

GUILD ♦ EDITION

Woodsmith®

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Made Easy**

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from the editor Sawdust

I've had the opportunity to speak with a lot of woodworkers over the years. During those conversations, I often get to hear the stories of how people first got into woodworking. And I've noticed a common theme among them. Most of these woodworkers will tell you about a special person in their life who introduced them to the hobby and helped them learn as they got started.

In some cases, it's a parent, grandparent, or other relative. Sometimes it's a shop teacher. And other times, it's a neighbor or a friend. But the story is usually the same — that person took them under their wing and not only helped them with the technical aspects of woodworking, but also provided inspiration.

I think it's that face-to-face, one-on-one connection that really makes the difference. Sure, you can learn a lot from reading about something in a book (or magazine) or by watching a *YouTube* video. But there's just no substitute for having someone right by your side, showing you how it's done.

I've certainly had my share of tutors when it comes to woodworking, starting with my own father, right down to the many talented people I work with here at *Woodsmith*. But as we get older, I think it's important to ask ourselves how we might be able to inspire someone else. Perhaps you have a child or grandchild that you can encourage to take up the hobby. How about a local scout group or 4-H club that may be looking for someone with woodworking experience to serve as a mentor? Or maybe you have a friend or acquaintance who has always envied your talent, but just needs a little guidance to take the first step. One thing I've discovered is that helping out someone who is new to woodworking is a great way to reignite your own passion for the hobby.

Of course, one of the best ways to get started is by building a small project together. If you're looking for ideas, you might want to check out the folding serving tray on page 18 of this issue. (That's it shown in the photo above.) It doesn't require a lot of time or materials to build. But with half laps, mortise and tenon joints, and a latticework panel, it offers some interesting challenges for a beginner, as well as the seasoned woodworker.

Vince

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Tips & Techniques

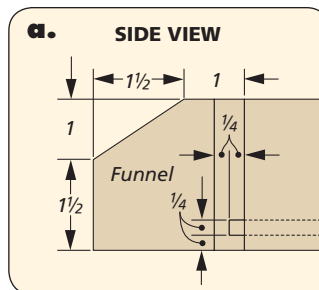
Hardware Sorting Tray

Every woodworker has that can. You know, the one that sits on your shelf and collects miscellaneous hardware and fasteners. Inevitably, I end up dumping out the entire can to fish out the odd piece that I need for a project. It was during one of these “fishing trips” that I decided to build the tray you see above.

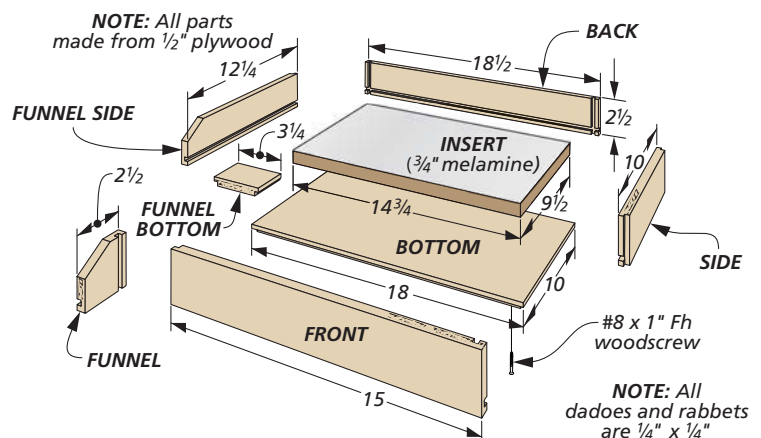
This tray was inspired by a trip to the drugstore where I saw the pharmacist sorting pills on a similar tray. This allows me to easily sort through and pick out what I need. Best of all, the rest of the hardware can be then dumped back into the can using the “funnel” on the end.

CONSTRUCTION. The construction of the tray is straightforward. The sides of the tray are attached to the front and back using tongue and dado joinery. The bottom of the tray is rabbeted to fit in a groove. For the sorting surface, I used a piece of melamine. The thickness of the melamine creates a recess on one end that allows me to shake the hardware back into the can when I’m done, as shown in the inset photo above. If the melamine starts to get damaged and chipped, it’s easy to unscrew the melamine and replace it. Now, I can quickly take my can and empty the contents onto the tray.

Emanuel Ringel
Fort Washington, Pennsylvania



▲ The funnel on the end allows you to easily return all unnecessary fasteners to the container.



Win This Forrester Blade

Simply send us your favorite shop tips. If your tip or technique is selected as the featured reader's tip, you'll win a Forrester Woodworker II blade. To submit your tip or technique, go to SubmitWoodsmithTips.com. There you can upload your tips and photos for consideration.

The Winner!

Congratulations to Emanuel Ringel, the winner of this Forrester Woodworker II. To find out how you can win this blade, check out the information at left.



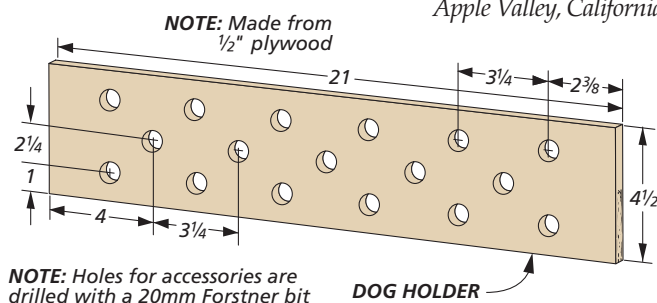
Workmate Dog Kennel

Because I use my *Workmate* all over the house, I'm always losing the bench dogs that came with it. As a simple storage solution, I attached a piece of plywood underneath the worksurface. The piece of plywood "kennels" the dogs when they're not in use, yet keeps them close at hand for when I need them.

BUILDING THE KENNEL. To create the holder, I simply cut a small piece of plywood that easily slips into the channel of the legs of the *Workmate* base (inset photo). A series of holes hold the dog posts, and silicone caulk holds the plywood in place. When the bench is folded, the extra plywood is folded out of the way.

Kris Nelson

Apple Valley, California



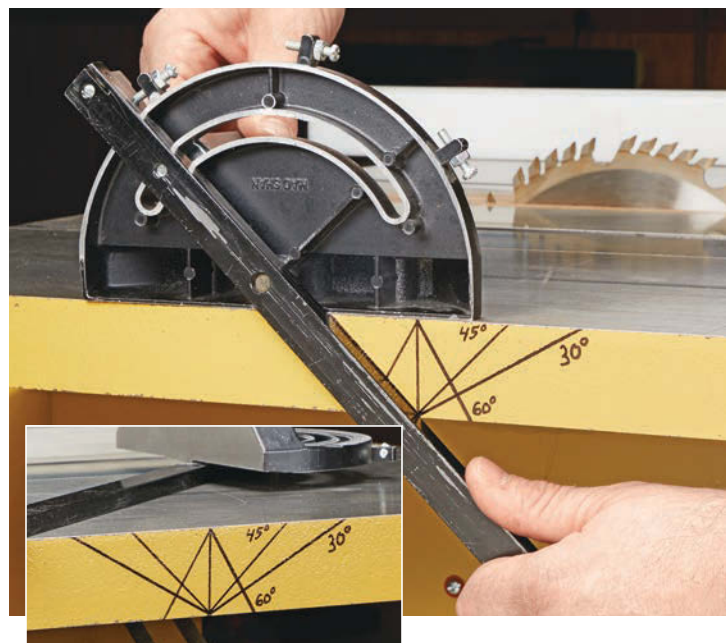
Easy Miter Gauge Setup

In the past, I've never found the marked angles on most miter gauges to be accurate. I've always relied on a plastic protractor to set my miter gauge at specific angles. To speed the set up of angles on my miter gauge, I came up with a quick solution.

As you can see below, I marked common angles on the edge of my table saw table. I simply used a permanent marker and a protractor gauge to draw the lines. You could also use a scribe for a permanent mark. Now, instead of reaching for my protractor, I can simply lay my miter gauge on the table and set the runner to the appropriate angle.

Min-Hao Kuo

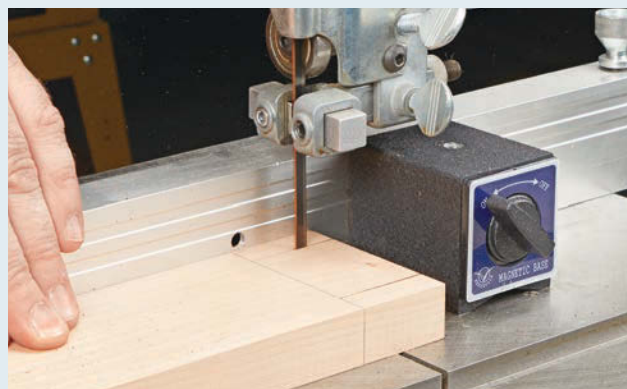
East Lansing, Michigan



QUICK TIPS



At a Glance. Dennis Volz of Des Moines, IA uses dry erase tape and markers to quickly identify set-ups on certain tools. For example, Dennis marks his brad nailer with what length of brad is loaded, and also marks what grit of sandpaper is on his sander.



Band Saw Stop Block. Roger Rayburn of Colorado Springs, CO uses a switched magnetic block on his band saw as a stop block. To quickly change the length of each cut, simply turn the switch to disengage the magnet and reposition. The block can be stored underneath the table for easy access.



▲ A few screws through the connector blocks are all that's needed to attach the two sections of track. Remove the spanning blocks before use.



▲ The combination of a fixed and movable cleat allows the guide to be attached to full or half sheets of material without clamps.

Two-Piece Saw Guide

I got tired of trying to store the long circular saw guide that I use to break down sheet goods. So I came up with the guide you see above.

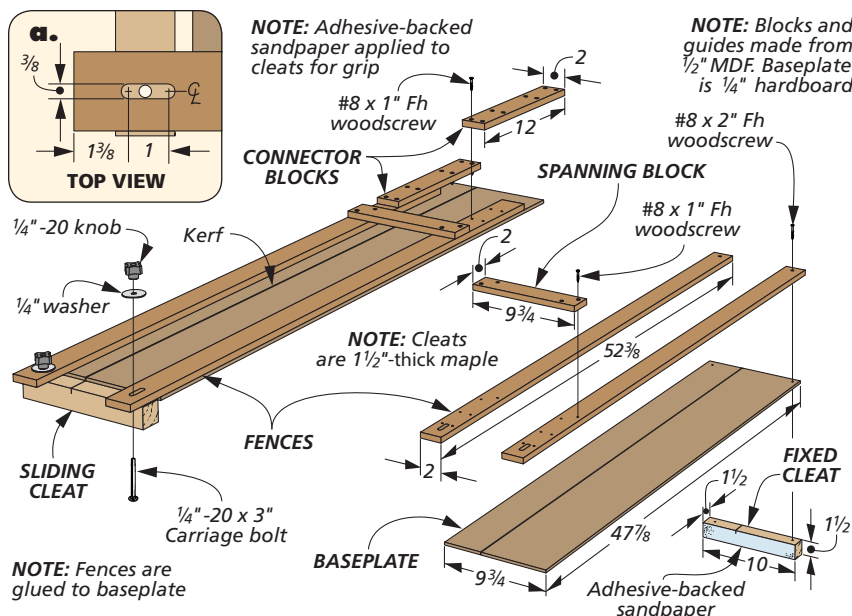
There are a couple of great things about this saw guide. First, it breaks apart into two shorter sections. The shorter pieces are easier to store in the shop than a long guide. Second, the construction method makes it a "zero clearance" guide, so you'll get much cleaner cuts with less tearout.

The guide consists of two hardboard baseplates that have fences along the edges. On one section, a hardwood

cleat is attached through slots in the fences. The slots allow you to slide the cleat to the workpiece, and tighten it in place. The other section has a fixed cleat. A pair of removable spanning blocks keeps the halves connected when the cleats are removed.

To connect the sections, first remove the spanning blocks that hold the track sides together. Next, screw the connector blocks in place. Then, it's a simple matter of tightening the cleats on your workpiece.

*Kent Martzan
Oswego, Illinois*



DIGITAL WOODSMITH

SUBMIT TIPS ONLINE

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

SubmitWoodsmithTips.com

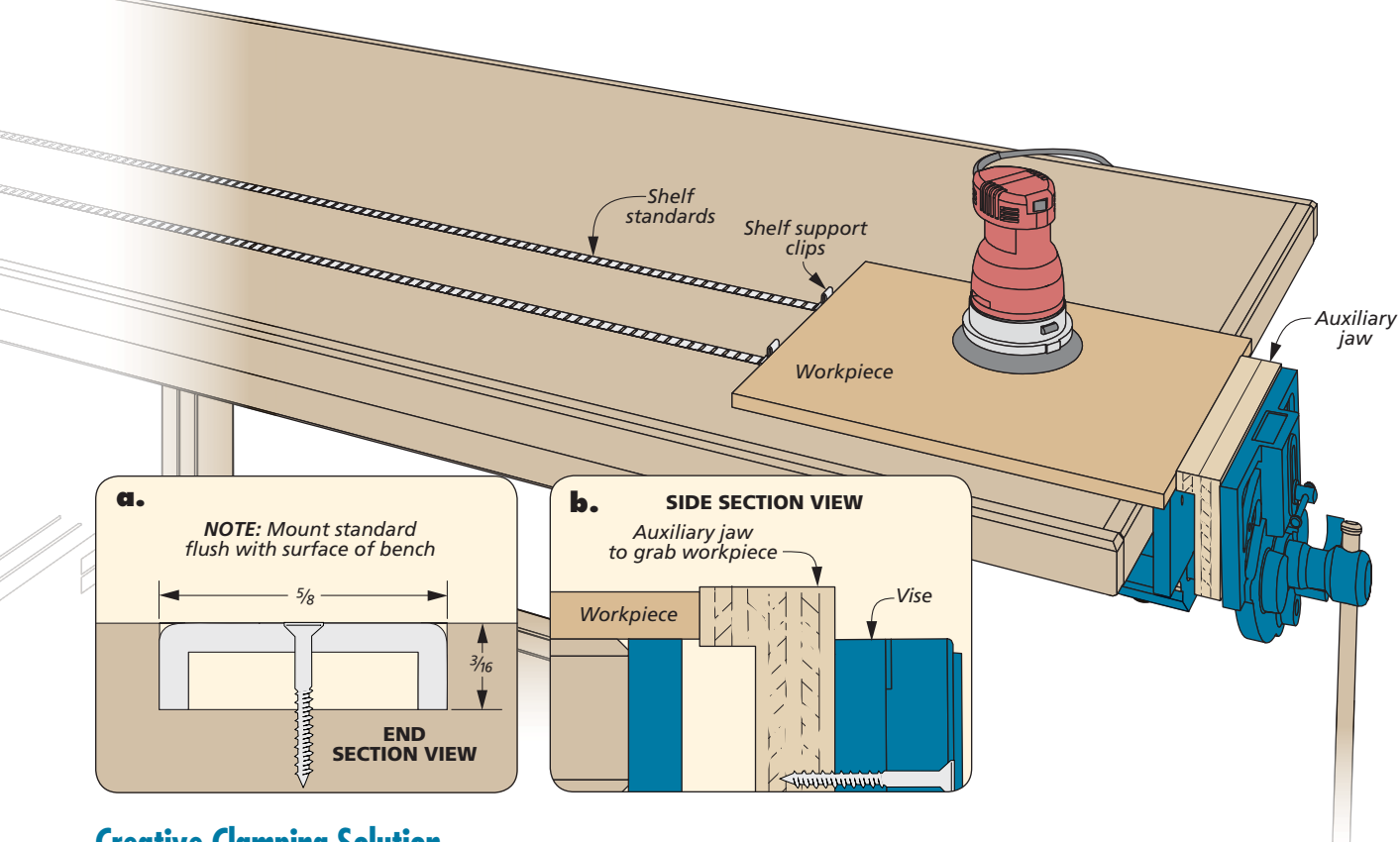
You'll be able to tell us all about your tip and upload your photos and drawings. You can also mail your tips to "Woodsmith Tips" at the editorial address shown on page 2. We will pay up to \$200 if we publish your tip.

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Creative Clamping Solution

I was constantly having trouble holding workpieces on my bench when sanding and routing. Clamps always seemed to be in the way, and I kept having to move them around. I tried one of those non-slip router mats, but they never held well. I solved the problem with a simple, adjustable bench dog system using two metal shelf standards, like you see in the main drawing.

The shelf standards align with an auxiliary jaw I have mounted on my end vise. Now, when I need to clamp a workpiece, I install a shelf support clip at the appropriate position on the standard and tighten the vise. To keep support clips handy, I secured a short piece of shelf standard to one leg of the bench and store them there when I'm not using them.

INSTALLATION. I used a straightedge to guide my router with a $\frac{5}{8}$ "-dia. straight bit. This left me with two grooves in the top of my bench to accept the standards. On my vise, I simply replaced the flat wood face with a rabbeted auxiliary plate. The top of the plate is left slightly proud to grip the workpiece.

Lewis A. Lowe
Sumter, South Carolina

QUICK TIPS



Sander Dust Collection. Charles Mak, of Calgary, Alberta upgraded the dust collection on his random orbit sander. Using a reducer, a coupling and a few hose clamps, he can now hook up his shop vacuum to the sander instead of using the original filter.



Parts Keeper. Howard E. Moody from Upper Jay, NY has a useful trick for keeping parts in order while disassembling and cleaning tools. He simply reaches for a sheet of paper and folds it into an accordion. The folds keep the parts in order and allows them to dry after cleaning.

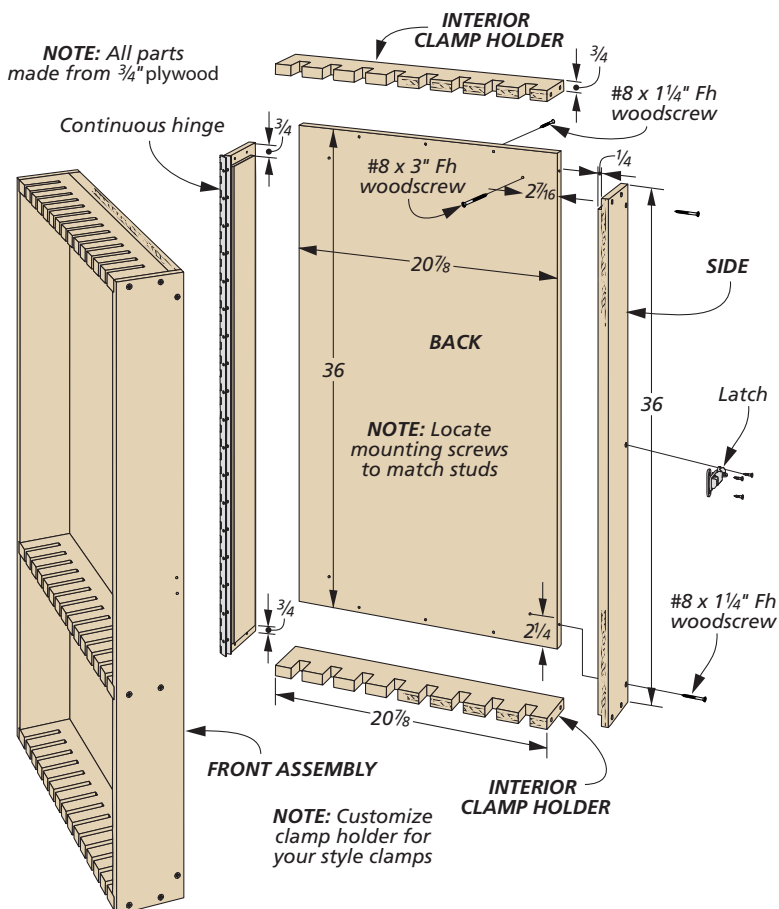
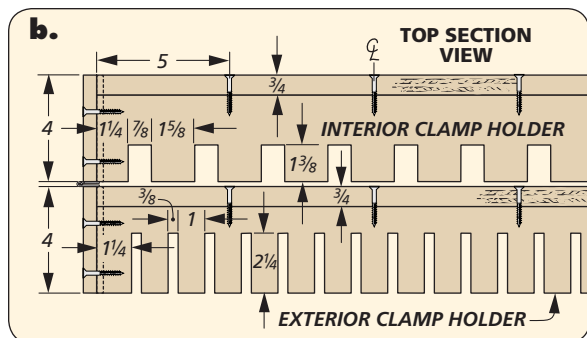
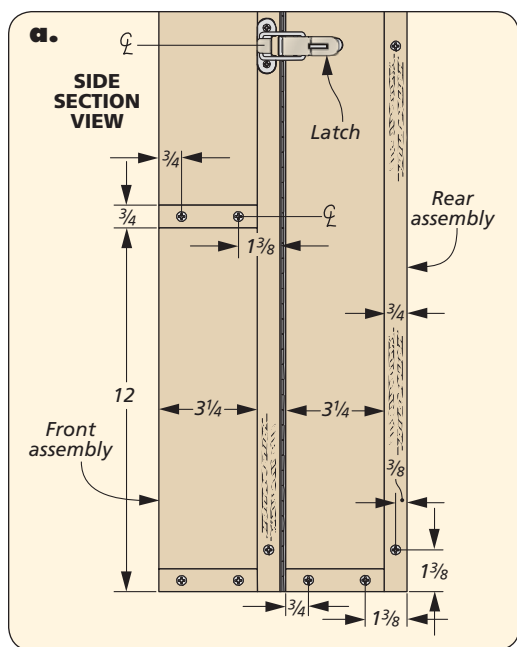
Clamp Storage Help

It's no secret that woodworkers love their clamps, and we can never have enough of them. But when I started to run out of room on my clamp rack, I had to get creative.

To house all of the clamps I had accumulated, I built this clamp rack that you see here. What's different about this clamp rack is that it's multilayered. The rear clamp rack is mounted on the wall. Then I added a hinged door that has another clamp rack on it. This allows me to pack twice as many clamps in the same amount of wall space.

CONSTRUCTION. Building the clamp rack is simple. Both cases are assembled using rabbet joints and screws. Rabbits and dados in the sides accept the clamp holders. The holders themselves have slots cut in them to accept the clamps. The rear case is hung on the wall and a continuous hinge connects the two. A latch on the opposite side holds the front case closed. By opening the latch, the front rack swings open allowing access to the rear case.

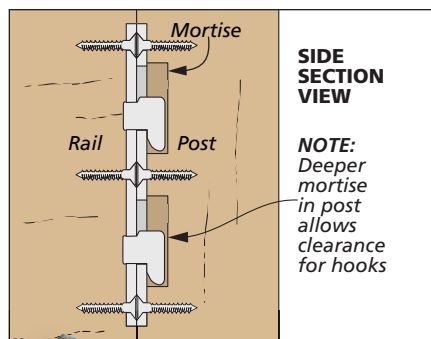
Dan Martin
Galena, Ohio



all
about

heavy-duty Bed Rail Hardware

Beds are about as simple as furniture can get. Generally, a headboard and footboard are connected by a pair of rails. The only mechanical connection is between the bed rails and the headboard (or footboard). This connection



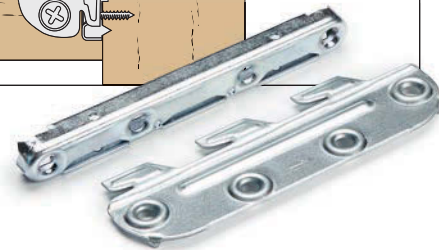
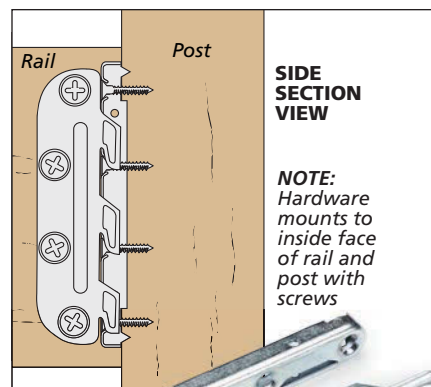
▲ Recessed connectors offer a hidden connection between rails and headboard or footboard.

is important for two reasons. First, it obviously holds the bed together. More importantly, it allows the bed to be taken apart. Beds are big. So having the ability to easily take them apart to move them is imperative.

When you start looking at bed hardware, the choices can be overwhelming. But with a little research, you can select bed hardware that will meet your needs.

RECESSED-BED RAIL FASTENERS. The first type of bed fastener that you may come across when looking at bed hardware is the recessed bed rail fasteners. (Left photo and drawing. When searching for connectors for the heirloom Craftsman bed on page 46, this is the type of connector we chose. There are two pieces to this style of hardware — a hook that gets recessed into the end of the bed rail, and a matching plate that is recessed into the headboard (or footboard).

The installation of the bed hooks is as simple as laying out and cutting a few mortises and attaching the brackets. The wedge-shape of the hooks helps draw the pieces together. This means that

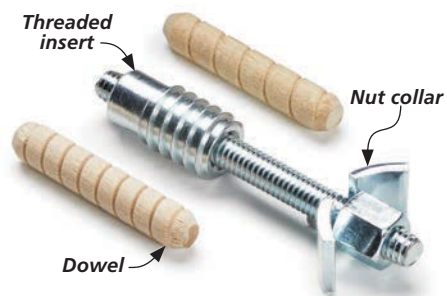
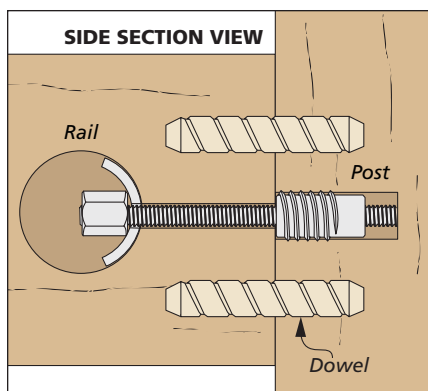


▲ Bed hooks are available in different configurations. This style screws onto the bed, requiring no mortises to attach.

they'll never loosen or need adjustment. One of the drawbacks of the recessed connector is that driving the screws into end-grain does not impart a lot of strength. For a creative solution on how strengthen this connection, see the How-To box on the next page.

SURFACE-MOUNT CONNECTORS. The surface-mount rail connectors are similar in function to the recessed bed fasteners. Instead of being mortised in however, these hooks mount directly to the inside face of the bed rails and the footboard (right photo and drawing on previous page). The surface mount is simpler to install, however, they're not hidden.

KNOCK-DOWN CONNECTORS. Knock-down fasteners are a common type of connector that are used on commercial furniture. The connectors come in different styles, one of the most common types is the nut and post (right photo). This type of connector consists of a threaded insert that's installed into the headboard. A threaded rod is then installed into that insert, and passed through a hole in the bed rail. A large recessed opening allows access to the end of the threaded rod, where a nut collar and nut is installed. The nut can then be tightened to bring everything together (drawing at upper right).



▲ While the hardware provides a solid connection, a pair of dowels keeps the bed rails from twisting during tightening.

This type of connector doesn't rely on any end-grain connection, making them very strong. However, they can loosen up over time and cause the bed to rack. To ensure that everything comes together smoothly, make sure to take your time and ensure holes are drilled square.

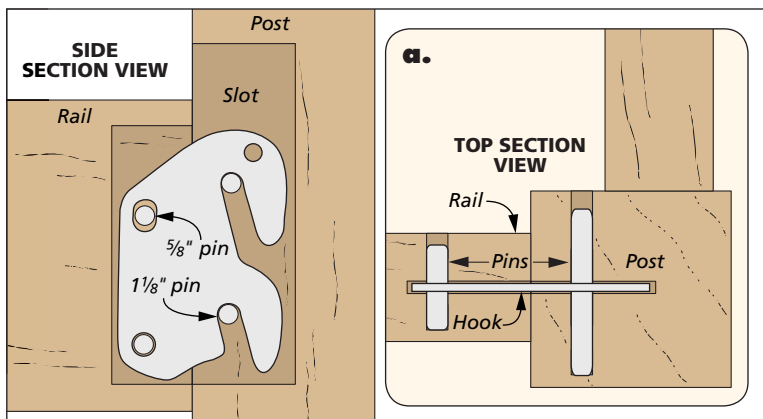
PINNED-RAIL BED HOOKS. Another type of connector you will find when looking at hardware is a set of bed hooks, similar to the recessed hooks talked about

earlier. Instead of being installed in a mortise with screws, this type of bed hooks are installed into a slot in the rails, as shown below. To hold the hooks in place, steel pins are inserted through the rail into the hook. A matching slot is cut into the bed post where longer pins are inserted.

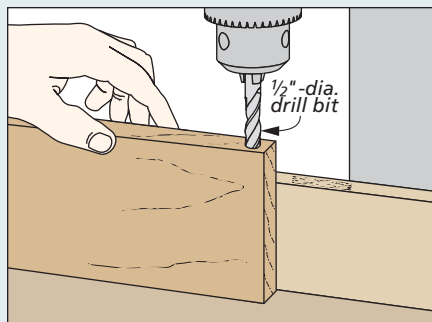
Selecting the right hardware for your bed build can seem overwhelming, but with this knowledge you can select the right hardware for your project. **W**



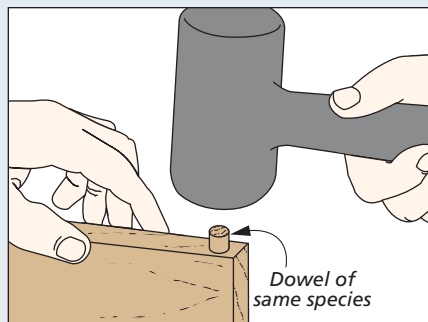
▲ A set of steel pins secure the hooks to the rail. These hooks then slip over longer pair of pins that are installed in the posts.



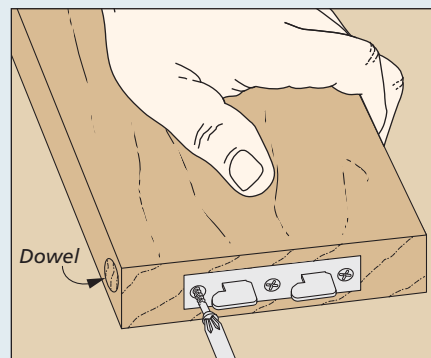
How-To: STRONGER END-GRAIN MOUNT



Drill Deep Hole. To strengthen an end grain-mounted fastener, drill a stopped hole in the bottom of the rail.



Insert Dowel. Glue a dowel into the hole that matches the hole size. A dowel of the same wood species will match best.



Install Fastener. Install the recessed hardware. The mounting screws will bite into the dowel, resulting in a stronger connection.



router table

Edge Jointing

Achieving a straight, smooth edge on a workpiece is typically a critical step for a successful woodworking project. And while

cutting a board with a quality rip blade at the table saw will generally accomplish the “straight” portion of the equation, it doesn’t always leave a smooth surface. You’re often left with blade marks on the edge, or worse, burn marks.

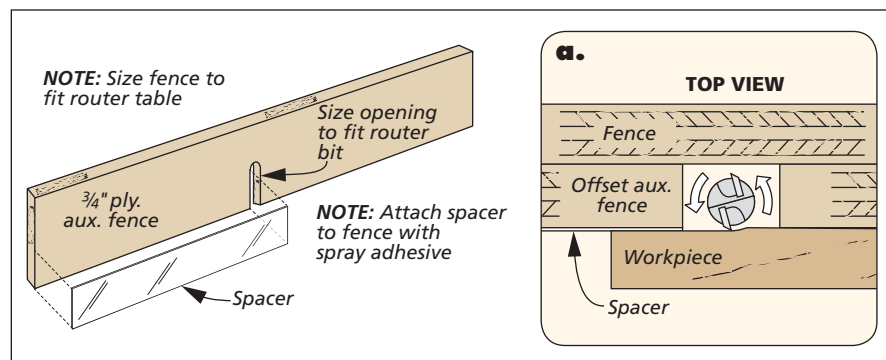
Smoothing the edge by running the board through a dedicated jointer is the obvious solution. But for many woodworkers — especially those just starting

out in the hobby — an expensive jointer may not be in the cards. Fortunately, there’s a foolproof way to get similar results at the router table.

ALL IN THE FENCE. The trick to using the router table as an edge jointer lies in the router table’s fence. Some commercially available router table fences have two independent fences that are adjustable in and out on either side of



▲ These are just a few options you could use for the spacer material on the edge-jointing auxiliary router fence.





▲ With the right end of the router table fence clamped to the table, use a straightedge to swing the left side of the fence into position. The router bit should just touch the edge of the rule.

▲ After positioning the left side of the fence, carefully clamp the router fence to the table. It's a good idea to do a test cut to make sure it's not removing too much material at one time.

the center opening. This type of fence is perfect for setting up for a jointing operation. It allows the "outfeed" side of the fence to be offset from the infeed side. In essence, it acts just like the offset tables of a stationary jointer.

However, if your router table fence doesn't adjust in this manner, don't despair. You can still set up for jointing with a one-piece router table fence. All that's required is to make a simple auxiliary fence, like the one shown in the main photo on the previous page.

MAKING THE FENCE. The auxiliary fence is nothing more than a piece of plywood with an opening cut in the center for the router bit. The left side of the opening is what makes this auxiliary fence different. On this side, you'll apply a thin spacer that makes the "outfeed" side stand proud of the infeed side. The drawing at the bottom of the previous page shows what I mean.

I'll talk more about the spacer material in a minute. But for now, just understand that this offset fence configuration is what makes the fence act like a stationary jointer's table.

MATERIAL CHOICES. You have several options when it comes to the material for the spacer. Thin aluminum sheeting or UHMW are excellent candidates. I opted to use a thin sheet of high-impact polystyrene (HIPS). This material is flexible, but also strong. And best of all, it's sold by thickness in increments of .010". This makes it a great choice since the thickness of

the spacer determines the amount of material removed per pass. The piece I used is .020" thick (just a shade over $\frac{1}{64}$ "). HIPS is also easy to hold in place with a light-duty spray adhesive. All of these spacer material options are shown in the lower left margin photo on the previous page.

CHOOSING THE BIT. Another nice feature of this edge-jointing setup is that no special router bit is required. A standard straight bit will work just fine. I chose a $\frac{1}{2}$ "-dia. bit with a $\frac{1}{2}$ " shank. A spiral bit could also be used for this operation, but with the minimal amount of material being removed, you probably won't notice an appreciable difference between the two.

SETTING UP FOR THE CUT. Like the rest of this jointing method, the setup is pretty straightforward, as well. After clamping the auxiliary fence to the router fence with the opening centered on the bit, I locked the right (infeed) end of the fence to the table.

Then, using a straightedge, I pivoted the left (outfeed) end of the fence so that it's just flush with the bit, as shown in Photo 1 above. This allows the outfeed side of the fence to fully support the workpiece after it passes the bit.

With the fence in position, clamp the left end to the table (Photo 2). You can use the workpiece you're jointing to set the height of the bit. It should extend just over the top edge of the board.

MAKING THE CUT. After the fence position is set, using it is a snap. I would

recommend using a pair of push pads to keep your hands clear of the spinning bit (main photo). With the workpiece tight to the infeed side of the fence, start it into the bit. Once the leading few inches of the workpiece pass the bit, keep the leading push pad on the outfeed side to maintain pressure against the outfeed fence. The trailing hand (push pad) provides the forward motion.

Depending on how rough the edge of the board is, a couple of passes may be necessary. But in short order, you'll end up with a smooth-edged workpiece, as shown in the photos below. All with a simple, shop-made fence for the router table. **W**



▲ Before jointing, the stock is rough (above). A couple passes using the auxiliary fence on the router table cleans it up (below).

what's new in Shop Aprons

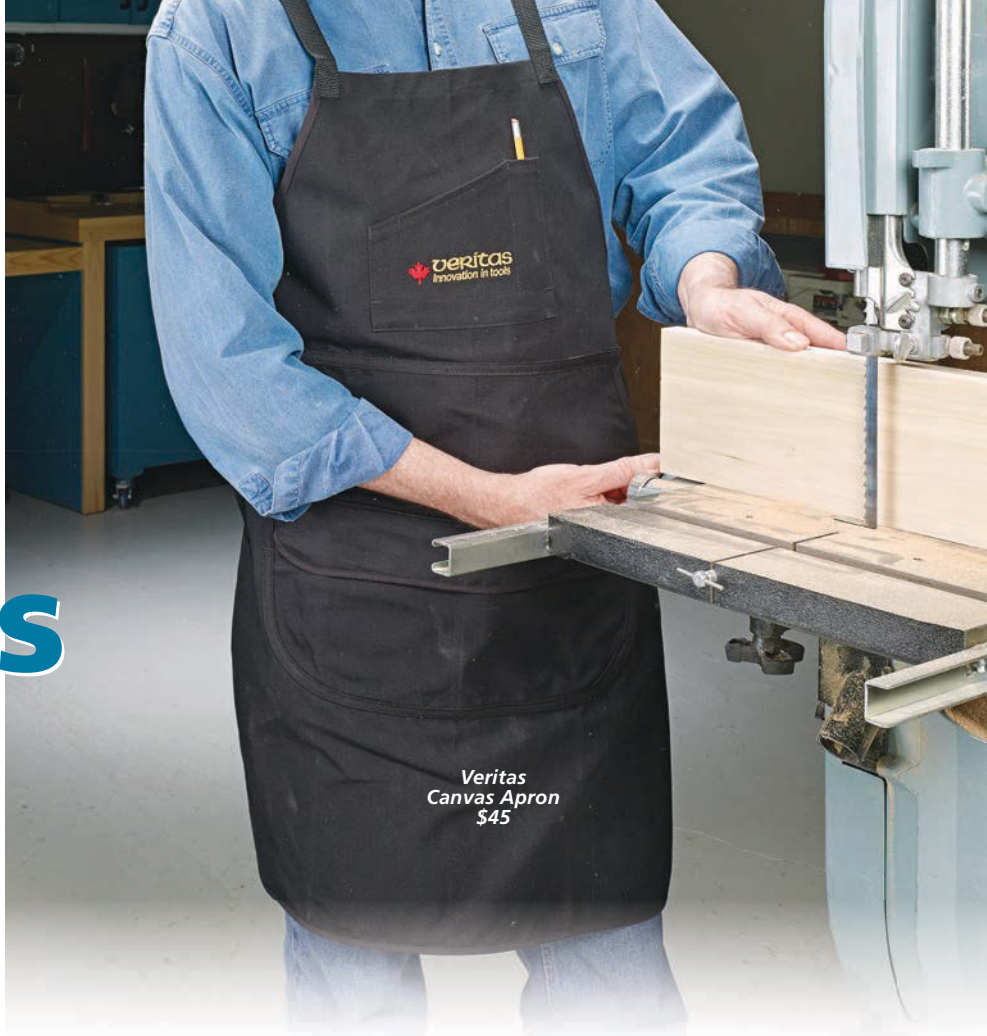
If you've ruined too many good shirts with an errant splash of varnish, it might be time to consider investing in a quality apron to protect your clothes (and yourself) while working in the shop. But with the vast selection available, you may not know which direction to go.

Here, I'll look at a few aprons that highlight what to keep in mind when selecting a shop apron. This will ensure that you pick the one that's best suited for the type of work you do.

ALL ABOUT THE COMFORT. Without a doubt, the most important factor when selecting an apron is to choose one that's comfortable to wear. After all, if you don't like the way it feels (or if it puts pressure in the wrong spot), you're less likely to actually use it.



▲ This apron from *Texas Canvas Wares* has an X-back design that spreads the weight evenly along the shoulders and back.



To that point, aprons with neck straps are notoriously uncomfortable. If you choose a heavy apron, or one with pockets that'll be filled with tools, you may want to steer clear of aprons that use a neck strap as the only means of support. The straps on these types of aprons have a tendency to dig into the neck and can cause muscle strain after a long day in the shop.



▲ The Y-back design of this leather apron from *Calavera Tool Works* is considered by some to be the ultimate in comfort.

Much more comfortable options include the X- or Y-back designs, as shown in the two photos below. These two options distribute the apron load more evenly on the shoulders and back for long-wearing comfort. All of the aprons shown in this article have one of these types of strap configurations.

MATERIAL OPTIONS. Another aspect to consider is the material the apron is made from. While some higher-end aprons are made from leather (left photo, top of next page), most will be made from a canvas material, like the *Veritas* apron shown in the photo above. There's even a model made from abrasion-resistant *Cordura* fabric.

If you opt for a leather apron, here's a couple of things to keep in mind. Leather aprons will generally have a longer lifespan than a cotton apron. But that long-term durability is typically accompanied by a higher price tag.

You'll also need to be prepared to do a little work to maintain a leather apron to keep it in good shape. Leather repels

most liquids, and seldom requires more than a gentle wipe-down with a damp cloth. But retreating the leather periodically with a leather conditioner is necessary to keep it from becoming brittle. The frequency of conditioning depends on several factors, including the environment you live in and the contaminants the apron is exposed to.

Caring for a cotton apron, on the other hand, is a snap. They can usually be machine washed and hung up to dry. And they're generally inexpensive enough that they can be worn for several years and then replaced if needed.

Another material option is a waxed canvas apron like the one made by *Texas Canvas Wares* shown at far right. A step up from a plain canvas model, the wax coating helps the material repel water and other liquid contaminants (upper right inset photo). Much like leather, a periodic rewaxing will help keep the water-proofing intact. But since they're substantially less expensive than leather, they prove to be a nice middle-of-the-road choice.

HOW LOW DO YOU GO? The apron's length is another consideration. Depending on the type of work you do, you could opt for a shorter, bib-length apron that extends just to the waist or slightly below, like the model from *Rockler*



Atlas 46
Cargo Pocket Apron
\$95

▲ If you like to keep a lot of tools close at hand, the Cargo Pocket Apron made by *Atlas 46* has you covered.



Calavera
Leather Apron
\$195

▲ This leather apron from *Calavera Tool Works* feels great to wear right out of the box, but comes with a high price tag.

shown in the lower right photo. Most full-length aprons fall to mid-thigh, or even to the knees. If you're doing a lot of work that requires you to bend or stoop down repeatedly, then a shorter style may be just the ticket.

POCKETS & ACCESSORIES. The final criteria to consider is the type or number of pockets you need. Some people prefer the cleaner, less-bulky feel of only one or two small, non-obtrusive pockets.

But if you move around the shop a lot, and like to keep your most-used tools close-at-hand, then you may opt for a style with many pockets. If that's the case, then the Cargo Pocket Apron



▲ The Cargo Pocket Apron from *Atlas 46* has numerous accessories available to customize how you carry tools.



Texas Canvas Wares
Apron
\$38

► Waxed canvas aprons, like this one from *Texas Canvas Wares*, are a solid compromise that shed water (inset).

from *Atlas 46* might be what you need (lower left photo).

This Cordura-made apron has numerous pockets, webbed-loops, and zippered pouches to hold just about anything. And as the middle photo below shows, it's highly customizable. You can easily add a drill holster, magnetic strips for holding hardware, or any of a number of other accessories.

Whatever your particular needs may be, there's probably a shop apron that's just right for the work you do in your shop. To find out where to buy any of the aprons shown here, check out Sources on page 67. **W**

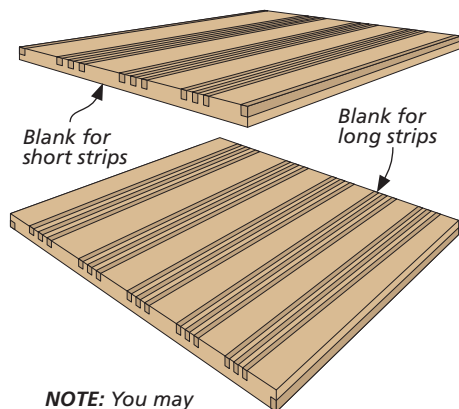


Rockler
Broad
Shoulder Bib Apron
\$18

▲ A shorter, bib-length apron makes stooping and kneeling easier. This denim canvas model is sold by *Rockler*.



simple, decorative Latticework Panels



NOTE: You may need more than one blank for each size

Start with Blanks. Wide blanks are safer and easier to work with when cutting the dados that form the half lap notches in the interlocking strips.

Frame and panel construction stands as a foundational woodworking technique. Besides offering a solid construction approach, it allows you use the panel to add some visual appeal. Solid wood raised panels or figured veneer panels are popular options.

Another, less-travelled route you can take is to make a lattice panel. That's what I chose for the serving tray on page 18. The geometric gridwork of interlocking strips creates a strong graphic element that's sure to become the focal point of any project.

MADE IN JAPAN. The origin of the pattern shown here comes from Japanese *kumiko* latticework. These sometimes elaborate, decorative patterns are used in room dividers, sliding doors, and

above entryways. Traditionally, the pieces of wood that make up the patterns were joined individually by hand. And while there's a satisfaction in this type of quiet work, I decided to showcase a technique that gets the job done a little more efficiently. So, I turned to what else, the table saw.

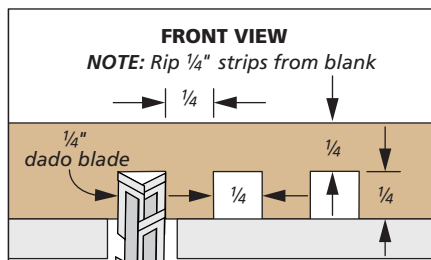
WHAT WOOD. Before getting into the technique itself, I want to mention the material I chose. Since the pattern formed by the strips should get all the attention, you don't want to use wood that has a pronounced grain. Also light-colored woods create a better contrast with the darker openings. For the serving tray, I used straight-grain cypress. I've also made latticework panels from basswood with good success.



▲ I like to use a rubber-bottomed push pad to safely and firmly hold the blank down on the saw table and against the rip fence. This ensures that the dado is cut to a consistent and uniform depth.

▲ A push block guides the blank to rip narrow strips safely. And a splitter installed in the zero-clearance insert plate prevents binding and burning for less cleanup later.

WIDE BLANKS, NOT STRIPS. Half-lap joints join the strips into a rigid panel. While narrow strips make up the panel, you don't start by cutting a bunch of strips. Instead, I worked with wide blanks, as shown in the left margin drawing on the previous page. Wide blanks are easier to control at the table saw. In addition, they're safer too, since you can keep your fingers away from the blade with push blocks and pads.



You need two lengths of blanks sized to match the length and width of the frame opening. So that means it's a good idea to create the frame and opening before working on the panel. Be sure to plane the blanks to final thickness as well.

CUT SOME DADOES. Form the half laps by cutting dadoes across the width of the blanks, as shown in the upper left photo. I used a dado blade sized for the thickness of the strip, and raised to half the thickness of the blank. This is illustrated in the drawing at left.

Consistency in spacing is your goal in cutting the dadoes to create the pattern. I found that cutting the middle dado of the pattern first helped me achieve an even spacing. The rip fence serves to locate each of the cuts. I used some test pieces to make sure the initial cut

was centered on the length of the blank. For the short pieces, you can guide the blank using just the rip fence (upper left photo). But for the longer blank, a miter gauge is a better option. Since this isn't a through cut, you can still use the rip fence as an end stop.

TURN BLANKS INTO STRIPS. Once all the dadoes are cut, replace the dado blade with a rip blade to create the strips (upper right photo). I used a thin-kerf, glue-line rip blade. The key here is to size the strips to fit the dadoes straight from the saw. Here again, test cuts on sample parts is the way to get the rip fence set just right. Another option for fine-tuning the size of the strips is shown in the lower left box.

The form shown in the main photo on the previous page keeps the panel square. With a snug fit of the strips in the notches, only a dot of glue on the four corner joints is necessary. The result turns an ordinary frame into a standout. **W**

How-To: DRILL PRESS THICKNESS SANDER

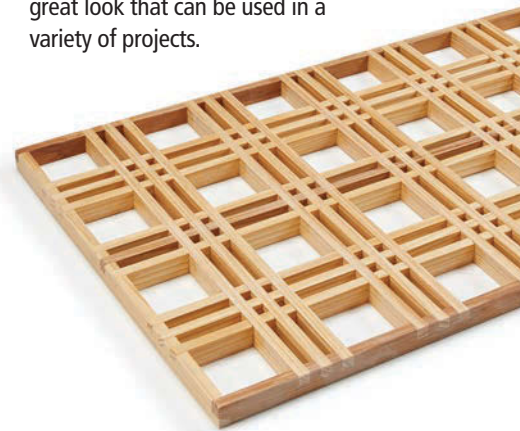
It can take some back and forth to dial in the table saw to get perfectly fitting strips. Another solution is to cut the strips a hair thicker than what's required and then sand them to fit.

To do this, I use a sanding drum in the drill press. With a fence positioned just behind the drum, this setup acts as a thickness sander. Set the fence for a light cut and feed the strips from right to left. Make light passes, moving the fence closer to the drum, until you have a snug fit.



▲ A sanding drum and a fence allow you to remove a consistent amount of material from small, thin pieces to achieve an exact size.

▼ The strips snap together to create a great look that can be used in a variety of projects.





lattice panel Serving Tray

This handsome project serves up lessons in traditional joinery, but it's the eye-catching panel that makes up the main course.

Usually, the items on a serving tray grab your attention first — good food or a refreshing beverage. But when you carry this tray in, people will be just as likely to focus on the unique panel at the center of it all.

At first glance, it looks like a glass panel resting on a wood lattice. A closer examination reveals that the lattice is inside the panel. Of course, there's a trick involved. The latticework is built up from narrow strips. The assembled

gridwork is then encased in epoxy. As you'll see, the process is pretty straightforward and the results are dramatic.

There's more going on with the other parts of the project, too. The handle assemblies feature angled, half-lap joints. It sounds much harder than it actually is. All it takes is some clear marking and a table saw trick or two.

The handles are also designed to fold flat for storage. Unique, low-profile hinges do the job. It requires some careful chisel

work to fit just right, but it's not difficult. Concealed, rare-earth magnets hold the folded handles in place against the frame.

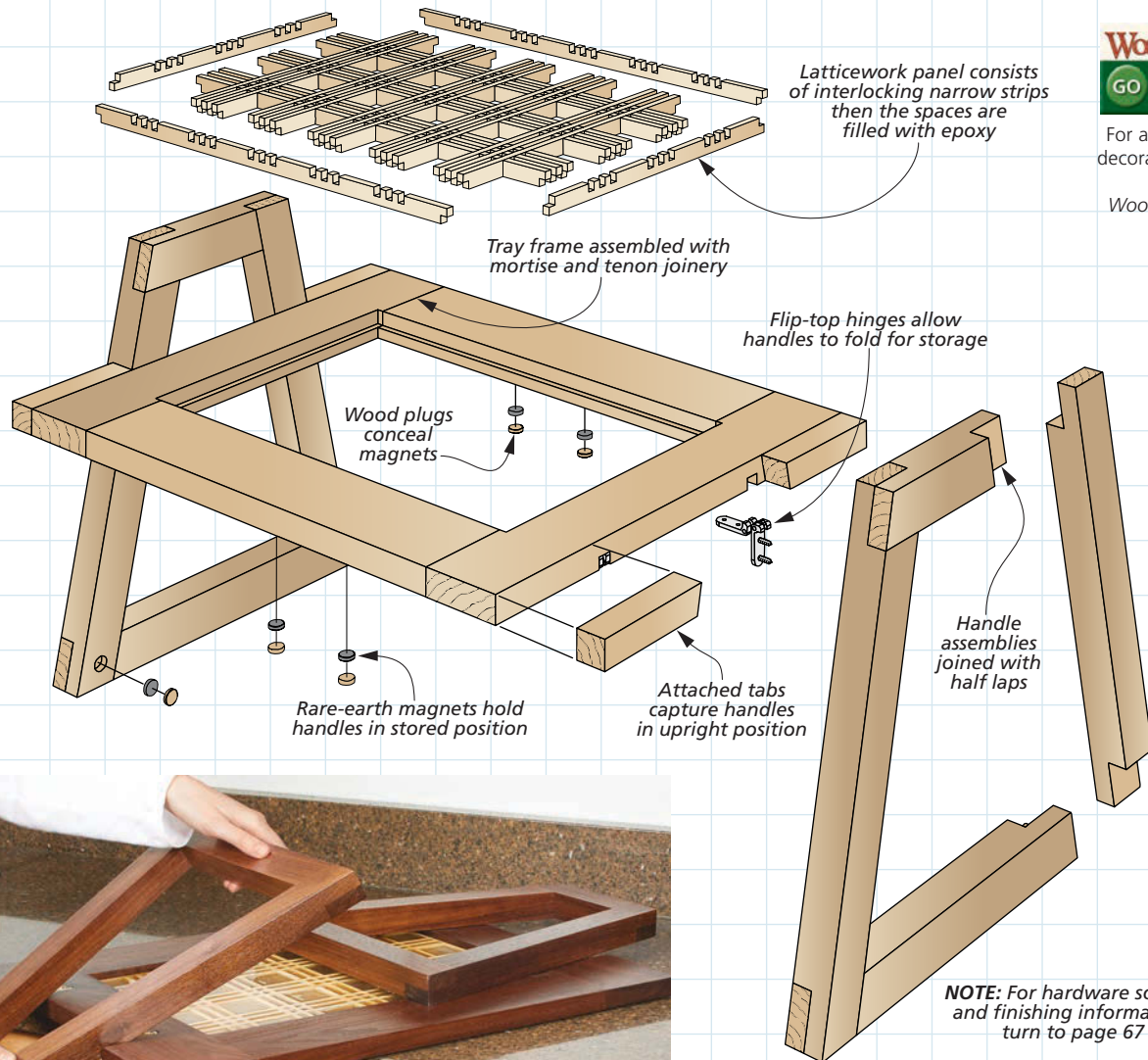
The upper frame that holds the lattice panel is the simplest part of the project. Here, you'll get a chance to hone your mortise and tenon skills.

It seems like there's a lot going on, however, the small scale of the project means you can tackle the construction in one weekend. By the next weekend, you'll be using it to serve up a special treat.

Construction Overview / OVERALL DIMENSIONS: 23¹/₄"W x 14¹/₈"H x 16¹/₂"D 29⁵/₈"W x 2"H x 16¹/₂"D (with handles folded)



For an additional decorative pattern, go to Woodsmith.com



► Flip-top hinges and rare-earth magnets allow the serving tray to fold up for convenient storage.

Materials, Supplies & Cutting Diagram

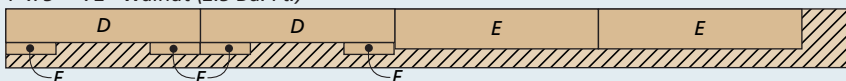
A Tops (2)	1 ¹ / ₄ x 1 ¹ / ₂ - 6 ¹⁵ / ₁₆	E Rails (2)
B Bottoms (2)	1 ¹ / ₄ x 1 ¹ / ₂ - 12 ³ / ₄	F Tabs (4)
C Sides (4)	1 ¹ / ₄ x 1 ¹ / ₂ - 15 rgh.	G Long Strips (11)
D Stiles (2)	7 ⁷ / ₈ x 2 ³ / ₄ - 16 ¹ / ₂	H Short Strips (17)

7 ⁷ / ₈ x 3 ³ / ₈ - 17 ¹ / ₄	• (8) 1/2"-dia. Rare-Earth Magnets
7 ⁷ / ₈ x 1 - 4 ¹ / ₄	• (2 pr.) Flip-Top Hinges w/Screws
1/2 x 1/4 - 15 ³ / ₄	
1/2 x 1/4 - 10 ¹ / ₄	

1¹/₄" x 3¹/₂" - 60" Walnut (1.8 Bd. Ft.)



1" x 5" - 72" Walnut (2.5 Bd. Ft.)



1/2" x 3 1/2" - 36" Cypress (.9 Sq. Ft.)



NOTE: Parts D, E, and F are planed to final thickness

Building the FRAMES

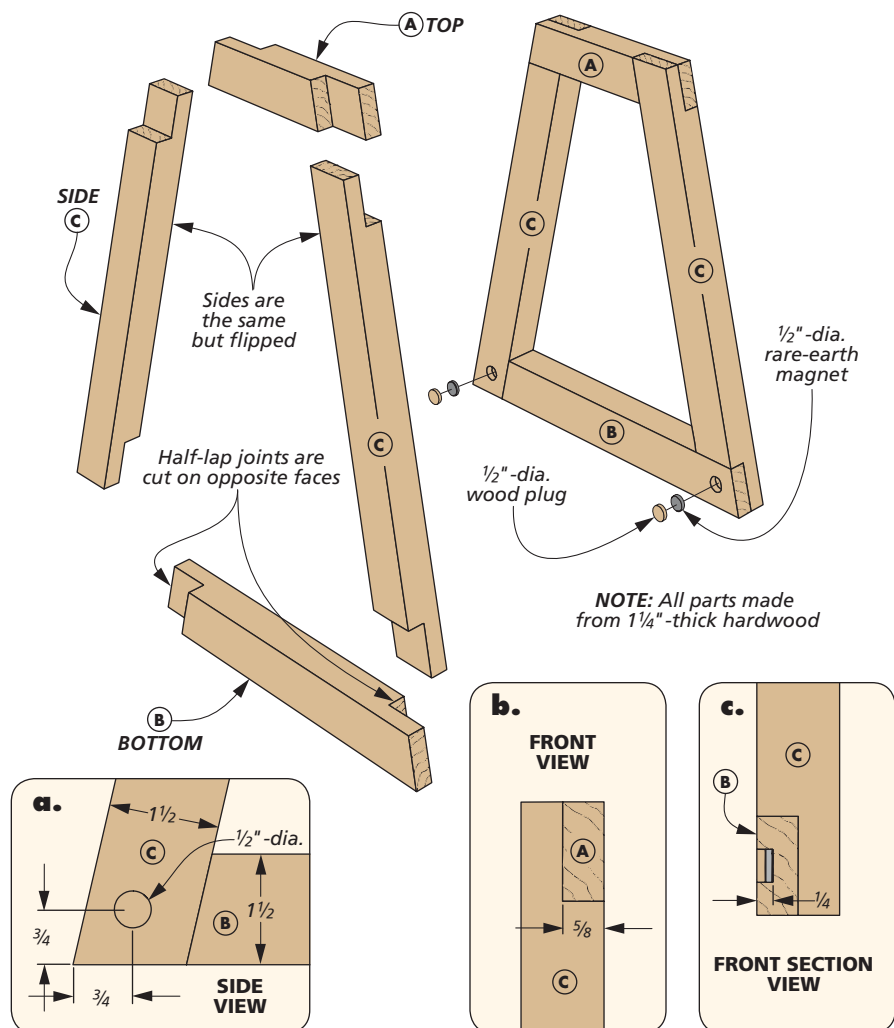
When you break down the construction of the serving tray into sections, you can see that you're really just making three frames — two for the handle assemblies and one for the serving surface. I chose to work from the outside in and start with the handle frames.

ANGLED ENDS. The first thing that you notice about the handle assemblies is their trapezoidal shape. That means you're going to be cutting some miters. Figure 1 below shows the setup I used at the table saw, though you can just as easily make these cuts at the miter saw.

Consistency is key. In order to get a solid assembly, similar parts need to be the same length. Clamping a stop block attached to the miter gauge is an effective method to achieve this.

HALF-LAP JOINERY. The handle frames are joined with half laps at the corners. There are a couple reasons for choosing this approach. First, on angled parts, the joinery is relatively simple to cut compared to making an angled mortise and tenon frame.

Second, the exposed joint surfaces add some visual interest to the assembly. In fact, I emphasized that by cutting the half laps on opposite faces of each of the parts, as shown in the drawing at right and in Figure 2. The result is that

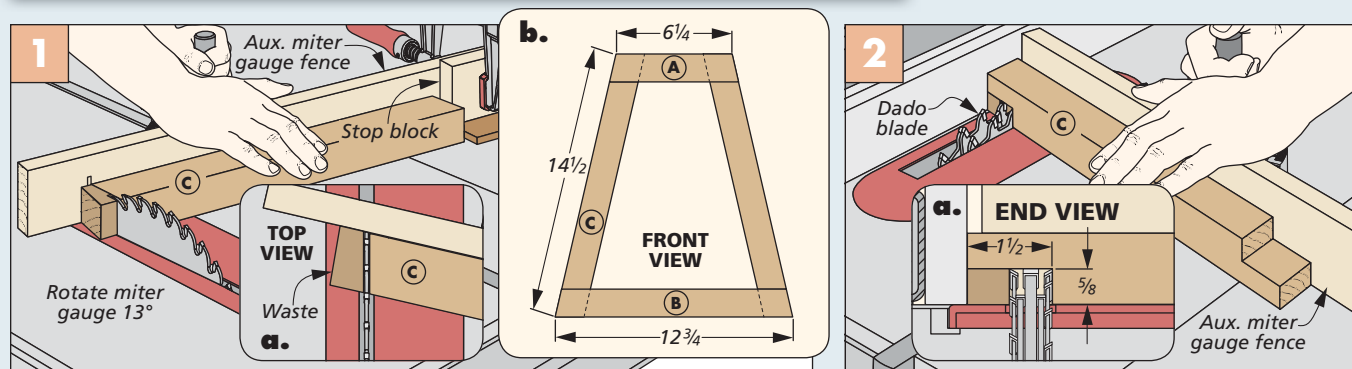


the parts seem to pinwheel as they flow from one to the next.

As I mentioned, cutting the half laps is straightforward. The setup is shown below. In order to set the miter gauge to

the correct angle, I loosened the miter gauge and set a workpiece in place. Rotate the miter gauge until the end of the workpiece rests flush against the rip fence (Figure 2).

How-To: CUT MITERED ENDS & HALF-LAP JOINTS



Mitered Ends. Cut the handle parts to length at the table saw. Use the miter gauge to cut the angle on each end of all the parts. Attach a stop block to the miter gauge to cut parts to consistent lengths.

Half Laps. Use the end of the workpiece as a gauge to set the angle of the miter gauge. The rip fence serves as an end stop.

When cutting the half laps on the top and bottom, you simply need to flip the pieces over to cut the joinery on the opposite face. However, for the sides you'll need to reset the miter gauge angle in order to cut the opposite end. When all the joinery is complete, it's time to grab the glue bottle and clamps to assemble the handles.

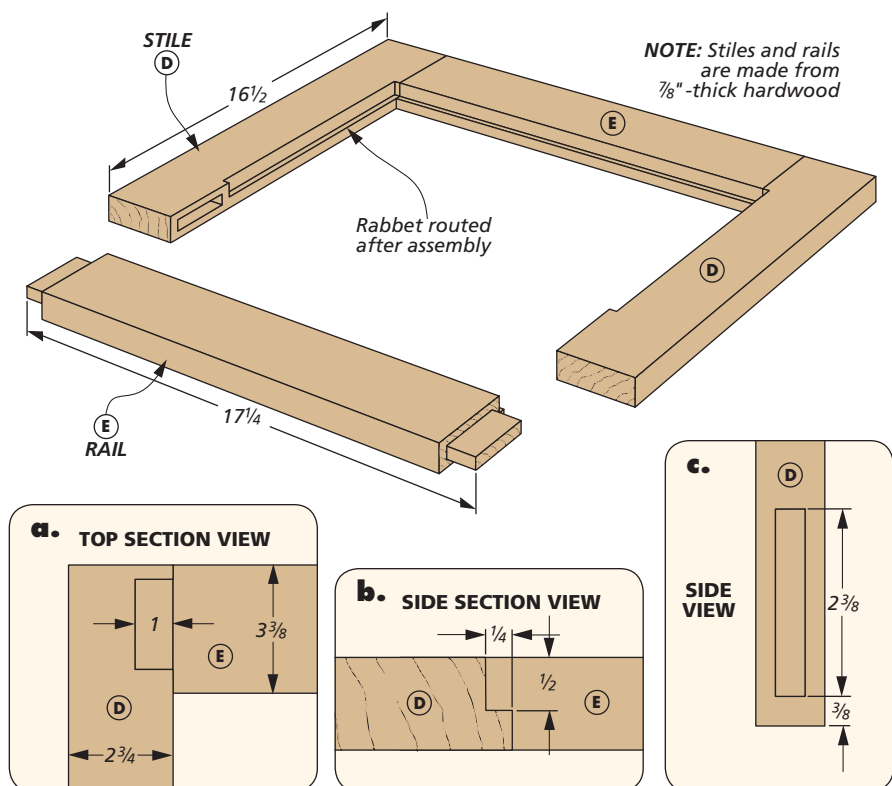
MAGNETS. The final detail to add on the handle assemblies (for now) is a pair of magnets, as in details 'a' and 'c' on the previous page. These hold the handles in the stored position. The magnets are recessed in a shallow hole and covered by a thin wood plug. You can read more about how to do this on page 65.

TRAY FRAME

With the two handle frames out of the way, it's time to make the third frame shown in the drawing at right. It holds the lattice panel you'll make later. While the construction is pretty standard, a simple mortise and tenon frame, there are a couple of things I want to point out.

EXTRA-WIDE STILES. The first detail is to make extra-wide blanks for the two stiles (I cut them 4" wide). The extra width is used to create short tabs that match perfectly down the road. Rip 1" from the outside edge of each stile blank and save the pieces.

JOINERY. At this point, you can carry on with the construction. Create mortises in the stiles. Matching tenons are



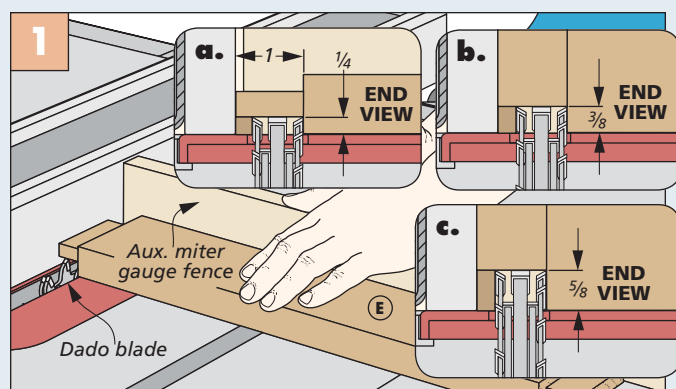
formed on the ends of the rails. The steps for cutting these are shown in Figure 1 below. When gluing up the tray frame, take care to keep it square and flat as the glue dries. This will make fitting and installing the lattice panel much easier later on.

ROUT A RABBET. Speaking of the lattice panel, you need to create a pocket in the top of the frame for the panel to rest in. Figure 2 shows how to do this with a

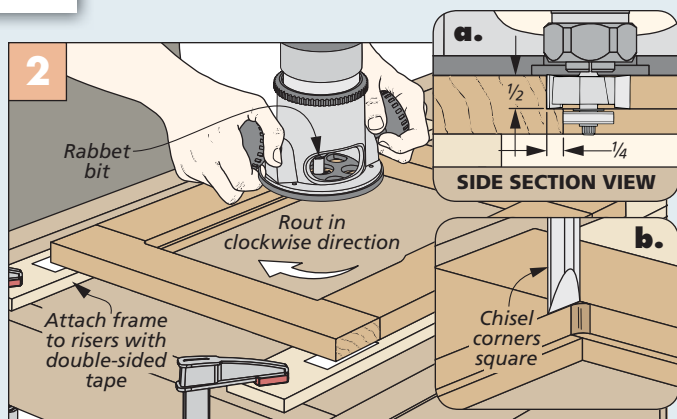
hand-held router. The router makes for quick work and a smooth, crisp rabbet. However, the router bit leaves rounded corners (Figure 2b). So a little hand-work is necessary to square them up.

Scribe the corner with a marking knife. Then remove the waste with a chisel. With light mallet taps, cut across the grain first in order to prevent a split that could spoil the workpiece. Then pare along the bottom to complete the rabbet.

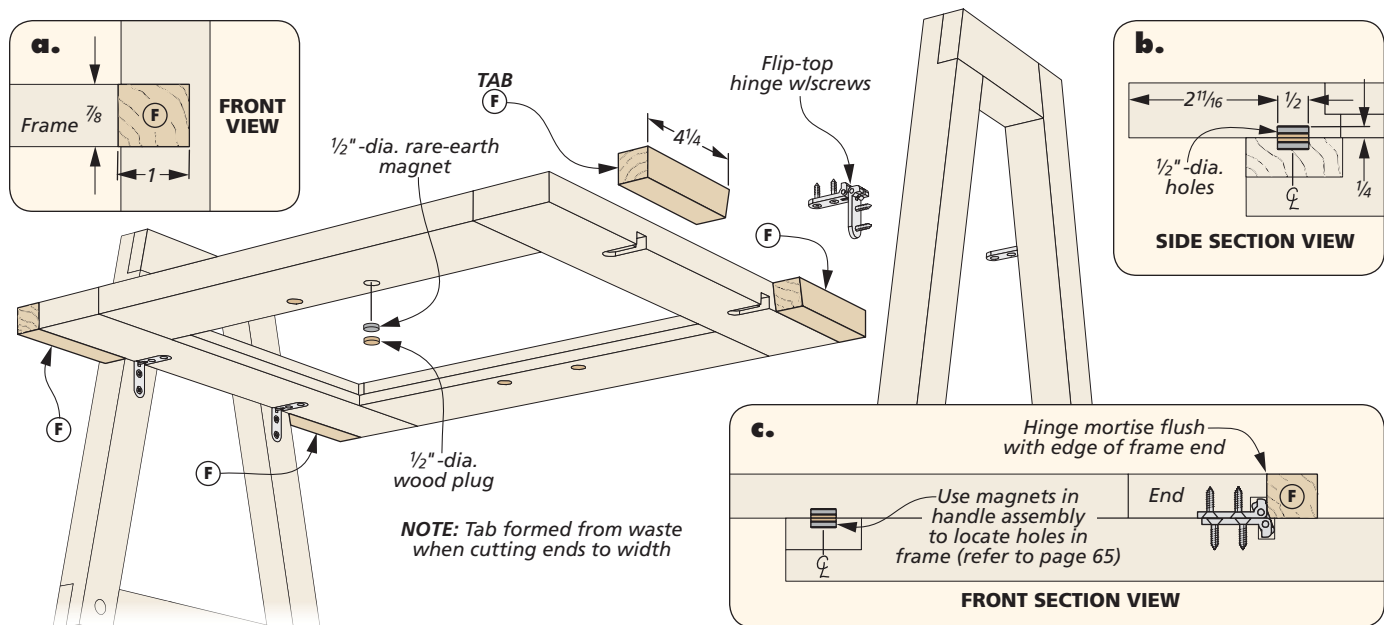
How-To: CUT TENONS & ROUT A RABBET



Tenons for the Frame. You'll need three different blade heights to form the tenons on the ends of the rails of the frame. Here again, the rip fence works as a stop.



ROUT A RABBET. To prevent the bit from hitting the workbench, support the assembled frame on a set of risers. Double-sided tape keeps the frame from shifting during routing.



Wrapping up the **TRAY FRAME**

At this stage of the game, you have three separate frames. There's just a little bit of work left to take care of, then you can bring the frames together.

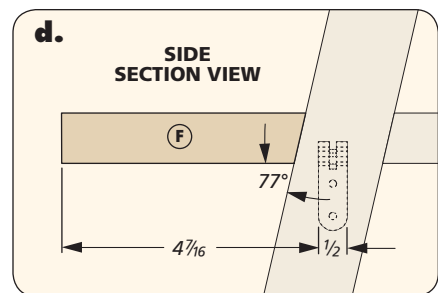
ADD TABS. The first order of business is to cut and attach a pair of tabs on each end of the tray frame. You can see this in the drawing above. The tabs form a recess to house the handle assemblies.

If you remember, the tabs are cut from the material removed from the extra-wide end blanks. Match up the grain and mark the length of the tabs. Note in detail 'd' that the inner end of each tab is

beveled to match the angle of the handle assemblies. Glue the tabs in place, keeping the faces and ends perfectly flush.

INSTALL HINGES. The handle frames are joined to the tray frame with narrow, flip-top hinges. These are similar to the hinges used on sewing machine tables. The hinges seat in mortises cut in the bottom face of the tray frame and the inside face of the handle assembly.

I started with cutting the mortises in the tray frame. The box below outlines the steps. I'll add a few details along the way. Detail 'd' above shows the location

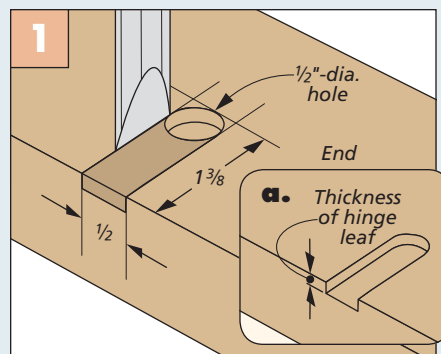


of the hinge mortise. I set the hinge in place and traced its profile on the frame.

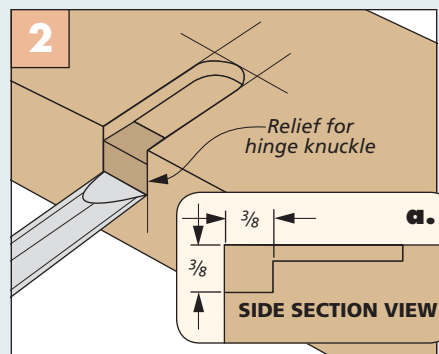
The hinge has a rounded end, so I used a matching Forstner bit to shape the end of the mortise, as in Figure 1.

A little careful chisel work is up next. Score the sides of the mortise with light

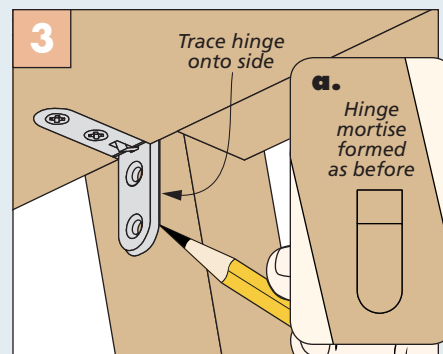
How-To: CUT THE HINGE MORTISES



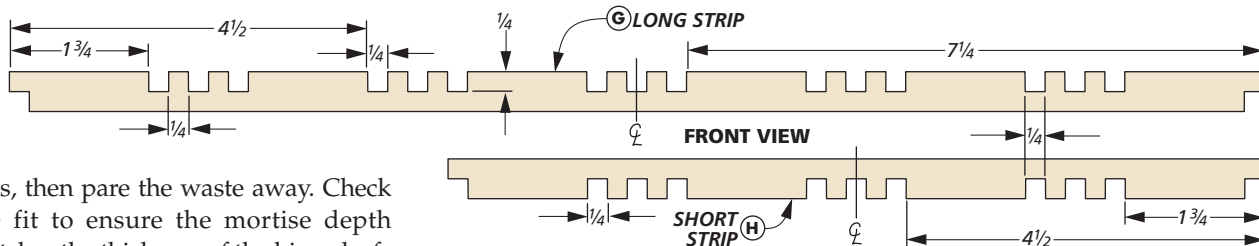
Start with a Hole. With a Forstner bit, drill out the end of the mortise. Use a chisel to clean the remaining waste.



Knuckle Recess. You need to make a deeper recess at the edge to provide clearance for the hinge knuckle.



Handle Mortises. Install the hinge and fit the handle assembly between the tabs to transfer the hinge location.



taps, then pare the waste away. Check the fit to ensure the mortise depth matches the thickness of the hinge leaf.

The hinge knuckle requires a deeper recess to be cut at the edge of the frame. For a neat appearance, take your time to avoid cutting the recess too deep (Figure 2). In addition, the recess shouldn't interfere with the mounting screws.

You can install the hinges in the tray. Figure 3 shows the process for marking the mortise locations on the handle assemblies. Finally, turn to page 65 to locate the magnets in the tray frame.

LATTICE PANEL

The home stretch of this project is to create the interlocking lattice panel. This consists of narrow strips joined with half laps in a geometric gridwork, as illustrated in the drawing at right. The key to making the panel efficiently is to cut the half laps in extra-wide blanks rather than fumbling with a lot of small strips. The process for how I did this is shown in the article on page 16.

FILL IT WITH EPOXY. In order to create a smooth, rigid surface, the lattice panel is filled with slow-setting epoxy (refer to sources on page 67). The box at right shows the steps that are required. It begins with making an assembly form from melamine. Because epoxy won't stick to melamine, this makes a good tray to pour the epoxy into.

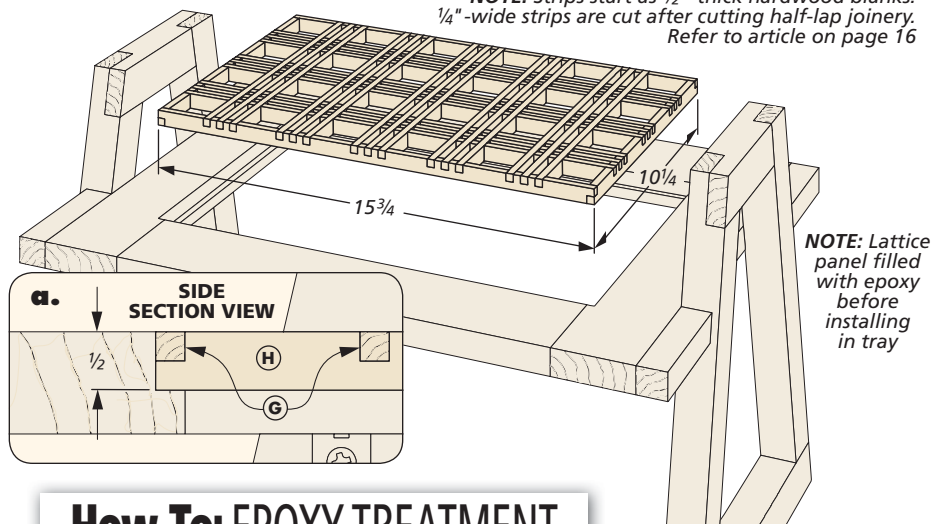
I poured the epoxy in two layers to help minimize bubbles. A small syringe is helpful for getting epoxy into the small spaces of the lattice. If bubbles do form, passing a heat gun over the epoxy helps to bring them to the surface.

After a few hours, you can apply the second coat so it's level with the lattice, as in Figure 3. The epoxy then needs to cure overnight before it's completely solid.

In the morning, it's time to remove the panel from the form. A little sanding is all that's necessary to clean up the edges for a snug press fit into the tray frame.

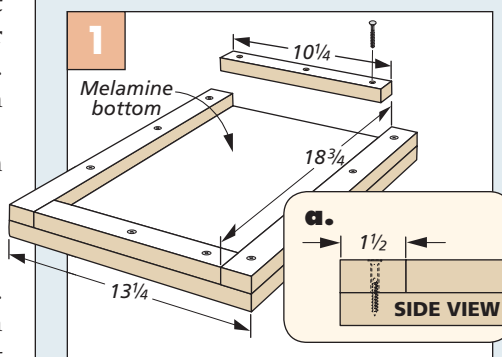
After the finish on the other tray components is dry, your tray will be complete and ready for service. **W**

NOTE: Strips start as 1/2"-thick hardwood blanks. 1/4"-wide strips are cut after cutting half-lap joinery. Refer to article on page 16

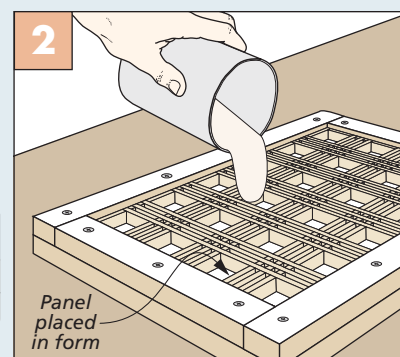


NOTE: Lattice panel filled with epoxy before installing in tray

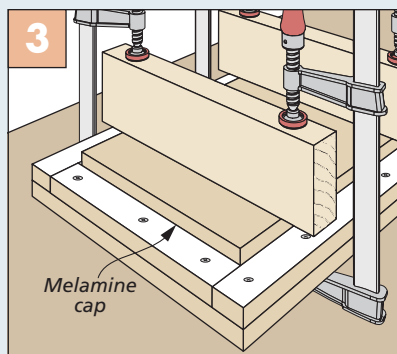
How-To: EPOXY TREATMENT



Assembly & Pouring Form. Melamine makes a great surface for containing the epoxy and lattice.



Pour the Epoxy. Aim to fill the panel about halfway with epoxy for the first layer.



Add a Cap. After pouring the second layer, clamp a melamine top to the form to hold the lattice flat.



▲ The completed, filled panel shows off the latticework while providing a durable, flat surface.

cordless drill Charging Station

This wall-mounted station will ensure that all your cordless drills are fully charged and ready to go at a moment's notice.



When cordless drills first came on the scene, the initial purchase price represented a pretty hefty investment. But while the batteries have gotten lighter, smaller, and more powerful over the years, at the same time the price for cordless drills has actually come down in real terms. Today, it's not uncommon for a woodworker to own two or three different cordless drills. And that's the inspiration behind the cordless drill charging station you see in the photo here.

This wall-mounted station has room for up to four cordless drills or drivers, as well as two or three chargers. A pair of drawers provides storage for drill bits and other accessories. And the top of the drawer unit serves as a shelf for extra batteries or other tools.

Of course, drills aren't the only cordless tools you'll find in a woodshop. So

we've included plans for a matching shelf for additional cordless tools at our website, *Woodsmith.com* (photo at right).

PLYWOOD CONSTRUCTION

The charging station is made almost entirely of plywood. As you can see in main drawing on the next page, it begins with a back panel that's cut to finished size. After laying out and drilling the countersunk holes for attaching the charging platform and drawer unit, you can radius the four corners.

The charging platform and drill rack are combined into a box-like assembly that's open at the front. A lip on the front of the platform prevents the chargers from sliding off the angled surface.

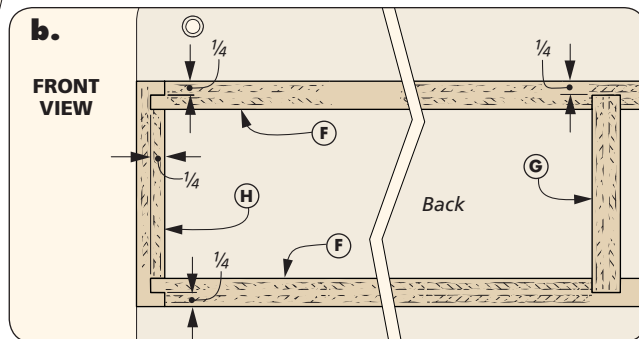
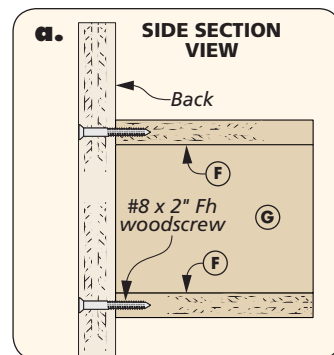
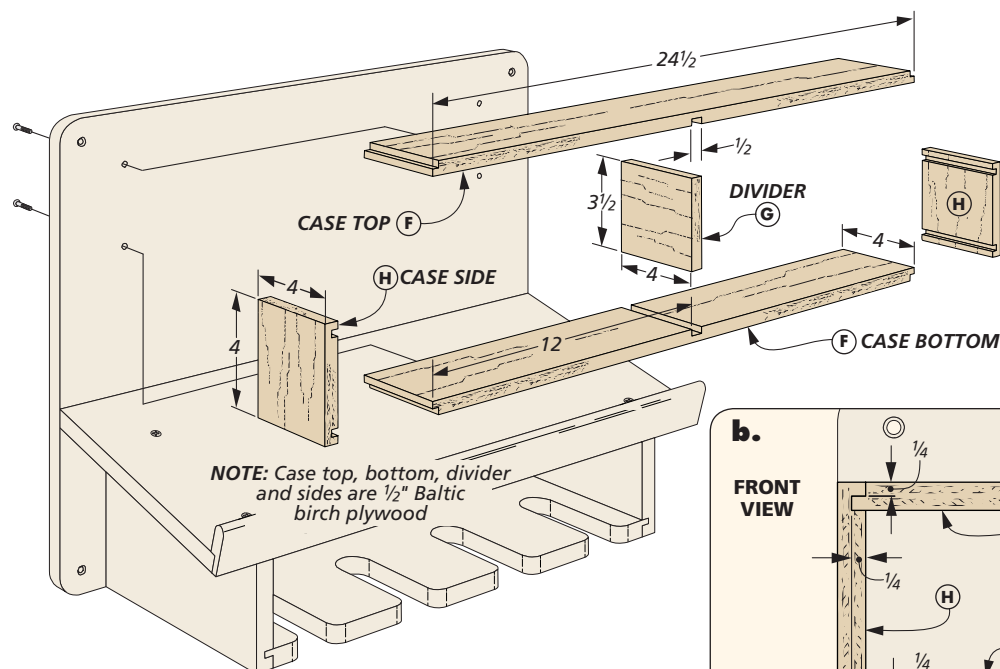
To build the box assembly, start by cutting the platform and ends to overall size. If you take a look at detail 'c' on



Plans for building the shelf shown above can be found online at *Woodsmith.com*

the next page, you'll notice that the back edge of the platform is beveled.

A pair of dadoes in the underside of the platform house the two ends (detail 'b'). And a narrow groove on the inside



Adding the **DRAWERS**

At this point, you already have a fully functional charging station. But to provide some additional storage for accessories, I chose to add a small drawer unit with a pair of drawers.

Like the rest of the charging station, the drawer case and drawers are made primarily out of plywood. But to keep the weight down and maximize storage space inside the drawers, I used $\frac{1}{2}$ " plywood instead of $\frac{3}{4}$ ".

As you can see in the drawing above, the drawer case is sized to match the width of the back. The case consists of a

top and bottom, two sides, and a divider. Tongues cut on the ends of the top and bottom fit into dados in the sides of the case. The divider is housed in shallow dados in the top and bottom of the case.

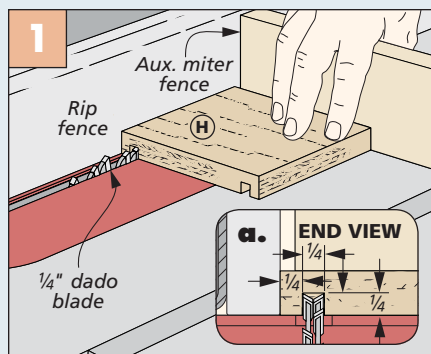
Detail 'b' above and Figures 1 through 3 in the How-To box below illustrate the joinery used in making the drawer case. There's nothing particularly difficult here — just a series of dado cuts. After cutting all the joinery, you can glue up the drawer case and mount it to the back of the charging station with screws, as shown in detail 'a.'

DRAWERS

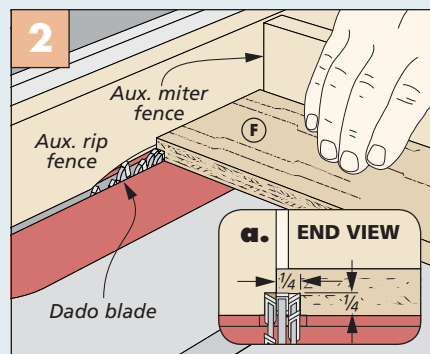
The two drawers that fit in the case are identical in size. They're sized to fit in the openings in the drawer case with $\frac{1}{16}$ " of clearance on either side and at the top. They simply slip into the openings and ride on the bottom of the case without any guides or runners.

If you take a look at the main drawing at the top of the next page, you'll see all the parts that make up each drawer. I began by cutting the drawer fronts, backs, and sides to finished size from $\frac{1}{2}$ " Baltic birch plywood.

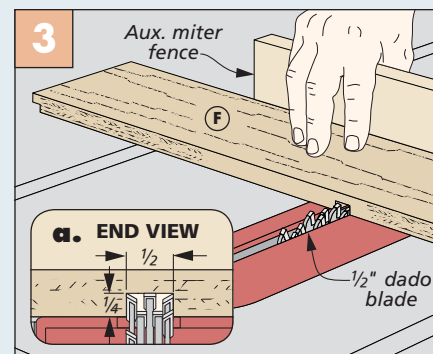
How-To: BUILD THE CASE & DRAWERS



Cut Dados in Sides. Cut a pair of dados in each case side to hold the case top and bottom.

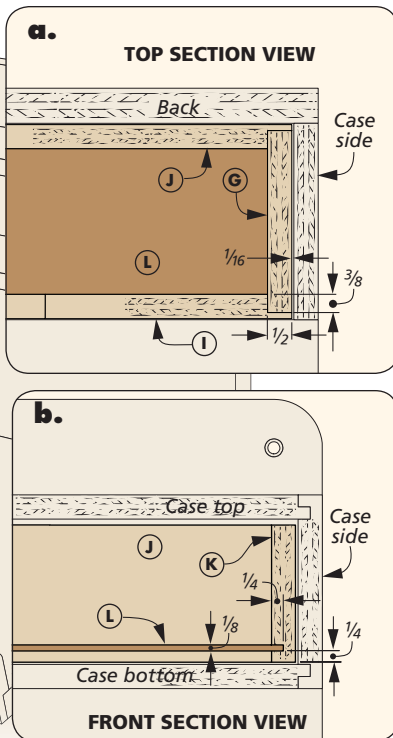
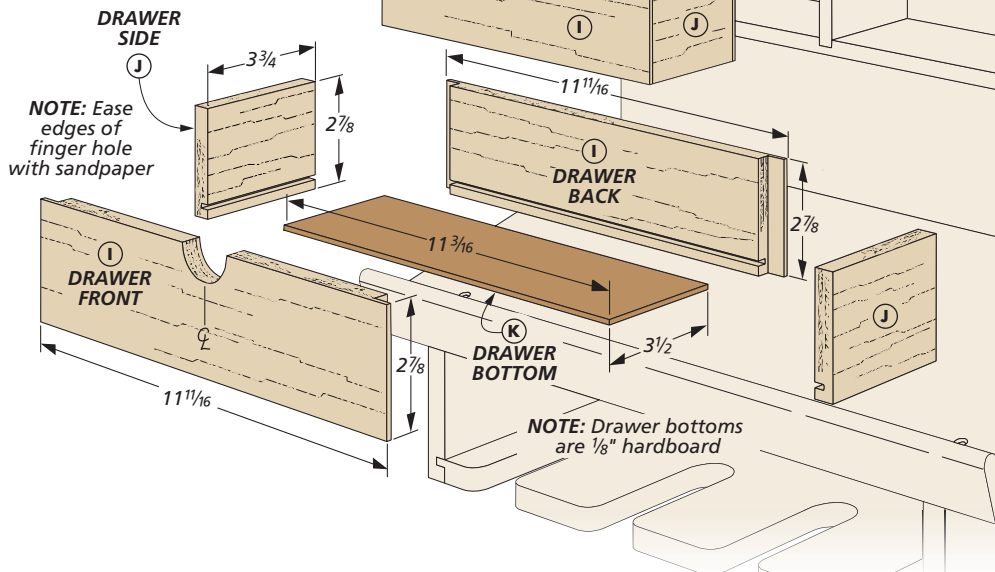


Tongues. Rabbets on the ends of the case top and bottom create tongues to fit in the dados in the case sides.



Centered Dados. A pair of shallow, centered dados in the case top and bottom hold the divider.

NOTE: Drawer fronts, backs, and sides are 1/2" Baltic birch plywood



The joinery used for the drawers couldn't be much simpler. Rabbits cut in the ends of the drawer fronts and backs hold the drawer sides. Figure 4 below gives the details on cutting these rabbits.

A kerf is cut along the inside face of each drawer piece to hold an 1/8" hardboard drawer bottom (detail 'b'). After cutting the drawer bottoms to size, there's just one more step to complete before assembling the drawers.

FINGER OPENING. In keeping with the simple construction of the drawers, I opted to forego any knobs or pulls and

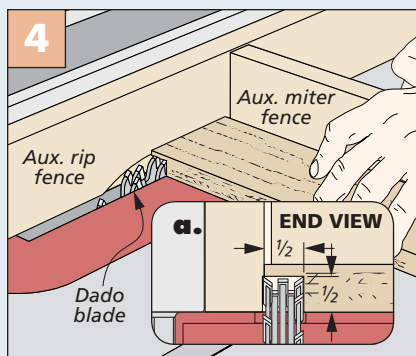
instead just cut a half-circle opening on the front of each drawer to serve as a finger pull. Figure 5 below shows the method I used to create these openings.

Once this is done, you can glue up the drawer fronts, backs and sides around the bottoms. Because the pieces are fairly thin, be careful not to pull the drawers out of square by overtightening the clamps as you assemble them. Once the clamps come off, you can install the drawers in the case.

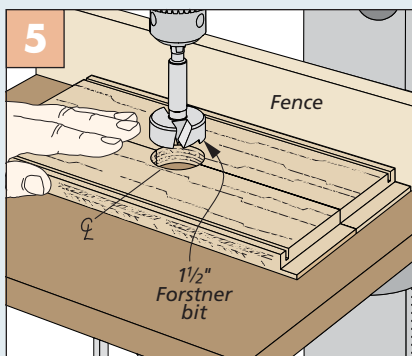
FINISHING TOUCHES. Even though this is just a shop project, I still applied a

finish to it. This not only helped protect the surface of the wood, but also made it easier to dust it off occasionally. I sprayed everything with a couple coats of satin lacquer and called it good.

To complete the charging station, I added an inexpensive power strip to the back, just under the drawer unit. The power strip makes it easy to plug in several chargers at once. Then all that remains is to find a convenient spot on the wall to mount the charging station and load it up with all your drills, chargers, and accessories. **W**



Drawer Joinery. Rabbits on the ends of the drawer fronts and backs are sized to hold the drawer sides.



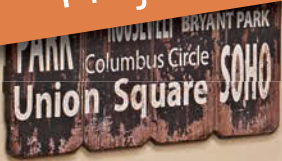
Finger Opening. Hold the two drawer fronts together while drilling a hole to create the finger openings.

Materials & Supplies

- A** Back (1) 3/4 ply. - 20 x 25
- B** Platform (1) 3/4 ply. - 10 1/2 x 25
- C** Ends (2) 3/4 ply. - 7 3/8 x 9 3/4
- D** Drill Rack (1) 3/4 ply. - 9 3/4 x 20
- E** Lip (1) 1/2 ply. - 2 x 25
- F** Case Top/Bottom (2) 1/2 ply. - 4 x 24 1/2
- G** Case Sides (2) 1/2 ply. - 4 x 4
- H** Case Divider (1) 1/2 ply. - 4 x 3 1/2
- I** Drwr. Frts./Bcks. (4) 1/2 ply. - 27 7/8 x 11 11/16
- J** Drwr. Sides (4) 1/2 ply. - 27 7/8 x 3 3/4
- K** Drwr. Bttms. (2) 1/8 hdbd. - 3 1/2 x 11 3/16
- (13) #8 x 2" Fh Woodscrews

ALSO NEEDED:

One 48" x 48" sheet of 3/4" Baltic birch plywood
One 24" x 48" sheet of 1/2" Baltic birch plywood
One 24" x 24" sheet of 1/8" hardboard



stylish Sliding Door Cabinet

Little extras are always a fun thing to stumble upon. This cabinet provides that with a hidden compartment that gives you twice the shelf space.

When you walk into a room, you'll notice this attractive shelving unit in the corner. While admiring the seamless joinery, you become aware that there's more to this cabinet than meets the eye. Upon closer inspection, the front of the case appears to be two sections.

As you pull on either end of the case front, the shelves glide apart, revealing a large space with a pleasant surprise.

Hidden behind the sliding cases is a mini-bar, with two full-width shelves. One of the shelves is stationary to give the cabinet strength. The other is adjustable, letting you tailor the space the way you like.

Between the two shelves is a slide-out tray. Pulling it out you'll see that it's hinged and flips open, giving you an extra-wide surface to serve friends a

favorite drink. Beneath the adjustable shelf is a simple rack that offers ample storage for the wine of your choice.

As you slide the tray away and draw the cabinet columns closed, don't be intimidated by all the moving parts. All it takes is a set of full-extension drawer slides and a keyboard tray slide. As you'll see, we've come up with some tricks that will make building this fun.



Construction Overview / **OVERALL DIMENSIONS: 33¹/₂"W x 52⁷/₈"H x 21⁵/₁₆"D (Closed)** **64³/₈"W x 52⁷/₈"H x 21⁵/₁₆"D (Open)**

NOTE: For hardware sources, turn to page 67

NOTE: The cabinet is finished with a coat of black lacquer primer and top-coated with two coats of satin lacquer

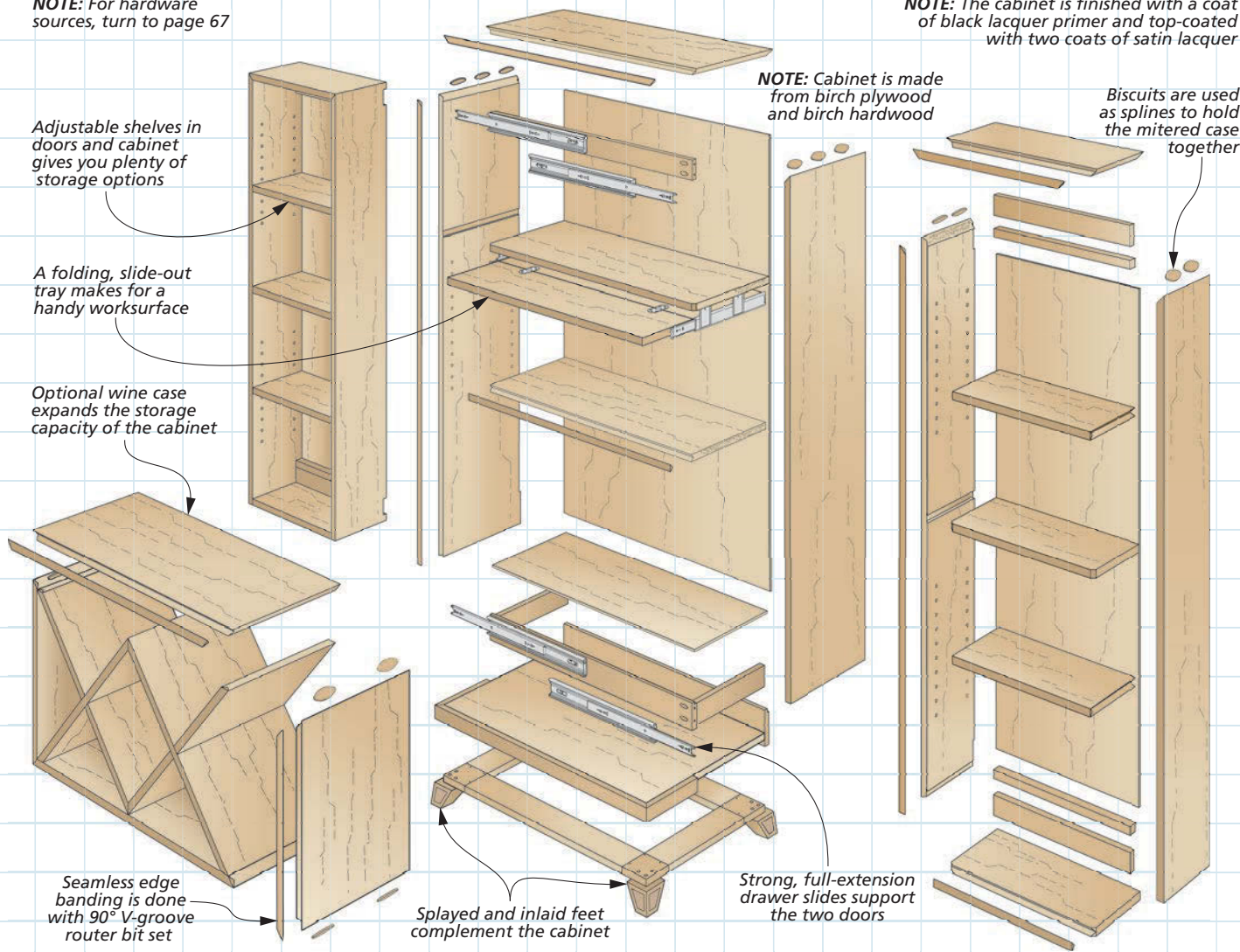
Adjustable shelves in doors and cabinet gives you plenty of storage options

A folding, slide-out tray makes for a handy work surface

Optional wine case expands the storage capacity of the cabinet

NOTE: Cabinet is made from birch plywood and birch hardwood

Biscuits are used as splines to hold the mitered case together



Seamless edge banding is done with 90° V-groove router bit set

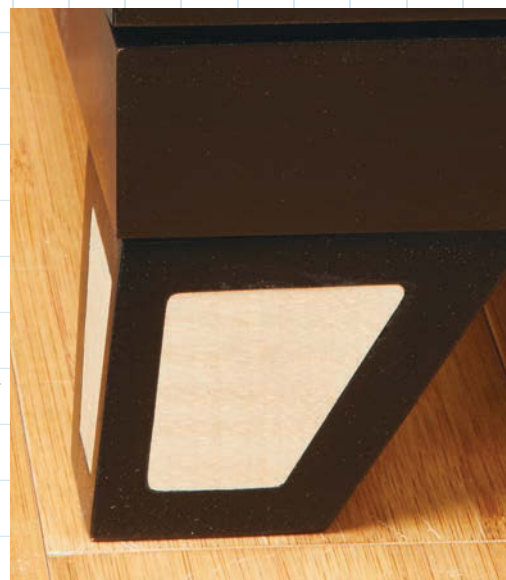
Splayed and inlaid feet complement the cabinet

Strong, full-extension drawer slides support the two doors



▶ The doors are attached to the cabinet with a set of full-extension drawer slides. The slides mount to the face of the cabinet and are hidden in a groove in the doors.

The feet sport a maple veneer inlay on the two outer faces. ▶ The inlays provide a nice contrast to the surrounding black lacquer.



this size, not to worry, there's an article on page 62 that'll give you the confidence to make those cuts. Since I was on a roll with trying some new wood-working methods, I decided to give the plywood edging a new twist as well.

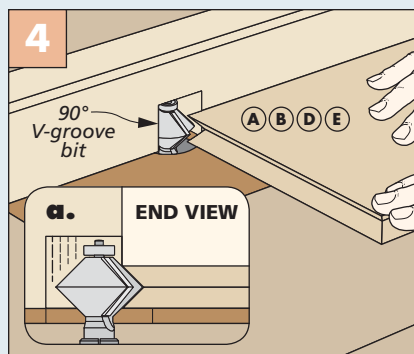
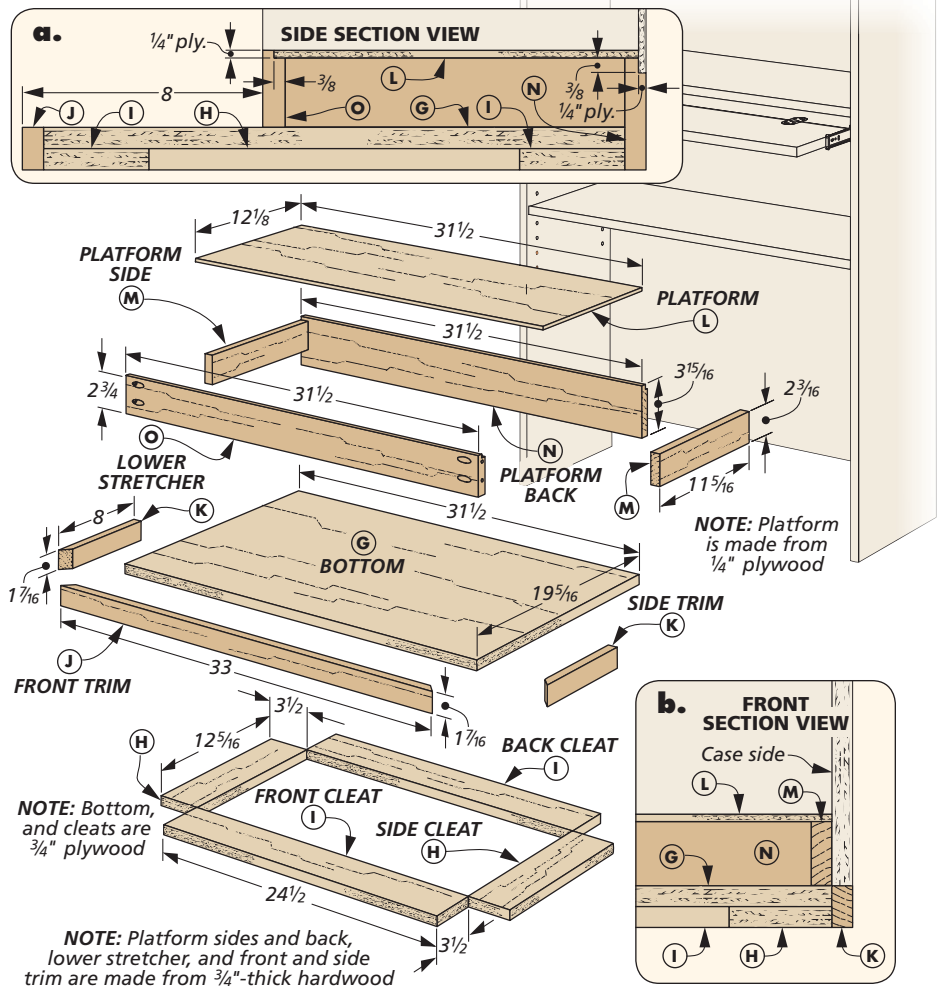
SEAMLESS EDGING. Instead of using veneer tape or a thin strip of solid-wood edging, I made the edging with a set of matching 90° V-groove bits. They work in tandem to hide the plywood layers with hardwood edging.

Both of the bits are used in the router table. The first one cuts a groove in the plywood workpiece. Then you use the mating bit to make the solid-wood edging that fits into the groove.

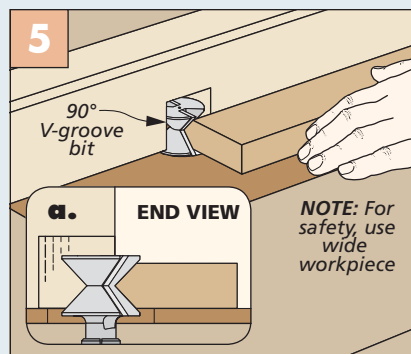
Figure 4 below shows the first step. As you rout this groove, there's one bit of advice I have — hold the material firmly into the fence to get a consistent groove. The same goes for the edging (Figure 5). Here, I made plenty of edging on long pieces of hardwood.

I routed the profile on both sides of the board, then ripped the strips free at the table saw. Leave these strips a little wide, so they completely fill the groove in the plywood. The first time I worked with these router bits, I made some test pieces to confirm the setup for each bit.

ASSEMBLY FIRST. When you've completed these two steps, don't glue in the edging just yet. Set it aside and assemble the case first. Then trim and install the edging on the sides and top. All that's left is to fit the edging in the fixed shelf.



V-Groove in Plywood. To ensure a consistent groove in the case parts, hold them firmly against the fence.

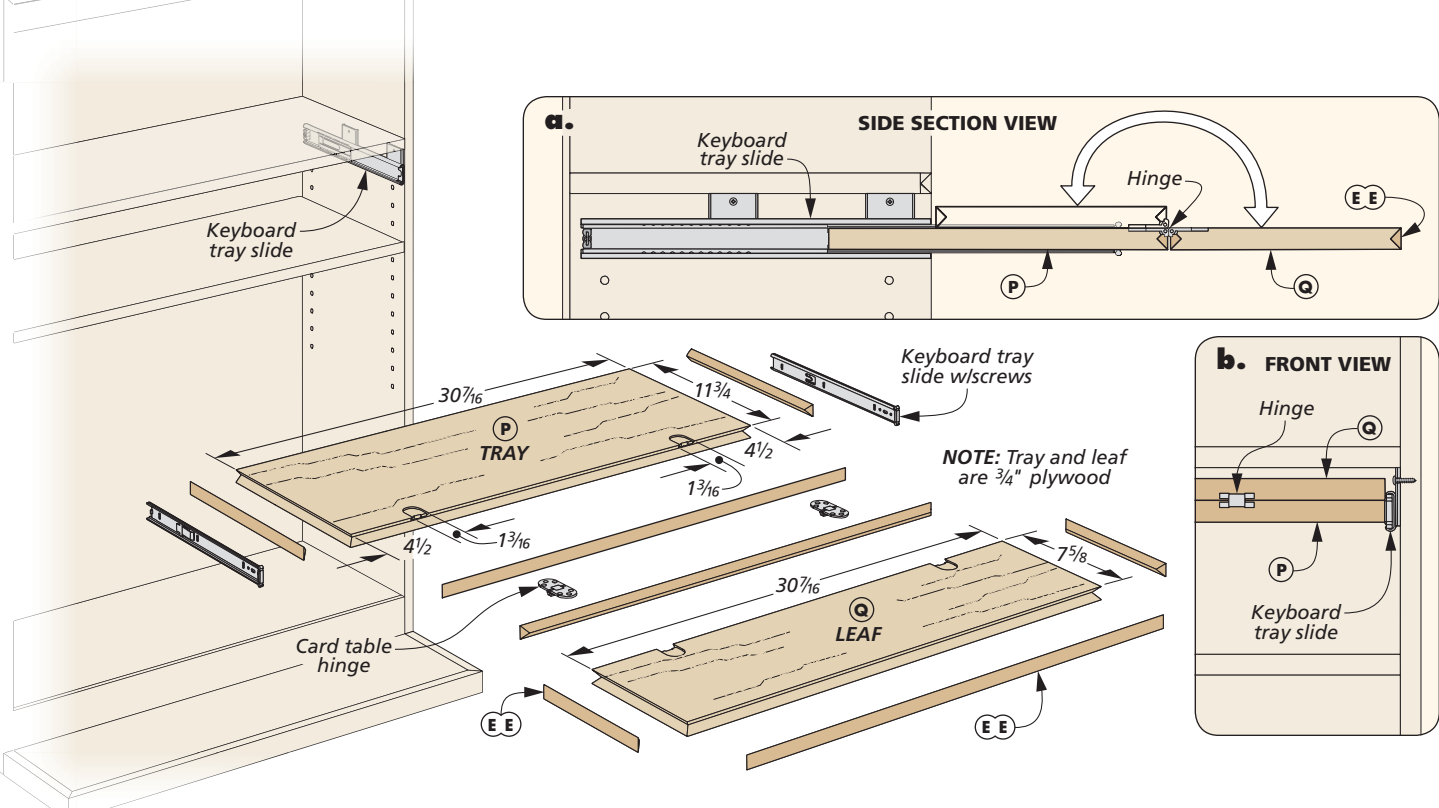


Edge Banding. Edge both sides of an extra-wide workpiece. Then cut the pieces free at the table saw.

BASE

The base is made up of two box-like sections. The lower, larger one supports the main case and extends out to the front of the sliding doors. Four cleats are glued to the underside of the bottom panel. The spaces formed by the ends of the cleats create pockets that you'll use to install the feet later. To hide the plywood edges of the bottom and the cleats, I trimmed them with wide hardwood strips.

The upper box creates a platform inside the main case. As you see in detail 'a' and 'b' above, the platform is supported by the sides, back, and the lower stretcher. The platform side pieces are glued to the side of the case. The platform back is attached to the sides with pocket screws, as is the lower stretcher. This stretcher, like its partner in the main case, is what the full extension slides are attached to. In turn, the doors will be attached to the slides after they're constructed.



Building the SLIDING SHELF & DOOR CASES

With the core of the case finished, I turned my attention to making the slide-out tray that sits just under the fixed shelf. The tray has two parts — a fixed section that travels on a pair of keyboard slides, and a hinged leaf that folds out. This setup lets you pull out the tray and flip open the leaf to use as a serving station (detail 'a').

The tray and leaf have the same edging that I used on the case (and will use on the doors as well). So after sizing the

parts, I attached all the edging. Next up is installing the hinge to connect the tray and leaf together.

HINGES. Since the hinges that join the leaf to the tray are mortised into the top of the surface, I wanted a perfect fit. This meant using a template like you see in the lower left drawing. There are more details on how to make this a perfectly flush fit on page 65. All that's left to do here is install the hardware and tray in the case.

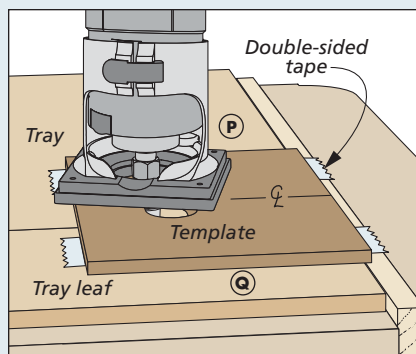
SLIDING DOORS

The doors are two narrow cases that slide open on a pair of heavy-duty drawer slides. Each door consists of two sides and a top that are mitered together (and reinforced with biscuits), and a bottom that's joined to the sides with a rabbet. In addition, there's one fixed shelf and two adjustable shelves. Like the main case, the edging is installed after each door case is assembled.

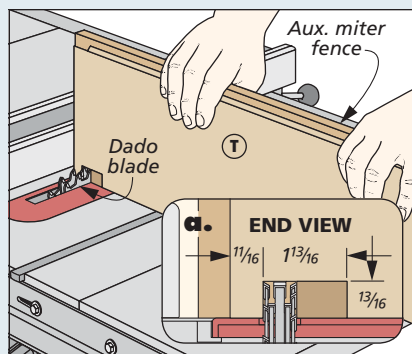
RAILS. The last pieces on the doors are the most critical, the rails and rail caps. These are the structural elements that the slides will be mounted to. As you can see in details 'a' and 'e' on the next page, these two parts are set in from the back of the doors. This creates a pocket for the drawer slides, keeping the profile as sleek as possible. To access the recess, I needed to cut a notch on the two inner door sides. That information is in the second drawing to the left. After the notches are cut, the door cases can be assembled.

SMOOTH OPERATOR. The drawings at the bottom of the next page show the steps for attaching the doors to the cabinet. But I want to mention a few things. Lay one of the doors on the case, aligning it flush with the top and sides. To install

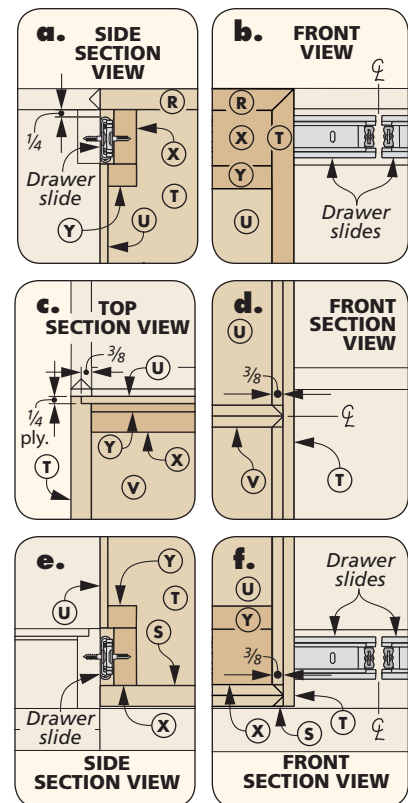
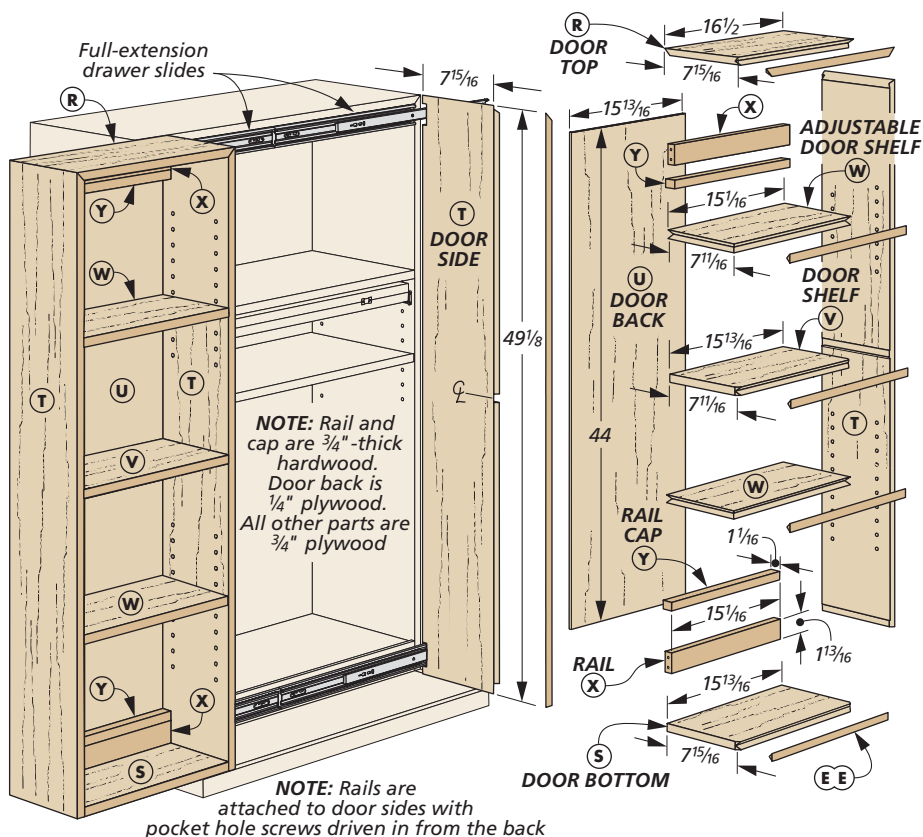
How-To: HINGE MORTISES & CASE NOTCHES



Mortises in Tray. Align the edges of the tray and leaf to the centerline. Template details are on page 65.



Cut Notches in Door Sides. A tall miter gauge fence supports the sides to cut the notch for the slides.



the upper slide, insert a $\frac{1}{4}$ " spacer and the slide into the opening (Figure 1). Keep the spacer and slide against the top of the rail opening. Now lift the door clear and attach the slide to the main case. For the other upper slide, I butted it against the end of the first slide and used a straightedge to align them.

WIDE SPACER. To install the lower slides, I made a wide spacer to position them on the lower stretcher. The spacer matches

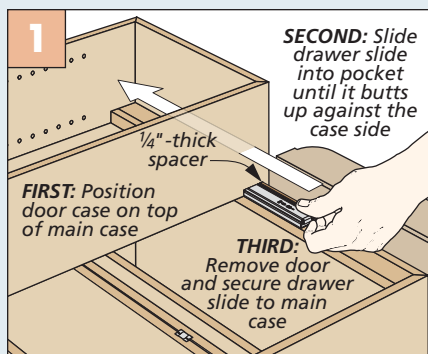
the distance between the rail openings on the back of the doors. I inset the lower slides from the side of the cabinet the same distance as the upper slides. When all was in place, I fastened the slides to the stretchers (Figure 2).

ATTACH THE DOORS. With the slides attached to the cabinet, all that's left is to connect them to the doors. The routine starts by applying a strip of double-sided tape on the slide to

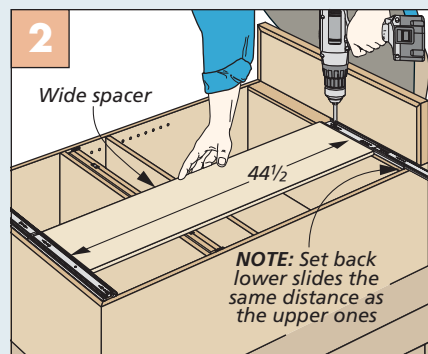
temporarily hold it to the door. Now, set the door on the cabinet, flush to the top and sides. Then start to "open" the door — just enough to attach the first screws through the slide into the door (Figure 3).

Take your time setting this first screw, and use an adjustable slot on the slide. It's also a good idea to check the alignment of the doors with the cabinet as you install the rest of the screws.

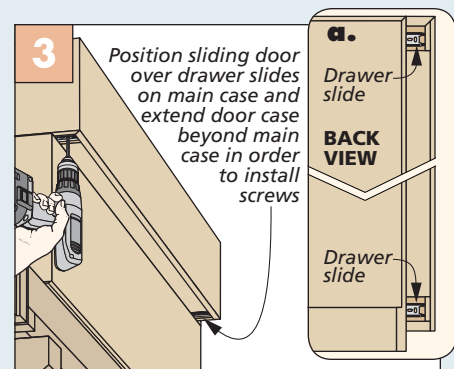
How-To: ATTACH SLIDES TO CASE & DOORS



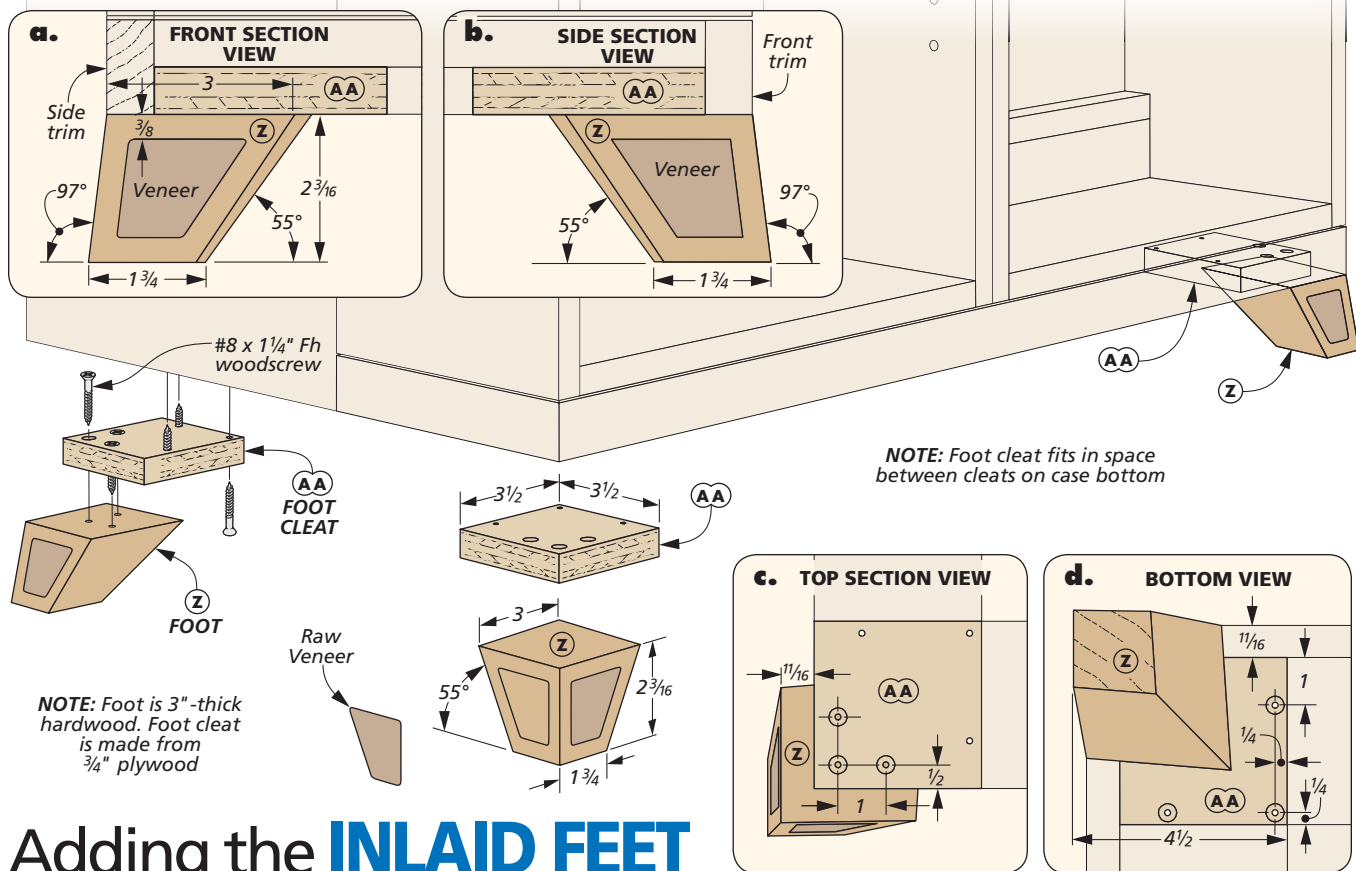
Position Drawer Slides. A spacer positions the first slide. Once installed, align the second slide to it.



Align and Install Lower Slides. To keep the lower slides parallel to the uppers, I used a wide spacer.



Attach the Doors. Place the door back on the cabinet, slide it and the slides open enough to attach the first screw.



Adding the **INLAID FEET**

It's time to take a break from working on the big parts of the cabinet and focus on some small details. The four feet that support the case are made of hardwood. They're tapered and splayed to add an accent to the base of the case. The outer faces have a hardwood veneer inlay to enhance the look. When finished, they're attached to the underside of the base with

plywood cleats. All this is shown in the drawings and details above.

The feet start out as 3" blocks that are cut from a hardwood turning blank. It's best to tackle the contours of the feet one face at a time. So the first order of business is to cut the blocks for the individual feet to length. Since the ends of the blocks are cut at an angle to create the tapered

foot, I made a jig that cradles the foot blank while cutting the blocks to length. The details are in Shop Notes on page 66.

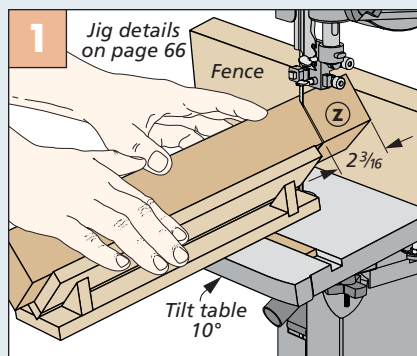
ANGLED BLOCKS. To get started, I tilted the band saw table 10°. Then, using the jig, I made an initial cut on the end of the blank. Next, I drew a line 2 3/16" from the end of the fresh cut. With the blank back in the cradle, align the blade of the band saw to this line and move the rip fence in place to use as a stop. Figure 1 to the left shows this.

INSIDE BEVELS. The two inner faces of the feet are beveled at 55°. Since these faces are hidden from view, I cut them at the band saw. Detail 'a' above shows where to mark the base of the feet to locate the bevel and start the cut. Figure 2 shows how to freehand this cut at the band saw. When the feet are all cut, you can sand the inner faces smooth.

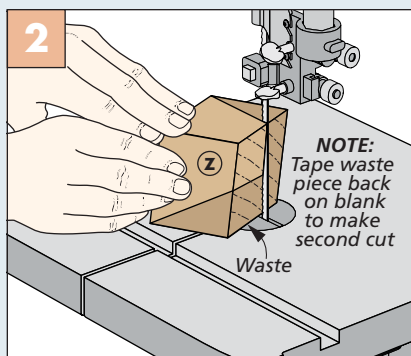
INLAYS

The outer faces of each foot have a curly maple inlay that adds visual interest to the cabinet. You can see what these look like in the main photo on page 28.

How-To: CUT THE FOOT BLANKS TO SIZE



Taper the Blanks. After trimming the end of blank to the proper angle, cut the foot blanks to size.



Free Hand Tapers. Lay out the tapers on the inside face of the feet and cut them free hand at the band saw.

TEMPLATE TIME. As with all inlay work, this is an exacting process that you'll want to take your time executing. But thanks to some up-front strategies, a properly made template, and an inlay bushing bit attached to your router, it'll seem like a walk in the park. Well, a focused walk in the park.

The exact measurements for the template opening are on page 66. It's important to make the template out of thin material so that it works with the inlay bushing you'll use on your router. A piece of $\frac{1}{4}$ " hardboard is a good choice.

An inlay bushing is different from a conventional router guide bushing in that it has a removable collar. This setup works great with a single template. You rout the recess first, with the collar on. Then to cut the inlay, you remove the collar, which accounts for the diameter of the bit. What you end up with is an inlay that matches exactly.

RECESS FIRST. After making the template (Figure 1), lay out the position of the foot on both sides of the template. Then attach a pair of cleats with pin nails to register the foot (Figure 2). With the template ready, use double-sided tape on the inside face of the cleats to hold the feet in place.

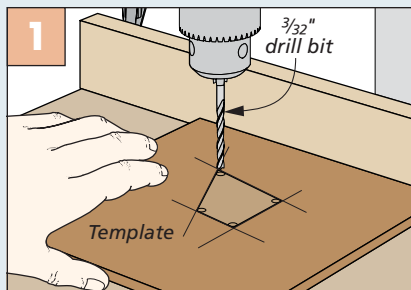
Figure 3 shows how I went about routing the recess. After tracing the edges, you can work back and forth to clear the field. Repeat this process on one face of all of the feet before moving the cleats to the opposite side of the template and routing the adjacent faces (Figure 4).

MAKE THE INLAYS. To make the inlays, attach the veneer to an MDF board with double-sided tape (Figure 5). Remove the collar on the bushing, then follow the contour of the template exactly to make the inlay piece (Figure 6).

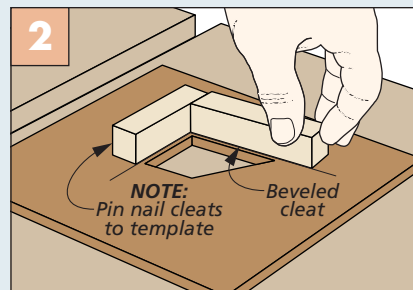
Move the template position on the veneer and repeat the process. To remove the tape from the inlay pieces, use lacquer thinner or mineral spirits. I rounded the corners of the inlay pieces with sandpaper as needed to fit.

CLEATS. I attached the cleats to the feet at this point (Figure 7). Doing this let me secure each foot in a vise while I did the detailed work of masking off the recesses (Figure 8). It also was a benefit while installing the inlays.

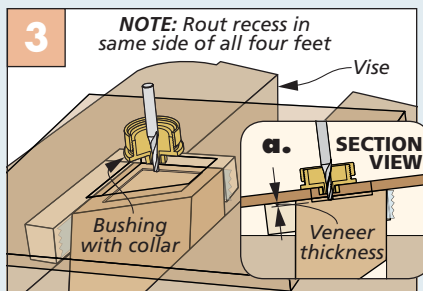
How-To: CREATE THE INLAID FEET



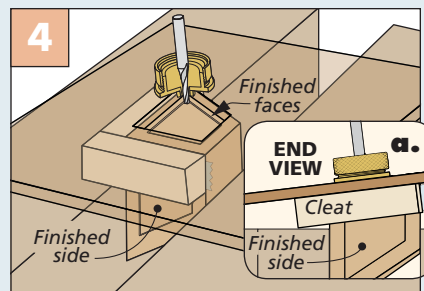
Hardboard Template. Drill the corners of the template first. Then cut away waste and file to the line.



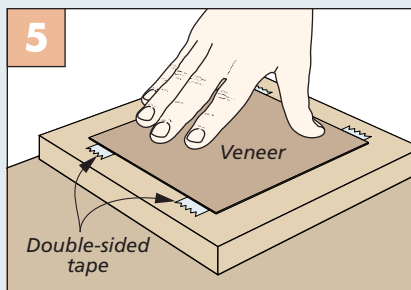
Attach Cleats. Use pin nails to attach cleats. For size and position of cleats, see Shop Notes on page 66.



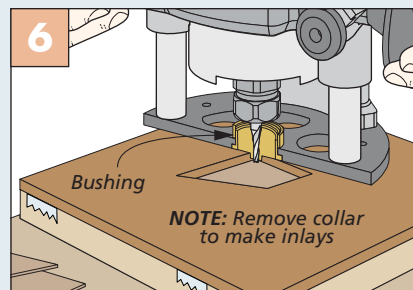
Rout Inlay Recess. Place the foot and template in the vise. Rout the recess into the same side of each foot.



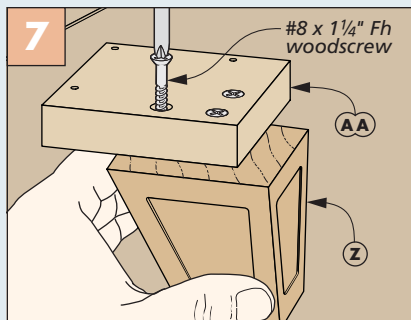
Flip Template. Attach cleats to the other side of template. Now you can repeat the process on all four feet.



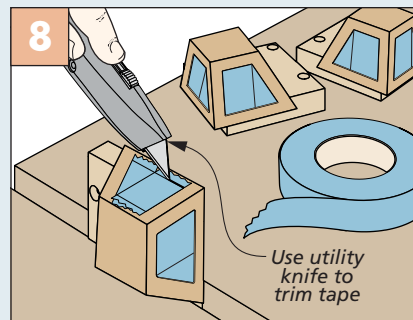
Prepare Veneer. Attach the sheet of veneer to a sacrificial MDF board with double-sided tape.



Rout Inlay Shapes. Stay tight against the edge of the template to make precise matching inlay pieces.



Attach the Cleats. Glue the cleats in place and let dry. Then drill pilot holes and fasten the cleat with screws.



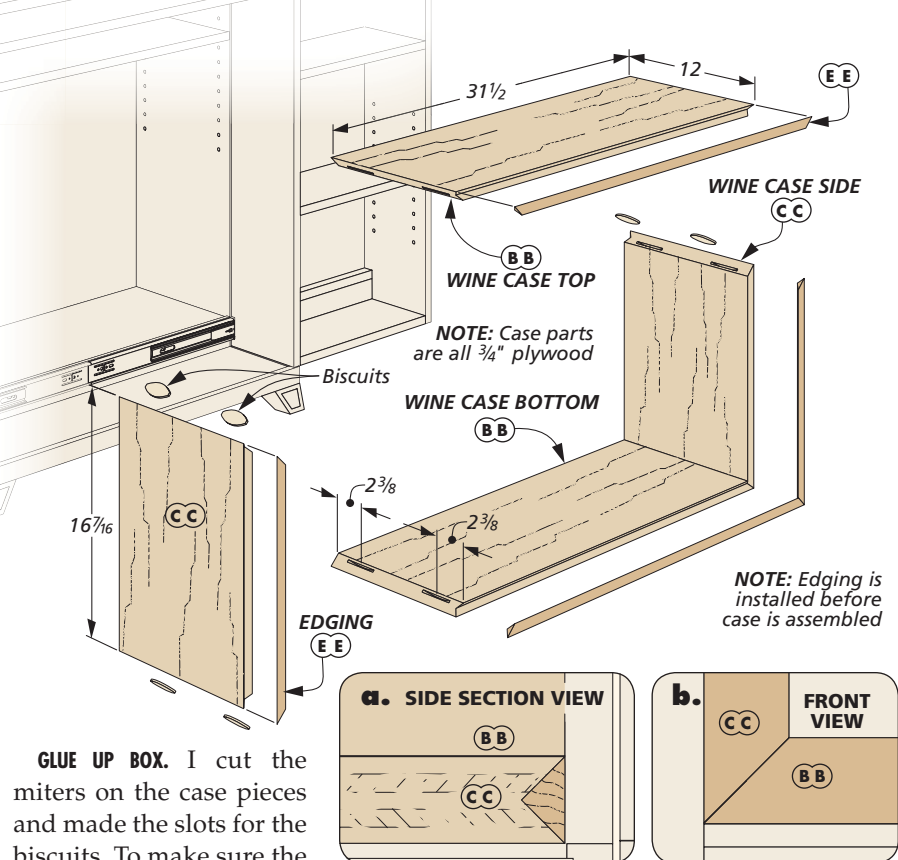
Finish Preparation. Mask off each recess before spraying lacquer. Then you can glue in the inlay pieces.

And finally the WINE CASE

You're on the home stretch. All that's left is to make the removable wine case. The case is an optional part of the project. But I had fun building it. It's not as small and fussy as the feet were, or as large as the main case and doors. Work at the bench is always a nice way to finish up a project.

The wine case is a simple box that has mitered and splined corners like the case and doors. It also has the same V-grooved edging. There are seven compartments that give you plenty of room to store a variety of your favorite wines. I chose to focus on the case first.

A DIFFERENT STRATEGY. Unlike the rest of the project, here I installed the edging in the four pieces that make up the case frame before mitering them to length. Since there are no fixed shelves to contend with, I can edge each piece before cutting them to final size. Also, as I'm sure you've noticed, the case doesn't have a back, so some extra care and attention are due during assembly to keep it square.



GLUE UP BOX. I cut the miters on the case pieces and made the slots for the biscuits. To make sure the open case stayed square, I aligned it to a framing square that I clamped to the bench.

MAKE THE DIVIDERS

Making the four dividers was next on the agenda. To start that adventure, I

laid out centerlines on the edges of the case top and bottom and transferred those lines to the back side of the case. Then I turned my attention to the dividers. As with the case, I installed the edging in each piece first.

Materials, Supplies & Cutting Diagram

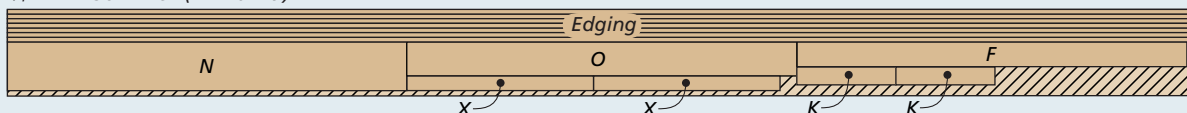
A Top (1)	3/4 ply. - 12 3/4 x 32 15/16	O Lower Stretcher (1)	3/4 x 2 3/4 - 31 1/2	CC Wine Case Sides (2)	3/4 ply. - 12 x 16 7/16
B Sides (2)	3/4 ply. - 12 3/4 x 50 5/8	P Tray (1)	3/4 ply. - 11 3/4 x 30 7/16	DD Dividers (4)	3/4 ply. - 12 x 21 1/4
C Back (1)	1/4 ply. - 32 1/4 x 46 3/4	Q Leaf (1)	3/4 ply. - 7 5/8 x 30 7/16	EE Edging	3/4 x 3/8 - 700 rgh.
D Shelf (1)	3/4 ply. - 12 1/2 x 32 1/4	R Door Top (1)	3/4 ply. - 7 15/16 x 16 1/2		
E Adj. Shelf (1)	3/4 ply. - 12 1/2 x 31 1/2	S Door Bottom (1)	3/4 ply. - 7 15/16 x 15 13/16		
F Upper Stretcher (1)	3/4 x 2 - 31 1/2	T Door Sides (4)	3/4 ply. - 7 15/16 x 49 1/8		
G Bottom (1)	3/4 ply. - 19 5/16 x 31 1/2	U Door Back (1)	1/4 ply. - 15 13/16 x 44		
H Side Cleats (2)	3/4 ply. - 3 1/2 x 12 5/16	V Door Shelf (1)	3/4 ply. - 7 11/16 x 15 13/16		
I Front/Back Cleats (2)	3/4 ply. - 3 1/2 x 24 1/2	W Adj. Dr. Shlvs. (2)	3/4 ply. - 7 11/16 x 15 1/16		
J Front Trim (1)	3/4 x 1 7/16 - 32 15/16	X Rails (2)	3/4 x 1 13/16 - 15 1/16		
K Side Trim (2)	3/4 x 1 7/16 - 8	Y Rail Caps (2)	3/4 x 1 1/16 - 15 1/16		
L Platform(1)	1/4 ply. - 12 1/8 x 31 1/2	Z Feet (4)	3 x 3 - 2 3/16		
M Platform Sides (2)	3/4 x 2 3/16 - 11 5/16	AA Foot Cleats (4)	3/4 ply. - 3 1/2 x 3 1/2		
N Platform Back (1)	3/4 x 3 15/16 - 31 1/2	BB Wine Case Tp/Bttm (2)	3/4 ply. - 12 x 31 1/2		

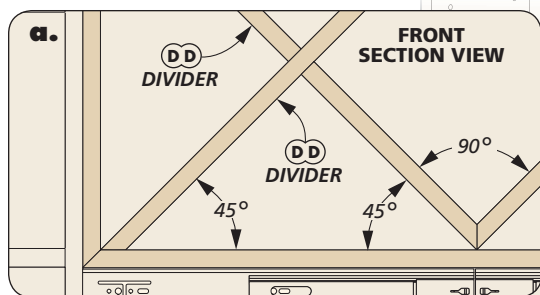
ALSO NEEDED:

Three 48" x 96" sheets of 3/4" birch plywood.
One 48" x 96" sheet of 1/4" birch plywood.
12" x 12" sheet of maple raw veneer.
3" x 3" x 18" maple turning blank

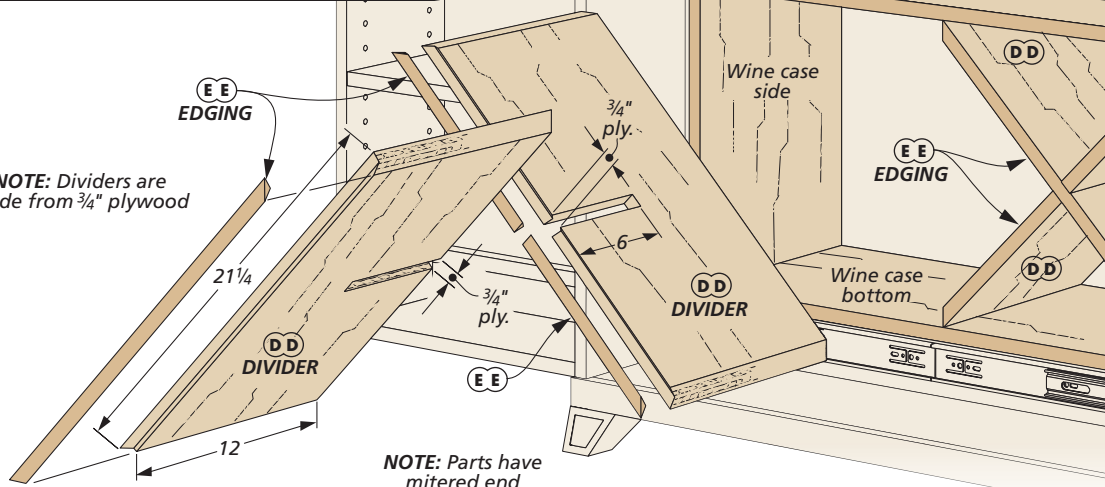
3/4" x 2" - 72" Birch (1.0Bd. Ft.)

3/4" x 7" - 96" Birch (4.7 Bd. Ft.)





NOTE: Dividers are made from $\frac{3}{4}$ " plywood



Fitting in the dividers in the case was just a matter of pairing them up. The four dividers end up making two V-shapes that are easy to work with. It starts with fitting each piece (Figure 1).

MARK THE DIVIDER NOTCHES. When the two "Vs" were snugly fit, I slid them together as you see in Figure 2. Then with a sharp pencil and a square, I transferred the intersection points of the dividers. I took each divider over to my table saw and cut the notches according to the layout

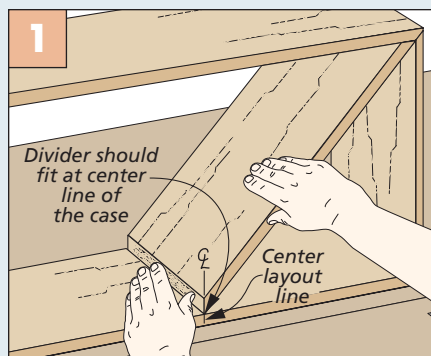
lines. I made these notches longer than the center of each divider. There's no need to be exact with this since the ends of the notches aren't visible.

GLUE DIVIDERS IN PLACE. Be mindful of how you apply the glue to the dividers. You want enough to make a good bond, but not so much that you're creating extra work later. For me, this meant feeding both sets of dividers in from the front, pushing any excess glue out the back.

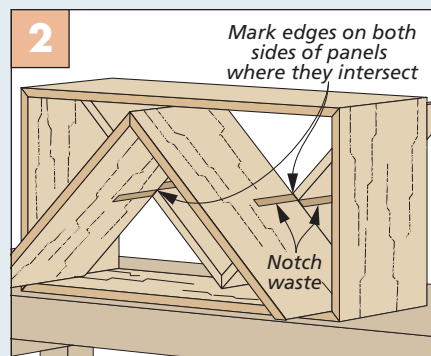
FINISH THE PROJECT. The cabinet has a lacquer finish. To get a even coat of finish on all the parts I started by removing all the hardware.

The first coat that went on was black lacquer. The lacquer gives the project a luster that you can't get with paint. When dry, gently knock down any nubs before applying two top coats of satin lacquer. When all is dry and reassembled, you can pour a glass of red and sit down with a good book. **W**

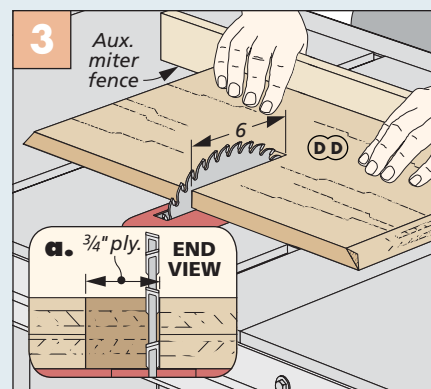
How-To: LAY OUT & CUT THE DIVIDERS



Fit Divider Pieces into Case. Each divider is cut to fit between the corner and center of the case.



Locate the Notches. Fit the two sets of dividers to the center of the case. Then mark the locations for the notches.



Cut Notches at the Table Saw. Cut each side of the notch. Then with a sharp chisel, chop the waste free.

plywood shop Final Three

Simple plywood construction and butt joints make these shop fixtures not only affordable, but quick and easy-to-build.

In the previous issue of *Woodsmith*, we built the first two pieces of our plywood shop. The first project was a stout workbench with a large worksurface. As a companion to the workbench, we added a wall-mounted shelf, complete with a tool rack.

In this issue, we'll further expand your shop's capabilities with the remaining pieces of the plywood shop. The first component is a tool stand that can be used as a miter saw station or a router table. Next, a rolling cart serves as an assembly table, as well as storage.

Finally, to complement the tool stand, we'll build a pair of adjustable supports. These serve as outriggers all around the shop when working with long workpieces. After finishing these three projects, your shop will be well equipped for future builds.



◀ Adding a router insert and a clamp-on fence converts the tool stand from a miter saw station into a versatile router table.

▶ A pair of adjustable supports are the perfect complement to the miter saw station and can lend an extra hand anywhere in the shop.



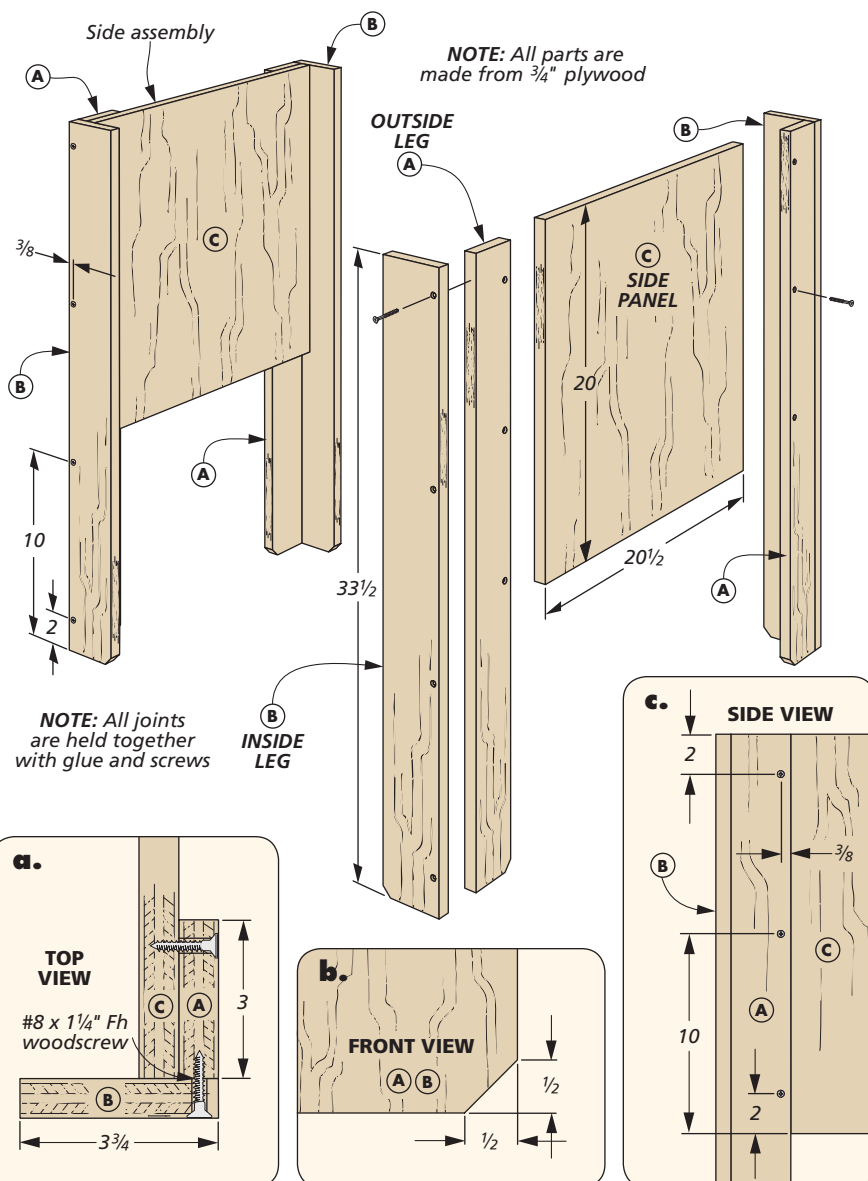
A BASE WITH TWO PURPOSES

I started by building the base for the stand. Both the router table and miter saw station use the same base, so if you're planning on building both, go ahead and make two. Screws and butt joints make these quick to build, but before you get started, check out the How-To below. Plywood has a tendency to chip when driving screws. Figure 1 details how to get clean, perfect holes every time.

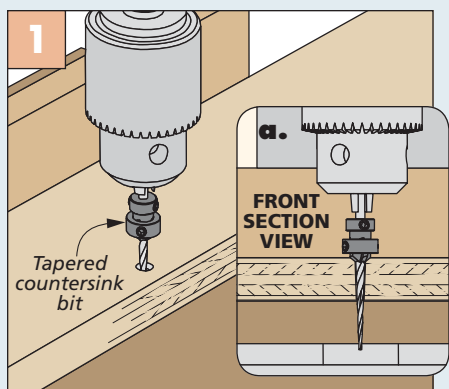
SIDE ASSEMBLIES. The stand is made up of two side assemblies, joined with a shelf and top. Each assembly consists of an inside and outside leg, connected by a panel. The legs are simply butted together at a right angle, as shown in detail 'a.' A circular saw and cutting guide make quick work of ripping the legs to size. The legs can be cut to length on the miter saw.

I beveled the bottom of each leg with a jig saw. Detail 'b' provides the dimensions for the bevel cuts and Figure 2 below outlines the cuts with the jigsaw. A few screws and some glue are all that's needed to secure the legs together.

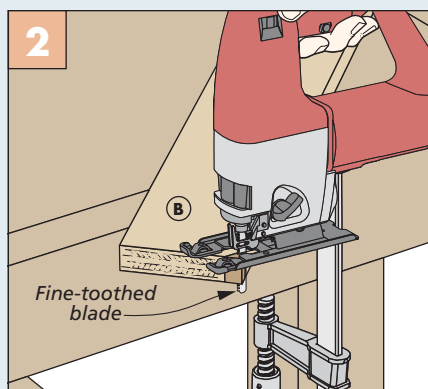
The front and back leg assemblies are connected with a plywood panel. To attach the panel to the legs, it's easiest to use spacers to lift the panel off the bench (Figure 3). With the panel elevated, glue can be applied to the edge of the panel and the leg assemblies can be held in place with screws.



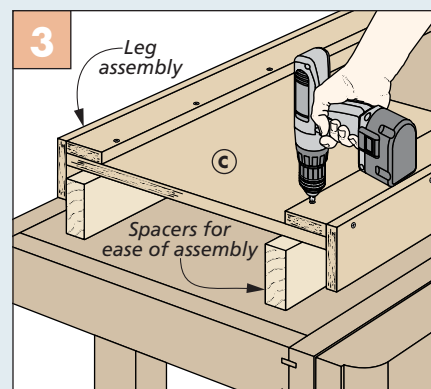
How-To: ASSEMBLE THE BASE PARTS



Perfect Holes. In order to drill chip-free holes that won't split, drill all holes with a tapered countersink bit.

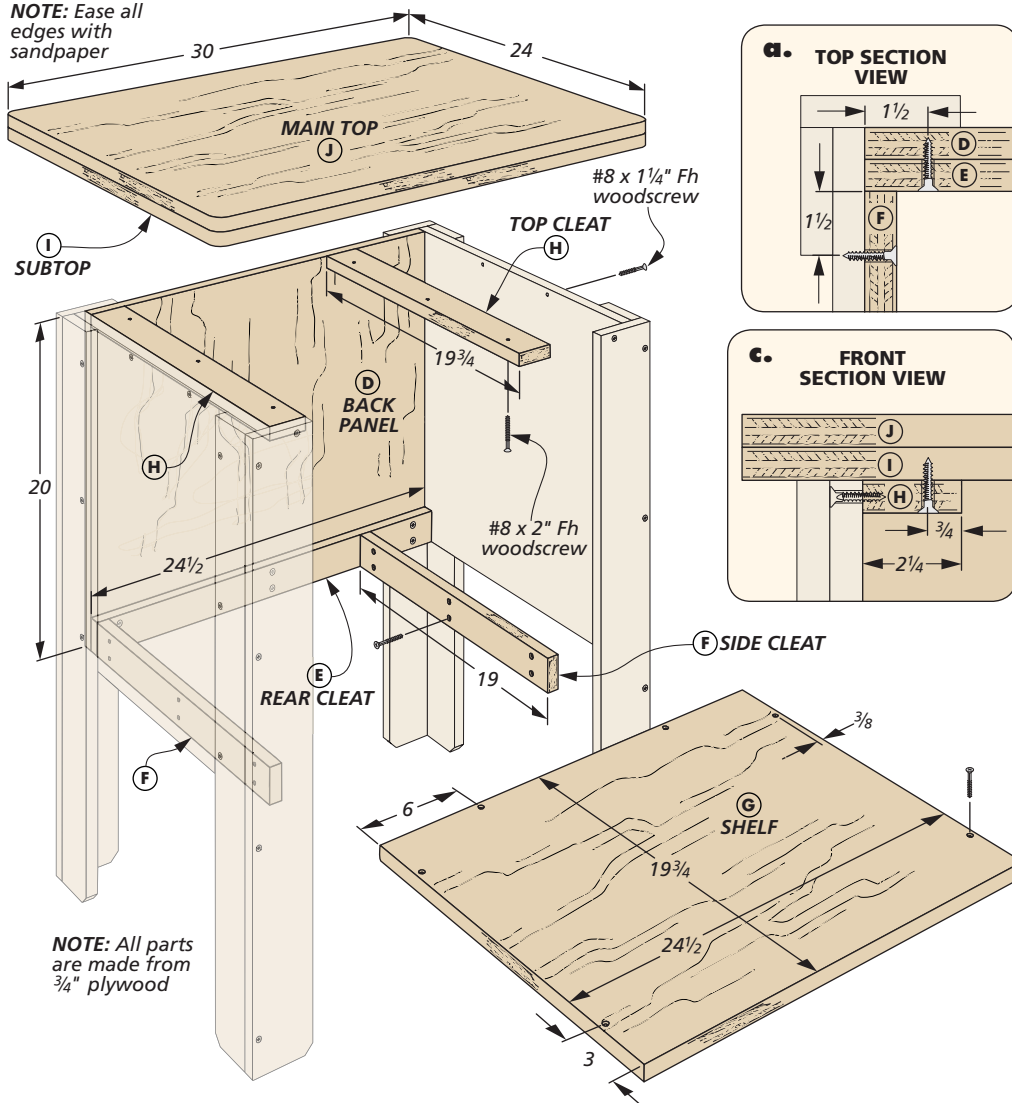


Bevel Leg Ends. The ends of each leg are beveled. Use a fine-tooth blade in a jigsaw to minimize tear out.

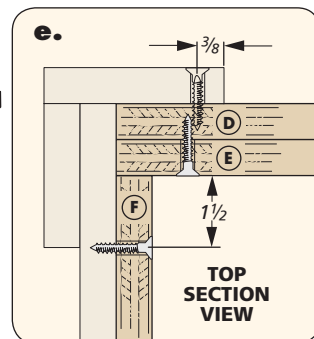
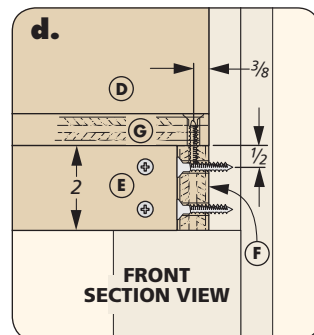
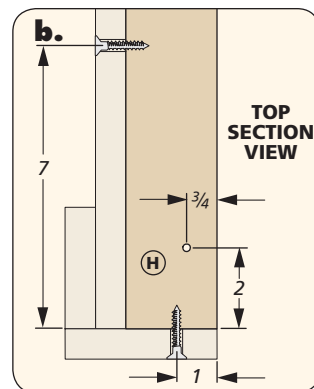
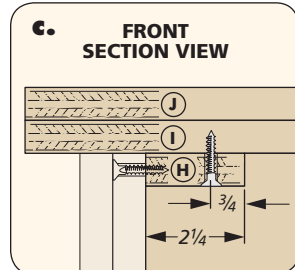
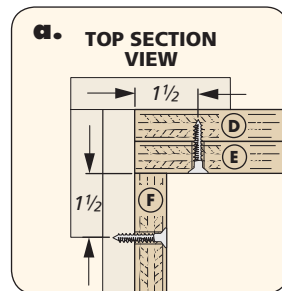


Side Panels. Use spacers to lift the panels off the workbench. The leg assemblies can then be screwed in.

NOTE: Ease all edges with sandpaper



NOTE: All parts are made from 3/4" plywood



Completing the **STAND**

With the side assemblies complete, you can work on connecting them and adding a worksurface. A two-layer top is strong enough to support heavy loads and a shelf below the top provides additional storage.

BACK PANEL. The two side assemblies are connected the same way as the legs — with a plywood panel. The process for attaching this back panel is also the same. Spread glue on the inside of the legs and drive screws through them into the back panel.

SHELF. It would be a shame to waste the area underneath the top of the station, so I added a shelf for extra storage. The shelf rests on three cleats. The cleats are attached to the back and side panels. Because the cleats are

narrow, be sure to predrill the mounting holes to avoid splitting them. After installing the cleats, the shelf can be dropped into place and held in with screws, as well.

TWO-LAYER TOP. As I mentioned earlier, the two-layer top on the stand adds additional weight and rigidity. To make it, start with the lower portion, the subtop. The subtop is cut to finished size and a 1" radius is marked on the corners. Using a jig saw with a fine-toothed blade, round the corners, making sure to leave the layout lines. Then sand each corner to the line.

MAIN TOP. The main top is cut slightly oversized, and is attached to the subtop using glue and screws from the underside. Make sure the main top

is centered on the subtop, with equal overhang on all four sides. After I had the two tops attached together, I used a hand-held router with a flush-trim bit to trim the main top flush to the subtop. The flush-trim bit has a bearing that guides the router bit along the subtop, ensuring a perfectly flush edge. With the top at final dimensions, you are ready to attach it to the stand. A pair of cleats secured to the side panels (detail 'c') is the ticket here.

If you are planning on using the station as a miter saw stand, stop here. However, if you're going to make the stand into a router table, there are additional details on the next page for cutting an opening for the router plate insert and building the fence.

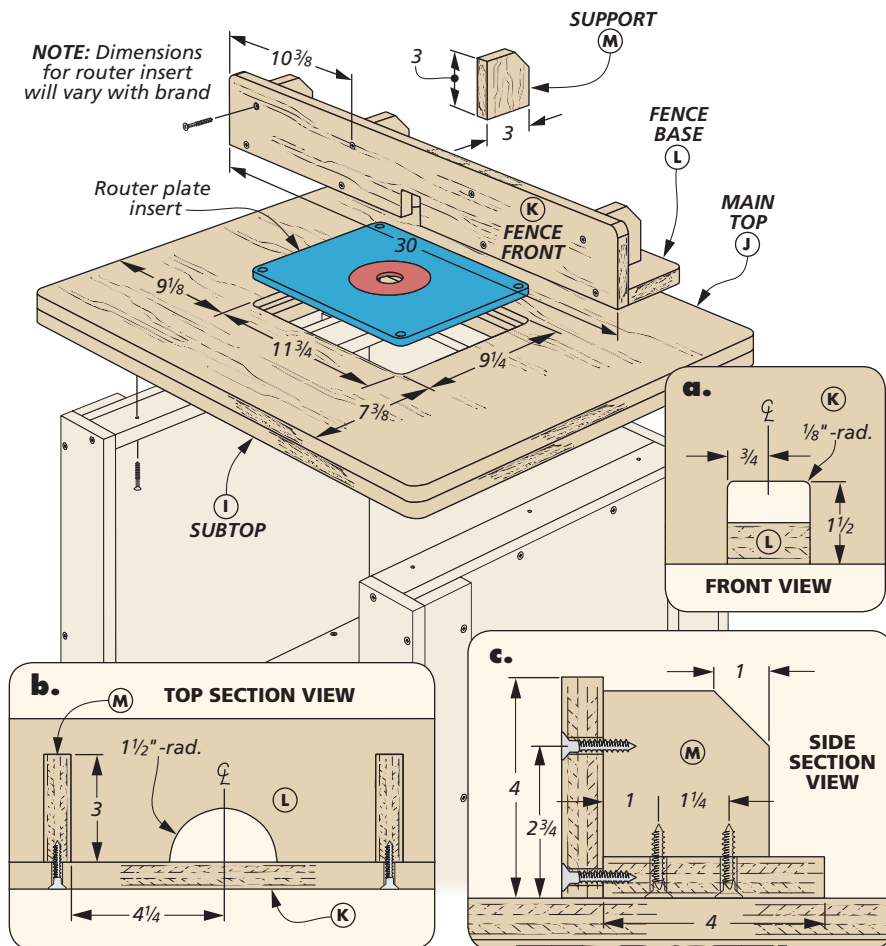
ROUTER TABLE

It can be argued that a router table is one of the most useful tools in a shop. You can cut joinery, joint boards, and add decorative profiles. By taking a few additional steps, we can convert the basic two-layer top from the previous page to a fully functional router table top, complete with a fence.

ROUTER INSERT. The first step to install a router insert is to use a drill and jig saw to cut an opening 1" smaller in both dimensions than your insert, as shown in Figure 1 below. With the opening cut, you can grab your router plate and move to the next step.

RABBETED OPENING. The insert plate rests in a recess around the edge of the opening. To achieve this, a rabbet is cut around the opening in the main top using a router and a dado clean-out bit. Make sure that your router bit matches the radius of the corners of your router plate insert. This will allow the router plate to sit in the rabbet and be flush to the top. All the details you need to create this rabbeted opening are outlined in the How-To box below.

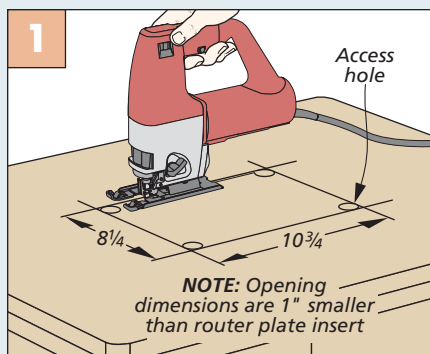
FENCE. With the router plate insert installed in the top, the next thing you'll need is a fence. The fence I've created here is nothing more than a pair of plywood strips. A notch is cut in the center with a jig saw to make room for the router bit. The strips are held together with screws and have supports on the back side.



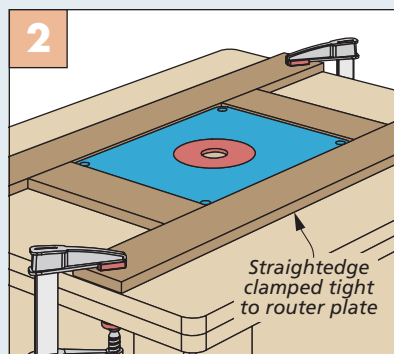
To attach the supports, glue them in place and drive screws from the front and the base. The supports serve a few purposes. First, they keep the fence from flexing. They also ensure that the fence face stays square to the tabletop.

To lock the fence in place, simply attach it to the tabletop with a clamp on each end. Fine adjustments to the fence can be made by pivoting one end. With the tool stand and router table complete, we can move on to the rolling cart.

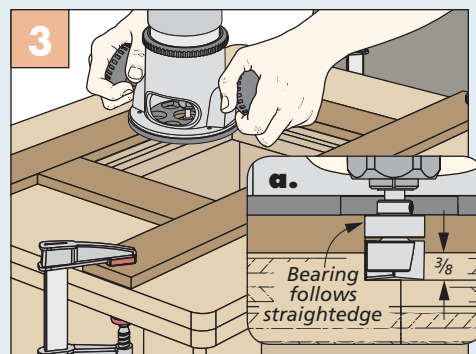
How-To: CREATE THE INSERT PLATE OPENING



Insert Hole. Use a Forstner bit to define the corners for the insert. Remove the waste using a fine-toothed jig saw blade.



Add Fences. Position the router plate, and clamp straightedges as a bearing surface for the router.



Rabbet Opening. Remove the plate and use a dado clean-out bit to rout along the straightedges, forming the rabbet.

Building the ROLLING CART

The next project, a rolling cart, provides a mobile worksurface that can be moved where you need it. In addition, it provides a solid surface for assembling projects. The cart is made of a few basic parts. A plywood case houses a pair of shelves that offer extra storage space. The top of the cart is two layers, like the tool stand. And the base of the cart has a set of heavy-duty casters to easily move it around the shop.

LOWER SHELF. While there are several different ways you could go about building this cart, I chose to start with the lower shelf and work from the ground up. Starting with the shelf allows you to have a good solid base.

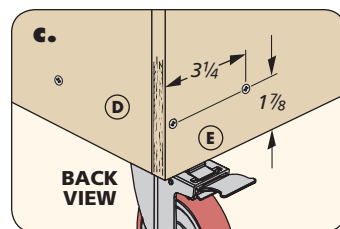
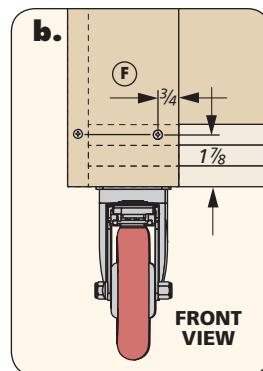
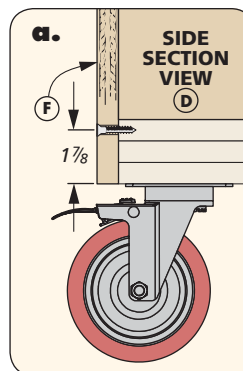
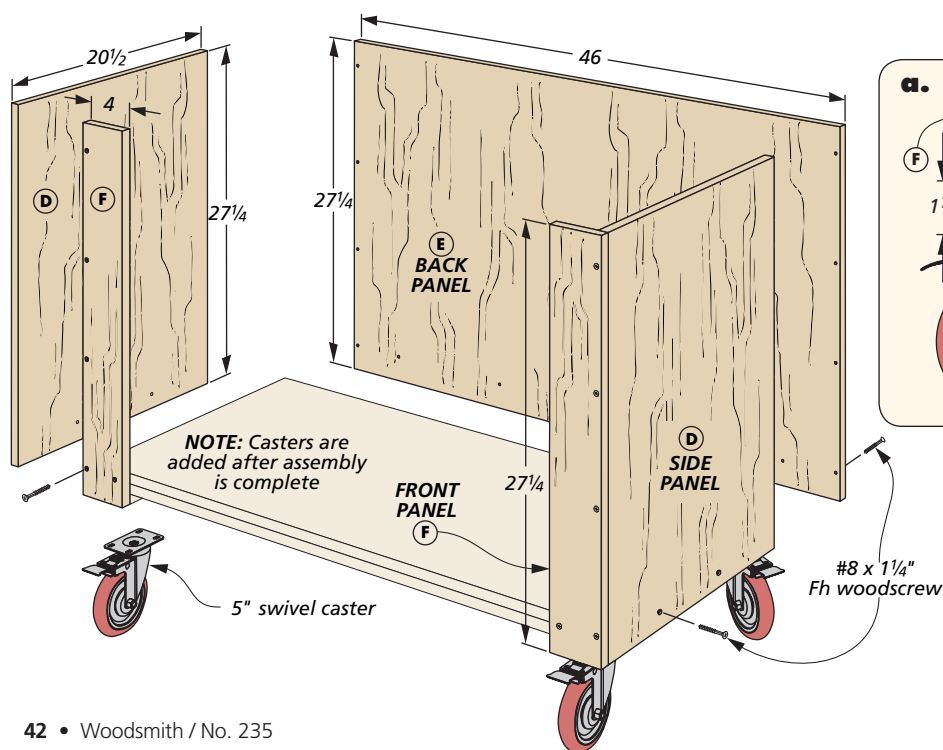
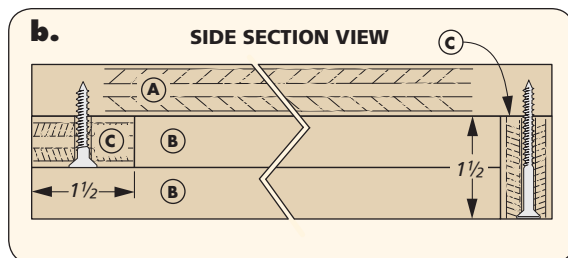
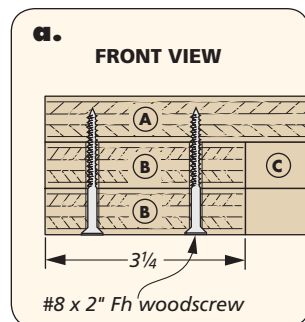
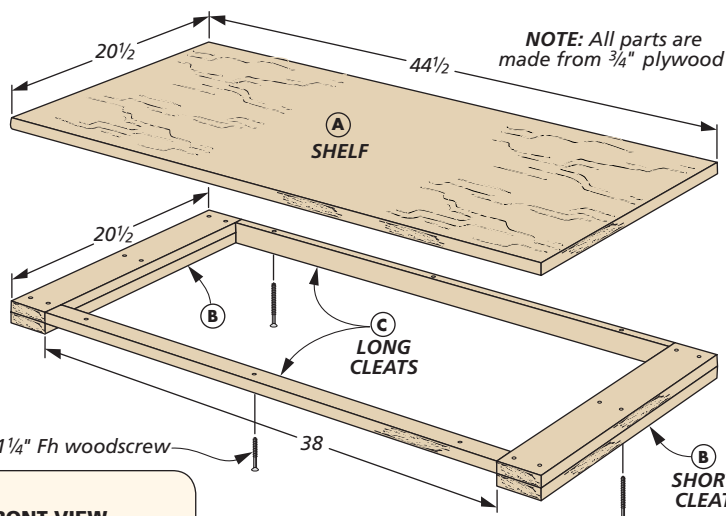
The lower shelf consists of a plywood panel and a series of cleats that the shelf is attached to. Because the casters will be attached to this framework, the short cleats are made up of two layers of plywood glued together. The casters are added after the assembly is complete.

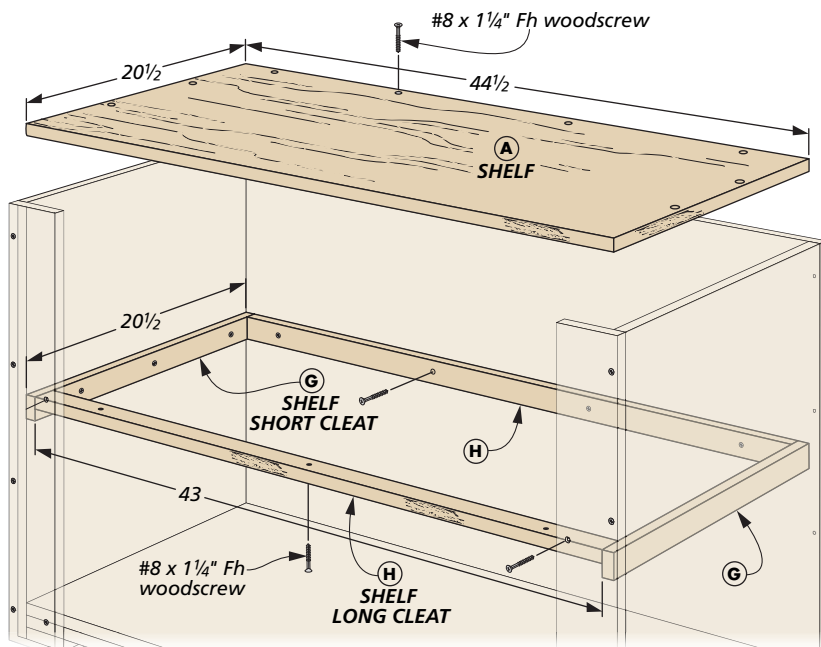
After the short cleats are glued together, they can be attached to the shelf using glue and screws. Detail 'a'

provides the information. This is easily done by flipping the lower shelf over while attaching all of the cleats. Longer, narrower cleats run the length of the lower shelf to add some rigidity. Note that the back cleat and front cleat are in different orientations (detail 'b').

CART PANELS. With the cleats attached to the lower shelf, you can flip the shelf back over and start building the case

around the shelf. I found it easiest to attach all of the panels with the shelf laying flat on my workbench. Each panel can then be stood on end and clamped in place while driving the screws. The side panels are attached to the cleats with screws. Next, add the back panel in the same manner. See main drawing below. Finally, you can attach the two front panels.





TOP AND MIDDLE SHELF

Now that the case of the cart is starting to take shape, you can add a little extra storage with an additional shelf. After installing the shelf, you'll install a top and some casters to wrap up the construction of the rolling cart.

MIDDLE SHELF. The construction and assembly of the middle shelf is nearly identical to the lower shelf (drawing above). A series of cleats around the interior of the case provide a place for the shelf, as well as an attachment point.

As with the cleats that we used in the tool stand, drill all of the mounting holes to prevent the cleats from splitting. With the cleats in place, the shelf can be dropped in from above and held in place with screws.

TOP. The top of the cart is built like the tool stand, as shown in the drawing below. As with the previous tops, the subtop gets rounded corners. The main top is left oversized and then attached to the subtop. A pass with the router and a flush-trim bit cleans up the top.

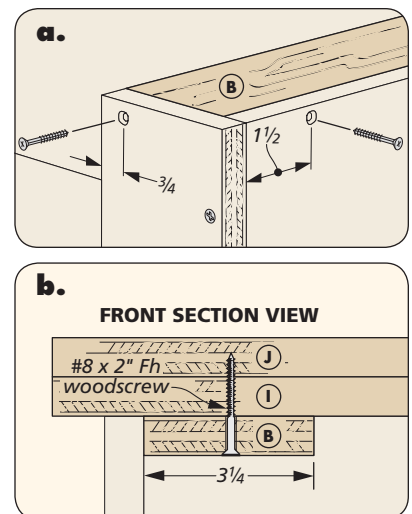
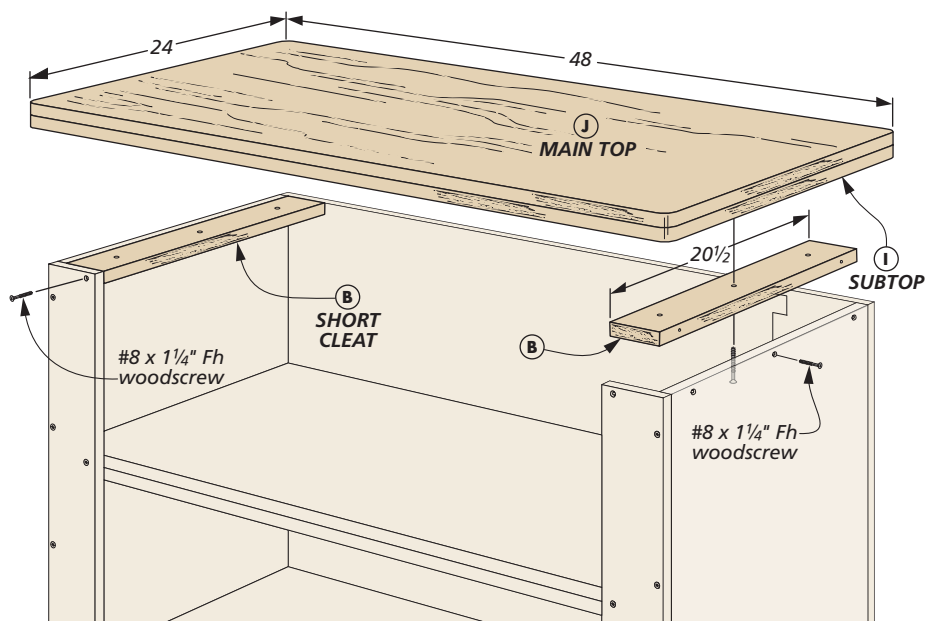
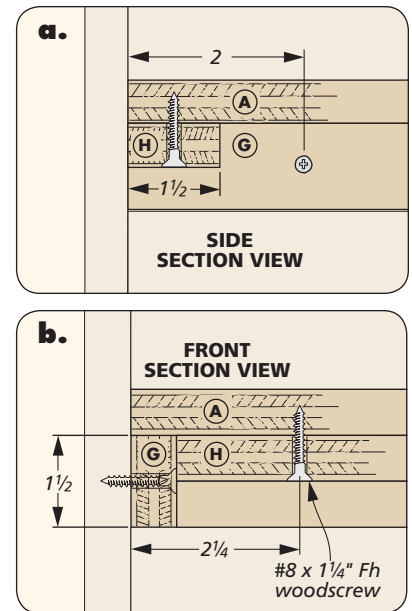
There are a pair of cleats that are attached to the sides and front of the cart. The top is then attached to the cleats with screws. Like the middle shelf, no glue is used when attaching the top. This allows the top to be easily removed or replaced if it becomes damaged. Ease the edges of the top with sandpaper.

LET'S GET ROLLIN'. The beauty of this cart is its utility. A lot of the versatility comes from the ability to move it around via the swivel casters that are attached to

the underside of the cart (main drawing, previous page). The swivel casters allow for greater maneuverability in tight areas. The casters I chose also feature a locking mechanism to keep the cart in place when you want it stationary.

To attach the casters, it's best to get a helper to flip the cart onto its top. With the cart upside down, the four casters can be installed at each corner. It's important to keep the casters on the double-layer cleats. This provides the most support, which will bear the weight of the cart and its contents.

With the casters attached, flip the cart upright and ease the remaining edges with sandpaper. For the final act, we'll wrap up our plywood shop with a pair of simple adjustable supports.



Making the ADJUSTABLE SUPPORTS

The tool stand we built earlier is a great addition to your shop. To complement the stand and help manage long pieces with ease, we're going to wrap up the plywood projects with a pair of adjustable supports. An adjustable riser allows you to chose the support height for different workstations. And the wide footprint makes them sturdy enough to pull double duty as sawhorses.

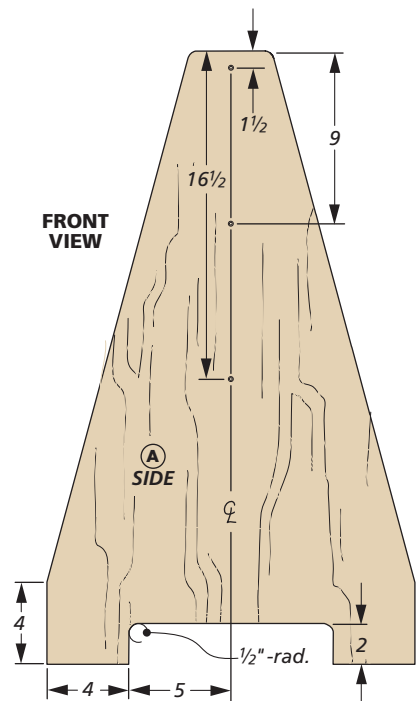
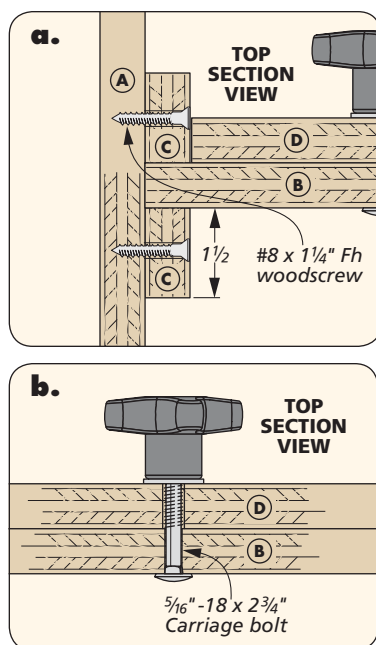
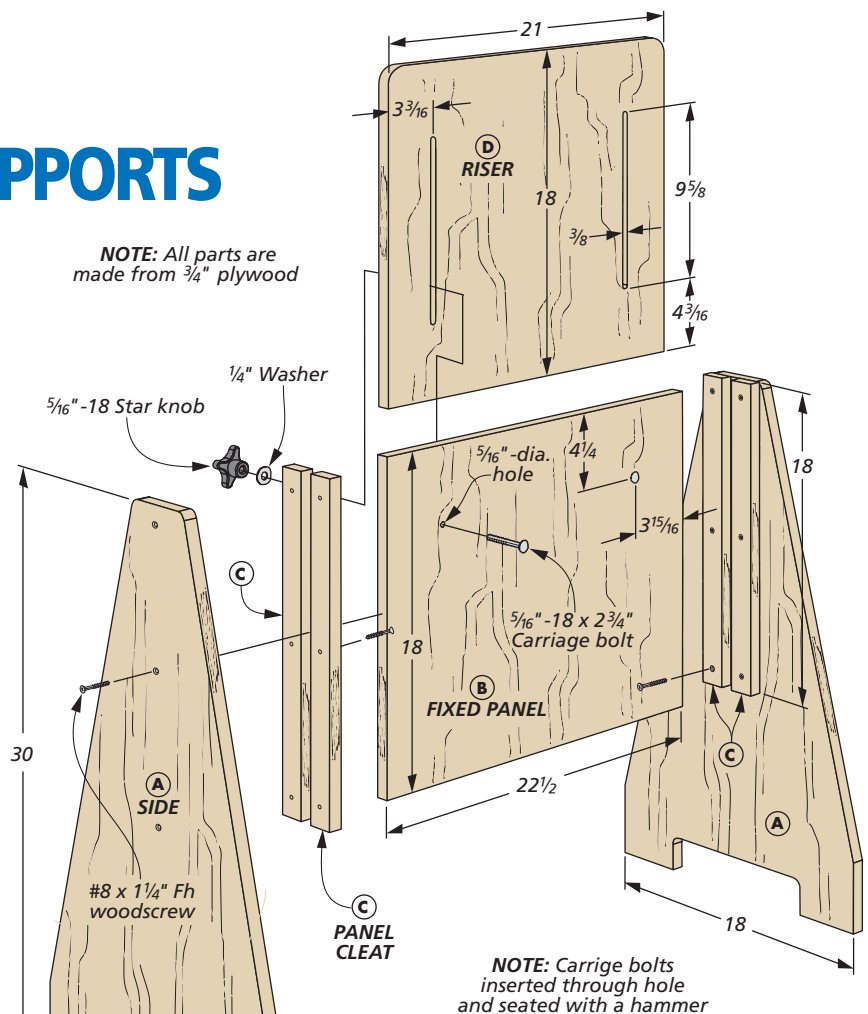
FRAME. The frame of the support consists of three pieces. A pair of sides with a set of cleats that capture a fixed panel.

To cut the sides to shape, I used a circular saw guide, as shown in Figure 1 on the next page. To cut the notch in the plywood sides, the corners are first defined with a Forstner bit and then a jig saw removes the waste (Figure 2). The fixed panel is attached to the sides with screws. Finally, cleats are attached to the sides along the panel and provide additional support.

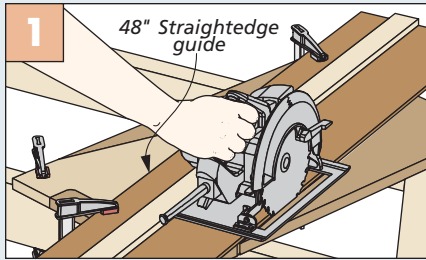
RISER PANEL. To create the slot in the adjustable riser, I grabbed my router and a straight bit. The dimensions for the slots are shown in the main drawing at right, and the process is outlined in Figure 3 of the How-To box on the next page. Multiple shallow passes are the key to getting a smooth cut.

LOCKING THE RISER. In order to attach the riser to the fixed panel, I used a pair of carriage bolts and knobs. Drill a hole to fit the carriage bolt in the fixed panel. Insert the carriage bolts into the hole until the square shoulder touches. A solid blow with a hammer will set the square shoulder into the plywood panel and keep it from spinning when you tighten the knobs. Now it's just a matter of slipping the riser over the bolts and securing it with the washers and knobs.

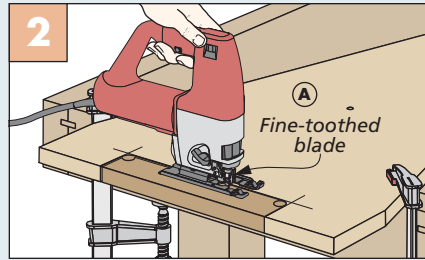
FINISHING. The tops and shelves of each of the projects in this article were finished with spray lacquer. The areas of the projects that did not get lacquer are painted with *General Finishes'* milk paint in "Tuscan Red" to match the projects from the previous article. **W**



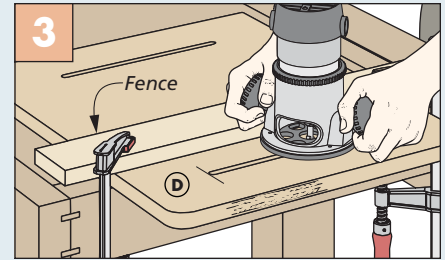
How-To: CUT PARTS & CREATE SLOTS



Tapered Sides. To cut the tapered sides of the support, use a straightedge guide clamped along the layout line.



Notching. After defining the corners with a Forstner bit, the notch is cut with a jigsaw and fine-toothed blade.

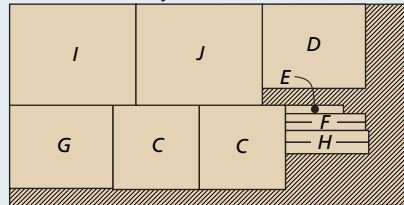


Slot Cutting. A few passes with a straight bit in a router make quick work of the slots in the riser panel.

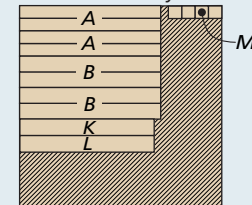
Tool Stand (for one stand and one fence)

- A** Outside Legs (4) $\frac{3}{4}$ ply. - 3 x 33½
- B** Inside Legs (4) $\frac{3}{4}$ ply. - 3¾ x 33½
- C** Side Panels (2) $\frac{3}{4}$ ply. - 20½ x 20
- D** Back Panel (1) $\frac{3}{4}$ ply. - 20 x 24½
- E** Shelf Rear Cleat (1) $\frac{3}{4}$ ply. - 2 x 24½
- F** Shelf Side Cleats (2) $\frac{3}{4}$ ply. - 2 x 19
- G** Shelf (1) $\frac{3}{4}$ ply. - 19¾ x 24½
- H** Top Cleats (2) $\frac{3}{4}$ ply. - 2¼ x 19¾
- I** Subtop (1) $\frac{3}{4}$ ply. - 24 x 30
- J** Main Top (1) $\frac{3}{4}$ ply. - 24 x 30
- K** Fence Front (1) $\frac{3}{4}$ ply. - 4 x 30
- L** Fence Base (1) $\frac{3}{4}$ ply. - 4 x 30
- M** Supports (4) $\frac{3}{4}$ ply. - 3 x 3
- (80) #8 x 1¼" Fh Woodscrews
- (6) #8 x 2" Fh Woodscrews

$\frac{3}{4}$ " x 48" - 96" Plywood



$\frac{3}{4}$ " x 48" - 48" Plywood

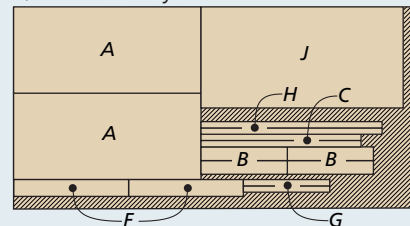


Materials, Supplies & Cutting Diagram

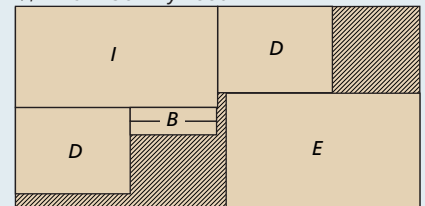
Rolling Cart

- A** Shelves (2) $\frac{3}{4}$ ply. - 20½ x 44½
- B** Short Cleats (6) $\frac{3}{4}$ ply. - 3¼ x 20½
- C** Bottom Long Cleats (2) $\frac{3}{4}$ ply. - 1½ x 38
- D** Side Panels (2) $\frac{3}{4}$ ply. - 20½ x 27½
- E** Back Panel (1) $\frac{3}{4}$ ply. - 27½ x 46
- F** Front Panels (2) $\frac{3}{4}$ ply. - 4 x 27½
- G** Shelf Side Cleats (2) $\frac{3}{4}$ ply. - 1½ x 20½
- H** Shelf Long Cleats (2) $\frac{3}{4}$ ply. - 1½ x 43
- I** Subtop (1) $\frac{3}{4}$ ply. - 24 x 48
- J** Main Top (1) $\frac{3}{4}$ ply. - 24 x 48
- (60) #8 x 1¼" Fh Woodscrews
- (21) #8 x 2" Fh Woodscrews
- (4) 5"-dia. Swivel Casters

$\frac{3}{4}$ " x 48" - 96" Plywood



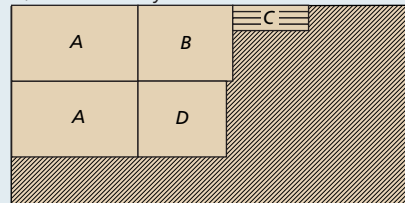
$\frac{3}{4}$ " x 48" - 96" Plywood



Adjustable Supports (for one support)

- A** Sides (2) $\frac{3}{4}$ ply. - 18 x 30
- B** Fixed Panel (1) $\frac{3}{4}$ ply. - 18 x 22½
- C** Panel Cleats (4) $\frac{3}{4}$ ply. - 1½ x 18
- D** Riser (1) $\frac{3}{4}$ ply. - 18 x 21
- (18) #8 x 1¼" Fh Woodscrews
- (2) 5/16" - 18 x 2¾" -Carriage Bolts
- (2) 5/16" - 18 Star Knobs

$\frac{3}{4}$ " x 48" - 96" Plywood





classic Craftsman Bed

Quartersawn white oak and Craftsman-era design elements combine to create this handsome companion to our Gentleman's Dresser.

When we featured the gentleman's dresser in *Woodsmith* No. 219 (shown above), we had a feeling that it might be a popular project with our readers. But we had no idea just *how* popular it would be. So after numerous requests, we designed this Craftsman-style bed to match the dresser.

TRADITIONAL JOINERY. Much like the dresser, the joinery used on the bed is easily manageable in your shop using

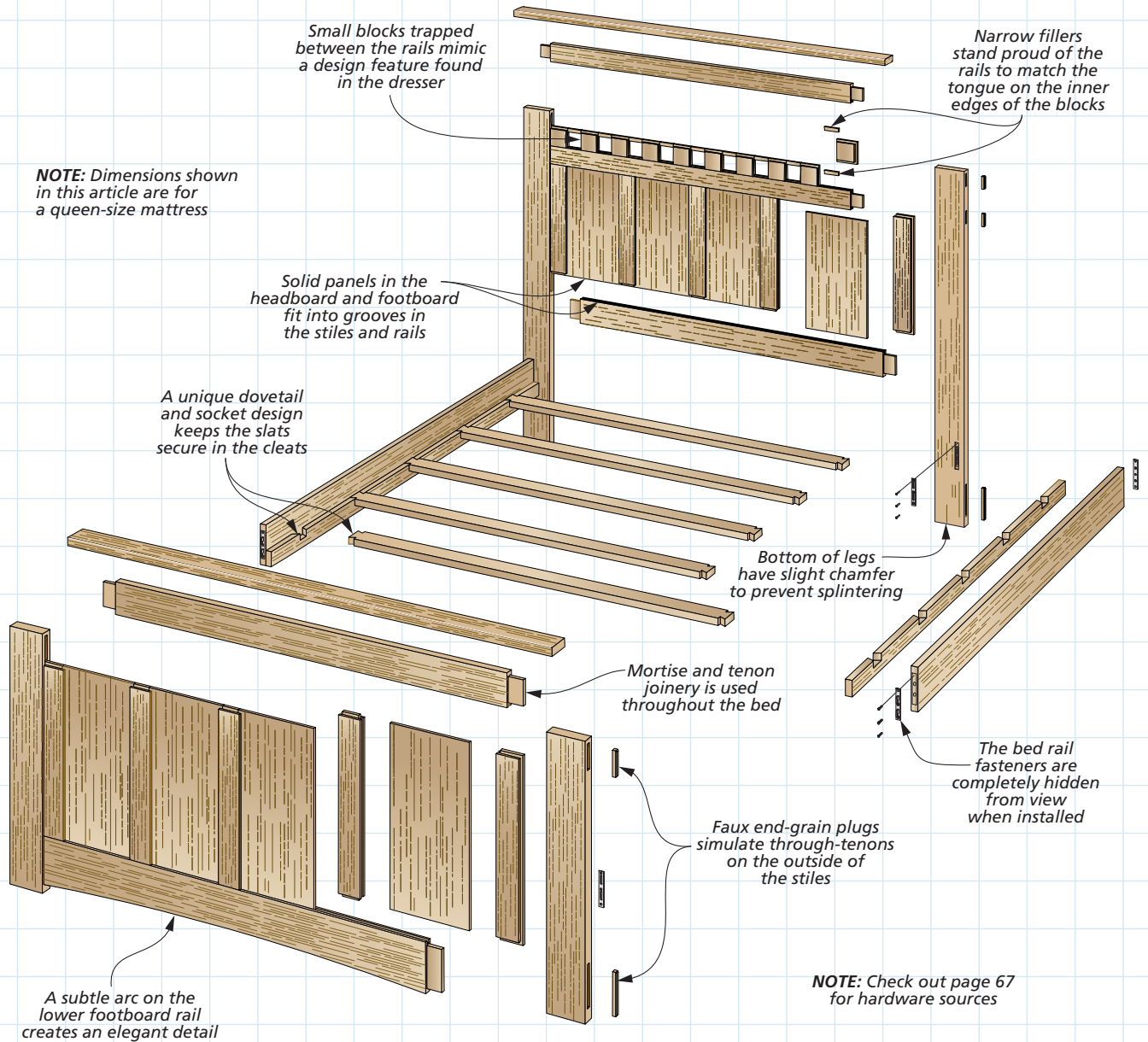
basic power tools. The headboard and footboard have stiles and rails that are held together with mortise and tenon joinery. Solid panels are captured in shallow grooves in the stiles and rails. And in keeping with the design of the dresser, we mimicked the square openings in the doors in the headboard.

KNOCK-DOWN ASSEMBLY. Of course, moving a bed around in the home calls for an assembly that is easy to take apart

and put back together. Here, we opted for bed rail fasteners that are housed in shallow mortises in the stiles and side rails. Creating the mortises on the ends of the side rails may seem intimidating, but don't worry. We'll walk you through our simple procedure to ensure perfect results.

So get your tools tuned up and ready to go. Turn the page to get started on this stately piece of bedroom furniture.

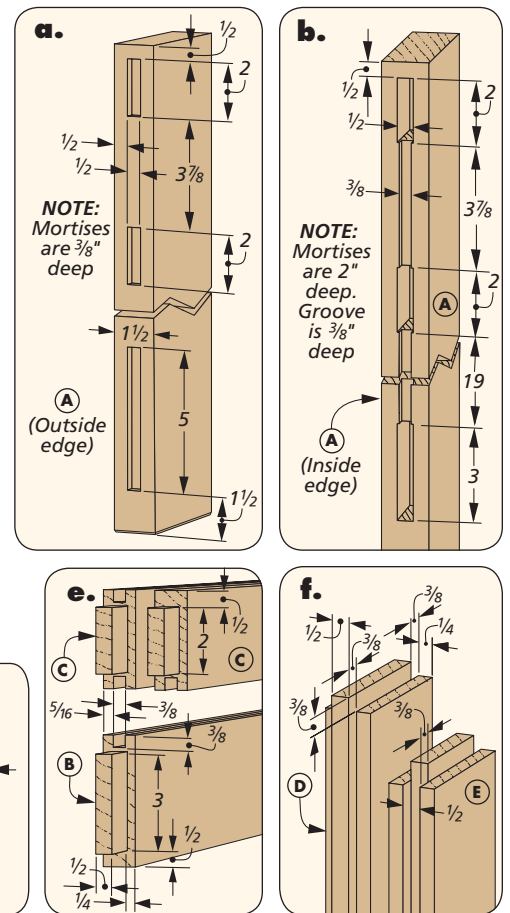
Construction Overview / OVERALL DIMENSIONS: 85½" L x 67¾" W x 57" H



▶ The inner edges of the blocks and the filler strips in the headboard stand proud of the surrounding stiles and rails.

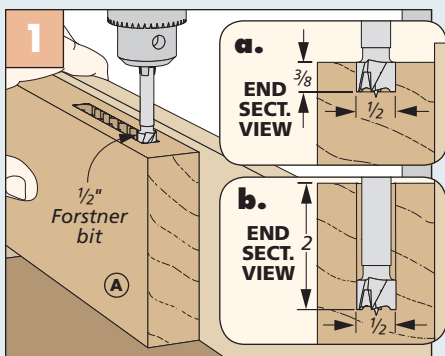
▶ Dovetails on the ends of the slats and sockets cut in the cleats prevent the slats from moving under a box spring.



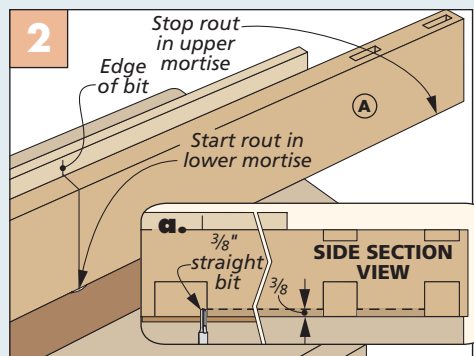


THICK LEGS. After cutting the legs to size, I moved to the drill press to form the mortises — three shallow mortises on the outside edge of each leg for the plugs and three deeper mortises on the interior of each leg to hold the rails. Figure 1 at the bottom of the page has all the details. After roughing out

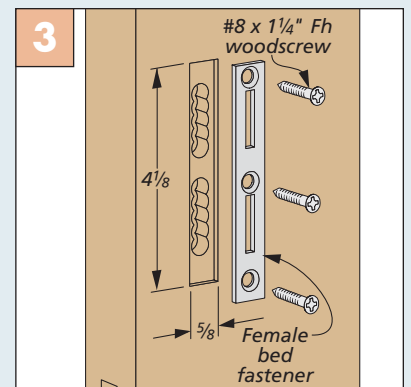
How-To: PREPARE THE LEGS



Create the Mortises. Use a Forstner bit at the drill press to remove most of the mortise waste in the legs.



Long Grooves. A straight bit loaded in the router table is perfect for making the long grooves in the edge of the legs.



Bed Rail Hardware. Shop Notes on page 64 provides more information for creating these mortises.

How-To: MAKE THE RAILS, STILES & BLOCKS

the waste, use a chisel to clean up the corners of each mortise.

LONG GROOVES. To make the long, centered grooves on the inside edge of each leg (detail 'b'), a quick trip to the router table is needed. Figure 2 on the previous page shows this procedure. Simply rout the groove from the lower mortise to the upper mortise, or vice versa depending on the leg.

ADD HARDWARE. Next, I added the female side of the bed rail fasteners (Figure 3). First, drill a series of overlapping holes to allow the hooks from the side rail fastener to drop below the surface. Then, I made a simple jig to aid in routing the pockets for the fasteners. Shop Notes on page 64 has the details. After routing, a chisel is used to clean up the corners.

Before moving on, I also chamfered the bottom edge of each leg. The main drawing provides this information.

RAILS, STILES & ASSEMBLY

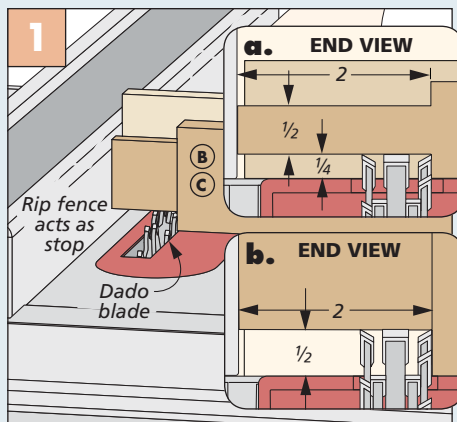
With the legs wrapped up, you can turn your attention to the rest of the parts that complete the headboard, starting with the three rails that connect the legs. When cutting them to size, be sure to note the bottom rail is wider than the other two.

RAILS. The tenons on the ends of the rails are easy to complete at the table saw (Figure 1, at right). Much like the legs, the rails require centered grooves, also. But here I used a dado blade in the table saw since these grooves run from end-to-end on each rail (Figure 2). The middle rail has a groove on both edges.

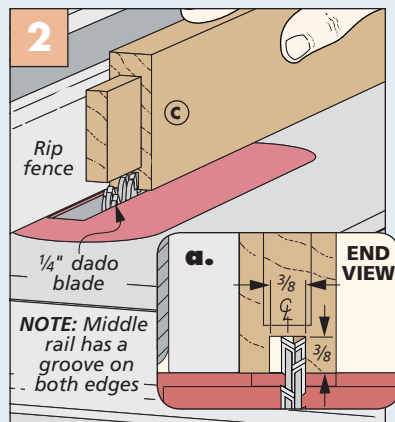
STILES. The inner and outer stiles for the headboard follow a similar path as the rails. The dimensions you'll need to cut these parts to size are shown in detail 'f' on the previous page. But instead of full-length tenons, they use stub tenons on the ends (Figure 3, at right).

The two outer stiles have rabbets on the outside edge to form a tongue, while the inside edge (and all of the inner stiles) have centered grooves to hold the panels. I stayed at the table saw to make all of these cuts, as well.

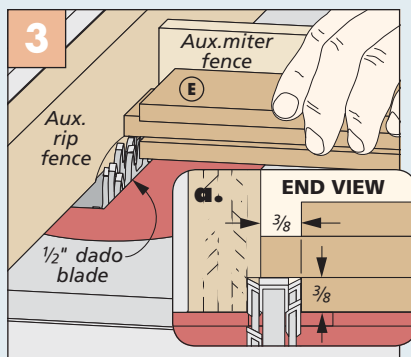
BLOCKS. The ten small blocks are made much the same way as the stiles. Figures 4 and 5 above, as well as detail 'd' on the previous page provides all the information you'll need to make them.



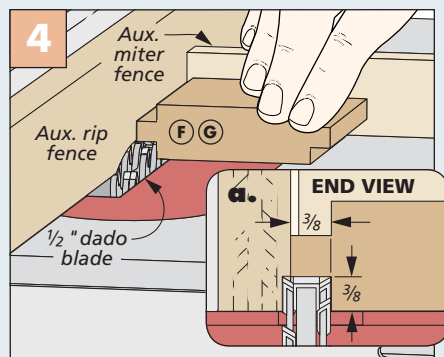
Tenons on Rails. Use the rip fence as a stop to define the tenon shoulder. Then remove the rest of the waste



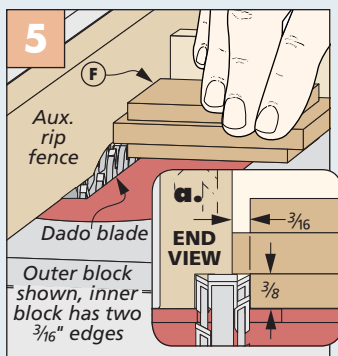
Centered Grooves. Switch to a narrower dado blade to make the centered grooves along the edge.



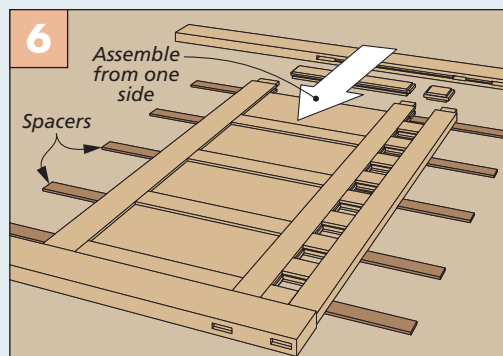
Stub Tenons. With a dado blade buried in an auxiliary rip fence, cut the stub tenons on the stiles.



Tongues on Blocks. Using the same table saw setup, cut the rabbets that form the tongues on the blocks.



Narrow Tongues. Move the rip fence to cut the narrow tongues on the blocks.



Assembly. Start at one end and add the rails. Then slip the stiles and panels in place. Finally, slide in the blocks and add the other leg.

THIN PANELS. Finally, there's nothing tricky about gluing up the panels. But the article on page 54 will provide a few tips to make this process easier.

ASSEMBLY. Figure 6 shows my process for bringing the headboard together. I only used a little glue to hold the panels

in place to allow for some expansion. I left the blocks loose in the rail grooves until the final leg was clamped in place. Then I went back and secured the blocks by adding some filler strips, working from one end to the other. The cap is the last piece to glue on top.

a couple of things. First, be sure to note that the stiles and panels for the footboard are slightly longer than the headboard. Also, you'll only need two mortises on the outside edge of the legs for the plugs, and two on the inside edge for the rails.

ARCHED RAIL. As I said earlier, the bottom rail on the footboard has a long, gentle curve along the bottom edge. So before cutting the tenons on the ends of this part, I made the curve. The How-To box at the bottom of the previous page shows the steps involved to complete the curve.

COMPLETE & ASSEMBLE. With the bottom rail in hand, the rest of the footboard parts can be finished up. Follow the same procedure as the headboard (minus the blocks and fillers) to assemble the footboard. You can set this aside for now and move on to the rails and cleats.

RAILS & CLEATS

The rails themselves are pretty straightforward to make. Simply pick a couple of nice, straight boards and cut them to size. The How-To box at right will walk you through the remainder of the steps to complete the rails and cleats.

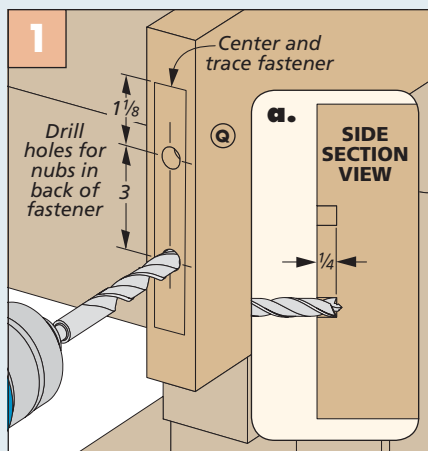
MATING HARDWARE. Adding the mating bed rail fasteners to the ends of the rails is the first order of business. Because they're installed on the narrow ends of the rails, they're not quite as simple to install as the female half that you installed in the legs earlier.

To begin, position the fastener on the end of the rail and trace the outline. On the backside of the male fastener, you'll notice a couple little "nubs" protruding from the backside of the hooks. Simply drill a couple shallow holes in the rail for these (Figure 1).

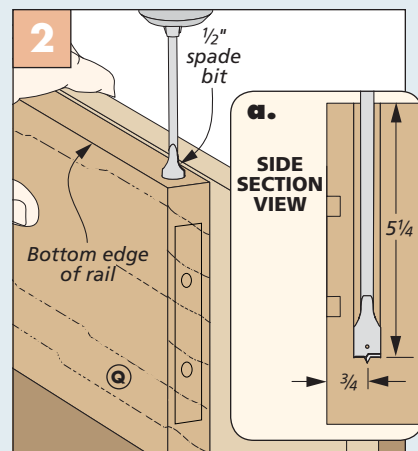
Removing the waste for the shallow mortise that the fastener rests in requires one more operation. I'll cover that more in-depth in Shop Notes on page 64.

DOWEL STRENGTH. Once the fasteners are eventually installed, they're held in place with woodscrews. But I was worried about the screws holding, since they're driven into end grain. So I inserted 1/2"-dia. cross dowels from the bottom edges of the side rails to give the screws something to "bite" into.

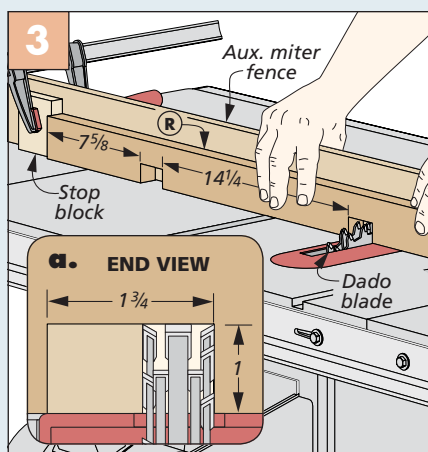
How-To: PREPARE THE RAILS & CLEATS



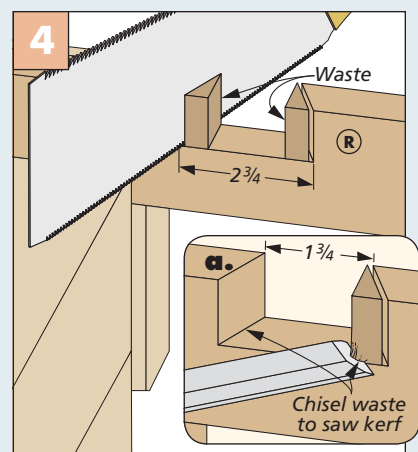
Clearance Holes. Drill the clearance holes in the rails to allow for the nubs on the backside of the fasteners.



Holes for Dowels. Use a spade bit to drill the deep holes in the underside of each bed rail.



Waste Removal. Use a wide dado blade at the table saw to remove most of the waste for the dovetail sockets.



Finish Up Sockets. A hand saw and sharp chisel are all you need to finish up each socket on the cleats.

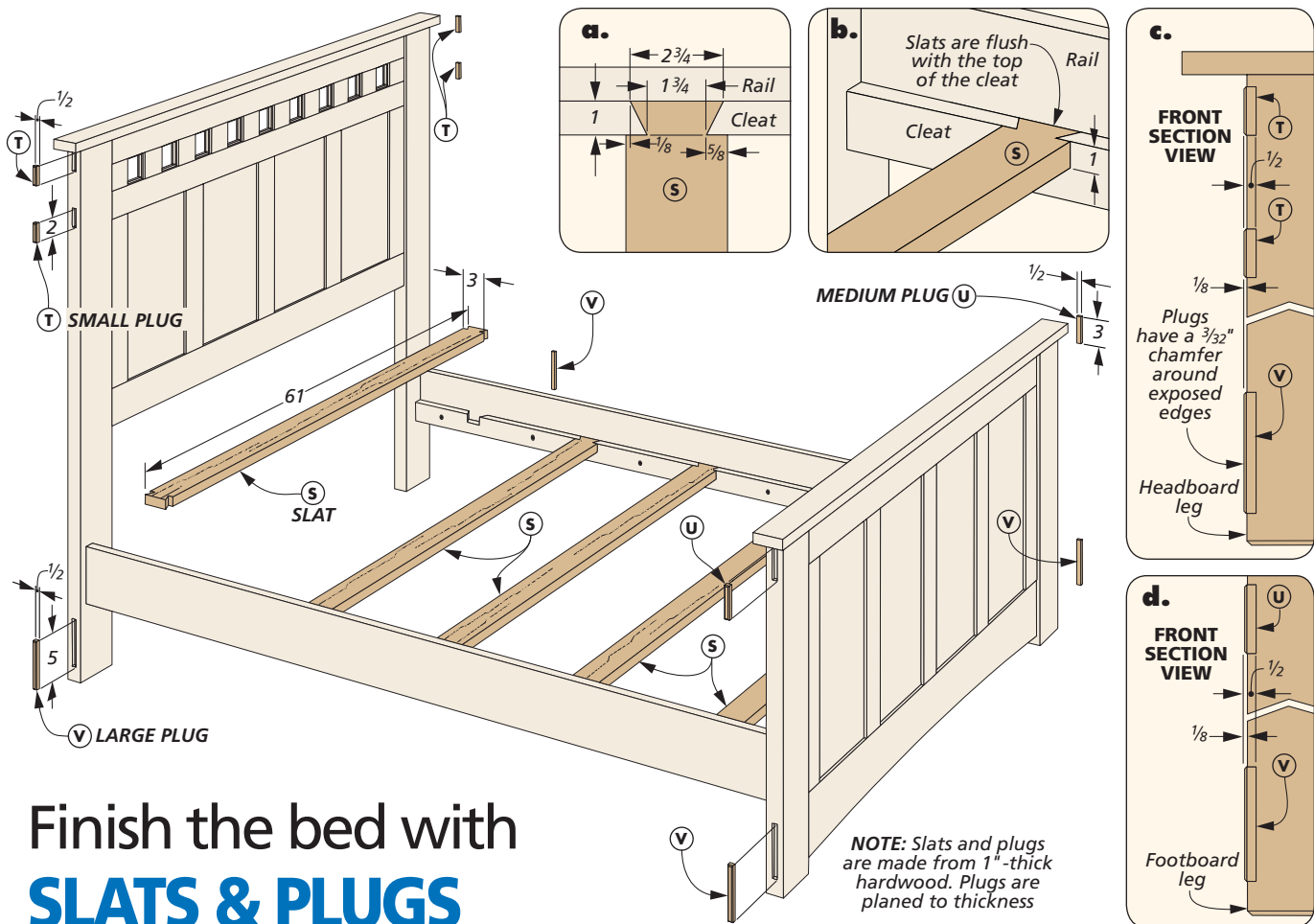
Figure 2 provides the details for drilling the holes for the dowels.

DOVETAILED CLEATS. Finally, you're ready to make the cleats. Again, you'll cut the stock to size to begin. Figure 3 above and detail 'e' on the previous page provide the information for laying out the dovetail socket positions. To remove the bulk of the waste, I used a dado blade in the table saw (Figure 3).

All that's left is to cut away the dovetailed edges of each opening to form the socket. A handsaw and chisel make quick work of this, as shown in Figure 4. Now, glue the cleats to the inside lower edges of the rails. I also added screws here for additional strength (detail 'e').



▲ Hidden fasteners are used to hold the rails to the legs. Shop Notes on page 64 has the details.



Finish the bed with **SLATS & PLUGS**

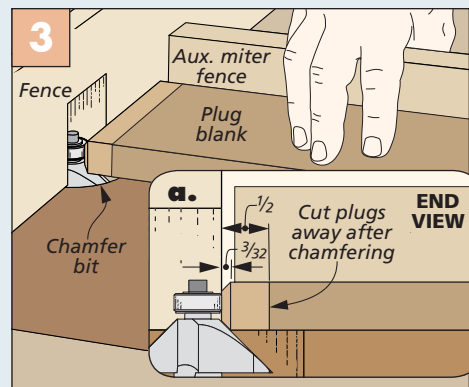
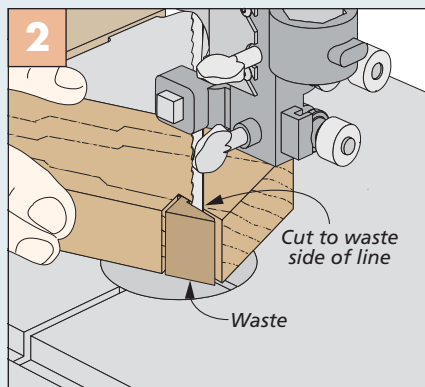
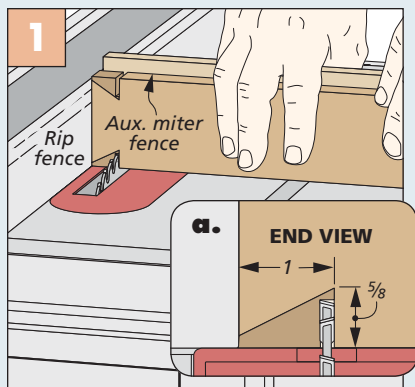
After wrapping up the side rail and cleat construction, I assembled the bed to check the fit of the rail assemblies between the headboard and footboard. This also gave me the opportunity to measure the distance between the rails

to get an accurate reading for cutting the five slats to length. After that, you'll make and install the plugs that finish up this project. But first, the slats.

DOVETAILED SLATS. Once you have the slats cut to length, you'll need to make

the dovetail cuts on the ends that fit the sockets in the cleats. Figures 1 and 2 in the How-To box below shows the two-step process I used to make these cuts. Details 'a' and 'b,' above provide the dimensions you'll need. Check the

How-To: MAKE THE SLATS & PLUGS



Form the Shoulder. At the table saw, place the board on edge to form the shoulder of the dovetail.

Finish the Cut. Move to the band saw to remove the rest of the waste. Clean up the cut with a file and sandpaper.

Chamfer the Plugs. After forming the chamfer on an oversize blank, cut each plug free at the table saw.

END-GRAIN PLUGS. To wrap things up, you just need to make and install the three different sizes of plugs to fit the shallow mortises in the headboard and footboard. Each plug stands slightly

Because these parts are small, I started with an oversize workpiece to make routing the chamfer easier. Figure 3 at the bottom of the previous page shows the setup. After routing the chamfer on the end of the board, simply cut the plug

For the finish, I opted to use the same stain that I used on the gentleman's dresser. Sources on page 67 gives this information. Now, move your bed to a quiet room and take a nice long nap. 

A Headboard Legs (2)	1½ x 5 - 56	J Caps (2)	1 x 3 - 67¾	S Slats (5)	1 x 3 - 61
B Headboard Bottom Rail (1)	1 x 4 - 58⅞	K Footboard Legs (2)	1½ x 5 - 32	T Small Plugs (4)	½ x 2 - ½
C Headboard Mid/Top Rails (2)	1 x 3 - 58⅞	L Footboard Bottom Rail (1)	1 x 6 - 58⅞	U Medium Plugs (2)	½ x 3 - ½
D Headboard Outer Stiles (2)	1 x 3⅞ - 18¾	M Footboard Top Rail (1)	1 x 4 - 58⅞	V Large Plugs (4)	½ x 5 - ½
E Headboard Inner Stiles (3)	1 x 3 - 18¾	N Footboard Outer Stiles (2)	1 x 3⅞ - 21¾		
F Outer Blocks (2)	1 x 3⅞ - 35⅞	O Footboard Inner Stiles (3)	1 x 3 - 21¾	• (1 Set) Bed Rail Fasteners	
G Inner Blocks (8)	1 x 3¼ - 35⅞	P Footboard Panels (4)	¾ x 10⅞ - 21¾	• (4) ½"-dia. x 5" Dowels	
H Headboard Panels (4)	¾ x 10⅞ - 18¾	Q Rails (2)	1 x 6 - 81	• (24) #8 x 1¼" Fh Woodscrews	
I Fillers (18)	¾ x 9/16 - 2½	R Cleats (2)	1 x 2¼ - 81	• (12) #8 x 1½" Fh Woodscrews	

M	P	
-----	-----	--

H	H	H	F	D	
-----	-----	-----	-----	-----	--

B	P	
-----	-----	--

A diagram showing a rectangular domain divided into two regions, L and P . Region L is the larger left portion, and region P is the smaller right portion. To the right of region P , there is a hatched area representing the exterior of the domain.

The diagram shows a cross-section of a two-layered structure. The top layer has a total width of $2a$ and a thickness of h . It contains a central region of width l with a dashed line. The bottom layer has a total width of $2a$ and a thickness of H . It also contains a central region of width l with a dashed line. The bottom layer is labeled with a coefficient of friction μ .

Diagram illustrating a queue system with a single server. The queue is represented by a long horizontal rectangle. The main part of the rectangle is labeled Q . The right end of the rectangle is divided into a small section containing four boxes labeled G (representing the server) and a hatched area below them.

A diagram of a beam of total length L and height h . A crack is located at a distance a from the left end. The beam is divided into three regions: J (crack tip to left end), E (crack tip to right end), and R (the entire beam). A vertical load V is applied at the right end.

P	P	P	E	
N	N	O		

A diagram of a 1D lattice with sites A and K . The lattice is represented by a horizontal line with a dashed line below it. The sites are labeled A and K above the line. The site K is shaded with diagonal lines.

A horizontal bar is shown, divided into two sections. The left section is solid tan and labeled 'S'. The right section is hatched with diagonal lines.

A diagram showing a cross-section of a two-layer system. The top layer is a solid light brown rectangle with a height labeled S . The bottom layer is a rectangle with a height labeled S , filled with diagonal hatching. The two layers are adjacent, sharing a common horizontal interface.

resawing for **Thin Panels**

Creating solid wood panels for a project is typically a pretty straightforward affair – you simply edge glue enough boards to achieve the width of the panels you need. It's then just a matter of planing them to final thickness

▼ Resawing thicker stock is a reliable way of producing thinner boards without wasting material through planing.

before cutting the panels to size. But when those panels need to be made from thinner material — say under $\frac{1}{2}$ " thick — a little forethought is needed to ensure good results.

In the case of the Craftsman bed on page 46, I used $\frac{3}{8}$ "-thick panels in the headboard and footboard construction. To make the best use of my lumber, I began with thick stock and resawed these pieces at the band saw.

PREPARE THICK STOCK. When selecting lumber for resawing, you'll want to choose stock that is more than twice as thick as what you need for your final panel thickness. In my case, I used 5/4 stock. This allows for the kerf of the blade and ensures that my glued up panels would still be thick enough so they could be planed to final thickness.

After resawing, the roughly $\frac{1}{2}$ "-thick boards that are created might seem

overly thick for what the final thickness of the panels needs to be. But that extra thickness allows you to remove about $\frac{1}{16}$ " from each face. This is generally more than enough to allow for any surface imperfections.

Since my band saw is only capable of resawing stock up to 6" wide, I made sure that the boards I selected were ripped narrow enough to meet this threshold. In fact, I opted to glue up my panels from three narrow boards to arrive at the nearly 11"-wide panels required for the bed (left photo). And by using narrow stock, it's easy to arrange the resawn boards to get a pleasing grain pattern before gluing up the panels.

You'll also want to leave the boards a few inches longer than final length. This allows for any snipe near the ends that may happen at the planer later on.

RESAW TIPS. Now you're ready to move to the band saw to cut the boards. Select a blade that is at least $\frac{1}{2}$ "-wide to reduce twisting or drift. A tall auxiliary fence is also necessary to guide the workpiece (near right photo).

When making the cut, a smooth and steady feed rate is best to avoid burning the wood. A sacrificial push block should be used to feed the board safely through the last few inches of the blade, as shown in the far right photo.

CHOOSE BOARDS FOR APPEARANCE. Panels tend to draw a lot of attention, so a consistent grain pattern really adds to the overall appeal of the project. For the bed panels, I selected boards that had a pleasing rift-sawn grain pattern and organized them for best appearance. To keep them organized before glueup, be sure to mark their order as shown in the photo below.

GLUEUP PANELS. With the boards in hand, now's the time to arrange them



▲ With a $\frac{1}{2}$ "-wide blade installed in the band saw and a tall auxiliary fence clamped in place, start the thick stock through the blade using even pressure. When the blade nears the end of the workpiece, switch to a push block to safely complete the cut.



in the clamps using your marks as a guide. Light pressure is best to keep the edges even. A few wedges tapped underneath the clamps can be used here to keep the seams in line (main photo on the previous page).

RIP & PLANE. When they come out of the clamps, the panels can be ripped to final width. But continue to let them

run long for now. Next, pass the panels through the planer, being sure to remove material from each face until the final thickness is reached (photo below). Finally, cut them to length. This should remove any snipe that occurred near the ends of the panels. To read about a prefinishing trick, check out the box below. **W**



▲ Before gluing the boards together into panels, take some time to arrange them for the most consistent grain pattern. To help keep several panels organized, make a pencil mark along the surface so the boards stay in the same order when it's time to assemble.



▲ After ripping the panel to width, make a few passes through the planer. Be sure to remove material from both faces.

Pro Tip: PREFINISHING PANELS



▲ If a panel shrinks after assembly, it could reveal an unfinished edge.

A common problem with solid panels housed in frames is the potential for the panels to shrink or swell over time. If the panels are stained after assembly, this can lead to unfinished panel edges showing later on (left photo). To avoid this, apply finish to the panels before assembly. This allows the finish to run from edge to edge, alleviating this concern.



▲ Staining the entire surface of the panel before assembly is a sure-fire way to avoid exposing an unfinished edge later on. Paying close attention to details like these will set your work apart.

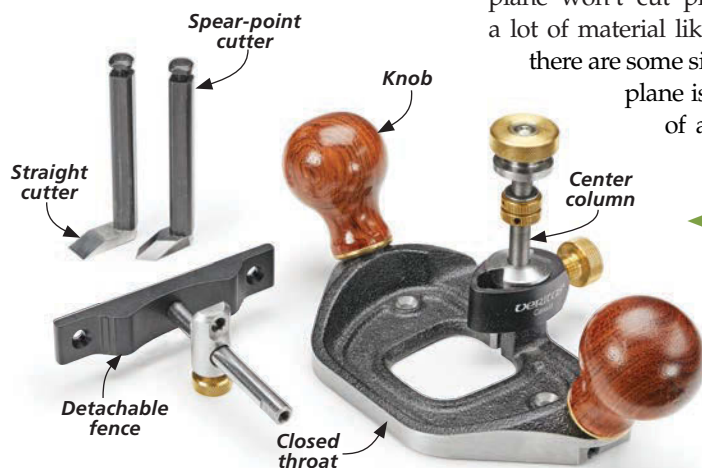
fine-tuning joinery with Router Planes

I often get asked which hand tool I couldn't live without in my shop. While that's akin to asking which of my children I would give up, it's a thought-provoking question. Although nearly every project I build gets extensive hand tool work, the router plane is the

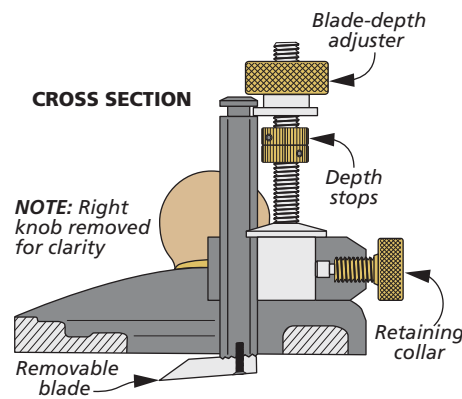
unsung hero of my shop. The router plane is a versatile tool that can be used to cut grooves, clean up dadoses, and fine-tune joinery for a fit that is hard to achieve with power tools.

ROUTER THAT DOESN'T ROUT. If you're unfamiliar with router planes, the name can be a little misleading. While a router plane won't cut profiles and remove a lot of material like an electric router, there are some similarities. A router plane is similar to the base of a router — it has a flat, wide base

with two knobs and a center column. A retaining collar holds a cutter to the center column. A depth adjustment knob controls how deep the cutter protrudes below the base (see the illustration below). Like a standard router, a fence can be attached to the base to guide the cutter along the workpiece.



Router planes have the advantage of the cutter and the base being in the same plane. This means your cuts will always be parallel to your reference surface.





▲ For cleaning up stopped grooves or dadoes, there's nothing better than a router plane. The cutter depth can be set to match the groove, and you can clean up the remaining waste at the stopped end.



▲ The spear-point cutter works well on cross-grain applications such as cleaning this dado in plywood. By making light passes across the width of the workpiece, you'll end up with smooth-bottomed dadoes.

GROOVY. One of the functions of a router plane is cutting grooves in a workpiece. To get started, simply attach the fence and set up a straight cutter in the plane. The width of the cutter will designate the width of the groove, so choose your cutter carefully. Hold the fence against the workpiece and make firm, smooth passes with the grain. On each successive pass, adjust the cutter a quarter to a half turn deeper. Wider grooves can be cut by moving the fence position.

Newly produced router planes, like the *Veritas* router plane shown in the left photo on the previous page, have fences readily available. If you own an older router plane and don't have a fence for it, you can simply attach an auxiliary base to the router plane and screw a guide cleat onto the base.

SQUEAKY-CLEAN DADOES. While I'm an avid hand tool user, there are a few things

that are pretty slow to do by hand. Cutting dadoes is one of those things. I generally set up a dado blade in my table saw. However, dado blades can leave a somewhat rough bottom in the groove. Generally, this isn't a concern. But when the end of the dado is going to be seen, or the parts won't seat fully, the router plane is my go-to tool (upper left photo).

When working across the grain, I grab my spear-point cutter as shown in the upper right photo. The spear-point cutter has more of a shearing action that helps in a cross-grain situation. To clean up the dado, simply set the depth and make firm, smooth passes down the length of the dado. What you'll be left with is a smooth, even depth dado.



▲ To clean up tenons, straddle the workpieces and use a pivoting motion. This motion will slice through the wood fibers to give you a perfect fit.

FINE-TUNING TENONS. My favorite use of a router plane is fine-tuning tenons. In order to clean up tenons and sneak up on a perfect fit, I can make passes with the router plane on each tenon cheek.

Simply set up a cutter in the plane (either square or spear-point work well) and straddle the tenon. In the photo above, I used a matching rail to rest half the base on. You can use a scrap also, just make sure both pieces are the same thickness. Straddling the tenon, I set my depth adjustment knob to take off a fine shaving. Working slowly, use a pivoting action to slice through the grain, working across both cheeks. Check your fit often, as taking shavings off each cheek will quickly have the tenon fitting perfectly.

Next time you have some fine-tuning to do, give a router plane a try. This simple, easy-to-master tool will become a trusted friend in your shop. **W**

Check This: REVERSIBLE BLADE

Router planes are available in two configurations — open or closed throat. The throat refers to the space in front of the cutter. A closed throat offers more stability, but less visibility than an open throat.

Most router planes have the capability to simply reverse the direction of the cutter to the opposite side of the column. This turns a closed-throat router plane into a bull-nosed, open-throat plane.



▲ By rotating the cutter and retaining collar to the opposite side of the center column, you can turn your closed-throat plane into an open throat.

removing Fasteners

Fasteners are a faithful ally in the shop and around the house. Screws make quick work of hanging doors, mounting drawers, and attaching sections of projects together. Brads and nails, used more commonly in construction, still show up in the shop now and then.

On occasion, fasteners have to be removed from a piece of wood. If they're damaged in some way, removing them becomes more complicated.

Regardless of whether it's a screw or nail, there are ways to navigate this frustrating moment with minimum wear and tear on your project and your nerves. We'll start by dealing with the devils that have threads.

MISTAKES HAPPEN. Often it's not your fault, but there it is, larger than life. When trying to replace an old broken hinge, you strip out the head of one of the screws. It really doesn't matter whether it's a slotted screw or Phillips head, you're left with a deeply

embedded screw, and a driver that freely twirls on the top of the fastener.

EXTRACTORS TO THE RESCUE. There's a fairly painless remedy though — screw extractors. There's a set of four extractors sold by *Lee Valley* that you see in the photo above. (Most home centers

Then back out screw slowly with extractor

First, bore out screw

As shown here, the bottom end of these extractors do the boring. Then, flipped in the drill, the top end extracts the screw.



A hollow sawtooth extractor bores a hole around a broken screw, making short work of digging out the fastener. Use an awl to break the plug free.

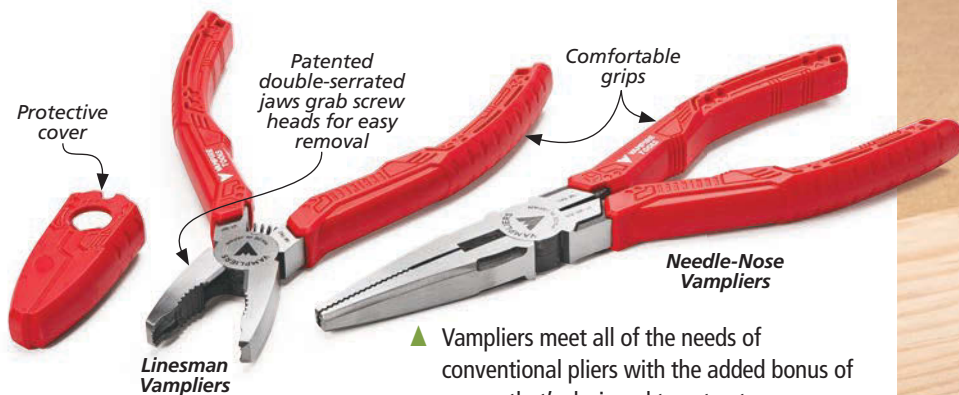
and hardware stores carry these kits as well.) They come with detailed instructions that I'll talk about briefly.

There's a chart on the instructions that tells you which of the four extractors you'll need for the size screw you're working on. Once you've selected the proper extractor, here's how it works.

DETAILS. One end has a cutter that bores a hole in the screw. The other end is the extractor that will bite into the hole you've drilled. Both operations are done with the drill in reverse.

With the cutter end, start boring out the hole (inset photo, above). Slow and steady with consistent pressure will give you the best results. I don't find it necessary to go as deep as the manufacturer suggests. But the hole must be centered on the head and parallel to the shaft. A dab of oil helps the cutting operation.

With the hole completed, flip to the extractor end of the tool. Again, with



steady pressure and the drill in reverse, I pulse the trigger gently to get a good bite on the screw. Once it's engaged, simply back the screw out, as you see in the main photo on the previous page.

BROKEN. Another common problem is when the screwhead snaps off. This can be easily managed with a hollow sawtooth extractor that you see at the bottom of the previous page. You start by making a guide board at the drill press with a bit the same size as the extractor. Then you place the board over the broken screw. After drilling deeper

than the screw shaft, remove the hole-saw. Often, the shaft of the screw falls free. If it doesn't, I use an awl to snap it off. Then fill the hole with a plug.

IN A PINCH. Another way to remove a damaged screw is with the unique pliers that you see above. The nose of the *Vampliers* is machined to grab just about any screw, regardless of how close it is to the surface. All you have to do is nestle the nose of the pliers around the offending fastener, and with a firm turn counterclockwise the screw starts to back out (photo above).

The set is available online from *Vampiretools.com*. Information on purchasing all of the other extractors is in *Sources* on page 67.

NAIL IT. There's a much bigger field of options when it comes to removing nails. And all of the tools are available at hardware stores and home centers. The How-To box below covers some of my favorites.

Thankfully, you don't have to deal with broken screws and bent nails every day. But these tools and tricks will help you through the task. **W**

How-To: TOOLS FOR REMOVING NAILS



▲ Pry bars come in many sizes and styles. The small, flat bars at top work in tandem. The more aggressive bar below is designed to be driven into the surface, digging out the most stubborn nail.



▲ The dynamic duo of side pliers and a flexible-blade putty knife get you out of all sorts of jams. Just place the pliers on top of the knife, then pinch and rotate the nail free without leaving a mark.

getting
to know

The Miter Saw



The miter saw is a mainstay tool of trim carpenters, home builders, and remodelers alike. Its accuracy and portability make it a favorite, go-to tool for these professionals. While a miter saw may never replace your table saw and a quality miter gauge, it can be valuable. If you're thinking of bringing one of these tools into the shop, here's a run-down of things to consider.

Broadly speaking there are three members in the miter saw family — the basic miter saw, compound saw, and sliding compound saw.

MITER SAW. The classic “chop saw” has bounced around in trucks and on the jobsite for decades. This tool does just one thing, cuts basic miters, as shown in the left How-To box on the next page. But it does it quite well. If the reason

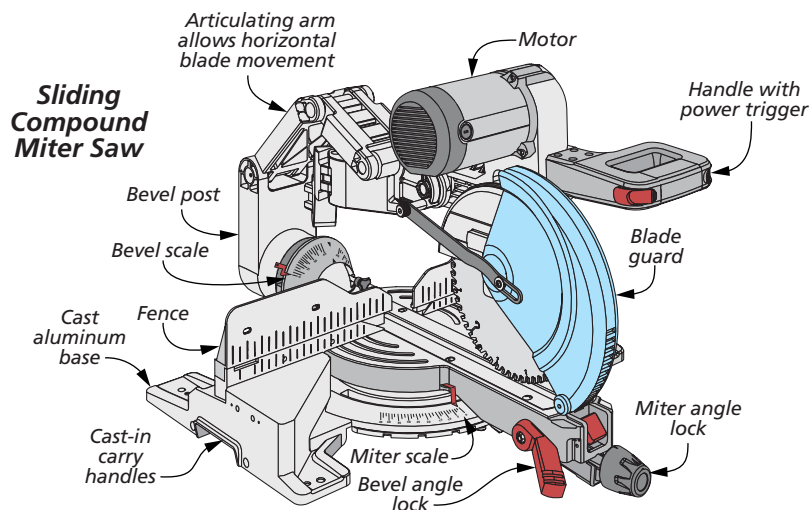
you're getting a miter saw is to chop material to workable sizes for projects, this simple tool might be for you.

COMPOUND MITER SAW. A compound miter saw differs from a standard miter saw in that the blade can be tilted as well as angled. This allows you to cut miters and bevels, as well as compound miters.

To accomplish this, a more complex hinge mechanism is required. Not only does this part have to guide the saw head up and down in the cut, it has to tilt and lock it in place accurately to make a beveled cut.

Compound miter saws come in two flavors — single bevel and double bevel, meaning that you can choose a saw that will only tilt in one direction, or one that can tilt both ways. This saw is ideal for cutting the crown moldings that wrap around the cases and cabinets of projects.

SLIDING COMPOUND MITER SAW. With a sliding compound miter saw, or “slider,” we're firmly in the category of all the bells and whistles. These saws extend the length of crosscut dramatically by putting the hinge and saw head on a set



of rails, or as in the case of the example shown here, an articulating arm. This lets you slide the saw head out to cut much wider material. This saw comes in single and double bevel options. And it's very helpful when crosscutting wide, long workpieces.

BLADE SIZE. Blade sizes in all of these categories will range from 7½" to 12". Most of the saws are in the 10" or 12" size. The saw shown has a 10" blade.

MITER SAW ANATOMY

From the ground up, let's review the basic components of a sliding compound miter saw. It starts with a metal base that holds a round table. On the front of the table, there's a lever or handle that lets you rotate the table and lock it in place to the desired angle (usually a few degrees past 45° in either direction) as shown in the upper left photo. You can set that angle for precision cutting using the miter scale that's attached to the base (inset photo below).

The base assembly also has a fence to hold the workpiece against while you make the cut. Behind the fence, there's a hinge mechanism that joins the saw head



▲ Miter cuts are made by turning the table of the miter saw to a desired angle. Lock that angle in place and make the cut.

to the base assembly. This hinge guides the saw head up and down and in and out. In the drawing on the previous page, this mechanism is a combination of the bevel post and the articulating arm.

SAW HEAD. How the saw head is put together varies depending on the manufacturer, but here's a general rundown. There's an arm that attaches to the hinge on the table. This arm supports the motor that runs the blade of

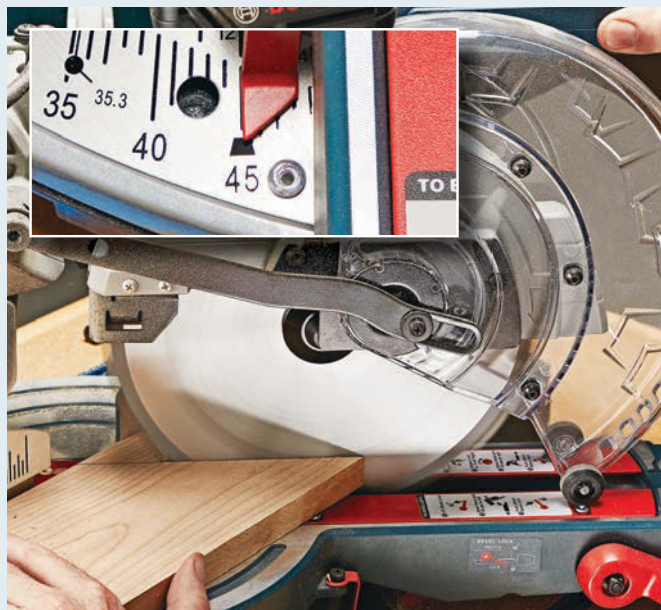


▲ Bevel cuts happen when you tilt the saw head. To do this you have to loosen the mechanism that holds the head in place.

the saw. The *Bosch* miter saw shown in this article has a belt-driven motor that sits above the blade. The handle that you guide the saw with is located in front of the motor.

The How-To box below provides more information about setting angles and making accurate cuts. Knowing the basics about miter saws should give you a leg-up when selecting the saw that'll work best for your shop. **W**

How-To: SETTING THE ANGLES & MAKING THE CUTS



▲ Miter cuts are angled cuts across the face of a board. You can make very precise cuts with a miter saw by turning the miter pointer (inset) to the proper setting on the scale.



▲ Bevel cuts are angled cuts across the edge or end of the board. As you can see in the inset photo, this saw is set up to make bevel cuts to the left or right. Some saws only rotate in one direction.



mastering the
table saw

accurate

Case Mitters

Making bevel cuts in wood is not an exotic task. But it's not one you do every day. In this instance, I'm talking about long bevels cut to create a mitered case. When you make this cut on mating pieces they can be brought together to form a miter, like the one you see in the photo below.

Any time you make a bevel cut, you have to be focused. This need for being deliberate increases when the bevel cuts

▼ The miter joint you see here is the result of making bevel cuts in two case pieces. The trick is keeping the cuts straight and square.

are long. Any slight variation or movement will telegraph and appear larger the longer that the cut is.

You have two challenges that you'll need to deal with. The first is making an exact 45° cut in the material. It might seem that "close enough" will do, but that's not the case with bevels. If the miter that's created when you bring them together isn't perfect, the case will be out of square.

The second horn of the dilemma is keeping the cut straight and square to the edge of the workpiece. Not doing this will leave the joints open at one end, or cause the case to twist.

I've found it's easiest to attack these problems one at a time (making test cuts along the way). This will eliminate a lot of headaches. Picking the blade to use for this operation is a good place to start.

SHARP BLADE. A sharp, crosscut blade with a high tooth count is what's

prescribed here. Not only does it give a clean cut, but it will move through the material with a lot less effort, letting you focus on feeding the board properly through the saw.

BLADE ANGLE. To get a perfect miter joint, the blade needs to be set at exactly 45°. To get this angle, you can't rely solely on the scale on the front of your saw. I make some test cuts and check them with the 45° face of my combination square. This will confirm that the angle is exact.

With the foundation of a sharp blade that's set to the proper angle, you can turn your attention to the next phase — guiding the workpiece past the blade for a straight and accurate cut. I'm going to focus on the two ways that I've found give me the best results.

CROSSCUT SLED. A crosscut sled is ideal for making cuts on wide boards where a rip fence won't work. The one you see in the photo above is ideal for cutting



▲ If the piece you're cutting is longer than the sled, not to worry. A stop block that has a hook cut into the end works perfectly. Just clamp the piece to the sled fence where you want it.

▲ To stop the workpiece from rotating or tipping, provide plenty of support from behind and below the board. Also, use sandpaper to hold the board in place. And wax the surfaces to eliminate friction.

bevels on long pieces. It will hold the workpiece steady and flat while making the cut. The sled is doing all the moving across the table saw. With the board immobile in the sled, you can focus on the cut. This works great when you're wanting to make a controlled cut on a wide board.

Speaking of controlling cuts, the photo above sheds a little light on that. When I need to cut a series of workpieces to an exact length, I use a stop block. In some circumstances the piece is longer than the sled, so I clamp a hooked stop on the fence that's positioned for the cut needed.

WINGING IT. If you don't have a crosscut sled handy, that's okay. You can make quality cuts with your miter gauge.

What you have to do is support the workpiece in a way similar to the sled.

This starts with a long auxiliary fence (with adhesive-backed sandpaper) on the miter gauge. The fence needs to be long enough to prevent the workpiece from rotating or shifting as you move through the blade. To keep the board from tipping, you'll need to support it on the outer end. The upper right photo shows you how. Regardless of how you choose to support the cut you're making, there are a few tips that will help make the process a success.

BE SNEAKY. It's best to start with your workpiece oversized. Then make the first bevel cut an inch or so away from the final cut. Doing so gives you a

stress-free feel for how the saw, and the method you've chosen to make the cut, works. You can practice your steady feed rate at the same time.

If the cut is out of square, the photo below left shows a good way to bring the board back in order. When you feel confident with the test runs, all you have left is a small cut to trim the board to length.

Most of the time, these tips will give you results that you'll be happy with. But on occasion, even with all of these precautions, you can still end up with a joint that's not quite up to snuff. The two right photos below provide solid tips for dealing with stubborn miters. Just like most things in life, the good things are worth the effort. **W**

How-To: FINE-TUNE MITER JOINTS



▲ A playing card shim will fine-tune the crosscut. Place it on the sled where it's needed to square the cut in the workpiece.

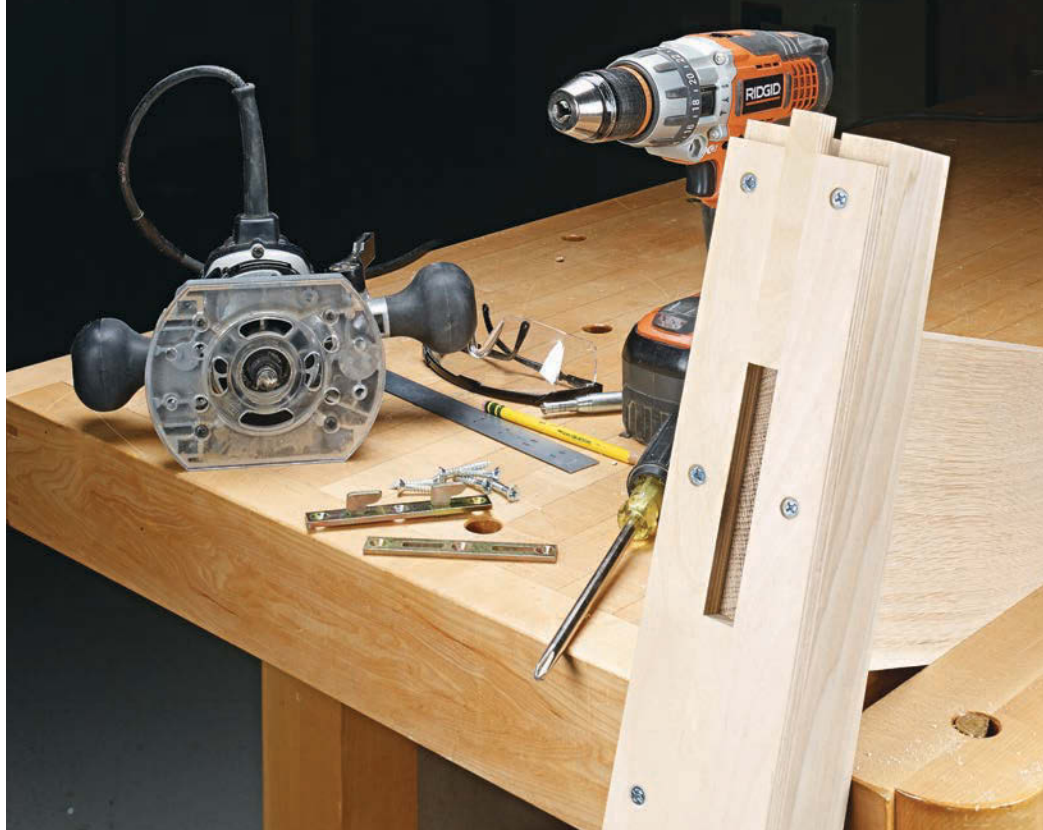


▲ Close a hairline opening of a miter with a bar that will roll the gap closed. Even pressure across the corner is best.



▲ A gap in the face of the miter is easily filled with matching wood putty. Once the putty is dry, sand off the excess.

Shop Notes



Installing Bed Hardware

The hidden hardware that connects the rails to the headboard and footboard on our Craftsman-style bed on page 46 is designed to be recessed in mortises. Creating these mortises is easy to do with the simple-to-build template shown above.

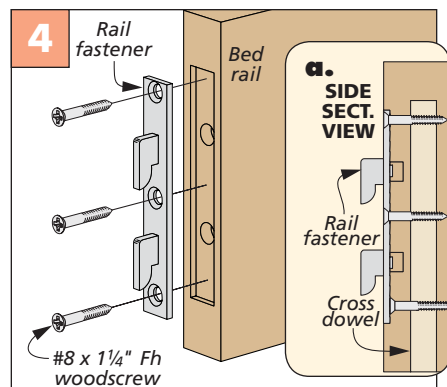
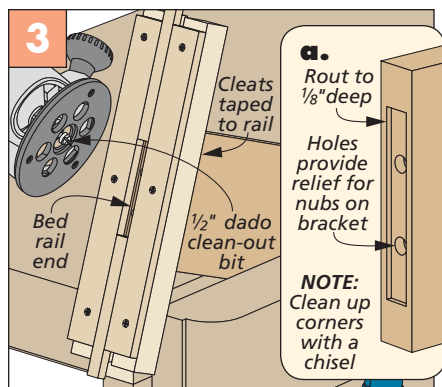
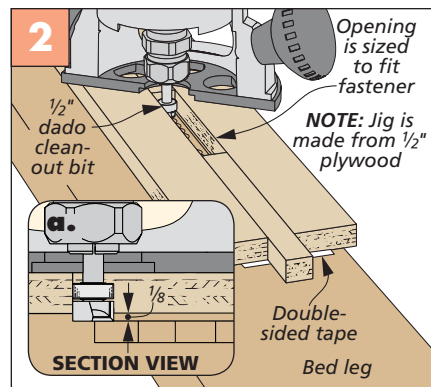
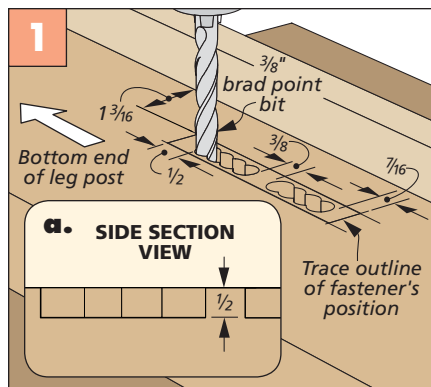
MAKE THE TEMPLATE. The only critical dimension for the template is the opening in the middle. This should be sized to match the size of the bed hardware. I made the two center pieces of the template the same width as the actual

fastener, and then sandwiched them between the outer pieces (Figure 2). For the mortises in the bed legs, you'll only need the top portion of the template. When making the mortises in the ends of the bed rails, you'll add a couple of cleats to the bottom of the template for stability (photo above and Figure 3).

LEGS FIRST. Before putting the template to work, you'll need to drill the overlapping holes in the legs, as shown in Figure 1. This provides the needed clearance for the hooks on the rail side of the fastener. With the holes drilled, secure the template to the leg with double-sided tape and use a dado clean-out bit to rout the mortise pocket (Figure 2). Use a chisel to clean up the corners.

NOW RAILS. The process for the rails follows a similar course. But instead of drilling overlapping holes, here you only need two shallow holes to allow for the nubs on the backside of the hooks (Figure 3a). Again, use the hardware itself to position these holes.

Now add the cleats to the underside of the template with screws and secure it to a rail end with tape. The rest of the process is the same as the legs. You can then add the cross dowels to the underside of each rail (Figure 4a) and fasten each piece of hardware in place with screws.



Dowel Centers & Plugs

The handles for the serving tray on page 18 fold flat for storage. Rare-earth magnets embedded in the handle assemblies and the underside of the tray keep the parts together. The tricky part is aligning the pairs of magnets.

Magnets are installed in the handle assemblies, first. After installing the hinges, I placed steel dowel centers over

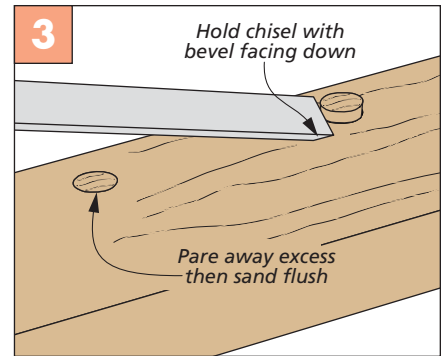
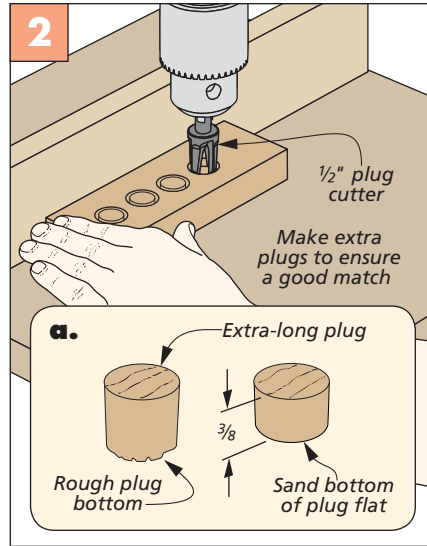
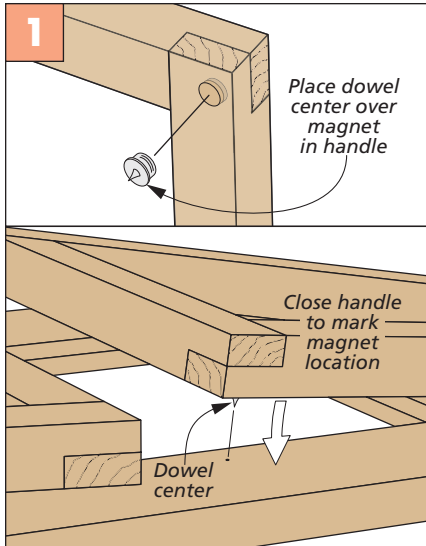
the magnets in the handles and then folded the handles closed. The spur on the dowel center leaves a dimple to mark the correct placement, as in Figure 1.

CONCEALED MAGNETS. I didn't want the magnets to distract from the look of the tray, so they're covered with thin wood plugs. The plugs are made with a drill press-mounted plug cutter, as shown in

Figure 2. I used scrap pieces from the project to create the plugs for the best grain and color match.

You'll create extra-long plugs to start with (Figure 2a). These are easier to handle as well as install. Fit the magnet into the shallow hole in the workpiece, then glue the plug over the top.

After the glue dries, pare away the waste with a chisel, as in Figure 3. When trimming, take thin cuts and pay close attention to the grain direction to avoid tearing out the grain on the plug. A final hand sanding completes the task and helps to blend the surfaces.



Mortising Template

The sliding door cabinet on page 28 features a tray that folds open when the shelf is pulled out. To allow the tray to fold, a pair of card table hinges are mortised into the tray and tray leaf. To create these mortises, all you need is a router and a shop-made template.

TEMPLATE. The template is simply a piece of 1/2" MDF with an opening sized to match the hinge. You can use one of the hinges to trace the outline

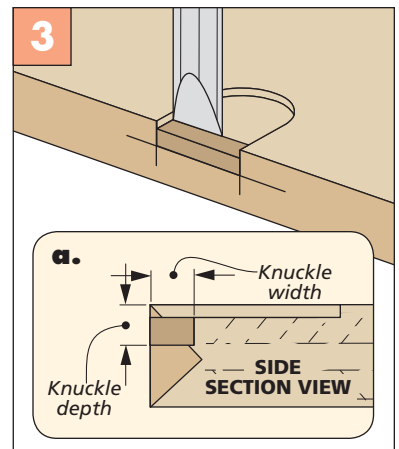
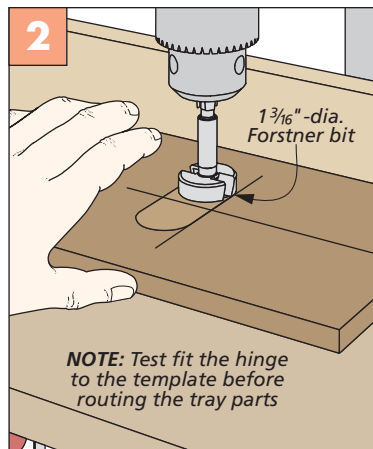
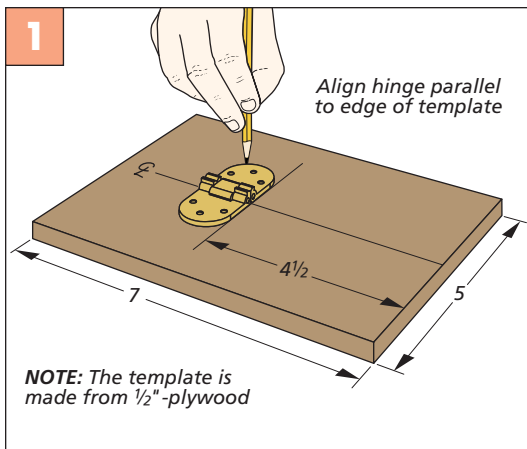
onto the MDF blank (Figure 1). I used the template to position the hinges a specific distance from the sides of the tray parts. Figure 1 also shows how to size the template and where to locate the opening.

I used a Forstner bit to drill a hole at each end (Figure 2) and then removed the rest of the waste with a jig saw. Now shape the edges smooth with a file and sandpaper. I did a test fit with the

hinge from both sides of the template to ensure that there's proper clearance.

Routing the opening is next. Page 32 shows how to do this. When that's done, you have one more task. The edge of the mortise needs to be deeper to allow for the knuckle of the hinges.

Figure 3 below provides the details. First, I laid out the depth of the mortise on the edges. I then cleaned out the space with a sharp chisel.



Inlay Routing Jig

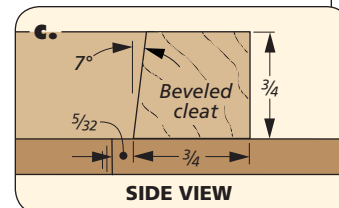
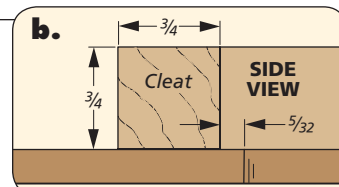
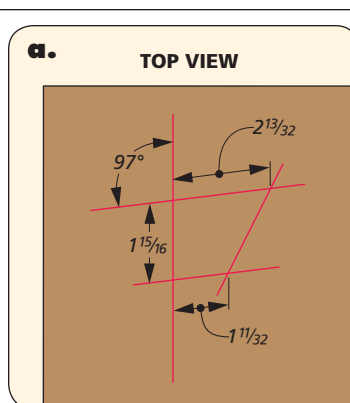
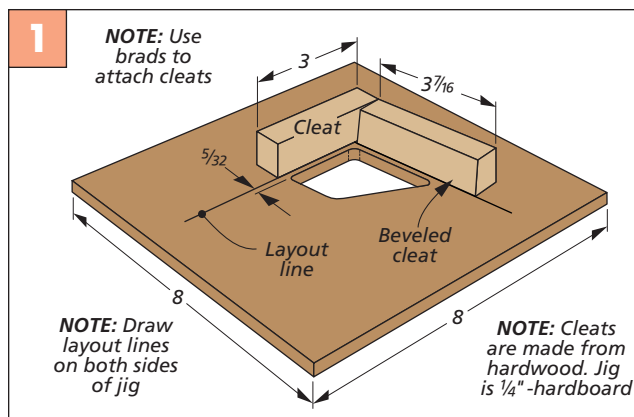
To create the inlays in the feet of the sliding door cabinet (page 28), I made the jig you see here. This jig does a couple of things — recess opposite faces of the feet and cut out the inlays for those recesses.

DOUBLE-DUTY. The jig works with an inlay bit and bushing installed in your router. Starting with a piece of $\frac{1}{4}$ " hardboard,

lay out the opening to the dimensions shown in detail 'a'. This includes marking lines for the cleat locations, as shown in Fig. 1. You're going to use the cleats on both sides of the jig, so draw the layout lines on both sides.

CLEATS. To match the angle of the foot, the top cleat is beveled. The other cleat

is square. When you're ready to install the cleats, just line them up to the set-back lines. You can use brads to hold them in place. Once you've finished routing one face of each foot, remove the cleats and attach them to the other side and repeat the process. Then you can use the jig to cut the inlays.



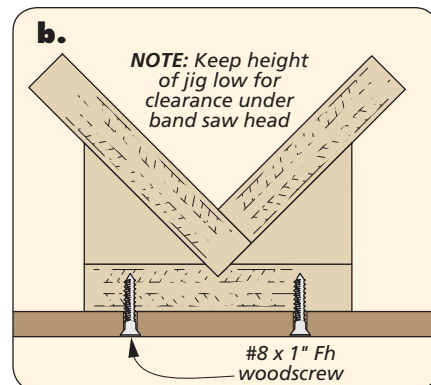
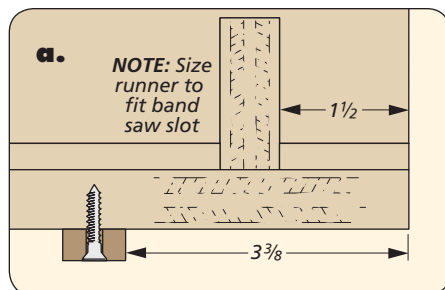
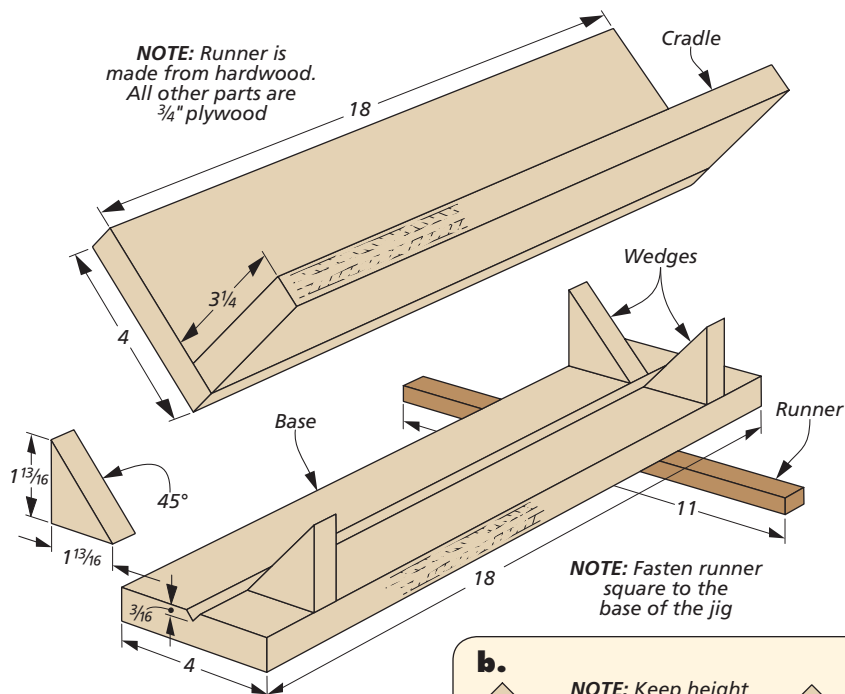
Foot-Cutting Jig

Making the feet for the sliding door cabinet on page 28 starts with cutting oversized hardwood blocks. These blocks are designed to splay out from the cabinet. The jig you see here is what I used to set the proper angle on the feet and cut them to their initial size at the band saw.

ANATOMY. The jig is comprised of four components. From the bottom up, there's a hardwood runner that rides in the miter gauge groove and a plywood base that supports an "L"-shaped cradle. This cradle holds the foot blank. And there are four wedges that support and tie the cradle to the base.

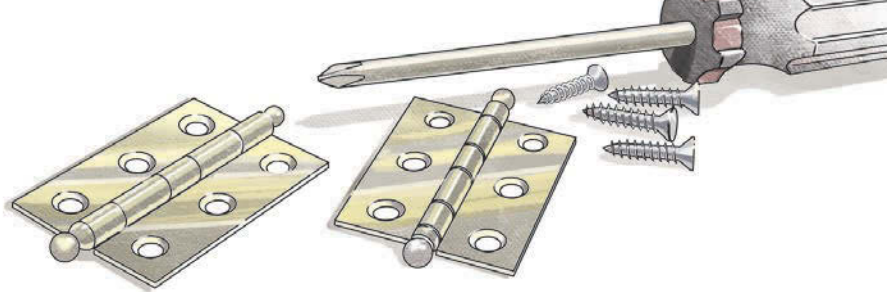
To register the cradle in the base and keep the height of the jig low enough to go under the head of the band saw, I cut a shallow V-groove in the center of the base at the table saw. I glued the wedges in place on either side of this groove. When the glue was dry, I glued the cradle to the wedges.

ATTACH THE RUNNER. Since the groove you cut in the base keeps the cradle parallel with the base, all you have to do is attach the runner square to the base as shown in detail 'a'. Flip back to page 34 of the main article to see how to put this jig to use. [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.

BED RAIL HARDWARE (p.10)

- **Rockler**
4" Bed Rail Fasteners . . . 28589
Knock-Down Connectors. 37928
Surface Mount Fasteners. 30247
Bed Rail Hooks 38606

SHOP APRONS (p.14)

- **Lee Valley**
Veritas Apron 67K10.10
- **Calavera Tool Works**
Leather Apron (Tobacco) . varies
- **Amazon**
Waxed Apron B071P9LM7P
- **Atlas 46**
Cargo Apron . .A46-JXL-CP-COY
- **Rockler**
Broad Shoulder Apron . . . 48974

SERVING TRAY (p.18)

- **Hardware Tree**
Flip-Top HingesH-15050PP
 - **Lee Valley**
Rare-Earth Magnets. . .99K31.03
105 Epoxy Resin54Z20.10
207 Epoxy Hardener . .54Z20.22
- The walnut handles and frames were wiped with *General Finishes' Seal-A-Cell* oil finish then sprayed with two coats of satin lacquer.

SLIDING-DOOR CABINET (p.28)

- **Rockler**
16" Drawer Slides47396
Keyboard Slides 24837
1/4" Shelf Pins 22781
Inlay & Bushing Bit 27593
- **Eagle America**
Edge Banding Set P16-4041
- **Lee Valley**
Card Table Hinges. . . .00W23.01

The cabinet was sprayed with black lacquer. Then after a very light sanding, it was sprayed with two coats of satin lacquer.

The black lacquer is *Clawlock* Black Primer W37011, from M. L. Campbell. As a substitute for the black lacquer, you could spray paint the entire cabinet prior to finishing.

PLYWOOD PROJECTS (p.38)

The plywood shop projects were finished with *General Finishes* "Tuscan Red" milk paint. Non-painted surfaces are finished with spray lacquer.

CRAFTSMAN BED (p.46)

- **Rockler**
4" Bed Rail Fasteners 28589
- **Rust-Oleum**
Gunstock Stain211728H

The bed was finished with a *Rust-Oleum* product, *Varathane* oil-based stain in "Gunstock" color. Simply wipe it on, let it sit for a few minutes, and then wipe off the excess. I then sprayed the bed with two coats of lacquer.

ROUTER PLANES (p.56)

- **Lee Valley**
Veritas Router Plane . . .05P38.01

REMOVING FASTENERS (p.58)

- **Lee Valley**
Micro Grabit 66J20.10
- **Woodcraft**
3/8" Extractor.MJ-833C
5/16" ExtractorMJ-833B
1/4" Extractor. MJ-833A
- **Vampire Tools**
Two Plier Set S2H

MITER SAWS (p.60)

The saw used in this article is the *Bosch* CM10GD sliding compound miter saw. The saw is available online or from local tool suppliers.

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MAIL ORDER SOURCES

Project supplies may be ordered from the following companies:

amazon.com

Atlas 46
636-600-9165
atlas46.com

Bosch
877-267-2499
boschtools.com

Calavera Tool Works
765-481-6775
calaveratoolworks.com

Eagle America
800-872-2511
eagleamerica.com

General Finishes
800-783-6050
generalfinishes.com

Hardware Tree
800-545-7947
hardwaretree.com

Lee Valley
800-871-8158
leevalley.com

ML Campbell
800-364-1359
mlcampbell.com

Rockler
800-279-4441
rockler.com

Rust-Oleum
800-901-0411
rustoleum.com

Vampire Tools
949-748-0552
vampiretools.com

Woodcraft
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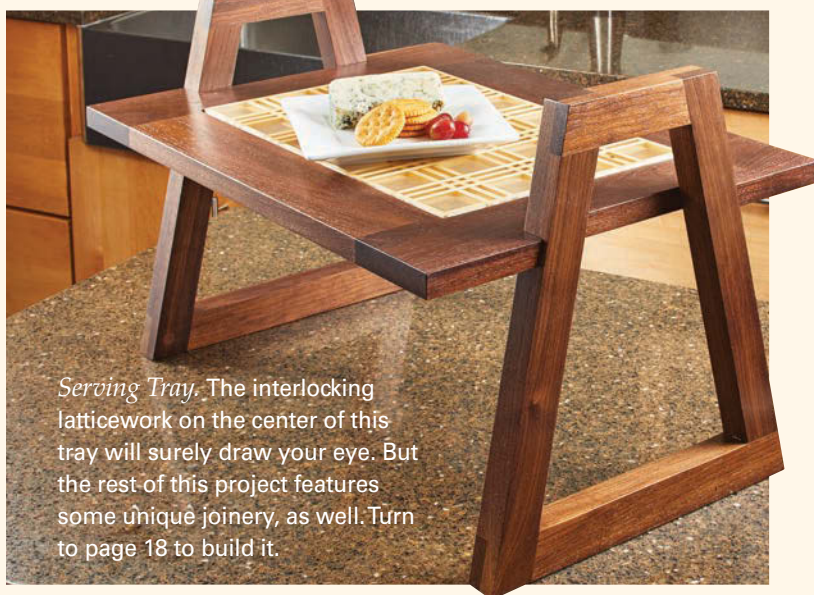


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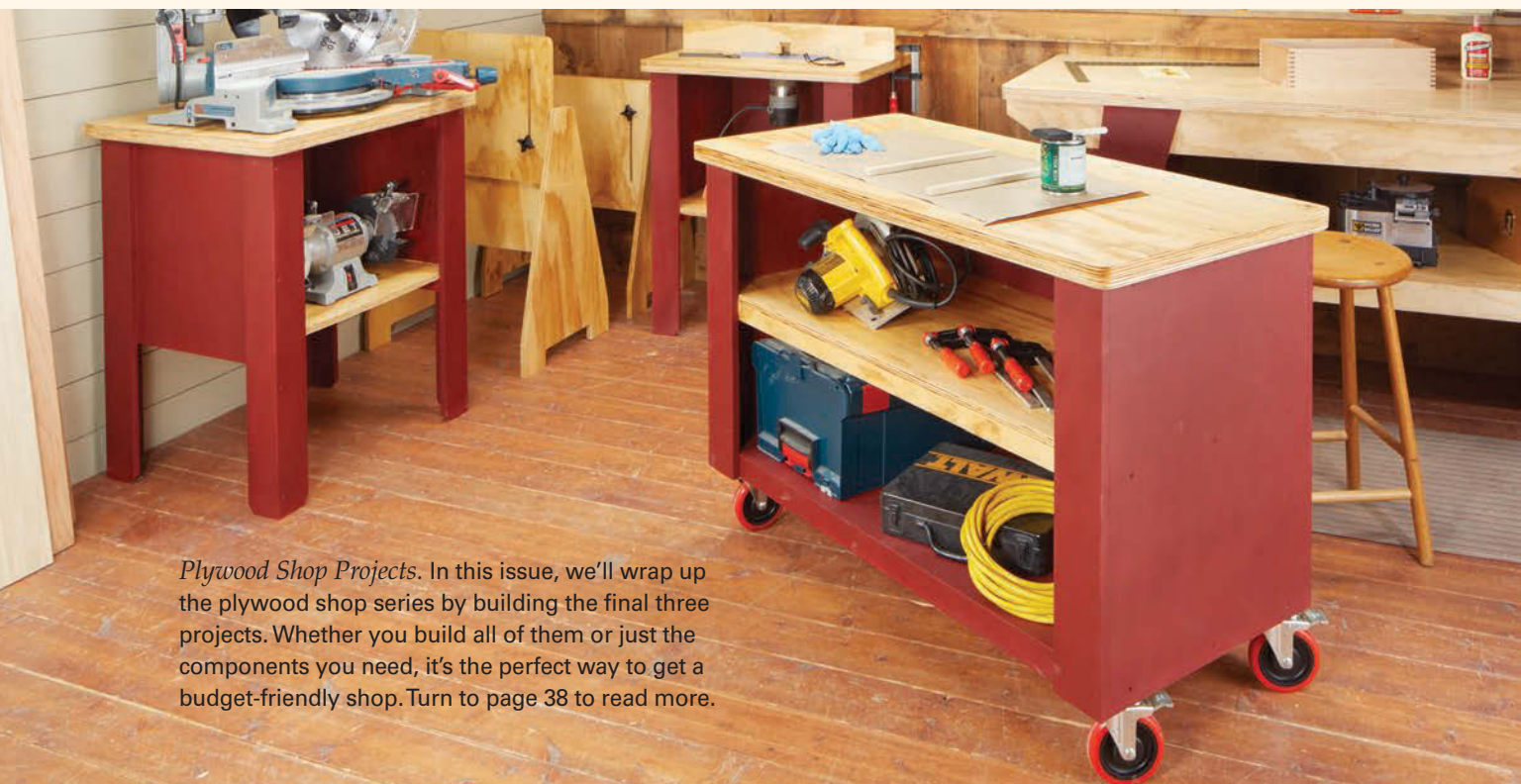
Charging Station. Find a home for all of your cordless drills, chargers, and accessories with this great shop project. Plans begin on page 24.



▲ *Display Cabinet.* Side-by-side doors on the front of this display cabinet slide apart to reveal a mini-bar for wine and cocktails. We'll walk you through the construction process starting on page 28.



Serving Tray. The interlocking latticework on the center of this tray will surely draw your eye. But the rest of this project features some unique joinery, as well. Turn to page 18 to build it.



Plywood Shop Projects. In this issue, we'll wrap up the plywood shop series by building the final three projects. Whether you build all of them or just the components you need, it's the perfect way to get a budget-friendly shop. Turn to page 38 to read more.