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Morris Chair

Comfortable and elegant. This Morris chair invites you to sit down, kick your feet up and read a book.

If you have any doubts, I can assure you that this roomy Morris chair is just as comfortable as it looks. With its wide stance, thick cushions and reclining back, it's made for relaxing.

But for me, the reward here wasn't just the end result, but the time spent getting there. This chair is Craftsman-style woodworking at its best — solid,

hands-on joinery with a few new and interesting challenges.

But challenges are just an opportunity to find solutions and that's what you have here. Take the stout legs for example. I wanted them to show quartersawn grain on all four faces. Impossible? Not with the clever traditional technique that I used and will show you.

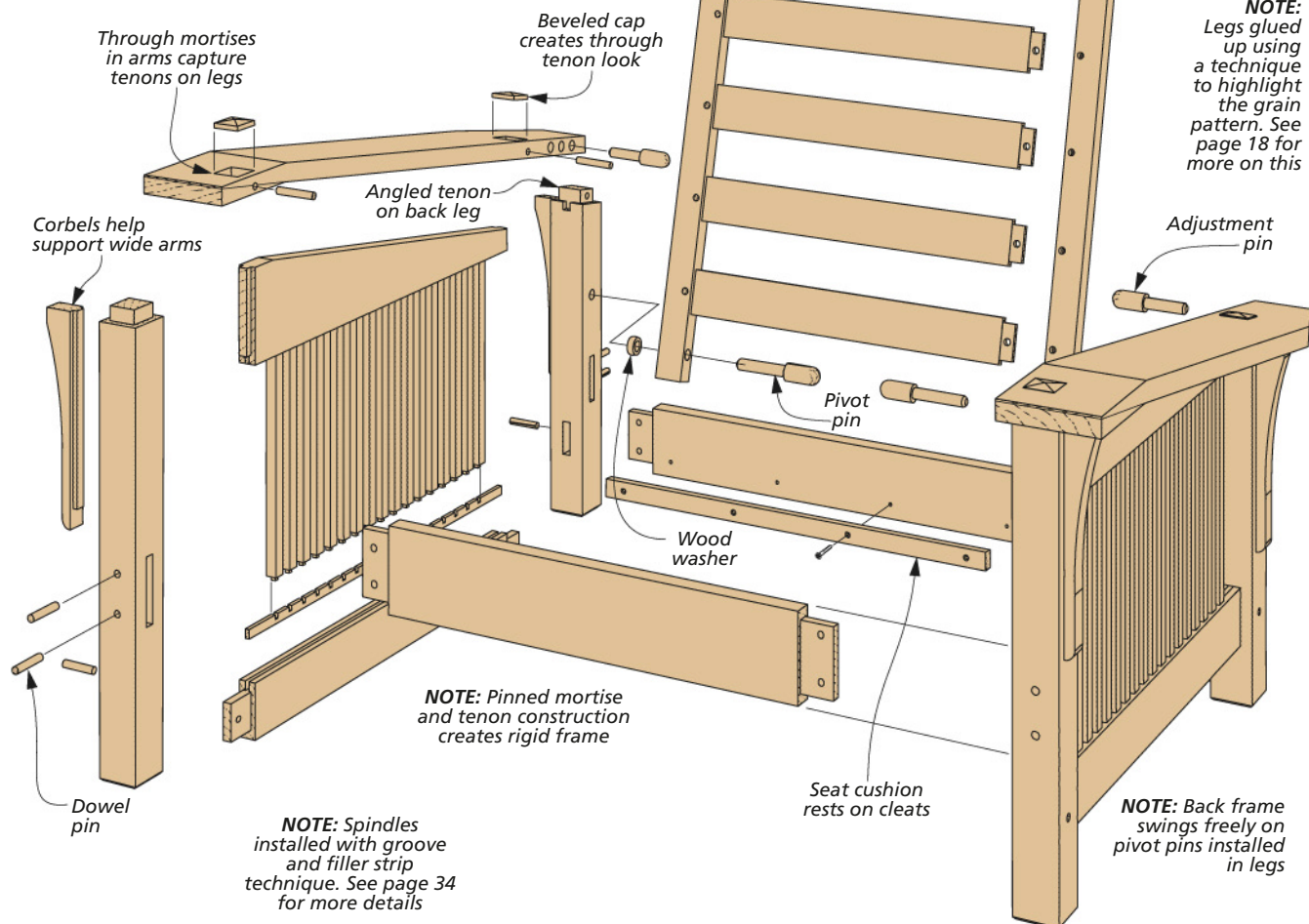
And you probably can't help but wonder how you'll make the sloping "bent" arms that give the chair its unique look. Well, a two-piece glue-up followed by a simple, step-by-step approach makes the shaping easy.

Then once you complete the chair, you might want to add the matching ottoman on page 16 to cap it off.

CONSTRUCTION DETAILS

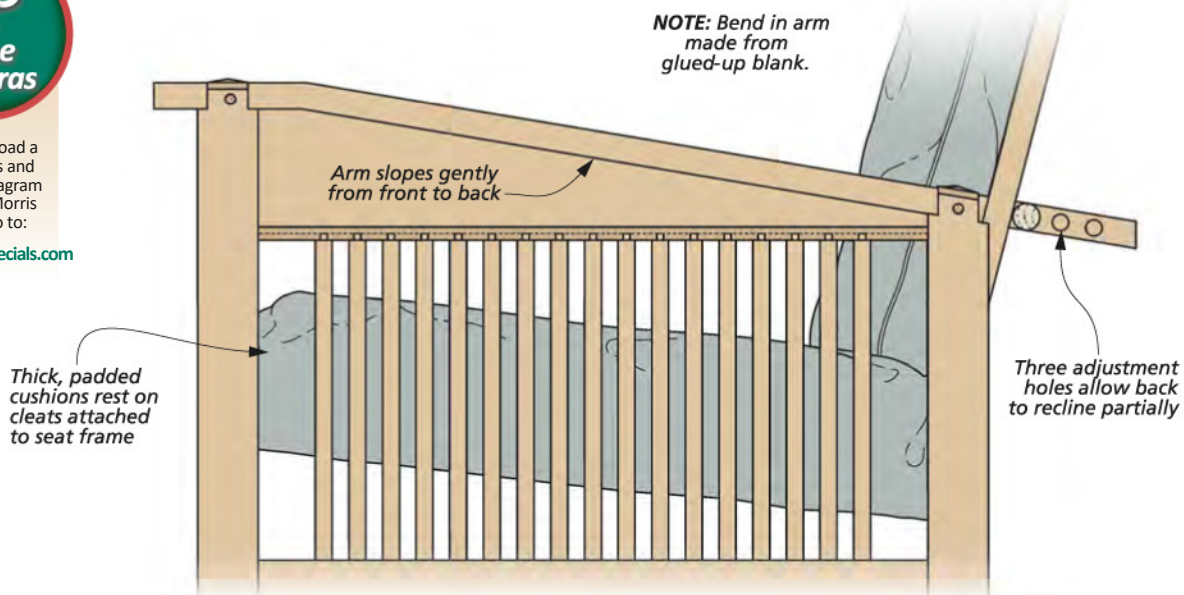
OVERALL DIMENSIONS:

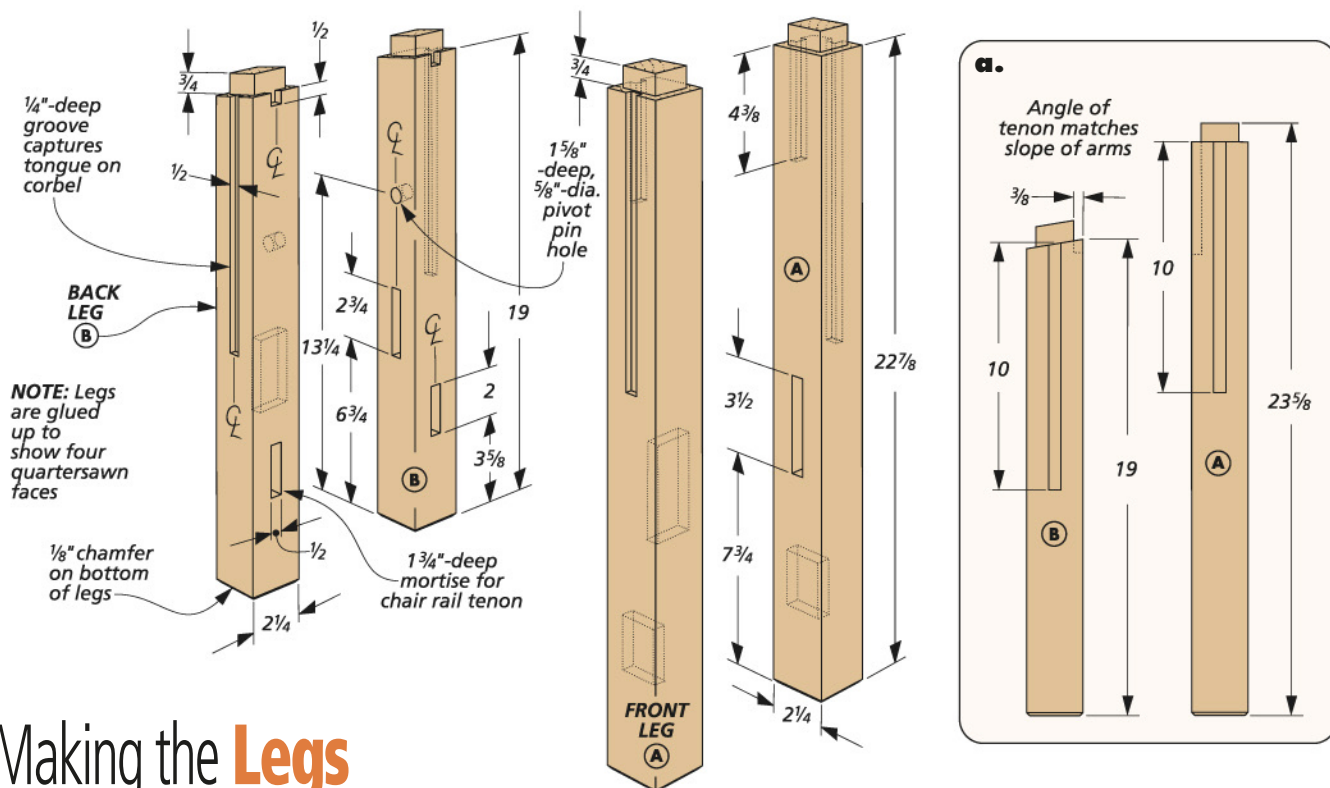
33" W x 40¼" H x 36½" D



To download a materials and cutting diagram for this Morris chair, go to:

WoodsmithSpecials.com





Making the Legs

This Morris chair is classic Craftsman design — solid-looking and solidly built. So to get things off on the right foot, I began by making four sturdy legs from quartersawn white oak.

THE LEG BLANKS. The thick blanks that I needed for the legs required gluing them up. But I didn't want the legs to have a "glued-up" look. So to make my leg blanks, I borrowed an old technique. The box below explains a simple process for making great-looking leg blanks with four quartersawn faces.

TENONS, MORTISES & GROOVES. Once the leg blanks are complete, you can begin work on the joinery that will connect the legs

to the other frame parts. The drawings above show you what's involved.

The first thing you need to concentrate on are the square tenons on the tops of the legs. These tenons will fit "through" mortises in the arms to add an extra measure of strength to the chair frame. And, as you'll see, the length of the shorter back legs is measured from the shoulders of the tenons.

The front leg tenons are pretty straightforward. But the angled tenons on the shorter, back legs are a different story. The opposite page will guide you through this.

With the tenons completed, you can turn your attention to cutting mortises and grooves. Each leg has two deep

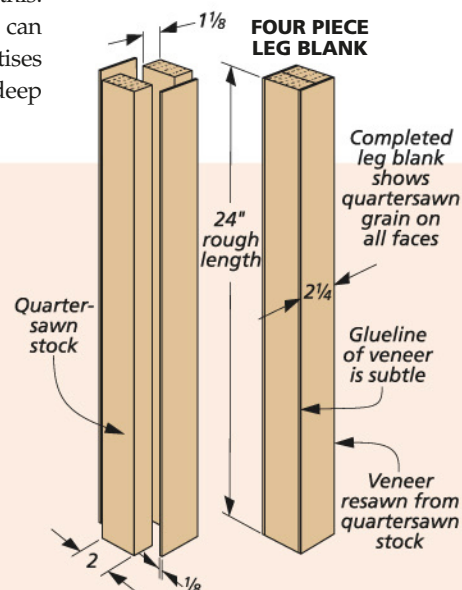
mortises that will capture stout tenons on the lower rails. The arms will provide most of the strength across the top of the chair sides. So for the upper side rails, I relied on stub tenons that fit in grooves routed in the legs. And a groove running down the outside of each leg will be used to attach the corbels you'll add later.

TWO HOLES. Finally, a $\frac{5}{8}$ "-dia. hole drilled in the inside face of each back leg will hold a wood pin that connects the back frame to the legs.

How-To: Quartered Legs

The quartersawn white oak used for Craftsman-style furniture has a distinctive "flecked" grain pattern — but only on the face grain. So a two-piece glueup would only show quartered grain on two sides. The other two would have a plain grain pattern as well as a pretty noticeable glue line. The traditional technique I used to glue up the leg blanks (shown in the drawing at right) solves both of these problems at once.

First, two $\frac{1}{8}$ "-thick pieces of quartersawn stock are glued up to create a $2\frac{1}{4}$ " x 2" blank. Next, I resawn some quartersawn stock into $\frac{1}{8}$ "-thick veneers and glued it to the "plain" faces. This hides the glue line and gives you four quartersawn show faces.



How-To: Angled Tenon

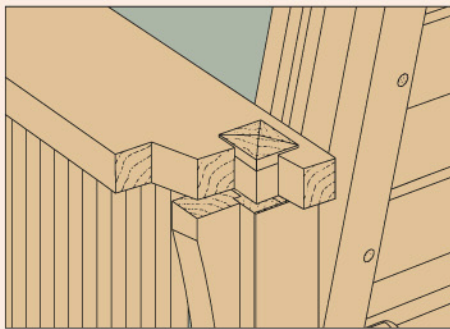
The sloping, “bent” arms of the chair add a few challenges. The first of these is the angled tenon on the top of the back legs that matches the “fall” of the arms. It just takes a step-by-step approach to get the job done.

Two Quick Notes. Before you turn on the table saw, there are a couple things to mention. First, as you can see in the drawing on the opposite page, the final length of the back legs is measured from the front shoulders of the tenons. So you won’t cut the legs to length until the tenons are complete. Second, for the best look, all the legs should have the veneered faces at the front and back. So, mark them clearly. Once the angled tenons are cut, you can’t turn the legs.

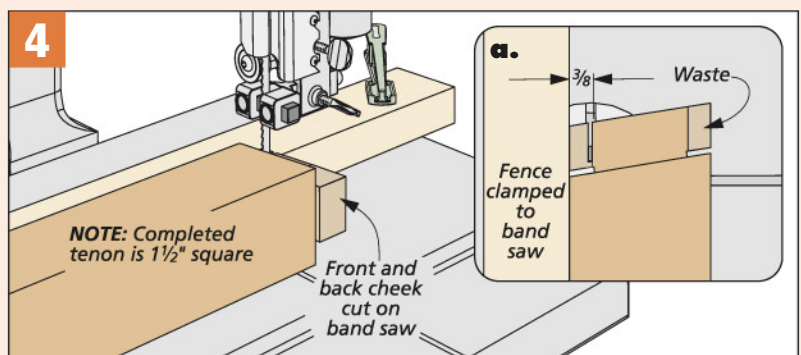
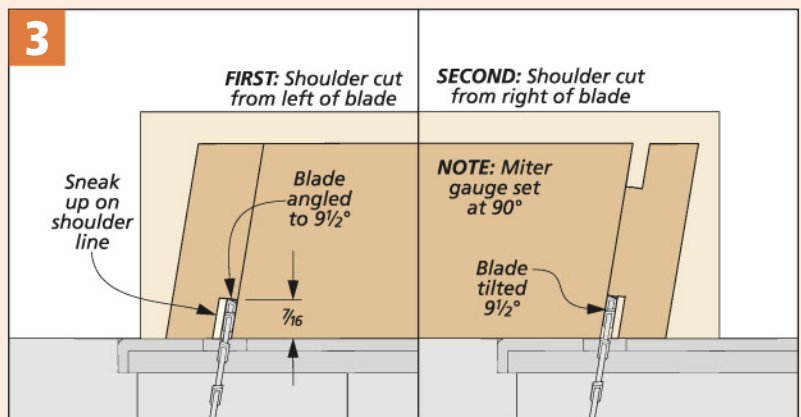
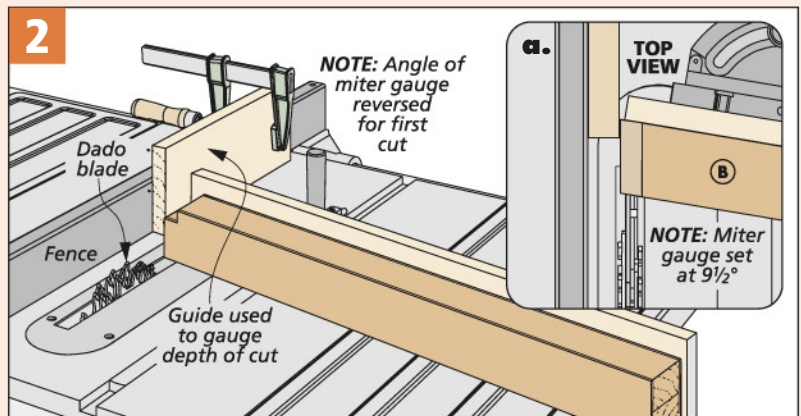
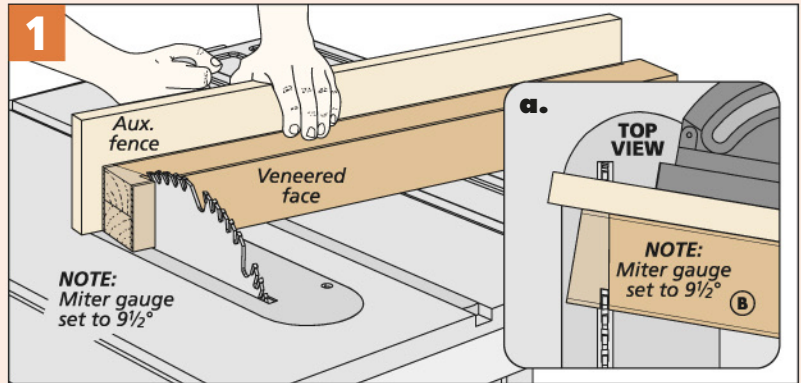
A Four-Step Program. Step One shows you how to get started — with a $9\frac{1}{2}^\circ$ cut on the end of the blank. Next, in Step Two, a dado blade is used along with a depth stop on the rip fence to cut the two side shoulders. For the first cut, leave the miter gauge at the $9\frac{1}{2}^\circ$ setting you used to make the end cut. For the opposite side, the miter gauge will have to be angled in the opposite direction. This will take care of the two sides.

Now, switch back to a standard blade for the front and back shoulders (Step Three at right). With the miter gauge set square and the blade tilted to $9\frac{1}{2}^\circ$, sneak up on the first shoulder cut. For the second shoulder, you’ll need to make the cut from the opposite side of the blade as shown.

For Step Four, I took the blanks to the band saw. Here, with a fence in place, I removed the waste from the front and back cheeks to complete the tenon. Finally, you can cut the legs to final length.



A New Angle. The angled joinery at the back of the chair is a minor challenge, but it provides a great pay-off.

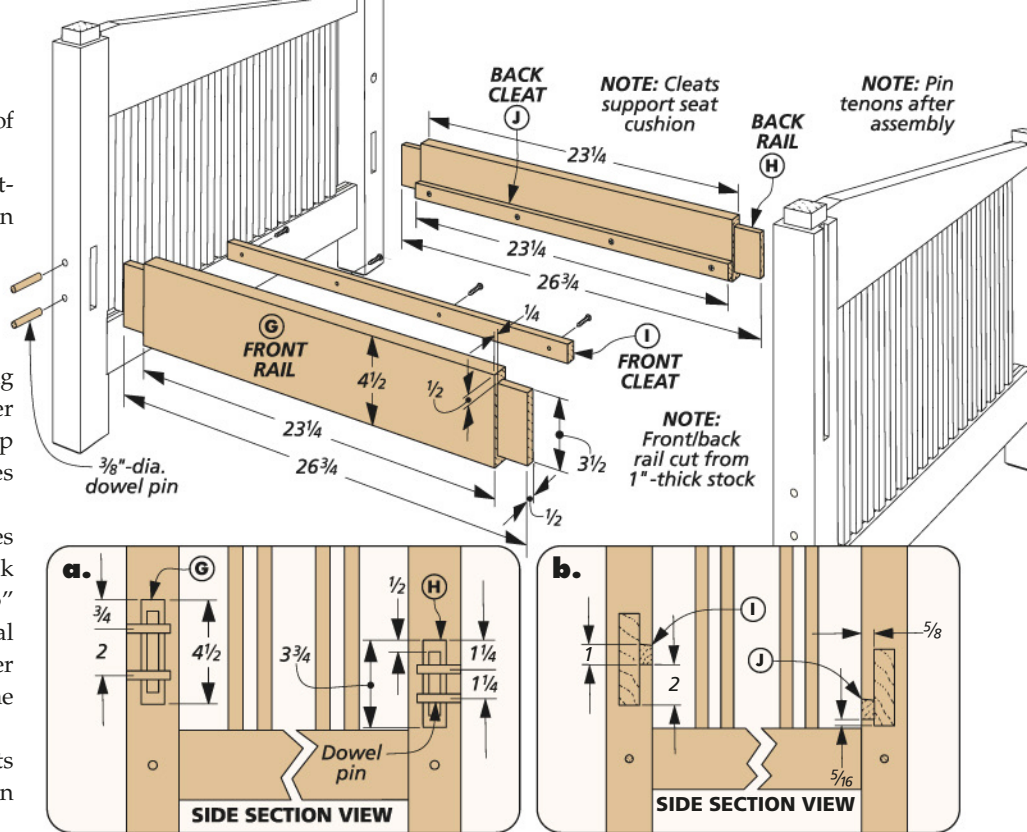


grooves. In short order, you have a series of perfectly sized and spaced mortises.

TWO SIDES FRAMES. After cutting and fitting the $\frac{5}{8}$ "-square spindles between the rails, you can get out the glue and clamps and put all the pieces together. First, glue the filler strips in place. Then insert all the spindles (with glue) into one rail. Then, working from one end, fit each spindle in order as you pull the rails together. A clamp or two will hold the rails and spindles together while you add the legs.

A STANDING FRAME. Once the two sides were assembled, I added a front and back rail to create a four-legged, "stand-up" frame. And then I added a traditional Craftsman detail by pinning all the lower tenons with dowel pegs. The box on the previous page shows the process.

Finally, after adding the two cleats that support the seat frame, you can move on to the arms.



A Closer Look: Will the Real Morris Chair Please Stand Up?

When you take a look at the drawings of the two chairs at right, you see a big difference. The chair in the lower drawing should look pretty familiar. You can easily see the common lineage it shares with our sturdy, Craftsman-style Morris chair. But, chances are, you've never seen a chair quite like the one in the upper drawing.

The truth is that both chairs are Morris chairs. Basically, any chair that has an adjustable back falls into this category. Through the years, there have been a lot of variations. Believe it or not, top chair is the original, upon which all the others were based.

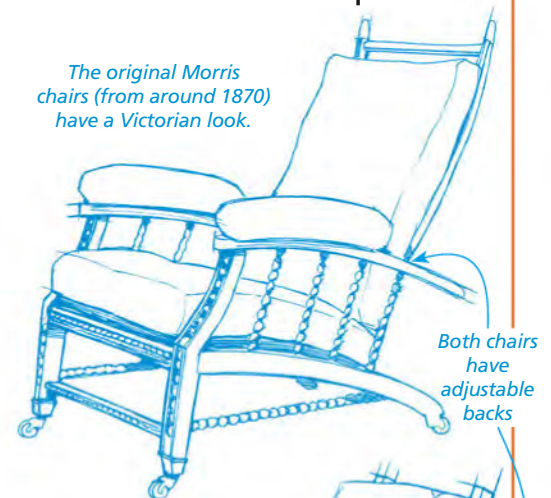
The first Morris chairs were named after and produced by the English Arts and Crafts design company owned by William Morris. Morris was a writer, philosopher, artist and, most importantly, an early pioneer of the Arts and Crafts movement in late 19th-century England. But truth be told, William Morris didn't design the chair that bears his name. That distinction goes to his chief designer, Phillip Webb.

In his time, Morris was actually best known for his wallpaper designs. But his philosophy of functional design and hands-on building methods are what he is best remembered for.

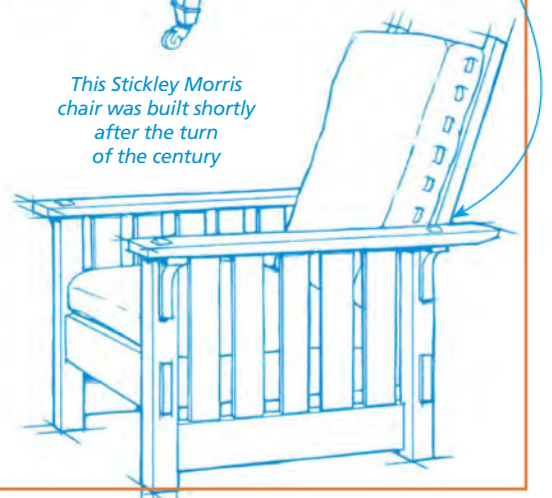
And this is where American furniture designer and manufacturer Gustav Stickley enters the picture. In 1900, Stickley traveled to Europe and picked up on the ideas of William Morris and other Arts and Crafts proponents. When he returned to the U.S., he dedicated himself to designing and building a style of furniture that fit the lifestyle of the American people. His "Craftsman-style" furniture would be simple, solidly built, and functional.

So Gustav Stickley gave us his uniquely American interpretation of the Morris Chair. For most of us, this is what we think of when we hear that name. I think you'll agree, that Stickley and his imitators brought the Morris chair as close to perfection as possible. The solid feel of a Craftsman-style Morris chair just begs you to sit down, put your feet up, and forget your cares.

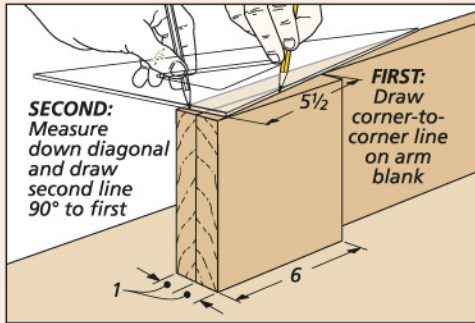
The original Morris chairs (from around 1870) have a Victorian look.



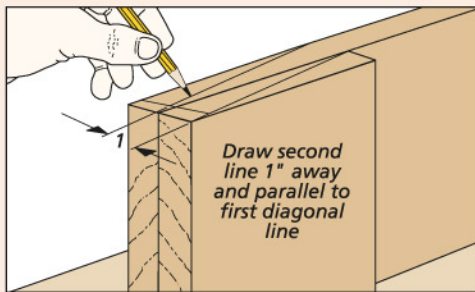
This Stickley Morris chair was built shortly after the turn of the century



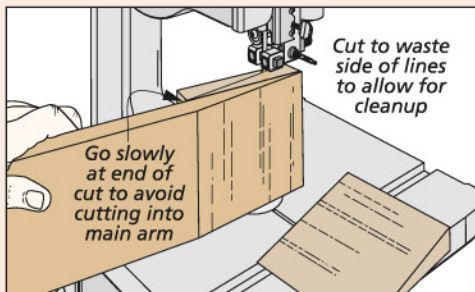
How-To: Add a Bend



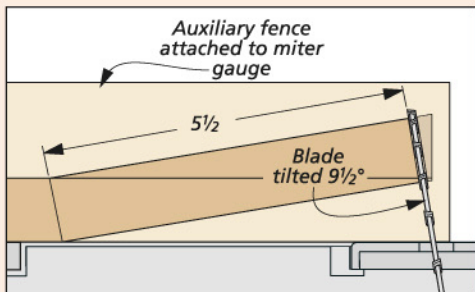
The Lower Side. First, lay out the lower side of the bend by simply drawing a corner-to-corner line on the short lower arm block.



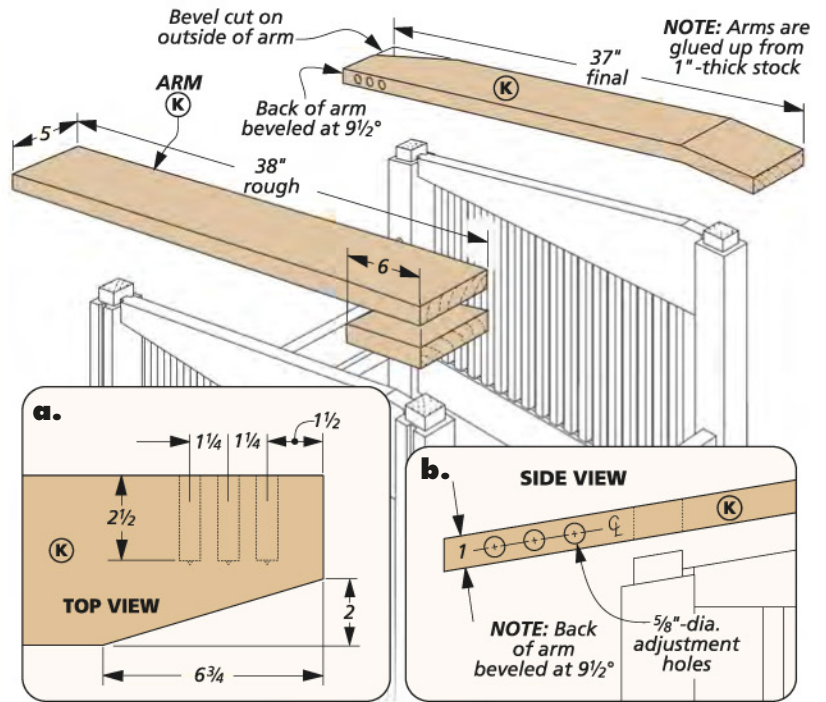
The Upper Side. Next, measure up 1" from your first line and draw a second line. This line will be the top side of the bend.



Cut & Clean. After carefully removing the waste at the band saw, I cleaned up the two faces with a block plane and sandpaper.



Square the End. Finally, you can take the blanks to the table saw to square the ends. You'll need to tilt the saw blade $9\frac{1}{2}^\circ$.



Adding the Arms

Now that the legs, rails, and spindles are assembled, the next task is to add the uniquely shaped arms. And this is where things really get interesting. Although, making the "bent" arms is a challenge, all it takes to get things done right is a steady step-by-step approach.

LOOK IT OVER. The best way to start is to familiarize yourself with what you need to accomplish.

The arms do more than just draw attention and create a comfortable resting place. They're actually an important structural part of the chair frame. A pair of through mortises in the front and back of each arm and a groove that runs between them allows the arm to fit over the side assemblies. All this joinery creates a rock-solid side frame and a strong connection for the arms. And for good reason. The end of the arms will support the pivoting back frame of the chair that you'll build a little later.

TWO BENT ARMS. But for starters, you'll need to create two arm blanks with the right shape. What you're shooting for are arms with a crisp bend that look like they

were cut from a single, solid-wood blank. The process I used to achieve this is straightforward.

The drawings above and in the column at left explain things pretty well. As you can see, a glued-up, two-piece blank is your starting point. Just be sure you get the lengths of the two pieces right and the blanks glued up flush at the front end. And then for a seamless look, take a little time to match the color and grain of the two pieces you glue up for the rough blank.

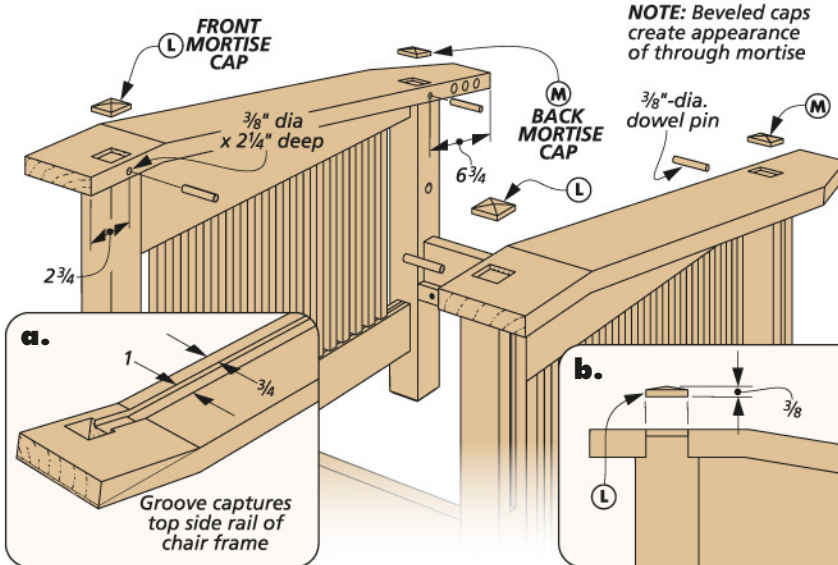
Once the rough blanks are made, you can create the bend (how-to column at left). And finally, trim each arm to final length with a bevel cut, as shown in detail 'b.'

ADJUSTMENT HOLES. The next two steps are pretty simple. First, I took the arms to the drill press. Here I drilled three, evenly spaced, $\frac{5}{8}$ "-dia. holes on the inside edge of each arm. These deep holes hold the adjustment pins that the back frame will rest against. And then, the back of each arm is trimmed at the band saw (detail 'a').

THE ARM JOINERY. Now you're ready to tackle the joinery that connects the arms to the lower frame. The major effort here involves drilling and chiseling out "through" mortises in the arms that match the tenons on the end of the legs. This job is made a



Groove Jig. This simple jig from Woodsmithspecials.com makes routing the groove on the underside of the bent arm easy.



little easier by the fact that the topside of these mortises will be plugged with separate caps, as illustrated in the box below. But you'll still want to get the best fit possible here. The box below will put you on the right track

GET IN THE GROOVE. With the mortises completed, there's only one more job to do before the arms can be added to the frame.

A 1"-wide groove needs to be routed between the two mortises on the underside of each arm. This groove allows the arm to fit over the upper side rail and seat fully on the leg tenons. If you're wondering how you're going to do this, just go to Woodsmithspecials.com.

ARMED & CAPPED. Once the groove is complete, the arms can take their place on the

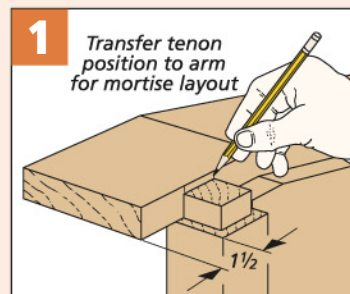
frame. Just glue them in place and then pin the tenons for good measure.

And finally, to wrap up this stage, I went back to the table saw to make the beveled caps that plug the top side of the arm mortises (detail 'b'). Making these caps is all laid out online as well. When glued in place, they should sit just proud (leave a $\frac{1}{32}$ " shoulder) of the arms.

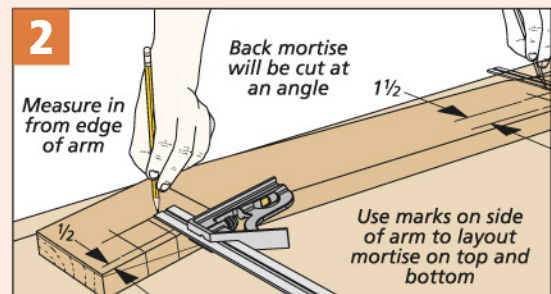
How-To: Arm Mortises

The through mortises in the arms are an important part of the joinery of the chair as well as one of its eye-catching features. Both the distance between the two mortises in each arm and the size of each mortise need to be right on. But you'll find that more than anything else, this just takes a slow but sure approach. It starts with a careful layout, followed by some work with the chisel. The drawings at right illustrate the process.

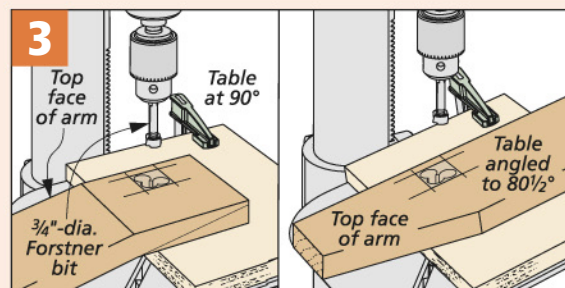
Keep in mind that since these are through mortises, your work will show on the tops of the arms. A crisp, accurate mortise on the topside will make fitting the mortise caps an easier job and the completed project much more impressive.



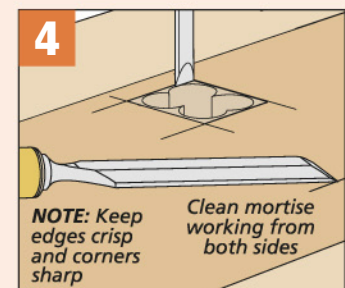
In Position. The leg tenons are used to mark the location of the mortises on the sides of the arms.



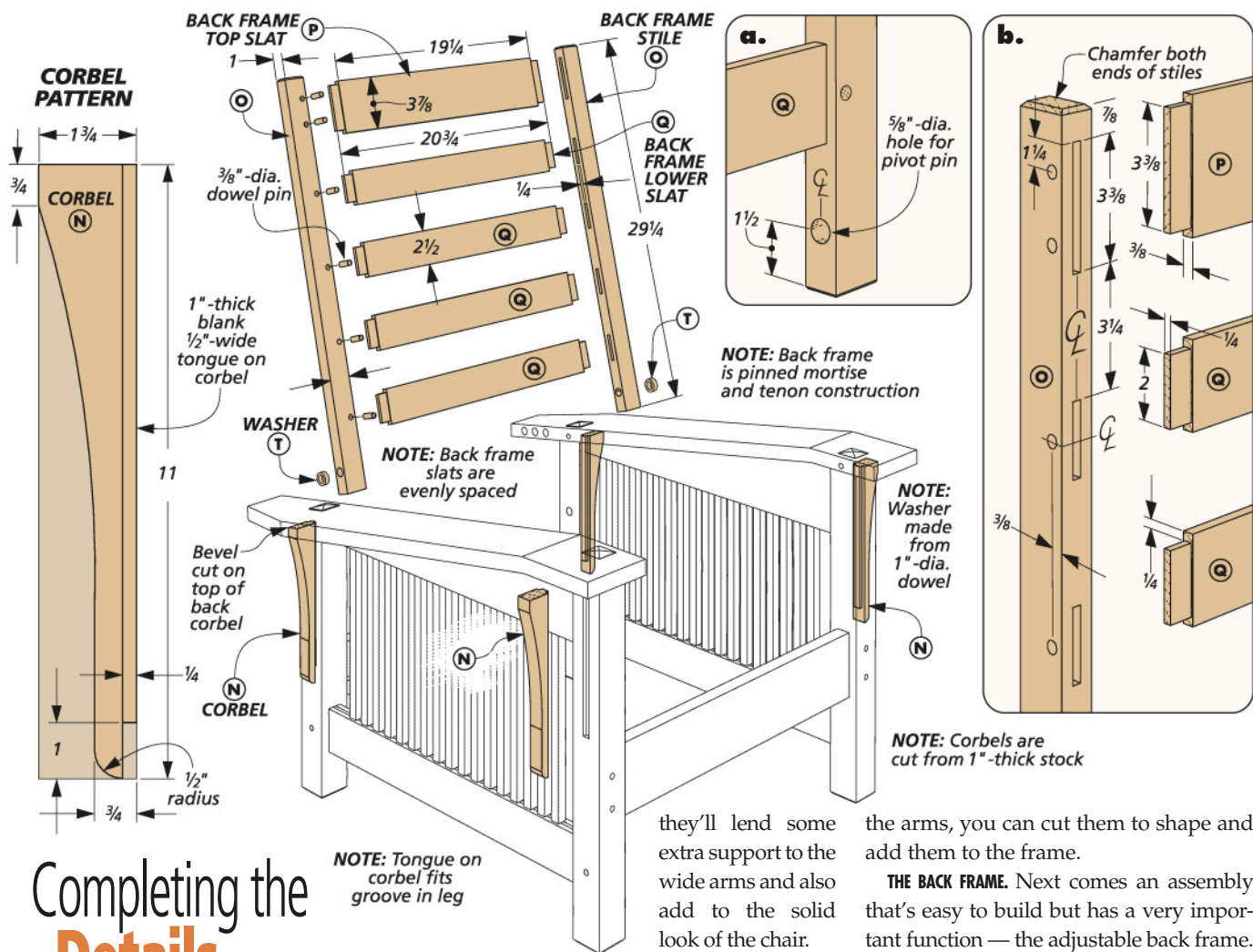
Mortise Layout. The marks on the side of the arms can then be "squared around" to the top and bottom to give you the right spacing.



At the Drill Press. The mortises are started by drilling out the waste on the drill press. Be sure to use a backup piece. You'll have to angle the table for the rear mortises.



Chisel & Mallet. Finally, pick up a chisel and mallet and clean up the mortises from both sides.



Completing the Details

At this point in the project you can relax a little bit. The biggest challenges are behind you. From here on out, it's just a matter of tidying up some final details.

THE CORBELS. The first of the finishing touches is to add the corbels (a fancy word for support bracket) beneath the arms. These are a pretty common design element of Craftsman-style furniture and here

they'll lend some extra support to the wide arms and also add to the solid look of the chair.

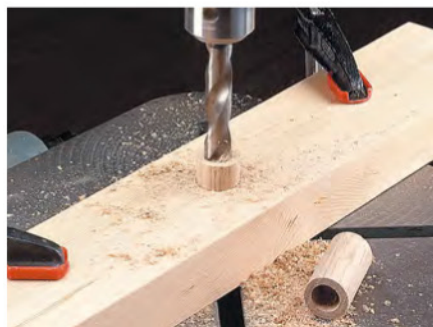
All four corbels follow the pattern shown in the margin above. But before cutting the corbel blanks to shape, you'll want to complete the simple joinery. Each corbel has a tongue that mates with the grooves you cut on the outside of the legs. This makes it easy to fit them in place and the attachment will be rock solid. And then after cutting the tops of the two back corbels to match the slope of

the arms, you can cut them to shape and add them to the frame.

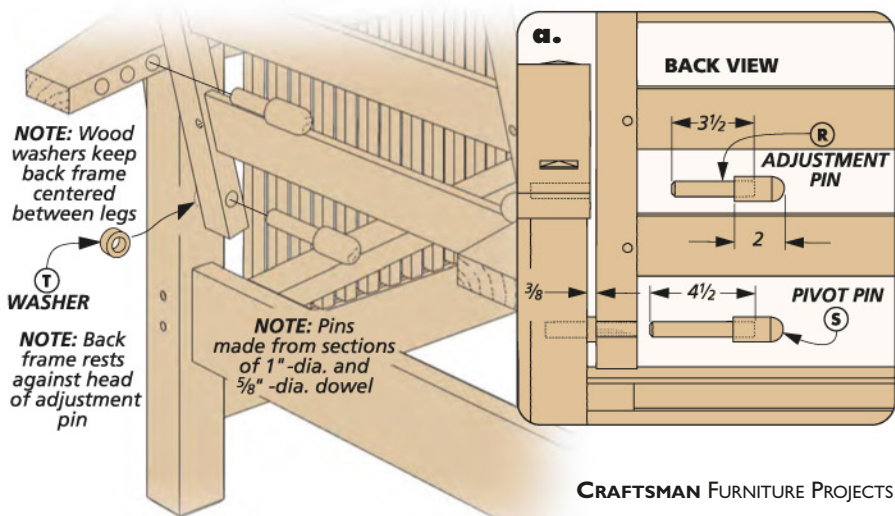
THE BACK FRAME. Next comes an assembly that's easy to build but has a very important function — the adjustable back frame. It's what makes the chair a Morris chair.

This frame needs to be both lightweight and easy to adjust, but also solid enough to carry its load. And the traditional pinned mortise and tenon "ladder" design used here will certainly do both of those functions well.

The exploded drawing above and details 'a' and 'b' show you what you need to know here, so I'll only mention a couple of details to take note of.



Washer. Both the washers and the pins can be made by using a hole in a scrap piece to center a hole in a section of 1"-dia. dowel.

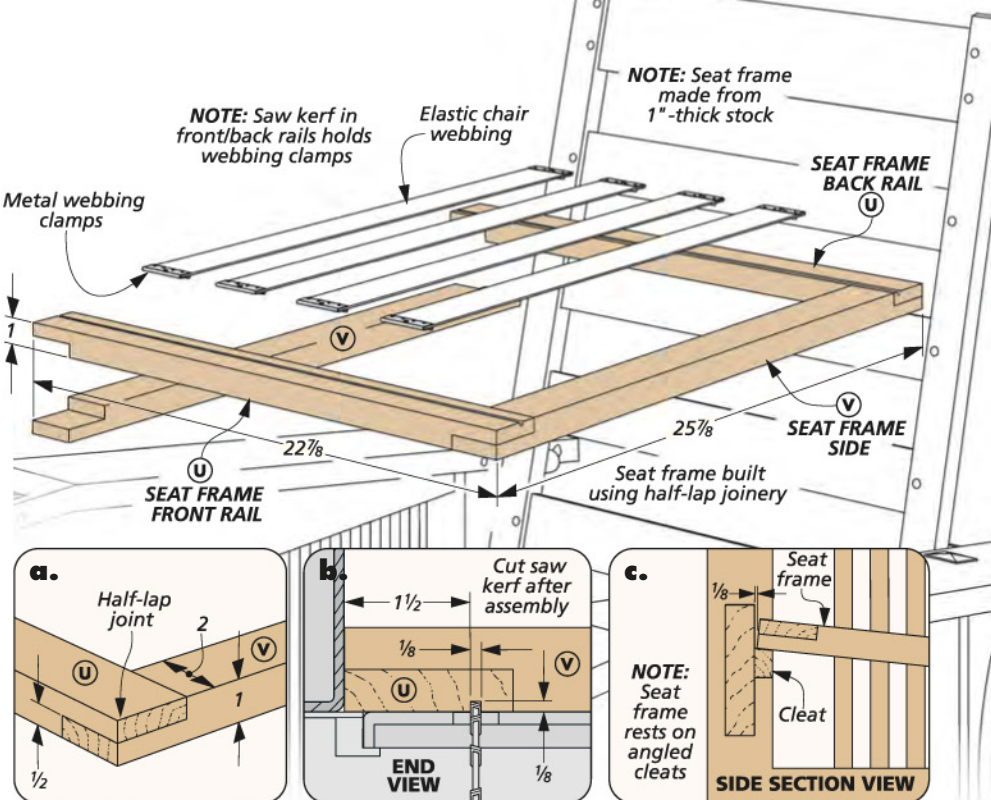


The back frame is held in place by a couple of pivot pins that pass through the frame stiles and into the legs. You'll want to drill the holes in the stiles before you assemble the frame. The frame is sized to fit between the arms of the chair with an $\frac{1}{8}$ " clearance on either side. And finally, a chamfer on the top and bottom of the stiles adds a classic Craftsman touch.

THE PINS. Once you've assembled the back frame, you're only a short step away from connecting it to the main frame. To do this, you need to make a set of pivot pins and a set of adjustment pins as shown in detail 'a' at the bottom of the previous page.

The two sets of pins are identical except that the shafts of the pivot pins are 1" longer. This extra length allows them to pass through the back frame stiles and still have plenty of bite in the legs.

The stout, two-piece pins can be made easily without any lathe work. The photo at the bottom of the previous page shows you how. I first used the drill press to drill a 1"-dia. hole in a piece of scrap. Then this hole is used to center a $\frac{5}{8}$ "-dia. hole in sections of 1" dowel. After gluing the $\frac{5}{8}$ "-dia. dowel shafts in place, chamfer the ends of the shafts. Then round over the heads and the pins are ready for use. But first, you'll need to make a pair of washers to



keep the back frame centered (drawing at bottom of the previous page).

THE SEAT FRAME. Now to wrap things up, all you need is a frame to support the seat cushion. And as you can see from the drawings above, this won't tax your skills. It's just a 1"-thick half-lap frame (detail 'a'). The frame rests on the cleats installed on

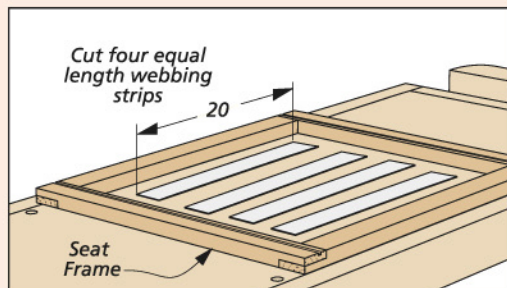
the front and back rail. So all you need to worry about is getting it sized to fit. When this work is done, the box below explains how to add a little "spring" to the seat.

After applying the finish, you can try your hand at some simple upholstery and give the chair a try. You'll find that the "sit" was well worth the effort.

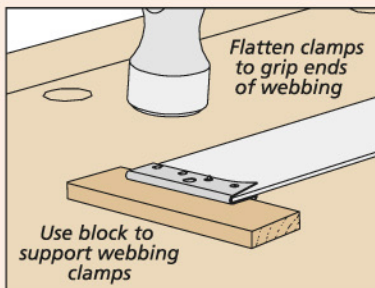
How-To: Install the Webbing

I considered simply using a solid piece of plywood as the base for the seat cushion. But the idea of having a seat with a little more "give" won the day. And in the end, the little bit of extra work was well worth it.

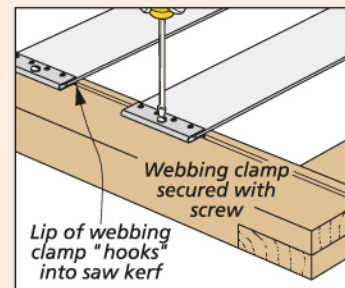
The process of adding the elastic webbing to the seat frame shown below couldn't be easier. The metal clamps grab the webbing tightly so that you can hook them into the frame kerf and screw them down.



Four Strips of Webbing. The elastic webbing will be stretched to fit the frame. So I cut four equal pieces 3" shorter than the distance between kerfs.



Attach the Clamps. Next, a webbing clamp is "pinched" tightly over each end of the webbing strips.



Attached. Attach one end in the kerf and stretch the strip to the opposite side and screw it down.

Matching Ottoman

Standing alone or placed in front of the Morris chair, this ottoman is a true classic.



Once you take a relaxing sit in the Morris chair, I can almost guarantee that you'll want to add this matching ottoman. But the best thing about this project is that it can easily stand on its own. With or without the chair, it's a great piece to build and also one to enjoy afterward.

GETTING STARTED. When you take a look at the exploded drawing below, you'll see that this project is just "nuts and bolts" joinery. First, you'll build the two end assemblies, then connect them with side rails and stretchers.

THE LEGS. The best place to start is with the four, solid legs. You can begin by cutting the legs (A) to size from 1 3/4"-thick stock.

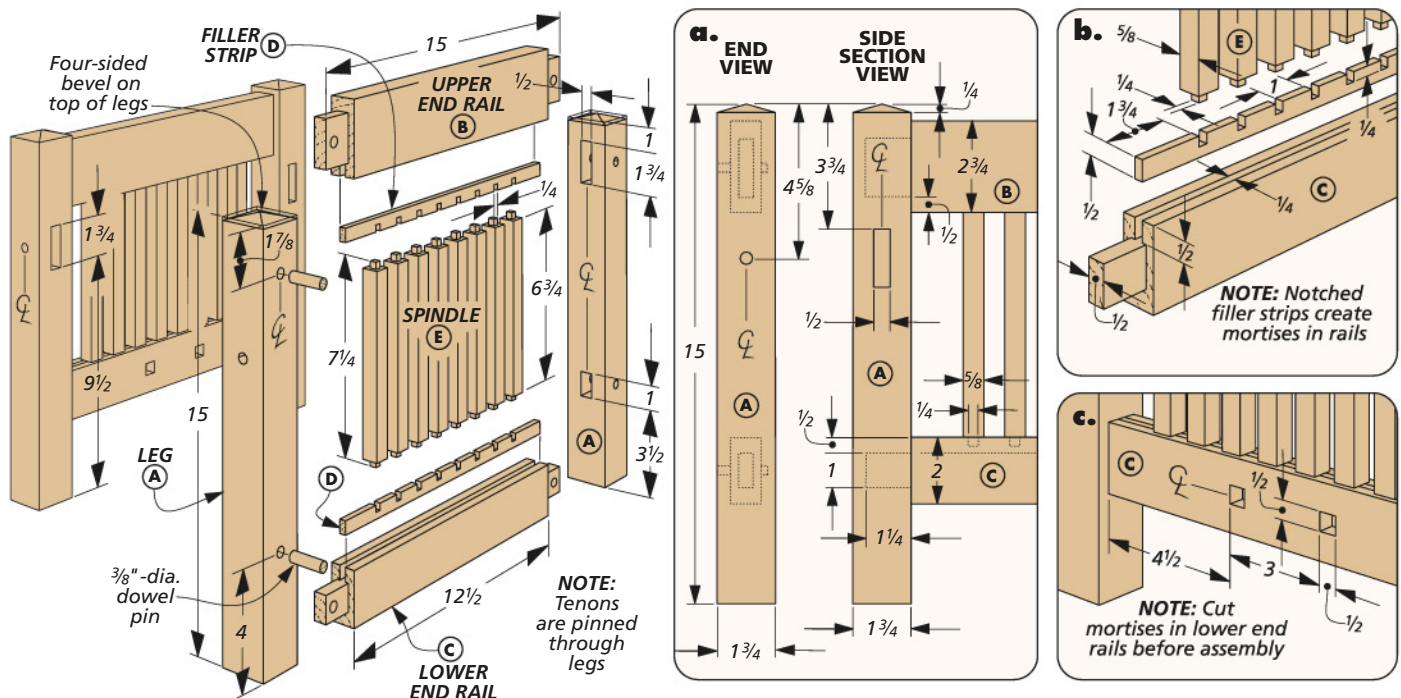
Next in line is the mortises — three in each leg. But before you get started, I suggest you pair up the legs (two for each end) and mark them clearly. This way, when you lay out the mortises, you're less likely to get confused.

With the mortises laid out, I first paid a visit to the drill press to drill out most of the waste. Then I took the legs to the workbench to clean up the mortises. Just take some time with a chisel to make clean cuts. Finally, I cut a four-sided bevel on the top of each leg (detail 'a').

RAILS & SPINDLES. The legs are now ready to have the end rails and spindles added. To match the sturdy look of the legs, I

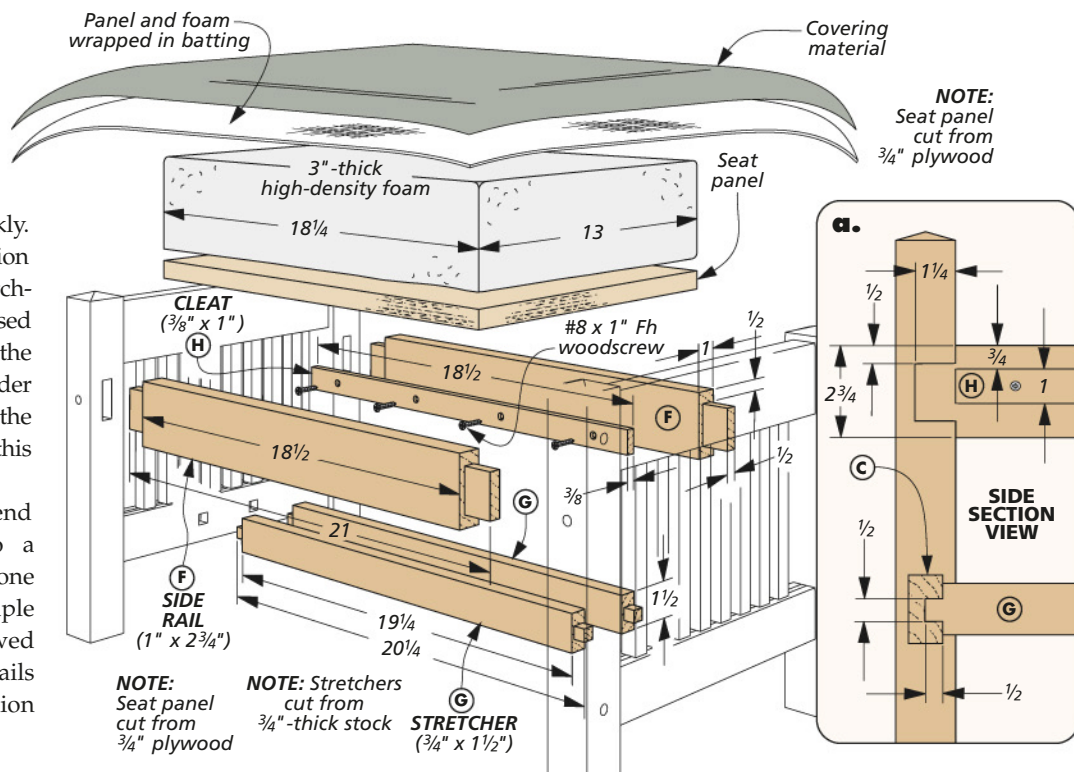
cut the upper end rails (B) and lower end rails (C) to size from 1"-thick stock. After cutting tenons to fit the mortises in the legs, you can add the grooves used to create the mortises for the spindles. To complete these mortises, I made four notched filler strips and glued them into the grooves in the rails as shown in detail 'b.' The 16 square spindles are the final pieces to the puzzle.

TWO ENDS. Before gluing each end assembly together, I took care of one final joinery task. And that's to cut two mortises in each of the lower rails. These mortises are for the stretchers that add some stiffness to the frame.



SIDE RAILS & STRETCHERS. After gluing up the two end assemblies, you're almost home. The next step, fitting the two side rails, as shown at right, will go quickly. But you'll want to pay attention when making the two stretchers. Since these are mortised into the lower end rails, not the legs, the shoulder-to-shoulder length will be different from the two side rails. You can see this in the drawing at right.

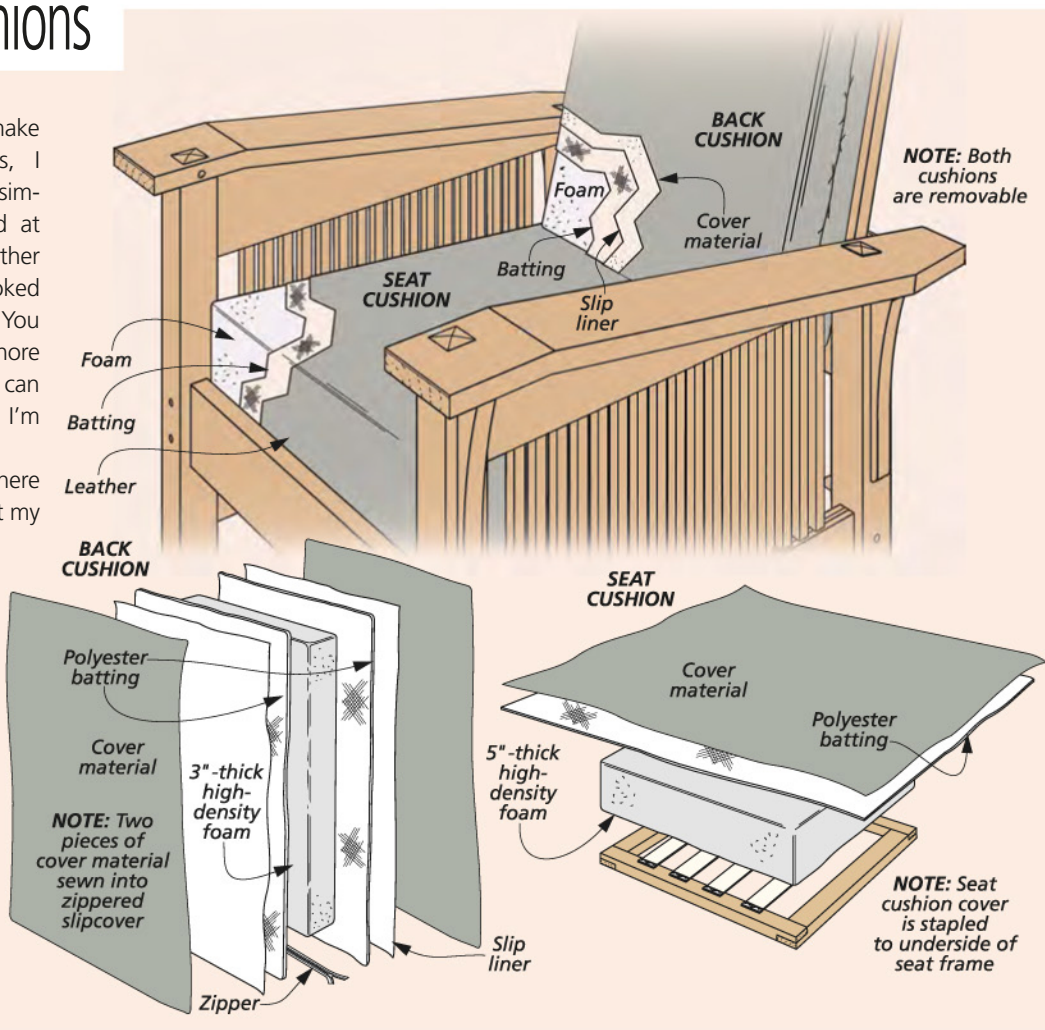
CLEATS. After gluing the end assemblies and rails into a sturdy frame, there's still one important detail left. A couple of cleats (H) need to be screwed and glued to the side rails to help support the cushion (detail 'a' at right).



Adding Cushions

When it came time to make the two chair cushions, I decided to keep things simple. And I was surprised at how easily they went together and how nice they looked when they were done. You may decide to leave this chore to a professional, but if I can work my way through it, I'm sure you can do it too.

About all I can give you here are the basics on how I pit my cushion together. The drawings at right show how the seat cushion and back cushion are assembled — batting and fabric cover a thick piece of foam. Note: the back cushion requires a little basic sewing.





Rolling Tool Cabinet

Roll this traditional-looking cabinet up next to your bench, and put all your tools in easy reach.

I suppose I could have bought a rolling tool cabinet. The kind with big banks of drawers and lots of storage underneath that auto mechanics use. But something just didn't seem right about storing my woodworking tools in a metal cabinet.

What I really wanted was a tool cabinet that was made from wood — one with a traditional appearance that I could roll right up to the bench while I'm working, then away for storage. So I decided to build a rolling tool cabinet of my own, see photo above.

It's designed with two separate storage units: a large base cabinet that rolls on casters and a smaller, tool chest style case that sits on top.

ROLLING TOOL CABINET. To provide storage for large hand tools and materials of different sizes, the rolling tool cabinet has a set of three progressively deeper drawers, see left photo. When you open the doors below, there's storage for portable power tools as well, see middle photo.

CRAFTSMAN TOOL CHEST. But small hand tools can get knocked around or lost in these

big storage areas. So to protect and organize precision hand tools, they're stored in a bank of shallow drawers in the upper tool chest, see right photo. (For more information on building just the tool chest, refer to page 25.)

WOOD & FINISH. To produce a consistent look between the rolling tool cabinet and the tool chest (and to keep wood movement to a minimum), I used quartersawn red oak and riftsawn (straight-grained) oak plywood. Most local lumber suppliers stock both of these.



Drawers. To provide easy access, the three drawers in the rolling cabinet are mounted on full-extension slides.



Shelf & Tray. Portable power tools are stored underneath on a large bottom shelf and a sliding tray.

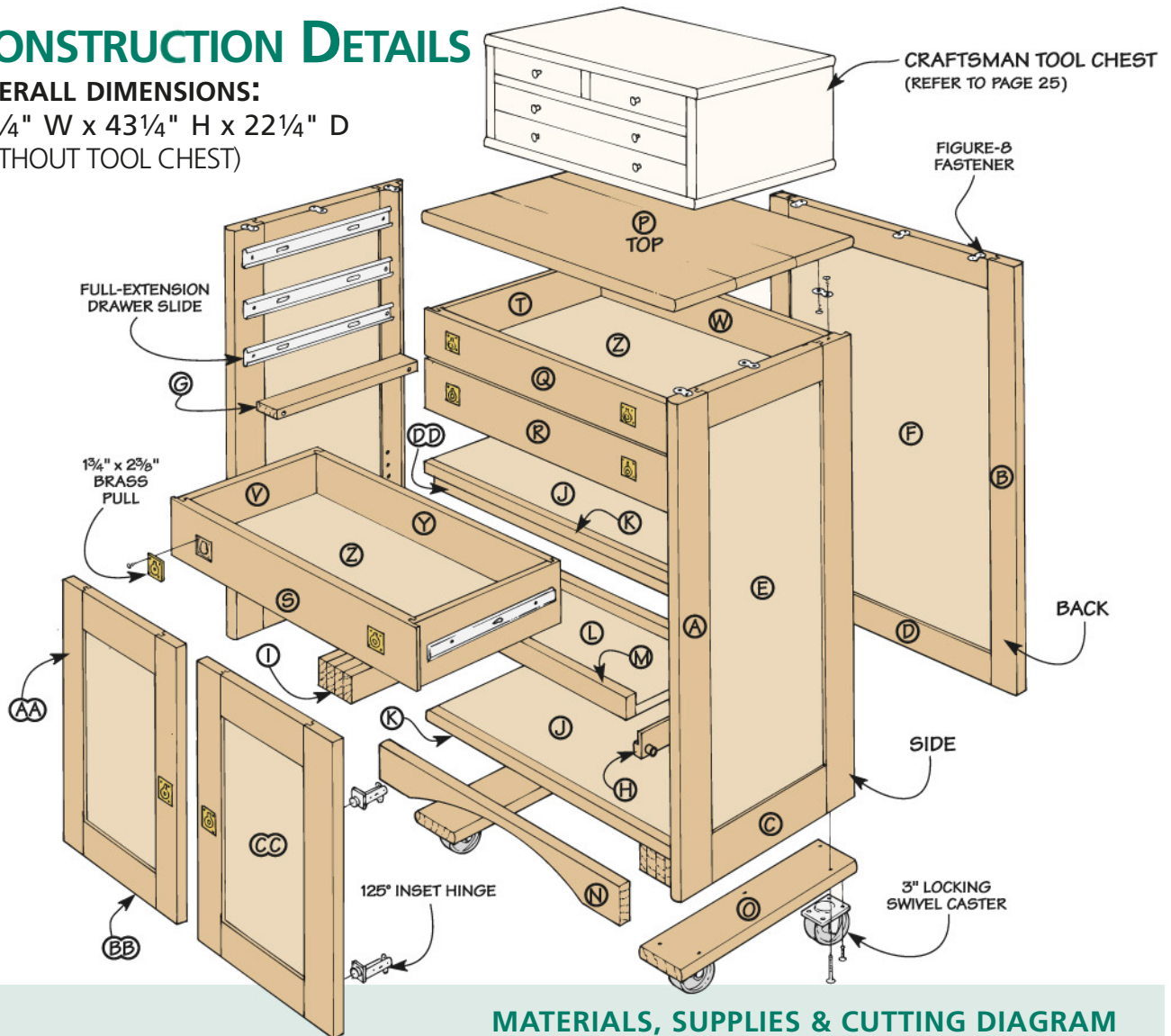


Tool Chest. Felt-lined drawers in the craftsman tool chest provide a special place for your precision hand tools.

CONSTRUCTION DETAILS

OVERALL DIMENSIONS:

32¼" W x 43¼" H x 22¼" D
(WITHOUT TOOL CHEST)



MATERIALS, SUPPLIES & CUTTING DIAGRAM

Case

A	Side Stiles (4)	¾ x 3½ - 38
B	Back Stiles (2)	¾ x 3½ - 38
C	Side Rails (4)	¾ x 3½ - 15½
D	Back Rails (2)	¾ x 3½ - 24¾
E	Side Panels (2)	15½ x 31½ - ¼ Ply.
F	Back Panel (1)	24¾ x 31½ - ¼ Ply.
G	Fixed Cleats (2)	¾ x 2 - 19½
H	Adjustable Cleats (2)	¾ x 1½ - 20
I	Corner Blocks (8 pieces)	¾ x 2¾ - 20⅛
J	Divider/Bottom Shelf (2)	20 x 30¼ - ¾ Ply.
K	Trim Pieces (2)	¾ x 1 - 30¼
L	Sliding Tray (1)	10½ x 29¾ - ¾ Ply.
M	Lip (2)	¾ x 1½ - 29¾
N	Apron (1)	¾ x 2¾ - 30¼
O	Base Pieces (2)	¾ x 4¾ - 22¼
P	Top (1)	¾ x 22¼ - 32¼

Drawers

Q	Top Drawer Front (1)	¾ x 3½ - 30
R	Middle Drawer Front (1)	¾ x 4¾ - 30
S	Deep Drawer Front (1)	¾ x 5¼ - 30
T	Top Drawer Sides (2)	½ x 3½ - 20½

U	Middle Drawer Sides (2)	½ x 4¾ - 20½
V	Deep Drawer Sides (2)	½ x 5¼ - 20½
W	Top Drawer Back (1)	½ x 3½ - 28¾
X	Middle Drawer Back (1)	½ x 4¾ - 28¾
Y	Deep Drawer Back (1)	½ x 5¼ - 28¾
Z	Drawer Bottoms (3)	28¾ x 20 - ¼ Ply.

Doors

AA	Door Stiles (4)	¾ x 3½ - 19⅞
BB	Door Rails (4)	¾ x 3½ - 8½
CC	Door Panels (2)	8½ x 13¾ - ¼ Ply.
DD	Door Stop (1)	¾ x ¾ - 30¼

- (3 pairs) 20" Full-Ext. Drawer Slides
- (2 pairs) 120° Inset Hinges
- (8) 1⅞" x 2¼" Brass Pulls
- (4) 3" Locking Swivel Casters
- (16) ¼" x 1" Lag Screws
- (16) ¼" Flat Washers
- (4) #8 x 2½" Fh Woodscrews
- (22) #8 x 1¼" Fh Woodscrews
- (9) Figure-8 Fasteners
- (18) #8 x ⅝" Fh Woodscrews

Plywood Case

I started on the rolling tool cabinet by making the case. Basically, it's a large open box that's divided into separate storage compartments, see drawing.

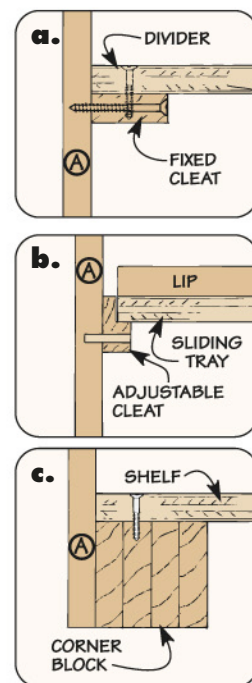
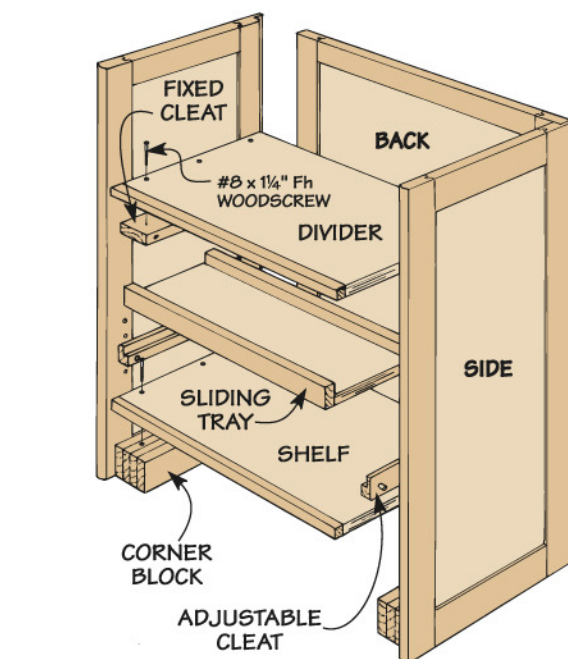
SIDES & BACK. To add rigidity to the case, the sides and back are made of solid wood frames and plywood panels. Each frame and panel is held together with simple (yet strong) stub tenon and groove joints.

The pieces of these frames are identical in width ($3\frac{1}{2}$ "). And so is the length of the side (A) and back stiles (B). You can see this in Fig. 1. But since the sides are narrower than the back, the side rails (C) are shorter than the back rails (D).

To accept the plywood panels and rails, there's a groove cut on the inside edge of each piece, see Fig. 1a. And stub tenons are cut on the ends of each rail to fit the grooves, see Fig. 1b.

PANELS. With the joinery complete, you can add the side (E) and back panels (F). These are just $\frac{1}{4}$ "-thick pieces of plywood that are glued into the frames.

At this point, there's still some work left to do on the sides. To make the sliding tray (added later) adjustable, I drilled a series of holes in the side stiles (A), see Fig. 1. And there's a rabbet that's routed in the back edge of each side to accept the back, see Fig. 1c.



BULLNOSE. To soften the front edges of the sides, I routed a bullnose. But rather than buy a special bit, I used a $\frac{1}{2}$ " round-over bit instead and made a pass on each side, see detail in Fig. 1. This leaves a slight "flat," but all it takes is a little sanding to smooth it out.

SUPPORTS

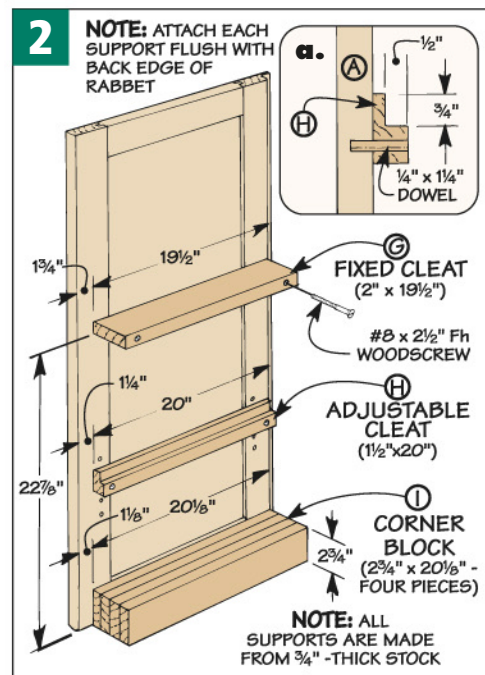
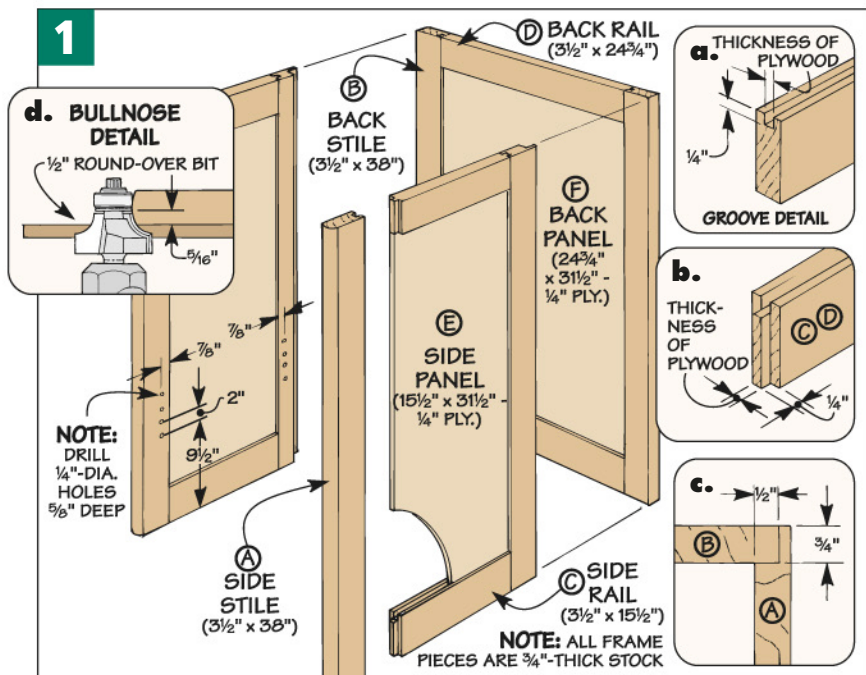
Before assembling the case, it's easiest to add supports for a divider, tray, and shelf.

FIXED CLEATS. The divider is supported by a pair of fixed cleats (G) made from

$\frac{3}{4}$ "-thick hardwood, see Fig. 2. After positioning each cleat flush with the inside edge of the rabbet, they're simply screwed to the side stiles.

ADJUSTABLE CLEATS. The sliding tray is also supported by two cleats. But to move the tray up or down, these adjustable cleats (H) have pins (dowels) that fit into the holes drilled earlier in the sides, see Fig. 2a.

To hold the cleats tight against the sides of the case, the tray sits in a rabbet cut in the edge of the cleats. Take a look at Fig. 2a. With this orientation, the edge



of the tray presses against the cleats and holds them in place.

CORNER BLOCKS. One last set of supports is a pair of corner blocks. Besides supporting the bottom shelf, these corner blocks direct the weight of the tool cabinet onto the casters, see margin.

To help carry this weight, the corner blocks (I) are made by gluing up four pieces of $\frac{3}{4}$ "-thick stock, see Fig. 2. These blocks are simply glued flush with the bottom of each side.

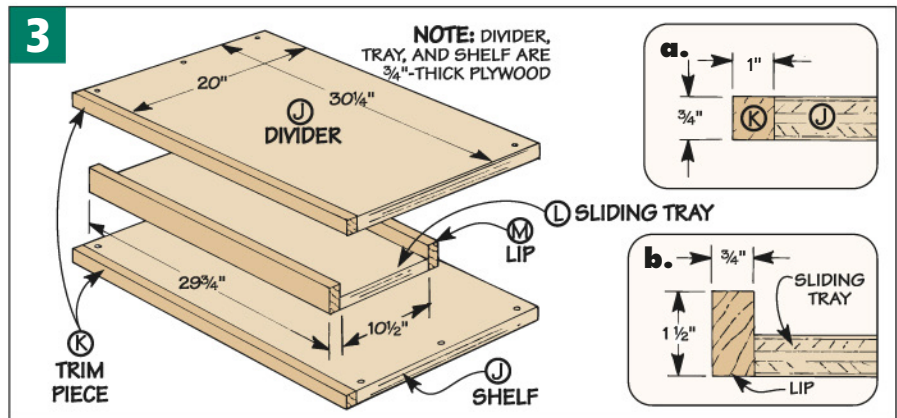
DIVIDER, TRAY, & SHELF

With all the supports in place, you can turn your attention to the divider, tray, and shelf.

DIVIDER. The divider separates the cabinet into an upper and lower compartment. The top compartment houses three drawers. And the lower one provides storage underneath.

The divider (J) is just a piece of $\frac{3}{4}$ "-thick plywood with holes drilled in it to attach it to the fixed cleats, see Fig. 3. Gluing on a hardwood trim piece (K) covers the front edge of the divider, see Fig. 3a.

SLIDING TRAY. To provide easy access to tools, the sliding tray (L) is a narrow



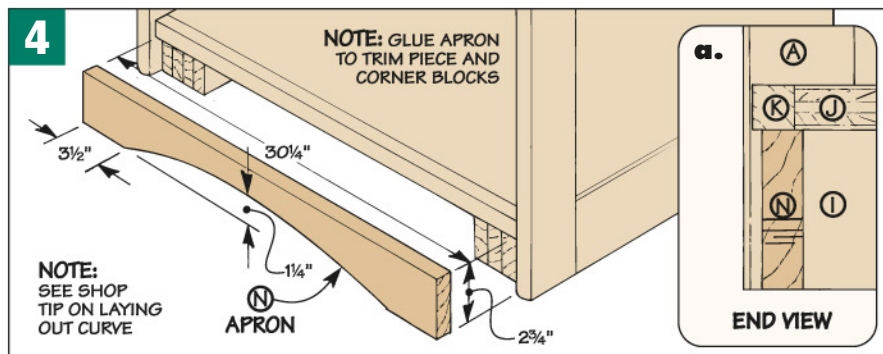
piece of $\frac{3}{4}$ "-thick plywood that pulls to the front of the cabinet. A hardwood lip (M) glued to the front and back edges keeps tools from falling off, see Fig. 3a.

SHELF. For storage at the bottom of the case, there's a shelf (J) that's identical in size to the divider. Again, a trim piece (K) creates a finished looking edge.

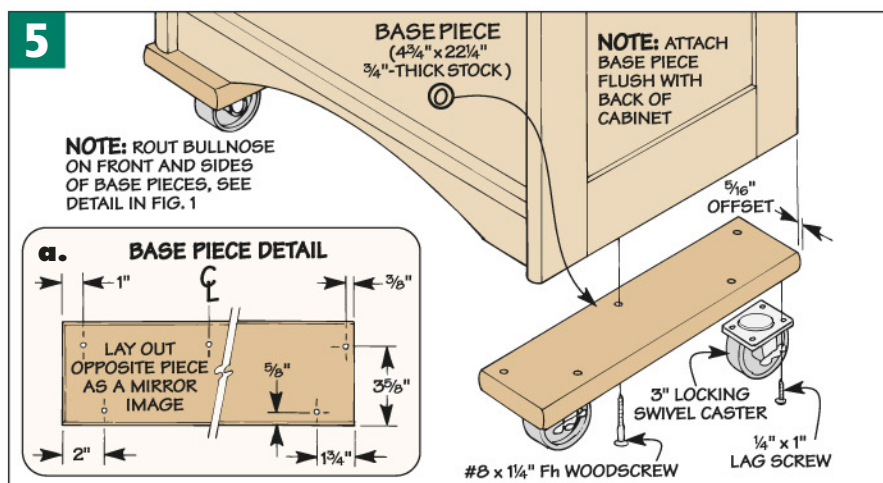
ASSEMBLY. At this point, you can glue up the case. To keep things square, I slipped the divider and shelf into the case. When the glue is dry and you've removed the clamps, you can screw the divider and shelf into place.

APRON. Next, I added a hardwood apron (N), see Fig. 4. After cutting a gentle curve on the bottom edge, this apron is glued to the trim piece (K) and corner blocks (I), see margin and Fig. 4a.

CASTERS. All that's left is to add four locking swivel casters. To provide a sturdy mounting platform for the casters, two base pieces (O) are attached to the bottom of the case, see Fig. 5. After routing a bullnose on the sides and front of the base pieces, they're screwed to the corner blocks and sides. Then just attach the casters with screws.



Caster Blocks. A thick corner block directs the weight of the cabinet and tools onto the casters.



Shop Tip



To lay out a large curve, bend a steel measuring stick against a pair of dowels or bench dogs. Then, mark the curve on the workpiece.

Solid Top

With the case complete, I started on the top of the cabinet. To provide a sturdy platform for the tool chest, the top (P) is a solid wood panel that's made by gluing up pieces of $\frac{3}{4}$ "-thick hardwood (oak), see Fig. 6.

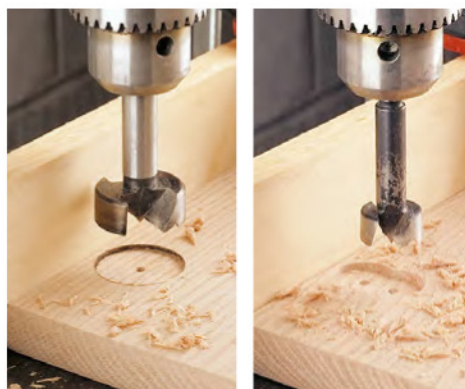
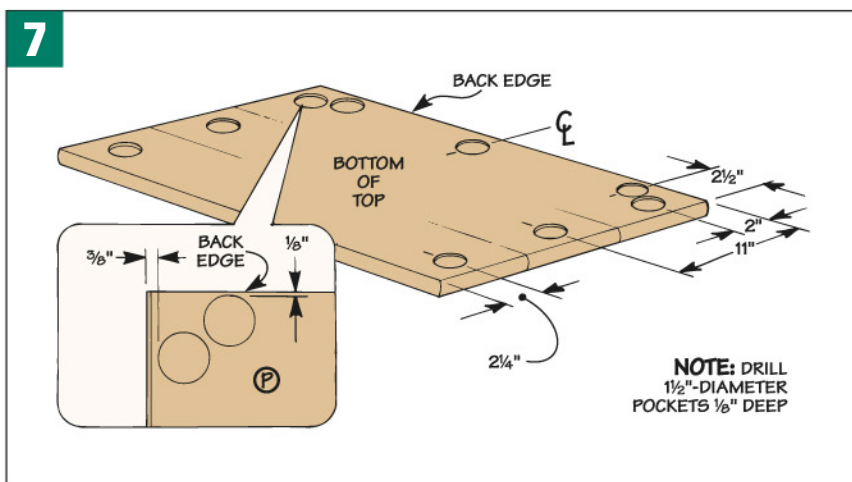
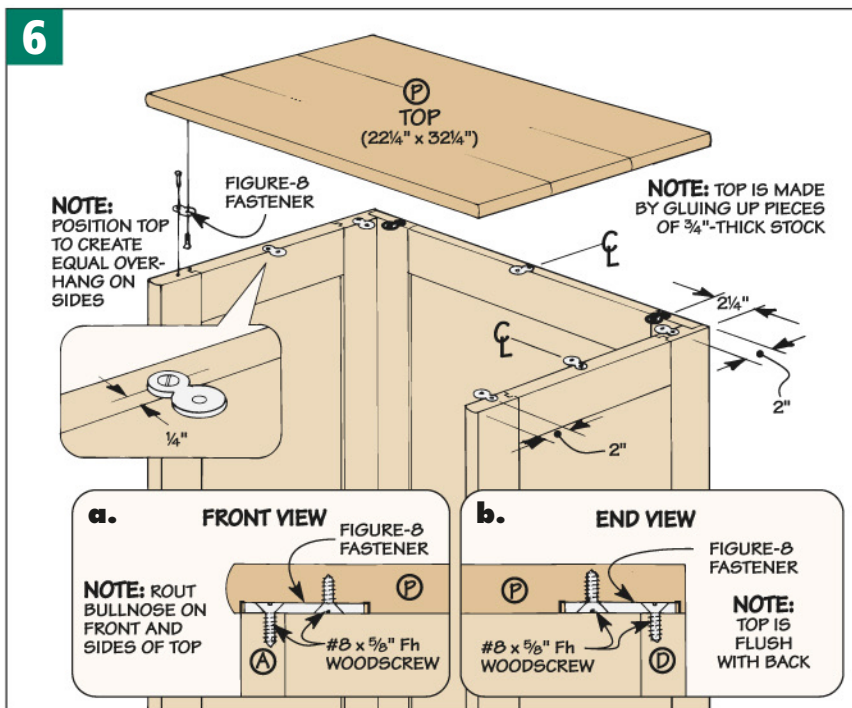
WOOD MOVEMENT. But a solid wood top creates an interesting problem when attaching it to the case. It has to be held tightly in place. But to keep the top from splitting, it still has to expand and contract with changes in humidity.

FIGURE-8. To secure the top and allow for wood movement, I used metal figure-8 fasteners. The small end of these fasteners attaches to the sides (or back) of the case, see details in Fig. 6. The large end fastens to the top. This way, when the wood expands or contracts, the fastener pivots and keeps the top from splitting.

POCKETS. The figure-8 fasteners are recessed into shallow ($\frac{1}{8}$ "-deep) "pockets." After laying out their location, I drilled the pockets with a $1\frac{1}{2}$ "-dia. Forstner bit, see Figs. 7 and 7a. But you can also drill overlapping holes with a smaller bit, see photos below.

Before attaching the top, there's one more thing to do. And that's to rout a bullnose on the front and sides only. The back edge is left square to sit tight against a wall.

INSTALL FASTENERS. At this point, you're ready to install the fasteners. Installation is just a simple three-step process. These steps are outlined in the box at the lower right. Note: To provide easy access to the case when working on the drawers, it's best to wait to attach the top until you've installed the drawer slides.



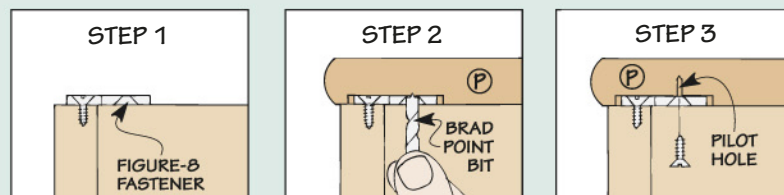
Pockets. To create crisp, clean pockets for the figure-8 fasteners, it's best to use a Forstner bit. This can be a large ($1\frac{1}{2}$ "-dia.) bit (left). Or a small (1"-dia.) bit and drill overlapping holes (right).

Figure-8 Fasteners



To install a figure-8 fastener, start by screwing the small end of the fastener to the sides and back of the case, see Step 1. Then, after positioning the top and marking the location of the hole

in the big end (Step 2), drill pilot holes in the top and screw the top in place, see Step 3. (Note: These fasteners are available from a variety of woodworking retailers.)



Fleet of Drawers

To provide storage for different sizes of tools and materials, I built three progressively deeper drawers for the upper part of the tool cabinet, see Fig. 8.

Strong locking rabbet joints hold the drawers together. And full-extension drawer slides provide easy access to what's inside. When you're picking out slides, make sure to take a look at the weight rating. Drawers can often get loaded down with hardware and tools, so you'll want to pick a slide that has a robust weight rating.

There's nothing complicated about building the drawers. The drawer fronts (Q, R, S) are made from $\frac{3}{4}$ "-thick hardwood (oak), see Fig. 8. And I used $\frac{1}{2}$ "-thick stock (maple) for the drawer sides (T, U, V) and backs (W, X, Y). Note: These pieces are sized to allow $\frac{1}{2}$ " clearance for the drawer slides and an $\frac{1}{8}$ " gap all the way around each drawer front.

LOCKING RABBETS. With the pieces cut to size, you can concentrate on the locking rabbet joints. There's an article available on Woodsmithspecials.com that covers creating a locking rabbet joint. Then just cut grooves in each part for the plywood bottoms (Z), see Fig. 8c.

DRAWER PULLS. Before gluing up the drawers, it's easiest to install the brass pulls on the drawer fronts. (For a step-by-step procedure, refer to page 24.)

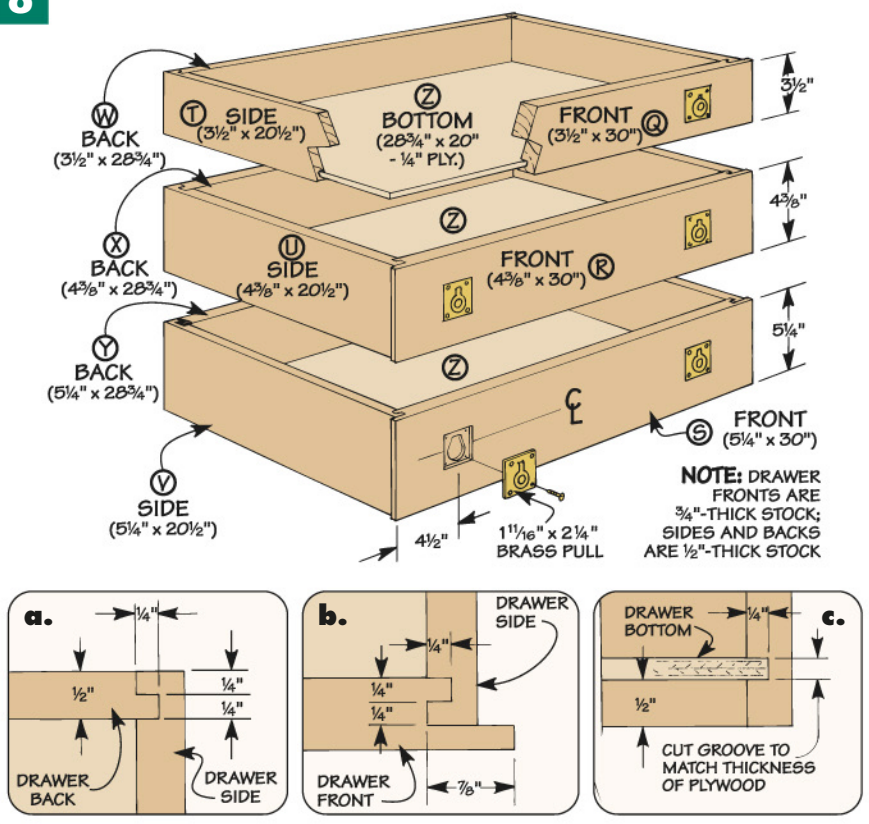
DRAWER SLIDES. Now it's just a matter of adding the drawer slides. These slides have two basic parts.

One is centered on the width of the drawer sides, see Fig. 9. It lets you adjust the drawer up and down, so you'll be able to fine tune the drawers for a consistent $\frac{1}{8}$ " gap all the way around.

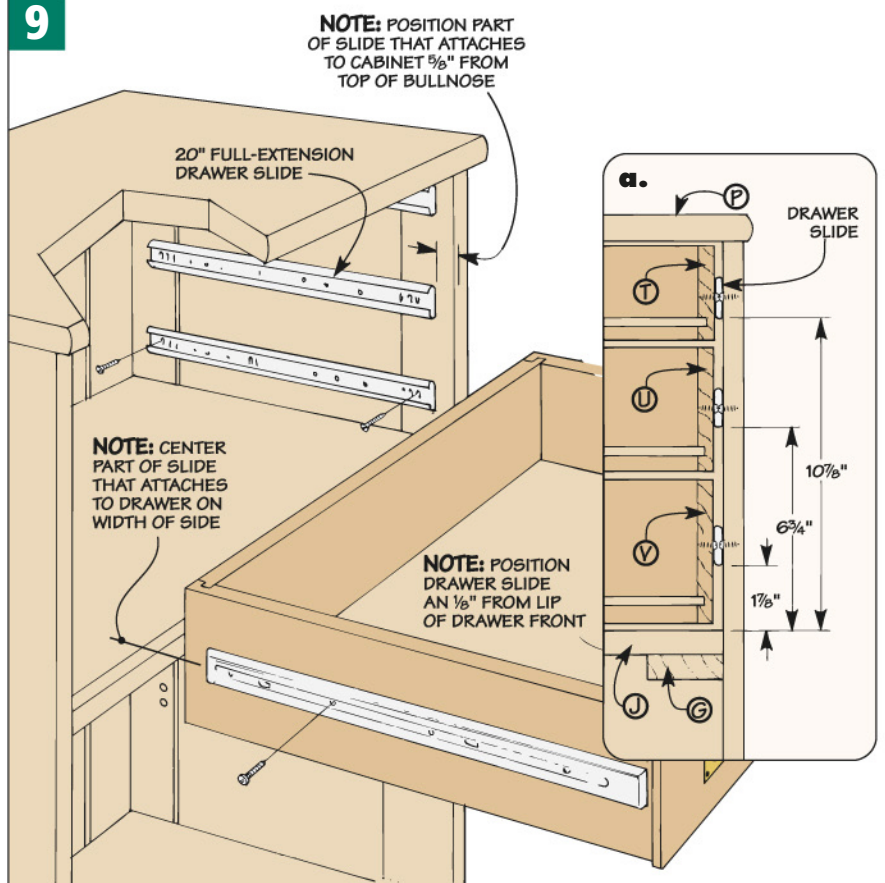
The other part attaches to the side of the cabinet. You can see this in Figs. 9 and 9a. By adjusting this part, you can position the drawer fronts farther in or out of the cabinet. Note: Since I wanted to recess the drawer fronts about $\frac{1}{8}$ " back, I located the slide $\frac{5}{8}$ " in from the top of the bullnose.

ATTACH TOP. Now there's only two things left to do. And that is attach the top (see the page) and slide the drawers in place on their slides.

8



9



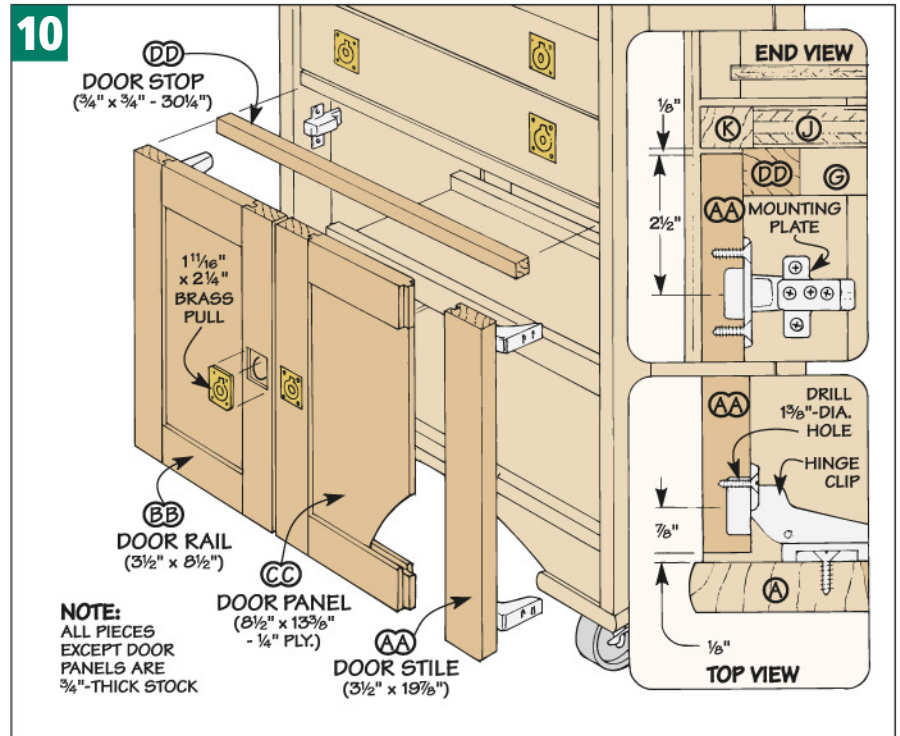
Small Doors

To keep dust and chips out of the lower part of the tool cabinet, I added two doors. Like the sides and back, the doors are simple wood frames and plywood panels that are held together with stub tenons and grooves.

APPEARANCE. In addition to the joinery, I also wanted to maintain a consistent appearance between the different parts of the cabinet. So the stiles (AA) and rails (BB) are the same width ($3\frac{1}{2}$ "") as the stiles and rails on the sides and back, see Fig. 10. And to match the spacing of the drawers, these frame pieces are cut to length to allow an $\frac{1}{8}$ " gap all the way around, see Figs. 10a and 10b.

Now you're ready to cut the stub tenon and groove joints, refer to Figs. 1a and 1b on page 20. Then, cut the door panels (CC) to size and glue up the doors and setting them aside to dry.

Before installing the doors, I added a stop (DD) that keeps them flush with the front edge of the divider when they're closed. This is a strip of hardwood that's



glued under the divider. This is detailed in Figs. 10 and 10a.

INSTALL DOORS. After adding brass pulls (see box below), you can install the doors. They're held in place with 120° European-

style hinges, see Figs. 10a and 10b.

This requires drilling a $1\frac{1}{8}$ "-dia. hole in the door stile to accept the hinge clip, see Fig. 10b. Then attach the mounting plate to the side, see Fig. 10a.

Installing Brass Pulls

It's easy to install a brass pull flush with the surface of a door (or drawer). All it takes is to cut a two-tiered mortise — a deep, oblong-shaped pocket for the part that sticks out in back, and a shallow, rectangular recess for the mounting plate.

TEMPLATE. To lay out the deep pocket, I use a hardboard template with a horseshoe-shaped opening to match

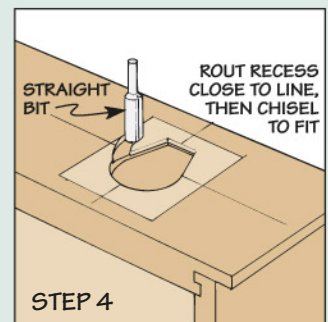
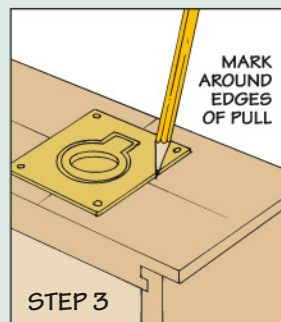
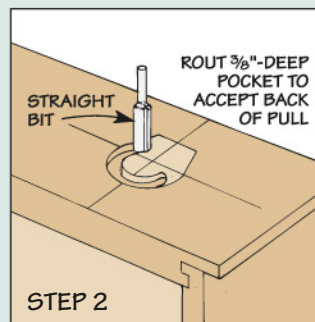
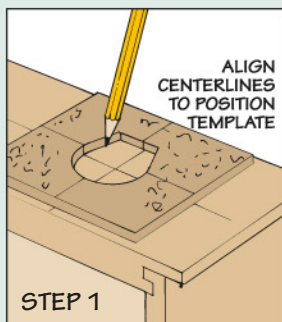
the back of the pull, see Step 1. To allow for some adjustment when positioning the mounting plate, the opening is $\frac{1}{16}$ " larger than the back of the pull. Note: I draw centerlines on the template to make it easy to align.

To form the deep pocket, it's easiest to use a straight bit and rout up to the line, see Step 2. Then, after setting the pull into the opening and marking



around the mounting plate (Step 3), rout the shallow recess up close to (but not touching) the line (Step 4).

Now chisel up to the edges, checking the fit of the pull as you work.



Tool Chest

Place this chest on top of the rolling tool cabinet. Or set it on a workbench. Either way, it protects and organizes your precision hand tools.



Special tools deserve a special place. At least, that's how I feel about some of my favorite hand tools.

Whether it's the bevel gauge that belonged to my grandfather, a brand new precision square, or my best set of chisels, it's reassuring to know they won't get knocked around or damaged. And that they're within easy reach when I reach for them and need to use them.

TOOL CHEST. That's why I built this craftsman tool chest that you see in the photo above. It protects and organizes my best hand tools. But what I like just as much is its traditional appearance — as comfortable as the look and feel of a tool that's polished with use.

SOLID WOOD. One thing that adds to this look is its solid wood panels made from quartersawn oak. Along with soft

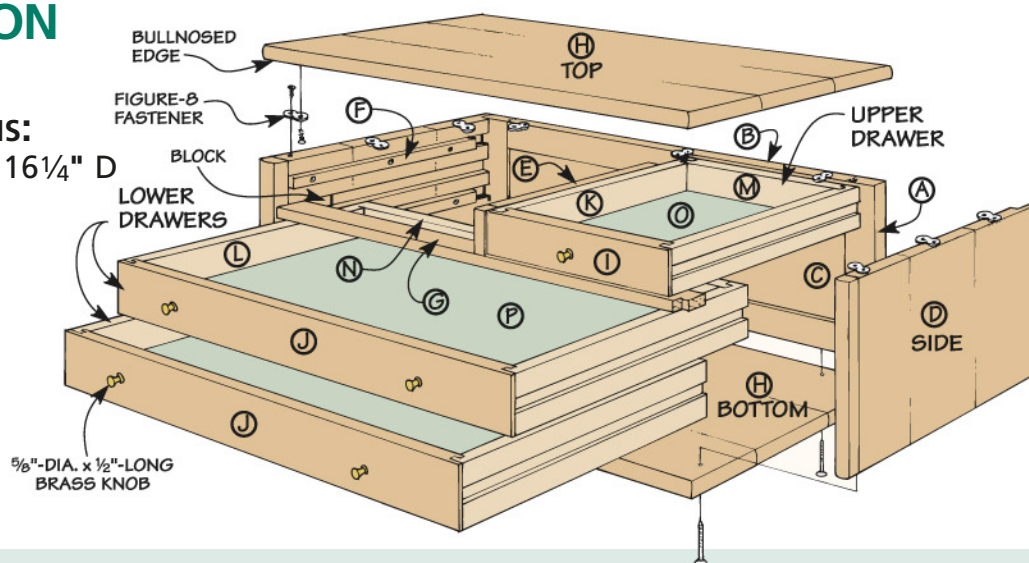
bullnosed edges, this makes the chest a perfect companion piece to place on top of the rolling tool cabinet. Or build it to stand by itself.

DRAWERS. Either way, a bank of four shallow drawers that run smoothly on wood guides provides plenty of storage and easy access to your tools. And lining these drawers with felt adds that final touch of craftsmanship.

CONSTRUCTION DETAILS

OVERALL DIMENSIONS:

28 1/4" W x 9 5/16" H x 16 1/4" D



MATERIALS, SUPPLIES & CUTTING DIAGRAM

Case

A Back Stiles (2)	3/4 x 1 1/2 - 7 13/16
B Back Rails (2)	3/4 x 1 1/2 - 24 3/4
C Back Panel	5 5/16 x 24 3/4 - 1/4 Ply.
D Sides (2)	3/4 x 16 - 7 13/16
E Vertical Divider	1/2 x 14 - 17 3/8
F Drawer Guides (8)	7/16 x 1/2 - 13 3/4
G Horizontal Divider	1/2 x 1 - 26 1/2
H Top/Bottom (2)	3/4 x 16 1/4 - 28 1/4

Drawers

I Upr. Drwr. Frnts. (2)	3/4 x 1 3/4 - 12 3/4
J Lwr. Drwr. Frnts. (2)	3/4 x 2 5/8 - 26 1/8
K Upr. Drwr. Sides (4)	1/2 x 1 3/4 - 14 1/2
L Lwr. Drwr. Sides (4)	1/2 x 2 5/8 - 14 1/2
M Upr. Drwr. Bcks. (2)	1/2 x 1 3/4 - 12
N Lwr. Drwr. Bcks. (2)	1/2 x 2 5/8 - 25 3/8
O Upr. Drwr. Btms. (2)	14 x 12 1/4 - 1/4 Hdbd.
P Lwr. Drwr. Btms. (2)	14 x 25 5/8 - 1/4 Hdbd.

- (6) 5/8" x 1/2" Brass Knobs
- (9) Figure-8 Fasteners
- (18) #8 x 5/8" Fh Woodscrews
- (1) #8 x 3" Fh Woodscrew
- (2) #8 x 2 1/2" Rh Woodscrews
- (9) #8 x 1 1/4" Fh Woodscrews
- (24) #6 x 5/8" Fh Woodscrews

Short Case

The case for the craftsman tool chest starts out simply enough — just two sides and a back that form an open, U-shaped frame, see Fig. 1.

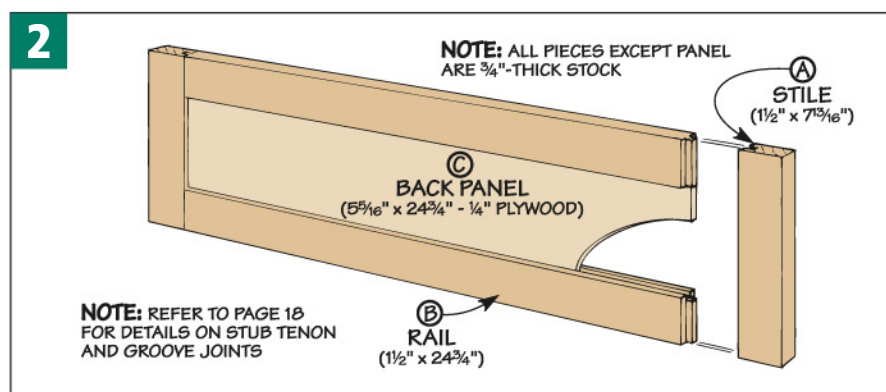
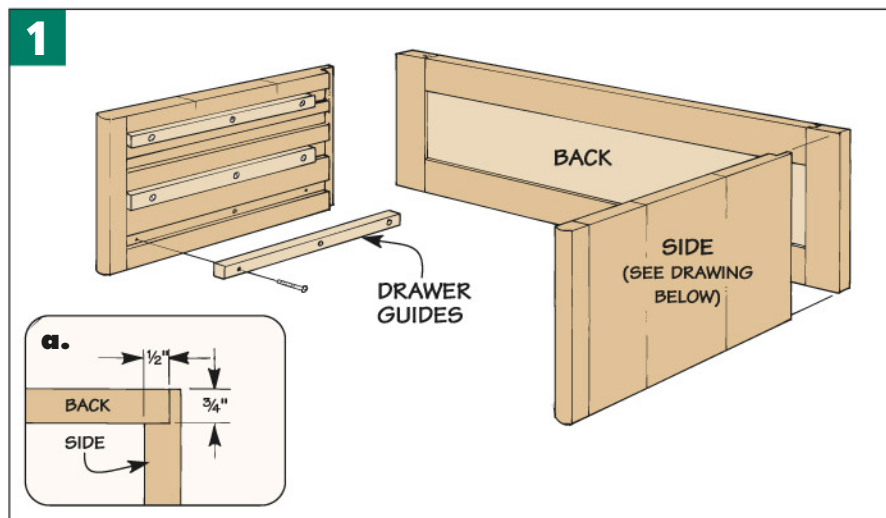
BACK. Like the sides and back of the rolling tool cabinet, the back is just a wood frame that surrounds a plywood panel. The frame consists of two short stiles (A) and two long rails (B), see Fig. 2. After cutting stub tenon and groove joints on these pieces (see page 20), a plywood back panel (C) is glued in the frame.

SIDES. With the back complete, the next step is to add the two sides, see drawing below. Besides enclosing the case, the sides support the wood guides for the drawers.

VERTICAL DIVIDER. In addition to the drawer guides on the sides, the vertical divider that separates the top two drawers also supports a pair of drawer guides, see drawing on the next page. So it's easiest to work on it at the same time as you make the sides.

SOLID WOOD PANELS. Both the sides (D) and the vertical divider (E) are made by gluing up solid wood panels, see drawings below and on opposite page. (Note: The sides are made from $\frac{3}{4}$ "-thick stock; the vertical divider is made from $\frac{1}{2}$ "-thick stock.)

The thing to be aware of is the grain direction of these panels runs vertically. This way, as the wood expands and

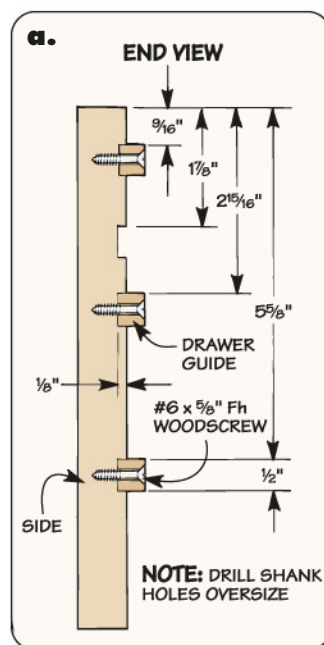
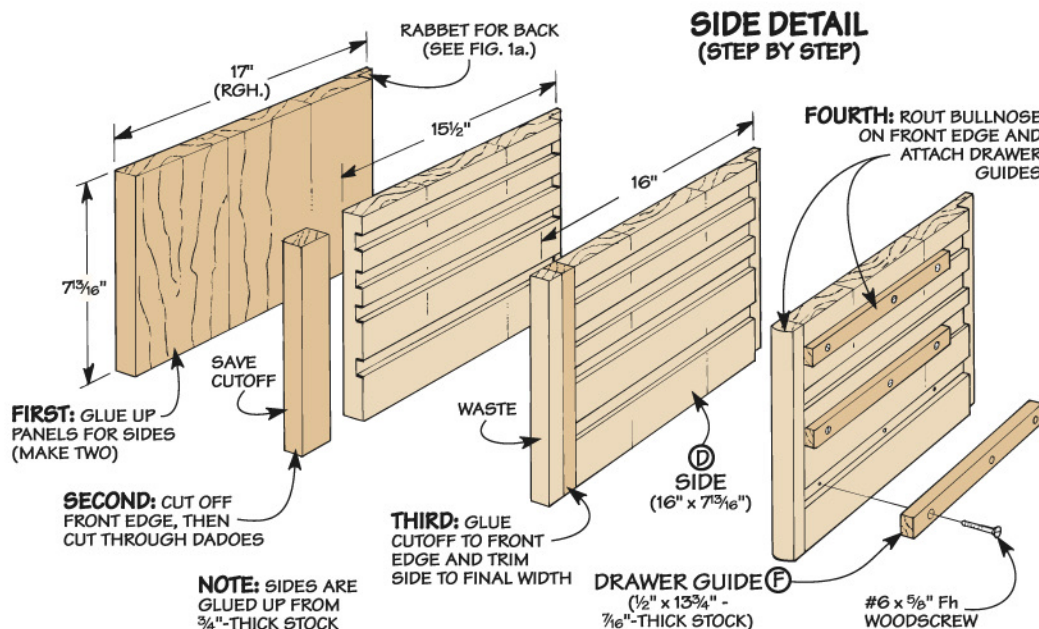


contracts with changes in humidity, the panels will move with the top and bottom of the case — not against them.

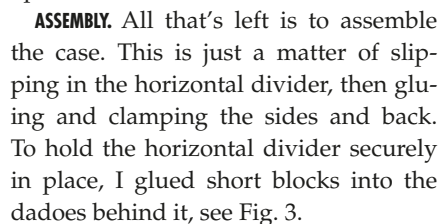
When the glue dries, the panels can be cut to final length (height). But to make

it easier later when cutting stopped dados for the drawer guides, they're oversized in width.

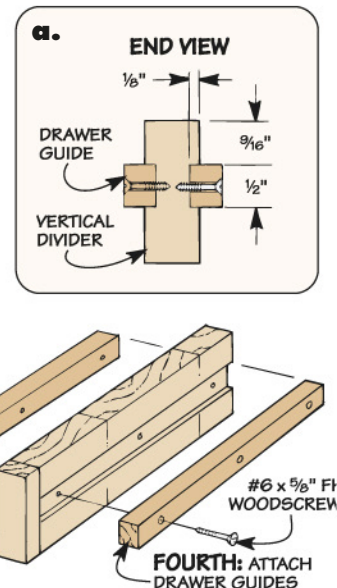
RABBIT. Before cutting these dados, there's one more thing to do. That's to



CUT TO WIDTH. After the glue dries, you can cut the sides (D) and vertical divider (E) to final width. To match the profile on the edges of the rolling tool cabinet, I routed a bullnose on the front edges of each side.



Edging. Cutting stopped dados is easy. Just cut the front edge off the panel. Then cut a series of through dados, and glue the front edge back in place.



Top & Bottom

The case of the tool chest is sandwiched between two solid wood panels — one for the top and the other for the bottom.

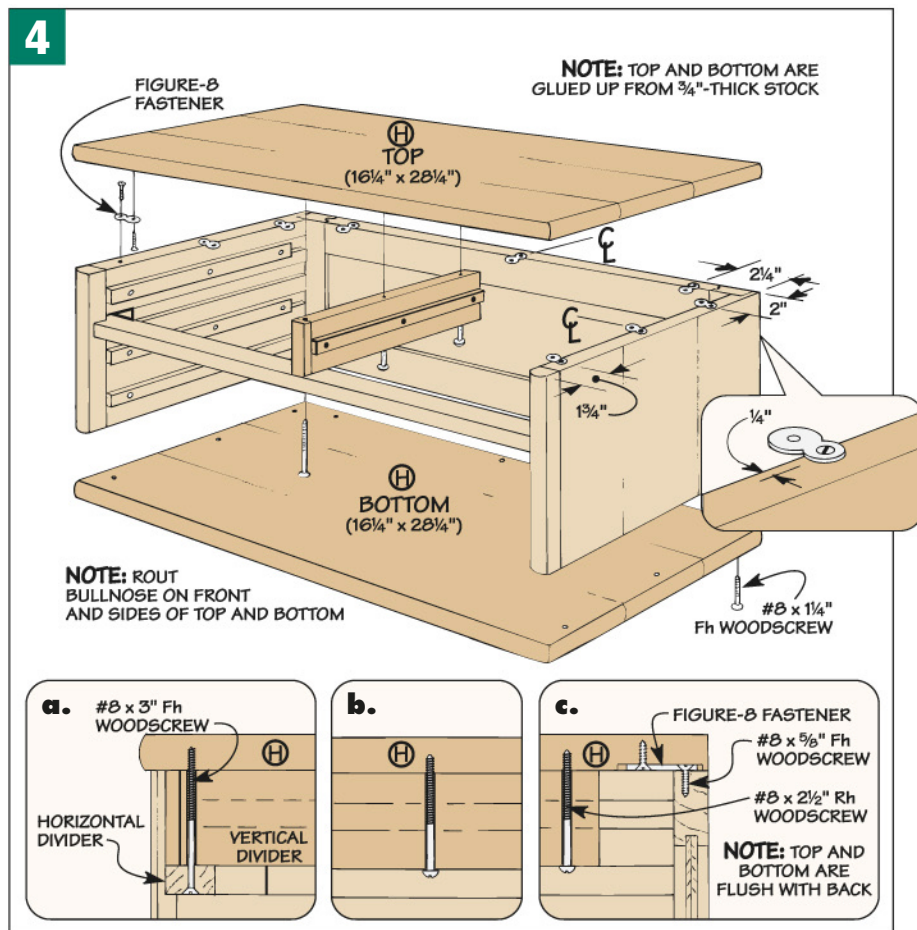
Both the top and bottom (H) are made by gluing up pieces of $\frac{3}{4}$ "-thick stock, see Fig. 4. The idea here is to orient the pieces so there's edge grain in front and back of the panels. This way, the top and bottom will move together with the sides (across their width) as they expand and contract with changes in humidity.

BULLNOSE. After gluing up the panels, there's one more thing to do. To match the look of the rolling tool cabinet, a bullnose is routed on the front and sides of each panel, refer to detail on page 20.

ATTACH TOP. Now you're ready to attach the top. Here again, I used figure-8 fasteners to hold it in place. Not because of wood movement. (Remember, the panels will all move together.) But because it's an easy way to attach the top without any hardware showing on the surface.

As before, the figure-8 fasteners are recessed by drilling a series of pockets in the top, see Fig. 5. And here again, the fasteners are screwed to the sides and back of the case, see Fig. 4.

To attach the top, it's easiest to lay it upside down on a worksurface, see Fig. 6. Then, after positioning the case so the top extends an equal amount on each

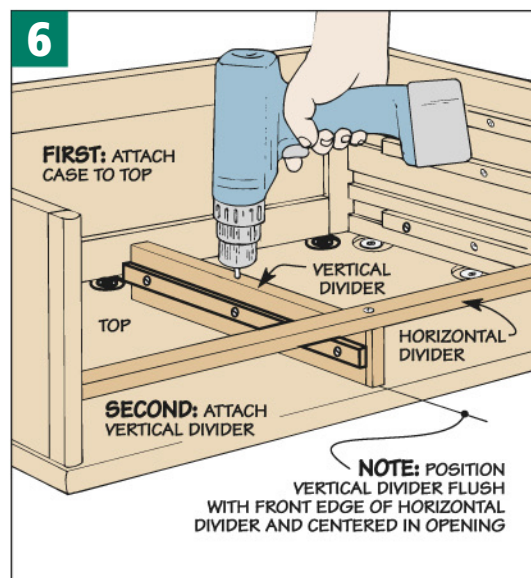
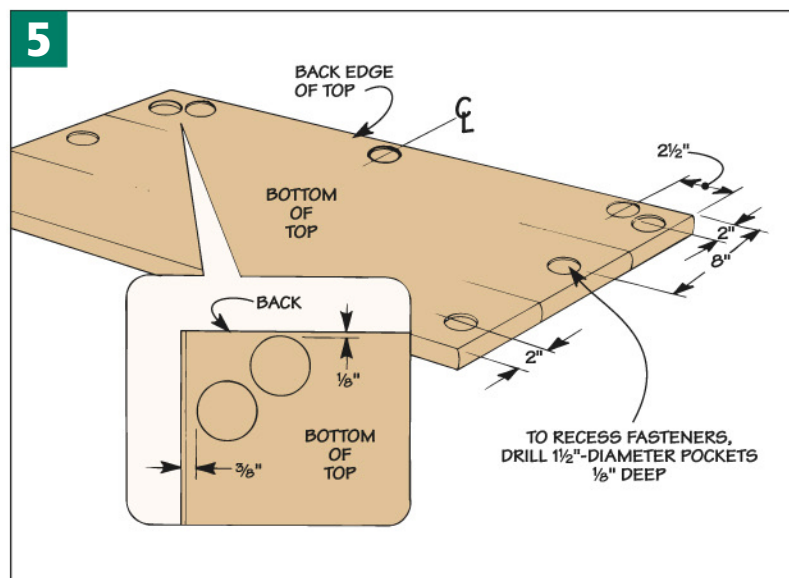


side (and it's flush to the sides at the back), simply screw it in place.

VERTICAL DIVIDER. At this point, you can attach the vertical divider to the top. It's held in place with three screws. A long flathead wood screw passes through holes drilled through each divider and

into the top, see Fig. 4a and 6. And shorter roundhead wood screws are installed in the center and the back. See Figures 4b and 4c.

ATTACH BOTTOM. All that's left to complete the assembly is to screw the bottom to the sides and back of the case, see Fig. 4.



Small Drawers

To hold different size hand tools, this tool chest has two narrow drawers on top and two wide drawers at the bottom, see Fig. 7. They slide in and out of the tool chest on the wood drawer guides installed earlier.

LOCKING RABBIT. Like the drawers on the rolling tool cabinet, they're held together with locking rabbet joints. But before cutting the joints, there are a couple of things worth mentioning.

First, the drawer pieces are sized to create a $\frac{1}{16}$ " gap all the way around, see Fig. 7a. And second, there's no lip on the front of the drawer. Instead, it's flush with the side of the drawer.

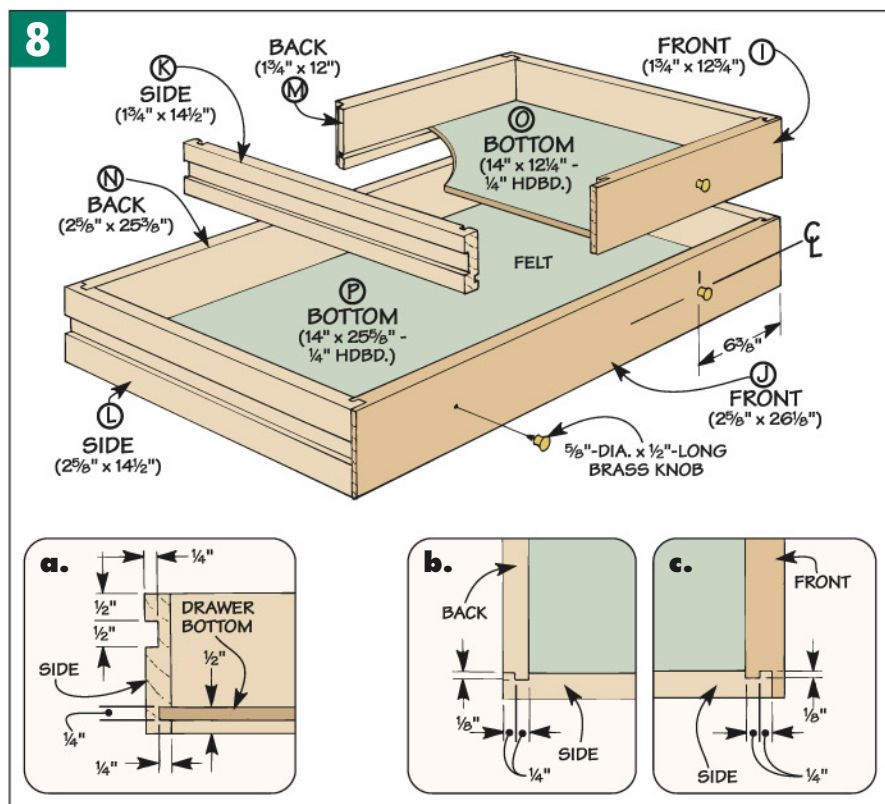
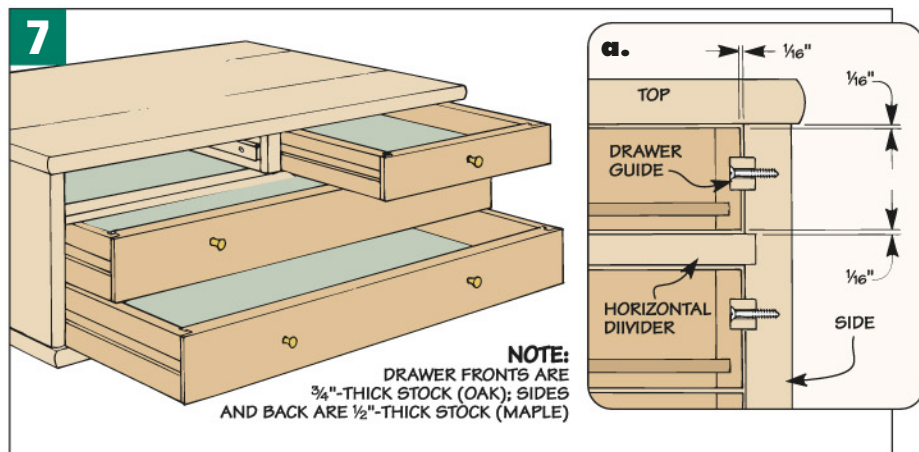
The reason for this is simple. When the drawers are installed, the wood guides are recessed into grooves in the sides of the drawers. So they're hidden by the drawer front. As a result, you don't need a lip to cover them like you do with the metal slides on the rolling tool cabinet.

Other than that, building the drawers is fairly straightforward. After cutting the drawer fronts (I, J), sides (K, L), and backs (M, N) to size, it's just a matter of cutting the locking rabbet joints, see Figs. 8b and 8c.

GROOVES. Before assembling the drawers, you'll need to cut the grooves in the side pieces for the drawer guides. To create a consistent $\frac{1}{16}$ " gap, the grooves are located $\frac{1}{2}$ " down from the top of each side, see Figs. 7a and 8a.

In addition to the grooves for the drawer guides, you'll also need to cut grooves for the $\frac{1}{4}$ "-thick hardboard drawer bottoms (O, P), see Figs. 8 and 8a. Then just glue up the drawers. After finishing the drawers, I add a little paste wax to the guide grooves.

FINAL DETAILS. To complete the chest, I added a set of brass knobs. These just screw into the drawer fronts, see Fig. 8. As a final touch, I always like to line drawers that are holding tools. It keeps them from sliding around, plus they just look nicer resting on a piece of leather or felt. See the box at right for how I finished out these drawers.



Felt Lining

Nothing shows off a set of fine hand tools better than a drawer lined with felt, see photo. And it's easy to install.

Using spray adhesive, attach an oversized piece of felt to a piece of posterboard that's cut to fit the drawer bottom. Then simply trim the felt to size and press it into the bottom of the drawer.



Wall Mirror

A stylish design with plenty of woodworking makes this mirror a hit in the shop and the home.

A wall mirror is a welcome addition to just about any room. It helps add depth in a small space, like a hallway, or it can provide a nice accent in a larger setting. The design for this mirror makes it not only attractive, but easy to build as well.

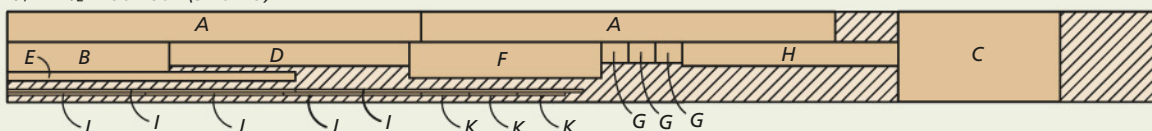
As you can see in the photo, the basic mirror frame is pretty straightforward. But a handful of details makes the mirror a more interesting piece. For example, a narrow shelf supported by corbels offers a place to display small items. And the decorative cove moldings between the corbels and on the top really give the mirror a more refined look. All in all, it's a great weekend project.



MATERIALS, SUPPLIES & CUTTING DIAGRAM

A Stiles (2)	$\frac{3}{4} \times 2\frac{1}{2}$ - 34 $\frac{1}{2}$	J Interior Frame Rails (3)	$\frac{1}{4} \times \frac{1}{4}$ - 12
B Top Rail (1)	$\frac{3}{4} \times 2\frac{1}{2}$ - 13 $\frac{1}{2}$	K Interior Frame Muntins (3)	$\frac{1}{4} \times \frac{1}{4}$ - 4
C Bottom Rail (1)	$\frac{3}{4} \times 7\frac{1}{2}$ - 13 $\frac{1}{2}$	L Back Panel (1)	$\frac{1}{4}$ hdbd. - 12 x 24
D Cap (1)	$\frac{3}{4} \times 2$ - 20		• (2) #8 x $1\frac{1}{4}$ " Fh Woodscrews
E Upper Cove Molding (1)	$\frac{3}{4} \times \frac{3}{4}$ - 24 rgh.		• (6) Brass Turnbuttons w/Screws
F Shelf (1)	$\frac{3}{4} \times 3$ - 16		• (1) 11 $\frac{7}{8}$ " x 23 $\frac{7}{8}$ " Mirror
G Corbels (3)	$\frac{3}{4} \times 1\frac{3}{4}$ - 2 $\frac{1}{4}$		• (1) 6" Frame Hanger
H Lower Cove Molding (1)	$\frac{3}{4} \times 2$ - 18 rgh.		• (2) $\frac{1}{2}$ "-dia. Bumpers
I Interior Frame Stiles (2)	$\frac{1}{4} \times \frac{1}{4}$ - 24		

$\frac{3}{4}$ " x 7 $\frac{1}{2}$ " - 96" Oak (5 Bd. Ft.)



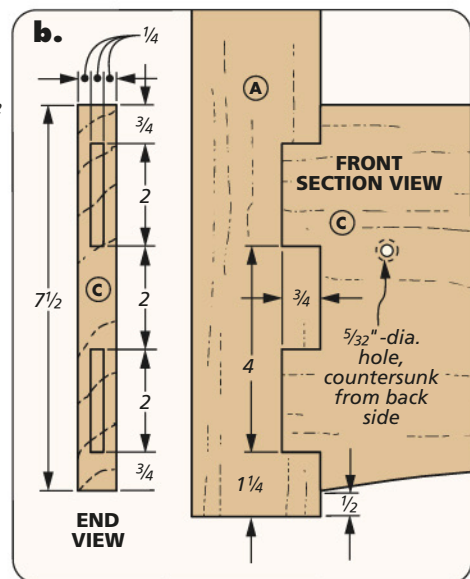
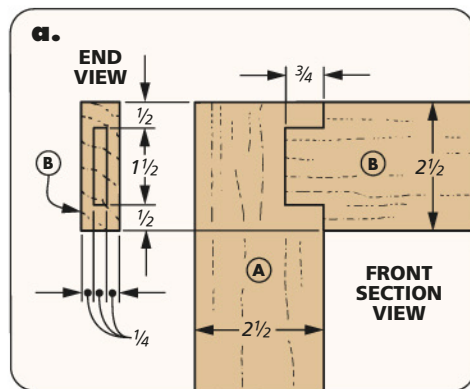
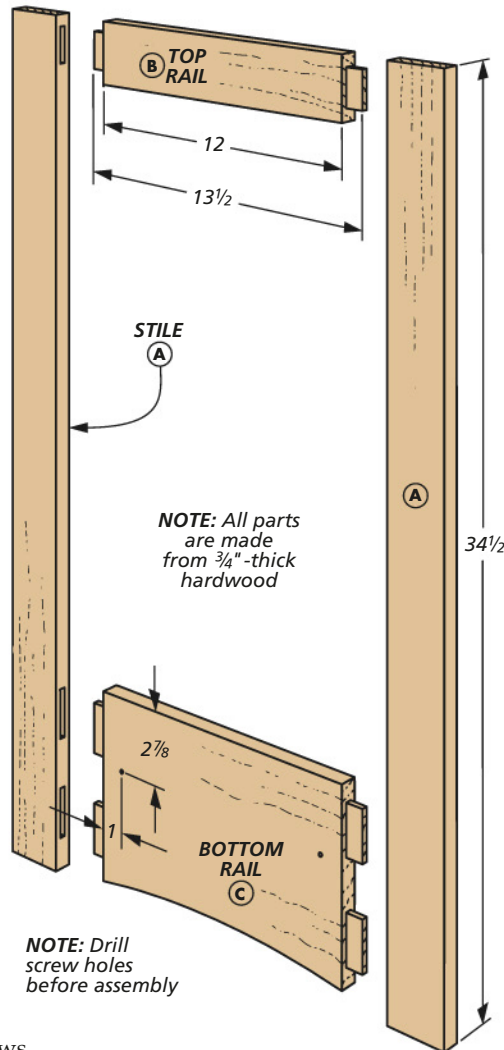
Starting the Frame

The frame needs to provide a solid foundation to carry the weight of the mirror and the shelf. So I chose mortise and tenon joinery to make sure it was up to the task. Because the bottom rail is extra wide, I used a double tenon to join this piece to the stiles.

STILES. Since I like to cut the mortises first then match the tenons to them for a snug fit, I started with the stiles. After cutting them to final size, you can lay out the mortise locations and drill out most of the waste at the drill press with a Forstner bit. Then clean up the sides and corners with a sharp chisel.

RAILS. Next, you'll cut the rails to size and get to work on the tenons. As you can see in the drawing at right, the top rail is straight with a single tenon on each end. The bottom rail, however, not only features double tenons, but a gentle curve on the lower edge as well. I cut the tenons first, while the workpiece was still square. The box below shows an easy way to turn one wide tenon into the double tenon you'll need here.

Once you've finished cutting and fitting the tenons, you can turn your atten-

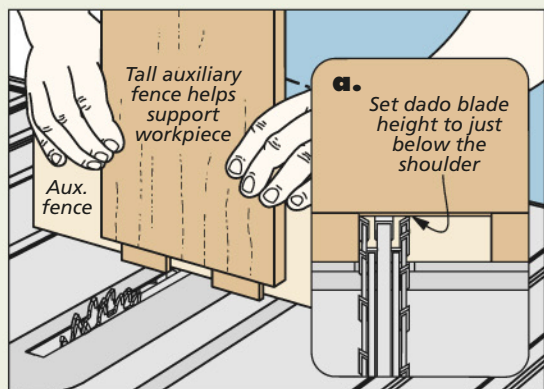


tion to the curve on the bottom rail.

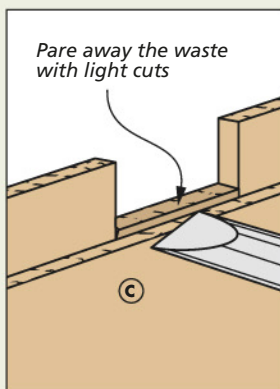
For this, I laid out the curve using a string and a piece of hardboard. The right drawing below shows how to do it. After cut-

ting the curve on the band saw, clean up the edge with a sanding drum. Then you can drill the countersunk screw holes for the shelf and assemble the frame with glue.

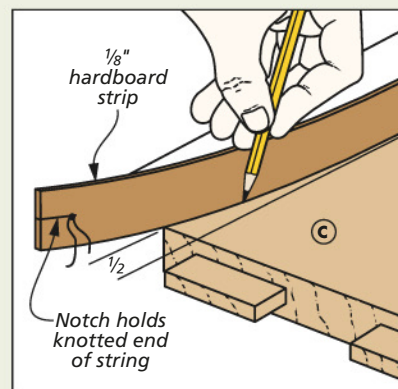
How-To: Construction Details



Double Tenon. After cutting the cheeks and shoulders, use the miter gauge and an auxiliary fence to nibble away the waste to form the double tenon.



Cleaning Up. A sharp chisel is all it takes to clean up the space between the tenons.



Layout. Use string to bend a narrow strip of hardboard to the desired curve, then trace the edge with a pencil.



Tablesaw Cove. *Woodsmithspecials.com* shows how to make coves on the table saw.

Adding the Details

As I mentioned earlier, it's the decorative details that really make this mirror stand out. After the glue dries on the assembled frame, you can get started on those details.

START WITH THE CAP. The first thing to add is the hardwood cap that sits atop the frame. All you need to do here is cut it to final size and attach it with glue.

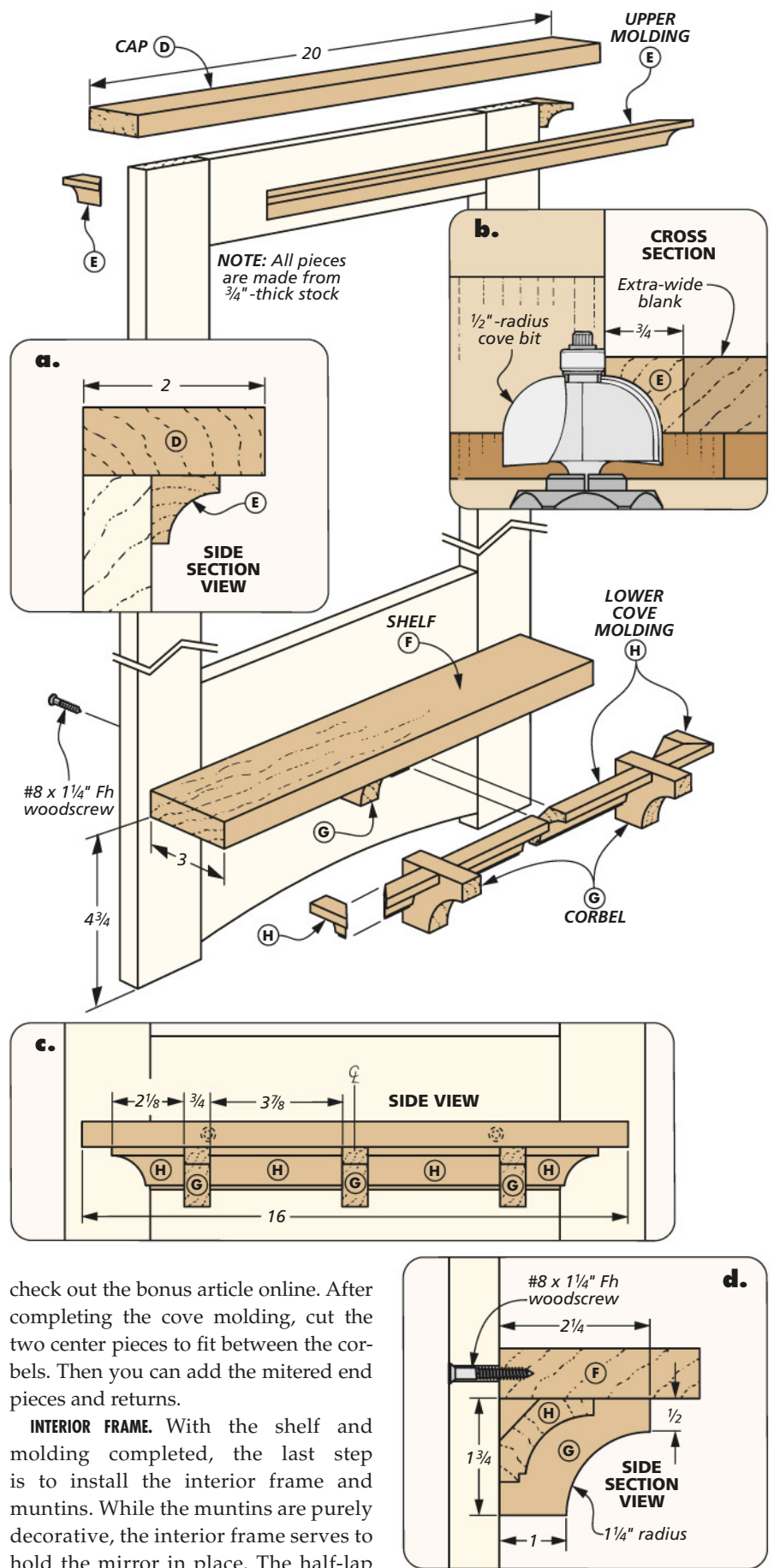
COVE MOLDING. The next step is to make the cove molding that fits under the cap. This molding provides a transition from the frame to the cap. To make the molding, I started with a wide blank and routed the profile on the edge (detail 'b'). Then I moved to the table saw and ripped the piece of molding to final width.

When you've completed the molding, miter the pieces to final length. The main drawing and detail 'a' show how the molding fits, including the small returns on each end. *Woodsmithspecials.com* has a few tips for this.

SHELF. At this point, you can move on to adding the shelf. Once again, it's simply a matter of cutting the shelf to final size and attaching it to the bottom rail. In addition to glue, I used screws to ensure a strong joint (detail 'd').

CORBELS & MOLDING. The small corbels and cove molding under the shelf add another decorative touch. To make the corbels, just cut the blocks to size and then cut out the rounded profile at the band saw. After a quick cleanup with a sanding drum, you can attach them with glue.

Now you can turn your attention to the lower cove molding. This molding is a little different than the simpler molding I used on the cap. For details on making the molding on the table saw,



check out the bonus article online. After completing the cove molding, cut the two center pieces to fit between the corbels. Then you can add the mitered end pieces and returns.

INTERIOR FRAME. With the shelf and molding completed, the last step is to install the interior frame and muntins. While the muntins are purely decorative, the interior frame serves to hold the mirror in place. The half-lap

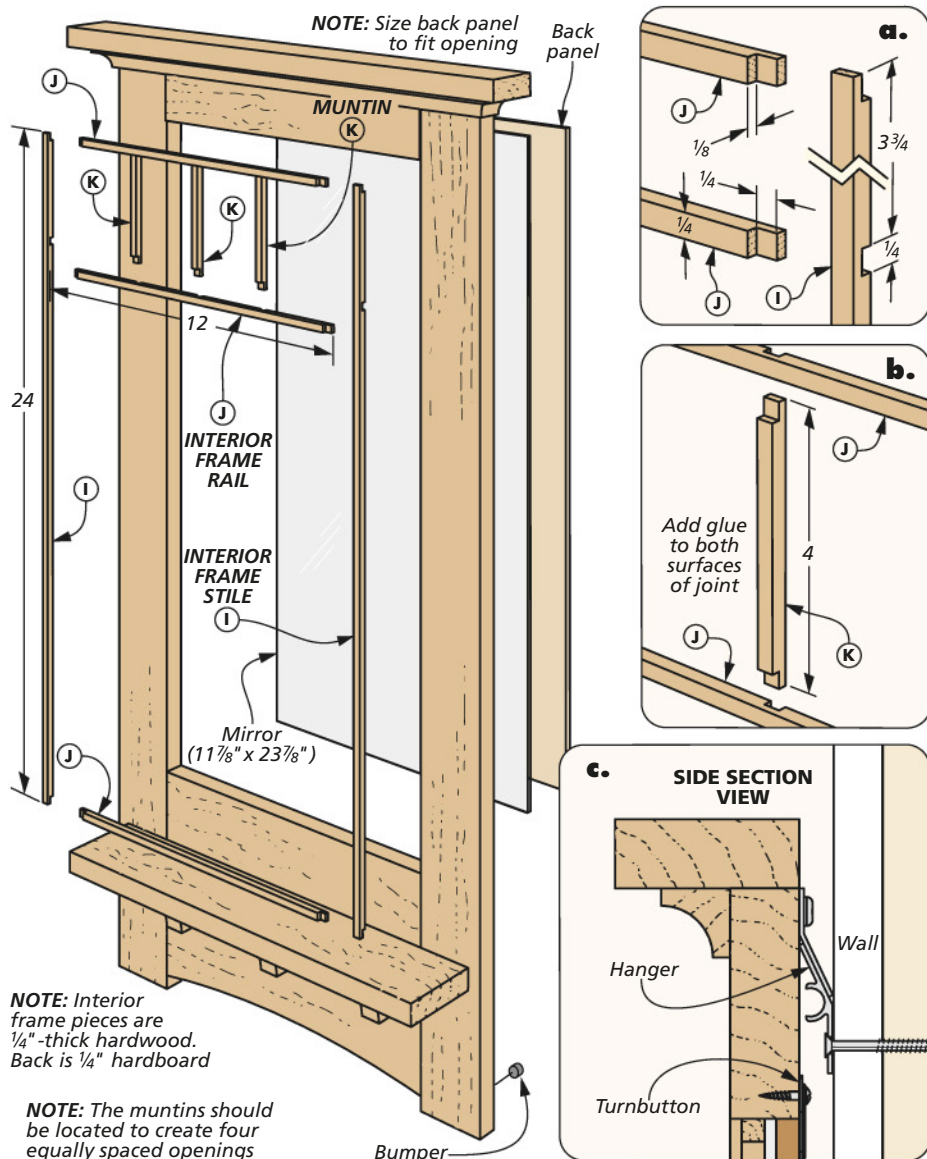
joinery will keep all the frame pieces and muntins locked together.

The first step in making the interior frame is to rip your stock into $\frac{1}{4}" \times \frac{1}{4}"$ strips. In addition to using a sturdy push block, I also made sure to install a zero-clearance insert on my table saw to safely make the narrow rip cuts. While you're at it, it's also a good idea to cut an extra piece to use for setting up the saw for the half-lap cuts.

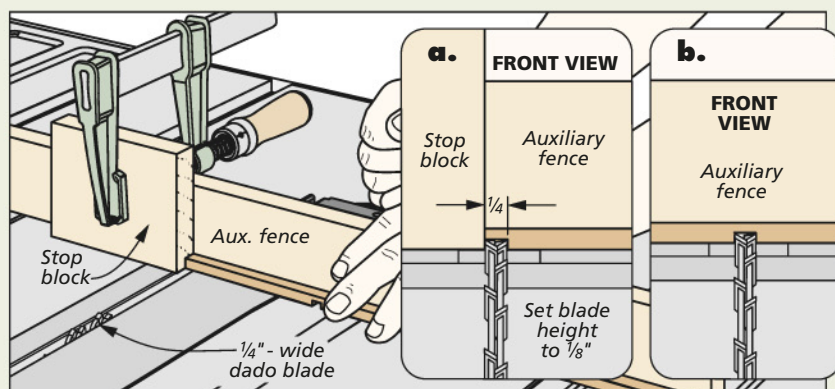
Now you can cut the rails and stiles to length. For this, I took the time to fit each piece carefully. You can make sure of a good fit by starting a little long, then sneaking up on the final length, dry fitting each piece in the frame as you go.

Once you have all the pieces cut to length, install a dado blade in the table saw and cut the half laps. The box below shows you how to get a good fit here, as well. When you're done, dry assemble the pieces to make sure they all fit together well. Now you can glue the pieces in place, starting with the rails and stiles. Then add the muntins.

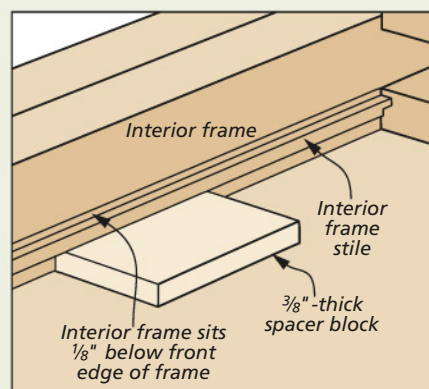
ADD THE MIRROR & HARDWARE. There are just a few things left to complete the mirror. I stained and finished everything first. Then you'll need to cut the hardboard back to final size and fit the mirror in place. I secured the back using turnbuttons and screws. Finally, attach the hanger and bumpers on the back and you're done.



How-To: Make & Install the Interior Frame



Half Laps. With an auxiliary fence and a dado blade installed, use a test piece to sneak up on the proper blade height (half the thickness of the workpiece). Then add a stop block to make sure the half-lap cuts are in the correct positions.



Attach the Frame. After dry fitting the interior frame, use spacer blocks to position the pieces. Then add glue and clamps.



Library Table

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 provide 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

NOTE: Sturdy base is built with mortise and tenon joinery

Large top is glued up from 1"-thick stock

NOTE: Main parts of table are quartersawn white oak

NOTE: Drawer support system designed for easy installation after base is assembled

Figure-eight fastener

Side-mount drawers slide on hardwood runners

Craftsman-style drawer pulls complement simple design of table

Shallow drawers add versatile storage

NOTE: Drawer sides and back are maple, bottom is plywood

Drawers use rigid, half-blind dovetail joinery

Stretcher strengthens base

Gently curved corbels lighten the appearance of large table

Stretcher joint reinforced with screws

False tenon hides screws and creates appearance of through-tenon joinery

Legs use glue-up technique that creates quartersawn appearance on all four faces

NOTE: For sources of hardware, see WoodsmithSpecials.com

FRONT SECTION VIEW

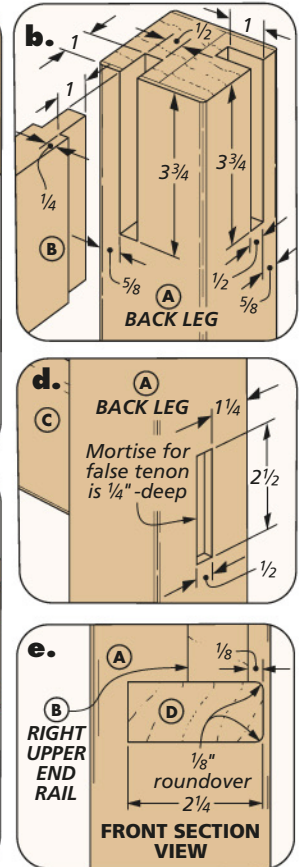
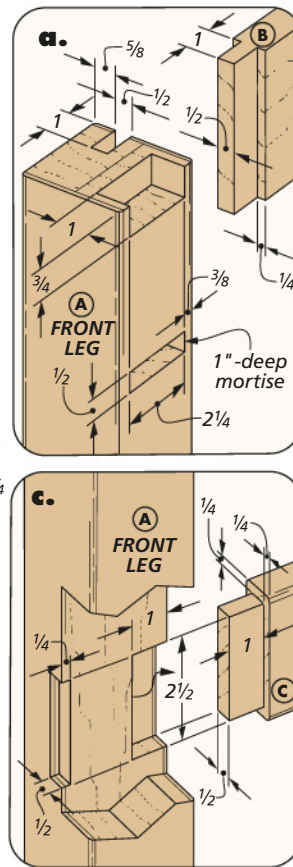
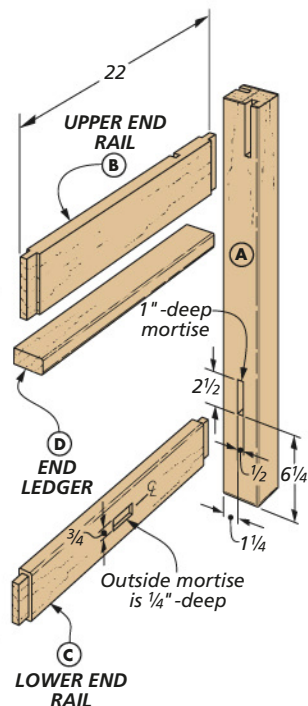
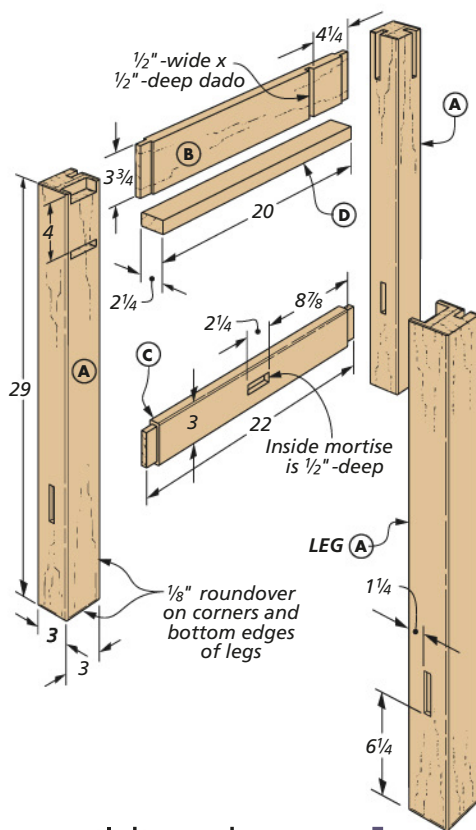
Decorative profile routed on top edges of drawer sides

Maple plywood drawer bottom

Top is easily fastened to base with figure-eight fasteners

Ledgers stand proud of base rails

Corbels attach to base with dowels and glue



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, along with 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, stout, 3"-square legs. As you can imagine, this requires gluing up

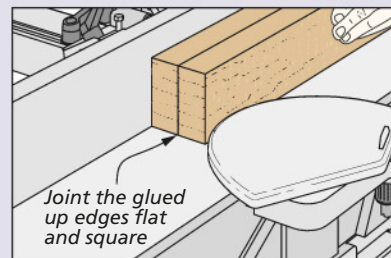
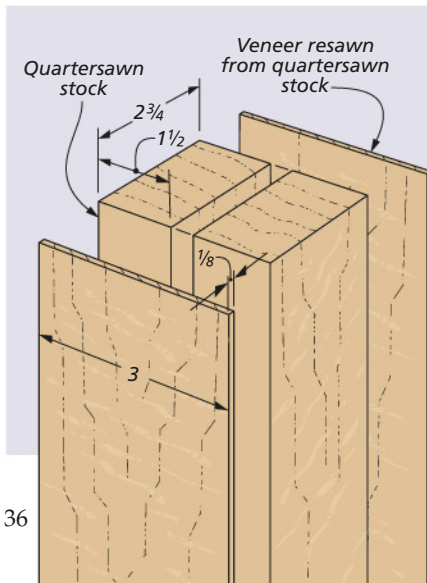
blanks from thinner stock. But this also gives you the opportunity to make a better-looking leg. I used a traditional Craftsman technique to make leg blanks that show quartersawn figure on all four faces with no noticeable joint lines.

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.

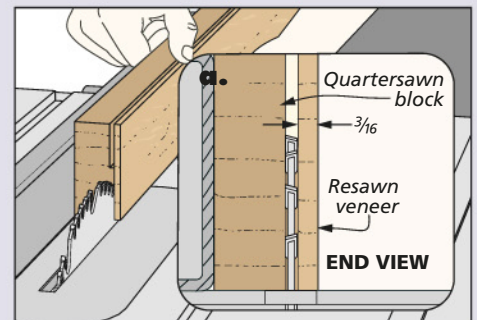
MORTISES. Once the leg blanks are completed and cut to final length, you can go to work on the joinery. The end rails and the front and back rails are all connected to the legs with a mortise and tenon joint. So cutting all the mortises in the legs is the first step.

If you take a look at the drawing above, you'll see that each leg has multiple mortises. And even though you're just working on assembling the end

How-To: Make a Craftsman Leg



Size the Blank. After gluing up an extra-wide blank from 1 1/2"-thick quartersawn stock, rip and then joint the blank down to 2 3/4" wide.



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

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 and accurately. 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.

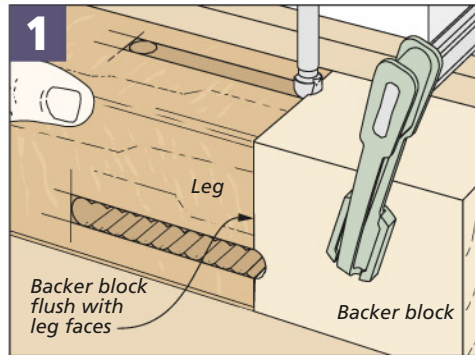
I created a classic, through-tenon look on the lower end rails by using a simple, false-tenon technique. This requires cutting a 1"-deep mortise centered on the inside face of the leg and a shallow mortise on the opposite face that holds the false tenon (detail 'c').

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

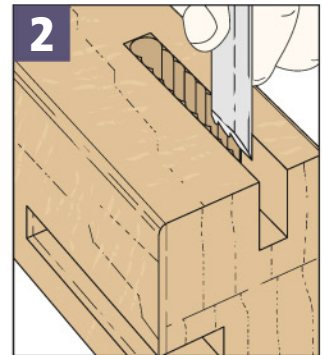
THE END RAILS. After completing the mortises, you'll be ready for a change of pace. Making the upper end rail assembly and the lower end rails will provide it. This work is pretty straightforward, but there are a few things to explain.

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

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. Use a sharp chisel to pare away the remaining waste and square up the ends.

'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 1/2"-wide dado across the inside face of both upper end rails (main drawing). Later, this will hold an interior rail that support the drawers.

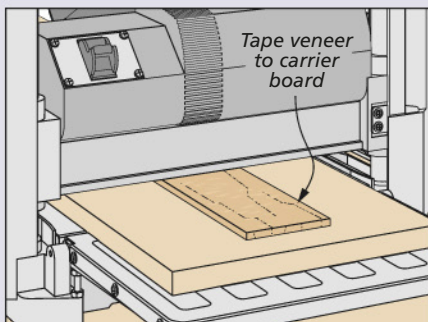
You also need to make separate horizontal ledger pieces that fit beneath the upper rail (detail 'e' at left). The ledger sits proud of the rails to create added visual interest. It will be cut to fit between the legs and glued in place, after the legs and rails are assembled.

A few more mortises. Completing the lower rails will take you back to the drill press and bench for a few more mortises (the main drawing on the previous page shows these). These mortises are for

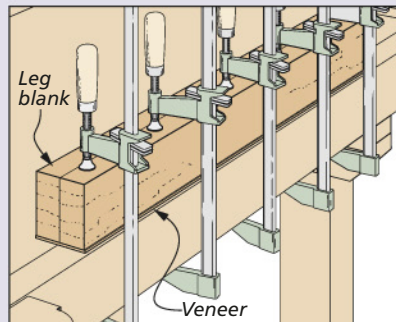
the long, center stretcher that connects the two lower end rails. Here, I again used a simplified through-tenon technique. A 1/2"-deep mortise on the inside face captures the stretcher tenon and a separate 1/4"-deep mortise on the outside fits the false tenon.

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.

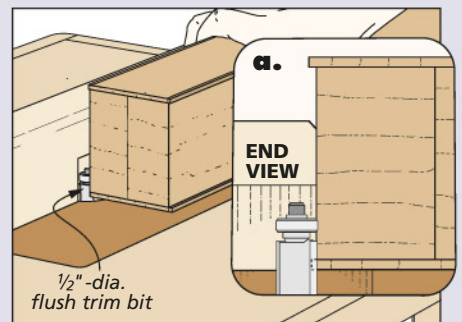
ASSEMBLY. According to the plan, all the end frame parts should be ready to assemble. First, I glued two legs and the upper and lower rails into a frame. Then, you can cut the ledger to fit the frame and glue it in place, as shown in detail 'e' on the opposite page.



Plane the Veneers. Next, I planed the veneers to 1/8" 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 1/8" roundover on all the long edges.

NOTE: Back rail and upper and lower drawer rails are made from 1" thick hardwood. Stretcher is made from 1/2" thick hardwood

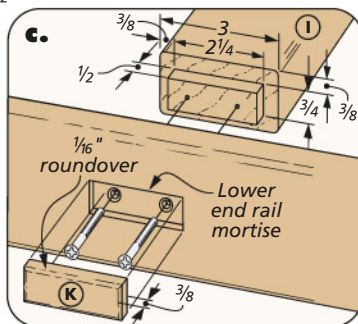
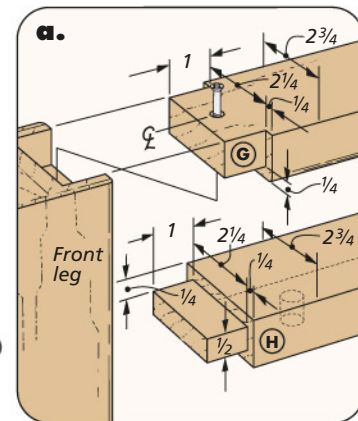
Labels and Dimensions:

- E BACK RAIL:** Length 44, Thickness 1 3/4
- F BACK LEDGER:** Length 42, Thickness 1 3/4
- G UPPER DRAWER RAIL:** Length 44, Thickness 1 3/4
- H LOWER DRAWER RAIL:** Length 44, Thickness 1 3/4
- I STRETCHER:** Length 45, Thickness 1 3/4
- J LEG FALSE TENON:** Length 13, Thickness 1 3/4
- K CORBEL:** Length 2 1/2, Thickness 1 3/4
- L:** Various small components and dowels.

Assembly Details:

- #8 x 2" Fh woodscrew:** Used for securing the back rail, back ledger, and stretcher.
- #8 x 2" Fh woodscrew:** Used for securing the leg false tenon.
- Drill holes for #8 Fh woodscrew:** Indicated for the back rail and back ledger.
- 1/8" roundover on edges:** Indicated for the leg false tenon.
- 1/2" x 1" dowel:** Used for securing the leg false tenon.
- 1/2" -dia. x 1/2" -deep hole:** Indicated for the leg false tenon.
- 1/8" dowel:** Used for securing the leg false tenon.

Inset b.: Shows the corner joint assembly with a 1/2" -dia. x 1/2" -deep hole and 1/8" -dia. dowels.



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.

the first step. Since the mortises in the legs have been completed, you're already half-way 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.

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.

a. END VIEW

b. END VIEW

UPPER DRAWER RAIL

Rip fence acts as stop

Dado blade

1

1/4

1

1/4

CRAFTSMAN FURNITURE PROJECTS

The 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, not the legs, the trick is getting the shoulder-to-shoulder length right.

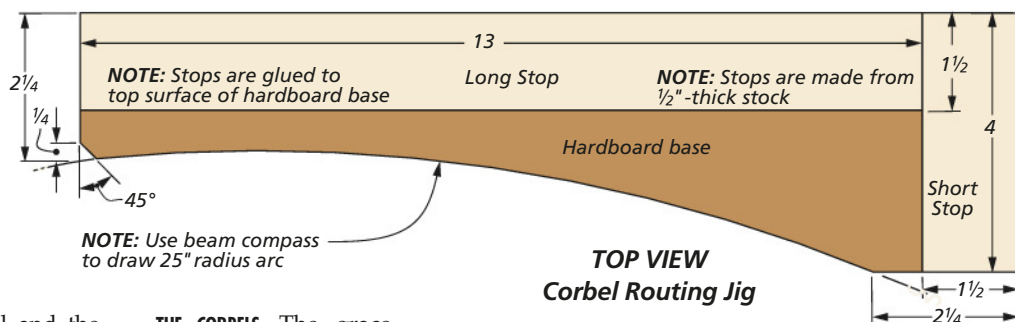
To do this, I fit the back rail and the drawer rails between the end frames and took a measurement. Then when you cut the tenons on the ends of the stretcher, sneak up on a tight fit, testing the "shoulder-to-shoulder" length to the dry fit base.

ROUND OVER. 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 $\frac{1}{8}$ " 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.

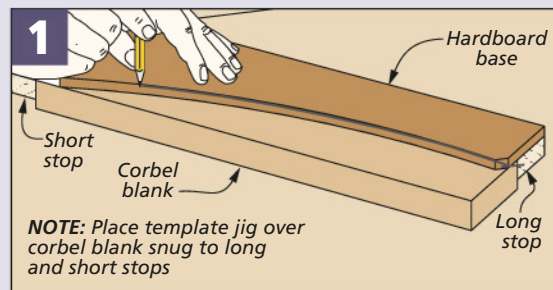
FALSE TENONS. The false tenons for the legs and those for the stretcher are different sizes, but otherwise, making them is pretty easy. The technique I used is explained on WoodsmithSpecials.com. When they're ready, you can glue them into the mortises, leaving them $\frac{1}{8}$ " proud.



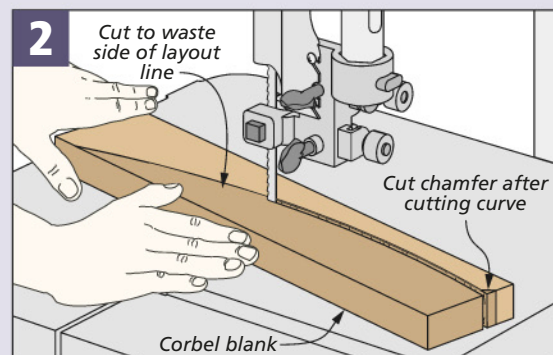
THE CORBELS. The gracefully shaped corbels I added to the base are a distinctive feature of Craftsman furniture. They help lighten and soften the heavy look of the table. The base requires eight, identical corbels. And being a focal point, I wanted them to be smoothly shaped and consistent. So rather than shape each corbel by hand, I made a template routing jig.

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 gluing the corbels to the base (centered on the legs), you'll rout a roundover on all the outside edges.

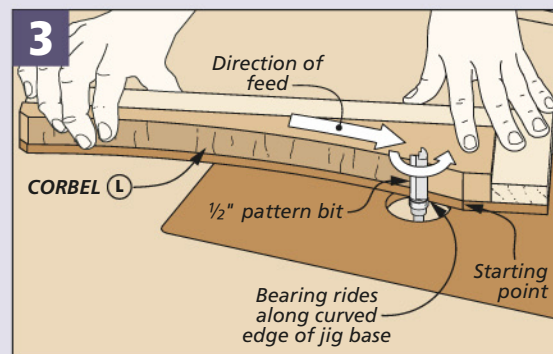
Shaping: Corbels



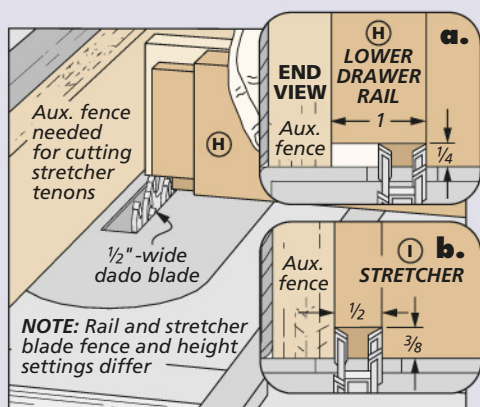
Trace the Shape. After cutting the eight corbel blanks to width and length, use the template jig to trace the finished shape onto each blank.



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



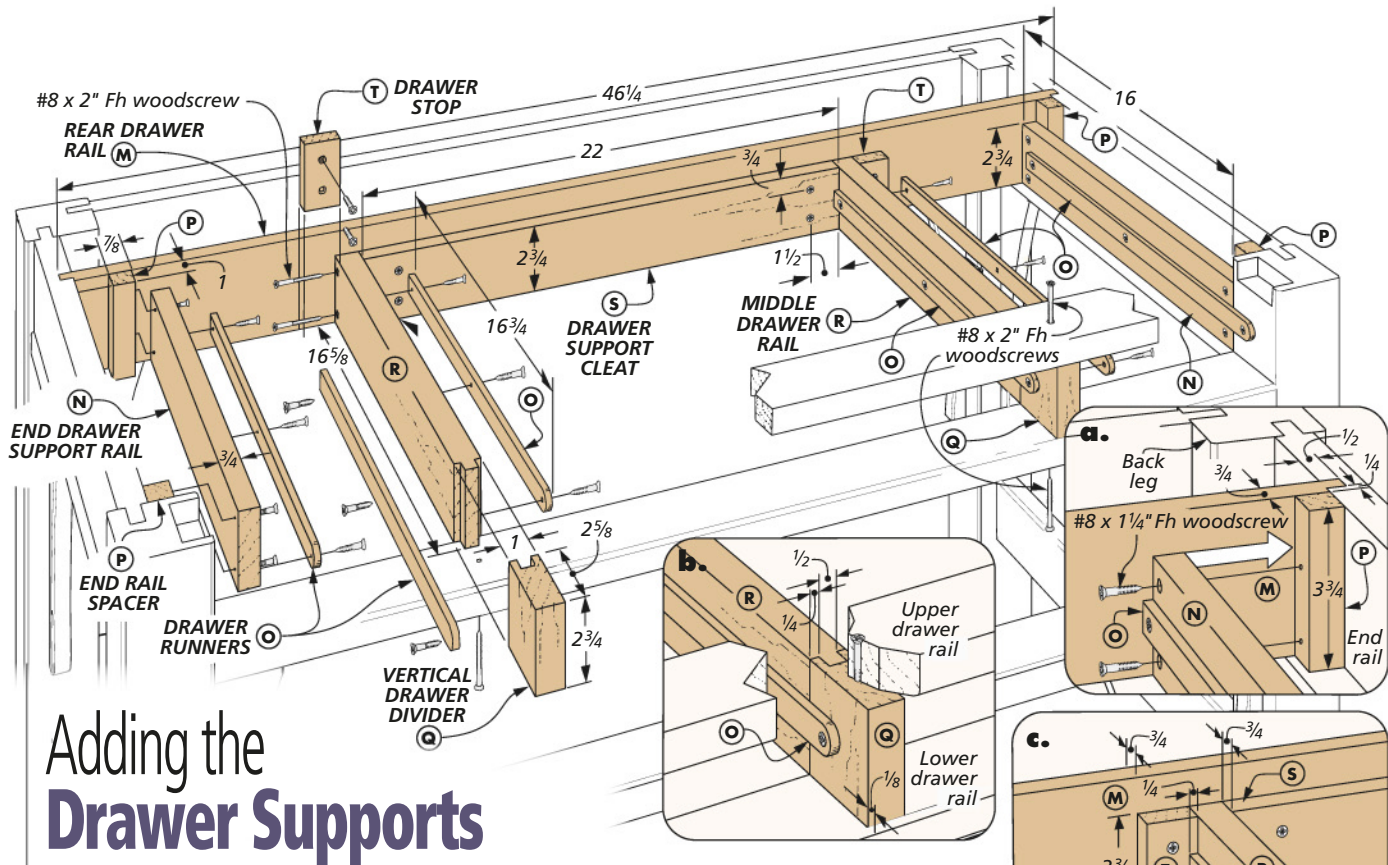
Flush Trim. Finally, I secured the blank in the jig with double-sided tape and trimmed the rough edge using a pattern bit. Rout "downhill" starting at the wide end.



Four Shoulders. On the lower drawer rail, cut the cheeks, then stand the pieces on edge to cut the shoulders.



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



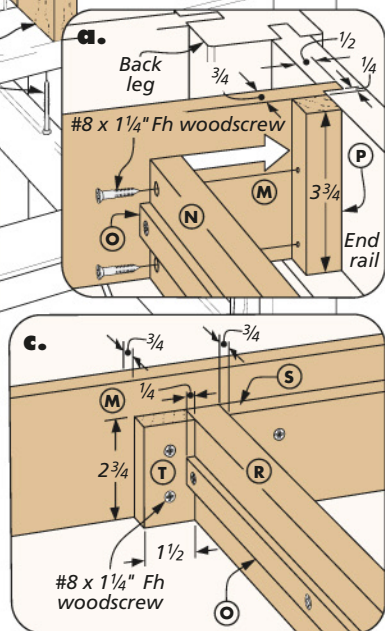
Adding the Drawer Supports

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 draw-

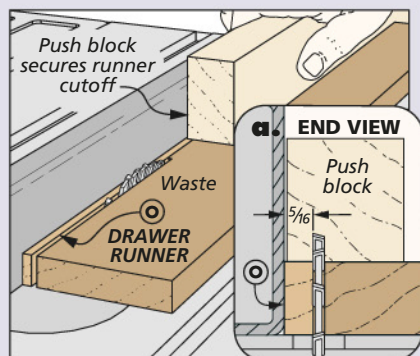
ing above, you'll get the picture and I'll introduce all the parts as they come up.

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.

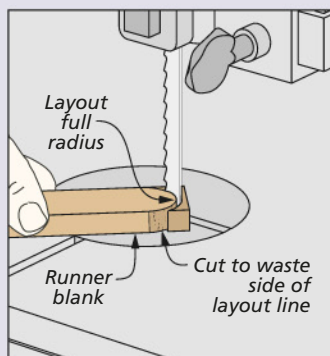


SUPPORT SYSTEM. With the long rail in place, you can start adding the drawer support rails and runners. You'll need to install a rail at each end and a middle assembly that forms the drawer openings.

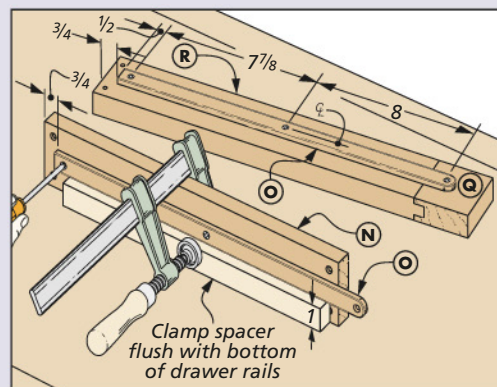
How-To: Drawer Runner Details



Rip to Size. To begin making the drawer runners, rip them to rough thickness from 3/4" stock. Then plane them to 1/4" thick.



Round the Ends. After cutting the runners to length, round one end at the band saw.



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.

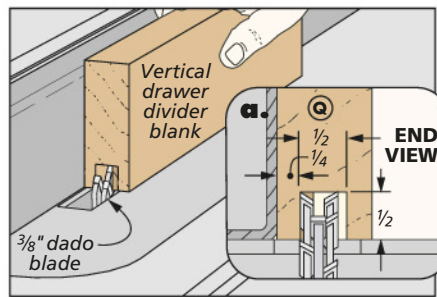
RUNNERS FIRST. But before attaching the rails to the frame, I made the drawer runners and pre-installed them. This is much easier than trying to accurately position and screw them in place afterward.

The runners are $\frac{1}{4}$ "-thick by $\frac{3}{4}$ "-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 $\frac{3}{4}$ " away from the back end of the rails. They'll lap onto the front legs so they can be screwed to them.

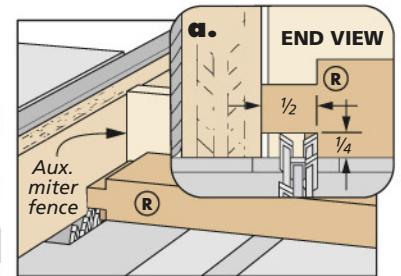
MIDDLE SUPPORTS. The middle rail assembly is a little different. Starting at the front, you have a pair of vertical dividers screwed between the drawer rails. The middle drawer rails are joined into the back edge of the dividers. Then a runner is attached to either side of this assembly (detail 'b,' 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

Shop Tip: Centered Tongue & Groove



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



Next, the 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.

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.

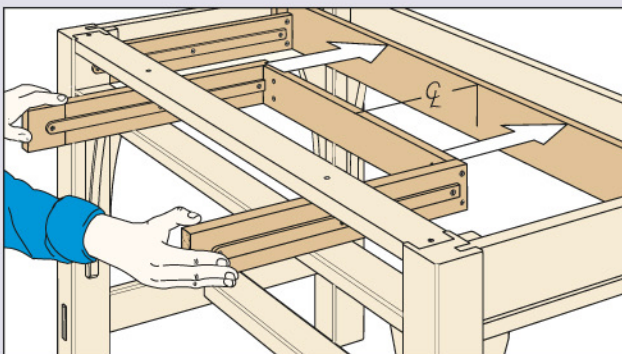
Now, you can add a drawer runner to each side of the assemblies. Make sure to space the runner away from the rear end (details 'b' and 'c,' opposite). Finally, the

support cleat can be cut to size and the assemblies screwed to either end.

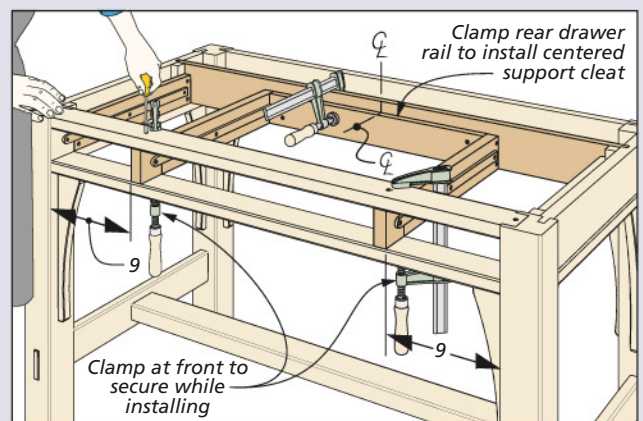
THE INSTALLATION. A look at the drawings below will help you understand the support installation procedure. The key is to get it positioned correctly before attaching it. The small drawer openings should be equal, with the rails square and aligned in the base. Take a few minutes to check, adjust and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

There's one more 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 screwed to the rear support rail, as in detail 'c' on the opposite page.

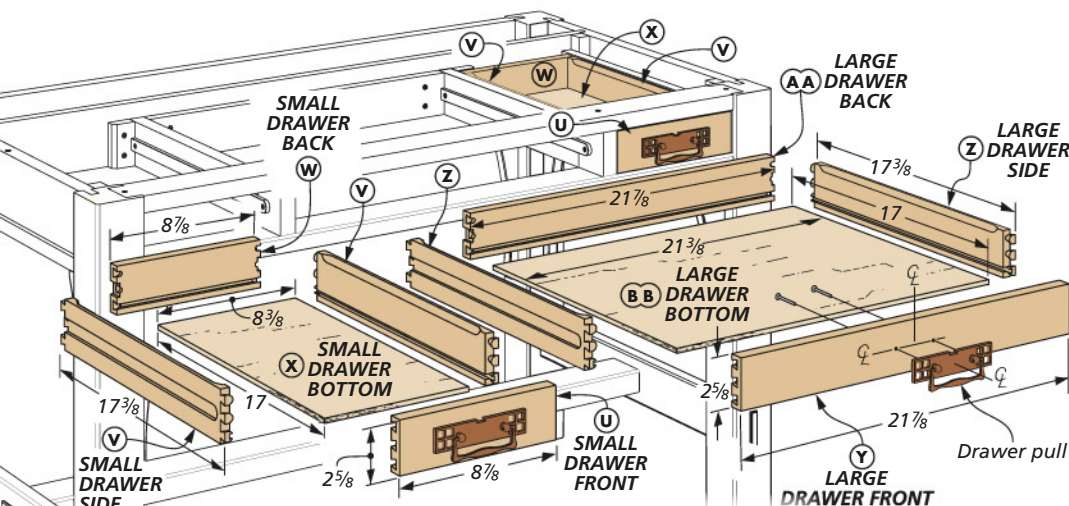
How-To: Install Middle Support



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

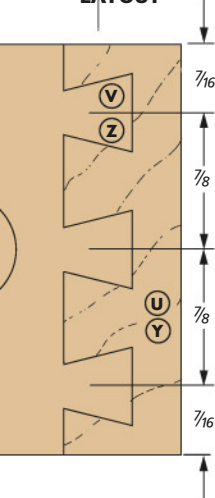


Adjust & Fasten. Before installing the screws, you'll want to carefully adjust the position of the assembly and make sure the drawer openings are square and level.



finishing up Drawers & Top

DOVETAIL LAYOUT



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 rout grooves in the sides to fit the runners in the base.

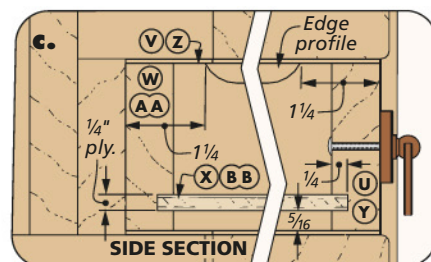
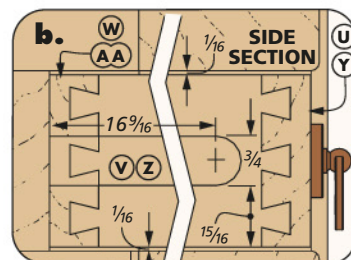
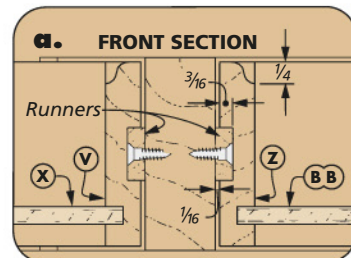
DOVETAILS. Before you can get started on the dovetail

joinery, you'll need to cut all the parts to size. I sized the drawers to have a $\frac{1}{16}$ " 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 ($\frac{7}{8}$ " on centers).

PROFILE. After cutting the grooves for the plywood bottoms at the table saw, I took the sides to the router table to add the decorative profile.

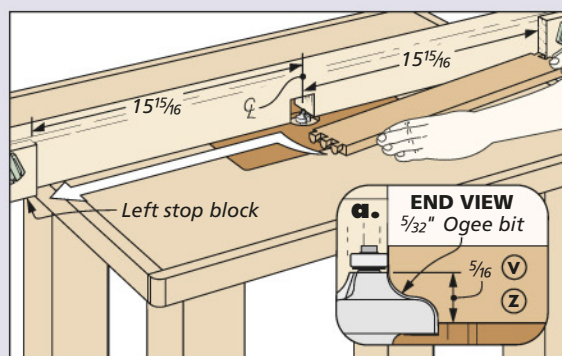
The profile is routed using a small ogee bit and is "stopped" short of the ends. To do this, I set up the router table with stop blocks clamped to the fence, as shown below. This allows you to make the cuts without routing to a line. You'll avoid the burning that occurs during a slow cut.



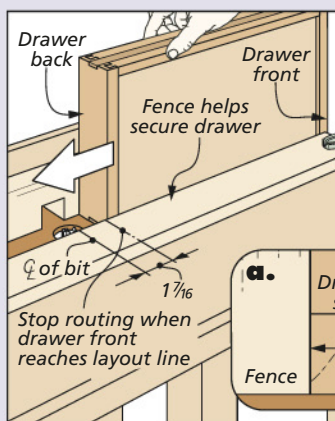
RUNNER GROOVES. After sanding the routed profiles, the drawers can be assembled and you can move on to the final step — routing runner grooves in the drawer sides.

I routed the stopped grooves with a single pass using a sharp $\frac{3}{4}$ " -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

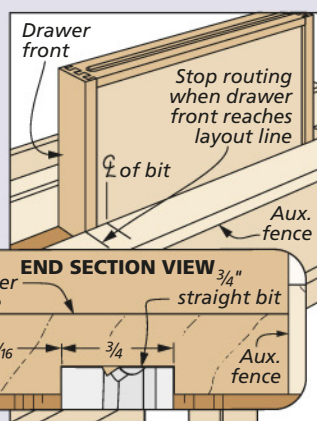
How-To: Drawer Details



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

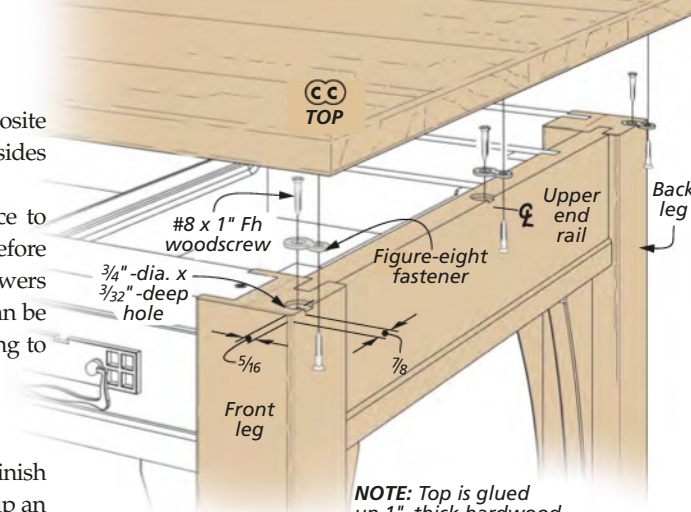
made the two cuts feeding in opposite directions. This way the cuts on both sides can be referenced from the top edge.

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

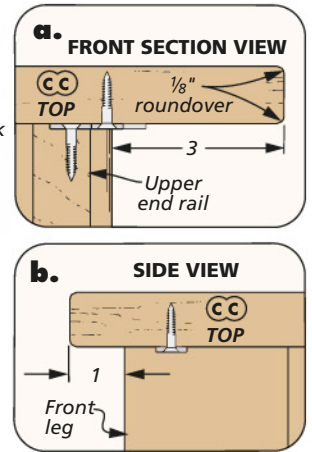
THE TOP

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.



NOTE: Top is glued up 1"-thick hardwood and cut to 28" x 54" size



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 start thinking about a finish. I suggest a good, durable varnish. After all, your library table will be around for a long time.

MATERIALS, SUPPLIES & CUTTING DIAGRAM

A	Legs (4)	3 x 3 - 29
B	Upper End Rails (2)	1 x 3 3/4 - 22
C	Lower End Rails (2)	1 x 3 - 22
D	End Ledgers (2)	1 x 2 1/4 - 20
E	Back Rail (1)	1 x 3 3/4 - 44
F	Back Ledger (1)	1 x 1 3/4 - 42
G	Upper Drawer Rail (1)	1 x 2 3/4 - 44
H	Lower Drawer Rail (1)	1 x 2 3/4 - 44
I	Stretcher (1)	1 1/2 x 3 - 45
J	Leg False Tenons (4)	1 1/2 x 2 1/2 - 3/8
K	Stretcher False Tenons (2)	3/4 x 2 1/4 - 3/8
L	Corbels (8)	3/4 x 2 1/2 - 13
M	Rear Drawer Rail (1)	3/4 x 3 3/4 - 46 1/4
N	End Drawer Support Rails (2)	3/4 x 2 3/4 - 16
O	Drawer Runners (6)	3/4 x 1 1/4 - 16 3/4
P	End Rail Spacers (4)	1 x 7/8 - 3 3/4
Q	Vertical Drawer Dividers (2)	1 x 2 5/8 - 2 3/4
R	Middle Drawer Rails (2)	1 x 2 3/4 - 16 5/8
S	Drawer Support Cleat (1)	3/4 x 2 3/4 - 22
T	Drawer Stops (2)	3/4 x 1 1/2 - 2 3/4
U	Small Drawer Fronts (2)	3/4 x 2 5/8 - 8 7/8
V	Small Drawer Sides (4)	1/2 x 2 5/8 - 17 3/8
W	Small Drawer Backs (2)	3/4 x 2 5/8 - 8 7/8
X	Small Drawer Bottoms (2)	1/4 ply. - 17 x 8 3/8
Y	Large Drawer Front (1)	3/4 x 2 5/8 - 21 7/8
Z	Large Drawer Sides (2)	1/2 x 2 5/8 - 17 3/8
AA	Large Drawer Back (1)	3/4 x 2 5/8 - 21 7/8
BB	Large Drawer Bottom (1)	1/4 ply. - 17 x 21 3/8
CC	Top (1)	1 x 28 - 54

- (14) #8 x 2" Fh Woodscrews
- (16) #8 x 1 1/4" Fh Woodscrews
- (12) #8 x 1" Fh Woodscrews
- (18) #8 x 5/8" Fh Woodscrews
- (3) Dark Bronze Bail Pulls w/Screws
- (6) Figure-Eight Fasteners

1 3/4" x 6" - 60" Quartersawn White Oak (Two boards @ 5 Bd. Ft. each)



1 3/4" x 4" - 48" Quartersawn White Oak (2.7 Bd. Ft.)



1" x 4" - 96" Quartersawn White Oak (3.3 Bd. Ft.)



1" x 4" - 96" Quartersawn White Oak (3.3 Bd. Ft.)



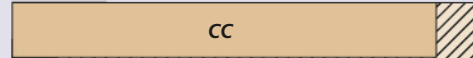
1" x 7" - 96" Quartersawn White Oak (5.8 Bd. Ft.)



1" x 5" - 48" Quartersawn White Oak (2.1 Bd. Ft.)



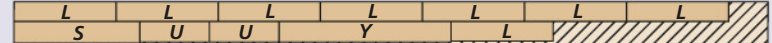
1" x 7 1/2" - 60" Quartersawn White Oak (Four boards @ 3.9 Bd. Ft. each)



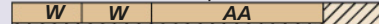
3/4" x 5" - 96" Quartersawn White Oak (3.3 Bd. Ft.)



3/4" x 5 1/2" - 96" Quartersawn White Oak (3.7 Bd. Ft.)



3/4" x 3" - 48" Hard Maple (1 Bd. Ft.)



1/2" x 6" - 60" Hard Maple (2.5 Sq. Ft.)



ALSO NEEDED: One 24" x 48" sheet 1/4" Maple plywood



Perfect Stub Tenon & Groove Joinery

Making stub tenon and groove joinery is a cornerstone of the Craftman style of furniture. This easy-to-make joint is a breeze with a router table.

When I make a project that uses stub tenon and groove joinery, I usually turn to my table saw to cut the grooves and to form the stub tenons. But lately, I've been using my router table. I've found it's quite easy to get flat-bottom grooves and nice, clean joint lines.

It only takes a little set-up to cut the grooves, as shown in the photo above. And a coping sled helps create the stub tenons. Here's what you need to know to turn your router table into a joint-cutting power house.



Centered Grooves. Make one pass along the edge of the workpiece. Make a second pass with the workpiece flipped end-for-end.



ROUTING THE GROOVE

I find it easier to make the grooves first and then size the stub tenons to fit. But there are a couple of challenges with creating a groove. The first is choosing which bit to use. The two bits that I reach for are shown below.

STRAIGHT BITS. A straight bit might be the obvious choice for cutting grooves. It creates a specific width groove. Most of the time my groove is $\frac{1}{4}$ " so I use a straight bit of that size. You have a couple of different options for the cutting edge style as well. The bit I like is a bit with a spiral upcut pattern. This style allows the bit to pull the chips and dust down and out of the groove. You can see this type of bit below.

Another option for cutting grooves is to use a slot cutting bit, also shown below. The slot cutting bit is like a dado blade for your router table. You can add and stack cutters to get slots exactly the width you need. One advantage of a slot cutter is you can form a deeper groove in one pass. Often a straight bit requires multiple passes to make grooves more than $\frac{1}{4}$ " deep. On the other hand, slot cutting bits tend to be more expensive than spiral bits.

SETTING UP THE CUT. After loading the bit into the router table, you'll want to set up the fence and bit height. I like to use a small ruler like the *Paolini* ruler from *Woodpeckers* to help set the bit height as well as the fence location. Setting the height is as simple as setting the ruler stop and raising the bit until it just touches the stop (inset photo, above). To set the fence location, I'll start by rotating the bit so the cutting edge is as close to the fence as it will get. Then, move the fence into position to

center the groove on your workpiece. After locking down the fence, you can make a test cut.

The key when test cutting is to make sure your test piece is the same thickness as your workpieces. Make a pass (photo above) and measure the groove. You're looking for the groove to be centered. Make any necessary adjustments to the fence to get the groove centered, and you're ready to rout your workpieces.

TWO PASSES. When you're routing your workpieces, there is a simple trick you can do to make sure that the grooves are perfectly centered. After making a pass to form the groove along one edge, simply flip the workpiece end-for-end and make another pass, with the opposite face against the fence. This ensures the groove is perfectly centered on your workpiece. Hold your workpiece tightly though. If the bit is cutting on the fence side, the bit will try and pull the workpiece through (called back routing). Just go slow on the second pass.

GROOVE DEPTH. A quick note about groove depth. Most of the time, I make my grooves for $\frac{1}{4}$ "-long tenons. To keep the tenon from bottoming out, I will cut my grooves slightly deeper. Usually, a $\frac{3}{8}$ "-deep groove is about right.

If the ends of the tenon and groove are going to be exposed however, like on the end of a door, I will aim for a groove that is just slightly deeper ($\frac{1}{32}$ ") than the tenon.



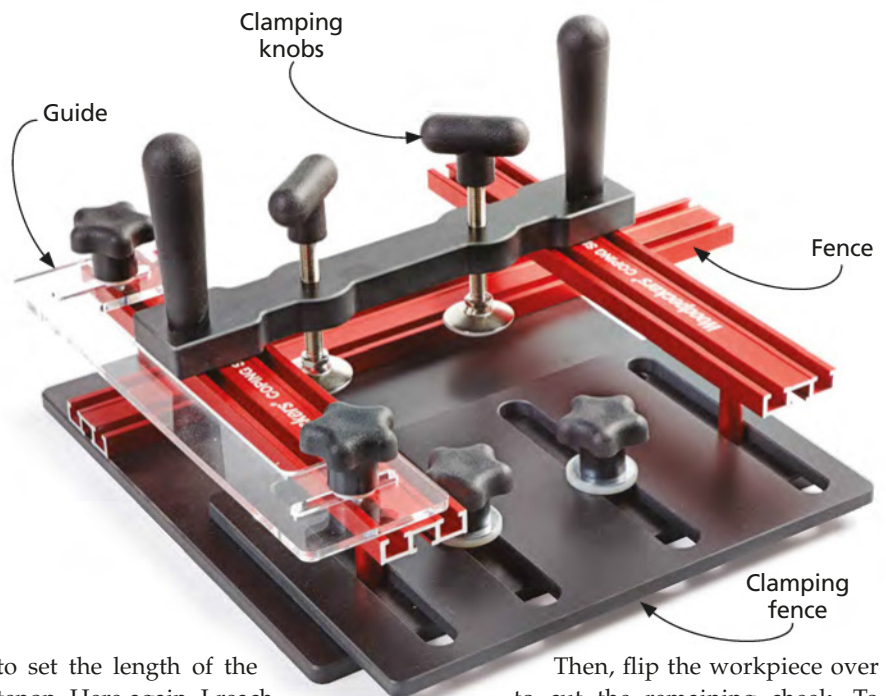
STUB TENONS

Now that you have the grooves cut, you can set up to cut the stub tenons on the rails. The stub tenon is formed by making cuts on each face of a workpiece, leaving only the material in the center. There are two variables to consider while sizing the tenons. First, is the width of the cut to make, which determines the length of the tenon. The second is how much material to remove, setting the tenon thickness. Luckily, we've already determined both of those factors by cutting the grooves first.

BIT AGAIN. Before making test cuts, I always swap out my bit to a larger bit than I used to make the groove. In this case, I'll swap the $\frac{1}{4}$ " bit for a $\frac{1}{2}$ " bit. This allows me to form the entire tenon cheek in one pass. Here, the cutter orientation doesn't matter a whole lot. I usually just reach for the sharpest bit in my collection.

USE A SLED. To form the tenon, you'll be routing across the grain. Two of the problems with routing in this direction is the likelihood of tearout and making sure to hold the workpiece securely while keeping it square to the bit. That's why I like to hold the workpiece in a router sled, like the one shown above from *Woodpeckers*. It solidly grips the workpiece square to the fence and allows me to use a backer board to reduce tearout. Not to mention, it gives me repeatable results. Before I upgraded to the *Woodpeckers* sled, I often used a shop-made version. You can see this type of sled in the lower box on the next page.

SIMPLE SETUP. As when routing the grooves, the fence position is critical



to set the length of the tenon. Here again, I reach for a small rule and set the fence to form a $\frac{1}{4}$ "-long tenon.

Setting the bit height is simple, especially if you saved one of your test pieces from setting up the grooves. Simply set the bit height to just remove the material on each side of the groove (left photo below). Cutting a tenon on the test piece will show you if you need to adjust the bit. You're looking for a tenon that fits snug into the groove, but doesn't need to be forced in place.

FORM THE TENON. With the router table set up, you're ready to cut your tenons. Insert your workpiece into the router sled, making sure it butts up against the fence. Then, make a pass on one face, forming one cheek of the tenon.

Then, flip the workpiece over to cut the remaining cheek. To finish out the workpiece, it's a simple matter of repeating this process on the opposite end.

ADDED DETAILS. As a woodworker, I love the classic stub tenon and groove look. It oozes Craftsman style. However, there are some instances where you might want to dress up a frame and panel assembly, such as a cabinet door. Luckily, you can utilize the same stub tenon and groove joinery, and simply add some decoration. Take a look at the upper box on the next page for a couple of examples.

The next time you have a project that calls for stub tenon and groove joinery, think about using your router table. I think you'll be surprised how easy it is to set up and get great-looking joints.



First Pass. Using a coping sled like the *Woodpecker* version, it's easy to cut all your tenons with one setup. Set the fence to cut the first cheek and lock your workpiece in the sled before making a pass.



Second Pass. To complete the tenon, simply loosen the clamping knobs and flip your workpiece over. Then, make another pass with the same router table setup to form the completed tenon.

Dress it Up: Spice Up Your Panels

The simple styling of stub tenon and groove joinery creates a classic frame and panel look. You can see this classic Craftsman style below. However, there are times when you will want to dress up a simple frame and panel. Luckily, this can easily be done using a simple technique of applying some molding to the interior of the panel.

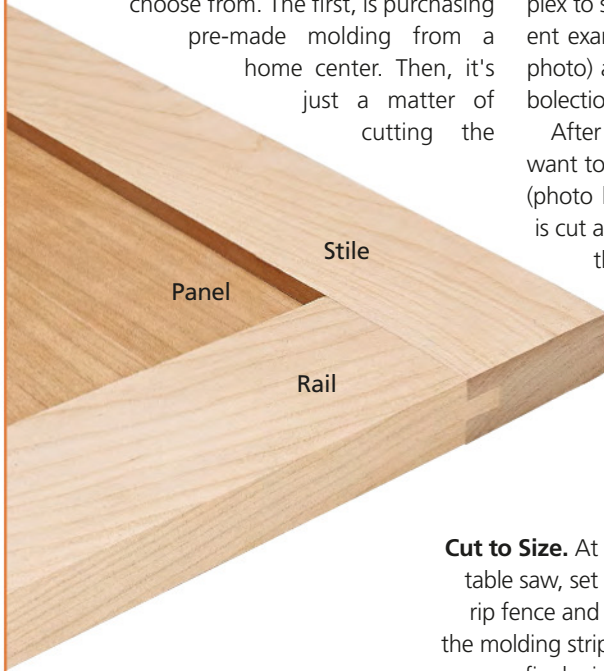
Routed Profiles. When adding molding, you have a couple of different paths to choose from. The first, is purchasing pre-made molding from a home center. Then, it's just a matter of cutting the

molding to size and mitering the ends before gluing in place on the panel.

Of course, there are instances where the hardware store may not have molding in the same species that you're using for your panel. In that case, you'll want to make your own molding. This is easy to do at the router table.

One of the things I like about making your own door molding is that you can create numerous different profiles ranging from complex to simple. At right you can see two different examples — a simple bead profile (lower photo) and a more complex molding called a bolection (upper photo).

After routing a piece of molding, you'll want to rip a section of it off at the table saw (photo below). For larger moldings, a rabbet is cut along the backside to sit over the lip on the rail and stiles, as is seen in the photo below and the bolection above.



Cut to Size. At the table saw, set the rip fence and cut the molding strip to final width.



Bolection

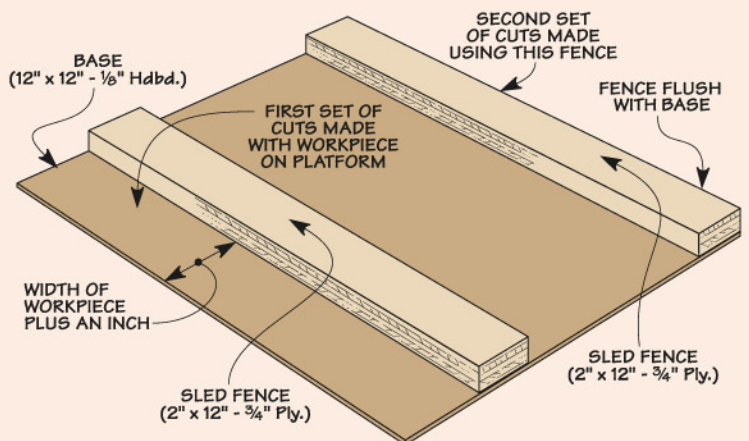


Bead profile

Routing Stub Tenons: Tenoning Sled

To rout the stub tenons on the ends of the rails, you need to keep the workpiece square to the fence. The Woodpeckers sled shown on the previous page excels at this. You can, however create a simple sled to do a similar job.

As you can see in the drawing at the right, this sled is nothing more than a base is made from $\frac{1}{8}$ " hardboard. On one end of the sled, the hardboard extends out past a fence to make a platform for the workpiece. This elevates the workpiece to make the initial cut on the ends of the rails. The fence at the opposite end of the sled is flush with the hardboard. It's used with the workpiece on the router table surface to create a full-depth tenon.



Metal Inlay Box

This box is an eye-catching project all on its own, but the metal inlay pattern on the lid makes it even better.



Making a box offers a good break from typical woodworking. Boxes require a small investment in materials — often from your scrap bin. And in a short time, you have a great-looking keepsake.

However, a box isn't short on woodworking challenges. In fact, a box invites

close inspection. So it pays to focus on the details. As a woodworker, the benefit is that the scale makes taking on a new technique a lot more manageable. That's certainly the case with this box.

METAL INLAY. The inlaid top is what draws your attention. I used thin metal pieces to

make up the pattern. As you can see, the metal provides a unique look.

Before getting to the inlay, you need to build the box. This Craftsman-style box has plenty of details. Corner posts give it a solid stance. And a few bevels and curves keep it from looking too blocky.

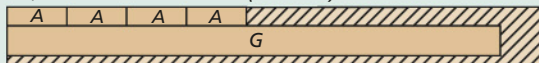
FULL-SIZE PATTERN



MATERIALS, SUPPLIES & CUTTING DIAGRAM

- | | | |
|----------|----------------|--------------------------|
| A | Posts (4) | 1 1/4 x 1 1/4 - 4 |
| B | Feet (4) | 5/16 x 1 7/8 - 1 7/8 |
| C | Sides (4) | 1/2 x 4 - 5 |
| D | Bottom (1) | 1/4 ply. - 5 1/2 x 5 1/2 |
| E | Lid Panel (1) | 1/4 ply. - 4 1/4 x 4 1/4 |
| F | Lid Veneer (2) | 1/8 x 4 1/4 - 4 1/4 |
| G | Lid Molding | 7/8 x 2 - 36 rgh. |
- (4) #6 x 3/4" Fh Brass Woodscrews
 - (1) 6" x 12" sheet 16-ga. Copper
 - (1) 6" x 12" sheet 16-ga. Bronze

1 3/4" x 4" - 36" White Oak (2 Bd. Ft.)



3/4" x 5" - 36" White Oak (1.3 Bd. Ft.)



NOTE: Plane all parts to thickness shown in materials list

ALSO NEEDED: One 24" x 24" sheet of 1/4" oak plywood



For additional decorative patterns, go to:
WoodsmithSpecials.com

CORNER POSTS

The body of the box only requires a handful of parts. Posts and feet make up the corners of the box. These are joined by the sides and bottom. I made the box out of quartersawn white oak to enhance the Craftsman look, but you can use other materials.

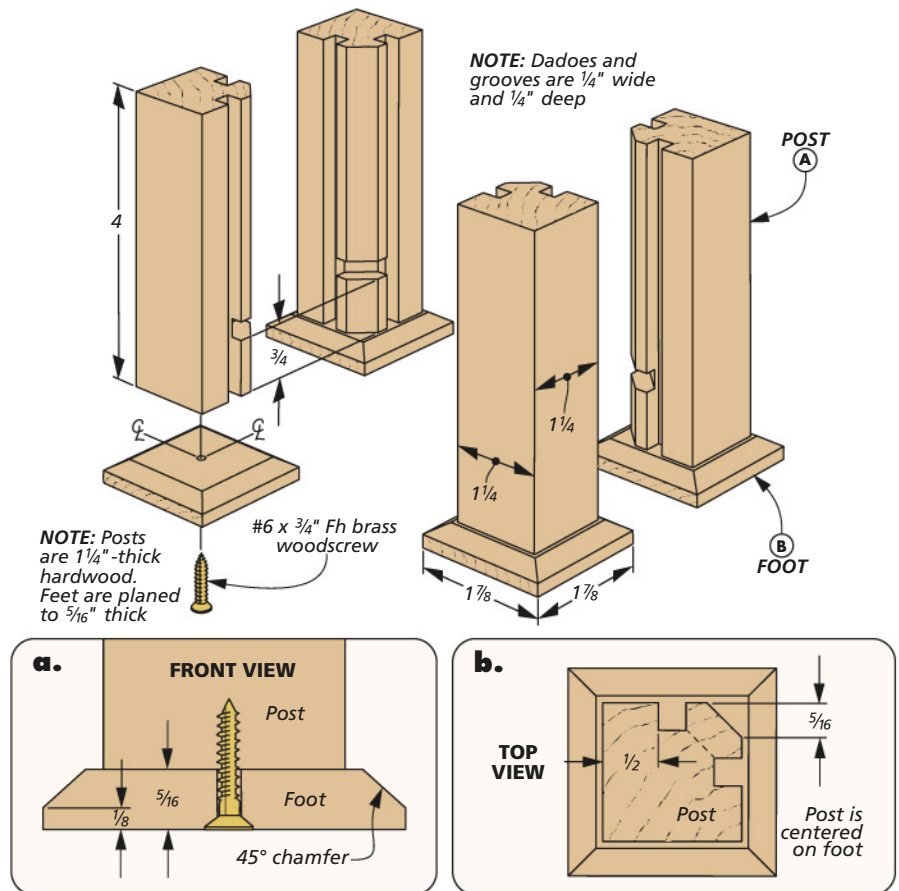
POSTS. The starting point on the box body is the corner assemblies you see in the drawing at right. The posts come first and have a few key details that I want to highlight. For the straightest grain on the four faces of the posts, look for riftsawn boards — where the end grain is running close to 45° to the faces.

A pair of grooves on the inside faces of the posts hold the box sides, as in detail 'b.' When it comes to cutting joinery on small parts like this, I prefer to use the router table for better control.

An added benefit is that a straight bit creates a smooth, flat-bottomed groove. The setup is shown below in Figure 1. The grooves are shallow enough that you can cut them in a single pass. I used a push block with a heel on the end to keep my fingers clear of the bit.

The corner between the grooves is eased with a chamfer bit to soften the edge, as you can see in Figure 2. You may be able to rout this in a single pass, but I cut the chamfer in two passes to make sure the profile is smooth and crisp.

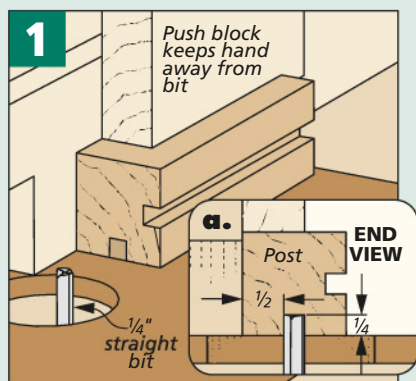
A dado near the bottom of each post is the remaining detail that you need to take



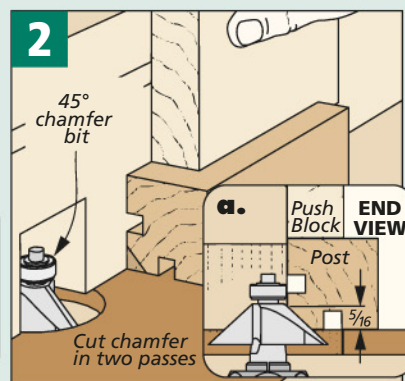
care of. This dado captures the bottom of the box at assembly time. The dado is cut with the chamfered face down on the router table. The trick is holding the post steady. My solution is shown in Figure 3 — a backer block that has a matching bevel cut on the leading edge. The backer also prevents tearout as the bit exits the cut.

FEET. Thin square feet anchor the posts. A small chamfer is routed on the upper edges. In order to make this cut safely, I used a rubber-bottomed push pad to control these small parts while routing the chamfer. It also helps to take light cuts. The feet are secured to the bottom of the posts with small screws.

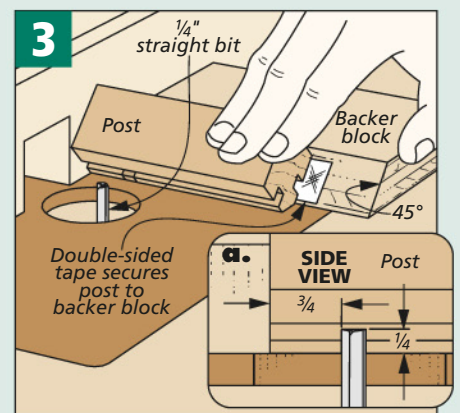
How-To: Router Table Joinery



Smooth Grooves. Use the same fence setting to rout both grooves. Flip the post end for end to make the second cut.



Chamfer the Corner. The chamfered edge creates a reference face for cutting an angled dado to hold the bottom.



Easy Angled Dado. The beveled edge on the backer block stabilizes the post while you cut the dado.

solid-wood Sides

Wrapping up the body of the box is simply a matter of connecting the dots, or grooves, in this case. Solid-wood sides span the distance between the posts, and a small plywood panel closes off the bottom of the box. The steps to get there will go by in short order.

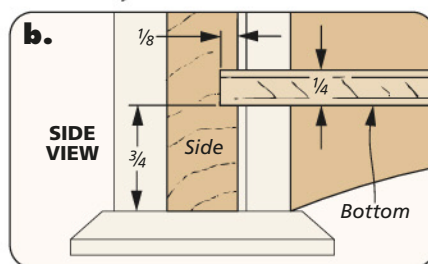
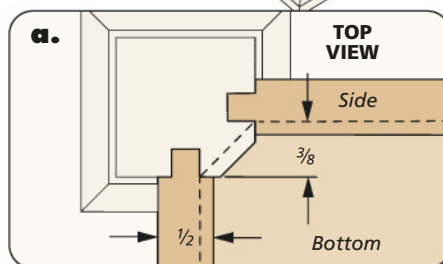
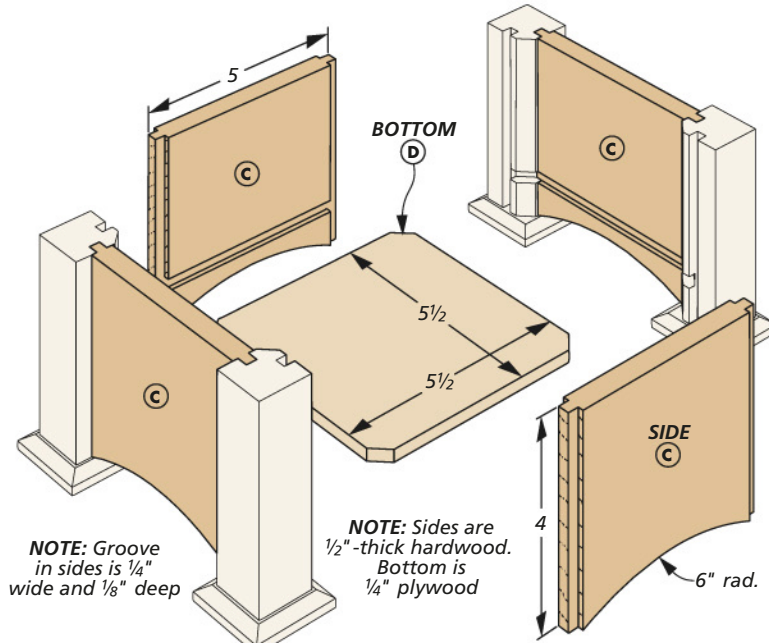
SIDES. The material for the four identical sides is planed down to $\frac{1}{2}$ " from thicker stock and cut to final size. Take extra care in sizing the parts so that all four are the same size.

Like the posts, the sides have two joinery details to take care of. The first of these is to form a tongue on each end to fit into the grooves you cut in the posts. The shoulder on this joint creates a nice clean look and conceals any inconsistency in the groove or tongue.

The tongue is created by routing a rabbet on each face, as shown in Figure 1 below. I used some test pieces to sneak up on both the thickness and length of the tongue for a snug fit and a tight joint line.

GROOVE. The other bit of joinery to tackle is cutting a groove. This groove (along with the dados in the posts) holds the bottom panel. Like before, I handled this quickly at the router table using a straight bit.

The key is making sure the groove in the sides aligns with the dados in the posts. A straightforward way to do this is to fit one of the sides into a post and mark the groove location directly on the side. You can use that piece as a gauge to set the fence on the router table.



CURVED EDGE. Having taken care of the joinery means you can change gears and do a little shaping. The lower edge of the sides has a slight curve cut into it. This curve adds detail to the look of the sides and gives the whole box a visual lift.

My aim in making the curves was to have all four as consistent as possible. The method I used was to shape the curve on one side and use it as a template for shaping the others. To do that, draw the curve on a side and rough cut the

waste at the band saw. From there, use a sanding drum, files, and sandpaper to refine the shape.

With a pleasing curve established, trace it on the remaining three sides. Like the first, you cut away most of the waste at the band saw. For the final trimming, use the first side as a template to smooth the others with a router and a flush-trim bit for a perfect match.

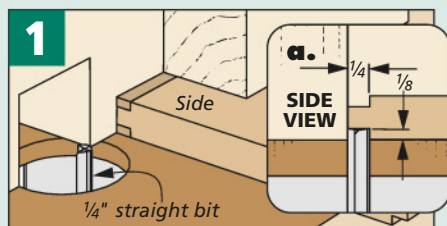
BOTTOM. All that's left on the box body is to make the bottom. I made it from a piece of $\frac{1}{4}$ " plywood. But there's a little more going on here than simply cutting the piece to size. That's because the corners need to be clipped to fit into the angled dados in the posts.

You want to avoid trimming too much and ending up with a gap. So I took my time and made several cuts to sneak up on a good fit in the corners. From there, you can glue up the box body.

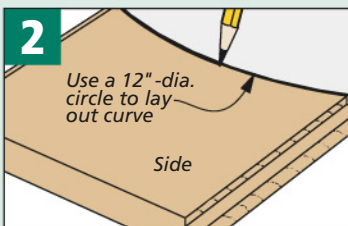
FRAME & PANEL LID

The other component of the box is the lid. It's made up of a laminated panel. It's wrapped with beveled molding and you can see this in the drawing on the top of the next page.

How-To: Panel Details

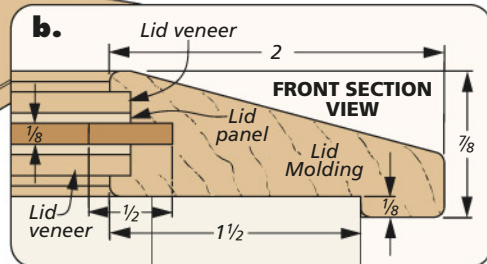
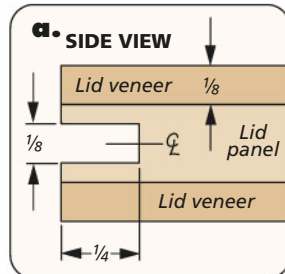
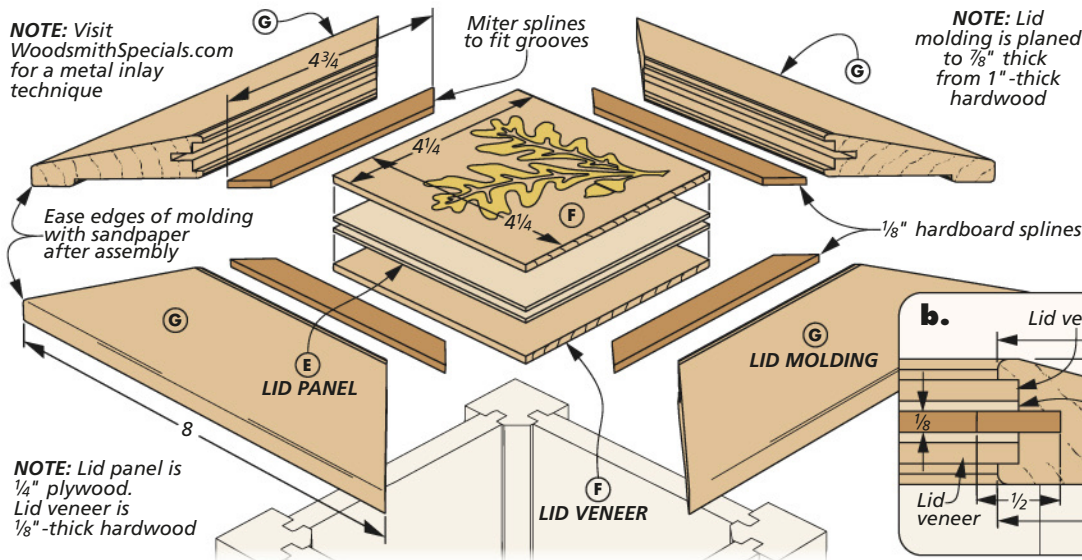


Create Tongues. With a straight bit in the router table, cut a rabbet on each face to create a tongue that fits the grooves in the posts.



Lay Out Curve. The curve on the lower edge of the box side runs right to the shoulder of the tongue on each end.

NOTE: Visit WoodsmithSpecials.com for a metal inlay technique



LAMINATED PANEL. There are several techniques to look at. The first of these is making the center panel. The panel has a plywood core. A thin piece of wood is glued to the top face to provide a thick substrate

for the metal inlay. A second piece of wood glued to the bottom face balances the panel. I routed a groove around all four edges with a slot cutter. This holds a spline for attaching the molding.

The technique to add the metal inlay pattern isn't difficult, and you can use it on a wide variety of projects. Go to WoodsmithSpecials.com to see how it's done.

LID MOLDING. Completing the panel means you can move on to making the molding. The box at left walks you through the steps. I found that the order shown helped me to get the best results and work as safely as possible.

Prepare molding blanks that are sized to final width and thickness. These extra-long blanks are easier to handle. A groove on the inside edge houses the panel for a clean look, as shown in Figure 1. To reinforce this joint, a deeper narrow groove is cut that aligns with the slot in the panel (Figure 2). Hardboard splines span the joint for a solid connection.

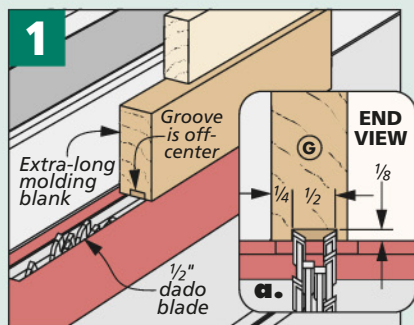
A rabbet on the bottom face of the molding registers the lid on the box to keep it centered. You can cut the rabbet with a standard blade, as in Figure 3.

I eased the edges with sandpaper to create gentle roundovers, as in detail 'b.' Then the molding pieces can be mitered to wrap around the panel. The key here is to carefully set up your table saw to cut accurate miters for tight joints.

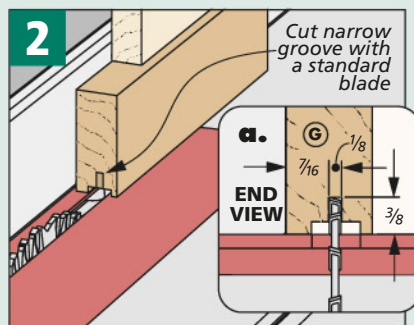
Cutting the splines to size and mitering the ends comes next. I then assembled the lid and molding at one time using slow-set glue and a band clamp.

The upper face of the lid is beveled. I waited until after assembly to do this because the completed lid is larger and safer to handle while making the cut. The payoff from all your efforts is seen once the stain and finish are applied.

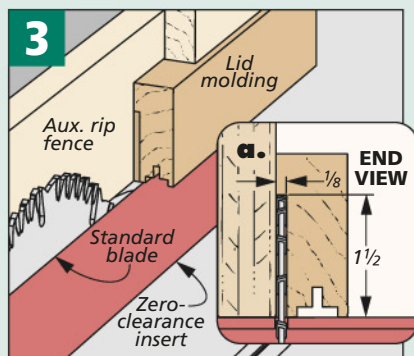
How-To: Mitered Frame



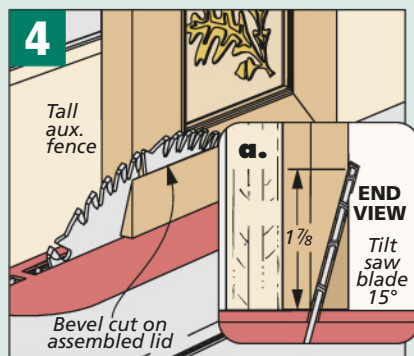
Wide Groove. Take your time to size the dado blade to match the thickness of the laminated panel.



Narrow Groove. Mark the molding so that the narrow groove is aligned with the slot in the edges of the panel.



Shallow Rabbet. To avoid damaging the rip fence, attach an auxiliary fence before cutting the rabbet.



Bevel Last. A tall auxiliary fence and a zero-clearance insert support the lid as you bevel the edges.



Classic Craftsman Bed

Quartersawn white oak and Craftsman-era design elements combine to create this handsome companion to our Gentleman's Dresser:

When we featured the gentleman's dresser in Woodsmith No. 219 (shown above and available on Woodsmithplans.com), we had a feeling that it might be a popular project with our readers. But we had no idea just how popular it would be. So after numerous requests, we designed this Craftsman-style bed to match the dresser.

TRADITIONAL JOINERY. Much like the dresser, the joinery used on the bed is easily manageable in your shop using basic

power tools. The headboard and footboard have stiles and rails that are held together with mortise and tenon joinery. Solid panels are captured in shallow grooves in the stiles and rails. And in keeping with the design of the dresser, we mimicked the square openings in the doors in the headboard.

KNOCK-DOWN ASSEMBLY. Of course, moving a bed around in the home calls for an assembly that is easy to take apart

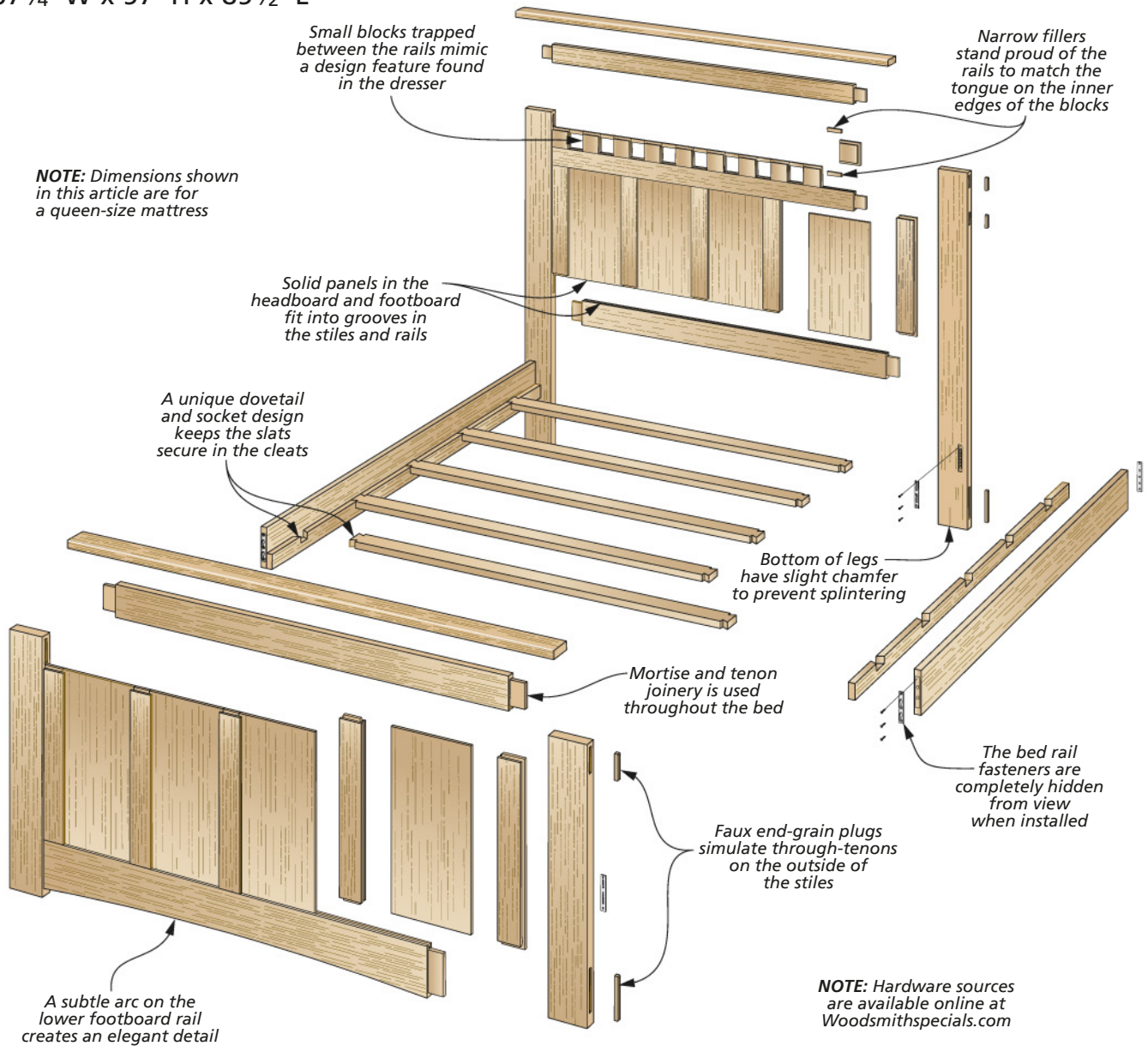
and put back together. Here, we opted for bed rail fasteners that are housed in shallow mortises in the stiles and side rails. Creating the mortises on the ends of the side rails may seem intimidating, but don't worry. We'll walk you through our simple procedure to ensure perfect results.

So get your tools tuned up and ready to go. Turn the page to get started on this stately piece of bedroom furniture.

CONSTRUCTION DETAILS

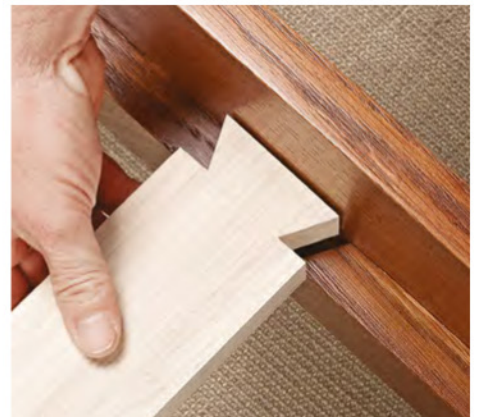
OVERALL DIMENSIONS:

67 $\frac{3}{4}$ " W x 57" H x 85 $\frac{1}{2}$ " L



Details. The inner edges of the blocks and the filler strips in the headboard stand proud of the surrounding stiles and rails.

Sturdy Slats. Dovetails on the ends of the slats and sockets cut in the cleats prevent the slats from moving under a box spring.



After roughing out the waste, use a chisel to clean up the corners of each mortise.

LONG GROOVES. To make the long, centered grooves on the inside edge of each leg (detail 'b'), a quick trip to the router table is needed. Figure 2 on the previous page shows this procedure. Simply rout the groove from the lower mortise to the upper mortise, or vice versa depending on the leg.

ADD HARDWARE. Next, I added the female side of the bed rail fasteners (Figure 3). First, drill a series of overlapping holes to allow the hooks from the side rail fastener to drop below the surface. Then, I made a simple jig to aid in routing the pockets for the fasteners. *WoodsmithSpecials.com* has the details. After routing, a chisel is used to clean up the corners.

Before moving on, I also chamfered the bottom edge of each leg. The main drawing provides this information.

RAILS, STILES & ASSEMBLY

With the legs wrapped up, you can turn your attention to the rest of the parts that complete the headboard, starting with the three rails that connect the legs. When cutting them to size, be sure to note the bottom rail is wider than the other two.

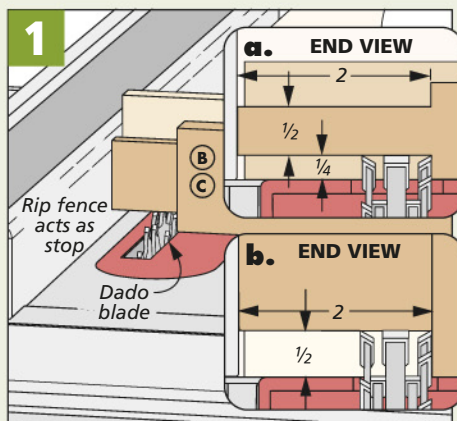
RAILS. The tenons on the ends of the rails are easy to complete at the table saw (Figure 1, at right). Much like the legs, the rails require centered grooves, also. But here I used a dado blade in the table saw since these grooves run from end-to-end on each rail (Figure 2). The middle rail has a groove on both edges.

STILES. The inner and outer stiles for the headboard follow a similar path as the rails. The dimensions you'll need to cut these parts to size are shown in detail 'f' on the previous page. But instead of full-length tenons, they use stub tenons on the ends (Figure 3, at right).

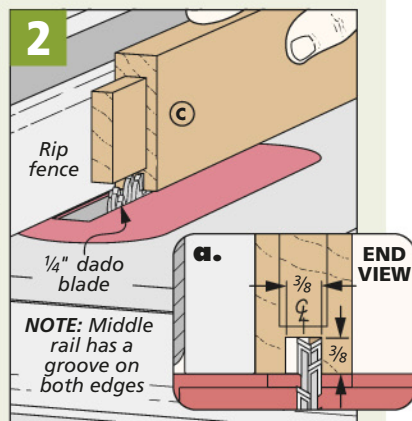
The two outer stiles have rabbets on the outside edge to form a tongue, while the inside edge (and all of the inner stiles) have centered grooves to hold the panels. I stayed at the table saw to make all of these cuts, as well.

BLOCKS. The ten small blocks are made much the same way as the stiles. Figures 4 and 5 above, as well as detail 'd' on the previous page provides all the information you'll need to make them.

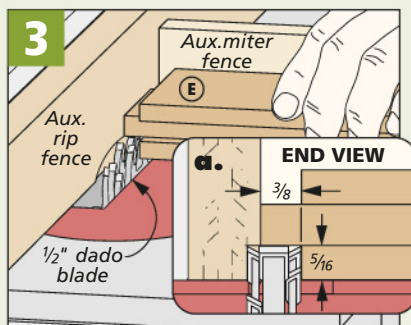
How-To: Make the Rails, Stiles & Blocks



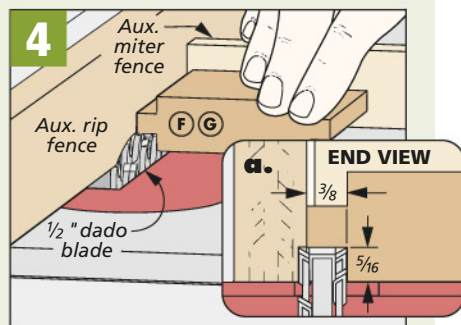
Tenons on Rails. Use the rip fence as a stop to define the tenon shoulder. Then remove the rest of the waste



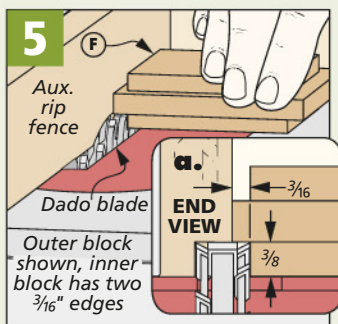
Centered Grooves. Switch to a narrower dado blade to make the centered grooves along the edge.



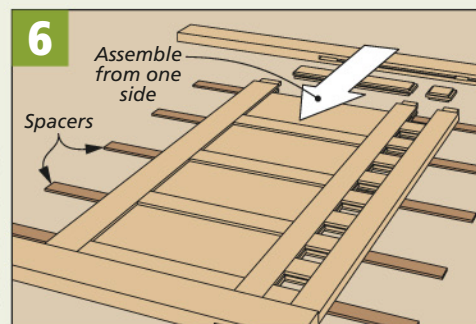
Stub Tenons. With a dado blade buried in an auxiliary rip fence, cut the stub tenons on the stiles.



Tongues on Blocks. Using the same table saw setup, cut the rabbets that form the tongues on the blocks.



Narrow Tongues. Move the rip fence to cut the narrow tongues on the blocks.

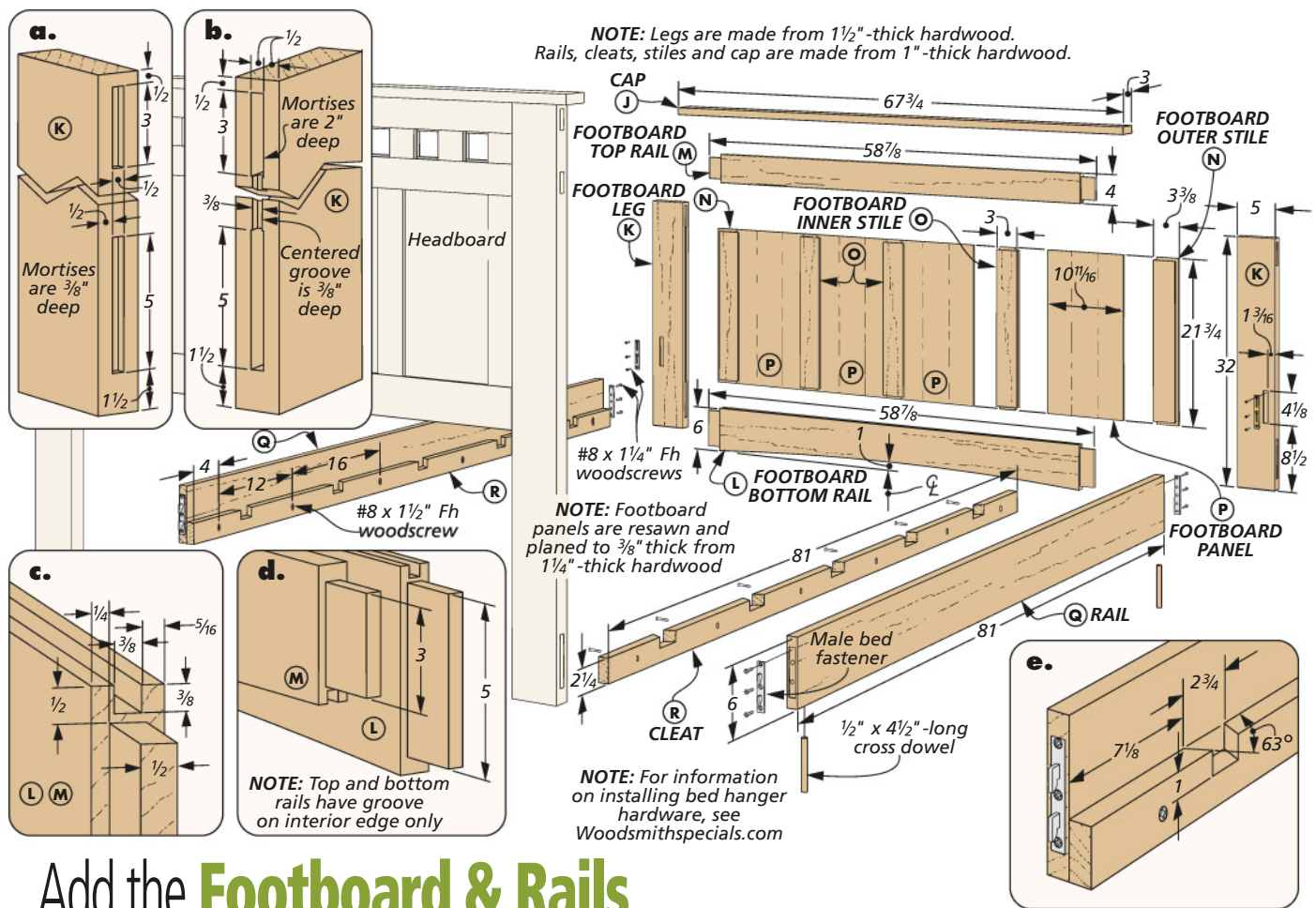


Assembly. Start at one end and add the rails. Then slip the stiles and panels in place. Finally, slide in the blocks and add the other leg.

THIN PANELS. Finally, there's nothing tricky about gluing up the panels. Just use some clamps to keep the thin panels flat as the glue dries.

ASSEMBLY. Figure 6 shows my process for bringing the headboard together. I only used a little glue to hold the panels in

place to allow for some expansion. I left the blocks loose in the rail grooves until the final leg was clamped in place. Then I went back and secured the blocks by adding some filler strips, working from one end to the other. The cap is the last piece to glue on top.



Add the Footboard & Rails

Having completed the headboard, you've mastered most of the techniques you'll need to build the footboard. The only differences between the two are the addition of a wider, arched bottom rail on the foot-

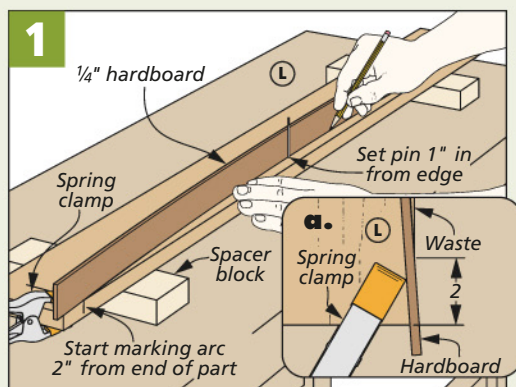
board. And because it's shorter than the headboard, the footboard doesn't have the small blocks along the top edge.

After the footboard, you'll also make the bed rails. Here, I utilized a unique set

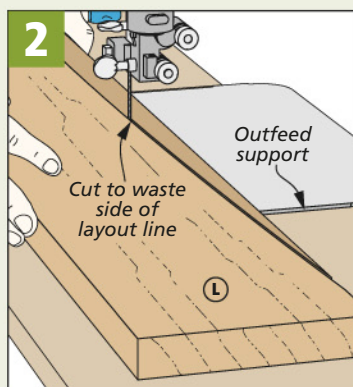
of cleats that incorporate dovetail sockets to keep the slats from moving around under a box spring (detail 'e').

FOOTBOARD, FIRST. You can look back to the previous two pages for a refresher to see

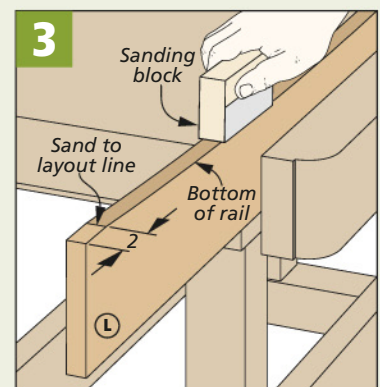
How-To: Lay Out & Cut Arched Rail



Arch Layout. Before cutting the tenons, use a narrow piece of hardboard as a guide to draw the curve along the bottom edge of the rail.



Cutting the Curve. Move to the band saw to carefully cut the curve along the length of the rail.



Sand It Smooth. I used a sanding block to help keep the edge square as I sanded the curve smooth.

how to build most of the parts for the footboard. I'll just point out a couple of things. First, be sure to note that the stiles and panels for the footboard are slightly longer than the headboard. Also, you'll only need two mortises on the outside edge of the legs for the plugs, and two on the inside edge for the rails.

ARCHED RAIL. As I said earlier, the bottom rail on the footboard has a long, gentle curve along the bottom edge. So before cutting the tenons on the ends of this part, I made the curve. The How-To box at the bottom of the previous page shows the steps involved to complete the curve.

COMPLETE & ASSEMBLE. With the bottom rail in hand, the rest of the footboard parts can be finished up. Follow the same procedure as the headboard (minus the blocks and fillers) to assemble the footboard. You can set this aside for now and move on to the rails and cleats.

RAILS & CLEATS

The rails themselves are pretty straightforward to make. Simply pick a couple of nice, straight boards and cut them to size. The How-To box at right will walk you through the remainder of the steps to complete the rails and cleats.

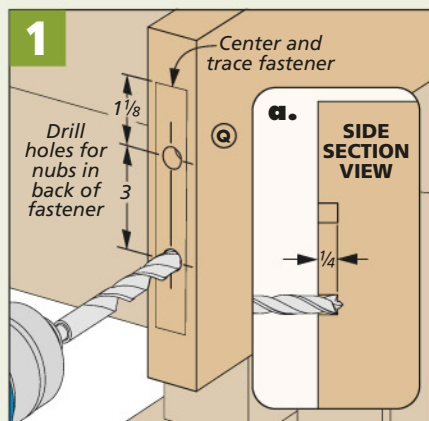
MATING HARDWARE. Adding the mating bed rail fasteners to the ends of the rails is the first order of business. Because they're installed on the narrow ends of the rails, they're not quite as simple to install as the female half that you installed in the legs earlier.

To begin, position the fastener on the end of the rail and trace the outline. On the backside of the male fastener, you'll notice a couple little "nubs" protruding from the backside of the hooks. Simply drill a couple shallow holes in the rail for these (Figure 1).

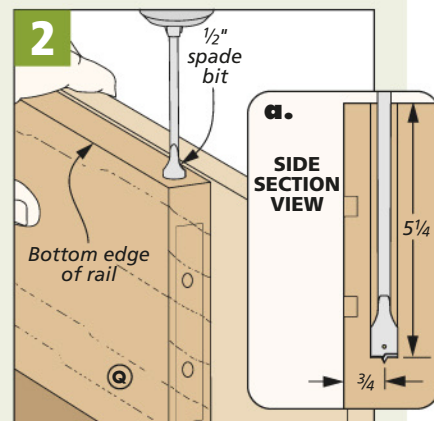
Removing the waste for the shallow mortise that the fastener rests in requires one more operation, and that's making shallow paring cuts with a chisel.

DOWEL STRENGTH. Once the fasteners are eventually installed, they're held in place with woodscrews. But I was worried about the screws holding, since they're driven into end grain. So I inserted $\frac{1}{2}$ "-dia. cross dowels from the bottom edges of the side rails to give the screws something to "bite" into.

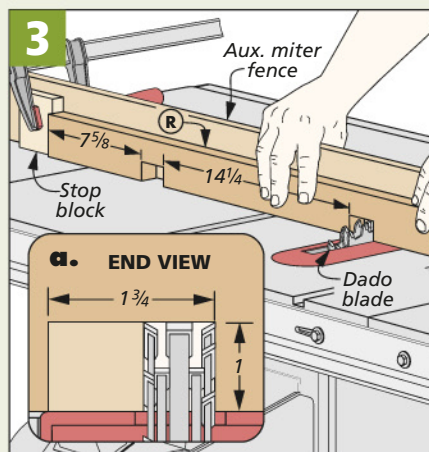
How-To: Prepare the Rails & Cleats



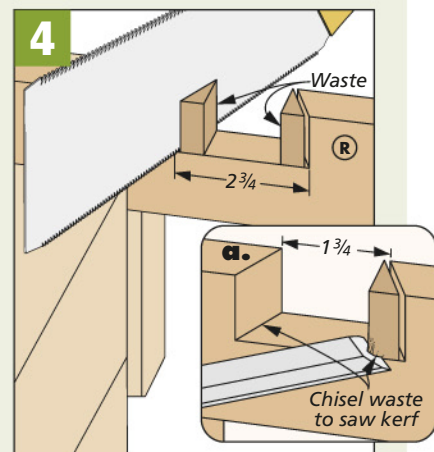
Clearance Holes. Drill the clearance holes in the rails to allow for the nubs on the backside of the fasteners.



Holes for Dowels. Use a spade bit to drill the deep holes in the underside of each bed rail.



Waste Removal. Use a wide dado blade at the table saw to remove most of the waste for the dovetail sockets.



Finish Up Sockets. A hand saw and sharp chisel are all you need to finish up each socket on the cleats.

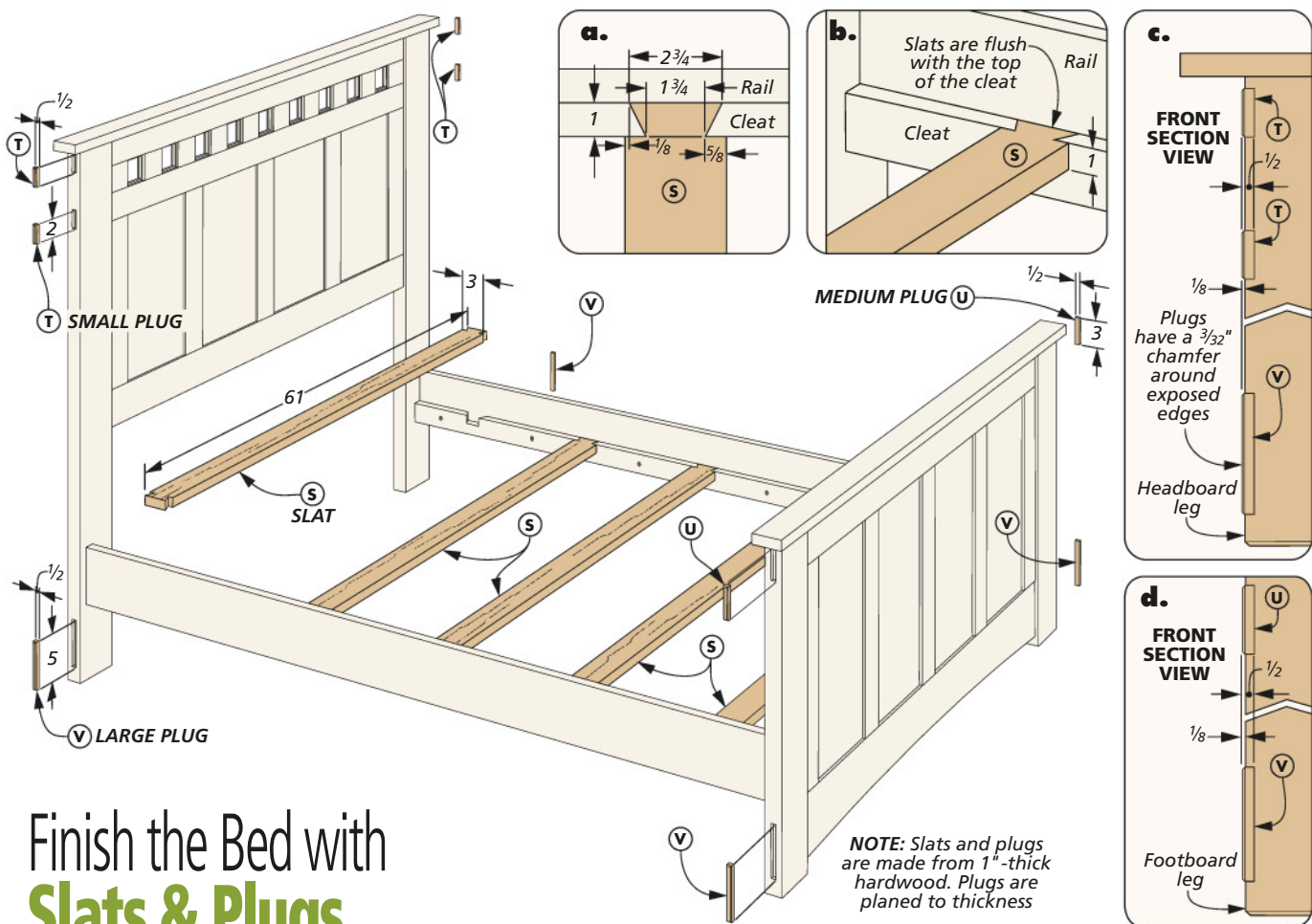
Figure 2 above provides the details for drilling the holes for the dowels.

DOVETAILED CLEATS. Finally, you're ready to make the cleats. Again, you'll cut the stock to size to begin. Figure 3 above and detail 'e' on the previous page provide the information for laying out the dovetail socket positions. To remove the bulk of the waste, I used a dado blade in the table saw (Figure 3).

All that's left is to cut away the dovetailed edges of each opening to form the socket. A handsaw and chisel make quick work of this, as shown in Figure 4. Now, glue the cleats to the inside lower edges of the rails. I also added screws here for additional strength (detail 'e').



Knock-down. Hidden fasteners are used to hold the rails to the legs. WoodsmithSpecials.com has the details.



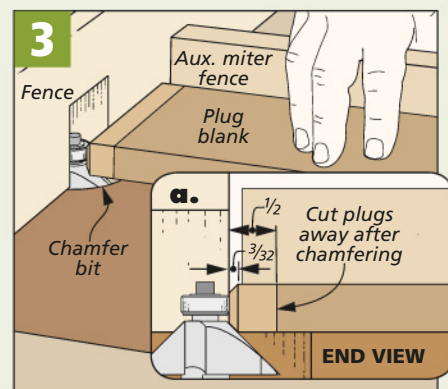
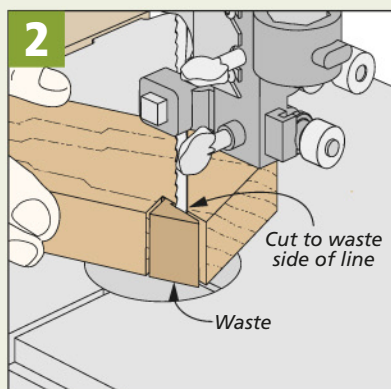
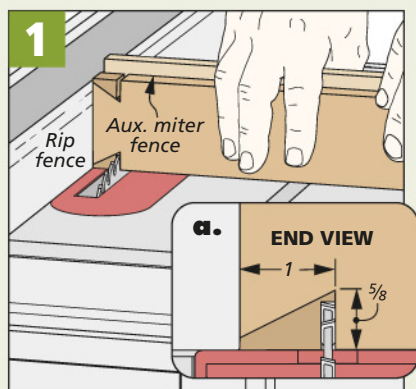
Finish the Bed with Slats & Plugs

After wrapping up the side rail and cleat construction, I assembled the bed to check the fit of the rail assemblies between the headboard and footboard. This also gave me the opportunity to measure the dis-

tance between the rails to get an accurate reading for cutting the five slats to length. After that, you'll make and install the plugs that finish up this project. But first, the slats.

DOVETAILED SLATS. Once you have the slats cut to length, you'll need to make the dovetail cuts on the ends that fit the sockets in the cleats. Figures 1 and 2 in the How-To box below shows the two-step

How-To: Make the Slats & Plugs



High-back Hall Bench

Solid frame and panel construction makes this bench as sturdy as it is attractive.

A hallway storage bench that also offers a place to hang coats is a practical and good-looking solution to entryway clutter. And this high-back bench is sure to get lots of admiring looks in any location.

It's also a great project to give your shop skills a workout. Both the bench and the upper assembly use frame and panel construction with stub tenon and groove joinery.

The choice of wood also contributes to the classic look. I used riftsawn oak for the frames and plywood panels. Both of these are pretty easy to find at most lumber suppliers.

We've also included an option for building a simplified bench. Either way, this piece is sure to be a welcome addition to any home.

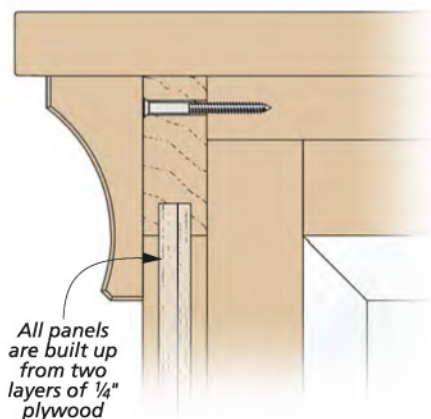
Options. This design also gives you two options for building the bench as a stand-alone piece. See Woodsmithspecials.com for more details.



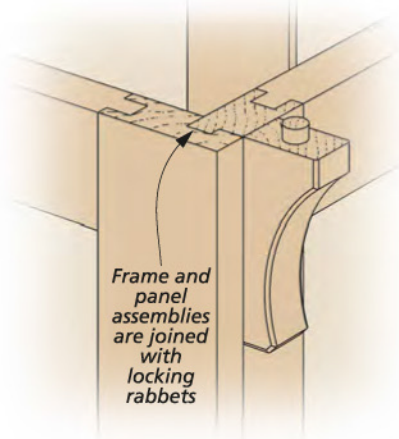
CONSTRUCTION DETAILS

OVERALL DIMENSIONS:
36" W x 71" H x 17" D

FRONT SECTION VIEW



BENCH JOINERY DETAIL



Subtop is attached with glue and screws

NOTE:
Upper frame and panel assemblies also use stub tenon and groove joinery

Upper assembly attaches to bench with connector bolts and T-nuts

Decorative cap

Beveled mirrors fit in rabbets in the upper frames

Bench top frame features mortise and tenon joinery

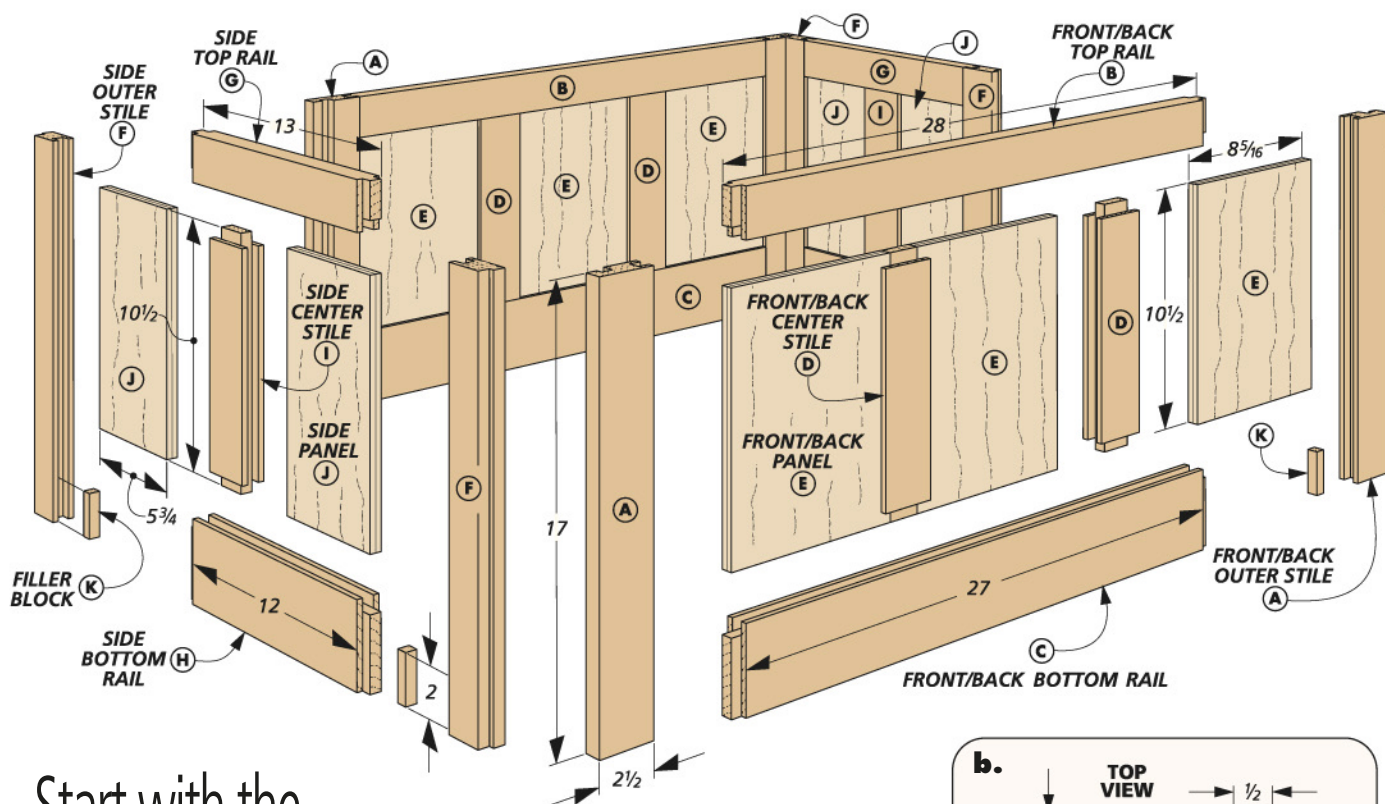
Frame and panel assemblies use stub tenon and groove joinery

Corbels hold dowels for joining the top frame

Filler block conceals bottom of groove

Plywood panels fit in grooves in hardwood frames

Case bottom rests on cleats attached to lower rails



Start with the Frames

The case for the bench section serves as the foundation for the entire project. It needs to be sturdy enough to support the weight of the back assembly as well as someone sitting on the lid. The frame and plywood panel construction uses stub tenon and groove joinery to guarantee plenty of strength. This design also makes it easy to build the project in individual sections.

PANELS. Before getting started, I want to talk a little about the panels. I used $\frac{1}{2}$ "-thick panels for the bench, but $\frac{1}{2}$ " cabinet-grade plywood can be hard to find. So I glued up two $\frac{1}{4}$ " panels instead.

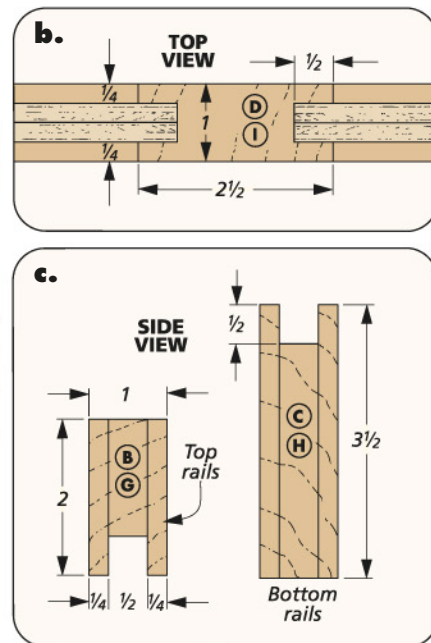
If you use this method, it's a good idea to glue up the plywood before moving on to the frames. This way, you'll know the exact thickness of the panels and can cut matching grooves in the frame parts. You'll also want to make the panels slightly oversize so you can trim them to their final size later.

THE FRAMES. Once you know the final thickness of the panels, you can start cutting out the frame pieces. To help keep things straight, I worked on the front and back frames first (since they're the same size), then moved on to the sides.

After cutting the rails and stiles to size, you can switch to a dado blade in the table saw and cut the grooves for the panels. Rather than trying to match the width of the blade exactly to the panels, I set the dado blade a little narrower (about $\frac{1}{4}$ "-wide) and made one pass, then flipped the piece and made another cut to complete the groove.

You'll want to experiment with a piece of scrap to get the perfect fit. But I think you'll find this method is easier than shimming the dado blade to the exact width to match the plywood. And it also keeps the groove centered on every piece.

STUB TENONS. Now that you've cut grooves in the rails and stiles, you're ready to cut the stub tenons on the rails and center stiles. These tenons will fit



into the grooves (like the plywood panels). Here again, a test piece is the key to setting up your saw to make the cuts. You'll want to get a fit that's snug, but not tight enough to require much force or clamping pressure to assemble.

For more detailed information on how to cut tight-fitting stub tenon and groove joinery, check out the article on Woodsmithspecials.com. One more thing: Don't forget that the center stiles get grooves on both sides and tenons on the ends as well.

ASSEMBLING THE FRAMES. At this point, you're ready to trim the panels to their final size and glue up the frames. Since the panels are plywood, you won't need to worry about them expanding or contracting during seasonal changes in humidity. This means you have the option of using glue in the grooves. But if the panels fit tightly in the grooves, you can skip the glue and avoid the problem of glue squeeze-out in the joints on the frames.

I clamped the center stiles and panels between the upper and lower rails first. This way I had a chance to make sure the edges of the panels and the tenons lined up well before moving on. Then you can add the outside stiles, attaching them to the rails.

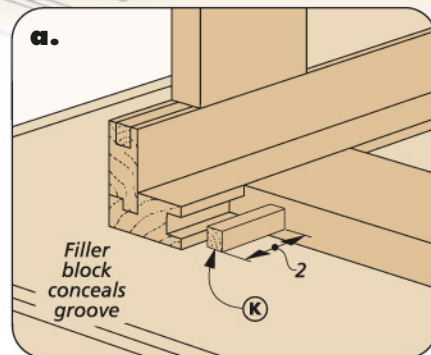
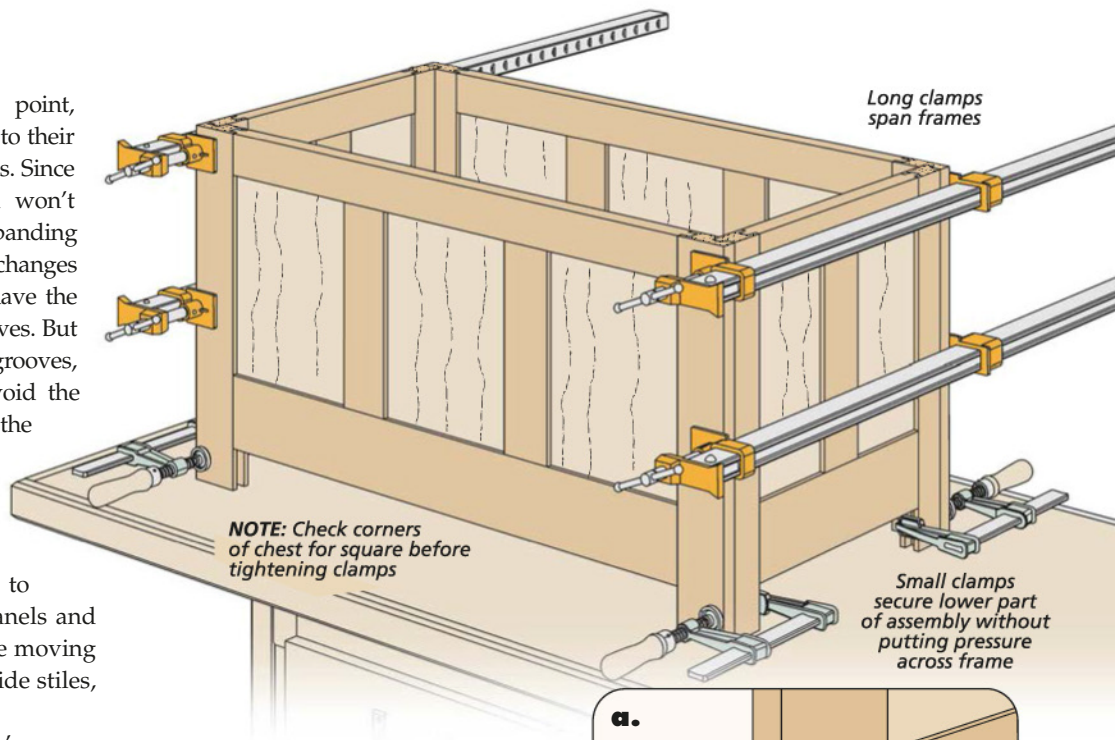
CONNECTING THE FRAMES. After you've completed the front, back, and side frames, it's time to cut the locking rabbet joinery that will hold the frames together. Now you could have cut these joints on the end stiles before assembly, but I find it easier to keep track of everything by cutting the joints after assembling the frames. And since these frames aren't too big, they're easy to work with at the table saw.

The locking rabbet is a very strong joint for case construction. In addition to the mechanical lock of this joint, it also offers increased glue surface for extra strength.

The box below explains the process of cutting the parts of the joint.

Assembling the base. With the joinery cuts complete, it's a good idea to dry fit the assembly and plan your clamping strategy. As you can see in the drawing above, I used small clamps to hold the bottom of the joints secure and then added longer clamps spanning the width of the side frames. This way, you'll get even clamping pressure along the full length of the joints.

FILLER BLOCKS. All that remains is to fill in the groove below the frames. For this,



I just glued some filler blocks in place and sanded them flush with the edge (detail 'a').

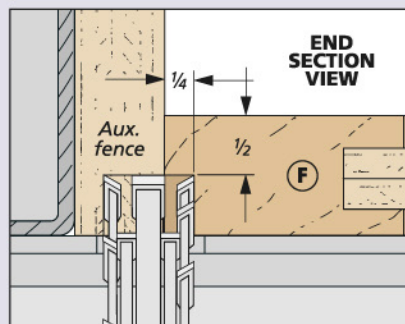
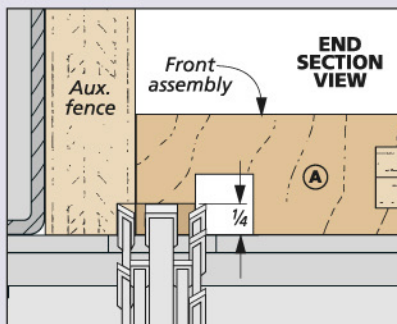
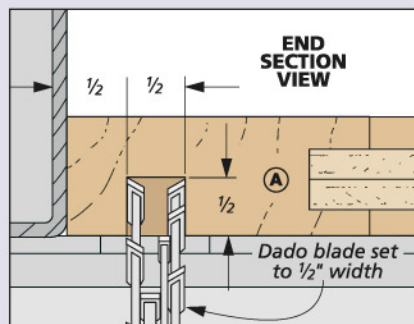
How-To: Cut the Locking Rabbet Joint

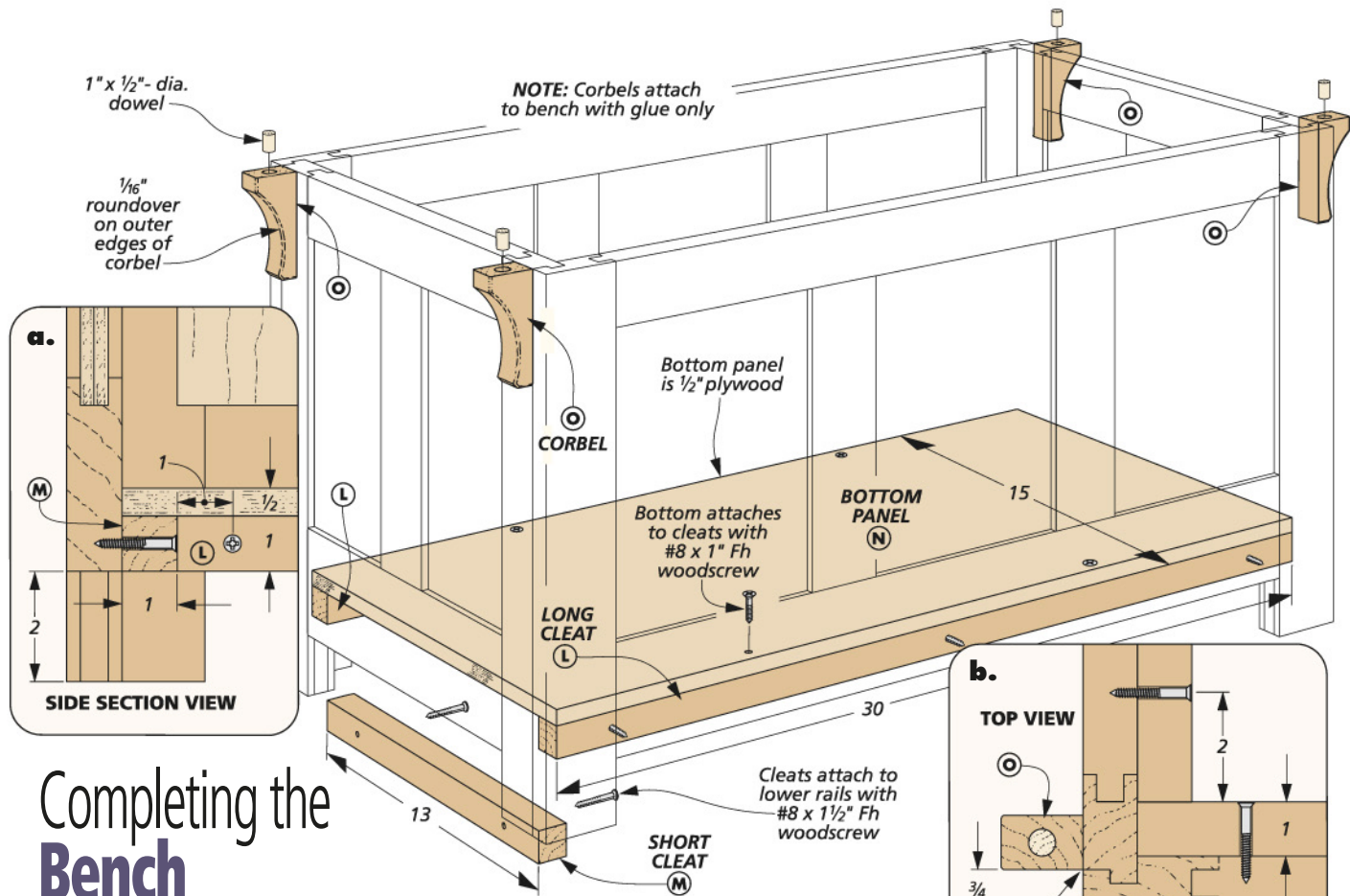
The locking rabbet is a great choice for the bench joinery. It's solid enough to provide a strong connection that won't rack.

I started work on the front and back frames. The first cut is just a groove run-

ning the length of the end stiles. For the second cut, you'll need to attach an auxiliary fence, as shown in the center drawing, below. Then, you can make the cut removing the waste to form the tongue.

Now you're ready to cut the rabbet, and in this case that means the side frames. As you can see in the far right illustration, the auxiliary fence covers part of the dado, exposing only 1/4" of the blade.





Completing the Bench

With the case assembled, the next few steps will add the top and bottom, as well as the supporting corbels. But before you go any further, you may want to take the time to remove any glue squeeze-out from the inside of the case first. It's more accessible now than it will be later.

ADD THE BOTTOM. The bottom of the storage compartment is just a piece of 1/2" plywood screwed to cleats attached to the bottom rails of the panels. As the details 'a' and 'b' above show, the cleats are attached with screws in countersunk holes.

I started by cutting the cleats to size and moved on to the drill press to pre-drill holes for the screws. This way, I was able to clamp each piece in place inside

the case and use it as a guide for drilling the matching pilot holes in the rails. Then, you can add glue and attach the cleats. Now it's just a matter of cutting a piece of plywood to size and fastening it to the cleats with screws.

CORBELS. The next step is to add a corbel to each corner of the case. The corbels will help support the top and add a Craftsman-style detail to the bench. Each corbel also holds a dowel that will help secure the top. You can see the pattern for the corbels in the full-size drawing below.

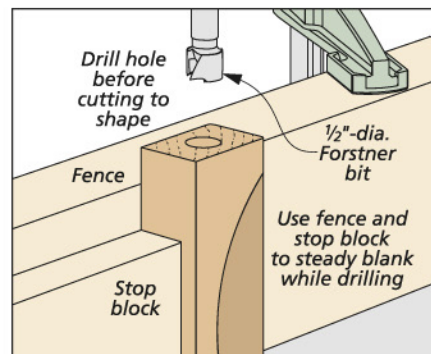
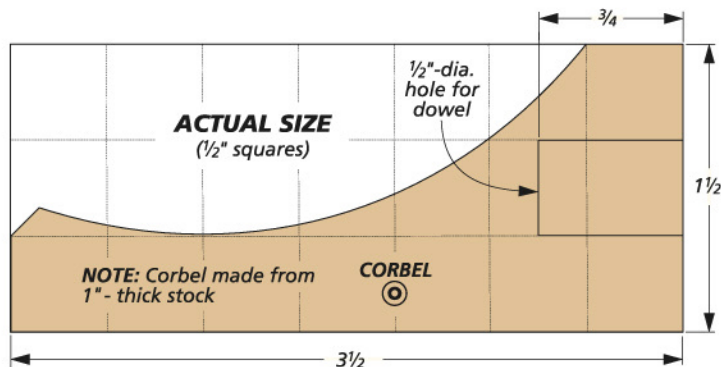
While you're at it, if you're going to make the upper assembly of the hall bench, you might as well save yourself some time and

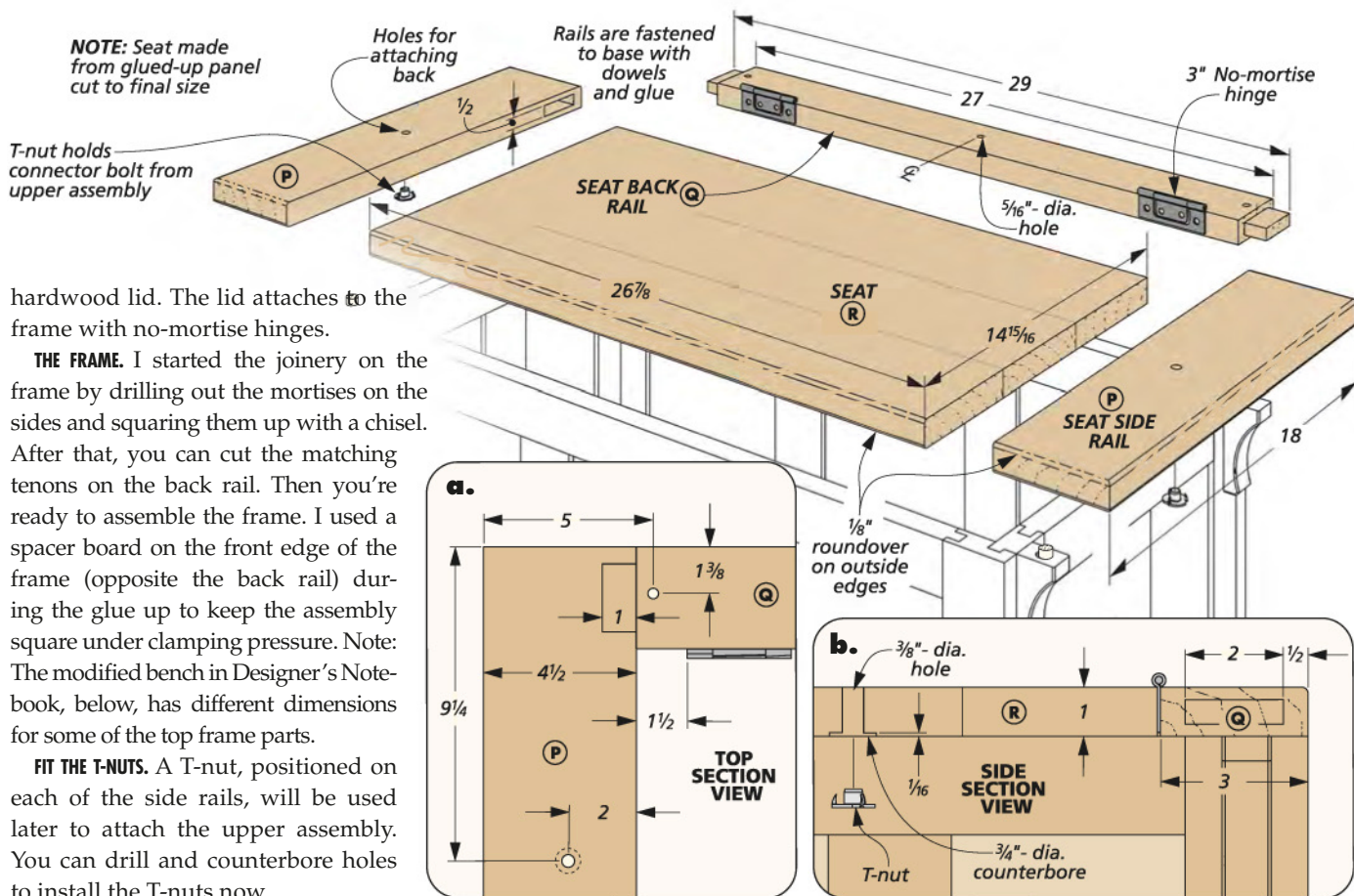
make the four corbels for the top. They're identical to the ones used here.

Before cutting the corbels to shape, I drilled the dowel hole (Figure 1, below). Then I used a band saw to cut them to final size and shape. After chamfering the outside edges at the router table, you can glue the corbels to the case.

THE BENCH TOP

The drawing at on the next page on the right shows how the top of the bench is built. It's a U-shaped, mortise and tenon frame that wraps around a





hardwood lid. The lid attaches to the frame with no-mortise hinges.

THE FRAME. I started the joinery on the frame by drilling out the mortises on the sides and squaring them up with a chisel. After that, you can cut the matching tenons on the back rail. Then you're ready to assemble the frame. I used a spacer board on the front edge of the frame (opposite the back rail) during the glue up to keep the assembly square under clamping pressure. Note: The modified bench in Designer's Notebook, below, has different dimensions for some of the top frame parts.

FIT THE T-NUTS. A T-nut, positioned on each of the side rails, will be used later to attach the upper assembly. You can drill and counterbore holes to install the T-nuts now.

ADD THE LID. The next step is to glue up a panel for the lid. After the glue dried, I cut the lid to final size.

No-mortise hinges make installing the lid a breeze. I fastened the hinges to the rail with screws first, then attached the hinge to the edge.

ATTACH THE TOP. Fitting the top to the base is made easier by placing dowel centers in

the corbels. Then it's just a matter of aligning the top and transferring marks from the dowel centers. Then, drill holes and attach the frame with glue and dowels.

I finished up by rounding over the top edges with a hand-held router. This not only softens the edge but adds a decorative detail.

Now you have a complete bench. If you're not planning to build the upper assembly, you can stop here or add the backstop shown below.

Pointy Dowels.

Dowel centers position matching holes.

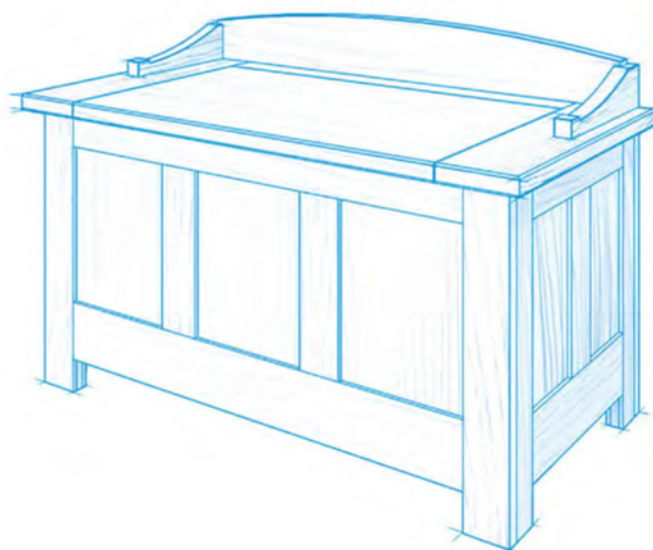


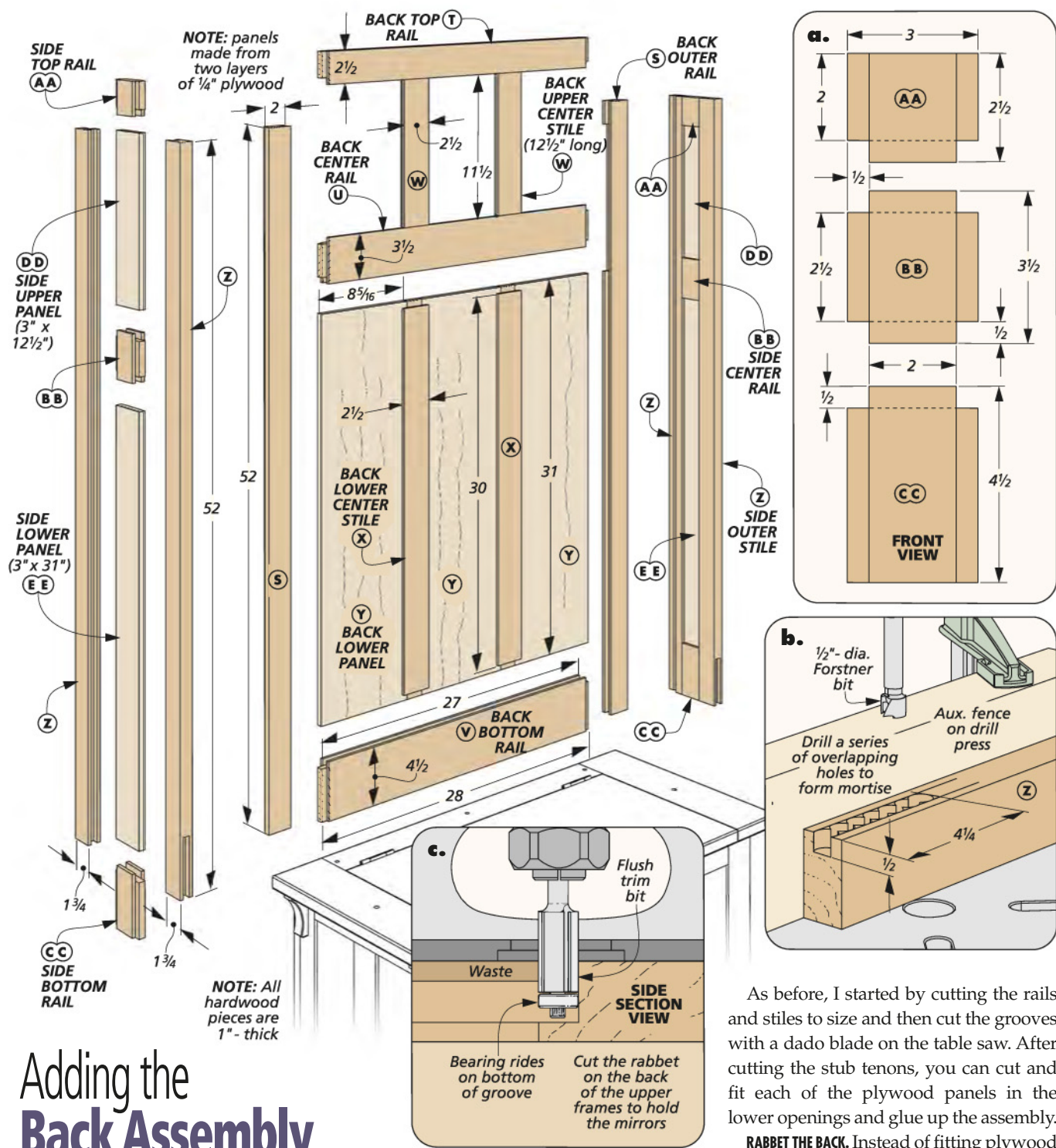
Designer's Notebook

The bench also makes for handy stand-alone storage in any room. This modified design leaves out the corbels in favor of a narrower top frame. It also features low-profile mounting brackets and a curved back rail. After assembling the brackets and rail, you simply attach the back to the bench with connector screws fitting into threaded inserts.



For complete plans for these design options, go to:
WoodsmithSpecials.com





Adding the Back Assembly

With the bench complete, you can turn your attention to the back assembly. Once again, it employs frame and panel construction. But in this case, it's just a wide back and two very narrow sides. Three beveled glass mirrors fit in rabbeted openings on the back. The assembly is capped by a hardwood top supported by corbels on the sides. These corbels mimic the corbels on the base.

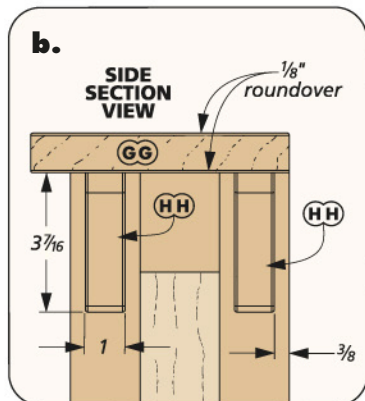
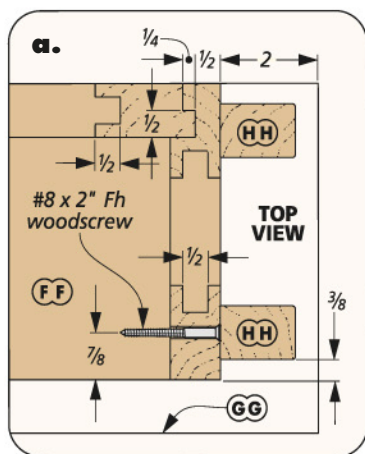
START WITH THE BACK. As you can see in the drawings above, the back assembly uses the same stub tenon and groove joinery as the bench. So the process of building the back and sides will be very similar to what you did earlier.

One difference is the addition of a center rail where the coat hooks and mirrors will be added. But this doesn't present any real complications in the joinery or assembly.

As before, I started by cutting the rails and stiles to size and then cut the grooves with a dado blade on the table saw. After cutting the stub tenons, you can cut and fit each of the plywood panels in the lower openings and glue up the assembly.

RABBET THE BACK. Instead of fitting plywood panels in the upper half, you'll need to flip it over and rout a rabbet on the back after assembly, as shown in detail 'c.' These rabbets will house the three mirrors.

The rabbets are easier to cut now that the frame is assembled since the size of the opening is defined. You can use your router and a flush trim bit to remove the waste. Just set the depth so the bearing rides on the flat bottom of the groove. Then clean up the corners with a chisel.



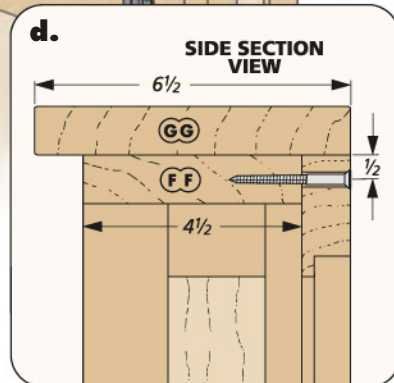
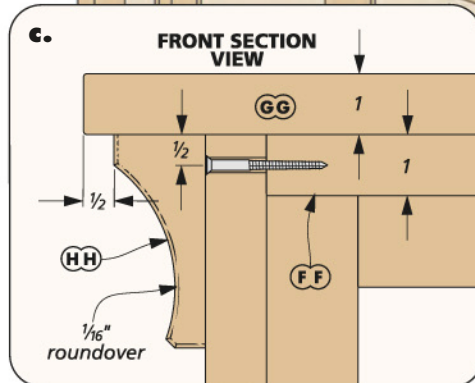
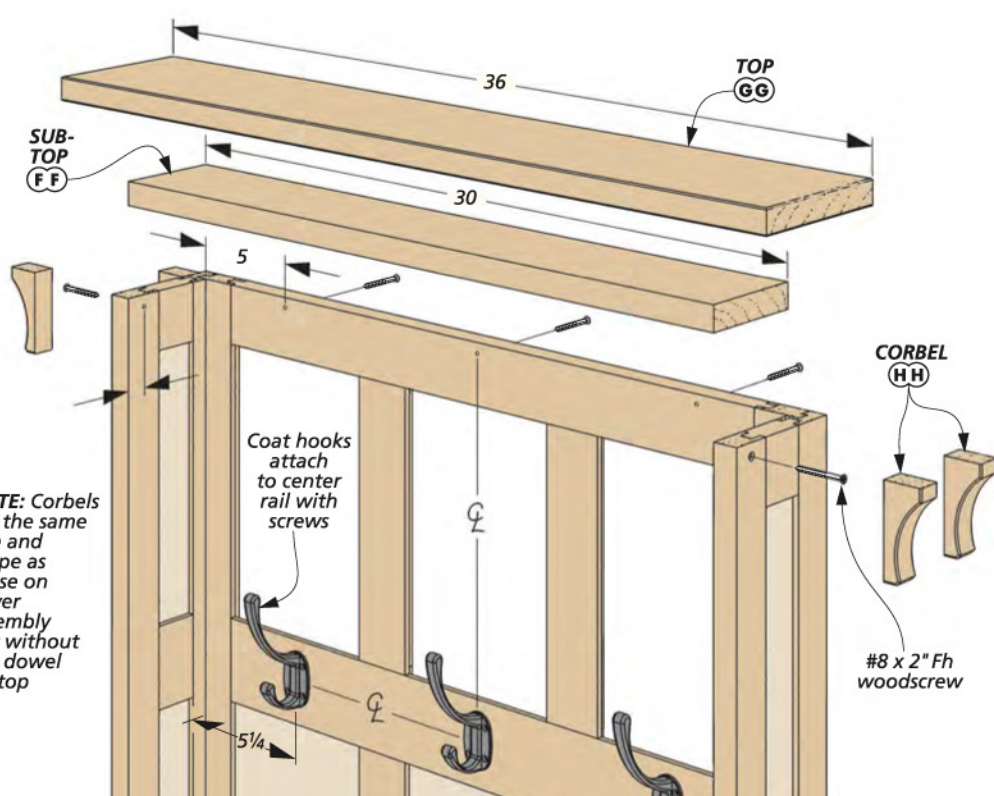
THE NARROW SIDES. After you've completed the back, the next task is to build the two sides. They use the same construction techniques as the rest of the project. But because of the short length of the rails, you'll need to take extra care when cutting the grooves and tenons.

The side frames also have an open mortise on the outside edge at the bottom. This mortise will hold a tenon on the support brackets you'll add later. I found it easiest to cut this mortise before cutting the groove on those pieces. I just drilled out the waste as shown in detail 'b' on the opposite page and cleaned up the sides with a chisel. Then you can assemble the side panels.

JOINERY. With the side frames assembled, you can head back to the table saw and make the locking rabbet joinery cuts. This time, however, the back frame gets the rabbet and the sides are grooved, as shown in detail 'a' above. This avoids a visible glue line on the side. Other than that, the process is the same as before. After cutting the joinery, just assemble with glue.

TOPPING THE ASSEMBLY. The drawings above show you how a hardwood sub-top fits

NOTE: Corbels are the same size and shape as those on lower assembly but without the dowel on top



between the sides of the back assembly. This piece adds stability and is secured with screws from the sides and back (details 'c' and 'd'). Don't worry, the screw holes on the sides will be covered by the corbels you'll add later.

A hardwood top is glued in place over the sub-top. The upper and lower edges of this piece are rounded over on all sides.

MORE CORBELS. With the top in place, you can attach the corbels to the sides and top with glue. These corbels are identical to the ones used on the bench, but they don't require holes for dowels — they're strictly decorative and are just added to match the bench.

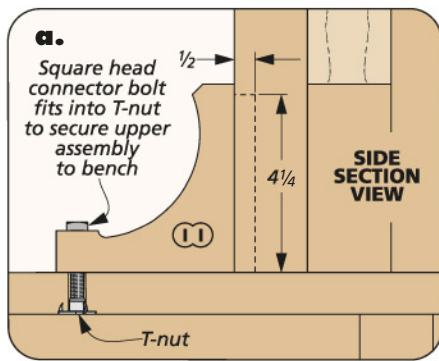
COAT HOOKS. At this point, while the upper assembly can still be laid flat on the workbench, it's a good idea to install the coat hooks. I think you'll find it's much easier to do this now rather than waiting

and trying to mark and drill holes with the back upright. The idea here is to keep the hooks centered on the rail and the individual panels.

Once you've drilled the holes, you can install the coat hooks with the matching screws. Refer to Sources on page 98 to find out about the hooks, screws, and other hardware used on this project.

Unique Hooks. Antique finish hooks add to the Craftsman-style look of the hall bench.



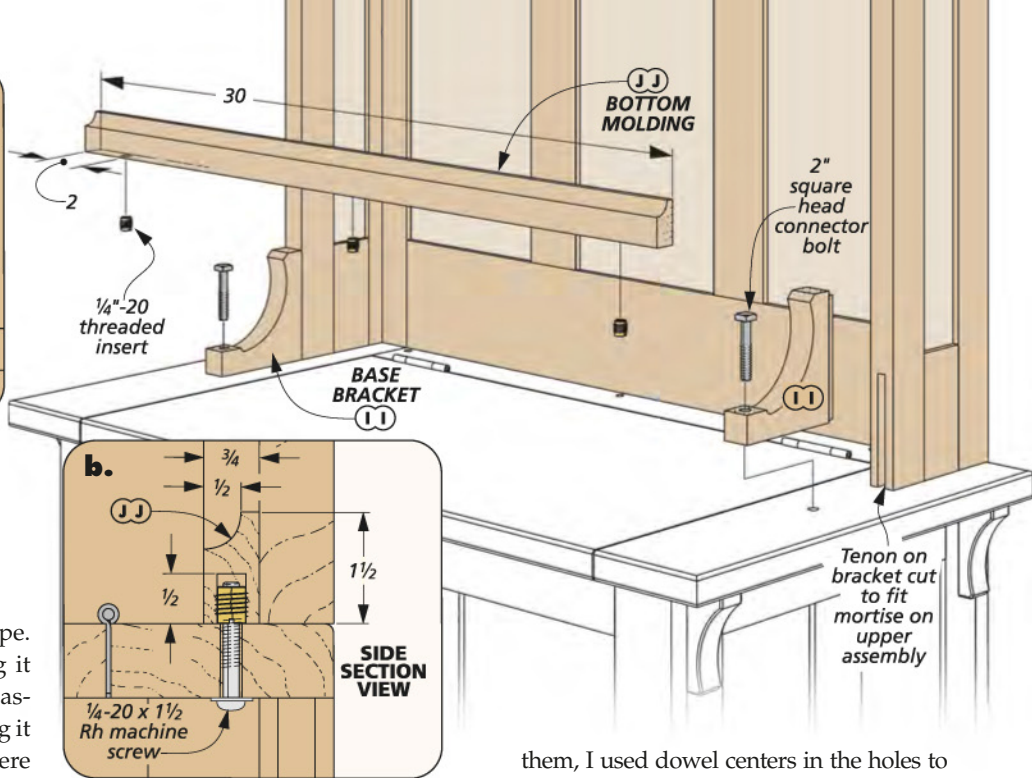


Attaching the Back Assembly

By now, the project is really taking shape. But there's still the matter of putting it all together. I wanted to be able to disassemble the bench in the future, making it easier to move. So connector bolts were the answer. In the drawings above, you can see how I used these bolts, threaded inserts, and machine screws.

First, I made brackets to attach to the back. The brackets hold a square-head bolt that fits into the T-nuts you installed earlier on the bench top (detail 'a'). Second, I made a strip of molding that fits on the bottom of the back with threaded inserts to accept machine screws in the bench, as shown in the main drawing and detail 'b.'

THE BRACKETS. I started by making the two brackets. The box below shows you how



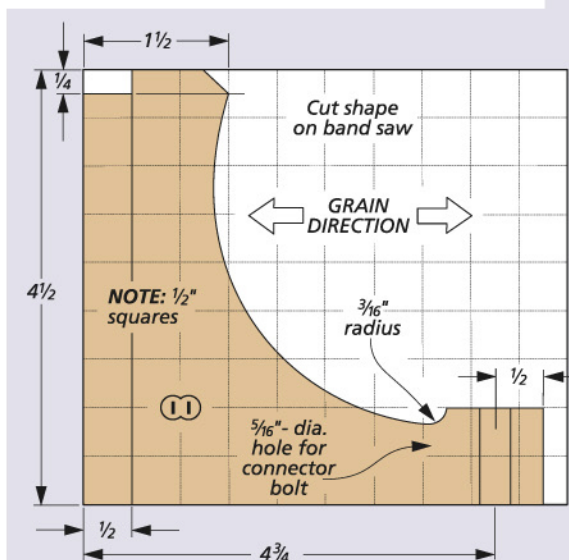
to do this. Then you're ready to glue the brackets in the mortises on the front of the sides. The thing to watch out for here is that you keep the bottom of the brackets flush with the bottom of the sides during the glue up. It will leave a noticeable gap if these parts aren't perfectly flush.

THE BOTTOM MOLDING. Now you can turn your attention to the molding at the bottom of the back panel. I started by drilling the holes for the threaded inserts while the stock was still square. But before installing

them, I used dowel centers in the holes to drill the matching holes in the bench top. Next, I moved to the router table and cut the cove profile on the molding. Then just install the threaded inserts and glue the molding in place on the back panel.

INSTALLING THE MIRRORS. The beveled mirrors really complete the look of the hall bench. And since you've already cut the rabbets in the back of the panel, installing them is a breeze. They fit in the recesses and are covered by 1/4" hardboard panels. The panels are held in place with shop-made, quarter-round glass stop.

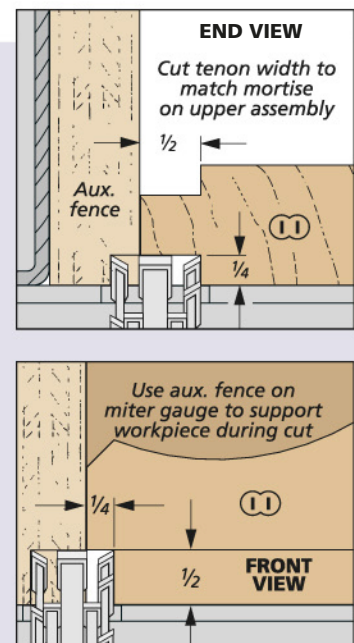
How-To: Bracket Details



The brackets that hold the upper assembly in place have a tenon to match the mortise on the sides. And since it's easier to cut the tenon while the stock is still square, that's the first step in making them.

I began by burying the dado blade in an auxiliary fence. Then you can cut both sides of the tenon. I finished by nibbling off the top end of the tenon (holding the piece with the miter gauge), as shown at right.

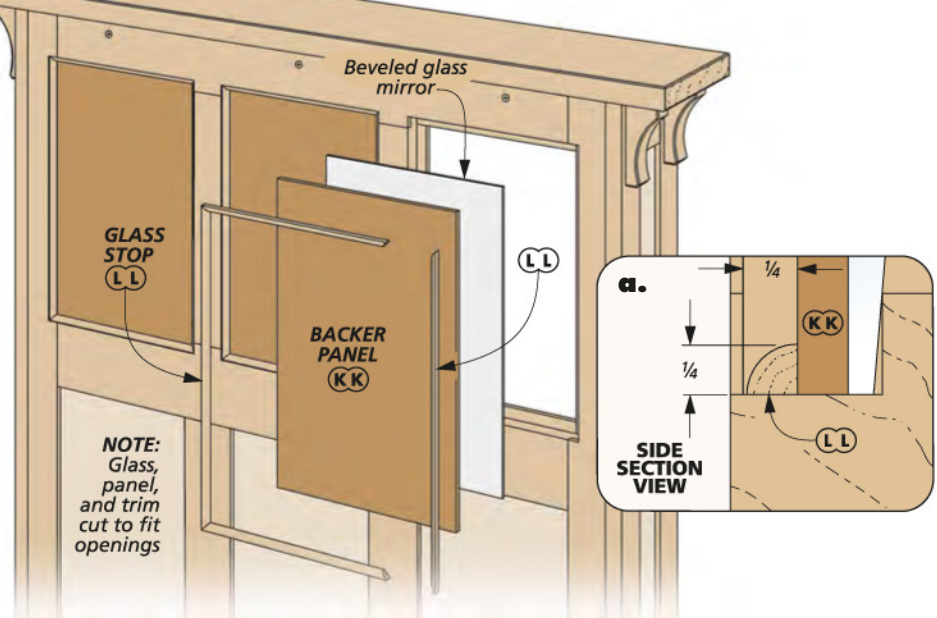
Now you can move to the band saw and cut the brackets to shape. The drawing at left provides the details. Then drill the hole for the connector bolt and finish up by giving the piece a good sanding.



Woodsmithspecials.com has all the details for making your own glass stop.

PUTTING IT ALL TOGETHER. After adding the mirrors, the last step is to attach the upper assembly to the bench. The connector bolts and T-nuts make this an easy task. I found it best to connect the bolts in the brackets first, then the machine screws that come up from inside the bench and attach to the threaded inserts in the molding.

After sanding, you're ready to apply a finish. Since you'll be sitting on the bench, you'll need a durable finish. I used a brush-on polyurethane. Then you're sure to get years of service from the hall bench.



MATERIALS, SUPPLIES & CUTTING DIAGRAM

Bench

A	Front/Back Outer Stiles (4)	1 x 2 ¹ / ₂ - 17
B	Front/Back Top Rails (2)	1 x 2 - 28
C	Front/Back Btm. Rails (2)	1 x 3 ¹ / ₂ - 28
D	Front/Back Ctr. Stiles (4)	1 x 2 ¹ / ₂ - 10 ¹ / ₂
E	Panels (12)	1/4 ply. - 8 ⁵ / ₁₆ x 10 ¹ / ₂
F	Side Outer Stiles (4)	1 x 2 - 17
G	Side Top Rails (2)	1 x 2 - 13
H	Side Bottom Rails (2)	1 x 3 ¹ / ₂ - 13
I	Side Center Stiles (2)	1 x 2 ¹ / ₂ - 10 ¹ / ₂
J	Side Panels (8)	1/4 ply. - 5 ³ / ₄ x 10 ¹ / ₂
K	Filler Blocks (8)	1/2 x 1/2 - 2
L	Long Cleats (2)	1 x 1 - 30
M	Short Cleats (2)	1 x 1 - 13
N	Bottom Panel (2)	1/4 ply. - 15 x 30
O	Corbels (4)	1 x 1 ¹ / ₂ - 3 ¹ / ₂
P	Seat Side Rails (2)	1 x 4 ¹ / ₂ - 18

Q	Seat Back Rail (1)	1 x 3 - 29	• (6) 1/4" Flat Washers
R	Seat (1)	1 x 14 ¹³ / ₁₆ - 26 ⁷ / ₈	• (1 pr) 3" No-Mortise Hinges
		• (10) #8 x 1 ¹ / ₂ " Fh Woodscrews	• (4) #8 x 1" Fh Woodscrews
		• (6) #8 x 2" Rh Woodscrews	

Also needed: 1/4 ply. - 48 x 96

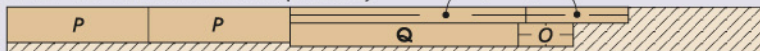
1" x 6" - 96" Riftsawn Red Oak (5 Bd. Ft.)



1" x 6" - 96" Riftsawn Red Oak (5 Bd. Ft.)



1" x 6" - 96" Riftsawn Red Oak (5 Bd. Ft.)



1" x 6" - 96" Riftsawn Red Oak (5 Bd. Ft.)



Upper Assembly

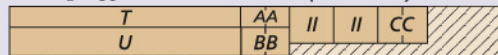
S	Back Outer Stiles (2)	1 x 2 - 52
T	Top Rail (1)	1 x 2 ¹ / ₂ - 28
U	Center Rail (1)	1 x 3 ¹ / ₂ - 28
V	Bottom Rail (1)	1 x 4 ¹ / ₂ - 28
W	Upper Center Stiles (2)	1 x 2 ¹ / ₂ - 12 ¹ / ₂
X	Lower Center Stiles (2)	1 x 2 ¹ / ₂ - 31
Y	Lower Panels (6)	1/4 ply. - 8 ⁵ / ₁₆ x 31
Z	Side Outer Stiles (4)	1 x 1 ³ / ₄ - 52
AA	Side Top Rails (2)	1 x 2 ¹ / ₂ - 3
BB	Side Center Rails (2)	1 x 3 ¹ / ₂ - 3
CC	Side Bottom Rails (2)	1 x 4 ¹ / ₂ - 3
DD	Side Top Panels (4)	1/4 ply. - 3 x 12 ¹ / ₂
EE	Side Bottom Panels (4)	1/4 ply. - 3 x 31
FF	Sub-Top (1)	1 x 4 ¹ / ₂ - 30
GG	Top (1)	1 x 6 ¹ / ₂ - 36
HH	Corbels (4)	1 x 1 ¹ / ₂ - 3 ¹ / ₂
II	Brackets (2)	1 x 4 ¹ / ₂ - 4 ³ / ₄
JJ	Bottom Molding (1)	3/4 x 1 ¹ / ₂ - 30

KK	Mirror Backer (3)	1/4 hdbd. - 8 ⁵ / ₁₆ x 12 ¹ / ₂	• (3) 1/4" Flat Washers
LL	Glass Stop (2)	1/4 x 1/4 - 96	• (2) 1/4"-20 x 2" Square Head Bolts
		• (2) 1/4"-20 T-Nuts	• (5) #8 x 2" Fh Woodscrews
		• (3) 1/4"-20 Threaded Inserts	• (3) Coat Hooks w/screws
		• (3) 1/4"-20 x 1 ¹ / ₂ " Rh Machine screws	• (3) 8 ¹ / ₄ " x 12 ¹ / ₂ " Beveled Mirrors

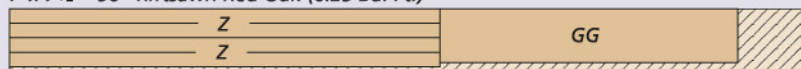
1" x 6" - 96" Riftsawn Red Oak (5 Bd. Ft.)



1" x 6 1/2" - 60" Riftsawn Red Oak (3.4 Bd. Ft.)



1" x 7 1/2" - 96" Riftsawn Red Oak (6.25 Bd. Ft.)



1" x 5" - 60" Riftsawn Red Oak (2.6 Bd. Ft.)



Also needed: 1/4 ply. - 48 x 96
1/4 hdbd. - 24 x 48



Wall-mounted Chisel Rack

Good tools deserve a good home. This chisel rack provides convenient storage and adds a touch of class to your shop wall.

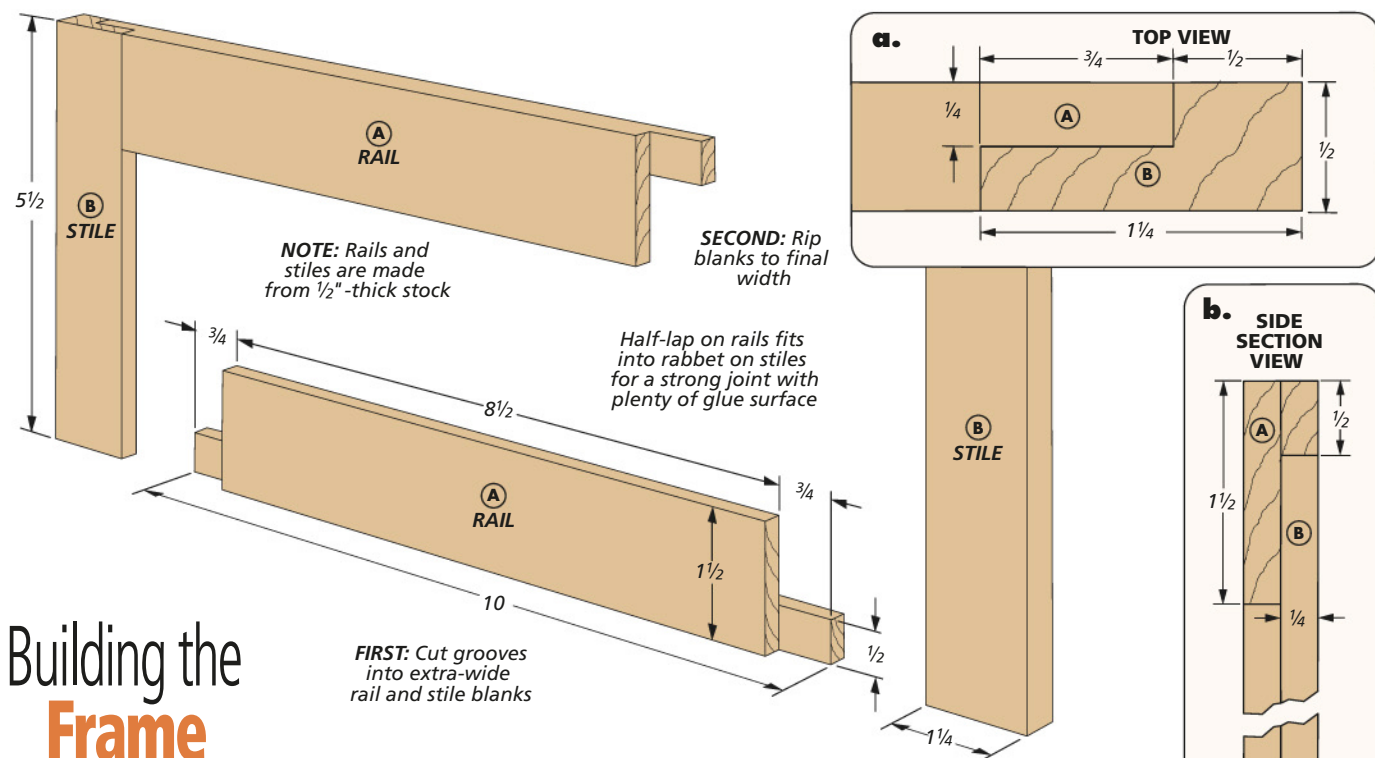
I used to store my chisels in a drawer. After that, I tried a wire rack on pegboard. But the edges always seemed to get dinged up from banging into each other. I finally decided to spend an afternoon building a nice, hardwood rack for them. And with this design, that's about all the time it takes.

A simple hardwood frame and panel serves as a foundation for the chisel holder. Then you add a pair of corbels, and a narrow, routed base trim. I chose oak for the rack, but you can use any hardwood you have lying around in the shop.

While this wall-mounted rack holds five chisels, it's pretty easy to expand the

width to hold as many as you need. All you do is lay out the spacing on the chisel holder and adjust the width of the frame to accommodate the new size.

All in all, it's sure to be a great addition to your shop. I'm sure you'll agree that taking care of your fine tools is time well spent.



Building the Frame

The chisel rack starts with a frame. I used half-lap joints on the rails that fit into rabbets on the stiles. The rabbets on the rails and stiles form a recess that will hold the back panel you'll add later.

MAKING THE RAILS & STILES. To get started, you'll need to plane or resaw some stock to $\frac{1}{2}$ " thick. Once you have the stock the right thickness, the box below shows you a safe way to cut the rabbets and half-lap joints. You'll start with a pair of extra-wide blanks. By cutting each pair of rails and stiles from a single blank, you can cut

the grooves that form the rabbets more easily and safely.

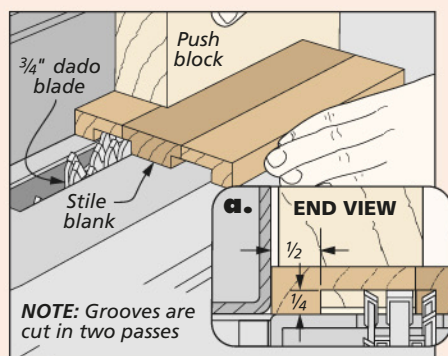
After installing a dado blade in the table saw, use a couple pieces of scrap to set the blade height to exactly half the thickness of the stock. Then cut the grooves in the blanks. After that, you'll need to install a single blade and cut the rails and stiles to final width.

Next, turn your attention to cutting the half-lap joints on the rails. For this, you can install the dado blade again. Then add auxiliary fences to both the miter

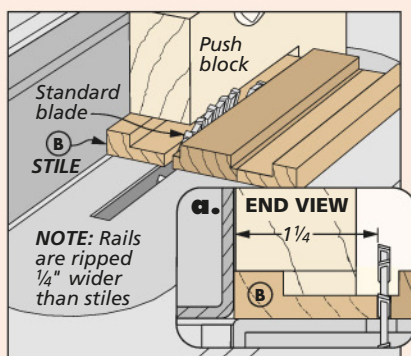
gauge and the rip fence. The far right drawing below shows how to use the auxiliary rip fence as a stop for making the cut.

After completing the joinery cuts, assemble the frame with glue and a clamp across each joint. Check the assembly after applying the clamps to make sure it's square.

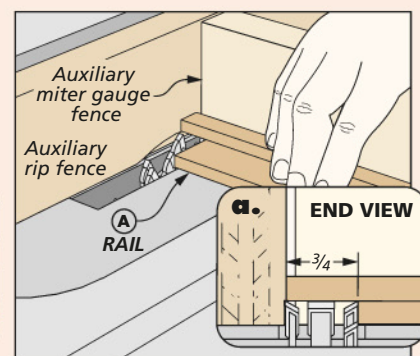
How-To: Cut the Rail & Stile Joinery



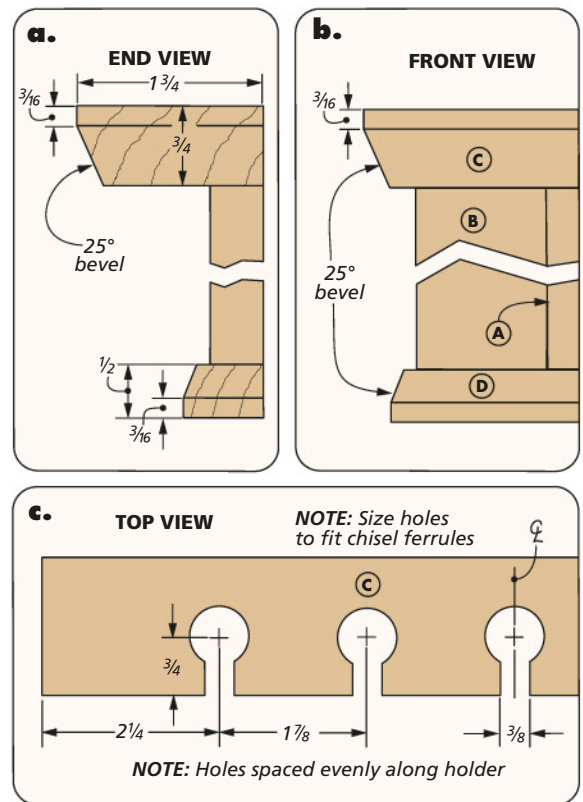
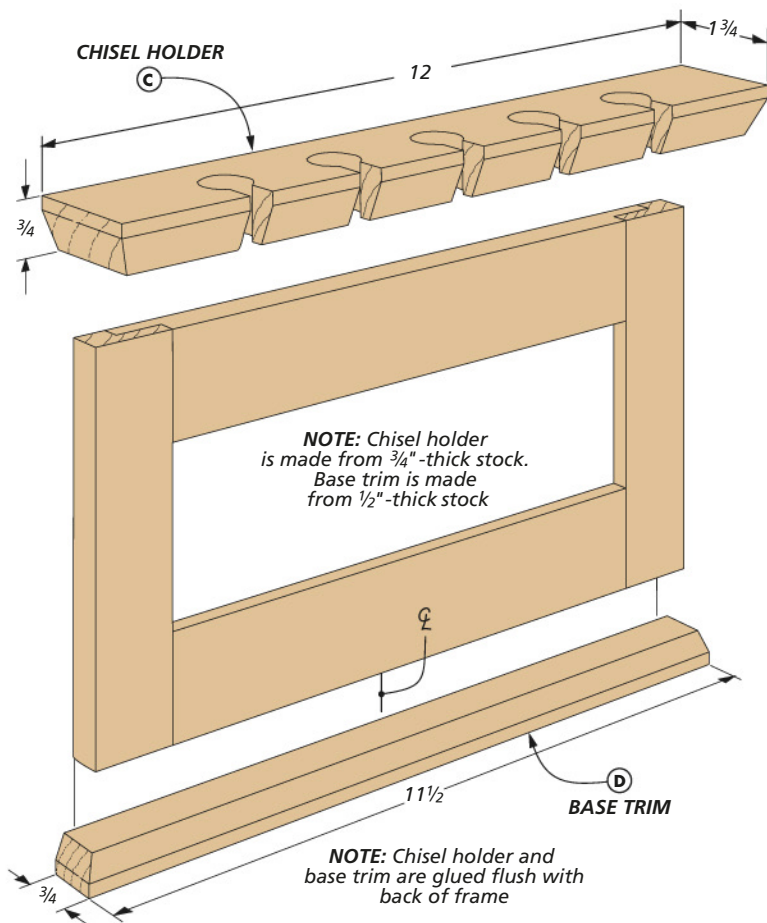
Cut the Grooves. Starting with extra-wide blanks, make two passes on both sides to cut the wide grooves in both the rails and stiles.



Cut to Width. Install a standard blade and use a push block to rip the rails and stiles to their final width, forming the rabbet.



Half-Lap Joint. With the blade buried in an auxiliary fence, use the miter gauge to cut the half-lap joints on the rails.



decorative corbels and a plywood back complete the chisel rack.

CHISEL HOLDER. The chisel holder is made from $\frac{3}{4}$ "-thick stock. After cutting the blank to final size, lay out the hole and slot locations and head over to the drill press (detail 'c'). You'll need to measure the ferrules on your chisels and drill the holes slightly larger ($\frac{1}{32}$ " - $\frac{1}{16}$ ") in order to get a good fit.

The box below shows how to make the holes. A fence on the drill press keeps the

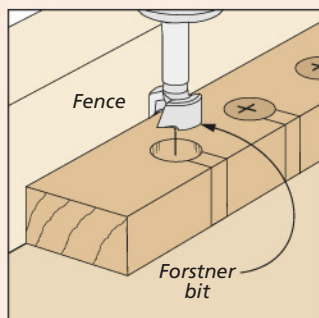
Completing the Chisel Rack

With the basic frame assembled, you're ready to move on to adding the chisel holder and the base trim. Obviously, the chisel holder is the "business end" of the project. But in addition to its functionality, I've dressed it up a little bit by add-

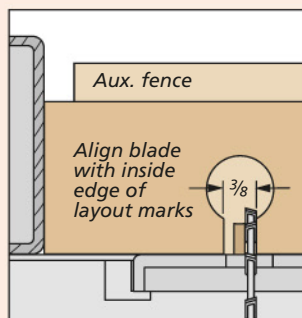
ing a bevel to the front edge and ends. As you can see in the main drawing above, a matching bevel on the base trim unifies the design of the rack.

I drilled a couple of holes in the rack to mount it to the wall. Finally, a pair of

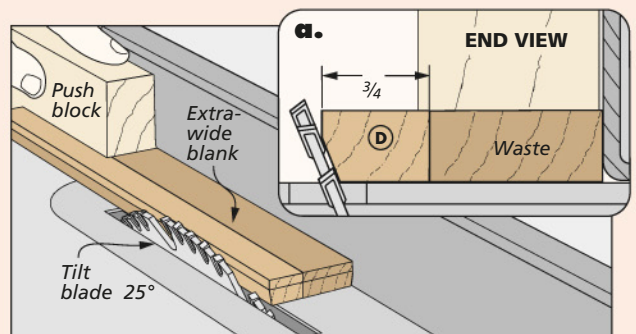
How-To: Make the Chisel Holder & Base Trim



Drill. Lay out the hole and slot locations on the blank and use the drill press to drill the holes.



Cut the Slots. After drilling the holes, use the table saw to cut a slot at each location.

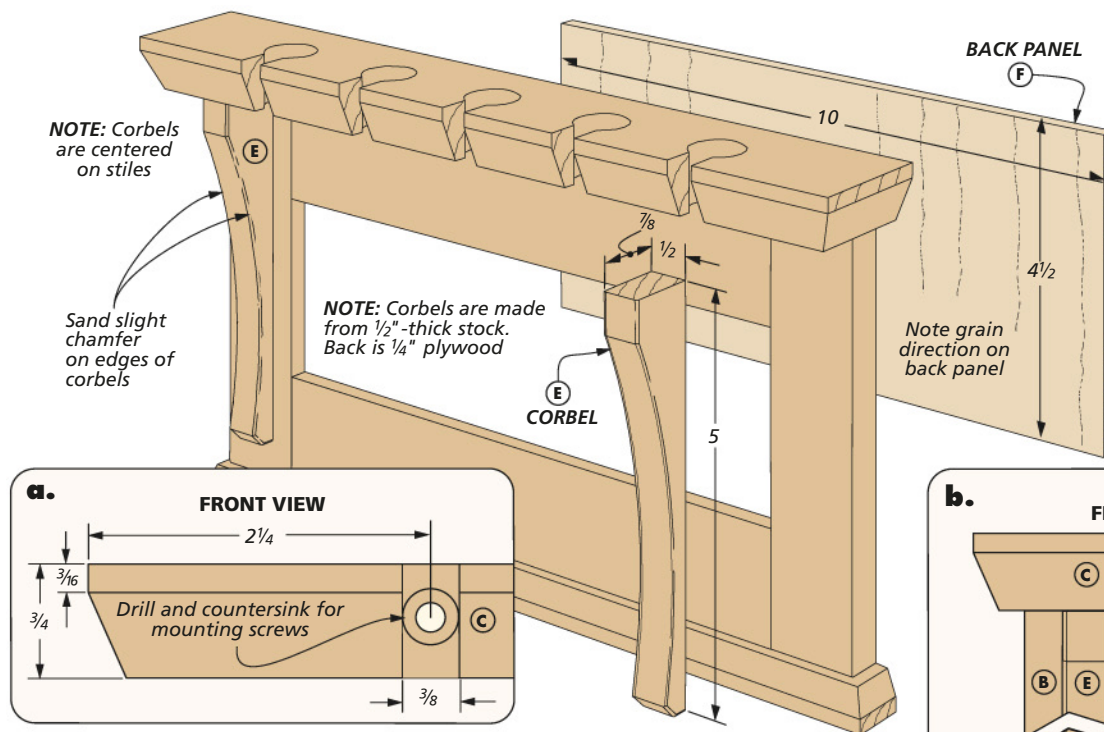


Bevel the Chisel Holder & Base Trim. For safety, start with a wide blank. Then, tilt the blade to 25° and rip a bevel on the front edges of the chisel holder and the base trim.



Pattern for the corbels and the cutting diagram are available on

WoodsmithSpecials.com



holes aligned. Then, use the table saw to nibble away the waste to form the slots.

Now tilt the table saw blade to 25° and use the miter gauge to bevel the ends of the chisel holder. Finally, complete the piece by cutting the bevel on the front edge.

BASE TRIM. The base trim is also beveled. It's a good idea to make the bevel cuts on a wide blank (bottom right illustration on the opposite page). After completing the base trim, you can glue it and the chisel holder to the frame and clamp the assembly.

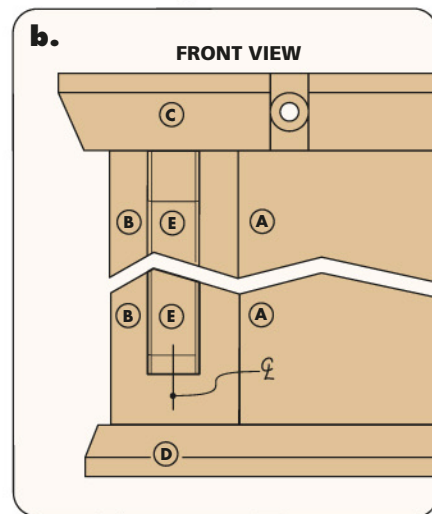
When the glue dries, drill and countersink a pair of holes through the first and last holes in the chisel holder (detail 'a,'

above). These holes provide an easy way to mount the rack to a wall.

CORBELS. At this point, you can get busy on the corbels. Use the full-sized pattern in the right margin to lay out the shape. The box below walks you through the process of cutting them to final shape.

A sanding drum makes quick work of cleaning up the band saw blade marks. I also chamfered the edges of the corbels with just a little hand sanding. When you're done sanding, attach them to the frame with glue.

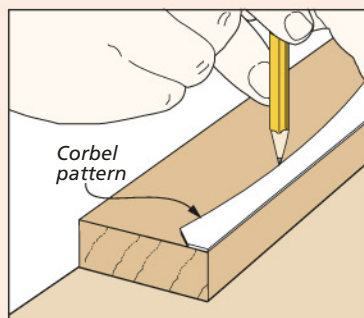
ADD THE BACK. Now you can add the plywood back. Simply cut the 1/4" plywood to



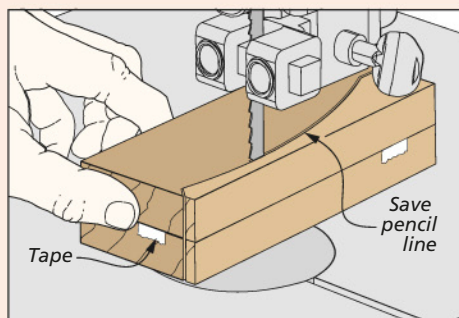
final size and install it in the recess in the back side of the frame with a little glue.

FINISH. As I do for most shop accessories, I gave the rack an oil finish. It's easy to apply and it looks great. All that remains now is to hang it on a wall near your bench and give your chisels a good home.

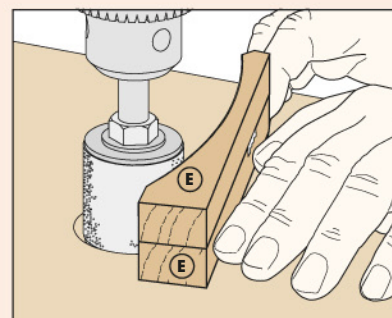
How-To: Cut & Shape the Corbels



Lay Out the Shape. Use the full-sized pattern in the margin above to trace the shape of the corbel on the blank.



Cut Out the Corbels. Attach the two blanks with double-sided tape and cut out the shape at the band saw.



Cleanup. Install a sanding drum on the drill press to remove the saw marks. Work through the grits for a smooth surface.



Dartboard Cabinet



Craftsman Details. The cabinet's frame and panel doors and detailed moldings make it an attractive addition to the game room.

This traditional cabinet is the perfect home for your dartboard. It's exactly the treatment this classic game deserves.

Some of my favorite memories are of playing darts in an English pub. But trying to import that experience into an American setting can be a challenge. First, you need an authentic board. After that, a classic cabinet to house the board and scoreboard can lend your game room a bit of the authentic pub atmosphere.

The cabinet shown above fills the bill. And you can choose a wood that complements your other furniture, as well. (I used quartersawn white oak to match my other Craftsman-style furniture at home.)

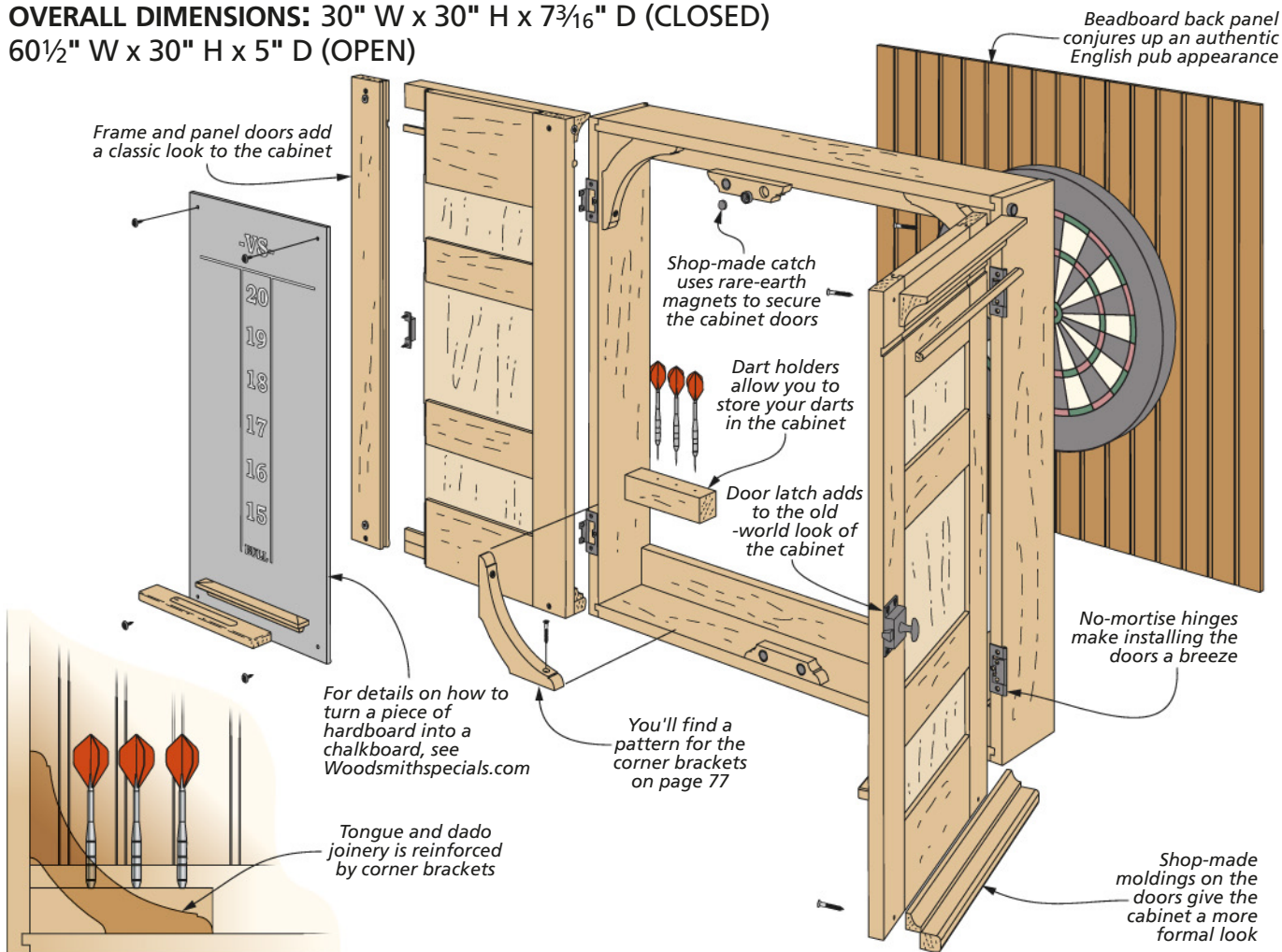
As for the woodworking, it couldn't be simpler. The basic cabinet relies on tongue and dado joinery, reinforced by the decorative corner brackets. The frame and panel doors are also pretty straightforward to build.

For the scoreboards, I used a chalkboard paint over hardboard. This works great and is much easier to cut and install than actual slate blackboards would be.

All in all, it's been a big hit here. Of course, everyone knows it's tough to beat a nice round of darts paired with a cold beverage.

CONSTRUCTION DETAILS

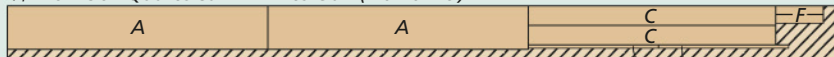
OVERALL DIMENSIONS: 30" W x 30" H x 7³/₁₆" D (CLOSED)
60¹/₂" W x 30" H x 5" D (OPEN)



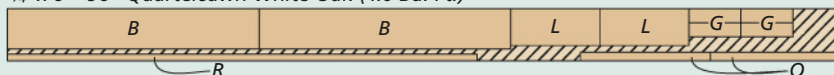
MATERIALS, SUPPLIES & CUTTING DIAGRAM

A Sides (2)	$\frac{3}{4}$ x 5 - 30	K Mid Rails (4)	$\frac{3}{4}$ x 2 ³ / ₄ - 10 ¹ / ₄	• (16) #8 x 1 ¹ / ₄ " Fh Woodscrews
B Top/Bottom (2)	$\frac{3}{4}$ x 4 ⁵ / ₈ - 29	L Bottom Rails (2)	$\frac{3}{4}$ x 4 ¹ / ₄ - 10 ¹ / ₄	• (20) #6 x ³ / ₄ " Fh Woodscrews
C Cleats (2)	$\frac{3}{4}$ x 2 ¹ / ₄ - 28 ¹ / ₂	M Top/Btm. Panels (4)	$\frac{1}{4}$ ply. - 10 ³ / ₁₆ x 4 ³ / ₁₆	• (8) #6 Finish Washers
D Back (1)	$\frac{3}{8}$ bdbd. - 29 ¹ / ₂ x 30	N Center Panels (2)	$\frac{1}{4}$ ply. - 10 ³ / ₁₆ x 8 ³ / ₁₆	• (8) 1 ¹ / ₄ " Pocket Hole Screws
E Corner Brackets (4)	$\frac{3}{4}$ x 6 - 6	O Upper Cove Molding (2)	1 ³ / ₈ x 1 ¹ / ₂ - 15	• (6) 1 ¹ / ₂ " Rare-Earth Magnets w/Cups
F Door Catch Blocks (2)	$\frac{3}{4}$ x 1 - 5 ¹ / ₂	P Bead Molding (2)	$\frac{3}{8}$ x ³ / ₈ - 15	• (6) ⁵ / ₈ " Magnet Washers
G Dart Holders (2)	1 ¹ / ₂ x 1 ¹ / ₂ - 6	Q Base Molding (2)	$\frac{3}{4}$ x 1 - 15	• (2 pr.) No-Mortise Hinges w/Screws
H Mounting Plate (1)	$\frac{1}{4}$ ply. - 3 x 3	R Cove Molding (1)	$\frac{3}{4}$ x ³ / ₄ - 55 rgh.	• (1) Door Latch
I Stiles (4)	$\frac{3}{4}$ x 2 ³ / ₄ - 30	S Scoreboards (2)	$\frac{1}{4}$ hdbd. - 12 x 24	
J Top Rails (2)	$\frac{3}{4}$ x 5 ³ / ₄ - 10 ¹ / ₄	T Chalk Trays (2)	1 ¹ / ₂ x 1 ¹ / ₄ - 10	

$\frac{3}{4}$ " x 6" - 96" Quartersawn White Oak (4.0 Bd. Ft.)



$\frac{3}{4}$ " x 6" - 96" Quartersawn White Oak (4.0 Bd. Ft.)



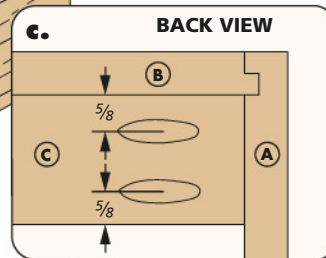
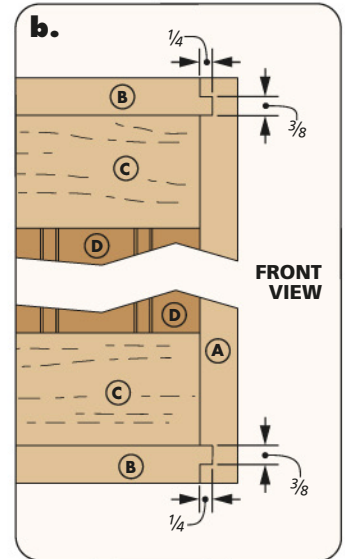
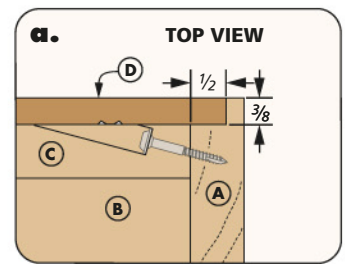
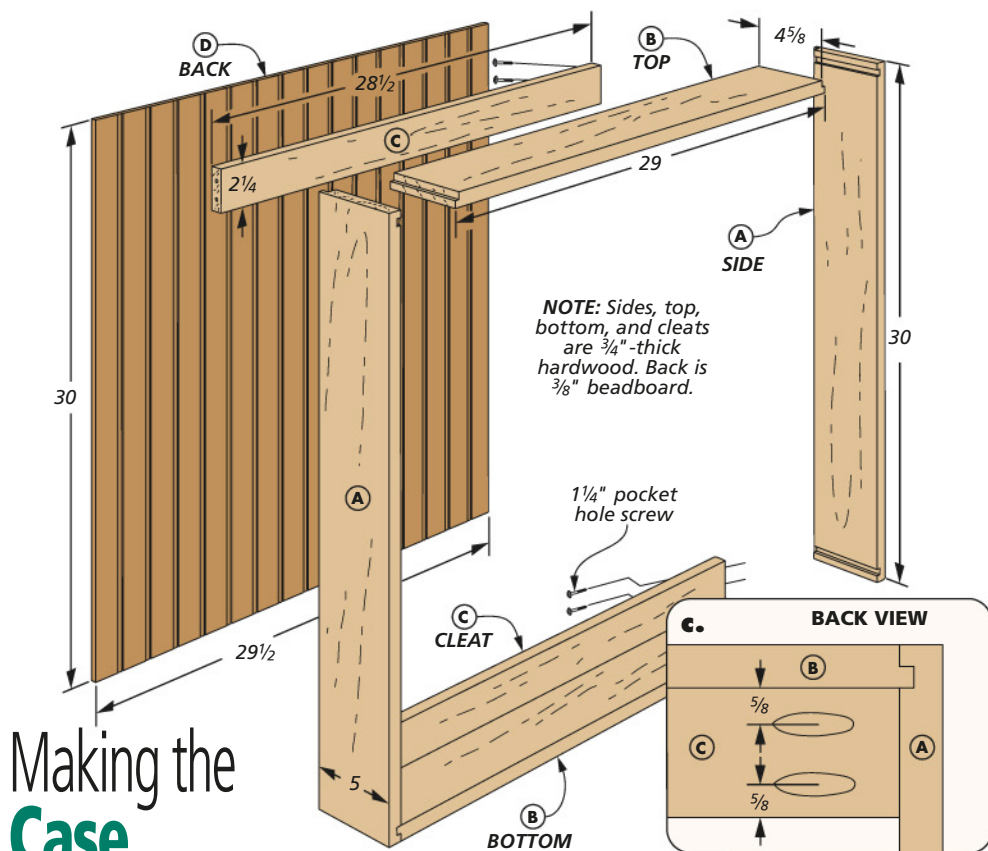
$\frac{3}{4}$ " x 6" - 96" Quartersawn White Oak (4.0 Bd. Ft.)



$\frac{3}{4}$ " x 9" - 48" Quartersawn White Oak (2.0 Bd. Ft.)



ALSO NEEDED: One 48" x 48" Sheet of $\frac{3}{8}$ " Yellow Pine Beadboard Paneling, One 24" x 24" Sheet of $\frac{1}{4}$ " Riftsawn White Oak Plywood, One 30" x 30" Sheet of $\frac{1}{4}$ " Hardboard



Making the Case

The basic case for the cabinet is pretty straightforward to build. The drawing above shows how I used tongue and dado joinery to connect the top and bottom to the sides. Cleats at the top and bottom of the case add strength to the joints. The addition of the beadboard back and corner brackets make the case rock-solid and attractive.

To round out the case, you'll add a pair of magnetic door catches and a couple of dart holders to keep your darts ready for competition.

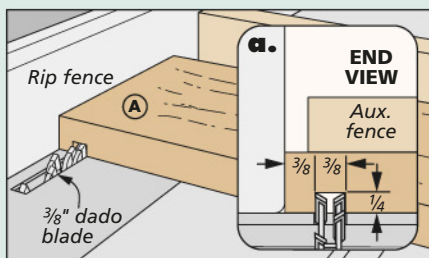
SIDES. After cutting the sides to final size, the next step is to cut a pair of dados that will hold the tongues in each end of the top and bottom. The left drawing below shows how I used an auxiliary fence on the miter gauge to guide these cuts. In detail 'a,' above, you can see how the sides also need a rabbet on the rear edge to hold the back. To cut the rabbet, just install an auxiliary rip fence and bury part of the blade.

TOP & BOTTOM. Since the table saw is already set up to cut rabbets, now is

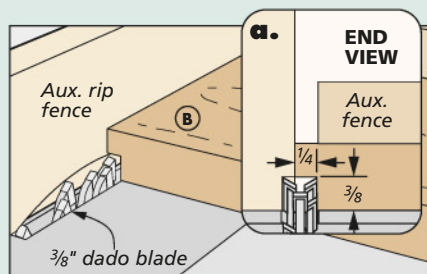
the perfect time to cut the tongues on the case top and bottom. Here again, I used the auxiliary miter gauge fence to make the cuts. The center illustration below shows how it works. Start with the blade a bit low and sneak up on the cut. Test the tongue in the dado until it's a nice, snug fit.

CLEATS. A pair of cleats help tie the case together. I used pocket hole joinery to secure the cleats. The big advantage to this type of joint is that it pulls the sides together and traps the top and bottom

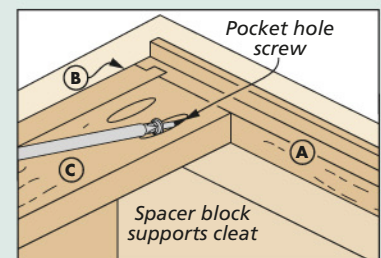
How-To: Case Joinery



Dados. With a dado blade installed and an auxiliary fence on the miter gauge, use the rip fence to locate the dados.



Tongues. Bury the dado blade in an auxiliary rip fence to cut the tongues. Sneak up on a snug fit to the dados.



Cleats. To hold the cleat in place while driving the screws, I cut a spacer block from a piece of scrap.

in the dados. On top of that, it's easy to make using a pocket hole jig. The right drawing at the bottom of the opposite page also shows the spacer block I used to hold the cleat in position while I drove the screws.

BACK. Now you're ready to cut the beadboard back to fit. But before you make any cuts, take a minute to lay out the size and center the beadboard. This will give you a much nicer look in the finished cabinet. With that done, you can attach the back using a few screws for now. (You'll paint it later, before the final installation.)

CORNER BRACKETS. Four corner brackets strengthen the cabinet and add a pleasant decorative accent. The pattern at right provides all the details you need to make the brackets.

The important thing to keep in mind is the grain direction. The grain should run the length of the bracket. The drawings below show what I mean and walk you through the process of cutting and shaping the brackets.

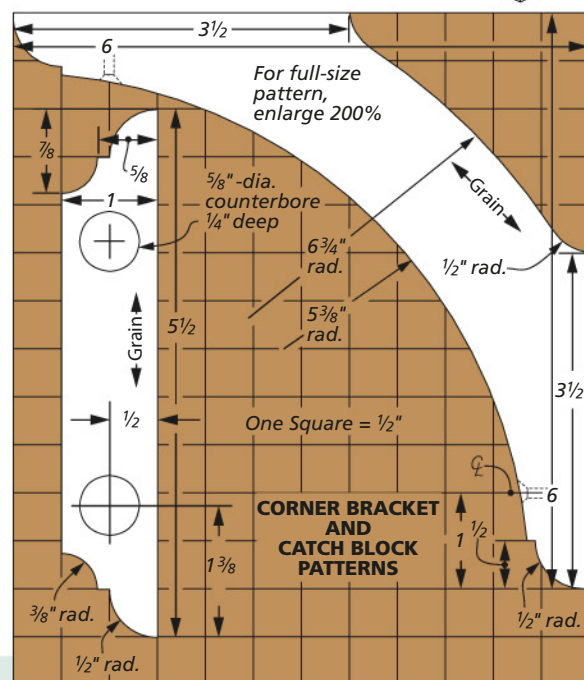
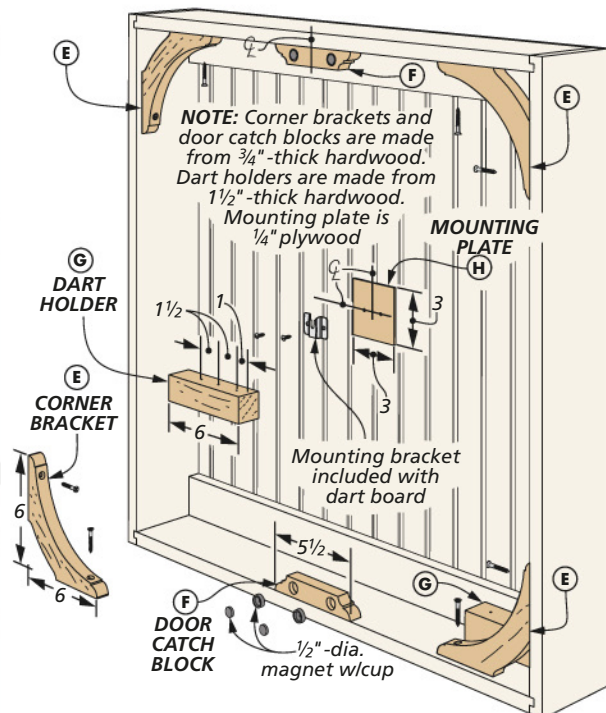
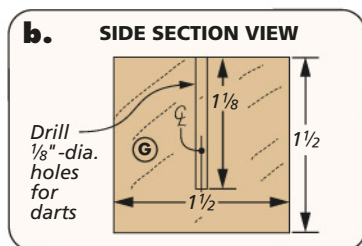
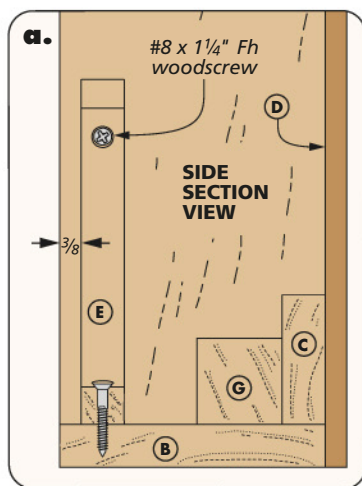
Finish them up by drilling countersunk screw holes at the locations shown in the pattern. Now you can install the brackets with screws and glue. Once again, I placed a spacer block behind them while I drove the screws.

DOOR CATCH BLOCKS. You'll also find the pattern for the door catches at right. As before, cut and sand them to final shape. Then drill the holes for the magnets. The

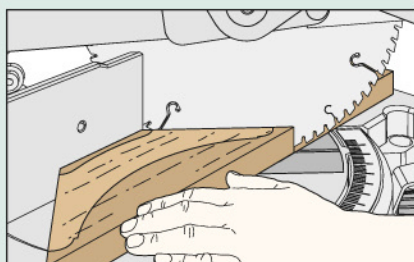
catches are glued in place, and positioned flush with the front edge of the case.

DART HOLDERS. I glued up narrow stock to make the 1½"-thick dart holders. After that, just cut them to final size and drill holes for the points of your darts (detail 'b').

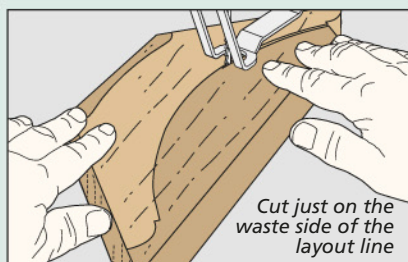
MOUNTING PLATE. Now, add the mounting plate. It provides a base for the metal bracket that comes with the dartboard. Center it on the back and glue it in place.



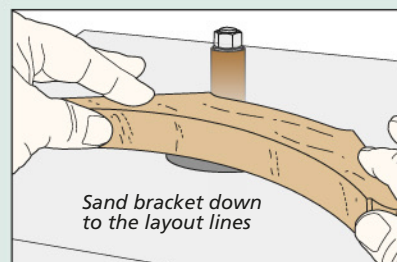
How-To: Shape the Brackets



Start with the Miters. After tracing the pattern for the bracket on an oversize blank, miter both ends.



Cut Out the Shape. You can cut out the shape of the brackets using a scroll saw, jig saw, or band saw.



Sanding. A spindle sander works great for removing the saw marks and cleaning up the edges of the brackets.

Completing the Cabinet

After assembling the basic case, the next step is to add a pair of frame and panel doors. I used simple stub tenon and groove joinery to build the doors.

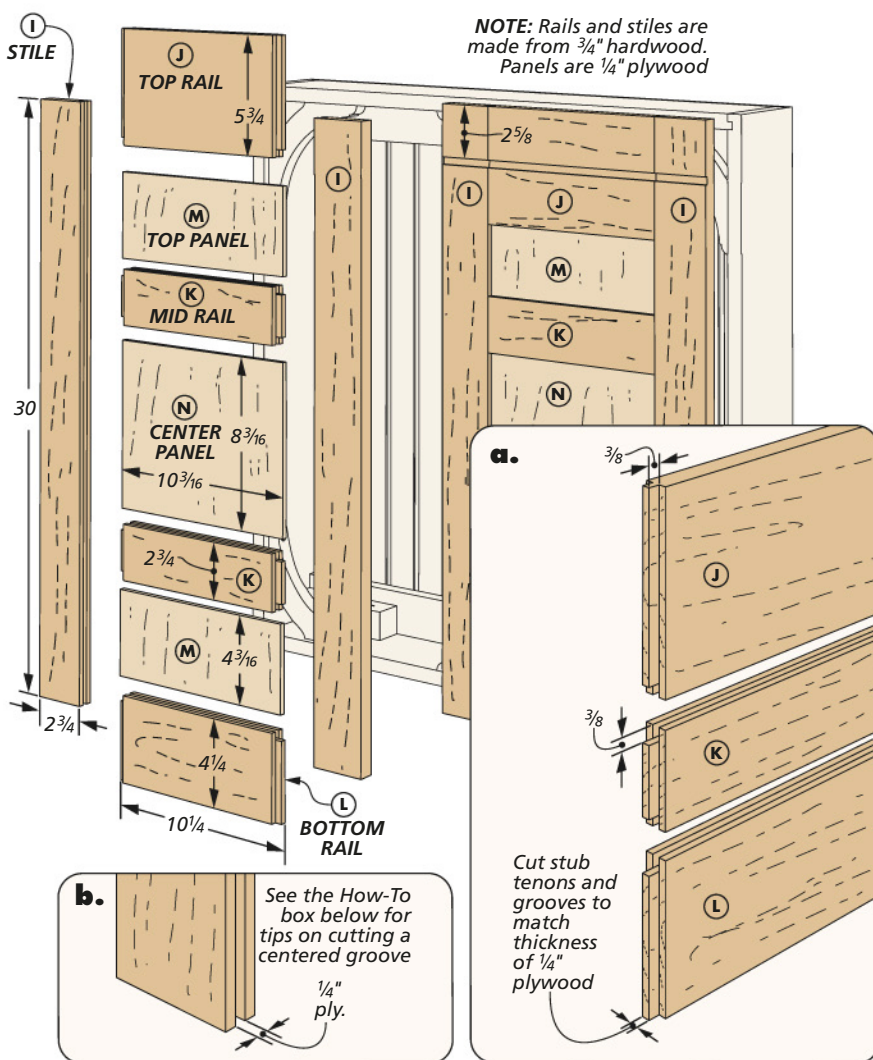
On the inside, I installed a scoreboard on each door with a chalk tray below. Then it's just a matter of adding some moldings, and the cabinet will be ready to install.

DOORS. I started by cutting the stiles and the rails to final size. Then you'll add a groove on the inside edge of each piece. Note that the mid rails have a groove on both edges.

The box below shows how to cut the grooves and stub tenons for the door parts. Each door also requires three plywood panels.

ASSEMBLY. Now you can assemble the doors. When the glue dries, take the doors back to the table saw and cut the groove along the front face that holds the bead molding. The right drawing below has the details.

MOLDINGS. I used a commercially available cove molding at the top of each door. (Refer to Sources at Woodsmithspecials.com.) The rest of the moldings are shop made. The left and center drawings at the bottom of the opposite page show you how to make them. There's no mitering necessary. Just cut each piece to fit the door and install them with glue and screws.

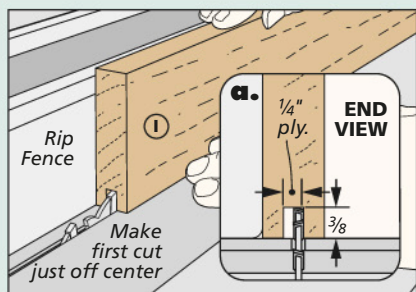


SCOREBOARDS. It wouldn't be much of a cabinet if it didn't include a scoreboard. I put one on each door because they're so easy to make. They're just hardboard sprayed with a chalkboard paint. The

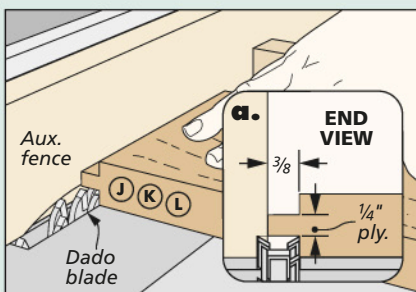
bonus article online covers the process of painting and adding the numbers.

CHALK TRAYS. A handy chalk tray gets mounted under each scoreboard. The right drawing below illustrates how I

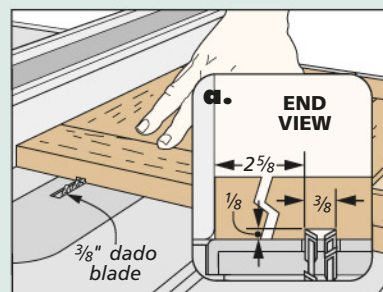
How-To: Door Frame Parts



Groove. To cut the centered grooves, make the first cut, then flip the workpiece and make the second cut.



Tongues. Bury a wide dado blade in an auxiliary fence to cut the tongues. Sneak up on a snug fit to the grooves.



Molding Channel. Use a dado blade and the rip fence to cut the shallow groove for the bead molding.

used a couple of stop blocks to “drop in” the blank and rout the shallow, centered recess in each. The blocks not only limit the length of cut, but they allow you to keep your hands well out of the way during the process.

Finally, another small piece of cove molding fits under the chalk trays. To give the molding a more finished look, I mitered a small return for each end.

Once you’ve attached the chalk tray and molding to the painted scoreboard, you can mount the board on the door. For this, I used small screws and finish washers.

MAGNETS & WASHERS. You can now drill screw holes in the doors to hold the magnetic washers as shown in the main drawing. The washers work with the magnets in the door catch blocks.

Detail ‘a’ shows the position for the washers I installed on the upper outside edge of both doors. Magnets mounted in the case sides hold the doors open when the dartboard is in use.

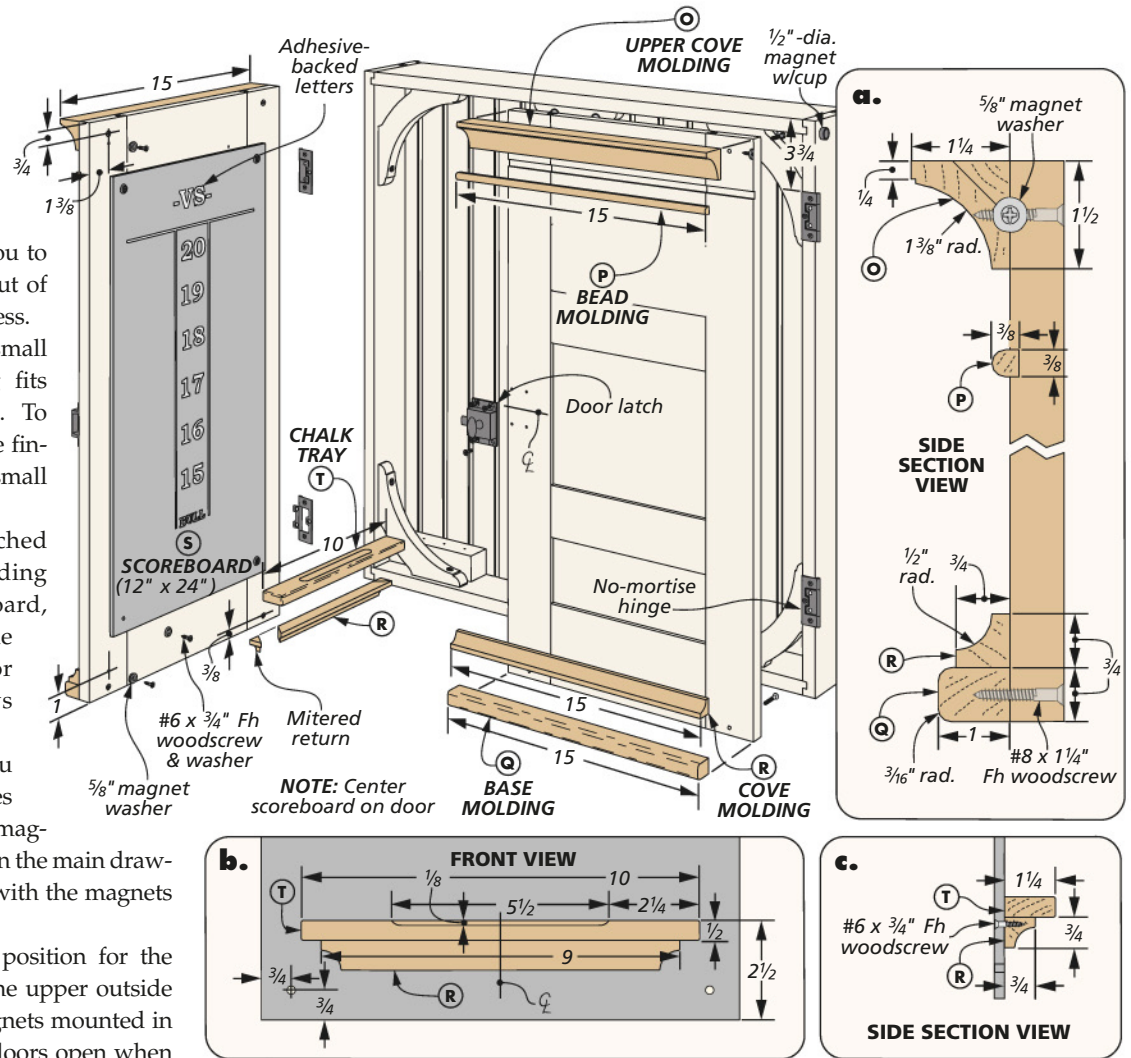
I used no-mortise hinges to hang the doors. There’s nothing tough about installing these hinges. Just lay out the position on the cabinet sides and attach the hinges with screws. Put the door in

position with shims to give it an even gap all around them. Then screw the hinge to the door.

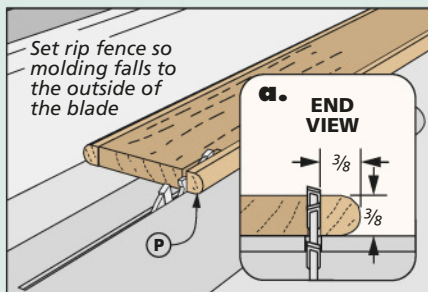
After hanging the doors, I installed the latch with screws. Now, you can paint the

beadboard back and screw it in place.

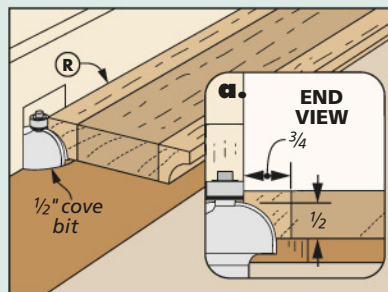
I finished the cabinet with a dark stain and a couple of coats of spray lacquer. When you’re done, just hang the cabinet and mount the dartboard.



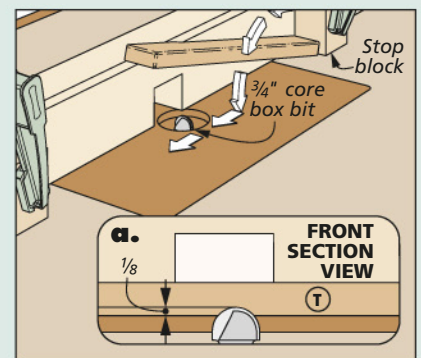
How-To: Door Moldings & Chalk Trays



Bead Molding. Rout the bead profile on an extra-wide blank. Then rip the strips of molding free at the table saw.



Cove Molding. With a cove bit in the router table, rout the molding in two passes to avoid tearout.



Chalk Trays. Clamp stop blocks to the fence to limit the length of cut and lower the workpiece onto the bit.



Quilt Rack

An heirloom quilt is a work of art and deserves to be displayed. Show off your cherished quilt for everyone to see with this beautiful quilt rack.

An heirloom quilt is a cherished possession that can really brighten up a room. And the rack that displays it should reflect a level of craftsmanship that measures up to the skill and time required to make the quilt.

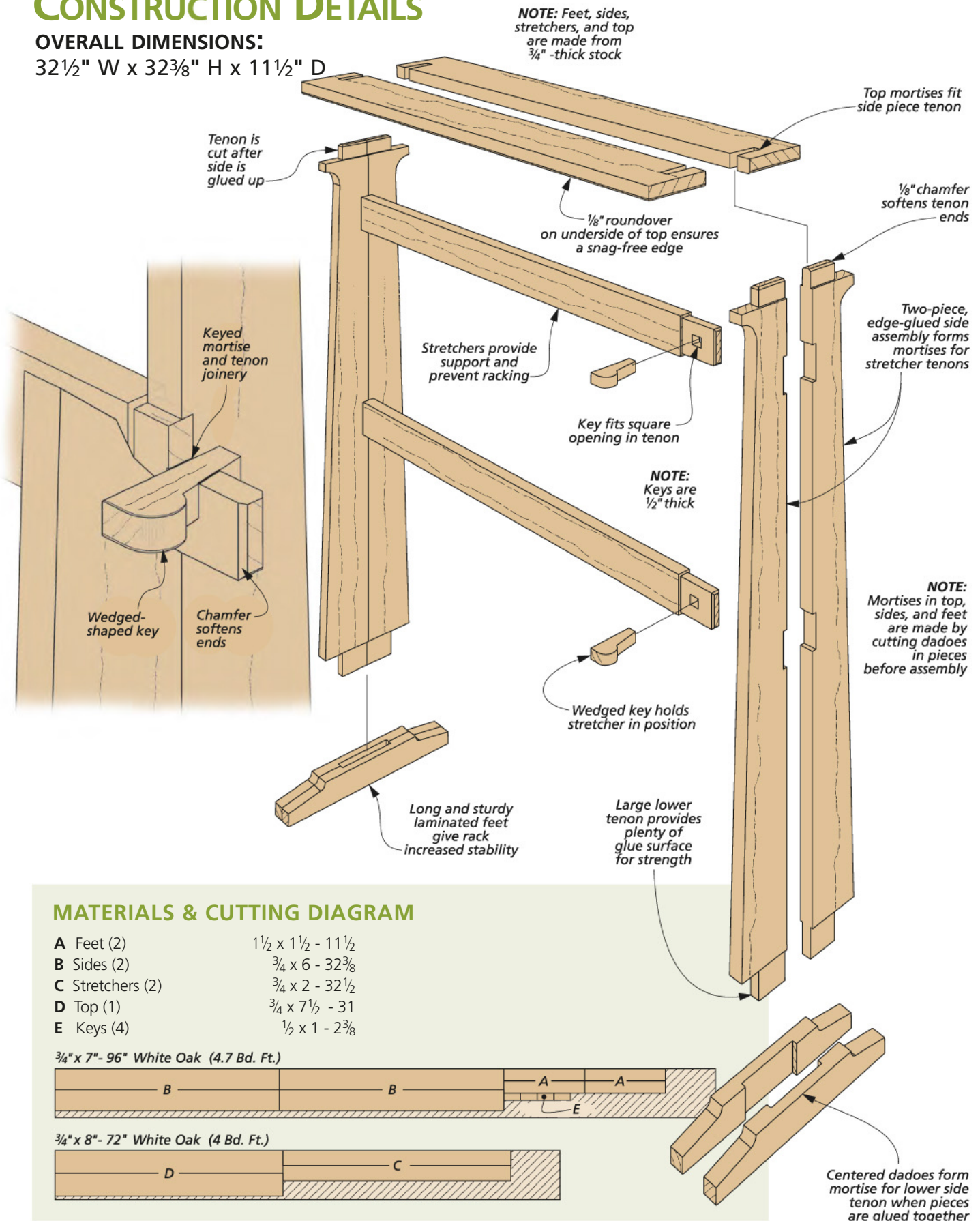
The quilt rack you see above provides the solution. Its Craftsman-style design complements the heirloom quality

of the quilt, and it's sturdy enough to display a quilt of any size. The mortise and tenon joinery provides strength and stability. And keys wedged into square holes at the ends of the stretchers add an interesting look. It's a great project that goes together quickly. Best of all, you'll be able to cut all the mortises and tenons at your table saw.

CONSTRUCTION DETAILS

OVERALL DIMENSIONS:

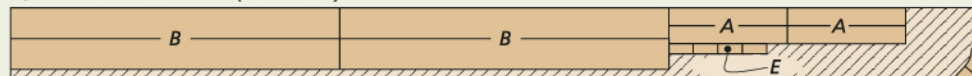
32½" W x 32⅜" H x 11½" D



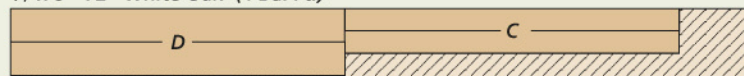
MATERIALS & CUTTING DIAGRAM

A Feet (2)	1½ x 1½ - 11½
B Sides (2)	¾ x 6 - 32⅜
C Stretchers (2)	¾ x 2 - 32½
D Top (1)	¾ x 7½ - 31
E Keys (4)	½ x 1 - 2⅜

¾" x 7" - 96" White Oak (4.7 Bd. Ft.)



¾" x 8" - 72" White Oak (4 Bd. Ft.)



Build the Sides & Feet

I began building the quilt rack by making the side assemblies. Each one consists of two parts — a side and a foot. Mortises for connecting the stretchers, top, and feet are made by cutting dadoes in the pieces before assembly.

FOOT. Each foot is made from two pieces of $\frac{3}{4}$ " stock. A dado in each piece forms a mortise for the lower side piece tenon when they're glued together. Begin by setting your table saw dado blade to make a wide cut. Then center a dado through each piece, as shown in the box below.

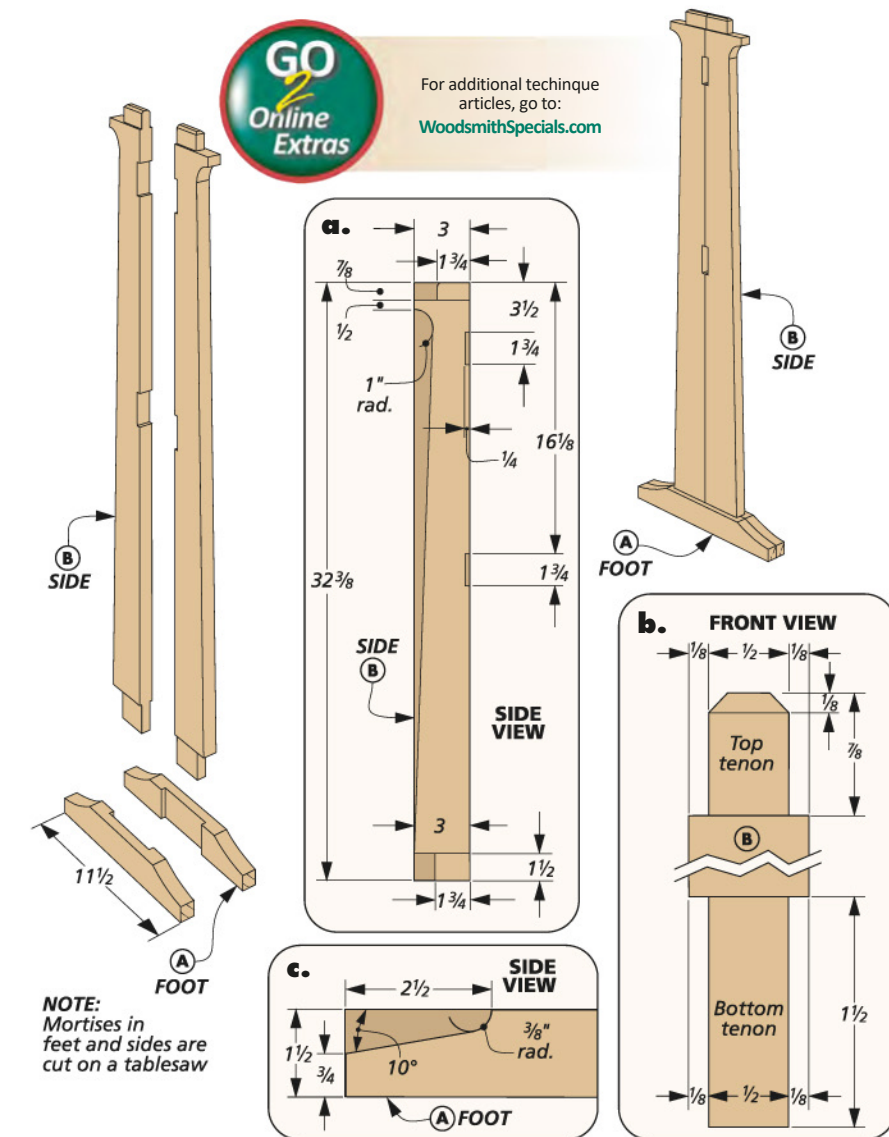
After cutting the dadoes, I used a spacer block sized to fit the dado, like you see in the photo below, to help keep the parts in alignment during glueup and clamping.

Finally, a trip to the band saw is all it takes to cut the feet to final shape (detail 'c'). With both feet completed, you're now ready to move on to the sides.

BUILD THE SIDES. The sides of the quilt rack are made by simply gluing two long pieces of stock together. But before you glue them up, you'll need to cut a couple of mortises to hold the stretchers you'll build later.

You can make the mortises in the sides in the same way you cut the mortises for the feet. Simply turn the workpiece on edge and use your dado blade to cut notches on each of the side pieces.

END TENONS. After gluing the side pieces together, you'll need to cut a tenon at each



end (detail 'a' and 'b'). The box on the next page shows you how this is done.

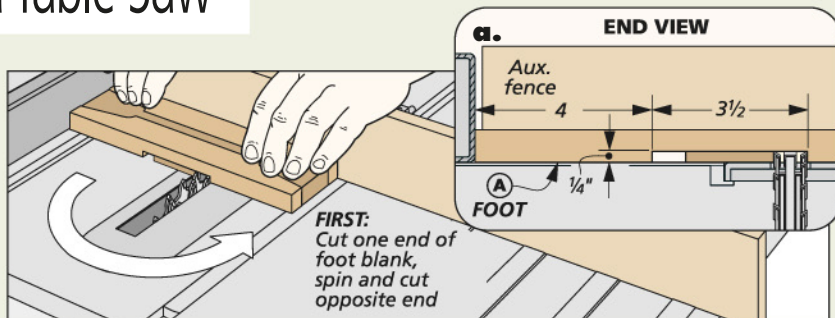
Finally, cut the sides to rough shape, leaving the layout line. Then all that's left

is to make a template and use a flush trim bit to trim each side to final size. You can find this handy technique in the box at the bottom of the next page.

How-To: Mortises on a Table Saw



Mortise Spacer. A spacer block sized to fit each mortise helps maintain alignment of the mortises when the pieces are glued and clamped together.



Centered Mortise. Use a wide dado blade to cut the foot mortise. Just set the depth of the cut and position the rip fence to make the first pass. Then just flip the blank, make a second pass, and then remove the waste in between.

Complete the Rack

With the sides completed, you're now ready to build the stretchers. The stretchers are one of the most interesting parts of the quilt rack. A tenon on each end has a square opening to accept a hardwood key. The key locks the stretcher in the mortise to hold the rack together.

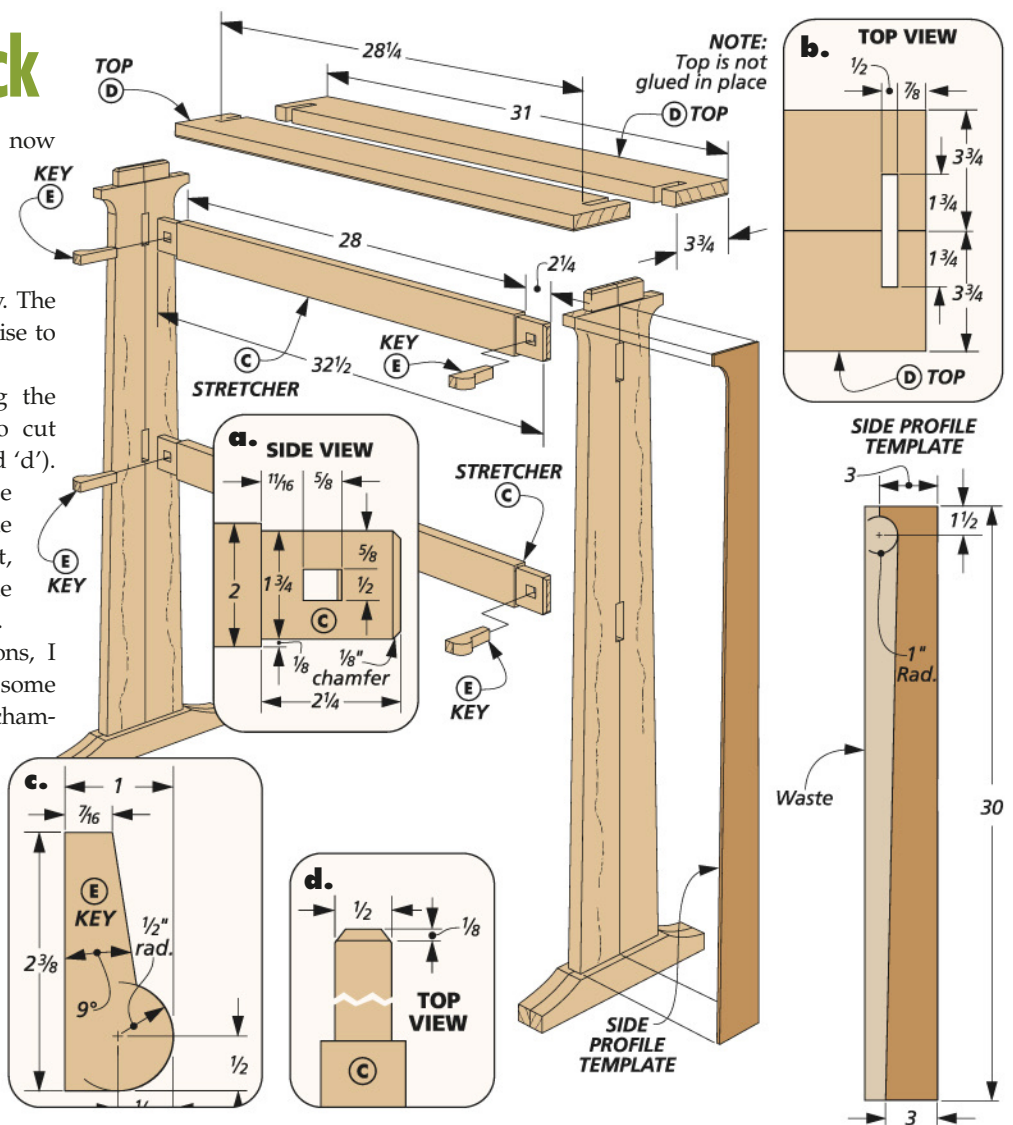
MAKE THE STRETCHERS. After cutting the stretchers to size, you'll need to cut tenons on each end (details 'a' and 'd'). Again, I used a wide dado blade setup to cut the tenons on my table saw. Just set your blade height, position the rip fence, and cut the shoulders and cheeks of the tenon.

To soften the ends of the tenons, I chamfered the edges. You'll find some handy techniques for cutting these chamfers on Woodsmithspecials.com.

Next, square an opening in the tenon to accept a key (detail 'a'). You'll also need to make keys to wedge into the tenons (detail 'c'). It's a good idea to take a little time here to make sure the hole is tapered to match the key. You can learn more about making these tenons and the keys by checking out Woodsmithspecials.com.

THE TOP. The last thing left to do is add a top to the rack. It has mortises similar to those on the sides to accept the upper side tenons.

You can make the top in much the same way you built the sides. You'll need to locate a notch in each top piece as shown

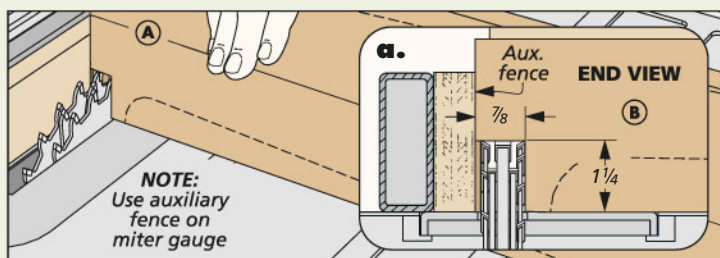


in the drawing and detail 'b' above. I used the same technique for cutting these mortises that I used in making the side pieces.

After gluing the pieces together I routed an 1/8" roundover along the bottom

edge for a snag-free edge. After applying a finish you can assemble the rack. Begin with the feet and sides. Then insert the stretchers and keys, add the top, and it's ready to display a quilt.

How-To: Tenons on a Table Saw



Side Tenons. After setting the dado blade to the correct height, turn the workpiece on edge. Then use the miter gauge and an auxiliary fence to keep the workpiece aligned for the cut.



Template Trim. After the side piece is cut to rough size, you can use a template and your router with a pattern bit to trim the piece to a smooth final shape.

Display Cabinet

The clean lines, quartersawn oak, and glass panels in this project will put your valuables (and your craftsmanship) in the best possible light.

What sets this display cabinet apart from other Craftsman projects I've built is clear—it's the glass. To allow you to see what's stored inside, this cabinet has beveled glass panels in the doors and on each end. Even the shelves are made out of glass so you can see clearly from top to bottom.

Glass doesn't make a project any harder to build. But large panels of glass are heavy, and I wanted to be sure these had plenty of support. This meant building strong, sturdy frames. Nothing tricky, just traditional mortise and tenon joinery to connect the frames. And a simple rabbet to hold the glass.

Once the four case frames are complete, they have to be assembled into a single unit. Here, I tried a "new" technique to hide the joint lines between the frames. I cut deep rabbets in the front and back frames to hold the ends. Then to camouflage the joint line, a chamfer is routed down the edge.

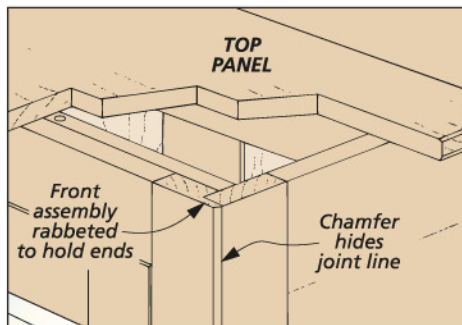
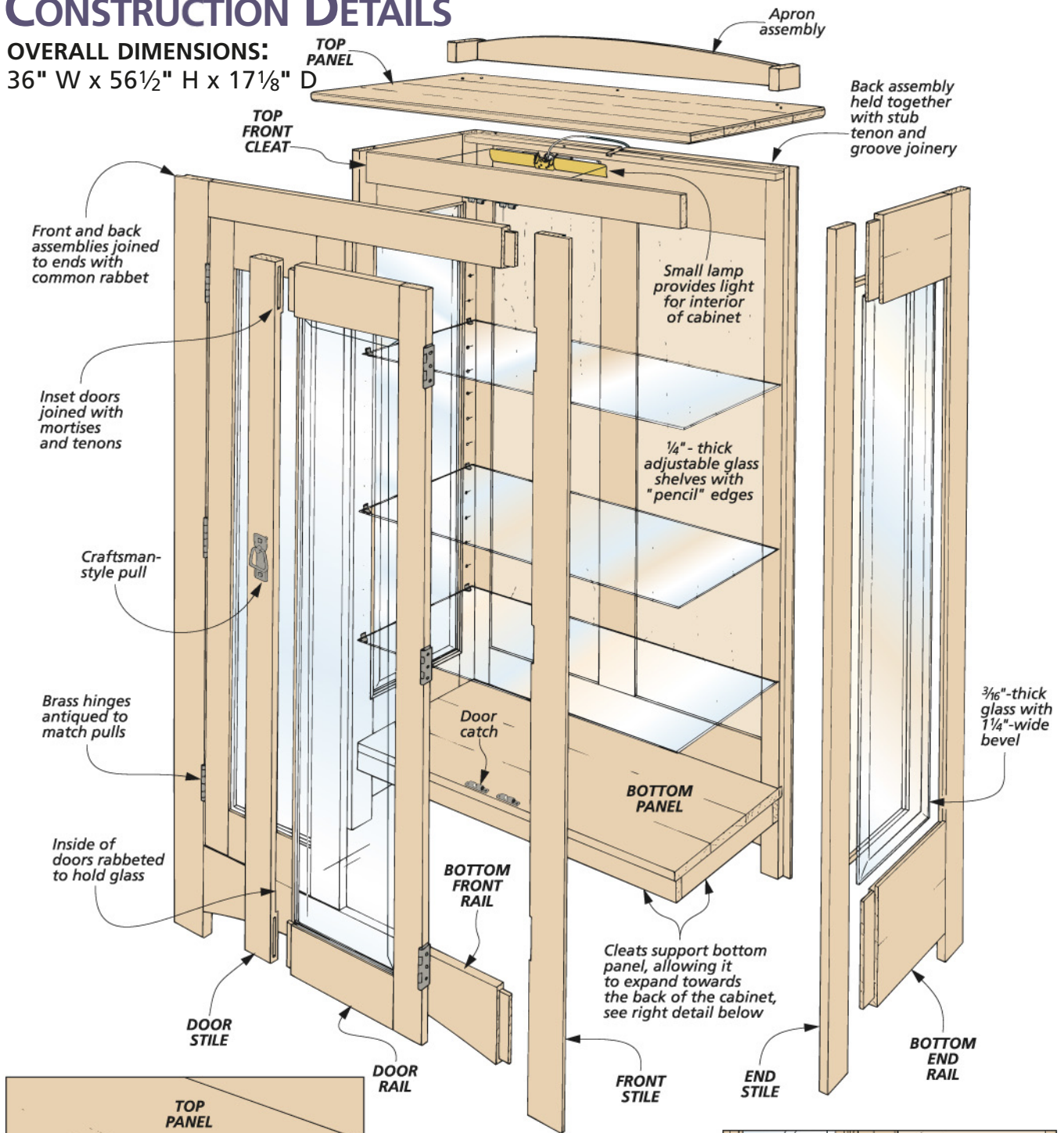
It's a small detail and one only a woodworker would notice. But it's another feature that makes this curio cabinet as worthy of attention as the display items inside.



CONSTRUCTION DETAILS

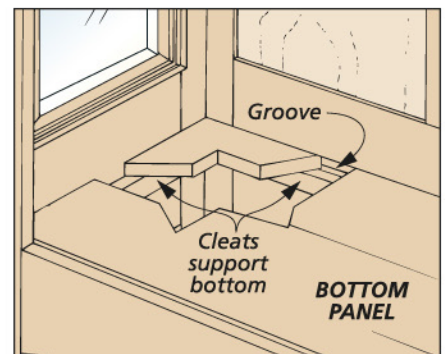
OVERALL DIMENSIONS:

36" W x 56½" H x 17⅛" D



Rabbet Joinery. Each corner of the cabinet is joined with a common rabbet. And the joint line is hidden with a small chamfer.

NOTE: Cabinet built with ¾"-thick quartersawn white oak and two ¼" oak plywood panels



Expansion. A solid wood panel has to be able to expand and contract. The bottom panel here expands into a groove in the back assembly.

End & Front Frames

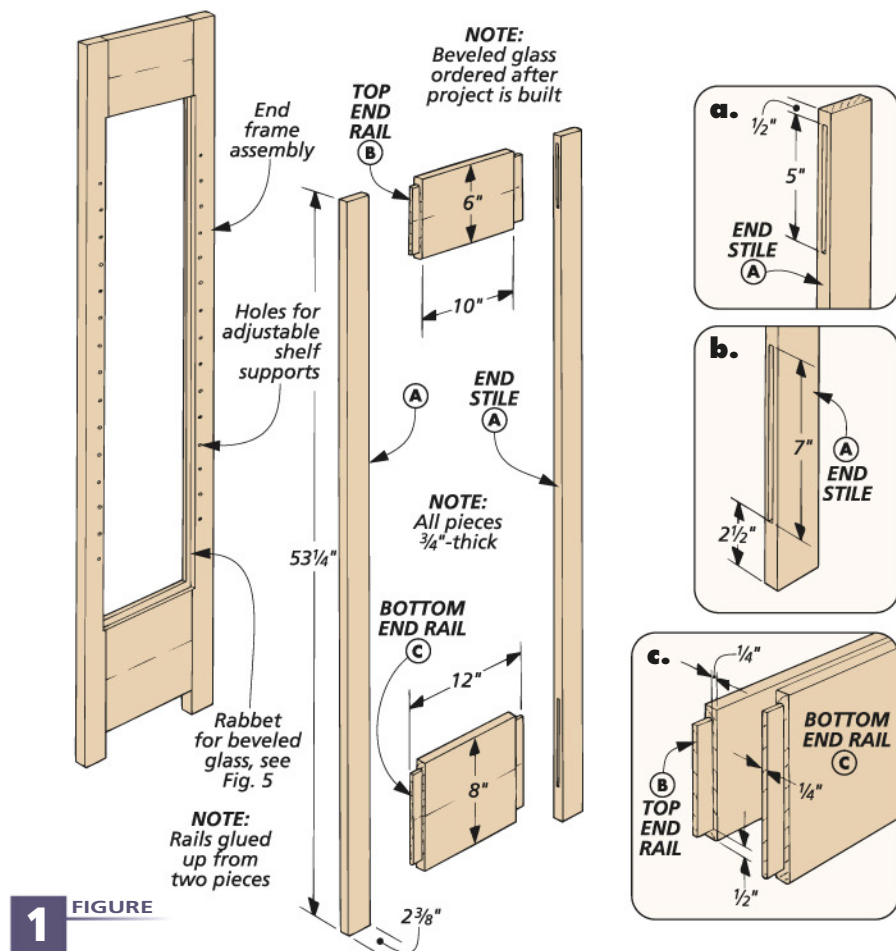
The case of this curio cabinet is made up of four frame assemblies. I built the two frames for the ends first and then worked on another one for the front. (The last assembly will be the back of the case that's added later.)

ENDS. To make the end frames, I started by cutting the end stiles (A) to size, as shown in Fig. 1. The top end rails (B) and bottom end rails (C) are glued up from two narrow pieces so there's less chance they'll warp with changes in humidity. But first let me mention something about gluing up quartersawn oak.

Quartersawn oak, which was often used in Craftsman furniture, is red or white oak that's milled so its faces end up with patterns of flecks or rays. So if you're gluing pieces together (like the rails here), you'll want to pay extra attention to how the patterns look next to each other.

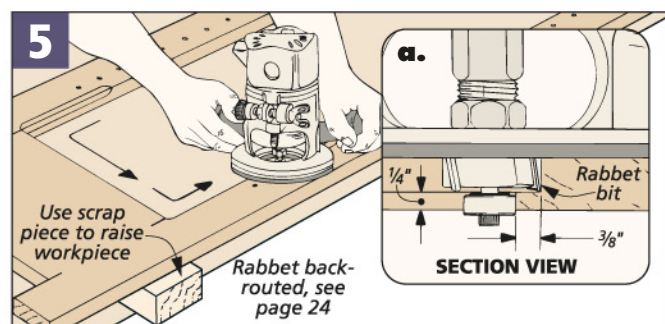
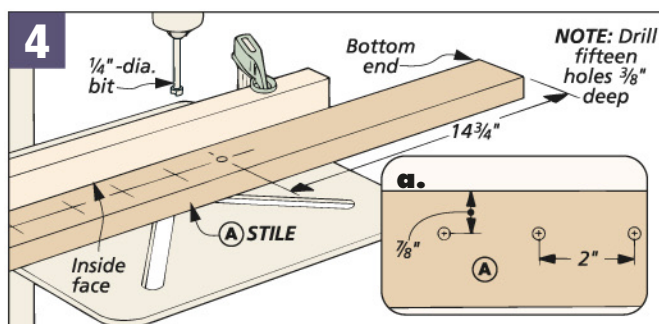
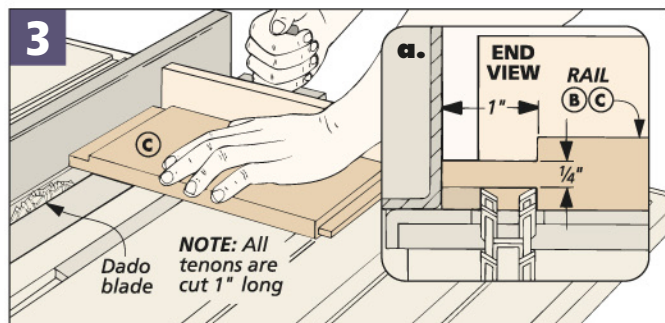
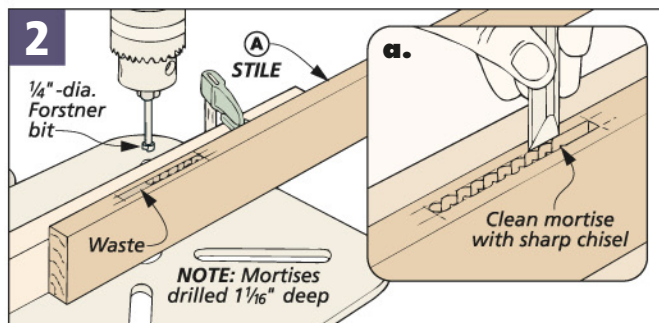
MORTISES. The stiles and rails are joined with traditional mortises and tenons. I began with the mortises in the stiles, roughing them out with overlapping holes, as in Fig. 2. And to make sure the tenons won't bottom out in the mortises, I like to drill the mortise holes slightly deeper than the length of the tenons (which will be 1" in this case).

TENONS. After cleaning up the mortises with a sharp chisel (Fig. 2a), I cut the ten-



ons on the ends of the rails to fit the mortises, as shown in Fig. 3. To do this, I laid the pieces down on the table saw to cut the tenons, but this would also be a good chance to try your hand at cutting tenons

with the bandsaw, as described in the article on WoodsmithSpecials.com. **ADJUSTABLE SHELVES.** Before gluing the end pieces into frames, you'll want to drill a series of holes in each stile for some adjustable shelf supports, as shown in Fig. 4. Just



be sure to lay them out very carefully so your shelves will end up level.

Now the end frames can be glued together. There's nothing particularly tricky here. The important thing is to check that the frames are flat. (The pressure of the clamps can actually put a twist into the frame.)

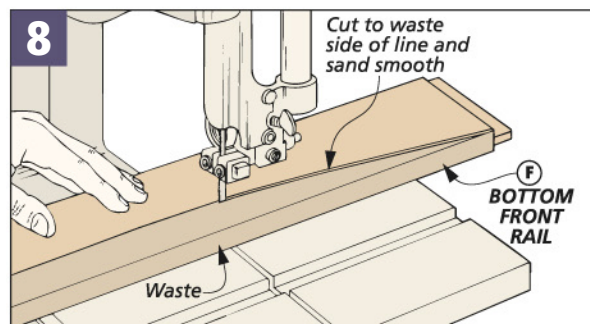
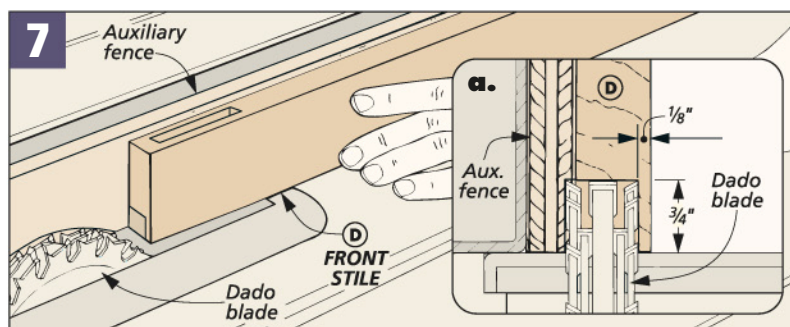
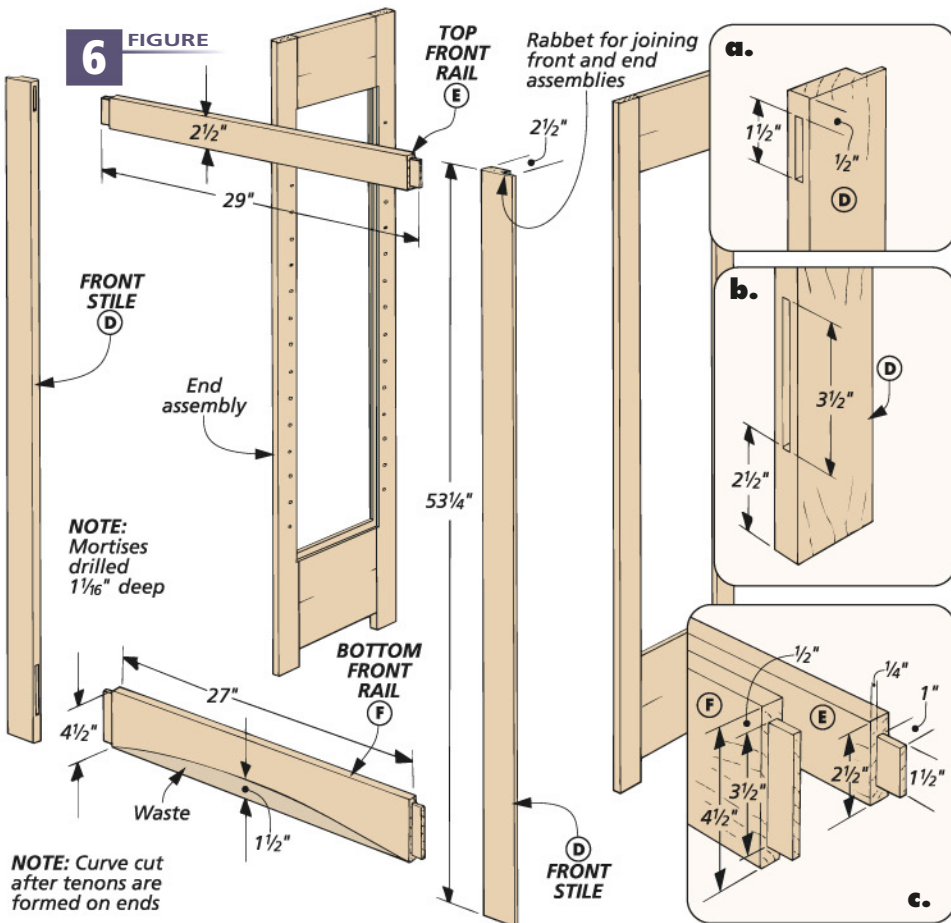
To complete the end assemblies, the last thing to do is rout a rabbet around the inside edge of the frame to hold the glass (Fig. 5). This is a fairly deep rabbet that will require several passes, and I was worried about chipout. So I "back-routed" most of these passes using a hand-held router. Then the corners were squared up with a chisel.

FRONT ASSEMBLY PIECES. Now that the end assemblies are complete, I began work on the front frame, see Fig. 6.

After the front stiles (D), top front rail (E) and bottom front rail (F) are cut to size, you can cut the mortises and tenons that hold them together, as shown in Figs. 6a, 6b, and 6c. There's nothing new here. The techniques are identical to the ones used on the end frames earlier, refer to Figs. 2 and 3.

However, there are still a couple things to do before the front frame can be glued together. First, rabbets are cut on the outside edges of the stiles. These create thin lips that will wrap around the front edges of the front of the end frames. (I'll talk more about this corner joint later on.) To end up with the smoothest gluing surface, I cut the rabbets on the table saw with the stiles standing on edge, as you can see in Fig. 7.

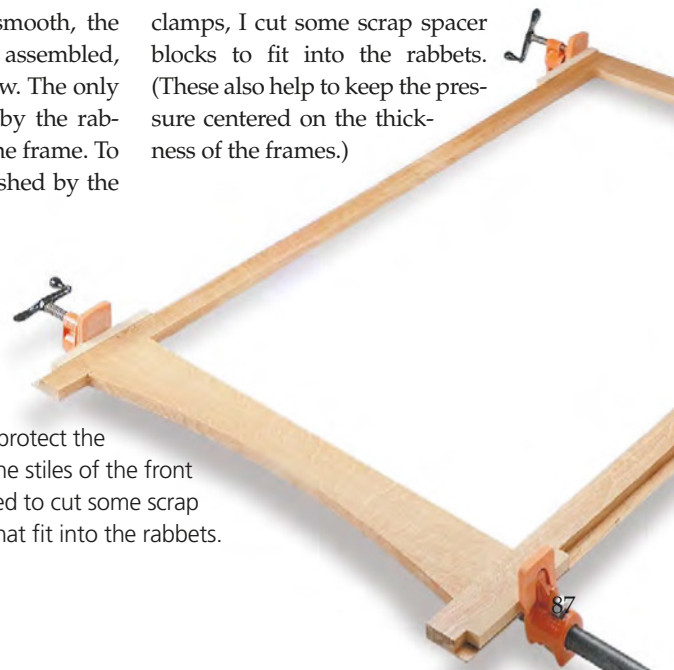
CUT CURVE. Next, I grabbed the bottom front rail and laid out the gentle curve on its bottom edge. To do this, I flexed a scrap piece of $\frac{1}{8}$ " hardboard against a couple nails. Then the curve can be cut with a band saw (Fig. 8) or a sabre saw.



After sanding this curve smooth, the front pieces are ready to be assembled, like you see in the photo below. The only problem is the thin lips left by the rabbets on the outside edges of the frame. To prevent them from being crushed by the

clamps, I cut some scrap spacer blocks to fit into the rabbets. (These also help to keep the pressure centered on the thickness of the frames.)

Dent-Free. To protect the fragile lips on the stiles of the front frame, you need to cut some scrap spacer blocks that fit into the rabbets.





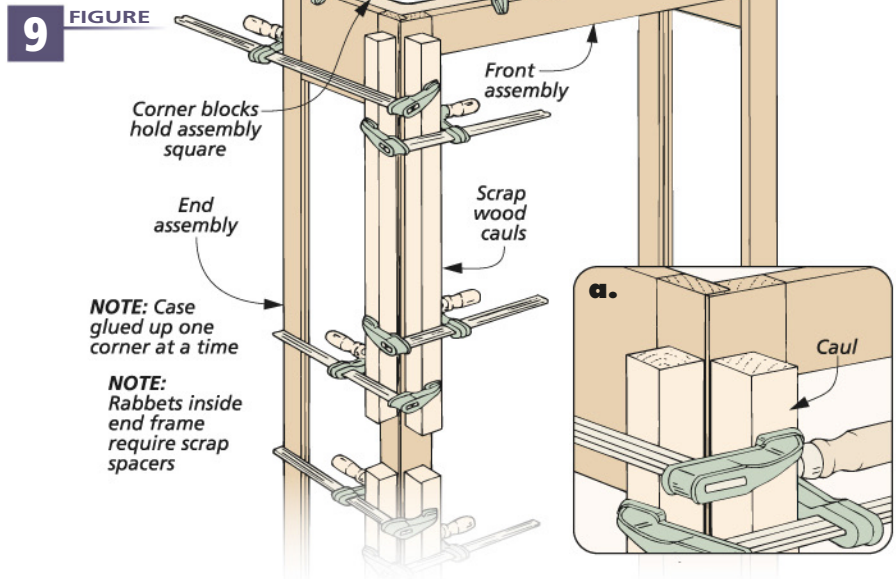
Even Pressure. Shop-made corner blocks hold each corner square, while cauls spread out the clamping pressure.

Bottom & Back Frame

Cutting the rabbets for joining the front and end frames was easy. The challenge now is to glue these tall frames together so there's a tight joint line and so the case is square. So even though I assembled one corner at a time, I also made a few "helpers," which you can see in Fig. 9.

CORNER BLOCKS. First, I cut a pair of corner blocks from scrap plywood. They held the frames square as I positioned the clamps, as shown in the photo. Plus they kept the assembly square as I tightened the clamps down.

CAULS. But I didn't place the clamps directly against the frames. I would've needed a truckload of clamps to pull the thin lip tight against the end frame. Instead, I spread out the clamping pressure by inserting cauls between the clamps and frames (Fig. 9). You may still need an additional clamp or two to close up some stubborn gaps, but you'd be surprised at how much the cauls help.



BOTTOM PANEL. When both corners were glued together, I glued up a bottom (G) and cut the panel to length to fit between the end frames (Fig. 10). What's a bit unusual is that the panel is ripped $\frac{1}{2}$ " narrower than the depth of the cabinet, as you can see in Fig. 10a. (This allows room for the back assembly later.)

BOTTOM CLEATS. Next I cut $\frac{1}{2}$ "-wide bottom front (H) and end cleats (I) and drilled shank holes in them for attaching the bottom (Figs. 10a and 10b). These shank holes are oversized ($\frac{1}{4}$ ") so the bottom panel will be able to expand and contract with changes in humidity.

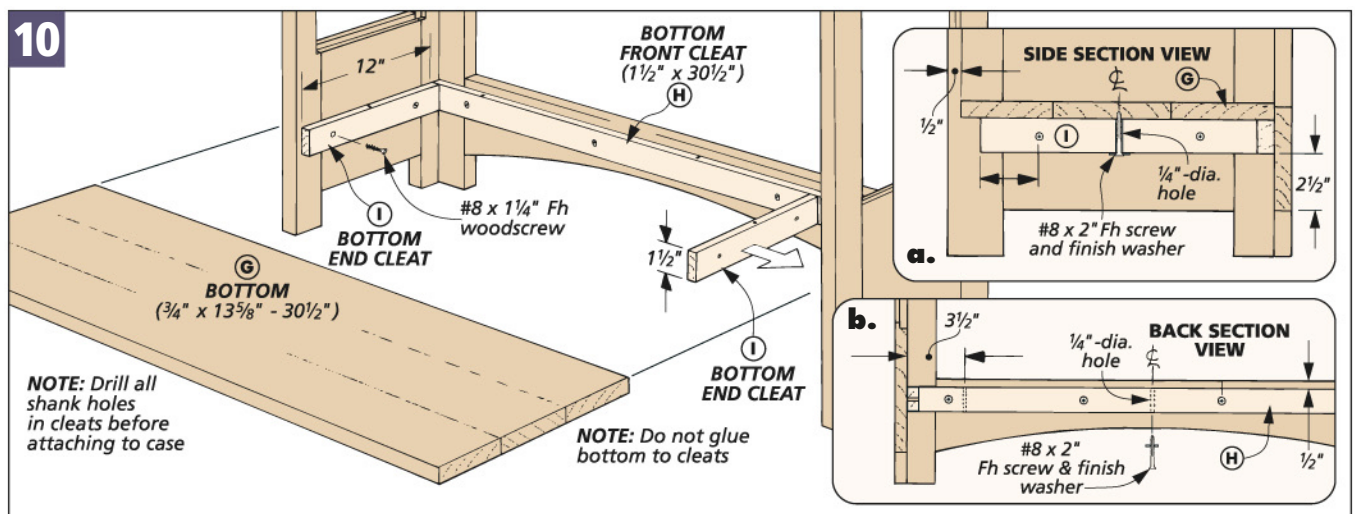
When gluing and screwing the cleats to the case, I positioned them $\frac{1}{2}$ " below the front rail (Fig. 10b). You can see in Fig. 10a that this will put the front edge of the bottom panel $\frac{1}{4}$ " above the front rail. But that's okay. I intended the bot-

tom panel to act as a stop for the inset doors that are built later.

BACK ASSEMBLY. After the bottom is screwed to the cleats, you can begin working on the back assembly. Instead of an open frame like the other assemblies, this one has two plywood panels and a center stile (Fig. 11). And a strong and easy way to connect all these pieces is with stub tenon and groove joinery.

To begin, the back stiles (J) and center stile (K) can be cut to size, as shown in Fig. 11. But like the end frames, you'll need to glue up the wide top back rail (L) and bottom back rail (M) from two pieces.

STUB TENON & GROOVE. Once all the frame pieces have been sized, work can begin on the stub tenons and grooves. First the inside edges of all the pieces (and both edges of the center stile) get a centered groove that's sized to hold a piece of $\frac{1}{4}$ " plywood, as you



can see in Fig. 12. Then mating stub tenons can be cut on both of the rails (Figs. 11b and d) and the center stile (Fig. 11c).

PANELS & PLUGS. With the joinery complete, I dry assembled the frame pieces and cut two back panels (N) to fit into the openings (Fig. 11). Then with the frame still dry assembled, two small plugs can be cut to fit the grooves in the stiles below the bottom rails. This “locks in” the position of these rails so the assembly will be a little easier.

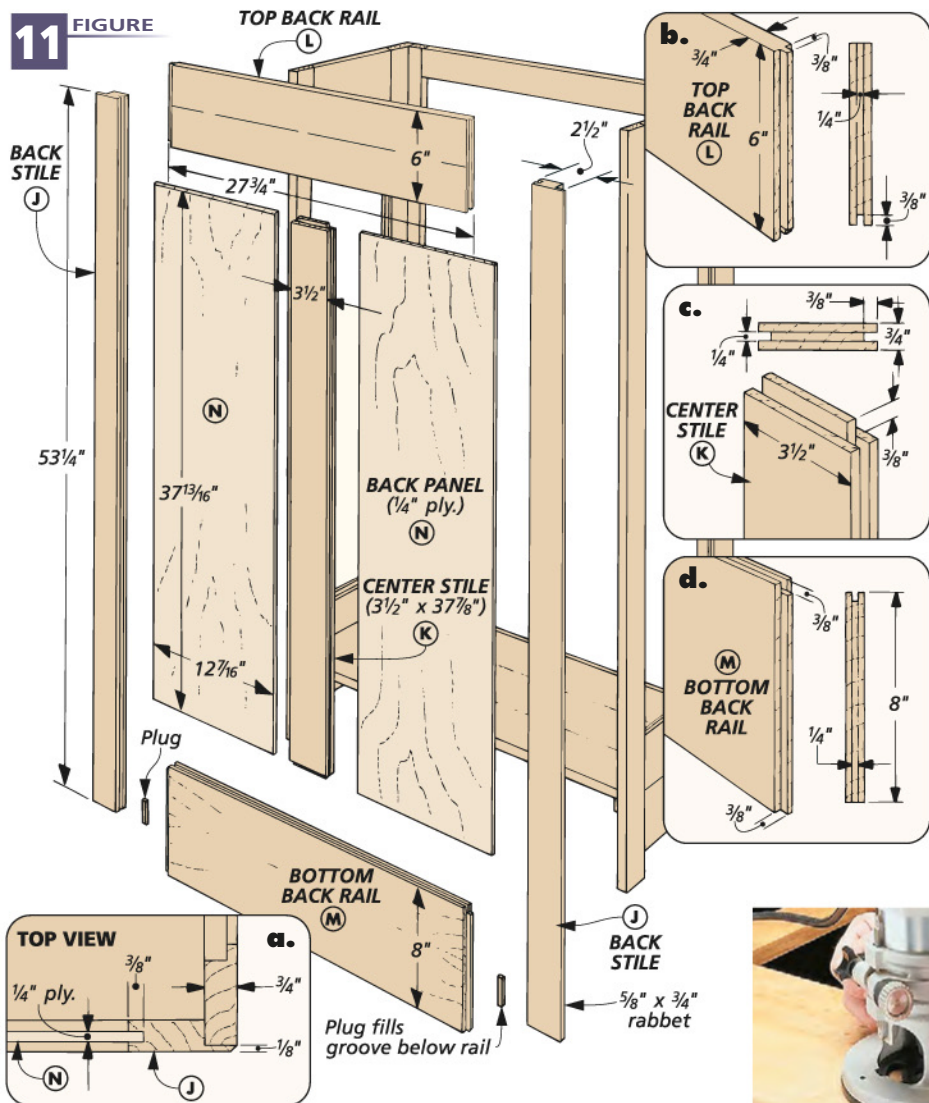
GLUE UP BACK. Now before gluing the back assembly together, the outside edges of the stiles (J) need to be rabbeted (Fig. 11a). This means that when gluing the back assembly together, you’ll need to set spacer blocks in the rabbets like you did earlier (refer to the photo on page 87).

After the back has been assembled, there’s one thing to do before it can be glued to the case. A groove needs to be cut across the assembly to fit over the bottom panel (Fig. 13). This groove won’t butt up tight against the back of the bottom panel (G), as shown in Fig. 14a. There’s a little “breathing room” so the panel can expand and contract.

ADD BACK. At this point, the back assembly can be glued to the case. I used the same cauls as before, but this time, both corners have to be glued up at the same time.

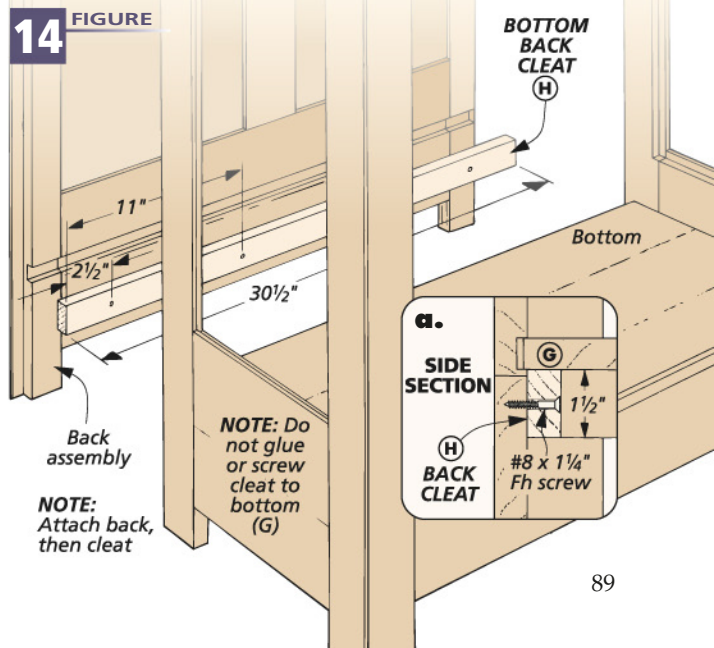
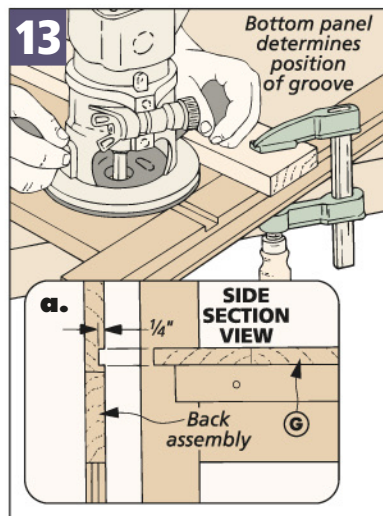
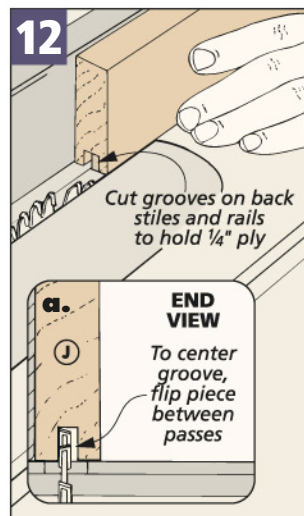
BACK CLEAT. When the glue was dry, I set the cabinet on its back and added a back cleat (H) that’s identical to the one in front. But when attaching this cleat, don’t screw it to the bottom panel. The panel has to be able to move freely.

CHAMFER. With the case still on its back, I hid the joint line at each corner with a



$\frac{1}{8}$ " chamfer, as shown in the photo. This chamfer is also routed across the ends of the corners. This is a simple detail to prevent chipout if the project is ever dragged across a floor.

Break The Edges. A small chamfer hides the joint line at each corner of the display cabinet.





Lighting. A “dual” lamp at the top of the case will put the display items in the best possible light.

Top & Apron

Now that the case has four sides and a bottom, the next logical thing to work on would be the top panel. But in order to attach the top, I had to add a couple cleats to the inside of the case. Each ended up a little different, so I worked on them one at a time.

FRONT CLEAT. I started with the top front cleat (O) first, as shown in Fig. 15. This piece does double duty. It holds the top down. And like the bottom panel, the top cleat hangs down $\frac{1}{4}$ " below the front rail (Fig. 15b) so it'll also act as a door stop.

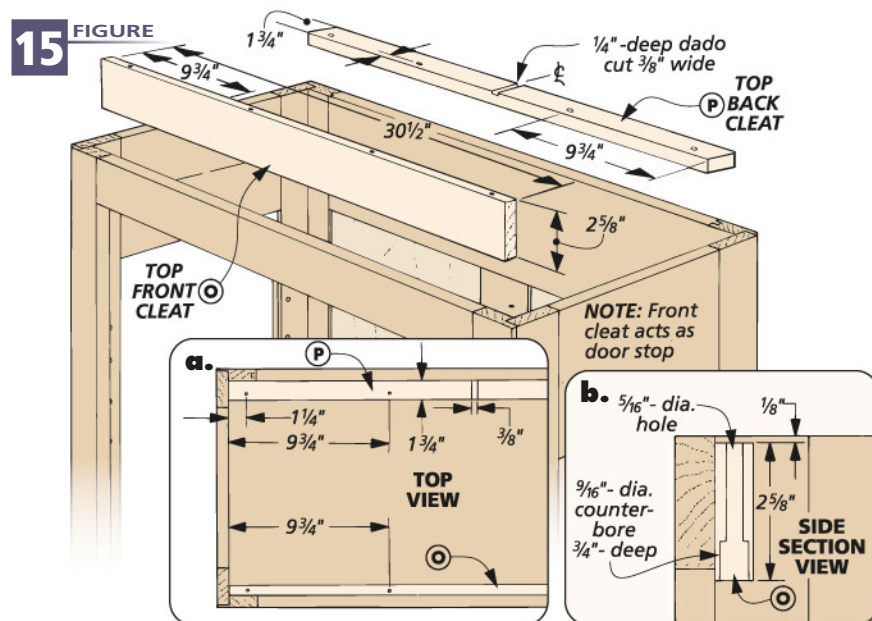
After cutting this cleat to size, I drilled counterbored shank holes in it for securing the top panel later (Fig. 15b). These holes are oversized so the panel will be able to expand and contract. In fact, the

counterbores were so large ($\frac{9}{16}$ "-dia. to hold a #8 flat washer) that I opted to drill them on the drill press. This helps avoid accidentally drilling through the face of the workpiece.

When gluing the front cleat to the case, I didn't position it flush with the top rail, as you might expect. Instead, it's set down $\frac{1}{8}$ " from the top. This way, when the top panel is added later, it's sure to be pulled down tight against the case.

BACK CLEAT. Next I added a second cleat to the back of the case. The top back cleat (P) is the same length as the front cleat, but I oriented it differently so there would be plenty of room to reach in and screw the top panel down later.

This cleat will also be set $\frac{1}{8}$ " down from the top of the case. However, if you plan on adding a lamp inside the case (as shown in the box below), you'll want to create a “channel” for feeding the cord



Dual Cabinet Lamp

With all the glass in this project, you might not think this cabinet would need any more light. But while there's plenty of light at the sides of the cabinet, I wanted to add a small source of light above the display items.

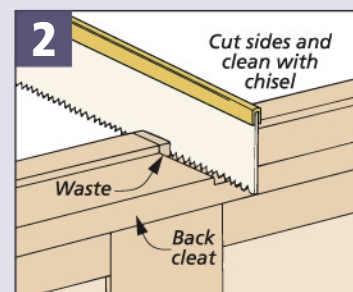
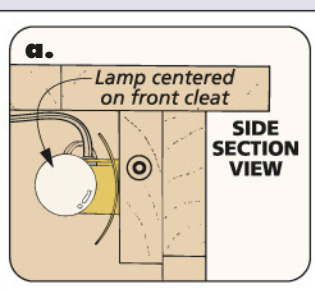
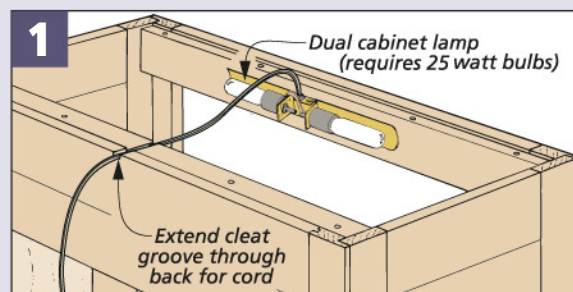
When picking out a lamp, I wanted one that was easy to install but wouldn't create a lot of heat inside the cabinet. So I chose a “dual” cabinet lamp, see the

margin photo. This lamp uses a pair of 25 watt incandescent bulbs with a “hood” over each to direct the light. And installation is easy. All you have to do is screw it to the top front cleat (O), as shown in Fig. 1 below. (It should be centered on the cleat top-to-bottom and side-to-side.)

However, you don't want to install the lamp quite yet. I drilled the mounting holes before the top was added. But

I didn't actually screw the lamp in place until after the cabinet had been finished.

The other thing before adding the top panel is to complete the “channel” for the cord. Since a dado is already cut in the back cleat (Fig. 15 above), use it as a guide and saw a kerf on each side of the dado (Fig. 2). Clean out the waste with a chisel. Note that the top will have to be removed when installing the lamp.



through the back assembly. So before gluing the cleat in place, I cut a shallow dado across its top face (Figs. 15 and 15a).

TOP. With the cleats in place, you're ready to glue up the top (Q), as shown in Fig. 16. I sized the panel to overhang the case 2" at the front and sides and $\frac{1}{8}$ " at the back (Figs. 16a and 16b). After it's cut to size, all that's left is to rout a $\frac{1}{16}$ " chamfer around the edges.

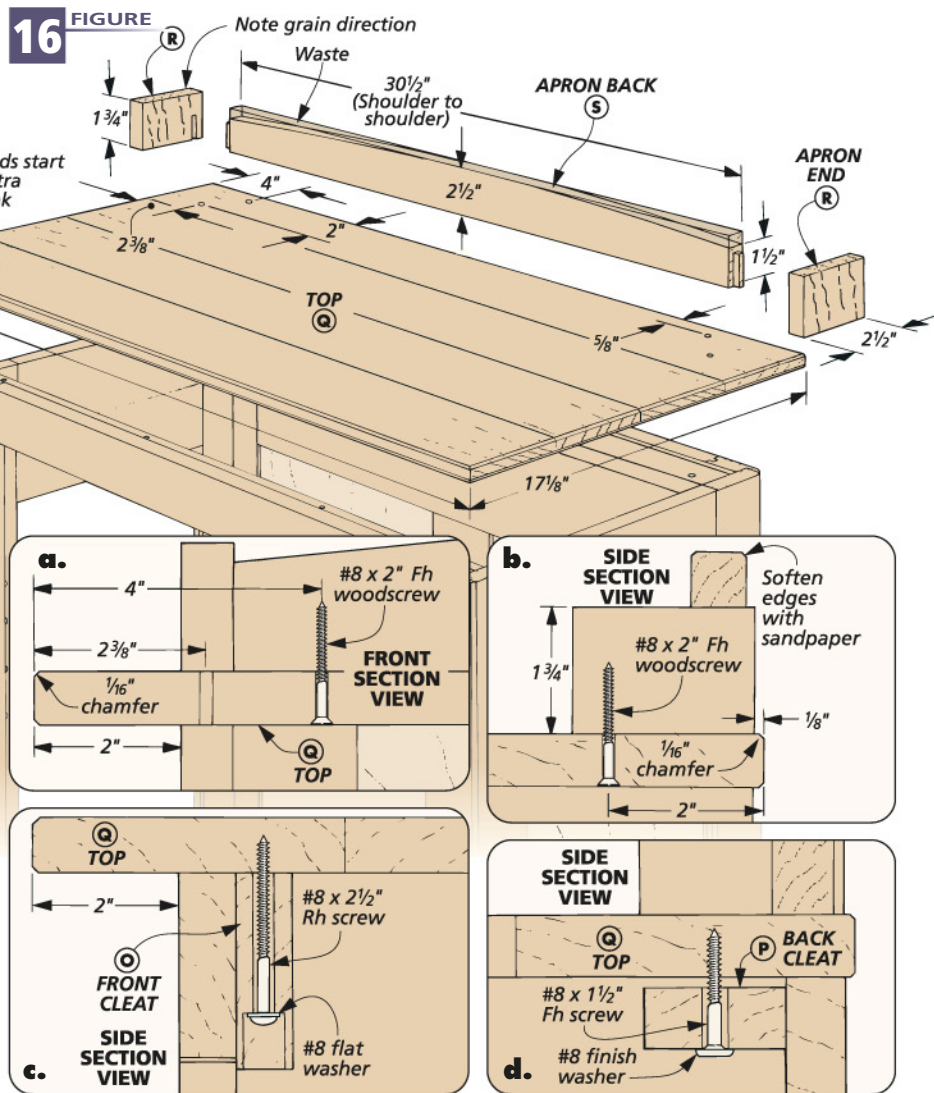
But it's not time to screw the top in place quite yet. The three-sided apron that wraps around the back of the top needs to be built and screwed to the top panel first.

APRON ENDS. To make this apron, I actually started with the apron ends (R) — the short pieces shown in Fig. 16. (I made them first because they have mortises that will hold the tenons on the apron back.)

The only thing challenging about building these end pieces is their size. They're too small to work with safely, so I started with one oversize blank. I laid out a mortise near each end and then drilled overlapping holes with the drill press, as you can see in Fig. 17. These mortises will actually be "open" on the bottom, so after squaring up one end and cleaning the sides with a chisel, the ends can be cut to final length ($1\frac{3}{4}$ ").

APRON BACK. With the ends complete, I made the longer apron back (S) that connects them. After cutting it to size, the first thing I did was cut the short tenons to fit into the mortises on the end pieces.

The unusual thing about these tenons is that because they are fitting into an open mortise there's only one large shoulder on top. So after cutting the cheeks, I set the

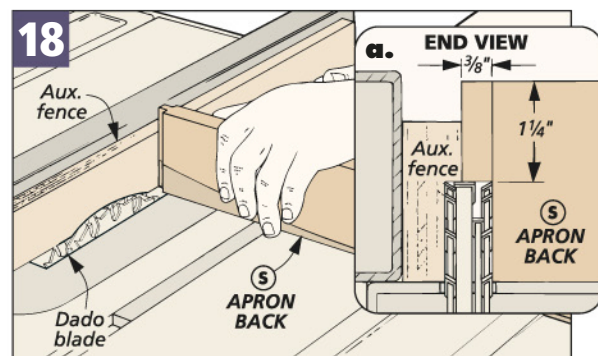
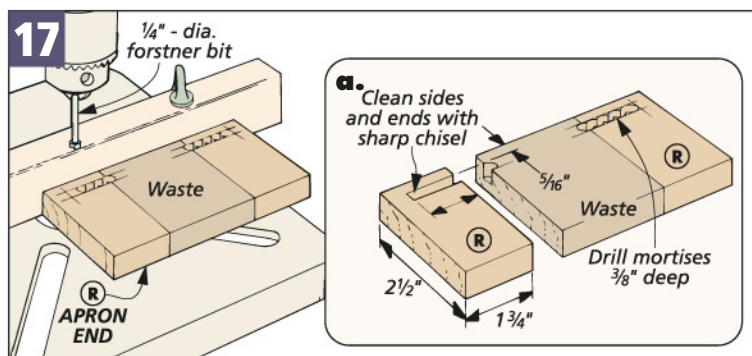


apron back (S) on its top edge and cut the shoulder in several passes, sneaking up on the height of the blade until the tenons fit snug, as you can see in Fig. 18.

Now that the tenon is cut, you're able to lay out the gentle curve on the apron back's top edge. Like the curve on the front frame (Fig. 8 on page 9), I cut this curve with a band saw, staying to the waste side of the line so I could sand it smooth.

ASSEMBLY. Clamping the apron together is no trick. And when the glue had dried, I softened the top edges with sandpaper, and then attached it to the top panel with woodscrews (Figs. 16a and 16b).

You could also screw the top to the case at this point (Fig. 16c). But both faces of the top need to be stained and finished later, so I just set it on the case so I could see what the curio cabinet looked like.



Doors & Glass

All that's left now is to build the two inset doors, as shown in the photo at left. Like the ends of the case, each door is just an ordinary frame that's built to hold a piece of beveled glass.

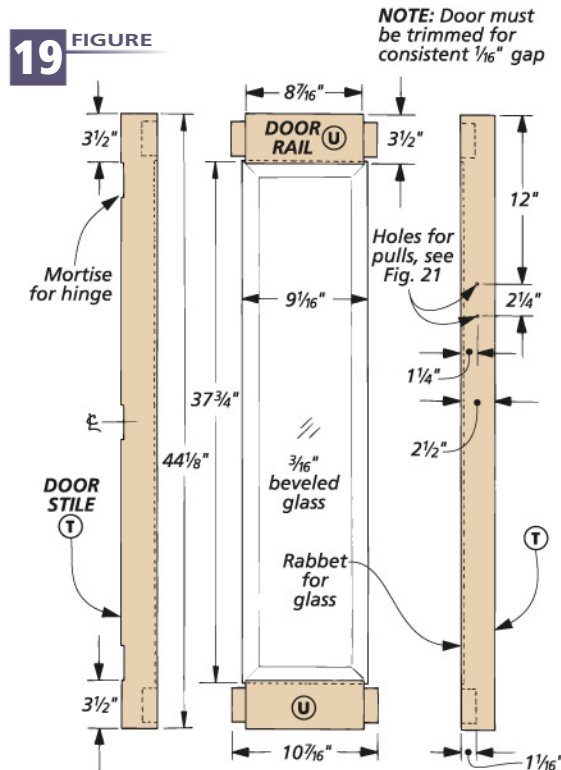
CUT TO SIZE. The biggest trick with inset doors is getting a consistent $\frac{1}{16}$ " gap on each side. But instead of trying to build the doors to the exact size, I cut the stiles (T) and rails (U) so that when the doors were assembled, they would fit tight top to bottom with no gap between them (Fig. 19). This way, I was able to trim the edges later to make sure the gaps ended up consistent.

MORTISE & TENONS. After the pieces are cut to size, you can join them with mortises and tenons, as shown in Figs. 19a and 19b. They're not any different than those you cut on the end frames.

With the joinery cut, the frames can be glued together. With tall inset doors I take special care to make sure each frame will end up flat before I start applying any glue.

RABBET. Next, the inside edges of the doors need to be rabbeted to hold the glass (Fig. 19c). This rabbet is identical to the one you backrouted in the end assemblies earlier (refer to WoodsmithSoicals.com).

MOUNT DOORS. To mount the doors, the first step is to cut the mortises for the hinges on the door stiles. (To keep



things simple, there aren't any mortises on the case. Just the doors.) I did this on the table saw with a tall auxiliary fence to support the frame, as you can see in Fig. 20. The trick is to sneak up on the depth of the mortise so exactly $\frac{1}{16}$ " of the hinge knuckle will stand proud when the hinge is screwed to the door (Fig. 20a). This creates the $\frac{1}{16}$ " gap between the doors and the case.

When the hinges are screwed to the doors, mounting them to the cabinet requires some patient and careful work. I like to mount the doors in the case one at a time, marking the amount to be trimmed right from the case (though I do remove them to do the trimming).

Once the doors have been mounted in the case, it's a good time to order all the glass for the project. I ordered $\frac{3}{16}$ "-thick glass with a $\frac{1}{4}$ "-wide bevel for the end frames and door frames. And for the adjustable shelves, I ordered $\frac{1}{4}$ "-thick glass with an edge that had been beveled (called a pencil edge).

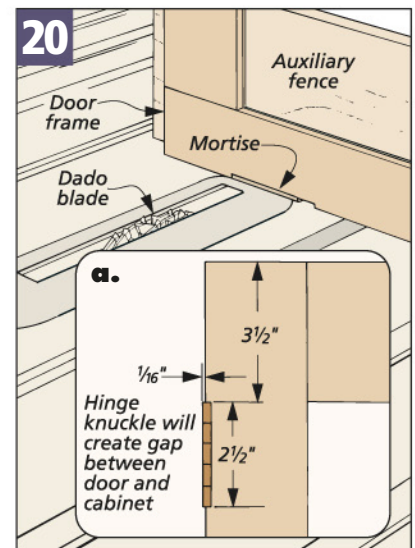
MATERIALS & SUPPLIES

A End Stiles (4)	$\frac{3}{4} \times 2\frac{3}{8} - 53\frac{1}{4}$
B Top End Rails (2)	$\frac{3}{4} \times 6 - 12$
C Bottom End Rails (2)	$\frac{3}{4} \times 8 - 12$
D Front Stiles (2)	$\frac{3}{4} \times 2\frac{1}{2} - 53\frac{1}{4}$
E Top Front Rail (1)	$\frac{3}{4} \times 2\frac{1}{2} - 29$
F Bottom Front Rail (1)	$\frac{3}{4} \times 4\frac{1}{2} - 29$
G Bottom (1)	$\frac{3}{4} \times 13\frac{5}{8} - 30\frac{1}{2}$
H Btm. Fr./Bk. Cleats (2)	$\frac{3}{4} \times 1\frac{1}{2} - 30\frac{1}{2}$
I Bottom End Cleats (2)	$\frac{3}{4} \times 1\frac{1}{2} - 12$
J Back Stiles (2)	$\frac{3}{4} \times 2\frac{1}{2} - 53\frac{1}{4}$
K Center Stile (1)	$\frac{3}{4} \times 3\frac{1}{2} - 37\frac{7}{8}$
L Top Back Rail (1)	$\frac{3}{4} \times 6 - 27\frac{3}{4}$
M Bottom Back Rail (1)	$\frac{3}{4} \times 8 - 27\frac{3}{4}$
N Back Panels (2)	$\frac{1}{4}$ ply. - $12\frac{7}{16} \times 37\frac{13}{16}$
O Top Front Cleat (1)	$\frac{3}{4} \times 2\frac{5}{8} - 30\frac{1}{2}$
P Top Back Cleat (1)	$\frac{3}{4} \times 1\frac{3}{4} - 30\frac{1}{2}$
Q Top (1)	$\frac{3}{4} \times 17\frac{1}{8} - 36$
R Apron Ends (2)	$\frac{3}{4} \times 2\frac{1}{2} - 1\frac{3}{4}$
S Apron Back (1)	$\frac{3}{4} \times 2\frac{1}{2} - 31\frac{1}{4}$

T Door Stiles (4)	$\frac{3}{4} \times 2\frac{1}{2} - 44\frac{1}{8}$
U Door Rails (4)	$\frac{3}{4} \times 3\frac{1}{2} - 10\frac{7}{16}$
V Glass Stop (4)	$\frac{1}{4} \times \frac{1}{4} - 96$

- (2) Door Pulls
- (3 pr.) $1\frac{3}{8}$ " x $2\frac{1}{2}$ " Brass Butt Hinges*
- (12) Glass Shelf Supports
- (4) Double-ball Catches*
- (1) Dual Cabinet Lamp
- (100) $\frac{5}{8}$ " Wire Brads (18 Gauge)
- (12) #8 x $1\frac{1}{4}$ " Fh Woodscrews
- (4) #8 x $1\frac{1}{2}$ " Fh Woodscrews
- (10) #8 x 2" Fh Woodscrews
- (4) #8 x $2\frac{1}{2}$ " Rh Woodscrews
- (9) #8 Finish Washers
- (4) #8 Flat Washers
- (4) $\frac{3}{16}$ " Glass Panels with $\frac{1}{4}$ " Bevels
- (3) $\frac{1}{4}$ " Glass Shelves with Pencil-edges

* Treated with a darkening solution.



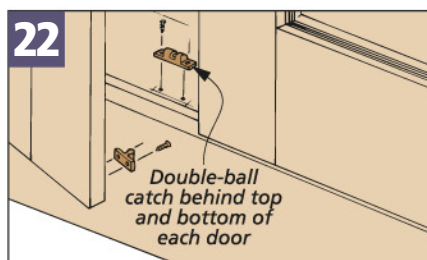
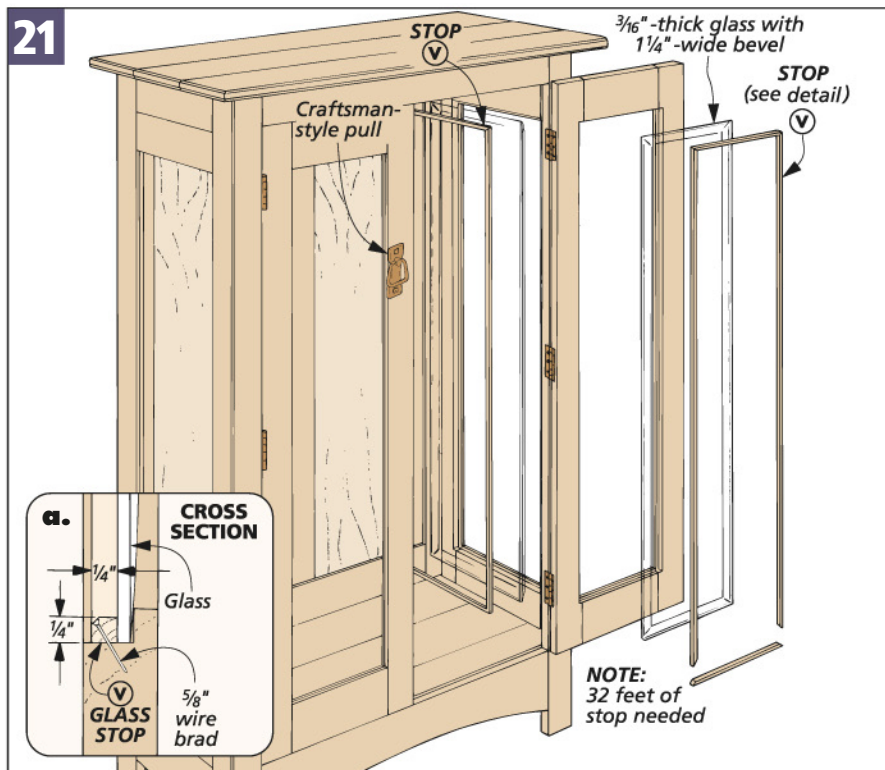
GLASS STOP. While waiting for the glass, you can make the glass stop (V), shown in Fig. 21a. The steps in the right margin show how to cut the stop safely from $\frac{3}{4}$ "-thick stock. (The chamfer routed in Step 1 will be a perfect place to locate the brads when you install the glass later.)

FINISH. After I had enough glass stop made, I began to apply the finish. The thing about a curio cabinet is it has to look as good on the inside as it does on the outside. This is a little easier with the top and doors removed, but the inside of the case will need to be sanded with more care than usual, especially the back.

To even out the color of the hardwood and plywood, I used a gel stain. To protect the wood, you can apply several top coats of either a polyurethane or varnish finish.

The wood wasn't the only thing that was finished on this project. Before installing the hardware, I darkened the bright brass hinges, door catches, and shelf supports to match the Craftsman-style pulls. This is just a matter of soaking the hardware for a while in a darkening solution. (The positions of the pulls and catches are shown in Figs. 19 and 22.)

The last step is to install the glass. The glass stop is mitered and nailed in place (Figs. 21 and 21a). The glass shelves rest on shelf supports, as in the photo below.



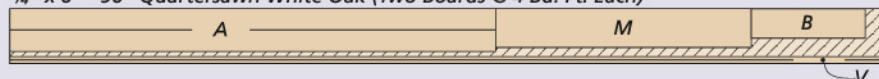
For a how-to on cutting glass, visit WoodsmithSpecials.com



Glass Shelves. The adjustable shelves are $\frac{1}{4}$ "-thick glass panels with "pencil-edges." The glass rests on angled shelf supports with adhesive-backed rubber cushions.

CUTTING DIAGRAM

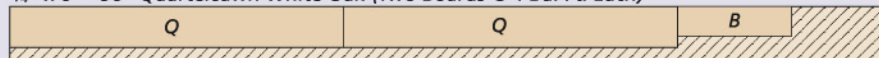
$\frac{3}{4}$ " x 6" - 96" Quartersawn White Oak (Two Boards @ 4 Bd. Ft. Each)



$\frac{3}{4}$ " x 6 1/2" - 96" Quartersawn White Oak (Two Boards @ 4.3 Bd. Ft. Each)



$\frac{3}{4}$ " x 6" - 96" Quartersawn White Oak (Two Boards @ 4 Bd. Ft. Each)



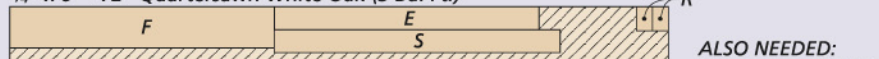
$\frac{3}{4}$ " x 6" - 96" Quartersawn White Oak (Two Boards @ 4 Bd. Ft. Each)



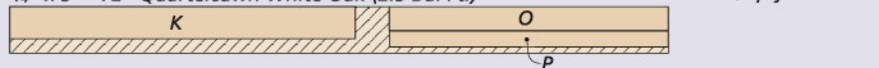
$\frac{3}{4}$ " x 5" - 96" Quartersawn White Oak (3.3 Bd. Ft.)



$\frac{3}{4}$ " x 6" - 72" Quartersawn White Oak (3 Bd. Ft.)



$\frac{3}{4}$ " x 5" - 72" Quartersawn White Oak (2.5 Bd. Ft.)



ALSO NEEDED:
Two 13" x 38" pieces
of $\frac{1}{4}$ " plywood



Book Rack

With just one board and a couple days in the shop, you can build a handsome place to organize and display your favorite books.

At first glance, there are a few things that make this small book rack really stand out. First, the decorative openings on the ends catch your eye. Then the joinery grabs your attention. Finally, the quartersawn white oak gives it a classic, solid look.

There are only three main parts to this project — a shelf and two ends. When building a small project, I tend to be particular with the details. So I enhanced the design with gently curved ends that include an arc on the bottom.

As for the joinery, the shelf looks like it's connected to the ends with through tenons. But these “tenons” hold a secret. They're actually plugs over screws that connect the shelf to the ends. The square openings are mirrored in the plugs. Both of these contribute to the Craftsman-style appearance of the book rack.

And speaking of the openings, there's a table saw technique for making these square holes that ensures they're perfectly sized and centered with minimum hassle.

For a consistent look, the cutouts and the plugs are all the same size. And I'll show you a quick and easy way to guarantee that the ends of the rack turn out looking like identical twins for a polished, symmetrical appeal.

So while this project may look simple, I think you'll find it an interesting one to build with minimal time, and material cost. Plus, you'll have the chance to hone some of your woodworking skills, and maybe add a few new tricks to your toolbox.

Make the Ends

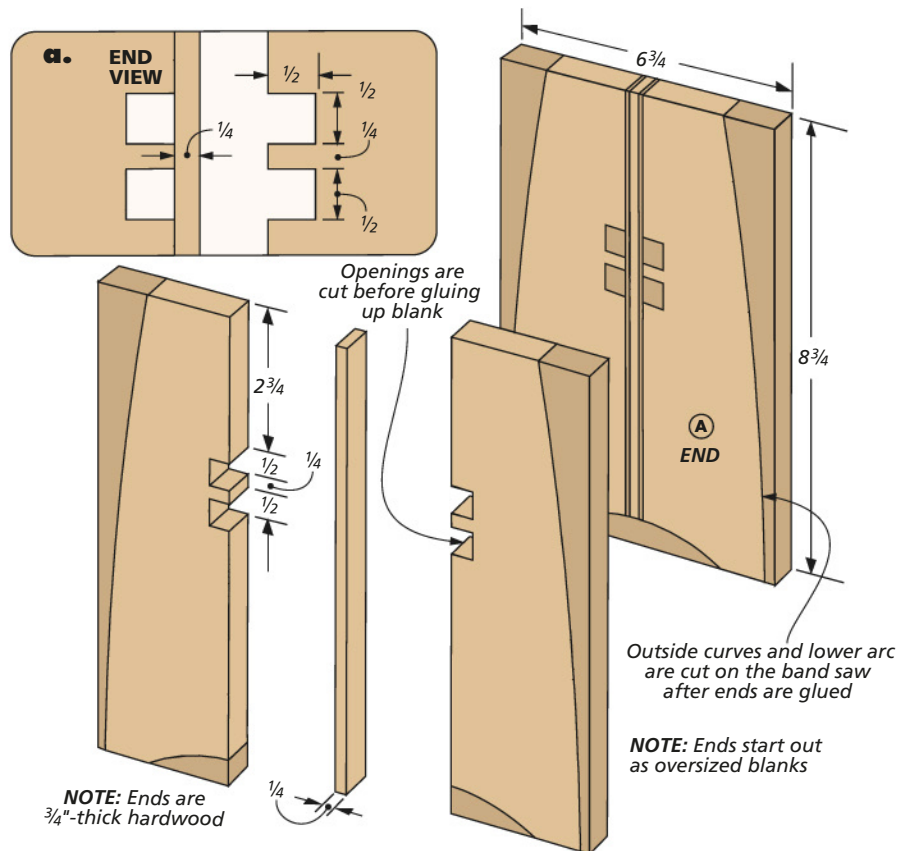
The two, curved ends define the look of the book rack and they support the shelf. In addition, the ends feature a pattern of square openings. And that's where I started with the book rack.

OPENINGS. The challenge in creating these openings is to get them even, smooth, and square. Rather than trying to chisel out the openings by hand, I came up with a table saw technique to do this.

It starts with an extra-wide blank, as you can see in the drawing at right. The blank is then sliced into three pieces. (The middle piece is simply a narrow strip.) The wide, outer pieces then have a pair of notches cut in one edge. When the parts are glued back together, evenly sized and spaced square openings are formed. By starting with an wide blank and gluing the pieces back together in the same order, you can practically eliminate any glue lines.

The box below shows you the specific steps to make the openings. It's a good idea to mark the face of each blank to help in reassembling the pieces later on.

NOTCHES. I cut the notches in each "half" of the ends with a dado blade. You can attach an auxiliary fence to the miter gauge to both support the pieces and prevent tearout.

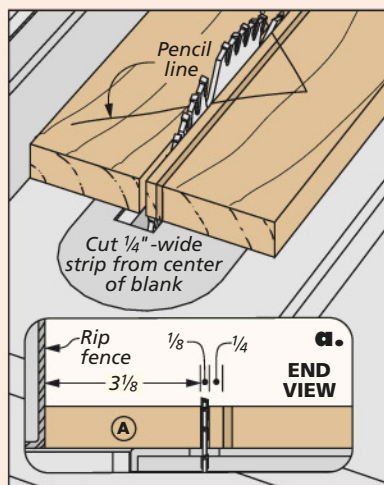


To keep the notches in each end aligned, I held the pieces together with a strip of double-sided tape. Then set the rip fence to locate each notch. Just be sure to leave a 1/4" tab between the two.

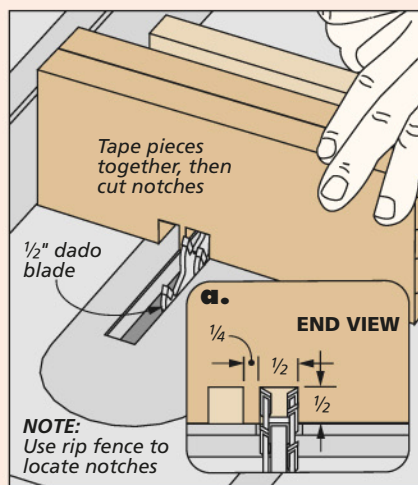
GLUE UP THE ENDS. Now you can reassemble the pieces to make the ends. What's

important here is to make sure all three pieces (and notches) are perfectly aligned. You can see the clamping setup I used for this in the lower right drawing. Apply wax to keep glue from sticking to the blocks. Once the clamps come off, the ends are ready to be shaped.

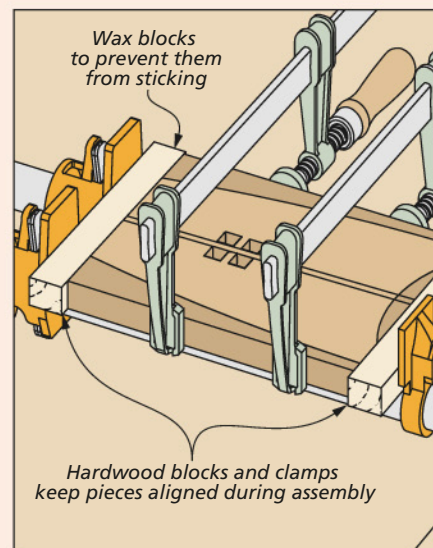
How-To: Create the Openings



Cut Apart. To create the three pieces, rip the first section free. Then turn the piece end for end and make another cut.



Make The Notches. Tape matching sides together to cut the notches so they are perfectly aligned when you glue them up.



Glue Up. Once the notches are cut you can glue the ends together. Use clamps in both directions to keep the pieces aligned.

Shaping the Ends

Now that you have the end blanks glued back together, there are just a few more steps to complete before adding the shelf.

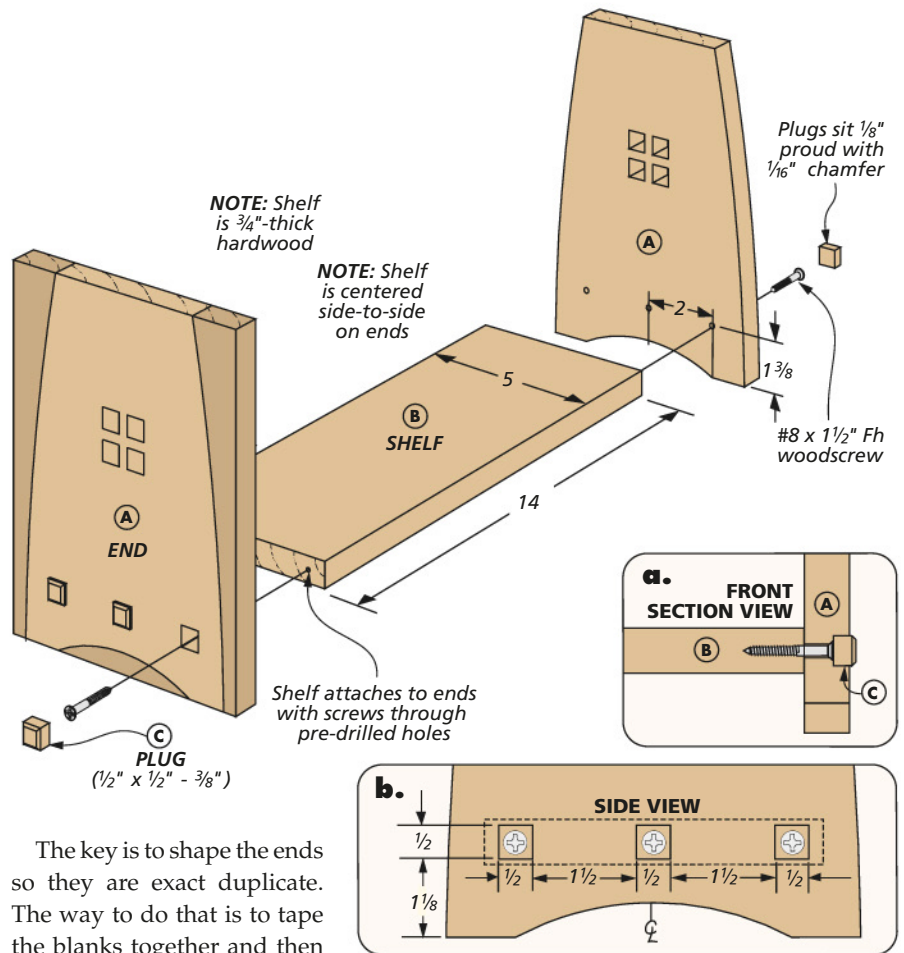
The shelf is attached to the ends with screws. The screws are set in shallow recesses and then covered with square plugs to create the look of through tenons.

RECESSES. I laid out the three recesses starting with the middle recess centered directly under the square openings. The remaining recesses are placed an equal distance away from the center, as you can see in detail 'b'. Since the end blanks are still square, you can use the edges to lay out the shape of each recess so that it's square and aligned with the others.

Creating the recesses is a two-step process, as you can see in the box below. The first step is to drill out most of the waste at the drill press. Then back at the workbench, square up the sides with a chisel. Work carefully here to keep the recess square and uniform.

With the recesses shaped, there's one more thing to do back at the drill press. And that's to drill a countersunk screw hole in each recess. Here, you can use the center point left by the Forstner bit tip to locate the holes.

CURVES & ARC. At this point, you can shape the edges and bottom of each end. The pattern on the opposite page makes it easy to lay out each detail. There's also a full-size pattern available to print out online at our website, Woodsmithspecials.com.



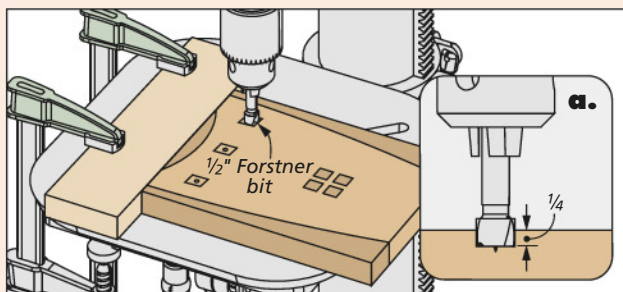
The key is to shape the ends so they are exact duplicates. The way to do that is to tape the blanks together and then shape them both at the same time. The box on the next page walks you through the process. In short, you'll tape the sides together before shaping.

ADD THE SHELF

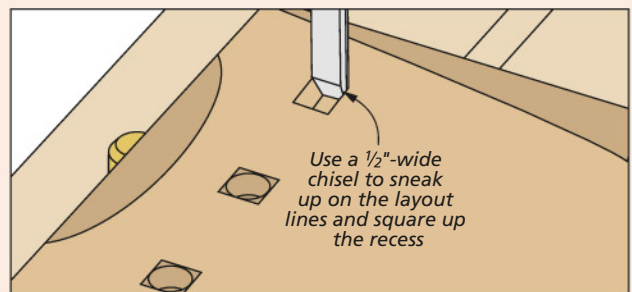
Completing the ends wraps up most of the work. All that's left is to make the shelf and some plugs. And the shelf is pretty straightforward.

SHELF. The shelf is simply a board that's cut to the size shown in the drawing above. As I mentioned earlier, screws connect the shelf to the ends. To drill pilot holes and install the screws, I raised the shelf on temporary supports. A clamp will keep everything in place while you're drilling, as shown in the third drawing at right.

How-To: Making Shallow Recesses



Drill Out the Waste. Use a Forstner bit to clean out the waste from each of the recesses. Center the middle recess directly under the four openings.



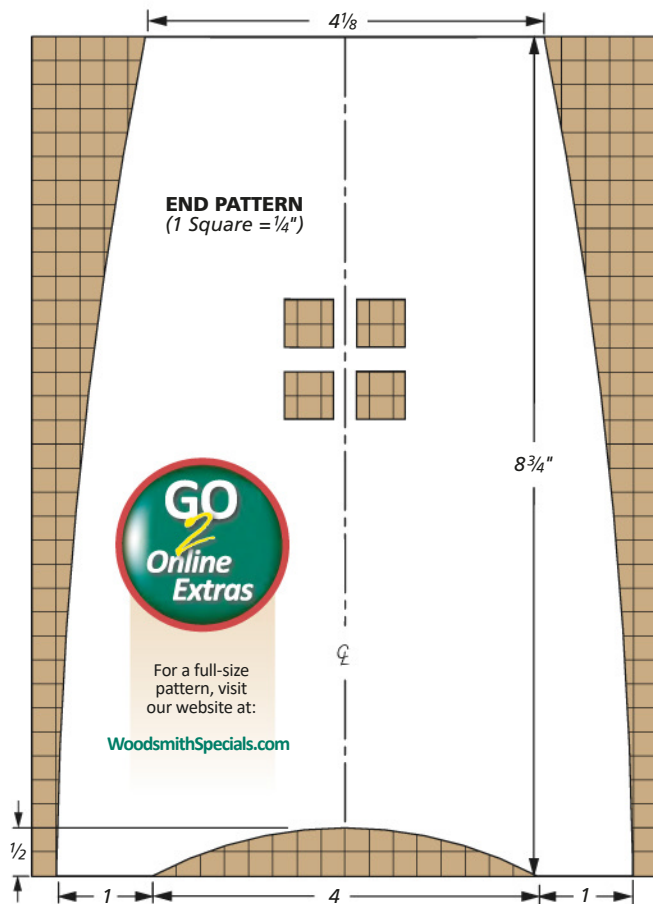
Square it Up. A sharp chisel helps you square up the corners of the recesses. Pay particular attention to keeping the corners square, so the plugs fit snugly.

How-To: Curves & Plugs

PLUGS. Since the plugs that cover the screws are meant to look like through tenons, it's important to note that the grain orientation is correct. And since the pieces are small, it's a good idea to work from an extra-long blank. Size the blank to fit snugly in the recesses in the ends.

After sanding a slight chamfer on the end of the blank, cross-cut the plug to length, as shown in the lower right drawing. Glue the plugs in place to complete the book rack. I finished the book rack with a stain and some spray lacquer.

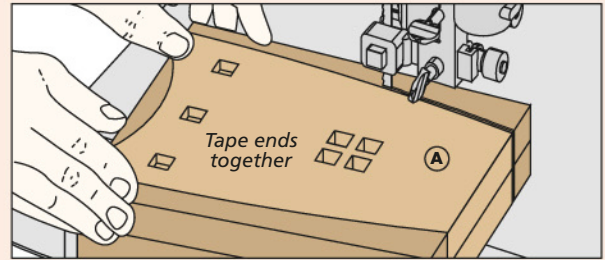
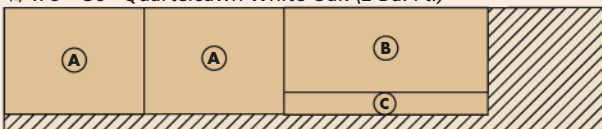
Finally, you can find the right place to display your latest creation — and your favorite books.



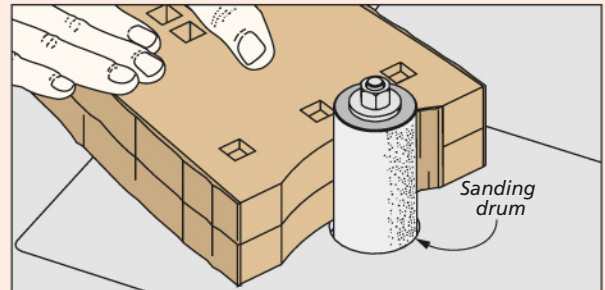
MATERIALS, SUPPLIES & CUTTING DIAGRAM

- A** Ends (2) $\frac{3}{4} \times 6 - 8\frac{3}{4}$
- B** Shelf (1) $\frac{3}{4} \times 5 - 14$
- C** Plugs (6) $\frac{1}{2} \times \frac{1}{2} - \frac{3}{8}$
- (6) #8 x $1\frac{1}{2}$ " Fh screws

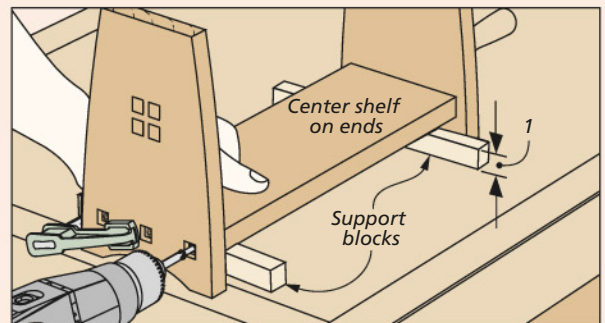
$\frac{3}{4}$ " x 8" - 36" Quartersawn White Oak (2 Bd. Ft.)



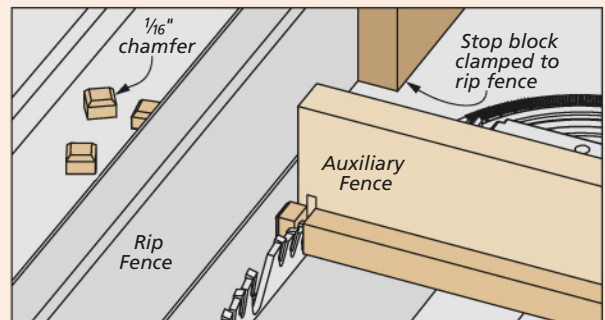
Shape the Ends. When you're ready to cut the curves and arc in the ends, use a band saw and cut just outside the line marked from the pattern.



Sand it Smooth. A sanding drum will make short work of smoothing the bottom arc. Sand the curves on the sides with a flexible cork or rubber sanding block.



Assembly. Supports at either end of the shelf raise it to the right height and keep it flat and level for drilling the pilot holes and driving the screws.



Chamfered Plugs. Sand a chamfer on the ends of the blank. Then cut the plug from the end of the blank, using a stop block in front of the blade.

Craftsman Furniture Projects Sources

MAIL ORDER SOURCES

Amana Tool
631-752-1300
amanatool.com

Amazon
amazon.com

General Finishes
generalfinishes.com

Hangman Products
818-610-0487
hangmanproducts.com

Horton Brasses.
800-466-3337
horton-brasses.com

Lee Valley
800-267-8767
leevalley.com

Rockler
800-279-4441
rockler.com

Van Dyke's Restorers
800-237-8833
vandykes.com

Woodworker's Hardware.
800-383-0130
wwwhardware.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.

MORRIS CHAIR (P. 6)

One thing I really liked about building the Morris chair was that it required almost no hardware. Even the four pins and the washers are shop-made. The few hardware items you'll need are for the seat cushion. I ordered 10 feet of elastic chair webbing (#40998) and a package of metal webbing clamps (#41004) from *Rockler* (the clamps are also called metal ends). I purchased the rest of my upholstery supplies locally. If you can't find a local supplier, check the margin at right for an online source

ROLLING TOOL CABINET (P. 18)

- **Lee Valley**
20" *Drawer Slides* 02K4220
120° *Inset Hinges* 00B1524
1 $\frac{11}{16}$ " x 2 $\frac{1}{4}$ " *Brass Pulls*... 01A4431
- **Woodcraft**
3" *Locking Casters* 159652
- **Rockler**
Figure-8 Fasteners 21650

WALL MIRROR (P. 30)

The wall mirror requires just a few hardware items. The brass turnbuttons (27912) can be purchased from *Rockler*. The mounting bracket (CH-5) came from Hangman Products. To finish the wall mirror, we applied a coat of *Varathane* Early American stain followed by two coats of lacquer.

LIBRARY TABLE (P. 34)

Classic Craftsman-style furniture deserves classic Craftsman-style hardware. So we chose a dark bronze Arts-and-Crafts pull from *Lee Valley* (01A2843). The figure-eight desktop fasteners that anchor the top came from *Rockler* (21650). The profile on the inside of the drawers was routed with a two-flute ogee bit by *Amana Tool* (54120). To finish the table, we used *Varathane's* Early American wood stain to further enhance the Craftsman look.

CLASSIC BED (P. 52)

- **Rockler**
4" *Bed Rail Fasteners* 32077
- The bed was finished with *Varathane* oil-based stain in "Gunstock" color. Simply wipe it on, let it sit for a few minutes, and then wipe off the excess. I then sprayed the bed with two coats of lacquer.

HIGH-BACK HALL BENCH (P. 60)

The hall bench is a great-looking way to welcome visitors into your home and keep clutter under control. While I could get the screws and washers locally, I ordered most of the other hardware items from *Lee Valley*: the 3" no-mortise hinges (00H5124), the T-nuts (00N2206), and the threaded inserts (00M9001). The coat hooks came from *Van Dyke's Restorers*.

DARTBOARD (P. 74)

- **Lee Valley**
1 $\frac{1}{2}$ " *Magnets* 99K3103
1 $\frac{1}{2}$ " *Magnet Cups* 99K3253
5 $\frac{5}{8}$ " *Washers* 99K3263
 - **Horton Brasses**
No-Mortise Hinges NM-7
Pantry Latch SL-6
- The beadboard back of the dartboard cabinet was painted with *General Finishes' Somerset Gold Milk Paint*. The rest of the cabinet was stained with a mixture of equal parts *General Finishes' Candlelight* and *Brown Mahogany* stains. After that, the entire cabinet was glazed with *General Finishes' Java gel stain* and sprayed with two coats of satin lacquer.

DISPLAY CABINET (P. 84)

After the doors on this cabinet are built, the glass can be ordered from a local glass shop. For the ends and doors, I ordered 3 $\frac{3}{16}$ "-thick glass with a 1 $\frac{1}{4}$ "-wide bevel and had these panels cut 1 $\frac{1}{8}$ " smaller than the frame openings. For the shelf panels, I ordered 1 $\frac{1}{4}$ "-thick glass with "pencil" edges. And they ended up 1 $\frac{1}{4}$ " less than the cabinet opening because the shelf supports I used were each about 1 $\frac{1}{16}$ " thick.

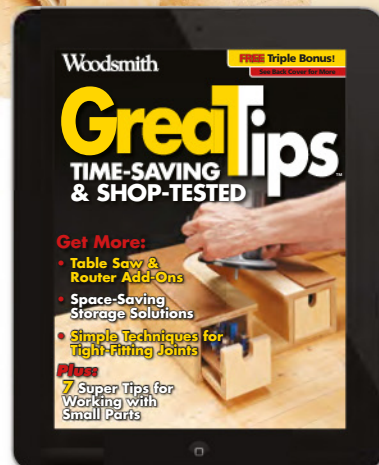
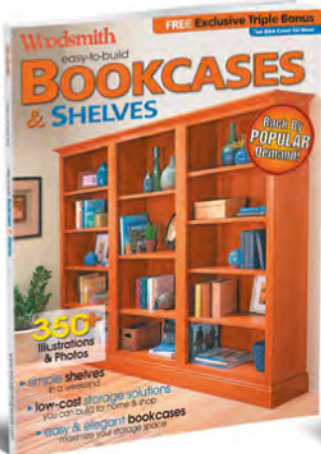
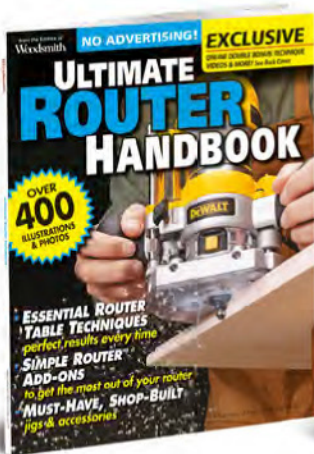
- **Van Dyke's Restorers**
Door Pulls 214501
- **Lee Valley**
Brass Butt Hinges 00D0203
Angled Shelf Supports 00U1801
Double-ball Catches 00W1201
- **Woodworker's Hardware**
Dual Cabinet Lamp ... SL3000.0514

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