the table saw fence and dado height.
21. Cut  $\frac{9}{32}$ " x  $\frac{11}{32}$ " tongues into the ends of the rails. The best way to center the tongues is to run both sides of the pieces over the dado head set at a height that produces a  $\frac{9}{32}$ "-thick tongue. Use scrap to make test cuts and finalize the height of the dado head.
22. Cut the material for the door panels and join them with biscuits and glue.
23. Dry assemble the door frames and carefully measure the inside opening. Add  $\frac{1}{2}$ " to both dimensions to get the finished size of the panels.
24. Cut the panels to size. Then raise the panels by running the edges through a router or shaper table fitted with a panel-raising cutter. The cuts should produce panel edges that are no more than  $\frac{1}{4}$ " thick. Test how they fit into the grooves of the door-frame pieces. When the panels are right, finish-sand them.

25. Glue the door frames together. Be very careful not to get any glue on the panels, which would limit their ability to “float.” It’s best to stain the panels before the door is assembled.

26. Cut a piece of plywood for the adjustable shelf, M. At this stage it should be 1" too wide and too long. Also cut the shelf band—N—to the correct width, but leave it about 1" too long.

27. Prep the shelf and band for biscuit joining then glue the band to the front edge. The band should project past both ends of the plywood. Allow the glue to dry.

28. With the band set against the rip fence, cut the shelf to finished width.

29. Crosscut one end of the shelf square, cutting through both the band and the shelf. Then cut the shelf to finished length.

30. Machine filler strips—P—to go against the inside of the case behind the face-frame to receive the drawer glides. The face of the filler strips must be flush with the inside edge of the face-frame stiles. Glue the filler strips in place.

31. Cut the drawer sides—Q—to their finished width and length. Cut the front and back—R—to width but leave them a little long.

32. Cut 1/4"-deep x 3/4"-wide rabbets across the ends of the sides, on the inside faces.

33. Calculate the length of the drawer front and back. Follow the instructions that came with your drawer slides. Typically, the finished drawer can be up to 1-1/16" smaller than the opening it is fitting into.

34. Cut the front and back pieces to the finished length. Cut a 1/4" slot in all four drawer pieces to receive the bottom, as shown in Figure 2.

35. Dry assemble the drawer sides, front and back, and measure the inside dimensions. Add 7/16" to both dimensions to determine the size of the drawer bottom, S. Cut the bottom to size.

36. Sand the interior faces of all drawer parts. Glue the drawer together, being very careful that it’s perfectly square when clamped.

37. Follow the manufacturer’s instructions and screw the drawer slides to the case and drawer. Assure the drawer operates properly. Adjust as needed. Then remove the slides from both the case and drawer in preparation for finishing.

38. Screw the top to the case. The top should be even with the back and centered left and right.

39. Fasten the hinges to the doors. Locate the bottom hinge so it doesn’t interfere with the drawer slides.

40. Fasten the hinges to the face-frame. Adjust as needed so the doors operate properly. Drill the doors for pulls. Before finishing, remove the hinges.

41. Cut and install the back—T—with glue and 4d finish nails.

## STAINING AND FINISHING

**Woodworker’s Tip:** *Though you may be tempted to cut short your sanding, preparation and application time, don’t do it. These tasks are very important steps in obtaining a high-quality finish. Remember, it is the finish, just as much as the fit and smoothness of the parts that will have great bearing on how people judge your craftsmanship. To ensure an excellent result, follow the steps listed in this section and also the instructions the finish manufacturer puts on its products.*

### FINISHING TIPS

- Test the stains and finishes you are planning to use on scraps of wood. On the back of the scrap, mark the stain/finish combination and the type of wood. Allow all samples to dry thoroughly before making your final finish selection. Save your samples for quick reference on future projects.
- All stains and finishes must be allowed to dry thoroughly between coats. Remember that drying times can vary due to humidity and other climatic conditions.
- If you have some leftover stain or finish, wipe the can rim so that stain or finish in the rim won’t dry out and prevent the lid from forming a tight seal.
- Brushes used for oil-based finishes must be cleaned with mineral spirits.

42. Finish-sand any remaining rough spots with 220-grit paper. Dust off the piece and wipe it carefully with a clean, lint-free cloth lightly dampened with mineral spirits.

### Recommended Finish

43. Apply the Minwax® Wood Finish™ you’ve chosen using a natural-bristle brush and a clean, lint-free cloth following the directions on the can. The brush will help you get the stain into the inside corners. Allow the Wood Finish™ to set for about 5 to 15 minutes, then wipe off any excess. To achieve a deeper color, you may apply a second coat after 4-6 hours, repeating the application directions for the first coat. Allow the stain to dry for 24 hours before applying the protective clear finish. Choose either Minwax® Fast-Drying Polyurethane or Minwax® Clear Brushing Lacquer but not both.

**Woodworker’s Tip:** *When wiping off stain, make certain that your last wipe with the cloth goes with the grain of the wood. This way, any stain you might miss during wipe-off will be visually minimized by the wood grain.*

### Applying Fast-Drying Polyurethane

44. Apply Minwax® Fast-Drying Polyurethane following the directions on the can. Use a good quality, natural-bristle brush. Allow the first coat to dry overnight.

45. The next day, sand all surfaces lightly with 220-grit or finer sandpaper using with-the-grain strokes. Dust off and wipe all surfaces with a cloth lightly dampened with mineral spirits. Apply a second coat of polyurethane and set the piece aside to cure overnight.

46. The following day, sand all surfaces lightly with 220-grit sandpaper. Dust off and wipe the piece with a cloth lightly dampened with mineral spirits and apply the third and final coat of polyurethane.

### Applying Clear Brushing Lacquer

47. Stir Minwax® Clear Brushing Lacquer well before and during use to rotate the product from the bottom to the top of the can. NEVER SHAKE.

48. Apply a coat of lacquer using a high-quality natural- or synthetic-bristle brush. Apply sufficient lacquer to seal open joints, edges and end grain.

49. Let the first coat dry at least 2 hours, then apply a second coat.

50. Apply a third coat, repeating the steps above for each coat. Apply a fourth coat, if desired.

51. After the final coat, allow at least 24 hours before using.

### Alternate Finish

52. Apply Minwax® Polyshades® following the directions on the can. Use a good quality, natural-bristle brush suitable for use with polyurethane. Stir the can contents thoroughly before starting and periodically repeat stirring during your work session. Allow the first coat to dry overnight.

53. The next day, sand all surfaces lightly with 220-grit sandpaper or very fine (000) steel wool using with-the-grain strokes. Dust off and wipe all surfaces with a cloth dampened with mineral spirits. Apply a second coat of Polyshades® and set the rack aside to cure overnight. To achieve a deeper color, you may apply a third coat after 4-6 hours, repeating the application directions. Allow the finish to cure for several days before using the stand.

**Woodworker's Tip:** *If you achieve the desired color on the first or second coats of Polyshades®, apply a clear coat of Minwax® Fast-Drying Polyurethane or Minwax® Wipe-On Poly for added protection.*

54. When the staining and finishing is complete and the topcoat is cured, install the doors, knobs and drawer.

### PRODUCT SAFETY

For your safety and the safety of those you work with, always read the safety warnings, which manufacturers print on their labels, and follow them to the letter.

**WARNING!** Removal of old paint by sanding, scraping or other means may generate dust or fumes that contain lead. Exposure to lead dust or fumes may cause brain damage or other adverse health effects, especially in children or pregnant women. Controlling exposure to lead or other hazardous substances requires the use of proper protective equipment, such as properly fitted respirator (NIOSH approved) and proper containment and cleanup. For more information, call the National Lead Information Center at 1-800-424-LEAD (in U.S.) or contact your local health authority.

**DANGER:** Rags, steel wool, other waste soaked with oil-based stains and clear finishes, and sanding residue may spontaneously catch fire if improperly discarded. Immediately place rags, steel wool, other waste soaked with this product, and sanding residue in a sealed, water-filled metal container. Dispose of in accordance with local fire regulations.

### When using oil-based wood finishing products:

#### CAUTIONS: CONTAINS ALIPHATIC HYDROCARBONS.

Contents are **COMBUSTIBLE**. Keep away from heat and open flame.

**VAPOR HARMFUL.** Use only with adequate ventilation. To avoid over-exposure, open windows and doors or use other means to ensure fresh air entry during application and drying. If you experience eye watering, headaches, or dizziness, increase fresh air, or wear respiratory protection (NIOSH approved), or leave the area. Avoid contact with eyes and skin. Wash hands after using. Keep container closed when not in use. Do not transfer contents to other containers for storage.

**FIRST AID:** In case of eye contact, flush thoroughly with large amounts of water for 15 minutes and get medical attention. For skin contact, wash thoroughly with soap and water. In case of respiratory difficulty, provide fresh air and call physician. If swallowed, call Poison Control Center, hospital emergency room, or physician immediately.

#### DELAYED EFFECTS FROM LONG-TERM OVEREXPOSURE.

Contains solvents which can cause permanent brain and nervous system damage. Intentional misuse by deliberately concentrating and inhaling contents may be harmful or fatal.

**WARNING:** This product contains a chemical known to the State of California to cause cancer and birth defects or other reproductive harm. **DO NOT TAKE INTERNALLY. KEEP OUT OF REACH OF CHILDREN.** CONFORMS TO ASTM D-4326. Contact a physician for more health information.

### When using water-based wood finishing products:

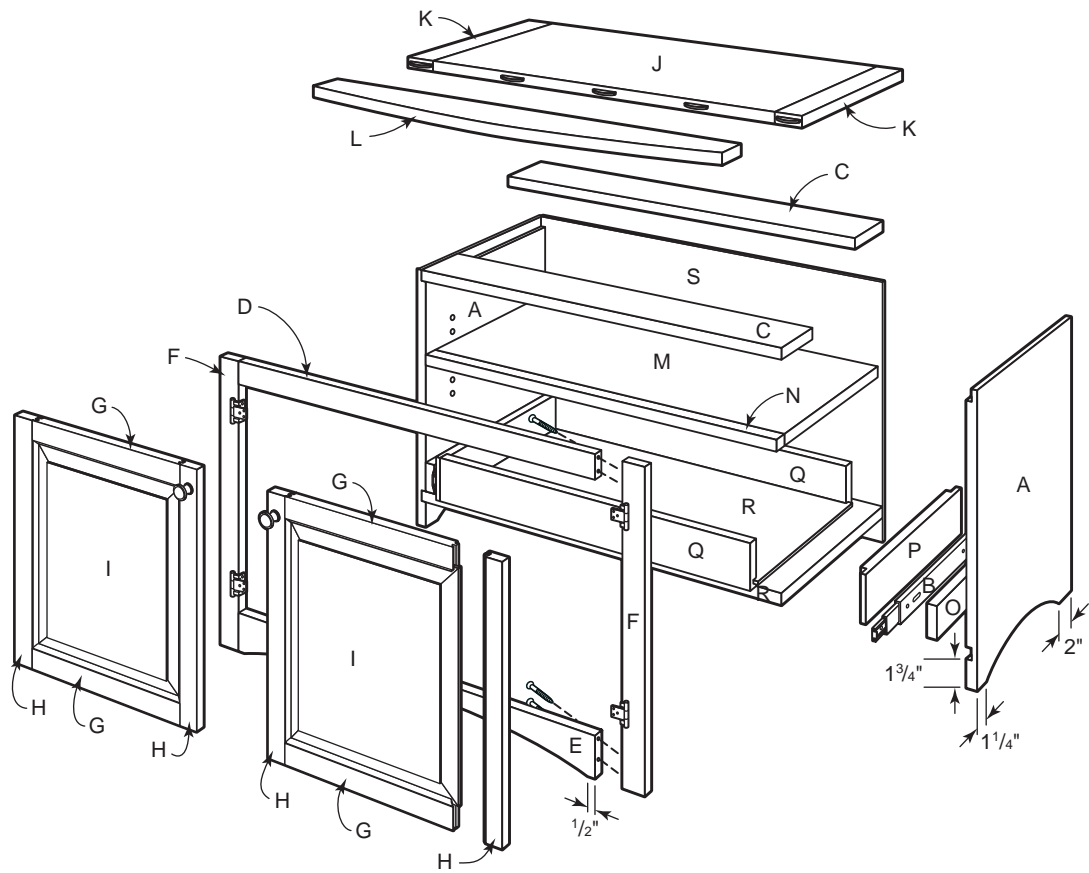
**CAUTIONS:** Use Only With Adequate Ventilation. To avoid overexposure, open windows and doors or use other means to ensure fresh air entry during application and drying. If you experience eye watering, headaches, or dizziness, increase fresh air, or wear respiratory protection (NIOSH approved), or leave the area. Avoid contact with eyes and skin. Wash hands after using. Keep container closed when not in use. Do not transfer contents to other containers for storage.

**FIRST AID:** In case of eye contact, flush thoroughly with large amounts of water. Get medical attention if irritation persists. If swallowed, get medical attention immediately.

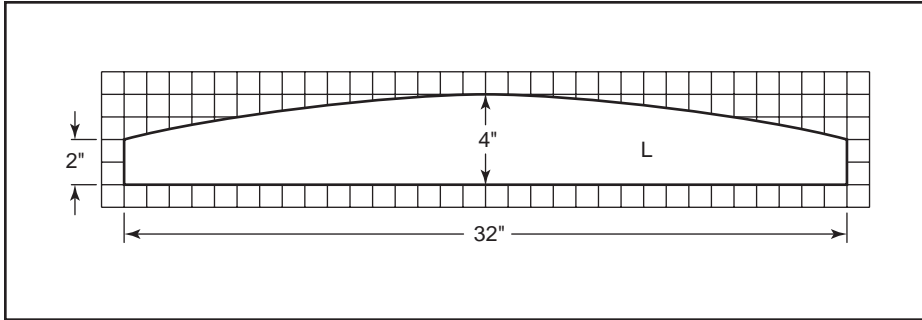
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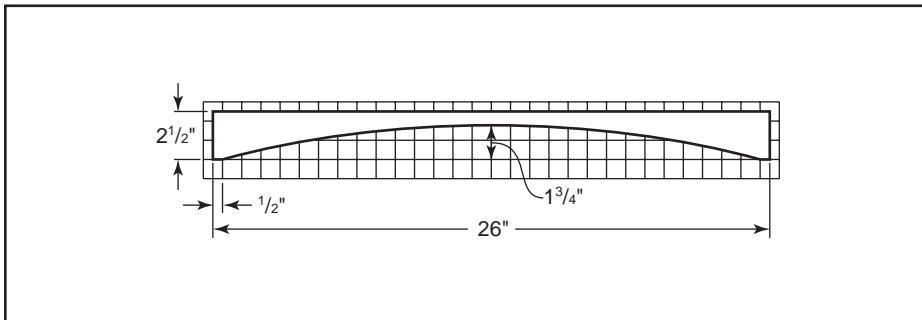
**FIG 1.**



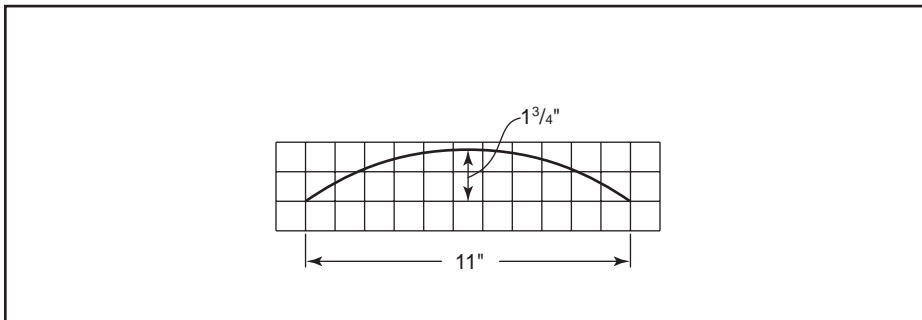
**GRID 1.**



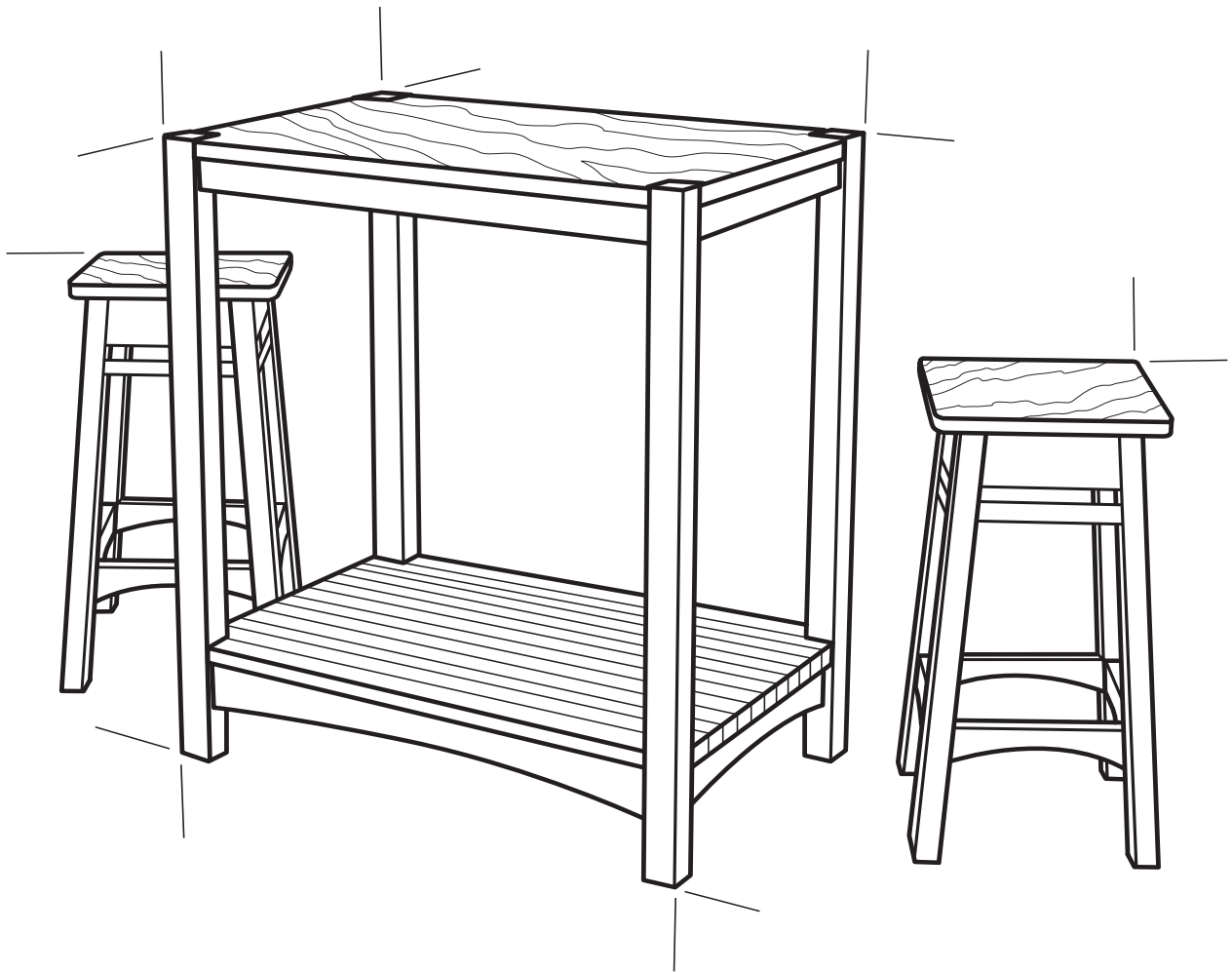
**GRID 2.**



**GRID 3.**



# Snack Bar and Stools



A stylish, all-purpose table that goes great with a pair of sturdy stools. This versatile table is perfect for schoolwork, small projects and board games.

If you haven't yet built your first table and chair set, you could do a lot worse than starting with this group. The simple lines of both pieces offer a pleasing style, but they'll also challenge you to be very precise with all your cuts and joinery. Meant for those with advanced skills, these projects will develop your skills in cutting compound angles, making mortise-and-tenon joints with a router and a table saw, making router-cut curves with a special jig, and more. And after you build these pieces, you'll learn more about applying stains and finishes to enhance the wood's natural beauty and ensure that it's well protected.

## TOOLS REQUIRED

### Hand Tools

- Handsaw
- Wood rasp and file
- Sanding block
- Bar clamps
- Vise
- Spokeshave or drum sander

### Power Tools

- Table saw
- Bandsaw
- Miter saw
- Plunge router
- Belt and orbital sanders

### Miscellaneous

- Safety glasses
- 120-, 150- and 220-grit sandpaper
- Clean, lint-free cloths
- Respirator
- Gloves for finishing
- Mineral spirits (for oil-based finishes)
- Water-filled metal container with tight-fitting lid
- Minwax® Wood Finish™ Stain Brush or other good quality, natural bristle brush (for oil-based stains and finishes)
- Minwax® Polycrylic® Brush or other good quality, synthetic bristle brush (for water-based stains and finishes)
- Carpenter's glue
- Double-faced tape

## SHOPPING LIST

Table	
Item	Quantity
8/4 legs	1 pc. 7-1/2" x 36-1/2"
4/4 rails	1 pc. 7-1/2" x 60"
5/4 slats	4 pcs. 7" x 36"; 1 pc. 2" x 36"
5/4 top	4 pcs. 6-1/4" x 36-1/2"
1-1/4" flathead woodscrews	45
Stool (material for one stool)	
Item	Quantity
5/4 legs, stretcher	1 pc. 4" x 24"; 1 pc. 4" x 36"
5/4 seat	1 pc. 11-1/2" x 11-1/2"
4/4 rails, tenons	1 pc. 5" x 36"
1-1/4" flathead woodscrews	4

Recommended Wood: Oak

Alternate Wood: Birch

## WOOD FINISHING PRODUCTS

### Recommended Finish

#### Table

- Prep: Minwax® Pre-Stain Wood Conditioner (if using soft or porous wood)
- Stain: Top and slats – Minwax® Wood Finish™ Sedona Red\*  
 Legs – Minwax® Wood Finish™ Golden Oak\*
- Finish: Minwax® Helmsman® Spar Urethane Satin

#### Stool

- Prep: Minwax® Pre-Stain Wood Conditioner (if using soft or porous wood)
- Stain: Top – Minwax® Wood Finish™ Sedona Red\*  
 Legs – Minwax® Wood Finish™ Golden Oak\*
- Finish: Minwax® Helmsman® Spar Urethane Satin

#### Alternate Finish

- Prep: Minwax® Pre-Stain Wood Conditioner (if using soft or porous wood)
- Stain/Finish: Minwax® Polyshades® Classic Oak Satin (or your choice of 9 Minwax® Polyshades® colors in satin or gloss)

## CUTTING LIST

Table					
Key	Part	Pcs.	Thickness	Width x Length	Notes
A	Leg	4	1-3/4"	1-3/4" x 36-1/8"	
B	Upper rail-end	2	3/4"	2" x 22-1/2"	3/8" x 1-1/4" x 1" tenon
C	Upper rail-side	2	3/4"	2" x 34-1/2"	3/8" x 1-1/4" x 1" tenon
D	Lower rail-end	2	3/4"	3" x 22-1/2"	3/8" x 2-1/4" x 1" tenon
E	Lower rail-side	2	3/4"	3" x 34-1/2"	3/8" x 2-1/4" x 1" tenon
F	Stretcher	1	3/4"	3/4" x 2" x 21-1/2"	
G	Slat	11	1"	1-13/16" x 36"	
H	End slat	2	1"	1-3/4" x 32-3/8"	
J	Top	1	1"	24" x 36"	
Buttons		12, see Fig. 1 for dimensions			
Plugs		30, 3/8" dia., store-bought or made with a plug cutter			
Stool					
Key	Part	Pcs.	Thickness	Width x Length	Notes
A	Leg	4	1-1/4"	1-1/4" x 23-1/16"	cut both ends at 85° compound angle
B	Upper rail	4	9/16"	3-1/2" x 6-5/8"	5° ends
C	Lower rail	4	9/16"	1-1/4" x 7-1/32"	5° ends
D	Stretcher	4	7/8"	2" x 9-3/32"	mark exact length against actual leg /rail assembly
E	Seat	1	1"	11-1/4" x 11-1/4"	1/2" radius corners
Loose tenons		24, sized to fit their respective mortises			
Buttons		4, see Fig. 1 for dimensions			

\*Or your choice of 20 Minwax® Wood Finish™ Stain colors.

## BEFORE YOU BEGIN

Good craftsmanship begins and ends with good work habits, so make the following steps part of your routine workshop practice. If you have any doubts or questions about how to proceed with a project, always discuss them with your shop instructor.

- Carefully and fully review plans and instructions before putting a tool to the project lumber.
- Work sensibly and safely. Wear safety goggles when doing work that creates flying chips and sawdust; wear the appropriate respirator whenever making sawdust or working with thinners or other solvents.
- At the end of every work session, clean up your shop area and put away all portable tools.

## CUTTING AND ASSEMBLY PROCEDURE

### Constructing the Table

1. Cut legs and rails (A, B, C, D, E) to size as shown in Fig. 1. The lengths given include the tenons.

**Woodworker's Tip:** *Make one extra leg as a test piece for your router mortising, and a couple of extra rails as test pieces for cutting tenons. These extra parts don't have to be full length.*

2. Lay out the mortise locations on the legs. Stand up the legs and double check to make sure there are two rights and two lefts (Fig. 2).

3. Cut the leg mortises, using a plunge router. If you clamp a couple of pieces together, they become a more stable surface for the base of the router.

4. Use a plunge router to cut slots in the upper rails for the 12 tabletop buttons.

5. Cut tenons on the ends of the rails. Use the miter gauge and table saw set up with a dado blade. You can use the saw fence for quick repeatability on these cuts. To do that safely, you must clamp a block to the fence just in front of the dado blade. Then set the fence to the appropriate position, using the block as the stop that determines the length of the tenon. Use your test rails to set the height of the dado blade, and test the tenon for a sliding fit in the mortises.

6. Round the corners of the tenons with a rasp and file, and miter the ends of the tenons.

7. Use the patterns shown in Fig. 3 to make template jigs for the curves on the lower rails. Make the template out of 1/4" plywood and fasten a guide handle to it as shown in Fig. 4.

8. Cut the curves in the lower rails on a shaper or table-mounted router. Secure the work pieces to the jigs with double-faced tape.

9. Lay out and drill the screws and plug holes on the two lower side rails (E). They should be centered on the length.

10. Dry-assemble the table, using clamps to snug up all the joints. Lay stretcher material in position, mark it and cut to fit between the rails.

11. If everything fits in the dry-assembly, start gluing. Begin with one long side, then the other. When these are dry, glue the end rails and clamp snug. Check for square by measuring the diagonals and adjust clamp compression as needed to produce right angles. Screw the stretcher in place, and sand the plugs smooth.

12. Glue together the boards for the top (J), then smooth the panel as needed with belt and orbital sanders.

13. Cut the top to size then notch the corners using the table saw technique shown in Fig. 5. It requires attaching a tall fence to the miter gauge and clamping the assembled top to it. A spacer block clamped to the fence lets the off-cuts fall safely away from the blade.

14. Insert the buttons into the kerfs on the upper rails. Test-fit the top on the table base, and drill screw holes through the buttons and into the top. Use a stop on your drill bit to prevent accidentally drilling all the way through.

15. Cut the slats (G, H) to size. Drill them for plugs, then drill screw clearance holes in each. Sand and ease all edges.

16. Lay out the slats on the rails, using shims to keep the spacing identical. Drill pilot holes through the clearance holes. Screw on the slats, glue in the plugs and then cut and sand the plugs flush.

**Woodworker's Tip:** *If you plan to finish the slats a different color from the legs, it's easier to drill holes in the bottom of the rails and screw on the slats from below. This way, the slats can be stained before being attached. Be sure to drill the holes before cutting the curves in the lower rails.*

### Constructing the Stool

1. Cut the legs, rails and stretchers (A, B, C, D) to width and rough length, then cut the compound angled ends on the legs. Notice that the edges of the rails and stretchers are cut at a 5° bevel. Don't cut the angled ends on the rails and stretchers yet.

**Woodworkers Tip:** *Use one piece for both upper and lower rails, and rip to make the two pieces. This will give you a good grain match. Also, it's a smart idea to have an extra leg and a couple of rail pieces to set up and practice your mortises. They can be cut from 2x4 lumber so you don't waste good wood.*

2. Lay out the locations for the mortises as shown in Figs. 6 and 7, then prop up all four legs to make sure the mortises face each other when the legs are in their proper orientation.

3. Mortise the legs, using a plunge router fitted with an edge guide. It helps to clamp a couple legs together so the router has a wider surface to slide on.



4. Trim the ends of the rails, using a stop on the fence of your miter saw to be sure each set of four is exactly the same length. Cut the ends of each of the stretchers to the same 5° angle.

5. Mortise the ends of the rails and stretchers by clamping them side-by-side vertically in a vise, with the ends flush. Clamp a block next to them to help support the base of the router. Then plunge-rout the mortises.

6. Clamp the rails between a pair of legs, put a stretcher in position, then mark it for the final cut as shown in Fig. 9. Make the other three stretchers to this length as well.

7. Make the loose tenons as shown in Fig. 6. Begin by machining the stock to the appropriate thickness for a sliding fit in the mortises you routed. Then rip the material to width, and with a round-over bit in the router table, make two passes to round the edges.

8. Dry-assemble two legs with the rails and stretchers in place to test your joints.

9. Use the dimensions shown in Fig. 8 to lay out the curve at the bottom of the stretchers (D). Cut them on the bandsaw with the table tilted 5°; smooth the curve with a spokeshave or drum sander.

10. Make four buttons to the dimensions shown in Fig. 6. Cut mortises on the inside surface of the upper rails for the buttons that secure the seat to the frame.

11. Next, cut mitered ends on the tenons as shown in Fig. 7. These angles don't have to be exact, so a handsaw or bandsaw is an easy way to cut them.

12. Do all finish sanding and round over all edges.

13. Glue up two legs with their stretcher and rails. Keep the assembly flat. You may want to use angled blocks to help keep the clamps from slipping, as shown in Fig. 10. Use a 1"-wide block to keep the upper and lower rails properly spaced.

14. Glue the other pair of legs, and when they're dry, glue the two assemblies together. This should be done with the stool sitting upright on a flat surface.

15. Cut the seat to size, round the corners, then round over the edges. Sand and attach the buttons that hold it to the rails with the woodscrews.

**NOTE:** If you decide to two-tone stain, it's best to stain and finish the seat and legs separately, then assemble.

## STAINING AND FINISHING

**Woodworker's Tip:** *Though you may be tempted to cut short your sanding, preparation and application time, don't do it. These tasks are very important steps in obtaining a high-quality finish. Remember, it is the finish, just as much as the fit and smoothness of the parts that will have great bearing on how people judge your craftsmanship. To ensure an excellent result, follow the steps listed in this section and also the instructions the finish manufacturer puts on its products.*

## FINISHING TIPS

- Test the stains and finishes you are planning to use on scraps of wood. On the back of the scrap, mark the stain/finish combination and the type of wood. Allow all samples to dry thoroughly before making your final finish selection. Save your samples for quick reference on future projects.
- All stains and finishes must be allowed to dry thoroughly between coats. Remember that drying times can vary due to humidity and other climatic conditions.
- If you have some leftover stain or finish, wipe the can rim so that stain or finish in the rim won't dry out and prevent the lid from forming a tight seal.
- Brushes used for oil-based finishes must be cleaned with mineral spirits.

## Recommended Finish

16. Apply the Minwax® Wood Finish™ you've chosen to the interior surfaces using a natural bristle brush and a clean, lint-free cloth following the directions on the can. The brush will help you get the stain into the many inside corners and other tight spots. Allow the Wood Finish™ to set for about 5 to 15 minutes, then wipe off any excess. To achieve a deeper color, you may apply a second coat after 4 to 6 hours, repeating the application directions for the first coat. Allow the stain to dry for 24 hours before applying the protective clear finish.

**Woodworker's Tip:** *When wiping off stain, make certain that your last wipe with the cloth goes with the grain of the wood.*

17. Using a good quality, natural bristle brush, apply Minwax® Helmsman® Spar Urethane Satin following the directions on the can. Allow the piece to dry for at least 6 hours before applying the second coat.

18. The following day, sand all surfaces very lightly with 220-grit or finer sandpaper using with-the-grain strokes. Dust off and wipe all surfaces with a cloth lightly dampened with mineral spirits. Apply the second coat of Helmsman® Spar Urethane. For added protection, apply a third coat to the table top.

## Alternate Finish

19. Prepare the wood as you did in the recommended finish.

20. Apply Minwax® Polyshades® following the directions on the can. Use a good quality, natural bristle brush suitable for use with polyurethane. Stir the can contents thoroughly before starting and periodically repeat stirring during your work session. Allow the first coat to dry overnight.

21. The next day, rub all surfaces with a fine steel wool (grade 000 or finer) using with-the-grain strokes. Dust off and wipe all surfaces with a cloth dampened with mineral spirits. Apply a second coat of Polyshades® and set the pieces aside to cure overnight. To achieve a deeper color, you may apply a third coat after 4 to 6 hours, repeating the application directions. Allow the project to cure for several days before using it.

**Woodworker's Tip:** *If you achieve the desired color on the first or second coats of Polyshades®, simply apply a clear coat of Minwax® Fast-Drying Polyurethane or Minwax® Wipe-On Poly for added protection.*

## **PRODUCT SAFETY**

For your safety and the safety of those you work with, always read the safety warnings, which manufacturers print on their labels, and follow them to the letter. Typical safety advice and instructions will contain information such as the following:

**WARNING!** Removal of old paint by sanding, scraping or other means may generate dust or fumes that contain lead. Exposure to lead dust or fumes may cause brain damage or other adverse health effects, especially in children or pregnant women. Controlling exposure to lead or other hazardous substances requires the use of proper protective equipment, such as properly fitted respirator (NIOSH approved) and proper containment and cleanup. For more information, call the National Lead Informations Center at 1-800-424-LEAD (in US) or contact your local health authority.

### **When using oil-based wood finishing products:**

**CAUTIONS: CONTAINS ALIPHATIC HYDROCARBONS. Contents are COMBUSTIBLE.** Keep away from heat and open flame. **VAPOR HARMFUL.** Use only with adequate ventilation. To avoid overexposure, open windows and doors or use other means to ensure fresh air entry during application and drying. If you experience eye watering, headaches, or dizziness, increase fresh air, or wear respiratory protection (NIOSH approved), or leave the area. Avoid contact with eyes and skin. Wash hands after using. Keep container closed when not in use. Do not transfer contents to other containers for storage.

**FIRST AID:** In case of eye contact, flush thoroughly with large amounts of water for 15 minutes and get medical attention. For skin contact, wash thoroughly with soap and water. In case of respiratory difficulty, provide fresh air and call physician. If swallowed, do not induce vomiting. Call Poison Control Center, hospital emergency room, or physician immediately.

**NOTICE:** Reports have associated repeated and prolonged occupational exposure to solvents with permanent brain and nervous system damage. Intentional misuse by deliberately concentrating and inhaling contents may be harmful or fatal.

**WARNING:** This product contains a chemical known to the State of California to cause cancer and birth defects or other reproductive harm.

**DO NOT TAKE INTERNALLY. KEEP OUT OF REACH OF CHILDREN.**

### **When using water-based wood finishing products:**

**CAUTIONS:** Use Only With Adequate Ventilation. To avoid overexposure, open windows and doors or use other means to ensure fresh air entry during application and drying. If you experience eye watering, headaches, or dizziness, increase fresh air, or wear respiratory protection (NIOSH approved), or leave the area. Avoid contact with eyes and skin. Wash hands after using. Keep container closed when not in use. Do not transfer contents to other containers for storage.

**FIRST AID:** In case of eye contact, flush thoroughly with large amounts of water. Get medical attention if irritation persists. If swallowed, get medical attention immediately.

**WARNING:** Contains Alkyl propanols, ethylene glycol, n-methyl pyrrolidone. **VAPOR HARMFUL.** Use only with adequate ventilation. To avoid overexposure, open windows and doors or use other means to ensure fresh air entry during application and drying. If you experience eye watering, headaches, or dizziness, increase fresh air, or wear respiratory protection (NIOSH approved), or leave the area. Avoid contact with eyes and skin. Wash hands after using. Keep container closed when not in use. Do not transfer contents to other containers for storage.

### **DO NOT TAKE INTERNALLY.**

**FIRST AID:** In case of eye contact, flush thoroughly with large amounts of water for 15 minutes and get medical attention. For skin contact, wash thoroughly with soap and water. In case of respiratory difficulty, provide fresh air and call physician. If swallowed, call Poison Control Center, hospital emergency room, or physician immediately.

### **DELAYED EFFECTS FROM LONG-TERM OVEREXPOSURE.**

Contains solvents which can cause permanent brain and nervous system damage. Intentional misuse by deliberately concentrating and inhaling contents may be harmful or fatal.

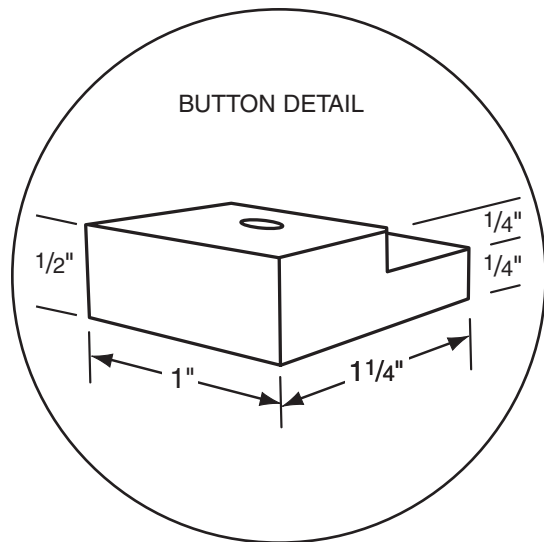
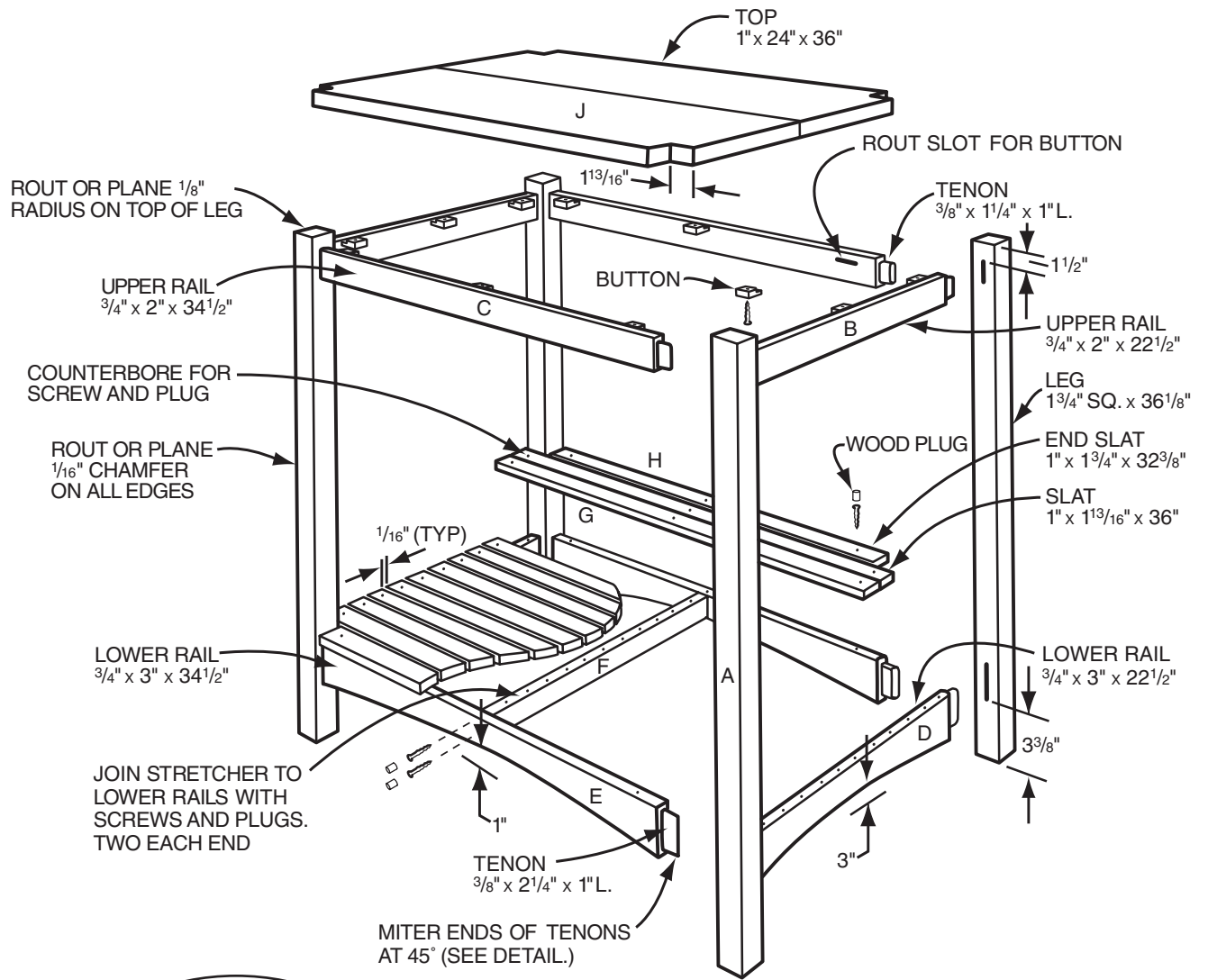
**WARNING:** This product contains a chemical known to the State of California to cause cancer and birth defects or other reproductive harm.

**KEEP OUT OF REACH OF CHILDREN.**

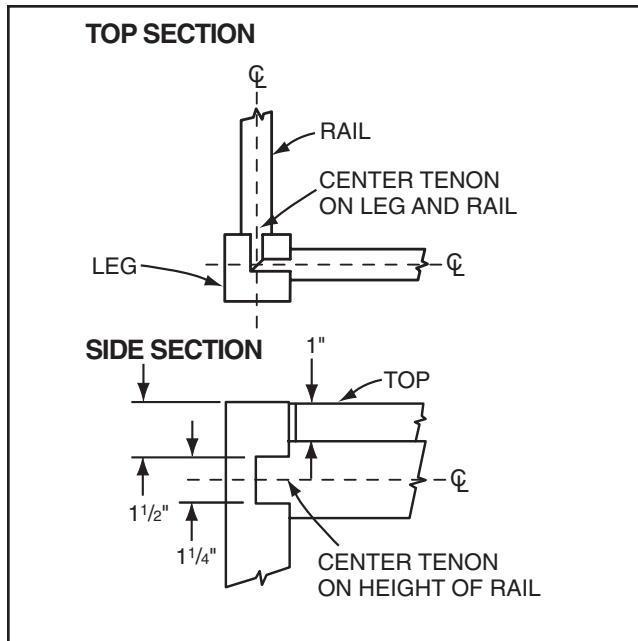
### **SAFE DISPOSAL OF RAGS AND WASTE.**

Please be mindful of the safe way to dispose of rags and other waste. Rags, steel wool and other waste products soaked with oil finishes or solvents may spontaneously catch fire if improperly discarded. Place rags, steel wool and other waste immediately after use in a water-filled metal container. Tightly seal and dispose of the waste materials in accordance with local trash removal regulations. Be sure to keep the waste out of reach of children.

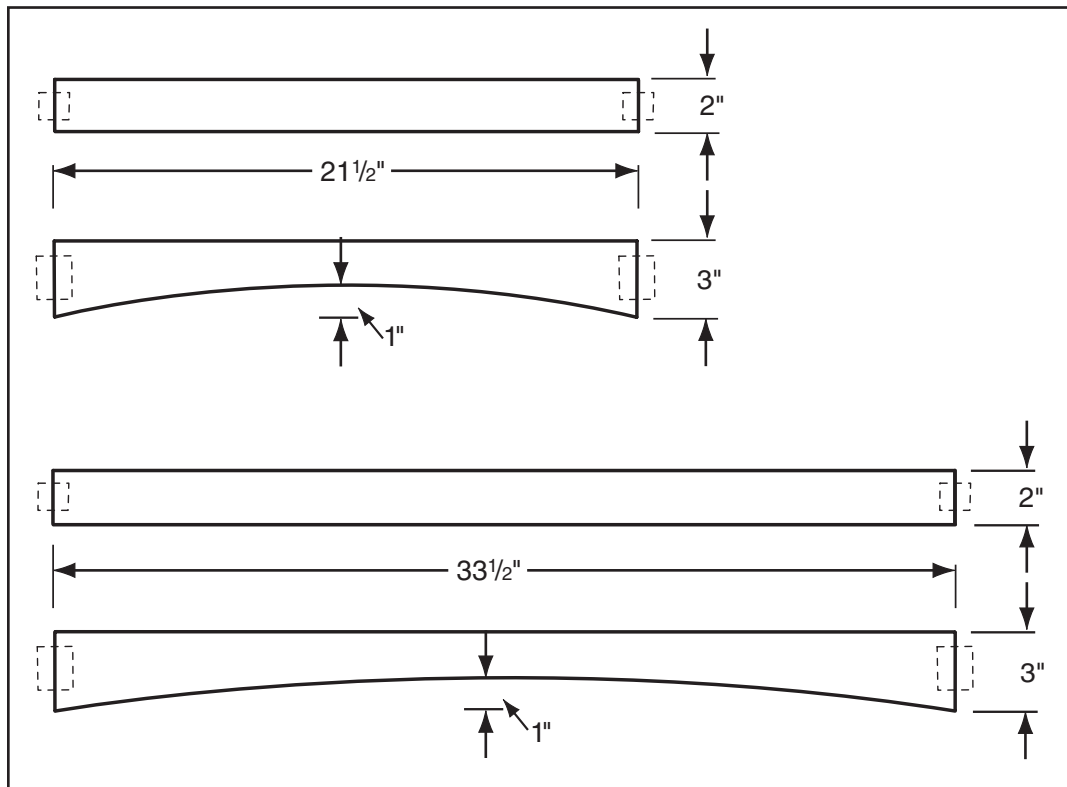
**FIG 1. TABLE DETAILS**



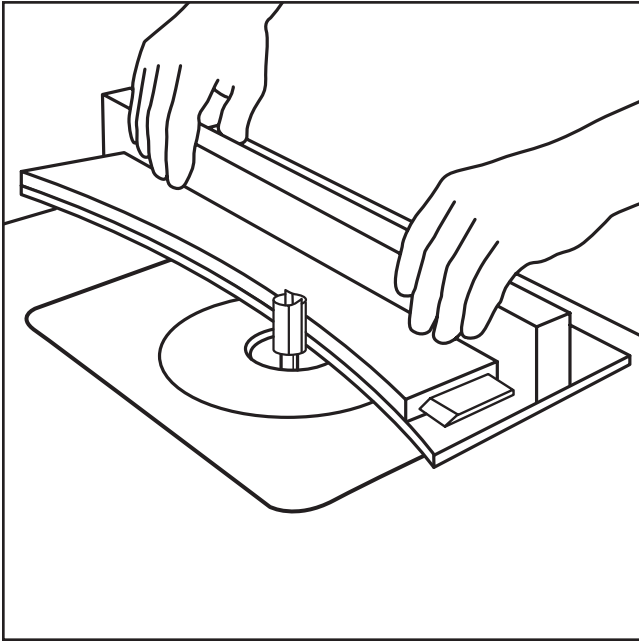
**FIG 2. MORTISE AND TENON DETAIL**



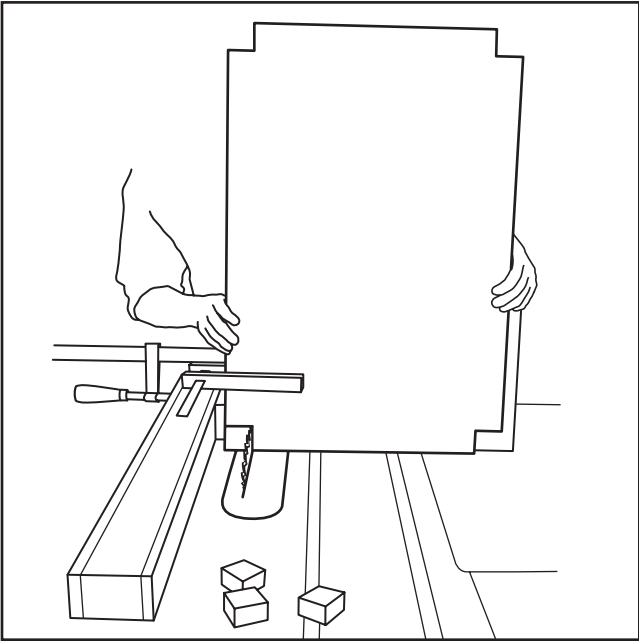
**FIG 3. CUTTING TEMPLATE OF LOWER RAILS**



**FIG 4. ROUTING A CURVE**

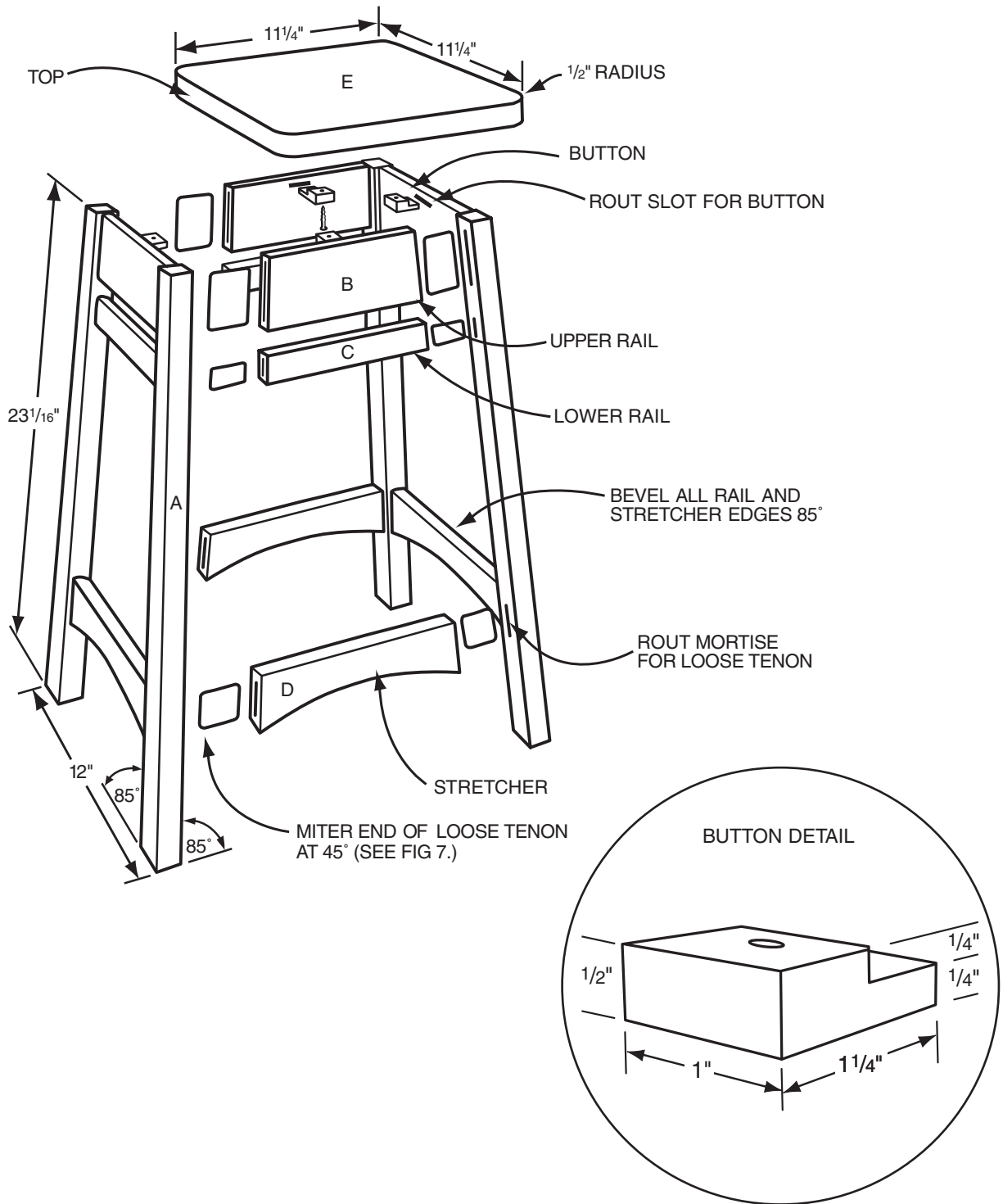


**FIG 5. NOTCHING THE TOP**

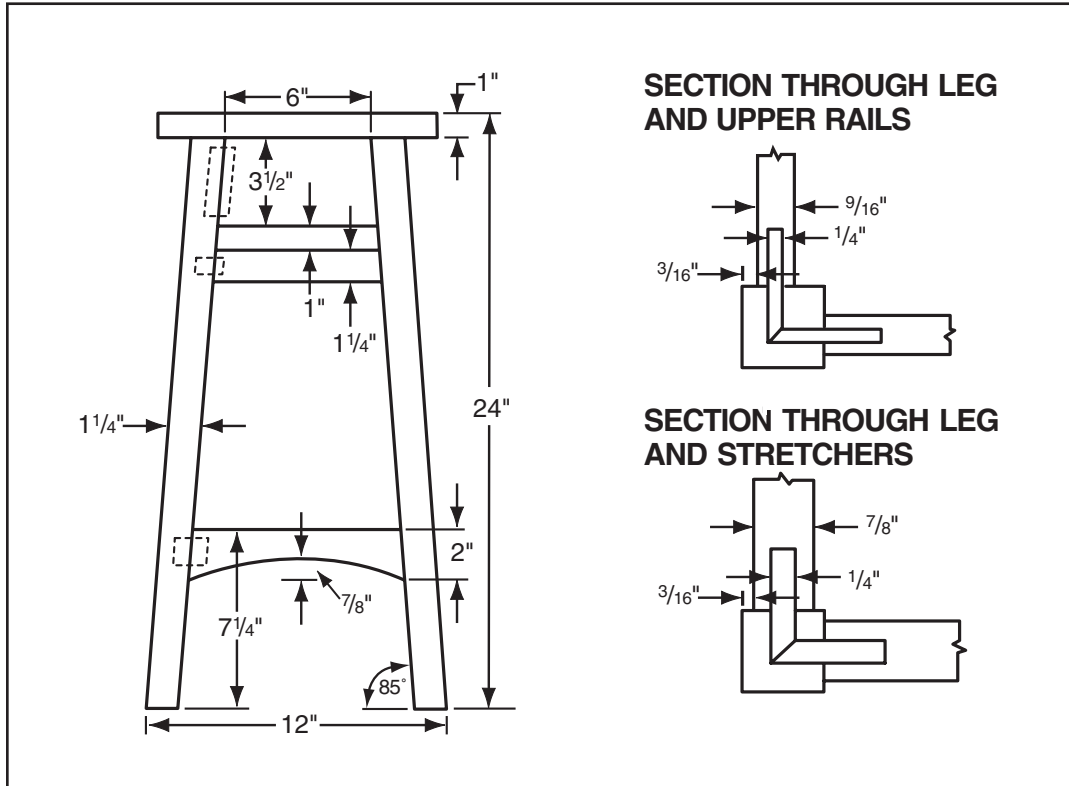




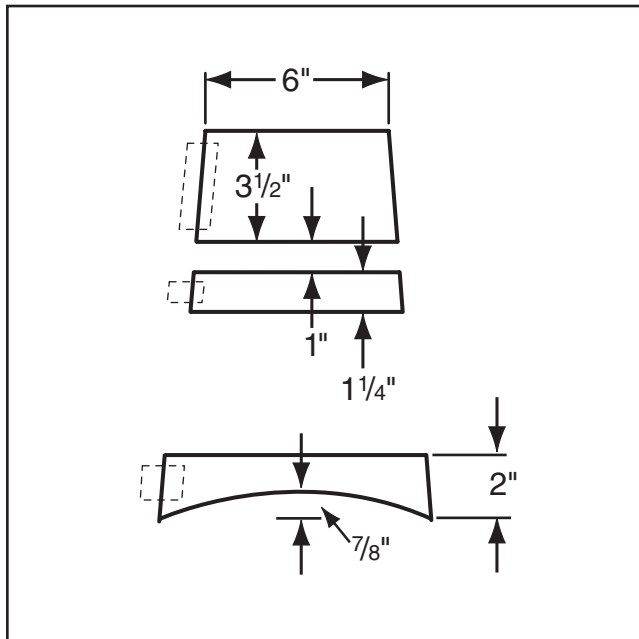
**FIG 6. STOOL DETAILS**



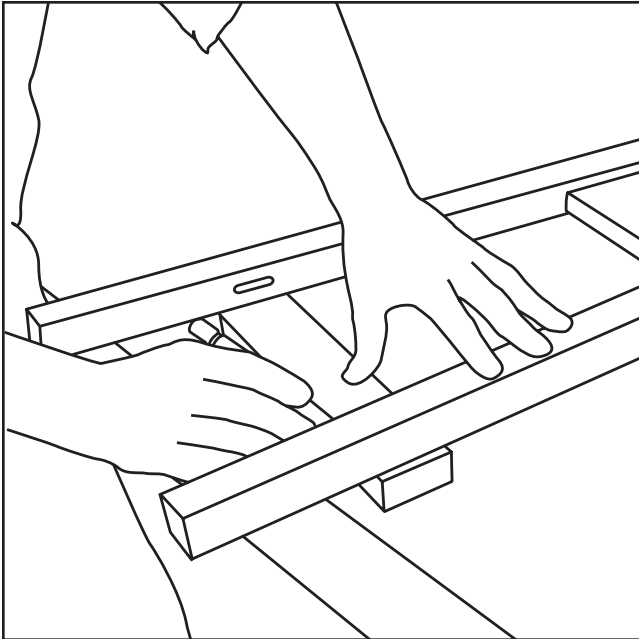
**FIG 7. ELEVATION AND SECTIONS**



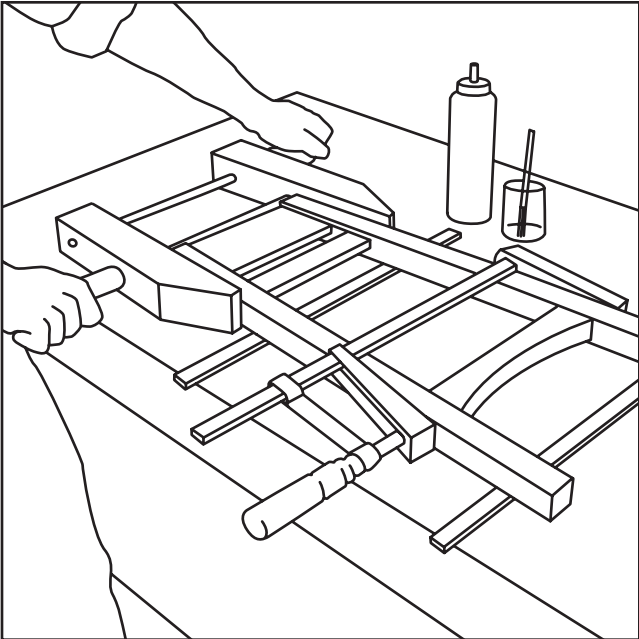
**FIG 8. DIMENSIONS FOR ALL RAILS**



**FIG 9. MARKING THE STRETCHER**



**FIG 10. ANGLED CLAMPING**



# Shaker Workbench

Country-style furniture has been the most popular furniture in this country for decades. It is easy to understand why. Besides its look being visually pleasing and compatible with just about any home setting, it is also very functional. This handsome piece, which is inspired by the past, proves the point. Though the original served as a light-duty workbench in a Shaker community, its good looks makes this piece a welcome addition in just about any room. In a dining room, it will serve handily when entertaining and, if used in the living room, it is a conversation piece. Or you may prefer to simply use it in your workroom for light-duty tasks such as crafts and painting.

An early Shaker Seed Bench observed in New England inspired its design and our version will require you to execute a variety of woodworking skills. You may already possess some of the necessary skills while others may be new to you. Cutting and shaping the various members is, of course, routine woodworking. However, we have added some detailing—such as the fingerlap joints on the drawer cases which present the builder with the chance to practice—(and show off) fine woodworking craftsmanship.

You should approach a project of this dimension the same way a professional woodworker would. First, carefully study both the how-to-build instructions and the drawings. If you feel unsure of any of the details, do take the time to resolve those questions by first discussing them with your instructor. Take this suggested step before you even buy the materials for the project.

## TOOLS REQUIRED

### Hand

- Pencils, Handsaws
- Awl
- Assorted-Dia. drill bits
- Phillips screwdriver (medium), Router Table
- Ruler (zigzag or tape)
- Block plane
- Mallet
- Assorted chisels
- Square (combination or try)
- Hammer and 1/32nd nailset
- Assorted files
- Clamps; Hand screw, bar Hand screw and bar & C-clamps
- Sandpaper 80-grit through 220-grit

### Power

- Table saw with dado head set
- Router, assorted cutters
- Planer
- Jointer
- Saws (band, radial arm)
- Sanders (stationary belt and portable belt, random orbit, pad)
- Drill press
- Portable electric drill with assorted bits
- Plate joiner with no. 20 biscuits
- Power screwdriver

## BUILDING MATERIALS REQUIRED

See Shopping and Cutting Lists

## WOOD FINISHING PRODUCTS

### Finish Recommended for this Project

- Minwax® Pre-Stain Wood Conditioner
- Minwax® Wood Finish™  
Ipswich Pine or other light finish  
(18 wood tones to choose from)
- Minwax® Fast-Drying Polyurethane®

### Alternate Finishes

#### All Water-Based for Easy Cleanup

- Minwax® Pre-Stain Water-Based Wood Conditioner
- Minwax® Water-Based Wood Stain (available in six pre-mixed colors and 60 custom colors)
- Minwax® Polycrylic® Protective Finish

#### Or, this one-step finish:

- Minwax® WoodSheen Rubbing Stain & Finish  
(available in seven colors)
- Minwax® WoodSheen Natural

### Miscellaneous

- Clean lint-free rags
- Paint thinner, if necessary
- Tack cloths
- Minwax® Wood Putty  
(color to suit selected stain)
- Minwax® Synthetic bristle brushes
- Water-filled metal container with lid  
(if oil finishes used)

## BEFORE YOU BEGIN:

Craftsmanship begins and ends with good work habits. Make it your routine to:

- Adhere to all workshop safety rules.
- Read through all instructions carefully; this includes manufacturer instructions on product labels as well as the building information in plans with which you will be working.
- Give your tools and workshop the care they deserve.

A final reminder before starting this project: Take the time to discuss your project with your instructor. You will avoid frustration and wasted materials.

## PROCEDURE

Construction begins by laying out the boards for rough-cutting to size. Take your time when doing this so as to avoid wasting costly materials. Lay out the boards for all the major carcass parts; you will cut the wood for the doors later.

Mark all parts for easy identity, before you do any cutting. Make sure you code each piece with its key letter; this prevents confusion later when all those parts are stacked in neat little piles of shorter-length pieces.

You are advised to work with the dimensions given on the drawing, since these closely replicate the piece studied in New England and are in accord with architectural standards.

## START WITH THE CARCASS

1. Lay out the boards for the carcass sides and the top. Cut the boards for these parts slightly oversize and set them into separate piles, one for each side and a third pile for the top.
2. Position the boards for the top on your workbench and arrange them to achieve the most pleasing grain arrangement. When satisfied, using a pencil lightly draw a cabinetmaker's triangle across the three pieces (this step permits returning boards quickly to the desired arrangement, later).
3. Make the pencil marks along the abutting edges to indicate where the plate joiner is to plough the grooves and cut the grooves to suit the no. 20 biscuits.
4. Apply glue to mating surfaces for the first two boards, insert the biscuits and, using a rubber mallet, tap the boards together.
5. Working quickly, apply glue to the board edges that will mate for the second joint and assemble using biscuits.
6. Use at least three bar clamps to apply light pressure on this setup—just enough to achieve glue squeezeout along the joint lines. Then set the clamped-up section aside to dry overnight.
7. Repeat these steps for the two sections that will become the carcass sides.
8. Next day, starting with the top, remove the clamps and with a sharp, heavy-duty hand scraper, remove excess glue squeezeout from the surface. Do not try to get all of it, just the excess that protrudes above the surface.
9. Sand both sides of the top by first using a random orbit sander and 100-grit paper; then switch to a belt sander and 100-grit abrasive. Make sure you work the latter in a direction parallel to the wood grain. Sand both sides of each section to remove all traces of glue squeezeout and to ensure the joints being flush and smooth.

10. Switch to 120-grit sanding belts and repeat the smoothing on both sides.

11. Install 150-grit paper on your finishing sander and complete smoothing of the top.

12. Repeat the scraping and sanding steps for the two-carcass end sections (D).

13. Next, cut the top surround parts to size. Measure for the two end sections and the front piece (A1 & A2) and cut all three parts slightly overlong. You want to make sure you have some extra length for when you cut the miters to install this trim on the top.

14. Before adding the surround, position the top on your workbench and lay out for the dados and edge rabbet that will receive the back-splash parts (B & C).

15. Insert a 3/4-in. dia. straight cutter in the router and use a clamped-on straight edge to guide your router as you cut these dados and the edge rabbet at back.

16. Cut the “backsplash” parts to their finish width and slightly overlong.

17. Temporarily assemble these three parts in the top so you can mark each for the exact length to cut them.

18. Cut the three parts—back and two end returns—to exact length.

19. Then lay out for the rounded corners on the two end returns and cut them to shape using scroll or band saw.

20. Sand the parts following the sequence spelled out in steps 9, 10 and 11. Do **not** assemble the backsplash parts to the top at this time.

21. Lay out and plough the edge rabbets to receive the cabinet back on the inside back edges of the carcass sides.

22. Carefully lay out and install the four shelf cleats at this time. Use carpenter's glue and 1-1/2 in. finishing nails; set the nailheads below the surface and fill the recesses with Minwax® Wood Putty.

**Note:** Since Minwax® Wood Putty does not accept stain, make sure you pick a putty color that closely matches the stain you plan to apply. Sand smooth and dust off.

23. Next, after double-checking the overall dimensions for your top, measure and cut the pieces for the rails.

24. It goes a lot easier at this stage if you have help assembling the carcass. Lacking assistance requires you to enlist the aid of clamps as a “third hand.” One way is to position a bar clamp with its bar resting on the worktable while its jaws hold a carcass leg upright. Then use a handscrew to secure the bar to the worktable.

25. Assemble the carcass using carpenter's glue and fasteners as indicated in the drawing. When all is assembled, check all corners for squareness—i.e., from top to sides, and from sides to front, etc.

26. When satisfied that the carcass is square, with bar clamps apply pressure across all glued joints to close all joints and achieve slight glue squeezeout. Let this setup rest 24 hours before proceeding.

27. Next day, install the top using glue and screws, as shown in the drawing. Put a dab of glue over each screwhead and tap in the dowel plugs to conceal screwheads. Note that the plugs are not necessary for the screws along the back edge; these will be concealed by the backsplash.

28. Squirt glue into the edge rabbet and dados in the top and spread it evenly. Install the rear backsplash, followed immediately by the end returns. Make sure you apply glue to the joints between the end returns and rear splash.

29. Use bar clamps to clamp the rear splash firmly to the top; make sure it is square to the surface of the top.



30. Next, secure the end returns by drilling undersized lead holes at an angle through the rounded front ends of the returns; secure the front ends with 2-in. finishing nails.

31. Immediately go to the rear of the piece and bore lead holes through the rear splash and drive three 2-in. finishing nails through the rear splash and into each end return.

32. Set all the nails slightly; fill recesses with Minwax® Wood Putty (see Note regarding putty in previous step number 22). Leave the clamps on the backsplash overnight.

## THE DRAWERS & DRAWER CASES

**Cabinetmaker's Tip:** *The drawer cases on this cabinet give the builder the opportunity to create an out-of-the-ordinary joint, one that is sure to draw admiring comments. The joint used on the drawer case is the fingerlap joint, due to the great amount of gluing surface, is an incredibly strong joint. Also called the box joint, it is a joint that, when executed properly, will never open. A fingerlap joint will be even stronger by boring through the "knuckles" and inserting a glued-in length of dowel. Though the latter is not a necessary step, you should know about it. If you decide to add the dowel, make sure you use only a very sharp wood-boring bit to bore the lead hole: do not use a high-speed twist drill. The end lap piece is fragile when exposed to drilling and can easily chip out: a twist bit is likely to cause such a break. Since a fingerlap joint looks best when the fingers are of a width equal to one-half the thickness of the stock being joined, the notches and fingers here are cut to 3/8-in. width. Install a dado head on the saw set to cut a 3/8-in.-wide notch: See the drawings for the suggested technique for making this cut.*

1. Cut the parts for the 1/4-in. plywood plates that serve as nailing cleats for the drawer half-box. Carefully lay out these parts and install them using carpenter's glue and 1-1/4 in. brads.
2. Cut Parts O and P for both drawer cases. Put I.D. marks on these pieces (i.e., box 1, and box 2) so parts do not become mixed during the cutting and assembly steps.
3. Lay out for cutting the fingerlap joints for both drawer cases; refer to drawing if this is your first time making this joint. **Note:** Many cabinetmakers cut the fingerlap notches to a width equal to stock thickness. However, the joint is more attractive, and the glue area increased substantially, if the notches equal half the stock thickness. Thus, the suggested fingerlap-width in this wood is 3/8 in.
4. Cut notches using the table saw technique and jig shown in the drawing.
5. After cutting the joints, test-fit them. Make light pencil marks where any knuckle may be tight (in order to interlock joint). Use a smooth file and sandpaper if necessary on the tight knuckles to assure the joint going together easily and tightly. Repeat steps for the second case. **Note:** Take extra care when hand-shaping and fitting these joints because they can be easily broken.
6. When satisfied with the joints, install the half-cases on the cabinet. Apply a small amount of glue to the mating knuckle surfaces and join the first drawer-case bottom to its mating side.
7. Immediately install the half-box on the cabinet. To do it, carefully squirt some glue along the plywood-cleat edges—where the bottom and side will abut them. With case held securely in position, drive-in 1-1/2 in. finishing nails, through predrilled holes angled through

drawer case side into the top. Check box to be sure it is still square and secure with angled nails through the bottom and into the cabinet side. Wipe off all glue squeezeout with a dampened cloth. Repeat to install second case.

8. Measure to determine size to cut case back (I) which should be flush with bottom and side and abutting the plywood cleats on top and cabinet. Install backs using glue and 1-1/2 in. finishing nails through drawer case. Bore lead holes for the nails to prevent any splitting of the case stock.

### The Drawers

The small drawers go together using conventional drawer assembly. Since your cabinet dimensions may vary, even slightly, from the dimensions shown on the drawing, cut the drawer parts only after taking measurements directly from the just-finished drawer cases. Do as the professionals do and mark each drawer to mate with its own drawer case, then use I.D. marks to keep each drawer paired with its case.

Because the drawers are so small, the hardwood stock for the sides is planed to 3/8-in. thickness.

1. Cut all parts for the drawers and sand pieces smooth, to the 150-grit stage. Make two piles of parts; each one containing a front, false front, two sides, back and a bottom. Keep parts in two separate piles.
2. Lay out for the bottom-holding grooves in drawer sides. Note that this groove in the sides aligns with the lower edge of the false drawer front. Install dado cutter to cut a 1/4-in.-wide dado on the table saw. Set dado cutter to plough 3/16-in.-deep grooves. Lock the rip fence at correct distance from dado cutters and plough the grooves.
3. Finally, lay out the dadoes in the sides to receive the backs. Take care at this point to assure that you cut these dadoes in the correct end of each side. Remember that the dadoes in opposite sides must be mirror image. Use the miter gauge and hold the workpiece securely as you plough the dado.
4. Build one drawer at a time. Start by fastening the false front (S) to the back of the drawer front; install with glue and 3/4-in. brads.
5. Align one side with front and attach with glue and 1-1/4 in. brads.

**Cabinetmaker's Tip:** *Here's the easy way to make certain the grooves for the bottom will be aligned with each other and with the bottom edge of the false front. Cut a 2 x 3-in. piece of the 1/4-in. plywood used for the bottom from scrap. Clamp the first side in a bench vise, front end up with groove toward you. Put the scrap piece into the groove so it projects slightly above the end—just enough to rest the false front against before nailing the two pieces together. Use the scrap to assist alignment of the second side too.*

6. With both sides attached, slide the bottom into the grooves until it abuts the back of the drawer front. Do not glue-in the bottom.
7. Put glue in both dadoes in the drawer sides and on the drawer back ends only. Slide the back down the grooves until it abuts the plywood bottom. The back should be flush at the top with the drawer sides. When all is in alignment, drive 3/4-in. nails through the bottom up into the drawer back. Repeat to assemble the second drawer.
8. Locate the knob positions, tap and indent with an awl and bore pilot holes for the screws. Install the knobs.

## THE DOORS

To make the doors, follow the same procedure that was used to edge-join the boards for the top and carcass sides. As before, finish door edge-joining step by sanding them on both sides to the 150-grit stage.

1. Check the actual dimensions of the two door openings in the cabinet you just assembled; size and cut your pair of doors to suit the openings in your cabinet.
2. Lay out for the hinges on the door stiles, see drawing for exact location. Using a sharp 3/4-in. chisel and mallet cut the mortises in doors; install hinges with screws provided.
3. Lay out the locations for the hinges on the door stiles by carefully measuring the hinges installed on doors. Locate hinges on stiles so that door, when hung, will have approximately 1/8-in. gap at both top and bottom. Mortise the door stiles to receive the hinges. (Do not worry about the door width at this time; you can plane it to fit later.)
4. Install the first door by holding it in place (i.e., top hinge leaf in appropriate mortise) with one hand, while driving the first screw home using an electric screwdriver. After the first screw is seated, the job goes quickly. Finish by driving all screws through both hinge leaves.
5. Repeat steps to hang the second door. If necessary, plane door edges at the center stile, as needed, to achieve proper door operation. Sand smooth to finish.
6. Lay out for the wooden knobs and latches and bore the holes for them.
7. Hand fashion the pair of latches and sand them smooth. Install on cabinet as shown in drawing.
8. Lay out and install the pair of magnetic catches.
9. Cut, and install the shelf. You can permanently install the shelf parts using glue and nails, but it is probably wiser to just set the shelves on the cleats. This way, should you want to change the shelf height later, you will be able to do so with minimal effort.
10. Install the 1/4-in. plywood back panel using 1-1/4 in. brads, but no glue (in case you ever have to remove back).

**Cabinetmaker's Tip:** *The finishing steps will be easier and go a lot faster if you leave the back off until all finishing is completed.*

## FINISHING THE BENCH

Some woods, including pine, have a tendency to take stain unevenly, thus making "blotching" a possibility. You can avoid undesirable blotches by using a pre-stain conditioner. Make sure you use an oil-based Conditioner when using oil stain. When using water-based stains, always use a pre-stain wood conditioner. This will allow grain to raise and be sanded prior to applying the stain color. The first finish outlined below is an oil-based finishing system.

### Before Staining

1. Remove the doors from the cabinet and take off all hardware, knobs, etc.
2. Run your hands over all cabinet surfaces to check for smoothness; sand where necessary using 150-grit paper wrapped around a soft backup block. Thoroughly dust off the piece and wipe carefully with a tack rag to remove all traces of dust.
3. Apply Minwax® Pre-Stain Wood Conditioner: brush it on evenly. Work quickly, maintaining a "wet edge" to avoid streaks or overlaps. Allow it to penetrate for 15 minutes.

4. After 5 minutes, use a clean, lint-free cloth to remove any excess Conditioner remaining on the surface. Proceed to the staining within 2 hours.

### Staining

1. Apply Minwax® Wood Finish™ using a natural bristle brush.
2. Bring a "loaded" brush to the surface and apply stain with across-the-grain strokes, followed immediately with brush strokes parallel-to-the grain.
3. Work a small, manageable area at a time and apply the stain to maintain a wet edge.
4. Allow the stain to remain on the surface for 5 to 15 minutes, time depending upon degree of stain darkness desired.
5. Wipe off all excess using a clean lint-free cloth. Make the final wiping pass in a with-the-grain direction.
6. Repeat these steps on all sections of the cabinet, inside and out.
7. To darken color, apply a second coat after 4 to 6 hours. Do not sand between the two stain coats.

### USEFUL FINISHER'S TIPS

- You can slightly round or "break" sharp edges on raw wood by using 100-grit paper in the pad sander. For a more pronounced rounding over, round the edges with the router and a 1/4-in. rounding-over bit.
- To achieve an "antique" look when using a Minwax® Wood Finish™ stain, don't break the edges until after the stain has been applied and dried. This will allow small amounts of wood to show through, creating the appearance of worn spots.
- Sand raw soft woods to at least the 150-grit level; use even higher grit abrasives for hardwoods such as walnut and birch.
- Allow all stains and finishes to dry thoroughly between coats. Sanding between coats is done with 180-grit to 220-grit sandpaper, the grit getting finer after each succeeding coat.
- Apply water-based finishes, such as Minwax® Polycrylics®, with quick, with-the-grain strokes.

### TOP COATING

The choice here is Minwax® Fast-Drying Polyurethane which is ideal for use on furniture because it provides a hard, durable finish. It is available in gloss, semi-gloss and satin sheens, with the latter being the best choice for this reproduction since it closely simulates the hand-rubbed look of old.

No matter which finish you opt to use, it is a good idea to open windows to ensure good air circulation and ventilation.

1. Allow the Minwax® Wood Finish stain to dry for at least 24 hours.
2. Stir the can contents thoroughly before starting (periodically repeat the stirring during your work session).
3. Use a natural bristle or foam brush to apply the first coat of Polyurethane. Work a small area at a time so you can maintain a wet edge at all times. Work quickly and make the final strokes in a with-the-grain direction.
4. Allow the finish first coat to dry overnight then sand lightly using 220-grit sandpaper wrapped around a soft backup block. Thoroughly dust off and wipe carefully with a tack cloth to remove all traces of dust particles.

5. Repeat application steps and apply the second coat.
6. For superior results, repeat above steps to apply a third coat of Minwax® Fast-Drying Polyurethane. Allow to dry overnight before reinstalling doors and hardware. Complete your cabinet by installing its back.
7. Allow the piece to rest for 1 week before putting it into service.

## ALTERNATE STAINS/FINISHES

### Water-Based Stain

#### BEFORE STAINING

1. Run your hands over the cabinet surfaces to check them for smoothness; sand where necessary using 150-grit paper wrapped around a soft backup block. Dust off the piece and wipe thoroughly with a tack rag. (Do not use steel wool to “sand.”)
2. Apply Minwax® Water-Based Pre-Stain Wood Conditioner. Work quickly, brushing it on evenly while maintaining a wet edge, to avoid streaks or overlaps. Allow Conditioner to penetrate for about 5 minutes.
3. After 5 minutes, use a clean, lint-free cloth to remove any excess Conditioner remaining on the surface. Allow 15-30 minutes before proceeding, but make certain you do follow with the next step, staining, within 2 hours.
4. Finally, check surfaces for whiskers that may have been raised. If you do find any, smooth them off using 180-grit (or finer) sandpaper wrapped around a soft backup block. Rub lightly then remove all sanding dust with brush and tack cloth.

#### STAINING

Note: There are six pre-mixed and 60 custom colors available in the Minwax® Water-Based product line. You can, if desired, use two colors to finish this piece, perhaps selecting a color tone, such as Green Bayou, for the carcass and a natural wood tone such as English Oak for the top. The choice is yours.

1. Start by opening the Minwax® Water-Based Wood Stain and, with a clean stick, stirring its contents thoroughly. Note: To avoid any chance of pigment settling during your staining operation, it is recommended that the stirring be repeated every so often during the staining step.
2. Apply the Stain using a nylon/synthetic brush, foam brush, staining pad or rag. Since Stain should be left on the surface for a relatively short period—about 3 minutes—work a small area at a time. While the Stain is still wet, remove any excess with a clean, lint-free cloth lightly dampened with Stain. Make the final wipe-off in a parallel-to-grain direction. Use light to medium pressure to ensure even color penetration.
3. **NOTE:** Should you have any uneven color penetration, immediately re-wet the surface with additional Stain and work it into the surface using either a rag or brush. Use light pressure over the dark and light areas until they blend together.
4. To increase color intensity, allow the first coat to dry 2 hours, then repeat the staining step.

**Finisher's Tip:** *No matter what clear finish you are working with, the job is certain to turn out better when you use a strong light. An inexpensive photo lamp is ideal. To ensure finding any*

*missed spots, position the lamp so its beam of light strikes the surface at a 45-degree angle to your line of vision. A missed spot will be flat, there will be no reflection. Move the lamp about as you move from one surface to the next to maintain the strong reflecting angle.*

#### FINAL STEP

##### Applying Clear Finish

1. Open the can of Minwax® Polycrylic Protective Finish and stir well. Do not shake Polycrylic. Note: Periodically repeat the stirring during the finish application. The finish appears milky in the can but will dry crystal clear.
2. Apply Polycrylic with a high-quality synthetic bristle brush. For best results, apply a thin first coat in the direction of the grain. Do not overbrush.
3. Allow the first coat to dry at least 2 hours, then sand smooth with 220-grit paper. Remove all dust with a tack rag.
4. Apply the next coat; let it dry 2 hours.
5. Apply the final coat.

Although the surface will be ready for light handling in 3 hours, allow the cabinet to cure for several days before reinstalling the doors and hardware, and putting the cabinet into service. Maximum durability will develop after 4 days.

#### ALTERNATE ONE-STEP FINISH

##### Minwax® WoodSheen

This finishing technique, a combined gel stain and protective finish, is an easy one to use. Yet, it permits you to achieve a handsome hand-rubbed look in just a couple of hours. Use it only on raw wood or over previous coats of Minwax® WoodSheen.

1. Sand surface smooth, to the 150-grit stage. Dust thoroughly and remove all dust with a tack cloth.
- Note:** It is a good idea to pre-treat softwoods, such as pine, with Minwax® Pre-Stain Wood Conditioner before applying WoodSheen. See directions in previous finishing section. Within 2 hours of this pre-treatment:
2. Shake the bottle of WoodSheen vigorously for about 15 seconds. Then to assure your satisfaction with the color, apply some stain to an out-of-sight test area, such as a shelf underside.
3. Liberally apply WoodSheen using a clean, soft cloth or foam brush.
4. Allow 5 to 15 minutes for penetration then remove excess by wiping lightly with a clean soft cloth.
5. Two coats are best: Wait a minimum of 2 hours and apply the second coat in the same manner as the first coat. Extra coats may be applied if increased sheen and deeper color are desired.
6. For additional surface protection, wait 2 hours after second stain application and wipe on a couple of coats of Minwax® WoodSheen Natural. Allow 2 hours between coats of the natural WoodSheen too.
7. Immediately after each use, tightly close the bottle.
8. Cleanup is with mineral spirits.

**CLEANUP TIPS**

- Clean all brushes used for water-based finishes immediately after use with warm soapy water.
- If you have product left over, wipe the can rim to remove all product in the rim. Liquids left in the rim can dry out and prevent the lid from forming a tight seal.
- Clean all brushes used for oil-based finishes with mineral spirits.

**VAPOR HARMFUL.** Use only with adequate ventilation. To avoid over-exposure, open windows and doors or use other means to ensure fresh air entry during application and drying. If you experience eye watering, headaches or dizziness, increase fresh air supply or wear respiratory protection (NIOSH/MSHA TC23C or equivalent), or leave the area.

Avoid contact with eyes and skin.

Wash hands after using.

Keep container closed when not in use. Do not transfer contents to other containers for storage

**DO NOT TAKE INTERNALLY.**

**FIRST AID.** In case of eye contact, flush thoroughly with large amounts of water for 15 minutes and get medical attention. For skin contact, wash thoroughly with soap and water. In case of respiratory difficulty, provide fresh air and call physician. If swallowed, get medical attention immediately.

**DELAYED EFFECTS FROM LONG-TERM OCCUPATIONAL OVEREXPOSURE.**

Contains solvents that can cause permanent brain and nervous system damage. Intentional misuse by deliberately concentrating and inhaling the contents may be harmful or fatal.

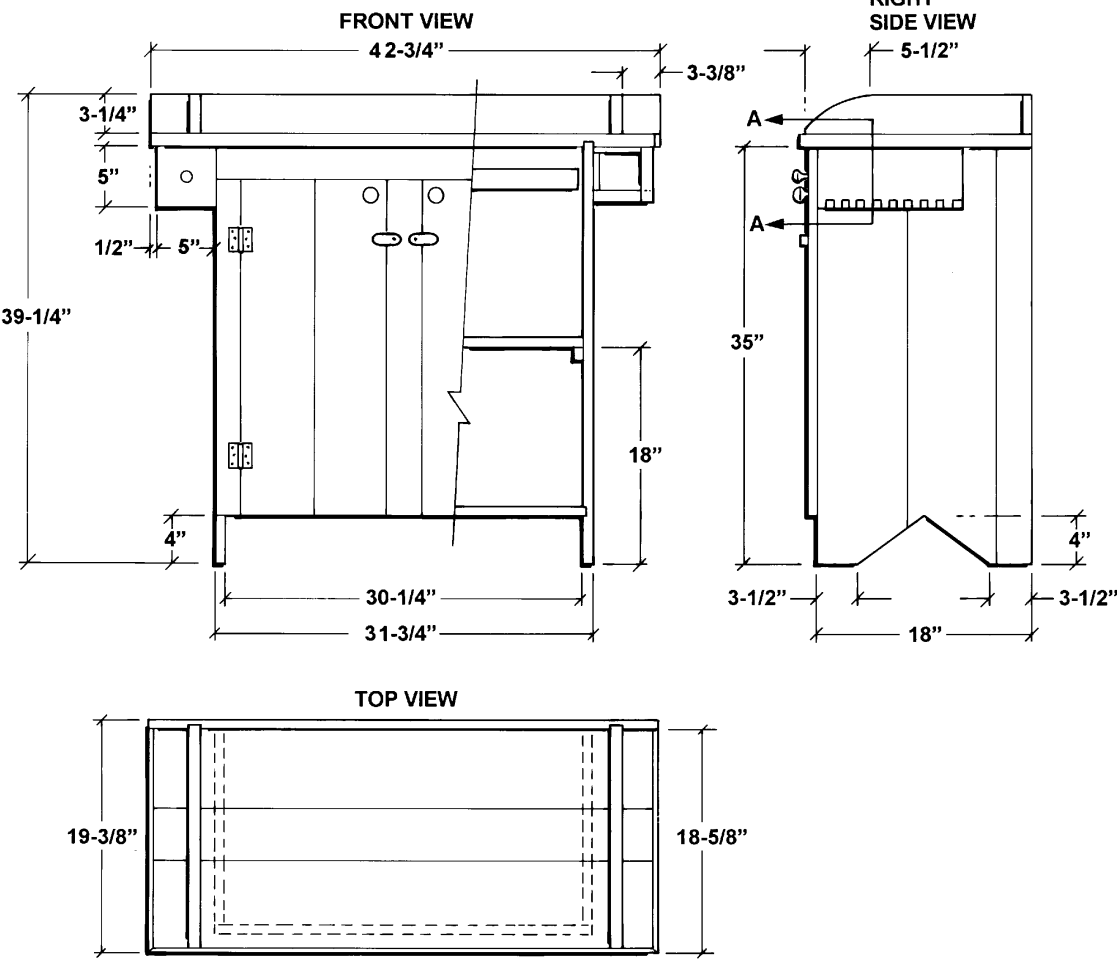
**Safe Disposal of Rags & Waste**

Please be mindful of the safe way to dispose of used rags and other finishing materials waste. Remember that rags, steel wool and other waste soaked with oil finish, mineral spirits, turpentine and the like may spontaneously catch fire if improperly discarded.

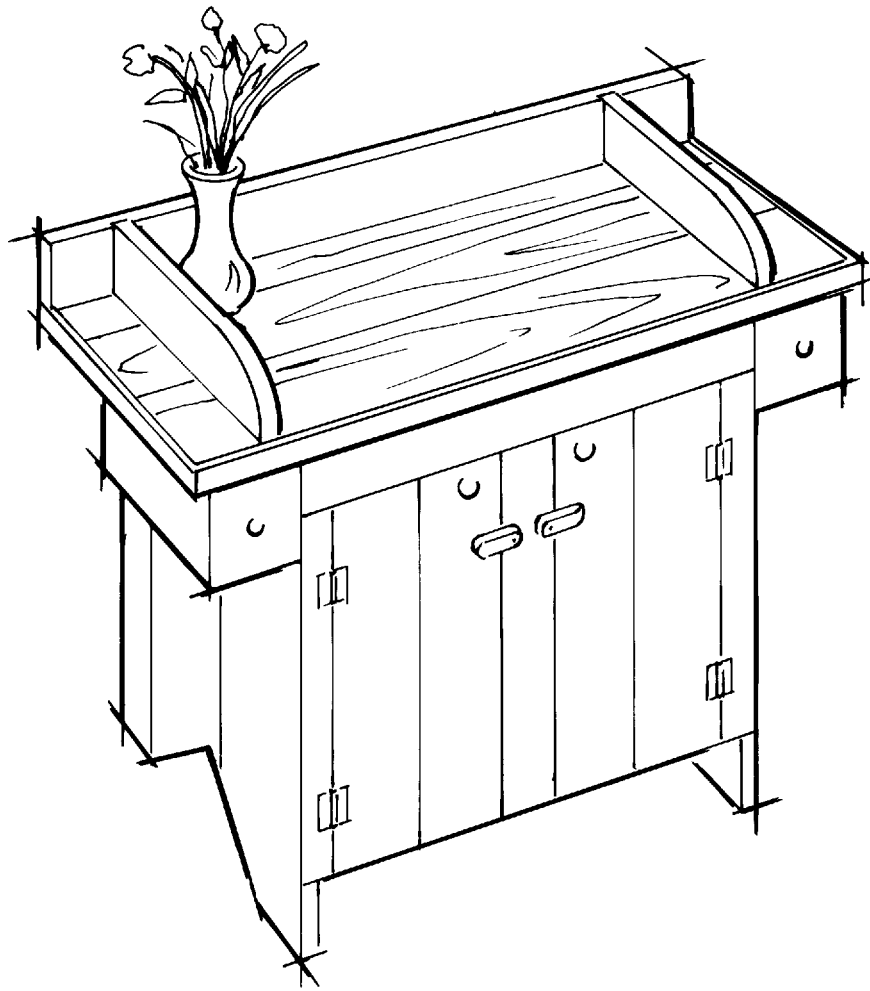
Always place these items in a water-filled metal container immediately after use. Tightly seal the container and then dispose of it in accordance with local fire regulations. Be sure to keep the container out of reach of children.

Created for GW&J and Minwax  
by Harry Wicks Woodworks, Catchogue, NY 11935 ©March 2000

# WORKBENCH SERVER

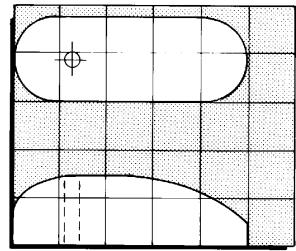




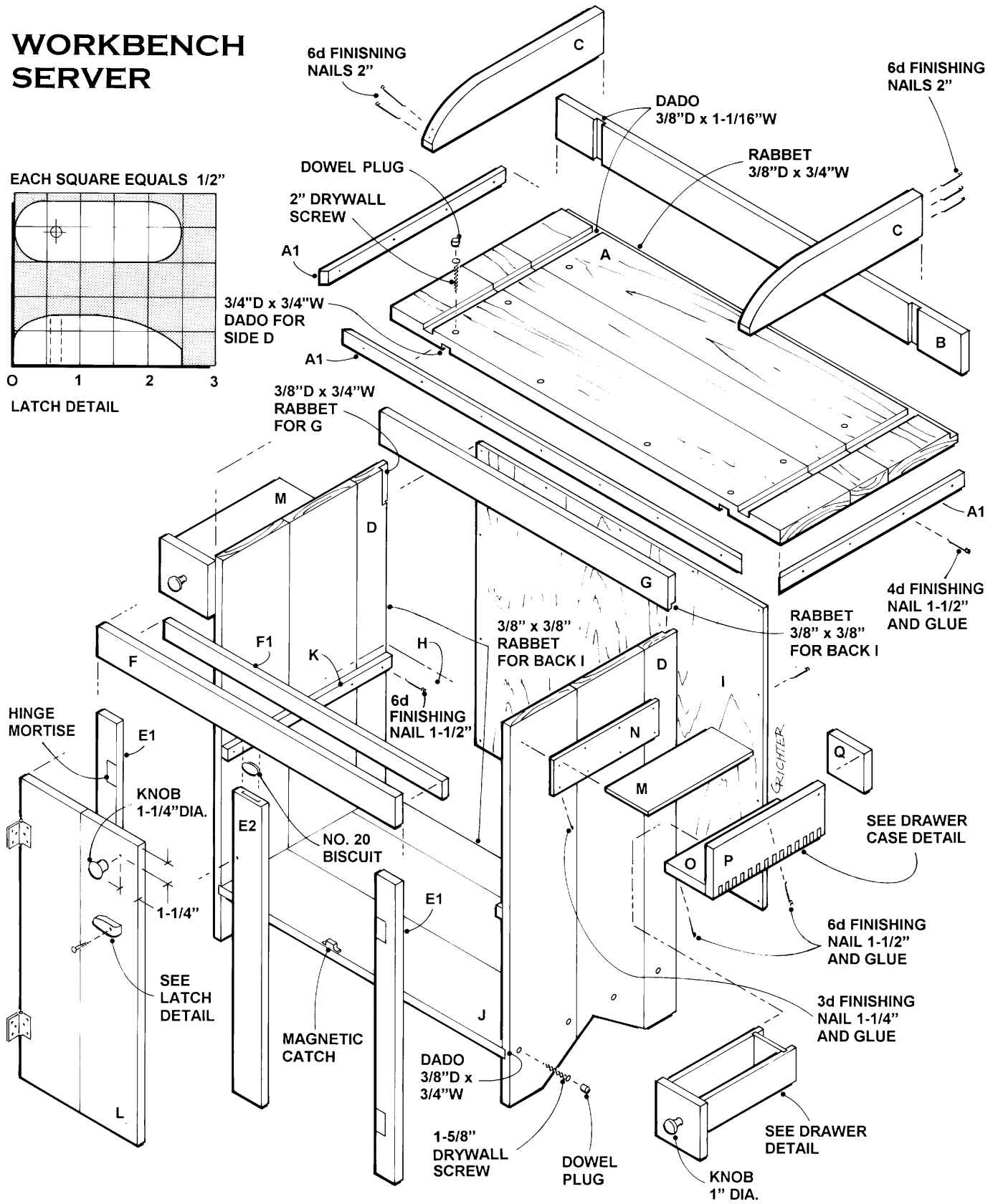


# WORKBENCH SERVER

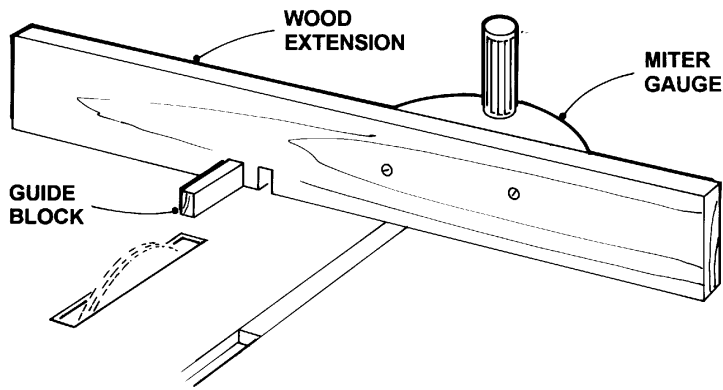
EACH SQUARE EQUALS 1/2"



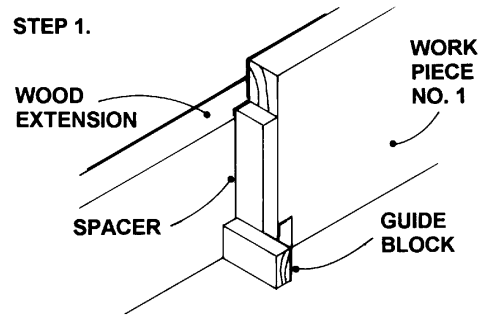
LATCH DETAIL



**FINGERLAP JIG**

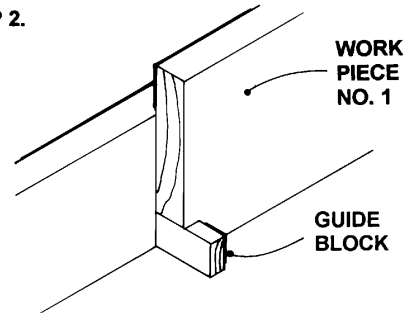


**STEP 1.**



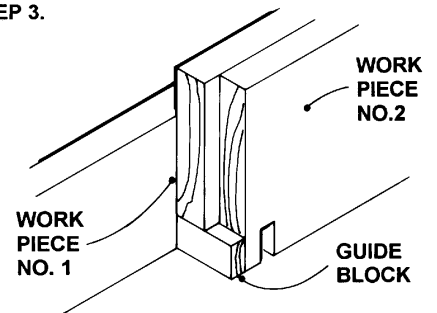
Step 1: Cut a spacer strip with dimensions that equal the groove width and insert it between guide block and 1<sup>st</sup> workpiece. Then, while holding the workpiece firmly, make the first cut.

**STEP 2.**



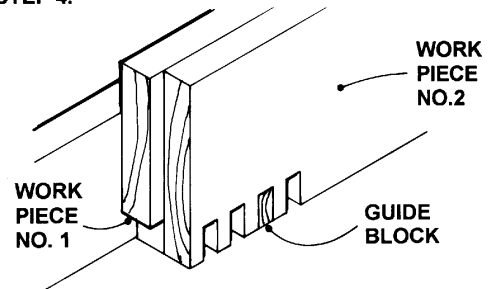
Step 2: Remove the spacer and move the workpiece over until it rests snugly against the spacer block.

**STEP 3.**



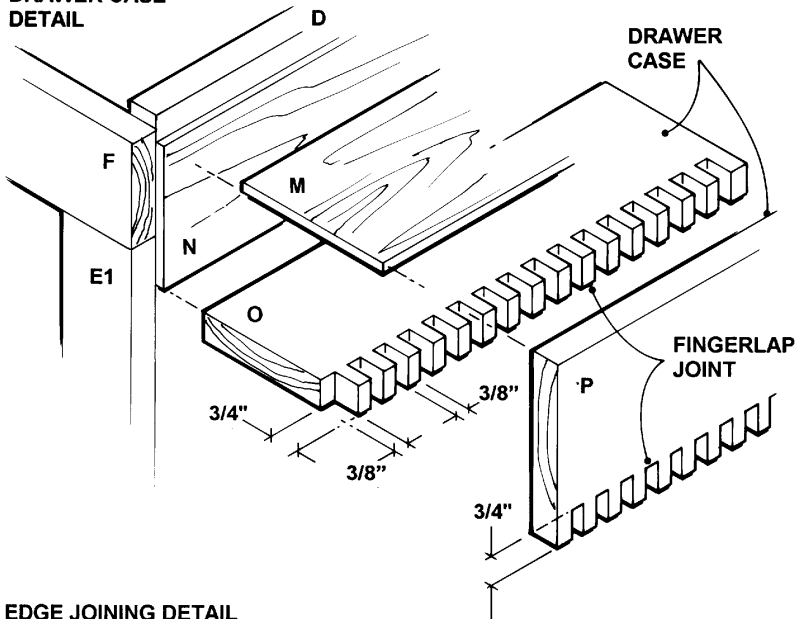
Step 3: Butt the 2<sup>nd</sup> workpiece tightly against the guide block, as shown. Then make a cutting pass to form the notch in both pieces simultaneously.

**STEP 4.**

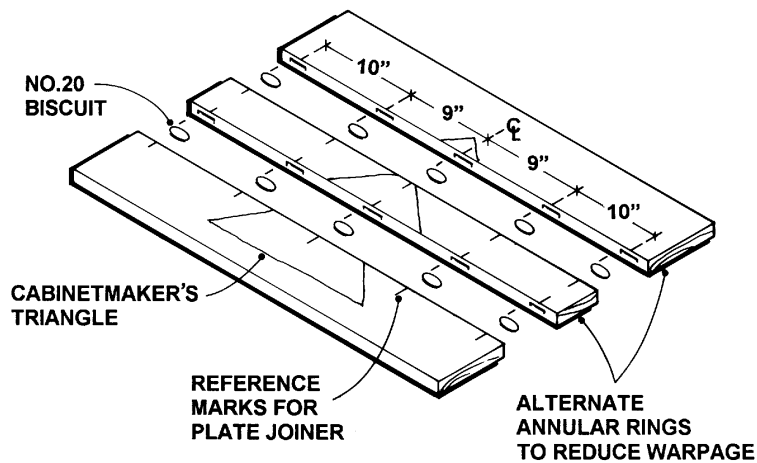


Step 4: Continue making cuts by placing the last notch cut over the guide block to position the boards for the next cut. Note: To ensure boards staying aligned together throughout the cutting process, use small c-clamps, if necessary.

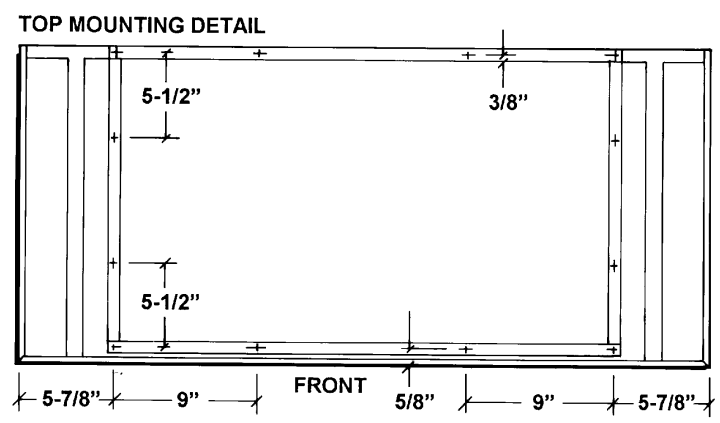
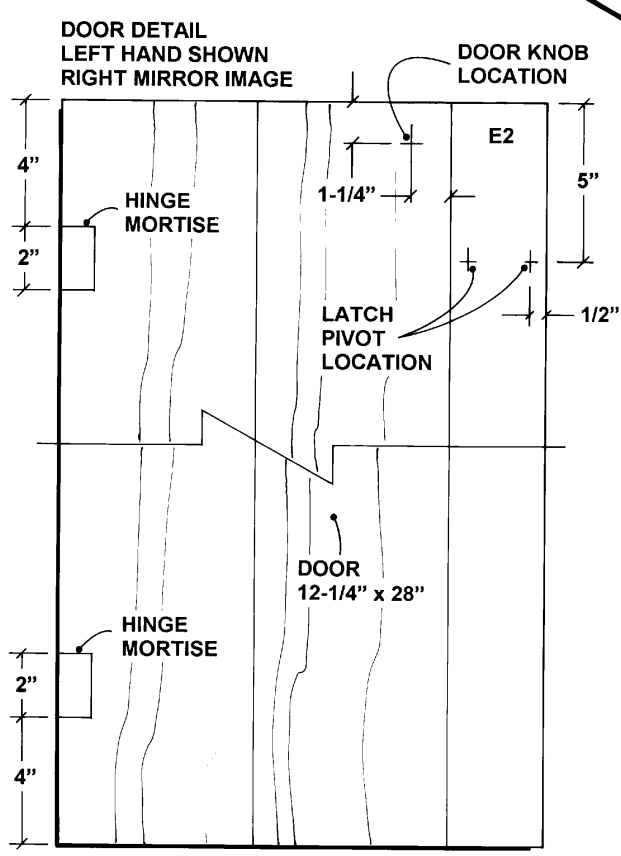
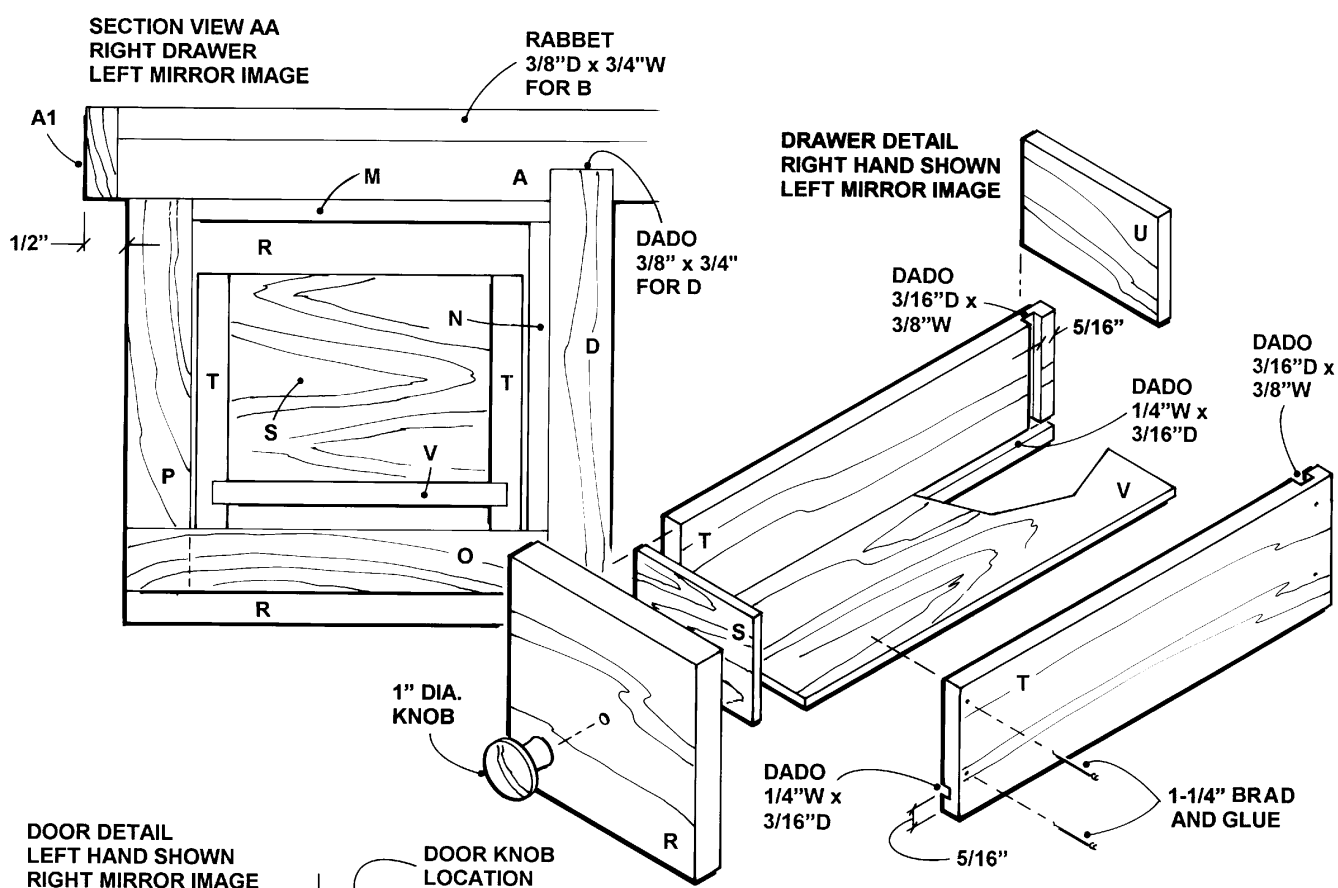
**DRAWER CASE DETAIL**



**EDGE JOINING DETAIL TOP SHOWN**



ALTERNATE ANNULAR RINGS TO REDUCE WARPAGE



## BUYING LIST

KEY	PART	BUY	MATERIAL
A	Top	1/8' 5/4 x 8 1/4' 5/4 x 6	Pine
B	Backsplash, rear	1/4' 1 x 6	Pine
C	Backsplash, ends	1/4', 5/4 x 6	
D	Sides, carcase	2/6' 1 x 8 1/6' 1 x 4	Pine
E1	Stiles	1/6' 1 x 4	Pine
E2	Stile, middle	1/3' 1 x 4	Pine
F1	Door stop	1/3' 1 x 2	Pine
F, G	Top Rail, front Top Rail, back	1/6' 1 x 4	Pine
H	Shelf	1/3' 1 x 8 1/3' 1 x 6	Pine
I	Back	1/4 x x	Plywood
J	Bottom shelf	1/6' 1 x 8 1/3' 1 x 4	Pine
K	Shelf cleats	From scrap box	Pine
L	Doors	1/6' 1 x 8 1/6' 1 x 6	Pine

**Misc.** Carpenter's glue, assorted grits sandpaper, 1-1/2 and 2-in. nails, 1-1/4 in. brads, two 7/8 or 1-in. dia. wooden knobs (drawers), two 1-1/4 in. wooden knobs (doors), two single magnetic catches, no. 800-498 from Woodworkers Supply, Casper, WY, 1-800-645-9292, two pair brass hinges 1-5/8 x 1-1/2 in., 1-1/4 in. no. 8 rh. screws (for turnbuttons).

Note: You should be able to cut the parts for the drawer cases and drawers from stock saved in your shop scrap box. If not, pick up 1/4' 1 x 6.

## CUTTING LIST

**NOTE: The actual dimensions shown on the chart below were the actual measurements taken from the prototype cabinet built in our shop. Do as craftsmen do and always check the dimensions given before doing any cutting. Do this because there can be variations on your project. If you find a variation — for example, the stiles on our original cabinet were 28-1/8" long. You may find that yours differ by 1/16" more or less. Remember, you are working with wood which can vary considerably.**

**If you do have a measurement variation, simply change the dimension in the table below.**

KEY	PART	PCS.	DIMENSIONS
A	Top	1	1-1/16 x 19-1/16 x 42"
A1	Surround, ends	2	3/8 x 1-1/16 x 19-7/16"
A2	Surround, front	1	3/8 x 1-1/16 x 42-3/4"
B	Backsplash, rear	1	3/4 x 3-5/8 x 42-3/4"
C	Backsplash, ends	2	1-1/16 x 3-5/8 x 18-7/8"
D	Carcase sides	2	3/4 x 18 x 35-3/8"
E1	Stiles	2	3/4 x 2 x 28-1/8"
E2	Stile, middle	1	3/4 x 3 x 28-1/8"
F1	Door stop	1	3/4 x 1-1/2 x 29-3/4"
F	Rail, front	1	3/4 x 2-3/4 x 31-3/4"
G	Rail, back	1	3/4 x 3 x 31"
H	Shelf	1	3/4 x 13 x 29-7/8"
I	Back	1	1/4 x 28 x 30-7/8"
J	Bottom shelf	1	3/4 x 17-1/2 x 31"
K	Shelf cleats	4	3/4 x 1 x 17-5/8"
L	Doors	2	3/4 x 12-1/8 x 28-1/8" (see note a)

Note a). Measure the actual door openings in cabinet and build doors to suit.



## DRAWER PARTS

### Cases

M	Top plate	2	1/4 x 4-1/4 x 11-3/8"
N	Side plates	2	1/4 x 3-5/8 x 11-3/8"
O	Case bottom	2	3/4 x 5 x 12-1/8"
P	Case side	2	3/4 x 4-5/8 x 12-1/8"
Q	Case back	2	3/4 x 3-7/8 x 4-1/4"

### Drawers\*\*

R	Drawer front	2	3/4 x 5 x 5"
S	False front	2	1/4 x 2-7/16 x 3-1/8"
T	Sides	4	3/8 x 3 x 10-1/16"
U	Back	2	3/8 x 2-7/16 x 3-5/8"
V	Bottom	2	1/4 x 3-1/2 x 10"

\*\*Check drawer case dimensions to verify drawer (parts) sizes. Adjust measurements, if necessary, and cut your drawer parts to suit the openings in your cabinet.

### NOTES

- The Buy column lists the lumber in lumberyard language. Your instructor has probably already covered the subject of buying lumber; that is, lumber is purchased using *nominal* dimensions, which are not the same as *actual* dimensions. Thus, for example, the listing (*nominally*) 1/5, 1 x 6 means you want one 5-ft. length of 1 x 6. The *actual* dimension for this board is 3/4 x 5-1/2 inches by 60 inches long.
- 5/4 in lumber jargon means five quarters. Bear in mind that this is the nominal dimension and that 5/4 stock, when dressed, can vary from 1-1/16 to 1-1/8 in. actual, depending upon the sawmill it is from.

Bring the above materials list to the lumberyard with you when you go to buy the materials.

# Oak Pie Safe



Build a brand-new antique! This versatile classic goes together fast with biscuit joinery.

- Built of solid oak in a simple, modified-Shaker style, this pie safe blends easily into most any décor. Adjustable shelves and a pair of drawers make it a versatile storage cabinet for more than just cooling off fresh-baked pies. The pierced-tin panels can also provide ventilation for a modern sound system. Or, you can use this cabinet to store clothing and take some of the pressure off an overstuffed closet or bureau.
- Biscuits make the joinery on this project as easy as pie. If you've never made a project of this scale before, or are new to biscuit joinery, this is the perfect place to start. You'll need to know how to make stopped rabbets for the back and dados for the drawers, but hanging the flush-fit doors is a breeze with no-mortise hinges.

This pie safe gives advanced woodworking students the opportunity to employ a number of their skills, including biscuit joinery for edges and corners, making templates, measuring, cutting, marking, gluing, clamping and mitering. And after you build the pie safe, you'll learn how to apply stains and finishes to protect the wood and keep it looking beautiful.

## TOOLS REQUIRED

### Hand tools

- Hold-down clamps
- Pipe or bar clamps at least 4' long
- Combination square
- Carpenter's square
- Hole punch
- Lampmaker's chisel

### Power Tools

- Biscuit joiner
- Table saw
- Router with a 3/8" rabbeting bit
- Jigsaw

### Miscellaneous

- Pencil
- Carpenter's glue
- Safety glasses

## SHOPPING LIST

Item	Quantity
4/4 oak	100 board feet
1/4" oak plywood	1 4'x8' sheet
1/4" diameter brass shelf supports	16
1-1/4" diameter wood knobs	4
Tin for pierced panels	4 pcs., 10"x14"
#20 biscuits	150
Brads, 3/4", 1", 1-1/4" long	1 box each size
#10 x 1-1/4" pan head screw w/ flat washer	8
#4 x 5/8" flat head screw	50
#10 x 1-1/4" flat head screw	10
No-mortise hinges	6

## WOOD FINISHING PRODUCTS

(Choose the recommended stain/finish or create your own combination)

### Recommended finish

Stain: Minwax® Wood Finish™ Cherry (or any color you prefer)

Finish: Minwax® Fast-Drying Polyurethane Satin

### Alternate Finishes

Stain: Minwax® Gel Stain in Cherrywood (or any color you prefer)

Finish: Minwax® Fast-Drying Polyurethane Satin

### Miscellaneous

- Sandpaper
- Gloves for finishing
- Clean, lint-free rags for wiping
- Mineral spirits
- Minwax® Wood Putty
- Minwax® Finishing Brushes
- Water-filled metal container with tight-fitting lid

## CUTTING LIST

### OAK PIE SAFE 57-3/4" H x 42-1/2" W x 16" D

Part	Name	Qty.	Dimensions
<b>CARCASS Oak hardwood</b>			
A	top	1	3/4 x 17 x 42-1/2
B	sides	2	3/4 x 15-1/4 x 57
C	shelves	5	3/4 x 15 x 39
D	back rail	1	3/4 x 4 x 39
E	drawer kickers	2	3/4 x 2 x 15
F	drawer runners	4	3/4 x 1-1/2 x 15
G	doorstop	1	3/4 x 1-1/2 x 3
H	drawer runner cleats	2	3/4 x 1-5/16 x 39
J	drawer kicker cleats	2	3/4 x 1-1/16 x 39
K	molding	1	3/4 x 3/4 x 42
L	molding	2	3/4 x 3/4 x 16-3/4
M	drawer runners	4	3/4 x 3/4 x 15
N	door latch	1	1/2 x 7/8 x 2-1/2

### FACE FRAME Oak hardwood

P	face stiles	2	3/4 x 3 x 57
Q	top rail	1	3/4 x 2-3/4 x 34-1/2
R	lower rails	2	3/4 x 2 x 34-1/2
S	drawer divider mullion	1	3/4 x 2 x 6-1/2

### DOORS Oak hardwood

T	door stiles	4	3/4 x 2 x 35-3/4
U	door rails	8	3/4 x 2 x 13-1/4
V	tin panel stops	24	3/8 x 3/8 x 15

### DRAWERS Oak hardwood

W	drawer fronts	2	3/4 x 6-3/8 x 16-1/8
X	drawer sides	4	1/2 x 6-3/8 x 15-1/2
Y	drawer backs	2	1/2 x 5-7/8 x 15-5/8

### OAK PLYWOOD

Z	back	1	1/4 x 39-3/4 x 48-3/16
AA	drawer bottoms	2	1/4 x 14-3/4 x 15-5/8

## BEFORE YOU BEGIN

Good craftsmanship begins and ends with good work habits, so make the following steps part of your routine workshop practice. If you have any doubts or questions about how to proceed with a project, always discuss them with your shop instructor.

- Carefully and fully review plans and instructions before putting a tool to the project lumber.
- Work sensibly and safely. Wear safety goggles when doing work that creates flying chips and sawdust; wear the appropriate mask or respirator whenever making sawdust or working with thinners or other solvents.
- At the end of every work session, clean up your shop area and put away all portable tools.

## CUTTING AND ASSEMBLY PROCEDURE

Refer to the project illustrations shown on pages 7, 8 and 9.

**Woodworker's Tip:** Sort your wood for grain and color. Select flat, straight-grained wood for the doors and face frame. This is one place you can't afford any warping. Cut the drawer fronts (W) from a single board so the grain flows from one drawer to the next. Choose boards with compatible figure and color for the sides (B) and top (A). Use the less desirable pieces for shelving.

**Woodworker's Tips:** There are three common sizes of biscuits: #20, #10 and #0. Number 20 biscuits offer the greatest gluing surface and are, therefore, the strongest. Use these whenever possible even if it results in the biscuit "breaking out" of the joint. In this project, breakouts occur on the face frame and door frames where narrow rails join the stile. But they won't be a problem if you offset the center mark for the biscuits so the breakout won't be seen. We did this on the face frame so the biscuits break out where the drawers and top cover them (see Fig. D). Breakouts on the door frames are covered by the stops for the tin panels. The top-rail biscuits on the door frames are also offset to keep the top edge of the door clean (Fig. B). Use the following tips to get better results with your biscuit joinery.

- Take the time to dry-fit each assembly using all the biscuits and clamps you'll need for the real thing. You'll be able to rehearse your glue-up and red-flag any misaligned biscuits.
- Assembly with biscuits needs to go smoothly because the biscuits swell quickly once glue is applied. For a more-relaxed assembly, use an extended-open-time glue.
- Getting glue in the biscuit slots can be a bit messy. Just squirt a bead into the groove and spread it along both side walls of the slot with a small glue brush.
- If you accidentally cut a biscuit slot where none belonged, and it's on an exposed edge, you can make a nearly invisible repair. Use a compass to mark a 4"-diameter circle in some oak that's 5/32" thick. Cut it out on the bandsaw and then glue the circle into the bad slot, cleaning up any excess glue. After the glue dries, flush-cut the repair and sand the edge smooth.

## THE CARCASS

1. Lay out and cut the biscuit slots for the top (A), sides (B) and shelves (C).

**Woodworker's Tip:** Cut the biscuit slots about 6" apart for edge joining. The biscuits align the surface of the boards and produce flush joints that will require little sanding. You don't want to expose a biscuit joint when making your final cuts, so keep your biscuits at least 3" away from the ends of the top (A) and the leg cutout area on the sides (B).

2. Dry-fit then glue-up and clamp the top (A), sides (B) and shelves (C); after the glue has dried, cut these pieces to length.
3. Use the leg patterns (shown in Fig. A) to lay out the shapes on the bottoms of the sides (B). Cut them out with a jigsaw.
4. Use a table saw to cut the rabbet on the back rail (D) for the back (Z). Use a router with a 3/8" rabbeting bit to cut the stop rabbet on the sides for the back.
5. Lay out the fixed shelf locations on the cabinet sides, then cut the biscuit slots for the shelves and the back rail.

**Woodworker's Tip:** Cut the slots in the end of a shelf (C) with the base of the plate joiner on the cabinet side (B). Clamp the shelf on the side so the top edge of the shelf lines up with the top edge of the layout mark on the side. Mark for biscuits in the middle of the shelf and 3 inches in from each end. Cut the slots in the side (B) with the plate joiner held vertical, using the markings on the shelf.

6. Drill holes for adjustable shelf pins.

**Woodworker's Tip:** An accurate way to drill for adjustable shelf pins is to use a perf-board template. Mark the bottom and back edge to correctly register the template on the other side of the cabinet. Mark the holes to be drilled (every other hole gives a 2" spacing) and use a sharp brad-point bit. Fasten a metal depth-stop ring to the bit or use your own depth stop made from 3/4" x 3/4" stock that's drilled down the center and cut to length.

7. Finish-sand all the pieces starting with 120-grit paper and working your way to 220-grit.

8. Dry-fit and glue the carcass. Use four clamps and some cauls for the shelves and a fifth clamp for the back rail. Be sure the carcass is glued-up square.

**Woodworker's Tip:** When doing the above assembly, make a few clamping cauls to ensure that the sides and top will be flat (see Fig. E). A caul is used to distribute clamping pressure across a wide joint. Make your cauls from 2x4s cut to the width of the cabinet. The wood should be well dried and square on all four sides. Choose one of the edges and plane or sand a 1/16" crown into it, marking the crown with an arrow.

9. Glue the drawer kicker cleats (J) to the bottom of the lower shelf. If you have a pneumatic brad nailer, tack the cleat in place first so it won't slide around when you apply the clamps.

## THE FACE FRAME

10. Lay out the face frame, as shown in Fig. D.

**Woodworker's Tip:** Labeling your project parts with letters and numbers works fine when you're dealing with a few pieces. But if your pile of parts gets mixed up, it can take a while to sort things out again. The cabinetmaker's triangle allows you to instantly identify the location and orientation of each individual piece. Here's how it works: Group your frame members face-side up in the same orientation they will have when assembled (stiles are vertical, rails are horizontal, etc.). Mark each group with a triangle that points up toward the top of the cabinet. (With parts like the top and shelves, the triangle will point to the back of the cabinet.) The triangle leaves two lines on each piece, making identification a snap (See Figs. B and D). If two or more assemblies are identical, like our pair of doors, add an extra line along the triangle's side for the rails and along the bottom for the stiles.

**Woodworker's Tip:** Group the face-frame stiles and rails together and orient them as they will be on the cabinet. Use the combination square to mark the precise position of each rail on the stiles. Make these lines light and long to distinguish them from your biscuit marks. Now, decide where an offset is needed to disguise any biscuit breakout. To figure out how much to offset the bottom rail, for example, subtract the width of the rail (2") from the width of the slot made by the joiner (2-3/4"). If you centered the biscuit on the rail, the slot would break out 3/8" on each side. To keep the biscuit inside the drawer opening, you'll need to offset the cut 3/8" toward the opening. Add 1/8" for insurance and you have an offset of 1/2".

11. Cut the biscuit slots and dry-fit the face frame.

**Woodworker's Tip:** Cut slots in the ends of narrow parts, like this face frame rail, using a simple jig to steady the work and provide a wider surface for the plate joiner fence. We used a 12" x 30" piece of melamine with a 3" x 18" piece of hardwood centered along the edge. Add a couple of hold-down clamps. Note in Fig. D how the cabinetmaker's triangle identifies the piece being cut as the top rail.

12. If you are mortising in your hinges, now's the time to lay out and cut the hinge mortises on the inside edges of the face stiles.

13. Lay out and cut the leg profiles on the bottom of each stile (see Fig. A).

14. Begin the glue-up with the drawer divider mullion (S) and the lower rails (R). Then glue the rest of the face frame together.

15. Trim any protruding biscuits and finish sand.

## FINAL ASSEMBLY

16. Glue the face frame assembly to the carcass. Tack the face frame in position with brads before applying clamps. Trim the face frame overhang with a flush-trim bit in a router.

17. Center the drawer kickers (E) in the drawer openings and attach them to the kicker cleats with a #6 x 1-1/2" screw.

18. Attach the drawer runner cleats (H, see Fig. C) with a brad, glue and clamp.

19. Assemble the drawer runners (F and M) and position them on the cleats so they set 1/16" into the drawer openings (see Fig. C). Attach the runners to the front cleat only (see Fig. C). You'll attach the back of the runners later.

20. Attach the top (see Fig. A).

21. Make the oak quarter-round molding (K and L) from a 3"-wide piece of oak. Round over the two long edges with a router and a 3/4" round-over bit. Rip the moldings off the piece and cut to fit. Glue and nail the front molding in place. Nail the side moldings in place but only glue the miter joint and the first couple of inches at the front of the case. This will keep the miter joint tight but still allow the carcass to move with the seasons.

## THE DOORS

22. Use a table saw to cut the rabbets on the back edges of the door rails (U).

23. Cut biscuit slots, dry-fit, glue and clamp the door frames.

**Woodworker's Tip:** Assemble your door frames on a perfectly flat surface using identical clamps. This helps ensure a flat door and saves all kinds of headaches later. Spacer sticks hold the frame up off the clamps (so it won't get stained by the metal) and in line with the clamp screw pressure (so it won't get twisted).

24. Finish the rabbets on the doors with a router fitted with a 3/8" rabbeting bit; this will also trim the protruding biscuits. Square the corners with a sharp chisel.

25. Fit the doors into the face-frame opening.

26. Make the door latch (N) and the door stop (G); mount only the door stop at this time (see Fig. A).

27. Make the tin panel stops (V) and miter them so they fit in place, but don't attach them yet.

## THE DRAWERS

28. Cut the dadoes and rabbets in the drawer fronts (W) and sides (X).

29. Finish-sand the insides of the drawer pieces, then glue and nail the drawers together making sure they are square.

30. Finish-sand the outside of the drawers.

31. Attach the drawer runners to the drawer runner cleat.

**Woodworker's Tip:** Mark the position of the drawer runners on the lower back support cleat. Have the drawer in place with even margins around the opening and enough room between the slides and drawer sides for smooth operation. Remove the drawer and fasten the runners with screws.

32. Drill holes for the door and drawer knobs.

33. Attach the back with screws. Screws allow you to easily remove the back for finishing and you won't be accidentally driving nails through the side of the cabinet.



## THE TIN PANELS

The pattern used in this project is a Lacework stencil, which is available from Country Accents (pattern #1004P, phone: 570 478-4127), or visit [www.piercedtin.com](http://www.piercedtin.com). Country Accents can also supply the 10" x 14" tin blanks and the hole punch and lampmaker's chisel. If you'd rather develop your own pattern, look through books about American quilts, where you'll find ideas for all sorts of geometric and floral designs. As was done with the Lacework pattern, the hole punch makes round holes, which should be spaced at roughly 1/4" intervals, and the lampmaker's chisel makes the elongated perforations.

Expect to spend 30 to 40 minutes punching each panel. Don't try to do all six in a row or you'll feel like punching more than tin. Take it easy and spread the job over a few sessions. Wear gloves when handling the tin to keep from etching in your fingerprints. The stencil kit comes with complete directions, but you basically just secure the tin to a piece of particleboard, tape the pattern to the tin with masking tape and have at it with the punch and chisel.

## STAINING AND FINISHING

**Woodworker's Tip:** *Though you may be tempted to cut short your sanding and wiping time, don't do it. Both of these tasks are very important steps in obtaining a high-quality finish. Remember, it is the finish, just as much as the fit and smoothness of the parts, that will have great bearing on how people judge your craftsmanship. To ensure an excellent result, follow the steps listed below and also the instructions the finish manufacturer puts on its products.*

### FINISHING TIPS

- Use scraps of wood to test the stains and finishes you are planning to use. On the back of the scrap, mark the stain/finish combination and the type of wood. Allow all samples to dry thoroughly before making your final finish selection. Save your samples for quick reference on future projects.
- All stains and finishes must be allowed to dry thoroughly between coats. Remember that drying times can vary due to humidity and other climate conditions.
- If you have some leftover stain or finish, wipe the can rim so that stain or finish in the rim won't dry out and prevent the lid from forming a tight seal.
- Brushes used for oil-based finishes must be cleaned with mineral spirits; for water-based products such as Minwax® Polycrylic® Protective Finish, clean brushes with warm water and soap.

**34.** Finish-sand the outside surfaces and ease all the edges. Vacuum the inside and wipe the entire piece down with a cloth dampened with mineral spirits.

**NOTE:** Whichever stain you choose, do the staining in two steps, starting on the interior surfaces and then moving to the exterior surfaces. Apply the Minwax® Wood Finish or Gel Stain you've chosen to the interior surfaces using a clean, lint-free rag. Allow the stain to set for about 10 to 15 minutes then wipe off any excess. Repeat for the exterior surfaces. Allow the stain to dry for 24 hours before applying the finish.

**Woodworker's Tip:** *When wiping off stain, make certain that your last wipe with the cloth goes with the grain of the wood. This way, any stain you might miss during wipe-off will be visually minimized by the wood grain.*

**35.** Apply Minwax® Fast-Drying Polyurethane following the directions on the can. Use a brush intended for use with Polyurethane. Allow the first coat to dry overnight.

**36.** The next day, sand all surfaces lightly with 220-grit paper using with-the-grain strokes. Dust off and wipe all surfaces with a cloth dampened with mineral spirits. Apply a second coat of Polyurethane and set the piece aside to cure overnight.

**37.** The next day, sand all surfaces lightly with 220-grit paper. Dust off and wipe the piece with a cloth dampened with mineral spirits and apply the third and final coat of Polyurethane.

**38.** Follow these same steps for finishing the knobs, the door latch (N) and the back (Z) separately, after first removing the back from the cabinet. Allow the cabinet and these pieces to cure for several days before doing the next steps.

**39.** Mount the tin panels in the doors, hang the doors and attach the knobs and the latch.

**40.** Attach the back and stand back to admire your work. Just think, food safes like this used to hold biscuits; now they're held together by them!

## **PRODUCT SAFETY**

For your safety and the safety of those you work with, always read the safety warnings, which manufacturers print on their labels, and follow them to the letter. Typical safety advice and instructions will contain information such as the following:

### **DANGER! MINERAL-BASED PRODUCTS ARE HARMFUL OR FATAL IF SWALLOWED. SKIN IRRITANT. COMBUSTIBLE. KEEP OUT OF REACH OF CHILDREN. DANGER:**

Contains mineral spirits. Harmful or fatal if swallowed. Do not take internally. Skin irritant. Avoid contact with skin and eyes. Wear rubber gloves and safety glasses when handling. Combustible. Do not use or store near heat, sparks, flame or other source of ignition. Close container after each use. Avoid inhalation and use only with adequate ventilation. If using indoors, open all windows and doors to make sure there is fresh air movement. If you experience light-headedness, dizziness or headaches, increase fresh air movement or leave the area. Reports have associated repeated and prolonged occupational overexposure to solvents with permanent brain and nervous system damage. Intentional misuse by deliberately concentrating and inhaling the contents may be harmful or fatal.

**FIRST AID:** If swallowed: Do not induce vomiting. Call physician immediately.

**FOR SKIN CONTACT:** Wash thoroughly with soap and water. If irritation persists, get medical attention.

**FOR EYE CONTACT:** IMMEDIATELY flush eyes thoroughly with water, then remove any contact lenses. Continue to flush eyes with water for at least 15 minutes. If irritation persists, get medical attention.

**IF AFFECTED BY INHALATION:** Immediately remove to fresh air. If symptoms persist, call physician.

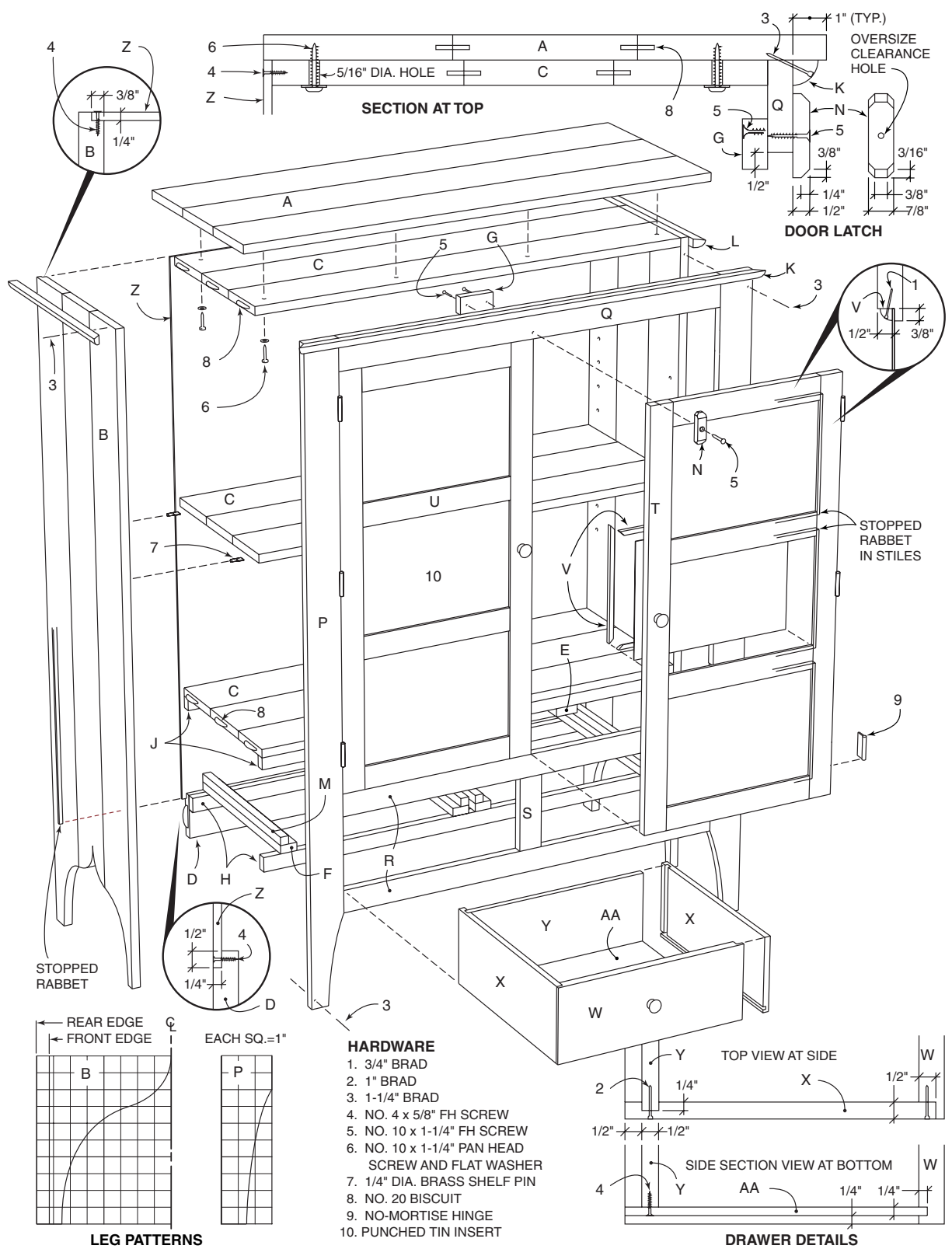
### **DELAYED EFFECTS FROM LONG-TERM OCCUPATIONAL OVEREXPOSURE.**

Contains solvents that can cause permanent brain and nervous system damage. Intentional misuse by deliberately concentrating and inhaling the contents may be harmful or fatal.

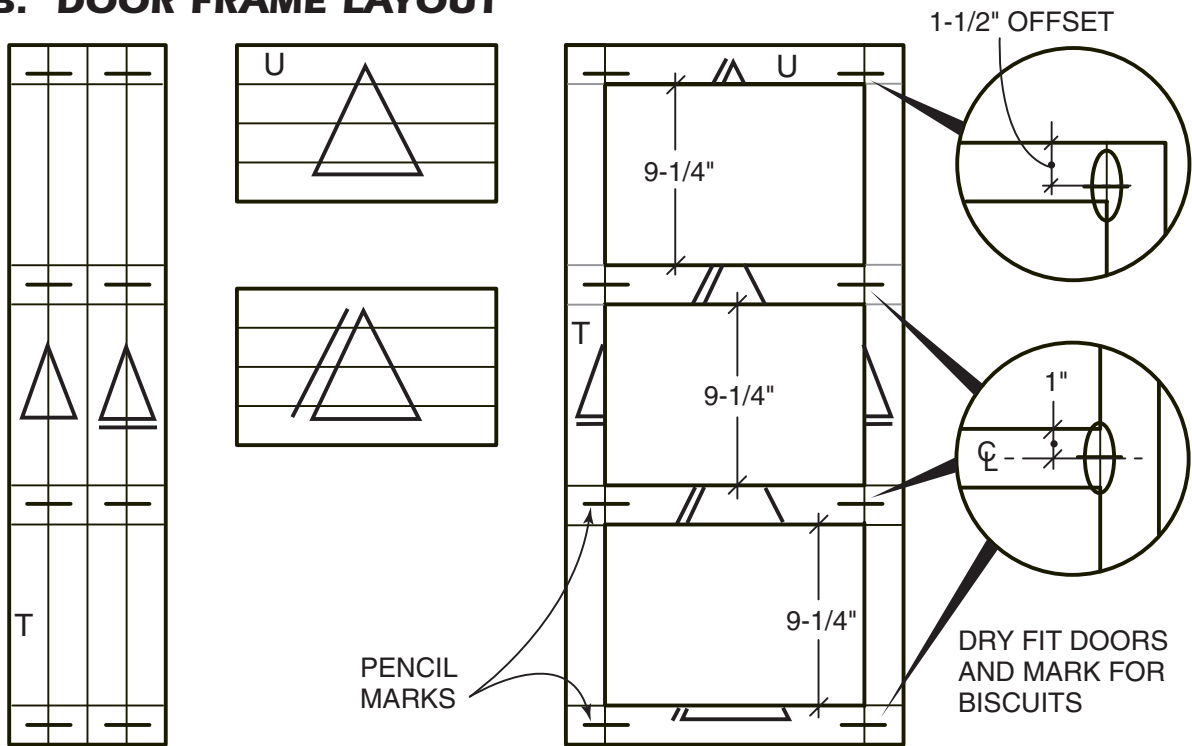
### **SAFE DISPOSAL OF RAGS AND WASTE.**

Please be mindful of the safe way to dispose of rags and other waste. Rags, steel wool and other waste products soaked with oil finishes or solvents may spontaneously catch fire if improperly discarded. Place rags, steel wool and other waste immediately after use in a water-filled metal container. Tightly seal and dispose of the waste materials in accordance with local trash removal regulations. Be sure to keep the waste out of reach of children.

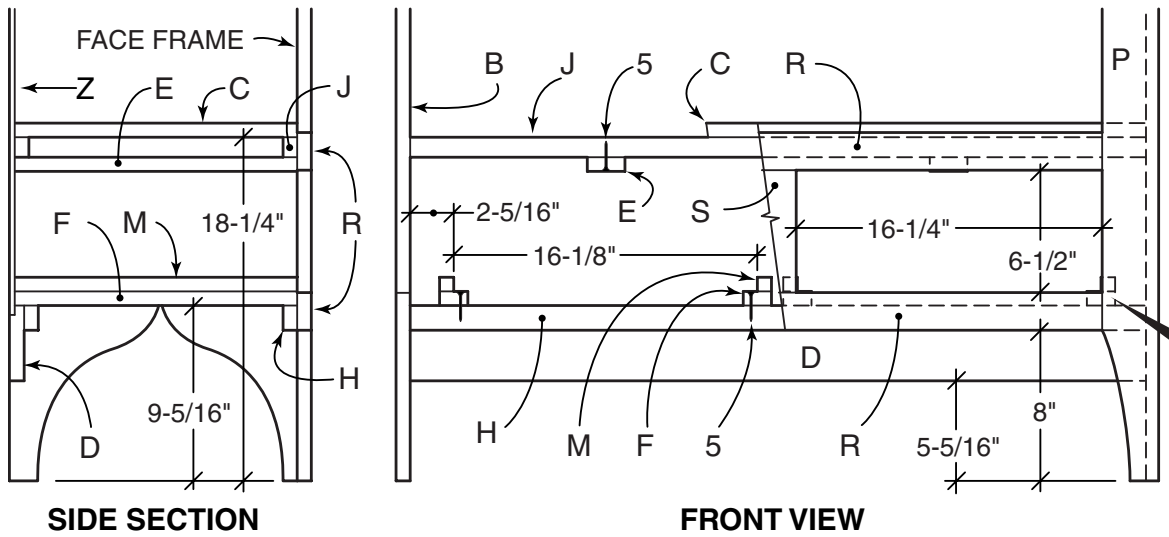
# FIG A. OAK PIE SAFE ASSEMBLY



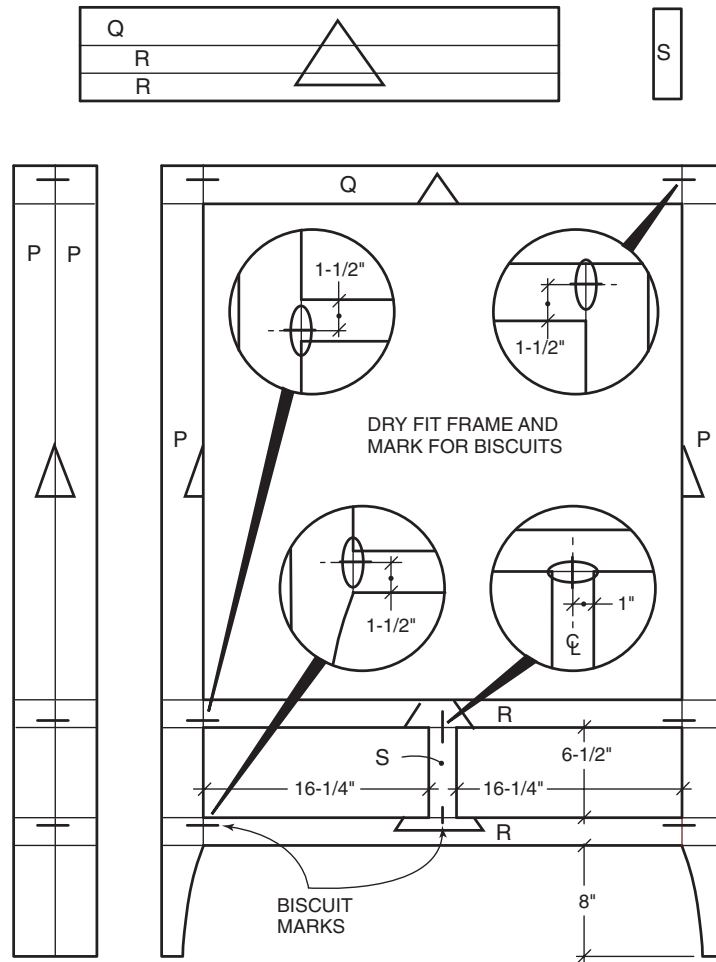
**FIG B. DOOR FRAME LAYOUT**



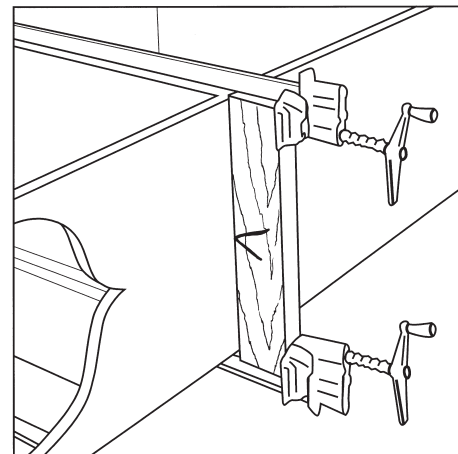
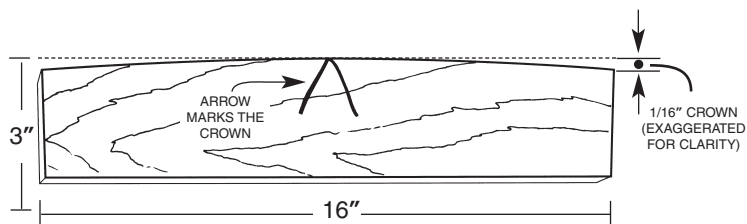
**FIG C. INTERIOR CONSTRUCTION**



**FIG D. FACE FRAME LAYOUT**

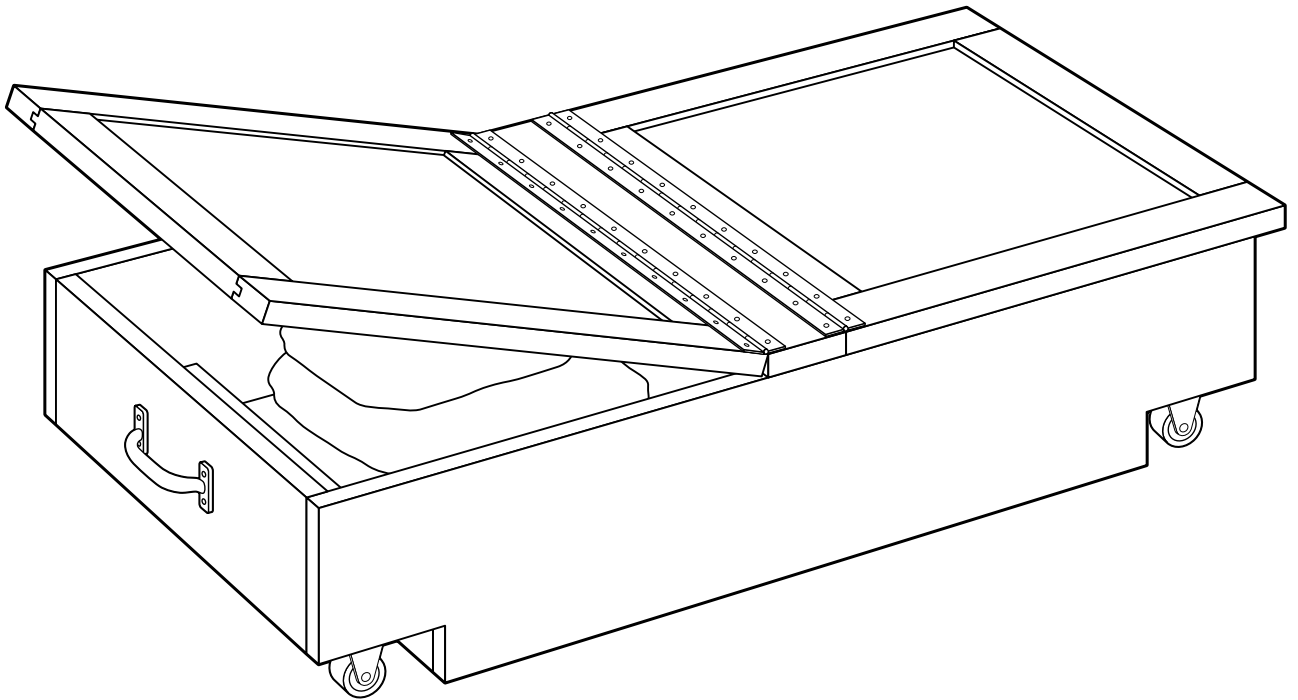


**FIG E. CAUL DESIGN AND USAGE**





# Hideaway Locker



If your stuff is spread all over and there's just no place to put it, you must need more storage. How about the space under your bed? This hideaway locker is the right way to do it! Designed to roll easily under a bed, to make the most of an underutilized storage space. Made from solid oak and oak plywood, this project will give advanced woodworkers more practice in the art of biscuit joinery and in making the stile-and-rail, recessed-panel lids that adorn the top. And after you build it, you will learn more about applying and using finishes to protect the wood and keep it looking beautiful.

## TOOLS REQUIRED

### Hand Tools

- Sanding block
- Pipe or bar clamps
- Adjustable square

### Power Tools

- Shaper or router table with tongue-and-groove cutter
- Biscuit joiner
- Table saw
- Miter saw
- Power drill with drill bits, Phillips-head screwdriver bit
- Orbital or finish sander

### Miscellaneous

- Safety glasses
- 120-grit sanding belt
- 120-, 150- and 220-grit sandpaper
- Carpenter's glue
- Clean, lint-free cloths
- Respirator
- Gloves for finishing
- Mineral spirits, for cleanup of oil based finishes
- Good quality, natural-bristle brush (for oil based finishes)

## SHOPPING LIST

**Wood Recommendation:** Red or White Oak

**Alternate Wood:** Pine

Part	Qty.	Th. x W x L
A, B, C, E, F, G, H	1	1x8x8'
	1	1x8x9'
D	1/4-sheet	3/4" oak plywood
J	1/4-sheet	1/4" oak plywood
Casters	4	2" fixed wheel, plate mount
Hinges	36" cut into two hinges	2" brass piano or continuous
Handle	1	5" to 6" brass utility

## CUTTING LIST

Overall Dimensions: 36" W x 8" H x 18" D				
Part	Name	Qty.	Material	Th. x W x L
A	Sides	2	Solid oak	3/4" x 6-1/2" x 36"
B	Caster supports	2	Solid oak	3/4" x 4-1/2" x 16-1/2"
C	Spacers	2	Solid oak	3/4" x 1-3/4" x 16-1/2"
D	Bottom	1	Oak ply	3/4" x 16-1/2" x 25-1/2"
E	Ends	2	Solid oak	3/4" x 4-3/4" x 16-1/2"
F	Hinge board	1	Solid oak	3/4" x 3" x 18"
G	Lid stiles	4	Solid oak	3/4" x 2" x 17-3/4"
H	Lid rails	4	Solid oak	3/4" x 2" x 14-3/4"
J	Lid panels	2	Oak ply	1/4" x 14-11/16" x 14-7/16"

## WOOD FINISHING PRODUCTS

### Recommended Finish

Prep: Minwax® oil based Pre-Stain Wood Conditioner  
Stain/Finish: Minwax® Polyshades® Mission Oak Gloss

### Alternate Finish

Prep: Minwax® oil based Pre-Stain Wood Conditioner  
Stain: Minwax® Wood Finish Sedona Red  
Finish: Minwax® Clear Brushing Lacquer Semi-Gloss

## BEFORE YOU BEGIN

Good craftsmanship begins and ends with good work habits, so make the following steps part of your routine workshop practice. If you have any doubts or questions about how to proceed with a project, always discuss them with your shop instructor.

- Carefully and fully review plans and instructions before putting a tool to the project lumber.
- Work sensibly and safely. Wear safety goggles when doing work that creates flying chips and sawdust; wear the appropriate respirator whenever making sawdust or working with thinners or other solvents.
- At the end of every work session, clean up your shop area and put away all portable tools.

## CUTTING AND ASSEMBLY PROCEDURE

1. Cut the sides (A) to size. Cut 1-3/4" x 4-1/2" notches in the ends of both pieces as shown in Fig. 1.
2. Cut the caster supports (B), the spacers (C) and the ends (E) 1/2" longer than specified and to their exact, specified width. Lay out and cut biscuit slots for joining these three pieces. Glue them all together using short bar or pipe clamps, assuring that all the joints are dead square.
3. When the glue is set on the two BCE assemblies, cut them to their final length on a miter saw, as shown in Fig. 2.
4. Mark biscuit locations on the sides (A) and in corresponding locations in the ends of B and E. Cut all the biscuit slots.
5. Dry-assemble the frame assembly (BCE and A) with clamps and measure for the bottom (D) as shown in Fig. 3. Cut the bottom to size.
6. Lay out and cut biscuit slots into the bottom and into corresponding locations on the frame pieces (BCE and A), as shown in Fig. 4.
7. Assemble the BCE assemblies to the bottom; then join the front and back pieces (A) to this assembly. With a glue-up like this, the more clamps you use, the better. Nine clamps running side to side will ensure tight joints from end to end.
8. Cut the hinge board (F) to the exact dimension of the assembled frame. Use glue and brads to fasten it to the exact middle of the frame.
9. Cut the lid stiles (G) to their specified width and length. This length will allow the lids to overhang the ends by about 1-1/4" to make for easy lifting. Cut the lid rails (H) to their specified width and length. This length will allow for 3/8" tongues for joining to the stiles.
10. Set up a tongue-and-groove cutter on a router or shaper table, as shown in Fig. 5, or however you prefer to machine the lid stiles and rails. This can also be done with a table saw equipped with a dado blade set up for a 1/4" cut.
11. Machine the stiles and rails and dry-assemble them to determine the size of the lid panels (J). For both the length and width, be sure to allow for about 1/8" of play inside the stile-rail frame.

12. Cut the lid panels (J) to size. Assemble the lids with glue and clamps.

13. Screw the casters to the underside of the case ends. Use a square to ensure that they are perpendicular to the ends, as shown in Fig. 6.

14. Center a handle on one end and screw it in place.

15. Screw hinges to the lids and the hinge board.

16. Prior to finishing, remove the lids, hinges, casters and pull. Sand or roundover all the sharp edges with a router.

## FINISHING TIPS

- Test the stains and finishes you are planning to use on scraps of wood. On the back of the scrap, mark the stain/finish combination and the type of wood. Allow all samples to dry thoroughly before making your final finish selection. Save your samples for quick reference on future projects.
  - All stains and finishes must be allowed to dry thoroughly between coats. Remember that drying times can vary due to humidity and other climatic conditions.
  - If you have some leftover stain or finish, wipe the can rim so that stain or finish in the rim won't dry out and prevent the lid from forming a tight seal.
  - Brushes used for oil based finishes must be cleaned with mineral spirits.
17. Finish-sand any remaining rough spots with 220-grit sandpaper. Dust off the piece and wipe it carefully with a clean, lint-free cloth lightly dampened with mineral spirits.

## Recommended Finish

18. Before applying Minwax® Polyshades® to a softwood such as pine, apply Minwax® oil based Pre-Stain Wood Conditioner, following the directions on the can. Applying it will help to ensure even absorption of stain and prevent blotchiness that can occur.

19. Apply Minwax® Polyshades® following the directions on the can. Use a good quality, natural-bristle brush suitable for use with polyurethane. Stir the can contents thoroughly before starting and periodically repeat stirring during your work session. Allow the first coat to dry at least 6 hours.

20. For the second coat, sand all surfaces lightly with 220-grit sandpaper or very fine (000) steel wool using with-the-grain strokes. Dust off and wipe all surfaces with a cloth dampened with mineral spirits. Apply a second coat of Polyshades® and set the rack aside to cure overnight. To achieve a deeper color, you may apply a third coat after 4 to 6 hours, repeating the application directions. Allow the finish to cure for several days before installing the hardware and using the hideaway locker.

**Woodworker's Tip:** *If you achieve the desired color on the first or second coats of Polyshades®, apply a clear coat of Minwax® Fast-Drying Polyurethane or Minwax® Wipe-On Poly for added protection.*

### Alternate Finish

21. Before applying Minwax® Wood Finish™ to a softwood such as pine, apply Minwax® oil based Pre-Stain Wood Conditioner, following the directions on the can. Applying a pre-stain conditioner will help ensure even absorption of stain and prevent blotchiness.

22. Apply the Minwax® Wood Finish™ you've chosen using a natural-bristle brush and a clean, lint-free cloth, following the directions on the can. The brush will help you get the stain into the inside corners. Allow the Wood Finish™ to set for about 5 to 15 minutes, then wipe off any excess. To achieve a deeper color, you may apply a second coat after 4 to 6 hours, repeating the application directions for the first coat. Allow the stain to dry for 24 hours before applying the protective clear finish.

***Woodworker's Tip:** When wiping off stain, make certain that your last wipe with the cloth goes with the grain of the wood. This way, any stain you might miss during wipe-off will be visually minimized by the wood grain.*

### Applying Clear Brushing Lacquer

23. Apply Minwax® Lacquer Sanding Sealer if desired, following label directions.

24. Stir Minwax® Clear Brushing Lacquer well before and during use to rotate the product from the bottom to the top of the can. NEVER SHAKE.

25. Apply a coat of lacquer using a high-quality, natural or synthetic-bristle brush. Apply sufficient lacquer to seal open joints, edges and end grain.

26. Let the first coat dry at least 2 hours, then apply a second coat.

27. Apply a third coat, repeating the steps above for each coat. Apply a fourth coat, if desired.

28. After the final coat, allow at least 24 hours before installing the hardware and using the hideaway locker.

### PRODUCT SAFETY

For your safety and the safety of those you work with, always read the safety warnings, which manufacturers print on their labels, and follow them to the letter.

**WARNING!** Removal of old paint by sanding, scraping or other means may generate dust or fumes that contain lead. Exposure to lead dust or fumes may cause brain damage or other adverse health effects, especially in children or pregnant women. Controlling exposure to lead or other hazardous substances requires the use of proper protective equipment, such as properly fitted respirator (NIOSH approved) and proper containment and cleanup. For more information, call the National Lead Information Center at 1-800-424-LEAD (in U.S.) or contact your local health authority.

**DANGER:** Rags, steel wool, other waste soaked with oil based stains and clear finishes, and sanding residue may spontaneously catch fire if improperly discarded. Immediately place rags, steel wool, other waste

soaked with this product, and sanding residue in a sealed, water-filled metal container. Dispose of in accordance with local fire regulations.

### CAUTIONS: CONTAINS ALIPHATIC HYDROCARBONS.

Contents are **COMBUSTIBLE**. Keep away from heat and open flame.

**VAPOR HARMFUL**. Use only with adequate ventilation. To avoid overexposure, open windows and doors or use other means to ensure fresh air entry during application and drying. If you experience eye watering, headaches, or dizziness, increase fresh air, or wear respiratory protection (NIOSH approved), or leave the area. Avoid contact with eyes and skin. Wash hands after using. Keep container closed when not in use. Do not transfer contents to other containers for storage.

**FIRST AID:** In case of eye contact, flush thoroughly with large amounts of water for 15 minutes and get medical attention. For skin contact, wash thoroughly with soap and water. In case of respiratory difficulty, provide fresh air and call physician. If swallowed, call Poison Control Center, hospital emergency room, or physician immediately.

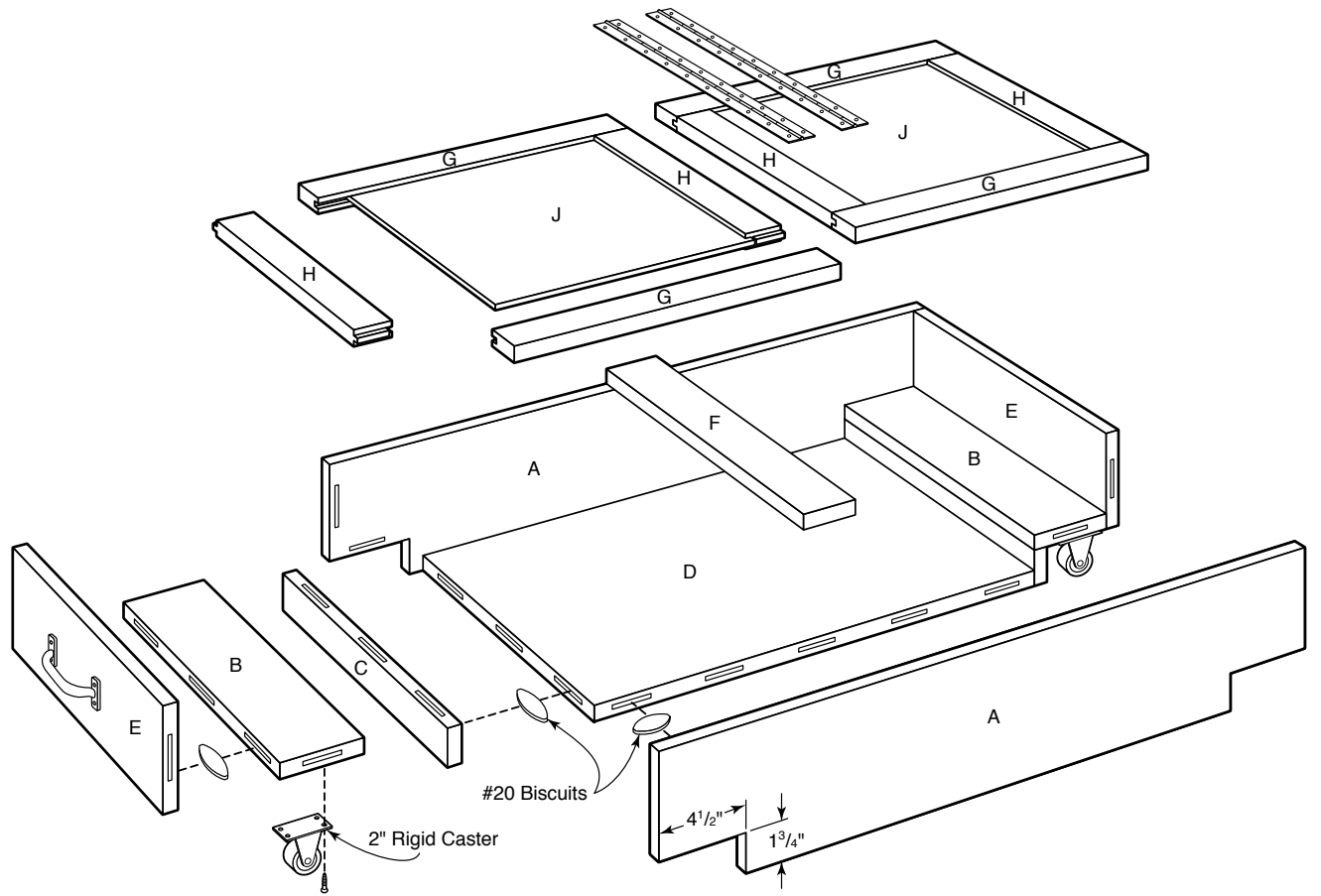
### DELAYED EFFECTS FROM LONG-TERM OVEREXPOSURE.

Contains solvents, which can cause permanent brain and nervous system damage. Intentional misuse by deliberately concentrating and inhaling contents may be harmful or fatal.

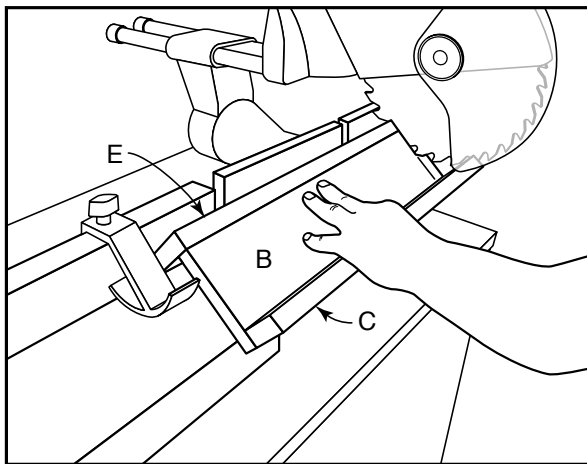
**WARNING:** This product contains a chemical known to the State of California to cause cancer and birth defects or other reproductive harm.

**DO NOT TAKE INTERNALLY. KEEP OUT OF REACH OF CHILDREN.** CONFORMS TO ASTM D-4326. Contact a physician for more health information.

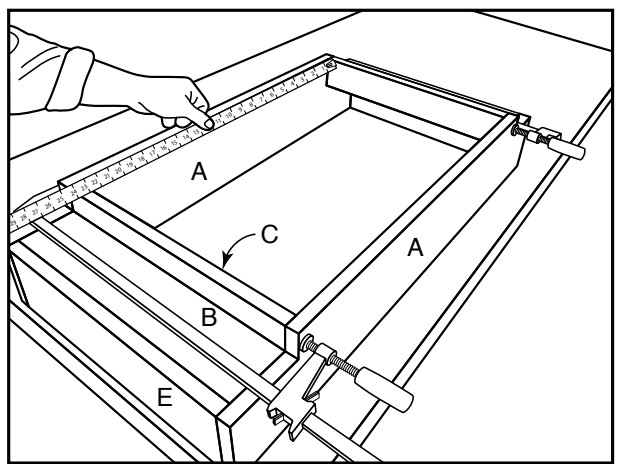
**FIG 1.**



**FIG 2.**

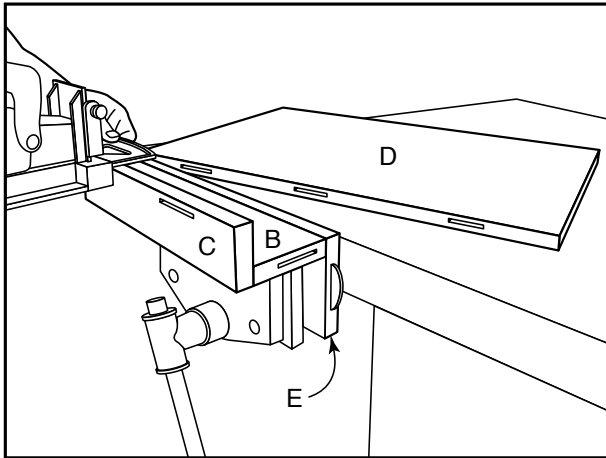


**FIG 3.**

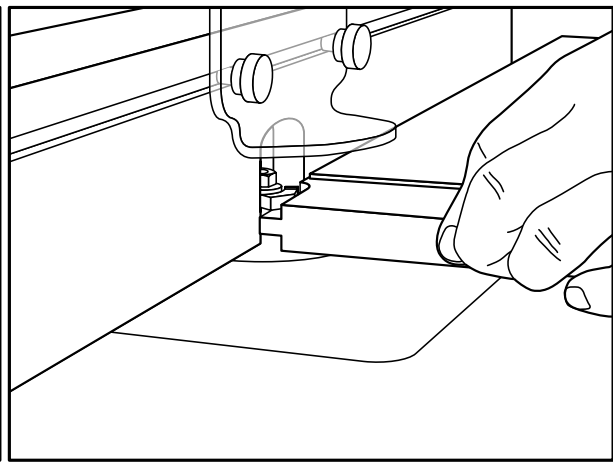
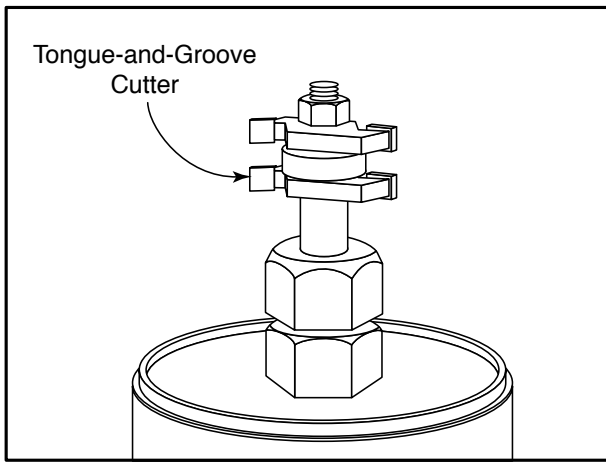




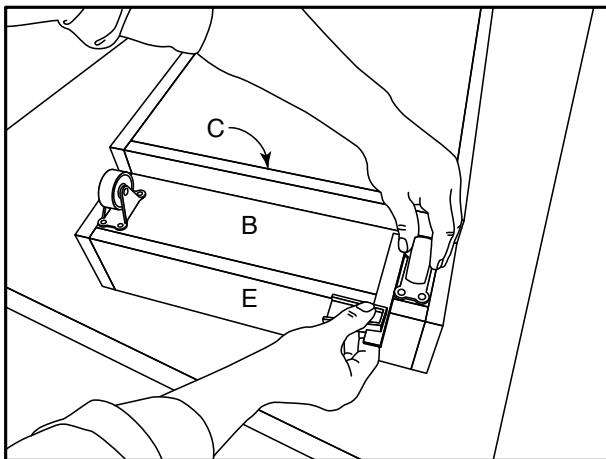
**FIG 4.**



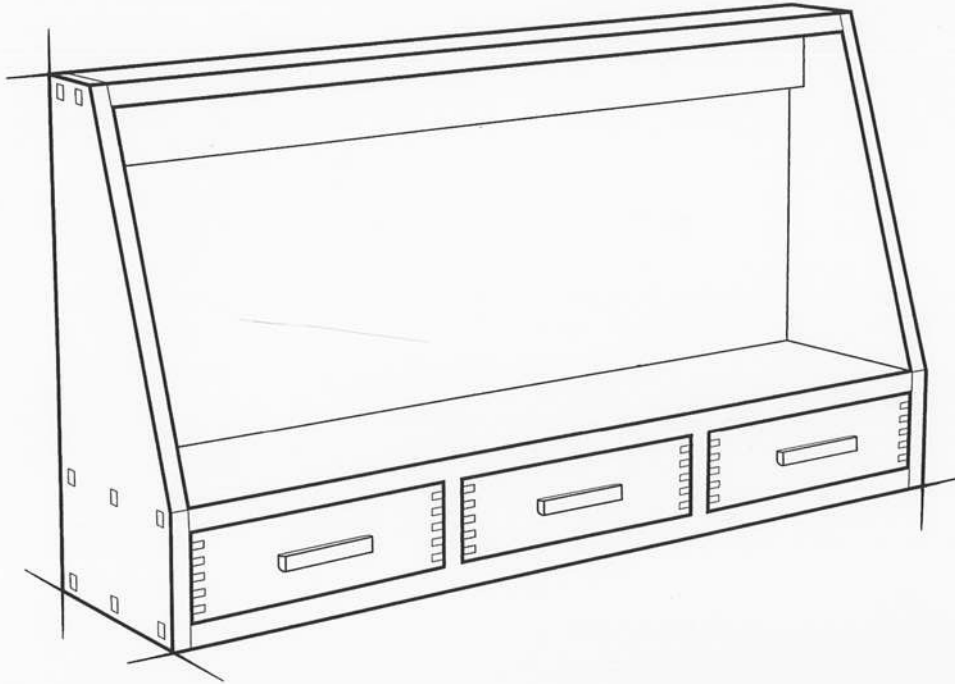
**FIG 5.**



**FIG 6.**



# Hard Maple Kitchen Shelf



Build a place for all that kitchen stuff! This traditional shelf-and-drawer unit can store everything from cookbooks and spices to gadgets and house keys. It's also versatile enough to be used anywhere in the house.

- The beauty of this kitchen shelf lies in the details, like the finger-jointed drawers, the square screw cover plugs and the matching, shop-made drawer pulls. Even a little detail like hiding the hanging bracket adds to the project's beauty by maintaining the piece's clean, uninterrupted lines.
- One trick to mastering the details, particularly the finger-jointed drawers, is to test all your setups on scrap wood before making your final cuts. Take your time cutting, aligning and fitting the parts together.

This shelf gives advanced woodworking students the opportunity to employ a number of their skills, including making finger joints, precise chiseling and close-tolerance fitting of the inset drawers into their openings. And after you build the shelf, you'll learn how to finish the piece by applying wood stain and protective clear finish. The last step will add beauty to your project and keep it looking great for years.

## A Bit About Hard Maple

Hard maple is exactly that, *hard*. Cutting it requires sharp tools, and sanding it takes a little longer than sanding most other hardwoods. But the reward of working with hard maple comes through in its rich, creamy color and subtle grain pattern. Hard maple is available at hardwood lumberyards. It's usually 3/4" thick, so you'll need to plane some of it to a 1/2" thickness for the drawers (see the Cutting List). If you don't have a thickness planer, ask the lumberyard personnel to do it for you.

## TOOLS REQUIRED

### Hand Tools

- Hammer
- 1/2" chisel
- 4 bar and 2 spring clamps

### Power Tools

- Table saw
- Drill and a 1/2" spade or Forstner-type bit
- Miter gauge
- Stacking-type dado blade
- Jigsaw
- Belt sander
- Orbital sander
- Router and a 3/8"-dia. rabbit bit

### Miscellaneous

- Pencil
- Safety glasses
- Carpenter's glue
- Gloves for finishing
- Sandpaper
- Clean, lint-free cloths
- Mineral spirits
- Water-filled metal container with tight-fitting lid
- Brush
- Minwax® Wood Finish™, Minwax® Polyurethane Brush or other good quality, natural bristle brush (for oil-based stains and finishes)
- Minwax® Polycrylic® Brush or other good quality synthetic bristle brush (for water-based stains and finishes)

## SHOPPING LIST

Item	Quantity
4/4 hard maple	17 board ft.*
1/4" x 8" x 11" hard maple plywood	3 pieces
No. 6 x 1-5/8" drywall screws	24
No. 4 x 3/4" brass flathead wood screws	6

\*Allows for 50 percent waste

## CUTTING LIST

Key	Pcs.	Size & Description
A	2	3/4" x 8" x 34-1/2" maple (bottom and shelf)
B	2	3/4" x 8" x 18" maple (sides)
C	2	3/4" x 8" x 3-1/8" maple (drawer dividers)
D	1	3/4" x 3-5/16" x 34-1/2" maple (top)
E	6	1/2" x 3-3/8" x 10-15/16" maple (drawer fronts and backs)**
F	6	1/2" x 3-3/8" x 7-9/16" maple (drawer sides)**
G	2	1/2" x 1" x 34-1/2" maple (wall hanger and wall cleat)
H	3	1/2" x 1" x 11" maple (drawer stops)
J	1	1/2" x 5/8" x 22" maple (three drawer pulls plus spares)
K	1	1/2" x 1/2" x 20" maple (makes 24 screw cover plugs)
L	1	3/8" x 2-1/2" x 34-1/2" maple (back)
M	1	3/8" x 1/2" x 34-1/2" maple (bottom of back)
N	6	1/16" x 3/4" x 7-1/4" maple (drawer runners)
P	3	1/4" x 7-1/4" x 10-5/8" maple plywood (drawer bottoms)

\*\*Oversized to allow trimming after assembly

## WOOD FINISHING PRODUCTS

### Recommended Finish

- Prep: Minwax® Pre-Stain Wood Conditioner
- Stain: Minwax® Wood Finish™ Cherry (or any color you prefer)
- Finish: Minwax® Fast-Drying Polyurethane Semi-Gloss

### Alternate Finishes

#### Two-tone finish:

- Prep: Minwax® Water-Based Pre-Stain Wood Conditioner
- Stain:
- Shelf- Minwax® Water-Based Wood Stain Parchment or Lemon Grass (or a Minwax® Water-Based Custom-Mixed Stain chosen from more than 60 colors)
  - Drawers- Minwax® Water-Based Wood Stain Deep Ocean (or a Minwax® Water-Based Custom-Mixed Stain)
- Finish: Minwax® Polycrylic® Protective Finish Semi-Gloss

#### Traditional one-tone finish:

- Prep: Minwax® Water-Based Pre-Stain Wood Conditioner
- Stain: Minwax® Water-Based Wood Stain Harvest Grain (or a Minwax® Water-Based Custom-Mixed Stain)
- Finish: Minwax® Polycrylic® Protective Finish Semi-Gloss

#### One-step stain & finish:

- Minwax® Polyshades® Classic Oak (or any color you prefer)

## BEFORE YOU BEGIN

Good craftsmanship begins and ends with good work habits, so make the following steps part of your routine workshop practice. If you have any doubts or questions about how to proceed with a project, always discuss them with your shop instructor.

- Carefully and fully review plans and instructions before putting a tool to the project lumber.
- Work sensibly and safely. Wear safety goggles when doing work that creates flying chips and sawdust; wear the appropriate respirator whenever making sawdust or working with thinners or other solvents.
- At the end of every work session, clean up your shop area and put away all portable tools.

## CUTTING AND ASSEMBLY PROCEDURE

Refer to the project illustration (Fig. A) shown on page 7.

1. Edge-glue boards to make pieces wide enough for the bottom, shelf, sides and drawer dividers (A, B and C). Now cut all the pieces to the sizes given in the Cutting List. Cut the 1/16"-thick drawer runners (N) off the edge of a 1"-wide piece of 3/4"-thick maple. To get continuous grain across the drawer fronts (E), cut them from one long piece. Label the pieces so you'll know how to assemble the drawers so the grain will flow across the frame of the shelf.

2. Lay out the shape of the sides (B), cut them with a jigsaw and then sand the sawn edges smooth.

3. Lay out, counterbore and drill the screw holes in the bottom, shelf and sides (A and B).

4. Using a combination square, draw squares around all the 1/2"-dia. counterbored holes. Using a 1/2" chisel, and the drawn lines as guides, "chop" open the round holes, turning them into square holes. For best results, cut across the grain first, then with the grain.

5. Assemble the case next. Start by cutting three 8" x 11" spacers from 3/4" scrap plywood. Align and clamp the spacers to the bottom (A) so each drawer opening will be 11" wide. Set the drawer dividers (C) in the slots between the spacers and drill screw pilot holes in the dividers. Glue and screw the dividers to the bottom and remove the spacers. Attach the shelf (A) to the dividers the same way.

6. Using a jigsaw or handsaw, cut twenty-four 3/8"-long square screw cover plugs from the 1/2" x 1/2" x 20" piece (K) that you cut earlier. If necessary, sand the edges of the plugs so they fit tightly in the square holes. Glue and hammer the plugs into the square holes in the bottom and shelf. Then let the glue dry. Use a belt sander with a 120-grit sanding belt to sand the plugs flush with the bottom and the shelf.

7. Cut the beveled edges at the top, wall hanger and wall cleat (D and G) with your table saw. Glue and clamp the wall hanger, back and bottom of the back together (G, L and M).

8. Use an orbital sander with 120-grit sandpaper first, then 180-grit, to finish-sand the outsides of the shelf and bottom. Then do the insides of the sides and top and the exposed surfaces of the back (L and M).

9. Glue and screw the sides (B) to the shelf and bottom, then the sides to the top (D). Glue and clamp the back to the top, then insert the remaining screw cover plugs as you did before.

10. Glue and clamp the drawer stops (H) to the bottom, then glue and press (no clamps needed) the drawer runners in place. Sand the top and bottom of the sides so they're flush with the top and bottom pieces. Then finish-sand the outside of the assembled shelf.

11. Make the drawers next. Cut the finger joints on the ends of the drawer fronts, backs and sides (E and F). See the section "Cutting the Finger Joints," below.

### Cutting the Finger Joints

Finger joints, also known as "box joints," are a strong and decorative way to assemble drawers or other projects that have 90-degree joints. Cutting the joints is fast once you set up the cutting jig. For nice, tight-fitting joints, the width of the fingers must be equal to the width of the slots cut between the fingers. Here's how to do it:

**CAUTION:** The blade guard must be removed for all the following steps. Be careful!

12. Make a 3/4" x 4" x 15" fence and clamp it to your miter gauge. Mount a 1/4"-wide dado blade in your table saw and set the blade height to 1/2". Cut a slot in the fence about 4" from the end, then remove the fence.

13. Cut an 8"-long piece of wood to fit tightly in the fence's slot. This piece is called a "spline." It's best to use a different saw to cut the spline so you don't disturb the dado blade setup. Cut a 2"-long piece off the spline and glue it in the fence's slot so it sticks out the front. Set the extra spline piece against the side of the dado blade. Push the fence's spline against the outside of the extra spline, then clamp the fence to the miter gauge (Fig. B). Screw the fence to the miter gauge and then remove the clamp and the extra spline piece. With this setup, the fingers and slots will all be the same width when they're cut.

**Woodworker's Tip:** Before you cut the finger joints, label each piece according to its location. This will make for easier assembly later.

14. Raise the dado blade an additional 1/32", to make it 17/32" high. When you cut the slots, the fingers will be 1/32" too long. You'll sand off the extra after you assemble the drawers.

15. Cut the slots in the ends of the drawer fronts and backs (E) first. The edges of these pieces start with a finger. Hold a drawer front against the fence and spline, and cut the first slot (Fig. C). Pull back the miter gauge, place the first slot over the spline, and cut the second slot. Continue doing this until all the slots on that end are cut.

16. Flip the drawer front over so the edge you started cutting before is the same edge you start cutting now, and cut the slots on that end. Do the rest of the drawer fronts and backs the same way.

17. Do the drawer sides (F) next. Since their edges start with a slot, the first finger of a drawer front is used to position the first slot of the drawer side. Slide the first slot of a drawer front over the fence's spline. Set the edge of the drawer side against the edge of the drawer front, and cut the first slot in the drawer side (Fig. D). Remove the drawer front, slide the drawer side over so the first slot is tight against the spline, and cut the second slot. Cut the rest of the slots as you did before, then do the other drawer sides.

18. Remove the dado blade and mount your regular blade in your table saw. Cut the drawer fronts, backs and sides so they're all 3" wide; the outside fingers of the drawer fronts and backs are equal in width; and the outside slots of the drawer sides are equal in width. You'll probably have to trim some wood off each edge. Now you're ready to assemble the drawers.

19. Lay out and drill the holes in the drawer fronts for the drawer pull screws. Finish-sand the insides of the drawer sides, fronts and backs.

20. Make the drawer clamping jig as shown in Figure A. Set the jig on two 1"-tall blocks so it will be in the center of the drawer sides as you clamp the drawer pieces around the jig. Assemble one drawer at a time. Using a small brush, apply glue to the finger joints, assemble the joints and place the drawer over the jig. Clamp the whole thing in the jig, but don't get the clamp heads on the protruding fingers. Let the glue dry for 1 hour, remove the clamps and jig, and clean off any oozed glue from the inside corners with a chisel or knife. Assemble the other two drawers, let the glue dry overnight, then sand down the protruding ends of the finger joints.

21. Rout the rabbets for the drawer bottoms (P) on the bottom edges of the drawers. Use the setup shown in Figure E.

22. Cut the round corners of the drawer bottoms so they fit in their rabbets. Finish-sand the drawer bottoms and the outsides of the drawers. Glue and clamp the drawer bottoms in their rabbets.

23. Cut the beveled edges of the long drawer pull piece (J), then cut the 1/16" reveals on the sides of that piece. Cut piece J into 4"-long pieces (three are for the drawer pulls; the others are spares). Cut the beveled ends of the drawer pulls (you can do this with a file), then cut the 1/16" reveals on the ends of the pulls.

24. Finish-sand the drawer pulls and smooth the edges of the reveals with a file and 220-grit sandpaper.

25. Sand smooth the sharp edges of all the parts, then attach the drawer pulls. The shelf is now ready for finishing.

## STAINING AND FINISHING

**Woodworker's Tip:** *Though you may be tempted to cut short your sanding, preparation and application, don't do it. These tasks are very important steps in obtaining a high-quality finish. Remember, it is the finish, just as much as the fit and smoothness of the parts that will have great bearing on how people judge your craftsmanship. To ensure an excellent result, follow the steps listed below and also the instructions the finish manufacturer puts on its products.*

## FINISHING TIPS

- Use scraps of wood to test the stains and finishes you are planning to use. On the back of the scrap, mark the stain/finish combination and the type of wood. Allow all samples to dry thoroughly before making your final finish selection. Save your samples for quick reference on future projects.
- All stains and finishes must be allowed to dry thoroughly between coats. Remember that drying times can vary due to humidity and other climatic conditions.
- If you have some leftover stain or finish, wipe the can rim so that stain or finish in the rim won't dry out and prevent the lid from forming a tight seal.
- Brushes used for oil-based finishes must be cleaned with mineral spirits; for water-based products such as Minwax® Water-Based Stains or Minwax® Polycrylic® Protective Finish, clean brushes with warm water and soap.

26. Before staining and finishing, finish-sand the outside surfaces and ease all the edges. Vacuum the inside and wipe the entire piece down with a cloth dampened with mineral spirits. If you're building the shelf with a softwood such as pine or a porous hardwood like maple, you'll need to prepare it for staining with a coat of Minwax® Pre-Stain Wood Conditioner. Applying this will help to ensure even absorption of stain and prevent blotchiness that can occur with some soft or porous woods. Simply brush the conditioner over all the wood and allow it to penetrate for 5 to 15 minutes. Then remove excess conditioner with a clean dry cloth.

**NOTE:** Whichever stain you choose, do the staining in two steps, starting on the interior surfaces and then moving to the exterior surfaces.

### Recommended Finish:

27. Apply the Minwax® Wood Finish™ you've chosen to the interior surfaces using a clean, lint-free cloth. Allow the stain to set for about 5 to 15 minutes then wipe off any remaining excess. Repeat for the exterior surfaces. Allow the stain to dry for 24 hours before applying the protective clear finish.

**Woodworker's Tip:** *When wiping off stain, make certain that your last wipe with the cloth goes with the grain of the wood. This way, any stain you might miss during wipe-off will be visually minimized by the wood grain.*

28. Apply Minwax® Fast-Drying Polyurethane following the directions on the can. Use a good quality, natural bristle brush. Allow the first coat to dry overnight.

29. The next day, sand all surfaces lightly with 220-grit paper using with-the-grain strokes. Dust off and wipe all surfaces with a cloth lightly dampened with mineral spirits. Apply a second coat of polyurethane and set the piece aside to cure overnight.

30. The following day, sand all surfaces lightly with 220-grit paper. Dust off and wipe the piece with a cloth lightly dampened with mineral spirits and apply the third and final coat of polyurethane. Allow the shelf to cure for several days before installing it. (See step # 41.)



### Alternate Finishes:

#### Two-Tone and Traditional One-Tone

31. Before applying Minwax® Water-Based Wood Stain to a hardwood or softwood, apply Minwax® Pre-Stain Water-Based Wood Conditioner following the directions on the can. After 1 to 5 minutes, wipe off all excess conditioner using a clean, lint-free cloth. Wait 15 to 30 minutes then use fine-grade paper to sand off any "whiskers" raised by the conditioner. Proceed to the staining within 2 hours.

32. Do the staining in two steps, starting on the interior surfaces and then moving to the exterior surfaces. Apply the Minwax® Water-Based Wood Stain you've chosen to the interior surfaces using either a cloth or a nylon/polyester brush. Allow stain to penetrate no longer than 3 minutes. While stain is still wet, wipe off all excess with a clean cloth that's been lightly dampened with stain. Allow the piece to dry for 2 hours before applying a second coat, if desired. Allow the piece to dry overnight before applying the clear finish.

**Woodworker's Tip:** Minwax® Water-Based Wood Stain is available in six factory (wood-tone) colors, a White Wash Pickling Stain and 60 custom-mixed colors. This means that you are not limited to just traditional wood colors (pine, oak, walnut, etc.). Instead, you can actually pick and apply a color to complement the décor of the room in which the shelf will hang. For this reason, make sure you look over all of the Minwax® color charts before making your final selection.

33. After allowing the piece to dry overnight, apply Minwax® Polycrylic® Protective Finish following the directions on the can. Stir the can contents thoroughly before starting and periodically repeat the stirring during your work session.

34. Working a small area at a time to maintain a wet edge, apply the first coat. Work quickly and make the final strokes in each newly finished section using with-the-grain brushstrokes.

35. Allow the finish to dry a minimum of 2 hours. Then sand lightly with 220-grit sandpaper wrapped around a soft backup block. Thoroughly dust off and wipe all surfaces with a cloth lightly dampened with water.

36. Repeat steps 33, 34 and 35, to apply the second coat.

37. Repeat the above steps to apply a third and final coat of Protective Finish. Allow the piece to cure for about 2 to 3 days before installing it. (See step # 41.)

### Alternate Finish:

#### One-Step Stain and Finish

38. After sanding the piece and wiping away the dust, apply Minwax® Polyshades® following the directions on the can. Use a brush intended for use with polyurethane. Stir the can contents thoroughly before starting and periodically repeat the stirring during your work session. Allow the first coat to dry overnight.

39. The next day, sand all surfaces lightly with 220-grit paper using with-the-grain strokes. Dust off and wipe all surfaces with a cloth dampened with mineral spirits. Apply a second coat of Polyshades® and set the piece aside to cure overnight.

40. If a third coat is desired for more color or increased protection, sand all surfaces lightly with 220-grit paper. Dust off and wipe the piece with a cloth dampened with mineral spirits and apply the third and final coat of Polyshades®. Allow the shelf to cure for several days before installing it.

41. When you are ready to install the shelf, attach the wall cleat to your wall, making sure to screw it into two studs. If it can't be screwed into two studs, use appropriate wall fasteners to handle the weight of the shelf and its contents. Then carefully hang the shelf on the wall cleat.

### PRODUCT SAFETY

For your safety and the safety of those you work with, always read the safety warnings, which manufacturers print on their labels, and follow them to the letter. Typical safety advice and instructions will contain information such as the following:

**DANGER! MINERAL-BASED PRODUCTS ARE HARMFUL OR FATAL IF SWALLOWED. SKIN IRRITANT. COMBUSTIBLE. KEEP OUT OF REACH OF CHILDREN. DANGER:** Contains mineral spirits. Harmful or fatal if swallowed. Do not take internally. Skin irritant. Avoid contact with skin and eyes. Wear rubber gloves and safety glasses when handling. Combustible. Do not use or store near heat, sparks, flame or other source of ignition. Close container after each use. Avoid inhalation and use only with adequate ventilation. If using indoors, open all windows and doors to make sure there is fresh air movement. If you experience lightheadedness, dizziness or headaches, increase fresh air movement or leave the area. Reports have associated repeated and prolonged occupational overexposure to solvents with permanent brain and nervous system damage. Intentional misuse by deliberately concentrating and inhaling the contents may be harmful or fatal.

**FIRST AID:** If swallowed: Do not induce vomiting. Call physician immediately.

**FOR SKIN CONTACT:** Wash thoroughly with soap and water. If irritation persists, get medical attention.

**FOR EYE CONTACT:** IMMEDIATELY flush eyes thoroughly with water, then remove any contact lenses. Continue to flush eyes with water for at least 15 minutes. If irritation persists, get medical attention.

**IF AFFECTED BY INHALATION:** Immediately remove to fresh air. If symptoms persist, call physician.

**When using Minwax® Polycrylic® Protective Finish:**

VAPOR HARMFUL. Use only with adequate ventilation. To avoid overexposure, open windows and doors or use other means to ensure fresh air entry during application and drying. If you experience eye watering, headaches or dizziness, increase fresh air supply or wear respiratory protection (NIOSH/MSHATC23C or equivalent) or leave the area. Avoid contact with eyes and skin. Wash hands after using. Keep container closed when not in use. Do not transfer contents to other containers for storage.

**DO NOT TAKE INTERNALLY.**

FIRST AID. In case of eye contact, flush thoroughly with large amounts of water for 15 minutes and get medical attention. For skin contact, wash thoroughly with soap and water. In case of respiratory difficulty, provide fresh air and call physician. If swallowed, get medical attention immediately.

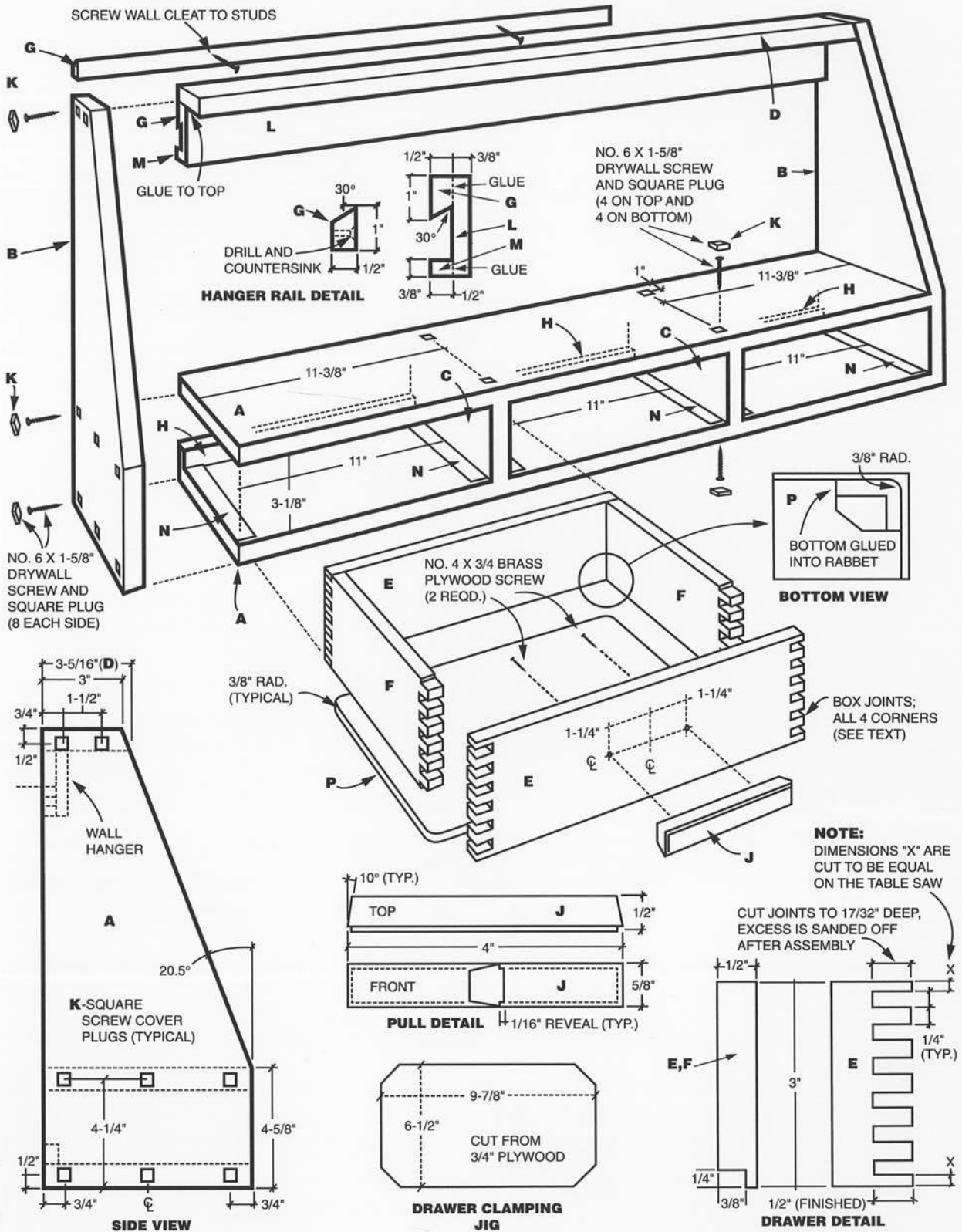
**DELAYED EFFECTS FROM LONG-TERM OCCUPATIONAL OVEREXPOSURE.**

Contains solvents that can cause permanent brain and nervous system damage. Intentional misuse by deliberately concentrating and inhaling the contents may be harmful or fatal.

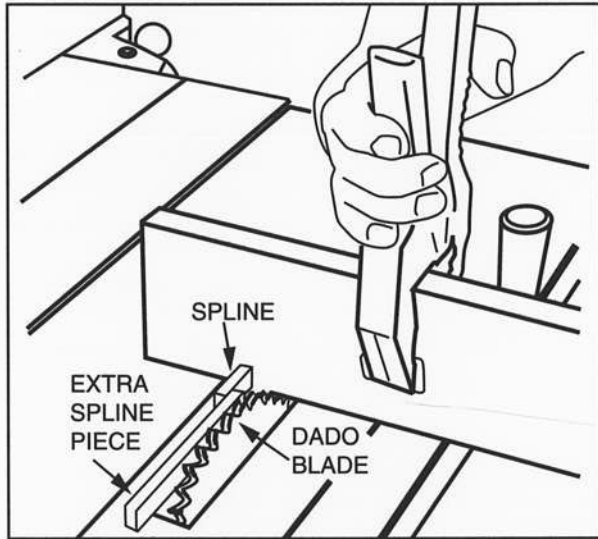
**SAFE DISPOSAL OF RAGS AND WASTE.**

Please be mindful of the safe way to dispose of rags and other waste. Rags, steel wool and other waste products soaked with oil finishes or solvents may spontaneously catch fire if improperly discarded. Place rags, steel wool and other waste immediately after use in a water-filled metal container. Tightly seal and dispose of the waste materials in accordance with local trash removal regulations. Be sure to keep the waste out of reach of children.

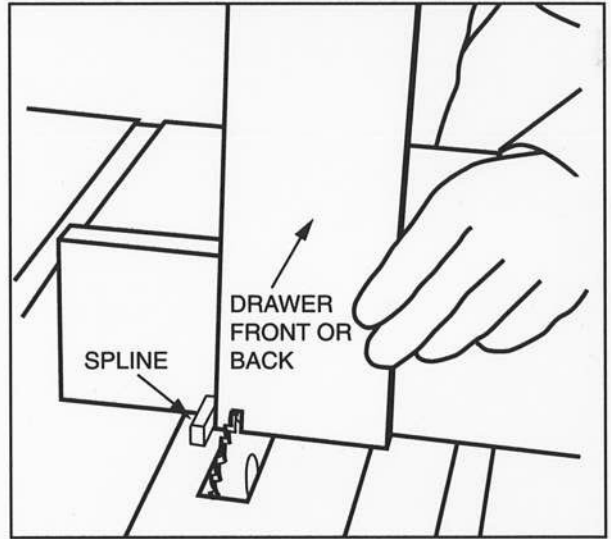
**FIG A. HARD MAPLE KITCHEN SHELF**



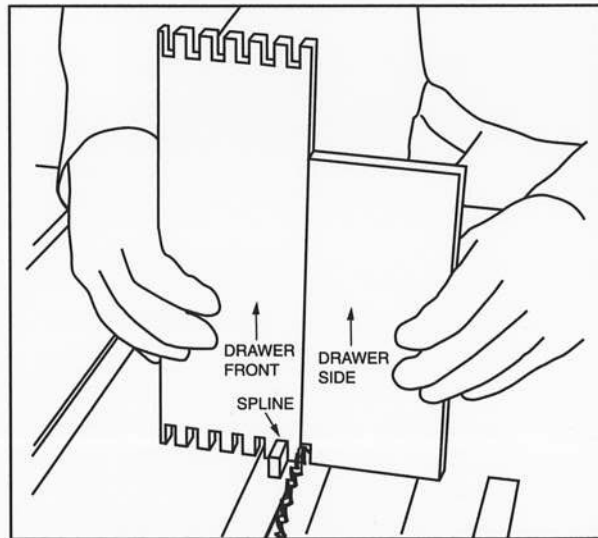
**FIG B. MAKING THE SPLINE GUIDE**



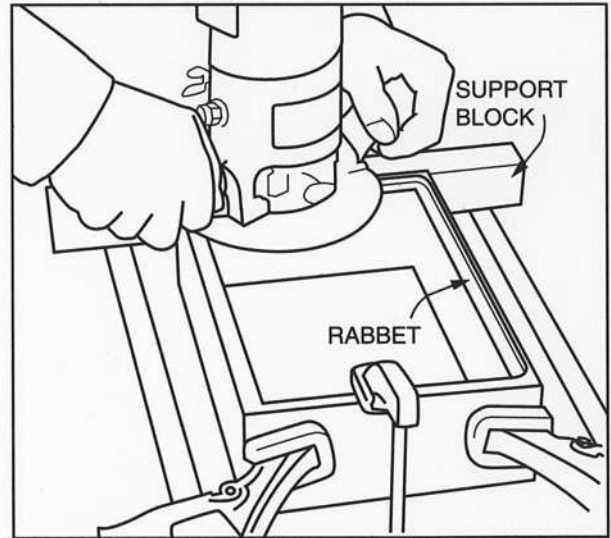
**FIG C. CUTTING SLOTS IN THE FRONTS AND BACKS**



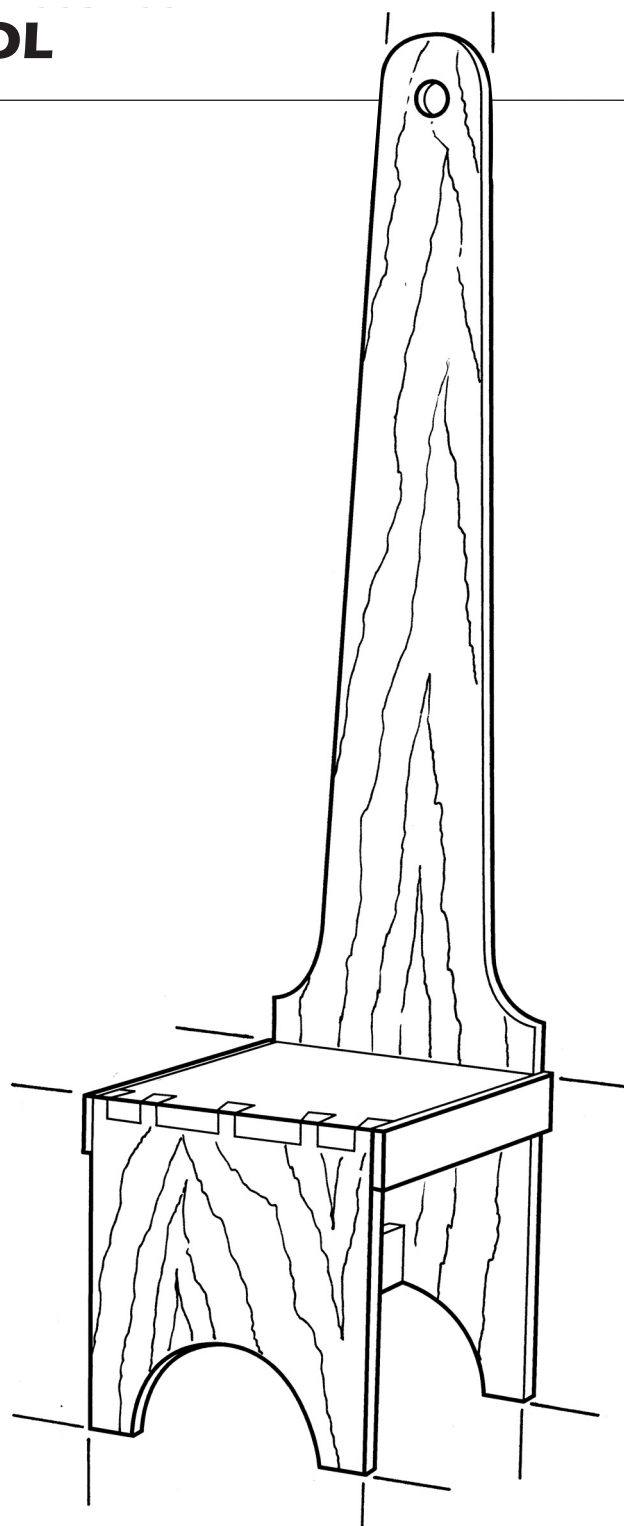
**FIG D. CUTTING SLOTS IN THE SIDES**



**FIG E. ROUTING RABBET FOR DRAWER BOTTOM**



## DOVETAILED STEP STOOL



Here's a project that's sure to advance your skills while producing a practical, good-looking piece of furniture. The stool's extra strength comes from three different kinds of dovetail joints, which make the strongest connection between wide boards like the ones used in this project. When the joints fit tight, the mechanical interlocking alone is enough to make them rigid.

This project gives advanced students experience in using a router and jigs to make three different kinds of dovetail joints: tapered and straight-sliding dovetails and a through dovetail. The shape and details of some of the stool parts will also give you practice in making and using templates for precision, repeatable cuts. And after you build the piece, you'll learn how to apply and use finishes to protect the wood and keep it looking beautiful.



## TOOLS REQUIRED

### Hand Tools

- Dovetail jig
- Hand plane
- Half-round file
- Hammer
- Framing square
- Clamps

### Power Tools

- Table saw
- Jigsaw or bandsaw
- Router
- 1/2" flush-cutting bit
- 1/4" shank dovetail bit
- Router table
- Sander
- Drill

### Miscellaneous

- Pencil
- Safety glasses
- Carpenter's glue
- Sandpaper
- Masking tape
- Clean, lint-free cloths
- Respirator
- Gloves for finishing
- Mineral spirits
- Water-filled metal container with tight-fitting lid

- Minwax® Wood Finish Stain Brush, Minwax® Polyurethane Brush or other good quality, natural bristle brush (for oil-based stains and finishes)
- Minwax® Polycrylic® Brush or other good quality, synthetic bristle brush (for water-based stains and finishes)

## SHOPPING LIST

The recommended wood for the project is oak; cherry or maple are nice alternatives. You'll need a 1"-thick board at least 64" long and 10" wide to make the back, front and seat, in addition to smaller pieces for the stretcher and rails (see the CUTTING LIST). If using the template, you'll also need some 1/4" tempered hardboard and 1/4" and 1/2" plywood to make the back template and the router jigs.

Item	Material	Quantity
<b>Stool</b>	oak, cherry or maple	
Front, back, seat		1 pc. 1" x 10" x 64"
Stretcher and rails		1 pc. 1" x 2" x 12"
<b>Back template</b>		
Template	1/4" tempered hardboard	1 pc. 10" x 43"
Plywood base	1/2" plywood	1 pc. 10" x 43"
Spacer	1/8" hardboard	1 pc. 10" x 43"
<b>Tapering Socket Jig</b>		
Guide boards	1/4" plywood	2 pcs. approx. 8" x 11-1/2" (see step 11)
Reference rails	1 x 2 scrap	2 pcs., 21" long
<b>Straight-Socket Jig</b>		
Guide boards	1/4" plywood	2 pcs. approx. 8" x 12"
Front rail	1/4" plywood	1 pc. approx. 2" x 22"
Back rail	1 x 2 scrap	1 pc. approx. 22" (see fig. H)

## STOOL CUTTING LIST

42-1/4" H 9-1/2" W 11-1/2" D					
Key	Pcs.	Part	Thickness	Width	Length
A	1	Back	3/4"	9-1/2"	42-1/4"
B	1	Seat	3/4"	9-1/2"	11"
C	1	Front	3/4"	9-1/2"	10"
D	1	Stretcher	3/4"	1-3/4"	10-1/2" (approx.)
E	2	Rails	5/16"	1-3/4"	11-1/2" (approx.)

## WOOD FINISHING PRODUCTS

### Recommended Finish

- Prep: Minwax® Pre-Stain Wood Conditioner (if using soft or porous wood)
- Stain: Minwax® Wood Finish™ Sedona Red (or your choice of 20 Minwax® Wood Finish™ Stain colors)
- Finish: Minwax® Fast-Drying Polyurethane Satin

### Alternate Finish

- Prep: Minwax® Water-Based Pre-Stain Wood Conditioner
- Stain: Minwax® Water-Based Wood Stain Green Tea (or a Minwax® Water-Based Wood Stain of your choice, available in 6 wood tones and 60 custom colors)
- Finish: Minwax® Polycrylic® Protective Finish Satin

## BEFORE YOU BEGIN

Good craftsmanship begins and ends with good work habits, so make the following steps part of your routine workshop practice. If you have any doubts or questions about how to proceed with a project, always discuss them with your shop instructor.

- Carefully and fully review plans and instructions before putting a tool to the project lumber.
- Work sensibly and safely. Wear safety goggles when doing work that creates flying chips and sawdust; wear the appropriate respirator whenever making sawdust or working with thinners or other solvents.
- At the end of every work session, clean up your shop area and put away all portable tools.

## CUTTING AND ASSEMBLY PROCEDURE

### Preparing the Wood

1. Ideally, the wood for the back, seat and front are made from one board to give the finished piece similar grain. Flat wood is essential for successful dovetailing. Boards that are cupped across the grain will be nothing but trouble. Start by milling rough lumber to 7/8" thick, taking an even amount off both sides. Set aside some extra wood for setting up dovetailing operations. Store the board on sticks so that air can circulate all around.

2. After a few days, see if the board is still flat. If the faces show a curve, run them through the jointer again and then use the planer to take the wood down to the final thickness of 3/4". Make sure all your wood is exactly the same thickness. Refer to the project illustration (Fig. A) shown on page 7.

### Making the Back Template

**Woodworker's Tip:** *Making a template for the back is worth the effort. You could lay out the pattern directly onto the wood, but smoothing and sanding it will take more time than preparing a thin template. Also, having a template will allow you to make multiple projects.*

3. Using a jigsaw or bandsaw, cut a piece of 1/4" tempered hardboard the same width as the back and crosscut the bottom so it's square to the sides. Draw a centerline from top to bottom. Draw both arches and the two circles that form the curved sides of the back. Mark points A and B as shown in Fig. B, and then connect them to form the tapered sides. Lay out and draw the circles shown to represent the curves at the top, sides and bottom. Cut the sides to shape.

4. Smooth the roughly cut curves with a half-round file. Use a block plane to straighten the sides. Run your hand around the template to feel for any high or low spots. A smooth template will pay off in a back that needs only light sanding.

5. Assemble the template with the materials shown in Fig. C. Cut the top and bottom layers of this three-part sandwich 1/16" smaller than the template in the middle. Screw the layers together to make a permanent sandwich. The template is the middle layer of the sandwich in order to allow your router bit to clear the bench top.

6. Drill holes through the template sandwich in order to screw it to the workpiece. This is done so not to damage the finished piece. Later drill the finger hole and rout the tapered dovetail socket, thereby removing the pilot holes made by the screws.

### Shaping the Back and Front

7. Rip (saw wood along the grain) the solid wood for the back (A), seat (B) and front (C) to the same width. Crosscut the back and the front a bit longer than their final lengths.

8. Align the template with the bottom end of the back and trace around it. Saw out the back, staying at least 1/16" away from the pencil line. Fasten the template sandwich to the face side of the back. Clamp the whole assembly to the workbench.

9. Rout around the back in a counterclockwise direction. You'll have to move the back to avoid bumping into the clamps, but make sure you rout each curve in one continuous pass.

10. Rout the front board's arch in the same manner. You won't be able to screw the sandwich to this piece, so use clamps instead. Finally, drill a 1"-dia. finger hole at the top of the back.

### TAPERED SLIDING DOVETAIL

The seat is joined to the back with a long sliding dovetail. Both the tail and socket are tapered, which makes it easier to fit and glue up than one that isn't. The tail slides easily into the front of the socket. The last inch is the only tough part—you'll have to push hard to get the joint home—but you'll be amazed at the strength of this joint. Making a tapered dovetail may sound difficult, but it's really quite easy. The secret is to create all the tapers with one shim that's about 1/32" thick. You'll make the tapered socket with the jig shown in Fig. E using guide boards made as described next.

### Table Saw Tapering Technique

11. Taper the guide boards for the socket jig on a table saw (Fig. D). Size them to fit your router base by subtracting the radius of the base from 9-5/8" to get dimension "A." Rip two pieces of 1/4" plywood to this width.

12. Tape a 1/32"-thick shim onto the corner edge of one piece as shown in Fig. D. Put this edge against the saw fence and rip the pieces again. Remove the shim and mark the wide end with an "X" on the lower right corner. Cut the second piece the same way and mark the wide end with a "Y" on the lower left corner.

### Tapering Socket Jig Assembly

13. Make two reference rails to the dimensions specified.

14. Nail the guide board marked "X" to one of the reference rails, as shown in Fig. E. Align the guide board with the end and side of the rail. Use a framing square to check your alignment. Nail the guide board to the second rail.

15. Nail the second guide board to the reference rail, positioning it so as to make an opening that is 1/8" wider than the diameter of your router base. Check the alignment before fastening the board to the second reference rail. When you're sure everything is right, put in screws to make the setup permanent.

### Cut the Tapered Socket

16. Use a standard 1/4" shank dovetail bit with a 14-degree pitch and 1/2" width to cut the socket. Clamp the jig down and rout the socket 5/16" deep, as shown in Fig. F, running the router along both sides of the tapered opening.

### Cut the Tapered Tail

17. The dovetail for the seat is cut on a router table. Shim both sides of the seat with a 1/32" shim to make the same taper as the socket (See Fig. G). Adjust the height of the router bit so it's exactly the same as the socket depth. The easiest way to do this is to unplug the router, lay the back board on the router table and raise the bit until it just touches the bottom of the socket.

18. Adjust the router fence by trial and error, using scrap wood to test the cut. Try sliding the test piece into the socket. It should start easily and gradually tighten up. You should be able to pound it home with your fist. Adjust the fence to change the fit. When it's right, rout the back edge of the real seat.

### Cut the Front Board

19. Slide the seat in place, square it to the back and measure from the bottom of the back to the top of the seat to get the length of the front board. Cut the front board to the exact length.

### NON-TAPERED SLIDING DOVETAILS

A stretcher just above the arches locks in the front and back, making a rigid structure. This sliding dovetail isn't tapered because a taper isn't necessary across a small dimension.

### Straight-Socket Jig

20. To cut the stretcher sockets on the inside faces of the back and the front, make a straight-sided jig to fit your router as shown in Fig. H. Cut the guide boards out of 1/4" plywood, the back rail out of scrap and the front rail out of 1/4" plywood.

21. The position of the front rail determines how long the socket will be. Add 4-3/4" to the radius of your router base to locate the front rail. Make the opening between the guide boards 1/8" wider than the router base. After assembling the jig, mark the center of the front rail.

### Rout the Stretcher Sockets

22. Mark the centerline of the back (A) and then set the straight-socket jig over it. Line up the two centerlines and clamp the jig and the back to the workbench.

23. Set the router in the opening and cut the socket 5/16" deep. When you bump the router into the front rail, you've reached the top of the socket.

24. Repeat steps 22 and 23 to cut the socket into the front (C).

### THROUGH DOVETAIL

This joint is traditionally cut by hand, starting with careful layout, precise cuts with a dovetail saw and lots of chiseling. Many woodshops, however, are equipped with some kind of dovetail jig that is used with

a router to make precision joints quickly. Since different jigs typically have their own specific setups and procedures, ask your instructor about using the one in your shop. If you're using it for the first time, practice the setup and router work on scrap until you feel you're ready to make the joint on the wood for your stool.

**NOTE:** The way a particular jig must be set up and used may effect the width of parts B and C and the bottom of part A, so study the jig before cutting your lumber.

### Make the Stretcher

25. Assemble the stool without glue and square the front and back to the seat. Set the uncut stretcher in place and mark the distance between the two dovetail sockets. Cut the stretcher (D) to length.

26. Shape the dovetailed ends of the stretcher on the router table. Test the fence setting with a scrap piece. The stretcher is quite narrow and it's not safe to merely stand it up on end on the router table. Instead, clamp a backer board alongside the stretcher so you have a wider bearing surface.

## FINAL ASSEMBLY

27. Glue and assemble the front to the seat. Check for square and plane or sand the dovetails flush. It's easier to hold two pieces in your vise now than the whole stool later.

28. Glue and assemble the seat to the back, then turn the stool upside-down and drop in the stretcher. You won't need any clamps. After the glue is dry, plane all the sides flush.

29. Make the two side rails (E); determine their precise length by holding them against the sides and marking cut lines. Cut them to length and glue and clamp them in place. After the glue dries, sand them even with the seat.

## STAINING AND FINISHING

**Woodworker's Tip:** *Though you may be tempted to cut short your sanding, preparation and application, don't do it. These tasks are very important steps in obtaining a high-quality finish. Remember, it is the finish, just as much as the fit and smoothness of the parts, that will determine how people judge your craftsmanship. To ensure an excellent result, follow the steps listed below and also the instructions the manufacturers put on their products.*

### FINISHING TIPS

- Test the stains and finishes you are planning to use on scraps of wood. On the back of the scrap, mark the stain/finish combination and the type of wood. Allow all samples to dry thoroughly before making your final finish selection. Save your samples for quick reference on future projects.
- All stains and finishes must be allowed to dry thoroughly between coats. Remember that drying times can vary due to humidity and other climatic conditions.
- If you have some leftover stain or finish, wipe the can rim so that stain or finish in the rim won't dry out and prevent the lid from forming a tight seal.

- Brushes used for oil-based finishes must be cleaned with mineral spirits; for water-based products, such as Minwax® Water-Based Stains or Minwax® Polycrylic® Protective Finish, clean brushes with warm water and soap.

**30.** Before staining and finishing, finish-sand all surfaces and ease all the edges. Wipe down the piece with a cloth dampened with mineral spirits. If you're building the stool with a softwood, such as pine, or a porous hardwood, like maple, you'll need to prepare it for staining with a coat of Minwax® Pre-Stain Wood Conditioner if you are using an oil-based stain or Minwax® Water-Based Pre-Stain Wood Conditioner if you're using a water-based stain. Applying the conditioner will help to ensure even absorption of stain and prevent blotchiness that can occur with some soft or porous woods. Following the directions on the can, simply brush the conditioner over all the wood and allow it to penetrate for 5 to 15 minutes. Then remove excess conditioner with a clean, dry cloth.

### Recommended Finish

**31.** Apply Minwax® Wood Finish™ using a natural bristle brush or a clean, lint-free cloth following the directions on the can. Allow the stain to set for about 5 to 15 minutes then wipe off any excess. If a second coat is desired, allow the piece to dry 4 to 6 hours before applying the stain. Allow the stain to dry for 24 hours before applying the protective clear finish.

**Woodworker's Tip:** *When wiping off stain, make certain that your last wipe with the cloth goes with the grain of the wood.*

**32.** Apply Minwax® Fast-Drying Polyurethane following the directions on the can. Use a good quality, natural bristle brush intended for use with polyurethane. Allow the first coat to dry overnight.

**33.** The next day, lightly sand all surfaces with 220-grit sandpaper using with-the-grain strokes. Wipe all surfaces with a soft cloth. Apply a second coat of polyurethane and set the piece aside to dry.

**34.** When completely dry repeat step 33, applying the third and final coat of polyurethane. Allow the finish to cure for several days before using the stool.

### Alternate Finish

**35.** Apply Minwax® Pre-Stain Water-Based Wood Conditioner following the directions on the can. After 1 to 5 minutes, wipe off all excess conditioner using a clean, lint-free cloth. Wait 15 to 30 minutes and then use fine-grade sandpaper to sand off any "whiskers" raised by the conditioner. Proceed to the staining within 2 hours.

**Woodworker's Tip:** *Minwax® Water-Based Wood Stain is available in 6 wood tones, a White Wash Pickling Stain and 60 custom-mixed colors. This means that you are not limited to just traditional wood tones (pine, oak, walnut, etc.), so look over the entire range of the Minwax® colors before making your selection.*

**36.** Apply Minwax® Water-Based Wood Stain using either a nylon/polyester brush or a soft cloth. Allow stain to penetrate no longer than 3 minutes. While stain is still wet, wipe off all excess with a clean cloth

that's been lightly dampened with stain. Allow the piece to dry for 2 hours before applying a second coat, if desired. Allow the piece to dry thoroughly before applying the protective clear finish.

**37.** Apply Minwax® Polycrylic® Protective Finish with a nylon/polyester brush following the directions on the can. Stir the can contents thoroughly before starting and periodically repeat the stirring during your work session.

**38.** Working a small area at a time to maintain a wet edge, apply the first coat. Work quickly and make the final strokes in each newly finished section using with-the-grain brushstrokes.

**39.** Allow the finish to dry a minimum of 2 hours. Then sand lightly with 220-grit sandpaper. Thoroughly wipe off all surfaces with a soft cloth.

**40.** Repeat steps 37, 38 and 39 to apply the second coat and third coat, sanding only after the second coat. After the third coat, allow the finish to cure for several days before using the stool.

### PRODUCT SAFETY

For your safety and the safety of those you work with, always read the safety warnings, which manufacturers print on their labels, and follow them to the letter. Typical safety advice and instructions will contain information such as the following:

**WARNING!** Removal of old paint by sanding, scraping or other means may generate dust or fumes that contain lead. Exposure to lead dust or fumes may cause brain damage or other adverse health effects, especially in children or pregnant women. Controlling exposure to lead or other hazardous substances requires the use of proper protective equipment, such as properly fitted respirator (NIOSH approved) and proper containment and cleanup. For more information, call the National Lead Information Center at 1-800-424-LEAD (in US) or contact your local health authority.

### When using oil-based wood finishing products:

**CAUTIONS: CONTAINS ALIPHATIC HYDROCARBONS. Contents are COMBUSTIBLE.** Keep away from heat and open flame. **VAPOR HARMFUL.** Use only with adequate ventilation. To avoid overexposure, open windows and doors or use other means to ensure fresh air entry during application and drying. If you experience eye watering, headaches, or dizziness, increase fresh air, or wear respiratory protection (NIOSH approved) or leave the area. Avoid contact with eyes and skin. Wash hands after using. Keep container closed when not in use. Do not transfer contents to other containers for storage.

**FIRST AID:** In case of eye contact, flush thoroughly with large amounts of water for 15 minutes and get medical attention. For skin contact, wash thoroughly with soap and water. In case of respiratory difficulty, provide fresh air and call physician. If swallowed, call Poison Control Center, hospital emergency room, or physician immediately.

**NOTICE:** Reports have associated repeated and prolonged occupational exposure to solvents with permanent brain and nervous system damage. Intentional misuse by deliberately concentrating and inhaling contents may be harmful or fatal.

**WARNING:** This product contains a chemical known to the State of California to cause cancer and birth defects or other reproductive harm.

**DO NOT TAKE INTERNALLY. KEEP OUT OF REACH OF CHILDREN.**

**When using water-based wood finishing products:**

**CAUTIONS:** Use Only With Adequate Ventilation. To avoid overexposure, open windows and doors or use other means to ensure fresh air entry during application and drying. If you experience eye watering, headaches, or dizziness, increase fresh air, or wear respiratory protection (NIOSH approved), or leave the area. Avoid contact with eyes and skin. Wash hands after using. Keep container closed when not in use. Do not transfer contents to other containers for storage.

**FIRST AID:** In case of eye contact, flush thoroughly with large amounts of water. Get medical attention if irritation persists. If swallowed, get medical attention immediately.

**WARNING:** Contains Alkyl propanols, ethylene glycol, n-methyl pyrrolidone. **VAPOR HARMFUL.** Use only with adequate ventilation. To avoid overexposure, open windows and doors or use other means to ensure fresh air entry during application and drying. If you experience eye watering, headaches, or dizziness, increase fresh air, or wear respiratory protection (NIOSH approved) or leave the area. Avoid contact with eyes and skin. Wash hands after using. Keep container closed when not in use. Do not transfer contents to other containers for storage.

**DO NOT TAKE INTERNALLY.**

**FIRST AID:** In case of eye contact, flush thoroughly with large amounts of water for 15 minutes and get medical attention. For skin contact, wash thoroughly with soap and water. In case of respiratory difficulty, provide fresh air and call physician. If swallowed, call Poison Control Center, hospital emergency room, or physician immediately.

**DELAYED EFFECTS FROM LONG-TERM OVEREXPOSURE.**

Contains solvents which can cause permanent brain and nervous system damage. Intentional misuse by deliberately concentrating and inhaling contents may be harmful or fatal.

**WARNING:** This product contains a chemical known to the State of California to cause cancer and birth defects or other reproductive harm.

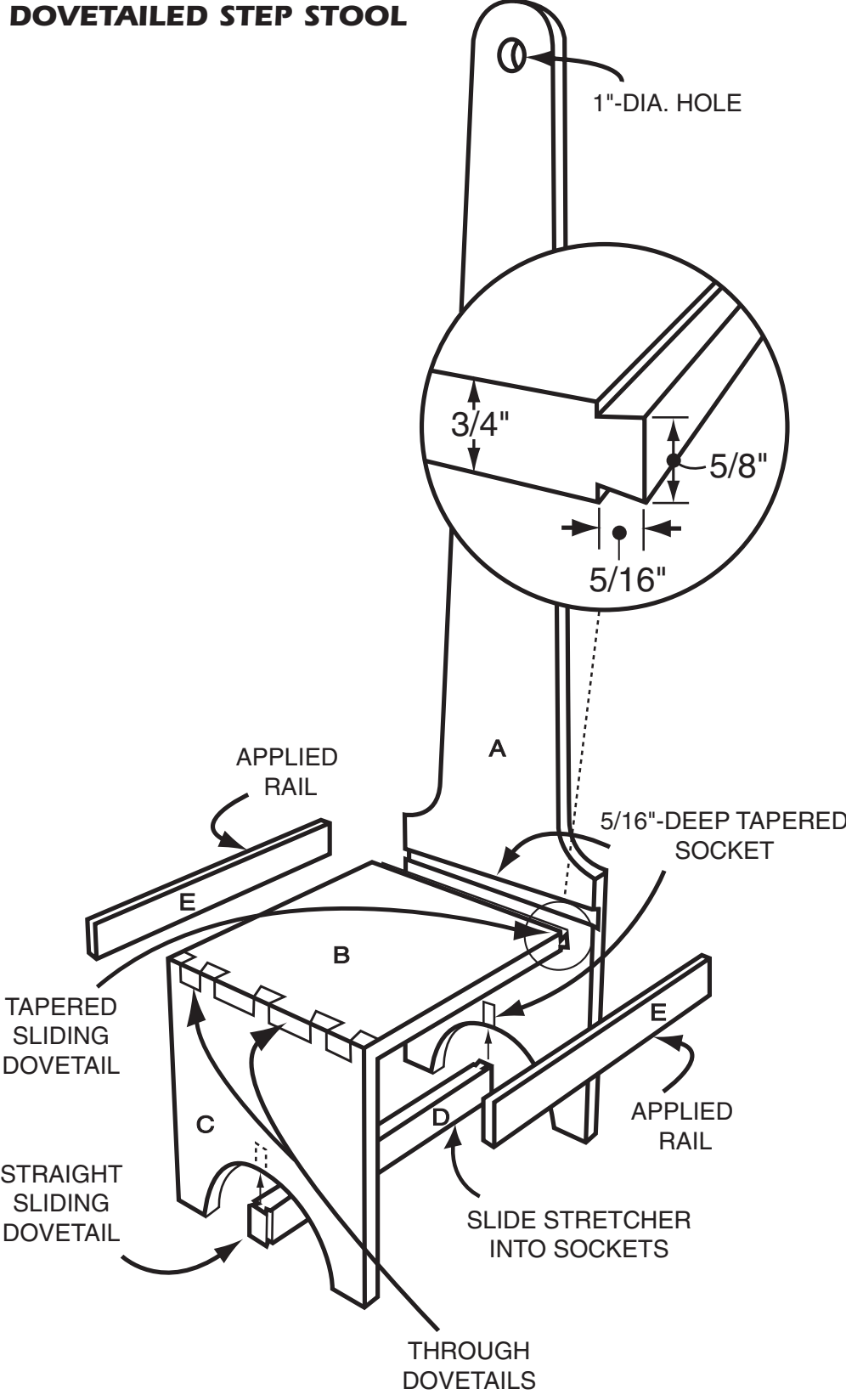
**KEEP OUT OF REACH OF CHILDREN.**

**SAFE DISPOSAL OF RAGS AND WASTE.**

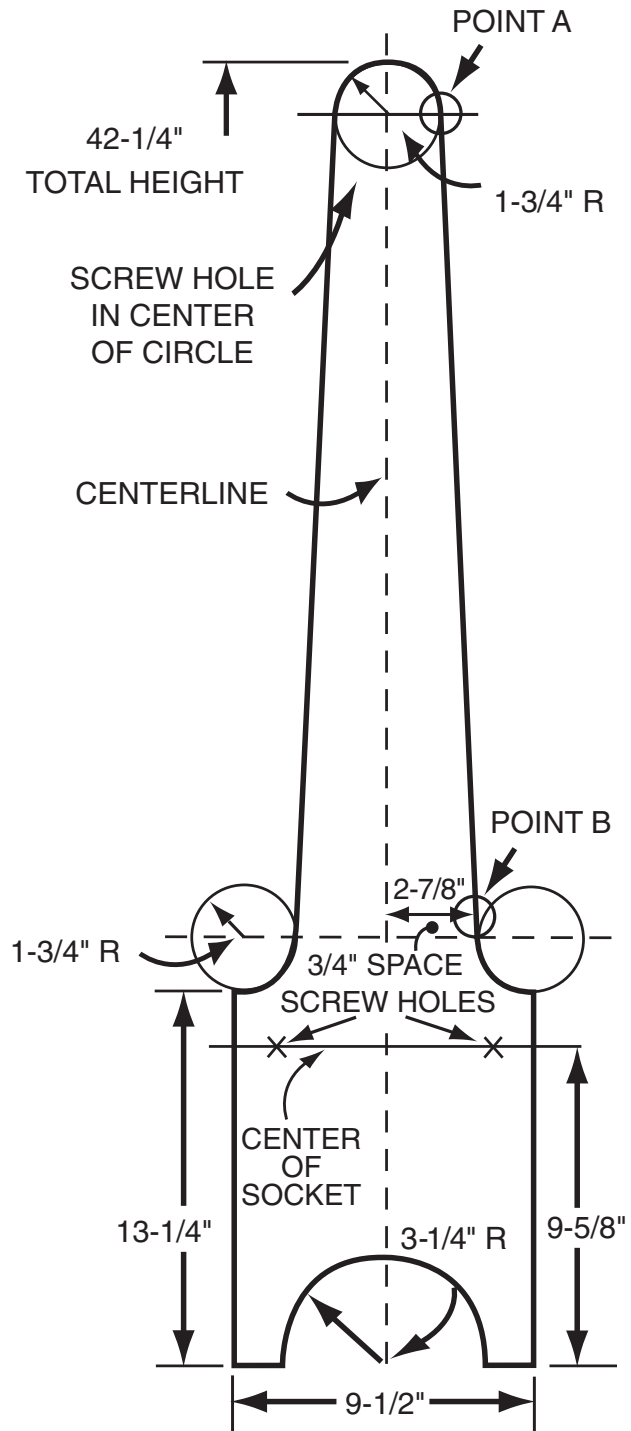
Please be mindful of the safe way to dispose of rags and other waste. Rags, steel wool and other waste products soaked with oil finishes or solvents may spontaneously catch fire if improperly discarded. Place rags, steel wool and other waste immediately after use in a water-filled metal container. Tightly seal and dispose of the waste materials in accordance with local trash removal regulations. Be sure to keep the waste out of reach of children.



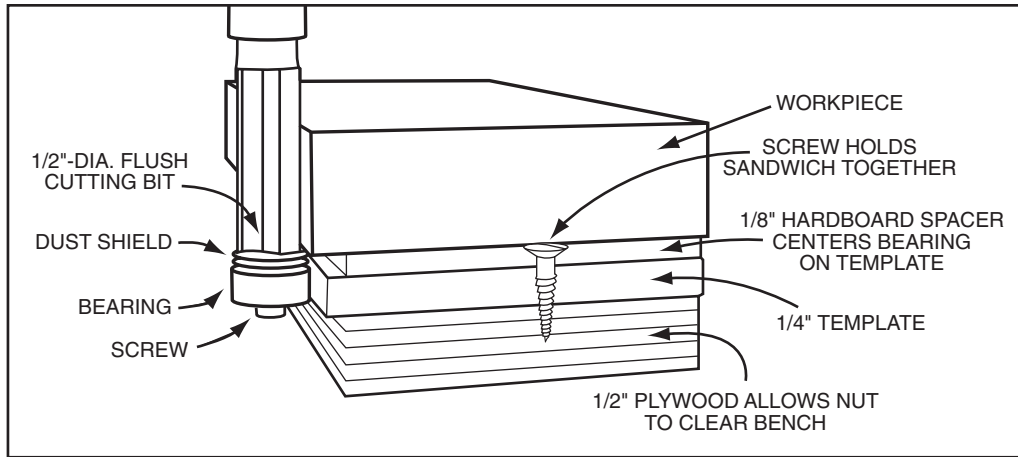
**FIG A. DOVETAILED STEP STOOL**



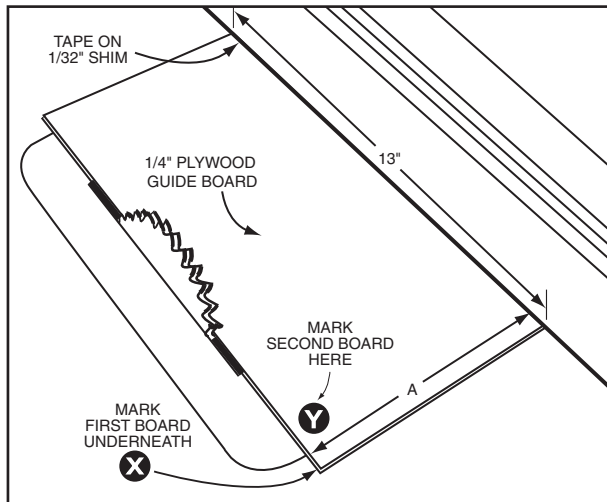
**FIG B. BACK TEMPLATE**



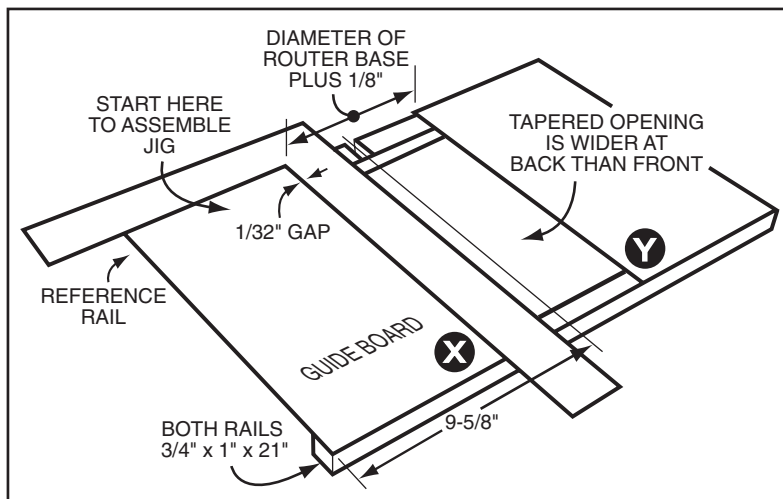
**FIG C. TEMPLATE SANDWICH**



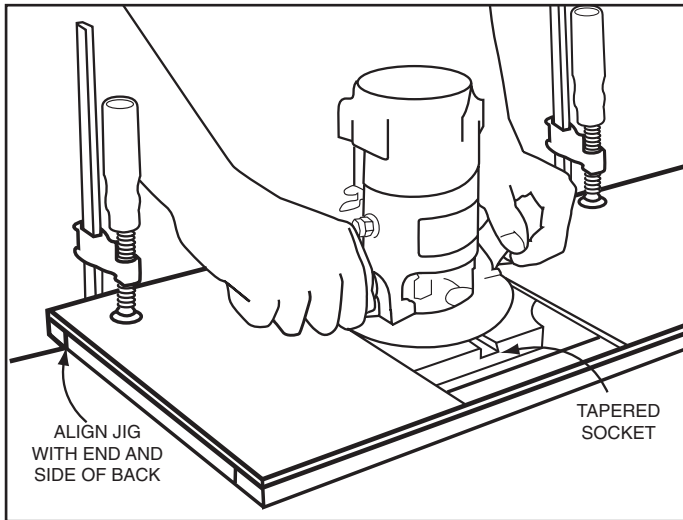
**FIG D. TABLE SAW TAPERING TECHNIQUE**



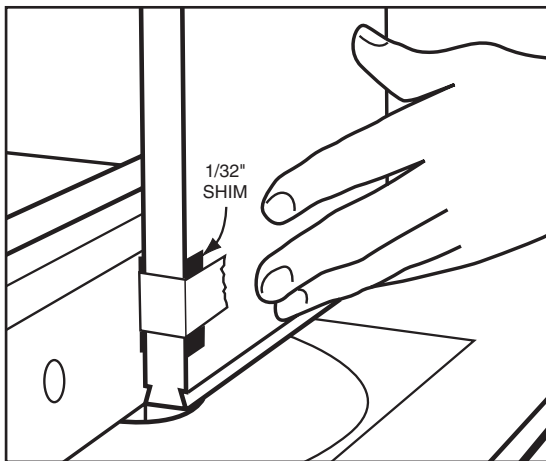
**FIG E. TAPERING SOCKET JIG ASSEMBLY**



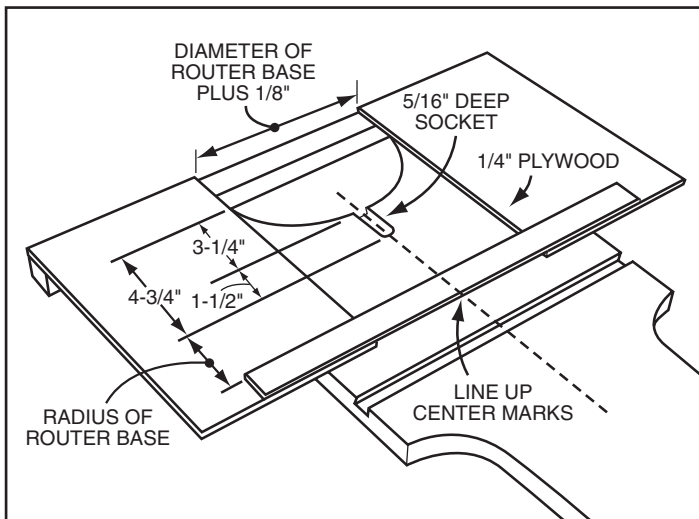
**FIG F. CUTTING THE TAPERED SOCKET**



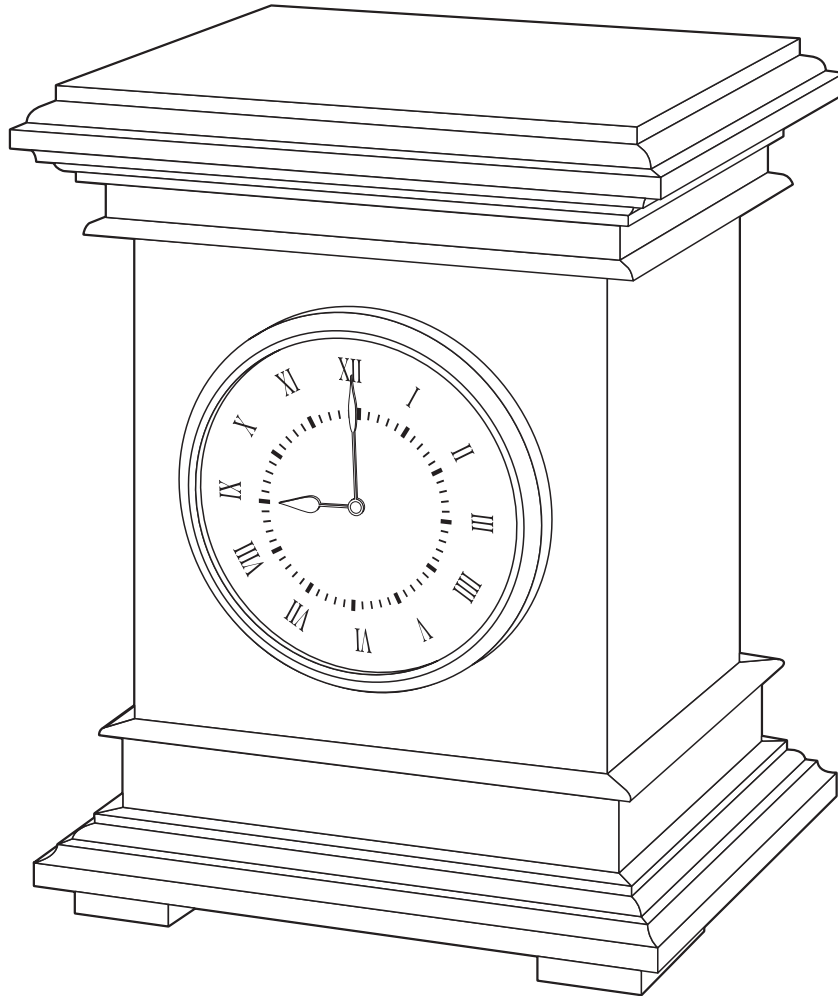
**FIG G. CUTTING THE SEAT DOVETAIL**



**FIG H. STRAIGHT-SOCKET JIG**



# Desktop Clock



This clock holds a secret chamber under the lid, and its construction involves a few secrets as well. The case is made from 1/2"-thick cherry plywood, which isn't available at most lumberyards. You can simply make your own by gluing together two pieces of 1/4" cherry plywood. Another secret to building this clock is to glue the moldings to the plywood case material first and then miter the parts on the table saw as a single piece. It simplifies the building and sure beats mitering all the moldings individually.

Advanced woodworkers will be challenged to execute this project neatly and precisely. You'll be doing a lot of router work to make the moldings and some precision rabbetting, dadoing and mitering to put all the pieces together. After it's assembled, you'll learn more about applying and using stains and finishes to protect the wood and keep it looking beautiful.



## TOOLS REQUIRED

### Hand Tools

- Backsaw
- Miter box
- Spring clamps
- Toggle clamps

### Power Tools

- Table saw
- Planer
- Router in a router table; a classic router bit and a 1/8" round-over bit
- Drill press with an adjustable circle cutter

### Miscellaneous

- Pencil
- Safety glasses
- Carpenter's glue
- Masking tape
- 120-, 150- and 220-grit sandpaper
- Clean, lint-free cloths
- Respirator
- Gloves for finishing
- Mineral spirits (for oil-based stains and finishes)
- Water-filled metal container with tight-fitting lid (for oil-based stains and finishes)
- Minwax™ Wood Finish™ Stain Brush or other good quality, natural bristle brush (for oil-based stains and finishes)
- Minwax™ Polycrylic™ Brush or other good quality, synthetic bristle brush (for water-based stains and finishes)

## SHOPPING LIST

Item	Quantity
1/4" cherry-veneer plywood	16" x 32" sheet; grain should run across the short dimension.
3/4" cherry	3" wide by 32" long, 1 pc. 3/4" x 6" x 48", 1 pc.
Battery-powered clock mechanism (see Source, page 5)	

## WOOD FINISHING PRODUCTS

### Recommended Finish

- Prep: Prep: Minwax® Pre-Stain Wood Conditioner (if using soft or porous wood)
- Stain: Minwax® Wood Finish™ English Chestnut (or your choice of 20 Minwax® Wood Finish™ Stain colors)
- Finish: Minwax® Fast-Drying Polyurethane Semi-Gloss

### Alternate Finish

- Prep: Minwax® Water-Based Pre-Stain Wood Conditioner
- Stain: Minwax® Water-Based Wood Stain Spice (or a Minwax® Water-Based Stain of your choice, available in 6 wood tones, a White Wash Pickling Stain, 60 custom-mixed colors, and 8 bold Accents™ colors)
- Finish: Minwax® Polycrylic® Protective Finish Semi-Gloss

## CUTTING LIST

Overall Dimensions: 8" x 6-3/8" x 5-3/8"					
Key Part	Pcs.	Material	Dimensions	Notes	
A Front, back	2	cherry	1/2" x 4-3/4" x 7-1/2"	Cut to final widths after attaching moldings C through K.  Rough-cut parts C through K to 32" long. They will be cut to final length after they are attached to the 1/2" plywood that makes up parts A and B.	
B Sides	2	cherry plywood	3-3/4" x 7-1/2"		
C Upper flat trim (front/back)	2	cherry	1/8" x 3/8" x 5"		
D Upper flat trim (sides)	2	cherry	1/8" x 3/8" x 4"		
E Lower flat trim (front/back)	2	cherry	1/8" x 3/4" x 5"		
F Lower flat trim (sides)	2	cherry	1/8" x 3/4" x 4"		
G Top classic molding (front/back)	2	cherry	5/8" x 3/4" x 6-1/4"		
H Top classic molding (sides)	2	cherry	5/8" x 3/4" x 5-1/4"		
J Bottom classic molding (front/back)	2	cherry	3/4" x 3/4" x 6-1/4"		
K Bottom classic molding (sides)	2	cherry	3/4" x 3/4" x 5-1/4"		
L Half-bead trim (front and back)	4	cherry	1/8" x 5/16" x 5-1/8"		
M Half-bead trim (sides)	4	cherry	1/8" x 5/16" x 4-1/8"		
N Lid	1	cherry	3/4" x 4-5/8" x 5-5/8"		
P Half-bead trim for lid (front/back)	2	cherry	1/8" x 5/16" x 6"		
Q Half-bead trim for lid (sides)	2	cherry	1/8" x 5/16" x 5"		
R Bottom	1	cherry	1/2" x 3-1/4" x 4-1/4"		
S Feet	4	cherry	5/16" x 1" x 1"		

Recommended Wood - Cherry

Alternate Wood - Mahogany

## BEFORE YOU BEGIN

Good craftsmanship begins and ends with good work habits, so make the following steps part of your routine workshop practice. If you have any doubts or questions about how to proceed with a project, always discuss them with your instructor.

- Carefully and fully review plans and instructions before putting a tool to the project lumber.
- Work sensibly and safely. Wear safety goggles and the appropriate respirator whenever making sawdust or working with thinners or other solvents.
- At the end of every work session, clean up your shop area and put away all portable tools.

## CUTTING AND ASSEMBLY PROCEDURE

1. Cut two 32" x 8" pieces of 1/4" cherry plywood so that the grain runs across the short dimension. Glue them together to form the 1/2" plywood needed for the clock case. Use a few bricks as clamps and a piece of cardboard to protect the plywood from getting scratched. After the glue has dried, rip the plywood to 7-1/2" wide. Take about 1/4" off each edge so they are both straight and parallel. Next, cut two 1/8" dadoes in the face of the plywood (Fig. 1). Use a push block for safety and to maintain even pressure while cutting.

2. Make the upper and lower flat trim pieces (C, D, E and F). Insert temporary spacer strips (use no glue) in the small dadoes in the panel to provide a stop for the flat trim to push up against, and glue the flat trim to the plywood panel (Fig. 2). Remove the spacer sticks before the glue dries to prevent them from getting stuck.

3. Cut a strip of cherry for the top and bottom moldings (G, H, J and K). Use feather boards to hold the molding against the fence and table for the smoothest cut. Shape these pieces with a classic router bit. Note that the top moldings are 1/8" thinner than the bottom moldings and they are attached to the plywood so they mirror each other (Fig. 1). Glue and clamp them to the plywood (Fig. 3). The edge of the molding and the plywood should be flush. If they're not, wait until the glue has dried and trim the parts flush on your table saw. Complete the plywood panel by cutting a rabbet at the top and bottom on the backside (Fig. 1).

4. Make the half-bead trim (L, M, P, Q) that goes around the case and the lid. This trim is very small, but is easy to make using the step-by-step cutting sequence shown in Fig. 5. Apply a thin bead of glue to the pieces that wrap around the case (L, M) and clamp them into the 1/8" x 1/8" dadoes previously occupied by the spacer sticks. If any glue squeezes out, wipe it away immediately with a damp sponge or towel.

5. Set your table saw blade to 45 degrees and use a table saw sled to miter the clock's four sides. Start by cutting the sides about 1/4" oversize. Then miter the sides to their final width. Hold each piece in place with a toggle clamp to ensure a straight cut and to keep your hands out of harm's way.

**Woodworker's Tip:** *Cut slowly to avoid chip-out on the moldings. If you do get a chip, save it and glue it back on. Use a toothpick to apply the glue and masking tape to hold the chip in place.*

6. Drill the opening for the clock insert into the front panel. The clock insert is centered vertically on the front between the two half-bead trim pieces (L). Set the drill press to its slowest speed and hold the part with two toggle clamps. Secure a backer board to the drill table with a couple of clamps. The backer board will ensure that the cutter makes a clean cut on the backside.

7. Apply glue to two sides first and hold them together with masking tape. Add the other two sides one at a time. Grasp the tape firmly and pull the parts tightly together. Then glue in the bottom and add the four feet (S) 1/8" in from the edges of the molding. Next make the lid (N). Cut the rabbets on the bottom of the lid (Fig. 4). Check that the lid fits easily into the rabbet in the top of the clock case.

8. Using a small backsaw and a miter box, miter the half-bead trim that goes around the lid (P, Q) and attach it to the underside of the lid (Fig. 6). You'll need some small spring clamps to hold these trim pieces in place while the glue dries. Remove one of the plastic jaw covers from the spring clamp to provide more pressure on the small trim. Leave the other jaw cover on to protect the top from getting dented.

## STAINING AND FINISHING

**Woodworker's Tip:** *Though you may be tempted to cut short your sanding, preparation and application time, don't do it. These tasks are very important steps in obtaining a high-quality finish. Remember, it is the finish, just as much as the fit and smoothness of the parts that will have great bearing on how people judge your craftsmanship. To ensure an excellent result, follow the steps listed in this section and also the instructions the finish manufacturer puts on its products.*

### FINISHING TIPS

- Test the stains and finishes you are planning to use on scraps of wood. On the back of the scrap, mark the stain/finish combination and the type of wood. Allow all samples to dry thoroughly before making your final finish selection. Save your samples for quick reference on future projects.
- All stains and finishes must be allowed to dry thoroughly between coats. Remember that drying times can vary due to humidity and other climatic conditions.
- If you have some leftover stain or finish, wipe the can rim so that stain or finish in the rim won't dry out and prevent the lid from forming a tight seal.
- Brushes used for water-based products, such as Minwax® Water-Based Wood Stains or Minwax® Polycrylic® Protective Finish, should be cleaned with soap and water; oil-based finishes must be cleaned with mineral spirits.

9. Sand all pieces with 120-grit paper, then move up to 220-grit to complete the pre-finish smoothing. Use an orbital sander and with-the-grain sanding strokes to remove any marks or scratches. Wipe the piece carefully with a clean, lint-free cloth lightly dampened with mineral spirits.

### Recommended Finish

10. Apply the Minwax® Wood Finish™ you've chosen to the interior surfaces using a natural bristle brush and a clean, lint-free cloth following the directions on the can. The brush will help you get the stain into the many inside corners and other tight spots. Allow the Wood Finish™ to set for about 5 to 15 minutes, then wipe off any excess. To achieve a deeper color, you may apply a second coat after 4-6 hours, repeating the application directions for the first coat. Allow the stain to dry for 24 hours before applying the protective clear finish.

**Woodworker's Tip:** *When wiping off stain, make certain that your last wipe with the cloth goes with the grain of the wood. This way, any stain you might miss during wipe-off will be visually minimized by the wood grain.*

11. Apply Minwax® Fast-Drying Polyurethane following the directions on the can. Use a good quality, natural bristle brush. Allow the first coat to dry overnight.

12. The next day, sand all surfaces lightly with 220-grit or finer sandpaper using with-the-grain strokes. Wipe all surfaces with a cloth lightly dampened with mineral spirits. Apply a second coat of polyurethane and set the piece aside to cure overnight.

13. The following day, sand all surfaces lightly with 220-grit paper. Wipe the piece with a cloth lightly dampened with mineral spirits and apply the third and final coat of polyurethane. When the polyurethane is dry, apply a thin bead of glue to the trim pieces (L, M) and clamp them to the clock case. If any glue squeezes out, wipe it away immediately with a damp sponge or paper towel. Allow the piece to cure for a few days before installing the clock mechanism. It's simply a pressure fit and requires no fasteners.

### Alternate Finish

Before applying Minwax® Water-Based Wood Stain to a hardwood or softwood, apply Minwax® Pre-Stain Water-Based Wood Conditioner following the directions on the can. After 1 to 5 minutes, wipe off all excess conditioner using a clean, lint-free cloth. Wait 15 to 30 minutes then use fine-grade sandpaper to sand off any "whiskers" raised by the conditioner. Proceed to the staining within 2 hours.

14. Apply the Minwax® Water-Based Wood Stain you've chosen using either a nylon/polyester brush or soft cloth. Allow stain to penetrate no longer than 3 minutes. While stain is still wet, wipe off all excess with a clean cloth that's been lightly dampened with stain. Allow the piece to dry for 2 hours before applying a second coat, if desired. Allow the pieces to dry overnight before assembling and applying the protective clear finish.

**Woodworker's Tip:** *Minwax® Water-Based Wood Stain is available in 6 factory wood tones, a White Wash Pickling Stain, 60 custom-mixed colors, and 8 bold Accents™ colors. This means that you are not limited to just traditional wood colors (pine, oak, walnut, etc.). Instead, you can actually pick and apply a color to complement the décor of the room in which the clock will be placed. For this reason, make sure you look over all of the Minwax® color charts or go to [minwax.com](http://minwax.com) before making your final selection.*

15. After allowing the assembled piece to dry overnight, apply Minwax® Polycrylic® Protective Finish following the directions on the can. Stir the can contents thoroughly before starting and periodically repeat the stirring during your work session.

16. Working a small area at a time to maintain a wet edge, apply the first coat. Work quickly and make the final strokes in each newly finished section using with-the-grain brushstrokes.

17. Allow the finish to dry a minimum of 2 hours. Then sand lightly with 220-grit or finer sandpaper wrapped around a soft backup block. Thoroughly wipe all surfaces with a cloth lightly dampened with water.

18. Repeat steps 15 and 16 to apply the second and final coat. Allow the piece to cure for a few days before installing the clock mechanism. It's simply a pressure fit and requires no fasteners.

### PRODUCT SAFETY

For your safety and the safety of those you work with, always read the safety warnings, which manufacturers print on their labels, and follow them to the letter. Typical safety advice and instructions will contain information such as the following:

**WARNING!** Removal of old paint by sanding, scraping or other means may generate dust or fumes that contain lead. Exposure to lead dust or fumes may cause brain damage or other adverse health effects, especially in children or pregnant women. Controlling exposure to lead or other hazardous substances requires the use of proper protective equipment, such as properly fitted respirator (NIOSH approved) and proper containment and cleanup. For more information, call the National Lead Information Center at 1-800-424-LEAD (in US) or contact your local health authority.

### When using oil-based wood finishing products:

**CAUTIONS: CONTAINS ALIPHATIC HYDROCARBONS. Contents are COMBUSTIBLE.** Keep away from heat and open flame. **VAPOR HARMFUL.** Use only with adequate ventilation. To avoid overexposure, open windows and doors or use other means to ensure fresh air entry during application and drying. If you experience eye watering, headaches, or dizziness, increase fresh air, or wear respiratory protection (NIOSH approved) or leave the area. Avoid contact with eyes and skin. Wash hands after using. Keep container closed when not in use. Do not transfer contents to other containers for storage.

**FIRST AID:** In case of eye contact, flush thoroughly with large amounts of water for 15 minutes and get medical attention. For skin contact, wash thoroughly with soap and water. In case of respiratory difficulty, provide fresh air and call physician. If swallowed, call Poison Control Center, hospital emergency room, or physician immediately.

**NOTICE:** Reports have associated repeated and prolonged occupational exposure to solvents with permanent brain and nervous system damage. Intentional misuse by deliberately concentrating and inhaling contents may be harmful or fatal.

**WARNING:** This product contains a chemical known to the State of California to cause cancer and birth defects or other reproductive harm.

**DO NOT TAKE INTERNALLY. KEEP OUT OF REACH OF CHILDREN.**

**When using water-based wood finishing products:**

**CAUTIONS:** Use Only With Adequate Ventilation. To avoid overexposure, open windows and doors or use other means to ensure fresh air entry during application and drying. If you experience eye watering, headaches, or dizziness, increase fresh air, or wear respiratory protection (NIOSH approved), or leave the area. Avoid contact with eyes and skin. Wash hands after using. Keep container closed when not in use. Do not transfer contents to other containers for storage.

**FIRST AID:** In case of eye contact, flush thoroughly with large amounts of water. Get medical attention if irritation persists. If swallowed, get medical attention immediately.

**WARNING:** Contains Alkyl propanols, ethylene glycol, n-methyl pyrrolidone. **VAPOR HARMFUL.** Use only with adequate ventilation. To avoid overexposure, open windows and doors or use other means to ensure fresh air entry during application and drying. If you experience eye watering, headaches, or dizziness, increase fresh air, or wear respiratory protection (NIOSH approved) or leave the area. Avoid contact with eyes and skin. Wash hands after using. Keep container closed when not in use. Do not transfer contents to other containers for storage.

**DO NOT TAKE INTERNALLY.**

**FIRST AID:** In case of eye contact, flush thoroughly with large amounts of water for 15 minutes and get medical attention. For skin contact, wash thoroughly with soap and water. In case of respiratory difficulty, provide fresh air and call physician. If swallowed, call Poison Control Center, hospital emergency room, or physician immediately.

**DELAYED EFFECTS FROM LONG-TERM OVEREXPOSURE.**

Contains solvents which can cause permanent brain and nervous system damage. Intentional misuse by deliberately concentrating and inhaling contents may be harmful or fatal.

**WARNING:** This product contains a chemical known to the State of California to cause cancer and birth defects or other reproductive harm.

**KEEP OUT OF REACH OF CHILDREN.**

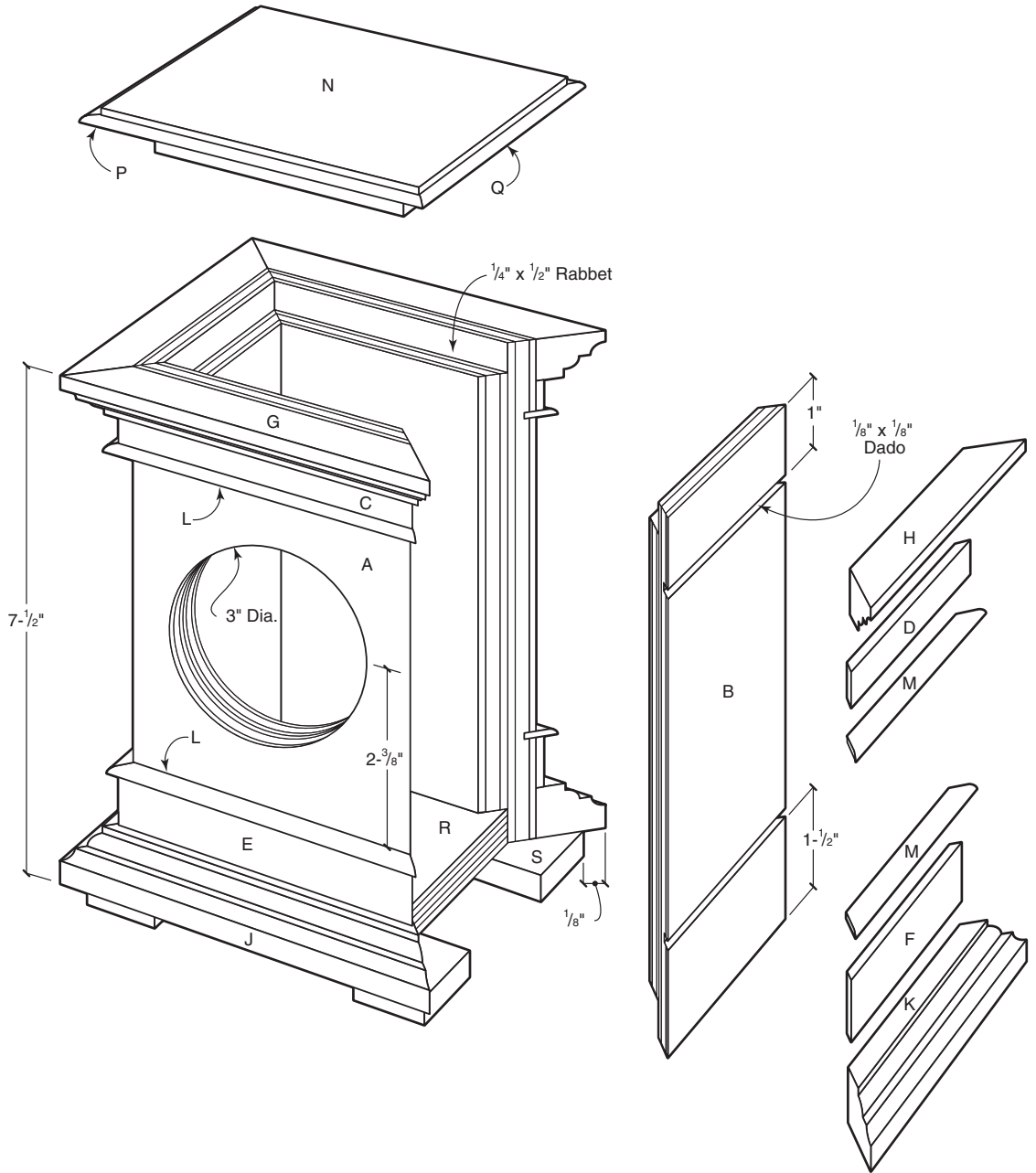
**SAFE DISPOSAL OF RAGS AND WASTE.**

**DANGER:** Rags, steel wool, other waste soaked with this product, and sanding residue may spontaneously catch fire if improperly discarded. Immediately place rags, steel wool, other waste soaked with this product, and sanding residue in a sealed, water-filled, metal container. Dispose of in accordance with local fire regulations.

**Source**

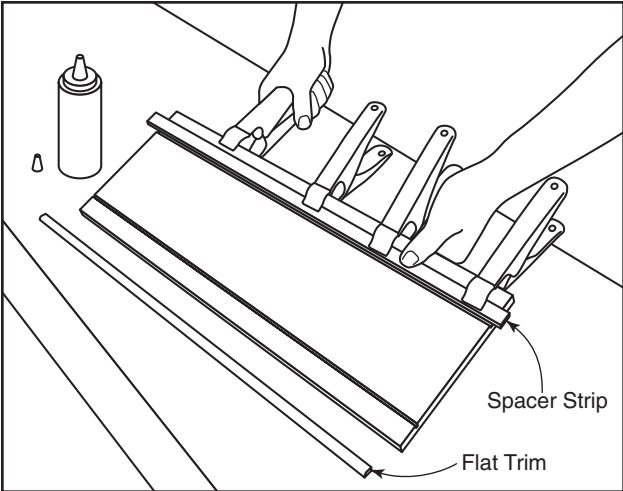
Clock insert, #23995, \$10.59  
Rockler Companies, Inc.  
(800) 279-4441  
www.rockler.com

**FIG 1. CLOCK DETAIL**

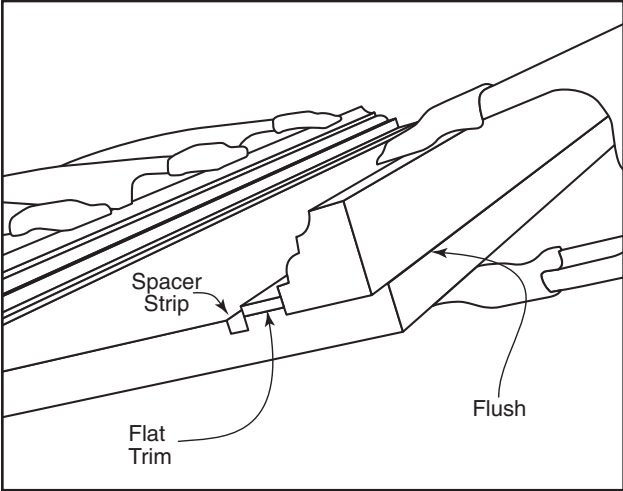




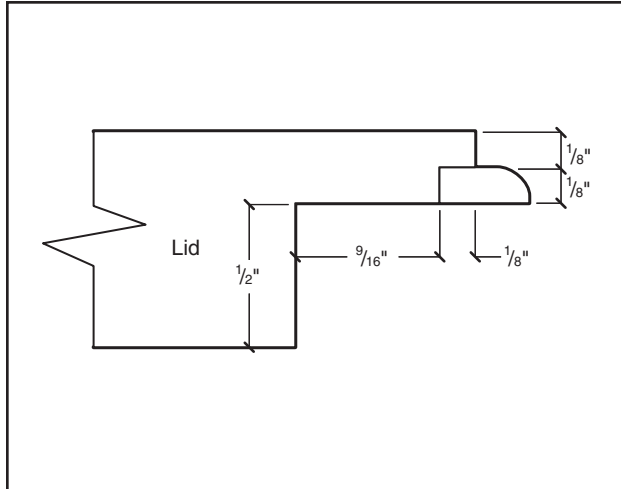
**FIG 2. GLUE AND CLAMP THE FLAT TRIM**



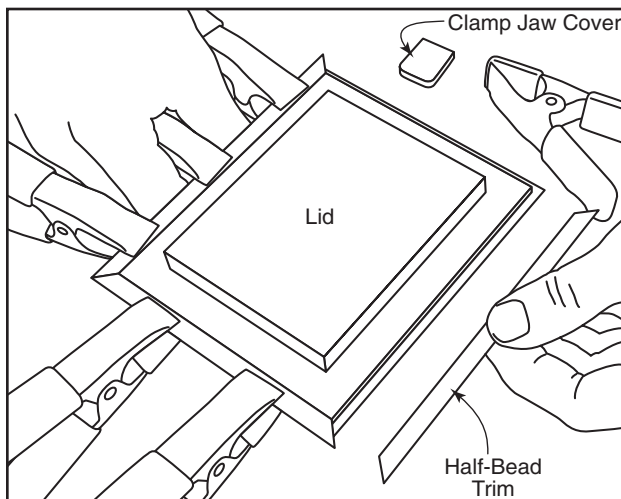
**FIG 3. GLUE AND CLAMP THE MOLDING**



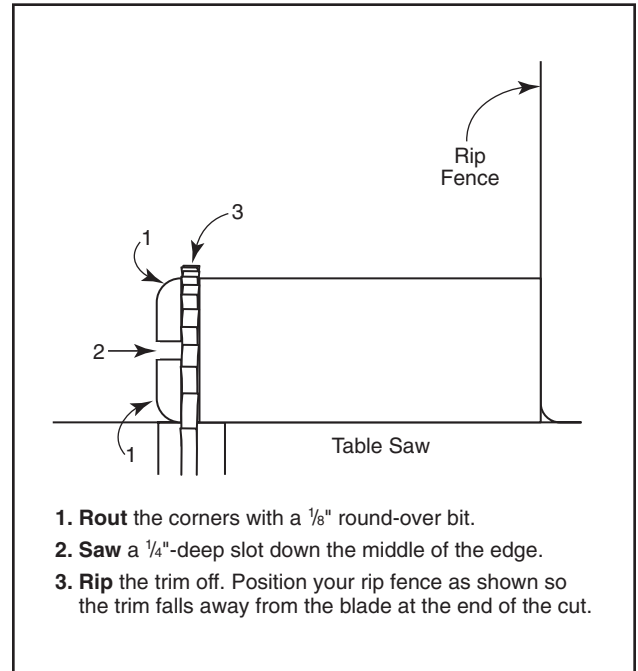
**FIG 4. BOTTOM LID DETAIL**



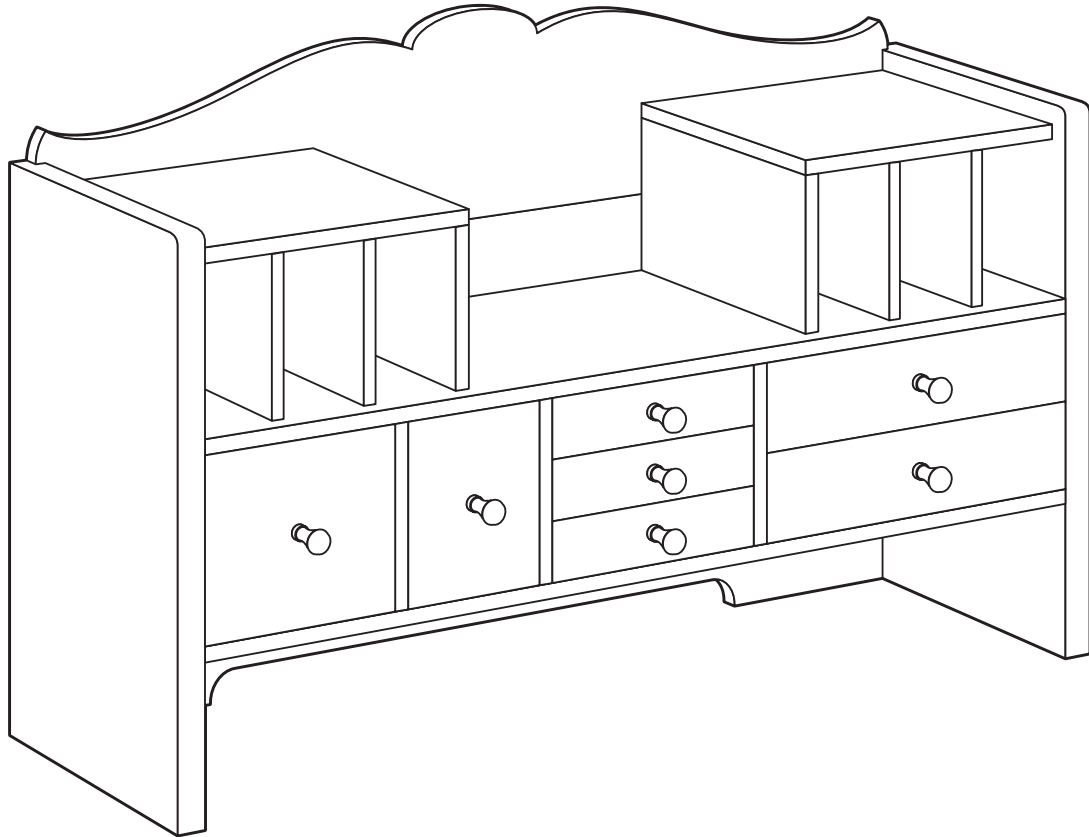
**FIG 6. GLUE THE HALF-BEAD TRIM**



**FIG 5. CUTTING SEQUENCE FOR THE HALF-BEAD TRIM**



# Desk Caddy



This desk caddy gives you the specialized storage features of a traditional secretary desk yet can sit atop any regular desk or computer work surface. Pigeonholes keep incoming mail organized while a variety of drawers hold stationery, pens and pencils and other supplies. The overall construction of the case uses sliding dovetail joints because they're strong, invisible and can be made with a router, as can the half-blind dovetails for the drawer boxes. You'll also get some practice with a scroll saw or jigsaw on the decorative top and with a lathe when you make the drawer pulls. And when it's all done, you'll learn more about applying and using stains and finishes to protect the wood and keep it looking beautiful.

## TOOLS REQUIRED

### Hand Tools

- Mallet

### Power Tools

- Table saw with combination rip/crosscut blade and dado blades
- Router and router table with straight-cutting and dovetail bits
- Router fence, used for sliding dovetails
- Drill with 1" dia. Forstner bit
- Scroll saw or jigsaw
- Orbital sander

### Miscellaneous

- Pencil
- Tape measure
- Safety glasses
- Carpenter's glue
- 120-, 180- and 220-grit sandpaper
- Clean, lint-free cloths
- Respirator
- Gloves for finishing
- Mineral spirits (for oil-based stains and finishes)
- Water-filled metal container with tight-fitting lid (for oil-based stains and finishes)
- Minwax® Wood Finish™ Stain Brush or other good quality, natural bristle brush (for oil-based stains and finishes)

## SHOPPING LIST

**Recommended wood:** Cherry

**Alternate wood:** Pine

3/4" x 11-1/2" cherry:	4 lin. ft.
1/2" x 11-1/2" cherry:	14 lin. ft.
3/4" x 9-1/2" cherry:	9 lin. ft.
1/2" x 7-1/2" clear pine:	8 lin. ft.
1/4" birch plywood:	One 20" x 30" piece

## CUTTING LIST

Overall Dimensions:  
36"w x 10-7/8"d x 20-3/4"h

Key	Part	Pcs.	Material	Dimensions
A	Sides	2	cherry	3/4" x 10-7/8" x 18-1/2"
B	Shelves	2	cherry	1/2" x 10-1/4" x 35-1/4"
C	Dividers	3	cherry	1/2" x 10-1/4" x 6-3/8"
D	Pigeonhole tops	2	cherry	1/2" x 9-1/2" x 10-5/8"
E	Pigeonhole end walls	2	cherry	1/2" x 9-1/2" x 5-1/2"
F	Pigeonhole dividers	4	cherry	3/8" x 9" x 5-1/4"
G	Back slats	3	cherry	5/8" x 8" x 35"
H	Drawer A front and back	2	cherry, pine	1/2" x 5-7/8" x 6-15/16"
I	Drawer A sides	2	pine	1/2" x 5-7/8" x 9-1/2"
J	Drawer A bottom	1	birch plywood	1/4" x 6-1/4" x 9-1/2"
K	Drawer B front and back	2	cherry, pine	1/2" x 5-7/8" x 4-15/16"
L	Drawer B sides	2	pine	1/2" x 5-7/8" x 9-1/2"
M	Drawer B bottom	1	birch plywood	1/4" x 4-5/8" x 9-1/2"
N	Drawer C front and back	4	cherry, pine	1/2" x 1-5/8" x 7-15/16"
O	Drawer C sides	4	pine	1/2" x 1-5/8" x 9-1/2"
P	Drawer C bottom	2	birch plywood	1/4" x 7-5/16" x 9-1/2"
Q	Drawer D front and back	2	cherry, pine	1/2" x 2-3/8" x 7-15/16"
R	Drawer D sides	2	pine	1/2" x 2-3/8" x 9-1/2"
S	Drawer D bottom	1	birch plywood	1/4" x 7-5/16" x 9-1/2"
T	Drawer E front and back	4	cherry, pine	1/2" x 2-7/8" x 12-7/16"
U	Drawer E sides	4	pine	1/2" x 2-7/8" x 9-1/2"
V	Drawer E bottom	2	birch plywood	1/4" x 11-7/8" x 9-1/2"
W	Drawer guides	14	pine	1/4" x 3/4" x 9-3/8"
X	Drawer pulls	7	cherry	3/4" dia. x 1" l (turned from 1 x 1 stock)

## WOOD FINISHING PRODUCTS

### Recommended Finish

Prep: Minwax® Pre-Stain Wood Conditioner

Stain: Minwax® Wood Finish™ Golden Pecan

Finish: Minwax® Fast-Drying Polyurethane Semi-Gloss

### Alternate Finish

Prep: Minwax® Pre-Stain Wood Conditioner

Stain: Minwax® Gel Stain Mahogany

Finish: Minwax® Wipe-On Poly Satin or Gloss

## BEFORE YOU BEGIN

Good craftsmanship begins and ends with good work habits, so make the following steps part of your routine workshop practice. If you have any doubts or questions about how to proceed with a project, always discuss them with your shop instructor.

- Carefully and fully review plans and instructions before putting a tool to the project lumber.
- Work sensibly and safely. Wear safety goggles when doing work that creates flying chips and sawdust; wear the appropriate respirator whenever making sawdust or working with thinners or other solvents.
- At the end of every work session, clean up your shop area and put away all portable tools.

## CUTTING AND ASSEMBLY PROCEDURE

1. Start by cutting only the case parts listed on the **CUTTING LIST**. Refer to Fig. 1 for the general layout of the entire piece. Don't cut the drawer parts until the entire piece is assembled, in case there are subtle changes to the opening sizes.

**Woodworker's Tip:** Before cutting parts that include half-blind dovetails, make a test piece to determine how long your jig makes the tails. Half-blind jigs do not all cut the tails to the same length. This variable will affect all the drawer parts and the pigeonhole end walls. It's safest to produce a sample half-blind joint first, then take measurements from that to determine the size of the rest of the pieces.

2. Rabbet the back edges of the sides (A) to receive the back slats (G).

3. Lay out the sliding dovetail slots on the sides and cut them with a router that's guided by a fence (Fig. 4).

**Woodworker's Tip:** After cutting the sliding dovetail sockets, note the change in depth of cut between the sides and the shelves. Then cut the tails on the ends of the shelves and slide them, partially, into their sockets. This will allow a precise socket-to-socket measurement to be taken for the dividers.

4. With a table-mounted router fitted with a fence (Fig. 5), cut the sliding dovetails on the ends of the shelves (B), the dividers (C), the pigeonhole tops (D) and the pigeonhole end walls (E).

5. Lay out and cut the dovetail slots on the shelves (B) to receive the dividers (C).

6. Lay out 1/8" x 3/8" blind dados in the top face of the top shelf (B) and the bottom faces of the pigeonhole tops (D) to receive the pigeonhole dividers (F). Also cut 1/8" x 1/2" dados in the top face of the top shelf to receive the pigeonhole end walls (E).

7. Set up the half-blind dovetail jig and use the hand router to cut the dovetails in the ends of the pigeonhole tops (D) and the pigeonhole end walls (E).

8. To finish the drawer detailing, cut 1/4" x 1/4" dados in the drawer fronts, back and sides to receive the drawer bottoms (J, M, P, S, V).

9. Lay out and cut the concave curve on the front edges of the pigeonhole dividers (F).

10. Make the tongue-and-groove joints on the appropriate edges of the back slats (G). Test-fit the slats in the back edges of the sides and rip the bottom slat as needed to make the top slat finish 3-1/4" above the sides.

11. Use the grid shown in Fig. 3 to lay out the scrollwork on the top-most back slat (G). Cut the design with a scroll saw or jigsaw and sand the edge to the finished shape.

12. In the bottom back slat, make a 1"-high, 23"-long cutout to serve as a pass-through for electrical cords. Give the inside corners of the cutout a 1" radius. Establish the radius with a 1" Forstner bit or cut it with a scroll saw.

13. After finish-sanding all the parts with 180- and 220-grit sandpaper, glue and assemble the shelves, dividers, sides and back, making sure that the case is dead square. Do not glue the back slats to each other or to the case; use only the specified screws. The back slats can be used to square the case and hold it square while the glue dries. Use a damp cloth or paper towel to wipe away any excess glue as soon as it appears.

14. Measure the resulting drawer openings and cut the drawer parts accordingly. See Fig. 6 to determine the locations of drawers A, B, C, D and E.

15. Use the dovetail jig to cut the half-blind dovetails in the drawer fronts, backs and sides (Fig. 2) (H, I, K, L, N, O, Q, R, T, U). Then set up either the router or the router table to cut the 1/4" x 3/4" slots in the drawer sides (I, L, O, R, U).

16. Assemble the drawers by gluing and joining the front, back and one side, slipping in the bottom and then gluing and joining the remaining side. A rubber or wooden mallet will help in tapping together the dovetails.

17. After waiting to let the glue set, test each drawer guide (W) in the slot with which it will be paired. Whenever the fit is too tight, sand the edge of the guide until it moves easily, but not at all loosely, through its respective slot.

18. Drill mounting holes in the guides. The rear hole should be horizontally elongated to allow for movement. The front hole should be vertically elongated to allow for adjustment.

19. Determine the locations of the drawer guides on the sides (A) and the dividers (C). Fasten the guides with #6 x 1/2" flat-head screws only, no glue.



20. Slide each drawer all the way into its respective opening. Adjust the drawer guides as needed. If necessary, plane or sand a drawer front, and possibly the sides, to produce a consistent gap between it and the case.

**Woodworker's Tip:** For the best appearance, cut all the drawer fronts from the same section of wood to get continuity in the grain.

## STAINING AND FINISHING

**Woodworker's Tip:** Though you may be tempted to cut short your sanding, preparation and application time, don't do it. These tasks are very important steps in obtaining a high-quality finish. Remember, it is the finish, just as much as the fit and smoothness of the parts that will have great bearing on how people judge your craftsmanship. To ensure an excellent result, follow the steps listed in this section and also the instructions the finish manufacturer puts on its products.

### FINISHING TIPS

- Test the stains and finishes you are planning to use on scraps of wood. On the back of the scrap, mark the stain/finish combination and the type of wood. Allow all samples to dry thoroughly before making your final finish selection. Save your samples for quick reference on future projects.
- All stains and finishes must be allowed to dry thoroughly between coats. Remember that drying times can vary due to humidity and other climatic conditions.
- If you have some leftover stain or finish, wipe the can rim so that stain or finish in the rim won't dry out and prevent the lid from forming a tight seal.
- Brushes used for oil-based finishes must be cleaned with mineral spirits.

21. Finish-sand any remaining rough spots with 220-grit sandpaper. Dust off the piece and wipe it carefully with a clean, lint-free cloth lightly dampened with mineral spirits.

### Recommended Finish

22. Apply the Minwax® Wood Finish™ you've chosen using a natural-bristle brush and a clean, lint-free cloth following the directions on the can. The brush will help you get the stain into the inside corners. Allow the Wood Finish™ to set for about 5 to 15 minutes, then wipe off any excess. To achieve a deeper color, you may apply a second coat after 4-6 hours, repeating the application directions for the first coat. Allow the stain to dry for 24 hours before applying the protective clear finish.

**Woodworker's Tip:** When wiping off stain, make certain that your last wipe with the cloth goes with the grain of the wood. This way, any stain you might miss during wipe-off will be visually minimized by the wood grain.

23. Apply Minwax® Fast-Drying Polyurethane following the directions on the can. Use a good quality, natural-bristle brush. Allow the first coat to dry overnight.

24. The next day, sand all surfaces lightly with 220-grit or finer sandpaper using with-the-grain strokes. Dust off and wipe all surfaces with a cloth lightly dampened with mineral spirits. Apply a second coat of polyurethane and set the piece aside to cure overnight.

25. The following day, sand all surfaces lightly with 220-grit sandpaper. Dust off and wipe the piece with a cloth lightly dampened with mineral spirits and apply the third and final coat of polyurethane.

### Alternate Finish

26. Apply the Minwax® Gel Stain you've chosen using a clean, lint-free cloth or natural-bristle brush. Follow the directions on the can. Allow the Gel Stain to set for about 3 minutes, then wipe off any excess with a clean, lint-free cloth. To achieve a deeper color, you may apply a second coat after 8 to 10 hours, repeating the application directions for the first coat. Allow the stain to dry for 24 hours before applying the finish.

**Woodworker's Tip:** When wiping off stain, make certain that your last wipe with the cloth goes with the grain of the wood. This way, any stain you might miss during wipe-off will be visually minimized by the wood grain.

27. Apply Minwax® Fast-Drying Polyurethane following the directions on the can. Use a good quality, natural-bristle brush. Allow the first coat to dry overnight.

28. The next day, sand all surfaces lightly with 220-grit or finer sandpaper using with-the-grain strokes. Dust off and wipe all surfaces with a cloth lightly dampened with mineral spirits. Apply a second coat of polyurethane and set the piece aside to cure overnight.

29. The following day, sand all surfaces lightly with 220-grit sandpaper. Dust off and wipe the piece with a cloth lightly dampened with mineral spirits and apply the third and final coat of polyurethane.

### PRODUCT SAFETY

For your safety and the safety of those you work with, always read the safety warnings, which manufacturers print on their labels, and follow them to the letter.

**WARNING!** Removal of old paint by sanding, scraping or other means may generate dust or fumes that contain lead. Exposure to lead dust or fumes may cause brain damage or other adverse health effects, especially in children or pregnant women. Controlling exposure to lead or other hazardous substances requires the use of proper protective equipment, such as properly fitted respirator (NIOSH approved) and proper containment and cleanup. For more information, call the National Lead Information Center at 1-800-424-LEAD (in U.S.) or contact your local health authority.

**DANGER:** Rags, steel wool, other waste soaked with oil-based stains and clear finishes, and sanding residue may spontaneously catch fire if improperly discarded. Immediately place rags, steel wool, other waste soaked with this product, and sanding residue in a sealed, water-filled metal container. Dispose of in accordance with local fire regulations.

**When using oil-based wood finishing products:**

**CAUTIONS: CONTAINS ALIPHATIC HYDROCARBONS.**

Contents are **COMBUSTIBLE**. Keep away from heat and open flame.

**VAPOR HARMFUL**. Use only with adequate ventilation. To avoid over-exposure, open windows and doors or use other means to ensure fresh air entry during application and drying. If you experience eye watering, headaches, or dizziness, increase fresh air, or wear respiratory protection (NIOSH approved), or leave the area. Avoid contact with eyes and skin. Wash hands after using. Keep container closed when not in use.

Do not transfer contents to other containers for storage.

**FIRST AID:** In case of eye contact, flush thoroughly with large amounts of water for 15 minutes and get medical attention. For skin contact, wash thoroughly with soap and water. In case of respiratory difficulty, provide fresh air and call physician. If swallowed, call Poison Control Center, hospital emergency room, or physician immediately.

**DELAYED EFFECTS FROM LONG-TERM OVEREXPOSURE.**

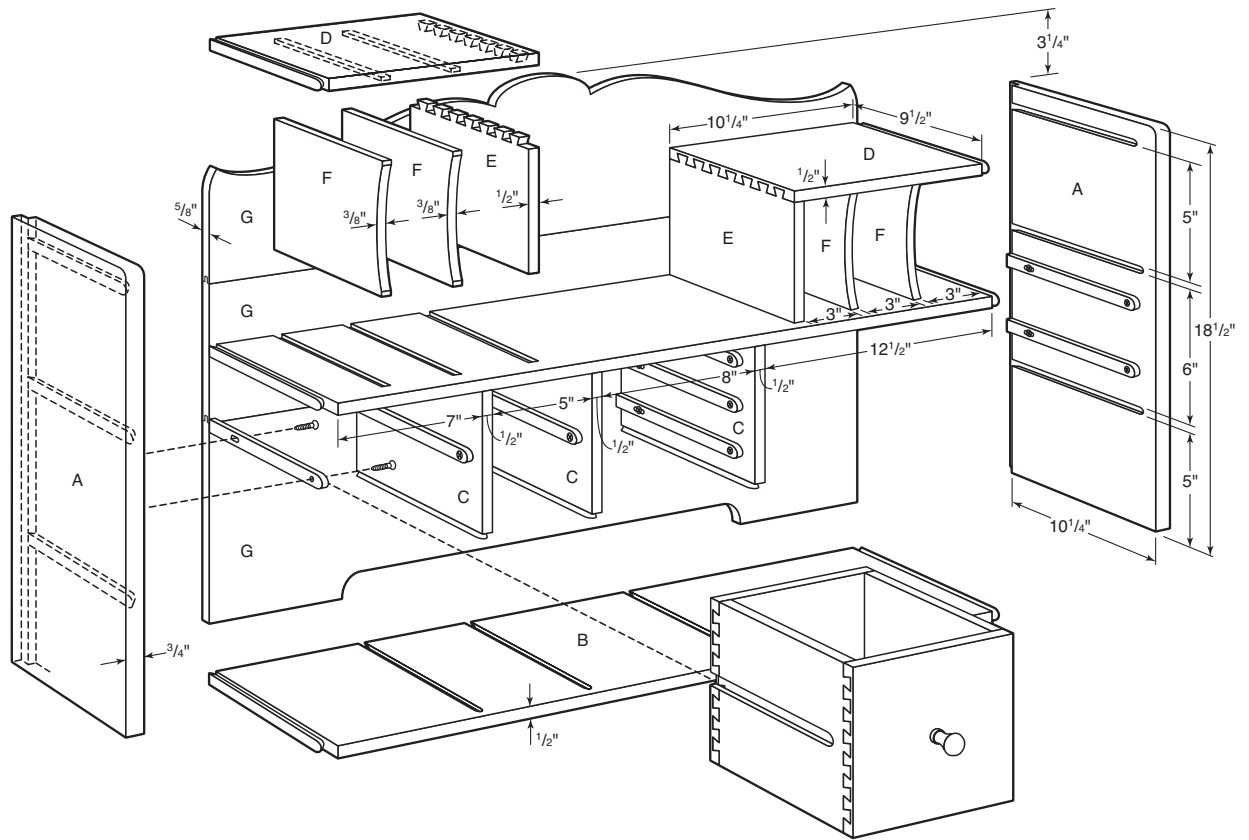
Contains solvents which can cause permanent brain and nervous system damage. Intentional misuse by deliberately concentrating and inhaling contents may be harmful or fatal.

**WARNING:** This product contains a chemical known to the State of California to cause cancer and birth defects or other reproductive harm.

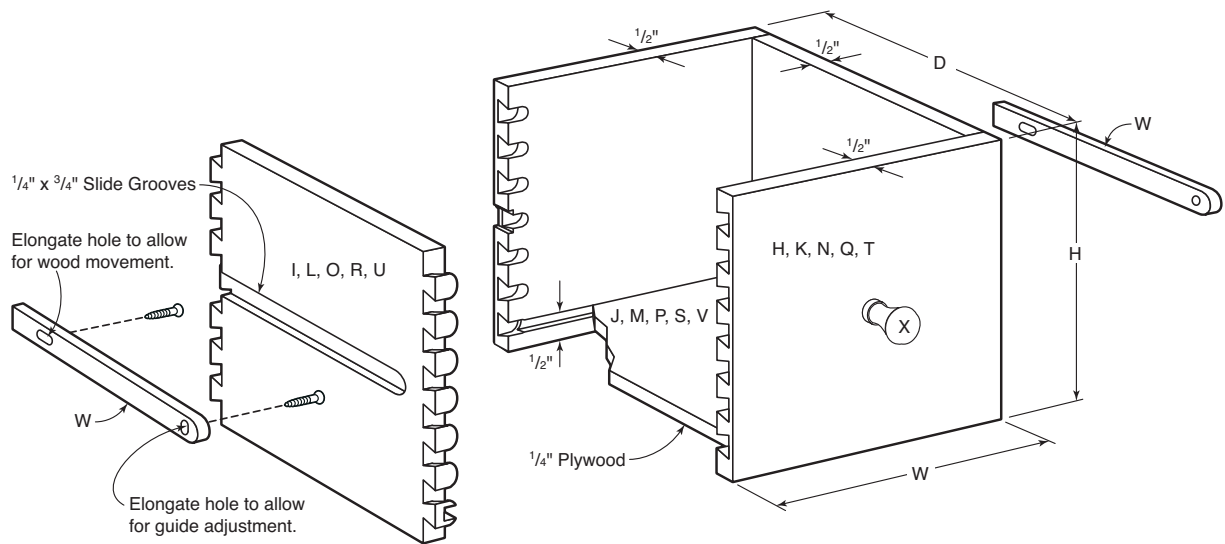
**DO NOT TAKE INTERNALLY. KEEP OUT OF REACH OF CHILDREN.**

CONFORMS TO ASTM D-4326. Contact a physician for more health information.

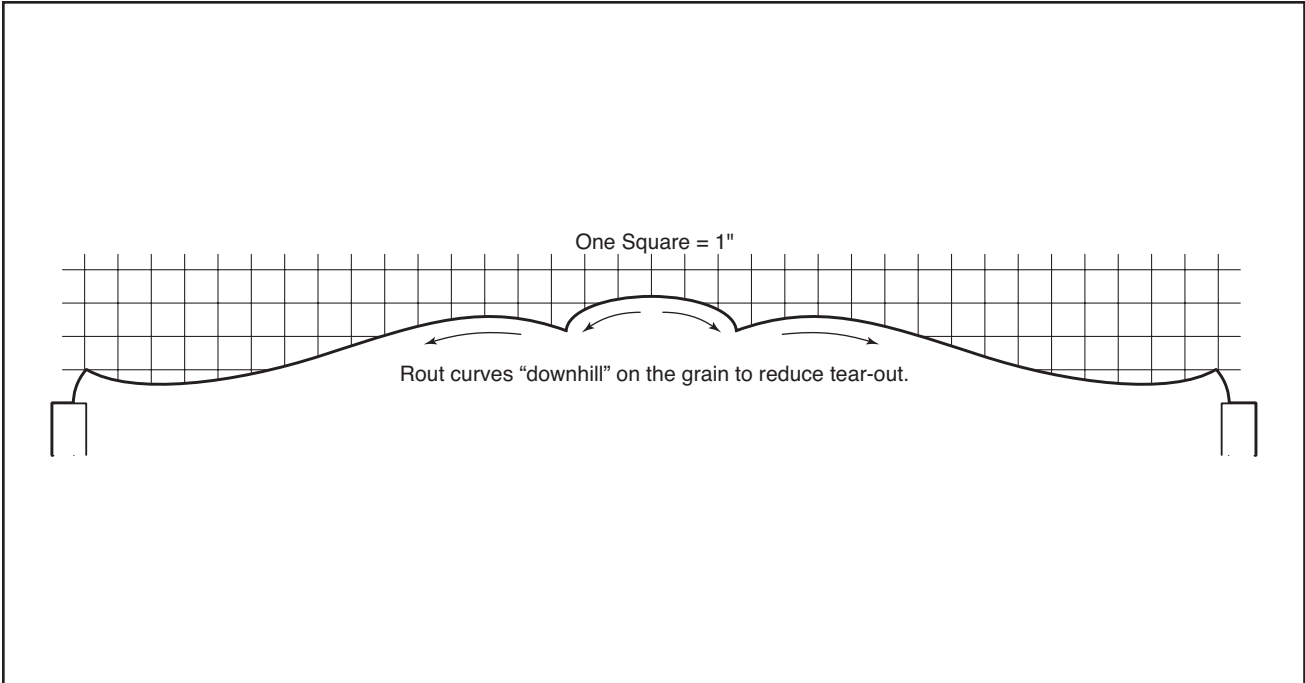
**FIG 1. DESK CADDY DETAILS**



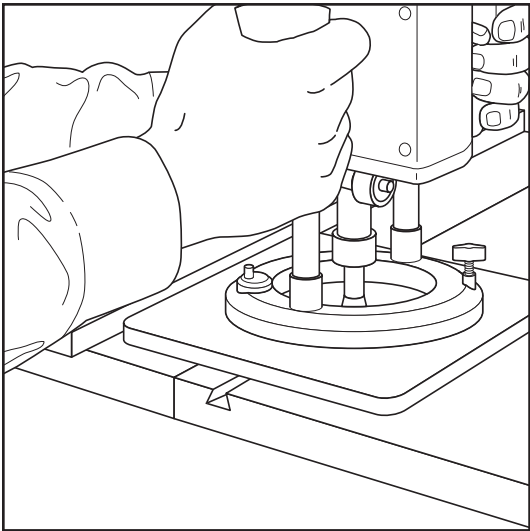
**FIG 2. DRAWER ASSEMBLY**



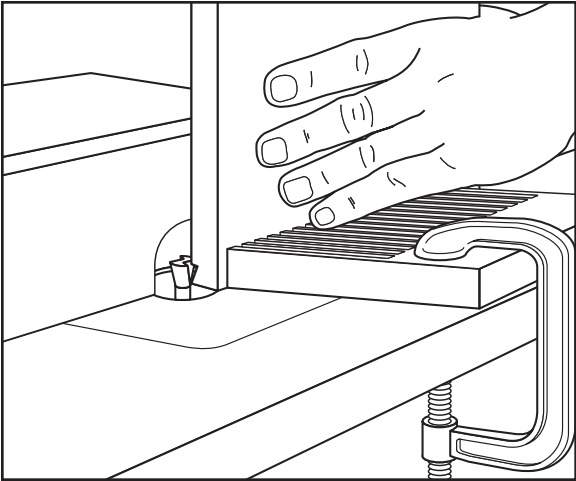
**FIG 3. SCROLL GRID FOR TOP RAIL**



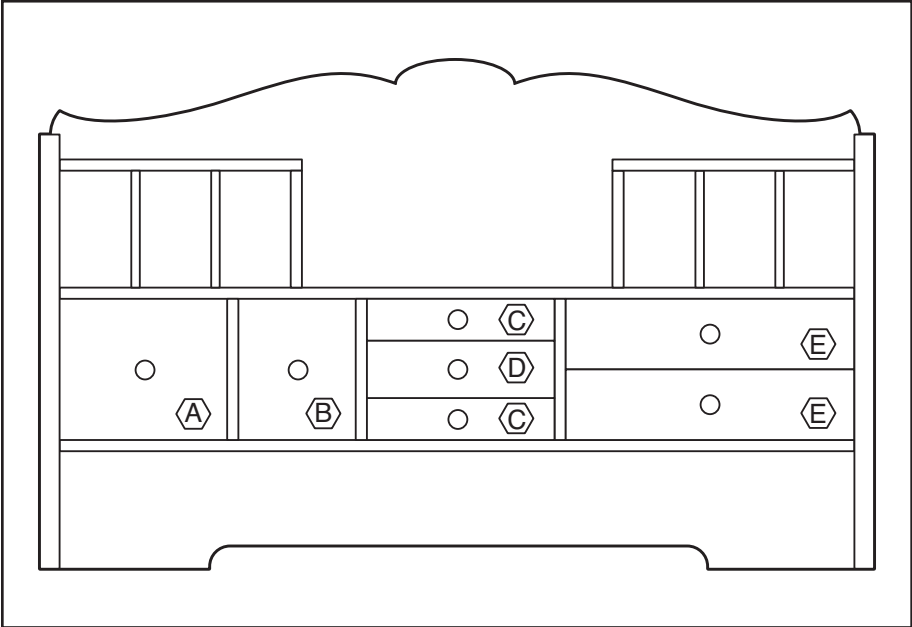
**FIG 4. CUT SLIDING DOVETAIL GROOVE**



**FIG 5. CUT SLIDING DOVETAIL TONGUE**



**FIG 6. DRAWER LOCATIONS**





# Contemporary Rolltop Desk

Made from red oak, this stylish rolltop writing desk provides a great deal of service in a small space. Based on a classic rolltop desk design, the piece includes a large drawer as well as a pigeon hole shelf unit for added storage space. To give the piece a contemporary look, the sides are extended to serve as the legs instead of resting on traditional pedestals.

This project will certainly challenge advanced woodworkers, testing their layout skills and ability to create and work with a router template, plough exact (mirror image) grooves as well as curved grooves, create accurate joints with the table saw, and create a professional-looking finish.

## TOOLS REQUIRED:

- |  |  |  |
|--|--|--|
| - Pencil                               | - Block plane                              | - Sanders (stationary belt, portable belt, random orbit, pad)      |
| - Ruler (zigzag or tape)               | - Assorted clamps                          | - Planer   |
| - Square (framing, combination or try) | - Assorted wood chisels                    | - Cordless drill-driver with Phillips driver bit                   |
| - 4 ft. T-square, or straight edge     | - Saws (dovetail, band, radial arm)        | - Safety glasses   |
| - Assorted files, rasps                | - Table saw and dado head set              | - Respirator   |
| - Phillips screwdriver (medium)        | - Jointer                                  | - Router (with 5/16" and 3/4" straight bits and rounding over bit) |
| - Hammer and fine nail set             | - Wood shaper                              |  |
| - Mallet (wooden or plastic)           | - Drill press (or portable electric drill) |  |

## MATERIALS REQUIRED:

See Shopping and Cutting Lists

## STAINING AND FINISHING PRODUCTS:

### Finish Recommended For This Project

- MINWAX® Pre-Stain Wood Conditioner
- MINWAX® WOOD FINISH™
- MINWAX® Fast-Drying Polyurethane

### Alternate finish choices (Choose one)

- MINWAX® PASTELS® Wood Stain
- MINWAX® POLYCRYLIC® Protective Finish
- MINWAX® POLYSHADES®
- MINWAX® WOODSHEEN®

### Miscellaneous

- MINWAX fine finishing brushes
- Clean rags
- Paint thinner, if required
- Water-filled metal container with cover

## BEFORE YOU BEGIN

This project requires 4/4 and 1/2" solid lumber and 1/4" cabinet grade veneer plywood. Since the majority of plywood panels are exposed to view on both sides, the plywood purchased should have cabinet-grade veneer on both sides. If two-sided material is not available, you can affix flexible veneer to the appropriate surfaces. Flexible veneer is widely available, comes in wide rolls and is easy to apply.

## PROCEDURE:

### I. Carcase – Layout and Cutting

1. Start by laying out the two curved rails (part A). For accuracy, make full size paper patterns for each of the two pieces (see diagrams for dimensions); carefully cut them out and tack them to the stock using a small amount of rubber cement. Note: Both pieces can be cut from a 10-1/2 x 30" board if laid out as shown.
2. Cut the curved rails using the radial arm saw to square the ends and cut the top portion; use the bandsaw to cut the curves.
3. Rip stock to width for all rails (parts D and F) and stiles (parts B, C, E) for the sides and back; cut pieces to length (see cutting list for exact measurements).
4. Mark each piece for the centered groove and tenon cuts. Note: All tenons and grooves are 1/4" wide x 3/8" deep unless otherwise indicated. Refer to diagrams for groove length information.
5. Set up dado cutter on the table saw to cut the centered grooves. Note: The grooves in the side stiles (part B) stop 7" from the bottom.

**BUILDER'S TIP:** Put two tape markers on the saw table opposite the lead and tail points. The two markers will guide you when making the partial groove cuts at the start or end of a run. This procedure also enables you to face the same side of each piece against the rip fence, which will help you avoid any problems due to inconsistencies in stock thickness (a common occurrence in hardwoods).

6. Using a 1/4" chisel, square the ends of the stopped grooves (parts B,C,E).
7. Set up a tenoning jig for the grooves on the top ends of the front stiles (part C). Cut grooves.
8. Next, cut the tenons on the rails (parts A, D, F). Start by making the shoulder cuts (width cut) on both sides of each end. Note that it will be necessary to shift the guide board to the other side of the blade for half of the cuts.

**BUILDER'S TIP:** The shoulder cuts on the curved rails (part A) are best done on a radial arm saw. Clamp a square board in place against the fence to serve as a stop to gauge the depth of the cuts and to align the curves. About the end of the rail against the stop, then make the cuts.

Then, use the table saw to make the cheek cuts (length cut). Note: If you have a multi-blade dado set you can make both cheek cuts in one pass by using only the two outside blades and a 1/4" spacer. Otherwise, make two passes with a conventional blade.

9. Next, cut the grooves in the edges of the curved rails on a shaper with a 1/4"-wide cutter. If you don't have access to a shaper, you can cut the grooves by making several passes with a router fitted with a slot cutter. The slot cutter will cut 1/2" deep although only a 3/8" deep groove is required. This is of no consequence; you need only adjust the dimensions of the plywood panel insert.

**BUILDER'S TIP:** If you must use the router to create the grooves on the curved rails, for best results make each groove in several slow passes, with each succeeding cut slightly deeper than the previous one

10. When the tongues and grooves have been completed, set up the dado head to cut the two stopped wide rabbets on the two back stiles (part B). The rabbet should be 5/16" deep x 13/16" wide, coming to a slightly rounded stop 7" from the bottom.
11. Next, sand all the inside edges of the stiles and rails. Dry assemble the pieces and measure the grooved openings for the plywood inserts (parts G,H,I,J). Sand the sharp corners of the frame at this time; wipe clean.
12. Cut the plywood panels to size. If you need to apply the flexible veneer, do so now. Cut the veneer slightly oversize and attach with appropriate amounts of veneer glue or contact cement. Trim off overhang. Allow glue to set.
13. Lay out and cut desktop slab (part L2). To start, rough cut a pair of boards to be edge-glued. Align the boards so they present the most pleasing visual grain; mark the mating pieces for the biscuit locations. Cut biscuit grooves with plate joiner. Apply carpenter's glue to board edges and biscuits; join boards, making sure ends are aligned, and clamp

together using bar clamps. Set aside for at least four hours. When glue is completely dry, remove clamps and cut to size.

14. Lay out and cut the desk top (part L1) to size. Cut the tambour stop (part K2) to length, sand smooth and affix to underside of desk top, 1/2" back from front edge. Set assembly aside.

## II. Assembly – Back and Side Frames

1. Assemble back frame. Apply glue to tenons on bottom rail (part F) and insert into the back stiles (part E). Slide in bottom plywood panel (part G) followed by the middle rail (part F). Then, slide in the top plywood panel (part H) followed by the third and final rail (part F), which should have glue on the tenons. Clamp pieces in place and set aside to dry. When dry, slightly round the bottom outside edge of the stiles (part E) to mate with the rounded rabbets in the side stiles (part B).
2. Assemble side frames. For each, start by applying glue to tenons on the bottom rail (part D) and insert into the side stiles (parts C and B). Slide in bottom plywood panel (part I) followed by the middle rail (part D). Finally, add the upper plywood panel (part J) and the curved rail (part A). Set assemblies aside over night.
3. When the glue has dried, sand the faces of the frames. Then, use the router with a straight cutter to make the dadoes (1/8" x 13/16") in the sides and back for the desktop slab (part L2).
4. Create a plywood template (see diagram) to cut the grooves in the sides that will receive the sliding tambour door. Cut out the template with a band or jig saw and carefully sand away any blade marks.
5. Lay out the template on the first side frame, setting it back 15/16". Tack template in place so its curved edge is parallel to the curved edge of the curved rail. Then, use a 5/16" diameter straight cutter with a router-template bushing guide to cut the grooves. Repeat for second side. Note: Take extra care when positioning the template on the second side, as the tambour door grooves need to be exact mirror images.

## III. Tambour Door

1. The 25 tambour slats (part N) are ripped from 1/2" stock on the table saw with the blade tilted at a 10 degree angle. A molding head cutter with a small radius curve is used to round the slat corners. Note: Use a feather board to keep the pieces snug against the rip fence.
2. Cut slats to length (see plans for dimensions). To cut the end rabbets on the underside of each slat, start by aligning the ends and taping them together. Then, clamp on a guide stick and make a pass with the dado head on the radial-arm saw. Using a guide stick helps you cut all the rabbets at the same time and guarantees that they will all have the same dimensions. Sand surfaces smooth and wipe clean.
3. A piece of 10 oz. canvas (part P) is used to join the slats. To assemble, start by taping the square yard of canvas to the workbench. Then, carefully lay out and tack down two guide strips — one along the back, the other along a side — making sure the strips meet at a right angle. Note: The side

guide should be less than 1/4" thick to permit the rabbet shoulders to abut accurately.

- Starting from the back edge and working forward, position and join the 25 slats to the canvas using contact cement. Note: It is imperative that you read and understand all contact cement application and safety instructions before proceeding with this step. After the 25 slats are in place, complete the door by affixing the tambour's bottom rail (part M - see diagram for dimensions) to the front and a retaining strip (part O) on the backside of the canvas aligned behind the bottom rail. The knobs will be attached to the bottom rail and secured with screws drilled through the retaining strip.
- Set tambour door assembly aside over night. After cement has set, position door knobs on tambour's bottom rail 4" in from each end. Mark the knob location; drill holes for screws. Insert screws from back side through retaining strip; screw knobs into place.

#### IV. Assembly

- Bore pilot holes for the screws in the top (part L1), back frame and side frames, using a 1/16" drill bit (see diagram for hole placement). Then, dry assemble the desk with desktop slab inserted and hold pieces in place with bar clamps. Now, continue drilling the pilot holes into the desktop slab and into the top edges of the vertical members.
- Disassemble the piece and finish drilling to counterbore and enlarge screw holes in the outer members.
- For the sake of convenience, it's wise to sand, stain and finish the inside surfaces of the desk at this stage, while the piece is disassembled (See Section VI).
- When the finish is dry, assemble the desk. After applying glue to the mating surfaces, attach the first side frame and the desktop slab to the back. Screw the pieces into place and wipe away any excess glue. Insert the tambour unit into the first side; attached the second side and finally the top. Screw the pieces into place.
- As the final step, cut the required number of wood plugs. Squirt glue into each screw hole and press plugs into place to conceal screwheads. If possible, allow plugs to rest over night before sanding. Projecting plugs should be sanded flush with cabinet surface using 120-grit paper in the random orbit sander. Finish all carcass sanding using 150-grit paper in the pad sander always working with the grain.

#### V. Pigeon Hole Shelf Unit (PHSU) and Large Drawer

- With the desk assembled, the PHSU and large drawer now can be constructed. To start, remeasure the desk to determine accurate dimensions for the two pieces. If necessary, alter the dimensions in the plans to suit.
- Lay out and cut the required members (parts Q through DD) to size. Plough the necessary rabbets (see diagram for dimensions) in the PHSU top (part T), PHSU drawer fronts (part AA) and larger drawer members (parts Q and R).
- Dry assemble the PHSU and large drawer to check for fit and size. Make any necessary adjustments.
- Again, for the sake of convenience, it's wise to sand, stain and

finish the PHSU and drawer while the pieces are disassembled (See Section VI).

- When the finish is dry, assemble PHSU and drawer using straightforward construction techniques.

**BUILDER'S TIP:** *Since the sides, back and bottom of the two small drawers in the PHSU are made of 1/4" plywood stock, and will carry little weight, they can be assembled using simple butt joints and brads. However, the front pieces (part AA) are made of oak and will require rabbets for assembly as indicated previously.*

- Locate and bore holes for the large and small drawer knobs. Attach knobs.
- Finally, lay out and cut the rails (part K1) for the large drawer (see plans for dimensions). Position rails on inside of each side frame and nail into place.
- Install PHSU and drawer into desk assembly.

#### VI. Sanding, Staining, Finishing

- Read and follow label instructions for all products.
- Sand surfaces smooth, then wipe with a tack cloth to remove all traces of dust.
- If working with a soft wood, such as pine, apply MINWAX® Pre-Stain Wood Conditioner according to label instructions. Wait 15 minutes, and wipe away excess using a clean rag.
- Within two hours, apply the MINWAX® WOOD FINISH™ of your choice to all surfaces using a clean brush and with-the-grain strokes. Remember to stir the stain well - do not shake. Allow stain to penetrate for 5-15 minutes. Wipe off excess with clean, lint-free rag. Additional coats may be applied for deeper color. Allow to dry at least 4-6 hours between coats.

**BUILDER'S TIP:** *To achieve a subtle "pickled" appearance, use MINWAX® PASTELS® Summer Straw.*

- Stir MINWAX® Fast-Drying Polyurethane before and during use. Do not shake. Using a natural bristle brush, apply a thin coat to all stained surfaces per label instructions.
- Allow finish to dry for at least three hours (longer if conditions are humid); when dry lightly sand again using 220-grit paper and wipe clean.
- Apply second coat and let dry. When dry, install the drawers knobs.
- Allow finish to cure for approximately two weeks.

#### Optional Stain/Finish:

*For stain and polyurethane protection in one easy step, use any MINWAX® POLYSHADES® or MINWAX® WOODSHEEN® color according to label instructions.*

#### VII. Clean Up

- If you have product left over, wipe the can rim so that product in the rim won't dry out and prevent the lid from forming a tight seal.
- Clean brushes used for oil-based finishes with mineral spirits; soap and water are all that is needed for brushes used for water clean-up products such as MINWAX® POLYCRYLIC® Protective Finish.



## VIII. PRODUCT SAFETY

**DANGER! HARMFUL OR FATAL IF SWALLOWED. SKIN IRRITANT. COMBUSTIBLE. KEEP OUT OF REACH OF CHILDREN.**

**DANGER:** Contains mineral spirits. Harmful or fatal if swallowed. Do not take internally. Skin irritant. Avoid contact with skin and eyes. Wear rubber gloves and safety glasses when handling. Combustible. Do not use or store near heat, sparks, flame or other source of ignition. Close container after each use. Avoid inhalation and use only with adequate ventilation. If using indoors, open all windows and doors to make sure there is fresh air movement. If you experience lightheadedness, dizziness or headaches, increase fresh air movement or leave the area. Reports have associated repeated and prolonged occupational overexposure to solvents with permanent brain and nervous system damage. Intentional misuse by deliberately concentrating and inhaling the contents may be harmful or fatal.

**FIRST AID:** If swallowed: Do not induce vomiting. Call physician immediately.

**FOR SKIN CONTACT:** Wash thoroughly with soap and water. If irritation persists, get medical attention.

**FOR EYE CONTACT:** IMMEDIATELY flush eyes thoroughly with water, then remove any contact lenses. Continue to flush eyes with water for at least 15 minutes. If irritation persists, get medical attention.

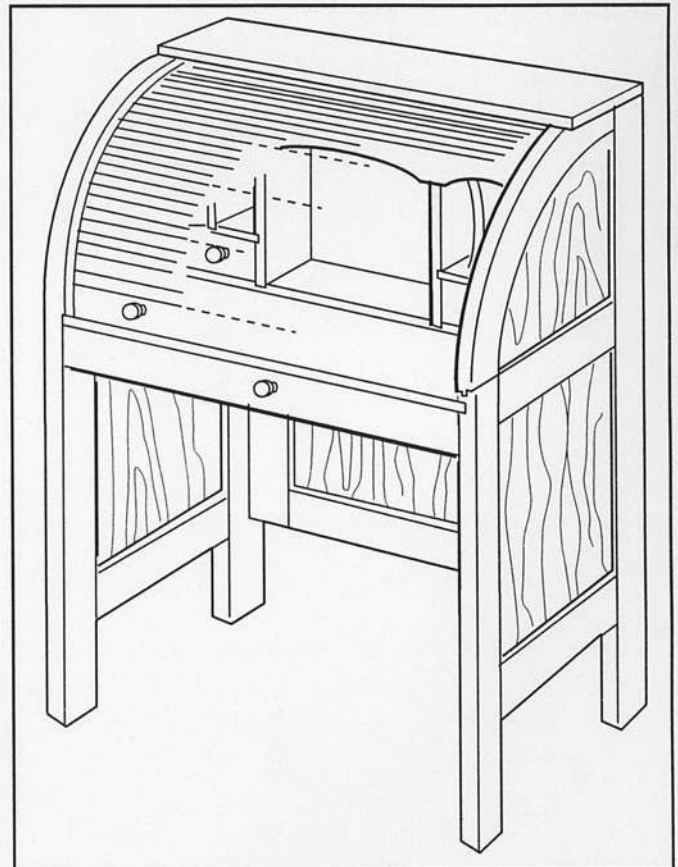
**IF AFFECTED BY INHALATION:** Immediately remove to fresh air. If symptoms persist, call physician.

## IX. Safe Disposal of Rags & Waste

Please be mindful of the safe way to dispose of used rags and other waste. Rags, steel wool and other waste soaked with oil finishes may spontaneously catch fire if improperly discarded. Place rags, steel wool and waste immediately after use in a water-filled metal container. Tightly seal and then dispose of in accordance with local regulations. Be sure to keep the container out of reach of children.

## FINISHER'S TIPS

- Most woodworkers agree that raw wood should be sanded to at least the 150 grit stage, before applying any finishing materials. Sandings between coats should be done with 180 to 220 grit abrasives.
- If you're working with a water-based finish, such as MINWAX® POLYCRYLIC® Protective Finish, don't use the standard tipping-off procedure. Instead: (1) Transfer a full brush-load to the surface and quickly spread using with-the-grain strokes. (2) Immediately use cross-grain strokes to eliminate any chance of holidays (missed spots). (3) Complete using with-the-grain strokes across the full length of the surface, being careful not to leave any heavy spots.
- When additional surface protection is desired, apply two or three coats of MINWAX® Paste Finishing Wax over all exposed surfaces. Let stand for 10 minutes, then buff with a clean fiber scrub brush. Finish buffing with a clean, lint-free cloth.
- It is critical that all stains and finishes be allowed to dry thoroughly between coats. Remember, drying times can vary due to humidity and other climatic conditions.



**COMPLETED PROJECT**

### Materials Shopping List, nominal dimensions

While oak was used in the prototype, mahogany, cherry, walnut and even pine are equally suitable woods for this project. If a different wood is substituted, make certain to check for dimensional differences in stock.

Quantity	Nominal Dimensions	Material
1 pc.	1/2" x 8" x 72"	Red oak
1 pc.	1/2" x 8" x 96"	Red oak
1 pc.	1/2" x 8" x 144"	Red oak
1 pc.	1" x 8" x 96"	Red oak
2 pc.	1" x 12" x 96"	Red oak
1 pc.	1/4" x 48" x 96"	Red oak, double-sided veneer grade plywood
1 pc (opt.)	18" x 96"	red oak flexible veneer (note: This is the minimum size available, actual size needed, if necessary, is 16 x 60")
1 sq. yard		Canvas
3	model no. BP-724-30	Amerock* knobs (or equivalent)
2	model no. BP-725-30	Amerock* knobs (or equivalent)
16	1/2"	Wood plugs (cut from red oak)
8	3/8" x 2"	Grooved dowels

### Cutting List, actual dimensions

Before cutting pieces to size, double-check all measurements. This way, if there is any deviation from the dimensions shown in the drawings, you can change them to suit the piece you are building. Be sure to mark any dimension changes in color on the original drawings.

Key	Part	Actual Dimensions	Pcs. Required
A	Curved rails	Cut both from one board (13/16" x 10-1/2" x 30")	2
B	Stile (sides)	13/16" x 3" x 42"	2
C	Stile (sides)	13/16" x 3" x 28-1/2"	2
D	Rail (sides)	13/16" x 3" x 14-3/4"	4
E	Stile (back)	13/16" x 3" x 35"	2
F	Rail (back)	13/16" x 3" x 23-3/4"	3
G	Back panel (top)	1/4" x 16-1/4" x 23-3/4"	1 (plywood)
H	Back panel (bottom)	1/4" x 11-1/4" x 23-3/4"	1 (plywood)
I	Side panel (bottom)	1/4" x 14-3/4" x 16-1/4"	2 (plywood)
J	Side panel (top)	1/4" x 11-1/4" x 14-3/4"	2 (plywood)
K1	Drawer rail	13/16" x 7/8" x 17-1/2"	2
K2	Tambour stop	13/16" x 3/8" x 28-3/8"	1
L1	Top	13/16" x 8-1/4" x 30"	1
L2	Desktop	13/16" x 19-3/8" x 28-5/8"	1 (glued up)
M	Tambour bottom rail	1/2" x 1-3/8" x 28-7/8"	1
N	Tambour slats	1/2" x 3/4" x 28-7/8"	25
O	Retaining strip	1/8" x 1-1/4" x 27-7/8"	1
P	Canvas	1 sq. yard	1
Q	Drawer (front and back)	13/16" x 2-1/4" x 28-1/8"	2
R	Drawer (sides)	1/2" x 2-1/4" x 18-1/4"	2
S	Drawer (bottom)	1/4" x 18-1/4" x 27-5/8"	1 (plywood)
T	PHSU top and bottom	1/2" x 5-1/2" x 28-1/8"	2
U	PHSU sides	1/2" x 5-1/2" x 11"	2
V	PHSU large dividers	1/2" x 5-1/4" x 11"	2
W	PHSU small dividers	1/2" x 5-1/4" x 8"	3
X	PHSU shelves	1/2" x 5-1/4" x 8"	2
Y	PHSU fascia	1/4" x 1-1/4" x 28-1/8"	1 (plywood)
Z	PHSU back	1/4" x 11" x 27-5/8"	1 (plywood)
AA	PHSU sm. drawer (front)	1/2" x 2-7/16" x 7-3/8"	2
BB	PHSU sm. drawer (back)	1/4" x 2-7/16" x 7-3/8"	2 (plywood)
CC	PHSU sm. drawer (side)	1/4" x 2-7/16" x 5"	4 (plywood)
DD	PHSU sm. drawer (btm)	1/4" x 4-3/4" x 7-3/8"	2 (plywood)

#### Hardware

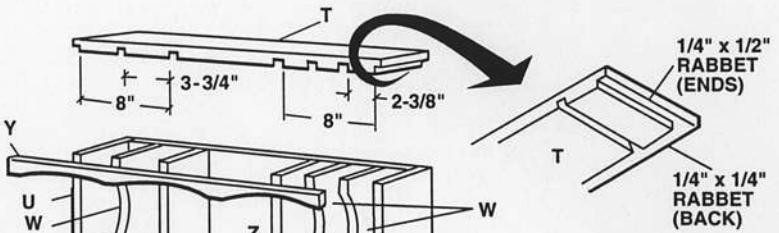
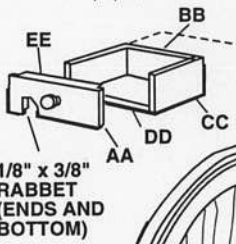
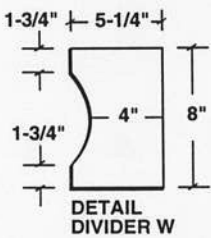
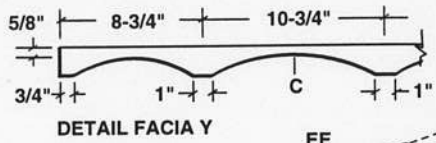
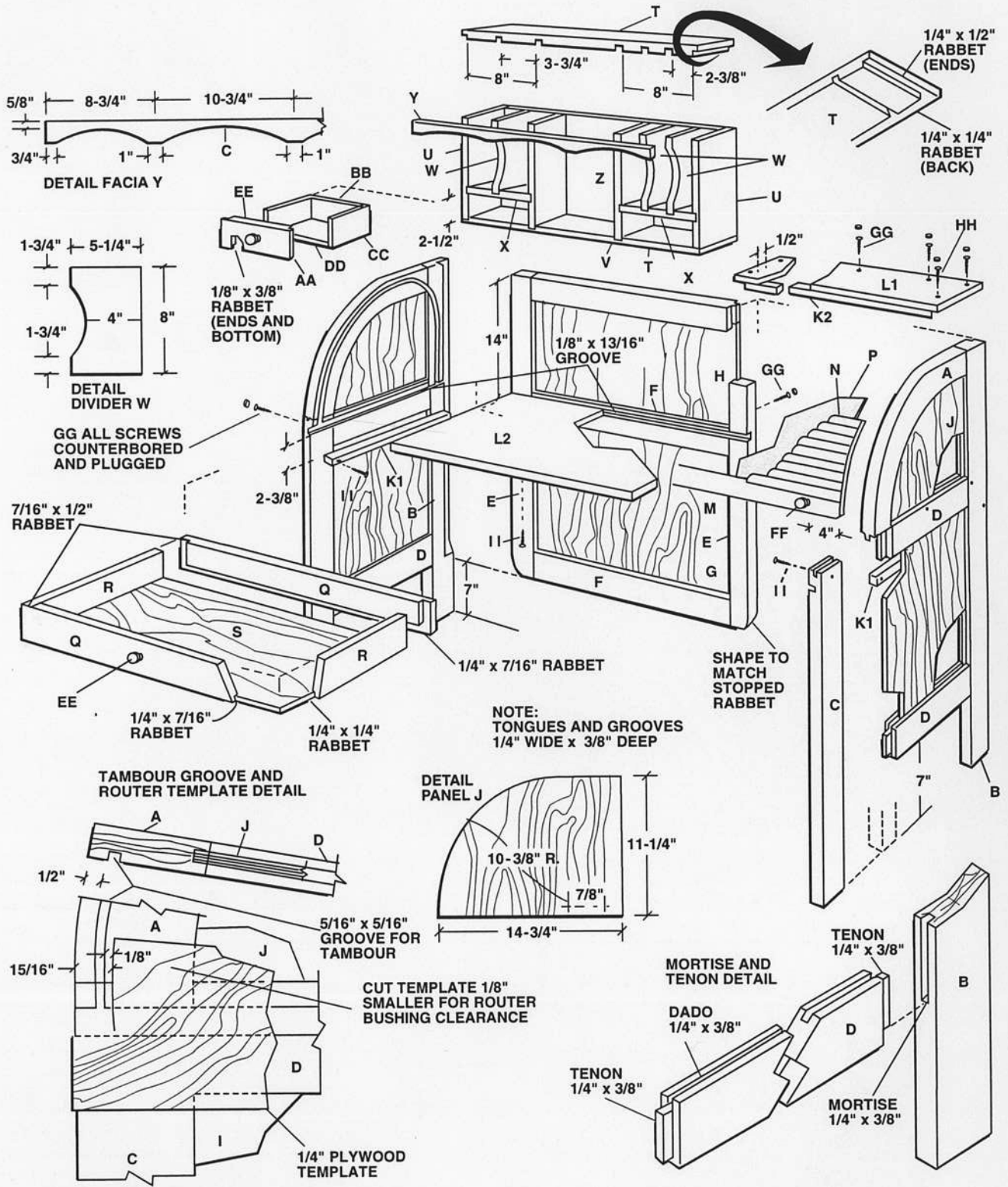
19 2-1/2" no. 12 flathead wood screws; two 1-1/4" no. 12 flathead wood screws; 6 1" no. 12 flathead wood screws

#### Miscellaneous:

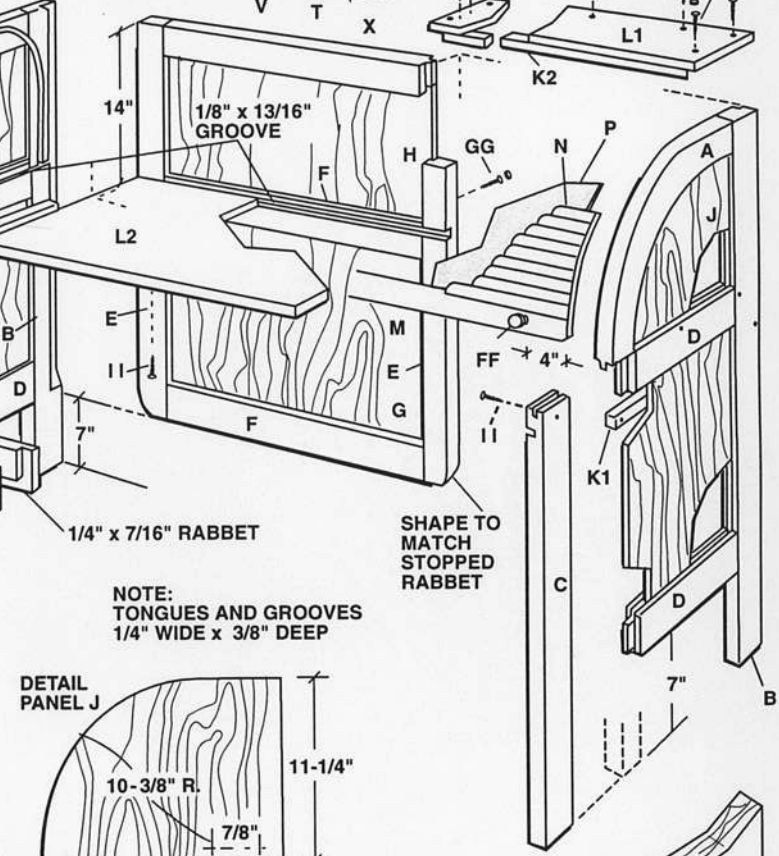
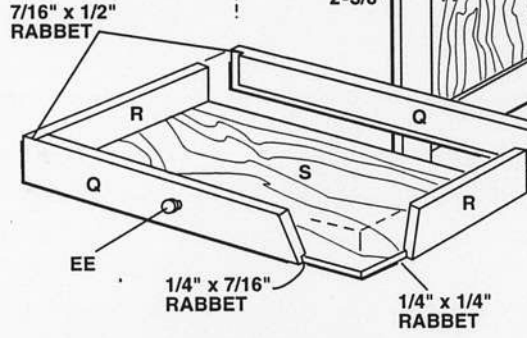
MINWAX Professional Strength Wood Glue, MINWAX fine finishing brushes, tack cloth, clean rags, water-filled metal container with lid, MINWAX® Sanding Block (100-through 220-grit), MINWAX® WOOD FINISH™ STAIN MARKERS™, mineral spirits, contact cement.

\* Amerock is a registered trademark of Newell Operating Company.

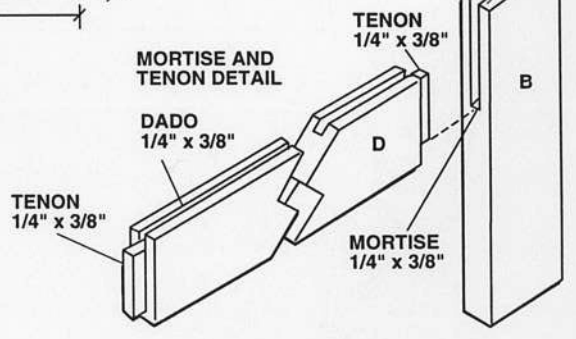
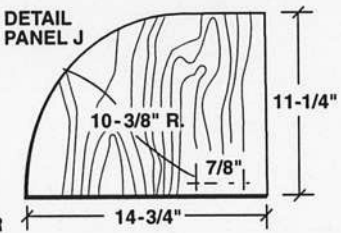
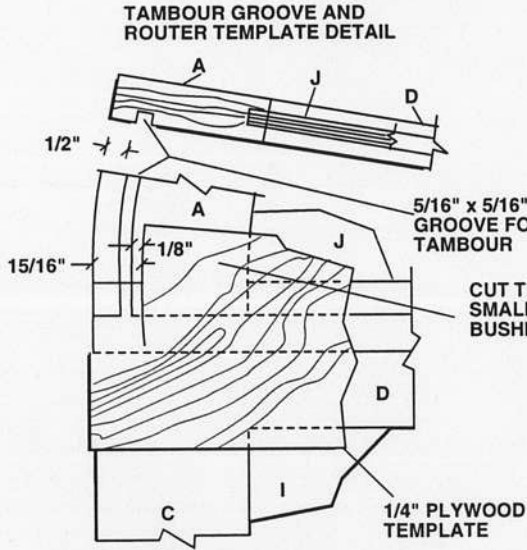


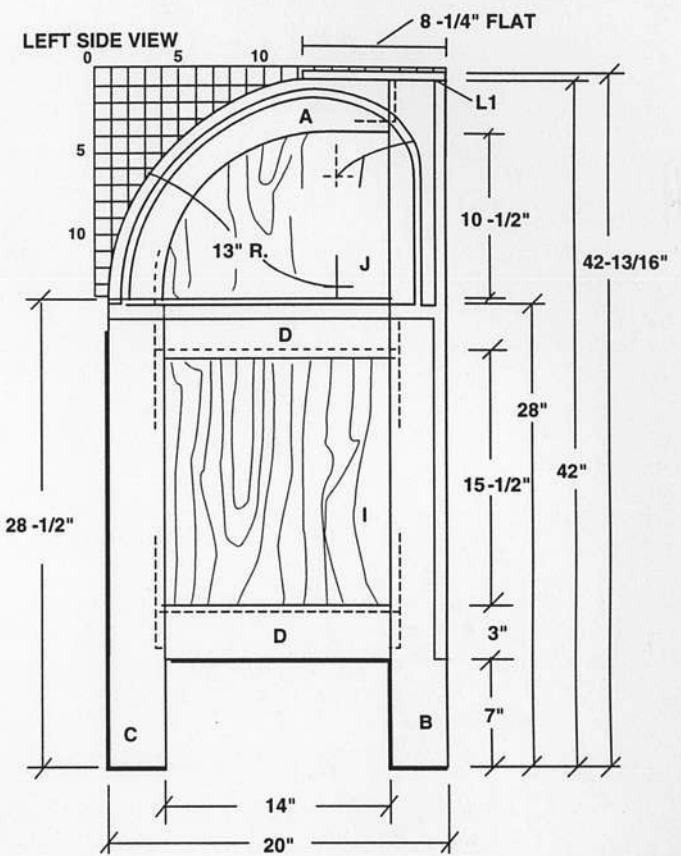
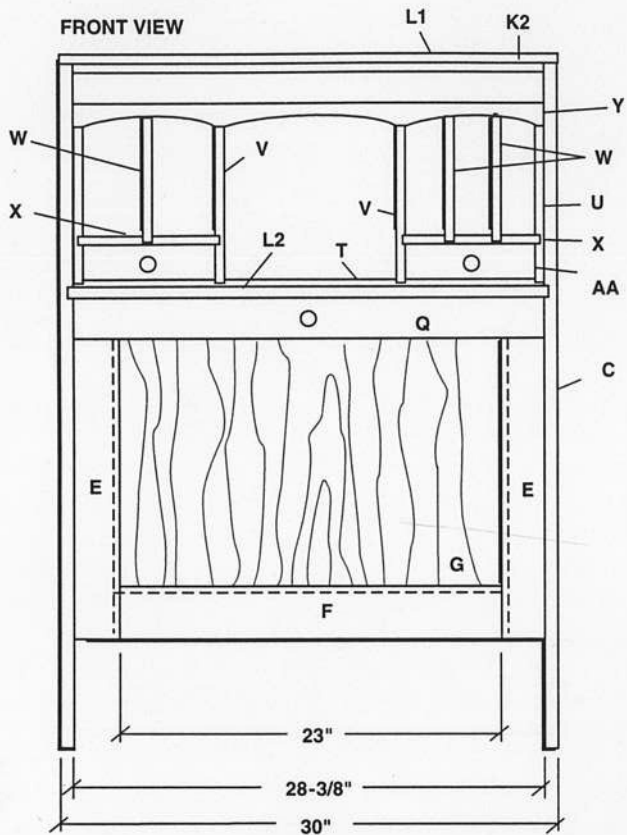


**GG ALL SCREWS COUNTERBORED AND PLUGGED**

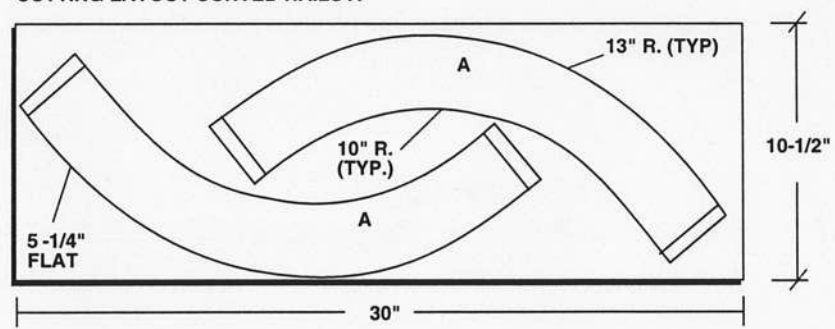


**NOTE: TONGUES AND GROOVES 1/4" WIDE x 3/8" DEEP**

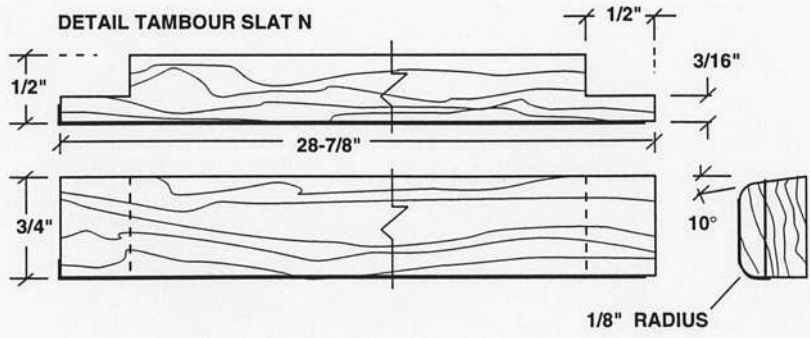




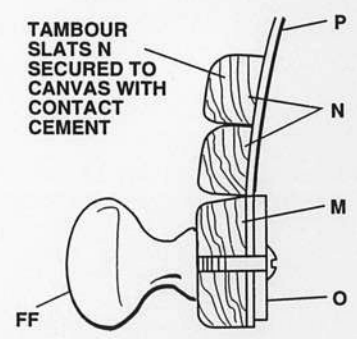
**CUTTING LAYOUT CURVED RAILS A**



**DETAIL TAMBOUR SLAT N**

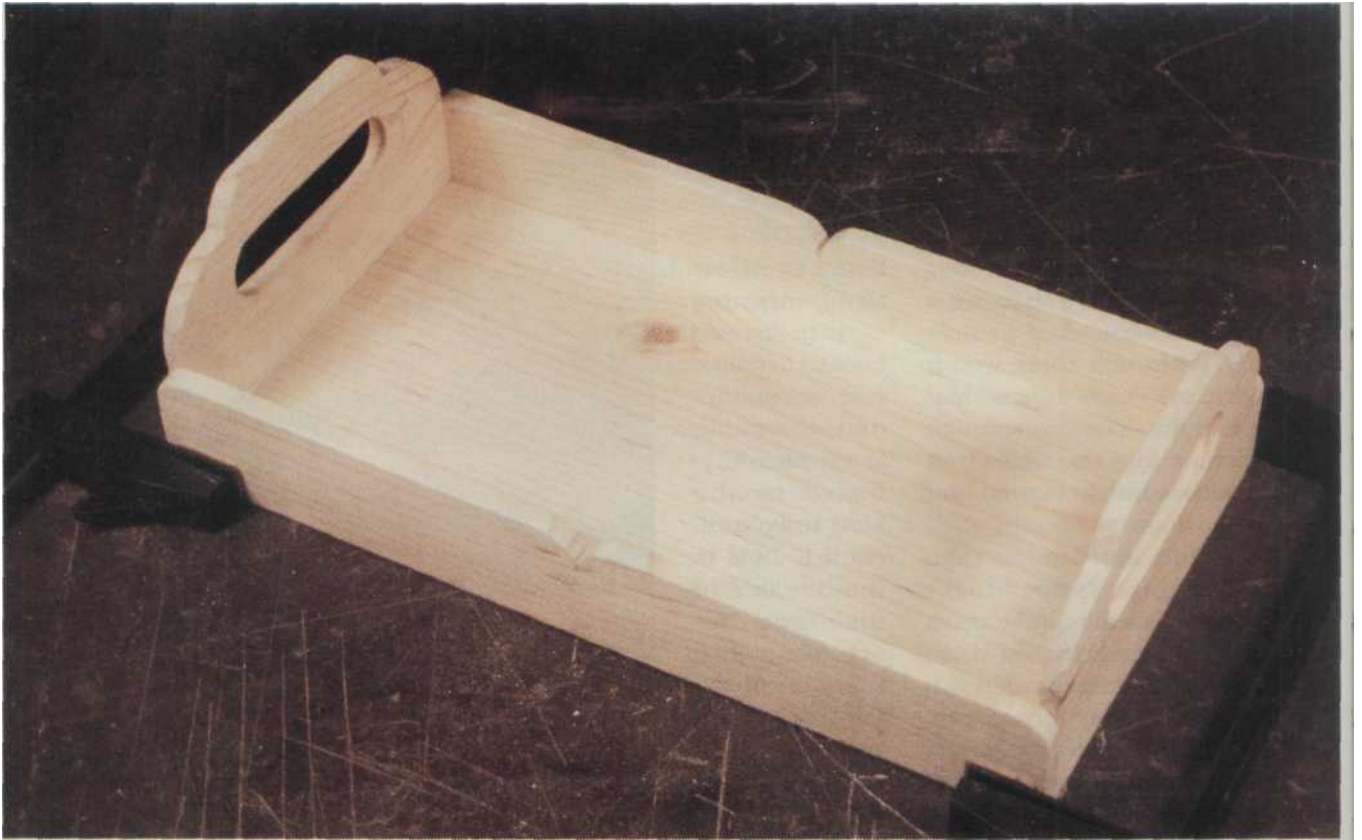


**TAMBOUR ASSEMBLY**



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# SERVING TRAY



This is a great project for using up some of that leftover, common pine you've got lying around the shop. It won't take much material or time to build this tray once you get the stock to its proper thickness.

You also should enjoy both the easy construction methods and the results. Another interesting feature is the use of round pegs that give the piece an antique look. Once you see how it's done, you'll want to use this method on other projects to add both strength and beauty.

Start with 3/4"-thick common pine stock and resaw it so it can be finished to a 1/4" thickness.

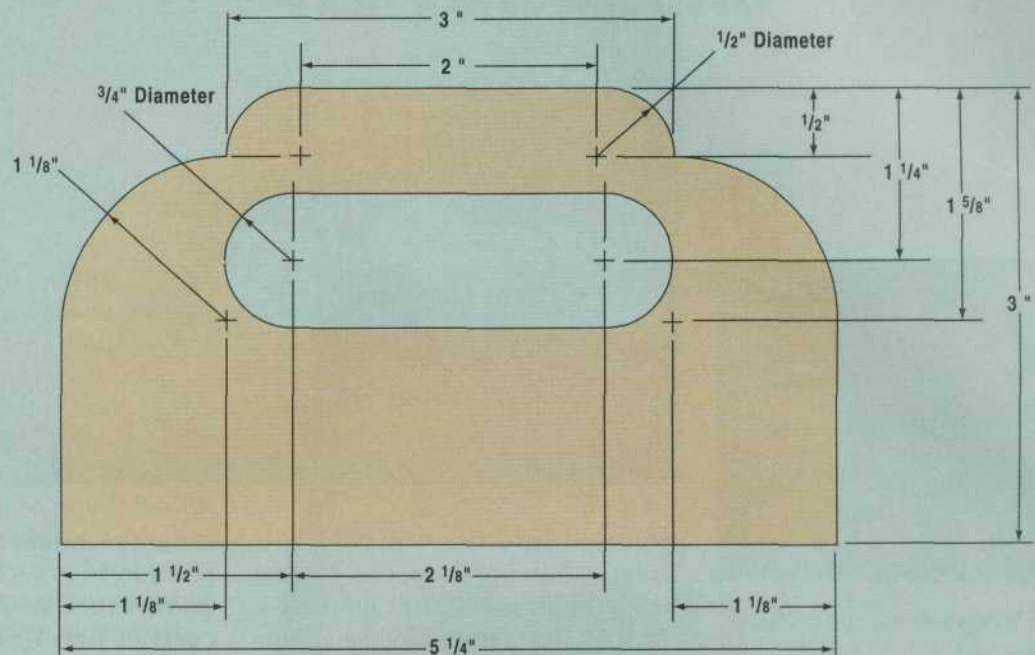
Resawing

the lumber is easily done on a band saw, but this material is so easy to work that you can probably hand plane it to thickness without too much trouble.

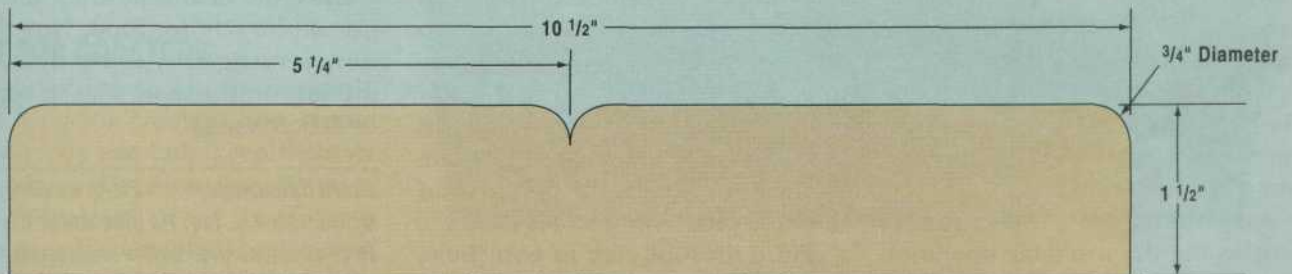
In either case, you should make sure all the cutting tools you're using are at their sharpest state because the fibers of softwoods, like pine, tend to compress rather than cut when worked with dull tools. This compression leads to crushed **edges** instead of the sharp edges that are formed when sharp tools are used.

If you elected to resaw the **boards**, you'll have to either finish plane or power sand the boards to

## DIAGRAM 1



End piece with dimensions for handle cut outs.



Front and back pieces with dimensions for decorative saw work.

their final thickness. I used a belt sander for this operation. The job went so quickly that the boards were down to their finished size almost before I realized it.

Cut the base to its finished length of 10", then set the rip fence on your table saw for the 5 1/4" width. Without changing the saw setting, rip another piece at least 7" long to the same 5 1/4" dimension. Cut this board into two pieces, each measuring 3 1/2" long x 5 1/4" wide. These two pieces will be used as the tray's ends.

Rip a pair of boards measuring at least 11" long into 1/4" widths to become the sides of the tray. Don't

cut these sides to length at this time.

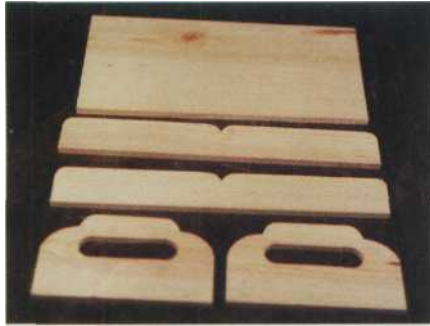
Before you go any further, you need to lightly touch up all the cut edges of the parts with some fine sandpaper. Be careful not to round any edges, just take off the fuzzies that formed when the cuts took place. Once this is done, your parts will be as clean as possible and ready for dry assembly.

Dry assembly is the act of putting the pieces together without any glue or fasteners to ensure everything is of the proper size. If you've never done this operation before, you should find this project to be a good opportunity to test it out.

Dry assemble the tray by butting one end panel against each end of the base board. Make sure the end panels are square to the base, and set a single side panel in position. Mark that panel for length, and cut both of the 1 1/2"-wide side panels to the same length. Touch up the cut edges with fine sandpaper, being careful not to round the edges.

Referring to the sketches, lay out the curved areas on the two end panels and two side panels. Instead of using a compass for the layout work, I found a drafting circle template works well and doesn't leave any holes from the compass pin. Cut the curves to shape, then drill a





The parts for the tray are completed and laid out prior to assembly.

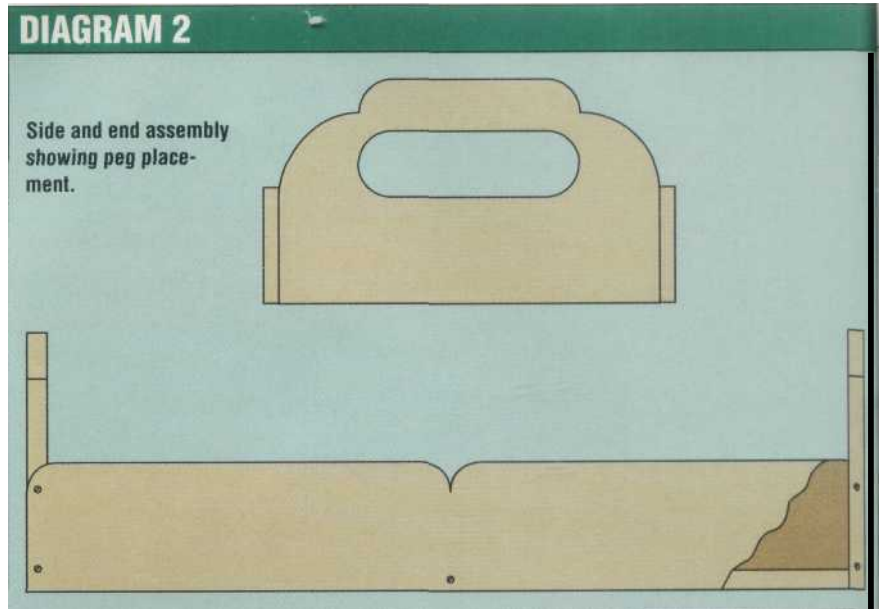
pair of 3/4"-diameter holes in each of the end panels for the finger cutouts. Use a coping saw, scroll saw, or jigsaw to cut out the finger openings in these two panels.

Lightly sand all pieces in preparation for final assembly, then dress up the cuts just made. Don't round any edges at this time.

Assembling the parts is just as easy as the dry assembly operation because you're doing the same steps, with the exception that this time you'll be using glue to hold the parts together. Set up for the assembly operation by getting your clamps set to the approximate openings and preparing your clamp blocks for use. Clear your work area, and have a container of water and a rag available for wiping up any excess glue.

Now you're ready to start. Apply some yellow woodworker's glue to the edges to be joined and butt all the parts together. A few light-duty clamps are all that are needed to hold the details in place.

Once the glue has completely dried, it's time to install the round pegs that help make this project unique. The pegs are nothing more than round wooden toothpicks that have had the tapered ends cut off,



then cut into two equal length pieces. The toothpicks I used needed only a #40 drill hole for a good fit, but you should check your toothpicks before drilling.

The holes should be drilled about 5/8" deep at the locations shown in the drawing. The pegs' exact locations aren't important. You also can create any pattern you choose to get the effect you want. I used only five pegs per side because the tray will be subjected to very light duty, but you could easily adjust the number to suit your own opinion on how the piece should look.

Put a drop of glue in each hole, then push the peg into place. Allow the glue to cure completely before trimming the pegs to length.

Trimming can be done with a sharp knife, a "setless" saw (like a backsaw), a chisel, or a belt sander. I chose a sharp chisel to get the pegs to the proper length, then touched up their ends with fine sandpaper.

At this time, you should dress up all the exposed edges on the assembly with sandpaper to remove the sharp areas. Pay particular attention to the end panels that will receive the most handling. It won't take too much effort to complete this step. Before you know it, you'll be ready to apply the finish.

I used a clear, water-soluble finish that's environmentally safe. Regardless of what you select for this job, you should follow the manufac-

turer's recommended application procedures to get the best results.

My directions called for three coats of finish with light sanding between coats. It definitely took more time for the coats to dry than it did to apply them, but the results were worth it.

Once the final coat dries, the finish will be safe for food. Now your new serving tray is ready to sit proudly on the table with its supply of delicacies.

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# CRAFTY COMPUTER DESK



For most computer owners, finding a desk with enough space for all the computer's components plus enough room to work is a challenge. While many models are on the market, most are made of pressed wood products lacking any redeeming aesthetic qualities.

This computer desk was carefully designed to satisfy the need for a functional work space and the desire for quality furniture.

A typical computer system has four basic pieces: a hard drive unit, monitor, keyboard and printer. These pieces must be hooked together with an array of plugs and cables. Through the pictures, drawings and text, you'll see how this center has been designed to accommodate these parts and hide unsightly cables.

The computer center consists of a desk and a hutch. Each is built as a separate unit, then assembled to complete the design. For both units, you will use 3/4" solid oak lumber, 3/4" MDF oak and 1/4" oak ply-wood. The solid oak is available in any length; the MDF and oak ply-wood come in 4' x 8' sheets.

A rule every experienced wood-worker lives by is "measure twice, cut once." Even though you're getting the most exact measurements possible, you should double check before cutting.

To begin, build the desk face frame from oak stiles and rails (**parts A-F**), using **diagram 1** and the **Materials List** as a guide. Special consideration should be given to the location of the shelf rails to accommodate your computer's

# DIAGRAM 1

## Materials List

### Desk

#### Desk Face Frames (3/4" solid oak)

- A 2 ends 1 5/8" x 29 1/4"
- B 1 middle 1 5/8" x 27 3/4"
- C 1 top 1 5/8" x 53 3/4"
- D 1 divider 1" x 20"
- E 2 dividers 3/4" x 20"
- F 1 base 2 3/4" x 20"

#### Desk Bulkheads (3/4" MDF oak)

- G 2 outer 23 3/4" x 29 1/4"
- H 1 inner 23 3/4" x 29 1/4"
- I 1 back rail 2 1/2" x 33"

#### Desk Shelves (3/4" MDF oak)

- J 3 22 1/2" x 23 3/4"

#### Drawers - (Overall 19" x 22", allowing 1/2" each side for the drawer slides.)

#### Top Drawer (3/4" MDF oak)

- K 2 sides 2 3/4" x 22"
- L 2 ends 2 3/4" x 17 1/2"
- M 1 bottom 1/4" oak 18 1/4" x 21 1/4"

#### Printer Drawer (3/4" MDF oak)

- N 1 side 2" x 22"
- O 1 side 11" x 22"
- P 2 ends 11" x 17 1/2"
- Q 1 bottom 1/4" oak 18 1/4" x 22 1/4"

#### Drawer Fronts

- R 1 1 3/4" solid oak 3 3/4" x 20 1/2"
- S 1 1 3/4" solid oak 12 1/2" x 20 1/2"

### Pull Out (3/4" MDF oak)

- T 1 19 1/8" x 20"
- U 1 3/4" x 3/4" x 20 1/2" solid oak

#### Guides (glue 2-3/4" pieces together)

- V 2 1 1/2" x 2" x 17"  
(3/4" x 3/4" rabbet)

#### Stop Piece

- W 1 3/4" x 3/4" x 17"

#### Desk Top (3/4" solid oak)

- X 1 25 1/2" x 59"

### Hutch

#### Face Frame (3/4" solid oak)

- AA 2 ends 1 1/4" x 37 1/4"
- BB 1 middle 1 1/4" x 22 3/4"
- CC 1 top 2 1/2" x 53 3/4"
- DD 1 left bott. 1 1/4" x 24 3/4"
- EE 1 right bott. 1 1/4" x 27 3/4"

#### Bulkheads (3/4" MDF oak)

- FF 2 outer 12 3/4" x 37 1/4"
- GG 1 inner 12 3/4" x 25 1/4"

#### Fixed Shelves (3/4" MDF oak)

- HH 1 shelf 12 3/4" x 26"
- II 1 shelf 12 3/4" x 30 3/4"

#### Adjustable Shelves

- JJ 1 12 3/4" x 25"
- KK 2 12 3/4" x 29 1/4"

### Inner Rails (3/4" solid oak)

- LL 1 2 1/4" x 29 1/2"
- MM 1 2 1/4" x 25 1/4"

#### Base Molding (3/4" solid oak)

- NN 1 2" x 60"
- OO 1 2" x 30"

#### Hutch Crown Molding (3/4" solid oak)

- 1 3/4" x 62"
- 2 3/4" x 16"

#### Top (3/4" solid oak)

- PP 1 14 3/4" x 59"

### Doors (3/4" solid oak)

#### Panels

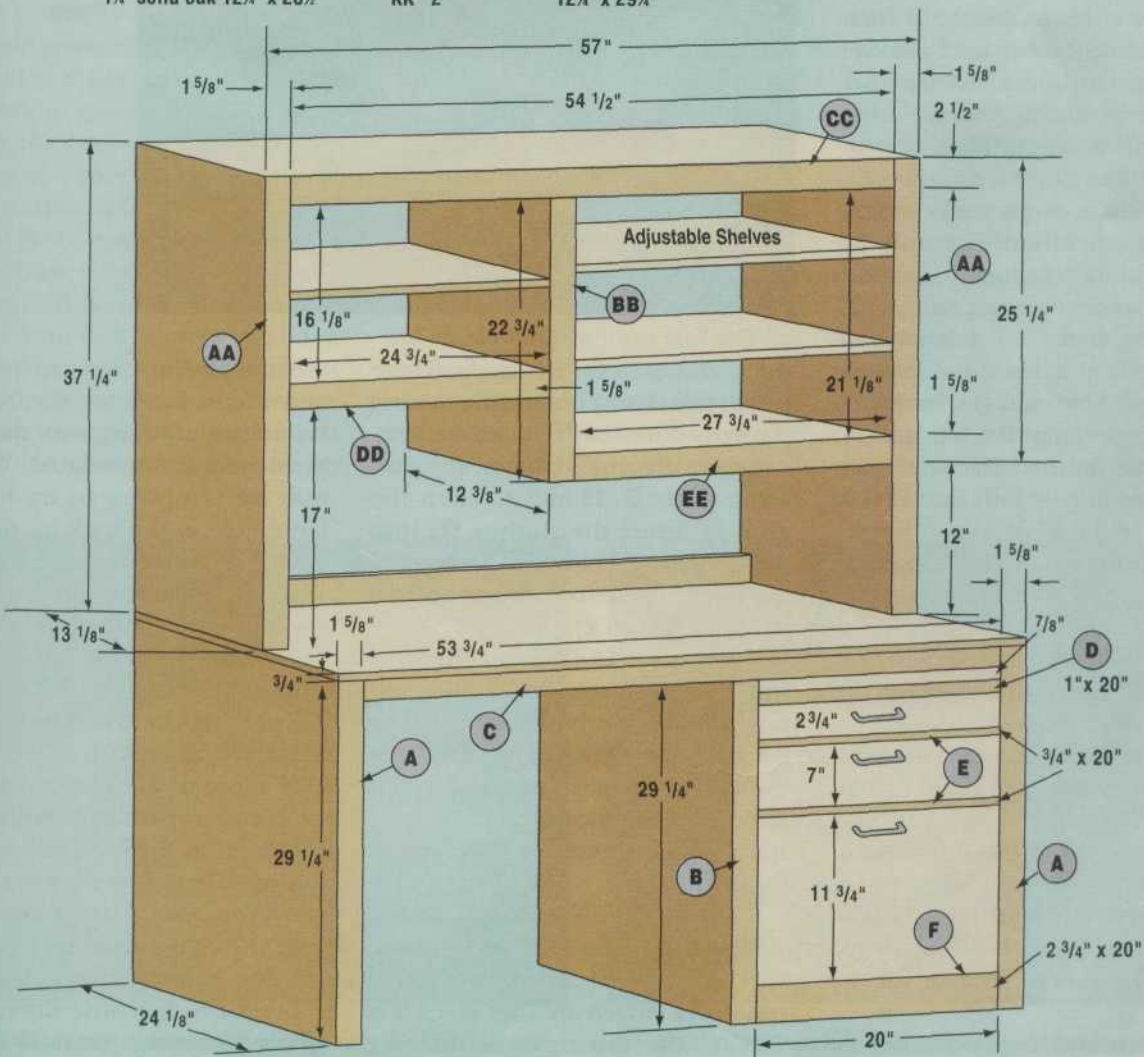
- 2 8 3/4" x 12 13/16"
- 2 10 3/4" x 17 3/4"

#### Frames

- 4 Rails 2 1/4" x 8 1/8"
- 4 Rails 2 1/4" x 10 1/8"
- 4 Stiles 2 1/4" x 21 3/4"
- 4 Stiles 2 1/4" x 16 3/4"

### Drawer Hardware

- 1 Set 22" full extension
- 1 Set 22" heavy duty full extension







1 Mirrored dados in the drawer bulkheads are ready to receive the drawer shelves.



2 The assembled drawer section with shelves in place. The face frame has already been glued on.

hard drive unit and printer. If you find the spaces inappropriate for your system, adjust the spacing accordingly.

There are a number of ways to attach the stiles and rails to form the face frame, but we used a doweling jig as the simplest option. Remember to lay out your doweling lines exactly before drilling.

If you'd like to try a different fastening method, screw pockets using a Kreg jig works well not only for the face frame attachment, but also for the carcass construction.

Once the frame has been assembled and the glue has dried, remove the clamps. Flat sand the back side joints to get a flat gluing surface.

Using the finished face frame, lay out the two drawer bulkheads (G & H) to make the  $3/8$ " dado cuts for the shelves (**photo 1**). The top dado holds the shelf to support the pull out board. The second dado is for the hard drive unit's shelf. The bottom dado houses the shelf for the bottom printer drawer.

Spacers will be needed on both bulkheads to allow the drawer slides to clear the face frame. You may need to custom fit the thickness of these pieces.

On the outside bulkheads (G), cut a  $3/8$ " x  $3/8$ " rabbet on the inside rear edge to accommodate for the  $1/4$ " back.

Before assembling, pre-sand the visible sides of the bulkheads and



3 The three backs in the desk unit shown in place. Notice the wire chase hole for the printer drawer.

Since all the computer's components must hook together with the hard drive unit, space for the cables must be accommodated.

the  $1/4$ " oak used for the backs. These pieces are almost impossible to sand properly once they're put together.

Assemble the drawer section using parts G, H and I. Then use glue to insert the shelves (J) into the dados in G and H. Clamp the assembly, check for squareness and let it dry (**photo 2**).

Next, glue and clamp the face frame to the assembled drawer section and the left bulkhead (G). Finish nail the back rail (I) between the two bulkheads. The back rail is important for supporting the knee space section and the  $1/4$ " plywood back.

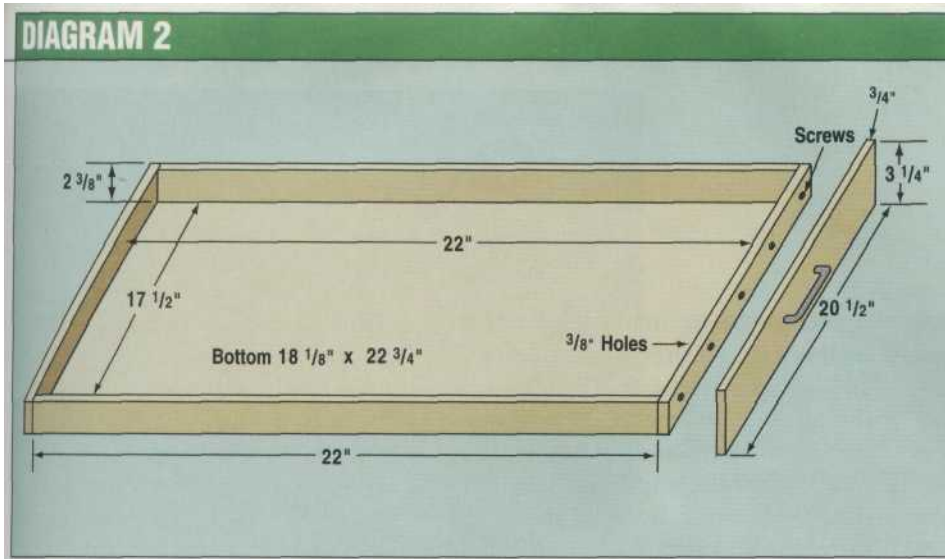
Using  $1 1/4$ " finish nails, attach a  $1/4$ " x  $33 3/4$ " x  $29 1/4$ " piece of oak plywood to the back of the knee space (**photo 3**). Attach another piece  $5$ " x  $22 1/2$ " to the top right behind the pull out shelf and the top drawer.

While it may be tempting to try to cut a large hole in the back for this area, it's actually easier to leave the entire space between the top drawer and the second shelf open to allow access for hooking up the hard drive unit.

Enclose the area behind the printer drawer with a  $1/4$ " x  $15 1/4$ " x  $22 1/2$ " piece of oak plywood. Cut a  $3$ " hole in this piece to match the hole you'll cut in the back of the printer drawer. These holes are essential to allow for cable passage and to prevent the cables from tangling when the drawer is opened or closed.

Build two box style drawers (**diagram 2**) using parts K-Q. The upper drawer is standard, but the





and the desk top will be easier to finish unattached, so don't glue the stop strip to the pull out.

The top of the desk (X) is fashioned from multiple oak boards. The lumber you have available will determine how many pieces will be necessary for its construction.

Joint the edges to be glued, then glue and clamp, making sure the top will dry on a flat. Again, pay attention to the growth rings while gluing.

Unless you're fortunate enough to have a multitude of double clamps, it's important that you alternate them about 8" apart (one on top, the next on the bottom, etc.) to keep the top flat (photo 5). When dry, the top is sanded with a random orbital sander and smoothed with a palm sander.

Next, attach the top. (Even if you finish the top unattached, you should attach it now to make final assembly easier.) To attach the top's back right-hand side, use a hole saw or expansion bit to create a 3" hole in the top shelf, then drill a 3/16" pilot hole in the right back corner brace. This gives you accessibility in fastening the desk top through the shelf to the corner brace.

On the right front side, drill a 1/2" hole about halfway through the top front rail. This pocket will give you

printer drawer has been designed to allow easier access to the printer and paper. Three sides of the drawer are 11" high, but the left-hand side is only 2".

When making the drawers, dado 1/4" x 3/8" deep, 1/4" up from the bottom of the sides and ends to allow for the 1/4" bottom. Use glue and nails or an air powered stapler to attach one end and two sides. Then slide the bottom into the groove and attach the last end. Square the drawer and turn the box upside down, running a heavy bead of glue around the bottom's inside.

The drawer fronts (R & S) are constructed from solid oak. The smaller front can be created from a single piece, but the bottom front will probably need to be glued-up. Alternate the growth ring pattern on the end grain of the boards to

prevent bowing. Pay attention to the grain pattern while you're arranging the drawer fronts.

Glue-up the pull out board made of MDF oak (T) with a 3/4" oak piece (U) glued on the front edge. Before you start gluing, cut a finger pull on the underside of **part T**, using either the table saw or a cove bit in a router.

Next, cut the rabbets in the pull out guide pieces (V). When in place, these will act as the top guide for the pull out. The top shelf will be the bottom guide and support, thereby creating a slot for the pull out to ride in (photo 4). Corner braces in three of the four corners add stability to the unit and will fasten the top.

Screw the stop piece (W) to the top of the pull out board at the desired length. The pull out board



4 The pull out board is shown in place with a top guide (V) being held in place with squeeze clamps.



5 Alternating clamps help keep the glued-up top level while drying.

room to maneuver your screwdriver or drill. Make a 3/16" pilot hole the remainder of the way for the screw. Attaching the left side is easier. Simply screw through the corner braces into the desk top.

An effort was made to maintain as much desk top working space as possible, so the key board was placed underneath it on a slide-out unit. There are a variety of options for the keyboard's hardware. The type shown (**photo 6**) is mounted on a board measuring 1 1/2" (or thicker) x 6" x 17", which in turn is mounted to the top's underside in the center.

The hutch's design gives special consideration to space utilization. Computer monitors, like hard drive

units, are being made bigger than in the past, so they require at least 17" in height. On this hutch, only the left side was made this height to provide maximum storage for office and computer supplies. You may prefer to make both of the shelf units equal in height.

The hutch's construction is similar to the desk's, with rails and stiles (**parts AA-EE**) fashioning the face frame. Using your face frame, mark the position for the 3/8" shelf dadoes on the bulkheads (FF & GG). Again cut a 3/8" x 3/8" rabbet on the rear inside edge of the outside bulkheads (FF) to accommodate the 1/4" back. The two back pieces (30 1/4" x 37 1/4", 26" x 37 1/4") will meet and overlap the inner bulkhead edge.

The hutch's bottom stationary shelves (HH & II) are flush with the top of the bottom face frame rails. Do not cut dadoes for the adjustable center shelves (JJ & KK).

Glue in the top rails (LL & MM) and the hutch base moldings (NN) to the inside of the back. Make sure the piece is flush with the inside of the back rabbets.

Next, cut out and glue-up the hutch top (OO). Again, remember to pay attention to the growth rings.

If you prefer not to use solid oak, make sure your crown molding covers the unfinished edges.

Next, glue the crown molding to the front and both sides. You can make your own crown molding if you have access to the proper equipment. If not, you can purchase preshaped crown molding from a local lumberyard.

Make sure your corner miters are tight before you start gluing. Attach the hutch top by gluing and clamping, or you can use some strategically placed screws through the front and back rails.

The doors depicted on this hutch are fashioned in the popular raised panel mode. In case of expansion, it may be beneficial for you to stain the interior of the panel prior to assembling rather than after, since the stain may not cover the unexposed areas.



6 The keyboard retracts under the top to allow for a cleaner desk top. Notice the cable running into the side of the drawer section.



7 The edge view of the door shows the through tenon and groove used to assemble the stiles and rails.



8 The back of the door shows the dados cut to receive the hinges.

The stiles and rails for the door are made on the shaper using a standard 1/4" tongue and groove (**photo 7**). Although some woodworkers find a 3/8" or 1/2" tongue and groove make the door stronger, the 1/4" is sufficient. Use the sizes given in the **Materials List** to cut out and assemble the doors.

To fasten the doors to the cabinet, a knife hinge (pivot hinge) gives a more finished look. To make the hinge grooves, use a 1/4" dado blade in your table saw raised 9/16". The groove is 1 3/4" long for the type of hinge shown (**photo 8**). Always check the manufacturer's instructions for specifications.

A 1/2" round over bit in a router was used to shape both the ends and fronts of the hutch and desk top. Shape all the edges of the doors and drawer fronts to your own style. Run a profile on the rest of the base material, then glue to the desk and hutch.

Attaching the hutch to the desk base is one of the easiest tasks. Simply drill pocket holes angled through the outside of the hutch back and screw in with face frame screws.

Now you're almost finished, with the exception of a couple modifica-



9 This detailed photo shows the hole cut in the drawer section's left bulkhead for the keyboard wire.

tions to allow the computer system to be hooked together.

To accommodate the cable from the keyboard to the hard drive unit, cut a 1" hole in the left side of the drawer section (**photo 9**) at the level of the hard drive unit shelf.

Next, cut a 2" hole in the back of the hutch to access the cable from the monitor to the system. The monitor will cover the hole nicely and isn't readily visible.

If you opt to cut the hole in the top of the desk, you will need to make the 1" hole in the drawer section larger (at least 2" to allow for the cable attachments).

Complete the entire piece using your favorite stain and preferred finish.

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# CAPPUCINO BAR





## Materials:

white pine 2" x 6", 8 feet long  
3/4" and 1/2" dowels, 3 feet each  
circular saw  
drill  
3/4" and 1/2" drill bits  
2 or 3 large C-clamps  
hammer  
2-1/2" drywall screws  
heavy-duty picture frame hangers  
paint  
polyurethane stain  
measuring tape  
black paint  
coarse, medium and fine sandpaper  
small scrap block of wood  
wood glue

*Note:* Before tackling this project, practice drilling on some scrap 2" x 6" wood pieces to see how straight you can make a hole. Always wear safety goggles when using the drill or saw.

## Steps:

1. Place the pine on the work table and measure 21 inches from the end that has the flattest cut. Put the straightedge on the board, diagonal from one corner to the other, and draw a cut line. Use the clamps to hold the wood down while cutting, and manipulate the wood in order to make a clean cut with the circular saw.
2. Put the cut piece on top of the other like a sandwich, so the widest end is now the top of the base for the shelf.
3. Make a pencil line along the sandwich edge to match the other.
4. Un-sandwich, re-clamp and cut along the line.
5. Cut the top, measure 29 inches from the edge and draw a cut line. Cut with circular saw.
6. Pick the side that will look the best for the front, and measure 2" from each end, measuring in towards the center. Mark. Draw a line from both of these to the back corners. Clamp and cut these two lines.
7. At the widest end (the top), find the center along the side where you are to insert the 3/4-inch dowel and mark. From this marked point, measure down the side 2-1/2 inches twice, then one inch back toward the uncut end, which is the back. These are the other two dowel marks. Clamp both pieces together like a sandwich.
8. Fit the drill with the 3/4-inch bit and with a steady hand, drill through both pieces as straight as possible.
9. Repeat for 1/2-inch dowels using the 1/2-inch drill bit.
10. Cut the 3/4-inch dowel to 20 inches and the two 1/2-inch dowels to 12 inches.
11. Sand all pieces with coarse, medium and fine sandpaper.
12. At the bottom of the base, if the edges are too sharp, wrap sandpaper around a block of wood and sand it flat.
13. Assemble the two sides of the base, with the top down, and set on the table. Feed the dowels through the holes and center each one. Use the scrap pine for the spacer in between the two sides. Mark each dowel and slide out to glue, then slide back to the marks and twist, spreading the glue. Allow to glue to dry for at least an hour.
14. Lay the newly glued base flat on its back with the spacer underneath, center the top next to the top base, and mark two pilot holes for each side, two inches apart. Mark and drill the four pilot holes, all the way through to the base.
15. Spread some glue on the tops of each base, reposition and screw together.



16. Turn over and find the center, mount the hangers 16 inches on center from the center mark on the back.
17. Finish by masking out the dowels on the base and painting the them with black paint. Apply a polyurethane stain and let dry overnight.

# CHINA HUTCH





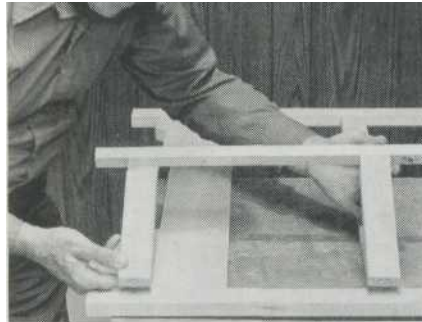
The frame sections of the china hutch are assembled with the aid of glue and spiral dowels. Dowel centers are recommended to ease matching of dowel holes.

gan, chinaware, antique vase, or collectibles? Here's the perfect cabinet for you, with lots of transparent glass to show off your treasures. It even has an elegantly wallpapered backing that can be changed at will. Select the decorative hardware to match the decor of your room—bright, brassy and modern or dark and intricate Mediterranean, or even sleek Oriental. You'll find a wide variety of handles and drawer pulls in all styles at any good hardware shop.

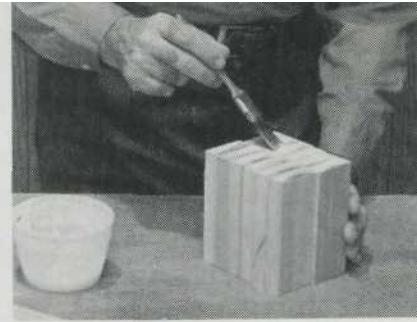
Choose flat defect-free boards in the wood of your choice for the frame. Rip them on the table saw into strips 1 3/4" wide. Remove all saw marks with a plane or jointer. Do not

you will need three strips cut to 28 1/2". These are for the crosspieces. You will also need one piece 5 3/4" x 28 1/2" to be used for the lower section.

Drill dowel holes as indicated; the use of a doweling jig and dowel centers is recommended. Mark off the hole locations and drill into the ends of the crosspieces. Make the holes 3/8" in diameter and 1 1/16" deep. Because of the narrow width (1 3/4") use only one dowel per joint. The jig will automatically center the hole. After drilling the crosspieces, use dowel centers to transfer the hole locations to the uprights. Use two dowels for



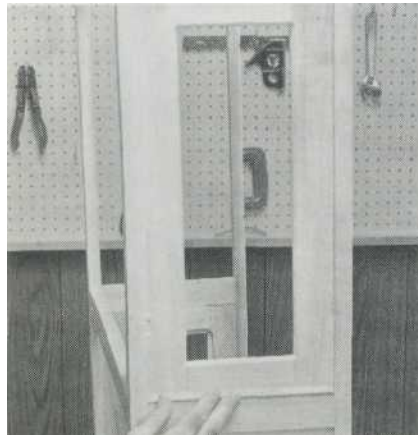
This photo more clearly shows how locating pins are used to transfer the dowel holes from the edge to front of frame. Use bar clamps till glue dries.



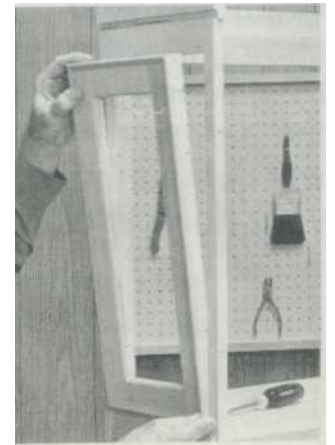
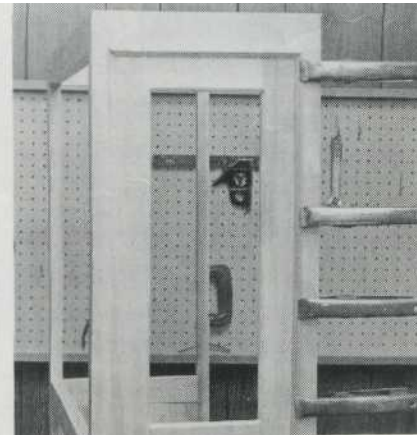
Shown here is how the end grain of the crosspieces are given a sizing coat of glue. Sized glue is made by mixing equal measurements of glue and water.



The upper, center, and lower panels are assembled with glue and nails. Pilot holes are drilled before nailing to prevent the thin wood from splitting.

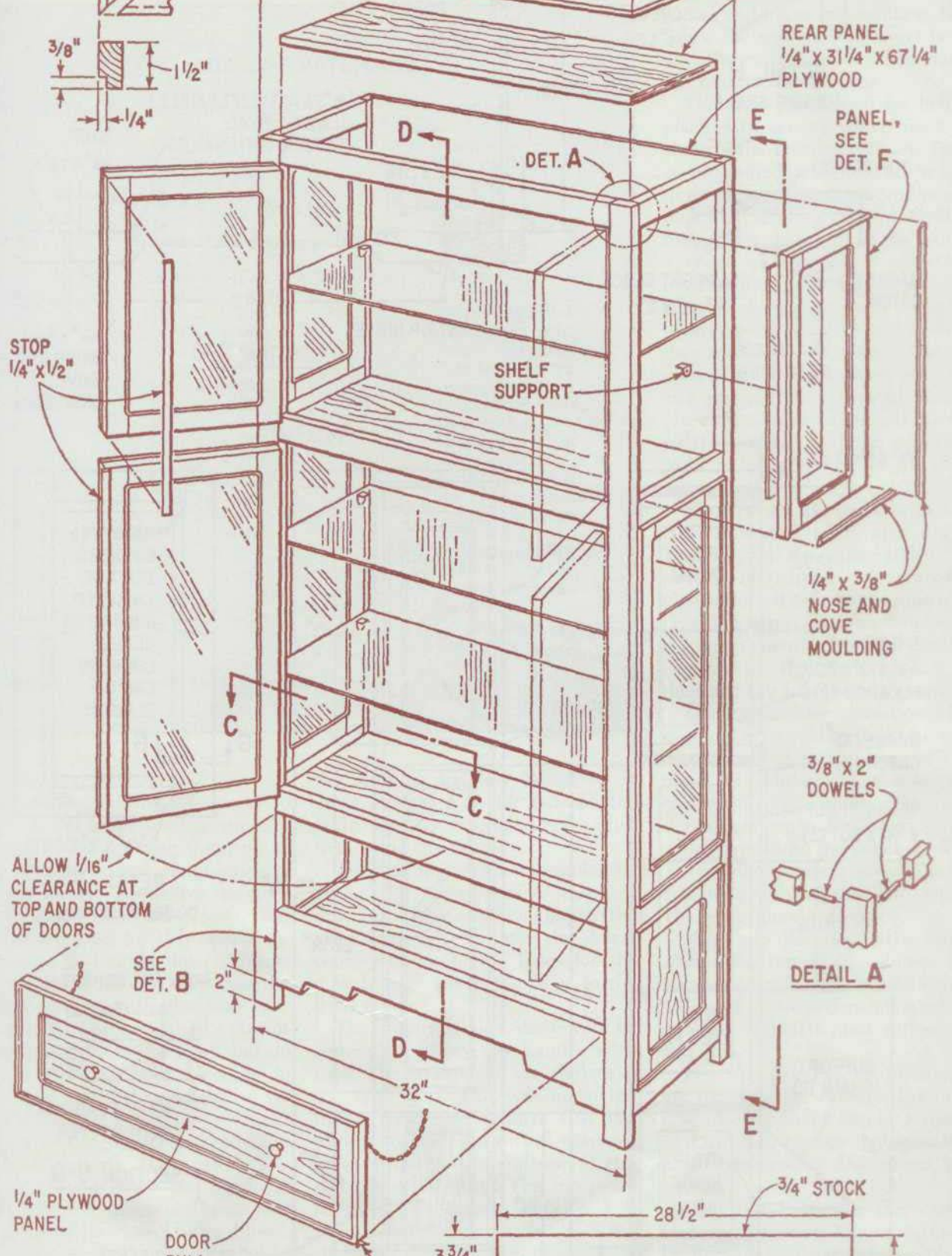


The edges of the panels are dressed up



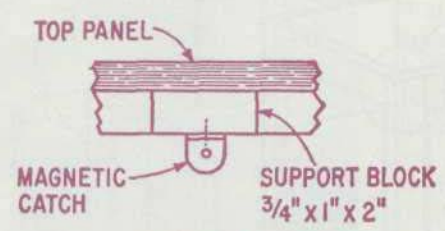
The inside edges of the panels must be rabbeted to accept the glass; they are



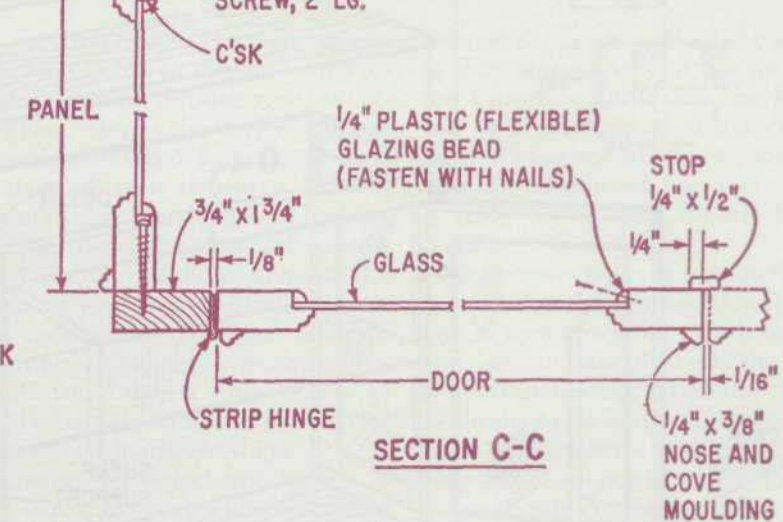


SCREW, 2 LG.  
1/4" LG.

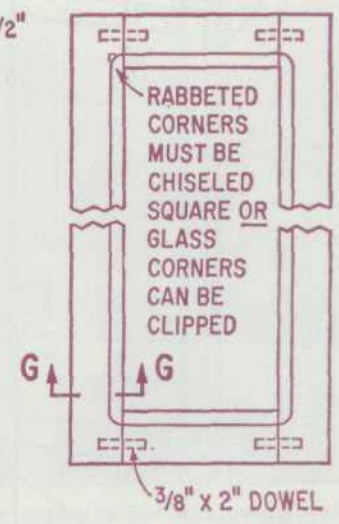
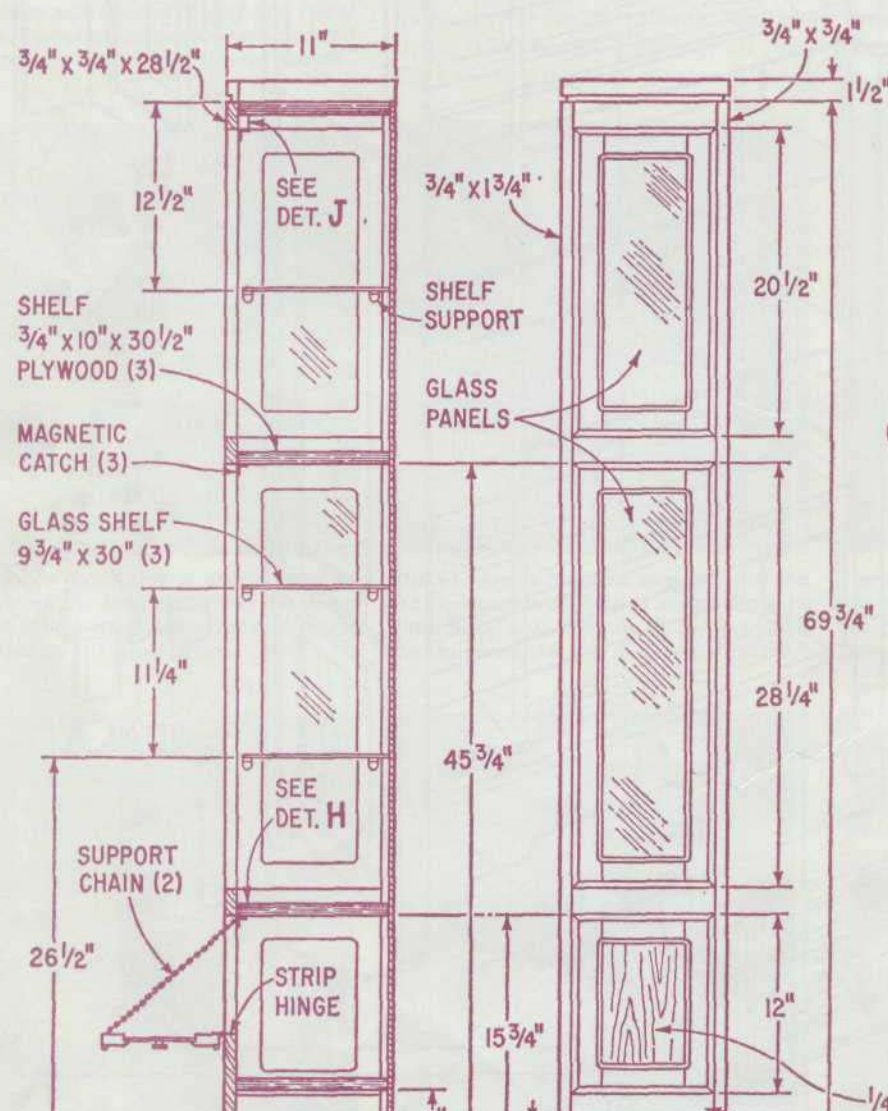
**DETAIL H**  
JOINING SHELF



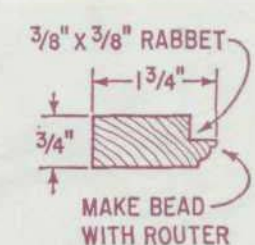
**DETAIL J**  
REAR VIEW



**SECTION C-C**



**DETAIL F**  
DOORS AND PANELS



**SECTION G-G**



QUANTITY	SIZE AND DESCRIPTION	PURPOSE
2	3/4" x 1 3/4" x 69 3/4"	Front stile
2	3/4" x 3/4" x 69 3/4"	Side stile
3	3/4" x 1 3/4" x 28 1/2"	Front rail
1	3/4" x 5 3/4" x 28 1/2"	Apron
8	3/4" x 1 3/4" x 9 1/2"	Side rail
2	3/4" x 1 1/2" x 11"	Side cap
1	3/4" x 1 1/2" x 32"	Front cap
1	1/4" plywood, 31 1/4" x 62 3/4"	Rear panel
4	3/4" x 10" x 30 1/2"	Shelves
4	3/4" x 2" x 20 1/4"	Upper side panel
4	3/4" x 2" x 28 3/8"	Center side panel
4	3/4" x 2" x 12 1/8"	Lower side panel
12	3/4" x 2" x 9 1/2"	Side crosspieces
4	3/4" x 2" x 20 1/8"	Upper door stiles
4	3/4" x 2" x 28 1/4"	Center door stiles
8	3/4" x 2" x 14 3/32"	Door rails
2	3/4" x 2" x 28 3/8"	Lower door stiles
2	3/4" x 2" x 7 7/8"	Lower door rails
1	1/4" x 4 3/4" x 24 1/4"	Lower door panel
2	1/4" x 3/8" x 60 ft.	Nose & cove molding
2	1/4" x 6 1/4" x 8 7/8"	Lower side panels
1	1/4" x 1/2" x 48"	Door stops
	8 ft.	Strip hinges
6		Pulls
3		Magnetic catches
	3/8" x 2"	Dowels
12	40 ft.	Glazing bead, plastic Shelf pegs

Also: have glass pieces cut to fit frames.

the wide bottom piece. Before assembling the parts to make up the frame section, prepare the clamps by opening them up to size; also have some scrap strips of wood at hand for protecting the work surface from the clamp jaws. Bar clamps are ideal for this operation. Dab some glue on the dowels, insert into the drilled holes, then coat the mating surfaces with glue and join. Use adequate pressure on the clamps to force glue from the joint, but do not overtighten. Check the frame to be certain that it is square, then set aside while the glue dries. Prepare the side crosspieces and the rear uprights. These are drilled and assembled much like the front frame, the only difference being that the depth of the dowel holes differs. The holes are drilled 1 1/2" deep into the 9 1/4" crosspieces and 1/2" deep into the uprights. After drilling the necessary holes

the uprights are only 3/4" X 3/4" in cross section, a double pass on the table saw is recommended rather than using the router. The side frames are assembled by gluing the crosspieces to the rear uprights. These are then glued to the front frame. Again, use the dowel centers to locate the holes for the dowels from the crosspieces to the front frame. The frame at this stage will be somewhat flimsy, so handle with care. The addition of the shelves is the next step. This will make the frame rigid and strong. Cut the frames to size, then drill diagonal holes through the bottom of the three lower shelves. The top piece is drilled from the top side. Use 1 1/2" round head (RH) screws to attach the shelves. The frames for the doors and side panels are made next. Cut the necessary pieces and assemble them

with the router later on when making the rabbets for the glass. The rabbets for the glass. The panels will be held in place with screws which must not show in the finished cabinet. This is accomplished by drilling screw holes in the rabbeted area where the glass molding will conceal them. Drill the holes before assembling the panels. When all the panels are assembled, rabbet them for the glass and cut the decorative bead using the router. Sand all edges and surfaces, then install into the frame. The nose and cove molding is added using glue and spring clamps to hold them in place. Miter all corners and use care not to mar the molding surface. A piece of felt glued under the clamp jaws is recommended.

Door panels are made with sufficient allowance for the strip hinges. The left-hand doors have a door stop added. The right-hand doors are beveled at the left edge to clear the other door. When installing the strip hinges, use only the end holes until you have checked fit. If fit is okay, you can then add the balance of the screws.

The bottom door which opens horizontally is treated in the same manner. Instead of glass, it has a 1/4" back panel. In addition, it has an insert to improve its appearance. This insert is simply a piece of 3/8" solid lumber which drops into the panel opening.

Add the plywood inserts to the bottom panels of the side pieces. These are glued into place. Next add the decorative strips around the top of the cabinet. This is made by rabbeting a long strip of 1 1/4" stock which is then cut apart and mitered. Hold it in place with screws and glue.

The rear panel of 1/4" plywood is not nailed to the cabinet. Instead it is screwed so that it can be removed as desired to change the decorative paper background. Use round head screws.

Drill the holes for the various pieces of hardware. Mount and check fit. Remove hardware when applying finish, then replace.

Finish the cabinet as desired. You can stain the wood and top with sev

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# CORNER DISPLAY CABINET



ALTHOUGH it looks complicated, there are short-cuts that take much of the hard work out of the project. First is use of readily available decorative molding strips; second is use of flexible wood tape to cover exposed plywood edges. The fancy scalloped curves on side pieces, fringe, and skirt can be cut with a power jig saw or saber saw, and if you clamp the two side pieces together you can use a wood rasp and sandpaper to get exactly-matching curves.

The entire cabinet is made of 1-inch thick veneered plywood, except for the door facings. These are 1/2-inch plywood. Use the veneer surface of your choice (birch, ash, mahogany, walnut, etc.) and buy wood tape to match.

Cut out the two back pieces. Note that one panel is 21 inches wide, the other is 20 3/4 inches. Rabbet the front and back edges of the narrower panel as shown in Detail A. Now cut out the bottom, top, intermediate top, and the shelves. Make up full-size patterns for the side piece scallops (or use those available as noted at the end of this article), trace them on the rectangular side pieces, and cut the wood to shape. Clamp the side pieces together as noted above, and trim to smooth, fair curves.

Make up the spine from 3/4-inch plywood (or hardwood), and bevel each side to a 45° angle. This gives added strength to the back joint.

Use glue on mating surfaces, and fasten the two back panels together with 1/4-inch #8 flat head wood screws. Be sure to drill pilot holes for all screws, and countersink for the heads. Next install the spine and the top panel with 1 1/4-inch #8 flat head wood screws, after coating the mating surfaces with glue.

Rabbet the rear edges of the two side pieces, and install them as shown in Detail A. Now you can install the bottom panel, the intermediate top, and the upper shelves. Cover the exposed edges of the shelves with wood tape before installation, and be sure that all these panels are square with the back and side pieces. Again, use glue on mating surfaces, and fasten with 1 1/4-inch flat head wood screws.

Make up a cleat of 3/4 X 3/4-inch pine stock, as shown in the exploded perspective drawing. Install it underneath the intermediate top, and fasten the apron to it. The face of the apron should be flush with the edge of the intermediate top.

Cut out the two spacers from 7/8" X 7/8-inch pine or other hardwood stock, and bevel one side of each to a 45° angle as shown in Detail A. These spacers are installed along the front edge of each side piece, bottom and intermediate top panels.

Use full size patterns for the skirt and fringe pieces, cut the pieces out, sand the curves smooth, and install them. The fringe goes under the front edge of the top panel, and the skirt goes under the front edge of the bottom panel. Make cleats of 3/4 X 3/4-inch stock as shown in the exploded perspective view, and install them behind the fringe and skirt pieces. Cover the scalloped edges with flexible wood tape.

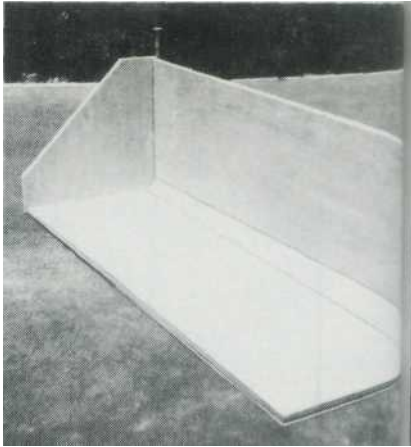
Now install the decorative molding at the top and intermediate top. Bevel the corners and use the same trim along the sides. Use glue and small brads to fasten the molding in place. Set the brad heads below the surface of the wood, and cover with matching wood filler. Cut out and install the cabinet shelf in the lower compartment after covering the front edge with wood tape.

Make up the two doors from 3/4-inch plywood, with 1/2-inch plywood facings and decorative molding around the edges as shown on the plans. Note that corners of facings and moldings must be mortised carefully for a snug fit. Round the edge of each door on the side opposite the hinges, and cover the exposed top and inner edges with wood tape.

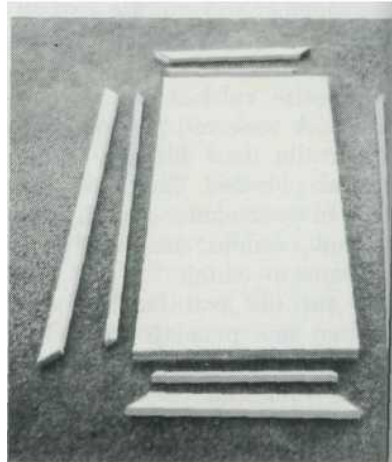
. For hinges, use the new knife type used by radio cabinet manufacturers. These come in left hand and right hand models, and they feature stops that prevent the doors from swinging all the way back. See Detail B for hinge and door relationship.

Finally, sand the cabinet lightly, and finish with two coats of varnish or other clear coating to bring out the natural beauty of the wood. Sand lightly between coats, and if additional coats are needed, sand before application. When the final coat is dry, install the doorknobs of your choice, and the project is done.

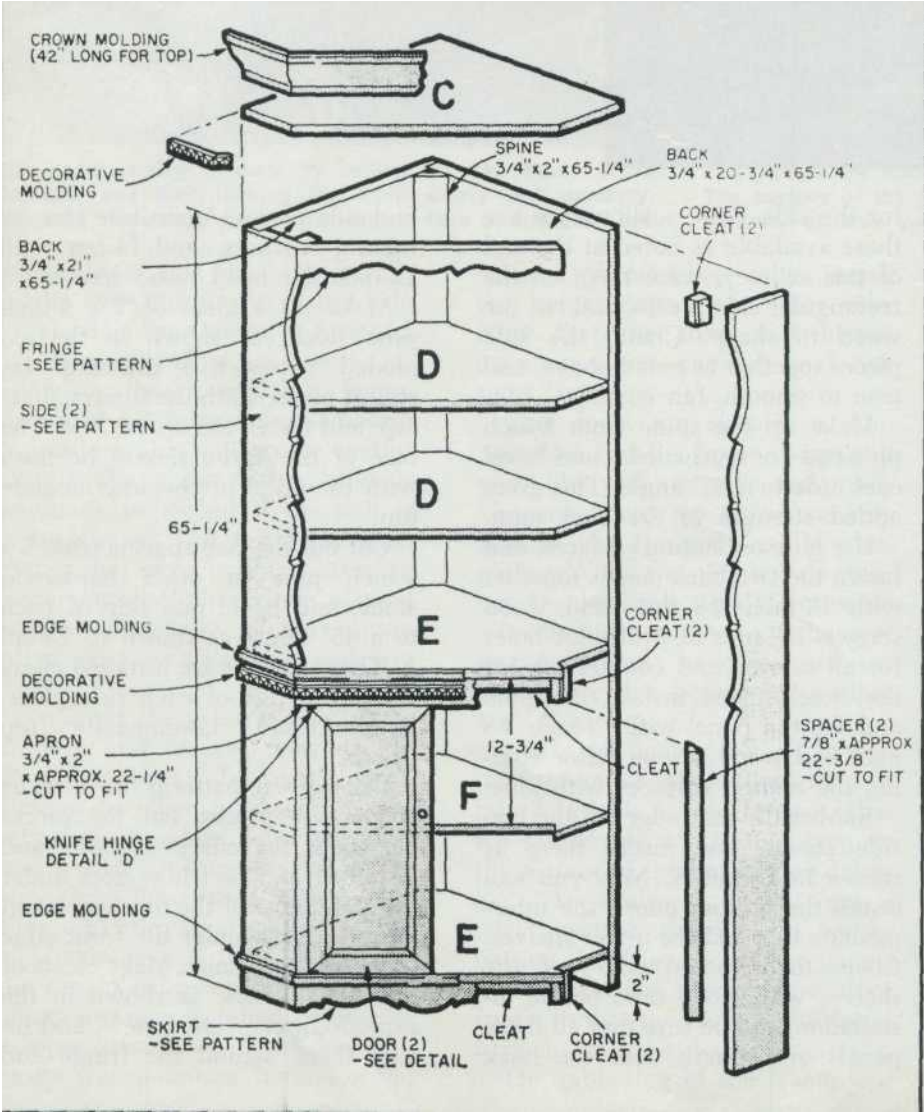
Shown here are the assembled back top and spine. The spine is beveled each side to a 45 degree angle, and gives strength to the back join



Put in the intermediate top, apron and shelves, covering shelf edges tape. Next is fringe and skirt, plus molding on top and intermediate top



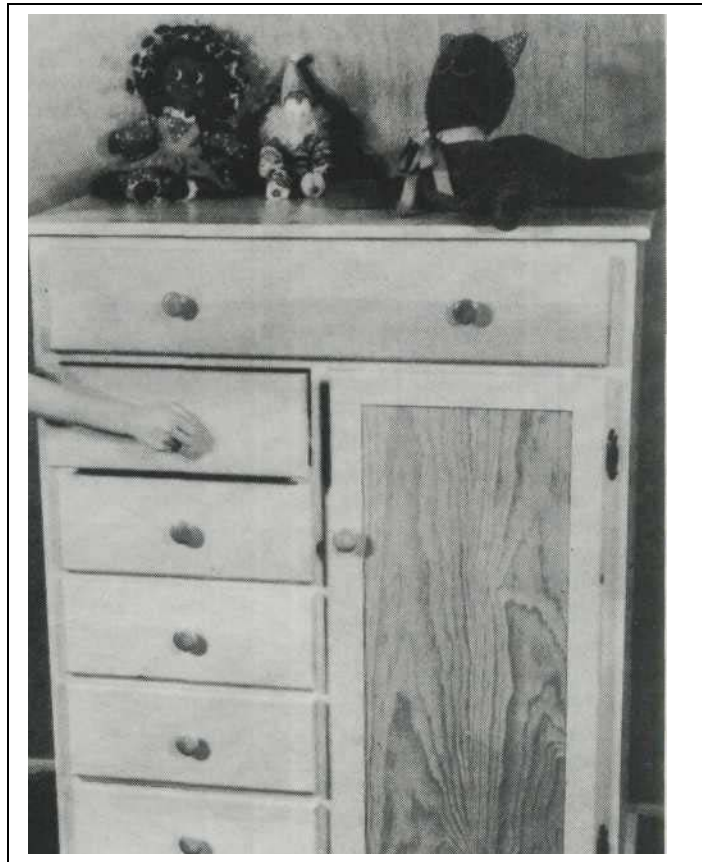
Attach door facings with glue, and wood screws. Work from backside door. The corners and facings must be mortised carefully for a snug fit





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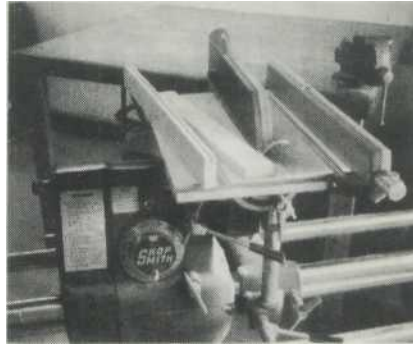
# CHILD'S ARMOIRE



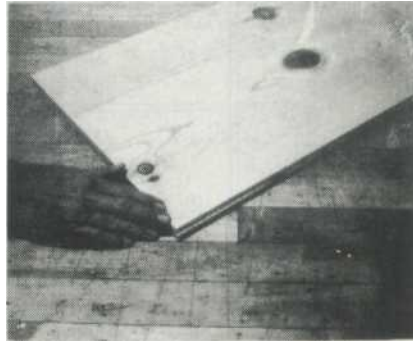
THIS CHILD'S ARMOIRE will make it easy for kids to keep their rooms neat and orderly. Its six drawers and two shelves provide enough storage space to house a substantial wardrobe. By following a simple modification to be described below, the shelf compartment can even be replaced with a small closet complete with clothes pole for hanging dresses, suits, or coats. Best of all, the armoire is designed especially with the pint-sized set in mind. No more standing on tippy toes just to reach a clean pair of socks!

Before starting on the project, carefully study all photos, diagrams, lists, and building instructions. One attractive feature worth noting at the outset is that no fancy joinery is required. With the exception of a few simple rabbets, nothing more complicated than butt joints is called for. On all of these joints, use 1 1/4" finish nails and glue unless otherwise specified. Another plus is that only the most basic of shop tools are needed, although a router is essential, and you'll probably also find a table saw to be helpful.

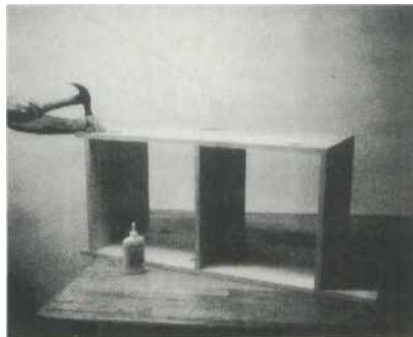
Because of the variety of dimensions encountered in the plan, we've simply indicated the total amount of 3/4" pine required, which is 47 board feet. This figure allows approximately 15% for scrap. When shopping at the lumberyard, bear in mind that the largest single width of pine called for in the plan is 6 3/8" (parts V and W). Procuring the hardware should not be much of a problem. If you do have difficulty, though, a complete



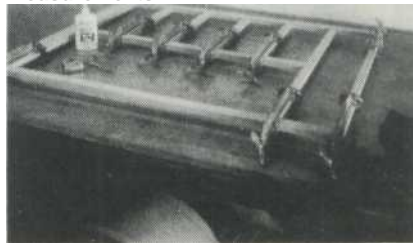
The first step is to cut all wood to proper size. Refer to the cutting schedule and Details 1 and 2 for further instructions.



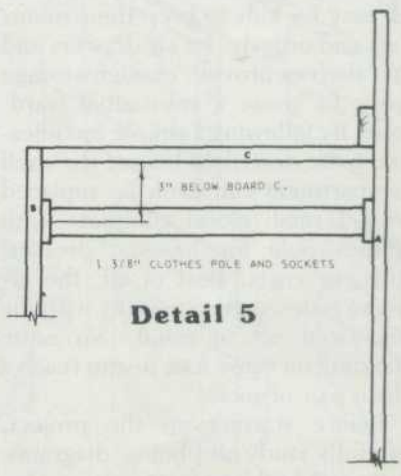
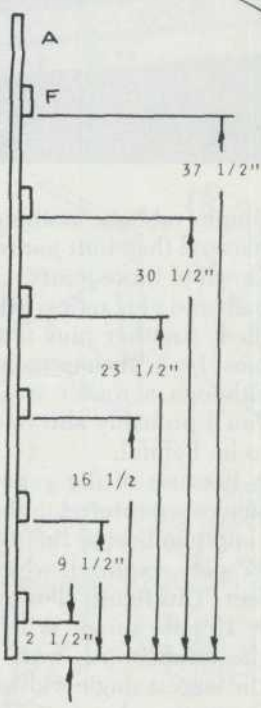
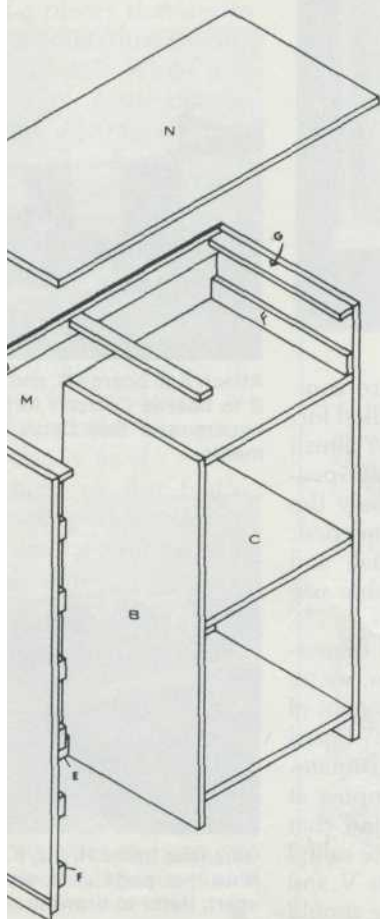
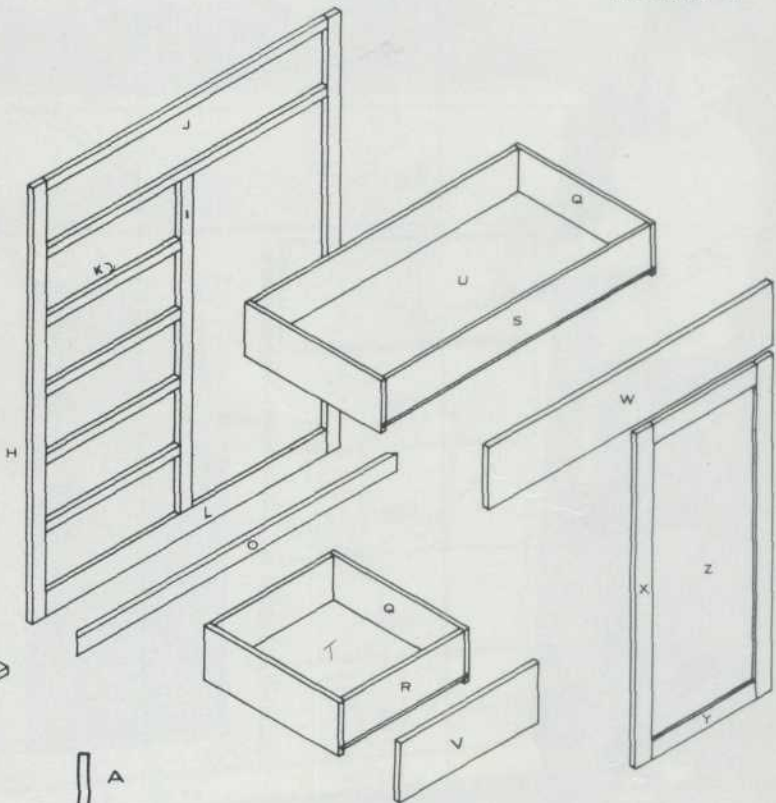
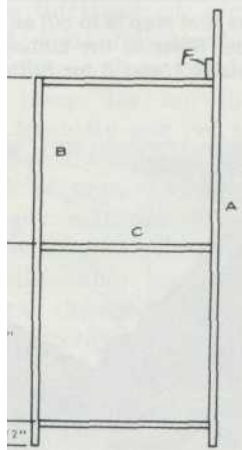
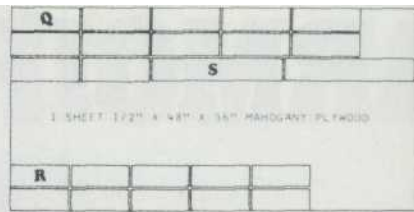
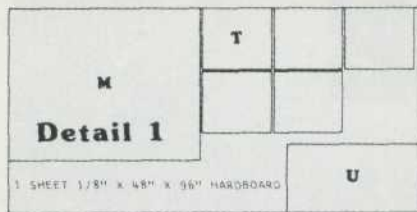
Glue boards together to make up boards A, B, C, and N. With a router, cut a thin rabbet on the back inside edge of board A.



Attach A to boards B, and C. Attach board B to boards C. Don't forget to check for squareness. See Detail 3 for measurements



Glue face frame H, I, J, K, and L together. Note that parts J, K, and L are each 6" apart. Refer to drawing on the next page.



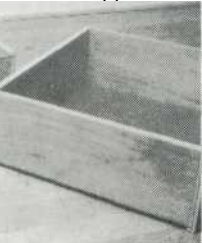
**Detail 4**



Attach face frame to A, B, and C. Attach upper back crosspiece D to boards A. Attach lower crosspiece E to A and B.



Attach two boards G to A, D, and J. Attach one board G to the center of D and J. Then attach drawer supports F to both boards A.



Nail Q to R using 1" brads. Slide hard-board T into groove in Q and nail. Follow the same procedure for the large drawer.



Attach drawer guides to boards Q and F. Nail the drawer fronts R and S to the drawer face panels using brads and glue.

set of hardware, replete with mounting instructions and all necessary screws, can be ordered through the mail. Write to the address found at the end of this article for more information.

**Cutting the Parts.** Begin by cutting all parts down to their proper sizes as indicated on the cutting schedule. Consult the panel layouts in Details 1 and 2 before cutting out parts M, Q, R, S, T, and U. Parts A, B, C, and N are formed by gluing smaller boards together. This not only saves you the trouble of hunting down unusually large widths of lumber, but is also an excellent strategy for avoiding possible warpage. Of course, whenever you build up large boards from smaller ones in this way, it's a good idea to use dowels for extra strength. When cutting out the parts, note that only two shelves (C) are needed if you intend to make the cabinet space into a closet.

With a router, cut a rabbet into the back inside edge of each part A side piece; this is to allow for the eventual placement of the rear hard-board panel (M). Similarly, cut grooves into the lower inside edge of each of the drawer sides (Q) to provide access for the hardboard drawer bottoms (T and U). In the interests of safety, you'll also want to round off all of the exposed edges of the piece with a router. The upper edges of the top piece (N), for example, should be rounded off to a 1/4" radius, as should the outside edges of the drawers (parts V and W) and cabinet door (parts X and Y).

**Construction.** Start by building the cabinet compartment with parts B, C, and one part A. Refer to the accompanying photos and to Detail 3 for the proper placement of parts. If you intend to make a closet out of the shelf space, ignore the middle shelf board (C) shown in Detail 3. Check for squareness and accurate alignment of all parts. Next, assemble the face frame from parts II, I, J, K,

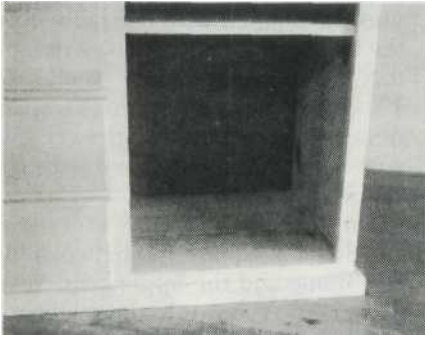
glue here, and drive the nails through part II (on the drawer side of the face frame) into the front edge of the side panel. To secure the construction, attach the upper back crosspiece (D) between the two parts A, following the placement indicated on the schematic. This crosspiece must be aligned with the rabbets on the two parts A in order to accommodate the rear hardboard panel (M). The lower back crosspiece (E), spanning from part B to the drawer-side part A, is similarly aligned with the rabbet on A.

On each side of the unit now, attach a top support (G) between the face frame and the upper rear cross-piece (D), as shown in the schematic and Detail 3. Then take the remaining part G top support and fasten it to parts D and J in the center of the unit. The drawer supports (F) are added next. Detail 3 shows how one part F is to be situated on the cabinet-side part A. The remaining six drawer supports are arranged on the drawer-side part A according to the measurements given on Detail 4. Once all the drawer supports are in place, carefully center the armoire top (N) and fasten it to parts D, G, and J. Set the unit aside now, and allow all glue to dry.

**Drawers.** Each of the five small drawers consists of two sides (Q), a front and back (both parts R), a hard-board bottom (T), and a face panel (V). Start by attaching the front and back to the sides with 1" brads and glue. As seen in the schematic, the tops of the two parts R are flush with the tops of the drawer sides. Next, slide the hardboard bottom (T) into the grooves of parts Q, and secure it with a nail or two. Repeat this procedure in assembling the large drawer from parts S, U, and the remaining parts Q.

Following the manufacturer's instructions, attach the 16" drawer guides now to the drawer supports (F) within the armoire unit and to the sides (Q) of each drawer. Assembly of the drawers is completed then with the addition of the face panels (parts V for the small drawers; W for the large drawer). Use glue here, and drive 1" brads through the drawer fronts (R or S) into the face panels. Again using 1" brads, fasten the hardboard rear panel (M) to the back of the armoire, driving the brads through M into parts A,





Use 1" brads to attach M to A, D, and E. Miter front ends of boards P and attach to A. Miter both ends of O and attach to L.

attached next. First, miter both ends of the front base piece (O) at a 45° angle, and miter the matching end of each of the two side base pieces (P). Parts P are then glued and nailed to parts A, while O is fastened to the face frame bottom (L).

**Cabinet.** The cabinet door comprises parts X, Y, and Z. Start by routing out a 1/8"-wide x 3/8"-deep channel centered along the inside edges of parts X and Y. The cabinet door panel (Z) is nestled within these channels and secured in place with glue. The excess channel space on both ends of each part X may be concealed with a wood filler. Otherwise, **cut** four 1/8" x 3/8" x 1 1/2" splines from scrap and glue into place. Hang the door with hinges mounted 4" in from each end. Attach wooden knobs to the drawers and cabinet door, sand the entire unit and finish as desired.

Assuming you've left out the middle shelf (C), it's an easy matter **to** make the cabinet compartment into a closet for hanging clothes. All that's needed is a pair of 1 3/8" diameter clothes pole sockets and a 17" length of 1 3/8" dowel. Just locate the sockets 3" below the cabinet ceiling (C), and centered on parts A and B. Detail 5 shows the arrangement found in the closet option.

and L, as shown in the schematic. The horizontal parts J, K, and L are spaced 6" apart in the frame to make room for the drawers. Clamp the completed face frame e securely, and allow all glue to dry before continuing.

The face frame assembly is then carefully positioned on the cabinet compartment and fastened into place. Now attach the remaining side panel (A) to the construction. Use

B, D, and E. The front and side base pieces are



## MATERIALS LIST

Qty.	Size	Material	Items
1	1/8" x 48" x 96"	Hardboard	M,T,U
1	1/2" x 48" x 96"	Mahogany plywood	Q,R,S
1	1/8" x 13" x 31"	Pine or birch plywood	Z
47	Board feet, 3/4"	Pine	A,B,C,D,E,F,G, H,I,J,K,L, ,N,O,P,V,W,X,Y

## CUTTING SCHEDULE

All measurements are in inches. All material is pine unless otherwise indicated.

Item	Qty.	Size	Description
A	2	3/4 x 16 1/4 x 44 1/2	Sides
B	1	3/4 x 16 1/8 x 37 1/2	Vertical divider
C	3	3/4 x 16 1/8 x 17 1/4	Shelves
D	1	3/4 x 2 x 34 1/2	Upper back crosspiece
E	1	3/4 x 2 x 16 1/2	Lower back crosspiece
F	7	3/4 x 2 x 16 1/8	Drawer supports
G	3	3/4 x 1 1/2 x 15 3/8	Top supports
H	2	3/4 x 1 1/2 x 44 1/2	Face frame sides
I	1	3/4 x 1 1/2 x 34	Face frame vertical divider
J	2	3/4 x 1 x 33	Face frame top drawer guides
K	4	3/4 x 1 x 15 3/4	Face frame drawer guides
L	1	3/4 x 2 1/2 x 33	Face frame bottom
M	1	1/8 x 35 1/4 x 44 1/2 (hardboard)	Rear panel
N	1	3/4 x 17 3/4 x 37 1/2	Armoire top
O	1	3/4 x 1 5/8 x 37 1/2	Front base piece
P	2	3/4 x 1 5/8 x 17 3/4	Side base pieces
Q	12	1/2 x 5 5/8 x 16 (mahogany ply.)	Drawer sides
R	10	1/2 x 5 1/4 x 13 3/4 (mahogany ply.)	Small drawer fronts and backs
S	2	1/2 x 5 1/4 x 31 (mahogany ply.)	Top drawer front and back
T	5	1/8 x 14 1/4 x 16 (hardboard)	Small drawer bottoms
U	1	1/8 x 16 x 31 1/2 (hardboard)	Top drawer bottom
V	5	3/4 x 16 3/8 x 16 1/4	Small drawer face panels
W	1	3/4 x 6 3/8 x 33 1/2	Top drawer face panel
X	2	3/4 x 2 x 34 3/8	Cabinet door frame verticals
Y	2	3/4 x 2 x 12 1/4	Cabinet door frame horizontal
Z	1	1/8 x 12 3/4 x 30 7/8 (ply.)	Cabinet door panel

### Hardware:

- 6 pair 16" drawer guides
- 8 1 1/2" diameter wooden knobs
- 1 pair door hinges
- 1 small box 1" brads
- 1 small box 1 1/4" finish nails
- 1 bottle yellow carpenter's glue
- 1 quart finish



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# CHINA HUNT



ARE YOU LOOKING for a showpiece china hutch to display your elegant chinaware, antique vase, or collectibles? Here's the perfect cabinet for you, with lots of transparent glass to show off your treasures. It even has an elegantly wallpapered hatching that can be changed at will. Select the decorative hardware to match the decor of your room—bright, brassy and modern or dark and intricate Mediterranean, or even sleek Oriental. You'll find a wide variety of handles and drawer pulls in all styles at any good hardware shop.

Choose flat defect-free boards in the wood of your choice for the frame. Rip them on the table saw into strips 1 3/4" wide. Remove all saw marks with a plane or jointer. Do not remove too much stock, just enough to clean the edges. Cut the strips to the various lengths. For the front, you will need three strips cut to 28 1/2". These are for the crosspieces. You will also need one piece 5 3/4" x 28 1/2" to be used for the lower section.

Drill dowel holes as indicated; the use of a doweling jig and dowel centers is recommended. Mark off the hole locations and drill into the ends of the crosspieces. Make the holes 3/8" in diameter and 1 1/16" deep. Because of the narrow width (1 3/4") use only one dowel per joint. The jig will automatically center the hole. After drilling the crosspieces, use dowel centers to transfer the hole locations to the uprights. Use two dowels for the wide bottom piece.

Before assembling the parts to make up the frame section, prepare the clamps by opening them up to size; also have some scrap strips of wood at hand for protecting the work surface from the clamp jaws. Bar clamps are ideal for this operation. Dab some glue on the dowels, insert into the drilled holes, then coat the mating surfaces with glue and join. Use adequate pressure on the clamps to force glue from the joint, but do not overtighten. Check the frame to be certain that it is square, then set aside while the glue dries.

Prepare the side crosspieces and the rear uprights. These are drilled and assembled much like the front frame, the only difference being that the depth of the dowel holes differs. The holes are drilled 1 1/2" deep into the 9 1/4" crosspieces and 1/2" deep into the uprights.

After drilling the necessary holes into the rear uprights, rabbet the edge to take the rear panel. Because the uprights are only 3/4" X 3/4" in cross section, a double pass on the table saw is recommended rather than using the router.

The side frames are assembled by gluing the crosspieces to the rear uprights. These are then glued to the front frame. Again, use the dowel centers to locate the holes for the dowels from the crosspieces to the front frame.

The frame at this stage will be somewhat flimsy, so handle with care. The addition of the shelves is the next step. This will make the frame rigid and strong. Cut the frames to size, then drill diagonal holes through the bottom of the three lower shelves. The top piece is drilled from the top side. Use 1 1/2" round head (RH) screws to attach the shelves.

The frames for the doors and side panels are made next. Cut the necessary pieces and assemble them with 3" finishing nails. Pilot holes for the nails must be drilled to simplify nailing and to prevent splitting. Note: Space the nails so they won't be cut with the router later on when making the rabbets for the glass.

The side panels will be held in place with screws which must not show in the finished cabinet. This is accomplished by drilling screw holes in the rabbeted area where the glass molding will conceal them. Drill the holes before assembling the panels.

When all the panels are assembled, rabbet them for the glass and cut the decorative bead using the router. Sand all edges and surfaces, then install into the frame. The nose and cove molding is added using glue and spring clamps to hold them in place. Miter all corners and use care not to mar the molding surface. A piece of felt glued under the clamp jaws is recommended.

Door panels are made with sufficient allowance for the strip hinges. The left-hand doors have a door stop added. The right-hand doors are beveled at the left edge to clear the other door. When installing the strip hinges, use only the end holes until you have checked fit. If fit is okay, you can then add the balance of the screws.

The bottom door which opens horizontally is treated in the same manner. Instead of glass, it has a 1/4" back panel. In addition, it has an insert to improve its appearance. This insert is simply a piece of 3/8" solid lumber which drops into the panel opening.

Add the plywood inserts to the bottom panels of the side pieces. These are glued into place.

Next add the decorative strips around the top of the cabinet. This is made by rabbeting a long strip of 1 1/4" stock which is then cut apart and mitered. Hold it in place with screws and glue.

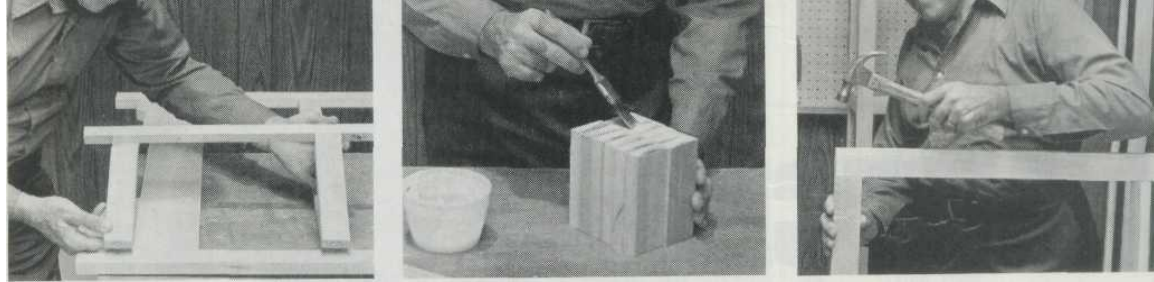
The rear panel of 1/4" plywood is *not* nailed to the cabinet. Instead it is screwed so that it can be removed as desired to change the decorative paper background. Use round head screws.

Drill the holes for the various pieces of hardware. Mount and check fit. Remove hardware when applying finish, then replace.

Finish the cabinet as desired. You can stain the wood and top with several coats of varnish for an antique look.



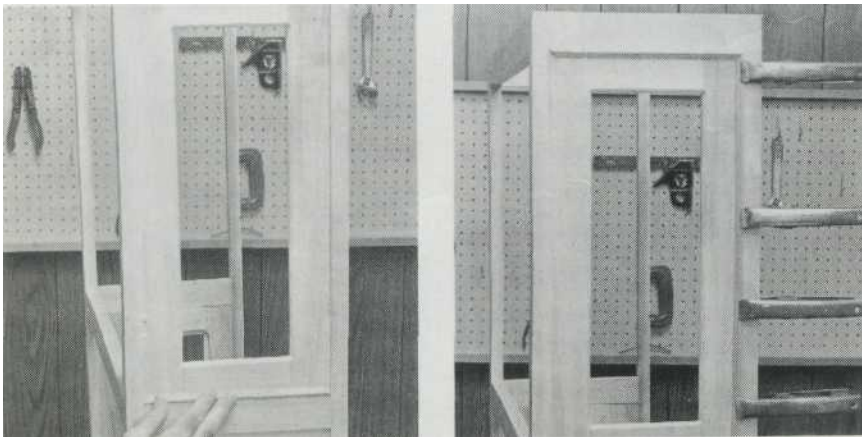
The frame sections of the china hutch are assembled with the aid of glue and spiral dowels. Dowel centers are recommended to



This photo more clearly shows how locating pins are used to transfer the dowel holes from the edge to front of frame. Use bar clamps till glue dries

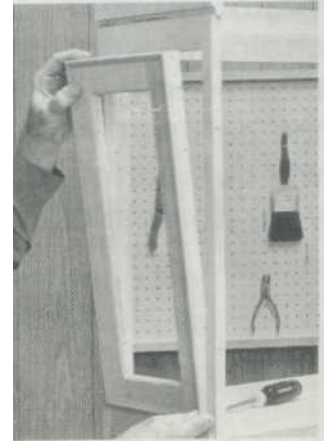
Shown here is how the end grain of the crosspieces are given a sizing coat of glue. Sized glue is made by mixing equal measurements of

The upper, center, and lower panels are assembled with glue and nails. Pilot holes are drilled before nailing to prevent the thin wood from



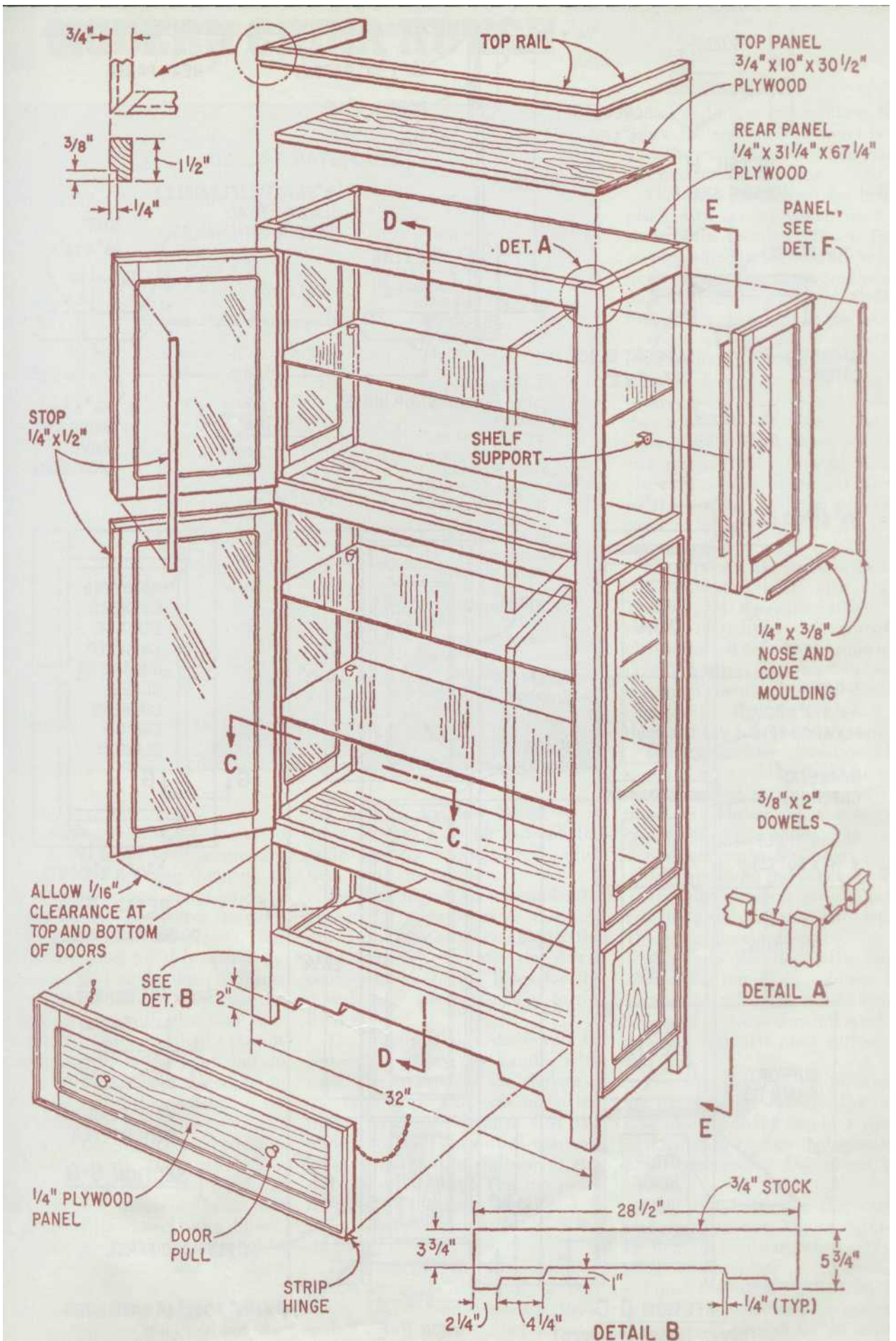
The edges of the panels are dressed up with the application of nose and cove molding. This molding can be bought at lumber yards, home decorating centers.

You won't need to use nails to apply the molding if you follow the technique shown here. The molding is simply glued into place, held by clamps until dry

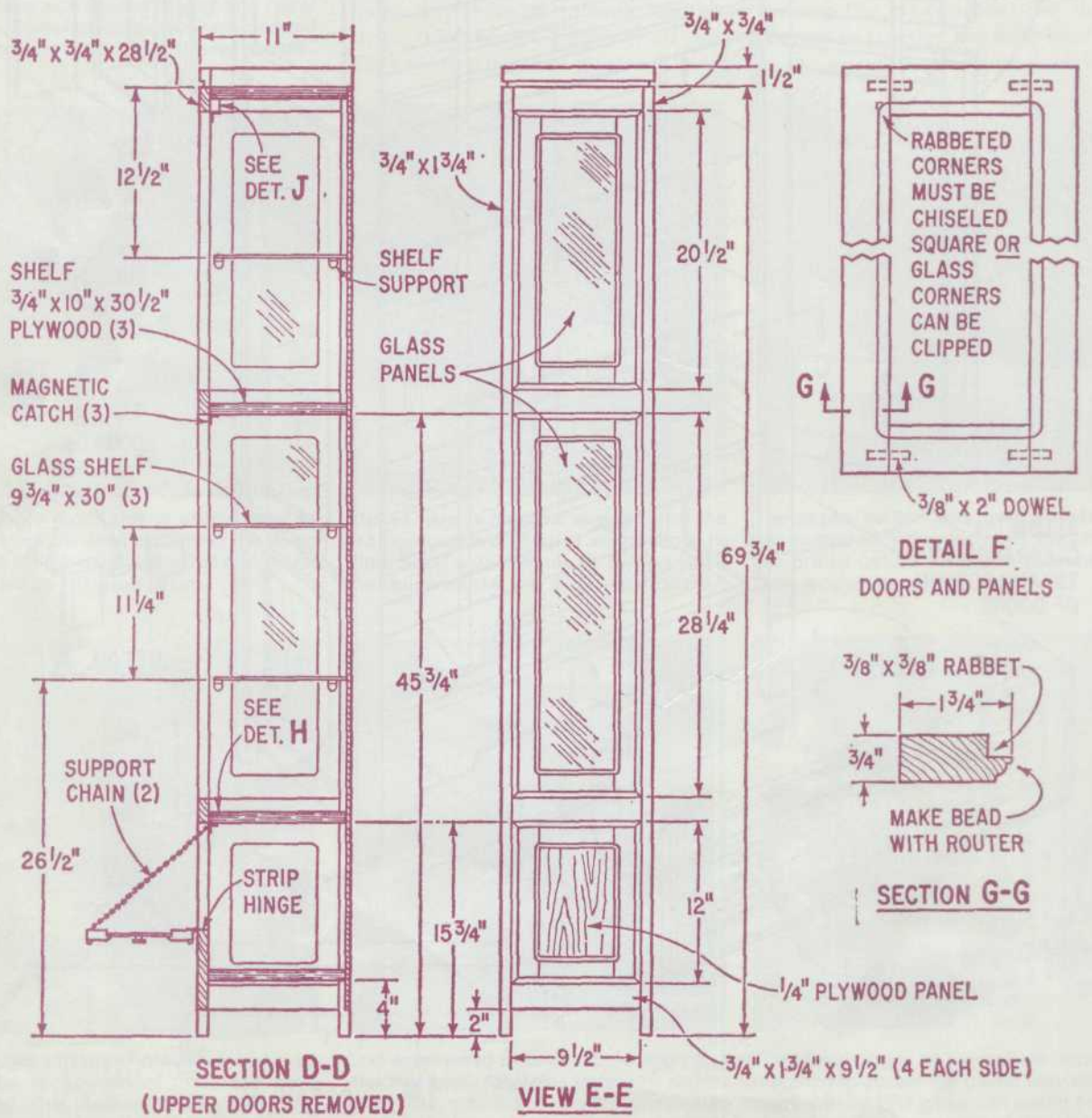
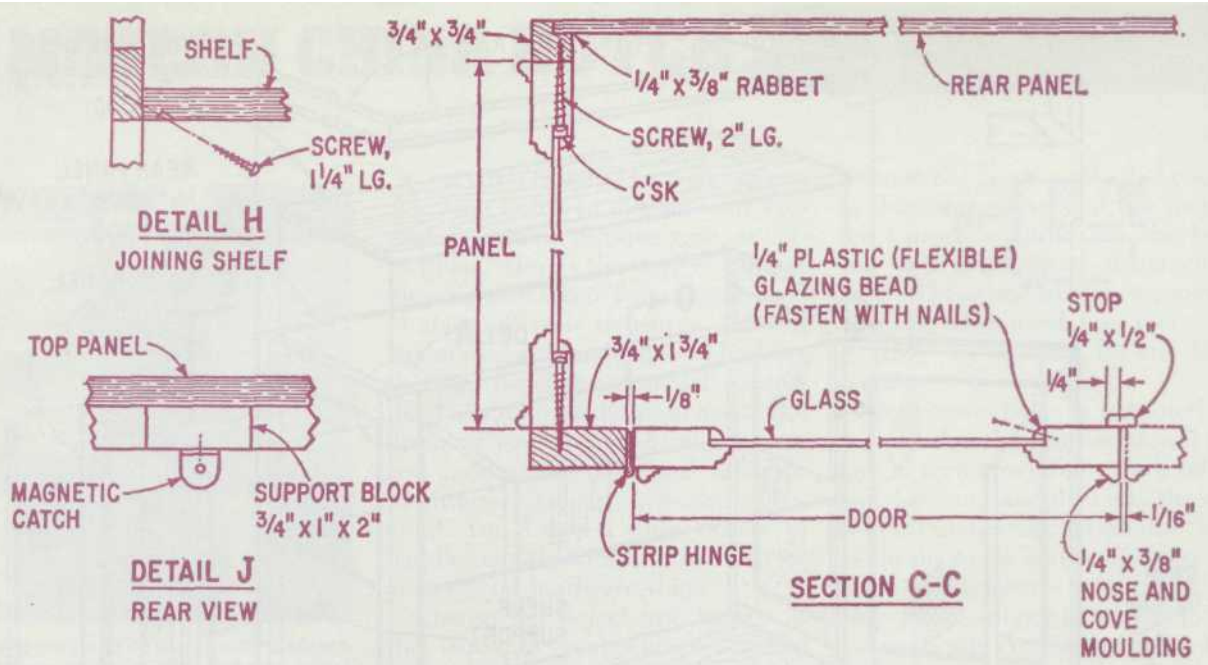


The inside edges of the panels must be rabbeted to accept the glass; they are re-moveable so that glass can easily be replaced in the event they are broken.









# Shaker-Style Woodbox



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iven the resurgence of fireplaces and wood-burning stoves over the last couple of decades, needs for in-home firewood storage also have redeveloped. Unlike earlier times, when many households depended upon wood-fueled fires for all of their cooking and heating, storage requirements today are somewhat reduced. This became readily apparent as I looked through my library for design ideas to construct a woodbox. While the room's overall ambiance is southwestern, it also contains a few other early -American antique pieces. A durable, functional woodbox was needed that, rather than providing a focal point for the room's decor, would serve its purpose without detracting from the ambiance.

Because the box was to be painted, I built it of clear white pine. Also, since the box was to be simple but functional, the joinery was selected on the basis of durability and efficiency. This box is easy to make, but it is still high quality. To ensure that the box would hang together as chunks of firewood are thrown in, and as the wood shrinks and swells with the changing seasons, the joinery, the grain orientations and the seasonal movements of its components all had to be carefully considered. As indicated in the drawings, da-

does and rabbets were used to join this box, securing the joints with cut nails. Cut nails are my choice over wire nails because they have more holding power and are historically correct for this style of joinery. I oriented the grain so the ends and bottom expand and contract in unison; that is, the cross-grain dimension extends front to back in these components. Thus, the front and back panels are carried along as the end and bottom shrink and swell.

The cross-grain orientation in the front, back and partition is vertical so these three components move as a unit as well. However, the partition is not carried with the bottom; therefore, the partition is housed in dados at each end and its length is adjusted so the bottom (along with the front and back panels) will move independently throughout the year.

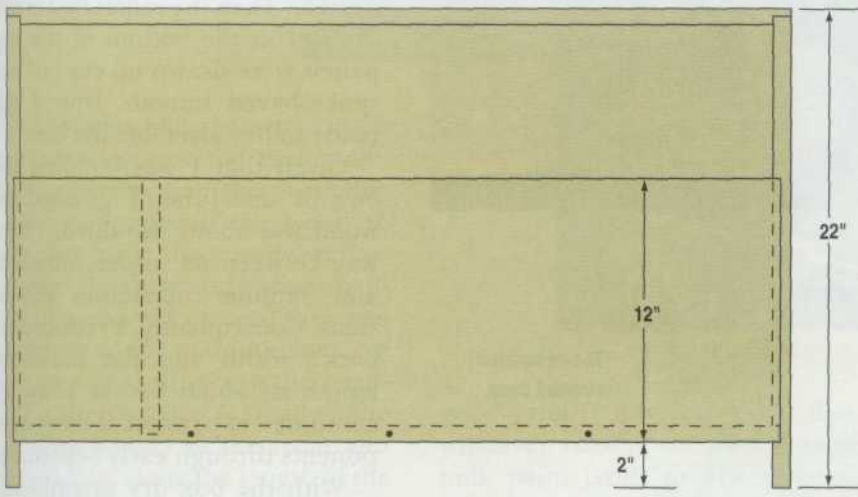
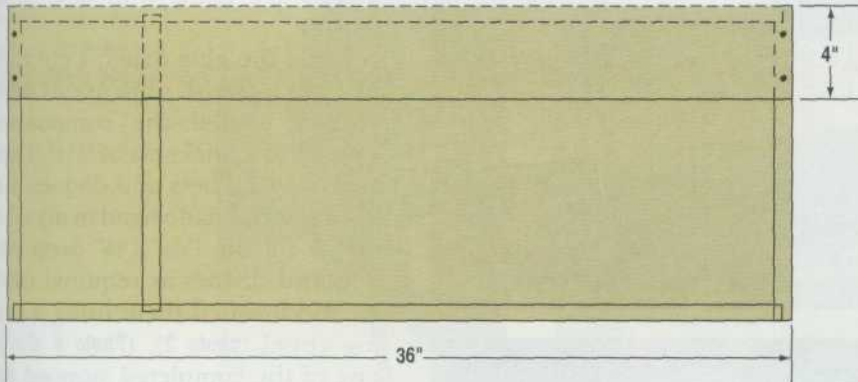
Finally, the rabbets in the end panels are stopped at the bottoms of the front and back panels. With the bottom housed in dados in the ends and in rabbets in the front and back, the bottoms of the front and back should be fixed, forcing expansion and contraction of these components to operate along their tops.

Since the back is housed in the top of the rabbet, the gap between the back and top from late-winter to mid-summer will be visible only from the back. However, the front will shrink to expose an 1/8" or so of the rabbets in each end, while in late summer the front's top edge will extend above the relief in the ends

If this is objectionable, one could use a housed rabbet and dado joint, stopping the dado below the relief. This is a more complicated joint, however, requiring a bit more time which translates, in the commercial world, to additional cost.

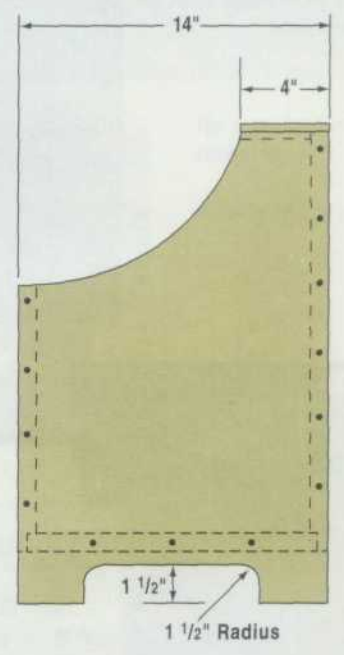
With these design and construction details thought through, I proceeded to select and square-up stock for this box, not overly concerning myself with grain and color matching since the box was going to be painted. I also did not discard stock because of blue stain as I glued-up stock to the panel dimensions given in the cutting list. To make the wider panels, I simply edge-joined the stock, liberally spreading yellow glue on the edges, and clamped the stock together. Since one of my most important goals is to build furniture that does not self-destruct a decade

## Dimensions



## Materials List

- White Pine:**
- 2 ends  $1\frac{3}{16}'' \times 14'' \times 21\frac{9}{16}''$
  - 1 front  $1\frac{3}{16}'' \times 12'' \times 35\frac{1}{8}''$
  - 1 back  $1\frac{3}{16}'' \times 19\frac{9}{16}'' \times 35\frac{1}{8}''$
  - 1 top  $1\frac{3}{16}'' \times 4'' \times 36''$
  - 1 partition  $\frac{3}{4}'' \times 11\frac{9}{16}'' \times 13\frac{1}{8}''$
  - 1 bottom  $1\frac{3}{16}'' \times 13\frac{1}{8}'' \times 35\frac{1}{8}''$
- 2d cut finish nails  
1 pint milk paint





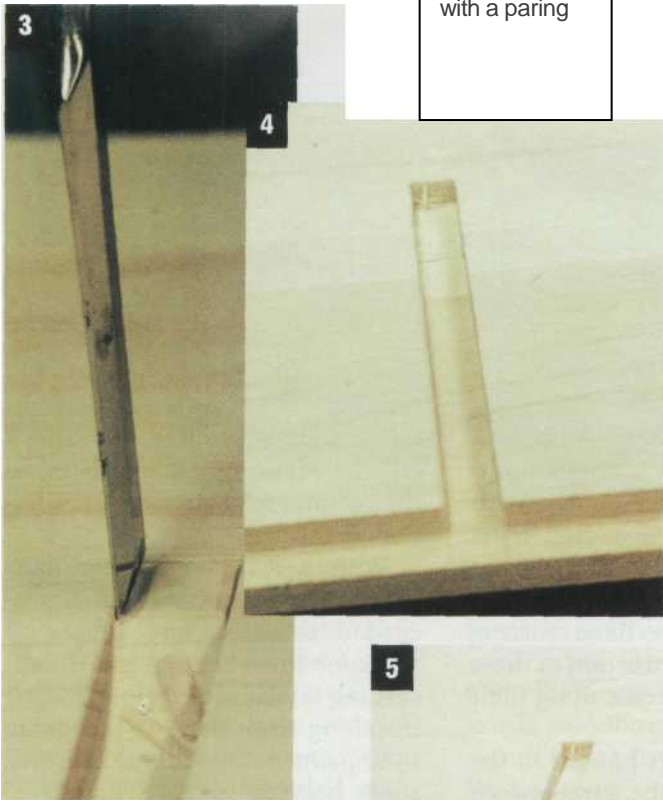


Cutting glued-up ends to finish dimensions



Cutting the rabbet in the bottom edge of the back panel

Completing a stopped dado with a paring chisel



The completed stopped dado.

or two hence, I did not "reinforce" these edge joints with biscuits or dowels.

Once the glue dried, I cut each piece to its finish dimensions (photo 1) and planed the components smooth to a thickness of 13/16". Then I laid out rabbets and dados. Using a stacked dado head in my table saw, I cut the 13/16"X3/8" deep rabbets and dados as required (photo 2), and finished them using a paring chisel (photo 3). (Photo 4 shows one of the completed stopped dados.) I also cleaned up the rabbets with a shoulder plane so the assembled joints would be tight and crisp (photo 5). Then the reliefs that create the feet in the bottom of the end panels were drawn in, cut out and spokeshaved smooth. Now I was ready to dry assemble the box.

Given that I was building this box in mid-June, I guessed my wood was about two-thirds of the way between its winter minimum and summer maximum dimensions. Consequently, I reduced the back's width and the partition's length by about 3/32" to allow for continued expansion of these components through early September

With the box dry assembled, I laid out the curved relief in the top front of the end panels. By drawing the curves full-size on the ends, I could play with the shape until I found one that was pleasing to the eye. Disassembling the box, I cut the reliefs in each end, spokeshaved them smooth, and sanded the inside surfaces to 180 grit. The box was now ready for final assembly.

As before, I assembled the box dry and clamped it together securely. No glue was used in the box's assembly to ensure that slight differences in expansion would not cause the components to pull themselves apart. Using a 1/16" drill bit, I provided pilot holes for the nails and proceeded to nail through the ends into the front, back and bottom panels. In using cut nails, which have a



Cleaning up a rabbet joint with a shoulder plane



Driving a cut nail, showing the wide dimension of the nail, is oriented along the grain of the wood you're nailing through

The assembled and sanded woodbox.



rectangular cross-section shape, the wide dimension must be oriented along the grain (**photo 6**); thus the wedge effect of the wider than thick nails is exerted against the end grain, thereby eliminating the possibility of the nail causing the wood to split. Similarly, the bottom was secured to the front and back by nailing through the front and back into the edges of the bottom panel. No nails are used to secure the partition, since the idea is to allow the partition dadoes in the front and back to float along the length of the partition as the bottom/ends unit expands and contracts. Finally, I nailed the top to the ends, then countersunk all nail heads 1/16" to 1/8" below the surface. The cavities were filled, and after the filler cured, all exterior surfaces were sanded to 180 grit. (**Photo 7** shows the assembled box.) While 180 grit abrasives leave far too coarse a surface for my taste, this box was to be painted with tavern green milk paint. Since milk paint provides a textured mat surface, sanding beyond 180 grit would have been a wasted effort.

Following the manufacturer's directions, I mixed a pint of tavern green milk paint and coated the box inside and out. Now I have painted a fair number of Windsor chairs with milk paint since I began building chairs in 1984, but despite this decade of experience, my reaction as the first coat of milk paint dries is almost always the same — good grief, I have ruined it! For whatever reason, the first coat of milk paint tends to dry off-color and blotchy, in a word, awful! (**photo 8**) Anyhow, I persevered and burnished the dry painted surface with #2 steel wool. Then I applied the second coat and, voila, things were looking up. Once the paint was dry, I again burnished the surface, this time with #0000 steel wool. Now the box looked like something I could sign.

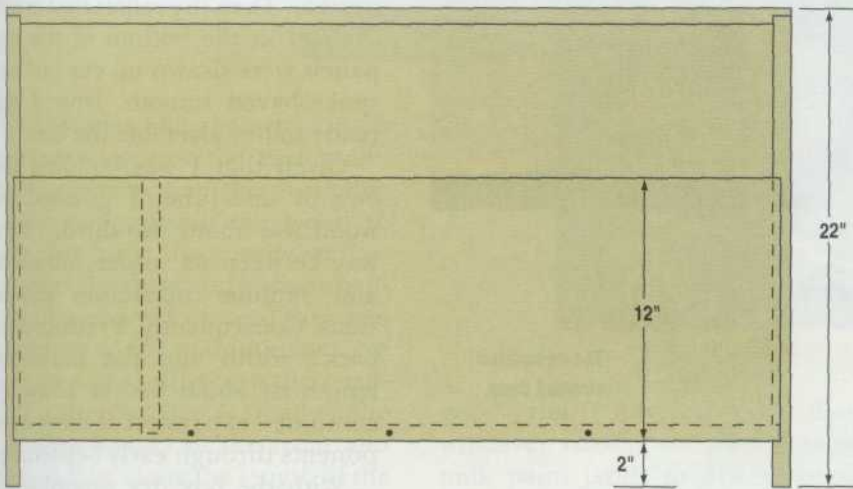
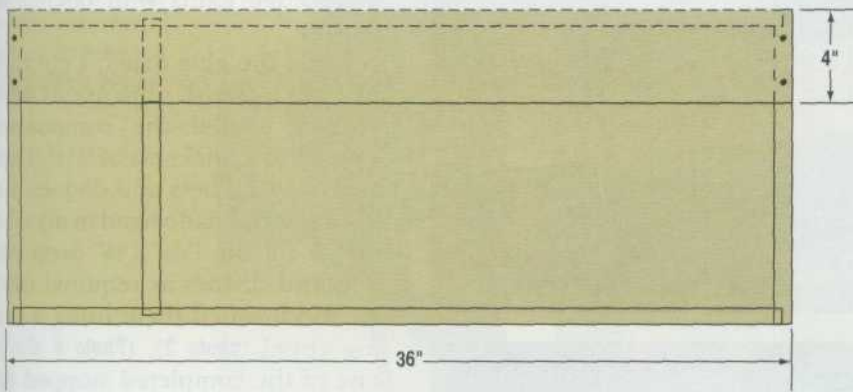
While the milk paint provides a



Applying milk  
pain

very durable and quite refractory finish, it does water spot badly. To minimize this, I always seal milk painted surfaces with an oil finish of some sort—tung oil, Watco Danish oil or, for this piece, a mix of equal parts of boiled linseed oil, turpentine and satin polyurethane varnish. I coated the box with this mix, let it stand for 10 or 15 minutes, then wiped off the excess with paper towels, taking great care to collect all the oily paper afterward and destroy them in my wood-burning stove to avoid having them

## Dimensions



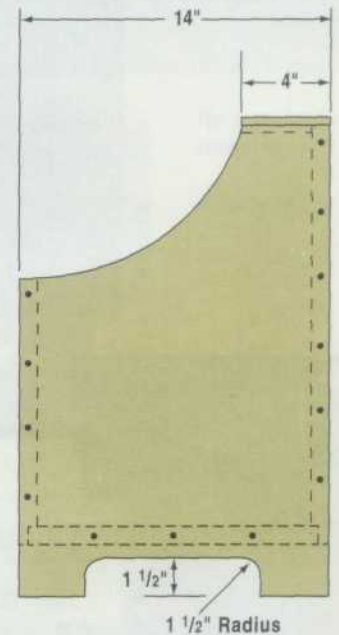
## Materials List

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2d cut finish nails

1 pint milk paint



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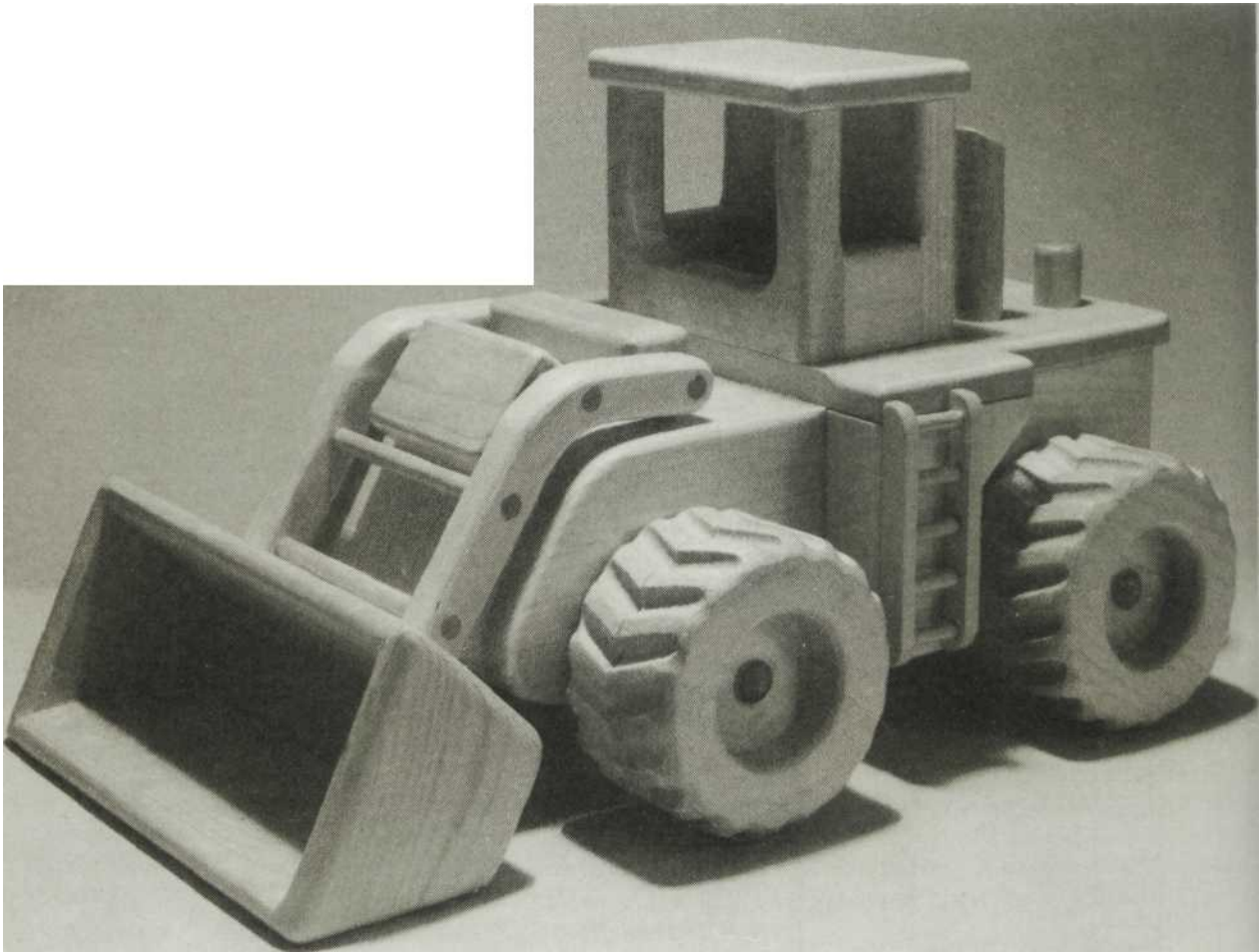
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# EARTH MOVER



This earth mover features a moveable shovel that stops in different positions. This project should successfully accommodate most of your child's heavy earth moving needs for quite sometime. It is pictured here built in clear pine but it can be built in a wide variety of woods. Soft maple would be an excellent alternate choice.

Begin construction with the body. Rip an 18" length of 3/4" stock 4-1/2" wide then set the saw for a 30 degree bevel. Make a crosscut to produce the mitered ends. Cut from the remainder then make a series of 1/8" deep kerf cuts spaced 1/8" apart to detail the radiator grille.

Cut the side pieces to size then bore the axle holes before assembly. Use a belt sander or hand plane (or both) to form the front end curves.

Cut the cab and remaining body parts to size then use the router with a 5/32" corner rounding bit to ease all sharp corners before completing the body assembly.

Construct the bucket and bucket arm assembly. Mark the location of the arm ends and use a chisel to cut the 1/4" deep mortises to receive them. If you have a brad point or Forstner bit that bores a flat bottomed hole, use it first then square the corners with the chisel. The bucket pivot is nailed and glued to the body after the entire bucket assembly has been completed.

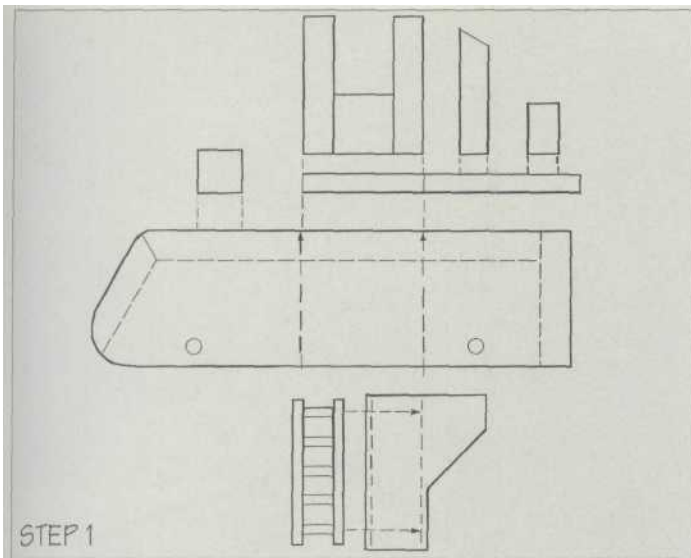
The fat wheels are made up by joining two discs of 1-1/8" stock after angled holes are bored to form the knobby treads. The simple jig used to

bore the holes features a hardwood guide block which has two holes drilled at 20 degree angles in **opposite** directions. Note that these holes must align with the pivot hole so they are bored from the bottom of the block before the jig is assembled.

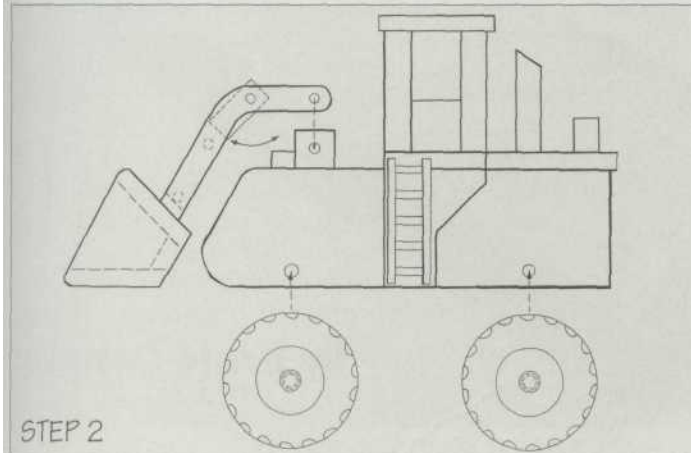
The jig may be used with a portable drill or on a drill press. If using a drill press tilt the table or prop the jig so the bit enters the angled guide holes squarely. Bore the holes in discs #1 & #2 as indicated. To save layout time make photocopies of the wheel diagram and attach to each disc with rubber cement.

Use a 2" dia. Forstner bit to bore the recess in the outer disc, Part 1, then Counterbore for the plug and axle. Saw the discs to final size after the angled holes are bored to reveal the treads. Use the router to round over the corners. Sand then glue the wheels to the axles in place on the body.

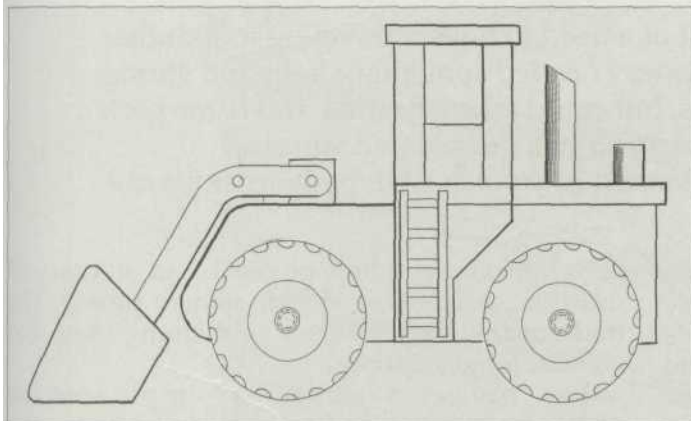
Finish with several thin coats of shellac or two coats of polyurethane finish.



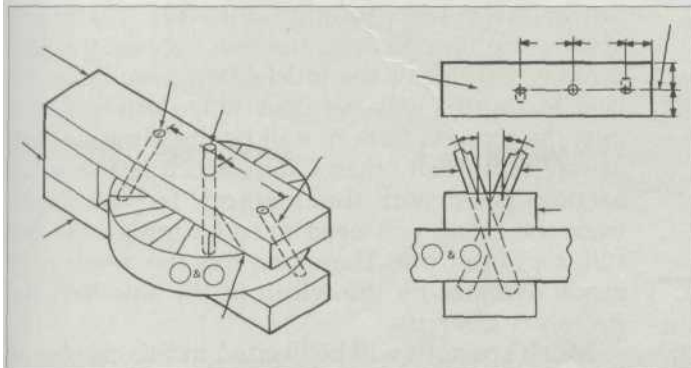
STEP 1



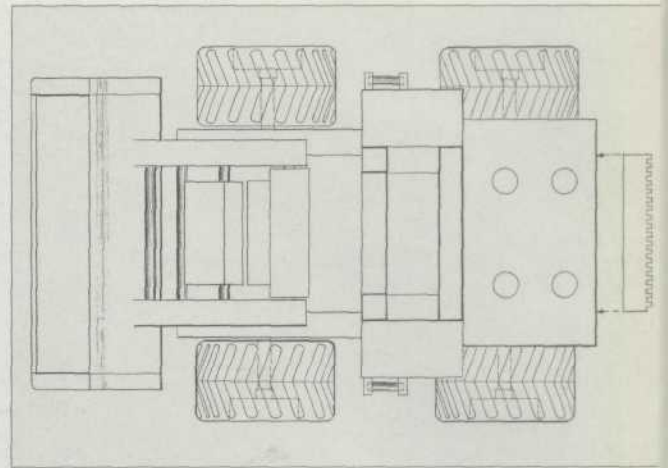
STEP 2



STEP 3 COMPLETED PIECE



JIG FOR CREATING TIRE TRENDS



PLAN VIEW OF COMPLETED PIECE

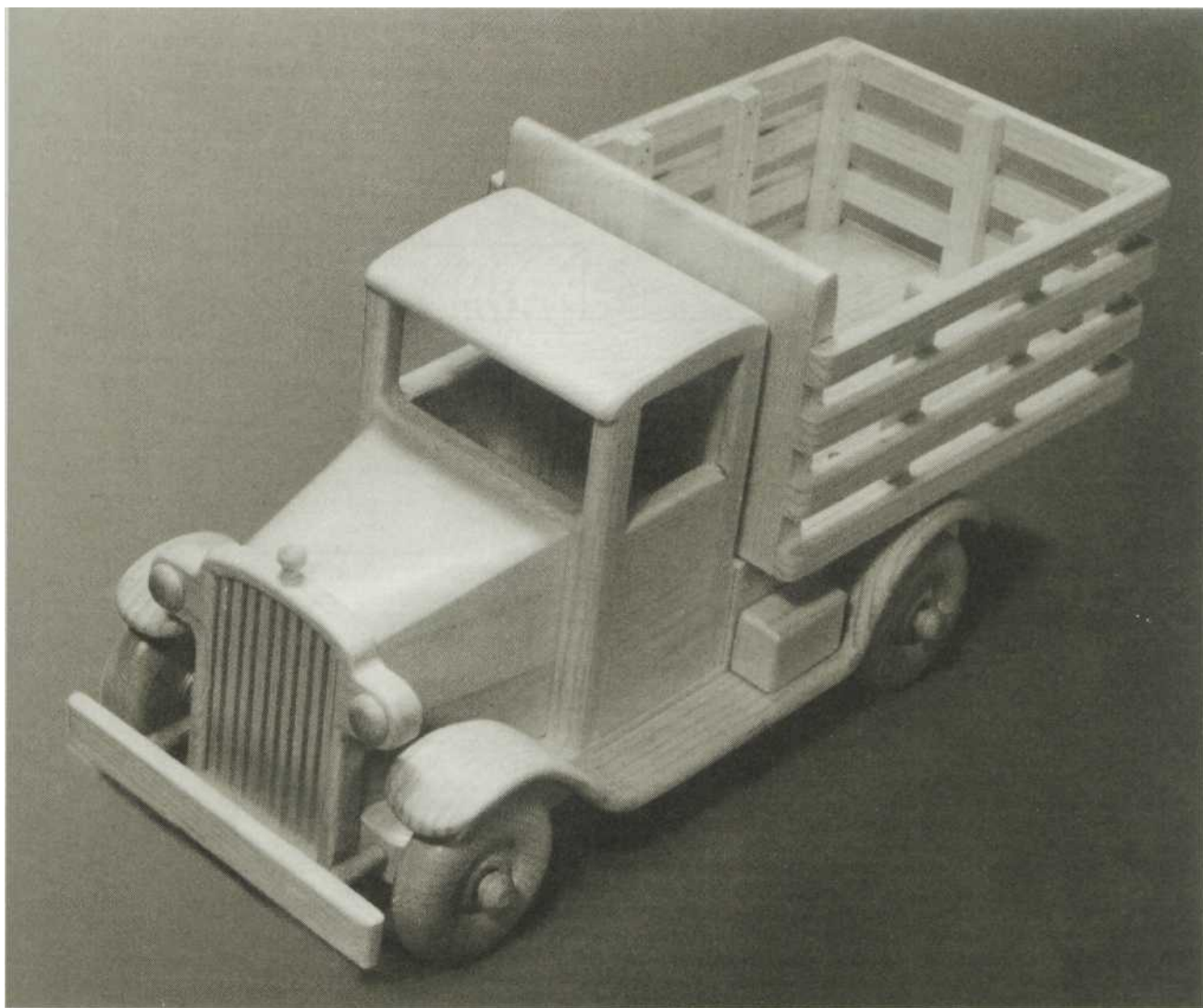
## BRUT EARTH MOVER MATERIAL LIST

### QTY. DESCRIPTION

4	1-1/8" x 5" dia.	(outer wheel)
4	1-1/8" x 5" dia.	(inner wheel)
2	3/8" dia. x 8-1/2" dowel	(axle)
4	5/8" dia. wood buttons	(hub cap)
1	3/4" x 3-5/16" x 4-1/2"	(body front)
1	3/4" x 4-1/2" x 10"	(body top)
1	3/4" x 3-1/2" x 4-1/2"	(radiator)
2	3/4" x 3-1/2" x 12"	(body side)
2	1-1/8" x 3" x 3-1/2"	(body)
1	1/2" x 3" x 3-1/2"	(cab deck)
1	1/2" x 3-7/8" x 6-1/2"	(engine hood)
1	3/4" x 3-1/2" x 5"	(cab front)
1	3/4" x 3-1/2" x 5"	(cab rear)
2	3/4" x 1-1/2" x 1-1/2"	(cab side)
1	1/2" x 3-3/8" x 5-1/4"	(cab roof)
2	3/4" dia. x 3-1/2" dowel	(exhaust)
2	3/4" dia. x 1-1/2" dowel	(exhaust)
2	1/2" x 2-3/4" x 4"	(bucket end)
1	1/2" x 3" x 8"	(bucket rear)
1	1/2" x 1-1/4" x 8"	(bucket bottom)
1	1/2" x 3-1/2" x 8"	(bucket front)
2	3/4" x 2-1/4" x 6-1/4"	(bucket arm)
1	3/4" x 1-3/4" x 3"	(bucket lift)
1	1/2" x 5/8" x 3"	(bucket stop)
1	1-1/8" x 1-1/8" x 3-3/4"	(bucket pivot)
4	5/16" dia. x 5-3/8" dowel	(arm support)
4	1/4" x 1/2" x 3-3/4"	(ladder rail)
10	1/4" dia. x 1" dowel	(ladder rung)
4	7/16" I.D. x 1" O.D.	(flat washer)

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# STAKE TRUCK



**H**ere is a neat easy to build toy truck that your child will treasure. This truck is made of clear pine but you may opt for a different stock.

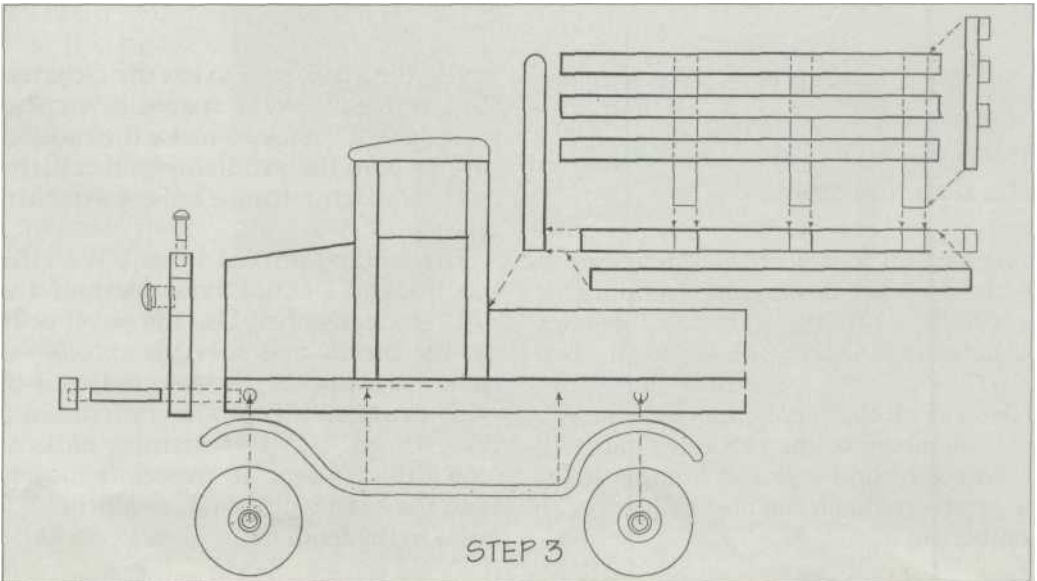
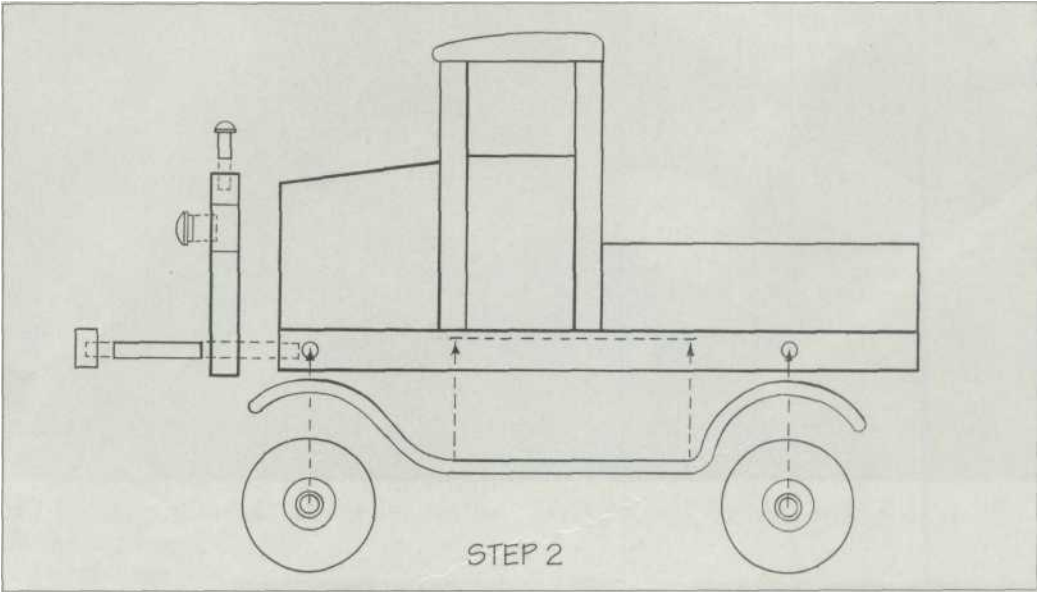
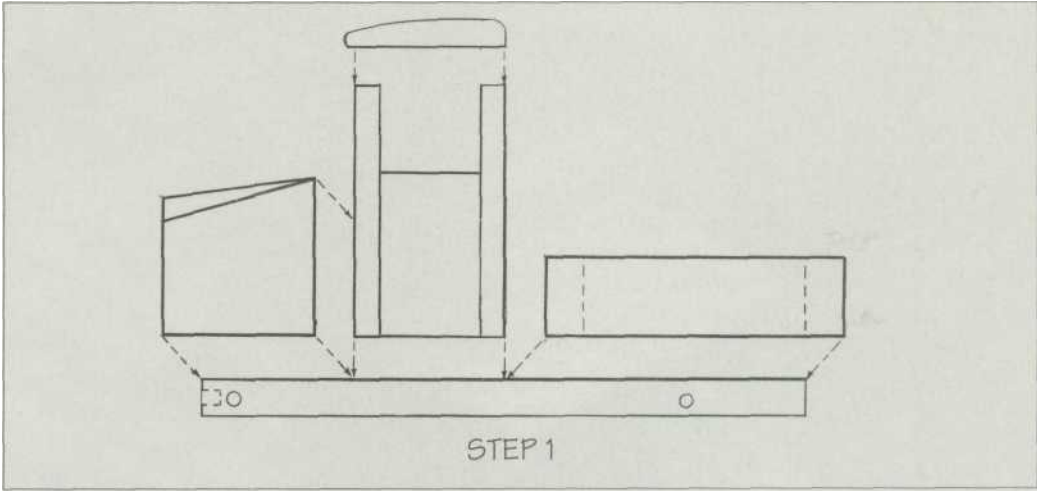
Begin gluing several pieces of stock together to make the thick block for the engine section. Cut this piece to size then saw the slants on the sides and use a plane and sander to form the top contour.

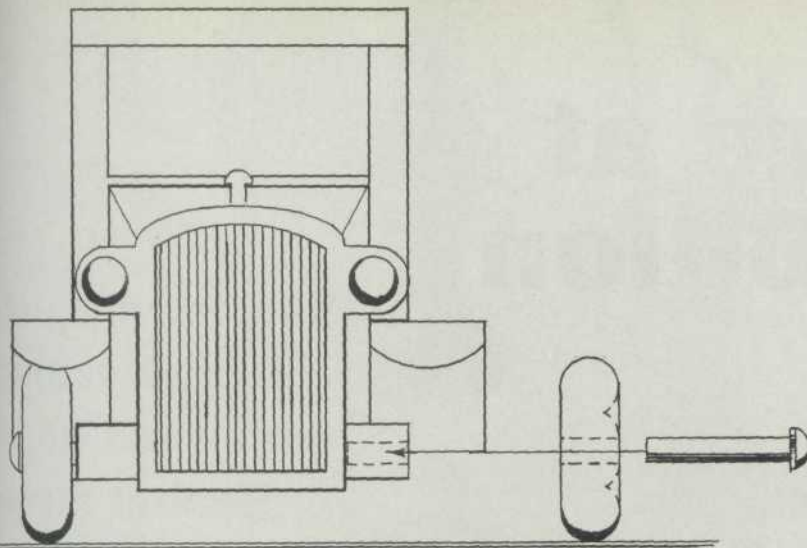
Next, finish sand all the pieces then join the cab front and back members to the cab sides and add the cab roof. Bore the blind axle and bumper holes in the base piece then attach the engine block, cab and back members to it.

Use the scroll saw to cut the radiator frame then cut a series of evenly spaced saw cut grooves in a piece of 3/8" stock to make the radiator frame. Be sure to bore the headlamp and radiator cap holes in the radiator frame before attaching it to the chassis.

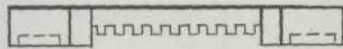
The fenders are cut from 1 1/2" thick stock. If this thickness is not available glue two pieces of 3/4" stock together. Use the scroll or hand saw to cut the profile and save the cutoffs—use them as back-up supports during sanding which is done with drum sanding attachments in a drill. Use thin, 19 ga. 1-1/4" finishing nails and glue to attach the fenders. To prevent splitting use a nail, with the head clipped off, as a drill bit to bore pilot holes in the fenders.



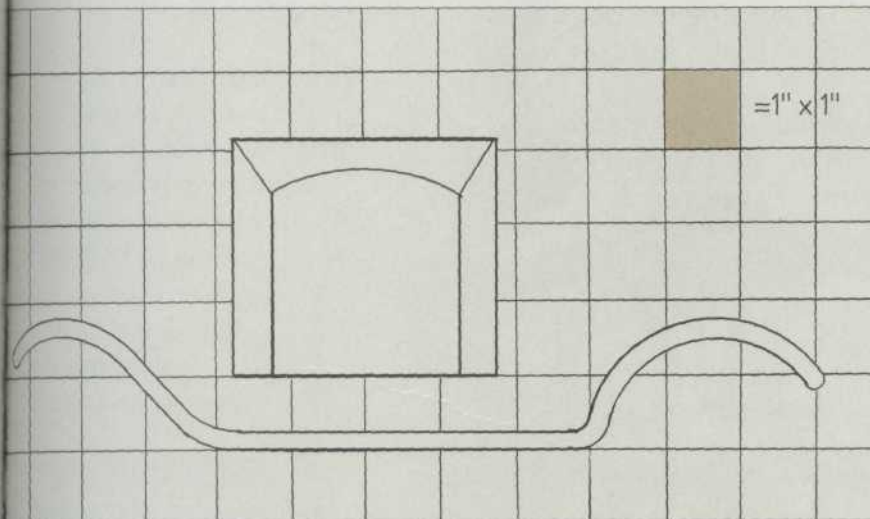




FRONT VIEW (SHOWN WITHOUT FENDER)



SECTION OF RADIATOR



The dump truck cargo container has two pivoting parts; the bin which tilts back on a pair of hinges, and the tailgate door which swings open when the bin is tilted up. Attach the hinges to the bin first then hold the bin in a fully raised vertical position so it butts against the rear of the body while marking the hinge screw holes.

To assemble the rails on the stake truck nail and glue the stakes into place in the bed notches then alternately lay the assembly on its sides and attach the rails in place with a dab of glue at each intersection.

The special parts including axle pegs, wood buttons and wheels are available from hobby and craft shops or through mail order woodworker's supply outlets.

The trucks may be clear finished with shellac or varnish or they may be painted with brightly colored non-toxic paints.

## TOY STAKE TRUCK MATERIAL LIST

All dimensions are in inches.

Truck body quantity is listed for one truck

QTY.	DESCRIPTION	QTY.	DESCRIPTION
1	3/4 x 4-1/2 x 12 (truck base)	2	5/8 dia. wood button (headlight)
1	3 x 3-1/8 x 3-1/2 (engine)	2	5/16 dia. x 1-5/8 dowel (bumper supports)
1	1/2 x 4-1/2 x 5 (cab front)	1	3/8 x 3/4 x 5-3/4 (bumper)
1	1/2 x 4-1/2 x 5 (cab rear)	1	7/32 dia. x 9/16 (radiator cap)
2	1/2 x 2 x 3-1/4 (cab side)	<i>Additional parts for stake truck:</i>	
1	1/2 x 3-5/16 x 4-1/2 (cab roof)	1	1/2 x 5 1/2 x 8 (bed)
1	3/4 x 1-5/8 x 3 (truck front)	1	1/2 x 4-1/2 x 5-1/2 (front)
2	3/4 x 1-5/8 x 6 (truck side)	7	5/16 x 1/2 x 3-1/2 (stake)
1	3/4 x 1-5/8 x 3 (truck rear)	8	5/16 x 1/2 x 8*-13/16 (side rail)
1	1-1/2 x 1-3/4 x 11-5/8 (left fender)	4	5/16 x 1/2 x 5-1/2 (rear rail)
1	1-1/2 x 1-3/4 x 11-5/8 (right fender)		
4	2-1/2 dia. x 3/4 (wheel)		
4	5/16 dia. x 1-7/8 (axle peg)		
2	3/4 x 1 x 1-5/8 (gas tank/tool box)		
1	1/2 x 3-3/4 x 4-1/2 (radiator)		
1	300/8 x 2-1/4 x 3-1/4 (radiator grille)		

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# TOY BOX



This little chest, which can hold a bunch of easily accessible toys, turns into a convenient bench when the top is closed. And the lid is controlled by a spring-tensioned support that prevents accidental slamming on little fingers.

Next, rip and crosscut maple edge banding and glue it to the panels (Photo 2). We used 3-way clamps, but you can try bar clamps or even masking tape. Note that the top edge bands of the end panels are slightly long, so they'll be sawn at an angle when the ends are cut to shape. Also, use three 19-gauge brads partially driven into each edge band to keep it from sliding. Band all the panels in this fashion -- except the lid, which gets its edge bands after the chest is assembled.

After the glue dries, scrape off glue beads and plane edge bands flush to the panel surfaces.

Next, set the table saw miter gauge to 35 degrees and make the angled cuts on the end panels (Photo 3). Glue and clamp the edge bands onto the sawn surface. We cut the panel dados and grooves with a router and a 1/2-in.-dia. straight bit. A rectangular frame is used to guide the router to make these cuts (Photo 4). Be sure that the side rails are parallel and are spaced to fit the diameter of your router base, plus the difference between the diameter of the router bit and the width of the required dado or groove. You must precisely measure the thickness of the plywood before setting the distance between the rails. (Hardwood plywood is always slightly thinner than its stated dimension.) Tack nail a movable stop across the rails to control the length of the cut, and cut each groove or dado in two passes. Then, using a chisel, cut the ends of the grooves square.

## Making The Splat Rail And Assembly

Cut the splats to shape, then smooth their edges. The pieces will be too small to clamp to a bench. Instead, use a 1/16-in.-radius corner-rounding bit in the router table for the job (Photo 5).



1--Tack nail a strip to the back of each panel. The strip should ride in the miter gauge groove as the panel is being cut.



2--Glue and clamp each of the edge bands to the panels. Note that the top edge band of the end panel is just slightly long.



4--Cut grooves and dados in the end panels with a router. Then tack nail a block across the rails to stop the cut.



With the dado head in the table saw, cut the groove in the top rail and the edge band on the back panel. Then cut the filler blocks to length, leaving the four end blocks 1/2 in. longer than the others. Remember to round off the rail edges before assembling the workpieces.

When the back assembly is dry, complete the project in the following sequence: Insert the back panel into the groove (Photo 7). Join the bottom and front to this subassembly, then add the second end and lay the chest on its back. Next, glue and clamp the entire assembly together (Photo 8) and check it for square. Cut the lid panel to size, glue and clamp the side bands to it and then add the front and back bands. Install the hinge and lid support, attach the standoffs and relieve any sharp corners with fine sandpaper. Finally, apply several coats of polyurethane to finish off the project.



5--Since the splats are so small, it's best to round over their edges on a router table. A ball-bearing bit usually works best.



6--Insert the splats and spacer blocks in the top rail. After the glue has dried, repeat the procedure on the back panel.



7--Begin the assembly by inserting the back into an end panel. Next, add the bottom and front, then the other end.



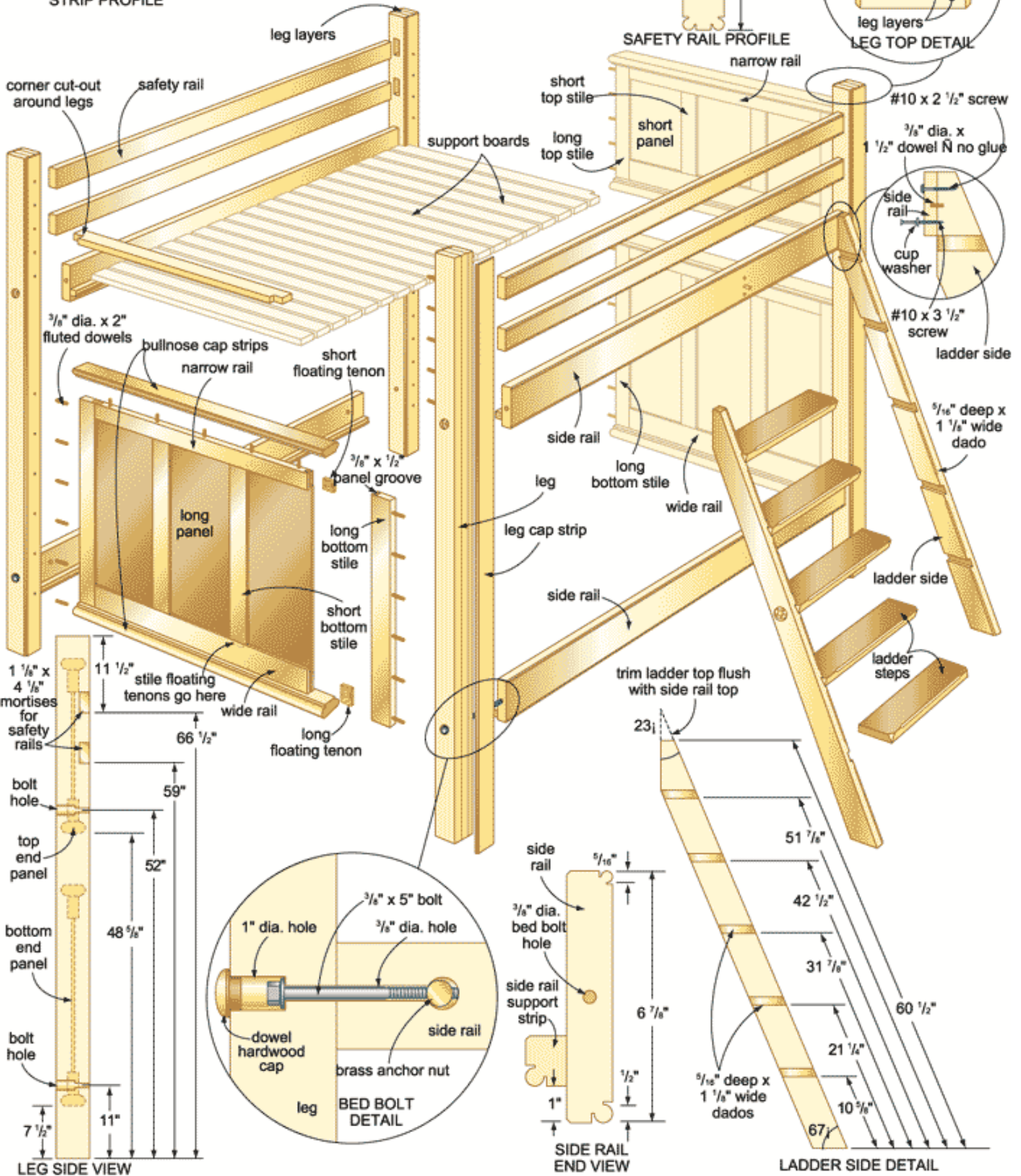
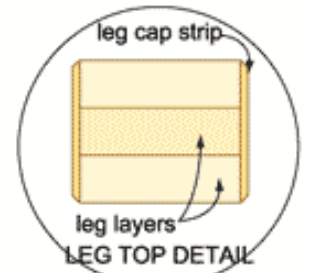
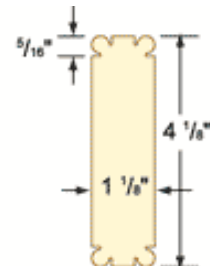
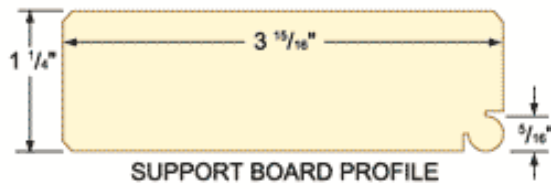
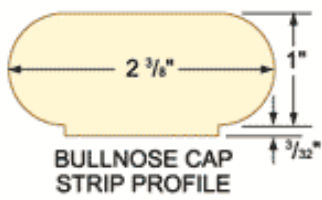
8--Clamp the chest using five bar or pipe clamps. Be sure to check the assembly for square before allowing the glue to set.



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# BUNK BEDS





<b><i>For the head and foot boards</i></b>	<b><i>Size</i></b>	<b><i>Qty.</i></b>
Legs	3 1/4" x 3 5/8" x 78"	1
Leg cap strips	3/16" x 3 1/4" x 78"	8
Long panels	3/8" x 9 7/8" x 24 1/2"	6
Short panels	3/8" x 9 7/8" x 17 5/8"	6
Long top stiles	1 1/8" x 2 3/4" x 24"	4
Long bottom stiles	1 1/8" x 2 3/4" x 30 3/4"	4
Short top stiles	1 1/8" x 2 3/4" x 17"	4
Short bottom stiles	1 1/8" x 2 3/4" x 23 3/4"	4
Narrow rails	1 1/8" x 2 3/4" x 33"	4
Wide rails	1 1/8" x 4 1/4" x 33"	4
Short floating tenons— <i>hardwood</i>	3/8" x 1" x 2 1/4"	16
Stile floating tenons— <i>hardwood</i>	3/8" x 1" x 1 3/4"	16
Long floating tenons— <i>hardwood</i>	3/8" x 1" x 3 3/4"	16
Bullnose cap strips	1 1/8" x 2 3/8" x 38 3/8"	8
Dowels	3/8" dia. x 1 1/2" fluted	40
<b><i>For the mattress support assembly</i></b>		
Side rails	1 5/16" x 6 7/8" x 76 3/4"	4
Side rail support strips	1 1/8" x 1 3/4" x 76 3/4"	4
Support rail screws	#14 x 2" round head, brass	24
Support boards	1 1/8" x 3 15/16" x 40 7/8"	40
Bed bolts	3/8" dia. x 5"*	8
Bed bolt caps	hardwood, 1" dia. domed caps	8
<b><i>For the ladder and safety rails</i></b>		
Ladder sides	1 1/4" x 4 3/8" x 61 1/2"	2
Main ladder steps	1 1/8" x 5 1/8" x 16 1/2"	5
Safety rails	1 1/8" x 4 1/8" x 78 3/4"	4
Long ladder screws and cup washers	#10 x 3 1/2"	2
Short ladder screws and cup washers	#10 x 2 1/4"	2
Dowels	3/8" dia. x 1 1/2" fluted	2

## Start With The Panels



**Variations of the tudor rose are all over my house. Although the spruce is strong, it proved difficult to slice cleanly. Consider white pine or basswood for carving**

Since construction-grade wood needs time to dry while you're building, I'll lead you through the preparation of parts in stages. Moving from one group of parts to another as you work allows wood to cup and twist (as it inevitably will) while you still have the opportunity to do something about it.

The panels are a prominent part of the bed, so choose and combine grain patterns with care. This is where artistry comes in. Since the finished panels are about 3/8" thick, you can easily get two panel parts by splitting 1 1/2" lumber down the middle, on edge. This leaves lots of extra wood for jointing and planing operations. If you don't have a bandsaw, rip the panel parts no wider than 4", then slice them in half, on edge, in two passes across your tablesaw. Splitting thick stock like this naturally reveals striking book-matched grain patterns on matching parts. This is good stuff, so make the most of it.

Next, spend time at the workbench arranging panel parts so they look their best. Mark the location of neighbouring pieces, then set them aside to dry for at least three or four days before jointing and edge gluing. Thin, newly split pieces like these tend to cup as they dry, so you'll want to let that happen before jointing. I designed the completed panels to be less than 12" wide so they could be milled in any benchtop thickness planer after lamination. Set the panel parts aside for now.



## Bags And Bags Of Shavings

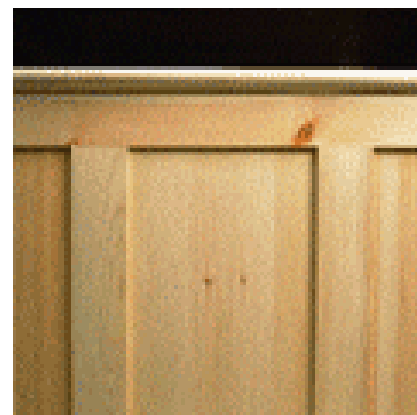
Most of the bunk bed parts are 1 1/8" thick, meaning you'll have to spend hours working with your planer to mill the 1 1/2"-thick boards down to size. You'll save time if you rough-cut all stiles, rails, bullnose cap strips, side rail support strips, support boards, safety rails and ladder parts to width first, instead of running uncut lumber through your planer, and then cutting these parts. Joint and plane components to 1/8" thicker than final size, then let them sit for a week with a fan blowing on the stickered pile before milling to final thickness. Keep the parts in separate groups so you can work on each kind in turn.

## Laminate The Legs

The bunk bed legs are thick and long, making them the most troublesome part of the project. The plans show how each leg has five parts: three hefty internal layers, capped by two face strips that hide the lamination lines.

Divide the 12 leg layers you cut earlier into four groups: three pieces for each leg. The idea is to arrange the layers so the outer face of each leg looks best. Mark relative layer locations, then joint and plane leg layers to 1 1/4"-thick and glue them together. A few wooden hand screws tightened across the edges of the layers will do wonders to align the parts as the main clamps draw them together. This saves lots of jointing later.

While the leg layers are drying, cut the leg cap strips slightly wider than listed and plane to final 3/16" thickness. When the legs are ready to come out of the clamps, joint and plane them to final size. Glue the cap strips over the sides showing the lamination lines, using as many clamps as needed for gap-free joints. Plane the excess edging flush with the legs, sand and rout a chamfer along all edges. The plans show how the joint line between leg and leg cap disappears if you cut so its edge lands on the joint line.



**Head and footboard panels are made of planks sawn in half on edge, so there's lots of bookmatched grain pattern. Use wood with growth rings perpendicular to the panel face**

## Back To The Panels

Joint one face of each panel member, then joint an edge, before ripping each piece to wider-than-final width and jointing this sawn edge. Keep all panel parts grouped, as you arranged them earlier for best appearance, while dry-fitting the panel parts. When everything looks good, edge-glue the panels, scraping off excess glue after a few hours when it's half-hard.

As the panels are drying, joint and plane the rails and stiles to final size, then trim to length. The plans show how the edges of these parts require grooves to house the panel edges. These grooves also admit floating hardwood tenons that join the panel frames. This is why the panel grooves extend around the ends of the rails. A wing-cutter router bit in a table-mounted router is the best tool for cutting these grooves. Take one pass from each side of the rail and stile parts so the grooves are centred. Aim for a 3/8"- to 7/16"-wide groove, then plane and trim your floating tenons for a snug fit.



**The corner of the underside of the top bunk, showing mattress support boards, mattress support strip and the bottom of the headboard where it joins the leg**

Dry-fit all stiles, rails and floating tenons under clamp pressure to check for tight joints, then measure the inside dimensions of the frame (to the bottom of the grooves) to determine the ideal panel size. Make the panels 1/16" smaller than these measurements and plane the panels to fit nicely within the grooves. Dry-fit the stiles, rails and panels, then assemble the frame permanently with glue. Give everything a day or two to dry, then joint the outside edges of the frame parts to level and square them.

Mill the bullnose cap strips on a table-mounted router, then fasten them to the top and bottom edges of the assembled panel frames using 3/8" fluted dowels. With all the parts of this project that needed dowelling, I invested in a self-centering drilling jig to help me bore accurate dowel holes in the panel edges and the ends of the side rails—all parts too large to be bored on my drill press. It worked wonderfully. When the cap strips are glued to the panel frames, run the edge of the assembly over the jointer again, taking a light cut to level the sides for a tight fit with the legs. Install 3/8"-fluted dowels across the leg-to-panel joints, dry-fit under clamping pressure, then join the legs and panel frames permanently. Cleaning glue squeeze-out from the corner where the legs meet the panel frames would be difficult without help. I used Waxilit, a glue resist that looks like skin cream. Smear some across the dry-fitted joints—when the joint is reassembled with glue the product prevents the squeeze-out from bonding to the surface wood. The hardened glue pops off with a chisel.

## Refine The Legs And Safety Rails

The plans show how each leg needs counterbored holes for the bed bolts, and two mortises to house the safety rails for the top bunk. Drilling the holes is easy (just don't do it before you've read further), though the mortises demand explanation. I made mine using a router and flush-trimming bit, guided by the shop-made plywood jig. This creates four identical round-cornered mortises in the legs that need to be squared by hand with a chisel. Use these mortises as a guide to plane, rip and joint the safety rails you rough-cut earlier, so they fit into the mortises sweetly. Complete the rails by sanding, trimming to final length and routing quirk beads

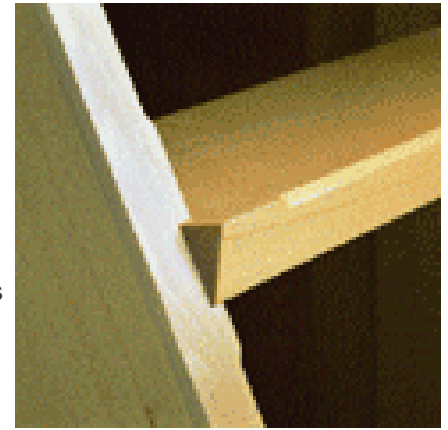
on all four edges. These extend to within 1 1/4" of the end of each safety rail.

## Side Rails, Support Strips And Support Boards

These parts connect the head and foot boards, and support the two twin-size mattresses that the bed is made for. Mill and trim these parts to final size, then rout quirk beads on all four edges of the side rails, on one edge of the support strips, and along one edge of the support boards. The plans show the details, though you're free to use whatever profile you like.

Before you go further, think about mattress size. Although there are supposed to be standard sizes out there, the variation from brand to brand can be considerable. It's safest to have your mattresses on hand, then measure them and adjust side rail hole locations in the legs, and the side rail lengths, to suit. The dimensions and locations I used are for mattresses that are slightly larger than printed mattress specs.

Drill holes in the legs and side rails for the bed bolts now, then glue and screw the mattress support strips to the inside edge of the side rails. If I had to build my beds over, I'd raise the support strips 1" higher than where I put them. That's what's shown in the plans. Without an exceptionally thick mattress, the side rails press into your legs as you roll out of bed. Raising the mattresses with the higher support strip location solves the problem .



**Chamfer the top front edge of the ladder steps for better resistance to wear. A sharp chisel makes quick work of angling the outer corners of each step**



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# CHILD'S BED



## Making the Headboard



The legs are first cut to length and then the mortises are cut into the four leg posts using a router fitted with a 16mm straight cutter, remembering to make handed pairs. It is important to ensure that each corresponding pair of mortises are cut at the same distance from the bottom of each leg so the rails, when fitted to the legs, will be square. The mortises can then be squared with a chisel or alternatively the tenons can be rounded to fit the holes. Rather than cut tenons individually on the end of each rail, cut a length of oak 950mm in length from each of the 200mm wide boards and clamp a straight edge guide in place. Use the router free hand against the guide to cut the rebates to form the tenons. Obviously care must be taken when setting the depth of cut as well as making sure that the straight edges are true on each side of the board. The boards can then be cut lengthways to form the rails and the ends notched by hand to fit the mortises.

A profile/scribe cutter set (Titman RPSS1) is used in the router table to form the profiles on the rail sides and the headboard, temporarily clamped together ensuring all is square. The length of the stiles can now be accurately measured and the appropriate length cut from the oak board. The ends of the boards can now be scribed on the router table without worrying about any breakout as the boards are a little overwidth anyway. After cutting the timber to width, the cutter can be reversed and the stiles profiled to match the rails. It will be noticed that one of the stiles is, in fact, a half width and this is to fit into a rebate cut into the leg to visually balance the panelled effect. Another dry assembly takes place spacing the stiles equally in place and the space for the panels accurately measured. All three panels should measure the same size. Each panel should be cut and planed so that it can fit neatly on top of the profiling with the headboard laid flat. I aim to cut the panel a whisper undersize to allow for any slight expansion in the timber as well as to ensure the assembly is straightforward without putting undue stress on the joints.

A bearing guided panel cutter (Titman RPCB7) is

used to shape the edges of the panels. The depth of cut is set so the panel is a tight fit into the profiled stile with its edge just off the bottom of the groove. With this set up the bearing runs along the sides of the panels so it is important that the edges are straight as any defect here will show up on the finished panel as a kink in the fielding. The footboard is made in exactly the same way.

## The Bed Rails

The long side rails are cut to length allowing an extra 60mm in the total length for the mortises and the tenons are formed using the router and a straight edge clamped in place as a guide. Care is taken to prevent the router rocking over the ends and thus removing too much timber. The ends are trimmed so the tenons are a tight fit into the mortises. All four edges are rounded over with a rounding over bit to remove sharp edges and as a decorative feature the top outside edge is moulded with a sunken bead cutter (Titman SBBC4) At this stage some 38 x 19mm softwood can be firmly screwed in place on the inside of each rail near the bottom edge. When the slats are screwed in place on this battening the mattress will sit between the rails rather than level with the top edge. This not only looks neater but it prevents the mattress from sliding around.

## Finishing and Final Assembly



All the joints are held together with threaded rods and barrel nuts. This entails boring a hole about 20mm deep on the opposite side of each mortise in the middle of the leg. This should be wide enough to take the steel washer as well as the socket used to tighten the nut. A hole the diameter of the threaded rod is drilled through the leg and into the ends of the tenons to a depth of about 100mm into each rail. A further hole is drilled either in the back of the headboard or footboard or on the inside of the side rails into which is inserted the barrel nut. Great care should be taken to ensure that this hole does not break through the other side of the rails where it would be seen and ruin the effect of the bed.

A small rail with a decorative moulding on each



side can be made to fit on top of the headboard and the footboard. This can have a shallow 20mm wide groove underneath so it fits neatly on top of the rails and can be held in place with a few spots of glue. Lengths of softwood, 75 x 25mm, are screwed in place with a 25mm gap between each to support the mattress.



Four acorns are turned on the lathe using the offcuts of timber from when the legs are cut to length. A spigot is left under the acorn and glued into a hole drilled on top of the legs.

The finish is a matter of personal preference but I covered all surfaces with a 50/50 mix of raw linseed oil and turpentine to bring out the grain and left this to dry thoroughly for a couple of days. Three coats of button polish are brushed on and allowed to dry. This is gently cut back with 0000 grade wire wool and wax and then buffed to a soft shine. As a finishing touch antique brass bed post covers were screwed in place to cover the nuts.

## Cutting List

Item	Quantity	Dimensions (mm)
Legs	4	75 x 75 x 1200
Headboard Panels	1	280 x 20 x 2500
Headboard / Footboard Stiles and Rails	2	200 x 20 x 1500
Bed Side Rails	2	75 x 35 x 2000

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# BOOKCASE





## Cutting the Parts

For precise crosscuts, first make a simple, self-aligning T-guide for your circular saw. Cut a piece of 1/2-in. plywood to 2 1/2 x 24 in. and glue and screw it to a roughly 12-in.-long piece of 1 x 4 pine that will serve as the crossbar of the T. Center the plywood strip along the 1 x 4 and make sure the pieces are perfectly square to each other.

Butt the crossbar of the T-guide against the edge of a piece of scrap lumber, tack the guide in place and make a cut through the 1 x 4 with your saw base guided by the plywood strip. Then, trim the 1 x 4 on the opposite side in the same way. Now, the ends of the 1 x 4 can be aligned with layout lines on the stock for precise cut positioning.

Begin construction by using a tape measure to mark the length of a side panel on 1 x 10 stock, and lay out the cut line with a square (**Fig. 1**). The side panels on our bookcase are 48 in. long.

Place the T-guide against the edge of the stock and align its trimmed end with the cut line. Tack the guide in place and use your circular saw to make the cut (**Fig. 2**).

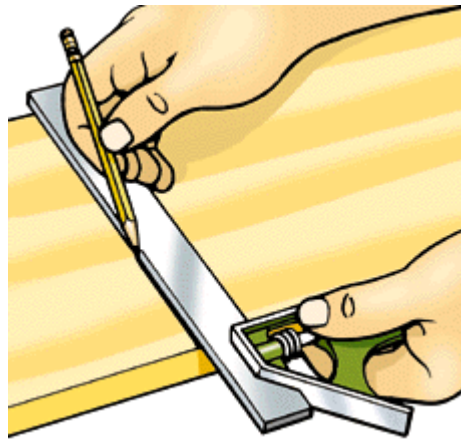
To support your work during the cuts, use 2 x 4s spanning two saw-horses for a temporary bench and clamp your work in place. Set your circular saw cutting depth so the blade cuts about 1/8 in. into the 2 x 4s.

After both sides are cut to length, lay out and cut the five shelves to length to suit the width of your bookcase. Our shelf length is 31 in.

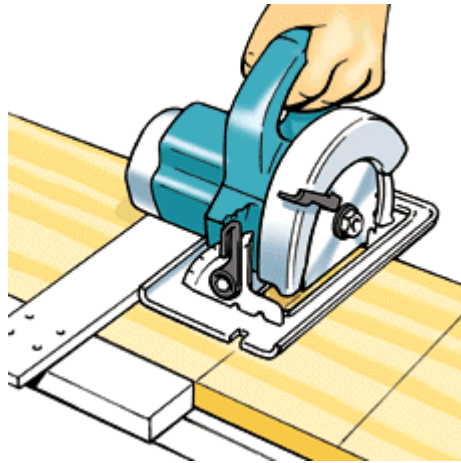
Rip the four lower shelves to 8 7/8 in. wide to allow for the thickness of the case back. Clamp each shelf to the sawhorses and tack a straight strip to the work to guide your circular saw (**Fig. 3**).

Next, cut the 10 shelf-support cleats from lengths of 1/2 x 3/4-in. parting strip. Use a handsaw to cut the pieces slightly oversize, then gang the pieces together with masking tape. Mark the cut lines and use your circular saw and T-guide to cut the cleats to 8 7/8 in. long (**Fig. 4**).

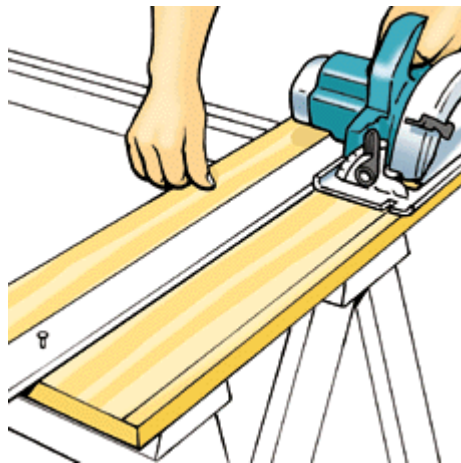
Because we varied the spaces between the shelves, the vertical back cleat lengths vary. Rough cut and mark the back cleats in pairs. From the top down, the lengths are 8, 9, 9 1/2 and 11 1/4 in. When cutting the back cleats with the T-guide, first gang them together so all the marks on one side align. After the cut, untape the cleats and reposition them so the marks on the opposite side are aligned for the next cut.



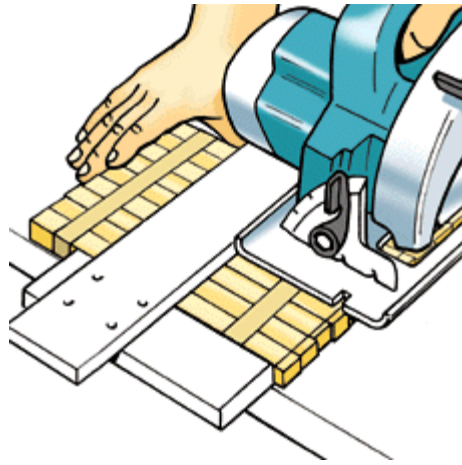
**Fig. 1** Mark the lengths of the bookcase side panels on 1 x 10 lumber and use a square to lay out the crosscut lines.



**Fig. 2** With a T-guide cut to match your saw, align the end of guide with crosscut line. Tack guide to the work and then make the cut.



**Fig. 3** Use a straight strip as a guide when ripping the four lower shelves to 8 7/8 in. The top shelf remains a full 1 x 10.

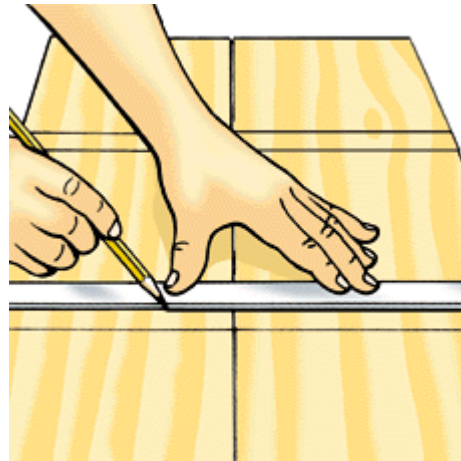


**Fig. 4** After cutting shelf cleats oversize, gang them together with tape, mark the cut lines and trim with a T-guide and circular saw.

## Assembly

First mark the shelf cleat locations. Hook your tape measure to the top edge of a side panel, extend the tape and place marks at the following dimensions:  $\frac{3}{4}$ ,  $10 \frac{1}{4}$ ,  $20 \frac{3}{4}$ ,  $31 \frac{3}{4}$  and  $44 \frac{1}{2}$  in. These marks indicate the top edges of the shelf cleats. Transfer the marks to the other panel. Lay both side pieces edge to edge with the marks on the outer edges and use a rule or straightedge to extend the shelf locations across both panels at once (**Fig. 5**).

Use 2d nails and glue to attach the shelf cleats to the sides. Position the cleats so they're flush with the front edges of the sides. Then, attach the vertical back cleats, leaving a  $\frac{3}{4}$ -in. gap at the bottom of each back cleat for a shelf (**Fig. 6**). The gaps will help to keep the shelves aligned during assembly. Align the back cleats with the back ends of the shelf cleats to provide the  $\frac{3}{8}$ -in. recess for the back panel.



**Fig. 5** Butt sides together with shelf-location marks on outer edges. Use a straightedge to extend the shelf marks across work.



**Fig. 6** Nail and glue shelf cleats and back cleats to the side panels. Note that cleats are recessed  $\frac{3}{8}$  in. from back edge of sides.

To join the sides and shelves, first lay a side panel on a few 2 x 4s placed on the floor. With a helper assisting, stand the shelves in position and lay the opposite side on the shelf ends. Start a pair of 6d finishing nails at each shelf location so the points just penetrate the shelves. Lift the side off and apply glue to the endgrain of the shelves. Let the glue soak in for a few minutes, then apply a second coat. Follow with a coat of glue on the sides and cleats. Replace the panel using the nail points to align the shelves. Then drive the nails (**Fig. 7**) and set them below the surface.

After the first side is attached, grasp the sides at one end while your helper grasps the opposite end and flip the assembly over. Secure the remaining side and check that the case is square. If necessary, tack a diagonal brace across the back to hold it while the glue sets. When the glue is dry cut a piece of parting strip to fit between the two top cleats and under the top shelf. This piece will be set 3/8 in. in front of the top shelf rear edge to provide room for the back panel. Glue and nail this long cleat to the shelf.

### Adding the Fascia

To fit the 1 x 2 fascia over the case front edges, first mark the stock for crosscutting. Make the vertical pieces 48 in. long to match the sides and mark the horizontal members at 29 1/2 in. Rough cut the pieces to length and use the T-guide and circular saw to trim them squarely to exact size.

Apply glue to one of the vertical members and nail it to the case so its edge is flush with the side. Then, add each horizontal member with glue and nails, keeping the top edges flush with the shelf tops (**Fig. 8**). Finally, add the remaining vertical member with nails and glue.

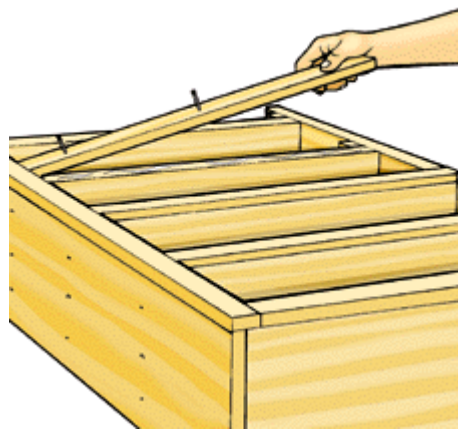
Use 1 x 4 stock for the front and two side baseboard pieces. Cut the length of each side piece to 10 in. long and glue and nail the parts in place. Then, cut the front baseboard piece to 34 in. long and secure it so its ends are flush with the side pieces.

After the glue has dried, use a block plane to trim a chamfer around the top edge of the baseboard. Plane the side pieces first, working from front to back to avoid splitting the corners of the front piece. Then, plane the front piece to match. It helps to lean the plane against the case to maintain a uniform angle (**Fig. 9**).

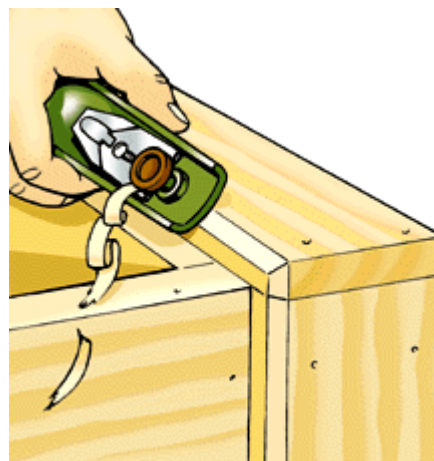
The final component is the case back. Lay out the cut lines on 1/4-in.-thick lauan plywood. Tack a straight strip to the panel to serve as a guide for your circular saw and cut the stock to size (**Fig. 10**). Attach the back panels to the case with glue and 1-in. finishing nails.



**Fig. 7** Secure one side to the shelves with glue and 6d finishing nails. Then flip the assembly over and attach the other side. Set all nails.

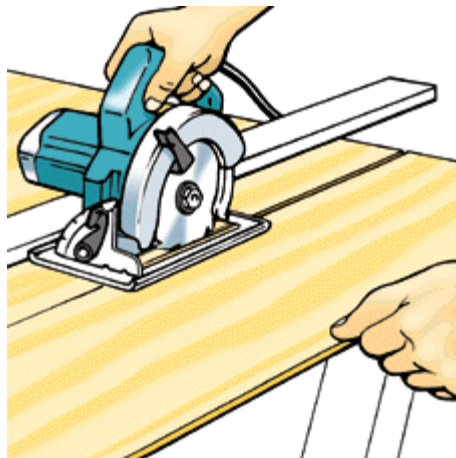


**Fig. 8** Attach the 1 x 2 strips to the case starting with a vertical member. Then, add the horizontal pieces and the other vertical.



**Fig. 9** Use a block plane to shape the chamfers on the baseboard. Rest the plane against the case to maintain a uniform angle.





**Fig. 10** Cut the 1/4-in.-thick back panel to size with a circular saw. Use a straight strip as a guide when making the cuts.

## Finishing

First make sure all the nails are set below the surface. Use a nail set to drive all nails below the surface. Then use a putty knife to fill the nail holes with wood filler and let the compound dry (**Fig. 11**).

Sand the entire bookcase with 120- followed by 220-grit sandpaper. Then, use a sanding block and 220-grit paper to slightly ease all corners. Thoroughly dust off the case with a tack rag.

If you plan to paint your bookcase, first apply two coats of shellac over each knot to prevent the knots from bleeding through the final paint job (**Fig. 12**).

Then, prime and paint the bookcase according to the manufacturer's instructions.



**Fig. 11** Use a nail set to drive all nails below the surface. Then apply wood filler over the nailheads with a putty knife.

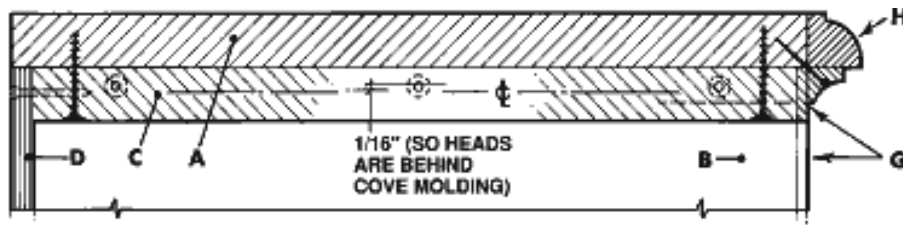


**Fig. 12** Apply shellac to any knots before painting. This will seal the knots and prevent sap from bleeding through.

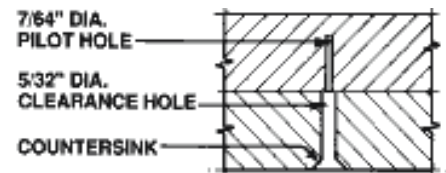
# **TRADITIONAL BOOKCASE**



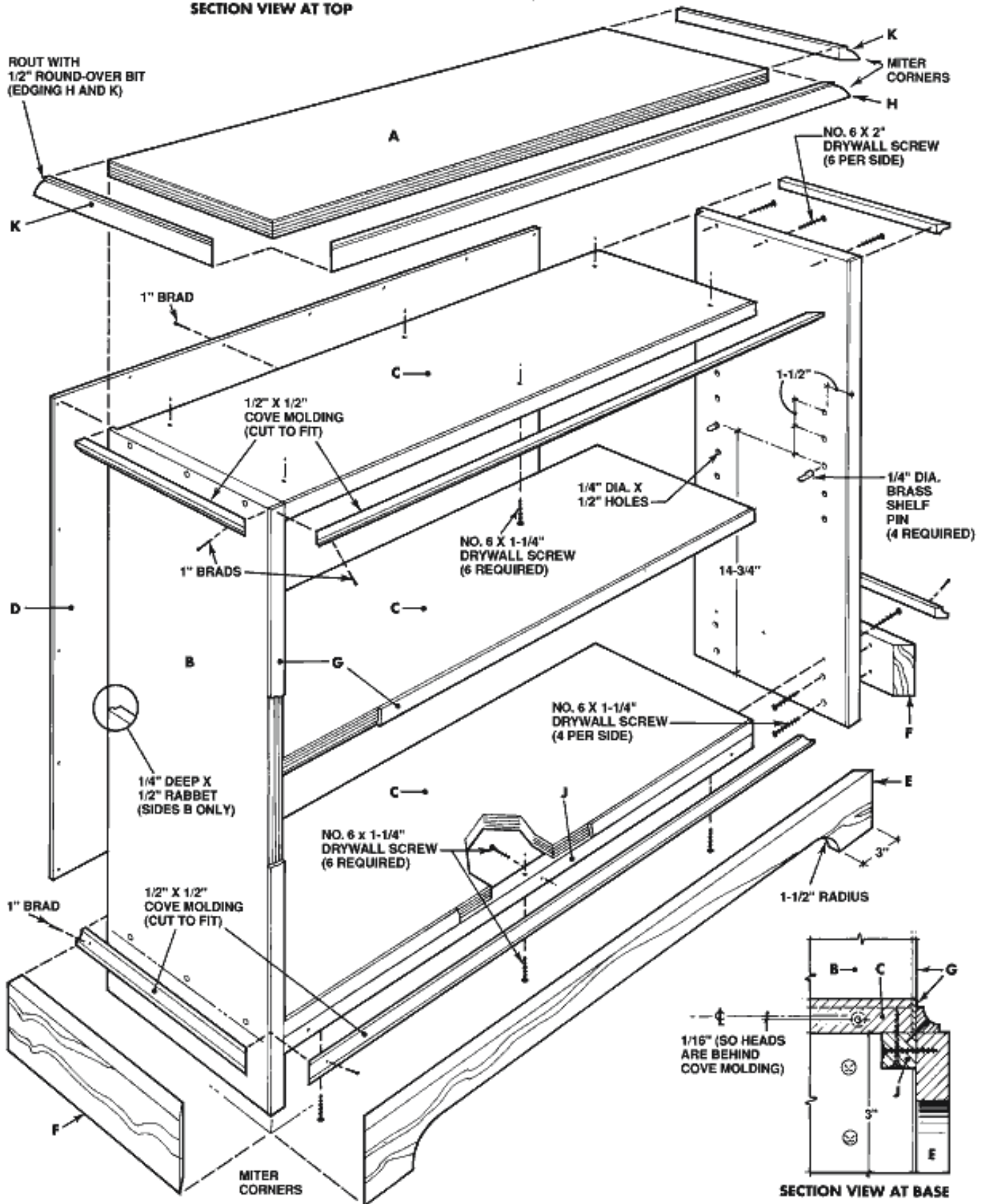




SECTION VIEW AT TOP



SCREW HOLE DETAIL



ROUT WITH  
1/2" ROUND-OVER BIT  
(EDGING H AND K)

NO. 6 X 2" DRYWALL SCREW  
(6 PER SIDE)

1/2" X 1/2" COVE MOLDING  
(CUT TO FIT)

1/4" DIA. X  
1/2" HOLES

NO. 6 X 1-1/4" DRYWALL SCREW  
(6 REQUIRED)

1/4" DIA. BRASS SHELF PIN  
(4 REQUIRED)

NO. 6 X 1-1/4" DRYWALL SCREW  
(4 PER SIDE)

1/4" DEEP X  
1/2" RABBET  
(SIDES B ONLY)

NO. 6 X 1-1/4" DRYWALL SCREW  
(6 REQUIRED)

1/2" X 1/2" COVE MOLDING  
(CUT TO FIT)

1-1/2" RADIUS

1/16" (SO HEADS  
ARE BEHIND  
COVE MOLDING)

SECTION VIEW AT BASE

## CUTTING AND ASSEMBLY PROCEDURE

Refer to the [Assembly Diagram](#).

1. Cut the 3/4" plywood pieces (A, B and C) to the sizes given in the Cutting List.

**Woodworker's Tips:** Many people have trouble cutting hardwood plywood cleanly, especially across the grain. For this bookcase, you'll have to master this skill, because some of the cuts will show on the finished piece. Here are a few tricks:

- Be aware of which side of your plywood is the good side, and keep it facing up while cutting on the table saw.
  - Adjust your saw so the fence is exactly parallel to the blade, and the miter gauge slots are exactly perpendicular to it. If not, the blade will tear up fibers where it touches the wood behind the cut.
  - For the smoothest cuts, use a 10" carbide-tipped saw blade with 60 to 100 teeth.
  - If you're still not getting clean cuts, score the cutting line deeply with a sharp utility knife before you saw.
2. Cut the solid wood pieces (E, F, G, H, and K) a couple of inches longer than the dimensions given, so they can be trimmed to exact size later. Part J can be cut to the specified size now.
  3. Rip part G into 1/8" strips for gluing to the front edge of pieces B and C. Your saw blade will be close to the fence, so use a push stick to guide the wood.
  4. Glue the strips (G) to the front edges of pieces B and C using yellow carpenter's glue. After the glue is dry, cut or sand the strips so they're flush with the plywood. You can do this with a block plane or belt sander. If you use a sander, be careful not to cut or sand through the thin veneer of the plywood. If you've never tried this operation before, you may want to experiment on some scrap plywood first. When the strips are flush with the veneer, trim the ends with a small handsaw.

**Woodworker's Tip:** Use strips of masking tape as clamps for the edge strips. Tape is strong enough for this job and less cumbersome than bar clamps. Apply a tape strip about every 3-4".

5. Cut mitered ends on the 3/4" edging (H, K) that is used for the top (A). Cut the front piece (H) first, so that the miters are exactly flush with the corners of the plywood, then cut the side pieces (K). Clamp them to be sure they fit, then glue. The sides can be long in back and trimmed after the glue is dry. When the glue has dried, sand the edging flush with the plywood.
6. Cut the profile on the edge of the top with a router, using a 1/2" round-over bit with a pilot bearing.
7. Mark where the screws will go into the sides of the case, the top and the cleats. Drill the countersinks, then the clearance holes for the screws. Note that these holes are slightly off-center (about 1/16"), so the cove molding you add later will completely cover them.

**Woodworker's Tip:** Drilling first and countersinking second can result in a rough, chatter-marked hole, especially on oak plywood, which tears easily. Drill the countersink first, or use a combination drill/countersink bit.

8. Carefully lay out and then drill the shelf pin holes into the inside face of the sides (B).

**Woodworker's Tip:** A common mistake is to drill the shelf-pin holes inaccurately, resulting in a shelf that wobbles because it's not sitting on all four corners. To avoid this, mark out the holes very carefully; use an awl to prick the surface where you want the drill bit to start; and use a brad-point drill bit, which won't easily wander off the mark.

9. Cut the rabbets on the back edges of the sides (B). The easiest way to do this is with your table or radial arm saw, making two cuts and adjusting the fence after the first cut. Or, install a dado blade and set up the saw to make the rabbets in one pass.
10. Finish-sand all the pieces you've made so far. Start with 120-grit paper and finish with 220-grit.

**Woodworker's Tip:** It's a good idea to do as much of your sanding as you can before any pieces are assembled. That way, you eliminate having to sand inside corners. The same goes for finishing: If you can finish parts separately and then assemble them, do it. Remember, however, that glue won't stick to a finished surface, so don't put finish on the surfaces of glue joints.

11. Dry-clamp the pieces to be joined with screws and drill the pilot holes, using the countersunk clearance holes as your guide.
12. Screw the bookcase together. Start by screwing the top and bottom shelves (C) to the sides (B). Then screw the base cleat (J) to the bottom shelf (C). Next, screw the top (A) to the case.
13. Hold the base front piece (E) to the front of the bookcase and mark on its inside surface where the miters should be cut. Cut these miters, then cut the miters on the base sides (F).

**Woodworker's Tip:** Test your miter cuts on a couple of pieces of scrap (plywood works fine) before making the final cuts.

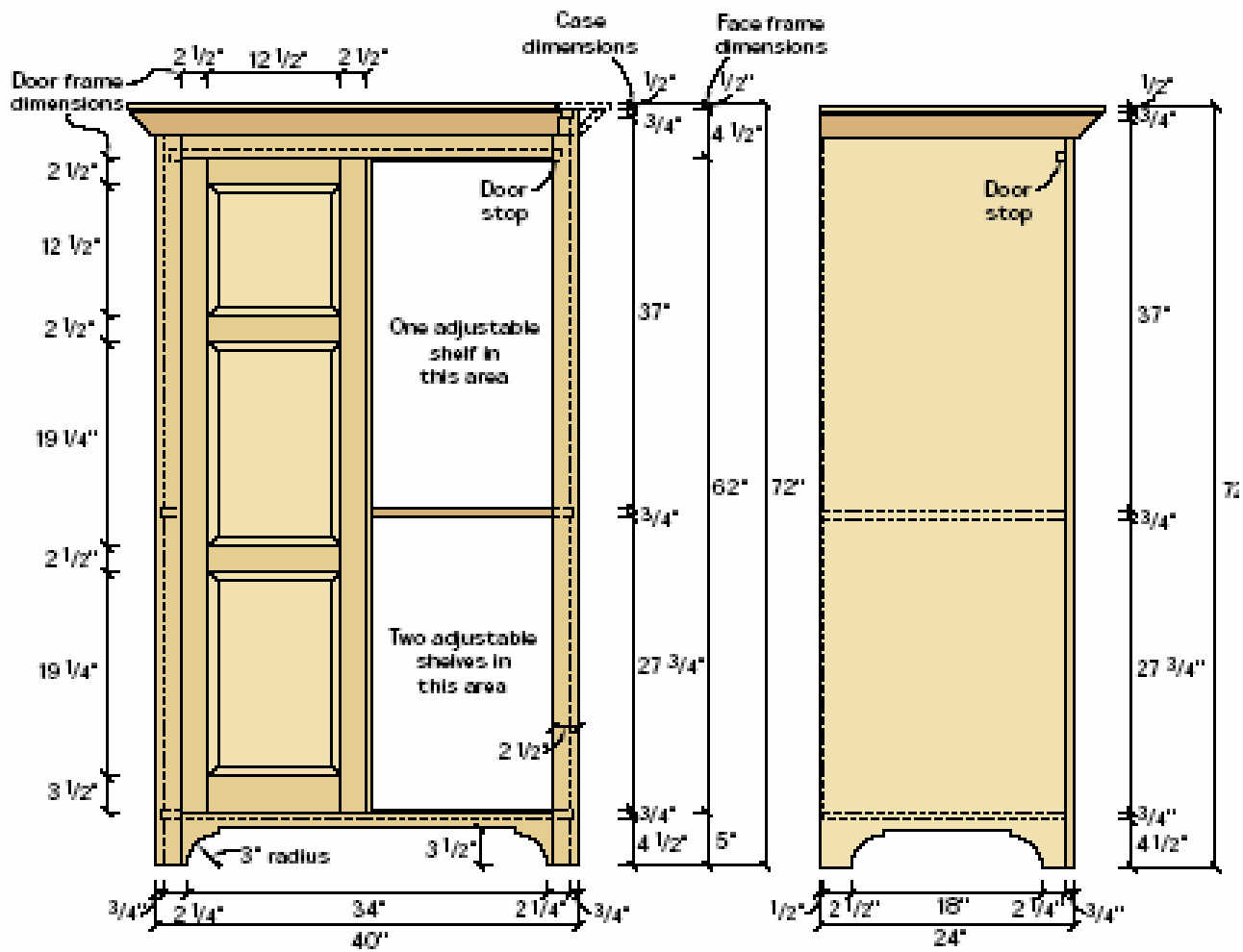
14. When the three base pieces (E and F) fit well, cut the curved opening at the bottom of the base front (E). Give all the base pieces a final sanding, then screw them onto the case. Use yellow carpenter's glue on the miter joints and other surfaces that meet. Trim the ends of the side pieces (F).
15. Mark the cove moldings for cutting the miter joints, and fit them on as you did with the edging and base piece—the front first and then the sides. Drill pilot holes for the brads, not just into the cove molding, but into the bookcase as well. Nail on the molding, sink the nailheads slightly with a nail set, push putty into the nail holes. When the glue is dry, trim the ends of the molding and sand them smooth.
16. Cut the back (D) to size and sand it, but don't nail it on until you've completed the finishing.

To prepare for finishing, slightly break all sharp edges on the bookcase with sandpaper.

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# TRADITIONAL ENTERTAINMENT CENTER





Shaker Entertainment Center			
No.	Item	Dimensions T W L	Material
2	Face frame stiles	3/4" x 29 1/2" x 71 1/2"	Maple
1	Face frame top rail*	3/4" x 4 1/2" x 37"	Maple
1	Face frame bottom rail*	3/4" x 5" x 37"	Maple
3	Door stiles	3/4" x 2 1/2" x 62"	Maple
1	Door stile	3/4" x 3" x 62"	Maple
6	Door rails*	3/4" x 3 1/2" x 14 1/2"	Maple
2	Door bottom rails	3/4" x 3 1/2" x 14 1/2"	Maple
2	Door panels	5/8" x 13" x 13"	Maple
4	Door panels	5/8" x 13" x 19 3/4"	Maple
2	Cabinet sides	3/4" x 23 1/4" x 71 1/2"	Maple
3	Fixed shelves	3/4" x 22 1/4" x 39"	Maple
3	Adjustable shelves	3/4" x 22 1/4" x 38 1/4"	Maple
1	Back	1/2" x 39 1/2" x 71 1/2"	Maple
1	Door stop	3/4" x 3/8" x 37"	Maple
1	Crown moulding	3/4" x 3 3/4" x 96"	Maple
1	Crown cap	1/2" x 3 1/2" x 96"	Maple
6	Hinges, Lee Valley #00H52.03, \$2.30 each, 800-871-8158 or www.leevalley.com		

\*Measurement includes 1"-long tenon on both ends

As cabinet construction goes, this is about as basic as it gets, and it still offers old-world joinery, styling and strength. The entire piece is solid lumber, using a face-frame front and a shiplapped back. The raised-panel



doors are held together with mortise-and-tenon joinery, and the crown moulding is all simple cuts on the table saw and jointer.

I start construction on face-frame cabinets by making the face frame first. All the other pieces will be sized to fit the frame, so it just makes sense to begin there. Also, the width of the face frame's stiles are 1/16" wider than shown in the drawing. This will allow you to trim them flush to the case after assembly.

There are a number of ways to fasten a face frame together, but when I'm making a piece of furniture that has the potential to be moved every so often I prefer the strongest joint I can think of — mortise and tenon. That's because if it's moving it's racking. While a strong back will help keep the cabinet from racking, the face frame does most of the work. In addition, if the piece is a reproduction, like the one here, it's appropriate to use a mortise-and-tenon frame.

I prefer to cut the tenons on the ends of the rails first, then use the tenons to lay out the mortises on the stiles. Set up your table saw to cut the 3/8" x 1"-long tenons, centered on both ends of the top and bottom rails. Then set up your mortiser to cut the mating mortises, setting your depth to 11/16" to avoid having the tenon bottom out in the mortise.

Once the mortises and tenons are cut, assemble the frame by putting glue in the mortises. Don't overdo it; glue can keep the tenon from seating properly in the mortise. After the glue is dry, I pin the joints using 3/8"-square stock.

### **Three-Panel Doors**

Since I'm already set up for making mortise-and-tenon joints, I go ahead and make the doors next. The doors are basic frame-and-panel construction using raised panels with an 8° bevel on the front face. Determine the size of the doors by making them exactly the size of the opening in the face frame. We'll trim them to fit later.

Before cutting the joints for the doors I make the groove in the rails and stiles for the raised panels. These grooves are 3/8" x 3/8" and are centered on the inside edge of each piece, with both edges of the center rails receiving a groove. After the grooves are run, start making the tenons on each end of the rails. Make the tenons and mortises the same size as you used for the face frame. Because the panel groove was run through the ends of each stile, the tenons on the top and bottom rails need to be haunched (the tenon shoulder is left wider to fill the notch left by the groove).

Next mark the locations for the mortises at the locations shown in the diagrams, and cut the mortises in the stiles.

The panels themselves are cut to size allowing 1/2" extra in both height and width to fit into the grooves in the door frame. With the panels sized, set your table saw blade to an 8° angle. Then set the rip fence to bevel the faces of the panels. The distance between the fence and blade should be set so that the bevel is about 3/8" thick, 1/4" in from each edge.

When the door pieces are ready, assemble the doors, again being careful not to use too much glue on the joints. Clamp up the doors and determine if the doors are square by measuring corner to corner. The distance should be the same in both directions. If not, adjust the door by tightening a clamp diagonally across the longer length. When everything is square, tighten the clamps and set the doors aside for the glue to cure.

When the doors are ready, take them to your saw and cut a 3/8" x 1/2" rabbet on the two interior edges to form a shiplap joint to keep the dust out. Then head to the jointer and trim them to size, allowing a 1/16" gap all the way around the doors. When fitting the doors, run the top and bottom of the doors over the jointer first, as the end grain on the ends of the stiles may tear out. By running the long grain edges last, you should be able to clean up any tear-out on the stiles.

With the doors fit, go ahead and mount the doors in the face frame. I used 2½" non-mortise butt hinges (see schedule). They look good, are easy to attach and are adjustable. When the doors are attached, take them off again to make it easier to glue up the cabinet.

### **Cabinet: Dadoes and Nails**

You're now ready to make the cabinet itself. All the cabinet pieces are made of solid lumber on this piece to keep it reproduction quality. The center shelf, top and bottom are fit into ¼"-deep by ¾"-wide dadoes in the sides. Use the diagrams to locate the dadoes. The sides of the cabinet have 3/8" x 1/2" rabbets run on the inside edges for the back. Cut the dadoes, then glue and nail the top, bottom and center shelf between the sides.

After assembling the case, lay it on its back and glue and clamp the face frame to the cabinet. Check for square, and make sure the overhang on the sides is even. When the glue is dry, I simply remove the clamps and use a flush-cutting router bit to trim the face frame flush to the sides. I used a ½" hardwood beaded shiplap back for this piece. The number of back slats is up to you. They can be random widths, or they can all be the same. I cut a ¼" x ½" rabbet on the slat sides, then add a ¼" bead on one edge using a beading bit in my router table. Don't attach the back yet, as it'll only make finishing more difficult. Set the pieces aside for now.

Shaker furniture is known for its lack of ornamentation, but the Shakers still had a sense of style. Style for this cabinet requires a crown moulding. Cut the moulding pieces to the sizes given in the materials list. Set your table saw blade to a 45° angle and bevel one long edge of the moulding piece. Then move to your jointer, adjust the fence to 45° and run the sharp bevel edge of the moulding over the jointer to leave ¼" flat on the moulding's edge. Repeat the entire process on the opposite edge.

Fit and cut the crown pieces to length, then glue and nail them to the case. On the side pieces I only glue the first 8" of the moulding and attach the back end with a screw through a slotted hole in the case. This allows the sides of the case to move during humidity changes without tearing the crown moulding off. I use small triangular glue blocks behind the crown moulding to support the crown. Next cut the ½" cap pieces to length, mitering them to overhang the crown by ¼", then attach them to the case as well.

### **A Simple Base**

You're almost done. To give the case a base (and to make it sit on an uneven floor without rocking) I used a jigsaw to cut out a pattern on the bottom of the face frame and the sides of the piece, essentially leaving legs. Drill the holes for the shelf pins. Then cut slots for ventilation in the back pieces, and holes through the shelves to pass wires.

The next to last step was finishing. I used a coat of dark oak stain over the entire piece and then applied three coats of semi-gloss spray lacquer.

All that's left is the hardware. You can use whatever you find attractive. I used a couple of turned pulls and added a stop rail behind the doors (at the top of the cabinet). A couple of bullet catches and I was ready to deliver it to the customer. Of course it'll take them another two days to get all the equipment hooked up and arranged the way they want it



When you trim the doors to size, make sure you support the door adequately and start with the top and bottom edges. That way any tear-out on the end grain will be removed when you run the long-grain edges over the jointer.



After the face frame is glued to the cabinet, it's a simple step to walk around the case with a flush-cutting bit in your router to trim the frame flush to the cabinet. A little sanding and you're ready to move on.



To bevel the crown pieces, first bevel cut one edge (shown) with the table saw blade set at 45°. Then move to your jointer (also set at 45°) and put a ¼" flat at a right angle to your first bevel.



Head back to the saw to cut the second bevel. As you'll see in the photo, by cutting the return bevel on the first edge you've provided a bearing surface for the rip fence, rather than let the bevel slip under the fence, messing up the cut.



With one last pass on the joiner you're ready to start hanging the crown.

To make sure the crown moulding is flush to the top of the cabinet, I temporarily screw two scrap strips to the top of the cabinet while I align the front piece. When the front piece is attached, it's fairly easy to carry the height orientation around to the sides. Then simply remove the strips.



The last step on the crown is to attach the cap to the crown and cabinet. Notice the glue blocks behind the crown moulding to support the crown and add stability.

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# PICTURE FRAMES





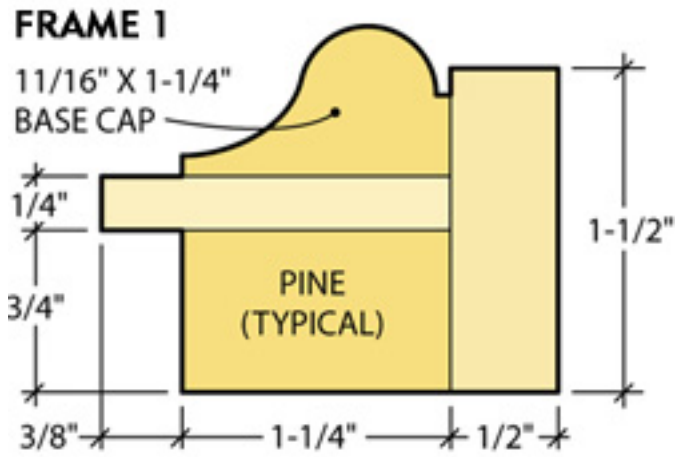
## Painted Pine Frames

Our first two frames are made from pine and are great candidates for a paint finish. They feature standard moldings available at well-stocked home centers (below we give the molding's reference number in addition to its common name). For all the frames, it's best to cut the rough materials about 2 or 3 in. longer than necessary before ripping to width or machining.

Frame 1 uses base cap molding (No. WM 166) and flat pine stock. Rip four  $3/4 \times 1-1/4$ -in. pine pieces and glue lengths of  $1/4 \times 1-5/8$ -in. lath to each. Place them face to face with the edge of one piece flush with the adjoining piece. Use spring clamps to hold the assembly while the glue sets. Then, spread glue on the back of the molding and clamp it to the top of the lath (Photo 1). Make sure that the outer edge of the molding aligns with the flush edge of the flat-stock assembly.

Next, cut the four laminated frame members to size with a miter saw (Photo 2). Use a small brush to spread glue on the mitered ends and assemble the frame in a miter clamp (Photo 3). Check that all corner joints remain tight as you tighten the clamp. After the glue has cured, remove the frame from the clamp and drive small brads into the corners to reinforce the joints.

Next, rip pieces of  $1 \times 2$  to  $1/2$  in. thick and miter them to fit around the perimeter of the frame. Apply glue and clamp them to the frame with spring clamps (Photo 4).



After gluing a  $1/4$ -in.-thick lath to a  $3/4$ -in. backer, add the molding to the lath. Use spring clamps to apply pressure.



Use a miter saw to make the  $45^\circ$  cuts at both ends of each piece. Make sure opposite pieces are the same length.



Spread glue on the mating surfaces and assemble the sides in a frame clamp. Use brads to strengthen joints.

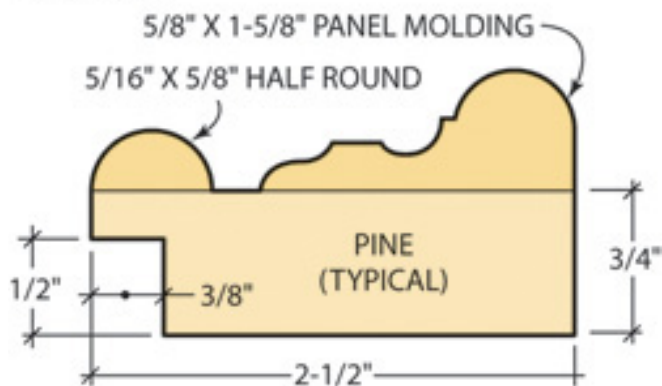


Cut banding strips of 1/2 x 1-1/2-in. pine to length with mitered ends. Glue these to the outside of the frame.

Frame 2 features a panel molding (No. WM 8174) and a 5/8-in. half round (No. WM 123), glued to 1 x 3 pine. After cutting the stock to rough length, spread glue on the back of the molding and use spring clamps to hold it to the 1 x 3 until the glue sets. Keep the panel molding flush to one edge and the half round flush to the opposite edge. When the glue is dry, use a dado blade in your table saw to cut the rabbet along the inner edge of the 1 x 3 (Photo 5). Then, miter the frame stock to exact length.

Since this frame is wider than the first, you can use No. 0 joining plates to reinforce the corners and eliminate the need for brads. Mark centerlines for the plate slots in the mitered ends of the frame stock and cut the

## FRAME 2



slots (Photo 6). Spread glue on the mitered faces, in the plate slots and on the plates, and assemble the pieces in the frame clamp to pull the corners tight. After about 20 minutes, use a small chisel or putty knife to remove any glue that has squeezed from the joints.

To finish these painted frames, first lightly sand with 150- and 220-grit sandpaper. Then apply an aerosol spray finish, following the manufacturer's instructions. We used Rust-Oleum Hammered Gold (No. 7210) and Hammered Silver (No. 7213) for our frames.



Frame 2 uses two moldings glued to 1 x 3 stock. Cut the frame rabbet with a dado blade and table saw.



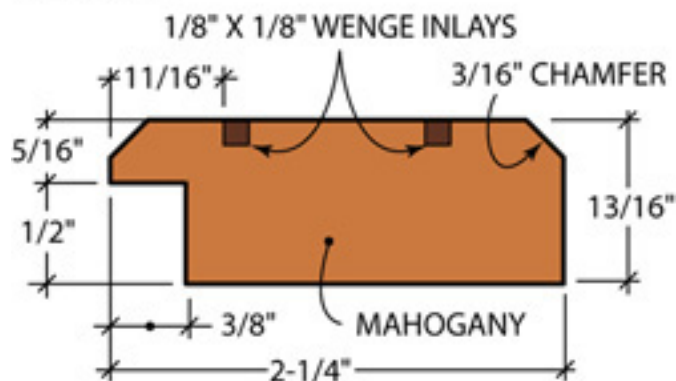
Reinforce the corners of wider frames with plate joints. Mark the centerlines and cut slots for No. 0 plates.

### Hardwood Frames

Another approach to building frames is to use hardwood with either a clear or stained finish. In each of the following designs, we've combined different woods and textures. After building four oversize pieces of frame stock for each design, use a dado blade or router table to cut the 3/8-in.-wide frame rabbet on the inner edge of each piece. Then, use a miter saw to cut the pieces to precise length and join the corners with plate joints.

Frame 3 is constructed of mahogany with wenge inlay. Begin by ripping 13/16-in. mahogany to 2-1/4 in. wide. Crosscut the stock to rough length, then readjust the saw blade and cut two 1/8-in.-deep kerfs in the face of each piece. Use a band saw to rip 1/8 x 1/4-in. inlay strips of wenge. Run a bead of glue into each saw kerf and press the inlay

### FRAME 3





strips into place. Use spring clamps to hold them while the glue cures (Photo 7). When the glue is dry, use a plane or sharp cabinet scraper to trim the wenge flush to the mahogany surface. Then, install a chamfer bit in your router table and bevel the two top edges of the frame stock.

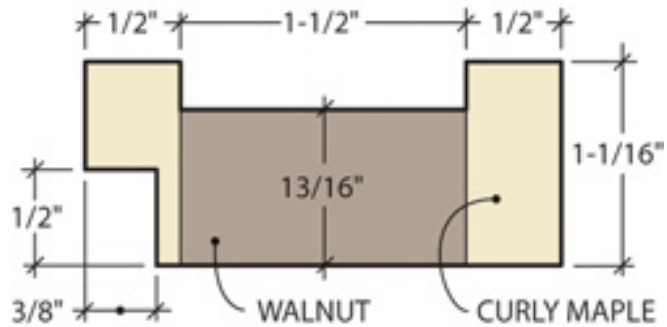


Frame 3 has two inlaid strips. Cut the slots on a table saw. Glue the strips in place and rout a chamfer on the edges.

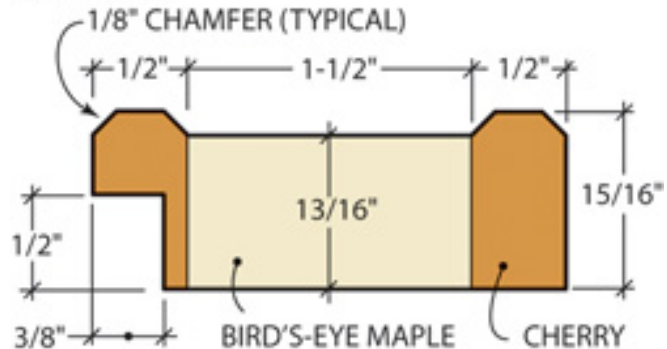
Frames 4 and 5 are variations on the same theme. For the first design, rip curly maple strips to  $1/2 \times 1-1/16$  in. and glue them to the edges of a  $13/16 \times 1-1/2$ -in. walnut field (Photo 8). Keep all pieces flush on the back side of the frame.

For the second variation, rip  $1/2$ -in.-thick cherry stock to  $2-1/2$  in. wide. Use a router table with a chamfer bit to shape all four edges of the cherry, then rip the molded stock into  $15/16$ -in. strips (Photo 9). Glue these strips to both edges of a bird's-eye maple field.

#### FRAME 4



#### FRAME 5





Clamp maple strips to both edges of a walnut field to form Frame 4. Make sure the pieces are flush on the back.

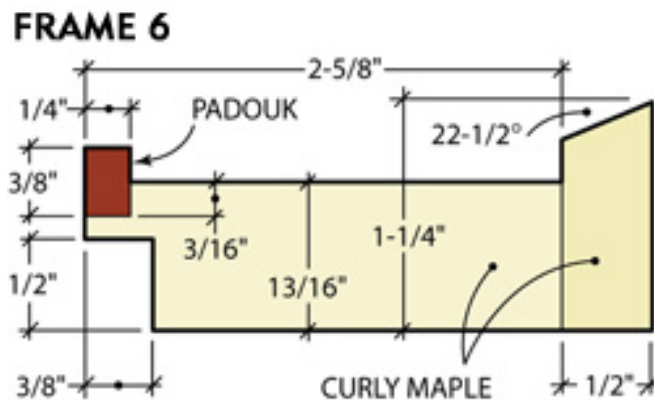


After routing chamfered edges on cherry stock, rip two strips. Glue them to the edges of a maple field for Frame 5.

For Frame 6, we've chosen curly maple for the field and raised outer band, with a padauk inlay that accents the inner edge. After ripping the maple stock to width, use a dado blade or router table to cut a 3/16-in.-deep x 1/4-in.-wide rabbet along one edge of each of the four frame pieces. Then, cut pieces of padauk to fit the rabbet in each piece. Glue the inlays in place, securing them with strips of masking tape until the glue sets (Photo 10).

To make the outer band, rip a 22-1/2° angle on the edge of a 1/2-in.-thick piece of maple. Re-adjust your saw to 90° and rip this beveled strip from the board. With four band strips made, glue each to the outer edge of the maple field pieces (Photo 11).

After sanding to 220 grit, we finished our





hardwood frames with clear shellac. This finish is easy to apply, it dries quickly, and it won't react with delicate artwork and mounting materials. Brush on a light coat with a good-quality bristle brush and let dry for at least 2 hours. Lightly sand with 320-grit paper to remove any roughness, and dust off. Apply one or two additional coats as needed. When the last coat is dry, rub it with 4/0 steel wool for a warm, satin gloss.



For Frame 6, glue paduk strips in a rabbet on the edge of a maple field. Use masking tape instead of clamps.



Glue the angled band strips to the outside of the maple frame pieces. Be sure that the strips are flush on the back.

## Mounting Equipment

Now that you have your wooden frames ready, it's time to gather the materials for mounting. You can buy what you need at any well-stocked art supply store.

Photos and prints are typically mounted within a broad mat-board window that highlights the artwork. Mat board is available in a variety of colors and a few textures as well. Make sure to get acidfree, or archival, mat board to protect the artwork from deterioration. This same material can be used as the mounting board behind the artwork. You'll also need archival mounting tape. This tape is made of linen cloth and is activated by wetting its glued surface. Backing board, installed behind the mounting board to keep it flat, can be either stiff corrugated cardboard or foam core stock. After the backing board, you'll need kraft paper to act as a dust cover over the back of the frame--a glue stick is a convenient way to attach the paper to the frame.

Most artwork requires a pane of glass to protect it from dirt and changes in humidity. In most cases, normal window glass will work, although a special ultraviolet-protective glass is available to help prevent fading. Nonglare glass is also used for framing. However, this type has a slightly dull appearance. Acrylic sheet can be a practical alternative to glass--especially if weight is an issue. But acrylic scratches easily, attracts dust and doesn't have the same degree of transparency as glass.

As for special tools, you'll need a straightedge and a mat cutter. Mat cutters come in a variety of configurations, ranging from basic \$15 models to professional versions costing a few hundred dollars. We achieved good results with a medium-priced Logan Model 3000 Pro-Am mat cutter and Adapt-A-Rule straightedge and ruler.

### Mounting The Artwork

Measure and mark the size of your mat and mounting boards. It's best to work from the back of the boards to prevent soiling the face. Place the boards on a piece of scrap cardboard and use a utility knife and straightedge to cut both pieces to size.

Position the artwork on the mounting board and mark the corners with light pencil marks. Rip two 1-1/2-in.-long pieces of linen mounting tape and moisten about 1/2-in. of each piece. Adhere the tape to the back side of the artwork, along the top edge so that about 1 in. extends beyond the top. When the glue dries, turn the piece face side up and position it on the mounting board. Rip two more strips of tape, each about 3 in. long, and moisten them. Apply them across the extending tape strips so the artwork is hinged to the mounting board (Photo 12). This system allows the print to expand and contract with changes in humidity, without wrinkling.

Mark the cutlines for the opening, or window, on the back side of the mat board. Typically, a mat extends over the image by no more than 1/4 in. on each edge. Use the straightedge and mat cutter to make the cuts (Photo 13). It's a good idea to practice on scrap board to learn how to start and stop the cuts exactly at the corners.

Place the cut mat over the mounted print (Photo 14). It's not necessary to attach the mat since the whole assembly will be sandwiched in the frame.



Use linen tape to attach photos and prints to the mounting board. Hinge the artwork at the top edge.



To cut the mat opening, mark cutlines on the back side of the mat board and use a mat cutter to make the cuts.



Place the mat over the print and mounting board. It's not necessary to fasten the two boards together.

Turn the frame upside down and install the glass. Then place the matted print into the frame (Photo 15). Cut the backing board to size and place it over the mounting board. Use framer's points to hold the back in place (Photo 16). You can use a special driving tool or a flat-blade screwdriver to install the points. On hardwood frames, the driving tool is worthwhile since the points are a bit harder to install.

Cut a piece of kraft paper slightly larger than the overall frame size. Rub a glue stick on the back side of the frame and apply the paper, letting it overhang on all edges. Press the paper to the frame to get a good bond and use a straightedge and utility knife to trim it 1/8 in. in from each edge. The simplest method of hanging a frame is to use a sawtooth-type hanger. Center the hanger on the back of the top rail of the frame and drive brads to hold it in place (Photo 17). On a hardwood frame, use an awl or bore small pilot holes for the brads.

Large or heavy frames are best hung with picture wire. Bore pilot holes, and install screweyes or D-ring hangers in the side frame rails about 3 or 4 in. from the top edge of the frame. String a length of picture wire between the hangers, leaving about 1-1/2 in. of slack. Twist the wire together to lock it to the hangers (Photo 18).

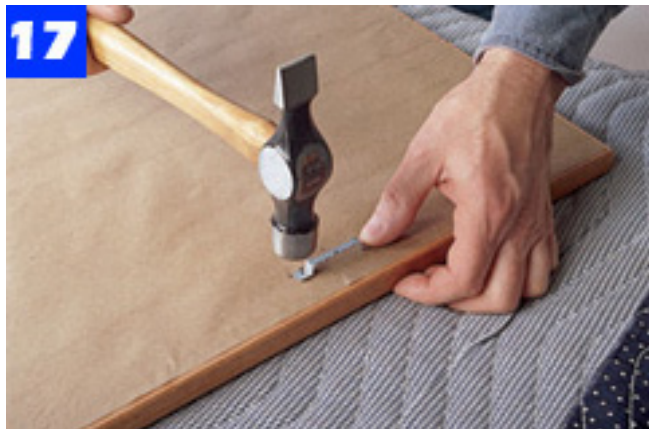


With the frame lying face side down, install the glass panel. Then, place the mounted artwork in the frame.

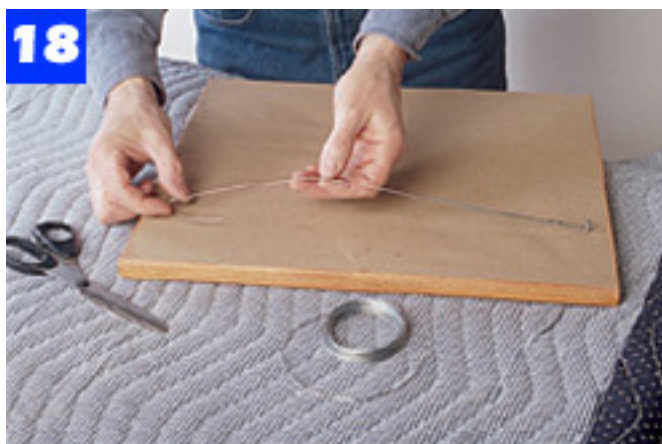


Place a corrugated or rigid foam backing board over the mounting board and hold it in place with framer's points.





A sawtooth hanger is fine for supporting light frames. Use brads to secure it to the center of the frame.



Hang heavy frames with picture wire. Install screweyes or D-ring hangers and string picture wire between them.

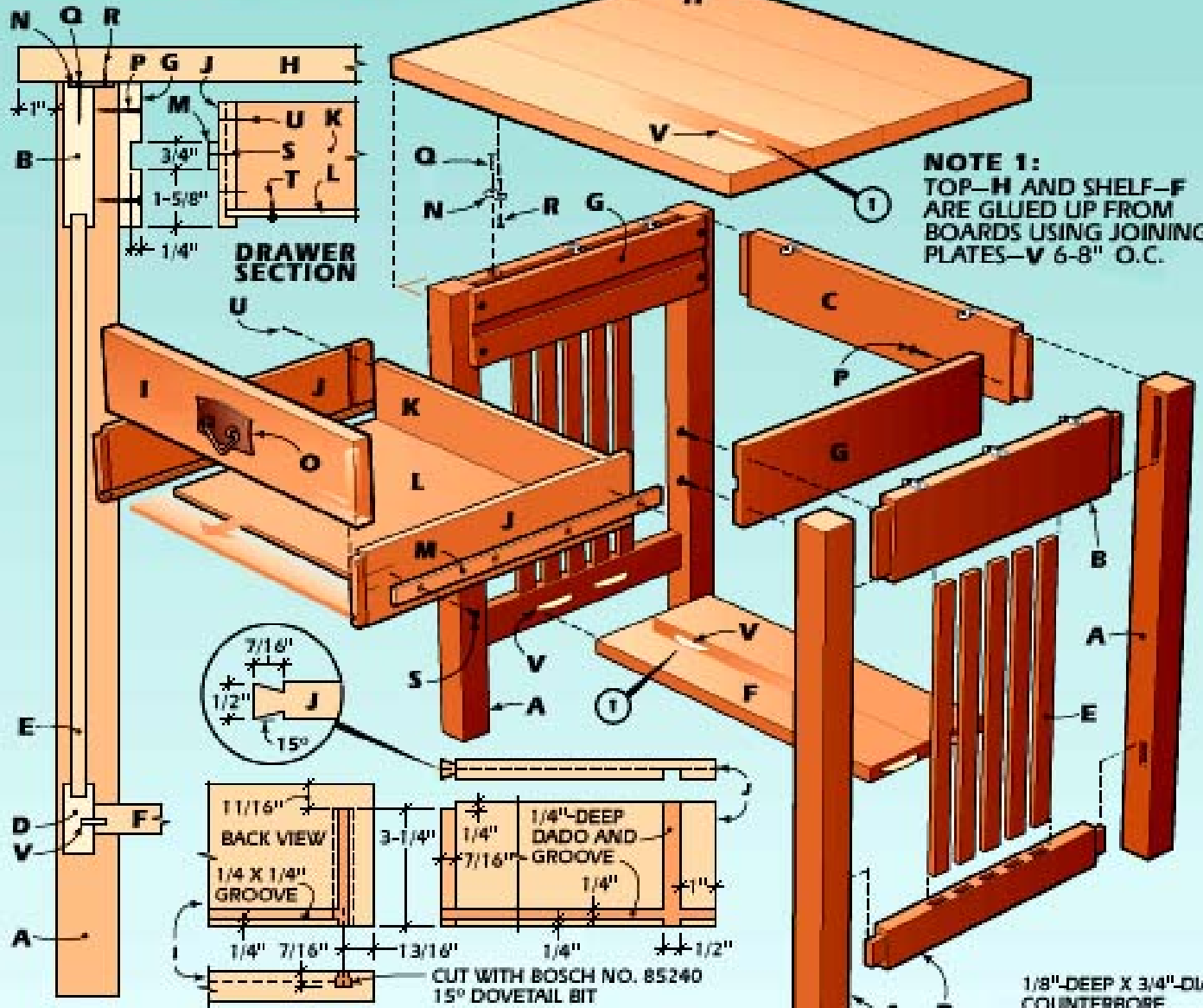
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# SIDE TABLE



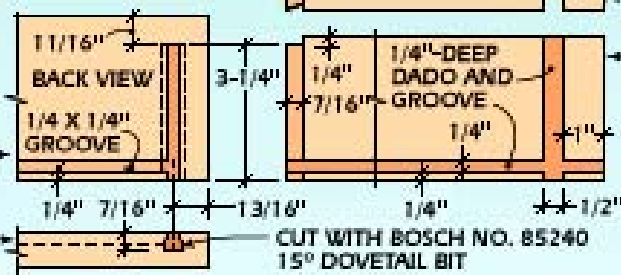


# SIDE TABLE 20" DEEP X 24" WIDE X 26" HIGH

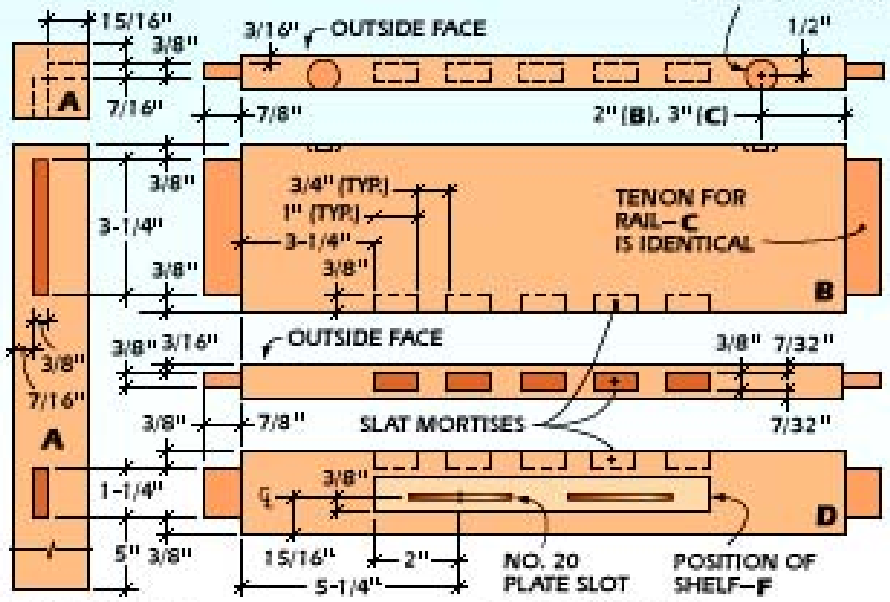


**SIDE SECTION VIEW**

**DRAWER DETAILS**



1/8" DEEP X 3/4" DIA. COUNTERBORE (2 REOD., RAIL-C; 3 REOD., RAIL-B)



**LEG DETAIL**

**RAIL DETAILS**

**MATERIALS LIST–SIDE TABLE**

<b>Key</b>	<b>No.</b>	<b>Size and description (use)</b>
<b>A</b>	<b>4</b>	<b>1 3/4 x 1 3/4 x 25" oak (leg)</b>
<b>B</b>	<b>2</b>	<b>13/16 x 4 x 16 1/4" oak (rail)</b>
<b>C</b>	<b>1</b>	<b>13/16 x 4 x 20 1/4" oak (rail)</b>
<b>D</b>	<b>2</b>	<b>13/16 x 2 x 16 1/4" oak (rail)</b>
<b>E</b>	<b>10</b>	<b>3/8 x 1 x 15 1/8" oak (slat)</b>
<b>F</b>	<b>1</b>	<b>13/16 x 8 x 19 7/8" oak (shelf)</b>
<b>G</b>	<b>2</b>	<b>5/8 x 4 x 15 7/8" oak (drawer guide)</b>
<b>H</b>	<b>1</b>	<b>1 x 20 x 24" oak (top)</b>
<b>I</b>	<b>1</b>	<b>13/16 x 3 15/16 x 18 3/8" oak (drawer face)</b>
<b>J</b>	<b>2</b>	<b>1/2 x 3 1/2 x 16 1/4" oak (drawer side)</b>
<b>K</b>	<b>1</b>	<b>1/2 x 3 x 16 3/4" oak (drawer back)</b>
<b>L</b>	<b>1</b>	<b>1/4 x 15 1/16 x 16 3/4" oak plywood (drawer bottom)</b>
<b>M</b>	<b>2</b>	<b>1/4 x 3/4 x 15 13/16" oak (drawer guide strip)</b>
<b>N</b>	<b>8</b>	<b>Knape &amp; Vogt No. 1547STL tabletop fastener</b>
<b>O</b>	<b>1</b>	<b>Whitechapel No. 106STH2 drawer pull</b>
<b>P</b>	<b>8</b>	<b>1 1/4" No. 8 fh screws</b>
<b>Q</b>	<b>8</b>	<b>1" No. 8 fh screws</b>
<b>R</b>	<b>8</b>	<b>5/8" No. 8 fh screws</b>
<b>S</b>	<b>8</b>	<b>1/2" No. 6 fh screws</b>
<b>T</b>	<b>3</b>	<b>5/8" No. 6 rh screws</b>
<b>U</b>	<b>8</b>	<b>3/4" x 16-ga. brads</b>
<b>V</b>	<b>16</b>	<b>No. 20 joining plates</b>

Misc: Yellow glue, 120- and 220-grit sandpaper, 0000 steel wool, aniline stain, tung oil varnish, paste wax.

## Stock preparation

Like the rocker and bookcase, the material used in this table is quarter-sawn white oak. The legs are cut from 8/4 solid stock, the top from 5/4 material and the rest from 4/4 lumber. For the drawer sides, you will have to either plane 4/4 stock to 1/2-in. thickness or have your lumber dealer plane the lumber to the finished size. The same holds true for the drawer guides, which are 5/8 in. thick.

The panels for the bottom shelf and tabletop are glued up from narrow boards. Cut stock slightly longer and a bit wider than required to yield the finished panel. Edge-joint each piece, then lay out the locations of the No. 20 joining plate slots every 6 to 8 in. along the mating edges. Keep the end slots about 3 in. from the finished ends of the panels.

Use the plate joiner to cut the slots, registering the cuts against a flat work surface. Then apply glue to the slots, plates and edges and assemble the panels. Use clamps to pull the joints tight, then let the glue set for about 20 minutes. After the glue fully cures, rip and crosscut the panels to finished dimension.

## Joinery

Rip and crosscut the remaining parts for the table base to finished dimension. Then, lay out the mortise in the table legs. Use a router with an edge guide and 1/2-in.-dia. up-cut spiral bit to make these cuts (Photo 1). Use a sharp chisel to square the ends of each mortise (Photo 2).

Use a dado blade in your table saw to cut the tenons on the side and back rails. Since the tenons are 7/8 in. long, you will have to make two passes for each tenon cheek. Readjust the blade height to cut the shoulders at the top and bottom edges of the tenons (Photo 3). Check the fit of each tenon in its matching mortise.

Mark the locations of the slat mortises in the side rails. Clamp a tall fence to the drill-press table to help locate the rails, then bore overlapping 3/8-in.-dia. holes to remove most of the waste (Photo 4). Complete the mortises by smoothing the walls and squaring the ends with a sharp chisel.



1--Use a router with an up-cut spiral bit and an edge guide to cut the rail mortises in the table legs. Make several passes.



2--When the routing is done, carefully square the ends and flatten the sides of each mortise with a sharp chisel.



3--Use a dado blade in a table saw to cut the rail tenons. First cut the cheeks, then readjust the saw to cut the shoulders.



4--Cut the slat mortises in the rails using a drill press to remove most of the waste and a sharp chisel to finish the cuts.

Lay out the joining plate slots on the bottom shelf and side rails. Use the plate joiner to cut the slots in the shelf ends, registering the cut on a flat workbench or on the top of your table saw (Photo 5). To cut the slots in the side rails, you must use a spacer block under the plate joiner to yield the proper slot position (Photo 6).

Before beginning to assemble the base, sand all the parts with 120- and 220-grit sandpaper, then dust off the pieces thoroughly. It is much easier to do a good job of sanding at this stage than it is once the base is together.

### Base assembly

Position the side slats in their mortises in one bottom side rail (Photo 7). If the parts fit properly, you need not apply glue to these joints, since the slats will be held captive between the rails. Place the top side rail over the slat ends, then clamp the assembly temporarily to be sure that the slats





are completely seated in the mortises.

Apply glue to the rail tenons and leg mortises, then assemble the table side. Clamp the joints tight, then compare opposite diagonal measurements to be sure that the assembly is square (Photo 8). Follow the same procedure for the other side. Apply glue to the joining plate slots, mortises, tenons and plates for assembling the shelf and back rail to the sides. Join the rail and shelf to one side (Photo 9), then place the opposite side over the shelf and rail ends. Stand the base on a flat work surface and clamp the joints tight (Photo 10). Check for square.

Use a router with an edge guide to cut a 1/4-in.-deep x 3/4-in.-wide dado in each drawer guide (Photo 11). Bore and countersink pilot holes for mounting screws in the guides, then sand the guides with 220-grit sandpaper before fastening them to the table legs (Photo 12).

5--Clamp the bottom shelf securely to a workbench. Then use a plate joiner to cut joining slots in both ends of the shelf.



6--Clamp the bottom rails to your table saw fence. Then use a plate joiner to cut joining slots in one side of both rails.



7--Test fit the side slats in the rail mortises. Sand or trim the joints, if necessary, to achieve a tight fit for each slat.





8--Apply glue to the mortises and tenons, then clamp the parts. Check for square by comparing diagonal measurements.



9--To join the sides to the back rail and bottom shelf, apply glue to the slots and plates, and to the mortises and tenons.



10--Clamp the side assemblies to the back rail and shelf and check the parts for square. Readjust the clamps if necessary.

Mark the locations of the tabletop fasteners on the top edge of the side and back rails. Use a 3/4-in. Forstner or multispur bit to bore the 1/8-in.-deep recess for the fasteners. Bore a pilot hole for each, then attach the fasteners with 1-in.-long No. 8 fh screws.

## Drawers

Cut stock to finished size for the drawer sides and back, and rip stock for the drawer face, but don't cut it to length yet. Instead, leave the drawer face blank about 12 in. long. The drawer sides are joined to the face with sliding dovetails. These joints are not difficult to cut, and they provide a nice compromise when you do not want to invest the time required for traditional dovetail corner joints. In order to cut these stopped dovetail slots, construct a U-shaped jig to guide the router. You can build this jig by screwing together three strips of scrap lumber or plywood. The dimensions of these pieces are not critical. But it is important that the three pieces are assembled square to each other.

Set the dovetail bit—we used a Bosch No. 85240—to cut 7/16 in. deep, then make an indexing cut into the fence of your jig to make locating your cut easy. Mark the position of the two slots—along with an end mark for each slot—on the inside surface of the drawer face, centered on the length of the face blank. Clamp the face to the routing jig with the indexing cut centered on one mark. Slide the router bit into the slot, turn on the motor and guide the tool along the jig to the end mark of the slot (Photo 13). Turn off the router and slide the bit back to the indexing cut to remove it. Repeat for the other slot. Cut the face to finished length.

Use the same dovetail bit in the router table to cut the dovetail shape on the ends of the drawer sides (Photo 14). For the joint with the drawer back, use a dado blade in the table saw to cut a simple dado. Then use a 1/4-in.-dia. straight bit in the router, and an edge guide, to cut the grooves for the drawer bottom in the face and drawer sides (Photo 15). Note that the groove in the face runs only between the dovetail slots.

Use a small backsaw to cut the shoulder at the top of the dovetail on each drawer side. Then dry assemble the drawer box to be sure that all joints fit properly. If all the joints are correct, sand all drawer parts, then apply glue and reassemble the drawer (Photo 16). Use brads to reinforce the glue joints between the back and drawer sides. Then clamp the drawer parts together. Check that the assembly is square.

Cut the drawer bottom from 1/4-in.-thick plywood, then slide it into place, and fasten it to the bottom edge of the drawer back with screws. You can remove the bottom later to make finishing the drawer easier.

Cut the drawer hanger strips to size, then bore and countersink pilot holes for attaching them to the drawer sides. Clamp the strips to the drawer sides, then fasten them with screws (Photo 17). Finish the drawer assembly by marking the locations of mounting screws for the drawer pull. Bore pilot holes and attach the pull.



13--Rout slots in the drawer face for the drawer sides with a dovetail bit. Use a square U-shaped jig to guide the router.



14--Use the same dovetail bit in a router table to cut both sides of the dovetails on the ends of each drawer side.





15--Cut a dado between the dovetail slots on the drawer face for the bottom panel. Cut matching dados in the drawer sides.



16--Apply glue to all the drawer joints, then clamp the box together. Reinforce the side-to-back joints with brads.



17--Slide the drawer bottom in place and attach it to the back with screws. Also, screw the guide strips to the sides.



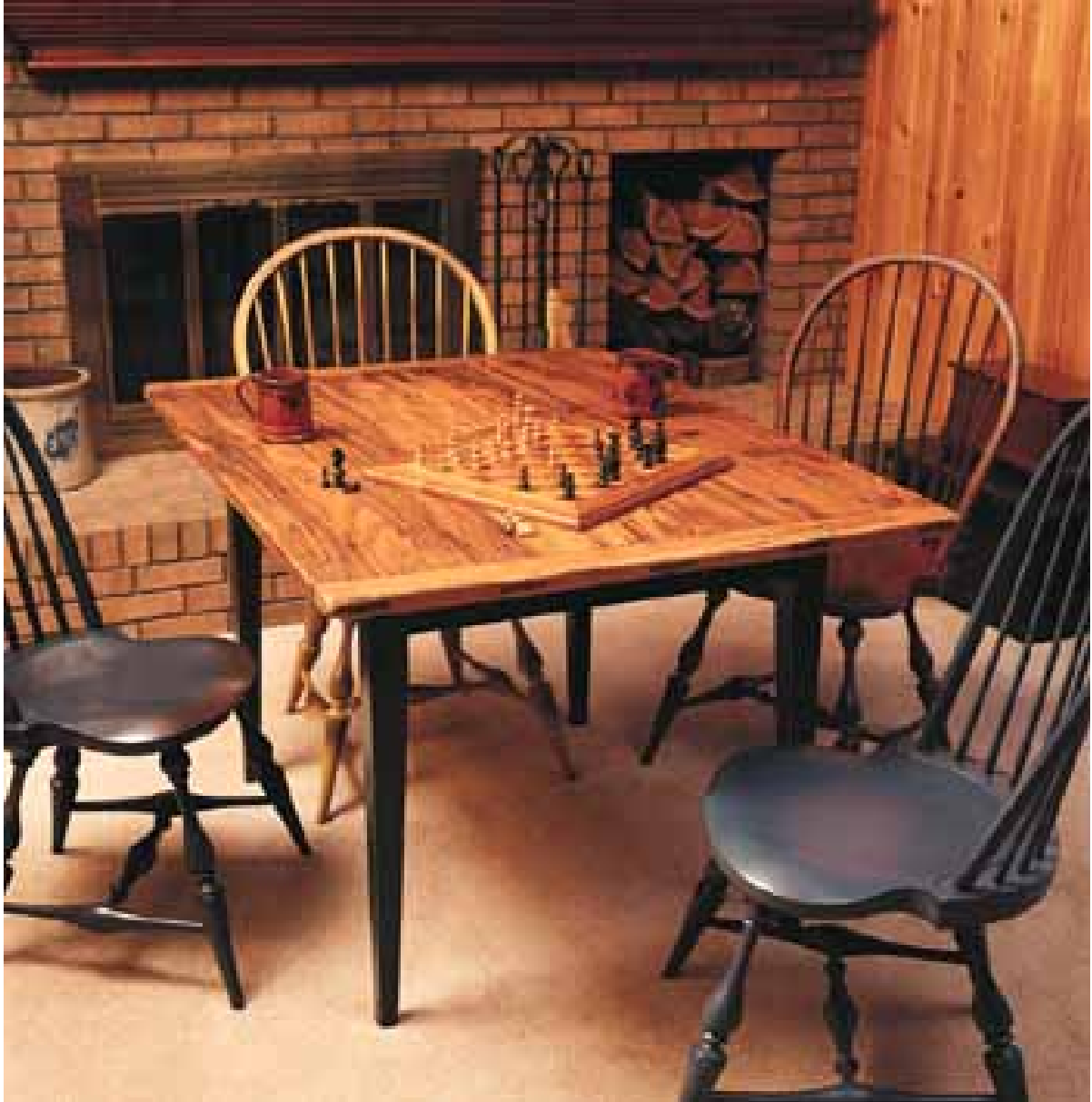
18--Center the base over the top and mark the fastener holes. Then bore pilot holes in the top and attach the base.

## Assembly

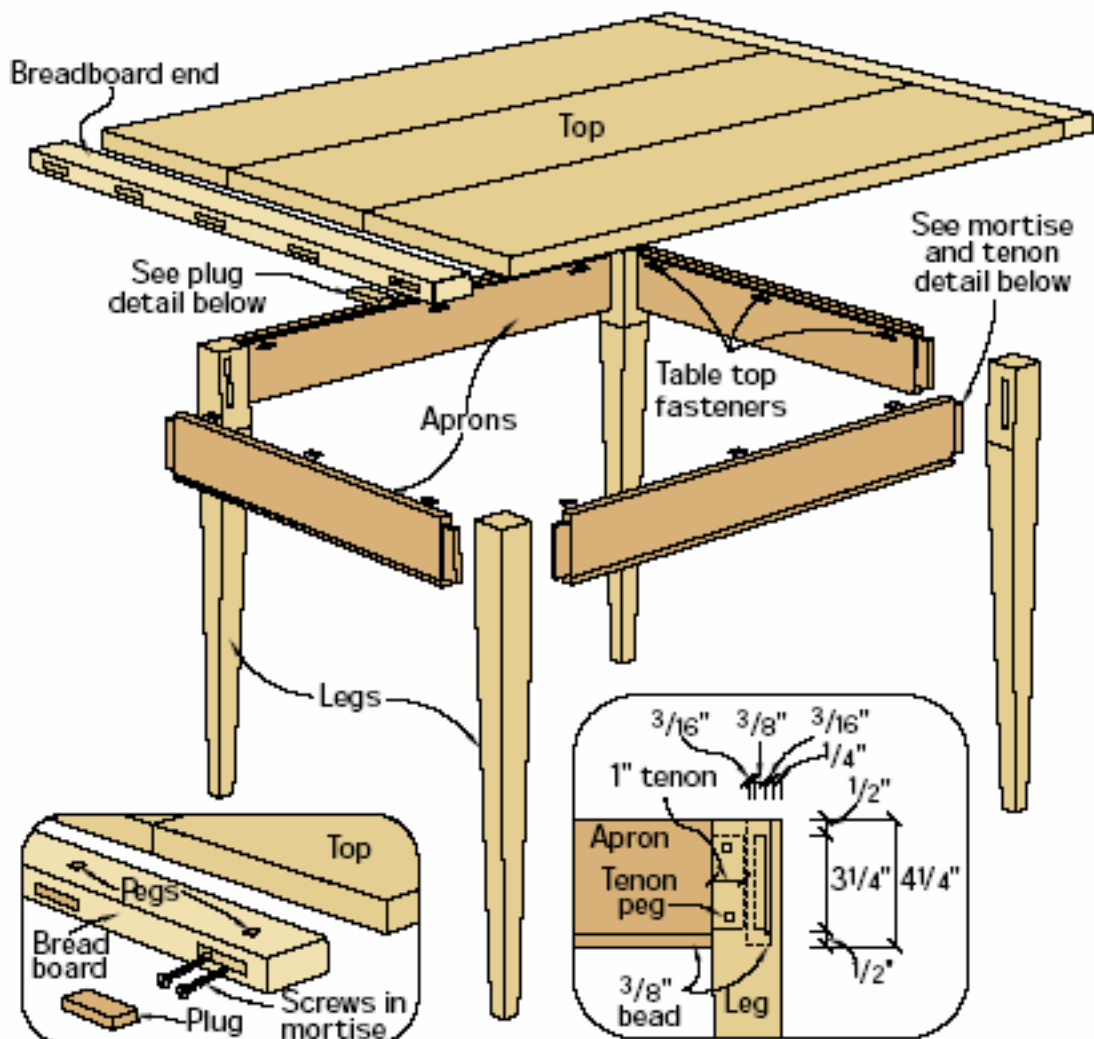
Sand the tabletop smooth with 220-grit sandpaper, then place it upside down on a padded surface. Invert the base on the top and adjust it for an even reveal on all sides. Next, mark the locations of the screwholes for the tabletop fasteners (Photo 18). Use a clamp to maintain the proper spacing between the front table legs.

Remove the base from the top and bore pilot holes for the tabletop fastener screws. Then, replace the base and install the screws. You'll need a screwdriver with a magnetic tip to start the screws between the drawer guides and side rails. Apply the same stain and finish that's described in "Rocking Chair."

# TAVERN TABLE







Detail of breadboard ends

Detail of mortise and tenon

Schedule of Materials:Tavern Table

No.	Item	Dimensions T W L	Material
4	Legs	2 <sup>1</sup> / <sub>8</sub> " x 2 <sup>1</sup> / <sub>8</sub> " x 28 <sup>1</sup> / <sub>4</sub> "	S
2	Aprons*	3 <sup>3</sup> / <sub>4</sub> " x 4 <sup>1</sup> / <sub>4</sub> " x 31 <sup>3</sup> / <sub>4</sub> "	S
2	Aprons*	3 <sup>3</sup> / <sub>4</sub> " x 4 <sup>1</sup> / <sub>4</sub> " x 25 <sup>3</sup> / <sub>4</sub> "	S
1	Top	1 <sup>1</sup> / <sub>8</sub> " x 36" x 43"	P
2	Breadboards	1 <sup>1</sup> / <sub>8</sub> " x 2 <sup>1</sup> / <sub>2</sub> " x 36"	P

P - chestnut; S-poplar • \* Including 1" tenon

Begin the project by milling the legs and cutting the taper. You can use a tapering jig for your table saw, but I don't recommend it. A few years ago I came up with a quick way to use a jointer to cut tapers faster and safer..

There are a lot of ways you can join the aprons to the legs, from totally traditional to quick-and-dirty. I prefer using a straight mortise-and-tenon joint, though if I were building a little side table or something else that wouldn't see daily abuse, the two less traditional methods I'm going to cover would work just fine. But before we talk about the bases, build the top.

## Making the Top

After I pulled the right boards from my woodpile, I got them ready for glue-up. I wanted this top to look rustic, so I didn't plane the lumber. Instead, I jointed the edges of the planks and glued up the top. Then I rough sanded it with a belt sander to get it reasonably flat and to remove some of the milling marks. Then I cut the top to size and worked on the breadboard ends.

For a long time I used traditional through-mortises to attach breadboards to cover the end grain of my tabletops. Other people showed me how to do it with slotted screw holes. I was always against using that method until I actually tried it. Now it's the only way I'll attach breadboards. You actually get less up-and-down movement using screws, and the top stays flatter-looking for a longer time. Here's how I make my breadboard ends.

After cutting the breadboards to size, cut 3/8"-wide by 2-1/2"-long by 1-1/2"-deep mortises in the breadboards. I cut five of these for my 36"-wide top. However many you use, it's always good practice to use an odd number of mortises so it's easier to lay them out. I put the two outside mortises 1/2" in from the end of the breadboard.

Now cut two slots for two screws in each mortise. I make the slots about 3/8" long to give the top some real room to move if it has to. You can make a router jig to cut the slots, or you can use your drill press and work the bit back and forth. Clamp the breadboard to the table top and put two screws in each mortise. I put the screws at the sides of the mortise, not at the center. I do this because I peg the fake plug later in the process, and this keeps me from boring a hole into one of my screws accidentally. Don't drive the screws in too tightly because you want the table top to be able to move.

Now plug the mortises. I cut plugs to fit the opening and taper them a bit so they fit snugly when tapped in place. Glue the plugs in place, then peg the plugs through the top with 1/4" x 1/4" square pegs.

Now age the top. I strike the top with a key ring full of keys; I even write people's names in the top with a knife. It's pretty amusing to watch people as they see me do this. They freak out.

Stain the top with a golden oak color and then add a natural oil finish, such as Watco, which is an oil/varnish blend. You don't want the top to look too shiny.

Now plug the mortises. I cut plugs to fit the opening and taper them a bit so they fit snugly when tapped in place. Glue the plugs in place, then peg the plugs through the top with 1/4" x 1/4" square pegs.

Now turn your attention to the base.

## Mortise and Tenon

Cut your aprons to size. Cut 1"-long tenons that are 3/8" thick. The apron lengths in the Schedule of Materials include the tenons. I cut my tenons first and use them to lay out my mortises, which results in less layout, in my opinion. These aprons are set back 1/4" from the front of the legs, this is called a "set back."

Now cut a bead on the bottom edge of the aprons using a beading bit in your router. Finally, cut a slot on the inside of the aprons for fastening the base to the top. I use metal



The plugs for the breadboard ends are made from the same material as the table top. Sand the plug to fit, put some glue on the sides and tap it in place.



I usually build my tables using straight mortise-and-tenon joinery. However, there are special cases when other methods are just as good or even better.



These table top fasteners are cheap (\$1.99 for a pack of eight) and sturdy. Simply place the clip end into the kerf in your apron and screw the other end to your table top.

tabletop fasteners from Rockler (see the supplies list at the end of the article). Rockler sells very sturdy ones, and I recommend them.

For these fasteners, the slot needs to be the width of your table saw's blade (between 1/8" or 1/16" wide) and 7/16" down from the top of the apron and 3/8" deep.

Glue up your base, peg the mortises through the legs and finish the base. I use square pegs in my legs. Drill a round hole through the leg and into the mortise. Then take a piece of square stock, whittle one end of it roundish, then pound it into the hole. It should convert your round hole into a square.

### Mitered Mortise and Tenon

This method is similar to the straight mortise and tenon above, but you must miter the ends of the tenons because your mortises meet in the middle of the leg. Why would they meet? Well you might have a thinner leg, or your mortises might be back farther if you chose to use a larger set back.

When this is the case, I make a standard tenon and chop the end off at a 45-degree angle on my miter saw. You're not trying to match the two miters exactly (it will never show) so leave a little gap between the two tenons. If it's too tight, it could get you in trouble because the ends of the tenons will touch before the shoulders seat into the legs.

### Pocket Screws

I wouldn't recommend this for a large table. If you're going to spend the money on the wood, you might as well do it right. But if you want to build a quick-and-dirty side table, this will work fine. Be sure to glue and screw this joint for added strength. It's important to keep the pieces tightly together as you screw the apron to the leg.

### Corner Brackets

Corner brackets are a faster alternative to traditional joinery, but they aren't as sturdy. However, you can't beat them when you want to make a table that can be knocked down and stored away.

These measurements apply to the brackets from Rockler (see the supplies box at the end of the article). The first step to installing these brackets is to cut a bevel on the inside corner of the legs. This is where you'll later install the hanger bolts. The best way to cut the bevel is on your jointer. Set the machine's fence to a 45-degree angle and the depth of cut to 1/4". Cut 3-1/2" in on the top corner as shown in the photo.

Now install the hanger bolts, which are odd-looking fasteners that have wood screw threads on one end and machine screw threads on the other. The wood screw end goes into the leg, and the machine screw end is bolted to the corner bracket. To install the hanger bolts, first lay out and drill pilot holes on the leg. Then install the bolts using the method shown in the photo.

Now you need to cut a kerf in each apron for the bracket to grab. The kerf should be 1-3/4" in from the end and 3/8" deep for these brackets. Different brands can use different measurements.

### Attaching the Top and Finishing

I attach the top with tabletop fasteners that I screw in place about every foot. On the long aprons, don't push the fasteners all the way into the kerf when screwing them down. This will give your top some room to move.

I finished the base with a couple coats of latex paint followed by a glazing stain. Finally, I added a couple coats of lacquer for protection.



When you have to use mitered mortise-and-tenon joinery, don't get too worked up about the fit of the miter. You don't want the miter too tight.



Mitered mortise-and-tenon joinery is common on tables with thin legs or when your set back is deeper than normal.



Be sure to glue the joint and hold the leg and apron together tightly while screwing it together.



Pocket screws aren't my first choice for building dining tables, but for a small occasional table, it'll work.



Use the bracket as a template for locating the holes for the corner bracket. Then use a drill press to make your pilot holes.

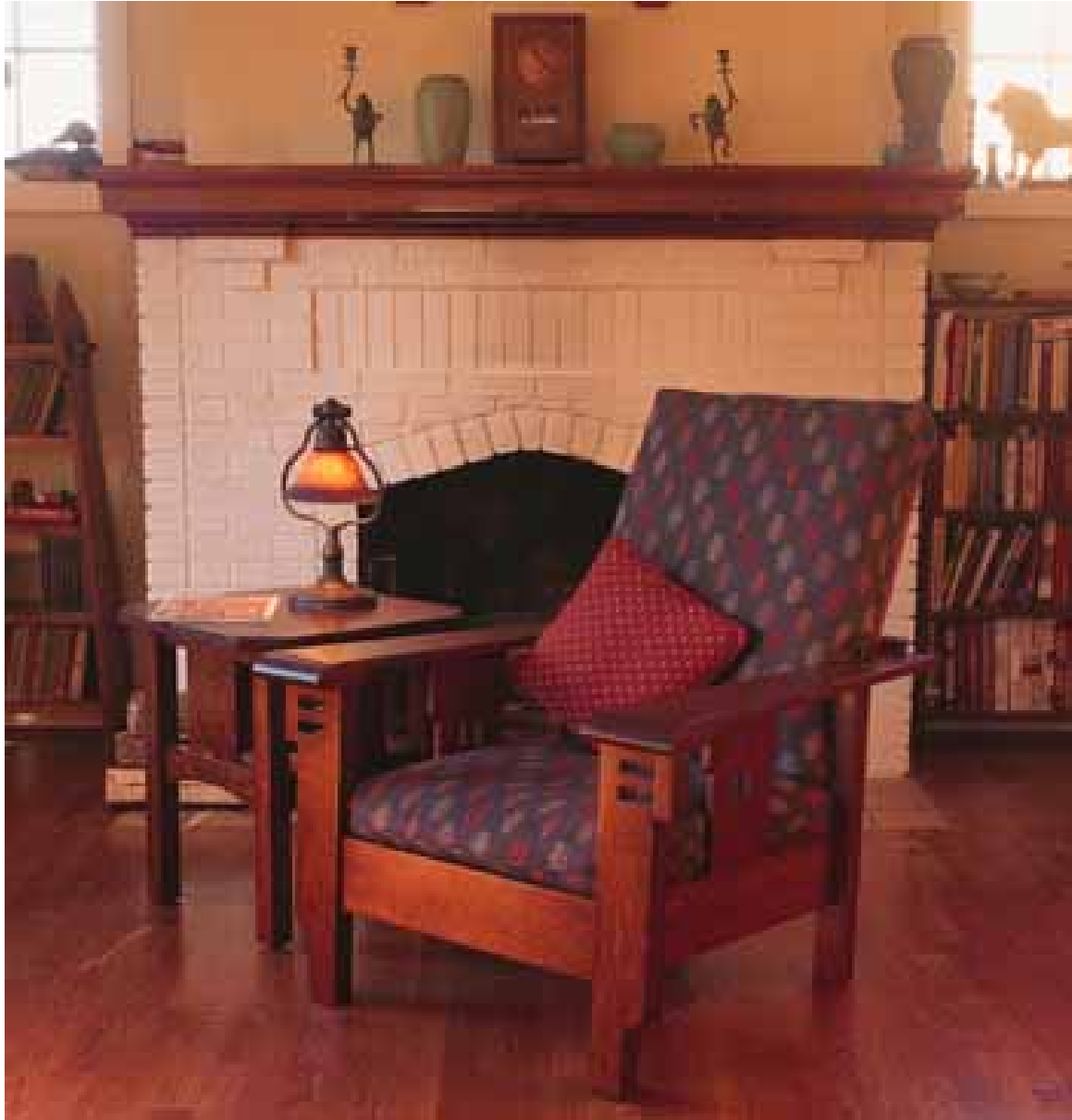


To install the hanger bolts, thread two machine nuts onto the end of the hanger bolt and tighten them against one another. Then grip the two nuts with a wrench and screw the hanger bolts into the leg.

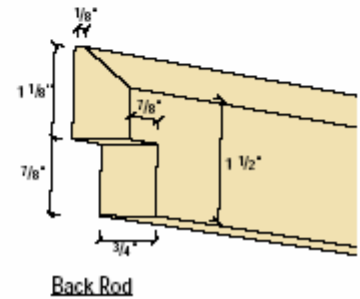
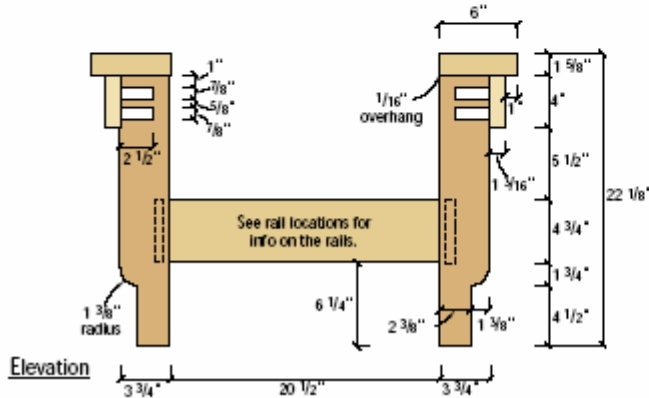
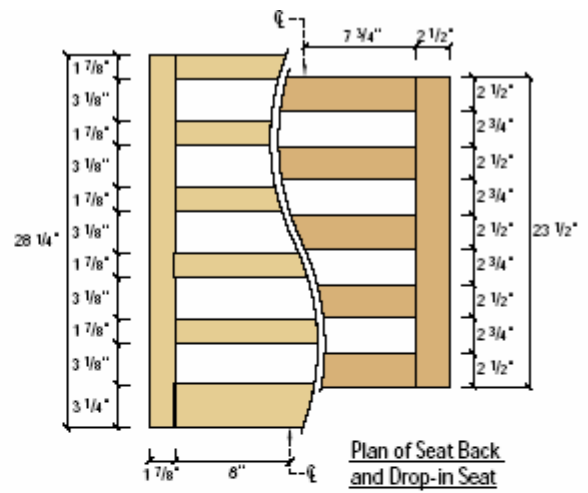
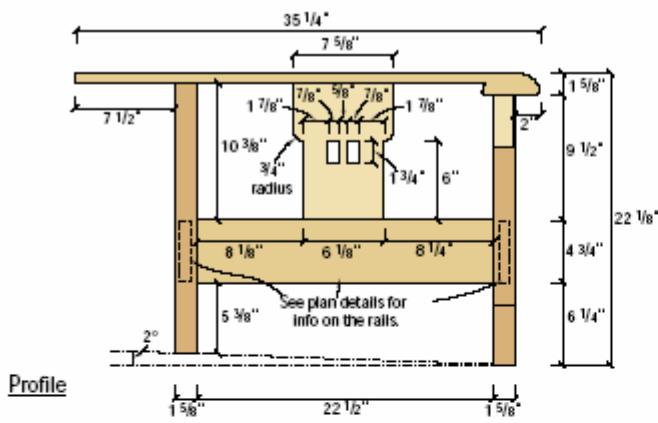


Corner brackets are great for building furniture that needs to be knocked down or moved frequently.

# MORRIS CHAIR



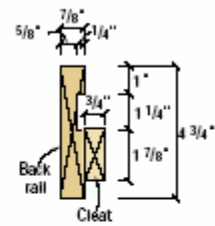
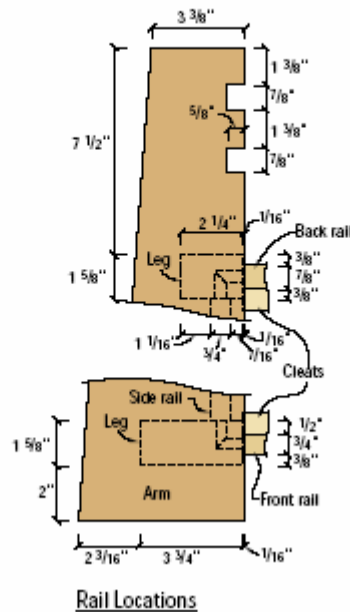
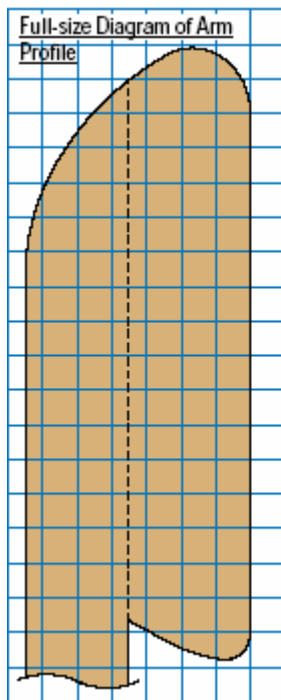




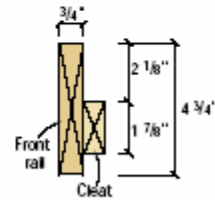
### MORRIS CHAIR

NO.	ITEM	DIMENSIONS (INCHES)			NOTES
		T	W	L	
<b>Chair frame</b>					
□ 2	Front legs	1 3/4	3 3/4	21	1/2" TOE
□ 2	Back legs	1 3/4	2 1/4	21	1/2" TOE
□ 2	Applied sides	1 3/4	1 7/8	4	
□ 1	Front rail	3/4	4 3/4	22	3/4" TBE
□ 2	Side rails	3/4	4 3/4	24	3/4" TBE
□ 1	Back rail	3/4	4 3/4	22	3/4" TBE
□ 2	Side slats	1/2	7 7/8	11 3/4	1/2" TBE
□ 2	Arm bldps	3/8	6	4 1/2	
□ 2	Arms	3/4	6	35 1/4	
□ 2	Cleats	3/4	1 3/8	20 1/2	
□ 1	Back rod	3/4	2	23 3/16	
<b>Drop-in seat</b>					
□ 2	Seat stiles	3/4	2 1/2	23 1/2	
□ 5	Seat rails	3/4	2 1/2	17	3/4" TBE
<b>Adjustable back</b>					
□ 2	Back stiles	3/4	1 3/8	28 1/4	
□ 5	Back rails	3/4	1 3/8	17 1/2	3/4" TBE
□ 1	Bottom rail	3/4	3 3/4	17 1/2	3/4" TBE

TOE = known one end - TBE = known on both ends



Cleat Location, Back Rail



Cleat Location, Front Rail

The "X" on the rails and cleats denotes a cross section rather than an end view.

### Mortises: Machine or No Machine?

First cut all your pieces to size according to the Schedule of Materials and begin laying out the locations of your mortises. The rule of thumb is that your mortises should be one half the thickness of your tenon's stock. When your stock is 3/4" thick, your mortises and tenons should be 3/8" thick. That means the tenons for the beefy back rail should be thicker (7/16") and those for the side slats should be thinner (1/4").

Also remember that except for the tenons on the legs and slats, all the tenons are 3/4" long. To ensure your tenons don't bottom out in your mortises, it's always a good idea to make your mortises about 1/16" deeper than your tenons are long.

After you mark the locations of all the mortises, it's time cut them. There are 38 mortises in this project. You'd be nuts to do these all by hand. Use this project as an excuse to purchase a hollow chisel mortising machine (about \$250) or a mortising attachment for your drill press (about \$70). If you can't swing the cash, I'd make plywood templates and cut the mortises with a router and a pattern bit. Making plywood templates is something covered later in the story.

One more thing: don't cut the mortises in the arms or the arm buildups until the chair frame is assembled. You'll cut these with a router and a pattern bit after the chair frame is assembled.

### Tenons With a Dado Stack

Once you get your mortises cut, make tenons that fit snugly into the mortises. You can use a tenoning jig or the fence on your table saw, or you can use a router. I prefer to use a dado stack and my miter gauge.

While your dado stack is in your saw, cut the groove in the back piece that holds the seat frame. See the drawing for the location of this groove.



Make the mortises in the legs before you shape the curve near the bottom or make cutouts on the top.



When pattern-routing the curve on the legs, make sure you have the work firmly clamped in place. I have the pattern and leg wedged between two pieces of oak (the pattern is on the underside of the leg). Then the leg itself is clamped to the table. You also could perform this operation on a router table with a starting pin for pattern-routing.

Once you cut your tenons, prepare to assemble the drop-in seat and the adjustable back. To save yourself some grief, sand the edges of the rails that you won't be able to get to after the frames are assembled. Now put glue in all the mortises and clamp up the frames. Set them aside to dry.

## Curves and Cutouts

What makes this Morris chair stand out are the curves and cutouts on the legs, arms and slats. Each curve and cutout needs a slightly different strategy.

The large curves on the legs and the small curves on the side slats were cut using a plywood template and a pattern-cutting bit in a router. I made the patterns from 1/2"-thick Baltic birch plywood. Use the drawings to make your own plywood template using a scroll saw, band saw or coping saw. Smooth all your cuts with sandpaper, then try shaping a couple scraps with your template to make sure your pattern produces the right shape. When satisfied, cut the curves to rough shape on your band saw (about 1/16" shy of your finished line) and clean up the cut with a router and pattern bit. Finish shaping the legs with a chisel.

To produce the large cutouts on the front legs, do what Oscar Onken did: cheat a bit. Make the "cutouts" using a dado stack on your table saw, with the legs on edge. Then glue the applied sides to the legs to cover the open end of the cuts. Instant cutout. While you're at it, cut out the notches on the arm pieces for the rod that adjusts the back.

To complete the legs, you need to cut the bottom of all four legs at a 2-degree angle so the chair sits flat on the floor. I recommend you make a full-sized mock up (see the photo above) so you can get the angle exactly right. Cut the angle on a chop saw.

## Assembly

Now you're almost ready to assemble the chair frame. You'll need to first miter the tenons slightly where they meet to fit in the mortises using your table saw. Now finish sand everything. I went to 150 grit using my random-orbit sander and hand sanded the whole piece with 180 grit. Yes, it makes a noticeable difference.

Now glue the front rail between the front legs and the back rail between the back legs. Clamp and allow your glue to dry. Use 1/4" dowels to pin the tenons from the inside of the chair. This strengthens the weakest point of this chair. It's at this joint where the original chair came loose.

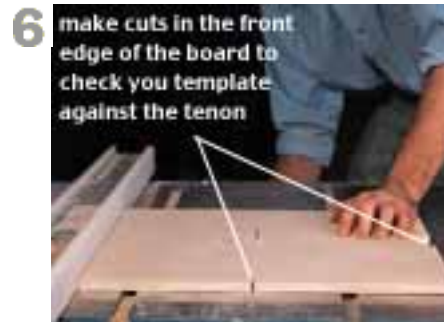
Glue the side rails between the front and back legs and you can see your chair take shape.

## Learn to Make Square Templates

Now you need to work on the arms. First glue the arm buildup pieces to the front of the arms. Then get ready to cut the mortises on the arms that will hold the tenons on the legs and side slats. A word of advice here. Mock up an arm out of scrap wood and practice on it first.

To make plywood templates for the mortises, you need to make a square hole in the middle of a piece of ply. The best way to do this is by making plunge cuts into your plywood on your table saw. Refer to the photo earlier in the story to see how to do this.

Now cut your mortises. I used a template bit with cutters on the bottom and a guide bearing on top. If you don't have a bit with cutters on the bottom, you can still plunge with a straight bit. Just plunge slowly and wiggle the router a bit as you go. Cut the mortises in two passes.



**6** make cuts in the front edge of the board to check you template against the tenon

**3** To make a template for the mortises in the arms and the cutouts on the side slats, position your plywood over your table saw and raise the blade into the ply. Move the fence over and repeat. Then turn the pattern 90 degrees and repeat for the other edges of the pattern. Note that I made cuts in the front of the pattern to help me size the pattern to the tenons.



Be sure to make a full-size mock-up of the legs and sides to determine the angle you need to cut on the bottom of the legs.



When you determine that angle, use a grease pencil or magic marker to paint the bottom of the legs. I cut the back and front legs simultaneously. Slowly inch your legs in after each cut until the color is all gone.



Peg the tenons that join the front rail to the front legs and the back rail to the back legs. If you've ever pegged tenons before, you

After you're sure the arms fit on the legs, cut the curve on the front of the arm. Attach the full-size pattern to your arm and cut the shape on a band saw. Clean up the cuts with a stationary belt sander. Now taper the arms with your band saw and clean up the cut with your jointer. Glue the arms and slats in place.

Now shape the back rod that adjusts the seat back angle. Bevel one edge of the rod on your jointer and cut notches on the ends so the rod fits between the arms. Attach the back to the seat frame with a piano hinge. Screw the cleats to the front and back of the frame in the locations shown in the diagram; slip the seat in place.

## Finishing

This takes some effort, but it is well worth it. The first step is to dye the chair with an alcohol-based aniline dye that's reddish. See the supplies list for ordering information. Then apply one coat of boiled linseed oil to the chair. You can get this at any home center store. Wipe off the excess and let it dry overnight. The linseed oil helps seal the wood before your final coloring step and helps bring out the ray flake.

Now wipe on a thin coat of Lilly's warm brown glaze. We live and die by this stuff when finishing Arts & Crafts furniture. We're not aware of a catalog that sells it, but you can visit Lilly's website (at the address in the supplies box) to find a paint store that carries this glaze. Wipe the glaze until you achieve an even tone. Allow it to dry overnight. Finally, apply three coats of a clear finish -- whatever you're comfortable with.

**7** know that dowels can be wildly different sizes than they're supposed to be. Here's a trick. If your dowel is a bit undersized, glue it in place and cut it nearly flush to the surface. Then put several drops of thinned glue on the end grain of the dowel. It wicks in the glue, expands and glues up tight. When the glue is dry, cut the dowel flush.



Be sure to make a test arm before you go mortising the real thing. You'll be glad you did.

# TANSU CHEST





Schedule of Materials Step Tansu

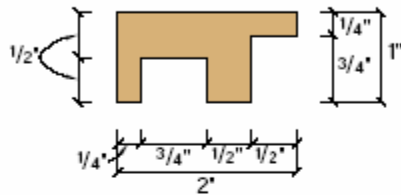
Lower Cabinet

No.	Item	Dimensions T W L	Material
2	Top & bot.	3/4" x 17" x 51"	Pty
4	Cabinet stiles	1" x 2" x 16"	M
2	Side panels	3/4" x 15" x 16"	Pty
1	Back panel	3/4" x 16" x 47"	Pty
4	Dr stiles	3/4" x 2" x 16"	M
4	Dr rails	3/4" x 2" x 21"	M
2	Thin rails	3/4" x 1" x 21"	M
2	Top panel	1/4" x 7 1/16" x 21"	Pty
2	Lower panel	1/4" x 4 1/16" x 21"	Pty
4	Interior stiles	1/4" x 1" x 7"	M
4	Runners	1/4" x 1/4" x 46"	M
1	Partition	3/4" x 13" x 16"	Pty
3	Cleats	3/4" x 3/4" x 13"	M

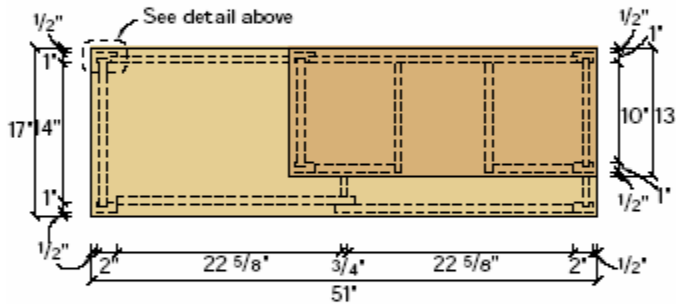
Upper Cabinet

No.	Item	Dimensions T W L	Material
2	Top & bot.	3/4" x 13" x 31"	Pty
4	Cabinet stiles	1" x 2" x 11"	M
2	Side panels	3/4" x 11" x 11"	Pty
1	Back panel	3/4" x 11" x 27"	Pty
2	Vert dividers	3/4" x 10 1/2" x 11"	Pty
4	Lg drw frts	3/4" x 4" x 8"	M
8	Drw sides	1/2" x 4" x 10 1/8"	Pty
4	Drw backs	1/2" x 4" x 7 1/2"	Pty
6	Drw bot	1/4" x 7 1/2" x 9 3/4"	Pty
2	Sm drw frts	3/4" x 3" x 8"	M
2	Drw sides	1/2" x 3" x 10 1/8"	Pty
4	Drw backs	1/2" x 3" x 7 1/2"	Pty

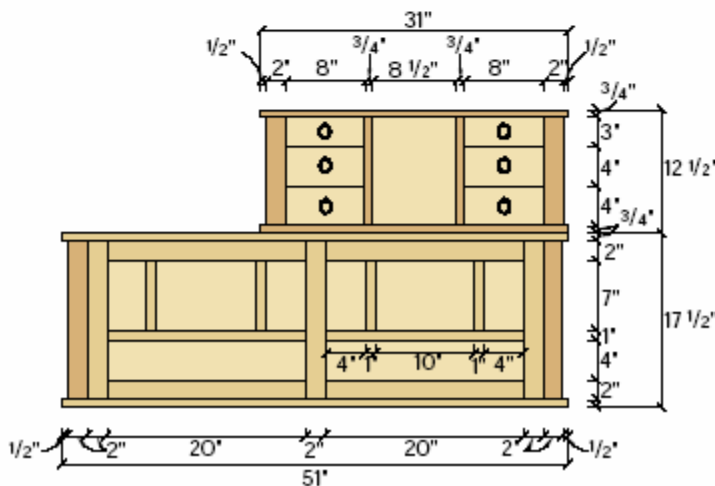
M= Hard maple, Pty= Maple plywood



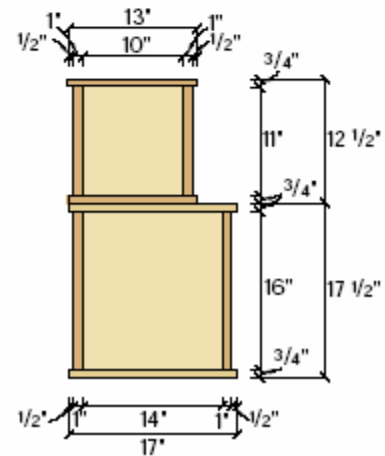
Detail of back cabinet stiles



Plan



Elevation



Profile

Construction of this chest is simple. You'll need a sheet and a half of 3/4" maple plywood, one board of 1"-thick maple that's about 8' long and 8" wide and some 1/2" and 1/4" plywood scraps for the drawers. The carcasses of the upper and lower cabinets are built the same way. First cut all your pieces to size and iron on veneer edge tape to cover all the exposed plywood edges.

Now cut the grooves and rabbets on the cabinet stiles. The side panels are glued into 1/2"-deep x 3/4"-wide grooves milled 1/4" in from the edge of the cabinet stiles. The back panel is nailed and glued into a 1/2"-deep x 3/4"-wide rabbet on the inside of the stiles. Screw each assembly to its bottom board. Glue and nail the partitions in place.

Lower Cabinet Doors

Build the two sliding doors using stub tenons that rest in 1/4"-wide by 1/2"-deep grooves. The only exception to this is the grooves in

the thin rails, which should be 1/4" wide and 1/4" deep. Also, the interior stiles are merely applied to the doors after construction; they are not structural. After dry-assembling your doors, glue up and clamp them up.

When dry, glue the interior stiles in place and cut a 1/4"-wide by 1/2"-deep groove on the top and bottom of each door that will allow the door to slide on the runners. Then cut the four runners; make sure they slide smoothly in the doors' grooves. Attach the runners to the top and bottom of the lower cabinet using brads and glue.

I spaced my runners so that the front door is flush to the front edge of the cabinet stiles. Then I left a 1/16" gap between the two doors. Fit the doors to the opening in the chest. Now screw the top to the carcass through cleats that are screwed to the sides and partition of the case.

## **Upper Cabinet Drawers**

Here's how I built my drawers. Cut 1/2" x 3/8" rabbets on the ends of the drawer fronts. Then cut 1/2" x 1/4" rabbets on the back edge of the sides to hold the back piece. Then cut a 1/4" x 1/4" groove to hold the drawer bottom on the sides, back and front that's 1/4" up from the bottom edge. Glue and nail the sides to the drawer front. Slip the bottom in place. Glue and nail the back to the sides.

How you hang the drawers is up to you. I cut 1/4"-deep x 5/8"-wide stopped dados that were centered on each side of the drawer. Then I nailed drawer runners to the carcass's partitions and drawer runners with plywood build-up strips to the sides. When the drawers move smoothly, nail the top to the case. Putty any nail holes. Apply three coats of a clear finish

You might have noticed from the photo that I made the grain direction of the drawers run vertically instead of horizontally. This is OK for such small drawers, and I did this because each bank of drawers now reminds me of one of those Japanese landscape paintings

# STORAGE CABINET



## SHAKER STORAGE CABINET

NO.	LET.	ITEM	DIMENSIONS (INCHES)			MATERIAL
			T	W	L	
<b>Face Frame</b>						
□ 2	A	Sides	$\frac{3}{4}$ "	2 $\frac{1}{2}$ "	51 $\frac{1}{4}$ "	Poplar
□ 1	B	Top rail*	$\frac{3}{4}$ "	2"	45"	Poplar
□ 1	C	Bottom rail*	$\frac{3}{4}$ "	5 $\frac{1}{2}$ "	45"	Poplar
<b>Doors</b>						
□ 4	D	Sides	$\frac{3}{4}$ "	2 $\frac{1}{2}$ "	43 $\frac{3}{4}$ "	Poplar
□ 6	E	Rails*	$\frac{3}{4}$ "	2 $\frac{1}{2}$ "	18 $\frac{1}{2}$ "	Poplar
□ 4	F	Panel	$\frac{5}{8}$ "	17"	18 $\frac{3}{8}$ "	Poplar
<b>Carcass</b>						
□ 1	G	Top	$\frac{3}{4}$ "	19"	50"	Maple
□ 2	H	Sides	$\frac{3}{4}$ "	17 $\frac{1}{4}$ "	51 $\frac{1}{4}$ "	Poplar
□ 1	I	Bottom	$\frac{3}{4}$ "	16 $\frac{3}{4}$ "	47"	Poplar
□ 2	J	Dividers	$\frac{3}{4}$ "	16 $\frac{3}{4}$ "	45 $\frac{1}{2}$ "	Poplar
□ 1	K	Nailing strip	$\frac{3}{4}$ "	1 $\frac{1}{2}$ "	46 $\frac{1}{2}$ "	Poplar
□ 1	L	Blocking 1	$\frac{3}{4}$ "	2 $\frac{1}{4}$ "	45 $\frac{1}{2}$ "	Poplar
□ 1	M	Blocking 2	$\frac{1}{2}$ "	1 $\frac{1}{4}$ "	45 $\frac{1}{2}$ "	Poplar
□ 5	N	Adj. shelves	$\frac{3}{4}$ "	16 $\frac{3}{4}$ "	22 $\frac{3}{8}$ "	Poplar
□ 10	O	Masonite shelves	$\frac{1}{4}$ "	16 $\frac{3}{4}$ "	20 $\frac{1}{4}$ "	Masonite
□ 1	P	Back	$\frac{1}{2}$ "	47"	51 $\frac{1}{4}$ "	Ply

\* - 1" tenon on both ends

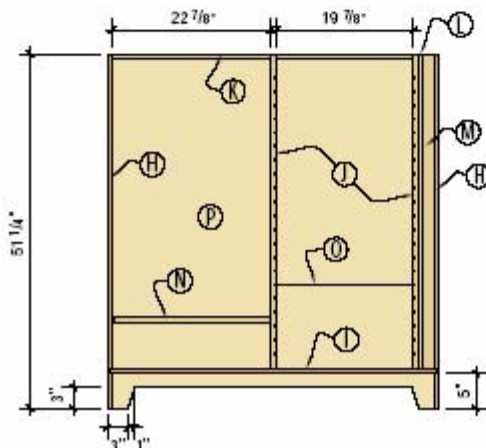
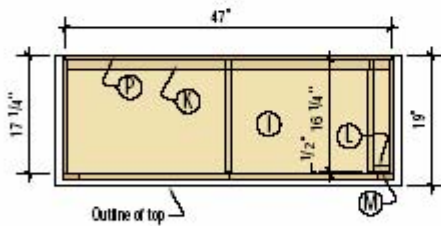
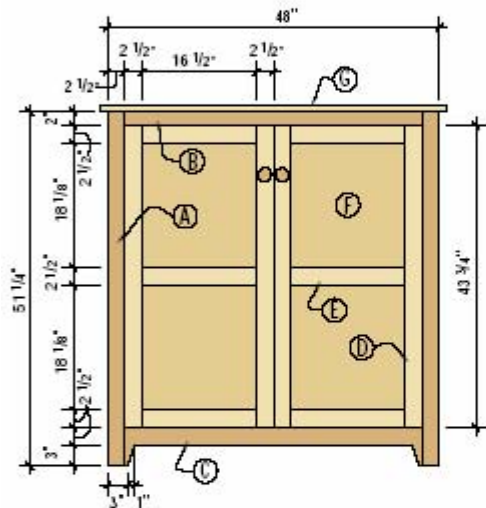
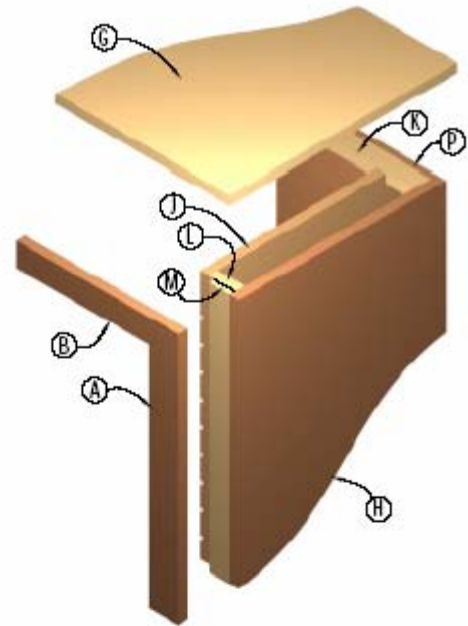
## SUPPLIES

Woodworker's Supply  
800-645-9292

Amerock non-mortising hinges,  
#891-740, \$2.95 each

Horton Brasses  
800-754-9127

Maple knobs, #MK-3, 1 $\frac{1}{2}$ " diam-  
eter, call for pricing



## How to Pack Lots of Stuff Into Small Spaces

Organizing clutter is an interesting problem that you also might face as you design storage in your home or case pieces. Here's what I did: Behind the left door I put a series of five  $\frac{3}{4}$ "-thick adjustable solid-wood shelves. These would handle the heavier games and books. Behind the right door is a series of  $\frac{1}{4}$ "-thick tempered Masonite shelves. These 10 shelves slide in and out of  $\frac{1}{4}$ " x  $\frac{1}{4}$ " dados.

The Masonite won't hold a lot of weight, but it's just right for storing lightweight objects. Think home office, and you'll know what I mean. Masonite (sometimes called "hardboard") shelves are perfect for storing letterhead, envelopes, CDs and any other paper goods in an office. The other challenge in this piece was getting the shelves, doors and face frame positioned so they didn't interfere with one another. As you'll see in the drawings, it took a few pieces of "blocking" to get everything to work in this cabinet.

## Face Frame First

This seems backwards, I know, but begin construction by building the face frame. The size of the case and doors are determined by your face frame, so it's clearly the place to begin.

When ripping out the material for the face frame stiles, cut them each about  $\frac{1}{16}$ " wider than the dimension called for in the cutting list. This will make your face frame hang over the edge of the case sides. Once the face frame is attached, you can trim it flush for a perfect fit.

I use mortise-and-tenon joinery to build both the face frames and doors. The tenons are  $\frac{3}{8}$ " thick and 1" long, and I usually cut a  $\frac{3}{8}$ " to  $\frac{1}{2}$ " shoulder on the edges. Be sure to cut your mortises  $1\text{-}\frac{1}{16}$ " deep so your tenons don't bottom out. When everything fits, put glue in the mortises, clamp the frame and allow the glue to cure.

## Doors are Second

Next, build the doors. It's much easier to fit the doors into your face frame before it's attached to the case. Build the doors much like you did your face frame by using mortise-and-tenon joints. The only difference is that you need to cut a  $\frac{3}{8}$ " x  $\frac{3}{8}$ " groove in the rails and stiles to hold the door panels.

I cut my grooves along the entire length of the stiles; as a result, I cut my tenons with a "haunch" to fill in that extra space on the ends of the stiles. The panels are flat on the front, and beveled on the backside so they fit in the grooves in the rails and stiles. I cut that bevel by setting my table saw blade to  $7^\circ$  and slicing off a little of the backside of each door until the panels fit snug and without rattling.

Sand the panels up to your final grit (120 will be fine for a painted piece) and assemble the doors. Sand the assembled doors and face frame and then peg the tenons if you like. I used square pegs that I pounded into round holes.

## Finally, the Case

The case goes together quickly thanks to my nail gun. Begin construction by cutting a  $\frac{3}{4}$ "-wide by  $\frac{1}{4}$ "-deep dado in the side pieces for the bottom of the cabinet. I like to use a dado stack in my table saw for this operation. Now cut a  $\frac{1}{2}$ " x  $\frac{1}{2}$ " rabbet on the back edges of the sides to hold the plywood back in place. Sand the inside of the case and get ready for the first bit of assembly.

Put the case together on its back. First put glue in the dados in the sides and fit the bottom in there. Nail the bottom in place from the outside of the case. I use a finish nailer for this task.

Now put the nailing strip in place at the top of the case. The diagrams show you where this needs to be, but essentially it's flush with both the rabbets in the sides and top of the case. Nail it home. Glue and nail the face frame to the case using brads. Trim the face frame flush



Behind the left door are five  $\frac{3}{4}$ "-thick adjustable solid-wood shelves, perfect for heavier games and books. Behind the right door are 10  $\frac{1}{4}$ "-tempered Masonite shelves, perfect for storing letterhead, envelopes, CDs and other home-office related items.



I'm not perfect, and neither are you. If your face frame is exactly the width of your case, it's going to be difficult to fasten it square. Make life easier by ripping your stiles  $\frac{1}{16}$ " oversize in width. After you nail and glue the face frame to the case, use a flush-trimming bit in your router to trim the face frame flush with the side of the cabinet's case.



to the case.

## All the Insides

There's nothing complicated about the insides once you have a plan. Begin by cutting the  $\frac{1}{4}$ " x  $\frac{1}{4}$ " dados in the dividers. These are spaced 2" apart, and there are 21 of them. I used a dado stack in my table saw and simply moved the fence  $1\frac{3}{4}$ " after each pass.

Now it's time to add the dividers to the case. Turn the case on its head. Cut a notch in each divider so it will fit around the nailing strip. Get the divider right where it needs to be and nail it in place through the bottom and the nailing strip. Now nail the two blocking pieces shown on the diagram in place. The blocking does a couple things. First, it allows the Masonite shelves to be slid in and out without having to swing the doors wide open. Second, the thinner piece of blocking fills in the gap between the divider and face frame and leaves room for the hinges.

Now drill the holes in the left side of the case and the center divider for the adjustable solid-wood shelves. I'm partial to 5 mm holes spaced  $1\frac{3}{8}$ " on center.

Mark the base cutouts on the sides, front and plywood back of the case using the diagrams as a guide. Use a jigsaw to make these cuts and clean up your work with sandpaper.

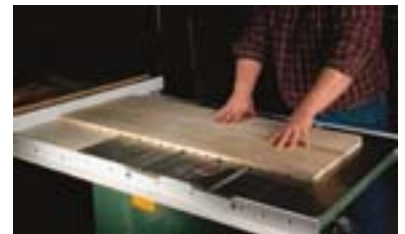
Cut your top to size. I used a piece of bird's-eye maple. You have a couple options for attaching the top. You could use pocket holes, figure-8 fasteners or wooden cleats. No matter which way you go, prepare the case for the top but don't attach it. I like to glue the top to the front edge of the case after finishing.

## Finishing

On the knobs, top and all the inside pieces (except the Masonite), I wiped on a light honey-colored stain. Then I painted the case a dark red and added a topcoat of lacquer to protect the paint. Hang the doors, nail in the back and add the knobs.



You can see the haunch on the tenons on the rail closest to the camera. When it comes to fitting your panels, remember to work tight in summer and loose in winter. Panels of this size will shrink and contract noticeably.



You could use a router and a straight bit to make this cut as long as you had a reliable way of guiding the router (such as an edge guide). I find a table saw is much faster for this operation.

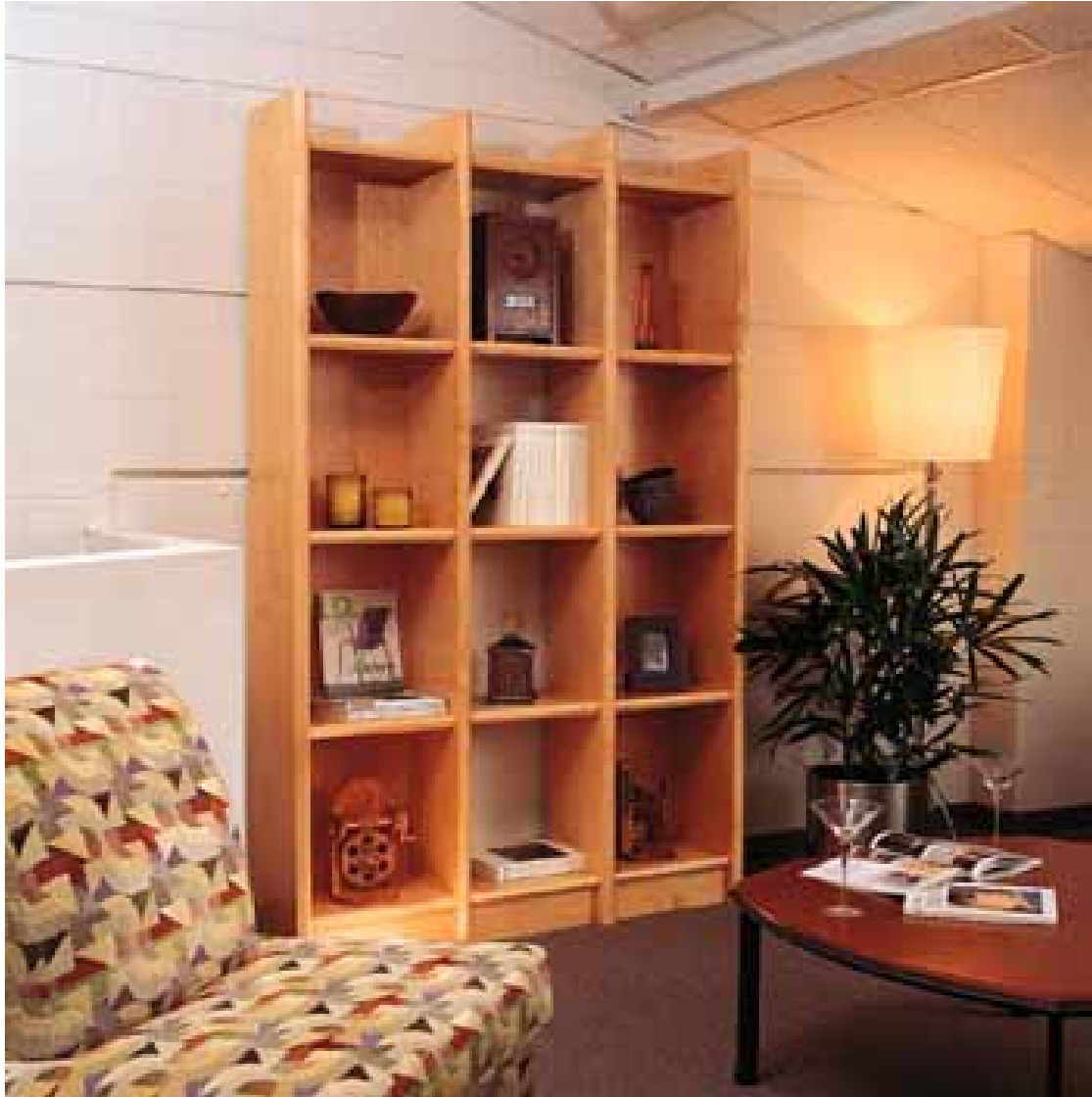


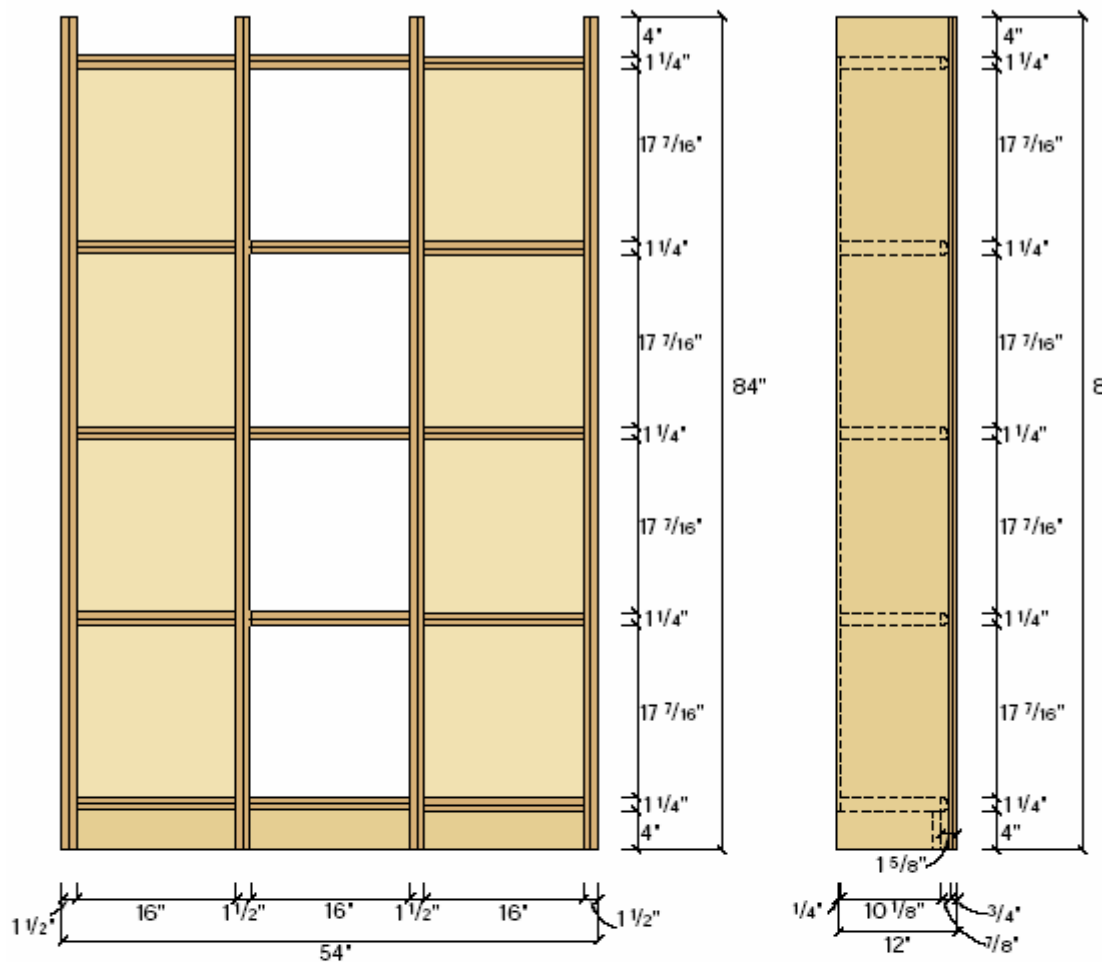
Once you nail the dividers in place through the bottom piece, turn the case over on its feet and nail through the nailing strip into the dividers.



In addition to cutting this detail on the sides and front, I also cut it on the bottom of the plywood back, which gives it a finished look when the cabinet is viewed from down low or from a distance.

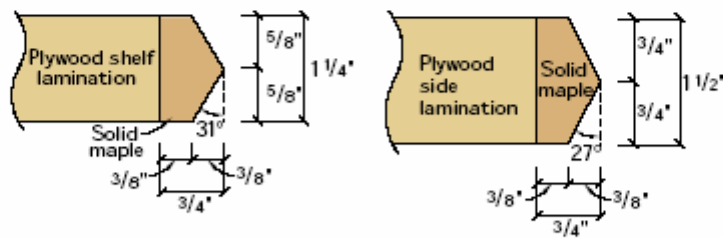
# SHELVES





Elevation

Profile



Detail of bevel profiles

Schedule of Materials: Contemporary Shelves

No.	Item	Dimensions T W L	Material
4	Sides	3/4" x 11 1/4" x 84"	Plywood
4	Sides	3/4" x 11" x 84"	Plywood
10	Outr. shelf tops	3/4" x 10 1/8" x 16"	Plywood
10	Outr. shelf bottoms	1/2" x 10 1/8" x 16"	Plywood
5	Cntr. shelf tops	3/4" x 10 3/8" x 16"	Plywood
5	Cntr. shelf bottoms	1/2" x 10 3/8" x 16"	Plywood
2	Backs	1/4" x 17 1/2" x 76"	Plywood
3	Aprons	3/4" x 4" x 16"	Plywood
4	Side edging	3/4" x 1 1/2" x 84"	Maple
15	Shelf edging	3/4" x 1 1/4" x 16"	Maple

Supplies: Woodworkers' Supply (800-645-9292), 12 6" taper connectors, # 928273 \$4.95/pkg. of four. 18 wire shelf supports, # 826028, \$1.45 apiece for 10+.

It's rare that bookshelves look as interesting as the objects you display on them. After all, how much can you decorate the edges of your shelves and sides? This unit is unusual because the shelves and sides are beefier than you would normally see, and the two bevel cuts on the front edges give these shelves nice visual interest. Best of all, perhaps, is that this piece is simple and quick to build.

## Dividers and Shelves

Start by cutting out the sides and shelves. The 1-1/2"-thick sides are made by gluing two pieces of 3/4"-thick plywood together. The 1-1/4"-thick shelves are made by gluing 3/4"-thick plywood to a 1/2"-thick piece. Note that the finished sides have a 3/4" x 1/4" rabbet for the back that's formed by gluing a narrower piece to a wider one. The adjustable and fixed shelves in the side openings are all the same width. The center shelves are 1/4" wider to account for the lack of a back.

To cut the sides, crosscut a whole sheet of plywood to the length of the sides first, then rip them to width (11" and 11-1/4"). Cut the sides a little wide (1/16"), initially, to give yourself a little room to saw off a square straight edge. This will give you a clean edge for attaching a piece of maple later. Now nail and glue the dividers together, remembering to offset the back edge for the rabbet. Place your nails so the shelves will hide them.

Here's an easy way to cut the shelves. Rip them to width from a full piece of plywood, then nail and glue up a length of shelving. Then crosscut the shelves to length from the long pieces. You can get five 16" shelves out of a 96" rip. For even less work, cut the shelves to length after attaching the edging.

## Edges and Angles

The edges for the bookshelves are solid maple. Because the thickness of 3/4" and 1/2" plywood is considered "nominal," you will end up with finished thicknesses about 1/16" less. Rip your edging stock a little wide and attach it with biscuits and glue. With a flush-cut bearing bit in a router, trim the edging flush to the sides and shelves, then clean up your work with a plane or scraper.

The last step is to bevel the edging. The photo shows how I did this on the table saw. Remember that the setup must change for the different width pieces.

## Making it a Stand-Up Unit

The next step is to mill stopped grooves in the topmost and bottommost shelves to accept the tapered sliding connectors that attach the sides together. The grooves in the ends of the shelves are 3/4" wide by approximately 3/8" deep, and milled with a dado set on the table saw. It helps to make a practice joint because the depth of the groove is critical to a snug fit using this style of connector.

## Installing the Shelves

After cutting the slots in the shelves, lay out and mount the small part of the tapered connector to the side. The large connector will mount to the shelf groove with the wide end towards the shelf front. Do a test fit on the shelves. The shelves in the side units should be flush to the rabbet in the back edge of the sides. The center shelves should be flush with the back.

The next step is to cut the stopped grooves in the rest of the shelves for the hidden wire shelf supports. If your blade is too narrow, take two cuts to get the 1/8" groove necessary to slide the shelf onto the wire supports. Some drill and chisel work will be necessary to lengthen the kerf to accept the entire 9-3/4" length of the shelf wire. This requires drilling and chiselling into the end of the front edge. Lay out and drill the locations for the wire supports in the side and center sections so the shelf heights will match across the bookcase.

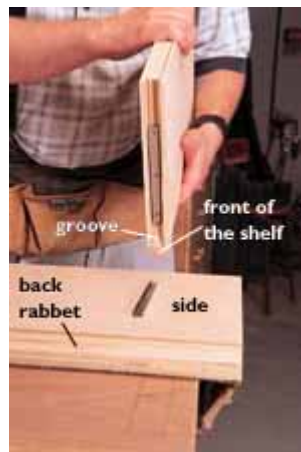
Now it's time for all the parts come together. Begin by assembling the two outside units



**Face-Glue the Parts:** Once you've got your parts cut to size, glue and nail them together leaving the rabbet at the back. Set and putty the nails, then rip the dividers to their final width.



**Profile:** The bevels on the edges are basically a "V" shape on the entire edge. See the diagram at right for the details and cutting angles. Clean up your saw marks with a plane.



**Mount Knockdown Hardware:** Use a dado stack to cut a 3/4" x 3/8" groove from the joint where the edge attaches to the shelf to the back of the shelf. The knockdown hardware is mounted in about the middle of the shelf. It pulls together pretty tightly, so you might want to sand any bumps or ridges off the ends of the shelves to keep from scratching the sides.



of the bookcase. Tip them onto their backs and attach the aprons to the bottom shelf using cleats and screws. Next attach the side units together forming the center section. The best way to do this is to assemble with the front facing up. Use a handscrew clamp to hold up the sides while you're assembling. The apron on the center bottom can be screwed onto the shelf and braced with corner blocks prior to assembly. Push the lower shelf into place and mark the location of the apron, also called a "kick" or a base. Then remove the shelf and add two stop blocks to the sides to support the center apron from behind.

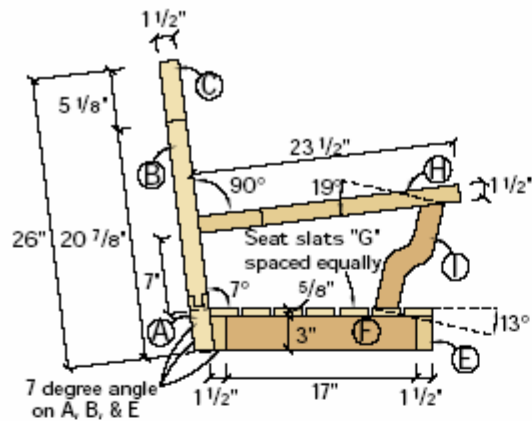
When you're happy with the fit of the parts, disassemble the bookcase and finish. I applied a coat of light stain to give the maple an aged appearance. (I used about two ounces of linseed oil and colored it with Olympic stains, one-half Early American #41552, and one-half Red Oak #41567. 1/4 teaspoon of each.) Wipe on an even coat of oil. Wipe off the excess and let it dry for 24 hours. The next day, lightly sand the surfaces and clean them with a tack rag. Finish with two or three coats of a clear finish.



**Magic Wire:** After cutting the 1/8" grooves in the shelf sides, assemble the case. Tap the wire shelf supports in and slide the loose shelves in place.

# GARDEN SWING

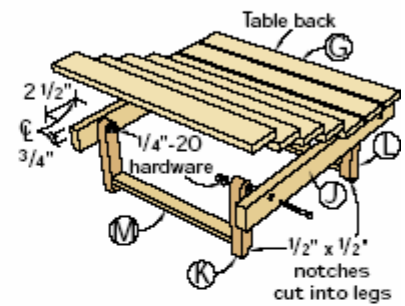
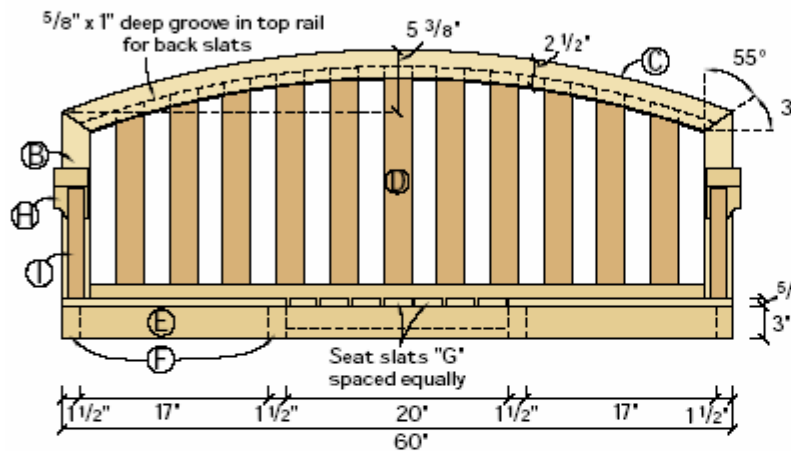




#### Schedule of Materials: Garden Swing

No.	Ltr.	Item	Dimensions T W L	Material
1	A	Bottom back rail	1 1/2" x 5" x 55"	Cedar
2	B	Back stiles	1 1/2" x 2 1/2" x 20 7/8"	Cedar
1	C	Top back rail	1 1/2" x 8" x 60"	Cedar
11	D	Back slats	5/8" x 2 1/2" x 20 1/2"	Cedar
2	E	Seat rails	1 1/2" x 3" x 60"	Cedar
4	F	Seat stringers	1 1/2" x 3" x 17"	Cedar
21	G	Seat slats	5/8" x 2 1/2" x 20"	Cedar
2	H	Arms	1 1/4" x 3" x 23 1/2"	Cedar
2	I	Arm supports	1 1/2" x 4" x 12"	Cedar
2	J	Table battens	3/4" x 1 1/2" x 19 7/8"	Cedar
2	K	Table legs	1" x 1 1/4" x 6 1/2"	Cedar
2	L	Table legs	1" x 1 1/4" x 8 1/4"	Cedar
2	M	Table leg braces	5/8" x 1 1/4" x 13"	Cedar
2	N	Table support seats	1" x 2" x 20"	Cedar

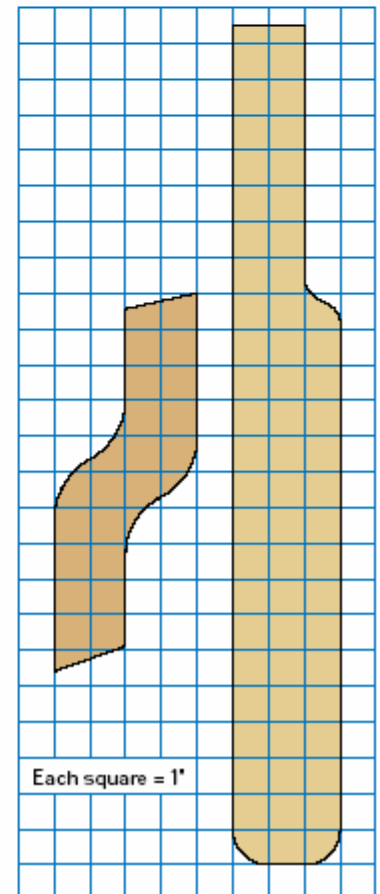
\*Longest slat, cut to fit. \*\*Length oversize to allow fitting.



#### Schedule of Materials: Swing A-Frame

No.	Item	Dim. T W L	Material
4	Frame legs	4 x 4 x 96"	PTP
1	Top center rail	4 x 4 x 96"	PTP
2	Top outer rails	2 x 4 x 96"	PTP
2	Leg supports	2 x 6 x 48"	PTP
4	Swing-N-Slide EZ Frame Braces		
4	Swing-N-Slide Leg top braces		
2	3/8" x 6" eye bolts		
4	3/8" flat washers		
4	3/8" nuts		
8	S-connectors		
4	6-foot lengths of chain		

PTP = pressure treated pine



Start the project by heading to the lumber yard. The six-foot swing as shown required one 2x8, one 2x6, five 2x4s, and 10 1x4s all in eight-foot lengths. I chose western red cedar because it's a durable, lightweight, outdoor wood and is less expensive than redwood. At Midwest prices, the lumber cost about \$120.

## Seat Frame

Once back in the shop, start construction by cutting the seat rails and stringers from the 2x4s. As you probably know, dimensional lumber comes with rounded edges. You'll need to get rid of them. Cut the pieces for the rails and stringers to their 3" thickness by first running one edge over the jointer until they have a square edge, then rip them to 3" wide. To give the seat a comfortable back angle, set your saw blade to an 7-degree bevel and run the back rail on edge to give a 7-degree angle to the back.

Now cut the pieces to length and screw the stringers between the rails, spacing them as shown. The center section spacing is critical because the pop-up table needs to be square so it can be lifted out and turned in place and the legs lowered. Use 2" galvanized deck screws when screwing the seat frame together.

Mill all the slats at the same time because they are essentially the same size. Cut the 1x4s into 24" lengths, and plane the boards to 5/8" thickness. Then rip them to their 2½" width and crosscut the seat slats to 20". To give the swing a finished look, cut an 1/8" roundover on all four top edges of each seat slat using a bit mounted in a router table.

Attach the slats for the permanent seats, running the slats from side to side. They should flush up in length to the outside edges of the stringers, and the front slat should be flush to the front rail. Use about 3/8" spacing between the slats. I decided to attach the slats to the frame using finish nails and an air nailer. This left a much smaller hole than screws, and it was very quick.

To finish the seat I decided to build the top surface of the table at this point. The spacing works the same as on the side seats, but run the slats from front to back. The slats are attached to two table battens (¾" x 1-½" x 19-7/8") that are held 1/16" or so away from the inside face of the front and rear rails. This gap should allow the table to lift out without binding, but some slight fitting may be necessary. Don't worry about the legs yet, we'll do that later.

## Build the Back

Next, turn to the back of the swing. Mill the bottom back rail and two stiles to size as described earlier to leave crisp edges. Run the bottom edge of the bottom back rail and both stiles through the saw at an 83-degree angle to match the bevel on the seat. Then take the 2x8 top rail and lay out the top arch of the swing by marking the center of the rail, then mark 2-½" down from the top at the center. Tap a small brad nail into the board at this spot, then put two more brad nails into the board at the bottom corner of the board at either end. Then take an eight-foot strip of ¼"-thick wood and bend it across the top nail, attaching the strip to the two lower nails with spring clamps. The arch formed by the strip can then be marked with a pencil, and then a second line (2-½" above the first line), marked. Jigsaw the piece to the outside of these lines, then sand the piece smooth.

To determine the length of the top rail, lay the bottom rail and side stiles flat with the bottom rail between the stiles. Clamp these pieces in place, then lay the top rail across the tops of the stiles, flush to the top outside corner of each stile. With the top rail in place, mark the point where the inside curve of the rail intersects the inside edge of the stiles. Connect the two points and this is the angle to cut on the top edges of the stiles and on the ends of the top rail, to form mitered joints. The back frame will be held together with a double helping of biscuits, but first you need to cut the groove in the top and bottom rails to hold the slats.



With the seat frame assembled, nailing the slats in place was a cinch with a pneumatic finish nailer and stainless steel nails. Note the 7-degree bevel on the rear of the back seat rail.



Holding the arched top rail steady was the most difficult part of routing the top groove for the slats. Remember to make the cut in two passes on each side. In this photo you can see that the rail hasn't been cut for length yet, allowing extra support for the router at the beginning and end of the cut.



With the miters cut on the top rail and back stiles, space the slats and use the top rail to mark the angle and length of each slat, (adding 1").

Running the groove in the bottom rail is fairly simple. Set up a router with a straight bit (or an up-spiral bit) of either 3/8" or 1/2" diameter. Next set up a fence on the router 7/16" from the bit, and set the bit for a 1/2" depth. (The final depth is 1", but take it in two passes.) By running the router on both long edges of the rail, the groove will be centered on the piece. Check the fit of the back slats in the rail (or better, a test piece), then make the groove.

To cut the same groove in the arched top rail, see the photo at left. You will need to adjust the depth of the final cut a bit to compensate for the curve of the arch.

Miter the top rail to length, then check the fit of your slats in the grooves. The spacing between the slats should be about 2-1/4", but double-check your dimensions.

After cutting the double biscuits at the joints, place the slats in the bottom groove and locate the top rail in position on the slats. Mark the height and curve on each slat. Remove the slats, numbering them as you do. Now add 1" in length to the marks on the slats and cut them to their finished length using the band saw. You're now ready to glue up. I used polyurethane glue for all my glued joints. The polyurethane adhesive provides a strong water-resistant bond in even long-grain to short-grain joints. Don't glue the slats in place, however. Place them in the grooves in their approximate positions, then after the frame has dried, use a brad nailer to tack the slats in place with a single brad at top and bottom, from the back. To protect the lower rail from rot from standing water in the groove, cut blocks, (called fillets), the size of the spaces and glue them in place.

You're now ready to glue and bolt the back to the seat. I used four 1/4" threaded bolts with washers to bolt the bottom rail of the back to the back rail of the seat. Hold the bottom edges of each flush, and again use polyurethane glue on this joint.

Next cut the two arms and arm supports from 2x4 material and cut them to shape using the scaled drawings on the next page. You may want to cut the angle on the bottom of the support and on the back end of the arms, then fit them in place and confirm the location and angle of the top end of the supports. Attach the arms to the back with a long deck screw through the back stile. Glue the support to the arm and to the seat with 1/2" dowels between.

The last step is to put the legs on the table, and to notch and fit the support cleats. Start by cutting the leg pieces to the sizes given in the Schedule of Materials. They are two different lengths to allow the table to sit parallel to the ground, even though the swing itself is angled back. Round over the top end of each leg to allow it to swivel without catching, then drill 1/4" clearance holes, 1/2" down and centered on the legs. Drill clearance holes in the table battens 1/2" up from the bottom edge, and 1" in from the inside corners. Attach the legs using 1/4" x 2 1/2" bolts with two washers on either side of the leg and a nylon-lined nut to hold the legs tight, but not immobile.

Check the spacing between the legs (near the bolts) then cut the leg braces to fit, and screw them in place between the legs.

Now head back to the saw and cut the two table support cleats to fit between the inside stringers. Clamp these in place, center the table in place left to right and mark the location of the legs.

Remove the cleats and cut 7/8" x 1" notches on the leg locations. Then use a handsaw to trim the ends of the legs to form tongues to fit into the mortises you've just created in the cleats. Glue the cleats in place, and once dry, the table will drop into place in the cleats, holding the table steady.

After adding 3/8" x 4" eye bolts to the front and rear of the swing seat, the swing is ready to hang. If you've got a porch, find a sturdy joist and get the lemonade. If you happen to be missing a porch, construct a simple A-frame structure to let you swing in style anywhere in your yard.



The back of the arm is simply screwed in place through the back stile, while the support is attached to the arm and seat with dowels and polyurethane glue. Notice the foamy squeeze-out of the glue at the joints.



With the notches cut in the support cleats, the two pieces can be glued in place in the seat frame.



Last, but not least, bolt the table legs in place to the table battens. Note the notches on the ends of the legs which drop into the previously cut notches to stabilize the table.



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# GLOBE STAND





You might prefer a tapered-leg taboret with wedged tenons...



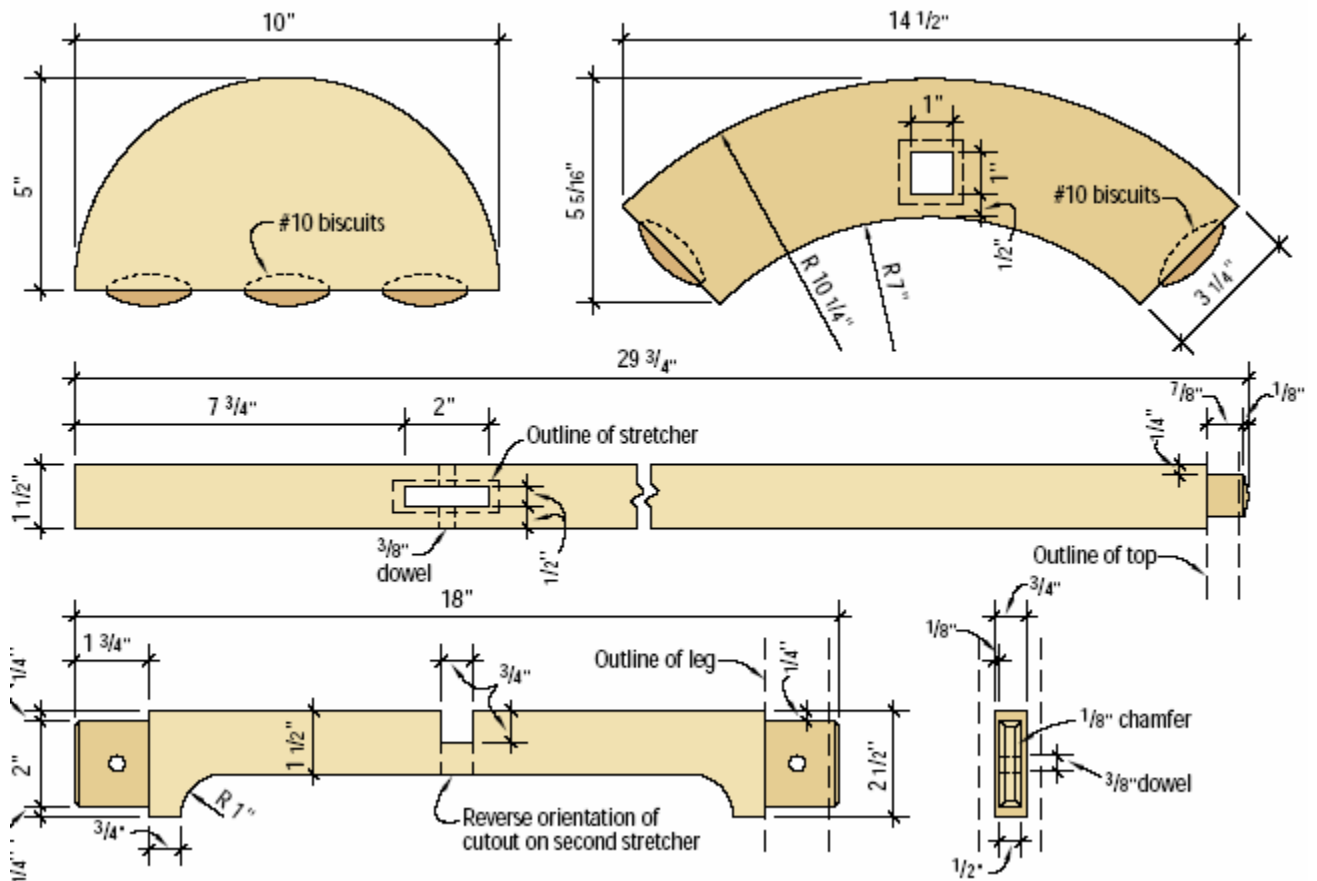
...or a globe stand in the style of Frank Lloyd Wright...

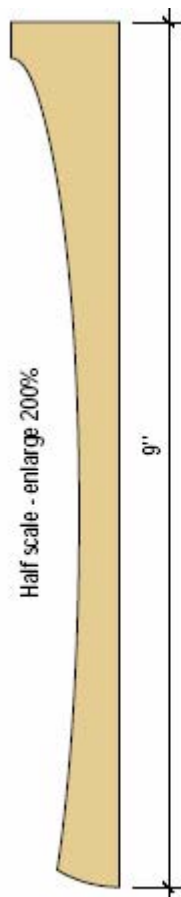


...or even in the style of a Gustav Stickley end table.

## ARTS & CRAFTS GLOBE STAND

NO.	ITEM	DIMENSIONS (INCHES)			MATERIAL
		T	W	L	
4	Top pieces	$\frac{3}{4}$	$5\frac{5}{16}$	$14\frac{1}{2}$	Cherry
2	Table pieces	$\frac{3}{4}$	5	10	Cherry
4	Legs	$1\frac{1}{2}$	$1\frac{1}{2}$	$29\frac{3}{4}$	Cherry
2	Stretchers	$\frac{3}{4}$	$2\frac{1}{2}$	18	Cherry
4	Corbels	$\frac{3}{4}$	$\frac{7}{8}$	9	Cherry





## Around the World in Four Easy Pieces

Start by laying out the four top quadrants. With the exception of the legs, all the parts for this project are sized to be cut from 1 x 6 stock. Before turning to your band saw to test your eye/hand coordination on the outside curves, cut the 1" x 1" mortises. They're easier to form when there are still flat sides to press against a fence.

While splined joints might have been another "trick" that I could have thrown into the mix, I opted for the ease and familiarity of biscuits when assembling the ring. After gluing up the ring, cut the arcs slightly wide of the line on the band saw. I used a shop-made circle-cutting jig on my router table to refine the outside edge. Then I used a router edge guide to trim the inside edge to a perfect circle.

I also used biscuits to join the two halves of the lower table. I added another level of detail with a 1/4" x 1/4" chamfer on the top edge of both the ring and table. Finally, I plowed two 1/4"-deep x 3/4"-wide grooves that crossed in the middle of the bottom of the table to position it squarely on the stretchers.

The legs are formed from 2 x 2 stock. Although the 1/2" x 2" through-mortises were made on the legs with a straightforward series of cuts with a 1/2" mortising chisel, the through-tenons required some attention to detail. After cutting the tenons on the ends of the legs to fit the mortises, I determined that a 14° bevel would give me an 1/8"-high pyramidal top. The tenon is sized to allow for an 1/8" vertical rise above the top before transitioning into the slopes. I like the look, and it's more forgiving than trying to align four pyramid bases exactly with the tabletop.

The stretchers are joined with a simple half lap. The ends of the through-tenons are chamfered at a 45° angle. I then pegged each tenon using 3/8" cherry dowels through



Use the plans from the diagrams to lay out your mortises on your top pieces. Draw the mortise locations on paper, photocopy the plans and use rubber cement or a spray adhesive to attach them to your wood. Then it's simple matter of cutting where the lines tell you to.



After you've cut your top to size, you need to clean up the band-sawn edges using a router table, a straight bit and the shop-made jig shown here. First cut a piece of 1/4"-thick plywood to the same size as your top and attach it to the top using a spray adhesive. Nail the center of the 1/4" plywood to a sub-base of 3/4" plywood. My router table is part of my table saw setup, so I attached a miter bar to the 3/4" plywood, which allowed me to slide the jig into position. If you don't have a miter slot, you

23/64" holes after slightly tapering the ends of the dowels. With the holding power of contemporary glues, they're only for show anyway.

Speaking of show, the corbels that "support" the top are structurally unnecessary to this project. Visually, however, they're the icing on the cake. Glue them in place and clamp them up.

To mount the globe on the stand, you need to cut two 1/4"-long x 1/4"-deep notches in the inner edge of the ring. Rather than setting up my router and a jig for the operation, I chucked a 1/4" Forstner bit into my drill press, made a 1/4"-deep hole that was tangent to the inner edge, and squared up the bore with a sharp utility knife. See the photo at left for details.

Because cherry darkens quickly enough through oxidation and exposure to ultraviolet rays, I used a clear wipe-on oil finish to emphasize the contrast between the end grain of the through-tenons and pegs and the face grain of the legs and top. If you've got 'em, you might as well flaunt 'em.

might need to first clamp the jig in place and raise the router bit while it's running to get your cut started.



Once you get the outside shaped perfectly, you can use that edge to guide your router. I used a commercial edge guide (the [Micro Fence](#)). Essentially, two rounded guides ride along the outside edge of the top, ensuring the straight bit cuts a perfectly circular path. You also could make this cut using a commercial or shop-made circle-cutting jig for a router.



Though there are many complicated ways to attach corbels to legs, I prefer to simply glue and clamp them in place.

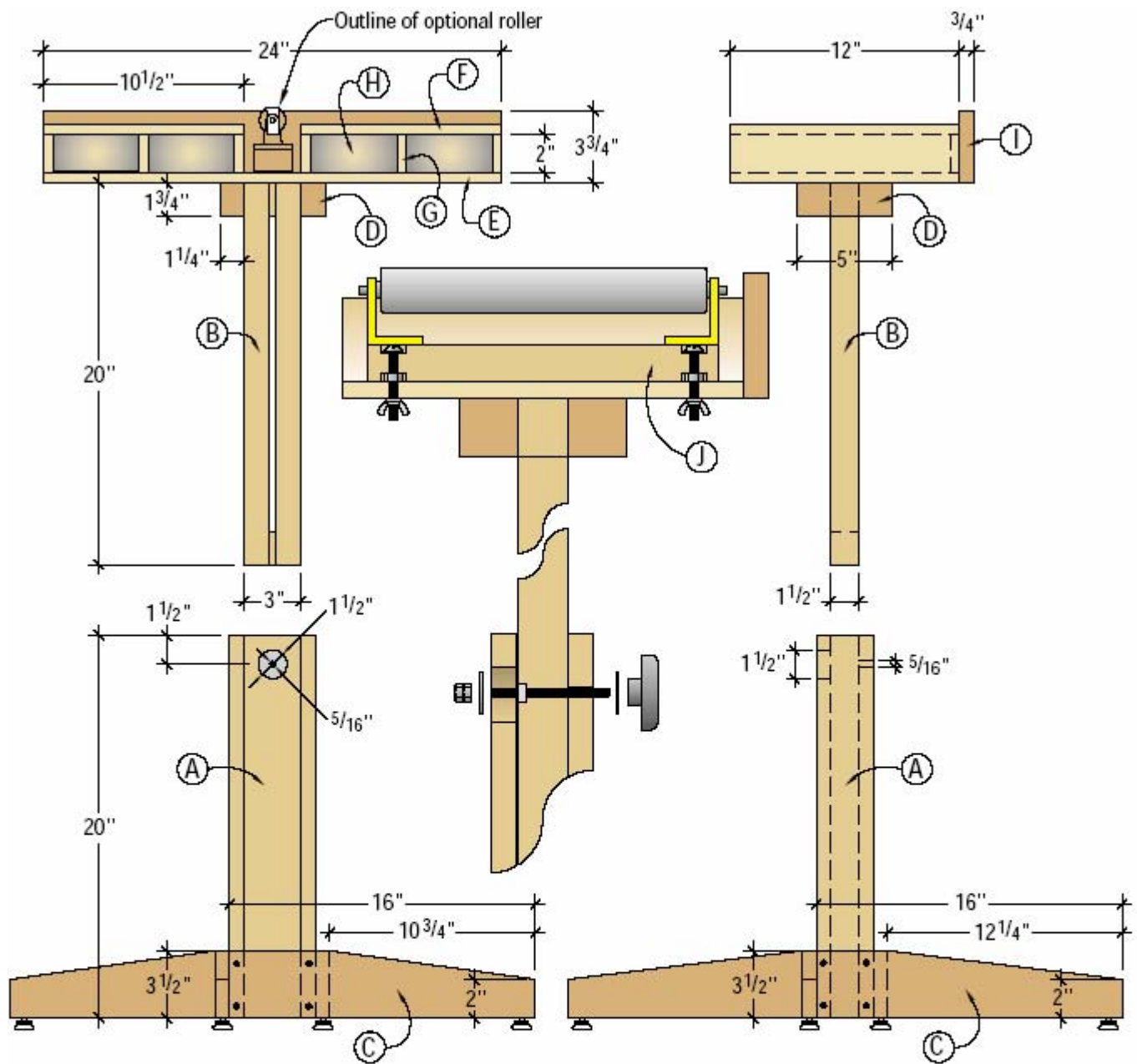


Here's a close look at the notches in the top that hold the pins on the globe.

# LUMBER CUT-OFF STAND







## CUT-OFF STAND

NO.	LET.	ITEM	DIMENSIONS (INCHES)			MATERIAL	
			T	W	L		
□	4	A	Column sides	$\frac{3}{4}$	3	20	Hardwood
□	1	B	Post	$1\frac{1}{2}$	3	20	Hardwood
□	4	C	Feet	$\frac{3}{4}$	$3\frac{1}{2}$	16	Hardwood
□	2	D	Mounting blocks	$1\frac{1}{4}$	$1\frac{3}{4}$	5	Hardwood
□	1	E	Bottom	$\frac{1}{2}$	12	24	Plywood
□	2	F	Tops	$\frac{1}{2}$	12	$10\frac{1}{2}$	Plywood
□	6	G	Dividers	$\frac{1}{2}$	2	12	Plywood
□	4	H	Backs	$\frac{1}{2}$	2	$4\frac{1}{2}$	Plywood
□	1	I	Fence	$\frac{3}{4}$	$3\frac{3}{4}$	24	Hardwood
□	1	J	Roller block	$1\frac{1}{8}$	2	$9\frac{1}{2}$	Hardwood

HARDWARE	
NO.	ITEM
□	1 Star knob, (item# 862214)*, \$1.49
□	1 Threaded rod, $\frac{1}{4}$ "-20 x $3\frac{1}{2}$ "
□	4 $\frac{1}{4}$ "-20 hexagonal nuts
□	1 $\frac{1}{4}$ "-20 square nut
□	2 $\frac{1}{16}$ " x $1\frac{1}{2}$ " fender washers
□	2 $\frac{1}{4}$ "-20 x $1\frac{3}{4}$ " machine bolts
□	2 $\frac{1}{4}$ "-20 wing nuts
□	2 $\frac{1}{4}$ " lock washers
□	1 10" roller (item #921635)*, \$7.69
□	1 Bracket set (item #95-505)*, \$3.29

The stand is remarkably simple to build. Make the lower support using  $\frac{3}{4}$ "-thick hardwood of your choice that's glued and screwed together using butt joints. The slotted post supporting the top section is formed by cutting, then regluing the pieces – no complicated router work. The top is  $\frac{1}{2}$ "-thick Baltic birch plywood pieces nailed together to form a torsion box for extra strength.

## From the Bottom Up

To make the stand easily adjustable in height, I chose a post-in-sleeve design. Start with the post. The finished size of the post is given in the materials list, but start with a length of wood that is  $\frac{1}{4}$ " wider, thicker and longer than the finished size. This leaves room for saw cuts to form the slotted post and fitting room for overall size.

Next, take a look at the square  $\frac{1}{4}$ "-20 nut you have for the locking hardware. Measure the width across the nut and add a fraction of an inch to that dimension. This will be the gap that you want to leave in the center of the post. The square nut will need to move freely up and down the gap, but not turn in the space.

Form the post by ripping the board into three lengths, with the two outer pieces being equal in width, and the center piece being the same width as the nut. Then crosscut the narrow piece into two  $1-\frac{3}{4}$ "-long pieces. Glue those between the long outer sections and your post is almost complete.

Once the glue has dried, remove it from the clamps and run it through your planer to fine tune the thickness. Trim the post to length and move on to the sleeve.

The sleeve is formed by cutting the pieces to size, then simply gluing the four pieces together to form a rectangular column. Be careful to align the pieces to avoid cleanup and provide a square (and glue-free) center sleeve.

## Lock-n-slide

The locking mechanism for the post is a length of threaded rod with nuts, a couple of fender washers and a handle slipped through the column. To make the clearance holes in the column, measure down  $1-\frac{1}{2}$ " from the top on the front side and make a mark in the center of the column. Take the column to your drill press and, using a  $\frac{5}{16}$ "-diameter drill bit, drill completely through both sides of the column.

Now switch to a  $1-\frac{1}{2}$ "-diameter Forstner bit and, using the  $\frac{5}{16}$ " hole on the back side as your center, drill a larger hole in the back.

The rest is hardware. Spin the two hex nuts onto the end of the threaded rod and use wrenches or pliers to tighten the nuts against one another to lock them in place. Then slip one fender washer on the long end of the rod and against the pair of hex nuts.

Now thread the square nut on after the washer and tighten it against the washer and hex nuts. Insert the assembly (long end first) into the larger hole in the back of the column, threading it into the center slot in the post (which you've slipped into place).

When the threaded rod pokes out the  $\frac{5}{16}$ " hole on the front side, add another washer and the star handle. You're done. Make sure the square nut is rotated to slip into the slot to make a tight fit.

## Add the Feet

The last part of the base is the feet. These are just four boards screwed to the bottom of the column. I trimmed a long taper on the top of each to make it a little more aesthetically pleasing.

When you drill the clearance holes for the screws, pay attention to where the screws are located, or you'll end up drilling into another screw. Offset them slightly and you'll be fine.

With the feet attached, I added four adjustable leveler feet to make sure the stand would



To form the post, the rough piece is ripped into three pieces, the center piece is cut to form two small blocks, and then the whole thing is glued back together.



As you glue up the column, use the post to check the spacing. The post should slip easily into the sleeved column. You want the post to move easily, but don't make it too loose or you'll make the stand wobbly.



The feet are attached to the column with flat-head screws. Watch the screw alignment or you'll drill into another screw.



Some simple hardware from your local home center store allows you to lock the post solidly, but quickly loosen the post and readjust for any height. The hardware is shown at right, resting on top of the

sit solidly on my uneven garage floor.

## Torsion-box Top

I wanted to make the top of the stand as lightweight and strong as possible, but still stable. To accomplish this I used ½"-thick Baltic birch plywood and built an open-front torsion box.

Before making the box, locate the center position on the bottom plywood piece and mark where the top of the post will meet the box. Then screw two 1-¼" x 1-¾" x 5" solid-wood blocks to the underside of the plywood, centered and on either side of the post's location. Use these two mounting blocks to attach the table to the post after you have completed the table.

To form the box, simply assemble it with a brad nailer, making sure to align all the edges to keep things square. The two tops are held flush to the outside ends, leaving a 3"-wide gap in the center to allow plenty of room for a circular saw or jigsaw blade. The space in "the valley" ends up at a 2-½" depth, which should allow clearance for almost any jigsaw blade and lots of room for the blade of a circular saw.

With the table frame complete, nail ½" x 2" x 4-½" backs into the spaces at the rear of the box, closing up the opening. The hardwood fence is next. Drill four clearance holes and screw the fence to the back of the box, screwing into the backs.

To avoid any concern of binding a saw blade during the first few uses, cut a notch in the fence 1" wide and as deep as the blade depth you're most likely to use.

You're now ready to attach the table to the base. Drill clearance holes in the center of the mounting blocks under the table, then screw the table to the post.

## A Little Something Extra

The roller is really inexpensive, and is quick to put together and attach. Simply drill two ¼" clearance holes in the 1-1/8" x 2" x 9-½" roller block, 1-½" from each end, and centered on the block. Use a ½"-diameter drill bit to countersink the top of the holes to fit the head of a machine bolt and a locking washer. Then flip the block over and use a 1-½" Forstner bit to countersink the bottom of the hole to accept a hex nut.

Before attaching the hardware, place the block in the table valley and use a pencil to mark the hole locations on the table bottom. Then drill oversized ¼" holes at those locations.

With the bolts inserted and tightened down, screw the roller mounting brackets in place on the block. The ends of the bolts will slide easily into the holes in the table, and the roller can then be attached using two wing nuts. When the roller isn't needed, it fits snugly inside any one of the open-end spaces in the table.

No matter where you use this stand, you'll find rough-cutting lumber a more pleasant experience. I'm pretty sure there are a few other uses for this stand as well. Just give me some time.

column before being attached through the holes.



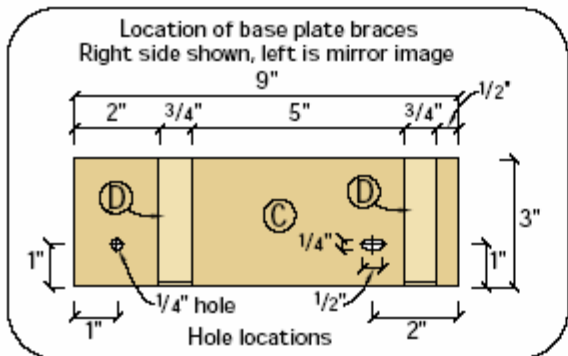
This shot shows the partially assembled table, with three exposed dividers and the other side covered with the top. You can also see the screws through the bottom that hold the mounting blocks in place. While the box itself is nailed together, the fence is attached with screws to allow for replacement if it gets cut up too much in use.

# DRILL PRESS TABLE

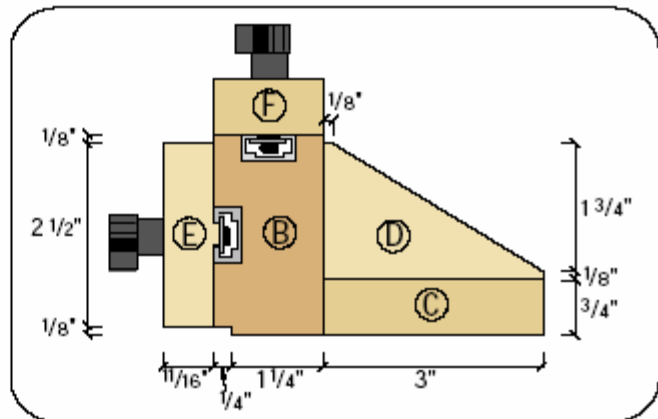


**Schedule of Materials: Drill press table**

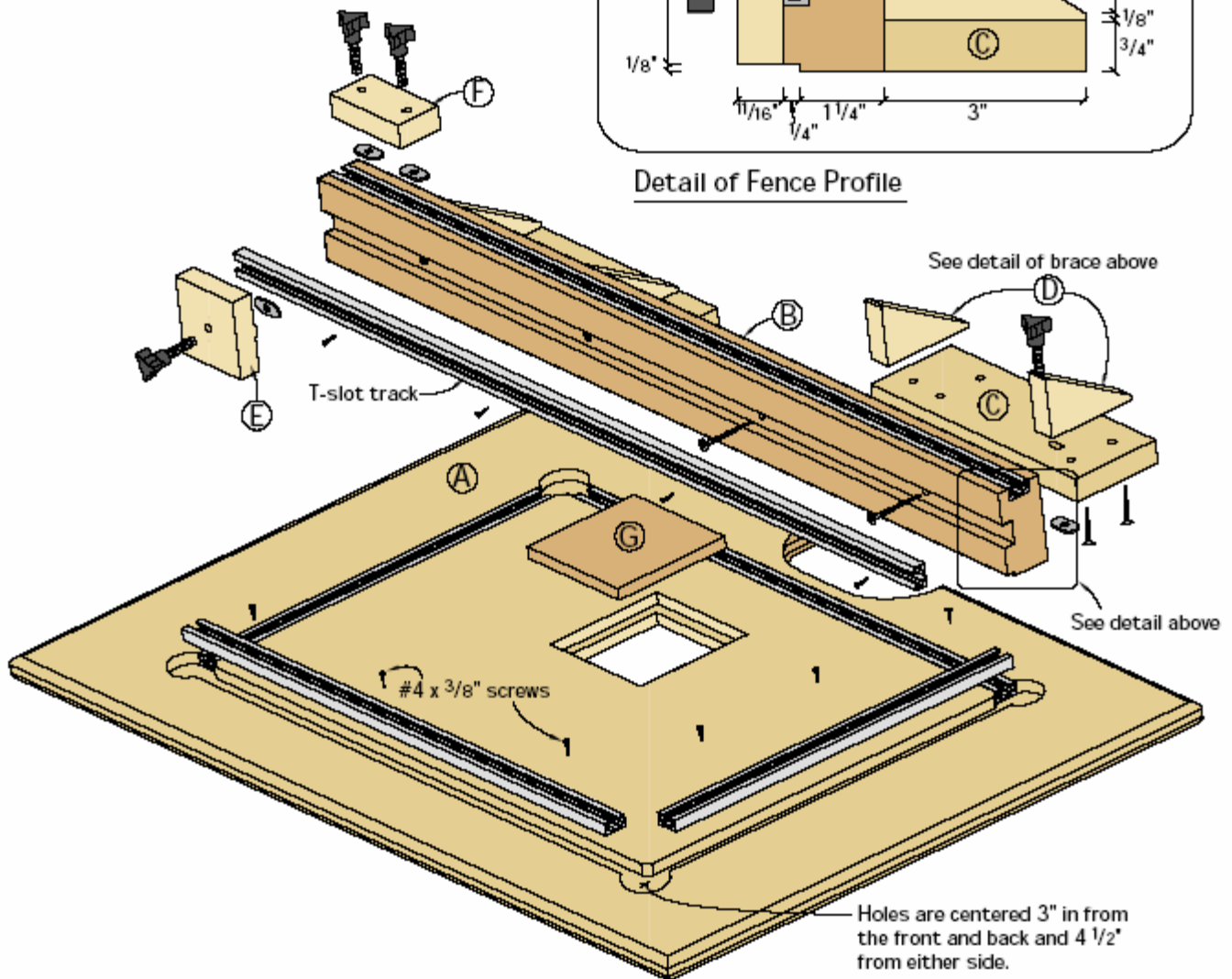
No.	Let.	Item	Dimensions T W L	Material
1	A	Platform	3/4" x 20" x 29"	Plywood
1	B	Fence	1 1/2" x 2 3/4" x 30"	Hardwood
2	C	Fence base plates	3/4" x 3" x 9"	Plywood
4	D	Base plate braces	3/4" x 3" x 1 7/8"	Hardwood
2	E	Stops	3/4" x 2 1/2" x 2 1/2"	Hardwood
2	F	Hold-down plates	3/4" x 1 1/2" x 3"	Hardwood
1	G	Insert plate	3/8" x 4" x 4"	Plywood
2 Part #88F05.02 DeStaCo clamps — \$14.50 ea.				
6 Part #12K7901 24" T-slot track — \$4.95 ea.				
8 Part #00M5102 1 1/8" 3-wing knobs — \$6 for 10				
8 Part #05J2115 T-nuts — \$1.15 for 10				
All hardware available from Lee Valley 800-871-8158				



Plan detail of hole locations for base plate



Detail of Fence Profile





## Start With the Base-ics

The base platform for the table is made from 3/4" plywood, which should be void-free. Again, adjust the size as necessary to fit your drill press. First you need to get the table ready for the T-track, which is what holds the fence and hold-downs in place. Start by locating the four recessed holes that allow the T-slot mechanism to slip into the track without disassembling the mechanism. Each hole is 1-1/2" in diameter and 3/8" deep.

Next, locate the grooves in the center of the holes and use a router with a 3/4"-wide straight bit to cut the grooves to a 3/8" depth. The T-slot track should fit into the grooves with the top surface just below that of the plywood table. The grooves should be as parallel as possible to one another to allow smooth movement of the fence.

## Replaceable Center

Now cut the hole for the 4" x 4" replaceable insert. First locate and mark the position centered on your table, then mark in from that line by 3/8" to locate your cutting line. Drill clearance holes in two corners of the square, then use a jigsaw to cut out the center piece. Next, determine the thickness of the material you will use for your insert (the 3/8"-thick Baltic Birch we used is actually metric and shy of 3/8") and set a 3/8" piloted rabbeting bit in a router to a height to hold the insert flush to the top surface of the table.

While your jigsaw is still out, locate, mark and cut out the notch in the back of the table. This allows the table to move closer to the drill press' post and tilt without interference.

As a final friendly touch on the table, I used a 3/8" roundover bit in my router to soften all the edges on the table, both top and bottom. You'll get fewer splinters if you do this.

## Milling the Fence

The fence is the heart of the table, and the wood should be chosen for durability and straightness. Quartersawn hardwood, carefully surfaced and planed, will do nicely. After cutting the fence to size, use a dado stack to mill two 3/8"-deep by 3/4"-wide grooves in the fence. The first is centered on the top surface of the fence, and as in the grooves in the base platform, a piece of T-slot track should be used to confirm that the groove is deep enough to allow the track to fit just below the surface of the wood. The second groove is then cut centered on the face of the fence. One other bit of table saw work is the 1/8" x 1/4" wide rabbet cut on the inside bottom edge of the fence. This rabbet allows dust and debris to be pushed into the rabbet, so your work will fit against the fence.

One option that I considered was adding an indexing tape measure on the fence. Every time the table is moved the tape would need to be readjusted to zero, and for the infrequent use the tape would see I decided against it. A stick-on tape can easily be added to the fence face if that's more to your personal taste and needs.

## Fence Support Braces

Unlike the fence on a router table, the fence on a drill press table won't see a lot of lateral pressure. So the main purpose of the braces is to hold the fence square to the table at the drilling point. In my case I've also given the braces the job of mounting the fence to the table.

Start by cutting the two base plates and the four braces to size. The braces are triangles with the bottom edge 3" long and the adjoining right angle edge 1-7/8" long. The third side is determined by simply connecting the corners. Locate the braces on the base plates according to the diagrams and pre-drill and countersink 3/16" diameter holes in the base plates to attach the braces to the plates.

To mount the support braces to the fence, again refer to the diagrams to locate the proper spacing on the fence. Then drill and countersink screw holes through the face groove in the fence. Clamp the brace to the fence and screw the brace in place.

With the braces attached to the fence, use the T-slot fastener locations on the diagrams



Another view of the drill-press table. Here I'm cutting pocket holes in a table apron.



**ROUT THE GROOVE** The grooves for the T-slot track allow the fence to be used left-to-right and front-to-back on the table to take advantage of the built-in tilting feature of the existing table.



**RABBET FOR THE INSERT** After cutting the hole with a jigsaw, the opening is rabbeted using a bearing-piloted router bit. Then chisel the corners square and fit the replaceable center tightly into the rabbet. Make a couple extras.



**ROCK SOLID** The fence is made of a sturdy, stable hardwood. Cut a groove the length of the top and face of the fence. The grooves support T-slot tracks, which can be used for stops, hold-downs and other accessories.

as a starting point for drilling the holes in the base plates, but check the location against your table for the best fit. Two holes are drilled in each plate to allow the fence to be moved to the perpendicular position (either to the right or left of the quill), by simply relocating one of the T-slot fasteners. Check each hole in relationship to that position.

## Attaching the Track

Assuming you purchased the 24" lengths of track listed in the Schedule of Materials, you should be able to cut the tracks for the table first, leaving fall off that can be added to the two remaining full length tracks to give you the necessary 30" lengths of track for the fence. When attaching the track, first pilot drill the hole in the center of the track (a groove is provided in the track to simplify that location), then use a countersink to widen the hole to accommodate a #4 x 5/8" flat head screw. Keeping the screws as flush as possible to the inner surface of the track will make the stops and hold-downs move much easier.

## Finishing Touches

Stops and hold-downs designed for use in T-tracks make the drill press most useful. The stops are simply square blocks of wood with one side milled to leave an indexing strip that fits into the slot on the T-slot track. By using the saw to cut tall but shallow rabbets on two edges of each block, the stops are completed fairly easily. For safety, run the rabbet on a longer 2-1/2" wide piece of wood, then cut the stops to square afterward. The T-slot fasteners are simply inserted into a 1/4" hole drilled in the center of each stop block.

The hold-downs are simply blocks of wood with DeStaCo clamps mounted to the top. Each block is drilled for two T-slot fasteners, one on either end. Then the clamp is screwed to the top surface of the block. While the DeStaCos are good for this application, they aren't as versatile as I wanted. I replaced the threaded-rod plunger with longer all-thread (1/4" x 36) to provide maximum benefit from the clamps. The rubber tip of the plunger is important to the function of the clamp, and if you can manage to reuse the existing tip it's very helpful. If not, I found rubber stoppers in a variety of sizes in the local Sears hardware store. After carefully drilling a 1/4"-diameter hole two-thirds of the way into the stopper I was able to screw it onto the rod with little difficulty.

## Attaching and Personalizing

The table should attach easily to your existing drill press table using four lag bolts countersunk flush into the surface of the auxiliary table. Once attached you should find that the auxiliary table overhangs the metal table quite a bit. One personalized touch I want to suggest is adding small drawers to the underside of the table to store bits, wrenches and chuck keys..



**FENCE BRACES** The fence is supported by two simple brackets screwed to the rear of the fence. The location of the triangular braces is important to the track orientation, so follow the diagrams carefully for location.



**LAYING TRACKS** Install the T-slot tracks in the grooves with flat head screws countersunk into the track. The braces are attached to the fence by screwing through the face groove prior to attaching the T-slot track.



**HOLD IT** The hold-downs and stops are made from 3/4" hardwood. To make the guide to hold the stops square to the fence, cut a 1/16" x 1-1/8" rabbet on both sides of the inside face.

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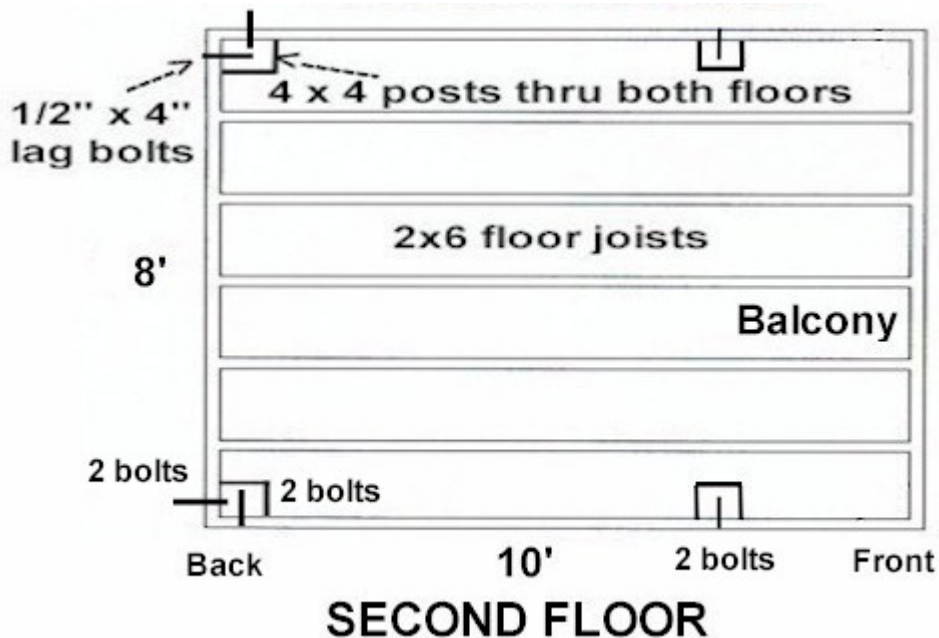
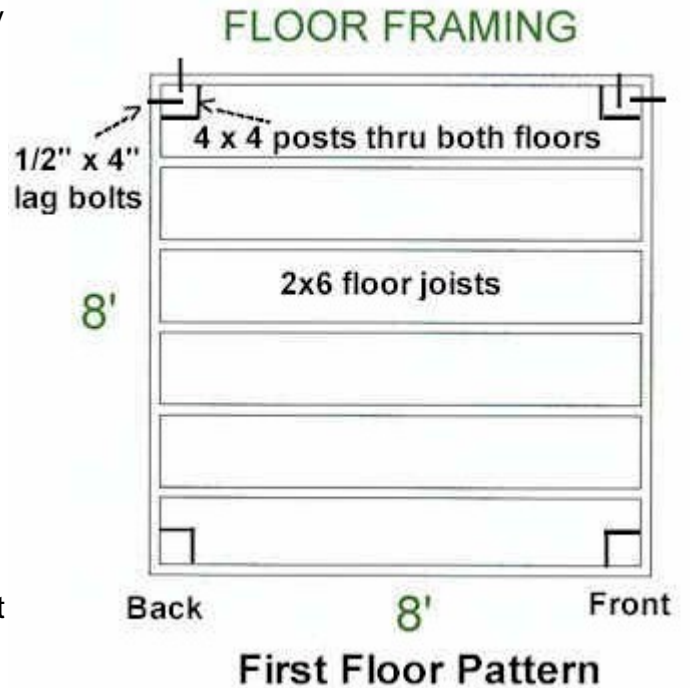
# FORT PLAYHOUSE



**Step 1:** Frame 1st and 2nd floor system following diagrams shown. Use 2x6x8' pressure treated lumber and measure to have outside to outside dimensions exactly 8' x 8' on first floor, and 8' x 10' for the 2nd floor.

**Step 2:** The lumber and measurements on the next step will be determined by what you are going to do with this structure. If you will be making the bottom a storage shed, the height you will need will be taller than if it is a playhouse. For a children's playhouse use 4x4x10' PT lumber uprights. Measure 60" from one end (make that the bottom) and mark a line. This is the mark for the **bottom** of the second floor joists.

**Step 3:** Install 4 - 4x4x10' uprights to first and second floor framed sections following measurements given in step 2. Bolt these uprights in place with 2 - 1/2"x4" Galv. lag bolts at each attachment point. On corners place 2 on each side of the corner.



**Note:** The easiest way to accomplish step 3 is to assemble the unit on it's side. Use a helper when lifting the structure to the upright position.

**Step 4:** With the unit in the upright position we are ready to level and brace it. Level the first floor on the ground. Using a level, temporarily plumb and brace the vertical uprights, while 45 degree braces are installed on the first floor that are shown in the picture. Cut these 24"

long with a 45 degree angle in each end. Bolt these to the bottom of the second floor joists and the 4x4 upright as shown.

**Step 5:** Now it's time to install the plywood floor. Add 3 1/2" long nailers to the sides of the 4x4 uprights at the spot where the plywood floor meets the upright. (the cut out is necessary to allow the upright post to pass through the plywood floor). If you do not add these nailers the floor will be springy. Measure, cut and install the plywood floor on both floors. Use pressure treated 5/8" plywood if possible. (1/2" will work if 5/8" cannot be located)

Note: The extra 4x4's in the photo at the front entrance are optional (location A) . They are in place to hold the railing on both floors.

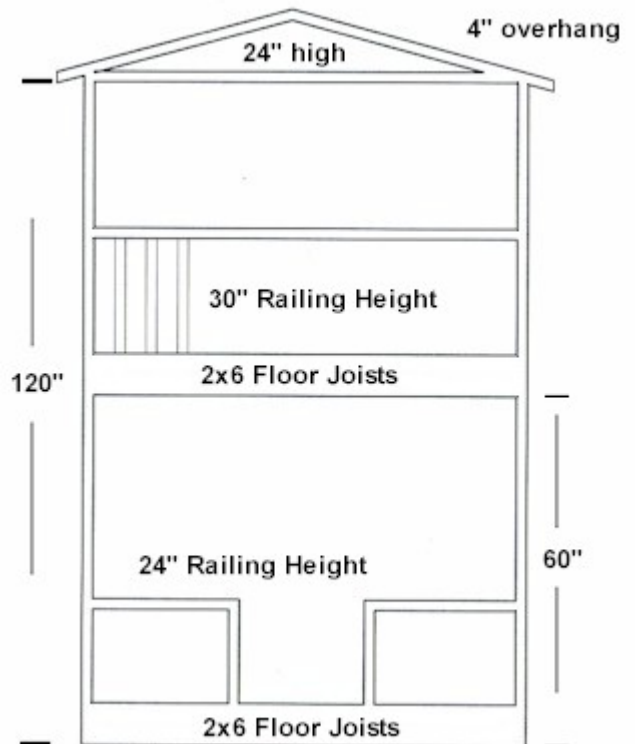
Another Note: This design uses a simple 2x4 ladder (location C) that is mounted in the back of the first floor. The ladder is vertical with a 16"x24" hole cut in the second floor plywood for the visitors to climb through. If you are building a shed in the bottom, you could place the ladder up the outside in the back and cut a section of railing out. Another choice is to have the entrance on the side of the front balcony.

Step 6: Install siding as shown, covering the floor joists as well as the railing area. The siding (location B) can be T-111 plywood siding (or individual fence boards). Siding on the gable ends (location E) use the same materials and instructions.

**Note:** The 45 degree braces on the second floor are 14" long.

**Step 7:** Install railing on front balcony. This railing can be any style you desire. The picket style railing shown fits the rustic western theme of the entire structure.

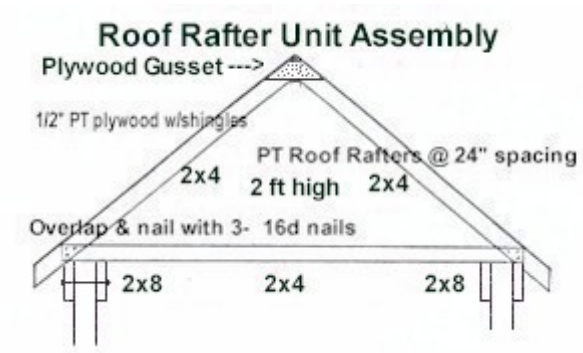
The railing shown is simple to install. It uses the pickets as the supports...there are no corner supports holding the railing. Note in the photograph how the pickets are bevel cut at the bottom. They are securely fastened to the floor joists on 3 1/2" spacing. The top rail is two 2x6 boards nailed together in an "L" shape. The pickets are nailed in the crook of the "L" as shown. Miter cut the left and right corners of the railing.



**Step 8:** Measure, cut and install the roof. Start by installing the double 2x8 header on each side of the 4x4 uprights. Install header flush with the top of the 4x4's, and bolt assembly together with 1/2" x 8" galv. carriage bolt. Roof system uses 2x4 rafter assemblies on 24" centers with 1/2" plywood sheathing. Make 7 roof rafter assemblies following the measurements in the drawing below. Make these assemblies on a flat surface, and install them 1 at a time with 24" spacing from front to back of the playhouse. After all 7 assemblies are in place and temporarily braced, install the roof sheathing. Overhang the plywood roof sheathing 2 inches all around as shown in the pictures.



Install shingle molding on the outside of the gable ends, on top of the siding at the underside of the roof sheathing. (location F) Install roof shingles of your choice.



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# CHILDREN'S PLAY STRUCTURE



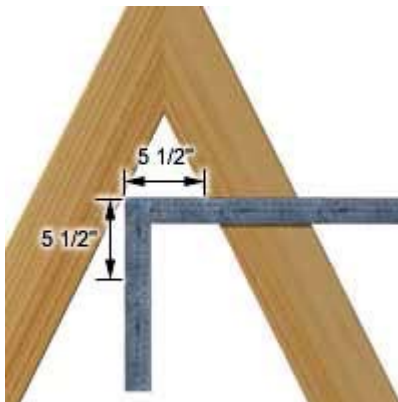
## 1. Raise the structure

- 1.1** With stakes and strings, mark off the perimeter of the area where you will need to dig a 10 x 8 ft. (3 x 2.4 m) hole.
- 1.2** Excavate the entire surface to a depth of 6 in. (152 mm). At each corner (inside the perimeter) dig an 8 x 8 in. (203 x 203 mm) square ten inches (approx. 250 mm) deep for the structure's four posts, which will be driven in at a 63° angle.
- 1.3** Cut one end of each of the four 6 x 6 in. (152 x 152 mm) posts at a 27° angle. These posts will then be joined in pairs to form two peaks.



- 1.4** We suggest assembling the structure on the ground before placing it in the excavated area. Lay your two 6 x 6 in. (152 x 152 mm) posts flat on the ground to form a "V" and screw or nail them together.

- 1.5** Mark the two posts where the gap between them is 5 1/2 in. (140 mm). Mark again 5 1/2 in. (140 mm) lower, in line with the peak, at the centre of the two posts. This second line will mark the top of the beam support. As a precaution, leave an extra 1/4 in. (6 mm) clearance for easier insertion of the beam.

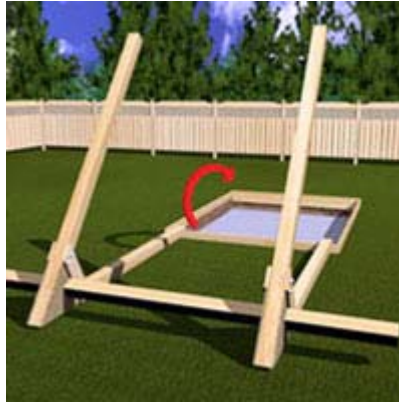


- 1.6** Cut the beam supports (a total of 4) out of 2 x 8 in. (50 x 203 mm) planks, cutting the ends at a 63° angle so that they align with the peak, along the posts (at 27°).



**1.7** Bolt the supports to the posts or attach them using lag screws (two at each end).

**1.8** Now place the two rafters sideways on the ground and insert the 6 x 6 in. (152 x 152 mm) by 14 ft.-long (4.3 m) beam into the two spaces provided so that they protrude by 36 1/2 in. (927 mm) at each end. Nail it at a 45° angle into the two support boards. Use wood scraps to make one or two blocking pieces that you will insert into the remaining (triangular-shaped) space. Toe nail them in.



**1.9** Trace and cut out four gussets (pieces of wood to stop the legs spreading) from a 1/2 in. (13 mm) sheet of plywood. They will be used to close the two sides of each peak. Cut out a space at the base of each one to insert the beam. A head to tail layout on your plywood will limit the number of cuts and save plywood (see sheet 5/6 of the attached Planimage plan). Using an electric drill, screw in the gussets on each side of the posts.

**1.10** Stand the structure upright and place it inside the perimeter, inserting the posts into the corners. Pack top soil around the base of the posts.

## **2. Make a sandbox**

**2.1** Spread a geotextile sheet over the entire excavated area.

**2.2** Nail together the four 2 x 10 in. (50 x 254 mm) planks that will edge the sandbox and place them inside the perimeter (over the geotextile sheet) and resting against the posts at the four corners, without extending beyond the borders. According to this plan, your sandbox will be 9 1/2 x 7 ft. (2.9 x 2.1 m).

The border will be buried 4 in. (100 mm) into the ground. Backfill the outside.

**2.3** Attach the four corners of the border to the four posts with lag screws.

## **3. Place the beams of the platform**

**3.1** Cut six 4 x 4 in. (100 x 100 mm) posts into 7 ft. (2.1 m) lengths. Using a table saw, make a notch 1 1/2 in. (38 mm) deep and 9 1/2 in. (241 mm) long at the bottom of the six posts.

**3.2** Set the height of your circular saw blade at 1/2 in. (13 mm) before making a notch into the six posts, at 2 ft. 7 in. (0.8 m) from the unnotched end. On the four posts already notched, this second notch should be on one of the lateral sides in relation to the previous notch so that the two notches are on adjacent sides. More on the subject in the "corner posts" section on page 6/6 of the plan.

**3.3** To make the roof, cut a 1/2 in. 4 ft. x 8 ft. sheet of plywood in two, to obtain two 2 x 8 ft. boards. Rip one of the long ends of each board at a 45° angle. Attach the two boards to each side of the beams to form the roof.

**3.4** To build the platform beams, cut four 2 x 6 in. (50 x 152 mm) planks into 5 ft. 5 in. (1.7 m) lengths. In your plywood, cut out two boards 5 1/2 in. (140 mm) wide by 5 ft. 5 in. (1.7 m) long. Make two beams by inserting a plywood board between two 2 x 6 in. (50 x 152 mm) planks. Glue and bolt the three boards together (see page 6/6 of the plan).

**3.5** Insert each beam into the lateral notches in the two corner posts and, using an electric drill, screw them in opposite the notches from outside the posts.



**3.6** Place the notches at the bottom of the corner posts on the sandbox border and centre the frame between the structure posts (peaks).

Bolt to the structure and to the sandbox border.

#### 4. Install the joists of the platform

**4.1** Place metal hangers for the 2 x 6 in. (50 x 152 mm) floor joists on the beams so that once installed, they will be centered 12 in. (305 mm) apart.

**4.2** Cut joists out of 2 x 6 in. (50 mm x 152 mm) boards. You will need seven 9 ft. (2.7 m) long joists for the ends. Also plan two other 9 ft. 7 in. (2.9 m) long joists for the ends.

**4.3** Attach the joists to the hangers and double the border joists by attaching the two boards that make up the ends of the posts to the outside edges of the border joists.

**4.4** To make the studs, cut three 4 x 4 in. (100 x 100 mm) posts into 3 ft. 1/2 in. (0.9 m) lengths. At one end of each, make a notch 2 in. (50 mm) deep and 5 1/2 in. (140 mm) long.

**4.5** Position the two remaining 4 x 4 in. (100 x 100 mm) posts, placing the notches out, over the border joist before attaching them to the joists. The first post will be attached to the joist 26 in. (660 mm) from the outside end of the 6 x 6 in. (152 x 152 mm) post and the second 18 1/2 in. (470 mm) from the first measurement.



**4.6** Use the same procedure to attach the three studs. Position the first stud 18 1/2 in. (470 mm) from the last stud attached in the preceding step, and the other two at the opposite end of the platform, each 26 in. (660 mm) from the outer edge of the 6 x 6 in. (152 x 152 mm) structure, on the border joist (notch out).



## 5. Build the floor of the platform

**5.1** Cut 1 1/4 x 6 in. (32 x 152 mm) boards into 6 ft. (1.8 m) lengths. Following this plan, you should require about fifteen of these boards.

**5.2** Use an electric drill to screw the boards to each floor joist, leaving a 1/8 in. (3 mm) clearance between each.

To ensure uniform spacing, temporarily insert the tip of a 1/8 in. (3 mm) diameter nail into each joist.

**5.3** Where there are posts, measure and mark the cutting line on the board. Use a jigsaw to cut the appropriate opening.

## 6. Add a railing to the platform

**6.1** To build the railing, cut two 2 x 4 in. (50 x 100 mm) boards into 5 ft. 2 in. (1.6 m) lengths for the two sections that will be between the 6 x 6 in. (152 x 152 mm) posts. Cut the boards into 26 in. (660 mm) lengths for the four other sections.



**6.2** Screw the long railing sections to the 4 x 4 in. (100 x 100 mm) posts at a 45° angle (the height of both being equal).

**6.3** Cut 32 in. (810 mm) rails out of 2 x 2 in. (50 x 50 mm) boards. Make a 45 degree cut at one end of each for finishing. Calculate the number of rails required, keeping in mind that they will be centered 4 in. (100 mm) apart.

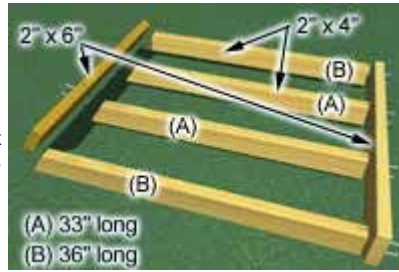
**6.4** Attach the rails (bevelled end up) to the ramp and the border joist or post, as the case may be, screwing them in with an electric drill. Set them 1 1/2 in. (38 mm) from the top of the ramp. Make sure they are level.

## 7. Dress up the access ramp

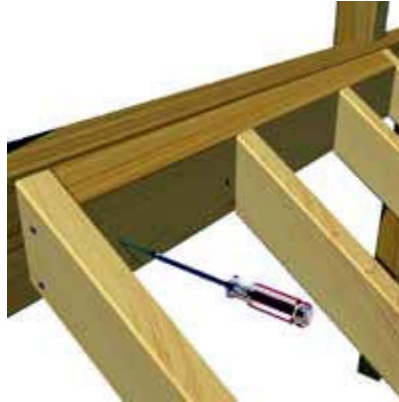
**7.1** Cut four 2 x 4 in. (50 x 100 mm) planks, two for the outside pieces, 7 ft. (2.1 m) long and the two others, for the inside pieces, 6 ft. 10.5 in. (2.09 m) long. Cut one end of all four pieces at a 54° angle. Cut two 2 x 6 in. (50 x 152 mm) planks, one to a length of 36 in. (914 mm) and the second 33 in. (838 mm) long. Bevel the ends of the 33 in. (838 mm) plank at a 54° angle.

- 7.2** Build the access ramp upside down on the ground. Center the right angle ends of the 2 x 4 in. (50 x 100 mm) boards to the 36 in. (914 mm) long 2 x 6 in. (50 x 152 mm) board every 12 in. (305 mm).

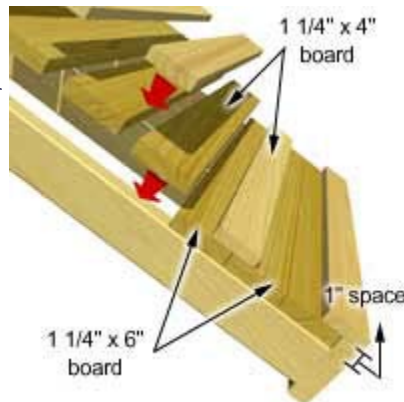
Be sure to leave a 1 in. (25 mm) clearance on the 2 x 6 in. (50 x 152 mm) to attach the floor. House the 33 in. (305 mm) long 2 x 6 in. (50 x 152 mm) into the other end of the ramp and attach it to the 2 x 4 in. (50 x 100 mm).



- 7.3** Flip the assembled component right side up and screw it to the main structure. Working from the bottom up, finish the access ramp floor by nailing in 36 in. (914 mm) long 1 1/4 x 6 in. (32 x 152 mm) boards.



- 7.4** Starting at the ground section of the access ramp, attach 1 1/4 x 4 in. (32 x 100 mm) boards to every second floorboard, making sure to center the boards over the voids. These boards will be used as stairs for easier access to the structure's upper level.



## 8. Build the bridge

- 8.1** Out of two 2 x 6 in (50 x 152 mm) boards, make two 21 in. (533 mm) and two 18 1/2 in. (470 mm) long boards. Attach the two longest boards perpendicular to the sandbox border and to the ladder posts by screwing or nailing them in at a 45° angle.
- 8.2** Nail the two other boards perpendicular to the first two, equidistant from the ends and at a 45° angle.
- 8.3** Finish the floor the same way as for the platform floor, with four 22 1/2 in. (570 mm) long 1 1/4 x 6 in. (32 x 152 mm) boards.

## 9. Fix the ladder

**9.1** Attach a 2 x 2 in. (50 x 50 mm) board to the top of the bridge.

**9.2** Next, determine the height of the four 21 1/2 in. long (546 mm) 2 x 4 in. (50 x 100 mm) boards that will be used as steps by calculating the distance between the platform floor and the top of the 2 x 2 in. (50 x 50 mm) board attached at step 1. The steps should be evenly spaced.

**9.3** Screw the steps to the posts with an electric drill.

## **10. Install the swings**

**10.1** In a 2 x 8 in. (50 x 203 mm) board, cut two 18 in. (460 mm) lengths and drill a hole 2 in. (50 mm) from each end, for the ropes.

**10.2** For each swing, drill two holes at the centre of the beam, leaving a 4 in. (100 mm) space at the end of the beam. The two holes should be 14 in. (355 mm) apart. Bolt the two support hooks into the holes.

**10.3** Thread the rope through the holes in the swing and tie securely.

**10.4** Cut the rope so that the height between the ground and the top of the seat of the swing is 18 in. (460 mm).

Fill the base with sand, sit back, relax and watch the kids delight in your new creation!

Have a great summer!

### **Tools list**

- Carpenter's Pencil
- Carpenter's level
- Circular saw
- Drill
- Hammer
- Jig saw
- Safety goggles
- Shovel
- Speed Square
- Table saw
- Work gloves

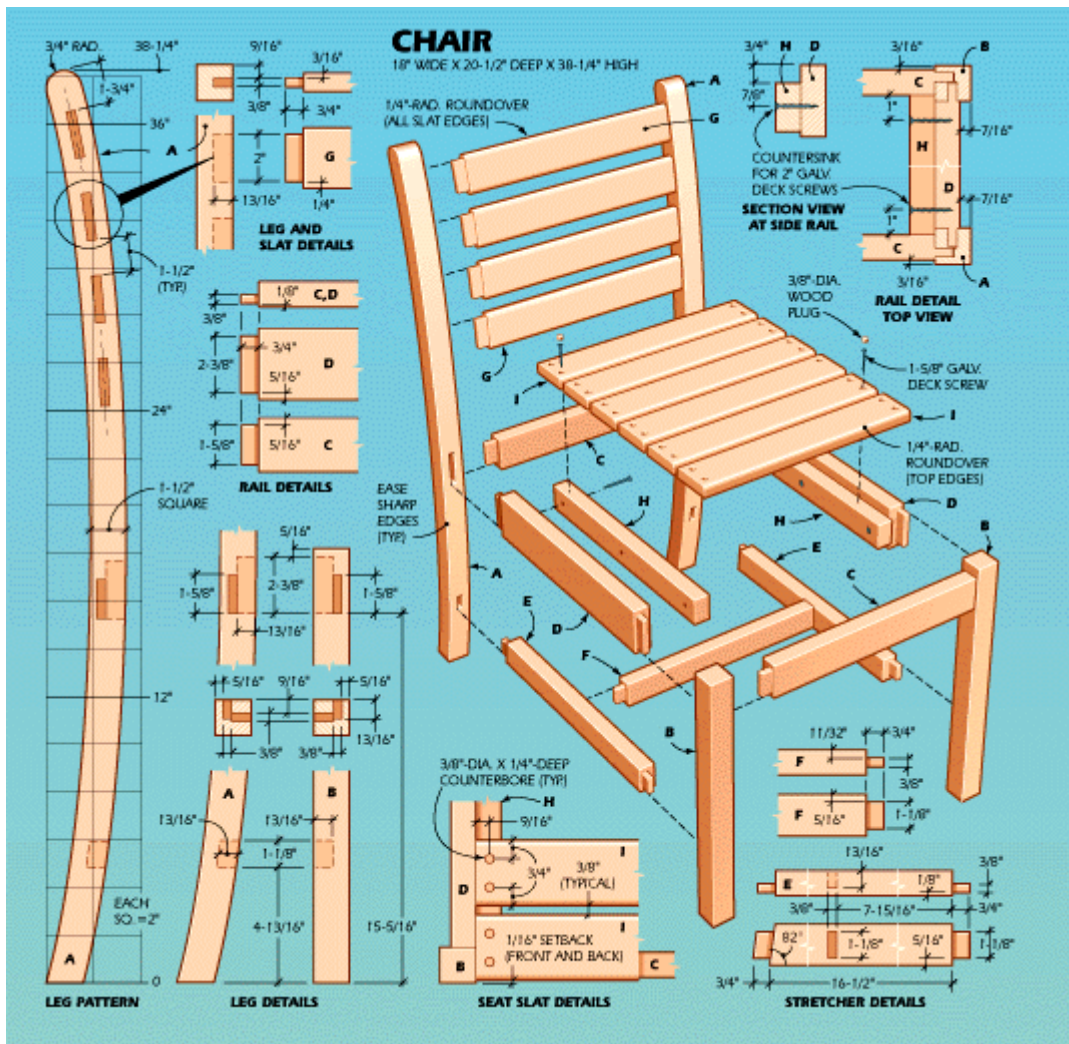
### **Material list**

- "Cool Wave " slide NE4675 (see Swing-N-Slide® Co.)
- 1 x 6 in. (25 x 152 mm) boards
- 1/2 in. (13 mm) plywood
- 2 x 10 in. (50 x 254 mm) planks
- 2 x 2 in. (50 x 50 mm) planks
- 2 x 8 in. (50 x 203 mm) planks
- 4 x 4 in. (100 x 100 mm) posts
- 6 x 6 in. (152 x 152 mm) posts
- Geotextile sheet
- Metal hangers
- Nails
- Sand
- Treated wood screws

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# OUTDOOR CEDAR TABLE AND CHAIRS

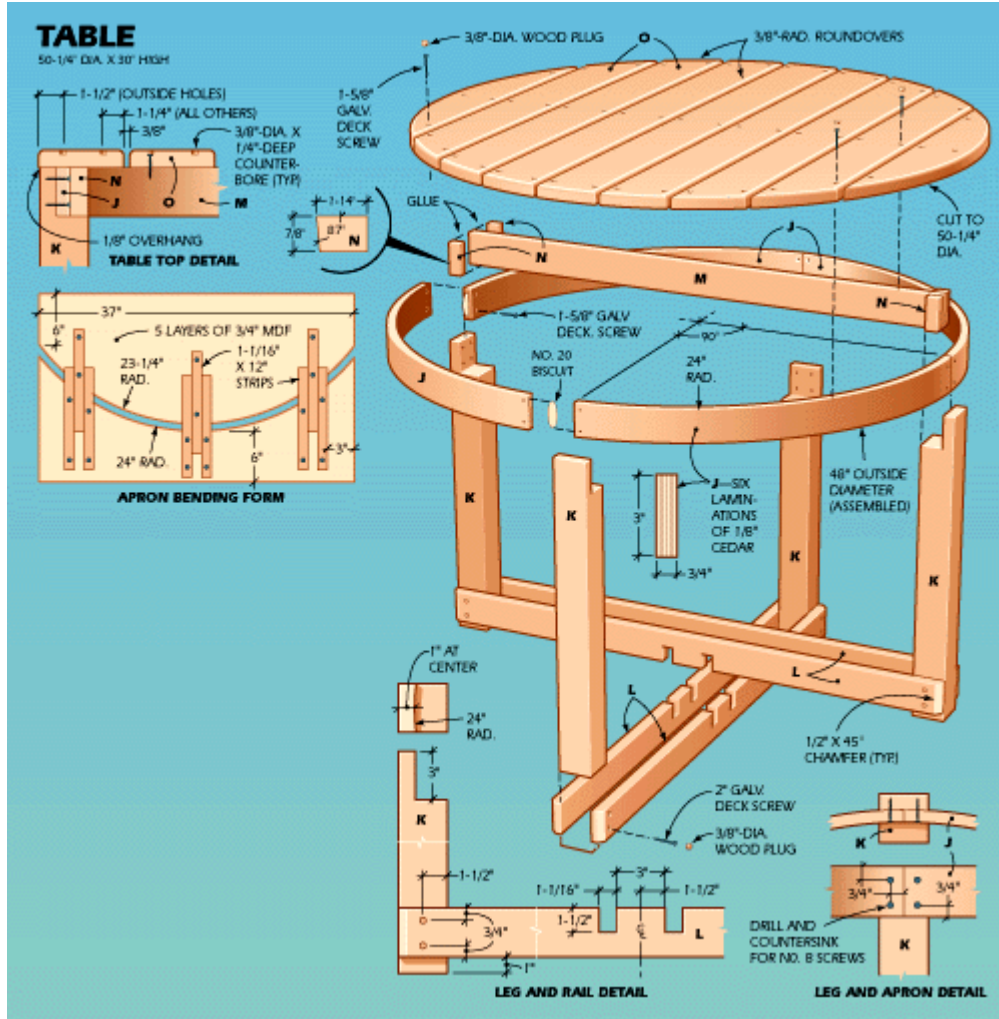




MATERIALS LIST—TABLE AND CHAIRS		
Key	No.	Size and description (use)
A	2	1 1/2 x 3 1/2 x 38 1/4 in. cedar (leg)
B	2	1 1/2 x 1 1/2 x 18 in. cedar (leg)
C	2	1 1/16 x 2 1/4 x 16 1/2 in. cedar (rail)
D	2	1 1/16 x 3 x 17 in. cedar (rail)
E	2	1 1/16 x 1 3/4 x 18 in. cedar (stretcher)
F	1	1 1/16 x 1 3/4 x 16 1/2 in. cedar (stretcher)
G	4	3/4 x 2 1/2 x 16 1/2 in. cedar (slats)
H	2	1 1/16 x 1 3/4 x 16 in. cedar (cleats)
I	6	3/4 x 2 1/2 x 15 in. cedar (slats)
J	4	3/4 x 3 x 37 1 1/16 in. cedar (apron)
K	4	3 x 3 x 28 15/16 in. cedar (leg)
L	4	1 1/16 x 3 x 50 in. cedar (rail)
M	1	1 1/16 x 3 x 46 1/2 in. cedar (rail)
N	4	7/8 x 1 1/4 x 3 in. cedar (block)
O	9	1 1/16 x 5 1/4 x 50 1/4 in. cedar (slat)



**Misc:** 1 5/8 in. and 2 in. galvanized deck screws, 3/8-in.-dia. wood plugs, No. 20 biscuits, Titebond II glue, two sheets 3/4-in. x 4 ft. x 8 ft. MDF, Cabot Clear Decking Stain No. 1400.



## Building the Table

We used air-dried, clear red cedar for our project. While normally we use kiln-dried stock for woodworking, we couldn't locate kiln-dried material in the sizes we needed. Besides, using kiln-dried lumber is not that important for outdoor furniture because these pieces are subjected to wide variations in humidity. To stabilize the air-dried stock, we brought it into the shop and stacked it neatly in a dry space out of direct sunlight, with evenly spaced strips of wood between each board. This is known as sticking.

Start by making the laminating form. We chose MDF (medium-density fiberboard) for the form because it is inexpensive.

First, make the trammel base for the router. Install a 3/4-in.-dia. straight bit in the router, and bore a 3/8-in.-dia. hole through the trammel so that the hole's center is 24 in. from the outside of the router bit. Use a short length of 3/8-in. dowel to pin the trammel to a large piece of MDF. Now, make three passes with the router to cut an arc through the stock (**Photo 1**). Temporarily leave a section of the panel connected at each end of the arc. Make a set of alignment marks across the arc, and use the router to cut the panel into two sections. Use the two sections as templates. Cut slightly oversize blanks from the remaining panel stock. Screw a template to each blank, and use the router with a flush-trimming bit to cut the blanks to finished radius (**Photo 2**). Each routed piece becomes the pattern. To prevent glue from sticking to the form, apply a coat of varnish to it. Then wax it after the varnish dries.



1 Make the bending form template with a plunge router on a trammel arm. Cut an arc in a sheet of MDF.



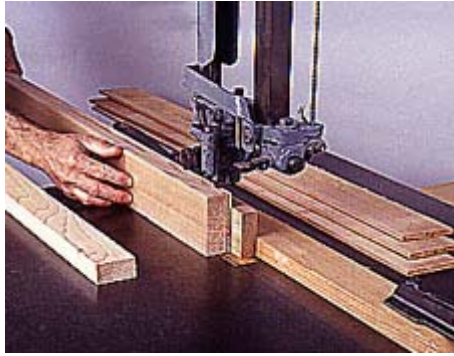
2 The remaining pieces of the form are trimmed to size using the template, router and flush-trimming bit.

Next, place 3/4-in.-thick blocks between the bending forms, and temporarily clamp the forms together. Fasten alignment strips to the surfaces of the forms (**Photo 3**).

Set up the band saw with a tall rip fence and a 1/2-in.-wide, four-tooth-per-inch blade. Rip 1/8-in.-thick, 48-in.-long cedar strips (**Photo 4**).



3 Use 3/4-in.-thick spacers between the bending form pieces. Clamp the form pieces together and fasten alignment strips.

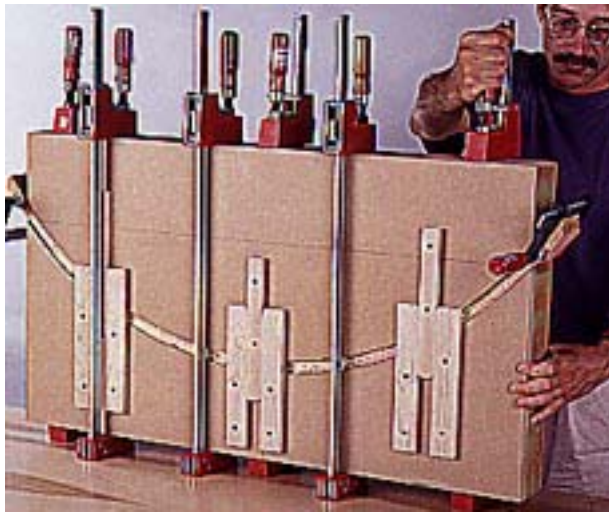


4 Resaw the 1/8-in.-thick apron laminate strips on the band saw. Use a pushstick at the end of the cut.

Spread glue on the strips, and place the six strips stacked in the form. Clamp the form together (**Photo 5**).

When all the apron blanks have been glued up, plane a square, straight edge on each blank, then rip the apron blanks to finished dimension.

Next, make a plywood cradle with a radius that matches the apron's finished outside length. Clamp the cradle to a long auxiliary fence attached to the table saw's miter gauge. The first cut removes one rough end from the apron (**Photo 6**). Turn the apron around, and crosscut the apron to finished length.



5 Clamp the laminate strips at either end to keep them from shifting. Apply pressure with equally spaced clamps.



6 Make a cradle. Then crosscut the apron blank to finished length. The apron length and cradle arc length are equal.



Use the cradle again to hold the apron as you cut the biscuit slot in each end (**Photo 7**). Assemble the apron. Then apply glue to the apron ends, the biscuit slots and the biscuits. Use a band clamp to apply clamping pressure (**Photo 8**). Check the apron diameter for distortion, and adjust it if necessary. Rip, joint and crosscut the leg stock to finished dimension. To cut the curved notch in the leg, first make a 90-degree cut and then use a sharp chisel to pare the curve.



7 Transfer the cradle to a bench, and use it to hold the apron section in place while cutting the biscuit slots.



8 Glue and clamp the apron sections together using a strap clamp. Check its diameter at several points.

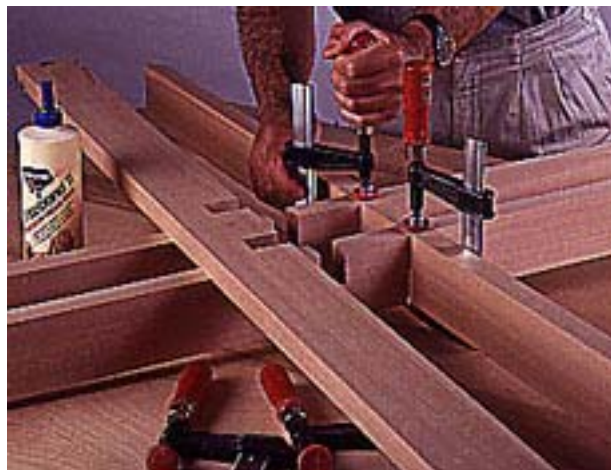
Rip, crosscut and notch the table rails and chamfer the edges. Spread glue on the notches, and clamp the pieces together (**Photo 9**).

Position a table leg between a pair of rails, and counterbore the screw holes. Fasten the legs and rails with galvanized deck screws.

Center a leg over each apron joint. Countersink the screw holes, and drive screws into each leg (**Photo 10**).

Now cut the crossrail to size. Place the crossrail into the leg assembly, and cut the glue blocks to fit at its ends. Glue the blocks in place.

Rip and crosscut the top slats to size. Use a rounding-over bit in the router to ease the slat edges. Clamp the center slat in position, bore its pilot holes and fasten it to the apron. Fasten the remaining slats to the center rail spaced 3/8 in.



9 Glue and clamp together the half-lapped rail assembly. Check that the parts are square to one another.

from each other. Mark out the top's diameter (**Photo 11**) and cut it to shape with a sabre saw. Sand the slat ends smooth, then use the router and rounding-over bit to ease their edges.

Use a plug cutter in your drill press to make the plugs to cover the screwholes. Glue the plugs over the screwheads, and use a chisel to pare the plugs smooth. Sand the table smooth with 120-grit sandpaper.



**10** Position the apron so each of its joints is centered on a leg. Use four screws at each joint to attach the apron to the legs.



**11** Space the boards equally, and screw them to the crossrail. Draw the outline of the top on the boards.

## Chair Construction

The first step in chair construction is to make a thin plywood template for the rear leg. Rip and crosscut the rear leg blanks, then trace around the pattern onto the leg (**Photo 12**). Cut the outside of the leg to shape, and smooth its outline with a block plane (**Photo 13**). Cut its inside surface to shape, and smooth it with a spokeshave.

The other chair components are ripped, crosscut and planed to final dimension. Lay out the mortises and tenons on these pieces. The mortises are most easily cut with a router and a spiral up-cutting bit (**Photo 14**). This will require that you cut the ends of the mortises square with a chisel. However, this process will not work on the inside surfaces of the rear leg because the router fence does not have a straight edge to bear against. Cut these mortises by



**12** The first step in building each chair is to make a template for the rear leg, and trace it on the leg blanks.



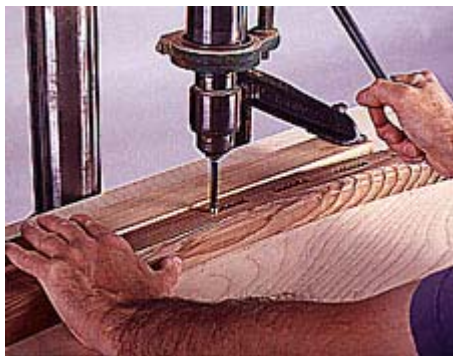
laying the leg against a fence on a drill press table. Bore a series of overlapping holes (**Photo 15**). Then cut the mortises square with a chisel.



**13** Cut the outside curve on the leg. Clamp it to the bench, and smooth the curve with a block plane.



**14** Use a plunge router with its fence positioned on the leg's straight face. Cut the side rail and stretcher mortises.



**15** Remove the bulk of the side rail mortises on the drill press. Chisel the mortise sides and ends square.

Cut the tenons on the back slats, rails and stretchers using a dado blade installed in the table saw (**Photo 16**). On the rails and stretchers, be careful to keep track of which face of the component you are working on because the tenon is not centrally positioned on these pieces. Adjust the height of the dado blade accordingly. Also, note that the tenon that joins the side stretcher to the rear leg has an angled shoulder. Cut this by hand using a dovetail saw or backsaw.



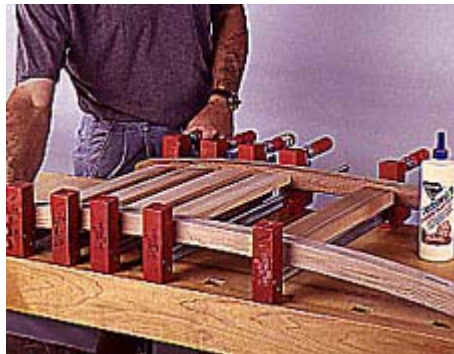
**16** Clamp a stop to the miter gauge fence. Use a dado blade to cut the tenons on the rails, stretchers and back slats.

Begin the final assembly by gluing and clamping together the side stretchers and the cross stretcher (**Photo 17**). Measure diagonally from both corners of the assembly to check it for square. Next, glue and clamp together the rear legs, slats and rail (**Photo 18**). Glue and clamp the front legs and rail. Then, glue and clamp together all the subassemblies (**Photo 19**). Cut and install the cleats and the seat slats. Install wood plugs.



**17** Glue and clamp together two side stretchers with a cross stretcher. Check the assembly for square.

The chairs and tables were finished with a clear coat of Cabot Decking Stain No. 1400.



**18** Clamp together the rear legs, a rear rail and four back slats. Use one clamp at each joint location.



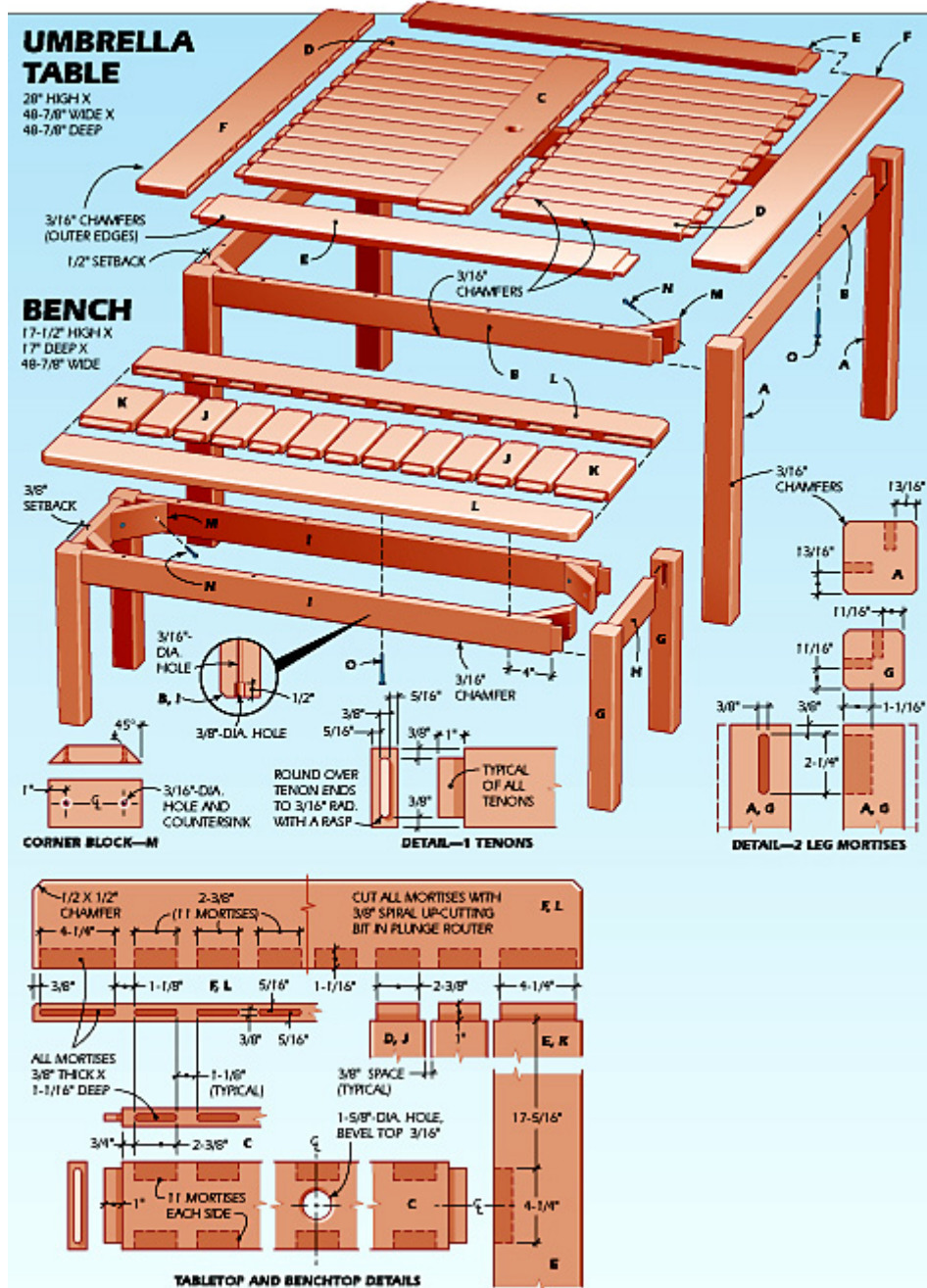
**19** Glue and clamp together the rear leg subassembly, the front legs and the stretcher subassembly.



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# OUTDOOR TABLE AND BENCH





## MATERIALS LIST--UMBRELLA TABLE AND BENCH

Key	No.	Size & Description (use)
A	4	2 3/4 x 2 3/4 x 27" cedar (leg)
B	4	1 x 3 x 43 7/8" cedar (apron)
C	1	1 x 5 x 40 7/8" cedar (rail)
D	22	1 x 3 1/8 x 18 15/16" cedar (slats)
E	2	1 x 5 x 40 7/8" cedar (rail)
F	2	1 x 5 x 48 7/8" cedar (stile)
G	16	2 1/4 x 2 1/4 x 16 1/2" cedar (leg)
H	8	1 x 3 x 12" cedar (apron)
I	8	1 x 3 x 44 7/8" cedar (apron)



J	44	1 x 3 1/8 x 9" cedar (slats)
K	8	1 x 5 x 9" cedar (rail)
L	8	1 x 5 x 48 7/8" cedar (stile)
M	20	1 x 2 3/4 x 5 1/4" cedar (block)
N	40	2" No. 8 fh galvanized screw
O	48	3" No. 8 fh galvanized screw

## Making The Parts

The table legs are cut from 4 x 4 stock (or they can be glued up from thinner material). When using 4 x 4 stock, cut each leg to rough length. Next, clamp a fence to the band saw table, and rip the blanks to a 2 3/4 x 2 3/4-in. square (**Photo 1**). Then clamp the leg to a workbench, and use a razor-sharp plane to remove the saw marks (**Photo 2**). Unless you are very experienced with a hand plane, check the workpiece frequently as you go. The edges of the leg must remain square to one another. Remember that you are only smoothing the surface, so do not remove too much material.



Rip the table leg stock out of a cedar 4 x 4. Clamp a temporary rip fence to the band saw table to do this.



Clamp a table leg to a benchtop and remove saw marks with a hand plane. To make a smooth cut, push the plane at an angle.

Use a miter gauge on the band saw to crosscut the leg blanks to finished dimension (**Photo 3**).

Since the bench legs are smaller than the table legs, it is a better use of materials to glue them up from three pieces of 3/4-in.-thick stock. You can simplify the job if you plan to make the blanks large enough to cut four legs from each glued-up stack.



Crosscut the legs on the band saw. Here, a shopmade crosscutting table and a miter gauge are used to make the cut.

Rip and crosscut material for the leg blanks slightly oversize, then use a foam roller to spread glue on the mating surfaces of each piece. Assemble the pieces into a stack, and clamp the pieces together (**Photo 4**). After about 20 minutes, scrape off the glue that has squeezed from the joints, then allow the glue to fully set.



For the bench legs, spread glue on 3/4-in.-thick stock. Lay disposable material under the pieces and clamp them together.

Now use the table saw to rip the blanks to 2 1/4 in. wide, and crosscut the bench legs to finished length.

Lay out the mortise locations in all the legs for the apron joints. You can speed the process by clamping four legs together with their ends perfectly aligned. Then, mark across the stack using a square (**Photo 5**). Next, use the router and edge guide to cut the leg mortises (**Photo 6**). It's best to use a spiral up-cutting bit in the router because that type of bit pulls the dust and chips out of the cut, and reduces the strain on the motor. This also keeps the bit's cutting edge cooler.



Rip and crosscut the individual bench legs to size, and then clamp them together. Mark out mortise locations on the legs.



Using a spiral up-cutting bit in a plunge router, cut the table leg mortises. Two legs clamped together provide a stable base.

Rip and crosscut 1-in.-thick stock for the table and bench aprons as well as for the top frames and slats. Install dado blades in the table saw, and then use the miter gauge to guide the workpiece over the saw blades when cutting tenons (**Photo 7**). Note that you can use the rip fence as a stop to gauge the tenon length. Since the tenons are 1 in. long, you need to make two passes to complete each cheek.



Use a dado blade setup in the table saw to cut the tenons on the apron pieces. Butt each apron to the fence, and make the cut.

Cut the tenons across the width of each workpiece, then adjust the blade height and move each workpiece over the blade on edge to cut the shoulder (**Photo 8**). Clamp each workpiece upright in a vise and gently round over the tenon's edges using a wood rasp (**Photo 9**).



To cut the shoulders on a tenon, stand the apron up, and hold it firmly to the miter gauge. Butt it to the fence and make the cut.



Round off a tenon with a rasp. The tenon's radius matches the radius left by the spiral up-cutting bit used to cut the mortise.



Lay out the mortise locations for the tabletop and benchtop joints. Use a router with an edge guide and a spiral up-cutting bit to cut the mortises (**Photo 10**). It is best to clamp three workpieces of the same width together when routing to form a wide and stable base for the plunge router.

Mark the location of the umbrella posthole in the center rail of the tabletop, and then use a Forstner bit in the drill press to bore the hole.

After laying out the locations of the holes in the aprons for mounting the top, use a Forstner bit in the drill press to counterbore a recess for each screwhead. Next, use a 3/16-in.-dia. bit to drill the pilot holes for the screw shanks. Each of these holes is centered in a recess.

To complete the part-making process, install a chamfer bit in the router table, then use it to cut the 3/16-in.-deep chamfer on the table and bench legs, aprons and top parts as shown in the plans (**Photo 11**). Note that not all edges are chamfered.



To cut the long row of mortises in each stile and rail, clamp three of the work-pieces together to support the router.



Use a chamfer bit in the router table to cut the chamfer on all four edges of the legs for the benches and table.

## Assembly

Begin assembly with the benches, since they are smaller and are much easier to work with. After you refine your technique on them, you can assemble the table.

It's worth noting that all the parts for the table and benches should be dry assembled before glue is applied. With the assemblies joined in this manner, make reference marks and numbers on the backs of the parts or in some other discreet location. Before proceeding to gluing and clamping, gather the parts together in batches so they are not confused during the assembly process. In some cases, you'll want to make a second dry fit midway through the assembly process, such as when gluing and clamping a stile or rail to multiple slats that have been glued to a stile or rail on the opposite side. This is a necessary evil to ensure that the parts go together smoothly--the parts may have fit the first time you tried them but shifted slightly when they were glued up as a subassembly.

Apply glue to the mortises of two bench legs and on the tenons of one short apron. Use a small wood shim to spread glue on the mortise walls, and use a small brush to coat the tenons. Press together the apron and legs, and



Glue and clamp together a pair of bench legs and one short apron. Make two of these subassemblies.

then clamp the subassembly to pull the joints tight (**Photo 12**).

When the glue is dry on these parts, glue and clamp the long bench aprons to the end subassemblies (**Photo 13**). It's best to do this on a flat work surface to ensure that the base assembly is not twisted.

Assemble the table base in the same manner as the bench bases. Make two subassemblies consisting of a pair of legs and one apron. When the glue has set on these, join the subassemblies spanned by a pair of aprons.



Join two leg-apron subassemblies spanned by a long pair of aprons. Glue and clamp this to complete a bench base.

Now move on to assembling the benchtops. Since there are several slats in each top, assemble each top in stages. First, glue and clamp the slats to one long rail (**Photo 14**). After the glue sets on those joints, apply the opposite rail.



The first stage in assembling a benchtop is to glue and clamp slats to one stile. Use one clamp in the center of each slat.



Multiple subassemblies are made in assembling the tabletop. First, slats are joined to the center rail.



Approach the tabletop assembly in the same manner. Begin by gluing and clamping a slat at each end of the center rail. Fill in between these two slats with more slats (**Photo 15**). When the glue is dry on this subassembly, glue and clamp slats to the opposite side (**Photo 16**). Next, glue and clamp the side rails to this subassembly (**Photo 17**). When the glue is set on that subassembly, position clamps across it and then glue and clamp one stile to it (**Photo 18**). Complete the top by gluing and clamping the second stile.



A second set of slats is glued and clamped to the center rail. Again, use one clamp in the center of each slat.

Using this technique, you will not have to worry about getting all the parts together before the glue begins to set. Your results will be better, and the stress of a frantic assembly is eliminated.



Glue and clamp a side rail to the center rail. One clamp, carefully centered, should provide enough force.

Mark the benchtops and tabletop for the 45 degree corner cuts, and make these cuts with a sabre saw. Sand the cut corners smooth, then use the chamfer bit in the router to shape the table edges and benchtops. Use the router and chamfer bit to shape the top edge of the umbrella hole as well.



Clamp one stile at each end of the top subassembly. Space clamps evenly and at the center of a tenon.

Rip, crosscut and miter the 1-in.-thick stock to make corner blocks. Bore and countersink pilot holes in each block, and then attach them with screws to the aprons for the table and benches (**Photo 19**).



A corner block is installed at each leg on the table and the benches. A pair of screws holds each block to the aprons.

Invert the tabletop on a padded surface, then place the base over it. Adjust the base so there is an even reveal on all sides of the top, and then attach the base to the top with screws (**Photo 20**). Assemble the benches in the same manner.



Attach the tabletop to the base with several screws. Drive each screw into its matching counterbored hole in the apron.

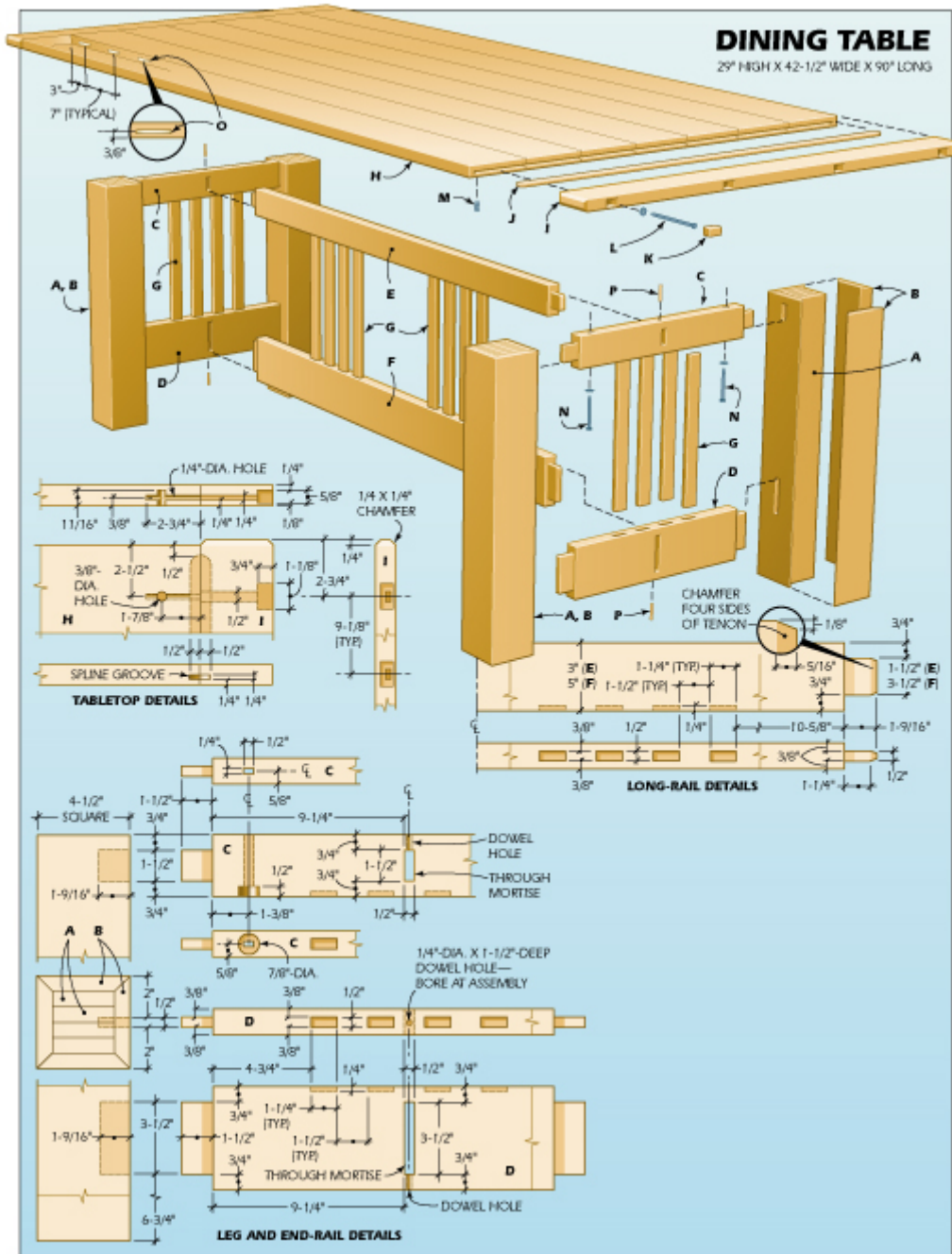
Sand all surfaces with 120-grit and 140-grit sandpaper, and remove all dust with a tack cloth. While cedar is resistant to rot and insect infestation, it will weather if left untreated. To preserve its natural color and protect it from the elements, apply a penetrating finish with a high-quality brush.

A pigmented stain could easily be used on this project. In fact, pigmented finishes provide greater protection against weather damage--even if they do obscure the wood's grain. Although most people prefer white, green or redwood-colored finishes for outdoor wood furniture, there's nothing to prevent you from being a bit more creative. The finish could be color matched to other outdoor furnishings, or to the house itself.

For maximum protection against the elements, use a paintable water-repellent preservative, followed by a compatible primer and topcoat. Visit your paint store to buy these three products and check that they are fully compatible.

# OAK DINING TABLE





MATERIALS LIST--DINING TABLE		
Key	No.	Size and description (use)
A	16	3/4 x 3 x 28" oak (leg core)
B	16	3/4 x 4-1/2 x 28" oak (leg face board)
C	2	1-1/4 x 3 x 22" oak (end top rail)
D	2	1-1/4 x 5 x 22" oak (end bottom rail)
E	1	1-1/4 x 3 x 55 7/8" oak (long top rail)



F	1	1-1/4 x 5 x 55-7/8" oak (long bottom rail)
G	16	1/2 x 1-1/4 x 14-1/2" oak (slat)
H*	1	1 x 42 x 83" oak (top panel)
I	2	1 x 3-1/2 x 42-1/2" oak (breadboard end)
J	2	1/4 x 1 x 41" oak (spline)
K**	8	3/8 x 5/8 x 1-1/8" oak (plug)
L	8	1/4"-20 x 5" rh machine screw, washer
M***	8	1/4"-20 steel cross dowel
N	4	1/4"-dia. x 3" lagscrew, washer
O	as reqd.	No. 20 joining plate
P**	4	1/4"-dia. x 1-1/2" dowel
Misc.: Medium Fumed Oak aniline dye (No. W1190) available from Woodworker's Supply, 5604 Alameda Place N.E., Albuquerque, NM 87113; Waterlox Original Sealer/Finish (Waterlox Coatings Corp., 9808 Meech Ave., Cleveland, OH 44105).		
* Overall size, laminate from available stock.		
** Finished dimension. Cut oversize and trim flush.		
*** Cross dowel (No. 31823)		

### Leg Construction

Each leg is formed by surrounding a solid core with mitered face boards. First rip stock for the leg cores, using up any wood that has defects in its appearance. Crosscut these boards a few inches longer than finished length. Spread glue, assemble them in stacks of four, and apply clamps. After about 20 minutes, scrape off glue that has oozed from the joints. Secure a tall auxiliary fence to the table saw rip fence and clamp a holddown featherboard to the auxiliary fence. Set the table saw blade at 45° and rip bevels along both edges of each face board (Photo 1). Then, crosscut the boards to match the cores.

Apply glue to the face-board mating surfaces and to all sides of a core for one of the legs. Assemble the leg, alternating clamp direction so that even pressure is applied on all sides (Photo 2). Construct the remaining legs in the same manner and scrape off excess glue after about 20 minutes. When the glue is dry, use a band saw and miter gauge to crosscut the legs to finished length.

Lay out the leg mortises as shown in the drawing. Then, use a plunge router with a spiral up-cutting bit and edge guide to cut them (Photo 3). Take two or three passes to reach the full mortise depth so you don't burn the bit or overload the router. Square the ends of the mortises with a sharp chisel.



With a featherboard holding the stock against the table, rip a 45° bevel on both edges of each leg face board.



## The Rails And Slats

Use a dado blade in the table saw to cut the rail tenons (Photo 4). Since the blade will leave small ridges, it's best to cut the tenons about 1/32 in. oversize and then pare to the exact size. Clamp a stopblock to the saw table to set the tenon length. Hold the rails on edge to cut the shoulders at the top and bottom edges. Use a sharp chisel to pare the small ridges off the faces of each tenon.

Lay out the through mortises in the end rails and use a 7/16-in.-dia. bit in the drill press to bore slightly overlapping holes that remove most of the waste from each mortise (Photo 5). Use a sharp chisel to finish cutting the joints (Photo 6). Work halfway through the joint from one face, then turn the rail over to finish from the other side.



Spread glue on joint surfaces and clamp the face boards to the leg core. Alternate clamp directions to pull the joints tight.



Rout the leg mortises with a spiral upcutting bit. Reach finished depth in several passes to reduce router strain.



Use a dado blade in the table saw to cut the rail tenons. A stopblock clamped to the table ensures consistent cuts.



Using a 7/16-in.-dia. bit, bore slightly overlapping holes to remove most of the waste from the end-rail mortises.



Finish the through mortises with a sharp chisel. Work halfway through from each face to avoid tearing the wood surfaces.



Test fit each through tenon in its mortise. Mark around each tenon end to indicate the outer surface of the rail. Using this line as a guide, chamfer the tenon ends (Photo 7). Rip and crosscut the base slats to size and lay out the slat locations on the rails. Use the plunge router with edge guide to make the cuts (Photo 8). Clamp two rails together to provide a wider base for the router. Square the ends of each mortise with a chisel, and test fit the slats.

Next, mark the hole locations in the end top rails for fastening the tabletop. Use a Forstner bit to counterbore the recess for each bolt head (Photo 9), and then bore two side-by-side 1/4-in.-dia. holes for each bolt. Use a sharp chisel to remove the waste between the holes, leaving elongated slots. These wide bolt holes will allow the top to move with seasonal changes in humidity.

Use a sharp chisel or block plane to chamfer the ends of the tenons that extend through the end-rail

### **Base Assembly**

Begin assembly of the base by joining the slats to the

mortises.



Lay out the slat locations in the rails and rout the mortises. Clamp two rails together to form a base for the router.



Use a Forstner bit and drill press to counterbore recesses for the lagscrews in the bottom edges of the top end rails.



end rails. It's not necessary to use glue unless the slats are too loose. Use two clamps to hold the assembly together until it's joined to the legs (Photo 10).

Spread glue in the leg mortises and on the rail tenons for one end of the table. Join the end rails to the legs, apply clamps, and compare opposite diagonal measurements to be sure that the assembly is square (Photo 11). Then, let the glue cure and repeat the procedure for the other table end.

Join the slats and long rails, install clamps and then compare diagonal measurements. Spread glue on the through-tenon joints and assemble the table base. Use clamps on either side of the through tenons to apply even pressure (Photo 12).

Bore holes through the top rails and into the through tenons for dowels that will secure the joints. Apply glue and drive each pin into place (Photo 13). Cut off the dowel about 1/16 in. above the rail surface and use a sharp chisel to pare it flush. Turn the base over and install dowels through the bottom tenons.

Assemble the end rails and slats. Use two clamps to hold the pieces together until the rails are glued to the legs.



Join the end assembly to the legs and clamp. Compare opposite diagonals to be sure that the assembly is square.



Assemble the slats and long rails and glue the long rails to the ends. Use clamps to pull the joints tight.



Lock the tenons to the rails by gluing a dowel through the joint. Turn the base over and repeat on the bottom joints.



## The Tabletop

Select the stock for the tabletop, rip the boards to width, and crosscut a few inches longer than finished length. Plane or joint the edges of each board so they're straight and square, and then lay out joining-plate slots spaced about 7 in. on center. When cutting the slots, hold both the plate joiner and board tightly to your worktable so the slots will be accurately positioned.

Since the boards are long and heavy, it's best to begin assembly by joining only two. Then, after the glue cures, add one board at a time until the panel is complete. Use clamps every 6 to 8 in. along the joint to pull the boards together. After about 20 minutes, scrape off the excess glue, then wait another 30 minutes before adding the next board (Photo 14).

While the joining plates will ensure a reasonably flat panel, you'll need to plane the top to achieve a truly smooth and even surface. Use a jointer or jack plane to level the top. Make sure that the plane is razor-sharp, and work diagonally across the panel, taking light cuts (Photo 15). Use a cabinet scraper parallel to the grain to remove the plane marks, and then plane the edges parallel and to finished width.

Cut the top 1/2 in. longer than its final dimension with a circular saw or sabre saw. To make the finished cuts, first mount a 1/2-in. shank, top-bearing template bit in your router. Clamp a straightedge guide across the top panel, 1/4 in. from the end, and double-check that it's square to the panel edge. Then trim the end, allowing the router bearing to follow the straightedge guide (Photo 16). Use a scrap block clamped to the edge of the panel to prevent tearout at the end of the cut. Trim the opposite end using the same technique.

Rip and crosscut the two breadboard ends to finished size. Next, use a sharp block plane to cut the chamfered profile on the ends of each strip.

Use a slotting cutter to rout the 1/4-in.-wide x 1/2-in.-deep spline groove in the ends of the top panel. Note that the groove stops short of the panel edges. Use the same bit to cut a matching groove in one edge of each breadboard end.

Cut a spline with a 1/2-in. radius on the ends for each breadboard-end joint. Fit each spline into its groove in the top panel (Photo 17), install the breadboard ends and temporarily clamp them in place. Using a doweling jig and a long 1/4-in.-dia. bit, bore holes for machine screws that will fasten the breadboard ends to the top panel (Photo 18). When that's done, turn the top panel upside down and bore holes for the steel cross dowels using a brad-point bit with depth stop.

Remove the end pieces and use a sharp chisel to widen the four holes in each to 1/2-in. slots. Then, use a router



Begin assembly of the top by joining only two boards. After the glue cures, add one board at a time to reach full width.



Use a jointer or jack plane to flatten the panel. Set the plane to take a very light cut, and work diagonally across the top.



To trim the ends of the tabletop, use a template routing bit that follows a straightedge clamped to the



with edge guide to cut a mortise centered over each hole. Square the ends of the mortises with a sharp chisel as shown in the drawing.

workpiece.



Cut splines for the breadboard-end joints. A 1/2-in. radius on the ends matches the slot profile.



Clamp the breadboard end to the tabletop and use a doweling jig to bore through the strip into the end of the top.



Install the steel cross dowels, aligning the holes with the machine screwholes. Then tighten the screws.

Assemble the breadboard ends and the top panel, but don't use any glue on the joints. Insert a cross dowel in each tabletop hole, aligning the hole in the dowel with the machine screwhole in the breadboard end (Photo 19). Install the screws and washers to hold the ends in place.

Cut small blocks to plug the mortises over the screwheads, and glue the blocks in place (Photo 20). Let each block protrude from the edge of the strip. When the glue has cured, use a small block plane to trim the blocks flush.

Set the tabletop on the base, adjust it for proper overhang on all sides, bore pilot holes and install the 3-in. lagscrews and washers. Then, remove the top and sand all table surfaces to 220 grit.

### Finishing

We stained our table with a water-based aniline dye. To prepare for staining, wipe all surfaces with a damp sponge to intentionally raise the grain. When the wood is dry, lightly smooth the table with 220-grit sandpaper.



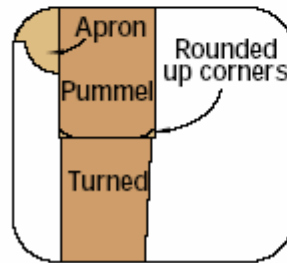
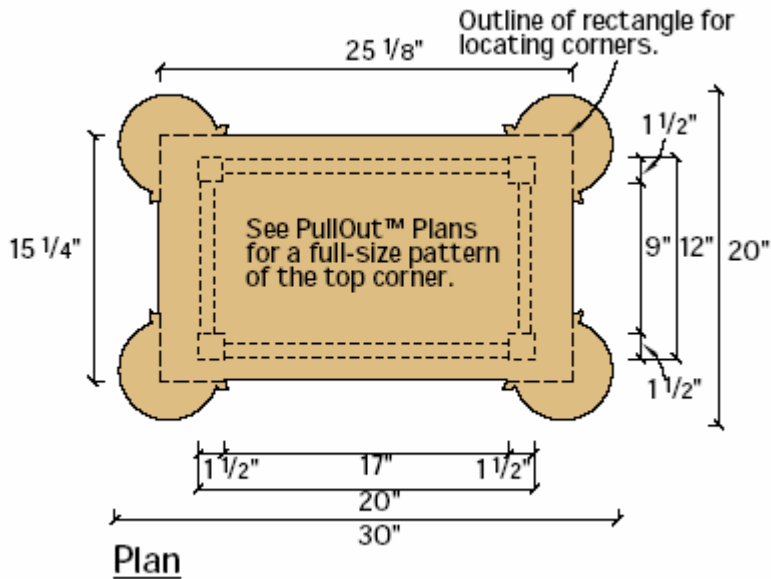
Apply the dye solution with a brush or rag, working quickly to avoid lap marks. Let the table dry overnight before applying the first coat of finish. If the wood surface is still a bit rough, lightly wipe with 320-grit sandpaper. Don't sand aggressively or you'll create light patches in the dyed surface. Clean with a tack cloth before proceeding.

We finished our table with four coats of Waterlox Original Sealer/Finish. Brush or wipe on the first coat and let it dry overnight. Lightly sand with 320-grit paper and remove all dust. For the remaining coats, let the finish sit on the wood for about 30 minutes, wipe off all excess, and let it dry over-night. When the last coat has fully cured, burnish with 4/0 steel wool and polish with a soft cloth.

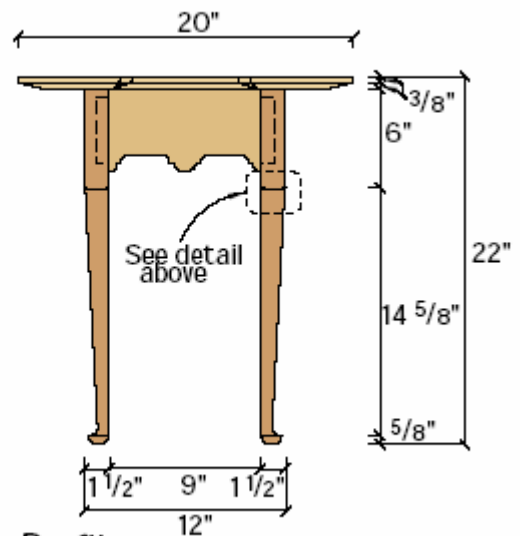
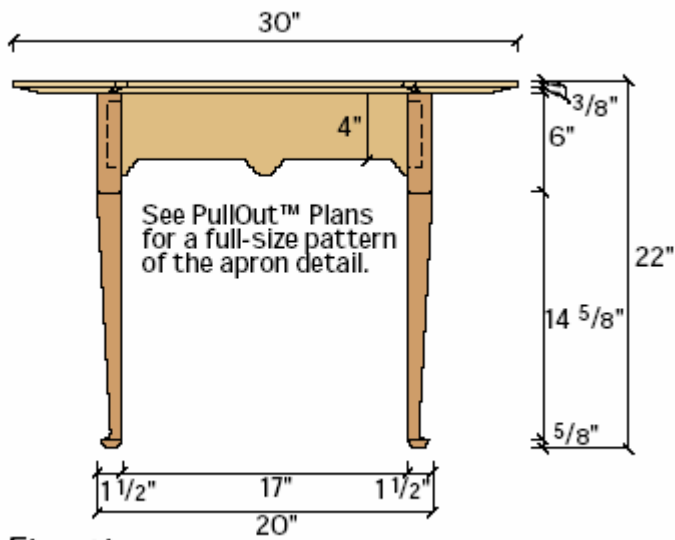
Cover the screwheads with small blocks glued into squared recesses. After the glue cures, trim the blocks flush.

# QUEEN ANN SIDE TABLES





**Detail of leg transition at top of turning**



**Schedule of Materials: Queen Anne Side Tables**

No.	Item	Dimensions	Material
1	Top	3/4" x 20" x 30"	Maple
4	Legs	1-1/2" x 1-1/2" x 21-1/4"	Maple
2	Long Aprons	3/4" x 5" x 18-3/4"	Maple
2	Short Aprons	3/4" x 5" x 10-3/4"	Maple

**Making Aprons** • These tables were made with simple mortise-and-tenon construction. Start by cutting the apron parts according to the Schedule of Materials. Next cut the 3/8" x 4"-wide x 7/8"-long tenons on the ends of the aprons.

**Making Pockets** • The last thing to do on the aprons is to drill the pocket holes for attaching the base to the top. Do this on a drill press with a 1-1/4" Forstner bit. Use a shop-built jig to hold the aprons in place for drilling.

**Leg Blanks** • Although the legs look complicated, they are not. The secret is an offset turning technique. First cut the blanks 1/8" longer than in the schedule. This gives you some room to work with when turning the pad on the end of the foot.

Use a straight edge to make an "X" from corner to corner on both ends of the blank. This will aid in finding the center as well as marking the offset. Now, on the bottom of the legs, determine which corner will face out. On the bottom of each leg, measure 1/2" from the center to the corner opposite the outside corner. This is the offset for the leg. Remember, the farther away from the center you go, the thinner the ankle (the area just above the pad) will be. Going any farther than 1/2" is dangerously close to having a leg pop off your lathe.

Mark a line completely around the blank 6" down from the top of the blank. To save time roughing the blank, lay out a 1-1/2" diameter circle on the bottom of the blank. Set your jointer to 45 degrees. Using the circle as a guide, lower the infeed table to the point where you can take the corner off, leaving about 1/32" to the circle. Go slow and joint to within 1/8" of the line where the turning starts. Now mount the blank in the lathe.

After mounting a blank between centers with the top towards the drive center, cut a small kerf at the line where the turning stops. Don't cut too far or you won't be able to remove the kerf. With a roughing gouge and skew chisel, turn a cylindrical blank from the saw kerf to the foot. At this point use a skew chisel round the corners of the pommel, the square part of the leg, where it meets the turned portion. Repeat on all the legs and you're ready to do the offset turning.

**Turning the Offset** • Before resetting the legs, measure up from the bottom 1/8" and from that mark another 5/8". Turn the lathe on and follow the marks around with a pencil. Take a parting tool and set it on its side. Cut a small incision at the 5/8" mark. This creates a shadow line from which to begin the offset turning. Set the lathe for its lowest speed and reset the tailstock so the leg center is mounted in the offset mark. This might look like an awkward setup but as you remove material the leg will turn with more stability. Finish the straight part of the leg with a skew chisel and the ankle with a roughing gouge. Finally, turn the pad foot as shown in photo 5. Now is the time to sand the legs. Start with 120 grit sandpaper and finish with 150 grit.

Now cut the 3/8" x 7/8" x 4" mortises in the legs, 5/16" in from the edge and 1/2" down from the top. Be careful when marking the locations of your mortises to make sure the turned feet face out. You'll notice that the mortises meet slightly at their bottoms. Simply plane away a little of the tenon where they meet. Now glue the base together. Start by gluing the short ends together and then attaching them to the long aprons.



**SCROLLING THE APRONS** • Lay out the scrollwork on the bottom of the aprons using the patterns supplied in the PDF from the "Making Pockets" step. Glue the patterns to 1/4" plywood, cut them out, trace the pattern on your aprons and cut them out on a band saw. Make relief cuts on the inside radii so you can scroll them out easier.



**DRILL POCKET HOLES** • Make sure that the bottom of the pocket is at least 7/8" from the top edge of the apron to prevent the screws from poking through.



**CUTTING CORNERS** • First mount a blank between centers with the top towards the drive center. Then use a saw to cut a small kerf on each corner at the line 6" from the top. Don't cut too far or you won't be able to remove the kerf. With a roughing gouge and skew chisel, turn a cylindrical blank from the saw kerf to the foot. At this point use a skew chisel to cut a small rounding up on the square corners of the top (see diagram). Repeat on all the legs and you're ready to do the offset turning.



After the glue is dry, finish sand the entire base, then lay out the holes for the cherry pegs. Any dark hardwood will do for the pegs, but cherry sands smooth and the end grain stains a dark color. Drill a 1/4" hole 1" deep. Follow suit with 3/16" and 1/8" bits, creating a tapered hole. After shaping 16 square pegs (tapered on four sides to a point), tap one in until you feel and hear it seat. The sound of the hammer hitting the peg makes a distinctly different sound when it seats. No glue is required for this as you are running a peg completely through the leg. It won't be coming out anytime soon. Cut the pegs, leaving 1/32" showing and sand until it is a rounded-over bump. Drill 1/4" holes into the pockets from the top of the base for attaching the top.

**Make and Attach the Top** • The top is the easiest part, but it can make or break the whole project. Wood selection is key. One hundred years ago, you could get extremely wide, highly figured curly maple at a low price. Amazingly most old porringers were one- or two-board tops. That's clear-figured wood 10- to 20-inches wide! Regrettably, those days are gone, and you will have to make do with the painfully high-priced, narrow lumber you get today.

Poplar is easy to get in a decent width and length, but I had to try the Amish sawmills in eastern Pennsylvania to find a retail source for decent curly maple (see the Schedule of Materials for one such mill). I managed to find decent 4/4 that's about 7" wide and a nice piece of 8/4 for the legs (I wasn't sure how thick the legs would be when I started so you could probably get away with 6/4 for leg stock).

The tops for both types of tables are the same size. They just require a different edge pattern. For the porringer top, lay out a 15-1/4" x 25-1/8" rectangle in the center of the top. Make a pattern for the top with 1/4" plywood as you did with the aprons. When you lay the inside corner of the pattern over the outside corner of the drawn rectangle, the outside of the radius should just touch the edge of the top. Trace the pattern on all four corners and jigsaw the top out.

For the "clover" shaped top, things are easier. Trace the double radius on all four corners. When you are done cutting the shape of the top out, chamfer the edges.

Chamfering the edges lightens the overall look of the table, and the chisel work underneath has a very sculptural feel. Before chamfering, use a marking gauge to mark a line that is half the thickness of the top on the entire outside edge of the top. Next, use an adjustable square to mark a line around the underside of the top. For the porringer the measurement is 1-1/2" and for the clover use a 2-1/4" line.

I chamfered the edges with a power planer. It's a tool used mostly by carpenters to remove material from doors when fitting and installing them. And in that role, this tool is unequalled. Finish sand the top to 150 grit.

The last assembly chore is to screw the top to the base. Begin by laying the top upside down on a blanket. Center the base on the top and screw it down with #10 x 1-1/2" wood screws.

In finishing the clover table, I sprayed on a custom-mixed aniline dye followed by three coats of clear finish. This turned the poplar to a mahogany-like color.

The porringer was a different story. To begin with, I hand scraped the top with a Stanley #80 cabinet scraper. With the lack of abrasive sandpaper 250 years ago, this is how the old tables were made ready to finish. Scraping with a properly prepared scraper blade will show up as rows of slight depressions (1/32" deep) with ridges about 2-1/2" apart. I stained the wood with aniline



**A WELL-TURNED ANKLE** • When you turn the lathe on, the leg's spinning creates a ghost image of what the finished leg will look like. Remove that "ghost" material with a roughing gouge. Stop at the second line that you drew earlier. Lay the gouge on its left side at the second line and slowly rotate the gouge clockwise as you go to the left. Go very slowly until you get the hang of how the wood reacts to the gouge.



**TURNING THE PAD** • The last thing to do on the legs is turning the pad on the foot. You do this last, as removing the foot material also removes the offset center. Reset the bottom of the leg into the original center and using a parting tool, turn away this "extra" length until it's about 3/8" diameter. This gives you some extra distance from the live center. Then using a small spindle gouge, turn the pad of the foot till it meets the 3/8" diameter. Sand the pad the same as the leg and you're done turning.



**SCULPTING UNDERNEATH** • When you've done all you can with a power plane, use chisels and planes to remove material down to the marked line.

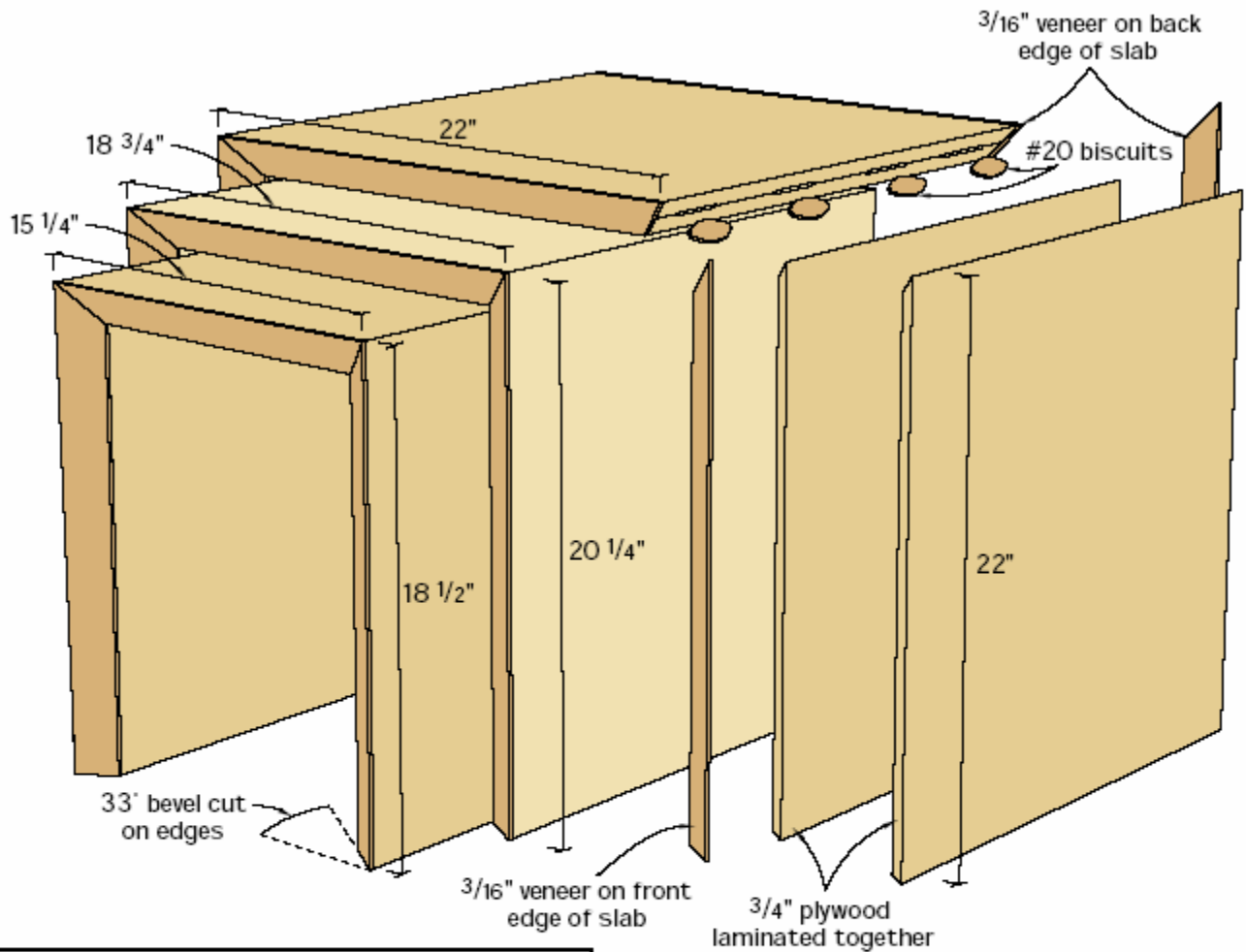
## How thick is it anyway?

When lumber yards count up the board footage that you buy, it's referred to as a tally. The "tallyman" carries a special notebook and a strange floppy stick called a "tallystick" (go figure!) with odd measurements on it. The lumber you buy is sorted by how many quarters of an inch thick it is. This system starts at 4/4 for 1" thickness on up to 16/4 for 4" lumber

dye and then applied one coat of boiled linseed oil and finished the table with four coats of dark shellac. This imparts a nice honey brown color to the curly maple and is easy to repair. Now where did I put that drink?

# NESTING TABLES





Nesting Tables			
No.	Item	Dimensions T W L	Material
4	Sides*	$\frac{3}{4}$ " x 22" x 22"	Birch ply
2	Tops*	$\frac{3}{4}$ " x 22" x 22"	Birch ply
4	Sides*	$\frac{3}{4}$ " x 21" x $20\frac{1}{4}$ "	Birch ply
2	Tops*	$\frac{3}{4}$ " x 21" x $18\frac{3}{4}$ "	Birch ply
4	Sides*	$\frac{3}{4}$ " x 20" x $18\frac{1}{2}$ "	Birch ply
2	Tops*	$\frac{3}{4}$ " x 20" x $15\frac{1}{4}$ "	Birch ply
6	Veneer edges	$\frac{3}{16}$ " x 2" x 96"	Birch/Maple

\*Sizes are of finished components, not cutting sizes.

## Make a Slab

Start the tables by ripping three sheets of plywood in half to just under 24" in width. You won't need all that width, but it will come in handy later. As for the lengths, using the full 96" is a little wasteful, but it makes gluing the two halves together easier.

After ripping the sheets, determine which three faces are most attractive and mark these as the outsides of the tables. Next glue the pairs together. To keep the sheets from sliding around during glue-up, pound a nail into each slab



Glue up the Slabs • Spacers underneath the slab allow the solid wood edging to hang over to evenly cover the edges. It doesn't take a lot of pressure to clamp the

about 1" from the ends. These ends will be cut off anyway, and it makes glue-up much easier. Stack the three pairs together, then clamp across the stack using stout wood braces to spread the pressure.

After the glue is dry, square off one end of each slab. Then cut the slabs to 68", 62-½" and 55" in length. Don't pitch the fall-off pieces, they'll be useful later. Next rip each slab to 23" wide to give you one flat edge. You could run one edge over a jointer, but the adhesive in plywood is murder on high speed steel knives. When you have one square edge, set the table saw's blade to bevel at 33° and rip the three slabs to 21-5/8", 20-5/8" and 19-5/8" wide respectively. Again, save the fall-off.

## Homemade Veneer

You're now ready to run some solid lumber to cover the plywood edges. I used soft maple edging on my birch ply tables.

Run out six lengths of 3/16"-thick solid wood for the edges. To plane wood that thin, you probably will have to put an extra board over the bed of your planer — most planers aren't designed for wood that thin.

With the strips ready, it's time to glue them to the slabs. Go find the fall-off from the bevel cuts and grab a couple other sturdy solid strips. Use the fall-off as a caul for clamping. By gluing the edges on the slabs with the bevel facing up, gravity is on your side. I also cheated a little by tacking the edge strips in place with a few small brads at either end. Once again, the extra inch in length will be cut off, so the nail holes won't show.

Glue the edging to the three slabs, then trim the edging flush to the plywood. I used a router with a flush-cutting bit for the back edges, and I used a jack plane to get the beveled edges nearly flush. Then I used a random orbit sander to flush the edges perfectly. To soften the edges I used some 120 grit paper and a block of wood to round over the sharp edges.

## Make Your Miters

The tables slip inside one another with a ¼" gap between each, so accurate cutting and spacing is important. To make the mitered corners and still maintain the grain pattern on the table tops, first crosscut the three slabs into three parts. Use the table saw with the blade set to 90°. Start by marking the middle of each slab and cut the top section from the middle of each slab, allowing the excess length to remain on the leg sections.

You're now ready to do the precision cutting, and you'll see quickly why a sharp blade is important. Start with the largest top (22" x 22") and set the blade bevel to exactly 45° and the rip fence to cut the miter exactly to the width of the top. If you have a left-beveling table saw you're in luck as the inside of the table is on the tearout side. If you have a right tilt, that sharp blade is important. Make the first bevel cut on one end, then spin the top and make the cut on the opposite end. Again, with a right tilt you have the extra difficulty of the first miter trying to slide under the rip fence. Adjust your cut for any variance and consider adding an auxiliary fence that fits tight to the table surface. Repeat this with all three tops.

You're now ready to make the miter cuts on the legs. Start with the 22"-high legs and work through the 20¼"- and 18½"-high legs, checking the spacing between the tables by "dry-nesting" as you go.

edges, and too much pressure will force the front edge caul to slide.



Center-cut Slab • The first miter cut on the center slab (on a right-tilt saw) will balance the fall-off piece on the blade. Be aware of possible kickback of the scrap piece.



Disappearing Miter Trick • Unless your rip fence is tight to the saw table, the miter will have a tendency to slide under the fence during the second cut (on right tilt saws). Recheck your measurements to accommodate this, or add a tight-fitting auxiliary fence to the standard rip fence.



A Little to the Left • Enough clamps and careful adjustment during glue-up will ensure tight miters and an evenly spaced opening from top to bottom.



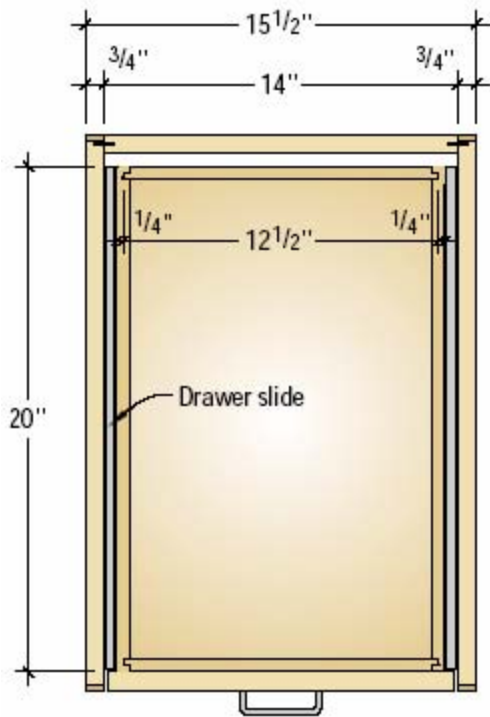
## Assembly

The hard part is done. The rest is biscuits and clamps. I used four #20 biscuits for each miter joint. With the biscuits cut, the fall-off pieces from cutting the slabs to length come into play. You'll stick them between the legs while gluing up the miters. It makes glue-up much easier. First check the internal dimension between the miters on each table top. Try to be as exact as possible, then cut spacers from the fall-off pieces for each table. Finish sand the interior faces of each table and the beveled front edge of each piece before assembly. Put glue on the miters and biscuits and glue the tables. Pay careful attention to the miter joint where the top and legs join. Unlike the hardwood edging, you only have about 1/16" of veneer to sand to match the joint.

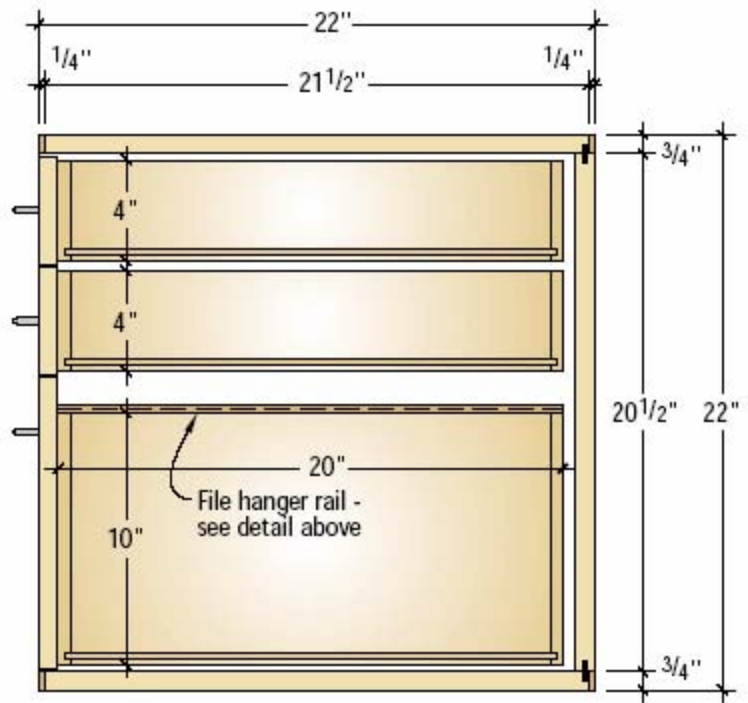
With the tables assembled sand the outer faces, paying extra care with the mitered joint. You're now ready to finish. I chose to simply add a few coats of clear finish to the tables, but any number of stains to match an existing decor will work well.

# MOBILE FILE CABINET

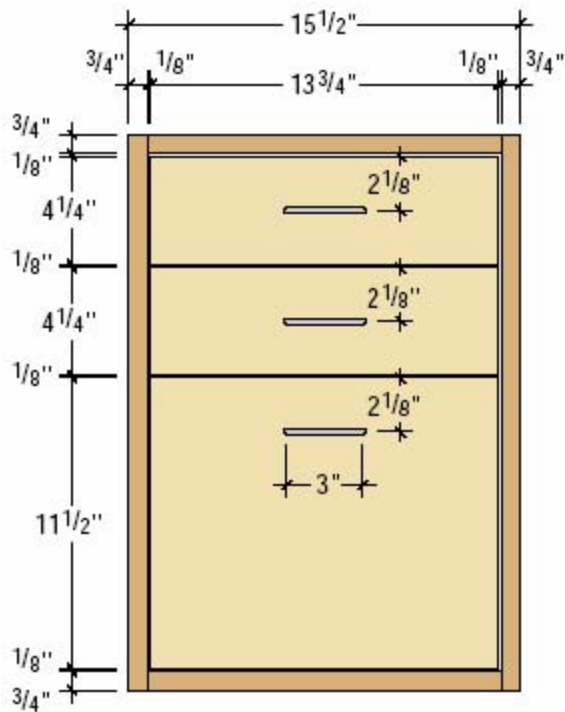




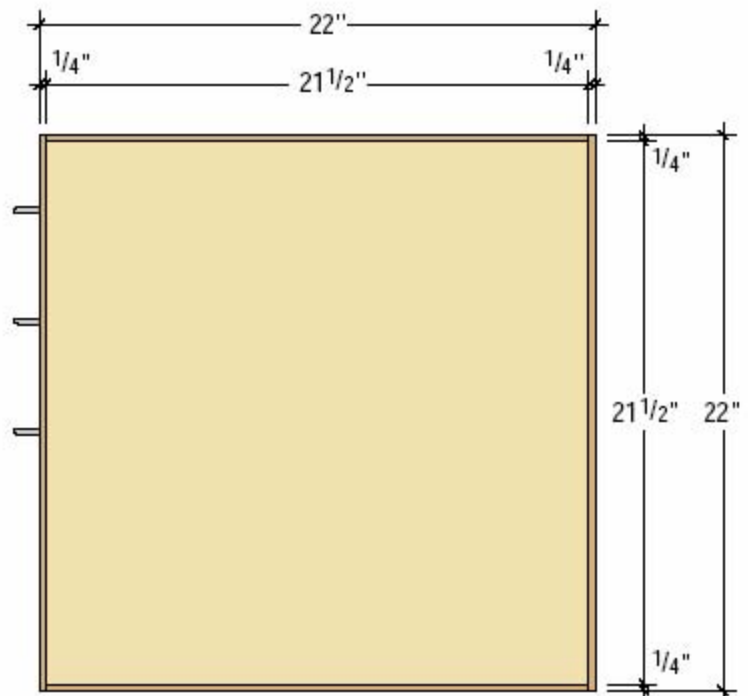
Horizontal section



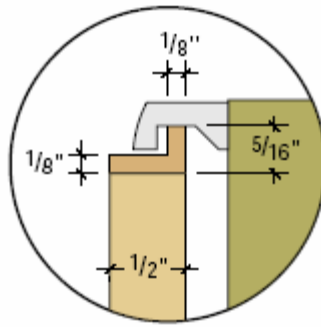
Profile section



Elevation



Profile



Hanger rail section

## Cutting and Edge-banding the Cabinet Parts

First inspect the edges of the plywood, because the joint between the solid-wood edge-banding and the plywood panel needs to be crisp. Although it is tempting, you can't assume that a factory edge is up to snuff, and a quick glance may reveal numerous dings, dents and scratches. I often end up ripping  $\frac{1}{2}$ " off of each factory edge. To minimize tear-out on cross-cuts, I use a sharp plywood blade and a zero-clearance throat plate. Feeding the panels more slowly, good-side facing up, also helps keep the cuts free of tear-out.

Once your panels are neatly trimmed to size, it's time to mill some edge-banding. I use cherry because I like the color that it darkens to, but substitute as you like: I've also used walnut with pleasing results. I simply plane the cherry to  $\frac{3}{4}$ ", then rip it into  $\frac{1}{4}$ " strips. Precision is critical, as inaccurately sized strips will either overhang the plywood panels and need to be trimmed, or they won't cover the edge entirely and you'll have to make new ones. I usually mill some extra stock in case I notice a defect in one of the strips that wasn't evident beforehand. The cut list calls for 12 strips, which allows for one extra.

I own a few clamps that are designed for attaching solid-wood edge-banding, but they end up gathering dust for several reasons. To edge-band a number of panels requires more clamps than I'm willing to buy, and some clamps seem to lack the clamping pressure that I'd like. I also hate lugging heavy, clamp-laden panels around the shop while I wait for glue to dry. My solution is probably not original, but it is highly practical: I use blue painter's-grade masking tape. It is quick, inexpensive and lightweight. You can even stack a series of panels on top of each other to use space efficiently. And because an ounce of prevention is worth a pound of cure, I use just enough glue to create a tiny amount of squeeze out, which I then wipe up.

Because the edge-banding may overhang a bit, I use a router with a flush-trim bit to carefully remove the offending cherry; a careful touch with a random-orbit sander will remove any glue residue left over. The side panels need to be edge-banded on all four edges, and the top and bottom panels get edge-banded on their front and back edges only. The back receives no edge-banding at all. As a word of caution, veneered plywood is notoriously unforgiving when it comes to sanding. I've learned the hard way that there is no adequate method for repairing sand-throughs in the top layer of veneer, so work carefully to ensure that you'll have to do a minimal amount of sanding.

## Assembling the Cabinet

I use biscuits here because they are strong and reliable. In addition, they are invisible once the cabinet goes together, and I didn't want any filled nail holes or plugged screws interfering with the lines of the piece or interrupting the flow of the grain.

I assemble the cabinet in two steps: First I sandwich the back between the top and



During the second stage of cabinet assembly, laying the cabinet on its side keeps you from fighting with gravity. The cabinet comes together relatively easily, and the alignment is a snap thanks to the biscuits.



Go slowly while rounding over the edges, as the cherry can tear out and splinter if a cut is rushed. The roundover is key to the smooth, clean feel of the piece.

bottom, and once the glue there has set, I sandwich that assembly between the sides. For the first step, I clamp the three parts together and line them up precisely. After marking the locations for biscuits, I pull off the clamps and cut the slots. After dry-fitting, I glue it up and wait a few hours. For the second step, I place one side panel flat on the table, inside facing up. I position the top-back-bottom assembly correctly on top of that, and finally place the remaining side on top of it all. With a couple of clamps holding the parts snugly in place, I mark the biscuit locations, then repeat the process I used on the first half of the cabinet assembly.

With a roundover bit in a router, I ease each edge, which softens the sharp lines of the cabinet. By routing the edge-banding after the cabinet is assembled, the inside corners of the edge-banding flow together smoothly, and the eye is swept through graceful little curves that add a fine detail to the finished piece.

## Making the Drawers

I build the drawers out of Baltic birch plywood because it is attractive, stable and inexpensive. If you like, you can mill solid-wood panels for the drawer parts – if you do, dress the stock to  $7/16$ ", as the Baltic birch plywood sold as  $1/2$ " actually measures out at  $1/16$ " less. Refer to the cut list for the quantities and dimensions you'll need here. Once you've got the drawer parts cut, rip a groove in the bottom of each – you could use a dado blade here, but for a small number of parts like this, I don't take the time to change blades: I just make two passes side-by-side for the  $1/4$ " groove.

For this project, I use a rabbet-dado joint to lock the drawer parts together. It is a strong mechanical joint with plenty of surface area for glue. I sketch it full-sized on paper, then set up my table saw to cut the dado on the inside face of the sides.

I use my miter gauge with a stop attached to make sure the dados are cut at a consistent distance from the ends of the drawer sides. This will take two passes. I then cut the rabbet in the drawer fronts and backs with a similar setup – just change the blade height and move the stop on your miter gauge to correctly position the cut. Test the fit of the joint now while you're still set up to make changes.

Once the rabbets and dados fit snugly, cut out the drawer bottoms. During glue-up, check that the drawers are square by measuring their diagonals. This ensures that the drawer fronts will line up evenly. If a drawer is slightly out of square, clamp it across the longer diagonal and apply pressure until it conforms. Once the glue dries, it should remain in the correct position.

So that hanging file folders can be easily slid forward and backward in the bottom drawer, you'll need to make two rails that mount on the top edges of the drawer sides. I mill two 20" strips of cherry to  $1/2$ "x  $5/16$ ". I then make two cuts with the table saw to create the "L"-shaped piece needed. The piece can then be screwed into the tops of the drawer sides – be sure to countersink the heads so that they don't stick up and interfere with the movement of files across the rails.

## Installing the Drawers

I use 20" Accuride slides because they're smooth and reliable. Each drawer requires one pair of slides, and each slide can be separated into two pieces: The larger one mounts inside the cabinet, and the smaller one attaches to the drawer. I keep the slides together during installation, and I use plywood spacers to lay them out evenly. With the cabinet on its side, I insert the lower spacer ( $4-5/8$ " wide), the first drawer slide, the middle spacer ( $6-1/4$ " wide), the second drawer slide, the upper spacer ( $2-7/8$ " wide), and finally the upper drawer slide. Then I simply screw the slides in place with three screws. After flipping the cabinet onto its other side, I repeat the process.

With the cabinet upright on my bench, I push the bottom drawer halfway in and place  $1/8$ " shims underneath it to establish a consistent and correct height for the drawer. I pull out the slides (it should be a snug fit, but not excruciatingly tight) and



Using spacers to position the drawer slides eliminates one of the leading causes of poor-fitting drawers: inconsistent spacing of slides. Before putting in the spacers, be sure to brush out any sawdust or woodchips that may have accumulated inside the cabinet. A  $1/16$ " discrepancy at this point could cause an annoying misalignment that you'll have to backtrack to correct later on.



A consistent reveal is key to the crisp feel of the piece. The shims shouldn't bow the cabinet sides out at all, but should fit snugly to ensure that the drawer front is centered and that the reveal is even on both sides.



line them up with the front edges of the drawer. I screw in the front edges of the slides, and then pull the drawer out all the way. With the shims still under the back edge of the drawer, I screw in the back-ends of the drawer slide. The top two drawers go in the same way, except I use thicker shims on top of the bottom drawer because it receives a taller drawer front to hide the tabs on file folders that protrude above the drawer box.

Trim your false drawer fronts to size on the table saw and iron on veneer tape to all four edges. To attach the drawer fronts, I remove the top two drawers and push the bottom drawer all the way into the cabinet. I then set the drawer front into position, using 1/8" shims on the bottom and sides to ensure a correct reveal all the way around. I use spring clamps to hold the drawer front in place, then I run screws into it from the inside of the drawer. The middle drawer front attaches the same way, but the top one doesn't have room to get a clamp around it. I solve this dilemma by dabbing some quick-set epoxy on the back of the drawer front then pressing it into position. Flipping the cabinet onto its back and shimming around the edges of the drawer front assures that it will remain aligned. Once the epoxy has cured, the drawer front can be secured with screws like the others.

To attach the drawer pulls, I make a template from a scrap of 1/4"-thick plywood and cut it to the same size as the upper drawer fronts. I draw lines across the vertical and horizontal centers of the template, and center my pull relative to these crosshairs. Once the holes are drilled on your template, you can place it directly on the drawer fronts and drill through your pre-positioned holes. Using a template like this might seem like extra work but, it saves time and guarantees consistent placement on each drawer front.

## **Finishing it Up**

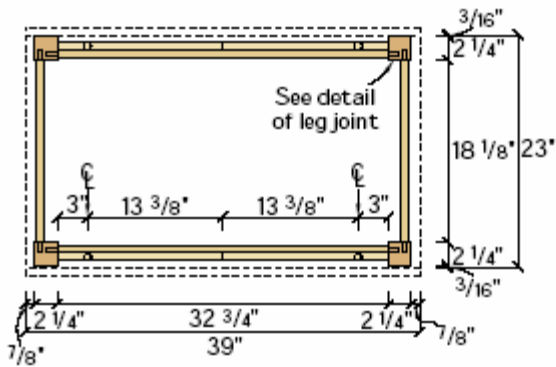
For an office environment, I favor the durability of oil-based polyurethanes, although if I were building this for my home, I might be tempted by the hand-rubbed feel of the newer gel varnishes. When your finishing process is completed, simply screw on four 2"-diameter wheels (locking casters will keep it from rolling around while you open and shut drawers), and bolt on the drawer pulls.

And now, the moment you've been waiting for: Go ahead and fill those drawers with all the stuff that usually clutters up your desk.

While I can't promise that you'll be more efficient or productive as you tend to whatever paperwork keeps you away from the workshop, I'm confident that you'll enjoy the smooth, crisp look of your new rolling file cabinet. And the clean desktop isn't half bad, either.

# DROP-LEAF TABLE





Schedule of Materials: Drop-Leaf Table

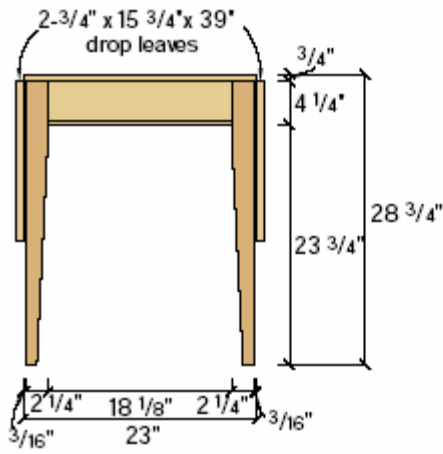
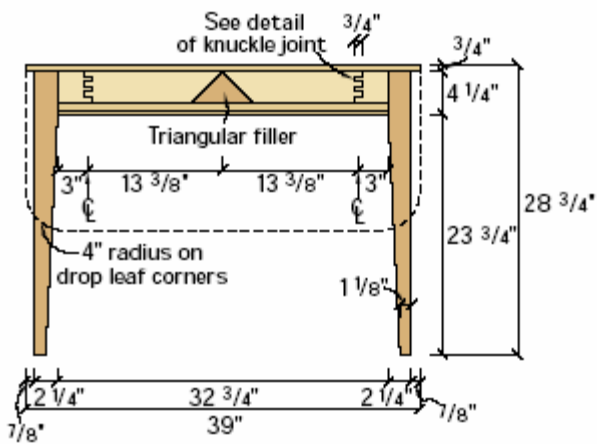
No.	Item	Dimensions T W L	Material	Notes
1	Table top	3/4" x 23" x 39"	Mahogany	
2	Leaves	3/4" x 15 3/4" x 39"	Mahogany	
4	Legs	2 1/4" x 2 1/4" x 28"	Mahogany	
2	Short aprons	3/4" x 4 1/4" x 20 1/8"	Mahogany	1" TBE; 1/4" offset
2	Long aprons	3/4" x 4 1/4" x 34 3/4"	Mahogany	1" TBE; 1 1/4" offset
4	Leaf supports	3/4" x 3 1/4" x 18"	Mahogany	
2	Triangles	3/4" x 3 1/4" x 6 1/2"	Mahogany	

TBE- Tenon, both ends; \* cut to fit

Supplies

- 4 Hinges for drop-leaves; Rockler part number 29249; \$4.29 for 2 hinges
- 6 Tabletop fasteners; Rockler part number 34215; \$1.99 for 8 fasteners

Rockler can be reached at [www.rockler.com](http://www.rockler.com) or 800-279-4441



### Start with the Basics

After cutting all your rough stock to length, surface your wood down to 3/4" thick (except for the legs). The original 19th-century table's top was only one board. You can still find mahogany in these widths, but I couldn't. To obtain the appropriate width, I had to glue up two boards for both the leaves and the tabletop. I used three biscuits at each joint to keep the boards aligned during glue-up. Also, if you can't get 2 1/4"-thick stock for the legs, ask for turning blanks at the lumber store instead; you might just get lucky.

### Mortises, Tenons and Tapers

The first step is to make mortise-and-tenon joints where the aprons join the legs. I made the tenons using a dado stack on the table saw. Cut the shoulders as shown in the photo on the next page. Make the tenons 3/8" thick, 1" long and 3 1/4" wide. After cutting your tenons, cut a groove in the aprons for the tabletop

fasteners, which will attach the top to the table's base. Make this slot by cutting a kerf in the aprons that's 7/16" down from the top edge. For a nice detail, I routed a bead on the bottom edge of the aprons.

The mortises on all the legs are made 1-7/16" from the inside for the short aprons and 7/16" from the inside for the long aprons as shown in the diagram below. Cut your mortises on the legs; I used a mortiser, but you can use a chisel or Forstner bit.

The original table had turned legs, but in order to simplify things, I tapered the legs. Tapering jigs for the table saw can be tricky, so I used a band saw to cut the tapers about 1/16" shy of my line and then cleaned up the cut on the jointer. The taper should start 1" below where the aprons end and result in a leg that tapers to one-half the original thickness. Remember: taper only the sides that have mortises.

## Install the Hinges

After tapering, sand the legs and aprons. Start with 100-grit sandpaper, move up to 150-grit, then finish with 220-grit. Next, glue up the legs and aprons and clamp. After gluing up the base, turn your attention to the top.

Install the hinges that connect the tabletop to the leaves. Use two on each side, and place them 7¼" inches from the end to allow room for the leaf supports. Lay out the location of the hinges by first placing a 1/16" spacer (I used pieces of plastic laminate) between the leaf and tabletop. Clamp the pieces together, put the hinges down and trace them with a pencil. Use a router with a straight bit to hog out most of the area. Then use a chisel to define the corners. Install the hinges and make sure they work properly.

A 4" radius on the outside corners of the leaves on the original table was a nice touch. In order to recreate this, I traced the curve from the original and made a template using a piece of plywood. Cut the shape to size on a band saw and then use the template with a router and straight bit to finish the radius.

## Make the Leaf Supports

To keep the leaves upright, assemble two supports for each side. These are basically two pieces of wood finger-jointed together to form a "knuckle" joint hinge. The ½" knuckle joints are made on a table saw using a finger-jointing jig. Round the edges of the "fingers" with a rasp or sandpaper so the joint pivots. Then drill a ¼" hole through the fingers and tap a ¼" dowel in place. Instant wooden hinges. One note: you'll have to cut a notch in the two supports so they'll clear the hinge barrels on the top. Mark the location of the notch when you dry-assemble the table. The angle cuts on the supports form a triangular hole against the apron. Cut a triangular piece of mahogany to fill this space, being careful not to let the filler rub against the supports. For simplicity, you may use brass hinges instead of knuckle joints.

## Sanding and Finishing

Remove the hinges from the tabletop and sand the table. Because the top will be the most visible surface, I chose to go up to 220 grit. The bottom requires only 150 grit. In order to simplify finishing, I waited to attach the supports until after finishing. This requires masking off the area where the support will be glued. For the finish, I applied a dark mahogany stain made by United Gilsonite Laboratories (P.O. Box 70, Scranton, Penn. 18501; 800-272-3235; [www.ugl.com](http://www.ugl.com)). The color is called "118 Dark Mahogany," order number 11811, LR1294. Both the phone number and the website can refer you to a retailer in



To cut the tenons, use a dado stack on the table saw. Reduce the tenon in thickness by 3/16" on each side.



Cut ½" shoulders on each side of the aprons.



You will need to fasten the tabletop using tabletop fasteners, which requires making a kerf in the aprons. I made this kerf on the table saw 7/16" from the edge and ¼" deep.

your area. After letting the stain cure, I applied four coats of clear lacquer.

## Final Construction Details

After the lacquer has dried, attach the supports and the triangle with glue and nails through the inside of the aprons. Place the top on the base and make sure the supports keep the leaves level. Now attach the top. Because of the expansion and contraction of wood, you will need to attach the aprons to the tabletop using tabletop fasteners. These fasteners are available from Rockler and are listed in the Schedule of Materials. The tabletop fasteners are installed by simply screwing the fasteners into place. Because the wood will move more in width than in length over time, be sure to leave more space on the long apron sides for the fasteners.

Overall, I was extremely pleased with the results of my project. I think my great-great-grandfather would be proud to know that I've continued the family tradition.



I made the mortises using a mortiser. In order to form the holes more safely, you should think of the path of least resistance. Instead of just going in a straight line from left to right or right to left, make two holes with a slight gap between. Then clear out the gap. If you simply work in a straight line, the mortiser's chisel could bend or break.

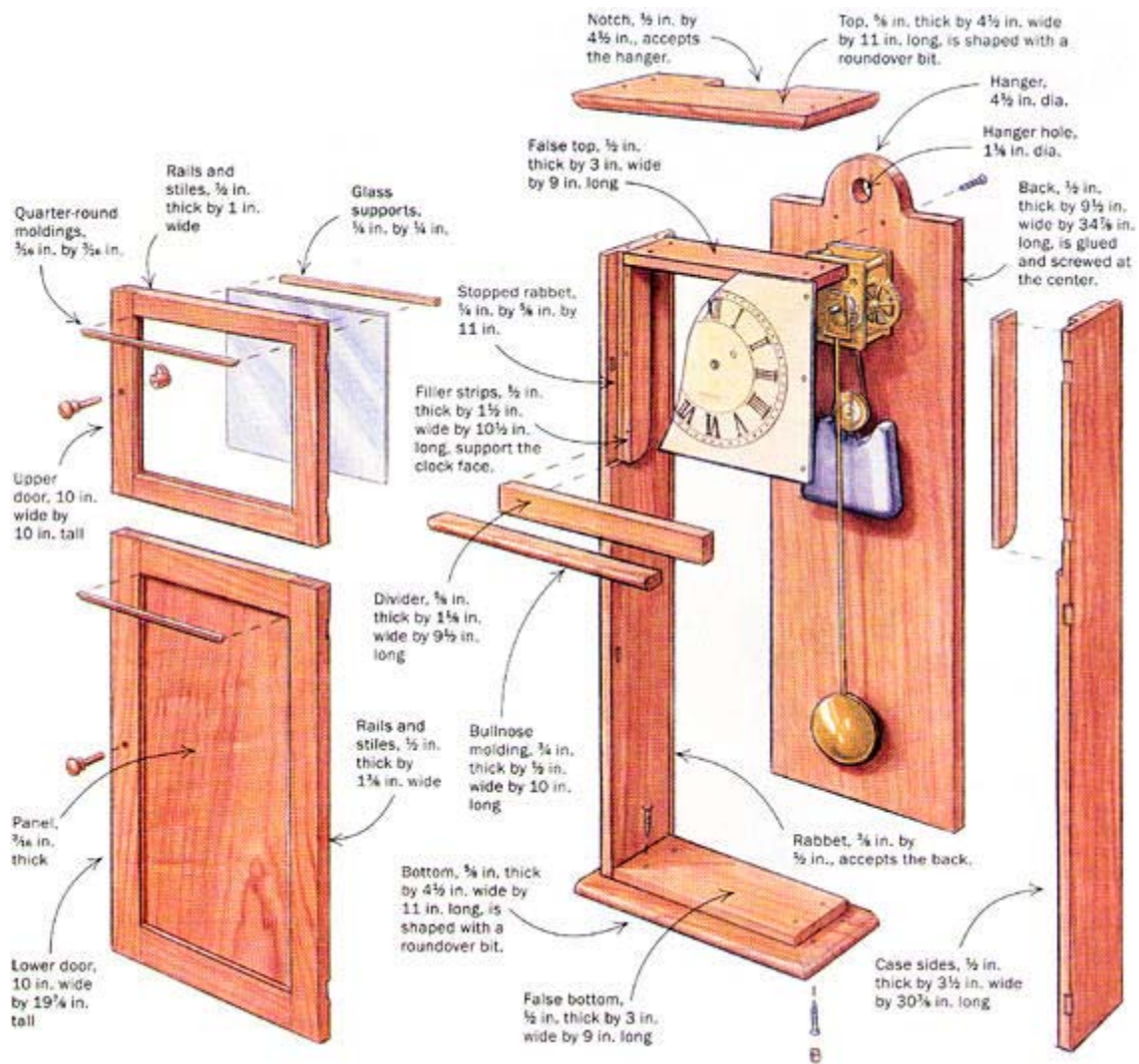


I tapered the legs on a band saw, then ran the legs over the jointer in order to make them smooth.



# SHAKER WALL CLOCK





### Make the case to fit the clock parts

I never start construction on a clock until I have the movement, dial and hands. Having these at the ready makes it much easier to fit the dial and allow proper clearance between the shaft, the hands and the glass, as well as the clock movement and the case back. I hate surprises.

Once you have the clock parts, you can cut the sides of the case to size. Then cut  $\frac{3}{8}$ -in. by  $\frac{1}{2}$ -in. rabbets to accept the back. The front of each side receives a stopped rabbet to accept the face. You could simply make the clock an inch wider and avoid cutting rabbets in the front, but -- for reasons more aesthetic than historical -- I prefer to keep proportions closer to the original.

Next, cut the top and bottom pieces and mold them with a quarter-round router bit. The back of the top is notched out 1/2 in. by 4-1/2 in. to allow for the hanger on the back of the case.

On the original, the top and bottom were merely nailed onto the sides. I use long, thin screws and plugs. Another alternative is dowels. I once had a student who attempted to use sliding dovetails, only to discover that they lasted from 12 until noon. With only 9/16 in. of overhang on the sides and part of that cut away by the rabbet, the remaining end grain is extremely fragile.

I prefer to use a false bottom and top, which not only make glue-up easier but also act as a doorstop in front and create rabbets to house the back. Glue the false top and bottom to the sides using butt joints. Once the glue dries, center the actual top and bottom on the case and screw them into the sides.



The false top and false bottom are simply butt-joined and glued to the sides. The actual top and bottom will reinforce this joint. Before the glue sets, check to make sure the case is level and square.



The top is screwed straight into the sides, then plugged and trimmed flush.



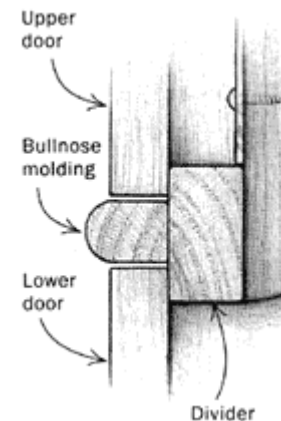
The back is screwed only near the center. The edges are then nailed into place, allowing for seasonal movement.

The clock back simply butts up against the false top and bottom and is screwed into place from behind. However, this is where wood movement comes into play. The back is about 9-1/2 in. wide, which means that a piece of flatsawn cherry will move about 5/32 in. (from 6% moisture content in winter to 13% moisture content in summer). If you can locate or glue up a quartersawn back, the amount of movement is cut in half, to 5/64 in. So, if you're building in the summer, when the back has reached a moisture content of near 12% or 13%, the back can be fitted tightly. In the winter, when the moisture content of the back is closer to 6%, a gap of just under 3/64 in. is required on each side. Also, leave a small gap where the half-round hanger protrudes through the top.

Another change I make is to increase the size of the hanger hole, from 1/2 in. to 1-1/8 in., to allow the clock to be hung on a Shaker peg. The back is merely nailed into place, with a dab of glue in the center to ensure that wood movement is equal in both directions.



The horizontal divider is sized to act as a doorstop for both doors. It is set into the stopped rabbet that holds the clock face.



Bullnose molding separates top and bottom doors. Shape the profile using a roundover bit, then cut it to fit flush with the sides.



Next, let in the two-piece molded divider between the top and bottom doors. A horizontal divider, which also acts as a doorstop, is set into the rabbet flush with the face, and then a bullnose molding is glued over it.

At this point it pays to plan ahead. Measure the depth of the movement to check that you have proper clearance for both the shaft and the glass of the door. Mechanical movements are either attached directly to the back -- as I've done -- or sit on a shelf. Quartz movements, being much shallower, are usually attached to the dial. If you use a spacer, the movement can also be attached to the case back. Planning ahead allows you to position the dial so that the hand shaft is close to the glass but does not touch it. Once you've established the location of the dial, glue two vertical filler strips to the inside of the case. Thick metal dials like the one I used can be screwed to these strips directly, while thin metal or paper dials should be adhered to 1/4-in.-thick plywood backings.

### Simple joinery for the doors

The doors are relatively straightforward, mortised and tenoned at each corner. Cut haunched mortise-and-tenon joints on center, and make sure to offset the glass and panel grooves to allow room for the thumbnail profile along the fronts. The frames are 1/2 in. thick, and the bottom panel is only 3/16 in. thick. The 3/16-in. quarter-round moldings are added after the panel is in place. On the top door, add the quarter-round moldings to hold the glass on the outside, and add 3/16-in. glass supports, nailed from the inside, to hold the back of the glass.



The quarter-round molding is shaped on the router, then mitered to fit the door. Becksvoort simply glues the molding to the rails and the stiles.



After the glass is set into the rabbet, small glass supports are nailed into place.



Before applying glue, carefully dry-fit the doors and see that they fit the case.

As far as a finish goes, I am partial to Tried & True Varnish Oil. It leaves a silky, penetrating finish that I prefer. More accurate for this clock would be a shellac finish, which was used on the original.

When hanging the clock from a peg board, carve a 1/2-in. flat spot at the top of the peg where it meets the hanger, leaving a slight ridge, to keep the clock from sliding forward on the peg. If the peg board is 3/4 in. thick, use a 3/4-in. spacer behind and near the bottom of the clock. A toggle bolt or similar anchor will attach the spacer to drywall or plaster if there is no stud nearby. Once the clock is perfectly plumb and running smoothly, drill a hole through the back into the spacer and anchor the clock with a screw. This keeps it from shifting during winding or an accidental bump.

# GREEK KEY DESK



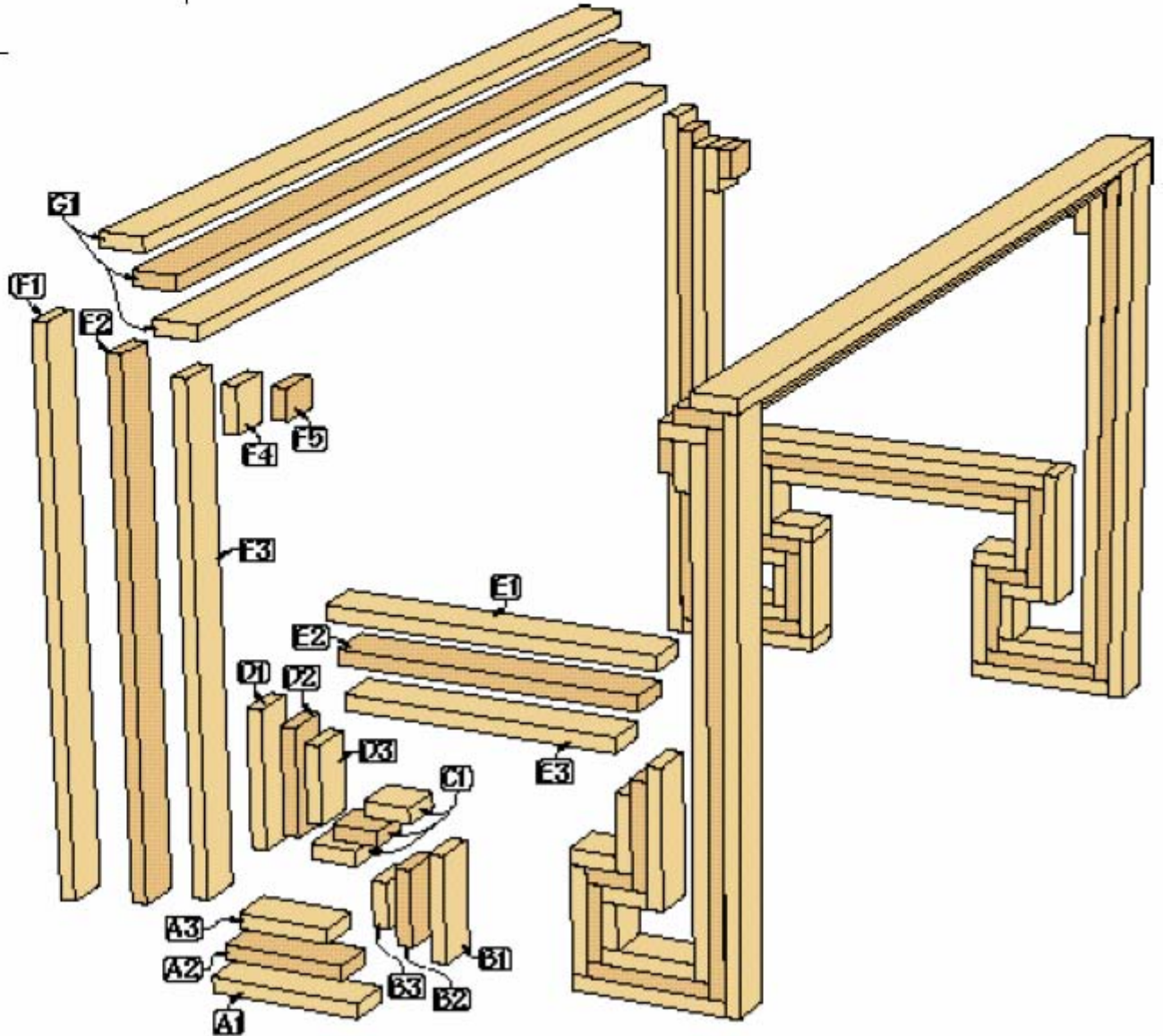


Schedule of Materials:

Greek Key Desk

No.	Item	Dimensions T W L
4	A1	$\frac{3}{4}$ " x $2\frac{1}{4}$ " x $7\frac{1}{2}$ "
4	A2 (*all)	$\frac{3}{4}$ " x $2\frac{1}{4}$ " x 6"
4	A3	$\frac{3}{4}$ " x $2\frac{1}{4}$ " x $4\frac{1}{2}$ "
4	B1	$\frac{3}{4}$ " x $2\frac{1}{4}$ " x $5\frac{1}{4}$ "
4	B2 (*all)	$\frac{3}{4}$ " x $2\frac{1}{4}$ " x $3\frac{3}{4}$ "
4	B3	$\frac{3}{4}$ " x $2\frac{1}{4}$ " x $2\frac{1}{4}$ "
12	C1 (*4)	$\frac{3}{4}$ " x $2\frac{1}{4}$ " x $2\frac{1}{4}$ "
4	D1	$\frac{3}{4}$ " x $2\frac{1}{4}$ " x $6\frac{3}{4}$ "
4	D2 (*all)	$\frac{3}{4}$ " x $2\frac{1}{4}$ " x $5\frac{1}{4}$ "
4	D3	$\frac{3}{4}$ " x $2\frac{1}{4}$ " x $3\frac{3}{4}$ "
2	E1	$\frac{3}{4}$ " x $2\frac{1}{4}$ " x $16\frac{1}{2}$ "
2	E2 (*all)	$\frac{3}{4}$ " x $2\frac{1}{4}$ " x 15"
2	E3	$\frac{3}{4}$ " x $2\frac{1}{4}$ " x $13\frac{1}{2}$ "
4	F1	$\frac{3}{4}$ " x $2\frac{1}{4}$ " x $27\frac{3}{4}$ "
4	F2 (*all)	$\frac{3}{4}$ " x $2\frac{1}{4}$ " x $26\frac{1}{4}$ "
4	F3	$\frac{3}{4}$ " x $2\frac{1}{4}$ " x $24\frac{3}{4}$ "
4	F4	$\frac{3}{4}$ " x $2\frac{1}{4}$ " x $2\frac{1}{4}$ "
4	F5 (*all)	$\frac{3}{4}$ " x $2\frac{1}{4}$ " x $1\frac{1}{2}$ "
6	G1 (*2)	$\frac{3}{4}$ " x $2\frac{1}{4}$ " x 48"

\*Indicate darker wood pieces



The desk is constructed by laminating strips of wood together. By making some of the layers shorter than others, you make the joints for attaching that lamination to another. As a result, all of the materials for this project must be machined precisely. Any variances will show up as gaps in the joints after final assembly.

## Tricks to Dead-on Components

There are two tricks to make sure your pieces are all the right size and won't slide around when you glue them up. First, when cutting out the pieces for this desk, I found it easier to cut them grouped by letters, such as A1, A2, A3. A1 is the longest piece, A2 is 1½" shorter, and A3 is 3" shorter than A1. Because all of the desk's components are stepped like this, I came up with a quick way to make these cuts. Cut the longest piece first using a stopblock on the fence of your table saw's sled or miter gauge. Then take two scrap pieces of ¾"-thick wood from the project and glue them together to form a 1½"-thick spacer. Hold this piece against the stop block to cut the second piece. Then make a second spacer using two more scraps and use both spacers to cut the third piece. This method makes the desk components perfectly sized. Cut out all your pieces, then get ready to glue them up.

To keep your pieces from sliding around during gluing, make a jig from two pieces of melamine-faced particleboard put together lengthwise at a right angle to create a straight fence. Then put a small piece of wood on the end of the jig to act as a stop. This gives you a square corner to work out of.

## On to Assembly

Start by gluing the E pieces and two sets of the D pieces together to form a shallow "U." (When gluing these step-mitered joints, I found it best to use polyurethane glue. It provides a strong bond for this type of joint.) I dry-fit all the parts to be sure I would be able to get all the pieces to come together tightly. After applying the glue, clamp the length of the E pieces first. By using ¾" spacers at the ends of the D parts, applying even clamping pressure is easy on the lengths of the D parts. Make two of these assemblies.

The next assembly consists of the C, B and A parts. The glue-up of this assembly is done the same way as the E and D assembly. Make four of these assemblies.

Next glue one of the E and D assemblies and two of the ABC assemblies together to form the Greek key part of the end assembly. I had to clean the glue squeeze-out at the joints and pare the wood down in a couple places with a chisel to get a tight fit. If your pieces don't come together tightly, your joints will not be strong.

For the next assembly, put two glue-up jigs at a right angle. This makes the glue-up of the two legs (F) to the Greek key assembly easy to keep square.

Glue the F4 and F5 pieces to the tops of each leg. Use a stop block to keep the pieces even with the end of the F3 piece of each leg.

The G pieces attach the two end assemblies together. It is easier to control gluing and alignment of the G1 pieces if they are glued into place one at a time, starting at the bottom and working up.

## Sanding and Finishing

I used a random orbital sander, going up to 150 grit sandpaper. Break all the sharp edges with a sanding block using 150 grit sandpaper. For a top coat, I applied three coats of a clear finish.

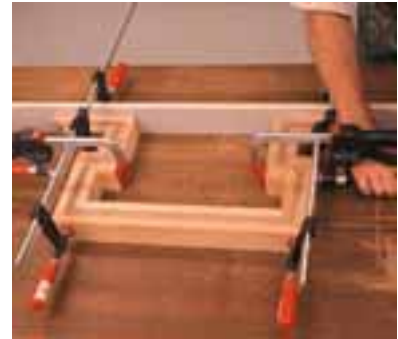
For the top I used a ½"-thick piece of 30" x 50" tempered glass polished on all edges. (To keep the glass in place, use six clear door bumpers applied to the top



Here I'm cutting the A2 piece with one of the spacers in place. To cut the A3 piece, use two of the spacer blocks.



Here I'm clamping the E and D pieces together. Use spacers on the ends of the D parts to hold them in place against your gluing jig.



This is where your parts start to look like something. Joining the three assemblies creates the Greek key at the bottom of the base.



When assembling the legs to the Greek key, I used a spacer (seen at the bottom of the photo above) to keep the legs spaced properly while gluing-up.

stretchers.) It wasn't until I completed this desk and had the glass top in place that I appreciated how striking it looked.



The stop block clamped at the end of the glue-up jig keeps the F4 and F5 pieces level with the top of the G3 piece.



Start by gluing G1 in place, then work your way up. As you can see in the photo, I clamped the entire leg to my assembly bench to make things easier.

# PICNIC TABLE



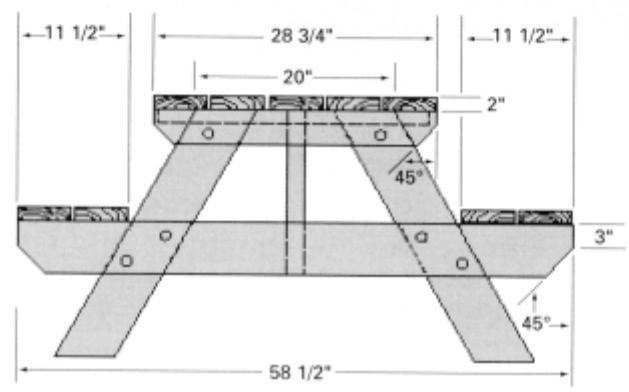
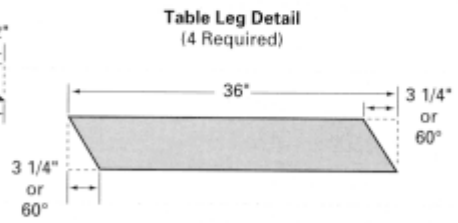
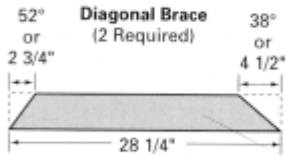
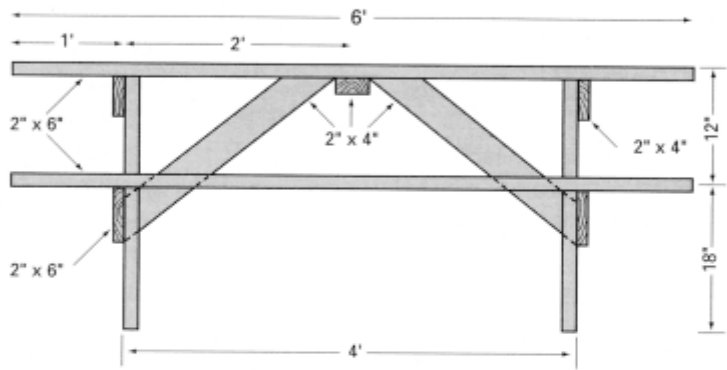
## Picnic Table

### Lumber

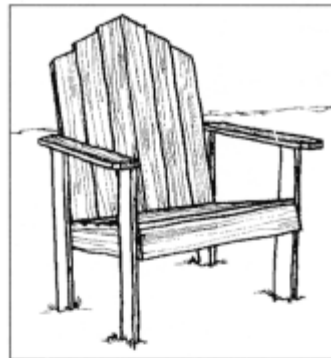
- ▲ Seat, Top, Legs: (6) 2" x 6" - 12'
- ▲ Seat Supports: (1) 2" x 6" - 10'
- ▲ Table Supports, Braces: (2) 2" x 4" - 10'

### Hardware

- ▲ (12) Galvanized Carriage Bolts: 3/8" x 3 1/2"
- ▲ (12) 3/8" Flat Washers
- ▲ 2 1/2" Galvanized Nails as required



# CHATAHOOCHEE CHAIR

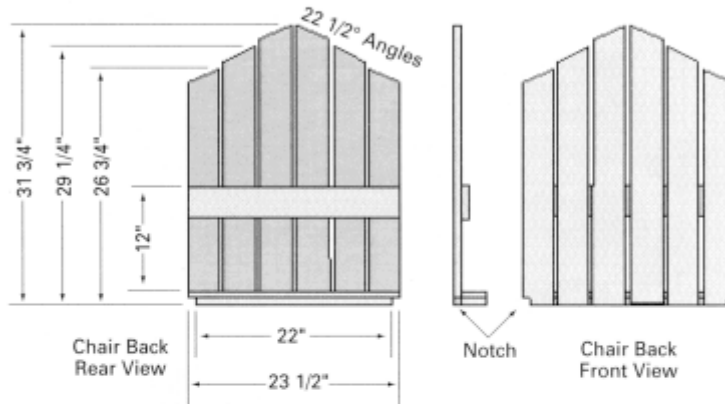


## Chattahoochee Chair

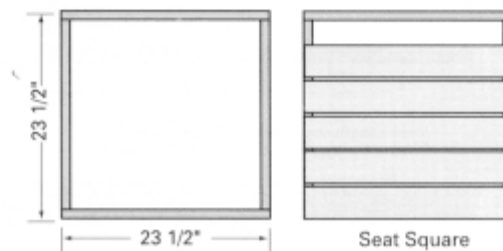
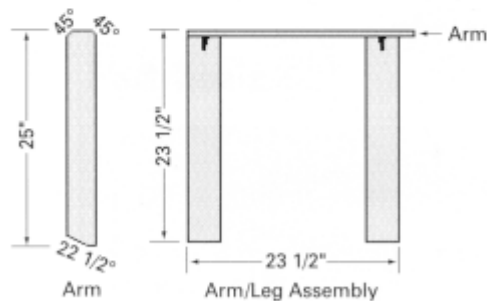
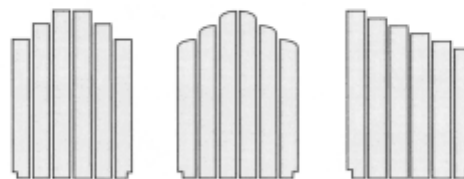
### Lumber

- ▲ (7) 1"x 4" - 8' [4' waste]
- or
- ▲ (5) 1"x 4" - 8' and
- ▲ (1) 1"x 4" - 12' [4' waste]

Hardware as required



### Chair Back Variations





# PLANTER BENCH



## Planter Bench

### Lumber

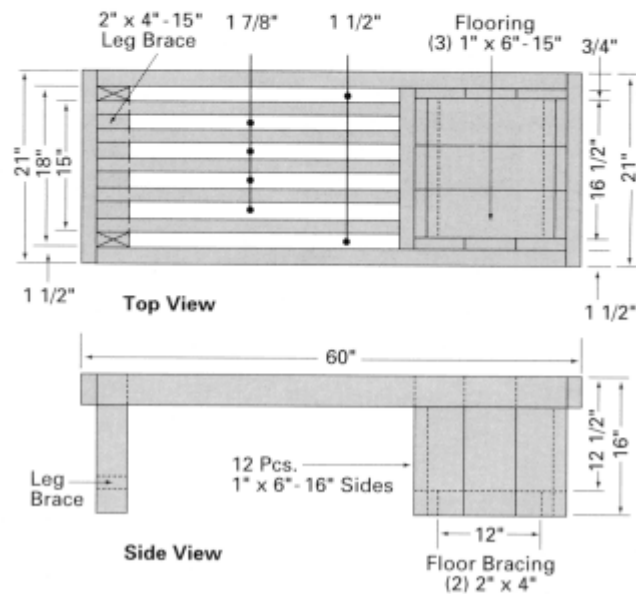
▲ (6) 2" x 4" - 8'

▲ (3) 1" x 6" - 8'

### Hardware

▲ 6d Galvanized Nails as required

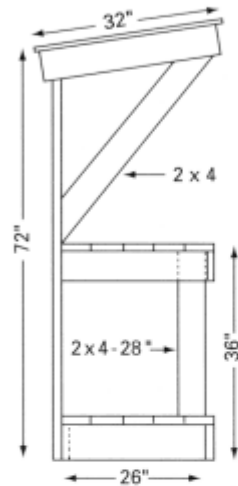
▲ 16d Galvanized Nails as required



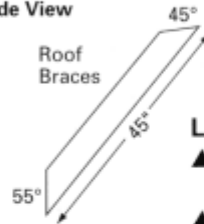
# GARDEN WORK BENCH



**Garden  
Work  
Bench**



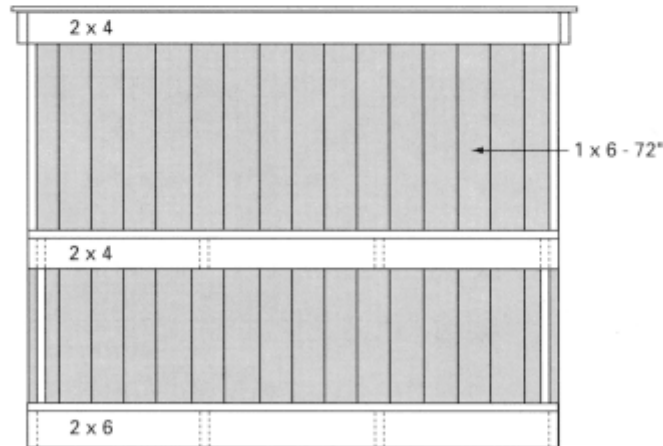
**Side View**



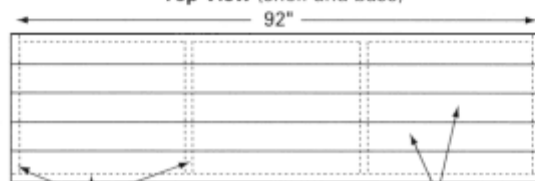
**Lumber**

- ▲ (1) 4'x8'- 1/2" Plywood
  - ▲ (3) 2"x4"- 8'
  - ▲ (3) 2"x4"- 12'
  - ▲ (5) 2"x6"- 8'
  - ▲ (2) 2"x6"- 12'
  - ▲ (5) 1"x6"- 8'
  - ▲ (8) 1"x6"- 12'
- Choice of Roof Covering  
Hardware as required

**Front View**



**Top View (shelf and base)**



Base frame 2 x 6s  
Shelf frame 2 x 4s

Base 2 x 6s  
Shelf 1 x 6s

# PLANTER BOX



## Planter Box

(2) 2" x 4" - 63"  
2' x 4' Lattice

### Lumber

▲ Base, Top Trim, Sides:  
(3) 2" x 4" - 12'

▲ Sides: (2) 2" x 4" - 8'

▲ Sides: (2) 2" x 8" - 8'

### Hardware / Nails

▲ Base to Floor: 3"  
galvanized as required

▲ Sides 2" x 4" to 2" x 8": 2 1/2"  
galvanized as required

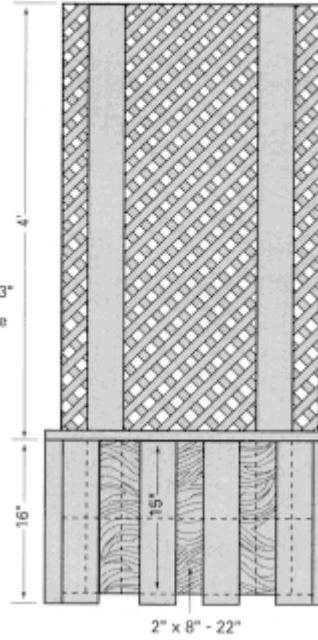
▲ Sides 2" x 8" to 2" x 8": 3"  
galvanized as required

### Optional Lattice Work

▲ (1) 2' x 4' Lattice

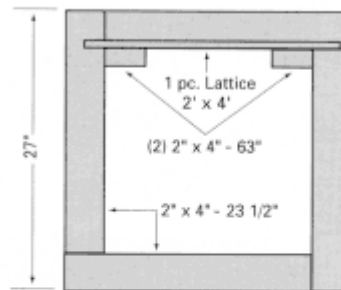
▲ (2) 2" x 4" - 63"

[(1) 2" x 4" - 12']

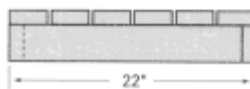
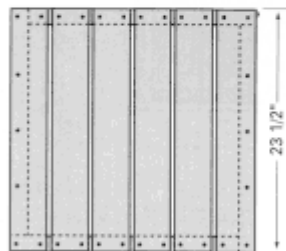


Box Front View

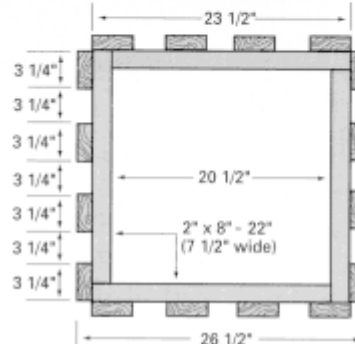
Top Trim



Base Top View



Base End View



Box Top View

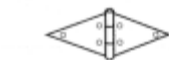
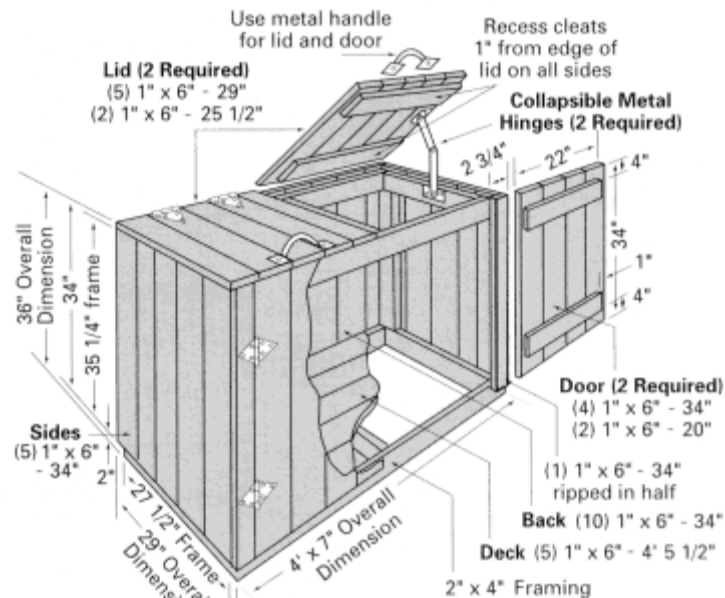
# STORAGE AND TRASH CAN BIN



## Storage and Trash Can Bin

### Lumber

- ▲ Frame: (2) 2" x 4" - 14'
- ▲ Front, Back, Sides, Deck, Lids and Doors:
  - (20) 1" x 6" - 6'
  - (2) 1" x 6" - 8'
  - (3) 1" x 6" - 10'

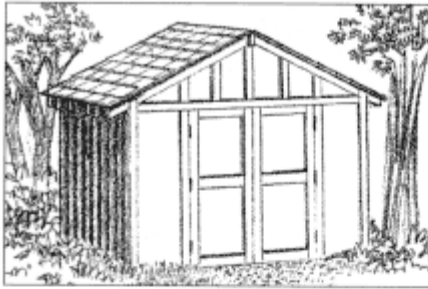


Attach lids and doors with strap hinges mounted on exterior

### Hardware

- ▲ Frame to Frame: 2" Nails as required
- ▲ All other 1" material: 1 1/2" Nails as required
- ▲ Lids: 2 pr. 5" Strap Hinges  
 (2) 5" Handles
- ▲ Doors: 2 pr. 2" Strap Hinges  
 (2) 5" Handles
- ▲ (1) Small Gate Latch

# STORAGE SHED



**Storage Shed**

## SHED Lumber

### Framing:

- ▲ (44) 2" x 4" - 8'
- ▲ (11) 2" x 4" - 10'
- ▲ (5) 2" x 4" - 12'
- Ridge Beam:
- ▲ (1) 2" x 6" - 14'

### Door Trim:

- ▲ (1) 1" x 4" - 8'
- ▲ (4) 1" x 4" - 10'
- Doorway and Gable End Batten:
- ▲ (8) 1" x 4" - 8'
- ▲ (2) 1" x 4" - 6'

### Batten Trim:

- ▲ (2) 1" x 4" - 10'
- ▲ (2) 1" x 4" - 12'
- ▲ (36) 1" x 4" - 8'

Wall, Roof, Door and Gable End Covering:  
20 sheets 4' x 8' x 1/2" Exterior Plywood

## Hardware and Other Materials

- ▲ 3d, 6d, 10d and 20d Nails as required
- ▲ Steel 'T' Door Hinges: 3 pr.
- ▲ Safety Hasp: 1 pc.
- ▲ Shingles: Sufficient amount for 170 sq. ft. Roof Area plus 13 ft. of Ridge and 26 ft. of Eaves

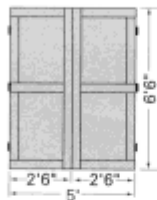
- ▲ Asphalt Roofing Paper: 2 rolls
- ▲ 7/16" Roofing Nails as required

## FLOOR Lumber

- ▲ (12) 4" x 4" - 4' Main Support Posts (length may vary according to terrain)
- ▲ (4) 2" x 8" - 12' Header Boards
- ▲ (2) 2" x 8" - 12' Fascia Ribbon Boards
- ▲ (2) 2" x 8" - 10' Fascia Ribbon Boards
- ▲ (8) 2" x 8" - 10' Joists
- ▲ (22) 5/4" x 6" - 12' Floor Decking

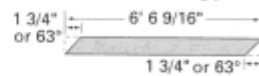
- A. Rear Wall Framing
- B. Front Wall Framing
- C. Side Wall Framing
- D. Floor Decking
- E. Corner Post Assembly and Top View

**Doors**  
Cut Double Doors from 2 sheets of 1/2" Wolmanized plywood and attach 1" x 4" Wolmanized trim as shown

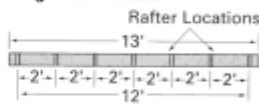


### Rafters

Cut 14 rafters 6' 6 9/16" long from 2" x 4"s and nail to ridge beam blocks and ceiling joists

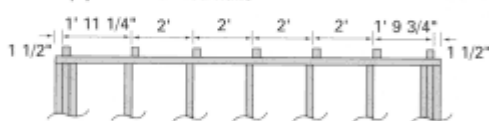


### Ridge Beam Detail



### Ceiling Joists

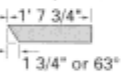
Toenail seven 2" x 4" x 10' joists along side wall top plates with 10d nails



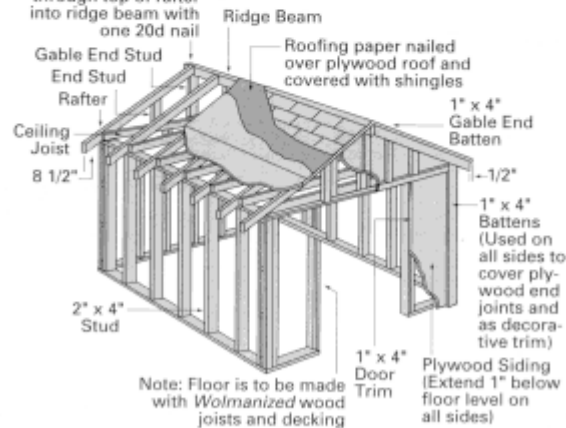
### Gable End Stud Detail (2 Required)



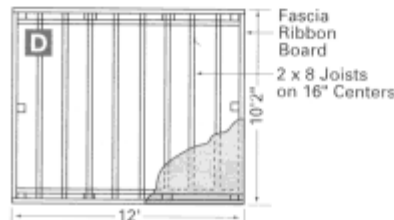
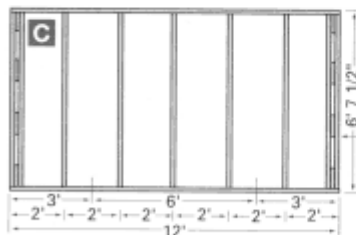
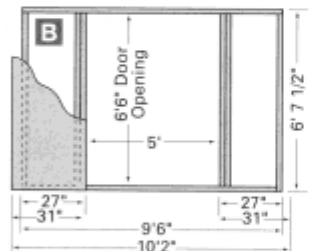
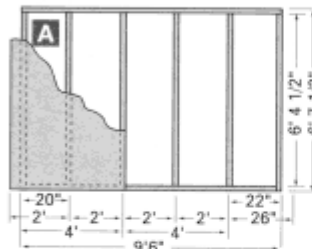
### End Stud Detail (4 Required)



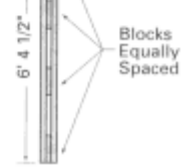
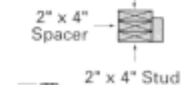
Toenail all rafters through top of rafter into ridge beam with one 20d nail



Note: Floor is to be made with Wolmanized wood joists and decking

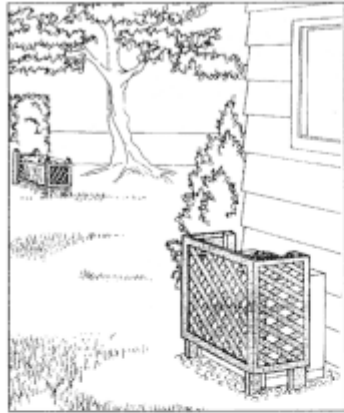


### Corner Post





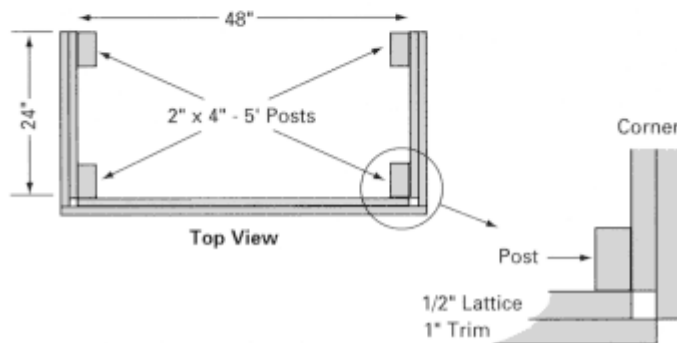
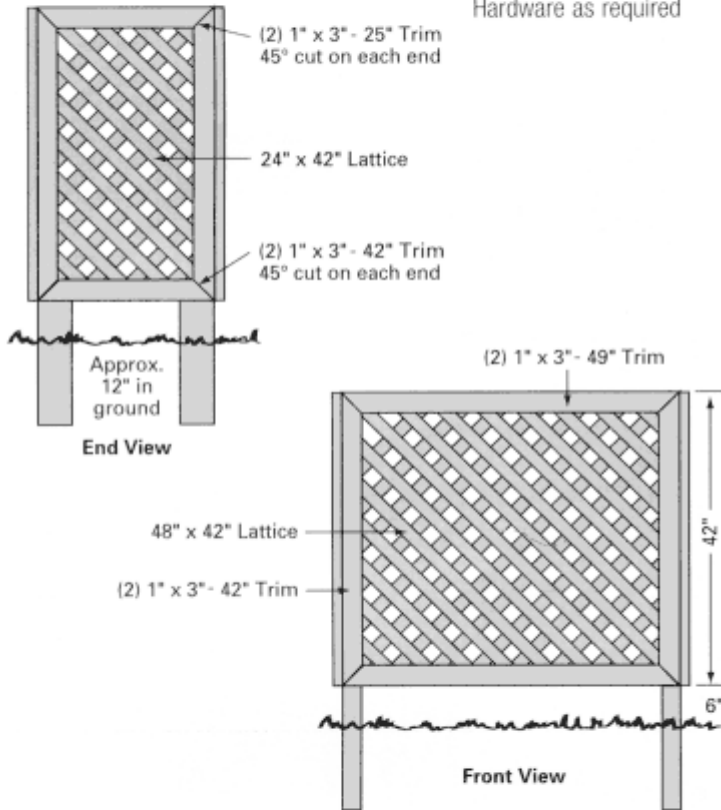
# UTILITY SCREEN



## Utility Screen

### Lumber

- ▲ (4) 2" x 4" - 5' Posts  
[2 pcs. 2" x 4" - 10']
  - ▲ (1) 4' x 4' Lattice\*
  - ▲ (2) 2' x 4' Lattice\*
  - ▲ (1) 1" x 3" - 49" \*\*
  - ▲ (6) 1" x 3" - 42" \*\*
  - ▲ (4) 1" x 3" - 25" \*\*
- [ \* 1 pc. 4' x 8' Lattice]  
[\*\* 3 pcs. 1" x 6" - 8']  
Hardware as required



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# BATHROOM TOWEL RACK

## Wood Selection

The two basic categories of wood used most often in wood working projects are hardwood and softwood. Hardwood is more durable and less prone to dents and scratches. It is also more expensive but will finish to a better advantage. Soft woods, like pine, are more prone to dents and scratches and do not have the durability of hardwood. Softwoods are much less expensive and easier to find.

Ask your lumber supplier to show you "Class 1 " or "Select Grade" lumber. Make sure it is properly dried, straight, and free of knots and defects. (It may be impossible to be completely free of defects but be sure you understand how to cut around these.)

Ask your Lumber supplier for assistance when purchasing your wood. Similar to laying a pattern out on a piece of cloth, often you can cut several different pieces of the same thickness of wood out of a single piece. It is a good idea to add up the total number of board feet, being careful to make sure you group short pieces in a board with long pieces to minimize waste.

This project could be built out of scrap wood already in your workshop. If you choose to use new stock from the lumber yard, both hardwoods and softwood are good choices.

**Note:** Developing a good relationship with Your lumber suppliers is important. They can help guide you in making material selections as well as making special orders for a type of wood you may desire for a project.

Now that you have reviewed safety hints, learned the mistakes to avoid, reviewed the basic components and gathered your tools and materials for your projects - you are ready to BEGIN!

## Steps to follow:

1. Cut the wood to size
2. Cut the dados for the shelves
3. Band saw the design
4. Drill holes for the rack or racks. (Depending on the size of your sides you can have one or two towel bars)
5. Assemble the bathroom rack

## Cut the Wood to Size

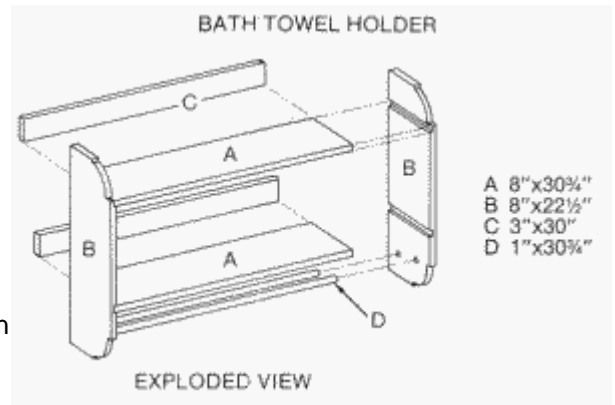
For this project there are two sides, two shelves, and the backs for the shelves. Wood from a lumber yard may not be square so square the ends before cutting the stock.

1. Crosscut the stock to length using a table saw with a stop block. Guide the wood through with the miter gauge. Note: Do not use a miter gauge with the rip fence as it may cause the wood to bind.
2. Rip the stock. Measure from the rip fence to the inside of the blade so that the cut is made on the scrap side of the wood and is the proper dimension.

## Cut the Dadoes for the Shelves

Check your plans for the exact location of the dado cuts.

1. Use a table saw with a dado set to make the cuts. A miter gauge with an extension fence and stop block will assure an accurate cut. A router with a guide board clamped at the correct distance can also be used to make the dado cuts. Note: Always start the router away from the wood and ease it up after the bit is on speed to make a clean cut.



## Cutting the Curve

1. Measure and mark the wood for the design that you wish to make. The one shown is two straight lines using a coffee can top to join the ends of the marks.
2. Using a band saw or a jig saw, cut the two straight marks first, then on the waste side of the curve, cut in and make short curved cut first, then going slowly cut the long side of the curve.
3. Repeat this process on the other ends.

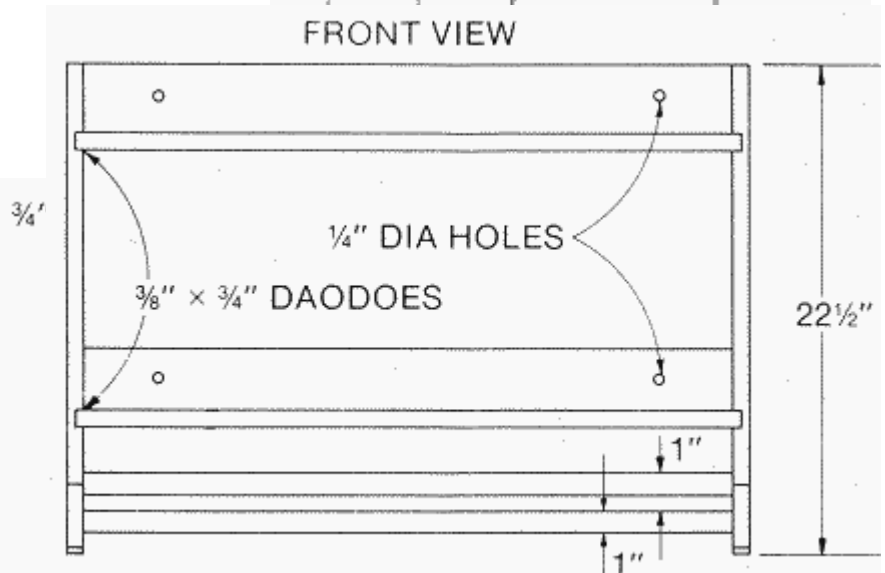
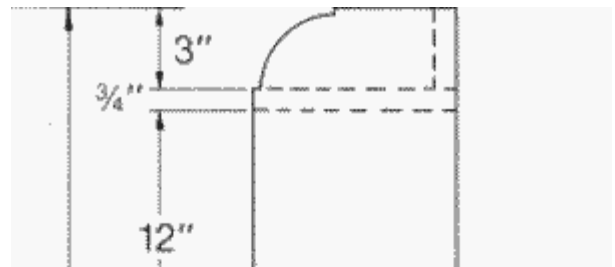
## Drill the Holes for the Towel Rods

Use a drill or a drill press to make the holes.

1. Measure according to the plans for the hole locations and mark them.
2. Set the depth for the hole to be drilled. A depth gauge can be made with a piece of tape wrapped around the bit if you are not using a stationary tool.
3. Drill the holes for the towel bar.

## Assemble the Bathroom Rack

1. Sand the pieces before assembling.
2. Assemble the unit dry to check for proper fit.
3. Apply wood glue to all edges and rod ends. Then use clamps to hold tight while drying.
4. Apply finishing nails while drying for additional strength.
5. Sand the rack and apply the finish you have selected according to the manufacturers instruction. There are helpful hints on finishing at the end of this pamphlet.



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# BANDSAW BOX

## Materials

### Wood Selection

The two basic categories of wood used most often in wood working projects are hardwood and softwood. Hardwood is more durable and less prone to dents and scratches. It is also more expensive but will finish to a better advantage. Soft woods, like pine, are more prone to dents and scratches and do not have the durability of hardwood. Softwoods are much less expensive and easier to find.

Ask your lumber supplier to show you "Class 1 " or "Select Grade" lumber. Make sure it is properly dried, straight, and free of knots and defects. (It may be impossible to be completely free of defects but be sure you understand how to cut around these.)

Ask your Lumber supplier for assistance when purchasing your wood. Similar to laying a pattern out on a piece of cloth, often you can cut several different pieces of the same thickness of wood out of a single piece. It is a good idea to add up the total number of board feet, being careful to make sure you group short pieces in a board with long pieces to minimize waste.

This project could be built out of scrap wood already in your workshop. If you choose to use new stock from the lumber yard, both hardwoods and softwood are good choices.

Note: Developing a good relationship with Your lumber suppliers is important. They can help guide you in making material selections as well as making special orders for a type of wood you may desire for a project.

Now that you have reviewed safety hints, learned the mistakes to avoid, reviewed the basic components and gathered your tools and materials for your projects - you are ready to BEGIN!

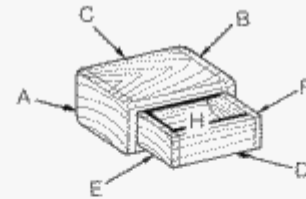
### Steps to Follow:

For this project you can use scrap pieces of wood from other projects or a solid block of wood to create a beautiful box. The steps to follow for this project are:

1. Laminate the pieces of wood (if not using a solid block).
2. Cut the block to size.
3. Make the drawers.
4. Finish sand the drawers and carcass.

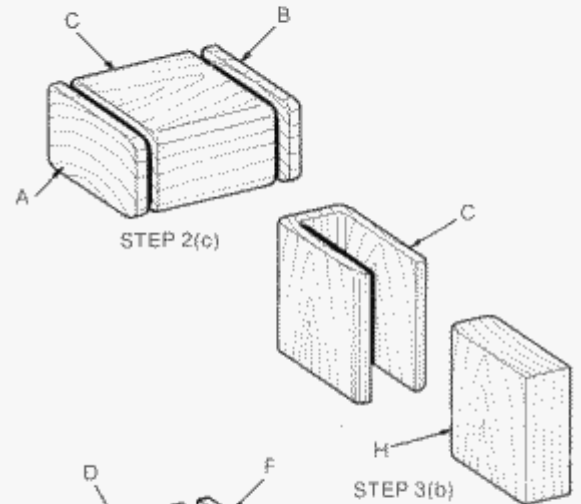
### Laminate the Scrap Pieces of Wood

1. Stack scrap wood of approximate width and length together for a stack that can be cut by your band saw blade.
2. Use wood glue on the inside pieces of the stack and clamp together and set over night to dry. Alternating the grains is a nice touch depending on the wood scraps that you are using.



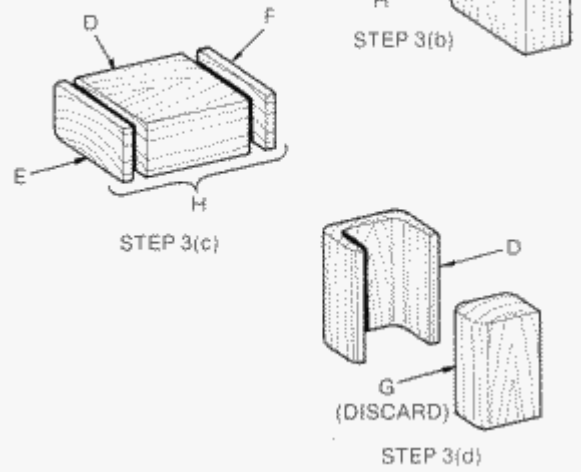
## Cutting the Sides (A & B)

1. Using a ¼" width band saw blade cut the block to size. A ¼" blade will be used for all the following cuts because it will provide a tighter fit for the drawers and a neater cut.
2. Mark the sides of the box, a "V" will do so that later when you glue the box you know which side belongs where.
3. Using the band saw cut the sides off being careful to make the cuts straight and accurate for later assembling of the box. The tape makes this cut at ½" into the solid wood.



## Making the Drawers

1. On the center block (C) mark the interior of the box for your drawer. Make the corners rounded so that the band saw will not bind when making the cut.
2. Cut out the drawer (H) making sure to go slowly and stay on the scrap side of the mark.
3. Cut off the sides of the drawers (E&F) being careful to mark their proper location for gluing later.
4. Cut the interior of the drawer out, again being careful to round the turns so that the band saw does not bind.
5. Sand lightly all the pieces before gluing on the sides.
6. F. Glue the sides on the carcass and the drawers. Use clamps to hold tight till the glue dries, over night is suggested.



## Finish Sanding the Drawers and Carcass

1. Using a belt sander finish sand the carcass. This can be used to round the edges as well as smooth the glue joints on the carcass.
2. The belt sander and fine sand paper can finish the drawer. Make sure that as you sand, check the drawer often for smooth opening and closing.



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# CUTTING BOARD

## Materials

### Wood Selection

The two basic categories of wood used most often in wood working projects are hardwood and softwood. Hardwood is more durable and less prone to dents and scratches. It is also more expensive but will finish to a better advantage. Soft woods, like pine, are more prone to dents and scratches and do not have the durability of hardwood. Softwoods are much less expensive and easier to find.

Ask your lumber supplier to show you "Class 1 " or "Select Grade" lumber. Make sure it is properly dried, straight, and free of knots and defects. (It may be impossible to be completely free of defects but be sure you understand how to cut around these.)

Ask your Lumber supplier for assistance when purchasing your wood. Similar to laying a pattern out on a piece of cloth, often you can cut several different pieces of the same thickness of wood out of a single piece. It is a good idea to add up the total number of board feet, being careful to make sure you group short pieces in a board with long pieces to minimize waste.

This project could be built out of scrap wood already in your workshop. If you choose to use new stock from the lumber yard, both hardwoods and softwood are good choices.

**Note:** Developing a good relationship with Your lumber suppliers is important. They can help guide you in making material selections as well as making special orders for a type of wood you may desire for a project.

Now that you have reviewed safety hints, learned the mistakes to avoid, reviewed the basic components and gathered your tools and materials for your projects - you are ready to BEGIN!

### These are the steps to follow for the cutting board:

1. Cut the stock
2. Laminate the boards
3. Finish the board

### Cut the Stock

1. The block thickness is determined by the width you cut the individual pieces. Example: For a block to be 111 thick you will cut the stock 1" wide because of the lamination process which will group the boards together.

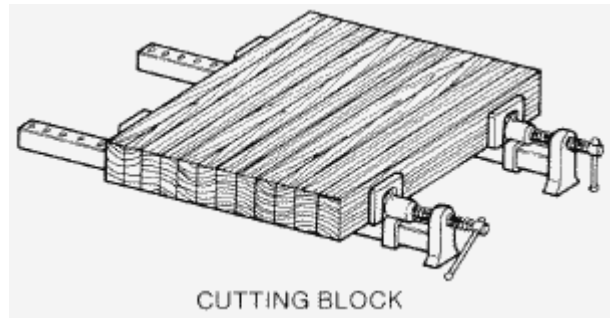
2. Cut the stock a little longer than you wish the length of the cutting board to be. You will cut the board to the finished side after it has been laminated and sanded.

## Laminating the Stock

1. Use resorcinol glue on both sides of the stock to glue them together. Resorcinol glue is water proof and will provide stability if the board is soaked in water.
2. After gluing, clamp the boards together and let dry overnight.
3. Scrub off extra glue before it dries to prevent chipping the cuffing blades when finishing and shaping.

## Finishing the Cutting Board

1. • After the board dries, take out of the clamps and use a belt sander to smooth the top and bottom surfaces.
2. Using a table saw or circular saw, cut the board to length. If using a table saw be sure that the cutting blade does not exceed 1/4" above the cutting board to prevent drag.
3. Using a shaper or router put around over edge on the top surface of the cutting board. Be careful to follow the guidelines reviewed in the tape.
4. Use a non-toxic finish such as mineral oil or a salad bowl finish for this project.



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# CASSETTE HOLDER

## Materials

### Wood Selection

The two basic categories of wood used most often in wood working projects are hardwood and softwood. Hardwood is more durable and less prone to dents and scratches. It is also more expensive but will finish to a better advantage. Soft woods, like pine, are more prone to dents and scratches and do not have the durability of hardwood. Softwoods are much less expensive and easier to find.

Ask your lumber supplier to show you "Class 1 " or "Select Grade" lumber. Make sure it is properly dried, straight, and free of knots and defects. (It may be impossible to be completely free of defects but be sure you understand how to cut around these.)

Ask your Lumber supplier for assistance when purchasing your wood. Similar to laying a pattern out on a piece of cloth, often you can cut several different pieces of the same thickness of wood out of a single piece. It is a good idea to add up the total number of board feet, being careful to make sure you group short pieces in a board with long pieces to minimize waste.

This project could be built out of scrap wood already in your workshop. If you choose to use new stock from the lumber yard, both hardwoods and softwood are good choices.

Note: Developing a good relationship with Your lumber suppliers is important. They can help guide you in making material selections as well as making special orders for a type of wood you may desire for a project.

Now that you have reviewed safety hints, learned the mistakes to avoid, reviewed the basic components and gathered your tools and materials for your projects - you are ready to BEGIN!

### Steps to follow:



1. Cut the wood to size.
2. Cut the dados for the shelves.
3. Bevel the shelves.
4. Drill holes for the rods. (Depending on the size of your sides you can have one or two sets of rods.)
5. Assemble the cassette holder.

### Cut the Wood to Size

For this project there are two sides, two shelves, and rods. Wood from a lumber yard may not be square so square the ends before cutting the stock.

1. Crosscut the stock using a table saw with a stop block. Note: do not cut the shelves at this time because of the bevel cuts to be made later. Guide the wood through with the miter gauge. Note: Do not use a miter gauge with the rip fence as it may cause the wood to bind.
2. Rip the stock. Measure from the rip fence to the inside of the blade so that the cut is made on the scrap side of the wood and is the proper dimension.

## Cut the Dadoes for the Shelves

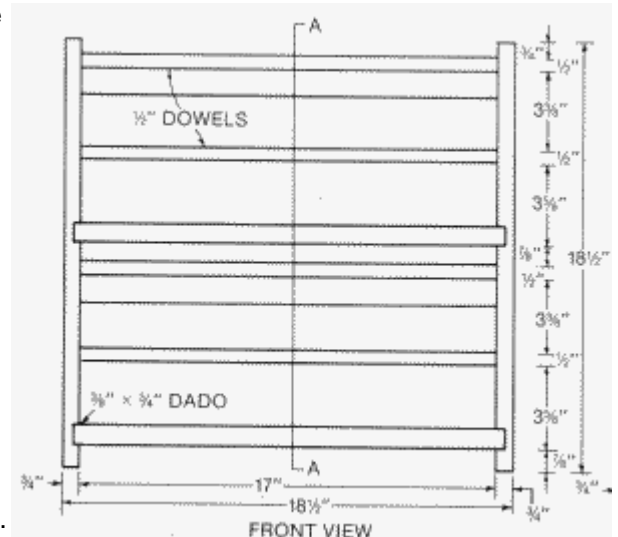
Check your plans for the exact location of the dado cuts.

1. The dadoes on this project are cut at a 45 degree angle. Use a table saw with a dado set to make the cuts. A miter gauge with an extension fence and stop block will assure an accurate cut. A router with a guide board clamped at the correct angle can also be used to make the dado cuts. Note: Always start the router away from the wood and ease it up after the bit is up to speed, to make a clean cut.

## Bevel the Shelves

Tilt the table or the table saw blade at a 45 degree angle. A circular saw can be used for this step by tilting the guide and blade at a 45 degree angle.

1. If you are using a circular saw, clamp on a guide to assure accuracy.
2. Check to make sure the angle is correct, and cut the shelves.



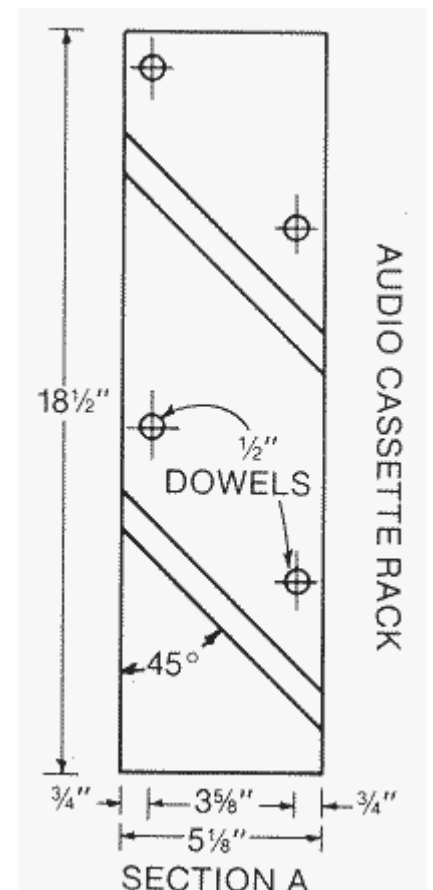
## Drill the Holes for the Rods

Use a drill or a drill press to make the holes.

1. Measure according to the plans for the hole locations and mark them.
2. Set the depth for the hole to be drilled. A depth gauge can be made with a piece of tape wrapped around the bit if you are not using a stationary tool.
3. Drill the holes for the bars.

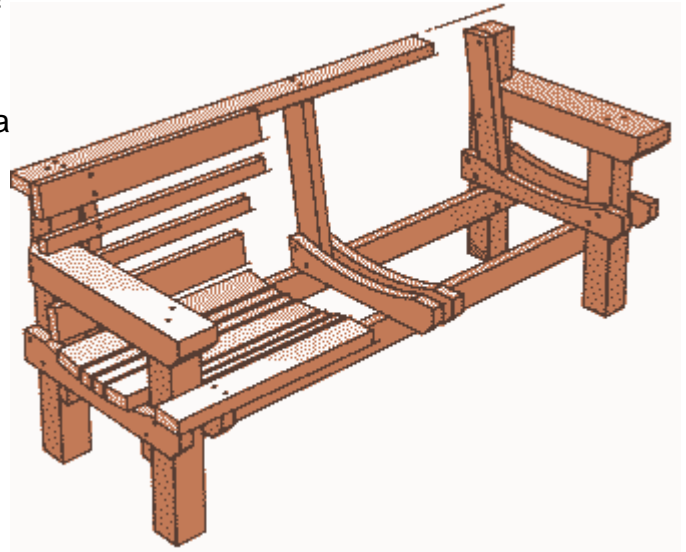
## Assemble the Cassette Holder

1. Sand the pieces before assembling.
2. Assemble the unit dry to check for proper fit.
3. Apply wood glue to all edges and rod ends. Then use clamps to hold tight while drying.
4. Apply finishing nails while drying for additional strength.
5. Sand the rack and apply the finish you have selected according to the manufacturer's instructions. There are helpful hints on finishing at the end of this pamphlet.



# BENCH SEAT

The clean, horizontal lines and rich redwood tones of this bench design reflect the simple beauty of Northern California. Comfortable and elegant with a gracefully curved seat and angled backrest, it offers a standing invitation to sit, relax and enjoy. This freestanding bench uses Construction Common or Deck Common redwood grades that have a pleasing mix of heartwood and sapwood. Where increased decay resistance is needed, use all-heartwood grades: Construction Heart or Deck Heart. Use only corrosion-resistant deck screws to prevent staining. Counter-sink and plug screw attachments.

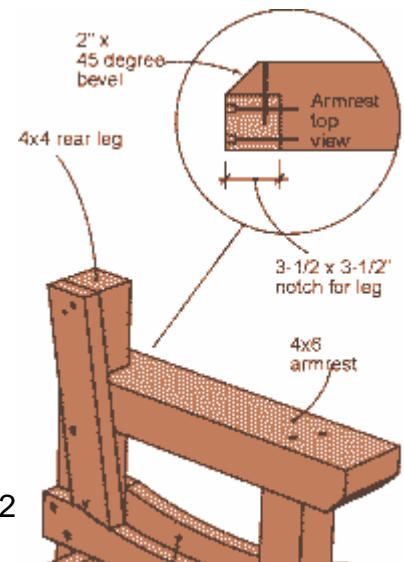


## Materials for Benches

	Quantity	Size	Length
Top, Seat and Backrest Rails	6	2x4	6 feet
Seat and Backrest Rails	6	2x2	6 feet
Main Braces	2	2x4	5 foot 9 inches
Seat and Backrest Supports	9	2x4	26 inches
Front Legs	2	4x4	20-1/2 inches
Back Legs	2	4x4	30-1/2 inches
Armrests	2	4x6	26 inches
Deck Screws	1-1/2 pounds	3 and 4 inches	

## Trim and Notch the Armrests

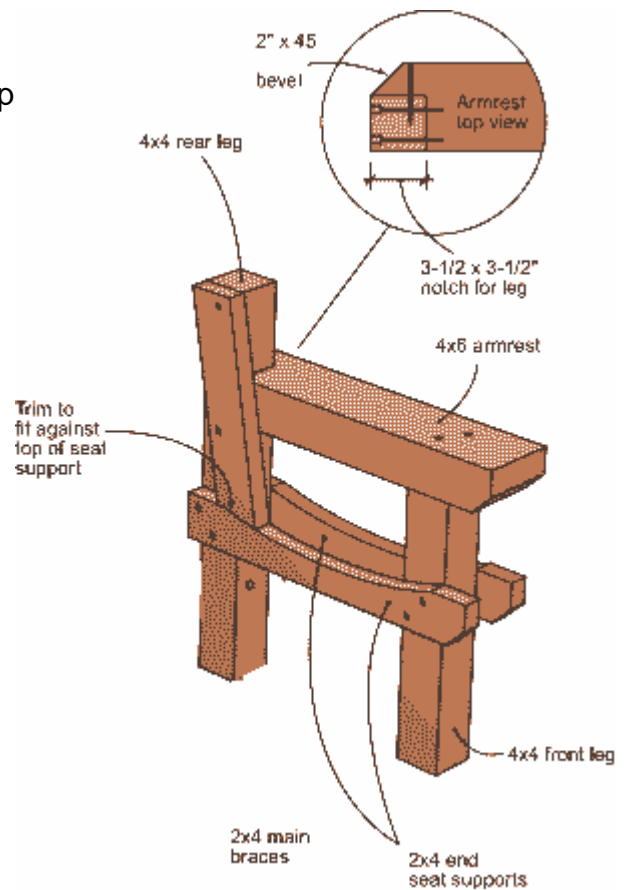
Start building the bench by trimming and notching the armrests. Trim the front end of each 4x6 armrest at a 45 degree angle, beginning 1-1/2 inches down from top. Notch the inside back of each armrest where it will wrap the rear leg. Finish with a 45 degree bevel cut. See armrest detail.





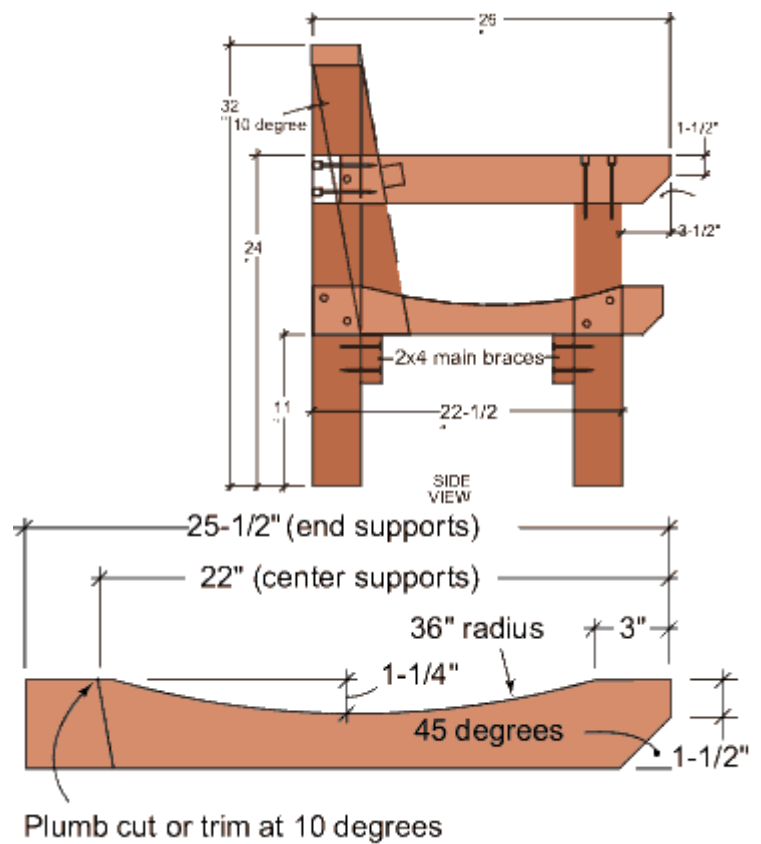
### Prepare the Legs

Using 4-inch screws, attach armrests to 4x4 rear legs 24 inches up from the bottom. Attach armrests to front legs by driving two screws through the armrest and into the top of the leg.



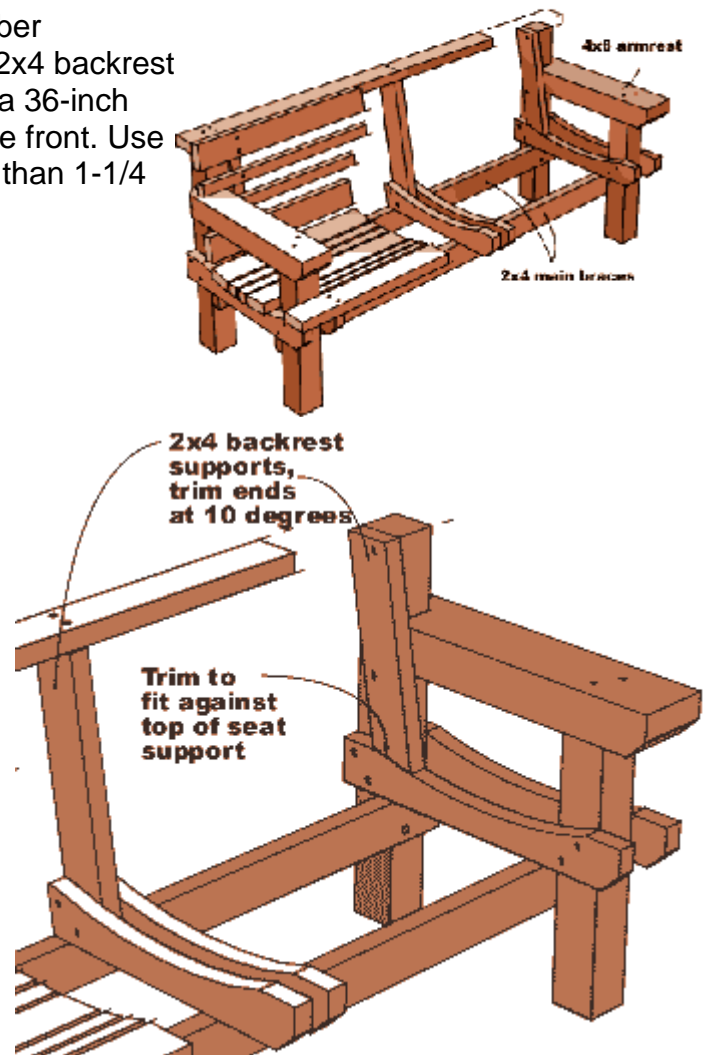
### Main Braces

Trim 2x4s for the main braces and attach to inside front and rear legs 11 inches from bottom.



### Seat Supports

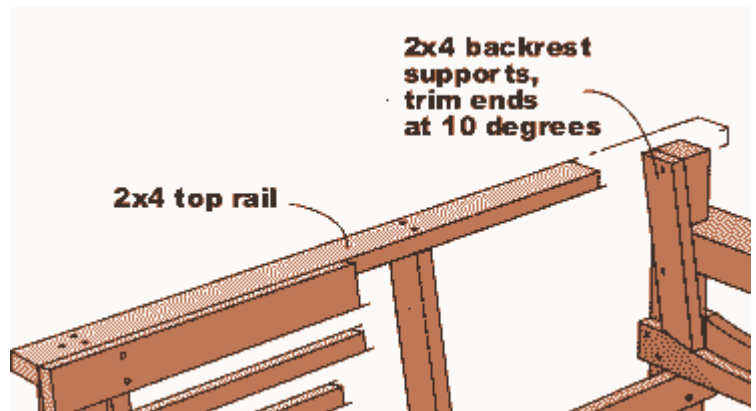
The curved seat supports are made up of 2x4 lumber sandwiching either the 4x4 rear legs or the single 2x4 backrest support. To shape the curve, make a template for a 36-inch radius cut. Mark the cut to start 3 inches in from the front. Use a bandsaw to cut the radius to a depth of no more than 1-1/4 inches.



Finish the seat supports with a 45 degree bevel cut to match the armrests. Note that the end and center seat supports differ slightly in length and attachments. End seat supports Trim four 2x4s to 25-1/2 inches. Attach the inside seat supports to the rear and front legs so they rest on the top edge of the 2x4 main braces. Attach the outside seat supports level with the inside ones.

### Center Seat Supports

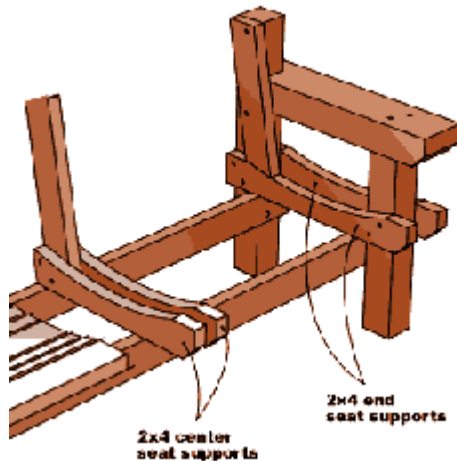
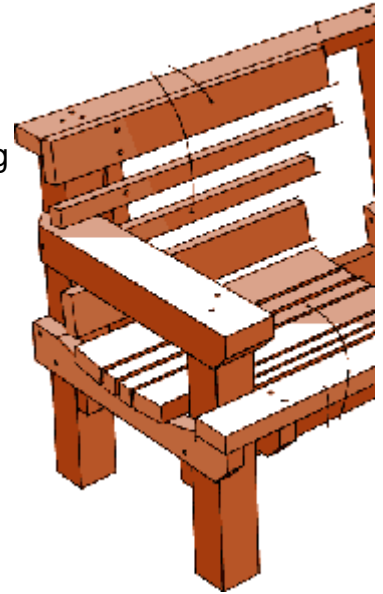
Trim the two center seat supports to 22 inches. Using a scrap piece of 2x4 as a temporary spacer for the backrest, attach these seat supports across the main braces flush with the back edge of the rear brace. Use two 3-inch screws for each joint, angled from below and inside. Remove the spacer.



## Backrest Supports

Trim the 2x4 backrest supports to a 10 degree angle at the top edge. The two end backrest supports start at the top of the 4x4 rear leg and trim to rest on top of the seat supports.

The center backrest trims flush to the bottom edges of the two center seat supports. Attach the end backrest supports to the inside of the 4x4 rear leg with two screws. The bottoms should fit snugly to the top of the seat supports and can be secured with screws driven at an angle from below. You should install the top rail before trimming and attaching the center backrest.

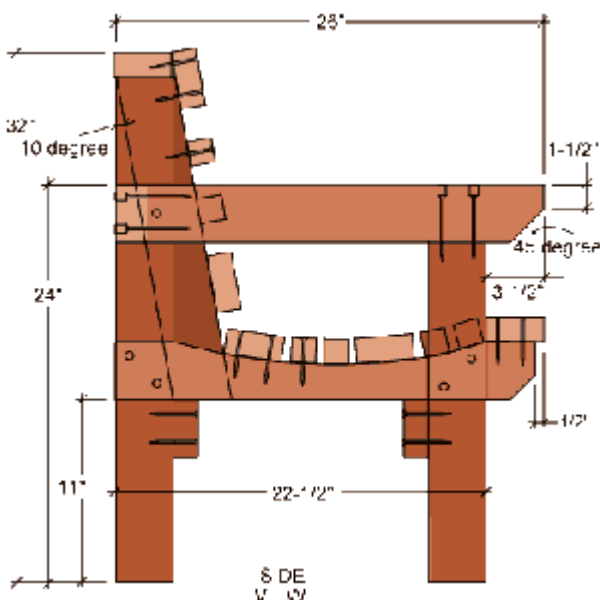


## Top Rail

Attach the 2x4 top rail to the rear legs with three deck screws at each end. Measure and trim the center backrest. Install between the seat supports and flush to the underside of the top rail. Secure with screws.

## Seat and Backrest Rails

Trim one 2x2 backrest rail to fit between the armrests. Trim the other 2x2 and 2x4 seat and backrest rails to six feet. Install the front seat rail so that it overlaps the seat support by 1/2 inch, and attach with two deck screws at each joint.



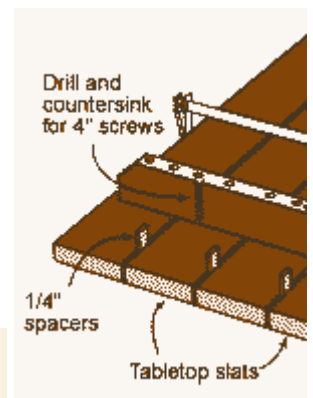
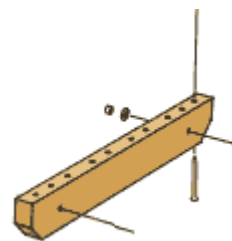
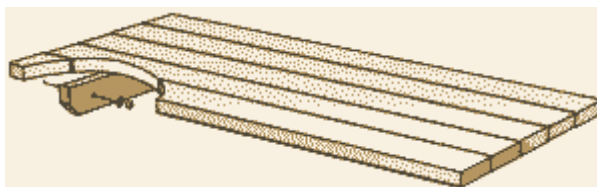
Attach the rear seat rail to each support with two deck screws. Adjust the spacing of the remaining seat rails before attaching. Space the backrest rails equally, and attach to supports with a single screw at each 2x2 and two screws at each 2x4.

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# PICNIC TABLE

An excellent weekend project, this easy-to-build picnic table will soon become the focal point of your backyard. Redwood's beauty and durability will ensure countless summers filled with barbecues, picnics and outdoor parties.

The economical, knotty redwood garden grades, such as Construction Common or Deck Common, are great choices for building your table. For maximum durability, choose Construction Heart or Deck Heart.

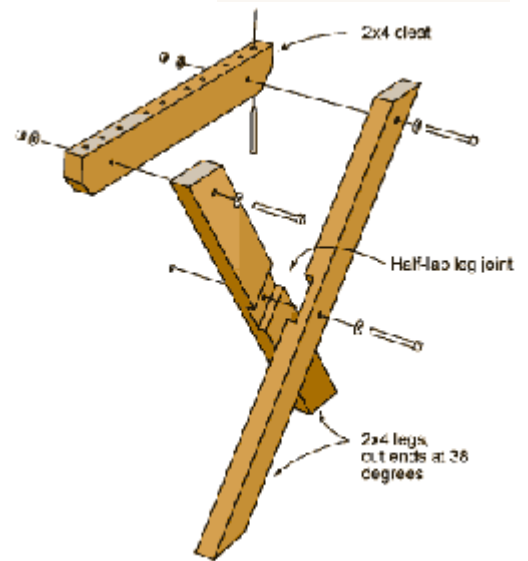
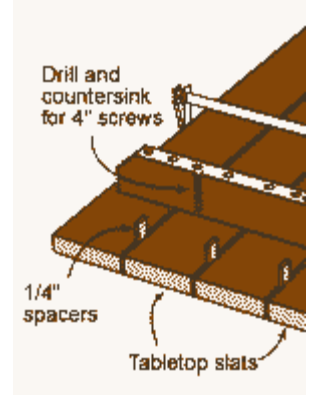


## Materials for Table

	Quantity	Size	Length
<b>Top Slats</b>	5	2x6	60 inches
<b>Cleats</b>	2	2x4	27 inches
<b>Legs</b>	4	2x4	40 inches
<b>Braces</b>	2	2x4	30 inches
<b>Machine Bolts, Washers and Nuts</b>	6 sets	3-1/2 inches x 1/4 inch	
<b>Deck Screws</b>	1 pound	4 inches	

## Build the Table Top

Measure and cut the 2x6 slats. Lay the slats on a clean and stable work surface with their most attractive sides down. Separate the slats with 1¼4-inch spacers and square. Clamp the slats together with a bar clamp.



### Fasten the Cleats

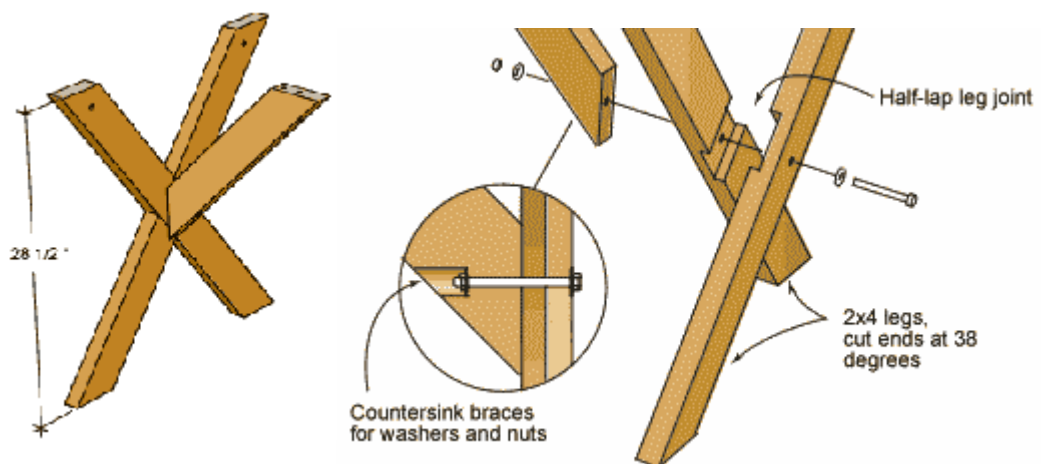
Cut the 2x4 cleats to 27 inches and trim the ends at 45 degree angles starting 2 inches down from top edge. Place a cleat on edge 7 inches from each end of the table top. Allow a 3/4-inch margin from the table's edges. With the combination countersink bit, drill two screw holes into the cleat above each slat, deep enough to set the screw heads below the surface. Fasten to slats with 4-inch screws.

### Assemble the Legs

Cut the legs to 39 inches with 38 degree parallel angles top and bottom. Loosely clamp legs together at their centers with C clamps. Adjust the tension in the clamp until you can open the legs to make a cross with a 28-1/2-inch span at each side, with tops and bottoms aligned. Mark along the sides of each leg where they cross. Remove the clamp and cut the half laps from each 2x4 leg. Reclamp the legs in position. Attach leg assemblies to table top cleat with two 3-1/2-inch x 1/4-inch machine bolts at each connection.

### Attach the Braces and Legs

Mark and cut table braces to fit between the table leg assembly and the table top with 45 degree angles at both ends. Attach braces to table top with 4-inch screws from below. Drill bolt holes through the "X" of the legs and completely through the angled ends of each 2x4 brace. Countersink the





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# Teddy Bear Bank



coins), fit the shaft with its dowels and end plates, glue-fix the bear to the top of the box, run the control cords down into the box and then variously tie the cords to the spring or shaft.

## MATERIALS LIST—

### MAKING THE TEDDY BEAR BANK

Having studied the working drawings for making the box and carefully selected your wood, set out the various dimensions and cut out the ten component parts—the four sides, the base, the top and the four inside-corner fillets. Cut the rabbets at the corners and glue up. Round over the edges of the base and lid with a quarter-curve profile and fit with countersunk screws.

Trace the side-view profile of the bear through to your chosen wood—best if it's a soft easy-to-carve timber like lime, jelutong or basswood—and cut it out on the scroll saw. Rerun this procedure for the front views. You should finish up with six parts—the head, the body, two arms

and two legs. Drill 1/2"-diameter holes down through the body, up into the head, through the shoulder and into the arm, and fit stubs of 1/2"-dowel for the neck and for the jointed arm.

When you have made the basic parts for the bear, use a knife to swiftly whittle the cutouts to shape. Don't try for anything fancy, just go for uncomplicated and stylized chunky forms.

Finally, having first used a scalpel and sandpaper to tidy up and create a good finish, use a dash of black acrylic paint to detail the nose, eyes and mouth.

### PUTTING IT TOGETHER

Once you have made the box and all the parts that go to make the bear, then comes the difficult task of putting the whole thing together. It's not so much that any single stage is difficult, but that everything has got to be just right. If one of the control strings is too slack, or the shaft is too tight, or whatever, then the movement won't work.

Start by running 1/16"-diameter holes through the neck and arm stubs. The neck needs a side-to-side hole for the pivot and a front-to-back hole for the control cords, while the arm needs a single front-to-back through-hole for both the control cords and the pivot strings. In essence, the controls are beautifully simple. There are four cords—one to pull the head down, one to pull the head up, one to pull the arm down and one to pull the arm up. And of course, depending upon how you want the action to go, fix either the "up" or the "down" cords to a lightweight tension "pulling" spring so the lever action becomes the positive movement.

Finally, when you are happy with the movement, cut two slots in the box (one for the lever and one for the

#### TEDDY BEAR

A Head (1)	2" × 2" × 2"
B Body (1)	2" × 2" × 3"
C Arms (2)	1" × 3/4" × 3"
D Legs (2)	3/4" × 2" × 3"

*Note that all the above pieces are oversize and allow for cutting waste.*

#### BOX

E Front (2)	3" × 4 1/4" × 6 1/2"
F Shaft plates (2)	1/4" × 2" × 2"
G Top (1)	1/2" × 5 1/2" × 7 1/2"
H Bottom (1)	1/2" × 5 3/4" × 7 3/4"
I End (2)	3/8" × 5" × 4 1/4"
J Corner fillets (4)	3/8" triangular section at 4 1/2" long

#### HARDWARE AND EXTRAS

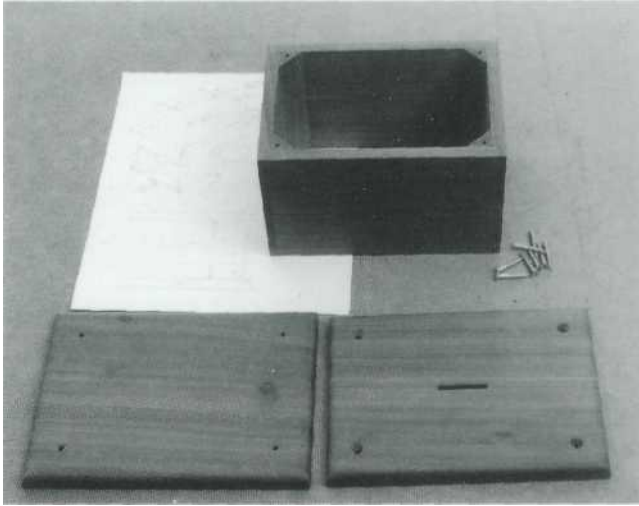
K Drive shaft (1)	broomstick dowel—cut to fit
L Slot and lever bars (2)	1/4" dowel—cut to fit
M Strong cord	—to fit
N Brass screws	—various
O Small quantity of black acrylic paint	

*Note that all box measurements are to size.*

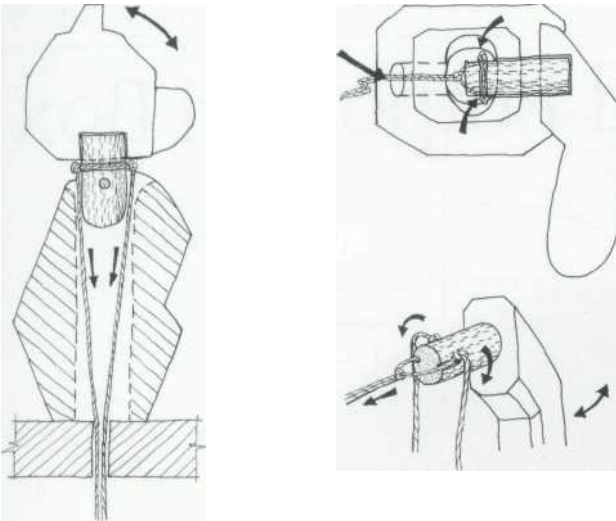
### SPECIAL TIP: GLUING

For swiftly fitting and fixing all the control cords, you can't do better than a cyanoacrylate. It's good for holding the knots tight, for little trial-and-error holds, for fixing the bear to the top of the box. In fact, it's just about perfect for everything.

### STEP-BY-STEP STAGES

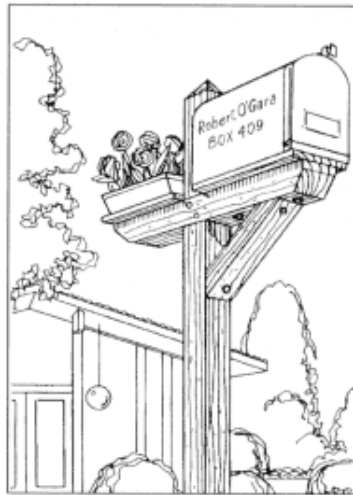


The finished box, with the bottom and top slabs ready to fit. Note how the fixing screws are placed so they run into the corner fillets.



2. Next we string the bear. This cross section shows how the control cords operate the up-and-down movement of the head on the pivot. Be sure to use strong twine and nonslip knots. Notice the plan view at top right, showing how the arm is both pivoted and controlled by the cords. A detail of the cord is shown at bottom right. See how one cord pulls and pivots the arm, while the other two cords operate the up-and-down movement.

# MAIL BOX STAND



## Mailbox Stand and Planter

### Lumber Stand

▲ Post, Arm and Brace:

(1) 4" x 4" - 12'

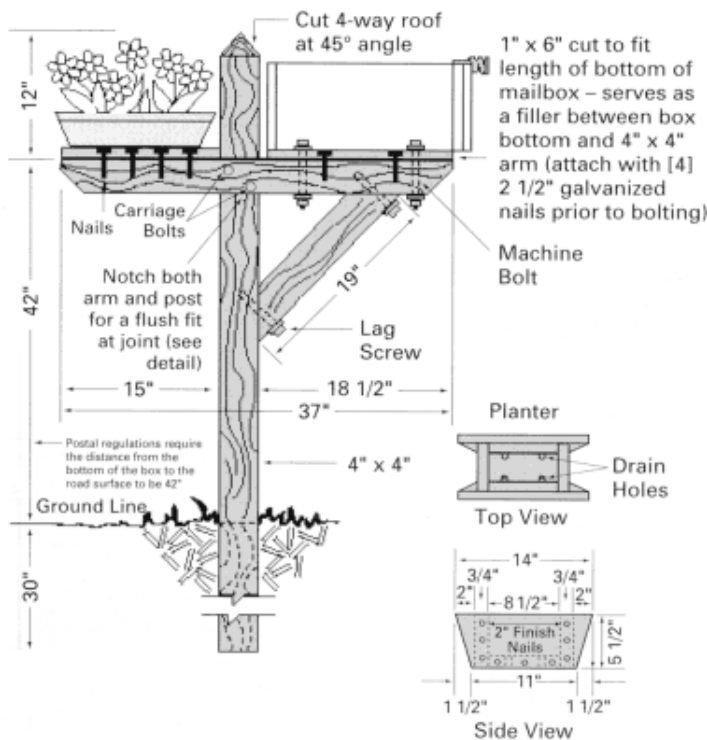
▲ Box and Planter Base:

(1) 1" x 6" - 3'

### Planter

▲ Sides, Ends and Bottom:

(1) 1" x 6" - 4'



### Hardware Stand

▲ Carriage Bolts with Nuts:  
(2) 5/16" x 4"

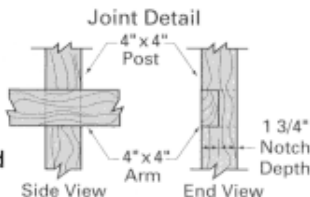
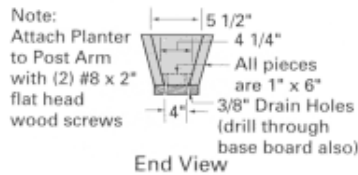
▲ Lag Screws:  
(2) 5/16" x 4"

▲ Machine Bolts with Nuts:  
(2) 5/16" x 5"

▲ Flat Washers (std.):  
(10) 5/16" I.D.

### Planter

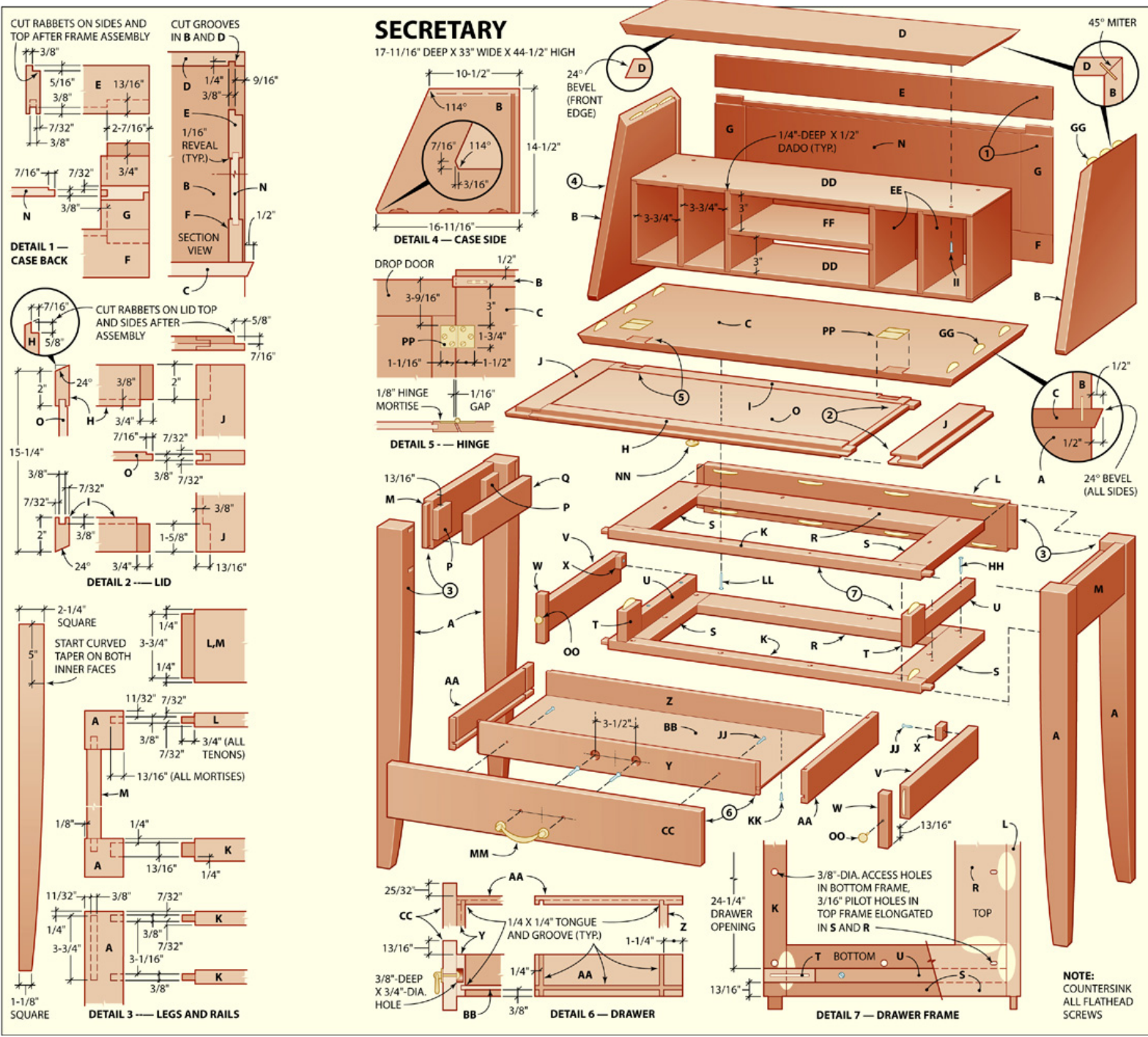
▲ 6d Galvanized Nails as Required



# SHAKER STYLE TABLE







### MATERIALS LIST--SECRETARY

Key	No.	Size and description (use)
A	4	2-1/4 x 2-1/4 x 29-3/16" mahogany (leg)
B	2	13/16 x 14-1/2 x 16-11/16" mahogany (side)
C	1	13/16 x 17 x 33" mahogany (bottom)
D	1	13/16 x 10-7/8 x 32" mahogany (top)
E	1	13/16 x 2-13/16 x 30-7/8" mahogany (back rail)
F	1	13/16 x 2-1/2 x 30-7/8" mahogany (back rail)
G	2	13/16 x 2-13/16 x 10-1/8" mahogany (back stile)
H	1	13/16 x 2-3/8 x 27-3/8" mahogany (lid rail)

I	1	13/16 x 2 x 27-3/8" mahogany (lid rail)
J	2	13/16 x 2-13/16 x 15-5/8" mahogany (lid stile)
K	2	13/16 x 1-5/16 x 29" mahogany (base rail)
L	1	13/16 x 4-1/4 x 29" mahogany (base rail)
M	2	13/16 x 4-1/4 x 13" mahogany (base rail)
N*	1	1/2 x 9-3/8 x 26" flakeboard (back panel)
O*	1	1/2 x 12 x 26-5/8" flakeboard (lid panel)
P	4	1/2 x 2-1/2 x 2-5/8" mahogany (spacer)
Q	2	13/16 x 2-5/8 x 11-1/2" mahogany (guide)
R	2	13/16 x 3 x 21-1/2" mahogany (frame rail)
S	4	13/16 x 3 x 12-13/16" mahogany
		(frame side)
T	2	13/16 x 2-5/8 x 3" mahogany (frame divider)
U	2	13/16 x 1-7/16 x 11-1/8" mahogany (blocking)
V	2	3/4 x 2-9/16 x 14-1/8" mahogany
		(lid support)
W	2	3/4 x 13/16 x 4-3/16" mahogany (facing)
X	2	1/2 x 1-1/8 x 1-1/8" mahogany (stop)
Y	1	1/2 x 2-9/16 x 23-11/16" mahogany (front)
Z	1	1/2 x 1-15/16 x 23-11/16" mahogany (back)
AA	2	1/2 x 2-9/16 x 14-1/8" mahogany (side)
BB	1	1/4 x 12-7/8 x 23-11/16" plywood (bottom)
CC	1	13/16 x 4-3/16 x 25-3/4" mahogany (drawer face)
DD	2	1/2 x 9 x 30-3/8" mahogany (insert top/bottom)
EE	6	1/2 x 7 x 9" mahogany (insert partition)
FF	1	1/2 x 9 x 12-7/8" mahogany (insert shelf)
GG	as reqd.	No. 20 plate
HH	4	2" No. 8 fh woodscrew
II	4	1" No. 6 fh brass woodscrew
JJ	4	1" No. 8 rh woodscrew
KK	3	3/4" No. 6 fh woodscrew
LL	10	1 1/4" No. 8 fh woodscrew
MM**	1	Drawer pull, Whitechapel No. 13PWLID
NN**	1	Lid pull, Whitechapel No. 76KSB2P
OO**	2	Support pull, Whitechapel No. 76KSP
PP**	2	Hinge, Whitechapel No. 166HISP

## Making The Legs

We ripped the four legs from one board. First, crosscut the board a few inches longer than required and plane one edge straight and square. Use a circular saw and ripping guide to cut blanks slightly wider than specified so you can plane the edges smooth and to exact size. Rip each piece by cutting half the depth from opposite faces to reduce the strain on your saw (Photo 1).

Mark the mortise locations and use a router and edge guide to cut the side- and back-rail mortises (Photo 2). Use a block clamped across each front leg to guide the horizontal front-rail cuts. Square all the mortises with a sharp chisel.

Make a full-size template to transfer the tapering leg shape onto two sides of each leg blank. Then, use a sharp plane to trim the faces to the line. When all legs have been shaped, crosscut them to finished length.

## Case Panels

The wide panels are made by gluing together narrower stock. We used a router table and a straight bit to true the edges for good joints. To joint stock in a router table, set up the fence to take a fine surfacing cut on the board edge. Then offset, through shims or adjustment, the outfeed side of the fence so it's aligned with the bit and will support the wood after the cut. Some commercial router tables have this feature built in. After adjusting the table for jointing, pass the mating edges of the stock past the cutter to trim them straight (Photo 3).

Use joining plates spaced 6 to 8 in. apart when gluing the panel pieces. After about 30 minutes, scrape excess glue from the surfaces and let the glue dry. Then, saw the panels to size with the appropriate beveled cuts (Photo 4). Keep the blade on the waste side of the layout line and plane the cut edges smooth.



Use a circular saw to create the leg blanks. Cut halfway through the stock, then flip it over to complete the cut.

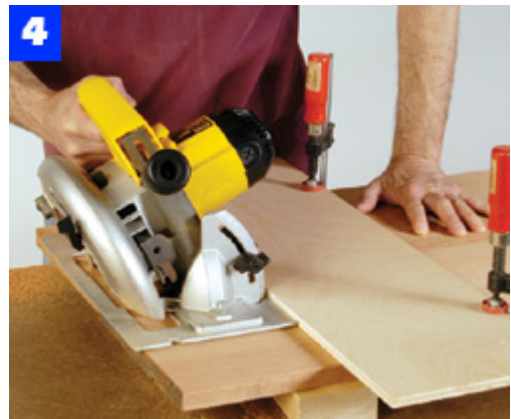


Lay out the mortise locations and use a router and edge guide to cut the mortises. Square the ends with a chisel.





Shim the outfeed fence of a router table so it's aligned with the bit, and use your table to joint the stock edges.



After gluing up the panels, use a circular saw to cut the panels to size with the appropriate angled ends and edges.



Cut all of the tenons with a router table and miter gauge. Use scrap stock behind

Lay out and cut the joining plate slots at the miter joints between the top and sides, and the joints between the bottom and sides. Then, rout the grooves in the side and top panels that house the case back. Rip and crosscut frame parts for the case back and drop-front lid to specified dimensions. At the same time, cut the rail stock for the desk base to finished size.

Rout the tenon cheeks on the back-frame stiles, lid rails and base rails with a 3/4-in. straight bit and router table (Photo 5). A scrap board behind the workpiece prevents tearout at the end of the cuts. With the cheeks shaped, use a backsaw to cut the shoulders at the top and bottom edges of the base rails.

Install a 3/8-in.-dia. bit in the router table and cut the grooves along the inside edges of the door and back-panel parts. Re-adjust the height of the bit to cut the mortises in the ends of

the back rails and lid stiles, and square the mortise ends with a sharp chisel. Rout the rabbets around the back and lid panels, and test the fit of the panel edges in the frame grooves.

Apply glue to the back mortise-and-tenon joints and assemble the stiles to the bottom rail. Slide the panel into position (Photo 6) and then add the top rail. Check for square, and assemble the lid in a similar manner.

Saw the beveled edges at the top and bottom of the door. Then, rout the rabbets around three sides of the back panel and along the top and ends of the door.

### Case Assembly

Apply glue to the case miter joints, slots and plates, and join the sides to the top. Clamp the parts in both directions to pull the joints tight (Photo 7), and check that the assembly is square.

Slide the back panel into the grooves (Photo 8), and join the sides to the case bottom panel.

the work to prevent splintering.



Assemble the back-panel rail and stiles, then slide the panel in its groove and add the remaining rail.



Apply glue and clamp the sides to the top. Clamp in both directions and check that the assembly is square.





Slide the back panel into the grooves in the case sides. After the glue dries, join the bottom to the sides with plate joints.

### **Building The Base**

Spread glue on the side-rail/leg joints and clamp each side subassembly. Cut the spacer blocks and guide strips to size, and glue them to the side rails as shown in the drawing on the first page.

Cut the parts for the drawer frames to size, and add the joining plate slots. Spread glue on the frame joints and assemble the top and bottom frames. Then, use plate joints to attach the frame divider. Bore and countersink pilot holes in the drawer guide strips, and secure them to the bottom frame with screws (Photo 9).

Lay out and cut the plate slots for joining the back rail to the drawer frames. Also, bore and countersink holes in the top frame for mounting the case. Note that some of the holes in the top frame are elongated to allow the case bottom to expand and contract. Then, bore access holes in the bottom frame.

Join the top frame to the bottom frame assembly, and then join the back rail to both drawer frames. When the glue has set, join the drawer-frame/rail assembly to the two leg subassemblies (Photo 10).

Cut the lid supports and facing strips to size and join the parts with plates and glue. Cut the stopblocks from 1/2-in.-thick stock and bore the pilot holes for securing them to the supports. Slide each support into its slot and fasten the stopblock. You'll remove the stop when it comes time to apply the finish. Place the case on top of the desk base, and fasten the parts temporarily.

Lay out the hinge locations on the case bottom and door. Use a sharp chisel to cut the mortises (Photo 11). Mount the hinges and test the operation of the door. If it binds against the case side, simply sand or trim the side or door rabbet until it works smoothly.

### **Drawer And Storage Insert**

Cut the drawer parts to size and use a router table to make the joints. Apply glue to the sides, front and back, and then assemble the box and check for square. Slide the bottom panel into place and screw it to the drawer back.

Mount the drawer pull to the drawer face, and screw the face to the drawer box. Test the fit of the drawer in its opening and trim where necessary. Then, temporarily mount the lid pulls and the support pulls.

Cut the parts for the storage insert and rout the dadoes in the top, bottom and center partitions. Apply glue and assemble the parts (Photo 12). Bore and countersink screwholes in the top of the insert, slide it into position and screw it to the case top.

## **Finishing**

Disassemble the secretary and sand all parts with 120-, 150-, 180- and 220-grit sandpaper. To achieve a smooth finished surface, we applied Behlen Pore-O-Pac filler before staining. First, thin the filler with filler solvent until it has the consistency of thick cream. Working on only a small area at a time, brush the filler into the woodgrain and let it set until it appears dull. Rub the filler off the surface and into the grain with burlap cloths and remove all excess. Allow the filler to dry overnight and sand lightly to remove any residue.

To achieve a deep reddish brown, we applied Behlen Solar Lux Medium Brown Mahogany stain. This is a solvent-based dye that dries quickly, so it's best to add Solar Lux retarder to slow the drying time and prevent lap marks. Let the stain dry overnight before applying the first coat of finish.

For our surface finish, we applied three coats of Waterlox Original Sealer/Finish. Liberally soak the wood surface with finish and wait about 20 minutes before wiping off the excess. After overnight drying, lightly sand the surface with 320-grit sandpaper and dust it off thoroughly before applying a second coat. Apply the final coat using the same technique. When the last coat is dry, rub the surface with 4/0 steel wool to remove any dust nibs and give the piece a warm glow. Polish with a soft cloth. Reassemble the desk and install the hardware. To ease drawer and door-support operation, apply a light coat of paste wax to the parts and then polish.

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# ADIRONDACK CHAIR

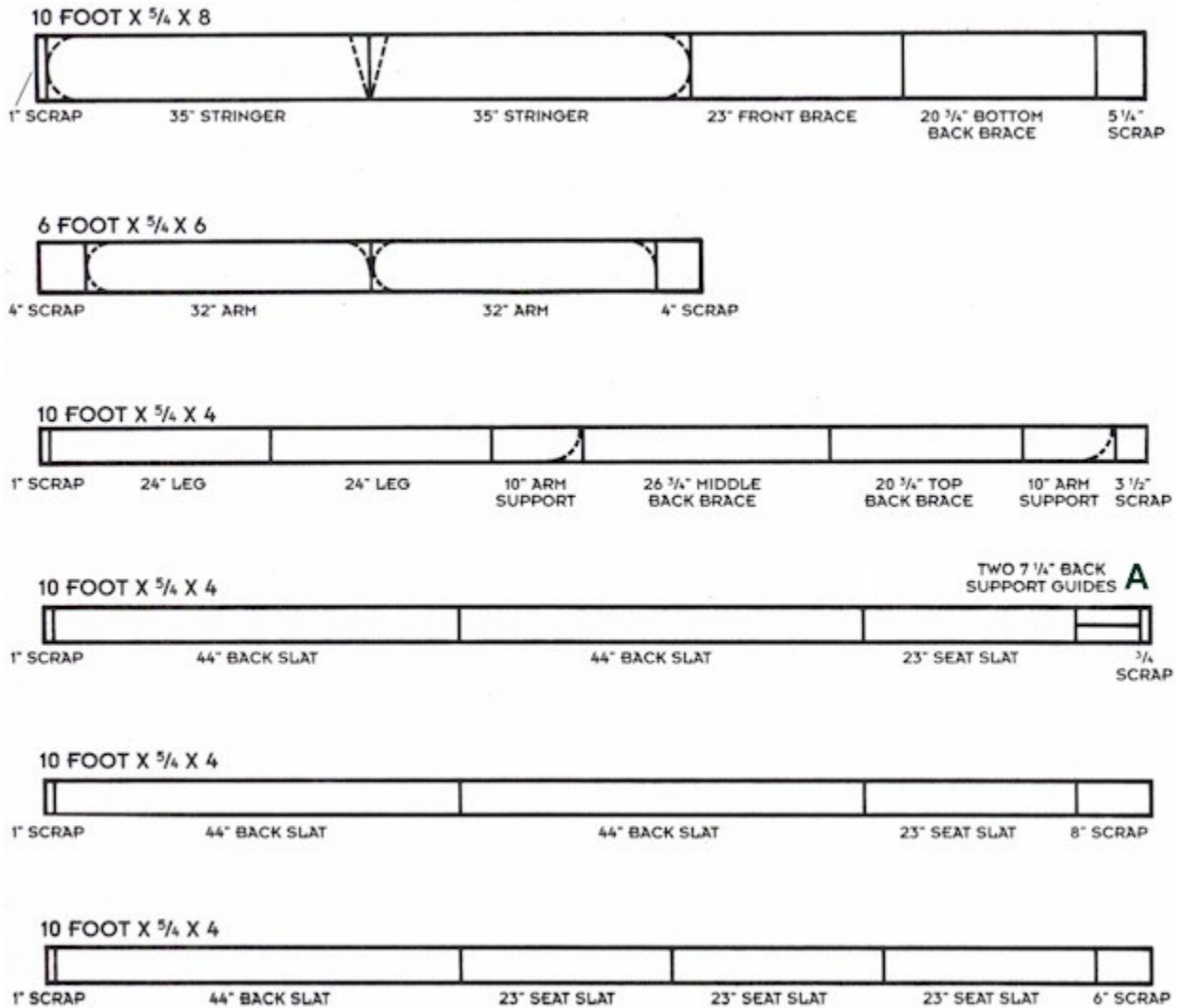


**Overview:** Adirondack chairs can be made from a variety of woods. The most common wood used in their construction is 5/4 pine. My recommendation is to use southern yellow pine (SYP) because its high resin content makes it naturally resistant to decay. If you have

trouble locating 5/4 SYP look for pine stair tread material. Stair tread material comes almost free of knots because it comes from the center of the tree. Let's get started...

**Step 1:** Mark and cut your materials per the cutting diagram on the next page. Sand and smooth each piece in preparation for assembly.

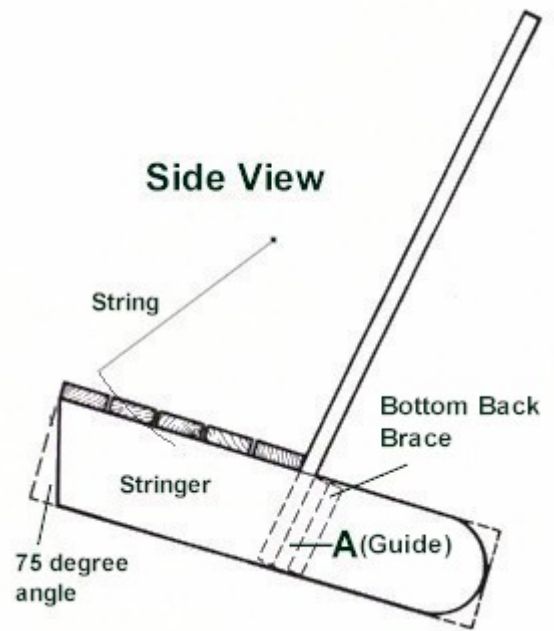
### Wood Cutting Diagram



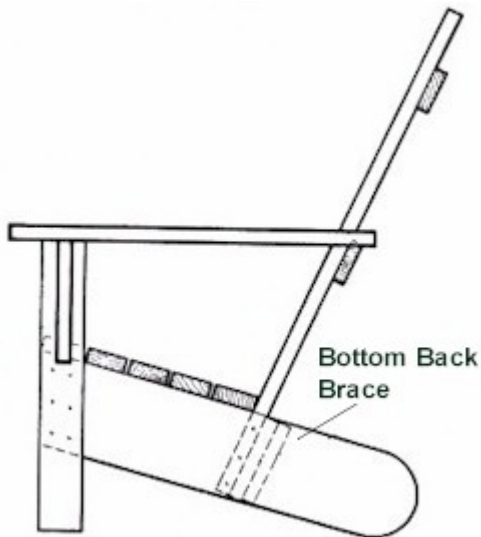
**Step 2:** After the wood is cut and sanded it's time to start assembly. We start with the two back legs (which we are calling stringers) The 2 stringers are the heart of the chair as they hold everything else together.

Use wood screws that are 1 5/8" to 1 3/4" long for all assembly, except where noted. Always pre-drill the holes to prevent splitting.

**Note:** Most assembly will be simply fitting the appropriate pieces together. The guides at location "A" (drawing on right) are noted on wood cutout diagram above.

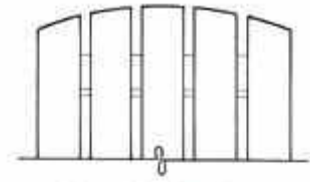
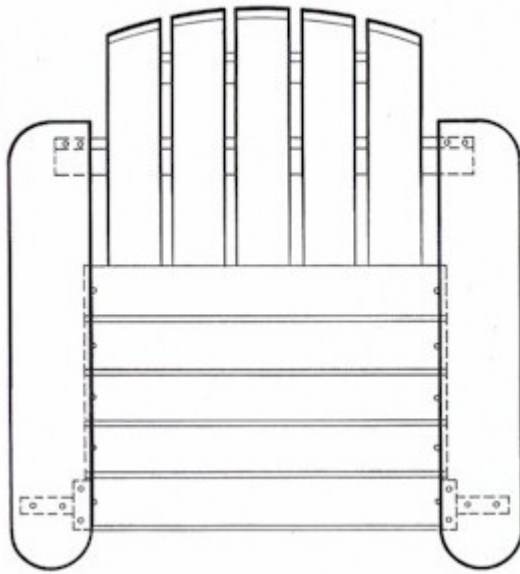


The string shown in the drawing above indicates how to cut curves for the seat or the back (if desired).

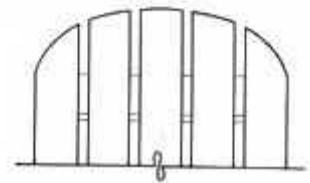
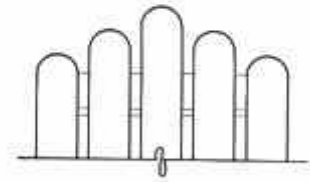
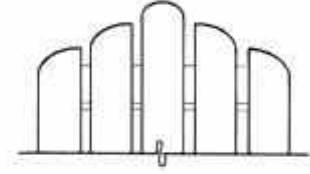




**Top View**

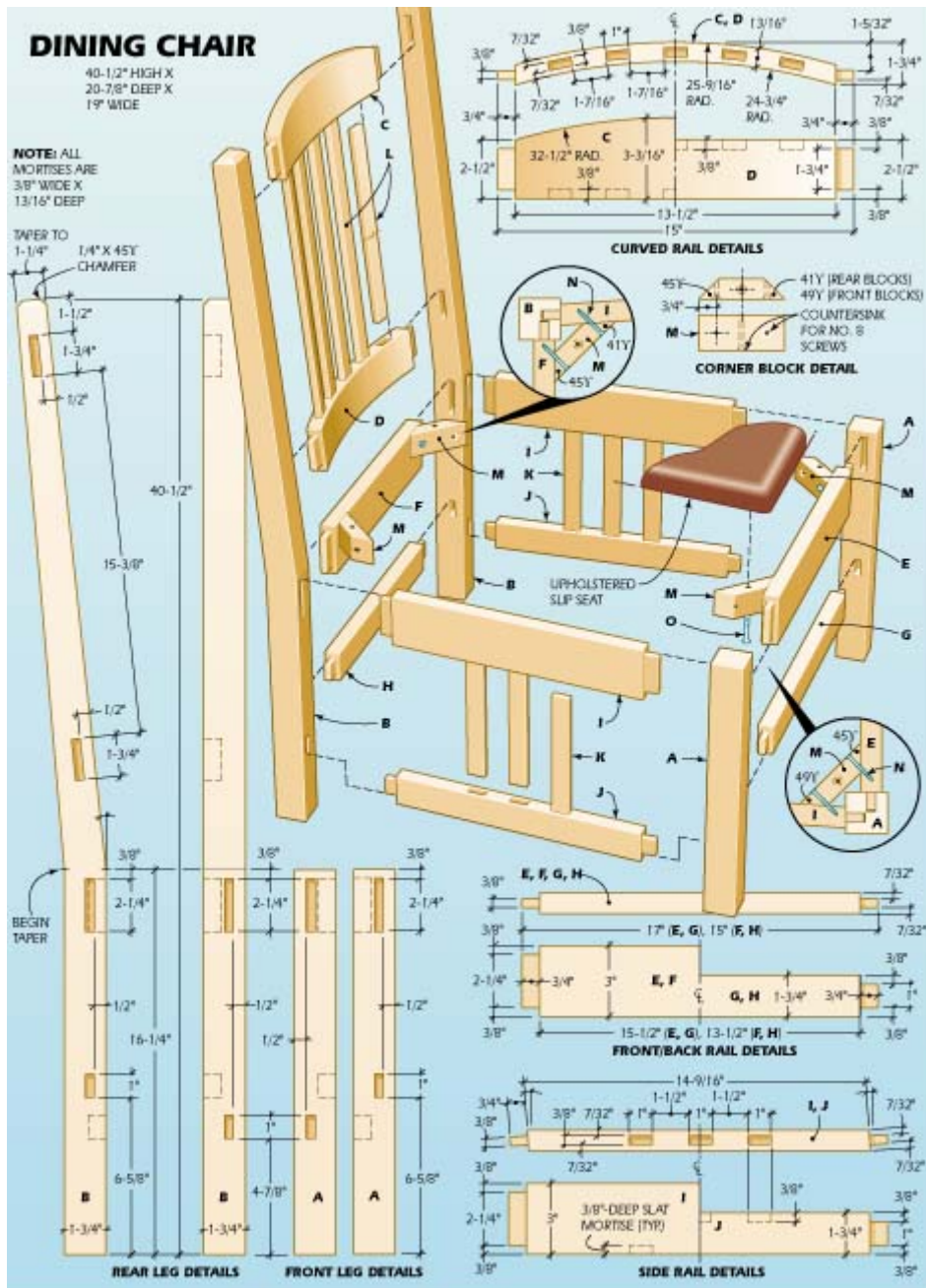


**Back Styles**



# ARTS AND CRAFTS CHAIR





MATERIALS LIST--DINING CHAIR		
Key	No.	Size and description (use)
A	2	1-3/4 x 1-3/4 x 16-1/4" oak (front leg)
B	2	1-3/4 x 3-3/4 x 40-1/2" oak (rear leg)
C	1	1-3/4 x 3-3/16 x 15" oak (top rail)
D	1	1-3/4 x 2-1/2 x 15" oak (bottom rail)
E	1	13/16 x 3 x 17" oak (top front rail)
F	1	13/16 x 3 x 15" oak (top back rail)

		rail)
G	1	13/16 x 1-3/4 x 17" (lower front rail)
H	1	13/16 x 1-3/4 x 15" oak (lower back rail)
I	2	13/16 x 3 x 16-1/4" oak (top side rail)
J	2	13/16 x 1-3/4 x 16-1/4" (lower side rail)
K	6	3/8 x 1 x 7-3/4" oak (side slat)
L	5	3/8 x 1 x 15-3/8" oak (back slat)
M	4	13/16 x 1-1/2 x 3-5/8" (corner block)
N	8	1-1/2" No. 8 fh woodscrew
O	4	2-1/4" No. 8 fh woodscrew
Misc.: Medium Fumed Oak aniline dye (No. W1190)		

### Making The Parts

Begin construction by ripping and crosscutting stock to size for the front legs. Then, cut two 4 x 42-in. blanks for the rear legs. Make a cardboard template for the rear legs and trace around it to transfer the shape to each blank. Saw to the waste side of the line with a band saw or sabre saw, and use a sharp plane to trim each leg square and to finished dimension (Photo 1).

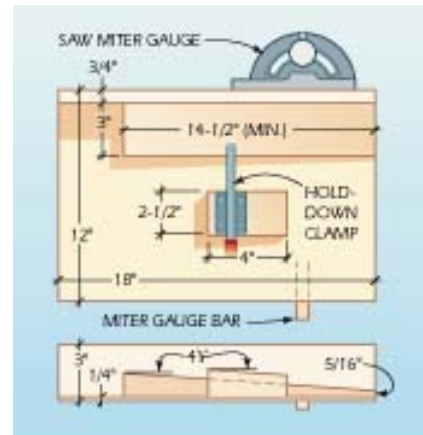
Mark the mortise locations on all legs. To make this job easier, clamp several legs together with the ends held even and mark across them using a straightedge or square as a guide. Install a 3/8-in.-dia. spiral up-cutting bit in your router, and use an edge guide to rout the mortises in the legs (Photo 2). Square the rounded mortise ends with a sharp chisel.

Cut blanks of 1-3/4-in.-thick stock for the curved back rails. Before cutting their curved profiles, use a table saw and dado blade to cut the tenons at the ends of the pieces (Photo 3). Note that the tenons are not centered across the thickness of the blanks. Cut one side of all the tenons first, then readjust the blade height to cut the other side. It's best to cut the tenons about 1/32 in. thicker than indicated, and then use a sharp chisel to pare the surfaces smooth and bring the tenons to finished dimension.

Make a cardboard template for the back-rail shape and use it to transfer the shape to each blank. Use a band saw to cut the inside curve of each rail (Photo 4). Then, remove the saw marks and smooth the curved shape with a spokeshave (Photo 5). Go back to the band saw to cut the outside curve and smooth that surface with either a block plane or spokeshave. Don't cut the arched profile of the top rails at this time.

Cut stock for the lower front and back rails to finished dimension and use a dado blade in the table saw to cut the tenons. Readjust the blade height and hold the rails on edge to cut the top and bottom shoulders at each rail end.

Next, cut stock to size for the side rails. Study the drawing to be sure you understand the angled tenons on these pieces. Label each rail with its



ANGLED-TENON JIG



After sawing the rear leg shape, use a sharp plane to remove saw marks and trim the leg to exact size.



location in the chair to avoid confusion when it comes time to cut the joints.

We built a jig to cut the angled tenons. To make the jig, first attach a hardwood fence to a plywood base, and then screw the assembly to your table saw miter gauge. Glue up four pieces of 3/4-in.-thick stock and band saw the stack into a ramp with an angle of 4°. Screw the ramp to the plywood base. To use the jig, hold a rail on the ramp and push the jig past the dado blade. We used a holddown clamp mounted on a tapered hardwood block to hold the workpiece.



Mark the mortise locations in the chair legs, and use a plunge router with an edge guide to cut the mortises.



Use a table saw and dado blade to cut the tenons in the blanks for the curved back rails. These tenons are not centered.



Lay out the back-rail curve onto the edge of each rail blank. Then, cut the inside curve on the band saw.





Use a spokeshave to smooth the inside curve of the back rail, and then cut and smooth the outer curve.

Cut one surface of each tenon with the ramp angled down toward the dado blade (Photo 6). Then, secure the ramp in the opposite direction and readjust the blade height for the opposite side of each tenon (Photo 7). If you're using the holddown clamp, you'll need to remount it. Then, use the miter gauge without the jig to make the angled cuts for the top and bottom shoulders of the side rails (Photo 8). Cut strips for the side and back slats. Crosscut the slats to finished length, and set them aside.

Lay out the slat mortises in the side rails and in the curved back rails. Mark the side-rail mortises by clamping several rails together and marking across the stack with a square. Mark the curved rails individually.

Install a 5/16-in.-dia. bit in the drill press and bore slightly overlapping holes to remove most of the waste from the mortises in both the curved and straight rails (Photo 9). Then, use a sharp chisel to pare the walls and square the ends of the mortises (Photo 10). Test a slat in each mortise--the fit should be snug. Make another template for the arched shape of the top back rail and use the template to trace the shape onto the workpiece. Use a sabre saw to cut the profile (Photo 11).



To cut the angled tenons on the side rails, support the stock in a table saw jig that holds the work at a 4° angle.



When cutting the opposite tenon faces on the rails, reverse the ramp on the jig and readjust the dado blade height.



Finish the rail tenons by cutting the top and bottom shoulders with the miter gauge and dado blade.



Use a 5/16-in.-dia. bit to bore slightly overlapping holes to remove most of the waste from each slat mortise.



Trim and square the slat-mortise walls with a sharp chisel. Then, test fit the slats--they should be quite snug.



Use a template to lay out the arched profile of the upper back rail. Then, cut to the line with a sabre saw and smooth.

Mark the shoulders on the top and bottom edges of the curved back rails and use a small backsaw to make the cuts (Photo 12). First, make the cuts into the endgrain of the tenon. Then finish the shoulder by cutting across the grain.

Place guide marks for the 1/4-in. chamfer at the top end of each rear leg. Clamp a leg in the bench vise and use a sharp block plane to cut the chamfers.

### Assembly

First, sand all parts with 120-, 150-, 180- and 220-grit paper, dusting off thoroughly between grits.

Spread glue on the mating surfaces for the front-leg/front-rail joints. Use a small shim to spread glue in the leg mortises and a small brush for the tenons. Spread the glue sparingly on the tenons to avoid excessive squeeze-out at the joints.

Join the rails to the front legs, then clamp the joints and compare opposite diagonal measurements to be sure the assembly is square (Photo 13). Let the glue set for about 20 minutes and use an old chisel to pare off any excess glue.

Next, insert the side slats in the mortises of the bottom side rails and position the top side rail over the slat ends. While you don't need glue in the slat joints, a drop of glue in a loose joint will keep the slat from rattling. Temporarily clamp the rails and slats (Photo 14).

Spread glue in the open mortises of the front-leg assembly and on the front tenons of the side rails, and join the side rails to the legs (Photo 15).

Join the back slats to the curved rails (Photo 16) and temporarily clamp the assembly. Again, it's not necessary to glue these joints unless a slat is loose in its mortise.

Spread glue on the tenons of the back rails and in the matching mortises in the back legs. Join the rails to the legs, clamp and compare opposite diagonal measurements (Photo 17).



Cut the shoulders of the curved back rail tenons with a small backsaw. First cut in from the end, then across the grain.



Join the front rails to the legs, and clamp. Compare opposite diagonal measurements to check for square.



Join the side slats to the rails. It's not necessary to use glue since the slats are held captive between the rails.



Spread glue on the rail and leg mating surfaces. Join the side rails to the front leg assembly and clamp.



Join the back slats to the curved rails. If a slat is too loose in its mortise, add a drop of glue to keep it from rattling.





Join the back rail and slats to the legs. Apply the glue sparingly, clamp, and check that the diagonals are equal.

Once the glue has set on the subassemblies, complete the chair frame by joining the side rails to the back-leg assembly. Spread glue on the mating surfaces and position the joints. Apply clamps to pull the joints tight. Set the chair upright on a flat worktable to be sure that all four legs sit evenly (Photo 18). Adjust the clamps and joints, if necessary, until any rocking is eliminated.

Cut corner blocks to reinforce the joints and provide a means for attaching the seat. Note that the angles for the blocks at the front of the chair are different than those for the rear blocks. Use a miterbox to cut the blocks. If your miterbox won't handle the 41° angle for the rear blocks, make the cuts on a band saw.

Bore and countersink pilot holes through the width of the blocks for attaching the seats. Use a clamp to hold each block in place while you bore and countersink pilot holes for attaching it to the rails (Photo 19). A combination bit and countersink is the most efficient tool for the job. Fasten the blocks to the rails with 1-1/2-in. No. 8 screws.

### Finishing

First inspect each chair for scratches, and sand if necessary. We used a water-soluble aniline dye for a beautiful, clear and lightfast color. To eliminate raised grain problems, wipe the chairs with a sponge dampened with clean water. Let the wood dry completely and lightly sand the surface with 220-grit paper.

Follow the manufacturer's directions for mixing and applying the dye, and be sure to allow sufficient drying time before applying a finish.

For our finish, we used Waterlox Original Sealer/Finish. Brush or wipe on the first coat, which will soak into the wood readily. Allow the finish to dry overnight. Lightly sand with 320-grit paper and remove all dust. For the next and subsequent coats, apply the finish and let it sit for about 30 minutes before wiping off any excess. Then, let the finish dry overnight. At this point, you will sand between coats only if the finish is rough. After three or four coats, burnish the surface with 4/0 steel wool to remove any rough spots, and polish with a soft cloth.

Finally, attach the finished slip seats to the frames with screws installed through the corner blocks into the underside of each seat.



Join the back subassembly to the front-leg/side-rail assembly. Work on a flat surface so the legs remain even.





# KENTUCKY CHAIR



You start with three six foot 2x4s ( I used pressure treated pine), ripped into nine equal  $1\frac{1}{2} \times 1\frac{1}{8}$  pieces. By judicious measuring, this should yield the following:

Seat: (A) 6 pieces 15" long ) each piece has two  $\frac{1}{4}$ " holes  
(B) 2 pieces 35" long ) drilled in the center of the wider side. Measure from the same end:  
1st hole  $1\frac{1}{2}$ ";  
2nd hole 12".  
(C) 9 pieces  $9\frac{5}{8}$ " long: Two holes,  $1\frac{1}{2}$ " from each end.

Back: (D) 4 pieces  $31\frac{1}{2}$ " long) Each piece has two holes, at  
(E) 2 pieces 29" long )  $1\frac{1}{2}$ " and 25" measured  
(F) 2 pieces 42" long ) from the same end.

All held together with 9 gauge galvanized wire..

Align seat pieces as : A-A-B-A-A-B-A-A and hold together loosely at top with a length of wire through the upper ( $1\frac{1}{2}$ " holes); At the lower (12")holes, intersperse each piece with a length of C. That is:

C-A-C-A-C-B-C-A-C-A-C-B-C-A-C-A-C. Wire and set aside.

Align back pieces in the order F-D-E-D-D-E-D-F, and again hold together loosely with a wire through the holes which are  $1\frac{1}{2}$  from the end.

Now marry the two parts by threading wire through the remaining holes, with the C pieces acting as the connectors. The new joint should have the configuration: C-F-C-D-C-E-C-D-C-D-C-E-C-D-C-F-C.

Draw all wires tight, cut off and secure ends somehow (I threaded them and used cap nuts).

Now take it all apart, sand as appropriate, finish as desired and reassemble.