SECRET WEAPON for Super-Smooth Surfaces

Must-Have Clamps for **GREAT GLUE-UPS**

QUICK & EASY Joinery

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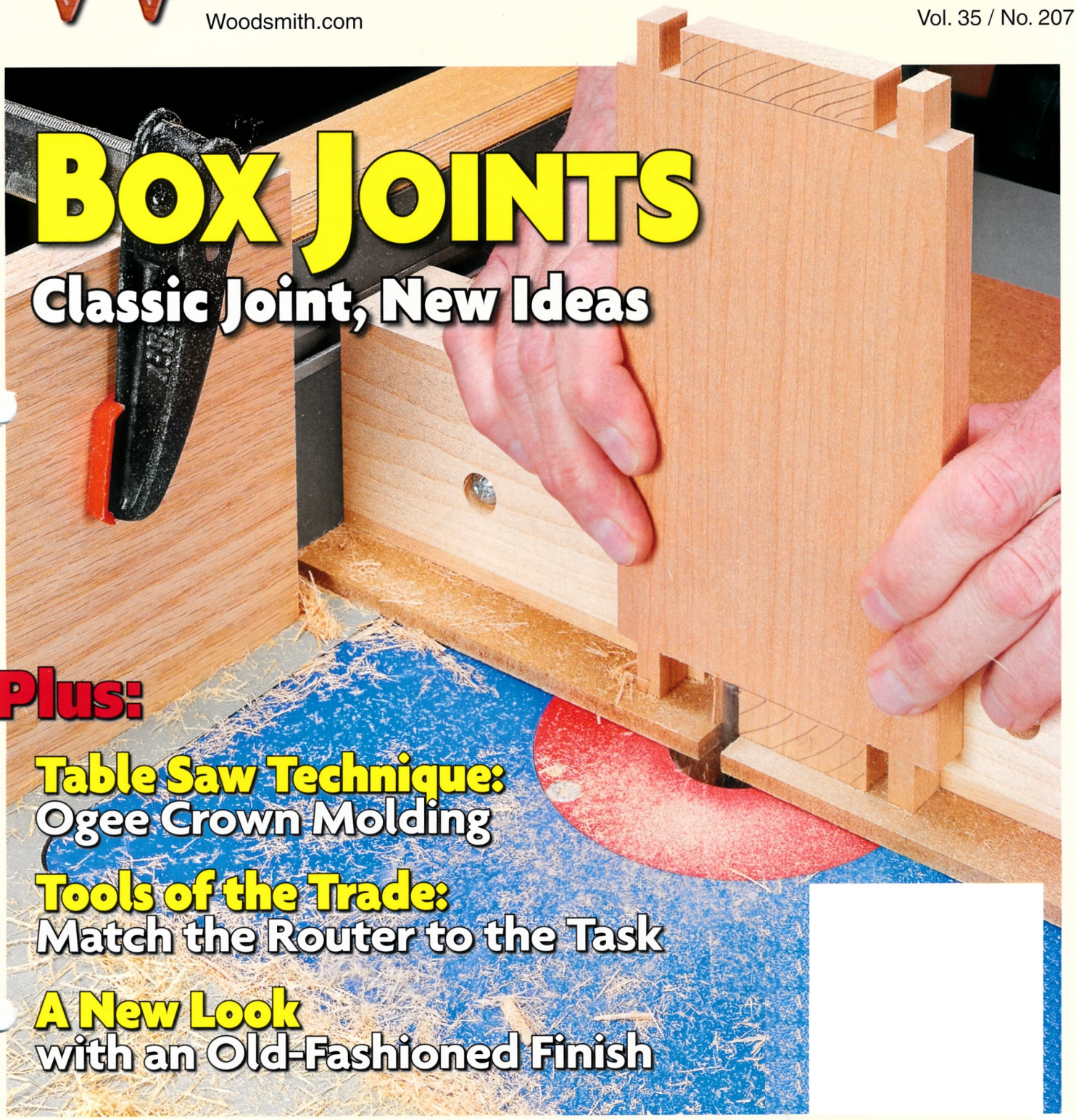


Box Joints

Classic Joint, New Ideas

Plus:

Table Saw Technique:
Ogee Crown Molding

Tools of the Trade:
Match the Router to the Task

A New Look
with an Old-Fashioned Finish

A Publication of August Home Publishing

Table of Contents

from our readers
Tips & Techniques 4

all about
Must-Have Bar Clamps 8
These clamps are the number one way to get great results on a wide range of glueups.

tools of the trade
Right-Size Your Router 10
Bigger isn't always better. Match the router to the task for top-notch success.

jigs & fixtures
Doweling Jigs 12
Quick and easy joinery is at hand with any of these doweling jigs.

tips from our shop
Shop Notebook 30

woodworking technique
Routing Classic Box Joints 40
Learn the best way to create box joints at the router table. Plus, we show you a new idea.

working with tools
Scrapers, the Secret Weapon 44
The key to a super-smooth surface is just an ordinary card scraper and the right technique.

finishing room
Limed Oak Finish 46
Give your next oak project a unique look with this old-fashioned finish.

details of craftsmanship
Ogee Crown Molding 48
Make your own custom crown molding by following a simple table saw technique.

hardware & supplies
Sources 51

Wine Rack page 14

Kitchen Cabinets page 18

projects

weekend project

Compact Wine Rack 14

Although this wine rack looks like some sort of puzzle, there's nothing complicated about the joinery. Simple half laps make it an easy build.

designer series project

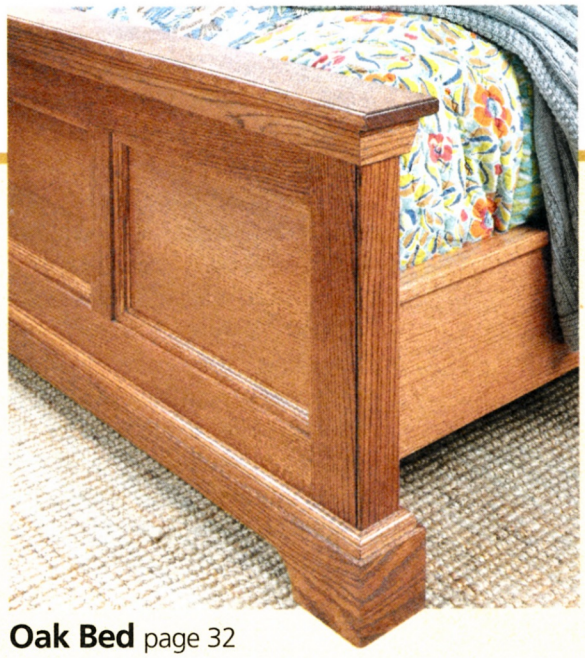
Kitchen Cabinets. 18

Building a set of kitchen cabinets is on most woodworkers' "bucket list." Our kitchen cabinet design keeps the construction simple and gives you plenty of options for customization.

heirloom project

Classic Oak Bed. 32

This elegant oak bed is the second piece in our bedroom suite. It features a number of classic details, but with updated construction techniques, building it is a breeze.



Oak Bed page 32

editor's note
Sawdust

At some point, just about everyone contemplates updating their kitchen with new appliances and cabinets. As a woodworker, I'm sure you've given a long, hard thought about building the cabinets yourself — whether it's to save money or simply customize the design to suit your needs and space. That's what makes kitchen cabinets one of the most requested woodworking plans.

A DIFFERENT APPROACH. Now, taking on the design and construction of your own kitchen cabinets is certainly a daunting task. And honestly, all the variables involved could fill volumes. So we're tackling the process by showing you a custom kitchen (page 18) for inspiration and then taking a look at how we would go about building similar upper and lower cabinets.

With the basic cabinet design and construction taken care of, we cover how to customize the cabinets by changing the drawer configuration and the door style, along with some lighting and trim options. Let us know what you think about this approach. In future issues, we'd like to feature additional articles covering more aspects of kitchen design and customization, such as corner units, sink bases, islands, and more.

BEDROOM SUITE UPDATE. In our last issue, we featured the first piece of our latest bedroom suite, a classic oak dresser. As promised, the next piece in the collection shows up on page 32 — a queen-size bed. If you haven't started on the dresser yet, you may want to get busy. The final two pieces in the suite, a nightstand and mirror, will be coming in the next issue.

WINE RACK. Building your own kitchen cabinets or a complete suite of bedroom furniture is quite a challenge. If you're looking for a project you can knock out in a weekend, take a look at the compact wine rack on page 14. Most of the parts are identical, and all of the joinery is cut at the table saw with some quick and easy setups. It goes together pretty fast, so you may find yourself making a couple extra for gifts — wine optional, of course.

Tips & Techniques

Fold-Down Work Table

I've always wanted an extra workspace in my shop for sketching up ideas and other small tasks. The only problem is, my shop isn't big enough for one.

My solution is this fold-down table. It's sturdy enough for light woodworking, and it folds out of the way when not in use (inset photo).

TABLE DETAILS. The top of the fold-down table is a piece of plywood with hardboard glued to it. It's wrapped with edging made from two layers of plywood and hinged to a wall cleat.

As for the legs, they're plywood pieces with mitered and rounded ends. A slot in the leg lets the table fold up. The bottom end of the leg fits in an angled pocket in the mounting block.

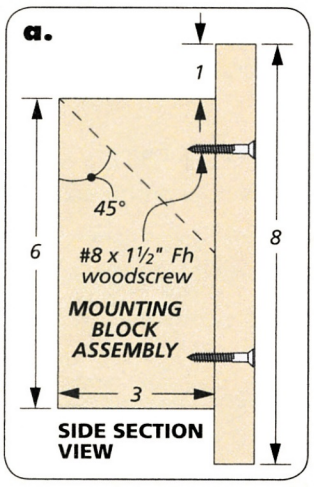
BUILDING THE TABLE. To make the top, I cut the plywood to size and glued on an oversized hardboard piece. Then I trimmed it flush to match. After making the plywood edging pieces, I cut centered grooves in them, mitered the corners, and glued them around the top. Each end of the table has a threaded insert added that accepts a studded knob.

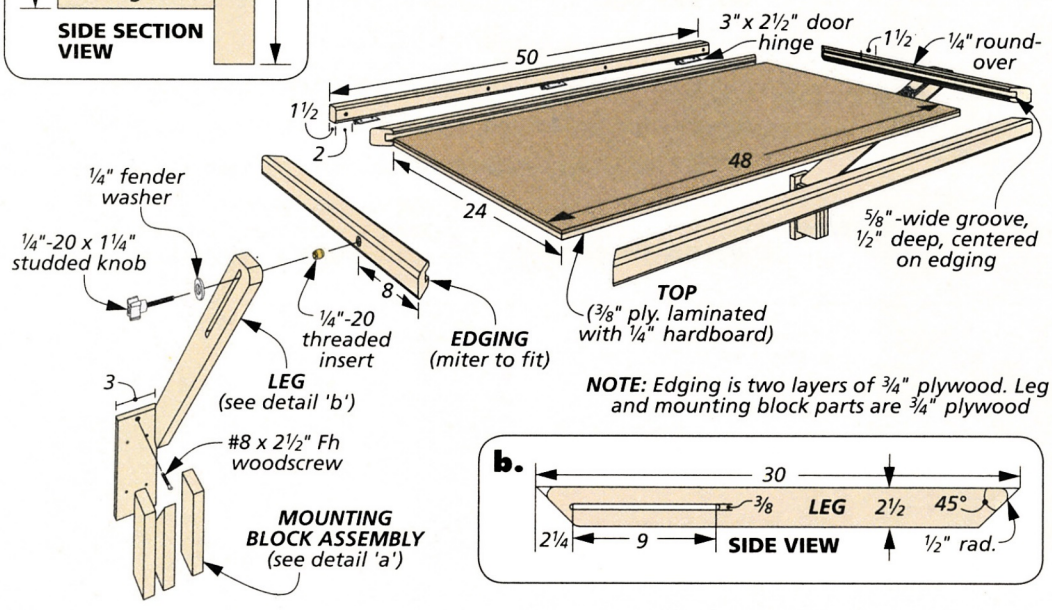
You can cut the slot in the legs with a jig saw or router. Now miter the ends and round them. Finally, you can make the mounting blocks. Detail 'a' provides you with the specifics.

TABLE INSTALLATION. The hinges are attached to the underside of the cleat and the back edging. Once that's done, you can move the table to the shop wall, level the cleat, and secure it to wall studs.

The legs are attached with studded knobs through the slots. Then you can have a helper assist you in leveling the tabletop, and use the legs to determine the locations of the mounting blocks on the wall. Attach them with screws, and your table is ready for action.

Bill Wells
Olympia, Washington





NOTE: Edging is two layers of ¾" plywood. Leg and mounting block parts are ¾" plywood

Scroll Saw Base

It's tough to beat a scroll saw for fine detail cuts. Unfortunately, it's also tough to work on a scroll saw that vibrates around on top of a workbench.

I didn't have room in my shop for a dedicated scroll saw stand, so I came up with the next best thing: A sand-filled box that deadens the vibrations of the saw.

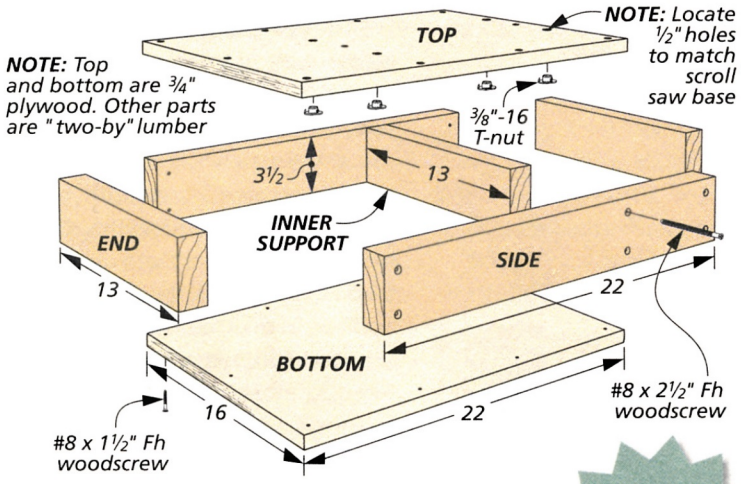
BASE DETAILS. Really, there's not much to this shop-made scroll saw base. It's a simple box that's assembled with butt joints. The secret is that, before closing it up, I added weight by filling the box with sand. That way, you can be sure the scroll saw will stay stable and vibration-free as you're making cuts.

To make the box, simply cut the top and bottom to size from plywood. The ends, sides, and an inner support are all made from "two-by" material. After cutting the parts, screw the entire box together, except for the top, which can be left off for now.

Before you add the top, lay out mounting holes on it to match your scroll saw base. Then drill counterbored pilot holes and install T-nuts in the underside of the plywood top at these locations.

Now fill the box with sand and screw on the top. Finally, it's time to set the scroll saw in place and install bolts to securely fasten the scroll saw to the base.

Chris Fitch
Knoxville, Iowa



SUBMIT YOUR TIPS ONLINE

If you have an original shop tip, we would like to hear from you and consider publishing your tip in one or more of our publications. Go to:

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Click on the link,
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You'll be able to tell us all about your tip and upload your photos and drawings. You can also mail your tips to *"Woodsmith Tips"* at the editorial address shown at right. We will pay up to $200 if we publish your tip.

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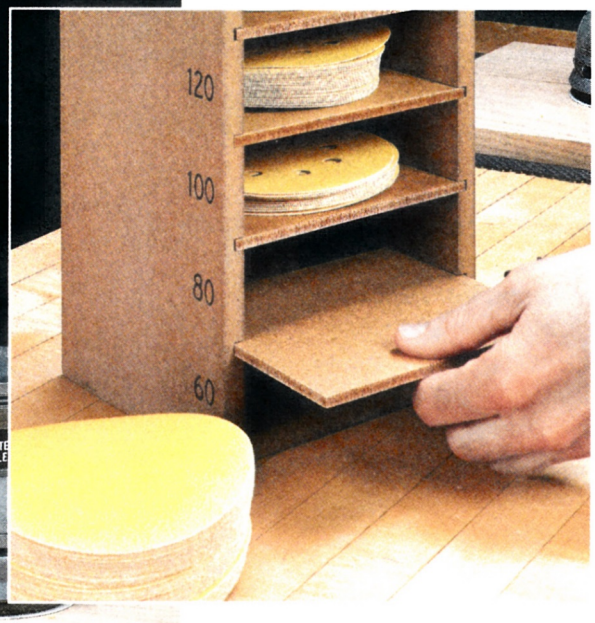


Sanding Disk Storage

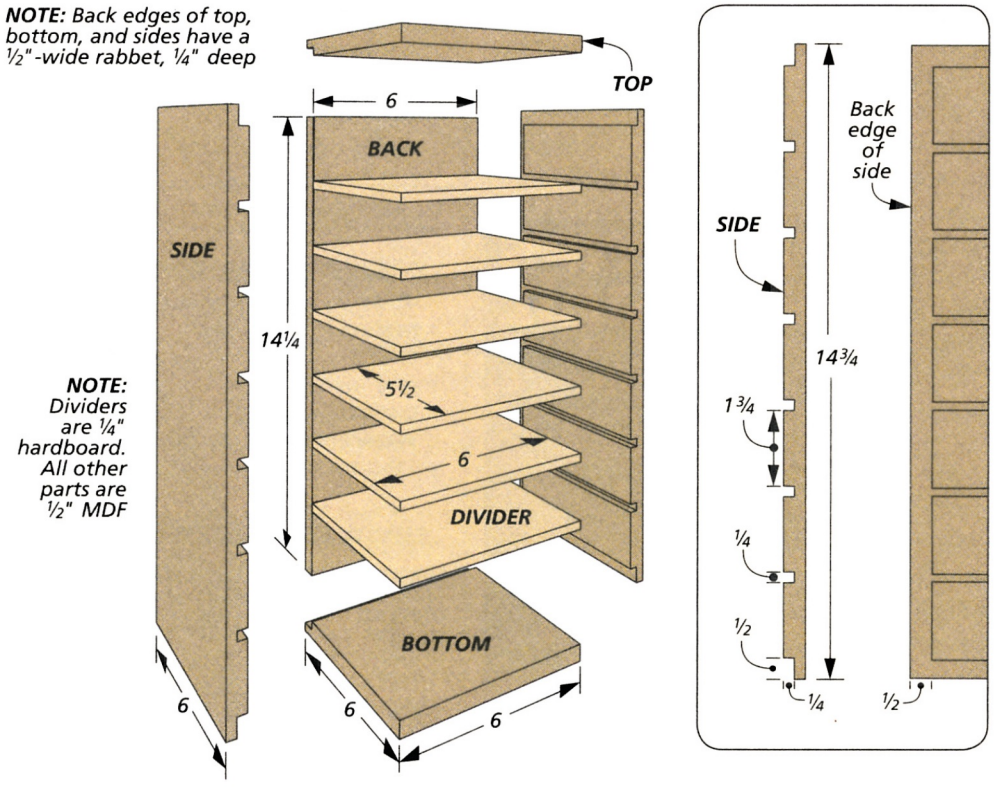
I have lots of sanding disks for my random-orbit sander, in a variety of different grits. But until recently, the disks would get mixed up, and finding the right one required some searching.

SANDPAPER ORGANIZER. I needed a better way to keep all my sanding disks organized and within easy reach, so I came up with the simple sanding disk storage tower you see here. Built from scrap MDF and hardboard, it has seven compartments to organize 5"-dia. sanding disks. Or, as you can see in the inset photo above, you can remove a divider if you need to increase the capacity of a compartment.

BUILDING THE BOX. Construction of this storage box is very straightforward. Just cut the sides, top, bottom, and back to size from MDF. Now cut rabbets and dadoes in the sides using the table saw equipped with a dado blade. There's also a rabbet on the back edge of the top, bottom, and sides to accept the back panel. Then glue all the parts together.

Finally, cut the dividers from hardboard to fit in the dadoes in the sides, and slide them in place to complete the organizer.

Bill Huber
Haslett, Texas



Easy Finish Mixing

Like any frugal woodworker, I like to reuse glass jars in the shop for mixing or thinning finishes. But most glass jars don't have a means of measuring the liquid inside. I solved that problem by turning my mixing stick into a measuring stick.

Just determine the ratio of each liquid you'll need, and recreate the ratio with layout lines at the bottom of your mixing stick (inset photo). Put the stick in a straight-sided container, and pour in your finish ingredients until they reach the proper line on the stick (main photo). Then stir them together.

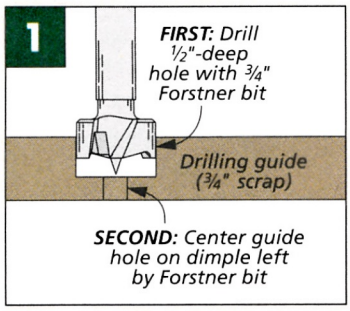
Glenn Bradley
Morena Valley, CA

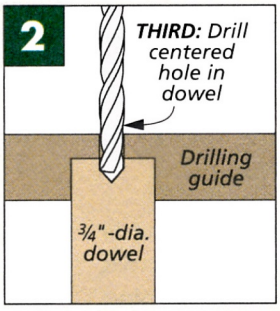
Perfect Dowel Centers

Drilling a centered hole in the end of a dowel is tricky. But I found a way to get great results every time. First, I simply drill a shallow hole in a scrap board using a Forstner bit that matches the diameter of the dowel. Then, I drill a second, smaller through hole that's centered on the "dimple" created by the Forstner bit (Figure 1).

Now, this scrap piece becomes the drilling guide for the dowel. Position the dowel in the Forstner bit hole, then drill into the through hole from the other side to create the centered hole in the end of the dowel (Figure 2).

Jim Goodman
Roy, Utah

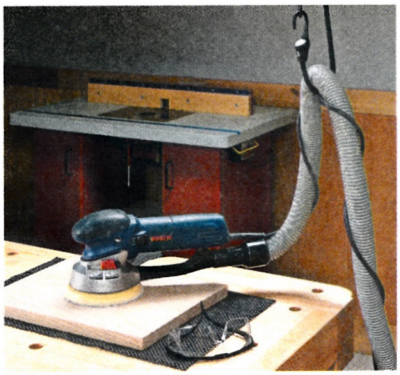




Quick Tips

VACUUM HOSE HOLDER

To keep the vacuum hose and cord out of the way when sanding, *David Ruhnke* of Austin, Minnesota, suspends them from a pair of bungee cords hung from a hook on the ceiling of his shop.



NON-SLIP SQUARE

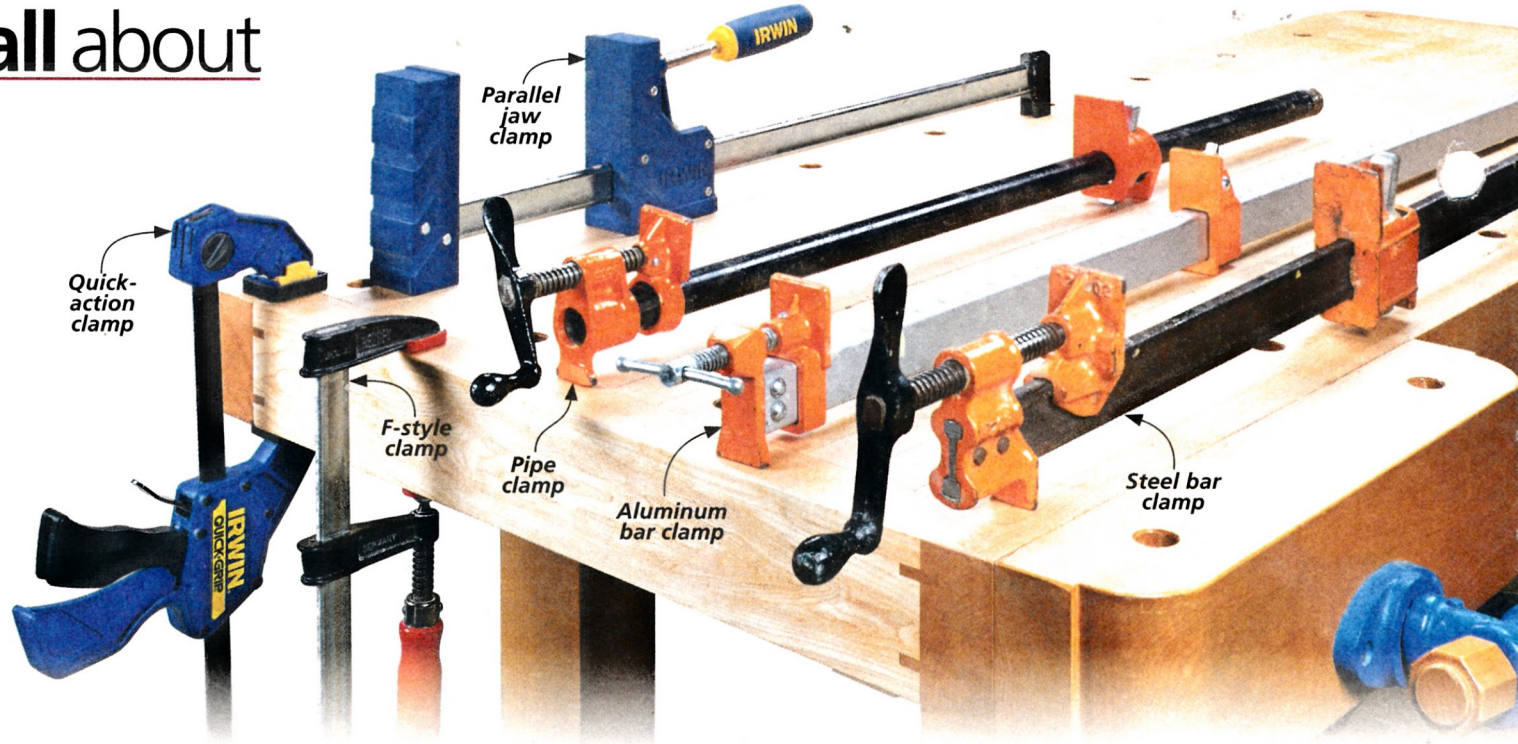
Framing squares have a tendency to slip when scribing layout lines. *John Cusimano* of Lansdale, Pennsylvania, solved the problem by placing self-adhesive vinyl bumpers on the underside of his framing square.

WIN THIS PORTER CABLE COMBO ROUTER

Simply send us your favorite shop tips. If your tip or technique is selected as the featured reader's tip, you'll win a *Porter Cable* combo router kit just like the one shown here. To submit your tip or technique, just go online to W*oodsmith.com* and click on the link, "SUBMIT A TIP." You can submit your tip and upload your photos for consideration.

The Winner!

Congratulations to Bill Wells, the winner of this Porter Cable combo router kit. To find out how you can win this router kit, check out the information on the left.



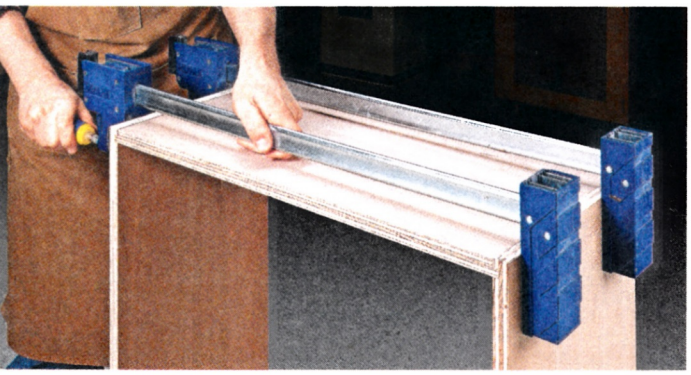
a guide to Bar Clamps

Woodworkers today have a wealth of clamping options to choose from. It seems like there's a specialty clamp to cover just about every assembly challenge. However, I find that in my shop it's the bar clamps that do most of the yeoman's work. So when it comes to stocking the shop with clamps, this is generally where I choose to put my money.

The catch is that the term "bar clamp" encompasses a number of related clamps. They all work similarly — one jaw is fixed at the end of the bar while the second jaw slides along it to provide adjustability. But you'll find that each style has its own unique features, pluses and minuses, and best uses. Here's a brief rundown of the choices.

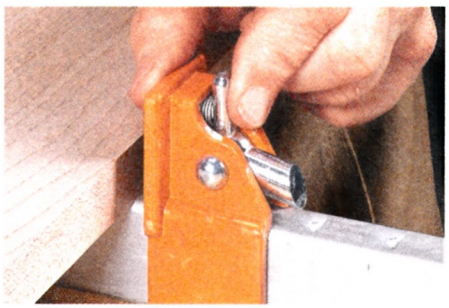
PARALLEL JAW CLAMPS

Parallel jaw clamps are a relative newcomer to the bar clamp lineup. The big selling point is that unlike other types of bar clamp, the large jaws are designed to stay parallel to one another when the clamp is tightened. Consequently, pressure is applied more evenly across an assembly, and keeping things square is made much easier. This makes them a good choice for case and panel assemblies, as in the photo at left.



▼ Squaring up case assemblies is almost automatic when using parallel jaw clamps.

Although fairly rigid, parallel jaw clamps are designed to provide only low to moderate clamping pressure. Overtightening may defeat the "self-squaring" feature. You'll find that clamps over 24" capacity can be heavy and sometimes awkward to use. These clamps don't come cheap, but picking up a few in the shorter lengths is a good investment.



▲ The sliding jaw on an aluminum bar clamp locks into detents spaced every 1" along the bar.

ALUMINUM BAR CLAMPS

Aluminum bars clamps manage to perform a nifty balancing act — maximizing rigidity and clamping pressure while minimizing weight. The light weight of these clamps will surprise you.

▲ The rigid steel bar, heavy jaws, and large screw of this style result in unequaled clamping strength. However, these same features can make the clamps hard to handle.

▲ F-style clamps offer the advantage of pin-point pressure and a wide reach — perfect for aligning the joints of a panel assembly.

A 48" clamp tips the scales at just a couple of pounds.

The clamping pressure offered is in the middle range, but still sufficient for most tasks. (The clamps tend to bow under heavy pressure.) The big advantage to this style is greater ease of use when clamping up large or awkward assemblies. You won't need a second set of hands.

The only knock on this style is shown in the right photo on the opposite page. Adjustment is not as seamless as with the other types. But this doesn't stop me from keeping a good supply of these clamps in the rack.

PIPE CLAMPS

If there was a Nobel prize for woodworking, the inventor of the pipe clamp would surely be a candidate. This is the all-purpose clamp that many woodworkers, myself included, rely on day in and day out. The reason for their popularity is versatility at a pretty reasonable cost.

Pipe clamps will handle just about any clamping task. Their clamping pressure is in the upper range, however, like an aluminum clamp the pipe will begin to bow when under heavy tension.

I like them for their flexibility. Since you supply the pipe, the clamp length is your choice. And as shown in the left photo below, even this can be changed.

STEEL BAR CLAMPS

Steel bar clamps are the big boys in the family. They're all about maximum clamping pressure and rigidity. Whenever I have a large panel to glue up or a stubborn case assembly to pull together, these clamps get the call. Take a look at the left photo above and you'll see why.

You'll quickly find that the one drawback to this style is their hefty weight. A 4'-long clamp may weigh 10 lbs. or more. But it's nice to have a few on hand just for emergencies.

F-STYLE CLAMPS

Due to their general ease of use, F-style clamps are often the first to come off the rack when a light-duty clamping chore is at hand. The pressure exerted is only moderate but has the advantage of being tightly focused by the small surface of the jaws. This, along with their deep reach allows them to take on tasks that other bar clamps can't handle (right photo above). I can't think of a shortcoming to this style and I keep a full rack ready and waiting.

QUICK-ACTION CLAMPS

This style of bar clamp is also a fairly new arrival that's quickly found its niche in the shop. The unique feature here is a pistol grip ratcheting mechanism that allows you to position and tighten the clamp with just one hand. Providing a moderately strong grip, these clamps are perfect for clamping small parts to an assembly either temporarily or permanently. Once you get used to the operation, you'll find yourself reaching for these clamps often. W

▲ Pipe clamps offer greater flexibilty than other types of bar clamps. When a longer clamp is needed, the pipes from two shorter clamps can be joined together with a coupler.

▼ A quick-action clamp frees up a hand for easier and more accurate positioning of parts.

using the Right-Sized Router

With the advent of new models and styles, the router game has changed in recent years. Here's how I make the most of them in my shop.

▲ Each type of router (production, mid-size, and compact) has a special place and a specific task list when it comes to woodworking in my shop.

Like many woodworkers, I own several different routers. What started as one dependable, mid-size router with a fixed based has evolved into a collection of routers with various power levels, sizes, and accessories.

Recently, the development of the smaller, compact router (main photo above) has given woodworkers even more options. And the popular "combo kits" that contain both fixed and plunge bases have many people considering these routers, as well.

Of course, having multiple routers is *never* a bad thing. But it can leave you wondering which router to turn to for the routing task at hand. With the three types of routers I have in my shop, I've come up with a pretty good system for deciding which router to use for which job. I think these tips will help you in your workshop, too.

HAND-HELD POWERHOUSE: THE COMPACT ROUTER

If you aren't using a compact router in your shop yet, this tool is definitely worth a closer look. These little routers are the natural evolution of the trim routers commonly used by contractors. But compact routers can do almost everything you'd expect from a larger router — they're just smaller. Many feature variable-speed adjustment, accept guide bushings for template work, and are even available with both plunge and fixed bases.

In my shop, this tool has become my go-to hand-held router. Most of my hand-held router work involves smaller profiles (like

roundovers and chamfers) or narrow dadoes, and this tool handles these tasks with ease. And by spending a little extra on a plunge base, it works great for smaller template routing jobs, as well.

As you can see in the main photo on the opposite page, the ergonomic size and light weight of these routers make them great for this work, avoiding the fatigue of lugging a heavier router around. Of course, there are a few limitations. For example, compact routers only accept bits with ¼" shanks, and they lack the power to drive bigger router bits that remove a lot of material at once.

THE TABLE STAPLE: THE MID-SIZE ROUTER

Thanks to the smaller router types, many in the industry have begun referring to the standard, 1¾- to 2¼-hp models as "mid-size" routers. Though a compact router has become my go-to hand-held tool, it doesn't mean my mid-size router is obsolete. Rather, it spends a lot of its time these days mounted securely in the router table.

For joinery work like cope and stick joinery (far right photo, above), you need the extra horsepower and variable speed required to spin large bits. The same goes for making edge profiles with large chamfer or roundover bits, which are both standard router table tasks.

▲ Mid-size routers are perfect for carving out bowls (left) and cutting cope and stick joinery (right).

There are a few instances where my mid-size router will make an appearance above the table, too. Sometimes I use it to rout ¾" dadoes for case joinery or remove a lot of waste with a large bowl and tray bit (photo above). The power of a mid-size router is essential for these operations.

RAISED PANEL MASTER: THE PRODUCTION ROUTER

If you don't own a production router, then you've probably at least admired the big 3¼-hp routers at the tool store. And while they're impressive, you really only need this router for the largest routing tasks: Spinning the biggest bits or removing large amounts of material with each cut.

Making raised panels is one example of when you need a production router. Raised panel router bits are usually 2½" to 3½" in diameter, and need to be run at a low speed of around 12,000 RPM. A bit this big requires the power that can only be provided by a large production router. Of course, you also need a big opening in your router table plate and fence in order to use it.

In my shop, I solved this problem by investing a small amount of money in a separate router plate for my production router. Then I just leave the router attached to the plate. That way, when it's time to rout raised panels, I simply swap out plates and adjust the fence in order to get started (photos below).

When it comes to which router you need for your shop, the answer just might be all three. But as you can see, different routers excel at different tasks. The chart below provides some additional information for comparing the three types of routers. W

▲ To save time when making raised panels, I attached my big production router to its own dedicated router table insert plate.

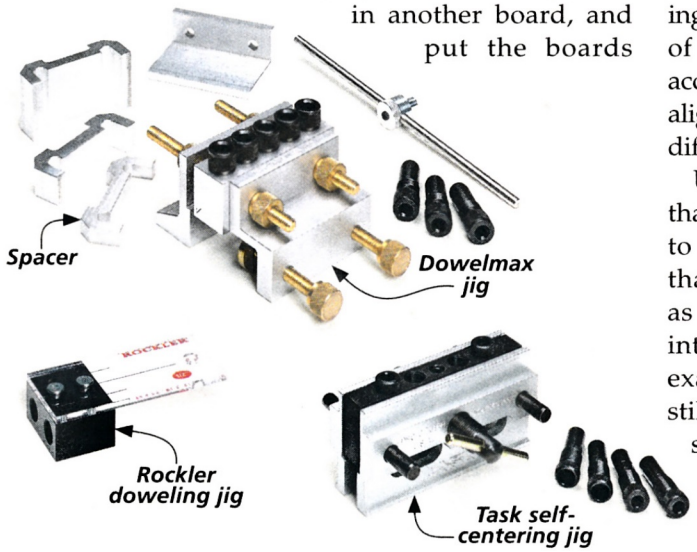
Router Comparison

	HP	Weight	Speed	Collets	Price
Compact	1-1¼ hp	3-4 lb	16K-35K rpm	¼"	$100-$200
Mid-Size	1¾-2¼ hp	7-9 lb	10K-27K rpm	¼" & ½"	$150-$300
Production	3 hp and over	15-18 lb	10K-21K rpm	¼" & ½"	$350-$500

choosing the best Doweling Jig

It doesn't get much simpler than dowel joinery, but picking the right jig for you is the key to success. Here's a detailed look at the options.

▼ Doweling jigs run the gamut from simple to very elaborate.



Let's face it — you don't have to be a master woodworker to understand a dowel joint. Drill holes in one board with a doweling jig, drill matching holes in another board, and put the boards together with wood dowels and glue between them.

But this seemingly basic concept is often harder to pull off in practice. Put simply, many doweling jigs just aren't up to the task of positioning multiple holes accurately. The result can be misaligned holes and projects that are difficult to assemble.

Ultimately, the doweling jig that's right for you comes down to the types of dowel joinery that you want to do, as well as your budget. If you're only interested in basic joinery, for example, a less expensive but still well-made jig will probably serve your needs fine. If you want a jig that can do everything from reinforcing miter joints to drilling mortises to making cabinet assemblies, however, it might be worth investing a little bit more money in your doweling jig setup.

THREE JIGS. With that sentiment in mind, let's take a closer look at three great options. Depending on the work you plan to do, one of these three choices should work well for you. (For more on where to purchase any of these jigs, see Sources on page 51.)

ROCKLER JIG. As far as simplicity goes, it doesn't get much more basic than the *Rockler* doweling jig ($15). What you see in the photo at left is essentially all there is to it: A hardened steel drilling guide attached to a plastic fence. The fence has three layout lines: One that's centered on the jig, and one centered on each of the two holes.

The *Rockler* jig comes in three sizes for different sizes of dowels and stock thickness — ¼" holes centered in ½" stock, ⅜" holes in ¾" stock, or ½" holes in 1" stock. The jigs are not adjustable for centering holes in other thicknesses.

If you commonly work with woods of these thicknesses, though, the jigs can handle most dowel joinery with ease. You just lay out the hole locations (or the centerline) between two mating boards, align the jig, and drill the holes as shown at right.

TASK SELF-CENTERING JIG. For basic dowel joinery in any stock up to 2" thick, the self-centering jig from *Task* is worth a closer look. As the name implies, this drilling guide adjusts to center itself on the workpiece.

The jig comes with three pairs of bushings for drilling different hole sizes (¼", 5⁄16", and ⅜"). And it features four holes for locating the bushings, so you can add more holes to a wide joint or vary the spacing of the holes. The miter joint shown in the main photo on the opposite page is a good example of when this comes in handy.

The self-centering nature of the jig also makes it great for some other doweling tasks, such as drilling holes in round stock or roughing out holes for a mortise. You can drill off-center holes by simply adding a spacer.

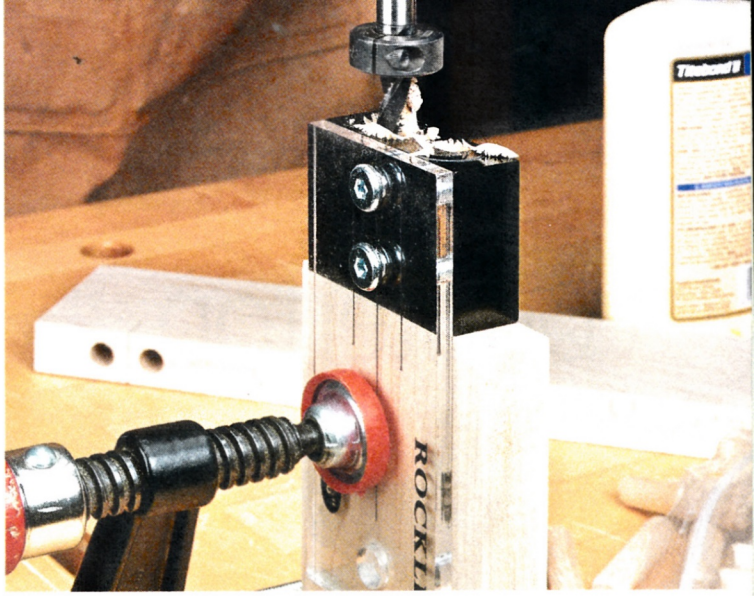
The jig can only be clamped to the end or edge of a workpiece, so you can't use it for assembling cases or drilling a hole in the face of a panel. Still, for around $60, it's a pretty good bargain for a well-machined, accurate doweling jig.

DOWELMAX JIG. The most versatile of all the doweling jigs is unquestionably the *Dowelmax*. If dowel joinery is your preferred method of joining wood, and you want to be able to use dowels in almost any joinery situation, then this is the jig for you.

Like the other jigs, the *Dowelmax* handles any edge or end drilling with ease in its typical configuration. But with a simple adjustment to the jig, you can also drill holes on the face of a workpiece for tasks like case joinery.

The *Dowelmax* comes with a handy accessory called a distance gauge. This simple, adjustable arm makes dowel joinery a great method for joining boards edge to edge to create glued-up panels. To use the distance gauge, simply drill the first hole in the edge of a board, then insert the gauge in this hole to establish the location of the second hole. It's a foolproof method that works great on mating boards, as shown in the photo below.

Of course, all this versatility comes at a price. The full *Dowelmax* system costs around $300. But if you want a precision tool that can handle virtually any dowel joinery task you throw its direction, then this jig is worthy of your consideration. W

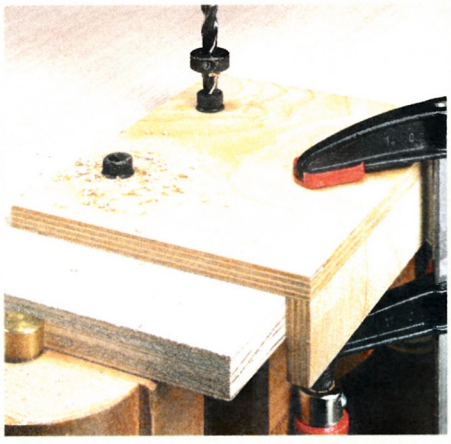


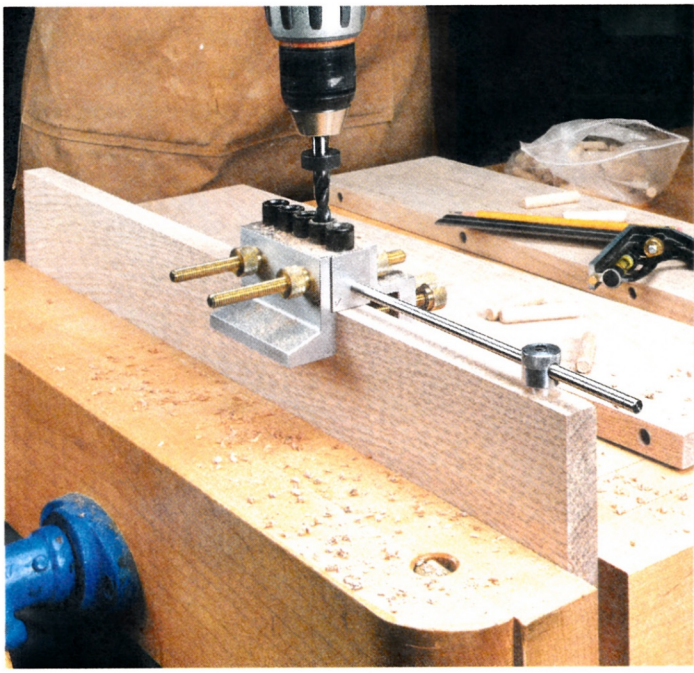
▲ The *Rockler* doweling jigs can handle basic dowel joinery in ½"-, ¾"-, or 1"-thick stock.

Build Your Own Jig

Another option for dowel joinery is to simply build your own jig with inserts and bushings from *Lee Valley* (below). These inserts press-fit into ⅝" holes drilled in wood, and they accept screw-in bushings for drilling holes that range in diameter from ⅛" to ⅜". You can make the jig any shape or size you need.

▼ Separate inserts and bushings make it easy to customize your own doweling jig.





▲ The *Dowelmax* distance gauge lets you create evenly spaced holes along the edges of boards for assembling a panel.

Weekend Project

countertop Wine Rack

This practical project is sure to be a fun test of your joinery skills and attention to detail. Using it will be even more enjoyable.

When building the unique wine rack shown above, I couldn't help but think of one those interlocking wooden puzzles that requires you to fit the pieces together in a specific order. The challenge here is somewhat similar but you'll have a big advantage. I'll provide the solution to this puzzle. And when you're finished, you get to pop the cork and pour yourself a tasty glass of wine.

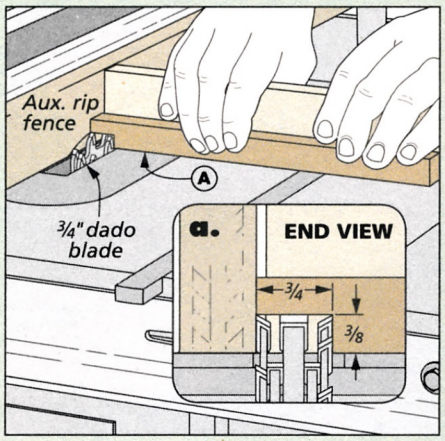
The rack is actually pretty easy to build. You'll start by assembling four identical side frames with half-lap joinery. These frames are then mitered and assembled into a square rack. Add a pair of crosspieces and some thin trim to the top and the job is complete.

GETTING STARTED. Each side frame consists of two legs, a center divider, and three horizontal rails, as shown in the main drawing on the opposite page. Cutting these pieces, as well as the top crosspieces, to size is your starting point.

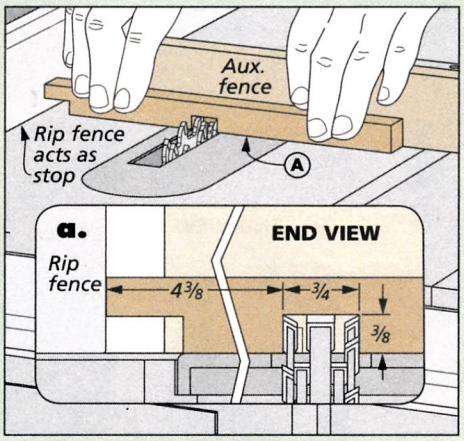
All the parts should end up exactly ¾" square. So to ensure accuracy, I cut $^{13}/_{16}$" square strips from a board and then planed them down to finished size.

The next step is to cut all the pieces to length. In the final assembly, the parts will be four

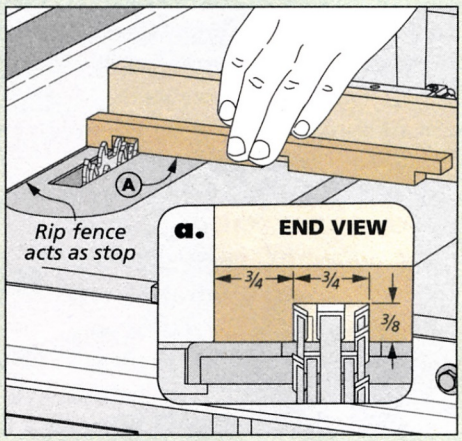
How-To: Side Joinery



Rabbets First. *You can use the same setup to cut the rabbets on both the vertical and horizontal pieces.*



Middle Notches. *Next, I reset the rip fence before cutting the middle notches on the legs and center dividers.*



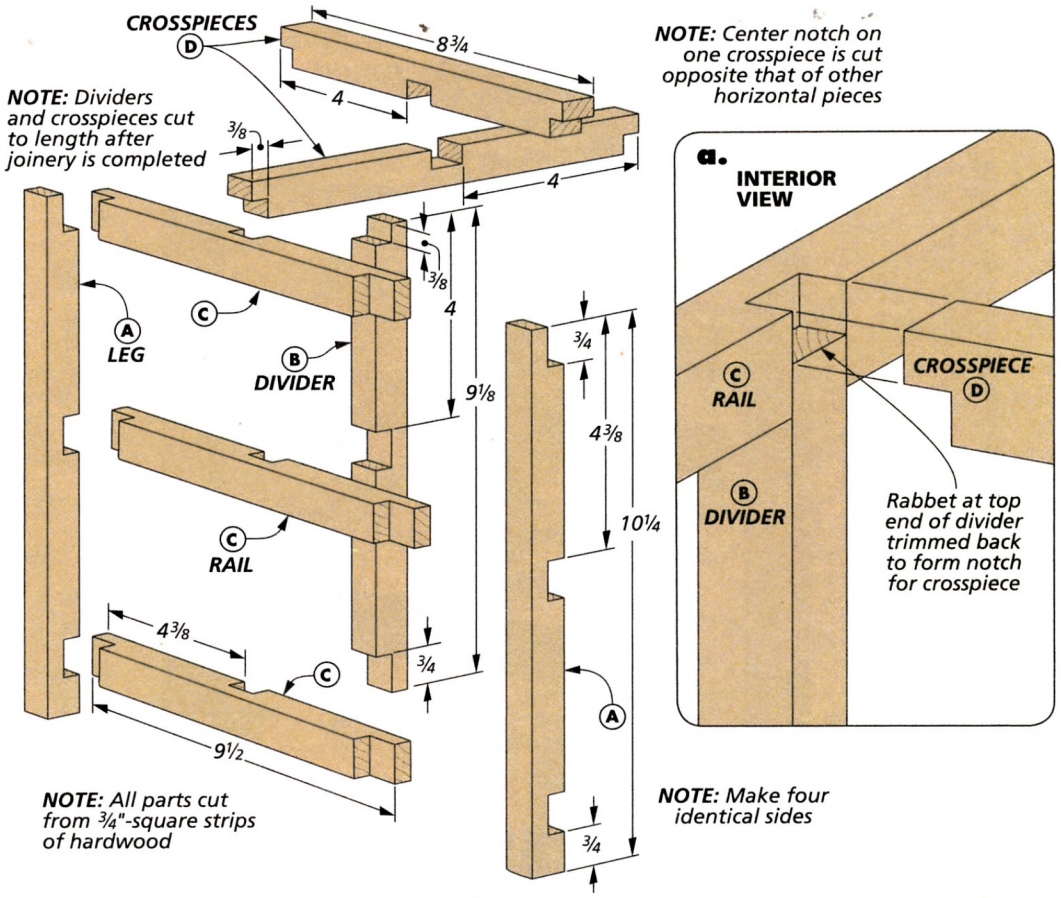
Lower Notches. *To cut the lower notches in the vertical pieces, you'll register the the bottoms against the rip fence.*

different lengths. But to simplify cutting the joinery, I initially started with parts of just two different lengths — one for all the vertical pieces (including the top crosspieces) and one for all the horizontal pieces. The dividers and crosspieces will be trimmed to final length after the joinery is completed. A stop block clamped to an auxiliary miter gauge fence ensures consistent lengths.

HALF-LAP JOINERY. With all the parts cut to working size, you can set up the table saw for the joinery. I started by installing a dado blade sized to match my ¾"-square parts. Next, I carefully adjusted the height of the blade with test cuts in some cutoff pieces. Your goal is a flush half lap.

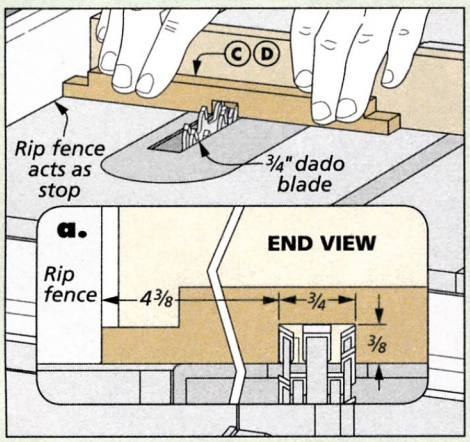
The How-To illustrations starting on the preceding page will lead you through the joinery steps. You'll make both end notch cuts (rabbets) and full notch cuts on all the pieces. The cuts on all the vertical pieces are identical. And with one exception, the cuts on all horizontal pieces are identical. To make the half-lap joint, the centered notch on one of the top crosspieces has to be opposite from all the other pieces.

Before getting started, I suggest you arrange the parts, label them, and mark the position of each cut so you won't get confused. And note that even though the center dividers are flipped when the sides are assembled, the joinery cuts are identical.

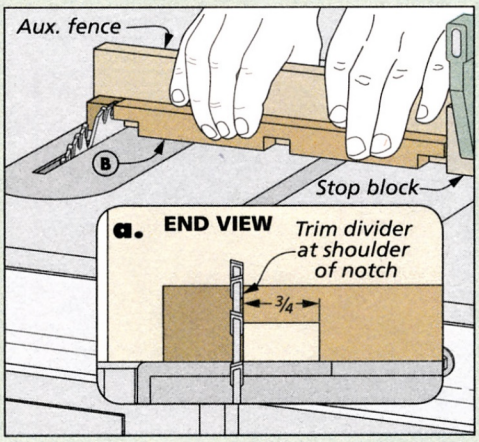


TRIM DIVIDERS & CROSSPIECES. Once all the rabbets and notches are completed, the center dividers and crosspieces can be trimmed to final length. The bottom ends of the dividers are cut off even with the lower shoulder of the notch, as shown below. At the upper ends, you'll trim off half the width of the rabbets (⅜"). This will create "half-notches" in the assembled sides to hold the ends of the top crosspieces, as shown in detail 'a' above.

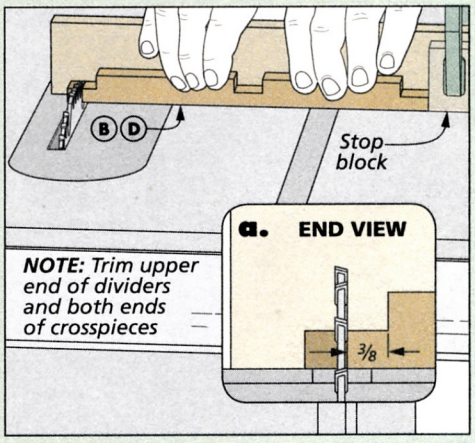
Finally, both ends of the crosspieces are trimmed to fit these half-notches. Again, you want to cut back the rabbets to half their initial width (⅜").



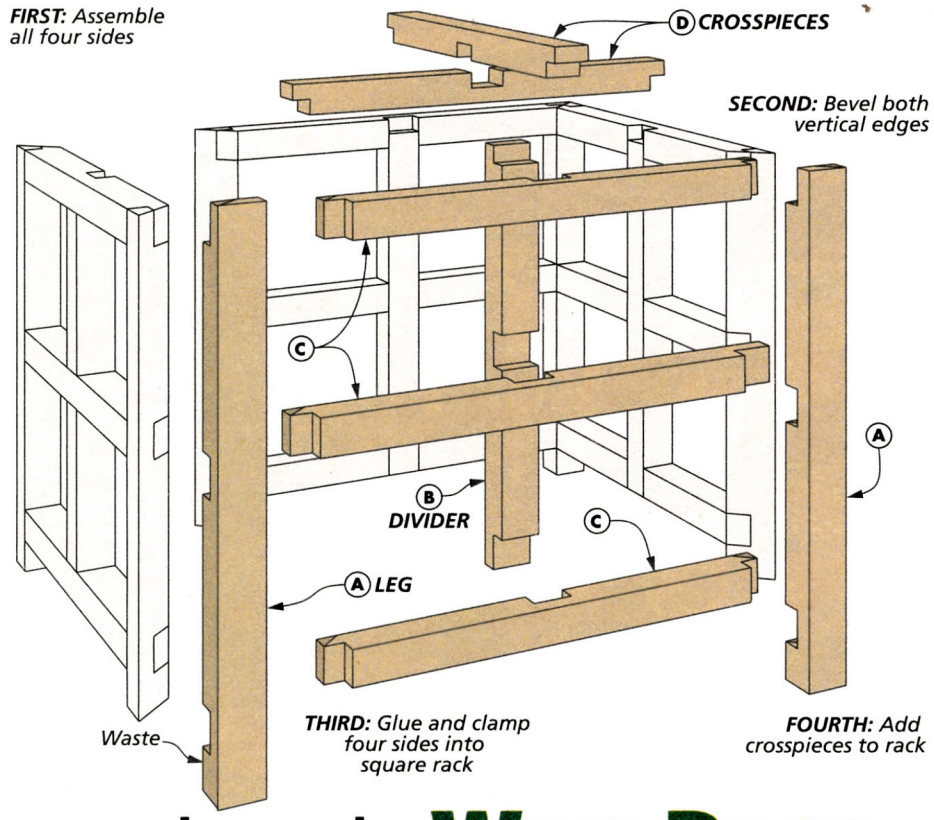
Centered Notches. *Finally, I adjusted the rip fence carefully to center the notches in the rails and crosspieces.*

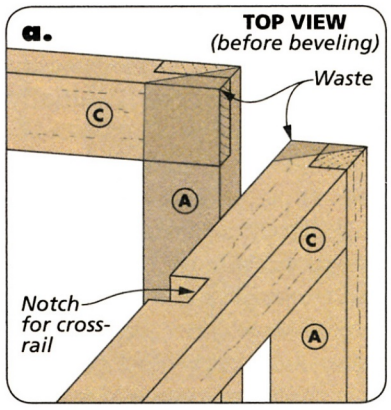


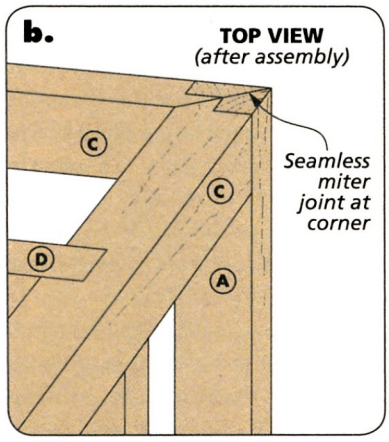
Lower Cuts. *The lower end of each divider should be trimmed to end up flush with the lower edge of the bottom rails.*



Final Length. *Adjust the stop block after each set of cuts when trimming the dividers and crosspieces to final length.*







completing the WINE RACK

With all the joinery completed, you're ready to assemble each of the four sides. The box below shows how to do this successfully.

A PLATFORM. Gluing all the joints together tightly into a flush, square assembly can be a challenge. So to make the task go smoother, I put together a clamping platform from MDF (left drawing below). It provides a flat, raised clamping surface and also serves as a squaring guide. A piece of waxed paper will keep the glue from sticking.

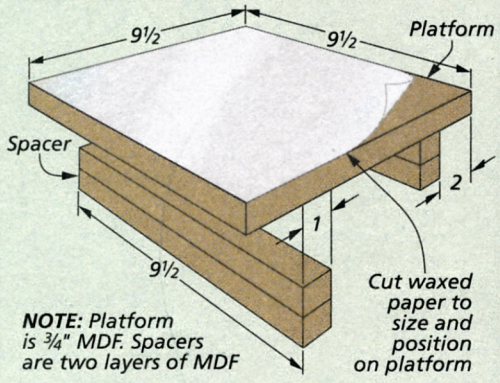
With plenty of clamps standing by, I began assembling the pieces with glue. Here's where order is important. Start with the center joint, then add the top and bottom rails, and finally the legs.

With all the parts in place, I used clamps tightened across the length and width of the sides to pull the joints together before adding clamps to the individual joints. Be sure to keep things square all through the process.

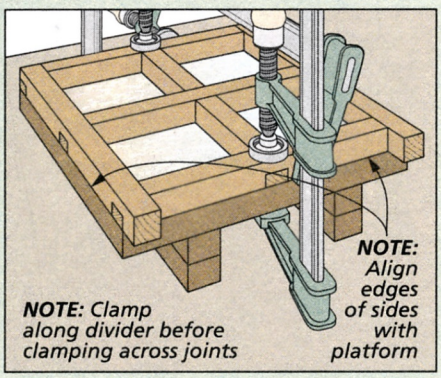
BEVEL THE SIDES. Once all four sides are assembled, the next step is to join them into a square rack, as shown in details 'a' and 'b.'

The upper How-To box on the opposite page shows how to make the 45° cuts on the sides. You want the point of the bevels

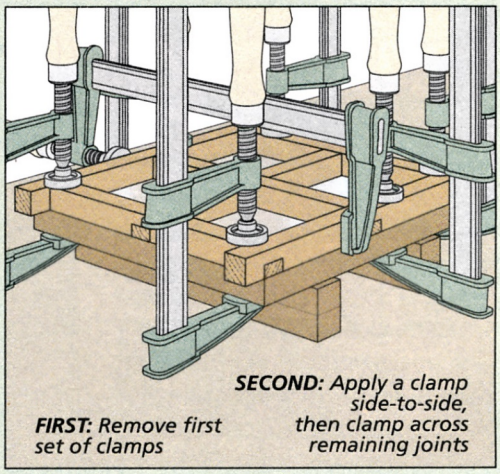
How-To: Side Assembly



Clamping Platform. *The platform is sized to the "square" dimensions of the sides. Spacers provide clamp clearance.*



Top-to-Bottom. *First, apply a clamp between the top and bottom rails. Then clamp the two middle joints.*



Side-to-Side. *Next, I pulled the legs up snug with side-to-side clamps before adding clamps across the remaining joints.*

to fall right at the outside corner of each leg. You'll be able to use the same setup to make all the cuts.

SECOND ASSEMBLY. Now comes another assembly. A couple of band clamps and the simple trick described on page 30 are the keys to gluing up the four sides in one painless operation.

And when the glue is dry, the two crosspieces can be added to the rack. I glued them in place using a clamp on the center joint and a clamp at each end.

THE TRIM. Now, all you have left to do is fit thin trim pieces around the top to hide the exposed half-lap joints. The catch is that I also wanted to maintain a clean, flush look. The solution is to set the trim in a recess cut around the perimeter, as shown below.

RECESS. So the first step is to cut the recess for the trim pieces at the table saw. The goal is a smooth cut with clean, square shoulders at the crosspieces. The drawing below shows the table saw setup. I started by installing a rip blade in the saw. Next, I added a tall auxiliary rip fence and buried the blade in it. Be sure the fence is square to the table.

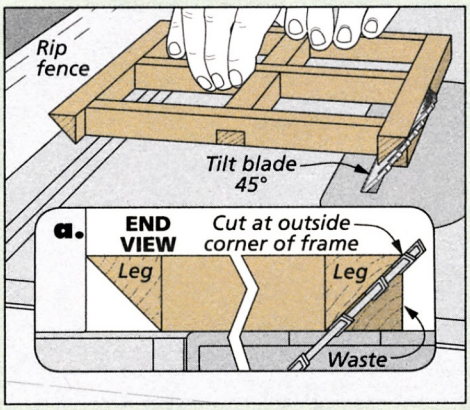
As you can see, the cuts are made with the sides of the rack flat on the table and the top snug to the rip fence. The top crosspieces will keep the rack steady when making the final cuts.

STRIPS. Next, you need to make trim strips to fit the recesses. I didn't try to cut the trim to match the exact depth of the recess, but instead made it just a hair thicker. Once installed, it can be sanded perfectly flush. All you need to do is rip one 48"-long strip from the edge of a blank.

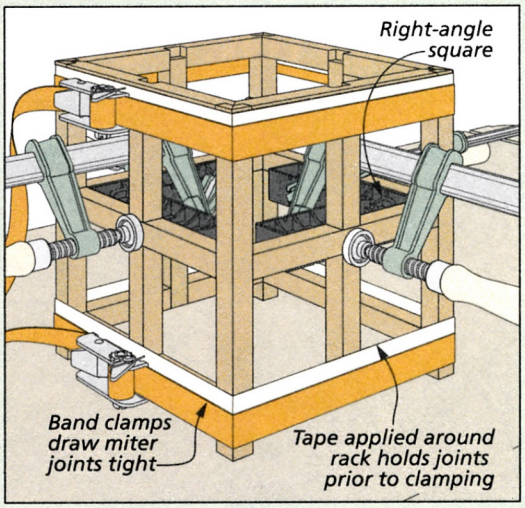
MITERS. Since the pieces are so thin, cutting the miters at the table saw isn't a good option. Instead, I used a sharp chisel and a shop-made miter guide. Again, the details are on page 30. As each piece was fit, I taped it in place. Then when all the pieces were mitered, I removed them one at a time to glue them down, as shown below.

A little bit of sanding is all you have left to do. When you soften the edges of the trim pieces, they'll disappear into the top rails. Then after stain and an easy sprayed-on finish, you can stock the rack with your favorite vintage. W

How-To: Miters



Mitered Corners. *You can use one edge to fine-tune the rip fence setting, then make the cuts one after another.*

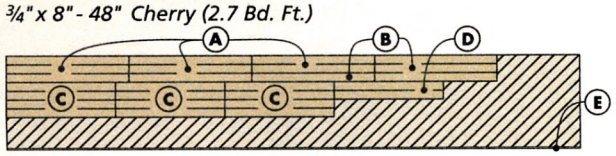


Tape, Then Clamps. *Masking tape will hold the rack together while you tighten a couple of band clamps. Page 30 offers more detail.*

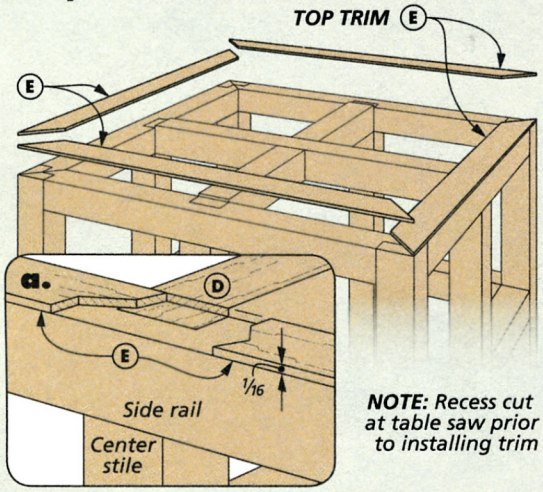
Materials & Cutting Diagram

A	Legs (8)	3/4 x 3/4 - 10 1/4
B	Dividers (4)	3/4 x 3/4 - 9 1/8
C	Rails (12)	3/4 x 3/4 - 9 1/2
D	Crosspieces (2)	3/4 x 3/4 - 8 3/4
E	Top Trim (4)	1/16 x 3/4 - 48 rgh.

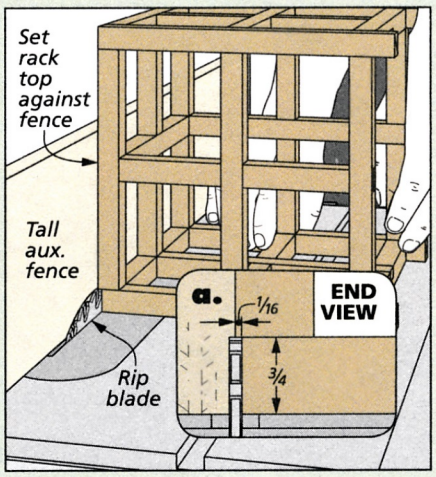
3/4" x 8" - 48" Cherry (2.7 Bd. Ft.)



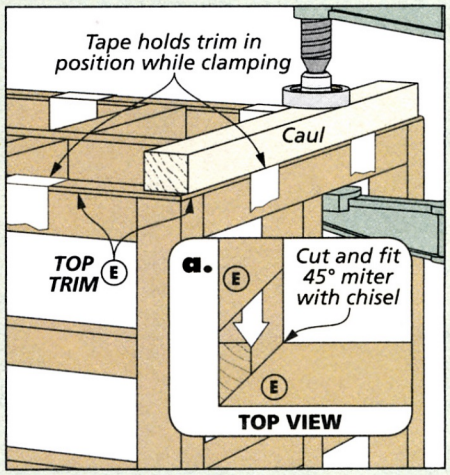
Top Trim



NOTE: *Recess cut at table saw prior to installing trim*



Trim Recess. *Adjust the blade height and exposure carefully before making each cut with a single pass.*



One at a Time. *After applying glue, use tape to keep the piece from shifting while you add the caul and clamps.*

custom Kitchen Cabinets

Ever dreamed of building your own kitchen cabinets? Turn that dream into a reality using our plans and tips from the pros.

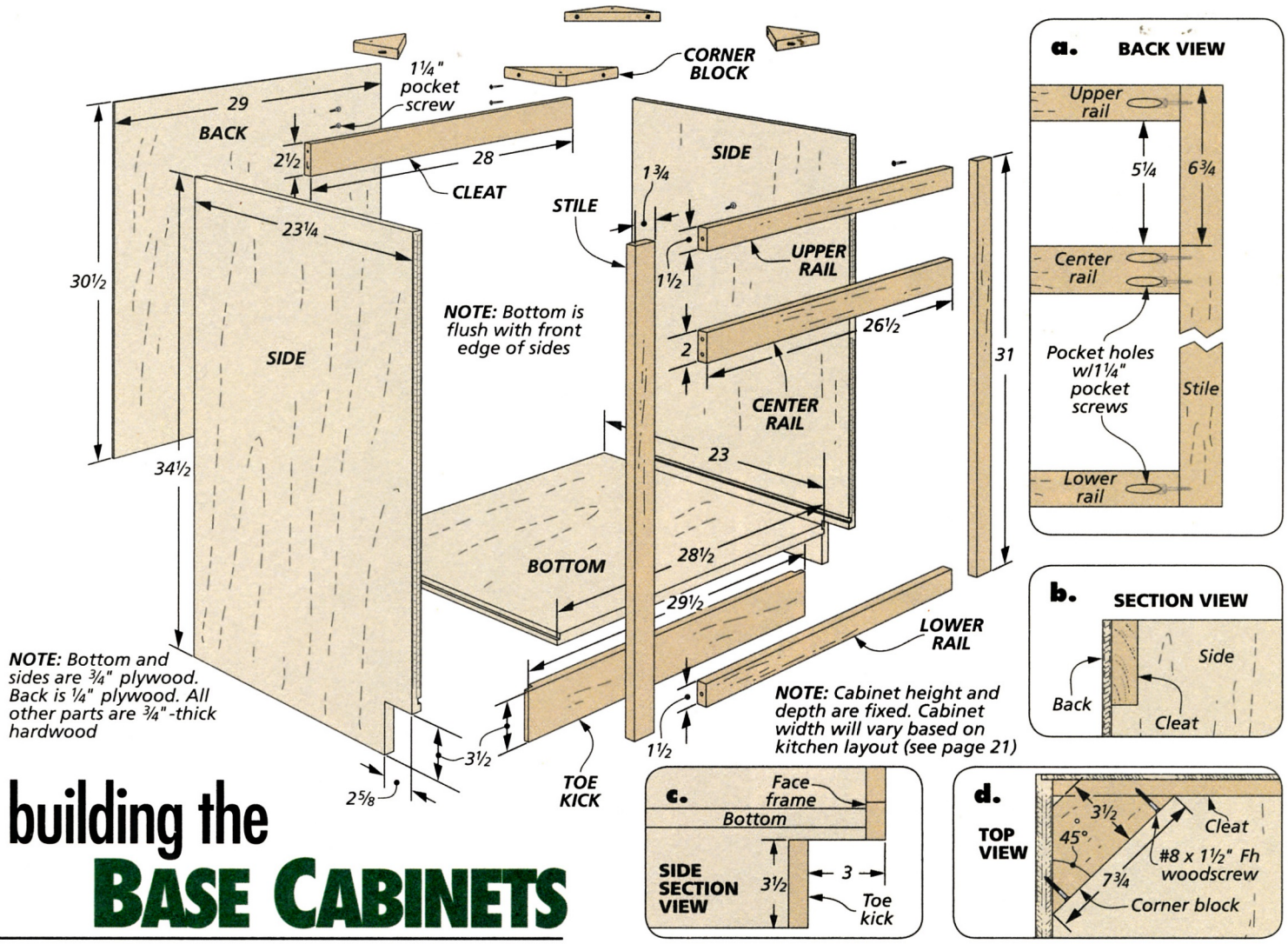
Building kitchen cabinets is certainly an ambitious project. Most woodworkers have at least considered making them at some point, but often the sheer scale of the undertaking is enough to give them pause.

Recently, however, a staff trip to a *Woodsmith* editor's kitchen provided us with a revelation. When you break the cabinets down into their basic components, the project is very achievable. Each cabinet is, after all, a simple plywood box outfitted with doors and drawers.

The only difference from other projects is that the cabinets are sized to suit your kitchen's space and needs. With that sentiment in mind, the kitchen you see here became the inspiration for our *Woodsmith* kitchen cabinet project.

A KITCHEN PRIMER. Over the next few pages, you'll find detailed plans for the essential components of any kitchen cabinet setup: Base cabinets, drawers, doors, and upper cabinets. Each component is built with plywood and hardwood parts, rock-solid construction, and simple techniques.

Of course, we can't plan for every variable in your kitchen. But throughout, you'll find a series of planning guides, style options, and professional installation tips to help you along the way. In the end, you should be armed with the knowledge needed to get started on your own kitchen cabinet project with confidence.



building the BASE CABINETS

The two essential components of any set of kitchen cabinets are upper and base cabinets. Above is the basic concept for the base unit.

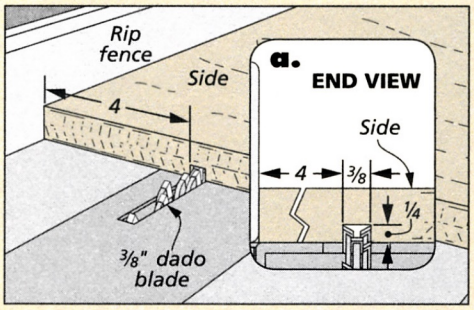
The base cabinet consists of plywood sides, a back, and a bottom. A cleat and corner blocks add strength to the cabinet. Later, the countertop is attached to the corner blocks. A face frame and toe kick cover the exposed plywood edges.

PLANNING AHEAD. Keep in mind that the cabinet above is just a basic idea to get you started. You'll find more guidance on planning out the specific cabinets in the box on the opposite page.

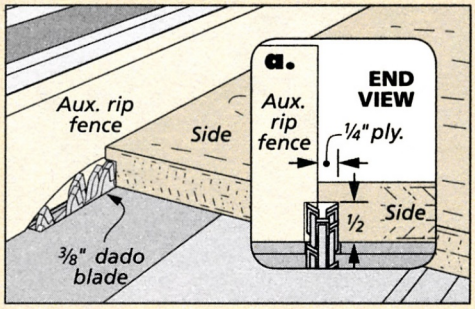
BUILD THE BASE. Once you size your cabinets, you can start cutting the plywood parts for each: the sides, bottom, and back. Now you're ready for a few joinery cuts on the sides and bottom. The drawings below walk you through these cuts. Next, notch the bottom of each side panel for the toe kick.

At this point, you're ready to assemble each cabinet. Make sure to align the front edges of the

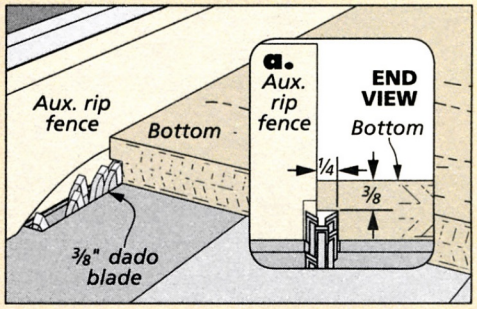
How-To: Cut the Case Joinery



Dadoes. *Use the rip fence to position the cut. Then guide the case side over the dado blade to cut the dado for the bottom.*



Rabbets. *Now adjust the blade and add an auxiliary rip fence to cut a rabbet in the back edge of each case side.*



Tongues. *With a slight adjustment to the dado blade height, you can also cut the tongues on the ends of the bottom panel.*

bottom and sides to allow space at the back of the cabinet for the back panel. Also, add a couple of spacers to keep the top of the cabinet square as you clamp it.

Before gluing on the back, you'll want to add a cleat between the two sides, near the top of the cabinet. Later on, this is used to attach the cabinet to the wall. Then you can glue on the back as shown in detail 'b' on page 20.

ADD HARDWOOD PARTS. Now it's time to cut the rest of the cabinet parts to size. These include the face frame, toe kick, and corner blocks

The face frame is built slightly wider than the cabinet to make it easier to align the cabinets side by side later. Its rails and stiles are joined with pocket screws (detail 'a,' page 20). Once glued to the cabinet, it covers the edge of the bottom panel (detail 'c').

As for the toe kick, it receives rabbets on each end to fit over the edges of the side panel notches. When all of the cabinets are installed, you can cover all the toe kicks with a longer, ½"-thick toe kick cut to fit your run of cabinets (more on this on page 28).

After the face frame and toe kick are complete, you can glue and clamp them to the base cabinet, as shown in the box below.

The corner blocks get cut to size and glued and screwed at the top of the cabinet. Detail 'd' on page 20 and the lower right drawing provide the specifics.

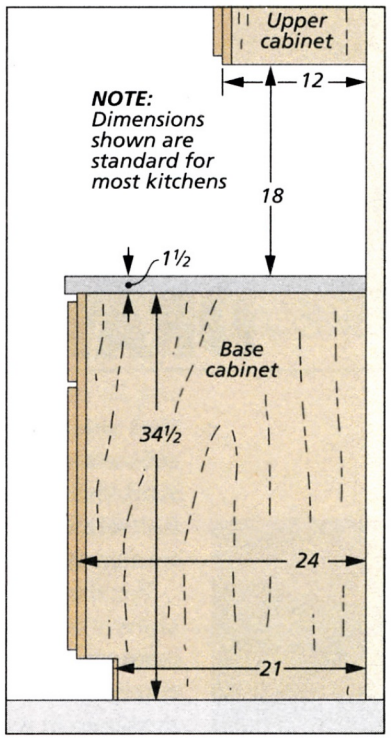
Cabinet Layout Considerations

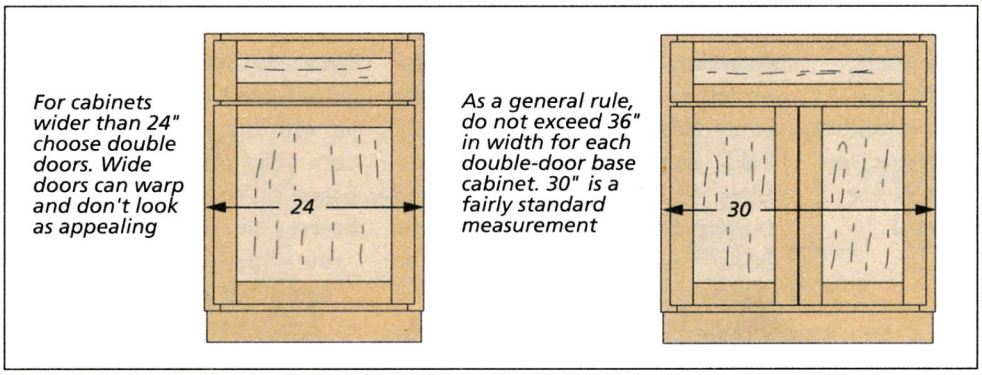
No two kitchens are alike. But there are enough similarities that you can use the plans here and some basic math to make cabinets to fit your kitchen. For example, the standard depth of base cabinets is 24", and the height is typically 34½" (illustration, right).

CABINET WIDTH. To determine cabinet width, measure the overall space to fill, and divide it up into cabinets accordingly, also accounting for the sink and appliances. In general, cabinets with double doors are usually not wider than 36", and cabinets with single doors should not be wider than 24" (illustration below). Also, cabinets narrower than 12" are hard to get into and should be avoided.

UPPER CABINETS. As far as wall cabinets go, here you have a standard depth of 12" in most kitchens. The height is determined by the ceiling. It's standard practice to leave 18" of space between the bottom of the upper cabinets and the countertop.

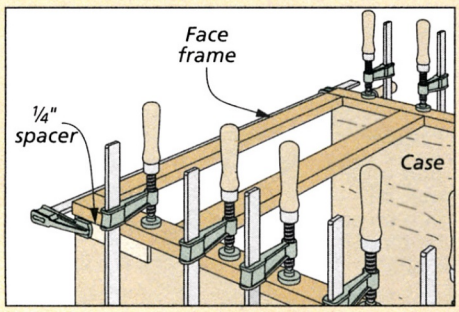
Here again, you'll want to plan your upper cabinet widths for a pleasing look. In general, you may want to make the upper cabinet layout similar to the cabinets below it for a consistent appearance.



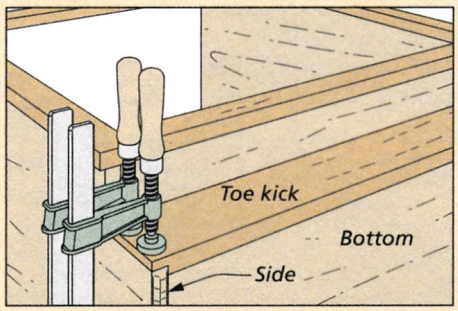


Base Cabinet Widths. *Measure the overall run of space to be filled and divide it up into cabinets for a consistent, pleasing appearance. It's okay to vary the width somewhat, but don't make the cabinets wider than 36" or narrower than 12".*

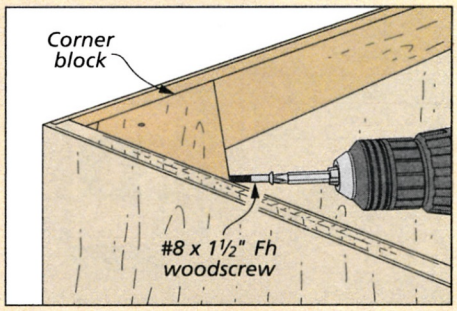
Add the Hardwood Parts



Face Frame. *Clamp thin spacers to the case sides. Then align the face frame with them as you glue and clamp it in place.*

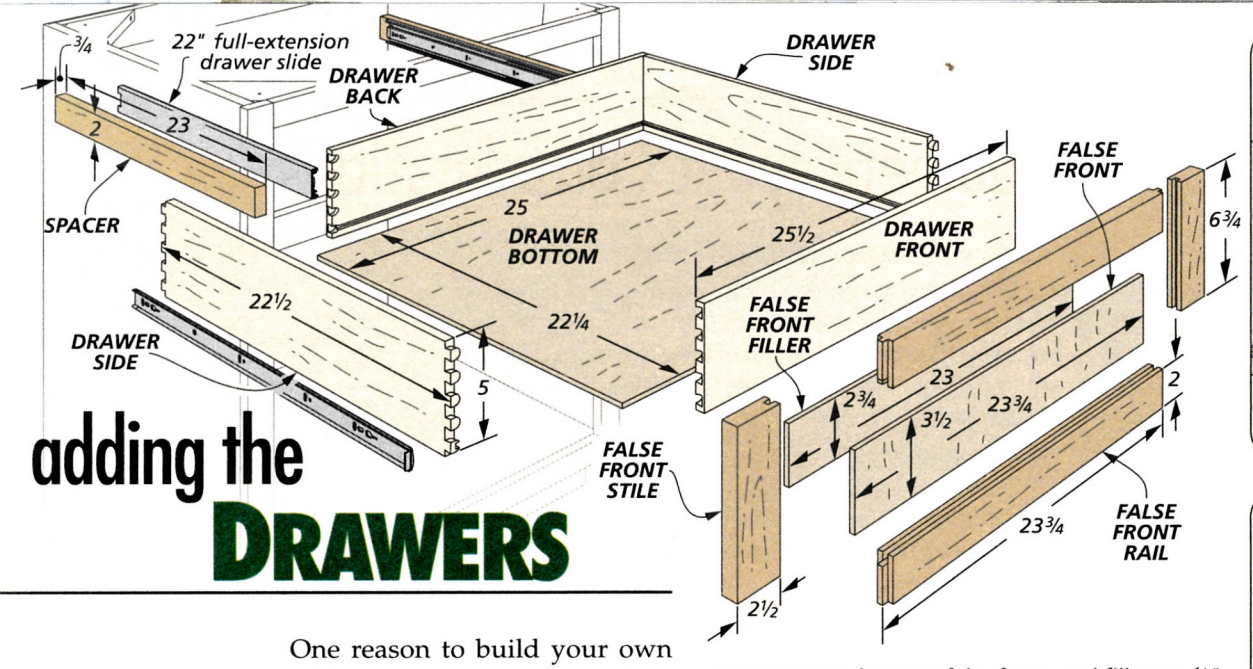


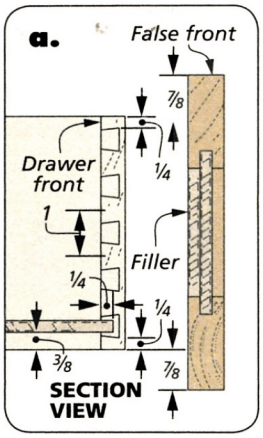
Toe Kick. *Rabbets on the toe kick fit over the notches on the case sides as you glue and clamp it in place.*

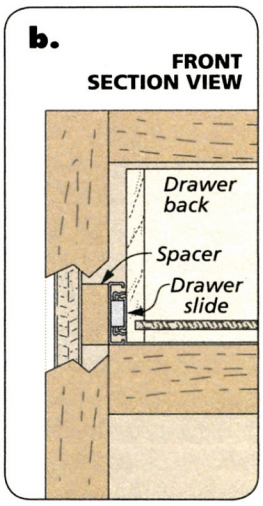


Corner Blocks. *Glue and screw the four corner blocks in place in each of the upper corners of the cabinet.*

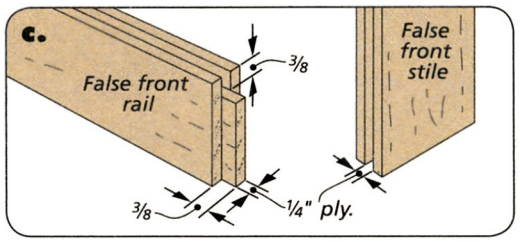
adding the DRAWERS







NOTE: *Drawer bottom, false front, and filler are ¼" plywood. Drawer parts are ½"-thick hardwood. False front parts and spacers are ¾"-thick hardwood*



▲ Soft-close drawer slides are a great addition to custom kitchen cabinetry (see page 51 for sources).

One reason to build your own cabinets is to add custom touches. And these drawers, with their half-blind dovetail joints and framed false fronts, fill the bill.

For the standard base cabinet shown on page 20, you'll just need one drawer. Of course, you can also add multiple drawers, as shown in the Designer's Notebook on the opposite page.

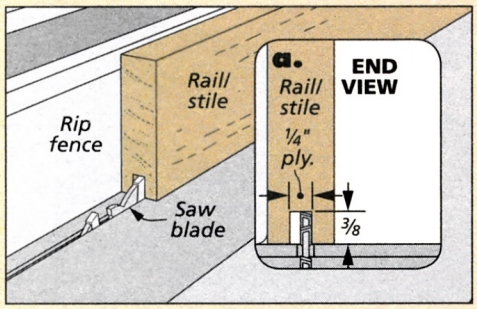
DRAWER ANATOMY. Whichever direction you go, the basic construction of each drawer is the same. Each one consists of a front, back, and sides joined with half-blind dovetail joints. A plywood bottom fits in a groove near the bottom edge of these parts. The false front is a frame and panel assembly that consists of plywood framed by rails and stiles.

MAKING DRAWERS. After cutting the parts to size, the first order of business is to cut the half-blind dovetails on the fronts, backs, and sides (detail 'a'). I used a dovetail jig with my router to make these cuts. The procedure will vary based on the jig you use, so it's best to let the instructions that came with the jig be your guide.

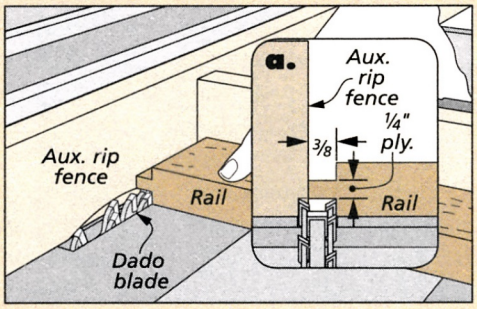
GROOVE FOR BOTTOM. Once you cut all the dovetail joints and check the fit, set up the table saw to cut a groove in all four parts to accept the drawer bottom (see detail 'a' above). Then you can glue up each drawer with the bottom in place.

FALSE FRONT. At this point, you can turn your attention to the frame and panel false front. Making the stub tenon and groove joints is easy to do on the table saw, as shown in the drawings below. Check the fit of all the parts, and then glue them up around the panel. Now finish up the false front by gluing a plywood filler strip into the cavity in the back.

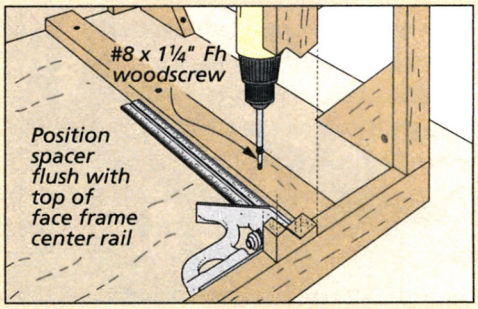
How-To: Make a False Front & Install Drawers



Centered Grooves. *Flip the rails and stiles end for end between passes to cut centered grooves on them.*



Stub Tenons. *To make stub tenons to fit the grooves, use a dado blade, and "sneak up" on the tenon thickness.*



Add Spacers. *Use a combination square to align the spacer with the top of the face frame center rail. Then screw it in place.*

This filler creates a flush surface for attaching the false front.

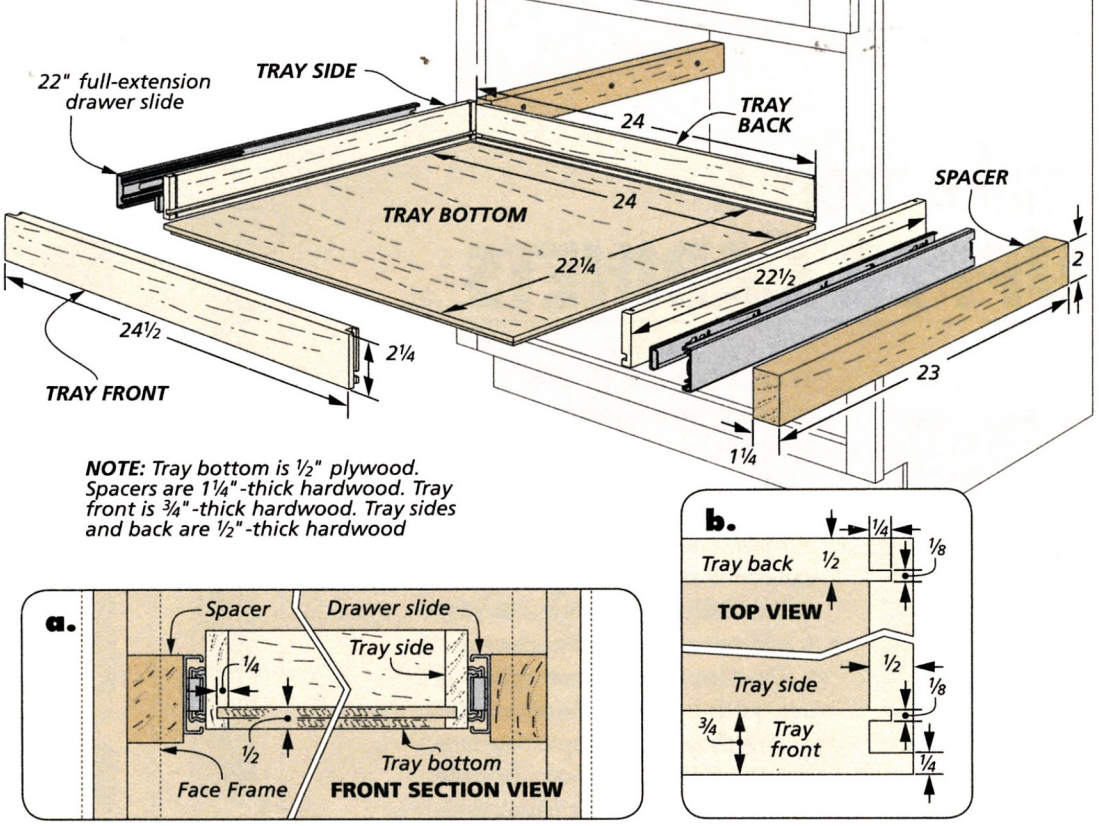
INSTALLING DRAWERS. The drawers are mounted in the cabinet on full-extension drawer slides. First, I screwed hardwood spacers in the cabinet, as shown in the lower right drawing on page 22, so that these slides would clear the face frame. Once the drawer is installed, position the false front and glue it on (detail 'a,' page 22).

PULL-OUT TRAYS. Pull-out trays can add more storage and function to the cabinets (illustration at right). These are perfect for storing pots, pans, or other kitchen items.

The tray consists of hardwood sides, front, and back pieces, as well as a ½" plywood bottom. Just like the drawers, each tray is mounted on slides, which are in turn mounted on spacers. The spacers allow the tray to clear the face frame and door frame that's added later, as you can see in detail 'a' above.

Since the trays are shorter than the drawers, I chose different joinery for them. Rather than dovetails, they have a tongue and dado joint at the back and a strong locking rabbet joint on the front (detail 'b'). You can find the details for cutting the joints on page 31.

Now all four parts get a groove near the bottom. Then the plywood bottom is rabbeted to fit in the groove (detail 'a'). Finally, you can glue up the tray, and install it in the cabinet, as shown above.

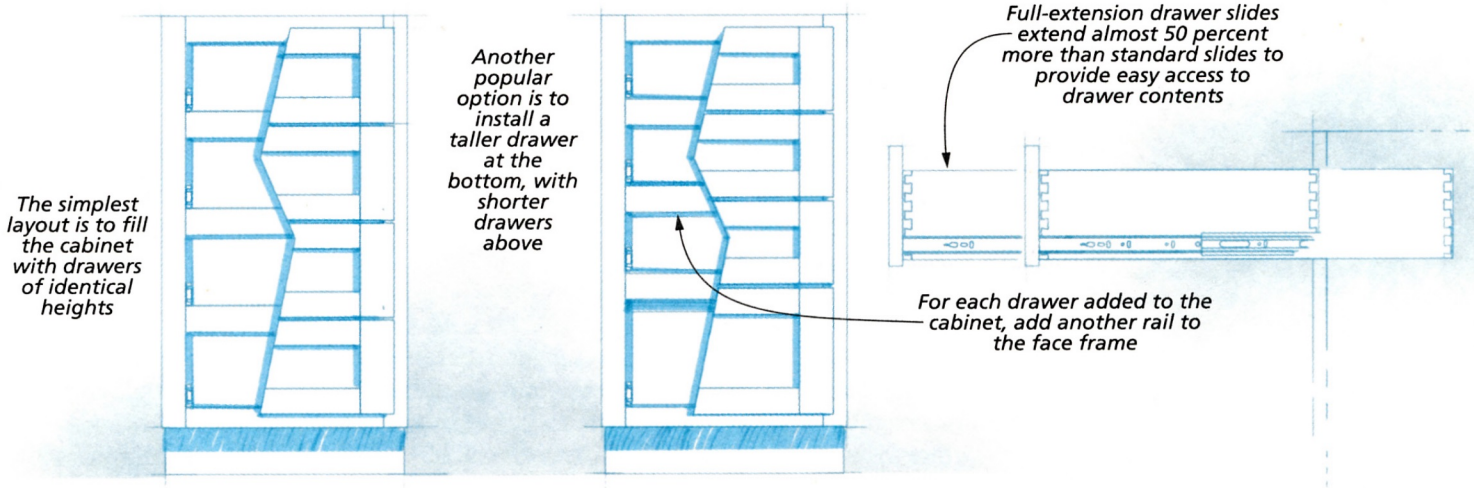


DESIGNER'S NOTEBOOK

Drawer Options

It's easy to modify the base cabinet to accept multiple drawers from top to bottom. You can make them all the same size, or vary the drawer height as shown below.

When it comes time to install the drawers, I recommend choosing full-extension slides. As you can see, below right, they make it a lot easier to access the contents of the drawer.



make doors & UPPER CABINETS

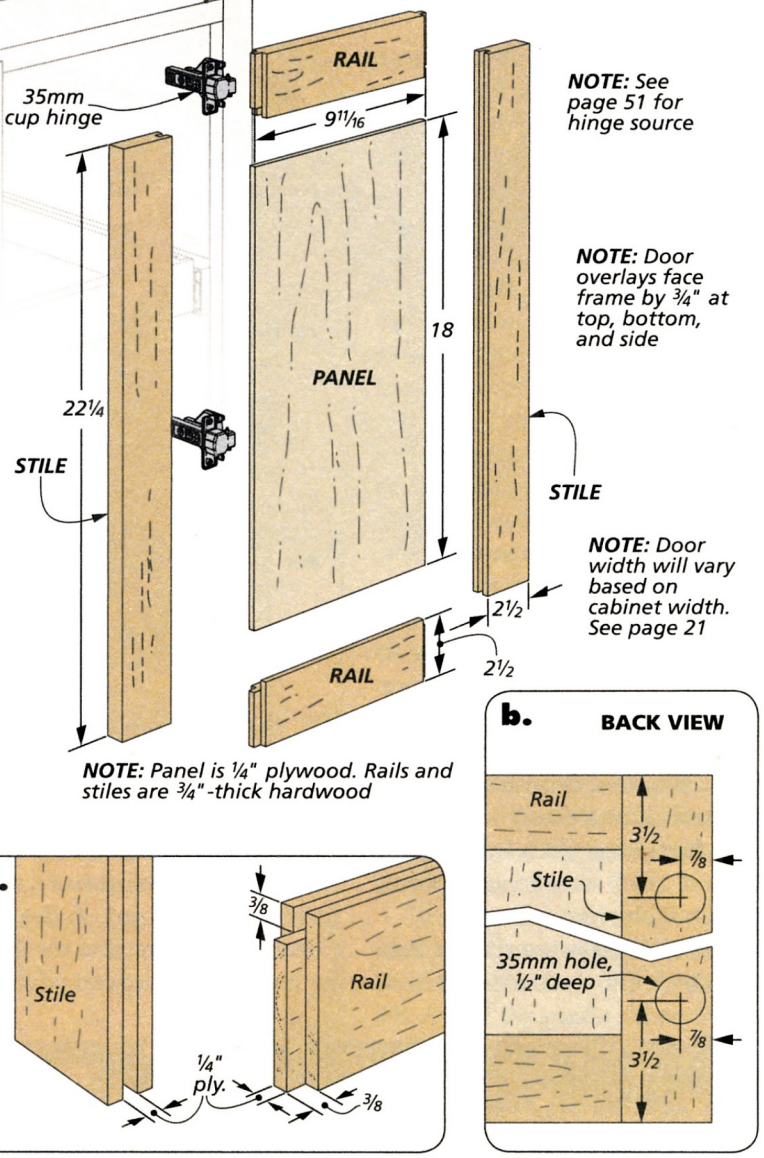
▲ Raised panel doors (top) or modern slab doors (bottom) give your kitchen an entirely different look.

There's just one element left to complete the base cabinets in your new kitchen, and that's to add doors. As you can see at right, I kept the construction of the doors simple. Each one is made up of rails and stiles joined with stub tenon and groove joints. A plywood panel rests in the groove.

The doors for these cabinets are full overlay doors. That means they rest on top of the face frame. Other options include inset doors that rest flush with the face frame, or partial overlay, which stand a bit proud of the face frame. You can also change the style of the doors for a different look (see the photos at left).

BUILDING DOORS. The grooves in the rails and stiles and the mating stub tenons on the ends of the rails (detail 'a') are the same as on the false drawer fronts. You can cut the joints as shown in the drawings on page 22.

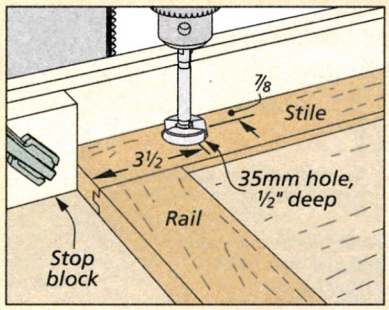
After assembling the doors, drill two holes in the door stile with a Forstner bit (see the lower left drawing). These holes accept cup hinges for installing the doors on the face frame, as shown in detail 'b' above.



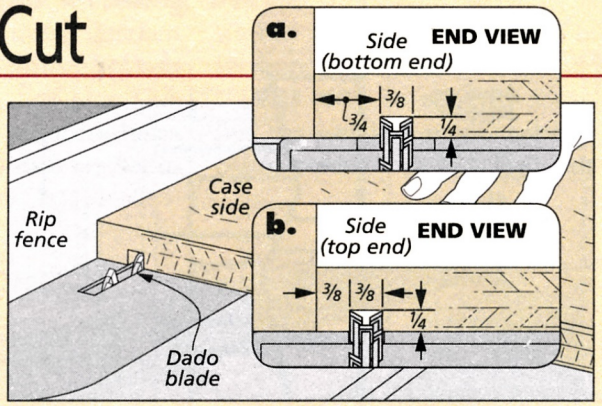
UPPER CABINETS

Now that the base cabinets are complete, it's time to turn your attention to the upper cabinets. In the photo on page 18, you'll notice that each stack of upper cabinets actually consists of two units: A shorter display cabinet mounted above a taller storage unit. For this design, we simplified things by incorporating both ideas into one tall cabinet.

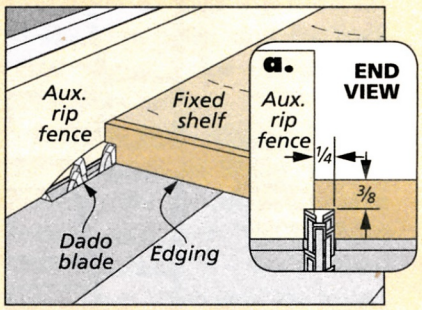
How-To: Drill & Cut



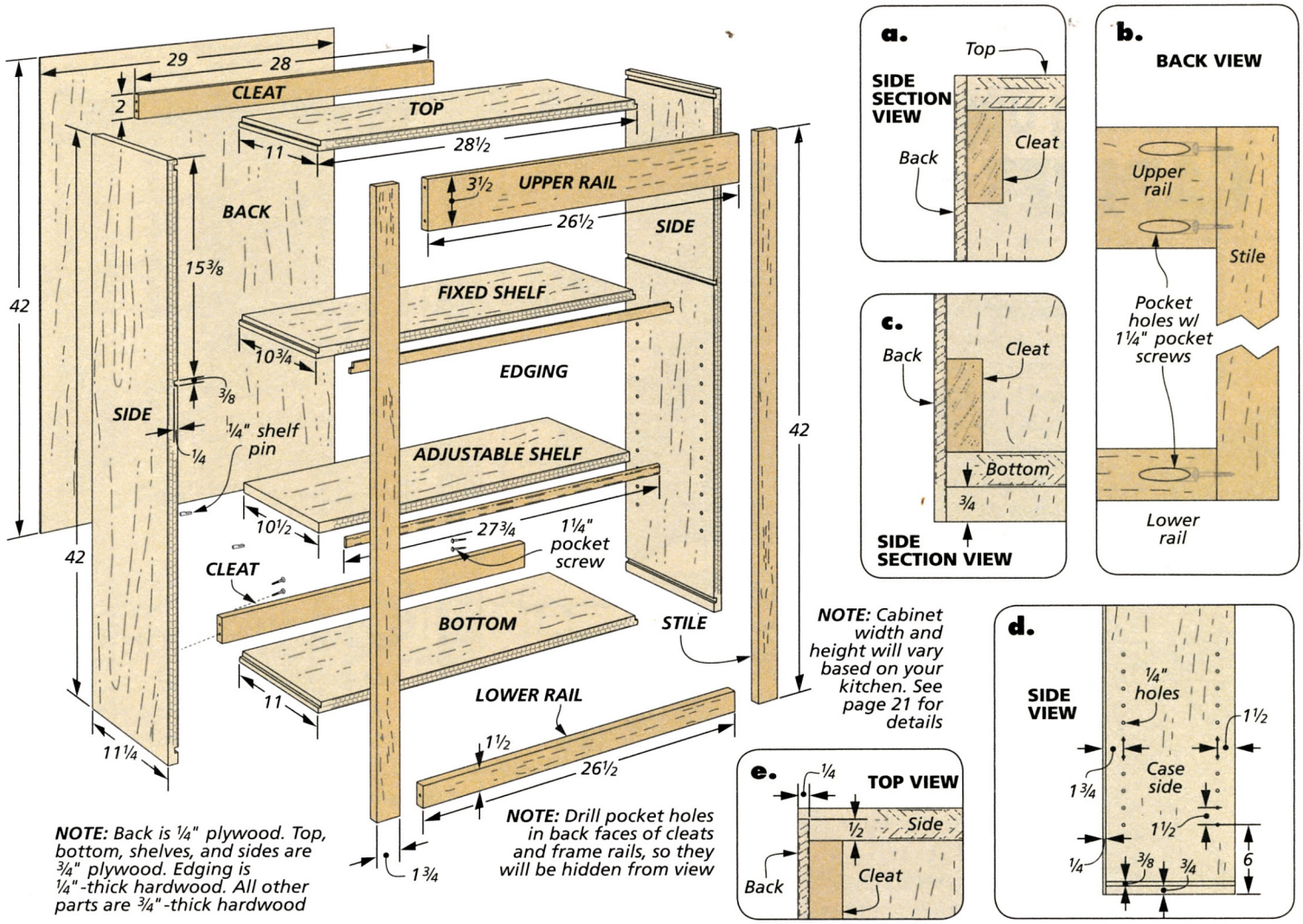
Hinges. *To drill the 35mm holes for cup hinges in the door stiles, use a Forstner bit in the drill press.*



Dadoes. *Each side receives three dadoes. To make a recessed bottom, cut the bottom dado (detail 'a') farther from the end than the top dado (detail 'b').*



Mating Tongues. *On the fixed shelf, glue on the edging strip before cutting the tongue.*



The construction of the upper cabinets is similar to the base cabinets, but there are a few differences worth noting. For one, the upper cabinets are completely enclosed, with plywood sides, back, top, and bottom. The bottom is recessed slightly to make space for under-cabinet lighting (more on this on page 27). The cabinets are also taller and narrower than the base cabinets.

Unlike the base cabinets that feature both doors and drawers, the upper cabinet has a pair of taller doors. Inside, an adjustable and a fixed shelf add additional storage to the cabinet.

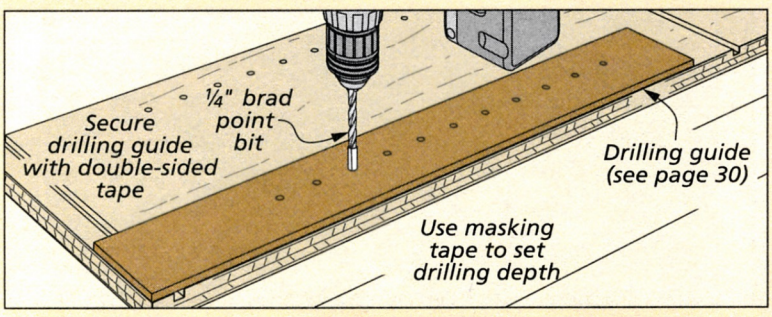
BUILD THE UPPERS. While the base case sides had one dado for the bottom, the upper case sides have three to fit a bottom, fixed shelf, and top. See the lower middle drawing on page 24.

Then cut mating tongues on those parts to fit the dadoes. Note that on the fixed shelf, you'll apply a strip of hardwood edging before cutting the tongue (lower right drawing, page 24). Also, rabbet the edge of the sides to accept the back.

The adjustable shelf will rest on shelf pins, and you can drill holes for those now (drawing at left and detail 'd' above). The drilling guide I used is shown in detail on page 30.

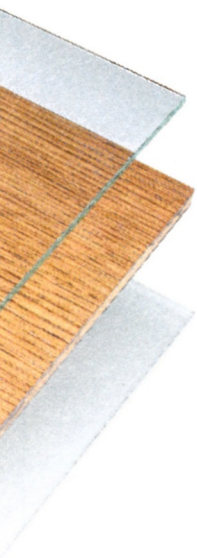
COMPLETE THE CABINET. There are just a few parts to add to the upper cabinet. First, cut the adjustable shelf to size, and apply a strip of hardwood edging to the front. As for the cleats, back panel, and face frame, they are made similarly to those on the base cabinet. You can find all the specifics in the illustrations above.

Shelf Pin Holes



Drilling Guide. *To drill precise holes for shelf pins, I created this hardboard drilling guide to clamp to the case sides. You can get all the details for making it in Shop Notebook on page 30.*

crafting upper CABINET DOORS



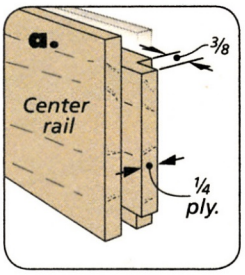
I chose clear glass for the upper door panels, but you can also use frosted glass or plywood to match the lower panel.

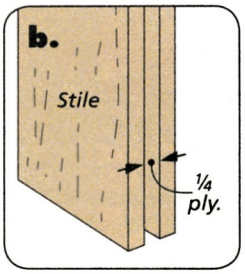
The taller upper cabinet doors are similar to the base cabinet doors you built earlier, but they're divided into an upper and lower panel by a center rail. This rail aligns with the fixed shelf in the cabinet.

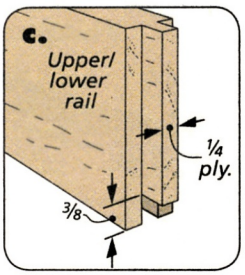
Just as before, building the doors starts with making a centered groove in the rails and stiles. Note that the center rail receives a centered groove on both edges (detail 'a'). Next, cut mating stub tenons on the ends of all three rails, and check the fit.

Now you can assemble the doors with glue and clamps. If you're using plywood for both the top and bottom panels, you can add the plywood panels to the assembly now.

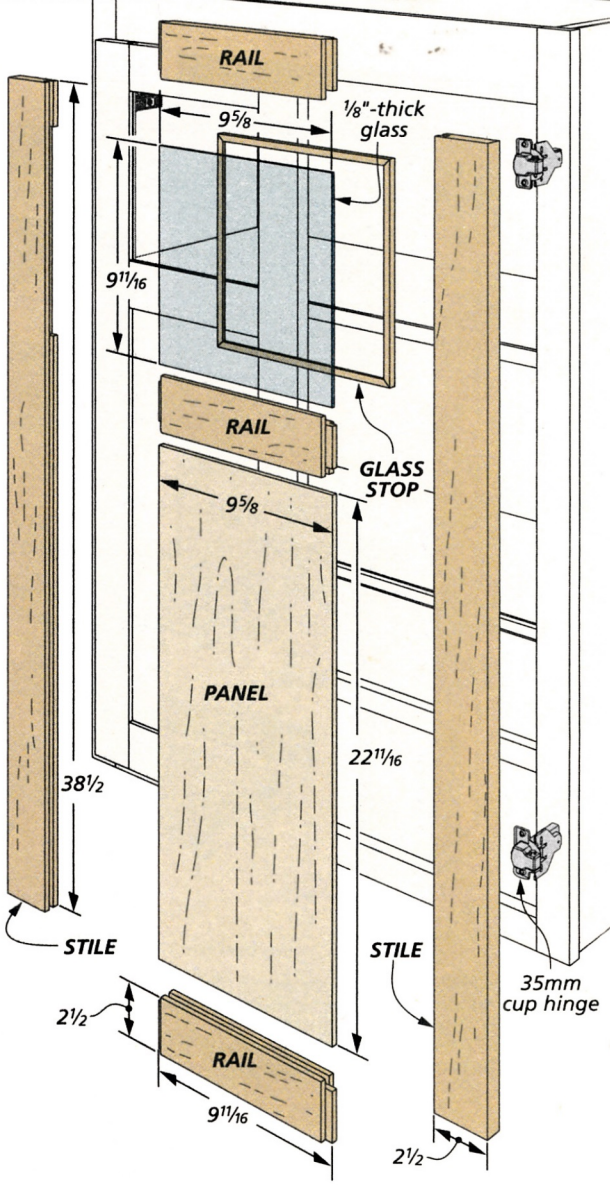
Another possibility, though, is to use glass for the upper panel. This creates a display area on the top shelf. If you choose this option, then you'll want to leave the upper opening empty for this initial glueup. Then, once the glue dries, rout a rabbet around that opening to accept the glass (lower left drawing). Order glass cut to fit in the opening, and secure it with glass stop, as shown in the lower right drawing. You can see how to make the glass stop in Shop Notebook on page 31.





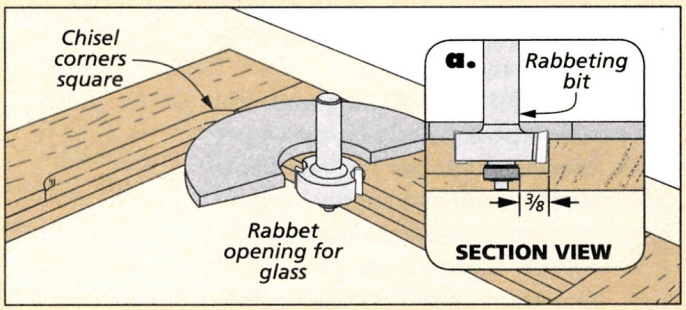


NOTE: Panel is 1/4" plywood. Glass stop is 5/16"-thick hardwood. Rails and stiles are 3/4"-thick hardwood

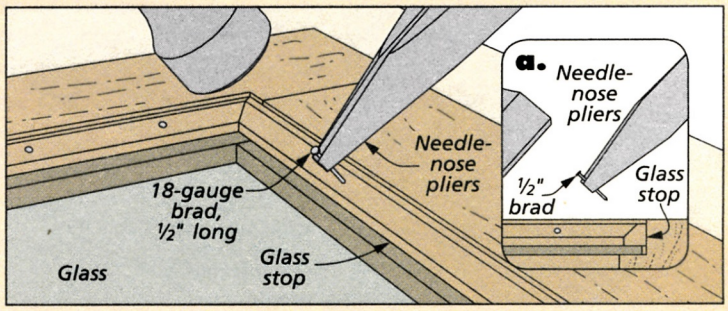


THE COMPLETE KITCHEN. Now that you've learned some of the basics of kitchen cabinets, you can use these ideas to build your own set. With a few modifications, any of the cabinets presented here can be adjusted easily to fit your space. Also, check out the style options on the facing page and the diagram on page 28 for some other "big picture" considerations for your cabinets.

How-To: Install the Glass Panel



Rabbet Opening. *Equip your router with a rabbeting bit and rout around the upper opening to create a recess for inserting the glass panel. Then chisel the corners square.*



Nail in Glass Stop. *Use small brads to carefully nail the glass stop in place and secure the glass. You can see how to make this glass stop in Shop Notebook on page 31.*

DESIGNER'S NOTEBOOK

Before installing your new kitchen cabinets, be mindful of some of the finishing touches you can add to them. For example, you can install lighting in the right places for both display and working at the countertop. Or blend your cabinets in with their surroundings seamlessly using decorative molding. Here are a few possibilities to get a truly custom look in your new kitchen.

Accent Lighting

Cabinet lighting is a must for today's kitchen, and it makes working in the kitchen a lot easier. There are a whole host of options available. As you can see in the photos at right, this kitchen features puck lighting in the tops of the upper cabinets, and larger LED fixtures underneath. See Sources on page 51 for some options.

You may want to consult an electrician to find the best lighting solutions for your kitchen. This way, you can have them installed so the wiring is hidden from view.

Finish Moldings

Another option for dressing up your finished cabinetry is to add decorative moldings. As you can see at left, the tops and bottoms of the upper cabinets are good places for adding these accent pieces.

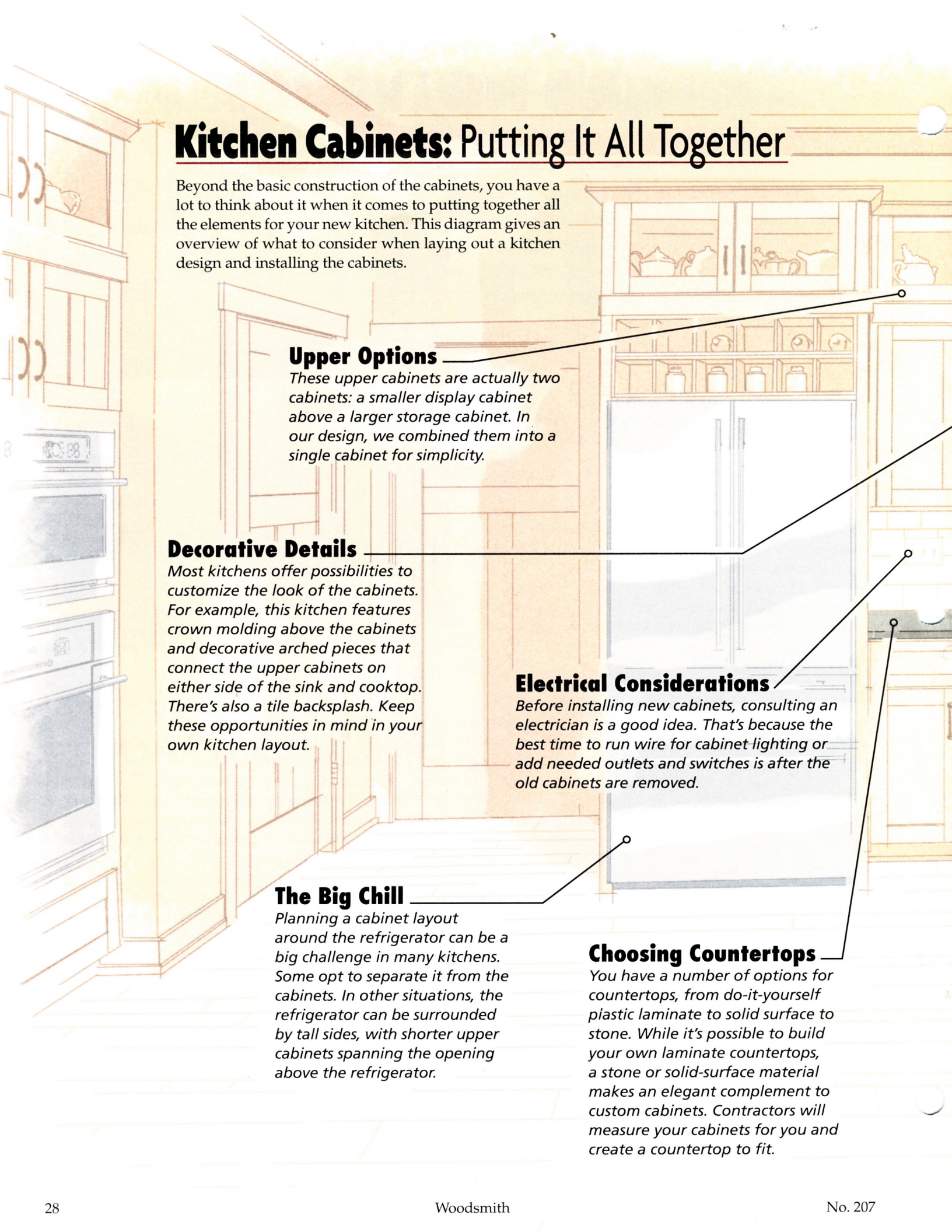
The crown molding we chose for the tops of the upper cabinets matches the simple, Craftsman style of this kitchen. It can be duplicated in the shop by making four 45° bevel cuts on the edges of the molding at the table saw. It is mitered at the corners and glued and nailed to the tops of the cabinets once they're installed.

The molding on the underside of the upper cabinet was purchased at a local lumberyard. It features a full bullnose profile with a beaded profile underneath. This molding increases the size of the recess below the cabinet and helps to hide the under-cabinet lighting from view.

Whether you choose to peruse the options at the home center and lumberyard, or simply make your own molding, there are a variety of options to add to your cabinets to give them a unique, finished look.

Kitchen Cabinets: Putting It All Together

Beyond the basic construction of the cabinets, you have a lot to think about it when it comes to putting together all the elements for your new kitchen. This diagram gives an overview of what to consider when laying out a kitchen design and installing the cabinets.



Upper Options

These upper cabinets are actually two cabinets: a smaller display cabinet above a larger storage cabinet. In our design, we combined them into a single cabinet for simplicity.

Decorative Details

Most kitchens offer possibilities to customize the look of the cabinets. For example, this kitchen features crown molding above the cabinets and decorative arched pieces that connect the upper cabinets on either side of the sink and cooktop. There's also a tile backsplash. Keep these opportunities in mind in your own kitchen layout.

Electrical Considerations

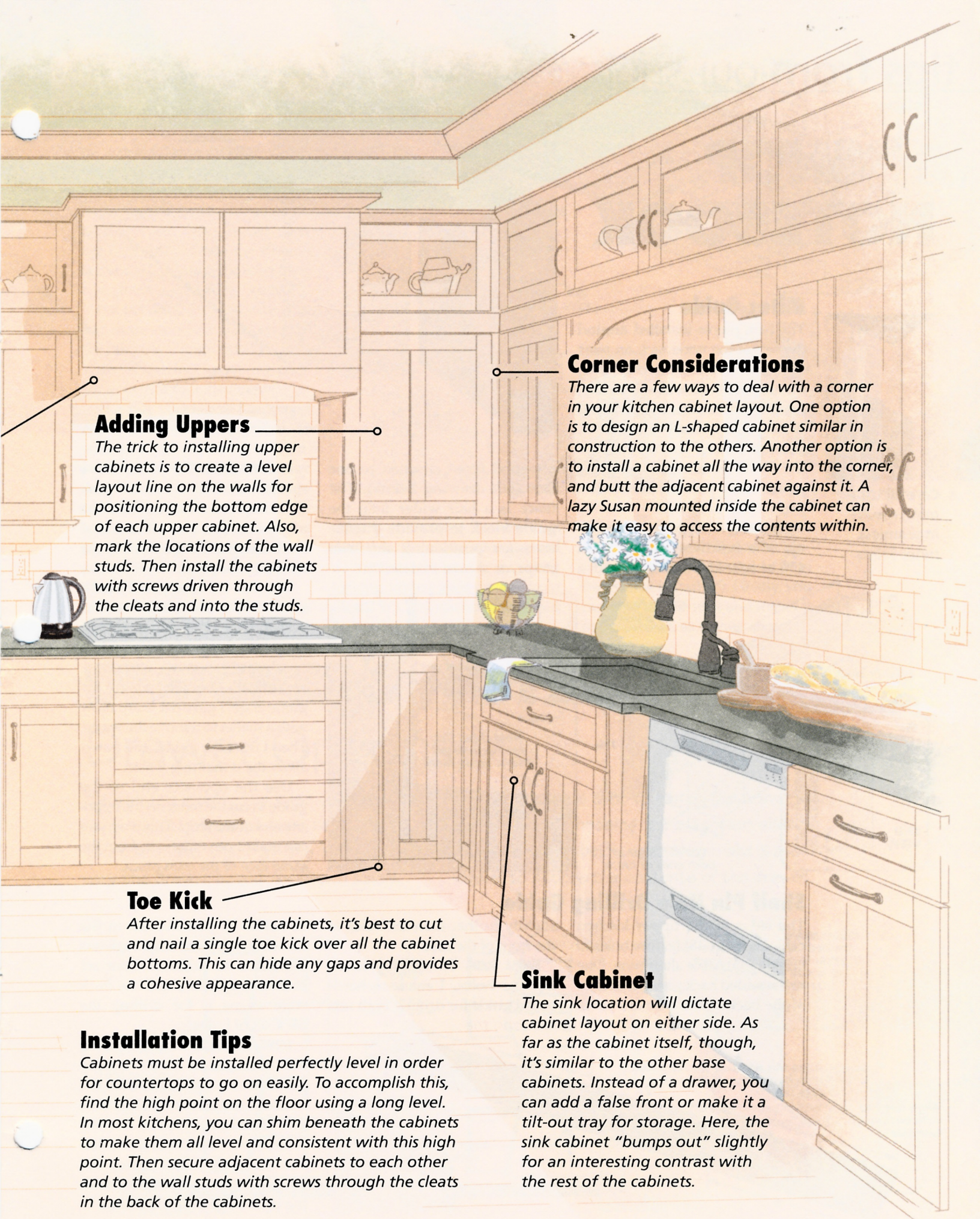
Before installing new cabinets, consulting an electrician is a good idea. That's because the best time to run wire for cabinet lighting or add needed outlets and switches is after the old cabinets are removed.

The Big Chill

Planning a cabinet layout around the refrigerator can be a big challenge in many kitchens. Some opt to separate it from the cabinets. In other situations, the refrigerator can be surrounded by tall sides, with shorter upper cabinets spanning the opening above the refrigerator.

Choosing Countertops

You have a number of options for countertops, from do-it-yourself plastic laminate to solid surface to stone. While it's possible to build your own laminate countertops, a stone or solid-surface material makes an elegant complement to custom cabinets. Contractors will measure your cabinets for you and create a countertop to fit.



Adding Uppers

The trick to installing upper cabinets is to create a level layout line on the walls for positioning the bottom edge of each upper cabinet. Also, mark the locations of the wall studs. Then install the cabinets with screws driven through the cleats and into the studs.

Corner Considerations

There are a few ways to deal with a corner in your kitchen cabinet layout. One option is to design an L-shaped cabinet similar in construction to the others. Another option is to install a cabinet all the way into the corner, and butt the adjacent cabinet against it. A lazy Susan mounted inside the cabinet can make it easy to access the contents within.

Toe Kick

After installing the cabinets, it's best to cut and nail a single toe kick over all the cabinet bottoms. This can hide any gaps and provides a cohesive appearance.

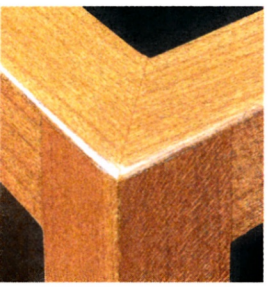
Sink Cabinet

The sink location will dictate cabinet layout on either side. As far as the cabinet itself, though, it's similar to the other base cabinets. Instead of a drawer, you can add a false front or make it a tilt-out tray for storage. Here, the sink cabinet "bumps out" slightly for an interesting contrast with the rest of the cabinets.

Installation Tips

Cabinets must be installed perfectly level in order for countertops to go on easily. To accomplish this, find the high point on the floor using a long level. In most kitchens, you can shim beneath the cabinets to make them all level and consistent with this high point. Then secure adjacent cabinets to each other and to the wall studs with screws through the cleats in the back of the cabinets.

SHOP NOTEBOOK

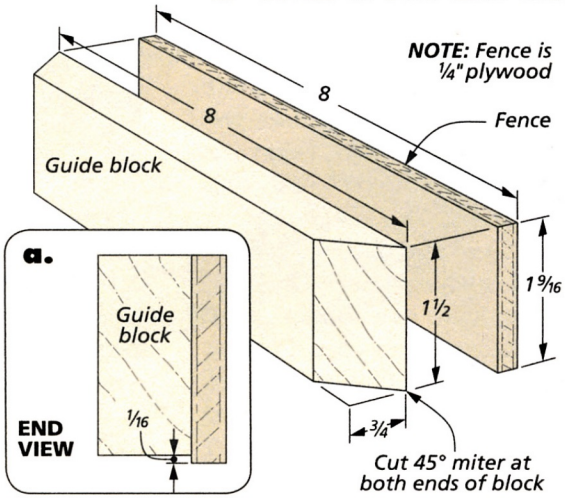


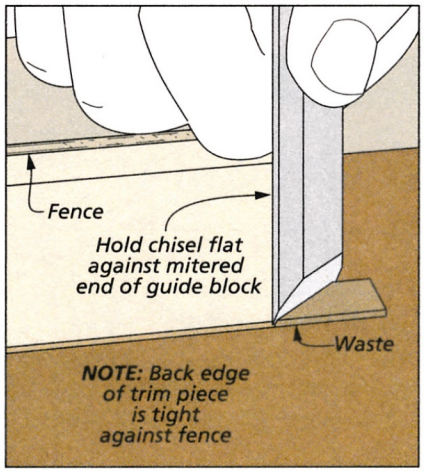
▲ Careful trimming results in seamless miter joints.

Miter Guide

The trim pieces installed around the top of the wine rack on page 14 are far too thin (about 1/16") to be mitered at the table saw. Instead, I made a simple mitering guide and used a sharp chisel to cut clean, accurate miters. This method has the added advantage of allowing you to easily pare the miters for a perfect end-to-end fit.

THE GUIDE. The guide is made up of a hardwood block with 45° bevels at both ends and a plywood fence attached to one face (left drawing below). The fence is a hair wider than the guide block to provide a reference for positioning the trim strips, as shown in detail 'a.'





USING THE GUIDE. The photo above shows the setup I used. I positioned a piece of hardboard at the edge of the bench as a backer and then clamped the guide over the marked trim piece.

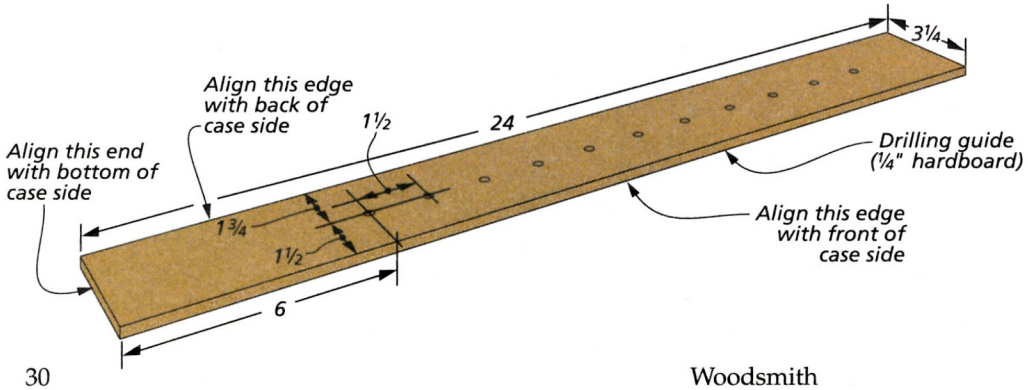
To make the cuts, you'll need a sharp, 1¼"-wide chisel. It works best to make the cuts in stages. First, I set the guide for an initial rough cut — about 1/32" extra long. Holding the chisel flat against the guide edge, I gave it a sharp blow with a mallet to remove the waste. Then I reset the guide, and pared away the remaining waste.

Use the opposite end of the guide to cut the miter on the opposite end of the strip. This way, you can make both miter cuts from the same face of the trim piece.

Shelf Pin Hole Drilling Guide

The sides of the upper kitchen cabinets (page 18) feature holes to accept adjustable shelf pins. Due to the added back panel, the holes at the back of the case are set in slightly further than the holes at the front of the case.

SIMPLE GUIDE. To simplify locating the holes, I made a hardboard guide for drilling both sets of holes. As you can see in the drawing, the front edge registers the guide to drill the front set of shelf pin holes, and the back edge aligns it for drilling the back set of holes.



USING THE GUIDE. Before drilling the front set of holes, simply position the jig flush with the bottom and front of the case side and clamp it or use double-sided tape. Then drill the holes. For the back holes, repeat the process with the jig aligned with the back edge of the case side.

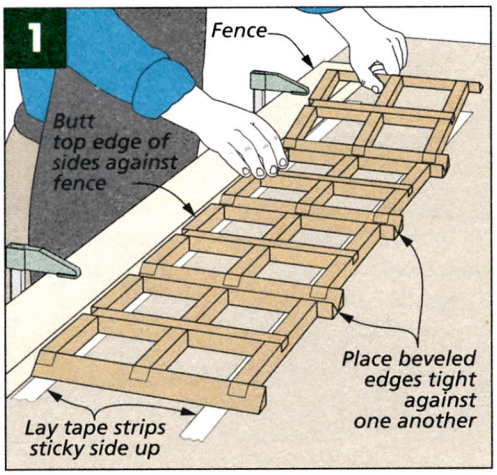
Wine Rack Assembly

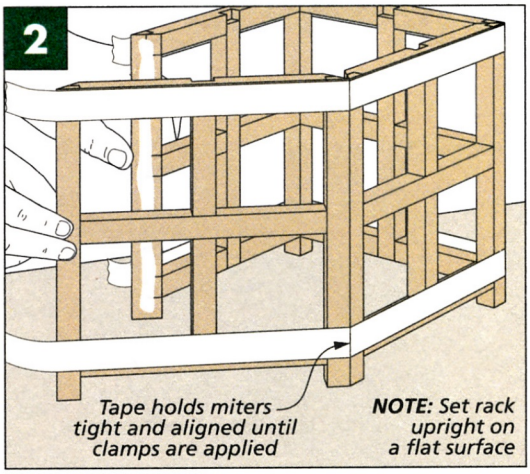
Gluing up the four mitered sides of the wine rack presents a challenge. How do you keep the sides aligned and the joints together while band clamps are being tightened around the assembly? The answer is to enlist some help from a roll of masking tape.

I began by cutting a strip of ¾" plywood slightly longer than the combined length of the sides to act as a fence (Figure 1). Next, I cut two pieces of tape to the same length and laid them out sticky side up. Place the first strip next to the fence to catch the top rails. The other strip is positioned to align with the bottom rails.

Now you can position the sides edge-to-edge along the tape, using the plywood fence as a reference to align the top edges. Press them down firmly to make sure the tape sticks.

When everything is positioned to your satisfaction, apply glue to the miter joints. Now all you need to do is "roll up" the four sides and turn the assembly upright. The tape will hold the joints together while the clamps are tightened around the rack.

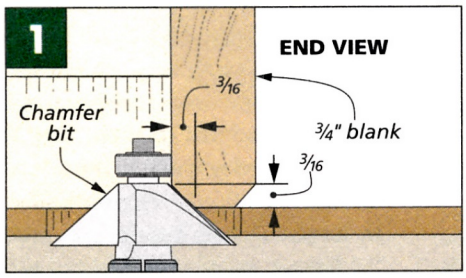


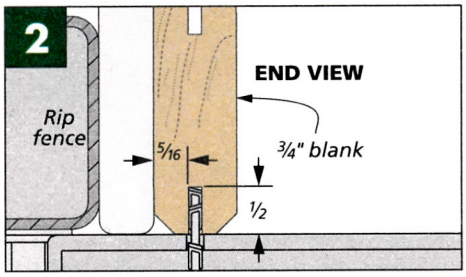


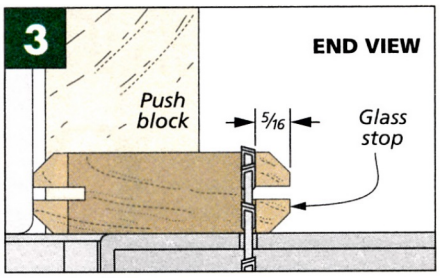
Glass Stops

The upper doors of the kitchen cabinets on page 18 feature glass panels. In order to secure these panels in the doors, you'll need to install glass stops. Luckily, it's easy to make four small pieces of glass stop from one wider blank, as shown in the three drawings below.

THREE-STEP STOPS. To make the glass stop, start at the router table, where you can chamfer all four edges of the wide blank (Figure 1). Next, move to the table saw, and cut a centered kerf in both edges of the blank, as in Figure 2. The final step is to rip each edge of the blank free to create four pieces of glass stop. Figure 3 shows you how this is done.





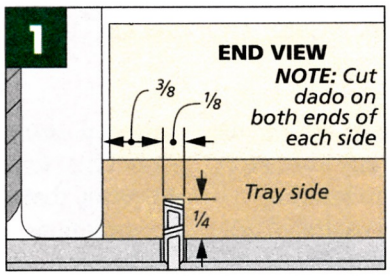


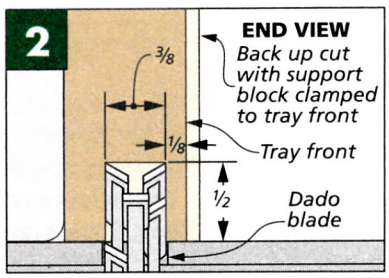
Two Tray Joinery Methods

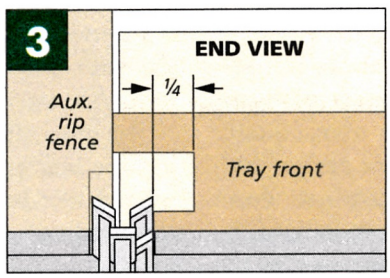
The pull-out trays for the kitchen cabinets have to be sturdy enough to hold heavy pots, pans, and other items. So I used two methods of joining them: A super-strong locking rabbet joint at the front and a simpler tongue and dado joint at the back.

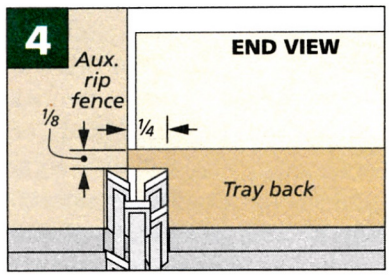
CUT THE JOINTS. For both types of joinery, you start by cutting small dadoes in the tray sides, as shown in Figure 1 at right. Next, you can move to the tray front to make the locking rabbet. This requires two cuts with a dado blade on the table saw, as you can see in Figures 2 and 3.

Now all that's left is to cut a tongue in the tray back to fit in the dado in the tray side, as shown in Figure 4. At this point, you can add the bottom panel and assemble the tray, which is explained in detail on page 23. W









traditional Oak Bed

The showpiece of any bedroom suite is the bed. This oak bed features rock-solid construction with eye-appealing details.

If the numerous calls and emails we've received are any indication, then a lot of you are building the oak dresser from *Woodsmith* 206. And we've already received several calls about the matching bed. Well, the wait is over.

The bed shown above complements the oak dresser perfectly, but stands on its own equally well. It's an elegant design with lots of attractive features. From the frame and panel look of the headboard and footboard to the mitered moldings, there's no doubt that this is a classic piece of furniture that will be passed on to the next generation.

On top of a great look, the combination of plywood panels and hardwood frames guarantee that the bed is plenty sturdy. But that doesn't mean it's tough to move.

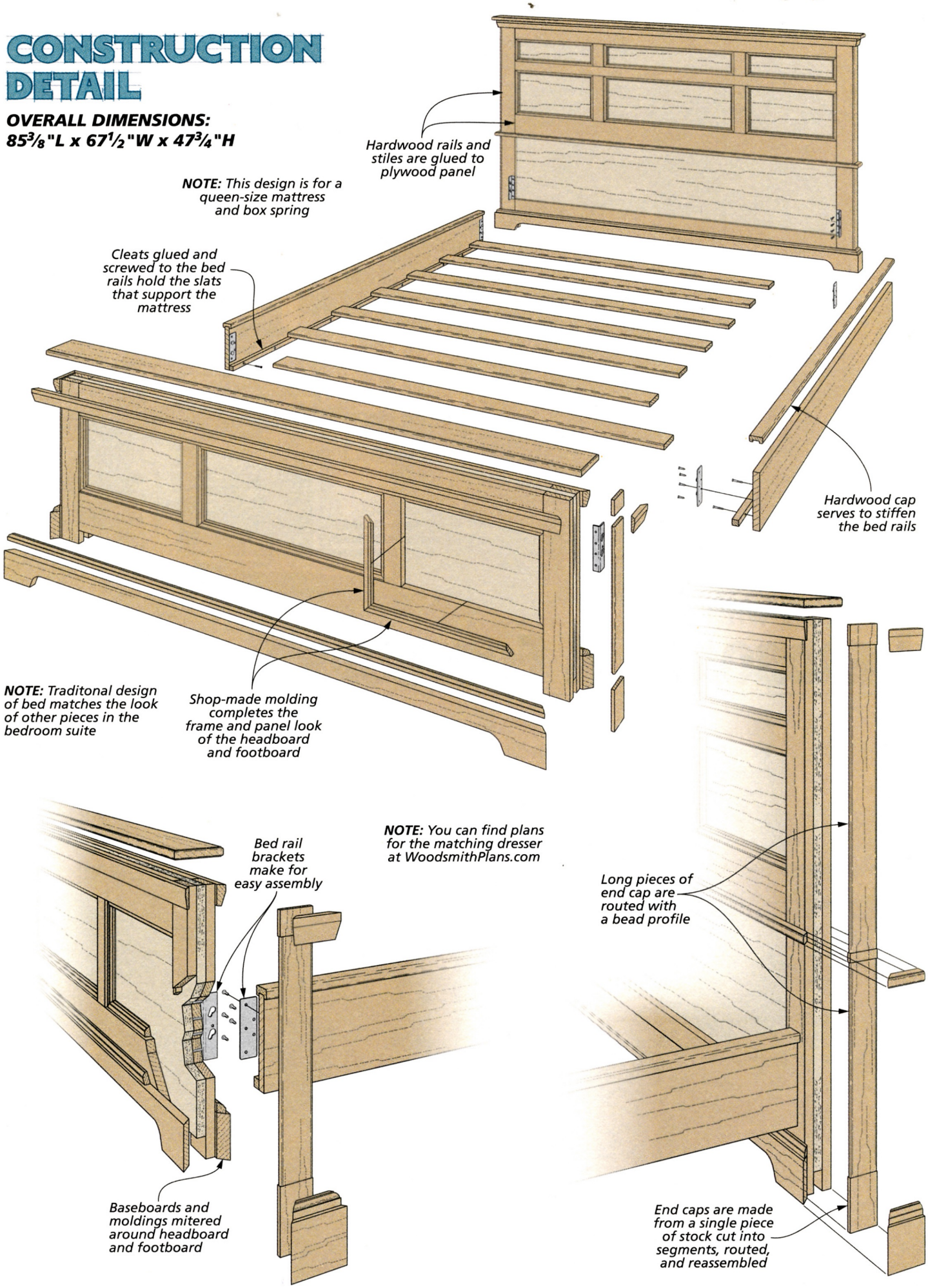
The brackets I used make taking the bed apart a breeze. But what I like best about the bed rail hardware is that it's easy to install and doesn't require a lot of fussy alignment. A couple of spacer blocks used to position the brackets during installation will ensure a good fit on the first try.

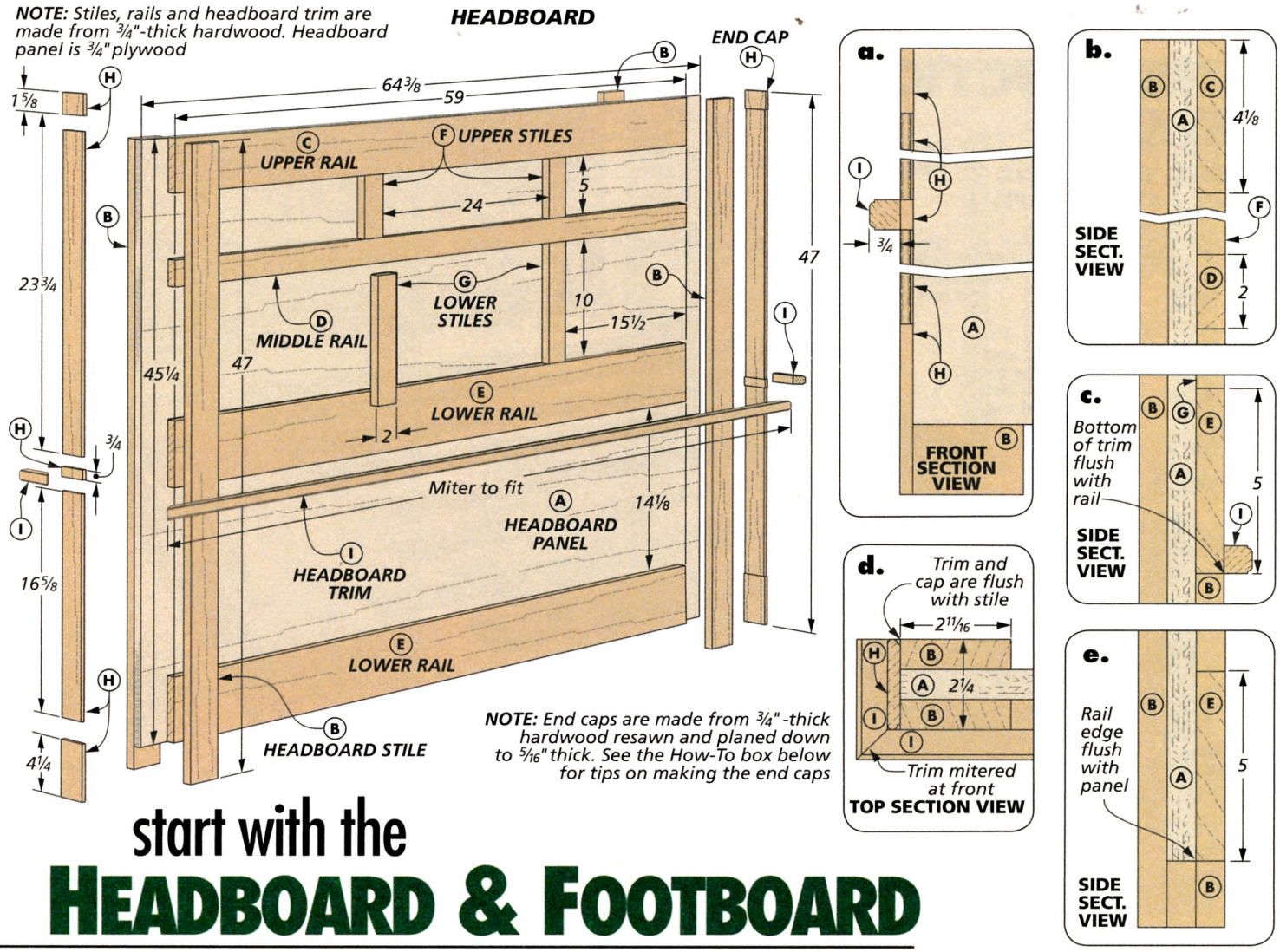
In fact, there's really nothing too difficult about building the bed. The step-by-step plan breaks the building process into a series of manageable tasks.

One word of advice before getting started: It's a good idea to have the mattress on hand before committing to the final dimensions — sizes can vary.

CONSTRUCTION DETAIL

OVERALL DIMENSIONS:
85⅜"L x 67½"W x 47¾"H





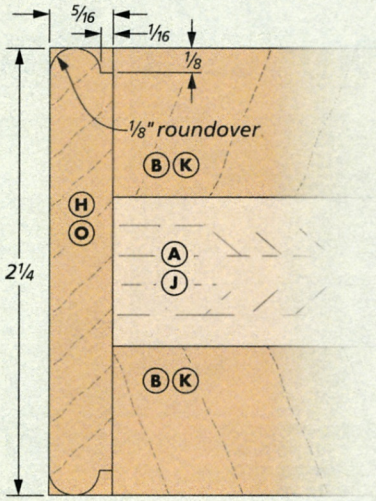
start with the HEADBOARD & FOOTBOARD

The headboard and footboard define the style of the bed. Both start with a simple plywood panel. Then, all you need to do is add the rails, stiles, and moldings to attain a beautiful result.

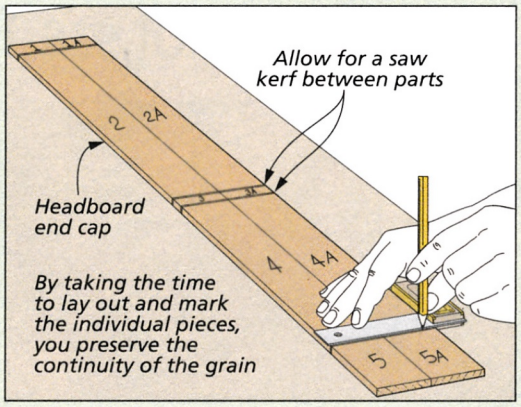
THE PANEL. Start by cutting the headboard panel to final size. It's also a good idea to give it a light sanding with 180-grit paper and then vacuum off the dust before attaching the other parts.

STILES. The stiles are the first pieces to add to the panel. By placing stiles on both the front and back, you're building up the ends to add depth to the headboard. Make sure the stiles remain

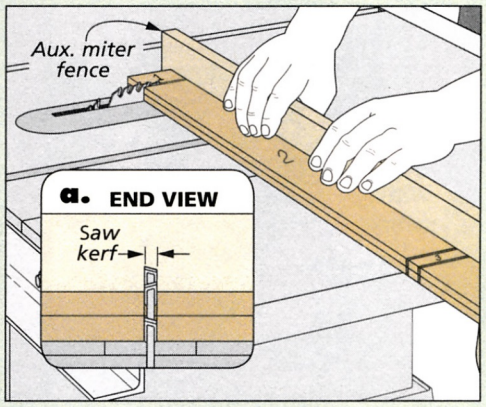
How-To: Make the End Caps



FULL SCALE END CAP PROFILE



Layout. *To keep everything in order, label the individual pieces. Remember to take into account the saw kerf when laying out the cuts.*



Cutting to Length. *Use a miter gauge equipped with an auxiliary fence to cross-cut the pieces to final length.*

flush with the top and ends of the panel when you add the glue and clamps. If they slide around too much, you can use a pin nailer to anchor them in place.

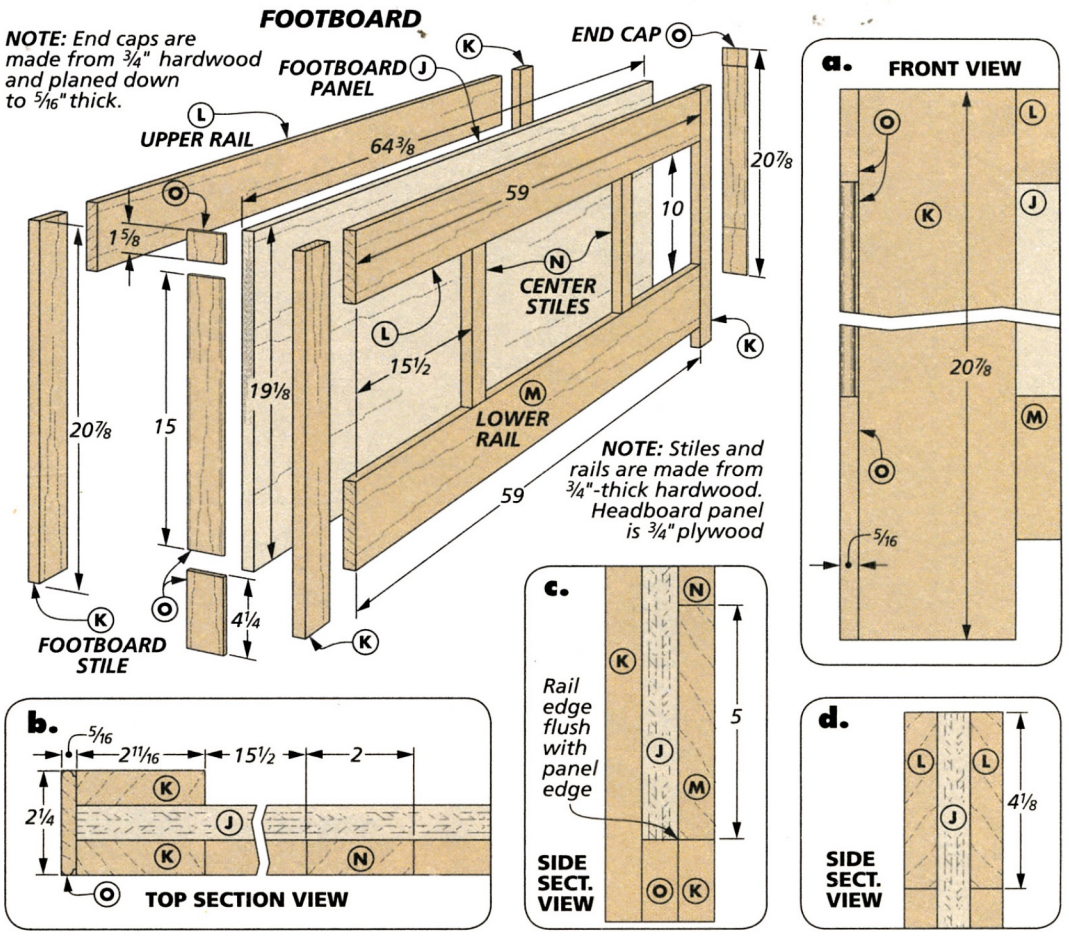
RAILS & CENTER STILES. The next step is to cut the upper, middle, and lower rails to final size. Measure accurately between the stiles at the top and bottom to be sure you have the exact length of the pieces. Now you can cut the remaining rails and stiles to final size. At this point, I put the headboard on a pair of sawhorses and dry fit the rails and stiles in place.

Starting with the top rail, add glue and clamps to attach it to the panel. Then add the remaining pieces in order, from the top down. This helps eliminate the possibility of gaps between the rails and stiles. Once again, add a few pins to hold things in place. After securing the upper stiles, add the middle rail, then the lower stiles. Finally, you can glue the two lower rails in place.

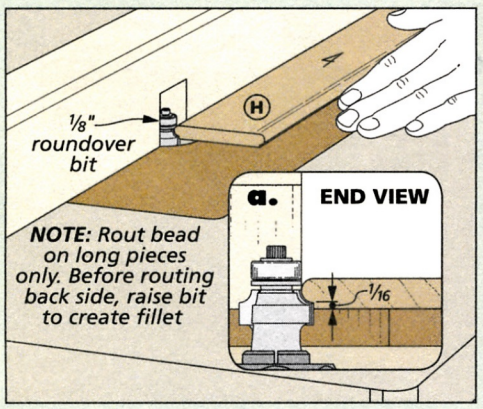
END CAP. To cover the plywood edges and the stiles, I made a thin, beaded end cap. Each cap starts out as a single blank, resawn and planed to 5/16" thick. I cut each one into the five pieces as shown in the drawings at the bottom of the opposite page. (You'll want to mark the pieces so you can keep them in order and maintain the grain pattern.) By using this method, I was able to rout an edge profile on the two long, inner segments (left drawing below). After that, it's just a matter of attaching the segments to the ends of the headboard.

TRIM. The center and right drawings below show how I made the headboard trim. You just rout the profile on the edge of a wide blank, then rip the strip of trim free from the edge. Detail 'd' on the facing page shows how the trim is mitered around the front edge of the headboard and cut flush with the back stile.

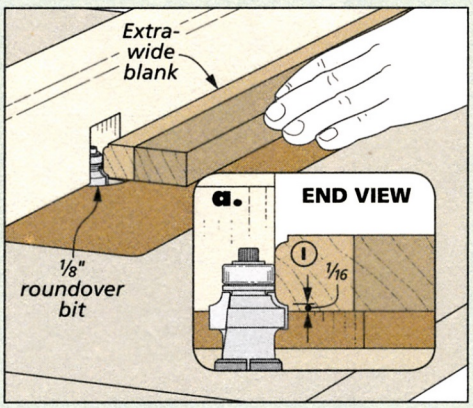
FOOTBOARD. You'll use the same techniques to build the footboard. The only differences are the size and addition of another top rail on the inside of the footboard.



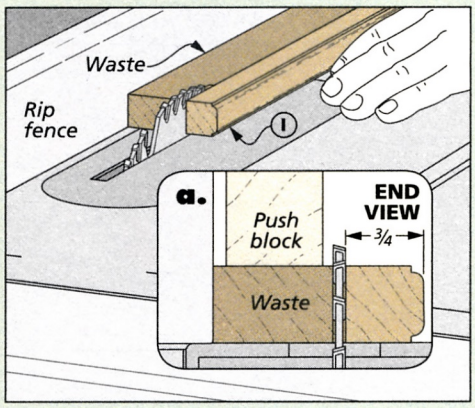
Edge Routing & Headboard Trim



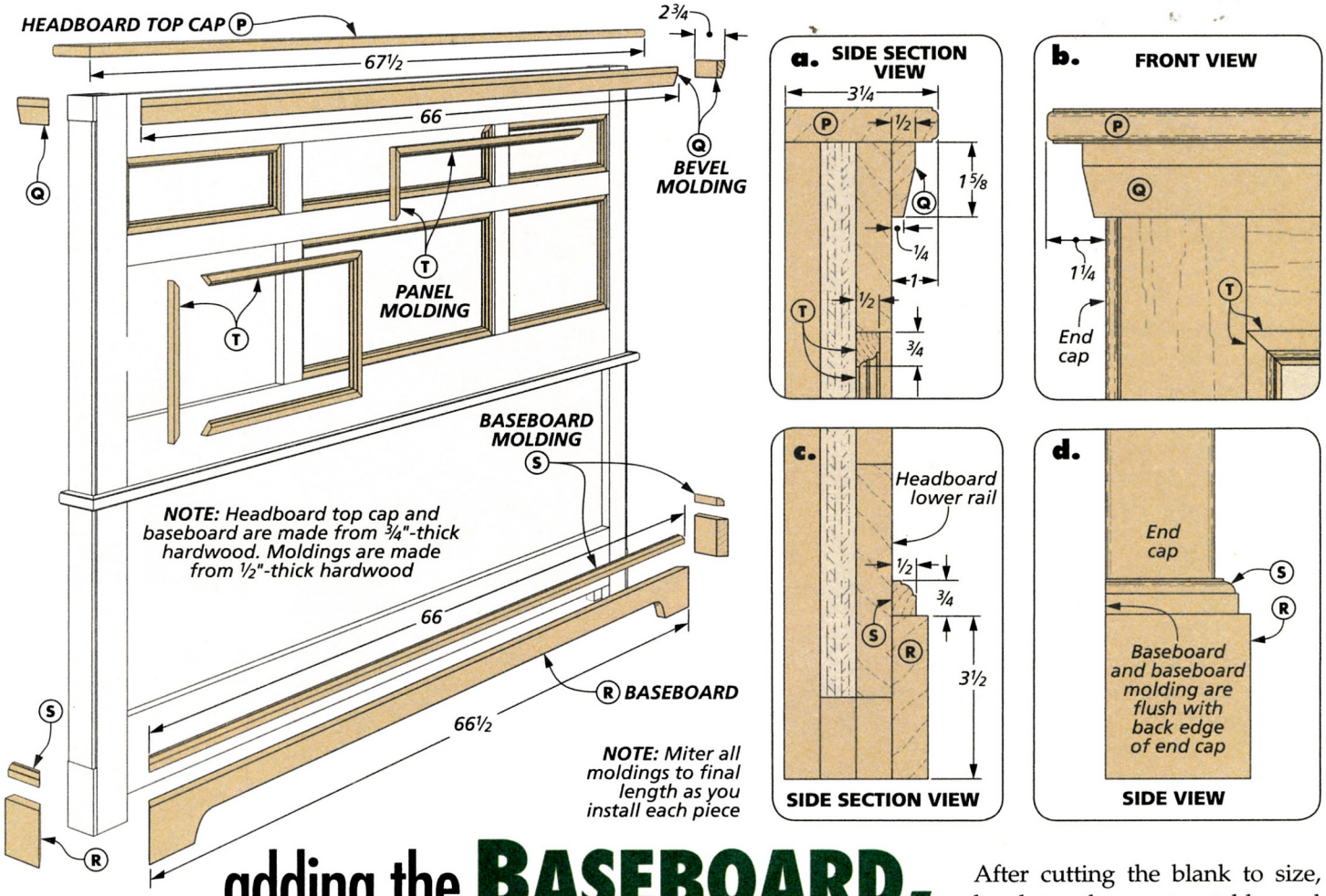
End Cap. *First, rout a shallow roundover on the outside edges, then raise the bit and rout the inside to complete the profile.*



Headboard Trim. *It's easier and safer to rout the profile for the headboard trim on an extra-wide blank.*



Trim to Width. *Set up the cut so that the trim falls to the outside of the blade. Then rip the trim free from the blank.*

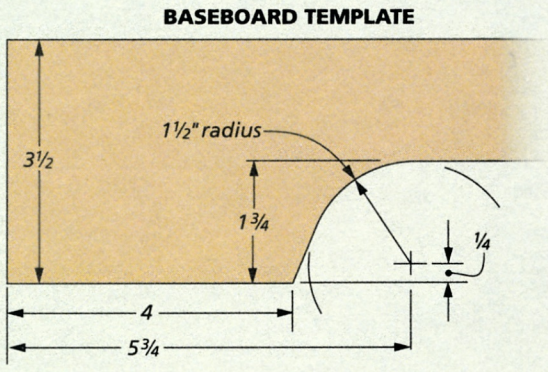


adding the BASEBOARD, MOLDING & CAP

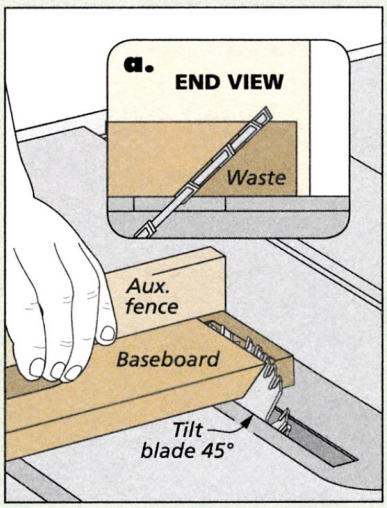
After creating the basic look of a frame and panel headboard and footboard, you're ready to add the details. It's the addition of the baseboards and moldings that really give the pieces a more formal look. A hardwood cap tops it off. During these steps, you'll get lots of practice mitering pieces for a perfect fit.

TOP CAP. The first thing to add is a cap to the top of the headboard. After cutting the blank to size, head to the router table and rout the edge profile on the ends and front edge. For this, all you need is a ⅛" roundover bit in the router table and a backer board or miter gauge to rout the ends of the blank. Detail 'b' shows the roundover with a filet on the finished shape of the ends. It's the same profile you used for the headboard trim earlier.

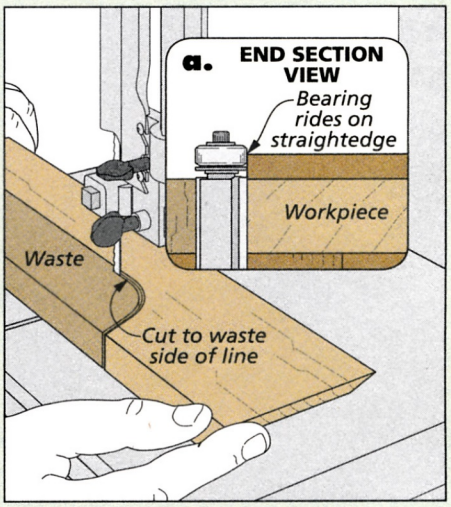
How-To: Baseboard



Baseboard Template. *Lay out the shape of the baseboard profile on ¼" hardboard. Then cut it to shape and sand it smooth.*



Miter. *Start by ripping the baseboard blanks to width before mitering them to final length.*



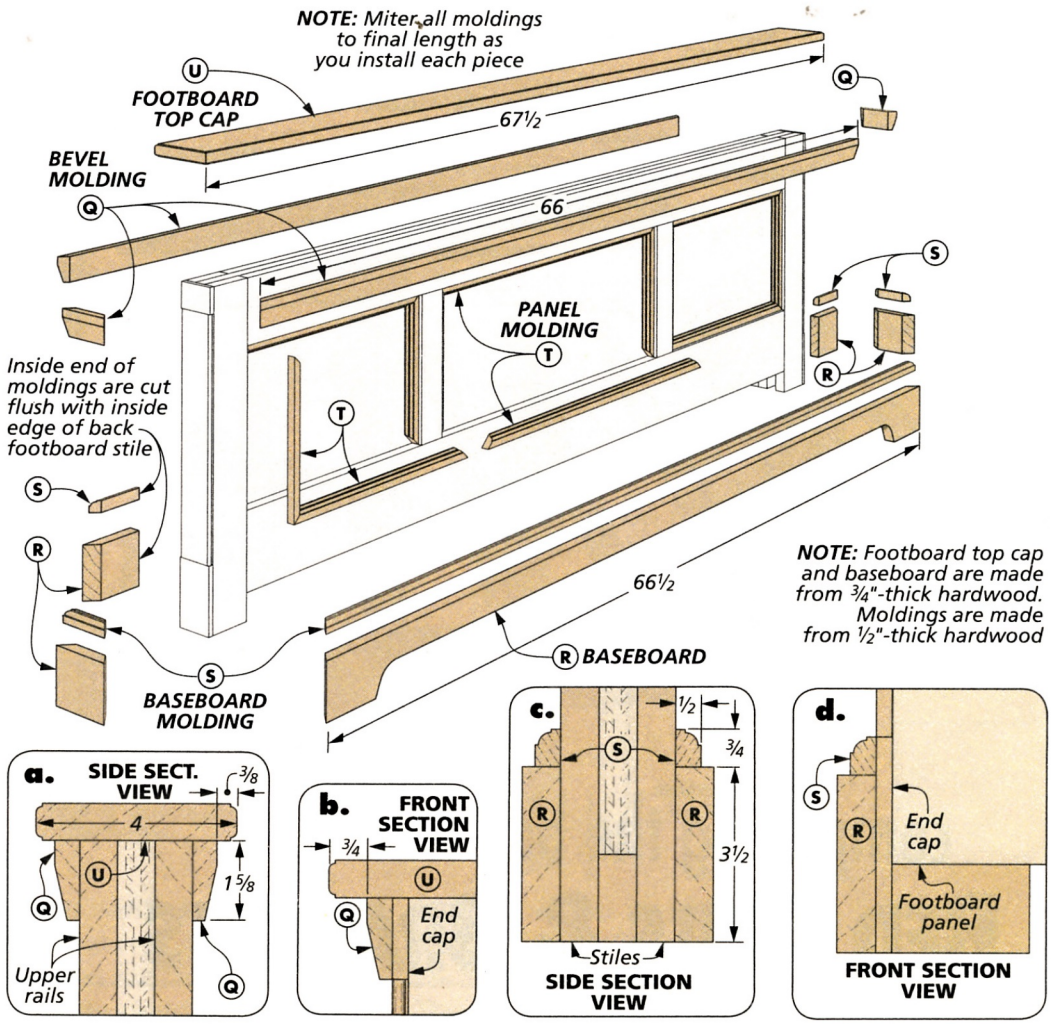
Cutout. *Remove most of the waste at the band saw. Then attach the template and trim the workpiece flush (detail 'a').*

As you can see in detail 'a' on the opposite page, the cap is installed flush on the back side. Attach it with glue and clamps.

BEVEL MOLDING. Just below the top cap I added a wide piece of bevel molding, mitered to fit around the edges. Once again, this is a simple, shop-made molding I cut at the table saw (the left drawing in the box below shows how). You'll use this same molding on the footboard, so make sure to cut two extra-long pieces while you have the saw set up.

BASEBOARD. A baseboard gives the bottom a finished look. On top of that, it's one of the features that ties together the other pieces in the bedroom suite. All you need to do is cut a long blank to final width and then miter the pieces to length. At this point, I dry-fit the pieces to ensure tight-fitting miters before moving on. The box at the bottom of the facing page shows how you can lay out and cut the baseboard profile.

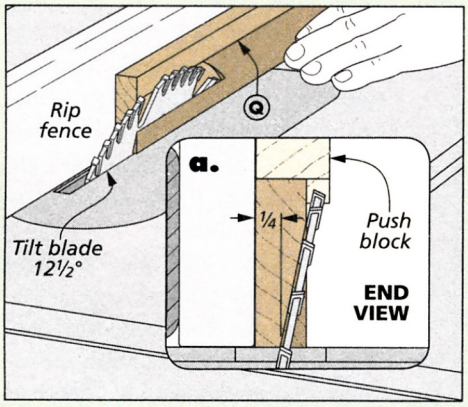
Another piece of molding fits on top of the baseboard to ease the transition. The center drawing below shows how to rout the profile on a wide blank at the router table. When you're done, rip the molding into strips at the table saw and attach it with glue. As before, I mitered the molding to wrap around the corners.



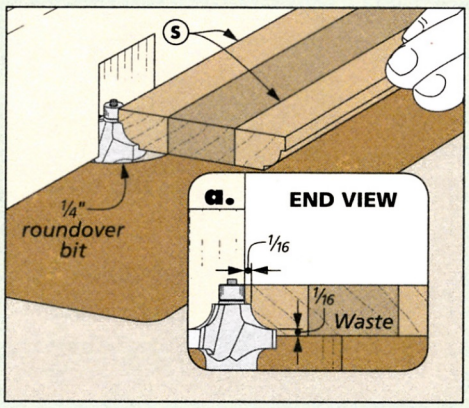
PANEL MOLDING. One final touch really adds to the visual appeal. By adding molding around each of the "panels," they take on a more formal appearance. I used another profile bit to create the molding and then mitered each individual piece for a perfect fit.

FOOTBOARD. The nice thing about this design is that you'll use the same moldings you made earlier to complete the footboard. Follow the same procedure. Once again, you'll need to add molding to both sides of the top of the footboard and baseboard.

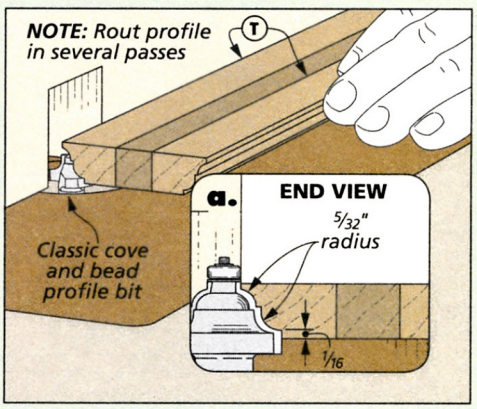
Molding Profiles



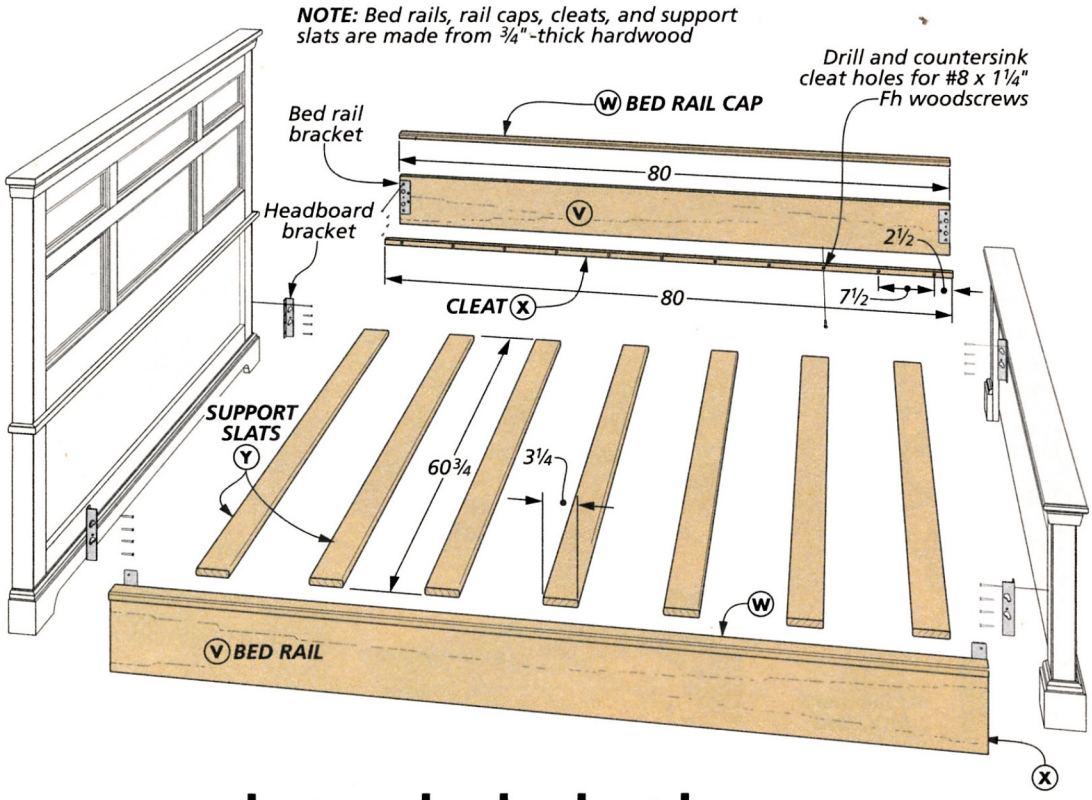
Bevel Molding. *You'll need a couple of extra-long blanks to make the bevel molding for the headboard and footboard.*

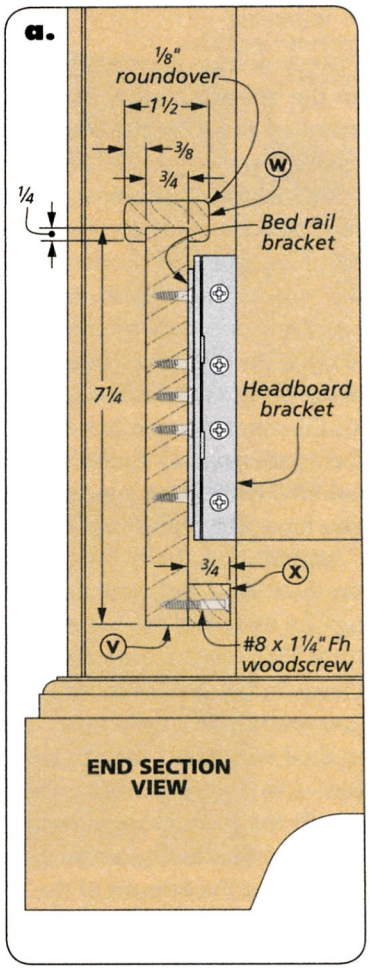


Baseboard Molding. *By starting with an extra-wide blank, you can rout the profile on both edges, then rip the molding free.*



Panel Molding. *After changing bits in the router, use the same technique to rout the panel molding and rip the strips to width.*





completing the bed with BED RAILS & BRACKETS

It's pretty smooth sailing from here on in. You'll start by making a pair of hardwood bed rails and caps. Then you can attach a cleat to each rail and install the hardware to connect the rails to the headboard and footboard. After that it's just a matter of adding the hardwood support slats to hold the mattress.

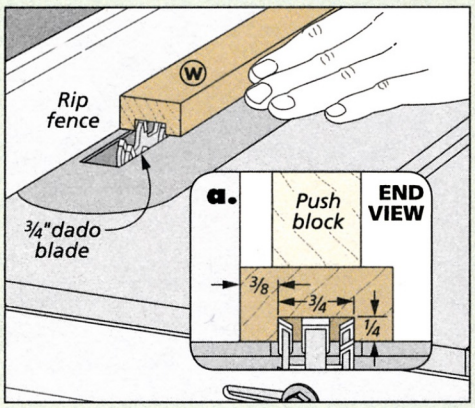
BED RAILS. A pair of bed rails tie the headboard and footboard together. I made the rails out of straight-grained hardwood. Then, I added a cap to the top edge to give the rails a more substantial look. A groove on one face fits over the rails. Use a dado blade in the table saw to cut the groove for a snug fit (box below, left). A simple roundover profile on the caps softens the hard edges. You can then attach the caps to the rails with glue.

CLEATS. A long cleat on the inside face of each rail holds the support slats. In addition to gluing the cleats, I also screwed them to the rails for plenty of holding power.

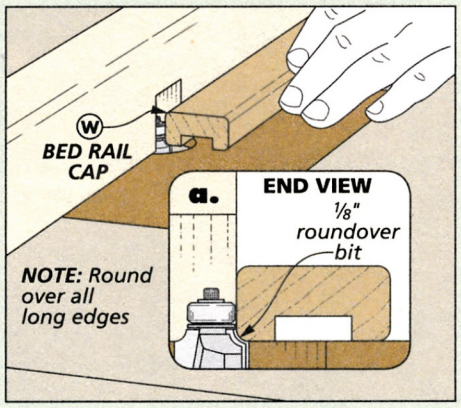
SUPPORT SLATS. The slats of any bed need to be strong to support the weight of the box spring, mattress, and the people sleeping. I used oak for the slats, but you could save a few bucks by substituting poplar for these slats, instead. It's a strong hardwood but less expensive than the oak. All you need to do is cut the slats to final size.

FINAL SETUP. Now you've completed all the parts, but you still need to put the bed together. Fortunately, bed assembly hardware makes this a snap. The bed rail brackets shown in the drawings above and on the opposite page couldn't be easier to install.

How-To: Shaping the Rail Cap



Cut a Groove. *With a dado blade sized to match the thickness of the rails, cut a centered groove in the rail caps.*



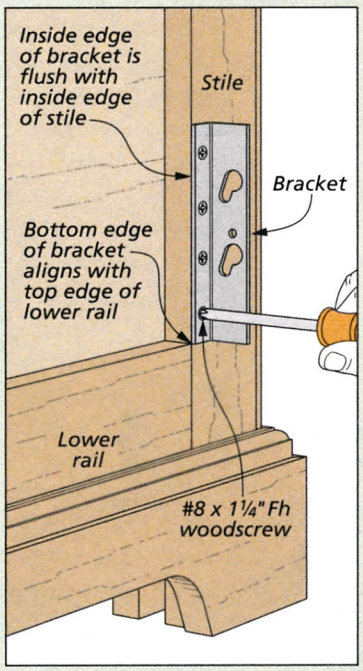
Rout the Roundovers. *Next, head to the router table to rout the roundovers on the edges of the rail caps.*

The only thing to keep in mind is the position. The How-To box at right walks you through the installation process.

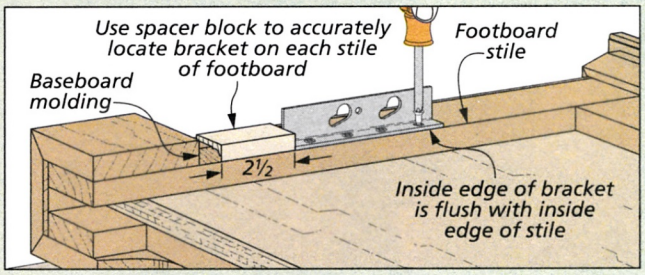
I wanted to make sure the receiving brackets on the headboard and footboard were flush with the inside edge of the stiles and the top of the lower rail on the headboard (left drawing). I used a spacer block to keep them at the same height on the footboard. You can install them with screws. The post brackets on the bed rails should also be flush with the ends of the rails and at the same height. Once again, a spacer block makes this installation pretty easy.

After staining and finishing, your bed is ready to go. (See Sources on page 51 for the finish information). Coming soon, you'll find the plans for a matching nightstand and a mirror to round out the suite.

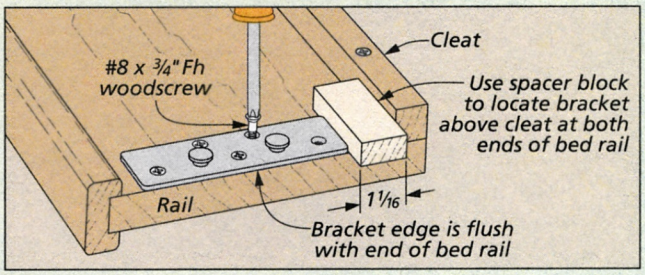
How-To: Install Brackets



Headboard Bracket. *Place the bracket as shown and drill pilot holes before adding the screws.*



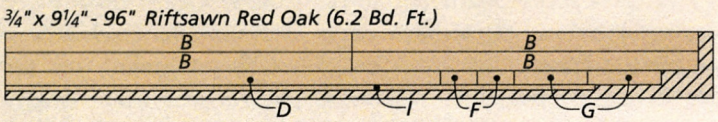
Footboard Bracket. *Cut a small gauge block out of a piece of scrap to use as an alignment tool. Then, all you need to do is align the edge flush for a perfect match.*

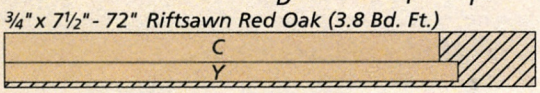


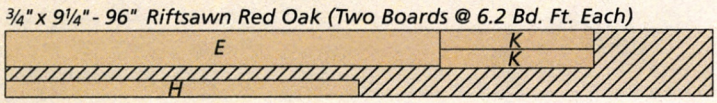
Rail Bracket. *Make another gauge block to vertically align the brackets on the ends of the rails. The edge of this bracket needs to be flush with the end for a snug assembly.*

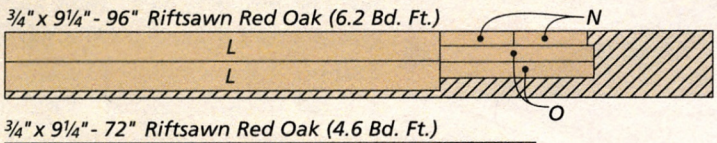
Materials, Supplies & Cutting Diagram

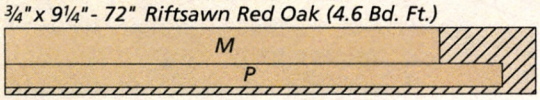
A	Headboard Panel (1)	¾ ply. - 45¼ x 64⅜	**K**	Footboard Stiles (4)	¾ x 2 11/16 - 20⅞	**U**	Footboard Top Cap (1)	¾ x 4 - 67½
B	Headboard Stiles (4)	¾ x 2 11/16 - 47	**L**	Footboard Upper Rails (2)	¾ x 4⅛ - 59	**V**	Bed Rails (2)	¾ x 7¼ - 80
C	Headboard Upper Rail (1)	¾ x 4⅛ - 59	**M**	Footboard Lower Rail (1)	¾ x 5 - 59	**W**	Bed Rail Caps (2)	¾ x 1½ - 80
D	Headboard Middle Rail (1)	¾ x 2 - 59	**N**	Footboard Center Stiles (2)	¾ x 2 - 10	**X**	Cleats (2)	¾ x ¾ - 80
E	Headboard Lower Rails (2)	¾ x 5 - 59	**O**	Footboard End Caps (2)	5/16 x 2¼ - 20⅞	**Y**	Support Slats (7)	¾ x 3¼ - 60¾
F	Headboard Upper Stiles (2)	¾ x 2 - 5	**P**	Headboard Top Cap (1)	¾ x 3¼ - 67½			
G	Headboard Lower Stiles (2)	¾ x 2 - 10	**Q**	Bevel Molding (1)	½ x 1⅝ - 20 ft. rgh.	•	(4) Bed Rail Brackets	
H	Headboard End Caps (2)	5/16 x 2¼ - 47	**R**	Baseboard (1)	¾ x 3½ - 15 ft. rgh.	•	(38) #8 x 1¼" Fh Woodscrews	
I	Headboard Trim (1)	¾ x ¾ - 80 rgh.	**S**	Baseboard Molding (1)	½ x ¾ - 15 ft. rgh.	•	(20) #8 x ¾" Fh Woodscrews	
J	Footboard Panel (1)	¾ ply. - 19⅛ x 64⅜	**T**	Panel Molding (1)	½ x ¾ - 50 ft. rgh.			

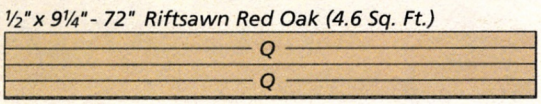


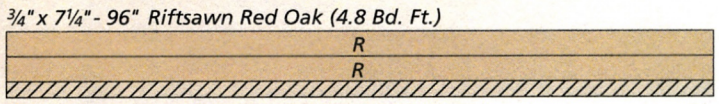


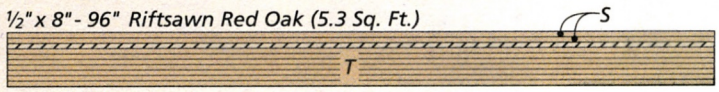


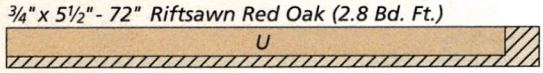


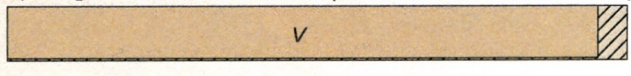


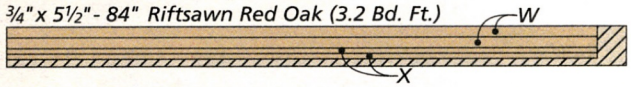


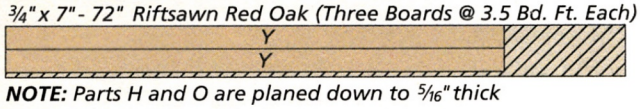












NOTE: *Parts H and O are planed down to 5/16" thick*

ALSO NEEDED: *One 48" x 96" Sheet of ¾" Riftsawn Red Oak Plywood*
One 24" x 96" Sheet of ¾" Riftsawn Red Oak Plywood

perfect-fitting Box Joints

The alternating grain makes box joints attractive.

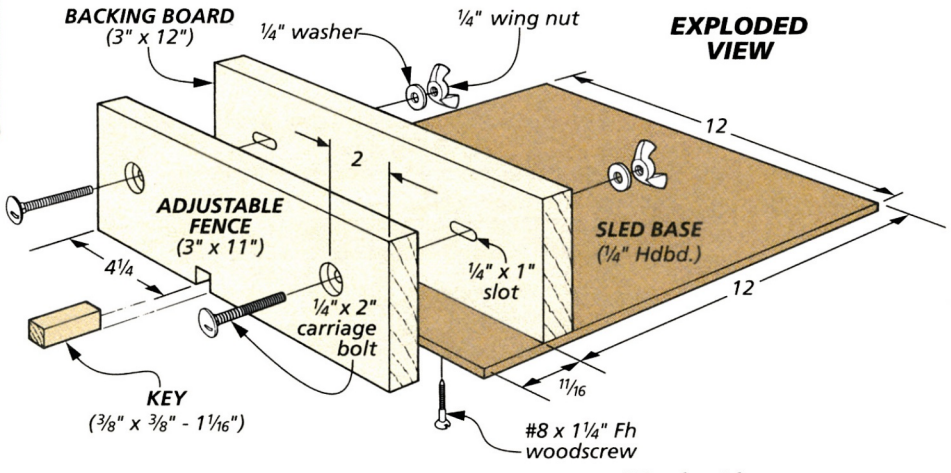
For good-looking and strong joinery, it's hard to beat box joints. With a little patience and a shop-made jig, they're easy to make.

Making snug-fitting box joints is a fundamental woodworking skill. This type of joint not only provides plenty of glue surface to guarantee a strong assembly, but it's also an attractive look for your project. Best of all, you can make a simple table saw or router table jig for cutting perfect box joints out of scraps you have lying around. And after you've learned the basics, you can even try some variations on this classic joint.

THE JIG. Whether you use a router table or the table saw, the jig for cutting box joints uses the same principle. A fence attached to a miter gauge or sled is used to hold the stock on end. A key, sized to match the thickness of the cutter, is integrated into the fence. The distance from the cutter to the key is the same as the width of the cut.

For stock ½" thick or less, I prefer the router table method because of the clean surfaces and crisp corners left by a sharp bit. The router table method also eliminates the need for the trial-and-error exercise of shimming a dado stack for a perfect joint. But if you're working with stock thicker than ½", then the table saw is a better choice for removing material to create the box joint.

With the router table jig shown at left, you can cut ¼", ⅜", and ½"



box joints with ease. (You'll need a separate fence and key for each size of box joint.)

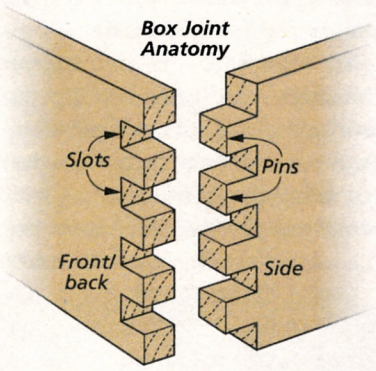
Another plus to this router jig is it's also perfect for creating variably spaced fingers. I'll talk more about that later.

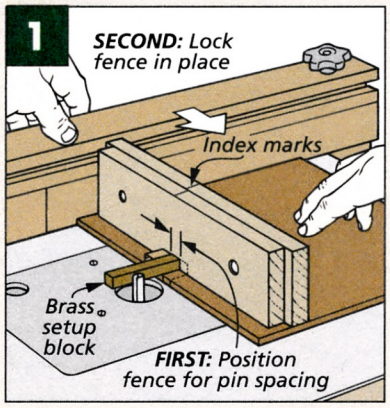
THE SETUP

The drawings at right show you how to set up the jig on the router table. The first step is to install a straight bit the same diameter as the width of the fingers on the joint. In my case, it's a ⅜"-dia. bit since I'm using a ⅜"-wide key. Set the height of the bit slightly higher than the thickness of the workpiece plus the thickness of the sled base. This leaves the pins on the assembled joint a little proud, so you can sand them flush later.

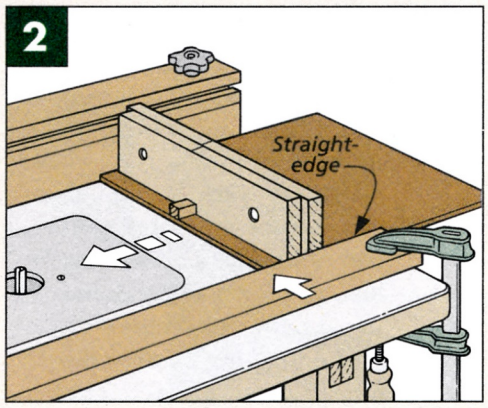
The next step is to set the distance between the bit and the key (Figure 1). Here, a brass or aluminum setup block between the key and router bit helps with initial positioning of the fence.

To prevent side-to-side movement while cutting the box joints, I trap the jig between the fence and a straightedge, as illustrated in Figure 2. Just make sure the jig slides smoothly (without play) across the length of the table. Finally, to prevent the bit from cutting through the backing board, I clamp a stop block to the router table fence (Figure 3).

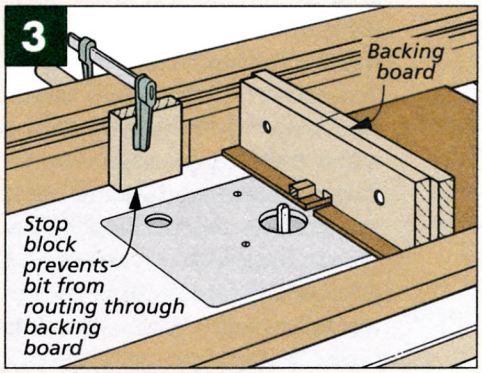




Fence. *Position the router table fence so the gap between the bit and key matches the key width.*



Guide. *For an accurate cut, clamp a straightedge to the tabletop parallel to the fence to act as a guide for the jig.*

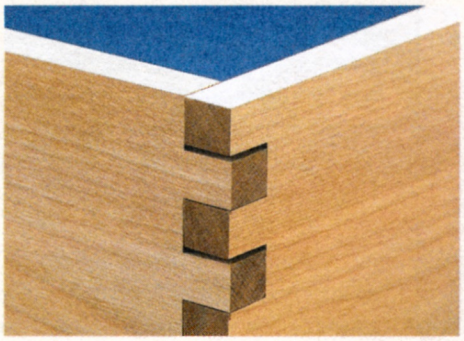


Stop Block. *Position a stop block on the fence to prevent the bit from cutting through the backing board.*

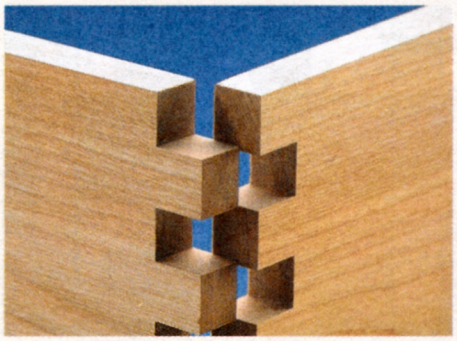
TEST PIECES. You're ready to start making some sawdust. It's a good idea to have some extra stock on hand for making test cuts. You'll probably need to make a few cuts and adjustments before you zero in on a perfect fit.

I mill these test pieces along with the actual project parts to ensure they're the same thickness. I use narrow test pieces, so I can cut both halves of the joint and test the fit. Remember, you can make a test cut and cut off the fingers to try again. It doesn't take long to zero in on a gap-free joint.

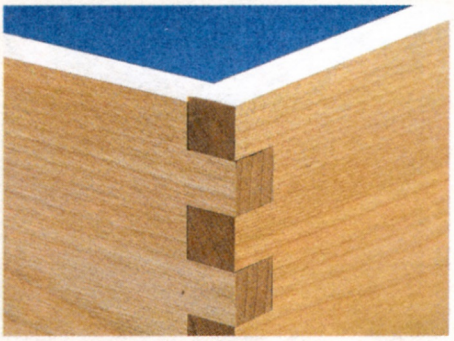
ADJUSTMENTS. The photos below show you what to do if you have trouble getting a good fit. If the joint is too tight, move the key closer to the bit by adjusting the fence. If the joint is too loose, move it away from the bit. I'm talking about making very small adjustments. It's easy to go overboard when making these fine tweaks. Making a pencil mark on the top edge of the fence and backing board makes it easier to monitor your progress.



▲ **Gap**. A gap between each pin and slot is caused by a key that's too close to the bit.



▲ **Too Tight**. If the pins won't fit in the slots at all, the key is set too far away from the router bit.

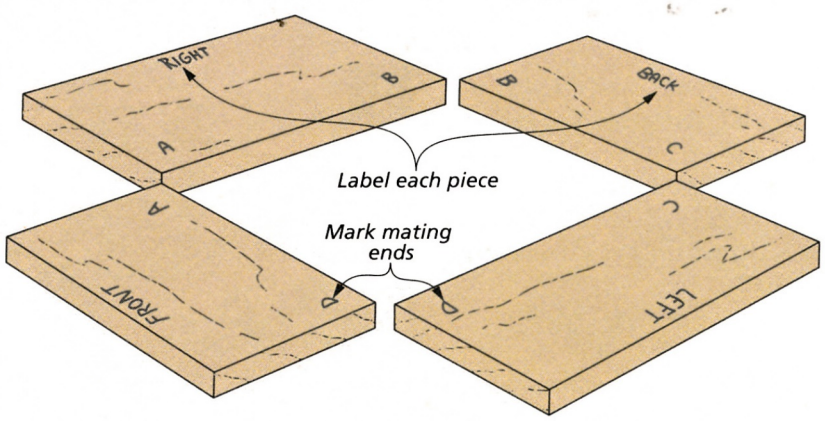


▲ **Offset**. An offset can be caused by not having the workpiece fully seated against the key.

BOX JOINT TECHNIQUE

Before you start cutting the project parts, there are a couple of things I want to mention up front.

LABEL THE PARTS. It pays to take a minute to label each end of the four pieces of the box, as shown in the drawing at right. This helps with positioning the piece in the jig and ensures you're cutting the correct profile on each end of the workpieces.



NARROWER IS BETTER. Another thing to keep in mind when considering box joints for a project is the width. The probability of error increases with the width of the workpieces. In other words, the wider the workpieces, the more difficult it is to cut the joints accurately. Even the smallest difference in the width of the pins and slots will be multiplied as the workpiece gets wider. For this reason, I seldom use box joints on workpieces wider than 6".

There's one other reminder I want to mention before you start. As I said before, make sure to always keep the workpiece tight against both the fence and the base of the jig during the cut. This helps ensure a proper-fitting, gap-free box joint. Once you get into a rhythm, it becomes second nature.

Now you're ready to get to work on the project. Use the drawings here and on the opposite page to guide you through the process of cutting each workpiece.

FRONT & BACK. In Figure 1, you can see how the first slot is located and cut on the front and back workpieces. Simply butt the edge against the key and make the cut. To finish the joinery on that end of the workpiece, slip the slot over the key and make the next cut (Figure 2). Repeat this process all along the end until you reach the opposite edge.

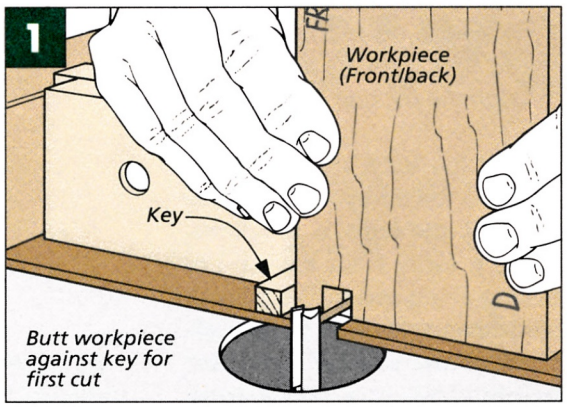
Figure 3 shows how to flip the workpiece end over end to repeat these cuts on the opposite end. Remember to keep the same edge of the workpiece against the key to start. The process is the same for the other side of the box.

SIDE PIECES. The technique for cutting the two side pieces is a little different. Since you started by creating a pin on the front and back pieces, you'll need to start on the side pieces with a slot. To locate the first slot on the side pieces, you'll use the front or back piece as an index.

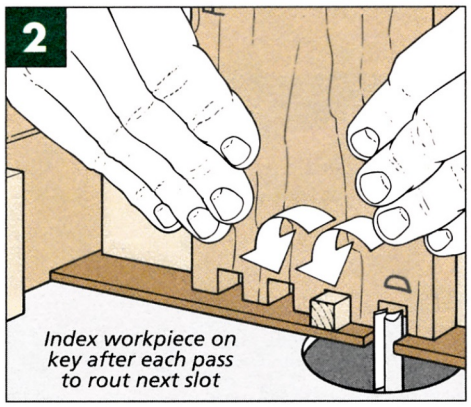
Figure 4 shows what I mean. Butt the side piece against the edge of the front or back workpiece. Hold the pieces tight to the fence, and then make the cut. From here on out, the process of slipping the slot over the key and making the subsequent cuts is the same as before (Figure 5).

To complete the joinery on the sides, you'll need to flip the workpiece end over end as before. And remember to index the first cut using the front or back piece. Simply repeat the process to cut the joinery on the opposite side.

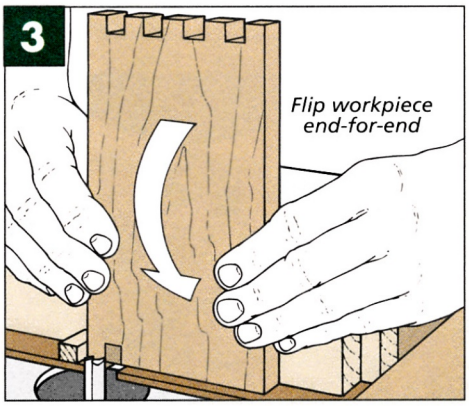
GROOVE FOR THE BOTTOM. Every box has to have a bottom. An easy way to incorporate one is to cut a groove in all the box parts. But doing this means that part of the groove will be exposed after the box is assembled. I solve this problem by cutting an end-grain plug to fill the gap, as in Figure 6. The gap all but disappears.



Front and back. *For the first slot in the front (or back), hold the workpiece tight against the key and firmly against the fence.*



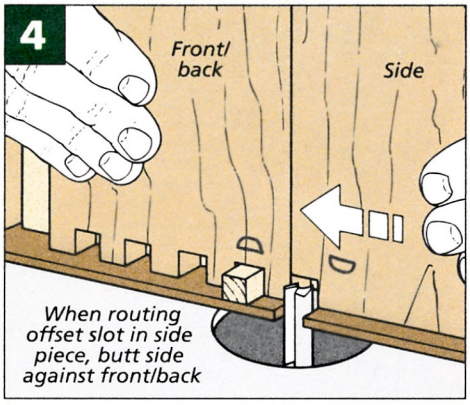
Index. *For the next slot, lift the workpiece, slip it onto the key, and take another pass. Repeat the process.*



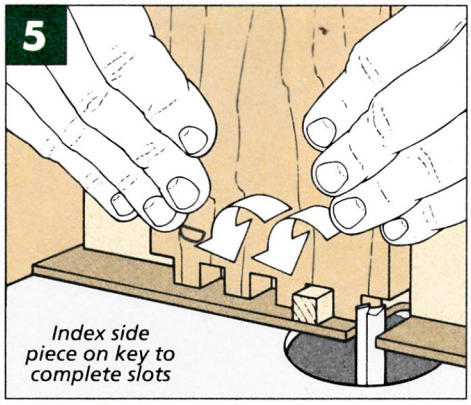
Flip. *The matching slots on the opposite end are cut by flipping the workpiece end-for-end and repeating the procedure.*

ASSEMBLY & CLAMPING

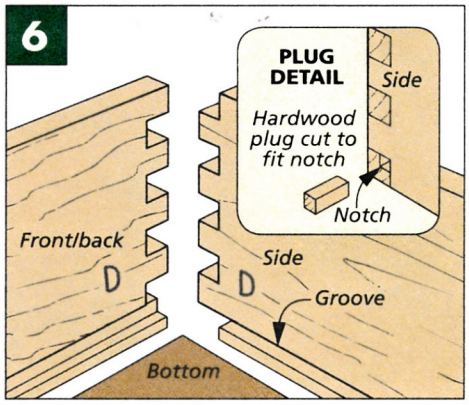
After cutting all the joinery and grooves for the box bottom, the assembly is pretty straightforward. I use band clamps and simple cauls, as shown in the photo



First Cut in the Side Piece. *Locate the first slot in the side piece by using the front or back piece as an index.*



Complete the Sides. *The process continues the same as before: Slip the notch over the key for each subsequent cut.*



Groove for Bottom. *The gaps from the groove in the assembled joint can be filled with a matching plug and sanded smooth.*

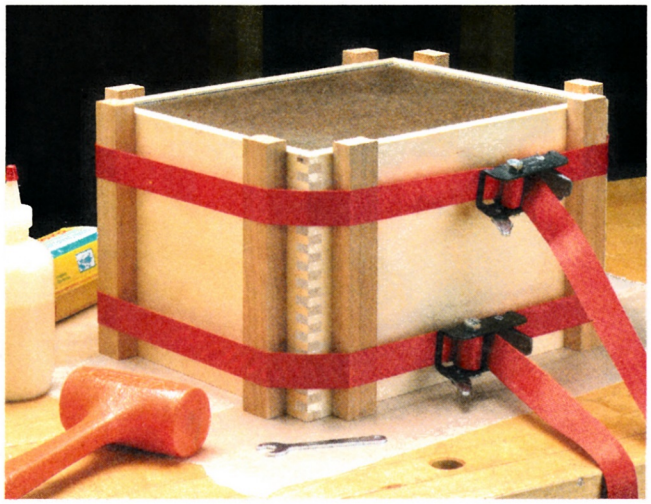
at right. You'll want to have the clamps and cauls within reach before applying the glue. A dry assembly can also be a good idea.

As you apply glue to the sides of the pins and slots, assemble one joint at a time. Use a square to keep things in position as you go. Before adding the fourth side of the box, slip the bottom panel into the groove. Tap the fourth piece in place to complete the assembly.

Position the cauls adjacent to, but not on top of, the box joints. This helps draw the joints together. Then you can apply the clamps, double-checking that the assembly is square.

After the glue dries, you can remove the clamps and cauls. At this point, I'll cut and glue in the plugs to fill the gaps that resulted from cutting the grooves for the bottom. You're looking for a seamless fit here. You can leave the plugs proud for now and simply sand them and the pins flush with the sides after the glue dries. In the end, the box should have tight-fitting joinery with no gaps.

As you can see, with careful setup and a simple jig, making box joints is easier than it might appear at first. To create a little variety and add visual interest, see the box below. W



▲ Simple cauls and band clamps result in tight joinery. The cauls are offset from the joint to apply pressure to draw the box joints tight.

Box Joint Variations

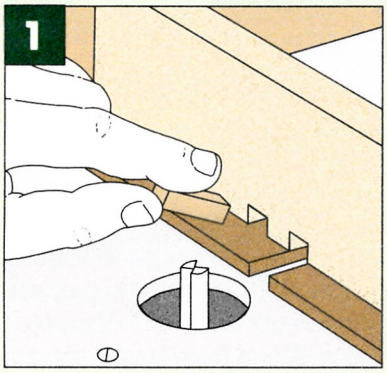
One of the things I like to do is change up the spacing of standard box joints for a different look. The router table jig makes this easy to do. There are many options limited only by your creativity. You can see two examples of joint variations in the margin photo.

SKIP A PIN. The easiest way to change the look is to skip a pin. The best way to do this is to cut the first notch or two on the front and back pieces, rotate the workpiece 180°, and repeat these cuts on the opposite edge, leaving a space in the center.

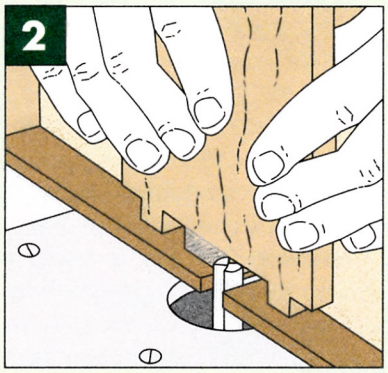
On the mating side workpieces, cutting the first part is the same as conventional box joints. You're going to use the front to index the first cut on the side.

Use the front piece to lay out the center cuts on the sides. By carefully aligning these marks with the slot on the jig, it's pretty easy to cut to the line (Figure 2).

VARY THE SIZES. By using different sized fingers, you can create visually interesting designs. As before, start by creating one edge to use as your template. Use this for laying out the mating piece and cut to the line as before.



Remove Key. *To remove the waste in the center of the side pieces, remove the key.*



Cut to the Line. *After laying out the joinery, use the slot in the jig as a guide to remove the waste.*

the mighty Scraper

Not all tools need to be updated for the modern wood shop. The simple hand scraper is as useful today as it was ages ago.

A hand scraper, sometimes called a card scraper, is nothing more than a small piece of flexible steel. But when you learn how to sharpen and use it properly, it can become one of your go-to tools.

With a scraper, you smooth a surface by removing the very finest of shavings. And when it comes to figured woods, you can scrape them without fear of tearout. All it takes is a few minutes to learn how to tune up a scraper and start making shavings.

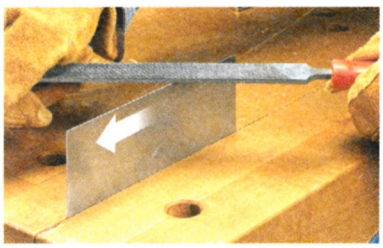
CHOOSING. You can use just about any type of tool or spring steel for a scraper. In fact, some people make their own out of the blades from old hand saws. But if you're shopping for a new scraper, there are a couple things to look for.

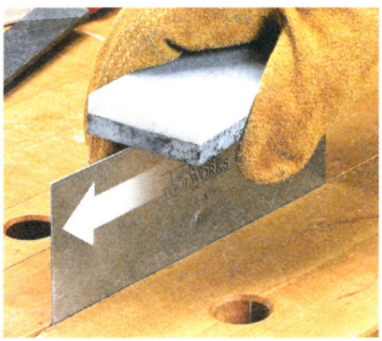
First, it's important that the steel isn't too hard or you'll have some difficulty sharpening it. Look for a hardness of around Rc50 for the steel. This is hard enough to retain a good edge, but still relatively easy to sharpen.

The second thing to consider is the thickness of the steel. A thin scraper (around .020") allows you to bend it more easily and works well for small areas. A thicker blade (.032") is better for keeping a larger surface flat while smoothing. Finally, there are curved scrapers for working both inside and outside curves (left photo).

SHARPENING. The key to using a scraper is forming a hook, or burr, on the edge. This hook is what does the actual cutting. You form the hook in a series of steps, as shown in the photos above and at the top of the opposite page.

You can find a scraper to fit the profile of just about any surface.





First, remove the old hook with a file (top photo), then hone with a medium-grit stone.

It starts with filing and stoning a clean edge. Then you use a hardened steel burnisher to draw out the steel and fold it over to create a hook. It takes some practice to get it right. Hint: A drop of oil on the edge makes burnishing easier.

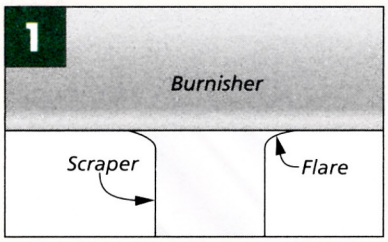
TECHNIQUES

The nice thing about scrapers is that you can use them in place of sanding. You'll need to use both hands (the scrapers shown in the box below are an exception to this rule). But you can cut on either the push or pull stroke. The drawings below show the hand positions for pushing and pulling the scraper.

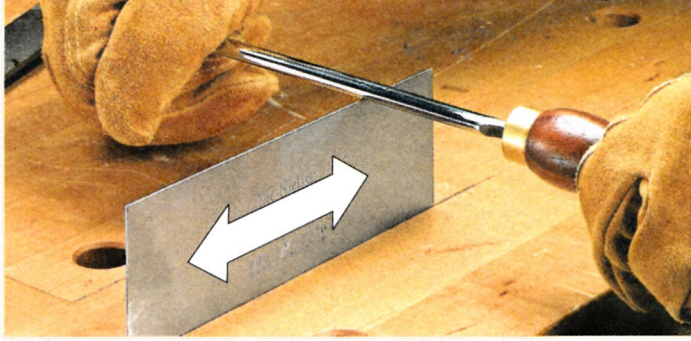
By flexing the scraper, you can concentrate the cut on a small area. This can be a big advantage in situations where you encounter a knot or difficult area of grain. But it's also easy to dish out a spot if you're not careful.

One of the advantages of using a scraper is that you get immediate feedback on how it's cutting. So you can make changes to the pitch angle or direction of the stroke on the fly — which is helpful when working with wood that has challenging grain or figure.

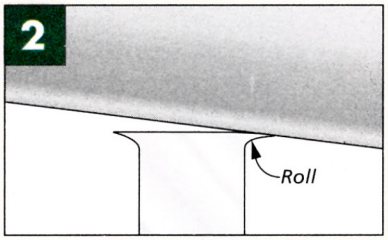
Changing the vertical angle of the scraper allows you to change the cutting action, as well. This is somewhat dependent on how heavy of a hook you put on the edge of the scraper. But it only takes a little experimentation to find what works best. The goal is to make shavings — not dust.



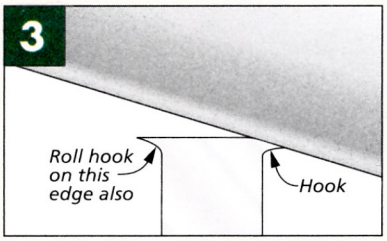
Flare the Edge. *Long strokes with the burnisher held square to the face will flare the edge.*



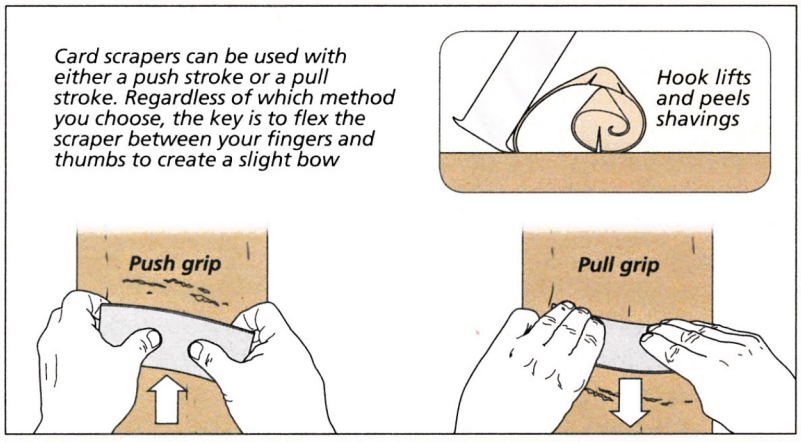
▲ Using firm pressure, run a hardened steel burnisher back and forth across the edge of the scraper to begin creating the hook.



Roll the Hook. *Now, tilt the burnisher very slightly to begin to roll the flared edge.*



Create a Sharp Hook. *Finally, a couple of light strokes at a steeper angle will create a sharp hook.*



ROUTINE MAINTENANCE. Scrapers don't require much maintenance, but they can rust if not protected. For that reason, I like to give mine a quick wiping of camellia oil before putting them away.

The most important thing to remember when storing a scraper is to protect the edges. The hook is fairly fragile, so you don't want it in a drawer where other steel tools can bang into it. Many manufacturers and retailers sell leather "wallets" that safely hold several scrapers.

Once you've mastered the scraper, you'll probably want to keep one close by your workbench. It's a great option for getting a flawless surface.

Ultimate Scrapers

It's hard to imagine improving upon a tool as simple as a scraper. But recently, when I heard about the *Ultimate Scrapers* from *Stewart-MacDonald*, I decided to give them a try (Sources page 51).

As you can see in the photos at right, these scrapers are made from much thicker steel than a conventional card scraper. Although they were originally designed for luthiers, they also work great for smoothing coves or other molding profiles often used in furniture. They can be sharpened with just a light touch of a fine grinding wheel, and they're a real pleasure to use.

▲ Available in two different sizes, *Ultimate Scrapers* are made out of ⅛"-thick, hardened steel. Like traditional scrapers, they can be used with either a push or pull stroke.

a classic

Limed Oak Finish

This "old-fashioned" technique is a great way to put a new look on your oak project. And I guarantee it's as easy as pie.

If you just wait long enough, everything that was once popular gets a second chance in the limelight — pardon the pun. This is the case with a traditional limed oak finish that was very fashionable during the middle part of the last century. This classic finish that offers a unique look is again showing up on some of today's furniture and cabinetry.

WHAT IS IT? A limed oak finish is also referred to as a pickled or blond finish. And there are a number of variations both in appearance and technique. Basically, the goal is to take advantage of the distinctive ring-porous nature of oak to create a light/dark contrast. In a nutshell, a white pigmented stain is applied to the wood. After the excess stain is cleaned from the surface, the pigment remains behind in the large, open pores, highlighting the rich grain pattern of the oak. You'll find that the interesting look complements both traditional and contemporary styles.

You have three choices for a liming material — stain, paint, or wax.

LIMING MATERIALS. The origins of this finish are hazy, but in one way or another involved the use of powdered lime. What's more important is how a limed oak finish is created using today's techniques. As I mentioned, the good news is that you have multiple options. First let's talk about the different materials that can be used to create a limed oak finish.

For many good reasons, powdered lime is no longer the pigment of choice. All you really need is a finishing material that contains a white pigment. There are several that fill the bill.

STAIN. If you check out the stain selection at the home center or hardware store, you'll more than likely find liming or pickling pigment stains — both oil and water-based. These are simply typical wood stains containing white pigments rather than the "wood" colors you'd normally find. I prefer the oil-based type due to its slower drying time.

PAINT. A second option is to use white or off-white paint — again either oil-based or water-based. Here, I think latex paint is a bit easier to work with. When paint is used, you don't want to apply it full strength. Thin it about one to one with the appropriate solvent. This makes application easier and slows down the drying process, giving you more time to wipe off the excess. You'll find that paint tends to leave more

color on the surface than a pigment stain. So if you're shooting for a blond oak look, paint can be a good choice.

WAX. Liming wax is the third choice. This is simply furniture wax with white pigments added. Liming wax can be used as both a stain and finish. However, the better option is to apply liming wax over a completed finish as you would a clear wax. Unlike the other materials, a protective top coat can't be applied over liming wax.

DIFFERENT TECHNIQUES & LOOKS. In addition to a selection of materials for liming, there are a variety of techniques or application methods. Each produces a different appearance, as shown above. Essentially, it comes down to the base upon which the liming pigment is applied.

Like a standard stain, the liming material can be applied to bare wood. This method will result in a deeper penetration into the open pores and will also leave more color on the surface of the wood.

If you want a sightly clearer look, apply a sealer to the wood first. A coat of shellac or lacquer will limit absorption of the pigments. You'll still get plenty of color lodged in the pores of the oak, but you'll be able to wipe more off the surface. This can be a good option if you're going to use paint as a liming material.

A third technique is to apply a wood-colored stain followed by a sealer before wiping on the liming material. The stain provides a more intense background to contrast with the white pigment. This look can be striking.

THE BASIC PROCESS. Although it's not difficult, there are a couple of tricks that will improve your results when creating a limed oak finish. Since the goal is to fill the pores with pigment, the first steps are to open them up and clean them out. This is started by attacking the surface with a fine, wire brush (near right photo). Brush vigorously along the grain, concentrating on the more porous areas of the oak.

▲ A liming stain on bare wood will leave color on the entire surface, as well as in the pores.

▲ A cleaner look is created by sealing the wood before applying the liming stain.

▲ The contrast is enhanced by first applying a dark stain and then a sealer.

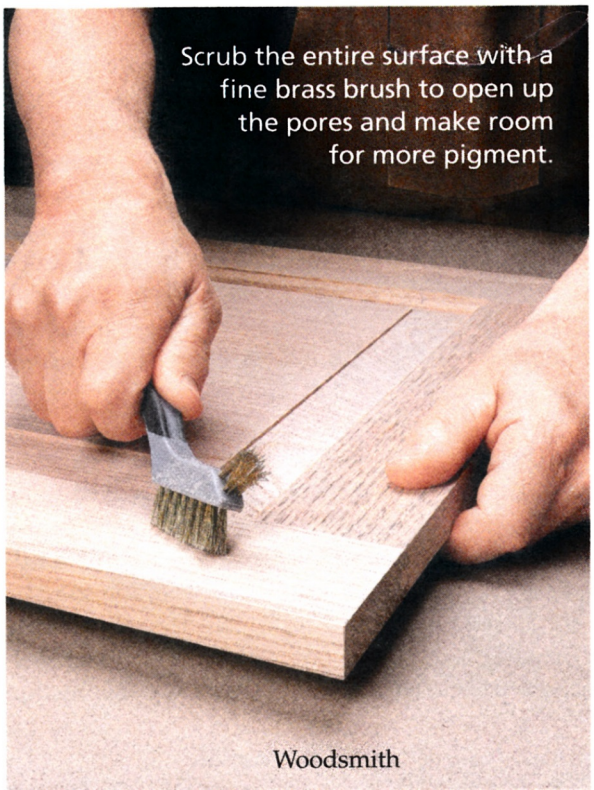
Once you've given the surface a good scrubbing, you want to clean it thoroughly with compressed air or a vacuum (lower right photo). Remove all the loose dust and debris from the pores to create maximum space for pigment.

The next step depends on which method you're going to use. You may want to leave the wood bare, seal it, or stain and then seal. Whichever way you're leaning, I would try a sample first. Once you start down one road or another, there's no turning back.

Applying the white pigment is straightforward. You simply start by wiping it onto the surface with a rag. The key is to force the pigment into the pores. So I work the stain a bit more than normal.

When you think you've filled the pores, you can begin to wipe off the excess with a clean rag (main photo, opposite). Try to remove most of the excess by wiping across the grain so as not to pull the pigment out of the pores. Follow with light passes along the grain to clean up any streaks.

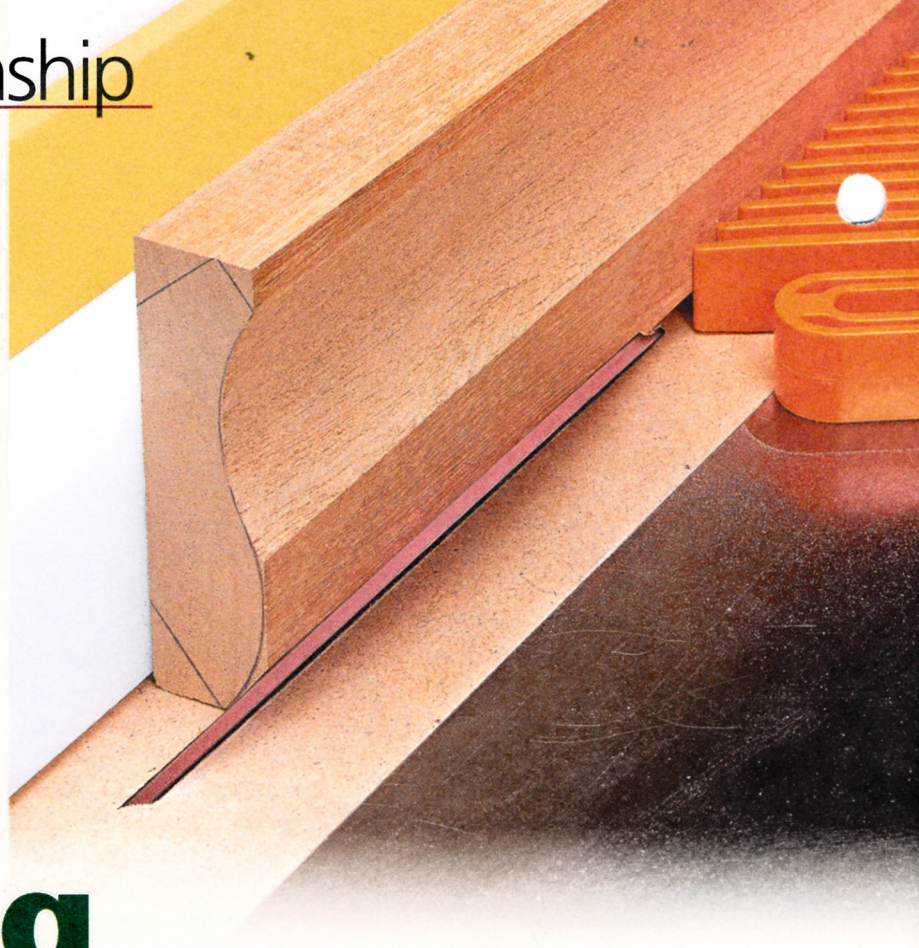
Once you've given the stain time to dry, the final step is to apply a topcoat. Even if the wood has already been sealed, the pigment still need to be sealed in. The "color" of the finish can affect the appearance. So keep this in mind. A clear, colorless topcoat such as lacquer or water-based will help maintain the bright contrast of the pigment. After all, you want to make sure your "old-school" limed oak finish looks fresh for many years to come. W



Scrub the entire surface with a fine brass brush to open up the pores and make room for more pigment.

▼ Compressed air does a good job of blasting the debris out of the pores.

▲ Work the pigment stain into the open pores with a vigorous rubbing action.



shop-made Ogee Crown Molding

Put the crowning touch on your cabinets with classic, shop-made molding. A simple, step-by-step approach is all it takes.

Gracefully contoured crown molding is easy to make at the table saw.

What do you do when you need some ogee molding for a project? Make a path for the router table? No, I mean the large, ogee crown molding that graces the cornice of a cabinet. For that, you take a trip to the home center or lumberyard — right? What about ogee crown molding that matches the wood in the project and is also in perfect scale? Now I'll bet I've got you stumped.

When designing and building a traditional project, it's often the moldings that define the style and can make or break the appearance. So it's important that you get it right. For most moldings or profiles, the router table provides an easy answer. But for larger moldings, you may have to take things into your own hands. And this is how you can solve the ogee crown dilemma — make your own custom crown at the table saw. It's much easier than you might think and offers the advantage of allowing you to match the product to the project.

THE CONCEPT. In essence, an ogee profile is simply an inside curve or cove that transitions to an outside curve or round. It's sometimes referred to as an S-curve, and molding made with an ogee profile is called a *cyma* molding. The radii of the two curves are often the same but don't necessarily have to be.

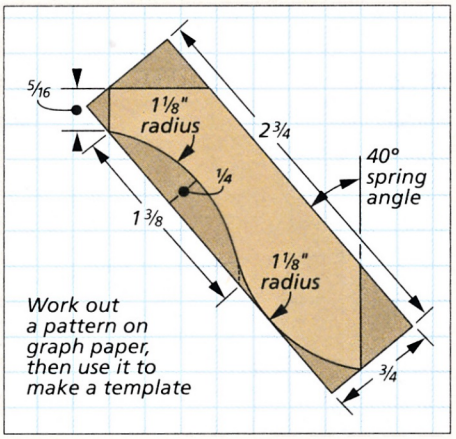
When making ogee crown at the table saw, the profile is formed in stages. You start by cutting a shallow cove near one edge of a blank. This is done with a tried-and-true table saw technique. The blank is trapped between a pair of angled fences as it's passed multiple times across the saw blade.

Next, you begin creating the rounded section of the profile with a series of bevel cuts. Here, the blank is held on edge and passed between the blade and the rip fence, as shown above. Once the rough shape of the roundover is formed, I knock off the remaining ridge with a block plane and then sand the entire profile to smooth and refine the shape.

After that, it's simply a matter of making several bevel cuts on the edges of the blank to create the spring angle of the molding. This is the angle at which the molding will be installed on the project. A look at the photo in the left margin will give you the idea.

DESIGN FIRST. As I mentioned, one advantage to making your own ogee crown is that it can be customized to fit the project. So to get started, you need a design or pattern for your molding.

This can be worked out in full scale on graph paper (example at right). The molding can be designed with the cove projecting beyond the rounded section (called a *cyma recta*) or, with the rounded section being prominent (*cyma reversa*). The drawings in the right margin illustrate the difference. The choice depends on which style best complements the project.



Make sure the molding fits the scale of the project. Don't go overboard on size. What seems to be a relatively small molding may end up looking just right when installed. Likewise, don't make the curves too severe. Gentle curves with larger radii will look more graceful. Finally, make sure the transition from the convex to the concave sections is seamless.

You'll also need to consider the spring angle when working out the design. This angle, used to make the final bevel cuts, affects the appearance of the molding when installed on the project. In most cases, a molding with slightly greater height than depth will have the most appealing appearance. A spring angle of 35° to 40° will produce this effect.

Once a pattern is worked out, you can use it to make a template from plywood or hardboard. Then, use the template to mark the profile on both ends of the blank or blanks, as shown in the upper right photo.

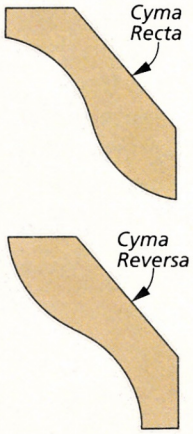
THE COVE. Now you're ready to head to the table saw. I briefly described how the cove section of the profile is cut with a series of angled passes over the blade. Once you're set up, these cuts are easy. The real test is positioning the two fences so that the profile of the cove is accurate and located properly on the blank.

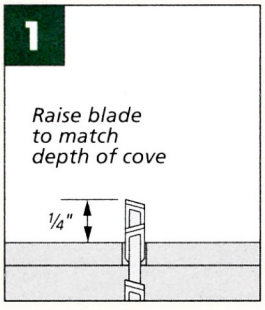
The angle of the fences is based on the width and depth of the cove profile taken from the pattern. The drawings below show how to use a parallelogram gauge to help find this angle. You begin by raising the blade to a height equal to the depth of the cove profile (1/4" here). Then, use tape to mark the two spots where the blade enters and exits the table.

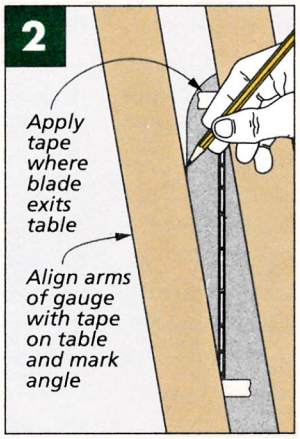
Next, adjust the gauge to match the width of the cove (1 3/8") and place it over the blade. Angle it until one arm aligns with each tape indicator and mark a line (Figure 2). This is the feed angle that will produce a cove of the desired shape. To locate the first fence, you'll mark a second line that accounts for the distance between the edge of the blank and the start of the cove (Figure 3).

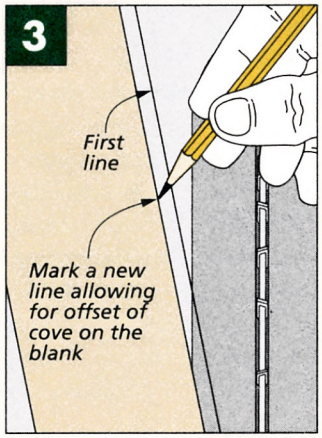
Once both fences are positioned to snugly sandwich the blank, the cove is cut in several shallow passes (Figure 4). Sneak up on the layout line for one final slow, skim pass. This will minimize the rough saw marks you'll have to sand away later.

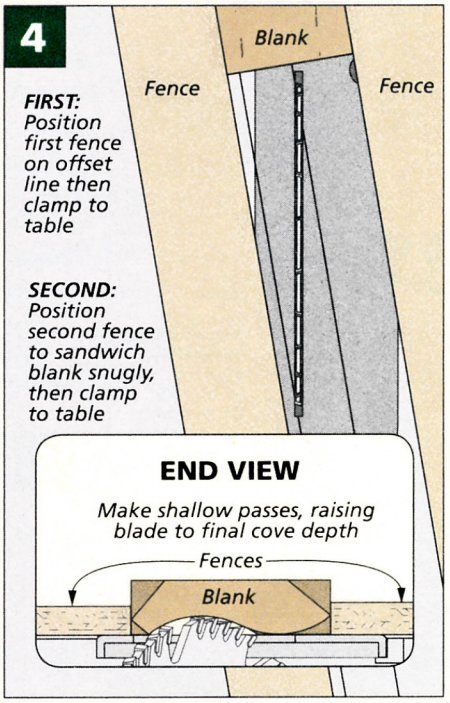
▲ Trace the profile on both ends of the blank.



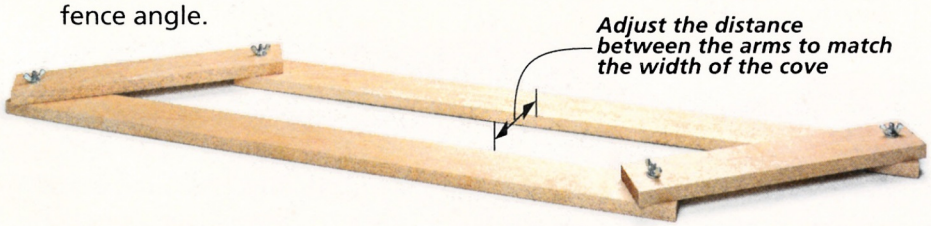








▼ An adjustable parallelogram gauge is the key to finding the correct fence angle.



BEVEL CUTS

With the cove cuts completed, your next task is to form the rounded section. As I explained, most of the waste will be removed with a series of bevel cuts. This is done in two stages with slightly different setups. First, the outer section of the curve is formed, followed by the inner section that transitions to the cove.

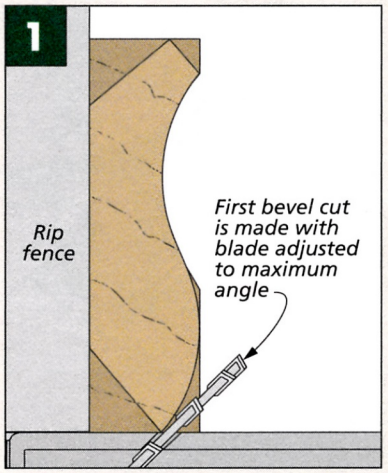
The outer waste is removed starting at the edge and working to the middle, as in Figures 1 and 2. The initial cut is made with the blade tilted to its maximum or near maximum angle. For each cut that follows, the blade is adjusted closer to perpendicular. Cuts at about 8° intervals will produce a fairly smooth curve.

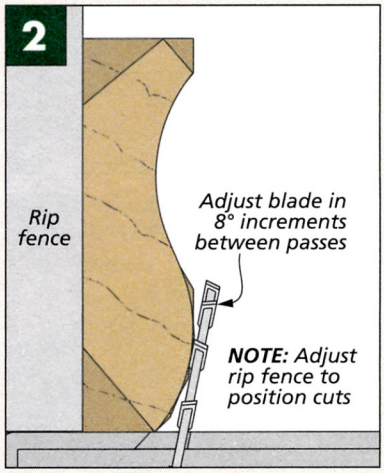
You want each cut to fall tangent to the layout line. So you'll have to adjust the rip fence between cuts to locate them accurately. I use the layout on the end of the blank as a guide.

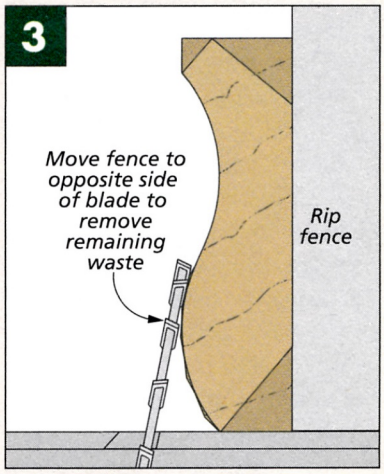
Once you've reached the high point of the curve, you'll have to reverse the setup to remove the small amount of waste left on the opposite side of the round. All you need to do is move the fence to the opposite side of the blade and then raise it slightly.

Completing the round will only require one or two cuts. The tilt of the blade will be shallow. As before, you can use the blank to help adjust both the blade angle and the position of the rip fence. Note that these cuts trap the blank between the blade and fence, so be sure to maintain firm control throughout the cut. The shallow blade angle and light cut both work in your favor here.

Before making the cuts that create the spring, sand the profile to a smooth, pleasing contour.







Shoot for a final cut that creates a smooth transition between the round and cove. But take care. It's better to leave a ridge that can be cleaned up than to cut too deeply.

CLEANUP. Before making the bevel cuts that create the spring angle, I like to clean up and refine the profile. The cove just needs to be sanded to remove the saw marks, however, the round needs a bit more work.

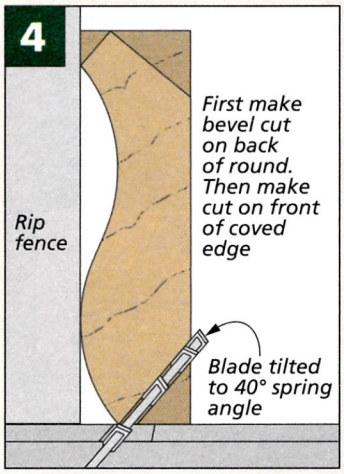
At this point the round still consists of a series of facets that need to be blended into a smooth curve. Start by knocking down the ridges with a block plane or hand scraper. Next, switch to 80-grit sandpaper and work over the entire surface, concentrating on creating a smooth transition between the curves (margin photo). Use your fingers to gauge your progress. When the profile feels smooth and you can't see any saw marks, work through the grits, stopping at 180-grit.

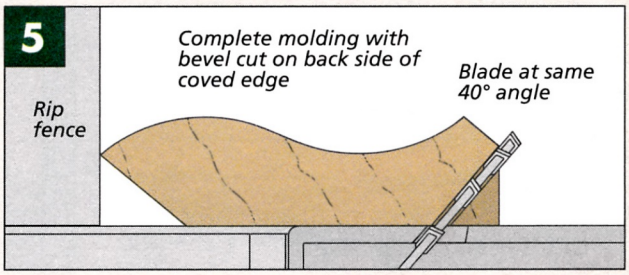
SPRING BEVELS. When you're satisfied with the shape of the profile, you can complete the molding by making the cuts that create the spring angle. There are three bevel cuts required — one on the back side of the round and one each on the front and back of the coved edge. If you're using a spring angle other than 45°, you'll have to make these cuts in two different orientations.

The bevel cut on the back side of the round comes first. This cut is made holding the blank on edge, as in Figure 4. Tilt the blade to the desired spring angle and then set the rip fence to position the cut on the layout line. Hold the blank tight against the fence as you feed it through the blade.

The cut on the front face of the coved edge comes next. And likewise, the blank is held upright for this cut. For the final cut on the back side of the round, you can lay the blank flat on the table, as shown in Figure 5.

Now all you need to do is sand or plane the edge that will be exposed, and you'll have ogee crown molding fit for a king. W





hardware & supplies

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 right margin for contact information.

The *Woodsmith Store*, in Des Moines, Iowa, is an authorized *Rockler* dealer. They carry many of the hardware items used in our projects. And they ship nationwide. Their customer service representatives are available for your calls from 8am – 5pm Central Time, Monday through Friday.

BAR CLAMPS *(p.8)*

You can order bar clamps from most woodworking retailers. They are often sold at home centers and hardware stores, as well.

ROUTERS *(p.10)*

The three types of routers shown in the article (compact, mid-size, and production routers) from a variety of tool manufacturers are available at home centers, hardware stores, and online retailers, such as *Amazon*.

DOWELING JIGS *(p.12)*

- **Rockler**
  - *¼" Doweling Jig* 48169
  - *⅜" Doweling Jig* 47516
  - *½" Doweling Jig*. 40939
  - *Self-Centering Jig* 49221
  - *Dowelmax Classic* 1002683
- **Lee Valley**
  - *Bushings & Inserts*. . . . . Varies

WINE RACK *(p.14)*

You won't need any hardware to build the wine rack, but you will need stain and finish. The rack was stained with our custom cherry stain consisting of three parts *Zar* cherry stain and one part *Woodkote Jel'd* cherry stain. This was followed with two coats of satin spray lacquer.

KITCHEN CABINETS *(p.18)*

- **Rockler**
  - *Blumotion Drawer Slides*. . Varies
  - *Blumotion for Doors*. . . . . Varies
  - *LED Lighting Kits* . . . . . Varies

To achieve the look of the cabinets shown in this article, we suggest using riftsawn red oak stained with *General Finishes' Gunstock Oil Stain*. Two coats of semi-gloss lacquer will protect the cabinets for years to come.

OAK BED *(p.32)*

- **Rockler**
  - *Bed Rail Brackets* 32077

The bed was stained with with *General Finishes' Gunstock Oil Stain* and then sprayed with two coats of semi-gloss lacquer.

SCRAPERS *(p.44)*

- **Stewart-MacDonald**
  - *Ultimate Scraper* 0631
  - *Mini Ultimate Scraper* 0632
- **Lie-Nielsen**
  - *Hand Scraper Set* . . . . . HSset

LIMED OAK FINISH *(p.46)*

- **Woodcraft**
  - *Briwax Liming Wax*. 144611

Most stain manufacturers offer a liming stain. You can usually find these at home centers, hardware stores, or wherever finishing supplies are sold.

MAIL ORDER SOURCES

Project supplies may be ordered from the following companies:

Woodsmith Store
800-444-7527

Rockler
800-279-4441
rockler.com

Amazon
amazon.com

General Finishes
800-783-6050
generalfinishes.com

Lee Valley
800-871-8158
leevalley.com

Lie-Nielsen
800-327-2520
lie-nielsen.com

Stewart-MacDonald
800-848-2273
stewmac.com

Woodcraft
800-535-4482
woodcraft.com

looking inside
Final Details

▲ *Wine Rack.* This stylish, compact wine rack is the perfect size for a few bottles of your favorite vintage. Step-by-step plans begin on page 14.

◀ *Kitchen Cabinets.* Using this designer kitchen for inspiration, we'll show you how to build your own custom kitchen cabinets. Learn more on page 18.

▲ *Oak Bed.* It may be traditional in appearance, but the construction method used to create the frame and panel look on this bed is anything but conventional. Instead, it uses a simple technique that avoids a lot of the complicated joinery associated with frame and panel construction. Turn to page 32 to find all the details.