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ALL-TIME FAVORITE PROJECTS™

12 Complete Project Plans -

Hand-Picked by the Staff of Woodsmith Magazine

Summer 2018

ALL-TIME FAVORITE PROJECTS™

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craftsman-style Bride's Chest

Functionality and beauty combine in this classic piece of American fine furniture. Best of all, it's every bit as practical as it is attractive.

You don't have to be a new bride to appreciate the beauty and utility of this traditional chest. The Craftsman-style design is loosely based on a Gustav Stickley original from the early 1900s. The design is both timeless and straightforward to build.

The chest not only looks attractive, but it also offers lots of storage. In addition to the large interior space, I added a lift-out tray for keeping smaller items out of the main compartment.

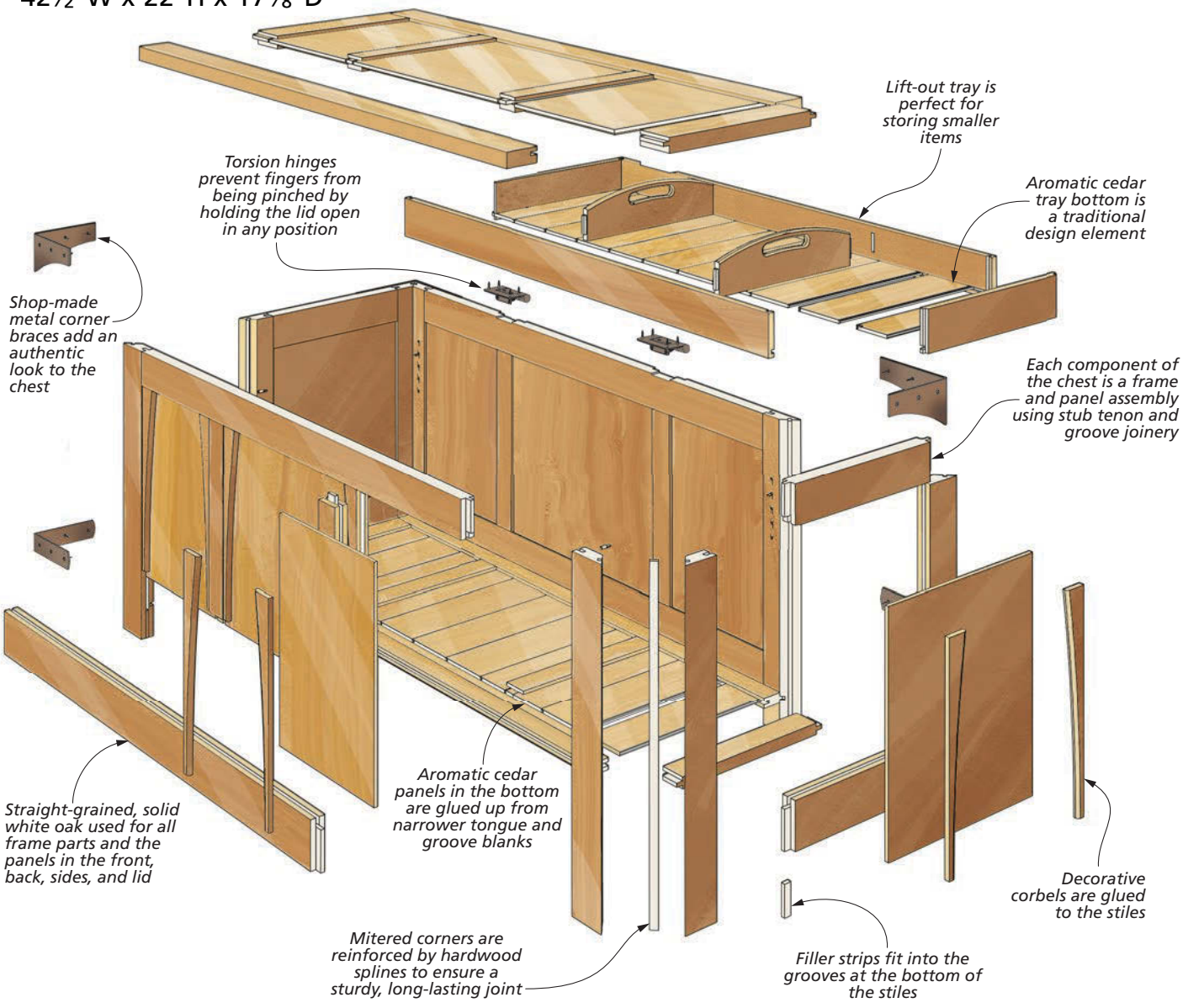
The chest consists of six frame and panel assemblies: the front, back, sides, bottom, and lid. While there are a few subtle differences between the panels, the techniques used to make them all are the same throughout the project. I used straight-grained white oak, the traditional choice for Craftsman-style furniture, for the frames and panels.

Although the woodworking techniques are not unusual, I did try my hand at a bit of metalworking to make the hardware. I was struck by the hand-wrought steel corner braces on the original chest. But when I looked at the options for similar hardware, I wasn't able to find anything comparable.

Instead, I used some steel from the hardware store and a few pyramid-head nails. I found the steel was easy to work using common shop tools, and a few simple metalworking techniques. With the addition of a patina solution, it makes a convincing instant antique.

Construction Details

OVERALL DIMENSIONS:
42½"W x 22"H x 17⅝"D



Lift-Out Storage. The tray features an aromatic cedar bottom. It's also divided into three sections for convenient storage.

Add Charm. The process for antiquing the steel braces is pretty straightforward, and the pyramid-head nails add authenticity.

Vintage Details. In addition to the quarter-sawn white oak, the decorative corbels give the chest a classic design element.

making the **Frames**

The chest is made up of a group of frame and panel assemblies: The front, back, lid, bottom, and two sides. Each one is made up of a hardwood frame and solid-wood panels. This frame and panel design relies on stub tenon and groove joinery.

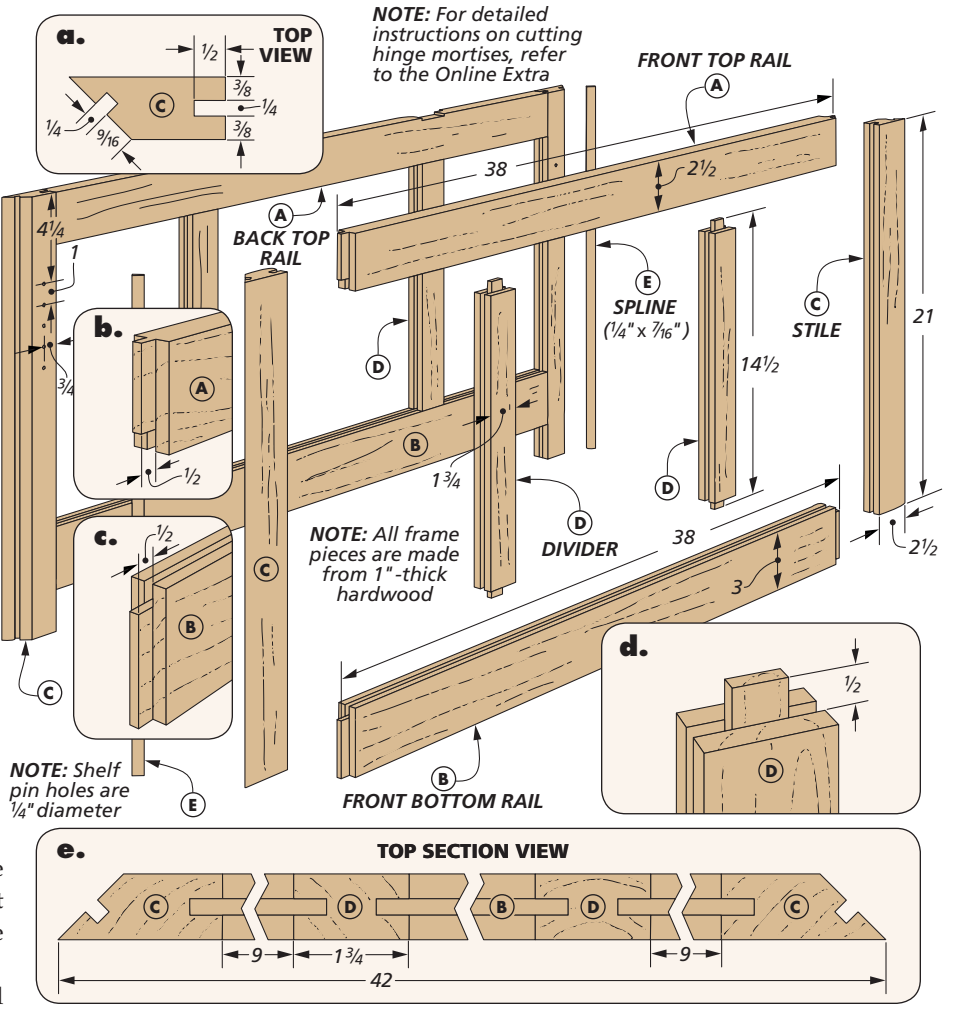
You'll note that the stiles on each of these frames are mitered and splines are added to help with alignment during the glueup. I started by making the front and back frames, then the two sides.

FRONT & BACK FRAMES

The front and back frames are identical except for the hinge mortises in the back top rail (left drawing below) For more on the hinge mortises, refer to *WoodsmithSpecials.com*.

THICKNESS. I started by planing several 5/4 boards down to a final thickness of 1". The thickness is not only true to the original Stickley design, but it's perfect for a sturdy chest that will potentially see several generations of use.

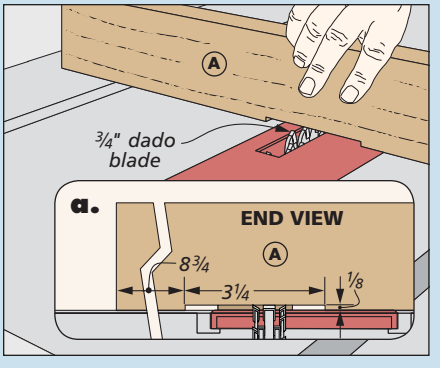
You can now cut all the rails, stiles, and dividers to final size. Note that the stiles for the side assemblies are the same as those used on the front and back. Cut all eight of them plus a couple extra to use as cauls when you assemble the frames. I'll get to the details on that later.



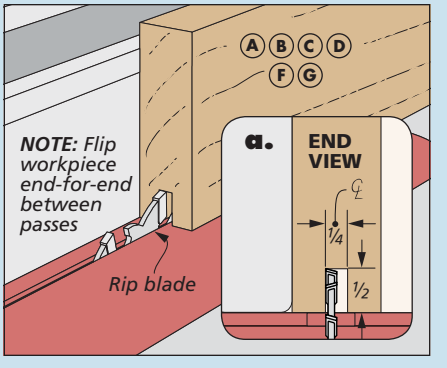
JOINERY CUTS. The box below walks you through the process for cutting the grooves and stub tenons needed for the joinery. The center drawing shows how I used a standard rip blade to cut the wide, centered groove for the panels in all the frame pieces.

After that, install an auxiliary rip fence and an auxiliary fence on the miter gauge, as well. The auxiliary rip fence

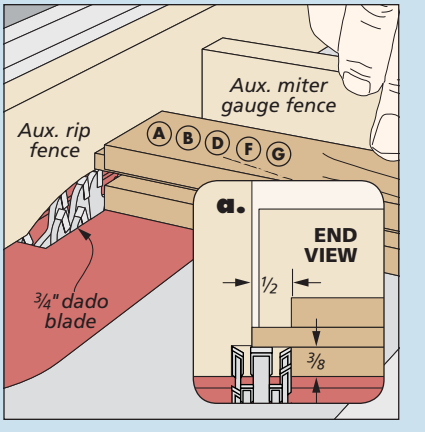
How-To: Make the Frame Parts



Hinge Mortises. With an auxiliary fence on the miter gauge, use the rip fence as a stop to nibble away the waste.



Centered Groove. Two passes, each one slightly off-center, allow you to cut a centered groove that will fit the panel.



Tenons. With the dado blade buried in an auxiliary fence, use a miter gauge to cut the tenons on the frame parts.

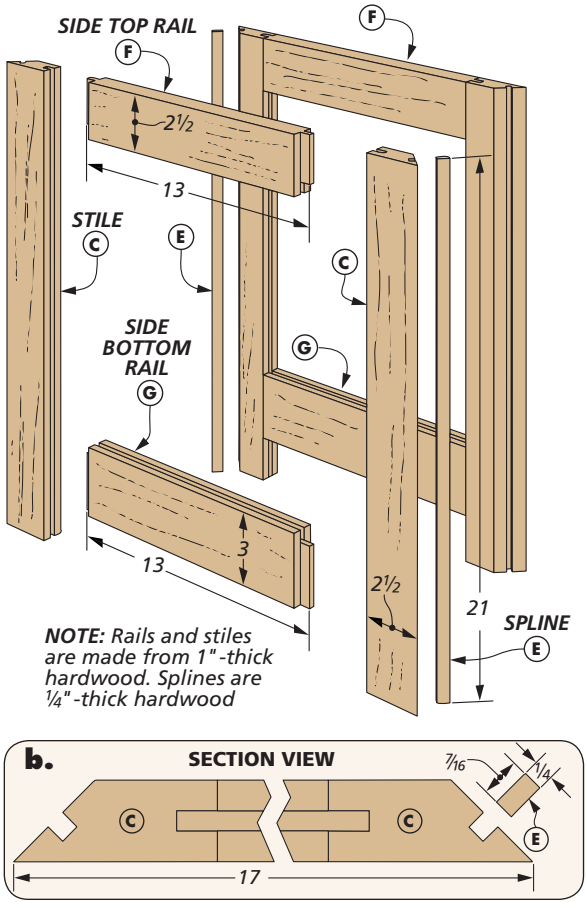
allows you to bury the dado blade for cutting accurate tenons. Test the fit of the tenons in the grooves as you go. You're looking for a snug, slip fit. If it's too tight, you run the risk of splitting out the sides of the grooved pieces. Too loose, and the joint may fail.

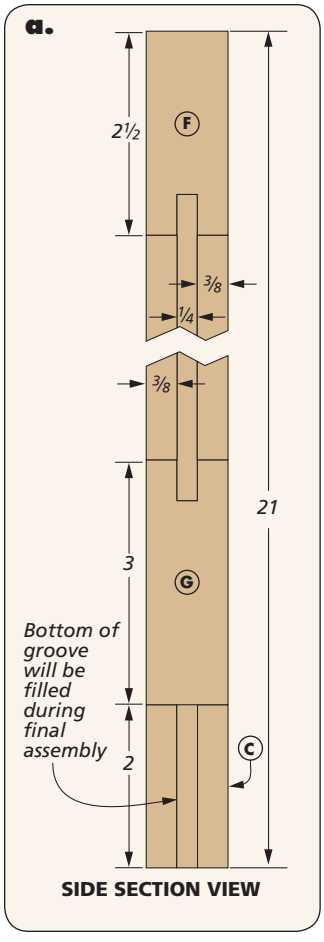
MITER STILES. As shown in the drawings, the stiles are mitered and splines are added to reinforce the joints. I started work on them by first mitering each one, including the extras (left drawing below).

Now is a good time to lay out the locations of the dividers (detail 'e,' opposite page). After that, mark the positions for the shelf pin holes on the stiles and drill them. The main drawing on the opposite page shows the locations.

GROOVE THE MITERS. In the center drawing below, you can see how I installed a ¼" dado blade and set the angle to 45°. Use this setup to cut the angled grooves in the mitered edges of the stiles. Use test pieces to check the setup of both the blade and fence to match those in detail 'a.'

SPLINES. At this point, you're ready to cut the splines that will go in the miters. After resawing some thicker stock and planing it to a thickness of ¼", rip it to final width (right drawing, below). Sneak up on a good fit for the splines. They should slip into the grooves easily.



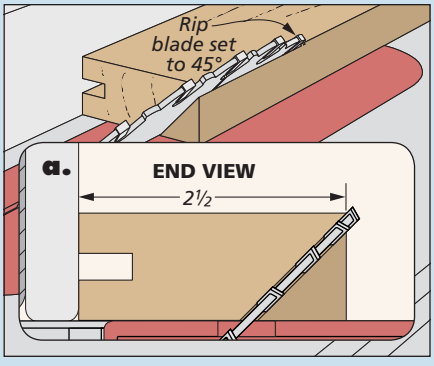


SIDE FRAMES

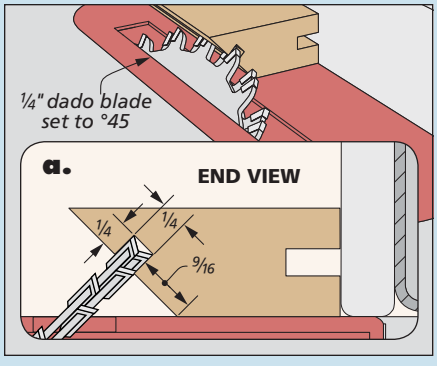
The side frames connect to the front and back with the mitered stiles. They differ only in size. You can start by cutting the top and bottom rails to final size (note the difference in widths). Then cut the grooves and tenons on each, as you did before. You'll use the mitered stiles and the splines you made earlier to complete the side frames.

DO A TRIAL FIT. Dry fitting all of the parts to this point reveals any problem areas with the fit of the components. I checked all of the frame assemblies to make sure that each piece fit and that they were square. Afterwards, you can move on to making the panels.

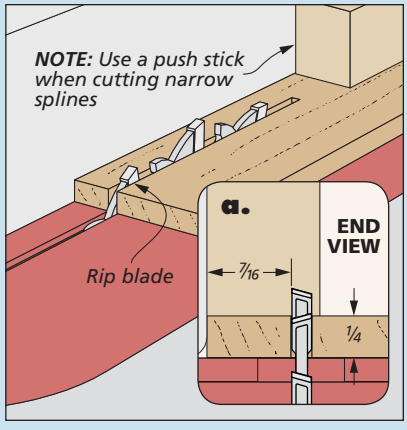
How-To: Cut the Miters & Splines



Miter Cut. Tilt the rip blade to 45° and set the fence as shown in detail 'a.' Then miter the edge of each stile.

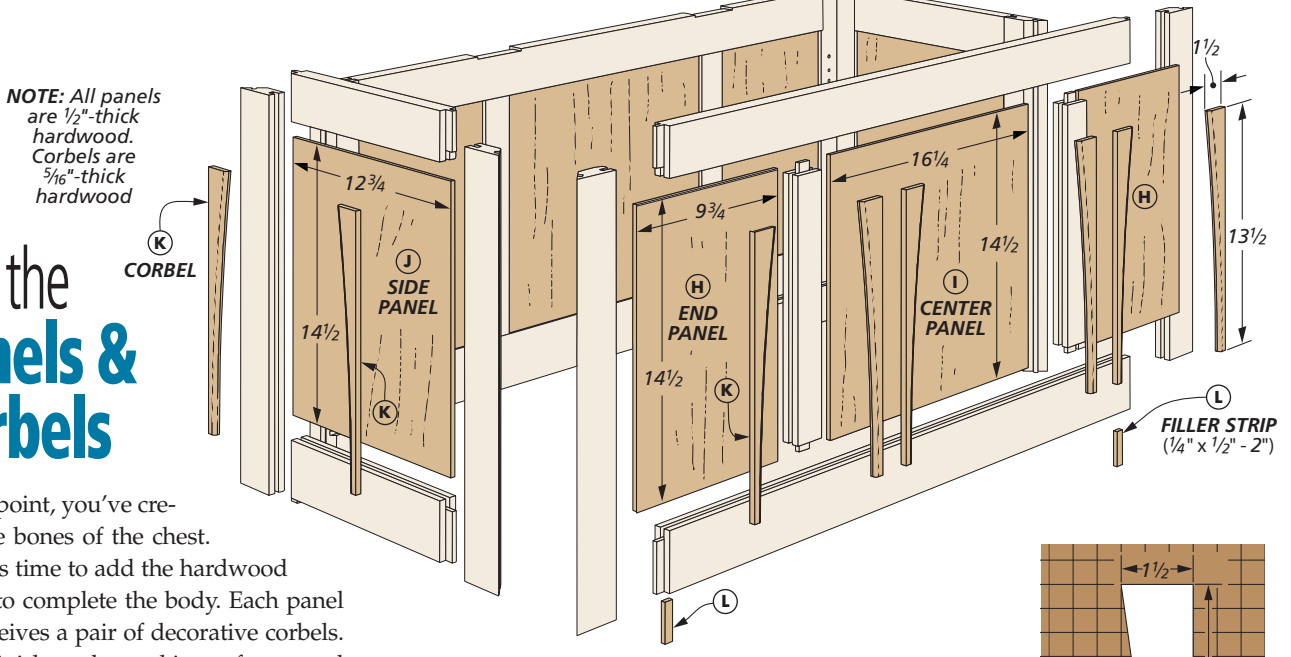


Groove. Install a ¼" dado blade tilted to 45° and to cut the groove for the spline in the mitered edge of each stile.



Splines. You'll need to start by planing some stock down to ¼" thick, then rip the four splines to width.

add the Panels & Corbels



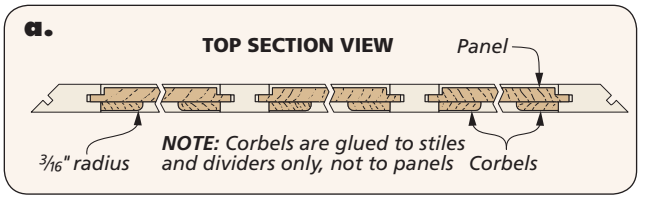
At this point, you've created the bones of the chest. Now it's time to add the hardwood panels to complete the body. Each panel also receives a pair of decorative corbels. You'll finish up by making a frame and panel bottom for the chest and assembling the components.

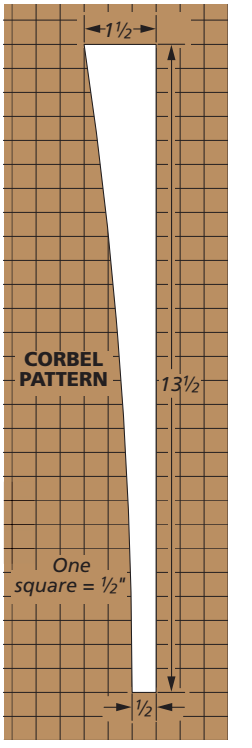
HARDWOOD PANELS. You'll need to resaw and plane some stock for the panels down to the necessary thickness (½"). Then glue up the panels and cut them to final size. With a dado blade buried in an auxiliary fence, rabbet the edges and ends of the panels (left drawing, below).

After dry fitting, stain and finish the panels. This ensures that no unfinished edges will peek out when low humidity levels causes the panels to contract.

CORBELS. Corbels glued to the stiles and dividers add to the Craftsman-style look. Once again, you'll have to plane some stock to final thickness (5/16"). I made a hardboard template to lay out the shape of the corbels. Later, you'll use the template to trim them flush after band sawing. Use the pattern at right to lay out the shape.

I also made a ¼" hardboard spacer to fit into the grooves in the frame for installing the corbels. Make the spacer a little wider to use during assembly to glue the corbels in place as shown in the center drawing below. A good coat of wax on the spacer helps prevent glue from sticking to the corbels during assembly. For more information on this, check out the Online Extra.

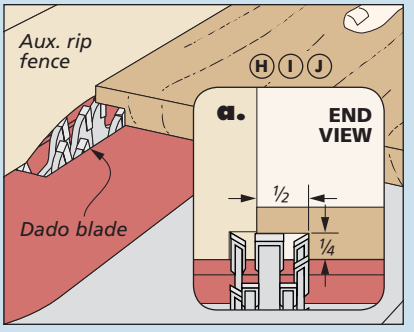




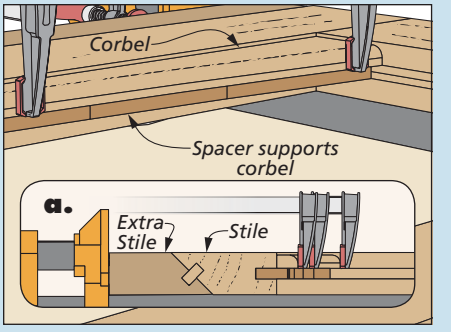
GO 2 Online Extras

For more information about installing the corbels, go to:
WoodsmithSpecials.com

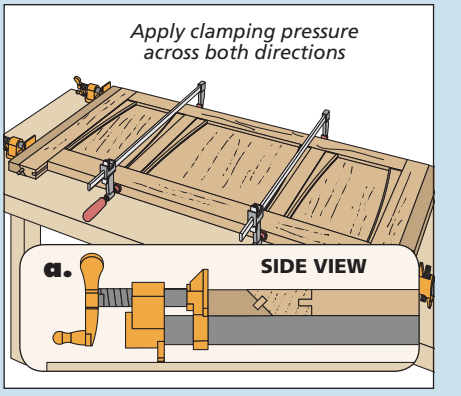
How-To: Frame Parts



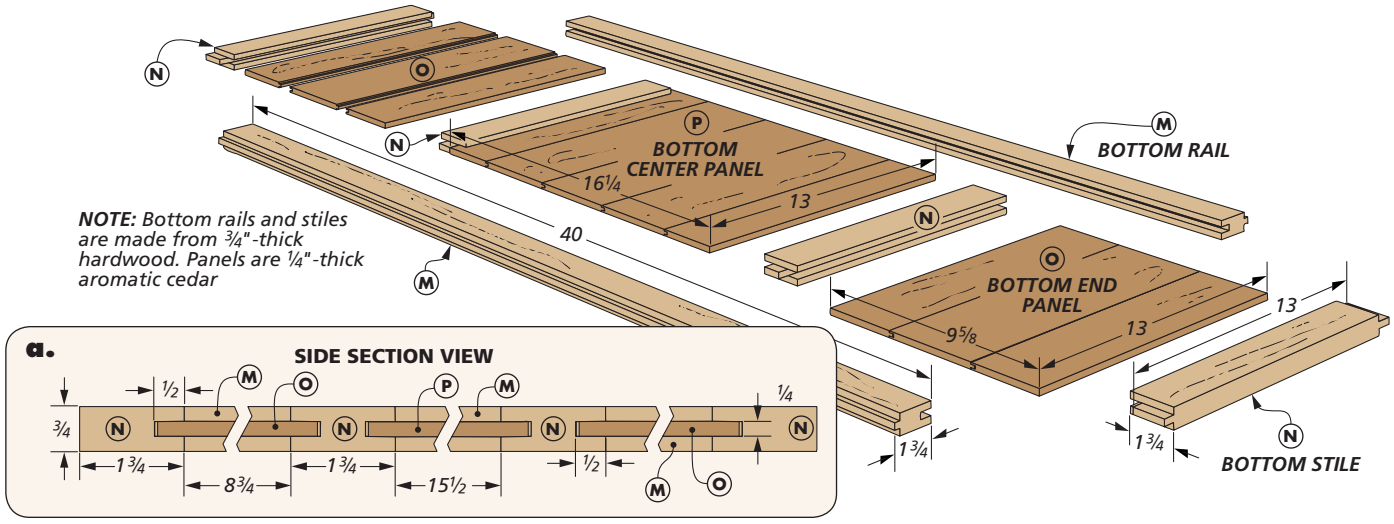
Cutting Tongues. With the table saw set up for cutting rabbets, cut the tongues for a snug fit in the grooves.



Install the Corbels. A hardboard spacer in the groove in the frame supports the corbel as you glue it in place.



Assembly. The extra stiles you made earlier now make the perfect cauls as you glue up the frame and panels.



ASSEMBLY. The nice thing about frame and panel construction is that it's easy to assemble and is virtually self-squaring. Simply apply glue to the tenons on the rails and dividers and add the clamps. Let the panels float freely without glue in the frames. Use the extra stiles you made earlier as cauls (right drawing at the bottom of the opposite page).

FILLER STRIPS. At this point, the grooves in the stiles are visible at the bottom, below the bottom rails. To fill the voids, I cut some filler strips, sized for a snug fit. A little glue is all you need to install them.

GROOVE. After the glue dries on the assemblies, take the front and back to the table saw. You'll need to install a dado blade and then cut a groove on the lower edge of both assemblies to hold the bottom (Figure 1).

BOTTOM. The process of making the bottom is captured in the drawings at right. In Figures 2 and 3 you can see that cutting the centered groove and tenon are just the same as you've been doing for the other assemblies. The first difference is shown in Figure 4, where I cut a tongue on the outside edge of the rails.

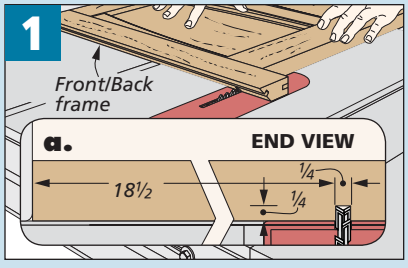
The only other change is that I chose ¼"-thick tongue and groove aromatic cedar paneling for the bottom. Aromatic cedar is a traditional wood for this type of chest as it repels insects.

ASSEMBLE THE CASE

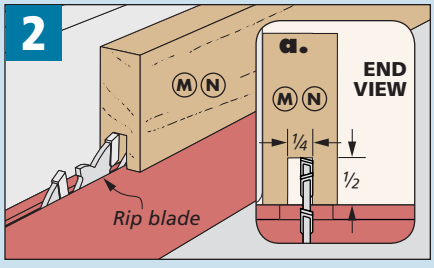
Now is the time to dry fit the assembly to make sure the bottom fits and the corner joints are tight. I then followed the sequence shown in the box at right to assemble all of the case parts, along with the corner splines.

With everything in position, use a couple of band clamps to securely hold it all together. Double check the case for square and let it dry overnight.

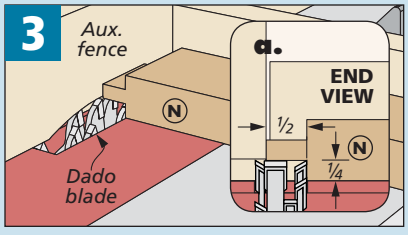
How-To: Build the Bottom



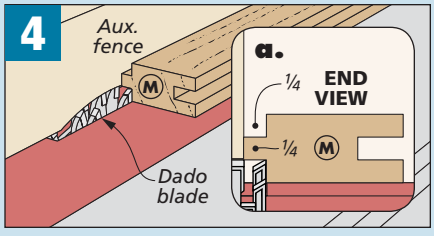
Groove for Bottom. Install a ¼" dado blade and cut a groove in the bottom rails and stiles for the bottom.



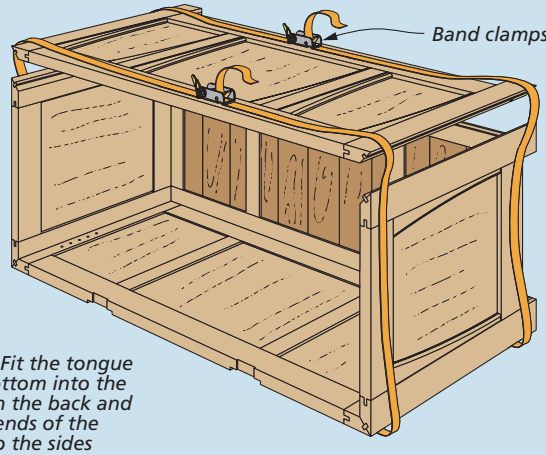
Centered Groove. Cut the centered groove for the cedar panels in the rails and stiles in two passes.



Tenon. You can cut another set of stub tenons on the stiles using the dado blade buried in an auxiliary fence.



Tongue. The outside edge of the rails needs a tongue to fit into a groove in the front and back of the chest.

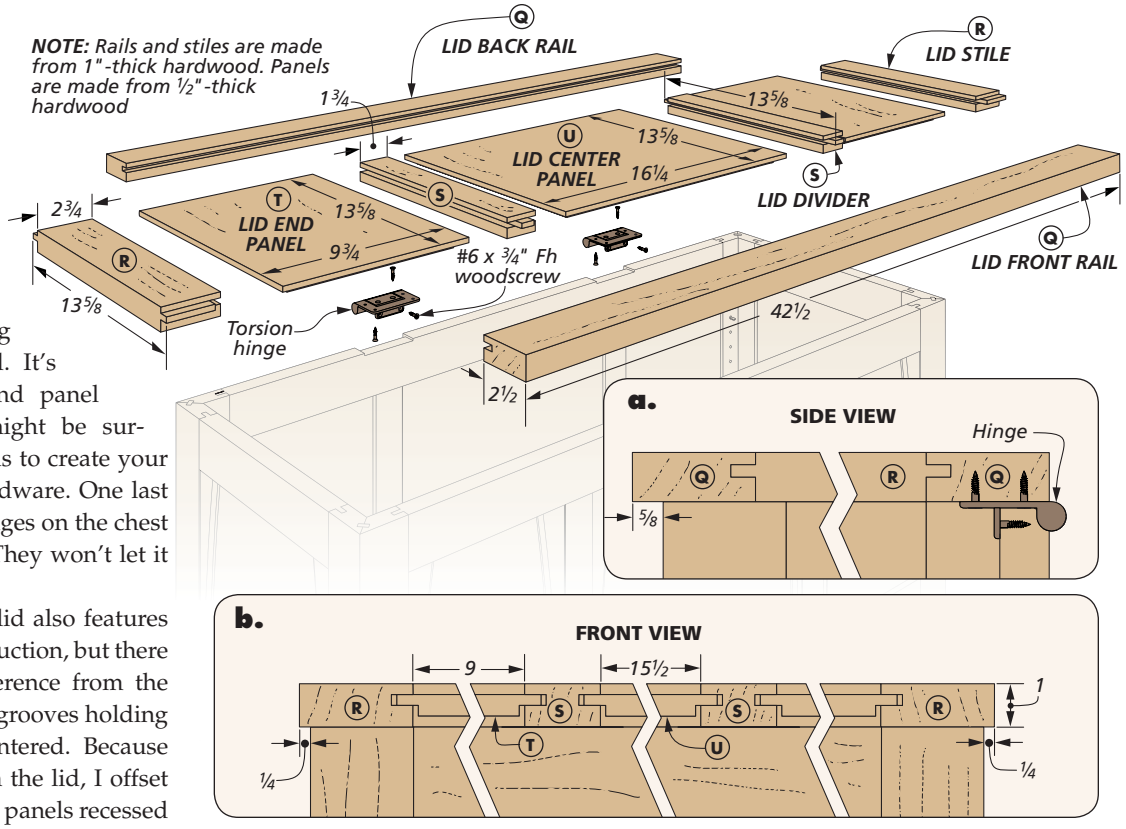


FIRST: *Glue the mitered sides in place using the splines to keep them aligned*

SECOND: *Fit the tongue on the bottom into the groove on the back and glue the ends of the bottom to the sides*

THIRD: *Now fit the front in place over the tongue on the bottom. Use the splines in the corners and tighten the band clamp*

a sturdy **Lid**



At this point, the chest just needs a lid and some hardware to complete the main case. There's nothing unusual about the lid. It's just another frame and panel assembly. But you might be surprised by how easy it is to create your own custom metal hardware. One last note, I used torsion hinges on the chest to make the lid safer. They won't let it drop on your fingers.

LID. It's true that the lid also features frame and panel construction, but there is one significant difference from the previous pieces — the grooves holding the panels are not centered. Because there are no corbels on the lid, I offset the grooves to keep the panels recessed ¼" evenly on both sides.

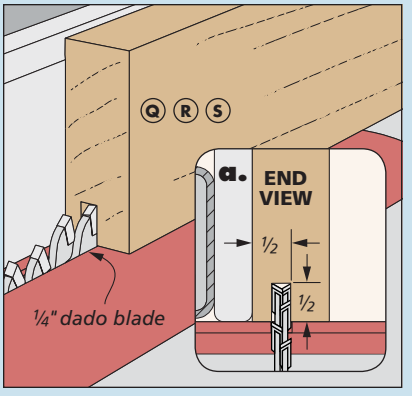
RAILS & STILES. After cutting the rails, stiles, and dividers to final size, you're ready to cut the joinery. The box below shows how to cut an offset stub tenon and groove joint that fits perfectly. It starts with the groove for the panels. The left drawing illustrates cutting the offset groove with a dado blade.

In the center drawing, you can see an easy technique for cutting matching offset tenons. The key is to set the dado blade just a hair below the groove you cut earlier. Then flip the workpiece over and change the blade height to match the groove on this side. This way, you're within one or two strokes with a hand plane of a perfect fit.

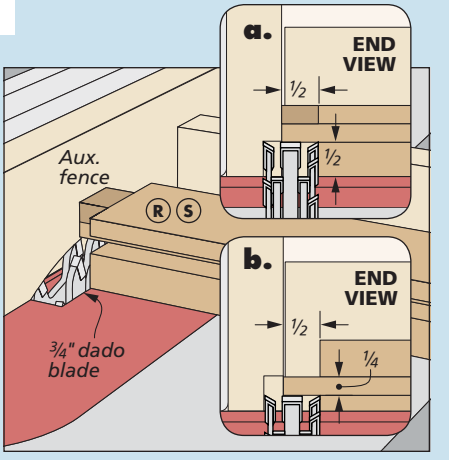
PANELS. Once again, you'll need to plane some of your stock to ½". Glue up the panels from narrower stock, and then cut the panels to final size. After that, rabbet the edges to fit into the grooves in the rails and stiles, as shown in the right drawing below. To prevent problems down the road, I stained and finished these panels just as I did the others before.

ASSEMBLY. Now you're ready to assemble and install the lid. But first, stain and finish the entire chest. Then attach the lid to the chest with the torsion hinges.

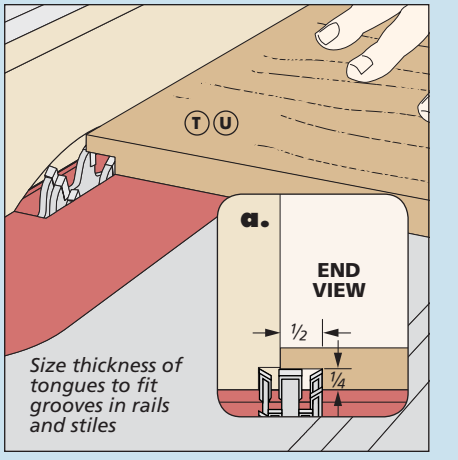
How-To: Top Joinery



Offset Groove. Set the rip fence to the dimensions shown and cut the offset groove in all the frame pieces.

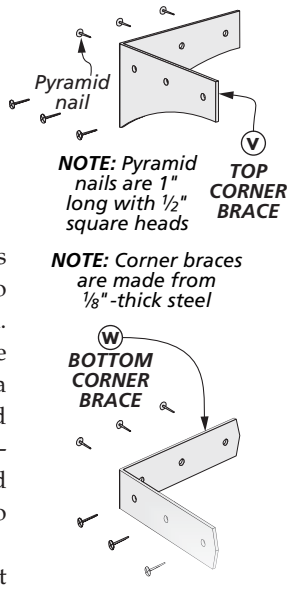


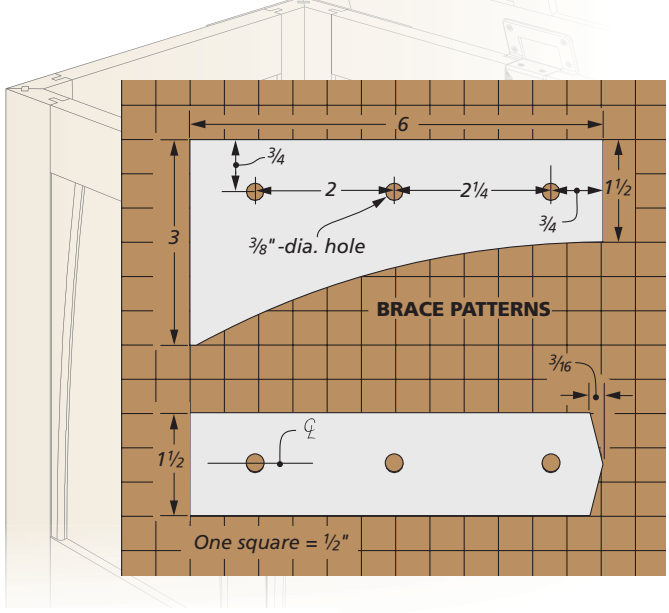
Offset Tenon. Use the groove in the stiles to set the blade height for cutting both sides of the tenon.



Panel Rabbet. After cutting the panels to final size, bury the dado blade in an auxiliary fence and rabbet all four edges.

shop-made Metal Braces





I chose to make my own corner braces from ⅛" sheet steel. There's no need to be intimidated by a little metal work. Before you start, take a look at the Online Extra article. It gives you an idea of the tools you'll want to have on hand for the basic tasks involved in making the braces. For both the upper and lower braces, start by cutting the steel to final length (12").

TOP BRACES. The step-by-step photos at right guide your journey. It starts by marking the shape of the brace and the nail hole locations (see the patterns at right). I like to use layout fluid for work on metal pieces. It helps avoid any confusion between a layout mark and a scratch on the surface of the metal.

DRILL. With everything marked, start by drilling out the nail holes at the drill press, as shown in Step 1. Use a low-speed setting and a few drops of oil on the workpiece to lubricate the bit.

CUT TO SHAPE. You can cut this mild steel to shape using a steel-cutting blade in a jig saw. By mounting the steel to a piece of wood, you support the edges and help the blade cut cleanly (Step 2).

SCORE CORNERS. There's one challenge with making steel corners — bending them to 90°. Step 3 shows how I scored the centerline on the inside face using an abrasive disk in a circular saw. This guarantees a good corner bend.

BEND. After scoring the line, all you need to do is clamp the brace down and bend it to 90° (Step 4).

CLEANUP. I used my random-orbit sander, followed by some hand sanding to clean up the metal surfaces (Step 5). This also prepares the metal for the patina solution you'll use later.

PATINA. Step 6 gives you an idea of how the spray-on patina works. You'll find more information about using it at *WoodsmithSpecials.com*.

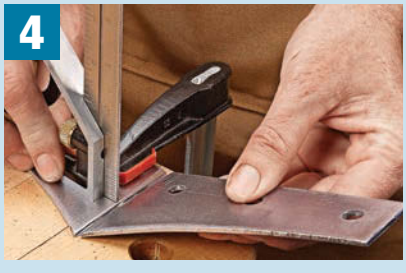
Test fit each brace and mark the location to drill pilot holes for the nails. Since the nails are a bit irregular, you'll need to take care to locate the heads properly so they're centered over the holes.

How-To: Make the Braces

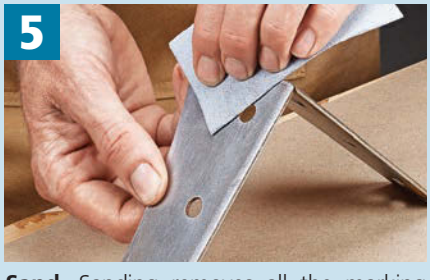
Drilling. After marking the shape and hole locations, drill the holes. I used a backer board to support the metal.

Arc Cut. With a metal-cutting blade in the jig saw, use a plywood backer to help cut through the mild steel.

Score Centerline. I used an inexpensive abrasive blade in the circular saw to cut just over halfway through the brace.



Bending. The scored line makes it easy to bend the steel. Use a square to guide you for a perfect fit on the corner.

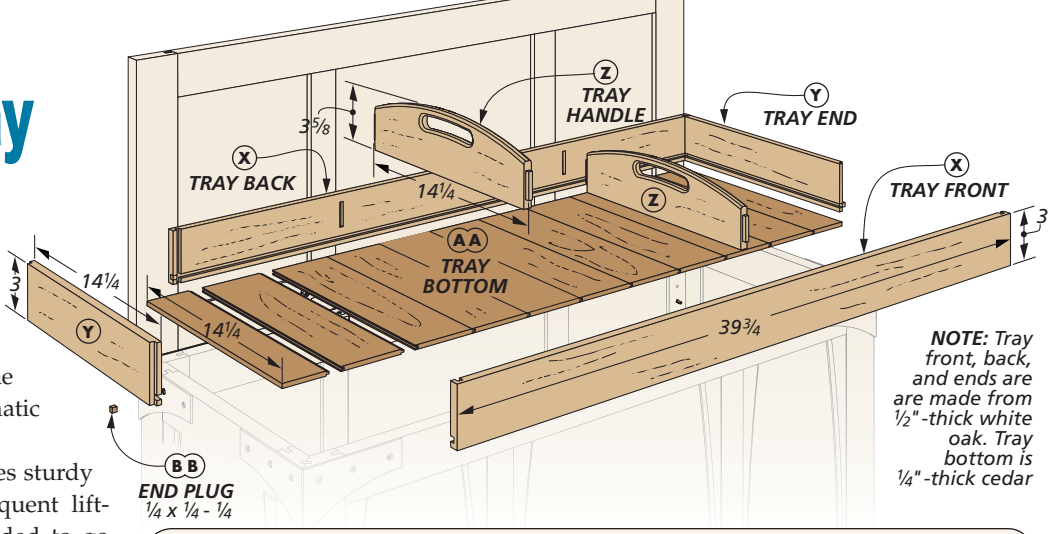


Sand. Sanding removes all the marking fluid and fingerprints from the surface of the metal in preparation for the patina.

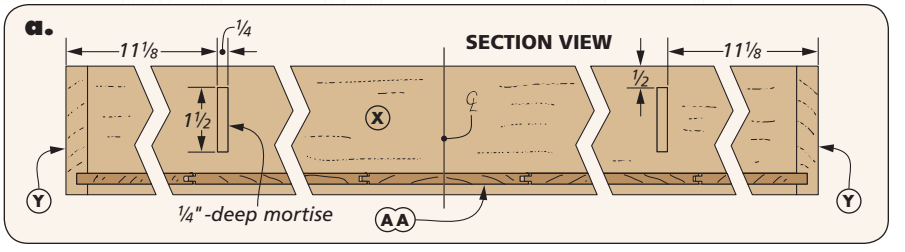
Patina. A spray-on patina is all it takes to for an aged look. For more on the two-step process, check out the Online Extra.

making the **Tray**

The original Stickley bride's chest had a handy pull-out tray that sat atop four wood stops. I replaced the wood stops with shelf pins to make it adjustable but left everything else largely the same. Here again, I used aromatic cedar as the tray bottom.



NOTE: *Tray front, back, and ends are are made from ½"-thick white oak. Tray bottom is ¼"-thick cedar*



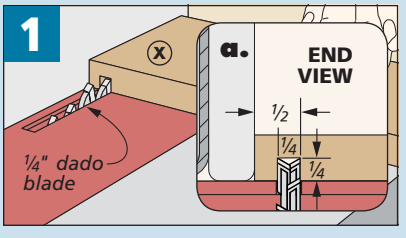
FRONT & BACK. The tray requires sturdy joinery to accommodate frequent lifting and replacing. So I decided to go with a joint that's both easy to make and very strong — tongue and dado. It's my favorite joint for drawers, having stood the test of time on several other projects. And since this tray is similar to a drawer, I think this joint is perfect for it. In addition, you'll notice that the tray front, back, and ends hold a groove for the bottom. The front and back also have mortises for the handles.

The drawings below serve as a guide as you set about making the individual pieces for the tray. Figure 1 shows how I used an auxiliary fence on the miter gauge to back up the dado cut and prevent tearout and splintering as the blade exited the workpiece. After that, you can cut the groove at the bottom of the front, back, and ends to hold the cedar bottom panel (Figure 2).

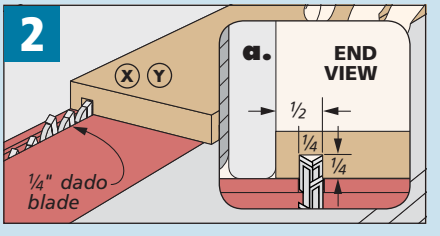
ENDS. Use the miter gauge to cut the tongues on the ends as in Figure 3. Check for a snug fit in the dadoes.

MORTISES. Now you'll need to lay out the mortises for the handles. After that, get out your plunge router and clamp on a straightedge to rout the mortises. (Figure 4). I just marked the top and bottom edges of the mortises. Then I routed to the line and squared the ends with a chisel.

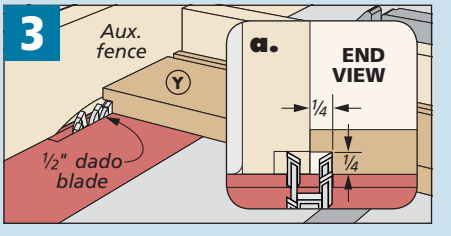
How-To: Make the Tray Components



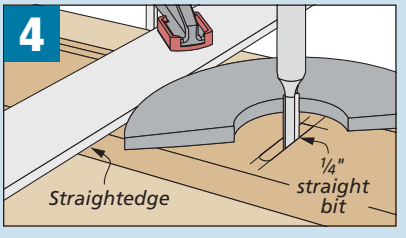
Dadoes. I installed an auxiliary fence on the miter gauge to cut the dadoes in the tray front and back.



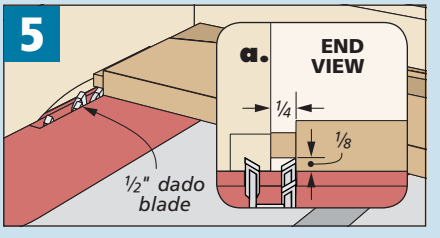
Groove for Bottom. Cut the groove for the bottom in the front, back, and ends using a dado blade.



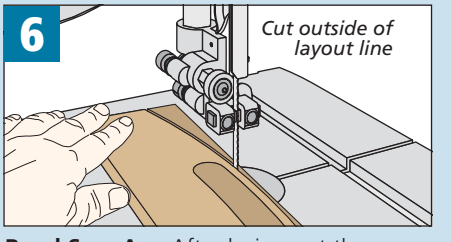
Rabbet. With the dado blade buried in an auxiliary rip fence, you can cut the rabbets on the ends to form the tongues.



Rout Handle Mortise. I clamped a straightedge to the workpiece and routed out the dadoes for the handles.



Handle Tenon. Cut the tenons on the ends of the handles using the dado blade buried in the auxiliary fence.



Band Saw Arc. After laying out the curve, cut the shape at the band saw, making sure to stay on the waste side of the cut.

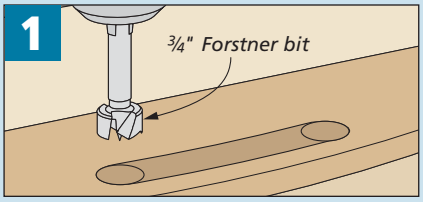
HANDLES. I cut the two handles to final size and formed the tenons on the ends before cutting them to shape. This makes it easier to cut the tenons, as shown in Figure 5 on the previous page.

After completing the tenons, lay out the curve on the handle using the dimensions shown in the lower drawing at right. At the band saw, cut the gentle curve, staying on the waste side of the line (Figure 6, opposite page).

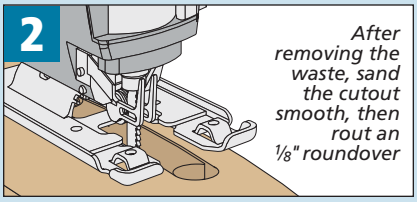
Now drill the two holes shown in Figure 1. The drawing below it shows the location. I used a jig saw to remove the waste in between the two holes to form the hand hold (Figure 2). A little hand sanding is all it takes to smooth the cutout. At the router table, rout the ⅛" roundover on the top edges and hand hold of the handle to make for a much more comfortable grip.

BOTTOM. Glue up the ¼"-thick cedar panel and cut it to final size. Dry fit the tray bottom by installing the two ends and the front and back. Then finish the tray parts before installing the cedar. After that, move on to final assembly.

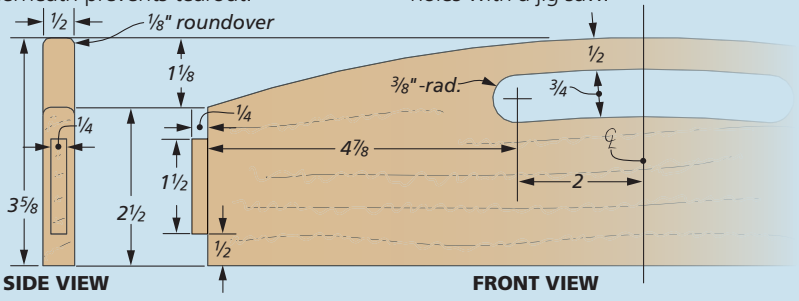
How-To: Form the Hand Hold



Drill. Drill the two starter holes at the ends of the hand hold. A piece of scrap underneath prevents tearout.



Jig Saw. Now you can remove the rest of the waste by cutting the arcs between the holes with a jig saw.

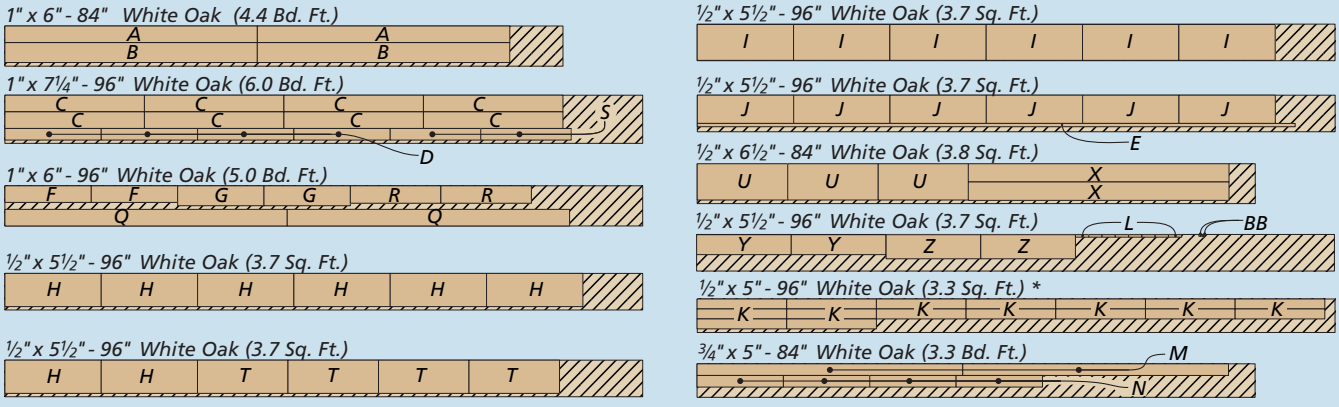


PLUGS. Finally, I installed four small plugs to fill the holes left by the grooves in the front and back. After applying the final stain and finish, the chest is ready to go (leave the cedar unfinished). This is one of those projects that is likely to be made as a gift. The lucky recipient is sure to treasure it for life.

MATERIALS, SUPPLIES & CUTTING DIAGRAM

A	Front/Back Top Rails (2)	1 x 2½ - 38	
B	Front/Back Bottom Rails (2)	1 x 3 - 38	
C	Stiles (8)	1 x 2½ - 21	
D	Dividers (4)	1 x 1¾ - 14½	
E	Splines (4)	¼ x 7/16 - 21	
F	Side Top Rails (2)	1 x 2½ - 13	
G	Side Bottom Rails (2)	1 x 3 - 13	
H	End Panels (4)	½ x 9¾ - 14½	
I	Center Panels (2)	½ x 16¼ - 14½	
J	Side Panels (2)	½ x 12¾ - 14½	
K	Corbels (16)	5/16 x 1½ - 13½	
L	Filler Strips (8)	¼ x ½ - 2	
M	Bottom Rails (2)	¾ x 1¾ - 40	
N	Bottom Stiles (4)	¾ x 1¾ - 13	
O	Bottom End Panels (2)	¼ x 9⅝ - 13	
P	Bottom Center Panel (1)	¼ x 16¼ - 13	
Q	Lid Front/Back Rails (2)	1 x 2½ - 42½	
R	Lid Stiles (2)	1 x 2¾ - 13⅝	
S	Lid Dividers (2)	1 x 1¾ - 13⅝	
T	Lid End Panels (2)	½ x 9¾ - 13⅝	
U	Lid Center Panel (1)	½ x 16¼ - 13⅝	
V	Top Corner Braces (4)	⅛ steel 3 x 12	
W	Bot. Corner Braces (4)	⅛ steel - 1½ x 12	
X	Tray Front/Back (2)	½ x 3 - 39¾	
Y	Tray Ends (2)	½ x 3 - 14¼	
Z	Tray Handles (2)	½ x 3⅝ - 14¼	
AA	Tray Bottom (1)	¼ x 14¼ - 39⅛	
BB	End Plugs (4)	¼ x ¼ - ¼	

- (48) ½" x 1" Pyramid Head Nails
- (2) 60 Inch/Pound Torsion Hinges
- (4) ¼" Shelf Supports
- (8 oz.) Japan Brown Patina
- (8 oz.) Metal Oil Finish



***ALSO NEEDED:** One (1) 15 sq. ft. box, Cedar Plank Paneling (O, P & AA)*
** Part K is planed to a final thickness of 5/16"*

linen Press

This stylish revival of a traditional furniture project will be a welcome addition to your home, as well as an heirloom to last for generations.

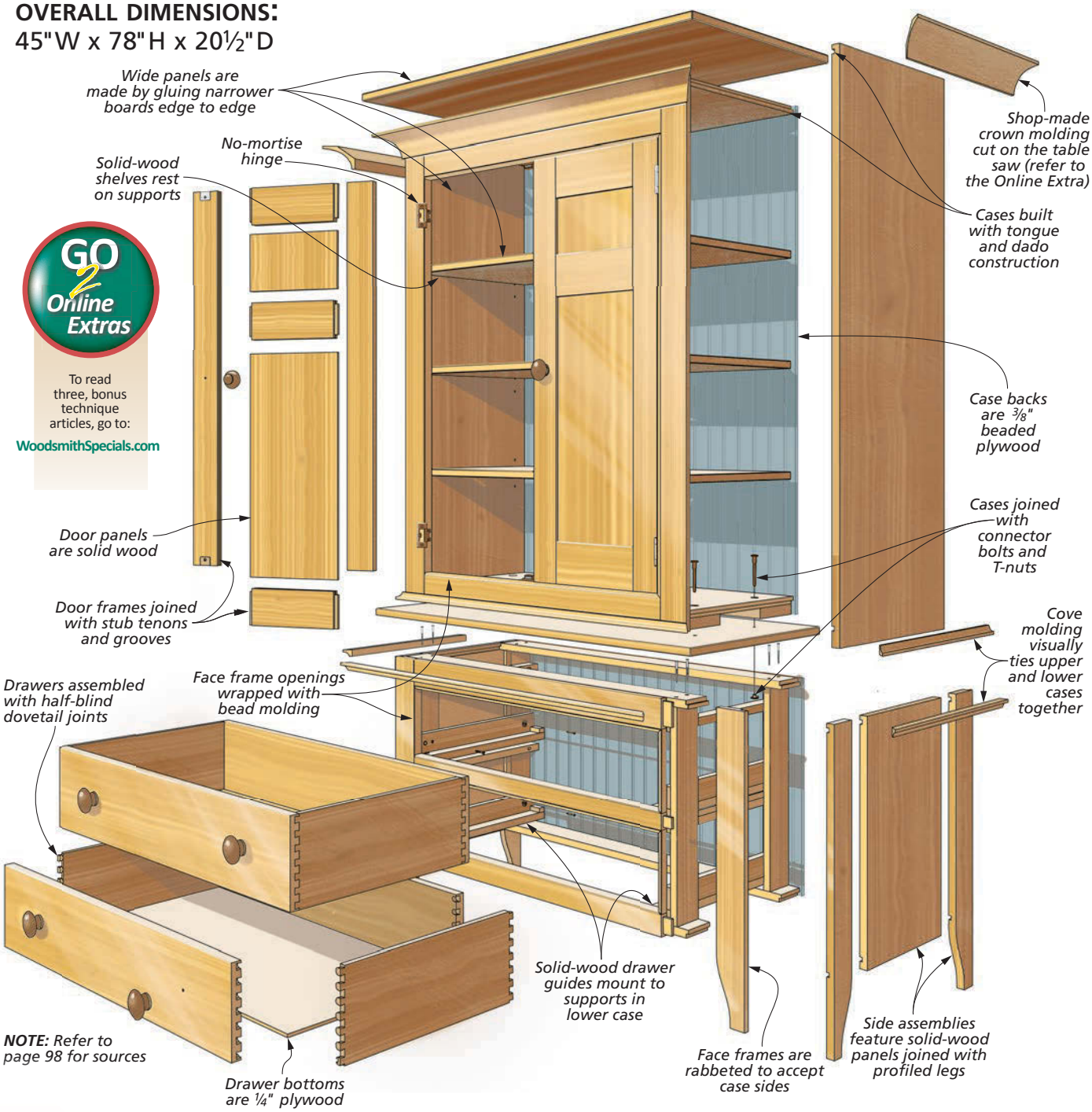
The linen press is a piece of furniture seldom seen in modern homes. But this cupboard that stores sheets, linens, and other textiles was essential in a previous era. Today, linen presses are often big-ticket items at antique furniture stores.

Made almost entirely from vertical-grain Douglas fir, this project is true to the tradition of the linen press and is sure to be a treasured heirloom in your family for many generations. Though it's a large project, the construction is fairly simple, with a few unique woodworking challenges mixed in for good measure.

As you begin the project, you'll notice nearly every part is made from solid wood. So it pays to have a keen eye for matching grain on the lumber you choose.

Construction Details

OVERALL DIMENSIONS:
45"W x 78"H x 20½"D



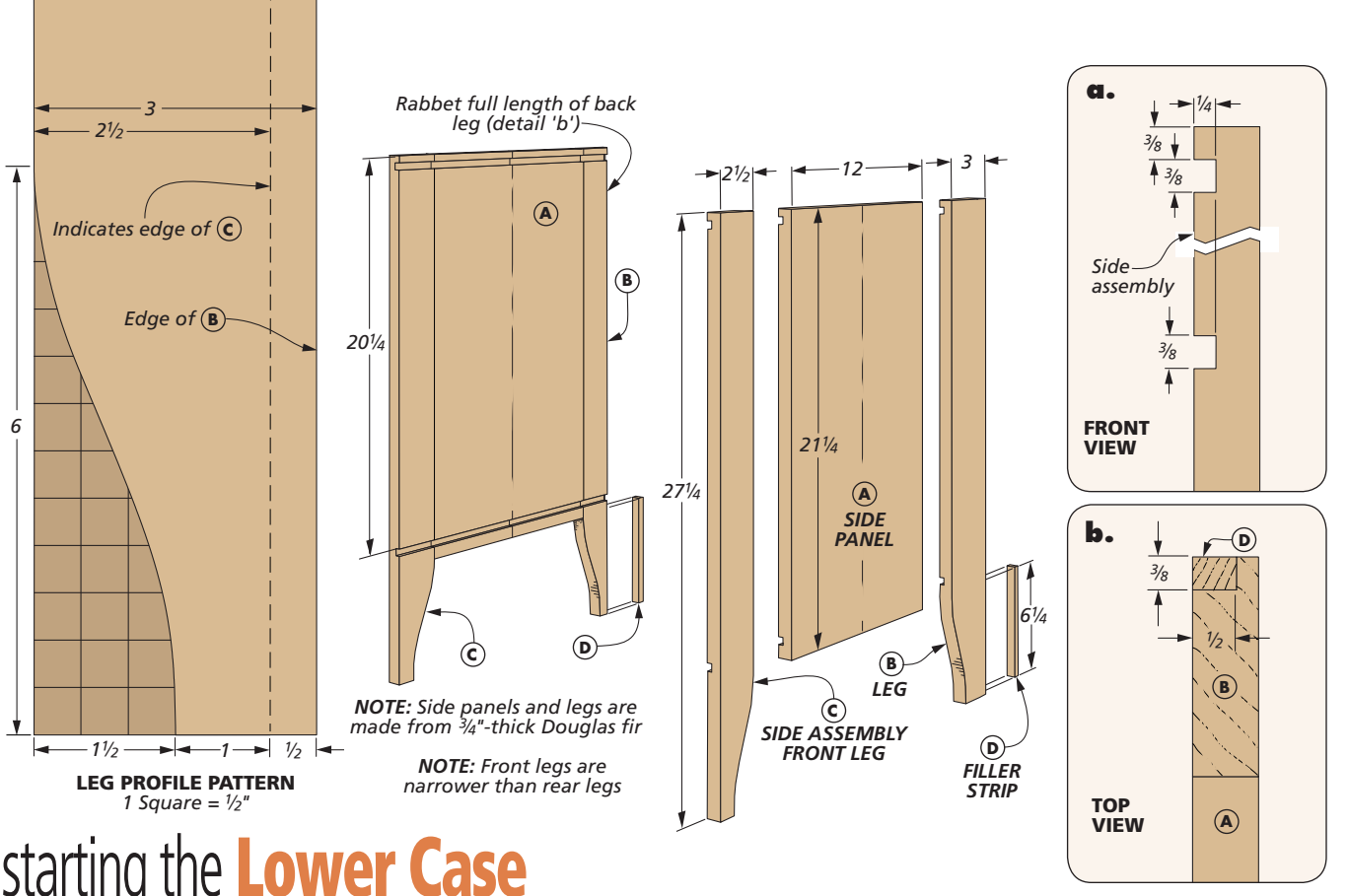
GO 2 Online Extras

To read three, bonus technique articles, go to:
WoodsmithSpecials.com

NOTE: *Refer to page 98 for sources*

Classic. Timeless details like mitered cove molding, bead molding, and half-blind dovetails make this linen press a true heirloom woodworking project.

Curves. The crown molding at the top of the case is made by passing a board over the table saw blade at an angle. You can see how it's done on page 22.



starting the Lower Case

The linen press is unquestionably a traditional piece of furniture. So making this project fit the definition of "heirloom" calls for not cutting any corners.

That meant choosing a wood, Douglas fir, that's sure to look good for generations. And there's very little plywood used in this project. Instead, I opted for solid-wood panels throughout the construction.

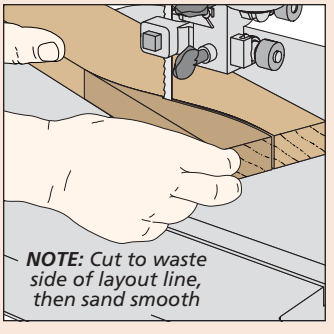
Choosing boards that look good is an important part of any project. But with all the glued-up panels in this project, matching the grain is especially important here. It's a good idea to take your time choosing lumber, being mindful of a consistent color and grain. An article with more information on grain-matching is at *WoodsmithSpecials.com*.

LOWER CASE SIDE PANELS. Once you have selected the lumber, the lower case is a good place to start. It holds two drawers and features profiled legs at the corners. The case's two side assemblies are made up of glued-up panels joined with legs.

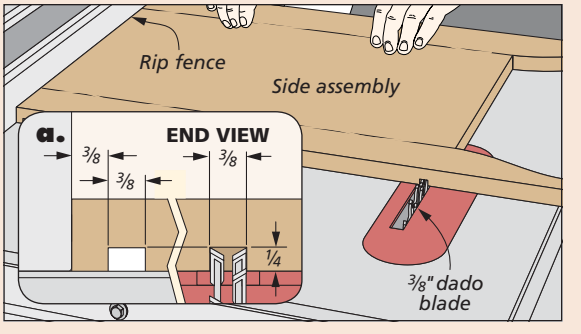
After spending some time at the planer thicknessing boards for this project, I got started by gluing up boards for the side panels. Once the glue dries, you can cut these panels to their final size.

LEGS. The next step is to prepare the legs. It's important to note that the front leg of each side assembly is narrower than the back leg. Later on, the front

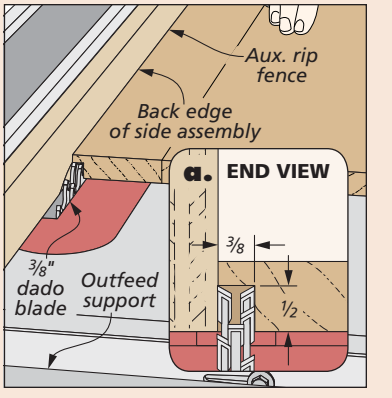
How-To: Create Side Assemblies



Cut Profile. Using the pattern above, trace and cut the profile on each leg at the band saw.



Dadoes. After assembling the sides, cut two dadoes on the inside face of each side at the table saw. Use the rip fence to guide the side over the dado blade.



Rabbet. To form a tongue, cut a rabbet on the back edge of each side assembly using a dado blade.

leg will fit in a rabbet in the face frame, which balances out the appearance of the legs.

Despite the different widths, the profile on each leg is the same (see the pattern on the opposite page). This profile can be cut on the band saw, as shown in the lower left drawing on the previous page.

SIDE ASSEMBLIES. After cutting the profile on the legs, you can focus on completing the side assemblies. The first step is to glue the legs to the side panels. Next you can cut a pair of dadoes in each side assembly (middle drawing, opposite page). Finally, you'll cut a rabbet along the back edge (right drawing, opposite page), and then glue in a filler strip at the bottom. Later on, the case's beaded plywood back will get attached above these filler strips.

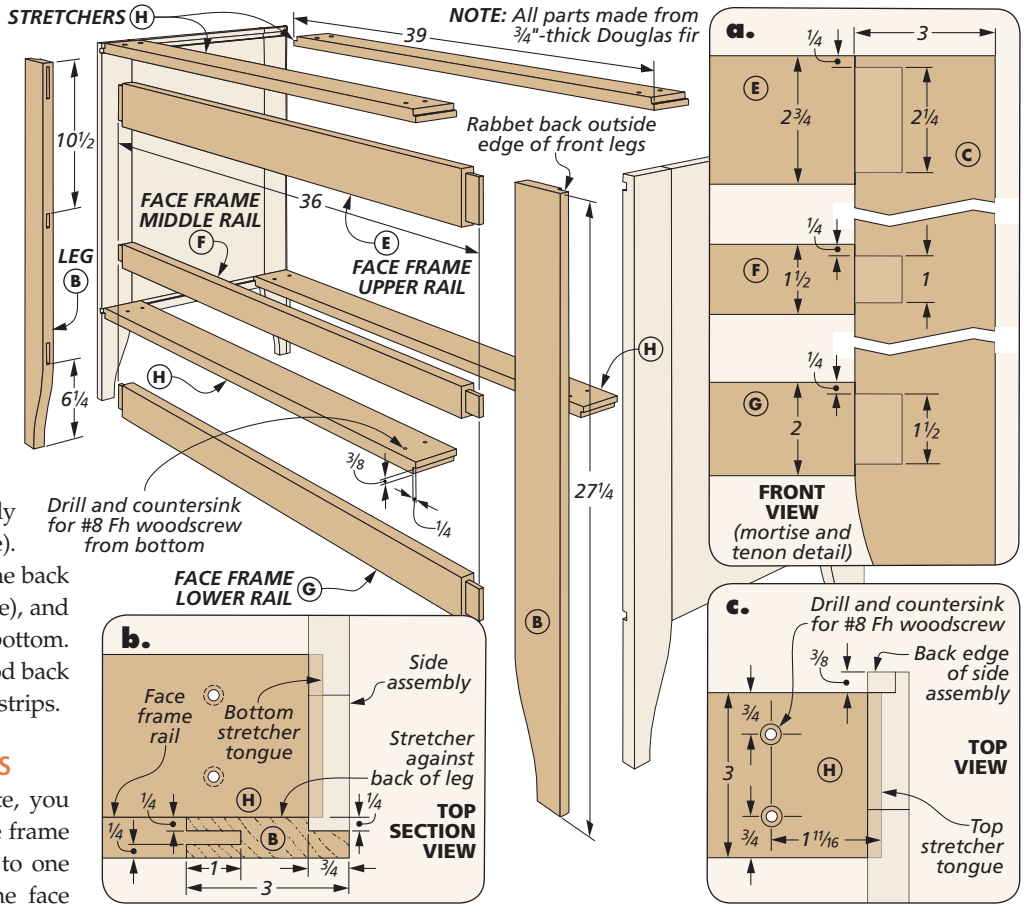
FACE FRAME & STRETCHERS

With the side assemblies complete, you can turn your attention to the face frame and stretchers that connect them to one another. Along with two legs, the face frame has three rails that are different widths. Tenons on the rails fit into mortises in the legs. The four stretchers have tongues on the ends that fit in the dadoes in the side assemblies.

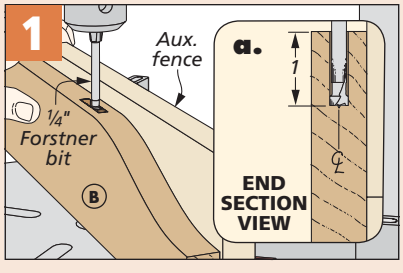
The legs of the face frame are identical to the rear legs of the side assemblies. After cutting them to shape, lay out and cut the mortises in the legs at the drill press (Figure 1). A chisel takes care of the rest. There's also a rabbet on the outside edge of each leg, as shown in Figure 2. This rabbet will fit around the front leg of the side assembly later on.

Now cut the rails and stretchers to size, and form tenons on the rails (Figure 3). Check the fit in the mortises as you go. The tongues on the stretchers are made similarly (Figure 4). You can also drill holes in the stretchers as shown above.

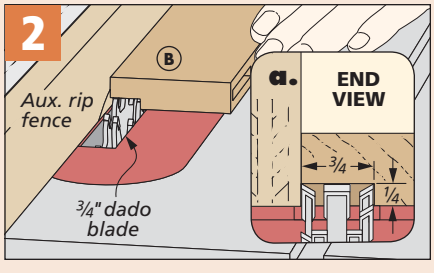
At this stage, you're ready to assemble the lower case components. First, glue the face frame together. Once it's dry, you can fit the side assemblies in the rabbets in the face frame, and slip the stretchers into the dadoes in the side assemblies. Apply glue and clamp the whole assembly together, checking for squareness as you tighten the clamps.



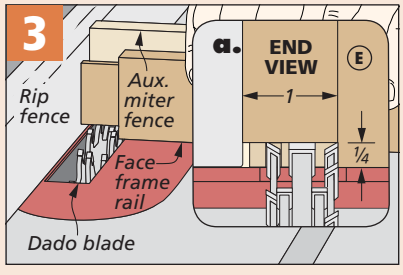
How-To: Face Frame & Stretchers



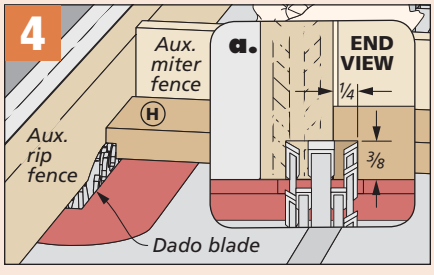
Drill Mortises. Cut the mortises in the face frame legs at the drill press, then clean up the waste with a chisel.



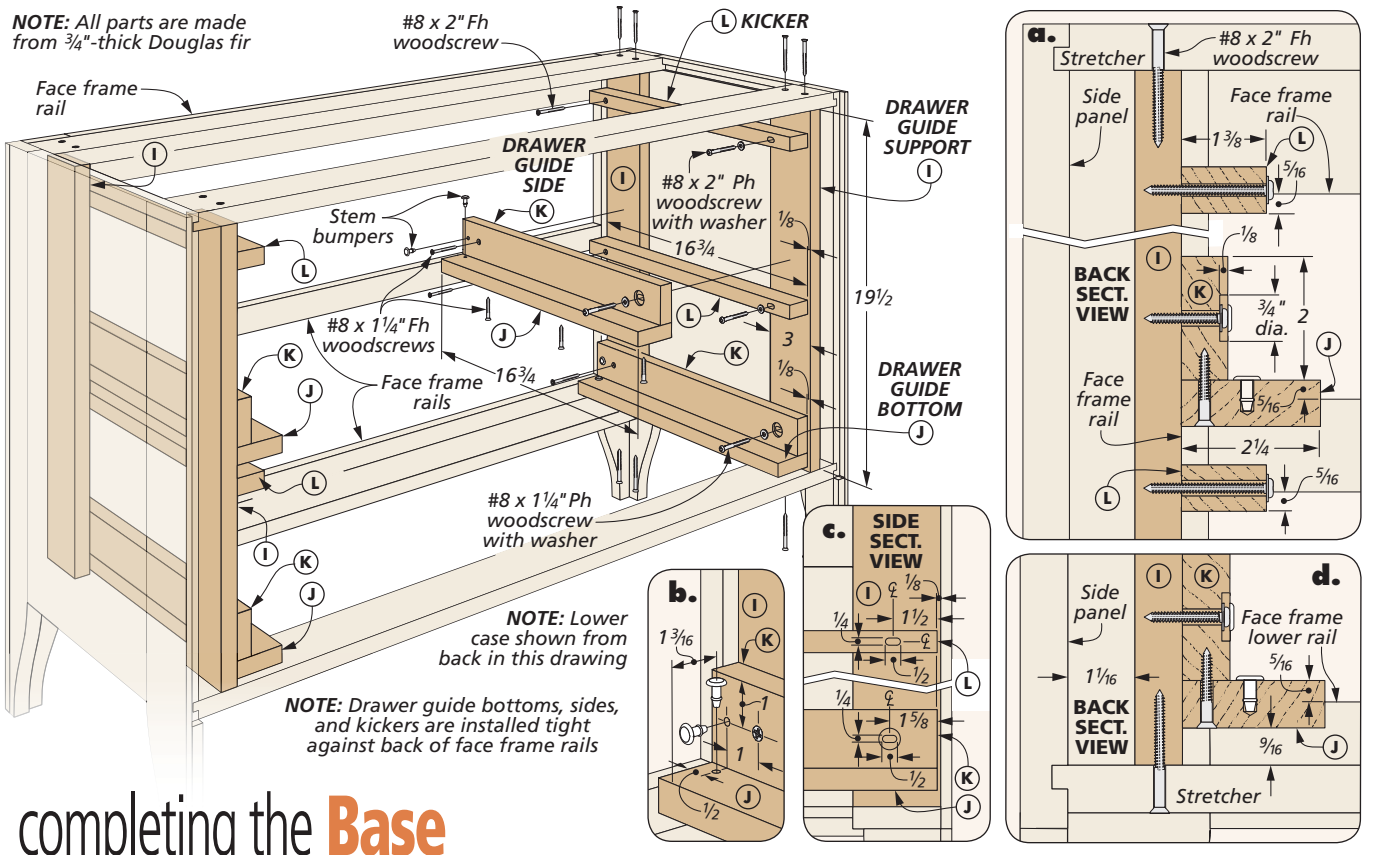
Rabbet Legs. The outside edge of each face frame leg gets rabbeted to receive the side assemblies later on.



Cut Tenons. The tenons on the three face frame rails are easy to make at the table saw with a dado blade.



Stretcher Tongues. Form the tongues on the ends of the stretchers using a dado blade and an auxiliary rip fence.



completing the Base

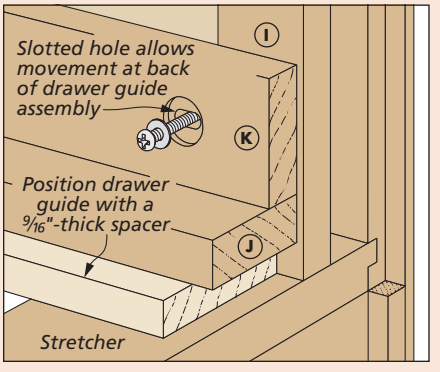
At this stage, the basic structure of the lower case is complete. However, there are a few pieces to add that will help the lower case accommodate drawers and support the upper case. Those parts include drawer guide supports, drawer guide assemblies, a top, as well as a few different kinds of molding.

DRAWER GUIDE SUPPORTS. The first parts to add to the lower case are the drawer guide supports. As you can see above, these are nothing more than vertical, solid-wood pieces that fit between the upper and lower stretchers. They're secured with screws and provide a stable mounting surface for the drawer guides and kickers that go in next.

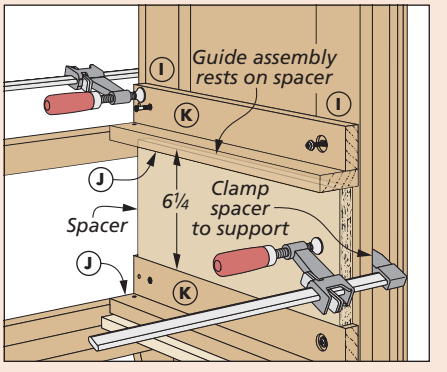
After cutting the supports to size, simply slip them in place between the stretchers. As you can see in detail 'd' above, they are spaced away from the side assemblies a bit, so you'll want to cut some small spacers to position the supports properly. Once they're in place, drill pilot holes into the supports using the holes in the stretchers as guides and attach them with screws.

DRAWER GUIDES & KICKERS. The drawers ride on four L-shaped drawer guide assemblies. Each assembly consists of a bottom and side that are held together with glue

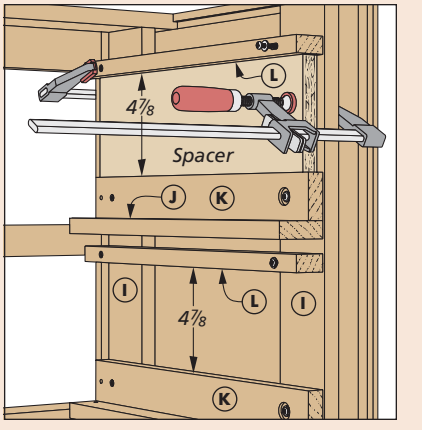
How-To: Install Guides & Kickers



Hole. This slotted hole with a counterbore allows for wood movement. To make it, drill holes side by side and chisel out the waste.



Spacers. Spacers made from plywood correctly position the drawer guides on either side of the case for mounting.



Kickers. The kickers prevent the drawers from tipping. Here again, use spacers when installing them.

and screws. To account for wood movement, each guide has an oversized, slotted mounting hole at the back (detail 'c' on the opposite page). The front mounting hole is a countersunk pilot hole.

Each guide has a pair of stem bumper glides installed on it. Detail 'b' on the previous page provides the locations for these.

To ensure that the drawer guides are located accurately in the openings, I used spacers to position them, as shown in the How-To box on the previous page. Once you get the guides positioned correctly, just screw them in place.

The last parts to go on are kickers, which prevent the drawers from tipping when opened fully. These are installed similarly to the drawer guides, but they require longer screws, as shown in the main drawing on the opposite page.

ADD MOLDINGS & A TOP

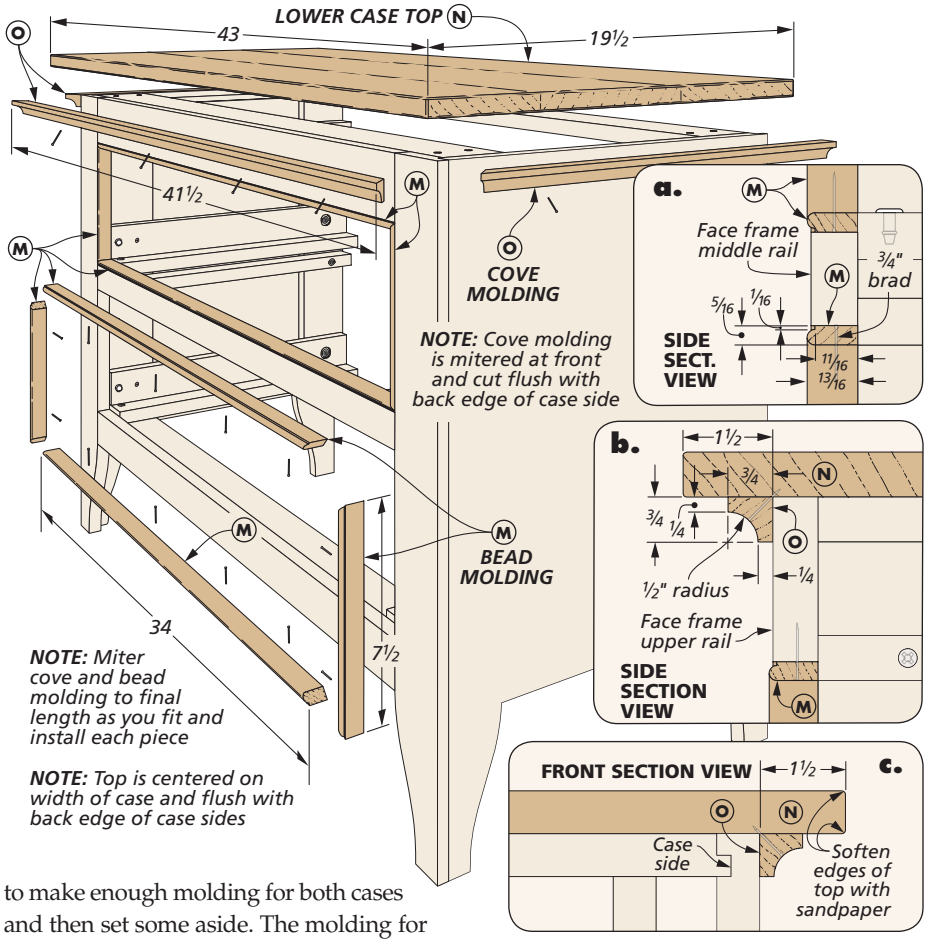
The lower case is just about complete. I finished things off by applying bead molding around the drawer openings in the face frame, adding a solid-wood top, and wrapping the underside of the top with cove molding.

BEAD MOLDING. The bead molding might look elaborate, but it's pretty easy to make. In fact, the left and middle drawings below show you how to make two pieces from a wider blank.

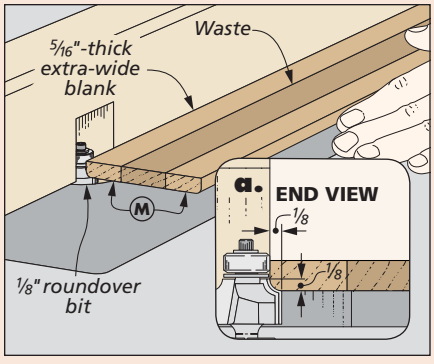
Just one more note on this bead molding: You'll also use it to wrap the opening in the upper case, so now is a good time to make enough molding for both cases and then set some aside. The molding for the lower case is mitered to fit the openings and then glued and nailed in place, flush with the back of the face frame.

TOP PANEL. The case top is a glued-up, solid-wood panel. Cut the panel to final size and ease the edges with sandpaper. Then position the top, and glue and clamp it on to the lower case.

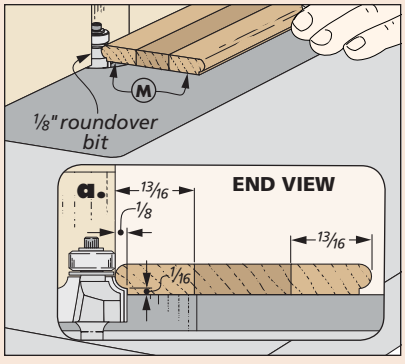
COVE MOLDING. The underside of the top is wrapped with cove molding. It's easy to make as shown below. Here again, it's a good idea to make some extra now to go around the upper case later on. After completing the molding, miter the pieces to size, then pin them to the case as shown above.



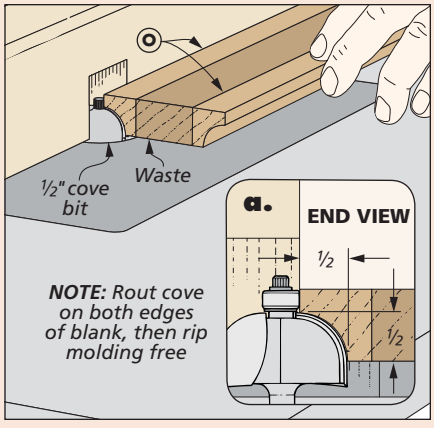
How-To: Rout Moldings



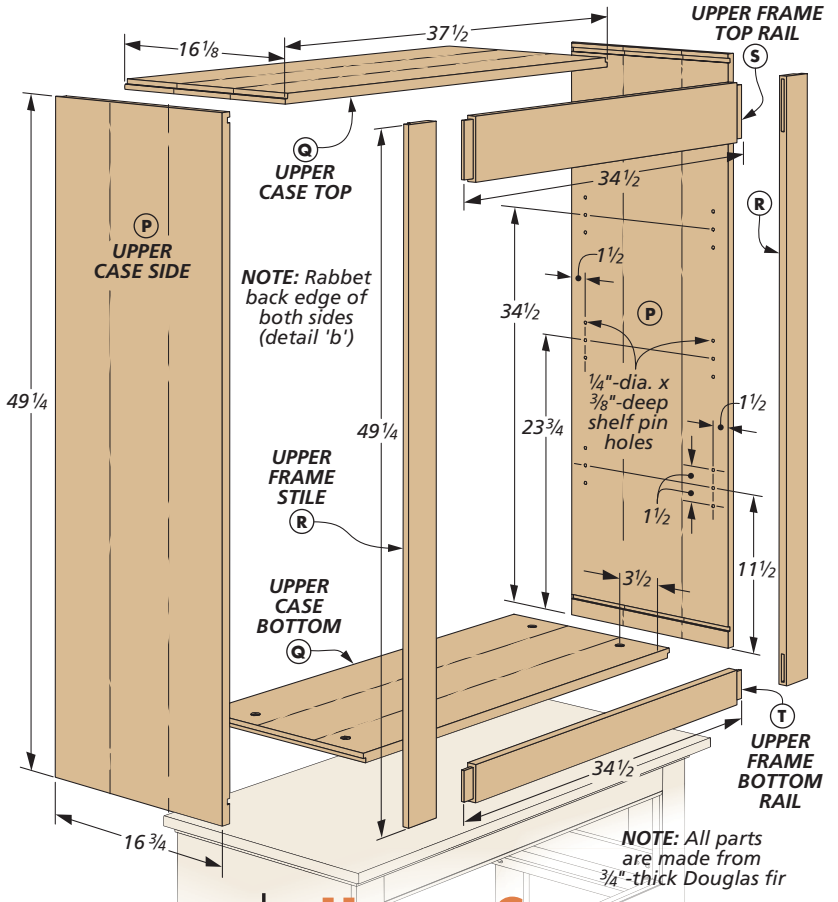
Roundover. To start two pieces of bead molding, rout a roundover on both edges of a wide blank.

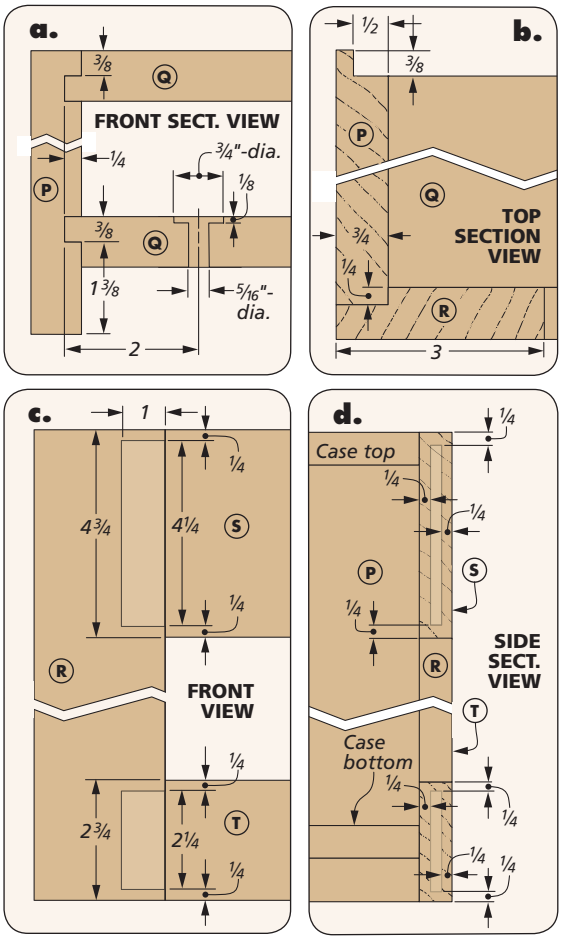


Raise Bit. For the second edge, raise the bit slightly. Then rip the individual molding strips to width.



Cove. Make the cove molding with a cove bit. Here again, a wider blank yields two pieces of molding.





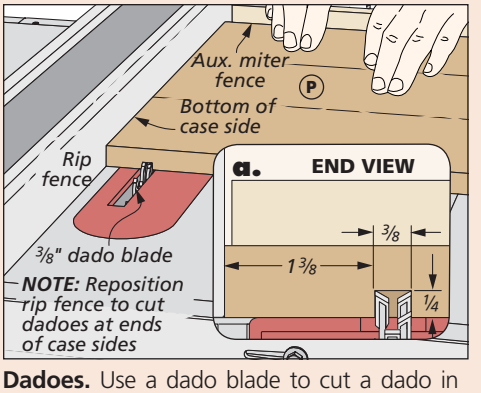
construct the Upper Case

Like the lower case, the upper case is assembled almost entirely from solid wood, with the exception of the beaded plywood back. Since the top, bottom, and sides are all made from glued-up panels, a good place to start is by getting all the panels glued together. When the glue dries, cut them to size. Note that the top and bottom are narrower than the sides to account for the face frame at the front and the back panel at the back.

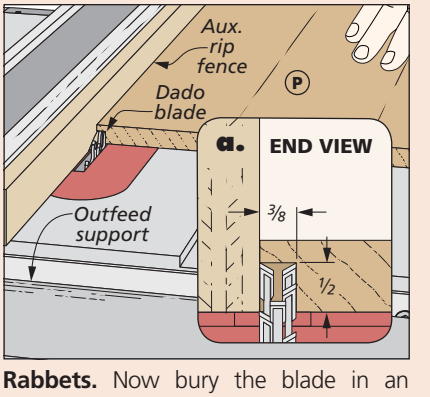
CASE JOINERY. The case parts are connected with tongue and dado joints, so you can get started on those next. You'll also use a dado blade to cut a rabbet in the back of the case sides, so it's a good time for that cut, as well. The drawings below walk you through all three cuts.

The case sides receive a series of holes for shelf supports. Use a shelf pin jig or careful work with a drill press for these.

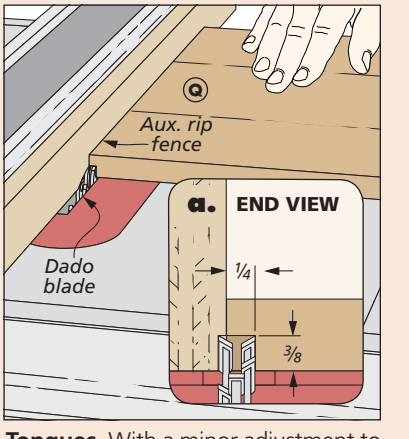
How-To: Create Dadoes & Rabbets



Dadoes. Use a dado blade to cut a dado in each end of the case side. Reposition the rip fence between cuts.



Rabbets. Now bury the blade in an auxiliary rip fence to cut the rabbets on the back edges of the case sides.



Tongues. With a minor adjustment to the dado blade setup, you can form the tongues in the top and bottom.

In addition, there are four shallow counterbored holes drilled in the case bottom (detail 'a'). These holes are for connector bolts that join the upper and lower cases to each other later on.

FACE FRAME. The upper case face frame is up next. Like the lower case face frame, it features rails and stiles connected with mortise and tenon joints. However, this face frame only has two rails.

Details 'c' and 'd' on the facing page show you the details of the joints. Note that there's also a rabbet on the edge of each stile to fit over the case sides, as shown in detail 'b' on the opposite page. Once all those cuts are made, the face frame can be assembled.

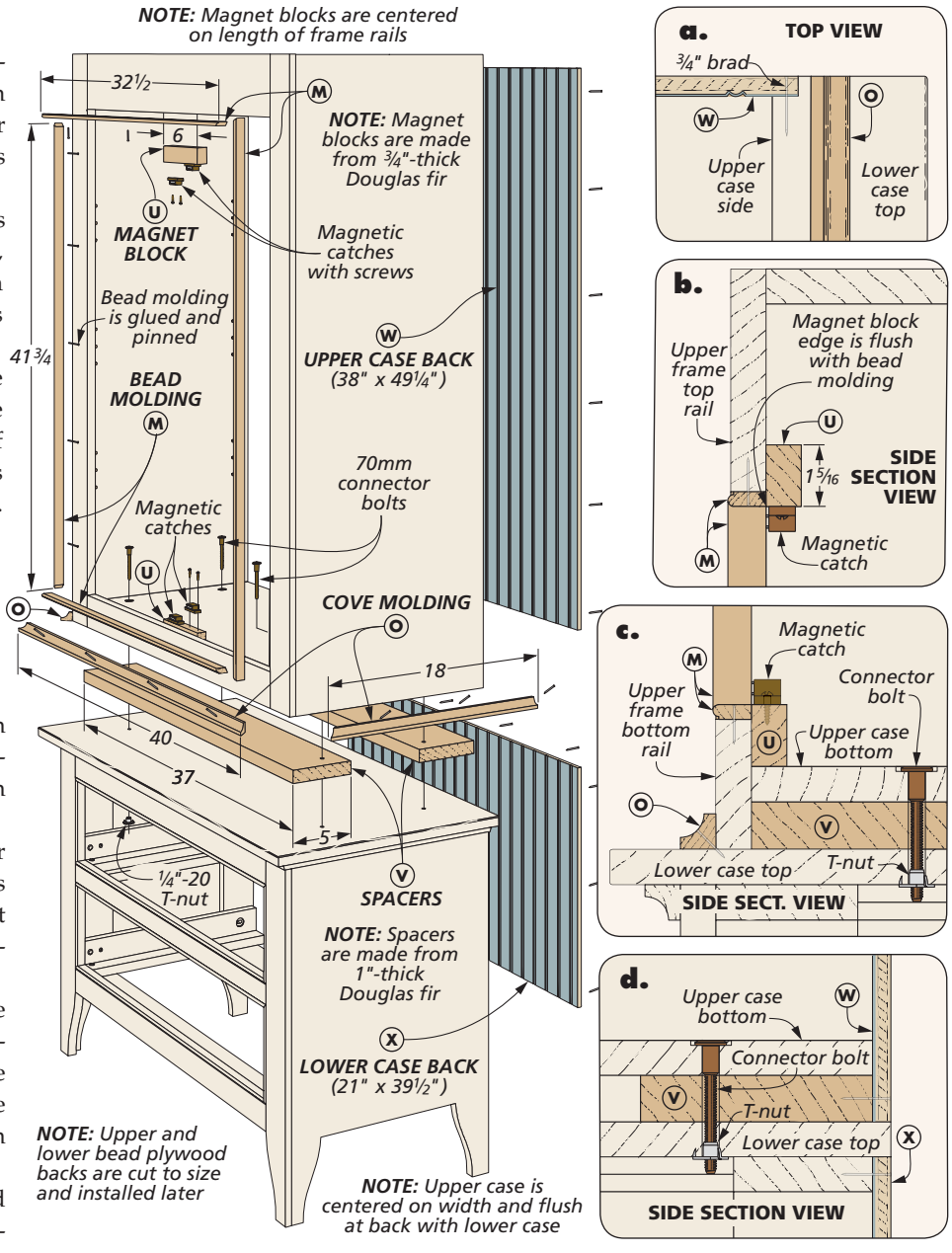
CASE ASSEMBLIES. Now you're ready to bring in the glue and clamps and assemble the upper case. Add the face frame, as well, to keep everything square as you tighten the clamps. You can also apply bead molding around the opening in the face frame, just as you did with the lower case (drawing at right).

With the case assembled, I added a pair of wood blocks with magnetic catches to hold the doors closed. The blocks fit behind the face frame rails and are centered on the width of the cabinet.

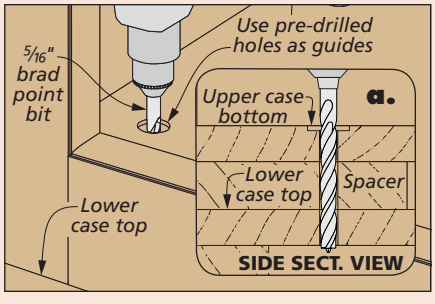
Before attaching the upper case to the lower case, you'll want to add two spacers to the cavity on the underside of the upper case. Then you can position the upper case above the lower case, flush with the back and centered on the width.

At this point, you can join the upper and lower case. This is accomplished with connector bolts and T-nuts, as shown in details 'c' and 'd.' To do this, use the counterbored holes as guides to drill through the spacers and lower case top, as shown at right. Now reach into the lower case and slip a T-nut into the hole from below. Add a connector bolt into the hole from above, and screw the two fasteners together using an Allen wrench (far right drawing).

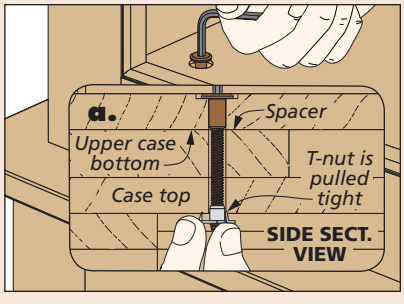
FINAL TOUCHES. The seam between the upper and lower cases is wrapped with cove molding. This can be mitered, glued, and nailed in place just as before. It's also a good time to cut the two case backs to size from beaded plywood. If you plan to paint them as I did, I'd wait until they're painted to attach them. (Paint information is on page 24.)



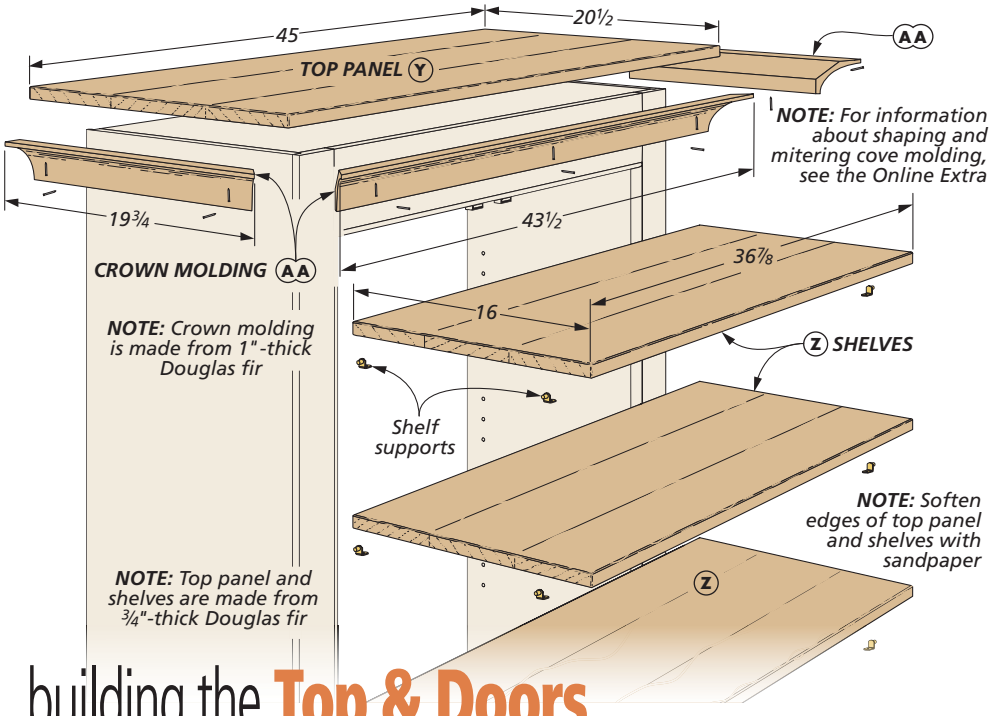
How-To: Connect the Cases

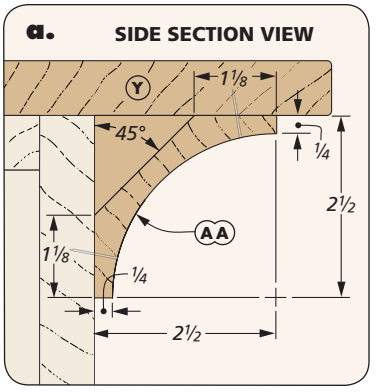


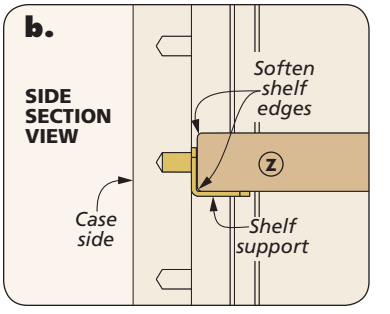
Pilot Holes. Using the holes in the case bottom as a guide, drill pilot holes down through the lower case top.



Connect Them. Tighten a connector bolt into a T-nut below to draw the fasteners, and cases, tightly together.







building the Top & Doors

Now that the cases are connected, just a handful of parts remain for completing the linen press. Those include three adjustable shelves for the upper case, a solid-wood top, crown molding, and doors.

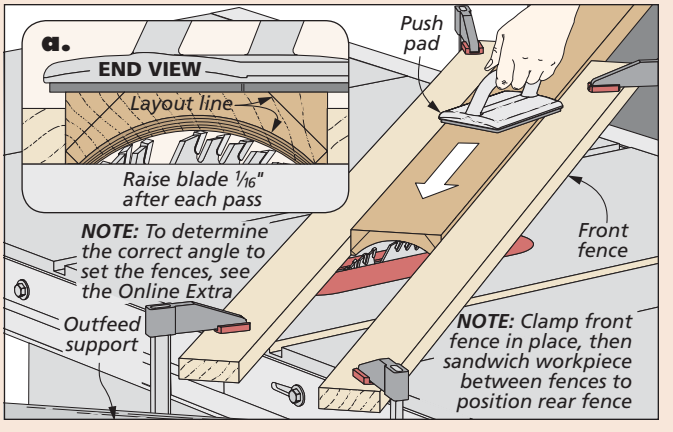
SHELVES & TOP. At this stage of the project, assembling great-looking, solid-wood panels from Douglas fir is probably old hat. Here again, the three shelves and top are all glued-up panels, so I suggest doing all four at once. Once you have them assembled and cut to size, use sandpaper to ease all the ends and edges of the panels. Now set the shelves aside until the linen press is complete, at which point they can be mounted on shelf supports as shown in detail 'b' above.

As for the top panel, it's mounted much like the upper and lower case tops for this project: Position it flush with the back and centered on the width of the linen press, and then glue and clamp it in place.

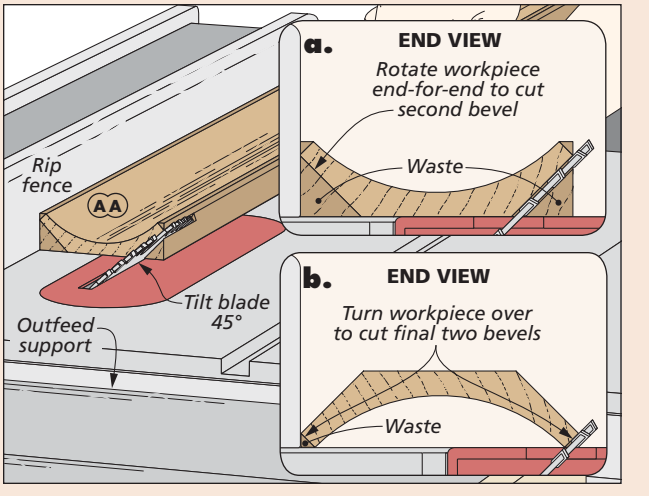
CROWN MOLDING. The next part of the project is crown molding that wraps the underside of the top panel and gets glued and nailed to the upper case. I used a unique technique to make the molding on the table saw.

To see what I mean, take a look at the illustrations below. If you've never cut a molding at the table saw like this, I'm sure that it looks a little unusual. But I assure you that when you set up the cut properly — and take very small "bites" out of the workpiece with each pass over the blade — it's quite effective.

How-To: Make Crown Molding



Cut the Cove. Once the fences are positioned at the proper angle, cut the cove by passing the workpiece over the blade at an angle. Remove a small amount of material with each pass.



Bevel Edges. Completing the crown molding requires four 45° bevel rip cuts at the table saw. Just rotate the workpiece between cuts to complete all the bevels.

SET UP THE CUT. To cut the crown molding, the first thing you need to do is establish the angle of the cut. You'll find a setup gauge that simplifies this process at *WoodsmithSpecials.com*. Using the gauge, you can set the two fences for guiding the workpiece over the blade, as shown in the lower left drawing on the opposite page.

CUTTING CROWN. After the fences are clamped onto the saw table, cutting the molding is easy. The secret is to cut the cove in multiple passes, only removing about 1/16" of material with each pass. Once the cove is the proper depth, you can complete the crown molding with a few bevel cuts (lower right drawing, opposite page).

MOUNTING MOLDING. The only other trick with this molding is mitering it at the corners. The easiest way to do this is to hold the molding at its installed angle while mitering it. Here again, you'll find the details for doing this with our Online Extra article. After the miters are cut, the molding can be glued and nailed in place just like the other moldings.

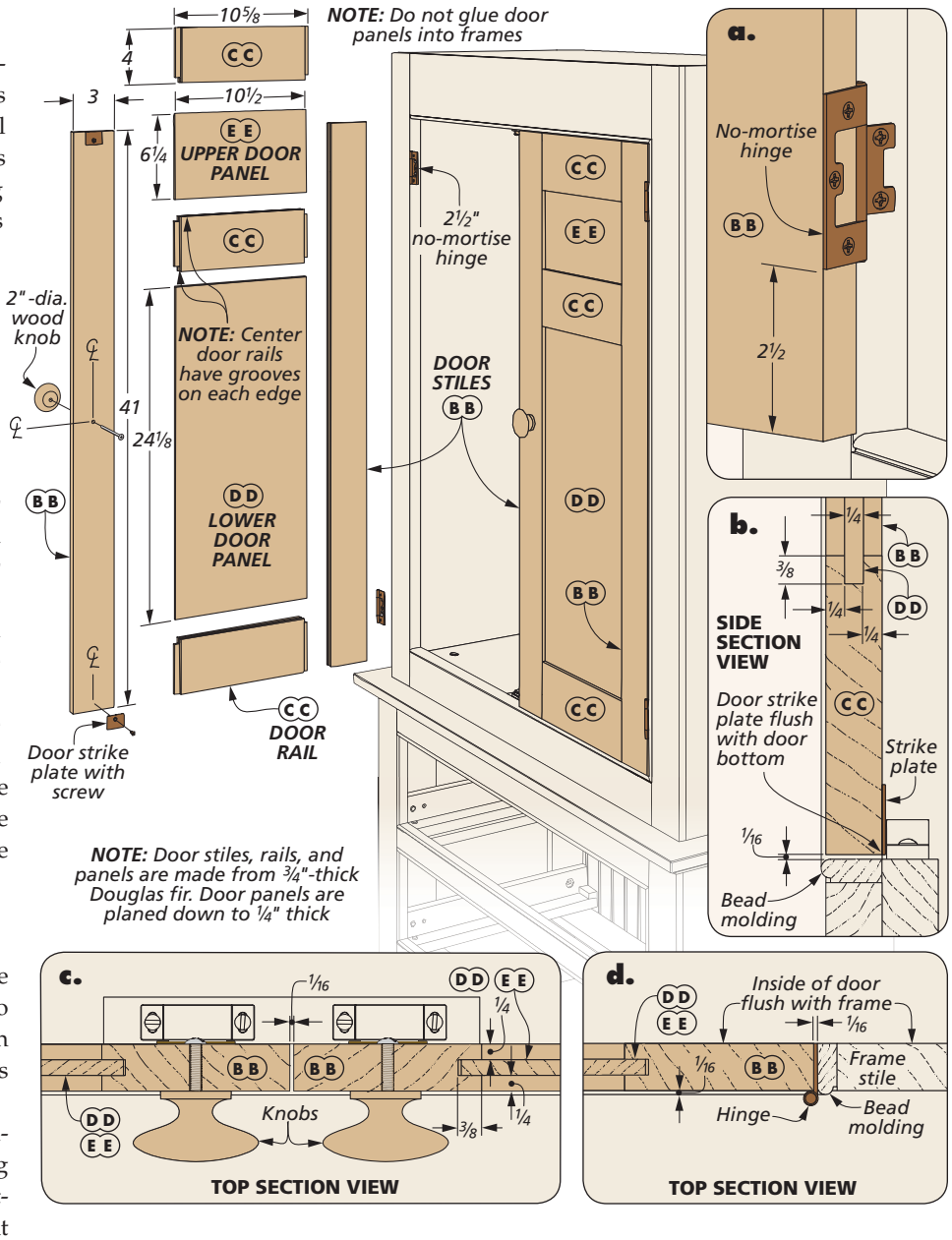
ADDING DOORS

The two doors that enclose the upper case are a fairly simple build. They feature two stiles joined to three rails with stub tenon and groove joints. The frame surrounds two panels made from solid wood.

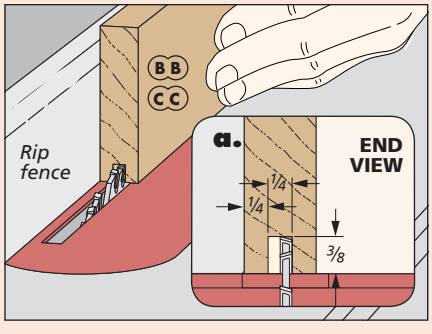
To make the door panels, I suggest gluing up thicker panels, and then planing them down to final thickness before cutting them to size. A thinner panel might bow as you apply clamps to it.

As for the stub tenon and groove joinery, it's easy to knock out at the table saw as shown at right. Then you can assemble the doors by gluing the rails and stiles around the panels. A bead of glue applied to the center of the top and bottom of the panels will prevent rattling, while still allowing for expansion and contraction.

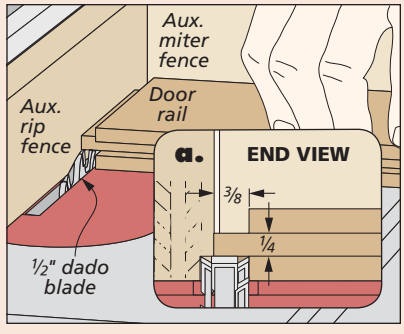
COMPLETE THE DOORS. Each door has a wood knob that's centered on the inner stile, (main drawing, above right). And the doors are mounted to the face frame with no-mortise hinges. Once the doors are installed, you'll want to add the strike plates to the backs of the doors so that they line up with the magnetic catches inside the upper case.



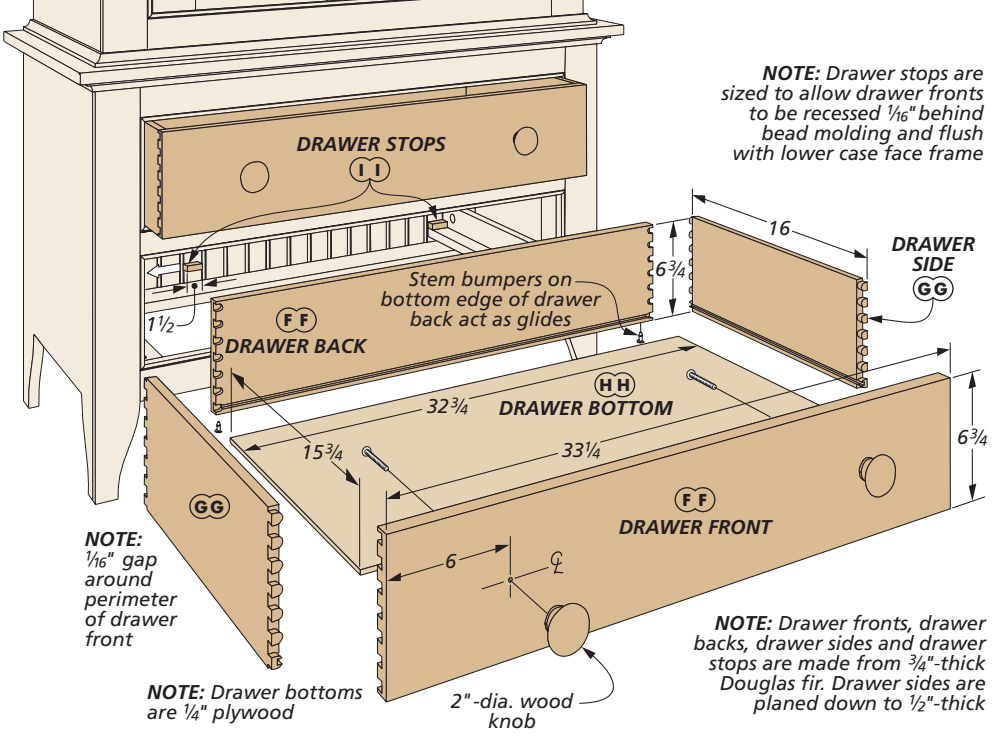
How-To: Cut the Door

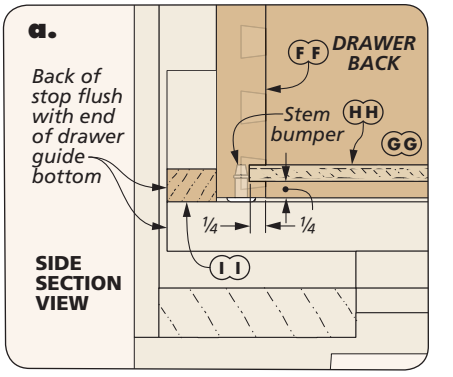


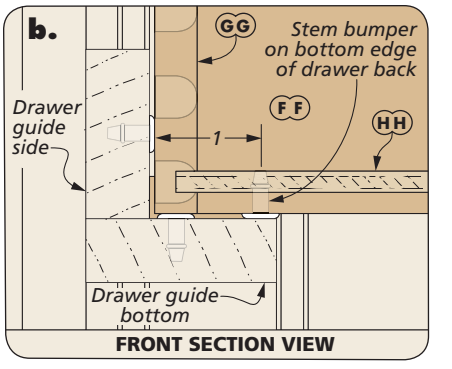
Centered Groove. Make two passes over a standard blade to cut a centered groove on each door part.



Stub Tenon. Use a dado blade to "sneak up" on the stub tenon. Test its fit in a groove as you go.







finish with the Drawers

This linen press is almost complete, but it needs a pair of identical-size drawers to fill out the lower case. And there's so much traditional detail throughout this project that I wanted to make sure the drawers continued with this theme.

DOVETAILED DRAWERS. To that end, I joined the drawer fronts and backs to the sides using half-blind dovetail joinery. A dovetail jig (such as the *Porter-Cable* model that I used) makes quick work of the joints and allows you to rout both parts of the joint in one operation.

The drawings below give you a good overview of how this works. Essentially, you clamp the front or back and side in the jig with an offset between the parts. Then you rout along the jig template using a router equipped with a bushing and a dovetail bit to create the joints.

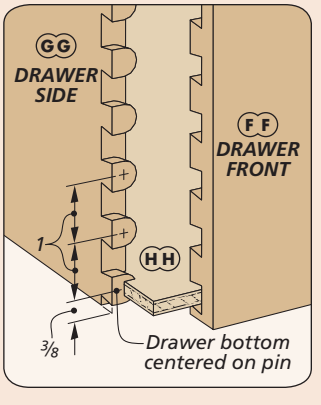
Once the joinery is complete, just cut a groove in all four parts to accept the bottom (lower right drawing) and then assemble the drawers. Add the knobs and stem bumpers, and the drawers are ready to slide in place.

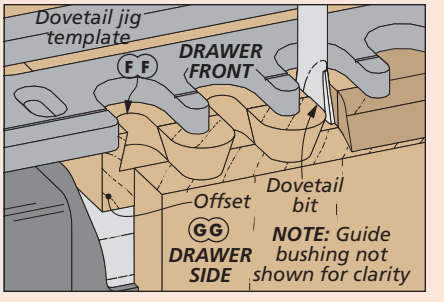
DRAWER STOPS. All that's left is to cut some drawer stops to position the drawer fronts flush with the face frame. The drawer stops fit in the back of the lower case and are glued in place on the drawer guide bottoms (detail 'a').

FINISH. At this point, you can take the doors off the hinges and apply some finish to make this linen press look its absolute best. I painted the beaded back panels with *Benjamin Moore's* "Dusty Cornflower" (CSP-605). The rest of the parts were wiped down with *General Finishes' Seal-A-Cell* and then sprayed with two coats of satin lacquer.

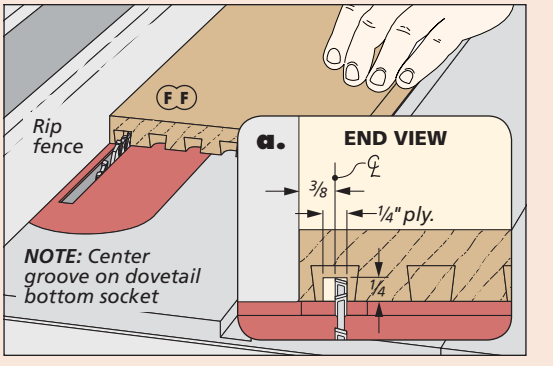
Put the backs, shelves, doors, and drawers in place, and the linen press is done. This heirloom is sure to be treasured by your family for generations.

How-To: Rout Dovetails





Dovetails. A dovetail jig and a router with a guide bushing make quick work of the half-blind dovetail joints.



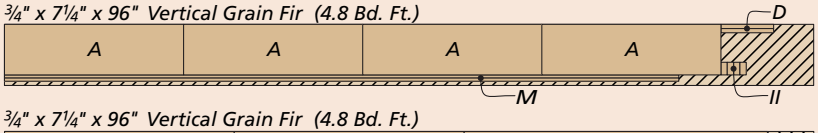
Grooves. The drawer fronts, backs, and sides all receive a groove to accept the bottom. Cut this in two passes on the table saw.

MATERIALS, SUPPLIES & CUTTING DIAGRAM

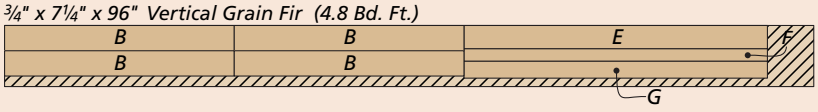
A	Side Panels (2)	¾ x 12 - 21¼
B	Legs (4)	¾ x 3 - 27¼
C	Side Legs (2)	¾ x 2½ - 27¼
D	Filler Strips (2)	⅜ x ½ - 6¼
E	Face Frame Upper Rail (1)	¾ x 2¾ - 36
F	Face Frame Middle Rail (1)	¾ x 1½ - 36
G	Face Frame Lower Rail (1)	¾ x 2 - 36
H	Stretchers (4)	¾ x 3 - 39
I	Drawer Guide Supports (4)	¾ x 3 - 19½
J	Drawer Guide Bottoms (4)	¾ x 2¼ - 16¾
K	Drawer Guide Sides (4)	¾ x 2 - 16¾
L	Kickers (4)	¾ x 1⅜ - 16¾
M	Bead Molding	5/16 x 13/16 - 320 rgh.
N	Lower Case Top (1)	¾ x 19½ - 43
O	Cove Molding	¾ x ¾ - 160 rgh.
P	Upper Case Sides (2)	¾ x 16¾ - 49¼
Q	Upper Case Top/Bottom (2)	¾ x 16⅛ - 37½
R	Upper Frame Stiles (2)	¾ x 3 - 49¼
S	Upper Frame Top Rail (1)	¾ x 4¾ - 34½
T	Upper Frame Bottom Rail (1)	¾ x 2¾ - 34½
U	Magnet Blocks (2)	¾ x 15/16 - 6
V	Spacers (2)	1 x 5 - 37
W	Upper Case Back (1)	⅜ bead. ply. x 38 - 49¼
X	Lower Case Back (1)	⅜ bead. ply. x 21 - 39½
Y	Top Panel (1)	¾ x 20½ - 45
Z	Shelves (3)	¾ x 16 - 36⅞
AA	Crown Molding	1 x 39/16 - 90 rgh.
BB	Door Stiles (4)	¾ x 3 - 41
CC	Door Rails (6)	¾ x 4 - 10⅝
DD	Lower Door Panels (2)	¼ x 10½ - 24⅛
EE	Upper Door Panels (2)	¼ x 10½ - 6¼
FF	Drawer Fronts/Backs (4)	¾ x 6¾ - 33¼
GG	Drawer Sides (4)	½ x 6¾ - 16
HH	Drawer Bottoms (2)	¼ ply. x 15¾ - 32¾
II	Drawer Stops (4)	½ x ¾ - 1½

- (20) #8 x 2" Fh Woodscrews
- (16) #8 x 1¼" Fh Woodscrews
- (12) Stem Bumpers
- (8) #8 x 1¼" Ph Woodscrews
- (4) #8 x 2" Ph Woodscrews
- (8) #8 Flat Washers
- ¾" Brads
- (4) ¼"-20 T-Nuts
- (4) Connector Bolts
- (6) Wood Knobs
- (4) No-Mortise Hinges
- (4) Magnetic Catches
- (12) Shelf Supports

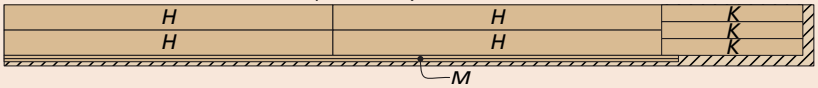
¾" x 7¼" x 96" Vertical Grain Fir (4.8 Bd. Ft.)



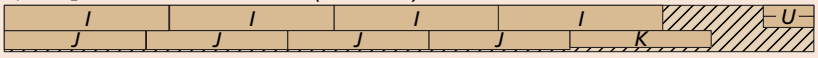
¾" x 7¼" x 96" Vertical Grain Fir (4.8 Bd. Ft.)



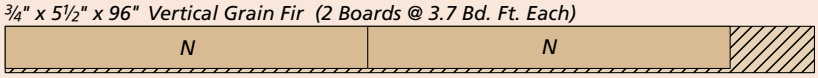
¾" x 7¼" x 96" Vertical Grain Fir (4.8 Bd. Ft.)



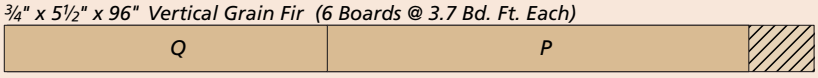
¾" x 5½" x 96" Vertical Grain Fir (3.7 Bd. Ft.)



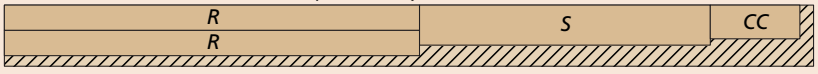
¾" x 5½" x 96" Vertical Grain Fir (2 Boards @ 3.7 Bd. Ft. Each)



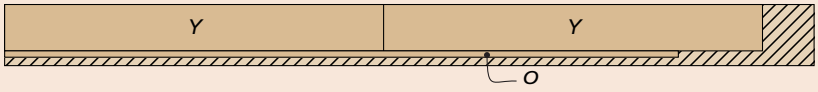
¾" x 5½" x 96" Vertical Grain Fir (6 Boards @ 3.7 Bd. Ft. Each)



¾" x 7¼" x 96" Vertical Grain Fir (4.8 Bd. Ft.)



¾" x 7¼" x 96" Vertical Grain Fir (2 Boards @ 4.8 Bd. Ft. Each)



¾" x 5½" x 96" Vertical Grain Fir (2 Boards @ 3.7 Bd. Ft. Each)

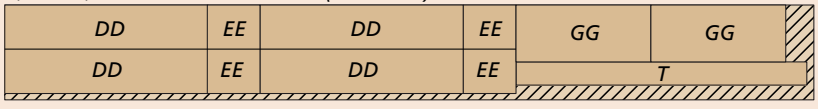
¾" x 5½" x 96" Vertical Grain Fir (2 Boards @ 3.7 Bd. Ft. Each)

¾" x 5½" x 72" Vertical Grain Fir (2.8 Bd. Ft.)

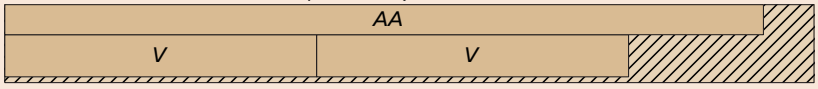
¾" x 7¼" x 96" Vertical Grain Fir (4.8 Bd. Ft.)

¾" x 7¼" x 96" Vertical Grain Fir (2 Boards @ 4.8 Bd. Ft. Each)

¾" x 11¼" x 96" Vertical Grain Fir (7.5 Bd. Ft.)



1" x 9¼" x 96" Vertical Grain Fir (7.7 Bd. Ft.)



***NOTE:** Parts DD and EE are planed to ¼", and parts GG are planed to ½" thick*

***ALSO NEEDED:** One 48" x 96" Sheet of ⅜" Beaded Plywood*
One 48" x 48" Sheet of ¼" Birch Plywood

step-back Bookcase

This easy-to-build bookcase is sure to stand out in any room. You can choose to build the center case alone, or build all three.

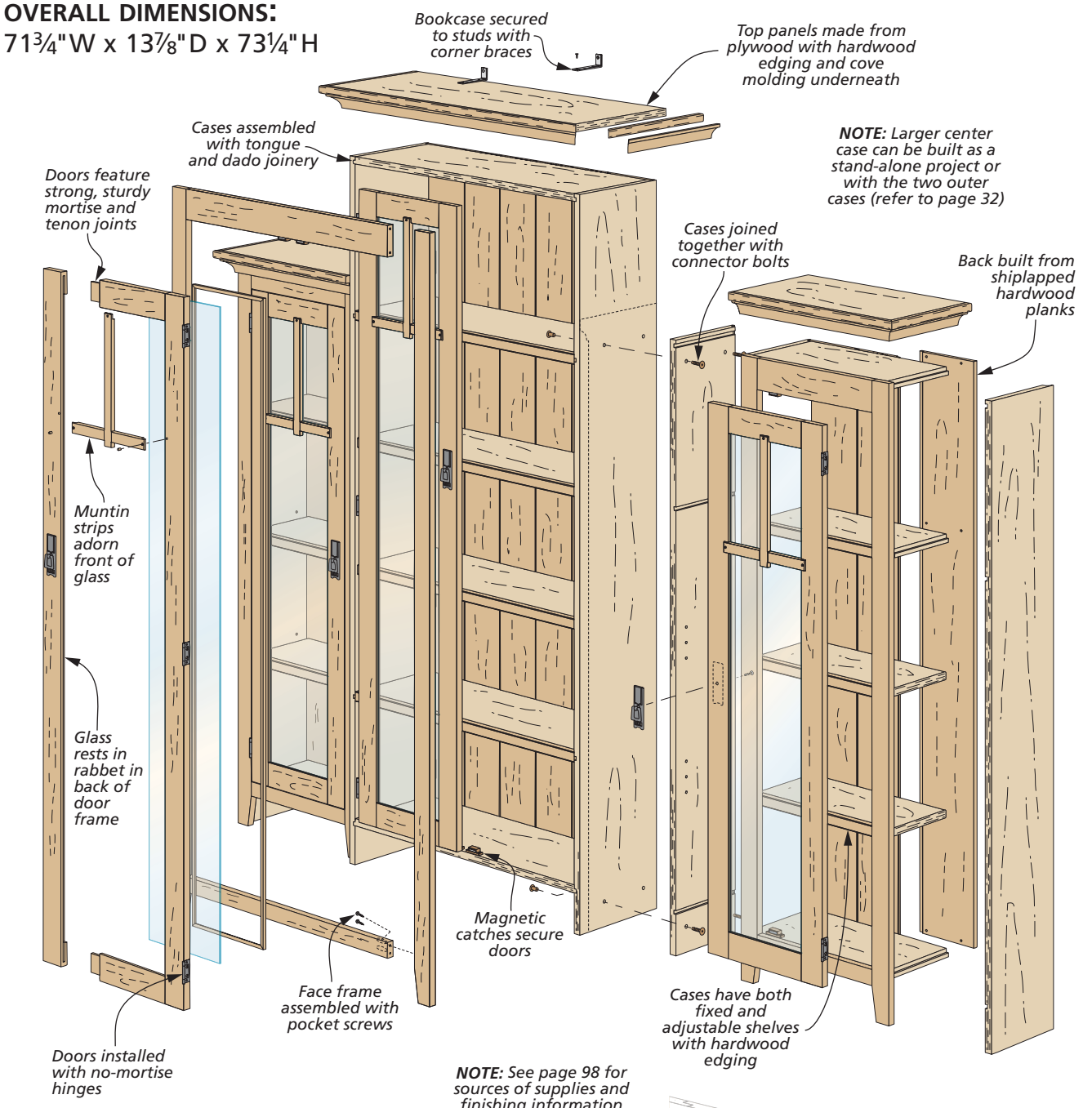
Most bookcases end up as more of a backdrop than a focal point in a room. It's the books and other items on the shelves that get the attention. This bookcase is a little different. With its "step-back" construction, glass-panel doors, and bold finish, it begs to be noticed.

Despite its elegant look, there's no need to be intimidated by the project. This bookcase is easy to build. At its essence, it's nothing more than three plywood boxes put together with tongue and dado joints. The fine-furniture feel of the project is provided by solid-wood face frames, hardwood backs, and glass-panel doors adorned with muntin strips.

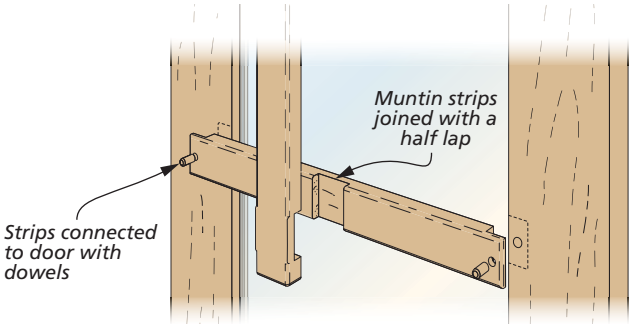
This project also offers you the option of building just the center case, which is a nice piece of furniture all on its own. But I prefer the dramatic look created when all three cases are set side by side.

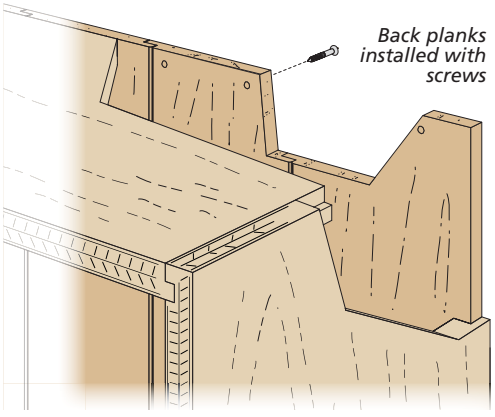
Construction Details

OVERALL DIMENSIONS:
71¾"W x 13⅞"D x 73¼"H



NOTE: See page 98 for sources of supplies and finishing information





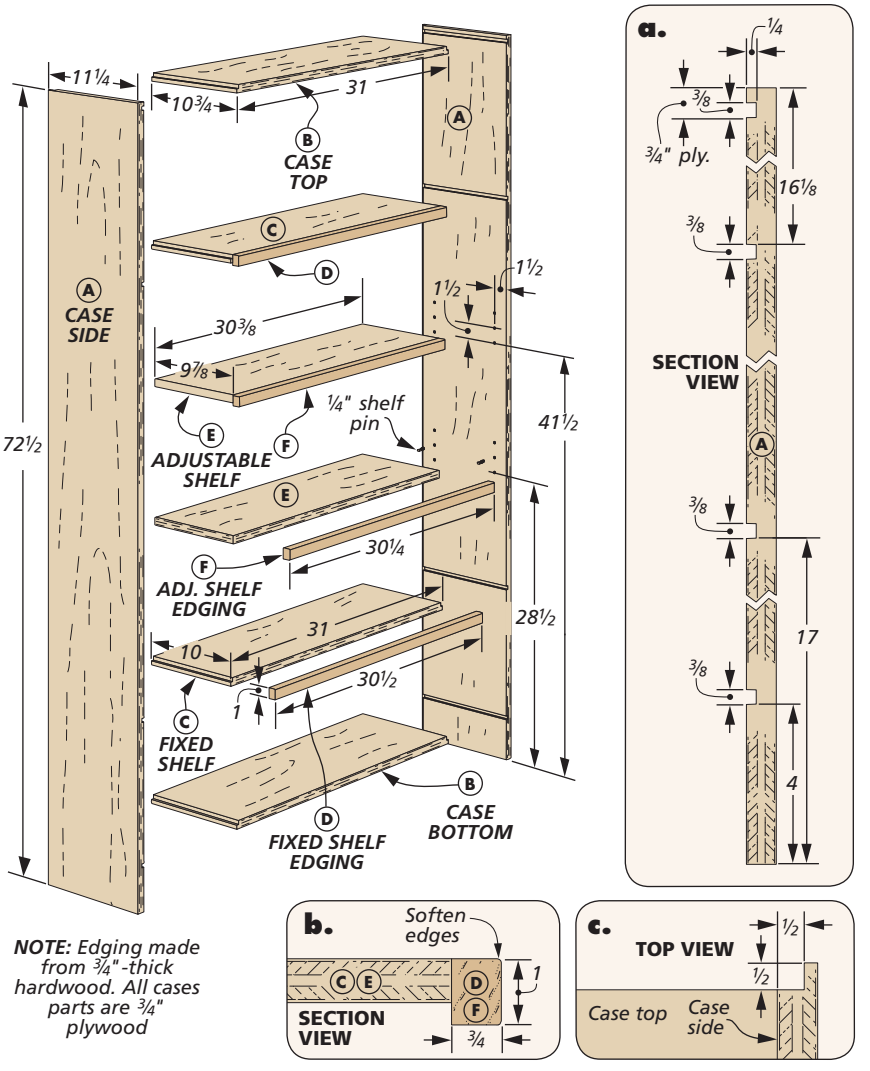
build the Case & Face Frame

The logical place to start on this project is with the cases. As you noticed on page 27, the center case is larger than its adjoining outer cases, but the construction details are nearly identical.

Here, we'll focus on the details of the center case. I'll cover the details for the outer cases later. You may want to consider building all the cases at the same time, though, so that you don't have to repeat machine setups later.

CUT PARTS TO SIZE. With your materials in hand, you can get started by cutting the plywood parts for your case to size. As you can see in the drawing at right, the top and bottom, fixed shelves, and adjustable shelves are slightly different dimensions, though the parts look similar.

JOINERY. Each of the case sides have four dadoes that accept tongues on the top, bottom, and fixed shelves. You can cut all these dadoes on the table saw, as shown in the first two drawings below. The case sides are fairly long, so it helps to add a long auxiliary fence to your miter gauge to support the pieces as you cut. It's also a good idea to have some form of outboard support at the side of your table saw.

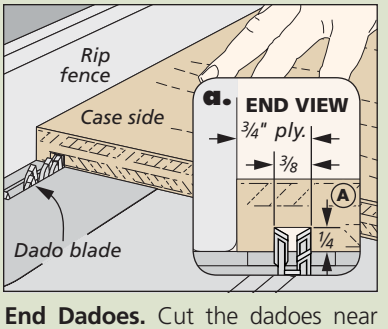


NOTE: Edging made from ¾"-thick hardwood. All cases parts are ¾" plywood

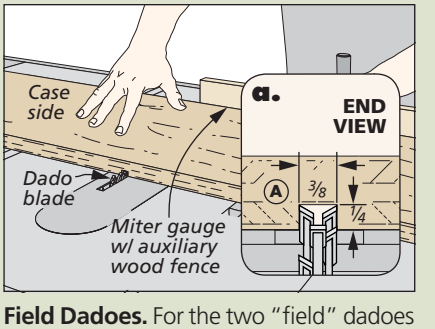
The mating tongues on the top, bottom, and fixed shelves are next. For these, "sneak up" on the thickness, and test the fit in the dadoes until you get them snug. Then, each case side receives a rabbet to hold the back planks. This requires a saw setup similar to what you just used for the tongues, as shown below.

Now is also a good time to lay out and drill the holes for shelf pins in the

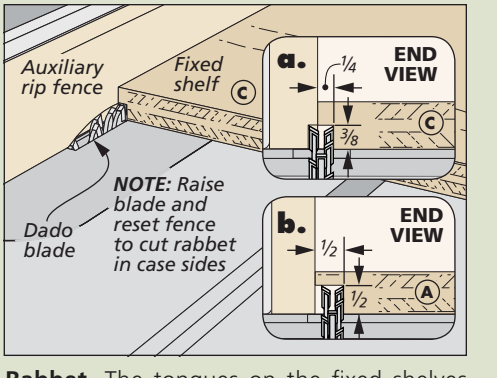
How-To: Make Case Parts



End Dadoes. Cut the dadoes near the ends of the case sides with a dado blade using the rip fence as a guide.



Field Dadoes. For the two "field" dadoes on each case side, you can guide the piece using a miter gauge with a long fence.



Rabbet. The tongues on the fixed shelves and the rabbets in the case sides can both be cut with a similar setup.

case sides, as illustrated in the drawing on the previous page.

CASE ASSEMBLY. At this point, you can check the fit of all the parts, and then glue and clamp them together. Note that the back edges of the fixed shelves are positioned flush with the rabbet on the case sides, just like the case top and bottom (detail 'c,' opposite page).

EDGING. This leaves space at the front of the shelves to add hardwood edging. While you're at it, the adjustable shelves get a strip of edging glued to the front, too, as in detail 'b' on the opposite page. You won't install these shelves until the project is complete.

FACE FRAME. To begin transforming this project from a basic plywood box into a fine piece of furniture, you want to add a face frame. It's made up of hardwood stiles and rails that are joined together with pocket screws. The face frame is then joined to the front of the case using glue and clamps.

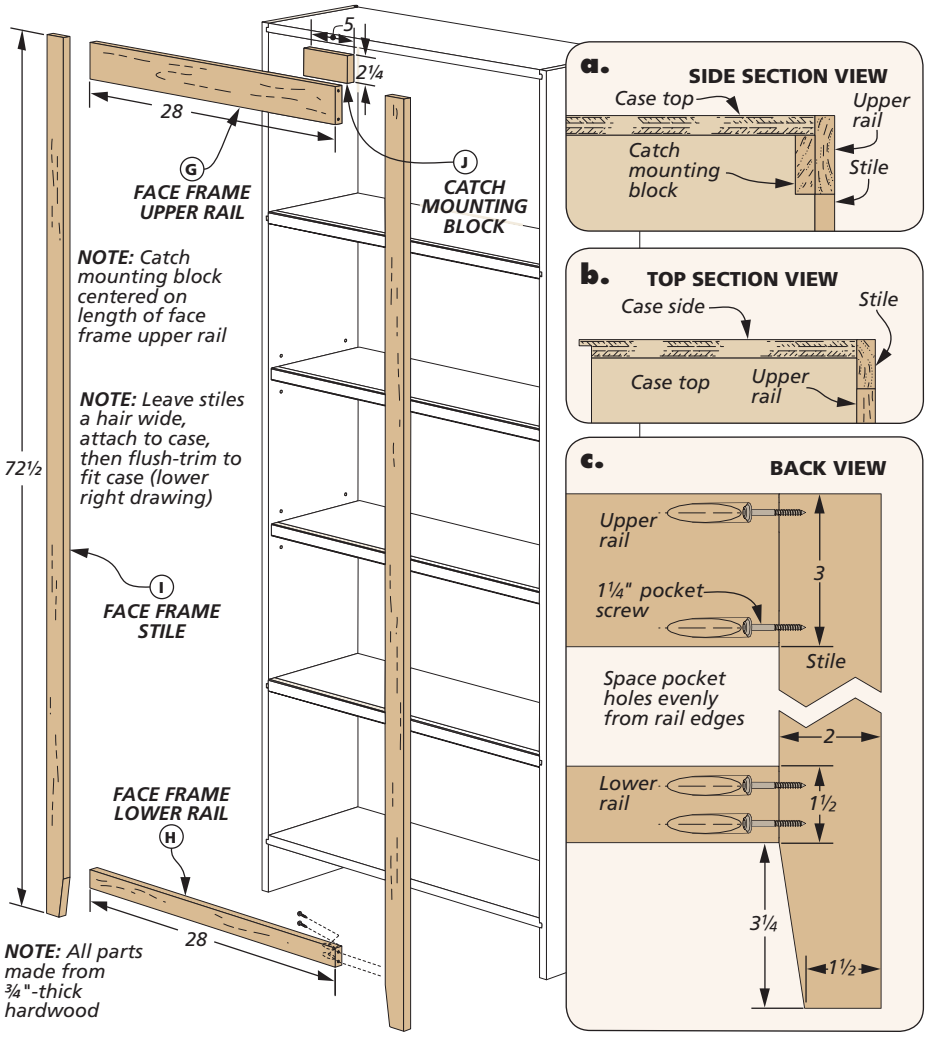
Though in theory the face frame should be the same outside dimensions as the case, it's often difficult to get an exact fit when you glue them together. So what I like to do is leave my stiles a hair wider than the final dimensions shown at right (about 1/16").

Then, after gluing and clamping the face frame to the case, I use a router and flush-trim bit to trim the stiles of the face frame for a perfect fit with the case, as shown in the lower right drawing.

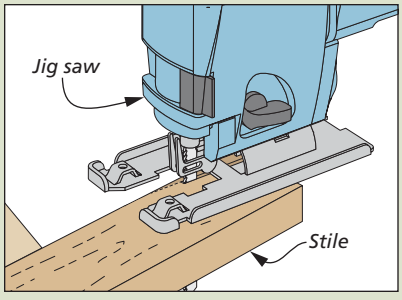
Once you've cut the face frame parts to size, the one detail to add before assembling them is a subtle taper at the bottom of the stiles. Because of the length of the stiles, I found this cut easier to make with a jig saw (lower left drawing).

Next, get out your pocket hole jig to drill all the holes in the frame rails and join the frames together with pocket screws (see detail 'c' above and the middle drawing below).

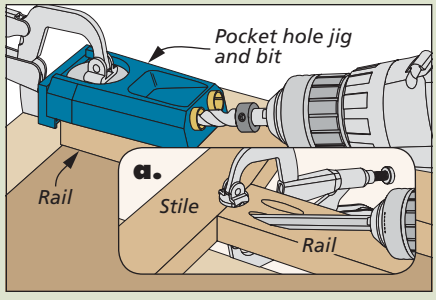
CATCH BLOCK. One final part is a block attached to the upper rail. This block holds the magnetic catches to keep the doors closed. You can just cut this block to size and stick it in place with glue and a clamp.



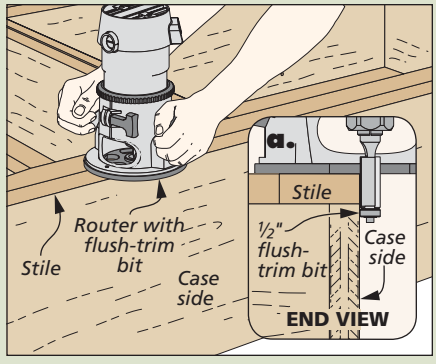
Add the Face Frame



Taper. Lay out the subtle taper on the face frame stiles, cut it with a jig saw, and sand the surface smooth.



Pocket Screws. A pocket hole jig will make quick work of the joinery used to connect the rails and stiles.



Rout Flush. After gluing and clamping the face frame to the case, use a flush-trim bit to make the edges flush.

add the top
Back & Doors

With the case complete, you can turn your attention to the features that really dress it up. Those include the top, the hardwood back, and the glass-panel doors.

START AT THE TOP. The top is a plywood panel wrapped with hardwood edging. After cutting the panel to size, you can miter, glue, and clamp the edging strips to the top panel (drawing at right).

The edging gets a subtle roundover on the top and bottom. Then the top is attached to the case flush with the back and with an equal overhang on each side, as shown in details 'b' and 'c.'

COVE MOLDING. What really dresses up the top is cove molding that is fitted to the underside. The molding is also mitered at the corners to wrap around the top of the case, as shown in the lower left drawing. Once the pieces are cut, they can be glued in place using spring clamps.

PAINT. At this stage, it's time to prime and paint the case components. That's because the next part you'll add is the back, which features a contrasting natural finish.

BACK PLANKS. I made the back of the bookcase out of red alder planks (a right plank, a left plank, and four center planks). The planks are each rabbeted along the edges to fit together with a slight gap between them (detail 'a'). You can cut the rabbets as shown in the lower right drawing. Note that the end planks have one rabbet, and the center planks have two rabbets.

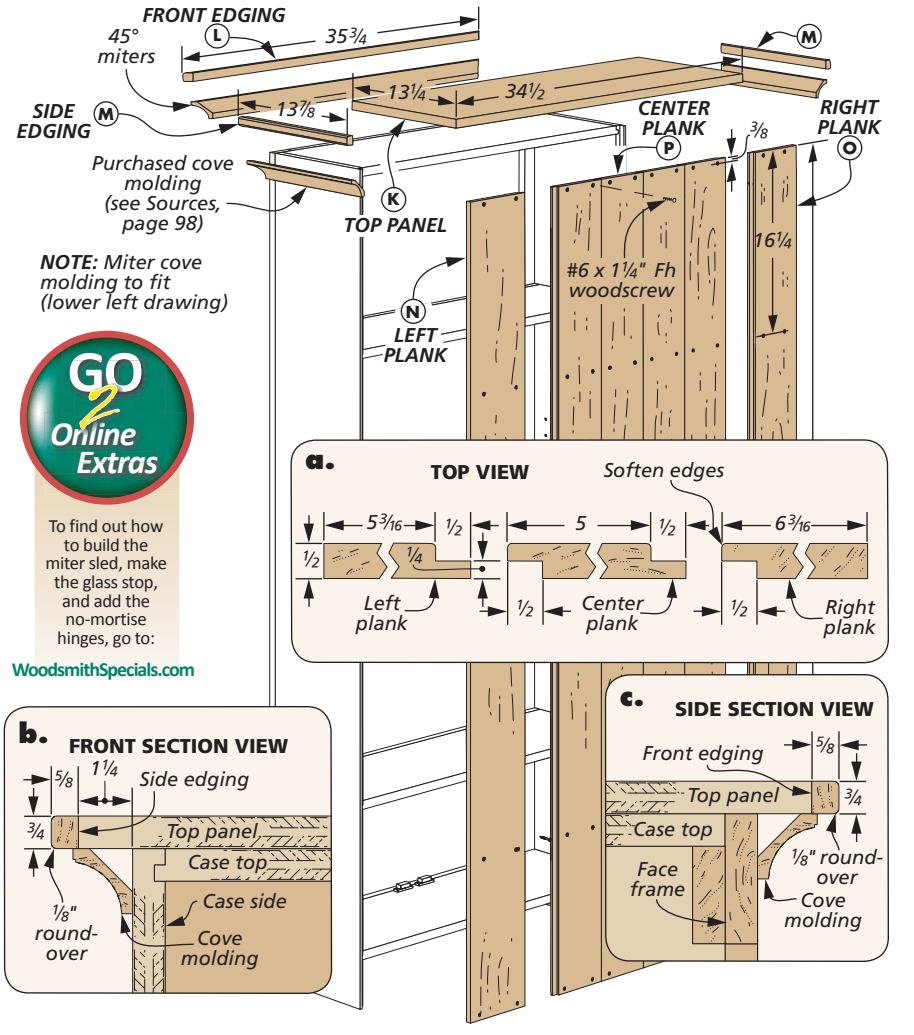
To highlight the wood tone, I applied lacquer to the planks. When it dries, they're ready to go in place in the cabinet. There's a slight gap between each, and playing cards make great shims to establish the correct spacing. Then drill countersunk holes in the planks and secure them from the back with screws.

DOORS. The final detail that really completes this bookcase is a pair of glass-panel doors. The door frames are constructed with mortise and tenon joints, and the glass rests in a rabbet routed in the back of the frame. Decorative muntin strips adorn the glass.

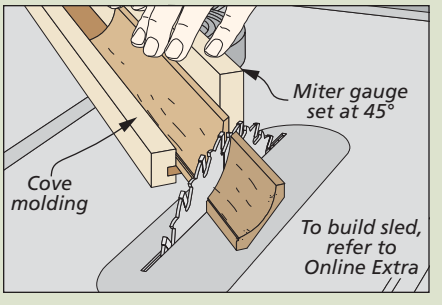
MORTISES & TENONS. Start making the doors by cutting the rails and stiles to size. Then lay out and drill the mortises near each end of the stiles on the drill press. Clean them up and square up the ends with a chisel. You'll get all the dimensions you need in detail 'a' on the opposite page.

Now you can cut the tenons (detail 'b'). This is best done at the table saw with a dado blade. Once you're done, assemble the doors with glue and clamps.

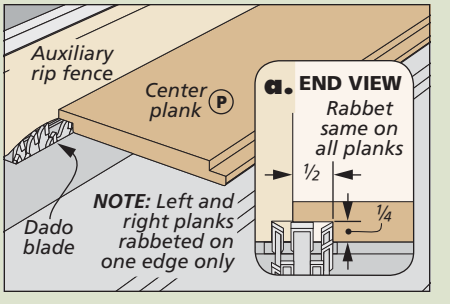
RABBET FOR GLASS. When the glue dries, rout a rabbet around the inside



How-To: Add Cove Molding Back



Miter Molding. The easiest way to miter cove molding is to position it at its mounted angle. This sled makes it easy.



Rabbet Back. All the rabbets on the back planks are the same. They can be made with a dado blade buried in an auxiliary fence.

perimeter of the back of each door using a rabbeting bit, as shown in detail 'd.' Then chisel the corners square.

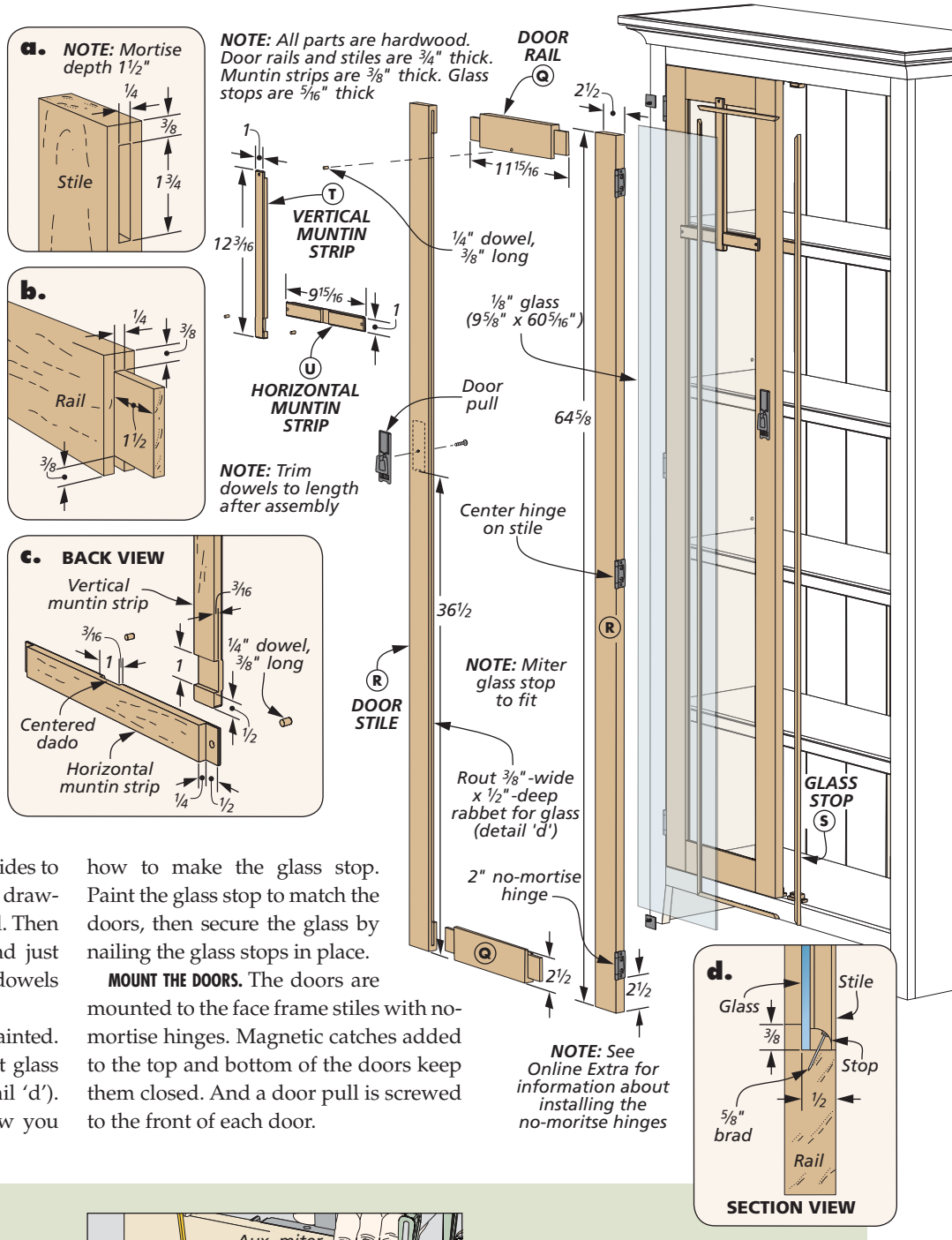
MUNTIN STRIPS. The muntin strips on the front of the doors are up next. A half lap between the strips provides a secure connection, and rabbets on the ends will overlap the door frame (detail 'c.') Dowels and glue connect the strips to the door in a secure way that adds a decorative touch to the doors.

The first thing to do on the muntin strips is drill the holes for the dowels (lower left drawing). Next, you can cut all the rabbets on the ends using a dado blade (two on the horizontal strip; one on the vertical strip). Adjust the dado blade, and cut the half laps where the strips intersect (lower middle drawing). Finally, join the strips with glue and a clamp.

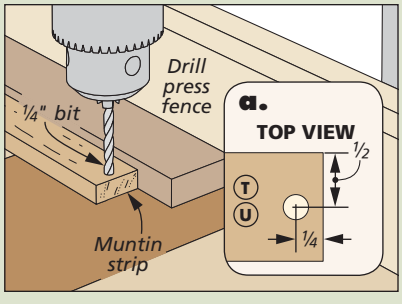
At this point, the muntin strips are ready to be attached to the doors. Set them in place, and use the holes in the muntin strips as guides to drill holes in the doors (lower right drawing). Glue in short lengths of dowel. Then trim and sand them so they stand just proud of the muntin strips. (The dowels will have a final length of 3/8".)

The doors are ready to be painted. While the paint dries, you can get glass cut to size to fit inside them (detail 'd'). The Online Extra article will show you how to make the glass stop. Paint the glass stop to match the doors, then secure the glass by nailing the glass stops in place.

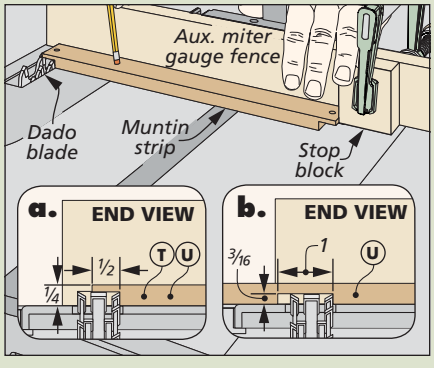
MOUNT THE DOORS. The doors are mounted to the face frame stiles with no-mortise hinges. Magnetic catches added to the top and bottom of the doors keep them closed. And a door pull is screwed to the front of each door.



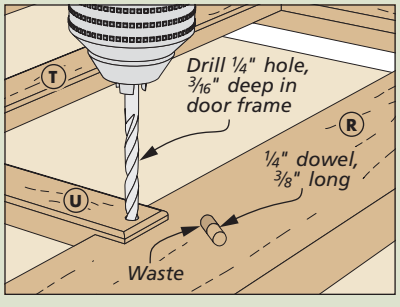
Make Muntins



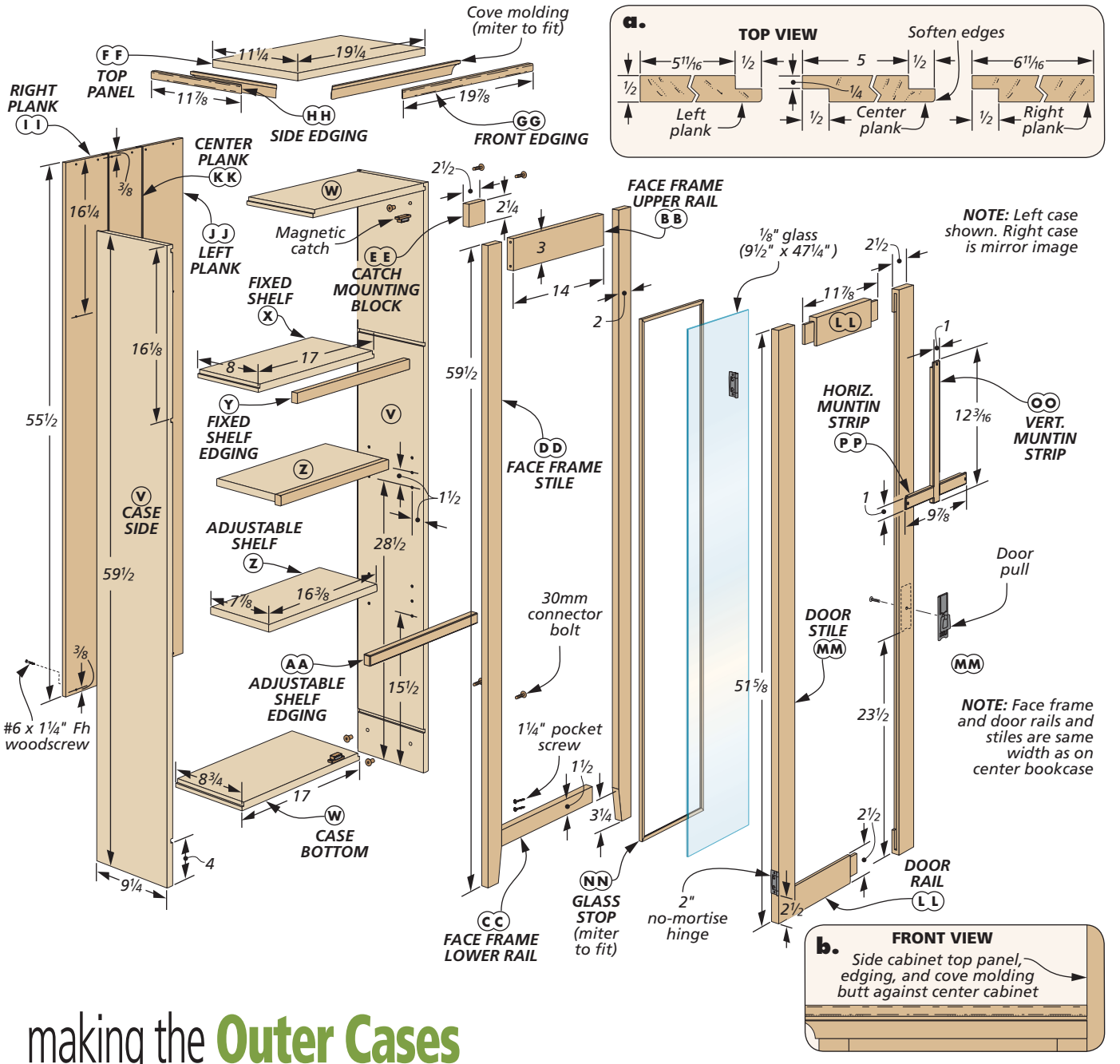
Drill Holes. The muntin strips are drilled to accept dowels. Use a drill press fence to ensure consistent spacing.



Rabbets & Half Laps. The rabbets and half laps on the muntin strips can all be made using a dado blade.



Attach Muntin Strips. Position the muntin strips, transfer the holes to the door, and glue in the dowels.



making the **Outer Cases**

Once you've built the center case, you won't find constructing the outer cases to be too difficult. Though the dimensions are different, the construction details of these cases are virtually the same. There are a few differences on the outer cases that I want to point out, though.

BUILDING THE OUTER CASES. The first distinction has to do with the shelves in the outer cases. Specifically, each outer case only has one fixed shelf, located near the top, while the center case has two fixed shelves.

The top of the outer case is a little bit different, as well. On the center case, the top panel is centered above the case, and the edging and cove molding wrap all the way around the sides. Here, the top is mounted flush on one side to butt against the center case (detail 'b'). The edging and cove molding wrap around one side and the front of the case. They end at a 90° angle flush with the edge of the top where it meets the center case.

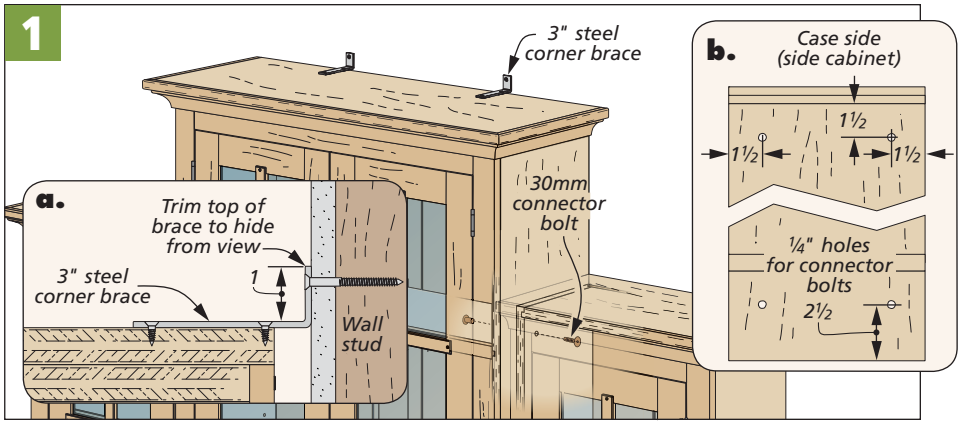
PLANKS. The back of the outer case is similar, but instead of six planks, it only features three. And each outer case only has one door rather than two. Because of this, the catch mounting block is smaller than the one on the center case. It's also attached to the case side, rather than centered in the case.

INSTALLING THE BOOKCASE. Once the cases are all painted and finished, there are a few small components that you'll want to add in order to install them safely and prevent them from tipping.

When you get the bookcases moved into position on the wall, it's a good idea to connect them to one another with connector bolts. This requires drilling holes in the case sides and adding the bolts, as you can see in the main drawing above and in detail 'b' on the opposite page.

As another safety measure, secure the cases to the wall to prevent them from tipping. To do this, I made a couple of wall brackets out of steel corner braces. First, trim the top of the brace with a hacksaw, so it won't be visible above the bookcase (detail 'a'). Then align each bracket with a wall stud. Finally, screw them to the top of the case and the studs, as shown at right.

Your step-back bookcase is now complete. And you're sure to find it to be an eye-pleasing step up from the average bookcase, as well as a fine piece of furniture for your home.



Safe Installation. To provide more stability, it's a good idea to attach the cabinets to one another with connector bolts (detail 'b'). Then, use steel corner braces to attach the center cabinet to wall studs, as shown in detail 'a.'

MATERIALS, SUPPLIES, & CUTTING DIAGRAM

Center Case

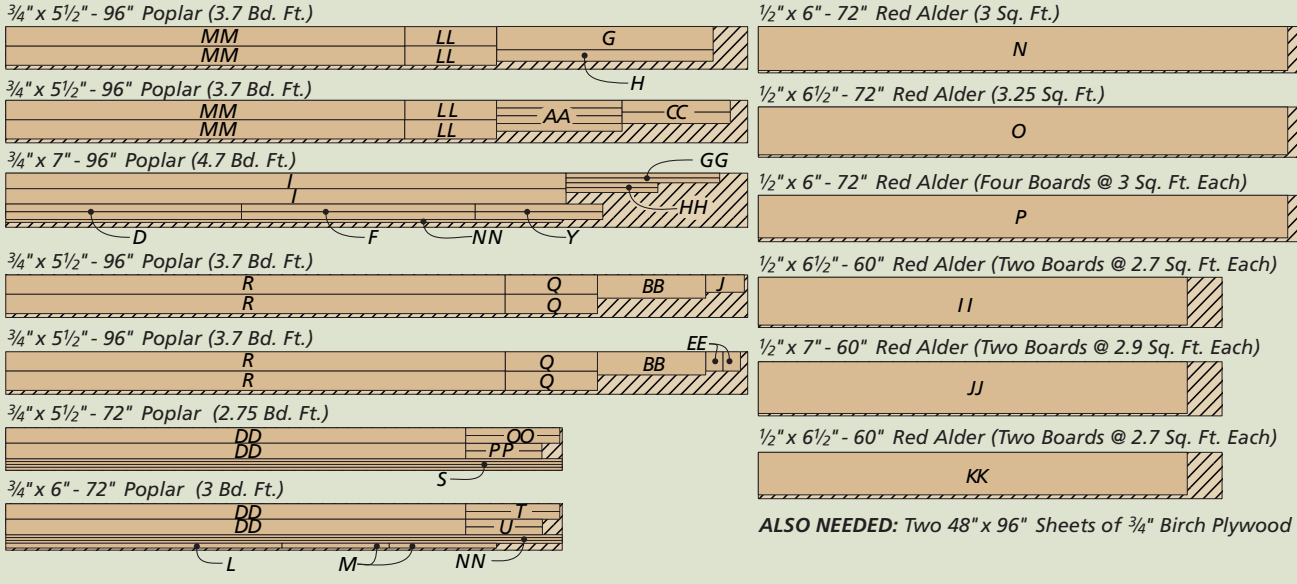
A	Case Sides (2)	¾ ply. - 11¼ x 72½
B	Case Top/Bttm. (2)	¾ ply. - 10¾ x 31
C	Fixed Shelves (2)	¾ ply. - 10 x 31
D	Fixed Shelf Edging (2)	¾ x 1 - 30½
E	Adj. Shelves (2)	¾ ply. - 9⅞ x 30⅜
F	Adj. Shelf Edging (2)	¾ x 1 - 30⅜
G	Face Frame Uppr. Rail (1)	¾ x 3 - 28
H	Face Frame Lwr. Rail (1)	¾ x 1½ - 28
I	Face Frame Stiles (2)	¾ x 2 - 72½
J	Catch Mtng. Block (1)	¾ x 2¼ - 5
K	Top Panel (1)	¾ ply. - 13¼ x 34½
L	Front Edging (1)	⅝ x ¾ - 35¾
M	Side Edging (2)	⅝ x ¾ - 13⅞
N	Left Plank (1)	½ x 51 1/16 - 68½
O	Right Plank (1)	½ x 6 3/16 - 68½
P	Center Planks (4)	½ x 5½ - 68½
Q	Door Rails (4)	¾ x 2½ - 111 5/16
R	Door Stiles (4)	¾ x 2½ - 64⅝
S	Glass Stop	5/16 x 5/16 - 290 rgh.
T	Vertical Muntins (2)	⅜ x 1 - 12 3/16
U	Horizontal Muntins (2)	⅜ x 1 - 91 5/16

Side Cases

V	Case Sides (4)	¾ ply. - 9¼ x 59½
W	Case Top/Bttm. (4)	¾ ply. - 8¾ x 17
X	Fixed Shelves (2)	¾ ply. - 8 x 17
Y	Fixed Shelf Edging (2)	¾ x 1 - 16½
Z	Adj. Shelves (4)	¾ ply. - 7⅞ x 16⅜
AA	Adj. Shelf Edging (4)	¾ x 1 - 16⅜
BB	Face Frame Uppr. Rails (2)	¾ x 3 - 14
CC	Face Frame Lwr. Rails (2)	¾ x 1½ - 14
DD	Face Frame Stiles (4)	¾ x 2 - 59½
EE	Catch Mtng. Blocks (2)	¾ x 2¼ - 2½
FF	Top Panels (2)	¾ ply. - 11¼ x 19¼
GG	Front Edging (2)	⅝ x ¾ - 19⅞
HH	Side Edging (2)	⅝ x ¾ - 11⅞
II	Left Planks (2)	½ x 6 3/16 - 55½

JJ	Right Planks (2)	½ x 61 1/16 - 55½
KK	Center Planks (2)	½ x 5½ - 55½
LL	Door Rails (4)	¾ x 2½ - 11⅞
MM	Door Stiles (4)	¾ x 2½ - 51⅝
NN	Glass Stop	5/16 x 5/16 - 240 rgh.
OO	Vertical Muntins (2)	⅜ x 1 - 12 3/16
PP	Horizontal Muntins (2)	⅜ x 1 - 9⅞

- (24) ¼" Shelf Pins
- (8) Magnetic Catches
- (60) ⅝" Brads
- (11 lin. ft.) 9/16" x 2" Cove Molding
- (4) Door Pulls
- (1) ¼"-dia. Dowel, 12" long
- (84) #6 x 1¼" Fh Woodscrews
- (8) 30mm Connector Bolts & Caps
- (3) 3" Steel Corner Braces
- (5 pr.) 2" No-Mortise Hinges
- (3) ⅛"-thick Glass Panels (two sizes)



ALSO NEEDED: *Two 48"x 96" Sheets of ¾" Birch Plywood*

decorative Keepsake Box

Graceful curves and fine details are at the heart of this unique box. But don't be fooled by its looks — construction is easier than you think.

GO 2 Online Extras

For complete plans for the finger joint jig, go to: WoodsmithSpecials.com

This time of year my mind turns towards gift ideas for the holidays. And nothing could be more appropriate than this beautiful keepsake box. Because it's so small, it's easy to splurge on highly figured or exotic wood without spending a fortune. The curved sides and ends add an interesting design element, too. And it's crafted with a snug-fitting capped lid to keep special collections and other treasures tucked neatly inside.

But perhaps the most interesting feature is the intricate-looking finger joints connecting the corners of the box. They appear wider on the ends than on the sides, but in reality, they're formed at the table saw while the box is square. The curved, profile cuts made later create this unique, asymmetrical illusion.

The box may appear complicated to build, but the construction is pretty straightforward. The key to success, as is the case with most small projects, is paying close attention to the details. I recommend making test cuts on less expensive stock for each operation.

FINGER JOINT BOX

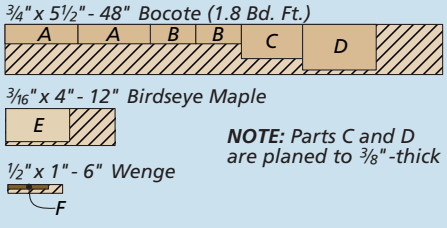
As I mentioned, the basic construction of the box consists of the finger joints at the corners. A groove in each side and end piece accepts a tongue cut on the box bottom. The bottom extends below the sides and ends to give the box the appearance of floating when sitting on a flat surface.

THE SETUP. Begin by cutting the four pieces to size for the box sides and ends. I let these pieces run a little long and wide. Any excess material gets cut away later when the box is shaped.

MATERIALS, SUPPLIES & CUTTING DIAGRAM

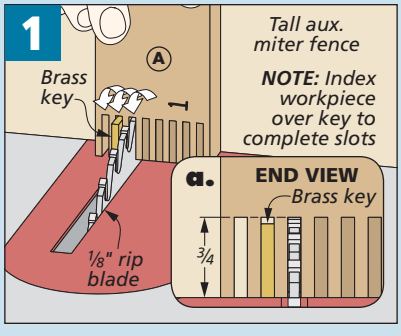
A Sides (2)	¾ x 2⅛ - 8
B Ends (2)	¾ x 2⅛ - 5
C Bottom (1)	⅜ x 3¾ - 6¾
D Lid (1)	⅜ x 5 - 8
E Lid Cap(1)	3/16 x 3⅝ - 7
F Handle (1)	7/16 x ½ - 4 3/16

• (2) ⅛"- dia. x 13/16" Dowels

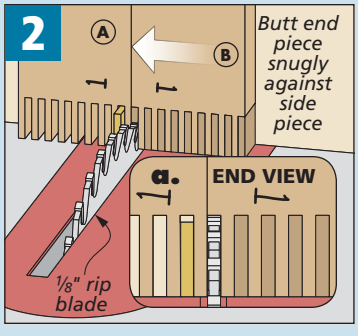


NOTE: Parts C and D are planed to ⅜"-thick

How-To: Cut Finger Joints



Cutting the Side Pieces. "Hop" the workpiece over the brass key to cut each successive finger joint slot.



Cutting the Ends. Use a side piece as an index to register the first slot in the end pieces.

To cut the slots at the table saw, a simple jig is needed to support the workpieces. The Online Extra article at *WoodsmithSpecials.com* shows the details for making this jig. Make sure the index key used for the jig is shorter than the final length of the fingers. This keeps the workpieces from bottoming out on the key as the slots are cut (Figure 1a, opposite page).

Also, since the finger joints are ⅛"-thick with ⅛"-wide spaces in between, you'll want to use a full ⅛"-thick rip blade that has flat-top teeth to form the slots. The flat ground teeth leave a smooth-bottom groove. This ensures a nice, tight joint when the sides and ends are glued together.

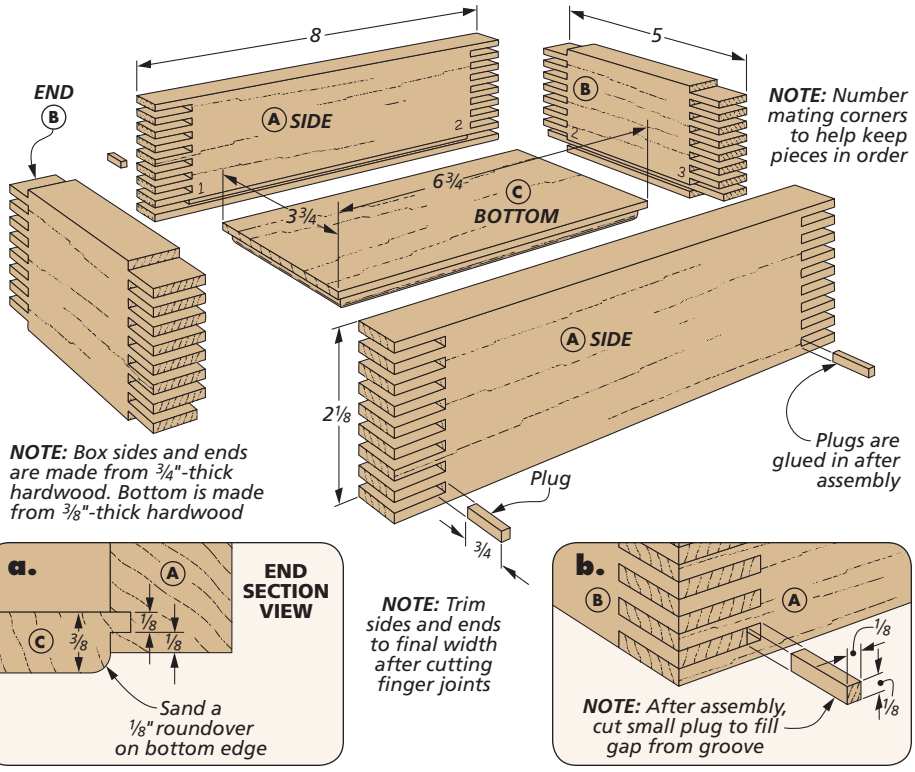
MAKE THE CUTS. Figure 1 on the opposite page shows how to cut the slots on the side pieces. Start by butting one piece against the key and snug to the fence, then make the first pass. "Hop" the workpiece over the key to cut the next slot. With the slots completed on one end, flip the workpiece end-for-end and make the cuts on the other end.

Use one of the side pieces as a spacer to position one end piece against the auxiliary fence (Figure 2, previous page). Make the first cut, then remove the side piece and continue cutting the slots as before. Now, rip the pieces to final width so that the sides begin and end with a full-thickness finger and the ends have a full-width slot.

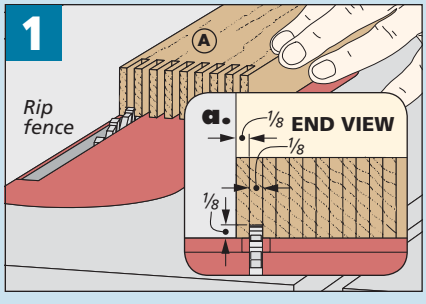
GROOVE FOR BOTTOM. Next, adjust the saw blade height to cut the groove in the inside face of each side and end piece (Figure 1, at right). This groove houses a tongue cut on the bottom panel. The rip fence provides proper spacing.

BOTTOM & RABBET. I cut the bottom panel to size at the table saw. Use a narrow dado blade buried in an auxiliary rip fence to rabbet the underside of all four edges (Figure 2). This forms the tongue that fits into the box sides and ends. Using a sanding block, round over the rabbeted edges of the bottom, as shown in detail 'a,' above.

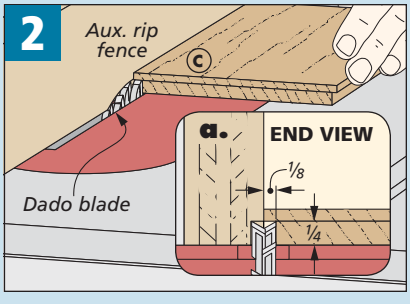
ASSEMBLE. All that's left is to dry fit all of the parts. When everything fits well, glue the box together (Figure 3). A couple of clamping cauls at each corner allows the finger joints to close tight. After removing the clamps, glue the plugs in place to cover the exposed ends of the groove (detail 'b,' above).



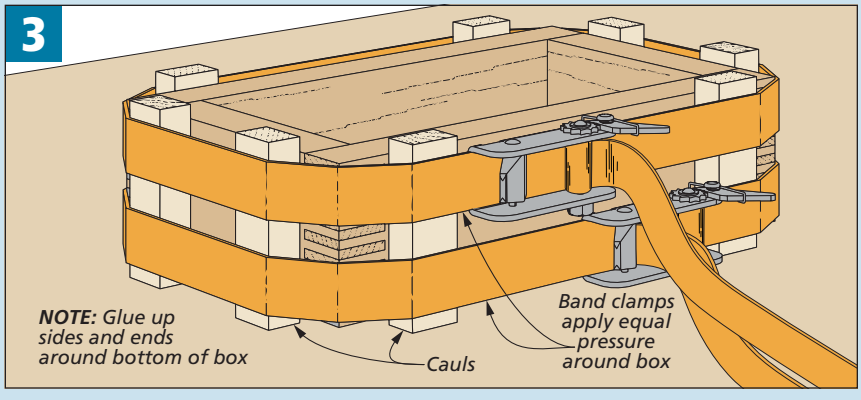
How-To: Cut Groove, Rabbet & Glueup



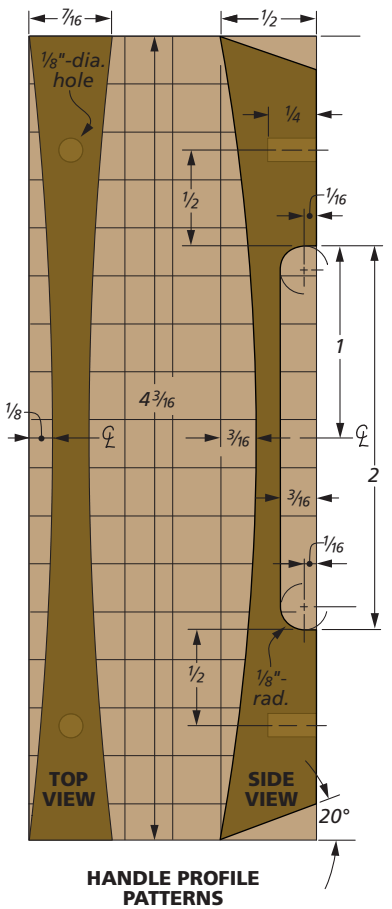
Cutting Groove. A groove on the inside face of the sides and ends houses the tongue on the bottom.



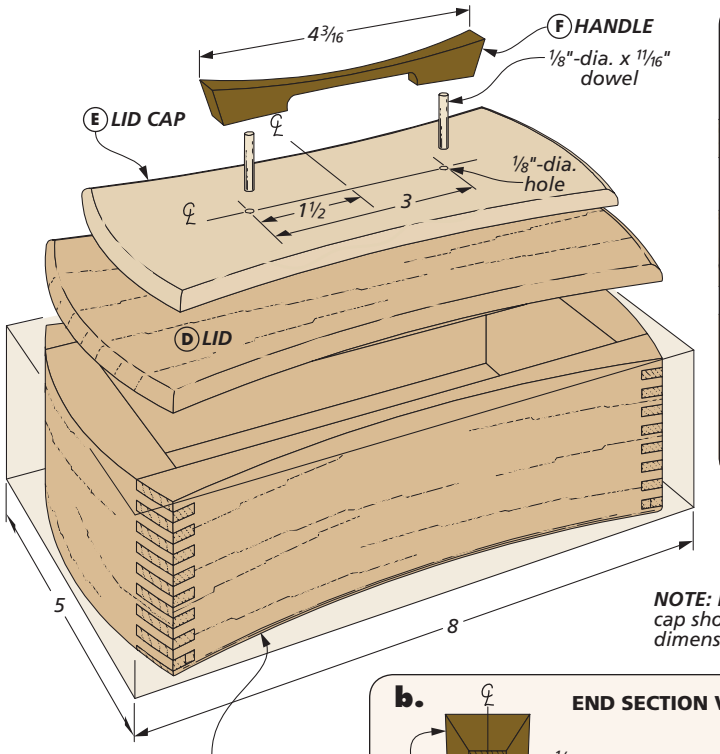
Rabbeted Bottom. A dado blade buried in an auxiliary rip fence makes quick work of cutting the rabbets.

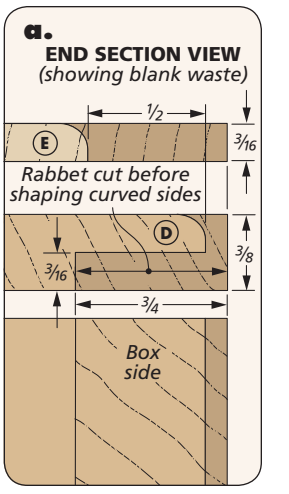


Glue & Clamp. With the bottom in place in the grooves, use a couple band clamps to hold everything together while the glue sets up. The cauls apply clamping pressure next to the joint, but not directly over it.

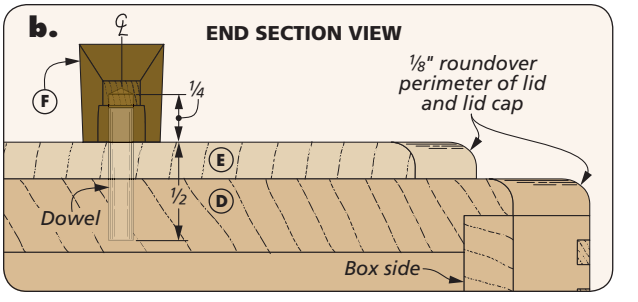


HANDLE PROFILE PATTERNS
(1 Square = ¼")





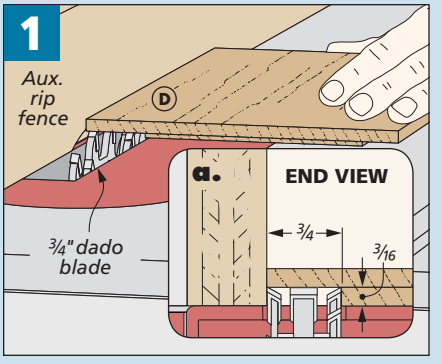
NOTE: *Blanks for lid and lid cap should match overall dimensions of box*



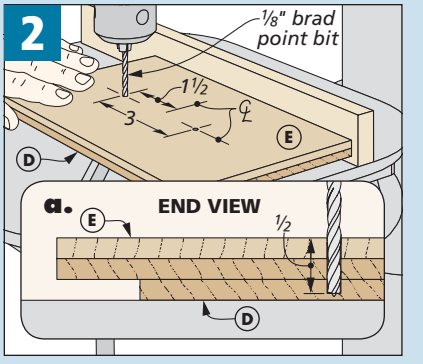
adding the **Lid & Handle**

With the basic box completed, it's time to turn your attention to making the lid assembly. It consists of two parts. The bottom portion of the lid is rabbeted on the underside for a snug fit in the box. Then a lid cap is glued on top of the lid. Here, a highly figured piece of wood (like the birdseye maple shown on page 34) can really complement the overall look of the box.

How-To: Lid Rabbets & Dowel Holes



Rabbeted Lid. Sneak up on the final size of the rabbet in the lid. It should fit snugly in the box at this point.



Dowel Holes. Double-sided tape holds the lid and lid cap blanks together while drilling the holes.

After completing the lid parts, the lid assembly and box will be held together and cut to their final shape at the band saw. The detailed handle tops it all off.

LID & CAP. Begin by cutting the blanks for the lid and lid cap to size. Both blanks start out the same size, but the lid blank is 3/8"-thick while the lid cap is only 3/16"-thick. Set the lid cap blank aside for now.

Next, I cut a rabbet around the bottom edges of the lid blank so it fit snugly in the box opening. To ensure a good fit, start by rabbeting the two opposing edges of the lid blank using an auxiliary rip fence and a dado blade in the table saw. Readjust the fence if necessary, and run the same two edges over the blade until they just slip into the box. You're aiming for a pretty snug fit at this point. Do the same for the two ends. A sanding block helps to fine-tune the fit and remove the saw marks.

DOWEL HOLES. Two dowels will be used to secure the handle to the lid. To drill the holes for these dowels, hold the lid and lid cap together with double-sided tape

(Figure 2, at left). Carefully mark the hole positions and drill the holes.

CURVES AHEAD. Now this project will really start taking shape. With the lid and cap blanks still held together with double-sided tape, follow the procedure shown in Figure 1 at right to lay out the curves on the ends and sides of the lid cap. I used a compass for the end curves and a gently flexed, thin strip of hardboard to trace the side curves.

With the lid assembly placed back on the box, move over to the band saw and cut everything to shape (Figure 2). Be sure to stay to the waste side of the layout line. The outside edges of the box are then easy to clean up with a large sanding drum in the drill press (Figure 3).

LID CAP. To add some visual interest to the box, the edges of the lid cap are offset from the edges of the lid and box. Figure 4 shows how I used a compass to scribe this layout line on the cap. Remove the double-sided tape holding the lid and cap together and head back to the band saw to cut the lid cap to its final size. Clean up the edges as before with a sanding drum.

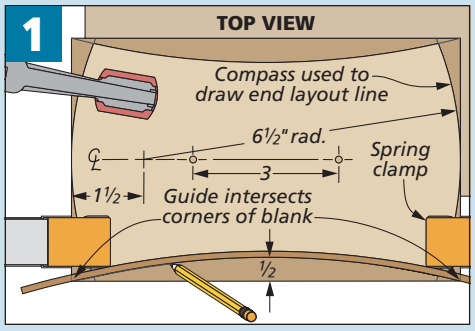
Before gluing the two lid parts together, you'll want to round over the top edge of both pieces. Detail 'b' on the opposite page shows what I mean. Next, I glued the two short dowels into the lid along with the lid cap. The dowels stand proud of the lid cap. They keep the two parts aligned and anchor the handle later on.

SHAPE THE HANDLE. Because the handle for the box is relatively small, I used an extra-long blank to keep my fingers well clear of the cutting operations. Figures 5 through 8, shown at right, walk you through the steps to bring it to shape.

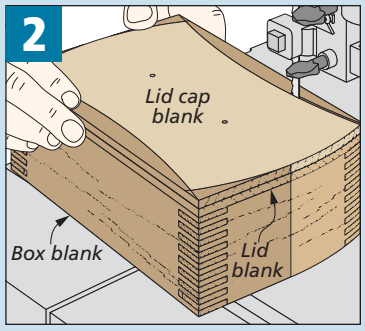
The profile patterns on the opposite page get glued to the blank. Use the side view pattern first to form the ends of the notch on the bottom edge as shown in Figure 5. Remove the rest of the waste at the band saw. Next, locate and drill the holes for the dowels (Figure 6) and cut the curve on the top edge.

The top view pattern can then be used to cut the curves on both sides, as shown in Figure 7. After cutting the handle free from the blank (Figure 8), a light sanding will finish it off. A little glue is all it takes to attach the handle to the lid and dowels. I finished the box with two coats of lacquer.

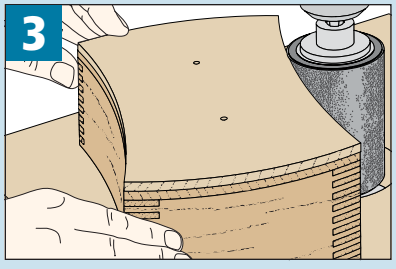
How-To: Shaping Lid, Box & Handle



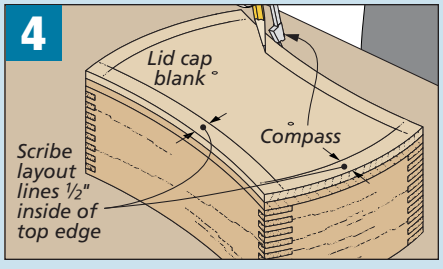
Lay Out Curves. A compass and a flexible hardboard guide strip work great to lay out the curves on the lid assembly.



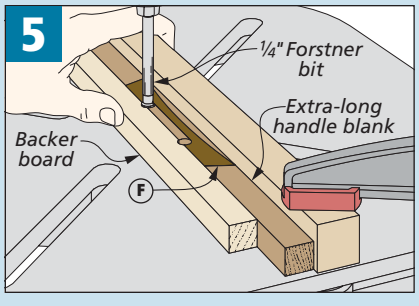
Shaping the Box. With the lid assembly nestled in the box, cut all four sides to shape.



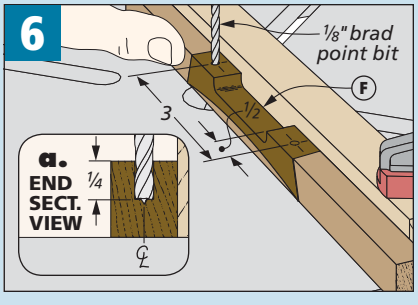
Sand Curves. A sanding drum in the drill press removes the band saw marks from the sides and ends.



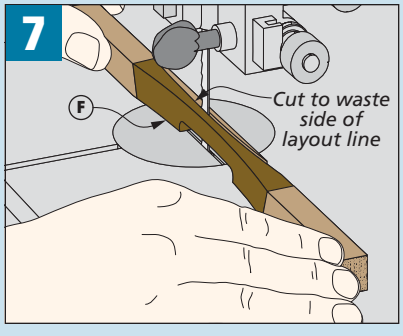
Offset Lid Cap. Use a compass and sharp pencil to scribe the four layout lines on the lid cap blank.



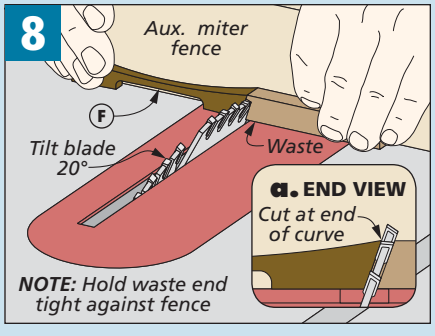
Handle Notch. Using a backer board, drill two holes in the handle blank to form the ends of the notch.



Drill Handle Holes. Lay out and drill the two holes for the dowel pins on the bottom of the handle blank.



Side Profiles. Back at the band saw, cut the gentle curves on both sides of the extra-long handle blank.



Beveled Ends. A bevel cut at both ends of the blank completes the final shaping of the box handle.

craftsman-style Clock

This mantel clock is small in size, but it's sure to be big in appeal.

A mantel clock in the Craftsman (or Arts & Crafts) style looks great in just about any setting. And the design shown in the main photo is a good example of the classic lines of that period. It also incorporates a hand-made, ceramic tile that reflects the traditional Arts & Crafts elements. Designers and builders of Craftsman homes and furniture often used highly stylized tile in their construction.

While I wanted to maintain a traditional look, I also took advantage of more modern conveniences, like a quartz clock movement. And though screws are used for some of the joints, you'll hide the screw holes by installing thin, end-grain plugs.

A plywood panel behind the front frame holds the clock movement and the tile. I made the unique face for the clock out of light-colored maple to contrast with the stained white oak. The four reference points on the face are also stained, end-grain white oak. Finally, a thin, plywood back panel is attached with screws to allow easy access to the movement.

Hand Made: Tiles for all Tastes

One of the most striking features of this clock is the decorative art tile framed in the area below the face. During the design phase of this project, I wanted to find a tile that seemed faithful to the traditional Arts & Crafts style, but not a direct copy of any single example. With just a little searching, I found a tile company that exceeded my expectations.

Motawi Tileworks, a small *Michigan* company, produces a diverse line of hand-made tile. The founder, Nawal Motawi started the company after doing extensive research on tile designs, glazes, and glazing techniques of the master craftsmen and artisans from the Arts & Crafts period. Today, *Motawi Tileworks* offers some of the finest quality tile available. Check out the designs at *motawi.com*.

FRONT FRAME

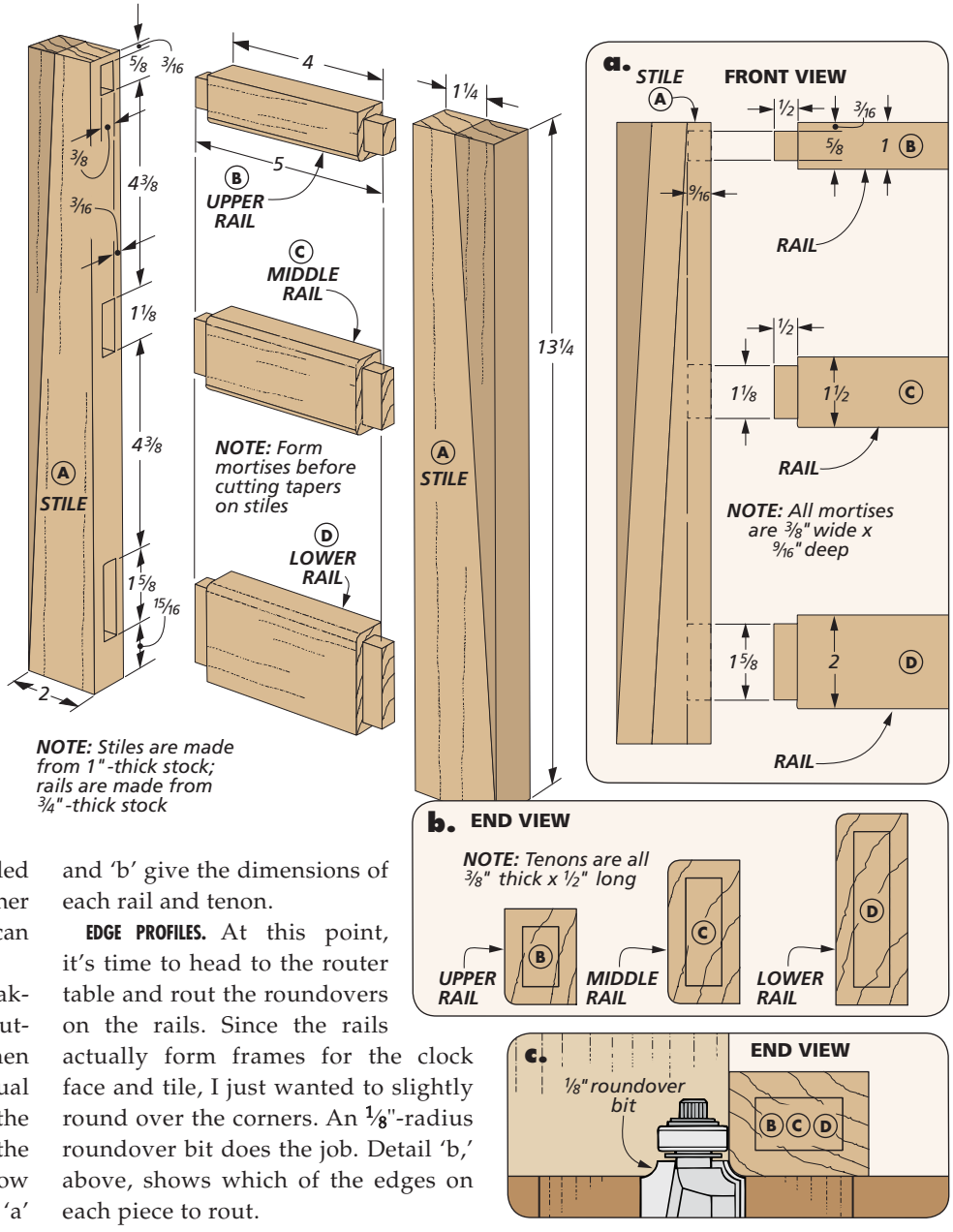
The tapered front frame sets the style for the clock. It consists of two tapered stiles joined by three rails, each a different width. The stiles form the borders of the upper and lower fields that contain the clock face and the tile.

Before getting started, you might want to take a look at the materials list on page 43. I mention this because the clock requires three different thicknesses of riftsawn white oak. It's a good idea to rough out those pieces up front and get all of the planing done at one time. Another helpful hint is to make sure to mill a little extra stock of each thickness for tool setups and spare parts in case you make a mistake.

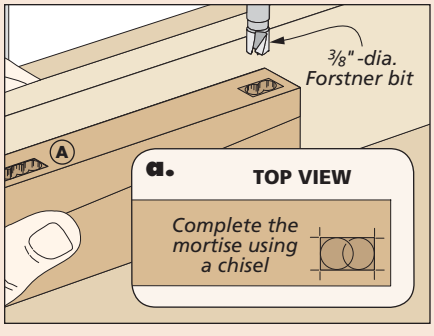
STILES. The first thing to work on is the pair of stiles. As you can see in the drawing at right, I cut the mortises on both stiles while the blanks were still square. The left drawing in the box below shows how I drilled out the mortises first, using a Forstner bit in the drill press. After that, you can square them up using a chisel.

RAILS. Now you can move on to making the three rails. I started by cutting the blanks to final length. Then I ripped each one to its individual width. Now install a dado blade in the table saw and an auxiliary fence on the miter gauge. The right drawings below show how to cut the tenons. Details 'a' and 'b' give the dimensions of each rail and tenon.

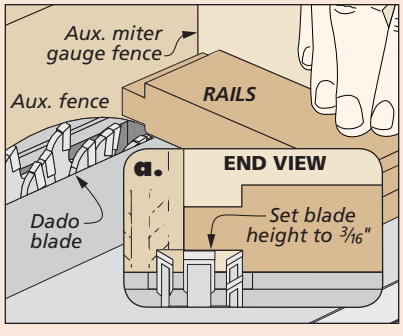
EDGE PROFILES. At this point, it's time to head to the router table and rout the roundovers on the rails. Since the rails actually form frames for the clock face and tile, I just wanted to slightly round over the corners. An ⅛"-radius roundover bit does the job. Detail 'b,' above, shows which of the edges on each piece to rout.



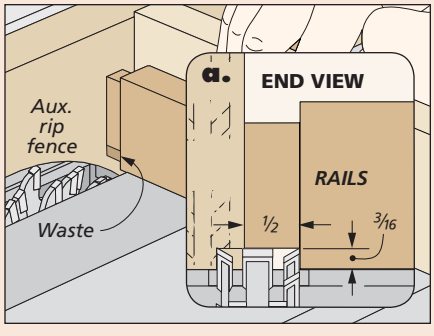
How-To: Make Mortises & Tenons



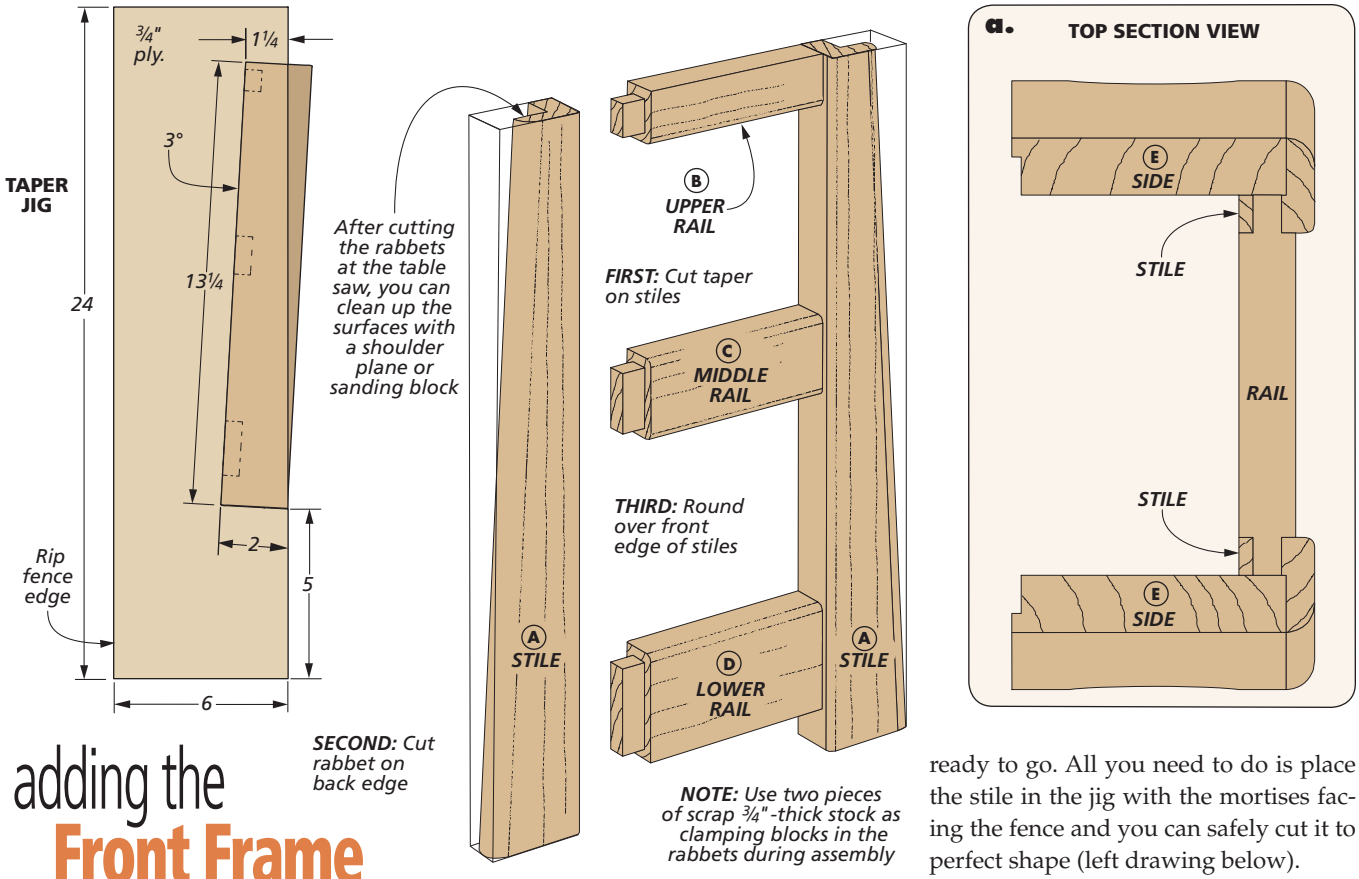
Drill Mortises. After laying out the size and location of each mortise, drill them out and square up the sides with a chisel.



Cut the Cheeks. Bury part of the dado blade in an auxiliary rip fence and use a miter gauge to make the cheek cuts.



Then the Shoulders. You can use the same blade and fence setup to cut the shoulders of the tenons.



adding the Front Frame

After completing the joinery for the rails and stiles, there's still a little bit of work to do before assembling the front frame. The first order of business is to taper the stiles. Then you'll need to cut the rabbet on the back edges to hold the sides.

Finally, I added another, larger roundover to the outer edge of the stiles. The illustrations below show you the processes, but I'll cover a few things that aren't in the drawings.

CUT THE TAPERS. Cutting the tapered stiles looks like a challenge. But like many woodworking tasks, a jig makes it a breeze. The shop-made jig shown at left above is easy to make and you can count on it to produce identical stiles.

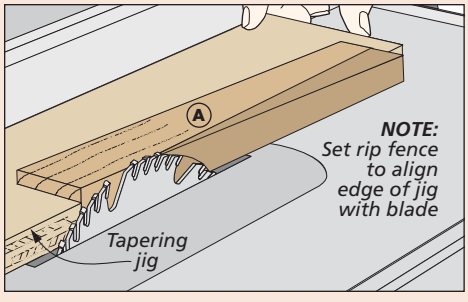
It's just a piece of plywood with the desired final shape of the stiles cut out. You can make the jig by cutting out the waste at the band saw. Then, just clean it up with a little sanding and you're ready to go. All you need to do is place the stile in the jig with the mortises facing the fence and you can safely cut it to perfect shape (left drawing below).

RABBET. After you've finished the taper cuts, you're ready to cut the rabbet on the outside back edge of the stiles. The middle drawing shows the technique for this cut.

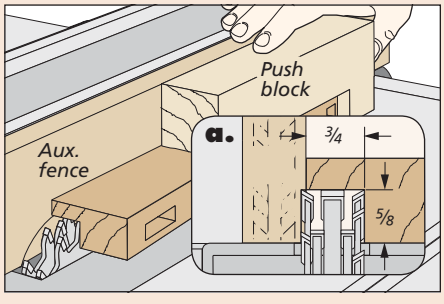
ROUNDOVER. Finish up the stiles for the clock by routing a roundover as shown in the right drawing below. This softens the edge and the look of the clock's front face.

ASSEMBLY. Now that you've completed the work on the rails and stiles, you can assemble the frame. Just brush a little

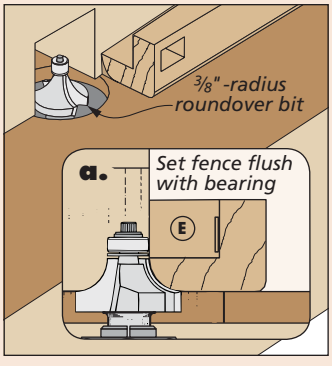
How-To: Complete the Stiles



Taper the Stiles. With the stile fit firmly in the tapering jig, all you need to do is set the fence and make the cut.



Rabbet. Set the dado blade to full width and install an auxiliary rip fence to cut the rabbet on the back edge of the stiles.



Soften the Edges. Round over the front outside edges of both stiles at the router table.

glue in the mortises and on the tenons. I used a couple pieces of ¾"-thick stock in the rabbets to act as clamping blocks during the glueup. This way, you can be sure to get a good glue bond by clamping across each joint.

SIDES. With the front frame complete, it's time to move on to the sides. The sides simply line up with the rabbets on the front frame.

I started by cutting the sides to final width. Then I cut the rabbet on the rear edge using a dado blade in the table saw. Finally, I installed a standard blade and tilted it to cut the bevel on the top and bottom edges of both pieces (left drawing, below).

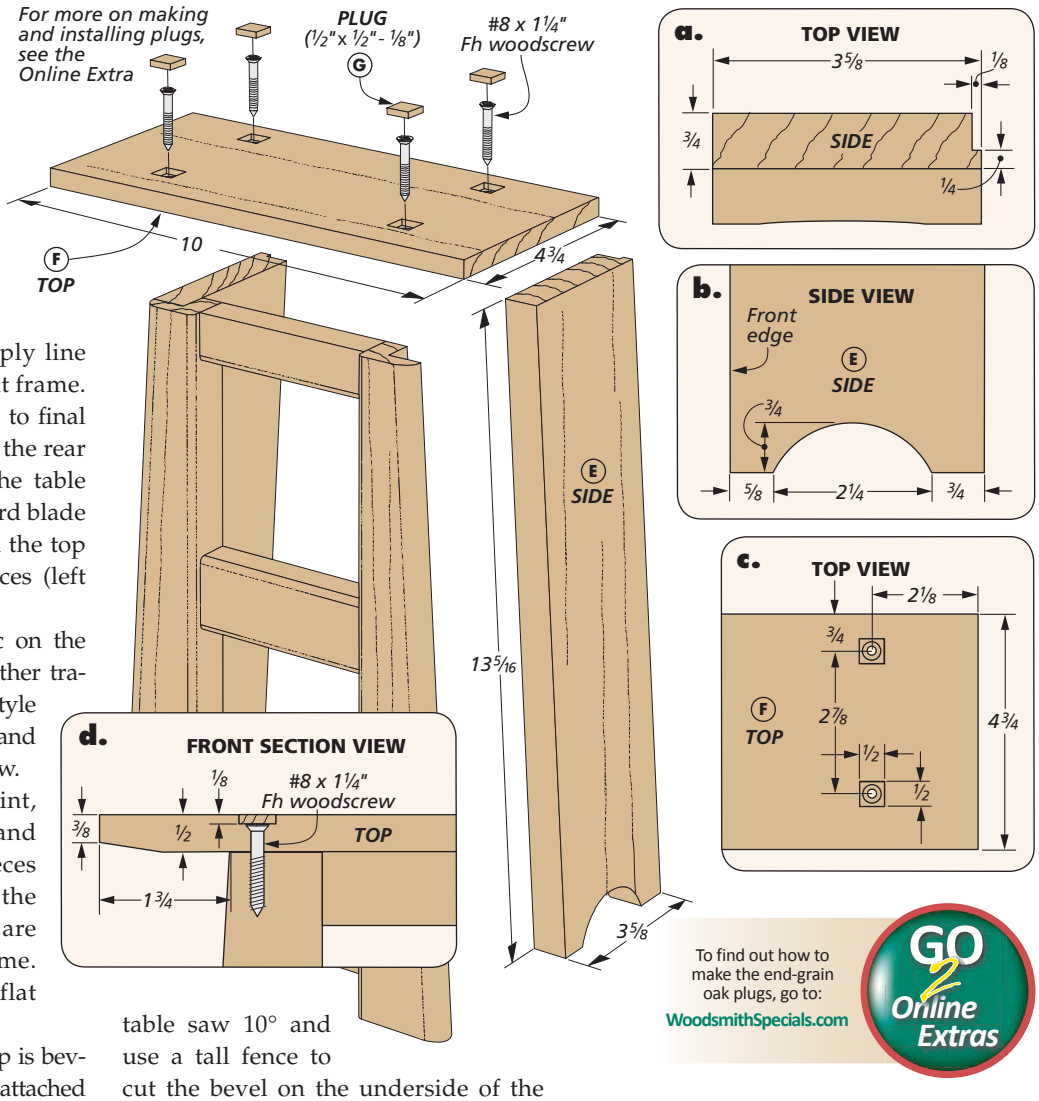
CUT THE ARC. The decorative arc on the bottom edge of the sides is another traditional feature of Craftsman-style clocks. I marked the arc in pencil and then cut the shape at the band saw.

ASSEMBLE THE SIDES. At this point, I glued up the face frame and sides. When clamping the pieces together, check to make sure the beveled ends of the sides are flush with the top of the frame. This step helps to ensure a flat surface for the top.

THE TOP. The underside of the top is beveled to lighten the look, then attached to the sides with screws. After assembly, I covered the screw holes with small squares of end grain oak.

First, cut the top to size from ½"-thick stock. Then tilt the blade on the table saw 10° and use a tall fence to cut the bevel on the underside of the blank. The right drawing below demonstrates how to do this.

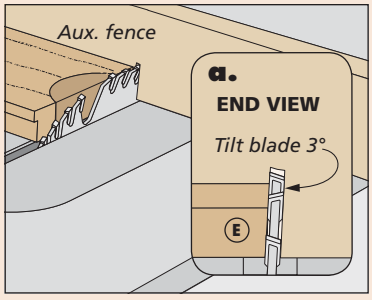
Now mark the locations of the screw holes on the top and drill the holes at the drill press. Then, cut the shallow mortises for the caps using a chisel. The Online Extra shows how to make the end grain oak plugs I used to cover the screw holes. After installing them, just sand them flush.



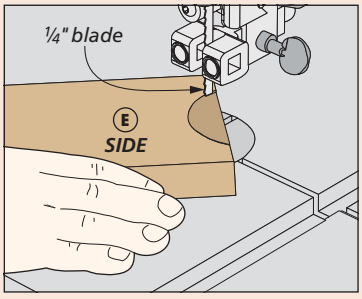
To find out how to make the end-grain oak plugs, go to: WoodsmithSpecials.com

GO 2 Online Extras

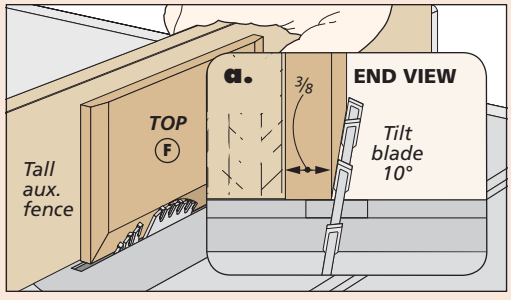
Sides & Top



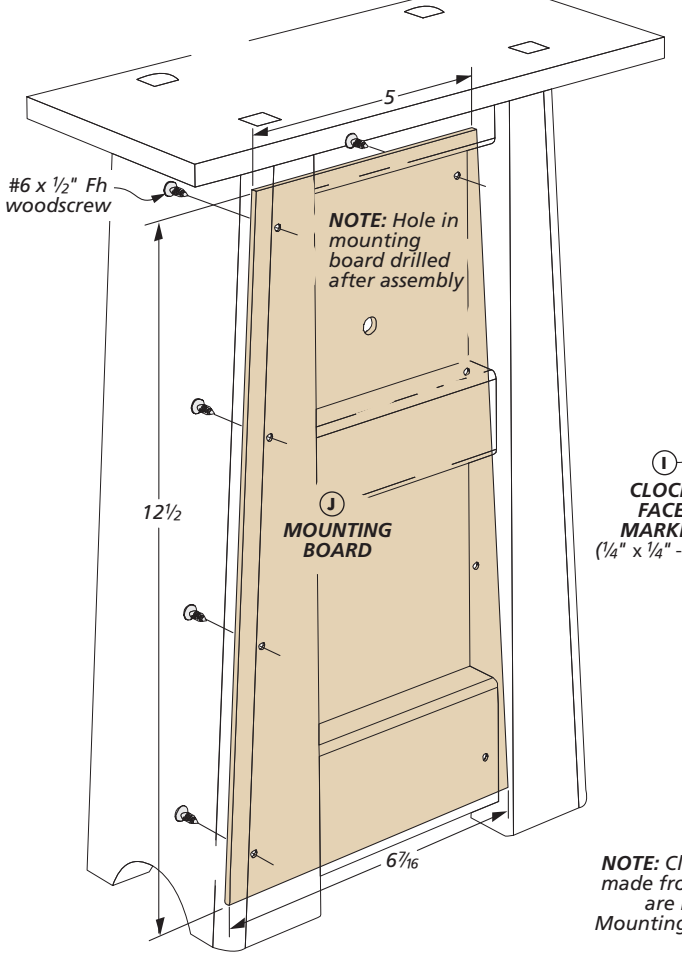
Bevel Cuts. Bevel the top and bottom edges of the sides using the miter gauge and auxiliary fence.

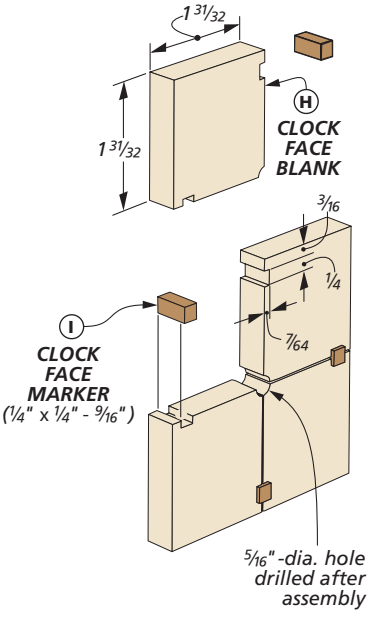


Cut the Arc. After marking the arc using a compass, go to the band saw to make the cut.

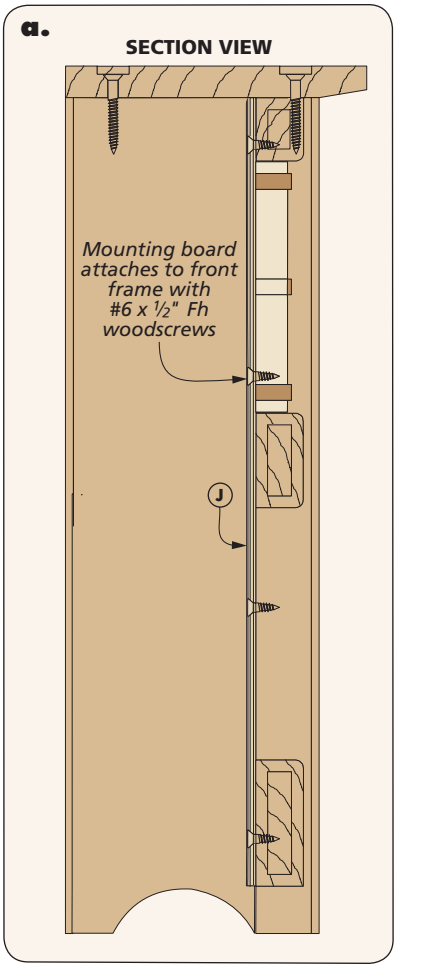


Bevel the Top. You can cut the 10° bevels on the top at the table saw by installing a tall auxiliary fence on the rip fence and tilting the blade.





NOTE: Clock face segments are made from ½" maple. Markers are made from white oak. Mounting board is ⅛" plywood



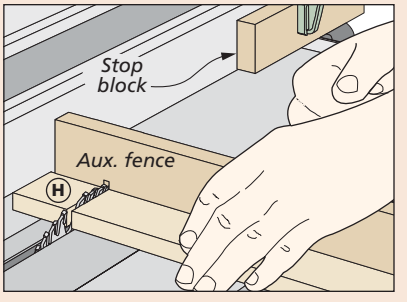
completing the Clock

With the case assembled, next up is adding the mounting board. This piece holds the clock movement and face, as well as the decorative tile. After that, you'll assemble the face and markers, install the clock movement, and complete the clock by adding the plywood back with screws.

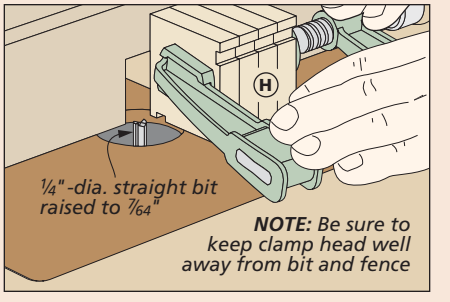
MOUNTING BOARD. You can start by laying out the shape of the mounting board and cutting it to final size. Then drill eight ⅛"-dia. screw holes for attaching it to the back of the frame.

CLOCK FACE. At this point, you're ready to make the clock face. The drawings in the box below walk you through the steps. The face is made from four pieces of ½"-thick maple separated by four small, square markers. I chose to use four pieces rather than one larger, single piece in order to create shadow lines in the face. When you assemble the four pieces and install the clock face markers, the resulting gap between the blocks creates a unique look.

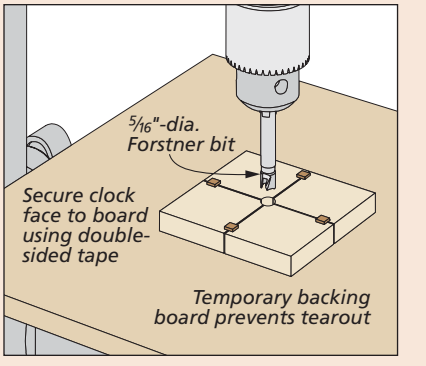
How-To: Make the Clock Face



Square Segments. I attached a stop block to the rip fence to set the length for cutting the individual blanks.



Rout the Notches. A clamp holds the blanks securely while you rout the notches using a straight bit.



Drilling the Face. After assembling the clock face, attach it to a backer board to drill the hole for the stem.

You can begin by cutting four maple blanks to equal size (left drawing in box on previous page). Then, head over to the router table to rout the notches for the markers. Clamp the blanks together and install a ¼"-dia. straight bit in the router table. After routing the first notch, move the clamp, flip the blanks and rout the other notch.

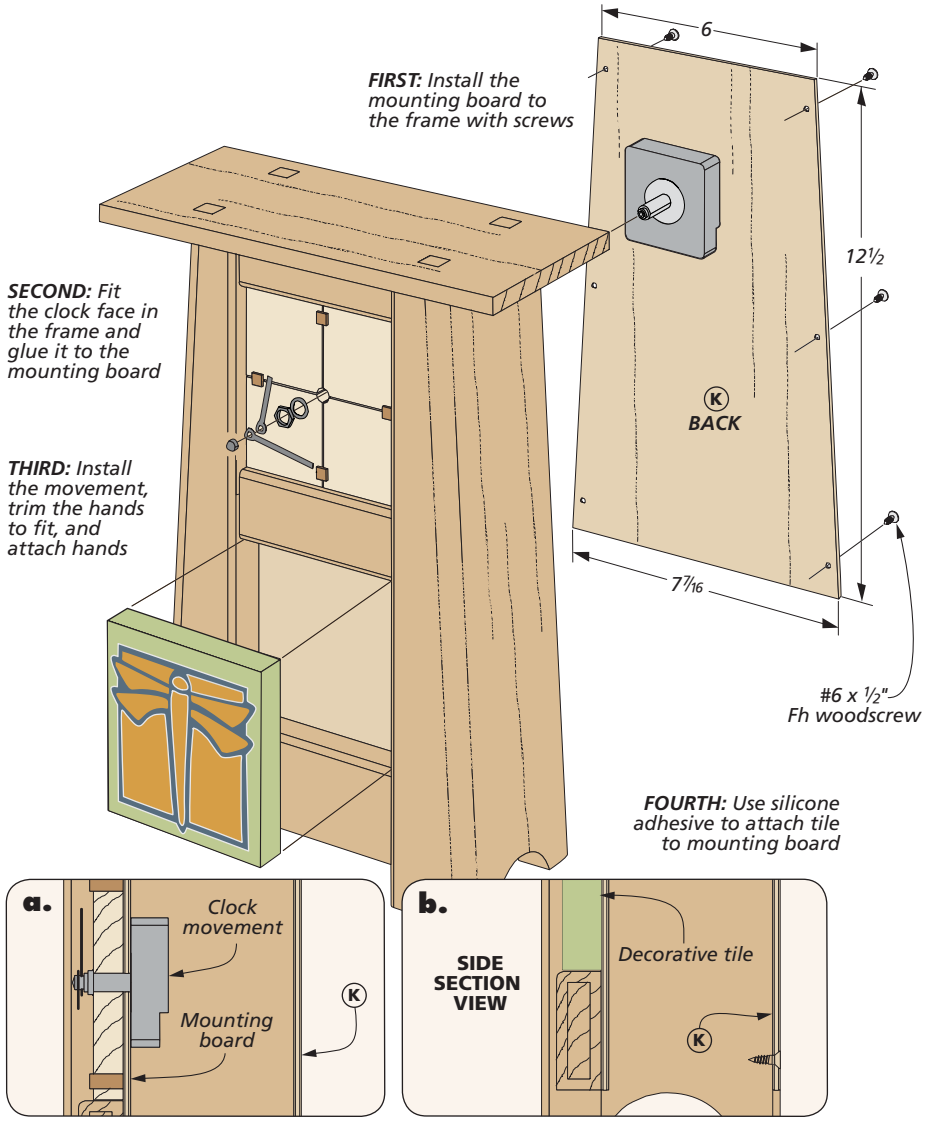
CLOCK FACE MARKERS. The four face markers are simply narrow pieces of oak that you'll stain to contrast with the maple. An easy way to make them is to rip a ¼" x ¼" strip of oak stock. Then, use a hand saw to cut the face markers to length.

ASSEMBLE THE FACE. After staining the markers, you can assemble the four face pieces by gluing the markers in the notches. When the glue dries, temporarily mount it to a backer board using double-sided tape and drill the center hole (right drawing at the bottom of the opposite page).

The most reliable way to do this is to install a 1/16"-dia. bit in the drill press. Lower the bit and center the intersection of the four face pieces directly under it. Now, you can be sure the hole you drill with a 5/16"-dia. bit is centered.

STAIN & FINISH. At this point, I stained the case. When the stain dries, you can add a clear finish to the case and the maple face before moving on to the final assembly.

MOUNTING THE CLOCK. The next step is to install the clock face on the mounting board. For this, I screwed the mounting board in position and applied a little glue to the back of the clock face. Then all you need to do is fit the face into the opening in the frame and use a caul on each side to clamp the face to the board. When the glue dries, drill the center hole through the mounting board and install the movement (detail 'a'). After trimming them to fit the clock face, install the hands.

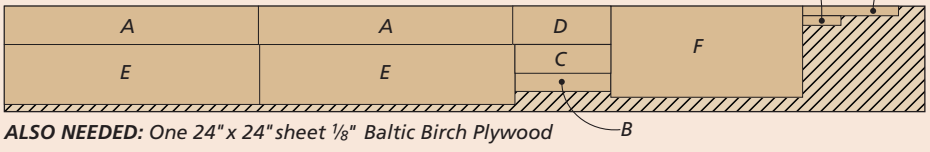


FINAL ASSEMBLY. Now you can attach the decorative tile to the mounting board with a couple beads of silicone adhesive. I completed the clock by attaching the back. All that remains now is to find the perfect spot for the clock.

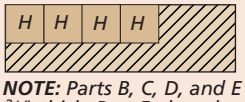
MATERIALS, SUPPLIES & CUTTING DIAGRAM

A	Stiles (2)	1 x 2 - 13¼	**G**	Plugs (4)	⅛ x ½ - ½	• (1) Push-On Quartz Movement
B	Upper Rail (1)	¾ x 1 - 5	**H**	Clock Faces (4)	½ x 1 31/32 - 1 31/32	• (1 pr.) Clock Hands
C	Middle Rail (1)	¾ x 1½ - 5	**I**	Clock Face Markers (4)	¼ x ¼ - 9/16	• (1) 4" x 4" Decorative Tile
D	Lower Rail (1)	¾ x 2 - 5	**J**	Mounting Board (1)	⅛ ply. - 6 7/16 x 12½	• (14) #6 x ½" Fh Woodscrews
E	Sides (2)	¾ x 3⅝ - 13 5/16	**K**	Back (1)	⅛ ply. - 7 7/16 x 12½	• (4) #8 x 1¼" Fh Woodscrews
F	Top (1)	½ x 4¾ - 10				

1"x 8"- 60" Riftsawn White Oak (4.2 Bd. Ft.)



½"x 4"- 12" Maple (.3 Sq. Ft.)



***NOTE:** Parts B, C, D, and E planed to ¾" thick; Part F planed to ½" thick*

***ALSO NEEDED:** One 24"x 24"sheet ⅛" Baltic Birch Plywood*

4-square Coffee Table

The versatility of this modular design makes it a valuable addition to the living room whether you use the tables individually or in a group.

I've been wanting to build a coffee table for a long time, but I just couldn't come up with a design that was right for the room. The problem was, I wanted a large table for the living room. But a conventional design would take up the space we often need when entertaining guests.

A modular coffee table was the perfect answer. The configuration in the photo above shows what I mean. Having four individual tables that can come together to form an attractive, larger table gives you plenty of space with storage below. To reclaim the floor space, all you need to do is rearrange the four smaller tables as end tables, or move them out of the way.

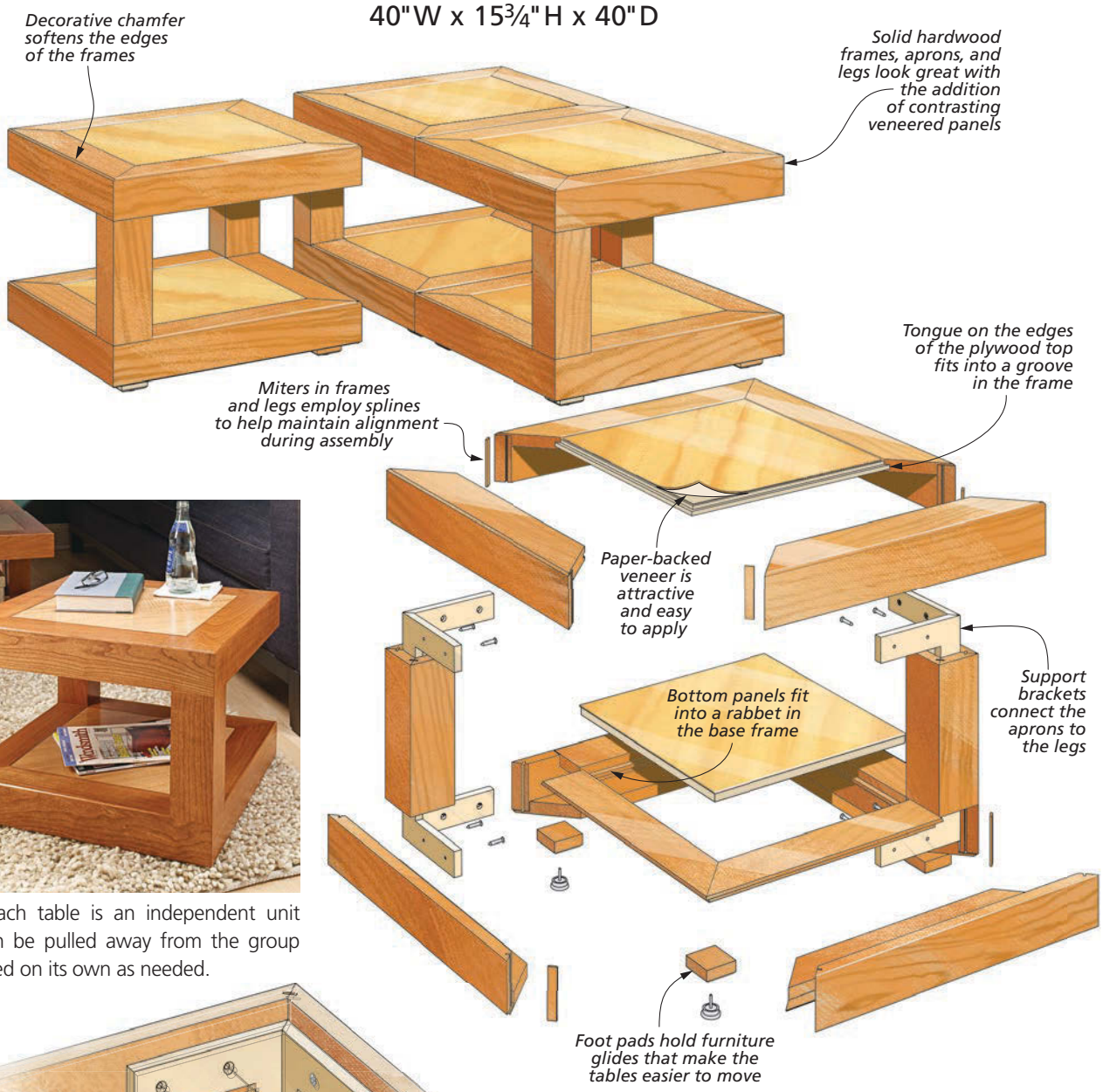
The top photo on the facing page shows how the individual, smaller units can be pulled out of the group and used to suit your needs. You can use them as singles or in pairs as required.

The construction of the tables is pretty interesting, as well. Each table has two legs that support the cantilevered top. And while the legs look massive, each one is simply a hollow, hardwood post. A pair of plywood brackets on the inside ties the legs to the frames.

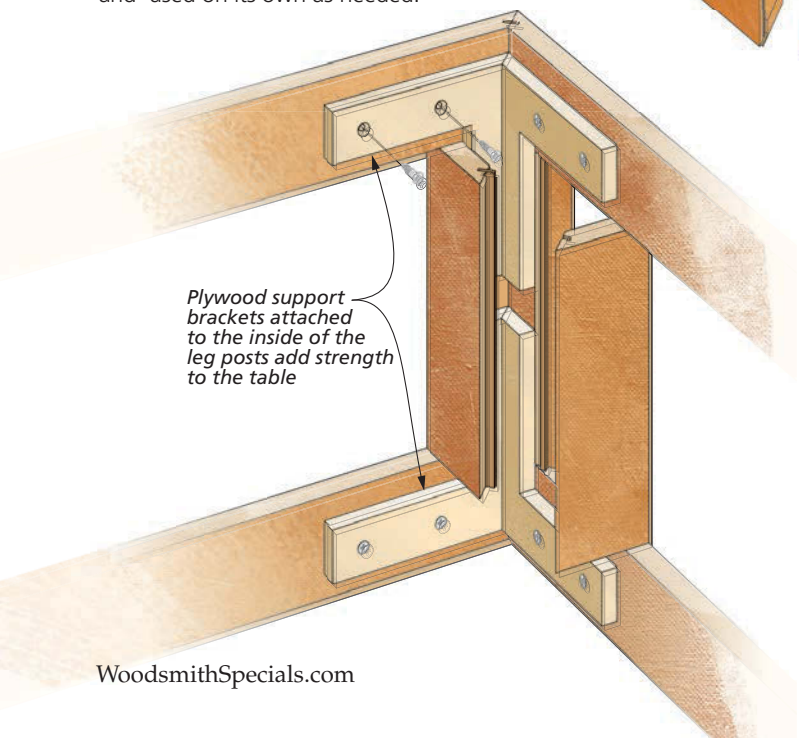
The combination is strong and easy to build. Well, it's easy once you've tuned up your table saw to cut spot-on miters, that is. There are a lot of them in this project. So taking the time to double-check the angles on some scrap before you start will pay big dividends down the road as you tackle the different miters.

Construction Details

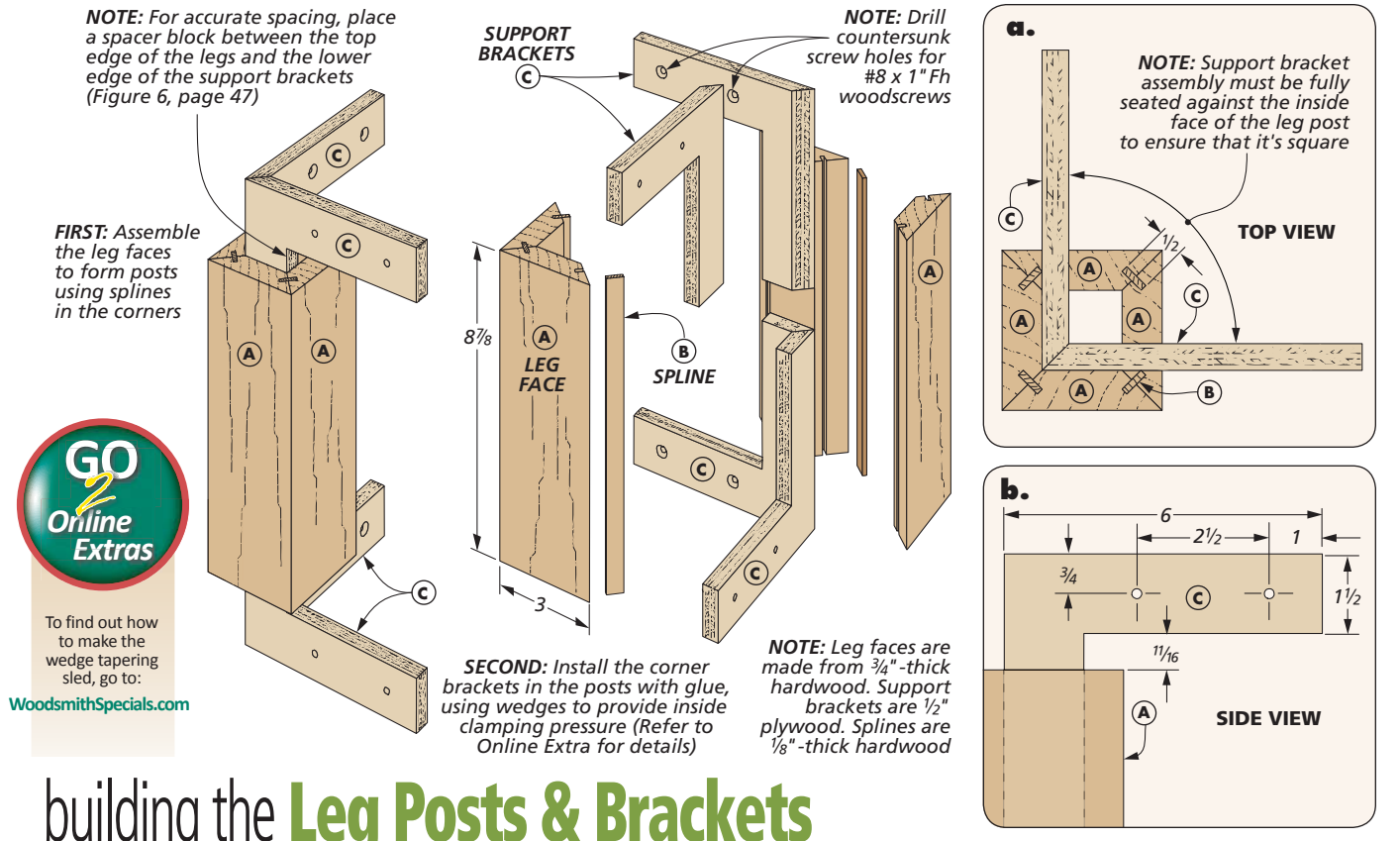
OVERALL DIMENSIONS:
40"W x 15¾"H x 40"D



One. Each table is an independent unit that can be pulled away from the group and used on its own as needed.



Or Many. One option for putting the four tables together puts the legs all on the outside edges. This gives you a large, unobstructed space underneath the table for handy storage.



GO 2 Online Extras

To find out how to make the wedge tapering sled, go to:
WoodsmithSpecials.com

building the Leg Posts & Brackets

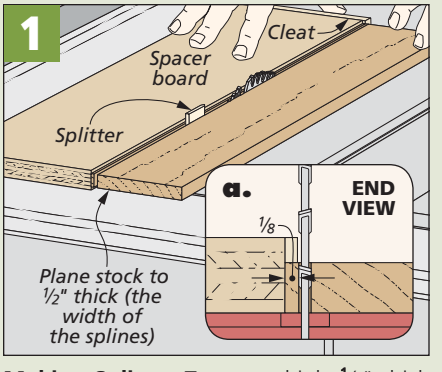
The four smaller tables that fit together to form the coffee table are all identical. So you might want to make them all at one time. If you do this, make sure to mark the pieces clearly to void confusion. It's also a good idea to cut a couple extra pieces to use for saw setups.

The first step in building the coffee table is to make all of the legs. They hold the L-shaped support brackets that attach the legs to the top and bottom table aprons.

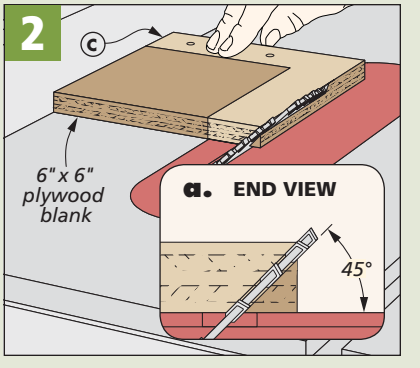
LEG FACES. The method for making the legs is illustrated on the facing page. Take some time to choose blanks that match well in color and grain. Then cut them to rough length. Be sure to leave the leg blanks wide so you can bevel the edges. This operation simply requires tilting the table saw blade to 45° and making the cuts. Figure 1 on the opposite page provides the details.

A few years ago, I learned a great trick for getting perfect miters and bevels on the table saw. You start by cutting the bevels on each piece, leaving them still just a bit wide. Then, nudge the fence in just a hair and make a second pass, taking just a skim cut on both edges. The result is a perfect miter.

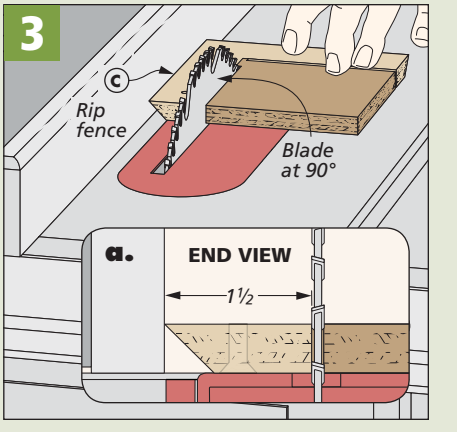
How-To: Cut Splines & Brackets



Making Splines. To cut multiple ⅛"-thick splines, place a spacer board against the rip fence, ⅛" from the blade.



Bevel the Brackets. With the bracket blank still square, bevel one edge of each blank by setting the blade to 45°.



Final Shape. Raise the saw blade to full height and cut close to the inside line. Complete the cut with a hand saw.

SLOTS. Next up, you'll cut the slot on each mitered edge for the spline. The splines provide extra strength to the joint, but they're not really necessary for this long-grain to long-grain assembly. I used the splines simply to keep the four faces aligned while I added the clamps.

Once again, a test cut or two to get the blade height and fence position right are in order (Figure 2). The placement of the slot isn't critical. It just needs to be consistent between all the mating pieces. Figure 2a shows the ideal placement.

After cutting the first few, dry assemble one of the legs to check for square and for gaps in the corners. You'll need eight pieces for a single table, and 32 if you build the whole coffee table, so it's worth double-checking each step to minimize the chances for gaps in the assemblies.

SPLINE. At this point, I cut all the splines I needed for the entire project. You can cut the spline pieces by just planing some stock to ½" thick and then ripping the spline strips from the edge. You can see what I mean in Figure 1 at the bottom of the opposite page.

LEG ASSEMBLY. Now you can glue up the four faces of each leg post, as shown in Figure 3 at right. The splines prove their worth here by making this a pretty straightforward task. After the glue dries, use a miter gauge on the table saw to square up the ends and cut the legs to final length (Figure 4).

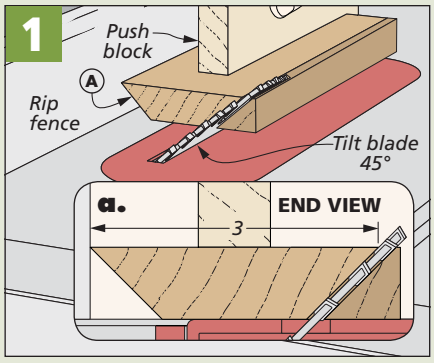
SUPPORT BRACKETS. Next up are the plywood brackets. Start by cutting some ½" plywood into 6" x 6" squares and bevel one edge of each (Figure 2 on the opposite page). The bracket pieces are mirror images of each other, so you'll need one right and one left piece. Figure 3 on the opposite page shows how I cut the brackets to final shape at the table saw.

After that, drill countersunk screw holes in the locations shown in detail 'b' on the facing page. I assembled the brackets by using painter's tape to hold the two pieces together at the bevel. Then just add glue and use an assembly square to clamp them together at 90°.

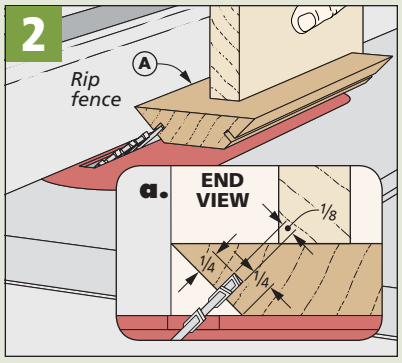
WEDGES. Since clamps won't reach inside the legs, I needed a way to put pressure on the brackets while gluing them in place. I used the oldest trick in the book — wedges. Figure 5 shows a sled for making wedges. See the Online Extra for the details. You'll need to cut a pair of wedges to glue up each assembly.

Figure 6 shows the glueup process I used. As you can see, I used a scrap piece to space the bracket assembly accurately and clamps to pull the wedges together. I waxed the wedges thoroughly to make sure they didn't end up glued to the legs.

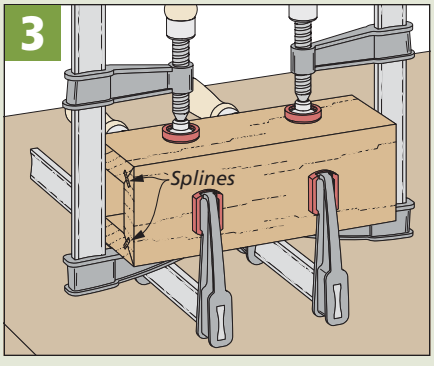
How-To: Build Leg Posts Assemblies



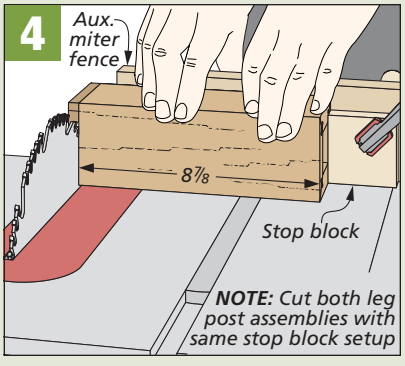
Cut Bevels. After making some test cuts to verify that your blade is at 45°, bevel both edges of the four leg faces.



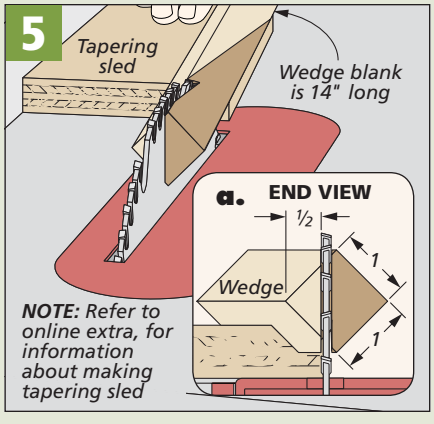
Slot for Spline. The position of the slot must be the same for each leg, so don't move the fence between cuts.



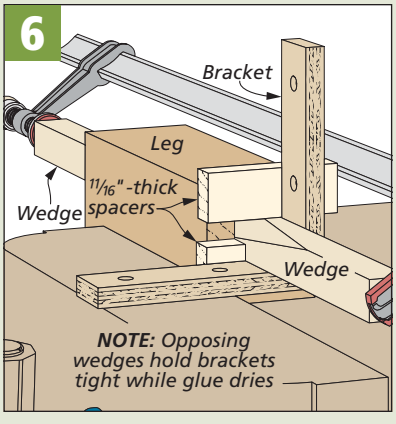
Assembly. The splines make assembly a breeze. You don't need to worry about the pieces shifting in the clamps.



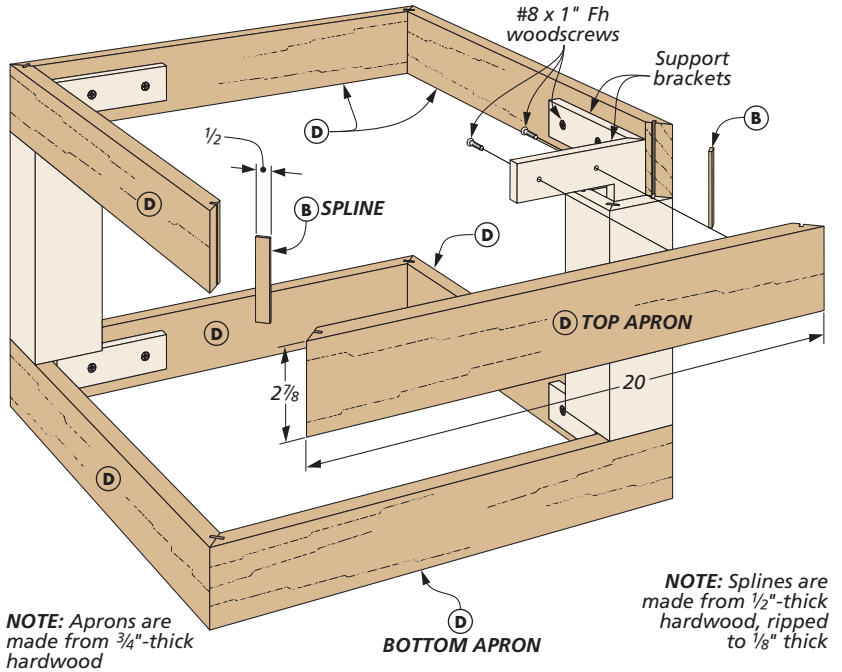
Final Length. After the glue dries, trim one end of each post, then use a stop block to cut them to final length.

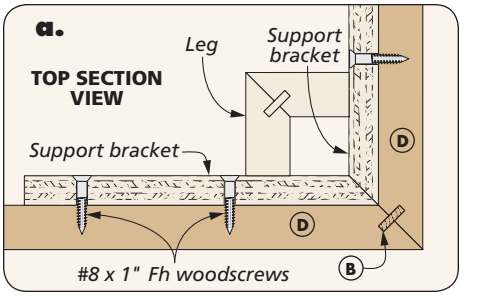


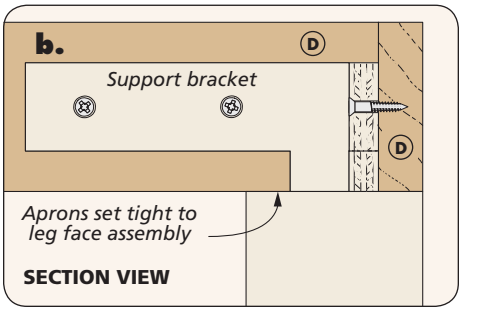
Wedges. Cutting the wedges to use as clamps isn't hard. You just need a tapering sled with a V-groove.



Glueup of Brackets. Using the wedges to clamp the brackets to the inside of the posts works great.







add the Aprons & Frames

With the leg post and support bracket assemblies complete, you're ready to move on to adding the hardwood aprons and frames. The mitered aprons attach to the support brackets at the top and bottom with glue and screws. They also have splines in the miters to help add strength to the end grain joint.

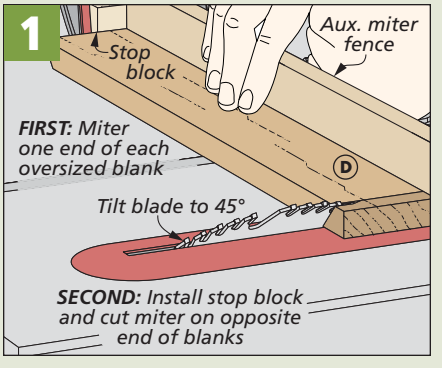
TOP & BOTTOM APRONS. The aprons are the most visible part of the tables other than the top, of course. So taking a minute or two to select some attractive stock for them is a good idea. After ripping it all to width, you can set up the table saw for cutting more miters. The box below shows the steps for cutting them. After mitering one end, install a stop block and miter the other end (Figure 1). The result should be dead-on accurate. Then use the miter gauge to cut the slots for splines, as shown in Figure 2.

Dry assemble the aprons and test the fit over the arms of the brackets. Taking the time to test the fit with a band clamp is an important step in achieving gap-free miters. Once you're satisfied with the fit, glue up the aprons using the splines for alignment. After the glue dries, attach each apron assembly to the bracket arms with glue and screws. The photo below shows what each corner should look like when you're done.

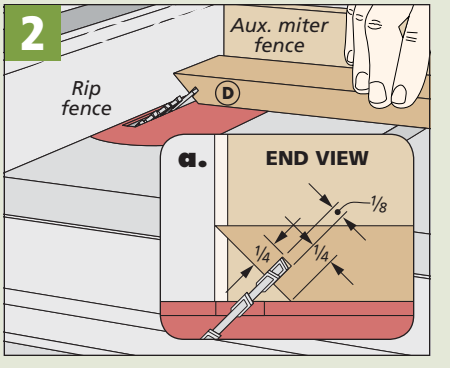
BASE FRAMES. I need to point out that there are two slightly different frames on the base of the table — an upper and a lower. The upper base frame has a shallow rabbet that holds the panel you'll add later. And both frames are rabbeted on the outside edge to fit inside the bottom apron. I started with the lower base frame.

LOWER BASE FRAME. Begin by ripping the frame pieces to final width, leaving them a bit long so you can cut the miters. Then set

How-To: Make the Aprons



Miters. With an auxiliary fence on the miter gauge, miter one end of the aprons, then miter them to final length.



Spline Slots. With a similar setup to the one you used on the leg posts, cut the 45° slots for splines in the apron pieces.

Final Results. The apron assemblies are attached to the upper and lower support brackets with glue and screws.

up the table saw to cut rabbets. The drawing at right shows how the rabbets form recesses for the veneered panels.

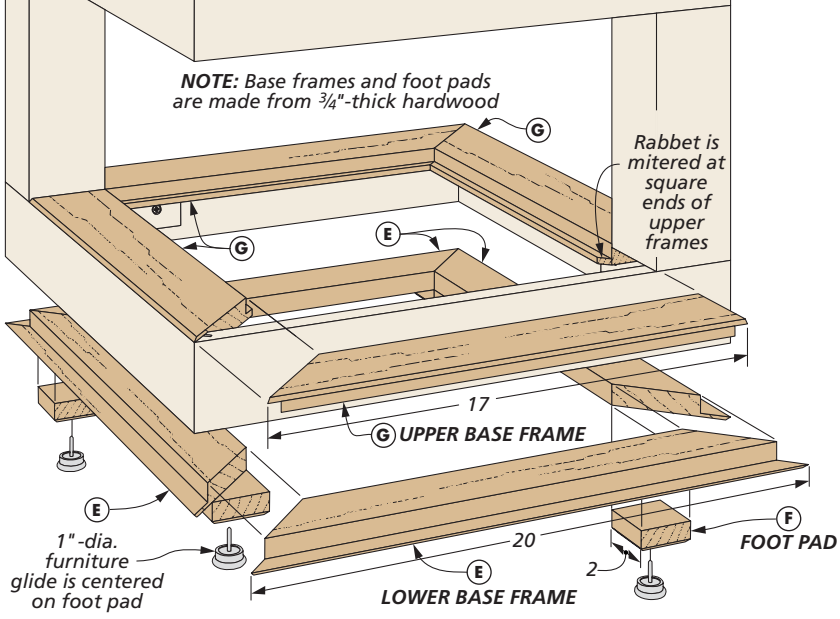
Figure 1 in the box below illustrates an easy way to cut consistent rabbets. All you need to do is install a dado blade set to full width and then attach an auxiliary rip fence on your saw. With the fence installed, raise the blade and cut into the auxiliary fence. This way, you can adjust the fence and accurately set the width of a rabbet.

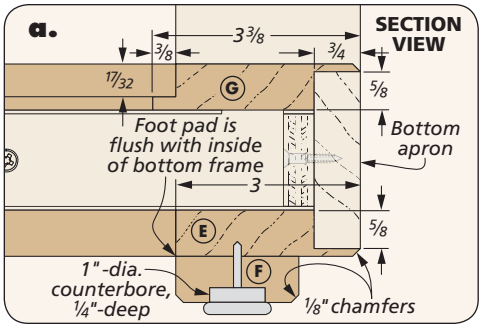
Figure 2 shows how I mitered the pieces. As before, use a stop block to cut them to length. Test each piece for a good fit as you cut them. After that, glue up the frame, chamfer the edges, and install it in place inside the apron.

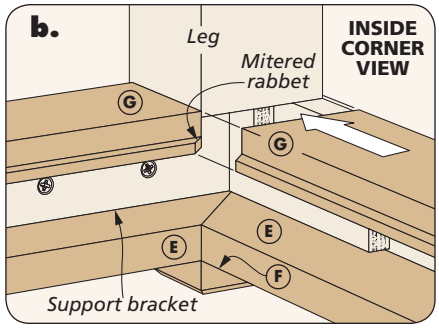
FOOT PADS. To raise the frames off the floor, I added foot pads in each corner of the base. After the glue dries on the frame assembly, you're ready to cut four foot pads and drill centered counterbores for the furniture glides. You can install the pads as shown in detail 'a' at right, but don't install the glides yet. Wait until after the table is finished.

UPPER BASE FRAME. The upper base frame also starts with cutting the rabbets. But for these pieces, you're going to need a rabbet on the outside edges and a narrower one on the inside edges. When they're installed, the frame will fit over the apron on the outside and create a space for the panel on the inside.

The upper frame pieces are mitered on one end and left square on the other.





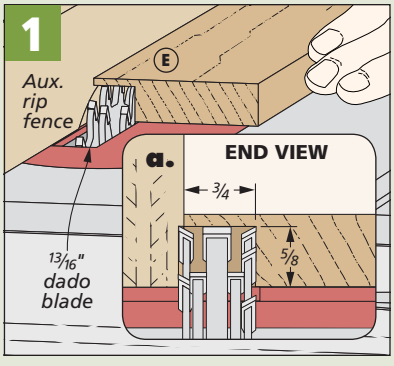


This is done so the frame will fit around the legs, and it requires a bit of finesse. You'll need to sneak up on the final length to avoid gaps in any of the joints.

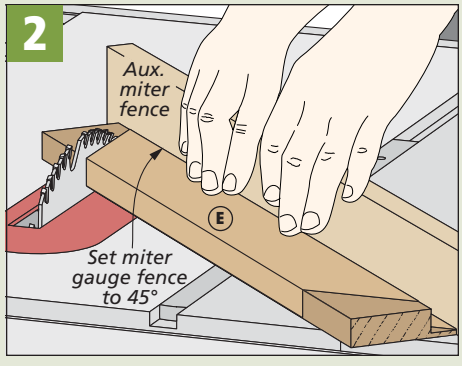
After cutting the rabbets, I cut the mitered end of each piece, leaving the pieces a hair long. This way, it's easy to sneak up on a perfect fit by cutting the square ends to fit. But before you do that, you'll need to miter the inside corner of the rabbeted edge as shown in Figure 3 below. Detail 'b' above shows the fit.

Now cut the square ends of the pieces and test the fit. Check for seamless miters on one end and a tight fit against the leg on the other as you glue them up.

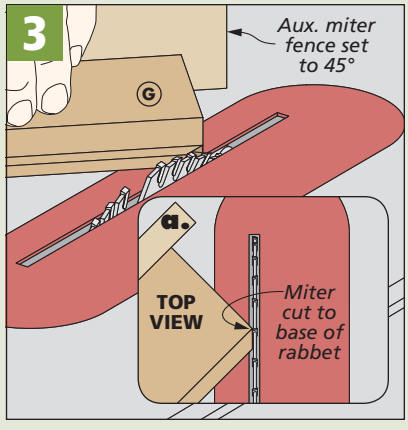
How-To: Cut & Install Frame Sides



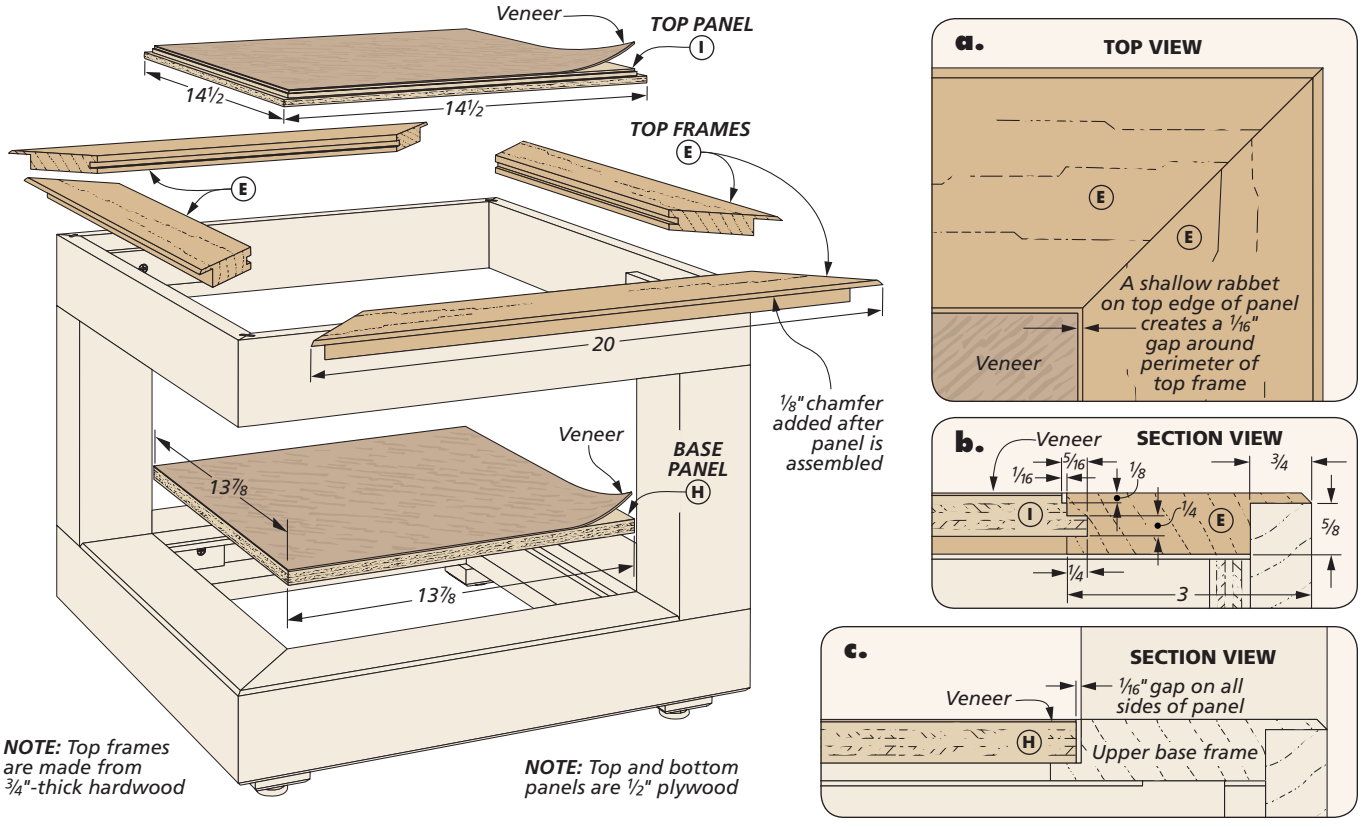
Rabbets. With a ¾" dado blade buried in an auxiliary fence, cut the rabbets on the frame blanks.



Miters. With the rabbets cut, miter the ends of the lower frames. Miter only one end of the upper frames and leave the other square.



Miter the Rabbets. Miter the inside edges of the rabbets on the upper frames so they fit when assembled.



completing the **Coffee Table**

With the aprons and base frames installed, the table is nearly done. All that remains is to install the veneered base panel, then make the top frame and panel assembly. After that, you can apply the finish and install the glides.

BASE PANEL. Veneered plywood panels fit in both the top and base frames. The lower panel just drops into the upper base frame you made earlier. The panel for the top fits inside the top frame with a tongue and groove joint. You'll need to wait until you've built the top frame for that one, but you can make and install the base panel now.

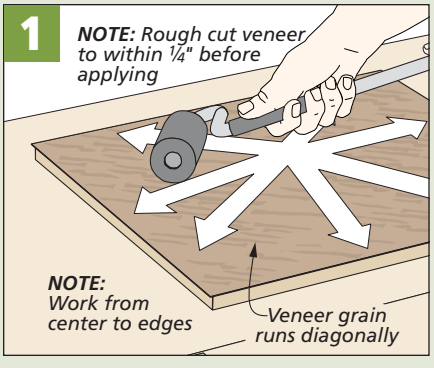
The plywood panels are decorated with an eye-popping figured veneer. I chose an exotic, curly anigre veneer to contrast with the cherry frames. Note also the orientation of the veneer. I kept each piece running diagonally in the frame. It produces a nice effect if you make all four tables and slide them together.

PAPER-BACKED VENEER. I used a paper-backed veneer for the tables. It's a lot easier to work with than raw veneer because you don't have to worry about it splitting or cracking while you're working with it. Another big advantage is that you can use contact cement to glue it to the substrate.

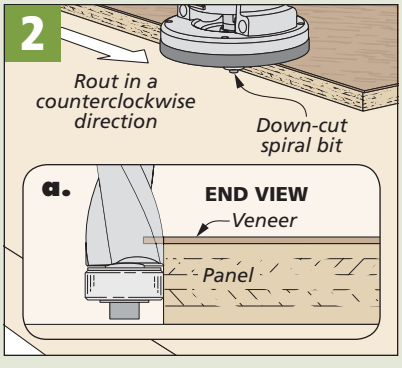
Measure the opening in the base to find the exact size for the panel. You're looking for a 1/16" gap all around. Then you can cut your veneer, leaving it about ¼" over final size (with the grain running diagonally). After cutting the plywood panel, you're ready to add the veneer.

CONTACT CEMENT. Next, spray the plywood substrate and the paper side of the veneer with contact cement. Let them both dry and then position the veneer on the plywood. Figure 1 at left shows how to use a J-roller to force out air bubbles. Make sure to start your stroke in the center of the panel. Slowly roll the entire surface until any air bubbles trapped under the veneer are gone.

How-To: Apply Veneer



Veneer. Apply a slightly oversized piece of veneer to the panel, then roll out the air bubbles, starting at the center.



Flush Trimming. With a flush-trim bit in your hand-held router, you'll get a nice, smooth edge on the panel.

The beauty of contact cement is that you don't need to wait for glue to dry. As shown in Figure 2 on the opposite page, you can break out your hand-held router and install a spiral down-cut flush-trim bit to rout away the excess veneer from the edges. When you're done, you can install the panel in the base with glue in the rabbeted edge of the base top frame.

You want the panel to be centered in the frame with an even gap all the way around. Playing cards make excellent spacers for the panel. Two or three cards on each of the four sides will help center the panel in the frame. Just be sure to add an equal number in each side.

TOP FRAME & PANEL. For the top, you'll need to start by making another frame. This frame is like the ones you made earlier, but there are a few key differences.

Like the lower base frame, this one has a rabbet around the outside to fit inside the apron. However, in this frame you'll also need a groove on the inside edge to hold a tongue on the top panel. In Figures 1 and 1a at right, you can see the details of the groove and how I cut it at the table saw with a dado blade. Set the four frame pieces aside for now while you make the panel.

With the exception of being a slightly different size, this veneer job is just like before. Cut the panel to final size and then spray it with adhesive. Then do the same to the veneer piece. After trimming the veneer, head over to the table saw.

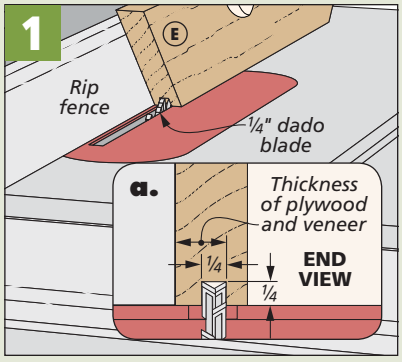
TONGUE. Install an auxiliary rip fence and cut a rabbet on all four sides, as shown in Figure 2. The rabbet forms a tongue on the panel to fit into the groove on the frame. With the veneered side down, sneak up on a snug-fitting tongue by testing it in the grooves in the frame. Raise the dado blade until you're happy with the fit.

I made a second cut in the veneer side of the panel to form a shadow line around the perimeter. Figure 3 shows how you can lower the blade to cut the rabbet.

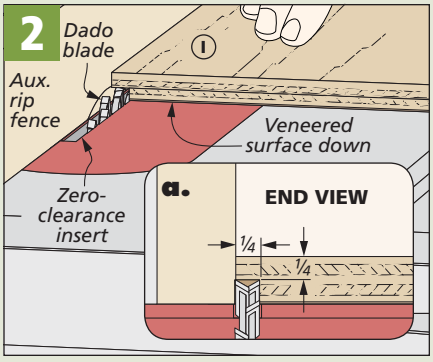
CHAMFER. Once I finished assembling the frame, I routed a small chamfer on the edge (Figure 4). After that, install the frame in the top apron with glue.

Once you've added a finish, you can install the furniture glides in the feet. Then clear a spot for your table. With the many possible combinations, you're sure to find one suitable for you.

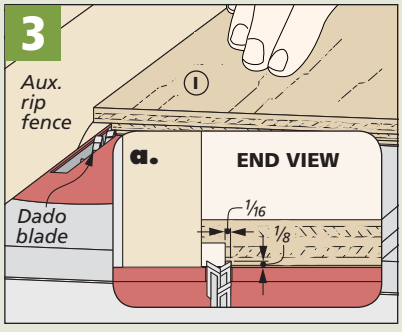
How-To: Cut Grooves, Rabbets & Chamfer



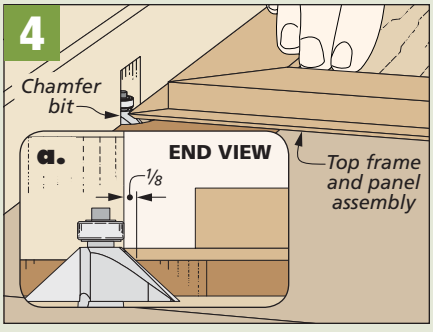
Groove the Frame. Set the rip fence to cut a groove in the frame pieces at the position shown.



Rabbet the Upper Panel. Start with the bit a little low, then raise it to sneak up on a snug fit in the groove.



Shallow Rabbet. Lower the dado blade to barely cut into the veneer to create a shadow line in the panel.



Chamfer Top Frame. Set the router table fence flush with the bearing and raise the bit just a hair to rout the small chamfer.

MATERIALS, SUPPLIES & CUTTING DIAGRAM

A	Leg Faces (8)	¾ x 3 - 8⅞
B	Spline	⅛ x ½ - 170 rgh.
C	Support Brackets (8)	½ ply. - 6 x 6
D	Top/Bottom Aprons (8)	¾ x 2⅞ - 20
E	Top/Lower Base Frames (8)	¾ x 3 - 20
F	Foot Pads (4)	¾ x 2 - 2
G	Upper Base Frame (4)	¾ x 3⅜ - 17
H	Base Panel (1)	½ ply. - 13⅞ x 13⅞
I	Top Panel (1)	½ ply. - 14½ x 14½

- (16) #8 x 1" Fh Woodscrews
- (1) 24" x 48" Flexible Veneer Sheet
- (4) 1"-dia. Furniture Glides

¾"x 6½"- 84" Cherry (3.8 Bd. Ft.)

D	D	D	D
D	D	D	D

¾"x 6½"- 84" Cherry (3.8 Bd. Ft.)

E	E	E	E
E	E	E	E

¾"x 6½"- 84" Cherry (3.8 Bd. Ft.)

G	G	G	G	F	F	F	F	
A	A	A	A	A	A	A	A	B

ALSO NEEDED:
One - 24" x 48" sheet ½" Baltic Birch Plywood

NOTE: *Part B planed to ½" thick, then ripped to width*

craftsman-style Library Desk

This classic project offers Craftsman design at its best. It's practical, simple in detail, and features solid, straightforward construction.

Craftsman-style furniture is always easy to recognize. That's because it's based on well established design philosophy. In a nutshell, the basic principles are that furniture should be simple in design, highly practical, and built to pass down from generation to generation. And one look is all you need to tell that the classic library table in the photo above hits the mark.

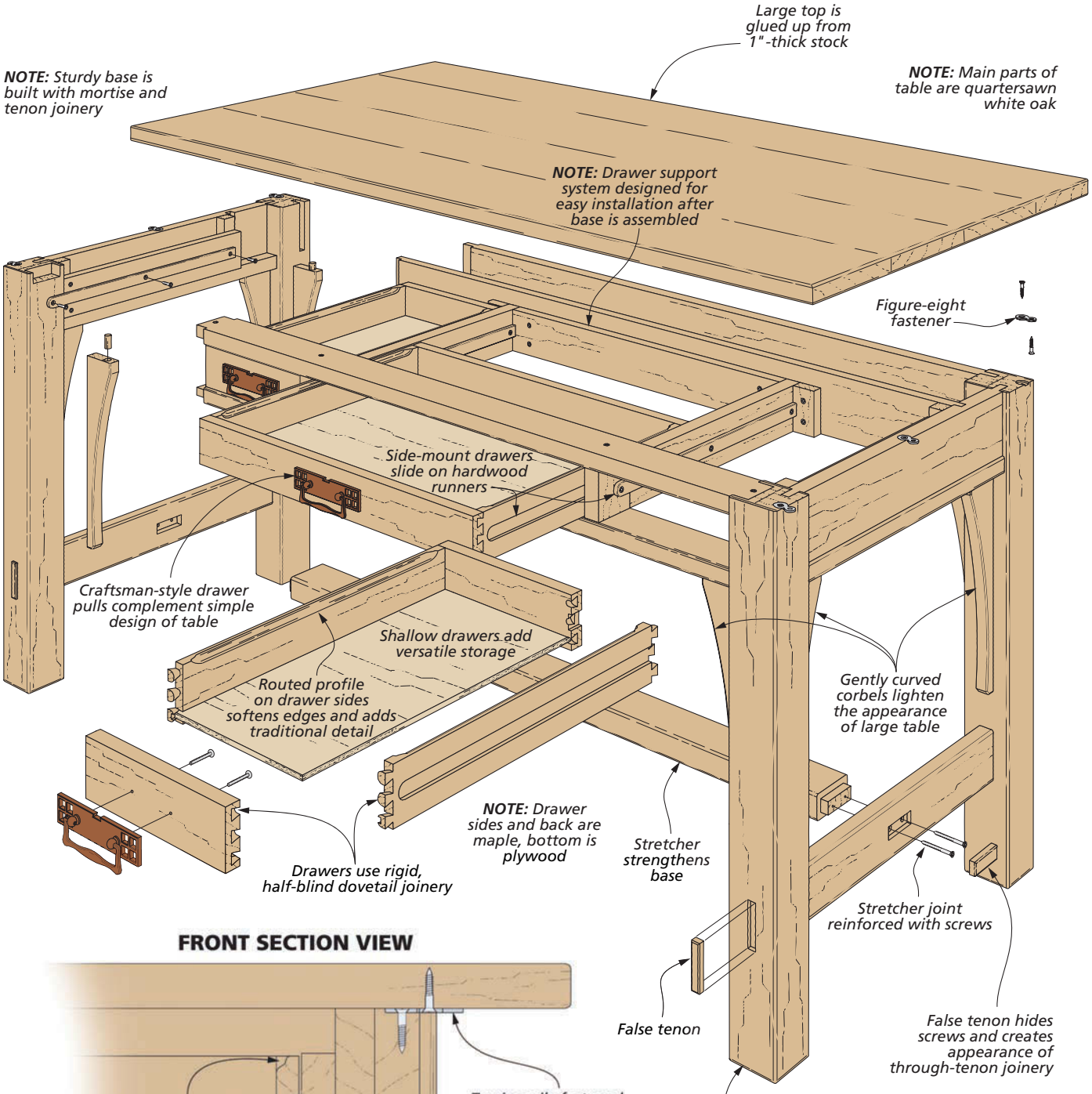
The Craftsman heritage of our table is unmistakable. It starts with a solidly built frame that supports a beefy top. The square, gently eased edges create clean, crisp lines. The minimal amount of aesthetic detail is added by the appearance of through-tenon joinery and the gracefully shaped corbels attached beneath the upper rails.

But here, form follows function. This table is meant to fulfill a purpose and the possibilities are pretty wide open. The spacious top provides plenty of display space or a comfortable work surface. When you consider the three shallow drawers for storage, the library table is a good candidate for use as an accommodating desk.

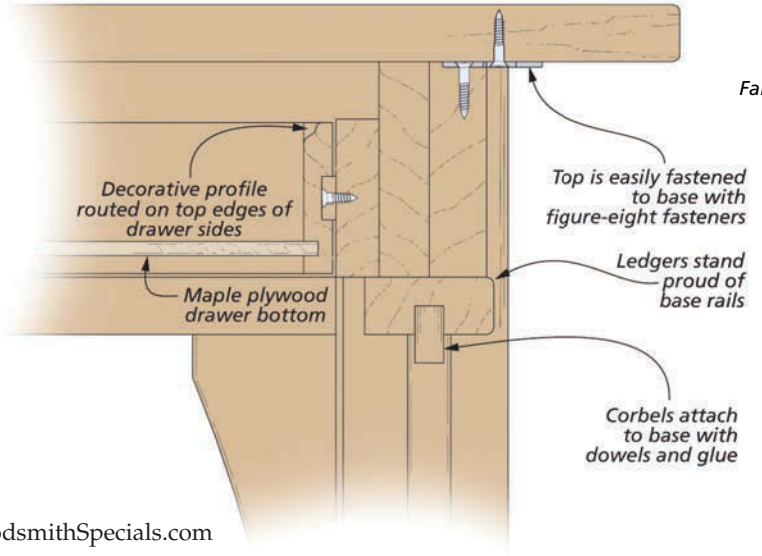
But all this aside, what appeals to me most about this project is the time spent building it. As it should be, the construction is very down to earth — just traditional joinery and techniques that will give your woodworking skills a good workout. And in the end, you'll have a treasured heirloom that looks great and will serve you well today and far into the future.

Construction Details

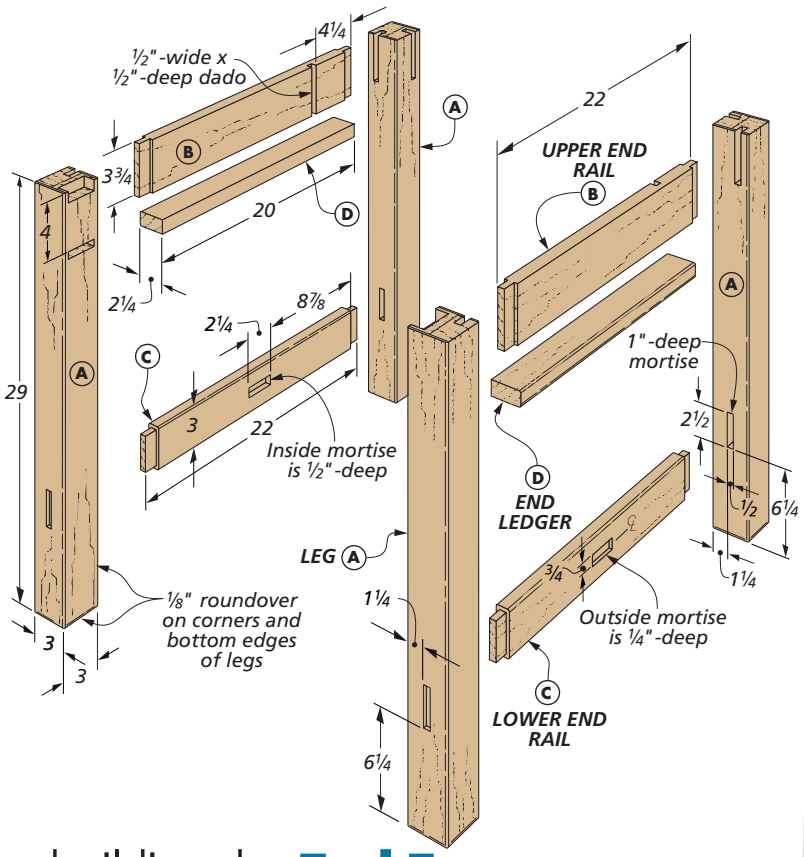
OVERALL DIMENSIONS:
54"W x 30"H x 28"D

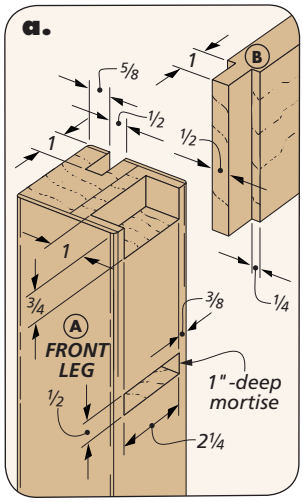


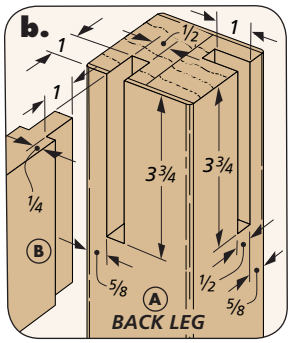
FRONT SECTION VIEW

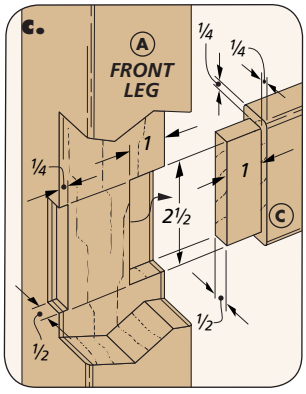


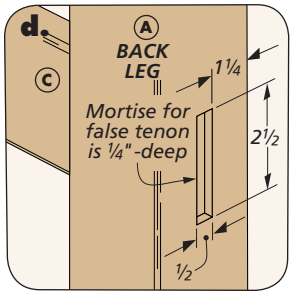
NOTE: For sources of hardware, see page 98

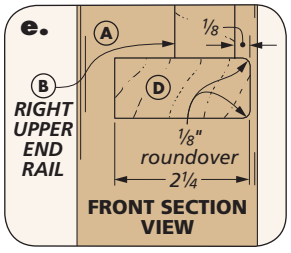












building the **End Frames**

I decided that the easiest way to build the table was to start by assembling the two, basic end frames. Then you can quickly complete the sturdy base by adding the front and rear rails, the center stretcher and all the details.

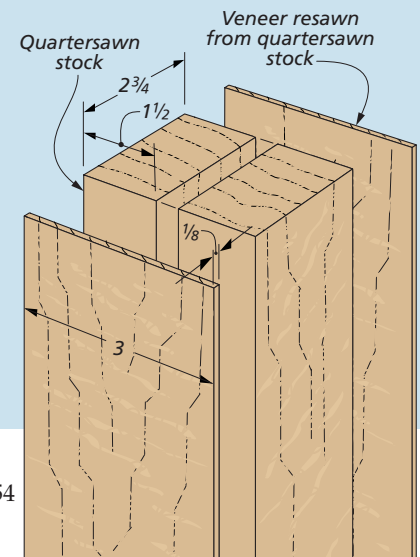
LEGS FIRST. Each end frame consists of two legs, a two-piece upper rail and a lower rail, as shown above. To begin, you'll need to make the four, 3"-square legs. As you can imagine, this requires gluing up blanks from thinner stock. But this also gives you the opportunity to make a better-looking leg. I used a traditional Craftsman technique to make leg blanks that show quartersawn figure on all four faces with no noticeable joint lines.

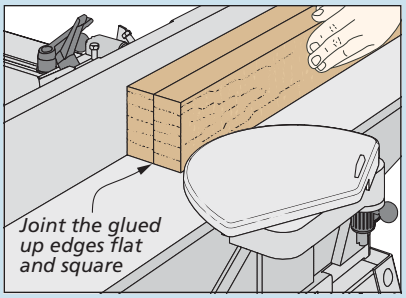
The simple process is laid out in the box below. In a nutshell, you're going to glue up a two-piece blank and then "skin" the joined sides with thin facings. The result is definitely worth the extra effort.

MORTISES. Once the leg blanks are completed and cut to length, you can go to work on the joinery. The end rails and the front and back rails are all connected to the legs with mortise and tenon joints. So cutting all the mortises in the legs is the first step.

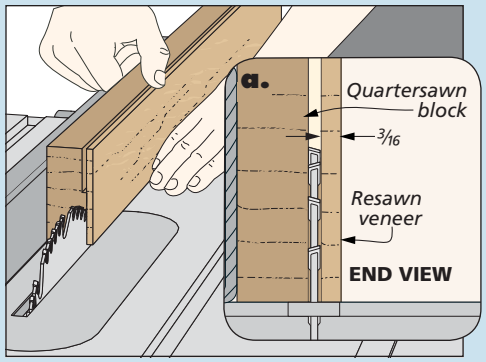
If you take a look at the drawing above, you'll see that each leg has

How-To: Make a Craftsman Leg





Size the Blank. After gluing up a wide blank from 1½"-thick stock, rip and then joint the blank down to 2¾" wide.



Resaw the Veneers. Now you'll need to resaw veneers from quartersawn stock. They should be slightly over width and over thickness.

multiple mortises. And even though you're just working on assembling the end frames at this point, you'll want to lay out and cut all the leg mortises now. This includes the mortises for the front and back rails that are added later.

THE WORK. The goal is to end up with two, mirror-image pairs of legs (front and back). So your first concern is laying out the mortises correctly. Then drilling them out at the drill press and cleaning them up at the bench will be pretty routine.

Before getting started, let me give you a rundown of what needs to be done. As you can see in detail 'b' on the opposite page, the end rails and back rail fit into off-center, open-end mortises. The drawings at right offer a tip for making these.

I created a classic, through-tenon look on the lower end rails by using a simple, false-tenon technique. This requires cutting a 1"-deep mortise centered on the inside face of the leg and a shallow mortise on the opposite face that holds the false tenon (detail 'c').

Finally, the front legs each need two "horizontal" mortises on the front inside face for the upper and lower drawer rails (detail 'a,' previous page).

THE END RAILS. After completing the mortises, you'll be ready for a change of pace. Making the upper end rail assembly and the lower end rails will provide it. This work is pretty straightforward, but there are a few things to explain.

As you know, both rails are tenoned into the legs. The upper rail gets a two-shouldered tenon, the lower end rail needs a four-shouldered tenon (details 'a' and 'c'). A dado blade in the table saw will handle the job. And while the dado blade is on the saw, you can cut a ½"-wide dado across the inside face of both upper end rails (main drawing). Later, this will hold an interior rail that supports the drawers.

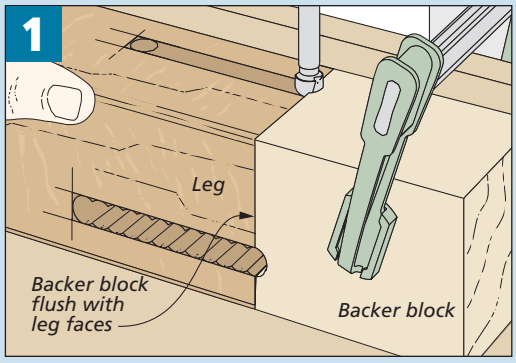
You also need to make separate horizontal ledger pieces that fit beneath the upper rail (detail 'e' at left). The ledger sits proud of the rails to create added visual interest. It will be cut to fit between the legs and glued in place after the legs and rails are assembled.

A FEW MORE MORTISES. Completing the lower rails will take you back to the drill press and bench for a few more mortises, see the main drawing on the opposite page. These mortises are for the long, center stretcher that connects the two lower end rails. Here, I again used a simplified through-tenon technique. A ½"-deep mortise on the inside face captures the stretcher tenon and a separate ¼"-deep mortise on the outside fits the false tenon.

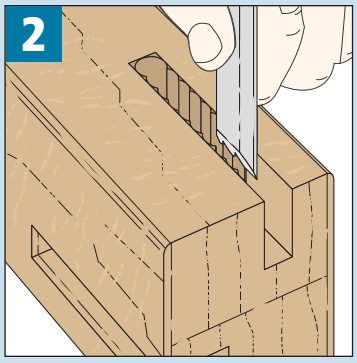
EASED EDGES. One more thing and then you can begin the assembly. I took a short trip to the router table to round over all the edges of the lower rails and the outside edges of the ledger blanks.

ASSEMBLY. According to the plan, all the end frame parts should be ready to assemble. First, I glued two legs and the upper and lower rails into a frame. Then, you can cut the ledger to fit the frame and glue it in place, as shown in detail 'e' on the opposite page.

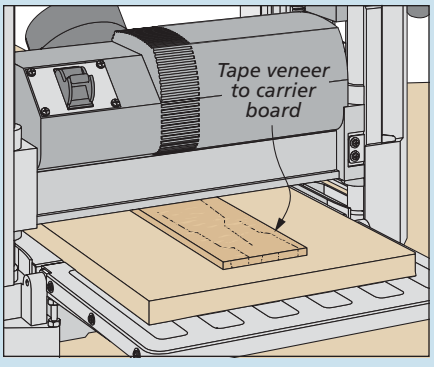
Shop Tip: Two-Step Mortises



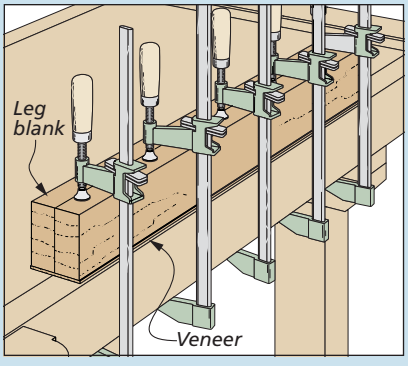
Drill Out the Waste. Start the mortises at the drill press by drilling out most of the waste. Use a backer block at the open end to keep the drill bit on track.



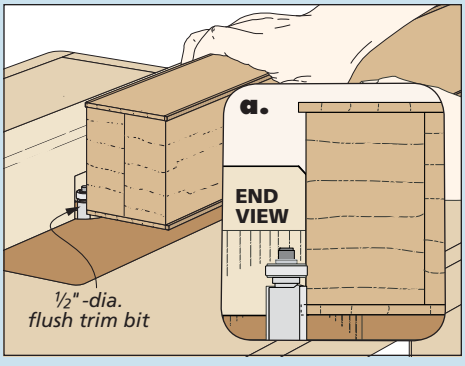
Cleanup. A chisel will complete the job. Pare away the remaining waste and square up the ends.



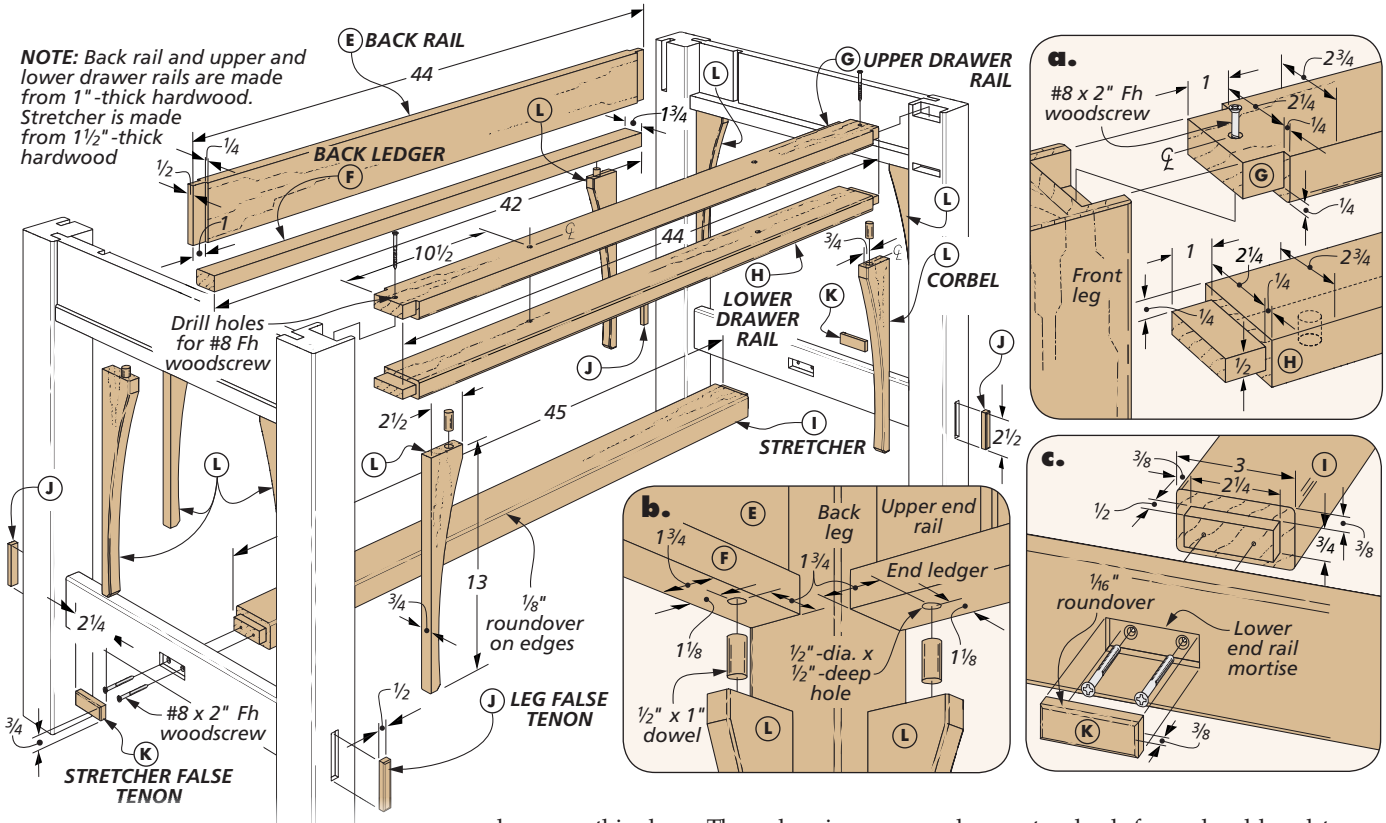
Plane the Veneers. Next, I planed the veneers to ⅛" thick by attaching them to a carrier board with double-sided tape.



Glueup. You can glue the veneers to the joined edges using the workbench to distribute the clamping pressure.



Flush Trim. To complete the legs, trim the veneers flush with the blanks and then rout a ⅛" roundover on all the long edges.



completing the **Base**

With the end frames assembled, you can start on stage two of the construction. This involves making and installing the miscellaneous parts that complete the base. You'll add the back rail and drawer rails, the long center stretcher, the corbels, and the false tenons.

DRAWER RAILS & BACK RAIL. Fitting the back rail and the drawer rails to the end frames is the first step. Since the mortises in the legs have been completed, you're already halfway home on this chore. The only minor complication is that the tenons on each piece are slightly different. A look at the box below will help avoid any confusion.

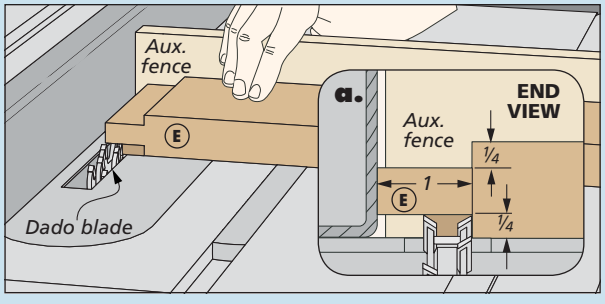
The back rail has the same two-piece design as the upper end rails. First, cut the back rail to size. Then cut a two-shouldered tenon on each end (first drawing below). The ledger is cut to width and rough length and the edges rounded over.

The two drawer rails are likewise, easy to fit. But as I mentioned, the tenons you'll cut on each one are a little bit different. The upper drawer rail has a three-shouldered tenon while the lower rail has a standard, four–shouldered tenon (detail 'a' above).

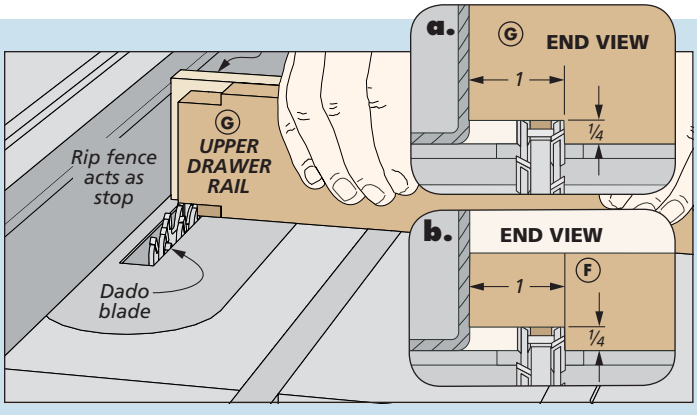
SCREW HOLES. Later on, you're going to add the interior support system for the three drawers. This includes two vertical divider/support rails that fit between the drawer rails. They're fastened with screws installed through the rails. So it would be a good idea to drill the countersunk screw holes in the rails before assembly.

CENTER STRETCHER. Next comes the center stretcher. Again, this part simply gets a tenon on each end. But since the stretcher fits between the lower end rails, the trick is getting the shoulder-to-shoulder length right.

How-To: Cut the Tenons

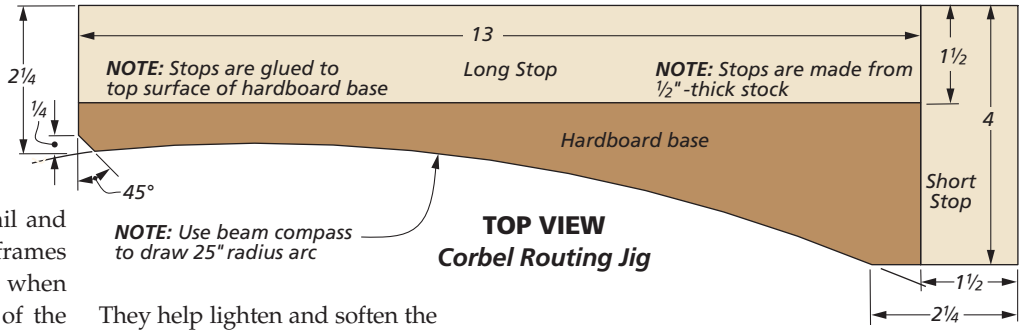


The Back Rail. The back rail requires a two-shouldered tenon. After setting the rip fence to gauge the length, raise the blade between passes to sneak up on the thickness.



Upper Drawer Rail. The upper drawer rail has tenons with three shoulders. Here, I cut the front and back shoulders first. Then I cut the thicknesss of the tenon to match the depth of the mortise.

GO 2 Online Extras
For more information on dowel joinery and making false tenons, visit our website: WoodsmithSpecials.com



To do this, I dry fit the back rail and the drawer rails between the end frames and took a measurement. Then when you cut the tenons on the ends of the stretcher, simply sneak up on a tight fit, testing the "shoulder-to-shoulder" length to the dry fit base.

ROUNDOVER. With the stretcher fit, you need to make a return trip to the router table before assembling the base. All the edges on the stretcher and the outside edges of the drawer rails and the back ledger need a ⅛" roundover.

ASSEMBLY. The assembly will go easier if you take it in small bites. I glued the rails and stretcher to one end frame, then the other. The final step is to reinforce the upper drawer rail and the stretcher joints with screws (details 'a' and 'c').

CRAFTSMAN DETAILS. Structurally, the base is complete. But you still need to finish up the "period" details — the false tenons and the corbels.

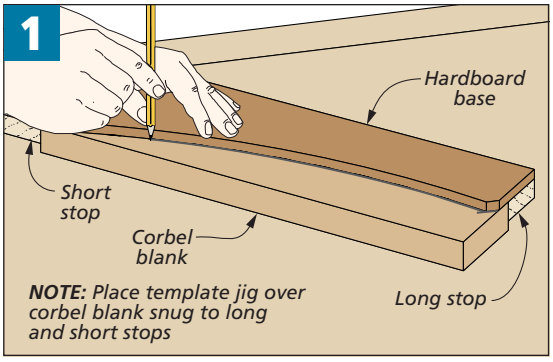
FALSE TENONS. The false tenons for the legs and those for the stretcher are different sizes, but otherwise, making them is pretty easy. Check out the Online Extras for a detailed explanation. When they're ready, you can glue them into the mortises, leaving them ⅛" proud.

THE CORBELS. The gracefully shaped corbels I added to the base are a distinctive feature of Craftsman-Style furniture. They help lighten and soften the heavy look of the table.

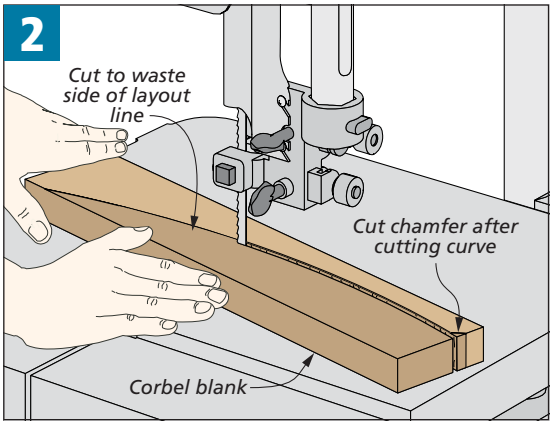
The base requires eight, identical corbels. And being a focal point, I wanted them to be smoothly shaped and consistent. So rather than shape each corbel by hand, I made a template routing jig.

CORBEL JIG. The corbel jig is illustrated in the drawing at the top of the page. It's just a simple sled that used to both lay out the profile and rout it to shape. The steps for using it are shown in the box on the right. Before adding the corbels to the base, you'll rout a roundover on all the outside edges.

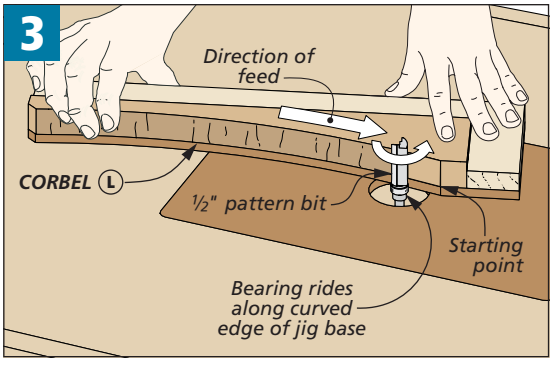
THE FINISHING TOUCH. When you attach the corbels, you want to center them on the thickness of the leg. The long edge can simply be glued to the legs. The top end needs to be doweled to the ledger or drawer rail (detail 'b,' opposite page). You'll find more information in the Online Extras article at *WoodsmithSpecials.com*.



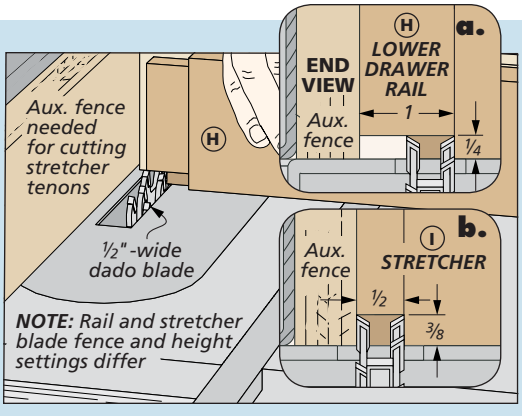
Trace the Shape. After cutting the eight corbel blanks to width and length, use the template jig to trace the finished shape onto each blank.



Rough Cut Each Blank. Next, take the blanks to the band saw and cut them to rough shape. Stay about 1/16" to the outside of the layout line.

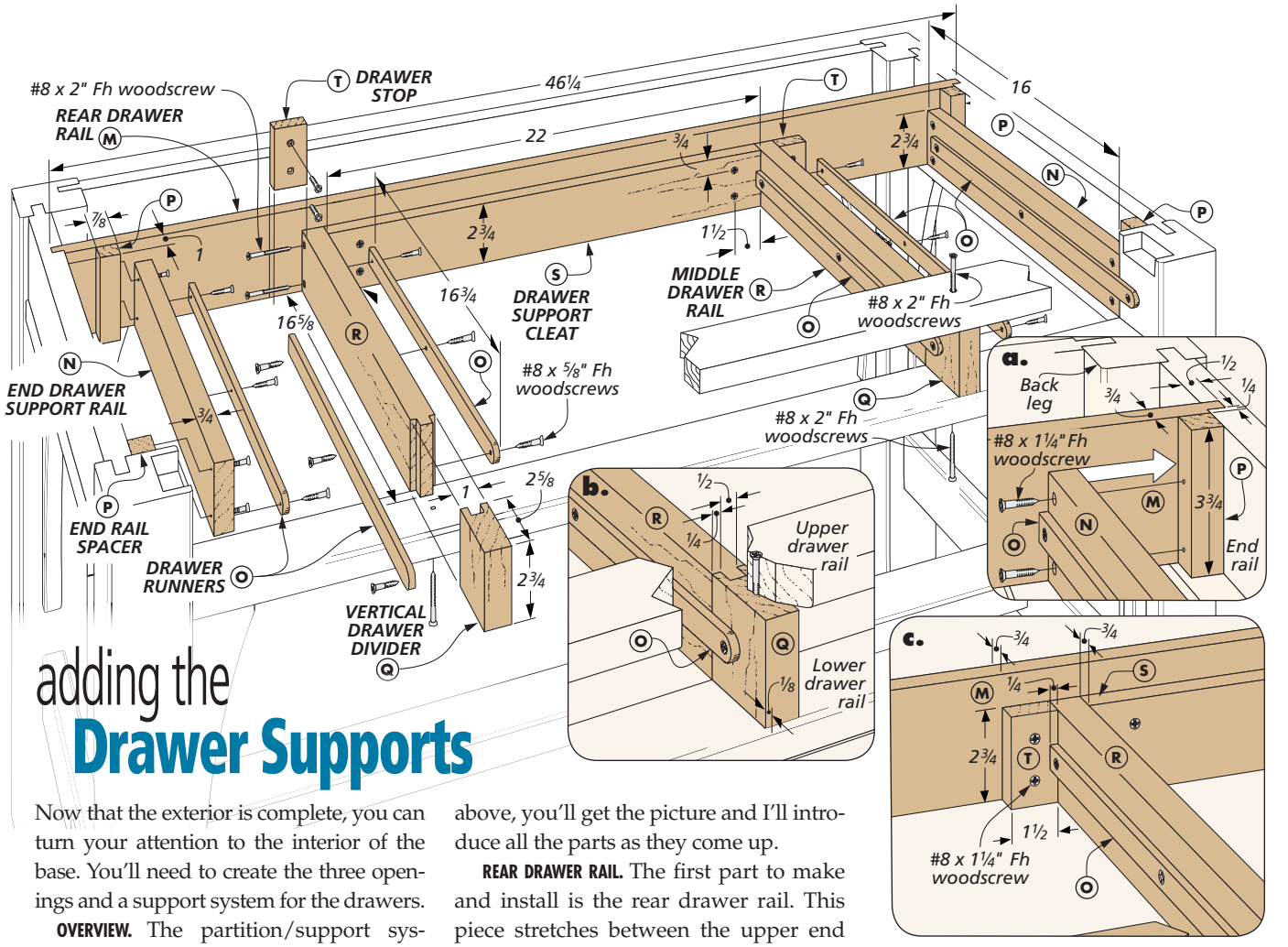


Flush Trim. Finally, I secured the blank in the jig with double-sided tape and trimmed the rough edge using a pattern bit. Rout "downhill" starting at the wide end.



Four Shoulders. The lower drawer rail and stretcher need four-shouldered tenons. Cut the cheeks, then stand the pieces on edge to cut the shoulders.

Distinctive. False tenons create a traditional through-tenon look.



adding the Drawer Supports

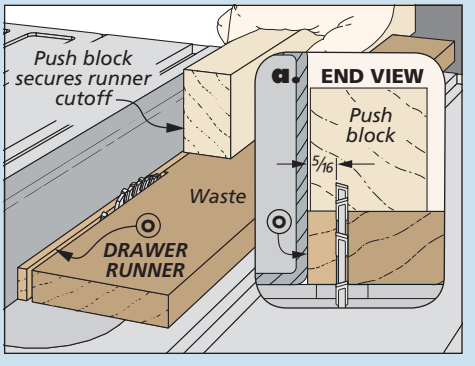
Now that the exterior is complete, you can turn your attention to the interior of the base. You'll need to create the three openings and a support system for the drawers.

OVERVIEW. The partition/support system has a fair number of parts, but it's designed to go into the assembled base very easily. The side-mount drawers slide on thin runners installed on a sturdy, interior framework. No bottom support is needed. If you take a look at the drawing above, you'll get the picture and I'll introduce all the parts as they come up.

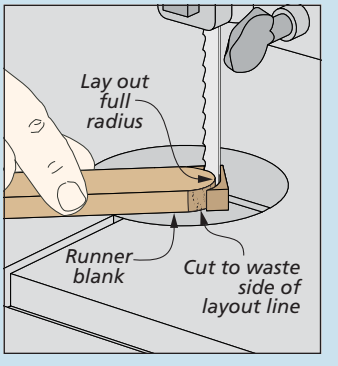
REAR DRAWER RAIL. The first part to make and install is the rear drawer rail. This piece stretches between the upper end rails to anchor the drawer support system. A short tongue cut on each end fits the dadoes you cut earlier in the end rails. You can simply apply glue to the tongues and then slide the rail into the dadoes from the top.

SUPPORT SYSTEM. With the long rail in place, you can start adding the drawer support rails and runners. You'll need to install a rail at each end and a middle assembly that forms the drawer openings.

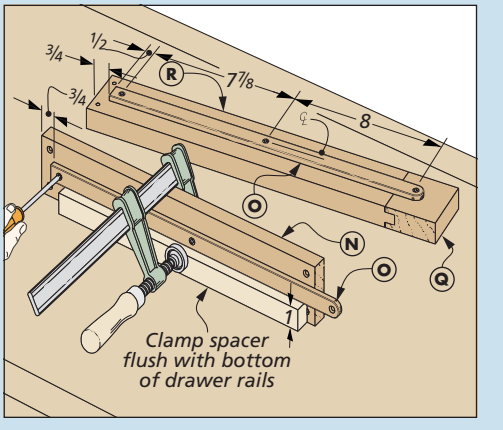
How-To: Drawer Runner Details



Rip to Size. To begin making the drawer runners, rip them to rough thickness from ¾" stock. Then plane them to ¼" thick.



Round Ends. After cutting the runners to length, round one end. Then sand it smooth.



Attach the Runners. A spacer clamped to the rail will help position the runner while you install screws through pre-drilled, countersunk holes.

I worked on the two end pieces first. These are simply cut to fit between the front leg and the rear support rail. They're attached by screwing them to spacers glued to the upper end rails (detail 'a' on the opposite page). They should sit flush to the inside edge of the leg.

RUNNERS FIRST. But before attaching the rails to the frame, I made the drawer runners and pre-installed them. This is much easier than trying to accurately position and screw them in place afterward.

The runners are ¼"-thick by ¾"-wide strips that are rounded on the front end. You'll need six in total, so I would make them all at once. The box at the bottom of the opposite page shows how to do the job. Note that the runners are positioned ¾" away from the back end of the rails. They'll lap onto the front legs so they can be screwed to them.

MIDDLE SUPPORTS. The middle rail assembly is a little different. Starting at the front, you have a pair of vertical dividers screwed between the drawer rails. The middle drawer rails are joined into the back edge of the dividers. Then a runner is attached to either side of this assembly (detail 'b,' opposite). The drawer rails are sized to butt up to the rear support rail and are held fast by screwing them to the ends of a support cleat. This cleat doubles as a drawer stop.

THE CONSTRUCTION. The nice thing about this design is that the whole thing can be preassembled and then added to the base. And I built it just as I described it, from front to back. The vertical dividers start out as an extra-long blank. This makes it easier to cut a groove in the back edge, as shown in the Shop Tip above. Once the groove is completed, you can cut two dividers to length.

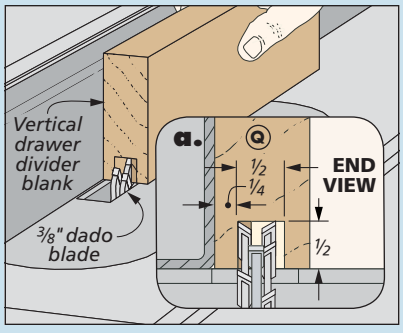
I cut the support rails to width, but left them extra long. Once a tongue is cut on the front end (drawing above), and the rail is glued to the divider, you can trim each assembly to final length. Just note that the dividers are recessed from the edges of the drawer rails.

Now, you can add a drawer runner to each side of the assemblies. Make sure to space the runner away from the rear end (details 'b' and 'c,' opposite). Finally, the support cleat can be cut to size and the assemblies screwed to either end.

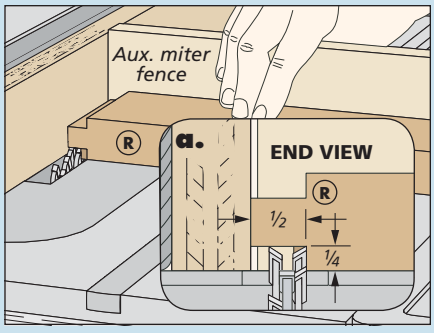
THE INSTALLATION. A look at the drawings below will help you understand the support installation. The key is to get it positioned correctly. The small drawer openings should be equal, with the rails square and aligned in the base. Take a few minutes to check, adjust and double-check before installing the screws in the vertical dividers and the support cleat.

There's one more quick task before moving on. The small drawer openings need stops. These are just small blocks that butt up to the middle drawer rails and are attached to the rear support rail with screws. This is shown in detail 'c' on the opposite page.

Shop Tip: Centered Tongue & Groove

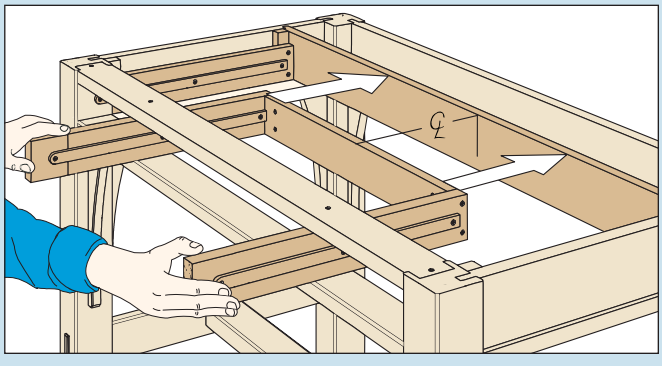


Groove. I used a dado blade to cut a groove on the divider blank. Flip the blank end for end between passes.

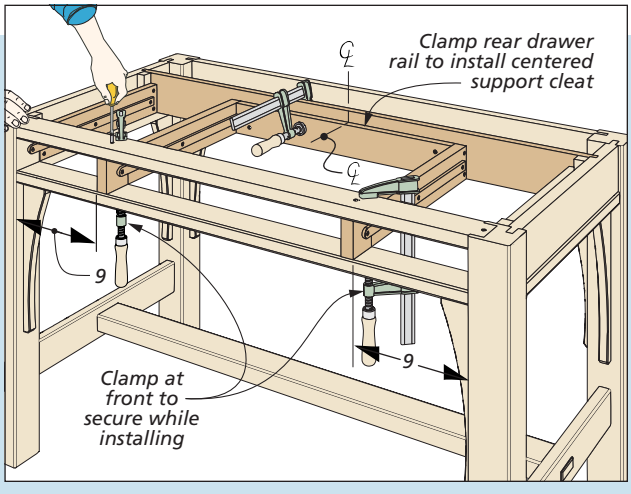


Tongue. You can use the same dado blade to cut a mating tongue on the rails. The rip fence will gauge the length of the tongue.

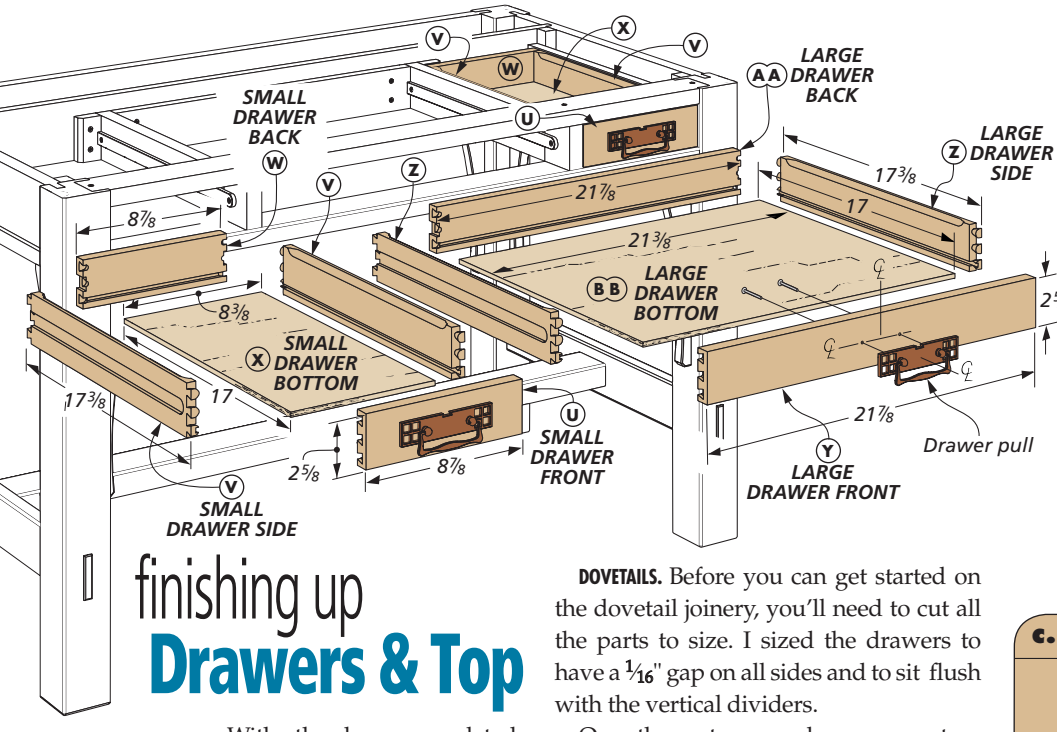
Install the Middle Support

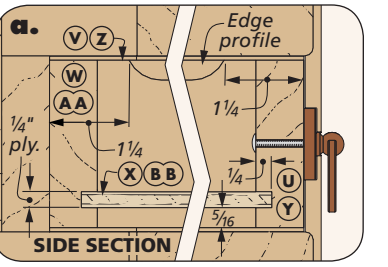


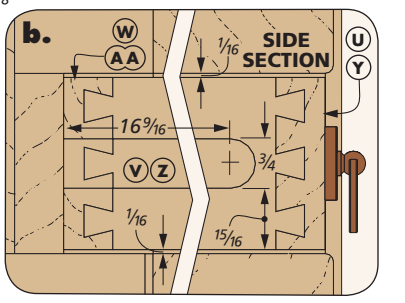
Slide It into the Base. After attaching the two rail assemblies to the support cleat, the entire assembly can be inserted between the drawer rails and temporarily held in place with a clamp or two.

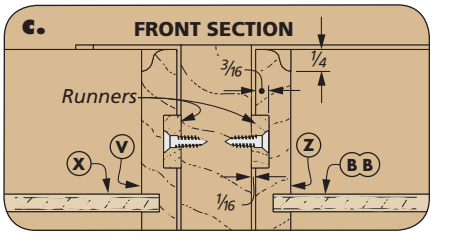


Adjust & Fasten. Before installing the screws, you'll want to carefully adjust the position of the assembly and make sure the drawer openings are square and level.









finishing up Drawers & Top

With the base completed, you're down to a few important details. Making the three drawers and then the top will wrap things up.

THE DRAWERS. The drawers have three features that guide the work you'll do. First comes the half-blind dovetail joinery used to build the boxes. Second, I added an authentic period detail by routing a profile on the top inside edge of the drawer sides. And finally, you'll need to rout grooves in the sides to fit the runners in the base.

DOVETAILS. Before you can get started on the dovetail joinery, you'll need to cut all the parts to size. I sized the drawers to have a 1/16" gap on all sides and to sit flush with the vertical dividers.

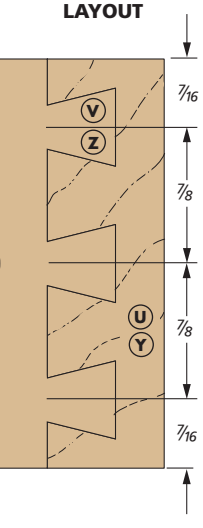
Once the parts are ready, you can set up your jig and get to work on the dovetails. As shown at left, they're laid out with a standard spacing (⅞" on centers).

PROFILE. After cutting grooves for the plywood bottoms at the table saw, I took the sides to the router table to add the decorative profile. The profile is routed using a small ogee bit and is "stopped" short of the ends. To do this, I set up the router table with stop blocks clamped to the fence, as shown below. This allows you to make the cuts without trying to rout to a line. You'll avoid the burning that often occurs during a slow cut.

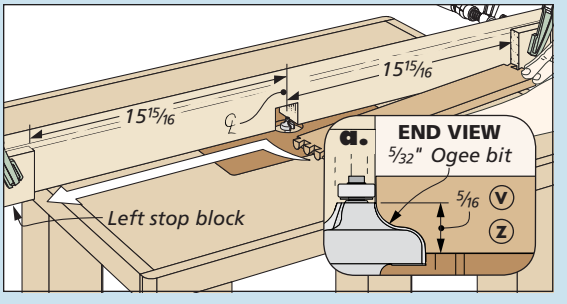
RUNNER GROOVES. After sanding the routed profiles, the drawers can be assembled and you can move on to the final step — routing runner grooves in the drawer sides. I routed the stopped grooves with a single pass using a sharp ¾"-dia. straight bit. The goal is centered grooves that are consistently positioned from side to side. The second and third drawings in the box show the trick. I trapped the drawer between the fence and a straightedge and made the two cuts feeding in opposite directions. This way the cuts on both sides can be referenced from the top edge.

It's a good idea to rout a test piece to check the accuracy of the setup before

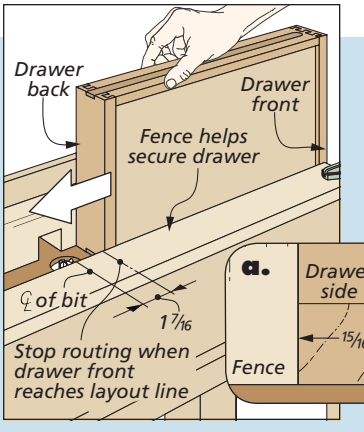
DOVETAIL LAYOUT



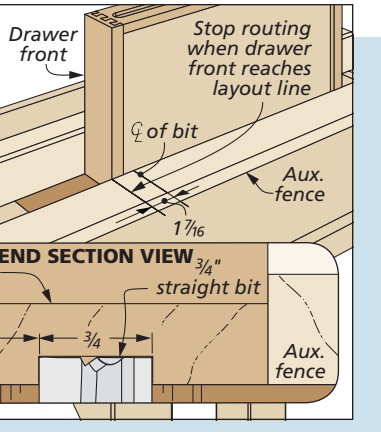
How-To: Drawer Details



Stopped Edge Profile. To rout the stopped ogee profile, butt the drawer side up to right stop block, plunge into the bit and rout to the left stop block.



Routing the Grooves. Feed in the usual right to left direction to rout the groove on one side.



Opposite Direction. To rout the groove on the opposite side, you'll need to feed from left to right.

routing the drawers. When the drawers are fit to your satisfaction, the pulls can be installed. And this leaves just one thing to do — make the top.

THE TOP

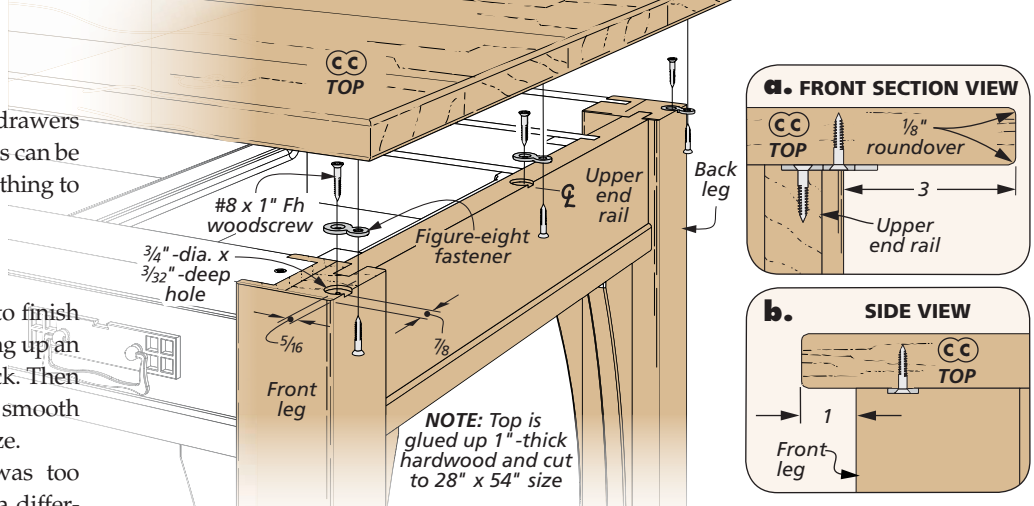
Adding the top is a relaxed way to finish up the table. You can start by gluing up an oversized panel from 1"-thick stock. Then take some time to clean up and smooth the top before cutting it to final size.

CUT TO SIZE. The heavy panel was too large for my table saw, so I took a different route. First, I cut it to rough size with a circular saw. Then I used a router, a straightedge and a flush-trim bit to trim it to finished size. Finally, I switched to a roundover bit to ease the edges.

THE LAST CHORE. Now you can install the top on the base. The inside of the base has limited access, so I mounted the top with figure-eight fasteners positioned around the perimeter, as shown above. I mortised one into the top of each leg and one in the center of each end rail (details 'a' and 'b'). The mortise is just a shallow hole drilled with a Forstner bit (main drawing).

After screwing the fasteners to the legs, you can position the top on the base and mark for pilot holes. The top should be centered with a 3" overhang on each side and 1" overhang front and back.

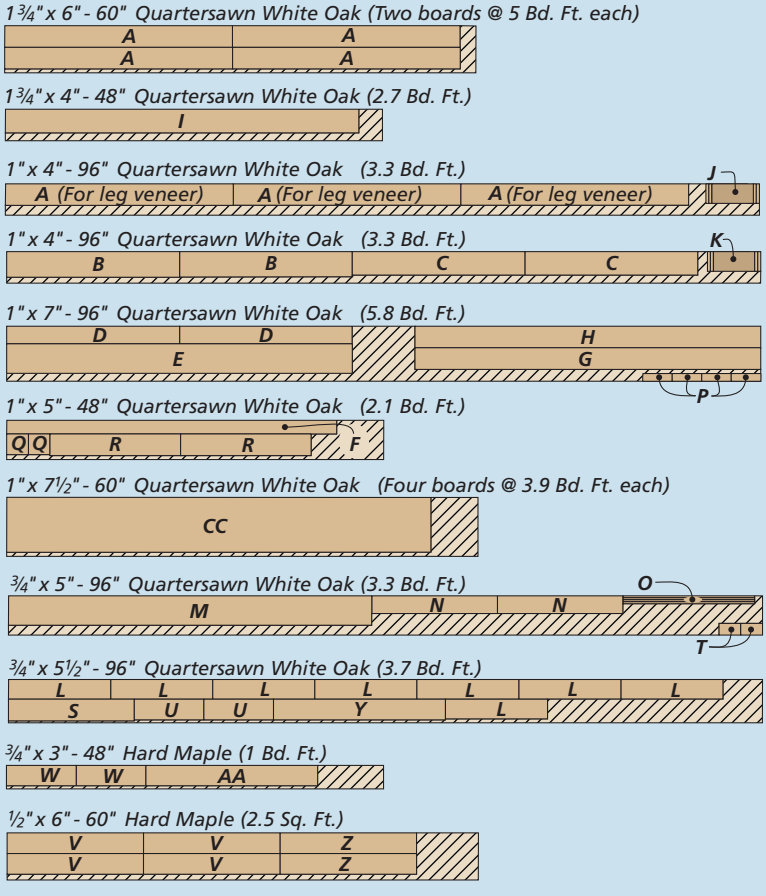
Once the top is screwed down, you can take a short break and start thinking about a finish. I suggest a good, durable varnish. After all, your library table will be around for a long, long time.



MATERIALS, SUPPLIES & CUTTING DIAGRAM

A	Legs (4)	3 x 3 - 29
B	Upper End Rails (2)	1 x 3¾ - 22
C	Lower End Rails (2)	1 x 3 - 22
D	End Ledgers (2)	1 x 2¼ - 20
E	Back Rail (1)	1 x 3¾ - 44
F	Back Ledger (1)	1 x 1¾ - 42
G	Upper Drawer Rail (1)	1 x 2¾ - 44
H	Lower Drawer Rail (1)	1 x 2¾ - 44
I	Stretcher (1)	1½ x 3 - 45
J	Leg False Tenons (4)	½ x 2½ - ⅜
K	Stretcher False Tenons (2)	¾ x 2¼ - ⅜
L	Corbels (8)	¾ x 2½ - 13
M	Rear Drawer Rail (1)	¾ x 3¾ - 46¼
N	End Drawer Support Rails (2)	¾ x 2¾ - 16
O	Drawer Runners (6)	¾ x ¼ - 16¾
P	End Rail Spacers (4)	1 x ⅞ - 3¾
Q	Vertical Drawer Dividers (2)	1 x 2⅝ - 2¾
R	Middle Drawer Rails (2)	1 x 2¾ - 16⅝
S	Drawer Support Cleat (1)	¾ x 2¾ - 22
T	Drawer Stops (2)	¾ x 1½ - 2¾
U	Small Drawer Fronts (2)	¾ x 2⅝ - 8⅞
V	Small Drawer Sides (4)	½ x 2⅝ - 17⅜
W	Small Drawer Backs (2)	¾ x 2⅝ - 8⅞
X	Small Drawer Bottoms (2)	¼ ply. - 17 x 8⅜
Y	Large Drawer Front (1)	¾ x 2⅝ - 21⅞
Z	Large Drawer Sides (2)	½ x 2⅝ - 17⅜
AA	Large Drawer Back (1)	¾ x 2⅝ - 21⅞
BB	Large Drawer Bottom (1)	¼ ply. - 17 x 21⅜
CC	Top (1)	1 x 28 - 54

- (14) #8 x 2" Fh Woodscrews
- (16) #8 x 1¼" Fh Woodscrews
- (12) #8 x 1" Fh Woodscrews
- (18) #8 x ⅝" Fh Woodscrews
- (3) Dark Bronze Bail Pulls w/Screws
- (6) Figure-Eight Fasteners



ALSO NEEDED: *One 24"x 48" sheet ¼" Maple plywood*

classic cherry Footboard Bench

Mortise and tenon joinery, double tapered legs, and a comfortable cushioned seat combine to make this an elegant addition to your home.

In most bedrooms, seating is often an afterthought. Besides the bed itself, there are very few options when it comes to a place to sit down. A lot of folks simply rely on an old second-hand chair for their main seating.

The footboard bench shown above creates a more pleasing and comfortable alternative. With gracefully tapered legs and rock-solid traditional joinery, this bench is sure to add beauty to any room setting, as well as adding new skills to your woodworking repertoire.

TIME-HONORED CONSTRUCTION. In designing this bench, I was aiming to use as few mechanical fasteners as possible. To that end, I chose mortise and tenon joinery for much of the project.

It all starts with the leg assemblies. Each end of the bench has three rails held securely between the tapered legs. A pair of long upper stretchers and a beefy lower stretcher connect the end assemblies together. It's then just a matter of adding some hardwood cleats and a plywood seat panel. A store-bought cushion caps things off.

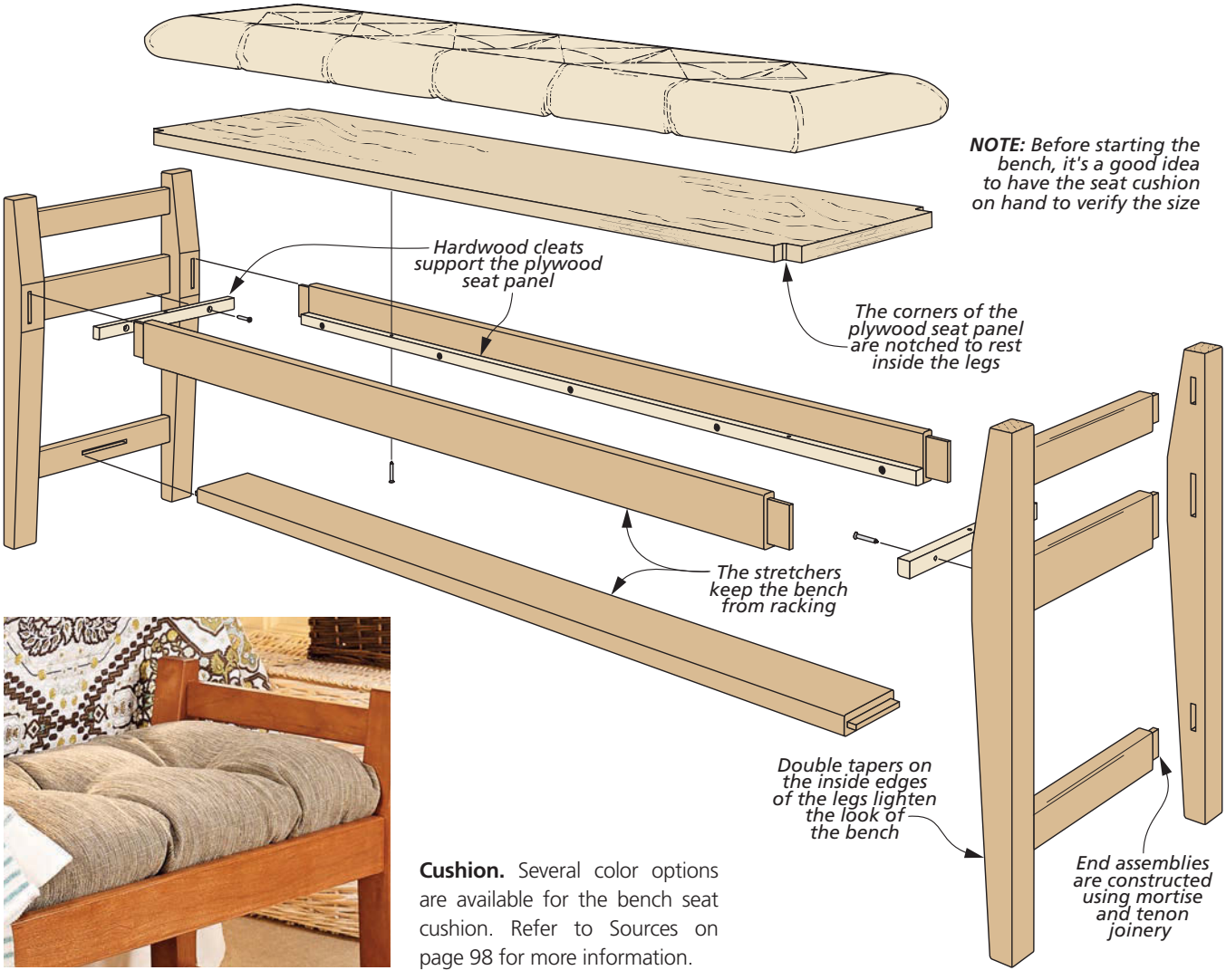
And while I designed this bench with the bedroom in mind, don't feel that you have to limit its placement to this one room of the house. Its fine features would allow it to look right at home in an entryway or mudroom, as well.

GO 2 Online Extras

For complete details on making a tapering sled, go to: WoodsmithSpecials.com

Construction Details

OVERALL DIMENSIONS:
50"W x 22"H x 14"D



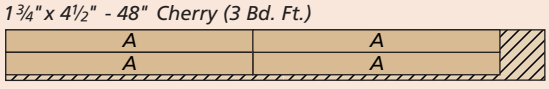
NOTE: *Before starting the bench, it's a good idea to have the seat cushion on hand to verify the size*

Cushion. Several color options are available for the bench seat cushion. Refer to Sources on page 98 for more information.

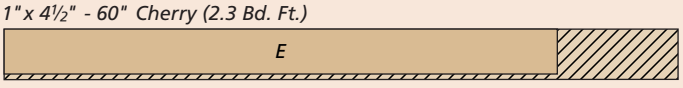
MATERIALS, SUPPLIES & CUTTING DIAGRAM

A	Legs (4)	1¾ x 2 - 22	**E**	Lower Stretcher (1)	1 x 4 - 49	• (1) Cushion (2½" x 12" - 48")
B	Upper/Lower Rails (4)	¾ x 1¾ - 12½	**F**	Long Cleats (2)	¾ x ⅝ - 46	• (20) #8 x 1¼" Fh Woodscrews
C	Middle Rails (2)	¾ x 2½ - 12½	**G**	Short Cleats (2)	¾ x ⅝ - 10½	
D	Upper Stretchers (2)	¾ x 2½ - 48½	**H**	Seat Panel (1)	¾ ply. - 12 x 48	

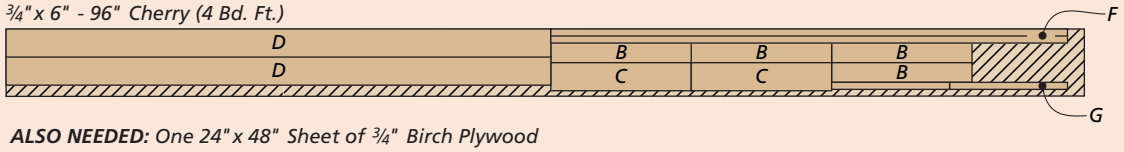
1¾"x 4½" - 48" Cherry (3 Bd. Ft.)



1"x 4½" - 60" Cherry (2.3 Bd. Ft.)



¾"x 6" - 96" Cherry (4 Bd. Ft.)



ALSO NEEDED: *One 24"x 48" Sheet of ¾" Birch Plywood*

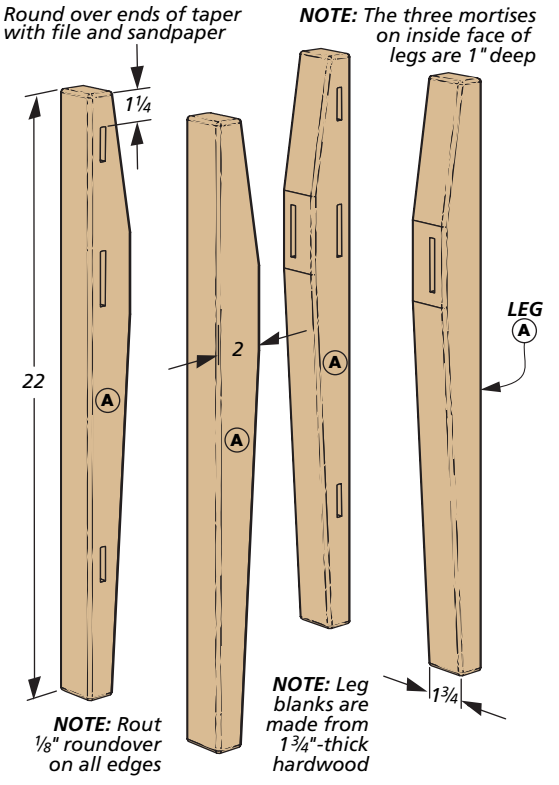
a solid Foundation

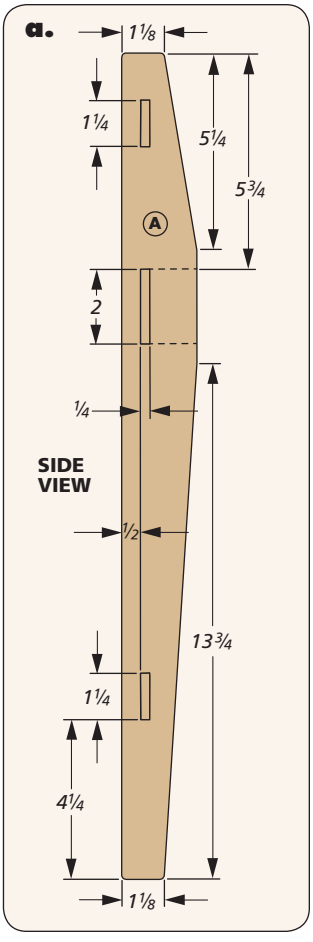
With their gradual tapers and rounded edges, the legs add a point of visual interest to the bench. But these legs are more than just good looks. They also include mortises on their inside faces that accept tenons on the end rails. Another mortise on the adjacent face houses a tenon formed on the ends of the upper stretchers.

LEG BLANKS. For the leg blanks, I used 8/4 stock and planed it to a final thickness of 1¾". Then you can rip the blanks to final size at the table saw. An alternative would be to make blanks glued up from thinner stock. Just make sure the seams are on the sides of the legs.

Whichever option you go with, be sure to select a pleasing grain pattern for the front of each leg. And because each pair of legs is a mirror image of the other, I made sure to label their position to keep things organized down the road.

LAYOUT WORK. Now that the four squared-up blanks are completed, mark the locations of the mortises. Be sure to note that the mortises in the middle of each leg are a little longer than the top and bottom mortises.



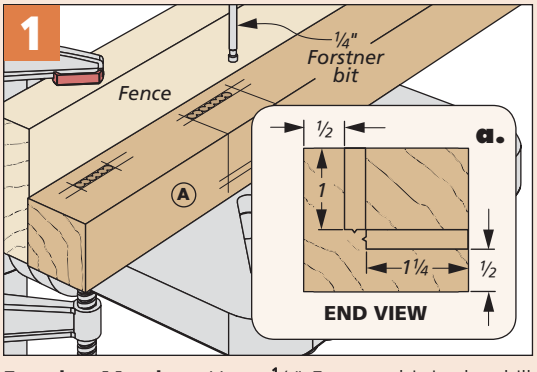


CUTTING MORTISES. Figures 1 and 2 below show the process for making the mortises. I'll just point out a couple of things. The single mortise on the inside edge of each leg is deeper than the three mortises on the inside face (detail 'a'). I set the stop on the drill press to a depth of 1" and removed the bulk of the waste for the shallow mortises first. Then it's just a matter of flipping each leg, resetting the drill press stop, and repeating the process. Use a sharp chisel to square up the ends and sides.

TAPERING THE LEG BLANKS. The idea of making consistent tapers on the legs may seem a little daunting at first glance, but I've simplified the process by using the taper sled shown in Figure 3 below. This sled will position the workpiece to cut both the long and short

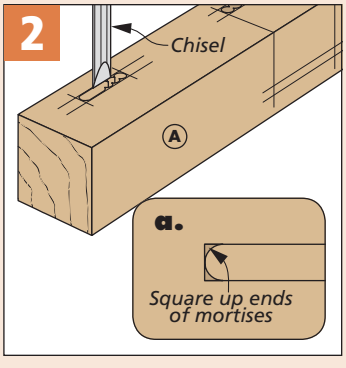
How-To: Shape the Legs

1



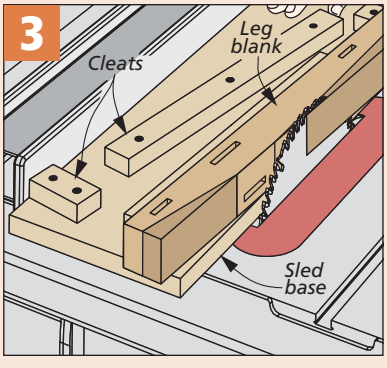
Forming Mortises. Use a ¼" Forstner bit in the drill press to remove the bulk of the waste for each mortise location. Be sure to overlap the holes.

2



Square Them Up. A sharp chisel is all that's needed to square up the corners of each mortise.

3



Tapering the Legs. See the Online Extra to find out how to build and use this simple table saw taper sled.

tapers simply by rotating the sled and flipping the workpiece after the initial cut. Go to *WoodsmithSpecials.com* to see how to build the sled.

SOFTEN THE EDGES. The final detail on the legs is to round over all of the edges. This is easy enough to do at the router table, with one exception. The tapered ends at the top and bottom are no longer at 90°. Because of this, you'll need to round over these edges using a file and clean them up with sandpaper.

MAKE THE RAILS

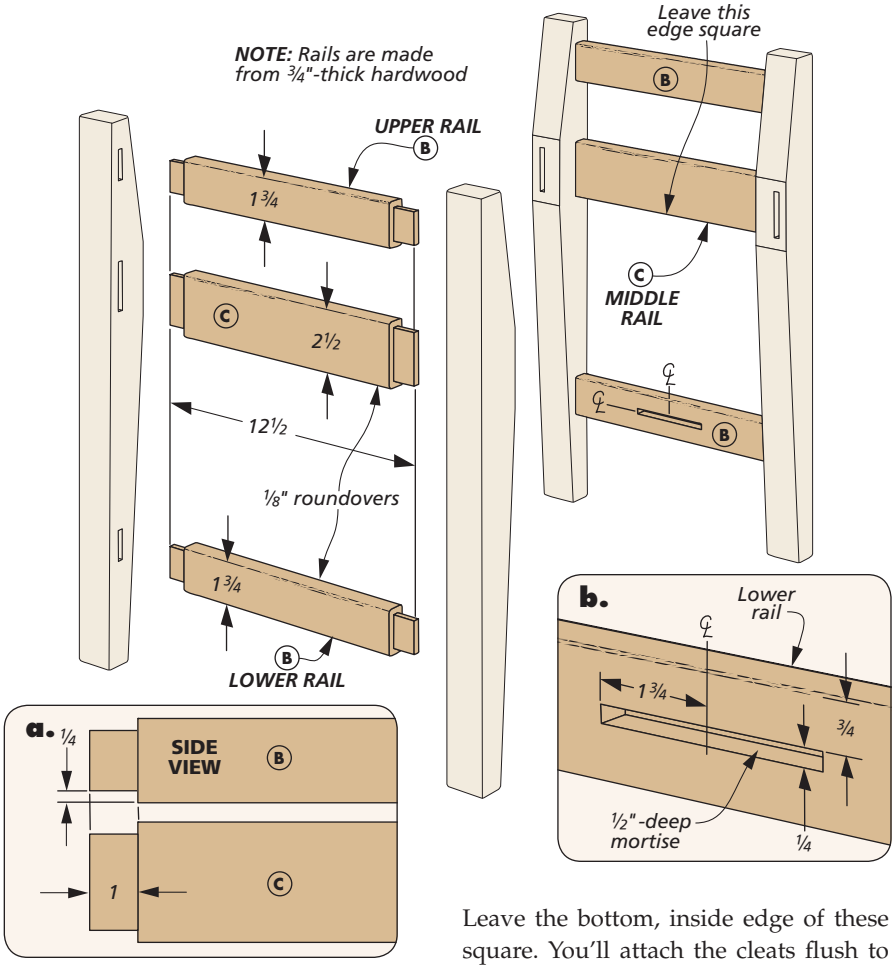
After completing the legs, the three connecting rails for each end assembly are up next. Start by cutting the workpieces to size. Note that the middle rail is slightly wider than the upper and lower rails.

CUTTING TENONS. As shown in Figures 1 and 2 below, I used the table saw to form the tenons on the ends of each rail. Since the cheeks and edges of the tenons are cut to the same depth, this requires only one setup and goes pretty quickly.

The rip fence acts as a stop when making the shoulder cuts. Then make another pass to remove the rest of the waste. A shoulder plane or sanding block can be used to fine-tune the tenons for a snug fit in the mortises.

ONE MORE MORTISE. The lower rails each receive a shallow mortise on the inside face (Figure 3). These mortises hold the lower stretcher. To make these mortises, use the same method that you did on the legs. Just be sure not to go too deep to avoid drilling through the workpiece.

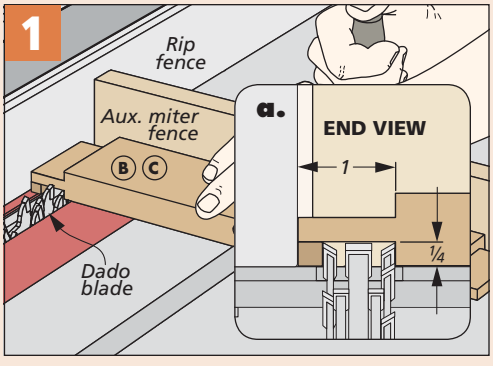
ROUNDED RAIL EDGES. With all of the joinery complete, head back to the router table to round over all four edges of the rails, with the exception of the middle rails.



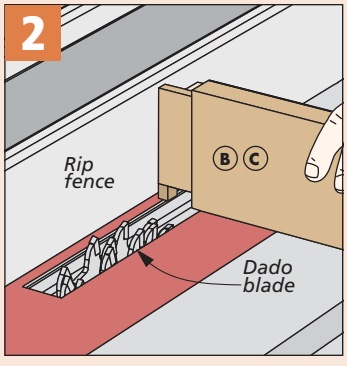
Leave the bottom, inside edge of these square. You'll attach the cleats flush to the bottom edge later on.

TWO END ASSEMBLIES. Bringing the rails and the legs together is a pretty straightforward process. I would recommend doing a dry assembly before adding the glue. If everything fits nicely, add some glue and clamp the parts together.

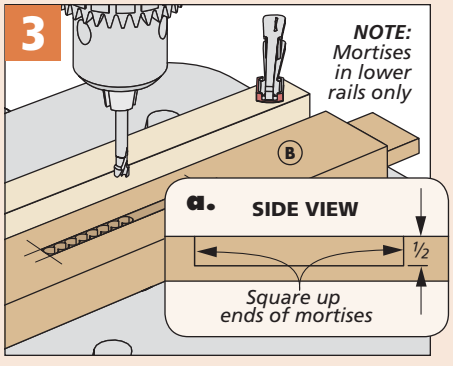
How-To: Make the Rails



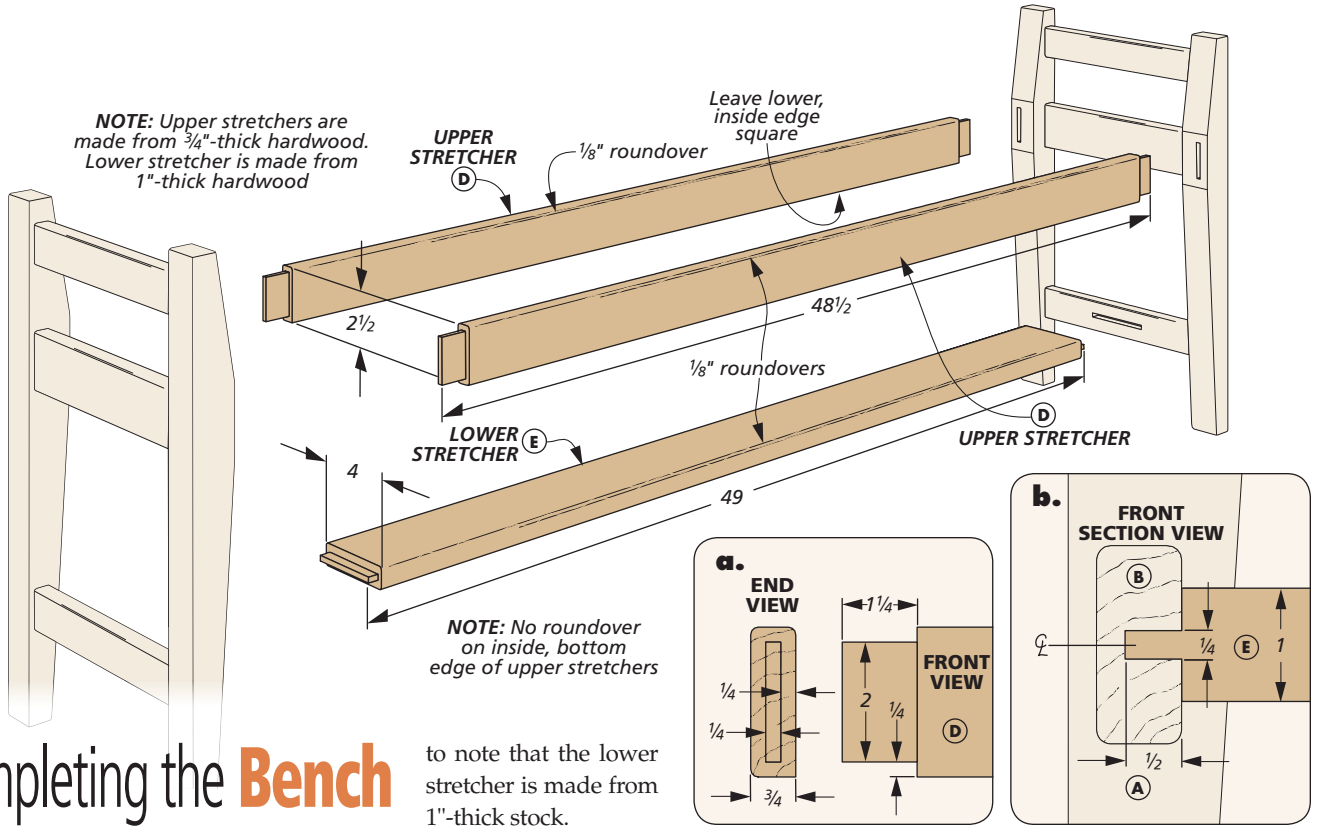
Rail Tenons. A dado blade works well to form the tenons. Register the workpiece against the rip fence to make the shoulder cuts (detail 'a').



Tenon Edges. Using the same setup, stand the workpiece on edge to finish the tenon.



Rail Mortises. Use the same technique that you did on the legs to form the shallow mortises on the lower rails.



completing the Bench

While the end assemblies are still in the clamps, you can turn your attention to the parts that connect them. This includes a pair of upper stretchers and the beefy, lower stretcher. After that, you'll only need to cut a seat panel to size, add some cleats for the panel to rest on, and drop the cushion in place.

MAKE THE STRETCHERS. As I said, the three stretchers combine to tie the ends together. The upper stretchers also serve as a place to secure the cleats for the seat. You'll start by cutting these three parts to size. Be sure to note that the lower stretcher is made from 1"-thick stock.

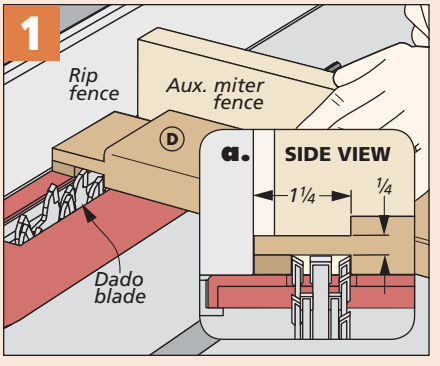
MORE TENONS. After completing the end assemblies, you're pretty familiar with making tenons on the table saw. The setups are shown in Figures 1 and 2 below. Just be mindful of a couple of things. First, since the stretchers are long, it's a good idea to use a long auxiliary miter gauge fence to support the workpieces through the cut.

Second, notice that the tenons on the ends of the lower stretcher are shorter than the tenons on the upper stretchers (details 'a' and 'b', above). And the lower stretcher also requires a slightly higher blade setup to make the cheek cuts.

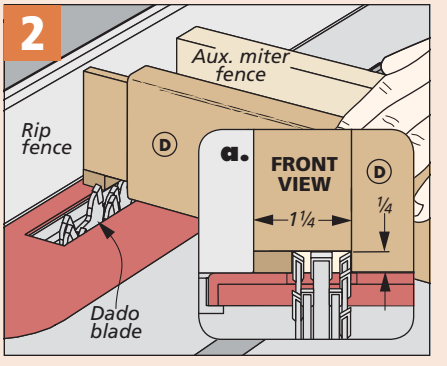
ROUNDOVER EDGES. With the tenons out of the way, you'll head back to the router table to roundover all of the long edges on the stretchers, again with one exception. Leave the inside, bottom edge of the upper stretchers square. The cleats will rest flush with the bottom edge.

CLAMP THINGS UP. Now's a good time to do any final sanding and test fitting before gluing the stretchers between the end assemblies.

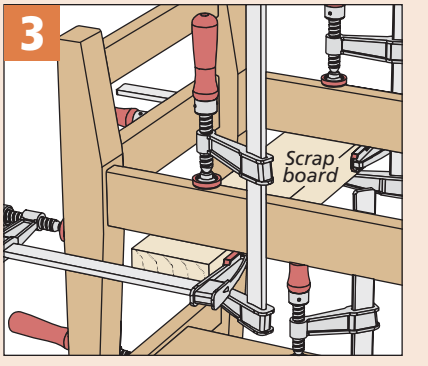
How-To: Add Rails & Stretchers



Upper Stretcher Tenons. Using the same method as you did for the rails, form the tenons on the stretchers.



Finish Up. After making the face cuts, flip the workpiece on edge to complete the tenon in a couple of passes.



Creative Clamping. A short scrap board clamped to the rails acts as an anchor point to assemble the bench.

And be sure the square edge of the upper stretchers is oriented correctly. Because the bench is longer than the pipe clamps I had on hand, I used a scrap board and some short clamps to hold the bench together. Figure 3 on the previous page shows what I mean.

CLEATS & SEAT PANEL

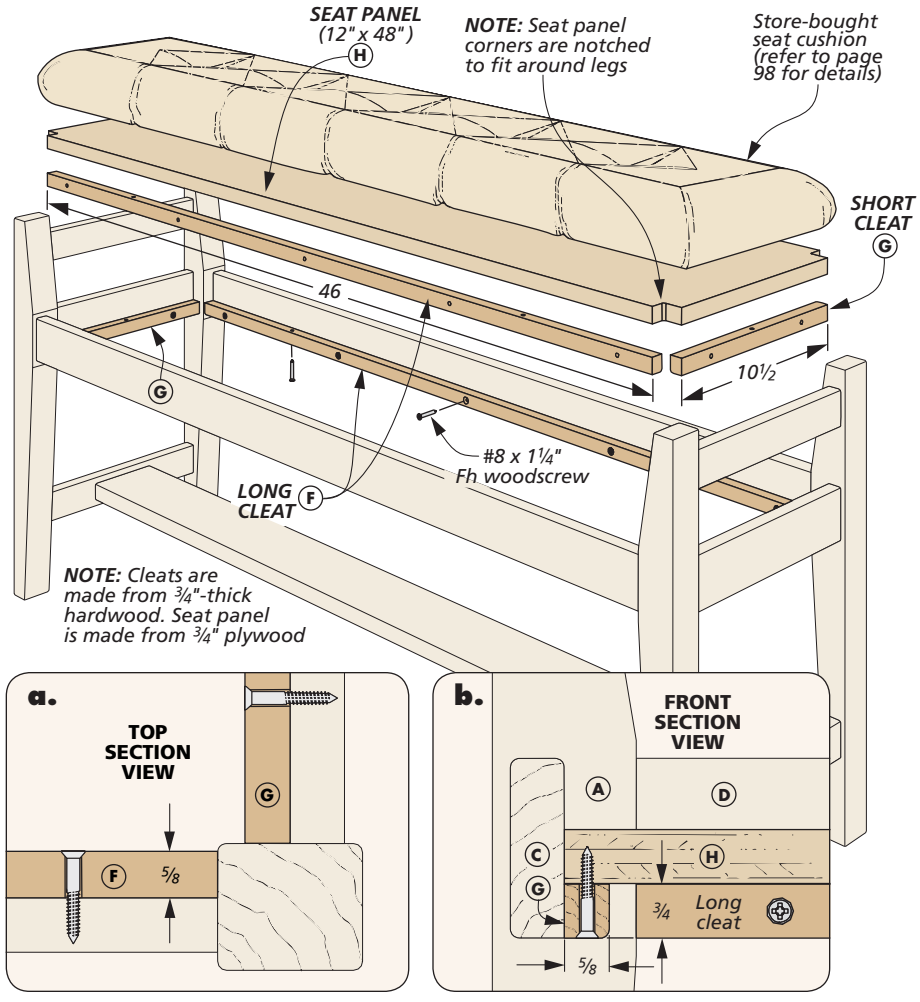
You're in the home stretch now. There are just a few details left to complete the bench. The first of those is to make the cleats that support the seat panel.

CLEATS. The cleats are just narrow strips of hardwood. Rip them to size and round over the lower inside edge of each one. I then drilled holes in each cleat for the seat panel and attached them flush with the bottom edge of the upper stretchers using only screws (detail 'b'). To keep the cleats flush with the bottom edge of the stretchers while I screwed them in place, I clamped a support board to the stretchers (Figure 1) to act as a helping hand.

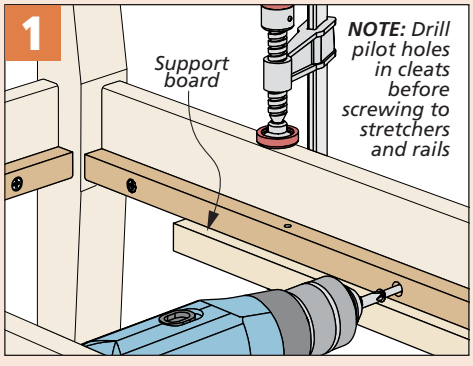
SEAT PANEL. The seat panel will be out of sight once the cushion is in place, so the type of plywood used isn't critical. I opted to use a piece of inexpensive birch for my bench. To get a good fit, measure the top opening between the middle rails and stretchers and cut the panel to size.

NOTCH CORNERS. As you can see in detail 'a' at right, the inside corner of the legs prevents the seat panel from dropping into place. The solution here is to cut a notch at each corner. First, lay out the notch location and drill a ¼"-dia. hole in the corner (Figure 2, below). Then finish each notch with a back saw, as shown in Figure 3.

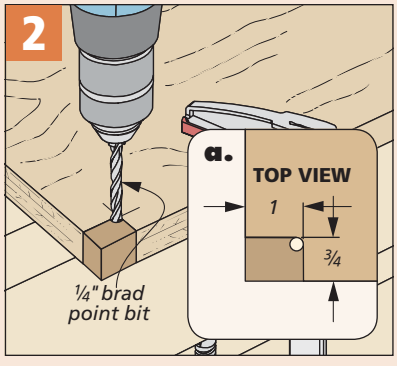
FINISH UP. With the panel completed, simply drop it in position on the cleats and hold it in place with screws. At this point, I applied a finish to my bench. (Refer to Sources on page 98 for more information.) With the seat cushion in place, this bench is ready for use.



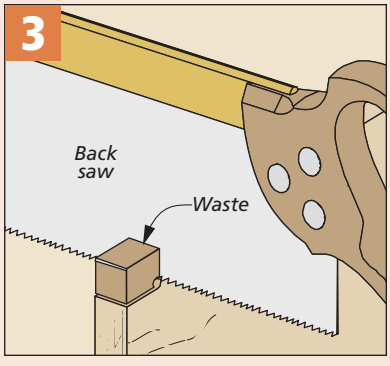
How-To: Install Cleats & Seat Panel



Support. A long, straight board clamped to the stretchers keeps the cleat flush with the bottom edge while it's screwed in place.



Form the Notches. After laying out the location of each notch, drill a hole in the inside corner.



Complete the Notch. Remove the rest of the waste for each notch using a sharp back saw.

space-saving Wine Rack

Traditional construction and modern accents combine to create style and practicality in one small, space-saving package.

A wine rack is a great addition to any kitchen or dining room. But if you don't have space for a large wine rack, then I think you'll like this one. This rack takes the concept of a basic wine crate and pumps up the style. It sits on a countertop or buffet so it's always ready when company arrives.

Just because the rack is compact doesn't mean I cut back on the details. The case is assembled with box joints, which make any project look impressive. Plus, I added contrasting feet and edging on the face of the rack.

LEARN A TECHNIQUE. From a woodworking point of view, this project will give you a chance to hone your skills. And if you're new to making box joints, I've included some helpful hints in a separate article found online.

I've also included design options for this project. If a wider rack would better suit your space, check out the Designer's Notebook on page 73.

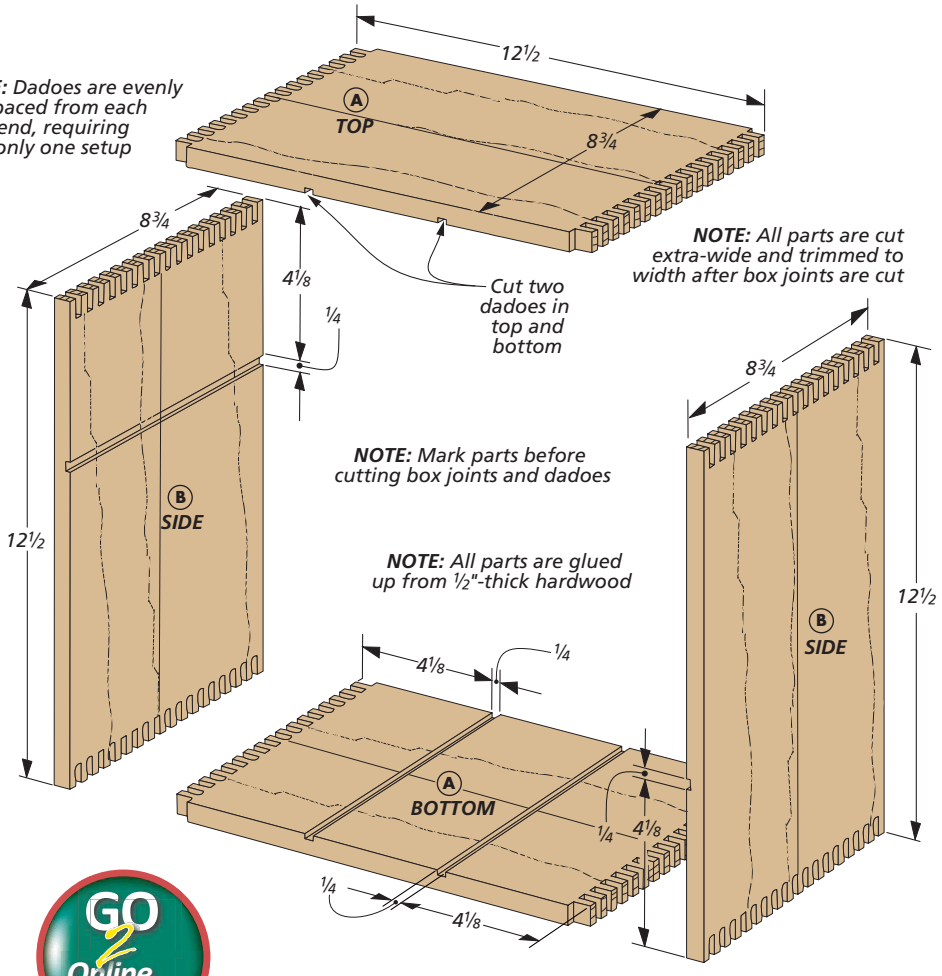
box joint **Case**

The wine rack is built by constructing a case and then adding a series of dividers and shelves. Later, you'll add edging and feet to complete the rack. The biggest challenge is cutting the box joints. But before you can start on the box joints, you'll need to size your workpieces.

PANELS. I glued up panels for the sides, top, and bottom. Starting with an extra-wide and extra-long blank, square up the ends and cut the four pieces to identical length. Later you can trim the extra width to even up the case. I used the simple table saw jig shown at *WoodsmithSpecials.com* to cut the box joints. You can see how it's done in the box below.

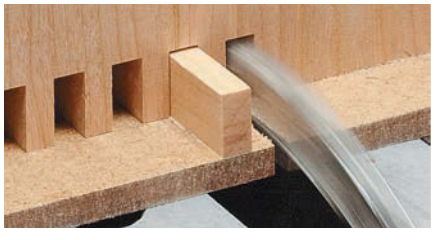
DADOES. When you've completed the box joints, go ahead and cut the dadoes for the dividers and shelves you'll add later. The top and bottom each have two dadoes, but the sides only have one. It's a good idea to mark each piece before you cut them, so you won't get the workpieces confused when you start the glueup.

GLUE UP. You can glue up the case before adding the shelves and dividers. This way, you'll have an easier time squaring up the case without extra workpieces in the way. But before you add any glue to the joints, dry assemble the case. After testing the fit, you can add the glue.



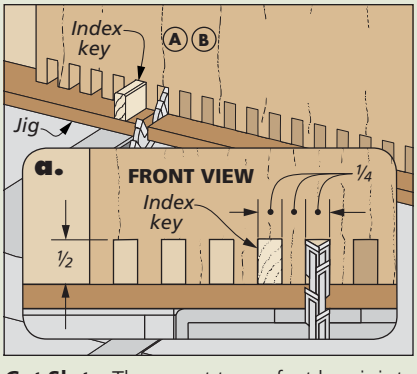
GO 2 Online Extras

To find out how to make a box joint jig for the table saw, go to:
WoodsmithSpecials.com

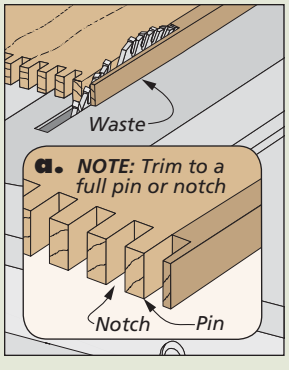


Simple Jig. For a step-by-step article on cutting perfect-fitting box joints, check out the Online Extra.

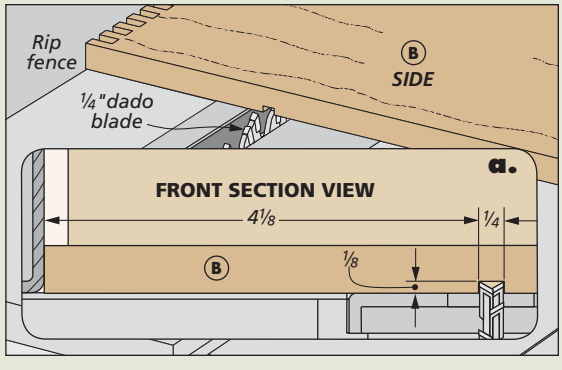
How-To: Cut the Case Joinery



Cut Slots. The secret to perfect box joints is having the key, dado blade, and space between sized identically.



Trim Edges. When the box joints are cut, trim the edges to final width.



Dadoes. You can use the same dado blade to cut the dadoes in the case sides, top, and bottom. The dadoes are equally spaced so only one set up is needed.

complete the **Case**

The inside of the rack is organized into sections with dividers and shelves. These create separate spaces to store bottles and glasses. A stop at the back of each shelf helps keep items contained.

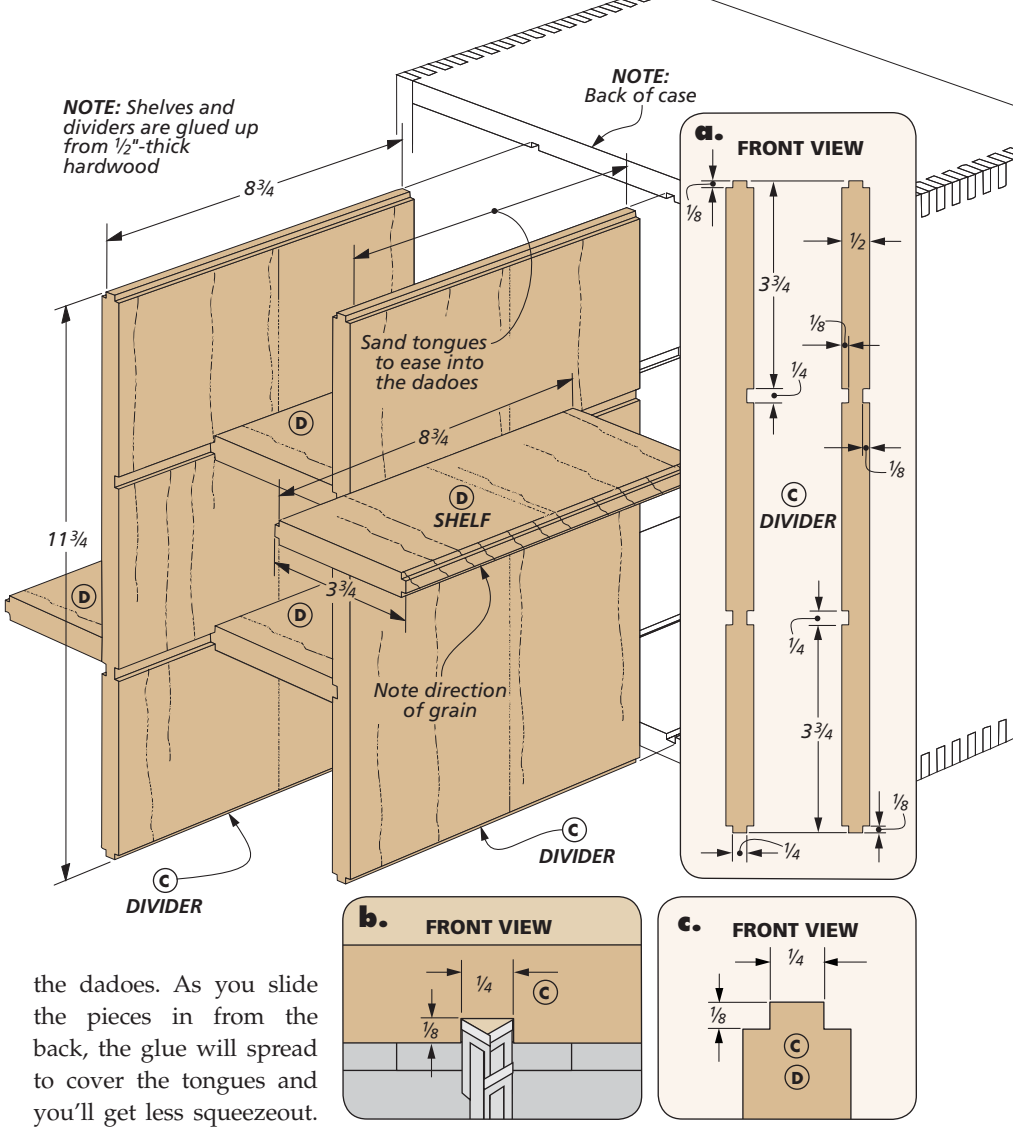
DIVIDERS. To build the dividers, I glued up panels and cut them to final length and width. Then I cut dadoes in the dividers to hold the shelves (box below). Here again all the dadoes are located the same distance from the ends of the dividers, so you can use one setup to make all the cuts (detail 'a'). Finally, you can cut the tongues on the ends of the dividers to match the dadoes in the case. This is shown in the center drawing below.

SHELVES. The shelves are also cut from glued up panels (note grain direction in the main drawing). Once they're cut to size, you can cut centered tongues to fit the dadoes (detail 'c').

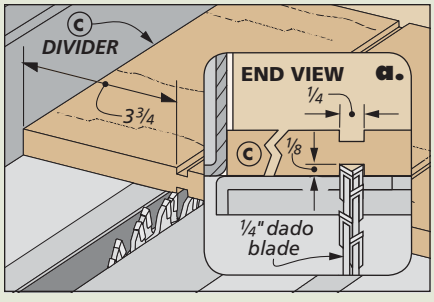
ASSEMBLY. The dividers and shelves slide into the dadoes from the back of the case. To make this easier, I lightly sanded the tongues, as shown in the right drawing below. Keep checking the fit as you sand them and then glue them in the dadoes. Apply the glue sparingly to the back of the dadoes. As you slide the pieces in from the back, the glue will spread to cover the tongues and you'll get less squeezeout. While the glue dries on the case, you can get started making the edging for the front of the rack.

EDGING. The edging on the face of the case serves two purposes. First, it provides visual appeal through the contrasting wood. And second, the edging covers the tongue and dado joints where the shelves and dividers join.

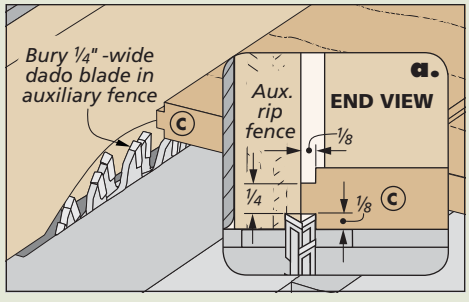
As you can see in the box at the bottom of the page, I ripped the edging



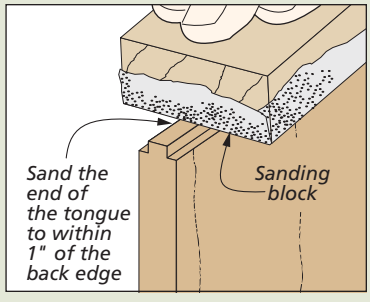
How-To: Cut Dadoes & Tongues



Divider Dadoes. The two dividers have a series of dadoes that hold the shelves in place on the rack (detail 'a').



Tongues. Each end of the shelves and dividers are held in place with tongues cut to match the dadoes on the case.



Ease the Tongues. Lightly sand the ends to within 1" of the back edge of the tongue, for an easier fit.

from a wide board. Once the edging is cut, it's centered on the front edges of the case. At first, getting it aligned exactly looked like it was going to be a challenge. So to solve the problem, I used a couple shop-made guides to help me glue the edging in place.

GUIDES. If you take a look at the right drawing in the box below, you'll see the guides are nothing more than blocks of wood with a rabbeted edge. I left a ⅛" lip on the guides to center them over the edge of the case. Then I inserted the edging between the guides so that it was perfectly centered on the edge.

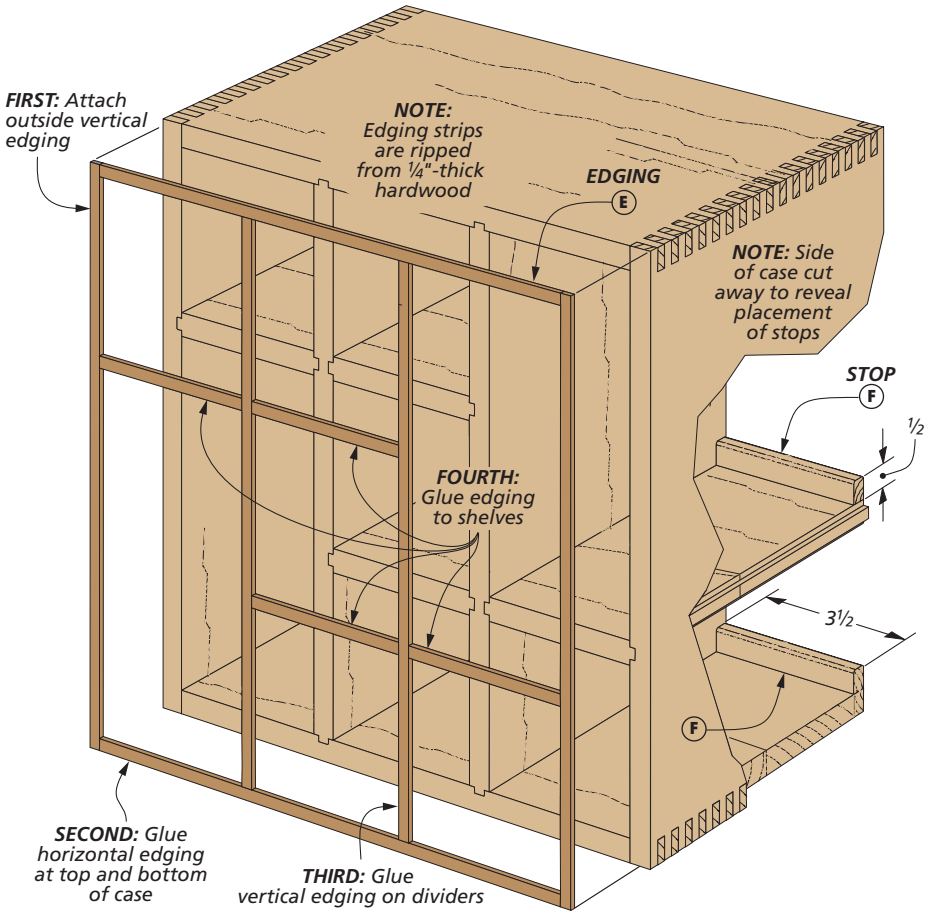
ATTACH EDGING. To attach the edging, I worked from the outer edges of the case to the inside. I glued the outside vertical edging first. Then I cut the remaining edging to fit, following the step-by-step process shown in the main drawing at right.

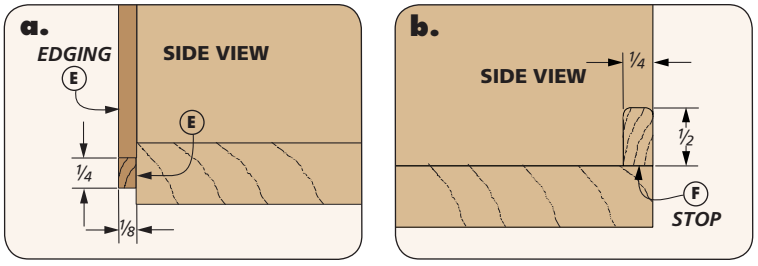
With the edging attached, there are just a couple details to add before the project is complete.

STOPS. There are stops at the back of each shelf to keep stored items contained on the shelves. These stops are just strips of hardwood with a small round-over on the top edges.

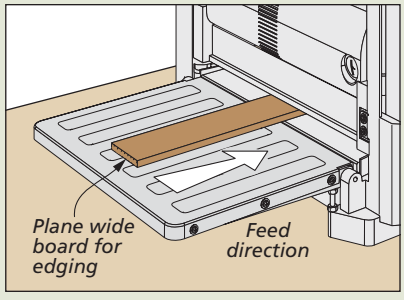
Cut the stops to length to fit the openings. Then lightly round over the top edges with sandpaper. Finally, glue the stops in place flush with the back edge of each shelf, as shown in detail 'b'.

There's just one final thing to take care of on the case. And that's to add the contrasting feet. You'll find more about the details for this on the next page.

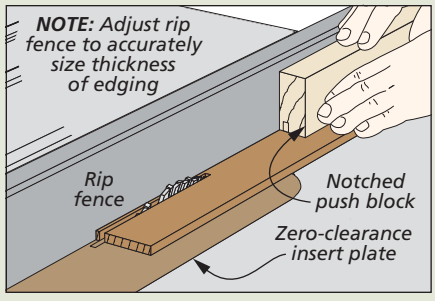




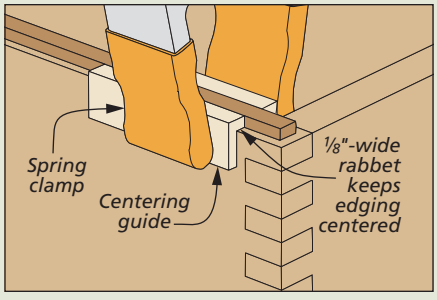
How-To: Making & Adding the Edging



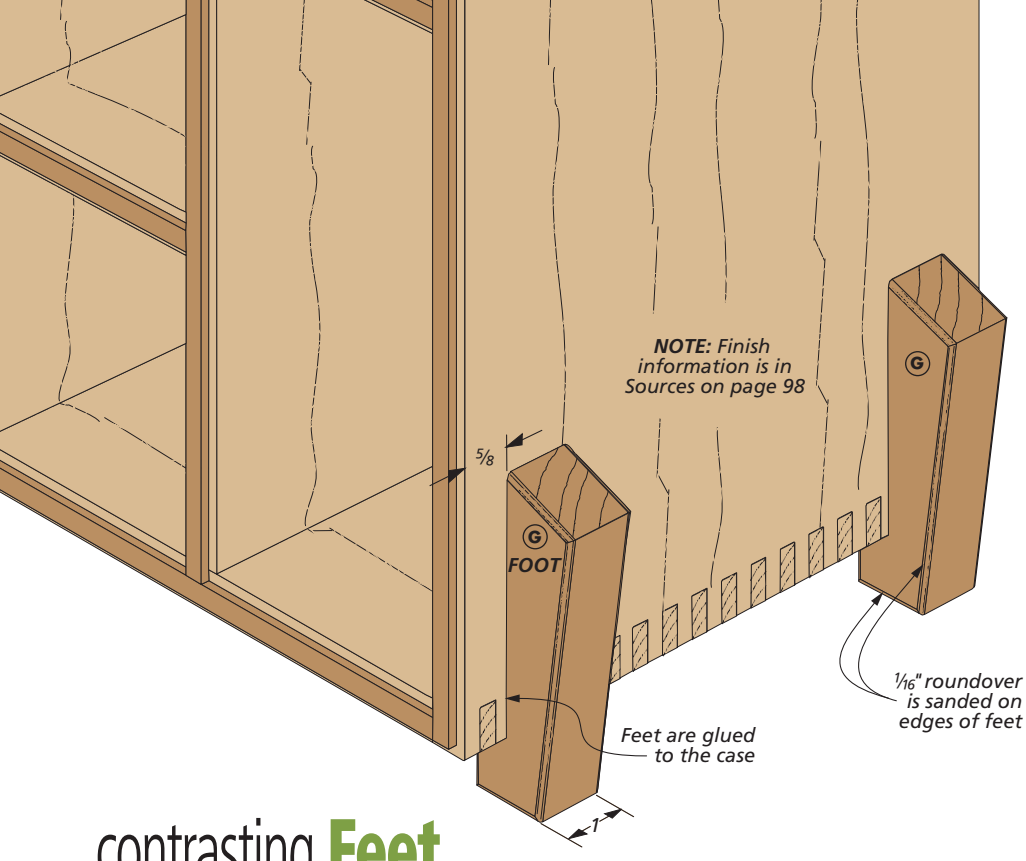
Plane Edging. Plane an extra-wide board to ¼" thickness before cutting it into strips for the edging.

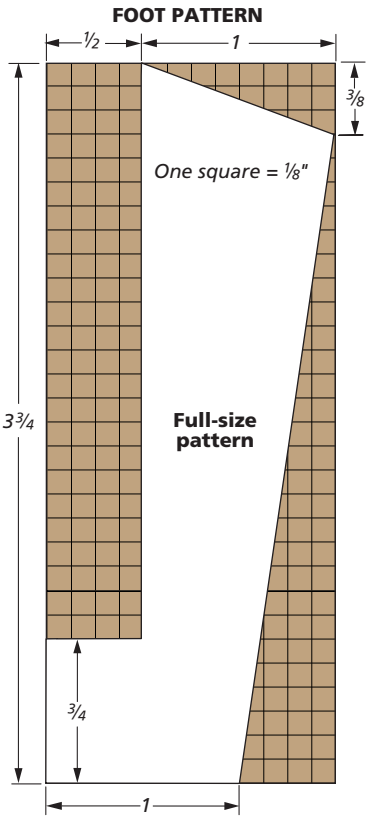


Rip Edging. Adjust the rip fence to the thickness of the edging and rip the individual strips free.



Center Edging. Clamp two guides on either side of the edge and insert the edging in between to center it.





contrasting **Feet**

The feet on the wine rack are another interesting detail of this project. Made with contrasting wood, they really make the rack stand out from the ordinary. And the tapers on the feet make them even more striking.

SHAPE THE FEET. Shaping the feet is pretty straightforward. But to make them easier to cut, you can use the full-size pattern in the upper right corner.

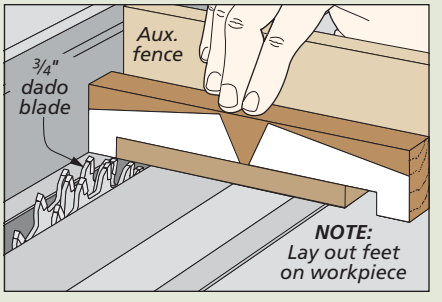
To make the feet, I started with a couple of extra-long blanks. I found it easier to work with a blank long enough to make two feet. Start shaping the feet by cutting a wide dado to form a notch that wraps around the case (left drawing, below).

Your next step is to cut the tapers on each foot. I did this on the band saw (center drawing below). Then you can sand to the line to remove the blade marks. I taped the feet together to sand them, so they were identical. Take a minute to sand a 1/16" roundover on the feet. When the feet are done, you can glue them to the case.

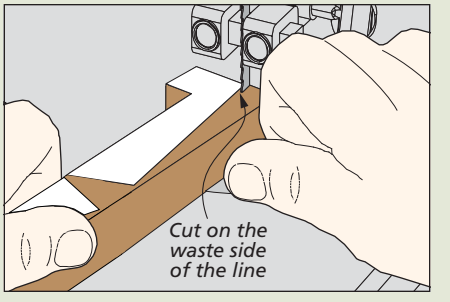
GLUE FEET. I used a simple spacer to position the feet from the edge accurately. It's a scrap piece with a 5/8"-wide rabbet cut in the edge. As you can see in the right drawing below, I placed the spacer on the edge of the case and aligned the foot for the glueup.

Once the feet are in place, all that's left is to add the finish. There's more about the finish in Sources on page 98. Then to complete the set, you can fill the rack with your favorite wines and special serving glasses.

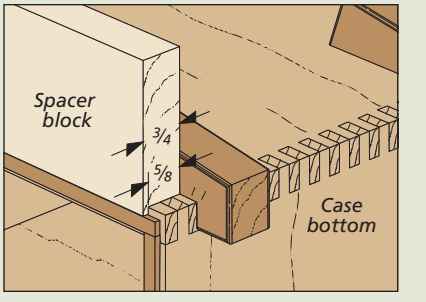
How-To: Shape the Feet



Cut a Notch. A 3/4" dado blade makes short work of the notch in the foot blank. Use the template as a cutting guide.

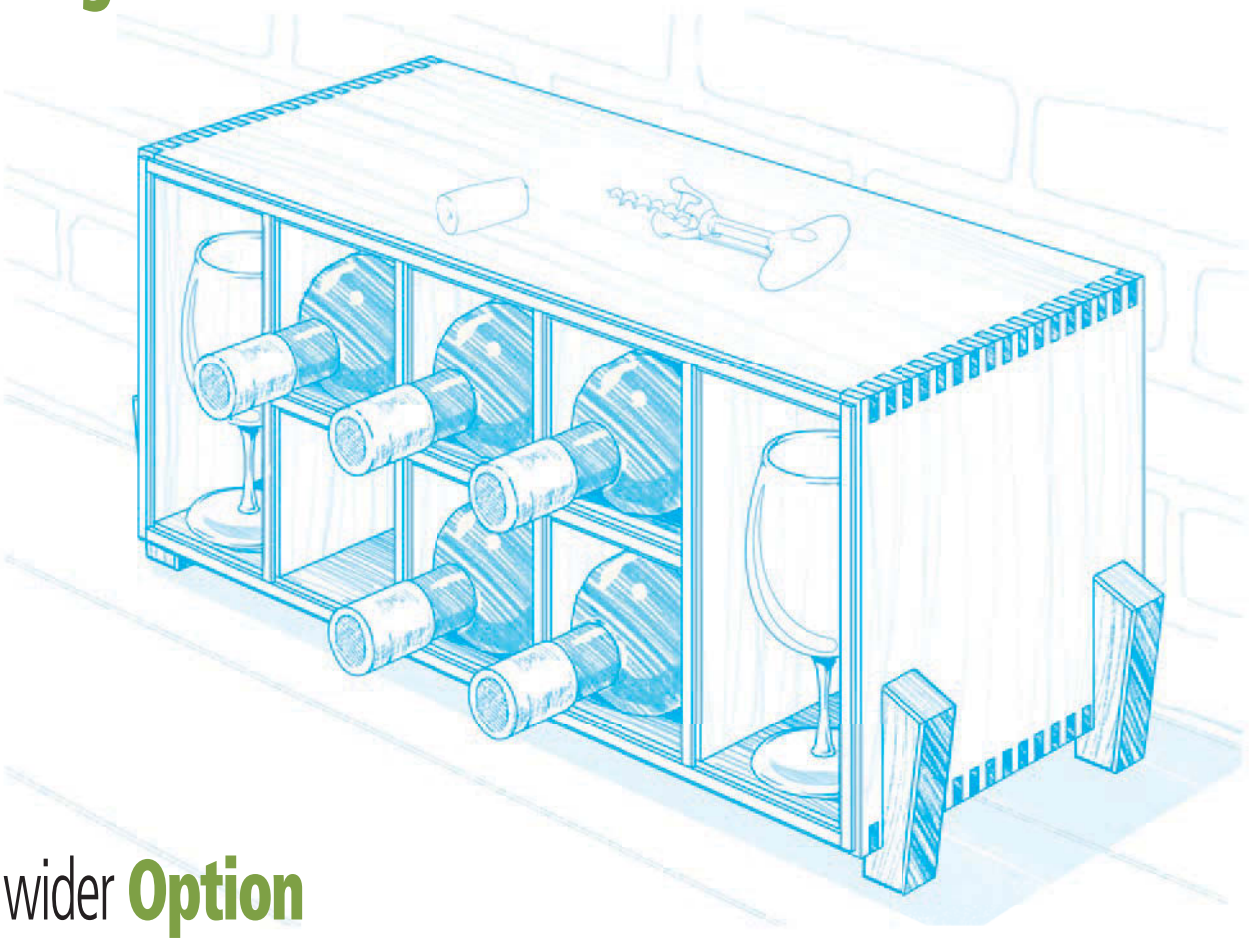


Shape the Feet. Cut the tapers on the top and side of the foot at the band saw. Clean up the saw marks with sandpaper.



Position Feet. Position the feet 5/8" from the front and back of the case. A simple spacer helps with this task.

Designer's Notebook



wider Option

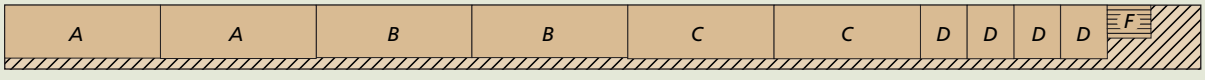
If you have a wider space for a counter-top wine rack, then take a look at the modified version shown above. It has room for up to six bottles and several glasses, but it sits slightly lower than the rack in the main article, so it may be a better fit for your space.

For this one, I used the same joinery and details as the square rack. While it's a simple task to modify the plans for this longer rack, our designers have done all the work for you. You'll find the complete drawings for this rack on our website at *WoodsmithSpecials.com*.

MATERIALS, SUPPLIES & CUTTING DIAGRAM

A	Top/Bottom (2)	½ x 8¾ - 12½	**E**	Edging (1)	¼ x ⅛ - 84 (rgh.)
B	Sides (2)	½ x 8¾ - 12½	**F**	Stops (7)	¼ x ½ - 3½
C	Dividers (2)	½ x 8¾ - 11¾	**G**	Feet (4)	1 x 1½ - 3¾
D	Shelves (4)	½ x 8¾ - 3¾			

½" x 5" - 96" Cherry (Two Boards @ 3.3 Sq. Ft. Each)



1" x 3½" - 24" Wenge (.7 Bd. Ft.)

double Porch Rocker

With its solid construction and elegant design, this double-wide rocker is sure to be the most relaxing project you have ever built.

I grew up in a rural area in a time when summer nights were spent relaxing on the porch. Those nights of long conversations about anything and everything, plus the occasional impromptu visit from a neighbor, are precious memories.

With this classic-style rocker, you too can spend time relaxing on your porch, deck, or patio. It has ample space for one person to stretch out while reading a good book. But it's just the right size to cozy up to your significant other, kids, grandkids, or the family dog.

The woodworking presents enough of a challenge to make it an interesting build. Our designer spent a lot of time getting the shape of the rockers just right for easy, no-effort rocking.

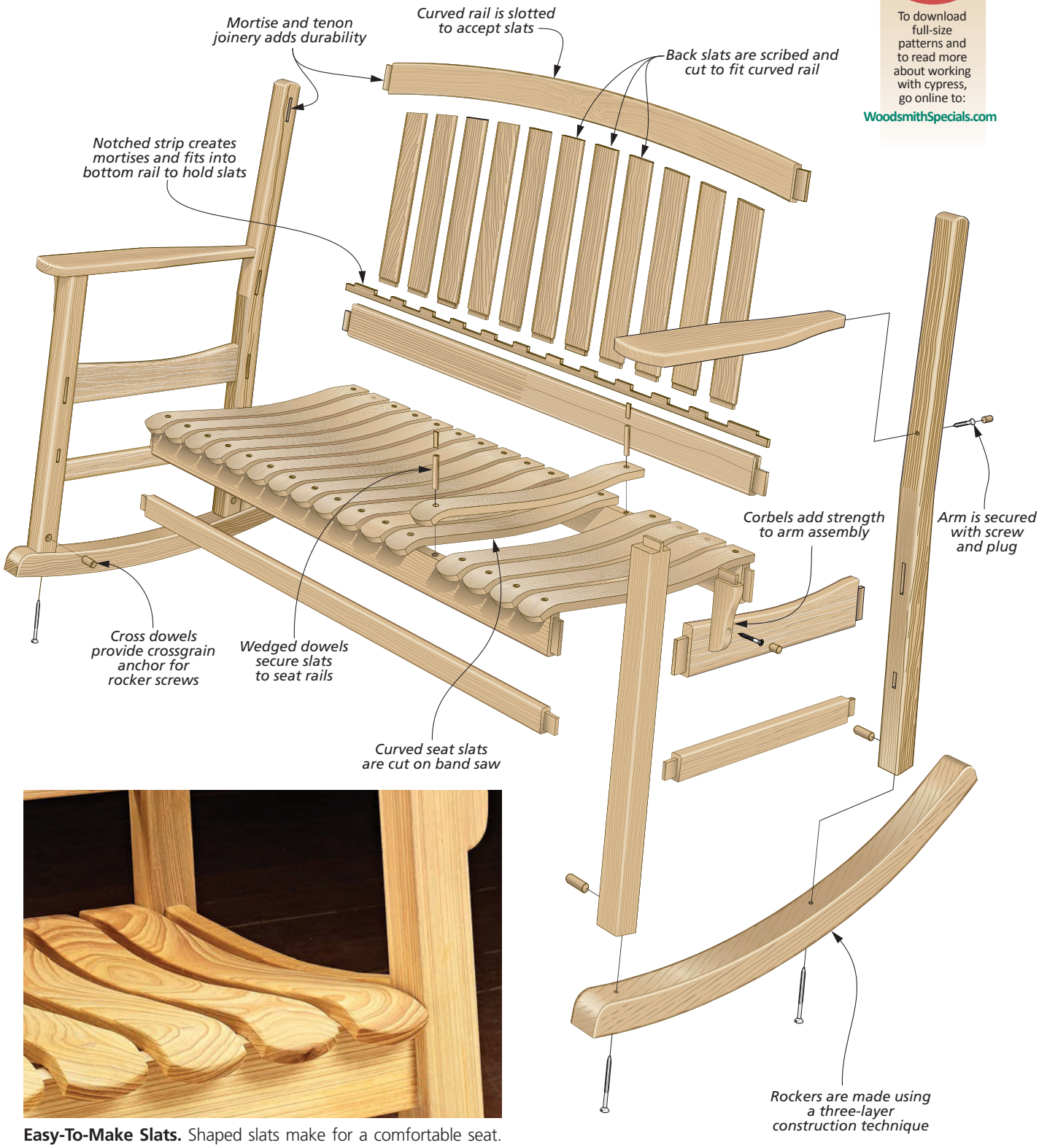
The seat slats are curved for comfort. I'll show you how to make them using a pattern to lay out the shape before cutting them on a band saw using a jig.

Also, there's something unique about the way the seat slats are attached to the rails. Instead of screws, I used slotted dowels secured with thin wedges. This provides a long-lasting connection that will stay strong for years to come.

I chose to use cypress because it's an attractive, durable wood that's easy to work with power and hand tools. Plus, it's suitable for outdoor use. Read more about cypress in our Online Extra article.

Construction Details

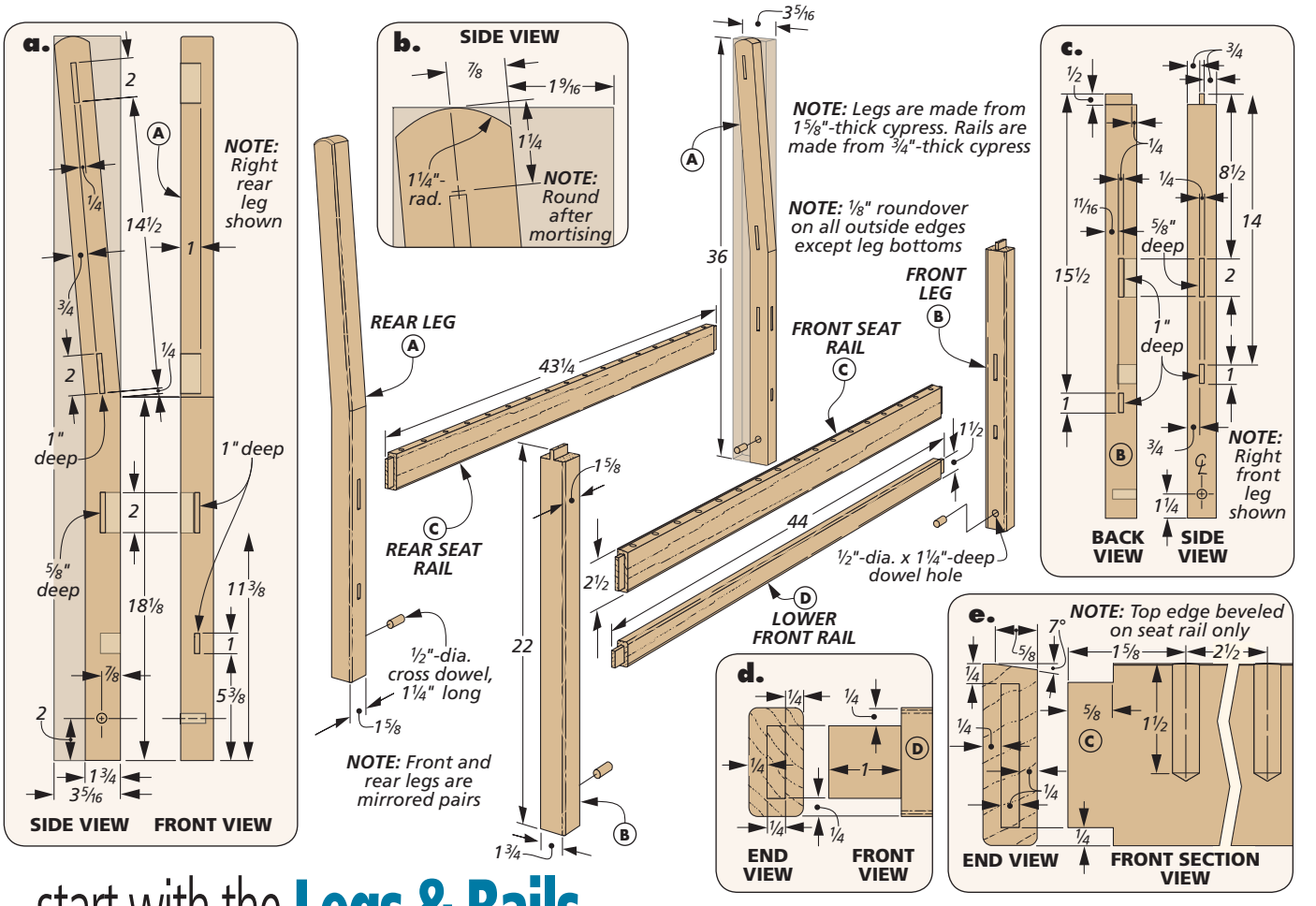
OVERALL DIMENSIONS:
48⅞"W x 36⅝"H x 35½"D



Easy-To-Make Slats. Shaped slats make for a comfortable seat. The ends are curved to avoid digging into the back of your legs as you rock. The slats are easy to form at the band saw.

GO 2 Online Extras

To download full-size patterns and to read more about working with cypress, go online to:
WoodsmithSpecials.com



start with the **Legs & Rails**

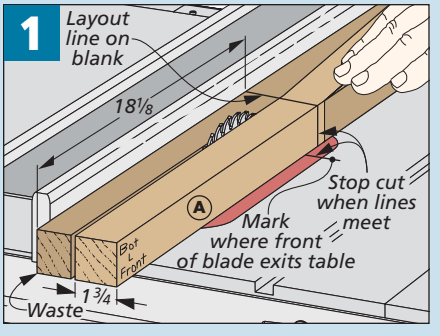
The construction of the rocker starts with the legs, seat rails, and lower front rail. But there's one thing I want to point out before you start: You won't assemble these components until after the seat and back are completed. For now, you'll just dry-assemble all of the parts to ensure a good fit.

REAR LEGS. All four legs are cut from stock planed to 1⅝" thick. The upper portion of the rear legs is angled. This tilts the back of the rocker for comfort.

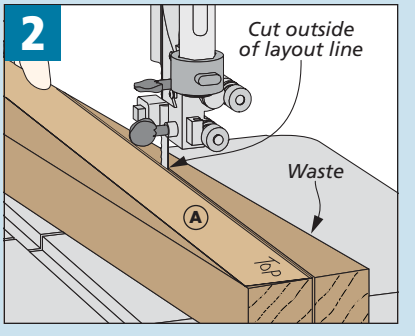
Detail 'a' above shows how the rear legs are cut from wide blanks. Some careful layout is in order here. You'll want to mark the top and bottom to keep the orientation correct as you cut the parts and lay out the mortises.

The box below shows the technique I used to ensure straight cuts. It starts by making a stopped cut at the table saw to define the width of the lower portion

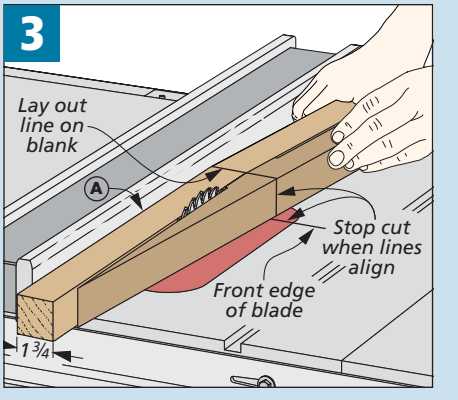
How-To: Cut Leg to Shape from Blank



First Cut. Mark where the blade exits the saw table. Then make a stopped cut to define the lower, straight portion.



Second Cut. Cut the inside face of the upper, angled portion at the band saw and then joint the face smooth.



Third Cut. Make another stopped cut to define the width of the top of the leg. Finish the cuts at the band saw.

of the leg. The second cut takes place at the band saw to cut the inside face of the upper, angled portion. After running this face across the jointer, head back to the table saw to make another stopped cut to define the final width of the upper portion of the leg. Complete both stopped cuts at the band saw to remove the waste. A little sanding creates a smooth transition.

FRONT LEGS. The front legs are easy to make. Cut them to width and form the tenon at the top end that will fit into a mortise in the arm of the rocker, as in Figure 1 at right. Be careful of the orientation here — the leg is 1⅝" wide across the front and 1¾" thick.

MORTISES. The legs require mortises to hold the rails, seat, and back. These are detailed in the drawings on the previous page and Figure 2 at right. Depending on the size of your drill press table, you may need to elevate the rear legs with a spacer to hold them level while drilling the front mortises.

CROSS DOWELS. The rockers are attached to the bottom ends of the legs. Screws don't hold well in end grain, so I added cross dowels for the screws to grab. Figure 3 shows how the holes are drilled.

Before moving on to the rails, round over the top end of the rear legs, as you can see in Figure 4. Then head to the router table to ease the edges.

A SET OF RAILS

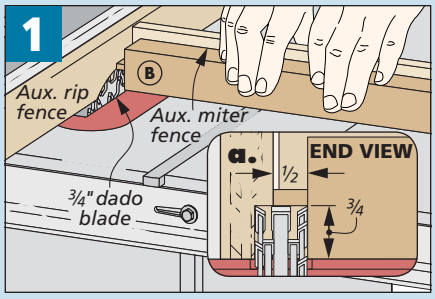
The two rails that hold the seat slats and the lower front rail follow a similar construction procedure at first. They all require a tenon on each end (Figures 5 and 6). Note that the overall size of the rails and tenon size differ between the lower front rail and the two seat rails.

DOWEL HOLES. Now focus your attention on the pair of seat rails. Each of the slats is held in place with a wedged dowel. You'll need 17 holes along the top edge of each seat rail (Figure 7). I placed the two rails side-by-side to lay out the hole locations.

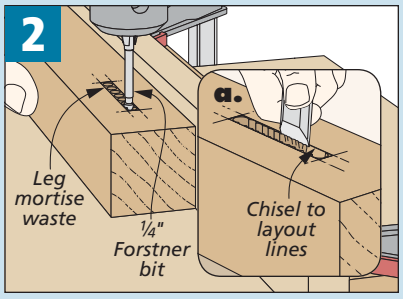
At the drill press, take time to adjust the fence to center the bit on the rail edges. A trick I use to do this is to lower the bit until it makes a dimple, then rotate the workpiece 180° and repeat the process until the dimples align.

BEVEL RIP. The final step is to slightly bevel the top edge of the front rail (Figure 8). This allows the curve on the seat slats to fit tightly against the rail.

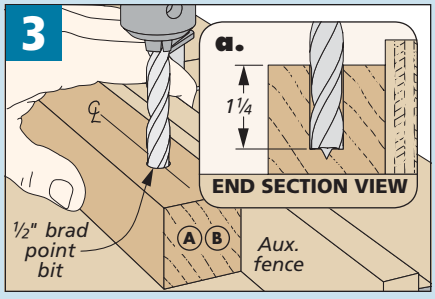
How-To: Tenons, Mortises & Dowel Holes



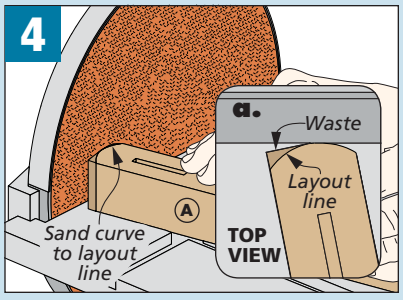
Short Tenon. The tenon at the top of each front leg helps to secure the arms of the rocker that you'll add later.



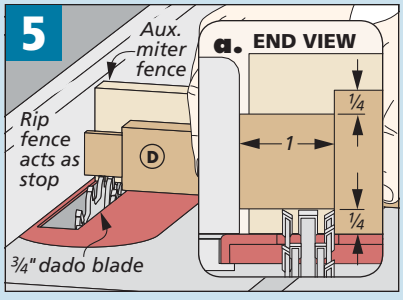
Making Mortises. Drill overlapping holes and then cleanly define the mortise with sharp chisels.



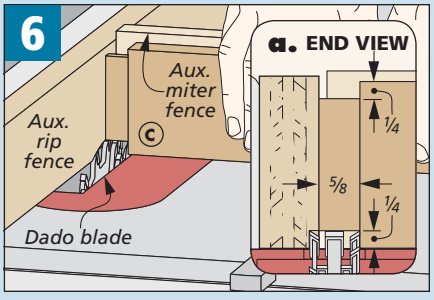
Cross Dowels. Each of the legs requires a hole for a dowel on the inside face. After drilling, glue the dowel in place.



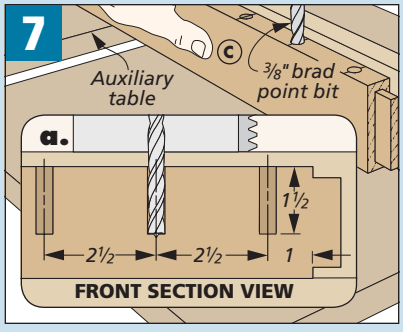
Smooth Shape. Lay out the curve at the top of the rear legs, then use the disk sander to shape them.



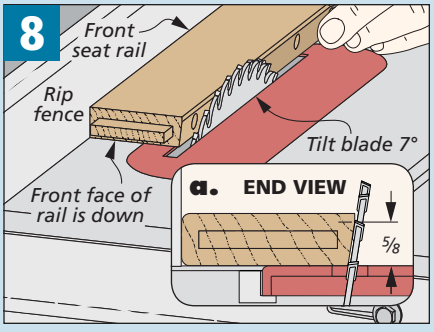
Lower Rail Tenons. The tenons on the lower front rail help add strength to the rocker assembly.



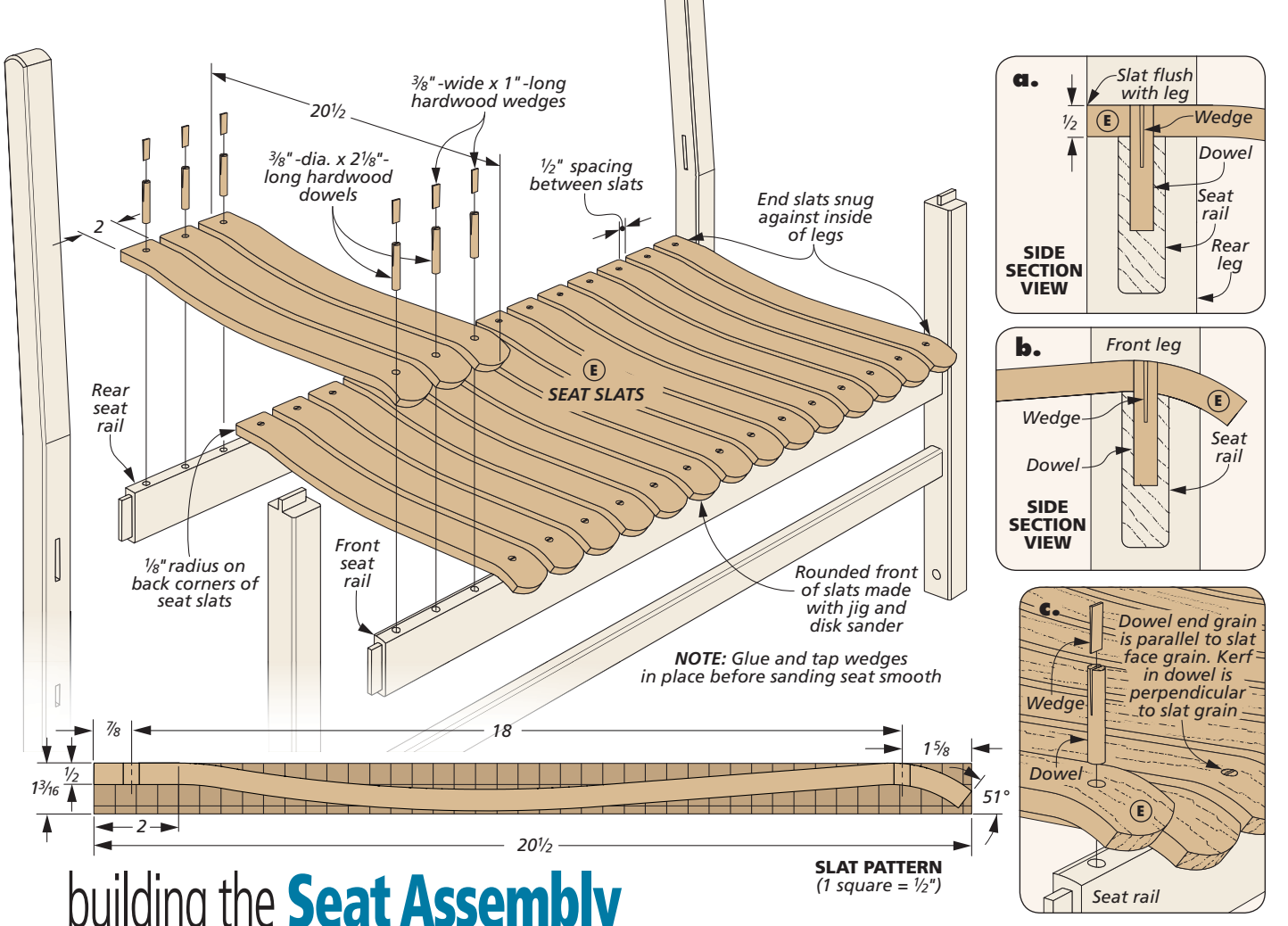
Tenons on Seat Rails. The tenons on the seat rails provide a strong connection to the legs of the rocker.



Dowel Holes. Carefully lay out and drill holes for dowels centered along the top edge of each seat rail.



Beveled Edge. To allow the curved seat slats to fit tightly to the front seat rail, rip a slight bevel along the top edge.



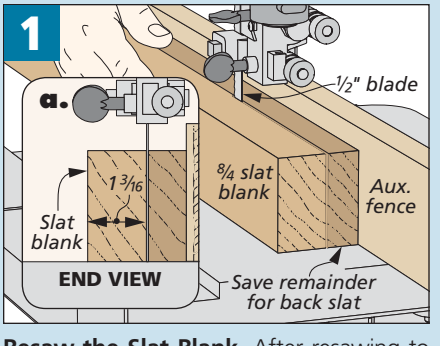
building the **Seat Assembly**

So far, you've made all of the parts that form the frame for the rocker. But before you can glue them up, you'll need to add a seat and back assembly. Most of this work happens at the band saw.

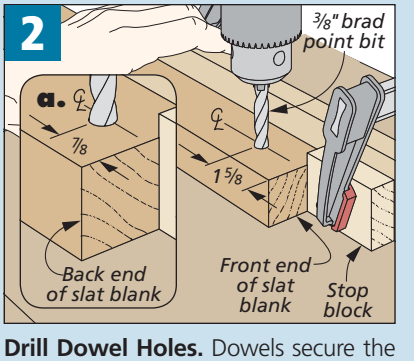
BAND SAW WORK. To make the seat slats, I started with 8/4 cypress blanks a little over 2¼" wide. From these blanks, resaw strips roughly 13/16" thick to create blanks for the curved seat slats (Figure 1 below). What's left over will be used later to make the slats for the back. Set those aside for now.

Rip each of the seat slats to their final width and then lay out the hole locations at each end of the blank (details 'a' and 'b' and slat pattern above). Each of the slats will be secured to the rails with a pair of wedged dowels. It's important that the holes for these dowels be drilled accurately so everything fits well during glueup. For this reason, I used stop blocks

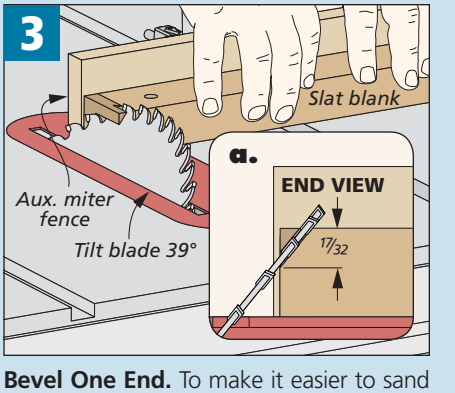
How-To: Prepare Seat Slat Blank



Resaw the Slat Blank. After resawing to create the blank for the seat slat, save the remainder for the back slat.



Drill Dowel Holes. Dowels secure the slat to the seat rails and also hold the blanks on the jigs used to form the slat.



Bevel One End. To make it easier to sand the rounded end of the slat later, cut a small bevel on each blank.

on the fence to accurately position the holes on each of the blanks, as shown in Figure 2 on the previous page.

The next step is to cut a bevel on one end of each blank, as in Figure 3, previous page. This makes it easier to round over the end of the slat after it's cut to shape.

SHAPING JIGS. Shaping the seat slats comes next. Figures 1 through 3 at right show a couple of jigs I made to lend a hand with this task. You can read more about them in our Online Extra article.

Before you can do any shaping, make a ¼"-thick hardboard template to trace the side profile onto the blank. The slat pattern is illustrated on the previous page. A full-size pattern can be downloaded online from *WoodsmithSpecials.com*.

Figure 1 illustrates how a two-sided holding jig secures the slat blank on a pair of dowels. After cutting what will become the top side of the slat, move the blank to the opposite side of the jig. Cut the bottom profile of the slat before sanding it smooth with the same jig (Figure 2).

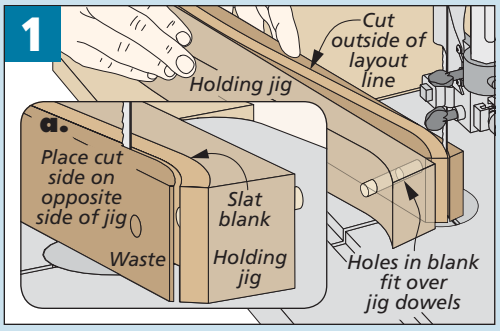
SANDING JIG. Another handy jig is one that helps hold the slat at the proper angle to shape the front end (Figure 3). The slat is held in place with dowels. After marking the curved profile using a posterboard pattern, I used a disc sander to sand to the line. See the Online Extra to learn more about the pattern and jig.

DOWELS & WEDGES. To secure the slats to the seat rails, I used dowels with wedges. The jig shown in Figure 4 is used to both cut the dowels to length and create the slots for the wedges (Figure 5). Take care to orient the dowel to cut the slot perpendicular to the grain. This helps to avoid splitting the dowel when inserting the wedge.

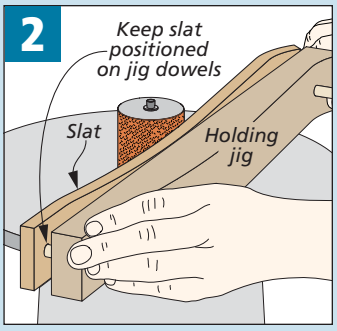
To make the wedges, I cut angled slots in a piece of maple with the grain oriented vertically, as illustrated in Figure 6. After cutting the strips, score the cut lines with a knife and snap the wedges free.

SLAT ASSEMBLY. Finally, you're ready to install the slats onto the seat rails. I used a jig to hold the rails secure during the process. You can find out more details about the jig at *WoodsmithSpecials.com*. When gluing the dowels, orient the slot parallel to the rails to avoid splitting the slats (Figure 7 and detail 'c'). Then glue and tap the wedges in place before sanding the entire surface of the seat smooth.

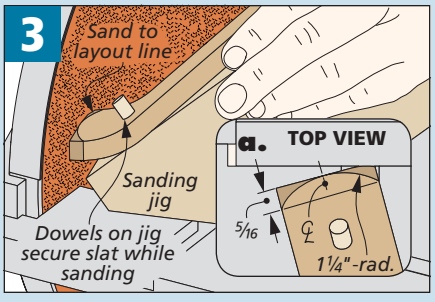
How-To: Profile Slats & Assemble the Seat



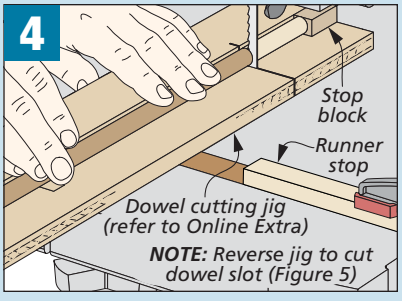
Band Saw Work. Use a holding jig to guide the slat blank when cutting each side of the slat to the profile lines that define the shape.



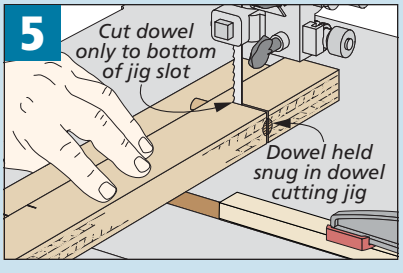
Smoothing. A spindle sander is ideal for smoothing the top and bottom of each slat.



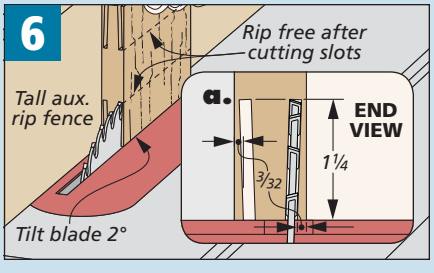
Rounded Ends. Use a jig to hold the slat at the proper angle to round over the end at the disc sander.



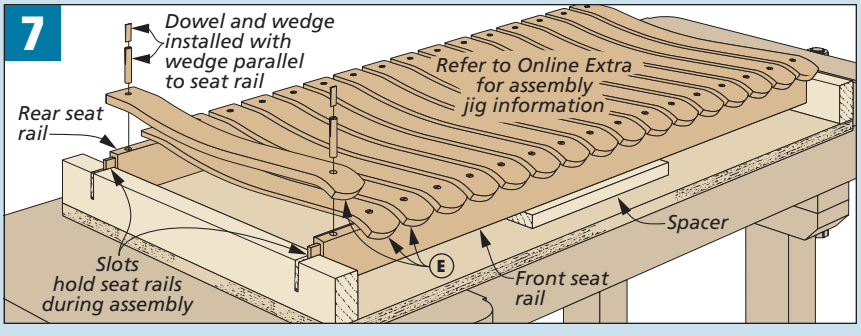
Cut & Slot Dowels. One jig takes care of cutting dowels to length and creating a slot for the wedges.



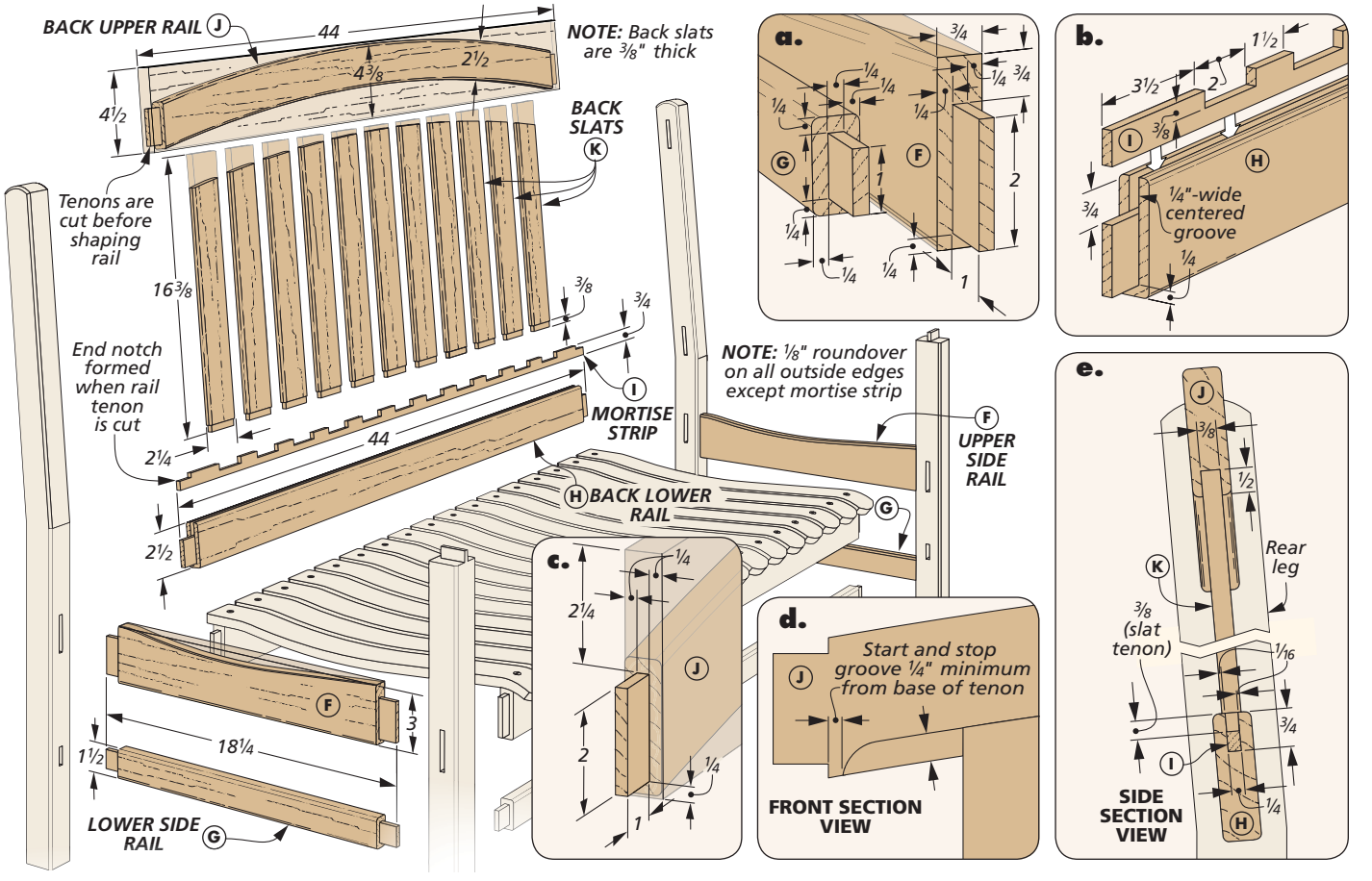
Grain Orientation. Cut the slot perpendicular to the grain direction on the end of the dowel.



Wedge Blanks. Cut angled slots in a blank first, then rip the strips free before trimming the wedges to width.



Seat Assembly. A simple assembly jig cradles the seat rails as you install the slats. Add glue to the hole in the seat rail and orient the slot on the wedges parallel to the rail while tapping them in place. Secure the wedges with glue.

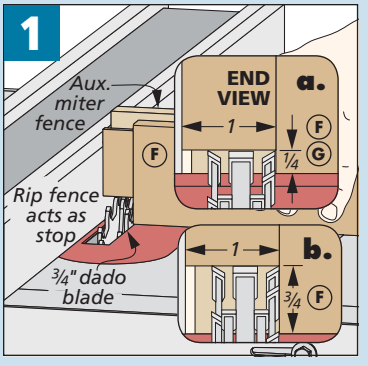


add the **Back & Side Rail Assemblies**

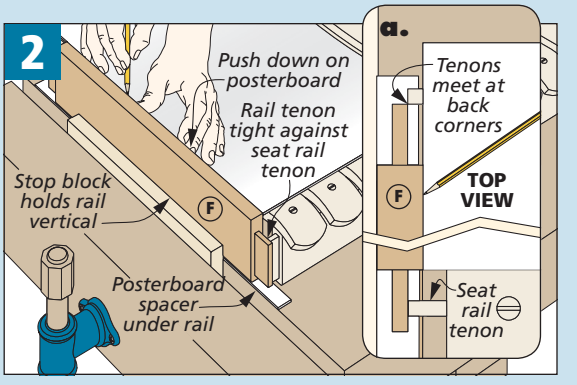
Connecting the front and rear legs of the rocker with a pair of rails comes next. Then you'll work on making the seat back. The back and the seat you just completed are the two main structures that connect the leg assemblies. Once these are done, you'll be ready to assemble the main components of the rocker.

SIDE RAILS. Looking at the drawings above, you'll see the two side rails that connect the front and rear legs. The upper rail has a profile along the top edge that aligns with the slat contour. The box below steps you through the process of making the upper rails. First, you'll cut the tenons on the ends of the upper rails at the table saw. To mark the seat profile on the side of the rail, position it against the seat assembly (Figure 2).

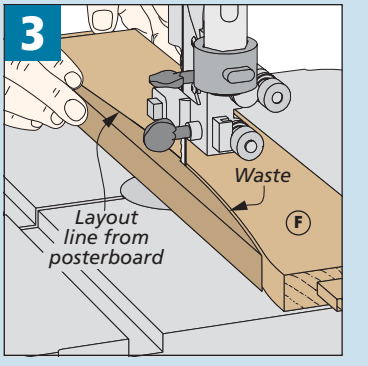
How-To: Make the Upper Side Rails



Tenons. Start by cutting the side rail tenons. Note that the tenons on the upper rail are offset.



Inexpensive Template Trick. To conform to the shape of the seat slats, use a piece of posterboard. Trace the slat profile onto the upper rail.



Cutting to Shape. Trim the upper rail to shape and then sand the profile smooth.

I used a piece of posterboard placed on the slats to serve as a guide to transfer the profile to the rail. Cut the profile at the band saw (Figure 3) and then round over the edges.

LOWER SIDE RAIL. The lower side rail is simple by comparison. All you do here is cut the tenons on each end and round over the edges.

LEG ASSEMBLIES. At this point, you can glue the side rails to their respective front and rear legs. This creates two end assemblies.

SEAT BACK ASSEMBLY

The How-To box on the right provides the details on creating the seat back for the rocker. The lower rail has a groove along the top edge that houses a mortise strip (Figure 1). This strip is simply notched to form mortises that secure the bottom end of the back slats (Figure 2). I cut the tenons on the ends of the rail after the mortise strip was glued in place.

CURVED RAIL. The curved upper back rail starts out as a wide blank. The first step is to cut a tenon on each end, as in Figure 3. I used a strip of hardboard to lay out the curves before cutting the rail to shape at the band saw (Figures 4 and 5).

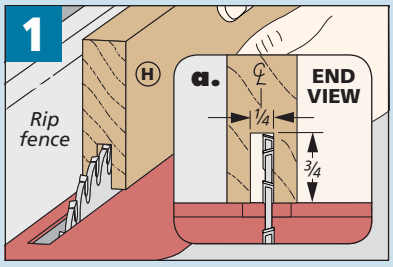
I cut a groove in the bottom edge of the upper rail to secure the upper end of the back slats. Figure 6 shows how a slot cutter in the router table is ideal for this task. Rout the slot in two passes, flipping the workpiece between passes to center the slot.

BACK SLATS. The slats for the seat back are made from ⅜"-thick stock. They're cut extra long so you can trim them later to match the curve in the upper rail. Cut a tenon on one end of each slat to fit the mortises in the bottom rail (detail 'e').

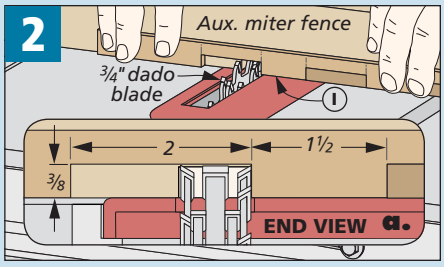
ONE MORE ASSEMBLY JIG. To help align the slats and rails during glue-up, I made a simple assembly jig (Figure 7). You can see in Figure 7a how a 7/16"-thick spacer positions the upper rail to serve as a guide to mark the curved cut lines at the top of each of the slats. This accounts for the extra length needed to glue the slats into the groove in the upper rail. Then you can step over to the band saw to cut each slat to length.

Before gluing up the back assembly, remove the spacers from the jig. Add glue in each mortise in the lower rail and at the top of the slats before clamping. Once the glue dries, dry-fit the seat and back assemblies to the leg assemblies to check the fit before applying glue and clamps.

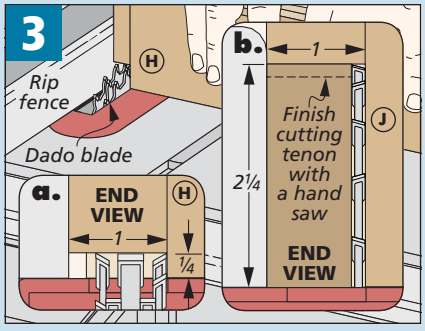
How-To: Create the Seat Back Assembly



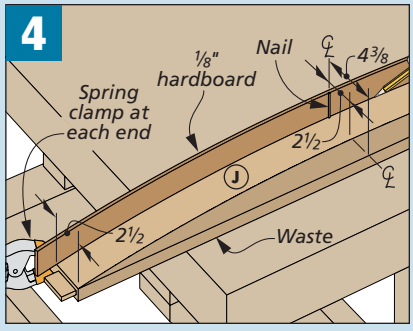
Centered Groove. To center the groove, make two passes, flipping the workpiece between passes.



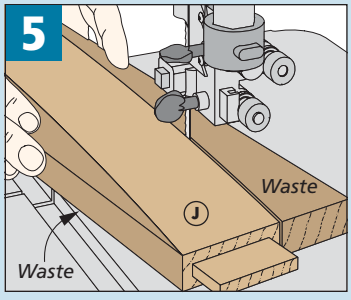
Notched Mortise Strip. Carefully lay out the notches before removing the waste with a wide dado blade.



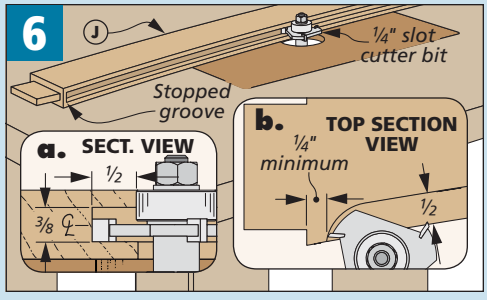
Tenons. Cut the tenons on the upper and lower back rails. Finish the tenon on the upper rail with a hand saw.



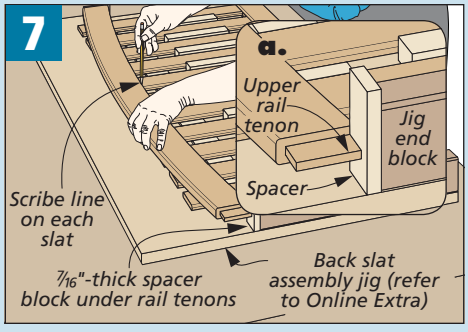
Curved Rail. Use a strip of hardboard to lay out the curves at the top and bottom edges of the upper rail.



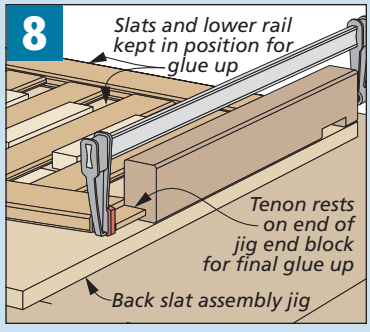
Cut & Sand. Cut the upper rail to shape at the band saw and then sand the curves smooth.



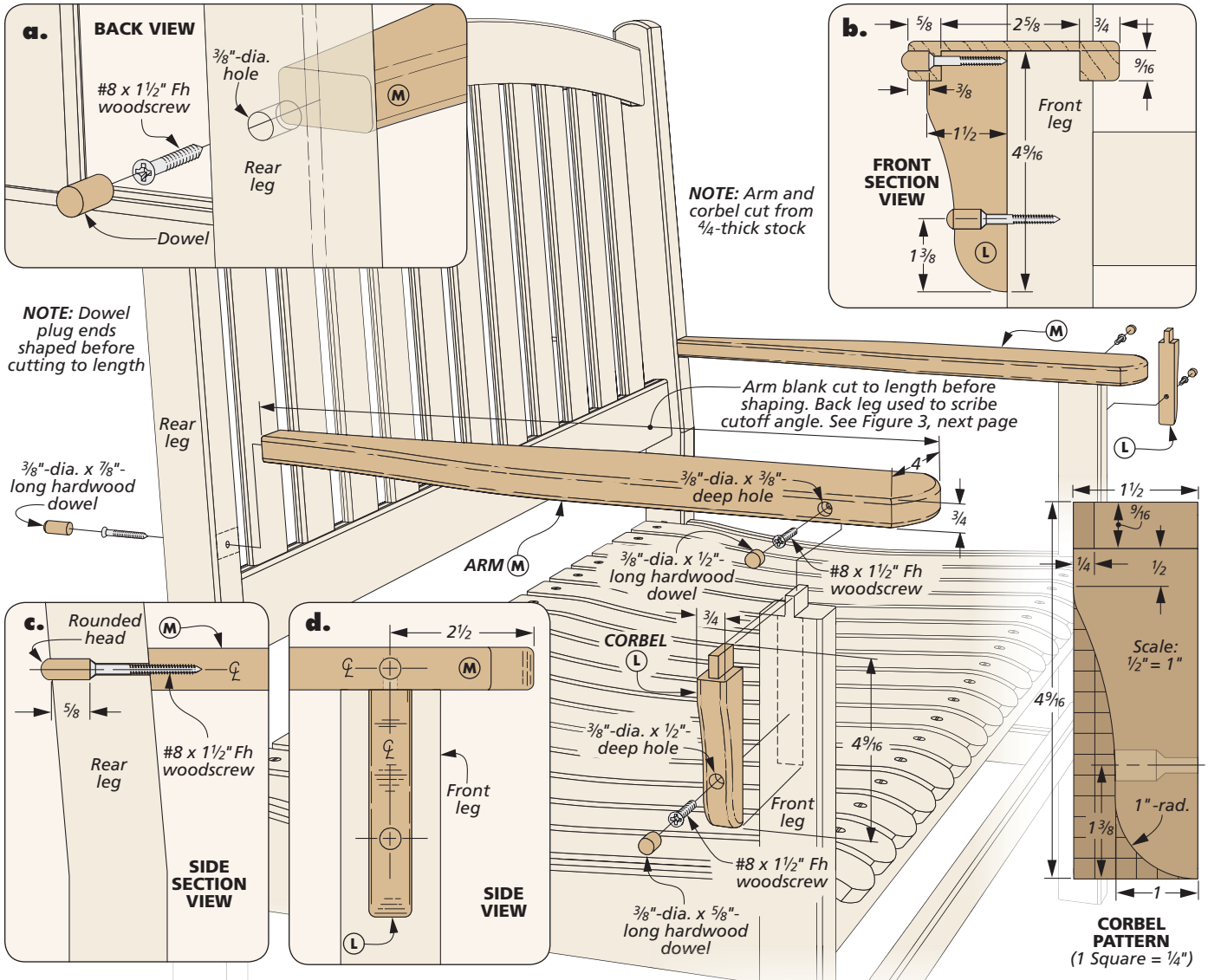
Cutting a Curved Groove. Make two passes with a slot cutter to create a centered groove. Flip the workpiece between passes.



Scribing. Use the upper rail as a guide to mark the cut lines on the back slats. Use a spacer to correctly position the rail.



Assembly. The assembly jig properly spaces the rails and slats to aid glueup and clamping.



shape & add the **Arms & Corbels**

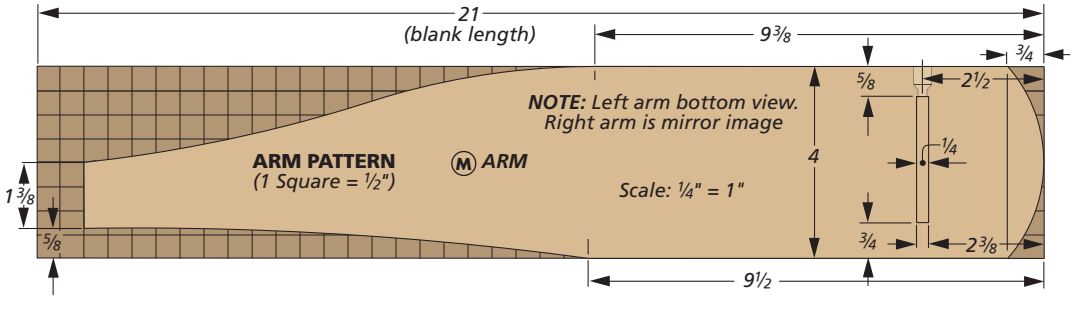
The main structure of the rocker is complete. Now you're ready to finish up by adding the arms, corbels, and rockers.

WIDE, SHAPED ARMS. The arms for the rocker are extra wide. But cutting them to shape is done after the joinery is cut. You'll also need to cut the blanks to length to fit the rocker before heading over to the band saw.

The pattern below shows how the blank is cut to width but left a little long. This is so you can scribe the cut line at the seat back for a perfect fit.

REINFORCED MORTISES. Figure 1 on the next page shows how to cut a mortise on the bottom face of each arm blank. This matches up with the tenon on the top of the front leg. A tenon on the corbel also fits into this mortise to provide additional strength. Then, to reinforce this connection, drill a counterbored hole on the outer edge of the arm for a screw and plug you'll add when installing the finished arm on the rocker (Figure 2).

CUTTING & SHAPING THE ARM. Figure 3 gives you an idea on how to cut the back end of the arm to fit the angle of the seat back. The important things to keep in mind is that the mortise should align with the tenon on the leg and the arm should be square to the leg. To accomplish this last goal, I used a couple of spacers to support the front and back ends of the arm. Then it's a simple matter of scribing the line where the arm and seat back intersect. Use this line as a guide to set the angle of the saw blade before cutting each of the blanks to length. You can see this illustrated in Figure 4 on the next page.



While you have the arm positioned, project a centerline from the edge of the arm around the back of the seat back. Drill a counterbored hole for the screw and plug used to secure the arm, as shown in detail 'c' on the previous page. Keep the bit parallel with the arm as you drill through the seat back.

SHAPING AT THE BAND SAW. A little band saw work is required to cut the arms to the final shape shown in the pattern at the bottom of the previous page. The technique I used was to stack the parts with the mortises facing out. Double-sided tape keeps the blanks from slipping as you cut out the shape.

There's another technique you could call on, especially if you're making more than one rocker. And that's to use a template at the band saw. For more on this technique, see the Online Extra article.

All that's left to do on the arms is sand and round over the edges. You don't need to round the edges where the arm connects to the seat back. I held off on attaching the arms until the corbels were made and in place.

CORBELS. A corbel on the outside face of each front leg provides additional bearing surface for the wide arms. Figure 6 provides the details for cutting the tenon on the blank.

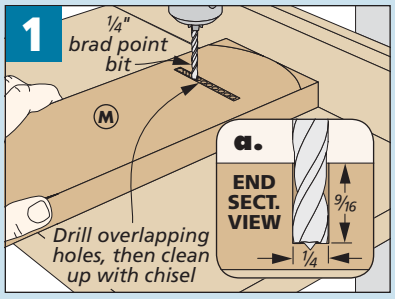
Shaping the corbels follows along the same lines as the arms: Drill a counterbored hole for a screw and plug, stack the parts, and cut them to shape (Figure 7). Sand them smooth before rounding over the outside edges.

ARM ASSEMBLY. With the arms and corbels at hand, now is a good time to dry-fit the parts. This is your last chance to make sure the arms seat all the way on the tenons on the legs and corbels. After making any necessary adjustments, attach the corbels to the front legs using glue and screws. Use the arm to help locate and hold the corbel in position as you drive the screw through the edge.

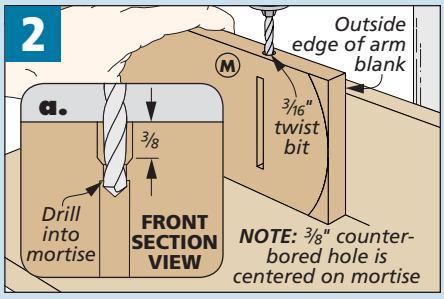
Secure the arm to the front leg and corbel with glue and drive the screw through the outside edge to secure it. And you can fasten the back of the arm with a screw through the seat back.

The last step is to plug the screw holes. Figure 8 shows how I rounded over the plug ends with a sanding block before cutting them to length.

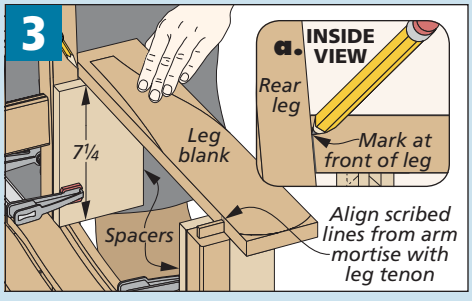
How-To: Shape the Arms, Corbels & Dowels



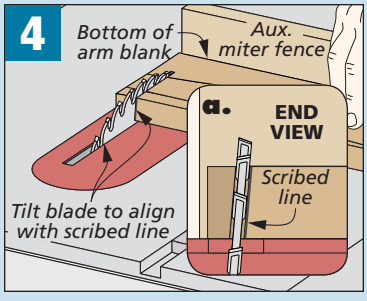
Mortises. Cut mortises in the bottom face of each arm to fit over the tenon on the legs and corbels.



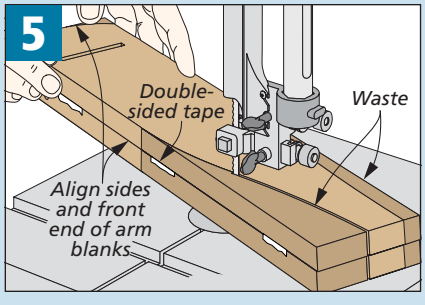
Reinforcement. A screw adds strength to the joint. Drill a counterbored hole in the edge for the screw and plug.



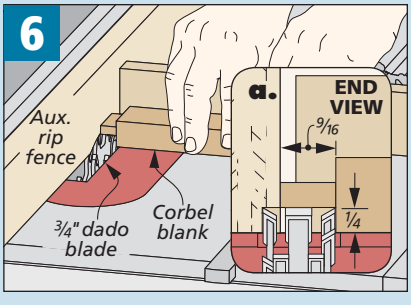
Scribing the Length. Support the arm on a couple of spacers before scribing the cut line at the back of the arm.



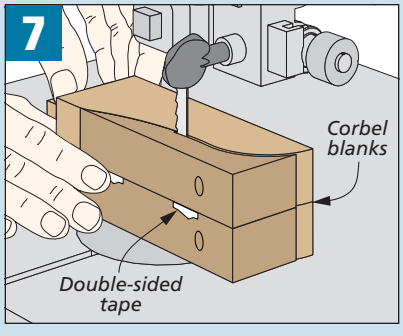
Cut to Length. Use the scribed lines as a guide to cut the arm to final length at the table saw.



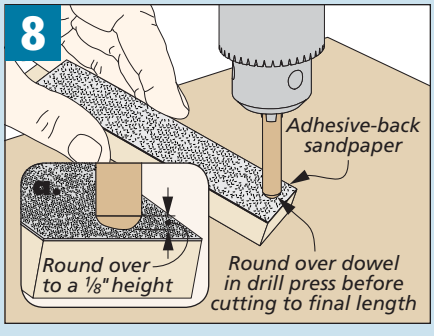
Shaping. Fasten the parts together with double-sided tape (with mortises facing out), and then cut to shape.



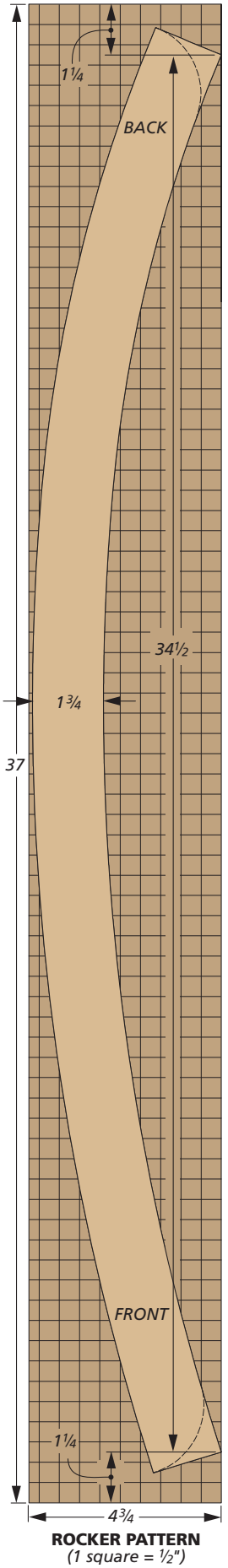
Corbel Tenons. Cut the corbel blanks to final size then cut the tenon on the end to fit the mortise in the arm.



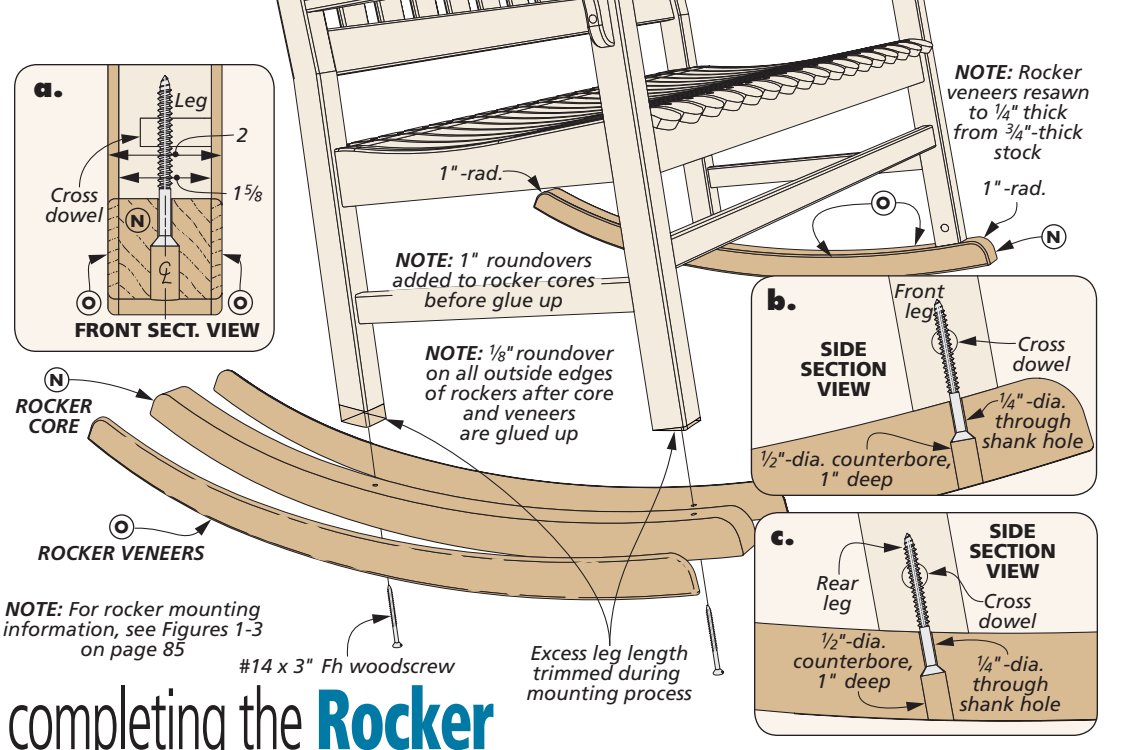
Shaping the Corbels. After drilling the counterbored screw holes, stack the parts to cut them to shape.



Rounded Plugs. Chuck an extra-long piece of dowel in the drill press to shape the end with files and sandpaper.



ROCKER PATTERN
(1 square = ½")



completing the **Rocker**

If building this rocker were a race, you'd be rounding the final curve, so to speak. All that's left to do is add the most important parts — a pair of rockers.

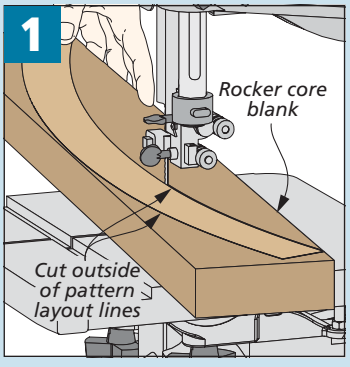
LAYERED CONSTRUCTION. The first thing you'll notice in the drawing above is that each rocker is made up of a core layer and two outside veneer layers. Adding the veneer layers helps strengthen the rocker. I purposely cut the veneers with a slightly different grain direction than the main rocker core. This, plus the glue, reinforces the rocker "sandwich."

CUTTING & ASSEMBLING THE PARTS. The rocker core and veneers are both cut from wide blanks using the pattern at left. But there's one thing I need to point out. The shape of the rocker isn't a symmetrical curve. There is a front and back, so it's helpful to mark the ends so you'll be sure to install them in the proper orientation later.

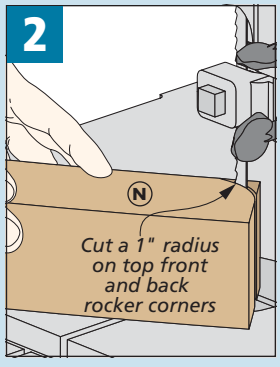
Figures 1 through 3 below illustrate the basics of the rocker construction. After cutting the core to shape and sanding it smooth, I resawed the veneers about ¼" thick. You'll joint them to their final 3/16" thickness after they're glued to the rocker core. When cutting the veneers to shape, leave a generous amount outside the cut line. This allows you some wiggle room when gluing the veneer to the core. The excess will be trimmed at the router table after they're glued to the core.

I glued the two veneer layers to the core with the rough, band-sawn face out. A couple passes over the jointer smooths the faces of the veneers before

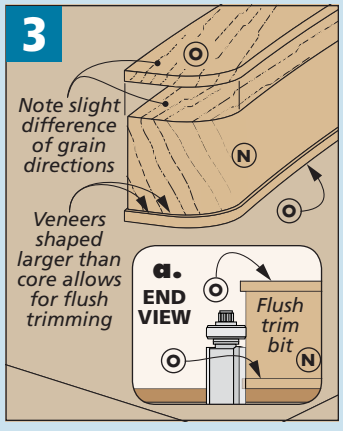
How-To: Build the Rockers



Rocker Shaping. Cut the rocker core and veneer to shape at the band saw.



Rounded Ends. Cut a 1" radius at each end and then sand the core smooth.



Apply Veneer. Glue the veneer with the rough side out then joint and trim smooth.

you trim them flush at the router table. The next task is to form the ⅛" roundover on all the edges.

ROCKER INSTALLATION. Attaching the rockers to the legs involves some hand work to get a good fit. The How-To box at right provides some guidelines to help you out along the way.

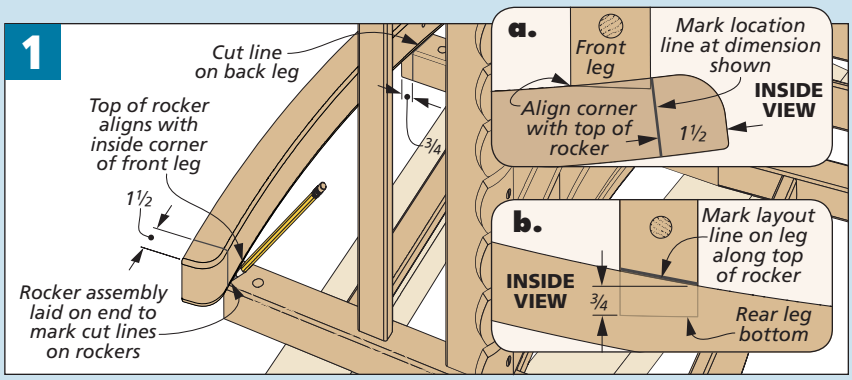
DEFINING THE CUT LINES. The end of each of the legs will be cut to conform to the shape of the rocker. In order to establish the guidelines, turn the rocker assembly on end and lay the rocker on the legs, as shown in Figure 1. It's important to position the rockers identically and according to the dimensions shown so that the rocking motion is smooth and consistent.

Shaping the legs is your next task. For this, I used a combination of hand saws, files, rasps, and sandpaper. Use the rocker to check the fit occasionally. Once you're satisfied, you can move on to marking the locations for the screws.

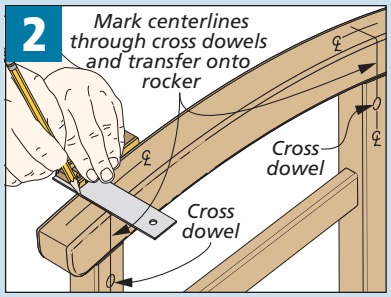
ATTACHING THE ROCKERS. Figures 2 and 3 at right show how I marked the locations for the screws. Project a centerline from the cross dowel to the bottom of the leg. Continue this line across the side and bottom of the rocker. Then strike a line to locate the midline of the rocker.

Use a hand drill to create a pilot hole through the rocker into the end of the leg. Try to keep the bit aligned with the leg's centerline. This ensures the screw engages the cross dowel to provide additional strength to the joint, as illustrated in Figure 3 above.

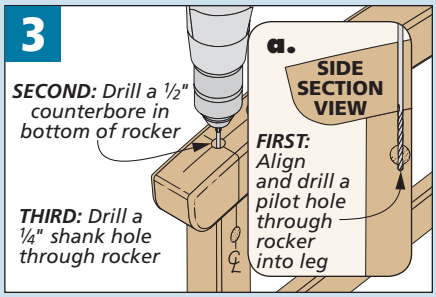
How-To: Install the Rockers



Positioning the Rockers. Using the dimensions shown, place the rockers on the legs to serve as a template for marking cut lines. Cut and shape the legs to the lines to conform to the rocker's curve, using the rockers to check your progress.



Locating Screw Holes. Mark the centerlines along the leg and rocker to find the centerpoint for drilling.



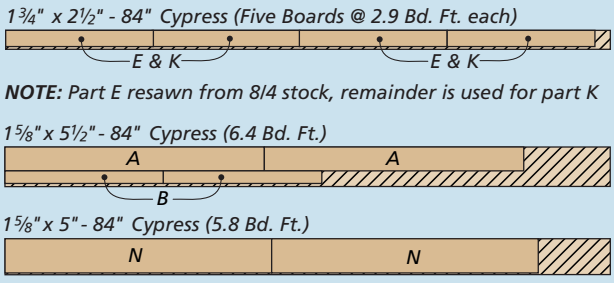
Drilling. Keep the drill bit aligned with the centerline of the leg to ensure the screw fully engages the dowel.

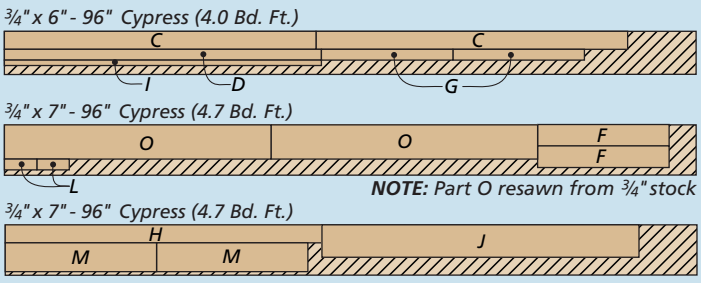
Now you can remove the rockers and drill the pilot holes to final depth. Replace the bit to drill the counterbores in the bottom of the rockers. Then you drill shank holes in the rockers for the screws.

To provide lasting protection for the rocker, I applied a couple coats of oil (refer to Sources, page 98). Then you can enlist some help to carry the rocker to the front porch and relax with a cold beverage.

MATERIALS, SUPPLIES & CUTTING DIAGRAM

A	Rear Legs (2)	1⅝ x 3 5/16 - 36	**H**	Back Lower Rail (1)	¾ x 2½ - 44	**O**	Rocker Veneer (4)	3/16 x 4¾ - 37 rgh.
B	Front Legs (2)	1⅝ x 1¾ - 22	**I**	Mortise Strip (1)	¼ x ¾ - 44			
C	Seat Rails (2)	¾ x 2½ - 43¼	**J**	Back Upper Rail (1)	¾ x 4½ - 44	•	(3) ⅜"-dia. x 36" Dowel	
D	Lower Front Rail (1)	¾ x 1½ - 44	**K**	Back Slats (11)	⅜ x 2¼ - 16⅜	•	(1) ½"-dia. x 12" rgh. Dowel	
E	Seat Slats (17)	1 3/16 - 2 x 20½	**L**	Corbels (2)	¾ x 1½ - 4 9/16	•	(6) #8 x 1½" Fh Woodscrews	
F	Upper Side Rails (2)	¾ x 3 - 18¼	**M**	Arms (2)	¾ x 4 - 21 rgh.	•	(1) ¾" x 6" - 4" Hardwood Wedge Blank	
G	Lower Side Rails (2)	¾ x 1½ - 18¼	**N**	Rocker Cores (2)	1⅝ x 4¾ - 37 rgh.	•	(4) #14 x 3" Fh Woodscrews	





mitered Frame & Easel

Your favorite photograph or piece of artwork will look great in this easy-to-build frame resting on a classic, adjustable easel.

Treasured photographs and artwork deserve a distinctive place in any home. And this mitered frame and easel combination makes a great place to display those cherished gems.

This project is pretty simple to build. There's no complicated joinery because both the base and the frame are built up from three separate components. The easel is nothing more than a three-tiered base with a support and clamp added to hold the frame in place. The individual components are chamfered to add to the form and character of the easel.

The two-layer frame is built by gluing the facing to a backer board and then adding profiled trim around the edges. I made the facing and the trim out of contrasting woods and chamfered the edges to add character.

There are several size options for this project — one for 8x10 photos and one for 5x7 photos. I've featured the 8x10 frame throughout this article, but I've also included the dimensions for a 5x7 version in the cutting diagram on page 89.

You can also build a set for an 11x14 photo or piece of art. The cutting diagram and materials list can be found at *WoodsmithSpecials.com*.

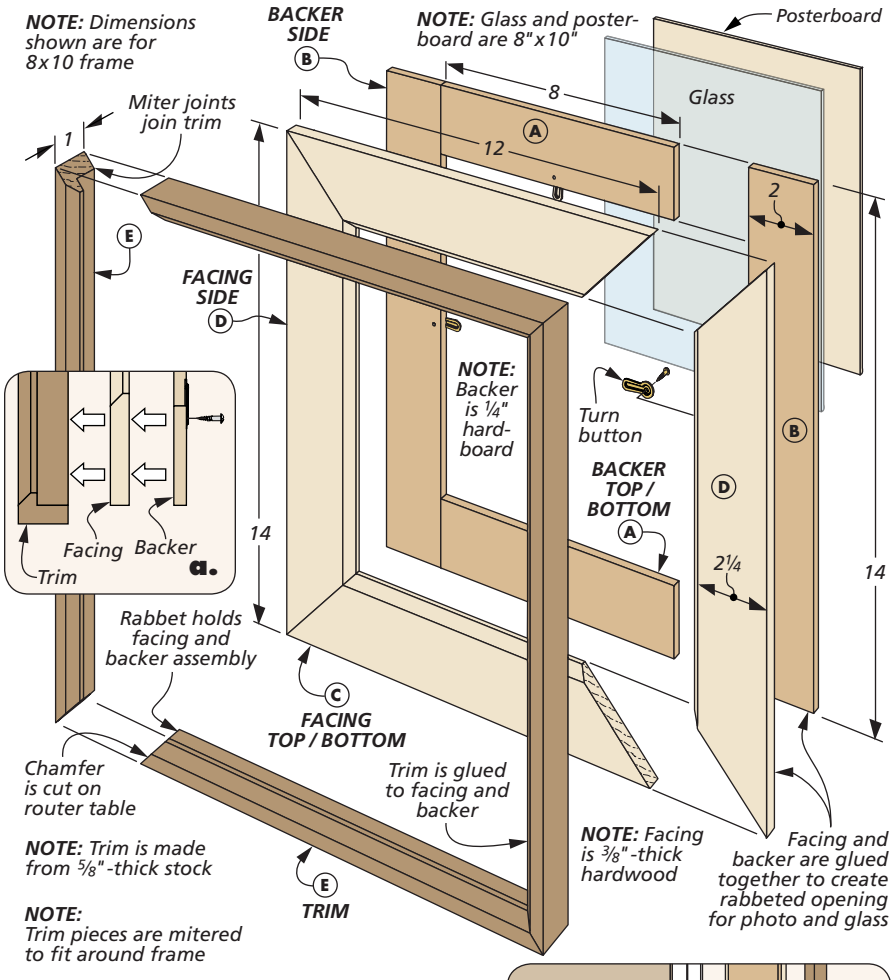
building the **Frame**

Building the frame for the frame and easel duo is pretty straightforward. To keep it simple, I eliminated the need for splines on the mitered corners by gluing the facing to a backer and then mitering the trim around the assembly. The trim has a rabbeted edge that fits tight against the facing and backer.

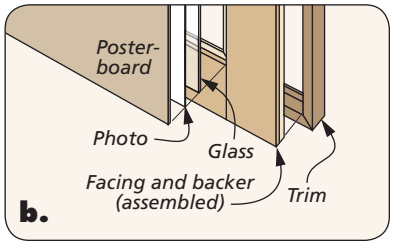
BACKER & FACING. The backer and the facing are sandwiched together. The backer is ¼" narrower than the facing. That way, when they are glued together, they form a rabbet to hold the glass and the photograph or artwork in the frame.

The backer pieces are cut to size and fit with butt joints (main drawing). The facing has mitered joints and a chamfer on the inside edge. I cut the facing to width and rough length and then routed the chamfered edge (How-To box below). The facing can be mitered to length and glued together onto the backer, as shown in detail 'a.'

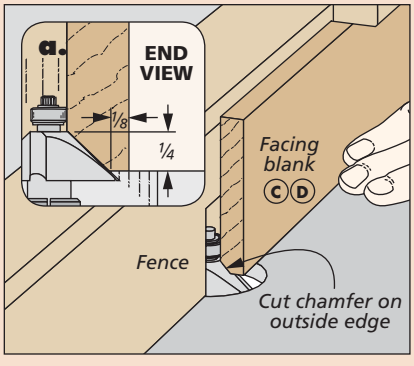
TRIM. The rabbeted trim fits around the facing and backer and has a chamfer on the inside front edge (main drawing). Again, it's easiest to do this work before the pieces are cut to length, as shown in the two right drawings in the box below. I ripped an extra-long workpiece to width for all four sides of the trim. You can rout the chamfer on one edge of the workpiece and then cut the rabbet on the table saw. Finally, just miter the pieces to length and glue them to the backer and facing edges.



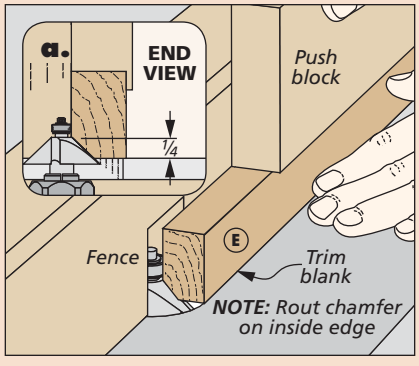
DETAILS. To finish up the frame portion of this project, add a piece of glass to the opening. I cut a piece of posterboard to back the photo (detail 'b'). Turn buttons along each edge of the backer will keep the backing and your photographs in place.



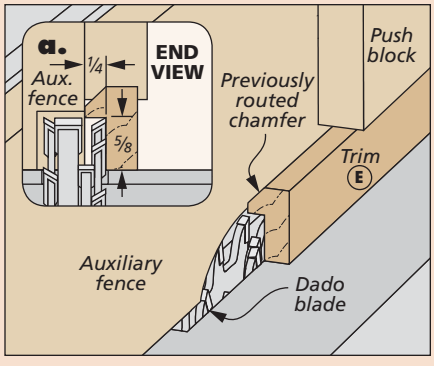
How-To: Shape the Frame Components



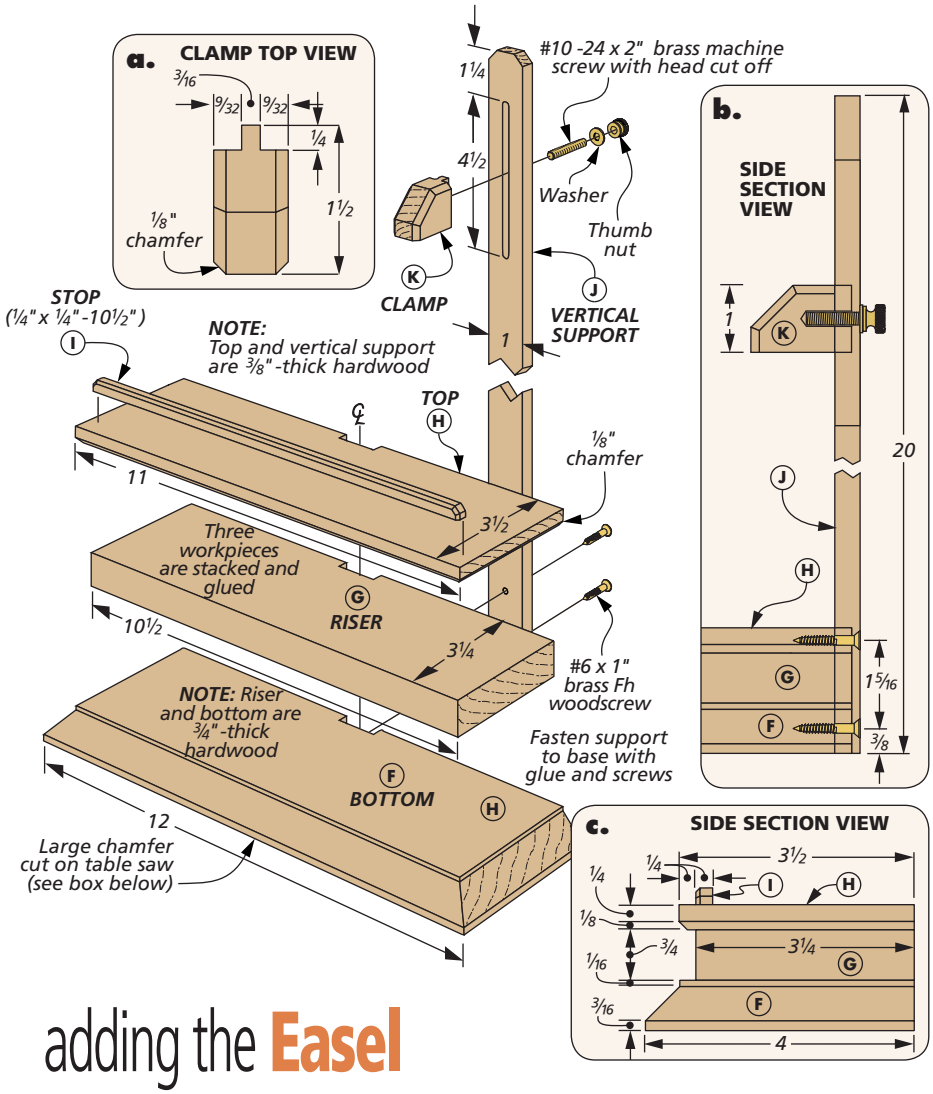
Facing Chamfer. You'll find that it's easiest to rout the chamfer on the facing blanks before mitering the pieces to length.



Chamfer. To make the trim for the frame, you can start by routing a chamfer on the outside edge of an extra-long blank.



Rabbet. Cut the rabbet on the inside edge of the trim on the table saw using a dado blade buried in an auxiliary fence.



adding the Easel

The easel consists of a base and a vertical support that holds a sliding lock to secure the frame in position. The base is assembled from three hardwood blocks — each with a different edge profile. This adds weight and an intricate profile to the easel. A dado in the back of the base holds the vertical support.

BOTTOM. The bottom of the base has a chamfer with a shoulder at the top. Cut the shoulder and the chamfer on the table saw. The How-To box shows the steps.

To define the shoulder, I cut a 1/16"-deep kerf in three sides of the top face. Then, I set the saw blade at 45° and cut the chamfer on the edges of the bottom.

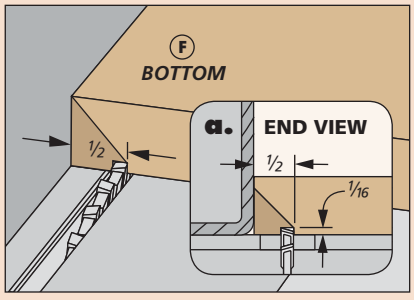
RISER & TOP. The riser in the center of the base is a rectangular workpiece cut to size with the edges left square. The top piece has a 1/4" chamfer on the bottom edge. After this workpiece is cut to size, you can rout the chamfer.

BEGIN ASSEMBLY. Once you have the three base pieces cut and shaped, you can glue them up. Assemble the pieces so they're centered from side to side but flush at the back edge. A few cut-off brads inserted in both faces of the riser will help hold the bottom and top in place as you apply the clamps for glueup. After the glue dries, you can cut the notch on the back of the base for the vertical support.

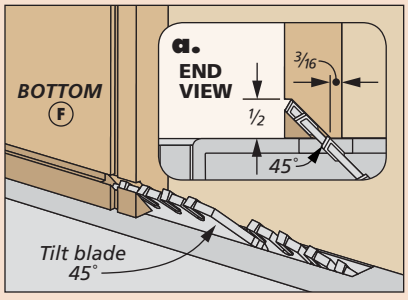
STOP. A stop on the front of the base keeps the frame from slipping off. It's a narrow piece with trimmed corners and chamfers along the edges. Because the finished piece is so small, I cut the profiles on an extra-wide blank. Just miter the corners first. Then, take the workpiece over to the router table to rout the chamfers on the edges. Finally, rip the stop free from the waste.

VERTICAL SUPPORT. At this point, the vertical support for the frame is ripped to width to fit the notch you cut earlier. The miters on the top corners of the support are cut on the table saw. After that, it's just a matter of cutting the slot to hold the clamp and drilling pilot holes for the mounting screws in the back.

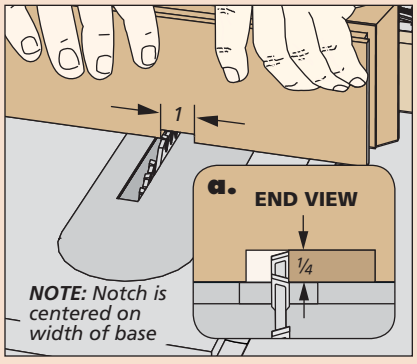
How-To: Shaping the Base



First. To shape the chamfer on the table saw, I started by cutting a kerf 1/2" from the edge on three sides of the workpiece.



Second. To complete the chamfer, you need to tilt the blade 45° and raise it to meet the kerf. Then, cut off the waste.



Notch. The notch in the base that holds the vertical support should be cut after the three layers of the base are glued up.

The slot in the support can be made on the router table. For more information, go to *WoodsmithSpecials.com*. Two screws hold the support to the base (detail 'b').

FRAME CLAMP. The frame clamp is a small piece with several short cuts and chamfers, so again, it's easier to work with an oversized blank. I cut the blank to width this time and then cut a bevel on the end of the piece. Once you've completed this, you'll need to go back to the router table to rout the chamfers on the edges. Then you can cut 9/32"-deep notches at the back of the clamp to form a tongue. Finally, cut the clamp free at the table saw. There's more information in the How-To box below.

You'll need to drill a hole through the middle of the tongue on the clamp to hold the screw that attaches it to the support. This may seem like it could be a challenge, but take a look at the photo below for an easy way to do this.

FINISH ASSEMBLY. The clamp is fitted with a cut-off 10-24 brass machine screw. Cut the screw to 1½". A bit of epoxy on the end of the screw holds it in place in the clamp. Then, add a washer and a brass thumb nut (main drawing).

FINAL DETAILS. The easel is designed to hold the frame either horizontally or vertically, depending on your photo or artwork. All you need to do now is to decide which of your photos or artwork to display.

Since the clamp is a small piece and needs to be drilled precisely, secure it to the drill press table using a handscrew.

GO 2 Online Extras

For information on making the slot in the support, go to:
WoodsmithSpecials.com

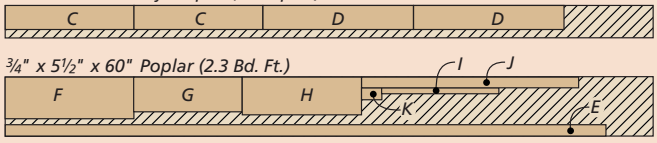
MATERIALS, SUPPLIES & CUTTING DIAGRAM

		8x10 Size	5x7 Size
A	Backer Top/Bottom (2)	¼ hdbd. - 2 x 8	¼ hdbd. - 2 x 5
B	Backer Side (2)	¼ hdbd. - 2 x 14	¼ hdbd. - 2 x 11
C	Facing Top/Bottom (2)	⅜ x 2¼ - 12	⅜ x 2¼ - 9
D	Facing Side (2)	⅜ x 2¼ - 14	⅜ x 2¼ - 11
E	Trim (1)	⅝ x 1 - 60 rgh.	⅝ x 1 - 48 rgh.
F	Base Bottom (1)	¾ x 4 - 12	¾ x 3½ - 9
G	Base Riser (1)	¾ x 3¼ - 10½	¾ x 2¾ - 7½
H	Base Top (1)	⅜ x 3½ - 11	⅜ x 3 - 8
I	Frame Stop (1)	¼ x ¼ - 10½	¼ x ¼ - 7½
J	Vertical Support (1)	⅜ x 1 - 20	⅜ x 1 - 17
K	Clamp (1)	¾ x 1 - 1½	¾ x 1 - 1½

- (4) ⅞" Brass Turn Buttons w/Screws
- (2) #6 x 1" Brass Fh Woodscrews
- (1) 10-24 x 2" Brass Machine Screw
- (1) #10 Brass Flat Washer
- (1) #10 Brass Thumb Nut

For 8x10 Size

½" x 3" x 60" Curly Maple (1.3 Sq. Ft.) ***NOTE:*** *Plane to ⅜" thick*

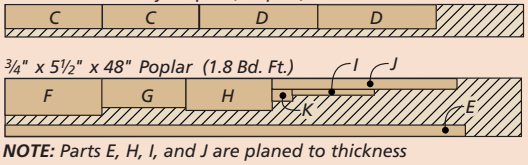


¾" x 5½" x 60" Poplar (2.3 Bd. Ft.)

NOTE: *Parts E, H, I, and J are planed to thickness*

For 5x7 Size

½" x 3" x 48" Curly Maple (1 Sq. Ft.) ***NOTE:*** *Plane to ⅜" thick*

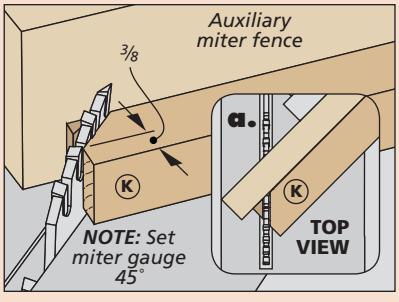


¾" x 5½" x 48" Poplar (1.8 Bd. Ft.)

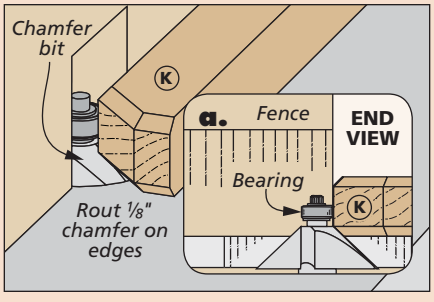
NOTE: *Parts E, H, I, and J are planed to thickness*

ALSO NEEDED: *One 12"x24" sheet ¼" hardboard for the 8x10 frame and a 12"x12" sheet ¼" hardboard for the 5x7 frame*

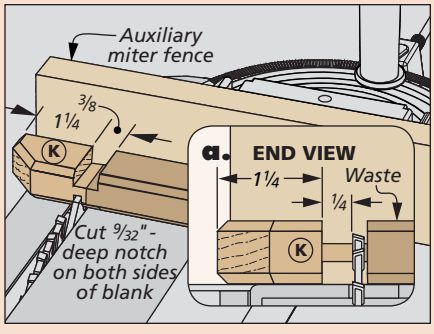
How-To: Making the Frame Clamp



Beveled Front. First, locate the bevel on the front of the clamp by marking a point ⅜" from the bottom of the workpiece.



Chamfers. The chamfers on the edges are cut on the router table. Use a miter gauge for the end and angled chamfers.



Tongue. The final steps are to cut the notch to form the tongue, and then cut it free from the blank.

Elegant Chessboard

From figured veneer and inlay to a board made up of individual squares, we've got the winning strategies to build this challenging project.

Whether you've been woodworking for many years or you're just starting out, it's hard to look at a project like this and not feel a little amazed by all the fine details. Like the richly veneered top and side panels, the inlay border around the top, and even the individually chamfered squares that make up the top. But don't let all these eye-catching elements overwhelm you or make you reluctant to try your hand at building this project.

The truth is that even though this appears to be a challenging and complex piece, we've come up with ways to deal with each step of the construction. Take the veneered, raised panels on the sides and drawer of the case, for example. You might think it would be difficult to fit the veneer to the panel. But the trick is to veneer the piece first and then cut the panel afterward.

DRAWER. One feature that I haven't really mentioned yet is the drawer that fits into the case. It can be pulled out from either side of the case so both players can have easy access to their playing pieces. There's a pair of cleverly installed catches to keep the drawer from sliding out accidentally. Inside the drawer are divided compartments to store the chess pieces safely when they're not in use (see inset photo above). And even though we've called this a chessboard, there are also compartments inside the drawer to hold checkers (for those of us who can't tell a rook from a bishop).

ONE MORE THING. The drawer (and case) are designed so that they can be optional. If you want, you can build just the top and have an elegant chess and checkers board that doesn't take up much space. This way, you still get a chance to try your hand at veneering, inlay, and making the chamfered square "tiles" on the top without having to build the entire project.

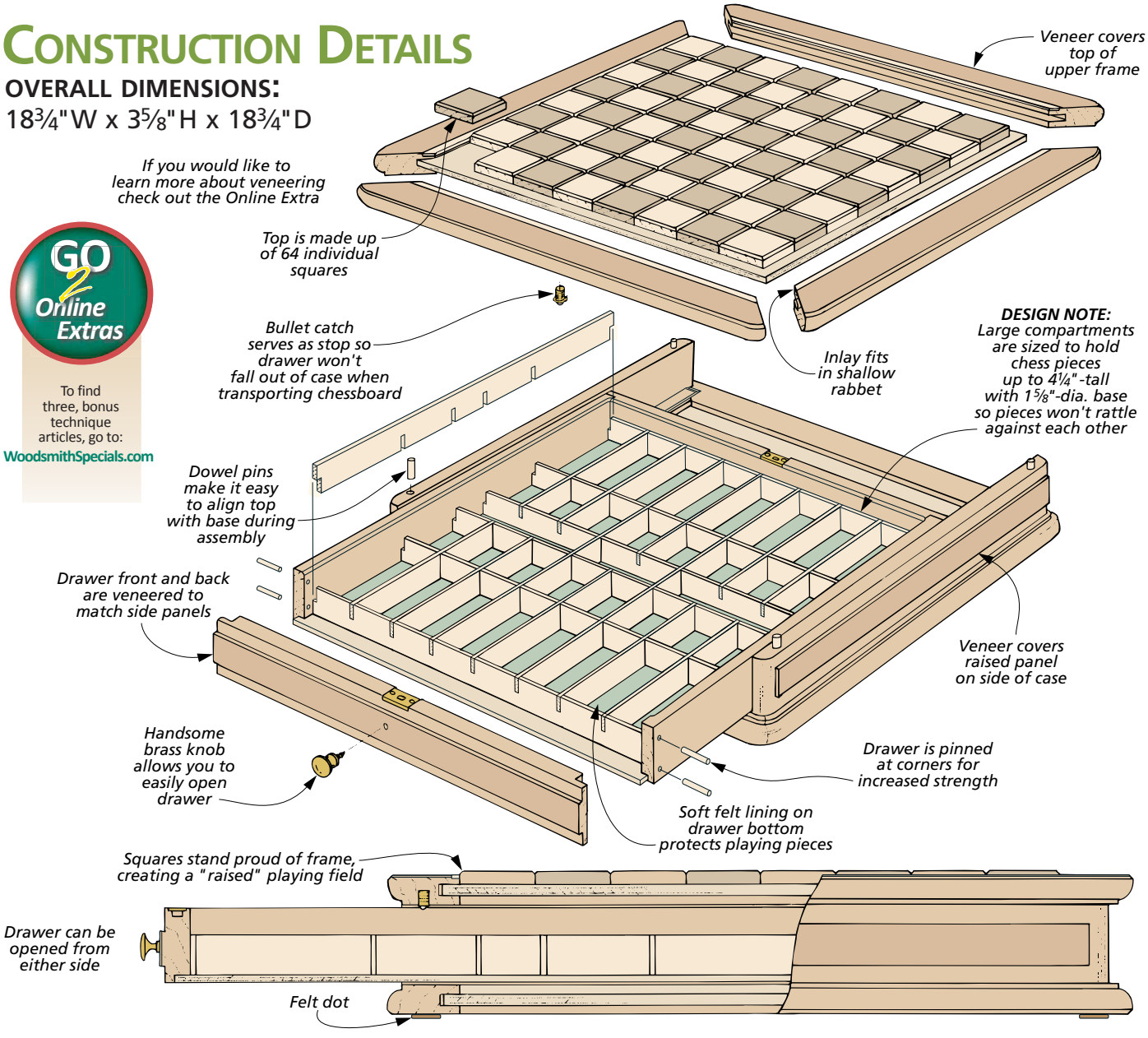
Construction Details

OVERALL DIMENSIONS:
18¾"W x 3⅝"H x 18¾"D

If you would like to learn more about veneering check out the Online Extra

GO 2 Online Extras

To find three, bonus technique articles, go to: WoodsmithSpecials.com



MATERIALS, SUPPLIES & CUTTING DIAGRAM

A	Squares (64)	⅜ x 1⅞ - 1⅞
B	Panels (2)	¼ ply. - 15⅞ x 15⅞
C	Frame Pieces (8)	¾ x 1⅞ - 18¾
D	Case Sides (2)	¾ x 2 - 17½
E	Drawer Fr./Bk. (2)	¾ x 1⅞ - 16⅛
F	Drawer Sides (2)	½ x 1⅞ - 17
G	Drawer Btm. (1)	¼ ply. - 15⅞ x 17
H	Drawer Runners (2)	1/16 x ½ - 17
I	Frt.-to-Bk. Dividers (9)	⅛ x 1 - 16¼
J	Side-to-Side Dividers (6)	⅛ x 1 - 15⅛

*Also Needed: Appr. 3 sq. ft. of Carpathian elm burl veneer and 6 lin. ft. of inlay

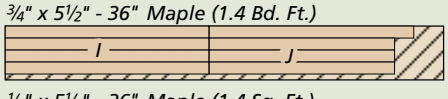
- (2) ¼" x ½" Brass Knobs w/Studs
- (2) Bullet Catches
- (1) .032"-thick Brass (½" x 6")
- (4) #2 x ¼" Fh Brass Woodscrews
- (1) Felt for Drawer
- (1) Posterboard for Felt
- (4) ¾"-dia. Self-Adhesive Felt Dots

***NOTE:** Squares (part A) are made from ½"-thick stock that is planed to ⅜" thick*

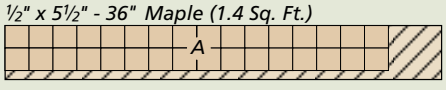
Also note that optional dividers (parts I and J) are resawn from ¾"-thick stock

***ALSO NEEDED:** 24" x 48" sheet of ¼" walnut plywood*

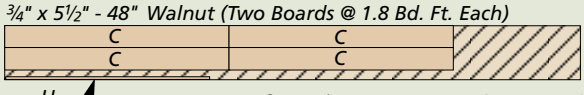
¾" x 5½" - 36" Maple (1.4 Bd. Ft.)



½" x 5½" - 36" Maple (1.4 Sq. Ft.)

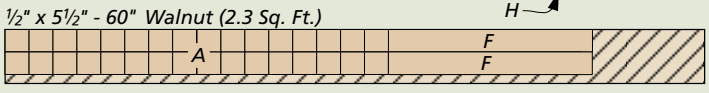


¾" x 5½" - 48" Walnut (Two Boards @ 1.8 Bd. Ft. Each)

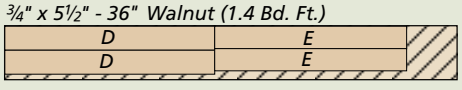


H

½" x 5½" - 60" Walnut (2.3 Sq. Ft.)



¾" x 5½" - 36" Walnut (1.4 Bd. Ft.)



Tiny Squares. Alternating maple and walnut squares make up the playing surface of this chessboard.

top & Bottom

The one thing that makes this chessboard different than most is the playing field. It's made up of sixty-four individual squares that are raised slightly above the surface of the border. Plus, small edge chamfers set each square apart from its neighbors. Together, these two elements transform a flat playing surface into a three-dimensional one.

Building the top of this chessboard is a lot like installing a tile floor. That's because the individual squares are glued down to a plywood panel, just like you would with floor tiles. Then once the squares are attached to the panel, a frame is constructed around them.

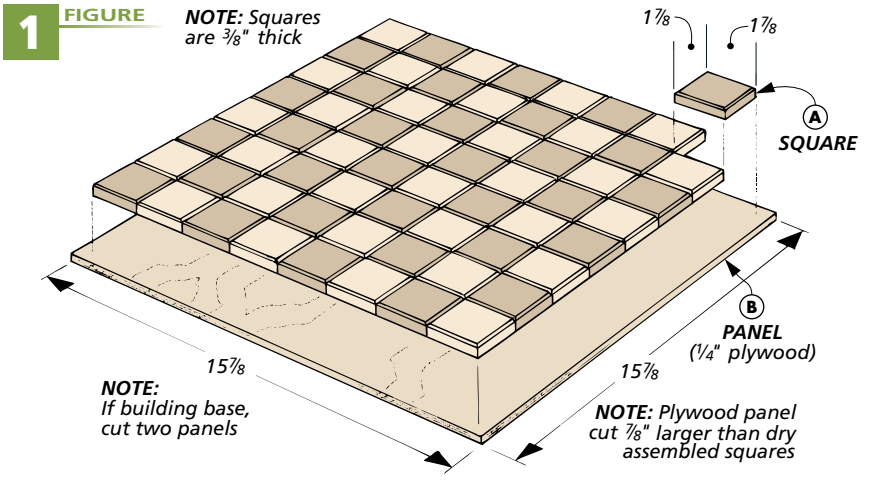
SQUARES. The trick to building the top is to cut all the squares accurately. This makes it a lot easier to keep the rows of squares aligned when it comes time to glue them down to the plywood panel. In order to make all the squares (A) the same size (and truly square), I used a jig, as shown in Fig. 2. (For more information on this jig, check out the Online Extra.)

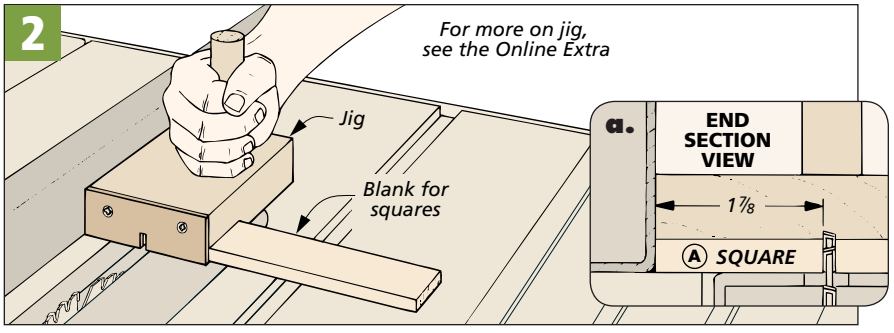
Once all the squares are cut, you can rout the chamfers around the top edges. As you can see in Fig. 3, I routed these chamfers on a router table, using a push block to safely hold each piece while routing.

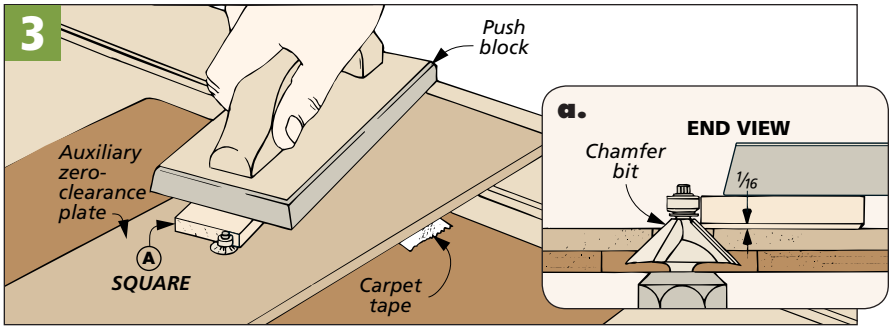
After all the chamfers have been routed, you can dry assemble the squares to determine how large to cut the panel to which the squares will be attached. There's just one thing to mention here. To give the squares some "breathing room" I placed paper spacers between each one. You can see how I used these spacers in Fig. 4.

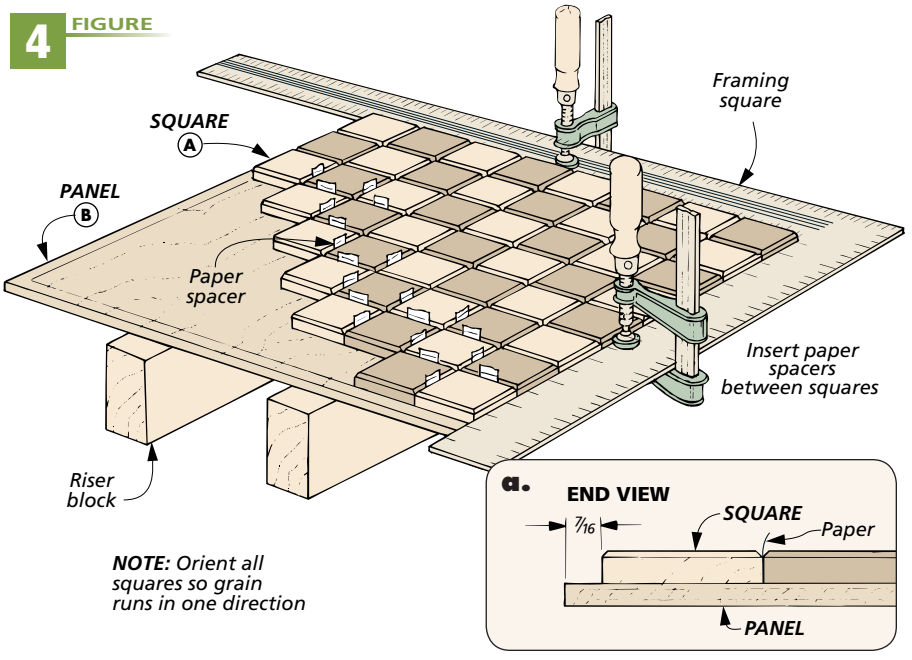
PANEL. With the squares dry assembled, you can measure for the panel (B). I cut my panel 7/8" larger in both length and width than the dry assembled squares. If you're building the complete chessboard (with the drawer), you'll need to cut a second panel for the bottom.

ASSEMBLY. Assembling the squares is just a matter of clamping the framing square









to the panel and gluing the squares down one at a time, like you see in Fig. 4. The field of squares should be centered on the panel, 7/16" from the edges (Fig. 4a).

FRAMES. Both the top and bottom panel are held in solid wood frames. These frames are identical except for the fact that the top frame has veneer and inlay strips applied to its surface (Fig. 5). Shop Note: If you're making just the top, you only have to build one frame.

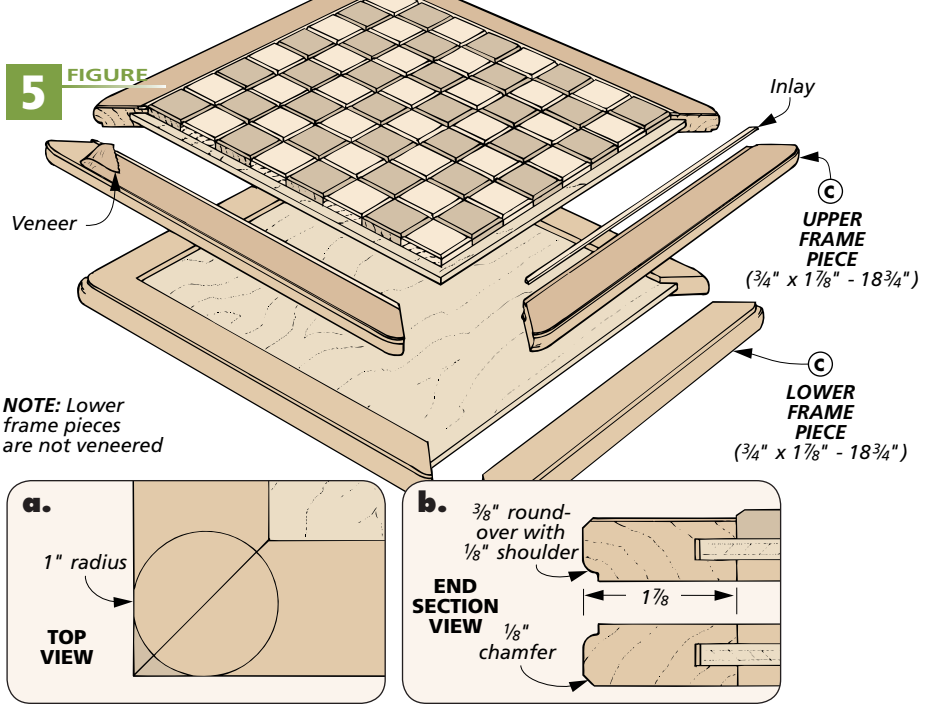
To make the frames, start by ripping the frame pieces (C) to width (Fig. 5b). Then the top face of the upper frame pieces can be veneered. (For more on veneering, go to *WoodsmithSpecials.com*)

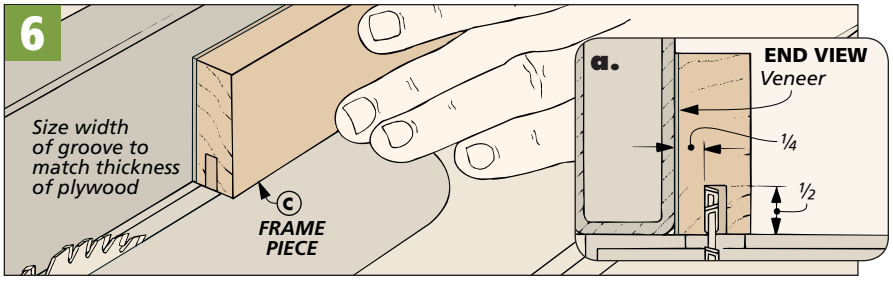
After applying the veneer, cut a groove on one edge of each frame piece to hold the panels, as you see in Fig. 6. You'll note in Fig. 6a that this groove is not centered on the thickness of the stock but is slightly offset. This is to ensure the squares will stand 1/8" proud of the frame.

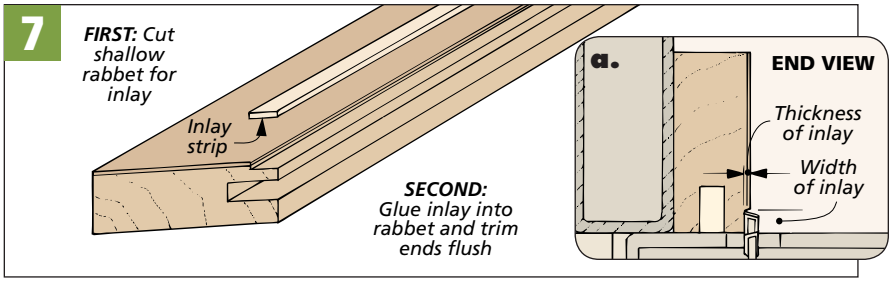
Once the grooves have been cut, the frame pieces can be mitered to length to fit around the panels. Then all you have to do is add the inlay strips to the upper frame pieces. This is just a matter of cutting a shallow rabbet for the inlay strip and gluing it in place (Fig. 7).

After trimming the inlay strips flush with the ends of the frame pieces, you can glue the frames up around the panels. Once this is done, all that's left to do is create the profile on the frames.

FRAME PROFILE. To start with, I used a band saw and some sandpaper to round the corners of each frame as shown in Fig. 5a. Next, a chamfer is routed on the top edge of the upper frame and the bottom edge of the lower frame, just like you see in Fig. 8. You'll have to adjust the height of the router bit for each frame due to the thickness of the squares on the upper frame (Figs. 8a and 8b).

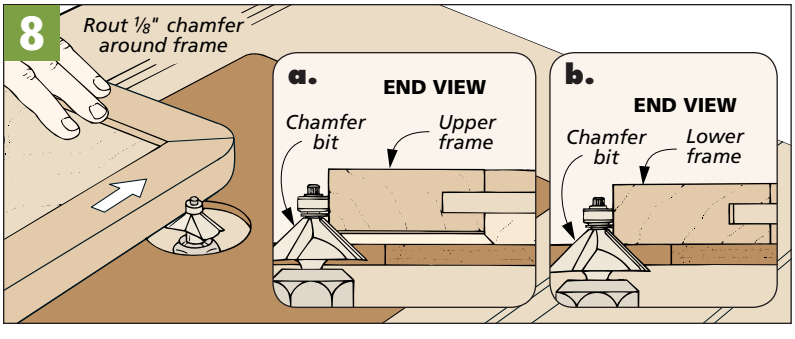


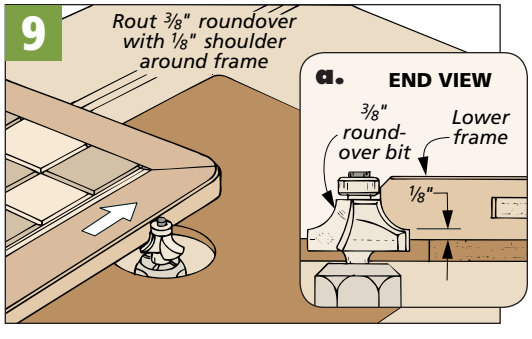




Finally, a roundover is routed on the edge of each frame, opposite the chamfer, as you can see in Fig. 9. When setting up to rout this roundover, note that there's a 1/8" shoulder between the roundover and the face of the frame (Fig. 9a).

Add Inlay. After gluing the inlay strip in place, the ends are trimmed flush with a chisel.





sides & Drawers

So now you have these two framed panels — one for the top and one for the bottom. The next step is to build the sides and drawer that will be sandwiched between them.

SIDES. The sides of the case feature a raised field that's veneered. But this isn't as difficult as it sounds. The trick is to veneer the whole face of the side first, then to cut the raised field afterward. I started by cutting two pieces of ¾"-thick stock for the sides (D) and veneering both of them (Fig. 10).

A two-step process is used to create the raised field. First, a roundover with a ⅛" shoulder is routed on the ends of each side, as you can see in Figs. 11 and 11a. Next, a straight bit is used to cut a rabbet along the edges of each side, just as is shown in Figs. 12 and 12a.

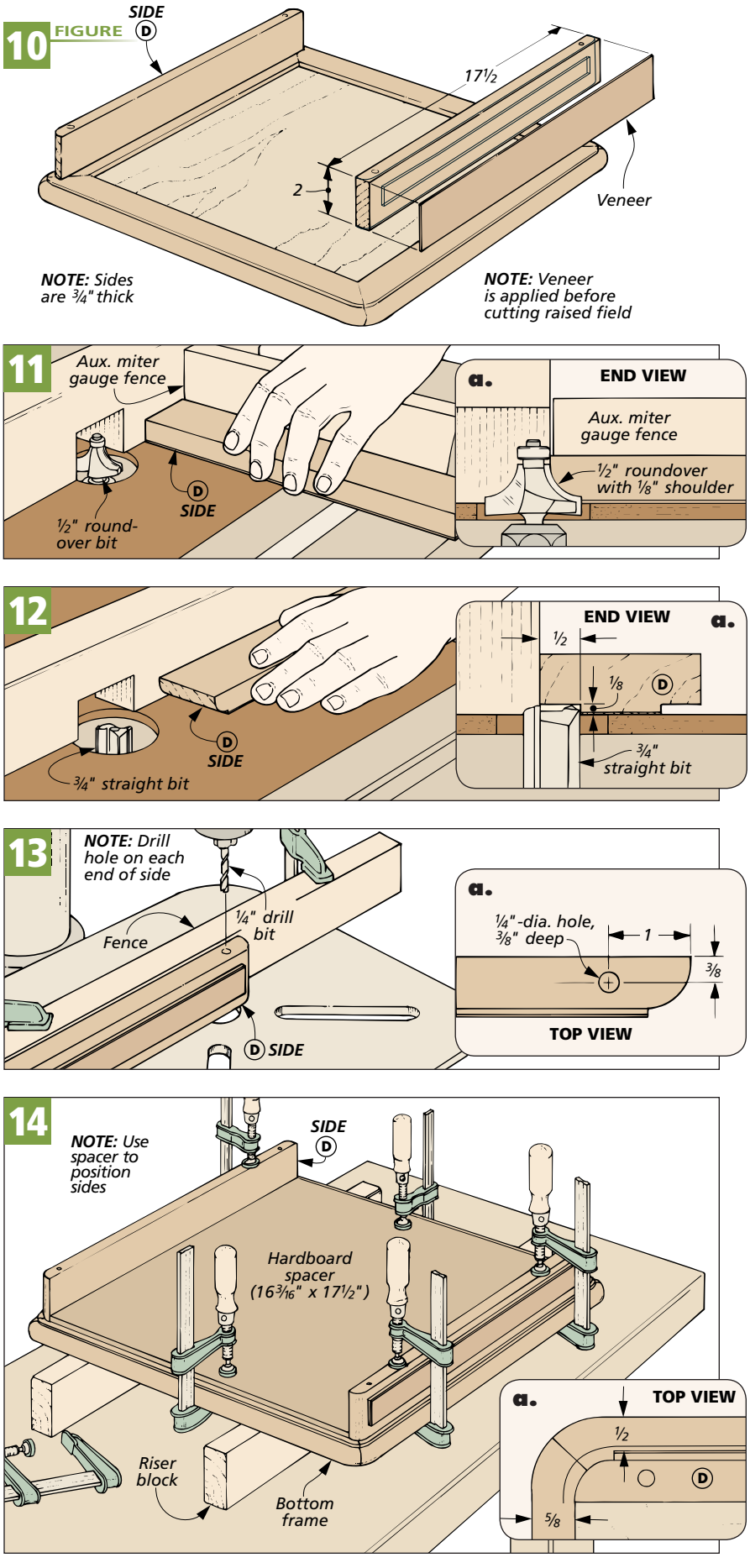
Before attaching the sides to the bottom of the case, I drilled a couple of holes in the top edge of each side piece, like you see in Fig. 13. These holes are for some dowels that will be used later to help align and attach the top.

The sides are simply glued down to the bottom frame. There are a couple of things to watch for here. First, you want the sides to be parallel so the drawer will slide smoothly without binding. Second, you want to make sure the ends of the sides are aligned with each other.

To make this easier, I made a spacer out of ¼" hardboard, as you can see in Fig. 14. This spacer is clamped in place to the bottom frame. The sides are set against the spacer, flush with the ends, and then glued and clamped in place. Shop Note: To avoid accidentally gluing the spacer to the bottom frame, you'll want to remove it as soon as the sides are clamped in place.

DRAWER. Because there are many other challenging aspects to this project (veneering, inlay, squares, etc.) I decided to keep the drawer as simple as possible. As you can see in Fig. 15, the sides are joined to the front and back with ordinary rabbet joints. Then a plywood bottom is added afterwards.

Like the sides of the case, the drawer front/back (E) feature veneered raised panels (Fig. 15). So after cutting the front



and back to size you can veneer one face of each piece. Creating the raised field is even easier than on the case sides. It's just a matter of routing a shallow (⅛" deep) rabbet along each edge of the veneered face, just like you see in Figs. 16 and 16a.

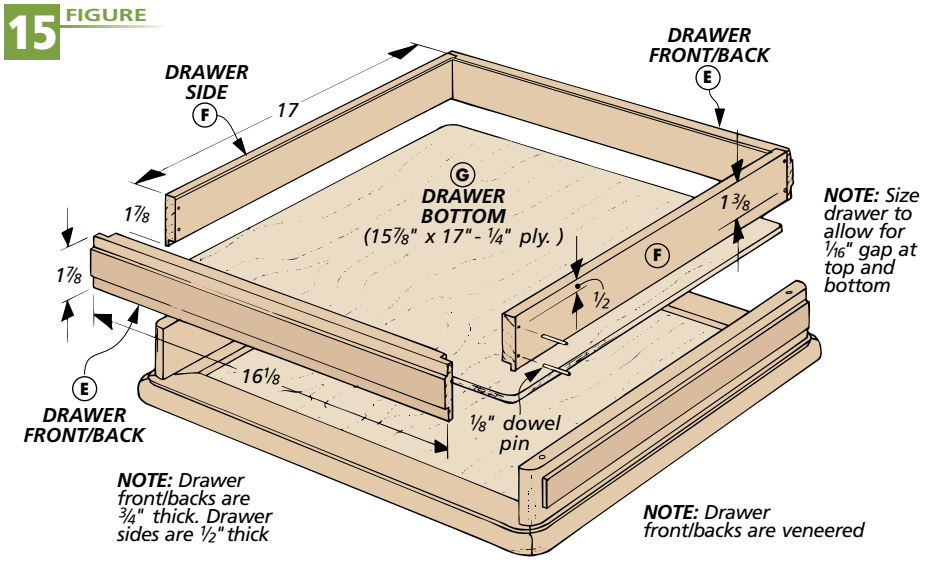
After creating the raised fields, the ends of the front and back can be rabbeted to accept the drawer sides, as shown in Figs. 17 and 17a. The drawer sides (F) are cut from ½"-thick stock, and the rabbets are sized to match this thickness.

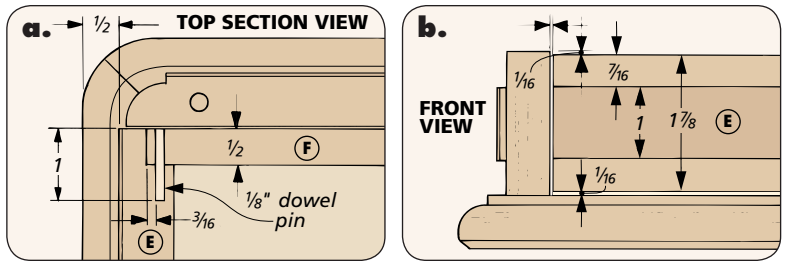
With the rabbets cut, the drawer sides and front and back can be glued up. Since the drawer bottom isn't added until later, there isn't really anything to help keep the drawer square. So while clamping it up you'll need to check carefully to make sure it's square.

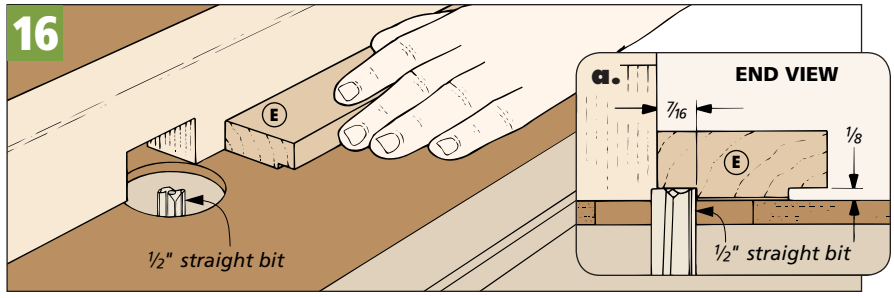
Once the glue was dry, I routed a chamfer on the inside edge of the top of the drawer. You can see this being done in Fig. 18. Next, I used a rabbeting bit to rout a rabbet all around the inside of the bottom edge of the drawer (Figs. 19 and 19a). The drawer bottom (G) is cut from a sheet of ¼" plywood to fit in this rabbeted opening in the bottom of the drawer. It's just glued in place. Shop Note: You'll need to round off the corners of the bottom to fit the rabbeted opening in the drawer.

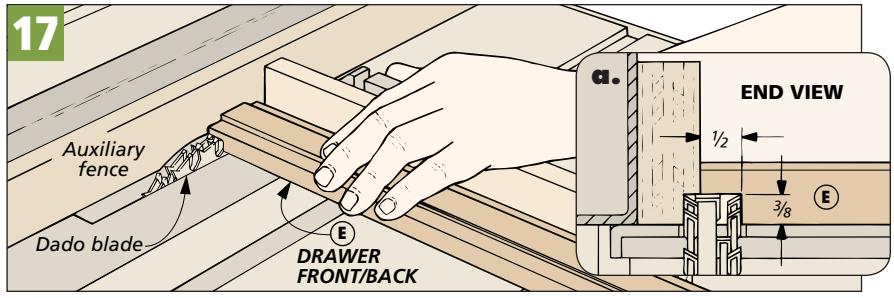
DOWEL PINS. The final step to completing the drawer is to reinforce each corner with a couple of dowel pins. Taking a look at Figs. 15 and 15a, you can see that I drilled holes through the sides of the drawer into the front and back for some ⅛"-dia. dowel pins.

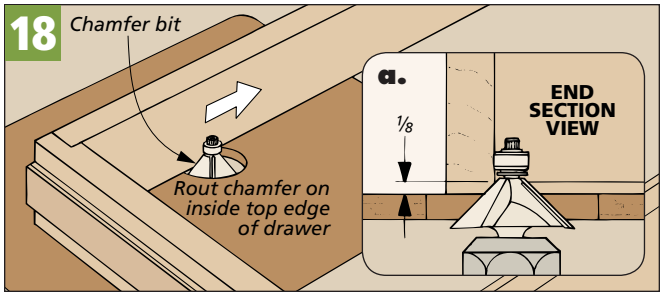
There's just one problem here. I couldn't find any ⅛"-dia. dowels in walnut to match the wood used in the drawer. So instead, I cut my dowel pins from a ⅛"-dia. birch dowel. Then after gluing the dowel pins in place, I colored the ends with a brown felt-tip marker.

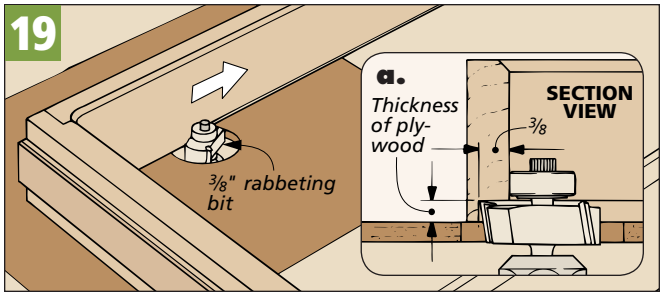












Positioning. Dowel centers are used to position the top on the base.

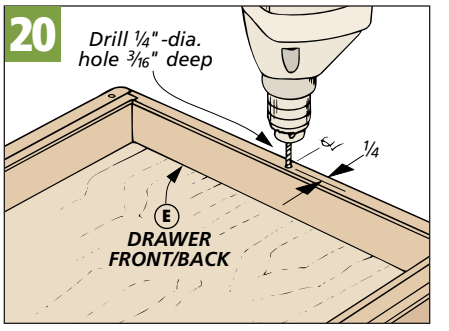
hardware & Dividers

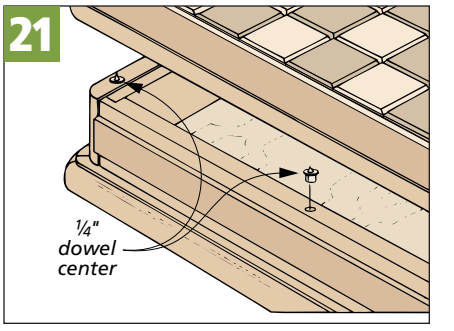
At this point, the construction of the chessboard is pretty much done — all that remains is to add a few pieces of hardware for the drawer and attach the top to the base.

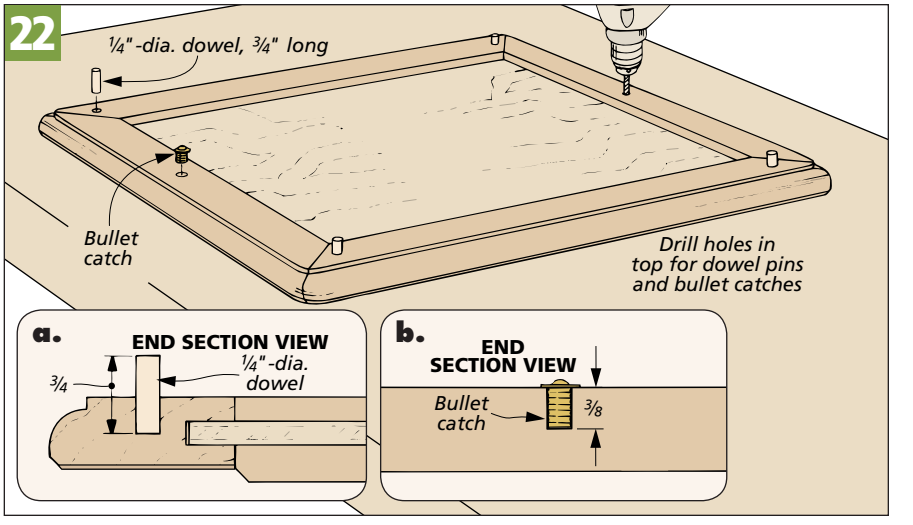
BULLETT CATCHES. One of the neat features of the drawer is the fact that it can be opened from either end. But this also created a bit of a challenge. Without any kind of back or drawer stop, how do you keep the drawer centered when it's closed and prevent it from sliding out whenever the chessboard is moved? The answer we came up with is to use a pair of bullet catches.

The bullet catches are installed in the underside of the top. Then catch plates are attached to the top edges of the drawer front and back to engage the bullet catches when the drawer is closed. The trick to installing these catches and plates is to make sure they line up correctly.

Square. While positioning the top with the dowel centers (see photo above) you can use a square to check the alignment of the top with the base.



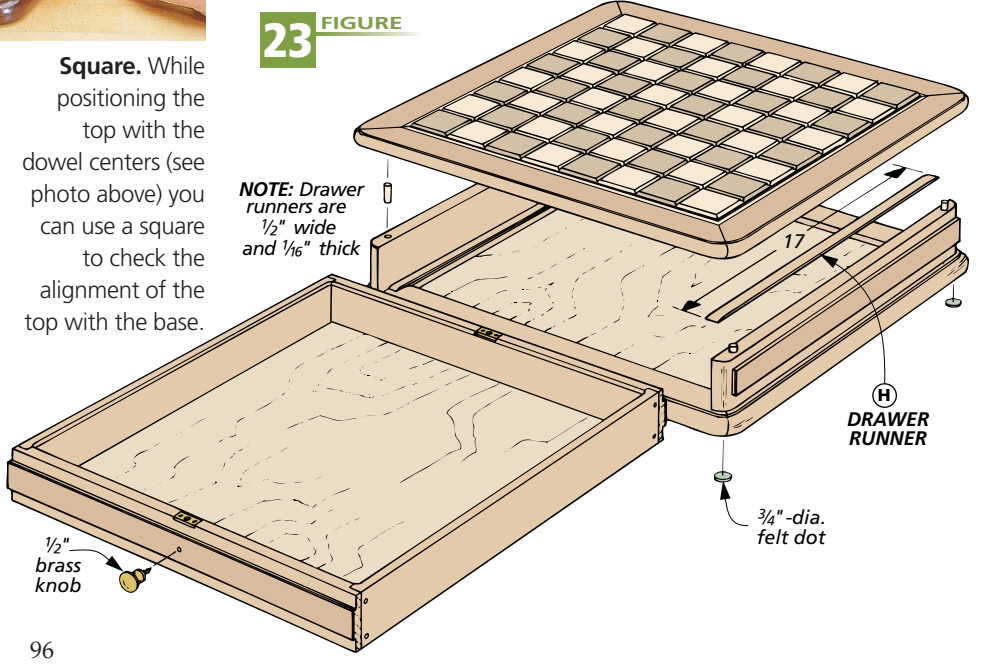


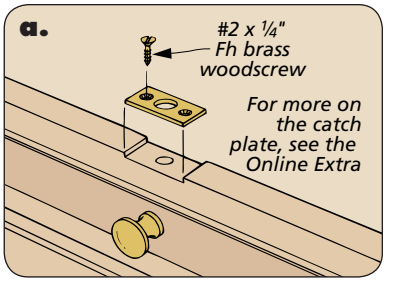


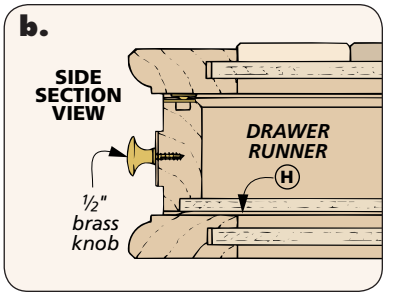
To do this, I started by drilling a centered hole in the top edge of the drawer front and back, as you can see in Fig. 20. Then I placed dowel centers in the holes in the drawer as well as the holes that were previously drilled in the sides of the case (Fig. 21). The top is then carefully centered over the base and pressed down lightly on the dowel centers (see the photos at left).

The dowel centers leave slight impressions on the underside of the top. These will help you to locate the holes for the bullet catches as well as the dowels that are used to align the top (Fig. 22).

With the bullet catches installed in the top, the next step is to make and install a couple of brass catchplates on the top edges of the drawer. These are simply set into shallow notches that are cut across





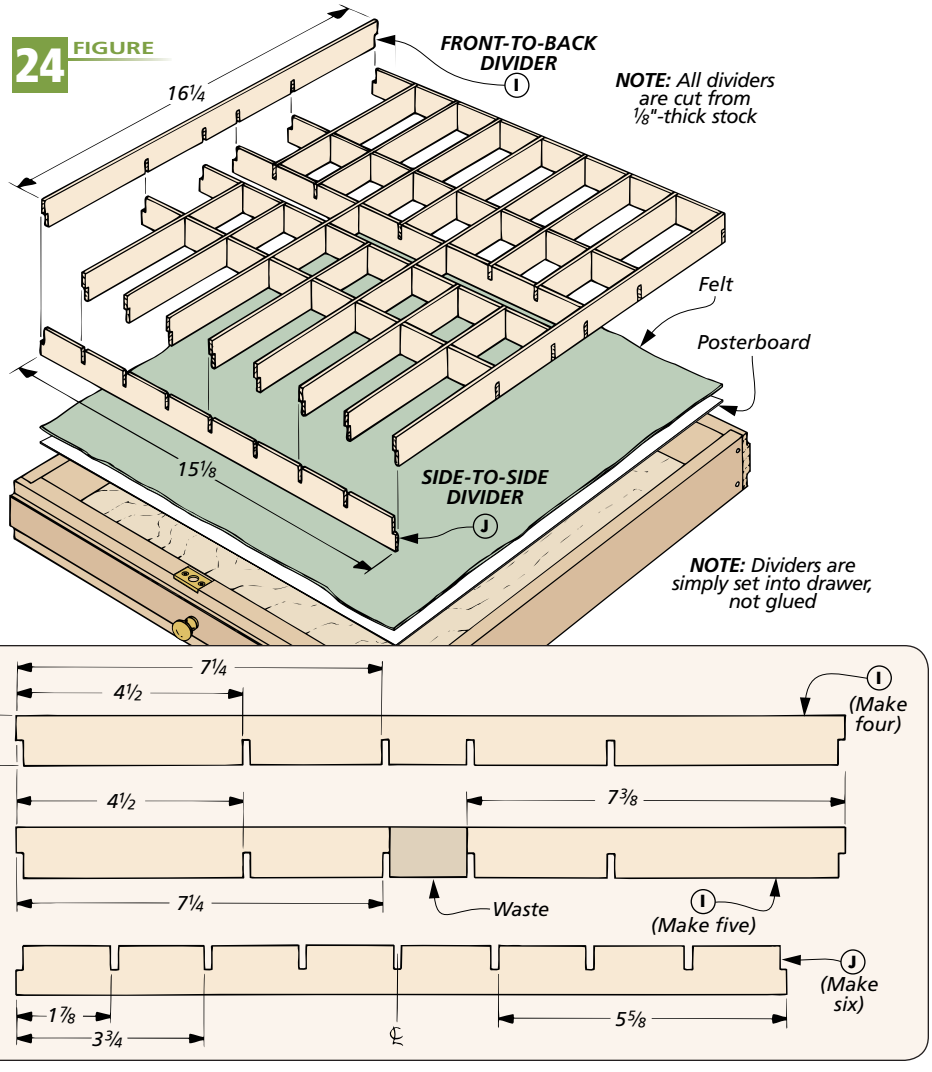


the top of the drawer front and back, as you can see in Fig. 23a. For more on this procedure, see *WoodsmithSpecials.com*.

Before adding the top, I cut a couple of thin strips of wood and glued them to the bottom of the case, as you can see in Fig. 23. These drawer runners (H) raise the drawer up slightly (1/16") and prevent the drawer sides from wearing grooves in the bottom frame of the case. After the runners are glued in place, the top can be glued to the case. Then I attached a couple of brass knobs to the front and back of the drawer, as shown in Fig. 23b. Finally, I lined the drawer bottom with some felt glued to a piece of posterboard and I added felt dots to the case bottom.

DIVIDERS. If you wanted to, you could call the chessboard complete at this stage. But I decided to take it one step further. I chose to add some dividers to the inside of the drawer to keep the checkers and chess pieces from rattling around. The dividers create individual compartments for the chess pieces and a couple of spaces for the checkers.

These dividers are nothing more than thin strips of wood joined with half laps and assembled in the drawer to create a grid (Fig. 24).



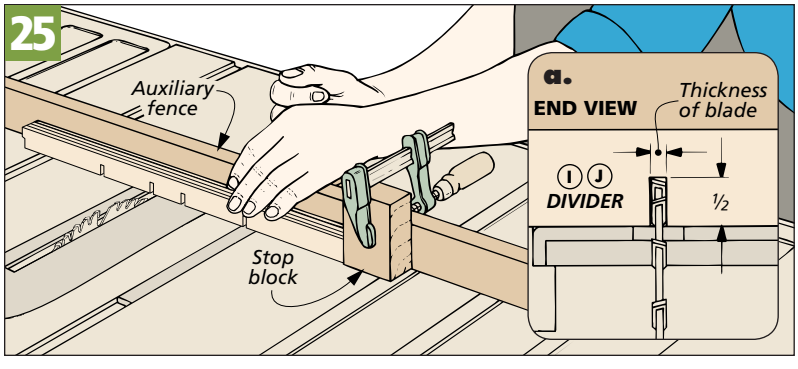
To make the dividers, start by planing or resawing some 1"-wide strips. The trick here is getting the strips to the correct thickness. You want them to be as thick as the width of the kerf created by your saw blade (about 1/8"). This way, the mating pieces will easily fit together after you cut the half lap joints. It's better to make the strips a hair too thin rather than making them too tight and having to pound them together when it comes time to assemble the grid.

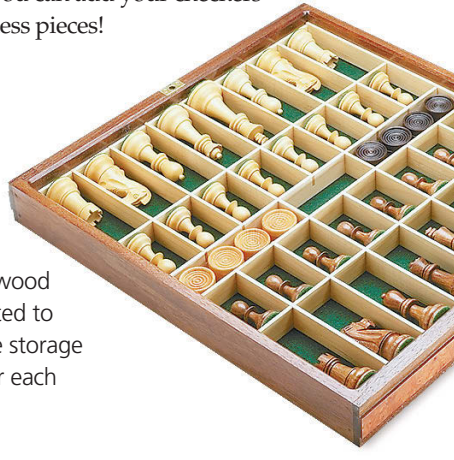
Once you've determined the correct thickness, you can cut the strips to length (Fig. 24a). You'll need nine front-to-back dividers (I) and six side-to-side dividers (J). (Later, five of the long strips will be cut up into ten shorter dividers.)

When you have all the strips cut to length, start making the half lap joints. To cut these, I used an auxiliary fence on my miter gauge. A stop block clamped to the fence is used to position the strips while cutting the half laps, Fig. 25.

I stacked the strips up in order to cut the half laps. Not only is this quicker, but you can rest assured the spacing of the half laps will be identical (Fig. 24a).

Once you've cut all the joints, you can cut out the center section of five of the long dividers to create ten short divider pieces. The dividers are assembled into a grid inside the drawer without using any glue. (The half laps lock the pieces together.) Then you can add your checkers and chess pieces!





Dividers. Half-lapped strips of wood are inter-connected to create a separate storage compartment for each playing piece.

All-Time Favorite Projects Sources

MAIL ORDER SOURCES

Amana Tool
800-445-0077
amanatool.com

Constantine's
954-561-1716
constantines.com

Improvements
800-634-9484
improvementscatalog.com

Klockit
800-556-2548
klockit.com

Lee Valley
800-871-8158
leevalley.com

Lowe's
800-445-6937
lowes.com

Motawi Tileworks
734-213-0017
motawi.com

Rockler
800-279-4441
rockler.com

Sculpt Nouveau
800-728-5787
sculptnouveau.com

Van Dyke's Restorers
800-237-8833
vandykes.com

Most of the supplies you'll need for projects in this book are available at hardware stores or home centers. For specific products or hard-to-find items, take a look at the sources listed here.

Retailers will periodically discontinue some items, so gather all the hardware that you need before you get started on your project. You can always adjust dimensions or drill different-sized holes to suit your hardware.

BRIDE'S CHEST (P. 4)

- **Sculpt Nouveau**

Deep Brown Patina ..TBR08ZDBR
Oil Finish OIL08ZBRN

- **Rockler**

60 lb. Torsion Hinges.....36275

- **Lowe's**

Cedar Plank Paneling.....408083

- **Van Dyke's Restorers**

½" x 1" Clavos Nails 02018072

I used *Varathane's* Gunstock stain to give the chest a Craftsman look. Then I sprayed on two coats of clear lacquer. I finished by glazing the chest with *General Finishes* Java gel stain, then another coat of lacquer to seal the glaze.

LINEN PRESS (P. 14)

- **Lee Valley**

Connector Bolts 00N15.70
Wood Knobs.....02G11.23
No-Mortise Hinges.....00H51.23

- **Rockler**

Magnetic Catches 26559
Shelf Pin Supports.....22765

STEP-BACK BOOKCASE (P. 22)

- **Lee Valley**

Door Pulls 01A23.75
No-Mortise Hinges.....00H51.32
Connector Bolts 00N16.30
Connector Bolt Caps.....00N20.12

- **Rockler**

Magnetic Catches 26559
Shelf Pin Supports.....22773

The cove molding used on the bookcase is *Ferche F606*. There's a dealer locator on the website listed at left. The bookcase is painted with *Benjamin Moore* "Andes Summit." The back planks are finished with three coats of lacquer.

CRAFTSMAN CLOCK (P. 38)

- **Klockit**

Quartz Movement 10004
Clock Hands (Black) 67943

- **Motawi Tileworks**

Dragonfly Tile (Green) 4432

The clock was stained with *Varathane* Oil Stain (Mission Oak) and then sprayed with two coats of lacquer.

COFFEE TABLE (P. 44)

- **Constantine's**

Anigre Flexible Veneer FV40

- **Lee Valley**

1" Furniture Glides.....06W01.02

The cherry components of the coffee table were stained with a mixture of three parts *Zar* Cherry stain and one part *Wood Kote* Jel'd stain (cherry). Then the entire table was sprayed with two coats of lacquer finish.

LIBRARY TABLE (P. 52)

- **Lee Valley**

Bail Pull (Old Brass).....01A28.40

- **Rockler**

Figure-Eight Fasteners.....21650

- **Amana Tool**

Two-Flute Ogee Bit 54120

The stain we used to finish the library table was *Varathane's* Early American stain, followed by two coats of lacquer.

FOOTBOARD BENCH (P. 62)

- **Improvements**

Chenille Tufted Cushion 485853

Our cushion is Sand, but there are several other colors available. The bench was stained with a mixture of three parts *Zar* cherry stain and one part *Wood Kote* Jel'd stain (cherry). Then it was sprayed with two coats of lacquer.

WINE RACK (P. 68)

The wine rack was finished with the same stain mixture and lacquer treatment as the footboard bench, listed above.

DOUBLE PORCH ROCKER (P. 74)

To provide protection for outdoor use, the rocker was finished with two coats of transparent cedar *Penofin Ultra Premium* penetrating oil finish. Apply a new coat every year or two.

FRAME & EASEL (P. 86)

- **Rockler**

⅞" Turnbuttons.....27912

The rest of the hardware can be found at a local hardware store or home center. The easel was finished with *General Finishes' Gel Stain* (Java). The picture frames were finished with *General Finishes' Seal-a-Cell*.

CHESSBOARD (P. 90)

Most of the hardware for the chessboard can be found at a local hardware store or home center.

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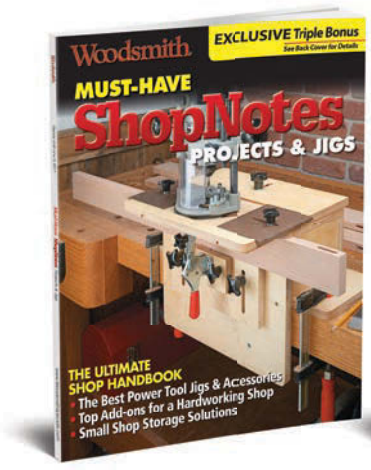

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7 essential tools for Metalworking

One way to add a distinctive touch to your woodworking projects is to create your own custom metal hardware. The corner braces on the bride's chest are a good example. You won't find these pieces in a catalog or at the hardware store. Although there are commercially available options, they're made from thinner metal and don't have the same gravitas as the shop-made versions.

The good news is, working with metal to create simple hardware like this is pretty easy. Chances are you already have some of the equipment you'll need on hand. But you might need to pick up a few additional tools and supplies to get the job done. Don't worry, though, you won't have to spend a lot of money.

One word of caution, however: Before you begin, take a little time to review your safety practices. Safety glasses must be worn when working with metal. You'll also want to keep a pair of leather gloves on hand for any tasks that involve freshly cut metal pieces with razor-sharp edges. And of course, cutting and grinding metal can generate a spray of sparks, so you should sweep the sawdust off your shop floor and have a fire extinguisher within reach before you begin.

Visual Aid. Scratches on the surface can make it tough to see your layout marks. Marking fluid makes them stand out.

[1] Measuring & Marking Tools

Chances are you already own most of the measuring and marking gear you'll need. You can use the same rules, squares, compasses, protractors, and angle gauges on metal, just as you would for woodworking layouts.

But when it comes to marking metal workpieces, the process is a little different. I usually apply layout fluid to the metal blanks I use for making parts (photo at left). Sometimes it's difficult to see a mark on bare metal, since it's so easily obscured by other scratches. But by covering the piece in layout fluid, the mark stands out and ensures accurate measurements. A scratch awl is the best tool for marking on the layout fluid-covered metal.

[2] Drill Press & Bits

Drilling metal with a hand drill gets old in a hurry. Plus, it's too easy for a drill bit to wander away from a layout mark using this method. A drill press makes the job far easier and more accurate (bottom left photo, opposite page). And a set of twist bits won't break the bank.

Remember to set the spindle speed to match the size of the bit you're using and the type of metal you're drilling (refer to your owner's manual for details). It's also a good idea to lubricate the drill bit with a drop of oil whenever you're drilling metal.

Finally, use a fence or clamp the workpiece to the drill press table to keep it stable. You don't want a metal workpiece to catch the bit and spin.

[3] Cutting Tools

Most of us have a hack saw hanging on a wall or in a drawer in the shop. If not, that's the next thing to pick up. You'll need the saw to cut pieces to size. For cutting curved shapes, a good set of metal-cutting blades for your jig saw can speed up the task (photo at right).

I also keep a few abrasive cutting wheels for my circular saw. They can cut through just about anything. You can see how I used them on the braces for the bride's chest. When using the abrasives, however, remember to cut using a series of light passes.

Cutting. The task of cutting metal can seem intimidating. But a hack saw and metal-cutting jig saw blades make it easy.

Add Threads. Tapping threads for a jig or project part adds a professional touch. A tap and die set makes this possible.

[4] Machinist's Vise

One thing to pick up, if you don't already have one, is a machinist's vise. You'll find that your woodworking vise, no matter the style, is simply not the right tool for holding metal. A good machinist's vise not only holds the workpiece, but also has an anvil-type surface that's invaluable for peening or shaping metal parts.

When you get the vise home, it's a good idea to make a couple of modifications. First, you'll want to mount it on a piece of plywood so you can clamp it to your bench when you use it. When it's not in use, it fits under the bench. Second, as you can see in the main photo on the opposite page, I made a set of auxiliary wood jaws. The wood grips a workpiece tightly but won't mar the surface.

Grind. A bench grinder is great for sharpening your tools, but can be used to clean up the edges of a workpiece, as well.

[5] Grinder & Files

A bench grinder is certainly a welcome tool to have on hand when working metal. I use a white aluminum-oxide wheel (photo at left) on one side and a stiff wire wheel on the other side. Both come in handy. Keep a small trough of water nearby, as well, for cooling parts.

FILES. When it comes to more delicate shaping, I turn to a good set of files. Make sure you have a variety of shapes on hand. Flat, round, square, triangular, half-round, and knife-edge are all useful pieces in a metalworking tool kit. You'll also want handles for the files. On top of that, make sure to pick up a file card to keep them clean. The thin, stiff wires on the card are perfect for cleaning out the very fine particles left in the teeth after a hard day's work.

[6] Tap & Die Set

The more proficient you become working metal, the more possibilities open up. For instance, I often make a metal jig or part that has a threaded hole for a threaded rod or bolt. This task requires a tap and die set. The set consists of hardened steel or carbide cutters to cut threads for most common sized screws and bolts. The photo above shows the setup for tapping threads.

Holes. Twist bits are designed for drilling in metal. With a little oil for lubrication they cut quickly, cleanly, and accurately.

Add Heat. Using a torch to heat steel brings it to red hot in no time. From there, you can bend, twist, or even harden it.

[7] Propane or MAPP Gas Torch

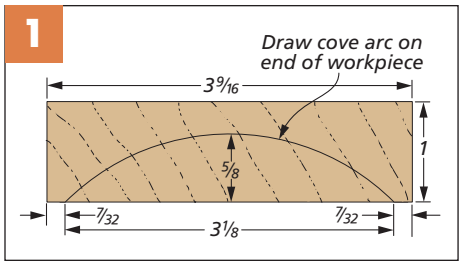
There may come a time when you need to bend or twist steel either into a decorative shape or to conform to a project design. In those cases, a propane or MAPP gas torch is the answer. MAPP gas, another form of propane, burns a little hotter but either generates enough heat to allow you to shape the steel.

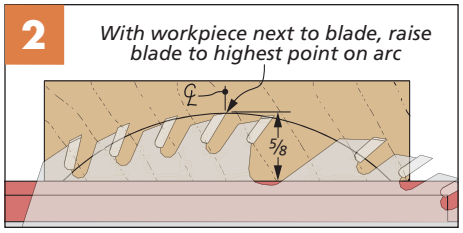
You'll find plenty of other uses for a torch. It's the best way to solder in many circumstances. And I like to use a torch for adding a darkened color to some metal surfaces.

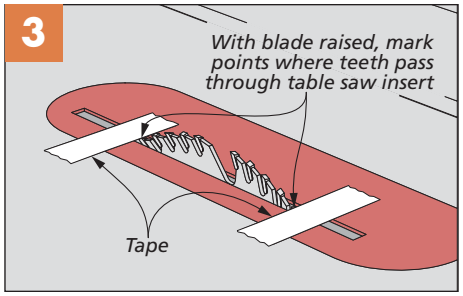
Whether shaping or twisting the steel, as in the photo at left, or heating it to harden a blade or cutting edge, an inexpensive torch will get the job done.

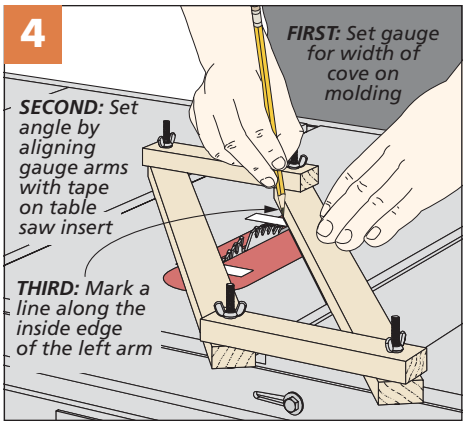
A touch of brass, aluminum, or steel can add an interesting element to just about any project. If you give metalworking a try, you'll be hooked.

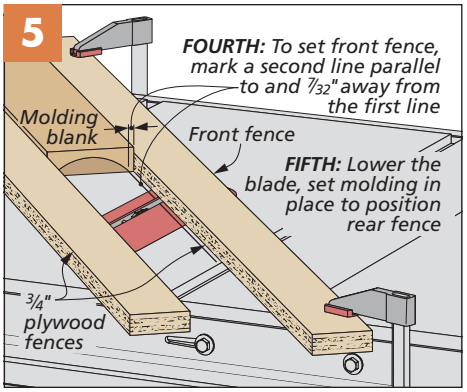
ONLINE EXTRAS











crown molding Setup

To cut the crown molding for the linen press, you'll need to pass the workpiece over the table saw blade at an angle in a series of passes. This cut isn't difficult to make, but it's important to set up a pair of guide fences at the correct angle for guiding the workpiece.

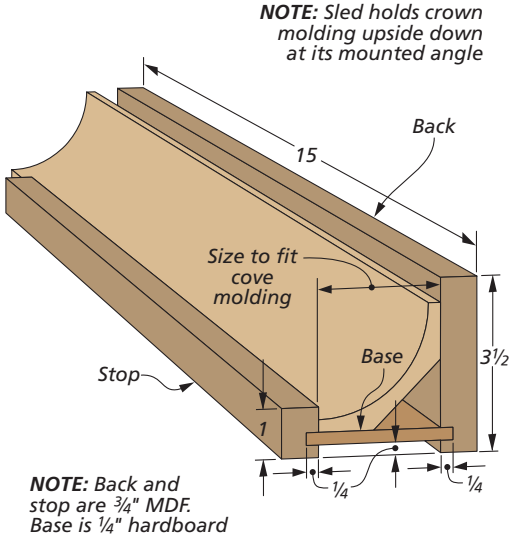
The best way to do this accurately is to use an adjustable gauge like the one shown in Figure 4 at left. The gauge is just four scrap pieces that are joined at the corners with bolts and wing nuts.

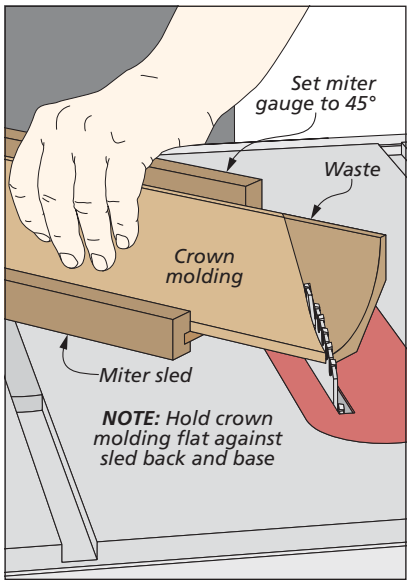
You can adjust the gauge opening to match the overall width ($3\frac{1}{8}$" in this case) of the cove arc shown in Figure 1. Then simply follow the sequence of drawings to establish the location of the guide fences. Once that's done, make the crown molding as explained in the article.

crown molding Miter Sled

The crown molding on the linen press is mitered to wrap around the edges. Because crown molding is installed at an angle, cutting this miter accurately can be tricky.

The solution is to cut the miter with the molding positioned at its mounted angle. This way, you simply set the miter gauge to 45° to make the cut. But it can be difficult to hold the molding securely at this angle while mitering it. The sled shown at right takes care of that. After building it, simply attach it to the miter gauge before cutting the molding.





ONLINE EXTRAS

cutting Small Squares

To build the chessboard, I needed quite a few 1⅞"-square hardwood blocks — sixty-four in all. The trick, of course, was getting the two cuts exactly the same (ripping the piece to width and crosscutting it to length).

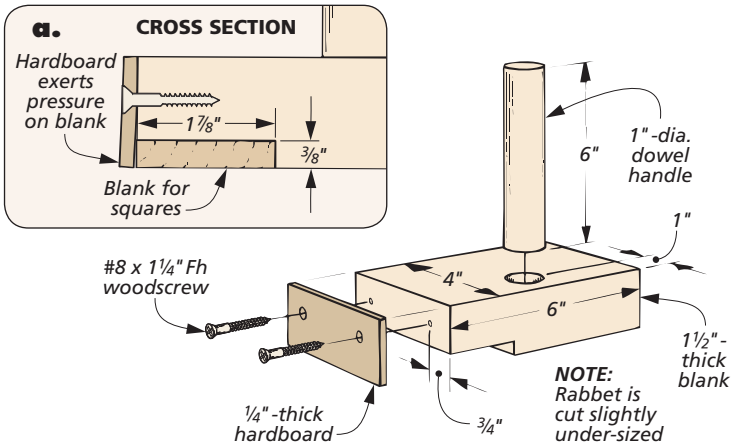
But I came up with a quick method for making both cuts with one fence setting. The blanks are ripped to width first. Then they're safely crosscut with a simple jig, using the rip fence as a positive stop, see photo.

JIG. My jig was made from a 1½"-thick block of hard maple. (But there's no reason it couldn't be made from a 2x6 scrap.) This block has a wide rabbet cut on its end. The depth (height) of this rabbet matches the thickness of the stock.

But the important thing is the rabbet's width — it should be a hair narrower than the width of the squares you're going to cut. This way, when you screw a piece of ¼" hardboard to the end of the jig, the hardboard will apply a little pressure to the workpieces, keeping them from slipping (detail 'a').

All that's left is to add a dowel handle, and you're ready to cut a few squares.

CUT SQUARES. To make the squares, the first thing to do is rip several blanks to width. (The chessboard squares were 1⅞" wide.) Then without moving the fence, slide a blank in the jig and set it on the saw, pushing the blank against the rip fence. (You may need to adjust the screws on the hardboard if the tension is tight or loose.)



Now simply push the jig (and blank) through the saw to crosscut the square. Then remove the piece and slide the blank back against the rip fence.

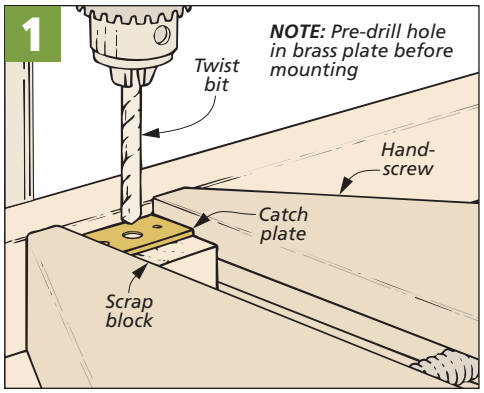
making & installing a Catch Plate

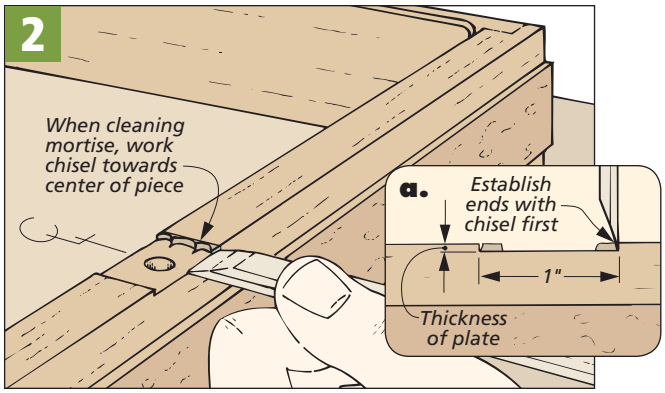
Most drawers close against a stop or a case back, but the drawer in the chessboard opened from either end. So how do you keep it in place? I decided to use bullet catches. But the catches I found didn't have flat catch plates. So I decided to make my own.

BRASS STRIP. At a local hobby store, I bought a short strip of ½"-wide brass that was .032" thick (about 1/32"). Then I used a hacksaw to cut two 1"-long plates from this piece and removed the burrs on the ends with a file.

DRILL HOLES. Next, three holes are drilled in each plate: a centered ¼"-dia. hole for the bullet catch and two small countersunk holes for the #2 screws that will be used to attach it to the drawer. The trick was holding this tiny piece while drilling. So I set it on a small scrap block and clamped them in a handscrew (Fig. 1).

CUT MORTISE. Now shallow mortises can be cut to hold the catch plates. (A hole was drilled earlier in these edges for positioning the top.) I decided to rout the mortise, using a hand-held router with a clamped-on support block, as shown in the photo in the article. I didn't rout the entire mortise, however. I cleaned up the ends with a chisel, carefully paring from the edges toward the center (Fig. 2).





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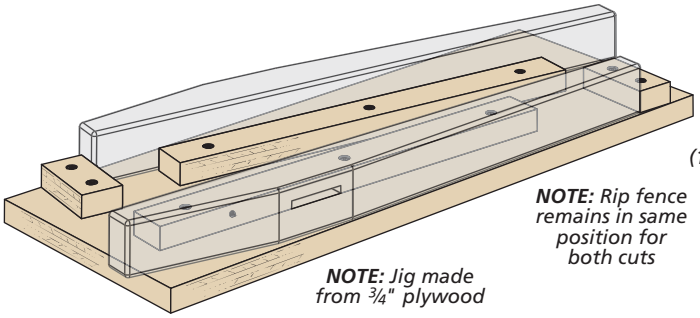
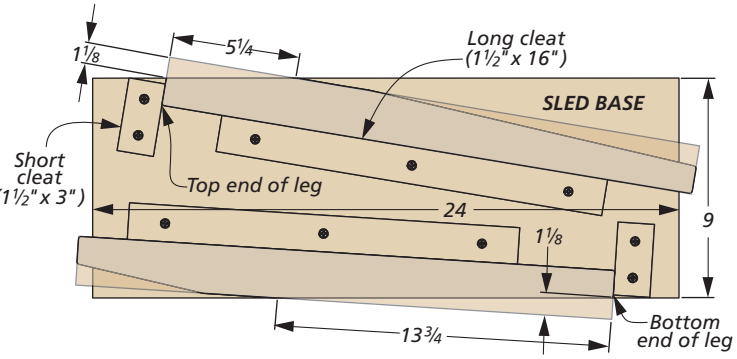




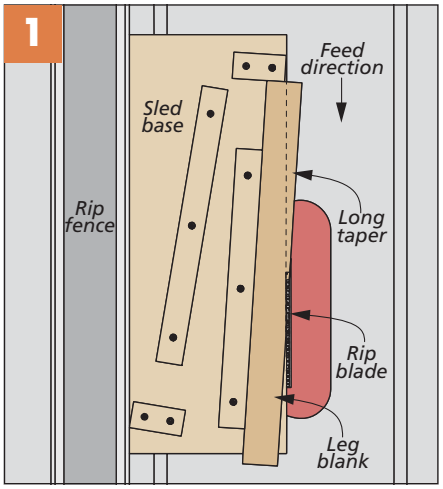
dual Taper Jig

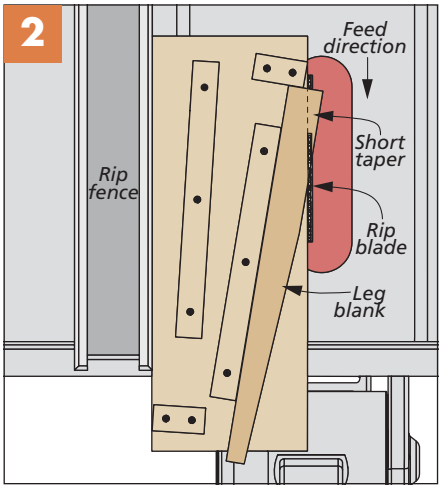
Each leg of the footboard bench has a pair of tapers on their inside face. One slopes toward the top of the leg while the other slopes toward the bottom. Since I don't own a commercial taper jig for my table saw, I decided to make the one shown here. This jig allows me to make the long taper at the bottom of each leg. I can then simply turn the jig around and reposition the leg blank to cut the short taper at the top of each leg.

LAYOUT WORK. Using the dimensions shown in the article, mark the layout lines for both tapers on one leg blank. This blank will be used to position the support cleats on the face of the sled.

SET UP THE JIG. Now line up the layout line for the long taper with one edge of the base (main drawing, above) and fasten the cleats in place with a few screws. Flip the workpiece to the other side of the sled and repeat the process for the short taper.

MAKE THE CUTS. With a rip blade installed in the table saw, set the rip fence for the width of the base and cut the long taper on a leg blank, as shown in Figure 1. Spin the jig around and reposition the leg blank to make the short taper cut (Figure 2). I used double-sided tape to hold the blanks in place while cutting.

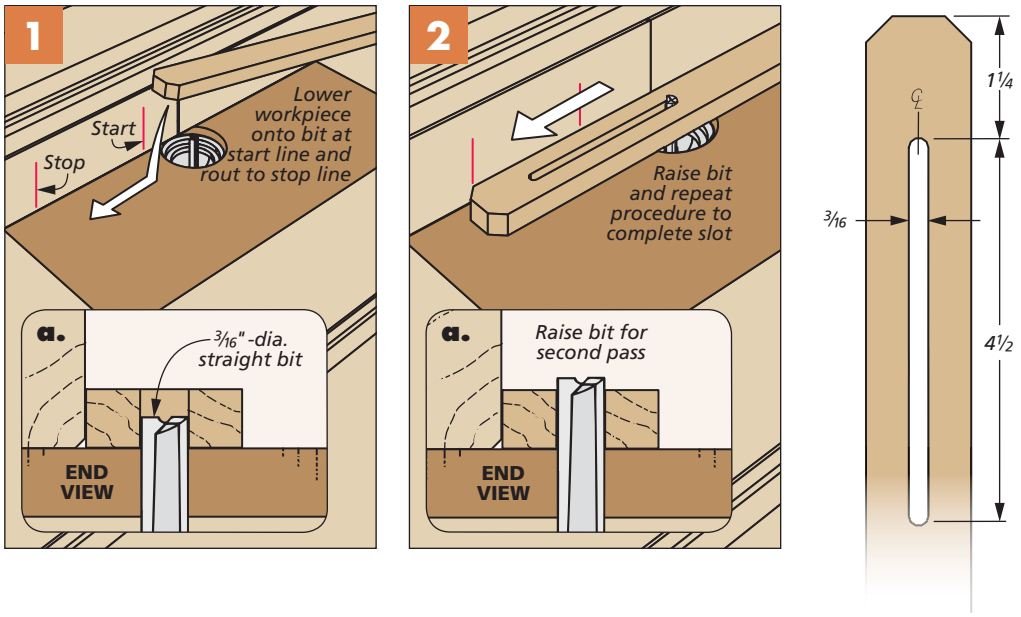




ONLINE EXTRAS

easel Slot

To accommodate different sizes of frames, the easel has an adjustable clamp. The clamp slides in a slot in the support arm. Using a 3/16"-dia. straight bit, I routed this slot in two passes, raising the height of the bit in between. I began by drawing stop and start lines on the fence of my router table (Figure 1, below). With the bit raised half way, I lowered the workpiece onto the bit at the start line and routed to the stop line. To complete the slot, simply raise the bit and repeat the process as shown in Figure 2.



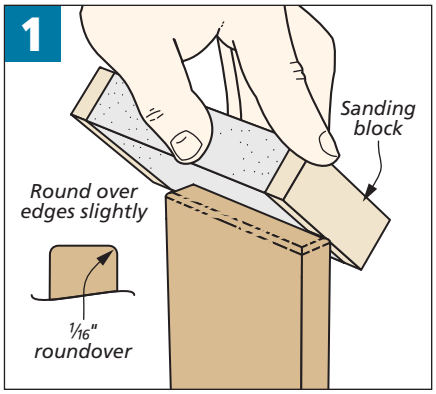
ONLINE EXTRAS

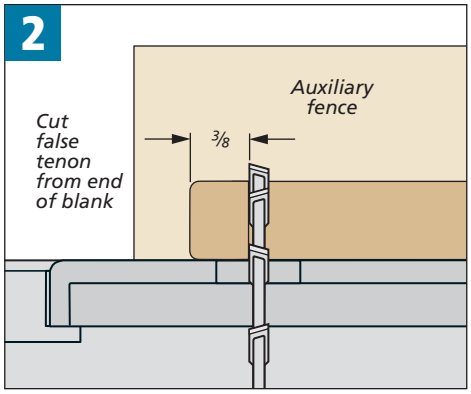
false **Tenons**

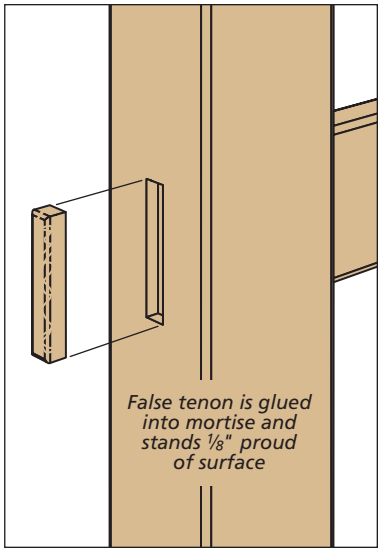
Making the false tenons for the library table posed a bit of a challenge. Because the false tenons are cut from end grain, you can't simply cut them from a long, narrow strip of wood.

The solution is a simple one. I planed down a blank to match the width of the mortise, and ripped it to match the length of the mortise. Then, using a sanding block, I rounded over the ends (Figure 1).

After cutting the false tenon free at the table saw (Figure 2, below), simply round over the ends of the blank again to make the next tenon.







False Tenons. End grain plugs give the library table the look of through tenons — without all the work.

dowel **Joinery**

When it came to adding the corbels to the library table, I decided to use dowels to reinforce the joint between the end of the corbel and the rails (drawing at right). This created a couple of challenges.

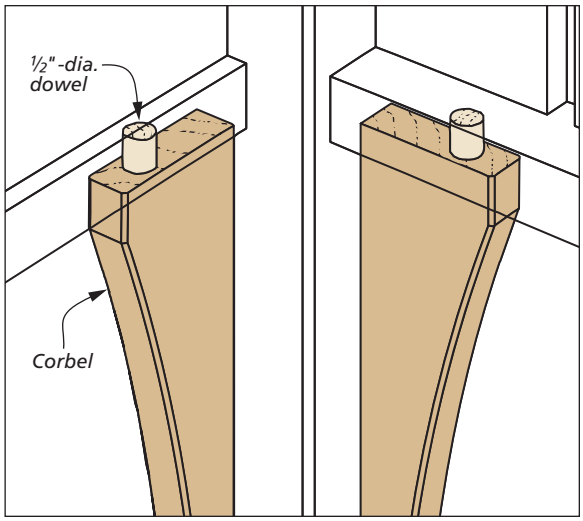
The first was figuring out a way to drill the holes for the dowels in the ends of the corbels. Drilling into hard end grain is never easy, especially in oak. The drill bit tends to wander off course.

The solution was to clamp each corbel in the vise on my workbench and use a doweling jig and a handheld drill to drill the hole (Figure 1). The doweling jig guides the drill bit and prevents it from wandering.

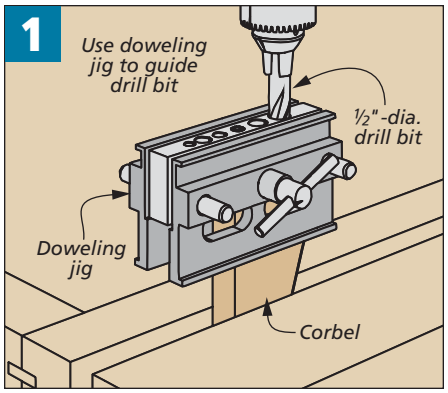
TRANSFER LOCATIONS. The second challenge was to come up with a way to accurately transfer the location of the holes from the corbels to the bottom of the rail or ledger.

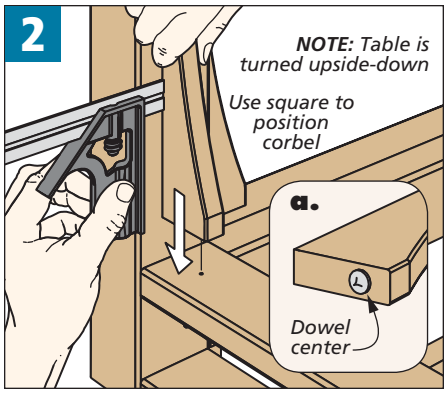
To do this, I simply placed a dowel center in the hole I just drilled in the end of the corbel. Then, using a combination square to help position the corbel, I pressed it in place against the ledger. The dowel center presses into the wood, creating a dimple on the rail or ledger as shown in Figure 2.

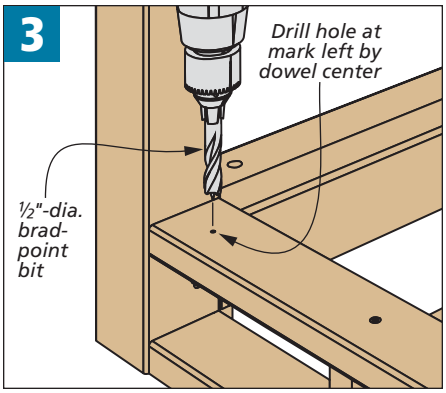
Then it's just a matter of drilling matching holes in the rails for the dowels (Figure 3) and gluing the corbels in place.



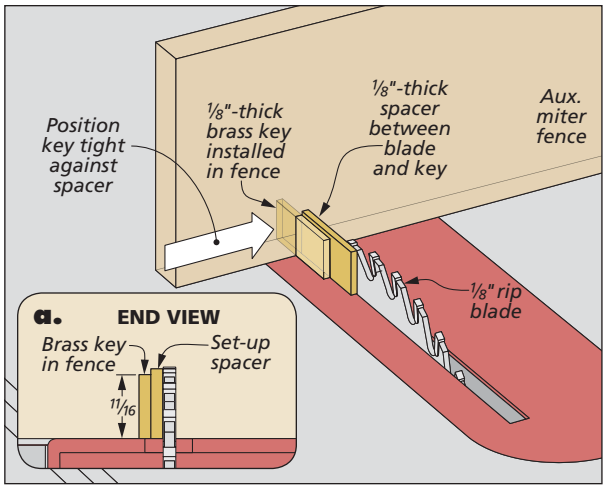
Dowel Joint. Dowels are used to strengthen the joint between the corbels and the rails of the table.







ONLINE EXTRAS



finger joint Indexing Jig

The decorative keepsake box uses finger joints at the corners to hold it together. I cut the slots for these joints at the table saw using an auxiliary miter gauge fence with a key installed in the fence. The fence supports the workpiece and the key allows the workpiece to be indexed for each successive slot.

BUILDING THE JIG. Since the finger joint slots are only 1/8"-wide, I decided to use a piece of 1/8"-thick brass stock for the key. Simply secure it with epoxy into a slot cut in the auxiliary fence. (You may have to lightly sand the key for a snug fit in the slot.) Another piece of brass stock works well for the spacer between the key and blade, as shown at left. Once the key is in the proper position, attach the auxiliary fence to the miter gauge.

get professional results by Grain Matching

As woodworkers, we're all aware of the need for tight joinery, smoothly planed and sanded surfaces, and even the importance of a durable finish. So we soak up techniques for getting the results we want in those areas and move on to the next project. In our haste, however, it's easy to forget about choosing the right color or grain for a particular part.

If the wood grain isn't considered early on, there's liable to be something "off" about the look of the finished piece. But when you get it right, the project really shines. For a great example, take a look at the linen press. Without giving some thought to the grain and color early on, the straight-grained Douglas fir used in the linen press could have been a nightmare.

Options. Both straight grain (top) and cathedral grain (bottom) can be useful in projects. The key is knowing what you need before you buy.

GETTING STARTED. You've probably heard that building a beautiful project begins at the lumberyard. It can take a little time, but choosing stock that's consistent in color and grain is a crucial first step. If you're lucky, you might find a new shipment of wood that contains pieces from the same log, sometimes even a book-matched set or two. These characteristics virtually guarantee good options for matching the grain.

Dampen. A little water on the surface of the lumber gives you a reasonably good idea of what it will look like when a finish is applied.

EXTRA STOCK. Of course, you'll also want to find boards that are as close as possible in color to get a consistent look. While you're shopping, buy at least 10% to 15% extra to give yourself a better chance to match properly and make test pieces. I often carry a bottle of water to dampen the surface of a board

to get an idea of what it will look like after a clear finish is applied (bottom right photo on the opposite page). After all, the finished color is what matters.

KNOW WHAT YOU NEED. A parts list can help you identify what kind of grain you need for the major parts of the project. I look for the straightest riftsawn or quartersawn pieces I can find for door rails and stiles (left photo below). But I also like to have a few flatsawn pieces with cathedral grain for the door panels. And if I need to make some legs out of thicker stock, I want to find grain that runs at about a 45° angle, so it presents a similar pattern on all four surfaces (bottom right photo).

If your project requires gluing up boards to make a wide surface, give these pieces a long, hard look to make sure they'll work side-by-side. The tabletop in the main photo and the panel in the left door, below, are two examples.

IN THE SHOP. When you get the lumber home, lay out the pieces and make the initial sorting of color and grain. A pair of sawhorses is perfect for this (photo above). Take the time to examine each board as you go, marking any defects. I often mark out the major or most visible parts in chalk on the face of the lumber to be sure I have what I need. (I'd rather go back to the lumberyard now while the same batch of boards is there rather than wait a few weeks until the opportunity is gone.) After that, sticker the lumber for a week or two while it acclimates to your shop.

Spread Out. A pair of sawhorses makes the perfect platform for doing a rough check of the stock that you bring home from the lumberyard. It's an easy way to make sure you have the color and grain matches you need for a tabletop or other large, glued-up assemblies.

When you're ready to start on the project, repeat the inspection process as you plane the stock to final thickness. Remember to plane that extra stock, too. It's nice to have a piece already planed if you need to remake parts.

After planing, things might look a bit different, so make sure you examine both faces of the lumber and use as much light as you can find, especially natural light if your shop has windows. Don't be afraid to change your mind from your original assessment. Once you're satisfied, mark out the pieces.

DRY FIT. Once you've cut the individual pieces and the joinery, a dry fit gives you a final opportunity to make any changes. This is where it's easy to tell yourself, "It's good enough," even if it isn't. A little time spent now remaking a mismatched part is nothing to worry about. In fact, doing so only affirms your good craftsmanship.

After following this process for awhile, you'll notice an improvement in your finished projects. And you'll never let grain problems happen again.

Lumber Selection. The door on the left features straight-grained rails and stiles with a bookmatched panel in the center. The door on the right was made by simply grabbing the next board in the stack. You can see the difference that a little time spent choosing the pieces makes.

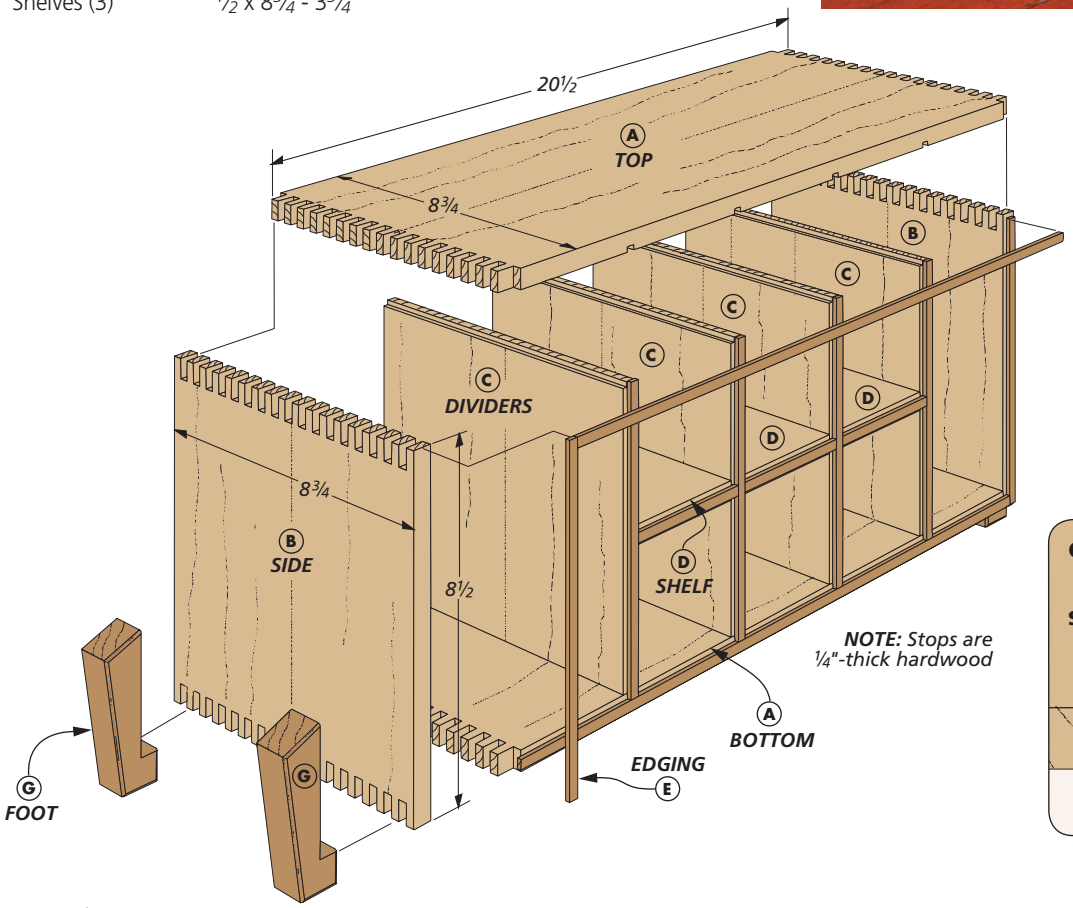
Diagonal. Legs can be a problem since all four faces are visible. Diagonal grain through the piece presents a consistent appearance.

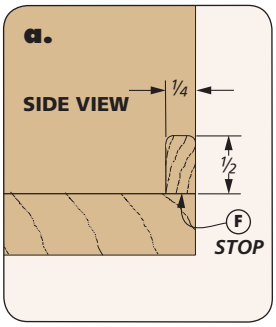
ONLINE EXTRAS

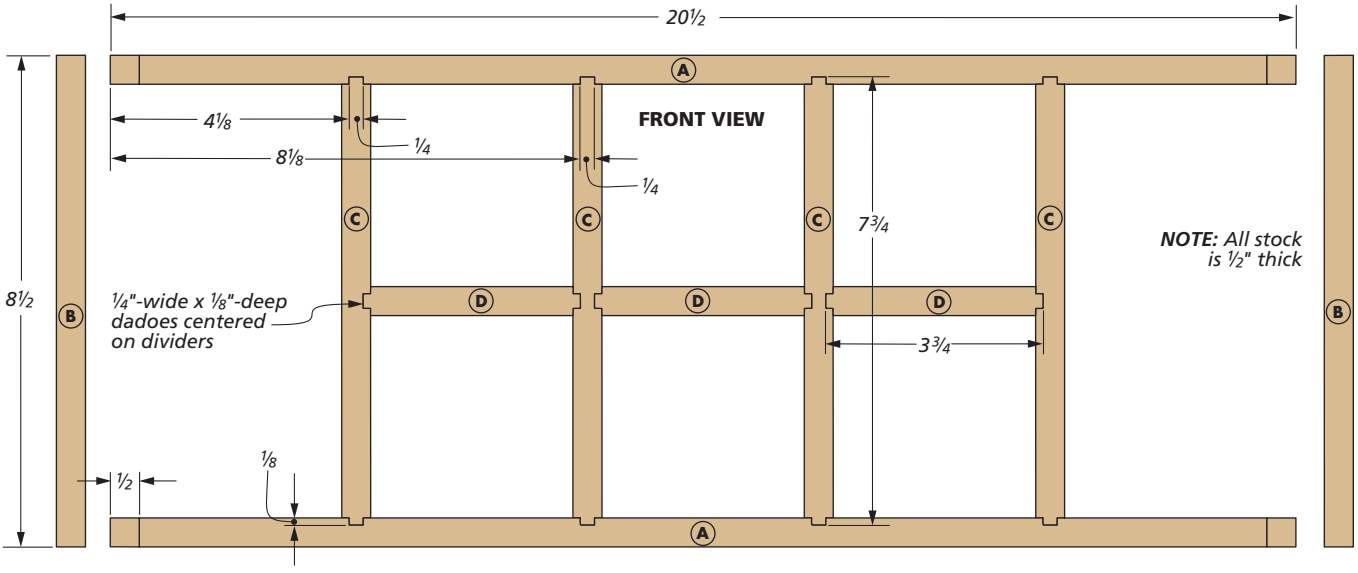
low profile Wine Rack

MATERIALS & SUPPLIES

A	Top/Bottom (2)	½ x 8¾ - 20½	**E**	Edging (1)	¼ x ⅛ - 108 (rgh.)
B	Sides (2)	½ x 8¾ - 8½	**F**	Stops (8)	¼ x ½ - 3½
C	Dividers (4)	½ x 8¾ - 7¾	**G**	Feet (4)	1 x 1½ - 3¾
D	Shelves (3)	½ x 8¾ - 3¾			



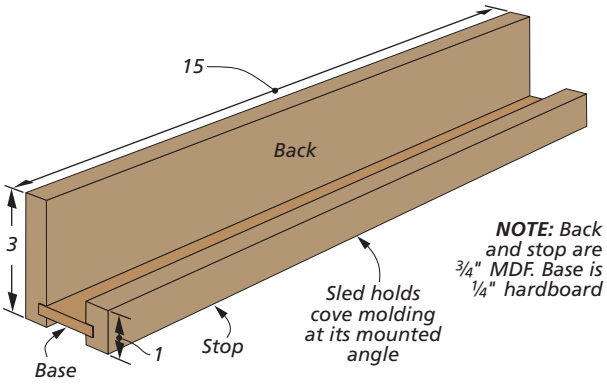




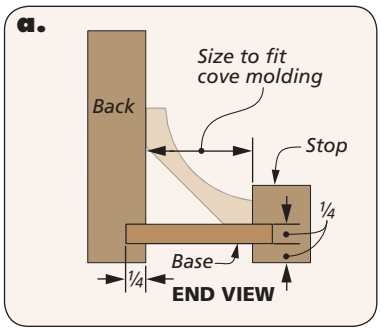
ONLINE EXTRAS

miter **Sled**

The cove molding at the top of the step-back bookcase is mitered to meet at the corners. Of course, because cove molding is installed at an angle, cutting an accurate miter often requires a tricky compound cut where you both tilt the table saw's blade and angle the miter gauge.



MITER SLED. An easier way to miter the molding is shown in the photo above and the illustrations below. You simply make a sled for your miter gauge to hold the molding at the same angle it will rest at when mounted on the bookcase. That way, all you have to do is set the miter gauge at 45° in order to cut the miter.



BUILD THE SLED. As you can see at left, there isn't much to building the miter sled. It features a back and a stop that are grooved to accept a hardboard base. The distance between the two parts matches the width of the cove molding at its mounted angle.

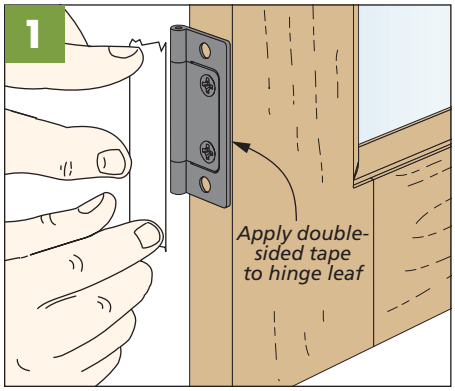
After cutting the parts to size, make the grooves in the back and stop. Then glue the sled together and screw it to the miter gauge. Now you're ready to miter your molding safely and accurately.

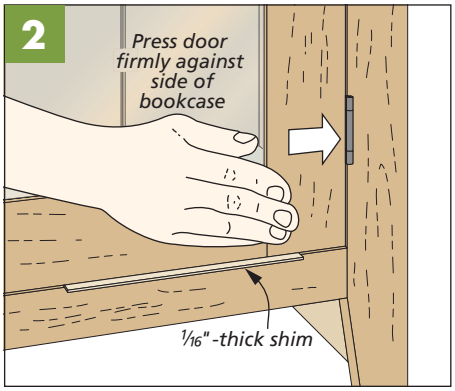
no-mortise **Hinges**

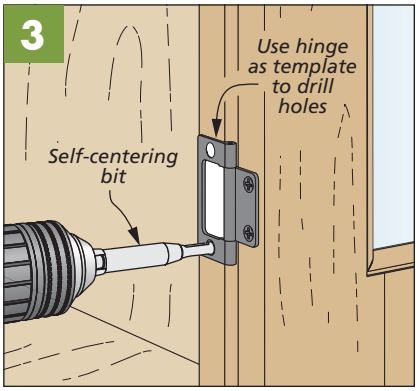
The doors of the step-back bookcase are mounted on no-mortise hinges. I installed the hinges on the doors first. They're simply positioned on the edge of each door and then screwed directly in place.

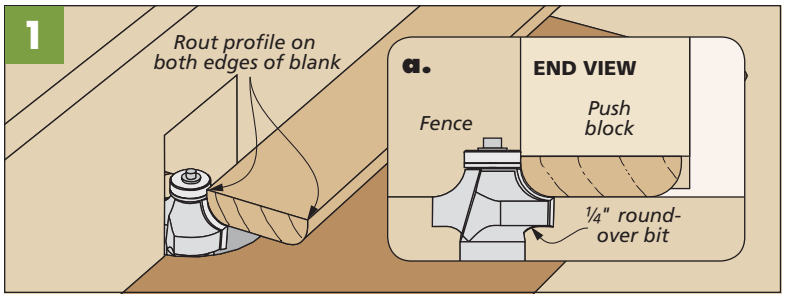
To locate the hinges on the face frame of the bookcase, place a piece of double-sided tape on each hinge (Figure 1). Then press the door against the side of the cabinet, using a $\frac{1}{16}$"-thick shim to create a gap, as shown in Figure 2.

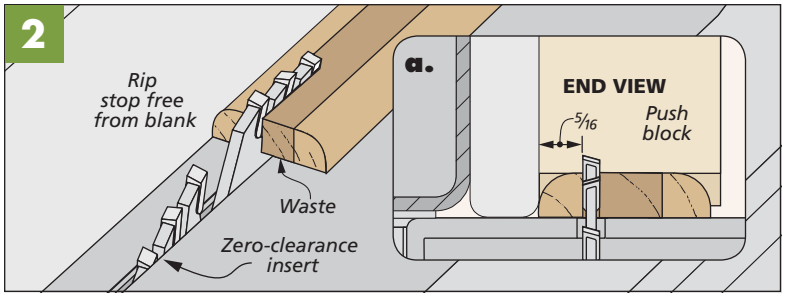
With the hinges taped in place, carefully open the door and use the hinge as a template to drill the screw holes, as in Figure 3. Finally, it's just a matter of removing the tape and screwing the hinges to the sides of the cabinet.











glass Stop

The glass panels in the doors of the step-back bookcase are held in place with quarter-round stop. To make this glass stop, I began by planing a wide blank to final thickness ($\frac{5}{16}$"). Once this was done, I routed a roundover on both edges of the blank, as you see in Figure 1.

To complete the glass stop, simply rip it free from both edges of the blank at the table saw, as illustrated in Figure 2.

A push block helps to safely guide the workpiece past the blade. All that's left after this is to miter the pieces to length and install them into the door frames.

ONLINE EXTRAS

frame & easel
Optional 11x14 Size

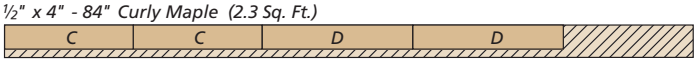
MATERIALS, SUPPLIES & CUTTING DIAGRAM

11 x 14 Size

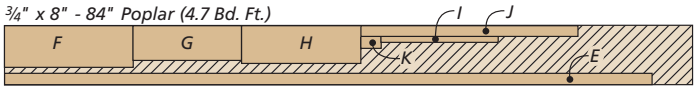
A	Backer Top/Bottom (2)	1/4 hdbd. - 3 x 11
B	Backer Side (2)	1/4 hdbd. - 3 x 20
C	Facing Top/Bottom (2)	3/8 x 3 1/4 - 17
D	Facing Side (2)	3/8 x 3 1/4 - 20
E	Trim (1)	5/8 x 1 - 80 (rgh.)
F	Base Bottom (1)	3/4 x 5 - 17
G	Base Riser (1)	3/4 x 4 1/4 - 15 1/2
H	Base Top (1)	3/8 x 4 1/2 - 16
I	Frame Stop (1)	1/4 x 1/4 - 15 1/2
J	Vertical Support (1)	3/8 x 1 - 26
K	Clamp (1)	3/4 x 1 - 1 1/2

- (4) 7/8" Brass Turnbuttons w/Screws
- (2) #6 x 1" Brass Fh Woodscrews
- (1) 10-24 x 2" Brass Machine Screw
- (1) #10 Brass Flat Washer
- (1) #10 Brass Thumb Nut

1/2" x 4" - 84" Curly Maple (2.3 Sq. Ft.)



3/4" x 8" - 84" Poplar (4.7 Bd. Ft.)



***NOTE:** Parts C, D, E, H, I, and J are planed to correct thickness*

***ALSO NEEDED:** One 12" x 24" sheet 1/4" hardboard*

ONLINE EXTRAS

adding a **Patina**

Adding a patina to the metal parts is a great way to give the bride's chest an antique look. Best of all, it's very easy to do. You can find out where to get the materials on page 98.

CLEAN & SAND. Before you start with the chemicals, you'll need to give the metal a good cleaning and sanding. I started with mineral spirits to remove any film on the steel (there's often an anti-rust coating). A random-orbit sander is perfect for a good scrubbing (Photo 1).

SPRAY-ON PATINA. In Photo 2 you can see how to spray the solution. I used a block of scrap to hold the brace up off the bench. You'll need to let the fluid pool and sit overnight to develop the color.

OIL. The last step, shown in Photo 3, is to brush on a couple coats of oil to protect the patina from chipping. No further finishing is needed.

Rough-Up. I used 60-grit paper first, then 100-grit to sand the fresh metal and rough it up a bit for the patina.

Add Solution. The solution starts working as soon as you spray it on. Flood the surface, then let it sit overnight.

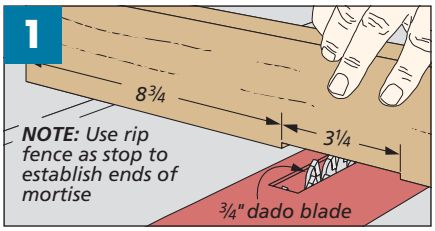
Topcoat. A foam brush is perfect for applying the oil topcoat. Give it two coats to protect the patina.

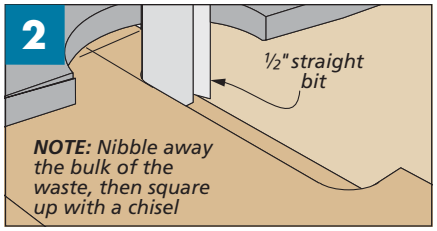
hinge **Mortise**

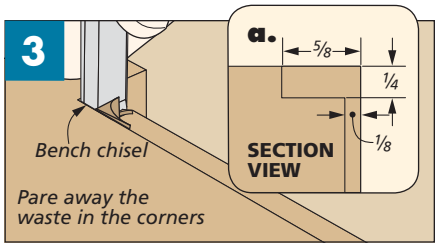
The torsion hinges I used on the bride's chest are great for keeping the lid from slamming shut. They will hold the lid open at any angle. On top of that, they're a breeze to install. You only need to mortise the top rail on the back.

TABLE SAW. Start by laying out the hinge position. Then you can remove most of the waste in between the marks using a dado blade in the table saw and the miter gauge (Figure 1). I used the rip fence as a stop for the inside edge.

ROUTER & CHISEL. Figure 2 shows how you can rout away most of the waste for the barrel of the hinge. After that, pare down to the layout line with a chisel (Figure 3). Then all you need to do is install the hinges with screws.



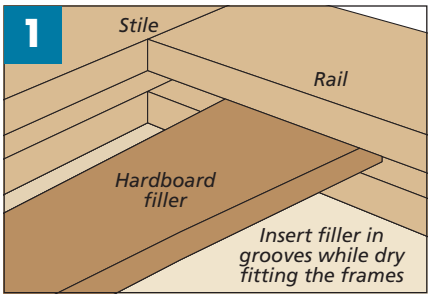


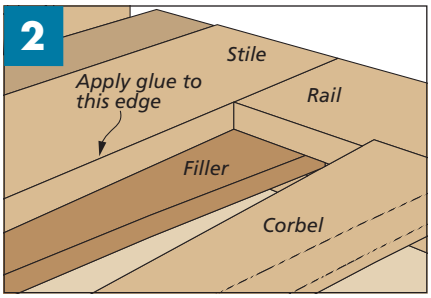


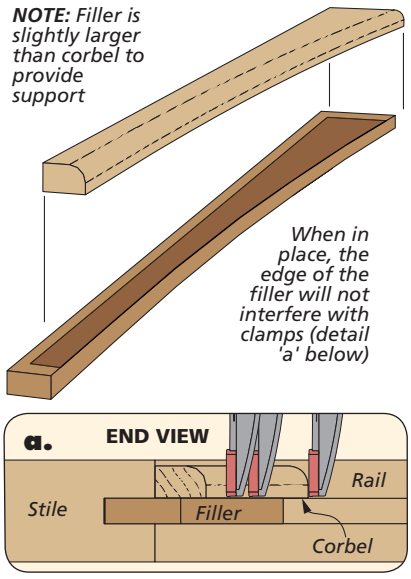
corbel **Installation**

The decorative corbels on the bride's chest complete the Craftsman-style look of the piece. But installing them was kind of tricky. The problem is, you don't want to glue them to the hardwood panels or they could separate from the stiles when the panels expand and contract with seasonal changes in humidity. The solution is to glue them to the stiles only.

FILLER. For this assembly, I made a hardboard filler that acts as a temporary shelf to hold the corbel in place (Figure 1). I made the filler by cutting an extra-wide hardboard blank. Trace the curve of the corbel onto the hardboard and cut it at the band saw. Then fit the filler in the groove in the stile and glue the corbel in position (Figure 2).





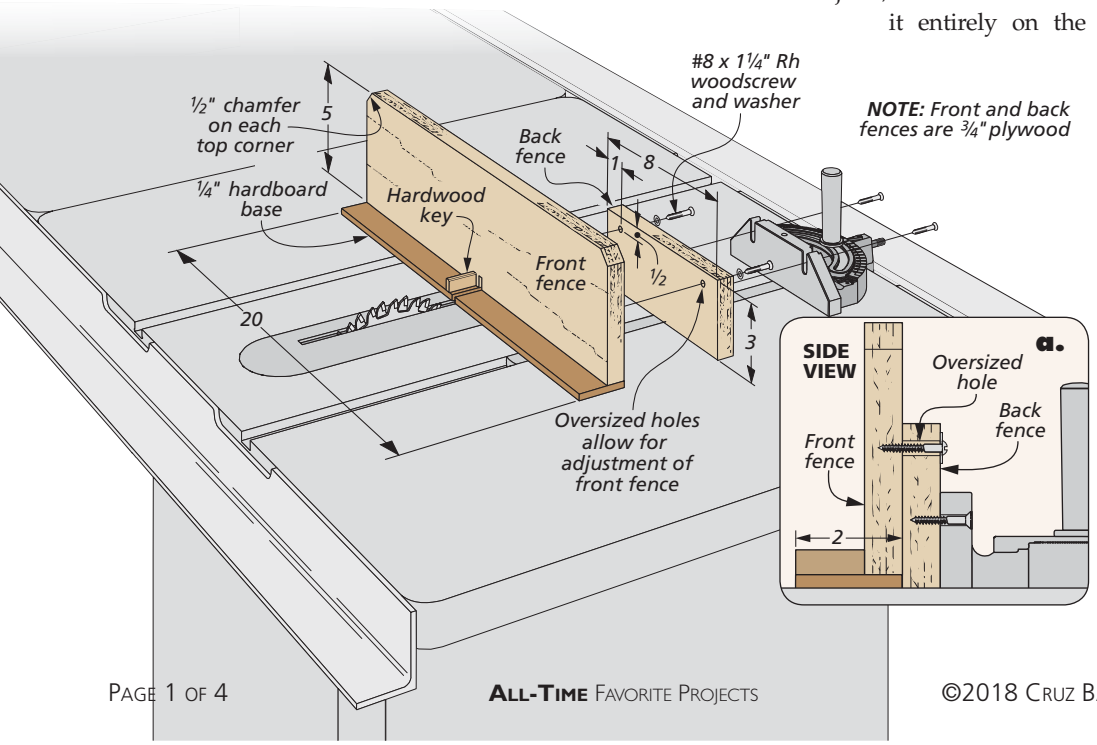


perfect-fitting Box Joints

All it takes to make this super-strong joint is a simple shop-made jig, a dado blade, and a table saw.

I often turn to box joints when I need an effective and attractive way to join the corners of a case or box, like in the case of the Wine Rack. This joint has interlocking pins that create extra glue surface to assure a strong, long-lasting joint. And the contrasting grain patterns really make a project stand out.

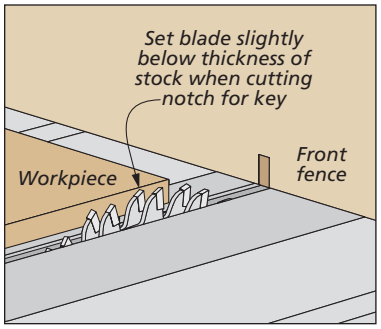
If there's one thing I like best about this joint, it's that I can cut it entirely on the table saw. The series of slots are cut with a dado blade or special box joint blade, to create equally spaced pins that fit snugly in slots on the adjacent workpiece. The cuts go pretty fast when you use a simple, shop-made jig.



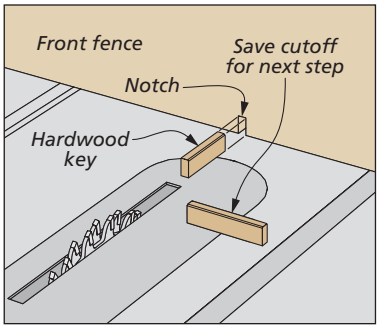
A SIMPLE JIG

In order for the box joints to look good and, more importantly, fit properly, you'll need to space the pins on each workpiece precisely. And the best way to do that is with a box joint jig.

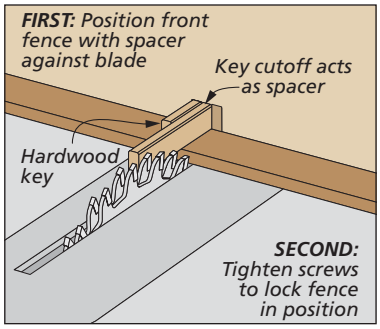
If you take a look at the drawing on the left, you'll see that the jig consists of two fences attached to your saw's miter gauge. The rear fence is simply screwed firmly to the miter gauge. And the front fence is attached with screws through two over-sized holes, so you can easily make adjustments to dial in a good fit.



Key Notch. Set the blade just below the thickness of your workpiece when you cut the notch.



Cutting a Key. Size the hardwood key to fit in the notch made by the dado blade in the front fence.



Space the Key. The key cutoff should fit snugly against the saw teeth during setup.

The front fence is your guide for cutting the workpieces. It has a key sized to match the width of the dado blade. The key is positioned the same distance from the blade as the width of the blade to create a pin between each cut.

This setup guarantees that the pins align with the slots in the mating piece. The fence backs up the cut. And a sled attached to the bottom of the front fence ensures that the workpiece is level.

BUILD THE JIG. I chose Baltic birch plywood for both fences because it's flat and stable, and it takes screws well. Once you've cut the workpieces to fit your saw, drill the oversized holes in the back fence (detail 'a', opposite page).

SET UP THE JIG. Completing the jig is really a combination of construction and setup. So your next step is to choose the dado blade you'll use to cut the slots. For the wine rack, you'll need a ¼" dado blade. For slots with perfectly flat and square bottoms, you can purchase a box joint blade set, like the one shown in the box on the right. But any dado blade will get the job done.

To make a notch for the key, raise the blade to just under the thickness of the workpiece (½" for the wine rack). You'll readjust the height later when you cut the box joints. With the front fence not yet attached to the back fence, cut a notch roughly centered on the front fence (upper left drawing). You can simply hold the front fence against the back fence to make this notch.

With the notch cut, you can turn your attention to making the hardwood key next. The key registers the workpiece as you make a series of cuts along the end to create the pins and slots. I cut an extra-long blank so I could use a piece of it to set the spacing between the key and the saw blade later.

Size the key to fit the notch in the fence. It should fit snugly, but not too tight. When you're sure of the fit, cut it to length and glue it in the slot in the front fence. Save the remaining piece of the key for the final setup steps.

BASE. With the key seated in the notch, you can glue the base to the bottom of the front fence. This base provides a flat surface for the workpiece to rest on while you make the box joints on the saw.

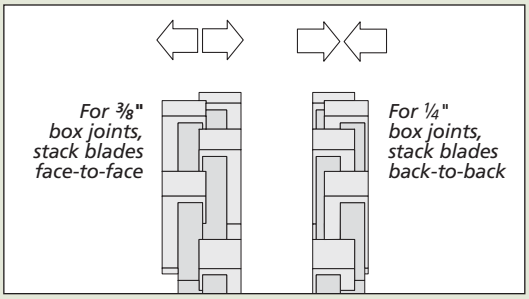
SET THE SPACING. To finish the setup, you'll need to space the key the correct distance from the blade. This is where the remaining length of the key comes into play. Place the cutoff portion of the key against the teeth of the saw blade and slide the fence over until the fixed key butts against it (right drawing, above). Again, this should fit snugly, but not tight against the saw blade. When the key is the proper distance from the dado blade, you can drive the screws into the front fence.

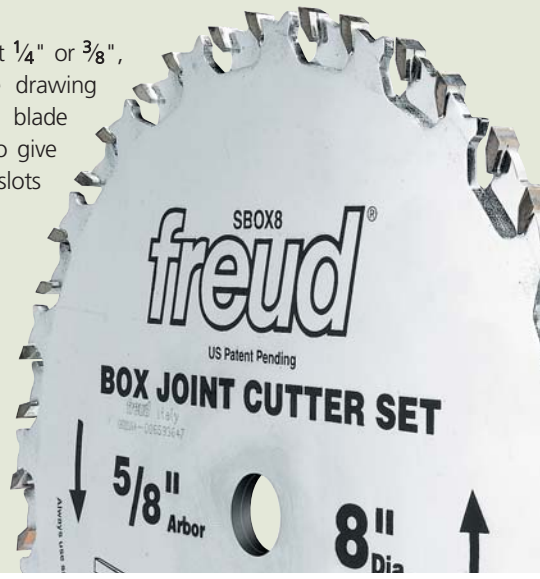
With the jig built and the setup completed, you can move on to make a test cut first, and then cut the final box joints in your project. I think you'll find the work goes pretty fast once you have the jig set up and ready to use.

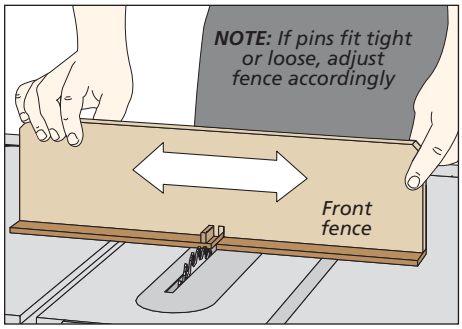
Worth a Look: Box Joint Blade

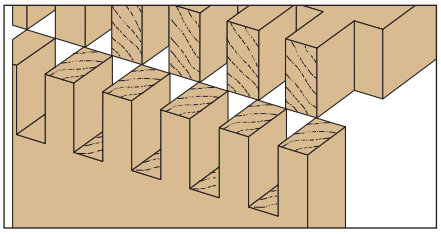
If you're looking for precise setups for common box joint sizes, then the Freud Box Joint Cutter Set is what you want.

The teeth are brazed to the blade off center so this set can cut precise slots at ¼" or ⅜", as shown in the drawing below. Plus the blade tips are ground to give you flat-bottom slots every time.

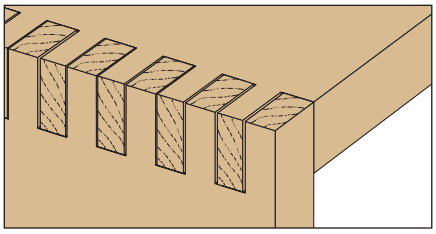




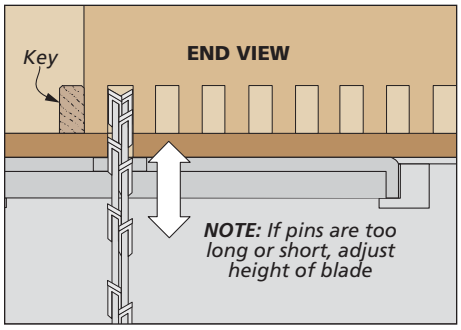


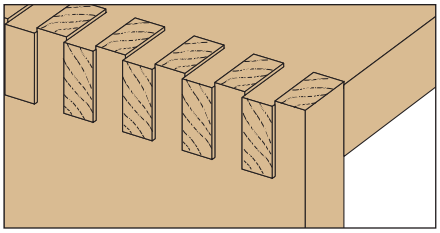


Too Tight. If you find the joint requires too much force, or won't go together at all, move the key toward the blade.

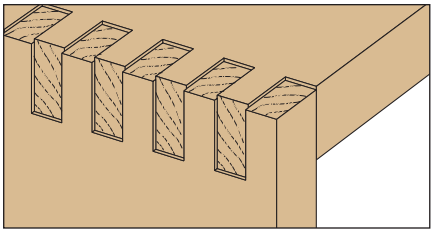


Too Loose. If there are noticeable gaps between the pins, adjust the fence to move the key away from the blade.





Long Pins. If the pins protrude too far (more than 1/32"), you'll need to lower the blade to correct this.



Short Pins. Short pins are the result of the blade being too low. Simply raise the blade to correct the problem.

Now you're ready to put your jig to the test by making the box joints. After some test cuts, you'll be on the way to the glueup.

LABEL THE WORKPIECES. Before you start cutting, you'll want to label each end and the top and bottom of the workpieces. This will help you keep the workpieces in the proper order while you're making the box joints.

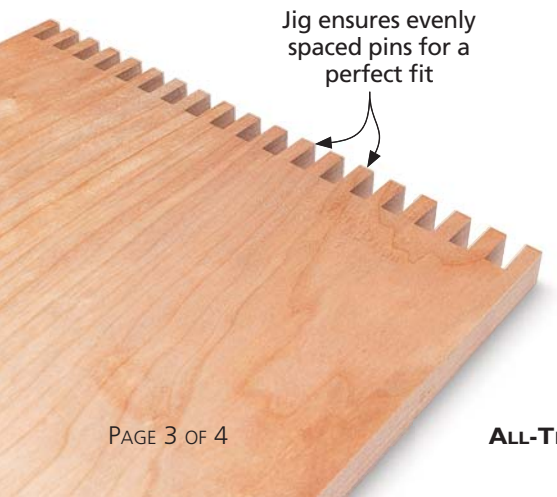
TEST CUT. With joinery this exact, it's always a good idea to make a couple test cuts. I started the process with test pieces milled to the same thickness and width as my project pieces. When you're ready to make your first cut, raise the saw blade to 1/32" over the thickness of the workpiece. I did this so that the pins were just a little long. Then I can sand the ends of the pins after the glue up and remove any glue squeezeout. (Remember to take the thickness of the sled into account when you're setting the blade height.)

There are a couple things to note as you make your first cut. Make sure you hold the workpiece tight against the fence at all times. And make sure the end of the workpiece is seated flat against

First Cut. Maintain a firm grip to keep the workpiece in position against the fence and tight against the key.

Cut & Repeat. As you move the workpiece after each cut, make sure the bottom edge stays flat on the sled.

Cut the Mating Piece. Flip the workpiece around to act as a spacer to cut the initial notch in the mating piece.



Complete Second Workpiece. Continue across the second workpiece until all the slots are cut.

Trim to Fit. If needed, trim the workpieces so that each one ends with a full pin or notch for a more finished look.

the sled. This consistency ensures that all the pins and slots will be identical in size.

CUT. To make the box joints, you'll cut a series of pins and slots along the end of the workpiece. The first slot is cut with the edge of the workpiece against the key, as shown in Step 1 at the bottom of the opposite page. When that slot is cut, fit it over the key and make the next cut. Then continue across the workpiece until all the slots are cut (Step 2).

ADJOINING SIDE. When the slots are cut in one workpiece, flip the workpiece around and use the first pin as a spacer to start the mating workpiece (Step 3). Continue cutting slots until you've reached the end of the second workpiece.

TEST FIT. When all the pins are cut, you can check the fit of the test joint. You should be able to insert the pins in the slots with gentle hand pressure. If you have trouble with the fit, take a look at the drawings at the top of the opposite page for some tips. A joint that's too loose won't hold well and could come apart. Likewise, a joint that fits too tight could cause the wood to split at the slots once the glue is added.

TRIM THE EDGES. Even though the pins and slots are the same size, each one may be just a hair smaller or larger than you intended. When this happens, you'll find you have an odd-sized pin or slot at one edge of the piece. In order to keep the case even, you can trim the edges of the workpieces so that a full pin or slot remains, as shown in Step 5 on the opposite page.

For tips on gluing and assembling box joint jigs, take a look at the box on the right. When assembly is done, you can sand the ends of the pins flush with the case and remove any glue squeezeout.

Box joints are an attractive option to join case or box corners. And I think you'll find they'll stand up to heavy loads and a lifetime of use, too.

How-To: Gluing it Up

All the painstaking setup and test cuts you've gone through will finally pay off when it's time for assembly. Box joints that are cut properly square up easily. But you'll still need to work quickly once you apply the glue. You can use a slow-setting glue like liquid hide glue or Tightbond III to give you a little more open time during the glueup.

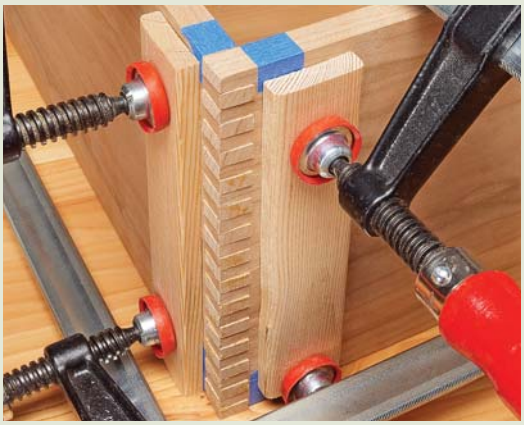
Glue. The advantage of box joints is the large amount of gluing surface the interlocking pins and slots create. So it only takes a small amount of glue to create a solid joint. In fact, you don't need to put glue on every surface. I like to use a brush to apply a small amount of glue to the top of each pin, as shown in the top right photo.

As you assemble the joint, the glue will spread to other surfaces. And you will get some glue squeezeout. I place masking tape next to the pins (top photo). This will trap any squeezeout on the inside corners where it's tough to remove. When the glue has skinned over, pull the tape off and the glue will come with it (bottom photo).

Clamping. Clamping box joints is a little different than clamping other types of joinery. Since the pins are slightly long, you won't be able to apply clamps directly to the corners of the case. So when you're ready to apply the clamps, you'll find clamping blocks come in handy. Take a look at the center photo to see how I used blocks to clamp the case. You can see that the blocks give you the ability to apply pressure to close the joint in both directions without touching the pins.

Glue Choice. With its longer open time, *Titebond III* is excellent for gluing box joints.

Proper Gluing. By applying glue only to the top of each pin, a strong long-grain to long-grain joint is created at each pin and slot.



Even Pressure. Clamping blocks distribute the force of the clamps evenly, without interfering with the proud-standing pins.

Glueup Tip. After the glue has set, removing the tape reveals a clean joint, with no cleanup required.

ONLINE EXTRAS

perfect parts with Pattern Sawing

Whenever a project calls for making several identically shaped parts, I immediately start thinking of ways to streamline the process. One of my favorite tricks to make multiple, identical parts is to use a pattern, or template.

Long story short, you trace the template on each workpiece blank and cut away most of the waste (often with a band saw). Then it's a simple matter to use the template to guide a flush trim bit in a router to create an exact copy.

One of the sticking points with this method is rough cutting the waste. The idea is to remove as much of the waste as possible. I aim for no more than 1/16" of waste outside the layout line.

Leaving a small amount of waste to trim away speeds up the flush trimming step. It also reduces the possibility of the edge of the workpiece tearing out.

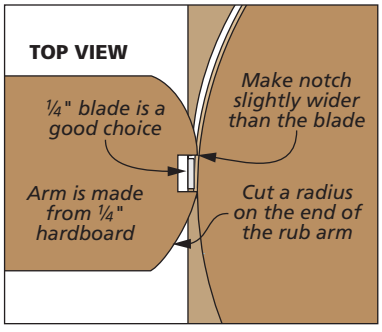
However, making "precise" rough cuts with a band saw is time-consuming and you run the risk of cutting across the line.

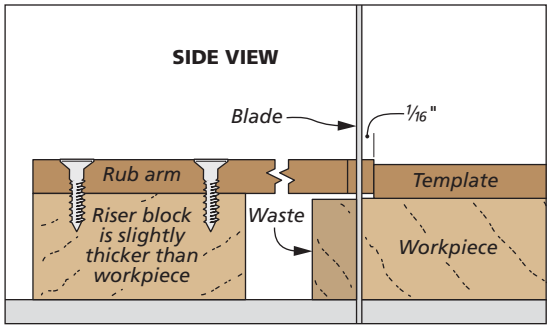
The answer to that is to put your template to work in a different way — guiding your band saw. The trick is creating a way for the band saw blade to follow the template while leaving a consistent, small amount of waste.

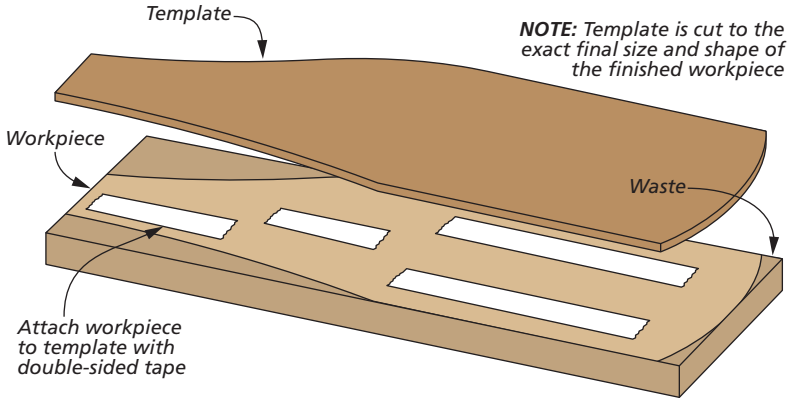
For that I use a rub arm, as shown in the photo above. It acts somewhat like a guide bushing on a router. The blade is recessed in the rub arm. You pass the workpiece through the blade keeping the template in contact with the rub arm creating an even reveal of waste.

RUB ARM DETAILS. There are a few important considerations when making the rub arm to get the best results. One of the first details is the overall size and shape. The end of the rub arm is curved so it can follow the tightest curve in your template. Like the template, I made the rub arm from 1/4" hardboard.

BLADE NOTCH. In order to leave a small amount of waste, the blade has to be







offset from the end of the rub arm. A notch on the end of the arm accepts the blade. It should be sized so it's a hair larger than the width of the blade. Speaking of the blade, I find that a ¼" blade is a good all-around choice for cutting most curved shapes.

Cut the notch deep enough so that you can recess the blade 1/16" in from the end of the arm. This is shown in the lower left drawing on the previous page.

SETTING UP THE RUB ARM. In order to maximize visibility and control, I like to work with the template on the top face of the workpiece. So the rub arm needs to be suspended above the saw table so that it contacts the edge of the template. To accomplish this, the rub arm is attached to a riser block that's slightly thicker than the workpiece, as in the lower right drawing on the previous page.

In addition to elevating the rub arm, you need to include clearance between the end of the arm and the riser block for the waste portion of the blank to pass through without catching. The block (and rub arm) is clamped to the side of the saw table, as shown in the main photo on the previous page. When preparing your workpiece, it's a good idea to size the blank to minimize the amount of waste that needs to be removed.

MAKING CUTS

If you've only cut curves freehand with a band saw, using a template and rub arm will seem unfamiliar at first. The truth is you get the hang of it pretty quickly. The real key in the process is keeping the edge of the template in contact with the two points of the rub arm on either side of the blade. The way to do this lies in your stance and how you position your hands.

YOUR STANCE. Unless the workpiece is long, I prefer to stand a little to the side of the band saw rather than directly in front of it. This location gives me a better view of the rub arm while monitoring the progress of the cut.

Use your left hand to move the workpiece through the blade left to right. The other hand provides side-to-side steering that keeps the template in constant contact with the rub arm, as you can see in the main photo.

TAKE IT EASY. Feed the workpiece at a steady rate allowing the band saw and blade to do the work of cutting. The blade will have a natural cutting pace that you'll pick up on in a short time.

How quickly you can make the cut depends on the density of the workpiece and the sharpness of the blade. You should feel mild resistance as you feed the workpiece into the blade.

Feeding the workpiece with too much pressure may cause the blade to distort, flexing either backwards or to the side which could spoil the template and workpiece. With a little practice, this will become second nature.

When you've completed a cut, the edge of the workpiece should look like what you see in the lower left photo. The blank will be slightly larger than the template and have telltale blade marks.

FLUSH TRIM. A quick stop at the router table is the last step (lower right photo). Here's where you can see the benefit of sawing with a template. With only a small amount of waste, you can work your way around the template and end up with a perfect project part.

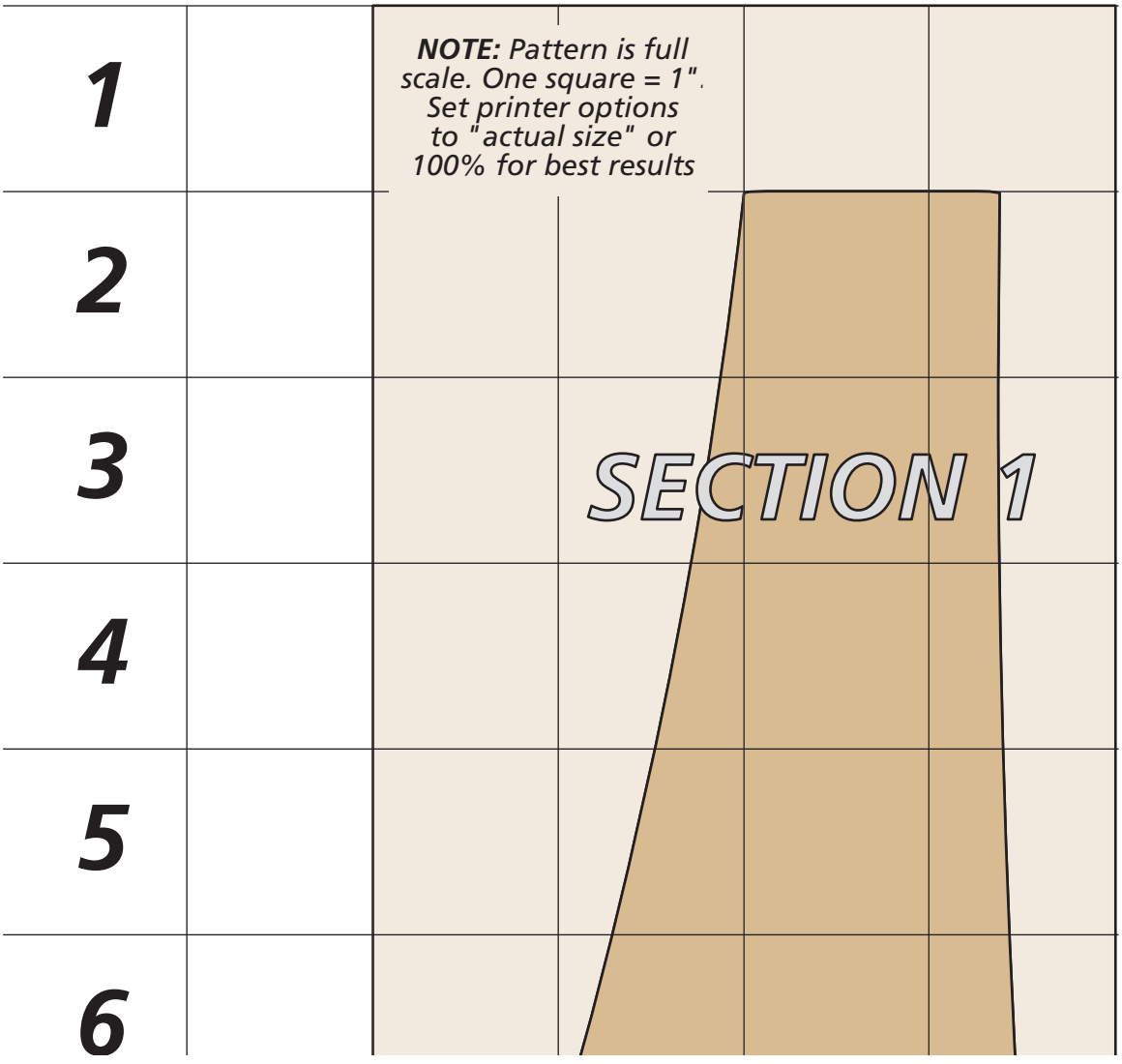
Templates simplify the process of making shaped parts. And adding your band saw to the mix is a great way to improve the consistency of your work.

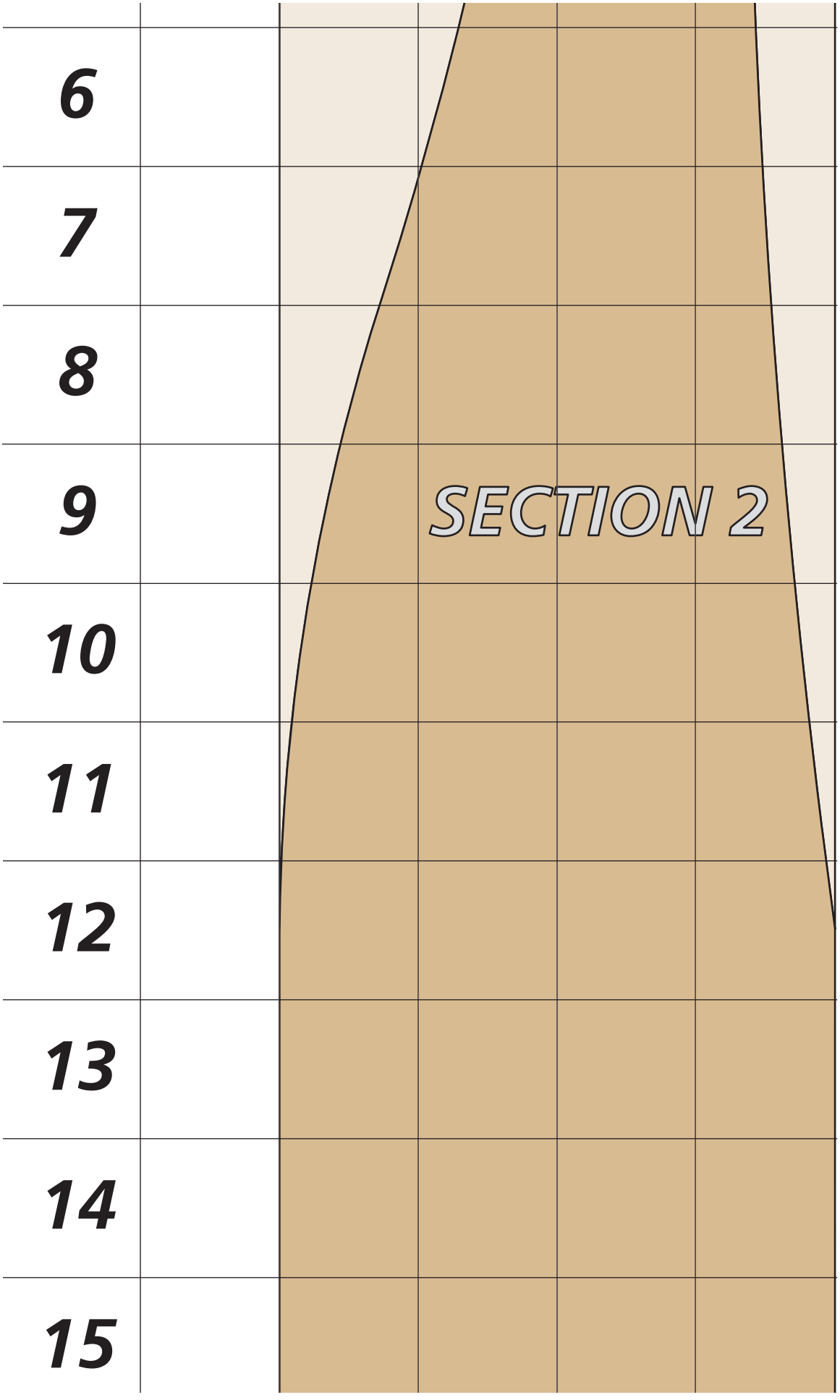
Trim. As you cut, steer the workpiece to keep the template in contact with the two points on the end of the rub arm. The result is a thin, even amount of waste that can be easily trimmed away.

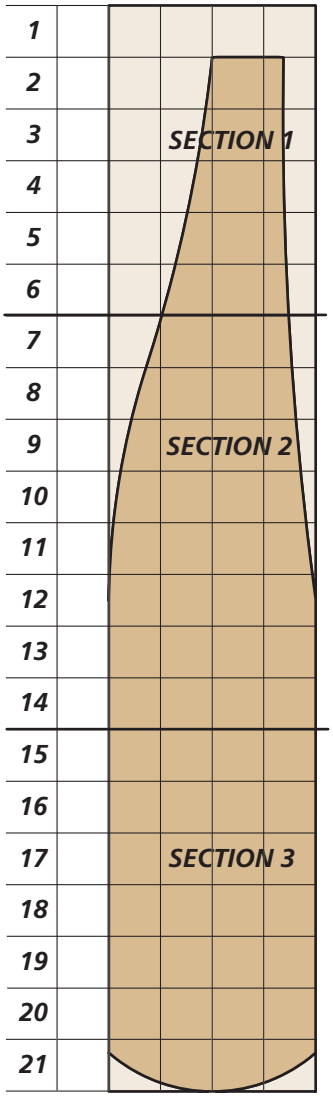
Clean. Leave the template in place and head over to the router table to clean up the workpiece. Set a flush-trim bit so that the bearing follows along the template to create a smooth, even edge.

ONLINE EXTRAS

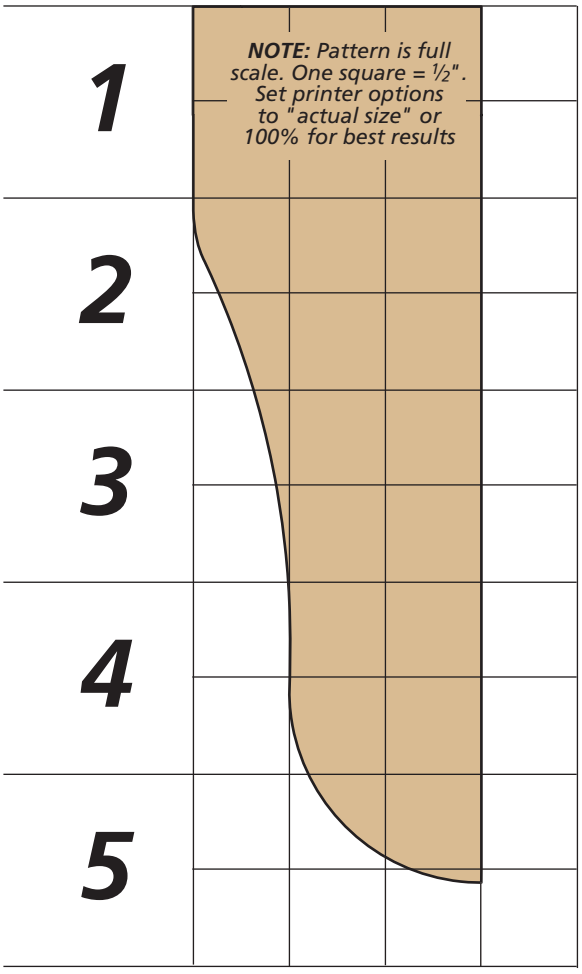
full-size pattern
Rocker Arm



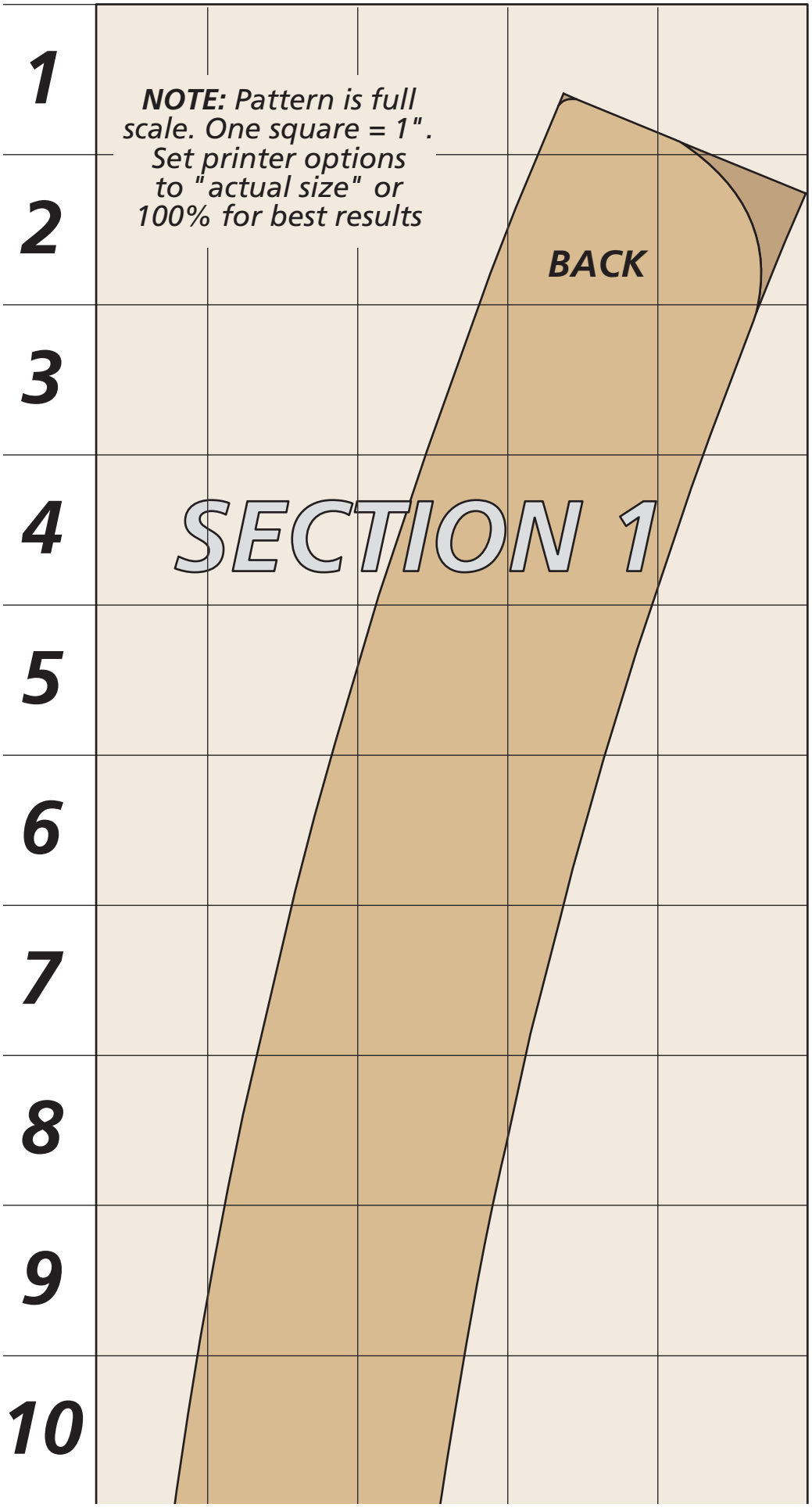


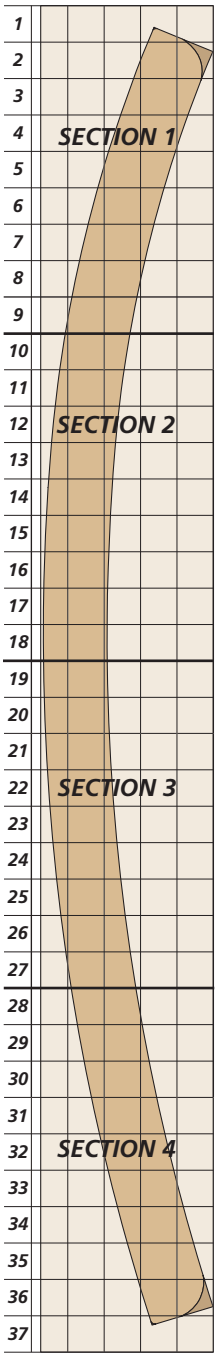


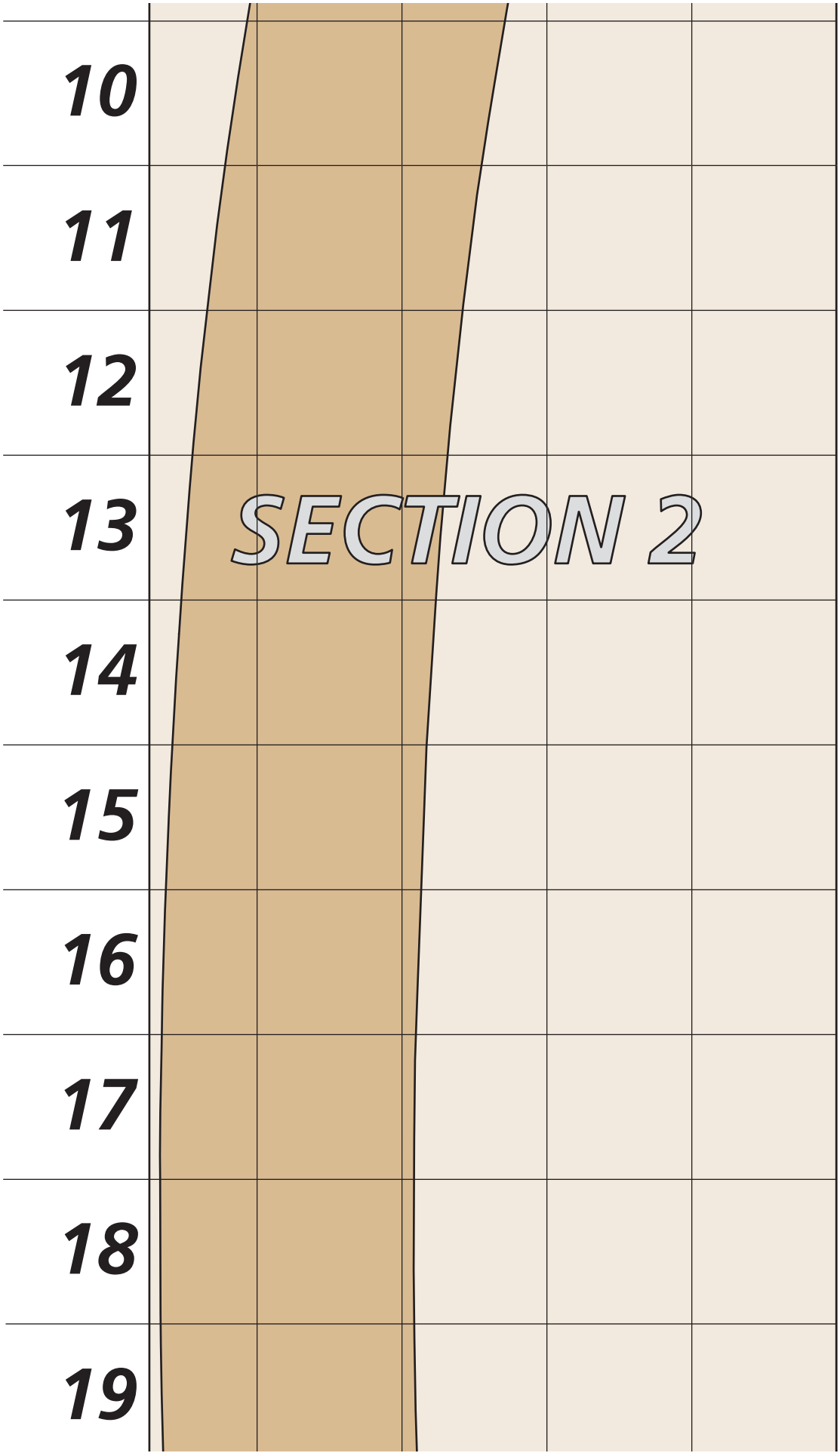
full-size pattern
Rocker Arm Corbel

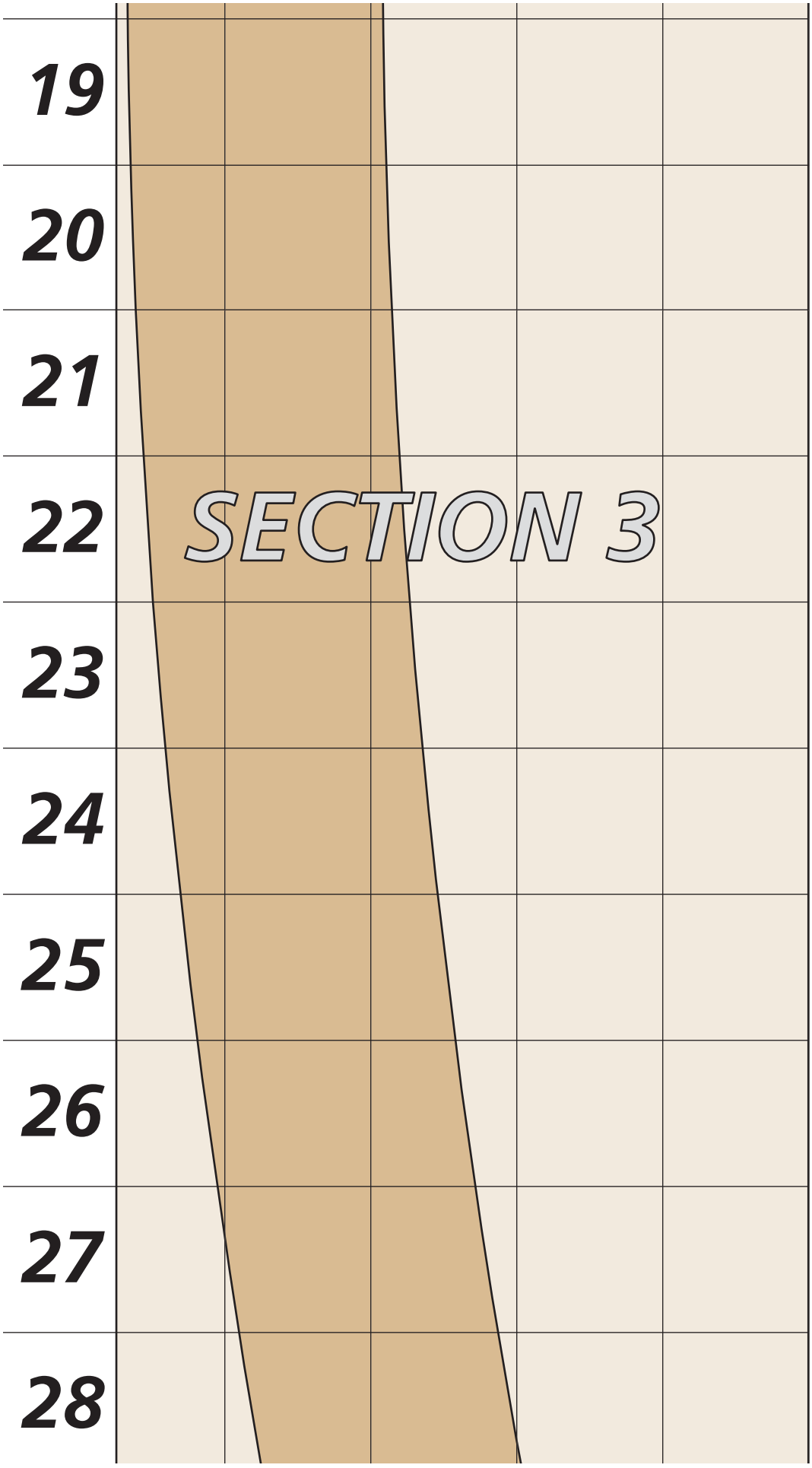


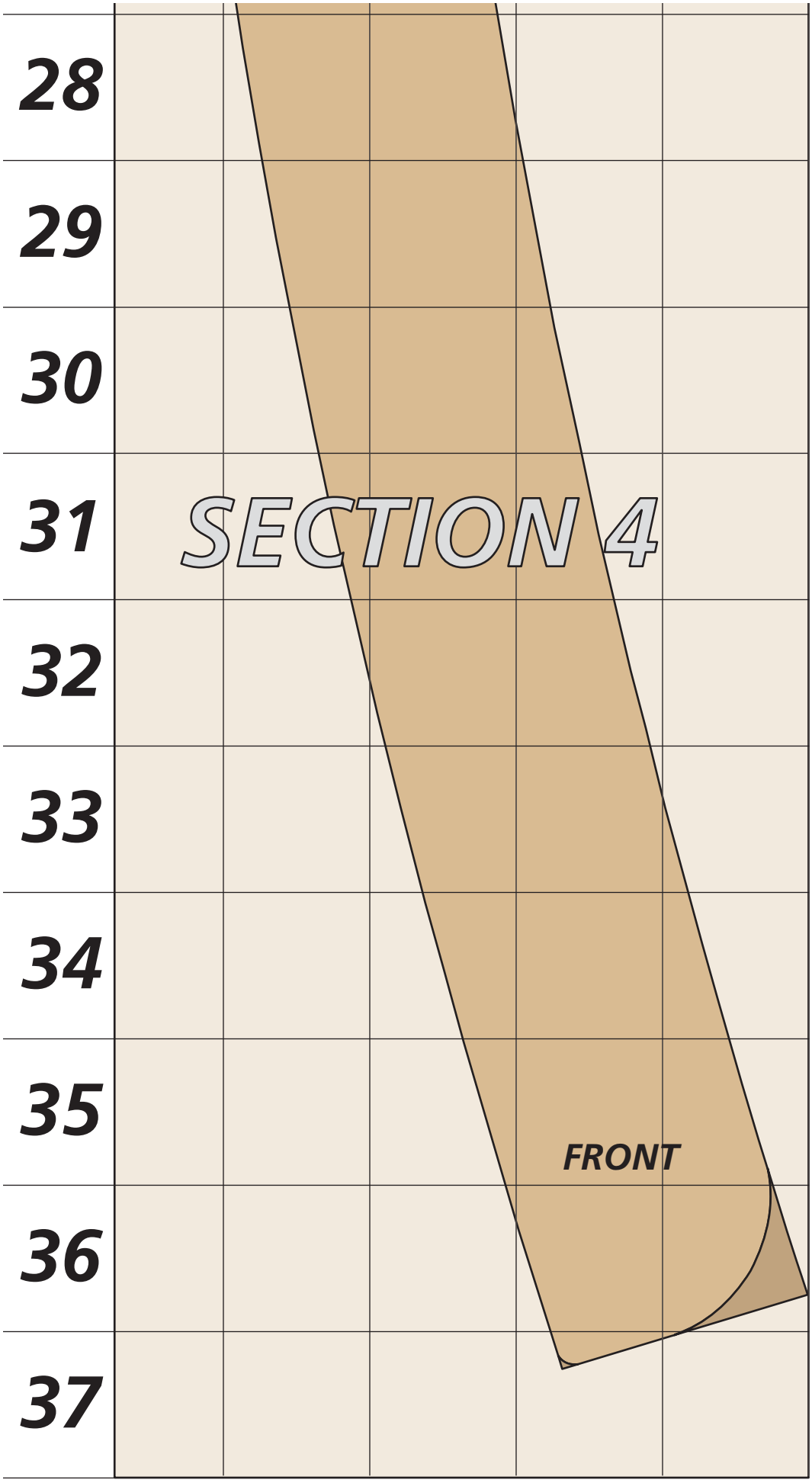
full-size pattern Rocker



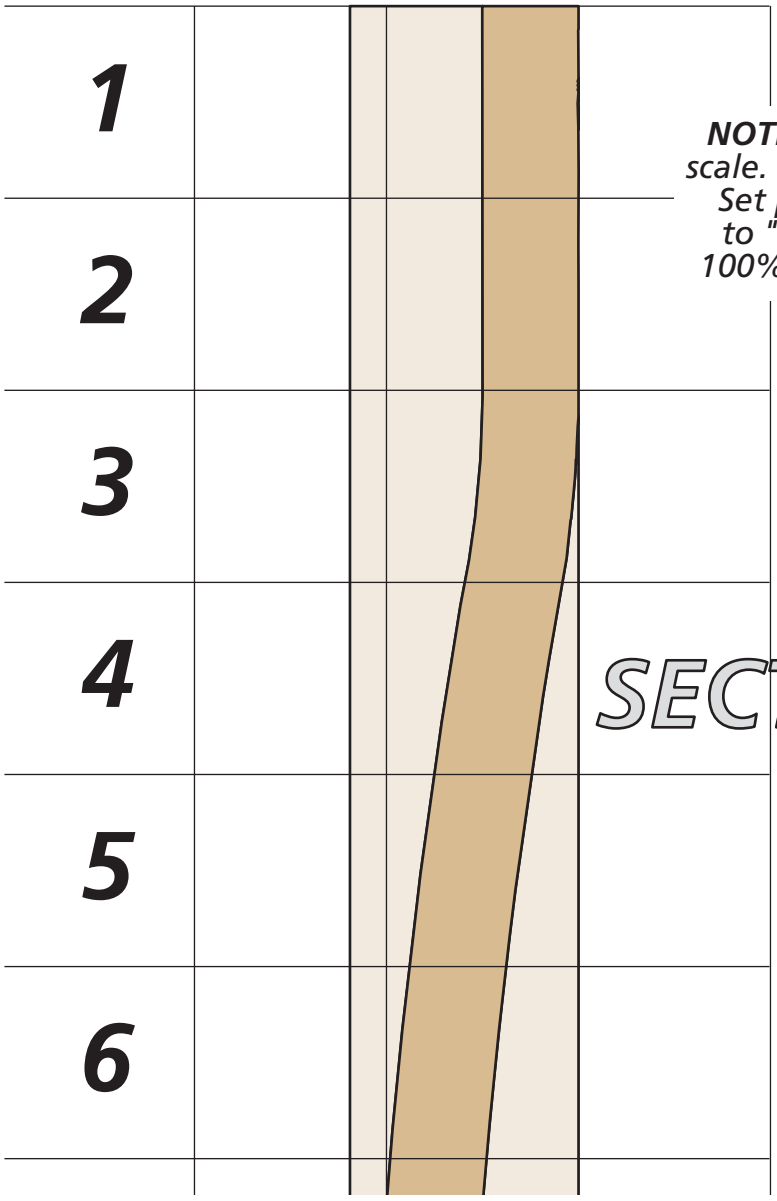




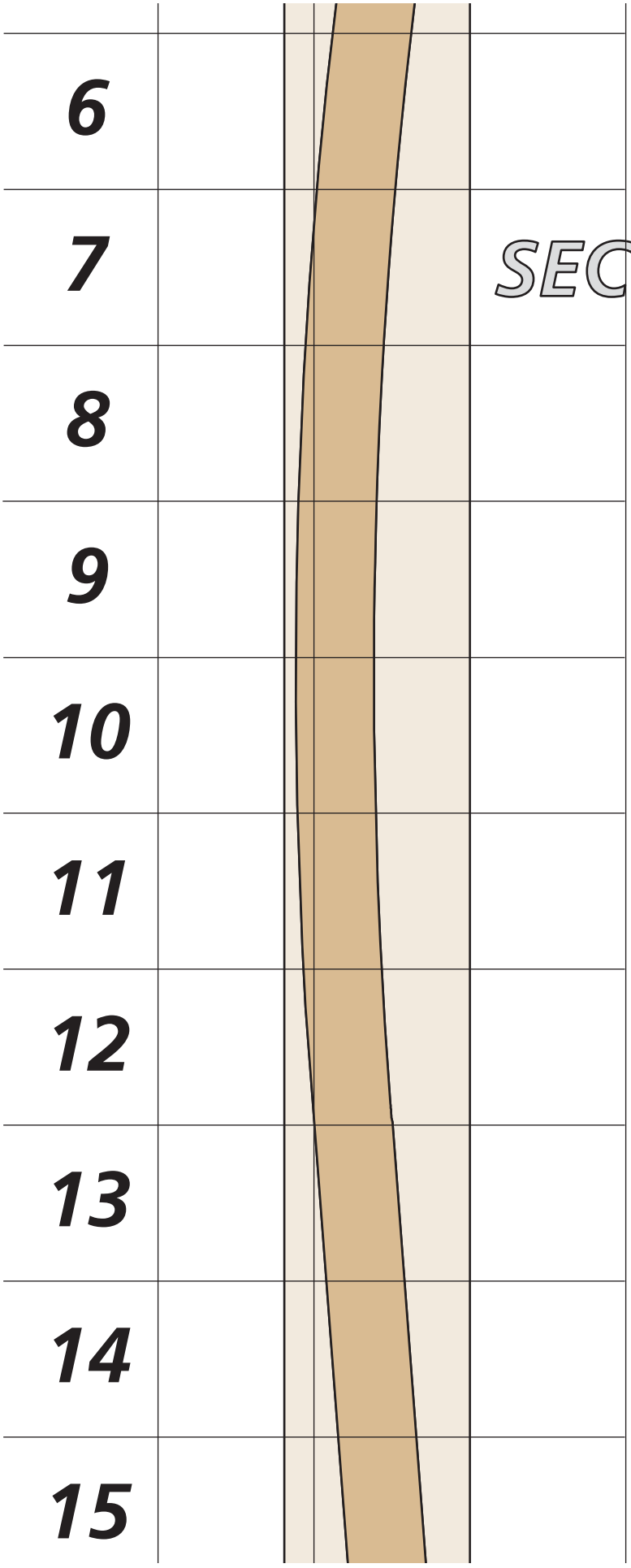




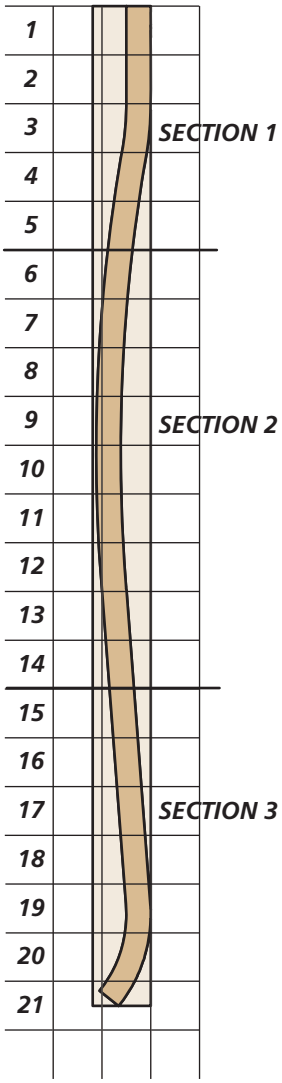
full-size pattern
Rocker Seat Slat

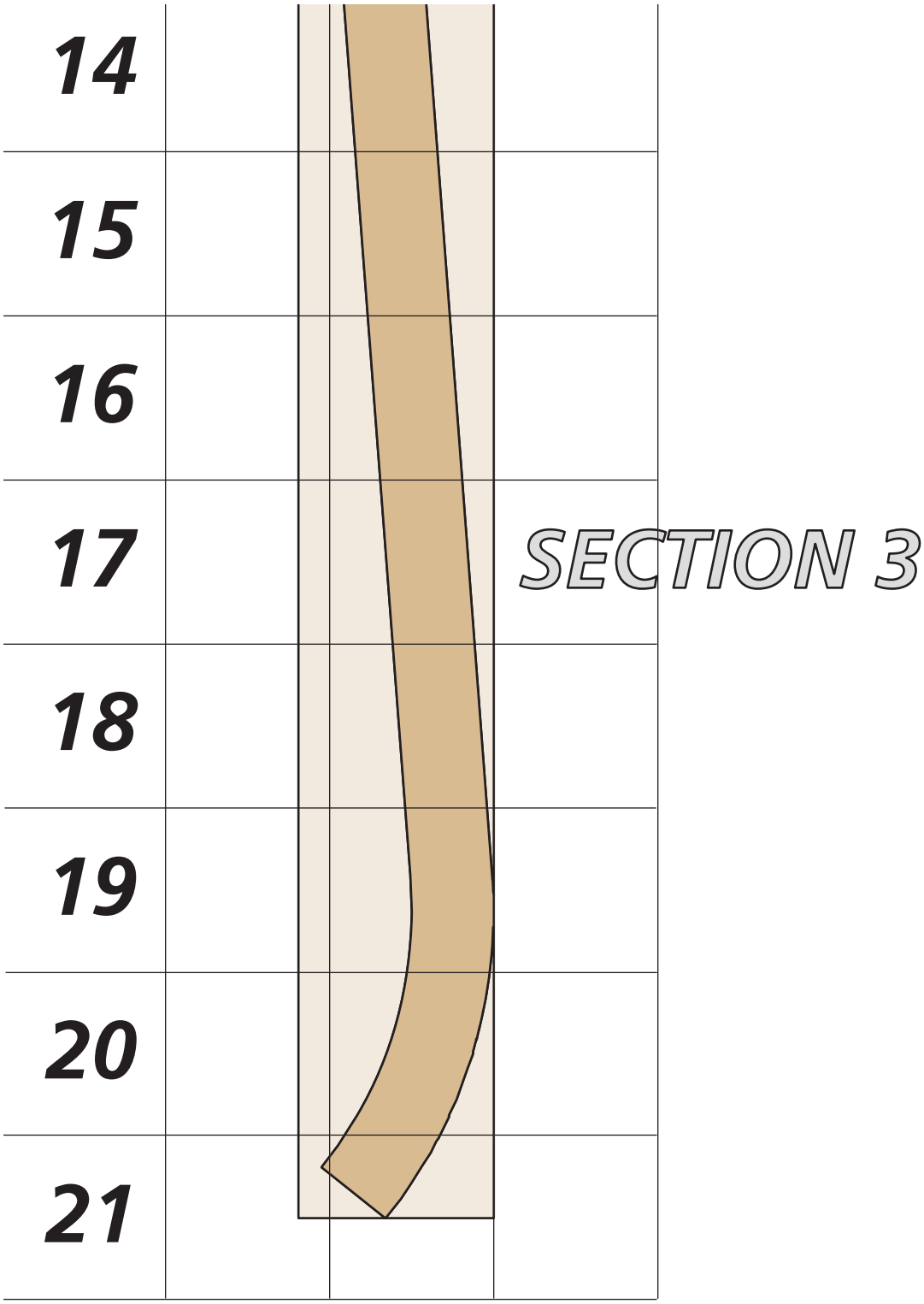


NOTE: *Pattern is full scale. One square = 1". Set printer options to "actual size" or 100% for best results*



SECTION 2





ONLINE EXTRAS

slat Sanding Jig

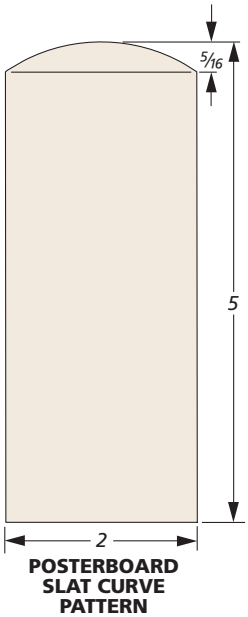
While working on the seat slats for the double-porch rocker, I struggled with how to lay out and shape the rounded end consistently from slat to slat. Trying to lay out a curve on the shaped slat was tricky. Plus, holding the slat by hand at the disc sander was awkward.

MAKING A PATTERN. A piece of posterboard turned out to be the ideal solution to the layout problem. As illustrated in Figure 1, all you need to do is cut a strip of posterboard the same width as the seat slat. Then lay out and cut the curve before using it as a pattern to transfer the curve to the seat slat.

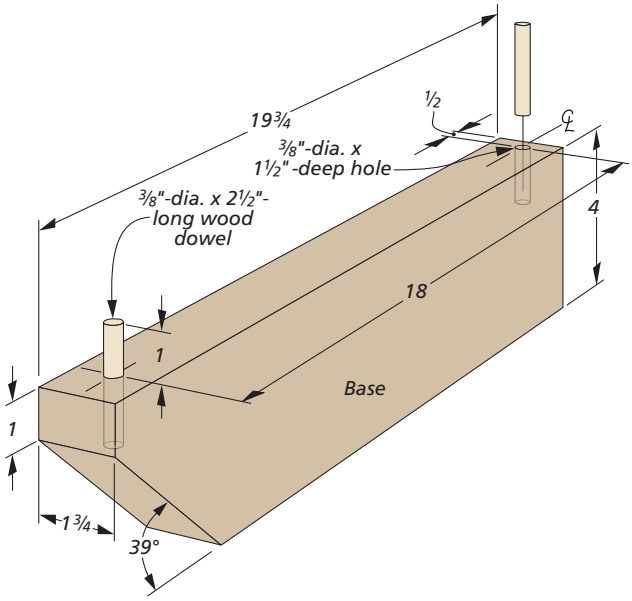
The drawing at the lower left shows how to shape the posterboard pattern. To use it, hold it securely to the bottom face of the seat slat with the end of the pattern flush with the end of the slat. After marking the curve on each slat, you're ready to make a jig to help with the final shaping at the disc sander.

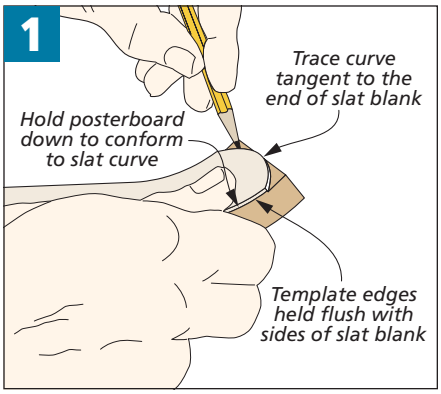
EASY-TO-BUILD JIG. For a safe, secure way to shape the slats, the jig you see here is a simple but effective solution. It's a thick blank with a beveled end to hold the seat slat upside-down at the proper angle. The holes in the slat fit over a pair of dowels to hold it securely.

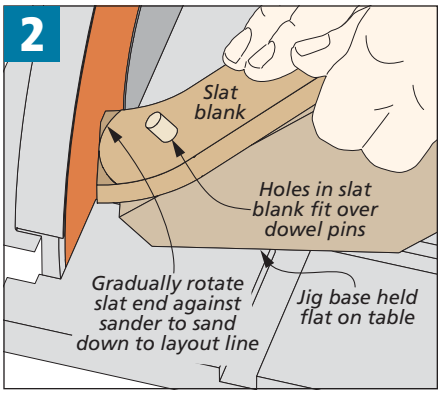
The seat slat fits on the jig with the bottom face up, as shown above. This keeps the edge of the curve square to the face of the seat slat. The beveled end of the jig sits flat on the sander's table. All you need to do is rotate the jig against the sanding disc and sand to the layout line you created earlier. The process goes pretty quick for consistent results.

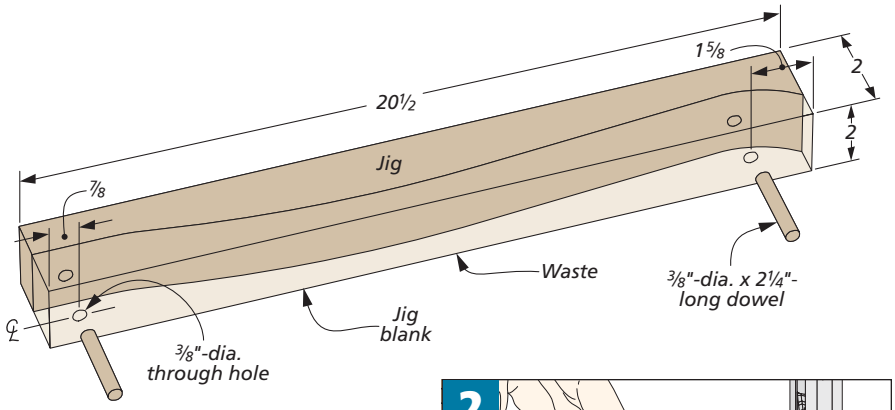


POSTERBOARD SLAT CURVE PATTERN









slat-cutting Jig

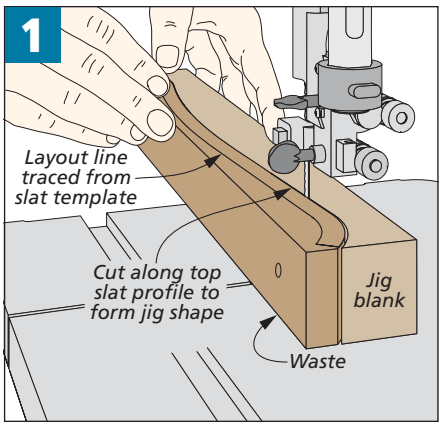
Cutting the seat slats for the porch rocker is an ideal task for the band saw. But once you cut one face of the slat, the resulting blank is pretty thin. It's difficult to keep it sitting flat on the band saw table while cutting the opposite face.

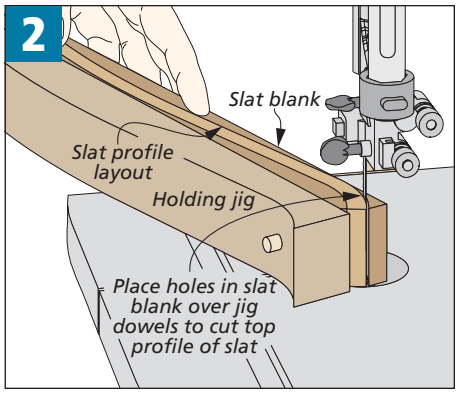
SHAPED JIG. To provide a more reliable and steady way to hold each slat blank for both cuts, I made the jig shown at right. The main drawing shows what the completed jig looks like. It's two-sided — one side holds the slat blank while cutting the top surface of the slat to shape. Then you move the slat blank to the opposite side of the jig to cut the bottom face of the slat.

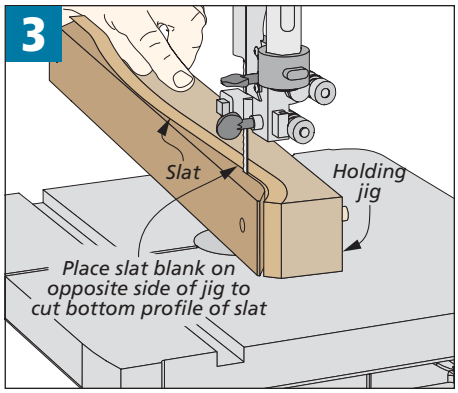
To make the jig, cut a blank to the size shown in the main drawing. Drill a hole at each end of the jig to accept a dowel. The dowels register and hold the slat blank in place on the jig.

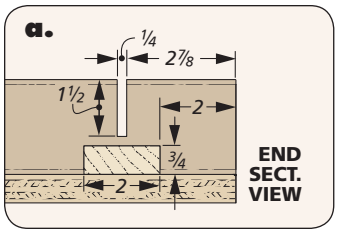
Use the pattern for the seat slat to lay out the shape of the top of the slat, as shown in Figure 1. After cutting the jig to shape, glue two dowels into the holes, making sure they project at least ½" from each side. (Any extra length will be cut off when you cut the first slat to shape.)

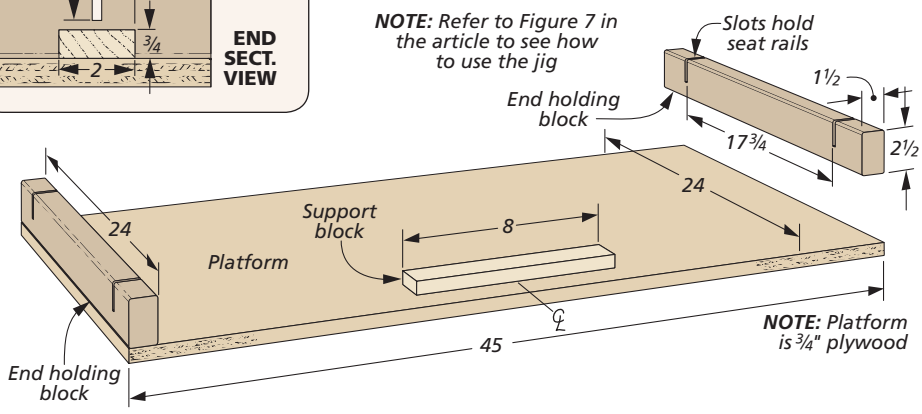
Figures 2 and 3 show how to use the jig to support the slat blank during each cut before sanding the curve on the end.











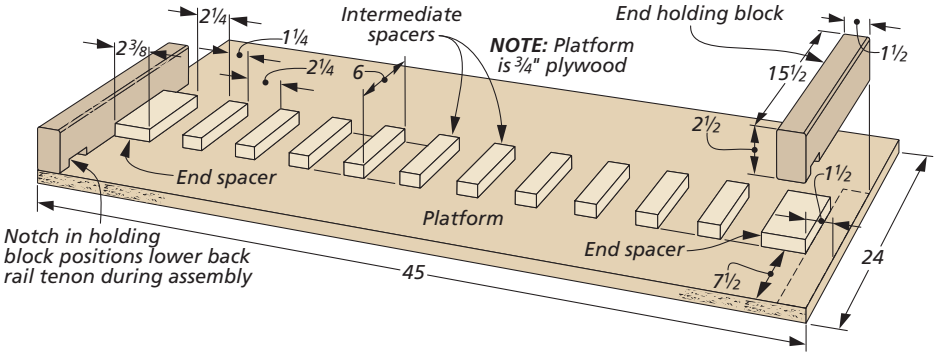
seat assembly Platform

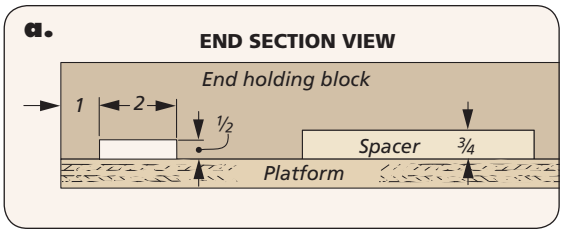
When attaching the seat slats for the rocker to the seat rails, I found it helpful to make a jig to hold the seat rails steady as I attached the slats. The details are provided in the drawings at left. This jig makes it easier to insert the dowels and wedges that secure the slats to the rails. The jig properly spaces the rails to align with the holes in the slats and keeps the rails from bouncing as you drive the wedges into the dowels.

back assembly Platform

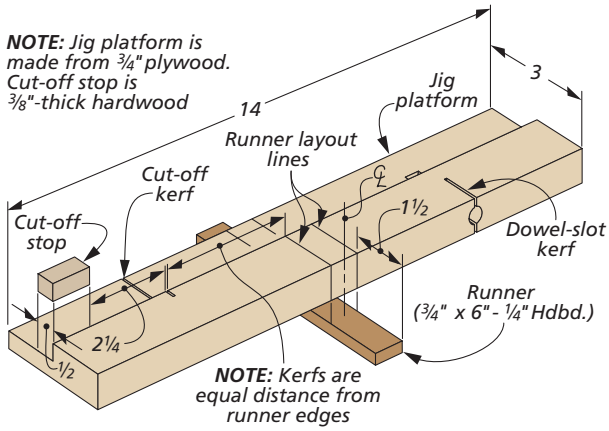
Like the seat assembly platform, the one shown at right makes it easier to lay out the slats for the back of the rocker. It holds them in place while the curve on the upper rail is marked.

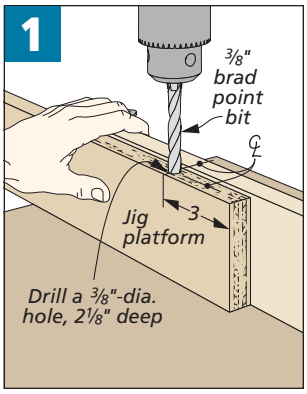
When it comes time to apply the glue to assemble the seat back, the jig helps position the slats with equal spacing and square to the bottom rail of the seat back. It also properly spaces the rails so the tenons on the ends of the rails fit the mortises in the rocker's legs after the glue on the assembly dries.

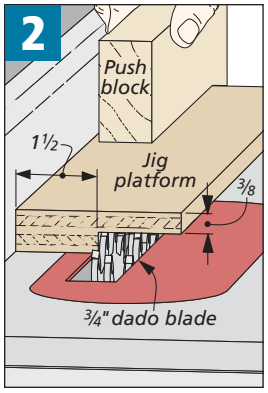


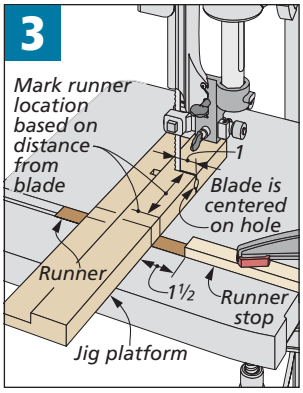


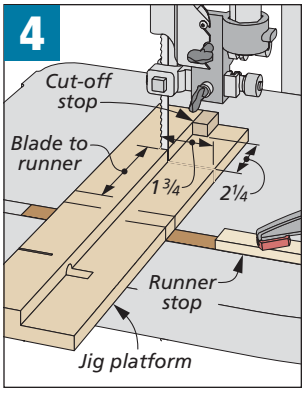
NOTE: Refer to Figures 7 and 8 in the article to see how to use the jig











dowel Slotting Jig

To secure the seat slats on the rocker you need to cut 34 dowels to length and create kerfs in them for wedges. I used the dual-purpose band saw jig you see at right. One end of the jig is used to trim the dowel to length. Rotate the jig 180° to cut the slot in the dowel.

EASY CONSTRUCTION. Start by drilling a hole on one edge at the drill press, as shown in Figure 1. This hole secures the dowel when cutting the slot for the wedge.

Next up, cut a wide rabbet along one face (Figure 2). The ledge created acts as a support for a long dowel when cutting the shorter pieces to length.

FINISH UP. Attach a hardboard runner so the blade is centered on the hole drilled, as shown in Figure 3. After cutting the first kerf in the hole, rotate the jig and cut a second kerf on the opposite edge, as you can see in Figure 4. Be careful to cut only to the depths shown at right. Finally, add a hardwood stop to one end for consistent cuts (main drawing).

ONLINE EXTRAS

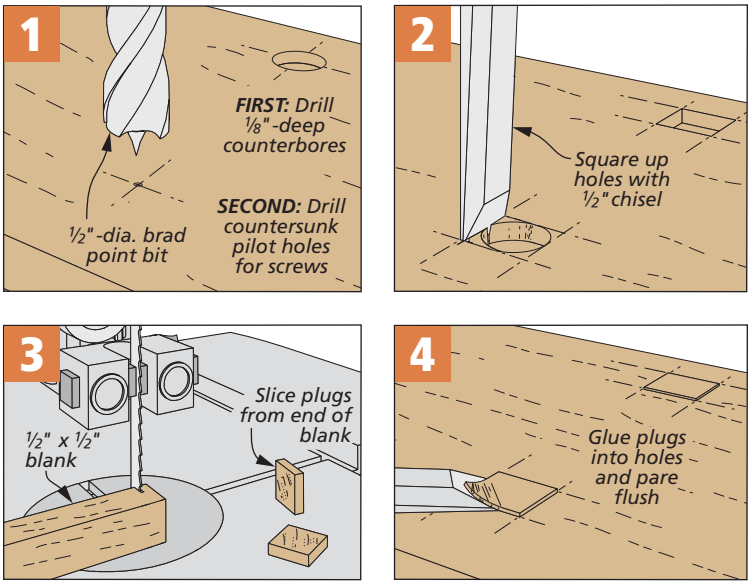
square Plugs

The top of the Craftsman-style clock is joined to the case with woodscrews. These screws are installed in shallow, square mortises and then covered with plugs. It's not a difficult process, but it does require a little attention to detail.

I started by drilling four shallow, ½"-dia. holes in the top of the clock for the screws, as shown in Figure 1. Then, using a chisel, I squared up each hole to create a shallow mortise (Figure 2).

To make the end-grain plugs, cut a ½" square blank and slice the plugs from the end of the blank at the band saw (Figure 3). I cut mine a little thick so they could be trimmed flush after being installed.

After screwing the top to the case, the plugs can be glued into the square openings. Then simply pare the plugs flush with the top of the clock (Figure 4).



ONLINE EXTRAS

veneering Basics

Looking to give your next project a facelift? Veneer is the key. And as an added benefit, you'll learn a new woodworking skill along the way.

All it takes is just one look at some of the beautiful veneers that are available to convince most woodworkers that veneering is something pretty special.

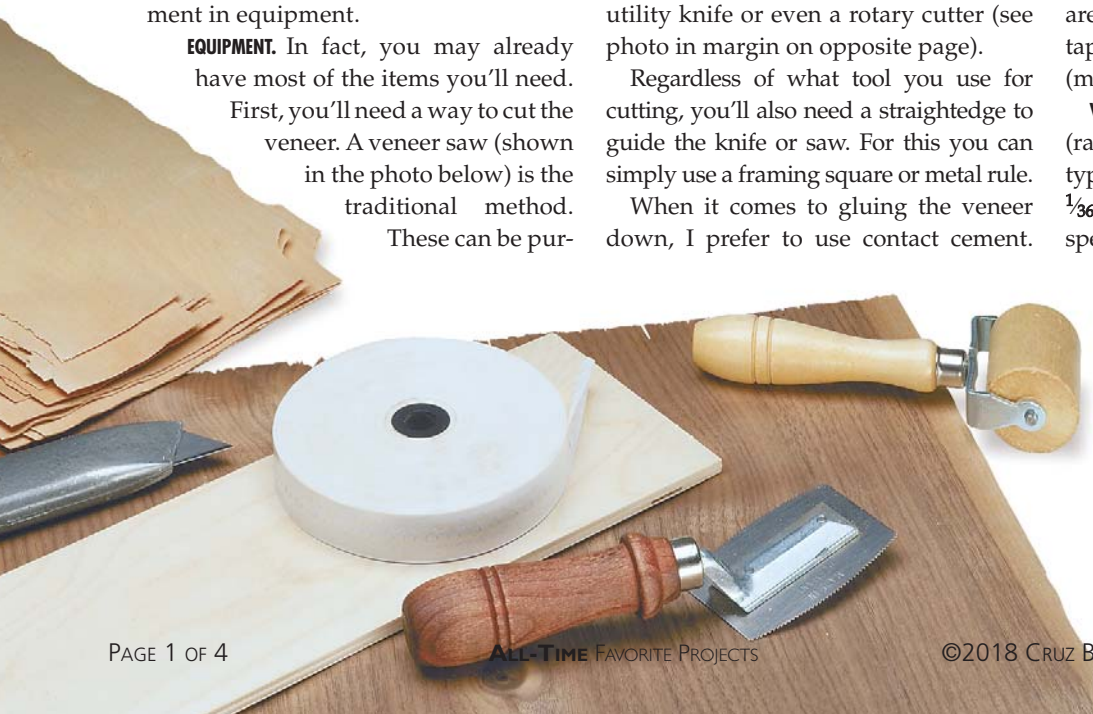
But aside from appearance, there are a couple of other great reasons to use veneer. For one thing, veneering is economical. It allows you to build a project with rare or expensive woods without having to take out a second mortgage on the house. And from a construction standpoint, a veneered panel made out of plywood or MDF is stronger and more dimensionally stable than one made from solid wood.

Despite this, veneer often gets a bum rap. Why? Well, I think a lot of woodworkers believe that veneering is messy, difficult work, involving a large (and expensive) veneer press and lots of specialized equipment. This may have been true in the past, but not any more. Modern adhesives make it possible for just about anyone to do veneering in their own shop, with a minimal investment in equipment.

EQUIPMENT. In fact, you may already have most of the items you'll need. First, you'll need a way to cut the veneer. A veneer saw (shown in the photo below) is the traditional method. These can be purchased for about $10. The blade on this saw doesn't have any set, so it makes a crisp, clean cut. But if you don't have one of these saws, you can also use a utility knife or even a rotary cutter (see photo in margin on opposite page).

Regardless of what tool you use for cutting, you'll also need a straightedge to guide the knife or saw. For this you can simply use a framing square or metal rule.

When it comes to gluing the veneer down, I prefer to use contact cement. A small (1" or 2"-wide) wooden roller comes in handy for pressing the veneer down. This kind of roller allows you to concentrate the pressure on a smaller area. You'll also need a roll of veneer tape to join pieces of veneer together (more on that later).



VENEER. I generally use traditional veneer (rather than foil-backed or self-adhesive types). These veneers are usually about $\frac{1}{36}$" thick and come in a variety of wood species. Because it is fairly thin, veneer should be handled carefully to avoid cracking or damaging it.

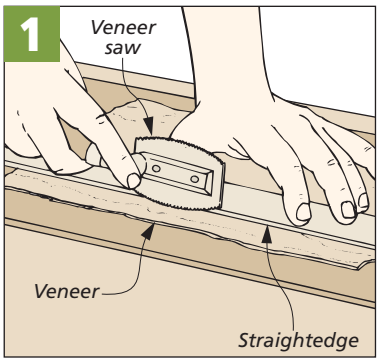
Veneer is sold by the square foot, in random widths and lengths. If you want to cover a large surface area, you'll need to join two or more pieces together to create a larger sheet.

In order to get a good color and grain match, veneers are usually sold in consecutive sheets, as they were sliced

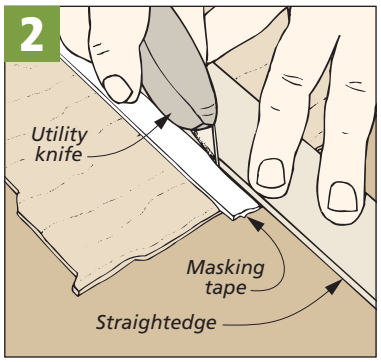
from the log. This stack of veneers is called a "flitch." The fact that all the sheets in a flitch look nearly identical can be used to create some interesting and striking visual patterns, as you can see in the box below.

CUTTING THE VENEER. The first step in using veneer is cutting it to size. For both the chessboard and the card box in this issue, I cut the veneer slightly larger than the piece I was covering. If you're using a utility knife, make sure you keep the blade tight against the straightedge. Because the blade is so thin, it tends to follow the grain, and can actually pull away from the straightedge. This isn't as much of a problem with the veneer saw, since it saws rather than slices it's way through the wood fibers.

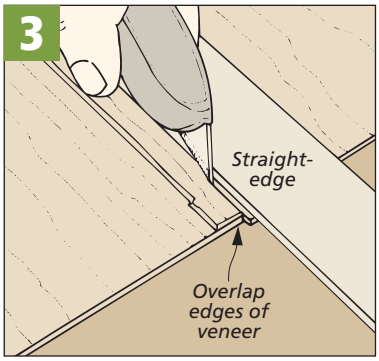
JOINTING THE VENEER. If you're going to be joining two or more pieces of veneer together, it's important to joint the edges to get a good, tight fit. To do this, I clamp the pieces between two straight boards so the edges of the veneer are sticking out about $\frac{1}{16}$" or so. Then I sand or plane the edges of the veneers flush with the boards.



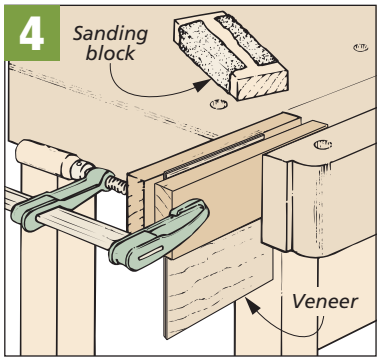
Score. To make a cut with the grain, start by making a couple of light scoring cuts with the veneer saw before cutting all the way through the veneer.



Tape. You can avoid splintering the edge when cutting across the grain by simply placing a strip of masking tape over the veneer.



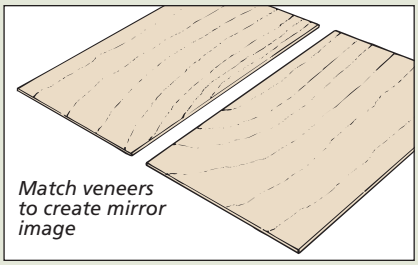
Joints. To create a tight joint when joining two pieces of veneer, overlap the edges slightly and cut through both pieces at the same time.



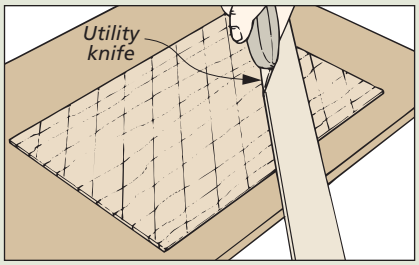
Sand. Another way to create a smooth joint is to clamp the veneers between a couple of boards and joint the edges by sanding.

Cutter. A rotary cutter (available at fabric stores) can be used with a straightedge for cutting veneers.

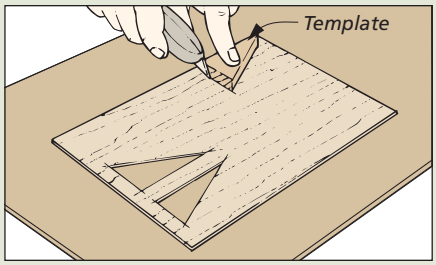
Veneer Patterns



Book Matching. Book matching is a common effect achieved by joining two or more consecutive pieces of veneer to create a mirror image of the grain pattern.



Herringbone. To create a herringbone pattern, cut strips of veneer at a 45° angle to the grain. Then orient the strips so the grain runs in opposing directions.



Pinwheel. For a pinwheel effect, use a template to cut matching triangles of veneer. Then piece the triangles together. Contrasting woods highlight the effect.

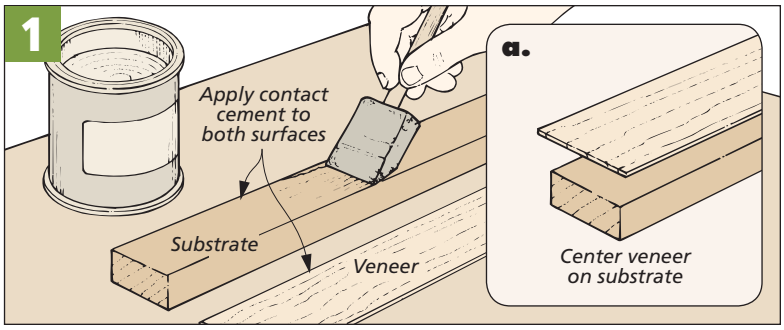
applying the **Veneer**

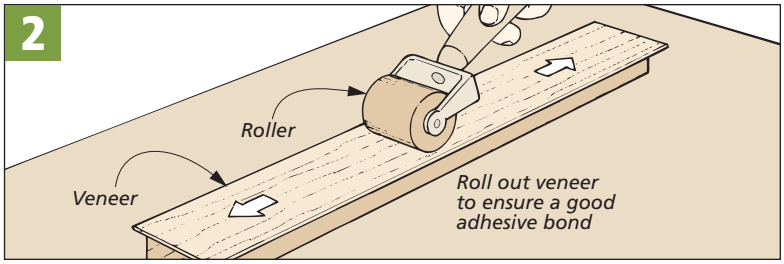
Once you have the veneer cut, you can glue it down to the substrate. For the projects in this issue, I used both solid wood and plywood as a substrate. You could also use hardboard or MDF. The important thing is that the surface is smooth and flat so that the veneer will adhere well.

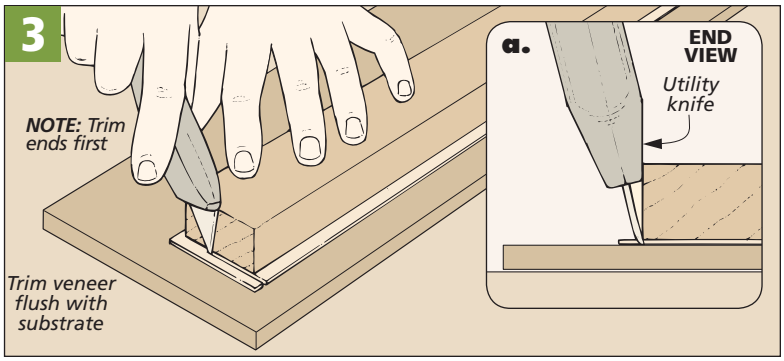
Gluing the veneer down is straightforward. First, contact cement is applied to both the veneer and the substrate, as you can see in Fig. 1. In most cases, you'll need to apply at least two or three coats of adhesive, letting each coat dry before applying the additional coats. Make sure you roll or brush the adhesive on as evenly as possible so that there won't be any imperfections that telegraph through to the surface of the veneer.

Once the last coat of adhesive has dried, the veneer can be placed onto the substrate. Since the adhesive will grab on contact, make sure that you have the veneer centered over the substrate the way you want it. If you're working with larger pieces, you may want to take a look at the tip in the margin at right.

As soon as the veneer is in place, start rolling it out as shown in Fig. 2. Work from the center out toward the edges,



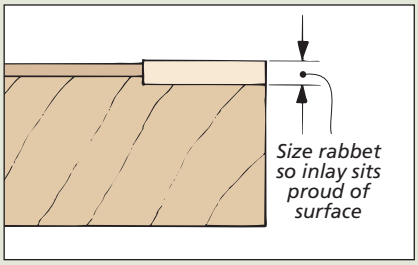




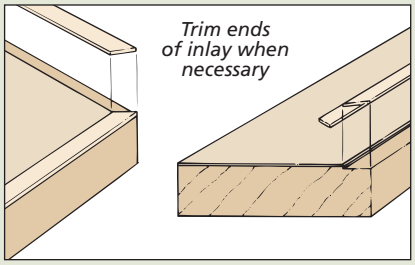
Inlay Strips

Inlay strips are a close cousin to veneer. They are narrow strips of wood that are usually applied as a border or accent on a project. Although you can use solid, one-piece inlays (called stringing) most inlays are created from glued-up pieces of wood to create striking patterns.

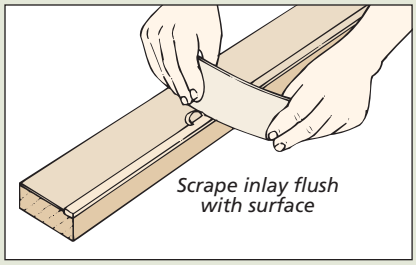
Applying an inlay is just a matter of cutting a groove or rabbet in your workpiece according to the width and thickness of the inlay. Then the inlay is glued in place. Once the glue is dry, the inlay can be sanded or scraped lightly to ensure that it's flush with the surface.



Cutting the rabbet. Size the rabbet (or groove) to match the width of the inlay. But make the depth just a hair less than the thickness of the inlay.



Trimming the inlay. Depending on the pattern of your inlay strip, you may need to carefully miter the ends and match up the mating pieces at each corner.



Scraping the inlay. After gluing the inlay strip in place, use a cabinet scraper to carefully scrape the inlay flush with the surface of the project.

rolling out any air pockets. Contact adhesive forms a better bond under pressure, so don't be afraid to put a little muscle into it as you use the roller.

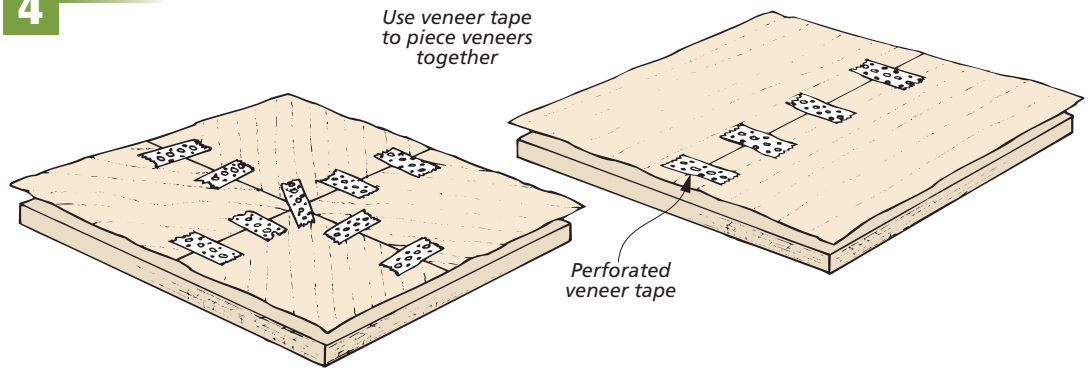
TRIMMING THE VENEER. Once the veneer has been rolled out, you can trim the edges flush with a utility knife, just as is shown in Fig. 3. Trim the end grain first and then trim the long grain edges.

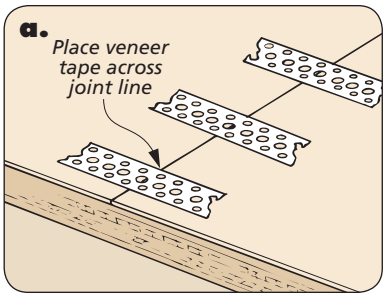
MATCHING VENEERS. If you're covering a large surface, chances are that you will have to join two or more pieces of veneer together. The key to doing this is to assemble the pieces before gluing them down to the substrate. That way you can make sure the joint lines are nice and tight.

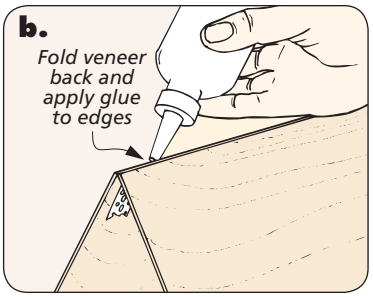
To hold the pieces of veneer together, I use veneer tape. This "tape" is just lightweight paper with a gummed adhesive on one side. Holes in the tape allow you to see "through" it as you're placing it over a joint. To use the tape, all you have to do is moisten the adhesive side and press it in place. If you take a look at Fig. 4, you can see how several strips of veneer tape are used to piece the veneer together.

Although the tape holds the sheets of veneer together, they can pull apart slightly under the force of being rolled out. To prevent this, I like to glue the edges of the veneer together. At first, this may sound impossible. After all, the veneer is only $\frac{1}{36}$" thick. But if you take a look at Fig. 4b, you'll see how it's done. Just fold the taped pieces of veneer back and brush some glue along the edges. Then fold the pieces back and clamp them flat for a few minutes while the glue dries.

4 FIGURE







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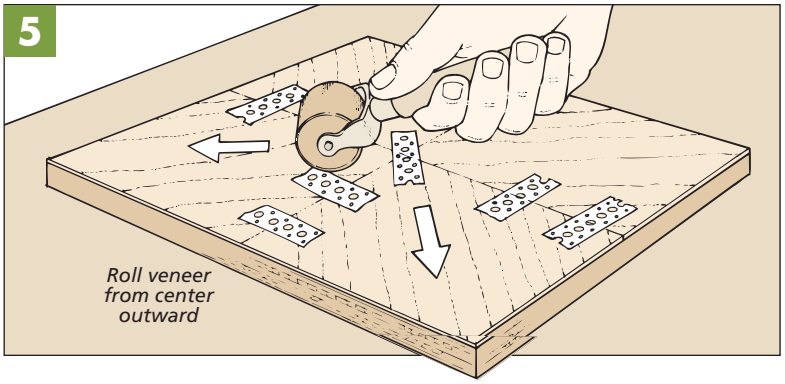
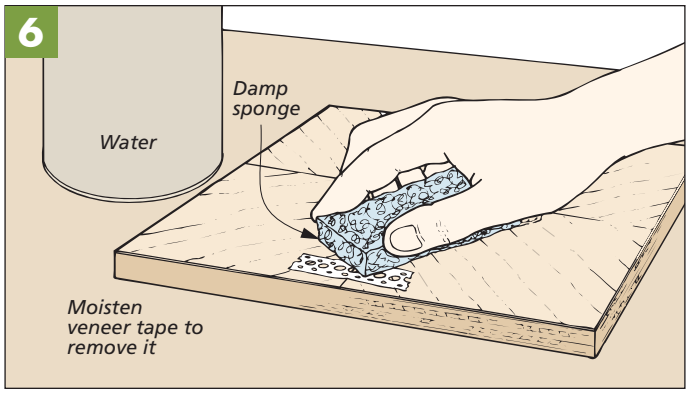


Spacers. Dowels can be used to prevent the veneer from contacting the substrate until you have it positioned where you want it.

Gluing the matched veneers down to the substrate is really no different than gluing down a single piece of veneer. Just make sure to roll the veneer from the center out.

Once you've got the veneer in place, you can remove the tape by moistening it with a damp sponge and scraping or peeling it off (Fig. 6). Light scraping or sanding across the entire surface of the veneer, as demonstrated in Fig. 7, will remove any residual adhesive and prepare the surface for finishing. Just don't get carried away with this step. It's easy to sand or scrape right through the veneer, spoiling an otherwise perfect job.

6



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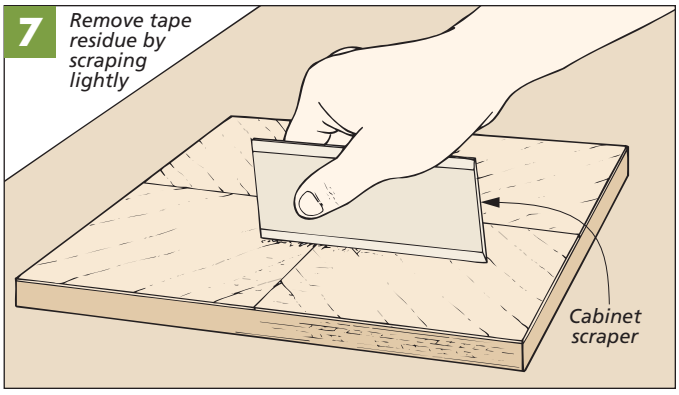


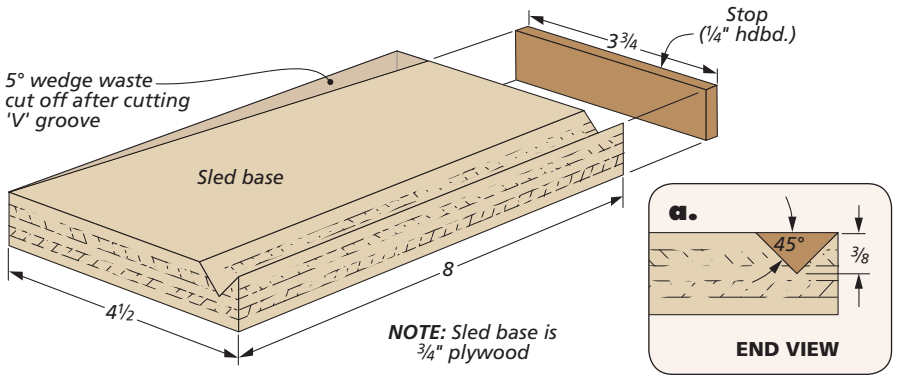
ONLINE EXTRAS

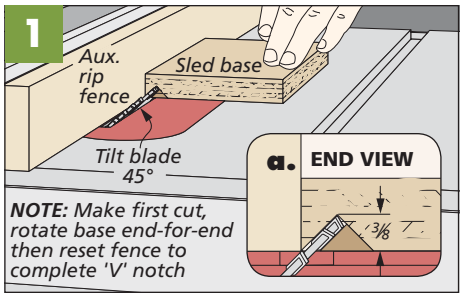
wedge-making Sled

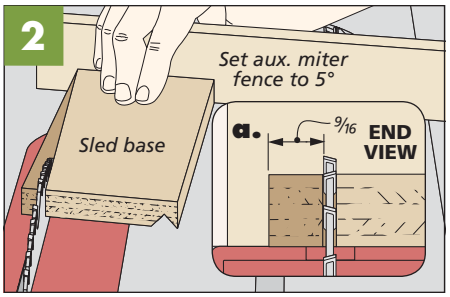
The legs of the coffee table are made up of four mitered pieces. Inside each leg rests a pair of sturdy plywood brackets that reinforce the table frame.

The only challenge with this assembly was figuring out how to clamp the brackets to the inside faces of the legs. To solve that problem, I used tapered wedges that fit in the leg openings and exert clamping pressure on the brackets.

SIMPLE SLED. To cut the wedges, I used the sled shown at right. It has a V-groove near one edge to hold the wedge blank at 45° (Figure 1). A slight taper on the other edge will ride against the rip fence of your table saw (Figure 2). After making the sled, you can cut out and use the wedges as shown in the article.

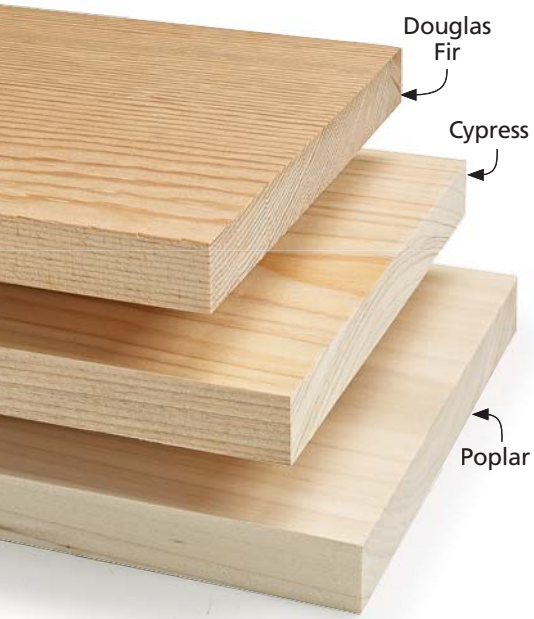






ONLINE EXTRAS

working with Cypress



Hardness. Cypress is a relatively soft lumber, falling between Douglas fir and poplar lumber on the Janka hardness scale.

When choosing a wood for outdoor projects, the harsh elements that the project will have to endure are a primary consideration. After all, most outdoor furniture will, at one point or another, be exposed to rain, snow, and the damaging effects of the sun's rays. Not to mention the possibility of insect damage.

Many woodworkers lean towards using cedar, redwood, or maybe even white oak. All of these species have characteristics that make them ideal for outdoor use. But one often overlooked option that's just as rot and decay resistant is bald cypress (main photo above).

OVERVIEW. Depending on what part of the country you live in, bald cypress (Taxodium distichum) goes by many aliases, including red, yellow, southern, or swamp cypress. But most refer to it as just plain cypress. As the latter nicknames would suggest, cypress primarily grows in the southeastern United States around the bottomlands and swampy marshes that border the Gulf Coast and eastern seaboard.

WORKING PROPERTIES. Although technically classified as a needle-bearing conifer, cypress trees mimic deciduous hardwood trees by turning brown in the fall and dropping their needles. And like their deciduous counterparts, the lumber produced from the cypress tree is often grouped together with other hardwoods, even though it's really a softwood.

As shown in the photo at left, cypress falls between Douglas fir and poplar on the Janka hardness scale. Since cypress is rather soft, it is very easy to work using either hand tools or power tools. And board edges are a breeze to rout without fear of burning the wood.

DECAY-RESISTANT. Even though it's a softwood, cypress lumber is strong, lightweight, and stable. Plus, a naturally occurring preservative called cypressene is produced in cypress heartwood. This preservative in the wood is what makes it resistant to decay and insects. But despite this oil content, it maintains good gluing, nailing, and finishing properties (photo below).

OTHER USES IN WOODWORKING. In addition to the characteristics that make it suitable for outdoor use, cypress is also desirable for general woodworking applications. It has a pleasant appearance that makes it ideal for furniture building, cabinet-making, interior trim, paneling, flooring, and a host of other indoor applications.

Much like walnut lumber, cypress has a noticable contrast between the lighter-colored sap wood (often found along the edges of boards) and the darker heartwood. Because of this, it pays to take some extra time when selecting your boards for any fine woodworking projects to achieve a uniform appearance.

AVAILABILITY. If you live in the southern regions of the country, you'll find cypress readily available in lumberyards and home centers, much the same way pine can be found in many northern states. Even in northern locations, many specialty lumber dealers stock cypress. It can also be purchased on several websites and shipped right to your door. (Keep in mind that shipping charges can get rather expensive.)

Glueups. Cypressene oil found in cypress lumber acts as a preservative and gives the wood its rot and decay resistance. Despite the presence of these oils, cypress maintains excellent gluing properties. Regular wood glue is all that's needed to form a strong joint.

Exotic. Pecky cypress lumber is easy to spot with its characteristic tunnels that are formed in living cypress trees.

UNIQUE VARIETIES. Some cypress trees can yield rather unusual offerings that are revealed when logs are milled into lumber. One of these distinctive variations is known as pecky cypress. Pecky cypress is characterized by the small tunnels that run with the grain of some cypress trees (photo, above).

These tunnels are caused by a fungus that sometimes attacks the heartwood of living cypress trees. When the trees are harvested, the fungus dies. The resulting tunnels that are exposed after being sawn into lumber are what give the lumber its name. This increasingly rare lumber is prized by furniture makers and builders alike.

You can find plenty of information about suppliers of pecky cypress online. Be forewarned, however, some companies require a minimum order for their specialty woods.

A Closer Look: Cypress Knees

Cypress trees are also known for another unusual characteristic: knees. No, they can't walk. But rather, this type of knee is a cone-shaped growth that is often found around the base of cypress trees growing in, or around, swampy ground.

As cypress trees growing in the swamps mature, extensions of the root system grow above the water or ground line forming these peculiar shapes. These root formations are very unique in that no two knees are the same.

So how are these useful to woodworkers? Well, cypress knees are quite soft. When dried, they're very easy to carve. And because of the distinctiveness of each knee, some people even display them in their natural state.

Knees. Cypress knees (above) grow out of the root system of the cypress tree in swampy areas. The knees rise above the waterline making them easy to harvest.

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