



On a warm summer day several years ago while walking the grounds of Winterthur, my wife and I wandered to a secluded area of the patio surrounding the reflecting pool. The area was shady but still had a great view. In this restful place, the museum saw fit to include a few chairs and a table for guests to relax and enjoy the scenery. Somehow I don't think they expected a furniture maker to discover the hidden treasure that was perched on the flagstone.

It was a simple design with details that stuck a chord with my affinity for William & Mary designs. It was drop-leaf table with two interesting gates. And while the table wasn't as refined or intricate as the miniature table in Issue #2, it certainly caught my eye and was immediately placed on my ever growing "to do" list.

Take Stock

While this table works perfectly outdoors, there's nothing to say that it can't be hauled inside when needed, or even left there permanently. If you expect that your table will remain outside, or spend a portion of its life there, special considerations on several fronts should be taken. Choice of wood, type of adhesive and the type of finish to be used should be well thought out.

Because I plan on using the table outside, the first decision focused on what species of wood to use. I wanted a wood that holds up well to changes in weather and withstands the tortures of the sun. It helps to choose species

that are readily available in your area and that fit your budget. For me, the choice was sapele, although I certainly could have used white oak or teak as both were available to me. (Teak, however, fell outside my budget – I want to keep the cost below \$200.)

Sapele is an African wood in the mahogany family. It holds up well to weather and has a great reddish-brown color. The color resists change even in direct sunlight, but the sun is the great equalizer – it turns everything white eventually. My plan is to use tung oil as a finish to preserve the wood and help the sapele keep its color a good while longer. And when the sun has finally done its job, a light sanding and some fresh oil brings the table back to (nearly) new.

The biggest problem I've got is that the sapele available to me has been skip-planed. This is a relatively new procedure in the woodworking industry. Lumberyards across the country have taken to passing nearly every board through a double-sided planer to remove the bulk of the marks left from the sawmill. They claim it helps people see the grain patterns (or figure) better, which it does. But the practice also causes problems for those of us who like their 4/4 material to finish greater than 3/4" thick. (Fig. 1)



(Fig. 1) Careful layout ensures the most efficient use of material.

By merely running the boards through a planer, the lumberyard hasn't removed any bow, twist or cup from the board. They've just made a smoother, slightly more parallel version of the cupped, twisted or bowed board that's 1/16" or more undersized. I often have trouble milling skip-planed boards to my desired 7/8" thickness because the board is already 15/16" thick, and I still need to flatten it at the jointer. Consequently, for this project, I sought boards that were almost flat, or close to it. (Fig. 2)



(Fig. 2) Skip-planed material is becoming more prevalent today. The thinner material often makes it difficult to mill the lumber properly and still maintain the desired thickness.

Digging through the stacks to come away with nearly flat material allowed me to mill the parts for the table without having to flatten the boards at the jointer. Plus, having a widebelt sander available in the 360 Woodworking shop made milling all the parts to 7/8" thick a breeze. Don't fret if you need to reduce the thickness to 3/4". With a few measurement adjustments, your table will look great, too.

Widebelt sanders work differently than planers in that they only apply enough pressure to the material to engage the

rubber drive-belt. A planer's pressure bar can actually press bow or cup out of a board. That's why, if you just run a bowed board through the planer, you come away with a thinner, smoother bowed board.

The pressure on a widebelt sander usually isn't enough to press out the cup or bow. And the amount of material being removed is minute by comparison to a planer. This adds up to the board being flattened by the sander as it is milled to thickness. But this won't work in extreme cases and a widebelt sander won't remove twist unless you do some finagling.)

With all the rough-cut boards milled to thickness, head to the jointer to create straight edges, then set up at the table saw to rip everything to width. Next, cut all the parts to length. Be sure to save some of the longer cutoffs for use later in the build.

Miles of Layout Made Easy

The table basically consists of eight frames – five of which include slats – that are assembled using mortise-and-tenon joints. That's lots of mortise layouts. Because there are multiples of nearly all the frame parts, I like to lay-out one breadboard or leg of each frame and use it as a template to layout the other matching parts. This saves time and increases accuracy; you don't need to worry about measuring incorrectly after the first part is complete. Because that first part is going to be your pattern, double- or triple-check your layout to ensure perfection before transferring the mortise marks to other parts. If you screw up here, it could be disastrous later. (Fig. 3)



(Fig. 3) Careful layout on a single breadboard end or leg allows it to be used as a pattern to layout the other identical parts.

After all the mortises are laid out on the appropriate pieces, the arduous task of cutting the 58 mortises begins. A hollow-chisel mortiser makes quick work of the job, but you can certainly cut them with a router or by hand.

I've designed the table to use three different sized mortises – $5/16$ ", $1/2$ " and $7/8$ ". The $5/16$ " mortises are used for the tabletop, gate-leg and shelf frames. The $1/2$ " mortises are the connections between the feet, legs and cleats, while the $7/8$ " mortises are used to join the main stretcher and legs. Happy mortising.

On our machine the setup to allow mortising of wider pieces is done by simply placing the workpiece on top of the fence and clamp. For a bench-top mortiser, you might need to make some modifications to the fence, the base or both. (You could also drill out the majority of the waste and square the corners with a chisel.) Set the depth of cut a little more than half-way through the thickness of the leg and chop the through-mor-



(Fig. 4) In order to cut the three through tenons on the legs, chop a little more than half way through on one surface, flip the board and finish the job from the other side.

tises from both sides. This avoids unsightly blowout on the back surface of the wood. When all the mortises are cut it's time to create tenons. (Fig. 4)



(Fig. 5) With the show face of the breadboard and toward the tabletop, raise the stack dado until the apex is at the level of the mortise wall.

To form tenons, I use the table saw and a stack dado. It's quick, accurate and can be set up easily. The best part of using a stack dado for tenons is that you can easily offset the tenon if your accuracy at the mortise was somewhat less than perfect. (Fig. 5)



(Fig. 6) Using a rip fence as a stop for making tenons isn't a problem because material is never trapped between the fence and the blade. Raise the dado to just over 1/2" to cut the shoulders on the tenons. Be sure to bump the fence a smidgen to ensure you don't bugger up the tenon shoulders.

Start by grouping all the parts with the same size tenons. Begin by making the 5/16" tenons. Set the depth of cut by using the show face of the parts to ensure the surfaces that are seen are perfectly flush. Lay the show face of a mortised part down against the table of the saw, then raise or lower the stack until the peak is in line with the inner wall of the mortise. Set your rip fence to the proper length, 1-1/2" over-all, then run all the show faces against the tabletop to form the first half of every tenon. (Fig. 6)



It's best to run an end or two on one of the cutoffs you saved earlier to act as a test piece to use to

(Fig. 7) Use a wide chisel to pare the shoulders perfectly flush.

tweak the setting for the second half of the process. Using the extra piece, cut and test-fit the tenon to your mortises. If the depth of cut needs adjusting, raise or lower the blade until you've dialed it in to a perfect slip fit. Run all the second sides of all the parts.

Before I change the rip fence for the 2"-long x 1/2"-thick tenons, I raise the blade to cut at a little more than 1/2" in depth to make the edge shoulder cuts. Unlock and bump your rip fence toward the blade about 1/64" to 1/32" to ensure the saw doesn't damage the shoulders you just formed. (The tiny misalignment will be sliced away with a chisel before assembly.) Stand the parts on edge and run the shoulders for all the tenons. Repeat the entire process to form the 1/2" tenons on the base legs. (Fig. 7)

Rounding Out the Joinery



(Fig. 8) Locate and drill the holes in the base stretcher before you start assembling all the frames for the table.

At the drill press, use a 1/4" bit to drill the holes through each pivot and gate leg of the two gate frames. Pieces of steel rod act as pintles for the shelves (brass rod also works). To locate the holes, dry assemble the frames and mark the leg and pivot at the center of the shelf opening. The hole is centered on the thickness of the parts. On four of the shelf slats drill a hole along one edge that is centered on the piece. Make it about 1" deep. (Be sure to pay attention to these four pieces when gluing up the shelves; assembling the shelves with one of these pieces in the wrong position could cause some problems.) The hole is for the end of the pintle. While at the drill press, locate and drill the 5/8"-diam-

eter holes in the main base stretcher for the gate's round tenons. (Fig. 8)

Layout the foot and stretcher design. Sketching the design is easy, especially if you use a pattern; I used a lens cap. After cutting one of the parts, I used that part to layout the remaining cutouts. Head to the bandsaw to cut all the areas to shape. Scrape, sand or file the cut edges smooth. An oscillating spindle sander cleans up the parts right quick. (Fig. 9)



(Fig. 9) Because I'm only making one table, I draw one half of the foot and use it as a pattern for the rest once it's cutout. Drawing the curves can be an easy, no-math involved problem if you find items around the shop to help. Here I use a camera lens cap to draw the curves for the foot and base stretcher.

You'll also want to layout for the round tenons on the ends of the pivots and rough cut them at the bandsaw too. Leave them square for now; we'll round them after the gates are assembled.

Put Epoxy to Work

Because the table is going to live outdoors during the spring, summer and fall months, adhesive choice is a concern. I've opted to go with System 3's T-88 structural adhesive. It's a two-part epoxy that I've been using for nearly 30 years. It's waterproof, UV resistant and easy to mix and use. You, however, can roll with whatever waterproof glue you choose. (Fig. 10)

Mix the epoxy according to instructions, in moderate batches so you can assemble and clamp a frame or two at most. The open time on T-88 is fairly long, but I find it easier to use it in small to medium size batches. Using a brush, slather up the mortises and tenons for each of the frames: The top, gates, shelves and base.

As the groupings are set in clamps, be sure to wipe off any excess epoxy. Use mineral spirits or naphtha to soak a rag. Be generous to ensure you aren't just pushing the epoxy into the pores of the wood. And, although there isn't an obnoxious smell, it's best to work in a well-ventilated area. And wear gloves – this stuff doesn't come off your hands easily, but it will keep your table together through some tough weather.

Because T-88 is a slow curing epoxy, clamp the frames and check everything for square. Let the assemblies sit overnight. You don't need a ton of pressure on the clamps; just enough to keep the joints closed. Don't remove the clamps before the epoxy has cured – there will be a fair amount of hydraulic pressure inside the joints that can push them apart if you remove the clamps even several hours after you mixed the epoxy. As I said before, clamp the frames and let them sit overnight. Don't fiddle with them until the next day. If you're limited on clamps, plan on multiple days to glue and clamp the frames.

After the epoxy has cured, it's time to form the round tenons on the gates. Clamp a gate frame into a vise with the tenon nub sticking up. With a combination square, mark 45° lines off the corners, then use a compass to draw a 5/8" circle at the center point. Using a handsaw, make relief cuts at the corners so that you can chop away the bulk of the tenon waste with a chisel. Finish shaping the tenon with a file, checking the fit in the base stretcher holes. The tenon should slip in and turn without rattling in the hole. (Fig. 11)



(Fig. 10) A scrap board, a brush and a stick are all that's necessary to mix and apply the epoxy to the joints.



(Fig. 11) Layout the round tenons on the square tenon nubs you left on the gate frame. Use a hand saw to make relief cuts at the corners and around the perimeter of the round tenon to help ease the removal of the waste with a chisel. Fine-tune the tenon with a file, rasp or sandpaper until it slips into the hole in the base stretcher.

Before proceeding, drill the two pivot-tenon holes into the top. (Center the holes along its length.) Layout and drill the 5/8" holes at the drill press.

Quick Layer of Protection



(Fig. 12) Rag on a couple of coats of Tung oil to begin the finishing process. The rest will take place over the next few months as additional coats are added while the piece gains color from exposure to the sun.

With all that work complete, sand everything in preparation for finish. Clean up the joints and make sure you didn't miss any epoxy. Also, lightly sanded the edges and the base frame with a random-orbit sander and break the edges of all the parts.

I find it easier to do the finish work before assembly. There's little use in coloring the sapele with dye or stain because the sun is going to bleach the color out of the piece in short order. Being a type of mahogany, sapele is photo-reactive and darkens a bit when exposed to sunlight. For that reason I start with two coats of Tung oil, allowing the first to dry before applying the second, then plan to let the sun take over the coloring process. As the color occurs

naturally, I'm going to add another coat of oil every two to four weeks throughout the summer until I get the build I want. (Fig. 12)

After the oil is cured, it's time to do the final assembly. Begin by cutting sections of $\frac{1}{4}$ " rod to the proper length. These are used as the shelf hinges and their length is determined by the width of the pivot/leg plus the $\frac{1}{4}$ " space between the gate frame and the shelf plus the depth of the hole in the edge of the shelf. In the end the hinge rods should be flush on the outside of the gate frames. (Fig. 13)

Insert the rods through the pivots and gate legs and into the edges of the shelves. This allows the shelves to rotate freely. If your shelves are sticky, make adjustments to the shelf holes until the shelves move without effort.

To keep the shelves in the horizontal position when in use, I mounted a barrel bolt to each gate leg that is captured by the keeper mounted to the bottom of the shelf. This way, when the shelf is rotated into the horizontal position, the bolt slides into the keeper and holds the shelf securely. (Fig. 14)



(Fig. 13) Using $\frac{1}{4}$ " steel or brass rod, insert the lengths through the holes in the gate assembly and into the shelf to create a pivot hinge.



The final step is to drill a couple of pocket holes in each cleat on the base. Through these pocket holes I use short deck screws to attach the center section of the top. Attach one end, then position the gate frames so the round tenons are aligned with the holes in the top and the stretcher. Attach the other end of the top and you're nearly finished.

(Fig. 14) A simple barrel bolt holds the shelf in the horizontal position keeping your outdoor amenities off the ground.

Invert the table on a workbench or large flat surface. Align the leaves with the table, then surface mount the hinges to the top and leaves. Surface mounting the hinges allows for the use of longer screws, which will hold longer outdoors. Flip the table over and test to make sure the leaves move freely up and down, and that the gates swing in and out unobstructed. (Fig. 15)



(Fig. 15) Flip the table on its top and surface mount the hinges to the leaves. You can use longer screws which will hold up better outdoors. Note the pocket hole screws that are used to attach the top to the base. Use deck screws for best weather resistance.

All that's left is to put this easy-to-build little project on your deck, patio or in your yard and let the sun go to work. I have a smaller patio, but the table size could be adjusted to fit your needs and space. Grab a bunch of your favorite outdoor-friendly wood, spend a couple of weekends in your shop and bring a little Winterthur to your backyard.

Chuck Bender (chuck@360woodworking.com) is a founding member of 360 Woodworking. He's glad to answer questions about his articles, or other matters about 360 Woodworking.

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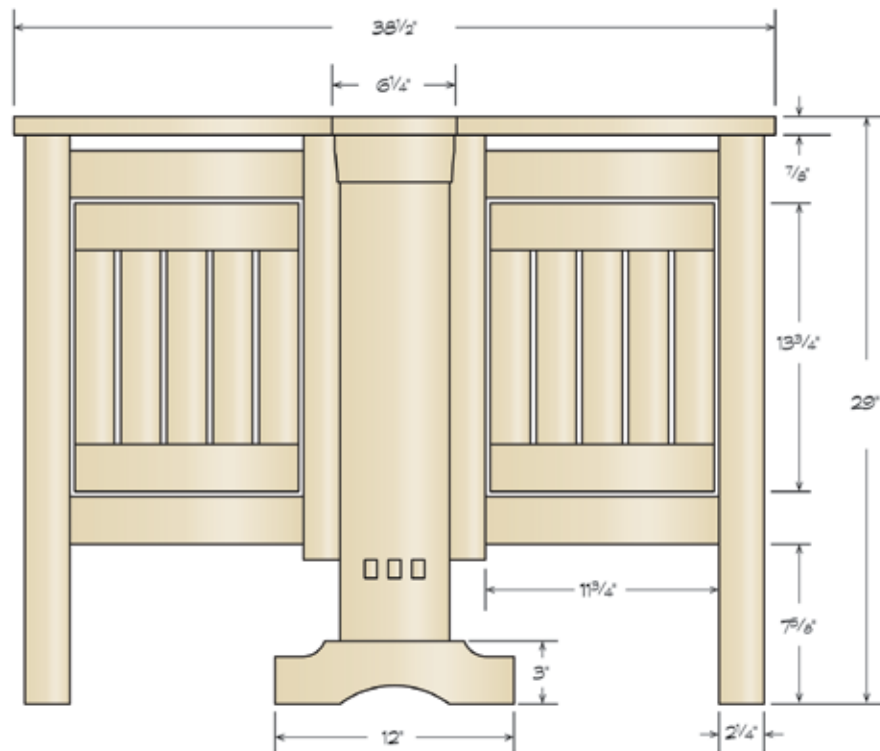
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[Learn more about William & Mary period dressing tables \(or lowboys\).](#)

Breakfast Table with a View								
#	Item	T	x	W	x	L	M	Notes
2	Leg	7/8"		5 1/2"		25 7/8"		2" tenons both ends
1	Main Stretcher	7/8"		5 1/2"		36 1/2"		1-1/2" tenons both ends
12	Top Slat	7/8"		3"		35 1/2"		1-1/2" tenons both ends
4	Leaf Breadboard	7/8"		3"		16"		
2	Center Breadboard	7/8"		3"		6 1/4"		
2	Foot	1 3/8"		3"		12"		
2	Cleat	1 3/8"		2 1/4"		6"		
2	Pivot	7/8"		2 1/4"		21 1/2"		length incl. 1/2" round tenons
2	Gate Leg	7/8"		2 1/4"		27 7/8"		
4	Gate Stretchers	7/8"		2 1/4"		14 3/4"		
10	Shelf Slat	7/8"		2"		12 1/4"		1-1/2" tenons both ends
4	Shelf Breadboard	7/8"		2 1/4"		11 1/4"		

Breakfast Table with a View				
Hardware Listing from Ace Hardware (acehardware.com)				
#	Item	Description	Price Each	Extended Price
2	5300181	Ace 2" Barrel Bolt	\$6.99	\$13.98
1		1/4" round rod	\$4.49	\$4.49
2	5297908	Ace 2" Bright Brass Non-removeable Pin Hinge	\$4.49	\$8.98

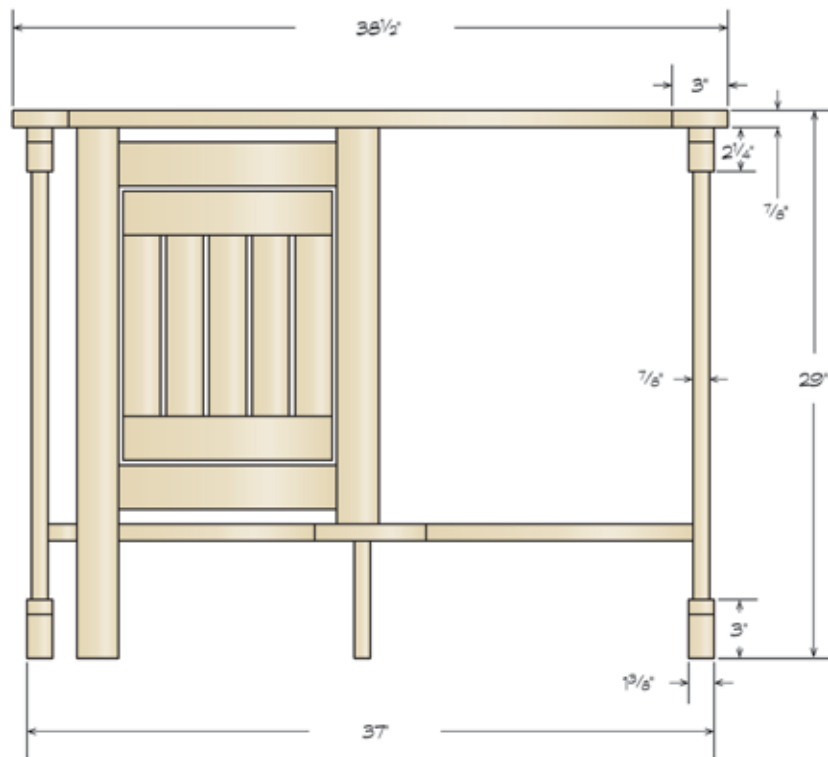


End View

Folding Outdoor Table
by Chuck Bender
from issue No. 4 ~ 360 WoodWorking

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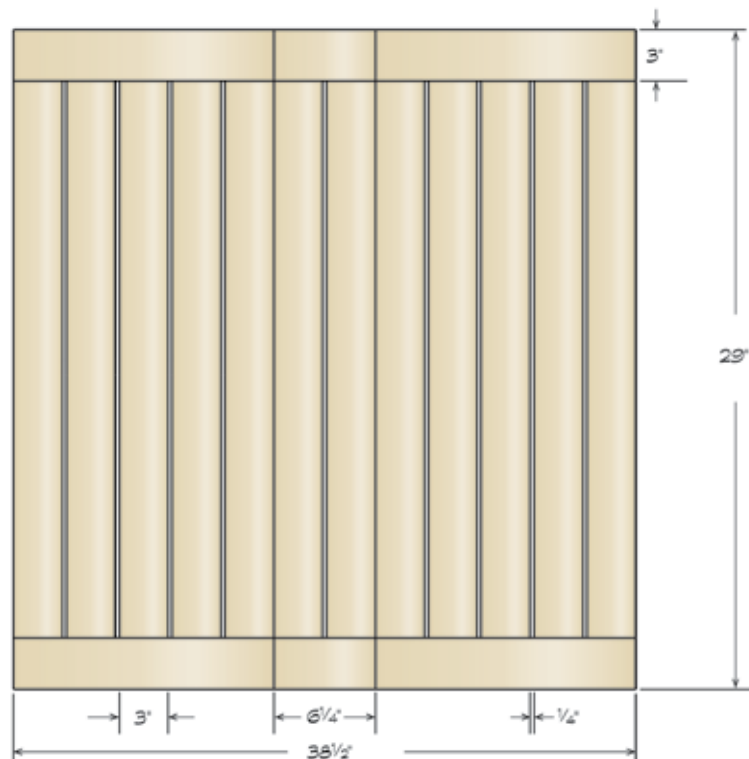


Side View

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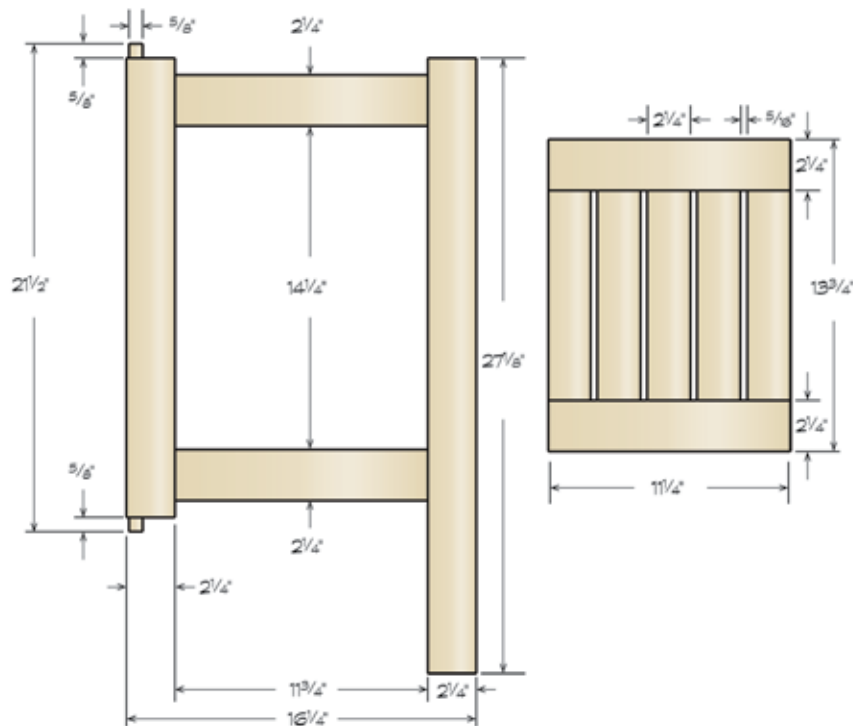


Top View

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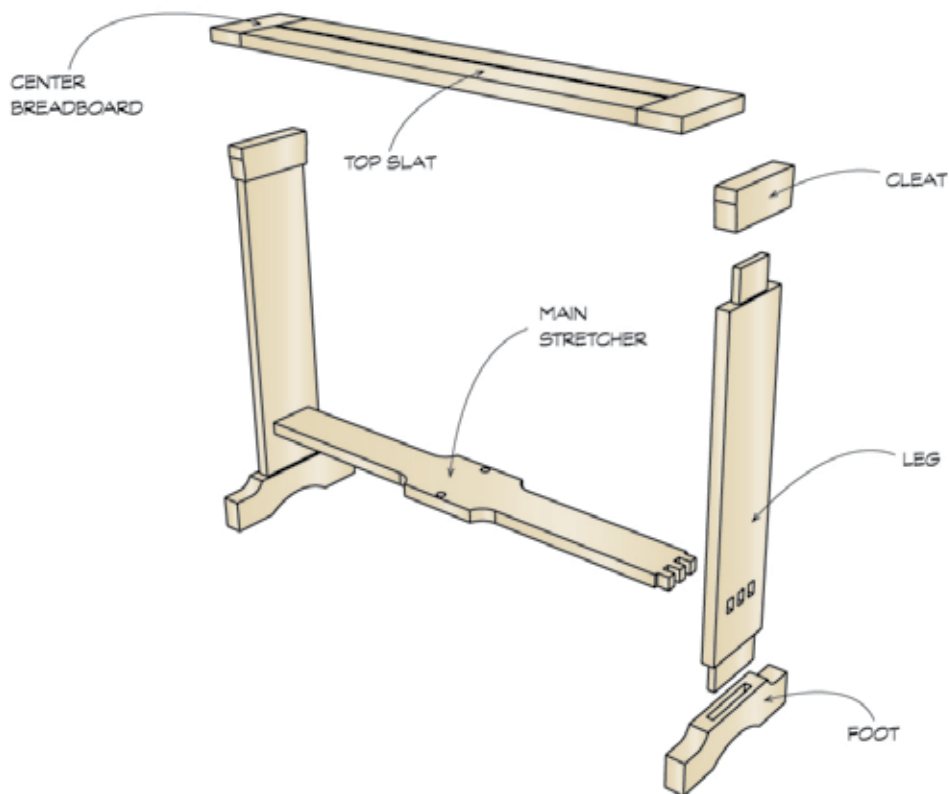


Shelf & Gate Detail

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Exploded View

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