TABLE SAW JOINERY–
Beyond the Dado Blade

ROUTING TECHNIQUES
For Perfect Joinery

ShopNotes®

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Vol. 22 Issue 130

All-New Crosscut Sled

- Zero-Clearance Insert
- Hairline Indicator
- Add-On Fence Extension

New Jig for Dead-On Box Joints

Secrets for Top-Notch Jigs & Fixtures

Top Shop Tips: Precision Layouts, Perfect Curves

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Cutoffs

Whenever I step into my shop, one of my main goals is to improve my skills. It might be a tighter-fitting joint on my latest project or simply a finish that goes on faster and smoother than the last time. The trick is using the time to stretch my abilities. If you share that goal, you'll find the best solutions inside these pages. There's always a wide range of projects and articles to help you improve your woodworking skills.

For example, when it comes to joinery, a rabbet is about as basic as it gets. But in the article on page 8, you'll find some tips and tricks for getting better results when cutting this bread-and-butter joint. And check out the lighting article on page 44. There you'll learn how to improve the light in your shop, from general lighting to getting task lighting right where you need it.

Finally, finishing is always one of those big challenges. That's why I'm really excited about the fold-up finishing station (page 14). Mounted to the wall of your shop, it'll have you applying better finishes in no time at all.

Help Wanted. To help continue providing all this valuable information, we're looking for an editor to join us here at *August Home Publishing* in Des Moines, IA. If you're enthusiastic about woodworking and enjoy being part of a team, let us know. You can apply online at our website, AugustHome.com, or email a cover letter and résumé highlighting your experience to Professionals@AugustHome.com. Or if you'd prefer, simply mail it to Human Resources, 2200 Grand Avenue, Des Moines, IA 50312.

Bryan

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from our Readers

Tips for Your Shop

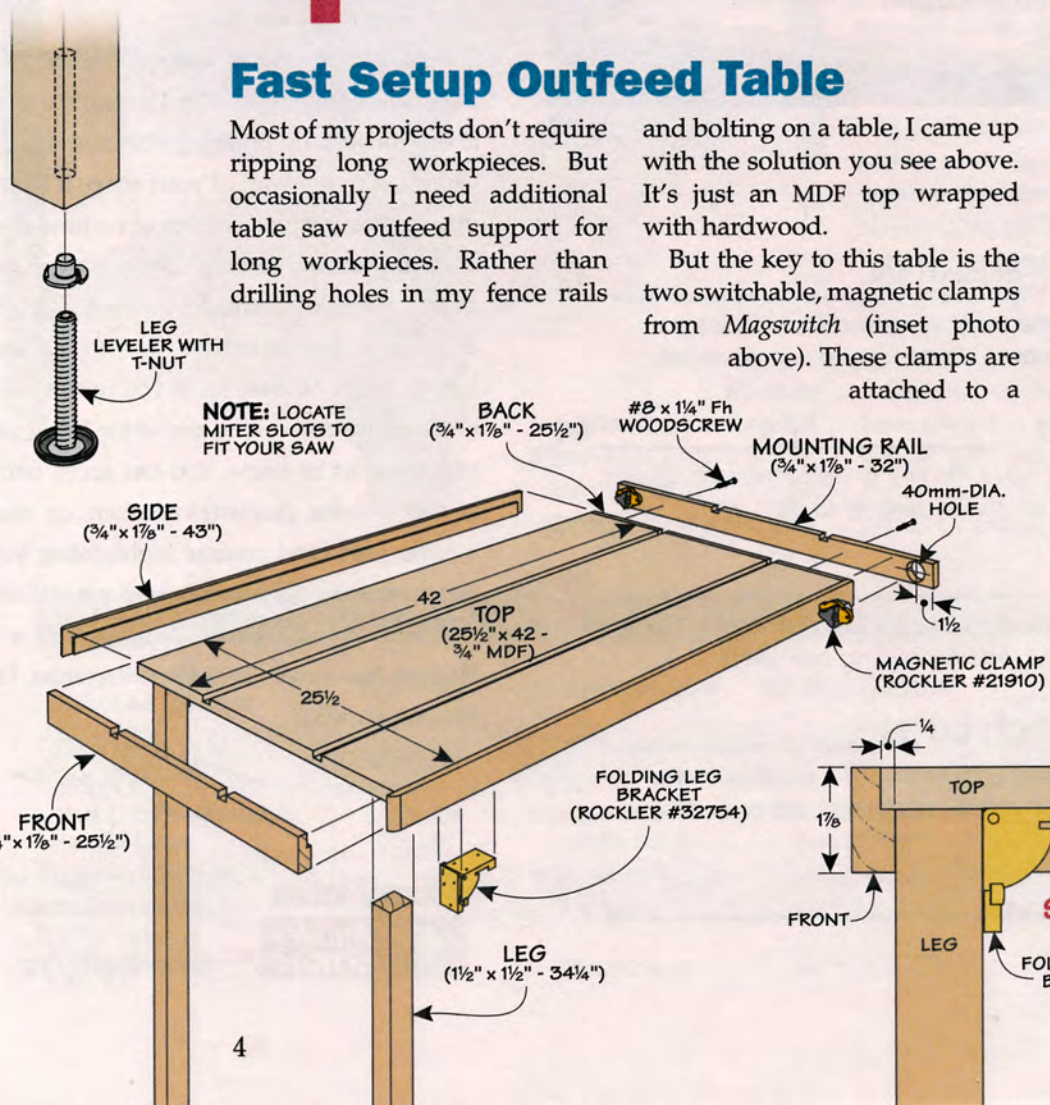
Fast Setup Outfeed Table

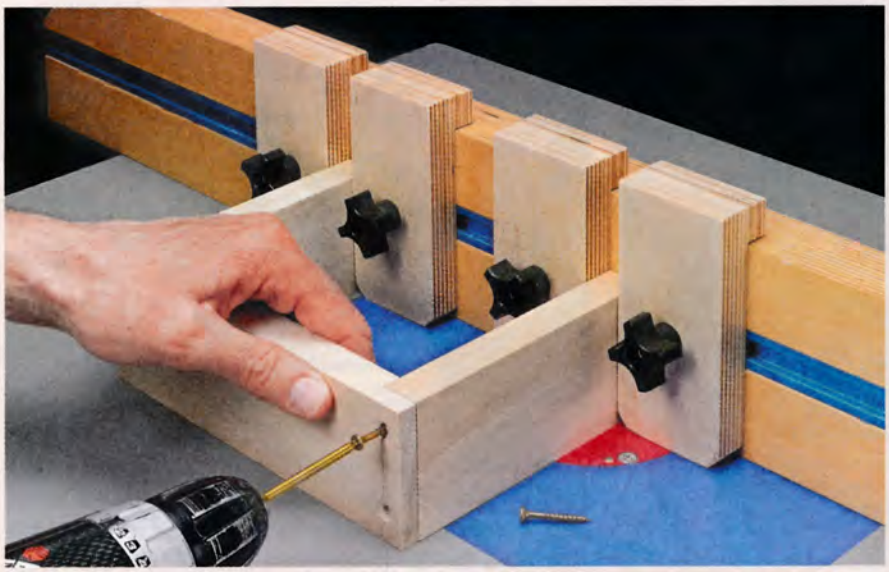
Most of my projects don't require ripping long workpieces. But occasionally I need additional table saw outfeed support for long workpieces. Rather than drilling holes in my fence rails and bolting on a table, I came up with the solution you see above. It's just an MDF top wrapped with hardwood.

But the key to this table is the two switchable, magnetic clamps from *Magswitch* (inset photo above). These clamps are attached to a mounting rail located at one end of the table (drawings below). With just a turn of a knob, I can quickly attach or remove the table from my saw.

On the other end of the table are two hardwood legs. They're connected to the underside of the table with folding leg brackets that allow the legs to be stored away. This makes storing the table a breeze.

Johnny Smith
Cypress, Texas





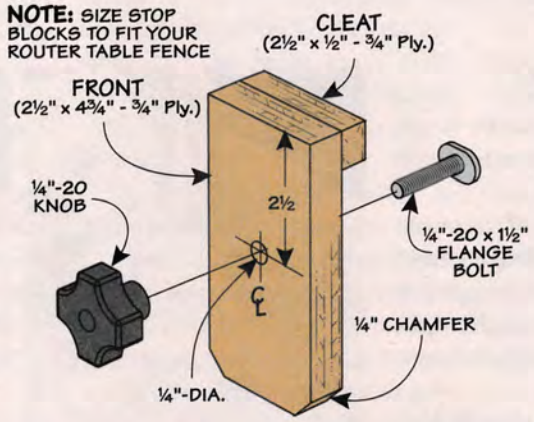
Assembly Helpers

It's always nice to have an extra set of hands available when assembling a project. But that's not always possible. So I recently added an accessory system to my router table that's the next best thing.

I made a set of four stop blocks that fit in the T-track of my router table fence. A flange bolt and knob secure the blocks in place. A cleat on the back of the block keeps the edges square with the table.

The blocks are great any time I need to keep a project square during assembly. Just position the blocks snug on each side of your workpieces and then tighten the knobs to secure them in place.

Larry Hagelberger
Anna, Ohio



Submit Your Tips Online!

If you have an original shop tip, we would like to consider publishing it. Go to

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SUBMIT A TIP

There, you'll be able to describe your tip in detail and upload photos or drawings. Or you can mail your tip to the editorial address shown in the right margin. We will pay up to $200 if we publish your tip. And if your tip is selected as the top tip, you'll also receive the *Porter-Cable* compact router kit shown on the right.

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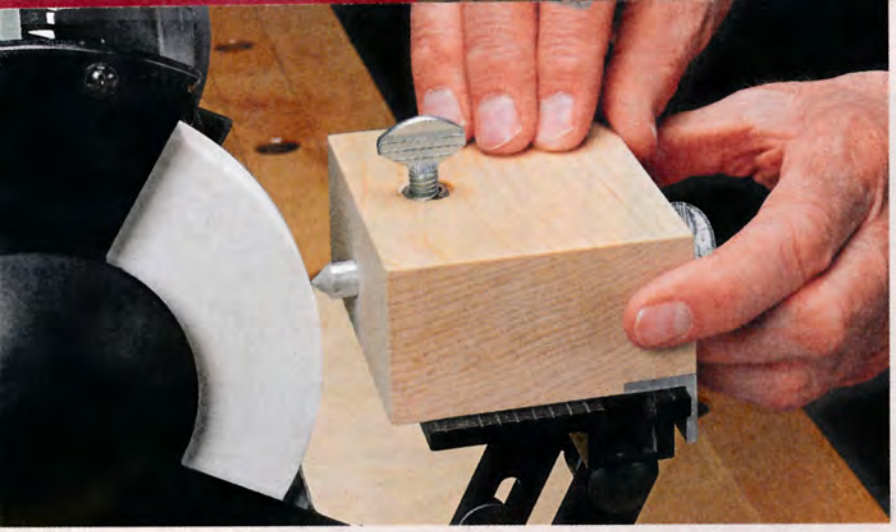
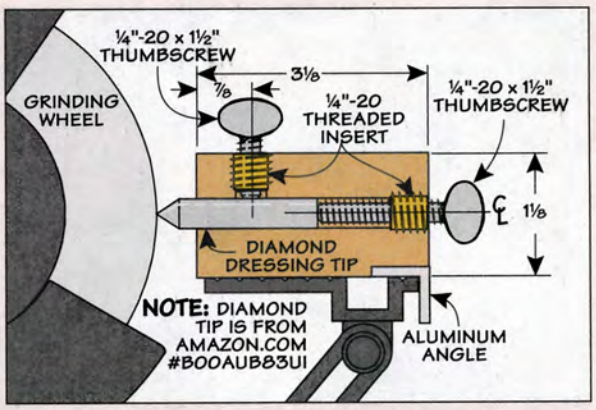




Wheel Dressing Jig

The wheels on my grinder get used for a number of tasks around the shop. And after a while, the grinding edges end up with uneven wear. Small grooves or a face that isn't square with the tool rest can really affect the performance of the wheels, especially when sharpening tools.

To keep my wheels in top shape I made the jig you see here. It utilizes a single-point diamond dressing tip to true up a wheel's edge.

It's just a short block of hardwood with a hole drilled to accept the dressing tip. A threaded insert and thumbscrew at the opposite end of the hole advances the tip towards the wheel (left drawing). Another insert and thumbscrew on the top of the block locks the tip in place.

A section of aluminum angle on the bottom edge of the block registers the jig against the tool rest. Use the jig to keep your wheels true by slowly sliding the block from side to side across the tool rest.

Paul Saffold
Inwood, West Virginia

Large Holes Made Easy

Some projects require drilling large holes. This can be tough when working with hardwoods like oak. A Forstner bit tends to overheat quickly and can even burn the wood.

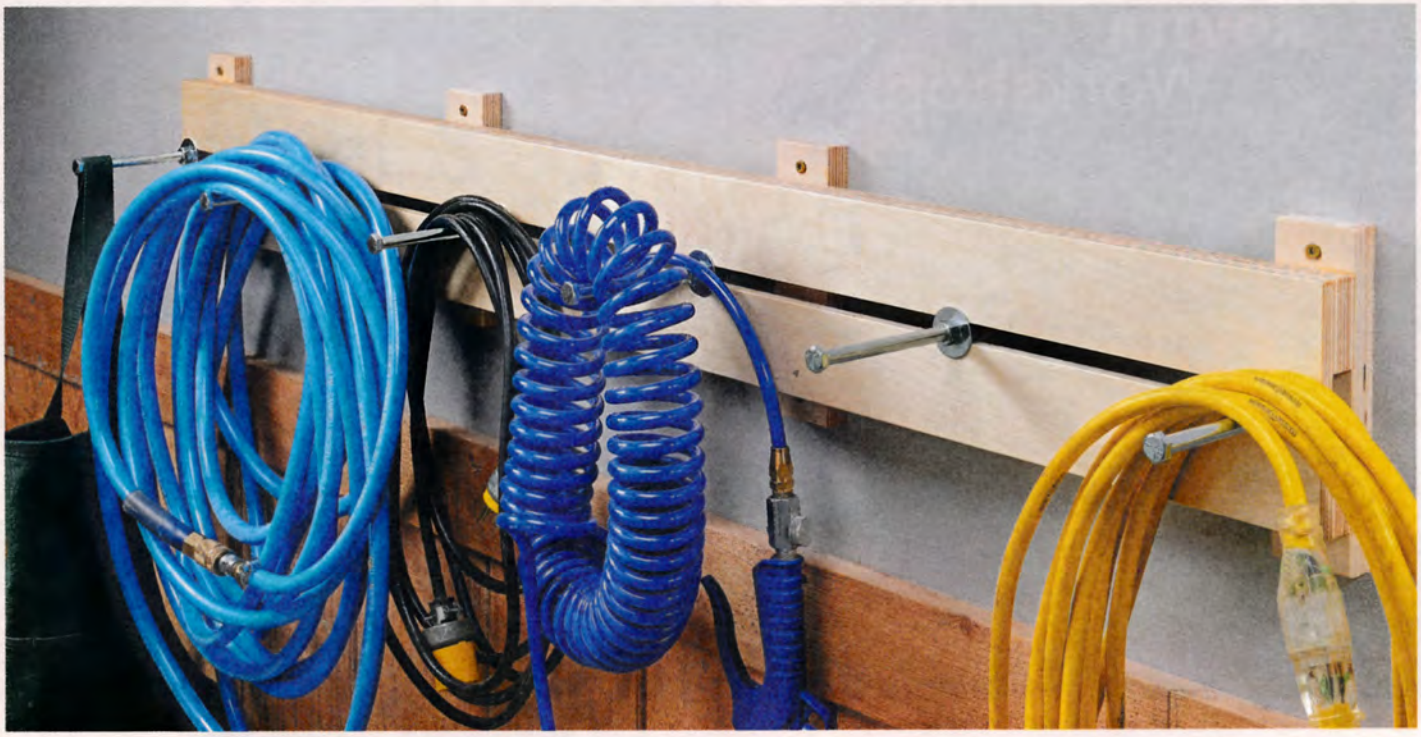
The solution I came up with is to remove most of the waste first with a smaller bit centered over the hole's final location (left photo). With the small hole drilled, I just change bits without moving the workpiece, as you can see in the right photo. Then I drill the hole to its final size which helps to prevent overheating the bit.

Charles Mak
Calgary, Alberta

Quick Tips

▲ ***John Blankeney*** *of Virginia Beach, VA, epoxied a copper pipe coupling to his clamp handles. A screwdriver in a drilled hole provides leverage in tight spaces.*

▲ ***Dimitri Vergison*** *of Wingene, Belgium, uses a 1" hole punch and hook-and-loop sandpaper to make sanding discs for his Sorby Micro Sandmaster.*

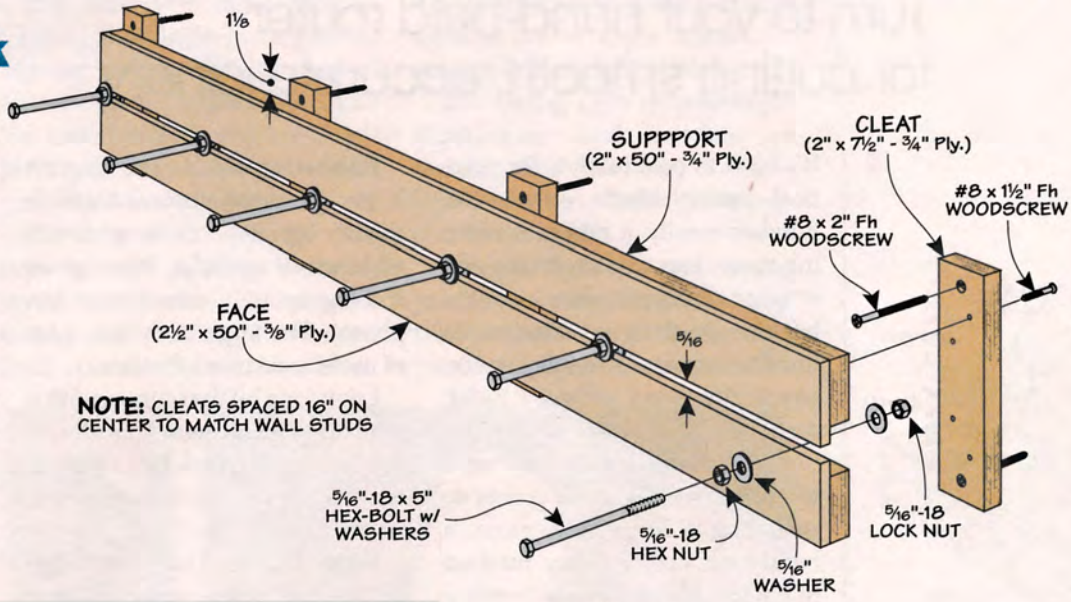


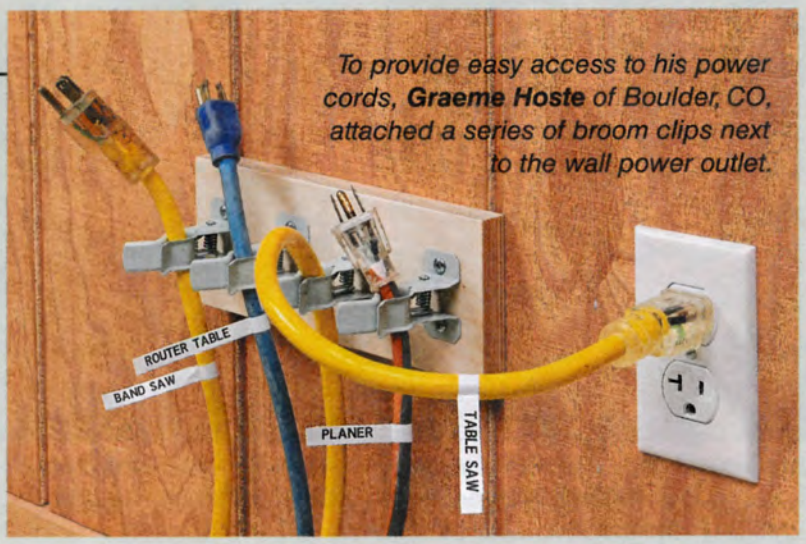
Adjustable Rack

I have a number of cords, hoses, and other items in my shop that are best stored by hanging on a rack. Rather than buying off-the-shelf hooks or hangers, I built the rack you see here.

The simple plywood construction is screwed to my wall studs. Long hex bolts serve as hooks, and can be positioned anywhere along the length of the rack to make room for each item.

Russel Reed
Merritt Island, Florida

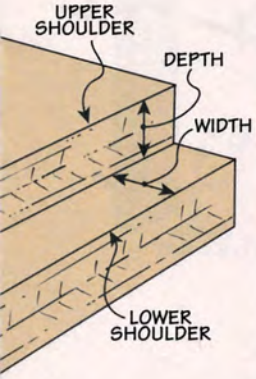




*To provide easy access to his power cords, **Graeme Hoste** of Boulder, CO, attached a series of broom clips next to the wall power outlet.*

tips & tricks for Routing Rabbets

Turn to your hand-held router for cutting smooth, accurate joinery.

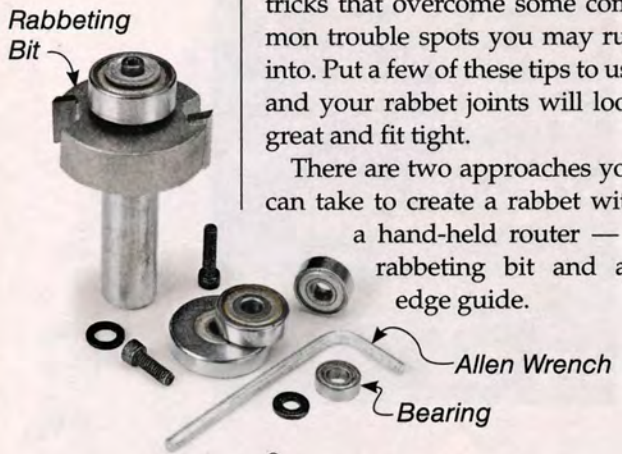


It's hard to beat rabbets for practical joinery that's easy-to-cut. Fundamentally, a rabbet is nothing more than a notch on the end or edge of a workpiece, as in the left margin drawing. Despite its humble nature, I use this joint on practically every project I build, no matter how complex.

Although there are many ways to cut rabbets, when it comes to rabbeting a large workpiece, a hand-held router is my method of choice. It's just easier to bring the tool to the workpiece. And a router bit does a good job of making smooth, crisp joints.

However, I've picked up a few tricks that overcome some common trouble spots you may run into. Put a few of these tips to use and your rabbet joints will look great and fit tight.

There are two approaches you can take to create a rabbet with a hand-held router — a rabbeting bit and an edge guide.



Rabbeting Bit. A rabbeting bit is my preferred choice. A good-quality bit cuts a clean rabbet in all kinds of material. What gives it a leg up is its size (lower left photo). The large body has a lot of mass to reduce vibration.

Look for a bit that comes with a selection of bearings. This allows you to cut several fixed rabbet widths simply by changing the bearing on the bit.

Edge Guide. Using an edge guide gives you a wider range of rabbet sizes. An edge guide is a common accessory that mounts to the router base and has a fence to guide the router along an edge, as shown in the lower photo.

With an edge guide, you can use an ordinary straight bit to rout a rabbet. I prefer a ¾"-dia. bit for its extra mass and to customize the width of the rabbets for the projects I build.

The fence is what determines the width of the rabbet. Since it's adjustable, you can set it to a

▲ ***Edge Guide.*** *The wide fences on either side of the bit run along the edge of the workpiece and establish the width of the rabbet. An ordinary straight bit is used to make the cut.*

precise width. For example, you can rout a rabbet to match the thickness of plywood.

When starting a cut with an edge guide, the key is making sure the fence is in firm contact with the reference edge before the bit contacts the workpiece. If it's not, the result is uneven edges at each end of a cut. You can add an auxiliary face to the fence to give you a longer bearing surface.

TAME TEAROUT

No matter which method you use, the obstacle standing in your way is tearout. This occurs when unsupported wood fibers splinter, leaving a blemish.

End Rabbets. While routing a rabbet across a workpiece, you can get tearout on the upper surface and far end of the cut. This is especially true in plywood. A two-pronged approach is in order.

To stop tearout on the top face of the workpiece, I like to first set the bit for a very shallow cut (about 1/32") and make a full width pass. This light cut scores the top shoulder of the rabbet (main photo on facing page).

The fix for tearout on the back edge is clamping a backer board in place. It supports the fibers on the workpiece for a clean exit.

Edge Rabbets. Tearout can also occur on the lower shoulder of the rabbet. Here again, the solution is to take a light scoring pass. This time the bit is set to its final depth. I like to rout backward from the usual routing direction (lower left drawings).

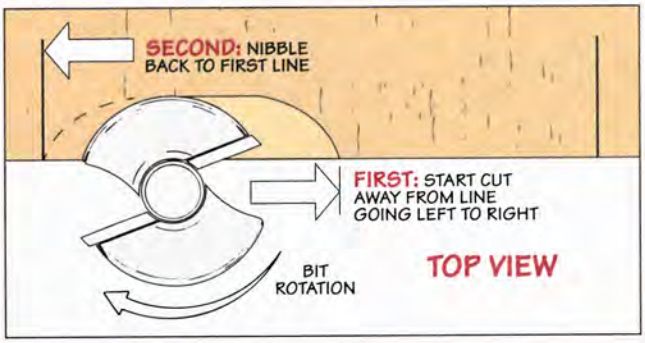
Backrouting keeps the fibers supported during the cut so they can't tear out. Go easy and maintain a firm grip on the router.

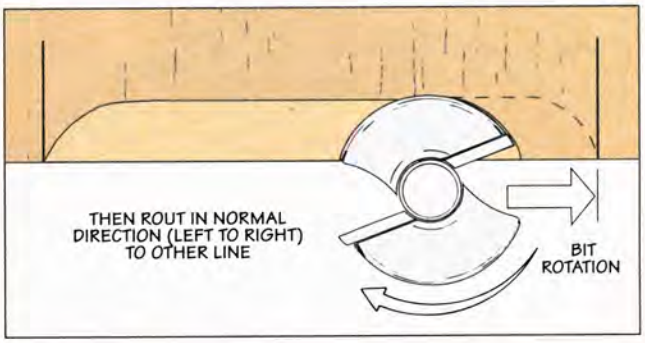
Where Rabbets Meet. If you need to cut a rabbet across the end of a workpiece *and* along the edge, rout the cross-grain rabbet first. Any tearout that occurs will be removed when the long edge rabbet is routed.

Deep Rabbets. For rabbets deeper than 1/4", I prefer to make the cut in at least two passes. This places less stress on the router and gives you a cleaner cut.

Stopped Rabbets. Creating a stopped rabbet is a perfect task for a hand-held router. You have great control to make the cut. And you can easily see your layout lines to know where to start and stop the router.

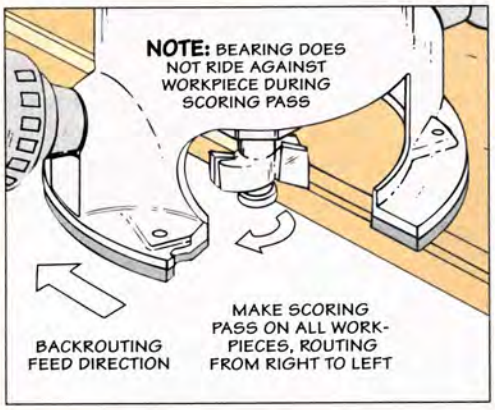
The goal is to stay within the layout lines.

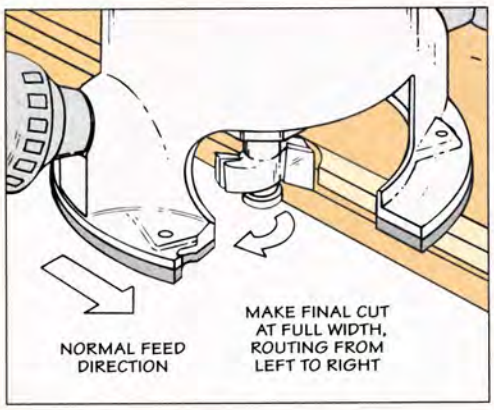




So to cut a rabbet that doesn't run completely along an edge, I like to start a short distance away from the line and nibble my way back (top drawing). Then rout in the normal direction until you reach the other line and pull the router away from the workpiece (near drawing above). All that's left is to square up the corners of the rabbet with a chisel.

Rabbets aren't "starter" joinery that you'll outgrow. They're an essential part of building strong projects. These tips will help you put them to best use.





how to rout rabbets In a Frame

One good application for routing a rabbet is creating a pocket on the inside of a frame to hold a glass panel. For this task, your only option is to use a rabbeting bit. Most of the other tips I mentioned apply when routing inside a frame. But there's one other thing that I want to mention. And that's the correct direction to rout. For the best control, move the router clockwise around the inside edge of a frame. When the rabbet is complete, square up the corners with a chisel.

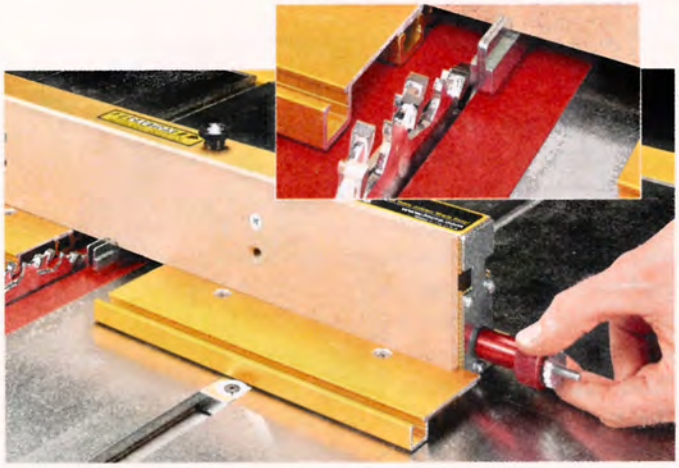
perfect results with Incra I-Box

Tight-fitting box joints are quick and easy with this precision jig.

For boxes of any size, box joints are ideal for their strength and attractive look. One key to making perfect-fitting box joints is the right setup. The problem is, the jig setup can be tedious. The width of the key, saw kerf, and distance between the key and blade must all match precisely.

When I heard about the *Incra I-Box* (photo above), I had to see if it was worth $150. I'll step you through the process of using the jig so you can decide if it's an investment you'll want to make.

Overview. The quality of the *I-Box* falls in line with *Incra's* reputation for precision. Its main body houses the mechanism for adjusting the width and location of the two pin plates that make up the key. A pair of stock ledges on the front of the jig support the workpiece. A hardboard backer board



▲ ***Setup.*** *Use the silver knob to move the pins against the blade to "zero" the jig (inset). Move the pins away from the blade with the red knob before making a cut.*

▲ ***Final Adjustment.*** *Make a test cut to gauge the width of the slots for the box joints (main photo). Then adjust the pins for a friction fit in the notch (inset).*

helps minimize tearout, and the blade guard also serves to support workpieces up to 1" thick. The entire assembly rides on an adjustable miter bar for smooth operation. I used it on the table saw, but it can also be set up on a router table.

A very informative DVD and detailed instruction booklet come with the jig. I highly recommend taking the time to watch the DVD. It shows how to use the jig for making standard box joints as well as unique variations, like the one shown in the lower right box.

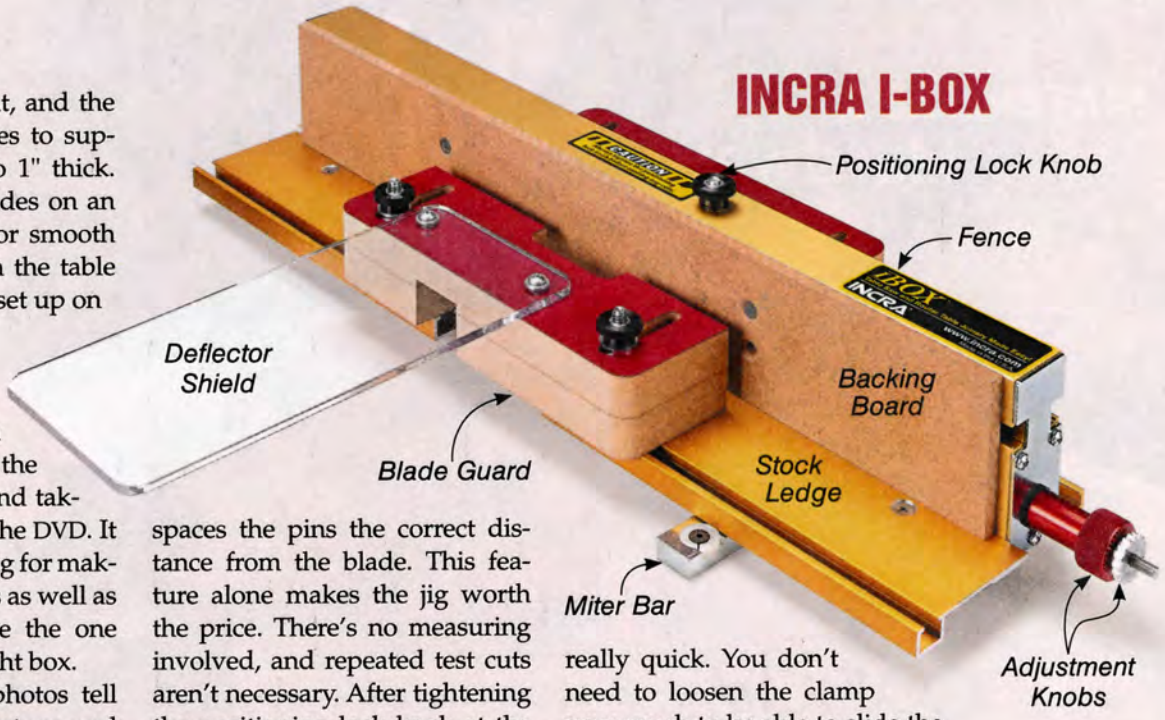
Setup. I'll let the photos tell the story on how to set up and use the jig, but I'll mention some highlights. Note: In some of the photos, we removed the guard so you can see the pins and blade.

The first step is to install a box joint blade set (refer to the article on page 46) or a dado blade sized for the width of the joint's pins and slots. You can cut slots from ⅛" to ¾" wide. You'll "zero out" the pin plates to the blade (lower left photos, opposite page).

Next, back the pins away from the blade using the red knob. Doing this also spaces the two pins apart. Then you can make a test cut in a scrap piece.

Turn the red knob until the pins are spaced for a friction fit in the notch in the test piece. As you do this, the internal threaded mechanism also automatically spaces the pins the correct distance from the blade. This feature alone makes the jig worth the price. There's no measuring involved, and repeated test cuts aren't necessary. After tightening the positioning lock knob at the top of the jig, you can cut joints immediately. As a matter of fact, the very first joints I cut with the jig fit together perfectly.

INCRA I-BOX



Cutting the Joinery. At this point, you'll adjust the stock ledges close to the blade and pins, and then install the blade guard. From here on out, the process of cutting box joints on each of the box pieces follows the traditional path. The photos below provide a general overview.

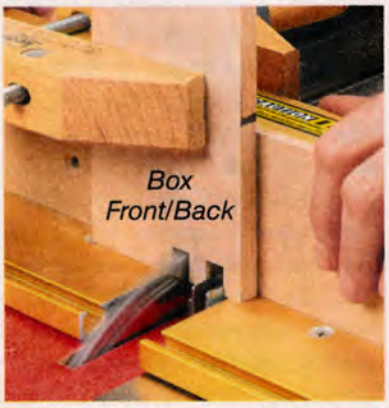
Incra recommends making a mark on the top edge of the four box pieces. This helps you to properly orient each workpiece.

A simple handscrew rests on top of the jig to clamp the workpiece. At first I thought this would be cumbersome to loosen and tighten for each cut, but it's really quick. You don't need to loosen the clamp very much to be able to slide the workpiece into position.

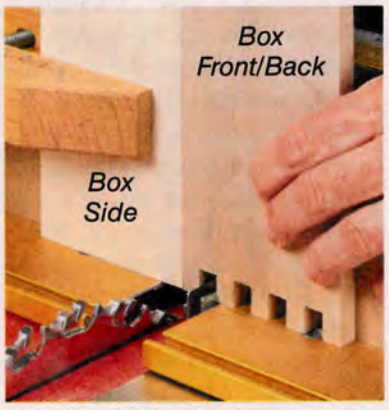
Front & Back. The left photo below shows how to cut the front and back pieces. Butt the piece against the pin and make a cut. Then slip the notch over the pins and repeat. To cut notches on the other end, flip the piece over.

Side Pieces. To cut the joinery on the sides of the box, you'll use the front or back piece to index the first cut (right photo below). After clamping the side in place, remove the front piece and make the first cut. Then complete the joint on that end of the side piece.

Worth the Price? After using the *I-Box*, I've already decided it's my go-to box joint jig. If you make a lot of box joints, the quick setup and accuracy make it worth every penny.



▲ ***Front/Back.*** *Make the first cut with the piece against the pin, then cut the remaining notches.*



▲ ***Sides.*** *Use the front or back to index the first cut in each of the box side pieces.*

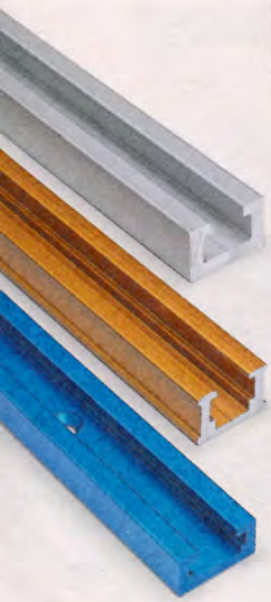
decorative Box Joints

The *Incra I-Box* includes instructions for creating decorative joints like the splined box joints you see at right. The built-in accuracy of the jig eliminates any guesswork and allows you to create these attractive joints almost as easily as standard box joints.

handy T-Track Accessories

Upgrade the quality of your shop-made jigs and fixtures by adding inexpensive T-track accessories.

One of the secrets of better woodworking is the ability to build jigs to assist with difficult tasks. Jigs not only speed up repetitive jobs, but they help attain a level of precision that's almost impossible otherwise. And it seems like every project calls for one or two tricky parts that can be made more easily or more accurately by using a shop-made jig.



▲ ***T-Track and Bolts.*** *You can use hex bolts, flange bolts, and nuts in most types of T-track.*

In just about every jig I build there's one versatile piece of hardware I turn to — T-track (margin photo). You can insert a nut or bolt, like the ones in the photo at left, to hold a stop, hold-down, or other accessory. Then you can position the accessory and secure it with the twist of a knob.

Size & Type. T-track is made from extruded aluminum, so it's plenty strong but doesn't add much weight to your jig. You'll find T-track in different widths and thicknesses, but most is designed for either ⅜" or ¼" hex bolts. You can even find T-track for adding a sliding miter track to your jigs and fixtures. The box at the bottom of the opposite page has all the details.

Installation. For most applications, you'll want to embed the T-track into the plywood or MDF base or fence of the jig, so it sits flush with the surface. This requires that you cut a groove or rabbet to hold the track. The key here is to size the dado for a snug fit. Like plywood, T-track doesn't measure exactly ¾" wide, so it's a good idea to measure the width before cutting a recess. (The examples I purchased were about .01" less than ¾" wide.)

With the track in place, you can use screws countersunk into the track to fasten it in place. In my experience, the predrilled countersink seldom fits the screw. I usually enlarge the countersink for a better fit. This prevents the head of the screw from sitting proud of the hole and interfering with the movement of the bolt.

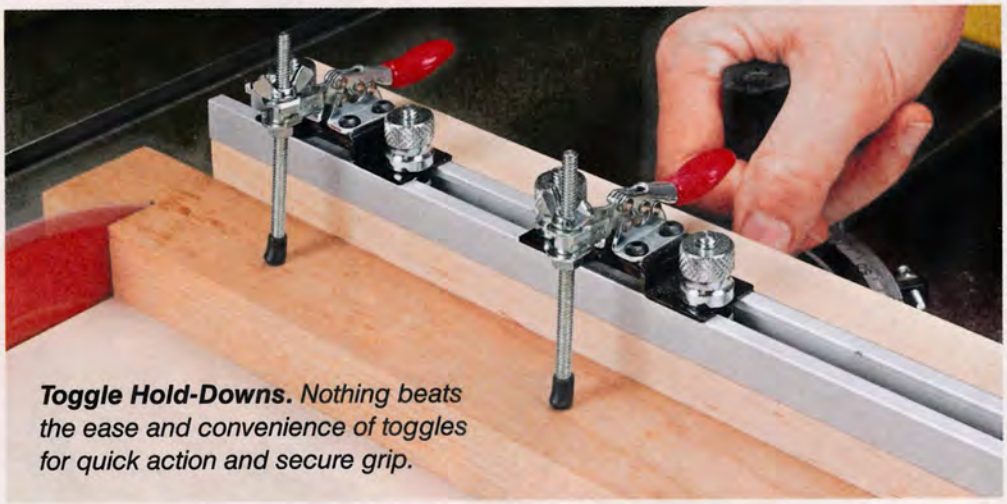
ACCESSORIES

Adding the T-track is only half the battle. It's the accessories that make a jig or fixture handy and useful. Chances are you've seen or even used T-track with a featherboard on a router table or other tool. And a featherboard is certainly one of the first accessories to put on your list. But there are more accessories available than ever before (see page 51 for sources).

Guides. One of my favorite accessories is the roller guide. The main photo on the opposite page shows how I use a pair of roller guides to hold a workpiece tight against the fence of the drill press. They allow you to move the workpiece back and forth to drill out most of the waste in a mortise while keeping the holes in a perfect line. You can make a similar jig for a benchtop mortising machine.

Hold-Downs. Quite often, shop-made jigs are used to hold a workpiece in position for cutting, routing, or drilling. The three photos above show a few of the options you have for keeping a workpiece in position.

The toggle clamps in the top photo are perfect for quick mounting. All it takes is a flick of the handle to lock a piece firmly in place. The heavy-duty screw hold-downs in the left photo above are a little less convenient, but can't be beat for holding power.



Toggle Hold-Downs. *Nothing beats the ease and convenience of toggles for quick action and secure grip.*

▲ ***Heavy-Duty Hold-Downs.*** *For drilling in metals, I like to use heavy-duty hold-downs in case the bit catches.*

▲ ***Aluminum.*** *For lighter work, the aluminum hold-down is perfect. A PVC tip prevents marring the workpiece.*

A handy compromise between those two is an aluminum hold-down like the one shown in the right photo above. The big advantage with this type of hold-down is that it's versatile enough to hold an odd-shaped workpiece. The knob makes it quick to set up, but it still holds firmly for most tasks.

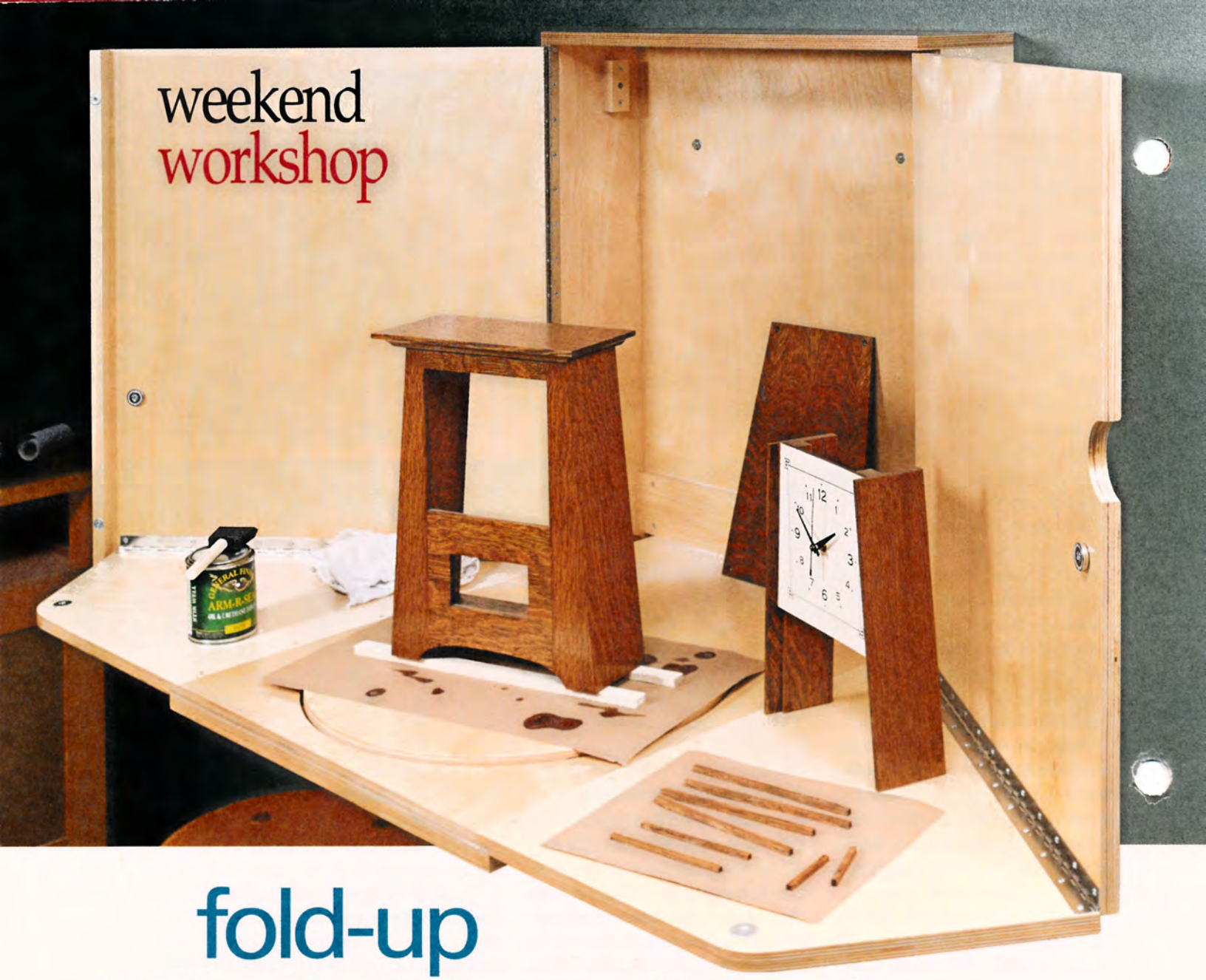
Stops. Finally, a flip-stop, like the one shown in the lower left photo, makes cutting several pieces to the same length foolproof. Just place the stop at the length you need and make the cut.

With so many accessories available, you're sure to find what you need for your next jig.

▲ ***Flip-Stop.*** *For cutting several workpieces to identical length, a stop is the answer.*

sliding Miter Bar T-Track

Some of my favorite jigs take advantage of the miter gauge slots on the table saw and band saw. But for other tools, like a router table, you may not have a miter slot to use. That's where the T-track and miter bar combination shown in the photo at right comes in handy. All you need to do to install it is rout a channel for the miter bar track and screw it in place. As you can see, the two interlock perfectly for a smooth-moving, tip-free action.



fold-up Finishing Station

This wall-mounted cabinet provides a dedicated worksurface for applying finishes to small projects.

In a small shop like mine, it's difficult to find a clear worksurface for applying a finish. The unique cabinet you see above is just the ticket for finishing smaller items. It features a pair of doors with fold-down wings. To create a wide finishing area, the wings interlock with the platform that includes a lazy Susan turntable.

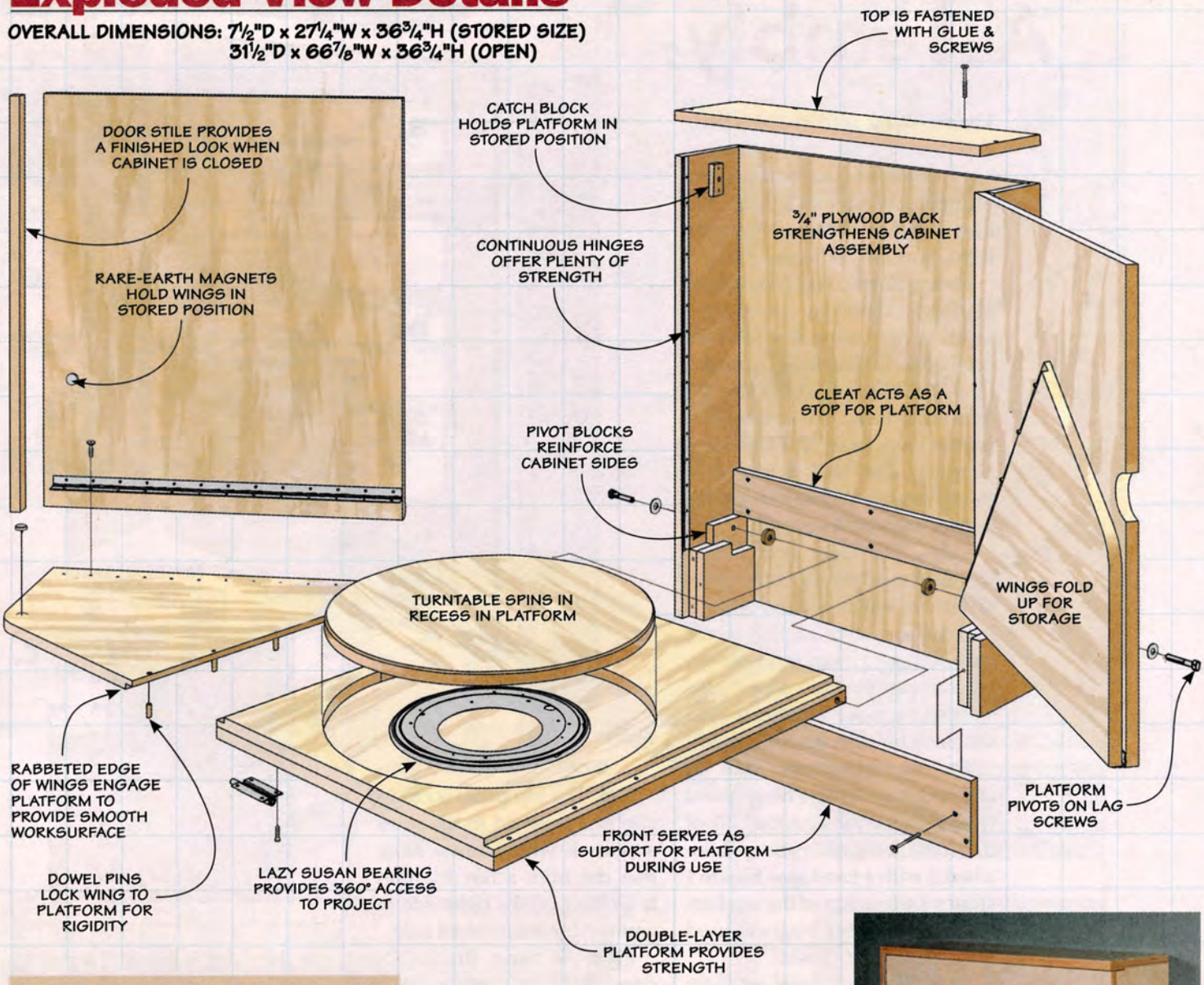
As you can see in the photo on the opposite page, the worksurface folds up into a shallow wall cabinet when not in use. This makes it a great solution for occasional finishing needs.

Sturdy. The cabinet is made with strong joinery and a cleat system to support the hinged platform. Durable continuous hinges on the doors and wings ensure smooth operation for years to come. A series of dowel pins on the wings engage holes in the platform to create a stable worksurface for your project.

With all of these features, it's easy to see why this is one project that deserves some time in the shop and a spot on your wall.

Exploded View Details

OVERALL DIMENSIONS: 7½"D x 27¼"W x 36¾"H (STORED SIZE)
31½"D x 66⅞"W x 36¾"H (OPEN)



ShopNotes GO ONLINE EXTRAS

To download a cutting diagram for the finishing station, go to: ShopNotes.com

Materials & Hardware

A	Sides (2)	7½ x 36 - ¾ Ply.
B	Top (1)	7½ x 27¼ - ¾ Ply.
C	Back (1)	26¼ x 36 - ¾ Ply.
D	Pivot Blocks (2)	6 x 6½ - ¾ Ply.
E	Stop Blocks (2)	6 x 5¼ - ¾ Ply.
F	Front (1)	5¼ x 25¾ - ¾ Ply.
G	Platform (1)	24 x 30½ - 1½ Ply.
H	Turntable (1)	19¾-dia. x ¾ Ply.
I	Cleat (1)	3½ x 25¾ - ¾ Ply.
J	Spacers (2)	1¼-dia. x ⅛ Hdbd.
K	Catch Block (1)	1¼ x 3 - ¾ Ply.
L	Right Door (1)	25 x 29¼ - ¾ Ply.
M	Left Door (1)	26⅜ x 30⅝ - ¾ Ply.
N	Stile (1)	¾ x 1 - 30⅝
O	Right Wing (1)	20 13/16 x 25 - ¾ Ply.
P	Left Wing (1)	19 7/16 x 25⅜ - ¾ Ply.

- (20) #8 x 1¼" Fh Woodscrews
- (2) ⅜" x 3" Lag Screws
- (2) ⅜" Washers
- (4) 36" Continuous Hinges w/Screws
- (1) 12"-dia. Lazy Susan Bearing
- (1) 4" Barrel Bolt Sliding Catch
- (2) 1"-dia. Magnets w/Cups & Washers
- (2) ⅝"-dia. Magnets w/Cups & Washers
- (1) Door Pull
- (1) ¼"-Dia. x 6" Dowel

▲ ***Compact.*** *The large finishing platform and wings all fold up neatly inside the cabinet.*

cabinet & platform
Assembly

The finishing station starts with a plywood case and a double-layer platform supporting the turntable. First, you'll build the basic case and then add the parts to support the platform.

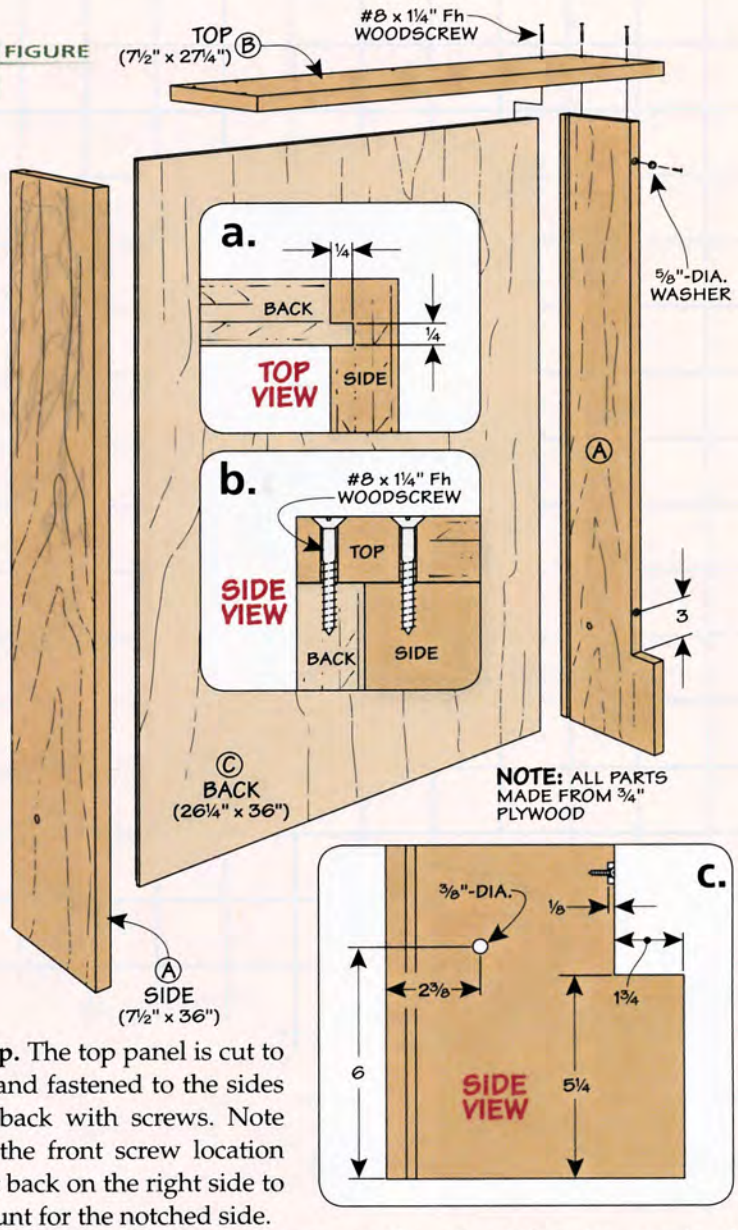
Strong Case. The drop-down platform cantilevers beyond the front of the cabinet while the back edge is forced up against a cleat. To stand up to the stress, I made the basic cabinet, including the back, from ¾" Baltic birch plywood. The back is joined to the sides with tongue and groove joinery for added strength.

Sides. The sides start out as identical workpieces cut to overall size, as illustrated in Figure 1. I routed a groove parallel to the back edge. These grooves are used to join the back later. I also stacked the sides together to drill the pivot holes at the drill press.

The right cabinet side is notched to provide a hinge point for the right door. I cut the bulk of the notch at the table saw and finished it with a hand saw. Figure 1 shows the location of the washers for the rare-earth magnets used to hold the door closed.

Back. The back panel provides plenty of surface area for mounting the cabinet to the wall. After cutting it to size, cut rabbets along the back side edges to form tongues that fit into the grooves in the sides, as in Figure 1a.

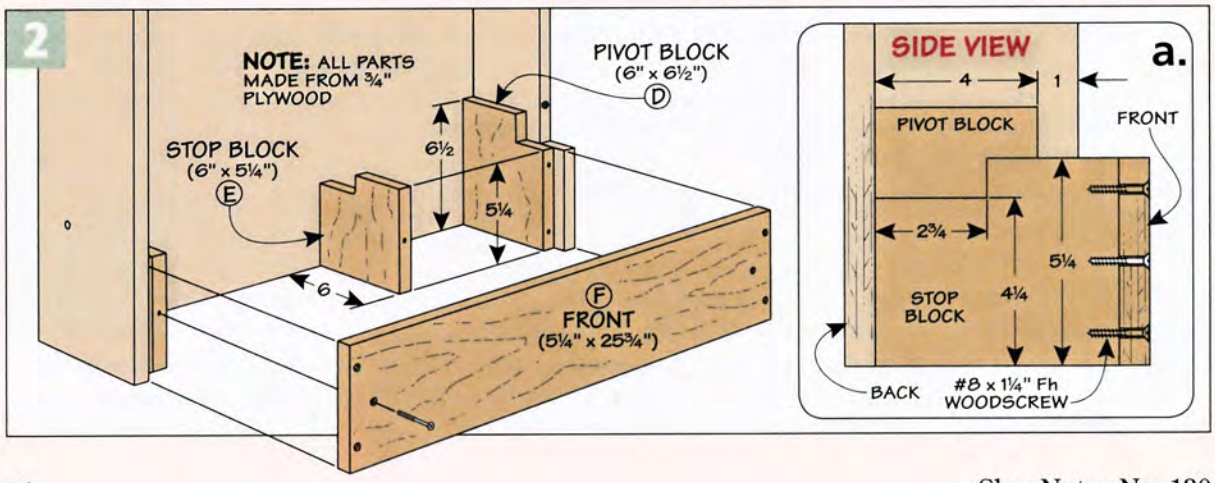
FIGURE 1



Top. The top panel is cut to size and fastened to the sides and back with screws. Note that the front screw location is set back on the right side to account for the notched side.

Pivot & Stop Blocks. Next come the four components that support the fold-down platform and turntable. To beef up the sides where the platform folds down, I added a pair of pivot blocks. As you can see in Figure 2, these L-shaped pieces are glued to the sides. Likewise, a pair of stop blocks are cut and glued to the pivot blocks. These blocks act as a stop when the platform is folded up into the cabinet.

Front. The front of the cabinet helps support the platform when in use, as shown in Figure 2.



After cutting it to size, I fastened it in place with screws.

Platform & Turntable. You'll focus your attention now on the fold-down platform. It consists of two layers of plywood with a large hole for the lazy Susan bearing and turntable (Figure 3).

Making the two layers of the platform is pretty simple. All you need to do here is cut them to size. I used a trammel with my router to create the opening in the upper layer. At this point you can glue the two layers together. A ¼" roundover on the back edge provides clearance when swinging the platform up and down.

I cut rabbets along the edges of the platform. These serve as a ledge for supporting the pair of fold-down wings.

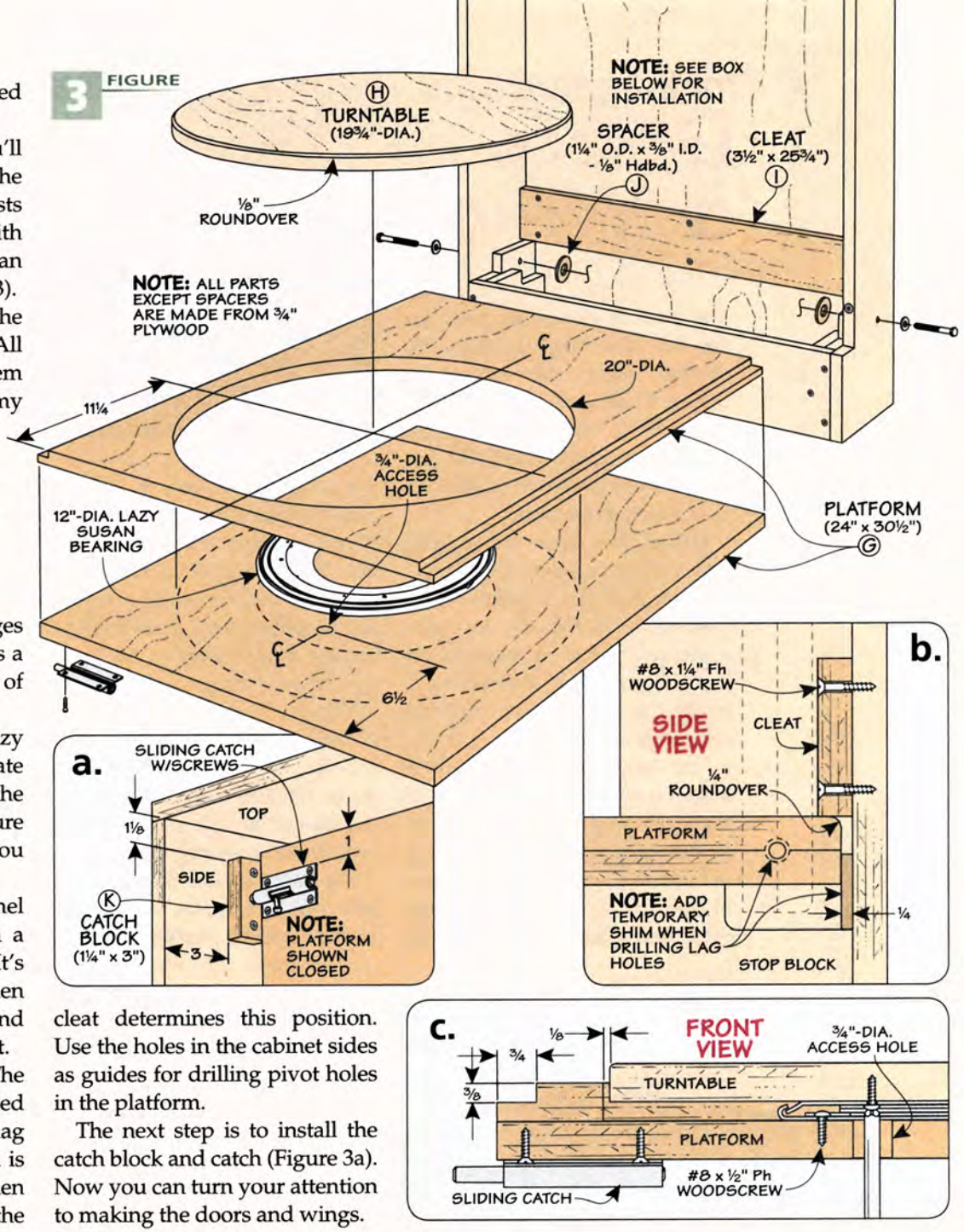
You'll want to have the lazy Susan bearing in hand to locate the access hole for attaching the turntable, as illustrated in Figure 3c. After drilling this hole, you can install the bearing.

Using the router trammel again, cut the turntable from a separate piece of plywood. It's sized to create a ⅛" gap when it's installed in the recess. Round over the top edge then install it.

Platform Installation. The box below shows how I installed the platform. A couple of lag screws act as pivots. The goal is to have the platform level when extended. The placement of the cleat determines this position. Use the holes in the cabinet sides as guides for drilling pivot holes in the platform.

The next step is to install the catch block and catch (Figure 3a). Now you can turn your attention to making the doors and wings.

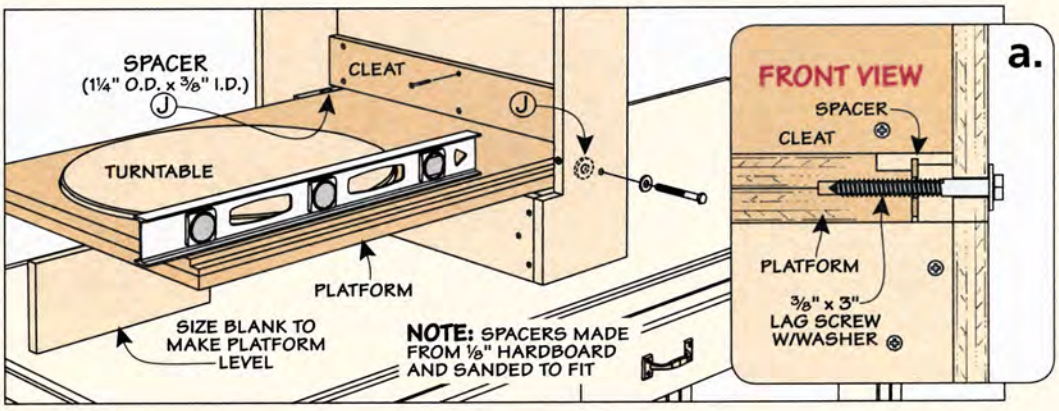
FIGURE 3



Platform Installation

The platform needs ¼" clearance at the back edge in order to pivot (Figure 3b above). I used a strip of hardboard as a shim.

Support the end of the platform to make it level and install the cleat tight to the platform. Drill the pilot holes for the lag screws. Finally, cut spacers from ⅛" hardboard and sand them to fit snugly between the platform and pivot blocks.



making the Doors & Wings

Alignment Pins. *Pins on the wings lock them into position on the platform.*

The pair of doors are next on the list. They nest against one another when the cabinet is closed. They each feature a fold-down wing that's hinged along the bottom edge of the door. The wings are rabbeted to mate with the rabbeted platform.

Doors. The doors differ from one another in size and construction, so keep that in mind as you go along. Once the right door was cut to size, I made a finger notch along the edge before attaching it to the right side with a continuous hinge (Figure 4).

The left door is just a little larger. It also has a stile glued to the inside face to fill in the notch in the right side when the door is closed. Before gluing the stile to the door, drill counterbores for rare-earth magnets that hold the door closed. After the stile is glued in place, attach the door to the cabinet and add the door pull. You can also install the rare-earth magnets on the front edge of the right cabinet side. Locate them to engage the washers in the door stile when the door is closed.

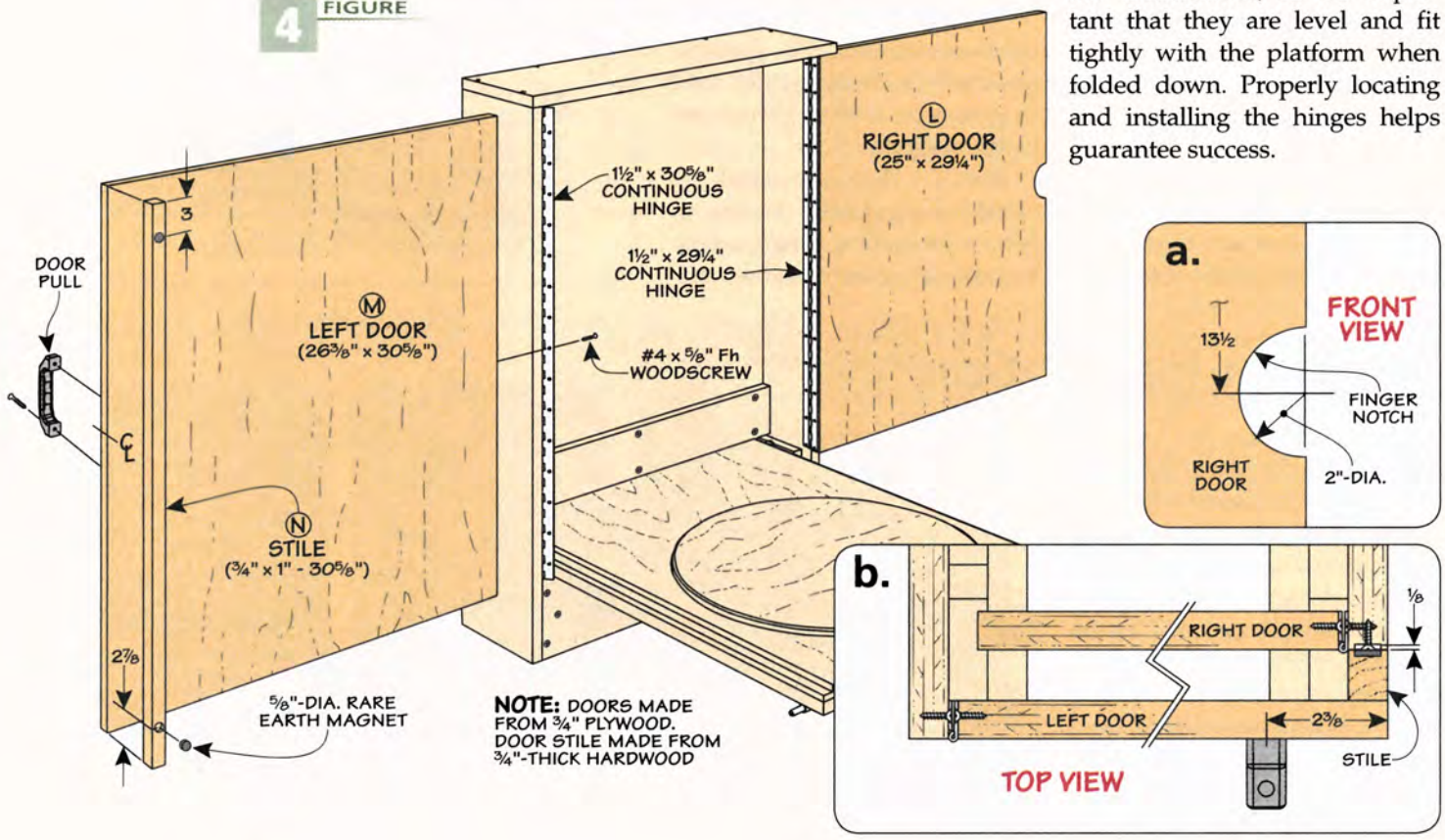
Wings. Like the doors, each of the fold-down wings is a little different. This is so that everything fits together nicely when the cabinet is both open for use and closed for storage.

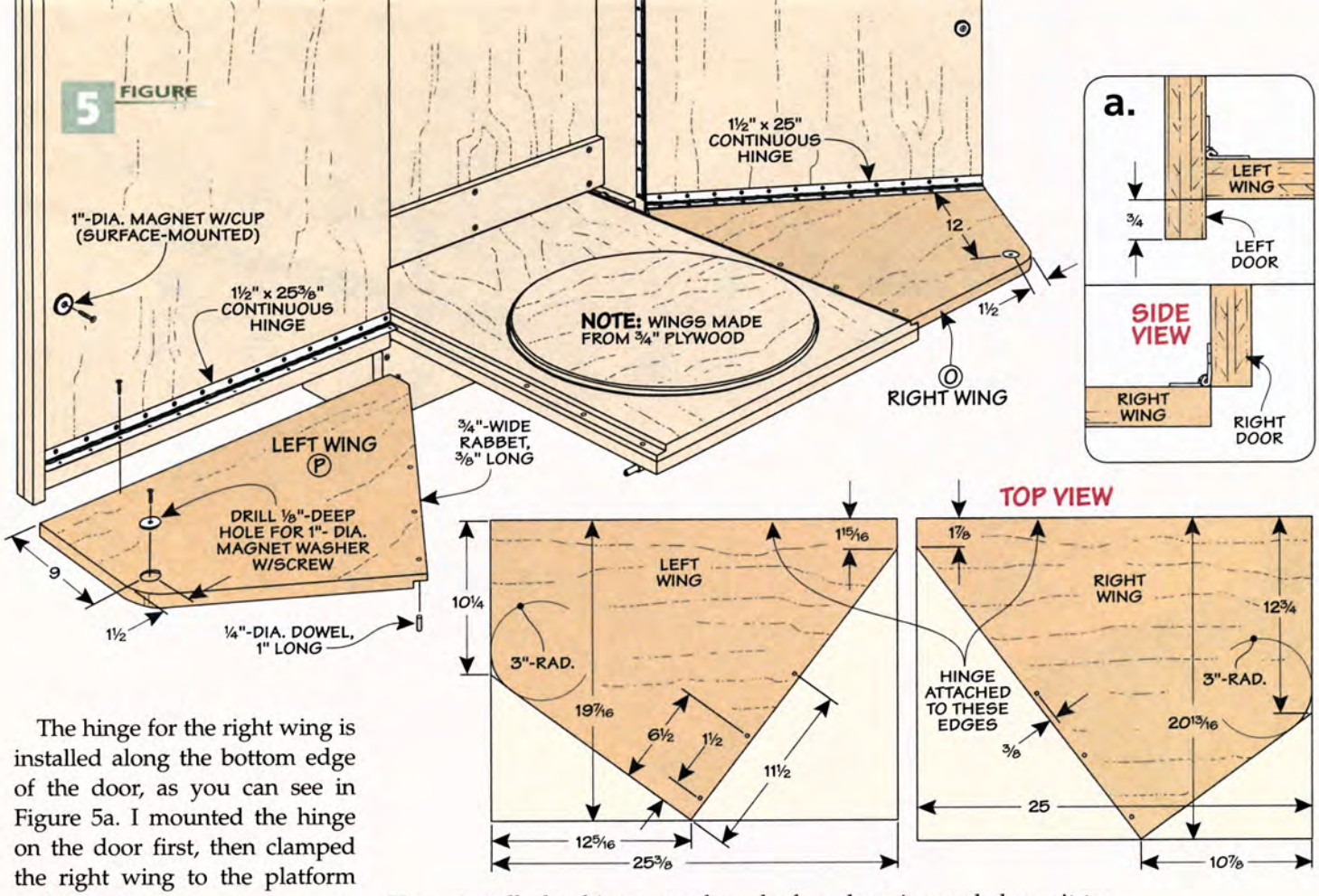
Figure 5 provides all the details you need to make the wings. Just cut out the blanks using the dimensions shown before forming the radius on the outside corner. A jig saw is ideal for cutting these odd-shaped blanks. Sand the edges smooth before cutting the rabbets along the edge that will rest on the platform.

Before installing the wings, I drilled counterbores for the washers used with the rare-earth magnets and installed them (Figure 5). They hold the wings upright when the cabinet is closed. You'll install the mating magnets on the doors later.

Installing the Wings. The wings form an integral part of the worksurface, so it's important that they are level and fit tightly with the platform when folded down. Properly locating and installing the hinges helps guarantee success.

FIGURE 4





The hinge for the right wing is installed along the bottom edge of the door, as you can see in Figure 5a. I mounted the hinge on the door first, then clamped the right wing to the platform and hinge leaf to locate the screw holes for the hinge in the wing.

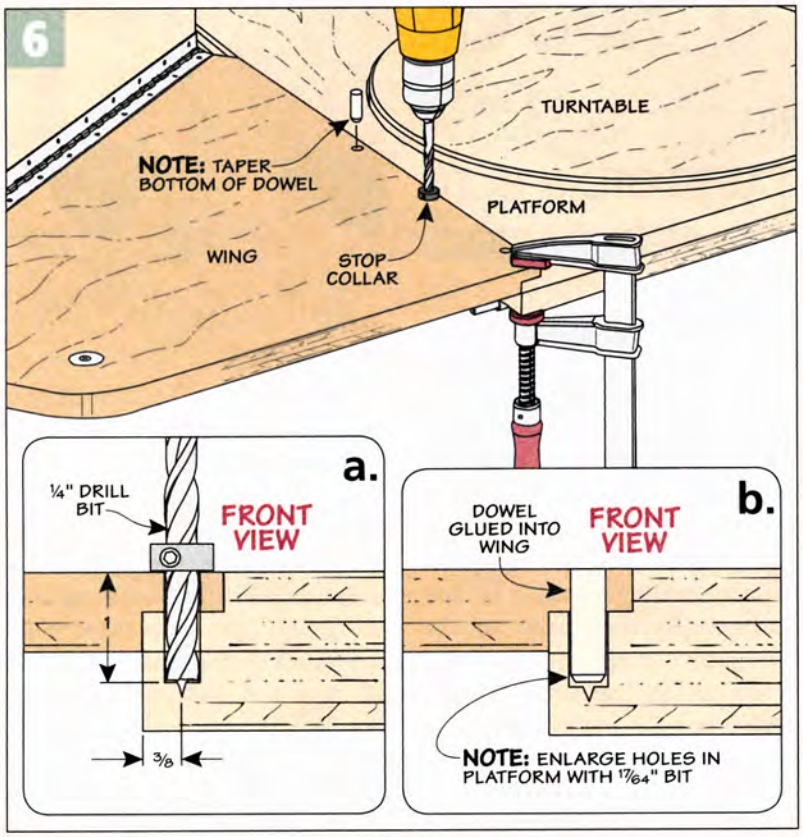
In Figure 5a, you can also see how the hinge on the left door is offset from the bottom edge. Here, install the hinge on the wing first. I clamped a straightedge across the wing and platform to keep it level. Then swing the left door against the hinge leaf on the wing and clamp it to to the door to make it easier to mark the screw hole locations.

After both wings were in place, I used a trick to locate the rare-earth magnet and cup on the inside of the door. Simply place a screw in the magnet cup with the magnet and stick this to the washer on the wing. When you fold up the wing, the tip of the screw marks the exact location for the magnet.

Dowel Pins. To hold the doors and wings together during use, I installed a series of dowel pins in the wings (Figure 6). These pins engage holes in the platform.

Figure 6 shows how to locate and drill the holes. Slightly enlarging the holes in the platform allow the dowels to slip in and out without binding, as shown in Figure 6b.

Put It to Use. All that's left now is to apply a few coats of clear finish and mount the cabinet to the wall. The next time you need to apply a finish to a small project, you'll have the dedicated space to do it.



ultimate Crosscut Sled

Square, accurate crosscuts for perfect project parts are a sure thing with this heavy-duty sled.

Making square crosscuts on the table saw is the key to gap-free joinery and easier project assembly. One of the best ways to guarantee accuracy is to use a crosscut sled, especially when it comes to cutting long workpieces.

Our version, shown above, features a unique dual-runner system that eliminates any side-to-side movement. Our designer, Kent Welsh, came up with a surefire method to adjust everything for perfectly square cuts.

The sled has some other features you'll appreciate, like a zero-clearance insert to help prevent chipout. Plus, the sled can easily handle panels up to 24" in width. And a sliding stop block with a cursor allows you to make repeatable cuts (inset photo). The sled also has a fence extension to support extra-long workpieces.

Base. It all starts with a ½" Baltic birch plywood base. All the dimensions you need to shape it are on the opposite page. I drilled out the inside corners to help define the shape. You can also drill the two holes for hanging the sled. A jig saw is perfect for removing the waste, then you can sand the edges smooth.

▲ ***Stop Block.*** *Align the cursor with the tape for repeatable and accurate cuts every time.*

Fence & Bridge. The fence and bridge are glued up from three oversized rectangular blanks of ½" plywood. I clamped them to my benchtop to keep them flat while the glue dried. Turn to the next page for the rest of the details on building the sled.

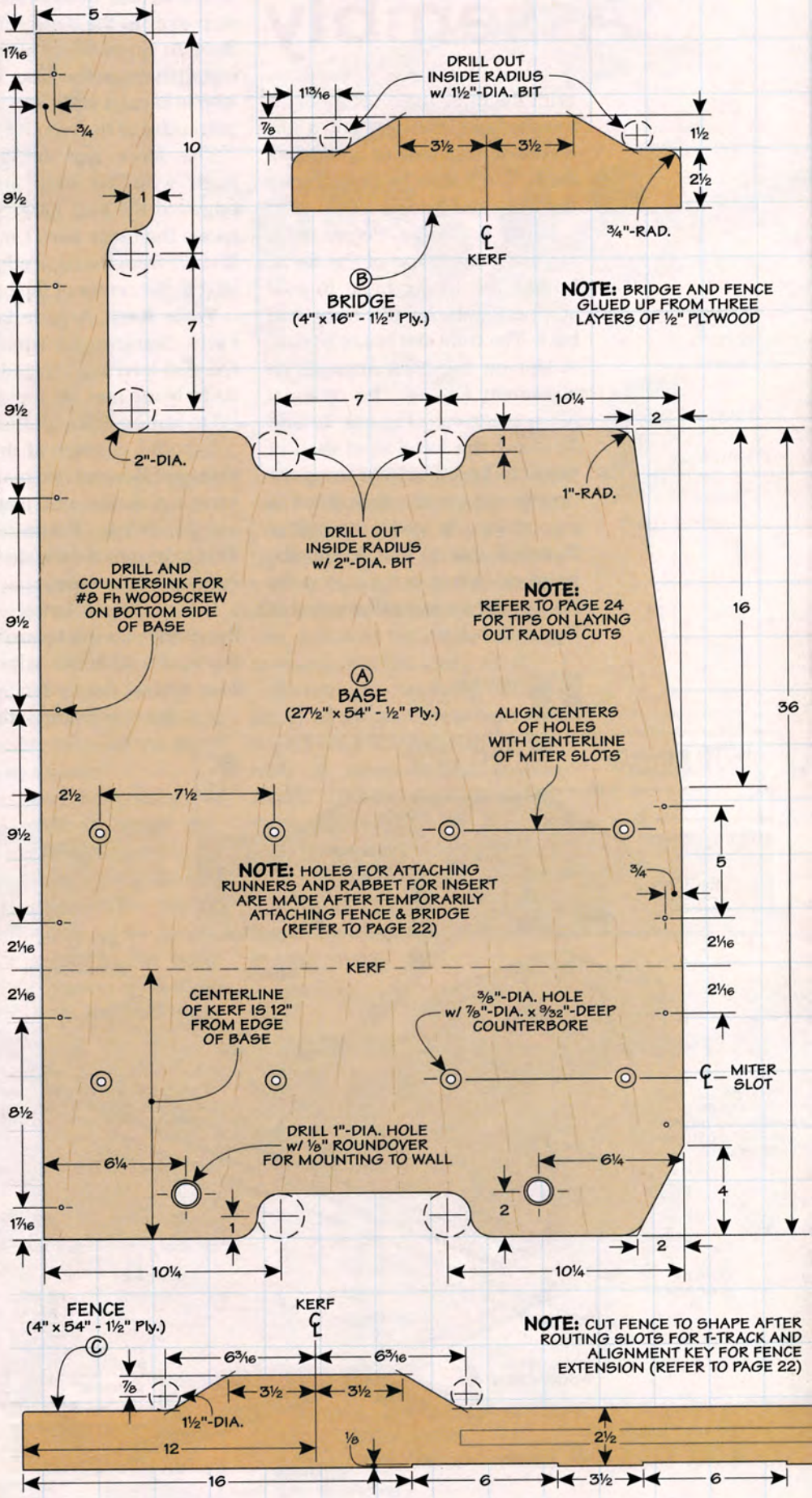
Materials & Hardware

A	Base (1)	27½ x 54 - ½ Ply.
B	Bridge (1)	4 x 16 - 1½ Ply.
C	Fence (1)	4 x 54 - 1½ Ply.
D	Runners (2)	¾ x 27½ - 5/16 Phenolic
E	Insert (1)	3 x 27½ - ⅛ Hdbd.
F	Stop Block (1)	2½ x 2½ - 1 Ply.
G	Stop Block Key (1)	5/16 x 2½ - 5/16 Phen.
H	Cursor (1)	1⅝ x 2½ - ⅛ Acrylic
I	Alignment Key (1)	¾ x 1 - 36
J	Fence Extension (1)	2½ x 24 - 1½ Ply.

- (1) 36"-long Aluminum T-Track w/Screws
- (1) 24"-long Aluminum T-Track w/Screws
- (11) #8 x 1½" Fh Woodscrews
- (8) ¼"-20 x ⅝" Ph Machine Screws
- (2) ¼"-20 x 1¼" Studded Knobs
- (2) ¼" Flat Washers
- (2) ¼"-20 Threaded Inserts
- (2) #8 x ⅝" Ph Woodscrews
- (2) #8 Washers
- (1) ¼"-20 x 1½" Hex Bolt
- (1) ¼"-20 Through Knob
- (9) ¼" Flat Washers
- (8) #4 x ⅜" Fh Brass Woodscrews

FIGURE 1

PATTERNS



final sled
Assembly

With the three main components roughed out, there are still a few details to take care of on each of them. You'll start by finishing up the fence and bridge.

Fence & Bridge. Before creating the final shape of the fence, I used the router table to rout stopped slots on the front and back. The front slot holds T-track. A slot on the back engages an alignment key for the optional fence extension. Figures 2c and 2d show the location of each of the slots. I used a chisel to square up the ends of the slots. Now is a good time to install the pair of threaded inserts that secure the fence extension in the slot at the back of the fence, as illustrated in Figure 2c below.

After laying out the overall shape of the bridge and fence, step over to the band saw to cut them to shape. Then temporarily install them on the base. The next step is to cut a wide kerf to create both sides of the base.

The fence and bridge align flush with the back and front edges of the sled base. Then, to locate the blade kerf, I marked a line 12" from the right edge of the sled to the center of the bridge.

Wide Kerf. A wide kerf provides clearance for squaring up the sled later on. I installed a ¼" dado blade and set the depth to ½" to just cut through the base.

I should mention at this point that you'll want to make sure your rip fence and saw blade are parallel to the miter slots. This helps ensure the sled makes dead-on square cuts.

Locate the rip fence to center the mark you made earlier over the blade. With the edge of the base against the rip fence, cut all the way through the base.

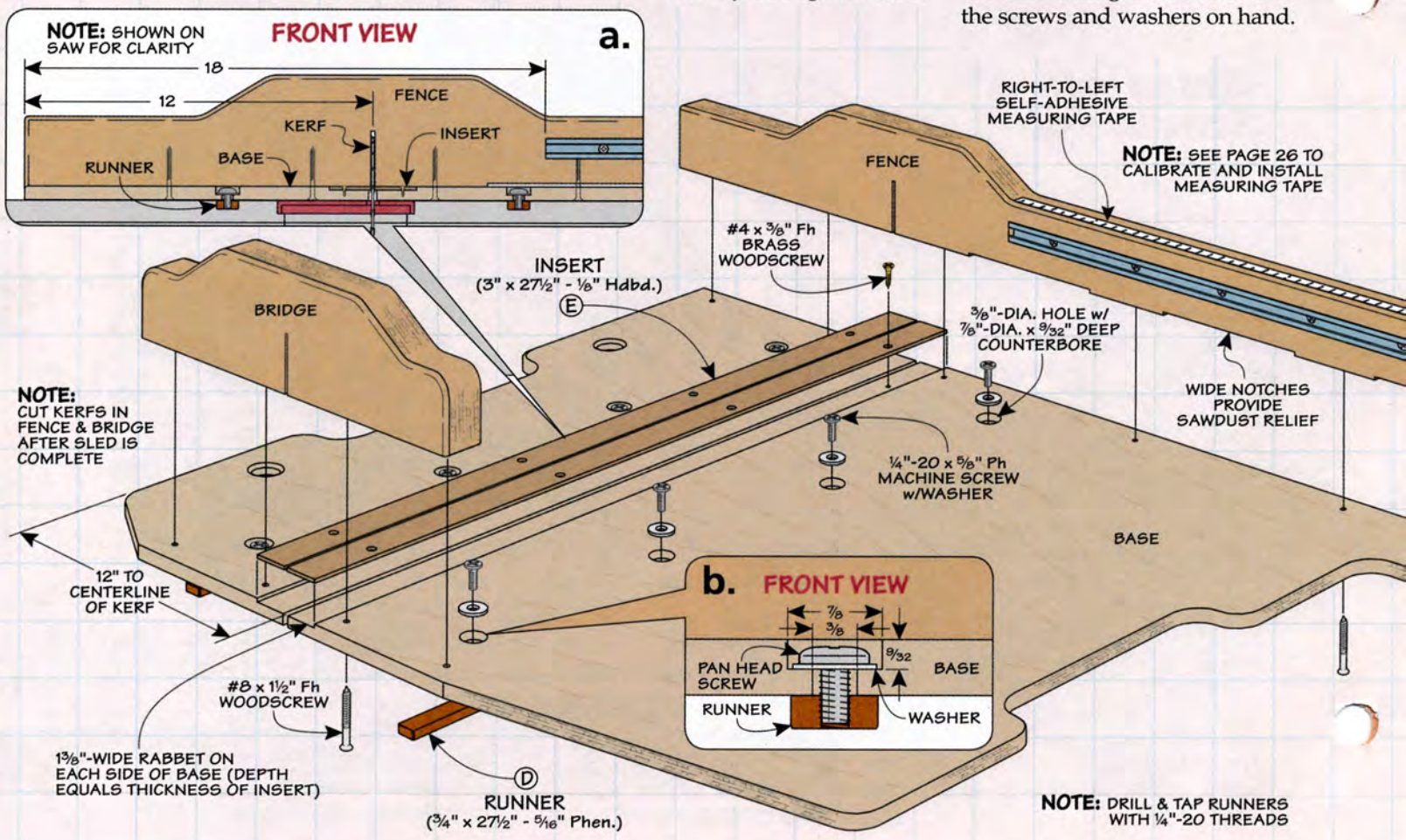
Before removing the sled from the saw, mark the centerline of each of the miter slots. You'll use these lines to locate and drill counterbored holes for attaching a pair of phenolic runners.

Rabbets & Notches. Each side of the base has a rabbet to hold a hardboard zero-clearance insert. After you remove the fence and bridge, switch to a ¾" dado blade to cut these rabbets along the top edge of the two base pieces.

Adjust the height of the blade to match the thickness of the hardboard and make the cuts. While you're at it, cut the wide, shallow notches along the bottom edge of the fence that serve as sawdust relief.

Counterbores. The drill press allows you to accurately drill the oversized, counterbored holes in the base for the runner screws. Take some time to carefully set the depth stop. The screw heads should sit flush or just slightly below the top face of the sled base, so it's a good idea to have the screws and washers on hand.

FIGURE 2



INSTALLING THE RUNNERS

At this point, you're ready to reattach the bridge and fence to the two base pieces in preparation for installing the runners. You'll want to install the blade you'll be using to help calibrate the sled and square everything up.

The runners are made from phenolic, a hard, durable plastic. They won't shrink or expand with changes in humidity and you can cut and drill them with your woodworking tools.

I took the time to carefully size the runners for a sliding fit in the miter slots. After cutting them to length, place them in the miter slots. Position the sled with the kerf centered over the blade and the rip fence snug against the edge of the base. Take some time to square the fence on the sled with the blade while keeping the kerf centered over the blade.

The bit used to drill the holes in the base can be used to mark the screw locations in the runners. Then drill and tap the runners to create threads for the screws. You can loosely install the runners with screws and washers and place the sled back on the saw for final adjustment.

While making sure the blade is still square to the fence, tighten the runner screws. You'll also want to check that the sled slides smoothly in the miter slots.

FINAL DETAILS

The hardboard insert is cut to fit and slips into the rabbets in the base. It's held in place with a few brass screws along the edges.

T-Track & Stop. To finish up the fence, install the T-track and make the stop. The stop is glued up from two layers of plywood and features a chamfered bottom edge for sawdust relief. A phenolic key on the back side of the stop keeps it aligned. The cursor helps position the stop over a measuring tape for repeatable cuts.

FENCE EXTENSION & TAPE

The optional fence extension is the last big piece to add. It greatly expands the capacity of the sled to accurately cut long workpieces (just over 5 ft.) to length.

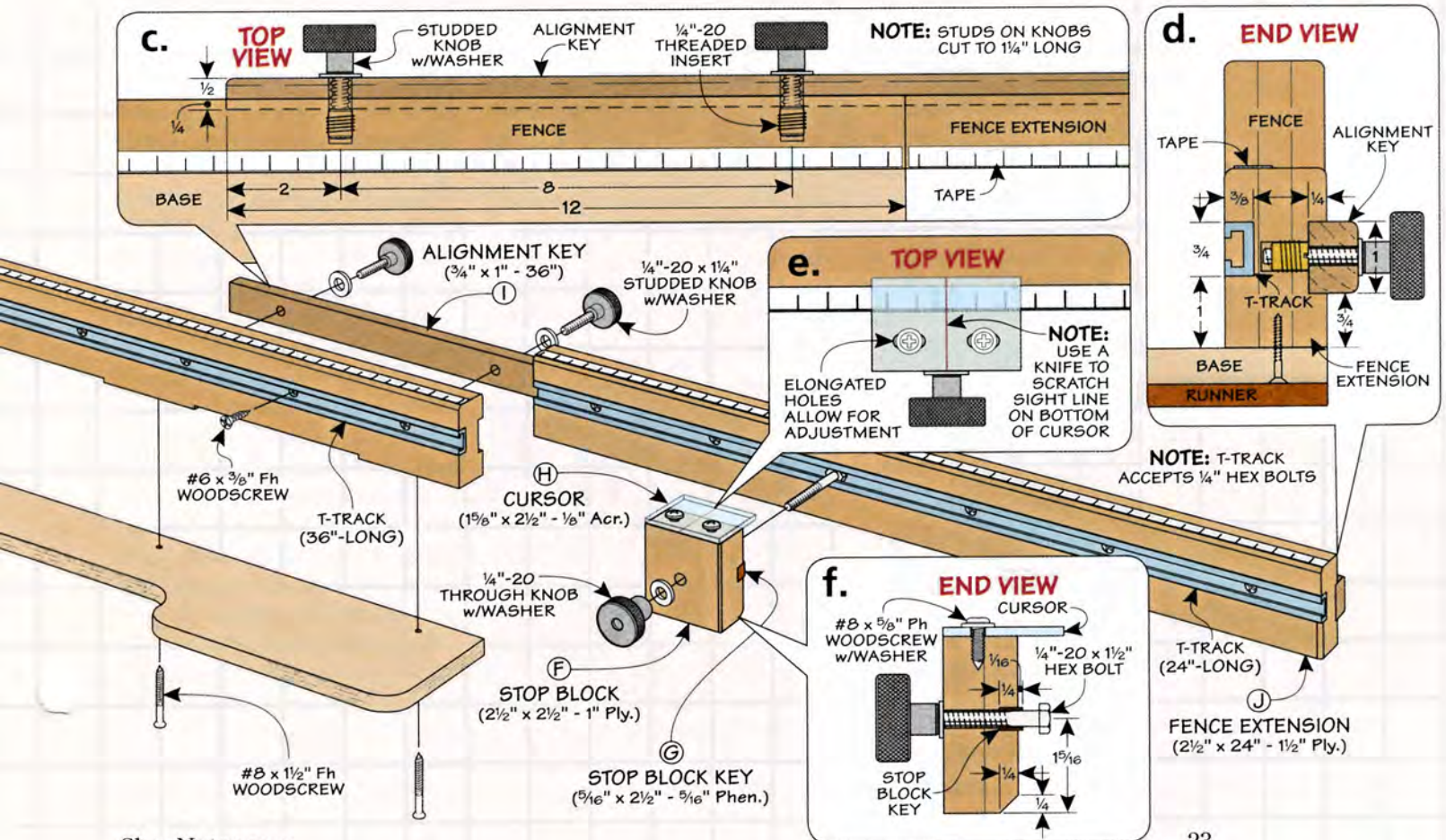
You can cut the fence to overall length but leave it an extra 1/8" wide. You'll trim it to final width after routing the slots for the T-track and alignment key.

I installed the alignment key to the main fence with studded knobs in order to lay out the location of the mating slot in the fence extension. After routing this slot, I clamped the extension in place to locate the slot for the T-track. It's important that the T-track aligns between the two fence parts so that the stop block can move smoothly between them.

Rout the slot for the T-track and install it. After gluing the alignment key in place on the fence extension, trim the extension to final width to match up with the main fence.

To see how I installed and calibrated the measuring tape, turn to Shop Short Cuts on page 26.

Finish. A clear finish helps the sled slide smoothly for making perfectly square crosscuts.



HANDS-ON
Technique

smooth Radius Cuts

With a few simple techniques, you can create straight slots and smooth, rounded corners.

▲ ***Center.*** *To find the center of an outside radius, use a combination square set to the radius.*

When making shop jigs and fixtures, I often like to round the outside corners and create a radius on inside corners. It just makes the project look better and in some cases, makes it easier to handle (like the crosscut sled on page 20). I want to pass along a few tips and tricks you can use to get smooth results.

Outside Corners. The key to scribing a radius on an outside corner is first finding the centerpoint to register your compass.

My solution is simple. All you need to do is set your combination square to the planned radius. Then scribe lines an equal distance from the edges of the workpiece near the corner. You can see how I do this in the inset photo above. The intersection of these two lines marks the centerpoint.

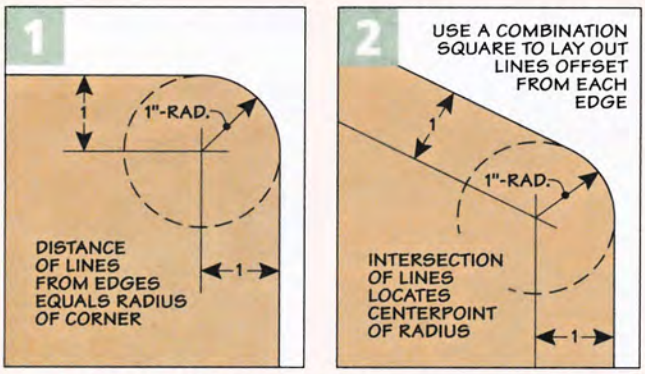
Now position the point of a compass at the intersection of the lines. Align the pencil point with the edge of the workpiece and then scribe the arc.

This technique isn't just for square (90°) corners. The drawings below show how the same technique can be used on an obtuse angle. No matter what the angle of the corner, the intersecting lines always mark the center of the desired radius.

Smooth Corners. Now that the profile is laid out, you need to remove the waste and smooth out the rounded edge. For a small radius, you can simply use a disk sander to remove the waste, working up to your layout line.

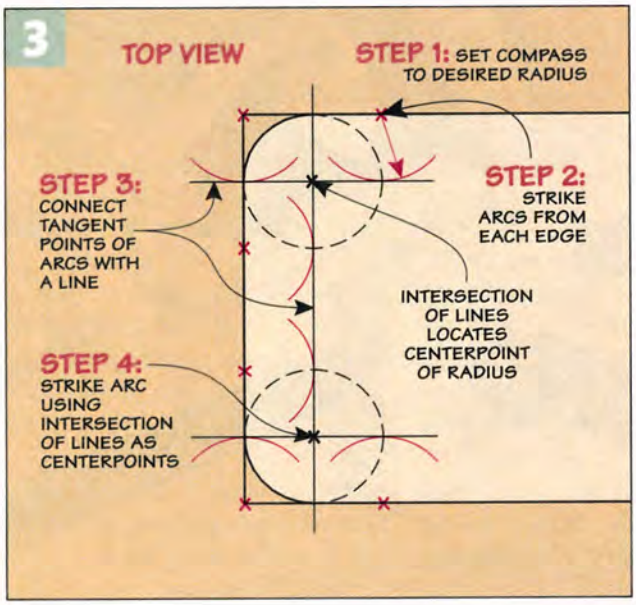
For a larger radius, use a jig saw or band saw to cut away the bulk of the waste. Then step over to the disk sander to smooth out the curve, as in the photo at left. You're aiming for a smooth transition between the arc and the adjacent straight edges.

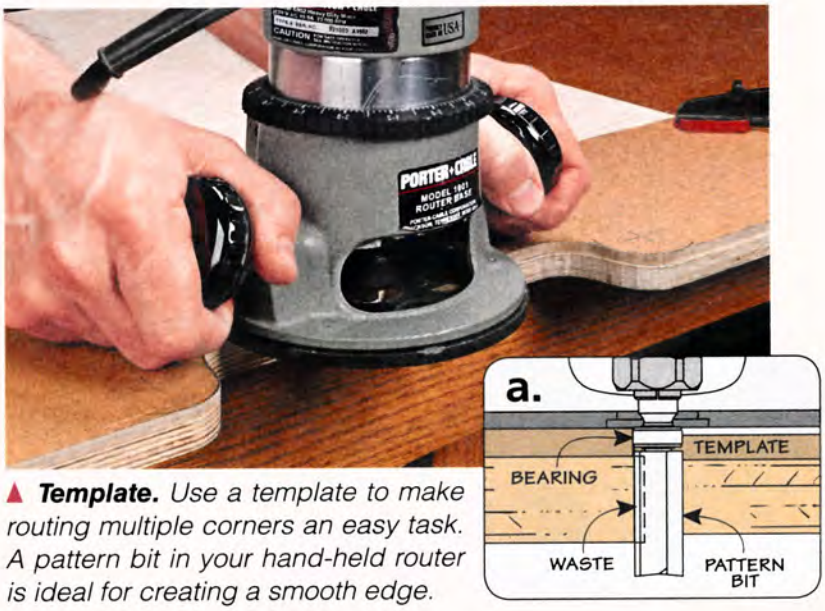
Inside Corners. The process for an inside curve is similar. I like to first lay out the straight lines that intersect the arc at its tangent points. Once that's done, locating the centerpoint is easier.



▲ ***Layout.*** *Whether an arc joins a square corner (Figure 1) or an odd-angled corner (Figure 2), the process of locating the centerpoint is the same.*

▲ ***Final Smoothing.*** *Use a disk sander to carefully smooth the arc to the layout line.*





▲ ***Template.*** *Use a template to make routing multiple corners an easy task. A pattern bit in your hand-held router is ideal for creating a smooth edge.*

One method of laying out the center of the arc is to set the compass to the radius and strike a couple of arcs along each adjacent layout line. Figure 3 shows how this is done. Then simply strike a line through the tangent points of each pair of arcs. As before, the lines will intersect at the centerpoint of the inside radius.

For small, inside curves, the best way to remove the waste is to drill it out. For a larger radius, use a jig saw to remove the bulk of the waste. Then use a sanding drum to smooth the arc.

Template Routing. If there are several rounded corners of the same radius, I'll work on making a hardboard template, as in the upper right photo.

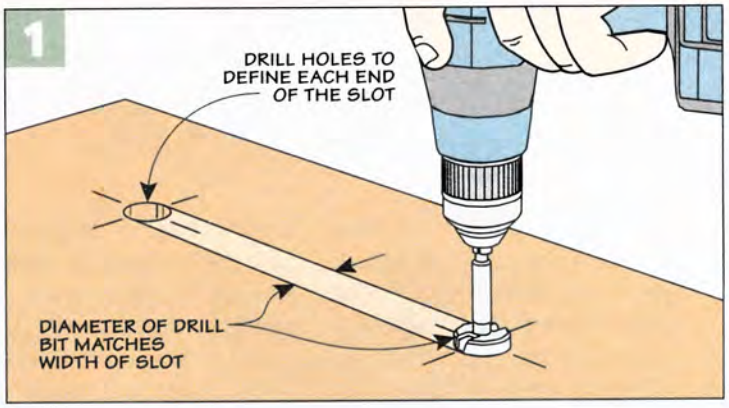
It's a good idea to invest the time to get the template smooth and perfectly shaped. Then after cutting away the bulk of the waste on the workpiece, attach the template with double-sided tape. As shown in Figure 3a, a pattern bit in your hand-held router makes quick work of producing a surface that requires only light sanding.

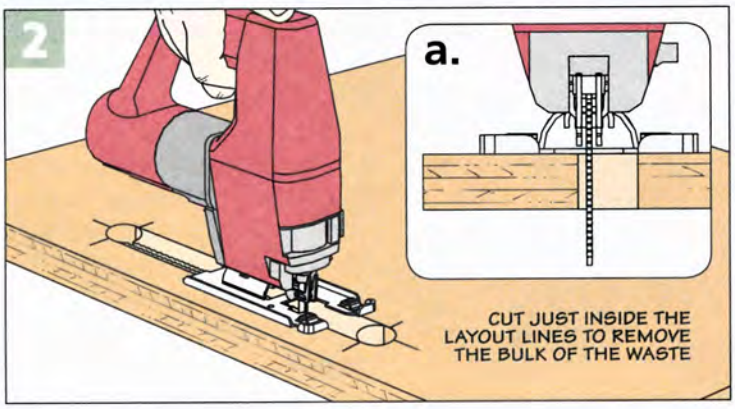
I use a similar process for creating large slots. The box below provides all the details. The end result is a great-looking part.

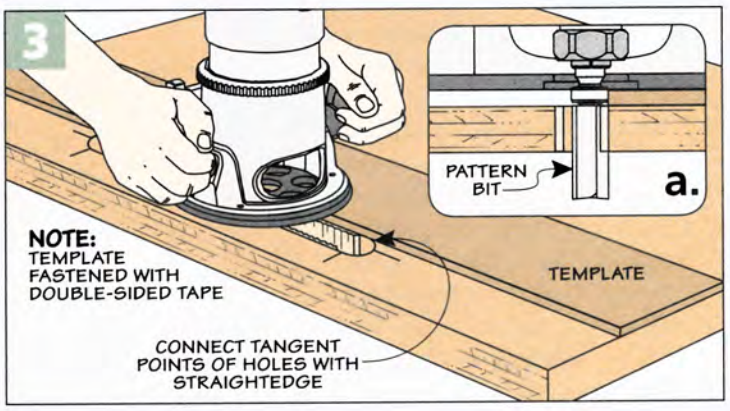
creating
Perfect Slots

To create larger slots (for hand-holds, as an example), I use the three-step technique shown in the drawings. It starts by laying out and drilling the holes that define the ends of the slot, as illustrated in Figure 1. The bit diameter matches the slot width.

The next step is to remove the bulk of the waste with a jig saw (Figure 2). The final step makes use of a straightedge guide and a pattern bit in your hand-held router (Figure 3). Use care to locate the straightedge at the tangent points of the holes.







Shop Short Cuts

Measuring Tape Alignment

Calibrating the measuring tape on top of the fence of the crosscut sled (page 20) is pretty easy. The goal is for the cursor on the stop block to accurately reflect the distance between the blade and the edge of the stop block.

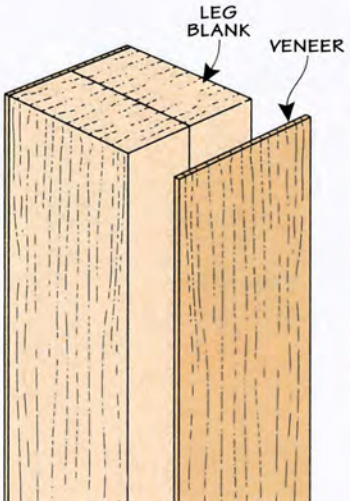
To do this, simply cut a scrap piece exactly 8" long. Place one end against the blade and tighten the stop block against the other end (photo above). Now partially remove the backing paper from the end of the adhesive-backed measuring tape. You can slide the tape under the cursor, being careful not to adhere the tape to the fence. The next step is to align the 8" mark under the line on the cursor. Remove the remaining paper and press the tape into place.

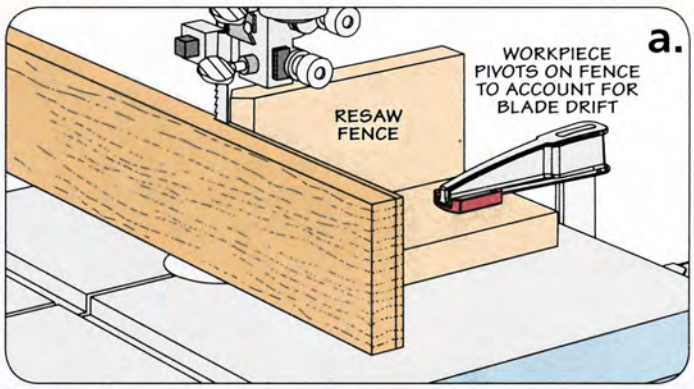
make your own Veneer

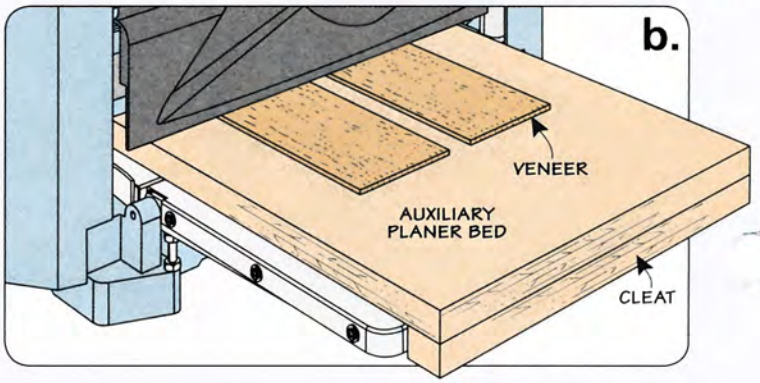
Since the legs for the tool cabinet (page 32) are glued up from thinner stock, the grain on the edge faces won't match the front and back. To hide the joint line and create a consistent, quartersawn look on all four faces, I glued on thin veneer (right drawing).

You can cut your own veneer using a band saw (detail 'a'). A resaw fence helps you keep the workpiece aligned and cutting straight for an even thickness. I rough cut the veneer about 3/16" thick.

The next step is to plane the veneer to final thickness. For that, I added an auxiliary table with cleats to hold it in place. It creates a smooth, raised platform to plane the pieces to finished thickness, as illustrated in detail 'b.'







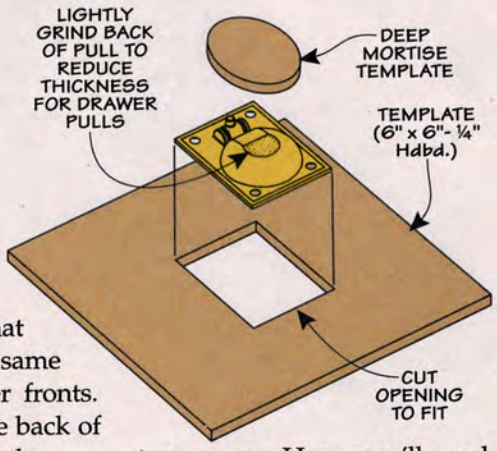
Drawer Pull Templates

The door and drawer pulls for the tool cabinet are recessed to sit flush with the face. To do this, you need to make a stepped mortise. A shallow mortise accepts the plate of the pull. And a deeper pocket accommodates the recessed cup. Since there are so many pulls to install, I used a couple of router templates to speed up the process.

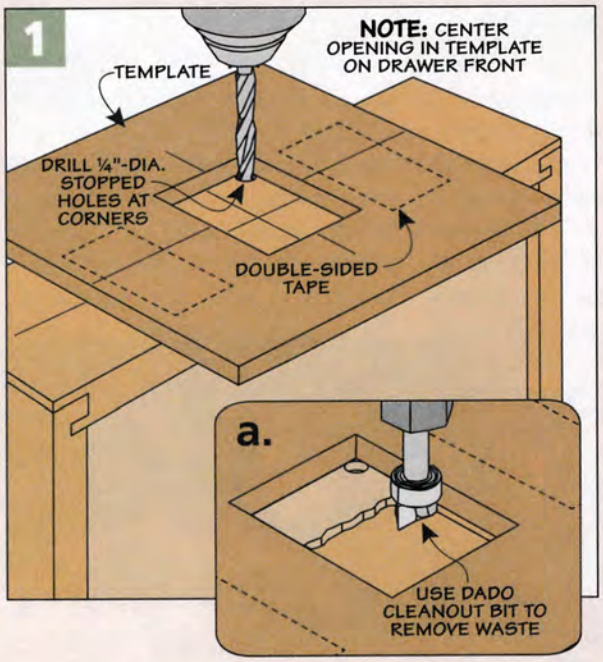
The first creates the shallow mortise, as in Figure 1. I predrilled the corners with stopped holes to match the radius of the plate corners. Then it was just a matter of setting the depth of the bit to match the thickness of the plate.

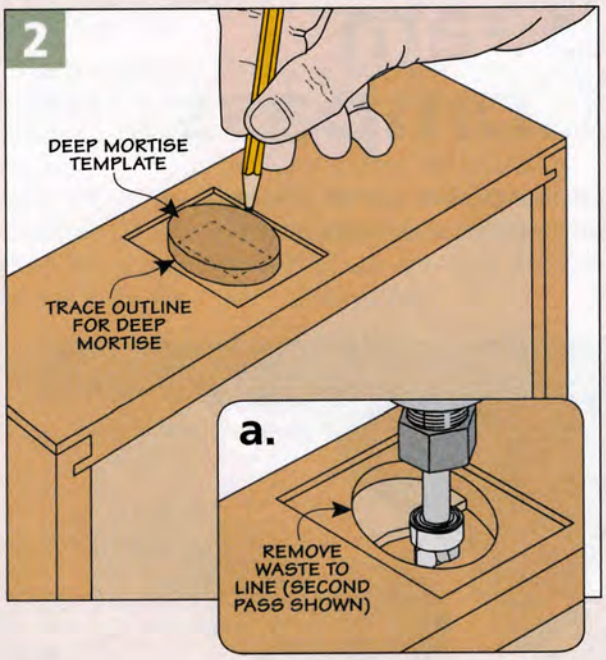
One important thing I want to mention is that the pull is nearly the same thickness as the drawer fronts. So I ground a flat on the back of the pull to reduce its depth.

The second template is used to lay out the location of the deeper pocket (Figure 2). Then I routed the pocket freehand in two passes. Here, you'll need to set the depth of the bit carefully. You want the pull to sit flush, but you don't want to rout through the drawer front.



▲ ***Drawer Pull.*** *Using a couple of templates and a hand-held router, you can install door and drawer pulls with a perfect fit.*



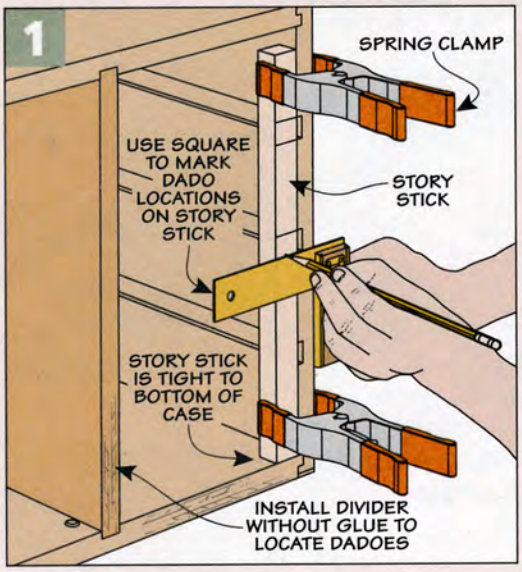


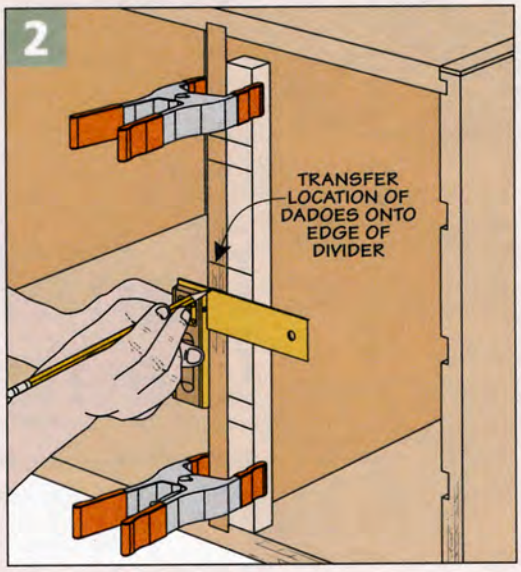
Aligning Dadoes

One challenge I ran into on the tool cabinet is getting the dadoes in the case sides and dividers perfectly aligned. So I turned to an old-fashioned trick. A narrow piece of scrap serves as a story stick. You can see how it works in the two drawings on the right.

Start by clamping the story stick to the case side, as in Figure 1. Use a square to transfer the dado locations to the story stick.

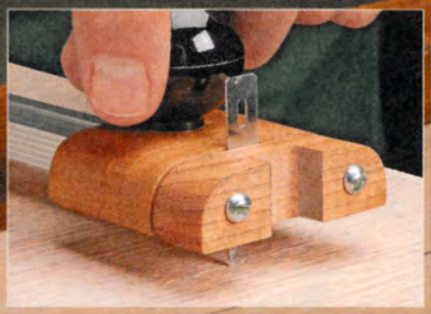
Move the story stick to the side of the divider. Use your square once again to transfer the marks on the story stick to the edge of the divider (Figure 2).





Beam Compass

Lay out perfect circles and arcs using a pencil or knife blade.



Panel Gauge

With a wide fence, scribing lines parallel to an edge is fast and accurate.

multipurpose Layout Tool

With just a few hours in the shop, you can transform a piece of T-track into one of your go-to tools.

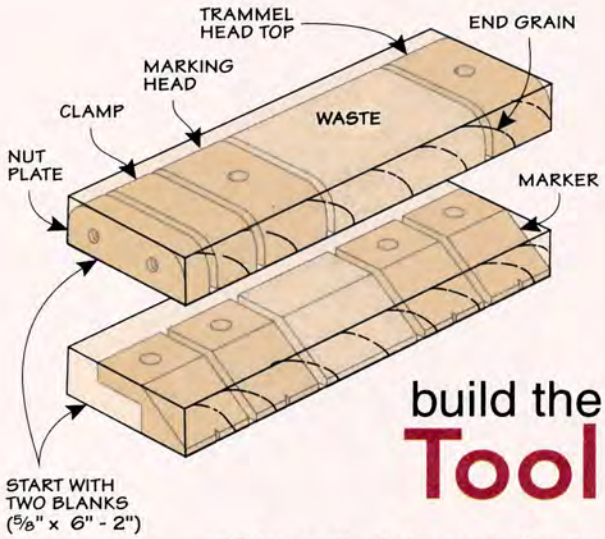
When I first saw the tool you see in the photos, I had a hard time coming up with a name for it. It started out as a panel gauge (left photo). But it's capable of so much more.

It all starts with a length of T-track. Then you add shop-made accessories to turn the T-track into a practical shop tool.

The marking head is designed to hold a carpenter's pencil or a hobby knife blade. The trammel head allows you to lay out circles and arcs (upper left photo). And with a few simple marking guides, the tool becomes a story stick, as shown above.

This is one project that you'll be glad to put to use in your shop. I've provided a few ideas, but I'm sure you can come up with with even more accessories and uses for the tool.

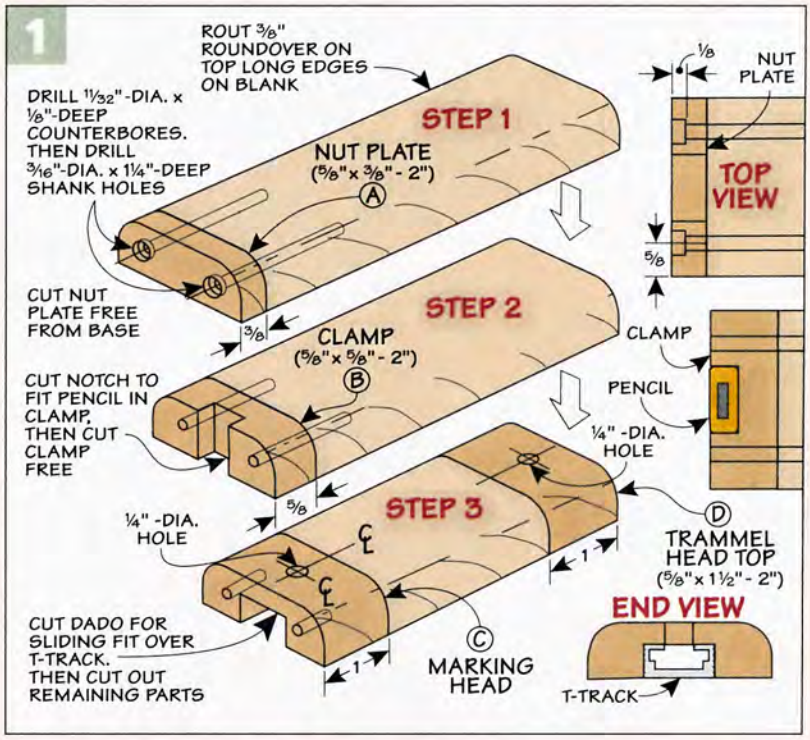
► ***Hardware.*** *Readily available hardware forms the foundation of this layout tool.*



build the Tool

Making all of the parts for the layout tool means working with small pieces. To make this task easier and safer, I started with short, wide blanks, as shown in the left drawing above. (I used cherry.) You'll form the basic profiles on the blanks and then cut them to width later.

End Grain. There's one other thing I need to point out. All of these smaller parts are made with the grain running in the longest dimension. This means you'll cut the blanks from the end of a workpiece that has been planed to thickness. Orienting the grain in this direction helps prevent splitting when tightening the knobs against the T-track.



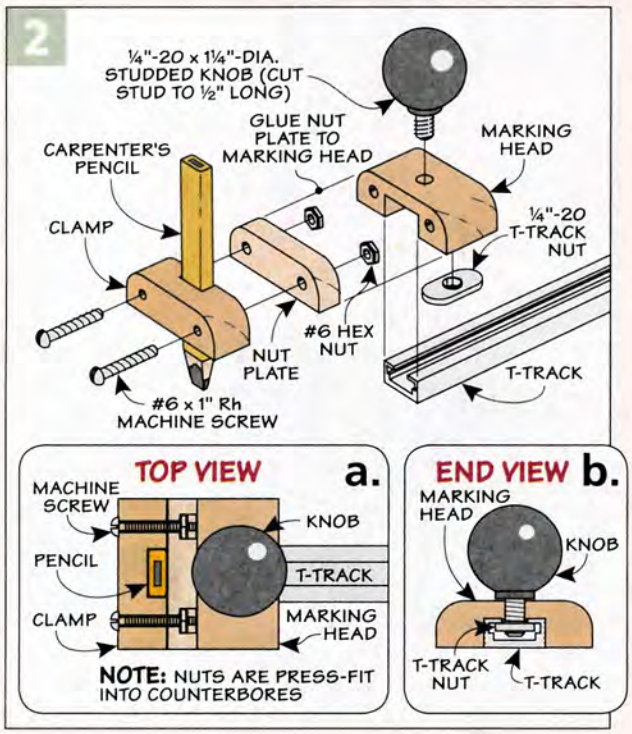
Marking Head Assembly. I started by making the assembly that holds a pencil or knife blade. Figures 1 and 2 show the three-step process of making each part and how they go together. The marking head is used to clamp the assembly to the T-track. A nut plate captures a pair of hex nuts for screws that clamp the pencil in place. The clamp can be rotated 180° to secure a readily available and inexpensive blade for a hobby knife.

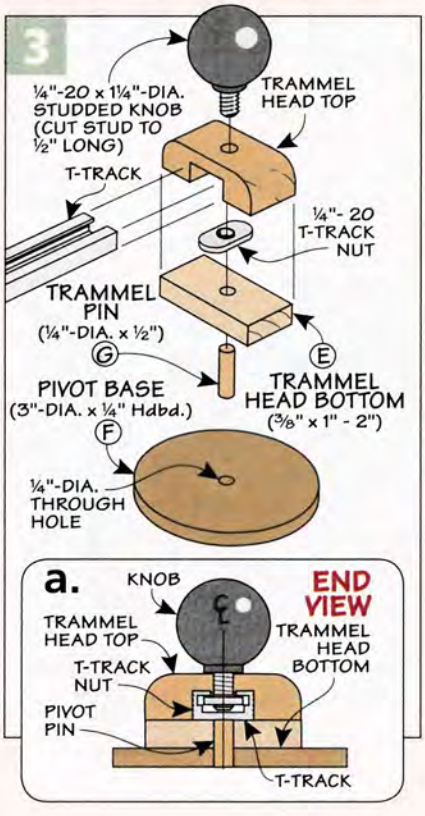
I routed a ⅜" roundover on the top long edges of the blank (Step 1, Figure 1). Then you can lay out and drill the counterbores and holes for the screws that will secure the clamp to the marking head. The counterbores are sized so the nuts can be pressed into place to prevent them from rotating. After cutting the nut plate free, press the nuts into place with a small bar clamp.

Use the remainder of the blank to make the clamp and marking head. To form a notch in the clamp to hold a pencil, as shown in Step 2, I stood the blank on end and nibbled away the waste at the table saw. The depth of the notch should be just slightly less than the thickness of the carpenter's pencil, so that it can be clamped tightly.

After cutting the clamp free from the blank, the next step is to cut a dado along the bottom of the blank (Step 3). The goal is a sliding fit over the T-track.

Cut the marking head from the blank so you can attach the nut plate and clamp. I glued the nut plate to the marking head with the nuts facing inward, as





in Figure 2. You can complete the marking head assembly by installing the pencil, clamp, screws, knob, and T-track nut.

Trammel Head. Figure 3 shows you how the trammel head is put together. The trammel head top is cut from the end of same blank you used to make the marking head. Cut and glue the trammel head bottom to the top. After gluing the trammel pin into the bottom, you're ready to install the trammel head.

The hardboard pivot base is simply a circle with a ¼" hole drilled through the center for the trammel pin. To use the trammel function, align the hole in the round base over the centerpoint on the workpiece. You can fasten the base with double-sided tape, then insert the trammel pin. Adjust the marker head to the desired radius and lay out the circle or arc on the workpiece.

Story Stick Markers. The markers shown in Figure 4 are cut from one blank. You'll cut a dado to fit over the T-track as before. And one edge of the blank is beveled. Figures 4a and 4b show how to complete the shape of the blank before you cut each of the markers to final width. Then you can drill the mounting holes.

I filed a small, triangular notch centered on the beveled edge of each marker. This serves as the registration point and also makes it easy to engage a pencil point. Finally, studded knobs fasten the markers to the T-track. I made my own studded knobs by gluing short lengths of threaded rod into the knobs with epoxy.

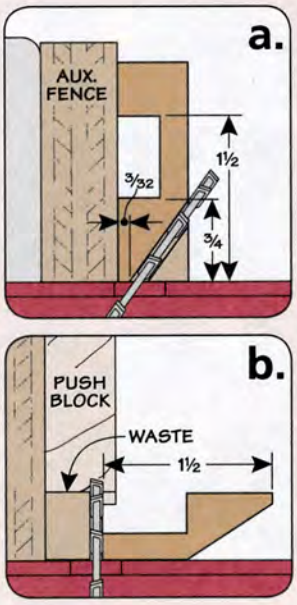
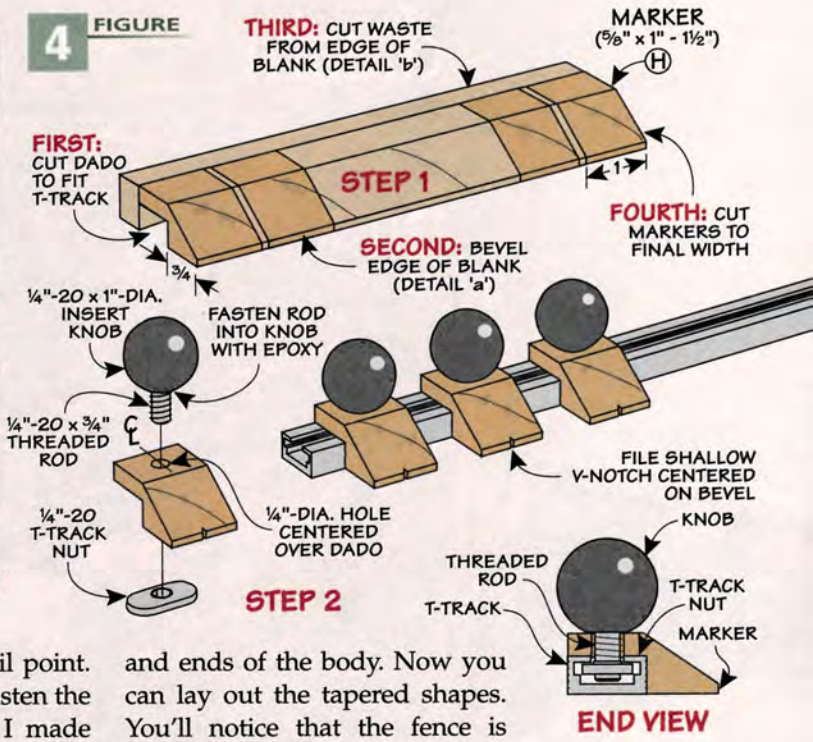


FIGURE 4



Panel Gauge Fence. The last component to build is the long fence. Figure 5 shows how it's a two-part assembly. I waited until after assembly to do all the shaping at the band saw.

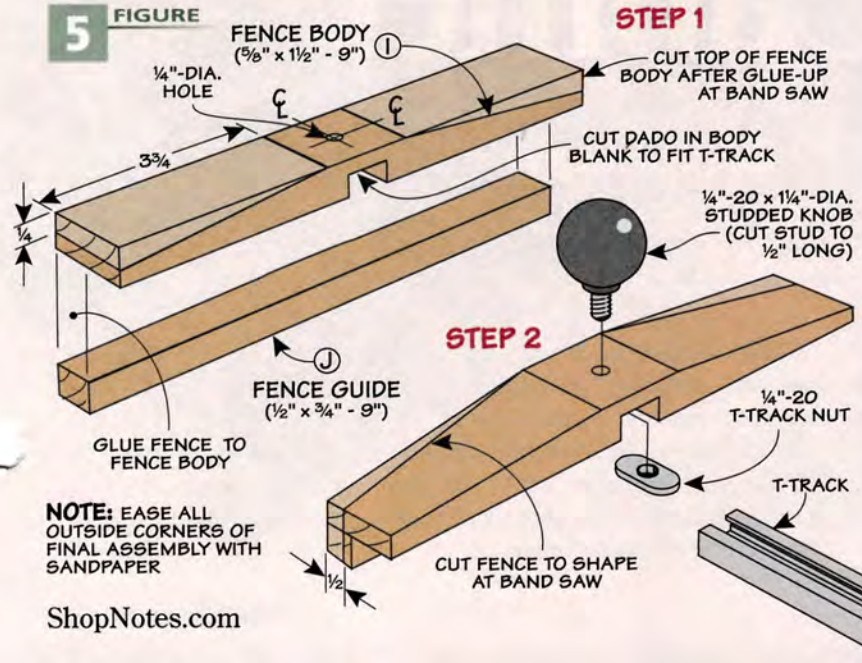
You can start by cutting the body and guide to overall size. Step over to the table saw to cut a dado centered on the bottom face of the body to fit over the T-track. Then drill the hole for the knob.

Glue the guide to the body, keeping the edge and ends of the guide flush with the back edge and ends of the body. Now you can lay out the tapered shapes. You'll notice that the fence is tapered in width at each end, as well as tapered in thickness. The shaping is easily done at the band saw, followed by a little sanding to round over the sharp edges.

Finishing. Applying a finish to all the parts was easy — I wiped on a couple coats of varnish. A spray-applied lacquer would also be appropriate for these small parts.

Putting the layout tool to use is your next task. That shouldn't be hard to do. I'm sure this is one of those tools you'll be glad to have in your arsenal.

FIGURE 5



Materials & Hardware

A	Nut Plate (1)	⅝ x ⅜ - 2
B	Clamp (1)	⅝ x ⅝ - 2
C	Marking Head (1)	⅝ x 1 - 2
D	Trammel Head Top (1)	⅝ x 1 - 2
E	Trammel Head Bottom (1)	⅜ x 1 - 2
F	Pivot Base (1)	3"-dia. x ¼ Hdbd.
G	Trammel Pin (1)	¼"-dia. x ½
H	Marker (4)	⅝ x 1 - 1½
I	Fence Body (1)	⅝ x 1½ - 9
J	Fence Guide (1)	½ x ¾ - 9

- (1) ¼"-20 T-Track
- (3) 1¼"-dia. Knobs with ¼"-20 Stud cut to ½" long
- (4) 1"-dia. Knobs with ¼"-20 Insert
- (4) ¼"-20 x ¾" Threaded Rod
- (7) ¼"-20 T-Track Nuts
- (2) #6 x 1" Machine Screws
- (2) #6 Hex Nuts

dream shop project

campaign-style Tool Cabinet

Modular design and straightforward plywood construction make building this cabinet surprisingly quick.

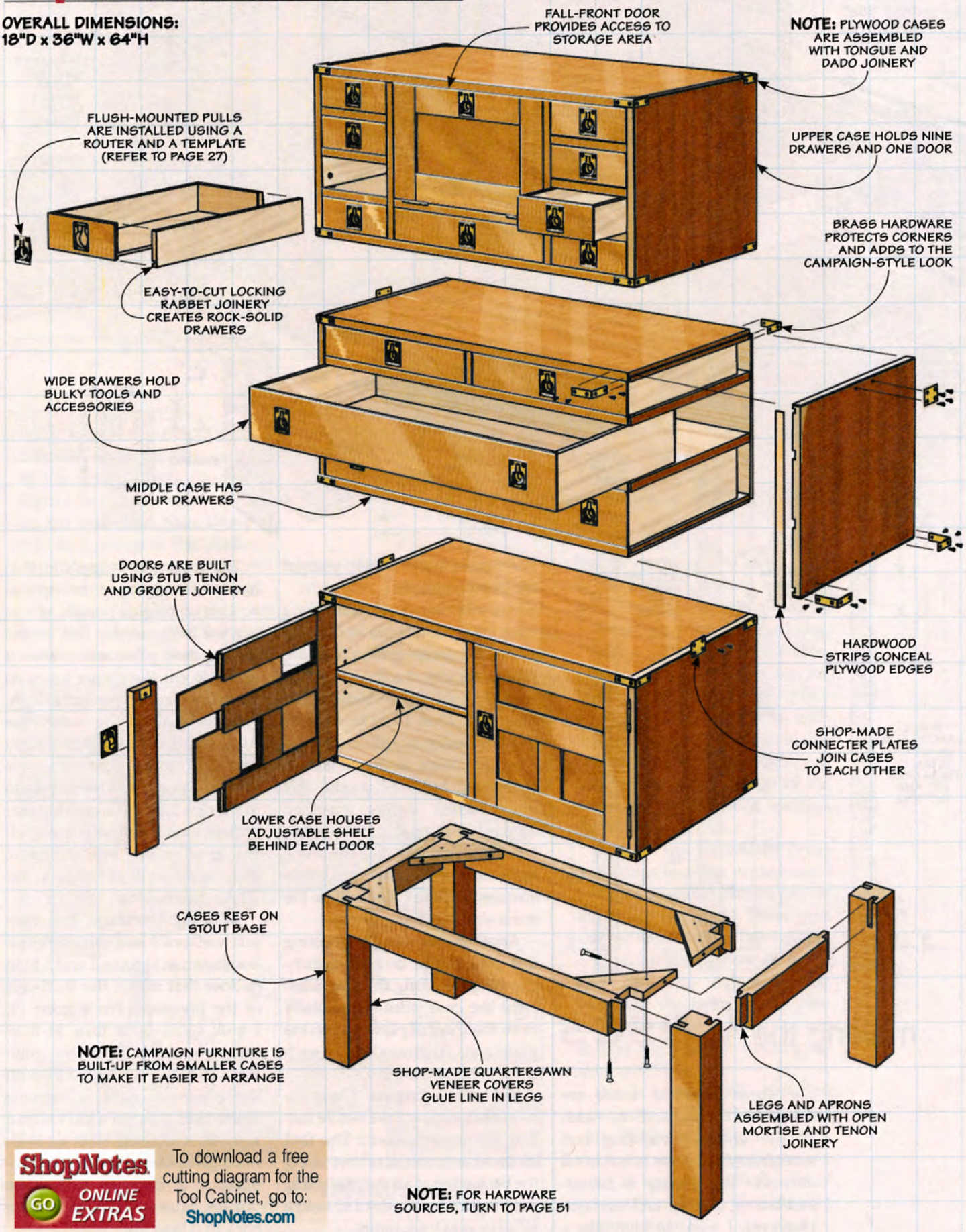
There's just something special about having a nice place to store your tools — like this impressive cabinet. In addition to keeping your most-used tools organized and within easy reach, it makes the time you spend in your shop more enjoyable.

This cabinet is based on 19th-century campaign furniture. These rugged, modular cases could be moved easily by military officers. While you probably aren't on the move, no doubt your shop could use this kind of efficient storage.

Exploded View Details

NOTE: TOOL CABINET IS MADE FROM QUARTERSAWN WHITE OAK PLYWOOD AND HARDWOOD

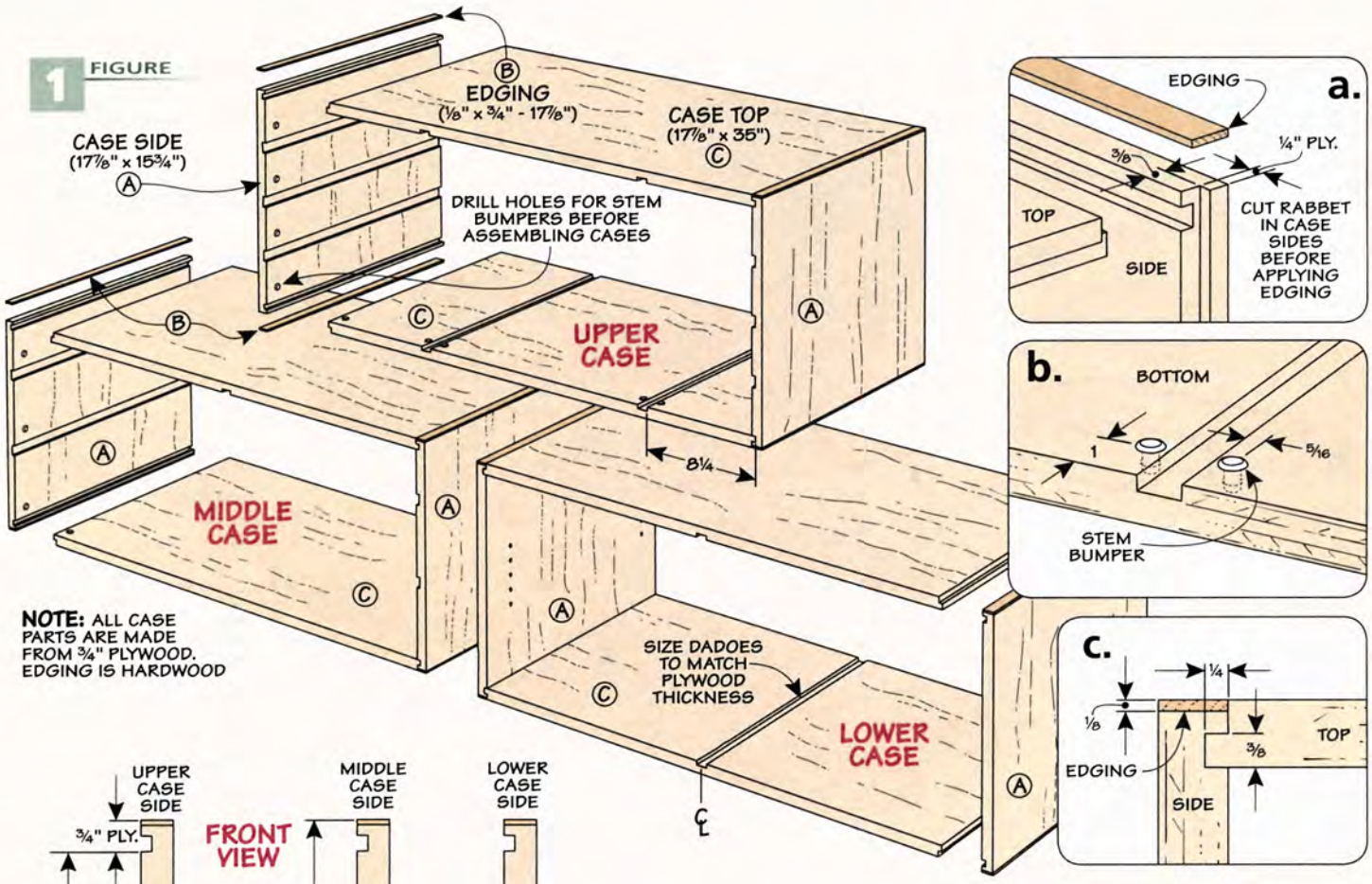
OVERALL DIMENSIONS:
18"D x 36"W x 64"H

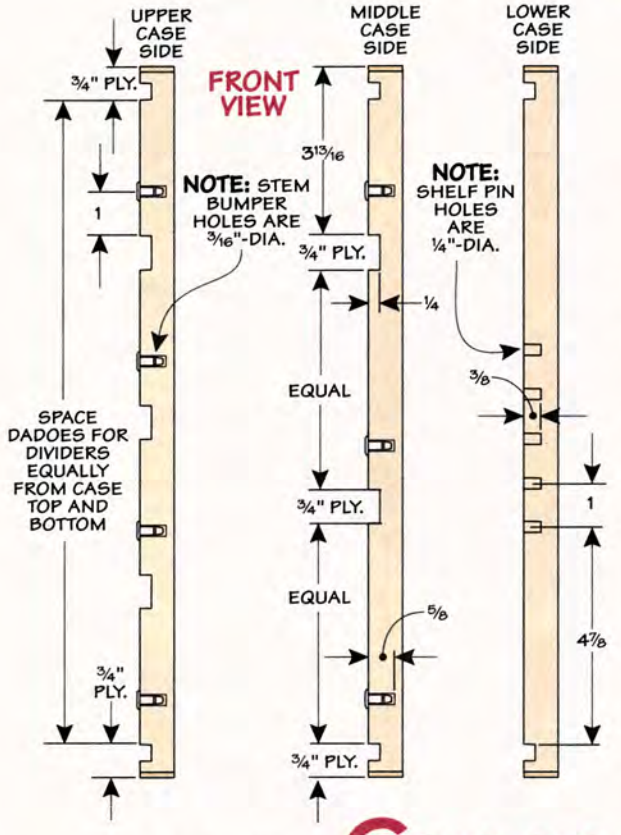


NOTE: FOR HARDWARE SOURCES, TURN TO PAGE 51

ShopNotes GO ONLINE EXTRAS

To download a free cutting diagram for the Tool Cabinet, go to: ShopNotes.com





making the Cases

The three plywood cases are the place to begin. Even with all the dividers, building and assembling the cases is not at all difficult. The joinery is bread-and-butter dadoes and rabbets. However, I want to highlight a few points that will help you get the best results.

For starters, don't think you need to try and glue up all the parts of each case at once. Instead, take it one step at a time. In a nutshell, I build the outside of the case first. Then I cut and install the smaller interior dividers.

Good Looks. Each case is built separately, but they should still match when stacked together. To reach that goal, cut the sides, tops, and bottoms for the three main cases at the same time. This ensures that the cases will be the same size when assembled.

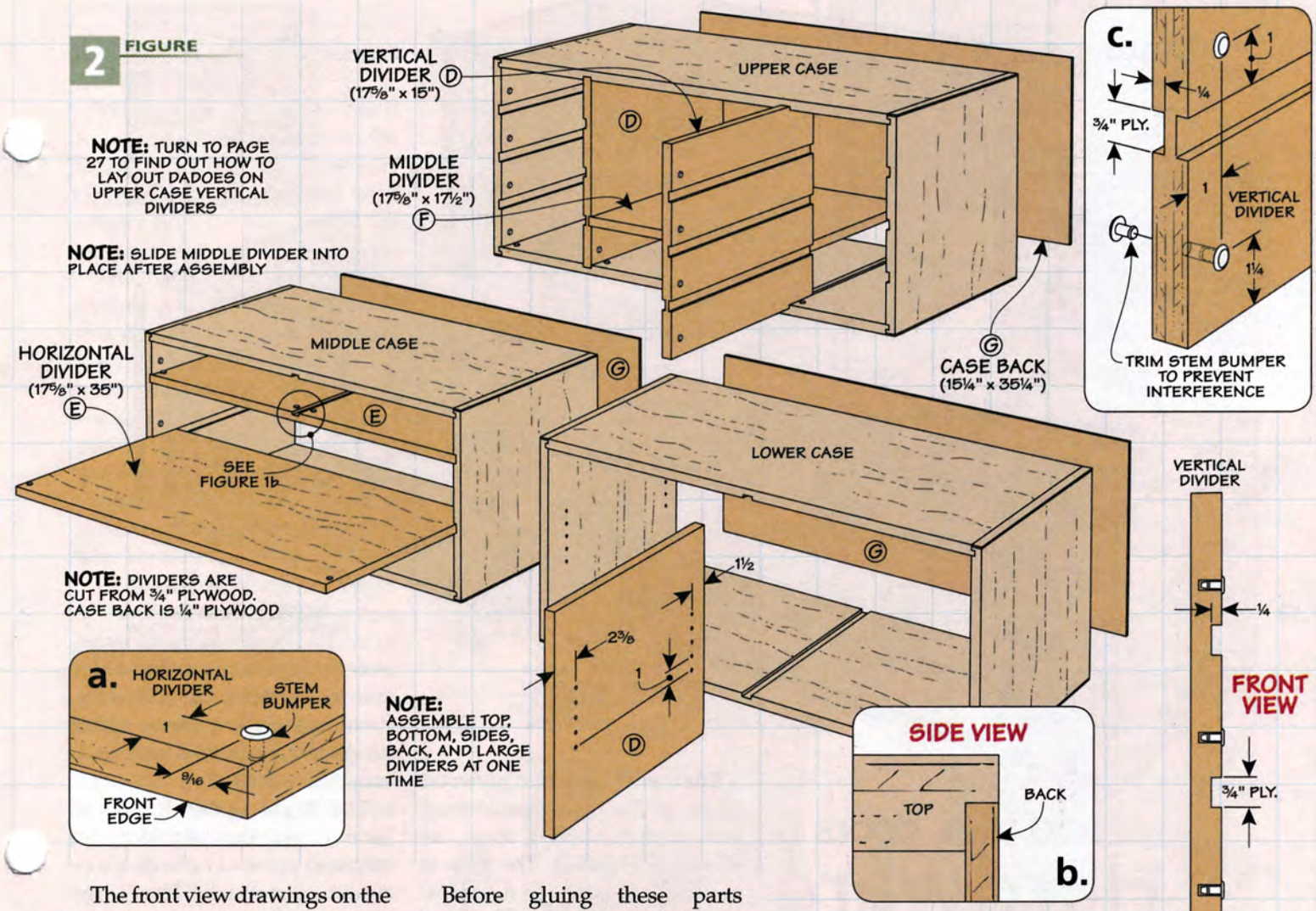
Another element in meeting this goal has to do with matching the grain along the case sides. I cut the case sides sequentially from the sheet of plywood, so the grain runs continuously up each side of the stacked cases.

Rabbets & Edging. There are two other steps to take before cutting the corner joinery. The first of these is to cut a rabbet along the back edge of all the case parts, as in Figure 1a. It's sized to hold a ¼" plywood back panel.

The other item is applying thin hardwood edging to the top and bottom of the side panels, as you can see in Figure 1c. This covers the exposed plies and makes it easier to cut the corner joints so the pieces end up perfectly flush.

Case Joinery. The outer case parts are assembled with tongue and dado joints. The joinery is formed by cutting a narrow dado in the case sides. The case top and bottom have a tongue cut on each end to fit snugly into the dado. Here again, look at Figure 1c for all the dimensions.

Add the Dividers. The various horizontal and vertical dividers shown in Figures 2 and 3 fit in dadoes that match the thickness of the plywood. For a good fit, I took some extra time to fine-tune my dado setup by making a cut and testing the fit with the plywood. Add or remove shims until you get a joint with a smooth, sliding fit with no slop. It's a good idea to note the combination of chippers and shims you use since you'll need to come back to it later on.



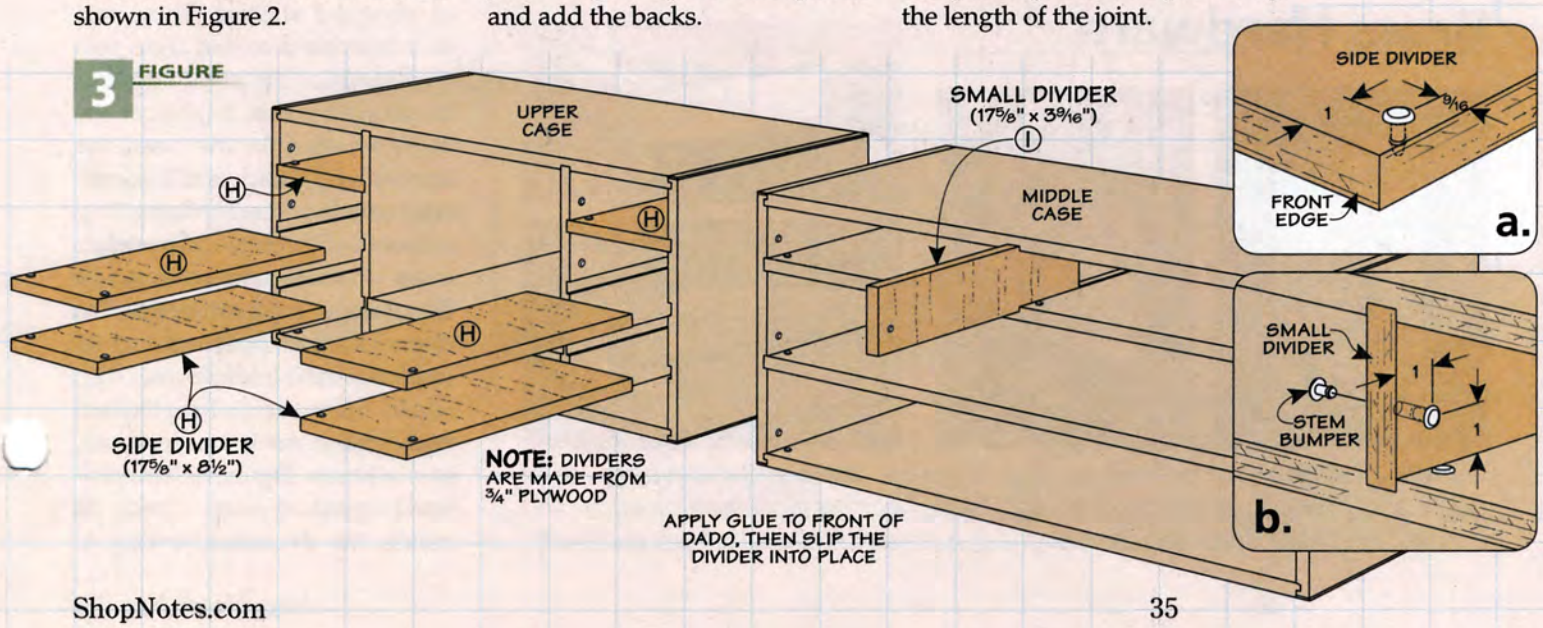
The front view drawings on the opposite page show the locations for dadoes in the sides. Figure 1 shows the other dado locations.

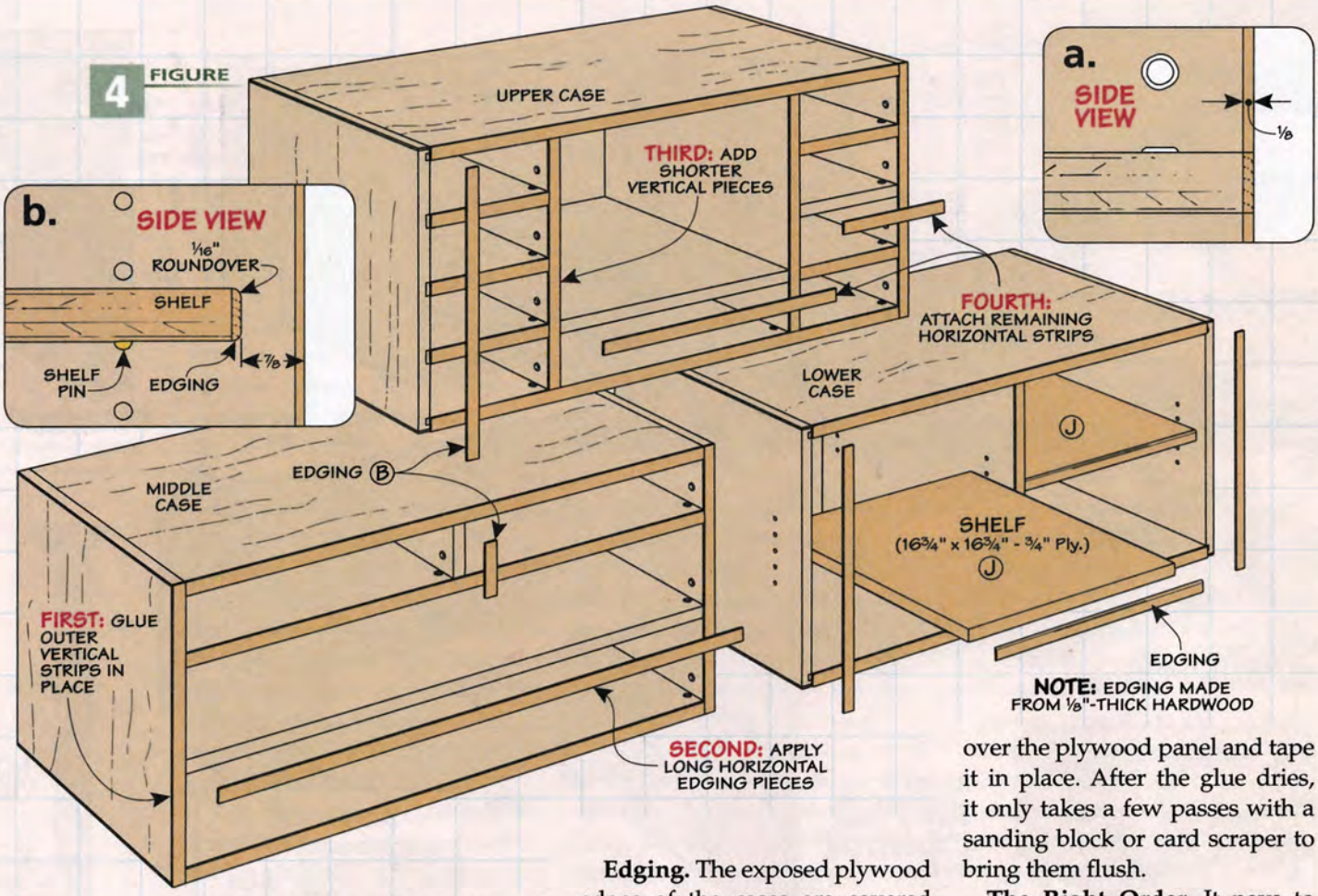
Large Dividers. I clamped the top, bottom, and sides together (without glue) to determine the size of the largest dividers: The vertical dividers for the upper and lower cases and the horizontal dividers in the middle case, as shown in Figure 2.

Before gluing these parts together, you still need to cut the dadoes in the dividers. They need to line up perfectly with the opposing dadoes. To find out how to do this, turn to Shop Short Cuts on page 27.

I also installed stem bumpers that support the drawers (Figures 1b, 2a and 2c). At this point, you can glue up the case pieces and add the backs.

Smaller Dividers. Cut the smaller dividers to fit the openings after gluing the cases together, as shown in Figure 3. Size them for a smooth, sliding fit in the dadoes. Apply a small amount of glue at the beginning of the dado. Sliding the divider into place spreads the glue along the length of the joint.





add trim, doors & Hardware

The heavy work involved in building the cabinets is behind you. The main task ahead is taking advantage of all the space inside the cases. But before you get to that, there's some trim work to complete.

Edging. The exposed plywood edges of the cases are covered with thin hardwood strips, as shown in Figure 4. The trick is in sizing and applying the strips. Here are a few tips that can make the process go a lot easier.

Blank Size. The strips are cut from a blank that's a bit thicker (about 1/64") than the plywood. This way, you don't have to align the strips perfectly as they're glued on. Masking tape works well as a clamp. Center the strip over the plywood panel and tape it in place. After the glue dries, it only takes a few passes with a sanding block or card scraper to bring them flush.

The Right Order. It pays to have a plan for attaching the strips, so you end up with a consistent appearance. Here's my strategy: Start with the outside vertical strips. Then apply the longest horizontal strips. Then just repeat the pattern as you work your way in — longest vertical piece followed by next longest horizontal piece.

Shelves. The lower case has two large openings. To divide the space further, I made a pair of plywood shelves. These rest on adjustable pins that allow you to customize the compartments to suit your needs, as you can see in Figure 4b. Like the cases, the front edge of each shelf is covered with hardwood edging.

Doors. The tool cabinet has three doors to enclose some of the storage compartments. The door in the upper cabinet is unique since it folds down.

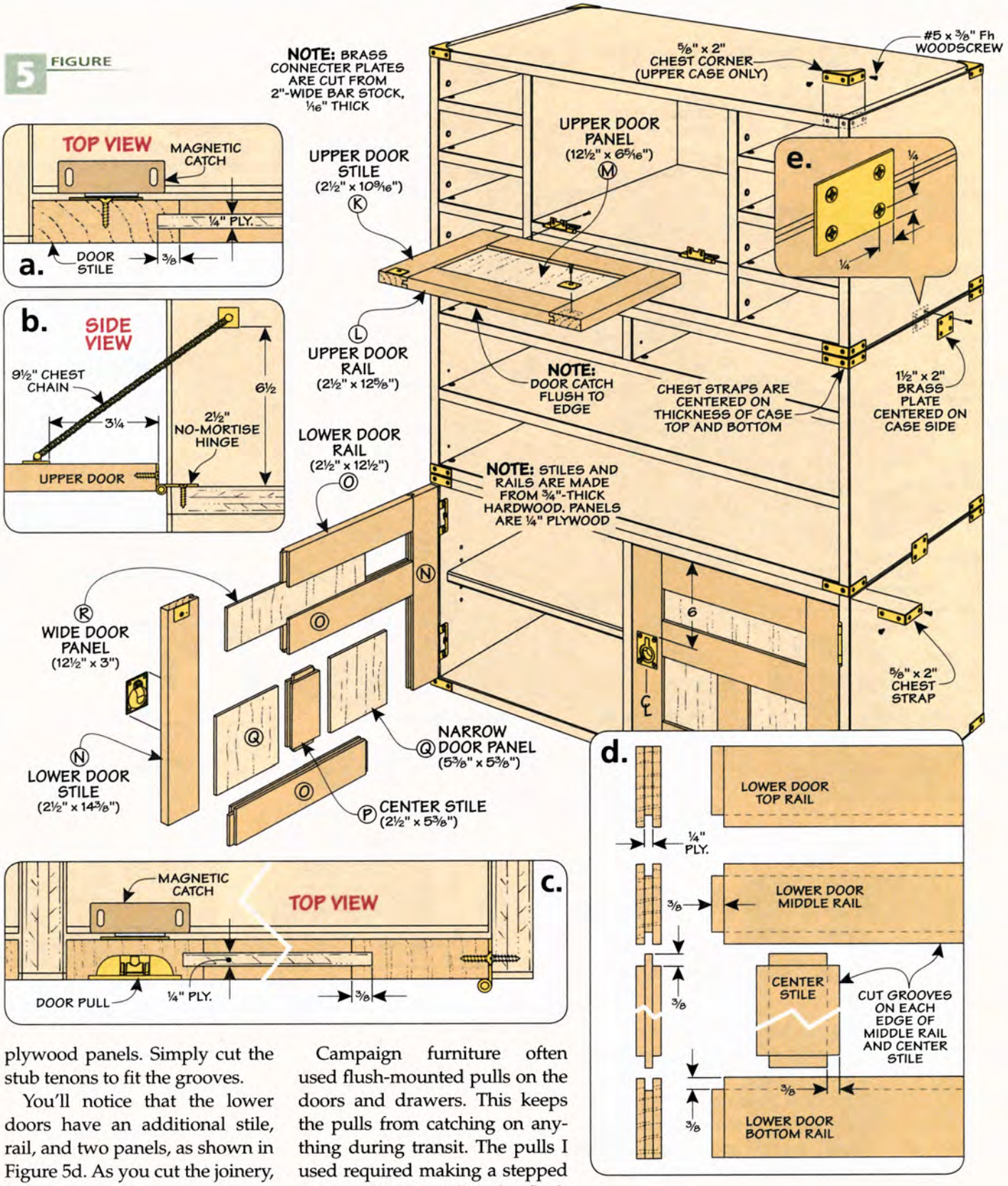
All three doors are joined with stub tenons and grooves, as shown in Figure 5. The centered grooves are sized to match the thickness of the ¼"

Brass Hardware

▲ ***Pulls & Plates.*** *Flush pulls are mortised into doors and drawers. Shop-made brass plates connect the cases and keep them aligned.*

▲ ***Corners.*** *Wrap-around chest corners protect the top edges and straps cover the lower corners.*

FIGURE 5



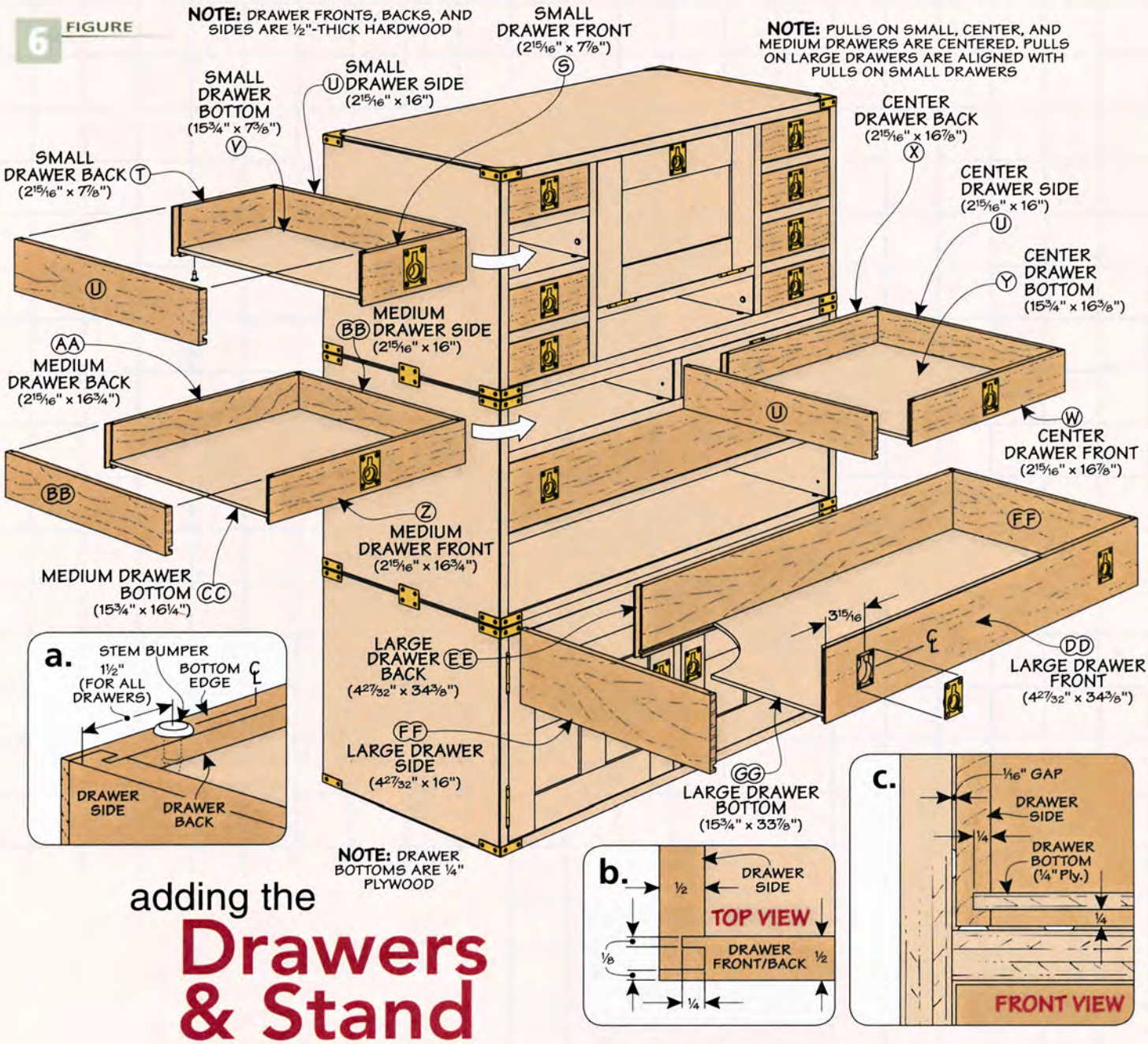
plywood panels. Simply cut the stub tenons to fit the grooves.

You'll notice that the lower doors have an additional stile, rail, and two panels, as shown in Figure 5d. As you cut the joinery, be sure to cut a groove on both edges of the middle rails and center stile. These parts also have a stub tenon cut on each end.

Door Hardware. All three doors swing on no-mortise hinges. Magnetic catches hold them closed. For the upper door, I added a pair of chains to hold the door level when it's opened.

Campaign furniture often used flush-mounted pulls on the doors and drawers. This keeps the pulls from catching on anything during transit. The pulls I used required making a stepped mortise for the pull to be flush with the surface, as in Figure 5c. On page 27, you can see a simple template routing technique that produces a perfect fit.

Case Hardware. While on the move, campaign furniture is vulnerable to damage at the corners. To protect them, L-shaped brass corners are added, as shown in Figure 5. These are simply screwed into place centered on the thickness of the case top and bottom. Wrap-around corner protectors are used on the top of the upper case. Here again, they're simply screwed to the surface. Finally, I made some brass plates to connect the cases to each other.



adding the

Drawers & Stand

A quick look at Figure 6 shows you that the next step involves making quite a few drawers. The main advantage here is flexibility. Having a range of drawer sizes means small tools and accessories aren't as likely to get lost. And the larger drawers are perfect for storing large or long items like squares, rules, and hand saws. They're even large enough to hold big hand planes.

There are nine drawers in the upper case and four in the middle case. (The lower case just has the two doors you've already made.) I know it sounds like a lot, but there are only four drawer sizes. So you'll be making the parts in batches, and the steps should move along pretty quickly.

Cutting Parts. While there are drawers in a variety of sizes, they share common construction. So I began by making up stacks of drawer parts. The drawer fronts, backs, and sides are made from ½"-thick material to save weight and maximize the space inside each of the drawers.

Size the fronts and backs to fit the openings between the stem bumpers. (Take note that the drawer fronts are quartersawn white oak while the backs and sides are made from maple.) When cutting the sides to length, be sure to take the joinery into account.

Joinery. Speaking of the joinery, I used locking rabbets at both the front and back of the drawer, as shown in Figure 6b. So once you're set up for each step, you can cut all the similar parts at one time at the table saw.

Here's a quick rundown of the process: Cut a slot on each end of the front and back. Then lay the part with the inside face down on the saw and trim back the inner tongue, as in Figure 6b.

This shortened tongue fits into a kerf cut into the mating

drawer side. Careful layout and setup will result in a snug fit.

Bottoms. The final step is to cut a groove in all the drawer parts to hold the plywood bottoms. The location of the groove is shown in Figure 6c.

Now the drawers can be glued up. I added a pair of stem bumpers to the lower edge of each drawer back, as illustrated in Figure 6a. This keeps the drawer level in the case.

STURDY STAND

The home stretch of the project involves building a stand to support the cases. It raises the cases off the floor to a more comfortable height. The emphasis here is stout construction to support all the weight of the cases and the tools stored inside.

Legs. Building a rock-solid stand starts with the legs, as shown in Figure 7. The legs are glued up to create square blanks. They're strong, but I still wanted them to look good. To cover the glue line and get a quartersawn look on all four faces, I glued thin pieces of veneer to the sides. You can read more about making your own veneer on page 26. A roundover on the bottom edges of the legs prevents them from chipping if the cabinet is dragged across the floor.

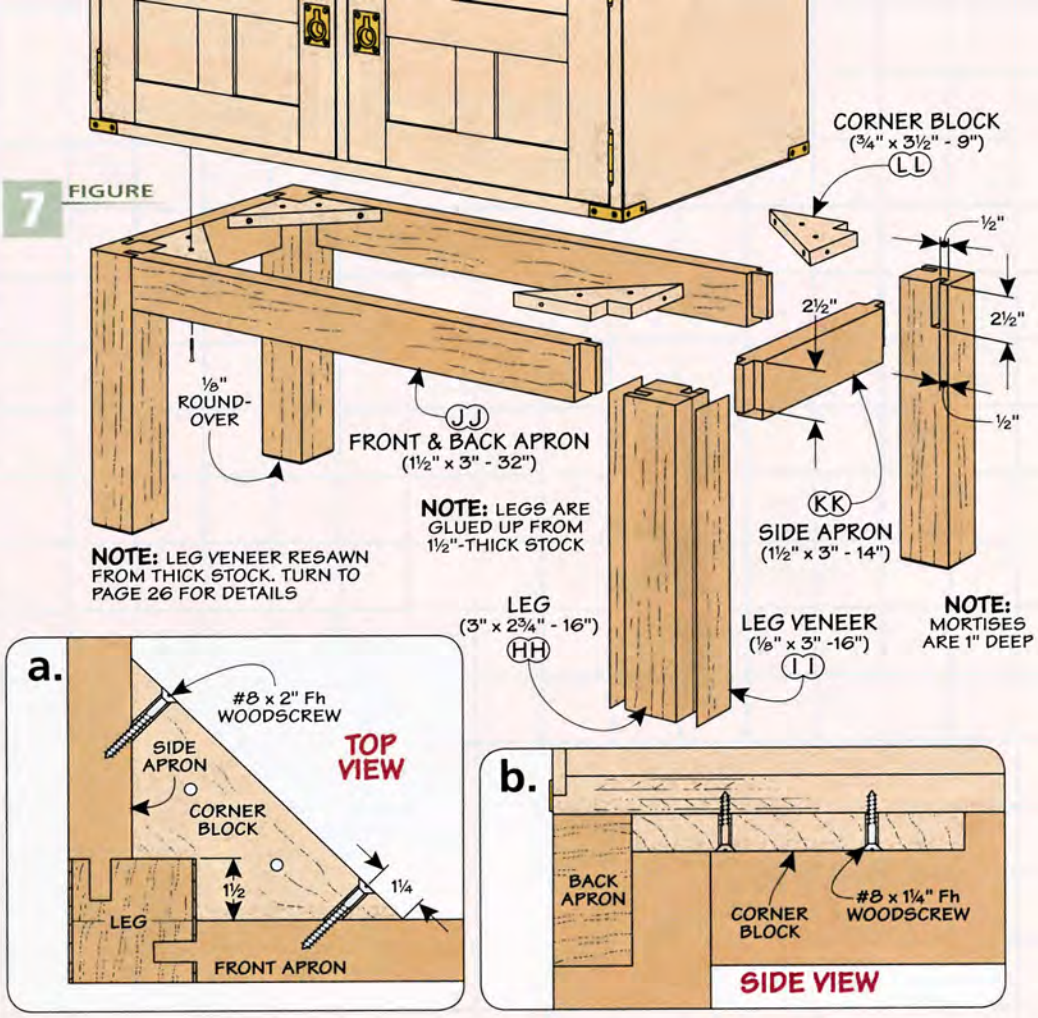


FIGURE 7

Mortise & Tenon. The legs and aprons are assembled with traditional mortise and tenon joinery. In Figure 7, you can see that the top of the mortise is open, and the mating tenon doesn't have an upper shoulder.

To further strengthen the joint and provide mounting points for the lower case, I added corner blocks, as shown in Figure 7a. Cut a notch in each block to wrap around the leg. These are glued and screwed in place.

Organizing the cabinet is the final step. The result is a fine-looking home for your tools that keeps them close at hand.

Materials & Hardware

A	Case Sides (6)	17⅞ x 15¾ - ¾ Ply.
B	Edging	⅛ x ¾ - 540 rgh.
C	Case Tops/Bottoms (6)	17⅞ x 35 - ¾ Ply.
D	Vertical Dividers (3)	17⅝ x 15 - ¾ Ply.
E	Horizontal Dividers (2)	17⅝ x 35 - ¾ Ply.
F	Middle Divider (1)	17⅝ x 17½ - ¾ Ply.
G	Case Backs (3)	15¼ x 35¼ - ¼ Ply.
H	Side Dividers (6)	17⅝ x 8½ - ¾ Ply.
I	Small Divider (1)	17⅝ x 3⁹⁄₁₆ - ¾ Ply.
J	Shelves (2)	16¾ x 16¾ - ¾ Ply.
K	Upper Door Stiles (2)	¾ x 2½ - 10⁹⁄₁₆
L	Upper Door Rails (2)	¾ x 2½ - 12⅝
M	Upper Door Panel (1)	12½ x 6⁵⁄₁₆ - ¼ Ply.
N	Lower Door Stiles (4)	¾ x 2½ - 14⅜
O	Lower Door Rails (6)	¾ x 2½ - 12½
P	Center Stiles (2)	¾ x 2½ - 5⅜
Q	Narrow Door Panels (4)	5⅜ x 5⅜ - ¼ Ply.
R	Wide Door Panels (2)	12½ x 3 - ¼ Ply.
S	Sm. Drawer Fronts (8)	½ x 2¹⁵⁄₁₆ - 7⅞
T	Sm. Drawer Backs (8)	½ x 2¹⁵⁄₁₆ - 7⅞
U	Sm. Drawer Sides (18)	½ x 2¹⁵⁄₁₆ - 16
V	Sm. Drawer Bottoms (8)	15¾ x 7⅜ - ¼ Ply.
W	Center Drawer Front (1)	½ x 2¹⁵⁄₁₆ - 16⅞
X	Center Drawer Back (1)	½ x 2¹⁵⁄₁₆ - 16⅞
Y	Center Drawer Bot. (1)	15¾ x 16⅜ - ¼ Ply.
Z	Med. Drawer Fronts (2)	½ x 2¹⁵⁄₁₆ - 16¾
AA	Med. Drawer Backs (2)	½ x 2¹⁵⁄₁₆ - 16¾
BB	Med. Drawer Sides (4)	½ x 2¹⁵⁄₁₆ - 16
CC	Med. Drawer Bottoms (2)	15¾ x 16¼ - ¼ Ply.
DD	Lg. Drawer Fronts (2)	½ x 4²⁷⁄₃₂ - 34⅜
EE	Lg. Drawer Backs (2)	½ x 4²⁷⁄₃₂ - 34⅜
FF	Large Drawer Sides (4)	½ x 4²⁷⁄₃₂ - 16
GG	Lg. Drawer Bottoms (2)	15¾ x 33⅞ - ¼ Ply.
HH	Legs (4)	3 x 2¾ - 16
II	Leg Veneer (8)	⅛ x 3 - 16
JJ	Front/Back Aprons (2)	1½ x 3 - 32
KK	Side Aprons (2)	1½ x 3 - 14
LL	Corner Blocks (4)	¾ x 3½ - 9

- (78) Nylon Stem Bumpers
- (6) 2½" x 1" No-Mortise Hinges w/Screws
- (18) 1¹¹⁄₁₆" x 2¼" Recessed Finger Pulls
- (112) #5 x ⅜" Fh Brass Woodscrews
- (4) Magnetic Catches w/Screws
- (2) 9½" Chest Chains
- (20) ⅝" x 2" Chest Straps
- (4) ⅝" x 2" Chest Corners
- (1) 2" x 12" - 1⁄16" Brass Bar Stock
- (8) #8 x 2" Fh Woodscrews
- (8) #8 x 1¼" Fh Woodscrews

HANDS-ON
Technique

beaded Shiplap Back

Create this classic look with a few simple router table and table saw techniques.

For most of the cabinets I build, a ¼" plywood back panel is an easy, practical solution. It's a simple matter to cut the plywood to size and then glue and screw it in place. From an appearance standpoint, however, the result can be somewhat bland.

One way to dress up the back of a project is to use a traditional, shiplapped back as shown in the photo above. A shiplapped back consists of a series of narrow boards with mating rabbets. It's designed with wood movement in mind. At the same time, it adds decorative detail to the cabinet and even contributes to the strength of the case.

How It Works. The lower left drawing shows the elements of a shiplapped back and how they work together. As you can see, the individual boards aren't butted tightly together. Instead there's a small gap between each one. This gives the boards enough room to expand and contract in response to changes in humidity.

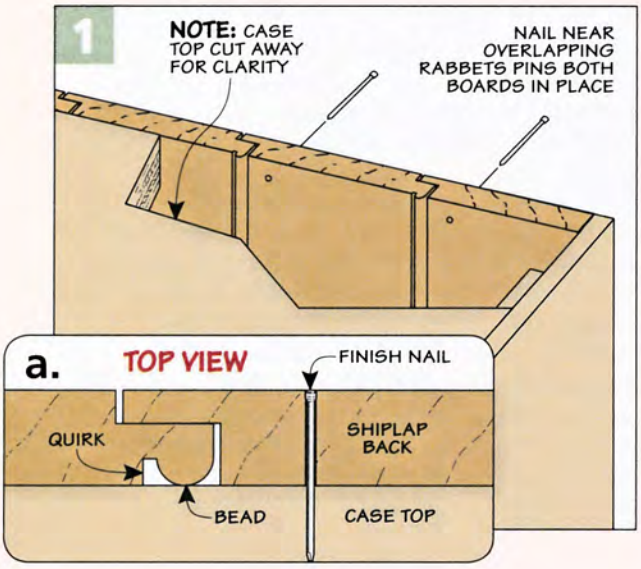
The gaps are concealed by two details. Overlapping rabbets on each edge "seal off" the back of the case, so you can't see through any open gaps. The other detail is the routed profile along one edge. I'm using a traditional, beaded profile. The shadow lines created by the profile blur the size of the gap into a uniform pattern.

Shiplapped boards are typically ½" thick and held in place by nails. The nails are driven into the case top, bottom, and any fixed dividers. Thin nails are flexible to move with the wood without coming loose, but they still add rigidity.

Create a Pattern. The boards used in the back don't have to be all the same width. In fact, you can use several widths to create different looks. The box on the opposite page shows the effect of three common arrangements.

Determine Board Width. The one challenging part of creating a shiplapped back is determining the number of boards and their width. For a uniform pattern, I've come up with a simple approach.

Pick a Size. Start by choosing a width for each back board. This will depend on the size and scale of the project. You'll also want to figure out a width that will evenly space the boards, plus leave a nearly full-width board at each side. You'll trim the two side boards to final width after shaping the beaded profiles. Then make enough boards to cover the back plus a couple extra.



SHAPING THE BOARDS

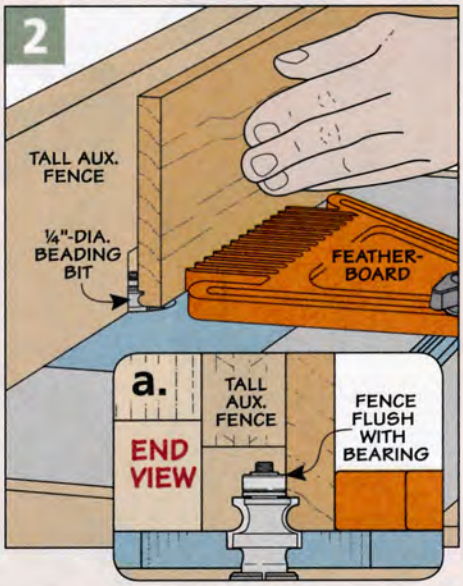
Once you've determined the number and pattern for the back boards, the next step is doing the shaping. The bead profile comes first, followed by the two overlapping rabbet joints.

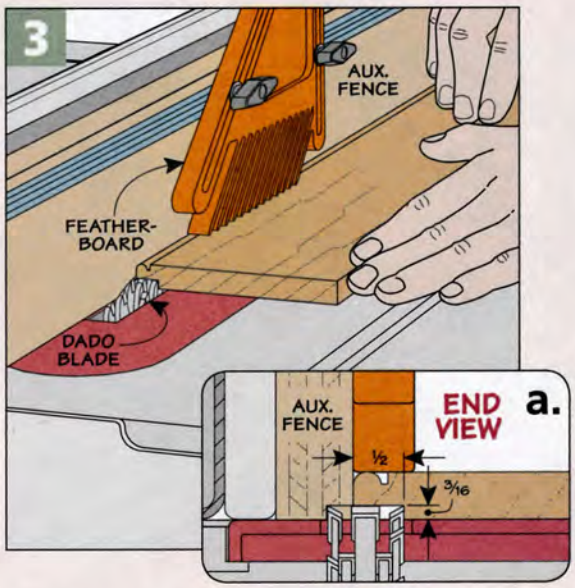
Routing the Bead. The reason I rout the bead first is stability. On the router table, the workpiece is held vertically against the fence. So there's a larger bearing surface before the rabbet is cut.

Install the beading bit in the router table and raise it so it will cut a full bead without a shoulder on the lower edge, as you can see in Figure 2a. Then set the fence so it's flush with the front edge of the bearing on the bit. A featherboard helps to keep the workpiece firmly against the fence throughout the cut.

A Pair of Rabbets. Cutting the rabbets is the next order of business. And for that, you can head over to the table saw. A dado blade makes quick work of cutting the rabbets. The setup is shown in Figure 3. While the process is pretty routine, there are a couple of things to note.

The first thing is that the rabbets aren't the same depth. The rabbet on the beaded edge is shallower than the other. The shallow rabbet leaves more material behind the quirk of the bead profile, so it's less likely to create a weak spot that can crack.





The other item to note is that the rabbets are cut on opposite faces. So it's a good idea to label your parts to keep from getting mixed up during the process.

Trimming to Width. After shaping the beads and cutting the rabbets, I lay out the boards on my workbench, leaving a 1/16" gap between each board. Using the opening of the cabinet back as a guide, I trim the outer two boards to leave an even reveal along each edge. Keep in mind that you aren't trimming the same amount off each board because of the overlapping rabbets.

Installing the Boards. I mentioned earlier that the boards are attached to the case with nails. But I use a specific nailing pattern. Even though nails are flexible, too many of them can trap the piece and restrict its ability to move.

Most boards have only one nail located near the rabbet joint, as shown in the drawing on the facing page. This serves two purposes. Of course, the nail secures the board it passes though. But the rabbet also secures the edge of the mating board. Just be sure the nail doesn't go through both boards so they can expand and contract. The side boards can be nailed to the case along the outer edges.

Making a beaded shiplapped back only requires a little extra effort. But the payoff that comes in the final appearance is definitely worthwhile.

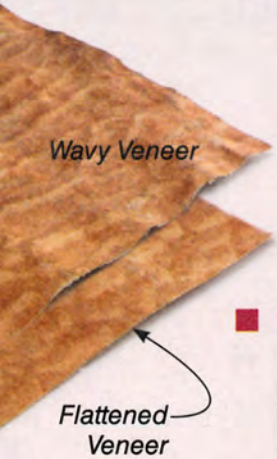
back Patterns

Traditional shiplapped backs use boards of a uniform width for a more formal look, as shown in the near drawing at right. You can create a more casual look by alternating narrow and wide boards (center drawing).

To create an informal, "country" look, use boards of random widths, as you can see in the far right drawing. This allows you to maximize the use of materials.

taking care of Veneer

Follow these simple steps to tame wavy veneer and keep it looking its best.



A highly figured or unusual piece of veneer can be all it takes to give a project a one-of-a-kind look. So when I come across some great-looking veneer, it's hard to pass up. The issue is what to do with the veneer while I'm waiting for the right project to come along.

Even though most veneers are just thin slices of wood, you need to treat them a little differently than typical boards. But that doesn't necessarily mean they're high maintenance. Whether you plan on using the veneer right away or storing it, there are some strategies for getting and keeping the veneer in top shape.

▲ **Veneer Press.** *Moisten the veneer before sandwiching it between paper to press it flat.*

Thin veneer reacts much more dramatically to internal stress and moisture in the air than thicker, solid wood does. This is especially true in highly figured veneer (left margin photo). As a result, veneer pieces can develop a wavy, curved surface.

Some minor distortion won't affect how flat the veneer will be in the finished project. However, for really wavy veneer sheets, like the top piece shown in the left margin, you'll want to take some time to flatten it. Besides getting a better glue bond in the final project, flat veneer sheets are less likely to be damaged in storage. Here are two solutions I use.

▲ **Spray with Warm Water.** *Water mixed with glycerin quickly softens the fibers of thin, brittle veneer so it can be flattened.*

▲ **Iron It Flat.** *A clothes iron set on medium can be used to quickly press the waves out of a piece of veneer.*

Wet the Veneer. To flatten the piece, you need to make brittle fibers soft and pliable. Start by spraying both sides of the veneer piece with warm water, as shown in the lower left photo. I like to add some glycerin to the water (about 10%). This helps the veneer stay supple for awhile after the water dries. Another option is to use commercial veneer conditioner. You can read about that in the box at right.

You want the veneer damp, but not dripping wet. As the water absorbs into the fibers, you'll notice the veneer relax. At this point, you can bend the sheet a lot more easily.

Press It Flat. On its own, the water and glycerin don't do much to remove the waves. They just make the veneer supple enough to work with.

My preferred method is to press the veneer flat. The idea is to evenly distribute clamping pressure across the thin veneer. The setup in the main photo and inset on the previous page shows you what you need to know.

I place the veneer between sheets of absorbent paper to draw away moisture. This sandwich is set on a large piece of melamine-covered particleboard. A second piece of particleboard goes on top. These heavy pieces create a smooth, flat surface. Clamps apply the force to press the veneer flat. I add some thick hardwood cauls to distribute the pressure evenly across the melamine panels.

After a couple of hours, replace the paper with fresh, dry sheets. Then I find it's best to leave the veneer in the clamps overnight to dry. The next day, the veneer will be much flatter, as shown in the margin photo. You can see it isn't dead flat, but the minor waves will flatten out when it's applied to the project.

Iron Out Wrinkles. If I want to use a piece of veneer right away, I turn to a faster method for flattening — a clothes iron. Set the iron for medium heat. (Use the steam option if the iron has one.) Then pass the iron over the moistened veneer, pressing it flat as if you're ironing a shirt.

Protecting & Storing. No matter which method you use, the flattening effects will wear off over time. The longer you wait before using the veneer, the more likely it is to distort and become wavy again. Take a look at the box below for some tips on protecting and storing veneer.

It doesn't take much time or effort to flatten veneer and help it look its best. And it will save you a lot of hassle the next time you want to use a dramatic piece of veneer in a project.

supplies for Flattening Veneer

A few specialized supplies come in handy when flattening veneer. Glycerin and commerical veneer conditioners turn rigid veneer into supple sheets that are easier to handle. (You can find sources on page 51.) A spray bottle allows you to apply just the right amount of water to the veneer.

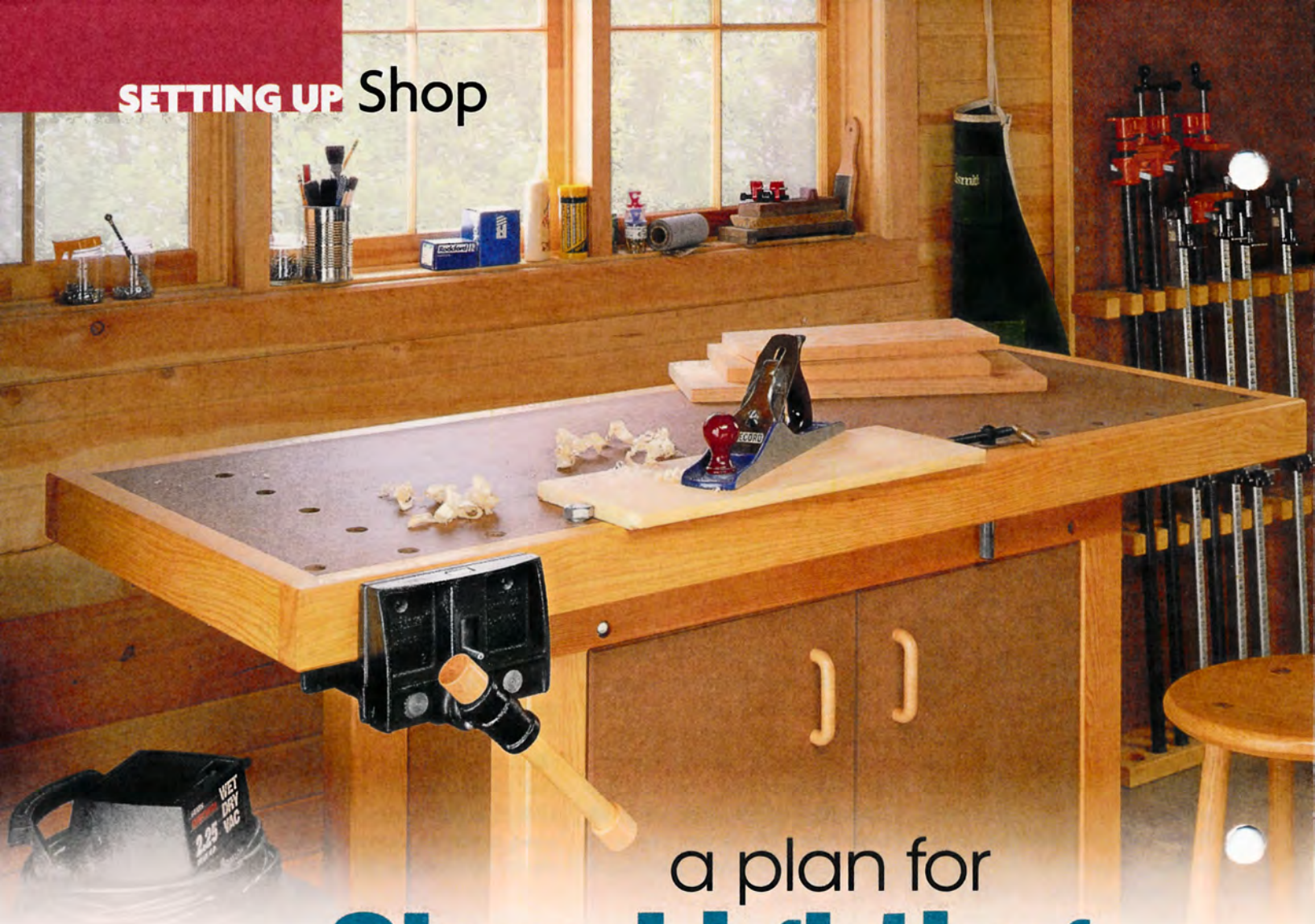
To stop splits and protect the edges, I like to use brown veneer tape. It's thin and doesn't leave a residue. I've also found blue masking tape will work for quick fixes, too.

tips for Storage

▲ ***Roll It Up.*** *Wrap long sheets of veneer in kraft paper and roll it for storage. Allow the veneer to relax a day or two before using.*

▲ ***Tape Edges & Splits.*** *Use veneer tape to pull minor splits together after flattening the sheet. Then apply a strip across each end to prevent cracks from developing.*

▲ ***Weigh It Down.*** *Store a stack of dry veneer sheets between MDF panels. The panels protect the fragile veneer, and the extra weight helps them stay flat.*



a plan for Shop Lighting

Choose the right kind of light to increase accuracy and safety in your shop.

Unless you're one of the lucky few who have designed and built a shop from the ground up, chances are you've had to make some changes and a few additions to the lighting in your workspace. The typical garage or basement shop usually has a pair of flourescent lights that leave much of the space in the dark. So before you can get on with the fun part of setting up your tools and getting to work, a few modifications are in order.

The right amount and kind of light can be pretty subjective. So rather than talk about specific light fixtures, I want to share some overall objectives I use to light my workshop. The drawing on the top of the facing page shows some ideas. Use these as a starting point for getting the right amount of light in your own shop.

WORKBENCH LIGHTING

When it comes to woodworking, you'd think that more light is better. That's true to a certain extent. Working in a dimly lit shop isn't enjoyable and can lead to errors.

But I find that when I'm at the bench, too much overhead light can be a problem. It can create glare and overwhelm layout lines or scribe marks. The details of a project can get lost as well. The shadow lines created by routed profiles lose their effect in bright light. Instead, I prefer enough overhead light to allow me to see what's going on for the overall project parts. Then if needed, I'll add more light to highlight specific details (more about this later).

Near a Window. I also like to have a window near my bench to provide side lighting. It's a great way to show off shadow lines and other visual effects. If a window isn't possible in your shop,

you can add a soft light from a lamp so that it shines indirectly on your bench.

LIGHTING FOR POWER TOOLS

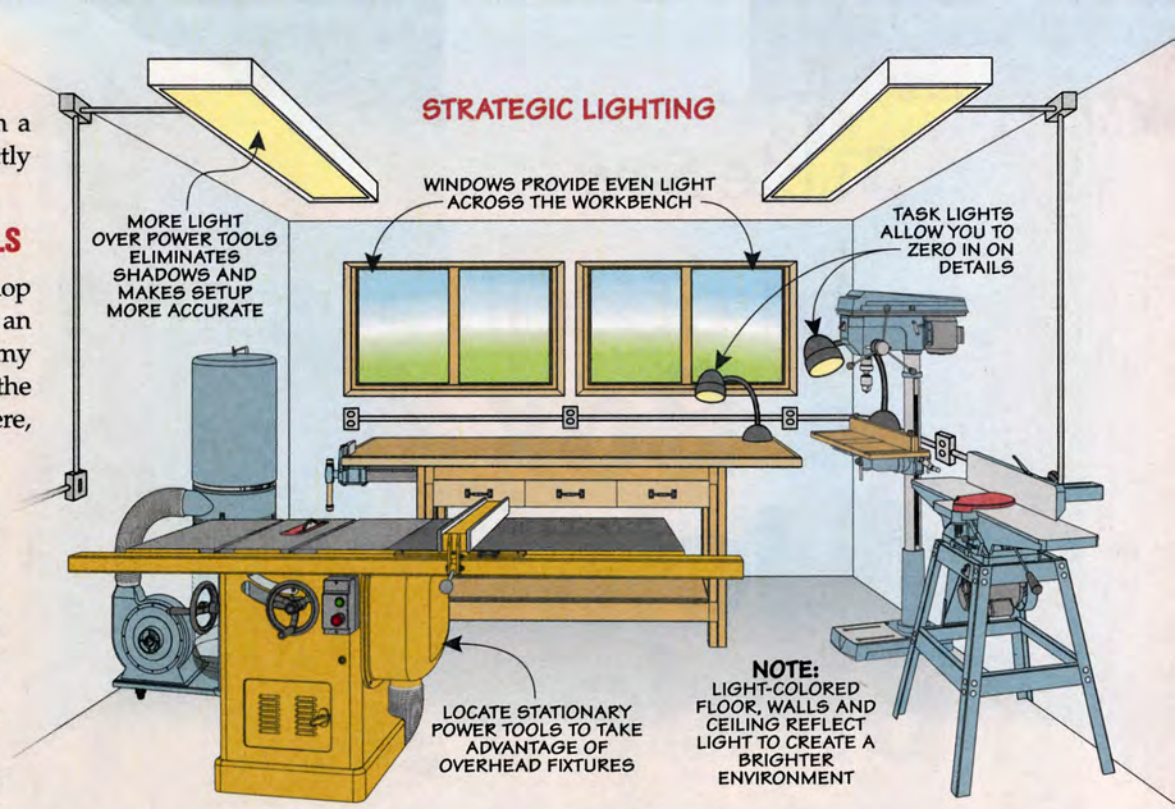
There are places in my shop where having a lot of light is an advantage. And that's over my stationary tools — especially the table saw and router table. Here, more light eliminates shadows so I can accurately position the fence, set bit or blade heights, and then align the workpiece to make the cut.

More light also increases safety. Bright, even light gives you a good view of the bit or blade throughout the cut to help keep your hands clear.

Getting more light on your table saw or router may be as simple as locating the tool under an existing fixture. Or you may need to replace a small fixture with a larger, brighter unit.

TASK LIGHTS

Zeroing in on details requires a different approach for lighting. Whether it's locating a drill bit on a workpiece, fine-tuning a joint, or cutting a curve at the band saw, you want things right on target.



For that, you need focused lighting in addition to the general lighting we've already talked about. Small, portable lights like the one shown in the lower left photo are a great way to add more light to a small area.

Sanding & Finishing. One type of task lighting deserves special mention — light for finishing and sanding. Overhead light conceals minor blemishes. The solution is to shine a raking light at a low angle across the surface (lower right photo).

The raking light reveals slight depressions and patches of tearout. For finishing, it highlights uneven finish coverage and brush marks.

Think of light as a tool to help you work more accurately and safely. And at the same time, you'll enjoy your shop more.

▲ ***Task Lighting.*** *For precise work, like drilling out a mortise, a focused task light eliminates shadows that lead to inaccurate results.*

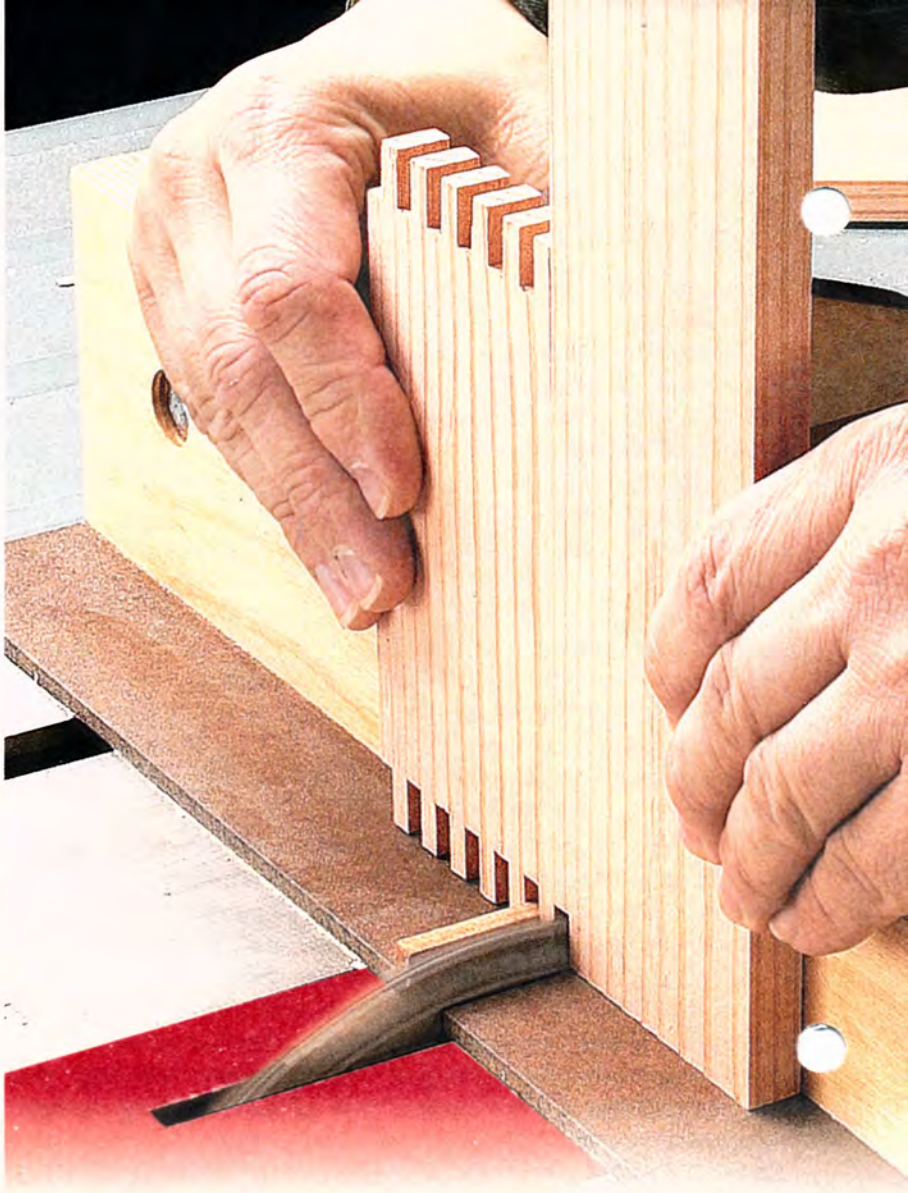
▲ ***Raking Light.*** *When sanding or applying a finish, shine a light at a low angle across a workpiece to highlight surface flaws.*

MASTERING THE

Table Saw

all about Box Joint Blades

Add clean, gap-free box joints to your next project. One key to success is using the right blade.

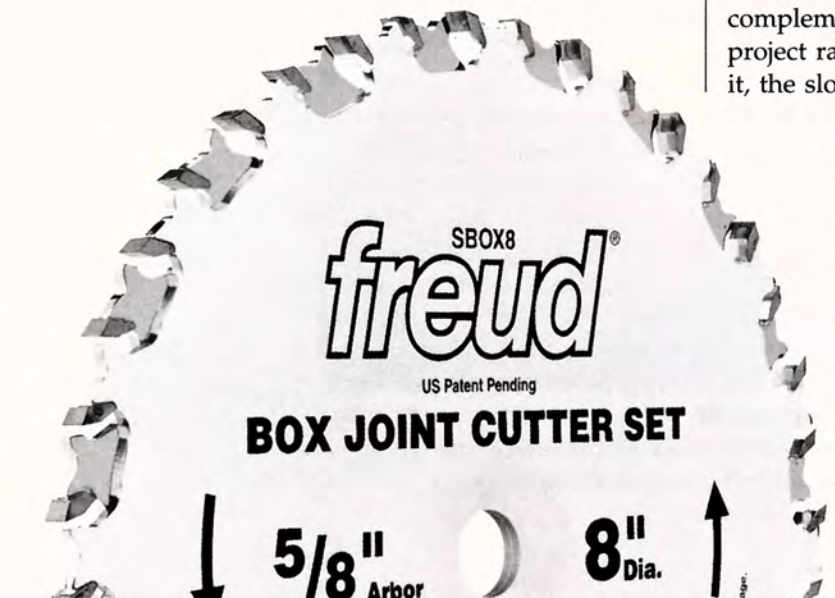


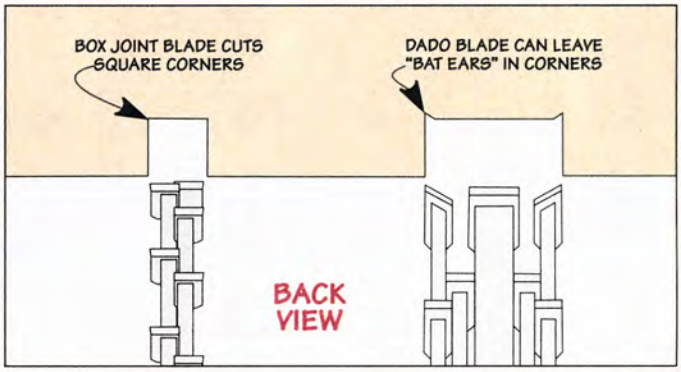
The distinctive appearance of a box joint is unique among the many joinery methods. The alternating pattern of end grain and face grain can really give a special look to the right project.

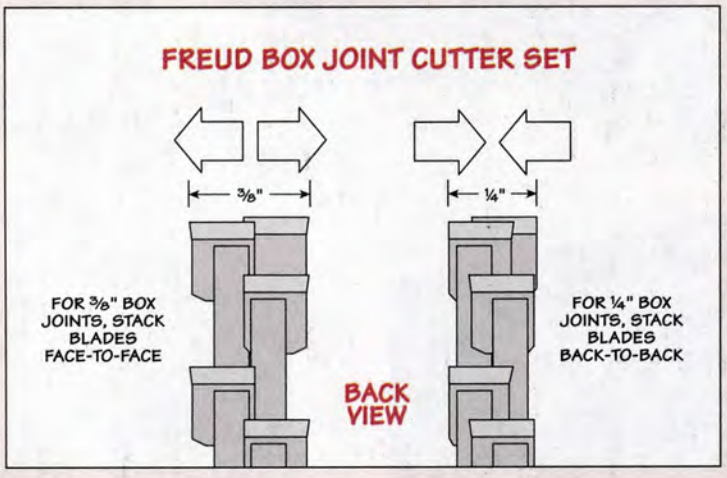
But in order for the joinery to complement the appearance of a project rather than detract from it, the slots and pins need to be cut cleanly and accurately. A proper jig is essential to get the spacing right (photo above), but the blade you use will also have a big impact on the end result.

Many woodworkers use a standard dado blade to make these cuts. But when the goal is to cut slots with a perfectly flat bottom and crisp 90° corners, the tooth

▼ ***Box Joint Blade.*** *Two blades with flat teeth cut perfectly square slots.*







▲ ***Cutting Rabbets.*** *Cutting a rabbet along the edge of a workpiece is easy with a box joint blade. An auxiliary fence protects the rip fence from accidental contact.*

configuration of these blades can make this difficult to achieve.

This is because dado blades are designed to make clean cuts *across* the grain of a workpiece. Hence the name "dado blade" instead of "groove blade" (box below). And to make these cuts cleanly, the teeth on the scoring blades of a dado set are beveled. This typically results in "bat ears" in the corners of the slots, as shown in the right drawing at the bottom of the opposite page.

Dedicated Blade. The solution is to use a dedicated box joint blade. These blades are available from several manufacturers, including *Freud*, *Amana*, *Forrest*, and *CMT*, and are generally 8" in diameter. For purchasing details, see Sources on page 51.

You may notice from the margin photo on the previous page that a box joint blade is actually a two-blade set with the blades positioned side-by-side — similar to the scoring blades on a dado set. But unlike what you'll find on a dado blade, there are no chippers sandwiched between them.

Teeth. The main difference, though, that really makes a box joint blade unique is the tooth shape. Every tooth on both blades has a perfectly flat top. You can see in the left drawing on the opposite page that this tooth configuration results in clean corners in the slots of your box joint. This means your pins will seat cleanly in the bottom of the slots without any gaps in the corners.

Another feature of a box joint blade is that the teeth on each blade are slightly offset to one side of the plate. This allows you to set the width of the cut for the pins and slots you need.

For the blade shown here, you can set the width to either 3/8" or 1/4" depending on how you install the blades on the arbor of your table saw. Other blades are available for different sizes. The drawings above show how this works.

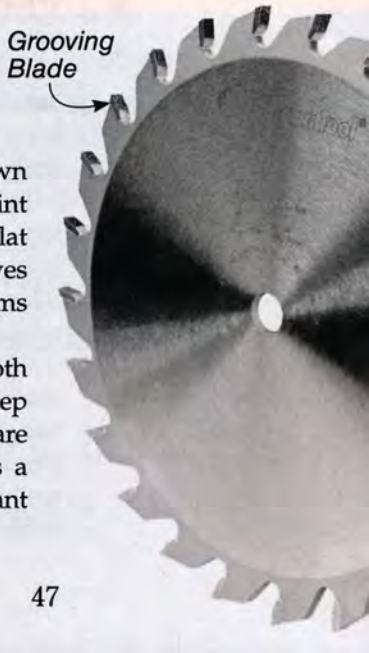
The benefit to this method is that the blade is always the exact width indicated. You never have to shim the blades to cut the slots to the correct width. Not only does this result in accurate cuts every time, but it eliminates any tricky setup. You can start cutting your joinery immediately after installing the blade. This can be a real time saver.

Other Uses. A box joint blade can be used for cutting other types of joinery as well. But the flat-top teeth perform best when cutting along the grain. That means you can cut rabbets along the length of your workpieces (photo above), or quickly cut grooves to an exact width.

My dado blade still sees a lot of use in my shop. But when looking for a quick setup and clean cuts along the grain, I turn to my box joint blade. Give one a try and I think you'll agree.

▲ ***Cutting Grooves.*** *Cut perfectly sized grooves without a complicated setup.*

another Blade Option



Most woodworkers are familiar with dado blades. They're the most common blade for making dadoes and grooves. But there is another, lesser known, option for cutting grooves: the grooving blade.

These blades are similar to box joint blades. But instead of using two blades to cut a 1/4" kerf, grooving blades use just one, extra-thick blade with 1/4"-wide teeth, as shown in the photo. Like box joint blades, the teeth have a flat top. So it's easy to cut grooves with perfectly flat bottoms and clean corners.

They're available in both 8" and 10" diameters. Keep in mind that these blades are heavy. So if your saw has a smaller motor, you may want to go with the 8" version.

◄ ***Shop Fox Heavy-Duty Workbench Leg System.*** *Square steel column legs help your bench stay sturdy and reliable.*

taking a look at

Workbench Legs

Save time and money when building a workbench by starting with a set of pre-made legs.

When it comes to setting up your shop, having a sturdy workbench is a must. Of course, building your own solid-wood bench can be an expensive and time-consuming project.

That's where these ready-made legs come in. By starting with a set of legs and adding a top and a few other components, you can build a reliable bench much more quickly.

While there are dozens of leg options out there, we've picked out some of our favorites to help you narrow down the best fit for you. (Turn to Sources on page 51 to see where we purchased them.)

All woodworkers have different wants and needs when it comes to their workbenches. From adjustable legs to complete leg kits, there's a set out there that's sure to be just what you're looking for.

SHOP FOX HEAVY-DUTY LEGS

For a heavy-duty workbench, the bench leg system from *Shop Fox* is a good option (photo above). It makes a nice-sized bench at 56" long and 28" deep (base measurements). The top and shelf aren't included, but this system does come with rectangular cross braces, hardware, and adjustable feet, in addition to the legs.

This system features square column legs made from galvanized steel for extra stability. The adjustable foot pads allow you to level the bench on uneven floors. And the off-white, powder-coated paint rounds out the look of this bench nicely.

The building process is simple with bolt-together construction, and the steel cross-braces include a lip for adding a ¾" plywood or MDF shelf. This leg system is sure to give you a rock-solid bench that's ready to handle anything.

KREG UNIVERSAL BENCH

If you own a pocket-hole jig, you're probably already familiar with *Kreg* products. But you might not know that *Kreg* sells several interchangeable components that you can use to create a custom bench. Since the legs and rails are sold separately, you can mix and match them to change the bench's height, width, and depth. There are 15 different combinations.

The legs come in two heights, 15¼" and 29", and the levelers and feet allow you to increase the height by up to 6" (see inset photo at right). They also come with pre-drilled holes to make assembly quick and easy.

The *Kreg* legs are made from 12-gauge, heavy-duty steel. And the 14-gauge steel rails include square-shoulder bolts to ensure an accurate and rigid assembly.

There are also some accessories available that work nicely with the universal bench system, including bench dogs, a bench clamp system, and a clamp vise. If you need a bench that can be easily moved around the shop, *Kreg* offers a set of 3" dual-locking casters.

The biggest challenge about this system is deciding what size bench you want to make. Then you can build the benchtop and shelf from materials of your choice to complete a solid bench.

◄ ***Kreg Bench.*** *With an array of different sized components available, you can customize the bench to your needs.*

◄ ***Shop Fox Adjustable Leg.*** *Two part, bolt-together legs make height adjustments easy with this bench.*

SHOP FOX ADJUSTABLE HEIGHT LEGS

Legs with adjustable heights are really helpful when customizing a bench for your shop. *Grizzly* offers some heavy-duty *Shop Fox* legs made of angle iron and plate steel. Each leg has a capacity of up to 2,000 pounds. For even more stability, you can bolt the legs to the floor. This pair is less expensive than the *Shop Fox* leg system on the opposite page, but it's still a good choice for a dependable bench.

The legs are available in two widths. You can get a pair that has a top width of 28", or if you're looking for a large benchtop, a 36" top width is offered. With an adjustable height range of 6", your bench can go from 30" to 36" tall.

One thing to note is that each side is sold separately, so you'll have to purchase two leg sets for a standard bench. *Grizzly* also has steel stringers (stretchers) available for whichever width you decide to go with (refer to Sources on page 51). Or, you can make your own stringer out of wood like we did.

EDSAL FLARED LEGS

What sets these *Edsal* legs apart from the others is their flared "foot" at the bottom. This not only provides a unique look, but it gives the bench a wider footprint for greater stability.

With a depth of 36", 14-gauge steel, and a fixed height of 32", this pair of legs makes a great base for a workbench. And they have a powder-coated finish.

These welded legs not only come pre-punched to accommodate a top and shelves, but they also have double electrical knockouts (see inset photo at right). Both the front and back ones will accept a standard 1⅞" electrical box for built-in power.

Once this bench is all put together, it'll be able to take on up to a 6,000-pound load. Adding a stringer (stretcher) makes the frame of the bench more rigid. You can buy a steel stringer from *Edsal* (also available on *Amazon*), or make your own out of plywood or solid wood.

► ***Edsal Flared.*** *Double knockouts in the front and back let you hook up a standard electrical box.*

▲ ***Rockler Workbench Leg Kit.*** *Resin legs create a solid bench and offer a great strength-to-weight ratio.*

UNIVERSAL WORKBENCH LEGS

While most workbench legs are made from steel, this leg kit (sold by *Rockler*) is made from plastic resin. I'll admit that I had some reservations about these legs at first, but once I had it all assembled, I was amazed at how sturdy this bench really is.

Surprisingly, the resin legs actually have a better strength-to-weight ratio than steel. Plus, the design of the legs helps keep the assembly square and combats racking forces.

All you need are some 2x4s and plywood or MDF to put together a bench fairly quickly using this kit. You can make your bench just about any size you need. The predrilled screw holes in the legs are angled like pocket holes for easy and fast assembly. One thing to keep in mind with these legs, however, is the height of the benchtop is fixed at 36".

Building a bench using these legs is simple. Each shelf can hold up to 1,000 pounds. With this kit, all you need is a drill and a saw — it only requires you to make straight 90° cuts. And the best part is that all of the hardware is included.

Product	Capacity	Material	Leg Type	Features	Price
Shop Fox Heavy Duty Leg System	5,000 lbs.	Galvanized steel	32" H, Adjustable	Bolts, steel cross braces included	$160
Kreg Universal Bench Legs	600 lbs.	Legs 12-gauge steel Rails 14-gauge steel	15¼"& 29" H, Adjustable	Square shoulder bolts included	Legs $60-$80 Rails $21-$78
Shop Fox Adjustable Height Legs	2,000 lbs. per leg	Welded angle iron plate steel	30"-36" H; can bolt to floor	Sides sold separately	$50-$60 per side
Edsal Flared Legs	6,000 lbs.	Welded 14-gauge steel	32" H, Fixed; can bolt to floor	Pre-punched double electrical knockouts	$65
Universal Workbench Leg Kit	1,000 lbs.	Plastic resin	36" H, Fixed	All hardware included	$68

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.

INCRA I-BOX *(p.10)*

- **Lee Valley**
  I-Box 86N60.20

T-TRACK *(p.12)*

- **ttrackusa.com**
  Roller Guides 3388
  3/8" T-Track 1019
  Toggle Hold Down 2987
  Hold Down 2990
  Flip Stop 2991
  Miter Track w/ T-Bar 1035

FINISHING STATION *(p.14)*

- **Lee Valley**
  1" Magnet Set 99K39.07
  5/8" Magnet Set 99K39.04
  36" Cont. Hinge 00N01.31
  12" Lazy Suzan 12K01.04
- **Reid Supply**
  Drawer Pull KHO-10

CROSSCUT SLED *(p.20)*

- **McMaster-Carr**
  1/4"-20 PH Screws 91249A539
  1/4"-20 Through Knob . . 6121K311
  1/4"-20 Studded Knob . . . 6042K85
  5/16" Phenolic 9322K16
- **Woodcraft**
  R-to-L Measuring Tape . . 145832

RADIUS CUTS *(p.24)*

- **Rockler**
  8" Compass 36021
- **Lee Valley**
  7 1/2" Compass 05N21.01

LAYOUT TOOL *(p.28)*

- **Lee Valley**
  1 1/4" Knob 00M55.05
  1" Knob 00M55.01
  1/4"-20 T-Slot Nut 05J21.15
  1/4"-20 T-Track 12K79.22

TOOL CABINET *(p.32)*

The tool cabinet is stained with a 50/50 mixture of *General Finishes' Espresso* and *Black Cherry* water-based finishes. It's topcoated with three coats of spray lacquer.

- **Lee Valley**
  No-Mortise Hinges 02H12.02
  Flush Pulls 01A44.31
  Chest Straps 00A18.01
  Chest Corners 00A17.01
  Chest Chains 00F04.01
- **Rockler**
  Stem Bumpers 28373

HANDLING VENEER *(p.42)*

- **Veneer Supplies**
  Super Soft 2 . . . . . supersoft
  Veneer Tape . . . . . vtape
- **Rockler**
  Glycerin 58446

BOX JOINT BLADES *(p.46)*

- **Amazon.com**
  Box Joint Cutter . . . B000ASGV1E
  10" Groover B001MQ55HE
  8" Groover B001MQ6X0W

WORKBENCH LEGS *(p.48)*

- **Rockler**
  Workbench Leg Kit 48509
- **Kreg**
  Bench Legs - Height . . . . . KBS 1
  Bench Rails - Width . . . . . KBS 2
  Bench Rails - Depth . . . . . KBS 3
  Caster Set PRS3090
- **Amazon**
  Edsal Leg Set B000LDC3LU
  Edsal Stringer B002SXGSQW
- **Grizzly**
  Shop Fox Leg Set D2910
  Adjustable Leg D2659
  Steel Stringer D2661

MAIL ORDER SOURCES

Woodsmith Store
800-444-7527

Rockler
800-279-4441
rockler.com

amazon.com

Grizzly Industrial
800-523-4777
grizzly.com

Kreg Tool
800-447-8638
kregtool.com

Lee Valley
800-871-8158
leevalley.com

McMaster-Carr
630-600-3600
mcmaster.com

Reid Supply
800-253-0421
reidsupply.com

ttrackusa.com
888-512-9069

Veneer Supplies
veneersupplies.com

Woodcraft
800-225-1153
woodcraft.com

ShopNotes

Tool Cabinet

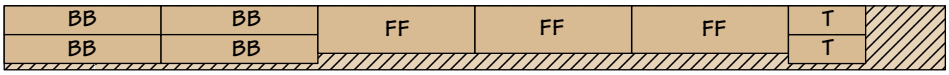
Materials List

A	Case Sides (6)	17⅞ x 15¾ - ¾ Ply.
B	Edging	⅛ x ¾ - 540 rgh.
C	Case Tops/Bottoms (6)	17⅞ x 35 - ¾ Ply.
D	Vertical Dividers (3)	17⅝ x 15 - ¾ Ply.
E	Horizontal Dividers (2)	17⅝ x 35 - ¾ Ply.
F	Middle Divider (1)	17⅝ x 17½ - ¾ Ply.
G	Case Backs (3)	35¼ x 15¼ - ¼ Ply.
H	Side Dividers (6)	17⅝ x 8½ - ¾ Ply.
I	Small Divider (1)	17⅝ x 3⁹⁄₁₆ - ¾ Ply.
J	Shelves (2)	16¾ x 16¾ - ¾ Ply.
K	Upper Door Stiles (2)	¾ x 2½ - 10⁹⁄₁₆
L	Upper Door Rails (2)	¾ x 2½ - 12⅝
M	Upper Door Panel (1)	12½ x 6⁵⁄₁₆ - ¼ Ply.
N	Lower Door Stiles (4)	¾ x 2½ - 14⅜
O	Lower Door Rails (6)	¾ x 2½ - 12½
P	Center Stiles (2)	¾ x 2½ - 5⅜
Q	Narrow Door Panels (4)	5⅜ x 5⅜ - ¼ Ply.
R	Wide Door Panels (2)	12½ x 3 - ¼ Ply.
S	Sm. Drawer Fronts (8)	½ x 2¹⁵⁄₁₆ - 7⅞
T	Sm. Drawer Backs (8)	½ x 2¹⁵⁄₁₆ - 7⅞
U	Sm. Drawer Sides (18)	½ x 2¹⁵⁄₁₆ - 16
V	Sm. Drawer Bottoms (8)	15¾ x 7⅜ - ¼ Ply.
W	Center Drawer Front (1)	½ x 2¹⁵⁄₁₆ - 16⅞
X	Center Drawer Back (1)	½ x 2¹⁵⁄₁₆ - 16⅞
Y	Center Drawer Bot. (1)	15¾ x 16⅜ - ¼ Ply.
Z	Med. Drawer Fronts (2)	½ x 2¹⁵⁄₁₆ - 16¾
AA	Med. Drawer Backs (2)	½ x 2¹⁵⁄₁₆ - 16¾
BB	Med. Drawer Sides (4)	½ x 2¹⁵⁄₁₆ - 16
CC	Med. Drawer Bottoms (2)	15¾ x 16¼ - ¼ Ply.
DD	Lg. Drawer Fronts (2)	½ x 4²⁷⁄₃₂ - 34⅜
EE	Lg. Drawer Backs (2)	½ x 4²⁷⁄₃₂ - 34⅜
FF	Large Drawer Sides (4)	½ x 4²⁷⁄₃₂ - 16
GG	Lg. Drawer Bottoms (2)	15¾ x 33⅞ - ¼ Ply.
HH	Legs (4)	3 x 2¾ - 16
II	Leg Veneer (8)	⅛ x 3 - 16
JJ	Front/Back Aprons (2)	1½ x 3 - 32
KK	Side Aprons (2)	1½ x 3 - 14
LL	Corner Blocks (4)	¾ x 3½ - 9

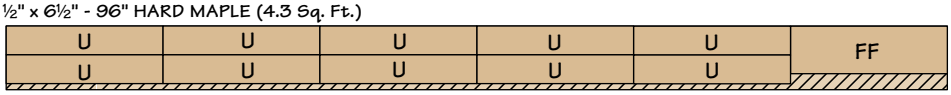
- (78) Nylon Stem Bumpers
- (6) 2½" x 1" No-Mortise Hinges w/Screws
- (18) 1¹¹⁄₁₆" x 2¼" Recessed Finger Pulls
- (112) #5 x ⅜" Fh Brass Woodscrews
- (4) Magnetic Catches w/Screws
- (2) 9½" Chest Chains
- (20) ⅝" x 2" Chest Straps
- (4) ⅝" x 2" Chest Corners
- (1) 2" x 12" - 1⁄16" Brass Bar Stock
- (8) #8 x 2" Fh Woodscrews
- (8) #8 x 1¼" Fh Woodscrews

Cutting Diagram

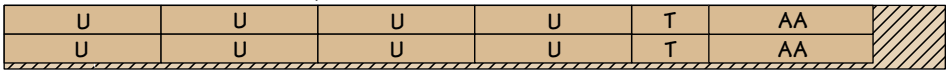
½" x 6½" - 96" HARD MAPLE (4.3 Sq. Ft.)



½" x 6½" - 96" HARD MAPLE (4.3 Sq. Ft.)

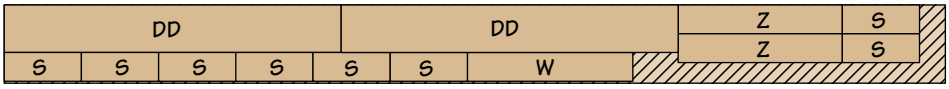


½" x 6½" - 96" HARD MAPLE (4.3 Sq. Ft.)



½" x 6½" - 96" HARD MAPLE (4.3 Sq. Ft.)

½" x 8" - 96" QUARTERSAWN WHITE OAK (5.3 Sq. Ft.)



Cutting Diagram cont.

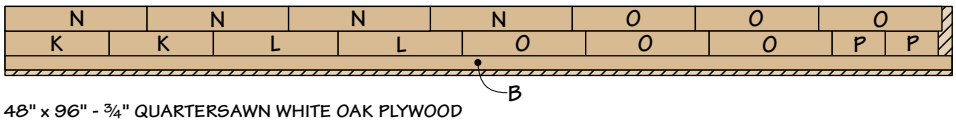
8/4" x 7" - 84" QUARTERSAWN WHITE OAK (8 Bd. Ft.)

8/4" x 4" - 72" QUARTERSAWN WHITE OAK (4 Bd. Ft.)

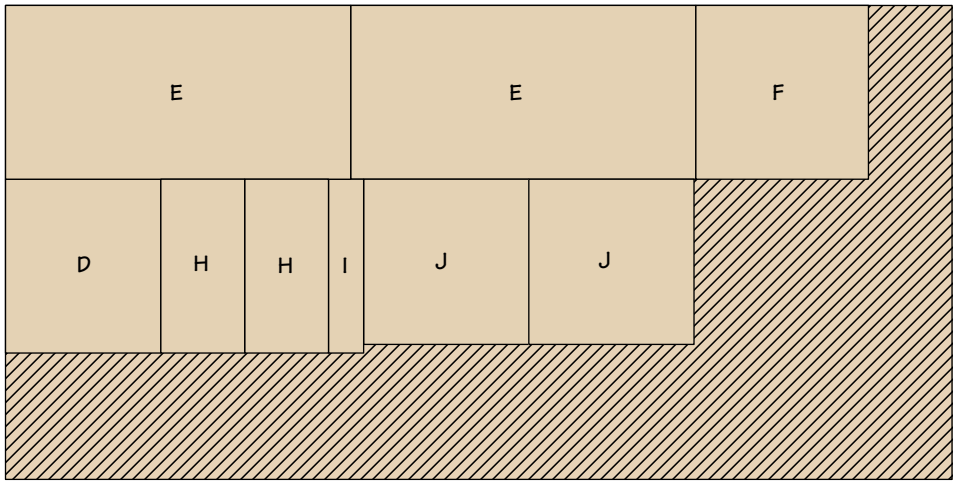
3/4" x 7¼" - 84" QUARTERSAWN WHITE OAK (4.2 Bd. Ft.)

NOTE: PART II RESAWN AND PLANED TO ⅛"-THICK

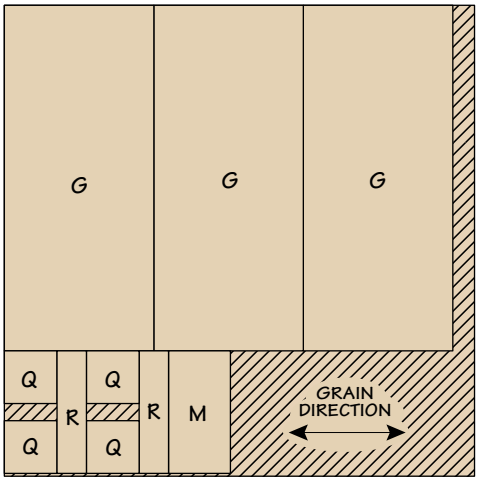
3/4" x 7" - 96" QUARTERSAWN WHITE OAK (4.7 Bd. Ft.)



48" x 96" - 3/4" QUARTERSAWN WHITE OAK PLYWOOD

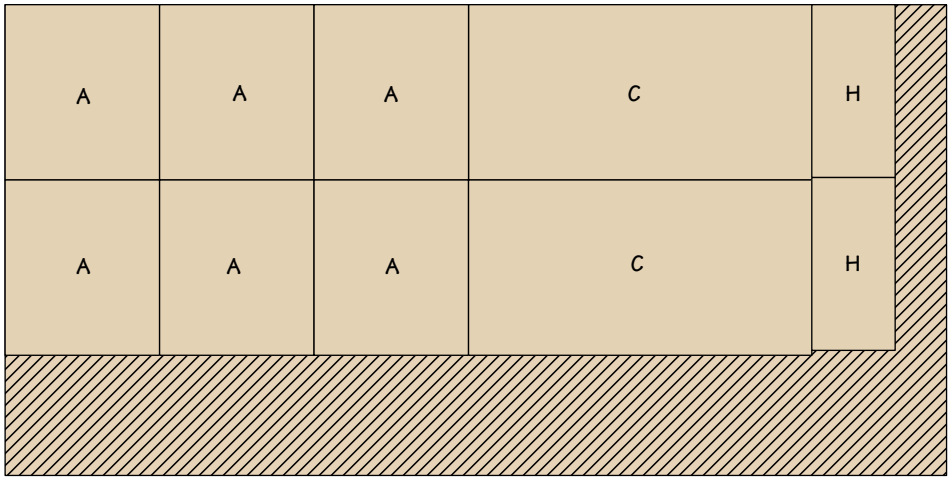


48" x 48" - ¼" QUARTERSAWN WHITE OAK PLYWOOD

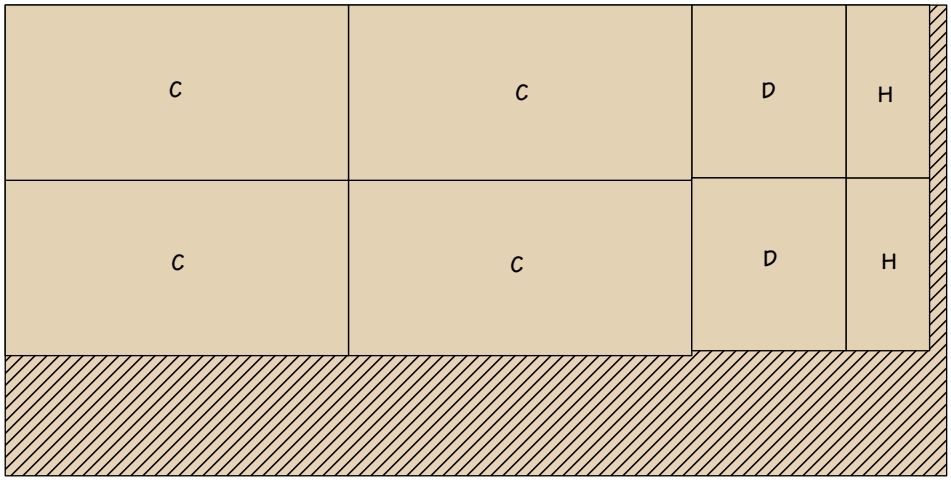


Cutting Diagram cont.

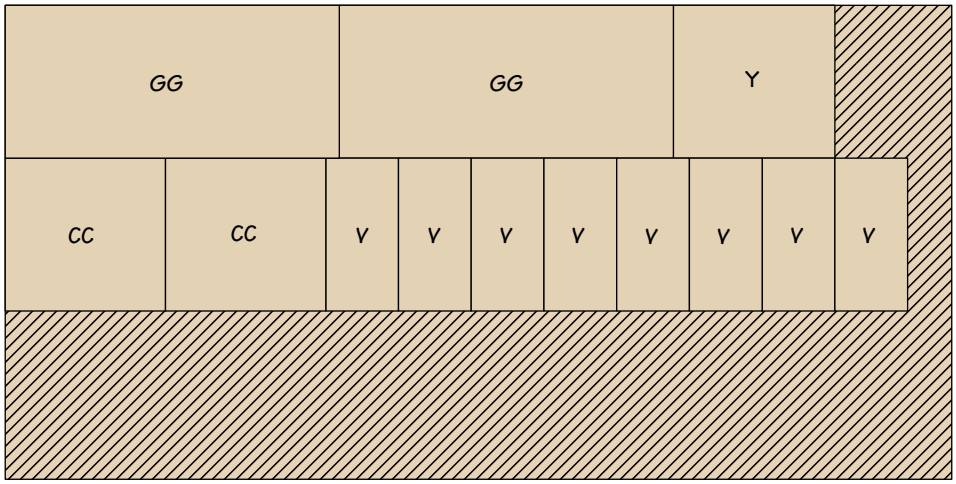
48" x 96" - ¾" QUARTERSAWN WHITE OAK PLYWOOD



48" x 96" - ¾" QUARTERSAWN WHITE OAK PLYWOOD



48" x 96" - ¼" BIRCH PLYWOOD



ShopNotes

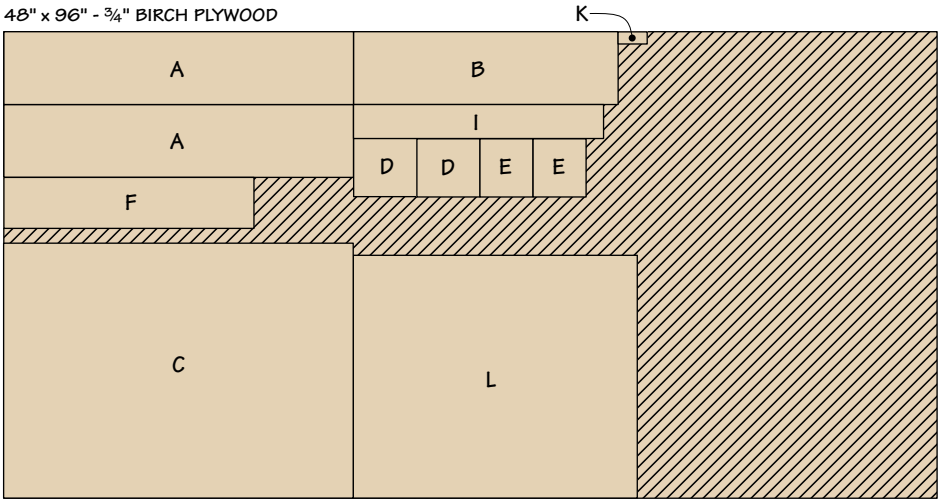
fold-up Finishing Station

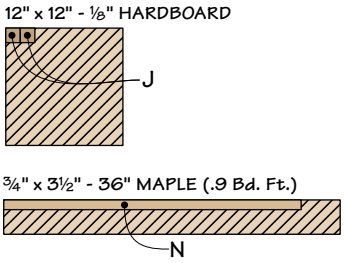
Materials & Hardware List

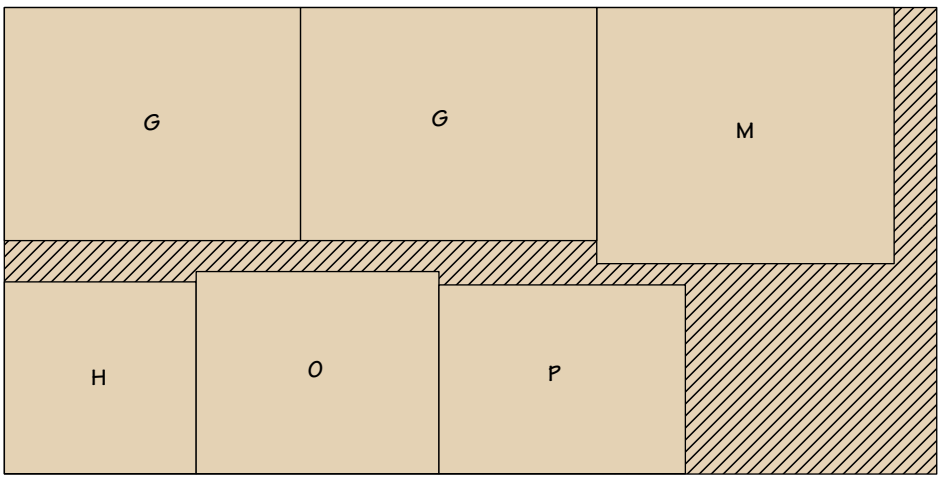
A	Sides (2)	7½ x 36 - ¾ Ply.
B	Top (1)	7½ x 27¼ - ¾ Ply.
C	Back (1)	26¼ x 36 - ¾ Ply.
D	Pivot Blocks (2)	6 x 6½ - ¾ Ply.
E	Stop Blocks (2)	6 x 5¼ - ¾ Ply.
F	Front (1)	5¼ x 25¾ - ¾ Ply.
G	Platform (1)	24 x 30½ - 1½ Ply.
H	Turntable (1)	19¾-dia. x ¾ Ply.
I	Cleat (1)	3½ x 25¾ - ¾ Ply.
J	Spacers (2)	1¼-dia. x ⅛ Hdbd.
K	Catch Block (1)	1¼ x 3 - ¾ Ply.
L	Right Door (1)	25 x 29¼ - ¾ Ply.
M	Left Door (1)	26⅜ x 30⅝ - ¾ Ply.
N	Stile (1)	¾ x 1 - 30⅝
O	Right Wing (1)	20 13/16 x 25 - ¾ Ply.
P	Left Wing (1)	19 7/16 x 25⅜ - ¾ Ply.

- (20) #8 x 1¼" Fh Woodscrews
- (2) ⅜" x 3" Lag Screws
- (2) ⅜" Washers
- (4) 36" Continuous Hinges w/Screws
- (1) 12"-dia. Lazy Susan Bearing
- (1) 4" Barrel Bolt Sliding Catch
- (2) 1"-dia. Rare-Earth Magnets w/Cups & Washers
- (2) ⅝"-dia. Rare-Earth Magnets w/Cups & Washers
- (1) Door Pull
- (1) ¼"-dia. x 6" Dowel

Cutting Diagram







Scenes from the Shop

Store your tools in style. This cabinet is based on 19th-century campaign chests and features loads of storage options. You'll find the detailed plans starting on page 32.

Perfect-fitting box joints in minutes? It's possible with this unique jig. Simple adjustments keep the setup time to a minimum. Learn all about this new jig on page 10.