HAND-HELD ROUTER Tips & Tricks

Sawing Straight **SECRETS FROM A PRO**

PLANER TIPS You Need to Know

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Table Saw Essentials
Curved Parts

Router Table Upgrade
Improve Accuracy & Convenience

EASY WEEKEND PROJECT:

RUSTIC BOX

Woodsmith

PUBLISHER Donald B. Peschke

EDITOR Bryan Nelson
MANAGING EDITOR Vincent Ancona
SENIOR EDITOR Wyatt Myers
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CONTRIBUTING EDITORS Phil Huber, Randall A. Maxey,

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GRAPHIC DESIGNER Becky Kralicek
CONTRIBUTING ILLUSTRATORS Dirk Ver Steeg, Peter J. Larson

CREATIVE DIRECTOR Ted Kralicek
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SENIOR ELECTRONIC IMAGE SPECIALIST Allan Ruhnke
PRODUCTION ASSISTANT Minniette Johnson
VIDEO EDITOR/DIRECTOR Mark Hayes
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EDITORIAL
Woodsmith Magazine
2200 Grand Avenue
Des Moines, IA 50312
woodsmith@woodsmith.com

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from the editor

Sawdust

The refreshed look of Woodsmith we premiered in the last issue generated a number of comments — and most of them were complimentary. But there was one area where a lot of you said we missed the mark: our *Sources* page. Or more correctly, the lack of that page.

We made the change because we thought it would be more beneficial to provide additional information in the issue and to specify the hardware and supplies within each article. But many of you felt this made it harder to find the information, and the manufacturer's contact information wasn't complete.

Well, with this issue, we're going back to including all the sources in one place (at the end of the issue). Like the rest of the magazine, it's been updated, but it still includes all the information you need to find the right hardware and supplies.

If you have other comments regarding the new look, changes we should make, or what kinds of projects and technique articles you would like to see featured, don't hesitate to drop us a line. We'd like your help in guiding the direction of the magazine as we continue to move forward.

Woodsmith Shop. Hopefully, you've had a chance to catch the latest episodes of the *Woodsmith Shop* TV show on PBS (in some areas, it's just started airing). That means we're making this latest season available on DVD. All 13 episodes of the show are included on a pair of DVDs. And a separate CD contains all the plans, articles, and videos mentioned on each show. You can find out how to order it (along with package options for all the past seasons) by visiting *WoodsmithShop.com*.

Bryan

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from our readers

Tips & Techniques

Right Angle Clamp

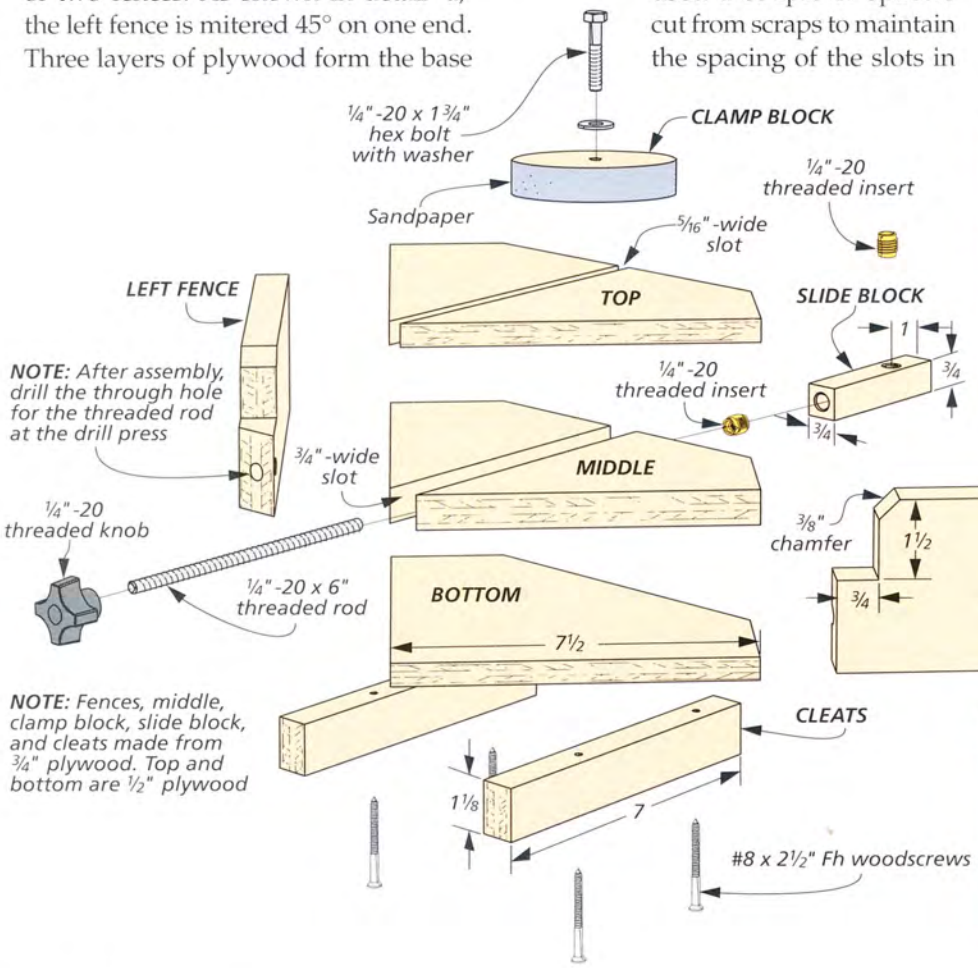
When assembling butt joints, it's sometimes difficult to hold two workpieces, drill pilot holes, and install screws, all while keeping everything perfectly aligned. To solve this problem, I came up with the right angle clamp shown in the photo above. It holds my workpieces at a perfect 90° while I pre-drill holes and drive screws.

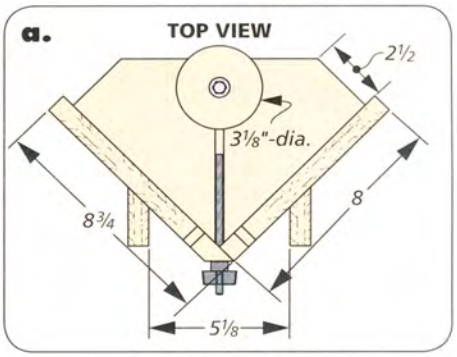
ANGLE CLAMP DETAILS. The clamp consists of two fences. As shown in detail 'a,' the left fence is mitered 45° on one end. Three layers of plywood form the base of the clamp. All three layers are cut to the same dimensions initially. The middle and top layers are then cut in half to form the slots.

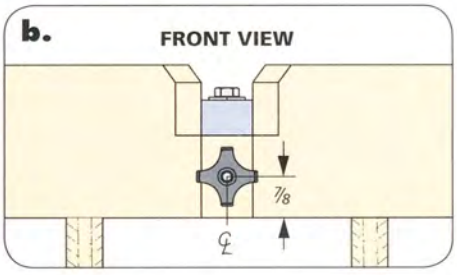
A slide block fits in the middle slot and has a threaded insert in one end to accept the threaded rod. An insert in the top face of the slide block accepts a hex head bolt that secures the round clamp block. When assembling the clamp, I used a couple of spacers cut from scraps to maintain the spacing of the slots in the top and middle layers. Be sure to wrap the spacers in wax paper to keep them from getting glued in place. Two cleats screwed to the bottom keeps the clamp elevated above the worksurface.

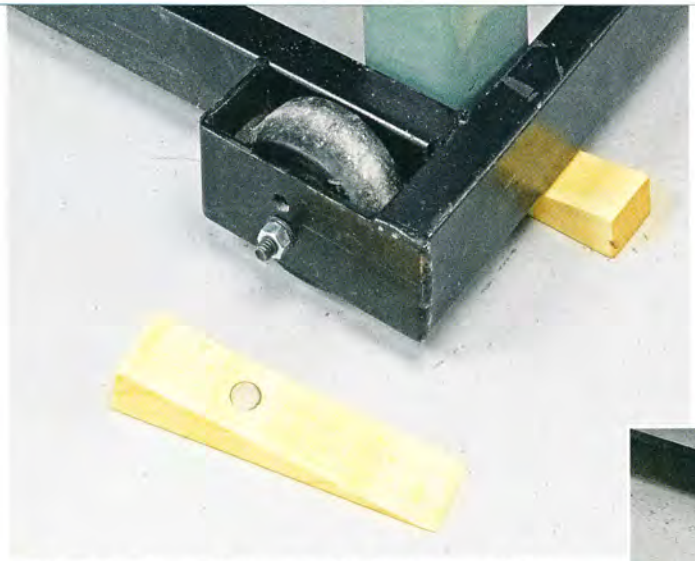
USING THE CLAMP. Insert your workpieces in the clamp as shown above and simply turn the knob to pull the clamp block tight. The openings in the back of the fences allow room for drilling holes and driving screws in a workpiece.

Fred Adams
Henderson, New York









Mobile Base Chocks

I keep most of the larger machines in my shop on mobile bases. Sometimes the machines will move during use, even with the mobile bases locked in the down position. I came up with these "chocks" to keep my machines stable.

WEDGES & MAGNETS. These simple wood wedges are inserted under the edge of the mobile base. A magnet recessed in one face lets me attach them to the machine leg.

Cory Hoehn
Jeffersonville, Indiana

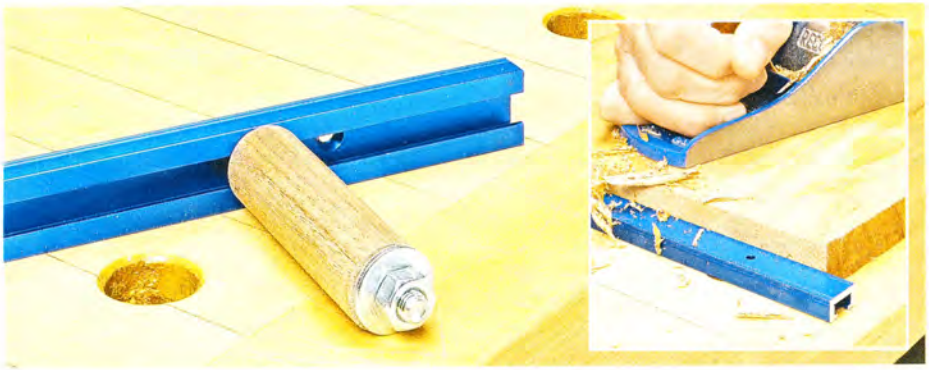
▲ These handy mobile base chocks keep your tools from moving during use. The rare-earth magnets recessed in the back face let you store them on the machine's legs when not in use (right photo).

T-Track Planing Stop

I tend to do a lot of hand planing in my shop. Using bench dogs is the go-to method I prefer for holding a workpiece to my bench. But recently, I needed to plane a board that was too narrow to span two adjacent bench dogs. So I came up with this planing stop using an extra piece of T-track and some dowels.

HOW IT'S MADE. The T-track can be just about any length, as long as it is longer than the spacing between two dog holes on your workbench. The posts are cut from a piece of ¾"-dia. dowel. I made each of mine 3"-long. I then drilled a through hole in each dowel at the drill press. A 3½"-long, ¼" hex head bolt slides into the track. The dowel is held on with a washer and nut. The dowels are easily adjusted to fit in the dog holes on your bench.

James Sullivan
Bend, Oregon



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

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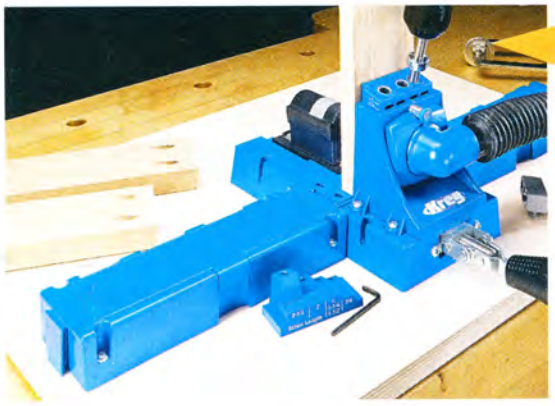


Win This Kreg K5 Jig

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." You can submit your tip and upload your photos for consideration.

The Winner!

Congratulations to Gerald Welf, the winner of this *Kreg K5 Jig*. To find out how you can win this jig, check out the information above.

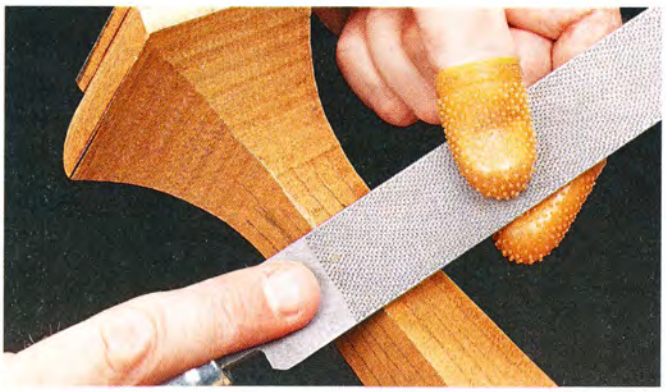
Multi-Miter Sled

I've found the table saw to be the most accurate way to make picture frames and other miter cuts. The trouble with using the table saw is that it takes eight individual cuts to complete one frame. To solve this problem, I made the table saw sled shown above. It reduces the number of passes needed to make one frame from eight to three.

SLED DETAILS. As you can see in the drawing on the opposite page, the sled consists of a ½" plywood base with front and back bridges made from two pieces of ¾" plywood laminated together. Two triangular fences attached to the base hold the four workpieces at the correct angle for mitering one end of each blank. Short sections of T-track sit in stopped grooves cut in the top of the fences. These T-track sections house hold-down clamps used to secure the workpieces to the sled.

To cut the parts to length, a pair of fence extensions are secured to the T-tracks on the fences. They provide support for the workpieces. A section of T-track is attached to one side of each extension, allowing a stop block to slide along its length. The stop block can be locked in place to set the final length of your frame piece.

QUICK TIPS



Rasp/File Holder or Finger Protector. *Charles Mak* of Calgary, Alberta likes to use rubber thimblettes to protect his fingers from cuts when using a file or rasp. Available at office stores, these disposable finger cones often have raised nibs on the outside to provide a sure grip.

Edge Sanding Block. To keep from rounding over the edges of a workpiece when sanding, *Tom Roessler* of Appleton, Wisconsin uses an edge sanding block. Adhesive-backed sandpaper is applied to the narrow piece with the rounded ends. The wide piece keeps the block square.

BUILDING THE SLED. Start by cutting the base to size. After gluing up the bridge pieces, shape them at the band saw. Round the upper edges, and attach them to the base with glue and screws. The miter bars are then attached to the bottom of the base using screws. These are spaced to accommodate the miter slots on your saw. Now, place the sled on the table saw and cut into the bridges and base to create the kerf.

FENCES. Use a combination square to lay out and cut the fences to size. You can then rout the stopped dadoes along the edges. After installing the T-tracks in the grooves, attach the fences to the base using glue and screws.

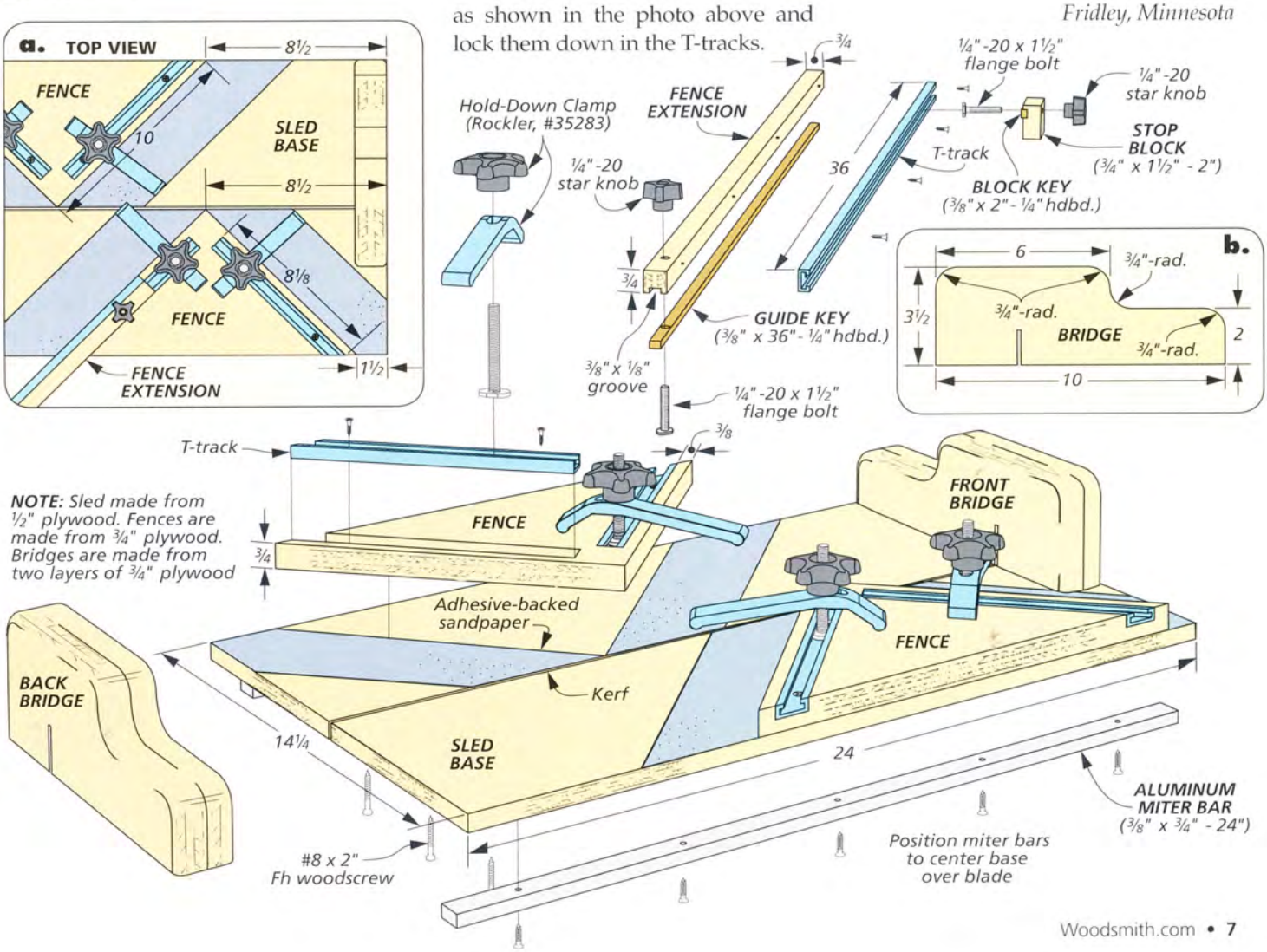
STOP GUIDES. Now cut the fence extensions and the keys to size. The keys fit in the opening of the T-track on the fences. The fence extensions are held in place with a knob and flange bolt. Next, screw a section of T-track to the extension. The stop block construction is similar to the fence extensions with a hardboard key fit into a dado. A knob and flange bolt are used to hold it to the T-track.

▲ Be sure to keep the frame pieces oriented in the right direction when making the second and third passes. Labeling the pieces after the first cut helps to keep them in order.

USING THE SLED. To cut miters, start by placing four frame pieces on the sled so they just overlap the kerf line. Lock them down as shown in the main photo. Pass the sled over the blade to make the first cut on all four pieces. Now remove the frame pieces and install the two fence extensions. Orient the extensions as shown in the photo above and lock them down in the T-tracks.

Set one stop block for the length of a frame stile and the other for the length of a rail. Insert one stile and one rail piece on the sled, lock them down, and pass the sled over the blade to make the second cut. Now, install the other stile and rail and cut them to size.

Gerald Welf
Fridley, Minnesota



all about

better results with Small Box Hinges

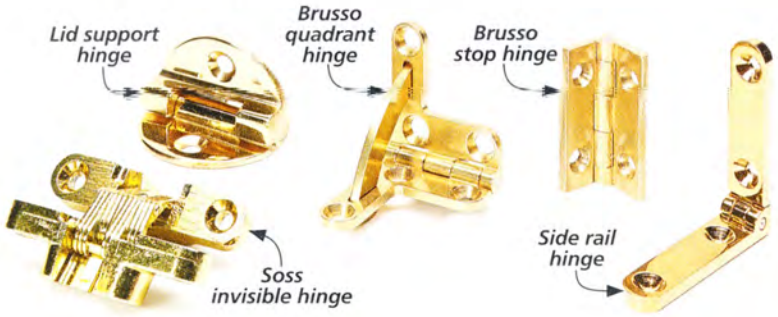
When it comes to their usefulness, small wood boxes have an almost unlimited potential. They can be customized for a wide range of uses, from jewelry boxes to presentation cases. Plus, they make terrific gifts. Whatever the final purpose, small box building is all about paying attention to the finer details.

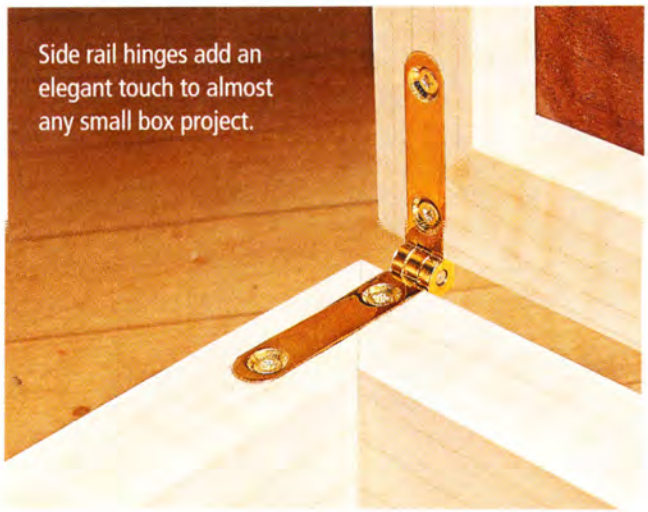
One feature that stands out prominently on a small box is the hinges. The right hinge can take an ordinary box to the next level. Of course, high-quality hinges often come with a premium price. Later in the article, I'll show you some of the reasons why quality hinges demand a higher price. For now, take a look at some of these unique hinge options available. They can really add a touch of class to your next small box project.

LID SUPPORT HINGES. A relatively new small box hinge on the market is the lid support hinge shown in the main photo above. The round design is a unique look not seen very often in other small hinges. This hinge is also one of the simplest to install. It can either be surface mounted or recessed in a shallow hole drilled with a 35mm Forstner bit. Simply clamp the box and lid together and drill the hole to the appropriate depth.

Another key feature of the lid support hinge is the built-in stop. The stop holds the lid open between 90° and 95°, eliminating the need for an additional lid support or chain.

▼ With a wide assortment of premium hinges available, it's easy to find a design to fit almost any small box.




Side rail hinges add an elegant touch to almost any small box project.

SIDE RAIL HINGES. The side rail hinges shown at the bottom of the opposite page are another great small box option with a built-in stop. They can be mounted on the surface or in a shallow mortise cut in the box side and lid as shown. A router with the appropriate size bit makes installing these hinges a breeze.

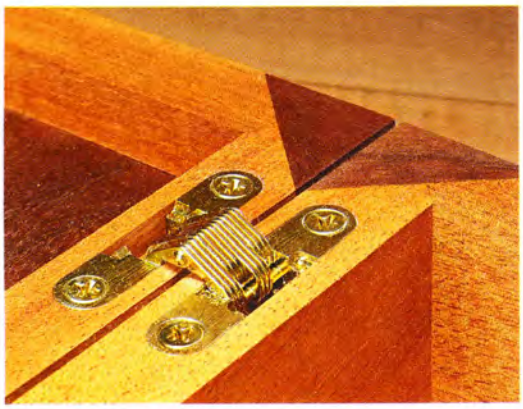
Machined from solid brass, these hinges are gold-plated and coated with an epoxy finish. This keeps oils from the wood and your hands from degrading the finish over time.

While they can be surface-mounted, these *Brusso* stop hinges are easy to install in a mortise. The square knuckle has a built-in stop.

Quadrant hinges require precise alignment to install. The arc-shaped support arm holds the lid open at 95°.

BRUSSO STOP HINGES. Although they share many of the same characteristics as a standard butt hinge, these solid brass stop hinges from *Brusso* (upper left photo) are more durable, have a smoother motion, and feature thicker components. Designed as a full-mortise hinge with square corners, they can easily be installed in shallow mortises made with a chisel.

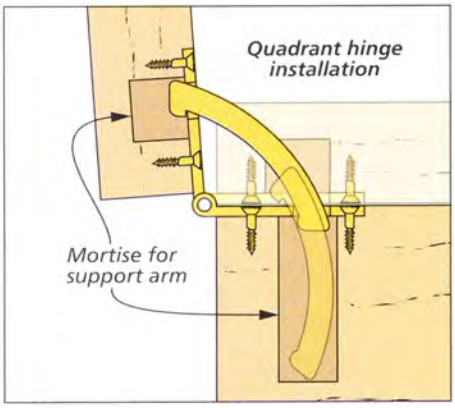
The square knuckles are engineered with a built-in stop to keep the lid open at 95°. This is a great feature and avoids additional hardware.



Soss Invisible Hinges are fully recessed in a pair of deep mortises. A pattern, provided with each set of hinges, makes the mortises easy to cut.

SOSS INVISIBLE HINGES. Available for a number of applications, *Soss Invisible Hinges* (left photo) are as beautiful as they are strong. They are cast from a zinc alloy and coated with a satin brass finish. When properly installed, these hinges are completely hidden from view when the box is closed. The two halves are recessed in a pair of mortises cut into the lid and back.

When installed as shown at left, *Soss* hinges open a full 180°, operating on a smooth, single action hinge. Or, if desired, one hinge leaf can be mortised into the upper inside face of the box, with the other mortised into the inside face of the lid. This allows the box lid to only open to about 90°.



BRUSSO QUADRANT HINGES. A quadrant hinge derives its name from the arc-shaped support arm that's a full quarter of a circle (photo above). This support arm acts as a stay to hold the lid open. It passes through the leaf and disappears into deep mortises when the box is closed, as shown in the illustration. Because of the support arms, careful planning needs to be done to ensure there is room for these deep mortises.

Also known as cigar box hinges, quadrant hinges can be used in any small box application. While similar to the side rail hinge, the quadrant hinge leaf wraps around to the back edge of the box. A template can be used to rout the shallow groove for the leaf.

After spending so much time and effort to build a beautiful small box, you don't want to overlook the importance of choosing the right hardware. So for your next project, keep some of these stylish hinges in mind.

QUALITY HINGES: WORTH THE PREMIUM?

"You get what you pay for" has never been truer than when selecting small box hinges. Less expensive hinges (far right) are typically stamped from thin metal and often have loose-fitting hinge pins.

Premium hinges, however, are generally machined from solid stock, and to very tight tolerances. They will often have a non-tarnishing finish to resist oils.

The premium hinge on the left is machined from solid brass stock, has stainless steel hinge pins, and a smooth motion.

a look at

Portable Workstations

The workbench in most home shops tends to be the main hub of activity. It's used for everything imaginable during the course of building a woodworking project, from beginning layout work and joinery operations, right through to the final assembly process. It often serves as a finishing station, as well. It's certainly no wonder then that the benchtop is usually occupied with project parts, various hand and power tools, and any number of other items used for the build.

So when the main bench is completely covered, that's where a portable workstation can earn its keep. Having a portable worksurface that can be set up quickly for temporary use, and stowed away when not needed, can be an indispensible tool in any workshop.

I tried out the six portable workstations shown above in our shop. Since everyone's needs vary, and because the workstations are such a diverse group, it would be a challenge to call a winner or a loser from this bunch. Instead, I'll point out the strengths and weaknesses of each one. Your buying decision will depend largely on the type of work you do, the features you need the most, and of course, how much you want to spend. The good news is, with a price range of $79 to $176, there is a workstation to meet just about any budget.

WOODCRAFT QUIKBENCH PORTABLE WORKBENCH. Weighing in at 23 lbs., the *QuikBENCH* from *Woodcraft* is the lightest of the six workstations tested, making it one of the easiest to move around the shop.

As the name suggests, it's also quick to set up by simply lifting up on the two top halves and locking them in place. The lower shelf folds down for added stability and serves as a great place to store tools and parts while keeping the worksurface clear.

The bench includes four plastic bench dogs to use in conjunction with the built-in vise. The vise itself has twin handles mounted on the front edge, with a rubber strip in the jaws to aid in gripping a workpiece. It certainly has adequate holding strength once a piece is clamped in place, but the entire bench tends to wiggle when performing certain tasks, like planing a board.

With the exception of the aluminum legs and braces, the majority of the *QuikBENCH* is constructed of molded plastic. Small trays in the top are great for holding loose parts. A removable power strip in the lower rail allows you to keep three tools at the ready. Simply connect the power strip to an outlet with an extension cord (not included).

The *QuikBENCH* can support up to 300 lbs. on its own. Or you can convert two workbenches into A-frame sawhorses by folding down the two worktable halves. Together, the two will support up to 2,000 lbs. This is a great idea even though it does require two *QuikBENCHES* to utilize this feature. Each workbench also has a tab and slot on the edge of the top opposite the vise. This allows you to connect two benches together to form a larger worksurface.

▲ The *QuikBENCH* is very easy to set up and performs well at light-duty tasks. The compact size when folded (above right) makes it convenient to tuck away in a corner or hang on a wall.

SKIL XBENCH PORTABLE WORKSTATION. The *Skil Xbench* also has a built-in clamping mechanism in the tabletop, but with a slight twist. This bench utilizes a "slide and lock" clamping system to hold material. This simply means that the rear jaw has a quick-release feature that allows it to slide up to the workpiece, instead of having to crank the handles all the way in and out. You then just have to give the handles one or two turns to secure the workpiece.

The *Xbench* has a beefy, steel frame that folds easily for storage, as shown in the photo at left. The tabletop is constructed from MDF panels with thick sections of aluminum on the long edges and plastic strips on the short edges. Built-in T-tracks on the front and rear of each top section allow locking clamp blocks to be placed anywhere along their length (inset photo, below left). And T-tracks on the inside faces of the jaws hold four pads that allow for gripping round stock.

While the *Xbench* is an all-around solid workstation, I did have trouble getting used to the clamping system. Sliding the rear jaw up to the workpiece was not a problem. However, the handles need to be turned simultaneously to lock them in place. This can be somewhat tricky when handling large, cumbersome objects. Fortunately, there are a set of folding support arms tucked underneath the front jaw. Swinging these into place assists in holding material while tightening the vise.

▲ The "slide and lock" clamping system on the *Skil Xbench* has great holding strength for its size.

BLACK & DECKER WORKMATE 425. The original *Workmate* portable workbench was introduced in 1973. Like many products, it has undergone small changes and upgrades over the years, both cosmetic and functional. But for the most part, the concept has stayed true to the original.

Like the previous two workstations, the *Black & Decker Workmate* has a front-mounted, two-handled vise. However, the "one-handed clamping" system of the *Workmate* lets you hold the workpiece in one hand and turn one handle until the piece is held snugly by the jaws. You can then tighten both handles for final clamping pressure. Removing the center section of the top allows the front jaw of the vise to be tilted up vertically to lock a workpiece, as shown in the main photo above.

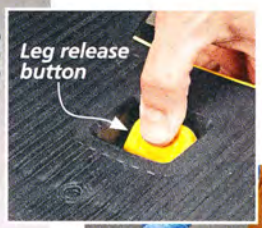
Another nice feature that's useful for working on large objects is the ability to fold up the legs (inset photo above).

▲ With the front jaw of the vise in the vertical clamping position, the *Workmate* will securely hold cumbersome objects like doors and windows (shown above). When not in use, the *Black & Decker Workmate* folds to a compact size for storage.

This lowers the overall height of the worksurface by ten inches. With a laminated bamboo top, solid metal frame, and a broad, stable footprint, it's easy to see why the *Black & Decker Workmate* has been around for over 40 years.

KETER FOLDING WORKTABLE. Having perhaps the most unique, quick-opening system, the *Keter* worktable comes ready to use right out of the box. As shown in the photos below, simply pull out on the release latches and lift up on the top. The aluminum legs drop down and lock in place. The webbed side and center pieces provide additional support. When folded, a handle on the side makes it easy to carry.

In contrast to the three previous worktables, the *Keter* table doesn't have built-in clamping. Instead, it comes with two "quick-grip" style clamps. These clamps can be slipped into a channel on the tabletop for horizontal clamping. Or they can be placed in the shorter slots for vertical clamping. When not being used, the clamps store neatly in the middle shelf.



▲ The *Keter Folding Work Table* is hands-down the quickest of the six workstations to set up and fold for storage (photo at right). As shown above, the "quick-grip" style clamps will hold a workpiece securely when slid into the channels on the tabletop.

With the exception of the aluminum legs, the remainder of this worktable is made of thick plastic. However, it's rated by the manufacturer to support up to 1,000 lbs., the most weight of any in this group. And that's certainly a good reason to give this portable bench a serious look.

▲ The vise on the *Rockwell Jawhorse Sheetmaster* has a completely hands-free operation. The foot-operated lever can apply up to one ton of clamping pressure. The wheels on the lower edge (inset photo above) make it easy to transport.

ROCKWELL JAWHORSE SHEETMASTER. Rightly described as a "sawhorse on steroids," the *JawHorse Sheetmaster* offers hands-free clamping via a foot-operated pedal. While it doesn't have a "worktable" look like the others, it's simple enough to clamp a piece of plywood in the jaws for an instant, temporary worksurface.

The *Sheetmaster* is the big cousin to the original *JawHorse*. And true to its name, the *Sheetmaster* can open to a full 49", enough to clamp a full sheet of plywood. This comes in very handy for breaking down large sheet goods. Rubber pads on the jaw faces ensure you won't damage your workpiece, either.

Constructed almost entirely of heavy-gauge steel, the *Sheetmaster* is extremely durable. That durability, however, comes with the heaviest weight of the six workstations at 53 lbs. Fortunately, when folded for transport, the *Sheetmaster* has two scooter-style wheels on the lower edge. This makes it easy to move around the shop or on uneven surfaces.

VIKA TWOFOLD 2-IN-1 WORKBENCH/SCAFFOLD. Versatility is the name of the game with this workbench/scaffold from *Vika*. Unfold the aluminum legs until they lock in the first position, and you have a 22"-high scaffold platform with a non-skid deck. To use in workbench mode, swing the legs around until they lock into the second position. The telescoping legs can then be extended for a 32"-high MDF worksurface.

In workbench mode, the *Vika* has a molded tray at one end to help keep small parts organized. And when connected to an extension cord, a built-in power strip provides power for up to three tools at one time. While this workstation does not include on-board clamping, the square sides of the frame make it easy to clamp to the surface.

Another nice feature is a hole in the MDF top. This allows through-holes to be drilled without damaging the benchtop. You'll find that this workstation takes a little longer than some of the others to go from folded to ready to use. But once set up, it offers a very stable and versatile platform.

CHOOSE WISELY. With such an array of portable workstations available, make sure to match your individual needs with the features that will benefit you the most. This will go a long way toward finding the right setup for your shop. W

◀ In workbench mode (left), the versatile *Vika* workstation has ample space for power tools. It can support up to 500 lbs. when used as a scaffold (below).

what's new in Router Lifts

A lift is a valuable addition to any router table. Here's a look at the options.

I wouldn't call a router lift an "essential" woodworking accessory. You can still use a router table just fine without one. But once you use one, I think you'll agree that it definitely ups the ante in the convenience department. It eliminates a lot of the headaches and hassle related to installing and adjusting the height of the bit.

▲ The *Kreg* lift features a handle for quick adjustments and a dial for precision.

WHAT'S NEW? Router lifts have been around for several years now. And as more woodworkers have realized how useful they are, the accessory has continued to evolve. So I took a closer look at some of the things that are new with router lifts, and what you'll want to consider when choosing one.

ROUTER TABLE SYSTEMS. One development with router lifts in recent years is that they are often built as part of a complete router table "system." This means that most router lifts are now designed to fit that specific manufacturer's table. If you choose a *Kreg* router lift like the one shown at left, for example, it will be designed to fit the *Kreg* router table. *Jessem*, *MLCS*, and *Rockler* are some other manufacturers making these systems.

Now, that doesn't necessarily mean you can't choose a different model of lift to go with your router table. But you'll want to be aware that you may have to modify your table to fit the router lift that you purchase.

If you're building a router table from scratch, you'll just need to size the opening to fit the insert plate that the router lift is attached to. And if you're starting with a different manufacturer's router table, you may need to enlarge the opening.

A NEW ANGLE ON LIFTS. Despite the different manufacturers, most router lifts operate in essentially the same way. They adjust from above using a handle that fits in the router table insert plate. But the new *U-Turn* router lift from *MLCS* is unique in that height adjustments are made from the side of the table (photo above).

This offers a couple of advantages when using your router table. For one, you can leave the handle in place while using the table, so you don't have to worry about misplacing it

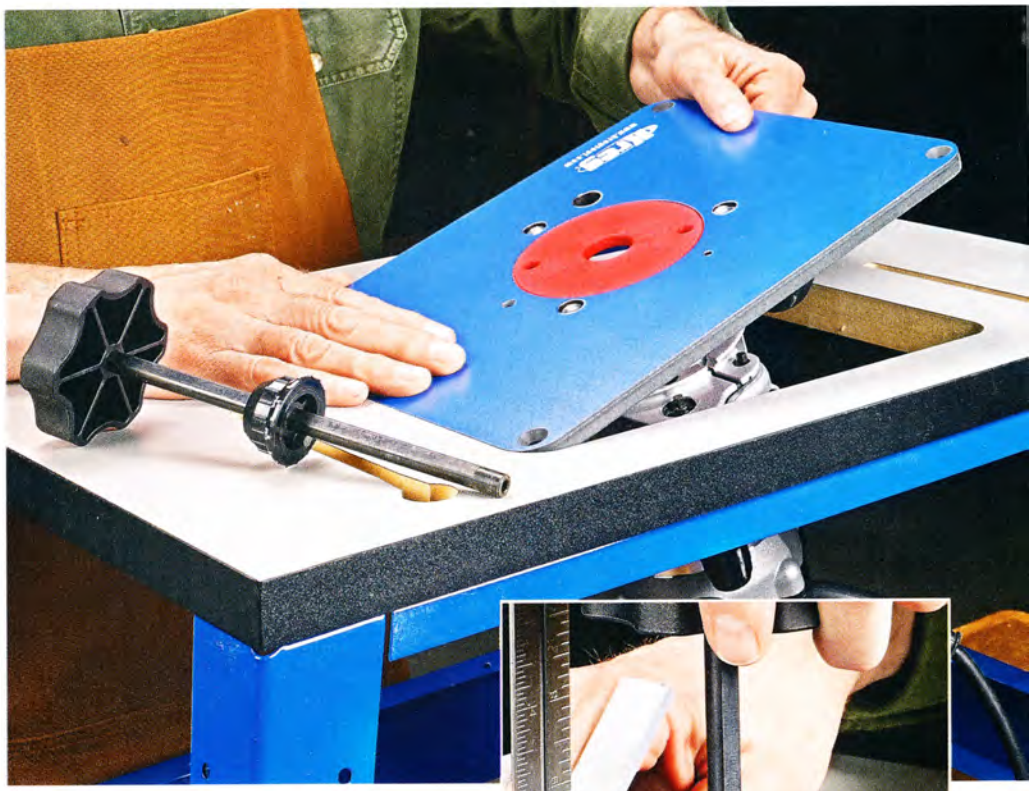
when it's not in use. Also, the side-mounted handle makes it easy to make adjustments with the workpiece on the tabletop. When you're trying to "dial in" the router bit height to match a mark on the actual piece, this lift offers an unparalleled advantage.

In use, the *U-Turn* is an impressive router lift. The construction is rock-solid, and it's attached to an aluminum insert plate. The height adjustment is easy to make, and the handle turns smoothly and steadily. It's definitely worth a look if you're in the market for a router lift. Plus, *MLCS* even makes a version of the lift that will fit in other manufacturers' router tables (see Sources on page 51).

ROUTERS WITH BUILT-IN LIFTS. Of course, if you're interested in a router lift, and you're also in the market for a new router, you have another option at your disposal. And that's to buy a router with built-in lift capability. Many newer router models sold by manufacturers like *Milwaukee*, *Porter-Cable*, and others have "above-the-table height adjustment" added to the router base. They're sold with a separate knob used to adjust the height of the bit in the router table.

This way, the router base itself becomes the router lift. With the *Porter-Cable* router shown above, for example, all I had to do was install the router base on the insert plate and drill an access hole in the plate for the knob. Then you can simply adjust the height from above like any other router lift (photo at right).

WHICH LIFT IS RIGHT FOR YOU? As you can see, there are certainly a lot of options when it comes to outfitting your shop with a router lift. Whether you choose a router with a built-in lift or a separate router lift, any one of these options will work great, depending on your shop's needs. Also be sure to check out the box below to add even more precision to your table's router lift.

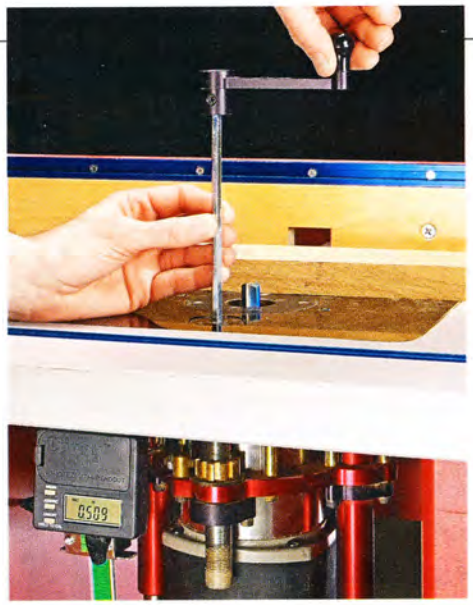


▲ Some router models come with built-in "above-the-table height adjustment." An included knob makes this easy.

REMOTE READOUT

You can bring even more accuracy to an existing router lift by adding this *Remote Digital Readout* from *Wixey*. It consists of a sensor attached to the router lift's carriage and a display panel that indicates the height of the router bit. The two units are connected to one another with a cable.

To use the digital readout, you simply position the router bit so it's flush with the surface of the router table, and then you "zero" out the scale with the touch of a button. Then raise the router bit to dial in the perfect height for the cut at hand.



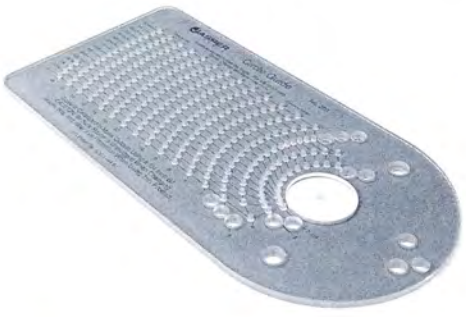
▲ A sensor that's attached to the router lift's carriage gives you a precise height reading on the display panel.

techniques
from our shop

smart ways to make Super-Size Holes

Drilling holes is an operation that comes into play in nearly every woodworking project. Most of the time, however, they're smaller holes for creating mortises or installing shelf supports, magnets, or other hardware. These tasks are easy for your basic Forstner or brad point bit.

Still, there are times when you'll need to install items like clock movements, lazy Susans, or even stereo speakers in projects. In these situations, the average drill bit just isn't going to cut it.

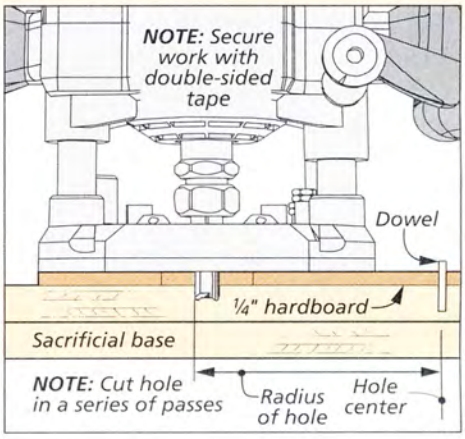


▲ Commercial trammels (like this one from *Jasper*) are available that fit different routers and cut virtually any radius.

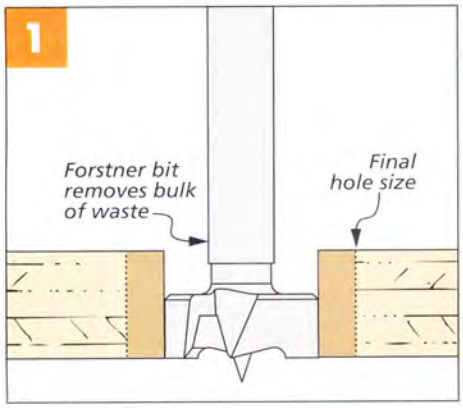
If a roughed-out hole is all you need, then a jig saw may work just fine. However, many projects require holes that are not only large, but also clean and smooth. Of course, it goes without saying that the holes need to be accurate, too. So I've outlined three of my favorite methods for creating large holes as cleanly and accurately as possible.

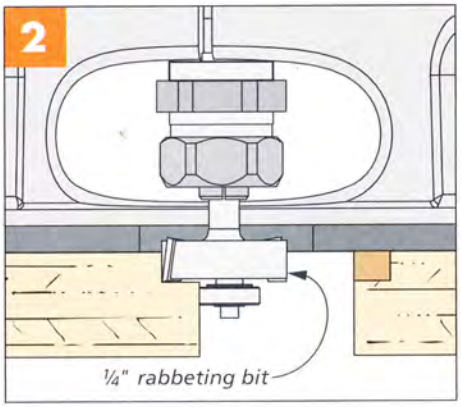
ROUTER WITH A TRAMMEL. For very large holes, using a plunge router equipped with a trammel is probably your best bet. A trammel is simply an auxiliary router base with a fixed end for guiding the router in a circle. By adjusting the length of the trammel, you can cut a hole of virtually any diameter that you desire. The distance from the pivot point to the outer edge of the router bit just has to match the radius of the hole that you want to cut.

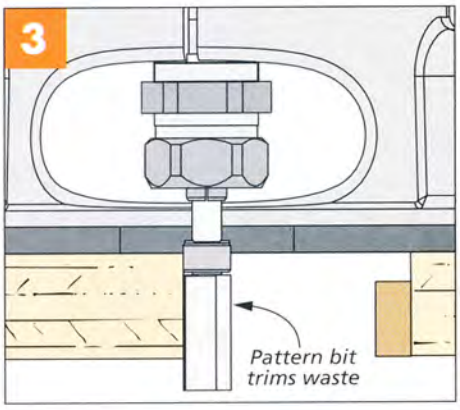
When it comes to trammels for your router, you have a lot of options at your disposal. For example, there are several commercially available trammels made from plastic, one of which is shown in the photo at left. This trammel, and many others, come predrilled with holes to fit various types of routers. The series of holes on the other side of the trammel can be used as the pivot point to cut a circle to your desired diameter.



If you only make large holes occasionally, it's also fairly simple to make a trammel in the shop, as shown above. I use ¼" hardboard for this purpose. To make one, you just remove the plastic baseplate from the router, and use it as a template for drilling the mounting holes at one end of the trammel. Then just make the trammel as long as needed to cut the hole. You can even make the trammel adjustable by drilling a series







of holes for circles of a different radius. A wood dowel is all you need as the pivot point for the trammel.

Once the trammel is built, making the hole is easy. You'll just secure the workpiece to a sacrificial base with double-sided tape, as shown in the illustration on the opposite page. Then rout the hole by making a series of progressively deeper passes with a straight bit until you cut all the way through the workpiece.

RABBETING/PATTERN BIT. In some instances, you may require a hole that's slightly larger than any drill bit in your collection. And purchasing a large Forstner bit can be a pricey proposition.

What I like to do in these situations is drill the hole undersize with a Forstner bit I already own, and then enlarge the hole with a rabbeting bit and a pattern bit. The sequence of illustrations above show you what I mean.

After drilling the initial hole, the rabbeting bit enlarges it slightly (middle drawing). Then the pattern bit rides along the shoulder of the rabbet to complete the hole (right drawing). You can repeat the process as many times as needed to produce a larger hole. Just keep in mind that whatever the size of the rabbet (¼" here), the new hole diameter will increase by double that (½").

MAKE A TEMPLATE. Another method of making a large hole is to use a circle cutter, sometimes called a wing cutter, on the drill press. This device, shown in the photo at left, has a center bit and an adjustable arm that establishes the radius of the circle. A cutter at the end of the arm scores the perimeter of the circle as it spins.

▲ After rabbeting the opening, run the pattern bit's bearing against the rabbeted portion of the hole to enlarge it.

Now, these circle cutters are pretty accurate, but they are not very good at cutting through hard, thick stock like hardwood or plywood. So what I like to do is use the circle cutter to make a template from thin hardboard, as shown in the photo at left.

After making this hardboard template, you can use it in a couple of ways to help you finish up the hole. First, lay it over the actual workpiece, and trace the circle onto your workpiece with a pencil. At that point, you can use that layout line to rough-cut the hole with a jig saw (lower left photo).

Now all that's left is cleaning up the rough edge and trimming the hole to final size. Here again, you can rely on the template. Just attach it to the workpiece with double-sided tape and rout around the perimeter with a pattern bit to trim the hole clean and smooth.

MORE THAN ONE WAY TO MAKE A HOLE. Making a large hole in wood isn't the most common woodworking task, but there are certainly projects where you'll have to do it. When the opportunity arises, any one of these three approaches should provide you with a hole that is accurate, clean, and smooth, in addition to being large.

▲ These drill press circle cutters work well for making a hole template in ¼" hardboard. Use a low RPM setting.

▲ Use the template to trace the hole, then cut it out with a jig saw. Stay just inside the layout line (inset photo).

▲ Finally, attach the template to the workpiece with double-sided tape and clean up the hole with a pattern bit.

Weekend Project

Rustic Slanted-Lid Box

Keep your kitchen essentials close at hand in this beautifully designed, practical project. Its traditional construction makes it a breeze to build.

There's nothing I like better than a small woodworking project that serves multiple purposes. And when I can build it in a single weekend, I like it even more. Designed primarily with kitchen use in mind, this slanted-lid box is the perfect case in point.

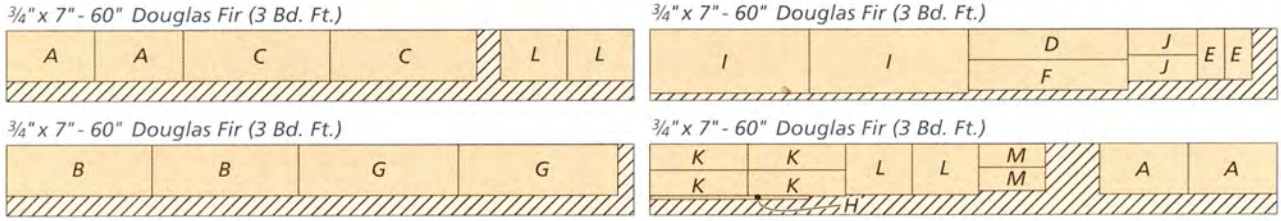
It has two drawers in the front for storing store small, frequently used items. Opening the slanted-lid reveals a surprisingly large storage area that is big enough to serve as a bread box. It's also sized to accommodate several boxes of plastic wraps and foils.

Conveniently, the lid doubles as a book (or tablet) holder. It's the perfect place for keeping your recipes close at hand. But what I really like about this box is its compact size and light weight, which makes it very easy to move right where I need it.

Materials, Supplies & Cutting Diagram

A	Sides (2)	5/8 x 9 1/2 - 8 1/2	**G**	Lid (1)	5/8 x 8 1/2 rgh. - 15 1/4	**M**	Drawer Backs (2)	1/4 x 2 5/16 - 6 3/8
B	Shelf (1)	5/8 x 8 7/8 - 14	**H**	Lip (1)	1/4 x 3/8 - 15 1/4		
C	Bottom (1)	5/8 x 9 1/2 - 14	**I**	Back (1)	5/8 x 12 rgh. - 15 1/4		
D	Front (1)	5/8 x 3 rgh. - 15 1/4	**J**	Drawer Fronts (2)	1/2 x 2 9/16 - 6 5/8		
E	Drawer Divider (1)	1/2 x 9 1/2 - 2 5/8	**K**	Drawer Sides (4)	1/4 x 2 9/16 - 9 3/8		
F	Top (1)	5/8 x 2 1/2 rgh. - 15 1/4	**L**	Drawer Bottoms (2)	1/4 x 9 1/8 - 6 3/8		

- (32) 1 1/2" Square-Cut Finish Nails
- (16) 1" Square-Cut Brads
- (2) Butterfly Hinges w/Screws
- (2) 1"-dia. Wood Knobs



I wanted my box to fit into a kitchen with country décor, so I chose to go with a solid-wood construction using straight-grained Douglas fir. Common pine would also be a suitable choice. Exposed cut nails and an aged finish add to the authenticity.

BUILD THE CASE

The construction of the slanted-lid box is pretty straightforward. Simple butt joints are used throughout the case with cut nails and a little glue holding it together. Be sure to pay close attention to the grain direction of the boards. Keeping the wood grain running in the directions shown adds to the aesthetic appeal of this project.

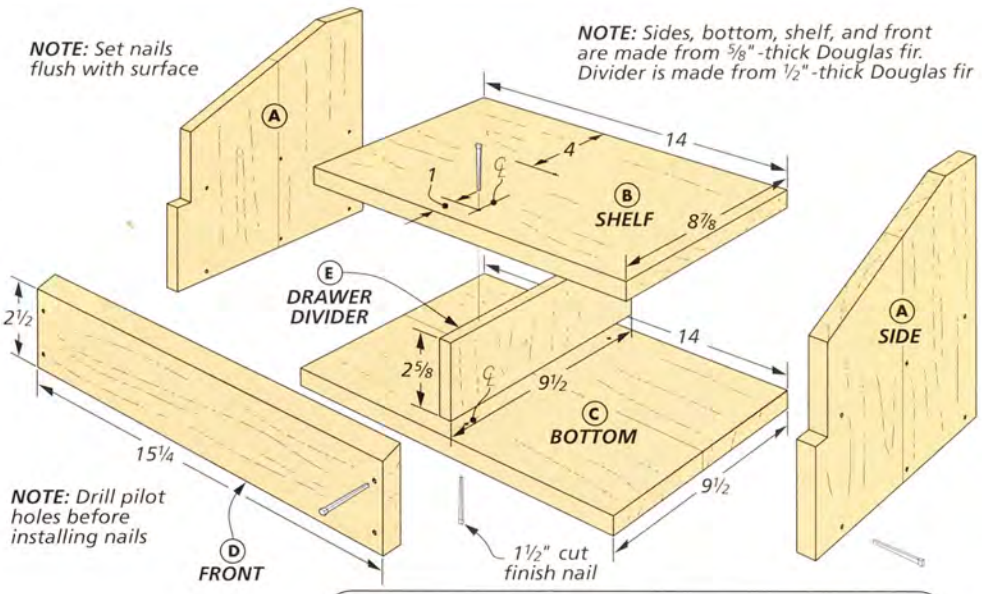
SIZE PARTS. Start by planing enough ⅝"-thick stock for the sides, shelf, bottom, and front. After gluing up the panels and cutting the pieces to size, it's just a matter of laying out and cutting the taper on the top edge of each side at the band saw. To ensure the tapers are identical, I used double-sided tape to hold the side pieces together while making the cut. Leave the sides taped together and finish them up by cutting the notches on the front edges.

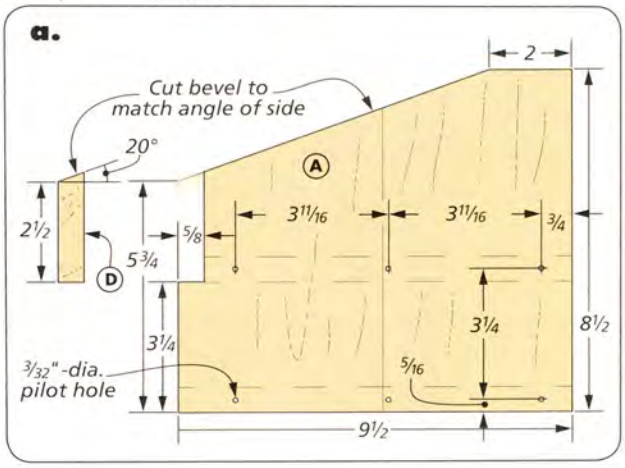
FRONT & DIVIDER. Next, cut the front to length, but leave it a little wide. With the table saw blade tilted to 20°, cut the bevel on the top edge of the front. When seated in the notches of the side pieces, the bevel should be flush with the angle cut in the sides, as shown in detail 'a.' Now cut the bottom edge of the front, sneaking up on the final width to get a perfect fit.

The drawer divider is planed to ½" thick and cut to size. Make sure to orient the grain of the divider vertically.

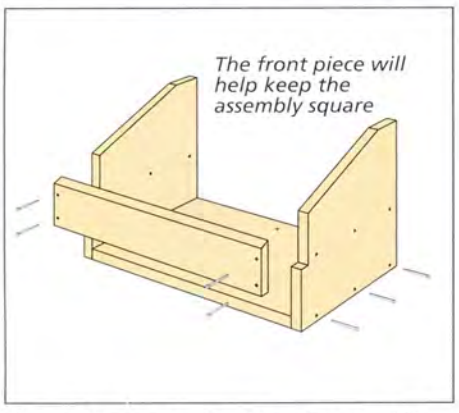
PUT IT ALL TOGETHER. The case assembly steps are shown in the How-To box below. Just a couple of notes about the assembly: I glued and clamped the parts together first before installing the cut nails. This makes it much easier to drill the pilot holes and hammer in the nails. I also used some spacers to support the shelf and to keep the drawer divider centered when clamping it in place, as shown in the second and third boxes.

Cut nails have a tapered shank for better holding power. This taper can sometimes split the wood, particularly when nailing near the end of a board. To reduce the risk of splitting, I drilled a pilot hole for each nail. I also made sure to orient the nails so the heads run parallel with the grain.

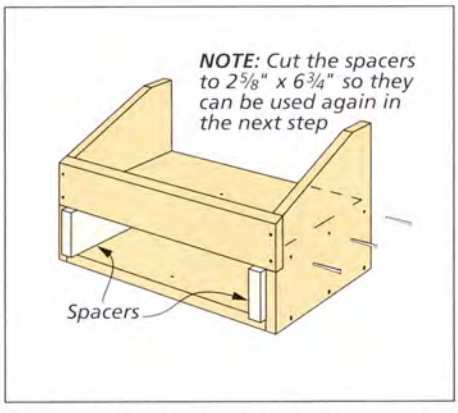




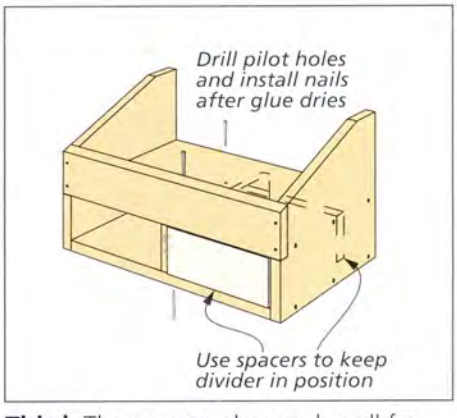
How-To: ASSEMBLE THE CASE



First. After removing the clamps, drill pilot holes and hammer in the nails in the sides and front.

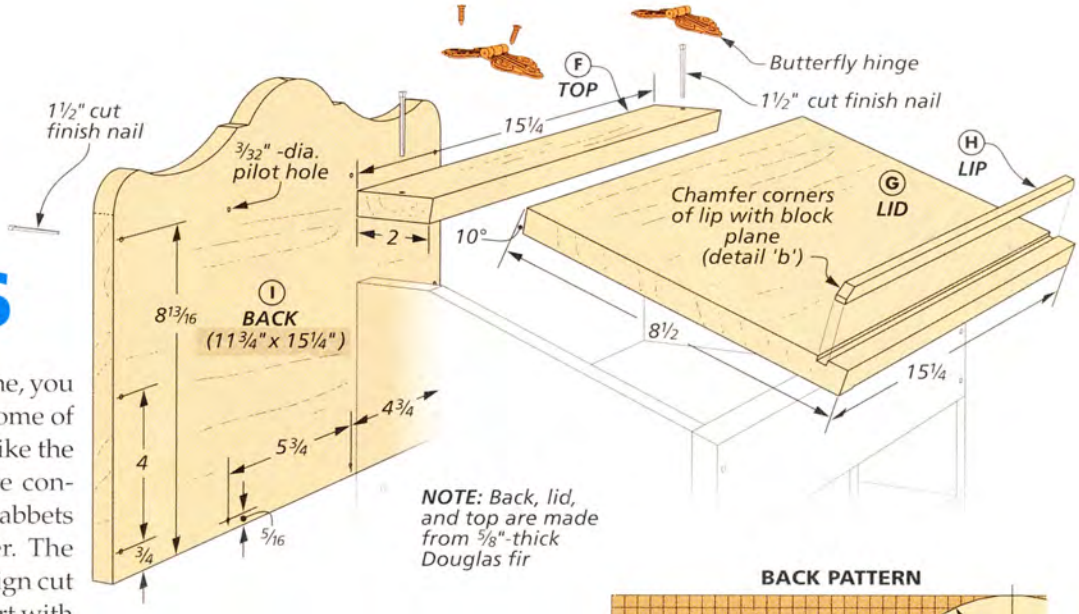


Second. The two spacers help keep the shelf in the proper position while gluing and nailing in place.



Third. The spacers also work well for keeping the drawer divider centered while it's glued and nailed in place.

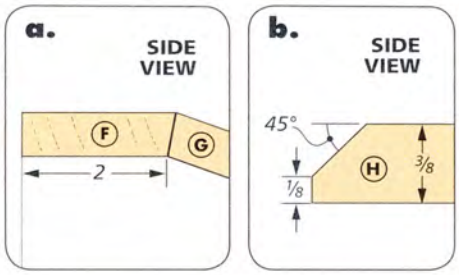
Making the BACK, LID & DRAWERS



With the bulk of the casework done, you can now turn your attention to some of the other details of this project. Like the rest of the case, the drawers are constructed of solid wood. Simple rabbets and dadoes hold them together. The back has a decorative scallop design cut on the top edge. But first, we'll start with the lid and the top.

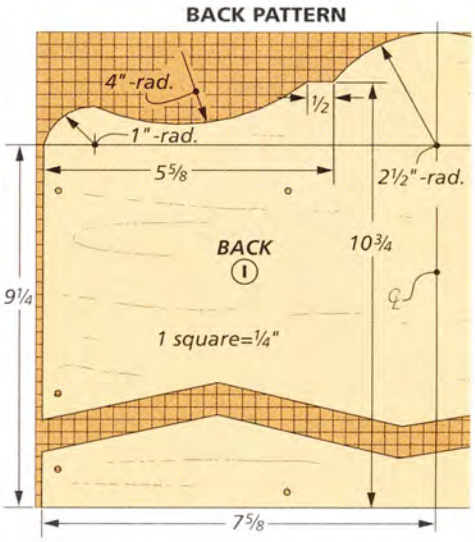
LID & TOP. Glue up a panel wide enough to cut the lid and top from the same piece. With the table saw blade tilted 10°, rip the board as shown in the How-To box below. You can then flip the top over, and the cut edges will mate up as shown in detail 'a' at right. Now it's just a matter of ripping the other edges of the lid and top to final size.

With that done, I cut the shallow groove on the lid face with a dado blade. This groove houses the book support lip. Next, rip a thin strip of stock for the lip and cut it to length. Glue and clamp the lip into the groove on the lid. I used a block plane to chamfer the outside corners of the lip (detail 'b'). Finally, glue and nail the top in place and attach the lid with the decorative hinges.

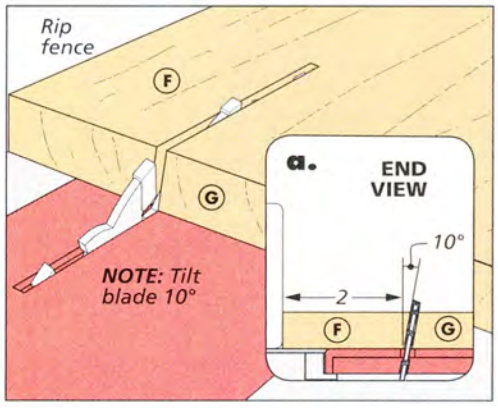


BACK. With the top and lid completed, it's time to turn your attention to the back. Using the pattern to the right, lay out the profile on the top edge of the back section. The band saw makes quick work of cutting this out. Keeping the blade just outside of the layout line allows you to sand to the line.

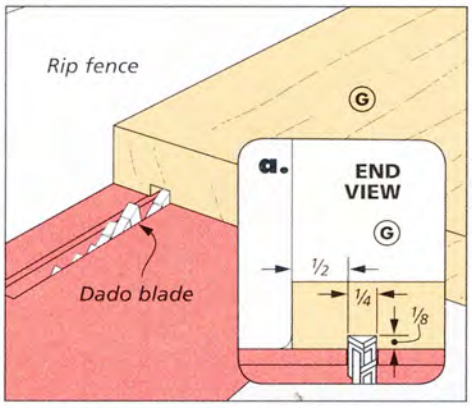
Now it's just a matter of gluing and clamping the back in place. Again, pre-drill the holes for the nails after the clamps come off. The nail spacing should be uniform around the back edge. You can then drive in the cut nails, being sure to keep the long length of the heads parallel to the grain of the back.



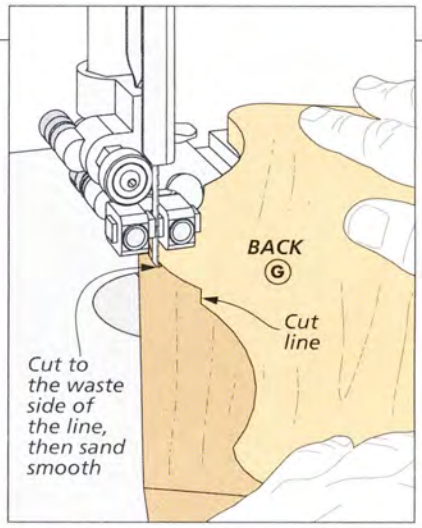
How-To: MAKE THE LID, TOP & BACK



Lid & Top. Ripping the lid and top from one piece of stock ensures the cut edges mate up perfectly .



Lid Groove. The groove in the lid can be cut using a dado blade at the table saw. This groove holds the lip.



Cut Profile. The profile on the top edge of the back is easily formed at the band saw.

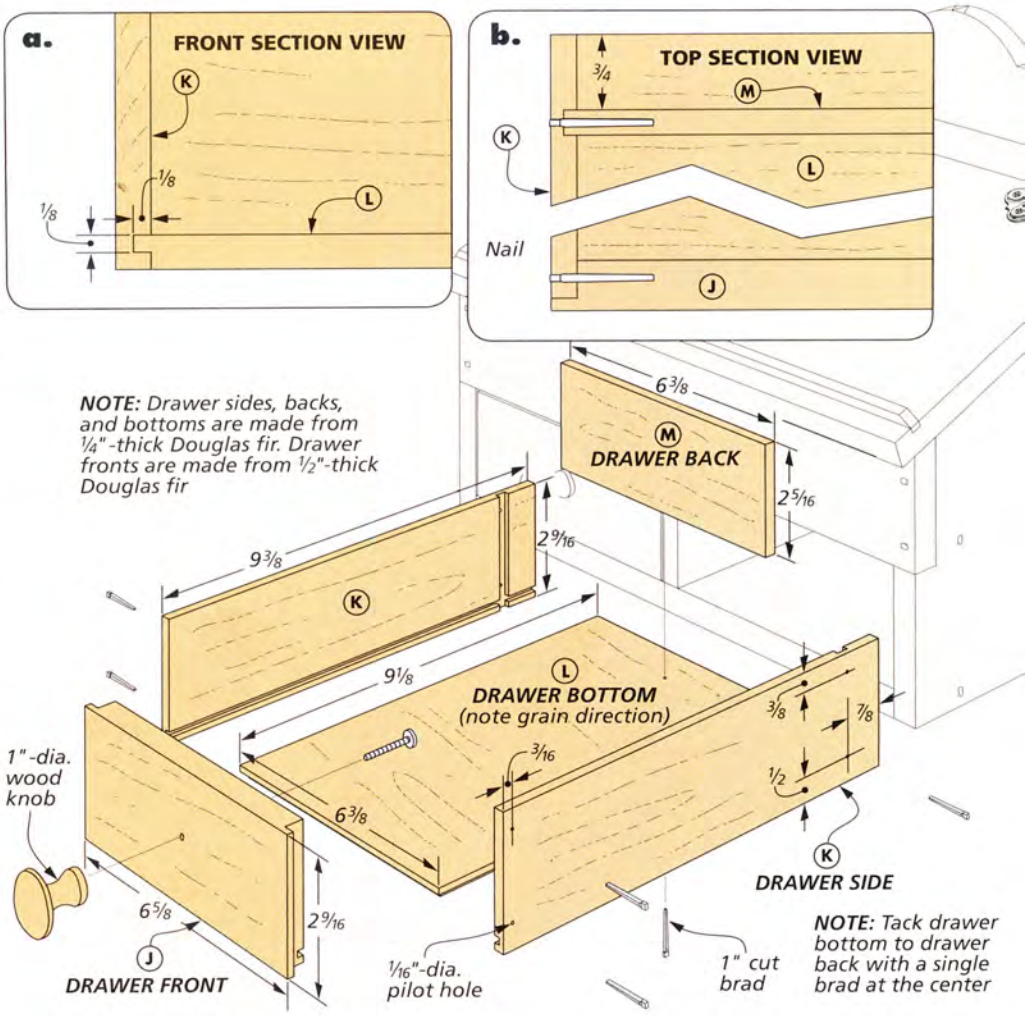
DRAWERS & ASSEMBLY

The two drawers that fit into the bottom openings couldn't be much simpler. The drawer fronts have rabbets cut along the ends to house the drawer sides. There are dadoes in the faces of the drawer sides for the drawer backs. And a shallow groove along the front and sides holds the drawer bottom.

DRAWERS. As shown in the How-To box below, I used a dado blade in the table saw to cut the rabbets on the ends of the drawer fronts. The width of the rabbets matches the thickness of the sides of the drawers. Now, with a ¼" dado blade installed in the table saw, I cut the dadoes in the inside face of each side piece. These house the drawer back.

A groove is needed along the bottom, inside face of the drawer fronts and the drawer sides for the bottom panels to fit into. These are easy to cut at the table saw, as well. Then it's just a matter of cutting a small rabbet along the front and side edges of the drawer bottoms (detail 'a').

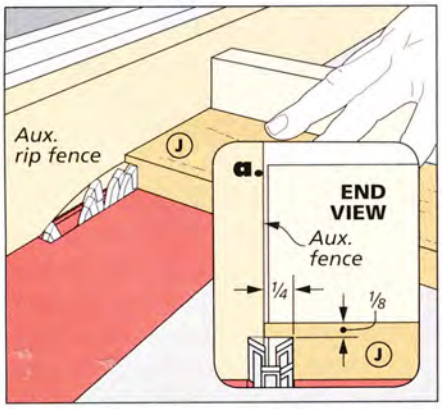
ASSEMBLY. Since these drawers have solid-wood bottoms, I only used a little glue in the groove of the drawer front to keep the panel from shifting. Letting the bottom panel "float" in the sides will allow for seasonal wood movement without splitting. Some glue in the rabbets in the drawer fronts, and in the rear dadoes of the side pieces hold the rest of the drawer together. Pre-drill the holes in the sides where shown and hammer in the cut brads.



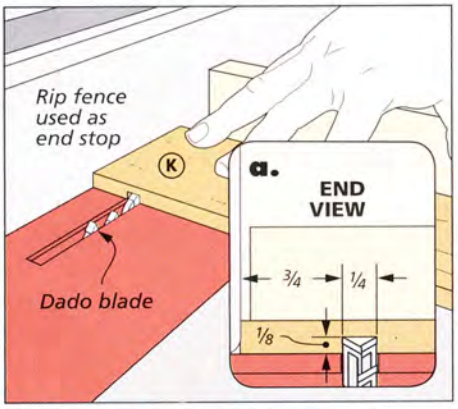
FINISH. After installing the wood knobs on the drawer fronts, it's time for some finish work. I wanted my box to look like it had been passed down for a couple of generations. In order to achieve that look, I decided to distress the outside using some common hardware.

I started by placing some various sized nuts and bolts in a plastic bag. Then it's just a matter of striking the outside of the box in various places to add random dents and dings. To see more about the finishing process of the lidded box, turn to Sources on page 51.

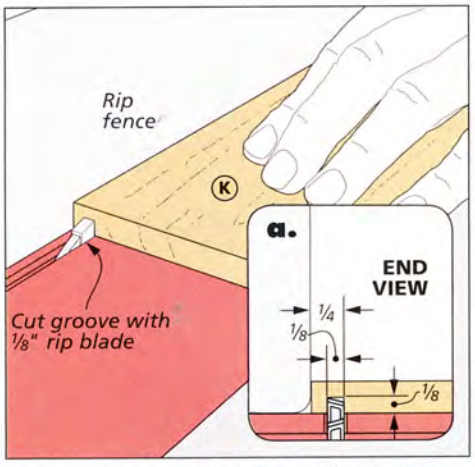
How-To: BUILD THE DRAWERS



Rabbet the Fronts. Cut the rabbets in the ends of the drawer fronts using a dado blade and an auxiliary fence.



Side Dadoes. Again using a dado blade, cut dadoes for the drawer back on the inside face of the drawer sides.



Drawer Bottom Groove. A kerf along the bottom, inside face of the sides and fronts holds the drawer bottom.

Designer Project

Craftsman-Style Sink Stand

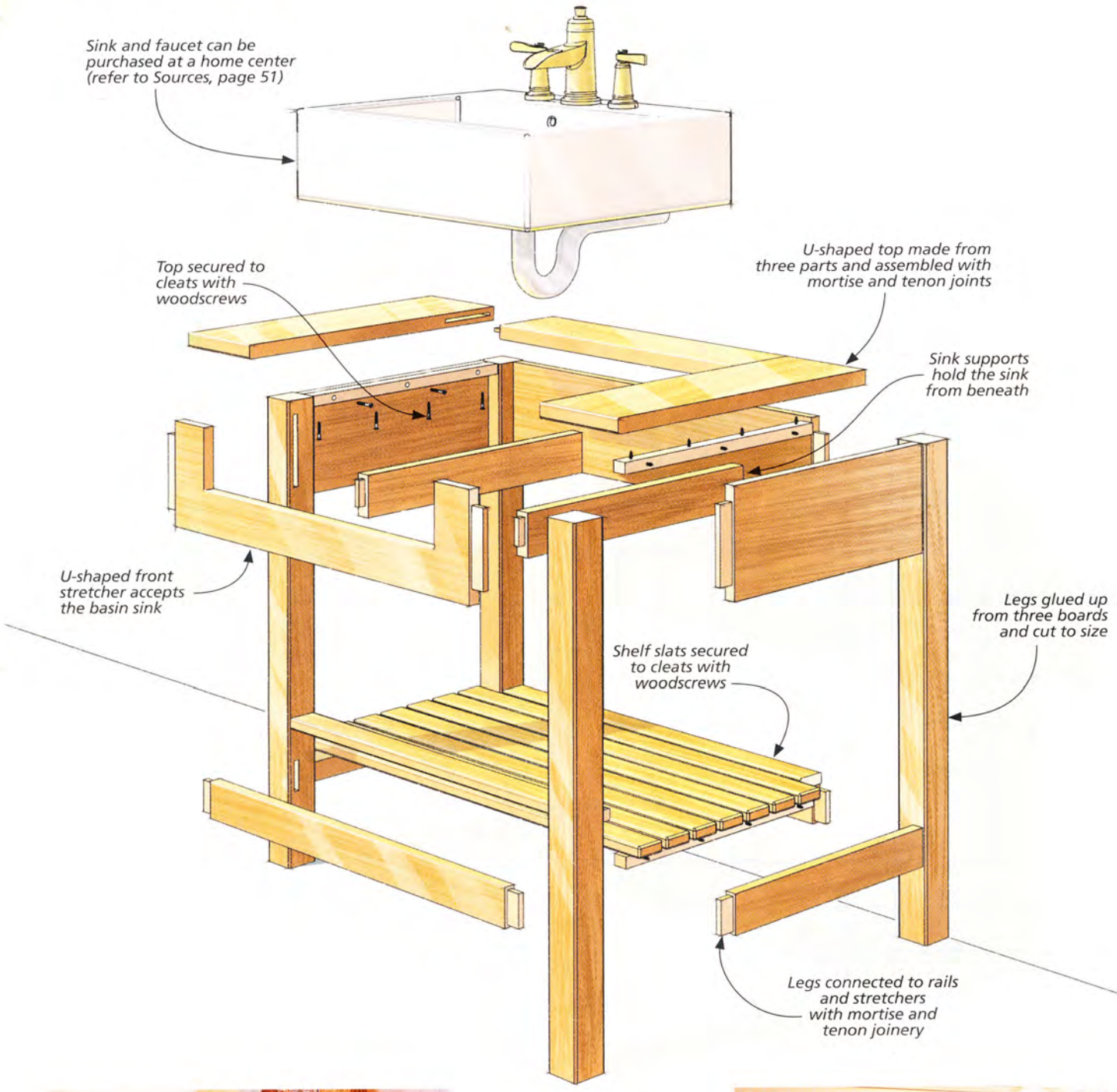
Give your bathroom a great new look. It's as easy as building this unique solid-wood sink stand with a vessel sink and faucet.

Most guest bathrooms aren't big on style. They typically feature a pedestal sink or an inexpensive vanity and sink combination.

But with this custom, solid-wood sink stand, you have the opportunity to add some real interest to an ordinarily average room in the home. And the best part is, the good looks are easy to achieve. The stand consists of two end assemblies joined to one another with four stretchers. The shelf is nothing more than a series of slats that are fastened to cleats. Even the top is solid wood.

All the parts are made from riftsawn white oak lumber. And though the sink and faucet look high-style, they can be purchased inexpensively. Along with construction details, you'll find a simple option for converting this stand for use in a master bathroom on page 29.

Construction Overview / OVERALL DIMENSIONS: 36"W x 33"H x 22"D



An open shelf made from solid-wood slats serves as a storage and display area beneath the sink.

The stylish vessel sink extends beyond the front and top of the stand to complete the unique look.

Build the **BASE**

The sink stand's open base has two identical end assemblies. Each one is made up of two legs and an upper and lower rail. Later on, the assemblies are joined to one another with stretchers.

MAKE THE LEGS. The legs are the first parts I started on. Each leg is glued up from three layers of ¾" stock. For a consistent look, find a good grain match on the boards. Trim them to final size after glueup.

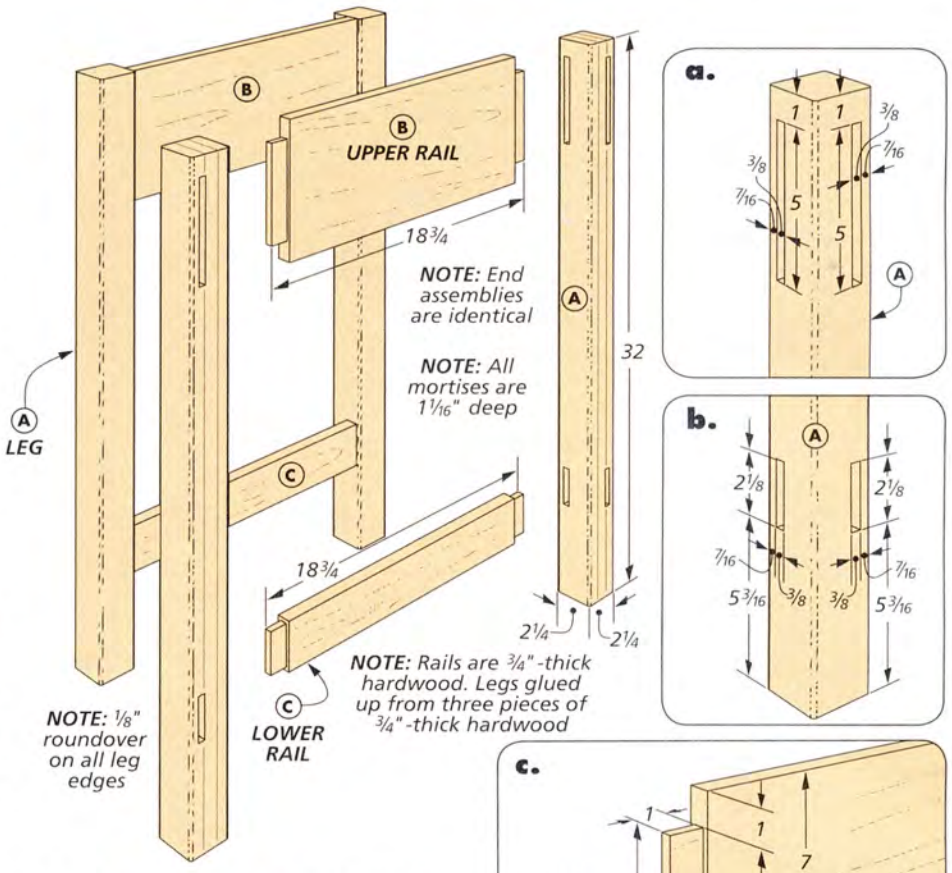
Now you can get started on the mortises on the legs. You'll want to mark the front, side, and back faces before you begin. The legs should be oriented with the glue lines facing to the sides and the continuous face grain at the front and back. The nice thing here is that two adjacent faces of each leg have identical mortises, so you can make all the leg mortises exactly the same.

To make the mortises, one option is to use a drill press and chisel, as shown below. Another choice is a mortising machine, which is explained on page 44. With the mortises done, all that's left is a slight roundover on the edges of the legs.

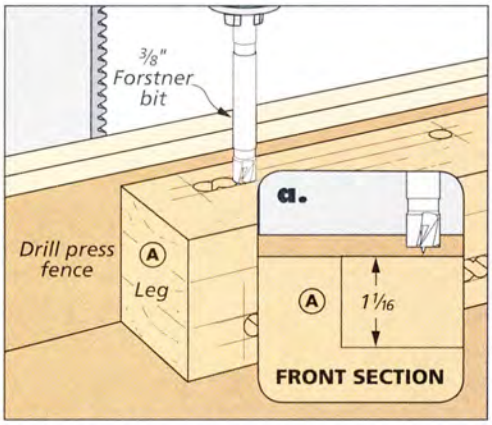
ADD RAILS. The next parts up are the upper and lower rails of each end assembly. The upper rails are wider than the lower rails. The rails have tenons on both ends to fit the mortises in the legs. You can refer to the two drawings at the lower right for guidance on making these cuts with a dado blade. Note that the cheeks (face cuts) are the same for all the rails, but the shoulders (edge cuts) on the upper rails are wider than those on the lower rails.

SIMPLE GLUEUP. Now you should be ready to glue up the end assemblies. Add glue, and then clamp the assemblies together. You can set them aside as you turn your attention to the stretchers that connect the assemblies to one another.

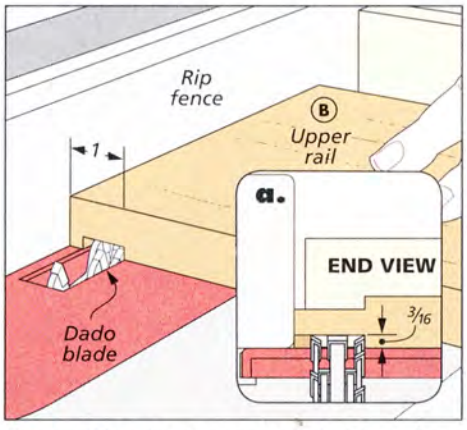
ADD STRETCHERS. After machining the rails, you'll be pretty familiar with



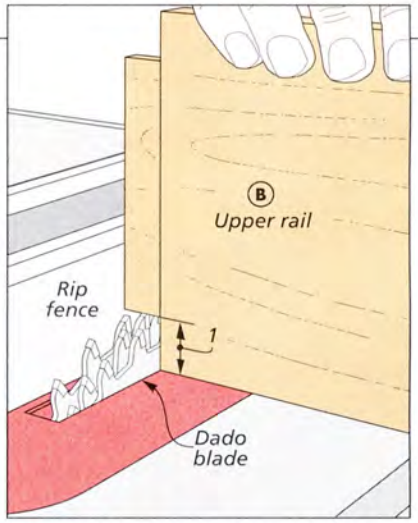
How-To: JOIN THE END ASSEMBLIES



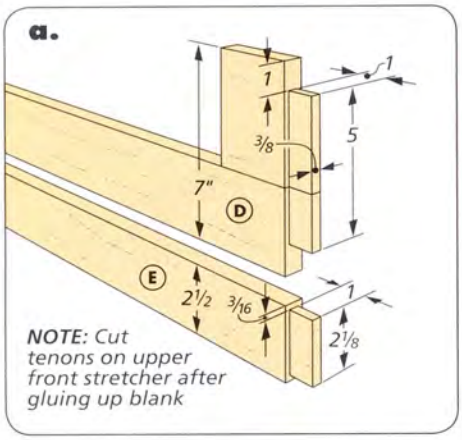
Drill Mortises. Remove the waste from each mortise at the drill press. Then square up the ends and edges with a chisel.

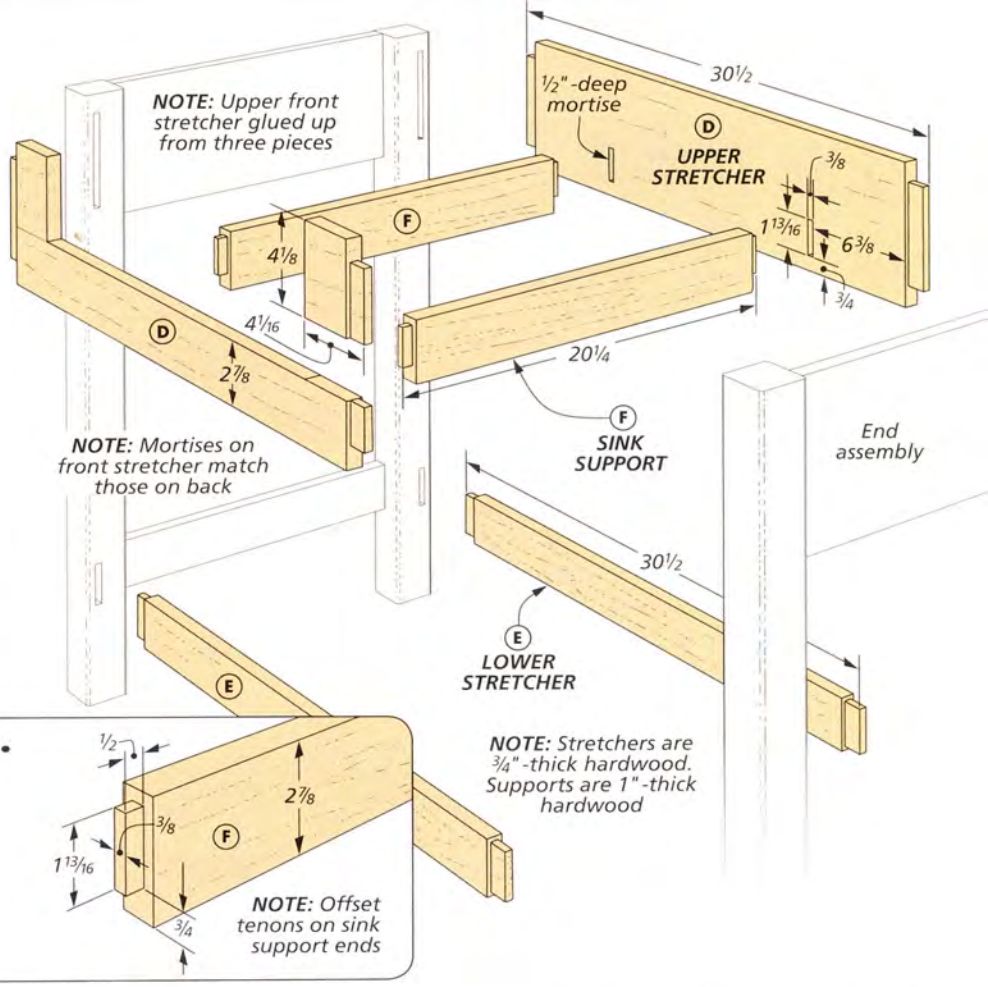


Tenon Cheeks. Set up a dado blade for the tenon cheek cuts and then cut them all at the same height setting.



Shoulders. The shoulders on the upper rail tenons (detail 'c' above) are wider than the lower rails (detail 'd').





the operations involved in making the stretchers. The two lower stretchers and the upper rear stretcher are similar to the rails, except they're longer. They also have tenons on the ends similar to the rails.

FRONT STRETCHER. The upper front stretcher, however, is a bit different from the others. It's a U-shaped piece to wrap around the front of the sink.

It's not difficult to make this piece. Just rip a wider board (lower left drawing), and then cut a pair of blocks from the upper board you created. Now glue the three pieces together for a good grain match, as shown in the middle drawing.

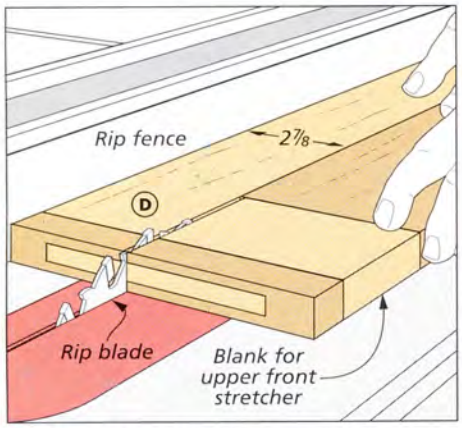
The stretcher receives tenons on the ends just like the other stretchers. You'll need to make a tall and long auxiliary fence to fully support this U-shaped piece while making the tenons.

SINK SUPPORTS. There are two parts left to add to the base assembly, and those are the sink supports. These parts are 1" thick and fit in mortises in between the top stretchers. The sink will rest on these supports.

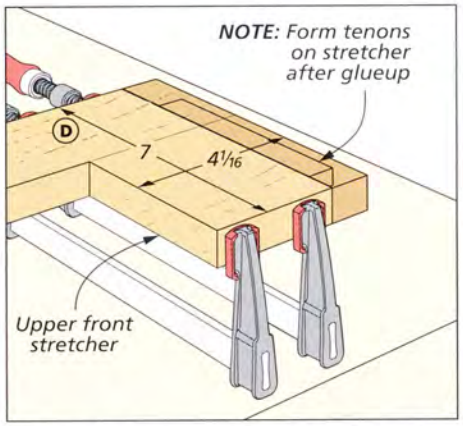
To accept the supports, you'll need to cut a pair of mortises in the inside face of each upper stretcher. The right drawing below and page 31 provide the details. As you cut the tenons on the sink supports, note that the lower shoulder is wider than the top shoulder (detail 'b').

FINAL BASE ASSEMBLY. You're now ready to glue the base together. Start by fitting the sink supports between the upper stretchers, and then fit the stretchers into the mortises in the legs. Once everything fits together properly, bring in the clamps to complete the job.

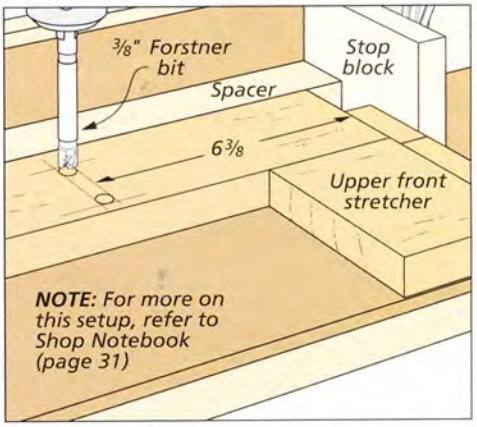
How-To: MAKE THE FRONT STRETCHER



Rip Stretcher Blank. To make the U-shaped top front stretcher, start by ripping a wider board at the table saw.

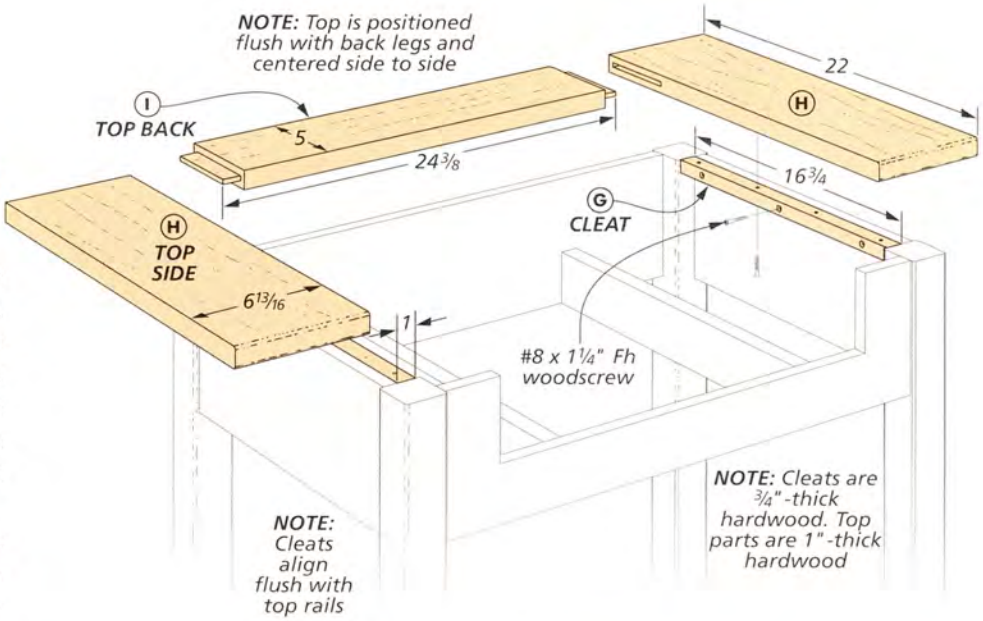


Glueup. Cut out a pair of blocks and then glue them to the lower board to form the stretcher.



Mortises on Stretchers. The upper stretchers have mortises on their inside faces. Here again, use the drill press.

Add a TOP & SLATTED SHELF



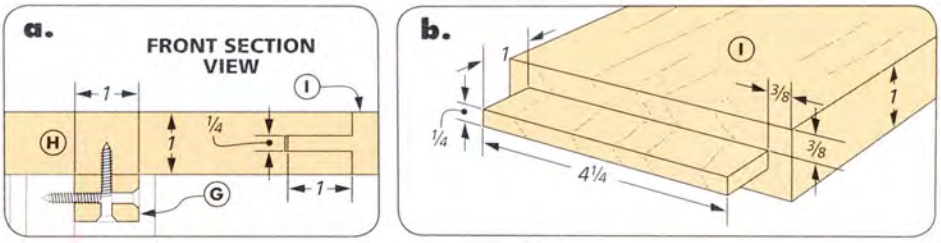
After the sink stand is completed, the sink will be surrounded by a U-shaped, solid-wood top of 1"-thick white oak. The top is made up of three separate pieces joined with mortise and tenon joints. The grain on the back piece runs 90° to that on the side pieces to minimize the amount of exposed end grain in the bathroom.

Though the opening is sized to the sink I used (Sources, page 51), it's probably a good idea to check the size before building the top to fit. That way, you can make any minor adjustments as needed.

INSTALL CLEATS. The top assembly is eventually screwed to a pair of cleats. So the first order of business is to cut the two cleats to size, as shown in the drawing at right. While you're at it, make two more for the shelf you'll install later.

Drill countersunk pilot holes in two adjacent faces of each cleat. Then position them on the upper rails, flush with the top edge and with the pilot holes facing into the cabinet and down. Now transfer pilot holes to the upper rails and drive in screws to secure the cleats.

MAKE THE TOP. Next up is the top itself. As mentioned earlier, it's made of a back and two sides. So you can get started by cutting these parts to size.



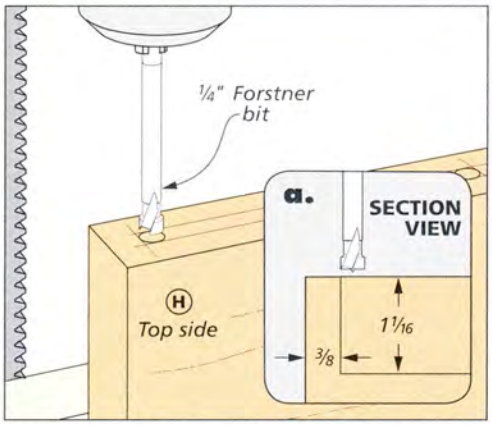
The top sides each receive mortises near their back ends to accept tenons in the top back. The drawing, below left, can be your guide for this. Here again, clean up the waste with a chisel.

Now cut tenons on the ends of the top back at the table saw using a dado blade (middle drawing). Test the fit in the mortises. Once it all fits together properly, you can glue and clamp the top panel, position it above the cleats, and clamp it in place.

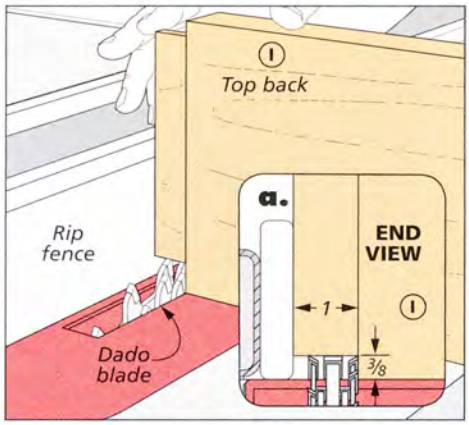
SECURE THE TOP. At this stage, it's time to drill pilot holes through the cleats into the top. Then drive in woodscrews to secure the top.

ADD THE SHELF. The slatted shelf is the next order of business. It's nothing

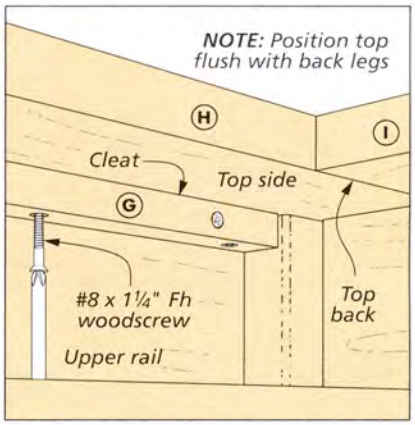
How-To: ADDING THE TOP



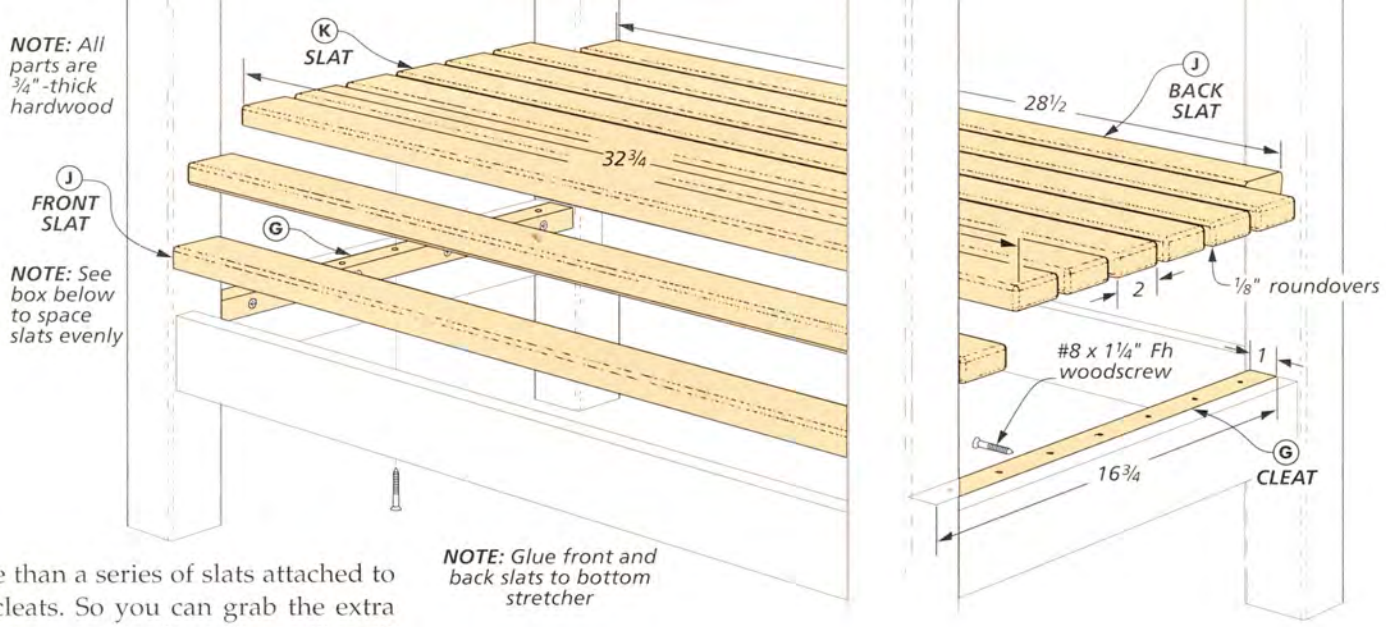
Drill Mortises. The wide mortises on the top sides can be made with a series of holes from a Forstner bit. A chisel completes the job.



Tenons. Tenons on the top back fit the mortises on the sides. They're easy to cut with a dado blade on the table saw.



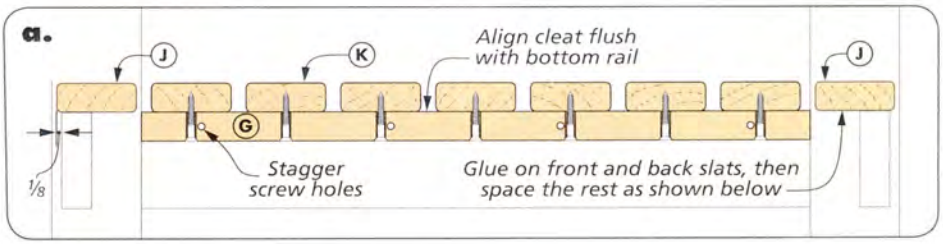
Attach Top. Position the top, and secure it by driving screws up through cleats into the top.



more than a series of slats attached to the cleats. So you can grab the extra two cleats you made earlier and install them, this time flush with the upper edge of the lower rails. Here again, make sure the pilot holes are oriented out into the cabinet and down.

FRONT & BACK SLATS. All the slats that make up the shelf are the same length, with two exceptions. The front and back slats fit between the legs, so they need to be a bit shorter. These two slats are attached to the stretchers with glue. The other slats are screwed to the cleats.

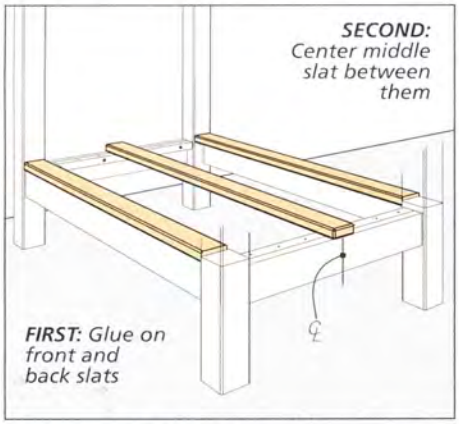
MAKE SLATS. With this in mind, you can rip the slats to width. Then cut them to length, making the front and back slats shorter. Round over the edges, and position the front and back slats on the lower stretchers as shown in detail 'a,' above right. Now glue and clamp them on.



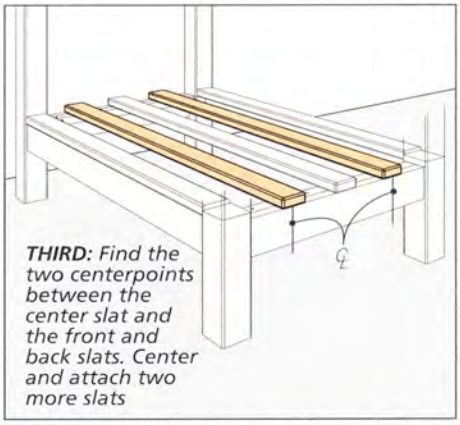
COMPLETE THE SHELF. The seven remaining slats seem like they should be simple to add to the sink stand, but there's one challenge: Spacing them out evenly along the cleats. Luckily, I came up with a simple solution for this that's shown in the drawings below. The secret is to find centerpoints, first between the front and back slats (left drawing), and then between the center slat and the front and back slats (middle drawing). Once these five slats are all in position, you should be able to simply center the remaining four slats by sight, as shown in the right drawing.

ATTACH THE SLATS. You have to attach the slats from below, so I suggest setting the stand on a pair of sawhorses. Clamp it securely in position. Then from underneath, drill pilot holes through the cleats into the slats, and secure the slats by driving in woodscrews.

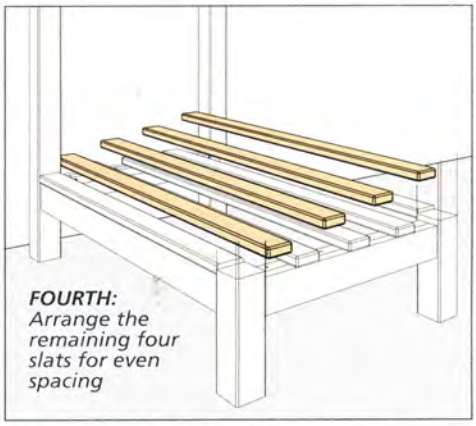
How-To: INSTALLING THE SHELF



First Three Slats. After gluing on the front and back slats, center the middle slat between them.



Next Two. Now work out from the middle slat, centering two more slats between the front and back slats.



Final Four. For the last four slats, you should simply be able to center them to achieve consistent spacing.

Install the SINK & STAND

With the sink stand assembled, stained, and finished, you're ready to have a helper assist you in moving it into place in the bathroom for the final installation.

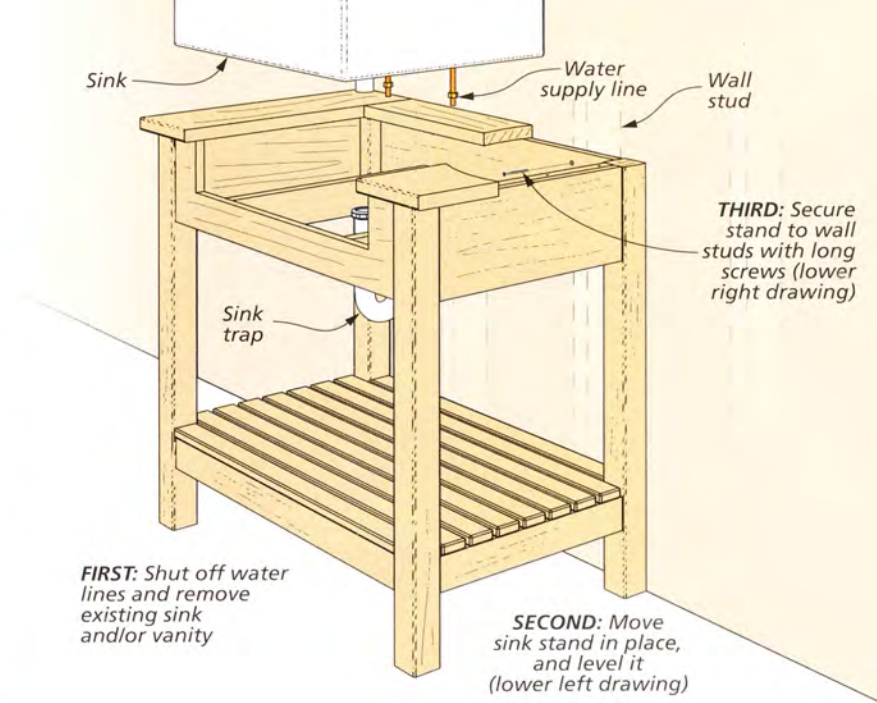
However, if you're uncomfortable with doing your own plumbing work, you may want to hire someone to help with the following steps. It starts with removing the existing sink. To do this, you'll just need to turn off the water valves and then remove the sink trap, as well as the water supply lines to the faucet. (Have a bucket handy to catch any water.) Then carefully remove the existing sink or vanity. There may be some screws, bolts, or anchors securing these items to the wall.

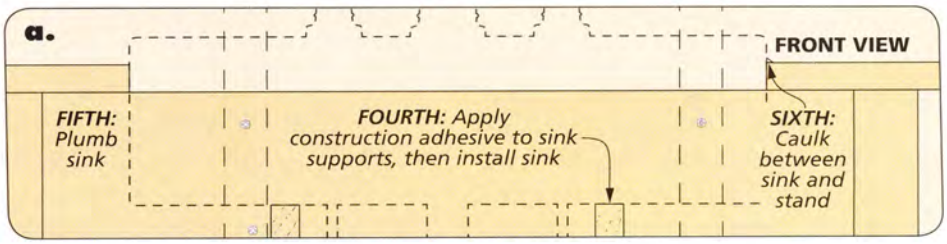
FIT THE STAND. Now you can move the sink stand into place. If you're lucky, it will fit just right, with no noticeable gaps around it. However, most walls and floors aren't flat and square, so you may need to trim a leg with a saw or shim beneath a leg so the stand sits level (lower left drawing). Once the sink stand is level, secure it by driving long screws through the back stretcher and into wall studs (lower right drawing).

ADD THE SINK. You're just about ready to install the sink. But first, I suggest installing the faucet now, before the sink is in place. You'll find this process a lot easier without the sink attached.

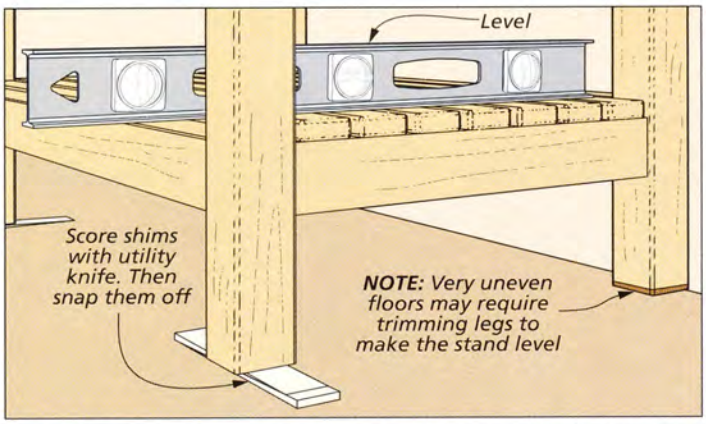
At this point, you should have a nice, seamless fit between your stand's top and sink. If it's just a little off, though, don't worry. Some caulk around the opening once the sink is secure can take care of this. But before installing the sink, you'll want to apply beads of construction adhesive to the sink supports to hold the sink, as explained in the drawings above.

Then it's a simple matter of reattaching the sink trap and supply lines, and your stylish new sink stand is complete. If you're interested in building a "double-sink" option for a master bathroom, see the drawings on the opposite page. W

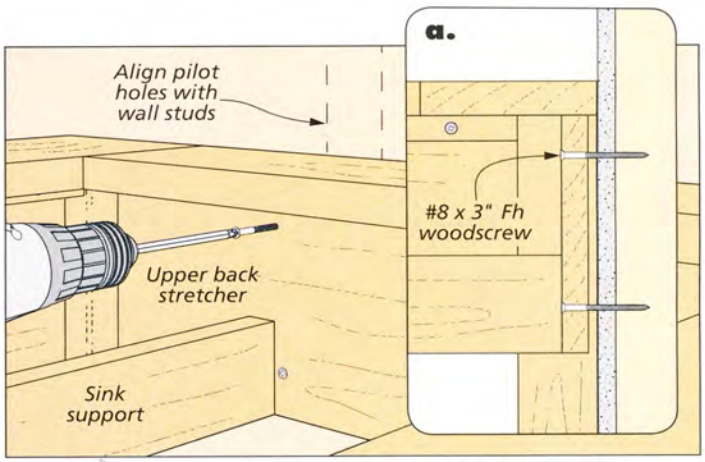




How-To: SECURE THE STAND



Level the Stand. Move the stand into place, and check it for level front to back and side to side. Wood shims can take care of subtle irregularities, or you may need to trim a leg slightly.



Attach to Wall. Once it sits level, installation is easy. Mark the locations of the wall studs and then drive a few long screws through the back stretcher and into studs behind it.

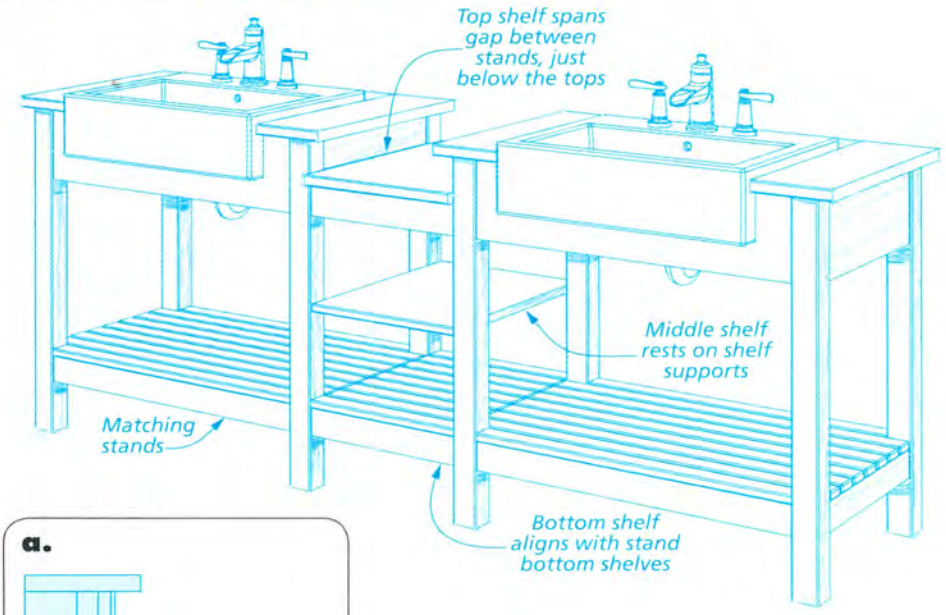
DESIGNER'S NOTEBOOK

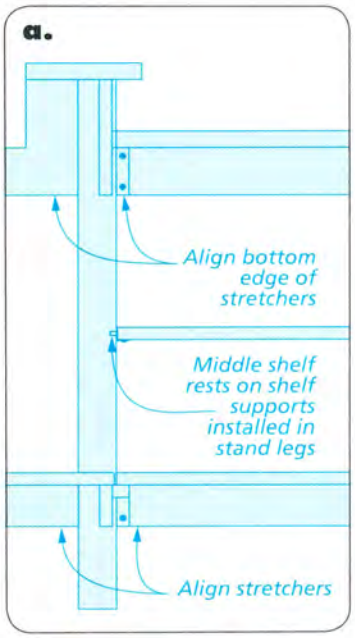
MASTER BATH OPTION

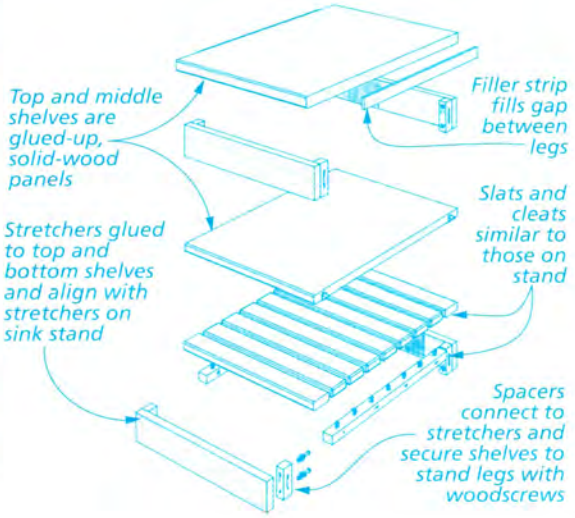
It's easy to modify the design of this sink stand to work for a master bath with double sinks. Just build two stands and then connect them with the simple shelving unit shown here. The top and middle shelves are glued-up panels. The bottom shelf is made of a series of slats to mimic the look of the bottom shelf on the sink stand. Here again, these slats are screwed to a pair of cleats.

The top and bottom shelves have a front and back stretcher glued beneath them. These stretchers create a consistent appearance and also provide a mounting point for the shelves. As for the middle shelf, it's simply installed on four shelf supports. You can drill holes in the sink stand's legs to accept these supports.

Woodsmith GO ONLINE EXTRAS — For detailed plans on this option, visit our website at Woodsmith.com

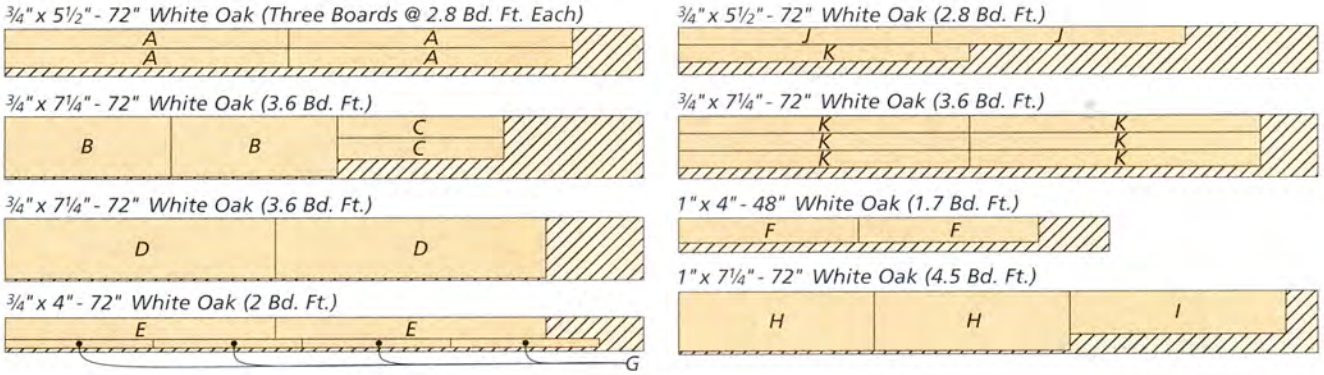






Materials, Supplies & Cutting Diagram

A Legs (4)	2¼ x 2¼ - 32	**F** Sink Supports (2)	1 x 2⅞ - 20¼	**K** Shelf Slats (7)	¾ x 2 - 32¾
B Upper Rails (2)	¾ x 7 - 18¾	**G** Cleats (4)	¾ x 1 - 16¾		
C Lower Rails (2)	¾ x 2½ - 18¾	**H** Top Sides (2)	1 x 6¹³⁄₁₆ - 22	• (36) #8 x 1¼" Fh Woodscrews	
D Upper Stretchers (2)	¾ x 7 - 30½	**I** Top Back (1)	1 x 5 - 24⅜	• Sink	
E Lower Stretchers (2)	¾ x 2½ - 30½	**J** Front/Back Slats (2)	¾ x 2 - 28½	• Faucet	



tips from our shop

Shop Notebook

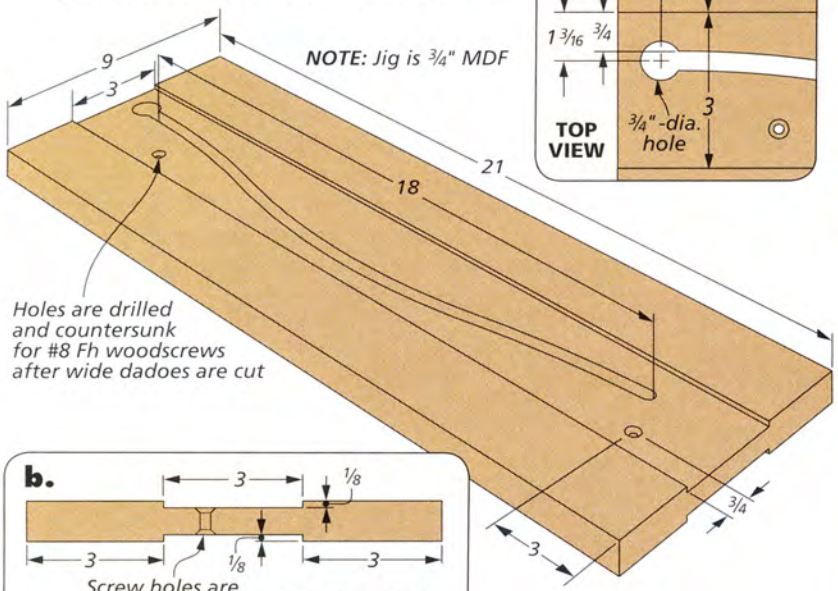
Curved Groove Jig

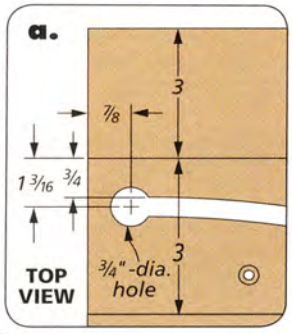
The curves in the bombé chest on page 32 make the project appear more difficult than it actually is. In fact, every curve is derived from the basic leg pattern on page 35. I even used that pattern as a template to make the jig shown below for routing the curved groove in the legs.

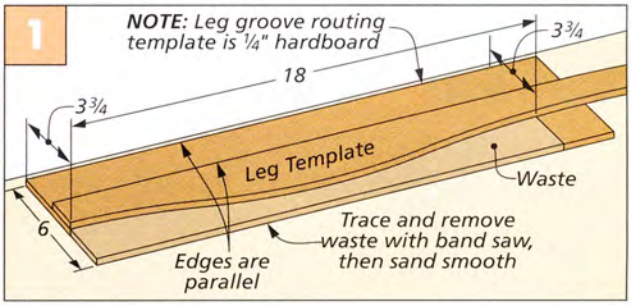
You can begin by cutting a piece of ¼" hardboard as in Figure 1. Then position the leg template on the blank as shown and trace the curve with a pencil. Mark a line at 18" on the template blank, the point at which you'll want to stop the groove. You can cut the curve at the band saw and then sand it smooth, making sure no bumps or depressions remain.

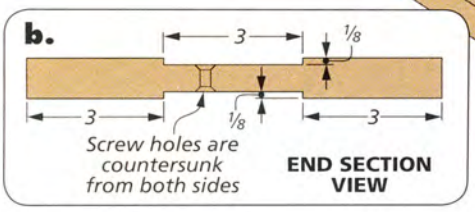
Now you'll need a ¾" MDF blank for the jig. The drawing below has the dimensions. Detail 'a' shows the location for a starter hole in the jig. After drilling the hole, clamp the template you just made to the blank, as in Figures 2 and 2a. Make sure you have a backer board beneath the jig blank so you don't rout into your bench. Then use a pattern bit set to a depth of about ¼" and make several passes to complete the curved slot.

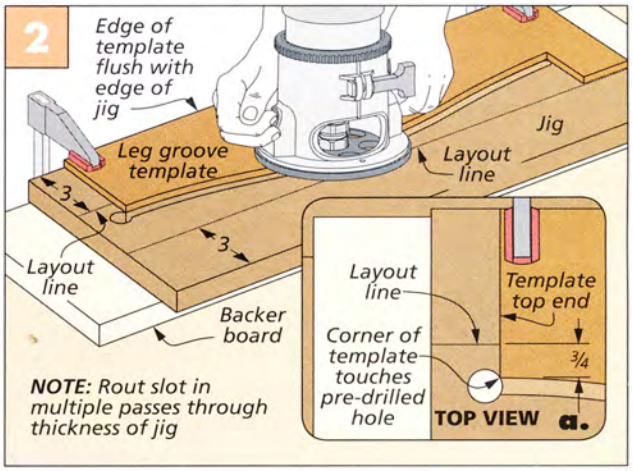
With a dado blade in the table saw, cut the shallow 3"-wide groove in the template. This aligns the jig to the leg blanks. A pair of countersunk screw holes (in waste areas) allows you to mount the jig to the blanks.











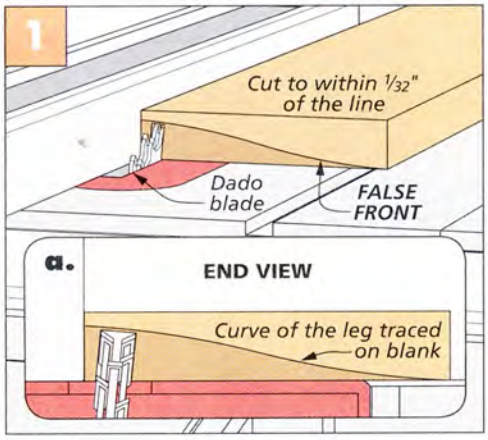
Curved Drawer Fronts

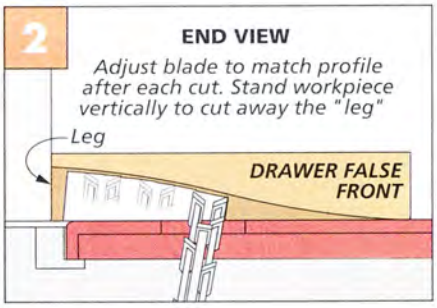
Shaping the curved false fronts for the bombé chest is one of several challenging tasks in the project. Fortunately, there's a straightforward solution to the problem.

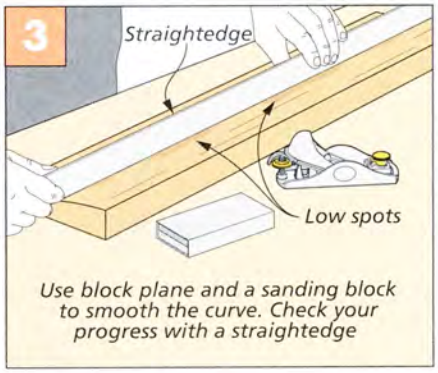
After tracing the profile shown on page 40, you can set up a dado blade to cut away the bulk of the waste from the blanks to form the rough profile.

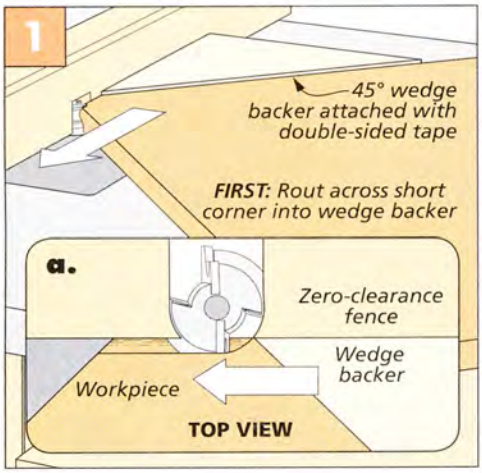
For the first cut, set the rip fence about ¼" away from the blade and the blade height just below the mark (Figures 1 and 1a). This will leave you a small "leg" to support the workpiece as you make the remaining cuts. Figure 2 shows the technique of incrementally moving the rip fence back and lowering the dado blade to match the profile.

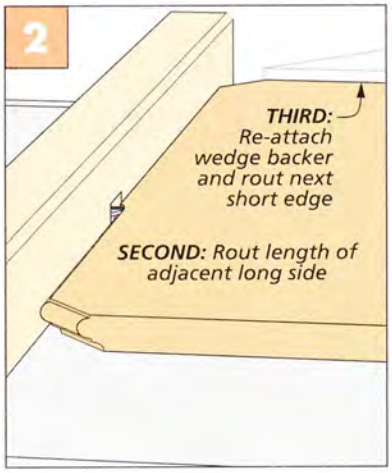
When you've removed as much of the waste as you can at the table saw, you're ready to refine the shape of the blank. For this, I turned to a block plane first, to knock down the high spots. To finish up, all you need is a sanding block contoured to match the curve. I started with 80-grit sandpaper and moved through the grits until I had a smooth surface. A long straightedge is the perfect tool for making sure the surface is consistent as you go (Figure 3).











Corner Edge Routing

At first glance, routing the edge profile on the top of the bombé chest looks pretty simple. But the narrow corners can easily be damaged by being pulled into the bit at the router table since they're too small to be supported by the fence.

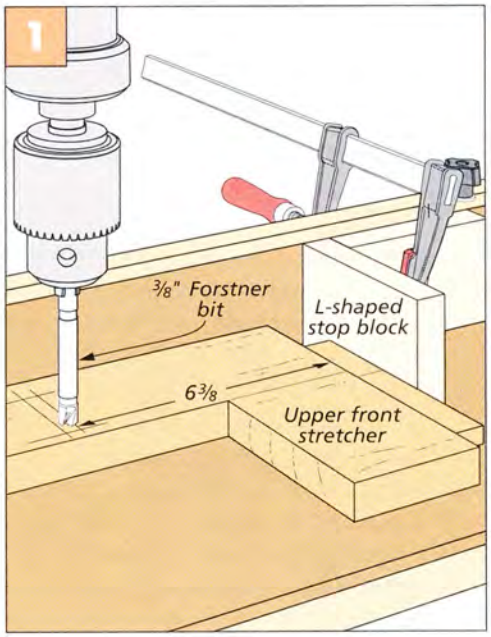
The solution I came up is pretty simple, but it was a lifesaver. All you need to do is attach a 45° backer board to the workpiece with double-sided tape. This way, the long backer board hugs the fence as you pass the tabletop past the bit. (Figure 1). You can also see how I improved the setup by making a zero-clearance fence around the bit, as illustrated in Figure 1a.

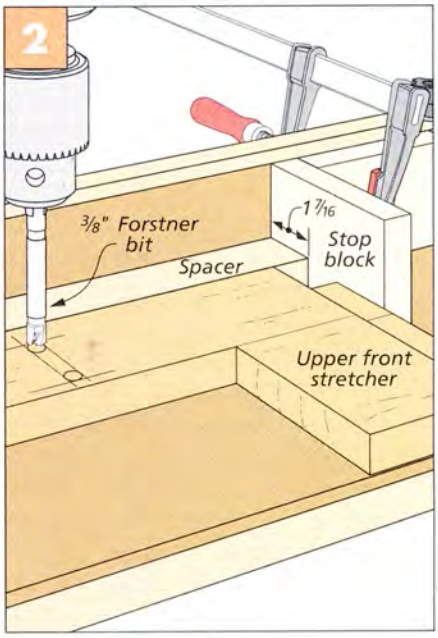
Drilling Face Mortises

The two upper stretchers on the sink stand (page 22) have vertical mortises cut on their inside faces. In order to drill these mortises precisely, I came up with a simple procedure.

The first step, as usual, is to lay out the mortise locations carefully. Then position a drill press fence to align the Forstner bit with the mortise's upper end. Clamp a stop to the fence to establish the location of the mortise on the length of the stretcher, and you're ready to drill the upper hole, as shown in Figure 1.

To drill the hole at the other end of the mortise, insert a spacer between the fence and workpiece (Figure 2). With the two end points established, remove the spacer and drill out the rest of the mortise.





Heirloom Project

Classic Bombé Chest

The flowing curves, breathtaking veneer, and large drawers make this elegant chest a fashionable and functional piece of furniture.

The origin of the bombé chest can be traced back to eighteenth-century France. It was one of many unconventional designs that resulted from relaxed standards imposed on craftsmen after the death of Louis XIV. Under Louis XV, artisan builders were free to experiment and move away from the more traditional designs. A variety of new shapes, carvings, and details emerged.

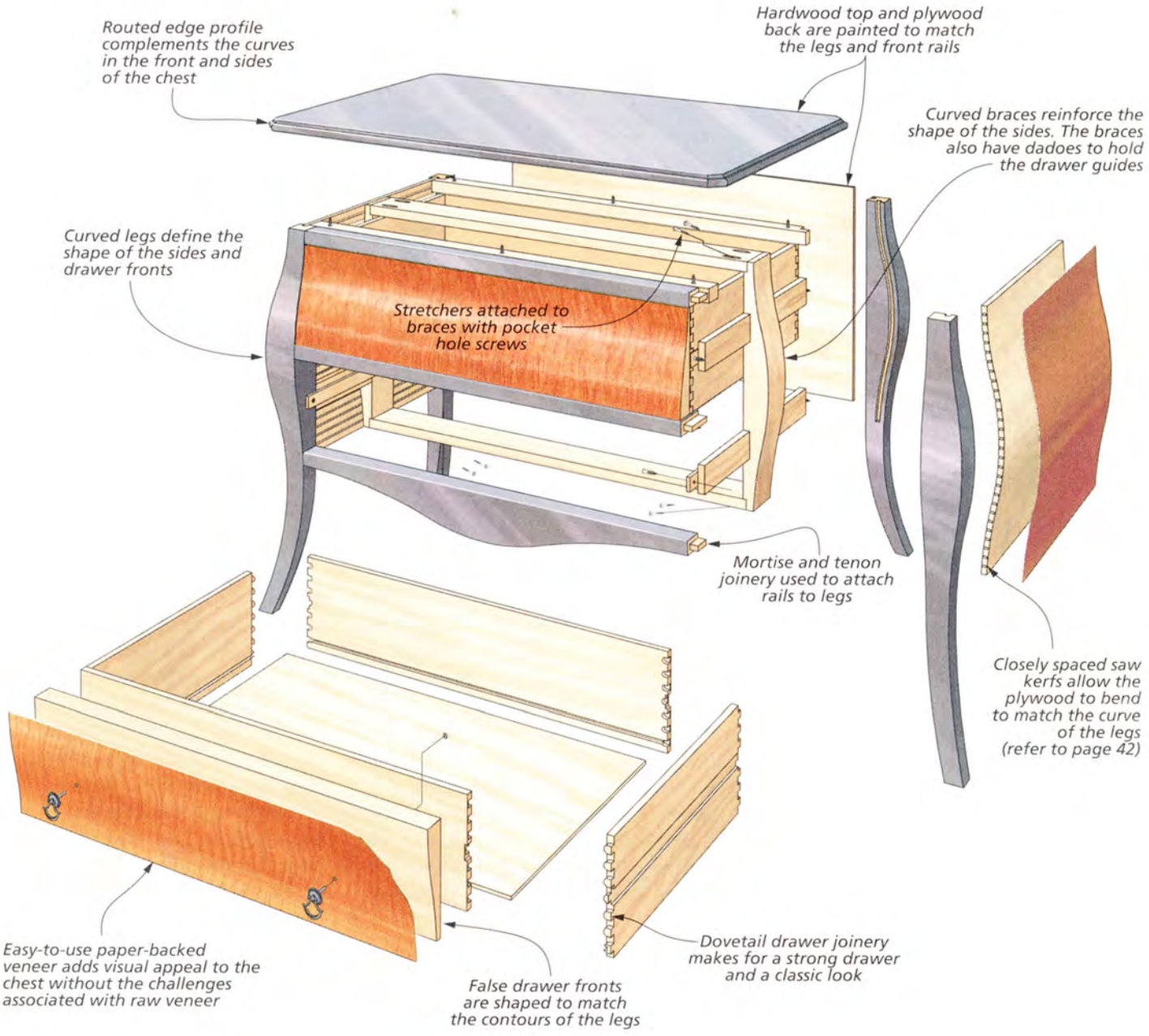
Today, bombé chests show up on many woodworkers' bucket lists of the projects they hope to tackle before they hang up their tools. The distinctive curved sides and drawer fronts offer an almost irresistible challenge.

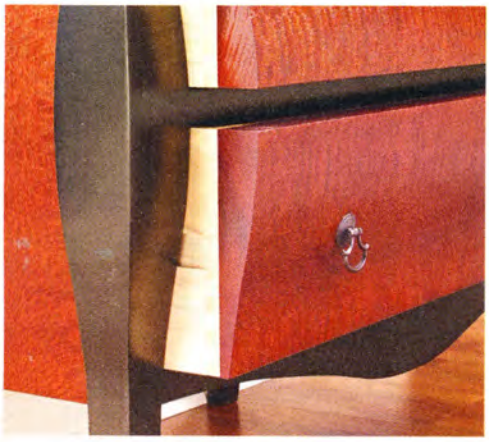
Over the years, several methods for making the curved pieces have been developed. Most traditional designs required large, 4"-thick slabs of mahogany that could be cut and sculpted into the bulging, curved sides.

Today, the requirement for that kind of stock puts the cost out of reach for most of us. So with this design, I wanted to make the bombé style accessible to the average woodworker by using materials that are both affordable and relatively easy to find.

But don't worry. The choices won't compromise the quality or appearance of the chest. I used painted poplar for the primary hardwood and cabinet-grade plywood for the curved panels. The chest is a perfect opportunity for showing off a unique veneer (I chose lacewood). I've also used a straightforward kerf-bending technique that makes shaping the curved panels a breeze.

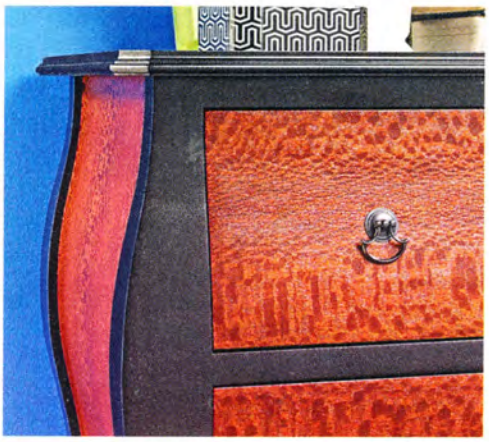
Construction Overview / OVERALL DIMENSIONS: 38"W x 30"H x 24"D

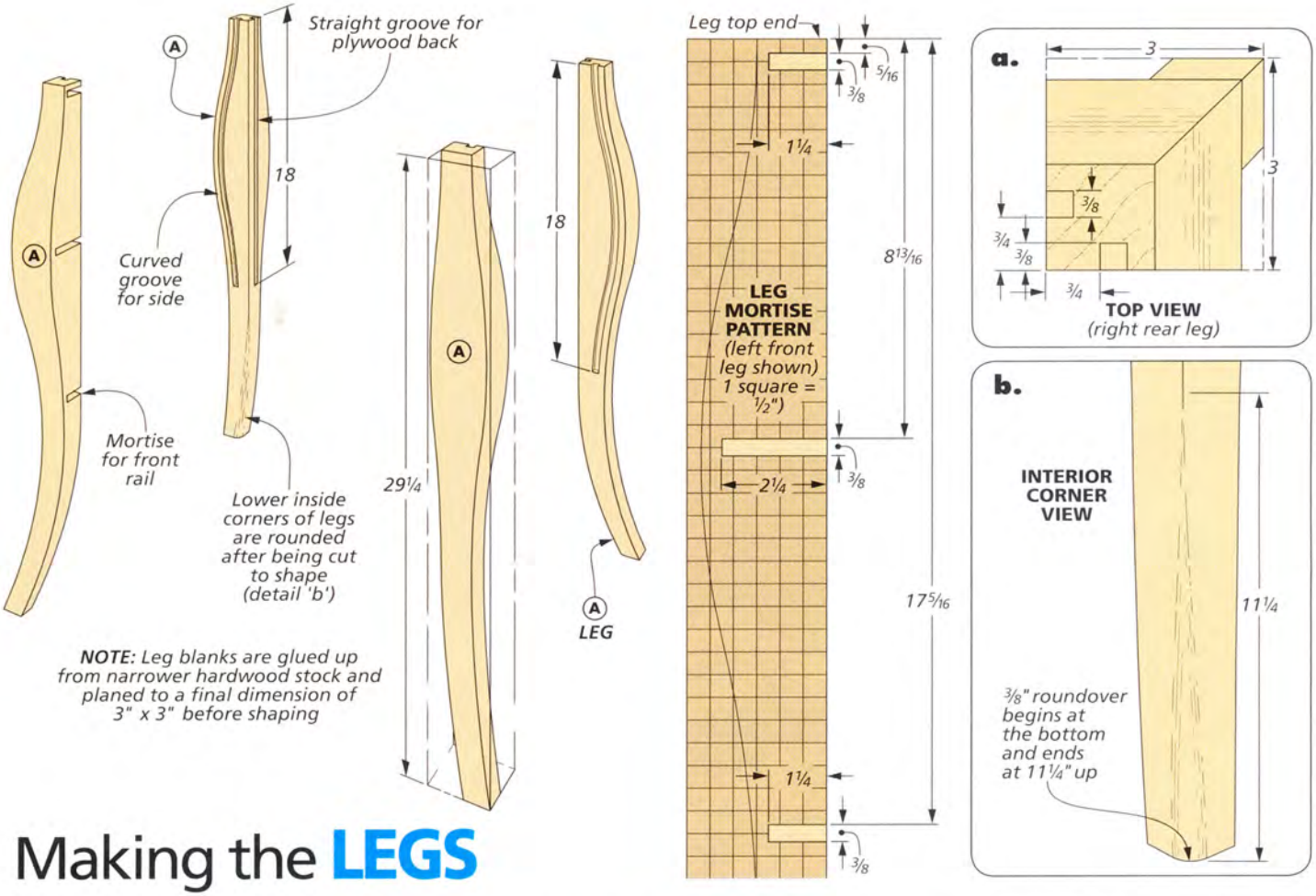




◀ The false drawer fronts are curved, but the drawer boxes are straight and square. You can see how to make the false fronts on page 40.

By cutting a series of saw kerfs in the plywood panels, you can fit them into curved grooves in the legs to define the shape of the bulging sides. ▶





Making the LEGS

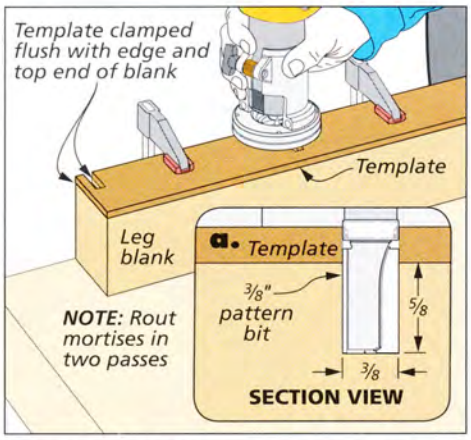
The legs are at the heart of the bombé chest, defining the curves of the entire piece. As you can see, they're curved on all four faces. In addition, the two front legs hold mortises for the front rails. Each leg also has a groove that runs parallel to the outside curve for the side panels. A straight groove in the rear legs holds the back. I used templates to cut and shape the legs. They're invaluable when making matching parts for a curved project.

BLANKS. I started out by gluing up four blanks for the legs. After cleaning up the glue and jointing the blanks, I planed them all to 3" square.

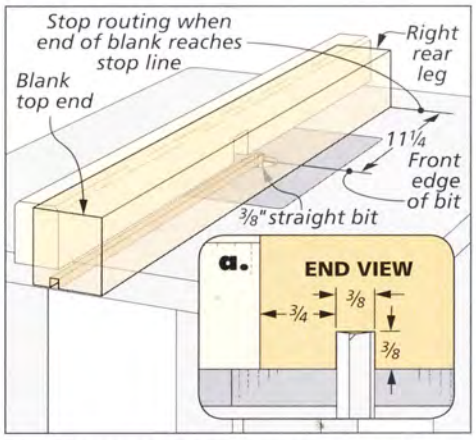
LAYOUT. Before you start shaping the legs, you'll need to lay out the position of the mortises and grooves. All the joinery cuts need to be made while the blanks are still square. It's a good idea to mark the leg positions on the top of each blank so you can keep them straight and avoid confusion.

MORTISES. The left drawing above has a pattern you can use to make a template for routing the mortises in the front legs. I used ¼" hardboard for

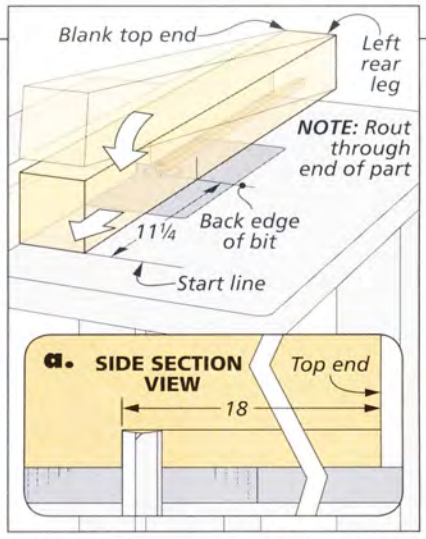
How-To: ROUT MORTISES



Front Leg Mortises. Clamp the hardboard template to the leg blank, making sure the end is registered at the top.



Routing Rear Legs. Measure from the outside edge of the bit and draw stop and start lines for routing.



Left Rear Leg. For the left leg, you'll need to drop into the cut using the lines on the table as your guide.

the template. Cut the three ⅜"-wide notches on the templates at the table saw with the blade raised to match the length of the mortises. All you need to do is "nibble away" the waste.

One unusual thing about the mortises is the orientation. They run horizontally to hold the three rails that form the openings for the drawers. They also extend to the inside edge of the legs, so routing them is the easiest option. Just clamp the template to the blank and use a ⅜"-dia. pattern bit to rout the mortises. The left drawing at the bottom of the opposite page shows you how to do it.

GROOVES. I turned to the router table to rout the stopped grooves in the rear legs that hold the back. The center and right drawings in the box on the facing page show the details. Before you start, make a couple of marks on your router table to show the stop and start points. Then you can use the marks to accurately cut the grooves in the leg blank.

MORE TEMPLATES. There's one more thing to do before cutting the legs to their final shape — rout the curved groove for the sides. The drawings at right walk you through this process as well as the other major steps you'll need to take to complete the legs.

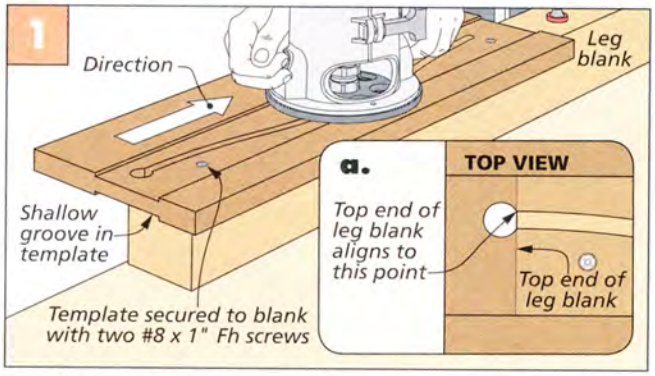
I started by making two templates — one to lay out the profile of the legs and another to rout the grooves for the sides. It sounds more confusing than it really is. For the dimensions and process of making the groove jig, turn to Shop Notebook on page 30.

Figure 1 shows the template in action. A recess in the template and two screws into the waste area of the leg blank keep it positioned properly. Make a first pass with the template in place, then you can remove it to rout it to final depth if your pattern bit isn't long enough to reach the full depth.

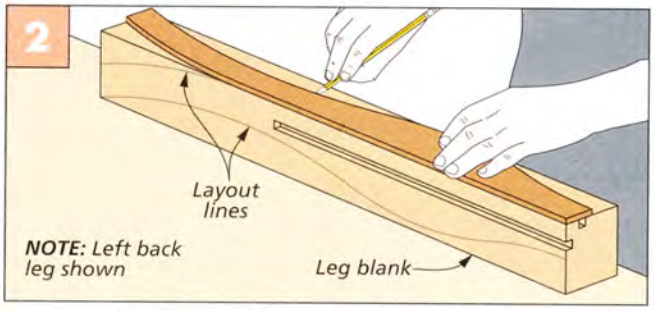
SHAPING THE LEGS. After squaring up all the mortises with a chisel, you're ready to start shaping the legs. Figure 2 shows how to mark the layout. Then, cut the legs to shape at the band saw. You'll notice in Figure 4 how I saved the waste and taped it back in place to keep the blank square for all the cuts.

Finally, grab a rasp and some sandpaper to shape the inside corner of the legs. Notice how the rounded over shape tapers up the leg (Figure 5).

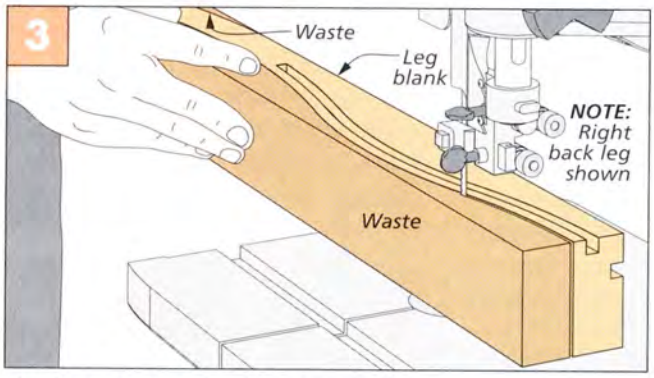
How-To: ROUT & SHAPE



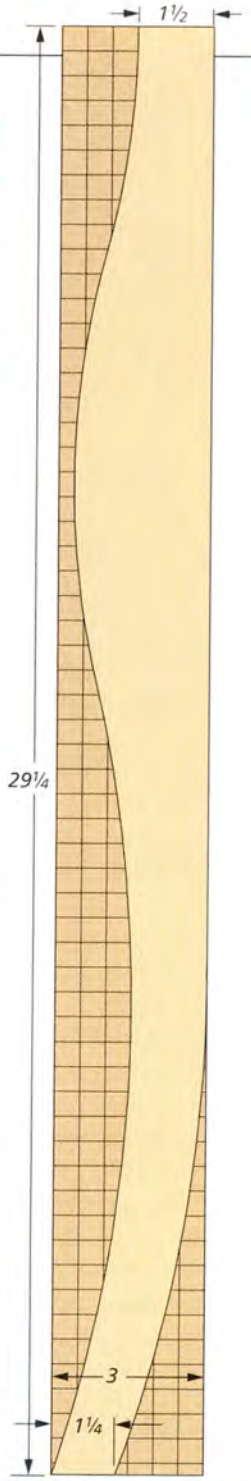
Routing Curved Channel. After securing the template with screws, a hole drilled in the top of the template allows you to place your router on the blank and rout the curve.



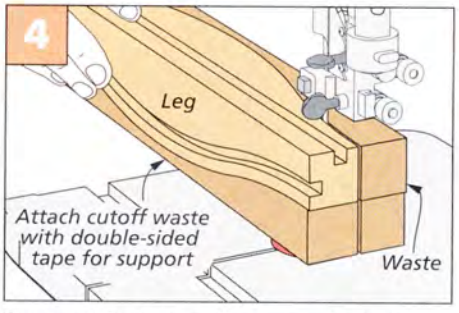
Lay Out the Shape. Trace the shape of the leg using the profile template. Note the orientation of the shape on the two adjacent faces.



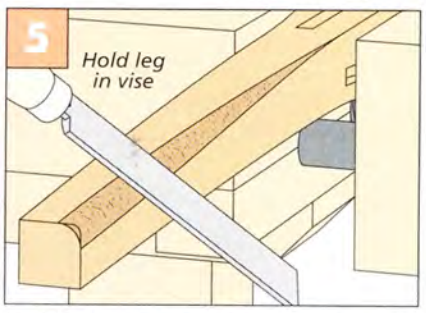
Cutting the Leg Profile. Stay on the waste side of the cut as you shape the leg. Hang on to the cutoff waste for later. You'll need it to cut the adjacent face.



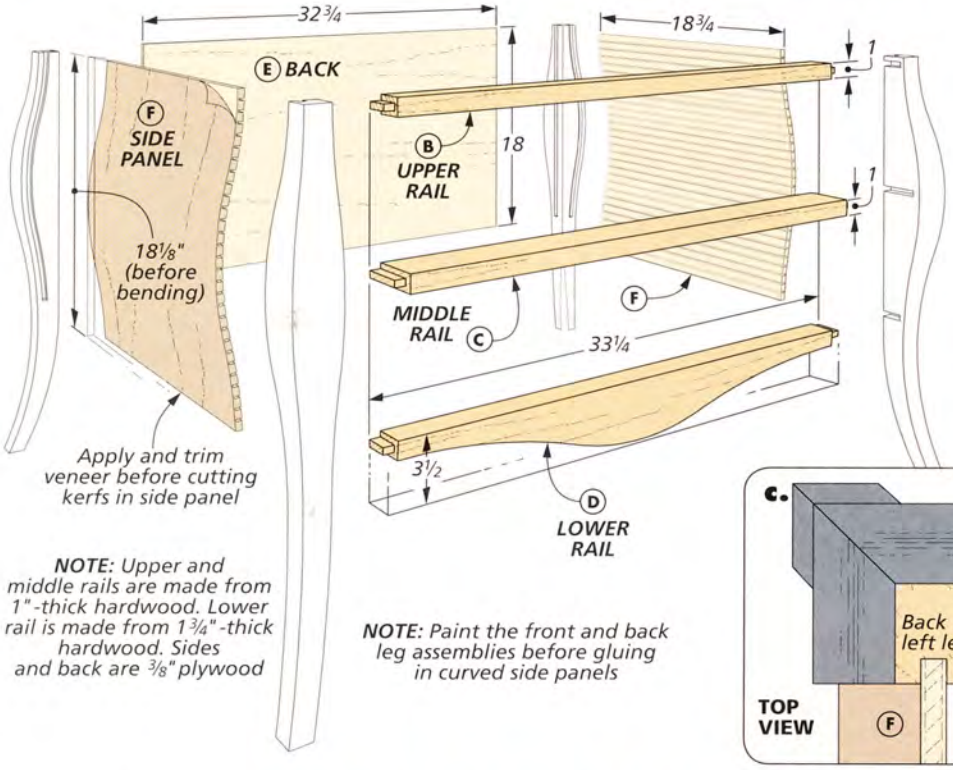
LEG PROFILE PATTERN
(1 square = ½")

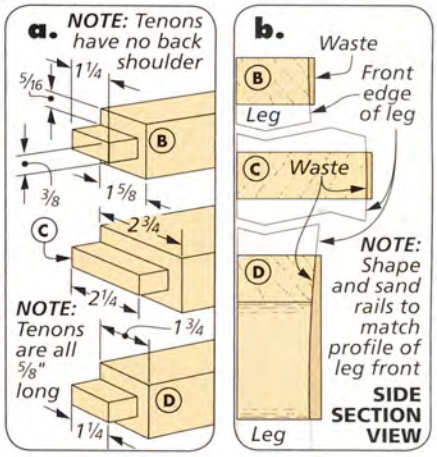


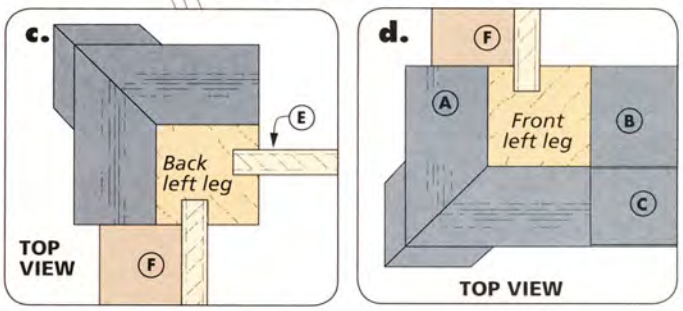
Second Cut. Tape the waste back in place on the blank and cut the second face, completing the shape of the leg.



Inside Corner. I created a radius on the inside edge corner of the legs with a bit of rasping and sanding.







Add the BACK, SIDES & RAILS

Three rails join the two front legs and divide the open space into two drawer compartments. The back legs are joined with the back fitting into the long grooves you routed earlier. The front and back sub-assemblies are then painted before you move on to installing the sides.

FRONT RAILS. Start by cutting the three rails to overall size. Note that the lower rail is glued up from narrower stock to attain the final width and thickness.

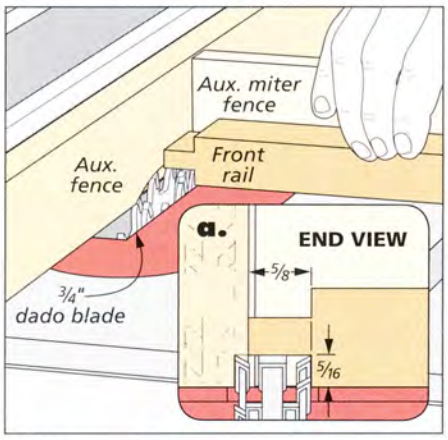
TENONS. At the table saw, install a dado blade and cut the tenons on each of the rails. For the upper and middle rails, this isn't a problem (left drawing below). But for the wider lower rail, I used a different approach. You can see how I did it in the center drawing below.

BOTTOM RAIL. Use the pattern below to make a template to lay out the curve on the bottom rail. Cut out the curve at the band saw and sand it smooth.

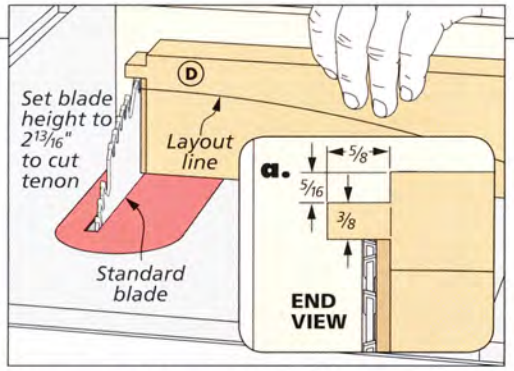
ASSEMBLY. This is a good time to dry assemble the rails in the front legs. Not only do you need to verify that they fit properly, but you also need to mark the front edges to match the curves of the legs (right drawing below). I used a combination of hand planes, sanding, and scraping to shape the profiles. For the lower rail, a long straightedge helps keep the profile consistent.

Now you can install the front rails and clamp the assembly. I used the template to cut out some cauls for clamping the assembly (Figure 1 on the facing page).

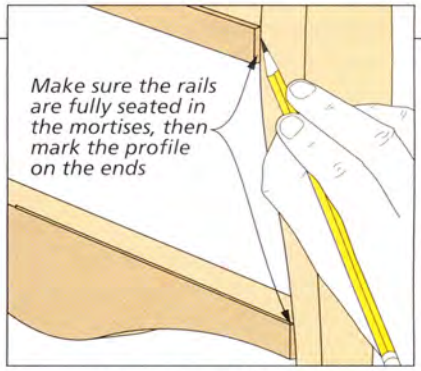
How-To: MAKE RAILS



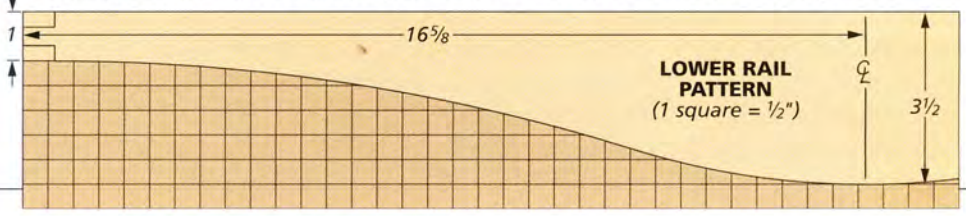
Rail Tenons. To cut the tenons on the rails, I used the rip fence as a stop to control the length of the tenons.



Bottom Rail Tenon. The wide lower rail called for a different setup. I used a combination blade to nibble away the waste.



Curves. Mark the profile of the legs on the ends of the rails so you have a reference while shaping them.



After cutting the plywood back to size, glue it into the long mortise in the back legs, clamping it as you did the front.

PAINT. Normally, painting and finishing come at the end of a project, but in this case it's much easier to paint the front and back before moving on. This way, you don't have to worry about getting paint on the veneered side panels you'll be adding next.

ADD THE SIDES

The side panels provide the "bulge" in the bombé chest. Bending them to fit the curved mortises might seem like a difficult proposition, but by cutting a series of kerfs on the inside of the panels, you'll find that the plywood will cooperate. (Refer to the article on page 42).

VENEER. I began with slightly long panels. This way, I could add the veneer and then trim them both to final size. Spray contact adhesive is perfect for attaching the paper-backed veneer. The glue is strong, but still elastic enough to accommodate the bending process.

Spray the plywood and the veneer with the contact cement and let it set up on both pieces. When it feels dry to the touch, position the veneer and use a roller to force out any air bubbles trapped under the surface. Start in the middle and work your way outward (Figure 2). Leave the panels extra long, then use the legs to mark final length after bending.

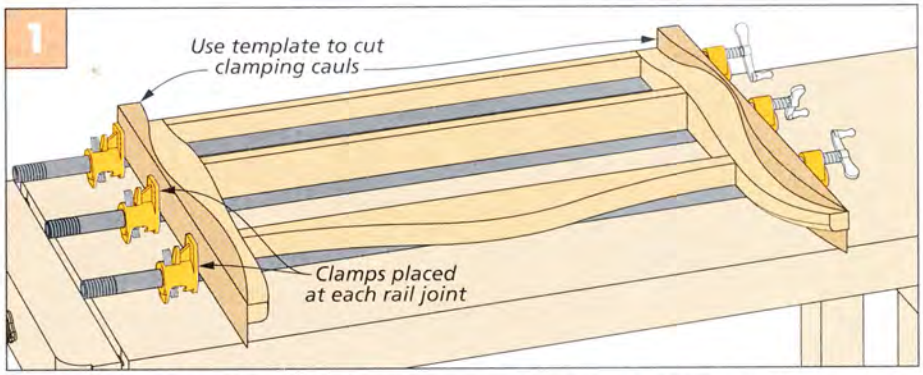
KERFING. Cutting the kerfs is easy, but you first need to get your table saw set up properly for the cuts. The article on page 42 will help you get started. After zeroing in on your setup, cut the kerfs across the full width of both sides.

INSTALLATION. You'll find it helpful to ease the inside surface of the sides to make it easier to fit them into the curved mortises on the legs (Figure 5). You want a snug fit, not too tight.

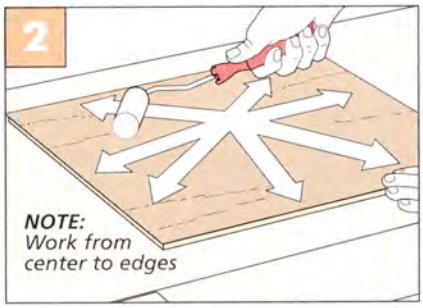
Once you're happy with the fit, you can trim the panels to final length and install them in the grooves in the legs. Figure 6 shows how you can use the cauls again to keep the legs flat on your bench as you insert the panels.

In Figure 7, the front and back subassemblies are joined. All you need to do is add the glue and clamp the side panels in place. Once again, use the cauls to clamp the assembly. I used three clamps on each side of the chest.

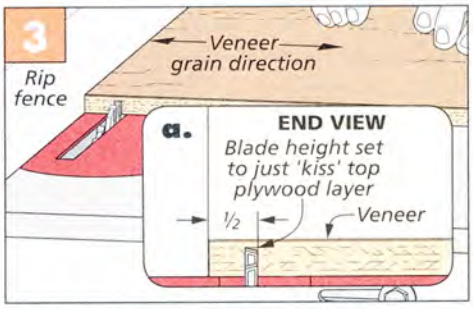
How-To: BUILD FRONT & SIDES



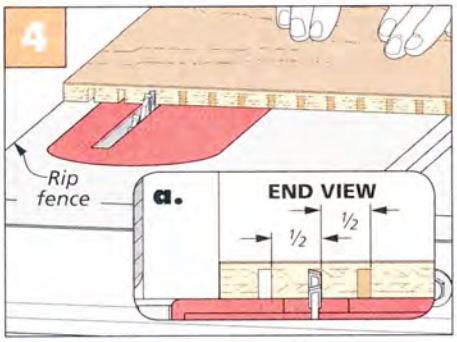
Assemble Front Rails. After shaping and sanding the front rails, slip them into the mortises on the legs and add a clamp at each joint.



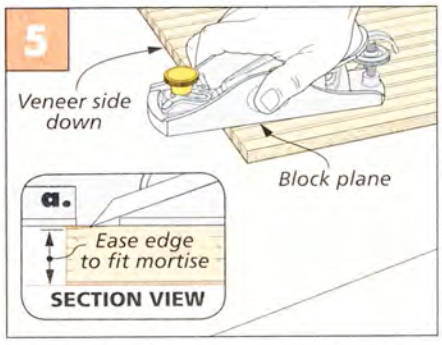
Veneer. When the contact cement is dry, set the veneer in place and use a roller to force out the air bubbles.



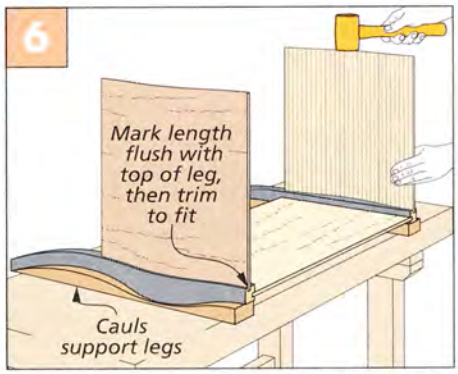
Kerf Cutting. With the blade height set to touch the last ply, start with the fence set to ½" and make the first cut.



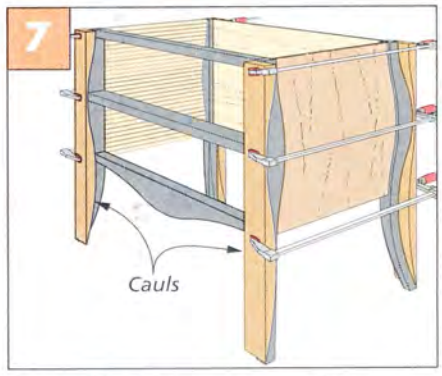
Repeat Cuts. After the first pass, move the fence ½" and repeat. Keep going until you've kerfed the entire panel.



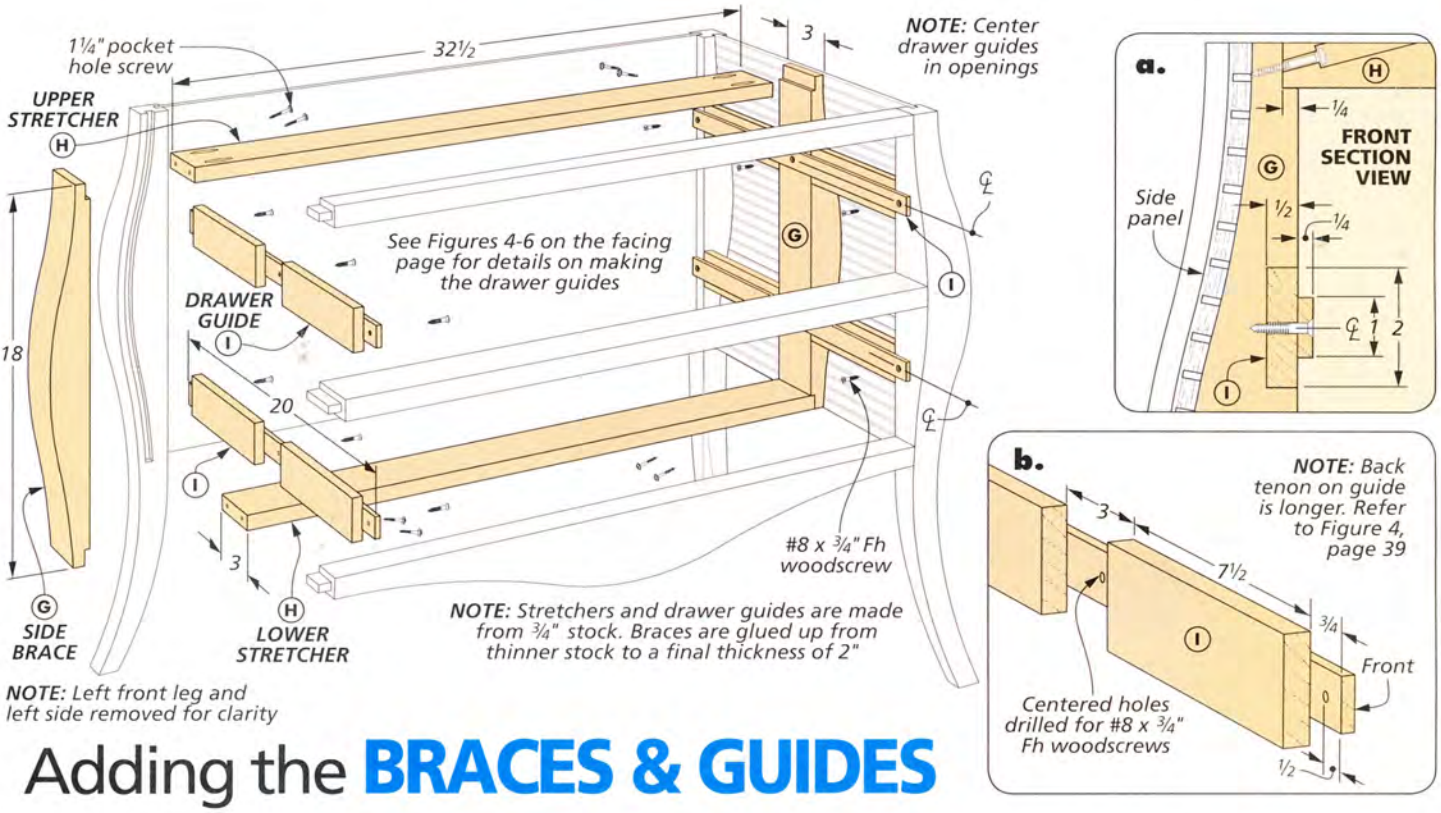
Easing the Edges. A block plane is the perfect tool for shaving the panel to fine-tune the fit into the mortise.



Sides. You want a snug fit when installing the panels. You can tap them with a mallet to ensure they're seated.



Assembly. Make sure everything remains square while you add clamps during the final assembly.



Adding the **BRACES & GUIDES**

One unique feature of the bombé chest is the frame that fits between the two sides. Two braces are shaped to fit the inside contours of the sides. The braces are connected by two stretchers that span the width of the chest. The braces also serve to hold the drawer guides.

SIDE BRACES. You'll want to start by gluing up a pair of oversize, hardwood blanks for the side braces. After the glue dries, clean them up, then cut and plane them to final size.

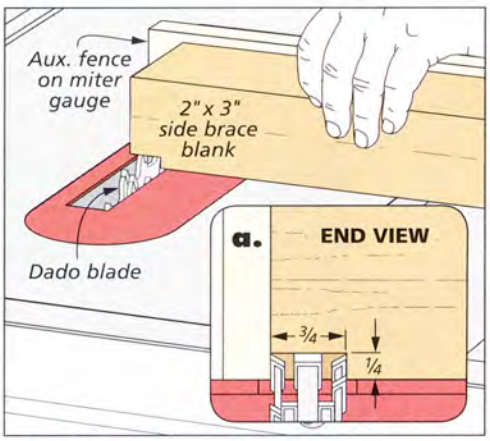
RABBET. The ends of the braces need a shallow rabbet to form a pocket that helps you position the stretchers, as shown in detail 'a' above. At the table saw, install a ¾" dado blade. Use a miter gauge equipped with an auxiliary fence to cut the rabbets on each end of the brace blanks (left drawing below).

SHAPING. The hardboard leg template you made earlier is all you need to trace the shape of the curve on the blanks. The center drawing below shows how to register the template at the end of the stretcher and where the curve meets the side. After marking the blanks, cut them to shape at the band saw. Check the fit as you work to smooth the edge and strive for a seamless joint on the inside of the case (Figure 1 on the opposite page).

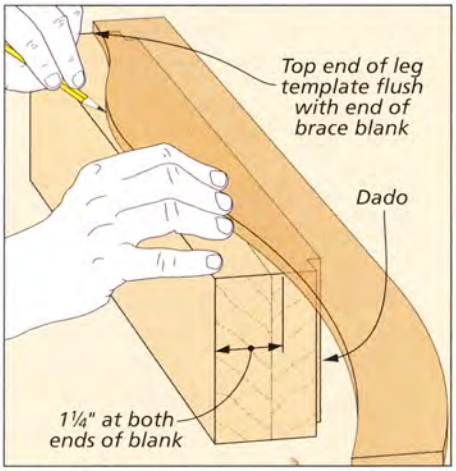
In order for the drawer guides to be in the proper position, you want the flat, inside face of the braces flush with the inside edge of the legs. It's okay to start with the inside face a bit proud, though. You can easily shave it flush on the jointer before you install it permanently.

When you have a good fit, attach the braces to the sides with glue. A plywood spacer helps position the braces in the center of the case and also keeps

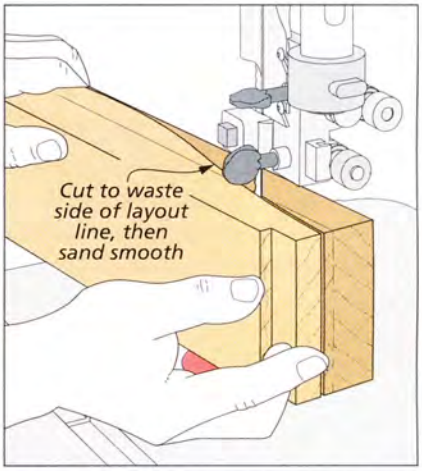
How-To: MAKE BRACES



Rabbets. Rabbets on the ends of the braces create a pocket for the stretchers. Cut them first, while the blank is square.



Brace Layout. Use the hardboard leg template to lay out and mark the shape of the leg on the blank.



Band Saw. As you cut the leg to final shape at the band saw, make sure to stay on the waste side of the cut.

them square while you glue them to the curved sides (Figure 2).

STRETCHERS. Now cut the two hardwood stretchers to final size. Figure 3 shows how I used a jig to drill the pocket holes in both ends of each stretcher. The pocket hole joints are very strong and ensure a long life for the chest. When you attach the stretchers, the pocket holes in both face outward for easy access. The main drawing on the facing page shows the orientation.

DRAWER GUIDES. Next up are the hardwood drawer guides. Rather than using metal drawer slides, I decided to go for a more traditional wood guide instead. You can see in the main drawing and detail 'a' that the guides are attached to the side braces and to the legs. I started by cutting two pairs of blanks.

While you're at the table saw, use an auxiliary fence on the miter gauge to cut rabbets on both ends of the blanks Note that the rabbet on the front edge is shorter (Figure 4a) than the one on the rear (Figure 4b). I just marked the length of each rabbet and aligned the blade on those marks to make the cuts.

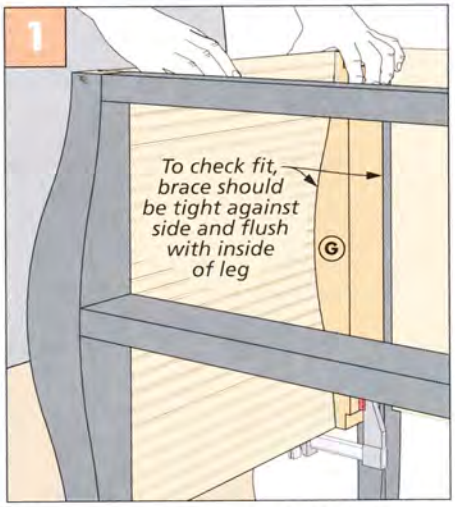
Before moving on to cut the wide dadoes that fit over the side braces, I marked the exact locations on each of the workpieces by holding them in place inside the chest. This way, you're guaranteed the dado location is spot on.

I attached a longer auxiliary fence to the miter gauge to cut the centered notch in the guides. You can align the layout marks with the notch in the fence (Figure 5). All you need to do is cut inside the lines. Test each piece by dry fitting it on the brace. When you have a snug fit for each one, check to make sure it's square to the opening and not tilted.

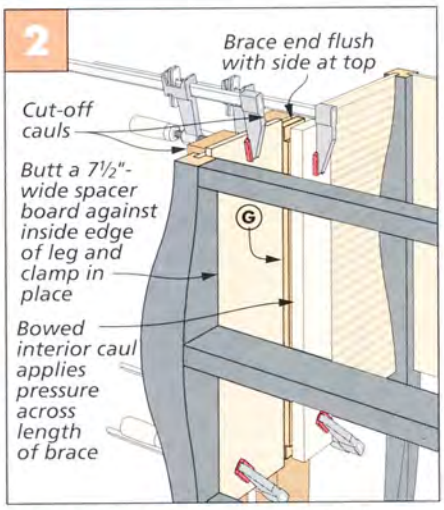
Finally, install an auxiliary rip fence and bury the dado blade to expose only ½". Then, cut the rabbets on the upper and lower edges of the drawer guides. Be sure to use a push block, as shown in Figure 6. Detail '6a' shows the dimensions for this cut.

All that remains now is to drill the countersunk screw holes in the ends and center of the drawer guides. Detail 'b' on the opposite page shows the locations. Now install the guides, making sure the short rabbet is on the front leg. Then you just screw the guides in place, centered in the opening.

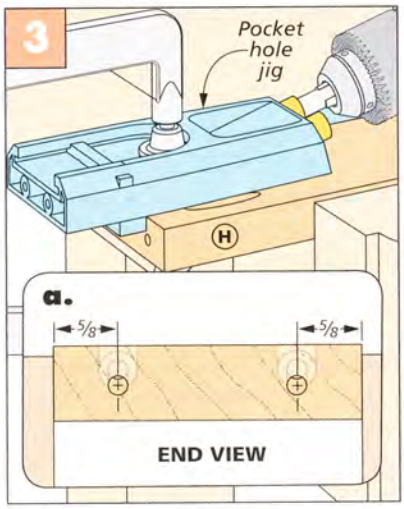
How-To: INSTALL BRACES & GUIDES



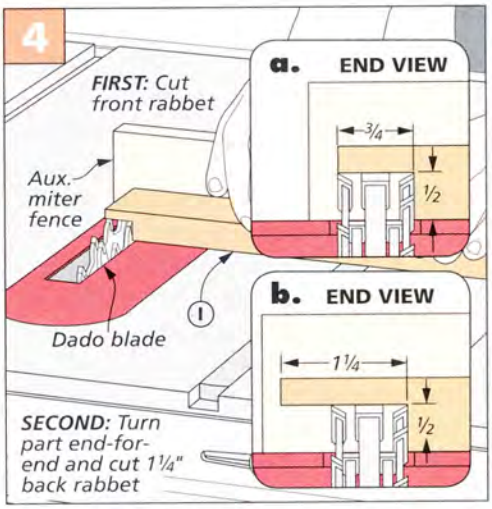
Fitting the Brace. After cutting the brace at the band saw, sand the curve smooth, checking the fit against the side.



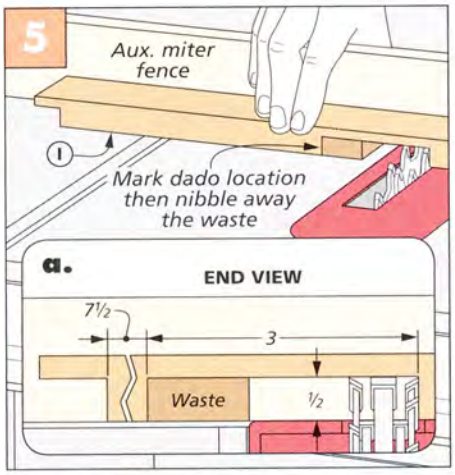
Positioning. Use a spacer board clamped to the sides to position the braces. Then you can add the glue.



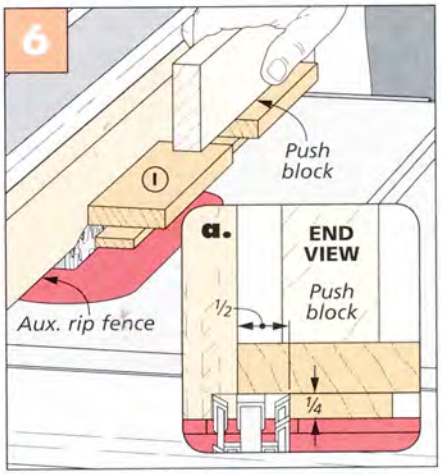
Pocket Holes. You'll need to drill a pair of pocket holes in each end of both stretchers for a solid assembly.



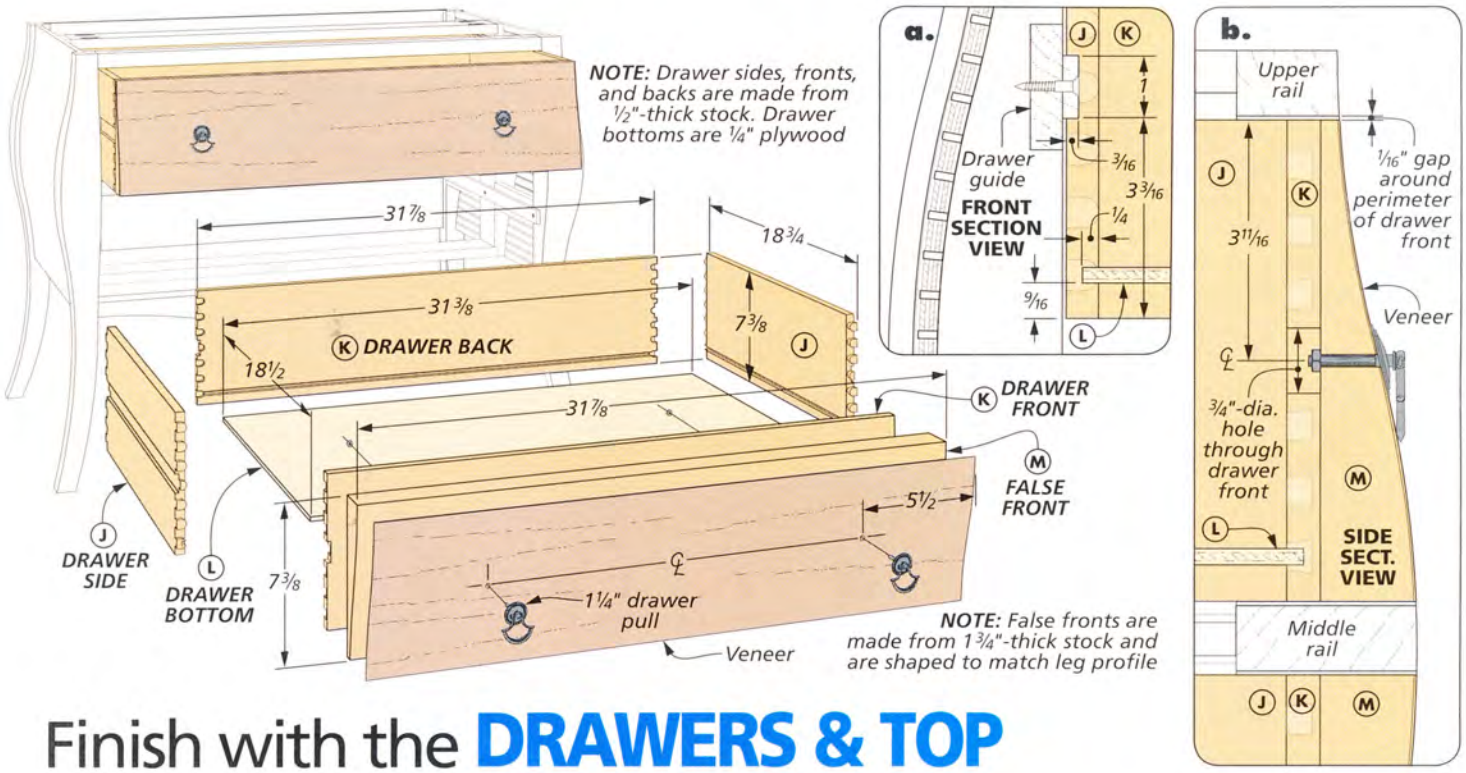
Rabbet. The first step in making the drawer guides is to cut rabbets on the ends of the blanks to fit over the legs.



Center Dadoes. Mark the position of the dadoes that fit over the braces. Remove the waste with a dado blade.



More Rabbets. Attach an auxiliary rip fence and bury the dado blade to cut the rabbets on the edges of the guides.



Finish with the DRAWERS & TOP

The two large drawers give the chest plenty of storage space. I used my dovetail jig for the joinery. While the assembly of the boxes is routine, the false fronts are anything but. They need to be shaped to match the profile of the legs. It may sound like a daunting task, but I found a method that makes it easy to do. After that, all that remains is to build the top and put it all together.

DRAWERS. I used poplar for the drawer fronts, backs, and sides. Follow the instructions for your dovetail jig to cut half-blind joints. The left drawing below gives you an idea of the spacing. The center drawing shows how to cut the groove for the plywood drawer bottom.

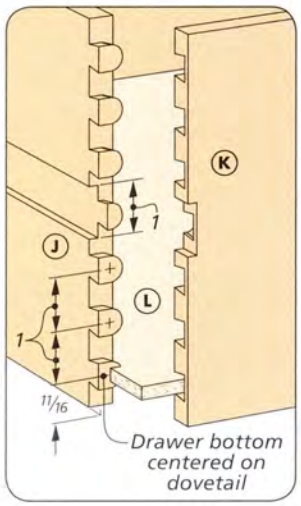
Now you can cut the drawer bottoms to final size and assemble the drawers. After cleaning up the glue, cut the shallow grooves for the drawer guides as shown in the right drawing below.

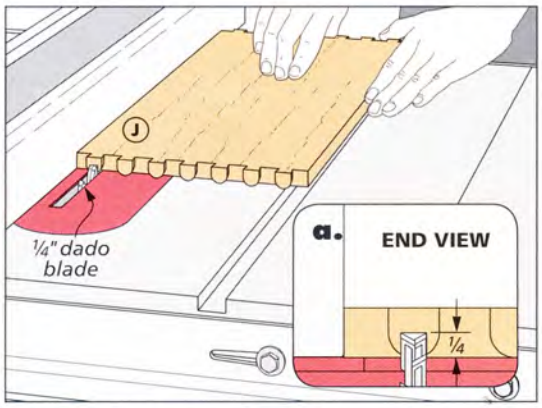
FALSE FRONTS. You'll need some thick stock for the false fronts in order to accommodate the curves. After cutting the blanks to size, drill the holes for the pulls while the stock is still square. You can see how I shaped the drawer fronts in Shop Notebook on page 31.

Before you start, however, you'll need to mark the profile on the blanks. For that, install the drawers in the chest, making sure they slide easily while pushing them in. Then, hold the blanks in place and trace the leg profiles on the edges of the blanks. Make sure to mark which is which to avoid confusion.

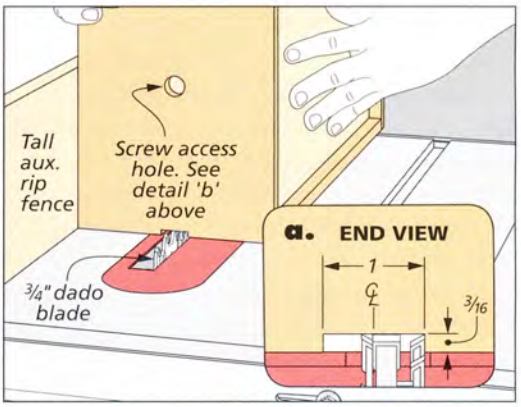
When you're done, a final sanding will prepare the blanks for veneer. Once again, I used contact cement to attach the veneer. After installing the veneer, trim it flush with the drawer fronts. Now install the drawer pulls with screws in the holes you drilled earlier.

How-To: MAKE DRAWERS





Groove. The groove for the plywood bottom needs to be located in the center of a tail so it's not visible after assembling the drawer.



Guide Dado. Cut the centered groove in the drawer sides, by making one pass. Then flip it end-for-end and make another.

CLEATS & TOP

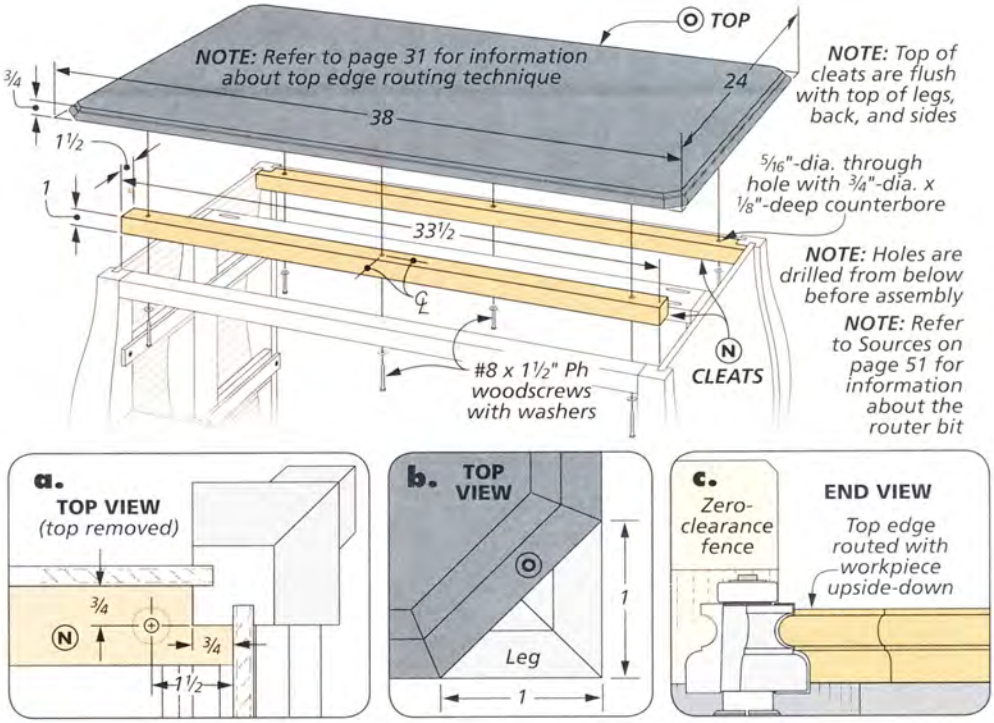
The final step is to add a pair of cleats and the top. The cleats are mounted on the front and back, allowing you to attach the top with screws.

CLEATS. Before cutting the cleats, measure between the tops of the legs at the sides. This way, you'll get an accurate length for the two cleats and you can cut them to final size. Then drill the counterbored screw holes as shown in the main drawing at right. At this point, you can glue the front cleat in place, attached to the front rail.

For the back cleat, I cut a notch to fit the ends around the corner of each leg. Detail 'a' has the dimensions for the notch and shows how everything fits together. With both cleats installed, you can turn your attention to the top.

THE TOP. I had to glue up narrow stock to attain the necessary width for the top. After the glue dries, clean up the squeezeout and sand the top smooth.

In the main drawing, you can see that I beveled the corners as a decorative detail. The dimensions of the corners are shown in detail 'b.' You could cut the corners with a jig saw, but I found it was easier to cut them with a hand saw.



Use a combination square to mark the 45° angle for the cut. After cutting off the corner, a sanding block makes it easy to sand away the saw marks and leave a nice, smooth surface.

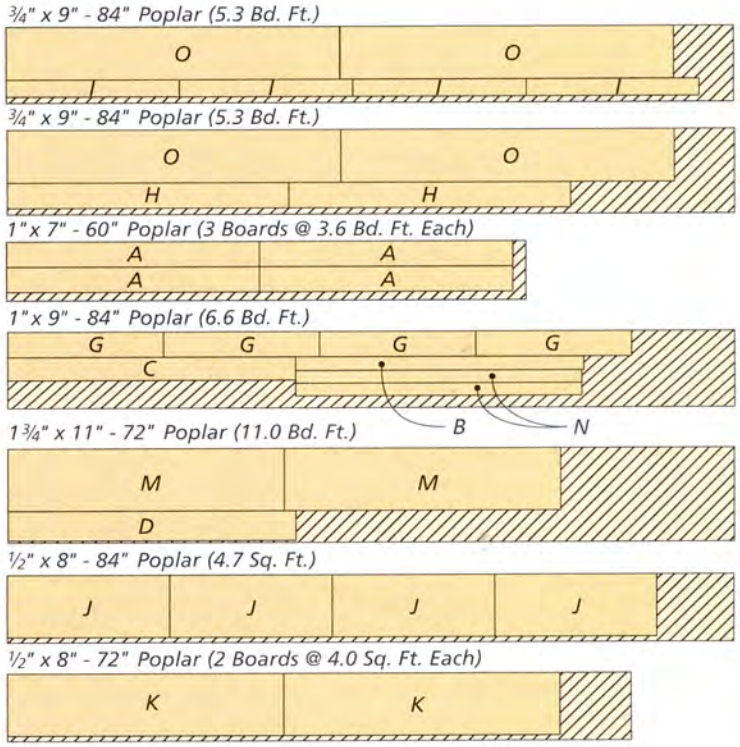
Routing the edge profile presents a bit of challenge. It has to be done at the router table, since there's nothing for the bearing of the bit to ride on. That's not a problem for the long edges, but the narrow corners could easily be caught in the bit opening. You can find out how I solved the problem on page 31.

After painting the top to match the legs, attach it to the chest with screws through the cleats. Then I sprayed a couple of coats of lacquer on the project, and it was ready for its new home.

Materials, Supplies & Cutting Diagram

A	Leg Blanks (4)	3 x 3 - 29 1/4
B	Upper Rail (1)	1 x 1 5/8 - 33 1/4
C	Middle Rail (1)	1 x 2 3/4 - 33 1/4
D	Lower Rail (1)	1 3/4 x 3 1/2 - 33 1/4
E	Back (1)	3/8 ply. - 18 x 32 3/4
F	Side Panels (2)	3/8 ply. - 18 5/8 x 18 3/4
G	Side Braces (2)	2 x 3 - 18
H	Upper/Lower Stretchers (2)	3/4 x 3 - 32 1/2
I	Drawer Guides (4)	3/4 x 2 - 20
J	Drawer Sides (4)	1/2 x 7 3/8 - 18 3/4
K	Drawer Fronts/Backs (4)	1/2 x 7 3/8 - 31 7/8
L	Drawer Bottoms (2)	1/4 ply. - 18 1/2 x 31 3/8
M	False Fronts (2)	1 3/4 x 7 3/8 - 31 7/8
N	Cleats (2)	1 x 1 1/2 - 33 1/2
O	Top (1)	3/4 x 24 - 38

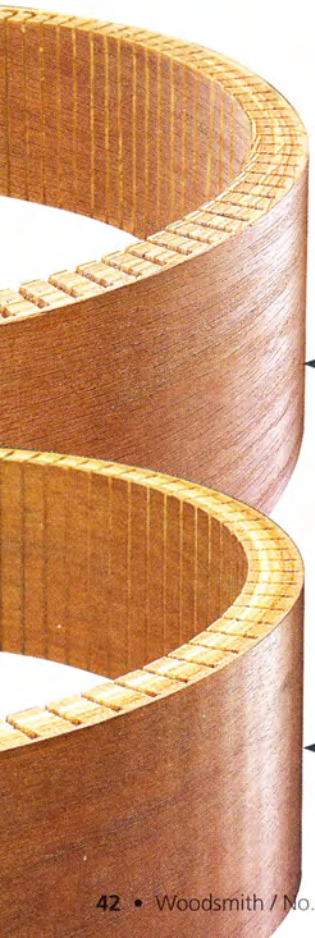
- (12) #8 x 3/4" Fh Woodscrews
- (8) 1 1/4" Pocket Hole Screws
- (6) #8 x 1 1/2" Ph Woodscrews w/ Washers
- (4) 1 1/4" Drawer Pulls
- (1) 2' x 8' Sheet Lacewood Veneer



ALSO NEEDED: One - 60" x 60" sheet 3/8" Baltic Birch Plywood
One - 60" x 60" sheet 1/4" Baltic Birch Plywood

tips for plywood

Kerf Bending



Kerf spacing is critical to achieve a smooth appearance.

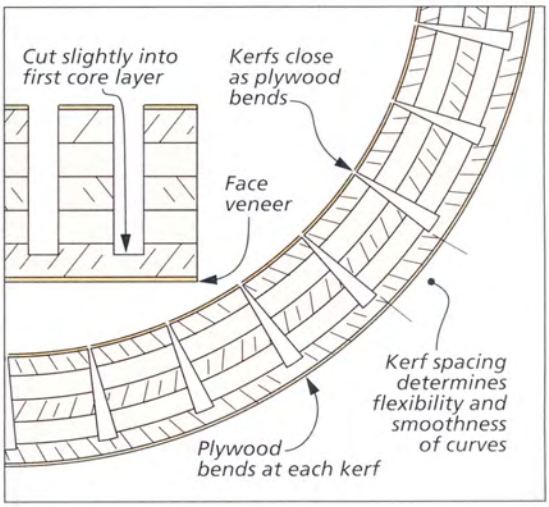
Tight spacing creates a smoother contour

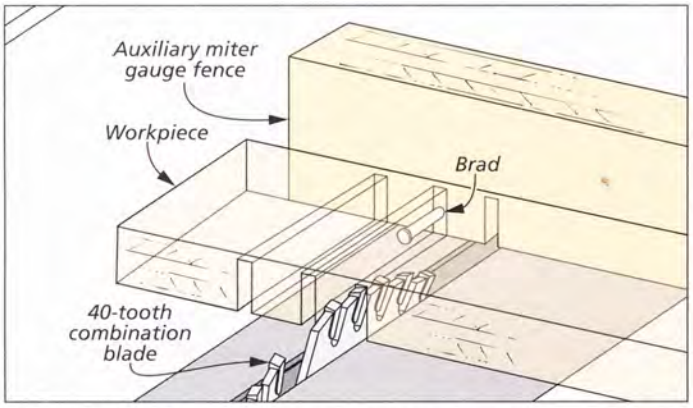
Spacing the kerfs too wide creates flat spots

Woodworking would be pretty boring if we never tried new ideas. An interesting departure from the norm can be breaking away from straight lines and adding a few curves to a project. One easy way to make curved parts is to kerf bend plywood. There's no special equipment required, and the results can be eye-catching. The bombé chest on page 32 is a good example. The main photo above shows how the sides are kerfed and bent to conform to the curved shape of the legs.

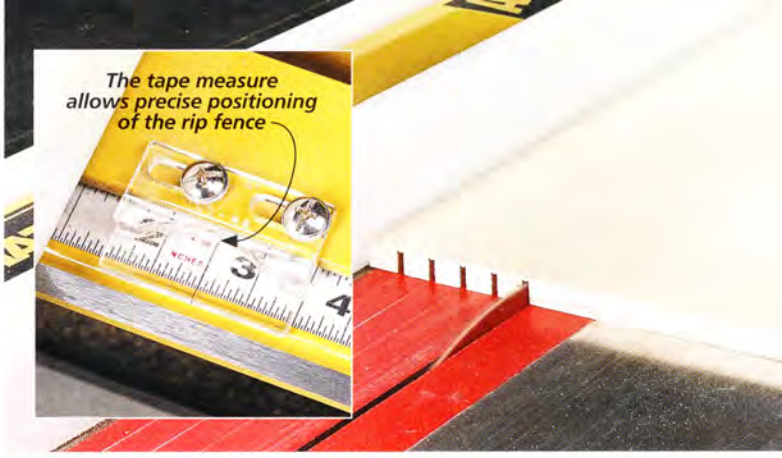
WHAT IS IT? Kerf bending involves cutting a series of regularly spaced deep grooves (kerfs) in the back side of a plywood workpiece. By removing this material, the veneered front face can easily be bent to a fairly tight curve. The depth of the kerfs and the distance between each one determine how tight a bend you can make.

WHY PLYWOOD? You can kerf bend just about any material from hardwood to plywood. But plywood is the most reliable, cost-effective, and easiest material to use. The perpendicular grain of





Kerf Cutting. For narrow project parts, like the curved aprons of a round table, use a miter gauge with an auxiliary fence to cut the kerfs. A brad in the fence acts as a key.



▲ To kerf larger workpieces, you can use the tape measure on the rip fence. When figuring the distance to move the fence between cuts, remember to take the width of the kerf into account.

the adjacent, overlapping plies adds a great deal of strength.

Hardwood plywood is preferred because it uses thin, hardwood plies rather than the thicker, softwood plies found in lower-quality plywood. And Baltic birch plywood reigns supreme with its very thin birch plies and lack of voids. If you're planning to veneer the workpiece, Baltic birch is an excellent substrate. (You'll want to glue the veneer to the plywood before bending to guarantee a good bond.)

DEPTH. As I said earlier, you can cut the kerfs on the table saw. But it takes a bit of patience to get the setup right. Setting the depth of cut is the first task. As a rule, I start with the blade set to just score the last full ply before the veneer. I should also mention that a 40-tooth combination blade cuts clean and works well for kerfing the plywood.

SPACING. The spacing between each kerf determines how tight a curve you can bend. The closer the kerfs, the tighter the possible radius. The drawing on the opposite page shows how the remaining plywood closes up when bent, preventing a tighter bend. I start at around $\frac{3}{8}$" between cuts. This way, you can use the measuring tape on your table saw fence and move the fence $\frac{1}{2}$" after each cut. (The $\frac{1}{8}$" kerf + $\frac{3}{8}$"-wide remainder = $\frac{1}{2}$".) The photo above and the inset show this process in action on a long workpiece.

Once you've made several cuts, you can test the flexibility. If the workpiece doesn't bend as much as you need it to, raise the blade just a hair and make some more test cuts.

When you're done, brush on some mineral spirits and then examine the results with a raking light. This will help you spot any subtle flat spots in the bend that might otherwise go unnoticed until later on, when you add a finish.

These flat spots, also known as telegraphing, are caused by the difference in the flexibility of the solid material left after the cuts and the thin, kerfed voids. The thin areas bend, but the remaining full-thickness plywood will remain flat. The margin photos on the opposite page show you how noticeable the flats can be.

The solution is to narrow the spacing between the kerfs. You can sand the surface lightly when you're done to help blend the two. But obviously you can't sand too deeply in plywood before you burn through the outer veneer of the plywood, or in the case of the bombé chest, the figured veneer. Again, a little bit of experimenting will help you find the right spacing so you can avoid having to sand away any flat spots.

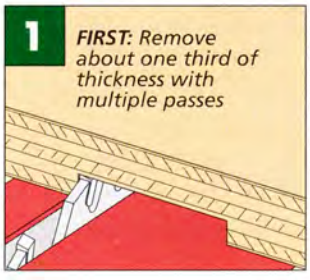
CROSSCUT JIG. When it comes to cutting consistently spaced kerfs in narrow parts, you can use a simple jig. Since this operation is similar to cutting finger joints, you can use the same principle here. But in this case, the accuracy isn't as critical. So instead of a super accurate jig, all you need is a brad in the face of an auxiliary miter gauge fence, like the one shown in the left drawing at the top of the page. After making a cut, shift the workpiece to the right, placing the groove over the brad, and make another cut. You'll find that you can move quickly through the process, even in a large panel.

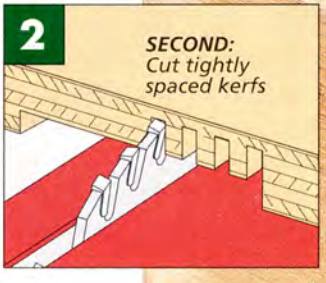
SUPPORTING THE BEND. After kerfing the workpiece, you'll still need a way to support it in your project. In the bombé chest, I fit the curved sides in a pair of grooves on the front and back legs, but I also added a center support. (Refer to page 38 to see you how this works.)

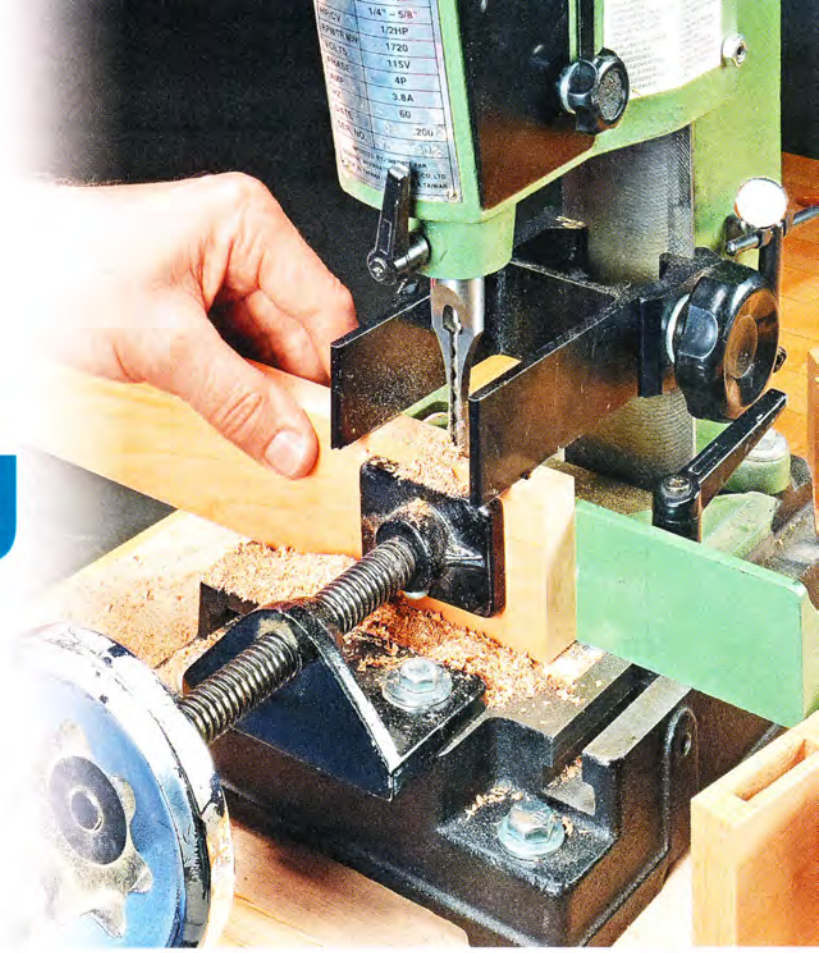
For long bends, a hardwood corner cut to fit will secure the bend and preserve the curve. The photo below shows what I mean and the drawings show how to cut the plywood.

You'll be surprised how easy this technique is to learn. And it will open up a lot of new ideas and possibilities for your projects. W

► When bending a tight radius, you might need to remove more of the plywood. This prevents the plies from closing up and limiting the bend.







mastering the Mortising Machine

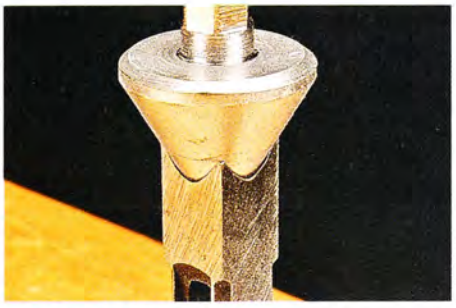
The common approach to making mortises is to drill overlapping holes at the drill press, and then square up the ends and edges with a chisel. It's effective, but definitely time-consuming. A mortising machine, or mortiser, offers a clear advantage in that it creates a square hole, eliminating the chisel work. While convenient, the mortiser does require proper setup and maintenance to get good results. Here's what you need to know.

SUCCESSFUL SHARPENING. A mortising machine is capable of drilling square holes courtesy of a hollow chisel paired with an auger bit. The auger bit drills the hole, while the hollow chisel squares it up in one fell swoop.

Of course, just like any chisel, the hollow chisel used with a mortiser is going to give you poor results if the edges are dull. That's why a good sharpening is critical from time to time to keep your mortising machine working its best. In fact, it might be worth sharpening up these tools right out of the box.

Fortunately, the process isn't difficult. The secret is a hand tool with a cone-shaped sharpening bit that fits into the chisel opening. Just a few twists are all it takes to keep the interior of the chisel clean and sharp (photo, above left). Then several passes on each outside face over a sharpening stone help to remove the burr and finish things up (photo, above right).

▲ To pick up these items for sharpening a mortising machine's hollow chisel and auger bit, refer to Sources on page 51.



Sharpen Chisel. This cone-shaped sharpener is specially designed to hone the inside edges of the hollow chisel.

Remove the Burr. A few passes over a bench stone remove the burrs and get the chisel ready to mortise.

Sharpen Bit. A small file is useful for sharpening the auger bit. The goal here is to clean up the bit and give the tips a fresh cutting face.

While you're at it, it's a good idea to keep the auger bit clean and sharp, as well. This just requires a little handwork with a small file, as shown in the photos above right. The main thing to focus on is the inside faces of the cutting lips. Here again, it only requires a few quick strokes with the file on the different facets of the bit to get good results.

SETTING UP THE CHISEL & BIT. Now that the hollow chisel and auger bit are ready to go, you're nearly prepared to cut some mortises. But first you

need to install them correctly in the machine. For the chisel and bit to work together properly, there needs to be a very small gap between the auger bit and the opening at the base of the hollow chisel. If they're not set up this way, the two components can bind together.

Luckily, there's a trick that you can use to simplify setting up the auger bit and chisel properly. The basics are covered in the two illustrations below. Essentially, what you do is set the chisel in the machine first, placing a penny between the shoulder of the chisel and the chisel housing above it. Then tighten the knob to lock the chisel in place.

Next up is the auger bit. Slide it into place, lining it up flush with the bottom of the chisel, and then tighten it into the chuck. At this point, all that's left is to loosen the knob holding the chisel, remove the penny, and then slide the chisel up. Square the chisel with the fence before retightening the set screw. The chisel and auger bit should now be perfectly aligned with the proper amount of space between them.

MORTISING THE RIGHT WAY. A sharp and tuned-up mortising set gives you a great start toward accurate mortises. But you still need to employ sound techniques in order to get good results. First, it's important to remember that making a mortise is a fairly aggressive cut, especially in a hardwood workpiece. That's why it's important to use the machine's hold-down to keep the workpiece in place, as shown in the drawings below.

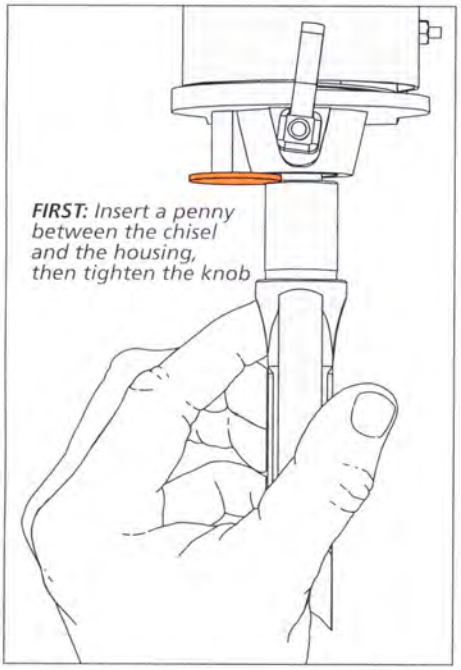
Also, don't force the bit into the wood. Instead, take small bites, and back the bit off frequently to clear dust and chips. This will help reduce friction and heat buildup.

There's also a specific sequence that I recommend when it comes to cutting along the length of the mortise. Some people simply cut overlapping holes, but I have found that this can cause the chisel to deflect toward the unsupported side of the hole.

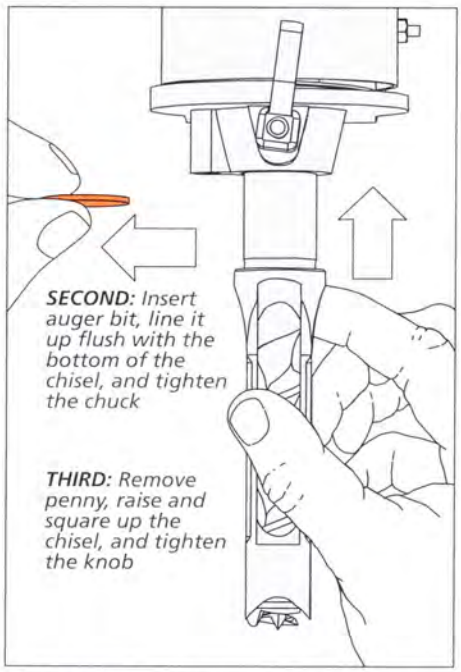
Instead, I suggest cutting the two ends of the mortise first, as shown in the lower left drawing. After establishing the end points, create a series of staggered holes across the length of the mortise, with a thin "bridge" of material between each one (middle drawing). This allows each hole to be fully supported on both sides.

Now you can remove the waste between the holes, as shown in the lower right drawing. At this point, the amount of material remaining in the mortise should be so small that it's easy to remove without the cut deflecting the path of the auger bit or chisel.

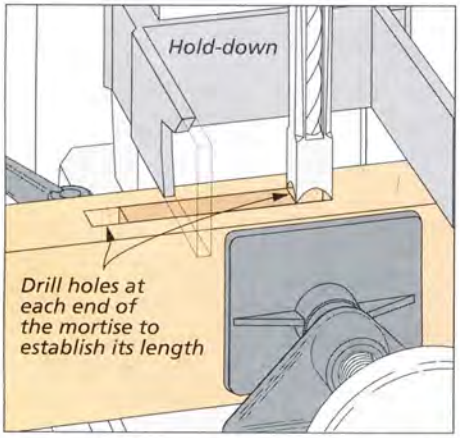
A HANDY WAY TO MORTISE. If a project calls for a lot of mortises, it's tough to beat the convenience of making them all with a mortising machine. When set up properly, it produces great results without all the arduous chisel work required to square up the edges. W



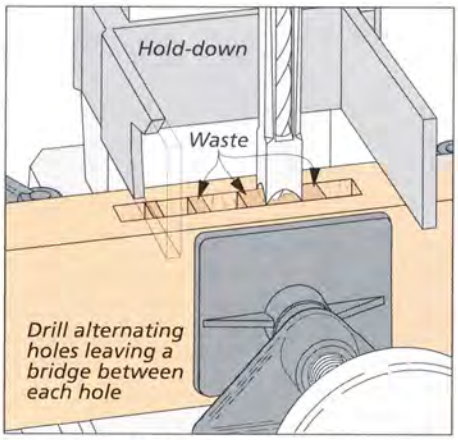
Use a Spacer. A penny makes the perfect spacer between the chisel and bushing when setting up the mortiser.



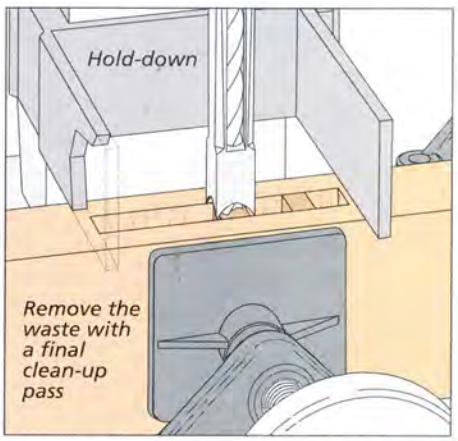
Final Fitting. After installing the bit, remove the penny and slide the chisel up into its final position for use.



Start with the Ends. The ends are the most critical cuts on a mortise, so it's best to create those holes first.



Staggered Holes. Now work your way across the mortise, leaving a bit of material between each hole.



Clean-Up Pass. Then go back across, removing the waste and completing the mortise with a final pass.

secrets for

Sawing Straight

The old joke goes, "How do you get to Carnegie Hall?" The answer, "Practice, practice, practice." The same can be said of hand tool skills. Sawing to a line or layout mark is a good example of this idea. Unfortunately, most hand tools don't come with an owner's manual. So you're on your own when it comes to operating a hand saw. The good news is, all it takes to make it a precision woodworking tool are patience, knowledge, and, yes, a little practice.

I should confess from the outset that I use power tools for the bulk of my sawing tasks, but my hand saws still see plenty of action. I enjoy the quiet in my shop without the noise of a table saw.

It doesn't matter if you prefer a Western saw or a Japanese-style saw. Either one can give you very high-quality results. And despite the fact that they cut differently, (Japanese saws cut on the pull stroke), the techniques for using them have many similarities.

▲ A bench hook consists of a base and a pair of cleats. One cleat fits on the underside and anchors to the edge of your bench. The other is a fence for the workpiece.

MARKING. Before you pick up a saw, you need to mark where you're cutting. This might sound like an obvious step, but making a proper mark that runs the length of the cut is important, especially when you're working on honing your skills. I use a pencil for marking saw lines. Learning to saw right next to the line (on the waste side, of course) is what it's all about.

HOLDING YOUR WORK. Half the battle of sawing accurately is holding the workpiece steady and supporting the cut. Each type of cut often requires a different solution, but a good bench vise will solve many of your problems. With a vise, you can secure the workpiece in the correct orientation for a variety of cuts (main photo above). The traditional bench hook shown in the photo at left is an effective method as well. And for a coping saw, a special bird's mouth board works well (see the box on the opposite page).

POSTURE. Good posture not only sets you up for success, but it can make the difference between working all day and knocking off early with a sore back. It's not a big deal if you're only making one or two cuts, but cutting a few dovetailed drawers without using proper posture can make for an uncomfortable day, at the very least. The photos at the top of the facing page have a few tips for developing good sawing posture.

GRIP. How you hold the saw will play a big role in determining your success. A light but firm grip may sound like a

For angled cuts like dovetails, tilt the workpiece in the vise to match the angle. Then you can make a straight cut.

Good posture not only helps your back, but your woodworking, too. Stand as straight as possible with your elbows close to your body.

contradiction, but that's what you need. Point your index finger in the direction you want to cut, but keep the other fingers fairly loose on the handle, especially when starting the cut. The index finger advice goes for pull saws, too.

STARTING THE CUT. With the line marked and the workpiece ready, place the blade of the saw on the workpiece and use your thumb or knuckle as a guide to start the cut. This works for both push and pull-cutting saws.

For Western saws, I like to start a crosscut using the teeth closest to the handle. This gives me a little more control as you establish the line. For a rip cut, the teeth toward the end of the blade are sometimes ground to make starting easier. With a Japanese saw, I start both crosscut and rip cuts near the handle.

CUTTING. There are a few things to focus on while making the cut. Again, some practice will make these skills second nature. First, try to keep the blade on a consistent line, just kissing the pencil mark (right photo). You'll find this is easier to do if you keep your elbows, shoulder, and wrist in line with the blade of the saw. By doing so, you'll naturally avoid tilting and twisting the saw blade. It might feel awkward at first, but it won't take long until it feels natural.

Next, make long strokes, using the full length of the blade to take advantage of the tool. Avoid a short, choppy action in favor of a smoother, longer stroke. This will also help keep the saw cutting straight. Above all, don't try to push down or force the saw. Just maintain a light pressure and let the blade do its job.

No matter how useful your power tools are, you'll find that there are plenty of situations when a hand saw is a good option. Proper hand saw technique will pay off in just about every project you build. Before long, you'll wonder how you got along without it. W

As you practice, work on just barely touching the pencil line. The closer you can get, the less you'll need to clean up.

COPING SAW CUTS

A bird's mouth board allows you access to every part of the workpiece.

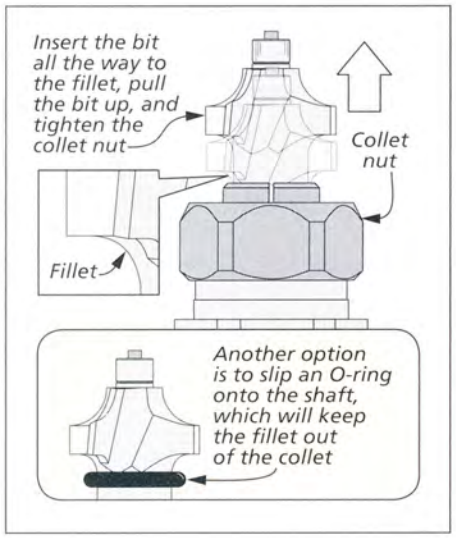
When it comes to making a curved cut, I reach for my coping saw. But like the other cuts shown above, you need a way to hold the workpiece.

The traditional method for holding a workpiece in this case is a bird's mouth board. The inset photo at left shows how this handy device got its name. The notch at the front looks like a bird's beak. The "mouth" allows you to move the saw blade around. You hold the workpiece by hand on the board, so it's easy to turn it to any angle you need to complete the cuts.

hand-held

Router Tips & Tricks

Few woodworking tools are as versatile as the router. Whether you use it for cutting rabbets (above), making frame and panel doors, or adding profiles to parts, a router can handle almost any task you give it.



But when you're just getting started, using a router isn't exactly intuitive. There are no gauges, scales, or fences on most routers. That's why some sound advice before setting up and using a hand-held router is often a good idea.

SECURING ROUTER BITS. On its own, a router isn't going to do much. You need to outfit the router with a bit to do the cutting. And even this requires a few basic steps in order to do it right.

▲ It's possible to over-tighten a router bit in the collet. By using one hand to tighten, you can avoid over-tightening, as well as pinched fingers.

To secure the bit in the router, you'll slide the bit's shank into a chuck known as a collet and tighten the collet nut (drawing at left). But you don't want to just stick the bit in as far as it will go and tighten the nut. That's because most router bits have a rounded portion at the top of the shank called a "fillet." If you were to tighten the collet on this fillet, it wouldn't get a firm grip on the shank, and the bit could slip in use.

To prevent this, you'll need to insert the bit all the way, and pull it back out past the fillet before tightening the nut. Another option, shown in the drawing at left, is to slip a rubber

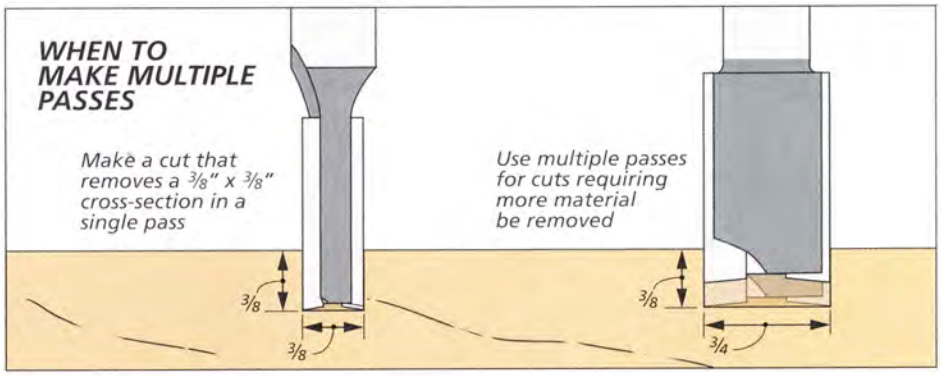
O-ring around the shank of the bit. This prevents the shank from seating too deeply in the collet.

Tightening the collet nut is done with either two wrenches or one wrench and a spindle lock, depending on your router model. You can actually over-tighten the collet if you're not careful, so a good rule of thumb is to tighten it by hand, and then add another one-third turn. I like to finish up by squeezing the wrenches with one hand to avoid pinching my fingers (lower right photo, opposite page).

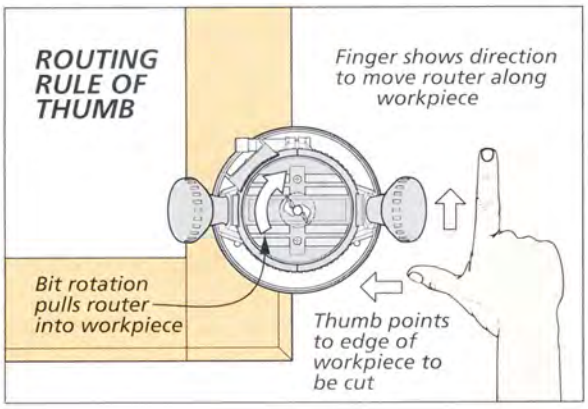
SET UP TO CUT. Once the router bit is secured, adjusting the cutting depth is the next order of business. This is usually a matter of adjusting the base until the bit emerges through the opening.

Before actually routing my workpiece, I like to set the end of a steel rule on the router base and hold it up to the side of the bit. This way, I can make sure the router bit is set up to match the depth of cut I want to make. Then I'll make a test cut in a scrap piece as a last check before I move along to the actual workpiece.

MULTIPLE PASSES. Sometimes, the profile of a cut made by a router is too large to be formed in just a single pass. In these instances, you'll need to reduce the size of the "bite" taken by the router bit and make the cut in a series of passes. The illustration above gives you a good guideline of how to handle these situations.



GO THE RIGHT DIRECTION. The first time you you use a router, the direction that you are supposed to move the tool along the wood is not readily apparent. But moving the router in the wrong direction can cause it to grab the workpiece and even pull free from your hands. To prevent this, you want to move the router against the rotation of the bit. And there's an easy way to figure out which direction to rout.



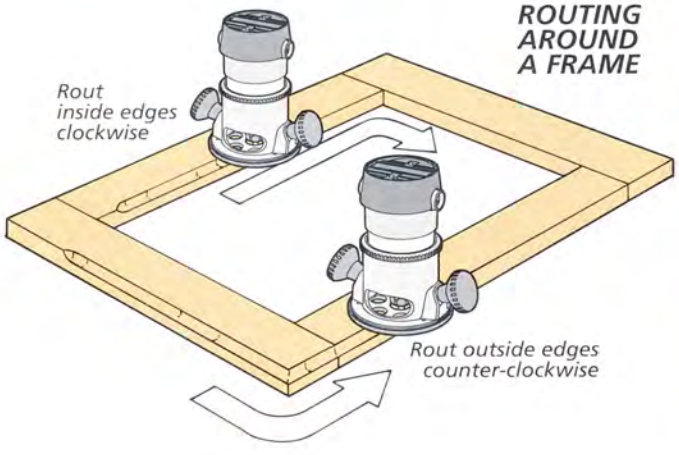
To rout in the proper direction, just refer to the illustration at left. You simply hold your right hand over the router in a backward "L" shape. Point your thumb at the edge to be cut, and your index finger shows the direction to move the router.

The only other place where you can sometimes get mixed up is when you're routing the inside or outside edges of a frame. But here again, the right hand trick still applies, as shown in the lower left illustration.

SECURE YOUR WORK. When routing with a hand-held router, the last order of business is to secure the workpiece so that you can rout safely. If you're making light passes, then a non-slip mat like the one shown in the main photo on the opposite page works great for keeping the workpiece in place.

Clamps or bench dogs can also hold pieces securely while routing, but you'll need to make a couple of extra considerations when using them. Clamps sometimes interfere with the path of the router, so I tend to reserve them for situations when I'm only routing one edge of a workpiece. Bench dogs are also effective, but you'll want to make sure the bit and bearing will safely pass over the top of them. For this reason, I tend to use them mainly for thick pieces (photo below).

READY TO ROUT. Few woodworking tools are more enjoyable to use than the router. Once you understand the basics of the tool, it opens up a wide world of woodworking possibilities.



▲ Bench dogs can be a useful workbench accessory when routing. Just make sure they rest safely below the path of the router bit and bearing before making a routing pass.

questions & answers

tips & tricks for

Better Planing

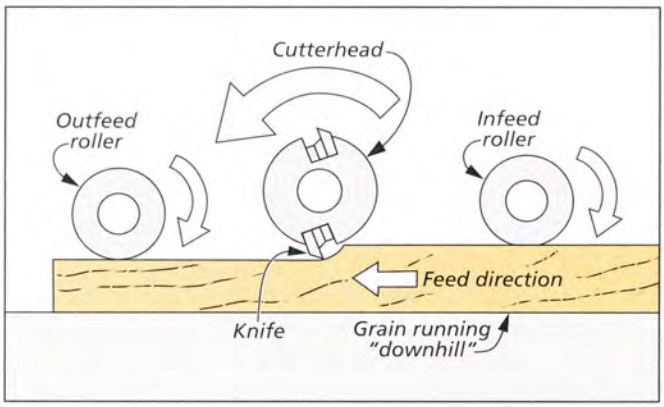
Q *My planer keeps leaving chips and divots in the surface of my boards. What am I doing wrong?*

Logan Plymale
Brunswick, Georgia

A Almost every woodworker has experienced chips or divots, called tearout, while using a planer. There are many factors that can lead to this happening. Fortunately, there are several steps you can take to help alleviate this problem in the future.

SHARP KNIVES. One of the easiest things to overlook on a planer is the cutting knives. The heat that builds up during use dulls the edges over time. You can usually notice the knives losing their edges because the planed boards will have a shiny, burnished look to them. The planer may sound louder as well. If neglected for too long, this can result in tearout. How frequently you'll need to sharpen or replace the knives depends on several factors: How often the planer is used, the hardness of the stock planed, the depth of cut taken, and the feed rate of the planer all play a role.

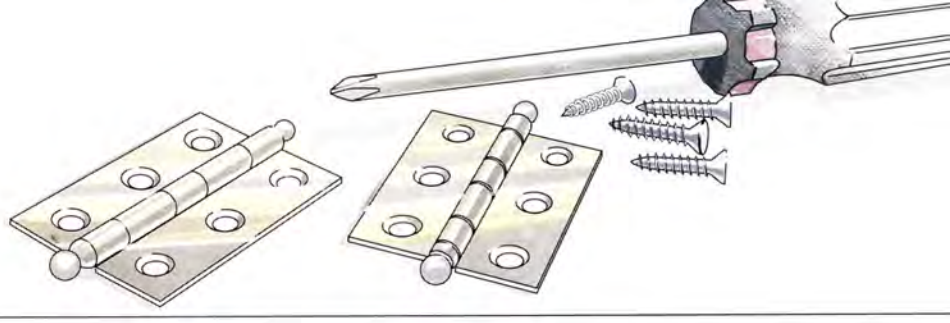
GRAIN DIRECTION. Feeding boards through the planer with the grain running "uphill" is another cause of tearout. The cutterhead rotation is shown in the illustration to the left. The key is to run stock through the planer so the grain runs "downhill" into the cutterhead as shown. This will keep the knives from digging into the grain, lifting it, and leaving deep nicks in their wake. If the grain direction of a board isn't consistent, I make a judgement call on the best feed direction.



WATCH YOUR DEPTH. Trying to take too deep of a cut is another thing that can lead to tearout. But how much material you remove with each pass will depend on your end goal. It's alright to make deep cuts if you need to remove a large amount of material. But when you start to get close to the desired thickness, pare back the cuts to 1/64" or less. The light passes will greatly reduce the risk of tearout on the boards surface.

CHIP ACCUMULATION. It's also important to have adequate dust collection when using a planer. If left to accumulate, the chips and shavings can get stuck to the feed rollers and then compressed into the freshly planed surface of the board. This will leave behind tiny pockmarks, or divots. At a minimum, use a large shop vacuum capable of pulling out the shavings to keep them from building up in the machine.

The next time you head to the planer, follow these simple steps. They'll go a long way toward leaving a smooth and tearout-free surface. W



hardware & supplies
Sources

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

SMALL BOX HINGES *(p.8)*

- **Lee Valley**
  Brusso Quad. Hinge . . 01B05.01
  Soss Invisible Hinge . . .00H02.02
- **Rockler**
  Lid Support Hinge 49162
  Side Rail Hinge. 11040
  Brusso Stop Hinge 70391
  Solid Brass Box Hinge . . . 21962

PORTABLE BENCHES *(p.10)*

- **The Home Depot**
  Keter Work Table 197283
  Vika Workbench V16200G1
  Jawhorse Sheetmaster . . . RK9002
  Workmate 425. 202516382
- **Woodcraft**
  QuikBENCH 154760
- **Sears**
  Skil Xbench. 311502

ROUTER LIFTS *(p.14)*

- **MLCS**
  U-Turn Router Lift 9563
  U-Turn 2 Router Lift 9562
- **Kreg Tool**
  Precision Router Lift . . PRS3000
- **Rockler**
  Porter-Cable 895PK 27168
  Wixey Digital Readout . . 25773

SUPER-SIZED HOLES *(p.16)*

- **Amazon**
  Router Circle Jig . . B00009K77A
  Circle Cutter. B00004T7P1

SLANTED-LID BOX *(p.18)*

- **Van Dyke's**
  Decorative Hinges. 201070
  1"-dia. Wood Knobs 214407
- **Lee Valley**
  1½" Finish Nails. 91Z40.44
  1" Brad Nails 91Z40.25

To age the box, I started by distressing the outside with random dents. I then sanded sharp edges, around knobs, along drawer edges, corners of the lid, and any place that would typically show the most wear. Next, I sprayed on one light coat of lacquer. This keeps the stain from soaking in too much. One coat of *General Finishes'* "Java" gel stain followed by one more coat of lacquer completes the box.

SINK STAND *(p.22)*

- **The Home Depot**
  Vessel Sink. 1417-8-CWH
  Faucet F-049-YW2K

The sink stand was stained with *Minwax* "Aged Oak" gel stain. Then three coats of satin polyurethane finish were applied.

BOMBÉ CHEST *(p.32)*

- **Horton Brasses**
  Drawer Pulls H-83
- **Eagle America**
  ⅜" Pattern Bit 117-0612
- **Veneer Supplies**
  2'x 8' Veneer. PBLACE28
- **Amazon**
  Edge-Forming Bit. 54322

The poplar and plywood portions of the chest were painted black. I also brushed on a coat of lacquer mixed with a pinch of red-brown *Transtint* dye. Then, I sprayed on a couple coats of clear lacquer.

MORTISING MACHINES *(p.44)*

- **Rockler**
  Sharpening Set 24727
- **The Home Depot**
  Mini Files 42030L
  Bench Stone 87933

Get the all-new Season 7 DVD set of the *Woodsmith Shop*! The set includes two DVDs with all the episodes plus a CD-ROM with bonus plans and articles. Collect the entire series by ordering individual seasons for $29.95 or save with package deals. Learn more at Woodsmith.com!

DVD Set: Season 7..... $29.95

MAIL ORDER SOURCES

Project supplies may be ordered from the following companies:

Woodsmith Store
800-444-7527

Rockler
800-279-4441
rockler.com

amazon.com

Eagle America
800-872-2511
eagleamerica.com

General Finishes
800-783-6050
generalfinishes.com

The Home Depot
800-466-3337
homedepot.com

Horton Brasses
800-754-9127
horton-brasses.com

Kreg Tool
800-447-8638
kregtool.com

Lee Valley
800-871-8158
leevalley.com

Minwax
800-523-9299
minwax.com

MLCS
800-533-9298
mlcswoodworking.com

Sears
800-697-3277
sears.com

Van Dyke's Restorers
800-558-1234
vandykes.com

Veneer Supplies
veneersupplies.com

Woodcraft
800-225-1153
woodcraft.com

online extra

Double Sink Option

Connect two sink stands in a master bathroom with these simple wood shelves.

The sink stand in issue No. 212 of *Woodsmith* is great for a small bathroom. But you can convert it for use in a master bathroom with double sinks. As you can see at right, it's just a series of shelves that span the gap between two sink stands.

The top and middle shelves are glued-up, solid-wood panels. The top shelf is notched on all four corners to fit around the legs of the sink stands. Just like the bottom shelf on the sink stand itself, the bottom shelf here is made up of narrower slats attached to cleats.

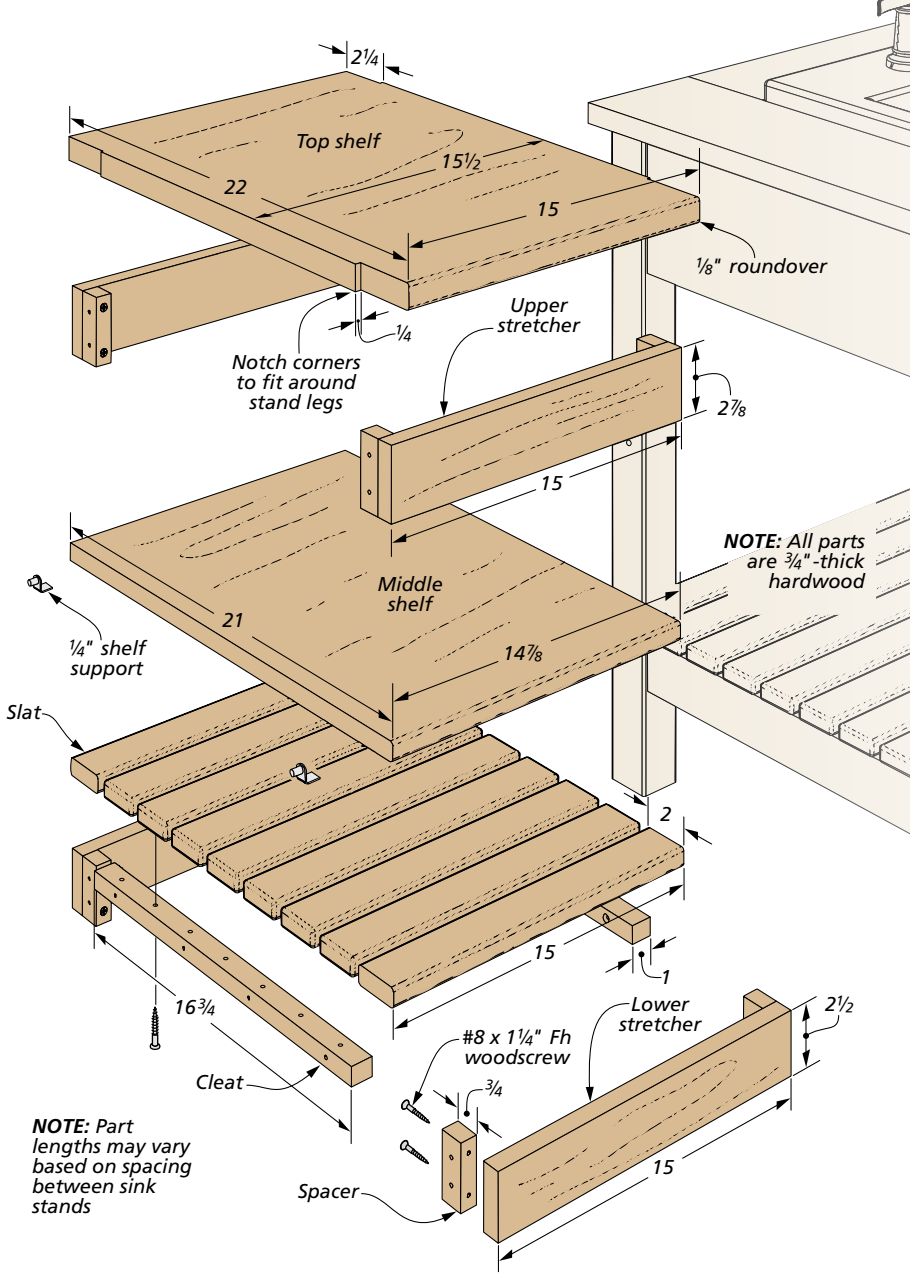
The top and bottom shelves are installed on stretchers that align with the stretchers on the sink stands (see detail 'a'). Between these two shelves is a middle shelf that rests above shelf supports installed in the sink stands' legs.

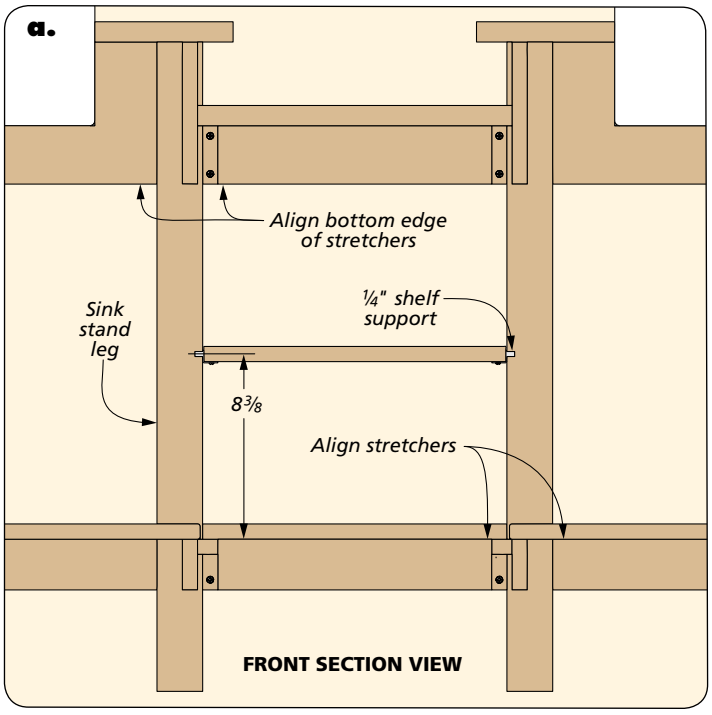
SIZING THE SHELVES. Before making the shelves, keep in mind that the size of the parts will vary based on your bathroom's layout. So take careful measurements before sizing the parts.

INSTALLATION. Once the parts are sized, however, installation is a breeze. As you can see at right, the stretchers have small spacer blocks screwed to the ends. After you attach these spacer blocks to the stretchers, all you have to do is align the shelf stretchers with the sink stand stretchers, as shown in detail 'a.' Then drive screws through the spacers and into the stand legs to secure them.

The top shelf simply slips in place between the sink stands, and the notches at the corners will keep it positioned properly in its opening. As for the bottom shelf, the slats are attached to two cleats following the same procedure that you used to install the shelf slats on the sink stand.

To add the middle shelf, carefully measure and lay out holes for shelf supports in the legs of the sink stand, as shown in detail 'a'. Then drill holes and install the supports. The middle shelf simply rests on the supports.



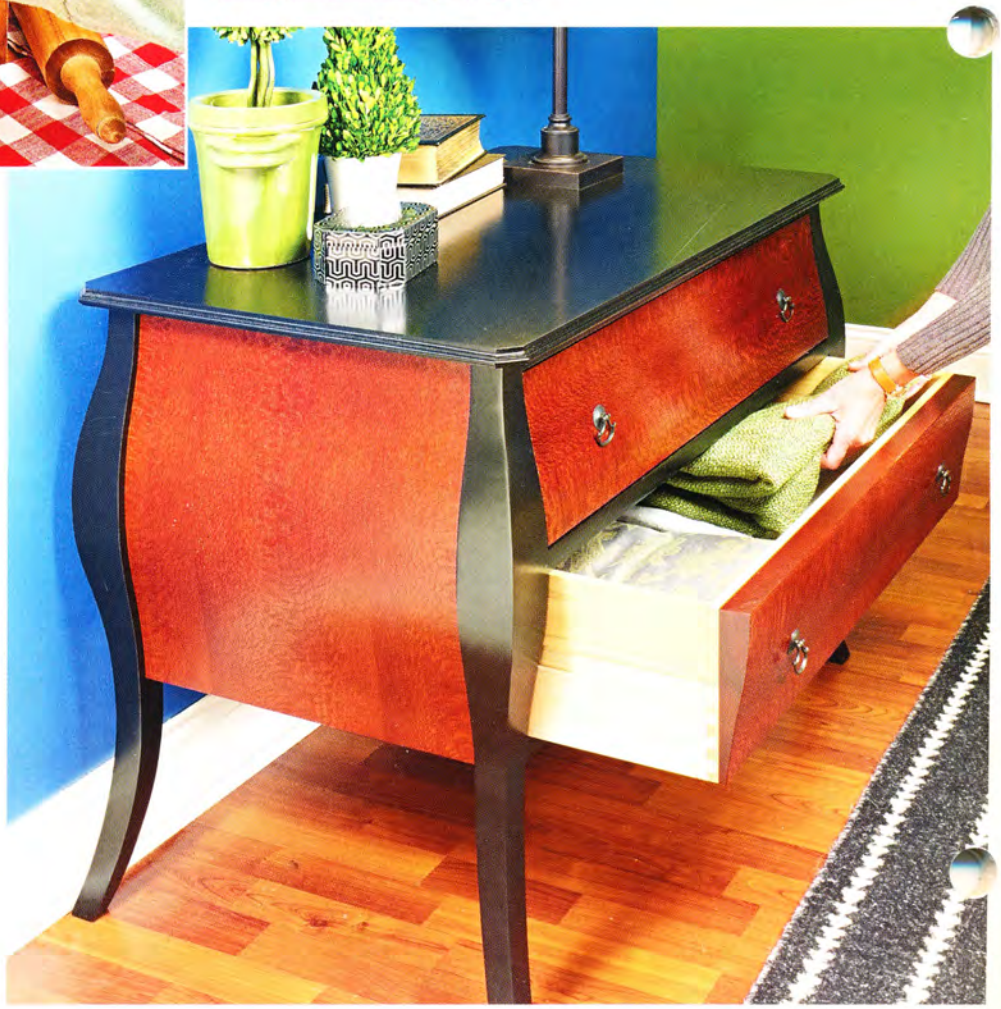


looking inside

Final Details

Sink Stand. This Craftsman-style sink stand will dress up any bathroom. Solid-wood construction and traditional joinery guarantee it will last. Step-by-step instructions begin on page 22.

Slanted-Lid Box. Simple styling, period hardware, and a distressed finish give this countertop box a timeless appeal. Build your own by following the plans on page 18.



Bombé Chest. This heirloom project features flowing lines and graceful curves. But don't be intimidated by the geometry — we've come up with three interesting techniques to simplify the construction. Turn to page 32 to learn how it's done.