



Woodsmith **PLANS**

HEIRLOOM COFFEE TABLE



COFFEE TABLE

This coffee table features cabriole legs, scalloped aprons, and an oval top. But the straightforward construction won't throw you any curves.

This coffee table is an elegant Queen Anne project. It features cabriole legs, a scalloped base, and an oval top with a hand-rubbed finish. But don't assume that this table demands a lot of time or highly specialized skills. It doesn't.

The legs are the most involved part of this table. So to help out, we've included a step-by-step article on page 8. Or if you just can't bring yourself to build the legs, you can buy them pre-made, see page 9. With the legs done, this project moves along pretty quickly. In fact, the table can almost be completed in a weekend.

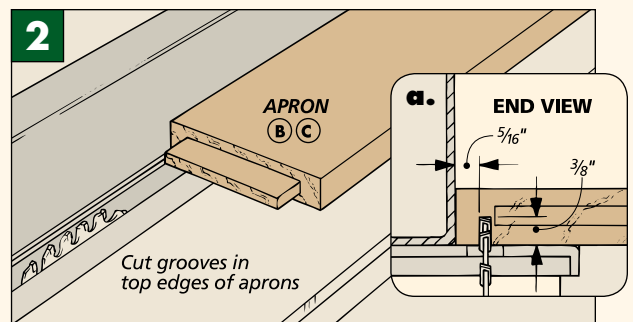
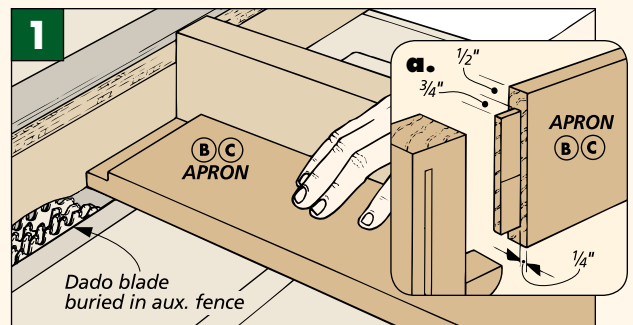
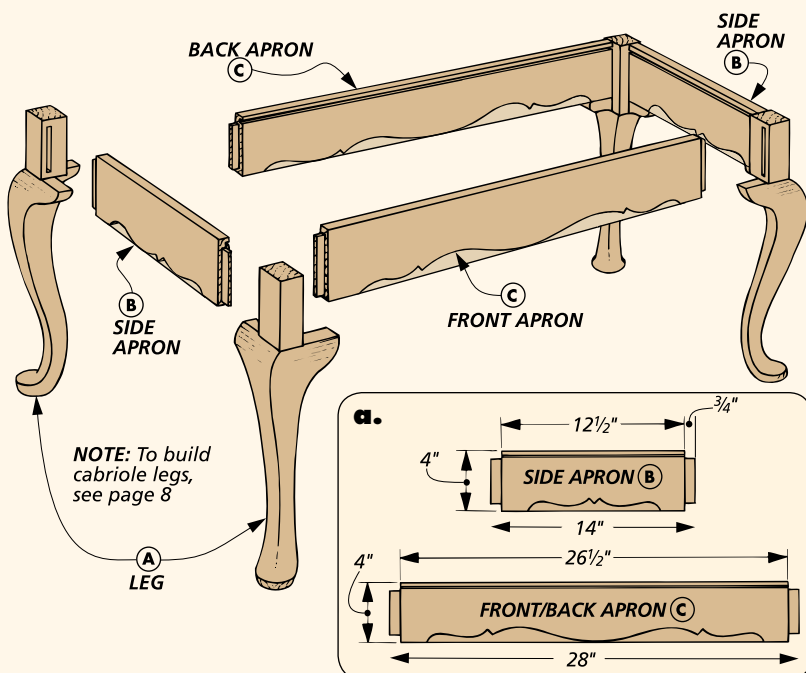
CABRIOLE LEGS. To build this coffee table, the first thing you need to do is to make the cabriole legs (A), as you can see in the drawing below. And as I mentioned before, you'll find a pattern for shaping the legs as well as detailed instructions for making them in the article on page 8.



RAILS & STRETCHERS. When the legs are complete, the next step is to connect them with $\frac{3}{4}$ "-thick side aprons (B) and front/back aprons (C). Both are the same width and have a scalloped profile cut on their bottom edges.

But before cutting the decorative profile, I cut the tenons on the ends of the aprons to fit the mortises in the legs, see Fig. 1.

Then after the tenons had been cut, I cut a groove on the inside



faces of the aprons, see Fig. 2. These grooves hold the simple Z-shaped fasteners that I used later to secure the top to the base.

SCALLOPED PROFILES. Now the aprons are ready for their decorative profiles. The nice thing is the symmetrical profile is the same on both the side aprons and the front/back aprons. So I only needed to make a half template for each set of parts.

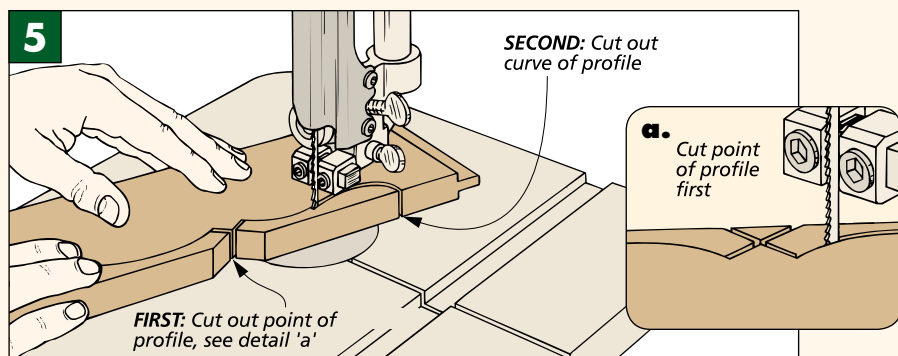
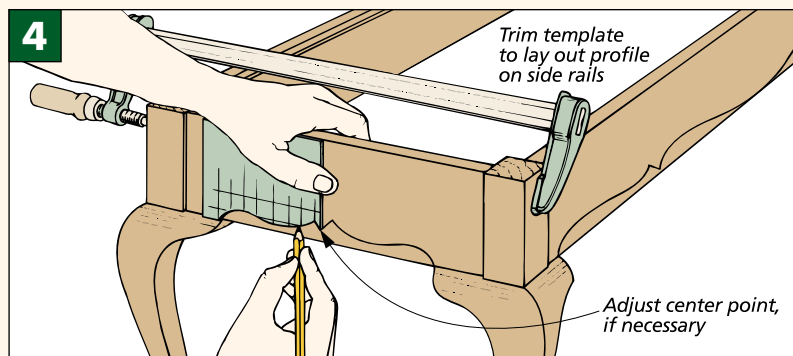
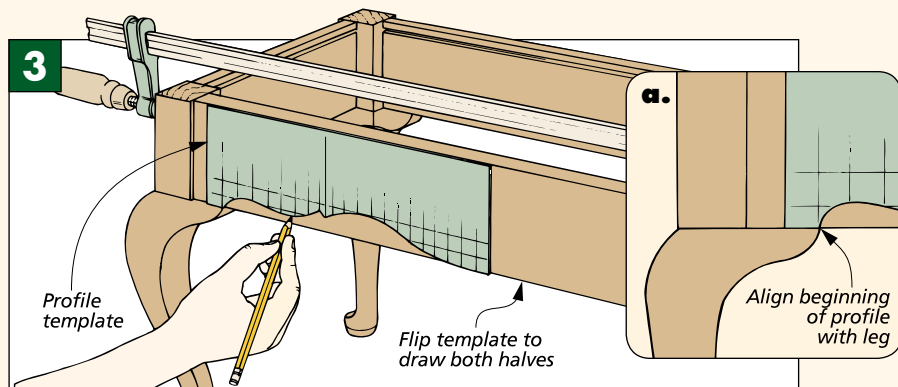
To create each template, you'll start with the scaled pattern shown below. Then simply transfer the profile onto a cardboard template.

With the template complete, I began laying out the profile on the front apron, see Fig. 3. To do this, the base needs to be dry assembled first. That's because the curve on the template must start where the transition block on the cabriole leg ends, see Fig. 3a. (It's also important to keep the top edge of the template flush with the top of the apron.)

Draw the profile; then flip the template over and draw it again, starting from the other end. The half template meets in a shallow curve at the center of the apron.

The profile on the side aprons is the same as the front/back aprons — just shorter (Fig. 4). So I simply trimmed off the template. As with the front/back aprons, the curve starts at the transition block. You may need to adjust the centerpoint of the profile.

After the profiles are laid out, the scalloped edges can be cut. The important thing here is to get a clean, sharp corner at the "point" of the profile. To do this, I started by cutting the point of each profile, see Fig. 5a. Then I cut from the



ends along the curves to the point to remove the waste, see Fig. 5.

Finally, I glued and clamped the base together. Then I sanded the scalloped edges smooth, making sure the joint lines between the transition blocks on the legs and the aprons were flush, see Fig. 6.

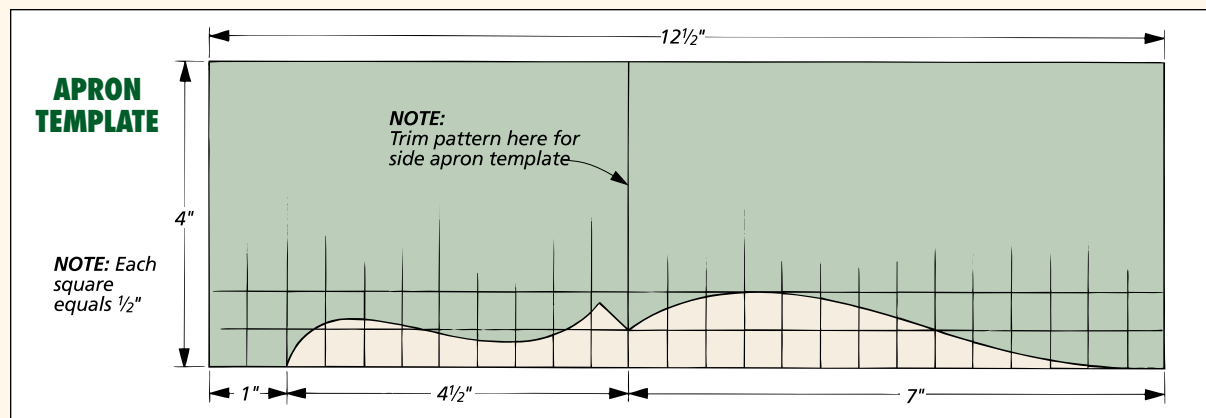
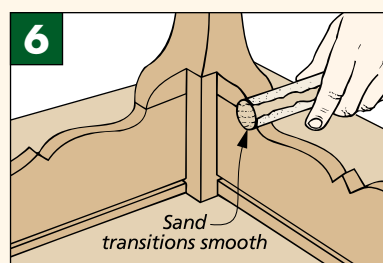


Table Top

With the base complete, I set about to build the top. This is pretty simple really. The top is just a glued-up mahogany panel cut in an oval shape.

To do this, I began by making a paper pattern first. Then I created a hardboard template from this pattern and used the template as a guide when cutting and routing.

PAPER PATTERN. As I mentioned, the first thing to do is create a pattern for the top, see Fig. 7. The oval shape of this table isn't a true ellipse. So it has to be drawn "freehand." This may sound a bit intimidating, but it really does require less artistic skill than you might think. You just draw a grid, plot some points, and connect the dots, see box below.

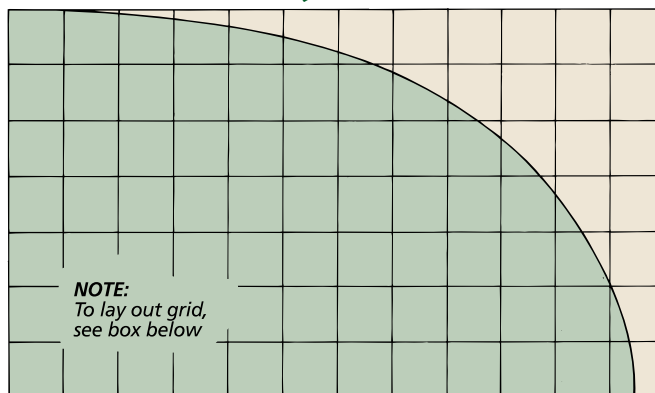
There's one more thing I want to mention: You don't even need to make a full pattern; a quarter pattern will do. And it will give you more a more consistent template.

HARDBOARD TEMPLATE. With the paper quarter pattern complete, I used it to make a full-size template out of $\frac{1}{4}$ "-thick hardboard, see Fig. 8. There are a couple advantages to creating a hardboard template for this project.

For one thing, if you happen to make a mistake when cutting or sanding the template, it's no big deal. Hardboard is cheap compared to mahogany. But even more important, it's much easier to shape and sand a $\frac{1}{4}$ "-thick

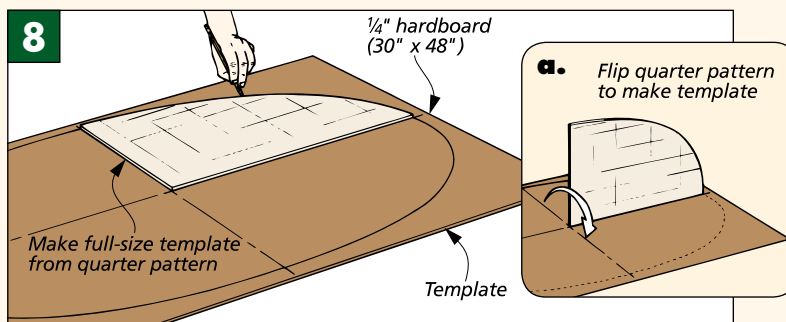
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TABLE TOP QUARTER PATTERN

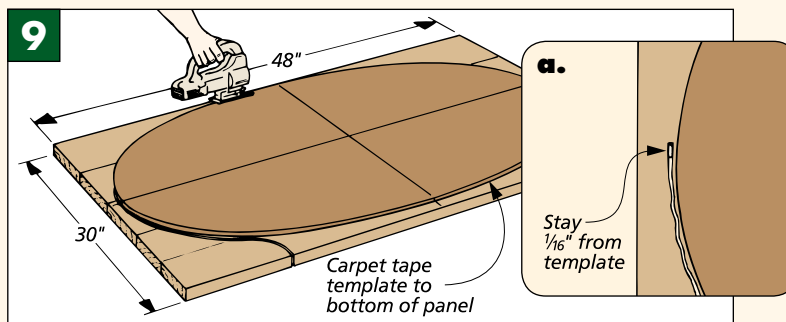


NOTE: Each square equals 2"

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QUICK AND EASY GRID



I'm not an artist and don't feel comfortable drawing freehand curves. But recently, I was shown a quick way to draw freehand curves by first creating a rough grid. All you need is some paper for the pattern,



a pencil and a tape measure, and a table with a square corner.

GRID. To do this, I made a 2" grid using a trick I'd been taught by a carpenter, see left and center photos. To draw the lines, hold the tape



firmly with one hand and "hook" the pencil on the end of the tape.

CONNECT DOTS. With the grid drawn, plot the points of the curve on the grid. Now, drawing the curve is just a matter of "connecting the dots."

hardboard template than a panel made from $\frac{3}{4}$ "-thick solid wood.

Plus, I was able to use the template to guide the router bit as I shaped the edge, refer to Figs. 10 and 11.

To make the template, I started by cutting an oversize blank and drawing centerlines on the top to create "cross hairs," see Fig. 8. (The blank was 30" x 48".) Next, I drew the pattern on the blank, flipping it around the centerlines from the quarter section until the layout was complete, see Fig. 8a.

When cutting out the hardboard template, I used a jig saw with a fine tooth blade, staying $\frac{1}{16}$ " from the layout line. Then I sanded the template up to the line.

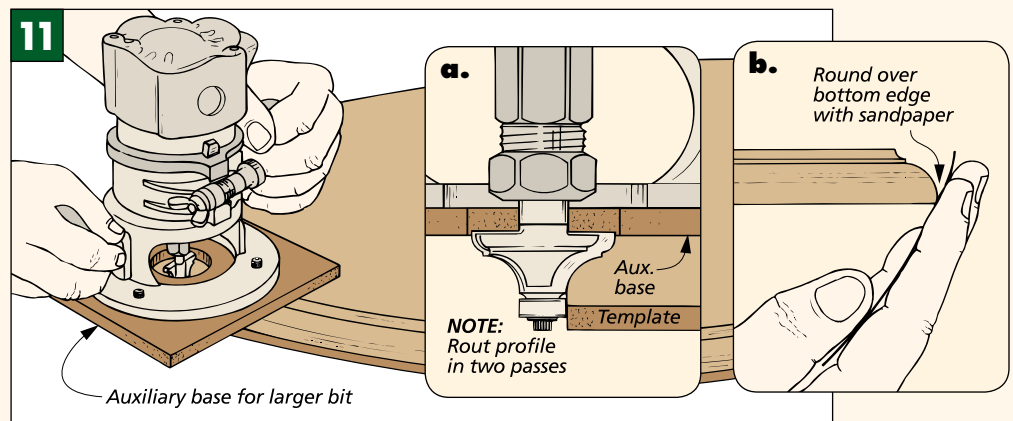
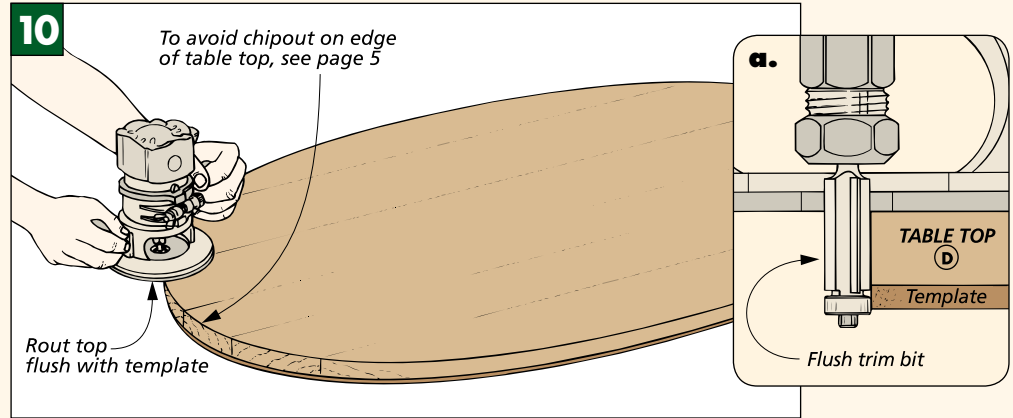
OVERSIZE PANEL. Now that the template is complete, the next step is to glue up a $\frac{3}{4}$ "-thick blank for the top. This blank starts out the same size as the template blank (30" x 48").

When the glue is dry, remove any excess glue and plane and sand the panel flat. Then carpet tape the hardboard template to the bottom face of the panel, see Fig. 9.

Like the template, I rough cut the panel with the jig saw. But this time to get the panel flush with the template, I used a flush trim bit in the router, see Figs. 10 and 10a.

However, when routing the edge of the table top, you're likely to run into some chipout. The solution is to backroute the edge, see page 5.

Next, I routed a profile along the top edge of the table, see Figs. 11 and 11a. (This requires the same



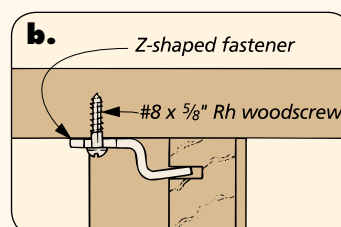
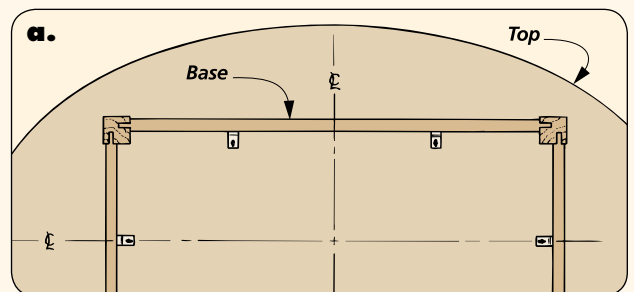
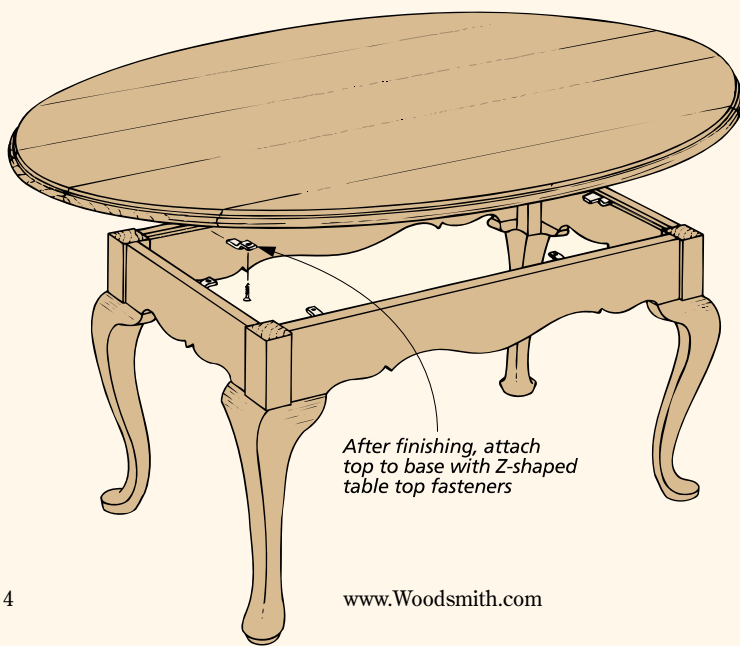
procedure as the flush trim routing.) There are a number of profile bits you can use. I chose a special *Freud* bit (product no. 99-011) designed especially for table top edges. Note: This bit didn't fit the opening in my router base, so I replaced it with an auxiliary base, see Fig. 11.

Once the profile was complete, I hand sanded the bottom lightly to remove the sharp edge, see Fig. 11b.

Before attaching the tabletop to the

base, I applied the finish. First, I put a coat of stain on everything. (For more on staining end grain, see page 6.) Then I applied a couple coats of varnish. It's a good idea to add a third coat to the top. This way, there's a thicker film of finish so you can "rub out" the finish to a high gloss.

When the finishing is done, the one thing that's left is to attach the table top to the base with Z-shaped fasteners, see drawing below. **W**



TALKING SHOP

Backrouting

One of the cardinal rules of routing is that you should always move the router (or the workpiece) so that the stock is fed into the cutting edge of the bit. There's a good reason for this.

DIRECTION. When routing in the normal direction (moving the router left to right), you're pushing the cutting edge of the bit into the wood (or vice versa on a router table). This gives you a lot more control over the cutting action. As soon as you stop pushing, the bit stops cutting.

If you rout in the opposite direction (backrouting), the feed direction is the same as the direction the bit is rotating. So the bit pulls itself forward as it digs into the workpiece.

On a router table, this can be disastrous. The router can actually pull the workpiece (and your fingers) right into the router bit. For this reason, I avoid backrouting on a router table.

Backrouting with a hand-held router is another story. Since the workpiece

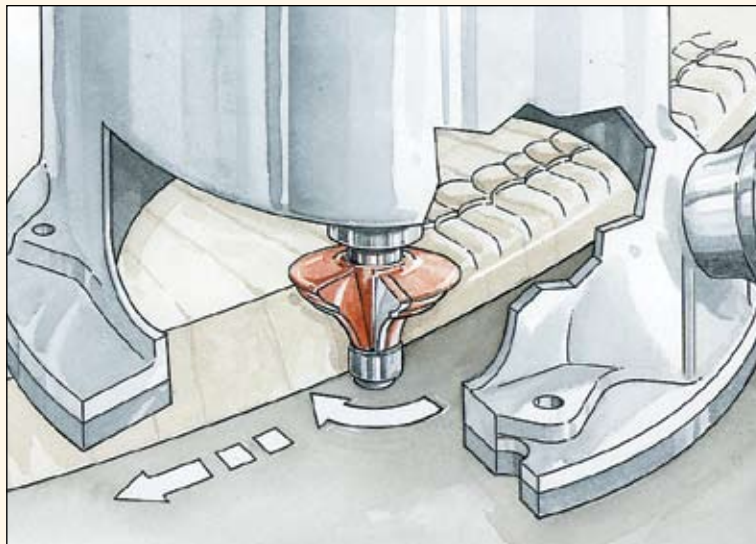
is clamped down to a bench, the bit tends to pull the router forward (instead of the workpiece). This makes it difficult to control the router, but you don't have to worry about your fingers coming into contact with the bit like you do on a router table.

So even though it's a little tricky, there are times when I backroute to get better results. Take the top of the coffee table, for example.

END GRAIN. Because of the oval shape of the top, it's impossible to avoid routing across end grain. In this case, if you rout around the top in the normal direction, you run the risk of ripping out large splinters of wood as you push the router bit past the end grain, see Fig. 1.

But by backrouting the top, the router bit pulls itself into the grain rather than pushing against it, see Fig. 2. So I was able to backroute around the entire edge of the top without any tearout.

SAFETY. But even with a



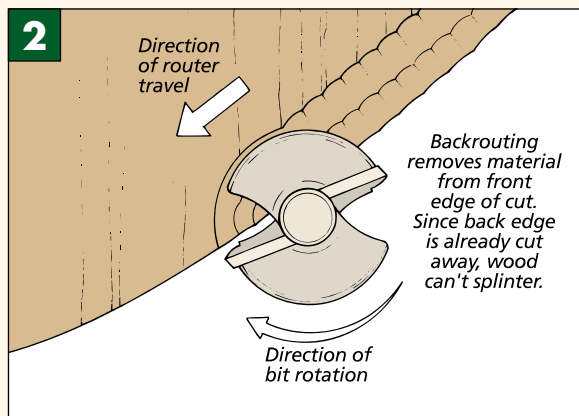
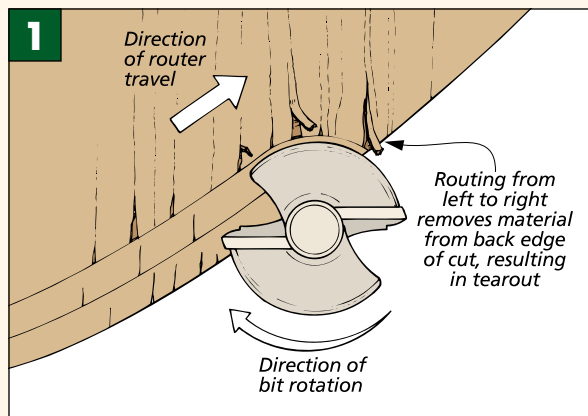
hand-held router, backrouting can be risky. So I usually take a few extra safety precautions. First, I always maintain a firm grip on the router in case it kicks back. And I clamp the workpiece down to my bench so that it doesn't shift or go flying off.

Start off by practicing on some scrap pieces of wood to get a feel for how the router reacts. At first, the router will feel like a dog on a leash that's just spotted a cat. It will have a tendency to kick back from

the workpiece and to skid along the edge.

But keeping your elbows tucked into your body and your arms and wrists locked in place should give you a little more control.

Finally, I take several very light cuts when backrouting instead of trying to make the cut in a single deep pass. Then, after I've removed all the material, I make a final pass with the router in the normal direction. This removes any chatter marks left behind by the backrouting. **W**



STAINING END GRAIN

When finishing a project, end grain can create some unique problems. Here are some quick solutions we've come up with in our shop.

There's one finishing problem that doesn't get a whole lot of attention: end grain. Often after staining, the end grain will look much darker than the face grain.

Maybe the reason why this problem doesn't get much attention is that woodworkers have just learned to "live with it." Still, there are a few steps you can take that will prevent this from happening. But it helps to know why it happens in the first place.

OPEN PORES. End grain naturally looks a little different than face grain. But it also acts differently too. The reason for this is simple. The end of a board is made up of open pores that work like a bunch of straws. Whatever is put on the surface of the board won't penetrate very quickly. But any liquid substance (like glue or stain) applied to the open ends will be pulled deep into the wood.

STAINING END GRAIN. Applying a stain creates a real problem for end grain. Again, the open pores suck up the stain like a kid at a soda fountain. But that's only part of the explanation; after all, end grain sucks up clear finishes just as deep as stains.



What makes the stain different is that it isn't clear. And the deeper the stain gets pulled into the wood, the darker the color at the surface will be. The result is ends that are noticeably darker than the face of a piece.

Getting the end grain to match the rest of the project is a matter of stopping the stain from penetrating so deep. That way, the end grain and face grain end up with roughly the same

amount of stain. Fortunately, there are a number of ways to do this.

GEL STAINS

When you're staining a project with a lot of exposed end grain, the easiest way to get a consistent color is to use a gel stain. A gel stain is like any other stain — it's just a little thicker. So instead of spilling over the surface of a workpiece, a gel stain will just sit there, like a glob of pudding.

LIMITED PENETRATION. Because a gel stain is thick, it won't penetrate very deep into the wood, whether it's face grain or end grain, see photos at left. The result is that the end grain and the face grain end up with an even, consistent color.

You might think that gel stains are all alike; a magical formula that an expert concocted. Although all gel stains are definitely thicker than regular liquid stains, they're not all the same. When it comes to end grain, the biggest difference is their thickness.



▲ A gel stain is just a thick stain. Its thickness limits the amount it penetrates, so I usually work it into the pores with a brush.



▲ After it's wiped off, you can see that the limited penetration of a gel stain means the end grain is the same color as the face grain.

I've used some stains that were the consistency of thick cream. Others were like a thick paste.

Remember, what you want is a stain that's not going to seep into the end grain. So when choosing a gel stain, just keep in mind that a thick stain will tend to penetrate less and give you a more even color.

DRAWBACKS. Of course, gel stains aren't the answer in every situation. There are times when I *want* the stain to penetrate as deep as possible. When I have a piece of figured wood, like bird's eye maple, I'm not going to use a gel stain because I want to highlight the figure of the wood. The gel stain isn't necessarily going to "hide" the grain. But it will even out the color more than I want it to.

The other time I don't use a gel stain is when I can't find the exact color I want. Here, I usually end up choosing a traditional (liquid) oil or water-base stain, so I take a different tack to handle the end grain.

LIQUID STAINS

When I work with a traditional liquid stain, I usually get a more even color if I do a little extra sanding on the end grain — to 600 grit instead of 220, see photos above. The reason this works is because you're burnishing the end grain. The pore openings are being polished so they're smaller and don't soak in as much stain.

CURVED SURFACES. With the coffee



▲ When staining end grain, a regular stain will soak deep into the pores of the wood, darkening the ends much more than the face.



▲ One solution to evening out the end grain is to sand it finer than the rest of the board. Here, I sanded the end grain to 600-grit.

table, the stain with the color I liked happened to be a traditional oil-base stain. The problem was the table was curved. In fact, this table threw me more than one curve.

For one thing, the cabriole legs have end grain at the top of the knees and the feet. But there's no "hard" corner where the end grain starts and the edge grain stops. So instead of sanding finer, I'd recommend using wood conditioner, see below.

But the oval top was a different matter. Wood conditioner applied to this narrow edge would seep into the face grain. I didn't want light streaks around the edge of the table, so I went back to the sanding solution and sanded the whole edge to 600-grit.

TOP COATS

When it's time to apply a top coat, end grain isn't nearly as much of a problem.

The finish penetrates just as deep, and in fact, you may notice that the end grain gets slightly darker. That's because oil and varnish tend to add an amber tint to the wood anyway. But I've never thought this was very noticeable, so I haven't gone to the trouble of sanding it any finer.

About the only thing you will notice about putting a clear finish on end grain is that it dries out a lot quicker. So I sometimes end up applying an extra coat of finish.

One final note: I've talked to woodworkers who sand *all* end grain to 600 grit, even if they're just applying a clear finish with no stain. They do this because the end grain looks and feels so much better after it's been sanded so fine. But I think this is a lot of unnecessary work. After you build up a film of finish on the wood, you won't be able to tell a difference. **W**

WOOD CONDITIONER



What can be a little confusing about end grain is that it isn't just limited to the ends of a board. It can show up on the face of some boards, too.

This is especially true of woods like pine, cherry, and maple that tend to have wild, wavy grain. When the grain turns up toward the face of a board, you end up with a small patch of end grain.

When staining, these areas of end grain can end up as dark blotches, see the left half of the board above. But you can avoid this.

One solution I often use is to apply a wood conditioner (or wash coat) before staining. This is usually just a solvent that evaporates slowly (although it can also be a very thin finish). Because the conditioner

is applied underneath the stain, it limits and evens out the stain's penetration, see the right half of the board above.

When staining the cabriole legs, one way to ensure an even color is to brush a heavy coat of wood conditioner on the entire leg. After letting it set a few minutes, wipe off any excess and apply the stain.

CABRIOLE LEGS

Cabriole legs may look like sculpture, but you don't need to be an artist to make them.

Cabriole legs look more like sculpture than woodworking. And while some designs can get fancy, I kept these cabriole legs pretty basic. All you need to do is follow the steps.

TURNING BLANKS. Cabriole legs start out as thick, square blanks. To avoid joint lines, I used solid stock to make the legs. The problem is finding stock that's thick enough.

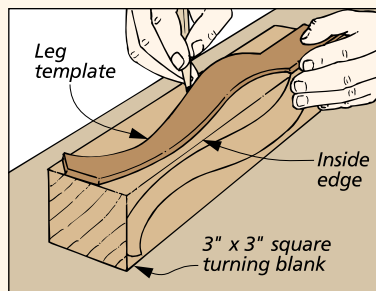
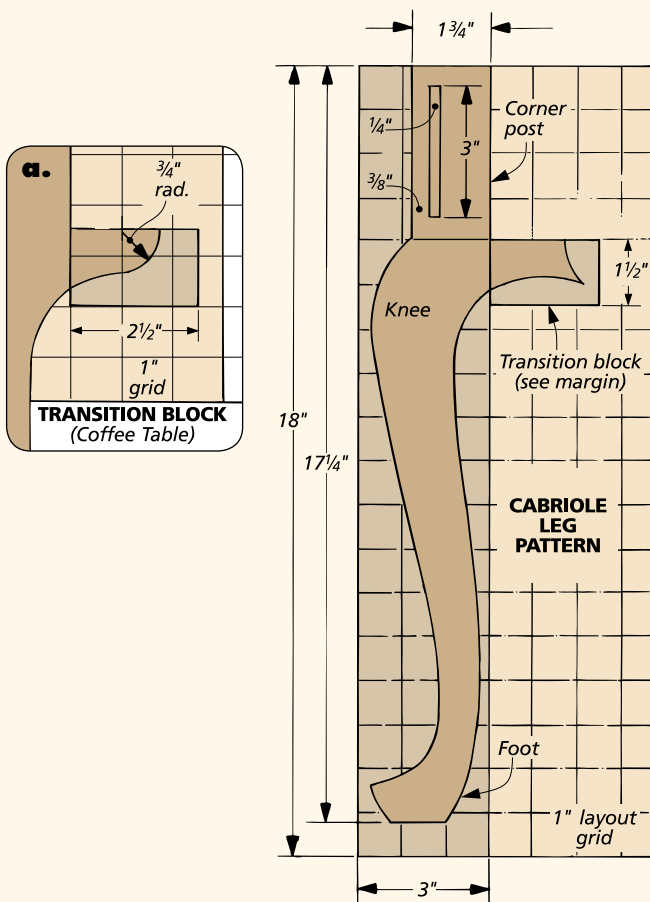
To get blanks this size, I use 3" x 3" turning squares. (You can order them from many woodworking catalogs.) I buy them extra long, so I can



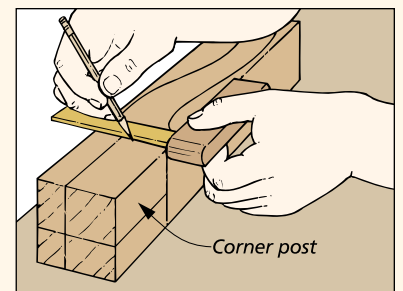
also cut the transition blocks from the blank. Turning squares often come rough cut, so you may need to square them up before you can begin shaping the cabriole legs.

MAKING PATTERNS. Once you have square turning blanks, the next step is

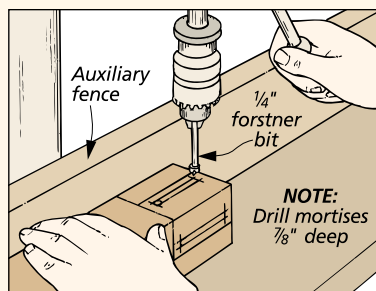
to create templates for the leg. (I made mine out of 1/8" hardboard.) There are two templates that you'll need to make: one for the leg and another for the inside faces of the transition blocks (added later). You can use the patterns shown below to create the templates.



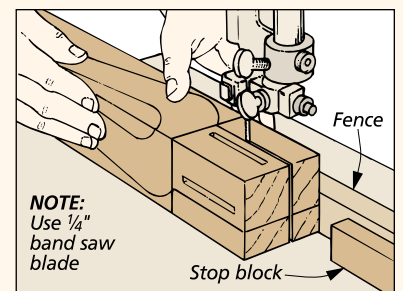
1 Position the template so the back edge of the corner post aligns with inside corner of blank. Flip template and repeat on adjacent side.



2 Next, use a square to draw reference lines around all four faces of the blank to indicate where the corner post meets the knee.



3 Cut the mortises on the two faces with the patterns. Drill a series of overlapping holes, and clean up the cheeks with a chisel.



4 Set up band saw to make the face cuts on the corner post. Use a fence to guide the leg and clamp a stop block to the fence.

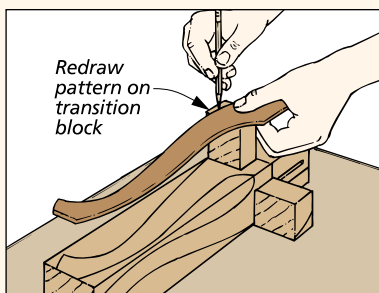
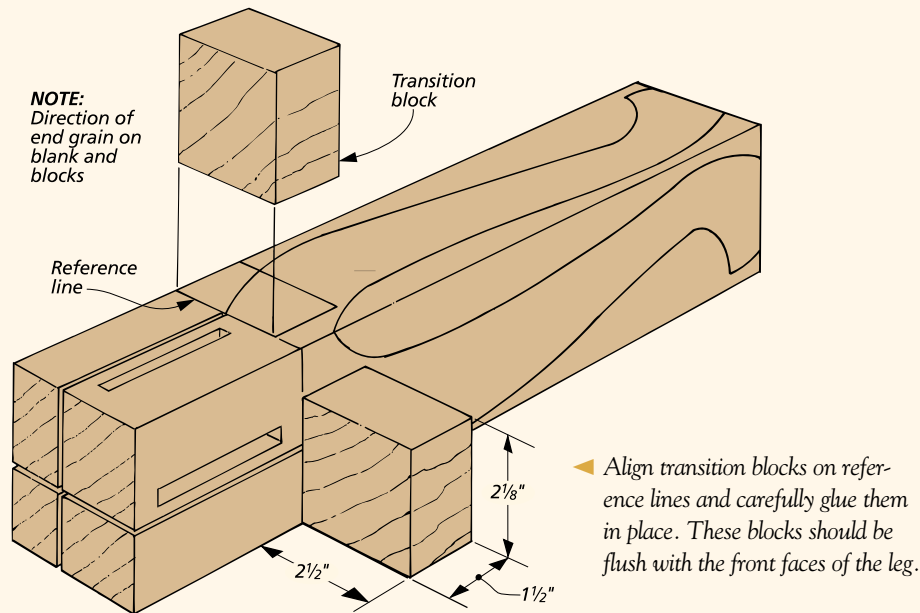
Or you can save some time and order pre-made cabriole legs from the sources listed in the right margin.

CORNER POST. After the shape of the legs are laid out, it's time to work on the blank. I start with the corner post at the top, back edge of the leg.

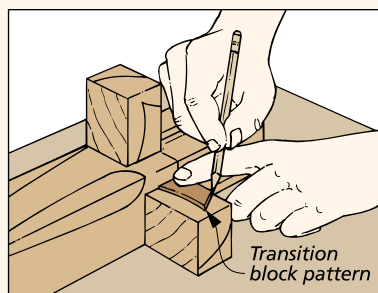
TRANSITION BLOCKS. While working on the corner post, you'll have to add two, rectangular transition blocks, see drawing at right. These blocks are glued on over the knees of the legs. They should also line up with the reference lines between the corner post and the knee so they end up square.

CUTTING THE LEGS. After the transition blocks are in place and the corner post is completed, it's time to cut the leg out. This is done in two steps. First, all the cuts are made along one face of the leg. Since these cuts remove part of the pattern on the adjacent face, you need to save the waste pieces. Then you simply tape them back onto the blank and cut the curves on the adjacent face.

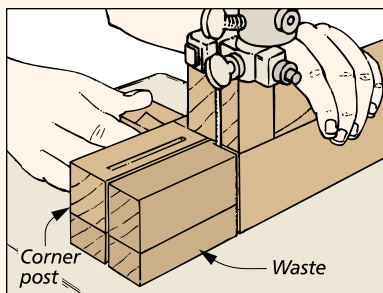
Now, while the leg is still relatively square, I sand the faces with a drum sander on the drill press. (You'll need an auxiliary table to do this.)



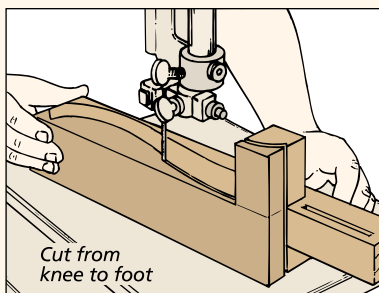
5 Redraw the knee on the outer faces of the transition blocks. The reference line on the pattern should align with the transition block.



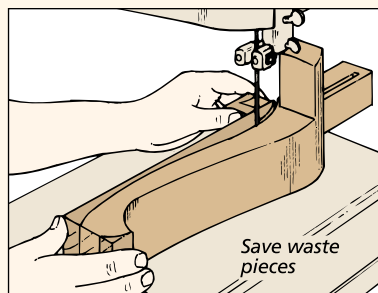
6 A second pattern is used to trace a profile on the inner faces of the transition blocks. Place this pattern in the corner and mark the outline.



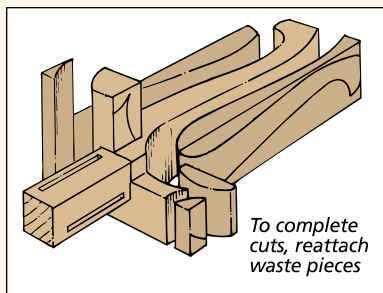
7 Start sawing at the corner post by aligning blade with top of transition block. Saw to the kerf. Then repeat the cut on the adjacent face.



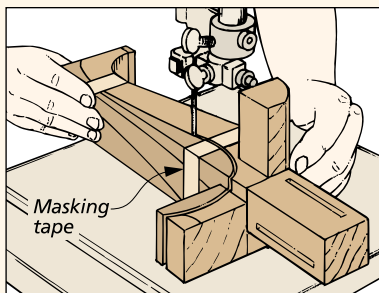
8 To cut the front face of the leg, start at the knee and saw around to the foot in one smooth pass. Be sure to save the waste piece.



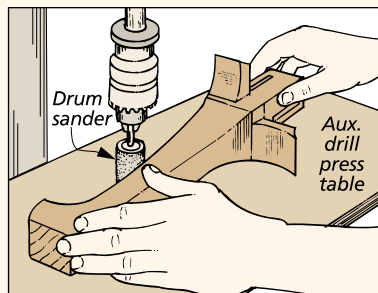
9 Cut the back of the leg just like the front. A second cut is needed to form the transition block. Again, save the waste pieces.



10 The waste pieces are needed when cutting the remaining faces of the leg blank. Tape the pieces to the blank in their original position.



11 Now, finish roughing out the leg by repeating the cuts on the front and back faces. Again, work from the knee to the foot.



12 At this point, the "square" legs can be sanded with a drum sander. But a larger auxiliary table will need to be added to the drill press.

SOURCES

Adams Wood Products
423-587-2942
adamswoodproducts.com

Woodcraft
800-225-1153
woodcraft.com

Woodworker's Supply
800-645-9292
woodworker.com

Shaping the Leg

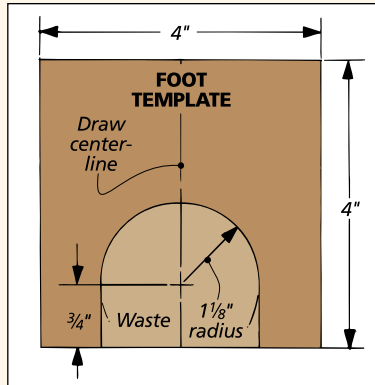
At this point, the blanks have been roughed out, so they're beginning to look like cabriole legs. But all the edges are still square. So now, it's time to do the final shaping that will soften these edges and give the cabriole legs their graceful appearance.

SEQUENCE. To shape the legs, I worked from the bottom up, starting with the foot and moving up to the transition blocks at the knee.

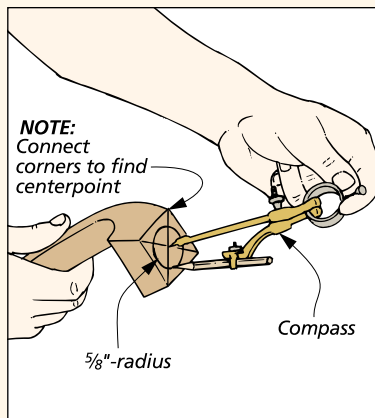
FEET. One of the tricks to making cabriole legs is to get four legs that look *similar*. And the feet are probably the most noticeable. So I shaped the feet on all four legs and then set them side by side to compare them. If one was noticeably smaller, I worked on getting the others to match it. But don't be *too* critical. After all, when the project's built, no one will be able to compare them as closely as you can now.

The first step for each foot is to lay out the final radius on the top. Then the square corners can be sawed off.

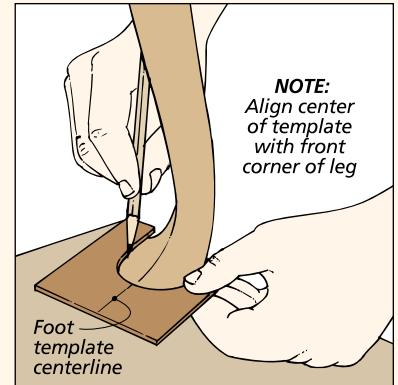
To do the shaping, I used a rasp and a half-round file. The rasp allows you to remove the wood quickly. But the file gives you a cleaner cut.



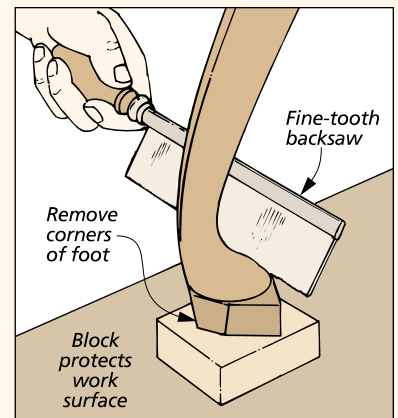
13 To begin shaping the legs, make a template to outline the foot. This is a piece of $\frac{1}{8}$ " hard-board with a $1\frac{1}{8}$ "-radius cutout.



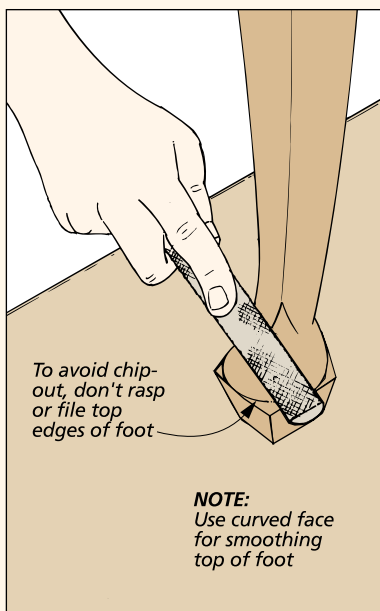
15 Then, find the centerpoint on the bottom of the leg, and use a compass to draw a circle on the bottom of the foot.



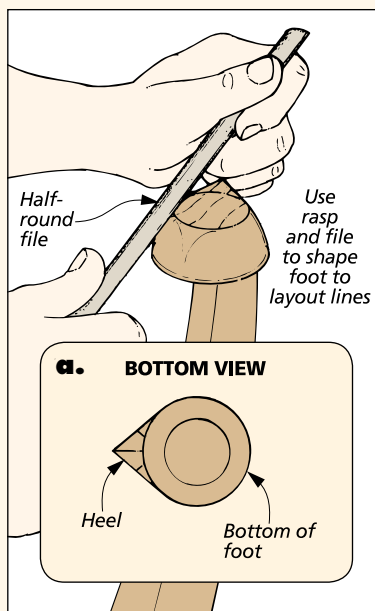
14 Now that the template has been made, the top of the foot can be laid out. Set the template on the foot and trace the outline.



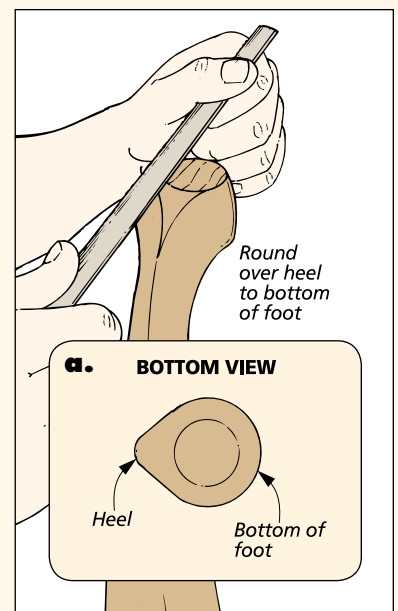
16 Next, hold the leg upright and cut away the front and side corners of the foot with a hand saw held at a slight angle.



17 Still holding the leg upright, file the top face of the foot. Remove the sharp line and feather it out across the top.



18 Clamp the leg in a vise and shape the front and sides of the foot, working from top to bottom to prevent chipout.



19 Next, shape the back of the heel by blending the radius on the bottom of the foot into the back of the ankle.

Both have a curved edge for cleaning up the top of the foot and a flat edge for shaping the sides of the foot.

LEGS. Once the feet were done, I started on the legs. There's not much to them. The front and back corners of the legs get a small, tapered roundover with a file and some sandpaper. But these roundovers aren't the same for the front and back. The front gets rounded over a little more, see Steps 20 and 22. The side corners are just softened with sandpaper.

Shaping the legs is no trouble.

The problem is holding them steady while you work. And you need some freedom to rotate the leg and work from different angles. So I came up with a shop-made carver's cradle by adding wooden extenders to the jaws of a common $\frac{3}{4}$ " pipe clamp, see page 12.

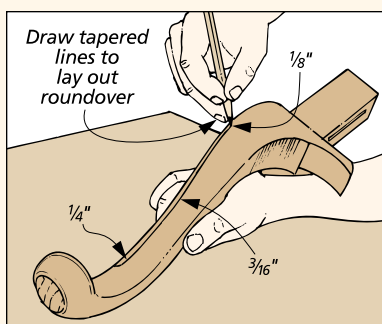
KNEES. The last area of the leg to work on is the knee, including the transition block. There's not much shaping to do. It's mostly just cleanup.

To begin, I removed the ridge between the corner post and the knee

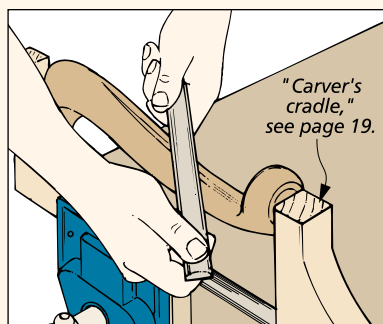
with a sharp chisel. But here, you have to work carefully. A slip with the chisel can put a scratch in the corner post which will be a chore to remove.

Next, I dry assembled the aprons and marked the location of their outside faces. Then I rounded over the top of the transition block with sandpaper, removing the hard edge.

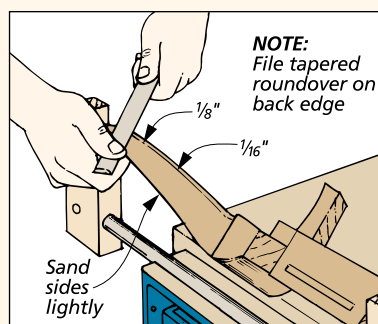
All that's left is to sand the leg to get it ready for the finish. If you're going to use stain, the trick is to get a consistent color. To do this, I used a wood conditioner. **W**



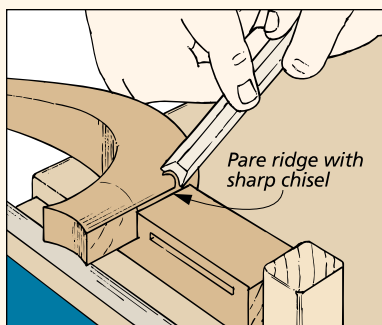
20 Lay out marks to show the tapered roundover on the front corner. Connect them with lines up and down the leg.



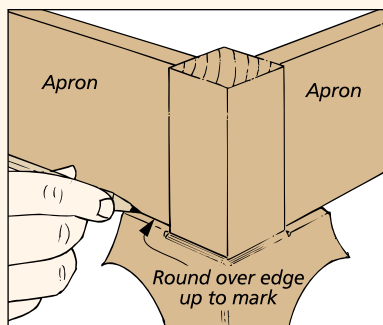
21 Now with a file and sandpaper, round over the front edge of the leg, following the lay-out lines that were just drawn.



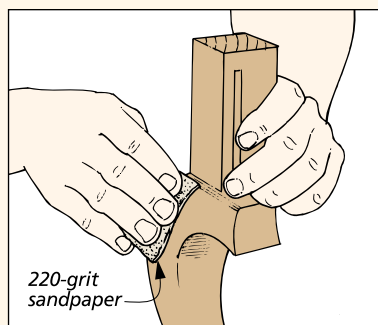
22 The back edge also gets a tapered roundover (not as much as the front). Also, lightly sand both side edges of the leg.



23 Between the corner post and the beginning of the knee, there may be a small ridge. This can be carefully pared away with a chisel.



24 Set the aprons in place and trace the front edges. Remove the aprons and round over the hard edge to the line using a chisel.



25 Finally, sand the leg to 220 grit. If you're applying a liquid stain, you might want to use a wood conditioner before staining the workpiece.

FACTORY-MADE CABRIOLE LEGS

If you want to build the projects in this issue without making the cabriole legs, we designed the projects so you can buy factory-made legs.

Of course, the design of these legs isn't exactly like ours. The critical difference is that the transition blocks are a bit different. This means you'll need to make some adjustments

in the profiles of the aprons that connect the legs so the transition between the two is smooth.

Which brings up another difference. With factory-made legs, you need to drill the mortises with the leg already shaped. But the curves get in the way, so you'll have to use a special spacer block, see page 12.



SHOP NOTES

Leg Clamping Jig

After cutting out cabriole legs, they still need to be filed and sanded to their final shape. To do this, I needed a way to hold the leg steady, yet leave plenty of room to work around it. I solved this problem with a special clamping jig.

This jig resembles a carver's "cradle" with a headstock and tailstock attached to the pipe clamp. Its pieces are constructed from 2x4 stock with a hole bored through each piece

for the pipe, see Fig. 1.

To keep the tailstock from swiveling, I cut a kerf part way through it on the bandsaw, see Fig. 2. Then I added a carriage bolt and wing nut. Once the jaw is set where you need it, just tighten the wing nut to keep the tailstock from turning.

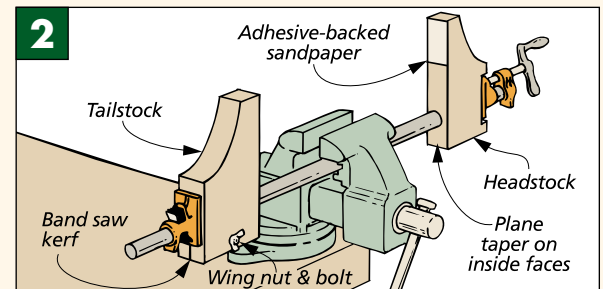
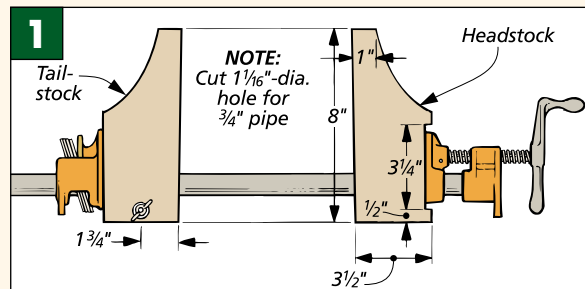
Keeping the headstock from moving is a little easier. Just cut a notch in one edge the same size as the jaw of the clamp.

As the clamp is tightened,



both the headstock and tailstock tend to tilt back. To compensate for this, I planed a slight taper on the inside edge of each piece.

Finally, I added a piece of self-adhesive sandpaper to the inside face of the jaws. It gives them a better grip on the leg.



Mortising Pre-made Cabriole Legs

One option that makes the coffee table easier to build is to purchase the legs instead of making them, see photo. But even pre-made legs will need mortises drilled in the corner post to hold the stretchers and rails.

The problem with drilling the mortises is the only thing square on the leg is the corner post. And when the leg is set down on the drill press, the curved edges get in the way. So to keep the leg square, I made

a spacer block to set it on.

This spacer is made from two pieces of 1 1/2"-thick stock glued together to form an L-shaped block. It holds the cabriole leg up off the table and out from the fence.

This way, the block keeps the face of the corner post square to the bit. It also helps to keep the leg and the fence aligned so the mortises are drilled in a straight line as the waste is removed.

