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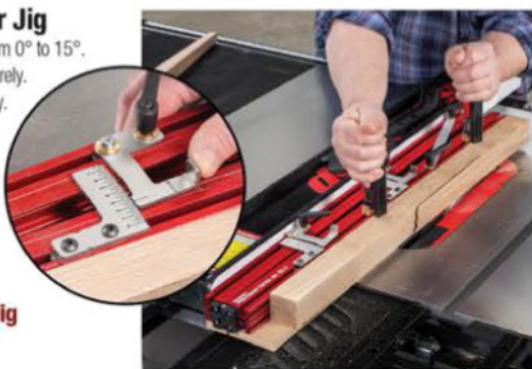
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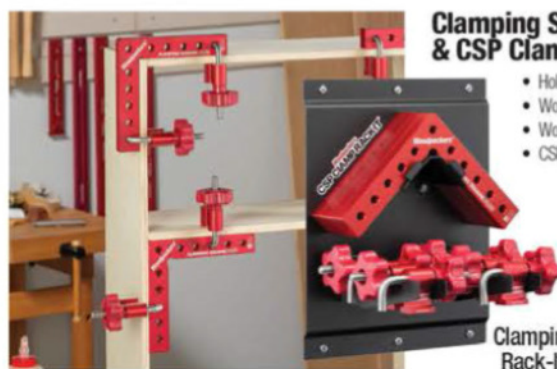
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from the editor Sawdust

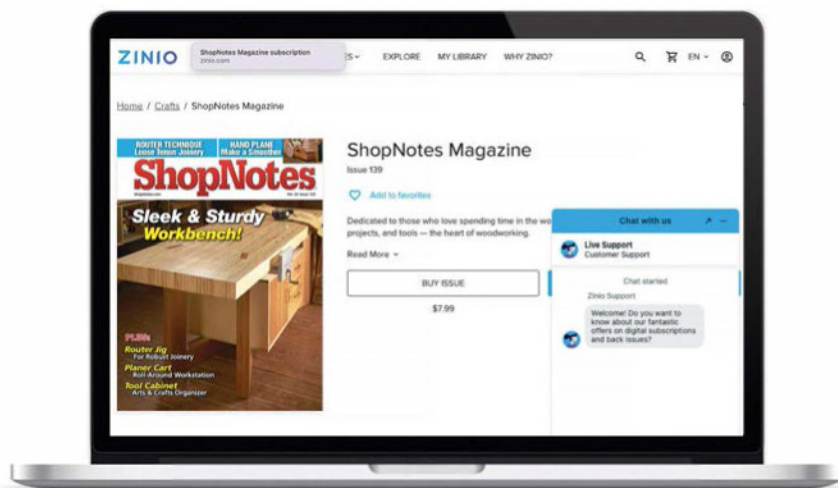
The light from my garage shop is especially inviting during this darker season of the year. Now that the holiday gift rush is over, it's time to focus on the next set of projects — and maybe explore a different branch of the woodworking tree. I've been dabbling in some carving projects. So I want to learn some new skills there and add to my carving tool set.

I'd like to give special recognition to the design and shop team for this issue. Chris, Steve, John, Marc, and Dillon designed and built five beautiful and fun projects. Just take a look at the contents on the next page. The range of styles and approaches to furniture is amazing.

In other news, we've relaunched *ShopNotes* as a quarterly digital magazine. Long-time subscribers will remember *ShopNotes* as our workshop-focused companion magazine. We've been working on the projects for the last year. And I've been excited (and waiting) to tell you about it.

ShopNotes offers a chance to dive deep into shop-made tools & jigs, shop furniture: workbenches, carts, workstations, and more. Each issue is filled with ideas and information to improve your shop and make you a better woodworker. There will be four digital issues each year. Subscribe at ShopNotes.com.

FRD



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Miter Saw Micro-Adjustment Stop

The miter saw is my main cross-cutter, but making small adjustments on the piece being cut isn't easy. The stop you see here was my answer. Since clamping a stop block to the fence is difficult on short pieces, the stop is long and attached to a plywood fence.

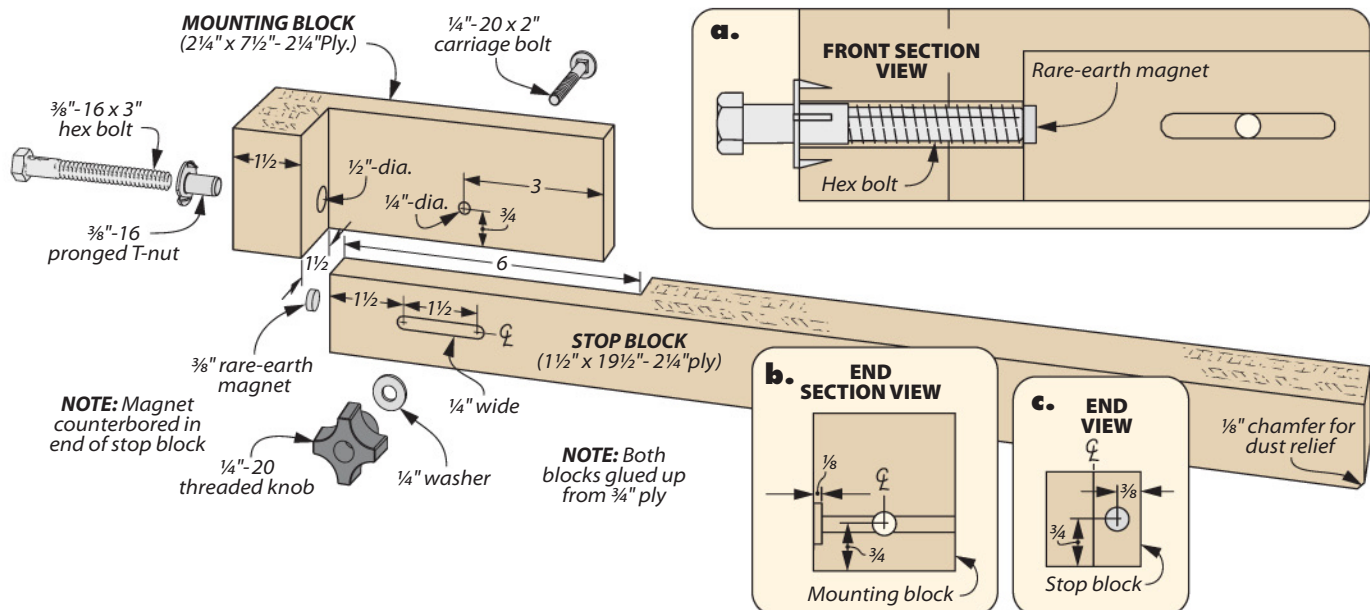
The stop is simple: two pieces connected by a couple bolts for

adjustability. The mounting block is L-shaped, with one hole for a hex bolt to fine-tune the stop block and another for a carriage bolt to lock it in place. The carriage bolt is counterbored, while the hex bolt threads into a T-nut.

The stop block is a long piece with a cut-out for the mounting block at one end and a chamfer

for dust relief at the other end. A recessed rare-earth magnet keeps the stop block attached to the hex bolt as it moves. A slot along the side accepts the carriage bolt. A washer and knob thread overtop, and tightening the knob locks the stop block in place for a cut.

*Dan Martin
Galena, Ohio*



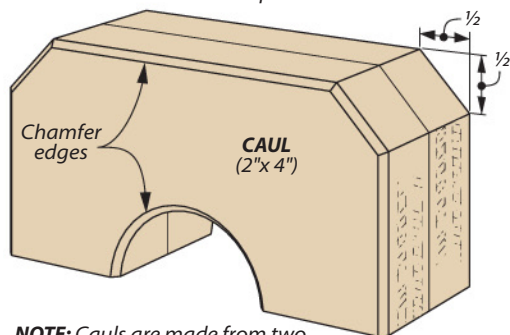
Arched Cauls

When gluing up a panel from multiple boards, keeping them all aligned can be stressful. Wet glue has a tendency to make boards shift when pressure is applied. However, a couple sets of cauls clamped along the joints ensures the panel surfaces stay flush. The ones pictured here are arched to keep the glue off.

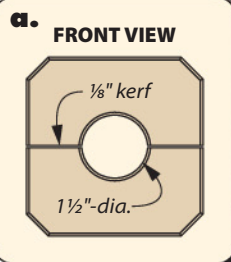
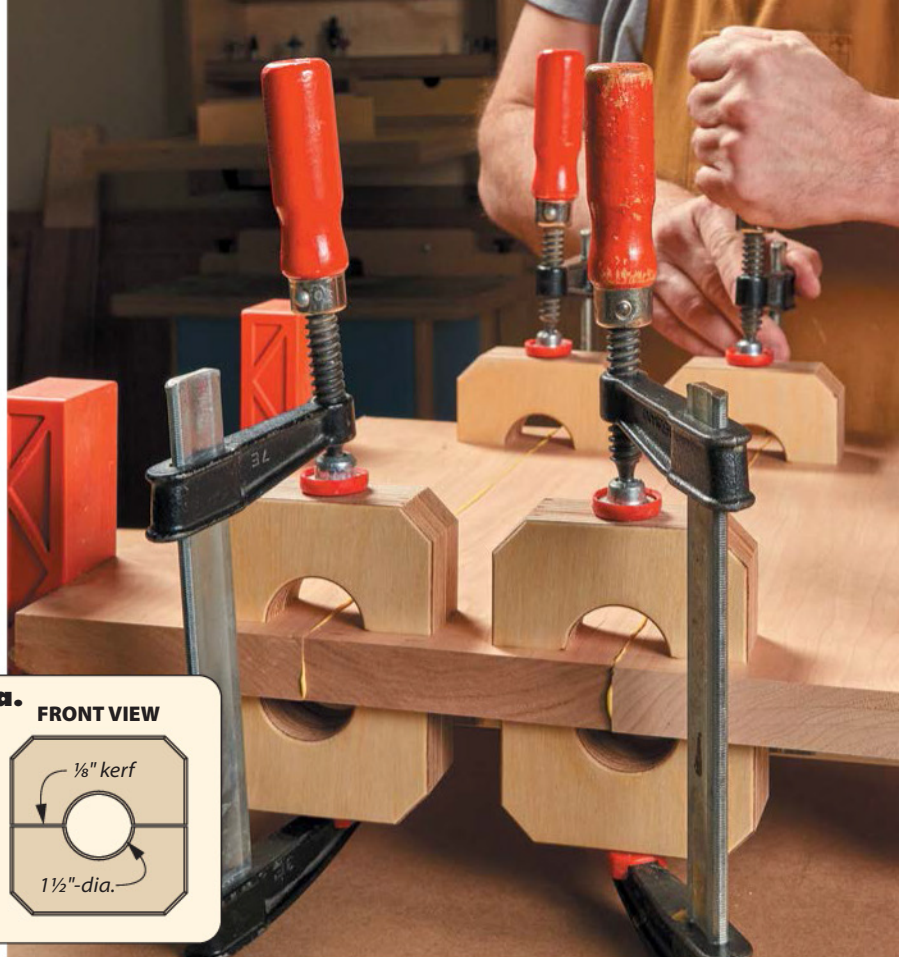
Make the cauls from two glued-up blocks of plywood, chamfering the edges and cutting off the corners. From there, bore a hole through the center for the arch and chamfer the hole. Cut the block in half, and you're left with two cauls.

Anthony Saldana
Aurora, Illinois

NOTE: Make from one blank, then cut in half to complete



NOTE: Cauls are made from two 4" x 4 1/8" pieces of 3/4" plywood



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QUICK TIPS



Painter's Pins.

John Hansen of Rapid City, SD was getting

ready to paint when he realized he didn't have anything to set his door frame on. Looking around the shop, he ripped a few pieces of scrap into thin strips, then shot pin nails every few inches along the length. These served as quickly made painter's points.

Super Glue Storage. *Paige Wilson of Chicago, IL* had found herself with a collection of open super glue bottles. To give the open bottles some extra shelf life, she put them in a container with a packet of silica gel. Silica gel is a dessicant, so it keeps the container at a low humidity, slowing the curing process of the open CA glues.



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QUICK TIPS



Laying Out Pipe Length. *Chris Benda of Gilbert, Iowa* thought up an easy way to mark pipe or dowel. He wraps a piece of paper evenly around the pipe, then lines it up with the length he's aiming for. Next he uses a permanent marker to mark out a consistent line around the pipe's circumference.



Bar Soap Marking. *Scott Grove of Canadigua, NY* uses spare bars of soap to make layout lines more distinct on dark woods. After marking out the baseline for his dovetails with a marking knife, he rubbed the bar soap over the line, then wiped away the excess to leave a distinct line.

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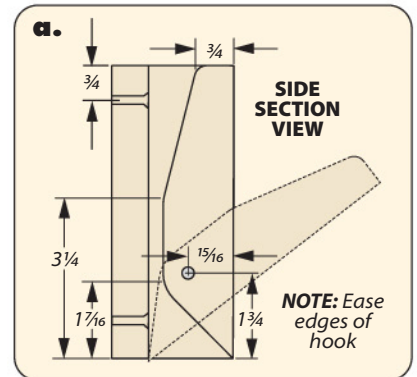
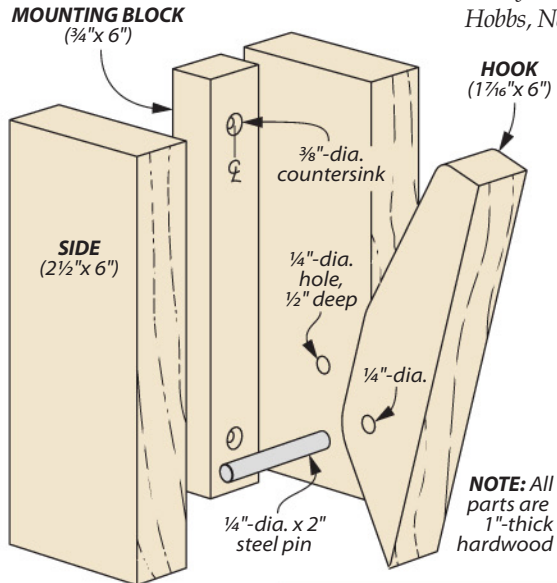
Fold-Down Apron Hook

When I'm in the shop, I almost always use an apron. It helps keep my tape measure, steel rule, and pencils handy, plus it keeps the sawdust out of my pockets. When I first started wearing one, I realized I'd need a hook to hang it, and I figured, why not make one instead of buying one?

The apron hook you see at left is what I came up with. It's pretty simple, using only four pieces of 1"-thick pine. First, I cut all the pieces to size, then I drilled out the holes for the pivot pin, as well as the countersunk pilot holes for mounting the hook on the wall. After that, I shaped the hook. I did the initial shaping at the band saw, then moved over to the edge sander to ease it into the shape I wanted. The exact final shape isn't critical, so long as the hook holds your apron.

To assemble this project, just apply glue to the sides of the mounting block, sandwich the sides on with the hook in between (on the pivot pin of course). Now screw the assembly onto the wall. The top screw can go in straight, but you'll need to angle the lower one.

*Barry Waphulkuhn
Hobbs, New Mexico*



ACTUAL SIZE

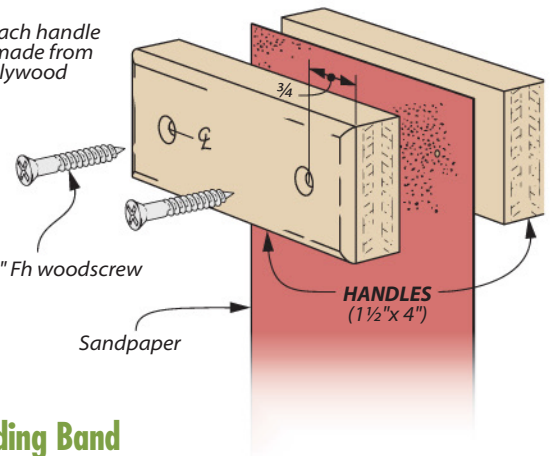




NOTE: Each handle half is made from $\frac{3}{4}$ " plywood

#8 x 1 $\frac{1}{4}$ " Fh woodscrew

Sandpaper



Sanding Band

Sanding oddly shaped pieces like the cabriole leg pictured at right can be a pain (even more so than an average sanding session). Matching the contours can be difficult and time-consuming, but this sanding belt makes hitting those curves much easier.

The belt itself is from a belt sander, measuring 4" wide and cut down to 16" long. The handles on the ends are pieces of $\frac{3}{4}$ " plywood. The plywood is screwed together, sandwiching either end of the belt. After that I chamfered the corners of the handles for a smooth, easy grip in my hand. When one belt wears down, I just attach the handles to a new belt.

*Travis Hahn
Calvin, Oklahoma*

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Crown Molding



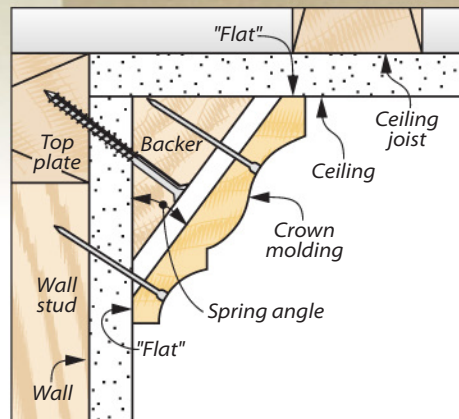
▲ Regardless of width or wood species, crown molding often has an ogee profile near the top edge and a cove at the bottom.

Any seasoned carpenter will tell you, installing crown molding is anything but a routine task. Unlike most moldings, which are attached flat to the wall, crown molding rests at an angle between the ceiling and wall. Because it “leans” at an angle, working with crown molding requires cutting compound angles, which can be a tricky operation. To complicate matters even more, in general construction, walls and ceilings are seldom flat, square, or plumb.

CROWN MOLDING CLOSE-UP

If you haven’t purchased crown molding before, it’s worth taking a few minutes to familiarize yourself with some of the basics — such as how it hangs on the wall.

WHICH SIDE IS UP? All crown molding has a decorative profile milled into the face of the molding. At first, it may not be obvious which side faces up toward the ceiling. An easy way to determine this is to look at the end of the molding (photo at left). Typically, an ogee profile (a double curve in the shape of an elongated ‘S’) is closest to the ceiling, while the smaller profile (often a cove) is at the bottom.



SIZE. In addition to a variety of profiles, crown molding also comes in a wide range of sizes. The most common width ($3\frac{5}{8}$ ") is readily available at most home centers. At some lumberyards and mill-work shops, $4\frac{1}{2}$ ", $5\frac{1}{4}$ ", $6\frac{5}{8}$ ", and even wider moldings are available.

When selecting crown molding, the idea is to make it proportional to the size and height of the room. For example, $3\frac{5}{8}$ " or $4\frac{1}{2}$ " molding is appropriate for an average-sized room (about 150-200 square feet) with an eight-foot ceiling. But you’d want to use wider molding in a large room with a higher ceiling.

SPRING ANGLE. Regardless of its width, crown molding is milled so it sits against the wall and ceiling of the room along two narrow edges or “flats” (inset detail on previous page). With these flats fitting tightly against those surfaces, the molding is tilted at an angle called its spring angle. You’ll need to take this angle into account when cutting crown molding and when making the backers that fit into the opening behind the molding (more on that later).

PLANNING THE JOB

As with any job, some careful planning up front will go a long way toward preventing problems from cropping up later.

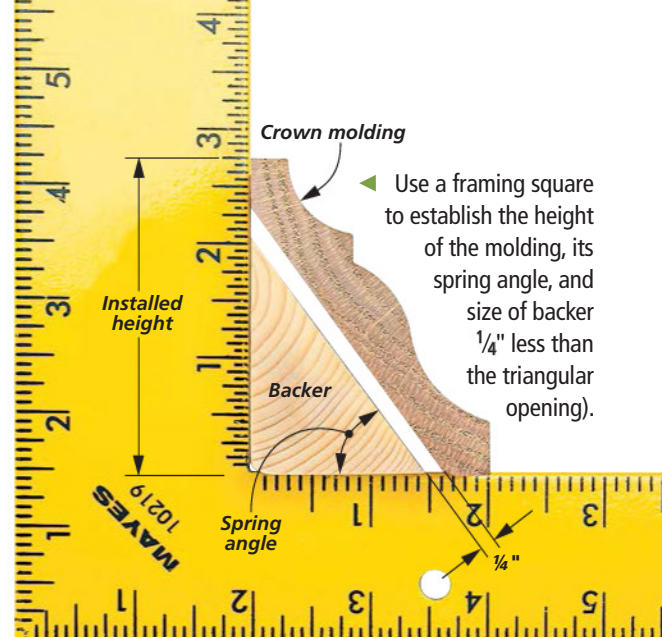
LOCATE WALL STUDS & JOISTS. For starters, I mark the locations of the wall studs and ceiling joists with blue (or purple) painter’s tape. This type of tape isn’t as sticky as regular masking tape, so it can be easily removed

without damaging the paint once you’ve finished the job.

LAYOUT LINES. The next step is to mark lines on the tape indicating the location of the bottom edge of the crown molding. These lines will make it easy to position the molding.

To determine the location of the lines, you’ll need to know the “height” of the crown molding once it’s installed. An easy way to do that is to use a framing square and a scrap piece of molding (photo, right). Just measure the distance from the corner of the square to the bottom edge of the molding. Then, cut a block to match that distance and use it as a gauge.

BACKERS. There’s one situation you’ll run up against that needs special attention. If the ceiling joists run parallel to a wall, there won’t be anything to nail the top of the molding to along the wall. Installing short backers (about 12" long) will provide



a solid mounting surface.

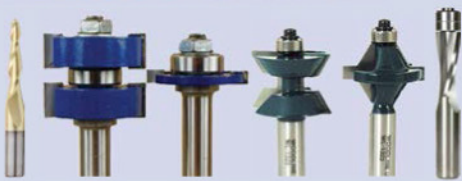
Backers are triangular lengths of 2x stock that fit into the opening behind the molding. Here again, use a framing square and scrap molding to determine the size of the opening (photo above). Keep in mind that you don’t want the backers to fit tightly against the molding.



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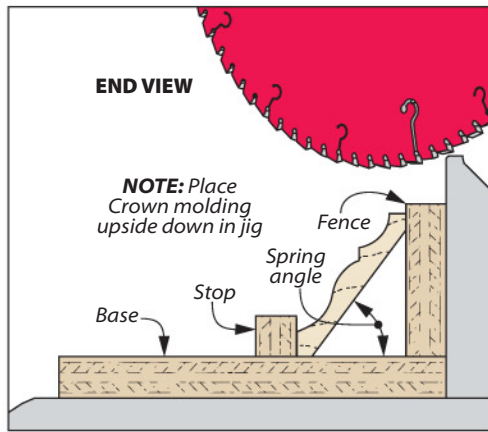


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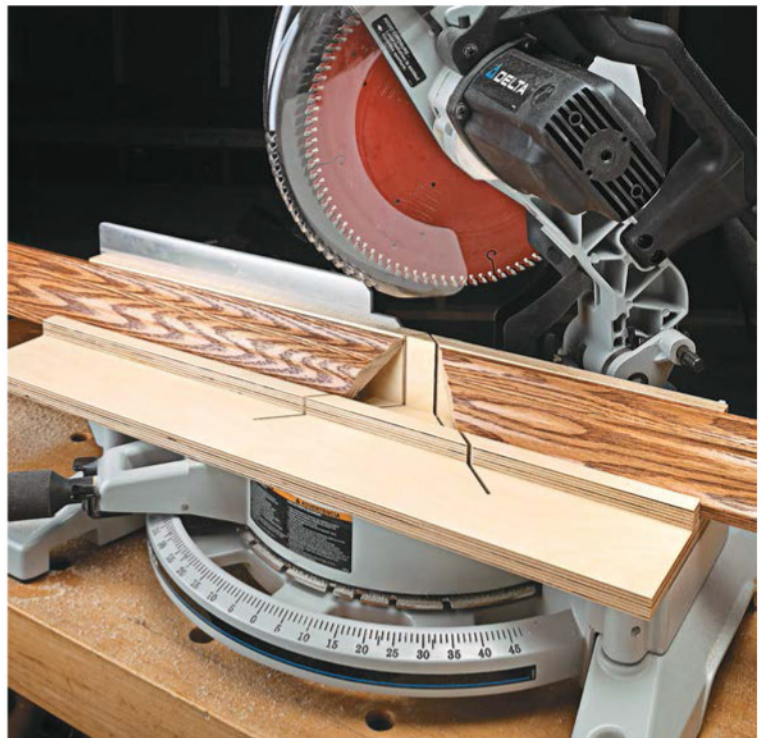


MAKING A JIG

When working with crown molding, getting a tight-fitting corner joint is all about making accurate compound angle cuts. This requires taking two angles into account: the spring angle of the molding (the angle it projects from the wall), as well as the angle of the corner.

One way to simplify things is to use a miter saw jig that holds the molding at its spring angle (photo, right). This way, with the molding tilted against the jig, all you have to do is cut a 45° miter.

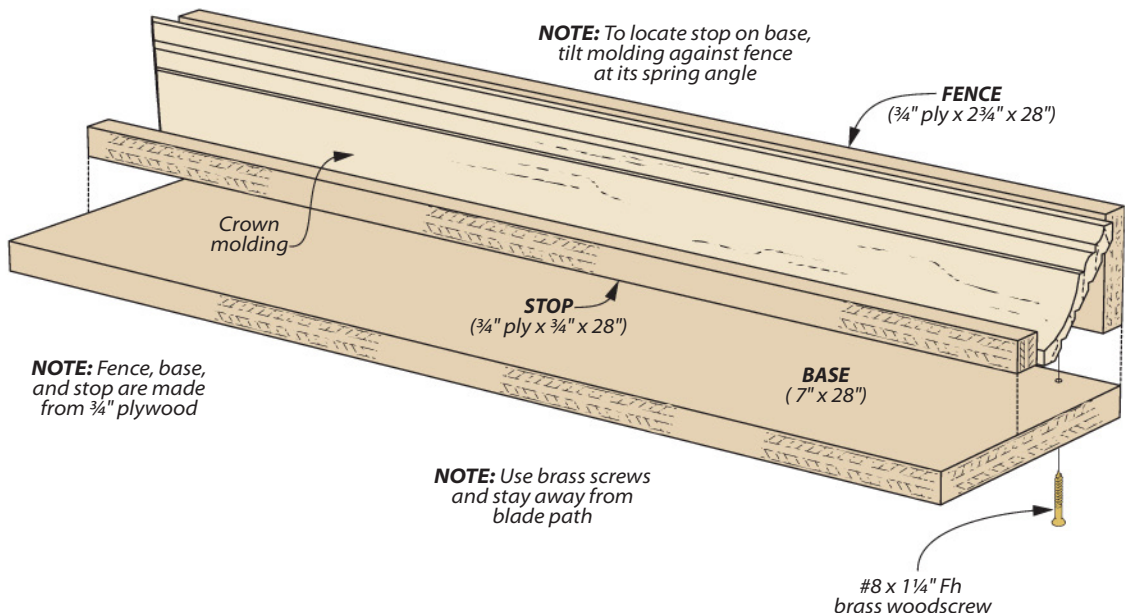
BUILD THE JIG. It only takes a few minutes to build a jig. The one shown below is made of $\frac{3}{4}$ " plywood, but it's a good project for using whatever scrap material you have on hand.



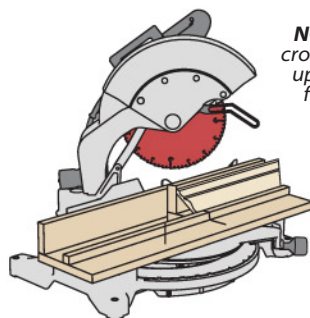
▲ A stop attached to the base of this jig prevents the crown molding from slipping off its spring angle, so you can focus on making simple 45° miter cuts. The base can be longer to provide outfeed support if needed.

The jig consists of three pieces: a base, a fence, and a stop. As you can see in the detail above left, the base and the fence act as the ceiling and wall, supporting the crown molding at its spring angle during a cut. The stop simply prevents it from slipping off its spring angle.

It's easy to determine the length of these jig pieces; they match the length of the miter saw (they can be longer if you like). The base has to be wide enough so that the kerfs made by the saw blade won't go all the way to the outer edge. For the fence, just be sure it's tall enough

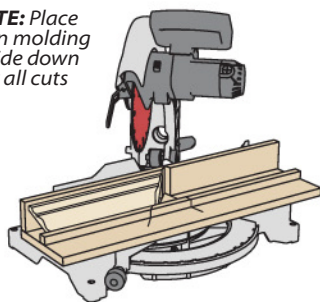


LEFT INSIDE CORNER



Rotate saw 45° right,
place molding on right

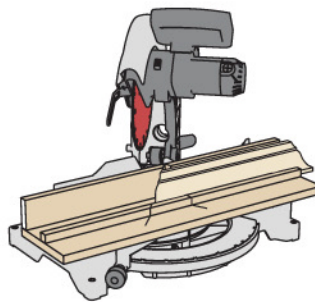
RIGHT INSIDE CORNER



Rotate saw 45° left,
place molding on left

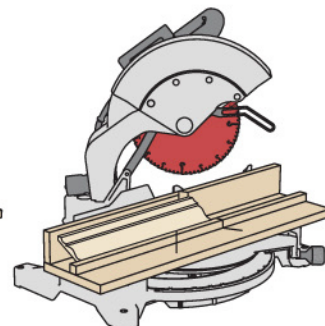
NOTE: Place
crown molding
upside down
for all cuts

LEFT OUTSIDE CORNER



Rotate saw 45° left,
place molding on right

RIGHT OUTSIDE CORNER



Rotate saw 45° right,
place molding on left

to support the crown molding.

After cutting the pieces to size, the base and fence are simply screwed together, forming an L-shaped assembly.

INSTALL THE STOP. Now it's just a matter of attaching the stop. An easy way to determine the location of the stop is to use a scrap piece of crown molding. Lean the molding up against the fence. It should be placed

upside down — that is, with the top of the molding against the base of the table and the bottom against the fence.

Check that it's resting on the narrow edges (or "flats") on the back of the molding. Then mark the location of the bottom edge of the molding on the base of the jig. Now align the stop with the layout line and attach it with brad nails.

MOUNT THE JIG. With the stop in place, it's just a matter of mounting the jig to your miter saw. It's held in place with screws installed through the pre-drilled holes in the miter saw fence.

The drawings above show the four basic miter cuts you'll use on crown molding. Next, we'll focus in on one that will be combined most often with a coping saw — the right inside corner.

TUNG OIL WOOD STAIN

Exterior & Interior



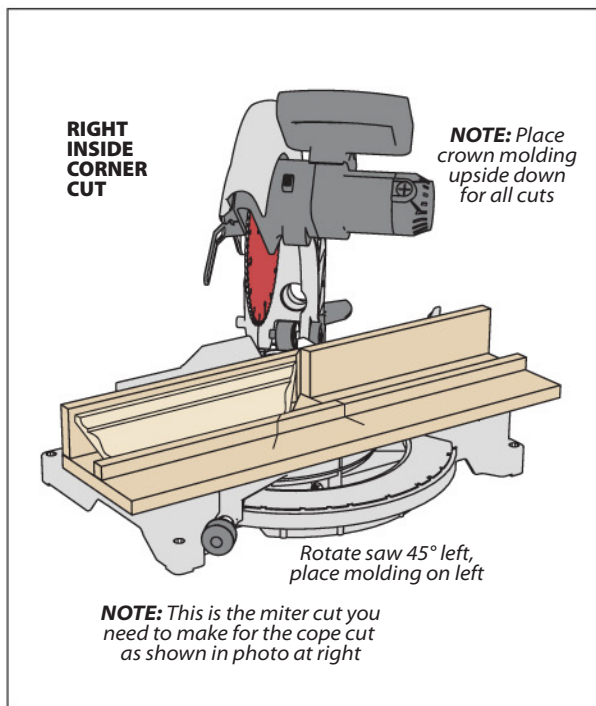
Longest Lasting

Maximum UV Protection
Deep Penetrating Oil

novausawood.com/exoshield



*Cedar outdoor kitchen finished with ExoShield Natural.



CUTTING CROWN MOLDING

The next step is cutting the crown molding. You have the jig in place, a sharp blade in the miter saw, and a stack of molding at the ready. Hopefully you've purchased some extra material so you can practice making this sequence of cuts that can bend your brain around a bit. That way, if you make a mistake while coping, there will still be enough material on hand to trim the end and try again. There's no need to be running to the lumber yard mid-project.

UPSIDE DOWN. Either way, you'll need to place the molding in the jig so it's upside down. In other words, the top edge of the molding rests on the base of the jig, and the bottom edge sits against the fence. (As I've mentioned earlier, think of the base as the ceiling of the room and the fence as the wall.)

AND BACKWARD. Since the molding gets sawn upside down, it must also be placed in the jig backwards. The previous page shows the saw and molding positions for cutting both inside and outside corners.



▲ After revealing the profile of the molding, it's time to make the cope cut. When making a cope cut, tilt the saw to make a backcut, then follow the contour of the profile as closely as possible, leaving a slightly "thick" edge.

COPING INSIDE CORNERS

More often than not, you'll be cutting an inside corner joint when working with crown molding. For an inside corner, I use a coped joint. With this type of joint, one molding is butted into the corner, and the adjoining piece is cut, or coped, to fit against it.

Let's visit a moment about why the inside corners don't use the much simpler butted

45° joints — that's a valid question. After all, outside corners are mitered, so what gives? First, it's the same reason you let panels float in frame and panel doors — seasonal movement. In this instance the problem is on a larger scale, but it has to be addressed if you want good-looking woodwork for a long time. Second, the three planes of two walls and a ceiling are often not square to each

other. So getting a closed miter on an inside corner is more of a headache than learning how to make the sleeve-like, flexible coped corner.

Before coping the joint, you'll need a "map" of the decorative profile of the crown molding to use as a guide while making the cut. That map is easy to come by. You simply position the molding on the jig for either a left- or right-inside corner, then cut a 45° miter on the end of the molding. Here, we're going to make an inside right corner cut. The miter saw set up for this cut is like you see in the drawing on the previous page. The freshly cut edge provides a visual reference that you can follow as you make the cope cuts.

COPING SAW TECHNIQUE

Once the miter cut is made, it's time to cope the molding to fit against the adjoining piece. The whole idea here is to backcut the end of the molding, following the contour of the profile as closely as possible, and leaving a slightly "thick" edge (photo, previous page).

For a chip-free cut, you'll want to mount the blade so the teeth point *away* from the handle of the saw. It also helps to make relief cuts, which allow



1 ▲ The first step is to make a relief cut from the back of the molding to the transition line between the two decorative profiles.



2 ▲ With the coping saw held at a steep angle, make a backcut along the cove profile, stopping at the relief cut.



3 ▲ Starting from the back of the molding, make a second relief cut up to the transition line where the ogee profile begins.



4 ▲ After completing the cope cuts, use a half-round file to refine the fit, working just up to the edge of the molding.

the waste blocks to fall free (Steps 1 and 3, above). Since you're cutting through a lot of wood the angle of the backcut in Step 2 takes some time to do. If you're patient and don't

force the blade you'll be much happier with the results. Finally, no matter how carefully you cut, you'll probably still need to file the end of the molding for a perfect fit (Step 4). The two photos to the left show you how to check your handiwork with a scrap of molding.

The savvy woodworker that you are means you know we've been using oak molding in these photos. The grain pattern in oak can be ornery at times. You might want to experiment with a well-behaved paint-grade poplar or pine to get the hang of the coping process.

Now that you're a master of the coped joint, you're about ready to take on any room in the house. In the next issue we'll have tips and insights on the rest of the journey. **W**



▲ To check the fit, hold the coped end against a scrap piece of molding. A file will fix small gaps.



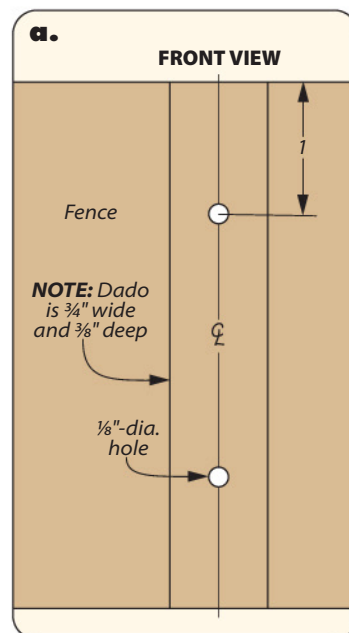
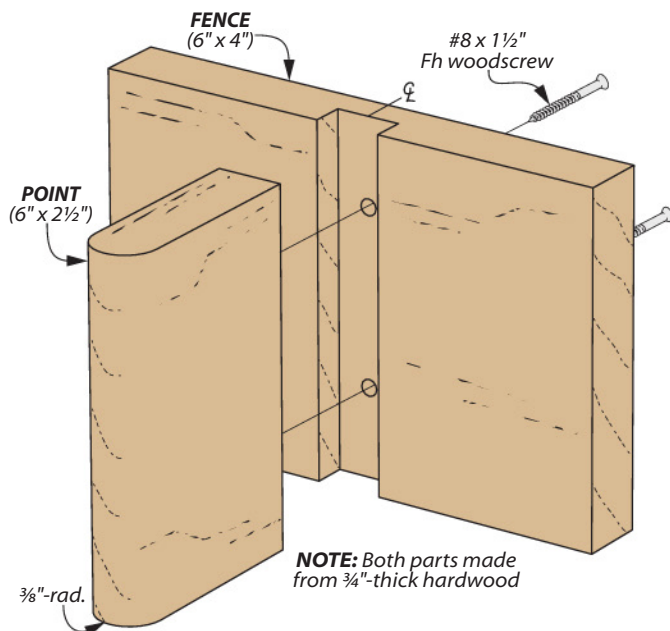
▲ When you have arrived at a tight-fitting joint, the line between the two boards will all but disappear.

Band Saw Point Fence

The band saw is one of the most versatile power tools in any shop. From pattern cutting to resawing to joinery, it's capable of jobs across the spectrum. The thin kerf of a band saw blade means less waste compared to a table saw or miter saw, and the downward cutting motion makes it one of the safest power tools to use. Despite these advantages, there is one big drawback that a lot of band saws suffer from: drift.

A saw that needs tuning or has a dull blade will really suffer, but even a well-maintained band

saw can pull to one side during a cut. There could be an issue with the tires — the crown, the axles, the alignment, the blade position on the crown — or it could be trouble with the blade itself, either in the set of the teeth or the tension the blade is under. While cutting freehand, drift can be actively worked against, but if you need to use a fence then you'd better hope it's adjustable, and that you've adjusted it right. However, there's a fence design that skips the need for adjusting while still providing the benefits of a fence.



POINT FENCE. If you've done a bit of band saw work, then you've likely come across a single-point fence. The concept isn't anything crazy: by keeping in contact with the workpiece at only one point, the fence maintains a consistent width (or thickness when resawing) while allowing for various angles of approach, and it makes

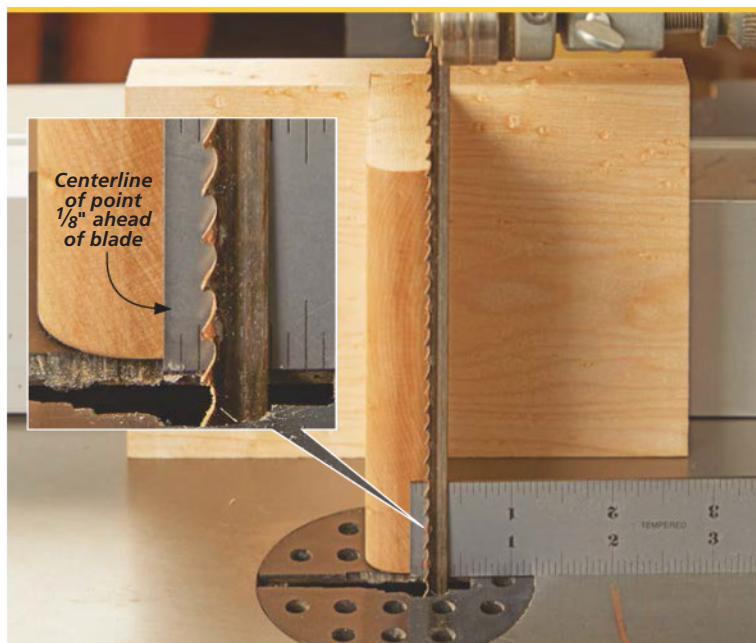
controlling the direction of the workpiece easier.

The most common use of a point fence is resawing, but it's often used when cutting curved pieces with a uniform width (or thickness). Less commonly though, a point fence can be used to counteract a drifting band saw, since there's no worry about misalignment.

MAKING A POINT FENCE. A single-point fence can be as simple as a long board with a rounded end that gets clamped to the table. It can also be a complex, fully adjustable replacement for your stock band saw fence. How extensive you'd like your fence to be is up to you, but I prefer to take the middle ground.

The point fence illustrated above keeps it simple. It's two pieces screwed together in a T-shape, then butted up to the stock fence of the band saw and held in place by F-clamps. The fence can be short if you only plan on doing rip cuts, but a taller fence is better when it comes to resawing.

ROUNDED OR FLAT. There are differing ideas on the best shape for the fence's "point." Some people find a small flat helps get a straight cut started. Personally speaking, I prefer a rounded end that has truly a single point of contact. The rounded edge is easier for me to pivot on curved pieces as well as keeping straight rips under control. If you're interested in a band saw point fence, it might be worth it to try both styles and see which you prefer.



▲ The workpiece needs to make contact with the point fence just before the cut begins. Position the point fence so the center (where it touches the piece) is $\frac{1}{8}$ " in front of the blade's teeth.



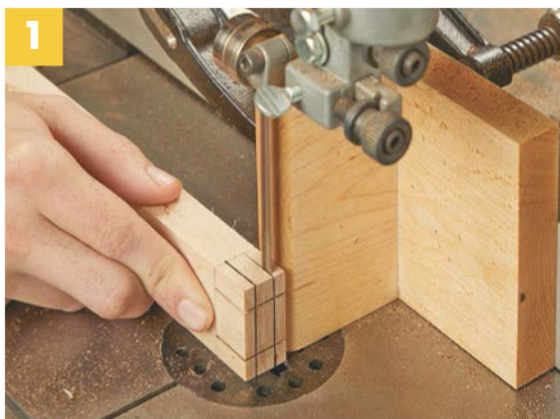
- ▲ A point fence will help you counteract drift. Keep the workpiece pressed firmly against the fence while cutting and work to find the best angle of approach.

USING A POINT FENCE

As I mentioned before, a big advantage to using a single-point fence is the control, like using a tool rest on a lathe. Not



- ▲ Since the point fence will keep a piece at one consistent width regardless of shape, it makes the perfect accessory for cutting curves, such as you might find on the stretchers making up the back of a chair.



- ▲ When making tenons, the point fence helps keep each side of the tenon even. For offset tenons, simply adjust the point fence accordingly.



- ▲ Once the cheeks of a tenon have been cut, a freehand crosscut finishes the job. This makes the band saw an excellent option for smaller tenons.

only does the fence keep a consistent width on the piece being cut, but it also allows you to easily adjust the angle of approach.

There's a small bit of technique to using a point fence—keeping in contact with the fence. If your blade does drift, it may want to pull away from the point, so you'll need to keep a bit of pressure applied against the fence while pushing through the cut.

As I mentioned before, the point fence is primarily an accessory for resawing and cutting curves. However, I find it useful for a variety of cuts, even joinery.

RESAWING. Whether it's cutting a thick piece of stock into two usable boards or slicing a nicely figured piece into bookmatched veneers, resawing is incredibly useful and best done on a band saw. A point fence is ideal for resawing, as it eliminates any worry that the fence might be misaligned with the blade drift.

Resawing with a point fence is easy. The point will help maintain a constant thickness, so you simply need to keep the cut straight and the workpiece pressed against the fence. This minimizes the blade marks and maximizes your material.

RIP CUTS. Straight cuts on the band saw are usually

reserved for thin and small pieces, which could be a danger to try on the table saw. This is where counteracting drift really comes in handy. If you've gotten the hang of resawing and making curved cuts, then you have all the skills required. The key is keeping the piece against the fence and finding the best direction to approach the cut from.

CURVED CUTS. Most of the work I do at the band saw is curving cuts that simply wouldn't be possible elsewhere. While many of these odd shapes are done freehand, a fence is useful for achieving a consistent thickness during the cut despite the shape (right photo above).

Again, some pressure must be applied against the point, as well as forward through the blade. Unlike with resawing however, you'll want to adjust the angle of approach along with the curve to minimize chatter and blade marks. Depending on the drift of your saw, the piece may want to pull away from the fence on a curved cut, so a few test cuts beforehand can be helpful.

TENONS. A point fence is handy for small tenons, especially those on the ends of boards that would be awkward at the table saw. After laying out the tenon, begin by establishing the cheeks (Step 1). Then pull aside

the fence and cut the waste free-hand (Step 2).

THE BRIDLE JOINT

While tenons can be cut by about any tool under the sun, there's one specific "band saw exclusive" joint that's far easier to make when using a point fence. The bridle joint you see pictured to the right is a great choice for long, narrow pieces. It creates a strong bond and offers a distinct look, making it a popular option on many frames.

Looking at the joint, you can see why I'd favor the band saw. While the tenon can be made as

easily as any other, the shape of the mortise calls out to be made at the band saw. Of course, if drift is an issue, then getting those lines perfectly straight for a good fit can be a hassle. That's where the point fence comes in.

MAKING THE MORTISE. The first and most important step is to establish the sides of both the mortise and the tenon, as shown in Step 1 below. This is where the point fence is useful, as it'll keep your cuts on-line. However, it's also important to minimize the

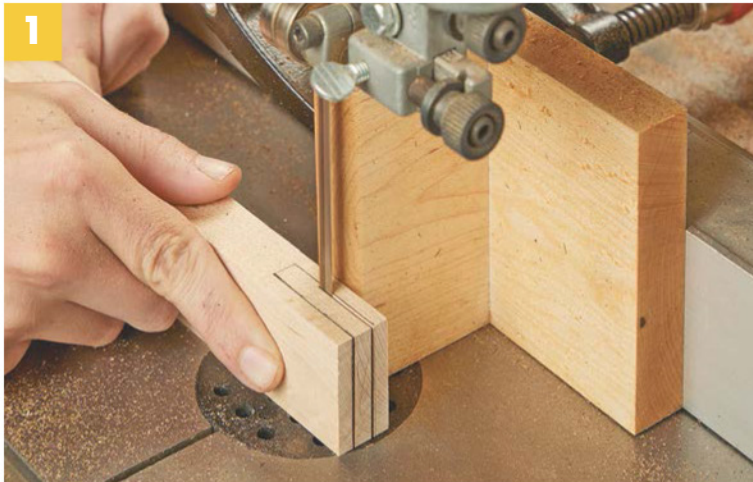
▲ A bridle joint provides a strong connection and a distinct look between two long, thin pieces. Typically, the rail is tenoned while the stile carries the mortise.

blade marks for a tight fit and a clean look. This means finding the right feed angle and keeping steady pressure both against the point and into the blade.

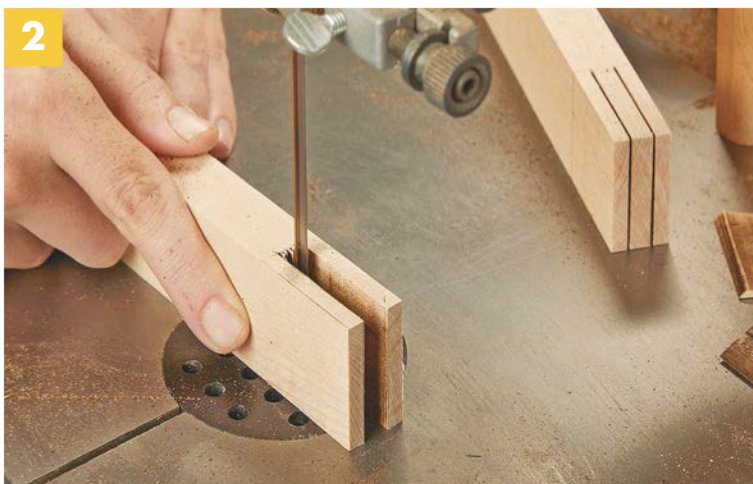
First cut the mortise. The tenon is next, but the fence will need to be nudged slightly toward the blade to account for the kerf.

Once both sets of straight cuts have been made, it's time to get rid of the waste with some free-hand cutting. Use a long, curving cut through the waste to free up the mortise. Bump the bottom of the mortise against the blade to clean it up (Step 2). If the bottom of the mortise is looking rough, clean it up with a chisel.

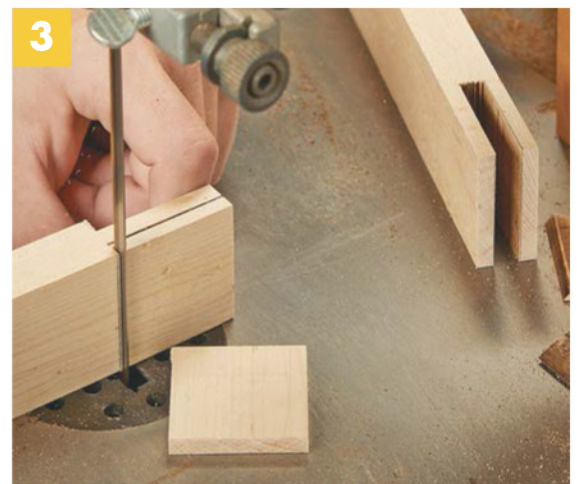
Completing the tenon simply means cutting the shoulders (Step 3). This should leave you with a snug, sturdy joint. **W**



▲ First, use the point fence to establish the cheeks of the joint. Cut the sides of the mortise first, then nudge the fence slightly (to account for the blade's kerf) and cut the sides of the tenon.



▲ Use a long, curving cut through the mortise's waste to clean it up, starting in the kerf of one side, then cutting to the opposite corner. From there, a series of "bump cuts" will clean up the base of the mortise.



▲ Crosscut the tenon's waste free, exposing the cheeks. With good form, this should leave few blade marks if any, resulting in a well-fitting joint.



A Grab Bag of Jigs & Good Tools

Every table saw comes with two mandatory accessories — a rip fence and a miter gauge. Out of the crate both items address a basic function. The rip fence guides material through the saw blade with the direction of the grain, while the miter gauge hold boards safely during a cut across the grain. Of course both do more with the addition of auxiliary fences and jigs. Here we're looking at two jigs for your miter gauge.

FALSE STARTS. One more thing I want to mention before we dive into the jigs — your table saw

blade needs to be parallel to the miter gauge slot for these jigs to work properly. That being said, let's take a look at the two of them.

MITERSET. If you visit *Miterset.com*, you'll find a site that's dedicated to making your miter gauge work with precision when cutting all manner of angles with your miter gauge. There are two jigs available to set angles on your miter gauge, and each comes with its own storage case. The jigs are made from anodized aluminum plate with a slot in the middle to hold your miter bar in place

while adjusting the angle of the head. Each jig has two tapered pins that fit in the holes drilled in the plates. A printed set of instructions are also included with the jig. The numbers that label the holes are laser-etched into the surface.

The hole arrays for both of these jigs are a mirrored pattern on either side of the miter bar slot to allow you to make left or right cuts with your miter gauge. Let's look at what each jig does.

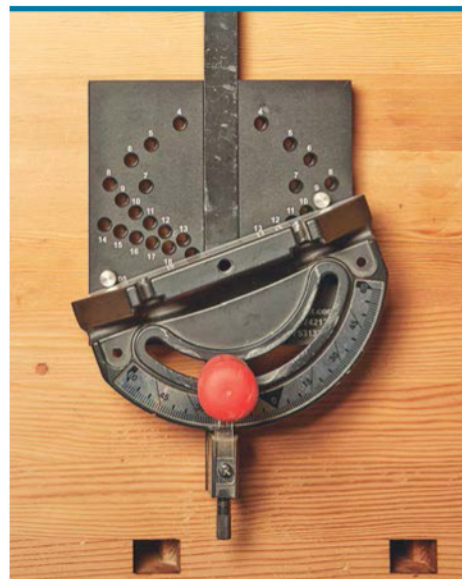
THE STANDARD PLATE. The *Standard* plate is shown in the photos at the bottom of the page. This jig sets your miter gauge to precise angles from 0.5° up to 52.5° (using the detent bar), doing so in 0.5° increments.

To use the jig you slide your miter gauge into the slot in the center of the jig and loosen the handle. Out of curiosity, I checked the 90° setting on my miter gauge against the jig (photo below left) the gauge dial on my miter head was off enough that I no longer rely on it for an accurate reading.

Place one pin at '00' and the other pin in the numbered hole



▲ Like the *Standard* plate, the *Segments* plate starts with a pair of '00' holes that each holds one pin as a point of reference.



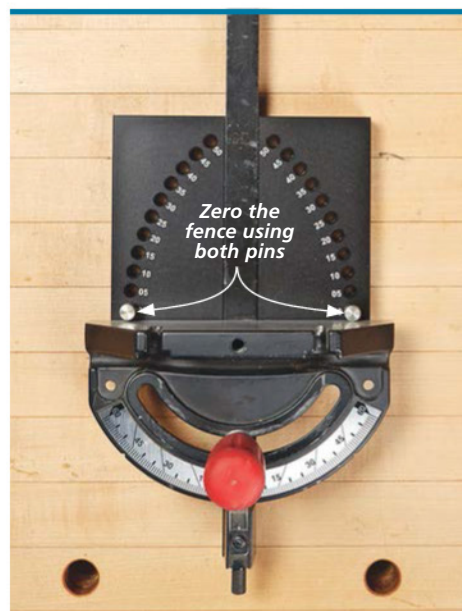
▲ Here, the jig has a pin placed in the hole labeled #9. That means you'll create a ring of 9 equal segments.

that represents the degree angle you want to cut. Now slide your miter gauge against the two pins and tighten the handle on your miter gauge. The photo below right shows the detent bar in action. The notches on either end of the bar allows you dial in the angle in 0.5° increments.

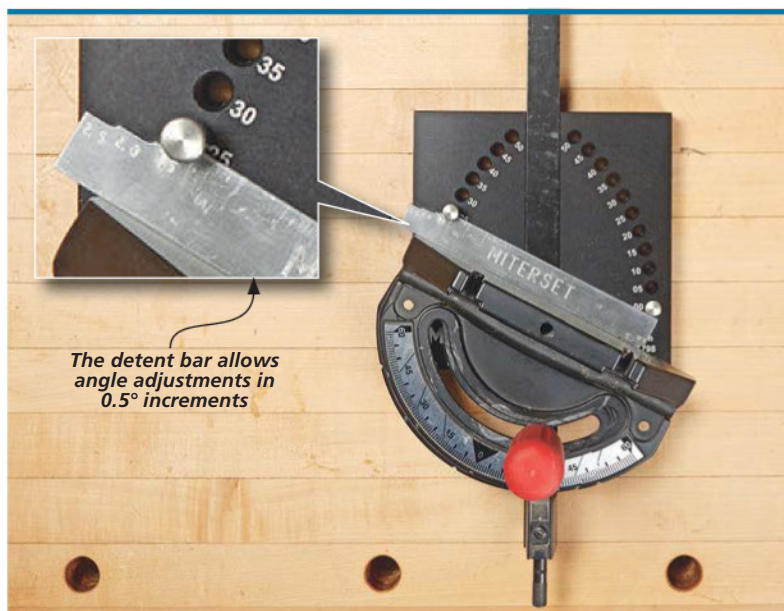
THE SEGMENTS PLATE. The other jig *MiterSet* makes is the *Segments*

plate. Like the *Standard* jig, the *Segments* jig aligns your miter gauge using a system of pins in numbered holes. This jig lets you divide a circle into as many as 20 equal segments, or as few as four (photos above).

These jigs aren't cheap, but they're super accurate. You can purchase the jigs separately, or as a set online at MiterSet.com.



▲ To set 90° accurately, loosen the handle and place the head against the steel pins in the '00' holes.



▲ The holes in the *Standard* jig are clearly etched in the surface at 5° increments. To dial the jig in at finer angle use the detent bar. This bar features a set of detents at each end for finer adjustments (inset photo).



► The QuickSet Work Bench has lots of amenities that make it worthy of being used in the shop.



▲ The orange tab under the handle unlocks the legs while the steel bar swings them open (top photo). To fold up the legs, unlock them first with the other tab (bottom photo).

QUICKSET WORK BENCH

Is it possible to have too many worksurfaces? Especially ones that fold up and can be tucked away when not needed? Well the *QuickSet Work Bench* from *ToughBuilt* makes a really good case for being added to your shop furniture collection, if for no other reason than its mobility. As you see in the photos to the left, just press the tab on the end of the table to set up and take down this sturdy work surface.

I'm not much for proprietary gimmicks like the *ClipTech* pouch attachment that you see in the main photo above, but that doesn't mean it isn't something worthwhile. But I do like all the openings in the surface for clamps. The openings are

nice and wide and they play well with my F-clamps when I need to hold something firmly in place. What would make me fall in love with this setup is if there were wheels on one end to roll the table around. After a quick search, I found this table available online at *Lowes.com*.

ISO TUNES LINK 2.0

Hearing protection is important. Did you hear that? Hearing protection is *critically* important. Forgive me if I'm coming off as Mr. Bossy Pants, but when you break a bone or pull a muscle those injuries will heal. Once hearing is gone, it's gone.

Fortunately there are comfortable options available that will keep you entertained, connected,



▲ The earmuffs are comfortable, from the padded headband to the memory foam cushions that cover your ears. And the volume is limited to 85dB.



▲ The control center on the *Link 2.0* earmuffs allows you to play and pause music. This is also the button where you can answer and end phone calls.

▲ Beneath the left earmuff there's a charging port for a USB cord that's provided with the unit.

and your hearing safe. The earmuffs you see in the photos above are a perfect example.

The *ISOtunes LINK 2.0* solves the conundrum that often happens with hearing protection — you're *too* isolated. These earmuffs connect with your phone via bluetooth for music and phone calls (there's a micro-phone attachment available that

we didn't try). The earmuffs come with a rechargeable lithium-ion battery and micro-USB charging cord. You can purchase the earmuffs online at isotunes.com, and many home centers.

NAIL PULLER

With the price of lumber these days salvaging old boards makes sense — in theory. In practice

pulling 16d nails out of wood can get exhausting real fast. The nail puller you see in the box below won't eliminate all the work, but it certainly helps.

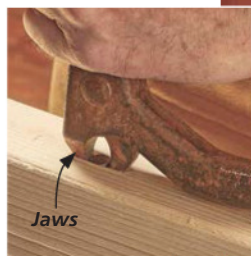
It's the *Crescent 19 Inch* nail puller. I've had the one you see here for over 30 years. This nail puller, along with newer models, can be purchased online and at local tool suppliers. [W](#)

OLD-SCHOOL LUMBER RECYCLER



Embrace the Beast.

This is a serious nail puller. First, straddle the jaws around the nail to be pulled (inset photo). Second, drive the jaws around the head of the nail (middle photo). Third, pry the nail free by pulling back on the handle. The heel of the puller acts as the fulcrum to remove the nail. It's not pretty, but it works.



Heavy steel construction



Slide hammer down over nail head



Levering back grabs nail head and pulls nail out



Marble Tower

This wooden wonder is a simple feat of engineering that provides a fascinating challenge in the shop and plenty of entertainment for children and adults alike.

Marbles are one of the oldest toys known to humanity. The earliest are estimated to have been made in 2500 BCE, and writings from the Roman empire show us that Roman children played with them much like kids might today. Of course, a modern child has no shortage of entertainment, but there's still something to be said about the simple, visceral joy of a toy like the one here.

ANCIENT TOY, MODERN DESIGN. The marble tower here is based off of the many marble run toys you may have seen in toy aisles — or, like me, had as a child. As simple as a marble is, a run isn't much more complex, and most are just a series of ramps for a marble to travel down. However, our designer, Chris Fitch, wanted something a bit meatier for this project, which led to the pump tower that feeds marbles from the bottom to the top.

RUDIMENTARY MECHANICS. As you may have gleaned from the photo at left, the tower is operated by a hand crank. While wooden mechanisms can often be daunting projects, this one couldn't be simpler. The hand crank is attached by a shaft to a rotor. The rotor has a marble sized gap, and when it's turned it takes the lowest marble on the track up into the channel in the pump. As the channel fills, marbles are forced up to the top until they roll out at the starting ramp. Each turn of the crank then pushes another marble down the tower.

The yellow pine, accented by hardboard bumpers, glows once finished, while the grain of the tracks flow together. All in all, this old-school toy makes a gorgeous gift for kids and grandkids that can also be appreciated by the grown-ups.



▲ Splines join the individual pieces of track that make up the start and end ramps for a sturdy connection.



▲ The marbles build speed rapidly as they follow the track, but a series of hardboard bumpers keeps them in line.

Starting at the **BASE**

Before getting to more intricate work, we'll need a foundation. The base and the post make up the bones of this project.

BASE. Cut the base to size, then radius the corners at the band saw. Clean them up at the edge sander, then set the piece aside for now.

POST. The post is made up of two faces and a center. After cutting the pieces to size, radius the corners and sand them clean as you did with the base. Use a dado blade and miter gauge at the table saw to make the notches that will hold the round tracks later.

PUTTING IT TOGETHER. Now to assemble the base and post. First, glue up the post, sandwiching the center between the faces. Once dried, seat the post on the base by driving countersunk screws up through the holes underneath (detail 'a').

PUMP

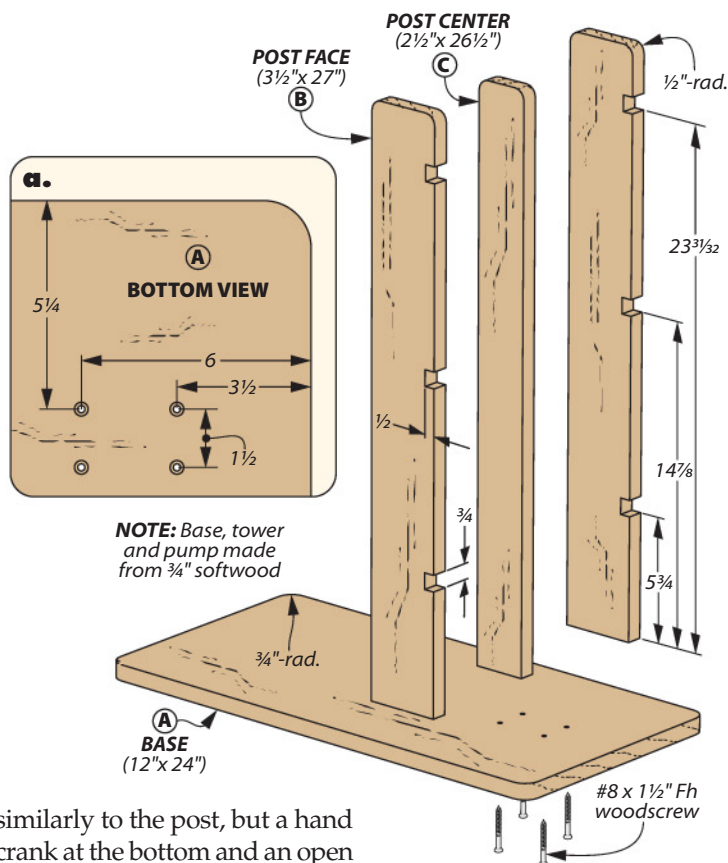
The pump sits at the heart of the project. It's structured

similarly to the post, but a hand crank at the bottom and an open channel through the center allow it to bring the marbles from the end back to the start of the tracks.

PUMP FACE. Begin by cutting the pump faces and pump center to size. As with the post, the pump will need shaped and sanded. The faces will also need notches

for the round tracks, which I cut at the table saw. Next, head to the drill press and drill out the rotor shank holes.

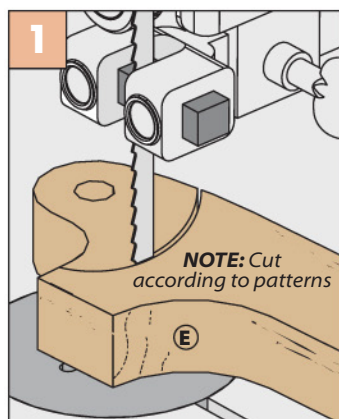
SLOTS. The slots are routed with a straight bit at the router table. Mark the start and stop points



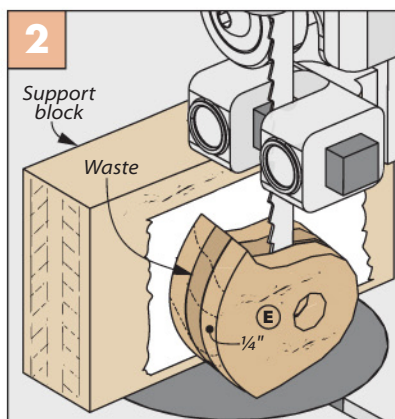
For full-size
Marble Tower
patterns, go to:

Woodsmith.com/265

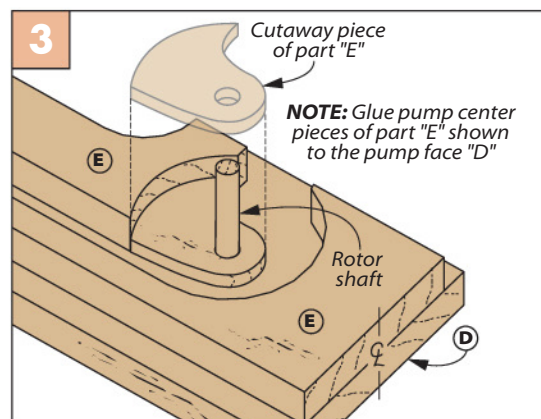
MAKING ROOM FOR THE ROTOR



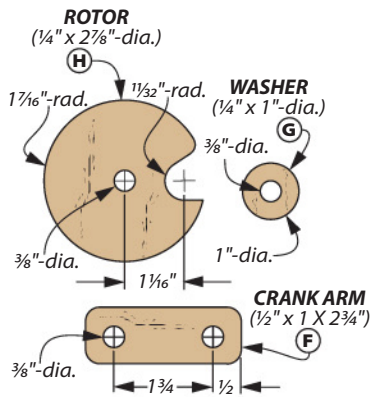
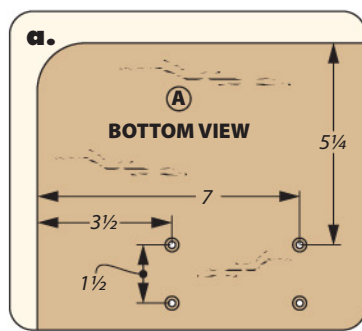
Cut Loose. At the band saw, cut the lower portion of the pump center free.



Core Removal. Attach the piece to a block. Slice ¼" off of each side to create two cutaway pieces.

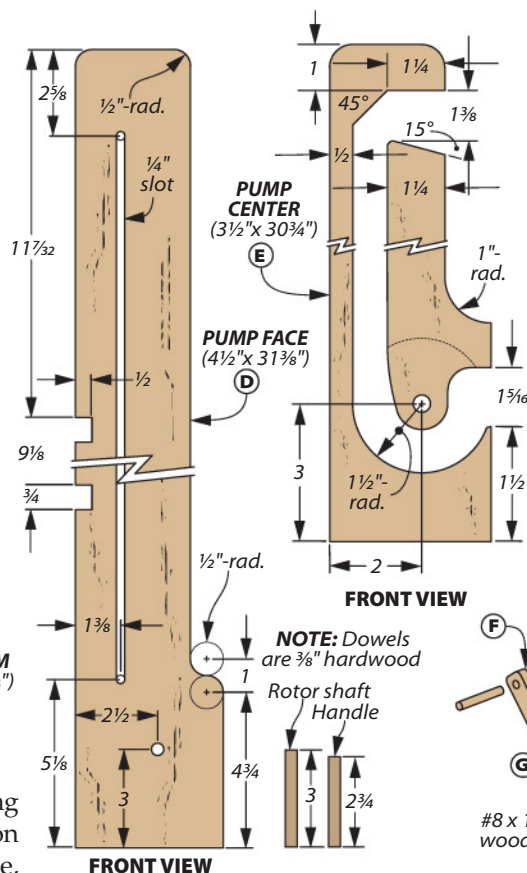


Reassembly. Glue the pump center pieces to one pump face. Only attach one ¼" cutaway piece at this time. Use the rotor to help locate the pieces.

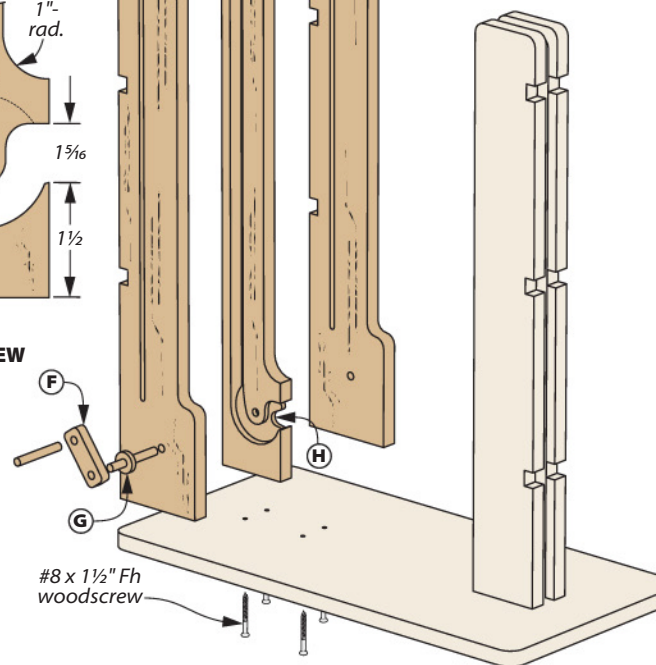


of the slot on the pieces, along with the location of the bit on the table's fence. Set the fence, then lower the piece onto the spinning bit just before the end of the slot. Backrout to that end of the slot, then rout out to the other end to complete the slot.

CRANK & ROTOR. Before cutting the crank arm, washer, or rotor to size, lay out their shape,



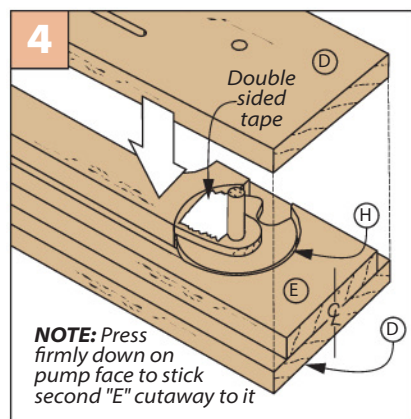
NOTE: Pump faces and center made from 3/4" softwood



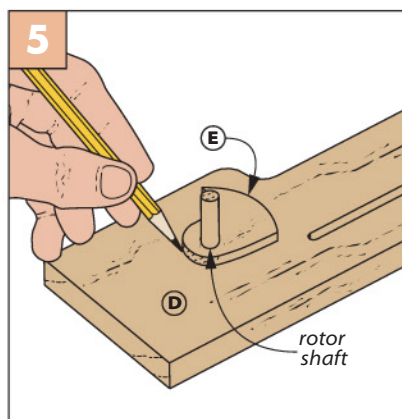
including the holes for the rotor and crank shafts. Drill out the dowel holes, then cut out the pieces on the band saw.

PUMP CENTER. The center is where the action takes place. Begin by drilling out the hole for the

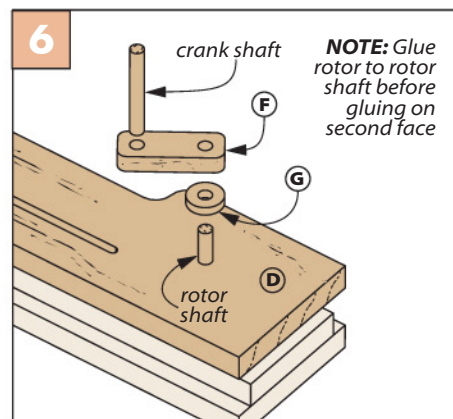
rotor shaft. At the band saw, cut the two pump center pieces from the one blank. Follow the steps below to make room for the rotor and to construct the pump. Once the pump is built, screw it onto the base.



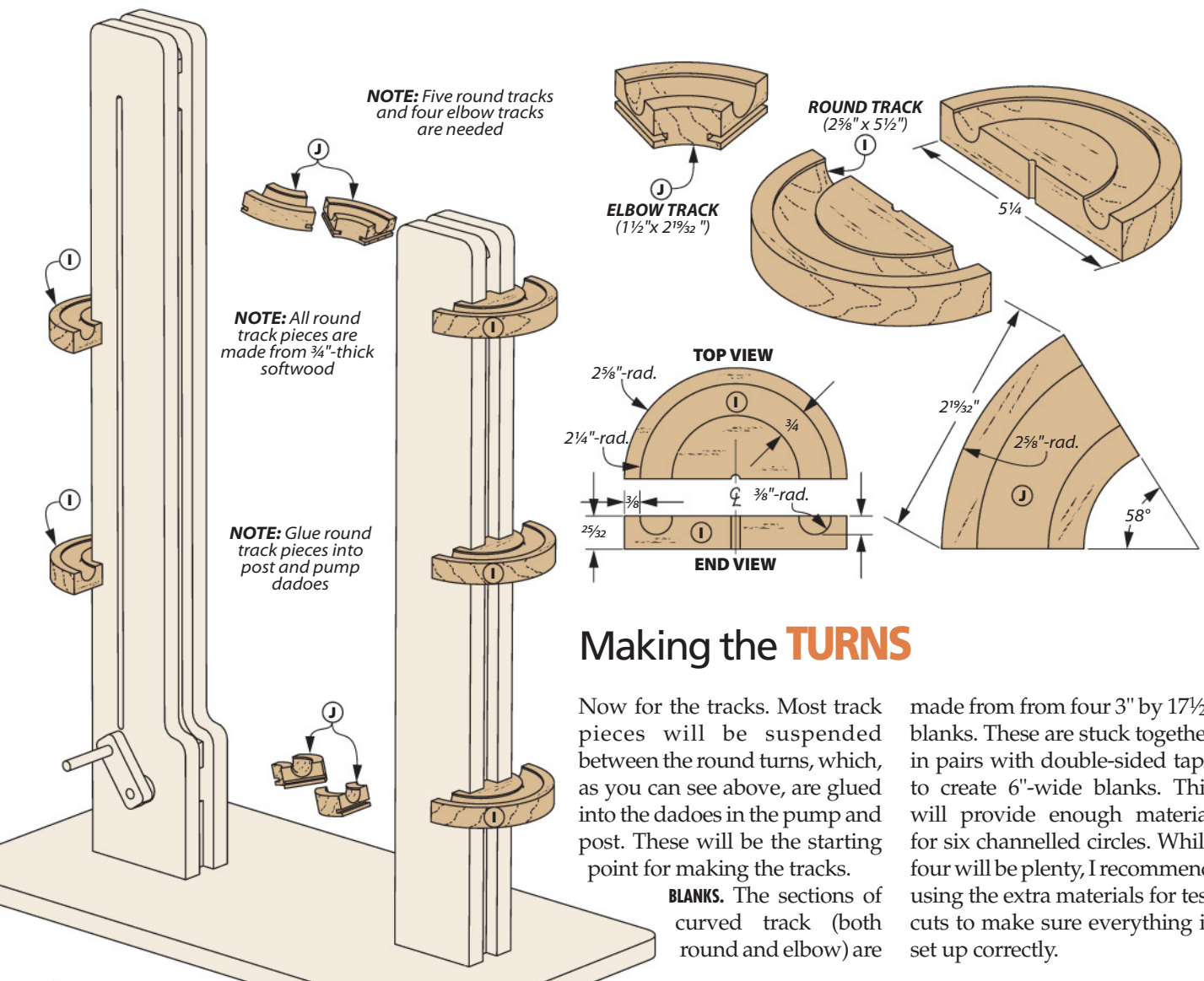
Second Face. Apply tape to the second 1/4" cutaway. Fit the rotor, center piece, and cutaway in place.



Lay Out Location. Remove second face and trace around the cutaway. Remove the tape and glue it on.



Crank. After the pump is assembled, the crank arm can be glued to the crank shaft and rotor shaft, with the washer in place.



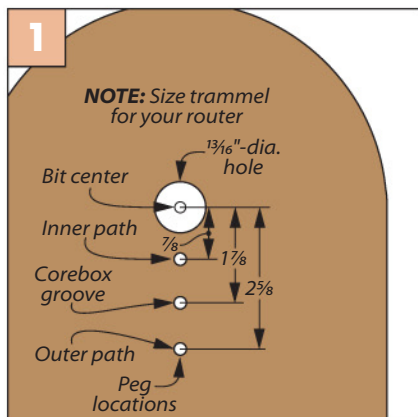
Making the TURNS

Now for the tracks. Most track pieces will be suspended between the round turns, which, as you can see above, are glued into the dados in the pump and post. These will be the starting point for making the tracks.

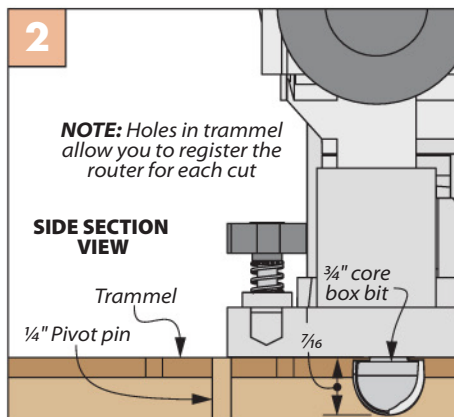
BLANKS. The sections of curved track (both round and elbow) are

made from from four 3" by $17\frac{1}{2}$ " blanks. These are stuck together in pairs with double-sided tape to create 6"-wide blanks. This will provide enough material for six channelled circles. While four will be plenty, I recommend using the extra materials for test cuts to make sure everything is set up correctly.

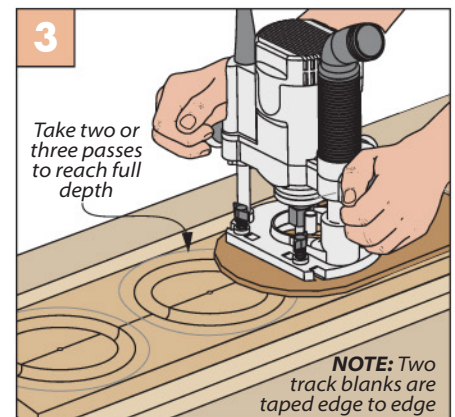
ROUTING CURVED TRACKS



Router Trammel. A trammel is used to rout the channels for the track, and to cut the track pieces free.



Registering. Drill a hole in the center of the circles, then use a $\frac{1}{4}$ " pivot pin to register the trammel for each cut.



Channel. Use a core box bit to rout the channel for the marbles. Make several passes to reach the final depth.

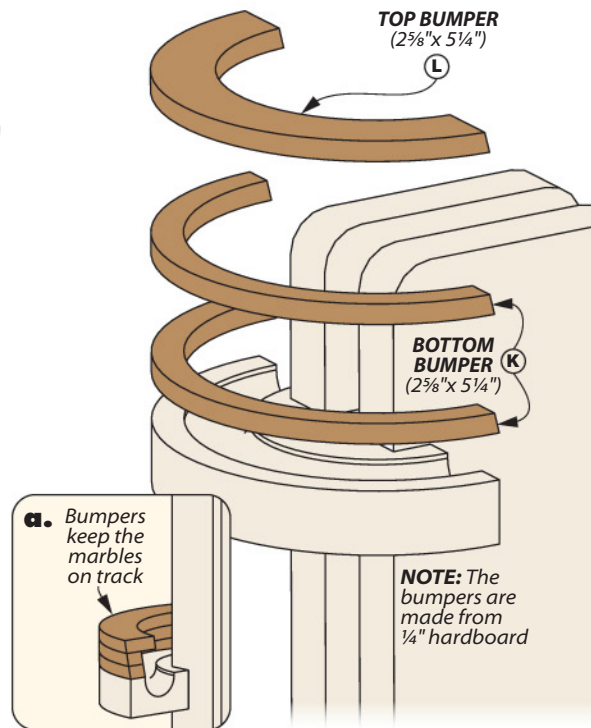
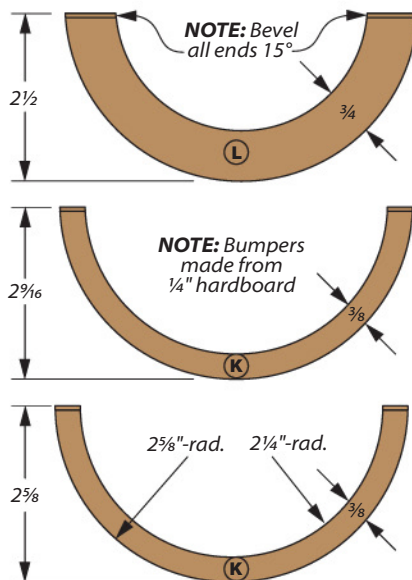
TRAMMEL ROUTING. A trammel and router are used to shape and cut the curved tracks, as illustrated in the boxes below. The first step is to make a trammel sized for your router with holes as shown in Figure 1. These will give your router a place to register for each cut.

CHANNELS. The channels are routed using a plunge router, a core box bit, and the trammel. Before you can rout however, you'll need to drill a hole where the circles' centers will be and insert a dowel to register the trammel on. Now rout the circular channels as in Figure 3.

OUTER CIRCLE. With the channels made, it's time to cut the waste off the edges. Swap out the core box bit for a straight bit, then use the outer path to rout the outer profile (Figure 4).

INNER CIRCLE. The elbow track pieces have a radius both inside and outside. To make this, take one circle and rout using the inner path hole on the trammel (Figure 5 below).

With the core removed, peel the blank apart. Cut the elbow tracks to size at the band saw,



then head to the table saw to cut the slots for the splines, as shown in Figure 6 below.

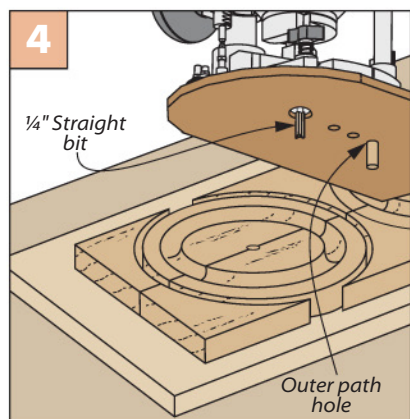
ATTACHING THE TRACKS. Now that the tracks have been shaped, pull them apart and peel off the tape. Glue the five round track pieces into their dadoes.

BUMPERS

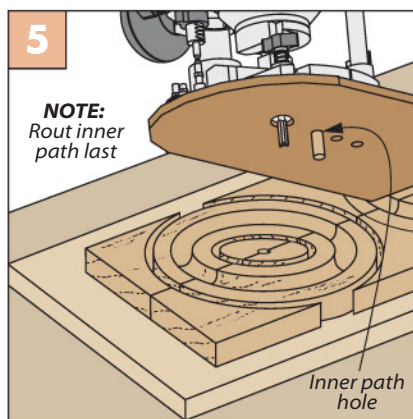
Pieces of hardboard act as bumpers on the turns for when the

marbles gain speed, keeping them on-track. Lay out their shape, then cut them on the band saw, keeping to the waste side of the layout lines. Sand them down to their final shape and size.

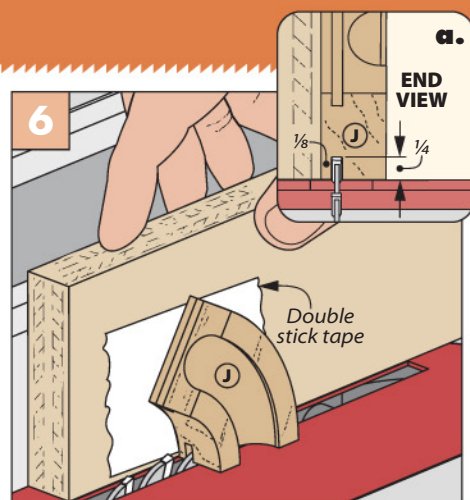
Glue the track pieces on as in detail 'a' above, then sand them flush with each other. Finally, use a chisel to bevel the ends for a pleasant transition.



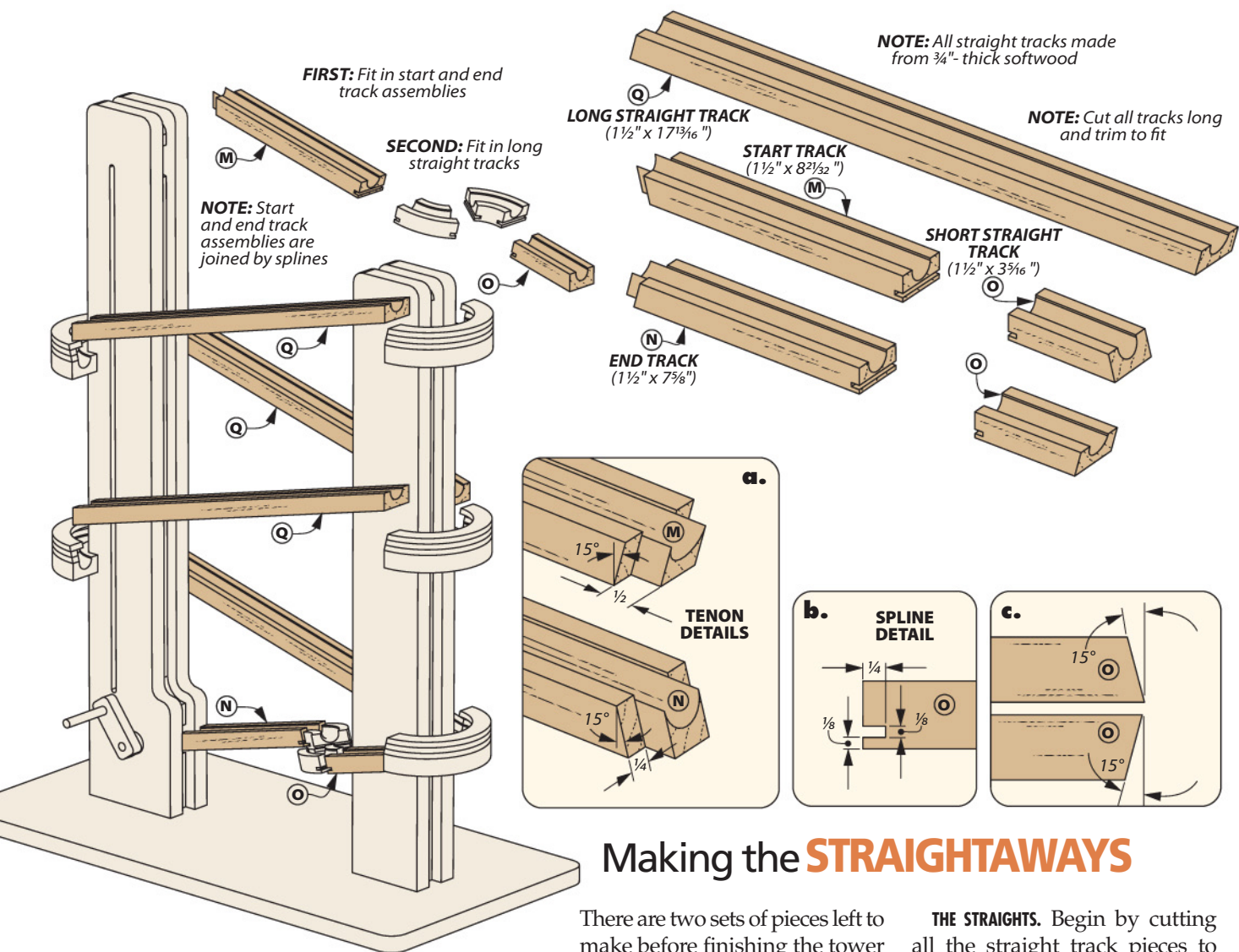
Free the Pieces. Register the router in the outer hole of the trammel and use a 1/4" straight bit to rout the circles free.



Remove the Center. Use the inner path to rout out the circle that will be the elbow tracks.



Spline Slots. To cut the slots for the splines, tape the elbow tracks to a block and cut the slots at the table saw.



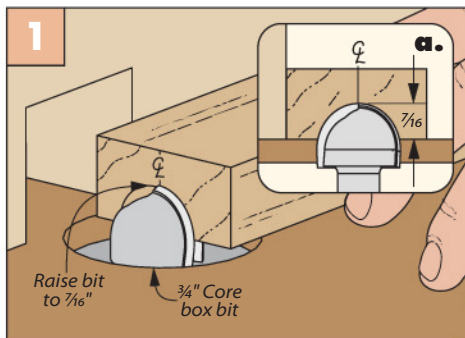
Making the STRAIGHTAWAYS

There are two sets of pieces left to make before finishing the tower — the straight tracks and the starting and ending tracks — in addition to one more bumper.

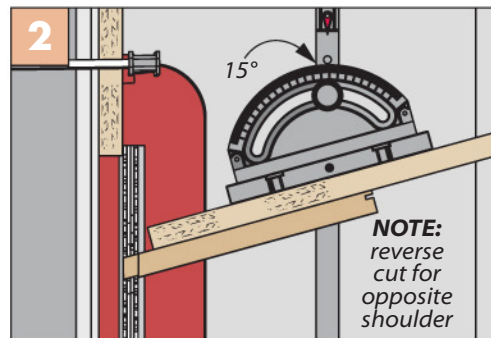
THE STRAIGHTS. Begin by cutting all the straight track pieces to size, including the start and end ramp pieces. Leave the short and long straight track pieces

STRAIGHT TRACKS & BEVELED TENONS

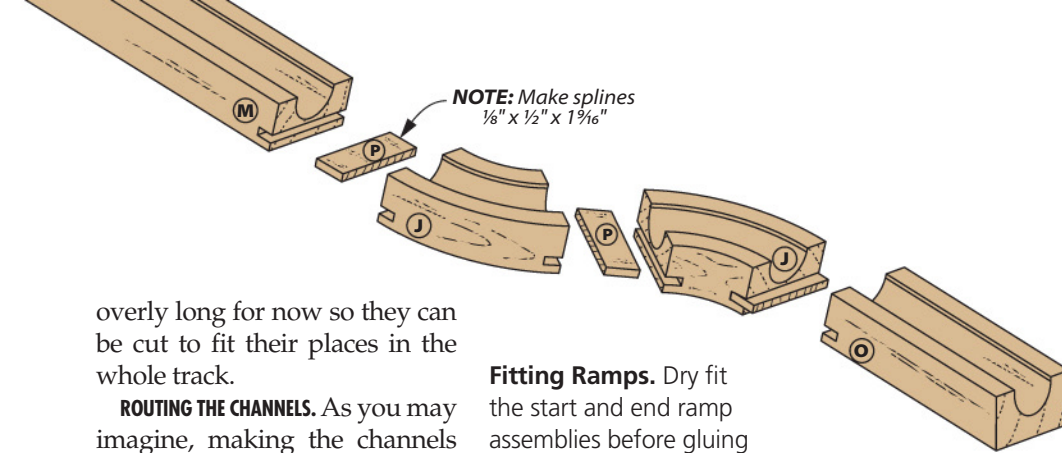
Start & End. As you can see above, the start and end tracks have a unique shape. First, a channel is routed through along with the other straight pieces. One end is then slotted while the opposite is beveled, and lastly a tenon is cut on the the beveled end, as shown in Figure 2 at the far right.



Straight Channels. To rout the channels, put the same core box bit in the router table and run the straight tracks through.



Beveled Shoulders. Angle the miter gauge to cut one shoulder of the tenon, then reverse the angle and cut from the other side.



overly long for now so they can be cut to fit their places in the whole track.

ROUTING THE CHANNELS. As you may imagine, making the channels on the straight tracks is a much easier task than it was on the turns. Get out that same core box bit at the router table to create the channels for the marbles, as shown in Figure 1 on the previous page.

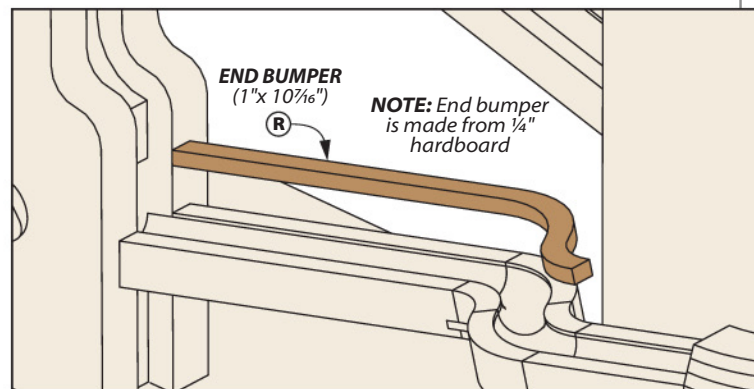
BEVELS. Each of the straight track pieces has a bevel on one or both sides. Cut these with a miter gauge and auxiliary fence at the table saw (Figure 2).

TENONS. The start and end ramp pieces each have a tenon on one end to fit into the pump. Make these at the table saw with a dado blade and miter gauge (Figure 2, previous page). The shoulders of the tenon are beveled, so the miter gauge will need to be turned 15° for these cuts, and opposite shoulders will need to be cut 15° on the opposite angle.

FITTING & ASSEMBLY

All the track pieces have been cut and shaped, so all that's left is fitting them. We'll begin with the

Fitting Ramps. Dry fit the start and end ramp assemblies before gluing the splines. Leave the short straight track extra long and trim it to fit exactly.



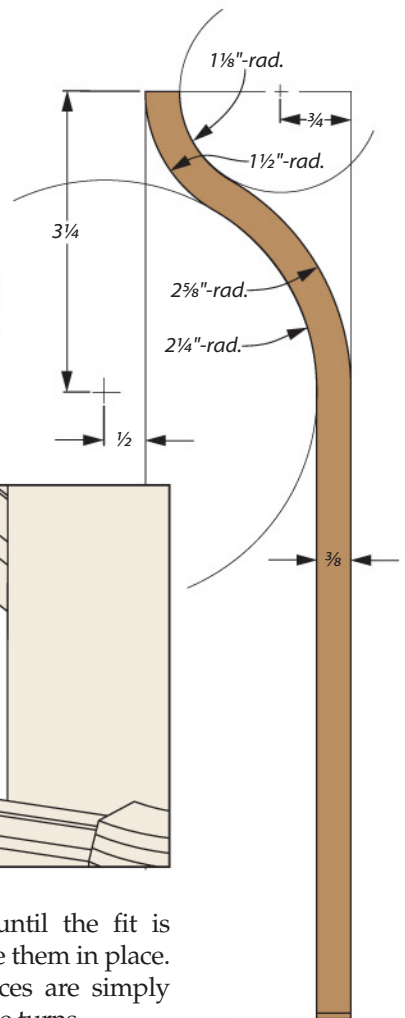
start and end ramps, then finish with the straight track pieces.

SPLINES. The start and end ramp pieces are joined by splines. The start and end tracks connect to the elbow tracks, which in turn connect to the short, straight tracks. Cut the splines to size, but don't glue up the ramps yet.

FITTING. Dry fit the ramps along with the elbow pieces and the short, straight pieces. Trim the

straight pieces until the fit is perfect, then glue them in place. The straight pieces are simply butt-jointed to the turns.

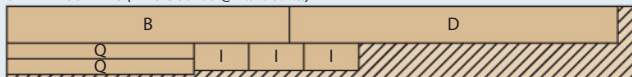
FINAL FITTING. To complete the tower, the long, straight tracks can now be fitted and installed. As with the shorter pieces, nibble away the waste until their fit is flush with the round track sections in order to complete the marble tower. **W**



Materials, Supplies & Cutting Diagram

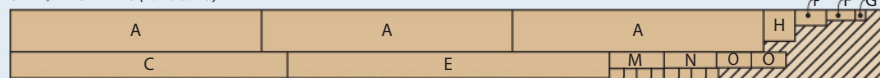
A Base (1)	$\frac{3}{4}$ x 12 - 24	E Pump Center (1)	$\frac{3}{4}$ x $3\frac{1}{2}$ - 30 $\frac{3}{4}$
B Post Faces (2)	$\frac{3}{4}$ x $3\frac{1}{2}$ - 27	F Crank Arm (1)	$\frac{1}{2}$ x 1 - 2 $\frac{3}{4}$
C Post Center (1)	$\frac{3}{4}$ x 2 $\frac{1}{2}$ - 26 $\frac{1}{2}$	G Washer (1)	$\frac{1}{4}$ x 1" -dia.
D Pump Faces (2)	$\frac{3}{4}$ x 4 $\frac{1}{2}$ - 31 $\frac{3}{8}$	H Rotor (1)	$\frac{1}{4}$ x 2 $\frac{7}{8}$ " -dia.

$\frac{3}{4}$ " x 7" - 60" Pine (Two boards @ 2.9 Bd. Ft.)



ALSO NEEDED: One 24" x 24" sheet of $\frac{1}{4}$ " hardboard

$\frac{3}{4}$ " x 17" - 84" Pine (4.1 Bd. Ft.)



I Round Tracks (5)	$\frac{3}{4}$ x 2 $\frac{5}{8}$ - 5 $\frac{1}{4}$
J Elbow Tracks (4)	$\frac{3}{4}$ x 1 $\frac{9}{32}$ - 2 $\frac{19}{32}$
K Bumper Bottoms (10)	$\frac{1}{4}$ hdbd. - 2 $\frac{5}{8}$ x 5 $\frac{1}{4}$
L Bumper Tops (5)	$\frac{1}{4}$ hdbd. - 2 $\frac{5}{8}$ x 5 $\frac{1}{4}$
M Start Track (1)	$\frac{3}{4}$ x 1 $\frac{1}{2}$ - 8 $\frac{21}{32}$
N End Track (1)	$\frac{3}{4}$ x 1 $\frac{1}{2}$ - 7 $\frac{5}{8}$
O Short Straight Tracks (2)	$\frac{3}{4}$ x 1 $\frac{1}{2}$ - 3 $\frac{5}{16}$
P Splines (8)	$\frac{1}{8}$ x 1 $\frac{1}{2}$ - $\frac{1}{2}$
Q Long Straight Tracks (4)	$\frac{3}{4}$ x 1 $\frac{1}{2}$ - 17 $\frac{13}{16}$
R End Bumper (1)	$\frac{1}{4}$ hdbd. x 1 - 10 $\frac{5}{32}$

- (1) $\frac{3}{8}$ " -dia. x 6" Dowel
- (8) #8 x 1 $\frac{1}{2}$ " Fh Woodscrews

DESIGNER Project



Drafting Table

Whether you choose to use this gem for drafting, drawing, or doodling is up to you. I think you'll agree, the term "back to the drawing table" never looked so good.

The work of designing shop projects, drawings, and creative paintings since the advent of the digital world has been a dazzling adventure, to say the least. And in many ways rightly so — the 'undo' feature that is available in all creative software programs has been a godsend.

THE REST OF THE STORY. While the digital defense team gloats about these merits, we all know that there are times when the old school analog realm works just fine, thank you very much. How about the touch and tooth of sublime surfaces from cotton rag paper to voluptuous vellum — along with your favorite drawing or painting instrument? That can't be replaced by a sterile monitor. And you'll never be forced to upgrade your pencils for this table. Speaking of the table ...

HAMMERED FINISH. Coating the base and sleeves with a spray-on hammered finish provides a sleek unified look to the table. These MDF base parts hint at an art nouveau-industrial kind of mash-up. Good looking and sturdy, that works for me.

As a counterpoint to the cooler vibe of the base, Dillon Baker threw some walnut into the mix. The walnut accents start with the stretchers (middle inset photo) and are used for the adjustable legs, cleats, and pencil tray (top inset photo) to add a warm, earthy element to the table.

The top is more MDF that is wrapped on both sides with plastic laminate, but not the edge, which plays nicely with the walnut. Lastly, as you see in the bottom inset photo, there's a shop-made pivot plate that provides any table angle you want.



▲ The pencil tray is a charming and practical drafting accessory. We used an aluminum hook to secure it to the top edge of the table.

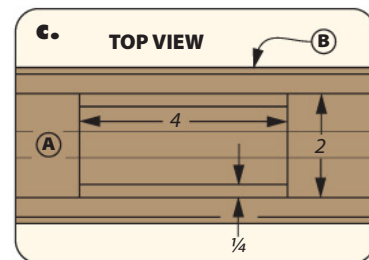
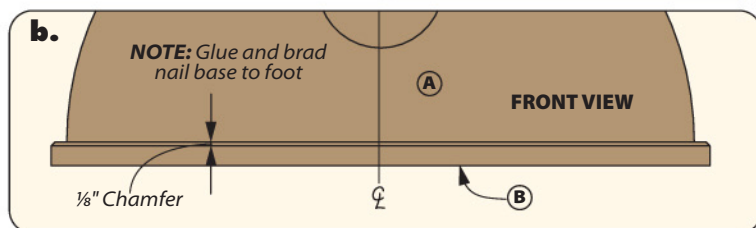
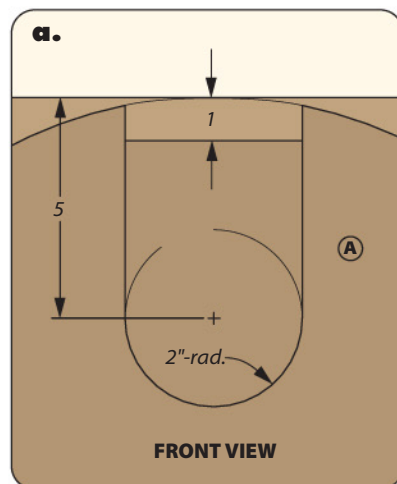
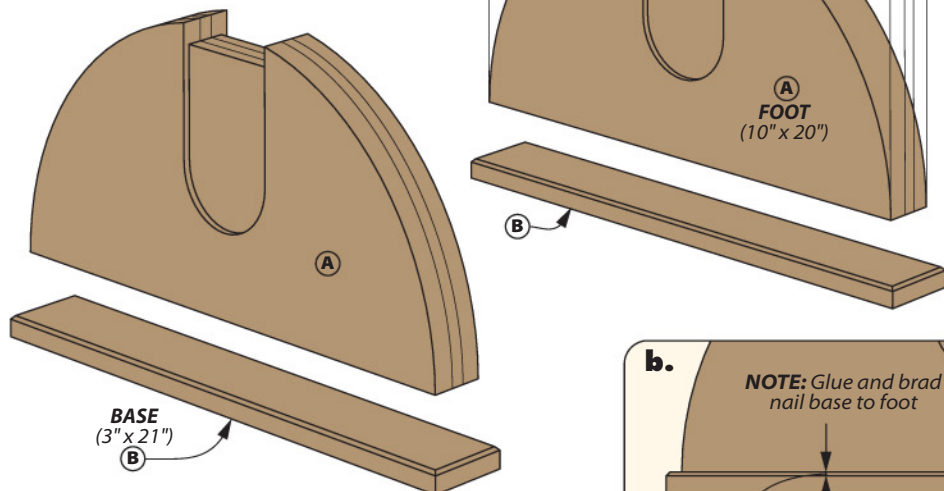


▲ Sturdy stretchers lock into the sleeves of the base to create an attractive way to make working at the table a wobble-free adventure.

▼ The shop-made pivot plate allows for infinite angle adjustments of the table surface. Making it is a nice break from scattering sawdust around the shop.



NOTE: The feet are two layers of $\frac{3}{4}$ " MDF and one layer of $\frac{1}{2}$ " MDF. The base pieces are $\frac{3}{4}$ " MDF



It begins with a **BASE**

A base for a table doesn't have to be boring to be stable. And this one isn't. All the parts are made of MDF (as is the sleeve on the next page). As you see in the drawing above, the foot is comprised of three pieces, so that's a good place to start — gluing up blanks, after cutting them to size.

SHAPE THE FOOT. Use the pattern you'll find at Woodsmith.com/265 to make a template for the foot. A pattern bit in your router combined with the template helps form a perfect groove in

the sides of the feet. The box below shows how to do this.

The grooves you've made in the sides will be your guide to make a notch in the top of the feet at the table saw. Then you can rough out the arc's profile at the band saw and smooth the surface with sandpaper.

THE BASE. The base that the foot sits on adds stability and a nice visual accent. Start out by cutting the base to size, then chamfer the edges along the top. As detail 'b' shows, the base

is centered on the foot and brad nailed in place.

SLEEVES

The sleeves are the multi-taskers of the table. The main drawing on the next page shows the parts that make up the sleeves. The upper portion of the sides combined with the front and back pieces create the hollow where the legs travel up and down. The lower portion wraps around the foot. What separates these two functions are the fillers.

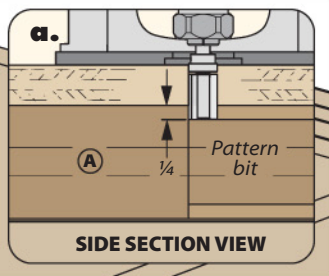
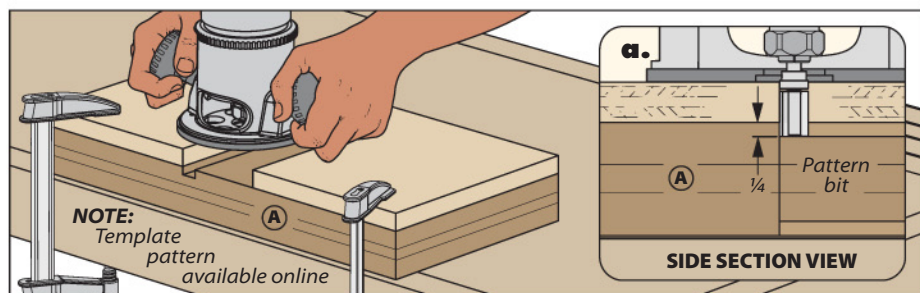
FILLERS. Frankly, the fillers can be made of whatever scraps you have in your lumber rack. We glued up the fillers with MDF scraps and set them aside to focus on the other sleeve parts.

Detail 'c' shows the bottom profile of the sides. They can be cut at the band saw, or with

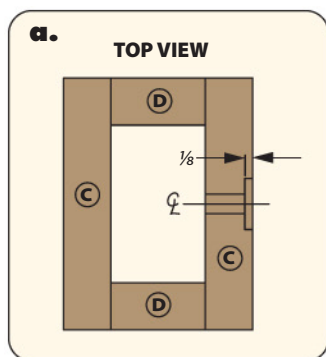


For a full-size pattern of the foot mortise, go to:
Woodsmith.com/265

MAKING A BIG GROOVE



Use a Template. A template attached to the base blank guides your pattern bit. Rout the edges first, then remove the waste in the center of the base.

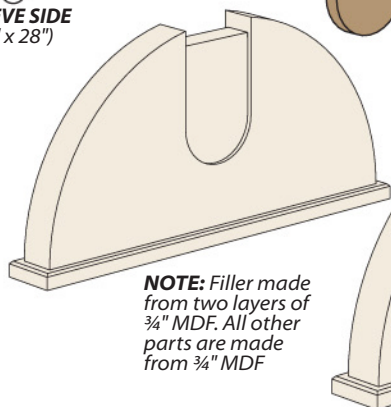
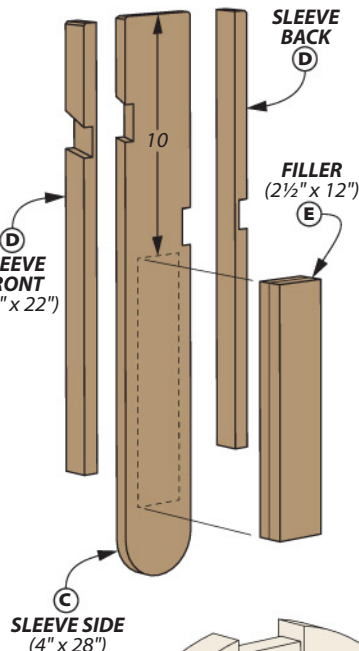


a jig saw, then smoothed with sandpaper.

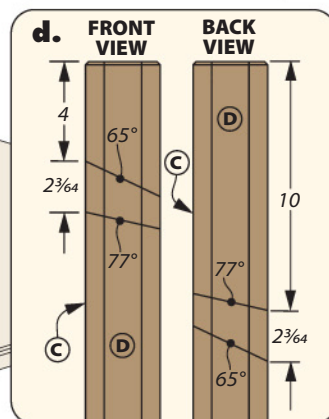
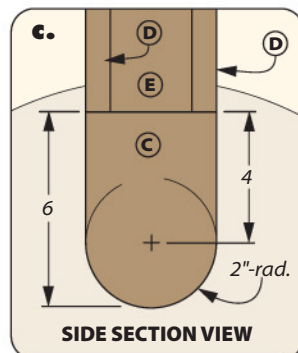
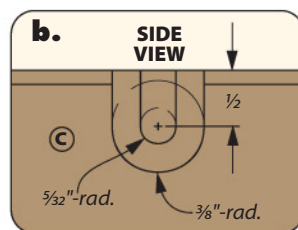
GLUE UP THE SLEEVE. To keep things in order, layout the position of the fillers on the front and back sleeves. Then spread a little glue on the mating surfaces and brad nail them to each other. Now you can glue the sides together. Double-check the alignment of all these parts before ratcheting down the clamps.

SOCKETS FOR STRETCHERS. To hold the saw-tooth ends of the stretchers firmly in place. You'll need to make the angled sockets across the face of the sleeves (front and back) that you see in detail 'd.' Later, you'll make the stretchers that nestle into these sockets. For now, let's focus on how to make the sockets.

The sockets are $\frac{1}{2}$ " deep and will hold the surface of the stretchers proud of the sleeves. Figure 1 below shows you how to go about this.



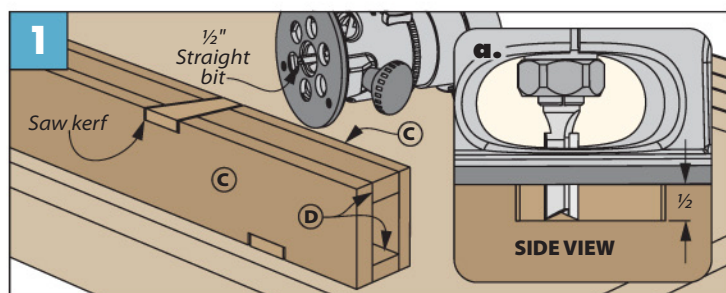
NOTE: Filler made from two layers of $\frac{3}{4}$ " MDF. All other parts are made from $\frac{3}{4}$ " MDF



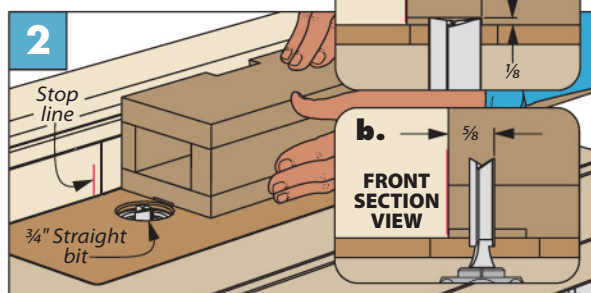
Notches for the table height adjustment knobs (details 'a' and 'b') are next on the list. In Figure 2 you see how to make both of the notches. When those are done, you need to chamfer the top edge of the sleeves.

To ensure the sleeves are square to the base, use a framing square held on the ledge of the base while you glue and brad nail the sleeves into the foot. With that, you're set up to make the stretchers and legs.

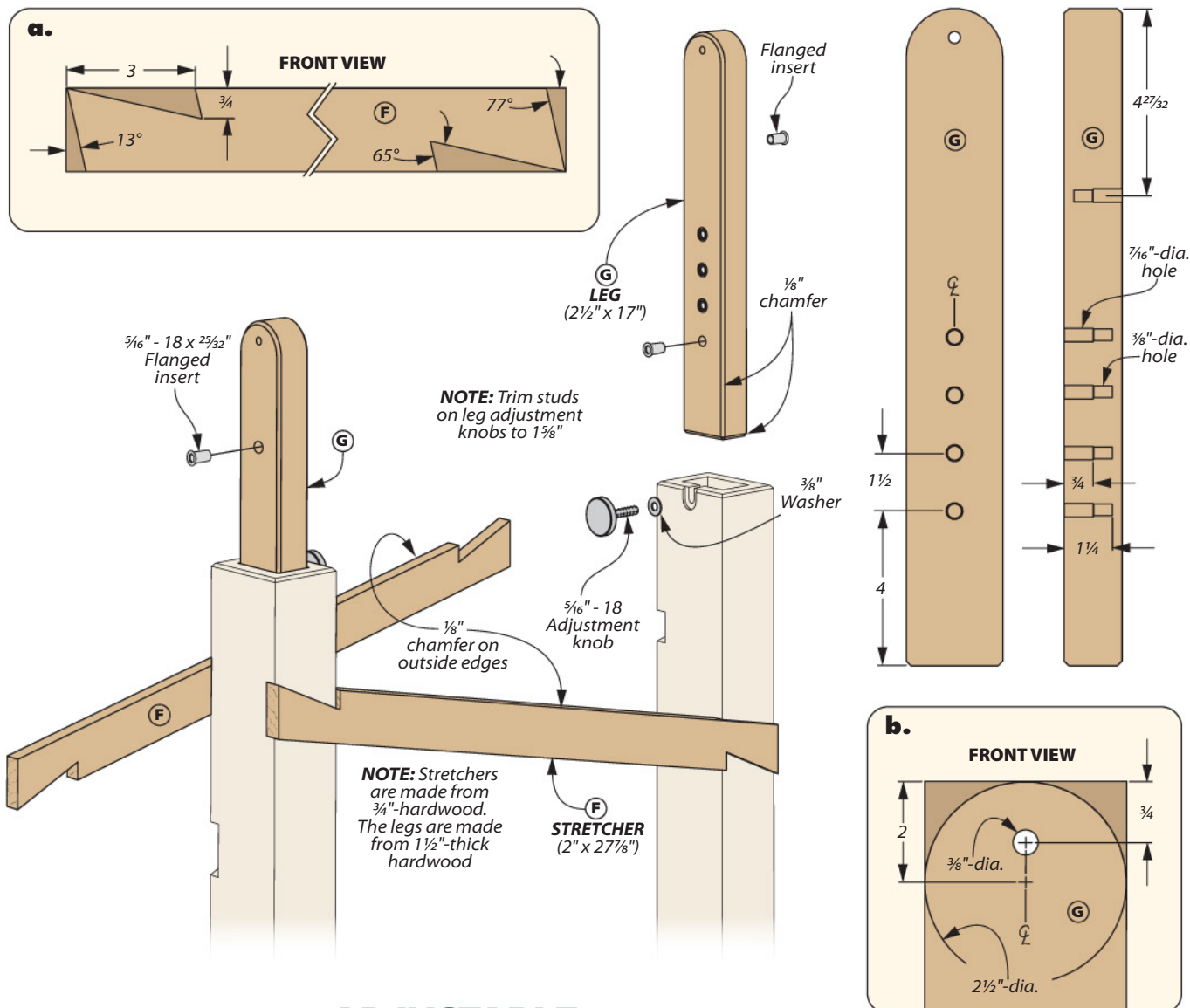
SHAPING THE SLEEVES



Removing Waste. After defining the walls of the sockets with a hand saw, remove the waste with a straight bit in your router.



Notch for Adjustment Knob. Routing the notches at the top of the sleeves is easily done at the router table.



Making the table **ADJUSTABLE**



For a full-size pattern of the stretcher ends and pivot bracket, go to:

Woodsmith.com/265

Now we're going to add some rigidity and flexibility to the table. The rigidity comes in the form of the stretchers that bring the base components together. The flexibility starts with the hardwood adjustable legs you see above — and culminates in the pivot bracket that ties the top to the table. Let's start the process with the stretchers.

STRETCHERS. Notice in detail 'a' above that the ends of the stretchers aren't square. You can use the information in that detail or go online and grab the pattern there and make a template for tracing.

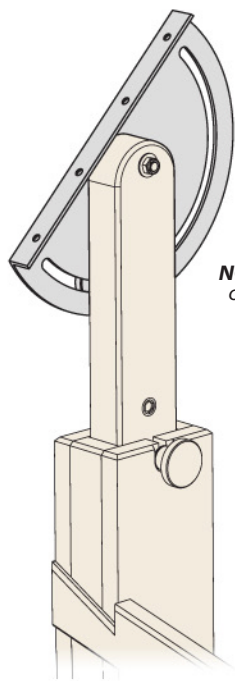
The band saw is the tool of choice for shaping the ends of the stretchers. When you're done cutting the shapes, sand them smooth. Then, like you see in the main drawing, add the chamfer on the outside edge.

A FORK IN THE ROAD. As Yogi Berra stated "If you come to a fork in the road, take it." We're at a moment like that in this project, and it has to deal with attaching the stretchers to the base.

The dilemma is that these parts have contrasting finishes, as the photos at the beginning shows, the base is painted, and the stretchers have a clear finish.

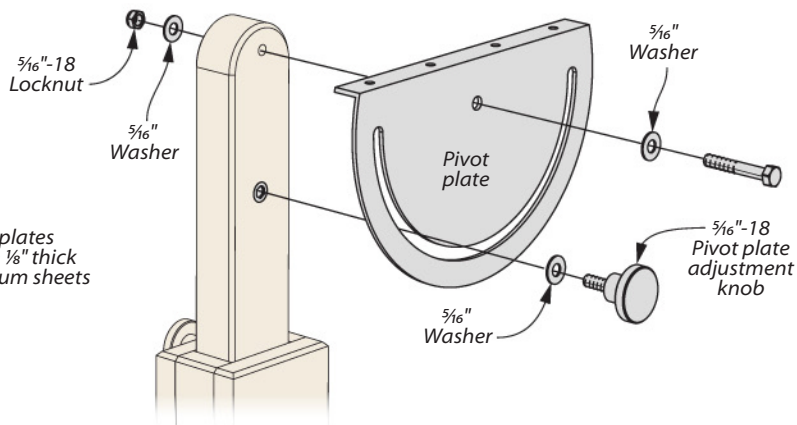
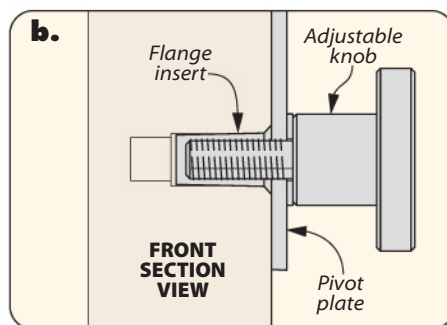
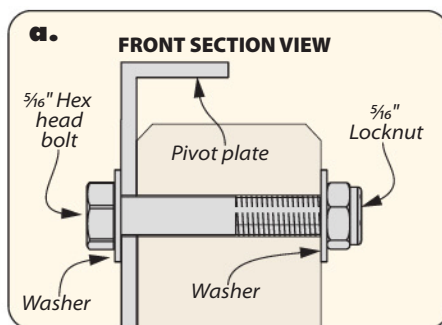
The norm is to save applying finish to the project at the end. But in this case I want the base assembled and the legs in place so that I can accurately attach the top to the pivot plates. So it makes sense to take a break from building and do some finishing.

The stretchers are finished with a wipe-on oil and a couple of coats of lacquer. As for the base, after the brad nail holes in the MDF parts are filled and sanded flush they're primed with lacquer, then sprayed with a hammered texture finish. When the paint is dry it's time to attach the stretchers.



NOTE: Trim stud on pivot plate adjustment knobs to $\frac{7}{8}$ "

NOTE: Pivot plates are made from $\frac{1}{8}$ " thick 12" x 12" aluminum sheets



BASE ASSEMBLIES

Start by standing the two base assemblies on a flat surface. As you glue and clamp the stretchers in place, use a tape measure to ensure the assemblies are parallel to each other.

ADJUSTABLE LEGS. The legs that slide in the sleeves to adjust the height of the table are next on the docket. After cutting them to their final size, lay out and drill the stopped holes for a set of flanged threaded inserts, and the through hole at the top of the leg for the pivot bracket.

Then shape the radius at the top of the legs (detail 'b' previous page). The last bit of dressing is to chamfer the edges of the legs. Then install the inserts in the stopped holes.

PIVOT PLATE

Now you get to spend some time making metal shavings. The pivot bracket starts out as a sheet of aluminum that you shape into the bracket you see to the right.

The easiest way to tackle this is to print out two copies of

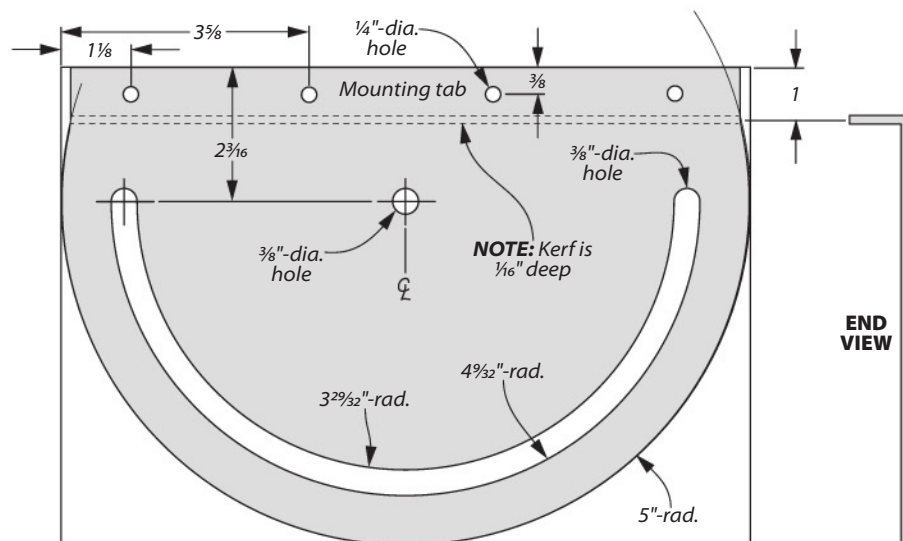
the pattern that's at *Woodsmith.com/265* and attach it the aluminum sheet with spray adhesive.

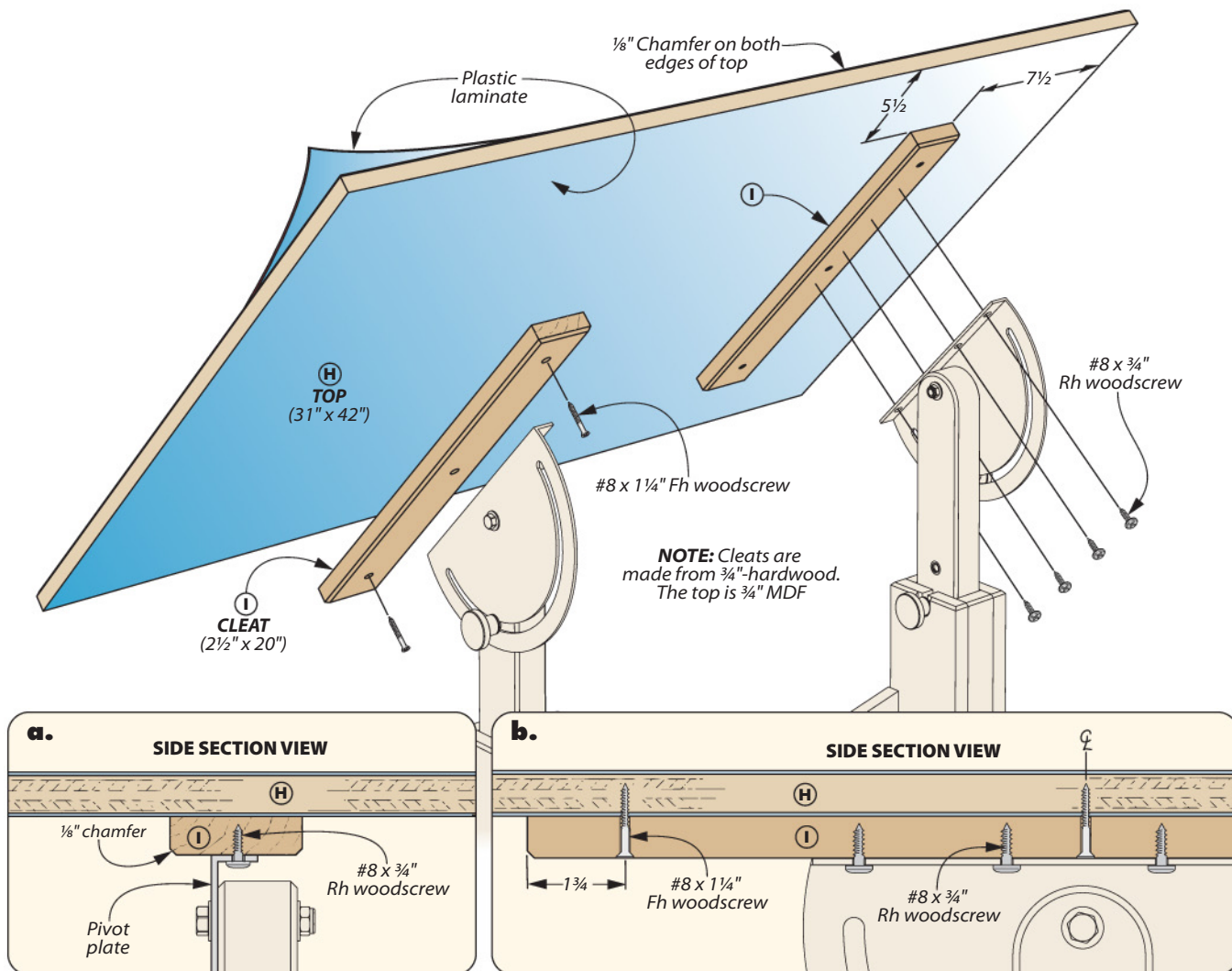
KERF FIRST. Score a line at the table saw where the mounting tab later gets folded. A non-ferrous blade will do this easily.

Next, drill three holes in the upper portion of the plate. The outer two are the end points of the adjustment arc. The center hole is for the pivot bolt. Use a trammel and $\frac{3}{8}$ " milling bit to make the arc in multiple passes.

Adjust the trammel to cut the outer profile. (Stop short of the mounting tab area.) Drill the holes in the mounting tabs and complete the final shaping along the edges. Now progressively sand the plates to an even sheen (100-220 grit).

To bend the tabs without deforming the body of the plate, sandwich the plate between two pieces of plywood along the kerf line, then slowly hammer the tab perpendicular to the plate.





Adding the **TABLE TOP**



To learn how to work with contact cement, go to:

Woodsmith.com/265

The last two parts of the table are fairly simple to build. The cleats screwed to the underside of the top are in turn fastened to the base through the pivot plates. You'll notice in the main drawing above that the top is skinned with plastic laminate on both sides — this is to prevent warping. For the most part MDF is a material that stays flat, so laminating both sides is just insurance.

Cutting the top to its final size is the first order of business. Then you can focus on the laminating process. First, let's review the ins and outs of working with contact cement.

CONTACT CEMENT. Contact cement is an adhesive used to bond large surfaces together. I'll hit the highlights here — for more in-depth information go to Woodsmith.com/265. What you do is apply a coat of adhesive to each surface, let it dry, then, using sticks as separators, lower one surface to the other.

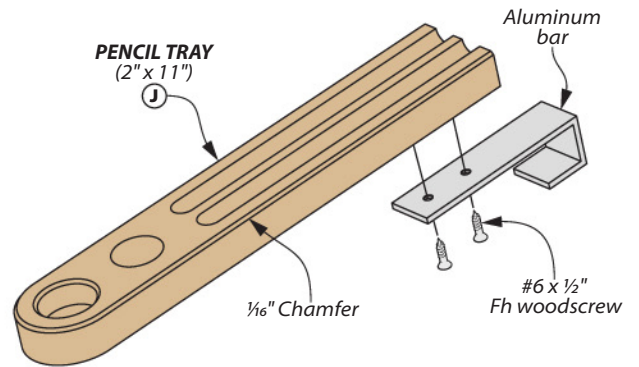
The separators provide a buffer between the two surfaces coated in contact cement. They can be sticks, dowels, or even old mini-blinds. Their job is to give you complete control over when and how the surfaces touch.

Position the laminate on the separators so the laminate

extends beyond the sides of the top. Starting at the center, slide one separator out at a time while pressing the laminate to the surface of the table with your other hand. Once the separators are removed, start back at the beginning with a J-roller to firmly bond the two surfaces.

The other side of the top gets the same treatment. To protect the finished surface, lay the top on a drop cloth. To dress the edges, use a laminate-trimming bit (or a chamfer bit). Now we can jump back into the last of the woodworking for the table.

CLEATS. The cleats are easy to make. After cutting them to size



and chamfering the edges, drill the shank holes and counter sinks (details 'a' and 'b,' previous page). When it comes to attaching the cleats to the underside of the top, you'll need to pre-drill through the laminate so you don't crack the surface.

ATTACHING THE TOP. To ensure the top is properly aligned to the table, it's best to draw the footprint of the pivot plate's mounting tab centered on the cleats. Then, with the pivot plates set parallel to the floor, place the top on the mounting tabs and screw the two together.

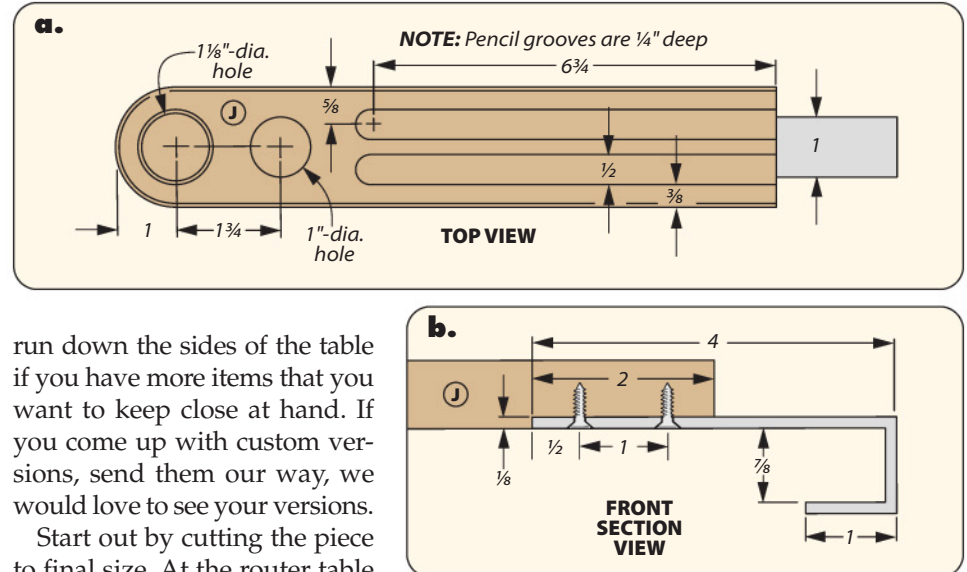
PENCIL TRAY

The pencil tray you see in the photo and drawings above hooks over the top of the table. This design can be expanded to

run down the sides of the table if you have more items that you want to keep close at hand. If you come up with custom versions, send them our way, we would love to see your versions.

Start out by cutting the piece to final size. At the router table rout the mortise on the underside (detail 'b') and square up the end. Rout the pencil slots with a core box bit. I used a larger core box bit in a drill press to make the bowl shape. Use

your drill press to make the cup that holds the pencil sharpener. Lastly, chamfer the cup opening and the top edge of the tray. With that, the tray and table are ready for service. [W](#)



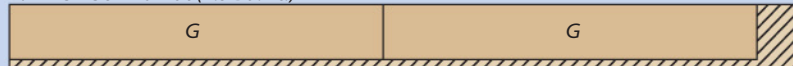
Materials, Supplies & Cutting Diagram

A Feet (2)	2 MDF - 10 x 20	H Top (1)	3/4 MDF - 31 x 42	• (8) 5/16" Washers
B Base (2)	3/4 MDF - 3 x 21	I Cleats (2)	3/4 x 2 1/2 - 20	• (2) 5/16"-18 Locknuts
C Sleeve Sides (4)	3/4 MDF - 4 x 28	J Pencil Tray (1)	3/4 x 2 - 11	• (6) #8 x 1 1/4" Fh Woodscrews
D Sleeve Front/Back (4)	3/4 MDF - 1 1/2 x 22	• (8) 5/16"-18 Flanged Inserts		• (8) #8 x 3/4" Rh Woodscrews
E Fillers (2)	1 1/2 MDF - 2 1/2 x 12	• (4) 5/16"-18 x 1 3/4" Adjustment Knobs		• (1) 1" x 6" Aluminum Bar
F Stretchers (2)	3/4 x 2 - 27 5/8	• (2) 1/8" x 12" x 12" Aluminum Plates		• (2) #6 x 1/2" Fh Woodscrews
G Legs (2)	1 1/2 x 2 1/2 - 17	• (2) 5/16"-18 x 2" Hex Head Screw		• (1) 4' x 10' Sheet of Plastic Laminate

3/4" x 5 1/2" - 60" Walnut (2.3 Bd. Ft.)



1 1/2" x 3" - 36" Walnut (1.5 Bd. Ft.)



ALSO NEEDED: One 24" x 24" Sheet of 1/2" MDF,
One 48" x 96" Sheet of 3/4" MDF

Japanese Hall Cabinet

The artful Asian influence that haunts this cabinet will grace your home. While building it will let you flex a wide variety of woodworking tasks.

Woodworking is always a fun endeavor, and when you come across a project like you see here, there are bonus points for variety. Which reminds me of another old saying, “variety is the spice of life.” That adage came to mind often when dealing with and thinking of this cabinet.

THE DESIGN. For instance, the big square that is the case and the overlay doors are soothed and supported by the curvilinear base. While the rattan *tondo* in the door agrees with the base, it does so in a more exotic way.

Speaking of the door, the term “frame and panel” door doesn’t speak to the beauty you see here. That’s because the hardwood panel has been brought flush to the frame and given a little separation as well. This slight-of-hand adds a graphic charm to the cabinet.

THE MATERIAL. Although white oak is the predominate wood used on the cabinet, the walnut feet on the legs add a mellow touch. And rattan always kicks things up a notch.

THE TECHNIQUES & TOOLS. Let’s see — some dovetail joinery at the bench, the ever-present table saw and drill press are on board, a little time at the lathe, routers cutting circles and mortising cylinders — toss in some rattan and hot water. There’s plenty to do here, so let’s head to the shop.

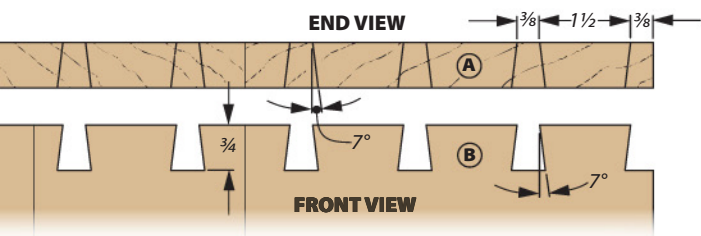


▲ The visual gift of simple geometry, and the contrasting grain patterns of dovetail joinery, mean the strength and beauty of the joinery will last a long time.



▲ The graphite-like shadow line between the door panel and frame encourages the rattan-covered opening to glow a little in its surroundings.





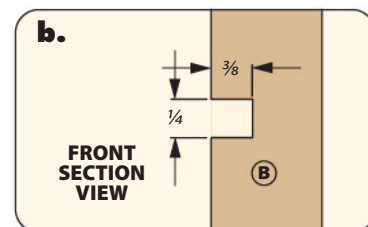
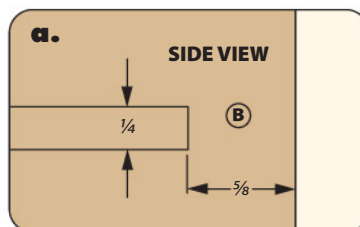
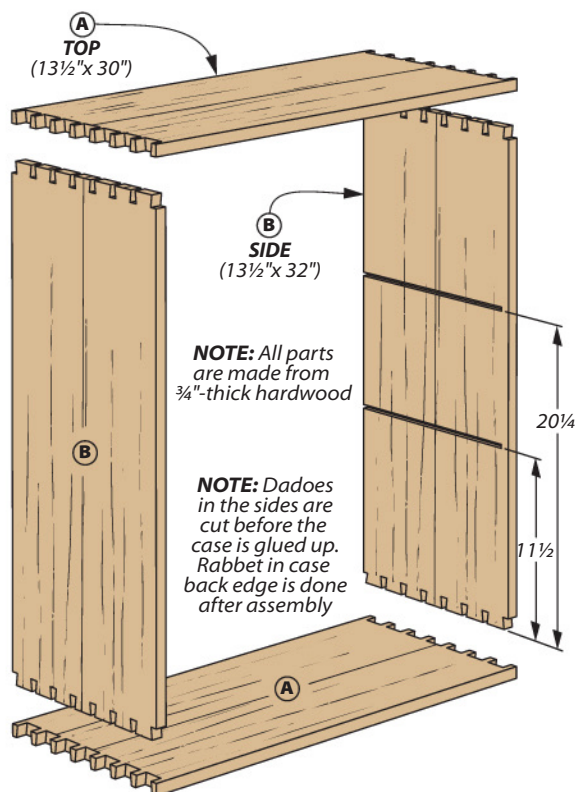
It all starts with a sturdy DOVETAILED CASE

The heart of this cabinet is the case. As you see in the drawings here, the joinery du jour that brings the case parts together is dovetails — they're fabulously strong and a delight to look at. After gluing up the panels and cutting them to their final length, you're ready to jump in.

The box below walks you through the process, but I'll add a few details here. You must have all the panels flat, smooth, and square. When you're happy with that, arrange the panels with the best faces forward and mark each adjoining corner to keep things in order.

PINS. Figure 1 shows how to layout the pins. The baseline represents the thickness of the panels. The drawing above shows the spacing of the pins.

When cutting the sides of the pins be sure to stay on the waste side of the line. Stop cutting

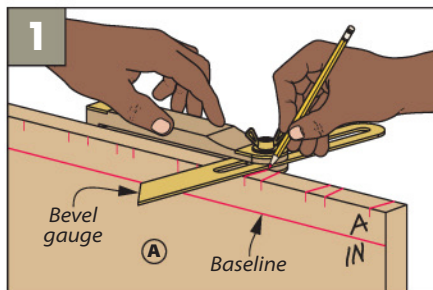


when you've reached the baseline on both sides of the panel. Figure 2 shows using a backer board to make an accurate baseline incision. Then chop away

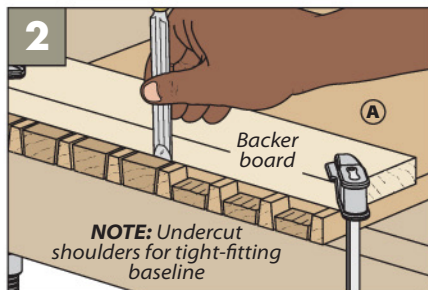
half of the waste before flipping the panel to do the other side.

When the pins are done you'll use them to lay out the location of the tails on the mating panels.

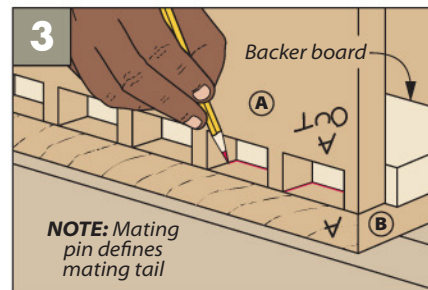
HAND-CUT DOVETAILS



Layout the Pins. First, draw the baseline and pin location, then use a bevel gauge to draw the angled lines.



Chop-chop. After you've cut the pins with a hand saw, clamp a board to the baseline and remove the waste.



Transfer to Tails. A sharp pencil transfers the pin location to the tails. Use a backer board to steady the panel.

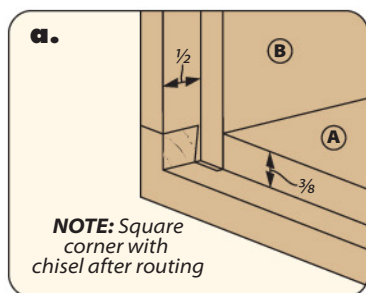
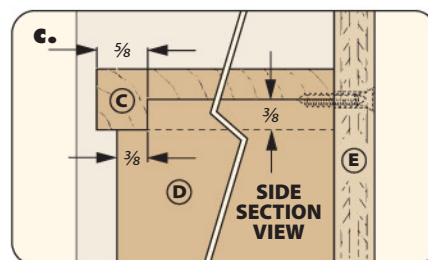
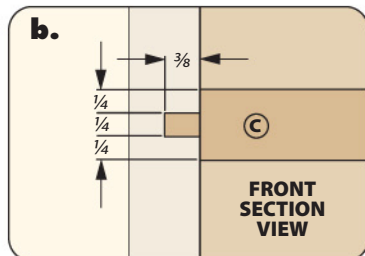
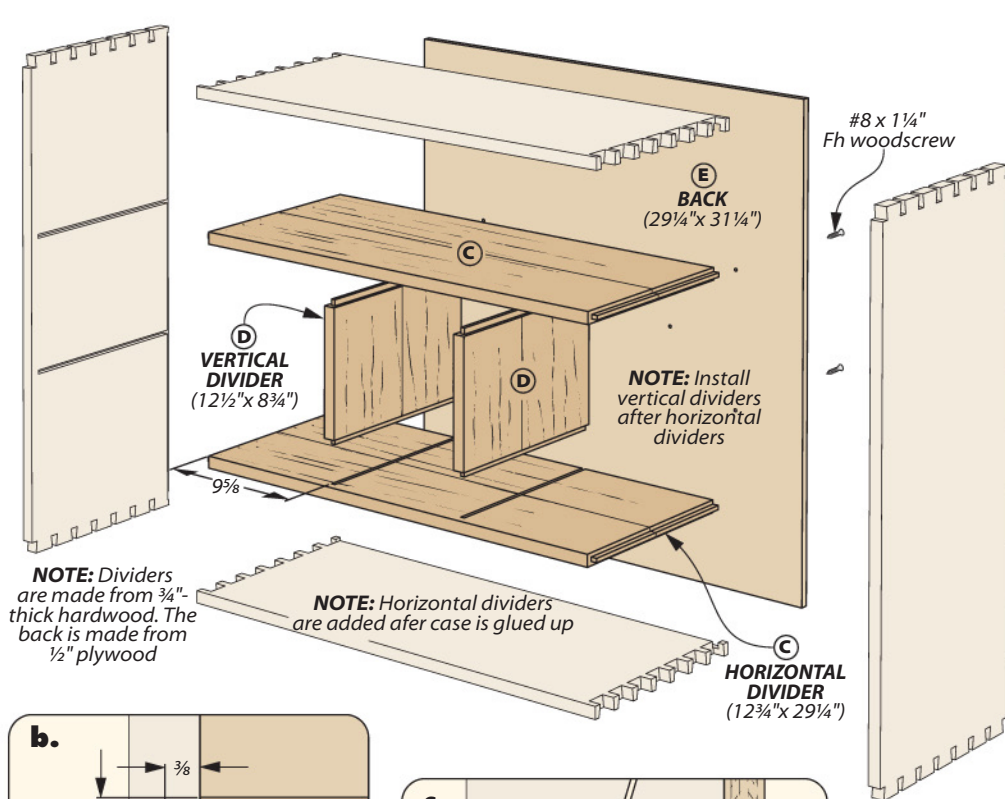


Figure 3 shows using the backer board to hold the panel in place while tracing the tail locations. Figure 4 shows removing the waste from the tails (like you did on the pins). Before you glue up the case, there are a couple of things to do.

MORE JOINERY. Now that you've finished the jazzy joinery, you have some dados and tongues to contend with. Let's start with the stopped dados for the horizontal dividers.

The main drawing and both details on the previous page show you all you need to know to make the stopped dados. Clamp a straight edge to the panels to guide a router. After the router calms down and is out of the way, square up the ends of the dados with a chisel. Now you can glue up the case.

GLUE UP. When gluing up the case you want all the clamping pressure to be on the tails. In this case the heads of the clamps are



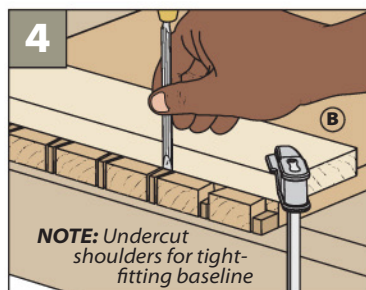
larger than the tails so I made the notched clamping block you see in Figure 5. After the clamps are stowed away, rout a rabbet on the rear edge of the case like you see in detail 'a' above for the plywood back.

DIVIDERS

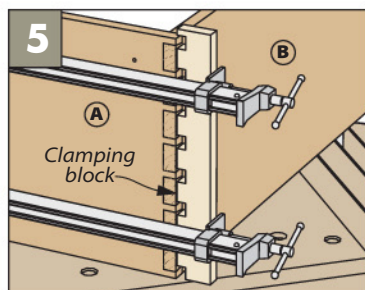
While I was chatting away about joinery you probably glued up the panels for all the dividers — good for you. If not, glue up the panels now. In the spirit of measuring twice and cutting once, check the distance between the dados in the case and then cut the horizontal dividers to length.

As you see in the main drawing and detail 'c,' there are more stopped dados on the inside faces of the horizontal dividers. When those are done, you can tackle the tongues that are on the ends of the dividers (detail 'b').

Install the horizontal dividers first, then follow up with the vertical dividers, and finally the plywood back.



Shape the Tails. Remove half the waste in the tails, then flip the panel and repeat the process.



Glue Up. Use a shop-made clamping block to apply pressure directly on the tails of the sides.

ends of the feet (Figure 2, previous page) Afterwards, you can glue the two parts together.

TURNING THE ASSEMBLY. Now it's back to the lathe to turn the final leg shape. You can add the chamfer on the bottom now, or with a router bit later. Otherwise, it's time to make some mortises in the legs.

DOUBLE MORTISES. Detail 'b' on the previous page shows the two mortises you need to cut into the legs. To do this safely and accurately you'll need to add temporary blocks that match the diameter of the legs to the ends of each leg assembly to hold the leg in place at the router table.

The first pass creates the large mortises that hold the shoulder profile of the stretchers (Figure 1). The second, smaller mortise (Figure 2) is for the tenon (it would be best to make this mortise in multiple passes).

STRETCHERS

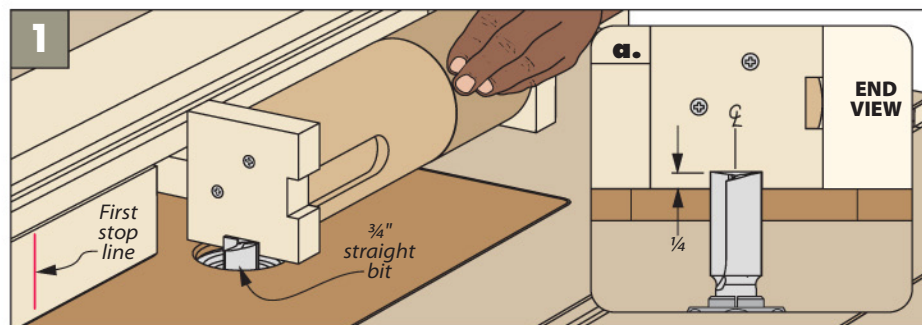
The four stretchers (two long, two short) that bring the legs together (main drawing, previous page) are straightforward workpieces. And the work starts at the table saw making tenons on the ends (Figure 3).

The same dado stack buried in an auxiliary rip fence will shape the tenon cheeks (Figure 3a) as well as the shoulder cut (Figure 3b), just raise the blade.

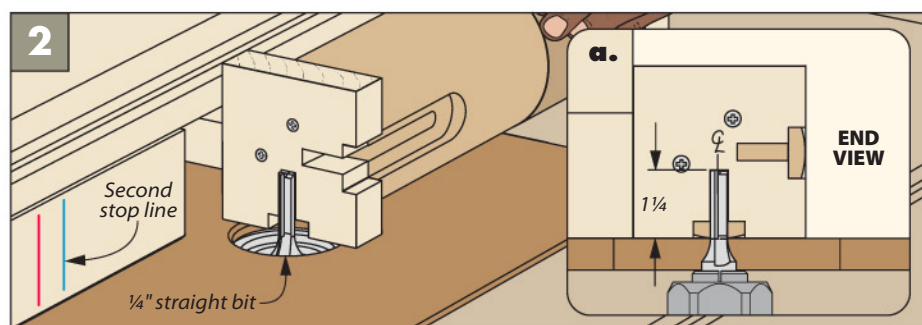
BIG EASY. To say you need to "ease" the bottom edge of the stretchers would be an understatement. A large roundover bit chucked into your router table (Figure 4) is what's called for to dress the stretchers profile.

Before gluing up the base there are pocket holes that you need to drill on the interior face of the front and back stretchers (detail 'c,' previous page). As you glue up the base, (with band clamps) confirm that the tops of the legs and stretchers are flush, and the frame is square.

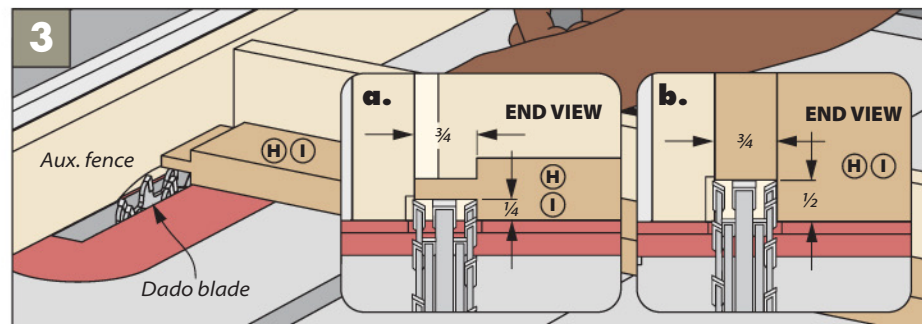
CONNECTING THE PARTS



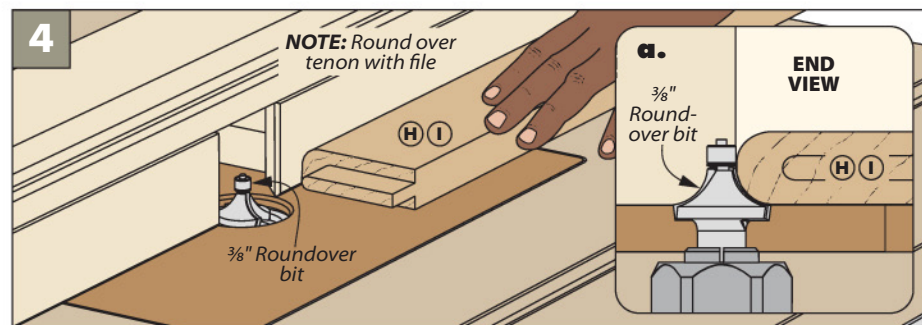
A Jig for Mortises. Attaching blocks to the ends of the leg assembly will hold it steady while you rout the first mortise. Then turn the blank 90° and rout the other mortise.



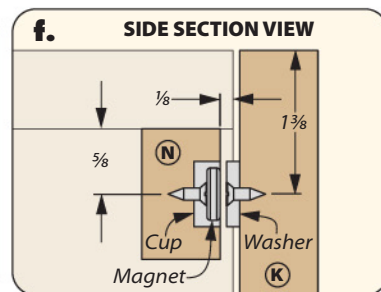
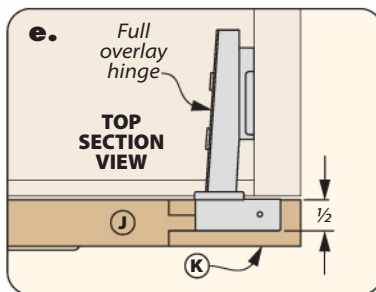
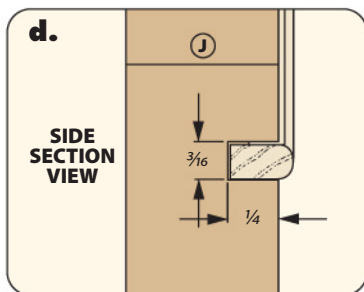
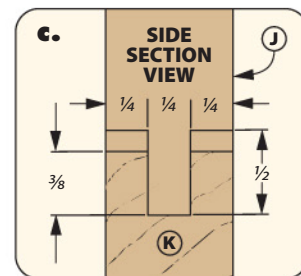
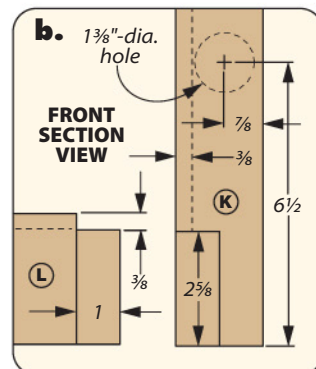
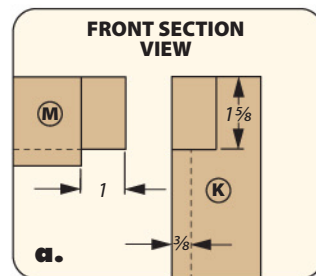
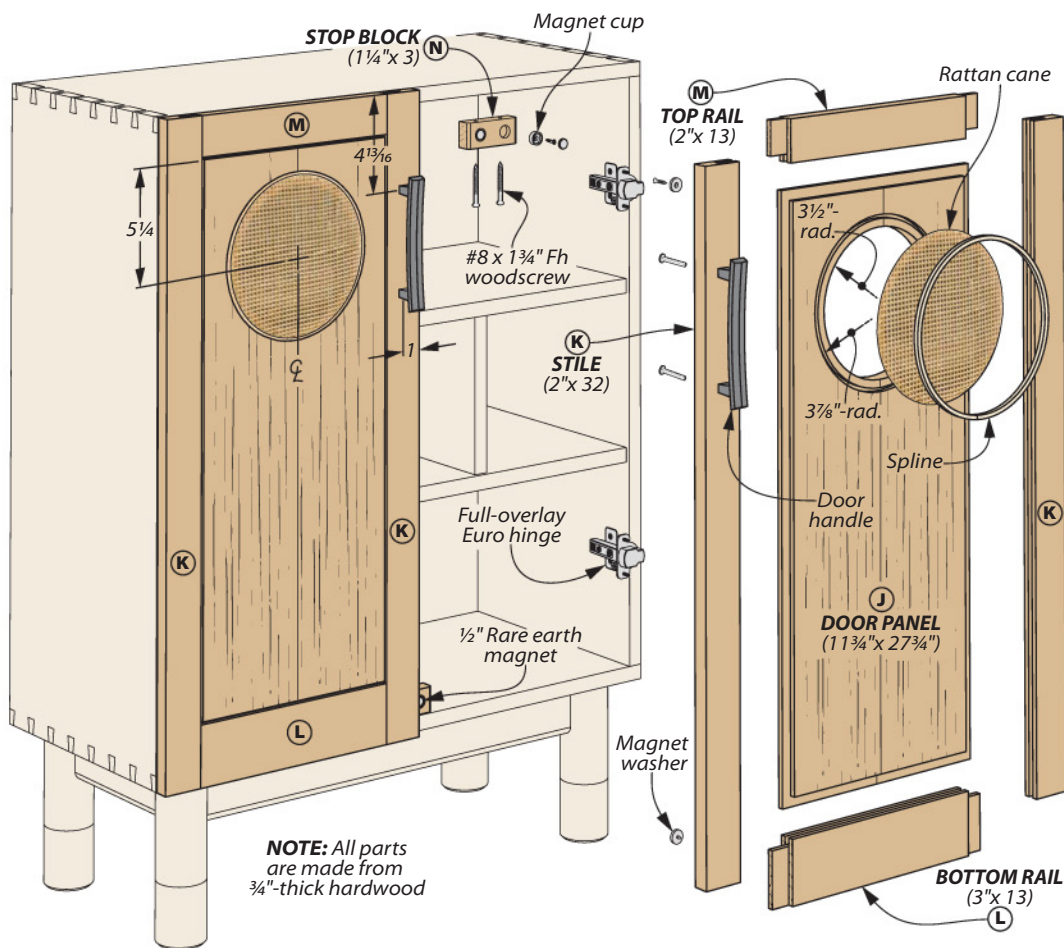
Smaller but Deeper. All you have to do for the second mortise is change out the bit and mark the second stop line on the router table fence.



Stretchers are Next. Over at the table saw you'll cut the tenons on the ends of the stretchers. Cut the cheeks first, then remove the material for the shoulders.



Roundover. A roundover bit chucked into the router table makes short work of the roundovers needed on the bottom edge of the stretchers.



Add a pair of great looking **DOORS**

The doors for this cabinet, like the design and materials on the rest of the project, are a notch above the standard fare. At first glance it's just a frame and panel door with a decorative opening in the upper center. But on closer inspection you'll find some subtle features that sing in the same key as the rest of the cabinet.

SOLID DOORS. No plywood here. These solid white oak panels

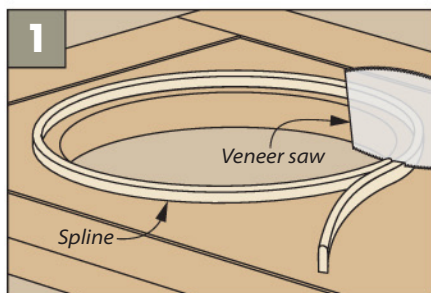
are graced with an extra-wide tongue that creates a nice shadow line between the surrounding frame. And that circle laced in cane rattan — we'll get to that shortly. You've got some panels to glue up first.

While the glue is curing on the panels, let's tackle the stiles and rails. A solid-wood panel needs to be able to move with seasonal changes. This means the frame surrounding it has to be the muscle holding the door together. So after you cut the centered grooves in the stiles and rails

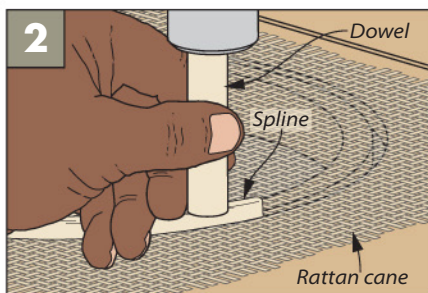
(detail 'c') you'll need to drill mortises in the end of the stiles to accommodate some beefy tenons (detail 'a') that you'll cut on the ends of the rails. Before we can put the doors together we've got to gussy up those panels that are waiting for you. Start by trimming them to size.

TRAMMEL TIME. The hole in the door panel (main drawing above) and the surrounding groove, are begging to be made with your router and trammel. So, with double-sided tape, attach the panel to a sacrificial

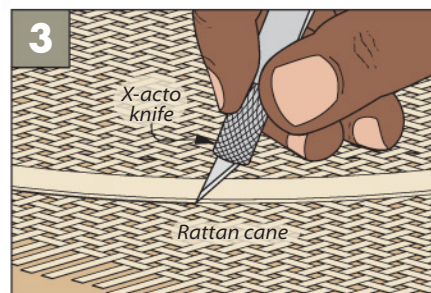
INSTALLING THE CANE SCREEN



Fit the Spline. After soaking the binding cane (spline) in hot water, fit it in the groove and trim it to length.



Install the Screen. Place the softened sheet of rattan over the opening and use a wood dowel to set the spline.



Trim & Lock the Screen. First, trim the excess cane around the spline. Then lock it in place with hide glue.

board, and rout the outer ring first (detail 'd,' previous page). Then adjust the position of the router on the trammel and make the opening in the panel. Next, back at the table saw, cut the tongues on the edges of the panels (detail 'c').

Now you can glue up the doors. Remember to let the panels float. Detail 'b' shows where to drill the holes for the full-overlay hinges (detail 'e'). The main drawing shows the screw hole locations for the handles. This is a good time to install the stop blocks in the case (detail 'f').

SPLINES & RATTAN

To decorate the hole you made in the door you're going to use the same two durable ingredients that make up the skins of wicker furniture. Open weave rattan cane comes in sheets and is used to cover large openings in chairs. Binding cane is the long strips of material that holds the rattan in place and wraps the rest of the chair.

HOT WATER. The only way you can work with these materials is to first soak them in hot water. In about 20 to 25 minutes the binding cane will be pliable

enough that you can fit them to the groove in the door. Figure 1 above shows how to do this.

In Figure 2 we've laid the rattan sheet in place over the opening. Then embed the spline with a wood dowel. Let the cane dry overnight and use the dowel to confirm the spline is still seated, then trim away the excess (Figure 3). Applying some hide glue in the groove will lock the spline and rattan in place.

The cabinet will glow nicely sprayed with lacquer after a coat of wipe-on oil dries. With that, your cabinet is ready for home. **W**

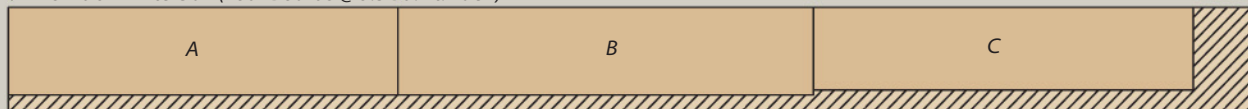
Materials, Supplies & Cutting Diagram

A	Top/Bottom (2)	$\frac{3}{4}$ x 13 $\frac{1}{2}$ - 30
B	Sides (2)	$\frac{3}{4}$ x 13 $\frac{1}{2}$ - 32
C	Hrz. Dividers (2)	$\frac{3}{4}$ x 12 $\frac{3}{4}$ - 29 $\frac{1}{4}$
D	Vert. Dividers (2)	$\frac{3}{4}$ x 12 $\frac{1}{2}$ - 8 $\frac{3}{4}$
E	Back (1)	$\frac{1}{2}$ ply. - 29 $\frac{1}{4}$ x 31 $\frac{1}{4}$
F	Feet (4)	2 $\frac{1}{2}$ x 2 $\frac{1}{2}$ - 4
G	Legs (4)	2 $\frac{1}{2}$ x 2 $\frac{1}{2}$ - 5
H	Long Stretchers (2)	$\frac{3}{4}$ x 2 $\frac{1}{2}$ - 24 $\frac{1}{2}$

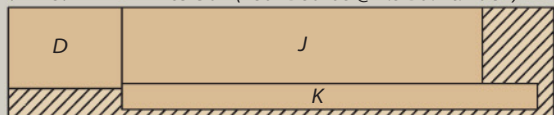
I	Short Stretchers (2)	$\frac{3}{4}$ x 2 $\frac{1}{2}$ - 9 $\frac{3}{4}$
J	Door Panels (2)	$\frac{3}{4}$ x 11 $\frac{3}{4}$ - 27 $\frac{3}{4}$
K	Stiles (4)	$\frac{3}{4}$ x 2 - 32
L	Bottom Rails (2)	$\frac{3}{4}$ x 3 - 13
M	Top Rails (2)	$\frac{3}{4}$ x 2 - 13
N	Stop Blocks (2)	$\frac{3}{4}$ x 1 $\frac{1}{4}$ - 3

- (4) #8 x 1 $\frac{3}{4}$ " Fh Woodscrews
- (1) 18" x 24" Open Weave Rattan Cane
- (1) $\frac{3}{8}$ " x 20' Binding Cane
- (2pr.) 110° Full Overlay Hinges
- (2) Door Handles
- (4) $\frac{1}{2}$ " Rare-Earth Magnets
- (4) $\frac{1}{2}$ " Magnet Cups
- (4) $\frac{1}{2}$ " Magnet Washers

$\frac{3}{4}$ " x 8" - 96" White Oak (Four Boards @ 5.3 Bd. Ft. Each)



$\frac{3}{4}$ " x 8 $\frac{1}{2}$ " - 42" White Oak (Four Boards @ 2.5 Bd. Ft. Each)



$\frac{3}{4}$ " x 6" - 42" White Oak (Two Boards @ 1.8 Bd. Ft. Each)



ALSO NEEDED: One 48" x 48" Sheet of $\frac{1}{2}$ " Oak Plywood, One 2 $\frac{3}{4}$ " x 2 $\frac{3}{4}$ " - 29" Walnut Turning Blank, One 2 $\frac{3}{4}$ " x 2 $\frac{3}{4}$ " - 29" White Oak Turning Blank

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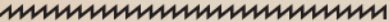
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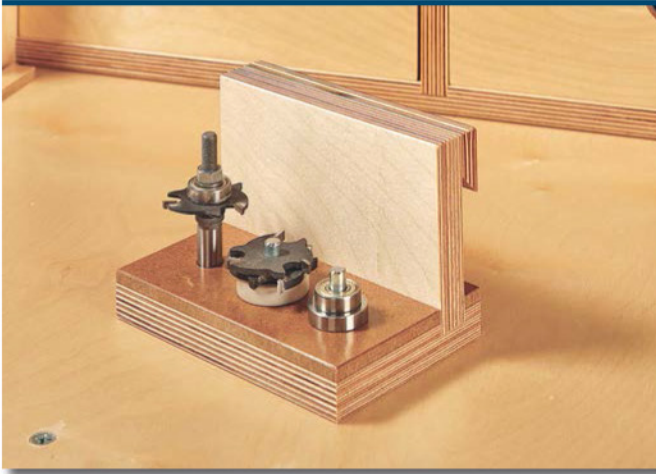


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▲ Practical caddies organize bit sets. The caddies hook onto to a French cleat system attached to the cabinet's back wall.



▲ Simple bit trays allow you to customize your bit storage. For example, this one sorts bits by the shank size.

Router Cabinet

This slim case corrals your routers, bits, and other gear. The construction keeps it approachable enough to build in a weekend.

It all starts with a purchase — a router. Then come the bits. Oh my, the bits. Very quickly, you can see the trouble. Where do you keep them? Don't forget the other gear: spare collets, wrenches, guide bushings ... the list goes on. What you need is a place to keep it all. This cabinet is the answer.

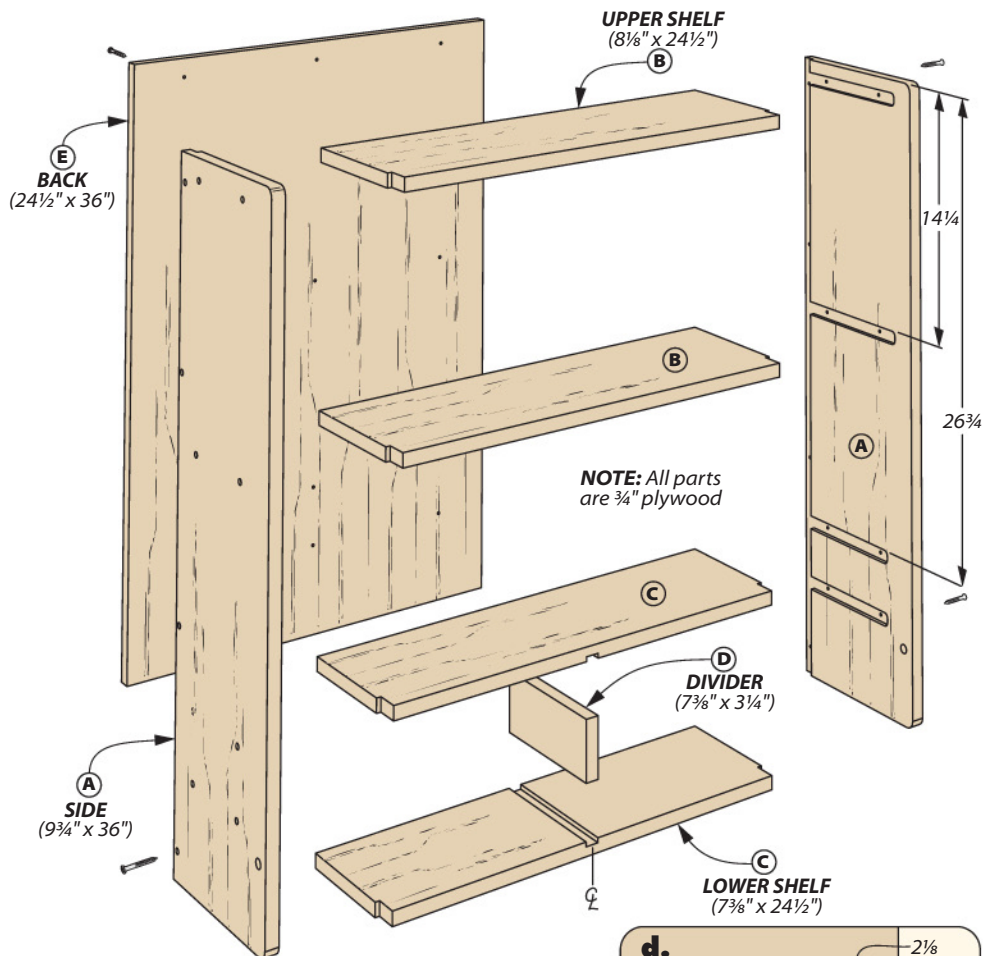
COMPACT & SPACIOUS. This cabinet offers several storage solutions that are meant to be customized. The upper compartment works for routers and other bulky gear. The main cavity is for the bits. Two options are shown in the upper photos. There are also a couple drawers in here, too.

The construction is all plywood, and the joinery consists of dados, rabbets, and grooves. So this one will go together easy.

WORKSURFACE. This cabinet has one other feature that puts it over the top: the front drops down to create a temporary worksurface (shown in the main photo). It's the ideal place to make bit changes, stage bits for upcoming steps, or do a little router bit maintenance.



▲ For all the storage space it contains, this cabinet doesn't take up much space. It's perfect for right above your router table.



Plywood CASEWORK

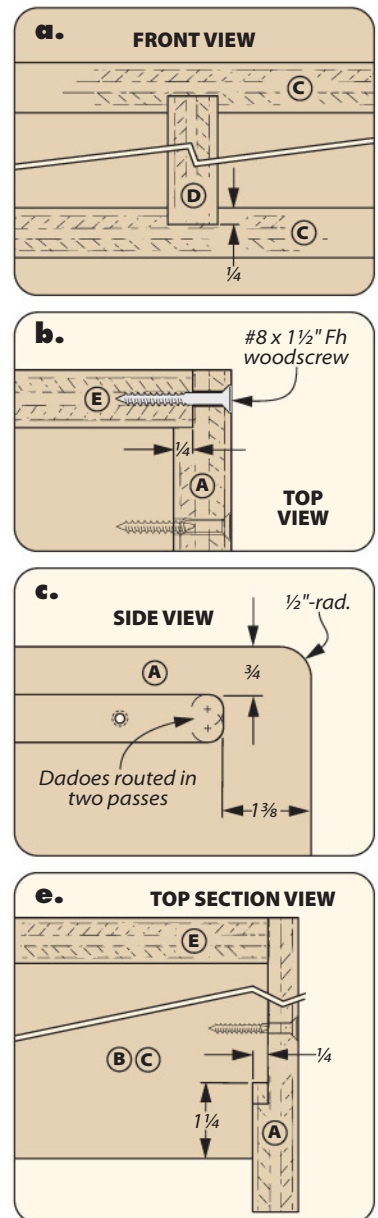
The drawing above shows the parts that make up the cabinet's case. As you can see, it's a simple affair. We used Baltic birch plywood for this version. The uniform plies have a clean look, which means we didn't feel that edging is necessary. However, feel free to use whatever sheet material you prefer.

SIDES. The sides are the place to begin. After sizing the panels, joinery is the next box to check on the list. Cut a rabbet along the back edge (detail 'b'). This houses the cabinet back come assembly time.

Take note that the back is made of 3/4" plywood — same as the other components. Sure it makes the overall cabinet heavier, but it also increases its strength and allows for turning the back into a mounting surface for storage.

STOPPED DADOES. There are four shelves that span the sides. These are held in stopped dados. On long parts like this, a hand-held router is the way to go to make the dados. The box on the bottom of the next page details one approach.

My main concern is making sure the width of the dados matches the thickness of the plywood. It's typical for plywood to measure less than its nominal size. Which means a 3/4" bit won't cut it. The solution is to use a smaller bit and rout each dado in two passes.



You can see in details 'c' and 'd' that the upper dados are longer than the lower two. I chose to leave the ends of the dados rounded. The shelves will cover the dados, so no one will ever know. A radius on the outer corners and pivot holes for the drop-front (detail 'd') are all that remains on the sides.

SHELVES. There isn't much to do for the four shelves besides cutting them to size. The two lower shelves require a centered dado for a divider that separates the drawer compartments, as you can see in detail 'a.'

The other detail is to cut a notch at each end of the shelves. This notch allows the shelf to fit the dado in the case and conceal the dado's end.

CASE ASSEMBLY. Time to get the glue and clamps out. I glued the lower shelves and divider together, first. Then glue up the sides and all the shelves. A few screws along the way reinforce the joints. Then cut the back panel to size, add glue, and screw it into the rabbet.

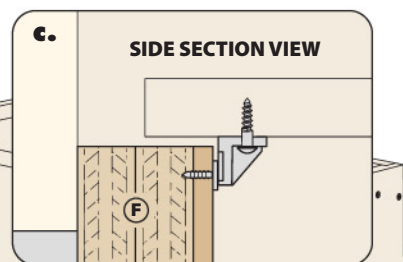
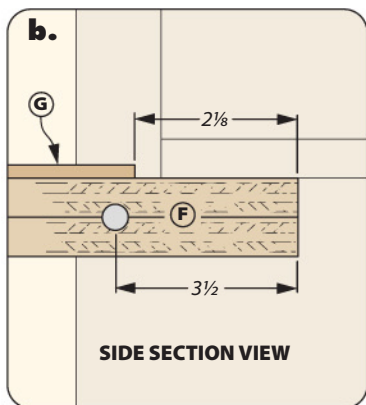
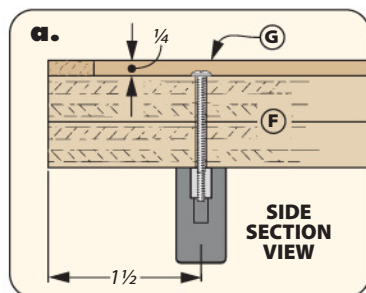
DROP FRONT

The drop-front door encloses the lower part of the cabinet. When open, it forms a small work space. Making it begins with gluing up two layers of plywood and cutting the blank to fit the opening.

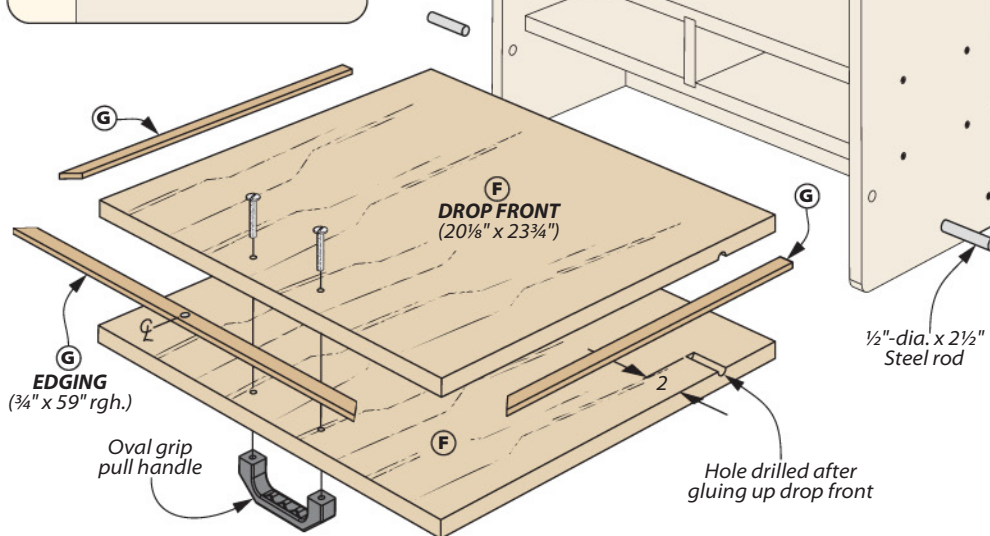
The next part is a little trickier. You need to drill a hole on each side for a pivot pin. The location allows the drop front to rest flat when open. Use the dimensions in detail 'b' at right. I clamped the drop front in place and used the holes in the sides as a guide.

Leave the pivot pins extra-long for now. This way you can remove them to fine-tune the fit and operation of the door.

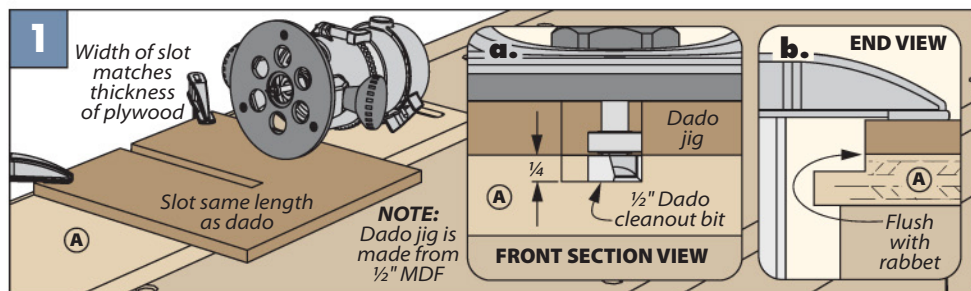
Finish things off with a band of hardwood edging along the front and sides. Then add a handle and a magnetic catch, as you can see in details 'a' and 'c'.



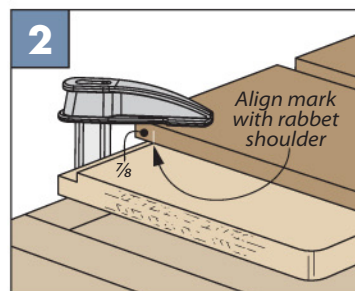
NOTE: Edging is 1/4"-thick hardwood. Drop Front is glued up from two layers of 3/4" plywood



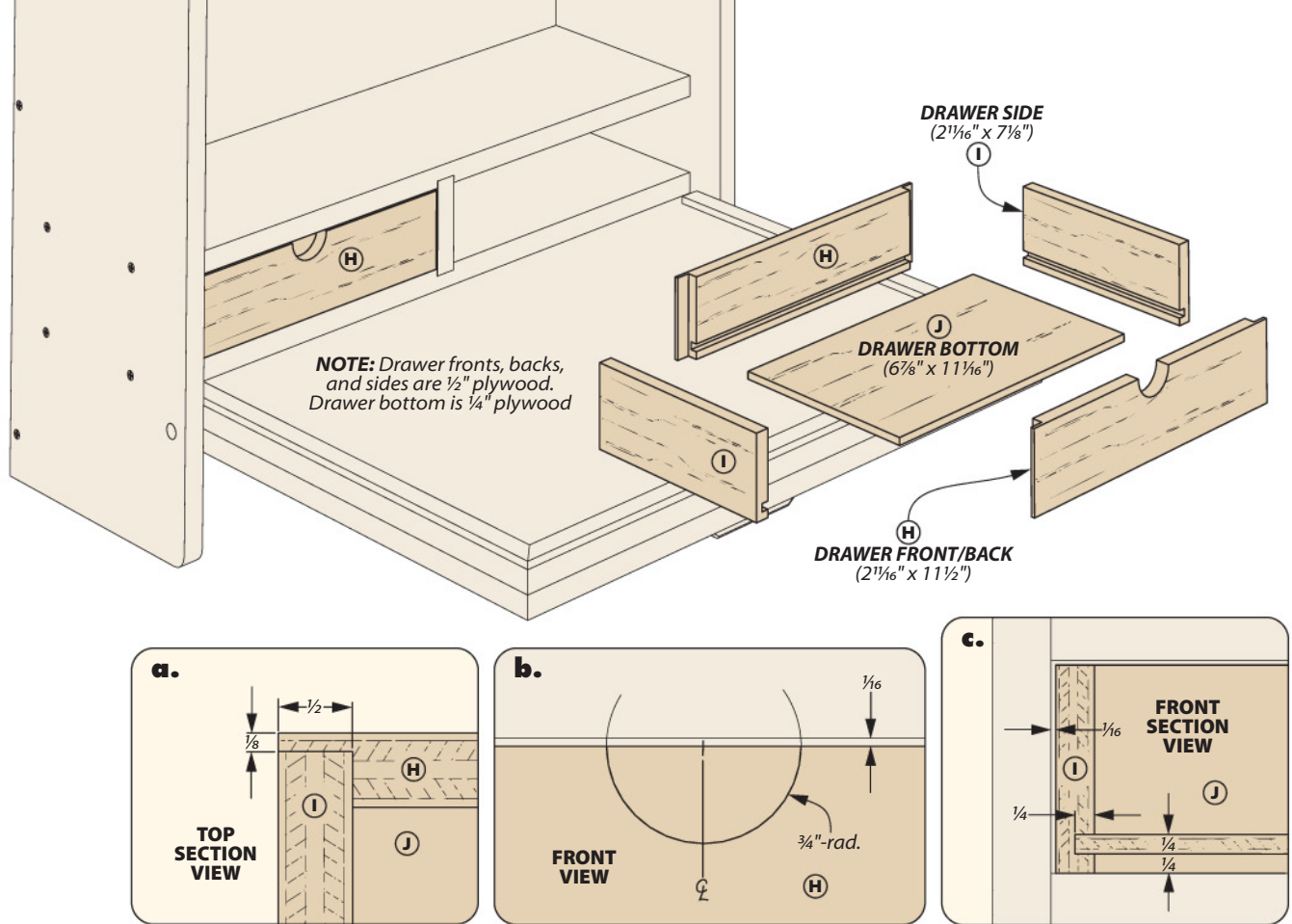
ROUTING STOPPED DADOES



Custom Dado Jig. Cut a long slot in a wide piece of MDF. The width of the slot should match the thickness of the plywood shelves. A dado cleanout bit follows the slot.



Back it Up. Adjust the jig to rout the lower dados.



Organized & ENCLOSED

A pair of drawers and doors complete the construction portion of this cabinet. So let's start with the drawers in the lower compartment.

These small drawers are meant to hold the loose odds and ends that tend to get lost or separated from each other: guide bushings, spare baseplate screws, cleaning brushes, etc. In addition, I like to keep extra screwdrivers and Allen wrenches with my routing gear so I don't have to hunt for those in the middle of a project.

SIMPLE DRAWER JOINERY. Since the drawers are small, I scaled down the material to suit. Here we used 1/2" plywood. Small drawers that don't carry a lot of weight means the joinery can be streamlined, too. As you can see in detail 'a' above, the sides fit into deep rabbets cut into the drawer fronts and backs.

The rabbets are cut at the table saw with a wide dado blade recessed in an auxiliary fence attached to the rip fence. Guide the workpiece with a miter gauge fitted with its own auxiliary fence. The miter gauge fence backs up the cut and prevents the edge of the drawer parts from chipping as the blade exits the workpiece.

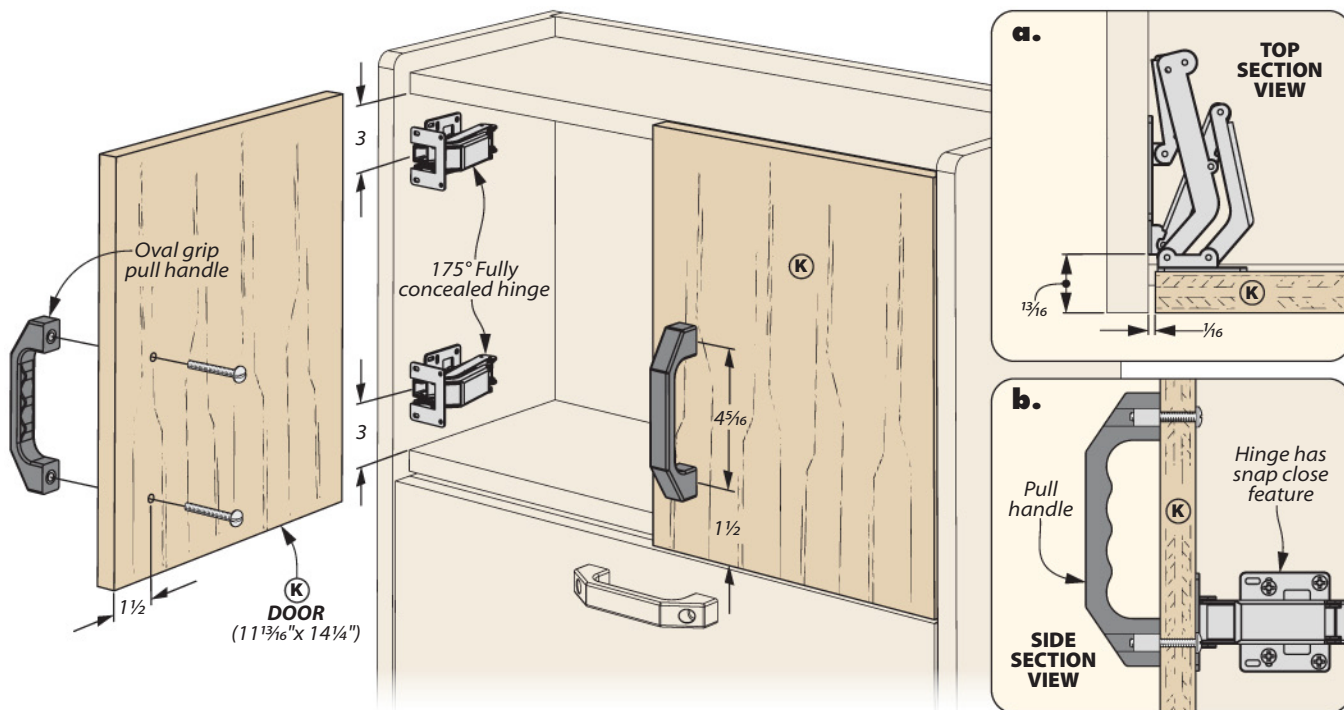
BOTTOM GROOVES. The drawer fronts, backs, and sides have a groove to house the plywood bottom. This is shown in detail 'c.' Measure the thickness of the plywood. If it's close to 1/4", you may be able to swap out the wide dado for just the two scoring blades and cut the groove in a single pass.

If the plywood is thinner, or your scoring blades create a too-wide kerf, you can make a tighter fit by just using a standard blade.

You just need to make the groove in two passes.

FINGER NOTCH. Instead of a hardware pull, the drawer fronts have a finger notch to open them, as you can see in detail 'b.' The notch is formed using a Forstner bit in the drill press. I clamped the two drawer fronts together and aligned the centerpoint of the bit with the seam between the fronts. This step keeps the bit from tearing out along the top edge of the drawer as it drills.

You can glue up the drawer at this point. Once the clamps are on, double check the drawer box is square. The glue offers plenty of strength for these small drawers, but you could drive a few brads through the sides and into the fronts and backs if that eases your mind. The small nail holes add a nice visual detail, too.



UPPER DOORS

The final components are the two small doors for the upper part of the cabinet. You can see in the drawing above that each door is made from a single piece of plywood. No need to add complexity at this late stage. Take note that the grain direction on the door runs up and down (to match the drop front).

The doors are inset between the sides and overlap the top shelf. The dimensions shown here worked for our version, but you'll need to base your doors on your own construction. You're aiming for an even gap side to

side (detail 'a') and along the bottom edge.

The doors are mounted on substantial-looking hinges. That's because I wanted the doors to open completely out of the way. No more bumped heads if I can help it. The main drawing and detail 'a' show the dimensions for installing the hinges. I recommend using the slotted holes in the hinges to start with. You can dial in the door's fit before locking it in by driving the remaining screws.

BUILT FOR OPTIONS. Now it's the (even more) fun part — customizing the interior. The photos on

the opening pages and below show some options we came up with. You can find the specifics at Woodsmith.com/265.

I say gather up all your router accoutrements and see what works for you. Send us your ideas and we'll share them.

A cabinet like this is a simple project. However, the bliss from not having to hunt for router gear shows how great gifts often come in simple packages. **W**



For the cabinet organizer plans, go to:

Woodsmith.com/265

Materials & Supplies

- | | | |
|-------------------------------|------------------------------|-------------------------------------|
| A Sides (2) | 3/4 ply. - 9 3/4 x 36 | • (36) #8 x 1 1/2" Fh Woodscrews |
| B Upper Shelves (2) | 3/4 ply. - 8 1/8 x 24 1/2 | • (2) 1/2"-dia. x 2 3/4" Steel Rods |
| C Lower Shelves (2) | 3/4 ply. - 7 3/8 x 24 1/2 | • (3) 4 5/16" Pull Handles w/Screws |
| D Divider (1) | 3/4 ply. - 7 3/8 x 3 1/4 | • (1) Magnetic Catch w/Screws |
| E Back (1) | 3/4 ply. - 24 1/2 x 36 | • (2 pr.) 175° Concealed Hinges |
| F Drop Front (1) | 1 1/2 ply. - 22 3/4 x 20 1/8 | |
| G Edging (1) | 1/4 x 3/4 - 59 rgh. | |
| H Dwr. Frts./Backs (4) | 1/2 ply. - 2 11/16 x 11 1/2 | |
| I Drawer Sides (4) | 1/2 ply. - 2 11/16 x 7 1/8 | |
| J Drawer Bottoms (2) | 1/4 ply. - 6 7/8 x 11 1/16 | |
| K Doors (2) | 3/4 ply. - 11 13/16 x 14 1/4 | |

ALSO NEEDED: One 48" x 96" sheets of 3/4" birch plywood. One 24" x 24" sheet of 1/2" birch plywood. And one 24" x 24" sheet of 1/4" maple plywood



- ▲ A French cleat mounted to the back of the cabinet holds bit set organizers. Find the plans online.



Hide-Away Gathering Table

▼ The tabletop is made from a plywood panel wrapped in mitered hardwood edging.

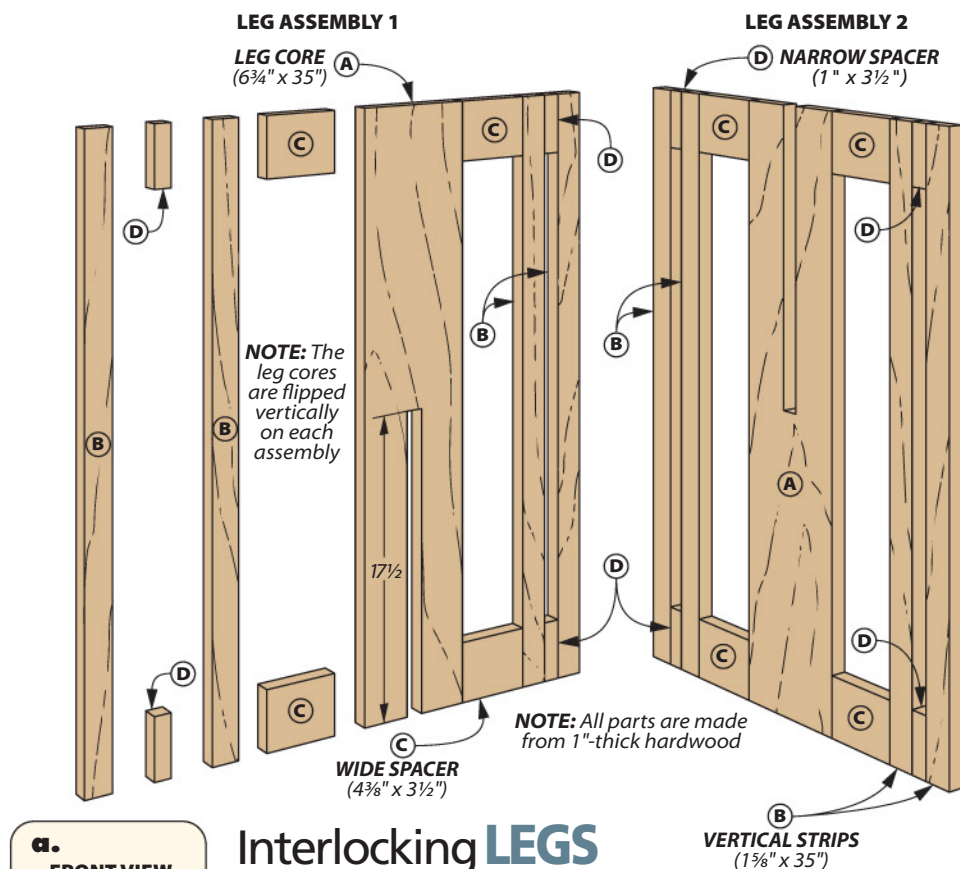


▲ Large dowels register the top with the leg assemblies and keeps the top centered/from sliding around.

A knock-down table can still be a high-quality piece of furniture. Get rid of that folding table in favor of something more sturdy and stylish.

There are times when you just need one more table. Whether you're hosting family for a holiday or getting ready for a weekly game of poker in the garage, it's nice to have something you can set up quick and put away at the end of the day without hassle. When these occasions roll around, I often find myself scrounging for the same flimsy, white, folding table. It's cheap, it's plastic, it's certainly not flat, and it's got a wobble that drives me mad. But, it is necessary — or at least it was.

The table you see pictured here is our alternative to the typical choice. The hardwood leg assemblies keep the table steady while also being able to slide together and apart easily. The top is made from a plywood panel surrounded by hardwood edging, keeping it at a conveniently portable weight. As you'll see later on in the article, the design of the table itself is simple, making this a great weekend project to tackle before your next gathering. Whether it's for kids or cards, this table knows how to be useful — and how to stay out of the way when it's not needed.



Interlocking LEGS

While the top may be the most eye-catching feature of this table, it's the leg assemblies that make it what it is. The legs are glued up from a series of spacers and a pair of interlocking core pieces, all sandwiched together by feet at the top and bottom of the assemblies. As you can see

above, the assemblies feature mating slots, allowing them to interlock to form the table.

CORE. The slotted leg cores are the central point of each assembly, making them an excellent place to start working. Begin by cutting both pieces to size, then head over to the router table.

SLOT. The stopped slot down the center of each leg core allows the assemblies to interlock. Making this slot is simply routing a stopped groove. Begin by laying out the slot on both sides of each piece, then marking the end of the slot to give yourself a stopping point. Install a straight bit in your router table and mark the position of the end of the bit on your fence.

Next comes routing. After setting the fence, run the workpiece through to the end of the slot to make the first groove. Raise the height of the bit and make the cut again, stopping at the end of the slot. Keep at it until you've routed the full slot.

This slot matches the thickness of the cores, but they'll also need to accommodate the paint later on. Once both pieces have been routed, sand through the slot to give it that extra needed room. Finally, square up the ends of the slots with a chisel.

VERTICALS. The vertical strips are long, straight pieces that provide support for the outer edges of the table. They're simple, and once you've cut them to size set them aside until the assembly.

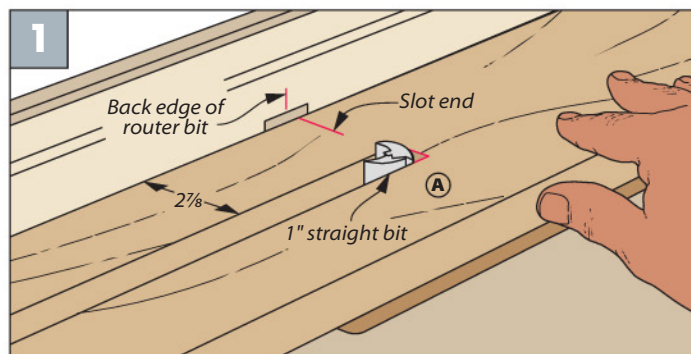
SPACERS. The spacers are a similar story to the vertical pieces. For now simply cut all the spacers to size and move on.

FEET & ASSEMBLY

Now for the last sets of pieces on the leg assemblies. The feet sandwich together the leg assemblies, and their curves add a bit of visual variety. Once you've cut the feet and foot spacers to size, print out the patterns provided for their curves (along with the ones for the foot spacers). Attach the patterns, then head over to the band saw for some shaping.

PATTERN CUTTING. Cutting the feet and spacers to shape is a simple task, but a little care goes a long way. As in Figure 1 on the next page, stay to the waste side

ROUTING THE SLOTS



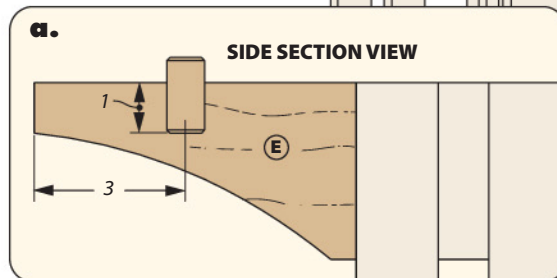
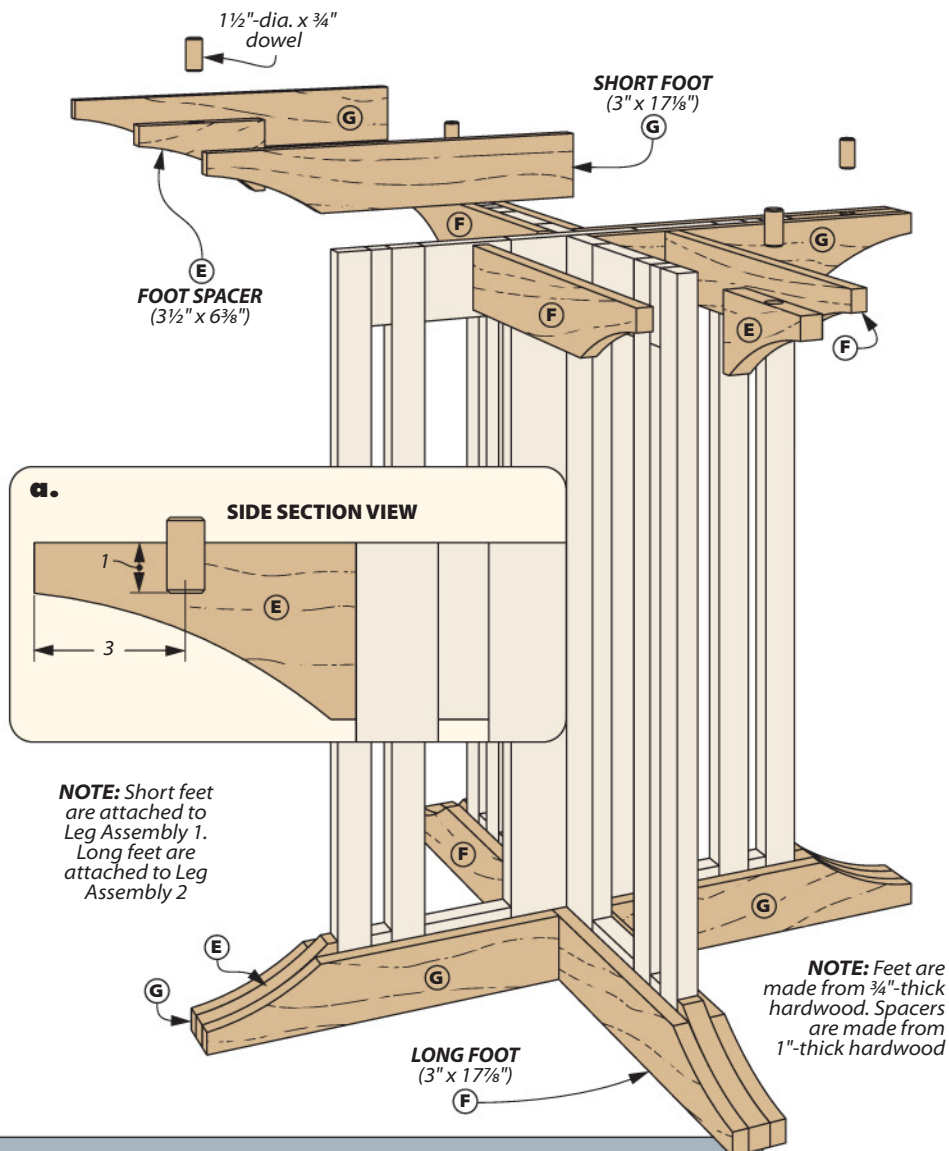
Straight Bit Slot Cutting. Mark out the stop point for your slot on both the router table fence and the workpiece. Make a series of cuts until you rout through, stopping at the line each time.

of the patterns, then sand to the final shape. To make sure they'd be identical, I stuck them together with double-sided tape and sanded them at once.

ASSEMBLY. It's time for the assembly. First, glue up the leg assemblies as shown on the previous page, using cauls to keep the pieces flush. Once dry, glue on the feet and foot spacers as well. Again, cauls help to keep the edges flush here. Since wet glue likes to make things slide when under pressure, I found pin nails to be helpful in keeping the pieces from shifting while being clamped up.

REGISTRATION HOLES. Holes in the upper curved spacers allow dowels to fit in and register the top when setting up the table (detail 'a'). The holes and dowels are pretty basic, but they'll need to properly align with each other. My solution was an MDF drilling guide.

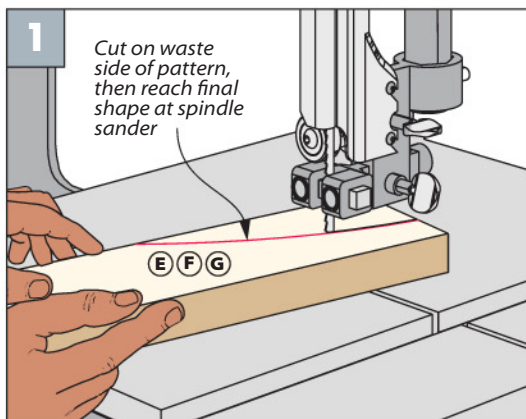
As shown in Figure 2 below, I began with a strip that spanned the length of the leg assemblies. I marked out the centerline, as well as where each hole would go. From there, I used the guide to bore both sets of holes.



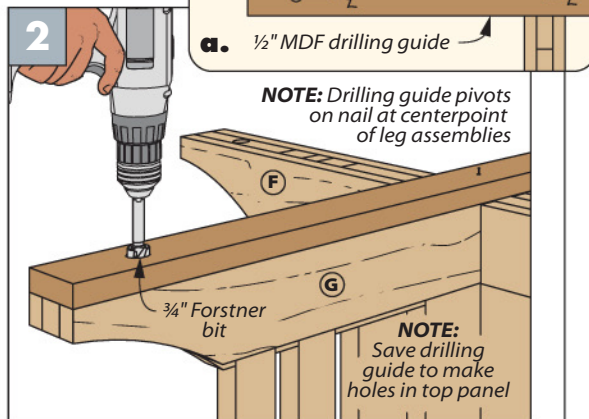
NOTE: Short feet are attached to Leg Assembly 1. Long feet are attached to Leg Assembly 2

NOTE: Feet are made from 3/4\"-thick hardwood. Spacers are made from 1\"-thick hardwood

CURVED FEET DETAILS



Cut to Shape. After attaching the patterns, cut the feet and spacers to shape, staying to the waste side of the patterns.

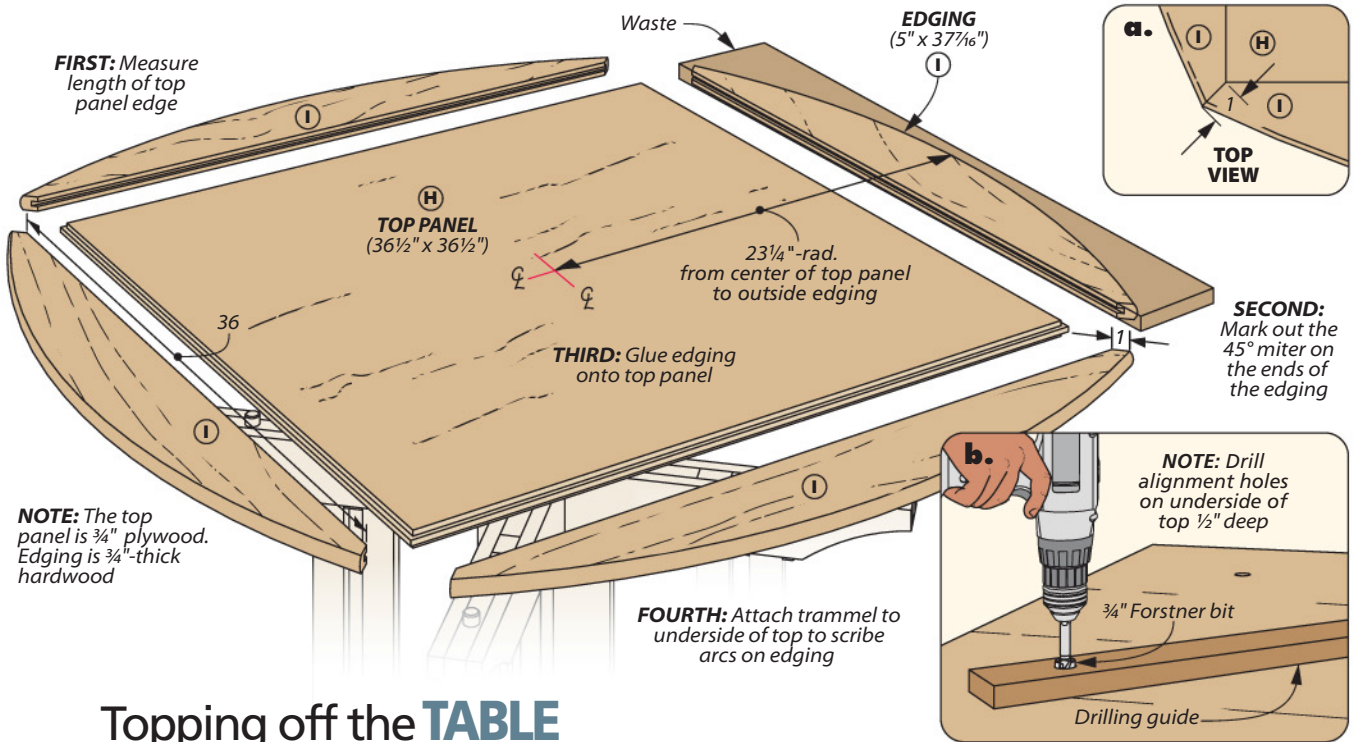


Dowel Drilling Guide. Make a drilling guide at the drill press as a template for the dowel holes. This will help align them on the top panel.



For patterns of the feet and foot spacer, go to:

Woodsmith.com/265



Topping off the TABLE

The tabletop is the last piece of this puzzle, and as you can see above, there's not much to it — just a plywood panel wrapped with hardwood edging. The panel and edging are held together by tongues and grooves while the ends butt together with simple miters. Finally, some shaping gives it a great look.

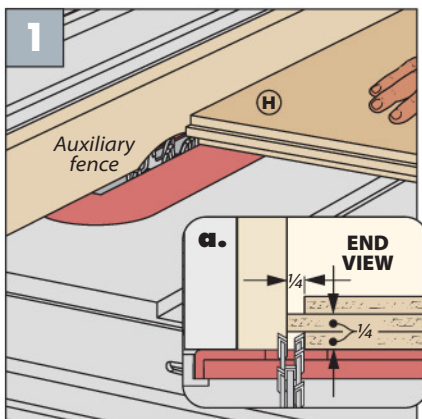
TOP PANEL. When selecting the piece to make the top panel from, it pays to be choosy and find a panel that matches the grain of the two edging pieces beside it. After cutting it to size, you'll next need to form the tongues (Figure 1 below).

Now it's time for the drilling guide again. First, use a straight

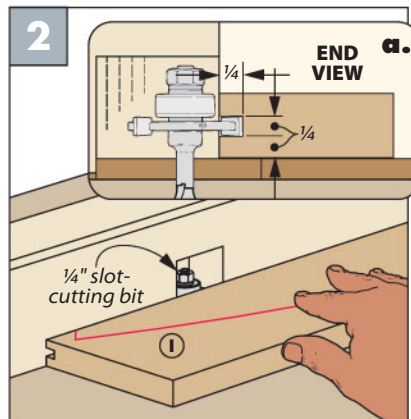
edge to mark corner-to-corner across the panel to find the center. From there, center the guide as you did on the legs and bore out the holes in the bottom of the panel (detail 'b').

EDGING. There are a few things to address on the edging pieces, and while none of them are particularly difficult, they should

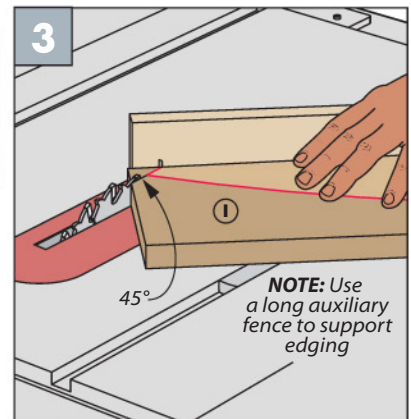
TENONS & CURVES



Rabbetted Panel. To add tongues to the edges of the top panel, use a dado blade buried in an auxiliary fence.

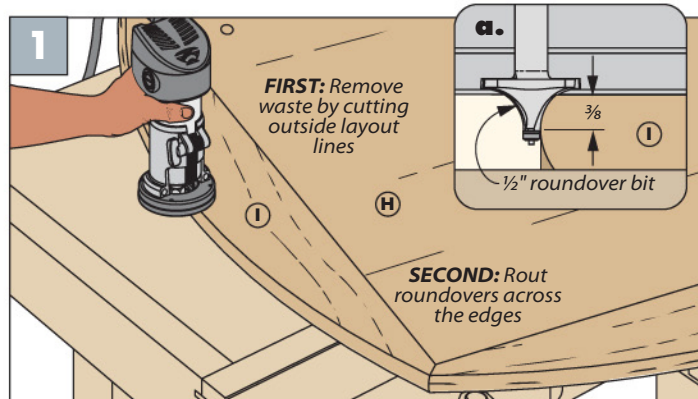


Grooved Edges. Before cutting the mitered ends, use a slot cutting bit at the router table to make the grooves.



Mitered Ends. Using a miter gauge with a long auxiliary fence, miter the ends of the edges at the table saw.

CURVE & ROUND



Cut then Rout. After attaching the edges to the panel, use a jig saw to shape the curves, then rout the bullnose edge.



▲ The two leg assemblies are joined at the slots, with the cores and feet forming tongues and grooves.



▲ When not in use, the gathering table can be disassembled and easily stowed away.

be handled in a certain order. First, head to the router table to cut the grooves for the panel's tongues using a $\frac{1}{4}$ " slot-cutting bit (Figure 2, previous page).

Now to miter the ends. Set your miter gauge up at 45° and make these on the table saw (Figure 3). Sneak up on the final size, dry fitting the pieces in place to make sure they'll be gap-free.

ASSEMBLY & SHAPING

Before doing any more work on the edging, it's time to glue up the tabletop, as getting a good glueup would only be more difficult later on. Once the edging is glued onto the top panel, the final shaping can be done.

CURVE & ROUND. To create the arcs on the edging, I used a trammel based on the dimensions in the main drawing on the previous page. After those were scribed, I used a jig saw to shape the tabletop. The jig saw doesn't leave pretty edges, so you'll need to clean them up with a block plane. They don't need to be perfect, just smooth enough for a bearing to ride easily across.

A roundover bit is used to ease the corners of the edging (Figure 1). Be sure the bearing rides exactly on the centerline — if it's

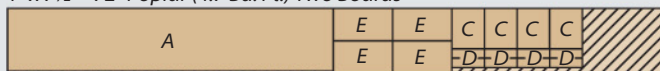
too high or too low you'll be left with a ridge in the center. A small flat will be left behind, but a little sanding will take care of it.

SETTING UP THE TABLE. Setting up the table is an easy, two-step process. First, slide the two leg assemblies together along their slots. Once they're interlocked, insert the dowels and set the top in its place. All the pieces should lock in firmly, and when it's time to put the table away, simply pull them back apart. **W**

Materials, Supplies & Cutting Diagram

A Leg Cores (2)	1 x $6\frac{3}{4}$ - 35	F Long Feet (8)	$\frac{3}{4}$ x 3 - $17\frac{7}{8}$
B Vertical Strips (8)	1 x $1\frac{5}{8}$ - 35	G Short Feet (8)	$\frac{3}{4}$ x 3 - $17\frac{1}{8}$
C Wide Spacer (8)	1 x $4\frac{3}{8}$ - $3\frac{1}{2}$	H Top Panel (1)	$\frac{3}{4}$ ply. - $36\frac{1}{2}$ x $36\frac{1}{2}$
D Narrow Spacer (8)	1 x 1 - $3\frac{1}{2}$	I Edging (4)	$\frac{3}{4}$ x 5 - $37\frac{7}{16}$
E Foot Spacer (8)	1 x $3\frac{1}{2}$ - $6\frac{3}{8}$	• (1) $\frac{3}{4}$ "-dia. x 6" Dowel	

1" x $7\frac{1}{2}$ " - 72" Poplar (4.7 Bd. Ft.) Two Boards



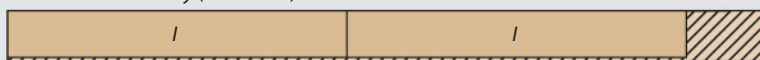
1" x $7\frac{1}{2}$ " - 72" Poplar (4.7 Bd. Ft.)



1" x 7" - 72" Poplar (4.4 Bd. Ft.)



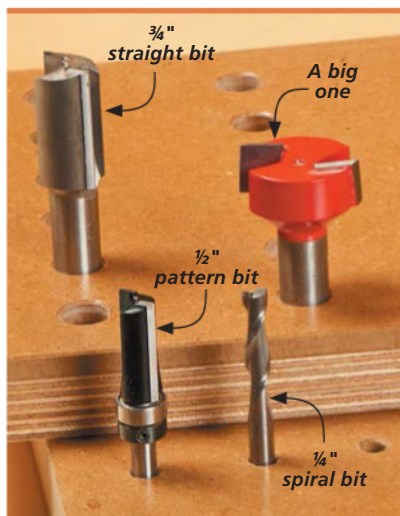
$\frac{3}{4}$ " x $5\frac{1}{2}$ " - 82" Cherry (3.2 Bd. Ft.) Two Boards



ALSO NEEDED:
One 48" x 48" sheet
of $\frac{3}{4}$ " plywood



Must-Have Joinery Bits



▲ A small assortment of straight cutting bits gives you plenty of options for cutting smooth joinery details.

Routers require bits. I use this obvious statement because routers are often (and rightly) recommended as an essential tool for furniture making. Without talking about the bits though new woodworkers don't have much to go on. When you combine the range of bits available and different types of woodworking projects to make, selecting and suggesting router bits becomes subjective and overwhelming.

THREE CATEGORIES. I divide router bits into three broad groups: joinery, profiling, and shaping. There's some overlap, for sure. However, this distinction helps to narrow down the conversation with other woodworkers about what kinds of bits to purchase. In this article, I'll share

the joinery bits I've come to rely on in my own projects along with some bits that I know others around here use frequently.

STRAIGHT BITS

The bits most commonly connected to joinery are straight-cutting bits. Often used for fundamental operations like grooves, dadoes, and rabbets. You can see several styles in the left photo. They're first on my list due to their versatility. Straight bits come in a range of sizes. You need a few to start.

SPIRAL BIT. I use a router to create mortises. In my projects, 1/4" is a common size. I have a spiral upcut for efficient chip removal in mortises up to 1" deep. This bit also works for grooves.



▲ These bits are designed for undersized plywood. With down-cutting flutes, they leave a smoother edge than ordinary straight bits.

PATTERN BIT. Next is a 1/2" pattern bit. This is a two-for bit. With a bearing on the shank, you can put it to work for pattern routing tasks, as well as the everyday dados and grooves. This is a good diameter for making larger cuts by taking multiple passes.

WIDE. A 3/4" straight bit is good to have for joinery sized for common hardwood stock found in a lot of furniture plans. It's also large enough to cut rabbets effectively.

WIDER. Keep an eye out for a larger straight bit. The specific size doesn't matter. (The one

shown is 1 1/4".) It's not critical, but it comes in handy when you need to remove a lot of material.

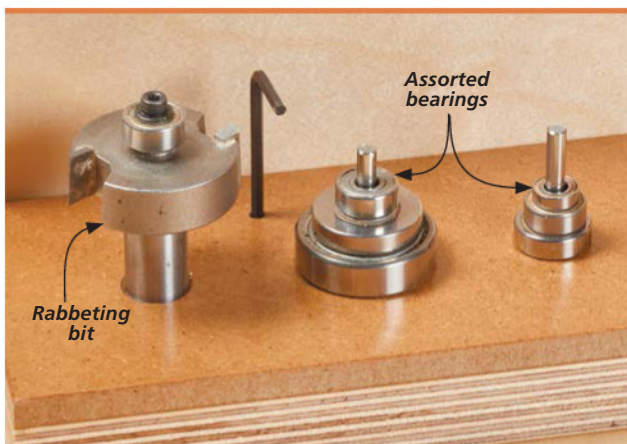
PLYWOOD BITS. The two bits shown in the upper right photo are sized for cutting grooves and dados to house 1/2" and 3/4" plywood. That means the cut they form is slightly smaller than the nominal dimension.

These have short cutting flutes that are also angled downward. Joinery is rarely cut deep, so the short length means more stability. By angling the flutes downward, the bit prevents the upper veneer on plywood from tearing out.

RABBETING BIT

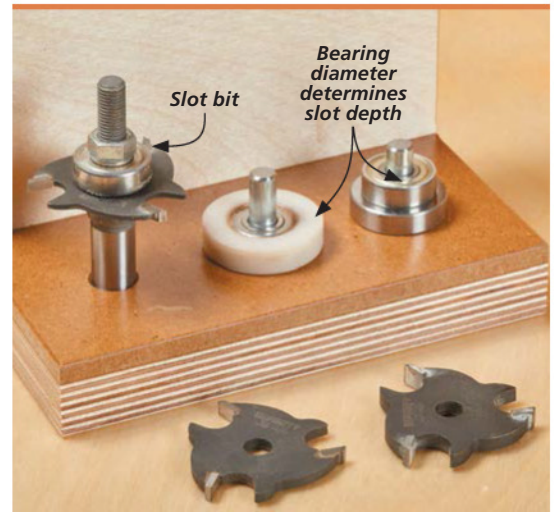
In the photos below, you'll see an upgrade bit. Related to straight bits, a rabbeting bit does cut a square profile. But it has a bearing on the top that sets the rabbet's width. A bit that comes with multiple bearings is preferred.

While straight bits cut rabbets well, a rabbeting bit has more mass behind it. That results in a cleaner, smoother cut from my experience. The bearing means you don't need to set up a fence or edge guide to work either at the router table or handheld. This allows you to form a rabbet on the inside of a frame, for example.



▲ A rabbeting bit set includes several bearings you can swap out to change the width of the rabbet you create. The larger bit diameter contributes to a smoother cut.





▲ Mix and match bearings and cutters to create a wide range of grooves. Some versions even allow the cutters to stack for thicker cuts.

SLOT CUTTER

The cutting action of a straight bit gives you a smooth cut, but requires multiple passes to make deeper grooves. A slot cutter, on the other hand, offers a more efficient cutting action (like a mini saw blade). The edge left behind is still crisp and smooth.

In spite of the name, I use a slot cutter for making grooves in

frame and panel assemblies. It's also ideal for reinforcing miter joints with splines.

Like rabbeting bits, a good slot cutter is one that comes as a set with additional bearings, as you can see in the upper right photo. However the cutters are interchangeable. So you can swap out cutters to make grooves in several sizes.

The limiting factor is that the location of groove on the workpiece is determined by how far you can safely extend the bit (upper right photo). Past about 1½" you'll need to opt for a straight bit.

◀ Stile and rail bits create interlocking corner joints, a profile and a groove to house a panel.



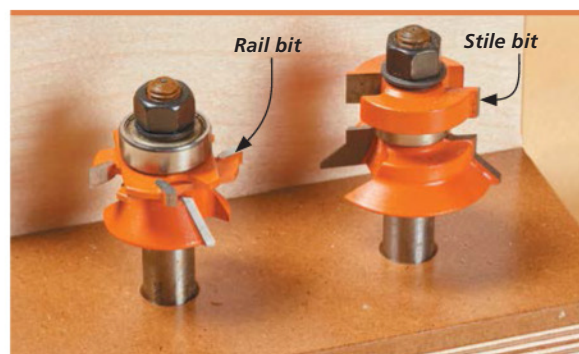
STILE & RAIL BITS

I mentioned how a slot cutter can be employed to make frame and panel joinery. However if your work includes a lot of door making, you may want to consider a stile and rail bit set, like the one shown below.

Rather than a single bit, these come in matched pairs. One bit cuts a profiled groove on the inside edge of all your door parts. The other bit is used to form a tongue and "reverse profile" on the ends of the rails. The lower left margin photo shows what I'm talking about. It's utility and beauty at the same time.

You can find sets that create a wide range of decorative profiles from roundovers to beveled "Shaker" style. The sets get pricey. So start with one version that will look good with other cabinets in your home already.

UP TO YOU. This list isn't meant to be exhaustive or prescriptive. In fact, there are a couple extra bonus bits in the box on the next page, but I believe a small assortment of straight bits are a common, flexible starting point. Where you go from there depends on the work you do — or plan to do in the future. It's a smart strategy for good work. **W**



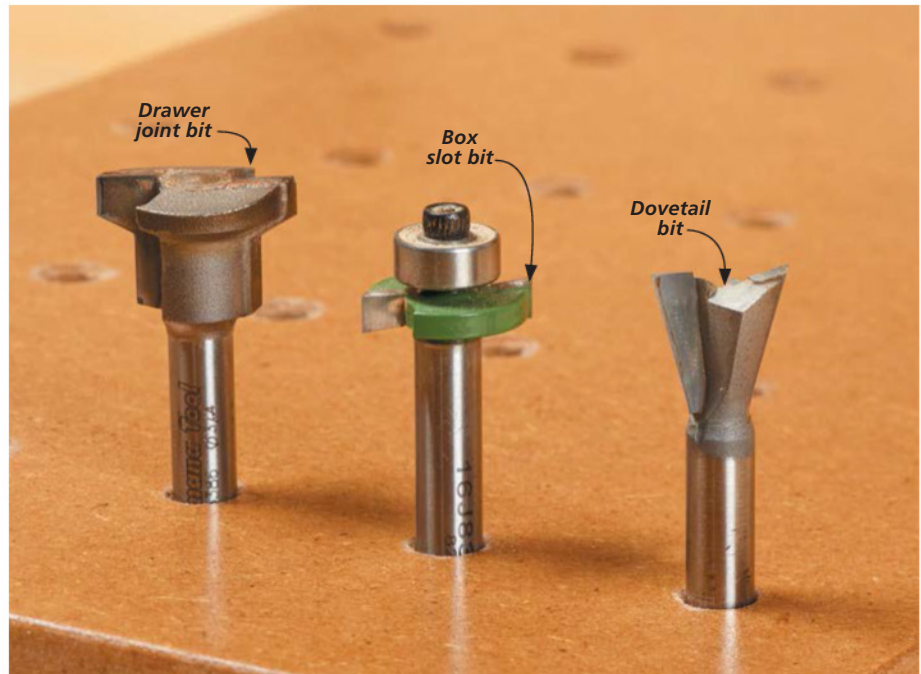
SPECIALTY JOINERY BITS

While sorting through my router bits, I found a few more joinery bits that are worth mentioning. I find them quite helpful, but they aren't the first ones on the list.

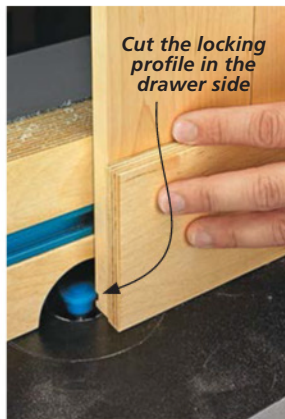
The drawer joint bit allows me to create an interlocking joint on drawer parts with just two setups. The result is something that looks like a locking rabbet joint you'd make at the table saw.

The box slotting bit solves the problem of visible drawer bottom grooves in boxes that use either dovetails or finger joints. It's designed to cut a stopped groove in a dry fit assembly.

Dovetail bits are usually associated with dovetail jigs, but they can do so much more. I don't use a jig for drawers (see above). But I do use a dovetail bit for making sliding dovetails or tapered sliding dovetails in projects.



Special Teams. These three bits expand the kinds of joinery you can tackle with your router. The drawer joint bit mimics a locking rabbet. The box slotting bit is perfect for small box makers. A dovetail bit is good for more than half-blind dovetail jigs.



Drawer Joint. With just one bit, you can create an strong joint for drawers. The shape of the cuts even helps pull the parts into proper alignment during glueup.



Box Slotting. Dry assemble your box and run a groove around the inside edge. This keeps the groove invisible for dovetails and box joints



Dovetail. Use a dovetail bit to create sliding dovetail joints in cases and table base assemblies — not just drawers.

Sources

Most of the materials and supplies you'll need to build the projects are available at hardware stores or home centers. For specific products or hard-to-find items, take a look at the sources listed here. You'll find each part number listed by the company name. See the left margin for contact information.

MAIL ORDER SOURCES

Project supplies may be ordered from the following companies:

Woodsmith Store
800-444-7527
store.woodsmith.com

Rockler
800-279-4441
rockler.com

Amana Tool
800-445-0077
amanatool.com

amazon.com

Benjamin Moore
855-724-6802
benjaminmoore.com

Cabinetmaker Warehouse
1-866-264-3513
cabinetmakerwarehouse.com

General Finishes
800-783-6050
generalfinishes.com

Lee Valley
800-871-8158
leevalley.com

Minwax
800-523-9299
minwax.com

McMaster-Carr
630-833-0300
mcmaster.com

Table Legs.com
1-800-748-3480
tablelegs.com

Woodcraft
800-225-1153
woodcraft.com

Woodline USA
800-472-6950
woodline.com

Varathane
Varathanemasters.com

MARBLE TOWER (p.28)

Once built, the marble tower was finished with *General Finishes'* "Seal-a-Cell."

DRAFTING TABLE (p.34)

- **McMaster-Carr**
Pivot Plate 89015K18
Flanged Inserts 92105A023
18-8 Washers 92141A031
5/16" Knob 6890K2
5/16" Hex Head Screw . 92198A691
5/16" Locknuts 91831A030
The 4' x 10' sheet of laminate ("Denim," Formica, vertical grade) came from *Cabinetmaker Warehouse*. After filling the brad nail holes, the MDF base of the table was sealed with two coats of lacquer (sanded between coats). Then sprayed with *Rust-Oleums' Forged Hammered "Antique Pewter."* (Three cans were used.) The walnut parts were lovingly coated with *General Finishes'* "Seal-a-Cell."

HALL CABINET (p.42)

- **Table Legs.com**
2 3/4" White Oak SQ2750X29-WO
2 3/4" Walnut . . . SQ2750X29-WA
- **Rockler**
110° Hinges 32894
3/16" Cane 84608
1/2" Rare-Earth Magnets . 30810
1/2" Magnet Cups 31668
1/2" Magnet Washers . . . 31668
- **Lee Valley**
Feng Handle 02W1343
When ordering the "Open Weave Cane" at *Rockler.com* (MCONFIG814) you have to put a value in the order field for pricing. The cabinet was rubbed with *General Finishes'* "Seal-a-Cell." When dry, it was topped with two coats of lacquer.

ROUTER BIT CABINET (p.50)

- **McMaster-Carr**
Handles 1661A4
- **Rockler**
175° Hinges 66613
How (or even whether) you finish a shop project is pretty

subjective. To give the plywood its best look for photos, we sprayed it with two coats of satin lacquer. A similar effect can be achieved with wiping varnish. I believe a good argument for a "no-finish" finish can be made as well.

GATHERING TABLE (p.56)

The legs of the gathering table were painted with with *Benjamin Moore's* "Nocturnal Gray." The top was finished with tung oil and two coats of spray lacquer.

JOINERY BITS (p.62)

There are many sources for the joinery bits shown in the article. *Woodline USA* is a great source for high-quality bits. The undersized plywood bits are made by Freud.

- **Freud**
15/32" Bit 16-109
23/32" Bit 16-116

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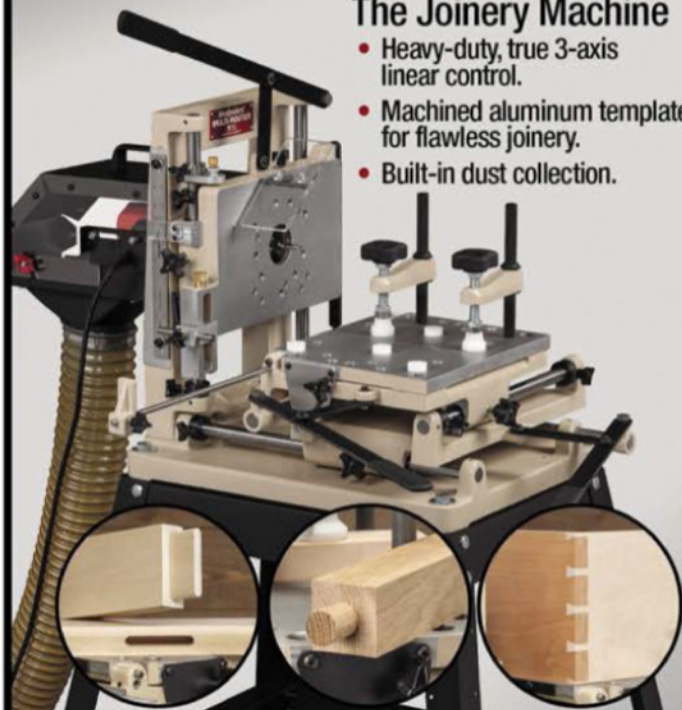


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