GUILD ◆ EDITION

Woodsmith®

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HEIRLOOM WINE CABINET

Traditional Icebox Design

Classic Joinery & Techniques

Elegant Period Hardware

INSIDE:

Taming Tricky Table Saw Cuts

A Better Way to Build Cabinets

Tips & Tricks for Routing Smooth Profiles

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from the editor
Sawdust

I honestly don't know when I first became interested in building things. It seems like it was always in my blood. My grandfather and father were both civil engineers, building bridges the entire time I was growing up. Early on, I had the privilege of going to construction sites to watch how things went together. (Yes, it was a different time then.) Later, I worked for my dad, having a hand in building bridges during my summer breaks from college.

So it's not unusual for me to stop and take a close look at any type of construction, whether it's a house, a bridge, or a skyscraper. I'm sure that's true for many woodworkers. What was it that really piqued your interest in making things?

For many, I'd hazard a guess that it was an *Erector Set*, a can of *Tinker Toys*, or even a box of *Lego* bricks. If you're like me, you had them all when you were growing up, spending countless hours constructing anything you could dream up. But the one I most closely associate with woodworking is a set of *Lincoln Logs*, or *American Logs*, one of its competitors. The cabin shown above was built from an *American Logs* set made over 70 years ago. It's a timeless toy that has been handed down through the family of Dirk Ver Steeg, one of our senior illustrators.

You can still buy all these products, but we thought we'd create our own set of building logs. If you turn to page 18, you'll see the final result, Linkin' Logs. Instead of the small scale of past designs, we enlarged everything overall, making them easier to handle. Since most of the parts are identical and require similar cuts, we developed a couple of jigs to help ensure accurately sized and spaced notches. Plus, you can add to the set by making more parts any time you wish. This way, everything fits together just right when you're playing with them — I mean when your kids or grandkids are playing with them.

All in all, it was a fun project to design, make, and quite honestly, play with. And if that's not enough to get you back into the shop, check out the rest of the issue for a lot of other great projects and articles.

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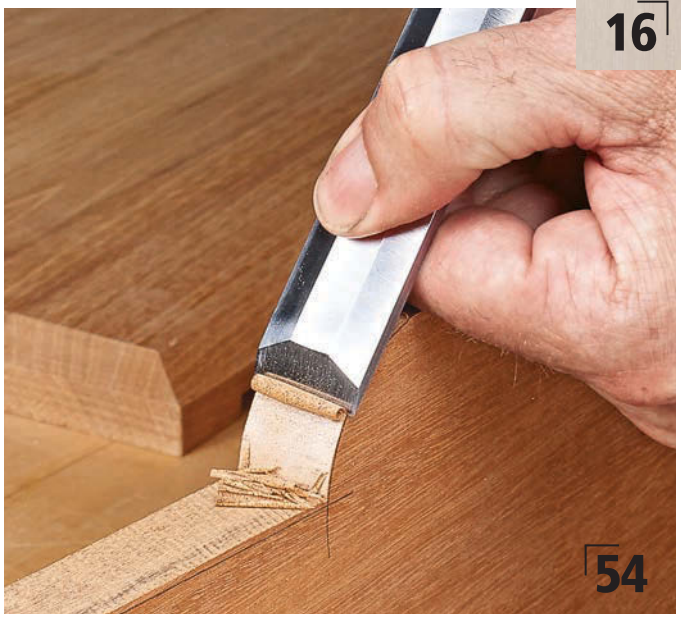

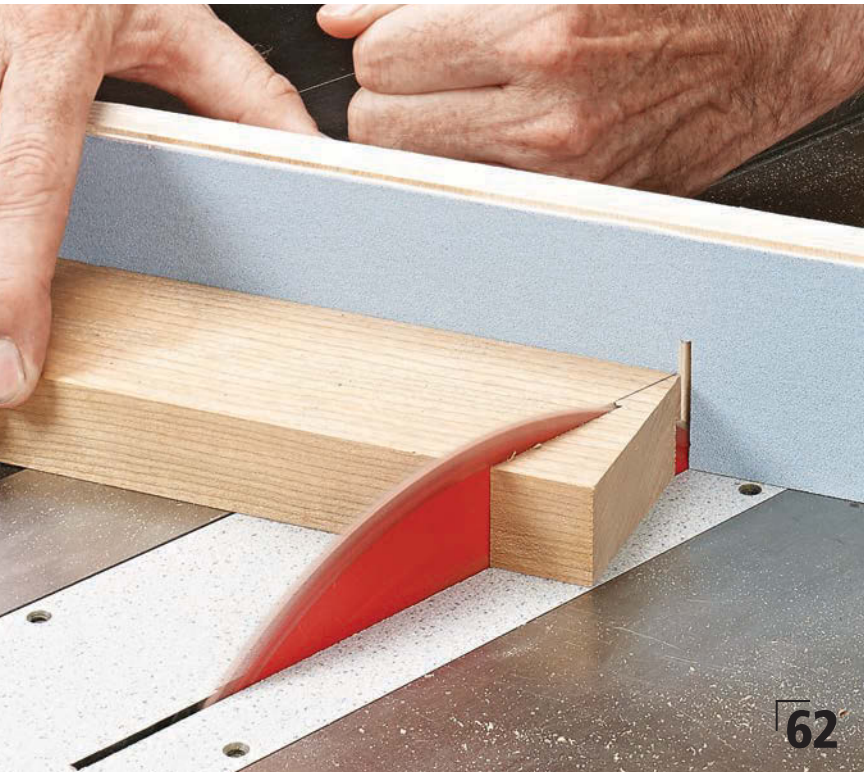

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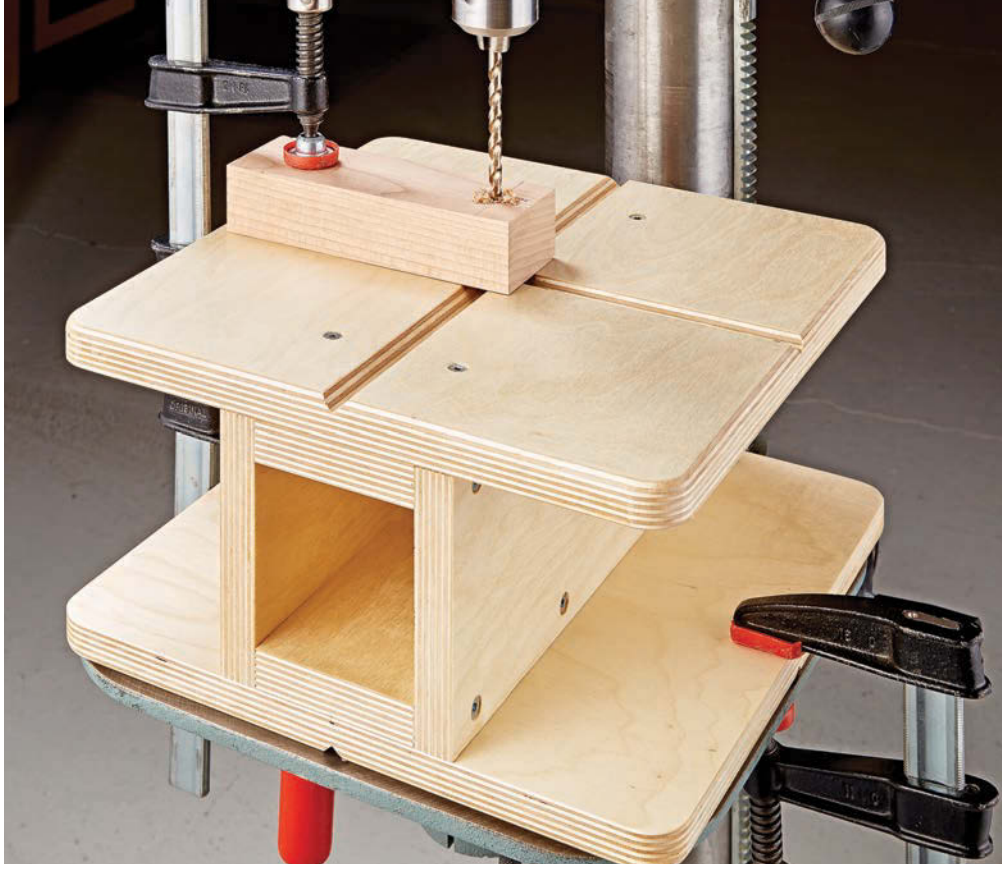
from our readers

Tips & Techniques



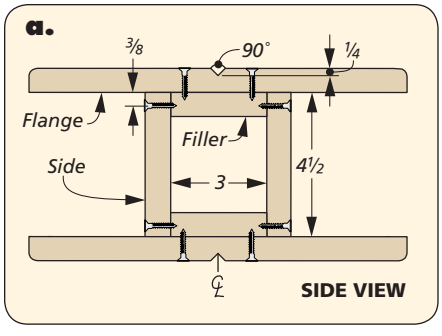
I-Beam Drill Press Table

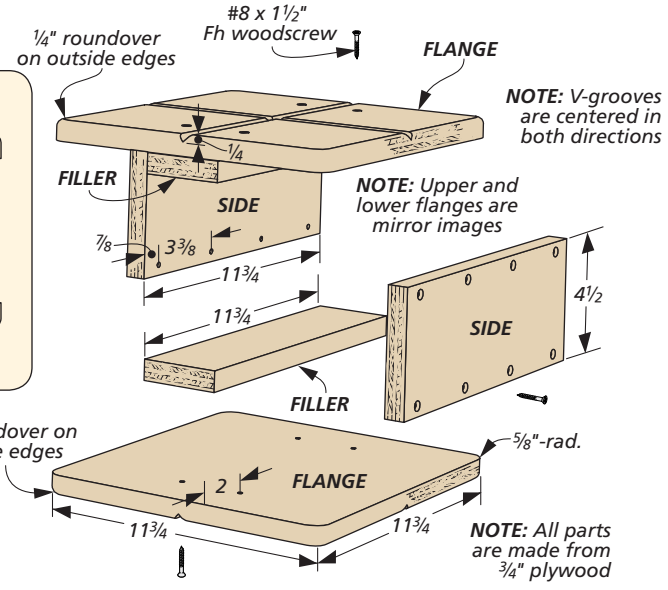
I do a lot of metalworking in my shop. This often leaves my drill press table oily and covered in metal shavings. To use my drill press for woodworking, I wanted a quick-change option that would give me a clean worksurface without going to the trouble of building a large auxiliary table.

What I came up with is this I-beam accessory that clamps to the drill press table. With this assembly fastened to the table, I can clamp workpieces to the upper flange of the I-beam.

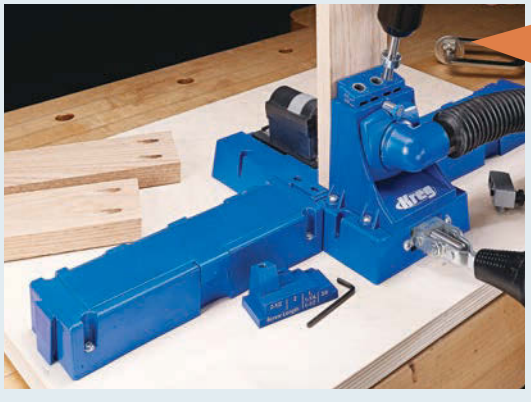
The I-beam is made entirely of plywood and is glued and screwed together. Its "I" shape provides support for the workpiece on the upper flange. The lower flange allows the assembly to be clamped to the drill press table. For extra control, I routed V-grooves in the upper and lower flanges to help hold round stock.

Jason Adams
McKinney, Texas





NOTE: V-grooves cut in upper and lower flanges so I-beam can be used in either orientation

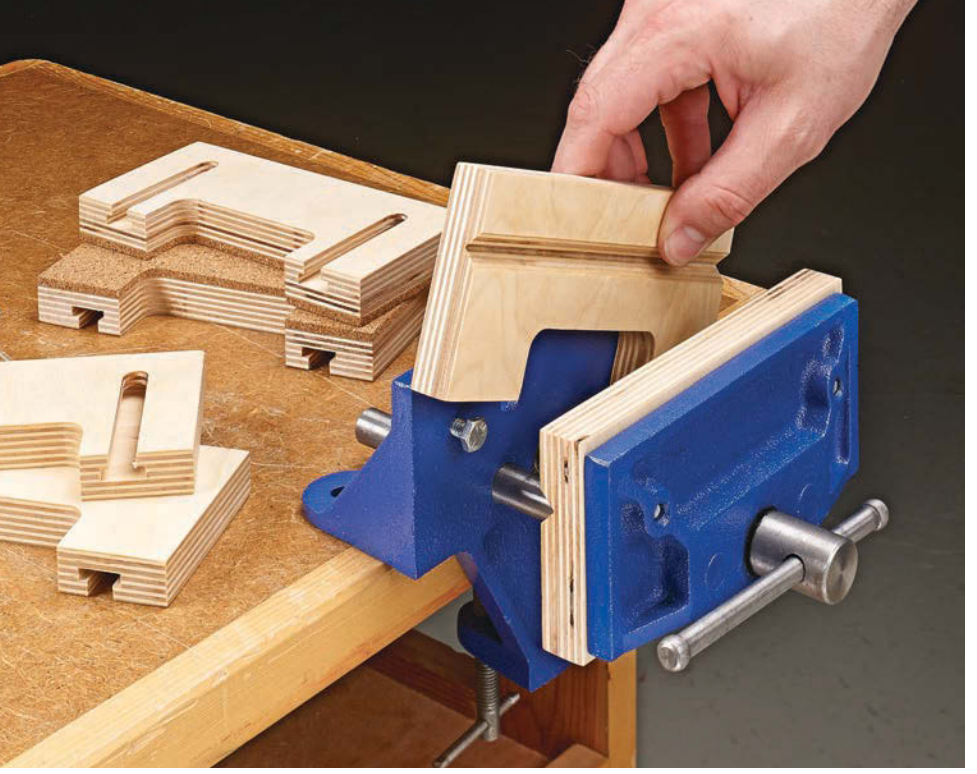


Win This Kreg K5 Jig

Simply send us your favorite shop tips. If your tip or technique is selected as the featured reader's tip, you'll win a *Kreg K5 Jig* just like the one shown here. To submit your tip or technique, just go online to *Woodsmith.com* and click on the link, "SUBMIT A TIP." There you can submit your tip and upload your photos for consideration.

The Winner!

Congratulations to DeLayne Peck, the winner of this *Kreg K5 Jig*. To find out how you can win this jig, check out the information at left.



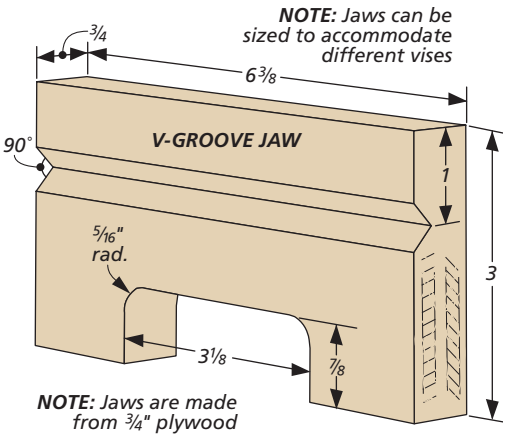
Vise Face Replacements

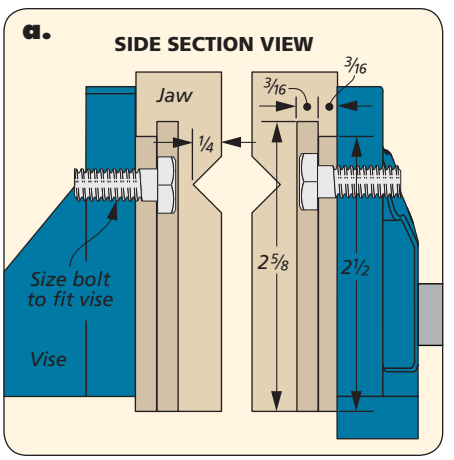
I use a 6" clamp-on bench vise in my shop for many jobs. When it was new, I installed some simple wood jaw faces in the vise to make it easier to use for woodworking. But over time, these wood faces had become nicked, scarred, and encrusted with glue. Needing some new faces, I decided it would be useful to make a few different styles for various tasks. I also wanted to make them so they would be easy to switch out. What I decided on is the design you see at left.

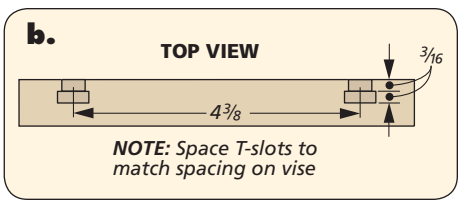
CLEVER SOLUTION. My interchangable jaw faces are easy to make. After cutting the new jaw faces to size from plywood, I routed T-slots in the back face of each replacement jaw. A T-slot cutting bit in the router table makes quick work of the task. The slots line up with the mounting holes on the face of the vise jaws. Insert a couple of hex head bolts in the vise and thread them in just enough so that the wood jaws slip in place.

I made one regular set of jaws, one set with cork faces for delicate parts, and one set with V-grooves for round stock.

Bill Huber
Haslet, Texas

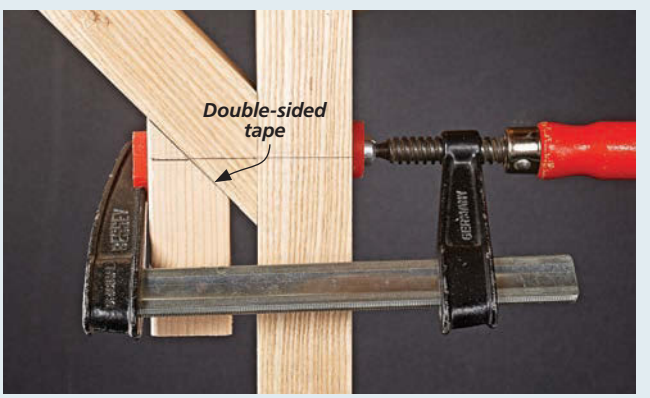




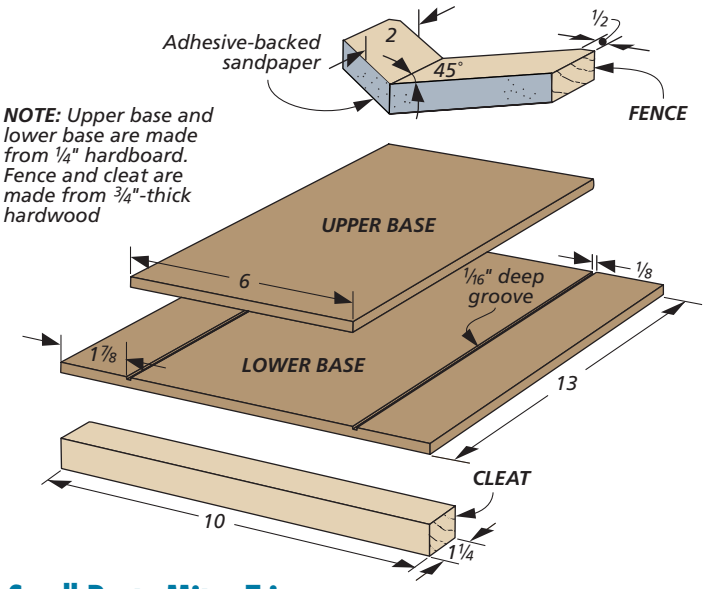


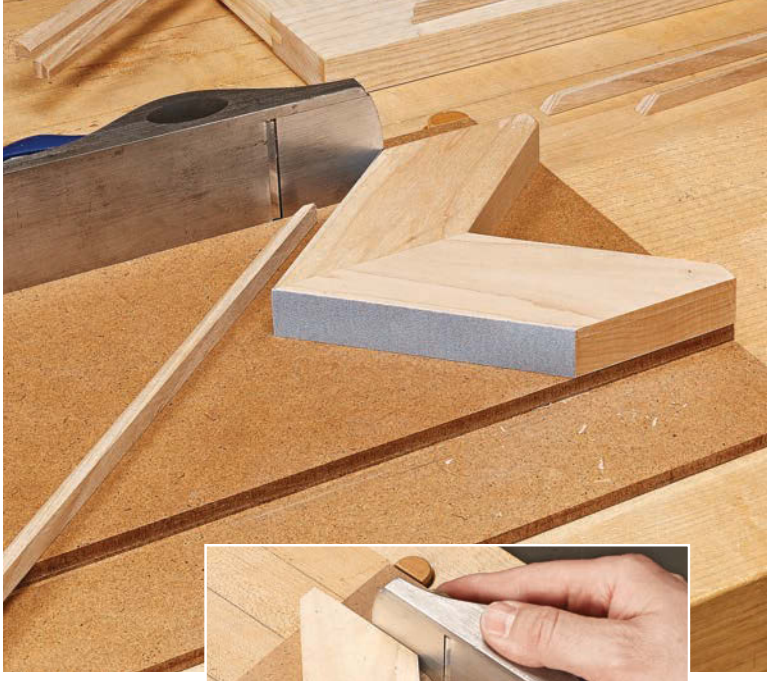
QUICK TIPS

Workbench Power. *Willie Elizardo* of *Zeeland, Michigan*, was having problems with the power strip on his bench always getting knocked around. He found the perfect solution while putting up the Christmas lights: An outdoor power bank with a stake that fits the dog holes of his bench.



Angled Parts. *Bill Wells* of *Olympia, Washington*, came up with a clever solution for gluing an angled piece to a flat surface without using fasteners. He simply uses the angled cutoff piece as a clamp block and some double-sided tape between the parts. A bar clamp holds everything together.





Small Parts Miter Trimmer

Cutting miters by hand using my miter box gets me close to the final length on small workpieces. But it doesn't quite get me the perfect fit I'm looking for.

To produce tight-fitting miter joints on small parts, I made the small parts miter trimmer shown above. This handy jig makes it easy to hold a piece at a 45° angle while shaving the mitered end with a block plane (inset photo).

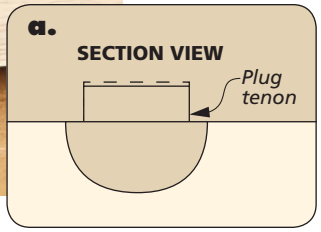
EASY BUILD. The construction of this small parts trimmer is pretty simple. It consists of a two-piece hardboard base, a 90° fence, and a bottom cleat. The upper base aligns the plane as it trims, and the lower base has grooves for keeping chips out of the path of the plane.

The fence is built from two pieces of ¾"-thick hardwood with 45° miters on both ends. The key to getting perfect miters with this trimmer is installing the fence so it sits at a precise 45° angle with the base. (Note: A combination square is a good tool to use to position the fence.) Also, it's equally important that the ends of the fence line up flush with the edge of the upper base.

The last part of the small parts trimmer is a ¾"-thick hardwood cleat. It fits against the edge of the bench, holding the whole assembly in place during use.

After the pieces are glued together, attach sandpaper to the fence to keep workpieces from slipping. Then, it's just a matter of trimming the mitered ends of the parts so they fit tight.

Allan Smith
San Diego, California

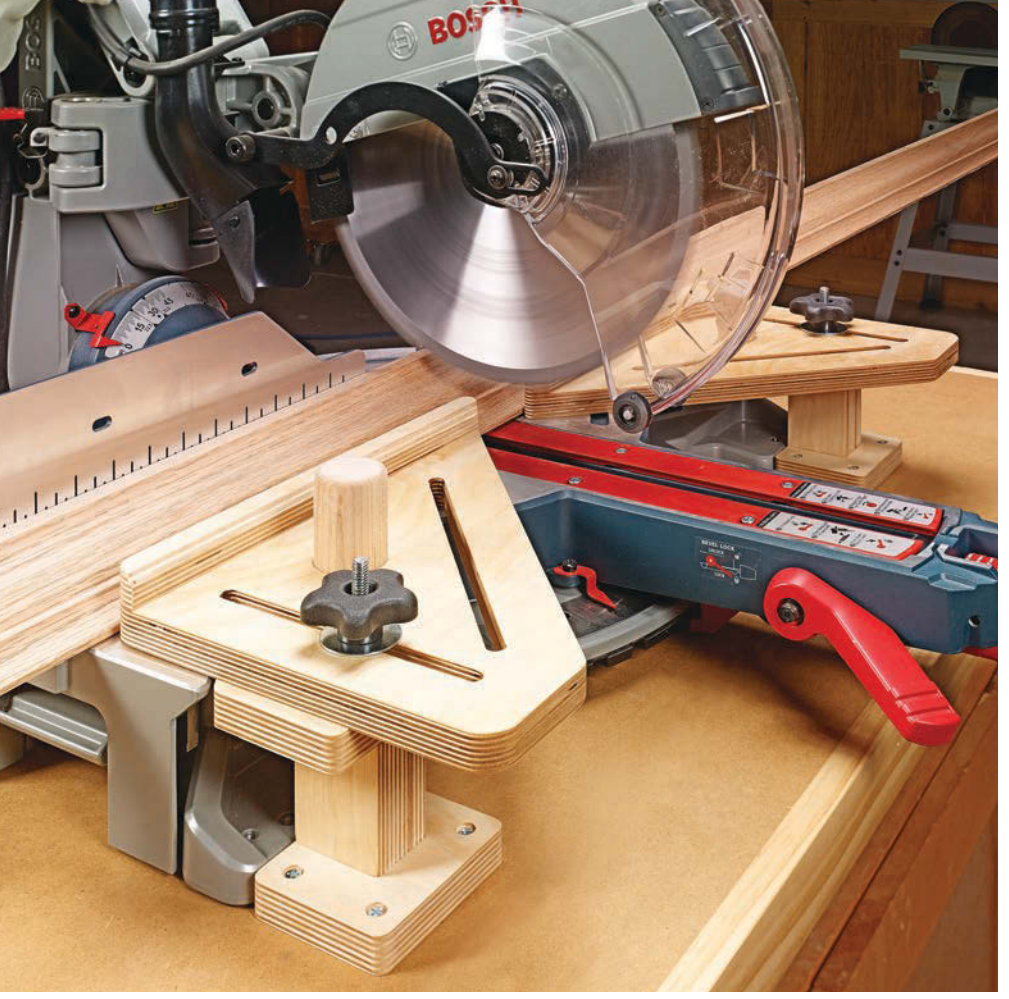


Button Box Feet

To finish off a small box, sometimes all I need is a simple means to slightly raise the box. I've found that small button plugs work perfect for the job.

To install, you only need to drill shallow holes in the bottom of the box for the plugs to slip into. The plugs are then glued in place. And if the box doesn't sit flat, simply run the plugs over a piece of sandpaper on a flat surface to level things out.

Edward Stiles
Lawton, Oklahoma



Outrigger Miter Saw Clamps

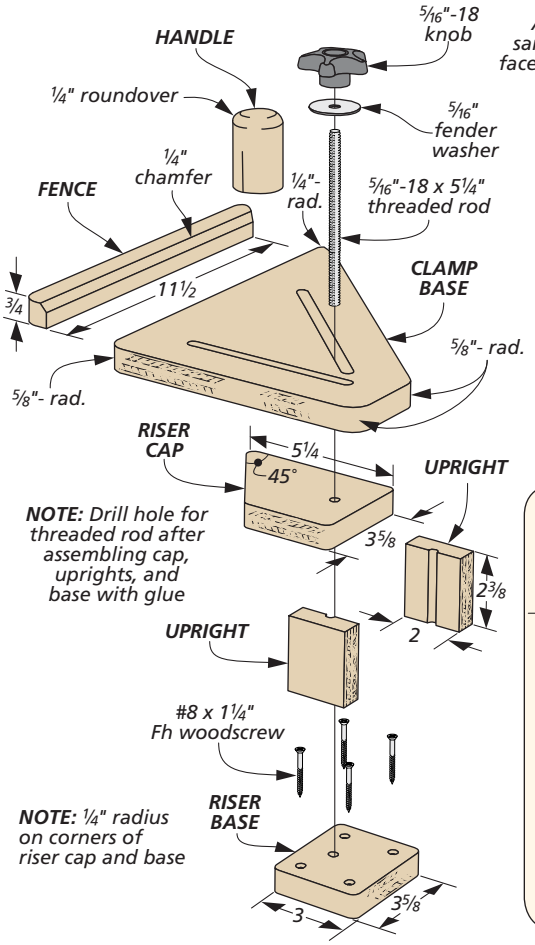
Using your hand to hold a workpiece against the fence of a miter saw can be a dangerous proposition. Especially if the workpiece is small or needs to be held at an angle (like the crown molding shown at left). To assist in situations like these, I designed this dual outrigger clamping system to use on my miter saw.

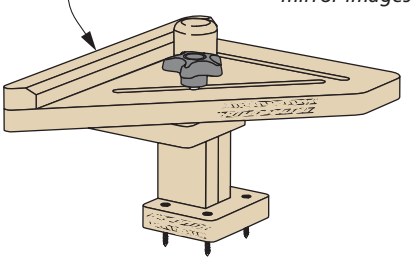
TWO COMPONENTS. This clamping system consists of two main components. The riser assemblies raise the clamps up to the level of the miter saw table. They're attached to the workbench with screws. The other parts consist of clamp assemblies that hold the workpiece against the fence. Each one has a tall fence on one side with a strip of adhesive-backed sandpaper on its face. The two slots allow for different clamp placements (photo below). A threaded rod and knob secures the clamp to the riser assembly.

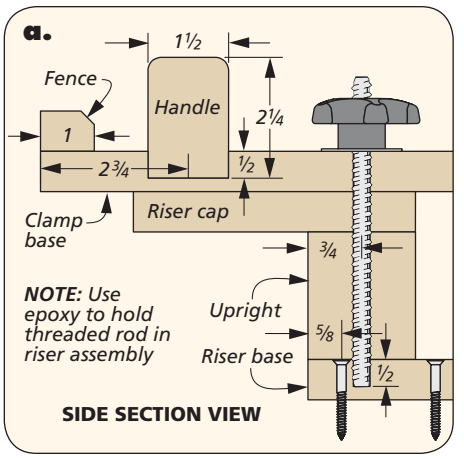
CUSTOMIZABLE DESIGN. This clamping system can be configured to fit other miter saws. For instance, the riser assemblies can be made taller or shorter by changing the dimension of the uprights. Or, the risers may work better to the side of the saw base, rather than in front.

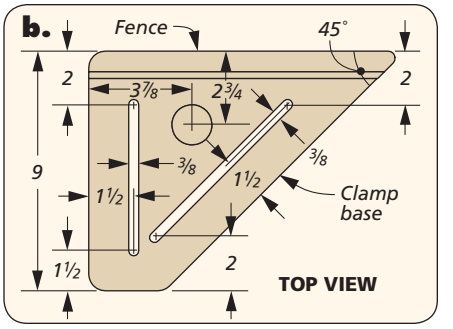
Gerald Welf
Fridley, Minnesota

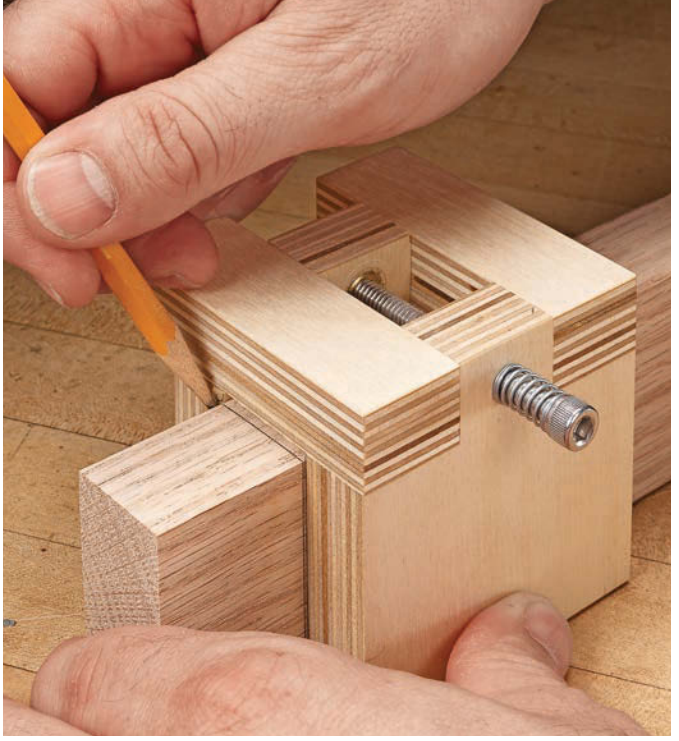
▲ For blade clearance, position the clamp base with the threaded rod through the 45° slot when making angled cuts.









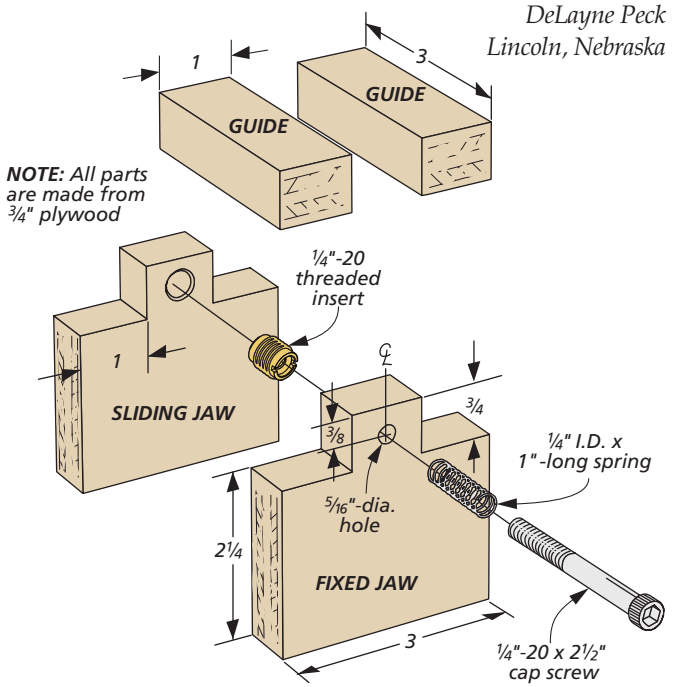


Simple Saddle Square

There are many commercial saddle squares available that allow you to mark three adjacent faces of a workpiece without moving the square, but they're rather expensive. What I wanted was a three-sided saddle square that wouldn't break the bank. What I came up with is the simple square you see above and in the drawing below.

PLYWOOD PARTS. This saddle square is made from four plywood parts and some common hardware items. The fixed jaw has two guides glued in notches at the top corners. I cut the notches at the band saw. The rear, sliding jaw gets a threaded insert installed as shown below. A cap screw and small spring hold the sliding jaw in position. Depending on the spring's tension, this square will adjust to accommodate workpieces from ¼" to 1¼" thick.

DeLayne Peck
Lincoln, Nebraska



QUICK TIPS

Pencil Lubricant. *R.B. Himes* of *Vienna, Ohio*, seldom has a can of dry lubricant handy. But he always has a pencil in his apron pocket. If he notices the miter gauge in his table saw sticking a little, he blows out the sawdust and scribbles on the sides and bottom of the miter gauge slot. The graphite keeps things sliding freely.

PVC Supports. To support a workpiece while gluing or finishing, *Dave Youngren* of *Clovis, California*, uses ¾" PVC pipe with a tee fitting on the ends to keep the pipe from rolling. The supports are inexpensive to make and can be easily cleaned off when they get too messy.

Non-Stick Clamps. *Jack Kreinbring* of *La Crosse, Wisconsin*, got tired of glue getting all over his handscrew clamps and leaving a sticky mess. To stop this problem he used contact adhesive to glue some small pieces of laminate to the jaw faces. They make cleanup a breeze.

all about

premium Sandpaper

▼ Available in a range of grits, premium sandpaper lasts longer and cuts faster than conventional sandpaper.

When it comes to buying a new tool for the shop, many of us will spend hours comparing specs and reviews before making a purchase. Yet for everyday items, we tend to just grab whatever is least expensive. But often there are differences in quality for even the most basic of shop supplies.

Take sandpaper, for example. The top abrasive manufacturers all offer at least one line of "premium" sandpaper. *Norton*'s line is called *ProSand*. *3M* has *SandBlaster* and *Fre-Cut Gold*. And *Mirka*'s premium paper is known as *GoldFlex*.

These all cost a bit more than ordinary sandpaper, but there are several benefits. Premium sandpaper lasts longer, doesn't tear as easily, and doesn't load up as quickly in use. To understand why, it helps to take a closer look at how premium sandpapers are manufactured and what makes them different.

As you can see in the drawing at the top of the next page, sandpaper is comprised of three main elements — a backing, the abrasive material (grit), and an adhesive layer that anchors the abrasive to the backing. Although there are some slight differences among the manufacturers, premium sandpapers generally have high-quality materials in all three areas.

BACKING. Let's start with the backing. Low-priced sandpaper often uses ordinary kraft paper as a backing. This material is inexpensive, but it's not very durable. When hand sanding, it's easy to catch the sandpaper on the edge or corner of a project and have the sheet rip or tear, decreasing its useful life.

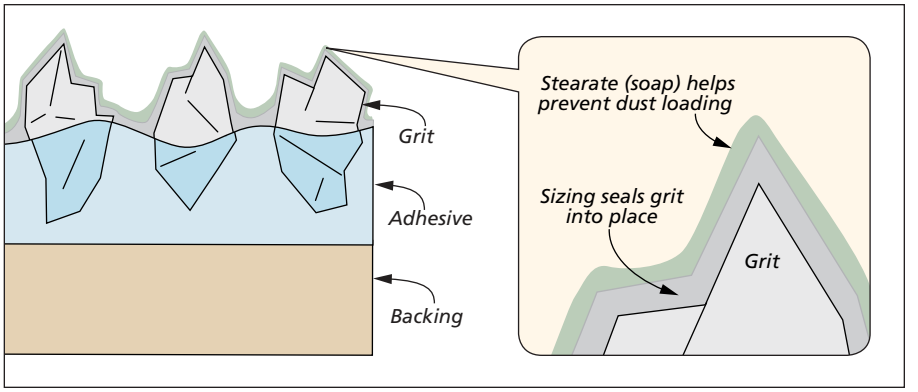
Premium sandpapers use a stronger backing material, typically reinforced with fiber and latex. This achieves two objectives. It makes the paper more flexible so that you can fold it or bend it to

conform to different shapes when sanding profiles. And it also makes the sandpaper more resistant to rips and tears.

In addition to being reinforced, the backing material used in some of 3M's premium sandpapers also has a special no-slip coating. The rubbery texture of this backing allows you to fold the sandpaper in half or quarters without having it slip while sanding.

ABRASIVE MATERIAL. The second element that goes into the making of sandpaper is the abrasive. There are three main types of abrasives used in the manufacture of sandpaper — aluminum oxide, silicon carbide, and zirconia alumina. For hand sanding of wood, aluminum oxide is generally considered the best choice. Aluminum oxide grains are sharp and hard, but also friable. This simply means the grains will fracture during use, exposing new, sharp edges.

However, not all aluminum oxide is equal. There are differences in the quality of aluminum oxide abrasive. The less expensive sandpapers usually use brown aluminum oxide, which is cheaper to produce but also breaks down faster. The premium sandpapers use a higher-quality abrasive. For example, *Norton* uses a white aluminum oxide. This abrasive material is heat-treated, causing the alumina molecules to fuse together. The treatment makes the material harder to break down and the result is longer-lasting sandpaper. The abrasive stays sharp longer, giving you faster results.



ADHESIVE LAYER. The third component of sandpaper is the bond that holds the grains of abrasive to the backing. This is actually applied in two stages. First, a base layer of adhesive, known as a make coat, is applied to the backing. After the abrasive material is applied to the paper, a second coat of adhesive is applied to anchor the abrasive in place. This is know as the size coat.

There are several different types of adhesives that can be used. The cheapest papers use animal glues. The problem with this type of bonding material is that as you use the sandpaper, the heat generated from the friction tends to soften the adhesive, and the sandpaper will start to shed the abrasive material.

▲ The rigid adhesives used in some inexpensive sandpapers (left) tend to crack and flake off when the paper is folded, as shown above.

But with the premium sandpapers, the bond is a resin mixture that combines strength, flexibility, and the ability to withstand temperature changes. Manufacturers tend to keep the exact formulas of the adhesives used on their premium sandpapers a secret. But you can see the difference in the photo above.

STEARATE COATING. The final element of premium paper is one that you probably won't find at all on cheaper sandpaper. This is a stearate coating that is applied to the surface of the paper. The stearate is a type of surfactant (soap) that serves to lubricate the sandpaper and prevent it from clogging up as quickly in use. This is especially helpful when sanding between coats of finish.

Premium sandpaper can cost two to three times more than regular sandpaper. But when you consider that it works faster (photo at left) and lasts several times longer, the difference in price isn't really all that difficult to justify. For more on where to find premium sandpapers, refer to Sources on page 67.

▲ After 50 strokes with both premium and ordinary sandpapers, you can see the difference in the amount of material that is removed. The higher-quality abrasives in the premium sandpaper stay sharp longer. This means they cut faster and don't break down as quickly.

routing

Bullnose Profiles

▲ The simple bullnose offers up a lot of different options when it comes to edge profiles for your projects.

On most woodworking projects, a decorative profile or molding — even a simple one — is preferable to a sharp, flat edge on parts like shelves and tabletops. And though it's about as easy as it gets, one that I find myself turning to time and again is the bullnose.

At its essence, a bullnose is a pretty basic concept: It refers to a profile in which both the top and bottom edges are rounded. But from this simple idea, you can create a lot of different looks for your projects.

TYPES OF BULLNOSES. Though all bullnoses have two rounded edges, there are several approaches to making the profile. Probably the easiest bullnose to understand is known as a full-radius bullnose. As the name implies, it's a workpiece that features a full radius, or a half-circle, on the edge (refer to the upper photo at left).

A partial-radius bullnose is a flatter, more gradual bullnose profile. It usually features an oval shape along the edge of a piece, rather than a full half-circle (middle photo, left).

Both of these types of bullnoses can be varied in other ways, too. As an example, for a different look you can form a bullnose that doesn't cover the full thickness of the workpiece and has a shoulder on one or both edges (lower photo).

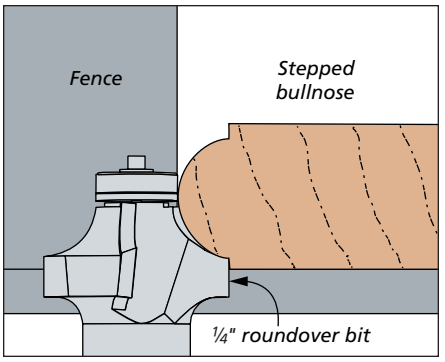
MAKING BULLNOSE PROFILES. I usually make bullnoses by using a standard roundover bit, either in a router table or with the router hand-held. The approach I take typically depends on the size of the workpiece. For example, if I want to add a bullnose to a tabletop after it's assembled, I'll use the hand-held router. But if I'm routing the edge of a small shelf, the router table is a great method that offers a bit more control.

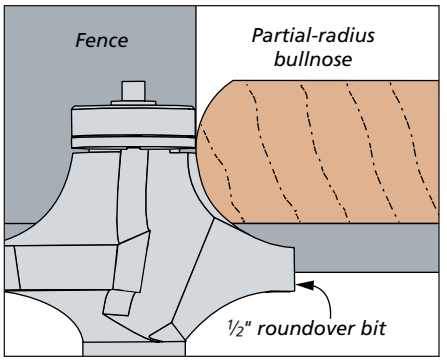
FULL-RADIUS BULLNOSE. Probably the easiest bullnose profile to rout is the full-radius bullnose without a step. For this operation, you simply choose a roundover bit that's half the thickness of the workpiece (for example, a $\frac{3}{8}$" roundover bit for

¾"-thick stock). Then set the roundover bit to cut a full roundover, and pass both edges of the workpiece over the bit.

If you want to add a step to one or both edges, you'll simply choose a smaller roundover bit. For example, you could use a ¼" roundover bit to create a full-radius bullnose with a ⅛" step on each edge of a ¾"-thick workpiece (upper drawing below).

PARTIAL-RADIUS BULLNOSE. To create a partial-radius bullnose profile, I use a roundover bit that's larger than half the thickness of the workpiece.





Here, I'll often use a ½" roundover bit to do a partial roundover on ¾"-thick pieces. Then you set the bit so the top edge of the carbide cutter is centered on the thickness of the workpiece, and rout both edges (lower left drawing).

The only drawback to this technique is that it often leaves a small ridge on the edge of the workpiece, particularly when using a hand-held router (photo below). However, this is usually easy to remove with a little hand sanding. One unique solution for routing a bullnose profile without creating this ridge is shown in the box at the bottom of the page.

BULLNOSE ROUTER BITS. Another approach to making bullnose profiles that overcomes some of the limitations of roundover bits is to purchase bits that rout the full bullnose profile in one pass. As you can see in the photos on the upper right, these are available with both full-radius and partial-radius profiles. The full-radius bits

▲ Cutting a bullnose in two passes with a roundover bit can produce a ridge in the middle, but it's easy to sand away.

▲ Bits are readily available to cut partial-radius or full-radius bullnose profiles on a variety of different thicknesses.

are often sold as either full-radius or simply bullnose router bits. Partial-radius bits are sold under a variety of names, including convex edge, oval edge, half bull-nose, and fingernail bits. (Refer to *Sources* on page 67.)

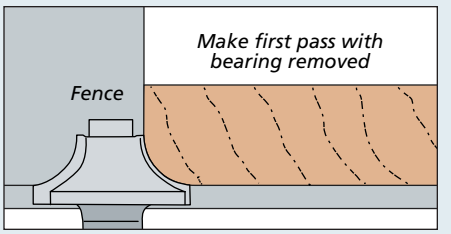
The bits come in a variety of bead lengths to match common workpiece thicknesses (½", ¾", 1"). And since you'll rout the bullnose in one continuous pass, the bits eliminate the center ridge that often appears when using a roundover bit. Since they have no bearing, these bits should be used in a router table.

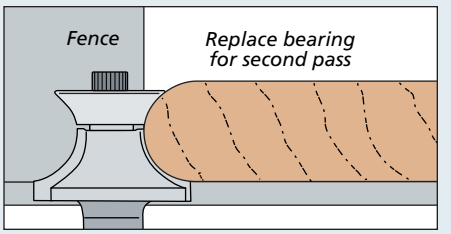
BETTER PROJECTS WITH BULLNOSES. You can rout bullnoses with your standard roundover bits or purchase dedicated bits to simplify the process. Regardless of your choice, it's tough to beat a bullnose profile for adding a comfortable, pleasing edge to your project parts.

Smoother Profiles: RADIUSED BEARING ROUNDOVER BIT

One of the problems with making bullnose profiles using two passes with a roundover bit is the ridge or flat that it creates at the edge of the workpiece. But *Ultra-Glide* roundover bits from *Amana* solve that problem. They feature a radiused bearing that matches the contour of the first cut to allow you to make a smooth second pass. As you can see in the drawings at right, the first pass is made with the bearing removed using the fence to guide the workpiece. (You can also use a matching roundover bit with a standard bearing, or simply add a standard bearing to this bit.) *Ultra-Glide* bits are available to cut ⅜", ½", ¾", or 1" roundovers.

▲ *Amana's Ultra-Glide* roundover bit follows the contour of the first roundover to create a smooth second pass.





great gear

hands-free Magnifiers

▼ A wide array of bench-mounted and head-mounted magnifiers are available to give a clearer vision of detailed work.

The bench-mounted magnifier features a fluorescent light and sun shade

This flexible gooseneck magnifier is easy to place where you need it

It's no secret that as we age, many of us could benefit from a little assistance in the vision department. And sometimes, even the healthiest eyes have trouble focusing on the finer points associated with certain tasks. Having a magnifier on hand is a great option to help you see the smallest details.

But not just any old magnifying glass will do the job. When it comes to woodworking, many operations require two hands to perform them safely. So a magnifier that you don't need to hold is essential.

Fortunately, there are many styles of hands-free magnifiers available. They can be broken down into two main categories: Head-mounted and bench-mounted magnifiers.

HEAD-MOUNTED OPTIONS. The two head-mounted versions shown below are typical of this style of magnifier. They generally have an adjustable

The Carson MagniVisor comes with an LED light and a full set of lenses

The Donegan OptiVisor has a quick-adjusting ratchet headband

▲ Head-mounted magnifiers, like the *Carson Pro MagniVisor*, are perfect for tasks where you'll be continually shifting your focus. This is a time-saving advantage when working on different areas of a sizable project.

▲ This benchtop magnifier features an acrylic lens and a flexible gooseneck that is easy to adjust. The weighted base keeps the magnifier from tipping over when moved around.

headband and a flip-down visor that holds the magnifying lenses. And some, like the *Carson Pro MagniVisor*, have an LED light incorporated into the design.

In addition, most of the head-mounted magnifiers come with several different lenses, all with differing levels of magnification. (For more discussion on magnification levels, see the box below.) The lenses on the *Carson MagniVisor* simply pop in and out of the frame, while the lenses on the *Donegan OptiVisor* are held in with a couple of small screws.

The main advantage of a head-mounted magnifier is the ability to quickly shift your focus while working on different areas of a project. This is beneficial when performing tasks such as sharpening a long handsaw, or doing carving work, as shown in the left photo above.

BENCH-MOUNTED OPTIONS. If most of your detail work is confined to a small area, or you find a head-mounted magnifier uncomfortable to wear, then a bench-mounted design may be right for you. While this type of magnifier typically only has a single magnification level, there are several different styles to choose from. Two examples are shown at the bottom of the previous page.

The lighted magnifier with the articulating arm is perfect for clamping onto the edge of a workbench. The arm allows it to be positioned quickly and easily for working on projects where there will be a single point of focus. A good example of this is the fine inlay work shown in the main photo.

Another bench-mounted option is the flexible gooseneck magnifier shown in the upper right photo. While this style does not have a light, its small design makes it easy to move around the shop for quick setup and use. The weighted base prevents it from tipping over when adjusted.

ACRYLIC OR GLASS. Another consideration to keep in mind when choosing a magnifier is whether to buy one with acrylic or glass lenses. The majority of magnifiers on the market today use acrylic material. However, glass lenses are still favored by some people.

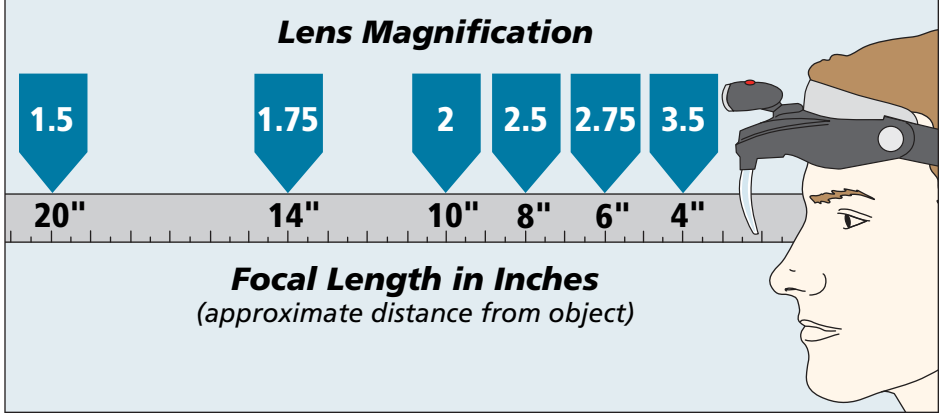
Acrylic is lightweight and shatter-resistant. But, in a shop environment, care needs to be taken with acrylic because it's susceptible to scratching.

On the other hand, glass is durable and difficult to scratch. Glass lenses also allow for high light transmission. This provides a very clear, precise image. But as you would imagine, glass is easier to break and somewhat more expensive.

The *Carson Pro MagniVisor* and the flex-neck magnifier both have acrylic lenses. The *Donegan OptiVisor* and the lighted bench lamp use glass lenses. (Refer to Sources on page 67.) The type you decide to buy should ultimately come down to the type of work you do the most. Whichever option you choose will certainly be a welcome relief to tired eyes. W

Understanding MAGNIFICATION LEVELS

While bench-mounted magnifiers only have one level of magnification, the head-mounted options usually have several different lenses available. Which level you choose for any particular task is determined by how far away from your eyes the workpiece will be. The chart below gives you a pretty good idea which lens you should try based on the working distance.



simple solutions for Reinforcing Rabbets

A rabbet joint or two usually find their way into just about any project I build. And for good reason: The joint is straightforward to create; it increases glue surface; and it helps register parts to ease assembly.

In most applications, a basic rabbet joint fits the bill. For example, a rabbet cut along the grain of a workpiece provides a solid, dependable glue joint.

On the other hand, some rabbet joints benefit from a little reinforcement. Rabbet joints used in drawers and cases are good candidates. That's because one of the glue surfaces is end grain, which doesn't contribute much to a strong joint.

Fortunately, you have some fastener options that can help beef up a rabbet joint. What's more, you can take the opportunity to make the method of strengthening the joint stand out as a decorative element to enhance the overall look of the project.

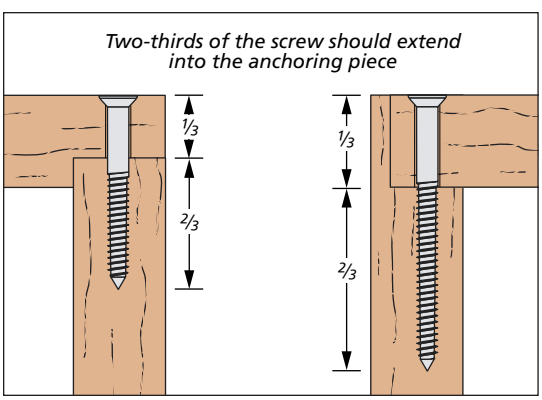
CHOOSE A DIRECTION. One of the first things to consider is the direction of the fastener. You can either drive a fastener into the piece that has the rabbet or the piece that's captured by the rabbet. The two orientations are shown in the lower left drawing. Both options will create a strong joint. The driving forces are appearance and function.

For example, in a plywood case, I may not want screws that are visible from the sides. So I'll cut a deep rabbet in the case sides and drive screws through the top and bottom of the case (photo at right).

If you don't mind seeing the fasteners, you can install the hardware through the rabbeted workpiece. Here, the rabbet can be fairly shallow since it only needs to keep the parts aligned.

The next choice you need to make is the type of reinforcement to provide for the joint.

▲ Drill shank and pilot holes to prevent splitting. Clamps keep project parts aligned while you drive screws.



I want to talk about three options here: screws, dowels, and nails.

SCREWS. One of the most common and simplest methods to reinforce a rabbet joint is to use screws. That's especially true for building plywood cases.

The advantage of using screws to reinforce a rabbet joint is that they speed up the assembly process. The screws act as permanent clamps that draw the two parts of the joint together while the glue dries.

That doesn't mean your clamps stay on the sidelines, though. I still use clamps to get the parts in position, but once the screws are in, you can remove the clamps and move on to the next stage.

There are some keys for choosing and using screws. Driving a screw into the edge grain of plywood is similar to driving a screw into the end grain of hardwood. It just doesn't have the same holding power as installing screws in face grain. To increase the strength, use a longer screw rather than a larger diameter screw. The drawing on the previous page shows the general guideline I start with.

Since the screws are driven into the edge of plywood pieces, it pays to drill an accurately sized pilot and shank hole before you install the screw. This prevents the workpiece from splitting as the screw is driven into place.

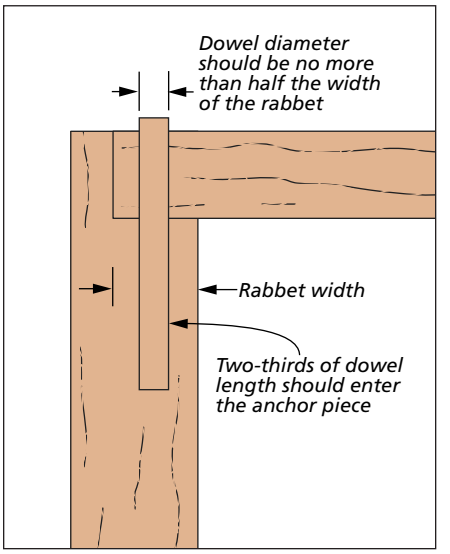
DOWELS. A second option for beefing up a rabbet joint is to use dowels. In my opinion, hardwood dowels provide a nicer look compared to screws. And the joint is still plenty strong.

Drawers are a good place to put dowels to work, as shown in the main photo and inset on the previous page. I used dowels that match the primary wood on the drawer front (cherry). It provides a good contrast with the maple drawer sides. The result is an eye-catching detail when the drawer is pulled out of the case.

▲ Driving nails near the end of a workpiece may cause a split. So drilling a pilot hole after assembly is a must.

▲ In order to prevent the short grain section from splitting out, clamp across the joint to support the end of the workpiece.

▲ Wait until after the glue dries before drilling holes for dowels. This prevents the parts from shifting out of alignment.



Adding dowels isn't complicated. But there are some points to keep in mind. I like to glue up the drawer first. Then I drill and insert the dowels once the glue is dry. This way, I can concentrate on one task at a time. It's a good idea to cut the dowel pieces a little long. After the glue dries, you can trim them flush. The upper right drawing offers tips on sizing dowels for the strongest joint.

I've found that dowel stock varies in size. And since the joint depends on a snug fit in the hole, it pays to be choosy. I take the bit and a pair of calipers along to the store to find dowels that match the drill bit I'll be using.

NAILS. The final reinforcing option isn't one that's often associated with fine furniture — nails. But the reality is nails offer surprising holding power and they come in a variety of finish options.

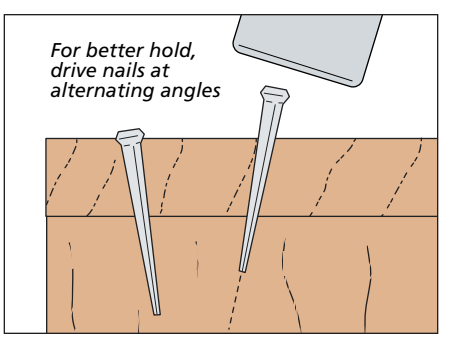
Nails can reinforce rabbets in small boxes and drawers that have thin parts. Drilling for screws or dowels here wouldn't leave enough material on either side of the hole to support the joint.

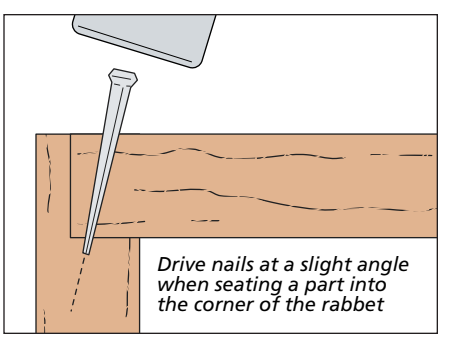
The type of nail that you use can make a big difference visually. Air-driven brads or pins create a good mechanical connection. The hole created in the surface is barely noticeable and easily concealed with filler. Old-style cut and wrought nails pack a dramatic punch and give a project a country or rustic flair.

You can increase the holding power of nails by angling them as you drive them home. The two drawings below show what I mean. Angle the nails like dovetails to resist pulling out (left drawing). Or nails can be angled to lock the joint tight, as in the right drawing.

As with dowels, I find that adding the nails after the glue is dry makes the process easier. The exception to this is with air-driven nails. Here you can apply glue and clamp the parts together. Then drive the nails to complete the job.

While cutting a rabbet may be one of the first joints you learned as a woodworker, that doesn't mean you outgrow the technique. Instead, it is an essential part of creating strong, long-lasting projects you can be proud of. W





Gift Project

creating fun with

Linkin' Logs

We've taken a traditional children's toy and upsized it to create a fun building set that's sure to spark creativity in young and old alike.

One of my favorite memories as a child is building log cabins with *Lincoln Logs*. This classic toy is great for developing hand and eye coordination not to mention inspiring fun for kids of all ages.

Our Linkin' Logs are the perfect gift for any woodworker to make in Santa's workshop. The process of making the logs and accessories is pretty easy using tools you already have.

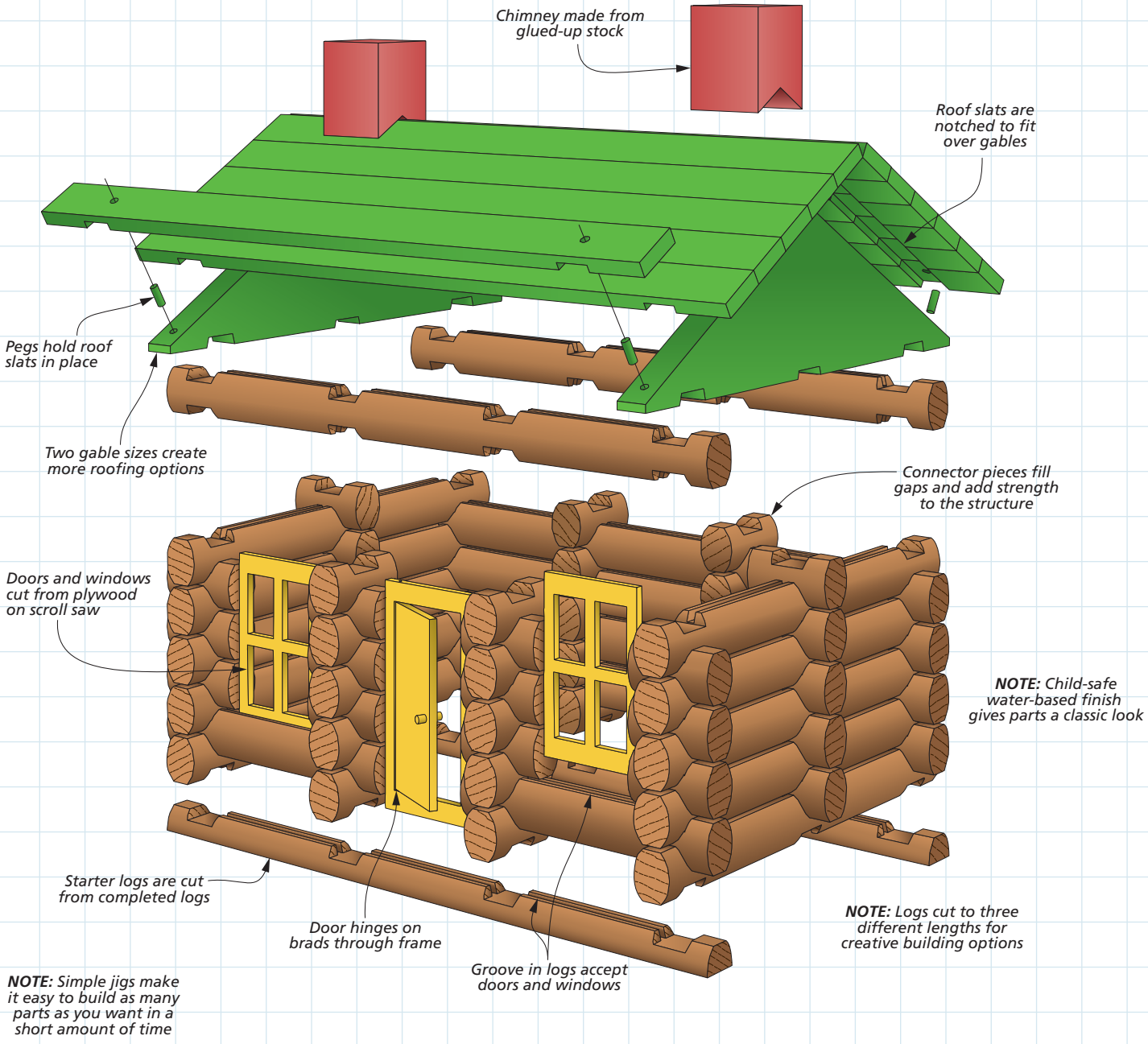
UPSIZE IT. The set of logs you see here is made from inexpensive poplar. They're larger than usual, which makes them easier for small hands to pick up and put in place. Plus, they offer the ability to add doors and windows. These are made from plywood and fit into grooves in the top and bottom edges of the logs.

ASSEMBLY LINE MANUFACTURING. As you might expect, there are a lot of pieces to make. It's a bit of a departure from building furniture — you're really just making a bunch of parts. And the more parts you have, the more creative you can get. I've given you a good starting point with the materials list on page 25. But you can make as many parts as you wish to create more building options.

The real trick is making so many identical parts quickly and consistently. The logs start with long blanks. Then you use simple jigs to cut the angled notches. Before cutting each of the logs to length with a handy cutoff jig, I'll show you how to create the rounded profiles.

Once you get started, you won't be able to stop. But that's okay. I bet you'll be building log cabins on your benchtop long before you apply the finish.

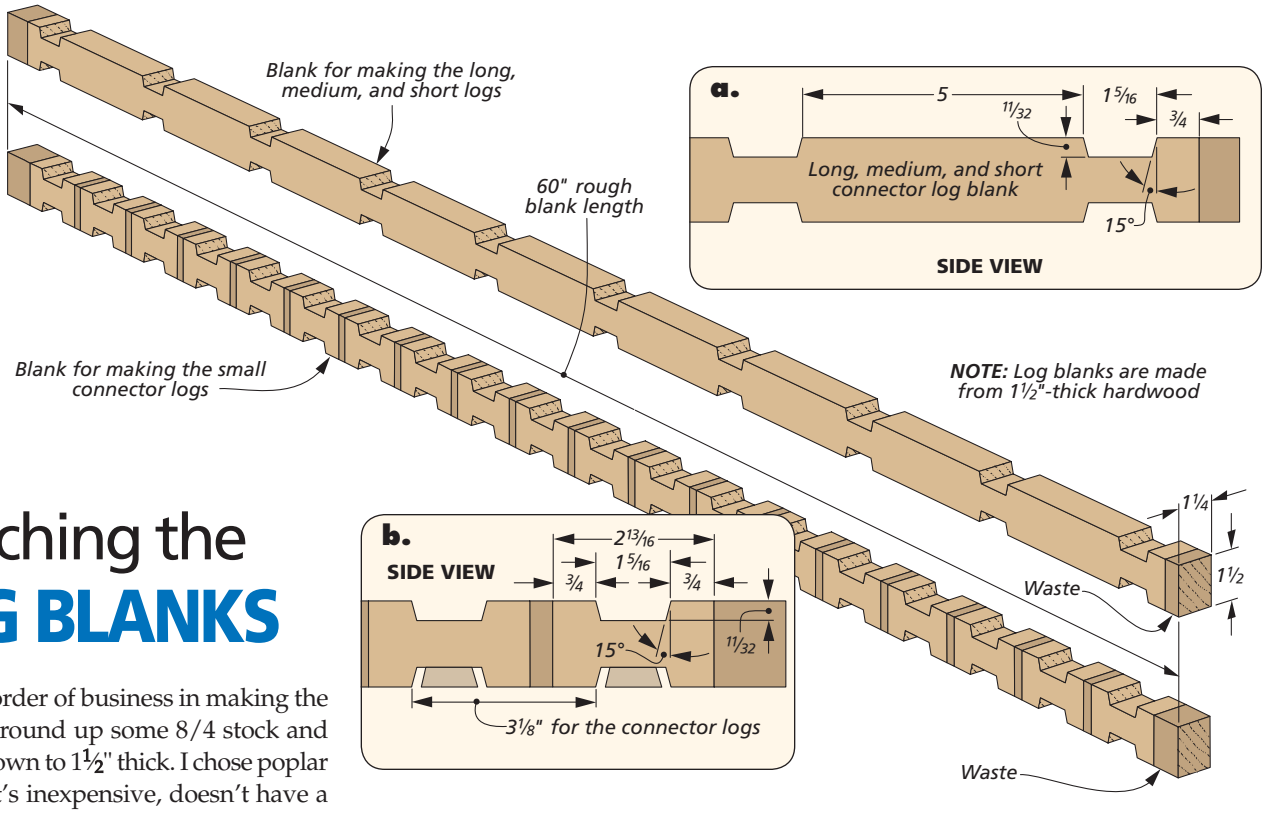
CONSTRUCTION Overview



▲ Doors and windows are made from ¼" plywood. The door hinges are made from small brads.

▲ Windows and doors fit into grooves cut into the logs. The window openings are cut on a scroll saw.

▲ The "starter" slat for the roof fits over short dowels in the gables to support the remainder of the roof.



Notching the LOG BLANKS

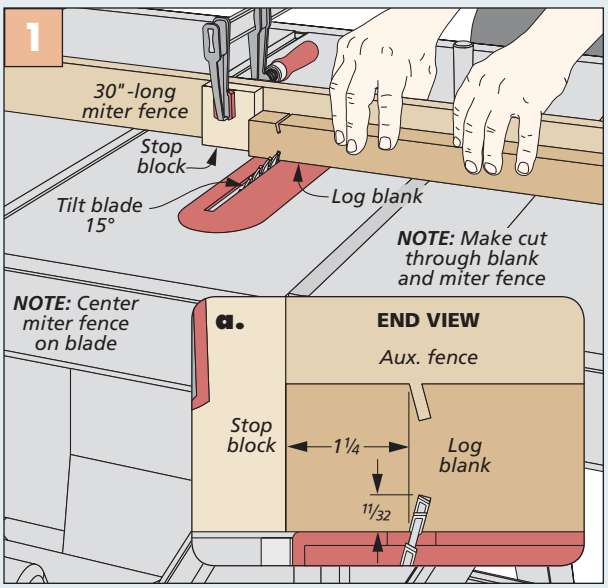
The first order of business in making the logs is to round up some 8/4 stock and plane it down to 1½" thick. I chose poplar because it's inexpensive, doesn't have a pronounced grain pattern, and is easy to work. Any other close-grained wood, like maple, would also be a good choice. You'll just want to be sure to avoid species that splinter easily.

All of the logs and small connector pieces are made from strips ripped to 1¼" wide. I started with blanks that were roughly 60" long.

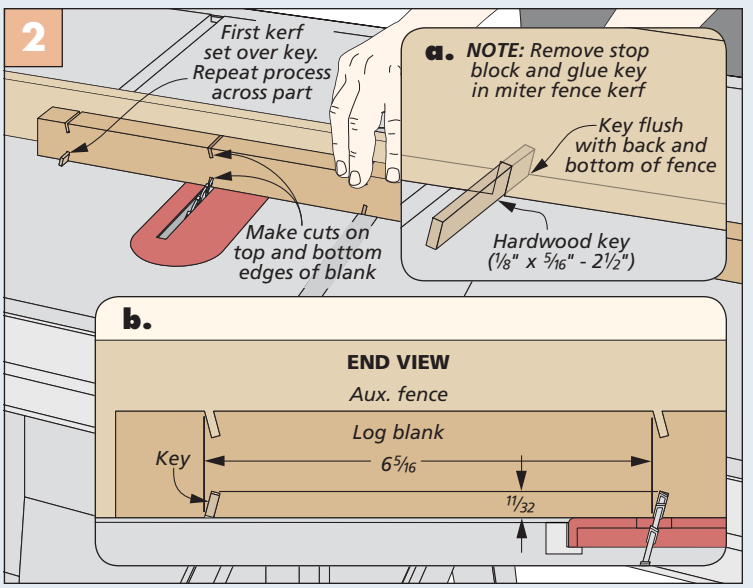
DEFINING THE NOTCHES. Notches in the logs allow them to interlock with one another. As you can see above, there are a lot of notches to cut. The ends of the notches are angled to better fit the rounded profile of the finished logs. Note that some of the blanks are used to create short connector logs, while the rest are used to make the short, medium, and long logs. Other than the spacing of the notches, the process of creating all of the logs is the same.

The box below shows how an auxiliary miter fence and a key ensure consistent spacing for cutting one side of all the notches. If you've used a box joint jig before, the process is pretty similar and is even easier to set up.

How To: MAKE ANGLED CUTS FOR NOTCH SIDES



First Cuts. Use a stop block on the auxiliary miter gauge fence to locate the edge of the first notch on both edges of each blank.



Cut & Repeat. Remove the auxiliary fence, insert a key, then reposition the fence as shown in detail 'b.' Note that this distance is 3⅛" for the short connector logs (detail 'b,' main drawing).

I started by making a key the same thickness as the saw blade. Set up a stop block on the fence about 1¼" from the blade to position the first cut on each blank. This provides a little waste for cutting each log to length later.

After you make the first cut, rotate the blank and cut a kerf on the opposite edge (Figure 1). Remove the fence and glue the key into the saw kerf. Reposition the fence so that the key is spaced from the blade as shown in Figure 2b. This distance is less for the short connector logs (detail 'b', top of the previous page).

Now, place the first saw kerf you cut over the key, then make a pass over the blade. This defines the end of the second notch. Repeat the process, stepping the blank along the edge. Rotate the blank once again to cut kerfs along the opposite edge. Be sure to make these cuts on all of the log blanks before moving on.

The box at right illustrates cutting the opposite end of the notches. For this, you can make a new fence that's a mirror image of the first one. Set your starting point from the blade, then complete all of the cuts along the blank, as in Figure 3.

REMOVING THE WASTE. With the edges of the notches defined, all that's left to do is remove the waste in between. For that, I made a simple sled that attaches to the miter gauge (Figures 4 and 5). The sled consists of a front and rear fence attached to a plywood base.

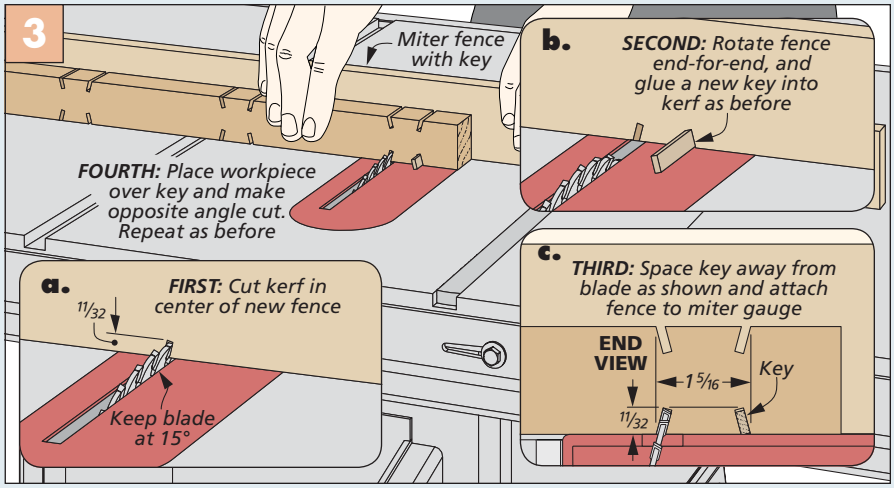
You'll notice that the workpiece is held against the front fence instead of the rear fence. Because there are so many notches to cut, I found it easier to align the notches over the blade using this method.

I marked the centerline on the sled and centered it over a ¾" dado blade before attaching it to the miter gauge, as in Figure 4. Cutting partway into the sled provides a visual cue for positioning the workpiece in the sled.

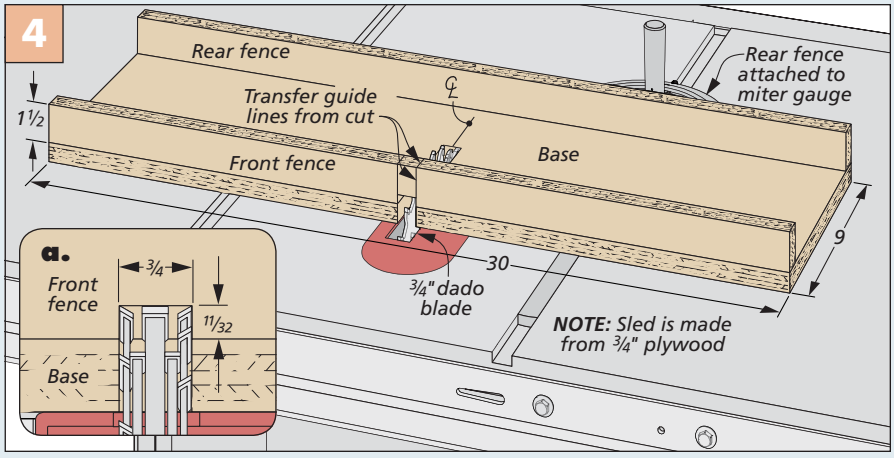
Lines on the fence and base of the sled help align the notch over the blade, as illustrated in Figure 5. These lines extend from the cut lines or kerf created by the dado blade. Now, it's just a matter of aligning the kerfs on the logs blanks with the layout lines on the sled and removing the waste. Repeat the process on both edges of the blank.

Since there are a lot of repetetive cuts to make, it's easy to become complacent. To be safe, stay focused on the task.

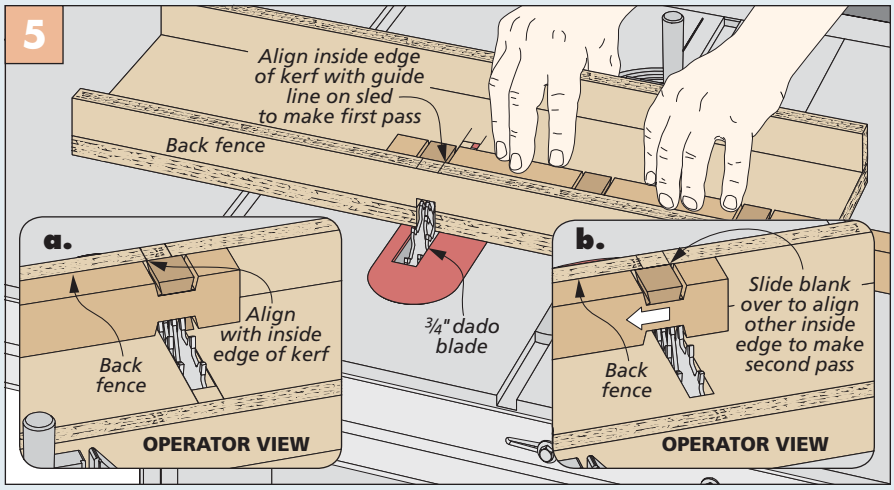
How-To: REMOVE WASTE TO COMPLETE NOTCH



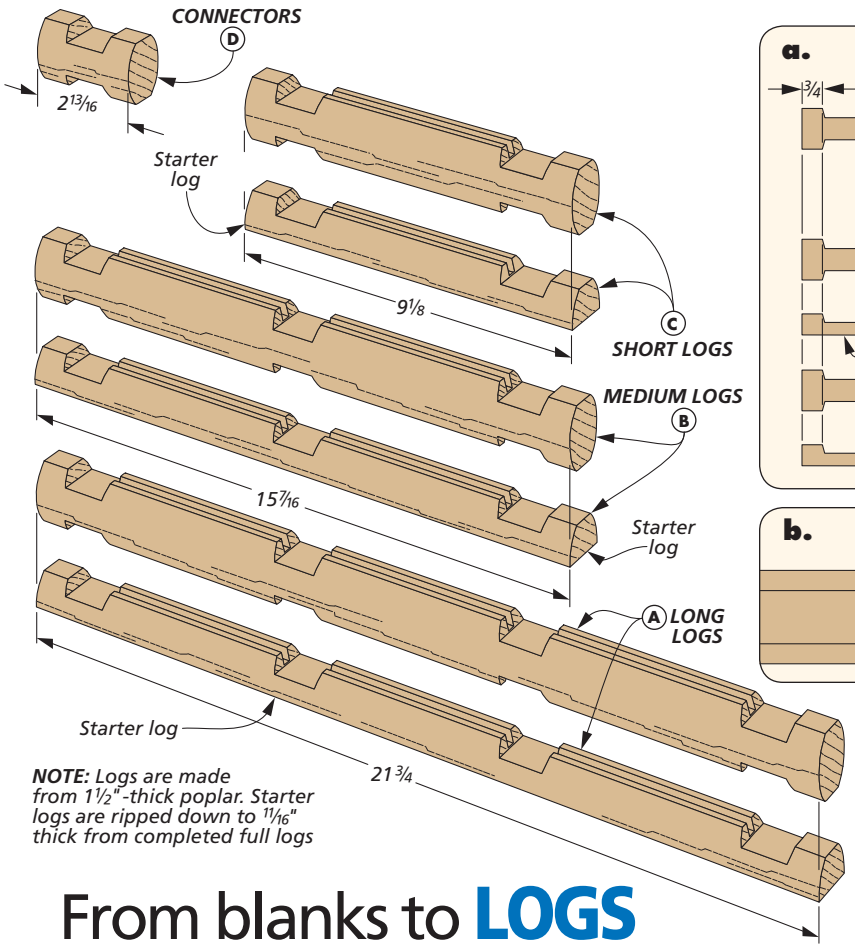
Defining the Notches. To create the opposite end of each notch, you'll use a fence with a key angled in the opposite direction. Use the dimensions shown in detail 'c' to position the fence and key before cutting all of the kerfs.

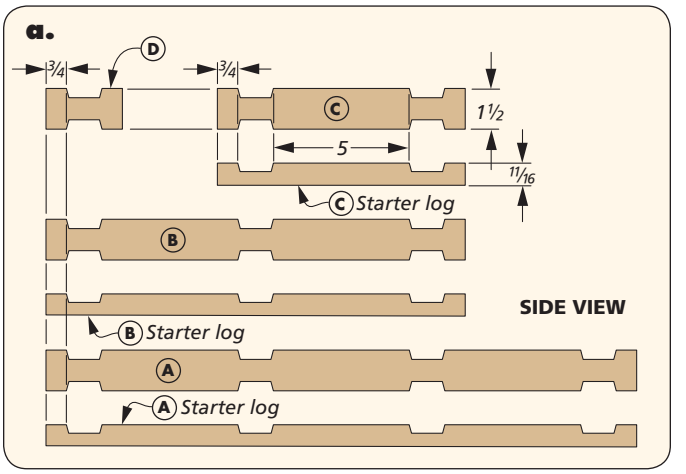


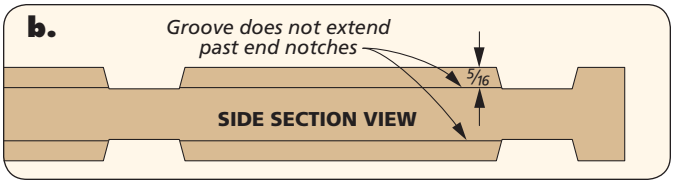
Build a Simple Sled. A sled attached to the miter gauge helps position the workpiece over a dado blade to remove the waste from the notches. Layout lines on the sled's fence and base help you position the workpiece for each cut.

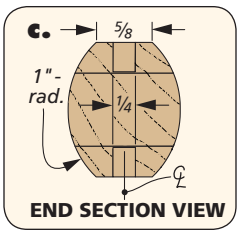


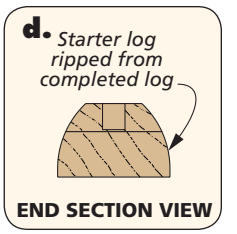
Two Passes. Align the inside edge of the kerf with one of the layout lines then make a pass over the blade. Move the workpiece over so the opposite kerf is aligned with the second layout line and make a second pass.











From blanks to LOGS

Once you've cut all of the notches in the long blanks, there are a few other steps to complete the logs. First, you'll create their rounded shape. Then you can cut the logs to length before routing grooves along the top and bottom edges to house windows and doors.

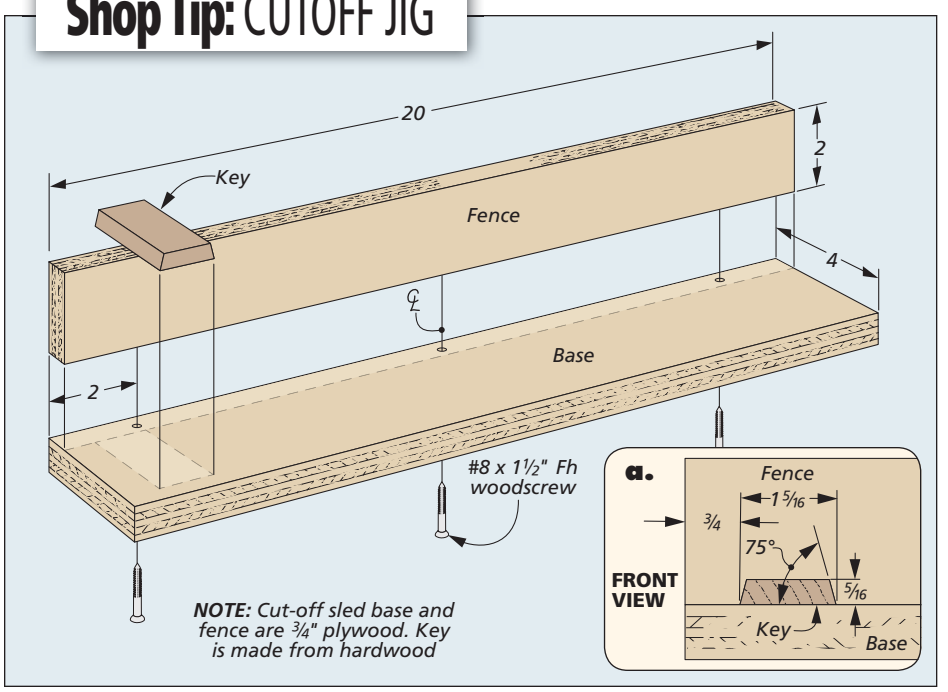
ROUNDED LOGS. The drawings above show how the sides of the logs are rounded, much like you'd find on a real log cabin. Detail 'c' above and Figure 1 on the next page illustrate how to create this profile on the router table. A 1" roundover bit is set up so that the top of the cutting edge is at the centerline of the blank. It's a good idea to use a couple of featherboards to hold the long blank tight to the fence and table throughout the cut. I'd also advise using a push stick to safely guide the tail end of the blank past the featherboards and bit. Make four passes to complete the profile on both sides.

CONSISTENT LENGTHS. At last you can cut the long blanks into manageable lengths to create the three log sizes and small connectors. To do this with repeatable accuracy, I used a cutoff jig attached to the miter gauge, as shown at left. The jig registers the blank by positioning each notch over a beveled key.

As you can see, the jig is a cinch to make. Just make sure the key is thin enough so that the blank sits flat on the base when a notch is positioned over the key. The most important dimension for the key is its width. You want the notch of the blank to fit snug over the key without shifting side to side.

Detail 'a' at left and Figure 2 on the next page give you the details for the setup at the table saw. The basic idea is to position the sled on the miter gauge to cut the blank, leaving 3/4" beyond the notch, as shown in Figure 2a.

Shop Tip: CUTOFF JIG



CONNECTORS. Cutting the short connector logs to length follows a similar process, as in Figure 3. I found it easier to make the first cut, then place the next notch over the key and make a second cut. Repeat this process for all of the notches. You're left with a bunch of small pieces with one end extra long. You can then go back and trim the opposite end of each piece (Figure 3a).

ROUTING GROOVES. It's time to step over to the router table for the next task. And that's to rout a ¼"-wide groove along the top and bottom edge of each log. There's one thing I need to point out about these grooves: They start and stop at the notch at each end of the blank.

Routing the grooves is a matter of using the technique shown in Figures 4 and 5 at right. Set up a ¼"-dia. straight bit and fence so that the groove is centered on the blank. You can use scrap pieces to get the setup right.

To rout these stopped grooves, carefully position the log with the end notch over the bit. Rout the groove until the bit cuts into the last notch. Then simply pivot the log away from the bit, as illustrated in Figure 5.

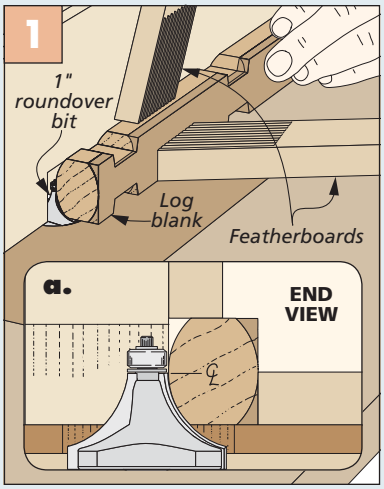
STARTER LOGS. If you stopped right here, you could build structures using the logs. But since they overlap at the corners, there will always be a gap at the bottom on two sides of your "building." So I created a set of starter logs. They're simply some of the logs ripped down the middle, as illustrated in Figure 6.

As you might imagine, ripping a rounded workpiece can be a little tricky. But if you use the setup shown here, you won't have any problems. The important thing to keep in mind is to register the flat edge of the workpiece against the rip fence. To help hold the workpiece in this position, I like to use a couple of featherboards (Figure 6). They apply consistent pressure to keep the workpiece tight against the rip fence and table.

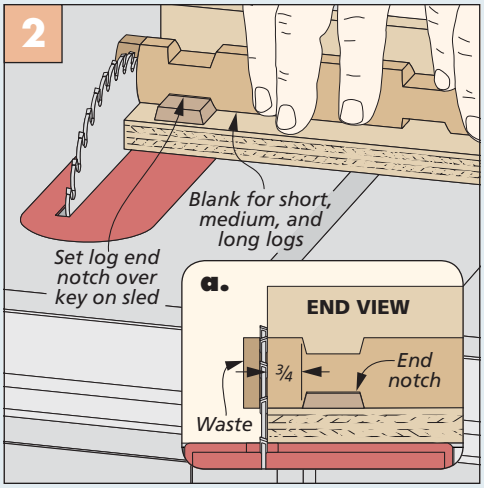
Another thing to keep in mind is to make sure the blade is centered on the log. This way, you'll create two starter logs with each log you cut.

SANDING. These logs will see a lot of use with little hands, so it's a good idea to spend some extra time sanding them smooth. Take care to soften all the sharp edges and remove any splinters. I used 150-grit sandpaper for final sanding.

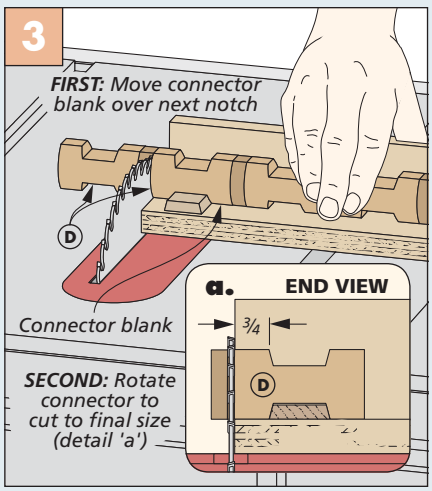
How-To: COMPLETE LOG CUTTING & ROUTING



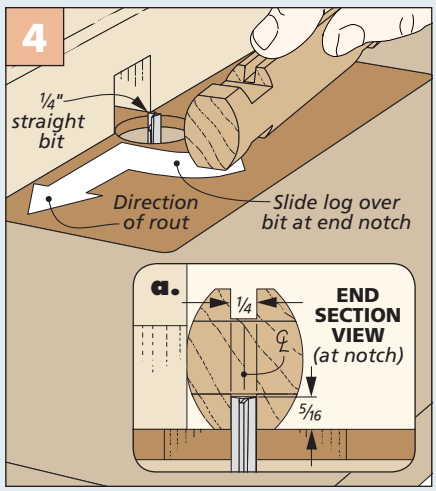
Rounded Logs. Using the setup shown above, make four passes to create the rounded sides.



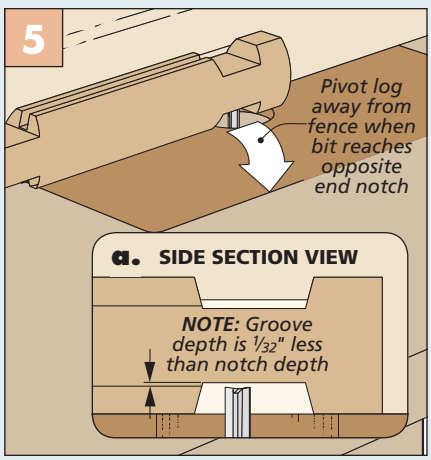
Cutting to Length. The cut-off jig makes it quick and easy to cut all of the logs to consistent lengths safely and accurately.



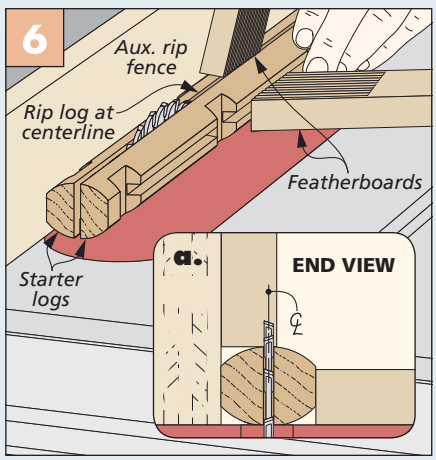
Making Connectors. Creating each of the small connector pieces is easy to do in two passes with the cut-off jig.



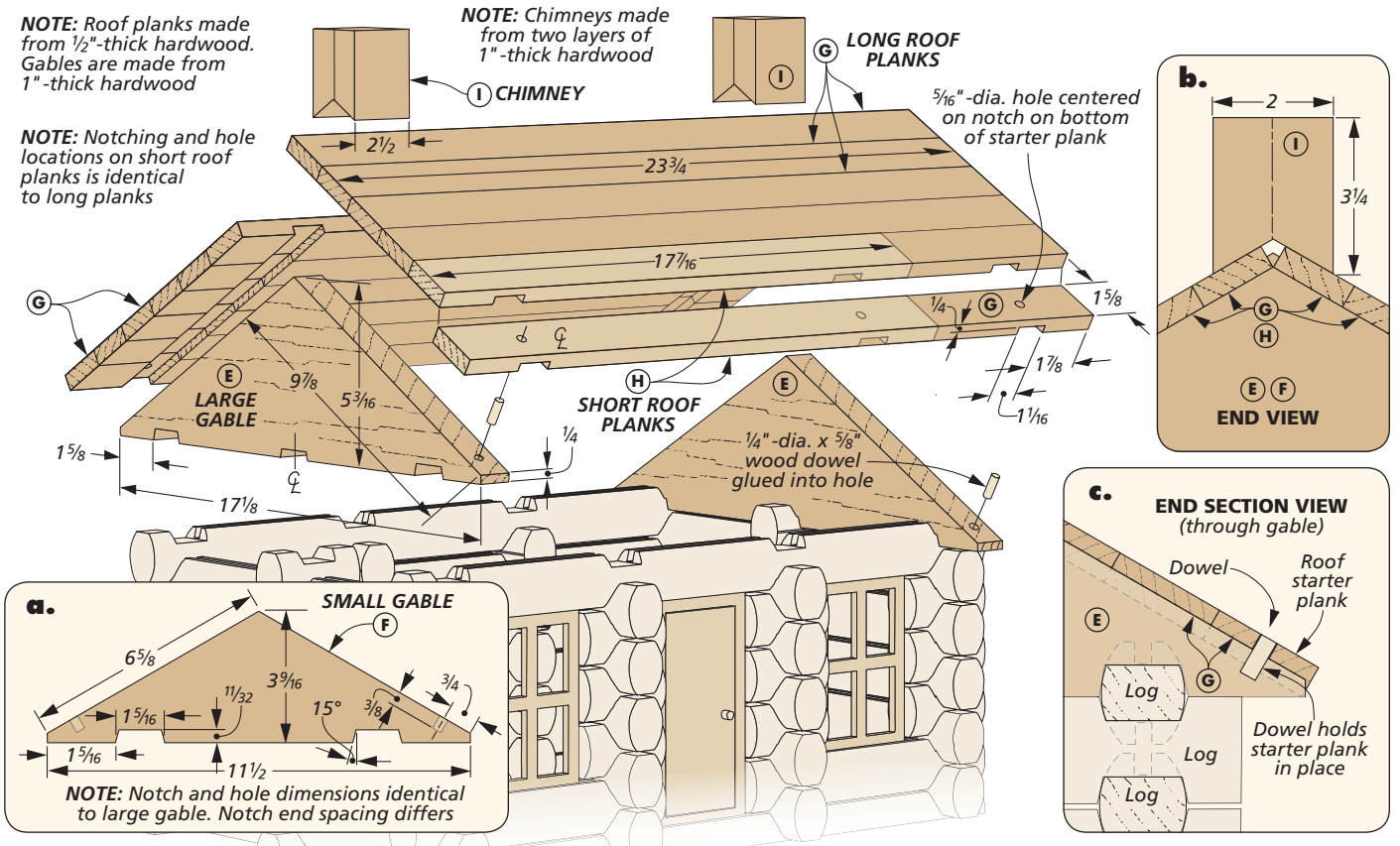
Routing Stopped Grooves. Use a straight bit to rout a groove along the top and bottom of each log.



A Stopping Point. When routing the groove, stop at the notch on the opposite end before removing the log.



Starter Logs. Ripping each log in half at the centerline creates a pair of starter logs.



Adding the ROOF, WINDOWS & DOOR

Now that all the logs are complete, you'll want to add a few more components. For even more fun, a roof, windows, and a door supply the finishing touches to complete your play-time structures.

CALL IN THE ROOFERS. Before you can make and add the roof planks, you'll need to make some gables. These fit over the logs at the ends of your structure and provide a platform for adding the roof.

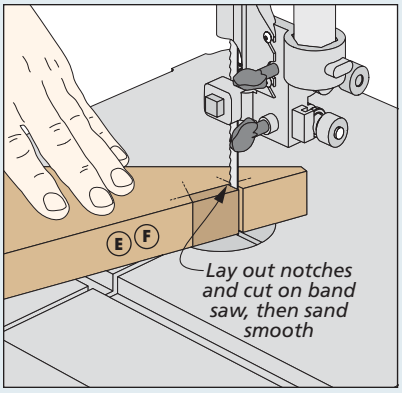
There are two sizes of gables, as shown above. There were only a few notches to make here, so I cut them at the band saw (left drawing below). After cutting the gables to shape, use a hand plane or sander to smooth the edges.

Short dowels at the ends of the gables support the first roof plank to keep it from sliding off. Drill the holes and glue in the dowels before moving on.

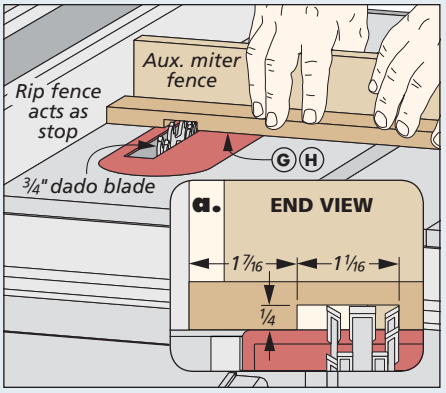
ROOF PLANKS. The roof planks are probably the easiest parts you'll make. I ripped them from a wide blank. Like the gables, there are two sizes. So you'll need to cut them to their respective lengths.

A notch near each end of the planks fits over the gable. I used a dado blade to cut these. The rip fence acts as a stop, as illustrated in the middle drawing below. Make the first pass at each end of all of

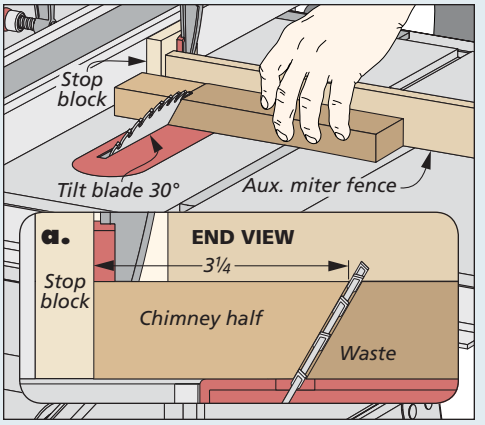
How-To: BUILD THE ROOF COMPONENTS



Gable Ends. A band saw makes quick work of shaping the gables and cutting the notches.



Notched Planks. To cut the dadoes in the roof blanks, use a dado blade. The rip fence acts as a stop.



Two-Part Chimney. Cut the end of the chimney blanks at an angle before gluing them together to form a V-notch.

the blanks to establish one edge of the notch. Then move the rip fence to establish the final width of the notch before making a second pass.

A PAIR OF CHIMNEYS. No log cabin roof would be complete without a chimney or two. I made mine from two layers of 1" stock. A V-notch at the bottom of the chimney fits over the roof planks. I created the V-notch by beveling the end of each half. I started with extra-long stock. Tilt the saw blade 30° and then cut the angle to create a pair of blanks, as shown in the lower right drawing on the previous page. Glue up the two halves, making sure to keep the pieces aligned as the glue dries.

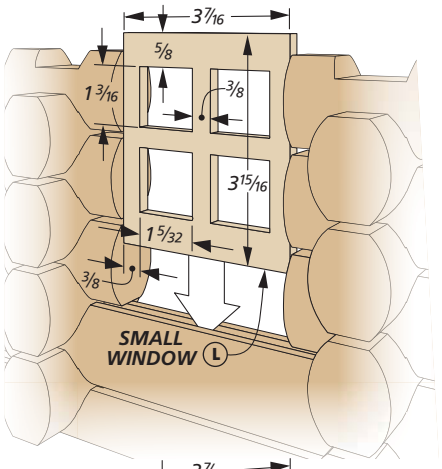
WINDOWS & DOORS

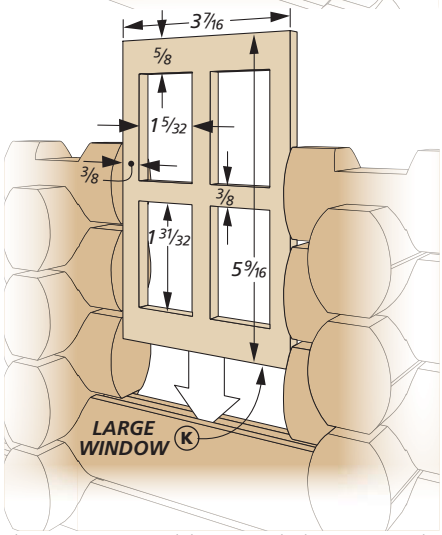
While you're adding some interesting details to your buildings, you might as well include some windows and doors. They're made from ¼" plywood. I used Baltic birch plywood since it's stronger than standard cabinet-grade plywood and doesn't break as easily in the hands of rambunctious young ones.

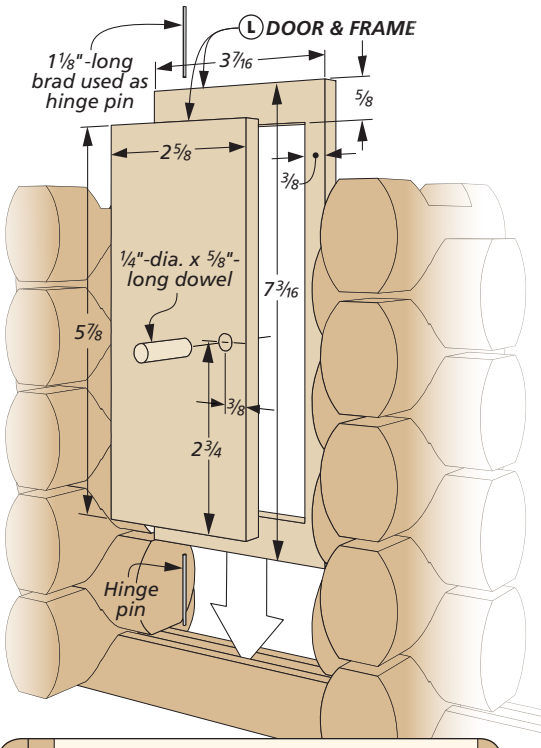
The dimensions for the two window sizes and door are shown at right. All of the parts are cut using a scroll saw, as you can see in the drawing below. If you don't have a scroll saw, you can use a coping saw. Just remember that you'll need to drill a starter hole for the blade.

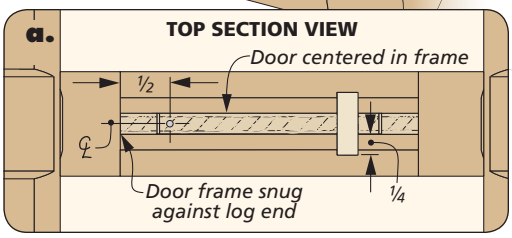
The door is cut out from a blank that also forms a frame to surround the door on all sides. I drilled a small starter hole at one corner of the door. To allow the door to swing like a real door, I made hinges by drilling pilot holes and tapping brads through the frame into the door while they were clamped in a vise.

The final touch to add is a doorknob. It's made from a short length of dowel glued into a hole in the door.









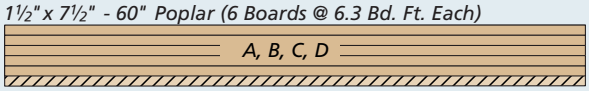
FINISHING. To finish all of the parts. I used a water-based dye diluted about 25% with water. Turn to Sources on page 67 to find out where to purchase the dye. Brush it on and allow it to dry thoroughly before setting out to build your log cabin structures.

Materials, Supplies & Cutting Diagram

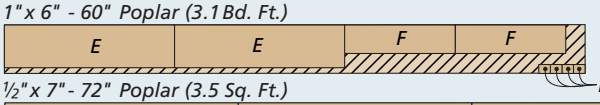
A	Long Logs (24)	1½ x 1¼ - 21¾	
B	Medium Logs (24)	1½ x 1¼ - 15⁷⁄₁₆	
C	Short Logs (24)	1½ x 1¼ - 9⅛	
D	Connectors (120)	1½ x 1¼ - 2¹³⁄₁₆	
E	Large Gables (2)	1 x 5³⁄₁₆ - 17⅛	
F	Small Gables (2)	1 x 3⁹⁄₁₆ - 11½	
G	Long Roof Planks (12)	½ x 1⅝ - 23¾	
H	Short Roof Planks (12)	½ x 1⅝ - 17⁷⁄₁₆	
I	Chimneys (2)	2 x 2½ - 3¼	
J	Small Windows (4)	¼ ply. x 3⁷⁄₁₆ - 3¹⁵⁄₁₆	
K	Large Windows (4)	¼ ply. x 3⁷⁄₁₆ - 5⁹⁄₁₆	
L	Door & Frame (1)	¼ ply. x 3⁷⁄₁₆ - 7³⁄₁₆	

- (2) #17 x 1⅛" Brads
- (9) ¼"-dia. x ⅝" Dowels

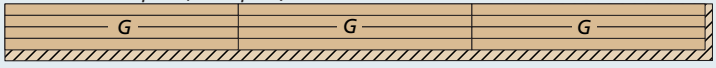
1½" x 7½" - 60" Poplar (6 Boards @ 6.3 Bd. Ft. Each)



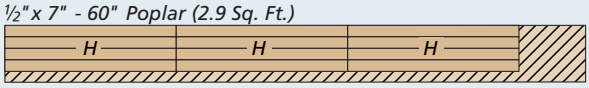
1" x 6" - 60" Poplar (3.1 Bd. Ft.)



½" x 7" - 72" Poplar (3.5 Sq. Ft.)

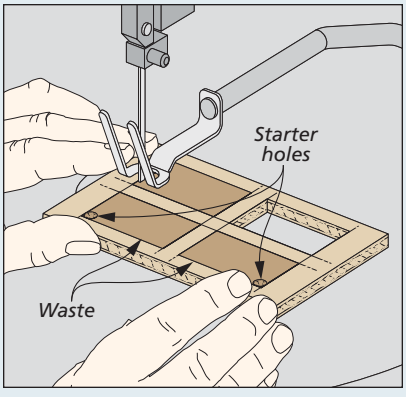


½" x 7" - 60" Poplar (2.9 Sq. Ft.)



ALSO NEEDED: *One - 12" x 24" sheet ¼" Baltic birch plywood*

How-To: MAKE CUTS



Window Panes. A scroll saw allows you to make the fine cuts necessary to create the window cutouts.

Shop Project

drill press Depth Stop

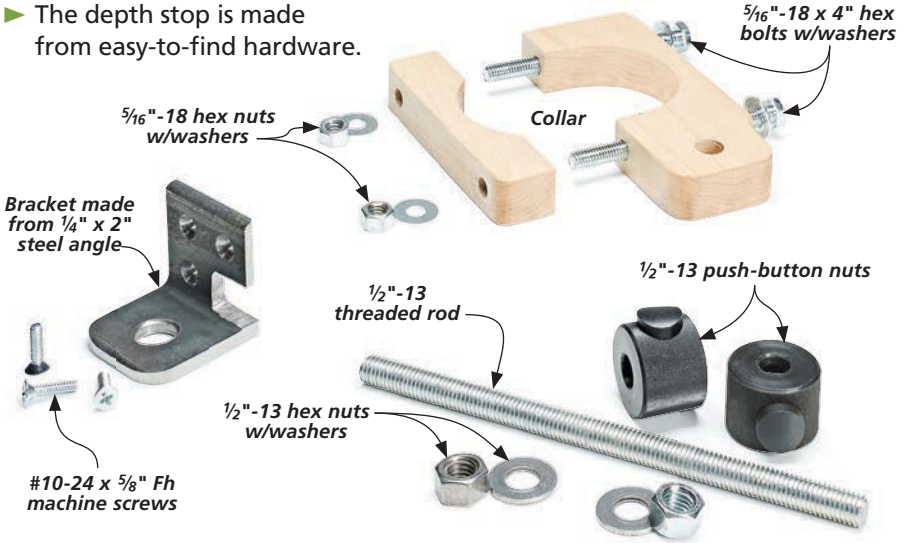
With a few pieces of simple hardware, you can build this add-on to make drilling holes at a consistent depth faster and easier.

The depth stop on some drill presses seems like an afterthought. Setting it can be a fussy operation. That's where the upgrade you see here really shines. Plus, it adds the ability to lock the quill at any height. (I'll talk more about this later.)

HOW IT WORKS. The photos and drawings provide an overview of how the depth stop works. First, a steel bracket mounts to the side of the drill press. A wood collar fits around the quill's metal collar. Attached to the wood collar is a threaded rod that passes through the bracket for adjusting the quill position. Push-button nuts act as stops on the rod.

EASY-TO-FIND HARDWARE. As you can see below, most of the parts you need to make the depth stop can be found at a hardware store. The only exception might be the push-button nuts.

► The depth stop is made from easy-to-find hardware.

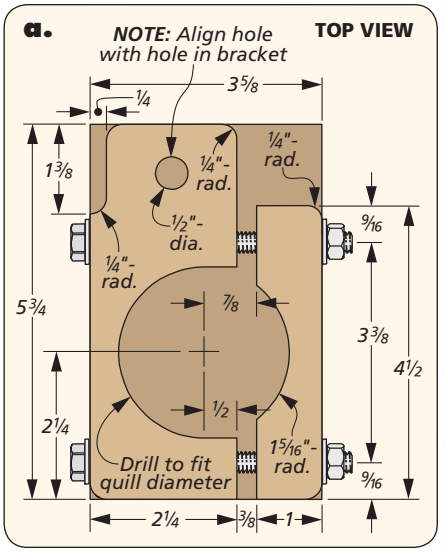


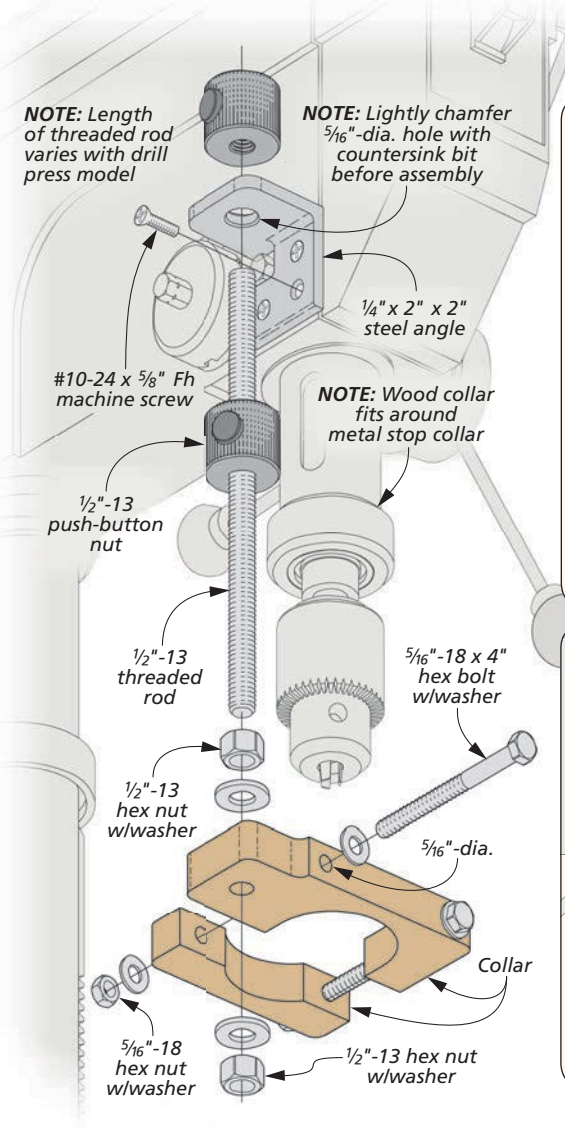
The big advantage of the push-button nuts is that they can quickly be repositioned. Simply depress the button on the side, slide the nut into place, then release the button. For fine-tuning the position, you can spin the nut as usual.

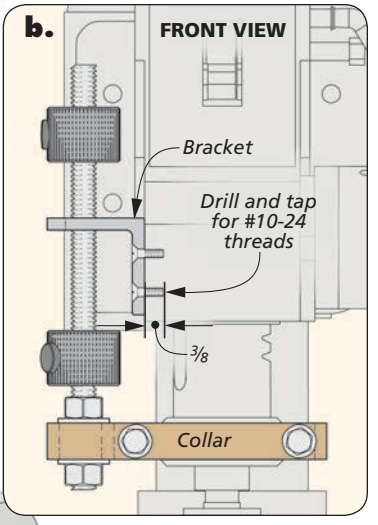
I've included two nuts: The top one sets the length of travel of the quill. Push the bottom nut up against the bracket and it locks the quill in its vertical position. This comes in handy when using sanding drums, for example.

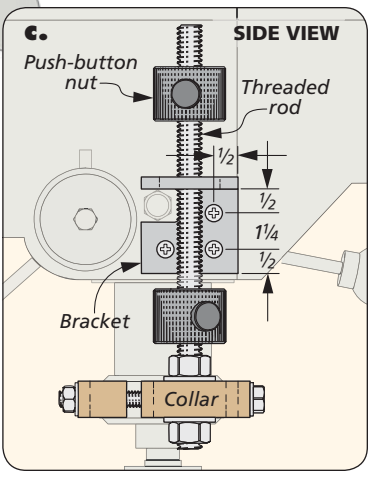
METALWORKING. I started by creating the metal bracket. It's made from a piece of steel angle, as illustrated in the box on the next page. To locate the bracket on the side of the drill press, find a spot in line with the quill and close to the bottom edge of the casting. For my bracket, I had to create a notch to clear the set screw and nut that holds the spindle in place (detail 'c'). Drill countersunk holes for #10 machine screws and the 5/8"-dia. hole for the threaded rod.

After cutting the bracket to length, grind the corners round and file all of the edges smooth. Use the bracket to locate









the tapped holes in the drill press casting. Drill the holes through the casting then tap them for #10-24 threads.

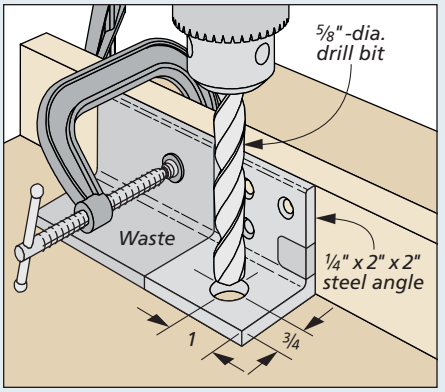
Now attach the bracket to the drill press. You'll use it to help locate the hole in the collar for the threaded rod. To figure out the length of rod you need, extend the quill all the way, measure from the top of the drill chuck to the bottom of the horizontal flange on the bracket, then add 3". Cut the rod to length and install a push-button nut. Slide the rod through the bracket and fasten the other push-button nut. This holds the rod in place while you work on the collar.

QUILL COLLAR. The collar starts out as a rectangular blank. I cut the blank to width, as shown in detail 'a' above. Then I drilled through the edge of the blank for the long hex bolts.

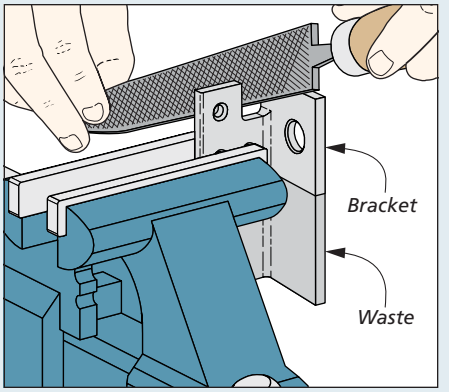
Start by laying out the centerpoint of the hole for the metal stop collar's diameter. Lay out the two parts on the blank and then drill the hole to fit the quill, as in the lower right drawing. Then cut the blank to separate the two parts.

Using hex bolts, washers, and nuts, mount the collar on the quill temporarily to locate the hole for the threaded rod. After drilling the hole, finish shaping the collar. Finally, you can assemble all of the parts for your new depth stop.

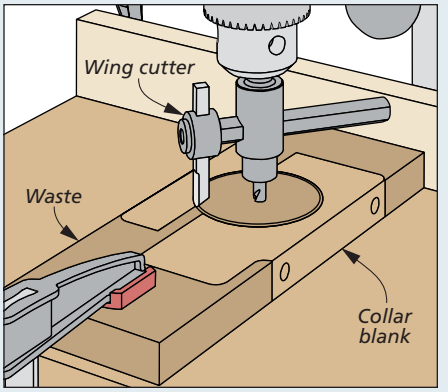
How-To: SHAPE THE PARTS



Drilling. Start with an extra-long piece of steel angle. Drill the mounting holes and hole for the threaded rod.



Creating a Notch. If the bracket interferes with any hardware on the drill press, create a notch for clearance.



Drill to Fit. Drill a hole sized to fit around the metal stop collar before separating the two pieces of the collar.

Designer Project

Classic Cherry Step Stool

With its solid construction and practical design, this project is sure to be the most useful piece of furniture in the house.

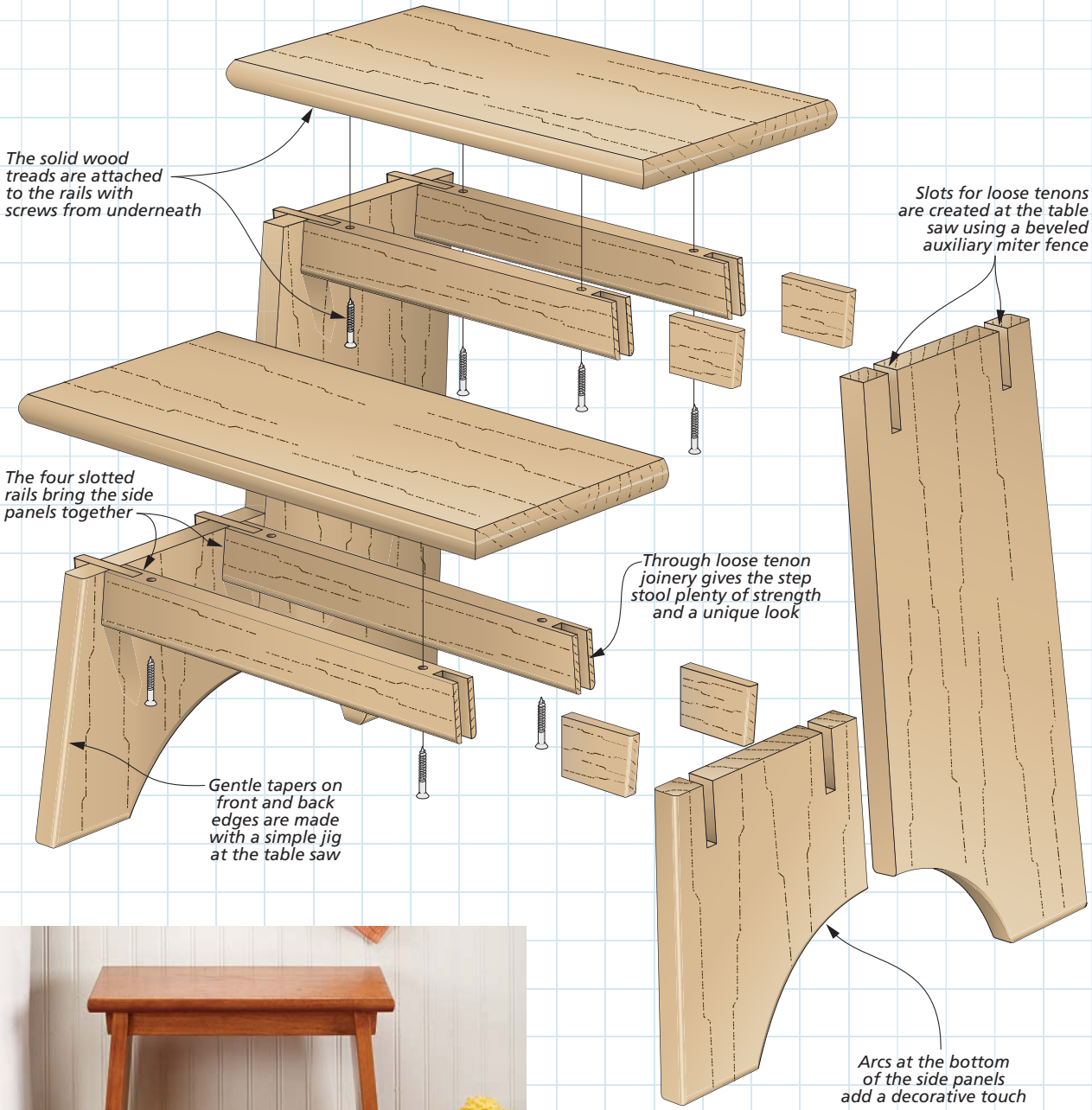
No matter what your height, we all could use a little assistance when it comes to reaching high objects around the house. However, climbing onto a poorly designed step stool often comes with its own perils. Some stools can be tippy and unstable, which just begs for an accident to happen. But that's not a problem with the step stool shown above.

The first thing you'll probably notice about this stool is the tapered sides that are splayed at the bottom. If you've ever stepped too close to the edge on a step stool that has straight sides, then the advantage of having a wide footprint is obvious. This is especially true if the stool is placed on an uneven surface. This small detail gives our step stool a big advantage over straight-sided designs by providing a rock-solid foundation.

All of these angles and tapers may appear intimidating. However, this step stool is designed so that most of the cuts can be made at the table saw with just a couple of simple jigs.

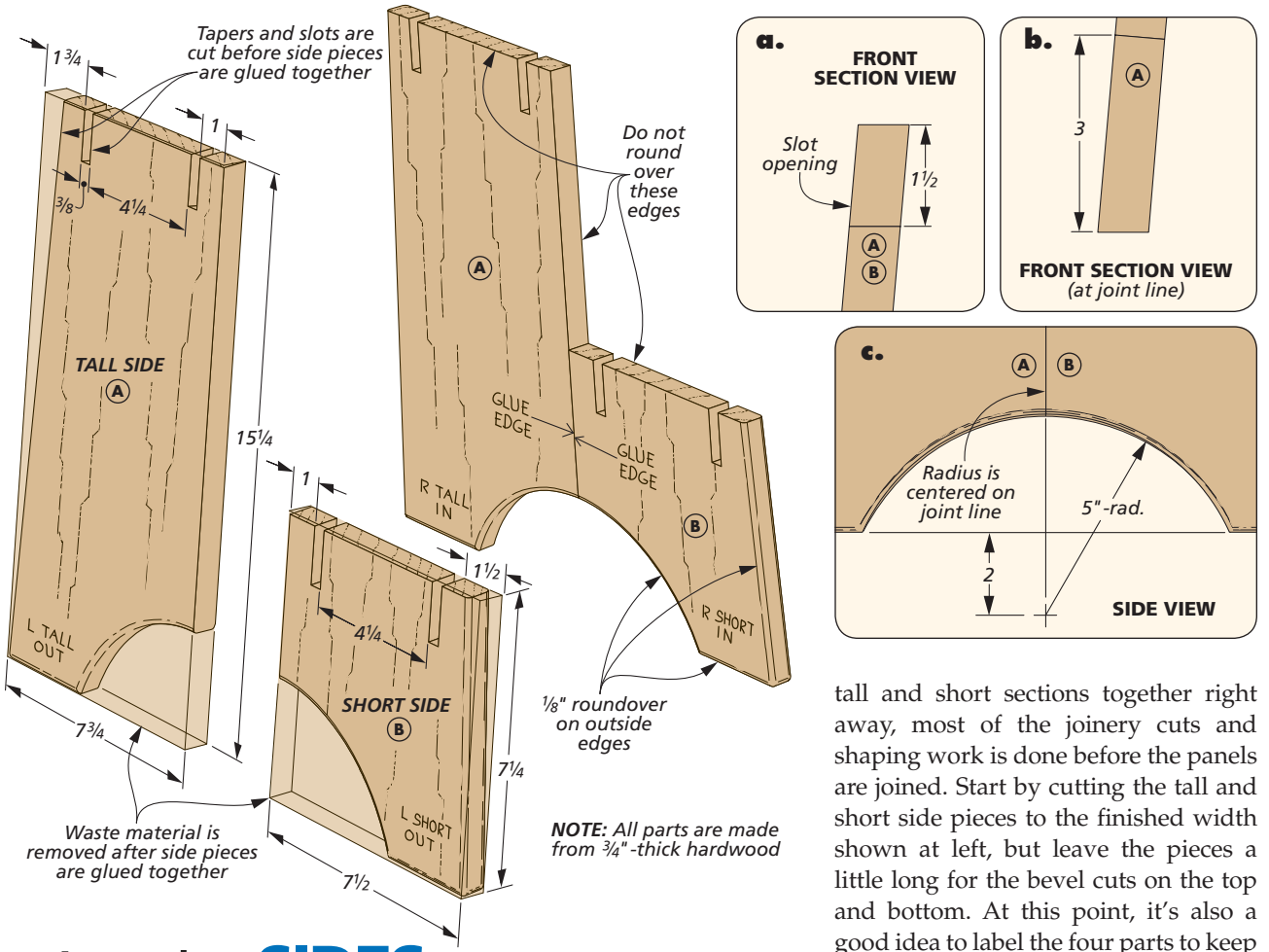
This includes the loose tenons that hold the four rails to the sides. The benefit of using loose tenons here is two-fold; they avoid the need to cut angled shoulders on a traditional tenon, and they give the step stool a unique look. So turn the page and get started on your own version of this soon-to-be classic project.

Construction Overview / *OVERALL DIMENSIONS: 16⅜"W x 16"H x 15¼"D*



▲ The splayed sides of the step stool provide a safe and stable foundation, making it appropriate to use in any room of the house.

NOTE: *Refer to page 67 for finishing information*



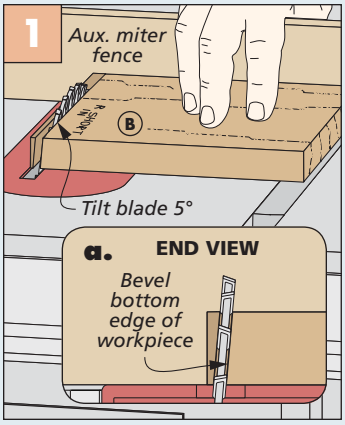
Shaping the SIDES

At the heart of the step stool are the two side panels. The panels are mirror images of one another with bevels on the top and bottom edges and slight tapers along the front and back edges. Slots cut on the top edges hold the loose tenons. The arches along the bottom reduce the overall weight of the stool while also providing more stability and a nice look.

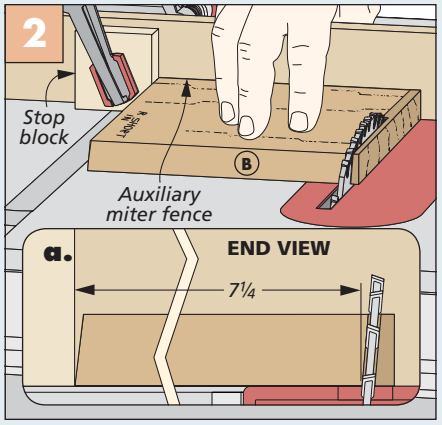
SIDE SECTIONS. Each side of the step stool is constructed from two glued up boards. But instead of gluing these tall and short sections together right away, most of the joinery cuts and shaping work is done before the panels are joined. Start by cutting the tall and short side pieces to the finished width shown at left, but leave the pieces a little long for the bevel cuts on the top and bottom. At this point, it's also a good idea to label the four parts to keep everything clear going forward.

CUT SIDES TO LENGTH. The drawings below show the process for cutting the side pieces to length. I'll just mention a couple of details. First, all of the bevel cuts are made at the table saw using the miter gauge equipped with a long auxiliary fence and the table saw blade tilted 5°.

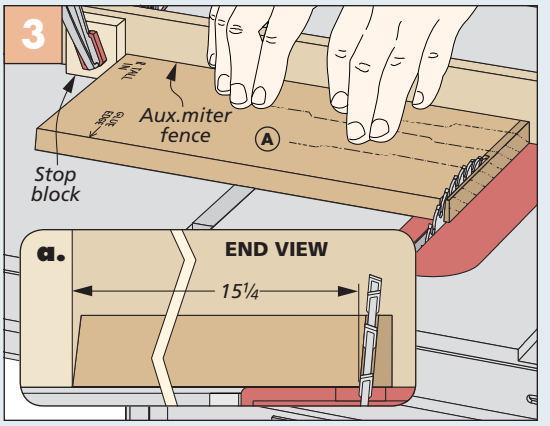
How-To: MAKE THE BEVEL CUTS



First Bevel Cut. Make a bevel cut on one end of each short and tall side piece.



Second Bevel Cut. Use a stop block clamped to the auxiliary miter fence to cut both short sections to final length.



Cut Tall Sides to Length. Reposition the stop block on the miter fence and make the second bevel cut on the end of each tall side section.

And second, it's important to keep the workpieces oriented correctly to maintain the left and right mirror images.

COMPLETE THE SIDES

With the side pieces cut to size, you can turn your attention to the rest of the operations that will complete each side panel. The first order of business is to cut the angled slots along the top edge of each piece. These house the rail-mounted loose tenons later on.

ANGLED SLOTS. Since the top and bottom edges of the side panels are beveled to give the step stool its splayed stance, the bottoms of the slots need to be cut at the same angle, as well. This may seem like a complicated cut, but it's actually quite simple. Start by bevel ripping the face of an auxiliary miter fence to 5° and attach it to the miter gauge (Figure 1a at right).

Mark the locations of the slots near the top edge of each workpiece. (Be sure to mark the inside face of each piece.) Now position one side piece against the auxiliary miter fence and clamp it in place.

Pass the workpiece over a ⅜"-wide dado blade to make the first slot. It's then just a matter of sliding the board along the auxiliary miter gauge fence, clamping it in position, and making the second cut (Figure 2).

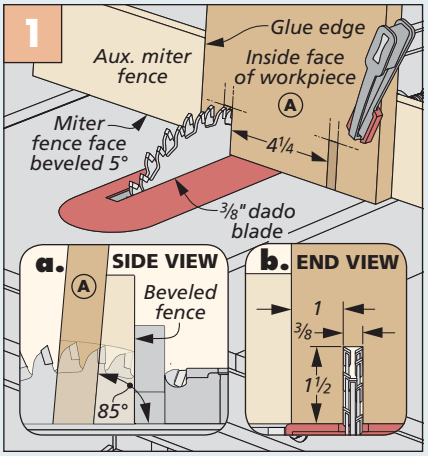
TAPER THE EDGES. The last operation that needs to be done to the individual side pieces before they can be glued together is to cut a slight taper on the outside edges. If you already have a taper jig, that's great. If not, Figures 3 and 4 at right show the method I used to make these cuts at the table saw using a piece of hardboard as a simple sled.

Start by laying out the taper position on each workpiece. (Note that the amount of taper is slightly different between the short and tall pieces.) Then, one at a time, use double-sided tape to secure each piece to the sled. The rip fence guides the hardboard sled while making the cut.

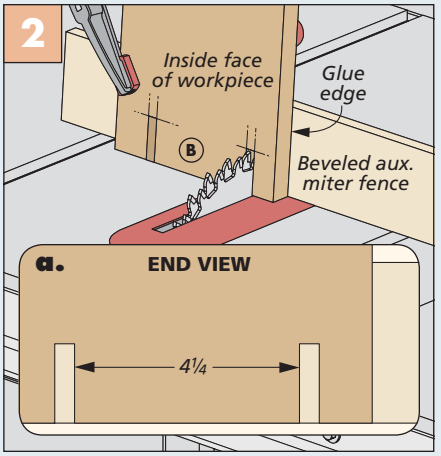
BRING THE SIDES TOGETHER. Gluing up the side pieces to complete each panel is pretty straightforward. However, I did use a couple tricks to ensure a perfect fit. Figure 5 at right shows what I mean. First, I used a long, straight board to align the bottom edges of the pieces. The other handy hint is to place a couple clamp blocks on either side of the panel. This helps to keep the joint line flush. Just be sure to slip a piece of waxed paper under the scraps to prevent them from sticking to the panels.

ARCS & ROUNDOVERS. Now, lay out and cut the arcs at the bottom of each piece. The band saw makes quick work of this cut (Figure 6). The saw marks can be cleaned up with a sanding drum. Finally, all that's left to complete the side panels is to round over the outside edges at the router table. Leave the top edges and the front edge of the tall side piece square.

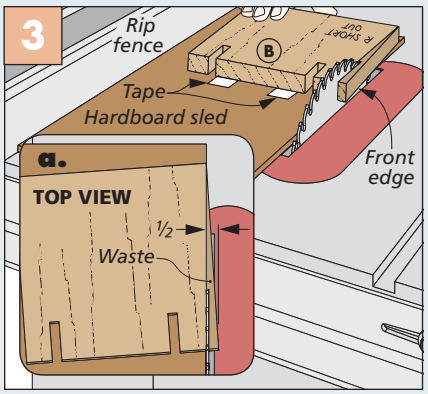
How-To: SLOTS, TAPERS & SHAPING



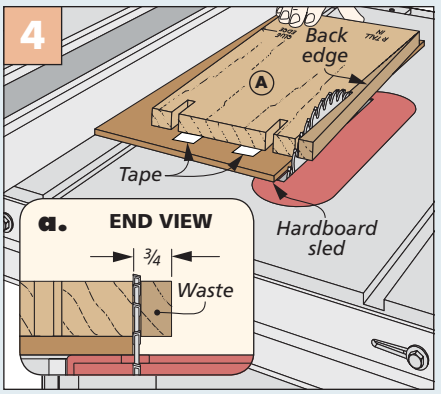
Cutting Angled Slots. Clamp the workpiece to the beveled miter fence. Use a dado blade to cut the first slot.



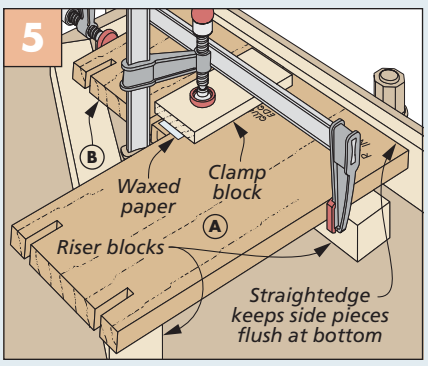
Making a Second Pass. Reposition the workpiece against the miter fence and make the second slot.



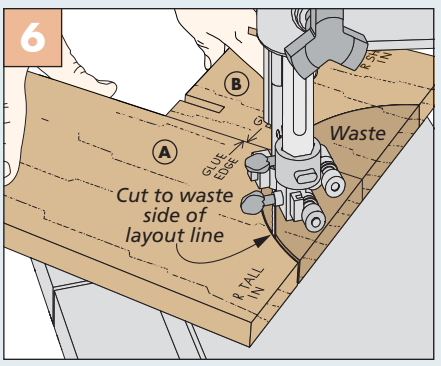
Short Tapers. Align the cut line with the edge of the sled. Use double-sided tape to secure the workpiece.



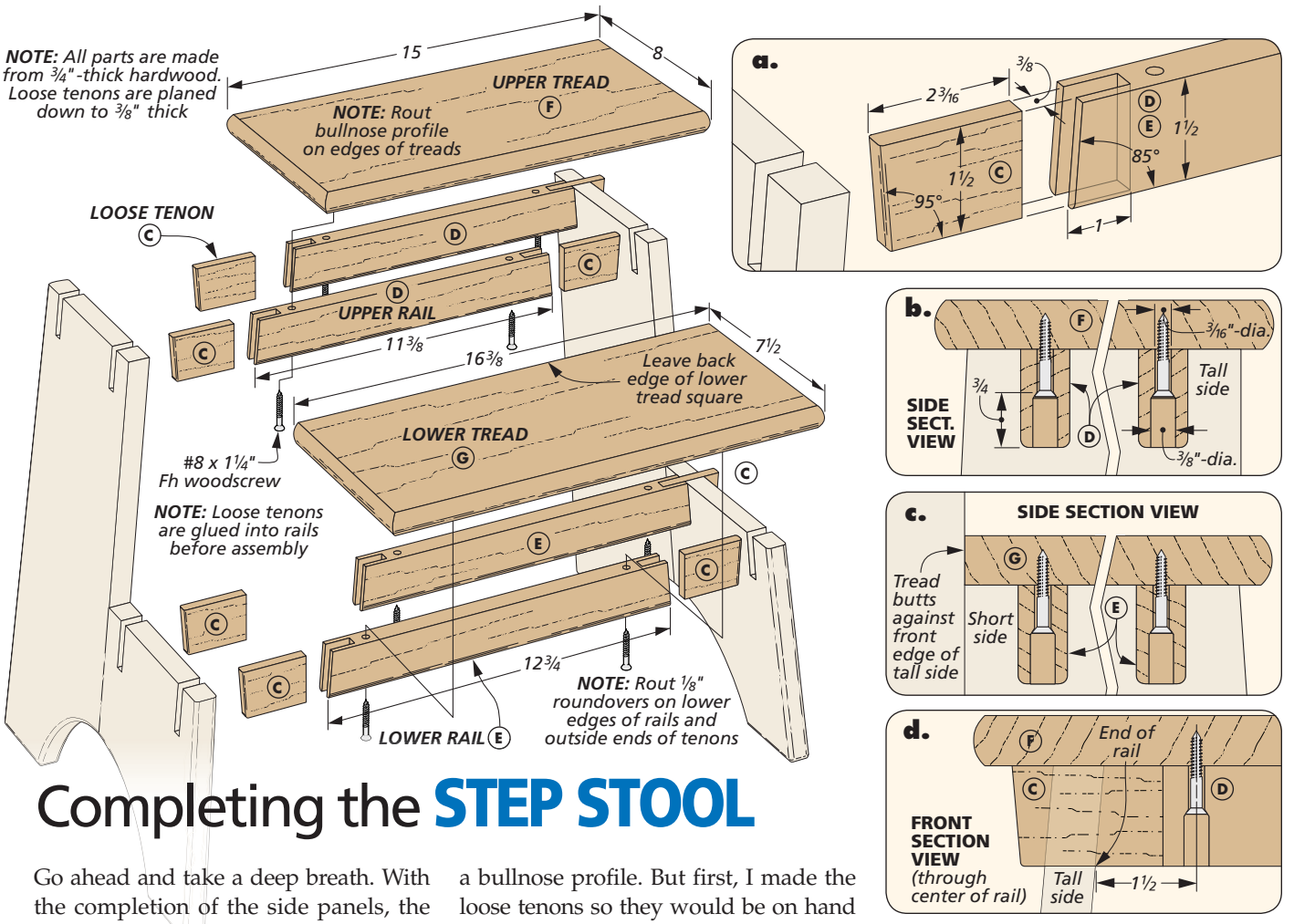
Cutting Tall Tapers. Using the same process, line up and attach the tall side sections to the hardboard sled.



Bring it Together. A long, straight board and a couple clamp blocks aid in the glueup process.



Cut the Arcs. Cut on the waste side of the layout line. Clean up the band saw marks with a sanding drum.



Completing the STEP STOOL

Go ahead and take a deep breath. With the completion of the side panels, the hardest part of this step stool is behind you. There's more work to be done, for sure. But the bulk of these remaining steps are a breeze in comparison.

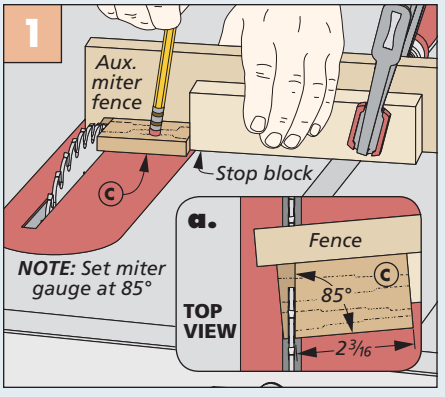
The four rails that bring the side panels together have open slots on the ends for the loose tenons and are mitered to match the angle of the sides. The treads are constructed from solid stock and routed with a bullnose profile. But first, I made the loose tenons so they would be on hand to test the fit in the rail slots.

LOOSE TENONS. Start by planing a piece of stock down to match the notches already cut in the sides. Cut the eight loose tenons slightly longer than needed. Figure 1 below shows how I used the miter gauge set at 85° to trim the loose tenons to final length. Then round over the mitered ends of each tenon at the router table.

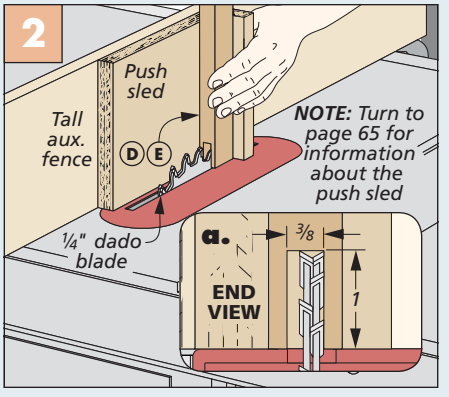
UPPER & LOWER RAILS. The four rails are up next. Cut them to their final lengths shown above, but leave the ends of the rails square for now. This makes cutting the slots in the ends much easier.

As shown in Figure 2 below, I used a simple push sled and tall auxiliary rip fence to support each rail as I passed it

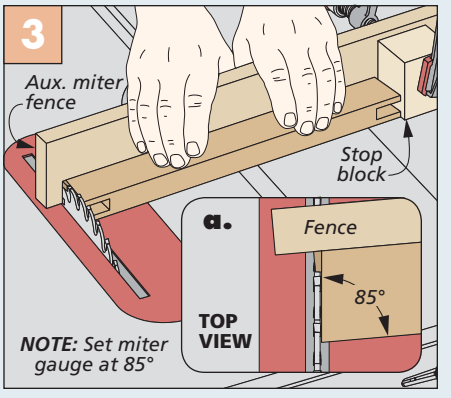
How-To: LOOSE TENONS & RAIL SLOTS



Miter the Tenons. Use a stop block and auxiliary fence to miter cut one end of all the loose tenons.



Slots in Rails. Make one pass, flip the workpiece edge for edge and make another pass to center the slots.



Miter the Ends. After mitering one end, set a stop block for the other end to ensure consistent rail lengths.

over a dado blade in the table saw. For more on how to make this sled, turn to Shop Notes on page 65.

To ensure the slots are perfectly centered on the ends of the rails, you'll use a ¼"-wide dado blade and make one pass. Flip the piece around and make another pass. This will allow you to sneak up on the final width of the slot. Use one of the loose tenons to check the fit.

Now, all that's left is to miter the ends of each rail. Since you'll only be removing a sliver of material from each end, use a sharp marking knife to carefully lay out these cut lines. Remove just enough material to bring the rails to their final length. After cutting one end, I used a stop block to ensure the upper rails were the same length (Figure 3, previous page). I then did the same thing for the lower rails.

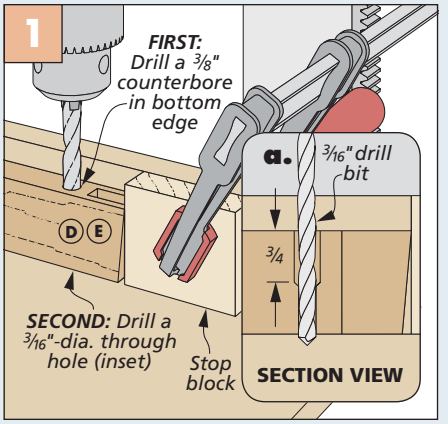
FINISHING TOUCHES

By now you probably have a pretty good idea of the remaining steps needed to complete this stool. The four boxes at right show the main operations that are left.

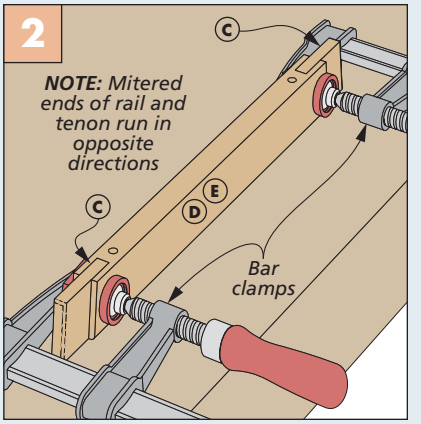
FINISH THE RAILS. The first of those is to move to the drill press and drill all of the counterbored holes used for securing the treads in the bottom edge of each rail. Figure 1a above gives the dimensions. I used a stop block clamped to the fence for quick placement. Then round over the bottom edge of each rail at the router table.

ADD THE TENONS. With all of the loose parts involved, it would be difficult to assemble the stool in one step. Instead, I opted to glue the loose tenons into the rail slots first. Bar clamps work great to hold everything in place (Figure 2). Just be sure that the mitered ends of the rails and the loose tenons are running in opposite directions. Details 'a' and 'd' at the top of the previous page show what I mean.

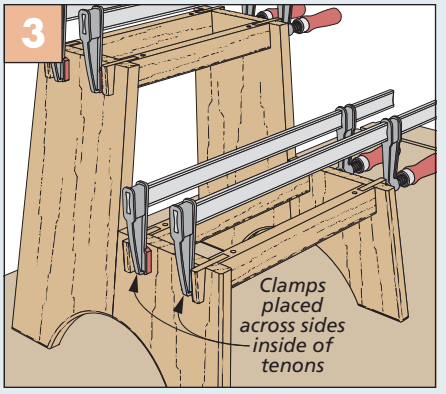
How-To: COMPLETE THE ASSEMBLY



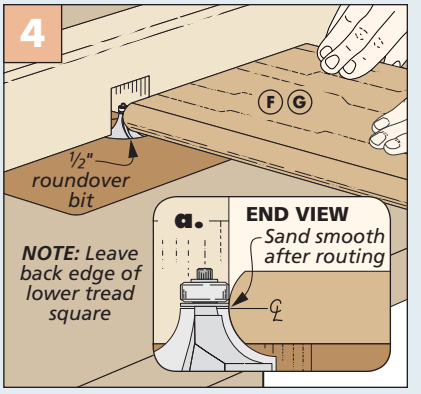
Drill Mounting Holes. Use a stop block clamped to the drill press fence to accurately drill the mounting holes.



Add the Loose Tenons. Using bar clamps, glue the loose tenons into the slots in the rails.



Glue Up Sides & Rails. On a flat surface, glue the four rails in place between the two side panels.



Tread Profiles. Make two passes at the router table to form the bullnose profile on the edges of the treads.

ASSEMBLY TIME. With the tenons and rails glued up, it's time to join the sides and rails together. While this isn't a complicated glueup, make sure to have all of the clamps you'll need ready to go. Since the step stool needs to be perfectly stable, I set the assembly on a flat surface as I added the clamps (Figure 3, above). This helps to ensure that the bottom edge of each side panel maintains contact with the floor.

TREADS. The last pieces to this step stool puzzle are the two treads. Start by cutting them to size. You'll then rout a bullnose profile on all four edges, with the exception of the rear edge of the lower tread. Leave this edge square. Figure 4 above shows the setup.

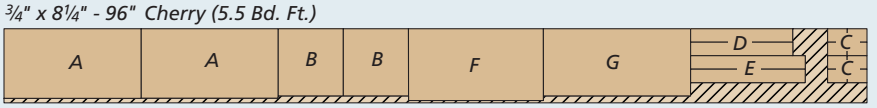
Now, position the treads as shown in details 'b' and 'c' on the previous page and mark the screw locations in the underside of each tread with an awl. Drill pilot holes in the bottom of the treads and attach them using screws.

All that's left before putting this step stool to work is to pick out the right finish to match its new home. To see the process I used, turn to Sources on page 67 for more information. When the finish fully cures, this stool will be ready for many years of service. W

Materials, Supplies & Cutting Diagram

A	Tall Sides (2)	¾ x 7¾ - 15¼	**F**	Upper Tread (1)	¾ x 8 - 15
B	Short Sides (2)	¾ x 7½ - 7¼	**G**	Lower Tread (1)	¾ x 7½ - 16⅜
C	Loose Tenons (8)	⅜ x 1½ - 2 3/16			
D	Upper Rails (2)	¾ x 1½ - 11⅜	•	(8) #8 x 1¼" Fh Woodscrews	
E	Lower Rails (2)	¾ x 1½ - 12¾			

¾" x 8¼" - 96" Cherry (5.5 Bd. Ft.)



NOTE: Parts 'C' planed to ⅜" thick

Shop Project

Sliding Cutoff Grinder

This unique shop-made project transforms an ordinary angle grinder into a benchtop tool for cutting metal parts accurately and easily.

I use metal parts from time to time in my projects, especially ones for the shop. But other than using a hacksaw and a whole lot of elbow grease, I didn't really have a good method for cutting these metal parts cleanly and accurately.

NEW ANGLE FOR GRINDERS. I do, however, own an angle grinder. And that served as the inspiration for the unique project that you see here. With a few basic parts and a little work, I essentially turned it into a small, sliding cutoff saw for accurately cutting thin metal parts.

PROJECT OVERVIEW. What makes this project work are the clever carriage and handle assembles. These hold the grinder and allow it to slide back and forth, as well as rotate up and down. The assemblies slide along the hardwood rail that you see in the photo above, which in turn is connected to a sturdy support arm that's bolted to the base.

And about that base: As you can see in the drawings on the opposite page, it's built up from three layers of plywood to be rock-solid. It also has a wide metal channel at the center for added safety, and a two-position fence for greater versatility. All in all, it's sure to add some precision to your metal-cutting operations.

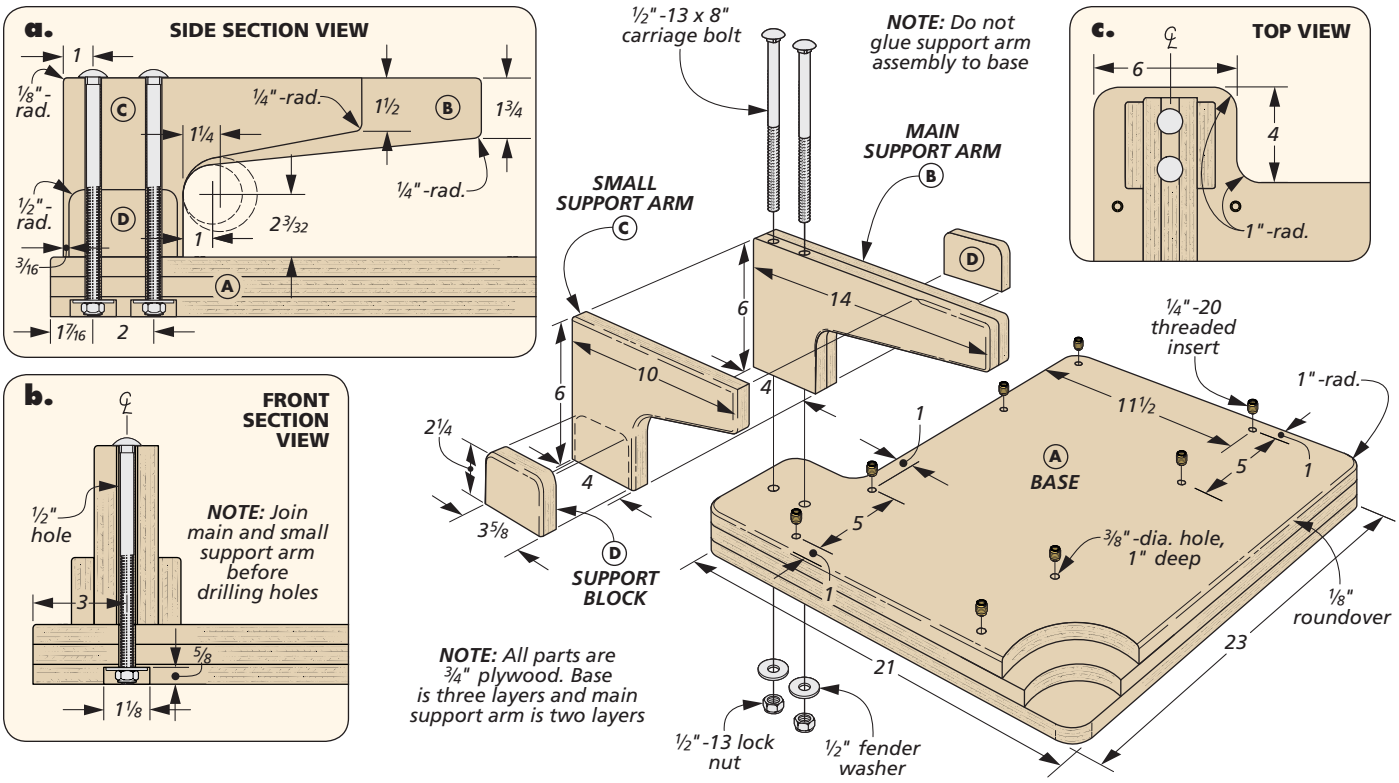
Construction Overview / OVERALL DIMENSIONS: 23"W x 15"H x 22 13/16"D

▲ The fence can be mounted in two positions for cutting wide or narrow metal stock.

Woodsmith GO ONLINE EXTRAS

For a full-size pattern of the handle, go to Woodsmith.com

▲ Resin slides mounted in the rail accept the carriage and handle assembly, allowing the grinder to slide back and forth.



The BASE & SUPPORT ARM

The cutoff grinder's base is a good place to start on this project. It's built up from several layers to make it sturdy, stable, and unlikely to shift as you're making cuts. It has softened edges and holes for mounting a support arm and fence.

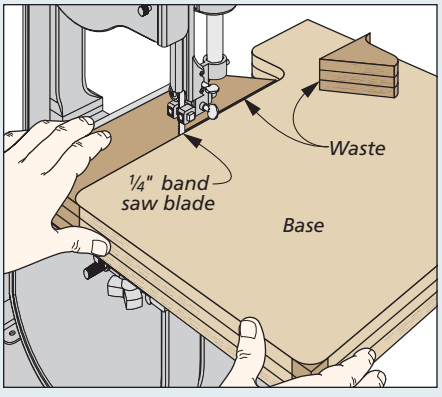
SIZE THE BASE. To make the base easier to assemble, I started with oversize panels. This way, you can glue them face to face without worrying about the edges being perfectly aligned. After that, it just requires a few table saw cuts to trim the base to final overall size.

SHAPING. A notch on the back edge of the base forms a tab for mounting a support arm. These cuts, as well as the radiused corners, are quick work at the band saw (lower left drawing). Then use a round-over bit to soften the top edge.

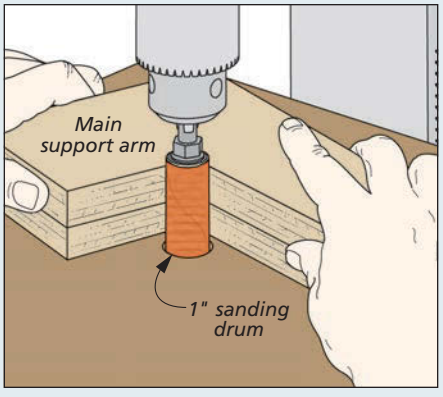
HOLES. There are some holes to drill in the base, as well. Two large counterbored holes near the back left corner let you bolt down the support arm later on (details 'a' and 'b'). And two rows of smaller holes accept threaded inserts for the fence. You'll drill these holes and install threaded inserts as shown above. The center channel and fence get added later as you're putting the final touches on your project.

SUPPORT ARM. The next part of the project is a support arm that connects the base to the assembly that holds the angle grinder. It consists of several built-up plywood

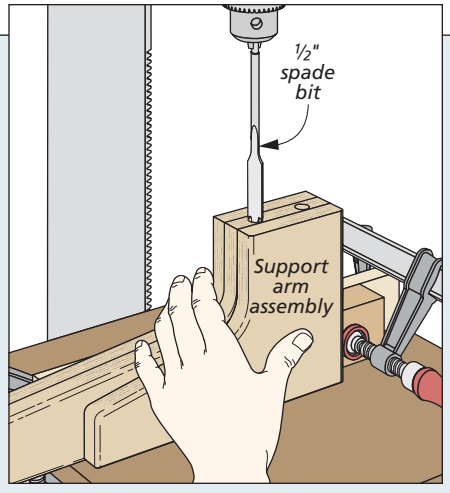
How-To: SHAPE THE BASE & SUPPORT ARM



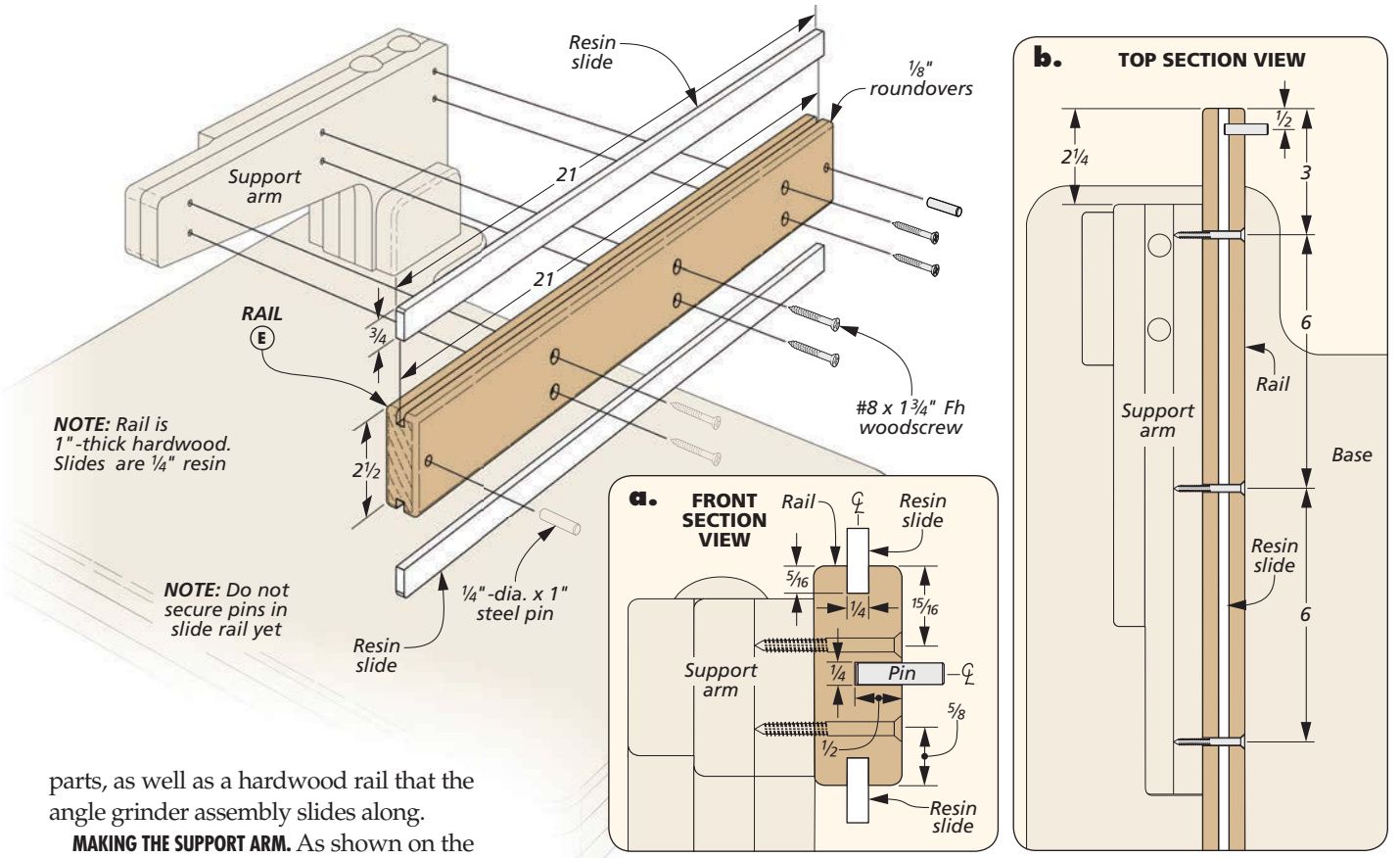
Cut Notch. The wide notch at the back of the base requires simple band saw cuts. Then sand the notch smooth.



Smooth the Shapes. I relied on a sanding drum in the drill press to smooth the radii of the support arms.



Holes. Use a spade bit to bore holes through the arm for carriage bolts. You may need to raise the table mid-hole.



parts, as well as a hardwood rail that the angle grinder assembly slides along.

MAKING THE SUPPORT ARM. As shown on the previous page, the support arm is a five-layer plywood sandwich. Two pieces of plywood form the main support arm, and then a small support arm is added to the side to give the structure even more rigidity. The two small support blocks widen the base of the support arm for additional stability.

You can get started by gluing two pieces of plywood together for the main support arm, and then cutting the arm to final size when the glue is dry. While you're at it, cut the small support arm and support blocks to overall size, as well. Next, use a band saw to cut the main support arm and small support arm to shape (detail 'a', opposite page). After a little sanding (lower middle drawing, opposite page), you're ready to glue the small support arm to the main support arm. They align along the bottom and back edges.

You'll need to drill two long holes through the support arm assembly for mounting it to the base. I used a drill press equipped with a spade bit for this (lower right drawing, previous page). A fence and stop block help align the assembly as you drill the holes. Then it's time to glue on the support blocks and bolt the support arm to the base.

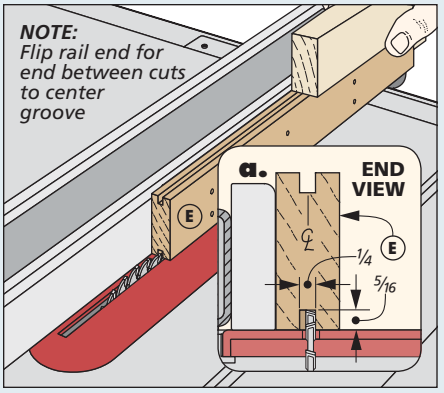
MAKING THE RAIL

The rail comes next. It's a piece of hardwood with grooves in the edges to accept resin slides. After cutting the rail to size, form the grooves in the edges (far left drawing). Have the slides on hand to check their fit in the grooves.

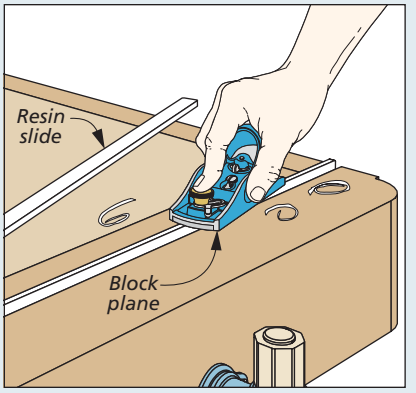
Countersunk holes in the face of the rail accept screws. And larger holes near the ends hold steel pins that will serve as stops for the carriage assembly. After drilling the holes, round the ends and edges of the rail.

SLIDES. The resin stock I used for the slides was rough, so after ripping the strips and trimming them to length, I dressed the edges with a block plane (near left drawing) before epoxying them in the grooves. Then it was just a matter of securing the rail on the support arm with woodscrews. Cut the steel pins to size now, but you won't insert them until later, after adding the carriage assembly onto the rail.

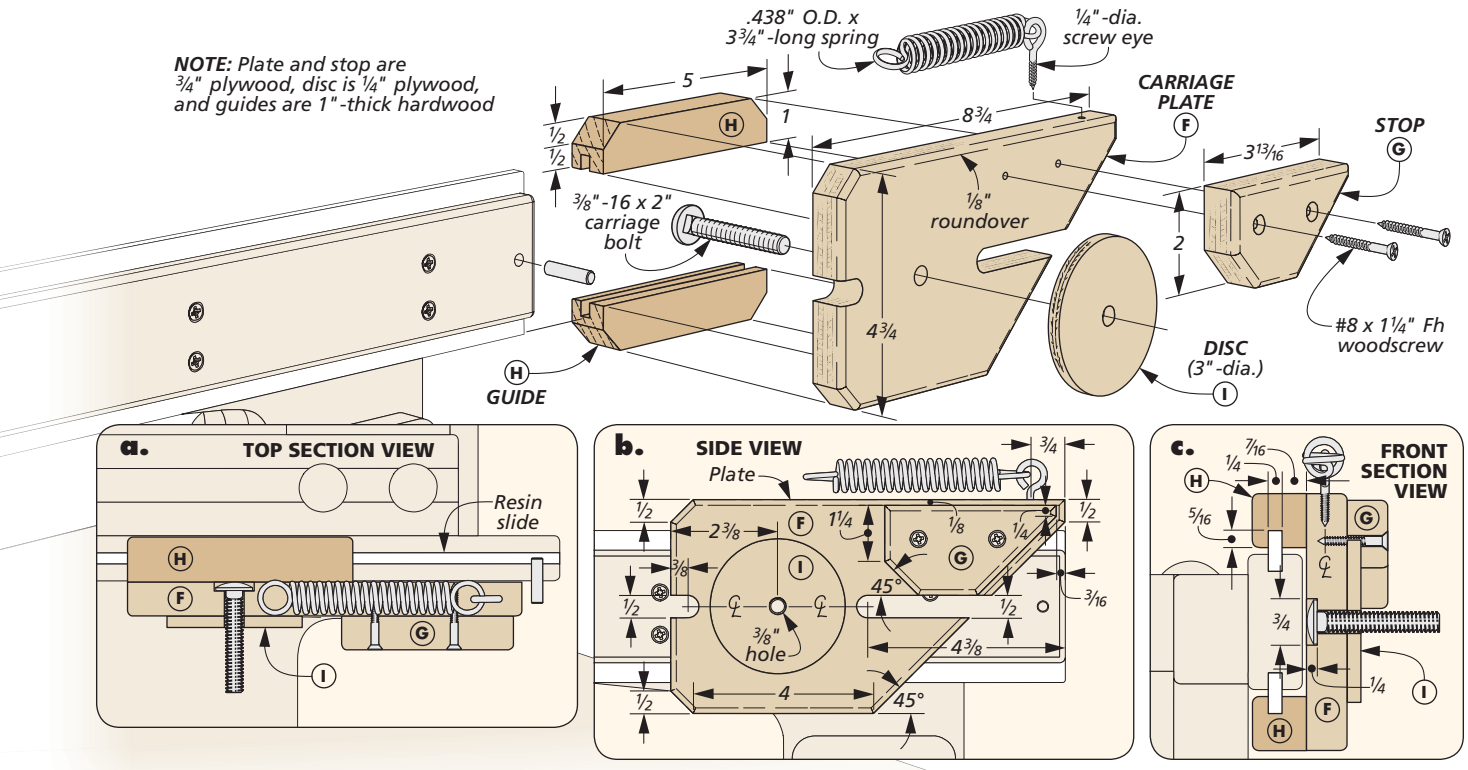
How-To: COMPLETE THE RAIL



Centered Grooves. Use a rip blade and flip the rail between passes to cut a centered groove sized to fit the slides.



Smooth Slides. To create smooth slides, make a few quick swipes along the edges with a block plane.



Adding the carriage & HANDLE ASSEMBLIES

A carriage assembly is the next component of the sliding cutoff grinder. This assembly moves along the resin slides on two guides. On the outer face of the assembly is a plywood disc. The disc mates with a ring on the handle assembly to let the grinder pivot up and down. A stop limits the travel of the grinder.

CARRIAGE PLATE. I started on the carriage plate. After cutting it to size, you'll form stopped slots at each end that butt against the pins on the slide rail. Make the slots as shown in Figure 1 below.

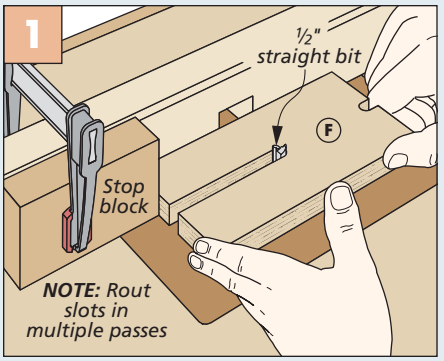
STOP & GUIDES. At this point, you can cut the plywood stop and hardwood guides to size. These parts (and the plate) all receive 45° cuts along some of the corners (Figure 2). The plate has a counterbored hole to attach the disc, and a hole on the top edge for a screw eye. The guides have grooves along the edges to fit over the resin slides in the rail (detail 'c').

DISC. The disc is the next order of business. It's made from thin plywood, so it's a perfect task for a drill press circle cutter (Figure 3). The key here is to drill at a slow speed, and have the plywood blank attached securely to a backer as you cut. When you're done, enlarge the center hole to ⅜". Now you can assemble the entire carriage assembly with glue and screws, as shown above.

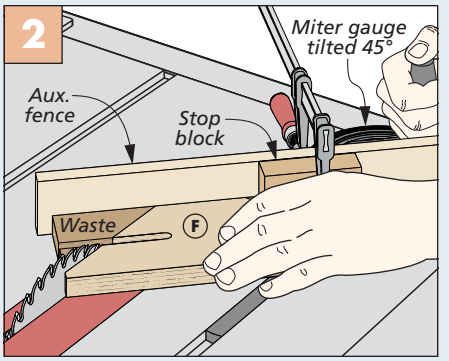
HANDLE ASSEMBLY

The handle assembly goes on next. On the inner face of the assembly, it has a ring that mates with the disc on the

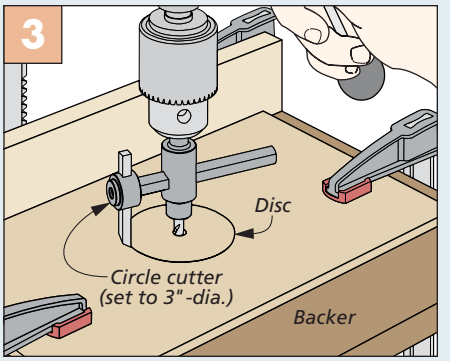
How-To: MAKE THE CARRIAGE ASSEMBLY



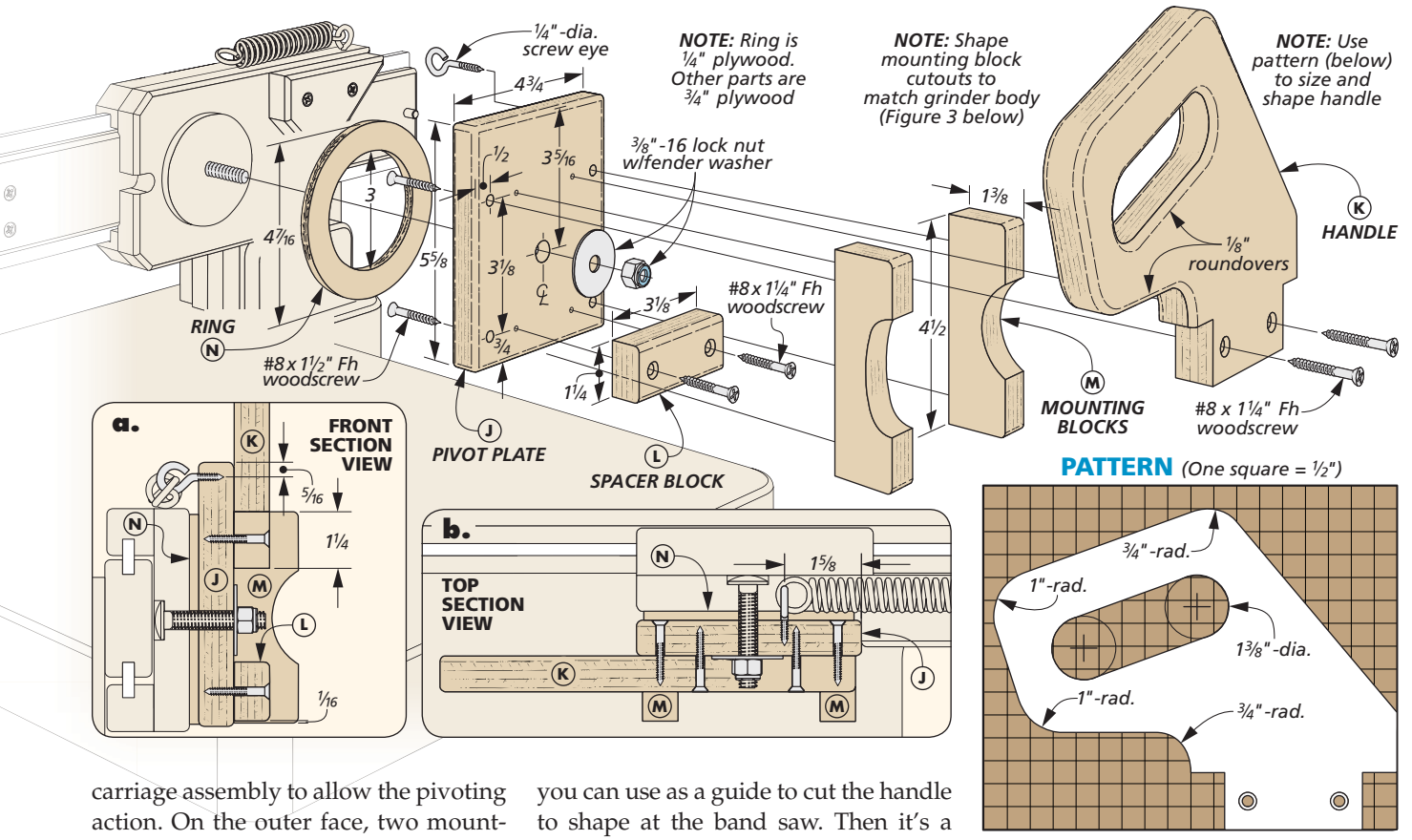
Stopped Slots. Set a stop block on the router table fence and make a series of passes to rout the slots in the plate.



Bevels. Rotate the miter gauge 45° in order to cut the beveled corners on the plate, stop, and guides.



Cut the Disc. Cut the disc from a larger plywood blank using a circle cutter running at low speed on the drill press.



carriage assembly to allow the pivoting action. On the outer face, two mounting blocks hold the grinder in place. A spring running from the carriage assembly to the handle assembly returns the grinder to a neutral position.

RING. The ring is made similarly to the disc. The difference is you'll make two cuts (Figure 1 below).

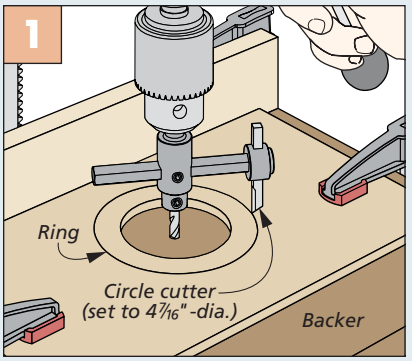
PLATE, SPACER & HANDLE. The pivot plate and spacer block are pretty basic (drawing above). These parts are cut to size, drilled, and rounded on the edges. The handle is a little more involved. There's a full-size pattern at *Woodsmith.com* that you can use as a guide to cut the handle to shape at the band saw. Then it's a matter of cutting the hand-hold (Figure 2) and softening the handle edges.

BLOCKS. The mounting blocks require a little work to get just right. The cutouts need to match the shape of the grinder body and hold the grinding wheel parallel with the handle. For my grinder, this required a different cutout on each block.

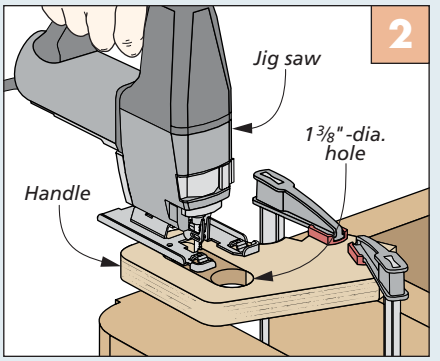
To get it right, lay out and cut the cutouts on your blocks, then put the grinder on the blocks on a worksurface. When the grinder wheel is parallel with the worksurface, your job is done (Figure 3).

ASSEMBLY. The handle assembly can now be glued and screwed together. Next fit the ring over the disc and secure the carriage assembly to the handle assembly with a bolt, washer, and lock nut. Snug up the lock nut so that the handle still pivots freely on the carriage assembly. Then add the screw eyes and spring between the carriage and handle assemblies. Finally, slide the guides over the resin slides of the slide rail, and insert the steel pins to complete the assembly.

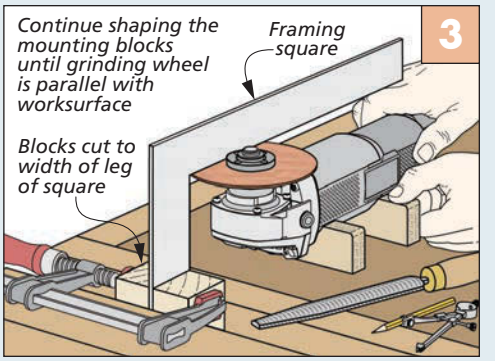
How-To: ADD THE HANDLE ASSEMBLY



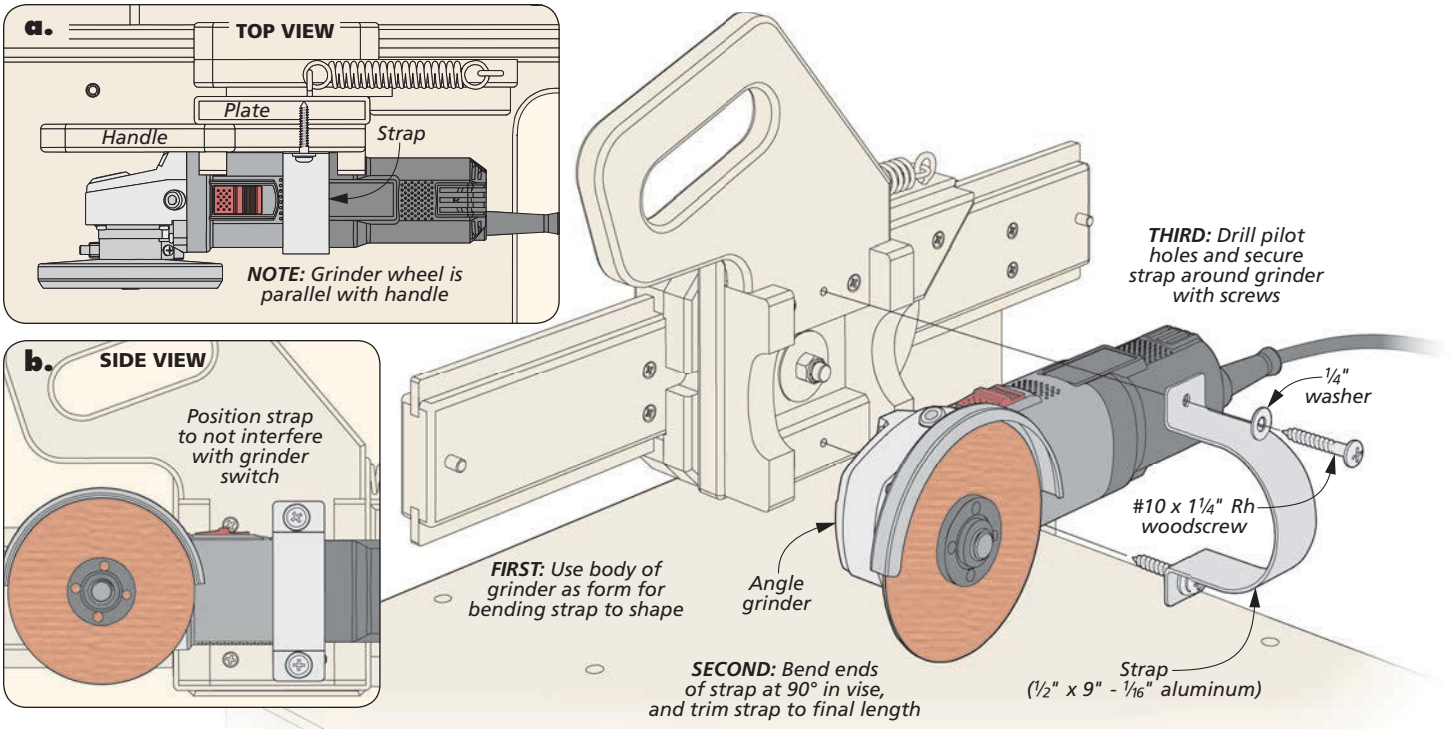
Cut the Ring. Cut the inner circle first, then the outer circle to form the ring for the handle assembly.



Hand-Hold. Drill two holes in the handle with a Forstner bit, then connect them with a jig saw to form the hand-hold.



Blocks. Test the fit of the mounting blocks to ensure that they hold the grinder wheel parallel with a worksurface.



Finishing touches for THE CUTOFF GRINDER

Your sliding cutoff grinder is nearing completion. A few more additions will leave you with the precision metal-cutting tool you've been waiting for. That starts with adding the grinder to the assembly.

STRAP. The angle grinder is held in place on the mounting blocks with a strap formed from thin aluminum. After cutting the strap extra-long, place it around the body of the grinder as shown in the drawings above and then use the grinder body as a form for bending the strap to match. After determining where the strap will meet the handle and spacer block, bend the strap at 90° in a vise at those locations. Then trim off the excess aluminum from the ends of the strap. Finally, position the grinder and strap on the handle assembly and drill pilot holes for screws. Secure the grinder to the mounting blocks by driving screws through the holes in the strap and into the handle and spacer block.

CENTER CHANNEL. The base of the cutoff grinder has a steel channel. This prevents sparks from directly hitting the plywood base. I waited until now to form the channel, so I could determine precisely where the grinder wheel would come in contact with the base. The steel parts used for the channel are cut to length with a hack saw.

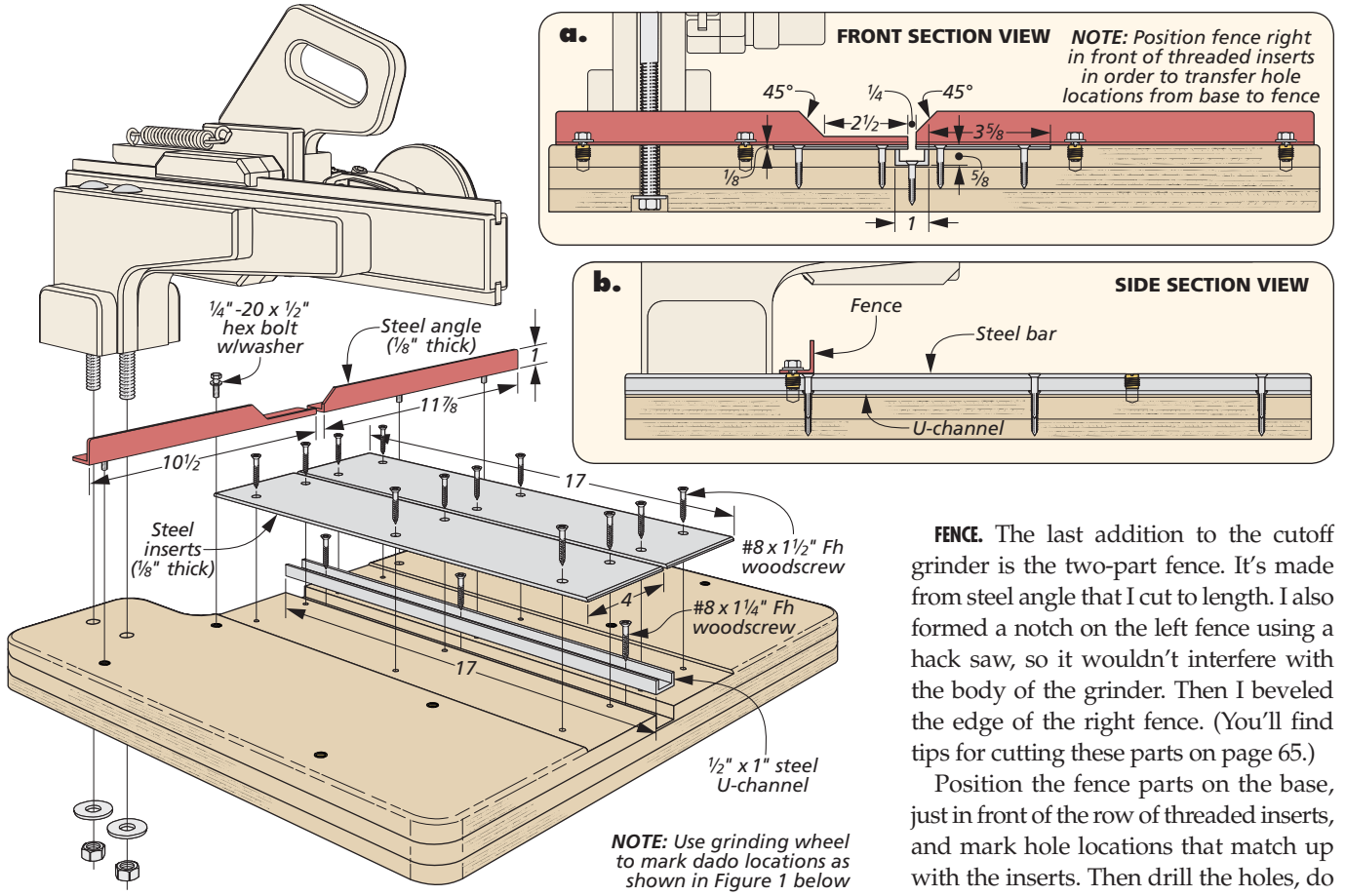
To locate the center channel, lower the grinder, and run it along the base to form the centerline for the channel you'll be cutting (Figure 1, next page).

Materials, Supplies & Cutting Diagram

A	Base (1)	2¼ ply. - 21 x 23
B	Main Support Arm (1)	1½ ply. - 6 x 14
C	Small Support Arm (1)	¾ ply. - 6 x 10
D	Support Blocks (2)	¾ ply. - 2¼ x 3⅝
E	Rail (1)	1 x 2½ - 21
F	Carriage Plate (1)	¾ ply. - 4¾ x 8¾
G	Stop (1)	¾ ply. - 2 x 3 13/16
H	Guides (2)	1 x 1 - 5
I	Disc (1)	¼ ply. x 3"-dia.
J	Pivot Plate (1)	¾ ply. - 4¾ x 5⅝
K	Handle (1)	¾ ply. - 8 rgh. x 10 rgh.
L	Spacer Block (1)	¾ ply. - 1¼ x 3⅛
M	Mounting Blocks (2)	¾ ply. - 1⅜ x 4½
N	Ring (1)	¼ ply. x 4 7/16"-dia.

- (8) ¼"-20 Threaded Inserts
- (2) ½"-13 x 8" Carriage Bolts
- (2) ½" Fender Washers
- (2) ½"-13 Lock Nuts
- (6) #8 x 1¾" Fh Woodscrews
- (2) ¼" x ¾" - 21" Resin Strips
- (2) ¼"-dia. x 1" Steel Pins
- (9) #8 x 1¼" Fh Woodscrews
- (2) ¼"-dia. Screw Eyes
- (1) ⅜"-16 x 2" Carriage Bolt
- (1) ⅜" Fender Washer
- (1) ⅜"-16 Lock Nut
- (1) .438" O.D. x 3¾"-long Spring
- (1) 1/16" x 1¼" - 9" Aluminum Bar
- (2) #10 x 1¼" Rh Woodscrews
- (6) ¼" Washers
- (1) ½" x 1" - 17" Steel U-Channel
- (2) ⅛" x 4" - 17" Steel Inserts
- (16) #8 x 1½" Fh Woodscrews
- (2) ⅛" x 1" - 12" Steel Angles
- (4) ¼"-20 x ½" Hex Bolts

ALSO NEEDED:
One 60" x 60" sheet of ¾" Baltic birch plywood
One 24" x 24" piece of ¼" Baltic birch plywood
0.8 bd. ft. of 1"-thick maple (parts E and H)



FORM THE CHANNEL. Now remove the support arm from the base and set up a dado blade in your table saw. Using the rip fence as your guide, cut a groove centered under the grinder wheel to accept the U-channel (Figure 2).

I also placed some wider steel inserts on either side of the U-channel (and overlapping it slightly) as added insurance against sparks. You'll want to lower the dado blade and make a series of passes to form rabbets for these inserts (Figure 3).

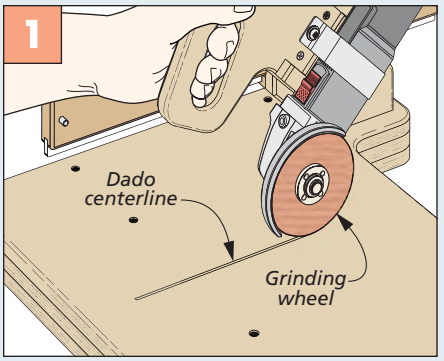
Next, cut a piece of steel U-channel with a hack saw to fit the center groove in the base. File and sand the ends smooth, drill countersunk pilot holes, and attach the channel in the groove with long screws for a secure connection. Repeat the process for the steel inserts, as well. I filed a chamfer on the ends of the inserts to soften them.

FENCE. The last addition to the cutoff grinder is the two-part fence. It's made from steel angle that I cut to length. I also formed a notch on the left fence using a hack saw, so it wouldn't interfere with the body of the grinder. Then I beveled the edge of the right fence. (You'll find tips for cutting these parts on page 65.)

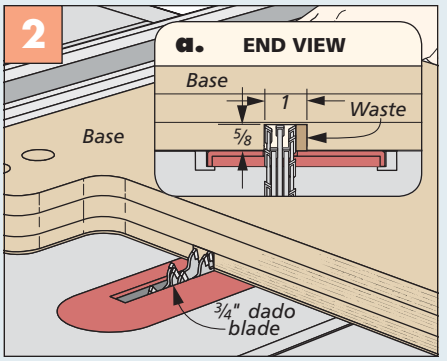
Position the fence parts on the base, just in front of the row of threaded inserts, and mark hole locations that match up with the inserts. Then drill the holes, do a little filing and sanding, and the fence is ready to be installed with bolts and washers, as shown in the drawings above.

PRECISION METAL-CUTTING. Reinstall the support arm on the base with the carriage bolts, do a little painting and finishing, and your sliding cutoff grinder is ready for action. It's sure to bring a much-needed measure of accuracy to all your cuts in metal, and that will ultimately lead to better shop projects. W

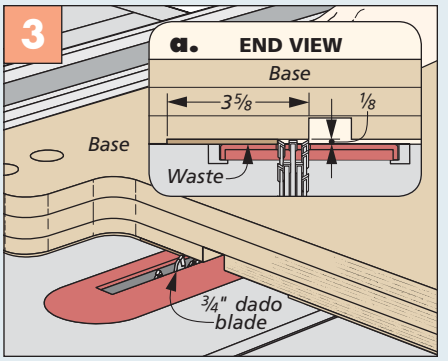
How-To: COMPLETE THE BASE



Score a Line. Run the grinder wheel along the base to score a line. This is the centerline for the U-channel.



Deep Dado. Set up a dado blade in the table saw, and pass the base over it to form the groove for the steel U-channel.



Shallow Dado. Lower the blade, and make a series of passes to create two shallow rabbets for the steel inserts.

Heirloom Project

icebox Wine Cabinet

This vintage-looking cabinet stands ready to supply cold drinks for your next get-together. Timeless construction makes it a pleasure to build.

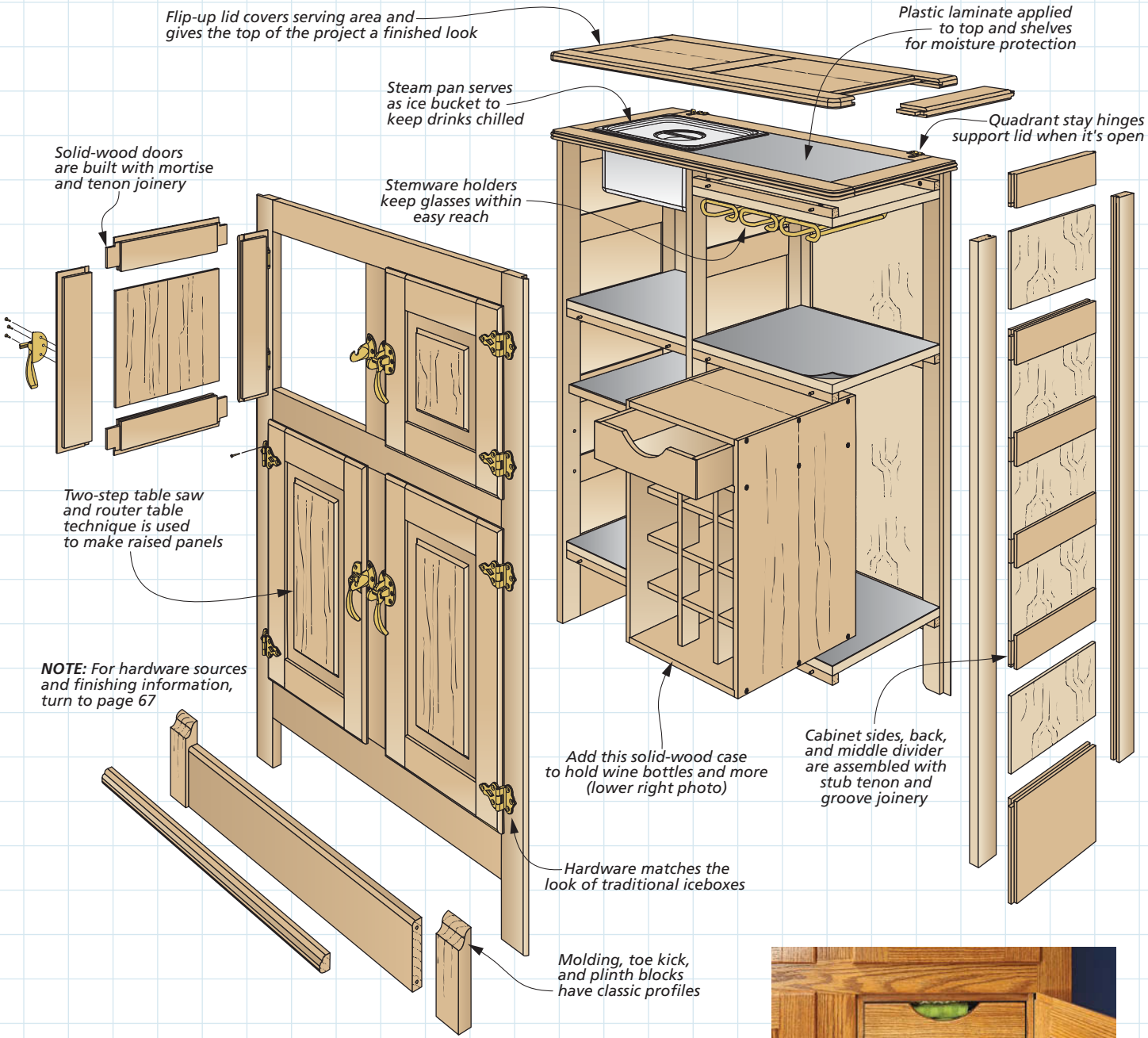
Long after my grandmother had an electric refrigerator, she still called it "the icebox." In her day, a large block of ice kept perishable food cold inside a well-insulated wood case.

While the original function of an icebox may be obsolete, one look at the photo above shows that the look is still fresh. This cabinet is based on an older design, but it has a new job — as a serving station. Inside are four storage compartments for storing beverages, glasses, and supplies. A flip-up lid conceals an ice bucket and laminate-covered serving area.

You'll find plenty of enjoyment in building this icebox, too. Like the styling, the construction is all traditional. I used red oak throughout. The case, doors, and lid feature stub tenon and groove as well as mortise and tenon joinery. Getting the period-style profiles and raised door panels right requires some clever router work. Even the finish is meant to evoke a well-used antique.

Once it's complete, you'll have earned a cold, refreshing drink. Then you can sit back and enjoy the result of your efforts.

Construction Overview / OVERALL DIMENSIONS: 34"W x 46⅝"H x 17½"D



▲ Lift the lid of the icebox to reveal a laminate-covered serving area with a built-in ice bucket.

▲ Solid brass icebox latches and hinges mount to the surface to complete the vintage look.

▲ A slip-in case holds up to 12 bottles of wine and contains a drawer for storing odds and ends.

Frame & panel **ASSEMBLIES**

Building the wine cabinet starts right where you'd expect, with the case. And the method of construction sets the tone for the classic look of the iceboxes of yesteryear. There are actually five individual assemblies to make: two sides, a center section, the back, and the face frame. With the exception of the face frame, all are frame and panel construction.

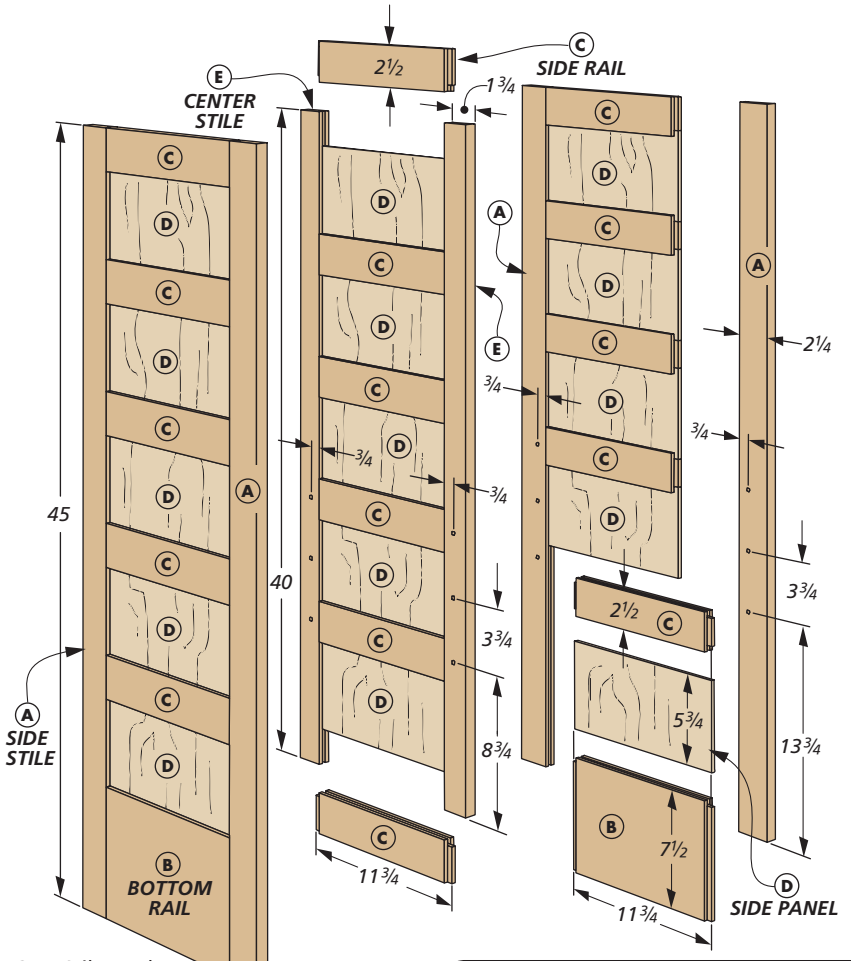
ALL AT ONCE. A quick look at the drawings on this page and the next shows that there's a lot of identical joinery to cut. So I took some time at the front to cut all the stiles and rails for the sides, center, and back so that once the table saw was set up for cutting the joints, I could knock it all out in a short time.

It pays to label your parts carefully to avoid mix-ups. For example, all the top and bottom rails have grooves cut along just one edge, while interior rails (and stiles) have grooves along both edges.

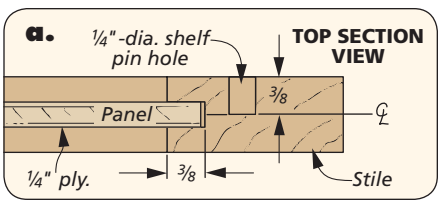
STUB TENON & GROOVE JOINERY. Considering all the stiles, rails, and panels that need to be joined, stub tenon and groove joinery offers a perfect solution. This joint is easy to cut at the table saw. Using plywood for the panels means you can glue them in place to increase the overall strength of each assembly.

Actually, the plywood serves as the gauge for creating the joinery. Here's what I mean by that. I like to cut the grooves first, then size the stub tenons on the rails to fit. For the best glue joint, the grooves need to be sized for a snug match to the thickness of the plywood panels. The box below shows the table saw setups for the grooves and mating tenons. Use test pieces to sneak up on the size of the joints until you're satisfied with the fit.

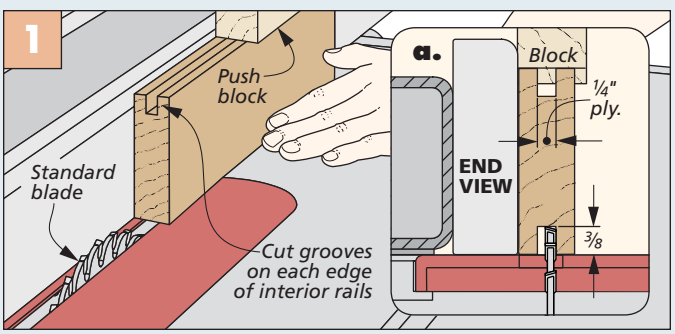
PANELS & ASSEMBLY. With the joinery wrapped up, dry assemble the frames to determine the final size of the plywood panels. From here, you can glue up the side and center assemblies. When the clamps come off, it's a good time to lay out and drill the shelf pin holes.



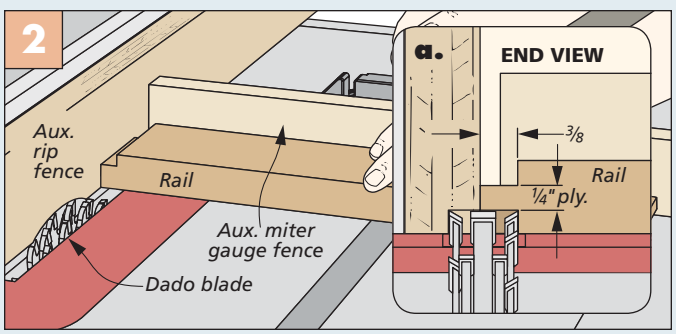
NOTE: Stiles and rails are made from ¾"-thick hardwood. Panels are ¼" plywood



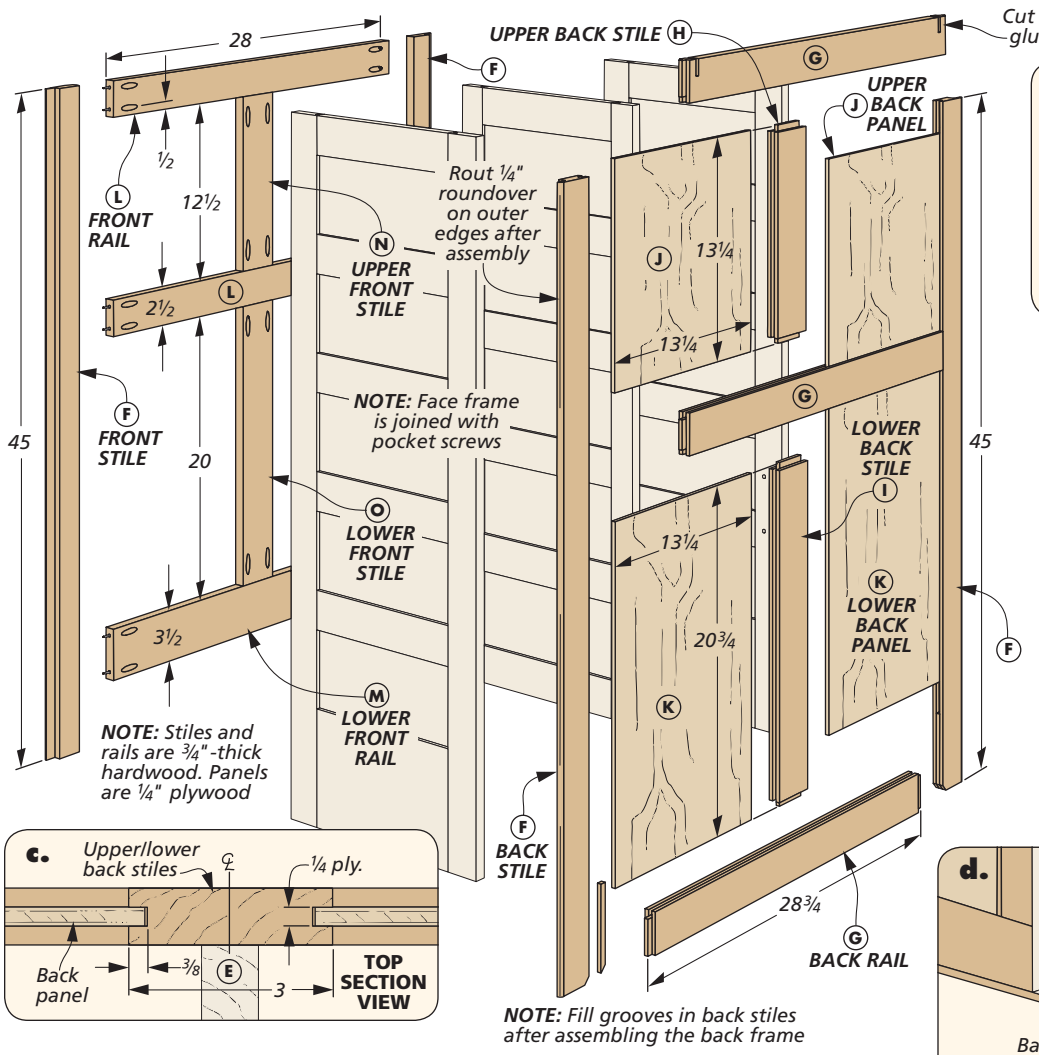
How-To: STUB TENON & GROOVE

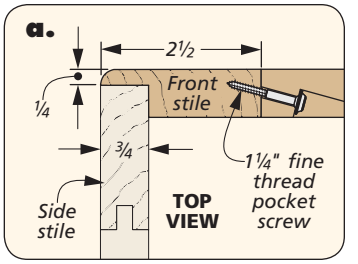


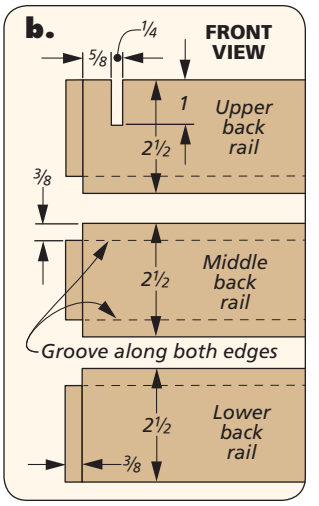
Grooves Come First. After making one pass, flip the piece end for end to center the groove. Take care to size the groove to match the plywood you'll use for the panels.

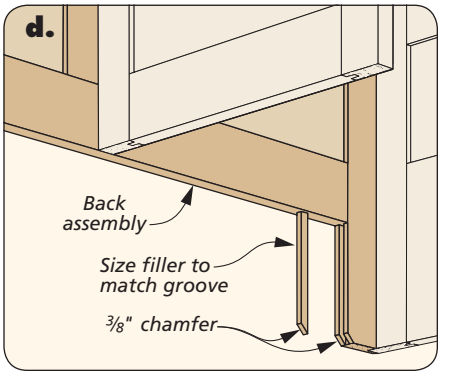


Stub Tenons. The other half of the joint is a stub tenon that's cut on the ends of the rails along with the upper and lower back stiles. Use test pieces to zero in on a good fit.









BACK & FACE FRAME

The back, on the other hand isn't quite ready for assembly. First, you need to cut a notch at each end of the upper rail (detail 'b'). This creates a pocket for the lid hinges. The stiles have a rabbet along the edge, as shown in the drawing below. This rabbet (and a similar one in the face frame) register the sides and ease assembly.

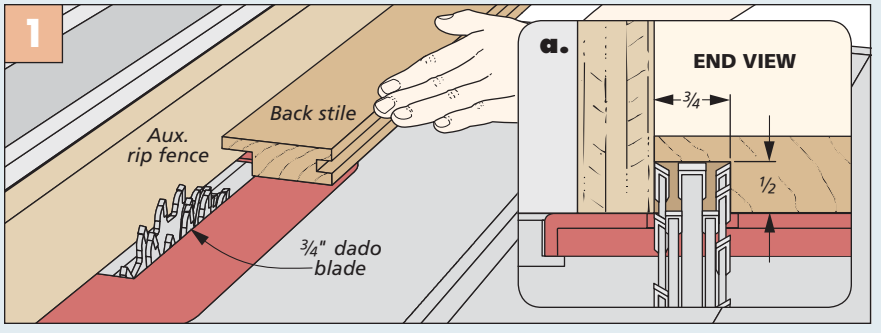
Following the glueup, I cut small pieces to fill the grooves at the bottom of the stiles for a cleaner appearance, as you can see in detail 'd' at right.

FACE FRAME. In contrast to the sides and back, making the face frame will go much more quickly. That's because the parts are simply cut to size and joined with pocket screws, as you can see in the drawing above and detail 'a.' Your goal here is to make sure that the overall size of the face frame matches the size of the back assembly, so you end up with a square case. (Don't forget to cut a rabbet on the face frame stiles.)

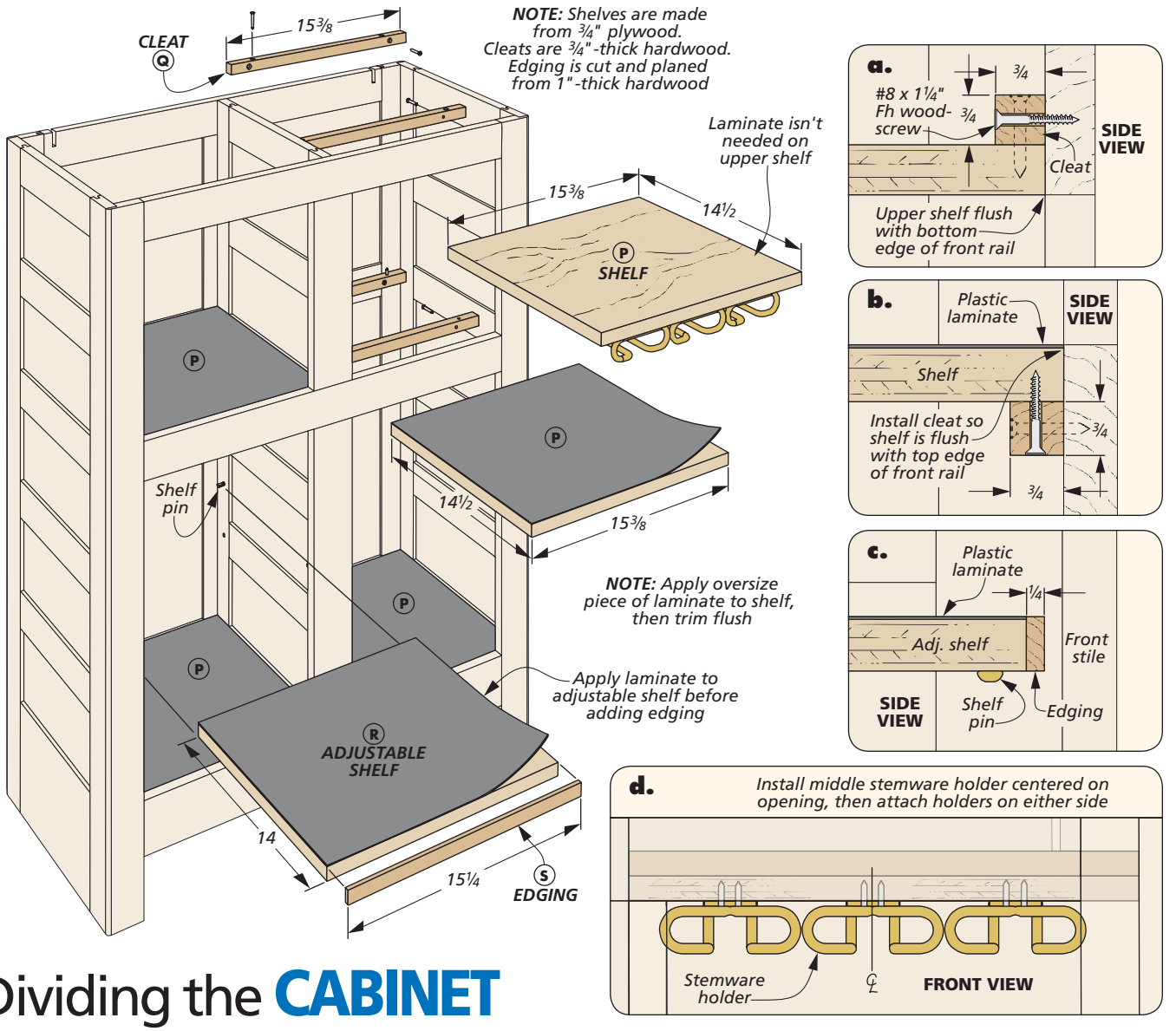
ASSEMBLY. It's time to see the project take shape. The sides fit nicely into the rabbets in the face frame and back. Getting the center section aligned may cause some headaches. To solve this problem, I marked the center on the back and face frame at the top and bottom edges. A centerline on the center assembly lets you align the components (detail 'c').

Take things one step at a time. Glue the sides into the back frame. When the glue dries, add the center. The face frame goes in place last. Wrap things up by softening the corners with a roundover on the front and back edges, as in detail 'a.'

How-To: RABBETING THE RAILS



Rabbet Simplifies Assembly. Cut a rabbet in the back and front stiles before gluing up the back and face frame so they're easier to handle. The width of the rabbet matches the thickness of the side stiles.



Dividing the CABINET

As it stands, the only thing missing from the case is some method to divide and organize the inside. That job is handled by a series of plywood shelves. Most of these are fixed in place. Since the case is already assembled, you need a way to secure the shelves. To solve this problem, I turned to a system of cleats. (More on these in a bit.) Once that's done, you turn your attention to dressing up the wine cabinet to create its distinct look.

▲ Slide the bases of glasses into the stemware holders to keep them organized and at the ready.

VERSATILE SHELVES. There's a little more going on with the shelves than simply cutting them to size. Since most of them are fixed, I didn't want to worry about wood movement. So the shelves are cut from oak plywood to match the cabinet.

Altogether, you need six shelves, as shown in the drawing above. But they aren't all the same.

Four are used for the floors of the compartments in the cabinets. One is attached as the "ceiling" for the upper right compartment and serves as a mounting surface for some stemware holders, as you can see in the left photo.

The last shelf is slightly smaller than the others. It rests on adjustable shelf pins. This allows you to position it to suit your needs, as in detail 'c.' If you don't plan on building the wine bottle storage rack shown on page 50, you may want to make a second adjustable shelf for the other side of the wine cabinet.

A second issue related to making the shelves is moisture. A wine and beverage cabinet is bound to see a few spills. To keep liquids from damaging the finish or plywood, I covered the four fixed and adjustable shelves with plastic laminate. (The stemware shelf doesn't need it.)

The laminate is applied to the plywood with contact cement. After cutting the plywood to final size, cut a piece of laminate that's a little larger than the shelf. The next step is to apply contact cement to both mating surfaces. When it's dry to the touch, bring the two together and roll the laminate for a strong bond. You can use a router to trim the laminate flush.

The adjustable shelf requires one more step. I applied a strip of hardwood edging to the front of the shelf to conceal the exposed plies, as seen in detail 'c.'

CLEATS. As I said earlier, a pair of cleats anchors each shelf to the case. These are attached to the back frame and face frame with screws. Locate the cleats so that the top of the shelf is flush with the top of the rails on the surrounding assemblies (detail 'b'). In a similar fashion, the stemware shelf is positioned so it's flush with the top of the opening, as in detail 'a.'

LOWER DETAILS

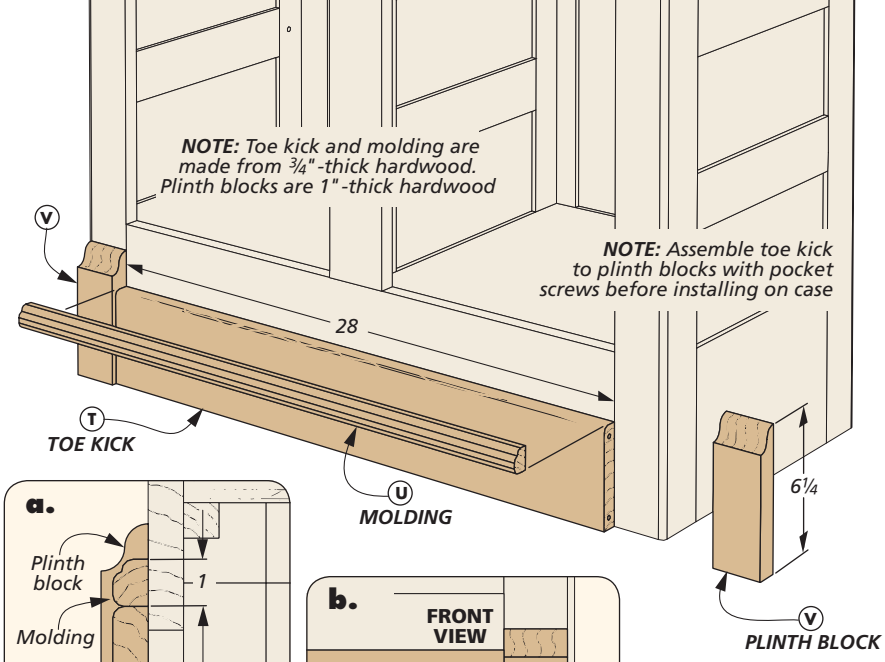
The trim details at the bottom of an old icebox are more than decorative. As the block of ice melted, water collected in a drip pan at the bottom of the icebox. To empty the pan, many iceboxes had a hinged, free-swinging toe kick for access. A strip of molding above the toe kick and thick plinth blocks on either side complete the effect of a solid, furniture-style base.

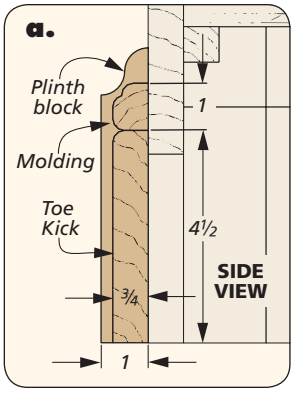
While this version of an icebox doesn't require a swinging toe kick, I wanted the same look, as shown in the upper right drawing. The main difference between this version and a vintage icebox is that here, everything is fixed in place.

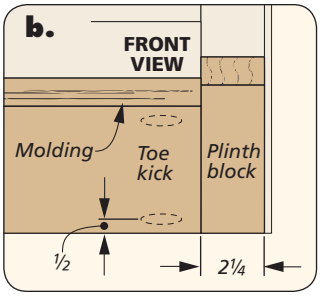
The box at right highlights the steps to making the various parts. I want to point out the roundover detail on the toe kick (detail 'a' above and Figure 1). Originally, this kept the toe kick from binding as it was lifted to access the drip pan. Here it creates a nice shadow line between the molding strip above.

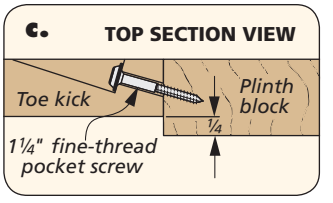
MOLDING. The molding strip has a double roundover profile on its upper edge and a roundover on the lower edge to match the toe kick. Figure 2 shows how to create the upper profile on an extra-wide blank for added safety. The molding can then be ripped to width at the table saw before routing the smaller roundover on the lower edge.

PLINTH BLOCKS. The final parts of the base are the plinth blocks, which run vertically. The top has an ogee profile that's made in two steps, as in Figures 3 and 4. Since you're routing across end grain, rout the profiles in several light passes to avoid burning. Raise the bit slightly between each pass until you reach the final bit height. The toe kick is attached to the plinth blocks with pocket screws. This assembly is glued to the case.

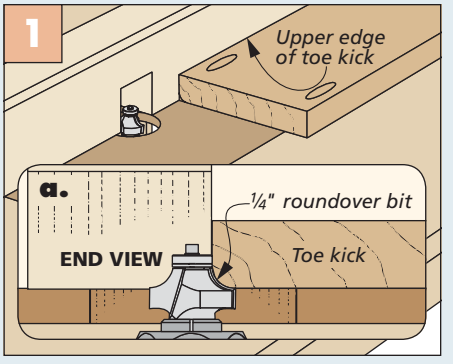




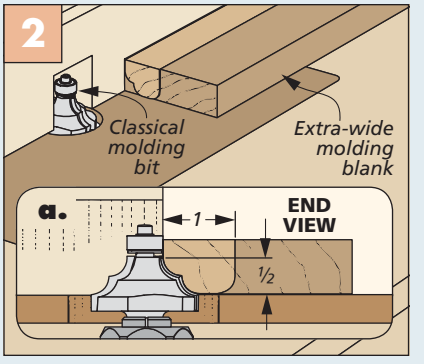




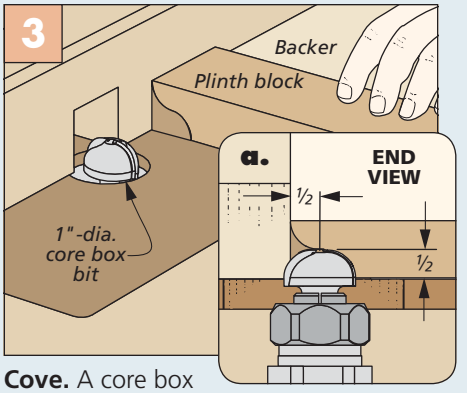
How-To: CREATING EDGE PROFILES



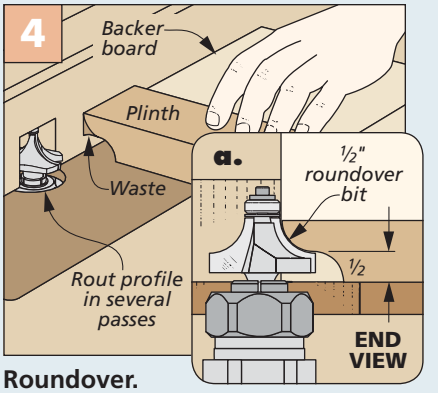
Toe Kick Profile. A small roundover on the upper edge mimics the look of traditional iceboxes.



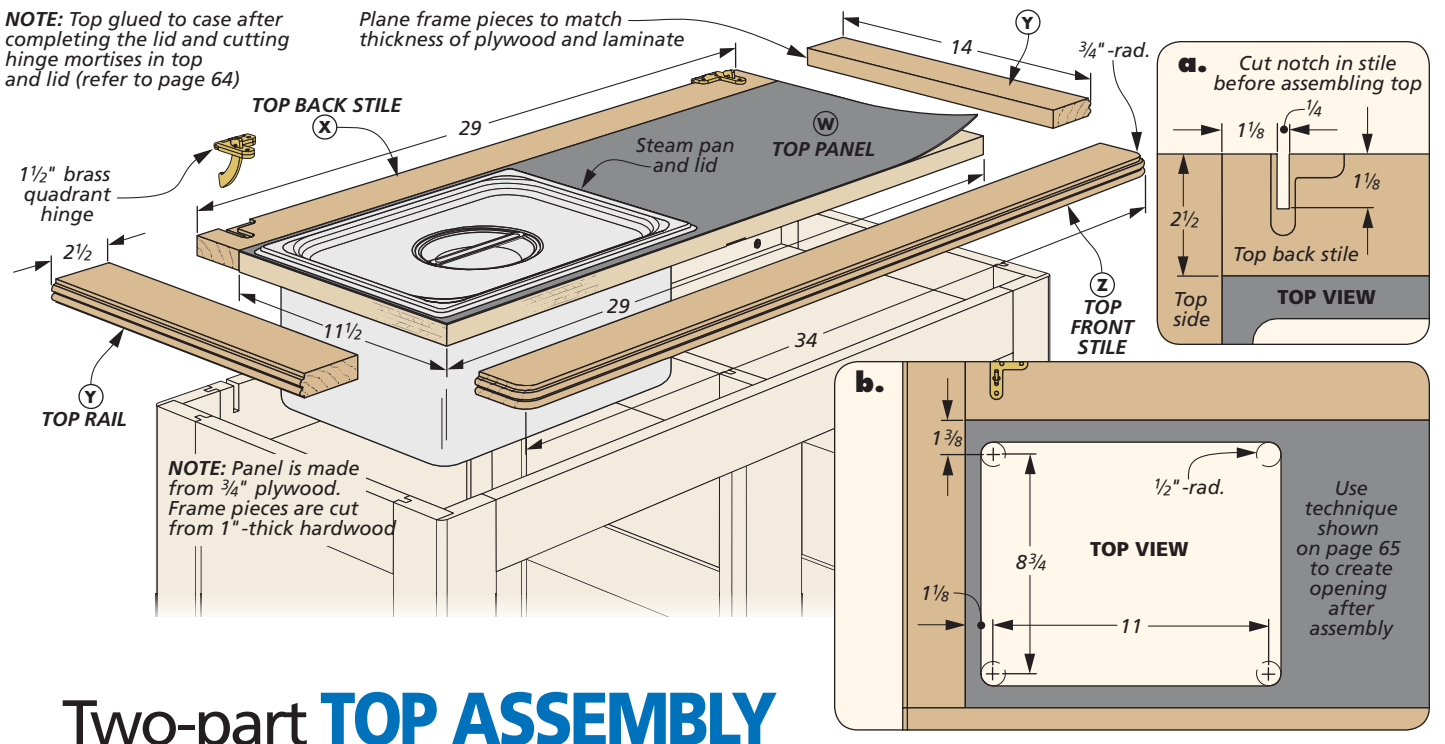
Molding. Using an extra-wide blank offers more control and keeps your hands away from the bit.



Cove. A core box bit forms the cove of the ogee profile. Remove the waste in several passes.



Roundover. Align the roundover bit to create a smooth transition with the cove.



Two-part TOP ASSEMBLY

From the outside, the top of the wine cabinet looks like an ordinary cabinet top — a frame with two raised panels. The difference is that there's another "top" hiding below. A frame and panel assembly doesn't work well for serving beverages. So I turned it into a lid.

The surface below is flat and offers a few amenities that make it ideal for entertaining. Like the shelves, the surface is covered in plastic laminate. I also incorporated an ice bucket to keep drinks chilled and ready. When the party is over, you can lower the lid and the icebox reverts to a mild-mannered cabinet.

A TOP FOR ENTERTAINING. The serving surface is a frame and panel assembly that's quite a bit different than the others in this project. You can see in the drawing above that it consists of a plywood panel wrapped with a hardwood frame.

You make the panel just like a larger version of the shelves, covered in plastic laminate. However, the combined thickness of the laminate and plywood is thicker than ¾". This means that the panel would extend below the frame and interfere with a good fit on the cabinet. The answer is to use thicker stock for the frame and plane it to match the panel.

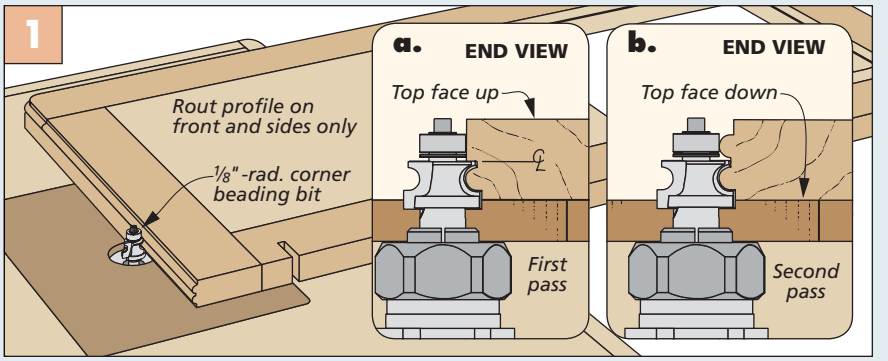
THE FRAME. The frame pieces are glued around the panel, starting with the back stile. Before gluing it in place, cut a notch at each end that lines up with the ones in the case back, as in detail 'a.' These notches create mortises for the hinges (lower left photo) that connect the lid.

Next, the sides are added, followed by the front stile. The opening for the ice bucket can be cut at this point (detail 'b').

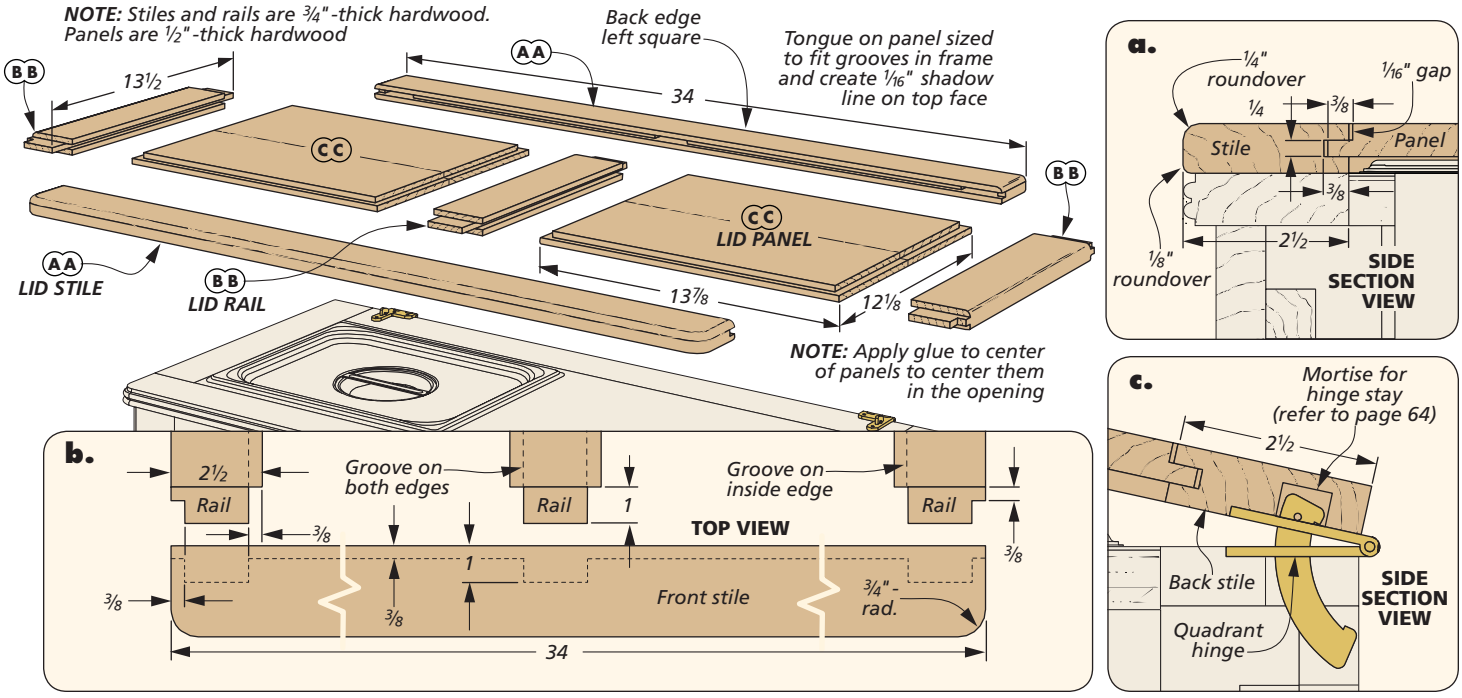
I softened the front corners with a radius and routed a double bead detail on the front and sides (box below). Hold off on gluing the top in place for now.

▲ Quadrant hinges have a built-in stay that holds the lid open without stressing the hinge knuckle.

How-To: ROUTED BEAD



Double Bead. The beads are cut with a standard beading bit. Your goal is to center the bead on the thickness of the top assembly. To do that, align the quirk of the bit with the center of the top. For the second pass, flip the top over.



THE LID

The formal lid echoes the look of the sides and the back with a couple of key differences. The main one is that it has ½"-thick, solid-wood panels instead of plywood, as shown in the drawing above.

Since the lid is hinged, the joinery needs to be stout to keep it flat and rigid. Adding deeper mortises and tenons is the way to go. The box at right shows the process.

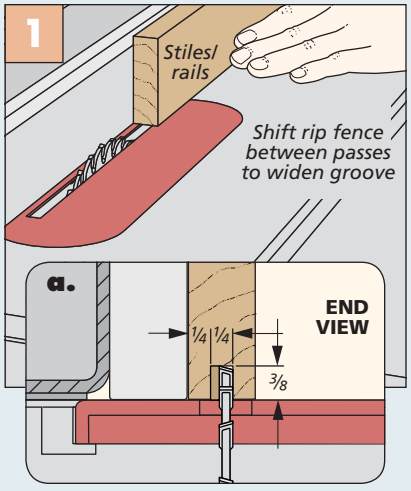
MORTISES. I used the groove in the stile (Figure 1) to align the drill bit for roughing out the mortise in Figure 2. The walls of the groove guide your chisel for paring the mortise flat and square.

TENONS. A dado blade in the table saw makes quick work of creating tenons, as shown in Figure 3. The tenons on the end rails have an added detail. You need to create a haunch on the outside edge to fill the groove for a finished look (detail 'b' above and Figure 4).

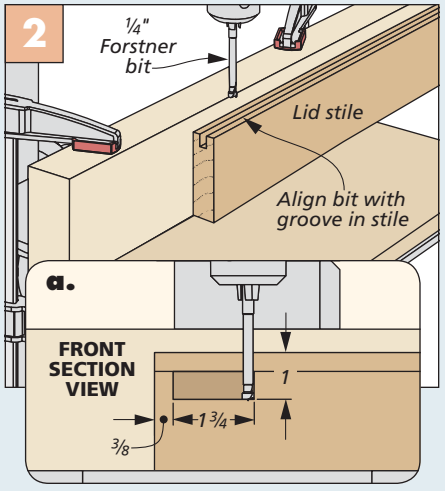
The solid-wood panels have a rabbet cut around all four edges. This forms a tongue that fits the grooves in the frame. To give the panel room to expand, cut the panels a little narrower overall than the distance between the grooves in the stiles, as shown in detail 'a' above.

HINGE MORTISES. After assembling the lid and softening the edges, you can create the hinge mortises. This process is detailed in Shop Notes on page 64. When you're done, glue the top assembly to the case and connect the lid to the top with the hinges.

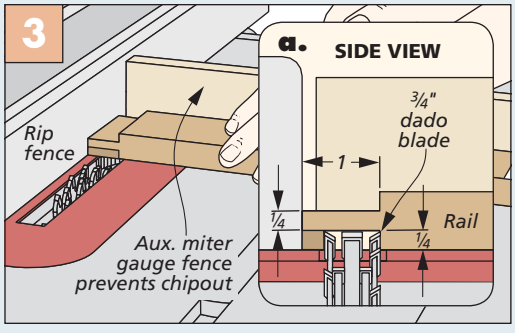
How-To: MORTISE & TENON



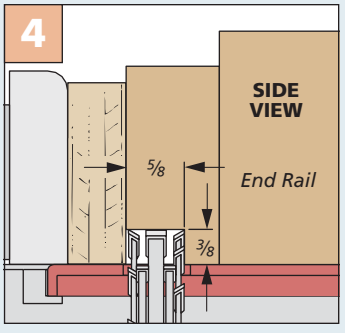
Groove. Adjust the rip fence to create a groove that matches the ¼" Forstner bit used for the mortise.



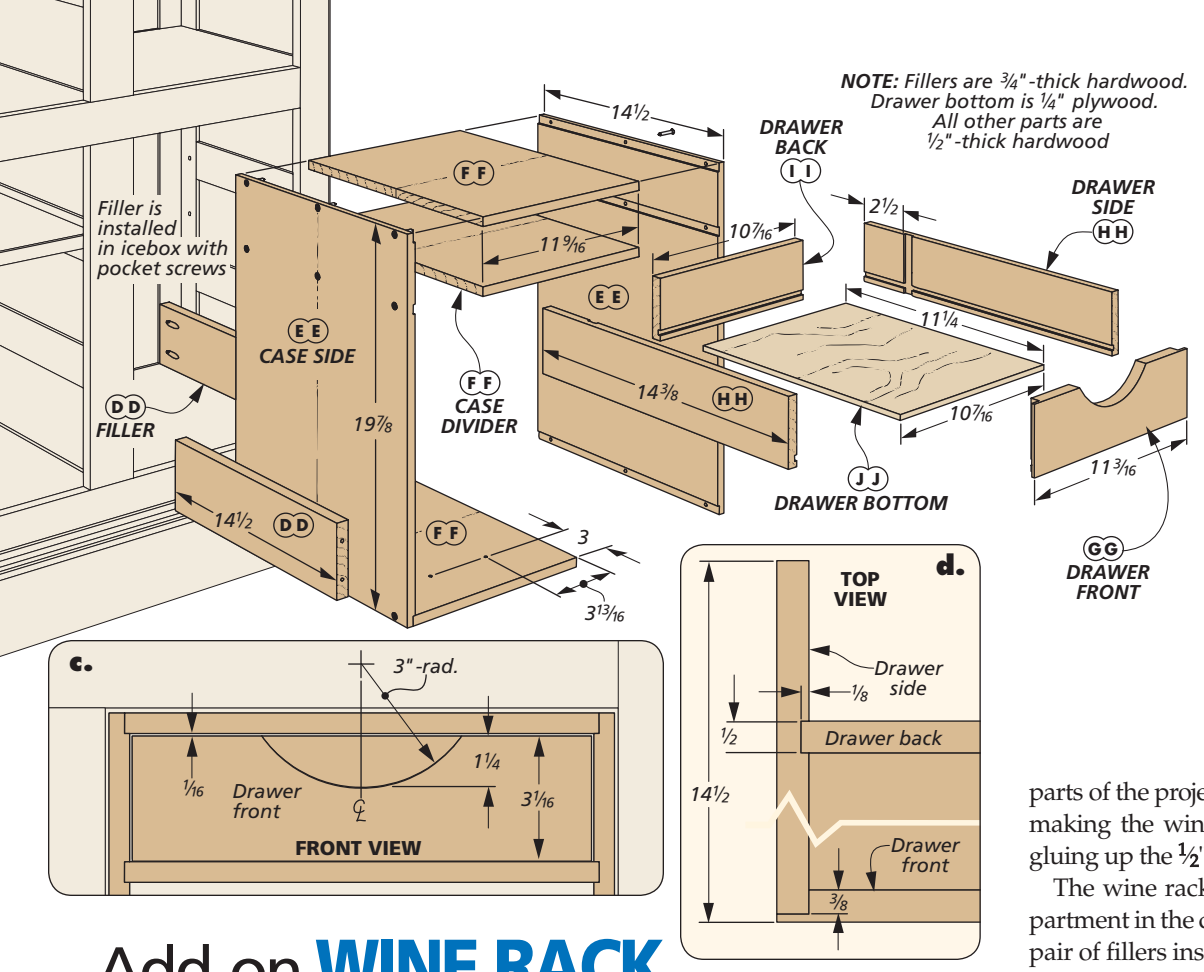
Mortise. Overlapping passes with the Forstner bit remove most of the waste. Use chisels to clean up sides and ends.



Tenon Cheeks. Raise the dado blade flush with the side of the groove to cut a tenon that fits snugly in the mortise.



Haunch. The outer shoulders of the end rails have a step that fills the groove in the stile.



Add-on **WINE RACK**

The fixed and adjustable shelves on the inside of the cabinet work just fine for general storage. However, the large compartments at the bottom present an opportunity for adding a specialized storage option. I made a case designed to hold up to 12 bottles of wine. It includes a small drawer for storing related accessories, as shown in the drawing above.

SOLID-WOOD CONSTRUCTION. What's nice about the case is that it just slips into the wine cabinet. So you can add it at any time. It's made from solid wood (except for the drawer bottom) to match the other parts of the project. The starting point for making the wine rack is preparing and gluing up the ½"-thick panels.

The wine rack is centered in its compartment in the cabinet. To do that, add a pair of fillers inside of the cabinet. These are installed flush with the inside edge of the face frame. These are simply installed with pocket screws, as in the drawing above and detail 'b.'

STRAIGHTFORWARD JOINERY. Rabbets and dadoes cut in the case sides are sized to hold the three dividers. This is illustrated in Figure 1 in the box below. I strengthened the joinery by driving screws through the sides, as you can see in detail 'a' above.

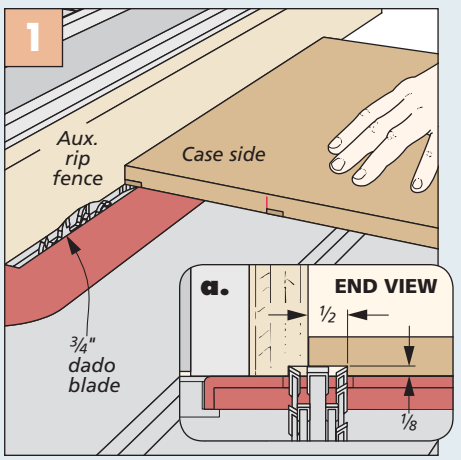
A SMALL DRAWER. The joinery on the drawer echoes the case. You can find the dimensions in detail 'd' and the right drawing in the box at left.

I do want to note a couple of interesting details. One problem with drawers is getting at items in the back. You run the risk of pulling the drawer completely out of the case, spilling the contents. This drawer construction solves that problem by installing the back a few inches in from the back end of the sides.

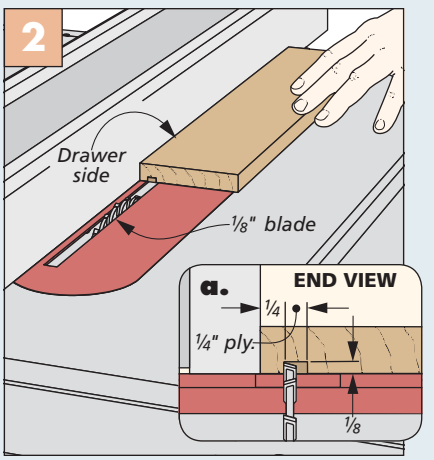
The other feature I want to highlight is on the drawer front. Rather than take up space with a pull, the front has a cutout. A quick trip to the band saw and a little sanding is all it takes to make this detail.

There's no back on the wine rack. So when the rack is installed, the drawer stops against the back of the icebox.

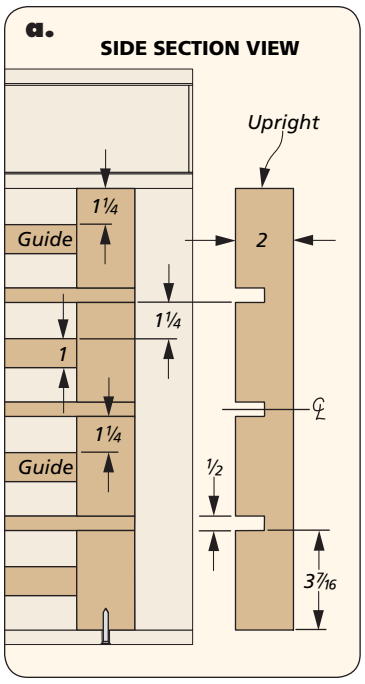
How-To: CASE JOINERY & GROOVES

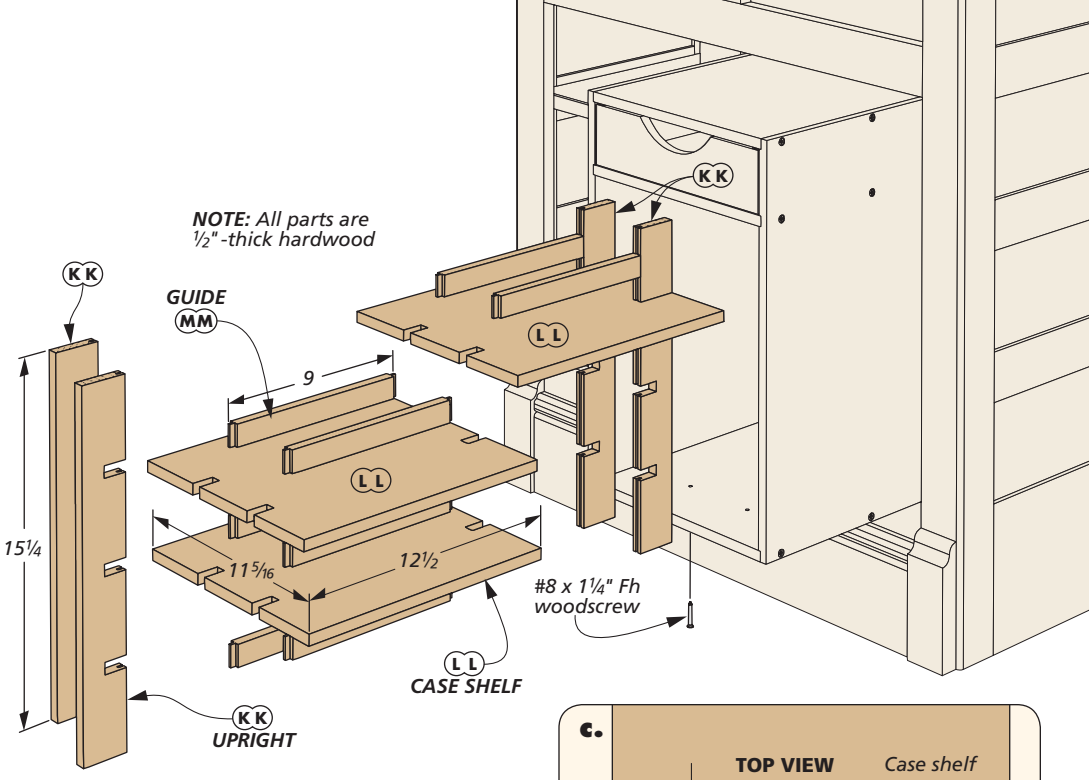


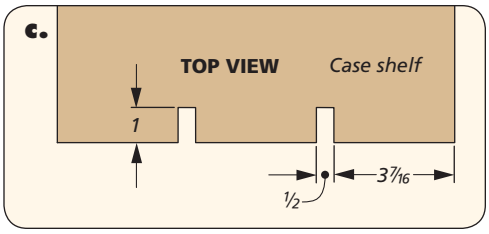
Case Rabbet. Recessing a wide dado blade into an auxiliary fence simplifies the task of sizing the rabbet.

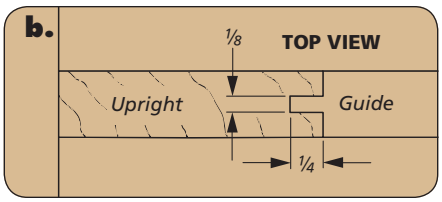


Drawer Bottom Groove. Cut the drawer bottom groove with a single blade in a couple passes.









BOTTLE HOLDERS

Creating a way to store bottles of wine is the next order of business. That task is handled by the interlocking grid assembly you see in the drawing above.

A set of notched uprights accept a pair of shelves to divide the lower portion of the wine rack case into 12 smaller cubbies. Narrow guides that run between the uprights prevent a bottle from drifting into another cubby as you slide it into place.

INTERLOCKING NOTCHES. The notches in the uprights and shelves serve two purposes. The first is to locate and space the parts consistently. The second purpose is to create a rigid structure that supports the weight of the bottles while still using relatively thin (½") parts.

There are two keys to keep in mind when creating the notches. The notches need to be spaced accurately. You can find the specifics in details 'a' and 'c.' Figure 1 in the box below shows one trick to do this for the uprights.

The other key is making sure the notches closely match the thickness of the mating parts. They should slide together easily but without any play.

It's a good idea to sand the uprights and shelves before cutting the notches. This way, you don't spoil the fit later. Here again, test cuts and sample pieces let you dial in the size of the dado blade.

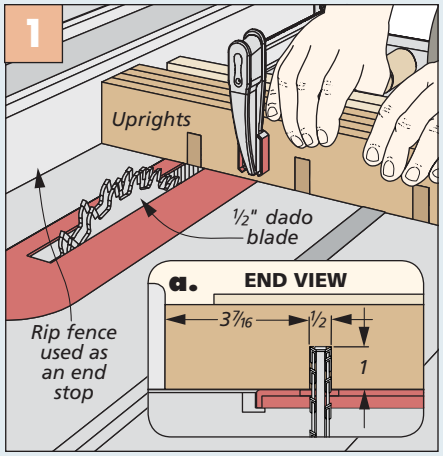
GROOVES. The inside edge of the uprights have grooves to accept stub tenons on the ends of the guides. This groove is a single kerf, as in detail 'b.'

Cutting the stub tenons on the guides goes the same as in the frame and panel assemblies you made earlier — just on a smaller scale. Figure 2 in the box at left shows the setup I used.

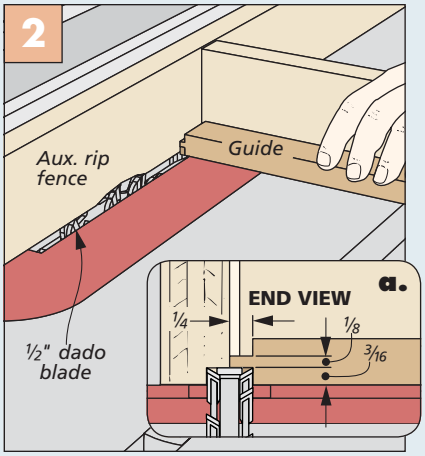
ASSEMBLY. Gluing up the bottle holder assembly involves a lot of parts. I used a slow-setting glue to give me time to bring everything together. To avoid a lot of difficult-to-remove squeezeout, just use a drop of glue on each of the joints.

Once everything is in place, slide it into the case to keep it square. Finally, drive a few screws through the case bottom into the uprights to lock it in place.

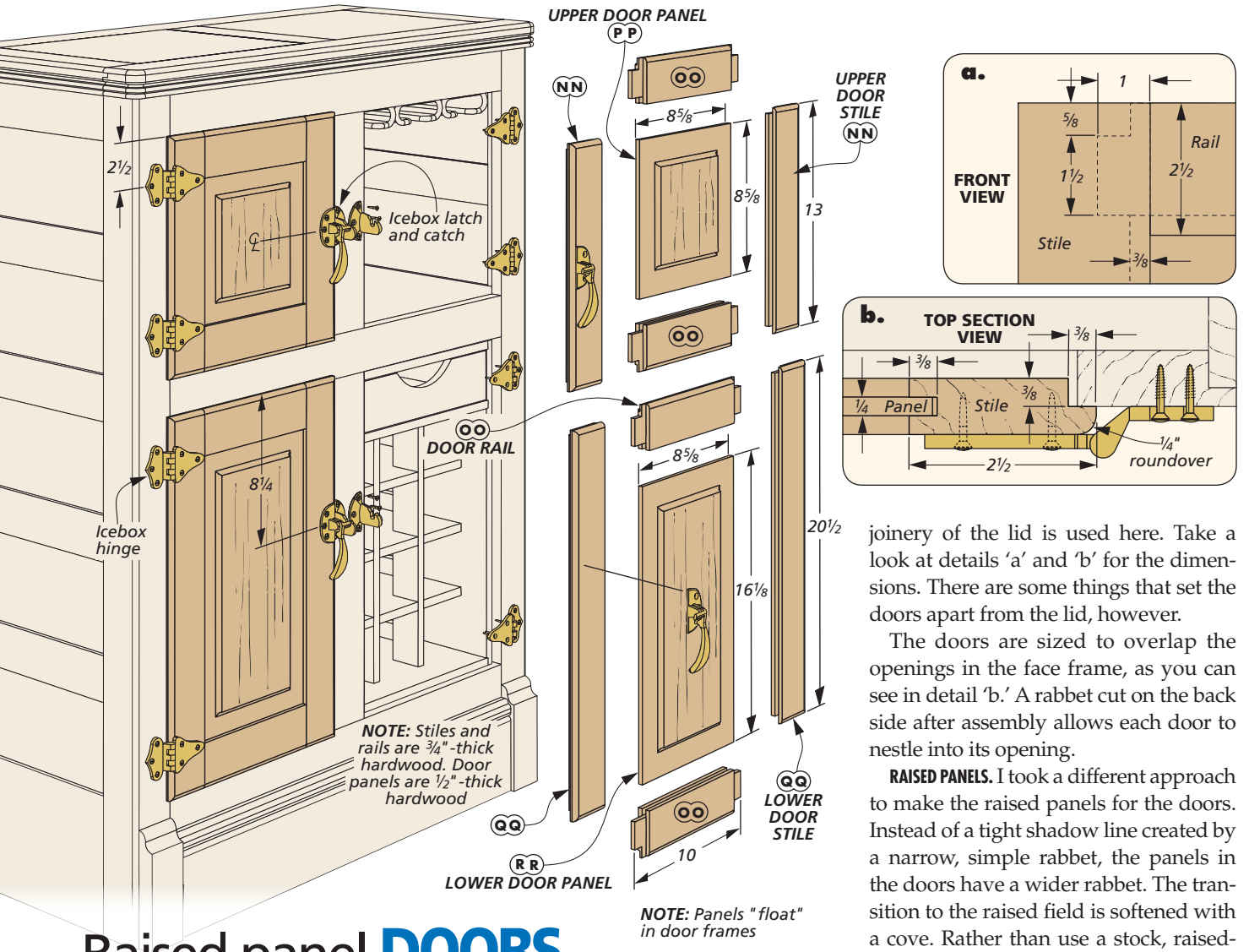
How-To: CUT NOTCHES & TENONS



Notches. To save time and guarantee alignment, you can cut all the notches in the uprights at the same time.



Small Stub Tenons. Size the stub tenons for a snug fit with a tight joint line at the shoulder.



Raised panel DOORS

You're in the home stretch. All that's left to complete the wine cabinet is to build the doors. The overall construction contributes to the appeal of the project. But the icing on the cake is the distinctive icebox hardware — solid brass latches and offset hinges that really draw your eye.

FAMILIAR CONSTRUCTION. After building the lid, you're pretty well set to make the doors. The haunched mortise and tenon joinery of the lid is used here. Take a look at details 'a' and 'b' for the dimensions. There are some things that set the doors apart from the lid, however.

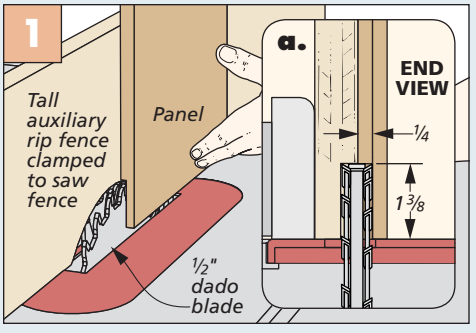
The doors are sized to overlap the openings in the face frame, as you can see in detail 'b.' A rabbet cut on the back side after assembly allows each door to nestle into its opening.

RAISED PANELS. I took a different approach to make the raised panels for the doors. Instead of a tight shadow line created by a narrow, simple rabbet, the panels in the doors have a wider rabbet. The transition to the raised field is softened with a cove. Rather than use a stock, raised-panel router bit, I used a two-step table saw and router table technique to get the look I was after. The lower left box shows you what to do.

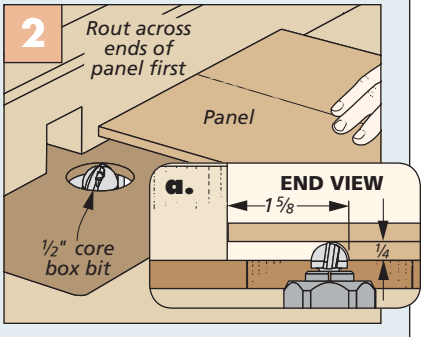
The rabbet is cut with a dado blade so that the resulting tongue is a tight fit in the groove in the door frame, as shown in Figure 1. This way, once you sand away blade marks, the fit will be right on. Take your time when setting up the core box bit to rout the radius. You want a seamless transition between the rabbet and cove profile, as in Figure 2.

INSTALLING HARDWARE. From a construction standpoint, the hardware has one big benefit — it's surface-mounted. Basically all you need to do is line it up and screw it in place. I noticed one of the latches had a slight sideways lean when the door was closed. Slight inconsistencies aren't unusual in cast hardware. To remedy this, I fine-tuned the catch (the part that's attached to the face frame) with a file. This gave the latch a little more room to fit smoothly and hang vertically.

How-To: MAKE RAISED PANELS



Wide Rabbet. Hold the panel on edge to cut the rabbet in a single pass. A tall auxiliary fence keeps it steady.



Rout the Cove. Align the center of the core box bit with the shoulder of the rabbet.

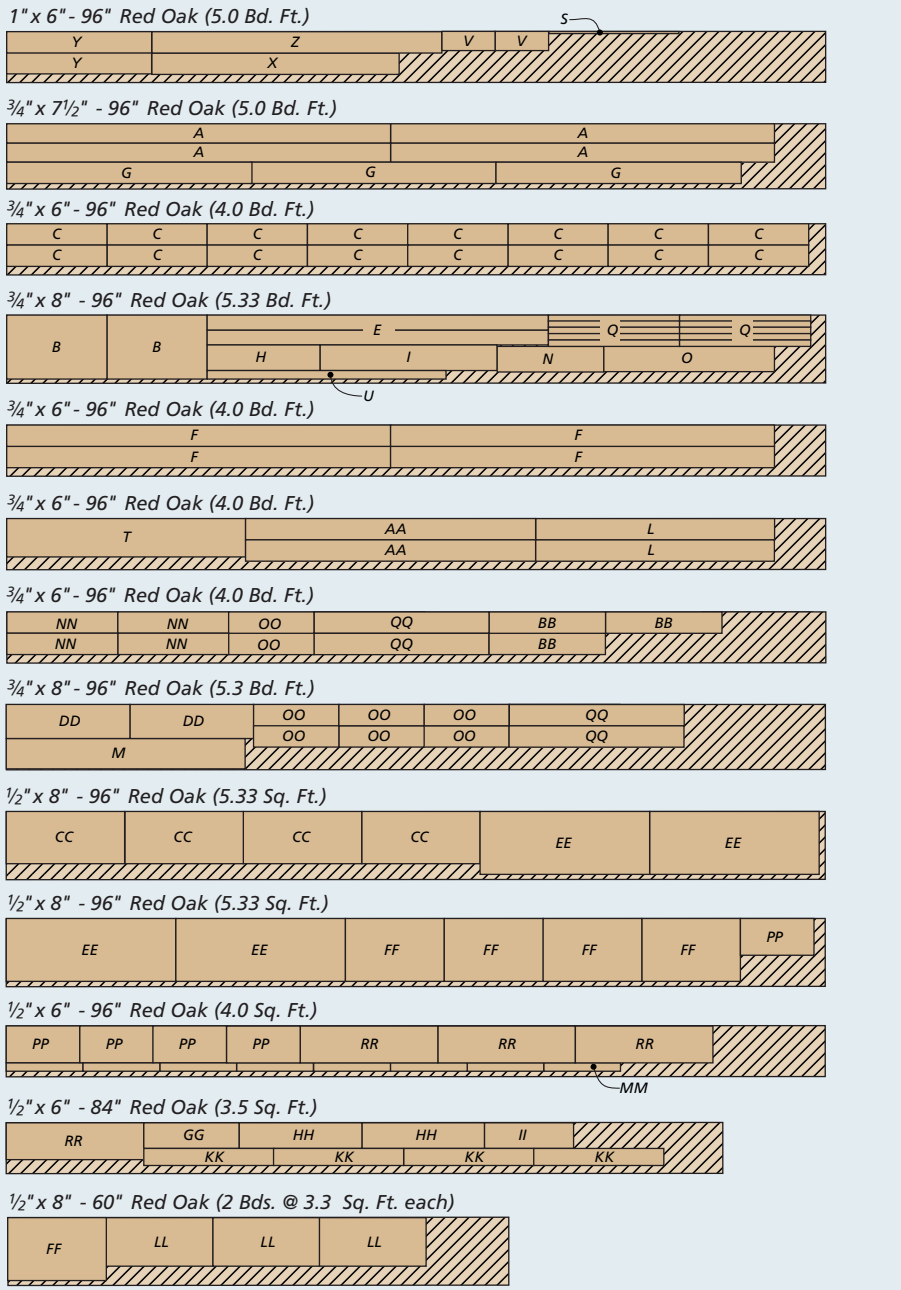
ANTIQUE FINISH. I wanted the finish for this cabinet to match its vintage charm. I came up with a layered approach that gives it the time-worn look of a cherished heirloom. It begins with a stain. Then a glaze is applied to mellow out the color of the stain and tones in the wood. Finally, a couple coats of clear finish give it party-proof protection. The specific colors I used are listed in sources on page 67.

Once it comes out of the shop, it's time to stock it up with your favorite refreshments. Then invite some friends and family over to celebrate your efforts in building this new old classic.

Materials, Supplies & Cutting Diagram

A	Side Stiles (4)	3/4 x 2 1/4 - 45
B	Bottom Rails (2)	3/4 x 7 1/2 - 11 3/4
C	Side Rails (16)	3/4 x 2 1/2 - 11 3/4
D	Panels (15)	1/4 ply. - 11 3/4 x 5 3/4
E	Center Stiles (2)	3/4 x 1 3/4 - 40
F	Back/Front Stiles (4)	3/4 x 2 1/2 - 45
G	Back Rails (3)	3/4 x 2 1/2 - 28 3/4
H	Upper Back Stile (1)	3/4 x 3 - 13 1/4
I	Lower Back Stile (1)	3/4 x 3 - 20 3/4
J	Upper Back Panels (2)	1/4 ply. - 13 1/4 x 13 1/4
K	Lower Back Panels (2)	1/4 ply. - 13 1/4 x 20 3/4
L	Front Rails (2)	3/4 x 2 1/2 - 28
M	Lower Front Rail (1)	3/4 x 3 1/2 - 28
N	Upper Front Stile (1)	3/4 x 3 - 12 1/2
O	Lower Front Stile (1)	3/4 x 3 - 20
P	Shelves (5)	3/4 ply. - 14 1/2 x 15 3/8
Q	Cleats (10)	3/4 x 3/4 - 15 3/8
R	Adjustable Shelf (1)	3/4 ply. - 14 x 15 1/4
S	Edging (1)	7/8 x 1/4 - 15 1/4
T	Toe Kick (1)	3/4 x 4 1/2 - 28
U	Molding (1)	3/4 x 1 - 28
V	Plinth Blocks (2)	1 x 2 1/4 - 6 1/4
W	Top Panel (1)	3/4 ply. - 11 1/2 x 29
X	Top Back Stile (1)	7/8 x 2 1/2 - 29
Y	Top Rails (2)	7/8 x 2 1/2 - 14
Z	Top Front Stile (1)	7/8 x 2 1/2 - 34
AA	Lid Stiles (2)	3/4 x 2 1/2 - 34
BB	Lid Rails (3)	3/4 x 2 1/2 - 13 1/2
CC	Lid Panels (2)	1/2 x 12 1/8 - 13 7/8
DD	Fillers (2)	3/4 x 4 - 14 1/2
EE	Case Sides (2)	1/2 x 14 1/2 - 19 7/8
FF	Case Dividers (3)	1/2 x 14 1/2 - 11 9/16
GG	Drawer Front (1)	1/2 x 3 1/16 - 11 3/16
HH	Drawer Sides (2)	1/2 x 3 1/16 - 14 3/8
II	Drawer Back (1)	1/2 x 3 1/16 - 10 7/16
JJ	Drawer Bottom (1)	1/4 ply. - 10 7/16 x 11 1/4
KK	Uprights (4)	1/2 x 2 - 15 1/4
LL	Case Shelves (3)	1/2 x 11 5/16 - 12 1/2
MM	Guides (8)	1/2 x 1 - 9
NN	Upper Door Stiles (4)	3/4 x 2 1/2 - 13
OO	Door Rails (8)	3/4 x 2 1/2 - 10
PP	Upper Door Panels (2)	1/2 x 8 5/8 - 8 5/8
QQ	Lower Door Stiles (4)	3/4 x 2 1/2 - 20 1/2
RR	Lower Door Panels (2)	1/2 x 8 5/8 - 16 1/8

- (32) #7 x 1 1/4" Washerhead Pocket Screws
- (1) 30" x 96" Plastic Laminate
- (62) #8 x 1 1/4" Fh Woodscrews
- (4) 1/4" Shelf Pins
- (3) Stemware Holders
- (1) Steam Table Pan and Cover
- (1 pr.) 1 1/2" Quadrant hinges w/Screws
- (4 prs.) 3/8" Offset Hinges w/Screws
- (2 ea.) Right and Left Latches and Catches



ALSO NEEDED: *One 48" x 48" Sheet of 3/4" Red Oak Plywood*
One 48" x 96" Sheet of 1/4" Red Oak Plywood

NOTE: *Parts S, X, Y, and Z are planed to 7/8"*

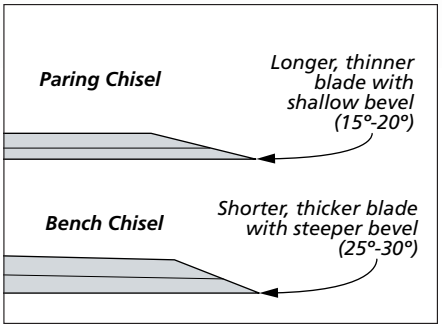
working with Paring Chisels

No woodworking shop would be complete without a set of bench chisels. They're the go-to tool for chipping away waste and trimming joinery. But there's another style of chisel every woodworker should have — a paring chisel.

Paring chisels were developed to remove small shavings for final shaping and smoothing. They're designed to be pushed with your hands instead of being struck with a mallet.

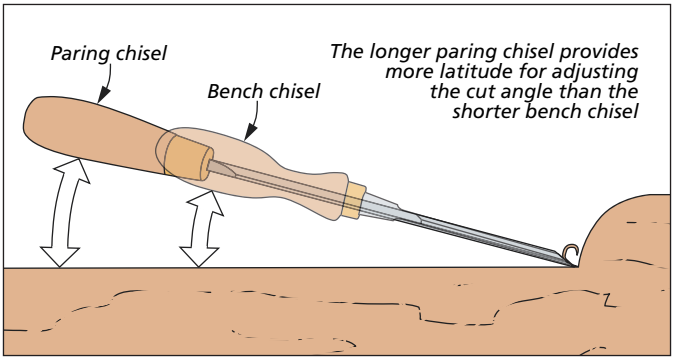
WHAT DEFINES A PARING CHISEL? A paring chisel is most recognizable by its length. Most are around 14" long. Your typical bench chisel, on the other hand, is about 10" long. Western-style paring chisels have a longer blade with a handle sized more like a bench chisel's handle. Japanese-style paring chisels are just the opposite: A shorter blade is attached to a long wood handle. For both styles, the overall combined length is much longer than a bench chisel. The photo below shows a comparision of all three chisel types.

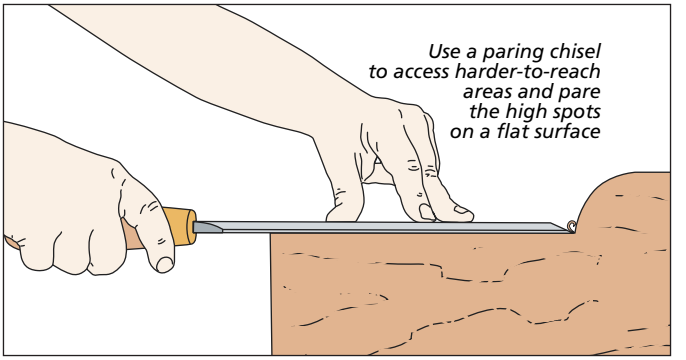
▼ Western-style and Japanese paring chisels are both longer than bench chisels. The longer length means finer control.



Another characteristic unique to paring chisels is the bevel angle. The average bevel on standard bench chisels is between 25° and 30°. A paring chisel has a lower bevel in the 15° to 20° range. This makes it easier to push through the wood fibers, particularly on end grain.

Finally, the blades on paring chisels are traditionally thinner than those on bench chisels. However, some manufacturers no longer hold to that tradition and make their paring chisels with thicker blades. Regardless of the blade thickness, it's the overall chisel length that counts.





ADVANTAGES

You can perform a lot of the same tasks with your bench chisels that you would with a paring chisel. But I'll show you why paring chisels are a better choice for some of those tasks.

ANGLE OF ATTACK. Paring chisels are longer for a couple of reasons. First, they provide better control and allow you to use your body as leverage. The length of a paring chisel also gives you finer control over the angle of the blade to the workpiece. The upper left drawing illustrates that for a given change in the angle, the handle of the paring chisel has to move a greater distance. Think of it as a giant protractor. A small movement changes the angle only a fraction of a degree for finer control over the cut.

▲ A paring chisel excels at making fine cuts where appearance counts, such as a through tenon. It's easy to control the cutting action for consistent results.

FLAT REFERENCE. You can also use a paring chisel like a plane to create a flat surface. In the right drawing above, the back of the chisel rides the surface to pare off the high spots. The same technique is used to clean out and smooth the bottom of a dado (lower left photo).

USE YOUR BODY. When cutting with a paring chisel, use your body to help push the chisel through the cut. You'll find that the cutting action is more controlled and requires less effort than letting your hands and arms to do all of the work. You use your body to lean into the cut as you guide the chisel with both hands (main photo).

SHAPING CURVES. My usual technique for the final shaping of a convex curve is to head to the disk sander. But there are times when the workpiece can't be positioned properly on the sander. And frankly, a disk sander can sometimes be overkill when shaping a curve.

I prefer the finesse I can get with a paring chisel. As shown in the lower right photo, it's easy to make light cuts to bring the curve to the layout line. Then a little hand-sanding is all that's required for final smoothing. I use this technique for final shaping of a workpiece after cutting it to rough shape at the band saw.

PRECISE CUTS. When it comes to making fine cuts where appearance counts, a paring chisel is ideal. Cutting chamfers on exposed tenons is a prime example, as shown in the photo at left. Light cuts with steady, consistent pressure while using both hands for control yield results you can be proud of.

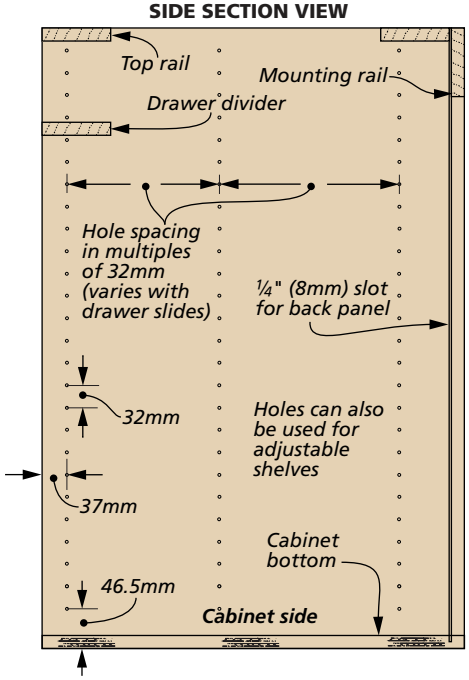
If you're looking to buy a paring chisel, I'd start with a 1" or 1¼"-wide chisel. These widths are great for paring mortises and general shaping tasks. As you discover how useful a paring chisel is, I'm guessing you'll end up with an entire set before too long. W

▲ The longer length of a paring chisel can work to your advantage. The lower bevel angle and flat back work to push through high spots to create a flat dado of consistent depth as you lean into the cut with your body.

▲ Making controlled cuts to bring a curve to final shape is best done with a paring chisel. Once you get the hang of it, you can create thin curls for a smooth surface.

using the 32mm

Cabinet System



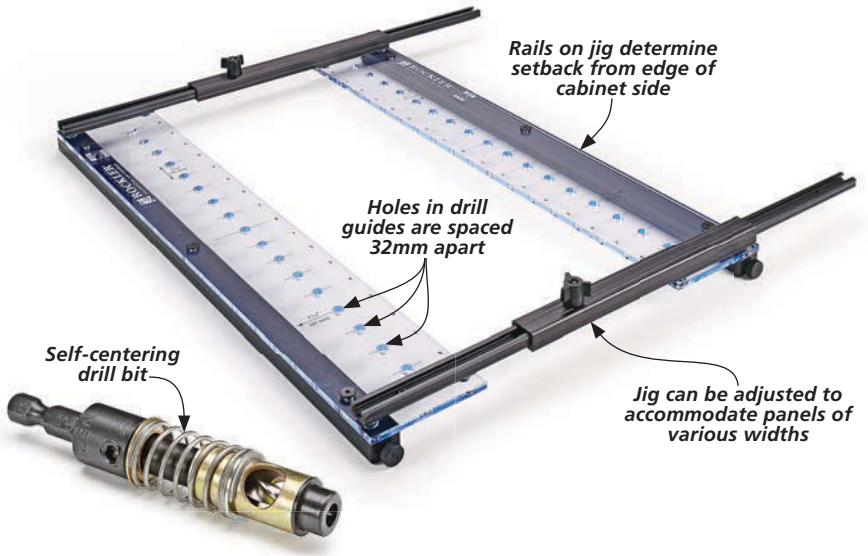
You may be familar with the terms "European-style" or "frameless" cabinetry. It's a popular cabinet construction style. And you can use it in your shop to create cabinets quickly and easily.

FAST & EFFICIENT. This system was born out of necessity. After World War II, there was a massive effort across Europe to rebuild, with a heavy demand for cabinetry. In order to support this effort in a timely and cost-effective manner, factories sprang up to produce these cabinets. An efficient system of cabinet construction was devised that came to be known as the 32mm system.

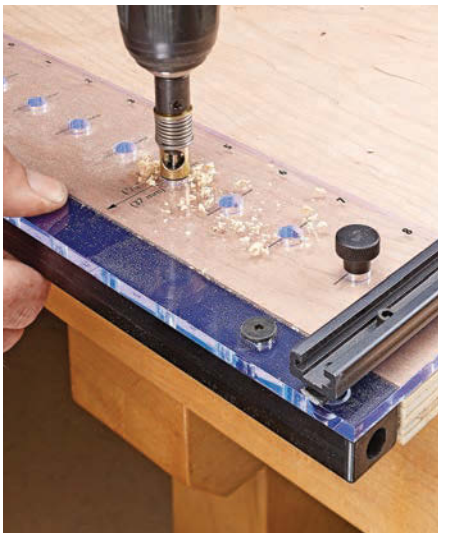
The 32mm system was designed from the ground up to be produced in a factory environment using semi-skilled labor. Drilling machines, called line borers, feature multiple spindles that drilled a row of evenly spaced holes in one operation. The spacing between each set of holes is 32mm. And it's this spacing that makes the system so versatile.

As shown at left, rows of holes are drilled in a flat panel that makes up the cabinet side. In traditional-style cabinetry, you'd equate these with shelf pin holes for adjustable shelves. But in the 32mm system, these holes are much more functional. I'll talk more about that in a bit.

And speaking of holes, there are only two sizes to deal with. The holes used for shelving, hinges, and drawer slides are 5mm. Factory-made cabinets also use 8mm construction holes for cabinet assembly. Specialty fasteners, like *Confirmat* screws or dowels, are used for quick assembly. The photo above and the drawings show a typical cabinet assembly.



▲ Drilling jigs are available from a number of suppliers for locating and drilling all of the holes for 32mm cabinet construction. The *Pro Shelf Drilling Jig* shown above is from *Rockler*. It uses a self-centering 5mm drill bit to accurately drill the holes at the proper spacing.



▲ To drill the first row of 5mm holes, a drilling jig creates the proper setback from the edge of the cabinet side.

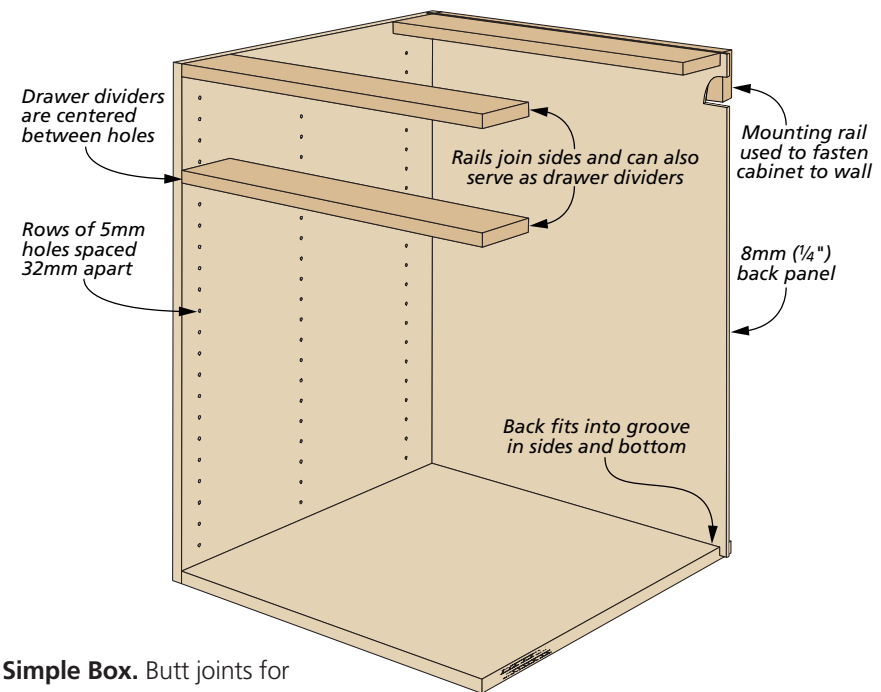
STRICT GUIDELINES. In order for factories to mass-produce cabinets, standards were developed for the sizing of the cabinet panels plus the location of the holes. This method of mass production means that the parts are interchangeable. For example, a cabinet side can be used on any cabinet in the set during installation.

European-style cabinets using the 32mm system are designed without a face frame. They usually feature overlay doors and drawers for ease of construction. Typical hole placement for this style of kitchen base cabinet is shown in the illustration on the previous page.

The setback, or starting location for the first row of holes is 37mm from the front edge if you're using overlay doors and drawers. For inset doors, you add the thickness of the doors to this number.

On true 32mm system cabinets, the offset from the back edge of the cabinet side is also 37mm. But in reality, this depends on what drawer slides you're planning to use and whether the doors and drawers are inset or overlay.

The distance between the rows of holes in the cabinet sides is based on multiples of 32mm. This makes installing drawer slides a snap, as you'll soon see.



Simple Box. Butt joints for the cabinet parts and a back panel that fits into a groove make for easy construction.

The standard offset from the bottom edge of the cabinet side to the first 5mm hole is 46.5mm when using 19mm (¾"-thick) stock for the bottom.

A LOT OF DRILLING. I'll admit that's a lot of holes to drill without expensive automated equipment. But, there are a number of jigs on the market to help, as shown in the photos above.

PANEL SIZING. There are also several online resources for helping you get the most out of the 32mm system. One of my favorites is from the hardware manufacturer *Blum*. They provide a handy, downloadable document named *Process 32* that gives you all of the dimensions you need for sizing the cabinet parts and laying out the hole spacing. You can find out where to download the document in Sources on page 67.

EASY CONSTRUCTION. As shown at left, making all of the parts and assembling them couldn't be easier. Two rails at the top connect the sides. These make it easy to fasten the countertop. If there are drawers, rails are used as the dividers to separate the drawers. After the back is installed, a mounting rail along the upper back edge serves as an anchor strip for fastening the cabinet to the wall. The nice thing is, all of these rails can be identical and cut from the same blank.

The back panel fits into grooves in the cabinet sides and bottom. It fastens to the back edge of the upper rail.

As you'll soon see, the advantages to this system are numerous, especially when it comes time for cabinet assembly and hardware installation.

IT'S ALL ABOUT SPEED

The heart and soul of the 32mm cabinet system is the ease and flexibility with which you can assemble a cabinet and install the hardware. As I've mentioned, jigs are available to help you accurately lay out and drill all of the 5mm holes. Besides 5mm and 8mm drill bits, there are a couple of other accessories you should consider.

LAYOUT TOOLS. Since the 32mm system is based on the metric system of measurement, you're not going to get very far using your imperial tape measure with feet and inches. It's simply not worth the time to convert back and forth.

I found a couple of tape measures by *FastCap* that are handy for laying out hole patterns for 32mm-style cabinets. They're shown at right. The great thing is, each of the metric scales has a little black diamond to mark every increment of 32mm. This makes laying out hole spacing a simple process.

If you're only making one or two cabinets, you can save the expense of a drilling jig by using *Layout Tape,* also by *FastCap* (right photo). It's printed with a hole pattern you fasten to the cabinet side and then simply drill at each crosshair.

SYSTEM HOLES. Now that you have a basic understanding of the 32mm system of cabinet construction, let me elaborate on how to take advantage of it. You may not realize it, but manufacturers of cabinet hardware have been catering to the 32mm system for years. If you take a look at the drawings above, you'll see one common example.

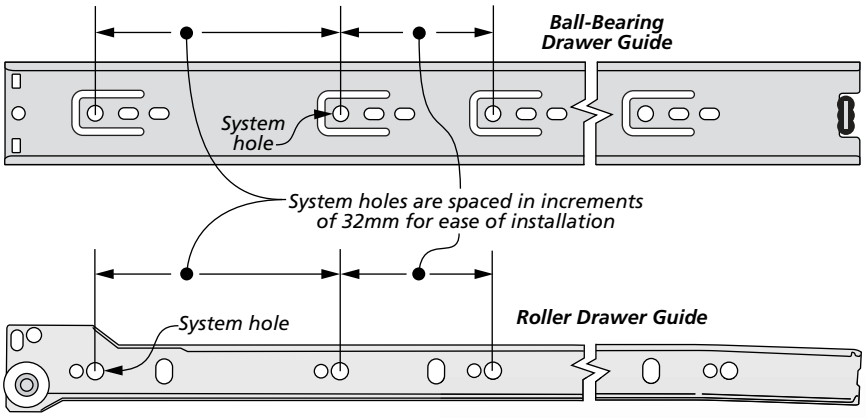
You may notice that some holes in drawer slides that are slightly larger than others. These are "system holes" that align with holes in the cabinet sides drilled using the 32mm system.

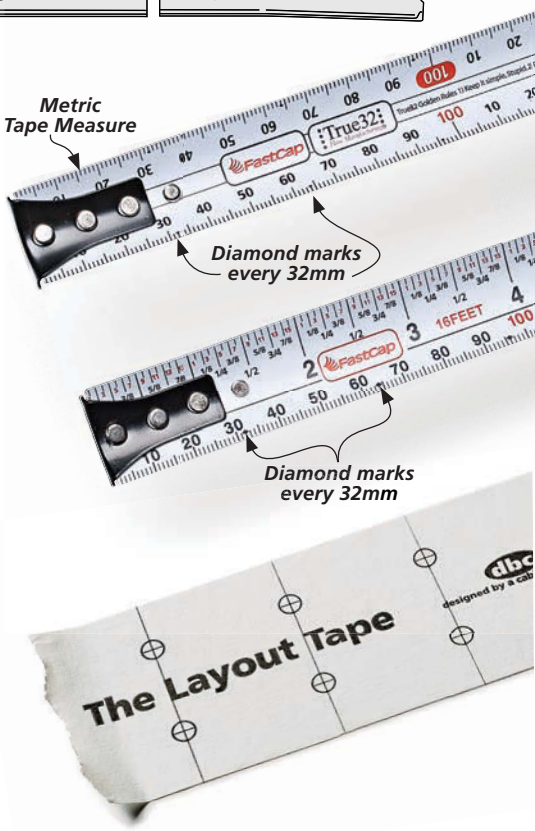
This has a couple of big advantages. First, you know that when you install the slides, they're automatically going to be level. No fancy installation jigs are required. Second, since the holes in the cabinet are predrilled, it's an easy task to secure them with screws.

Hinge plates for European-style hinges work the same way. The spacing between mounting holes is, by design, 32mm.

INSERTS & SYSTEM SCREWS. So how do you fasten this hardware into the 5mm system holes? There are a few easy solutions worth considering, starting with nylon inserts. As shown at the bottom of the page, inexpensive nylon inserts are available that fit the 5mm system holes. Once these are installed, standard #5 or #6 woodscrews can be used to attach the drawer slide or hinge plate.

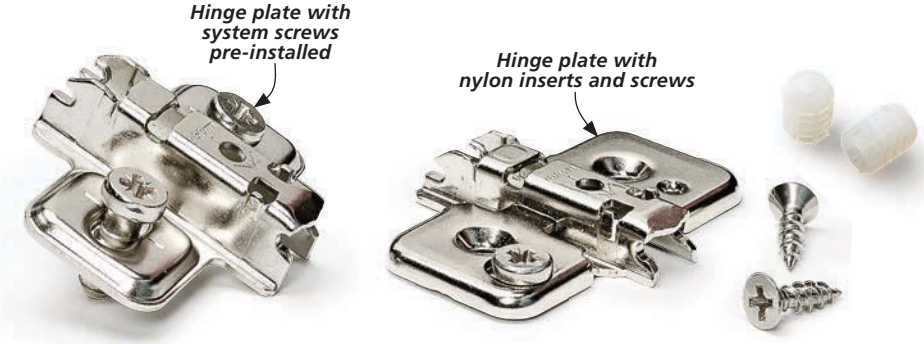
Special screws known as "system screws" can also be used. These screws are specifically designed to install cabinet hardware. Below, you can see a couple of them in the hinge plate. The thread





▲ A must-have item for 32mm cabinet construction is a metric tape measure (upper two photos). Layout tape (lower photo) makes laying out 5mm holes in cabinet sides quick and easy.

▲ *Pozidriv* screws (lower) are stamped with an "X." Phillips drivers (above) won't properly engage a *Pozidriv* screw.



▲ Mounting drawer slides and hinges is easy. Purchase hardware with system screws already installed (left photo) or use nylon inserts with standard woodscrews (right photo). Similar attachment methods can be used for the door portion of European-style hinges.

diameter securely fits a 5mm hole. For the system screws used on drawer slides, a shallower head on the screw means it won't stand proud, so it won't interfere with other moving parts.

You can purchase system screws in bulk from hardware resellers. But there's one thing you need to know. The heads on system screws are *Pozidriv*. They look similar to a Phillips head screw, but they aren't quite the same (photo, next page).

Pozidriv screws are marked with an "X" stamp on the head. A standard Phillips driver doesn't go deep enough into a *Pozidriv* screw to properly engage the head. This results in "cam-out" that makes the screw almost impossible to tighten. So my recommendation is to invest in an inexpensive *Pozidriv* hand driver or driver bit. It will take a lot of the frustration out of installing hardware.

HINGES. When it comes to mounting the hinge plates, the same attachment options apply. As for the door portion of the hinge, production cabinets use 8mm mounting holes. As with 5mm inserts, 8mm inserts allow you to use standard woodscrews to mount the hinge.

Special wedge-shaped brackets are fastened to a toe kick. A clip then slides onto each of the brackets.

A pair of clips mounted to the toe kick snap onto a leveler leg for ease of installation and removal.

Some manufacturers supply hinges with the inserts and screws already installed. All you need to do is press the hinge into the holes and you're done.

WHAT ABOUT FACE FRAMES? Everything I've talked about so far centers around the frameless, European cabinet style. What you may not know is that the 32mm system can also be applied to more traditional cabinetry that utilizes face frames.

The box below shows some spacers for mounting drawer slides in a 32mm cabinet design with a face frame.

How-To: DRAWER SLIDE SPACERS

You can take advantage of the 32mm cabinet construction method and still use face frames for a traditional look. Hardware manufacturers have products specifically made for this "hybrid" construction technique. One such product are the spacers shown here.

Spacers make it easy to install drawer slides in a face frame cabinet.

SPACERS. Instead of cutting wood spacers for drawer slides, the spacers shown below utilize the 32mm system holes. Several sizes are available to accommodate face frames of different widths (photo at left).

Select the size that brings the drawer slide flush to the inside edge of the face frame. Fasten the spacer into the 5mm holes in the cabinet sides and then install the drawer slide as usual.

You purchase the spacer height that brings the drawer slide flush with the inside edge of the face frame. As for hinges, there are a variety of European-style hinges that adapt to face frames.

AN ADJUSTABLE BASE

Now that you have a cabinet built, it's just a box. What about a base? If you have a row of cabinets like you'd find in a kitchen, a simple solution is to use 2x4 runners across the floor to mount the cabinet boxes. But there's an easier, more flexible option. The plastic legs you see above are designed specifically for ease of mounting. Plus, they can be used on any cabinet, not just frameless cabinets.

These cabinet add-ons bring a number of important benefits. The plastic legs are super strong. They not only elevate the cabinet off the floor, but they also act as levelers. The legs come in a kit that includes a couple of options for mounting them to the cabinet. You can also order larger feet as an accessory that snaps onto the bottom of the leg. This provides a better grip to adjust the level of the cabinet once it's in place.

A nice feature of this style of leg is the plastic clips that allow you to install toe kicks. The legs come with mounting plates to attach the toe kick. Once the plates are installed, slide the clips in place, then snap the toe kick onto the legs. It's also easy to remove the toe kick to gain access under the cabinet.

EASIER CONSTRUCTION. In spite of its historical origins on the factory floor, you can put the 32mm system to use in your shop. Now that you understand how the holes are layed out and utilized, you'll soon find it's a great way to make quick and easy cabinetry.

▲ A dado blade allows you to fine-tune the width of a dado or groove for a perfect fit with a mating board. For a rabbet, you can accomplish this by burying the blade in an auxiliary fence (inset).

the importance of

Dadoes, Grooves & Rabbets

You've probably noticed that many of the projects shown in *Woodsmith* contain parts joined with dadoes, grooves, or rabbets. These are some of the simplest woodworking joints around, but also the most important, particularly for tasks like putting case parts together.

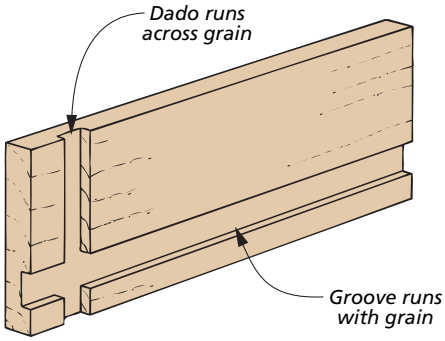
I like to think of dadoes, grooves, and rabbets as a great entry point into fine woodworking. It's possible to put parts together without them, but once you add these fundamental techniques to your skill set, they truly take your projects to the next level. The result is a measure of precision, accuracy, and strength for your projects that wasn't there before.

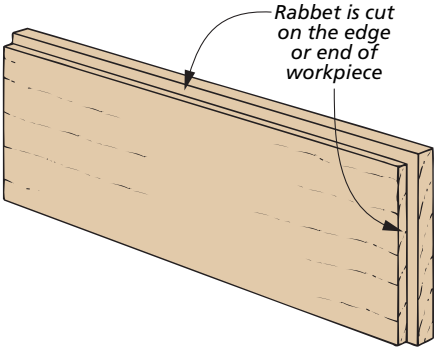
THE BASICS. Dadoes, grooves, and rabbets are all pretty easy joints to understand. Dadoes and grooves are both U-shaped channels in wood that are sized to fit a mating part. The difference is that dadoes are cut across the grain of a board, while grooves follow the direction of the grain (far left drawing).

Rabbets are L-shaped channels cut in the ends or edges of boards (near left drawing). They accept the mating end or edge of another piece.

WHY CUT THEM AT ALL? Oftentimes, the assemblies joined with dadoes, grooves, or rabbets are so simple that you might think that basic butt joints would suffice. However, there are several reasons why dadoes, rabbets, and grooves are superior to butt joints. Let me explain.

For one, cutting these joints produces two or three mating glue surfaces between boards, rather than just one.





A clamp-on straightedge ensures precise results when routing dadoes. You'll need to account for the offset between the bit and the straightedge.

A rabbeting bit has a bearing that rides along the end or edge of a workpiece, guiding the bit as it cuts the rabbet.

Dadoes and rabbets simplify case assembly, ensuring that parts are square and aligned as you add glue and clamps.

The increased glue surface makes the joints stronger. This is especially important for an end grain to edge grain connection between pieces, which is not strong on its own without joinery.

But perhaps more important, dadoes, grooves, and rabbets help to both register pieces and square assemblies as you begin to put them together. If you've ever tried to build a case using only butt joints, then you'll understand what I mean. It often takes more time to try to align all the parts as you apply the clamps.

Usually, it's a better idea to take the time before assembly to create these joints for aligning parts. The assembly process will go a lot more smoothly when every part has a place to lock into once the glue and clamps are applied. And simply having a pocket for the mating workpiece to rest in also helps to square your assembly, so all the mating parts of the case will line up correctly (lower photo at right).

USING A DADO BLADE. When it comes to making basic dadoes, grooves, and rabbets on workpieces, there are a few ways to go about it. My preferred method is to use a dado blade installed in the table saw. Dado blades are a good choice because you can use the right combination of cutters and shims to perfectly match the size of the joint to the part that will fit into it (refer to the main photo on the opposite page). This is especially useful when joining plywood, which is typically thinner than its stated thickness.

Rabbets are a snap on the table saw, as well. The key is to bury the dado blade in an auxiliary fence (inset photo, opposite page). To do this, you lower the dado blade below the surface of the table, and clamp a flat scrap piece to the rip fence to serve as the auxiliary fence. Now set the fence over the blade, turn on the saw, and slowly raise the dado blade to the desired height (or depth of rabbet), cutting into the auxiliary fence in the process. Then shut off the saw, and you can adjust the fence to match the desired width of the rabbet you'd like to cut.

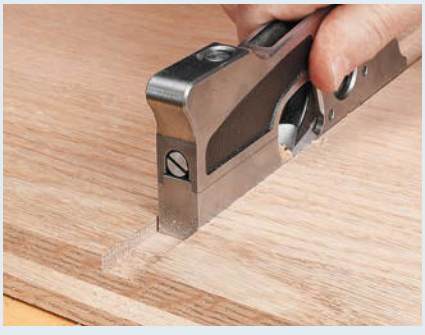
SMOOTH JOINERY. If there's any drawback to cutting these joints with a dado blade, it's that the blade has a tendency to leave small ridges on the bottom of the joints. This usually isn't a big issue, and you can easily clean them up if they'll be visible. You'll find a couple of great techniques for doing so in the box at the lower left.

ROUTING JOINTS. Though I prefer a dado blade at the table saw for cutting basic joinery, there are times that a workpiece (such as a case side) is too large or cumbersome to cut on the table saw. In these situations, I often turn to a router equipped with a straight bit and guided by a straightedge to cut dadoes or rabbets (upper left photo). To do this accurately, you just need to account for the offset between the edge of the router base and the edge of the bit when setting up the straightedge. This way, you can rout the joint right where you need it.

To cut rabbets with a router, I typically use a rabbeting bit. These bits have a bearing that rides along the edge of the piece, while the larger diameter cutter creates the rabbet. You can see how the bit works for cutting rabbets in the upper right photo.

Dadoes, grooves, and rabbets aren't difficult joints to cut. But spending a little time mastering these basic techniques can go a long way toward making better-looking, more accurate assemblies. W

How-To: CLEAN UP THE CUT



A few quick swipes with a shoulder plane remove ridges and leave a smooth, flat-bottomed dado.

If you don't have a shoulder plane, attach self-adhesive sandpaper to the edge of a scrap block to smooth the joint.

cutting smooth & accurate

Angles & Tapers

Most table saw operations center around two main tasks: cutting parts to size or cutting joinery. But your saw can be used for shaping parts, too. This can be as simple as cutting an angle along the edges or across the ends of a workpiece. That's what I'm going to focus on here.

▼ A glue line rip blade and a crosscut blade give you smoother results when cutting tapers and angles at the table saw.

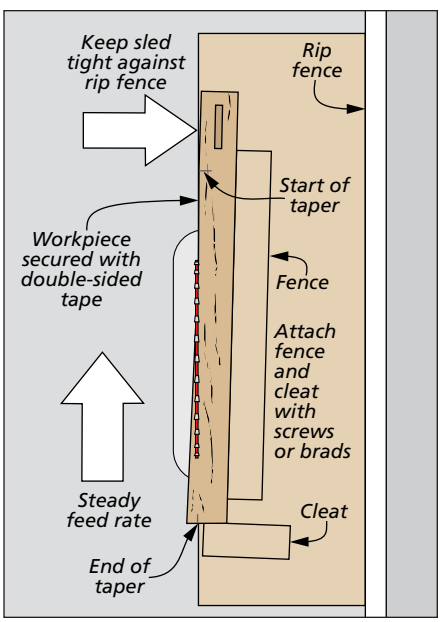
LONG TAPERS

An angled cut along the length of a workpiece, a taper, is probably the most common. A taper lightens the look of table legs. It's also used to add interest to case sides or add stability to a project, like the step stool on page 28.

SIMPLE SLED. While adjustable taper jigs are available, I usually make a basic sled dedicated to the task at hand, as shown in the photo above. The sled consists of a wide plywood base, a fence, and a cleat (drawing at right).

One edge of the base rides along the rip fence and the other is set against the saw blade. The position of the fence and cleat is determined by the cut you need to make.

Begin by marking the endpoints of the taper on one edge and end of the workpiece. Set the workpiece on the sled so that the two layout marks are aligned with the edge of the base. Now attach the fence on the opposite side of the workpiece with brads or screws. A short cleat at the end captures the workpiece and



▲ Lay out the starting and ending points of the angle directly on a workpiece. Then set the blade of a bevel gauge to line up with the marks. Use this piece as a setup gauge.

▲ Hold the stock of the bevel gauge against the bar of the miter gauge. Then rotate the miter gauge fence until it aligns with the blade of the bevel gauge. This will ensure consistent cuts.

resists the cutting action of the blade. I like to apply a strip of double-sided tape to keep the workpiece from shifting.

BLADE. You won't go wrong using a combination blade to make this cut. However, since it's mostly a rip cut, a glue line rip blade makes the cut more efficiently and leaves a smooth surface.

PUT IT INTO PRACTICE. In use, your main task is keeping the sled firmly against the rip fence as you push it past the blade. Ripping is heavy work for a saw. So pay attention to the sound of the blade and its cutting action. Feeding the piece too fast may cause the blade to vibrate and leave more marks. Going too slow can cause burning in some wood species.

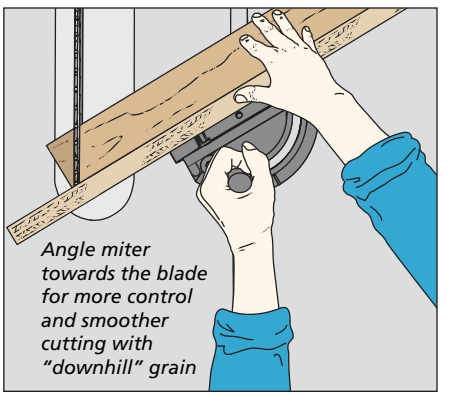
ANGLE CUTS

Making a cut across the end of a workpiece is another matter. But it's not any more complicated. The main difference is how the workpiece is guided. Instead of using a sled riding along the rip fence, reach for the miter gauge.

Setting up for the cut is a matter of adjusting the angle on the miter gauge. A protractor works great if you know the angle. Like a taper cut, I simply go by the layout lines. After marking the cut on the workpiece, set a bevel gauge to match the angle (upper left photo). Now you can use the bevel gauge to set the angle of the miter gauge, as you can see in the upper right photo.

AUXILIARY FENCE. Another part of set up involves attaching an auxiliary fence to the miter gauge to maximize workpiece control. There are a few details on the fence that make cutting angles much easier and safer, as in the photo below.

I extend the fence beyond the blade on the waste side. The extra length here allows you to direct the waste piece clear of the blade. The fence should be tall enough that once the miter gauge is set at the correct angle, you can raise the blade and cut a reference kerf in the fence. This makes aligning cuts a snap.



DIRECTION. Speaking of the angle, in most cases, I prefer to set up the miter gauge so it angles toward the blade (if possible), as in the drawing above. This orientation provides better visibility, and I find that the blade is cutting "downhill" to the grain resulting in a cleaner edge.

MAKING THE CUT. In practice, you'll find that making angled cuts with a miter gauge is pretty similar to making a 90° crosscut. A dedicated crosscut blade delivers a smooth surface (fewer blade marks) and less tearing on the top and bottom faces on the workpiece.

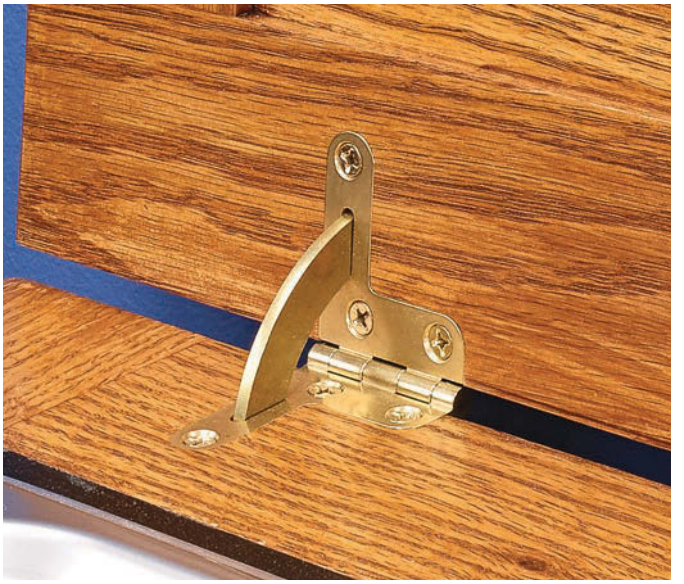
In order to prevent unwanted blade marks, slide the workpiece away from the blade after completing the cut. Then retract the miter gauge.

Cutting angles and tapers shouldn't be intimidating. With the right setup and a little know-how, you can make smooth crisp cuts no matter what angle it is.

▲ A long plywood auxiliary fence on the miter gauge provides a larger support surface to guide a workpiece for a steady cut. The fence should extend beyond the blade on the waste side of the cut so that you can safely push the waste piece away from the back of the blade.

tips from our shop

Shop Notes



Installing Quadrant Hinges

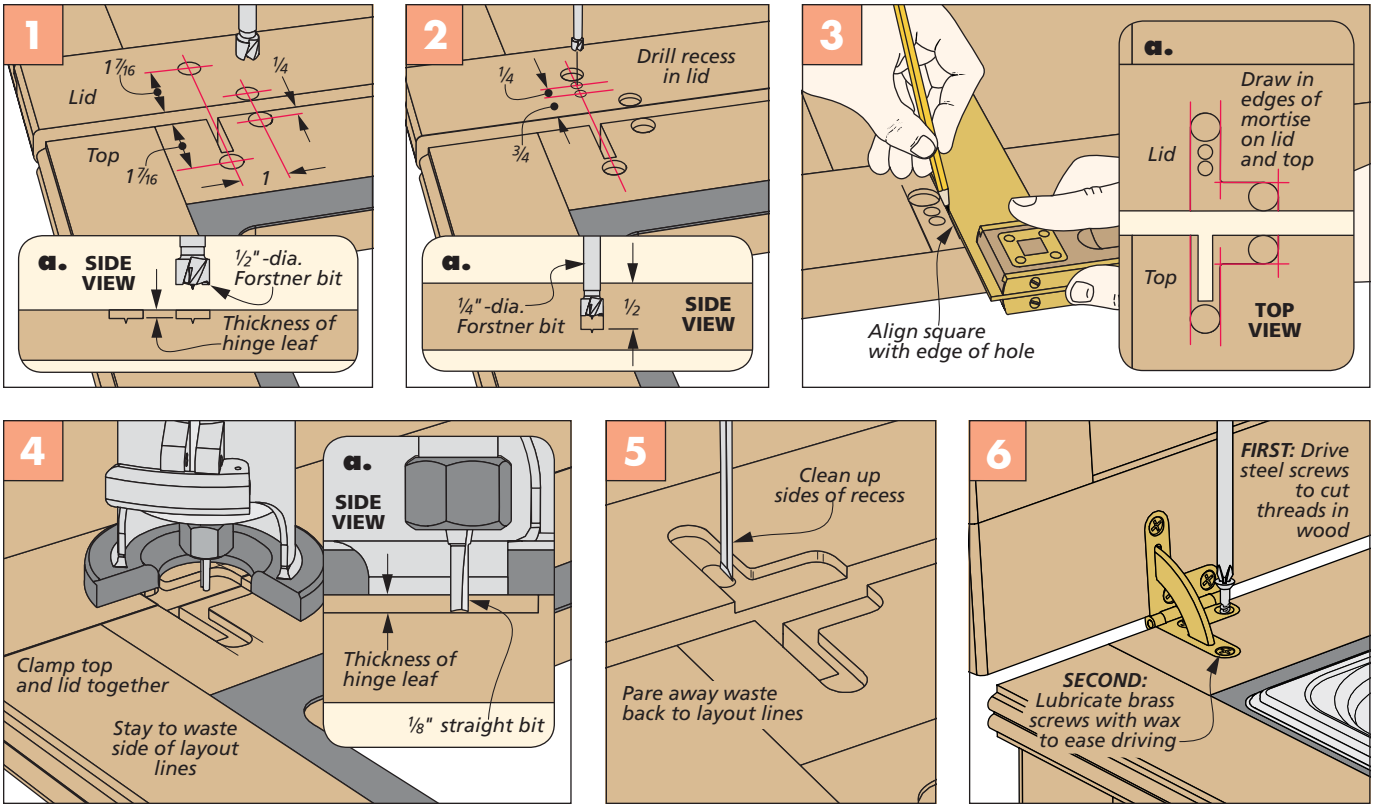
The hinges used on the lid of the wine cabinet (page 42) incorporate a built-in stay to keep the lid propped open. This feature, along with their L-shaped design, makes installing the hinges a little more challenging than an ordinary butt hinge.

LAYOUT. Accurate layout is the key. Once the top and lid are complete, you're able to lay out the hinge mortises on both assemblies at the same time. I based the layout dimensions on the size of the hinge, centering it over the notch in the top back rail, as shown in Figure 1.

ENDS FIRST. The rounded end of each leg mortise is created with a Forstner bit in a hand-held drill. The depth of the hole should match the thickness of the hinge leaf. Switch to a smaller bit to create a deeper recess for the head of the stay in the lid, as in Figure 2. Complete the layout by marking the edges of the mortise using a square, as shown in the Figure 3.

ROUT & PARE. A palm router and a small straight bit make quick work of removing the bulk of the waste in the mortise, as you can see in Figure 4. Just as important, the bit establishes a flat, smooth bottom for the hinge to rest in. A little cleanup with some chisels brings the mortise to its final size. Check the fit with the actual hinge to see if any adjustments are necessary to obtain a snug fit without any gaps.

In order to support the weight of the lid, the hinge screws need to have a solid grip. So take care to size the pilot holes accurately (especially those near the notch) and avoid stripping the screws as they're driven into place, as in Figure 6.

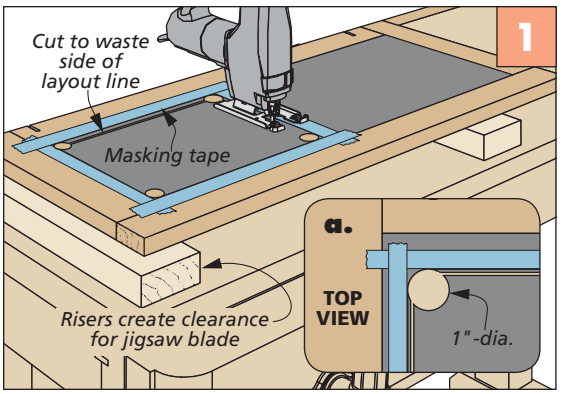


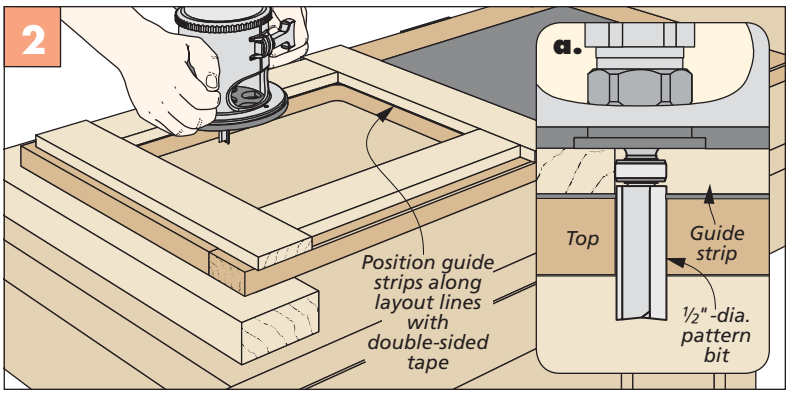
Creating Smooth Openings in a Panel

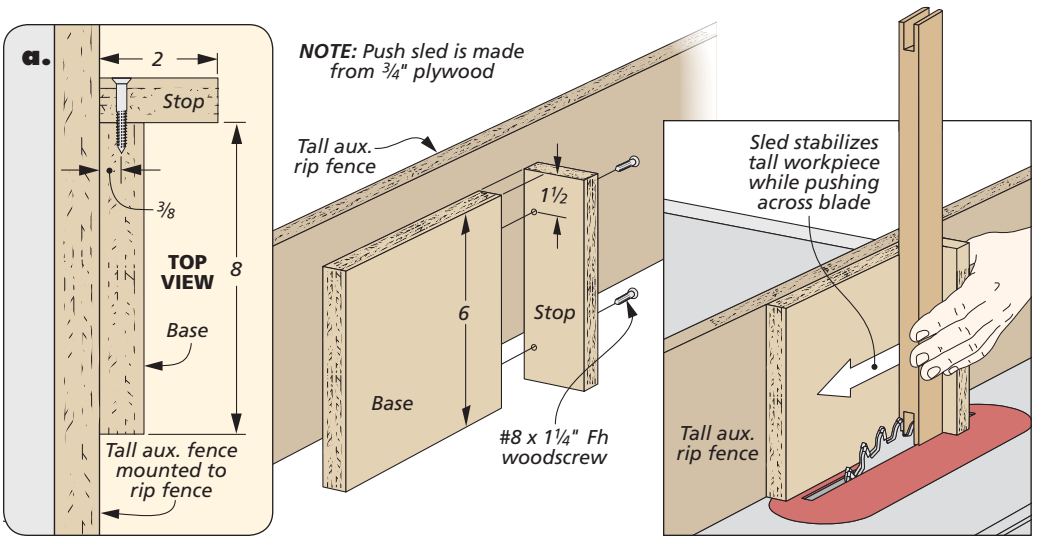
A stainless steel pan is used as an ice bucket in the wine cabinet project on page 42. The pan rests in an opening cut in the top assembly. While a lip on the pan conceals the edge of the opening, I still wanted a clean and smooth appearance when the pan is removed. To achieve that, the process breaks down into two main steps. First, you create a rough opening, then clean it up for a finished look.

ROUGH OPENING. A jig saw works great for cutting (Figure 1). But I drilled out the corners of the opening to provide access for the bit and to create a smooth radius in the corners. Then I drew layout lines that align with the outside edges of the holes. Apply strips of masking tape on the surface to keep the saw from scratching the laminate and help prevent the laminate from chipping.

CLEANUP. Even with a good blade, the edges of the cut will be somewhat ragged and uneven. To smooth and straighten them out, I used a router with a pattern bit (Figure 2). The bearing of the bit follows along a series of strips that are attached to the top with double-sided tape. Rout only along the edges without going into the corners to preserve the corner radius.







Push Sled

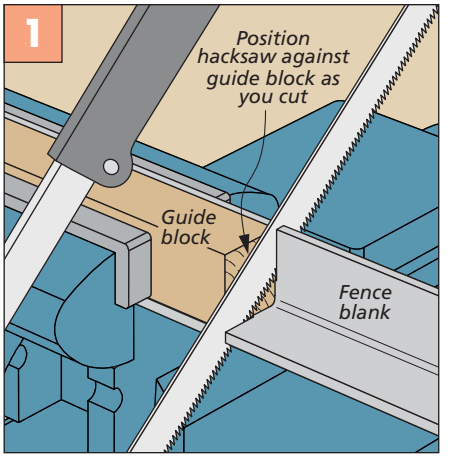
The four rails for the step stool on page 28 require slots on both ends for the loose tenons. To support the narrow rails while cutting the slots on the table saw, I made this push sled.

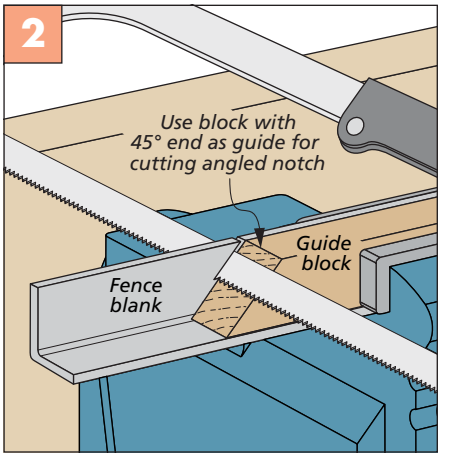
The push sled is simply a plywood base and stop screwed together to form a cradle for the rail to rest in. The sled, along with a tall auxiliary rip fence, stabilizes the rail as it's pushed across the dado blade.

Steel Cutting Guides

The cutoff grinder (page 34) is a great solution for making precise cuts in metal. But the irony of the project is that you have to make some accurate cuts in metal by hand first in order to build the project.

GUIDE BLOCKS. A few of those cuts are required for the steel-angle fence, which is both cut to length and notched at 45° on one end. To do this accurately, I made a guide block with a 90° and 45° end. Then I clamped the block and steel angle in a vise and cut along the block with a hacksaw (Figures 1 and 2) . W





questions & answers

choosing a Finish for Toys

I'm building some wood toys as gifts for my grandchildren. Do you have any recommendations for a finish that's safe and will hold up well over time?

Anthony Downs
Chesterfield, Missouri

It's understandable that you'd want to choose the safest stain or finish possible for a project that children will be using. And there are plenty of excellent options available for creating a wood finish that will look good, is safe, and will last a long time. However, it's also important to understand the truth about wood stains and finishes, as there's a lot of misinformation on the subject.

Many people are concerned about the safety of stains, as well as finishes like varnish and lacquer. This is due to the strong odors they emit while drying. Also, many of these products contain metallic drying agents that speed curing.

WATER-BASED. To avoid these issues with oil-based products, some consider water-based stains and finishes to be a safer choice. And with less odor and lower levels of VOCs (volatile organic compounds), water-based finishes are safer to apply. However, most of these products still have solvents and metallic drying agents in them.

THE TRUTH ABOUT SAFETY. The reality when it comes to both oil-based and water-based products, though, is that all finishes sold today are safe once they're fully cured. The general rule on a stain or finish being cured is 30 days, but it's probably fully cured when it's dry to the touch and there's no odor when you hold the project to your nose. This is why I felt comfortable choosing a water-based dye as the finish for the toy logs in this issue (photo above). You can also check the side of the container for more information about any finish's VOC levels and other safety information.

NATURAL OPTIONS. Once you know the truth about wood finishes, it should provide some assurances when it comes to the finish you choose for toys or other projects. However, if you want to avoid undesirable ingredients entirely, there are plenty of natural options. Natural oils such as raw linseed oil (often called flaxseed oil), tung oil, and mineral oil, for example, are all good choices that are non-toxic and provide a protective finish to wood. Beeswax is another option that is water repellant and can be used to protect wood products.

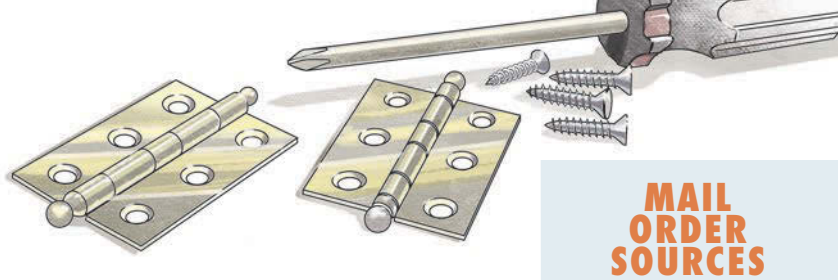
These natural products typically take longer to cure than other wood finishes, but they provide a nice, oiled look. And though they sacrifice some durability compared to other finishes, they are often easier to reapply as needed.

READ THE LABEL. Even with these natural products, though, it's important to read the label carefully, so you know exactly what you're getting. Raw or pure linseed oil, for example, is different from boiled linseed oil, which is often used as a base for other finishes and contains solvents and metallic drying agents. The same is true of tung oil, so you should look for a product that says "pure tung oil" on the label to make sure you're getting the right thing. Mineral oil is sold as both mineral oil or butcher block oil, and either product gives you what you need.

Finally, some of the finishes that are labeled as "food-safe" or "non-toxic" are not that much different from standard varnish or lacquer. For example, some finishes sold as "salad bowl finish" are nothing more than oil mixed with urethane and drying agents, just like ordinary wiping varnish.

As mentioned previously, all wood finishes are safe on any of your projects once they have fully cured. But for true peace of mind, you'll need to check the label carefully if you want a natural oil or wax finish for your project. W

hardware & supplies
Sources



Most of the materials and supplies you'll need to build the projects are 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.

PREMIUM SANDPAPER *(p.10)*

- **Rockler**
  Norton ProSand . . . . . varies
- **Homestead Finishing**
  3M Fre-Cut Gold . . . . . varies
  Mirka Goldflex . . . . . varies
- **Lowe's**
  3M SandBlaster Pro . . . . . varies

BULLNOSE PROFILES *(p.12)*

Bullnose profile router bits are available from a variety of the retailers listed at right, including *amazon.com, Rockler, MLCS,* and *Lee Valley*. You can visit *Amana Tool's* website to find out where to purchase the roundover bits with the *Ultra-Glide* radius bearing.

MAGNIFIERS *(p.14)*

- **Lee Valley**
  Magnifying Lamp. 17J30.20
  Flex-Neck Magnifier. 17J31.01
- **Amazon**
  Carson Mag. B007CDJKM2
  Donegan Mag. B0015IS6K2

LINKIN' LOGS *(p.18)*

- **Dick Blick Art Materials**
  Burnt Umber 00315-8059
  Hansa Yellow Med. . . . 00315-4131
  Red Oxide 00315-3091
  Sap Green 00315-7099

DRILL PRESS DEPTH STOP *(p.26)*

- **McMaster-Carr**
  Push-Button Nuts . . . 98150A770

STEP STOOL *(p.28)*

The step stool was stained with a mixture of three parts *Zar* cherry stain and one part *Wood Kote Jel'd* stain (cherry). Then it was sprayed with two coats of lacquer.

SLIDING CUTOFF GRINDER *(p.34)*

- **McMaster-Carr**
  ¼"-20 Inserts 90016A029
  White Resin Bars 8739K86
  1/16" x 1¼" Alum. 8975K198
  ¼" Steel Rod 8920K115
  3¾" Spring 9654K376

The metal parts below were purchased from *All Metals, Inc.*:

Steel Bar Channel . . 1" x ½" x ⅛" x 24"
Steel Hot Rolled Flat . . ⅛" x 4" x 24"
Steel Leg Angle . . . . 1" x 1" x ⅛" x 24"

Most parts were painted with *Krylon Rust Protector Hammered Finish* spray paint in Charcoal Gray. The slide rail was sprayed with lacquer. The fence was painted with red spray paint.

ICEBOX WINE CABINET *(p.42)*

- **Lee Valley**
  Shelf Supports 05H20.01
  Quadrant Hinges 01B05.04
- **House of Antique Hardware**
  Offset Hinges . . R-08BM-1500-PB
  Left Latch R-08BM-1506-PB
  Right Latch R-08BM-1505-PB
- **Big Tray**
  Steam Table Pan . . . . ABC ST1206
  Pan Cover . . . . . ABC 607120C
- **Rockler**
  Stemware Holder 1001876
- **Amana Tool**
  Classical Molding Bit 54141

The icebox was stained with Golden Oak from *Old Masters*. When the stain was dry, it was glazed with a mixture of four parts Burnt Umber and one part Van Dyke Brown using *Glazed Effects* by *General Finishes*. Finally, it was sprayed with two coats of satin lacquer.

PARING CHISELS *(p.54)*

The paring chisels shown in the article were purchased from *The Best Things*, *Traditional Woodworker*, and *Lee Valley*.

32mm CABINET SYSTEM *(p.56)*

- **FastCap**
  Layout Tape. . . . . . LAYOUTTAPE
  True32 Tape. PMMR-TRUE32
  Metric Tape PMS-12
- **Rockler**
  Shelf Drilling Jig. 31571

You can find a variety of 32mm hardware and accessories wherever cabinet supplies are sold. The drawer slide spacers were supplied by *Woodworker's Hardware.* To download the *Process 32* document from *Blum*, go to:

http://d1.blum.com/BEC003/process32_td_dok_bus_$sus_$aof_$v1.pdf

MAIL ORDER SOURCES

Project supplies may be ordered from the following companies:

Woodsmith Store
800-444-7527

Rockler
800-279-4441
rockler.com

All Metals, Inc.
888-638-2517
allmetalsinc.com

Amana Tool
800-445-0077
amanatool.com

amazon.com

Big Tray
800-244-8729
bigtray.com

Blum
800-438-6788
blum.com

Dick Blick Art Materials
800-828-4548
dickblick.com

FastCap
888-443-3748
fastcap.com

Homestead Finishing
216-631-5309
homesteadfinishing products.com

House of Antique Hardware
888-223-2545
houseofantiquehardware.com

Lee Valley
800-871-8158
leevalley.com

Lowe's
800-445-6937
lowes.com

McMaster-Carr
630-833-0300
mcmaster.com

MLCS
800-533-9298
mlcswoodworking.com

The Best Things
800-884-1373
thebestthings.com

Traditional Woodworker
800-509-0081
traditionalwoodworker.com

Woodworker's Hardware
800.383.0130
wwhardware.com

looking inside
Final Details

▲ *Step Stool.* Tapered sides and through mortise and tenon joints give this step stool a leg up on the competition. For a small project, it packs a big woodworking punch. Learn more about building it by turning to page 28.

▲ *Cutoff Grinder.* Give your hacksaw a rest by building this sliding cutoff grinder. It uses an inexpensive angle grinder and an abrasive wheel to make quick work of cutting metal stock to length. You'll find all the details on page 34.

▲ *Linkin' Logs.* These super-sized building logs will appeal to "kids" of all ages. But the real fun is in making them. We provide you with step-by-step instructions, starting on page 18.

► *Icebox Wine Cabinet.* With the doors and top closed, this wine cabinet looks like an old-fashioned icebox. But just open the lid and you have an instant serving center for your favorite beverages. Complete plans start on page 42.