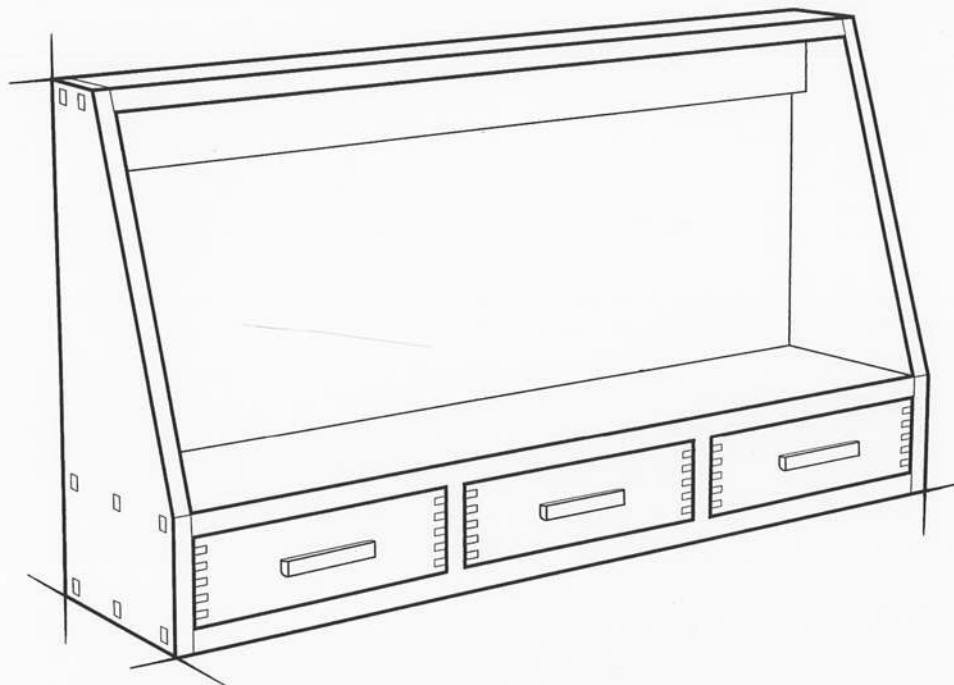


WOODWORKS: ADVANCED PROJECT 2002-2003

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 $\frac{3}{4}$ " thick, so you'll need to plane some of it to a $\frac{1}{2}$ " 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. rabbet 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

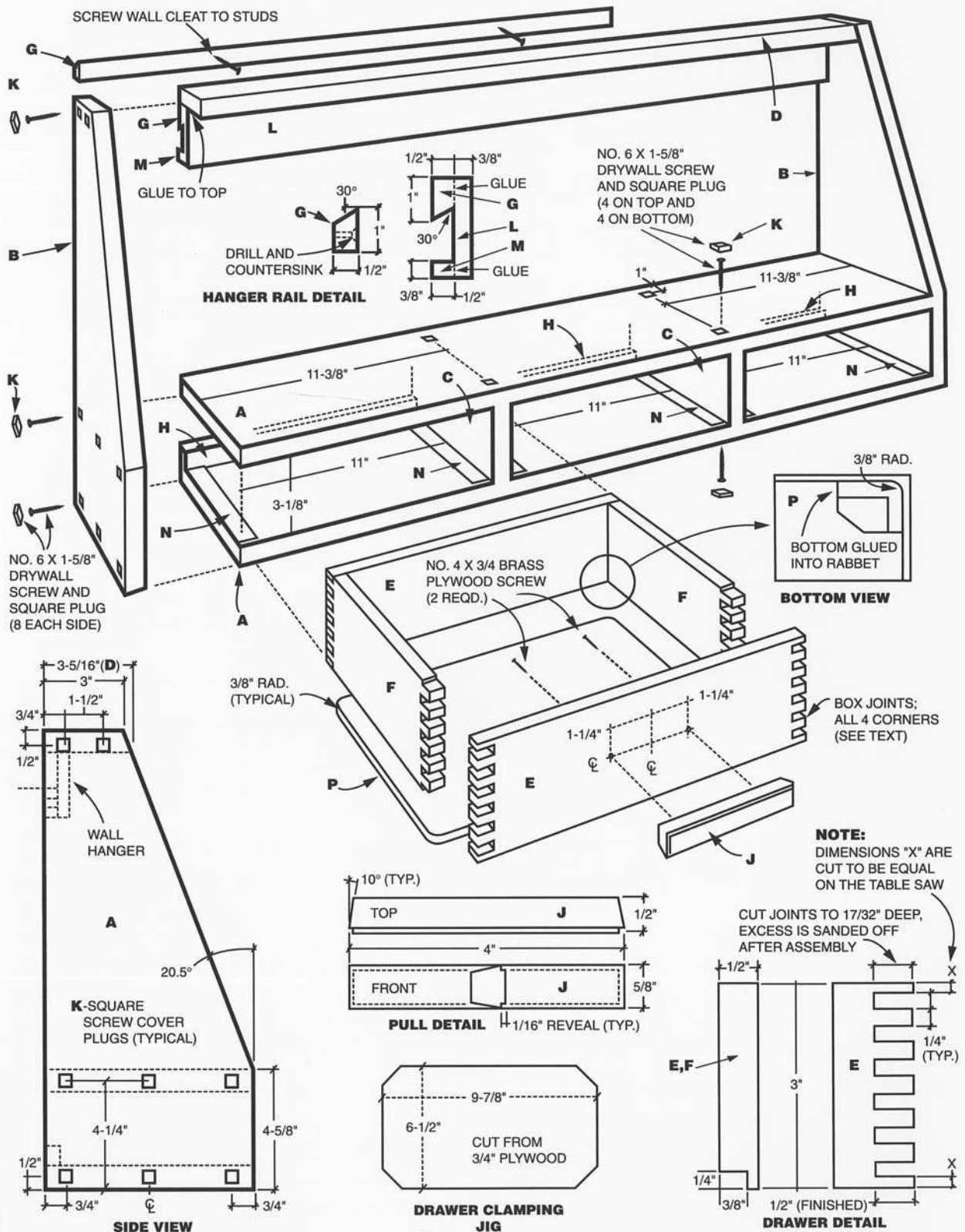


FIG B. MAKING THE SPLINE GUIDE

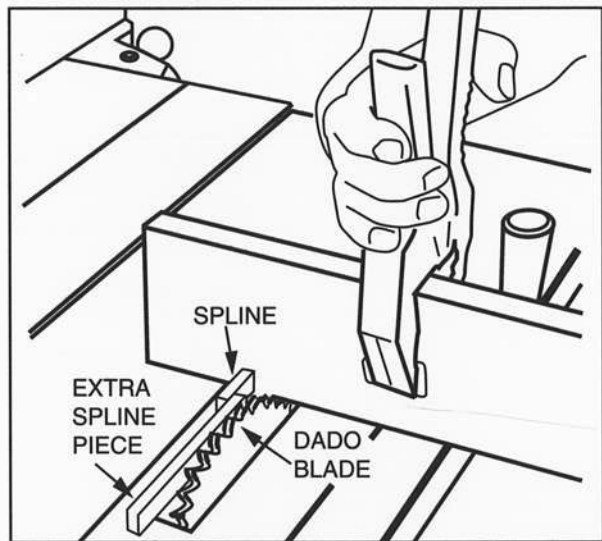


FIG C. CUTTING SLOTS IN THE FRONTS AND BACKS

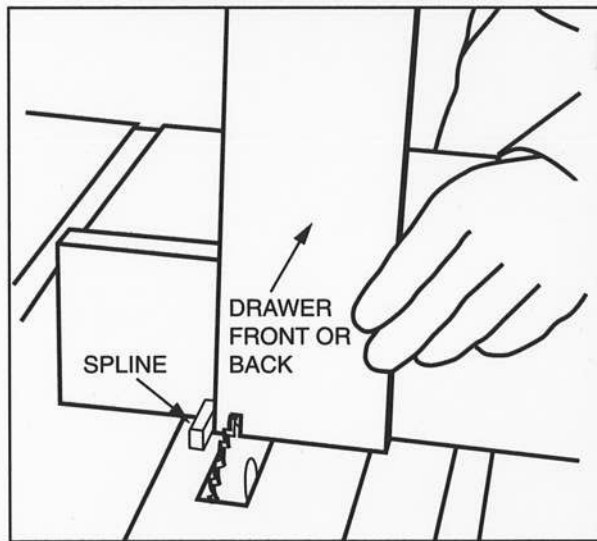


FIG D. CUTTING SLOTS IN THE SIDES

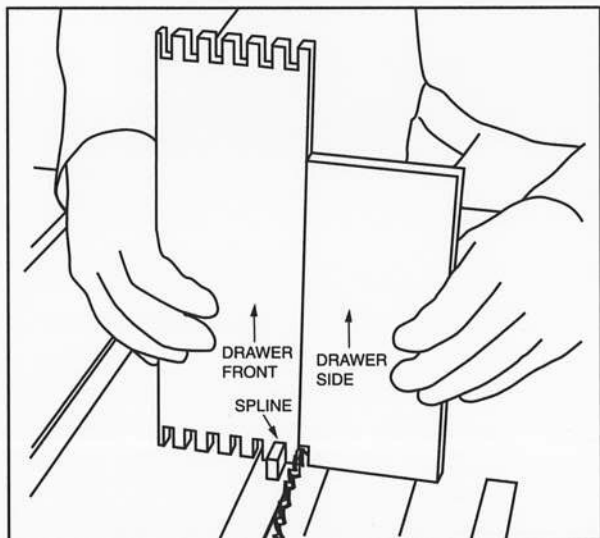


FIG E. ROUTING RABBET FOR DRAWER BOTTOM

