Easy-To-Master Table Saw Technique

ShopNotes

Vol. 18 Issue 104

Simple Router Add-On

Dozens Of Shop Uses!

Top 5! Workbench Accessories

pg. 44

ALSO INSIDE:

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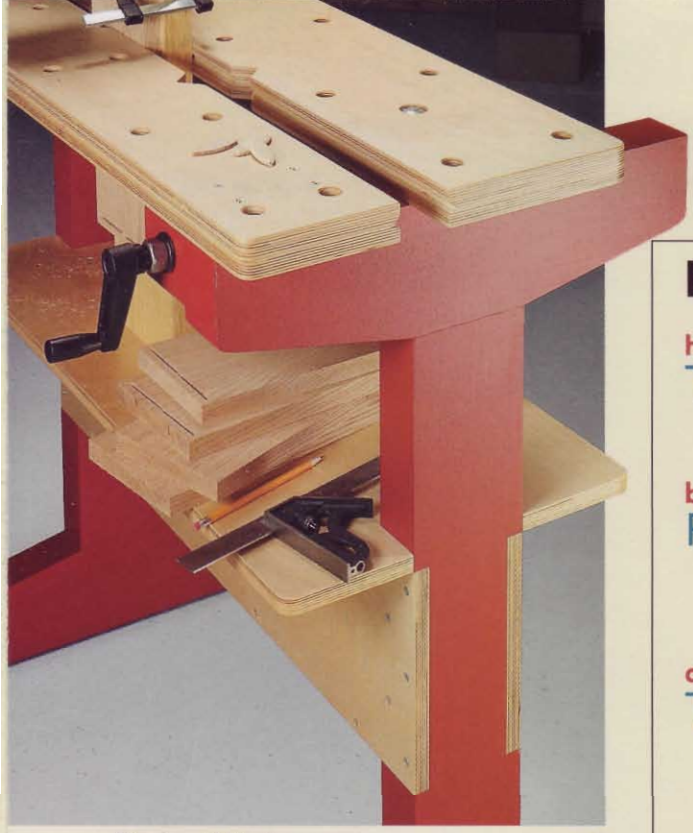
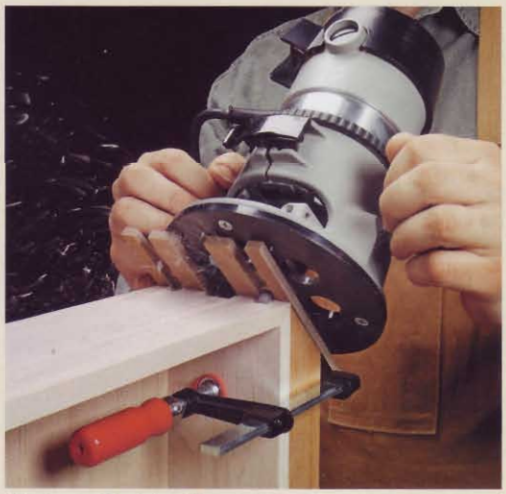


Project Workcenter *page 16*

Great Gear *page 48*



Using Guide Bushings *page 8*

Contents

Features

Departments

Wall-Mounted Tool Rack *page 36*

Cutoffs

If there's one lesson I've learned in the shop, it's that it pays to get back to basics every once in a while. The projects and techniques you'll find inside this issue allow you to step back and take a fresh look at the basics of woodworking.

To start off, you'll find some fundamental techniques you can use on any project — like tapering a workpiece on the jointer or getting more out of your router and table saw. You're sure to find something you can put to use right away. You'll also learn about some simple accessories you can use at the workbench to help you along with your everyday woodworking tasks.

The projects inside are sure to get your attention, too. The table saw workstation provides an extra-large worksurface for making a small benchtop saw work big. But it folds up for easy storage. The project workcenter is a heavy-duty small bench with a clamping top. So clamping workpieces or assembling a project is a breeze. Finally, the easy-to-build wall rack makes the most of wall space near your workbench. You can keep the tools you use most often within easy reach.

As you can see, there's a lot of great stuff packed inside. And you can find much more online at *ShopNotes.com*.

Terry

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This symbol lets you know there's more information available online at ShopNotes.com

Tips for Your Shop

Dual-Purpose Fence

Since my shop is small, I've incorporated a router table into my table saw wing. But instead of hassling with a dedicated fence when routing, I came up with a dual-purpose auxiliary fence that clamps to the rip fence. You can see what I mean in the photo above.

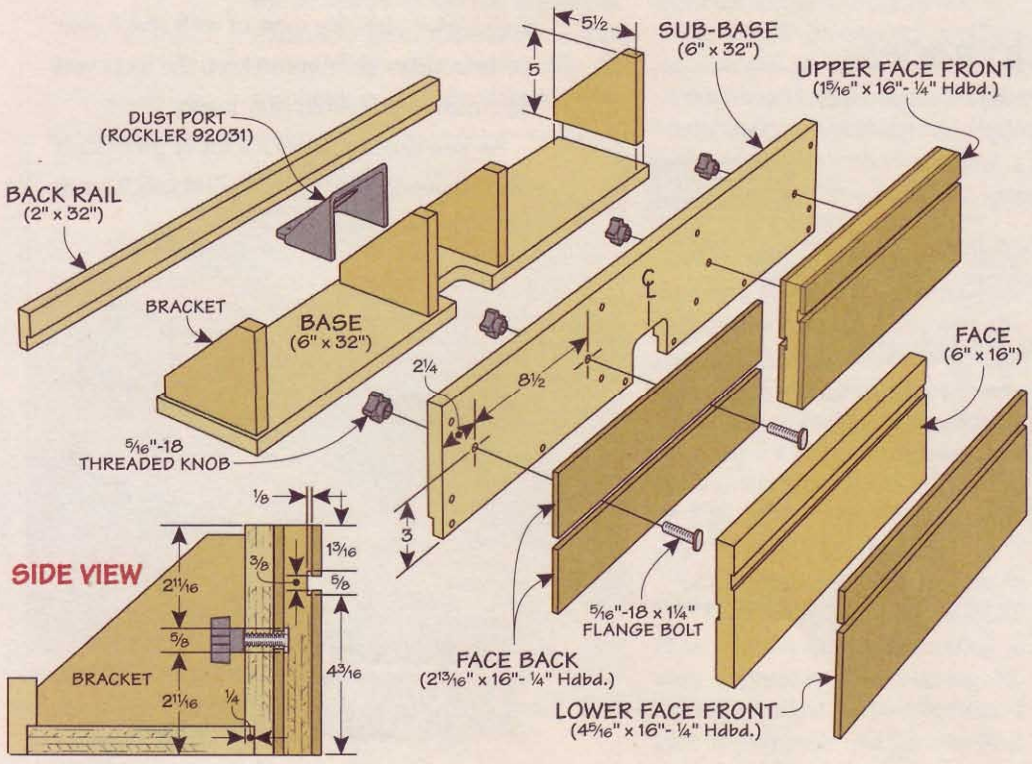
The beauty of this fence is that I can use it for both routing and table saw operations. When used with the router, I can take advantage of the built-in dust collection port. And there are split faces that can be adjusted to accommodate any size of router bit. The T-slot on the face allows me to use featherboards and other accessories.

To use the fence with the saw, simply clamp it on the side facing the blade. You can still utilize the T-slot for featherboards. But another advantage of the T-slot is it can be used to attach a sacrificial face when cutting rabbets. And the extra-tall fence provides plenty of support for tall workpieces.

The drawing on the left will give you all the details you need to build the fence. You can see how T-slots are formed on the back side of the faces. This allows the faces to be removed or adjusted.

Since building this fence, I can't imagine being without it. I find myself using it on almost every project I build in the shop.

Jesse Schmidtberger
Olathe, Kansas



Band Saw Cage

When cutting small pieces on the band saw, some may shoot away, never to be seen again. To help corral these small cutoffs, I built the jig shown at right. It's made from an inexpensive small plastic container and a piece of scrap for a base. The container forms a "cage" to keep the small cutoffs from getting lost. To provide clearance for the workpiece and make it easy to remove the small parts, cut an opening on one side. Then you can fasten the container to the base.

To use the jig, cut a kerf partway through the cage, then clamp the base to the band saw table (see photo). Just feed the workpiece into the opening and make the cut. The clear plastic container makes it easy to see your cuts and also helps to keep your fingers away from the blade. But best of all, it prevents the small parts from getting lost.

Ron Altier
West Lafayette, Ohio

Cutoff Labels

I store a lot of my cutoffs in horizontal bins. But I can never tell how long the pieces are without pulling them out and measuring them.

To solve this problem, I got into the habit of sorting them by length. I simply measure each cutoff and place it in the appropriate bin. You could take this a step further and mark each board with the width and type of wood. All it takes is a quick glance to select the right piece for your project.

Ron Talcott
Everett, Washington

Submit Your Tips Online

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SUBMIT A TIP

The Winner!

Congratulations to *Jim Powers* of Bonner Springs, Kansas. His stacking stools (shown on the next page) get a lot of use in his shop. His tip was selected as winner of the *Bosch Impactor* driver, just like the one you see in the photo at right.

To find out how you could win this driver, check out the information above. Your tip just might be a winner.

ShopNotes

Issue 104 March/April 2009

ShopNotes® (ISSN 1062-9696) is published bimonthly (Jan., March, May, July, Sept., Nov.) by August Home Publishing, 2200 Grand Ave., Des Moines, IA 50312.
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Subscriptions: Single copy: $4.95. One year subscription (6 issues): $27.95. Canada/International add $10 per year, U.S. funds.
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ShopNotes Magazine
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AUGUST HOME PUBLISHING COMPANY

Printed in U.S.A.

Versatile Stacking Stools

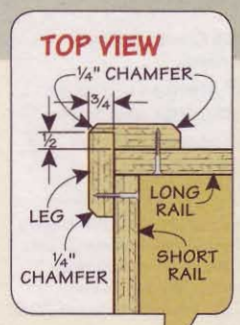
I'm always looking for ways to maximize space and work more efficiently. The stacking stools you see above do the trick. Used alone, they make great assembly tables. When two are stacked together, they're at just the right height for outfeed support at my table saw. And the tray at the bottom is handy for storing small tools and hardware. Plus, their heavy-duty plywood construction means they'll last for years.

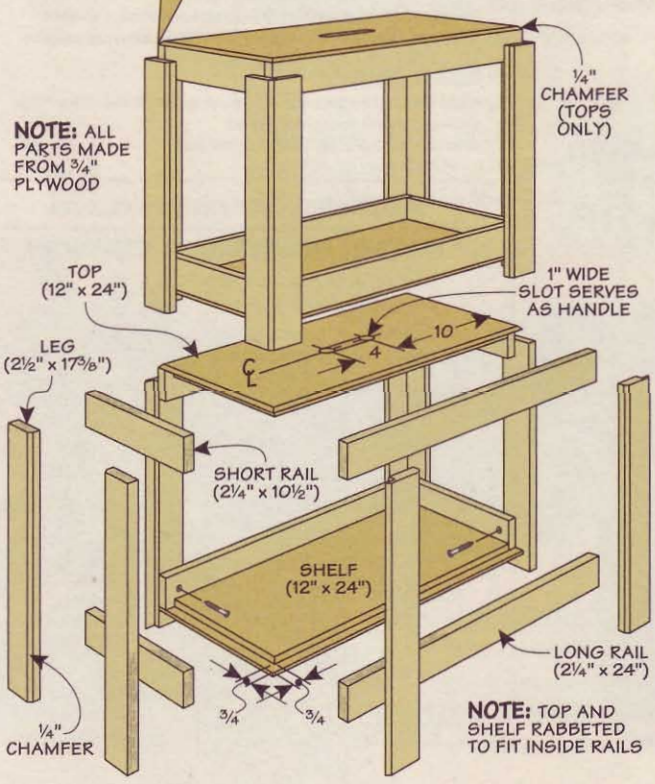
The drawing at left details their simple construction. Start by making a set of legs for each stool. Most of the pieces are put together with rabbet joints to make a strong assembly. The next thing to do is build a set of "boxes." One box will form the top of the stool. The other box is turned over to form a tray. On the top of the stool, I cut a handhold to make it easy to grab and move the stool.

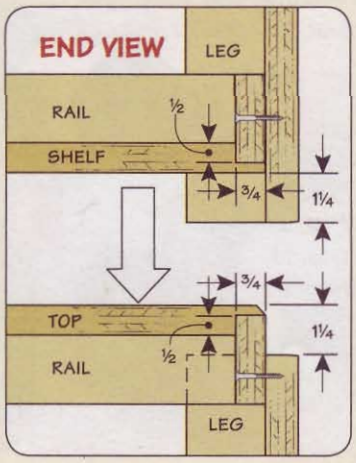
When fastening the top to the legs, the top should sit proud of the legs, as shown in the drawing. This allows you to nest two stools together to create a stable platform. Likewise, the tray should be high enough so that the legs on the upper stool rest firmly on the legs of the lower stool when stacked. Note: You'll want to dry fit the assembly to make sure the stools nest properly and securely.

These stools have come in so handy, I built two pairs and use them for a variety of shop tasks. And when they're not needed, they tuck neatly into a corner.

Jim Powers
Bonner Springs, Kansas





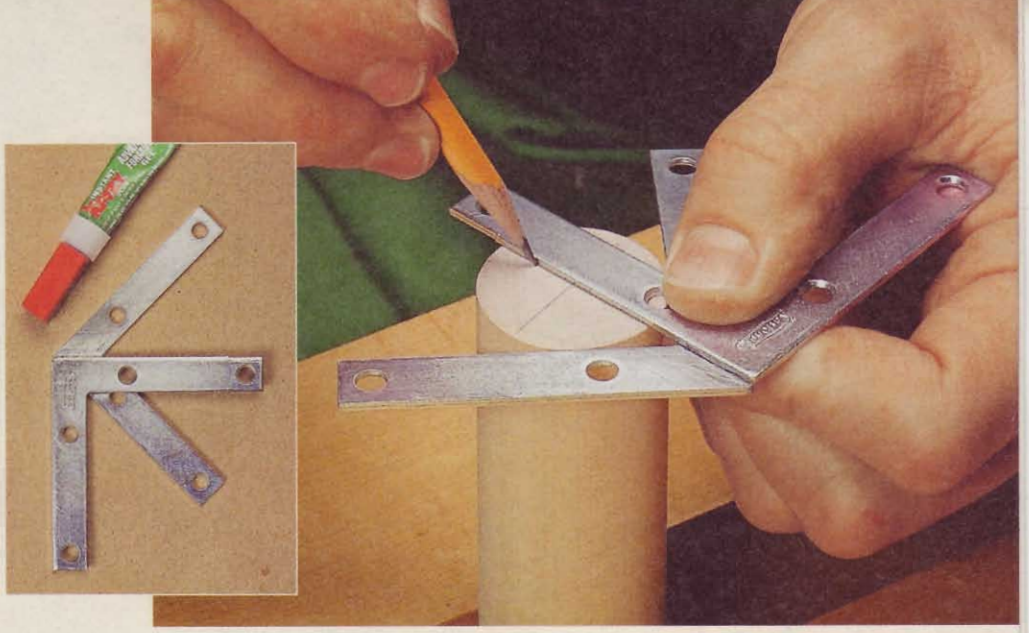


Center Finder

I do a lot of woodturning and can never locate my center finder. So I made several shop-made versions, like the one you see in the photo at right.

All you need are a couple of metal angle braces and cyanoacrylate adhesive like *Krazy Glue*. I use a plastic 45° drafting square to align the braces. It's important that the outside edge of the top brace aligns with the inside and outside corners of the bottom brace (inset photo). I used locking pliers to hold them while the glue sets.

Robert Shillis
Easton, Pennsylvania



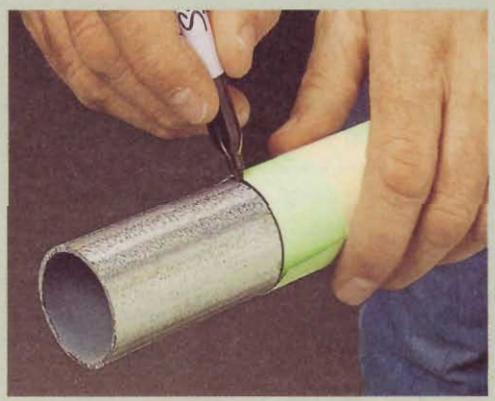
Compact Clamp Storage

While reorganizing my shop, I stumbled upon a quick and inexpensive way to store my odd assortment of clamps. All you need are heavy-duty shelf standards and brackets. You can use brackets of different lengths and arrange them to fit a wide variety of clamps. The important thing is to make sure the standards are securely anchored. (I spaced them every 16" to match the wall studs.) My clamp storage is located above the bench for convenience.

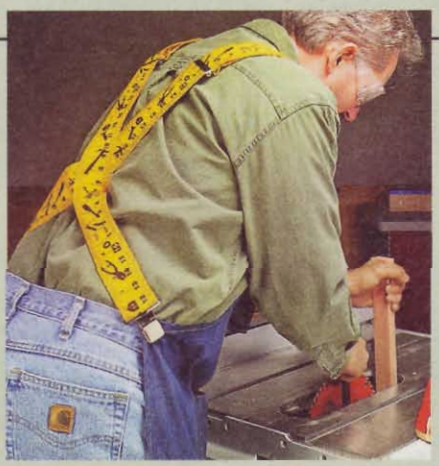
I use a pair of brackets to store long bar clamps and pipe clamps horizontally. And a board placed across a pair of brackets stores my smaller F-style bar clamps. Finally, individual brackets are handy for spring clamps, C-clamps, and handscrews.

Josh Maxey
Urbandale, Iowa

Quick Tips



▲ ***Chris Benda*** *of Gilbert, Iowa found a quick and easy way to mark pipe or tubing. Simply wrap the pipe with a strip of heavy paper and use the edge of the paper to mark a consistent line around the pipe.*



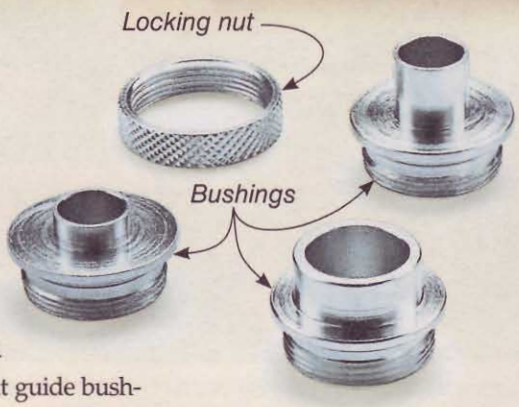
▲ *Most shop aprons have a narrow neck strap that becomes a "pain in the neck" after a while.* ***Mike Larson*** *of Wake Forest, NC solves the problem with a set of wide, clip-on suspenders.*

all about Guide Bushings

These inexpensive accessories make it easy to add precision and control to many router bits.

Part of what makes a router such a useful tool is that with a small assortment of bits, you can do a wide variety of tasks. One way to help you get even more out of those bits is to add a simple accessory — a set of guide bushings.

A guide bushing allows you to steer a bit with precision and control, so you'll get consistent results time after time. Most woodworkers are somewhat familiar with guide bushings since they're commonly used with half-blind dovetail jigs. But guide bushings are good for more than just half-blind dovetails.



▲ ***Two-Piece Design.*** *The most common type of bushing is held in place with a locking nut.*

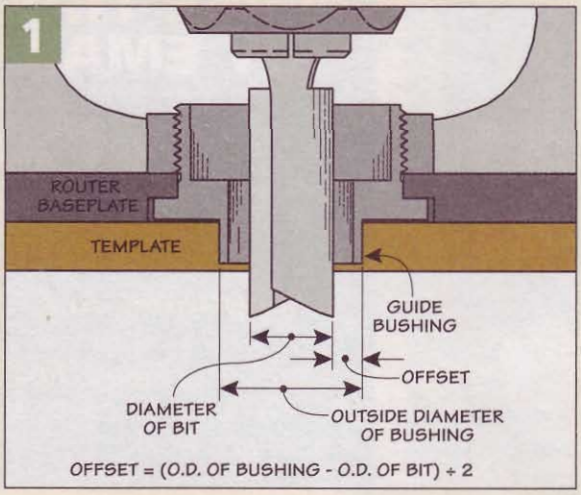
What They Are. When you get down to it, a guide bushing is nothing more than a metal collar that attaches to and extends below your router's baseplate, as you can see in the drawing at left.

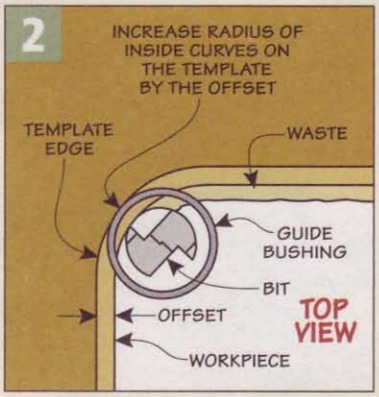
The bushings come in a range of diameters and lengths. Some are designed for specific uses like sign-making jigs or creating inlay patterns. (You can find sources for bushings on page 51.)

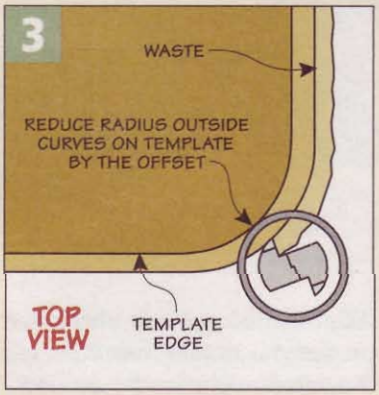
Following a Template. A guide bushing acts a lot like the bearing on a profile bit. The main difference is that since the bushing is located above the bit, you can make a cut anywhere on the workpiece. To do this, the bushing works in conjunction with a guide or template, as shown in Figure 1. The bushing follows along the edge of the template to control the bit as you make the cut. This lets you cut anything from perfectly straight lines to complex shapes.

This is the basic idea. But there's an important detail to be aware of to get the best results.

The Offset. In Figure 1, you can see that the bushing isn't flush with the outside edge of the bit. When you make the template and align it on your workpiece, you'll need to account for this difference. For example, using a ⅝" O.D. bushing







with a ¼" straight bit, the offset is 3/16". For dadoes or grooves, this just means the template needs to be offset from the layout line 3/16".

Curves. If the cut you want to make includes curves, the offset affects how you lay out those curves on the template. The kind of adjustment you need to make depends on whether the curve is an inside or outside radius.

To get a curve of the correct radius, you need to increase the radius for inside curves by the amount of the offset, as in Figure 2. On outside curves, the radius is reduced by the offset amount. This is illustrated in Figure 3.

Don't Sweat it. In my experience, dealing with the offset is probably the biggest obstacle when using a guide bushing. But as you can see, it's really just a matter of careful layout. And after a few uses, it'll be second nature.

Finally, try out one of the techniques shown in the box at right. I think they'll inspire you to find a few ways to use these versatile accessories. In the end, it will improve your woodworking.

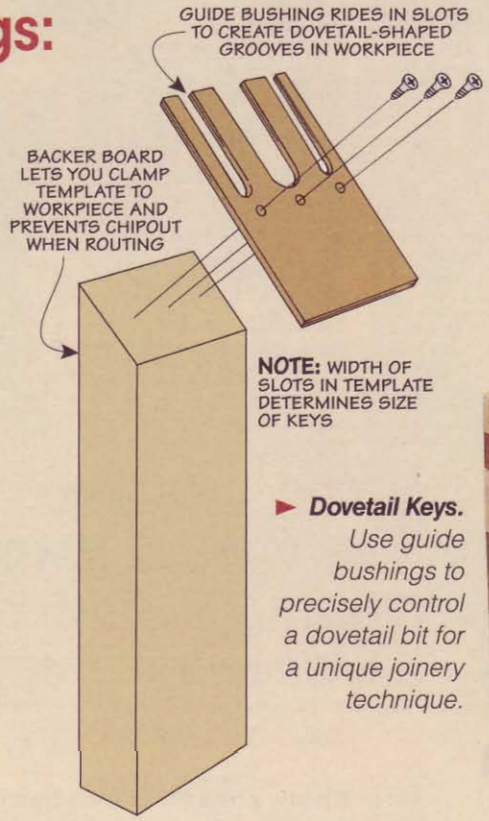
guide bushings: At Work

JOINERY

Using guide bushings for joinery can be as simple as a straightedge for dadoes and grooves. Or you can make something a little more involved like the dovetail key template shown here.

The template has fingers to direct a dovetail bit inside a bushing to rout dovetail-shaped notches (photo on opposite page). Then you can cut mating "keys" to strengthen (and decorate) miter joints, as in the photo at right.

The gap between the fingers controls the width of the keys. And since you make the keys to fit, you don't have to worry about exact sizing or spacing when making the template.



► ***Dovetail Keys.*** *Use guide bushings to precisely control a dovetail bit for a unique joinery technique.*

SURFACE EFFECTS

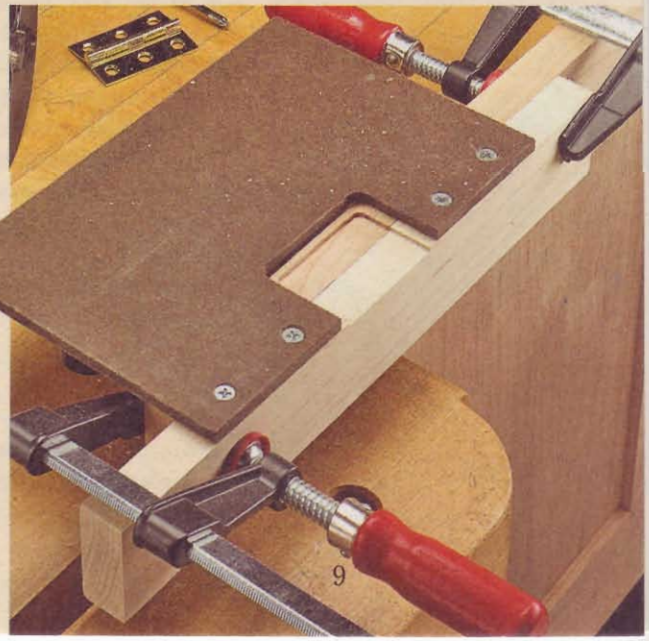
One of the great things about using a guide bushing and template is you can make a cut anywhere on the workpiece. You can see what I mean in the photo at right.

I'm routing a juice groove in a cutting board with a core box bit. This task would be impossible to do freehand. The template also gives me a good idea of the size and spacing of the groove on the cutting board. This same principle applies to other jobs like routing flutes.

◄ ***Juice Groove.*** *Guide bushings let you create "profiles" away from the edge of a workpiece.*

HARDWARE

Another way a guide bushing and template comes in handy is cutting perfectly sized recesses and mortises for hardware — for example, the hinge mortise shown at right. In this case, you need to size the template to account for the offset. Then it's a snap to create identical recesses any time. And you'll never have to worry about the fit.



► ***Hinge Mortise.*** *A guide bushing follows the template to create a flawless hinge mortise.*

Hardware

continuous Hinges

Strong, versatile, and easy to install, continuous hinges are great choice for a wide range of applications.

When a project calls for a heavy-duty hinge, like the benchtop table saw workstation on page 24, a continuous (or piano) hinge should be given first consideration. Like the ones shown in the margin, they're the perfect choice for solid, easy-to-install hinge hardware.

What They Are. A continuous hinge typically has two thin leaves. But don't be fooled, it's strong enough for just about any application, for a couple good reasons. First, the hinge (and pin) run the entire length of a door or lid, so it resists heavy-duty twisting and pulling. And with all the screws installed in each leaf, the hinge is resistant to pullout.

For these reasons, I've found that continuous hinges are a great choice, whether I'm building cabinets and small boxes, or shop jigs and fixtures. But it's always a good idea to understand exactly what's available and the best way to use them.

I usually use continuous hinges on frameless doors and lids. The barrel is visible when the hinge is closed, but it closes flat and usually complements the appearance of the project I'm building. You can also mortise (recess) or surface mount the hinge to suit your needs (drawings below).

Either way, the installation is easy. All you need to do is line up the hinge and attach it with the screws. To help with the installation, many continuous hinges now come with a few slotted holes. You can use the slotted holes to accurately locate the hinge and then secure it through the remaining holes.

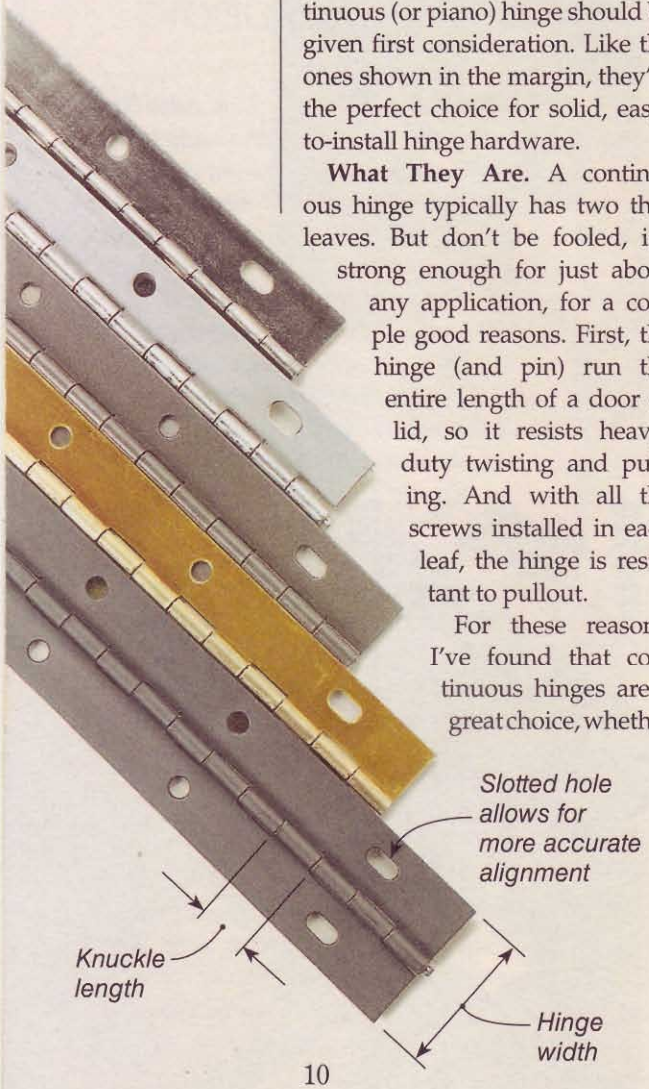
As you can see on these pages, continuous hinges are available in a wide range of styles, and finishes. All of which come into play in the project you plan to use them on. But what might be more important is the size of the hinge itself.

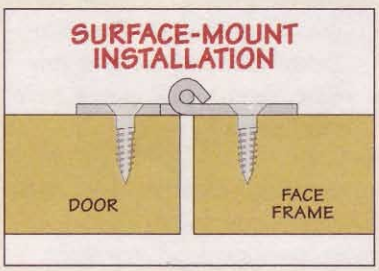
Widths. Continuous hinges come in varying widths — usually defined by the open width of the hinge, as shown at left. But some hinges, like the box stop hinge at the top of the opposite page, are specified by their closed width.

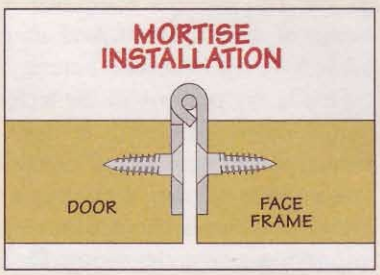
Some specialized hinges aren't defined by their open or closed width, like the ones in the box on the opposite page. Instead, it's the use and function you need to be aware of when it comes time to order hardware for a project.

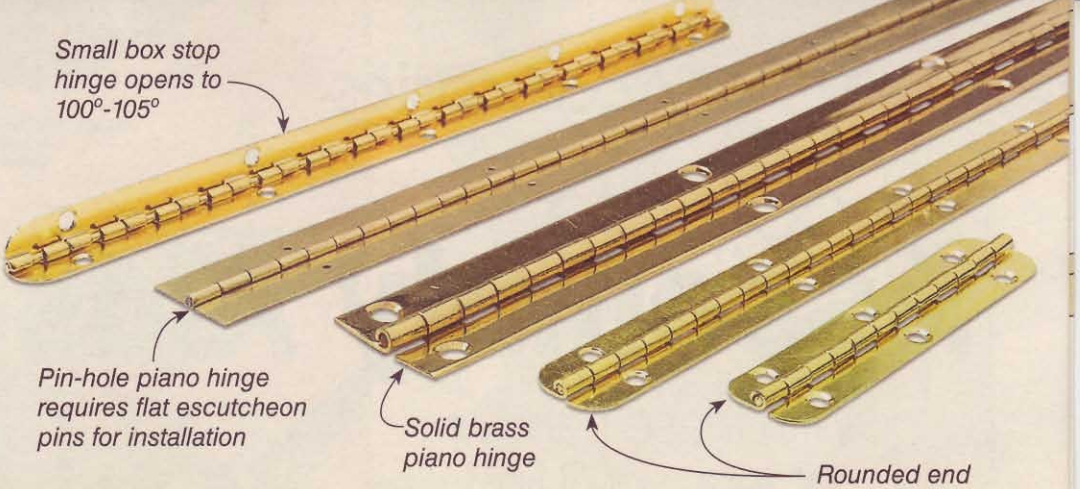
Besides the width, another important thing know is the length of the hinge. You'll find hinges from a few inches all the way up to 96".

Longer hinges usually come in even foot increments, so you'll almost always have to cut them to the length you need. But because







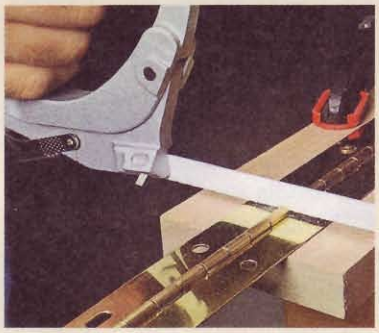


► ***Specialty Hinges.*** *Most of these small box hinges are meant to be used without cutting to provide a more finished look.*

of their construction and fixed pin, that's a simple process.

Cutting to Size. The main thing to consider when cutting a hinge to size is the knuckle length (margin on opposite page). The continuous hinges I use most often have knuckles ½" in length. So even though it's possible to cut the hinge anywhere along its length, it's best to cut in even ½" increments. That means you'll want to design your project to suit.

A continuous hinge needs solid support for cutting because of the thin leaves. This way, you don't have to worry about crushing or bending the hinge.



▲ ***Cutting to Length.*** *Screwing a hinge to a scrap piece provides solid support while you cut it to length with a hack saw.*

What I like to do is screw the hinge to a scrap and then use a hack saw to cut it to the length I want, as you can see in the photo below. The scrap provides support to "stiffen" the hinge for cutting. And once the hinge is cut, it's a good idea to grab a file and clean up the ends to remove any burrs.

Screw Hole Spacing. One thing I should mention is that the hole spacing for the hinge screws may affect where you cut the hinge. It never seems to fail that the length I want and the positioning of the holes never work out evenly.

At times I've had to trim both ends of a hinge to center the holes along each leaf. And I still may end up with hole positions I don't like. A solution to that problem is to buy a continuous hinge without screw holes (margin). This way, you can decide exactly where to drill and install the screws.

Screw Sizing. Speaking of screws, you'll want to be sure to size the screws to match the hinge. As you might expect, hinges come in a variety of sizes, so the screws do as well. Many continuous hinges will come with appropriately sized screws. But it's not unusual to have to order the screws separately.

When that's the case, the size required should be listed for each hinge. You'll also notice that some hinges don't use hinge screws. For a thinner, more delicate hinge (photo above), the installation will require small nails or escutcheon pins.

As you can see, there's more to choosing and using a continuous hinge than meets the eye. It's a handy piece of hardware that comes in a wide range of styles and sizes, so you can find one to suit just about any need.

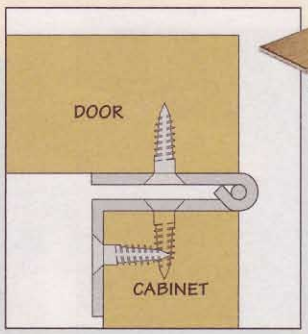
▲ ***No Holes.*** *Selecting a continuous hinge without pre-drilled screw holes allows you to position the holes as needed for a project.*

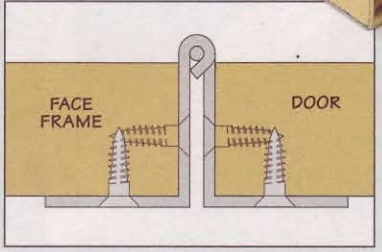
heavy-duty Wrap-Around Hinges

While standard continuous hinges work great, there are times when you may need a more secure installation. The hinges shown in the main photo and at the far right are just the solution.

Like other continuous hinges, they come extra-long (48") so you can cut them to the length you need. What makes these two hinges different is the design of the leaves. As you can see, the single wrap-around hinge (upper photo) features a 90° leaf. While the full wrap-around hinge (lower photo) has two 90° leaves. Note: Because of the leaf design, these hinges work best with ¾" material.

This wrap-around design provides more strength since it allows you to screw the leaf into the face and edges of a workpiece (drawings at right). For materials like plywood and MDF, this is a stronger and more secure installation. For sources, turn to page 51.



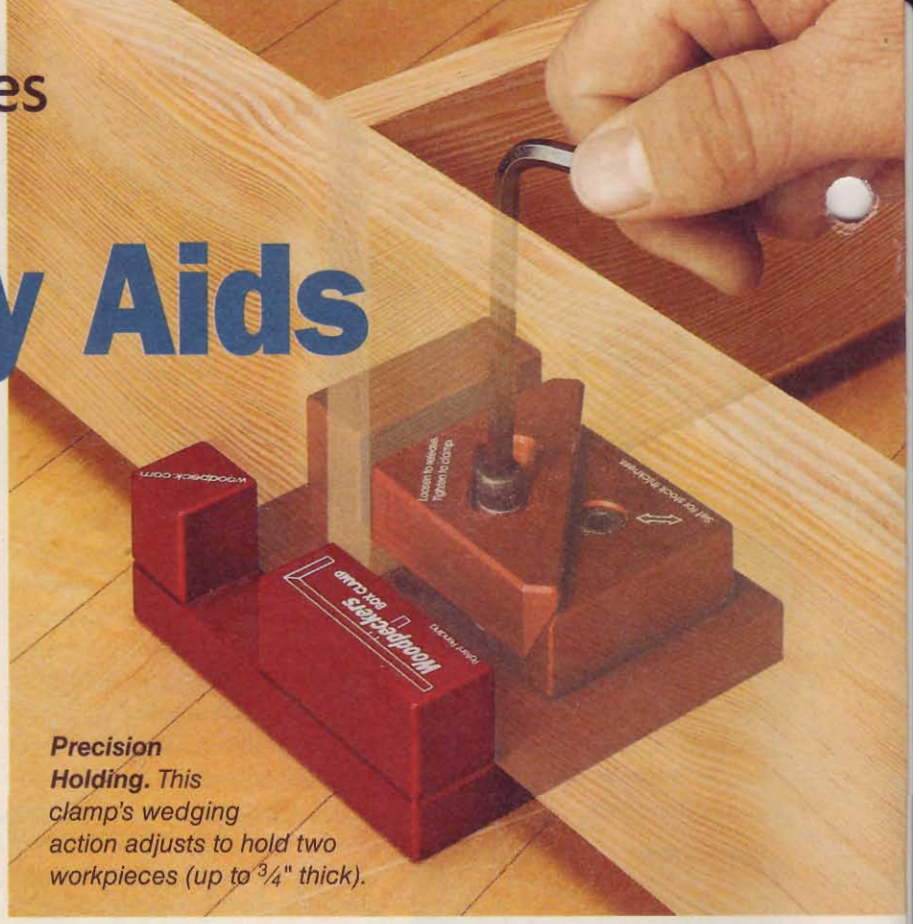


▲ ***Wrap It.*** *These wrap-around hinges are perfect for high-strength installations.*

accurate Assembly Aids

With these handy helpers, you'll find assembling any project is a lot less stressful.

A lot of woodworking involves building boxes — from jewelry boxes to cabinets. And when it's time to glue up the sides, top, and bottom, it's nice to have some help holding the workpieces in position. The products shown on these pages fill the bill.



Precision Holding. *This clamp's wedging action adjusts to hold two workpieces (up to ¾" thick).*

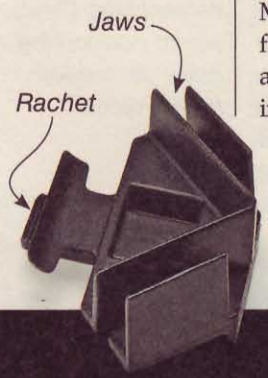
BOX & CASE ASSEMBLY

The *Box Clamp* you see above is a heavy-duty, high-tech fixture. Made by *Woodpeckers*, it's milled from solid aluminum to ensure accuracy. And its unique wedging action clamps the workpieces securely while you work.

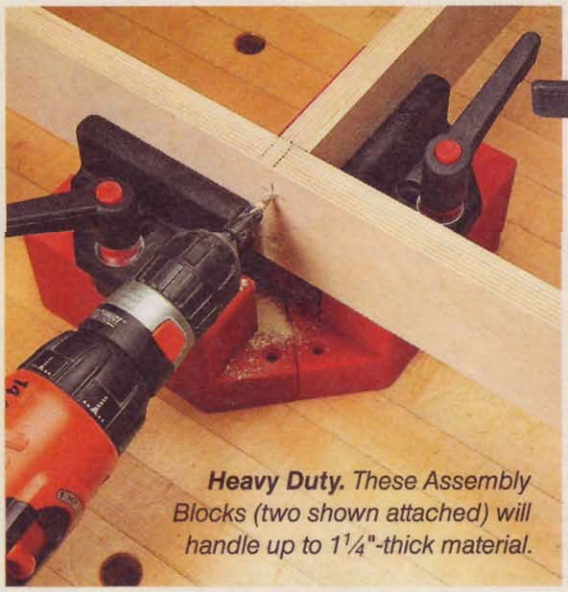
To use the box clamp, loosen the wedge and slide it against the workpieces. Then as you tighten the screw with the included Allen wrench, the wedging action clamps them tight.

Right-Angle Assembly. Having several of the inexpensive *Lee Valley* clamps within reach makes glue-ups go faster (lower left photo). You can put them in position at the corners or right-angle joints and ratchet them tight with one hand. That's a big plus, particularly when putting together a complex assembly.

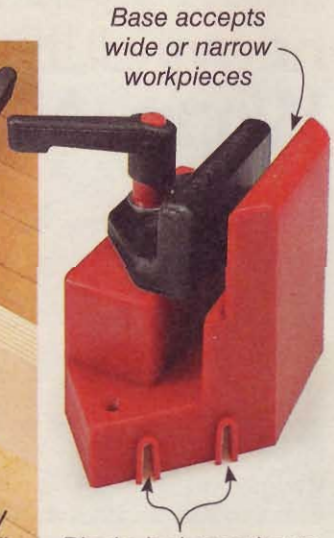
Simple and Fast. The *Assembly Blocks* from *FastCap* (below right) can handle any project from small boxes to large cabinet carcases. The stepped design of the fixed base accommodates wider cabinet sides or narrower pieces for small box construction. Simply slide the movable jaw against the workpiece and tighten it down with the ratcheting handle.



Ratcheting. *This right-angle clamp by Lee Valley clicks tight for box assembly.*



Heavy Duty. *These Assembly Blocks (two shown attached) will handle up to 1¼"-thick material.*



Blocks lock together to form a 90° assembly jig (photo at left)

▲ **Square Corners.** *With a few of these on hand, squaring up an assembly is a snap.*

CLAMPING SQUARES

While the products on the opposite page are great for assembling boxes and cases, I like to keep a few of the clamping squares you see on this page on hand. These useful shop assistants are made with precision to guarantee *any* project is assembled square. All you need to do is clamp them into a corner as you glue up a project. They help eliminate the constant checking for square that happens during assembly.

CNC Precision. If the ultimate in precision is what you're after, *Woodpeckers* comes through once again. They manufacture two types of clamping squares: one made from solid aluminum and the other made from phenolic. Both are milled square on the inside *and* outside faces.

Shop Precision. The aluminum *3D Squares* (top center photo) are precision milled on the outside faces. The right-angle flanges provide a lot of surface area for applying clamps. The *Rockler Clamp-It* squares (above right) are made from lightweight molded plastic. And *Rockler* also makes a *Clamp-It* to use when working with odd angles (box below).

Assembly Fixtures. There's another thing I like about the clamping aids I've talked about. Most of them can be fastened to a plywood base for use as an assembly jig (inset photo). This frees up your hands and lets you concentrate on applying glue, positioning the workpieces, and tightening the clamps. Using the clamping squares this way is great for building cabinet face frames, for example. You can quickly build your own jig for locating the frame pieces and keeping them square as you fasten them together.

Sources. These useful accessories make a great addition to your shop. Find out where to get them in Sources on page 51.

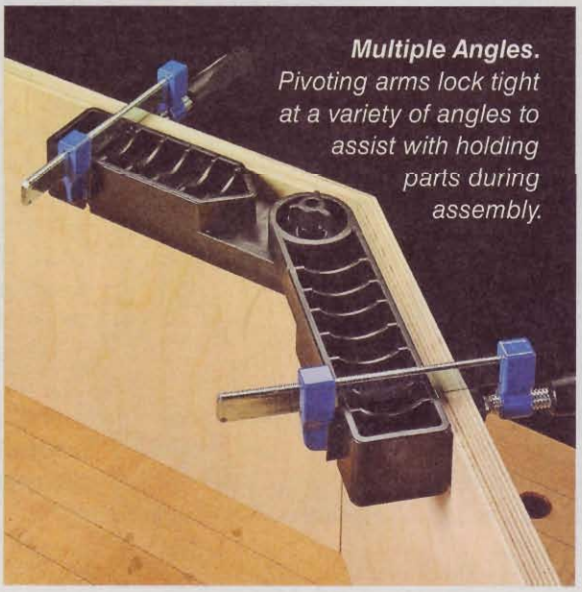
▲ **Extra Hand.** *You can buy the Rockler Clamp-It square in a set that includes a pair of small bar clamps.*

▲ **Fixture.** *Mounted to a plywood base, a clamping square becomes an assembly fixture.*

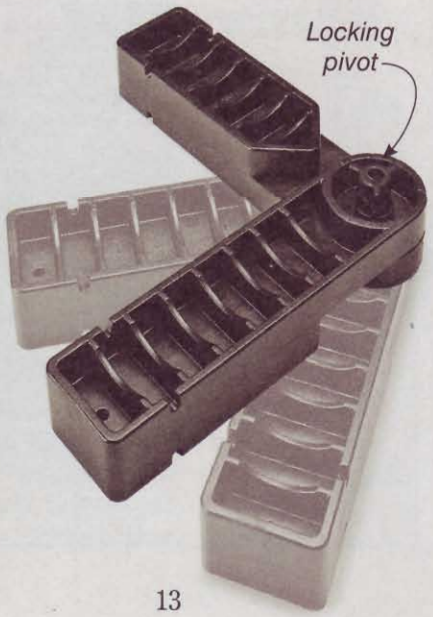
help for: Angles

Rockler's adjustable *Clamp-It* assembly tool comes to the rescue when your project calls for something other than square corners. You'll find that adding one of these to your shop arsenal will prove its worth the first time you use it.

Interlocking teeth at the pivot point securely lock the two pieces in 5° increments. Once the angle is set, it holds tight. Then all you need to do is clamp it to the workpieces for an accurate assembly.



Multiple Angles. *Pivoting arms lock tight at a variety of angles to assist with holding parts during assembly.*



simple steps to

Smooth Tapers

Tapering the legs of a project can really add to its looks. But if I'm only doing a set of four legs, I don't always want to make a dedicated tapering jig or complete a lot of detailed layout work.

My solution is to turn to the jointer — for a few reasons. First, it produces a clean, crisp cut that needs just a touch of sanding. And it doesn't require a lot of layout work. Plus, in the time it would take to build a jig, I can be done.

Getting Started. There is one thing you may want to consider before you begin tapering a set of legs. And that's any joinery that needs to be cut on the legs.

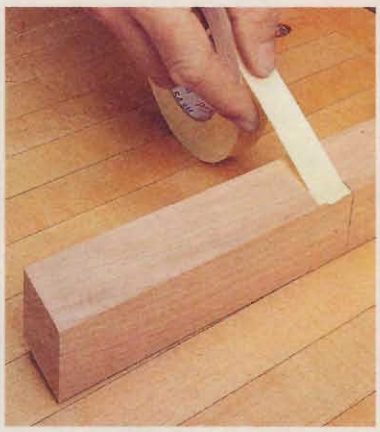
Depending on the length of the taper, there may only be a small flat spot at the top of the leg where it joins to the project. For this reason, you may want to lay out and complete any joinery before you start.

Overview. The basic technique here is simple. Instead of starting the taper at the end of the leg, the top of the leg is *lowered onto* the cutterhead. The key is knowing where to start the cut.

Reference Lines. To do this, I make a pair of reference lines. One marks the start of the taper (left photo below). The other indicates the front edge of the outfeed table (right photo below). Note: The maximum taper length is the distance from the reference line on the jointer fence to the end of the infeed table.

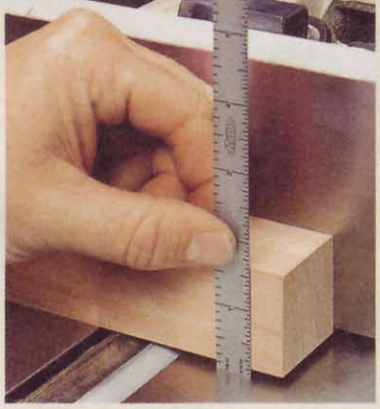
▲ ***Elegance.*** *You'll end up with perfectly smooth tapers using a jointer and this quick and easy process.*

▲ ***Start with Layout.*** *A saddle square makes it easy to lay out the starting point of the tapers around all four sides of the leg.*



▲ ***Leg Prep.*** *To prevent the jointer knives from making a "dished" cut, wrap two layers of masking tape around the leg.*

▲ ***Jointer Setup.*** *A pencil line on the fence of the jointer provides a handy indication of the front edge of the outfeed table.*



▲ **Depth of Cut.** *You can easily verify your jointer's depth of cut scale using a leg and ruler.*

Dished Cut. Since the leg is coming down at an angle, it's possible to create a dished cut at the beginning of the taper. To prevent this from happening, I wrap a couple layers of masking tape around the leg (center photo on the opposite page). This raises the leg just enough above the cutterhead to produce a smooth cut.

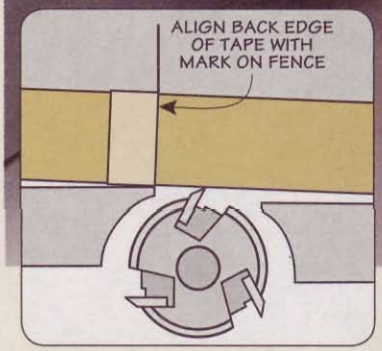
Depth of Cut. The next thing to do is set the depth of cut. Instead of making a full depth cut that matches the taper I'm looking for at the end of the leg, I get better results by making several shallow passes. For example, to produce a ¼" taper, set the jointer for a ⅛"-deep cut (photo above) and make two separate passes.

I've always found it best to allow for a clean-up pass, though. So I adjust the infeed table for a final cut that's a hair less (1/64").

Cutting the Taper. At this point, cutting the taper is just a matter of nudging the guard open with the end of the leg and then sliding it forward until the reference marks align (photo at upper right). Once the back edge of the tape aligns with the mark, you can lower the leg onto the cutterhead, as in the drawing at the upper right.

Safety Note: Be aware of your hand position at all times as you lower the leg onto the cutterhead and make each pass.

Next, hook a push block over the end of the leg to complete the cut. Provide gentle pressure against the leg as it moves onto the outfeed table of the jointer (inset photo at upper right).



Now, depending on the size of the taper, you may need to repeat the process. Just keep track of how many passes you make on each face. (I make a mark on the masking tape after each pass.)

Clean-Up Pass. All that's left now is to make a clean-up pass. The goal here is to take as light a cut as possible, yet still cut the taper right up to the layout line.

To do this, remove the tape on the leg and raise the infeed table until the knives just graze the layout line at the start of the taper (photo and drawing below).

Finally, instead of lowering the leg onto the cutterhead like you did before, make a full-length pass with the leg riding on the tapered side, as in the main photo.

The end result speaks for itself, as you can see on the opposite page. The process creates tapers that are smooth and straight.

This heavy-duty workcenter will be the best thing that's ever happened to your shop.

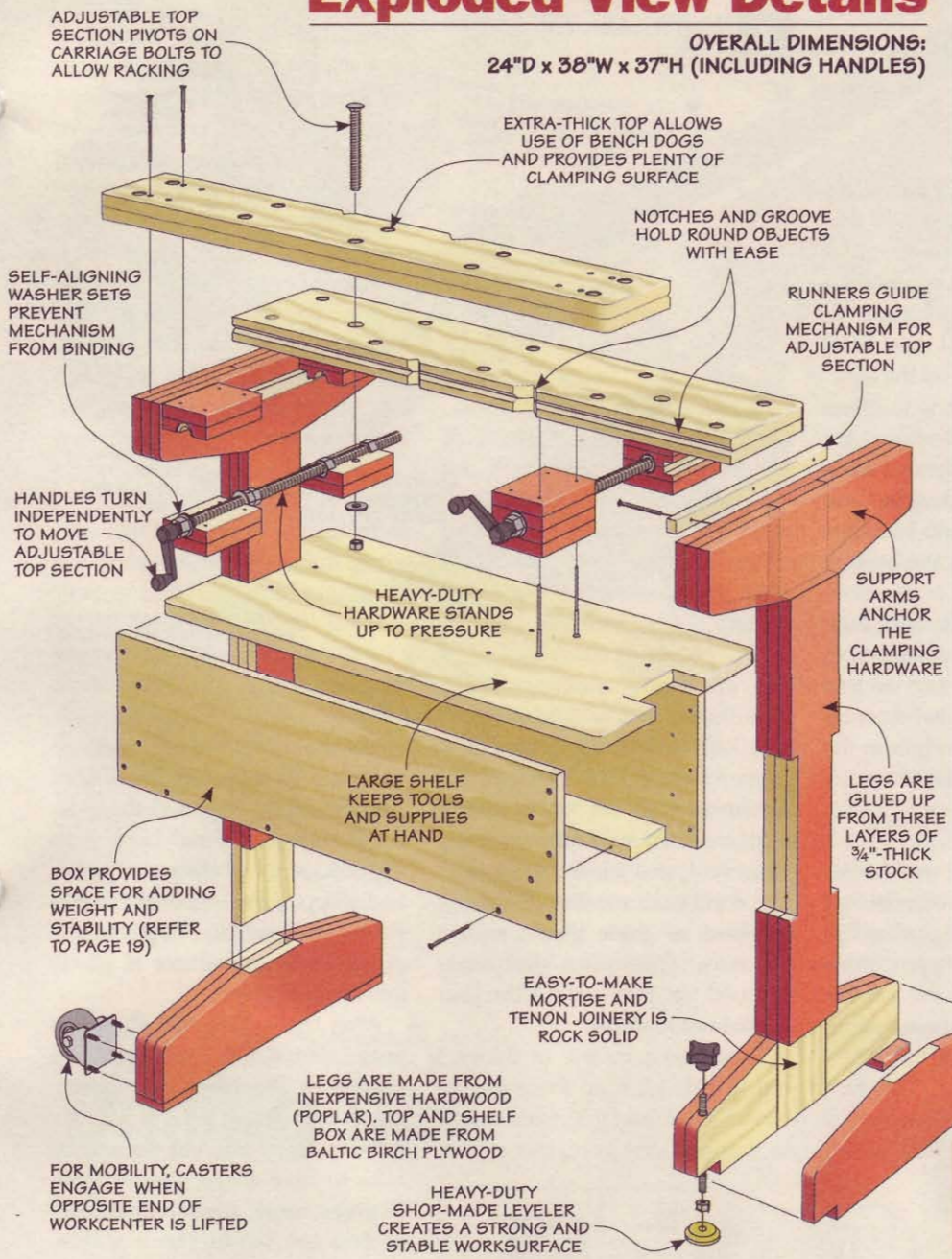
project Workcenter

You've probably seen or used one of those folding, portable project centers. They feature adjustable, clamping tops that come in handy for light-duty work. But I've never found them suitable for more demanding woodworking.

The version shown here solves that problem. It features a rock-solid base with a large shelf for storing your tools while you're working. And with the top's array of dog holes, notches, and grooves, you won't have any trouble clamping just about any workpiece. It's a project that's sure to earn a permanent spot in your shop.

Exploded View Details

OVERALL DIMENSIONS:
24"D x 38"W x 37"H (INCLUDING HANDLES)



Materials & Hardware

A	Feet/Support Faces (8)	¾ x 5 - 21
B	Feet/Support Spacers (8)	¾ x 5 - 8
C	Foot Pads (3)	½ x 2¼ - 3
D	Leveler Rod (1)	½"-13 x 6
E	Upright Faces (4)	¾ x 5 - 25
F	Upright Centers (2)	¾ x 5 - 35
G	Box Sides (2)	9 x 33 - ¾ Ply.
H	Box Bottom (1)	31½ x 28½ - ¾ Ply.
I	Shelf (1)	16 x 33 - ¾ Ply.
J	Runners (2)	⅝ x ¾ - 15¾
K	Anchor Blocks (2)	3 x 3½ - 5
L	Traveler Blocks (2)	3 x 3½ - 5
M	Clamp Rods (2)	⅝"-8 x 22⅞
N	Fixed Top (1)	6 x 38 - 1½ Ply.
O	Adjustable Top (1)	8 x 38 - 1½ Ply.

- (42) #8 x 1½" Fh Woodscrews
- (16) #10 x 4" Fh Woodscrews
- (8) #8 x ¾" Sheet Metal Screws
- (2) ½"-13 Hex Lock Nuts
- (2) ½" Flat Washers
- (2) ½"-13 x 5" Carriage Bolts
- (2) 3" Rigid Casters
- (2) ⅝" Self-Aligning Washer Set
- (10) ⅝"-8 Acme Nuts
- (2) ⅝" Flat Washers
- (1) Socket Leveler
- (1) ½"-13 Hex Nuts
- (1) ½"-13 Knob w/Insert
- (2) Crank Handles
- (2) 3/16" x 1" Roll Pins

ShopNotes GO ONLINE EXTRAS

To download a cutting diagram & 3-D model of the Workcenter, go to: **ShopNotes.com**

▲ ***Horizontal V-Groove.*** *You can clamp up pipe or tubing with confidence that it won't slip. Self-centering V-grooves hold it tight.*

▲ ***Vertical Notches.*** *Two notched areas in the top eliminate the hassle of securely clamping round objects.*

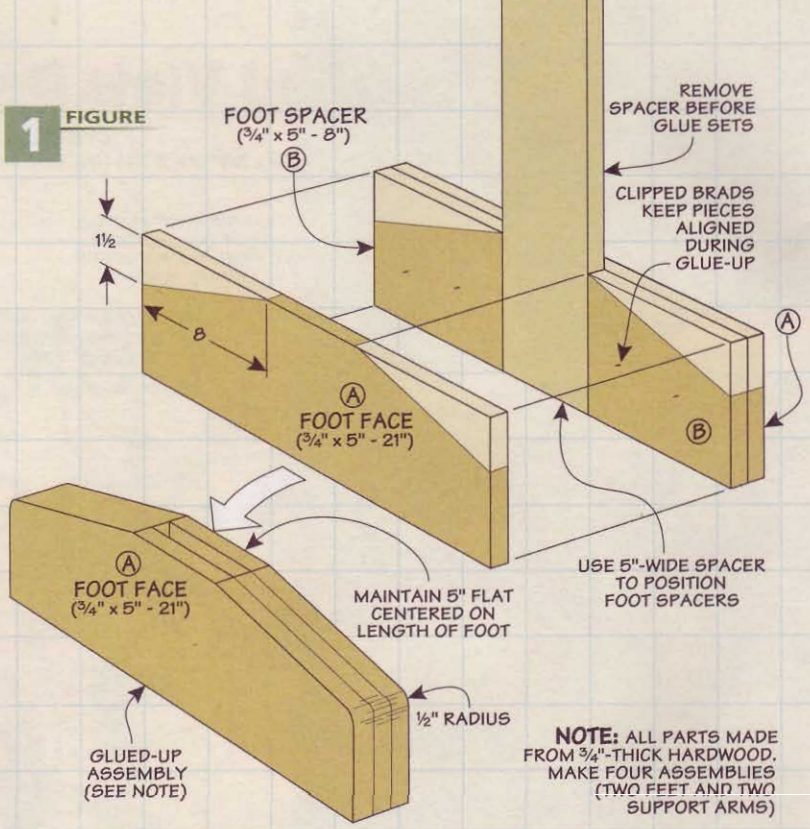
▲ ***Bench Dogs.*** *With help from a few bench dogs, you can clamp a workpiece of almost any shape.*

heavy-duty Base

When I set out to build this workcenter, my first concern was that it provide a stable platform. It shouldn't move when you're sawing or planing a workpiece. To accomplish this goal, I used mortise and tenon joinery on the legs.

But rather than cutting mortises and fitting tenons, I "formed" the mortises and tenons using a laminated construction technique. This method makes it easy to build the sturdy legs that form the base of the workcenter.

Later, you'll join the legs with sides and a shelf that form a box. What's great about this is that besides making the workcenter sturdy, you can add weight to the box to add more stability.



FORMING STABLE FEET

The foundation of the workcenter starts with the feet shown in Figure 1. But to keep things simple, I also made the two support arms for the top identical to the feet. So, you'll build four of these assemblies, then set two aside for later.

Layered Assembly. The feet, uprights, and support arms are glued up from 5"-wide stock. The key to building the legs is properly sizing the mortises for the uprights in the feet and support arms. There are two outside faces and two inner core pieces that form each mortise. It's easier to leave all these pieces square for now. Then after everything is glued up, you can cut the four assemblies to shape.

There are a couple of things I did to help glue up these assemblies. First, I used a 5"-wide spacer to position the core pieces that create the mortise. And I used an old trick. To keep the pieces from slipping when I applied the glue, I drove several small brads into the inside face of the outer pieces and snipped the heads off. At this point, you can dry-assemble the pieces (with the spacer in place) and apply clamps.

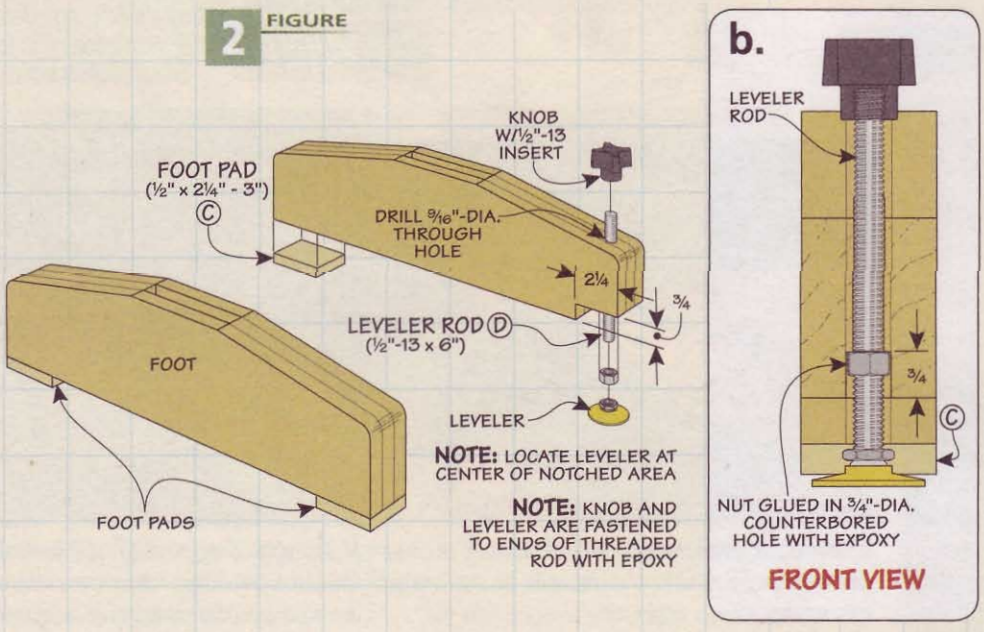
After that's done, the glueup is pretty simple. The brads help keep the pieces aligned as you tighten down the clamps.

Now before you cut the assemblies to final shape, one of them receives some special treatment, as you can see in Figure 2. You need to cut a notch and drill a hole for the shop-made leveler. These operations are easier to do while the assembly is square.

Pads, Casters, & Leveler. In Figure 2, you can also see the details needed to finish up the feet. I cut the tapered shape and rounded corners on the band saw. The rectangular foot pads help the workcenter sit flat on the floor.

The last bit of work to do on the feet is add the shop-made leveler. You can see how the pieces go together in Figure 2b.

Uprights. All the work is complete on the feet. Now you can start

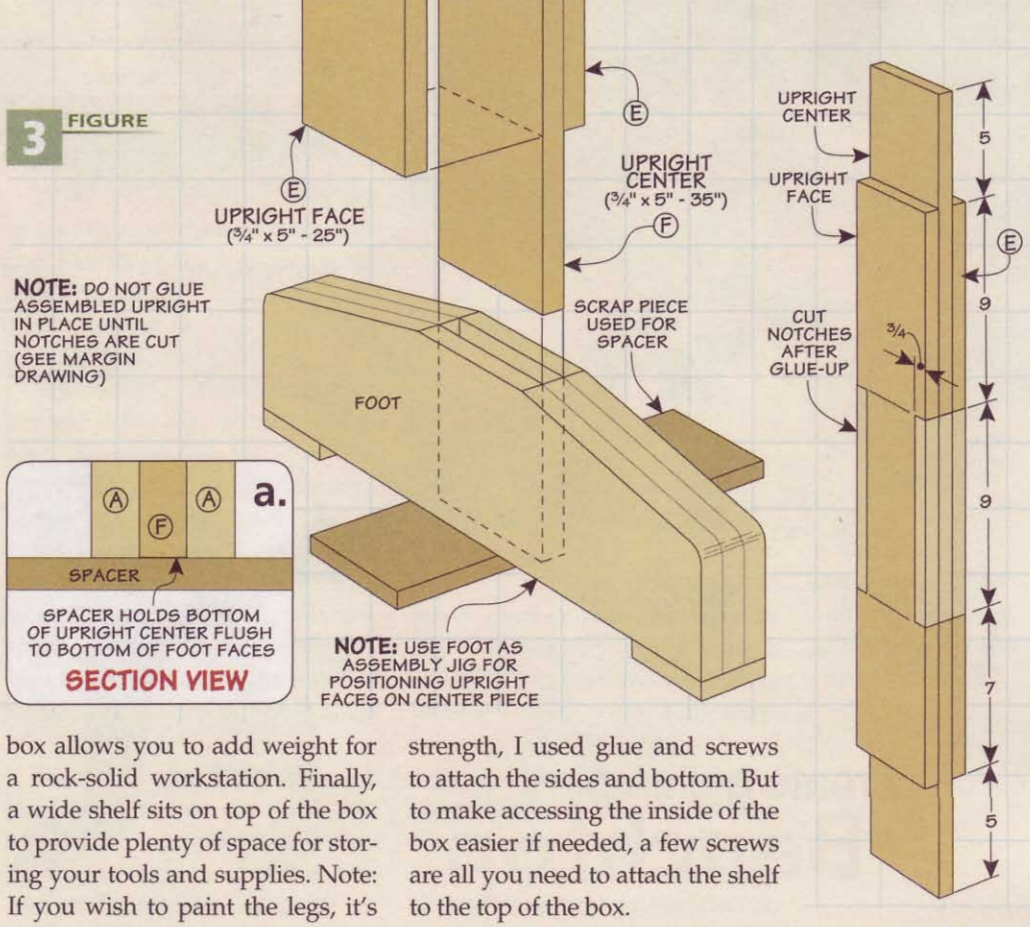


on the uprights. Figure 3 shows you how they go together. Like the feet, they're glued up from three layers. The center piece forms the tenons that fit into the foot and, later, the support arm.

Figure 3 shows how I used the foot as a glueup jig. The foot helps position the center piece and two outside faces of the upright.

But don't glue the assembly into the foot just yet. First, you'll need to cut the notches in the uprights for the box sides. A dado blade makes quick work of this task. At this point, you can glue the uprights into the feet, then start building the box to connect the two leg assemblies.

FIGURE 3



ADDING A STRONG BOX

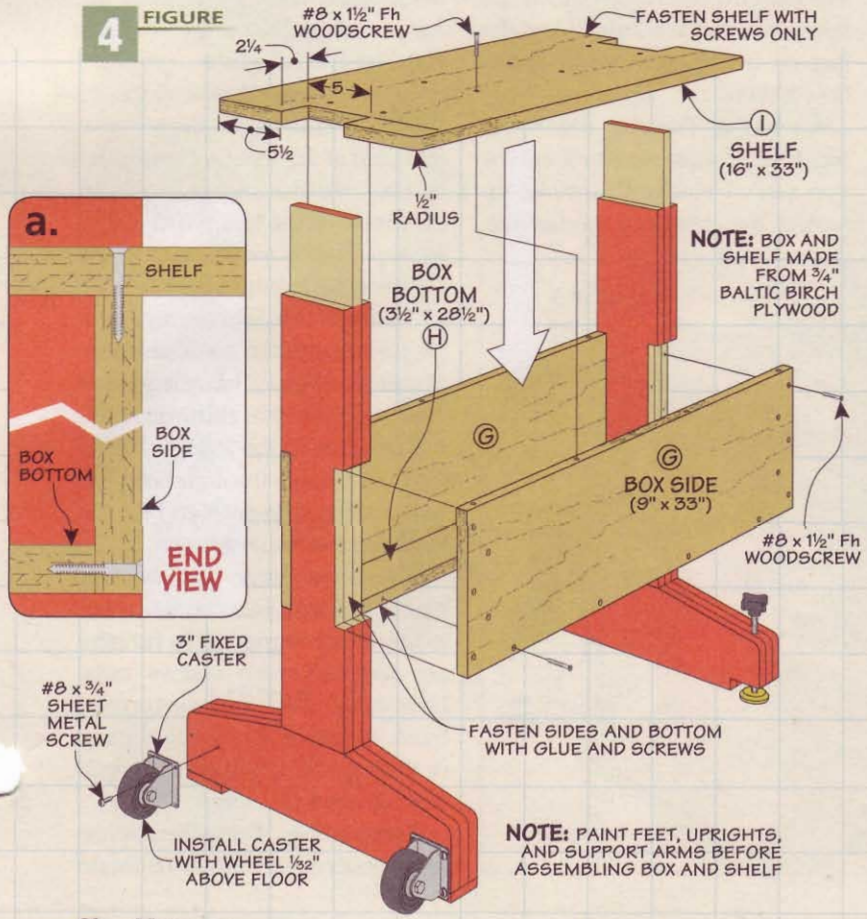
The box and shelf connect the legs and add a lot of rigidity to the workcenter's base. The two sides of the box form the "stretchers" that connect the legs and keep the workcenter from racking.

As you can see in the photo below, adding a bottom to the box allows you to add weight for a rock-solid workstation. Finally, a wide shelf sits on top of the box to provide plenty of space for storing your tools and supplies. Note: If you wish to paint the legs, it's easier to do that now, before you attach the box components.

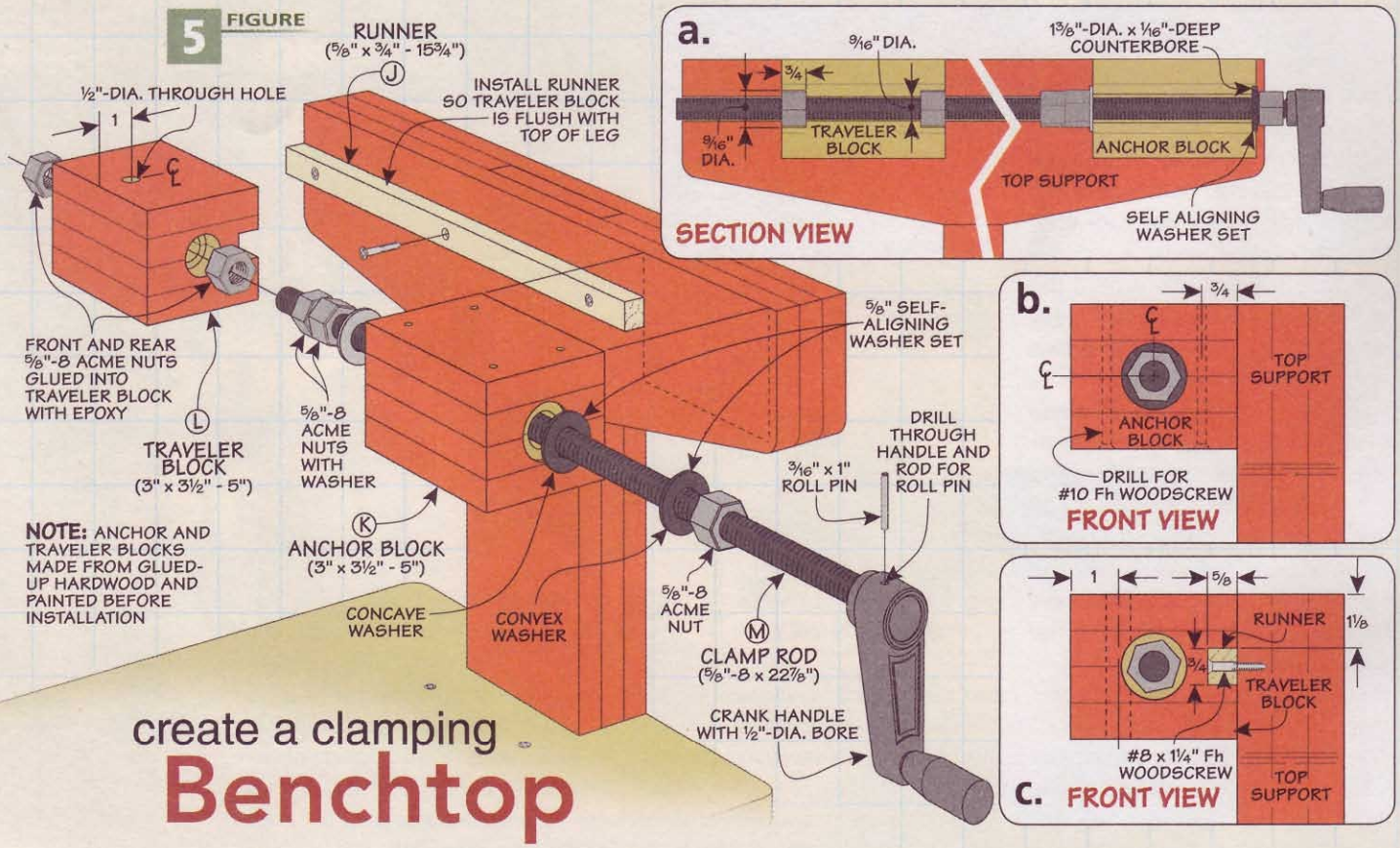
The drawing in Figure 4 shows how the box is put together. For strength, I used glue and screws to attach the sides and bottom. But to make accessing the inside of the box easier if needed, a few screws are all you need to attach the shelf to the top of the box.

Support Arms. Now that you have a solid base, you're almost ready to work on the top. But first, you need to attach the two support arms you made earlier to the top of the uprights. You can see them in the Exploded View on page 17. And before you turn the page to start working on the two-piece, clamping top, you can go ahead and add the two casters on the end opposite the leveler (Figure 4).

FIGURE 4



◀ ***Weighted.*** *Adding mass to the workcenter makes it a stable platform for working on your projects.*



create a clamping Benchtop

▲ ***Self-Aligning.*** *This special washer set adjusts to stay aligned with the Acme rod as the handles are turned.*

With the base of the workcenter complete, you can start to work on the benchtop. It's made up of two parts: a fixed "jaw" at the front and a larger rear jaw that moves back and forth when you turn the handles at the front of the workcenter.

The great thing is, you don't have to crank the handles at the same speed or at the same time to keep the adjustable jaw from binding. The mechanism is designed to allow the jaws to rack. This way, you can clamp angled or odd-shaped pieces securely. Some simple hardware makes it all possible. The margin photo at left shows the special washer sets I used. And the box on the opposite page shows how it all works.

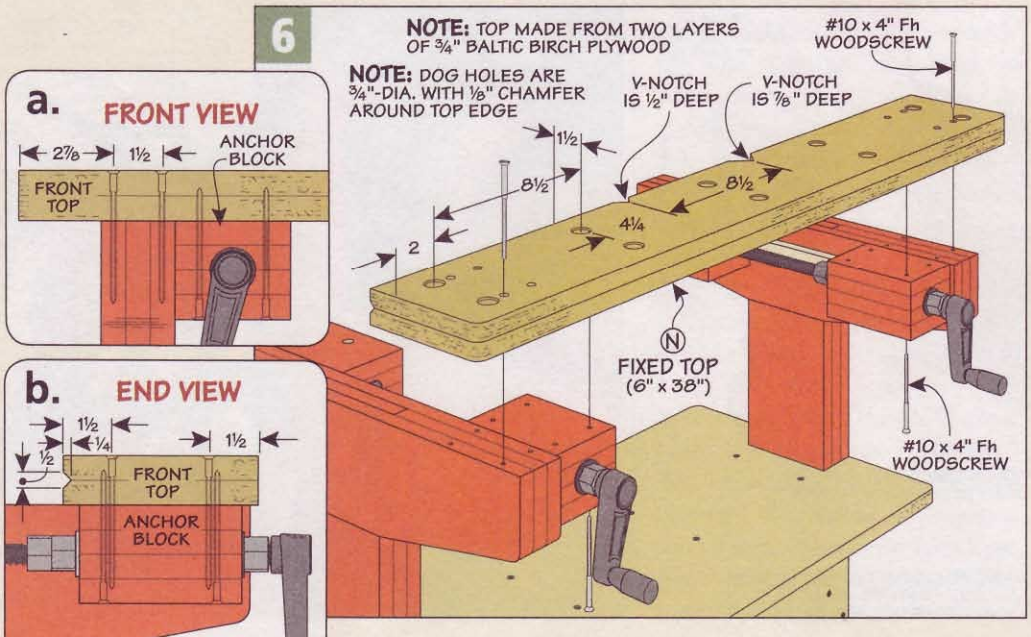
Anchor & Traveler Blocks. In the drawings above, you'll see the two sets of blocks that make up part of the clamping mechanism. They're cut from an extra-long, glued-up blank.

The anchor blocks are permanently attached at the front of the workcenter. Their job is to fix the Acme rod and handles in place. The oversized hole provides clearance for the threaded rod to "pivot" slightly when the rear jaw racks out of alignment. I temporarily clamped the anchor blocks to the inside of the legs, flush across the top. They'll be fastened to the fixed top with screws later on.

The traveler blocks are responsible for moving the adjustable top. These two blocks have a groove along one side that rides on a runner attached to the legs. In Figure 5, you can see a through hole and a counterbore on each end for the threaded rod and nuts.

Once you have the traveler blocks in hand, you can use them to locate the runners. The runners are fastened with screws only. Here again, the top of the traveler block should be flush with the top of the legs along the entire length of the runner (Figures 5a and 5c).

Assembling the Mechanics. Now you've got some work to do

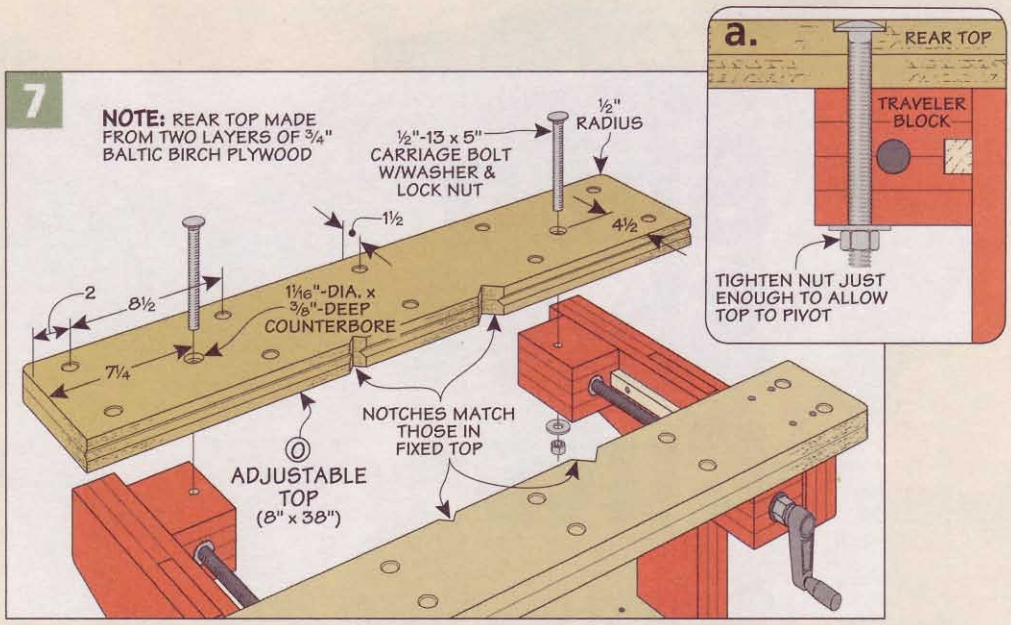


on the two pieces of Acme rod. The first is to cut them to length. Then you'll need to grind one end to fit the handle. (Refer to Shop Short Cuts on page 23.)

Installing the rod in the anchor blocks means capturing it with washers and nuts on each end. Thread-locking compound on the nuts ensures they won't work loose. The goal is to allow the rod to spin freely inside the anchor block with very little front-to-back movement. You can then attach the handles as shown in Figure 5.

Traveler Block Assembly. To complete the mechanism, I pressed the nuts into the counterbores and threaded the rod through them. If the rod binds at all, gently tap the end of the rod until the nuts seat on the threads and the rod spins smoothly. Then use a little epoxy to secure the nuts.

Making the Top. The two pieces that make up the top start out as an oversized blank glued up from two layers of plywood. After cutting them to size, it's a simple matter to cut the notches and V-groove.



(Refer to Shop Short Cuts on page 22 for help with this task.) Then you can drill the dog holes shown in Figure 7. You'll also need to drill holes for attaching each piece to the anchor and traveler blocks.

Attaching the Jaws. The rear, adjustable top is held in place with a carriage bolt through each traveler block. Tighten the lock nut snug but with enough slack to allow the jaw to pivot freely.

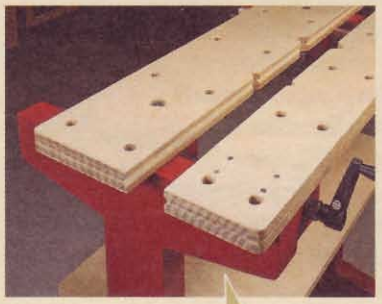
The fixed top is held in place with four screws into the support arms at each end. Four screws installed through the anchor blocks into the top tie everything together.

Putting it to Use. With the mechanism functioning smoothly, you're ready to put the workcenter through its paces on your next project. It won't take long before the project workcenter will be your go-to tool in the shop.

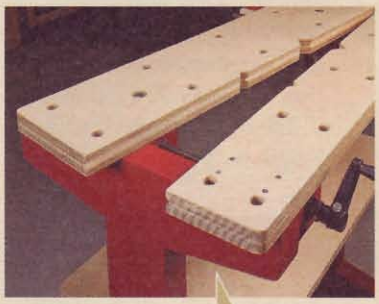
Always on Track

Designing a clamping benchtop that will intentionally rack might seem difficult. But this unique ability is what makes the workcenter so useful for clamping odd-shaped objects. The trick is to design a little "slop" into the mechanism to prevent binding.

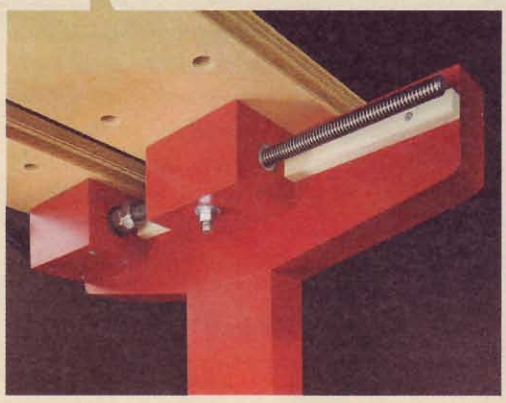
The key is to purposely allow for a little side-to-side movement of the rod at the back end. And this is easy to do. The oversized hole and the nesting halves of the self-aligning washer at the guide block take care of any problems. They allow the rod (and traveler block assembly) to pivot slightly as the jaw is cranked out of alignment.

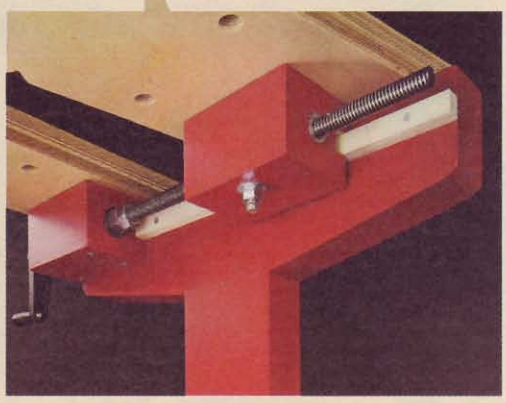


◀ ***Straight.*** *Turning the handles evenly keeps the traveler block engaged completely on the runner (below).*

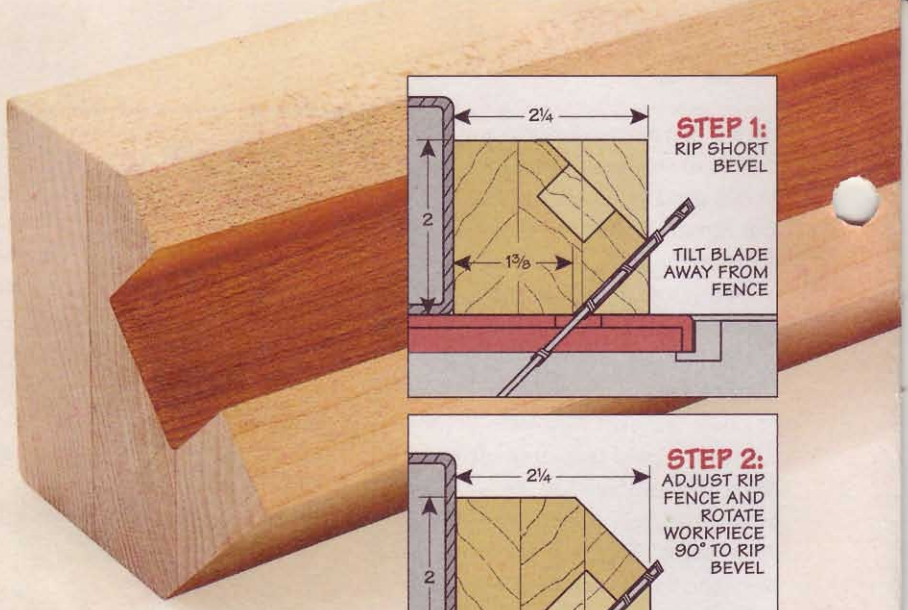


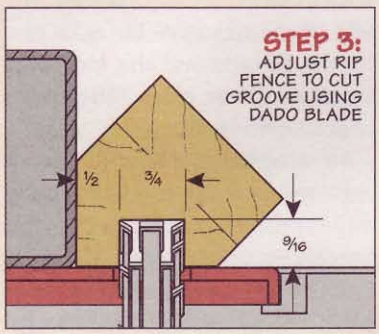
◀ ***Racked.*** *When the top isn't parallel, the traveler block disengages slightly without compromising clamping ability (below).*





Shop Short Cuts





Cutting the Wing Tracks

Cutting the wing tracks for the folding extension wings on the table saw station (page 24) can be done in a few easy steps. The drawings at right show you how.

After the stock is glued up and ripped to width, you can cut the tracks to shape in three steps: two beveled rip cuts and a groove cut.

First, set up your table saw as shown in Step 1. The first two cuts are made with the blade at 45°. You'll want to use a push block for these operations to keep your hands safely away from the blade.

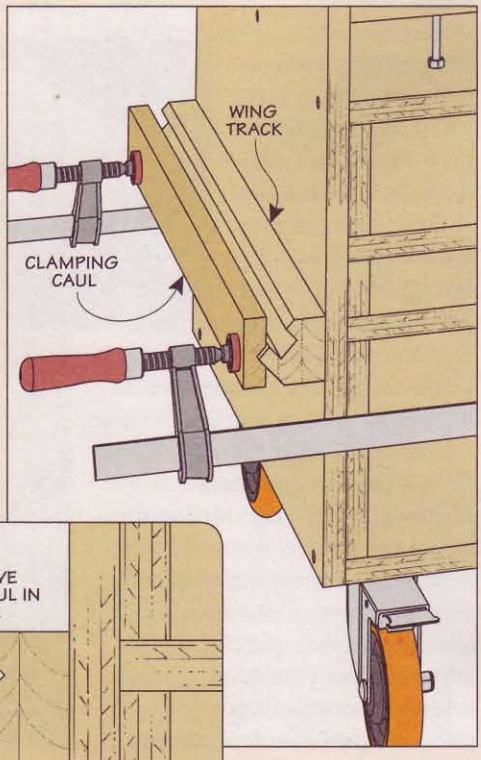
After beveling the first corner of the stock (Step 1), move the rip fence over to make the next cut, as you can see in Step 2.

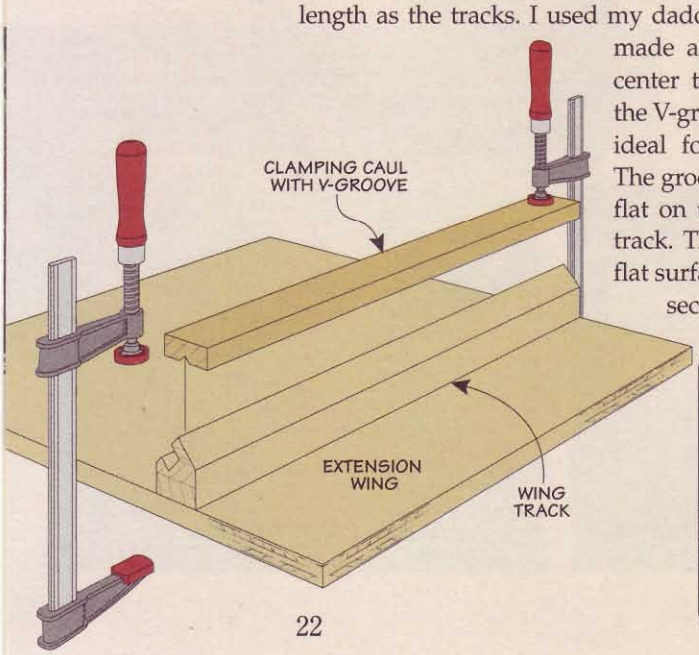
The final step requires a dado blade. The trick here is to size the width of the dado for a smooth, sliding fit of the plywood braces that support the extension wings.

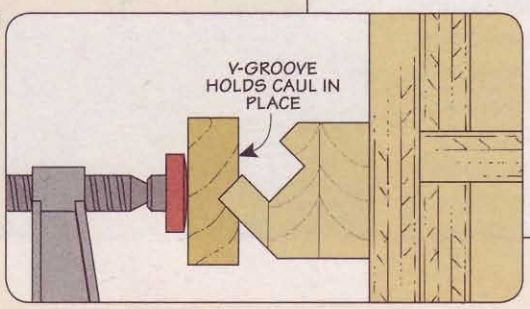
Custom Clamping Cauls

When it came time to glue the wing tracks in place on the table saw station (page 24), I realized my clamps couldn't get a firm grip on the pointed shape of the tracks. To get around this problem, I made custom cauls, as you see in the drawings.

The caul is made from a scrap piece of stock cut to the same length as the tracks. I used my dado blade tilted at 45° and made a shallow cut down the center to form a V-groove. It's the V-groove that makes the caul ideal for clamping the tracks. The groove allows the caul to sit flat on the pointed edge of the track. The caul then provides a flat surface for applying a clamp securely at each end.







Reducing Rod Diameter

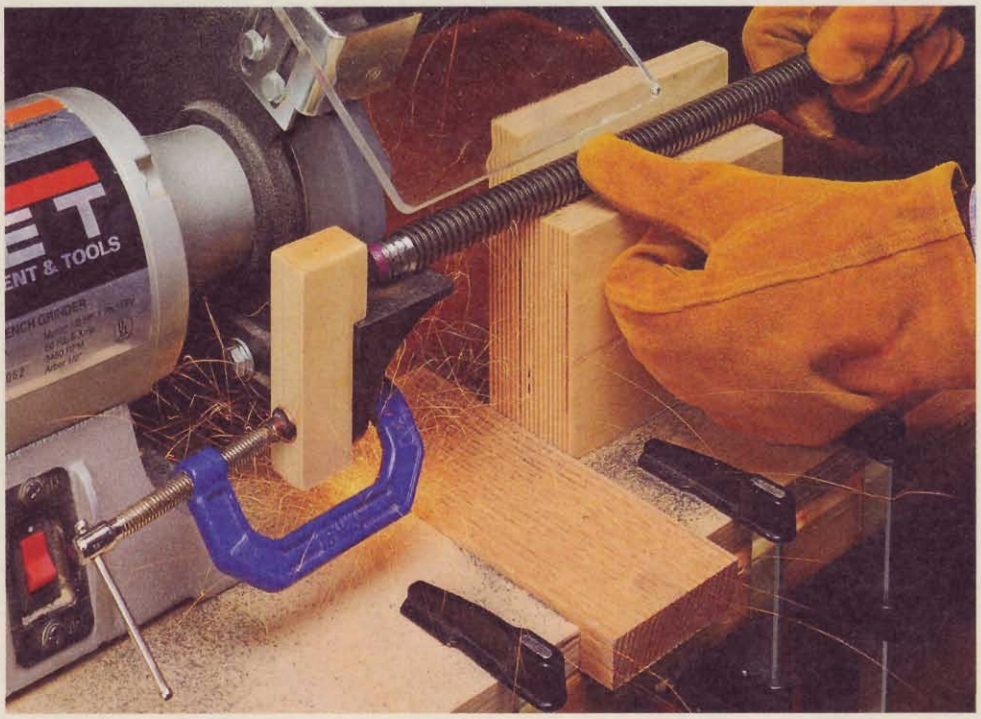
Along with cutting the Acme rods to length for the project workcenter (page 16), there's one other thing you need to do to them. And that's to grind down the diameter at one end to fit the inside bore of the crank handles.

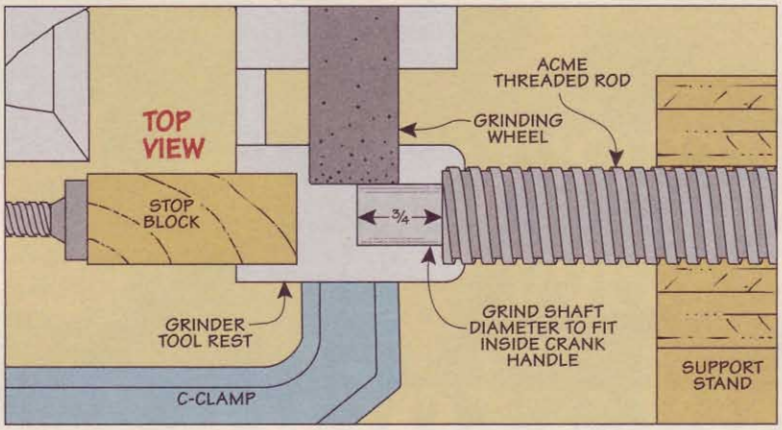
To make this task easy and accurate, I built the simple jig you see in the photo. A support stand keeps the shaft level and aligned with the grinding wheel. It's made up of two pieces of plywood fastened to a plywood base.

The other part is a stop block. It's a piece of hardwood clamped to the grinder's tool rest. It limits the length of the round "tenon" on the end of the rod and helps create a clean shoulder. The drawing at right shows how it all works.

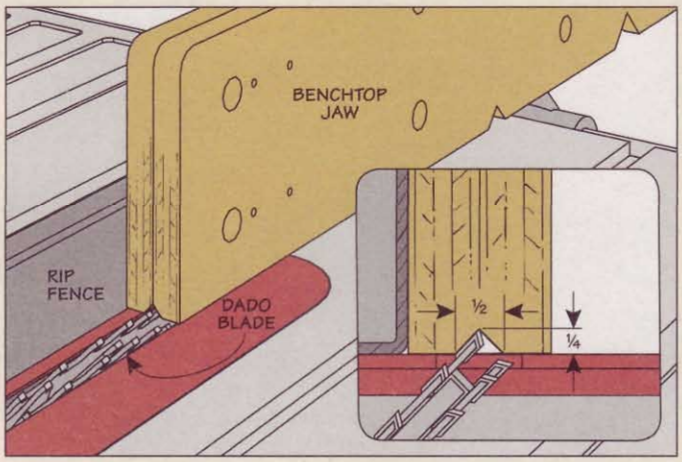
The trick to creating a straight, clean tenon is to continuously rotate the rod as you grind it. (Leather gloves will help protect your hands from the heat.) You're aiming for a snug fit, so check the fit frequently in the handle.

Finally, you can attach the handle by drilling a hole through the handle's bushing and the rod for the roll pin that secures it.



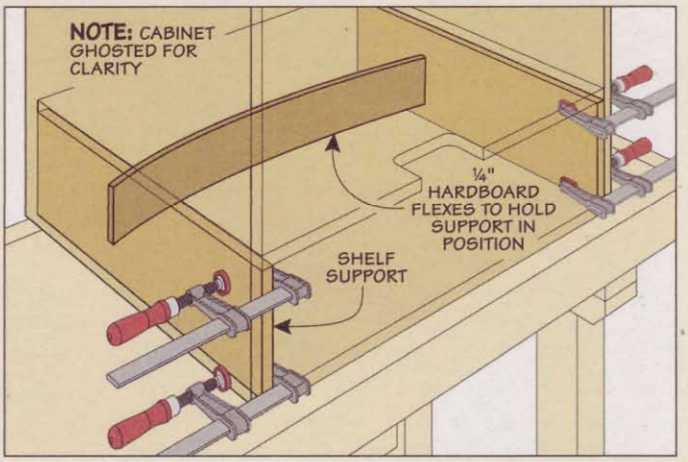


Horizontal V-Groove



▲ ***Tilted Dado Blade.*** *The two table sections on the project workcenter (page 16) have a V-groove along one edge. A dado blade set at 45° cuts the groove in one quick pass.*

Spring Clamp



▲ ***Inside Pressure.*** *Clamping the back of the shelf supports in the saw cabinet (page 24) is a challenge. Instead, use a ¼" hardboard strip cut a little long to act as a spring clamp.*

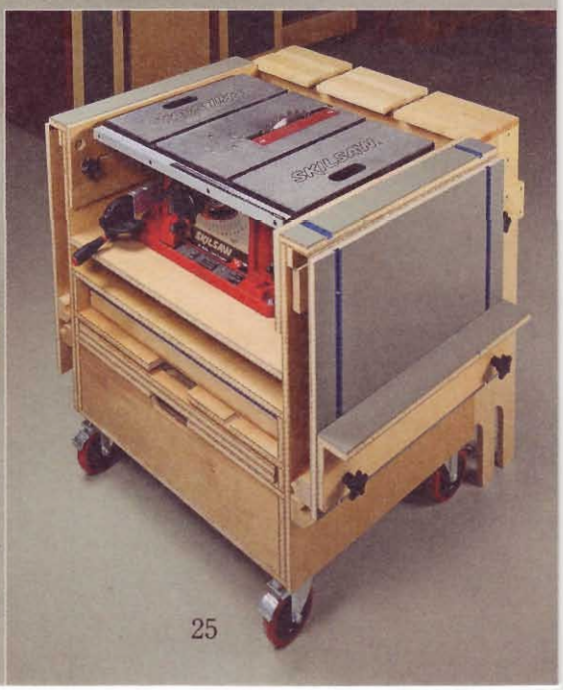
dream shop project

A mobile base, fold-up wings, plus infeed and outfeed support — this project gives a small saw big-time features.

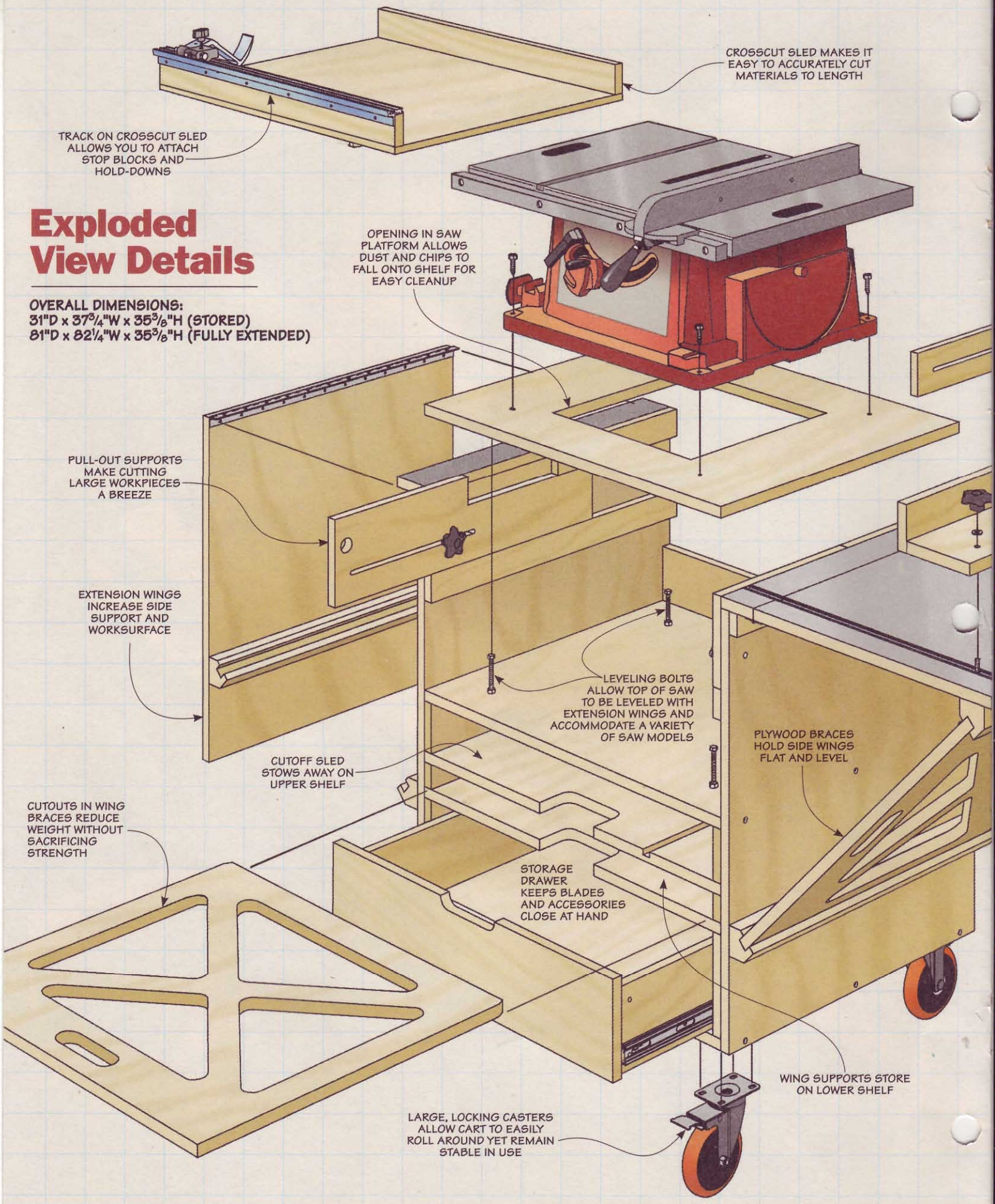
benchtop table saw Workstation

Benchtop table saws are designed for rough-and-tumble work at a jobsite. But their compact size and low price make them attractive for woodworkers, too. (I've used one for years.) Still, they do have some limitations. The small size of the saw table makes it nearly impossible to cut large workpieces — like plywood and MDF. And finding a place to put the saw can be a challenge.

That's where this station comes in. It provides a feature-packed home for your saw. (Turn to page 26 for the full run-down.) As you can see in the photo, it extends to create a large work area to tackle almost any size workpiece. To top it off, the whole thing folds up into a compact package you can store in any corner of the garage or shop.

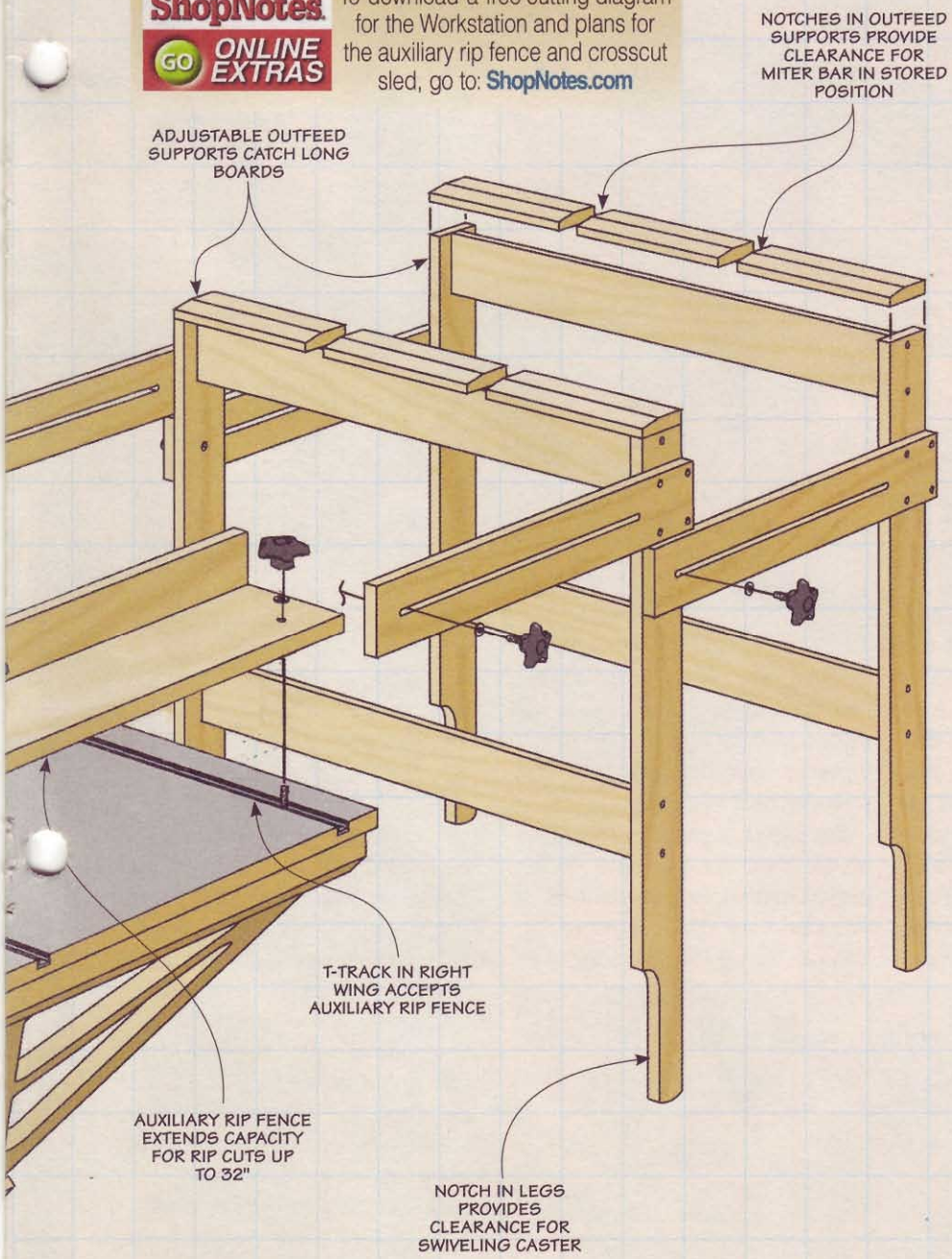


► ***Compact Footprint.*** *Fold down the wings and the workstation stores in a small space.*


CROSSCUT SLED MAKES IT EASY TO ACCURATELY CUT MATERIALS TO LENGTH
TRACK ON CROSSCUT SLED ALLOWS YOU TO ATTACH STOP BLOCKS AND HOLD-DOWNS
Exploded View Details
OVERALL DIMENSIONS:
31"D x 37¾"W x 35⅜"H (STORED)
81"D x 82¼"W x 35⅜"H (FULLY EXTENDED)
OPENING IN SAW PLATFORM ALLOWS DUST AND CHIPS TO FALL ONTO SHELF FOR EASY CLEANUP
PULL-OUT SUPPORTS MAKE CUTTING LARGE WORKPIECES A BREEZE
EXTENSION WINGS INCREASE SIDE SUPPORT AND WORKSURFACE
LEVELING BOLTS ALLOW TOP OF SAW TO BE LEVELED WITH EXTENSION WINGS AND ACCOMMODATE A VARIETY OF SAW MODELS
PLYWOOD BRACES HOLD SIDE WINGS FLAT AND LEVEL
CUTOFF SLED STOWS AWAY ON UPPER SHELF
CUTOUTS IN WING BRACES REDUCE WEIGHT WITHOUT SACRIFICING STRENGTH
STORAGE DRAWER KEEPS BLADES AND ACCESSORIES CLOSE AT HAND
WING SUPPORTS STORE ON LOWER SHELF
LARGE, LOCKING CASTERS ALLOW CART TO EASILY ROLL AROUND YET REMAIN STABLE IN USE

ShopNotes GO ONLINE EXTRAS

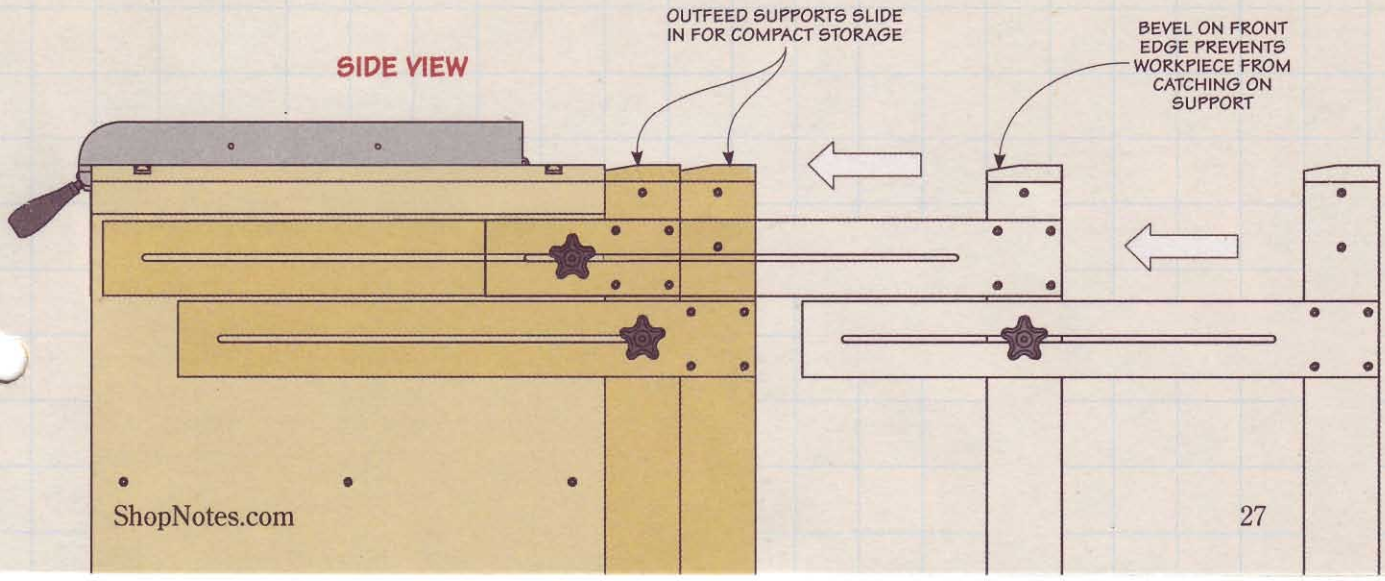
To download a free cutting diagram for the Workstation and plans for the auxiliary rip fence and crosscut sled, go to: ShopNotes.com



Materials & Hardware

A	Sides (2)	24 x 28½ - ¾ Ply.
B	Bottom & Shelves (5)	23¼ x 30 - ¾ Ply.
C	Back (1)	19 x 30 - ¾ Ply.
D	Lower Supports (2)	23¼ x 6¾ - ¾ Ply.
E	Middle Supports (2)	23¼ x 1¾ - ¾ Ply.
F	Upper Supports (2)	23¼ x 3½ - ¾ Ply.
G	Drawer Front/Back (2)	5½ x 26 - ¾ Ply.
H	Drawer Sides (2)	5½ x 22½ - ¾ Ply.
I	Drawer Bottom (1)	26½ x 21½ - ¾ Ply.
J	False Front (1)	6½ x 28¼ - ¾ Ply.
K	Cleats (2)	1½ x 24 - ¾ Ply.
L	Tops (2)	3 x 24 - ¾ Ply.
M	Right Wing (1)	24 x 20½ - ¾ Ply.
N	Left Wing (1)	24 x 25¾ - ¾ Ply.
O	Top Cover (2)	3 x 24 Plastic Lam.
P	Right Wing Cover (1)	24 x 20½ Plastic Lam.
Q	Left Wing Cover (1)	24 x 25¾ Plastic Lam.
R	Wing Tracks (4)	2¼ x 2 - 24
S	Wing Braces (2)	23¼ x 28 - ¾ Ply.
T	Support Cleats (2)	2 x 24 - ¾ Ply.
U	Infeed Supports (2)	6 x 24 - ¾ Ply.
V	Support Stops (2)	2 x 12 - ¾ Ply.
W	Legs (4)	¾ x 3½ - 34⅝
X	Rails (4)	¾ x 3½ - 30
Y	Tops (2)	¾ x 3½ - 32 rgh.
Z	Runners (4)	¾ x 3½ - 27

- (16) #8 x 2" Fh Woodscrews
- (16) #8 x 1¼" Fh Woodscrews
- (10) ¼"-20 Threaded Inserts
- (4) ¼"-20 x 3" Hex Head Bolts
- (4) ¼"-20 Hex Nuts
- (4) 5" Locking Swivel Casters
- (16) ¼" x 1" Lag Screws
- (2) 20" Full-Extension Drawer Slides w/Screws
- (2) 1⅛" x 24" Continuous Hinges w/Screws
- (1) 48" T-Track w/Screws
- (6) ¼" Washers
- (6) ¼"-20 Star Knobs
- (1) ¼"-20 x 13" Threaded Rod



start with the
Case

Part of what makes this table saw station a great addition to a small workshop is you get a lot of bang for the buck. What I mean is, after building this project, your benchtop saw will be able to do so much more. And the process of building it is pretty straightforward.

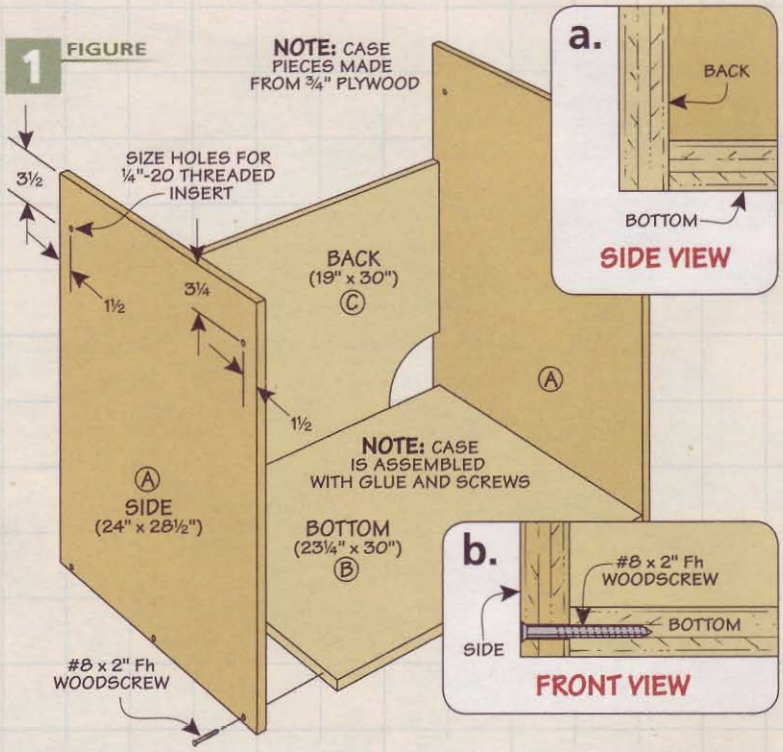
You can get an idea of this in Figure 1. All the workpieces are cut to size and joined with basic glue and screws. There are no complicated shapes or joinery to cut.

Building Tips. Before getting started on the actual construction of the workstation, I want to bring up a little chicken and the egg situation. The workstation is made mostly from plywood. And one of the main benefits of this workstation is that it allows you to cut large pieces of plywood. So it would seem you need the workstation to build the workstation.

The solution is to turn to your circular saw and a straightedge guide to cut the plywood pieces to the size you need. Just be sure to take your time and make sure the pieces are cut square. To view a video on how to do this, go to our web site, *ShopNotes.com*.

For identical pieces — the sides of the case, for example — it's important that they be identical. If you find they aren't, don't worry. You can clamp the pieces together and use one as a template. Trim the larger piece to match with a router and a flush trim bit.

FIGURE 1



CASE CONSTRUCTION

Now, let's get down to business. The workstation is built from the bottom up. Figure 1 shows how it's constructed. It's a simple box that's open at the top and front.

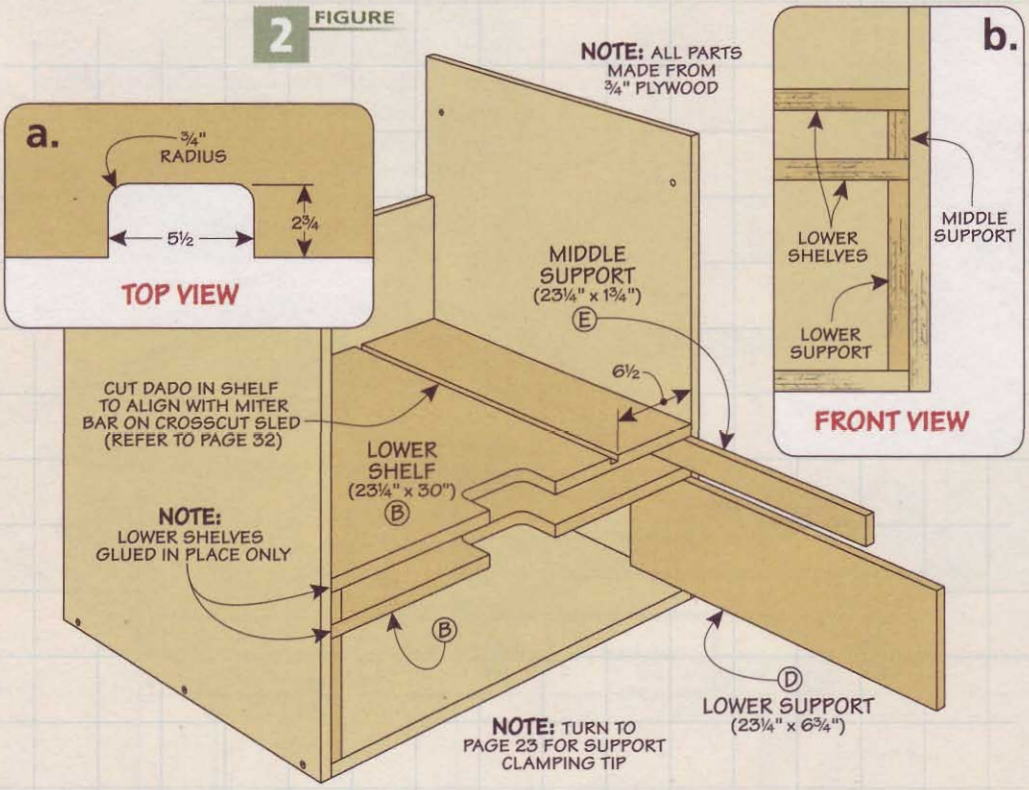
A Few Details. It's simple, but there are still a few things that I'd like to point out. First, the case back isn't the full height of the case. And it's captured between the sides and overlaps the bottom, as you can see in Figure 1a.

Another thing I want to mention is the bottom piece. You'll make several other pieces that are identical in size. So it pays to make all those pieces in advance.

Anchor Points. The final thing I'd like to mention has to do with the sides. There are a couple of holes near the top that you'll need to drill before assembly. These holes house threaded inserts. The front set serves as an anchor point for the infeed supports. The rear set is for the outfeed supports.

The Shelves. Inside the case are a variety of openings divided by shelves. The lower opening holds a drawer for stashing extra blades,

FIGURE 2



push blocks, and accessories. The center compartment holds the wing braces for storage. Above that is the place to store a crosscut sled that you'll make later. This shelf has a dado cut in it to accept the miter bar on the sled (Figure 2).

The upper two shelves work together to support the table saw. You can see what I mean in Figure 3. The table saw is bolted to the top shelf. This shelf also has a cutout for chips and dust to fall through.

Four small pockets in the bottom of this shelf capture the heads of hex bolts that are mounted in the shelf below it (Figure 3a). These thread into inserts to allow the top of the table saw to be leveled and flushed with the top of the case. It also means the workstation can accommodate a wide variety of saw makes and models.

The supports and shelves go in one layer at a time. Just be sure to cut the notches in the front of the shelves before gluing them in place, as in Figure 2a.

The shelves rest on plywood supports. You can see this in Figure 2. The supports are glued to the case sides. It's a challenge to glue the back of the supports in place. But you can see a simple clamping tip on page 23.

Casters. There's one thing left to complete the basic case. And that's to install the casters, as shown in

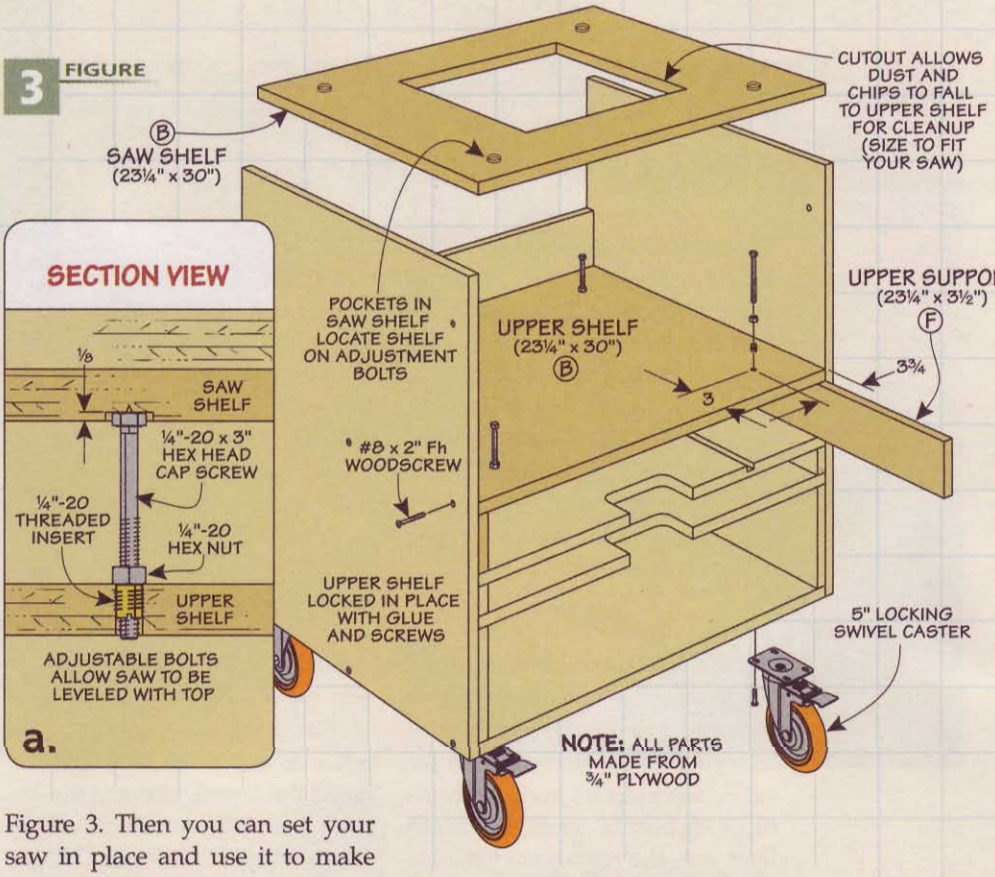


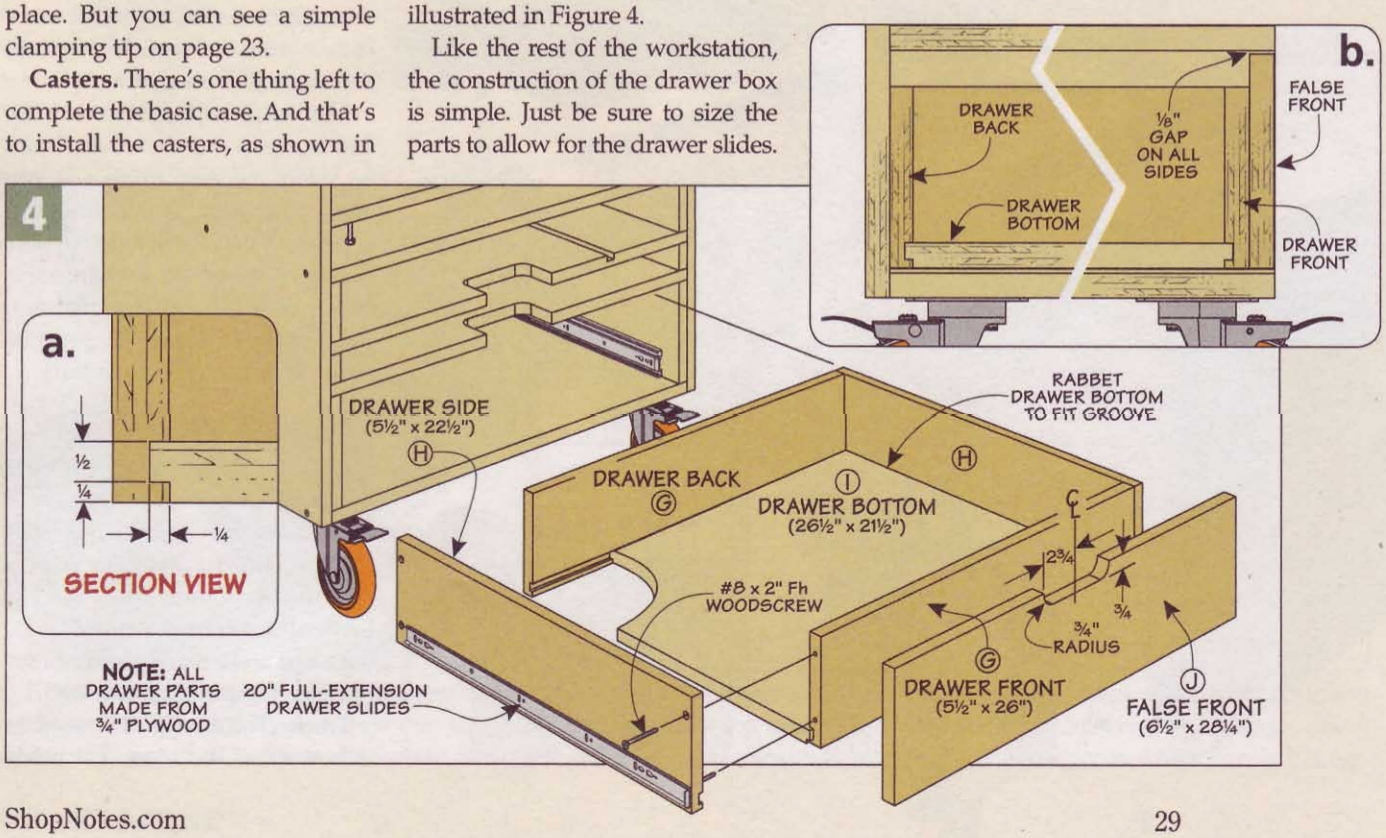
Figure 3. Then you can set your saw in place and use it to make some of the remaining parts.

DRAWERS

I mentioned earlier that the lower opening holds a drawer. You can build this now. To make the best use of my materials, I made the drawer out of ¾" plywood, as illustrated in Figure 4.

Like the rest of the workstation, the construction of the drawer box is simple. Just be sure to size the parts to allow for the drawer slides. I cut a groove in the front, back, and sides for the drawer bottom first and then screwed the pieces together around it.

The last part to make is the false front. It provides a clean look to the drawer and has a cutout along the top to serve as a pull.



extra-large, fold-up

Worksurface

The basic case you just completed provides mobility and plenty of storage for your benchtop table saw. But there's no reason to stop there. The next order of business is to add greater cutting and workpiece capacity to the saw. There are two phases to this. First, adding side support. And second, adding both infeed and outfeed support (more on this later).

WINGS

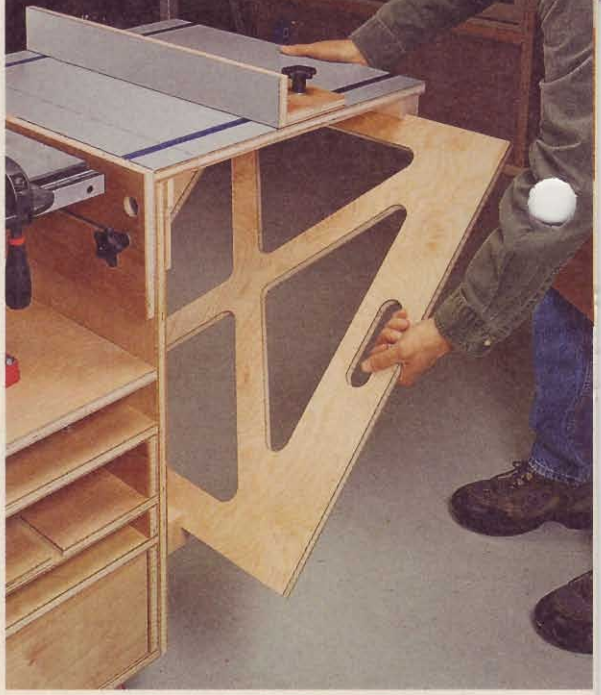
The first phase is shown in the photo at right. It consists of a pair of large, fold-up wings. The long left wing offers side support for wide workpieces and crosscutting long boards. A pair of T-tracks inset into the right wing lets you attach an auxiliary rip fence to make wider cuts accurately.

Wings & Tops. In Figure 5, you can see how each side wing is made up of two parts supported by a cleat. This narrow top forms the working surface of the project. When the table saw is installed, it should be leveled with this surface.

Since the tops and wings are likely to see a lot of use, I covered these sections with plastic laminate. The laminate also helps a workpiece slide across smoothly.

In the right top and wing you also need to install two lengths of T-track (Figure 5b). I found it's easier to apply the laminate and install the T-track into an oversize blank for each side. Then I cut the wing and top to final size. Doing it in this order also guarantees the T-tracks will align between sections.

To make the grooves for the T-track, I turned to the router table and a ¾"-dia. straight bit. To avoid stressing the router rout the grooves in several, shallow passes. (You could also use a hand-held router with an edge guide.)



▲ ***Flip-Up Side Wings.*** *Slide the braces into the grooves in the tracks to hold the wings upright.*

Extra Support. There are a couple of things to do before attaching the top to the case. First, make a cleat to add some extra gluing surface and support to the top.

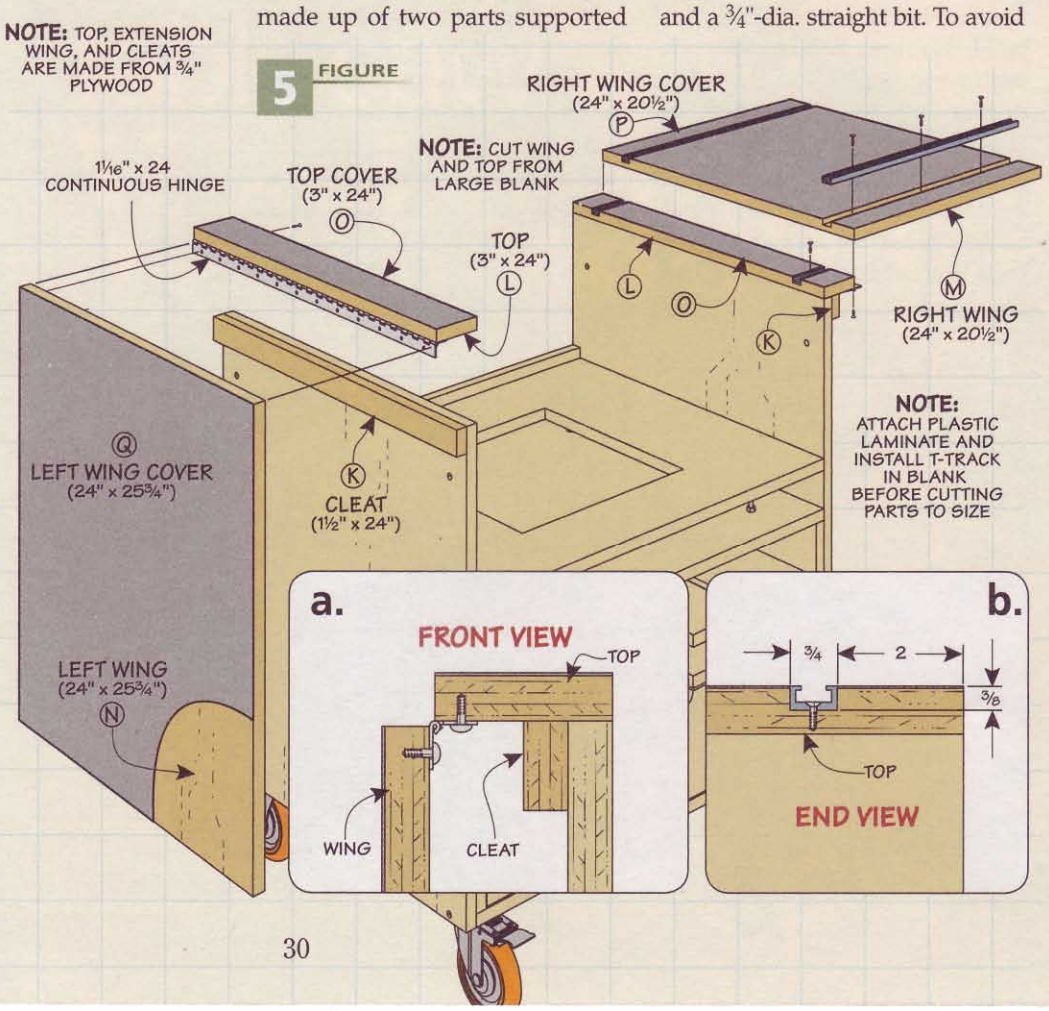
Then drill pilot holes for the continuous hinge that joins the wing and top. This will save some hassle later on. Just don't attach the hinge and wing yet.

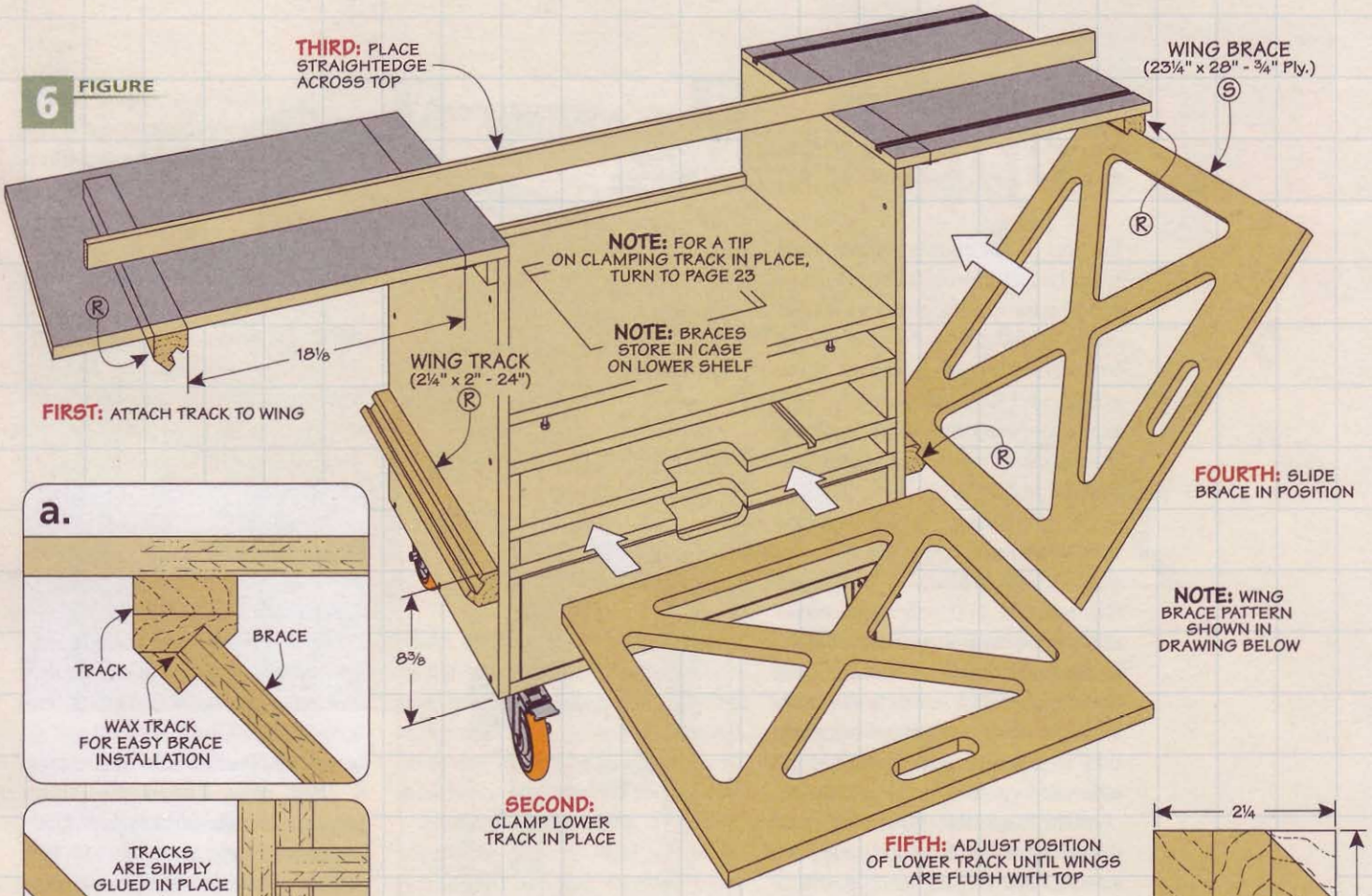
Now glue the top flush with the inside of case, as shown in Figure 5a. After the glue dries, you can attach the wing. You'll find this is easier if you tip the case upside down (or at least lay the case on its back). This way, you don't have to hold up the wing and screw the hinge in place at the same time.

TRACK & BRACES

As you might imagine, the side wings won't stay up on their own. So to keep each wing level with the top, the workstation uses a removable plywood brace that fits in hardwood tracks installed in the wing and case. Figure 6 shows how the setup works.

Track. The first part I want to talk about is the track. It's made





from three layers of hardwood and is beveled and grooved to accept the plywood braces. I used hardwood (maple) to make sure the tracks wouldn't split under strain.

Cutting the track can be a bit of a head scratcher. But there's a simple method to making the cuts. You can find step-by-step instructions in Shop Short Cuts on page 22.

At this point, you can glue a section of track to the under side of each wing using the dimensions shown above as a guide. Leave the other track off for the moment.

Braces. Now, you can turn your attention to the braces. Each brace is just a plywood panel that bears the weight of the wing.

A plain plywood panel of this size would be awkward to install and remove. So I shaved some weight by making large triangular cutouts. You can find the details in the lower right drawing.

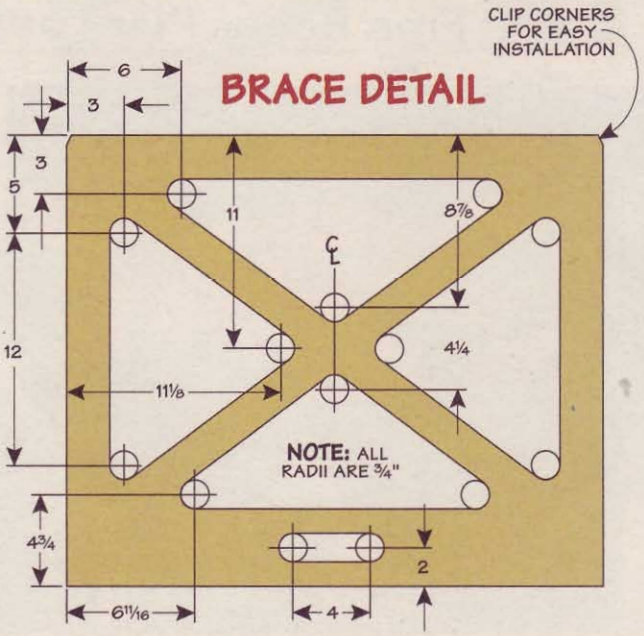
There's also a handhold cut along the front edge. Clipping the corners opposite the handhold makes slipping the brace into the tracks much easier.

The braces store on a shelf in the case when the wings are folded. You can see this in Figure 6 and the photo on page 25.

Leveling the Wings. With the braces complete, you're ready to complete the assembly. Your goal is to make sure the braces hold the wings flat and level with the top. The notes in Figure 6 give you an overview of the process.

I temporarily clamped the lower tracks in place using the dimensions shown in the drawing as a guide. Then I slipped a brace in place. A long straightedge held across the tops will show if you need to make any adjustments. Once you have the location marked, you can remove the brace and glue the track in place. The angled shape of the tracks makes gluing them tricky. You can find a solution for this on page 23.

It's also a good idea to wax the tracks to reduce friction as you slide the braces in place. Then you can move on to making the infeed and outfeed support systems.



infeed & outfeed

Support

Earlier, I mentioned that there were two components to the large work area of this project. You've completed the first, the side wings. What's left now is adding some infeed and outfeed support. This is crucial for cutting wide and long pieces safely because it gives you the greatest control.

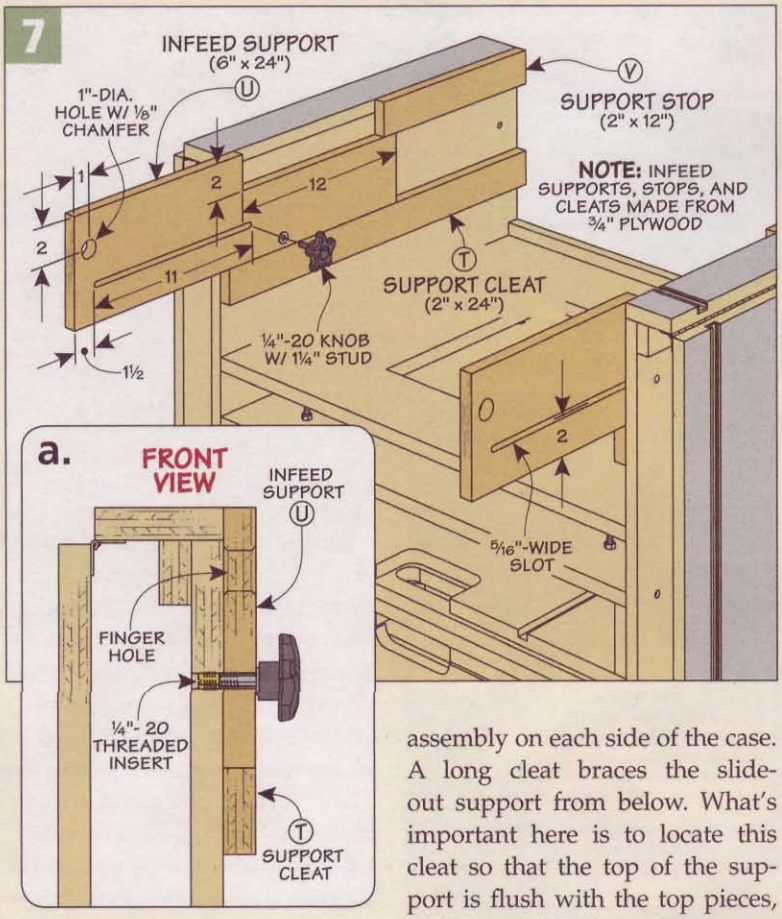
The infeed and outfeed supports take a different approach than the side wings. While the wings are flat, smooth, and solid, the infeed and outfeed supports form an open framework (Figures 7 and 9). There are a couple of reasons for this. In the case of the infeed support, they're separate so they don't act as a barrier to getting close to the saw.

In the back, the adjustable supports act like attached support stands. Now you can position them right where you need them or stow them against the back of the case when they aren't needed.

INFEED SUPPORT

Let's start at the front with the infeed supports. Benchtop table saws are notorious for having a short distance from the front of the saw table to the blade. This can make positioning a wide or long workpiece a challenge. These slide-out supports "extend" the worksurface for increased control.

Three-Part Assembly. As you can see in Figure 7 there's one assembly on each side of the case. A long cleat braces the slide-out support from below. What's important here is to locate this cleat so that the top of the support is flush with the top pieces, as illustrated in Figure 7a.



The Support. The support is an L-shaped piece of plywood with a long slot cut in it. This slot matches up with the threaded insert installed in the case side. With a studded knob and washer, you can fix the support in position.

Note: To get the stud length I wanted, I made my own studded knobs. It's just an insert knob with a length of threaded rod (or cut off bolt) glued in with epoxy.

There's one other thing to mention about the support. I drilled and chamfered a finger hole to make it easy to pull it out.

The Stop. The third part of the infeed assembly is the stop. This piece serves two functions. First, it acts as a back stop for the support in its stored position. The stop's second function is to keep the support from dropping down under the weight of the workpiece.

When you install the stop, make sure the support has a smooth, sliding fit. A little wax will also keep it moving smoothly.

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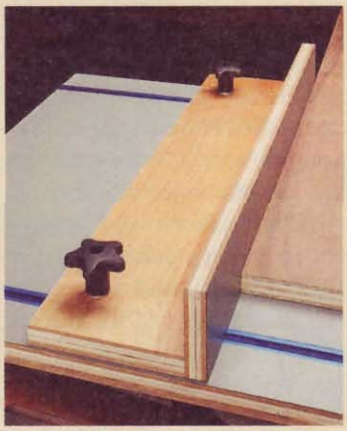
▲ ***Crosscut Sled.*** *The sled lets you make accurate cuts on panels up to 20" wide. A T-track on the top lets you add a stop for identical parts.*



▲ ***Auxiliary Rip Fence.*** *This fence rides in a pair of T-tracks in the right wing. It lets you rip wider pieces of plywood.*

OUTFEED SUPPORT

To wrap up construction of the workstation, you can turn your attention to the back and build the outfeed supports. These two adjustable supports can be located in a variety of positions to catch a board as it comes off the saw.

Solid Wood Construction. Building the outfeed supports is a little different from the rest of the project. Here, I used solid hardwood for all the parts. Solid wood stands up better to wear and tear. And it creates a strong, rigid frame for each outfeed stand.

Identical Assembly. To make the supports, you build two, identical "stands," as you can see in Figure 8. Each stand consists of a pair of legs joined by a pair of rails. There are two details on the legs that are worth mentioning. There's a notch on the inside edge of each leg. This notch provides clearance for the casters to rotate when the outfeed supports are stored.

The other detail to highlight is a slight radius on the bottom of each leg. This eases the legs to accommodate uneven floors and keeps the bottom of the leg from chipping as it slides on the floor.

Beveled Top. This assembly is capped with a set of three beveled tops. Beveling the leading edge prevents a workpiece from catching on the support (Figure 8a).

In the photo at right, you can see why I cut the top into three sections. The gaps allow the bar on a miter gauge or a crosscut sled to pass through. You need to size and arrange the top pieces to match the miter slots in your table saw.

Runners. The stands are joined to each other (and the case) by a pair of runners. A long slot in each runner makes it easy to adjust the positions of the supports (Figure 9).

The slot in the runner on the inner support needs to align with the threaded inserts you installed earlier in the case. Then to attach the outer support, you need to install another pair of inserts on the inner support legs. There's a gap between the runners so they wouldn't bind on uneven shop floors, as shown in Figure 9a.

Bonus Plans. This completes the construction of the workstation. But, you can get even more use out of it by building an auxiliary rip fence and crosscut sled (box on the opposite page). You'll find free plans for these at *ShopNotes.com*. Now, you can load up the workstation and put it to use.

▲ ***Clearance.*** *Gaps in the outfeed support tops allow the miter bar to pass through.*

FIGURE 8

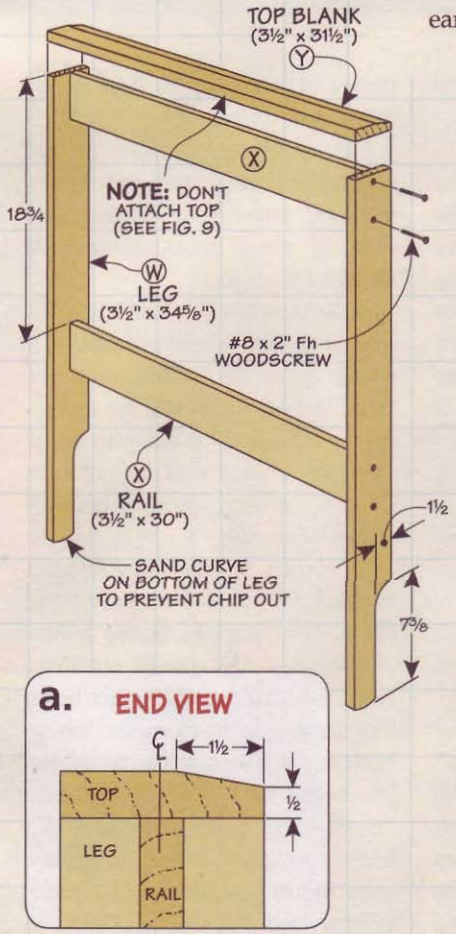
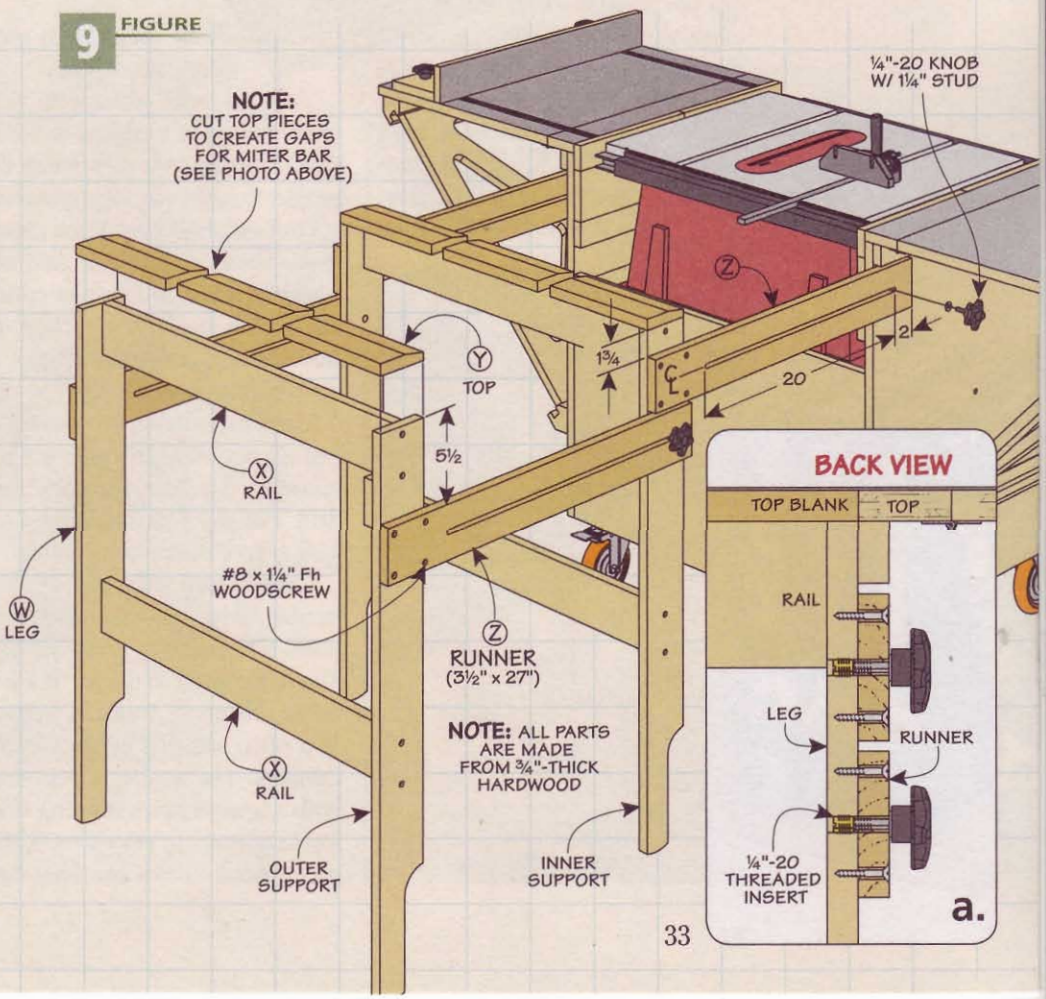


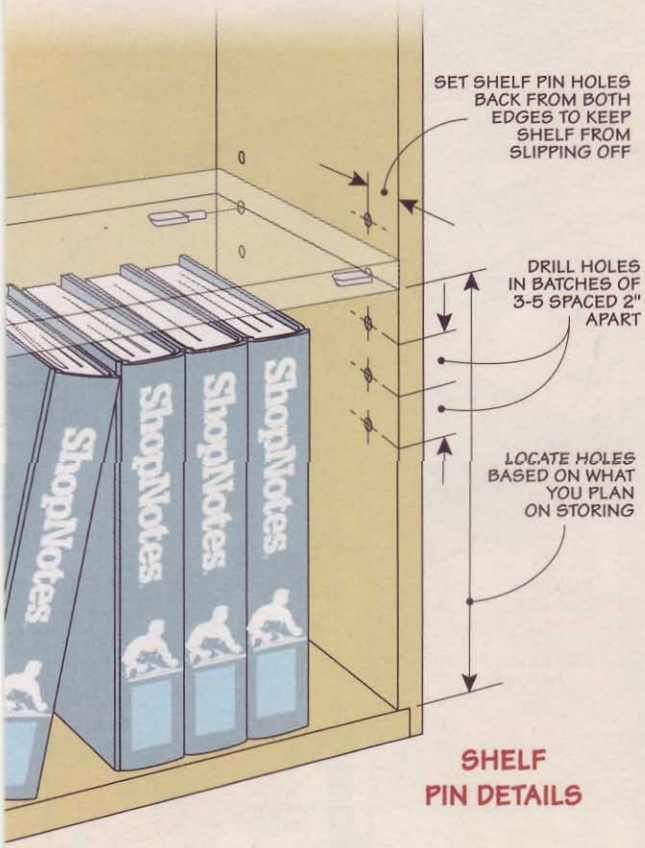
FIGURE 9



HANDS-ON
Technique

drilling perfect Shelf Pin Holes

Learn a few tips and tricks for adding adjustable shelves to your projects.



SHELF PIN DETAILS

Adjustable shelf pins are a great way to add some flexibility to the design of a cabinet or bookcase. They let you customize the project to suit your storage needs.

Drilling shelf pin holes seems to be about as basic as you can imagine. But if you've ever ended up with a shelf that rocked, or was uneven, you know it's not as simple as it seems.

In my experience, the process of getting perfectly spaced shelf pin holes starts before you pick up a drill. The key is to do a little planning before the project is built.

Customized Storage. The trouble with drilling shelf pin holes is it's easy to go overboard. You're tempted to think, "If a few holes are good, more is better." You often see this in commercial cabinets. The inside is peppered with a lines of holes running from top to bottom. In my opinion, this many holes looks cluttered and draws your eye away from other features of the cabinet.

Less is More. The fact is that most shelf pin holes will never get used, anyway. So drilling long rows of holes ends up being a waste of time, too.

Instead, what I've found works best is to drill shelf pin holes in small batches. Drilling sets of three to five holes still gives you plenty of flexibility, but you avoid the Swiss-cheese look. You can see what I'm talking about in the left margin drawing.

Of course, this means you need to carefully plan where to drill the holes. For example, books generally have a few pretty standard sizes. So drilling shelf pin holes less than 6" to 8" from the top or bottom of the case is pointless. It's better to space the holes in "book-sized" increments (12"-14") to accommodate anything from a shelf full of pint-sized paperbacks to oversized coffee table books.

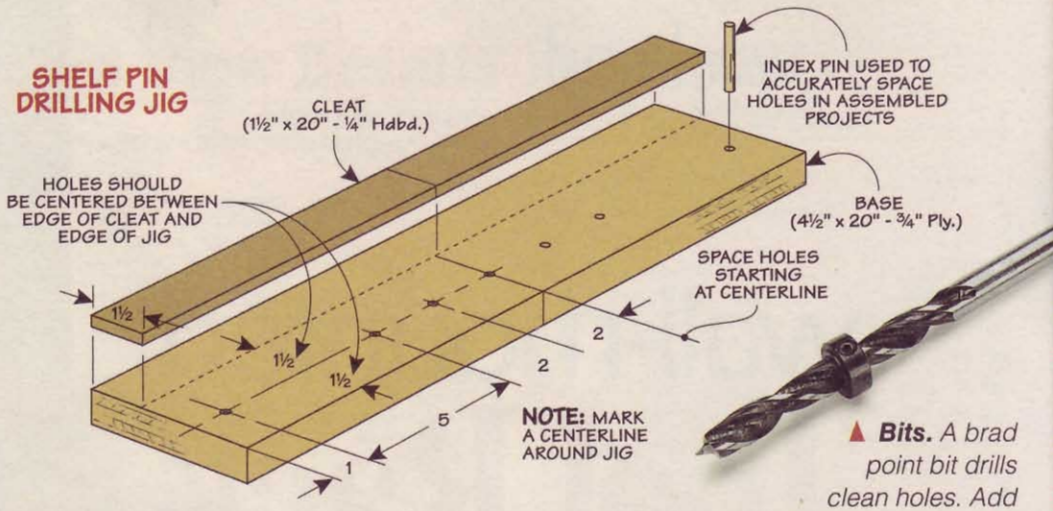
Setback. There's one final spacing detail to consider. And that's how far the row of holes is set from the front or back of the cabinet. At first glance, this doesn't seem like it's a big deal. But there are some good reasons to give this some thought.

The first point is if the pins are too close to the back edges of the shelf, it could fall off with only a slight movement. The second consideration has to do with appearance. I try to set the front holes back far enough so they're covered by the books on the shelves.

Drilling the Holes. Once you have the number and location of the holes set, the next step in the process is drilling the holes accurately. For this, I turn to a handheld drill and a jig.

The Right Bit. There's not much to say about the drill. But I do want to make note of the bit. I use a brad point bit (right margin photo). It makes a clean hole — especially in plywood. And it's a good idea to use a stop collar to drill to the right depth (about ⅜").

The Jig. The next thing to talk about is the drilling jig. It keeps the bit square to the workpiece and sets the hole spacing. The details for the drilling jig I use are shown in the drawing above. It's really just a piece of ¾" plywood with a hardboard cleat along one edge. The cleat registers the jig along the edge of the workpiece.



▲ ***Bits.*** *A brad point bit drills clean holes. Add a stop collar for consistent depths.*

Symmetrical. There are two things to keep in mind when making the jig. First, locate the holes starting at the centerpoint along the length of the jig. This allows you to use the jig to drill shelf pin holes based on the centerline of the jig or from either end of it.

The second thing is the holes should be centered between the edge of the jig and the edge of the cleat. This allows you to drill holes before or after assembly.

Before Assembly. I prefer to drill the holes before assembly when I can. Then I don't need to worry about access or clearance issues.

To use the jig, you start by marking the location of the center hole for each batch. Then it's just a matter of aligning the centerline of the jig on the mark and clamping it in place, as you can see in the photo on the opposite page.

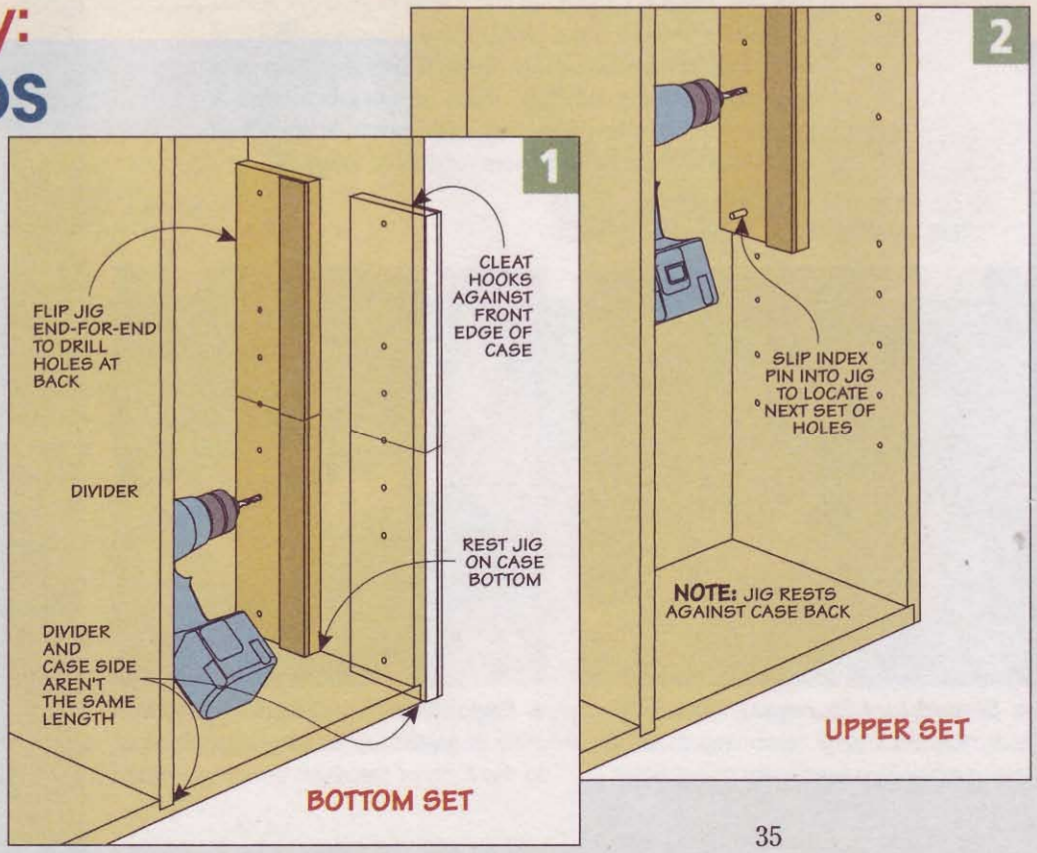
You can find tips for using the jig after assembly in the box below. Either way, the holes will be perfect and the shelves will rest secure.

after assembly: Drilling Tips

One of the main reasons to drill shelf pin holes after assembly is shown in Figures 1 and 2. Since the case side and the divider aren't the same length, there's no good reference point for laying out the holes.

Here, I use the case bottom as the reference edge for the drilling jig, as shown in Figure 1. The front set of holes is drilled with the cleat wrapped around the front edge of the case. To drill the rear holes, flip the jig end for end and nestle it against the case back.

Figure 2 shows how the remaining sets of holes are drilled. Here you can see how the indexing hole in the jig allows you to move it along in precise increments.



wall-mounted Tool Rack

Classic looks, simple joinery, and tons of storage. It all adds up to a must-have project for your shop.

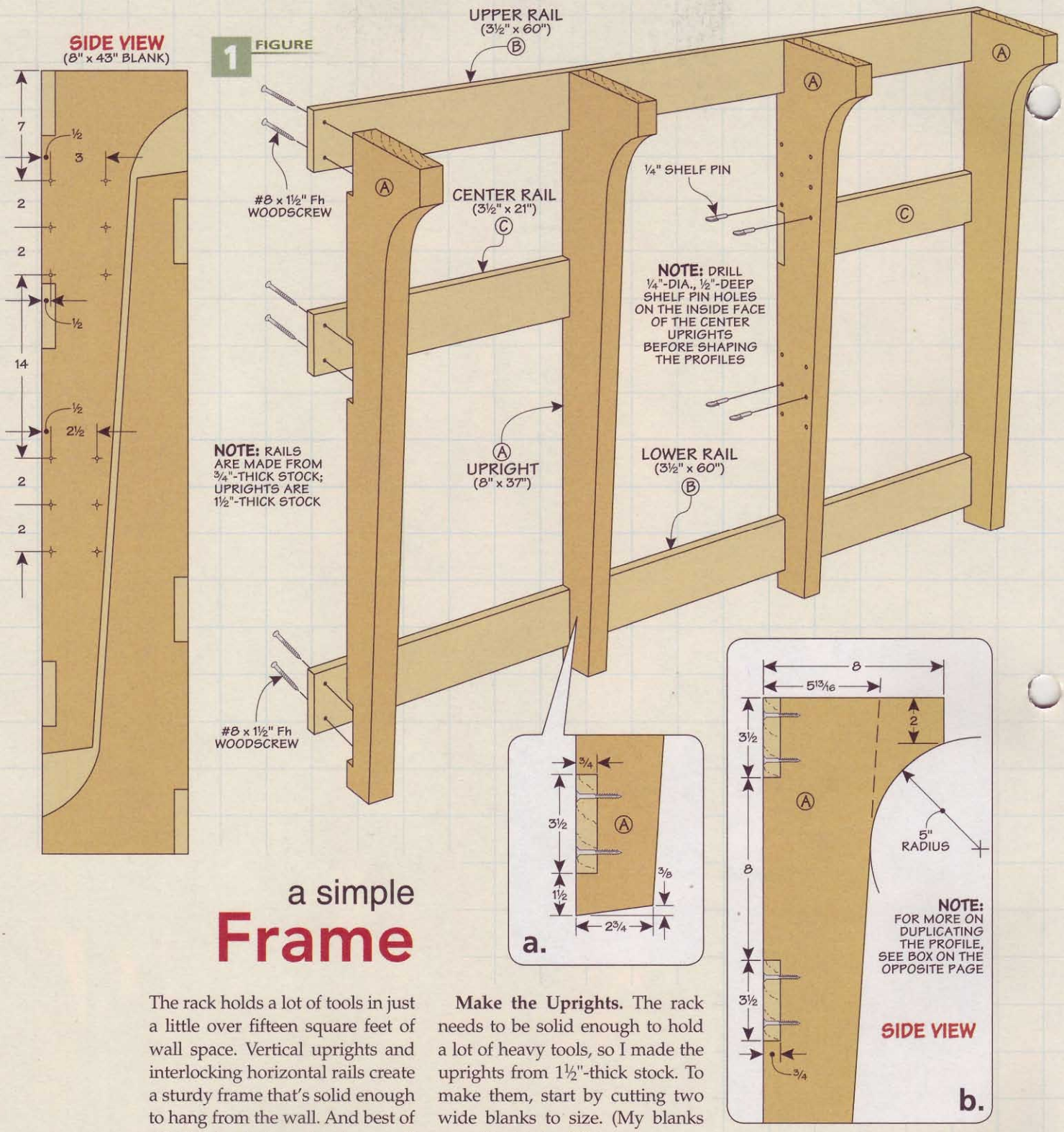
An easy way to make better use of any shop space is to organize where and how your most-used hand tools are stored. The compact, wall-mounted tool rack shown in the photo at right does just that. Best of all, the design offers flexibility to customize it for your own needs.

Many of the tools hang from dowels. But not every tool will hang on a peg. To solve that problem, I added adjustable shelves, a top shelf, and a unique slotted tool rack. The rack holds tools at an angle making them easy to remove (left photo below). Plus, no space is wasted. A good example is the pencil tray (right photo below). It all leads to less clutter and a more organized shop.

▲ **Slotted Tool Storage.** *Unique angled tool holders make removing tools, like these chisels, easy to do.*

▲ **Pencil Tray.** *Take advantage of every inch of space by adding a pencil tray to the tops of the rails.*


BOSCH
BLACK & DECKER



a simple

Frame

The rack holds a lot of tools in just a little over fifteen square feet of wall space. Vertical uprights and interlocking horizontal rails create a sturdy frame that's solid enough to hang from the wall. And best of all, it's simple to make changes if you want. I've set it up to hold my favorite hand tools, but with just a little planning you can modify it for your own tools.

The frame is made up of four uprights that are tied together with four rails. To strengthen the frame, I cut notches in the back edge of the uprights for the rails.

Make the Uprights. The rack needs to be solid enough to hold a lot of heavy tools, so I made the uprights from 1½"-thick stock. To make them, start by cutting two wide blanks to size. (My blanks were 8" wide by 43" long.)

Simple Joinery. As you can see in the margin drawing, the uprights have a profile with a radius and long taper on their front edge. With some careful layout, you can get two uprights from a single, wide blank. I used a band saw to cut the workpieces to rough shape. Then I laid out and cut all the notches for the rails, using the square edge at one end as a reference (Figures 1, 1a, and 1b). I installed a dado blade in my table saw and used the rip fence as a stop to accurately size and position the notches in the uprights.

Shelf Pin Holes. As you can see in Figure 2, there are a pair of

adjustable shelves between the two center uprights, so you'll need to drill shelf pin holes now. The layout is detailed in the margin on the opposite page. Note that the upper set of holes is spaced ½" wider than the lower set to accommodate a wider shelf. For more on drilling shelf pin holes, turn to the article on page 34.

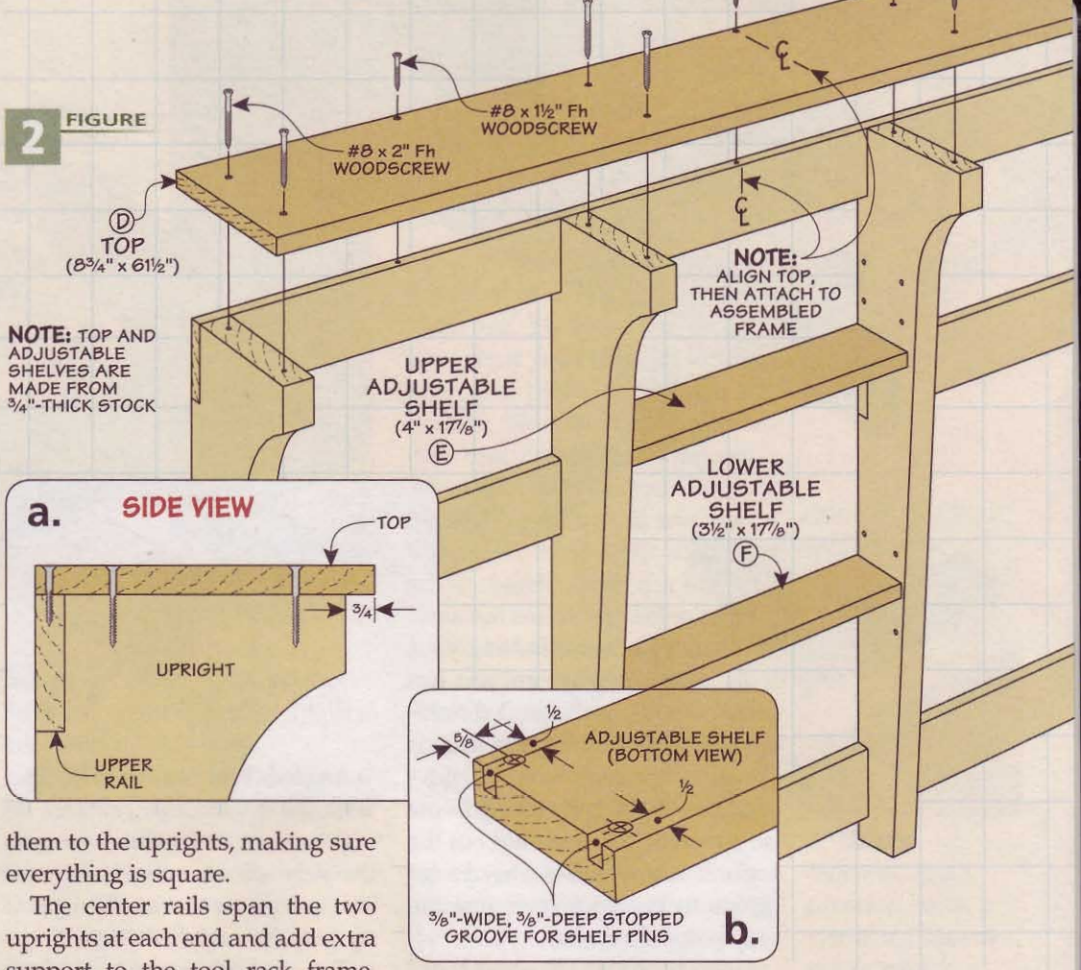
Add the Profile. With the joinery completed, you're ready to shape the uprights. If you take a look at Figures 1a and 1b, you'll find details for the radius and long taper on the front edge of the upright. Rather than cut each upright on the band saw and then cleaning up the saw marks, I decided to finish one upright, then use it as a template to complete the remaining three uprights. For more on how I did this, see the box below.

The final step to completing the uprights is to ease the sharp corner by beveling the end (Figure 1a).

Rails. Next, you'll want to get started building the rails. The upper and lower rails span the length of the rack and tie all the uprights together. Making them is pretty straightforward. Simply cut them to size and drill countersunk screw holes (Figure 1). Then screw them to the uprights, making sure everything is square.

The center rails span the two uprights at each end and add extra support to the tool rack frame. Go ahead and cut them to fit and screw them in place (Figure 1).

Shelves. Next I cut the top, upper and lower adjustable shelves, to size (Figure 2). After easing the edges slightly on the top, go ahead and attach it to the uprights.



The adjustable shelves rest on shelf pins. To keep the shelves in place as you remove items, add stopped grooves to the underside for the pins to rest in (Figure 2b). A Forstner bit in a drill press and chisel makes easy work of this job.

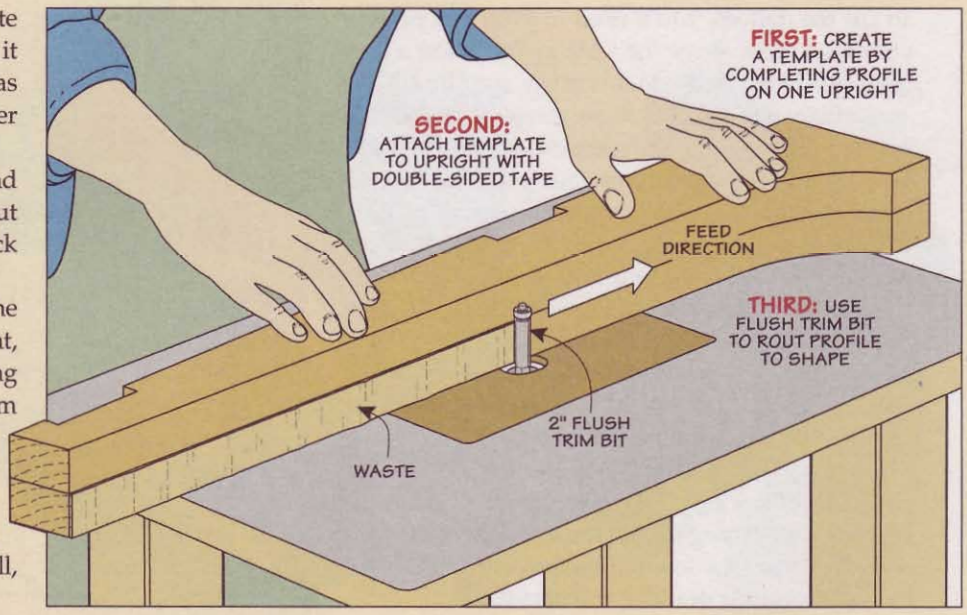
Making Duplicate Profiles

Shaping identical profiles on four separate uprights is a challenge. That's why I do it just once. Then I use the completed blank as a template to rout the profiles on the other three uprights, as shown in the drawing.

To do this, cut the first profile on a band saw, making sure to stay close to the layout line. Then, use a drum sander and a block plane to clean up the saw marks.

Template Routing. Once you have the template blank shaped the way you want, the rest is easy. Just rough cut the remaining blanks on the band saw. Then, attach them one at a time to the original using double-sided tape and rout away the waste.

Rout Downhill. To do this, use a flush trim bit mounted in a router table, as shown in the drawing. Just be sure to rout downhill, or "with" the grain to avoid tearout.



customize the

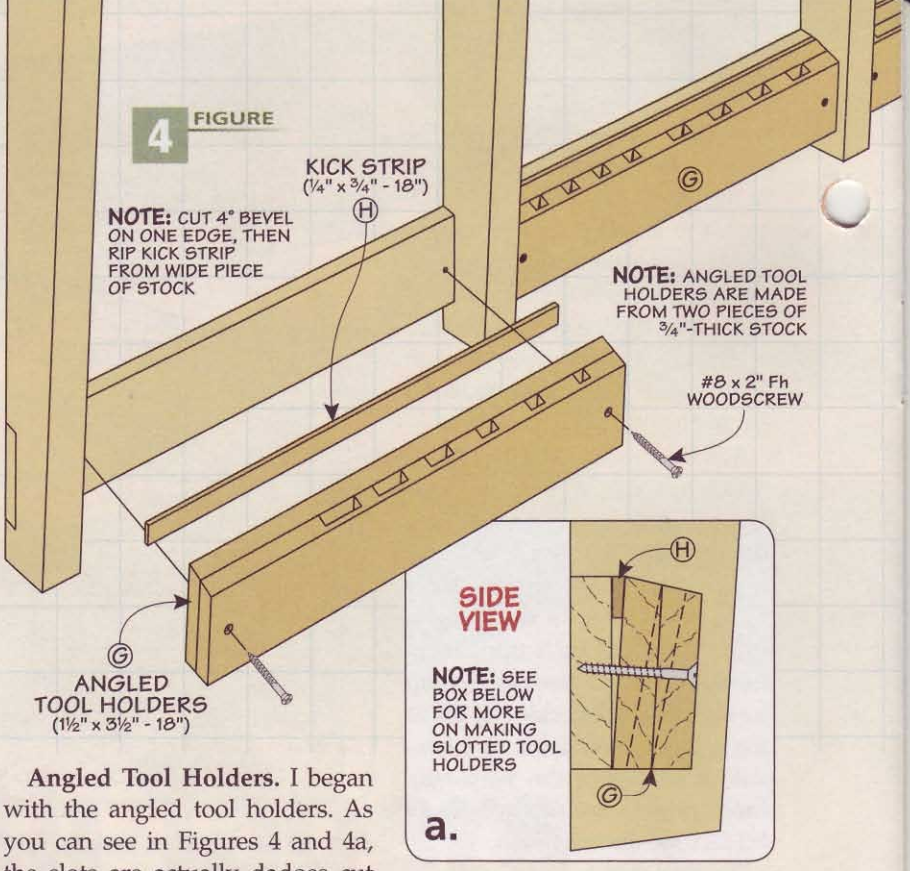
Tool Holders

All that's left now is to build the holders that store all the tools. Many of the tools hang from pegs. The pegs are just short lengths of dowel inserted into holes that are drilled into a replaceable face. This way, you can remove the face for a new one if you decide to add or replace a tool later. The rest of the tools are either placed on the shelves or held in slotted holders.

Where you decide to hang your tools determines where you can position tools in the angled holders below. So the first thing to do is decide where everything will go.

Locate Tools. I placed my frame on a workbench, then laid out the tools. This way, it's easy to arrange things to get your tools just the way you want them.

If you have any extra-long tools, like a hand saw or level, place them toward one end and be sure to arrange them so that you don't block access to other tools. Once things are laid out and marked, you can go ahead and start building the parts for the holders.



Angled Tool Holders. I began with the angled tool holders. As you can see in Figures 4 and 4a, the slots are actually dadoes cut into two pieces that are then glued up to make a single holder.

The dadoes are cut ½" deep at one edge of the board, but gradually taper to near zero at the back edge. I cut the dadoes on both pieces of all three holders using the same set up at the table saw. For more on how they're made, check out the box below.

To complete the tool holders, cut bevels on the tops and bottoms of each one, as shown in detail 'b' in the box below.

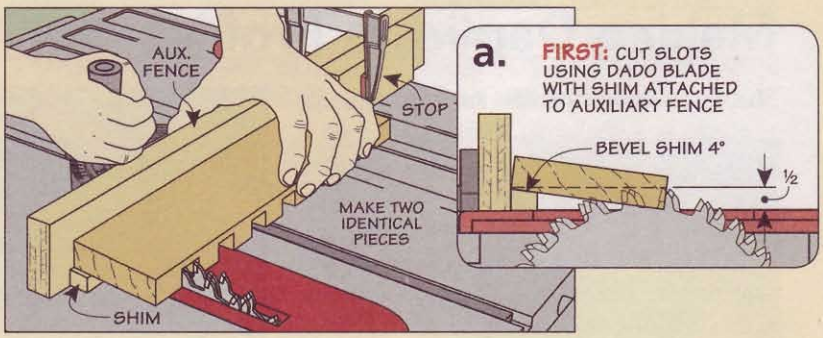
Kick Strip. The kick strips tilt the angled tool holders out a bit for easier access. They're similar to the shim that you used to cut the slots. They're glued in place behind the holders, like you see in Figure 4a.

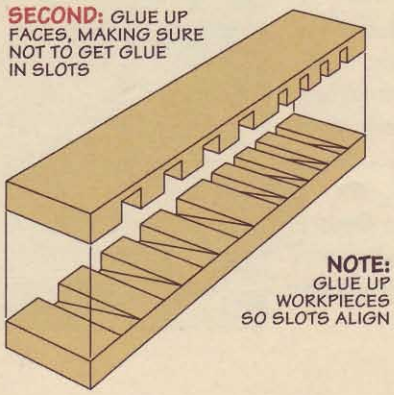
Cutting Angled Dadoes

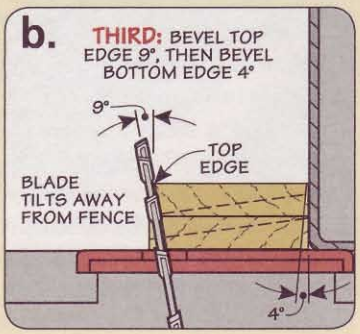
To cut the dadoes, you'll need to prop one edge of your workpiece above the table as you make a pass over a dado blade. To do this safely, start by adding an auxiliary fence to your miter gauge. Then, attach a beveled ½"-thick shim to the fence using double-sided tape. (To make the shim, tilt your saw blade 4° and cut it from the edge of an extra-wide workpiece.)

Cut Slots. As you can see in the upper drawing, the shim holds the workpiece at a slight angle. This way, the dado zeroes out at one end, but is ½" deep at the opposite end (detail 'a'). You can use a stop to position the dadoes, customizing each width to fit a specific tool. And be sure to cut a matching slot in the other piece before adjusting the stop for the next slot.

To complete the angled tool holder, rotate one workpiece 180° before gluing it to the other workpiece. (Be sure to avoid getting glue in the slots.) Once the glue is set up, bevel the top and bottom of the glued-up tool holder (lower drawing and detail 'b').







Hang Your Tools. Completing the wall rack from here on out is a snap. All you need to do is cut a few workpieces to size, drill some holes (both angled and straight), and install the pegs. (I used 3/16", 3/8" and 1/2" dowels of varying lengths for my pegs.) Once that's complete, you can add the pencil trays.

Custom Faces. Start by cutting the custom faces to size, as shown in Figure 5. There are four face pieces that get screwed to the rails between the uprights at the top and center of the frame.

Now use the layout you made earlier to drill holes for the pegs. Depending on the tools you're hanging, some of the holes will have to be perpendicular to the face of the peg racks. But I angled most of the holes at 4° (Figure 5b). This simply keeps the tools from slipping off the front of the pegs.

Drilling Shim. Here again, I used a narrow shim to tilt the faces while drilling the peg holes. This shim is also 1/2" thick and has a 4° bevel on one edge.

This time the strip is attached to back of the faces (Figure 5b). (I used double-sided tape to hold it in place.) Adjust the fence as needed for your peg layout, then drill the holes and install the pegs with glue.

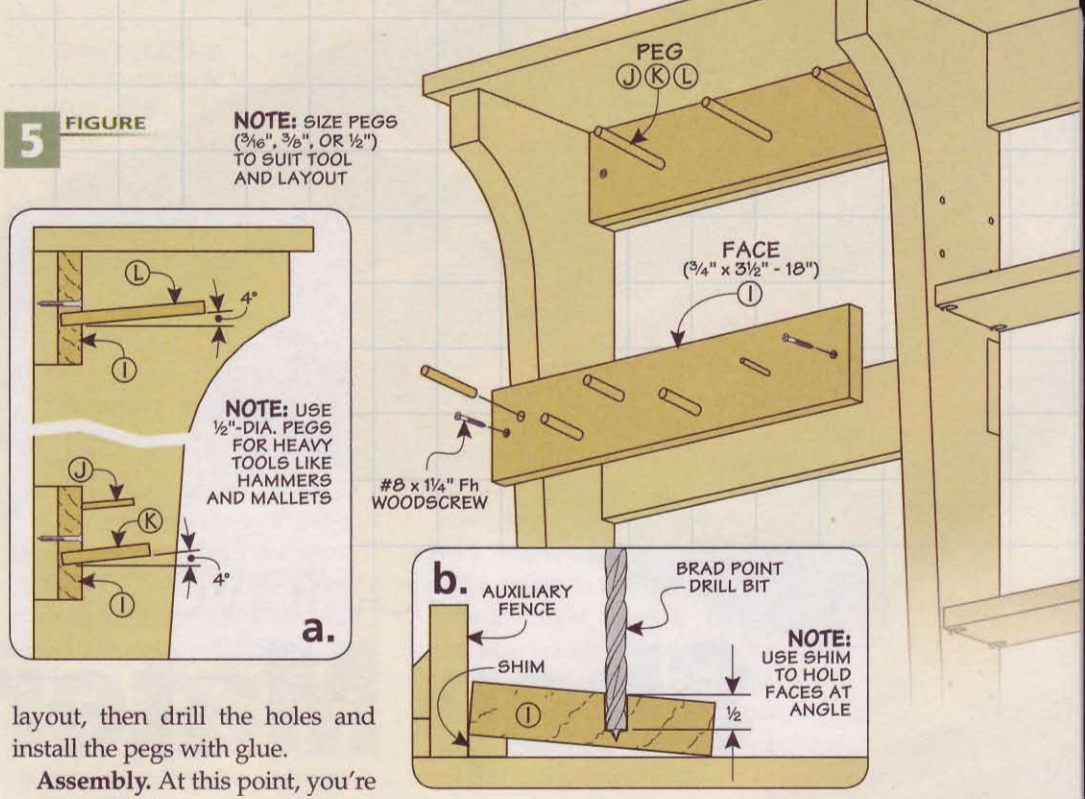
Assembly. At this point, you're ready to attach the custom faces to the rails, but I didn't use glue here. Instead, I simply drilled countersunk shank holes and attached them with screws (Figure 5). This way, I can replace them when needed. Now, let's get started making the pencil trays.

Pencil Trays. The space above the two center rails (and faces) is a perfect place to add a tray to hold all your pencils and other small items (Figures 6 and 6c).

To make the recess, cut the tray blanks to size and head over to the router table. Two passes over a core box bit created the rounded edges of the recess. Then, clean up the waste with a few passes over a straight bit (Figures 6a and 6b). Once that's complete, attach the trays to the top of the rails only. This way you can remove the faces later.

All that's left is to attach the rack to the wall with screws installed through the rails. You'll need to remove the faces to do this.

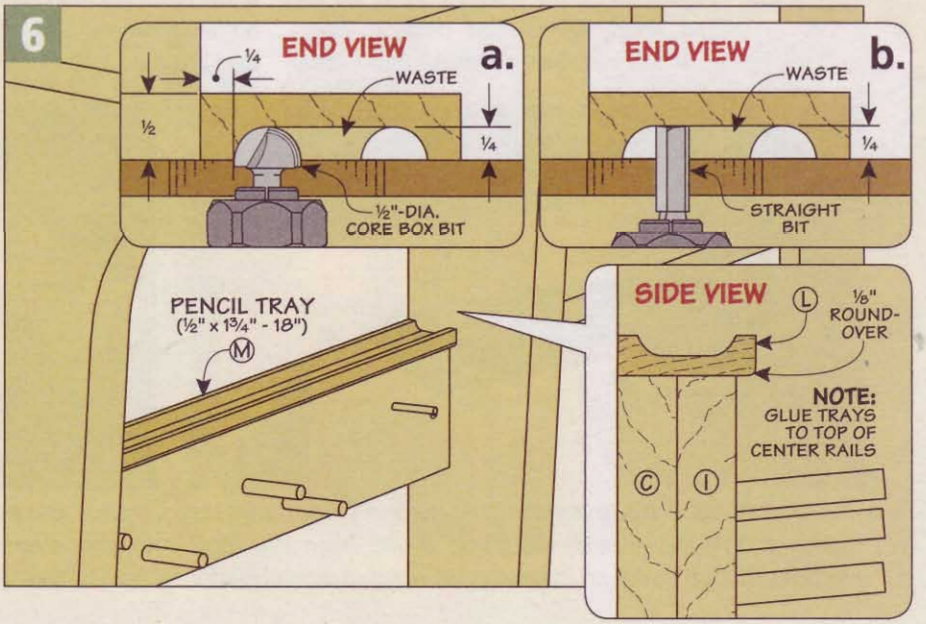
There you have it. A tool rack that keeps your tools close at hand. And all it took was a weekend to get everything in order.



Materials & Hardware

A	Uprights (4)	1½ x 8 - 37
B	Upper & Lower Rails (2)	¼ x 3½ - 60
C	Center Rails (2)	¾ x 3½ - 21
D	Top (1)	¾ x 8¾ - 61½
E	Upper Adjustable Shelf (1)	¾ x 4 - 17⅞
F	Lower Adj. Shelf (3)	¾ x 3½ - 17⅞
G	Angled Tool Holders (3)	1½ x 3½ - 18
H	Kick Strips (3)	¼ x ¾ - 18
I	Custom Faces (4)	¾ x 3½ - 18
J	Small Peg	3/16-dia. x 4½ rgh.
K	Medium Pegs	3/8-dia. x 42 rgh.
L	Large Pegs	½-dia. x 16 rgh.
M	Pencil Trays (2)	½ x 1¾ - 18

(27) #8 x 1½" Fh Woodscrews
(14) #8 x 2" Fh Woodscrews
(8) #8 x 1¼" Fh Woodscrews
(8) ¼"-dia. Shelf Pins



our favorite Shop Materials

Find out how to make better shop storage projects, jigs, and accessories.

One of the most important questions to ask when designing a shop project is, "What should it be made of?" It's a question I hear a lot.

Most *ShopNotes* projects are made from the assortment of materials shown in the photo above. Each one has specific qualities that make it ideal for projects that will see long-term shop use.

SHEET STOCK

A lot of the things I build for the shop are storage projects. Sheet stock makes it easy to build cases without having to glue up solid wood panels and deal with wood movement issues. Plus, it's cheaper.

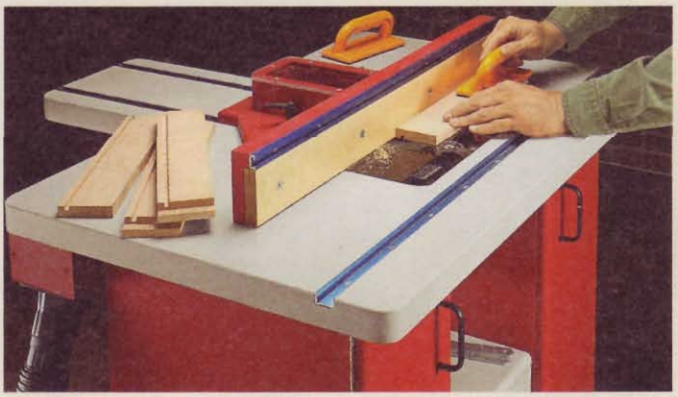
Baltic Birch Plywood. My first choice for building shop cabinets is Baltic birch plywood. Unlike standard home center plywood, Baltic birch is flat and more stable.

It has almost twice as many layers as standard plywood. And those layers are all high-quality birch veneers with no voids. Plus, Baltic birch plywood is strong and holds screws well. Another advantage is it's smooth. So projects look good in either a natural or painted finish. Although 60" x 60" sheets are the standard, you can now find 48" x 96" sheets, as well.

Medium-Density Fiberboard. Another option for building cases is medium-density fiberboard (MDF). It has a couple of big advantages. The first is that MDF is very flat and smooth. That makes it ideal for workbenches and tabletops, like the router table shown in the right photo below.

A second benefit is that it's heavy and absorbs shock and vibration.

▲ ***Baltic Birch & Hardboard.*** *This plywood workstation will stand up to hard knocks thanks to Baltic birch plywood. Hardboard tops make an inexpensive, rugged worksurface.*



▲ ***MDF & Laminate.*** *For sturdy, vibration-absorbing cases that are inexpensive to build, MDF (painted) can't be beat. Plastic laminate provides a smooth, durable tabletop.*

Medium-Density Fiberboard (MDF)

▲ ***Vertical-Grain Douglas Fir.*** *The tight, straight grain of Douglas fir gives this tool cabinet an heirloom-quality look.*

▲ ***Fir & Pegboard.*** *Construction-grade fir makes a strong, inexpensive wall cabinet. Pegboard panels add instant storage that can be easily customized.*

Again, this is a big plus for building tool stands and workbenches.

Another thing to like about MDF is it's very inexpensive. So building shop full of projects won't cost you a lot of money.

Hardboard. Not all sheet stock is used to make cases. One example is hardboard. Mainly, I use it for drawer bottoms and case backs. Since it's smooth and dense, it works well as a top covering for tabletops and jig bases, too. The best quality hardboard is "tempered" and is smooth on both faces.

Pegboard. You'll find a close cousin to hardboard in most shops and garages — pegboard. It's a great way to add storage to your walls, as shown in the upper right photo. Be aware that it comes in varying thicknesses. Look for the thickest pegboard. The thin stuff is more likely to warp over time.

Plastic Laminate. One final sheet stock I use is plastic laminate. This is the same stuff you find on kitchen counters. It's inexpensive, tough as nails, and provides a low-friction surface that resists glue, finish, and solvents. That makes laminate perfect for assembly tables and workstations like the one on page 24.

▲ ***Baltic Birch & Maple.*** *A precision jig is a prime candidate for Baltic birch plywood because it's smooth, flat, and stable. Hard maple fences provide a flat, rigid backbone for accurate results.*

SOLID WOOD

You can use almost any wood for shop projects. But there are two that see most of the action in my shop — Douglas fir and maple.

Douglas Fir. Actually, I use two very different types of Douglas fir. For many projects, common, construction-grade fir is a great choice. You can find it in many home centers. It's inexpensive and strong, and if you take your time selecting boards, your project will look great, too.

Vertical-Grain Fir. When I want to build a "fancy" shop project, I turn to vertical-grain Douglas fir. (You'll find it at some hardwood lumber dealers.) The tight, straight grain has a look that can't be matched (upper left photo).

Hard Maple. The other wood I often use is hard maple. What's not to like? It's smooth, strong, wears like iron, and it isn't likely to warp or twist. I like to use it for drawer boxes and jig fences, as shown in the photo at left.

Choosing the right material to use in a project is just as important as the right design. If you keep these versatile materials in your lumber rack, you can't go wrong. Your shop projects will work better and last longer.

Top 5 Workbench Upgrades

These easy-to-build accessories improve the performance of your workbench and increase productivity.

A good workbench is one of the most important "tools" in any workshop. The five bench accessories you see on these pages greatly increase its usefulness.

One of the most useful is the **bench jack** (1) shown at right. This handy support keeps the end of a long, edge-clamped board level.

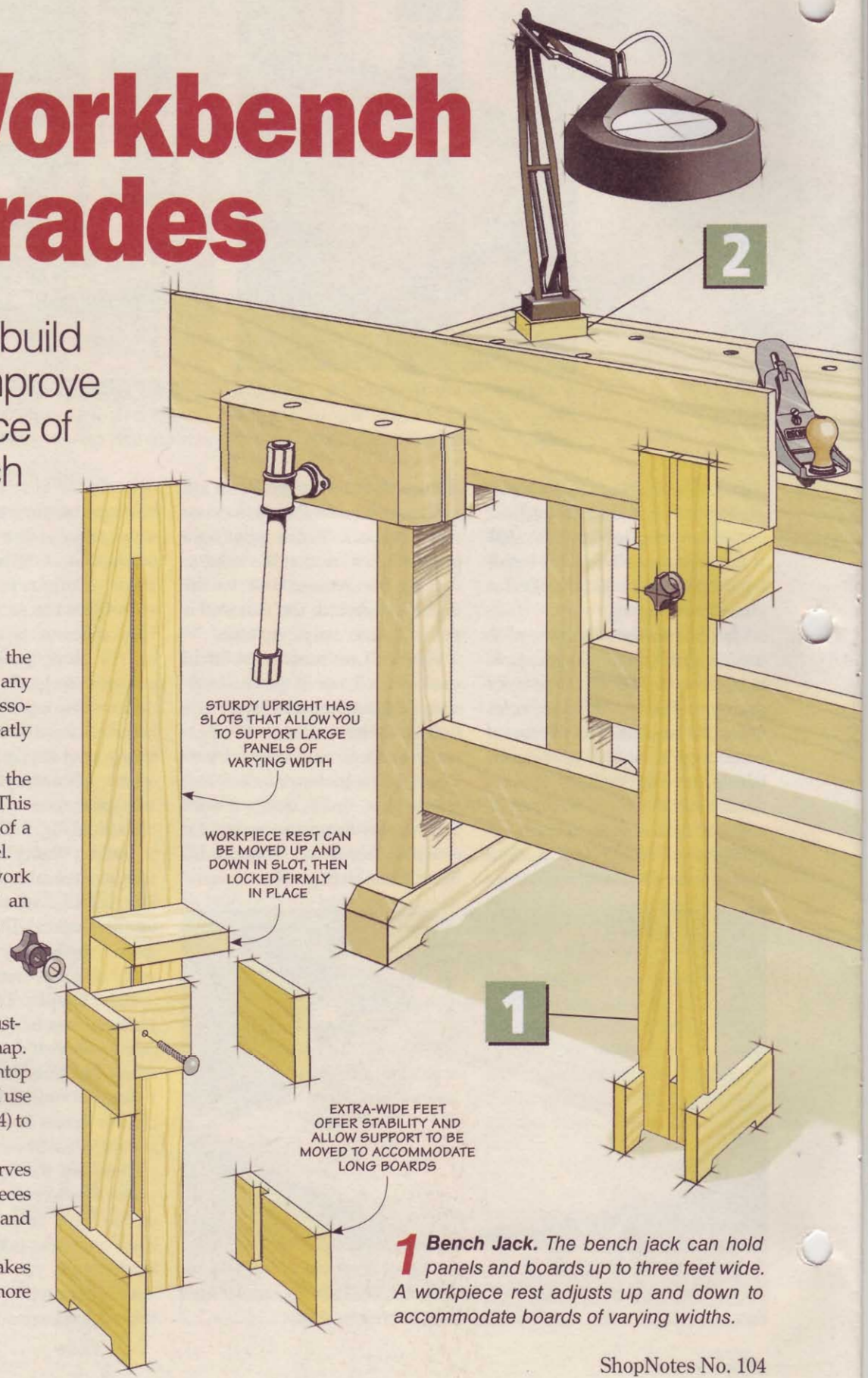
Then, to add light to the work area, I inserted the stem of an adjustable lamp in a simple **lamp mounting block** (2).

To help with sanding and planing tasks, I built a **bench stop** (3). The one-handed adjustment feature makes changes a snap.

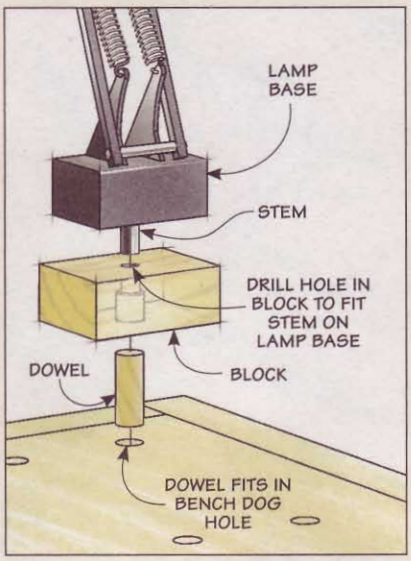
And, to preserve my benchtop during glue-ups and finishing, I use an **under-bench paper hanger** (4) to hold a roll of kraft paper.

Finally, a **bench hook** (5) serves as a benchtop cradle for workpieces and makes crosscutting boards and cleaning up tenons a snap.

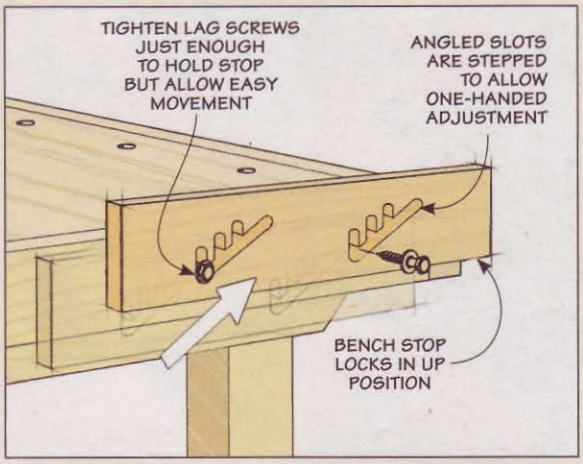
Each of these upgrades makes your bench a whole lot more useful than it already is.



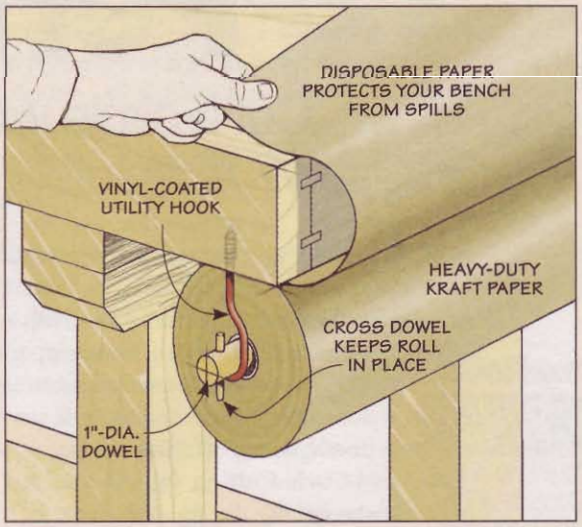
1 Bench Jack. *The bench jack can hold panels and boards up to three feet wide. A workpiece rest adjusts up and down to accommodate boards of varying widths.*



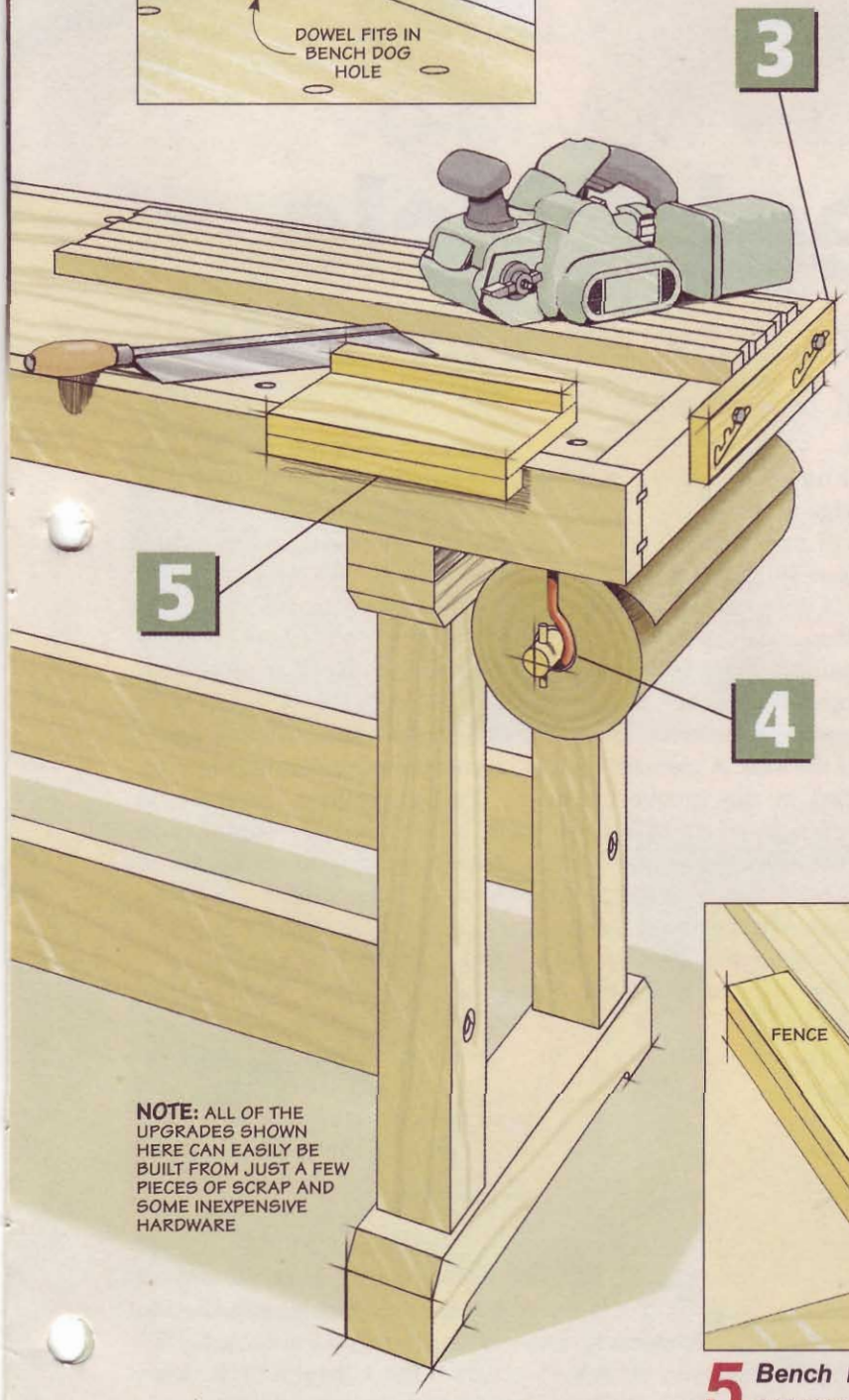
2 Lamp Mounting Block. *This simple mounting block holds the stem of an adjustable lamp. A dowel glued in the block slips into an existing bench dog hole on your workbench.*

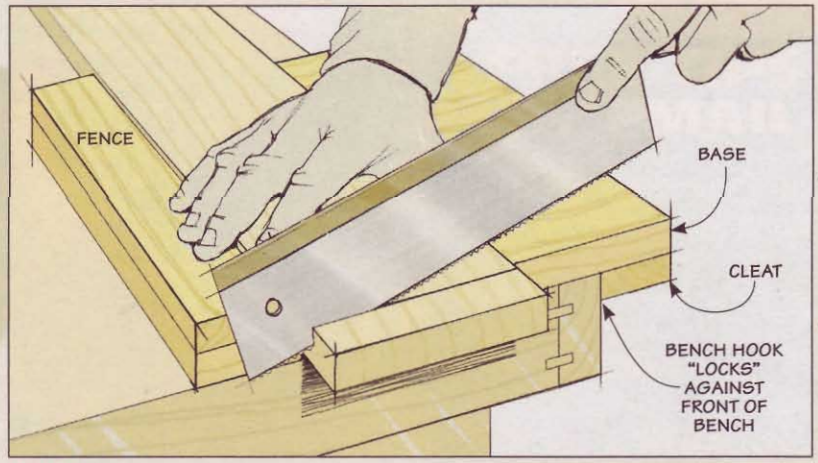


3 Bench Stop. *This easy-to-build bench stop has "stepped" slots that provide simple, one-handed operation when planing and sanding boards on your benchtop.*



4 Under-Bench Paper Hanger. *Two large hooks and a few dowels are all it takes to hold a roll of kraft paper so it rolls freely. Simply pull out a sheet to protect a workbench from spills.*





5 Bench Hook. *A pair of cleats allow you to "hook" this simple accessory to the top of your workbench. This makes it handy as a guide for cleaning up tenons or crosscutting parts to length.*

the easy way to a Perfect Circle

Cut a circle with crisp, clean edges on the table saw? Absolutely. All it takes is a simple, shop-built jig.

A table saw isn't a tool you think of when it comes to cutting a workpiece into a circle. But with a shop-built jig, cutting a circle up to 40" in diameter is quick, easy, and accurate. And it results in a surprisingly smooth, even edge.

Circle-Cutting Jig. As you can see below, the jig starts out as a large base with a hardwood runner glued to the bottom. The runner fits the miter slot of the table saw and guides the jig during the cut while the base supports the workpiece.

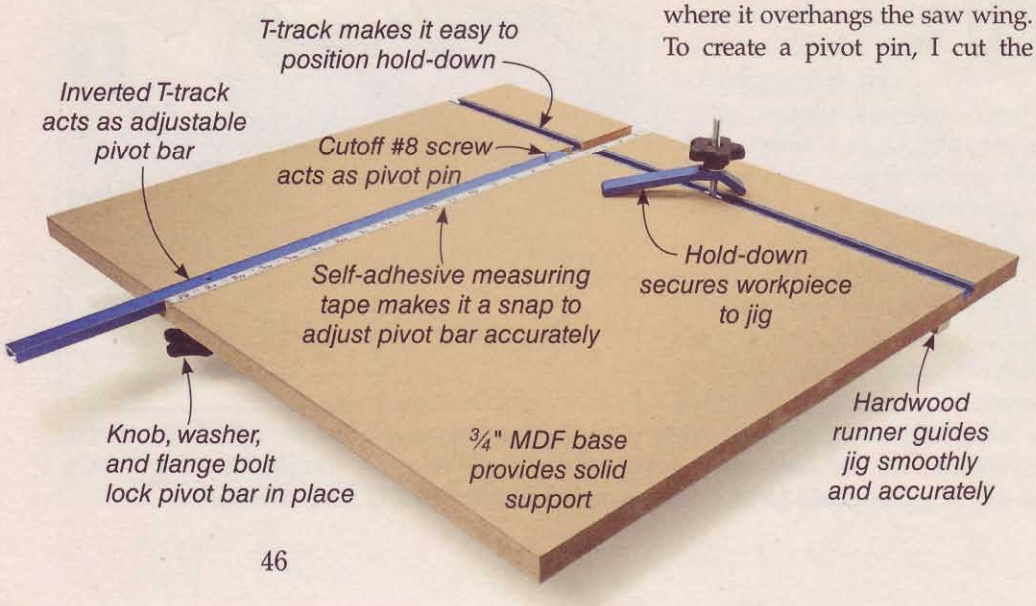
The runner is located to position the edge of the jig flush with the teeth of the saw blade. And size the base so it overhangs the left edge of the table saw wing by 2". (My base ended up 22½" x 26".)

A pair of intersecting grooves in the top of the base accept T-track. One groove is located 8" from the top of the base. A piece of T-track installed in this groove upside-down acts as an adjustable pivot bar. And to lock the bar in place, there's a knob and a flange bolt that comes up through the base where it overhangs the saw wing. To create a pivot pin, I cut the threads off a #8 Fh woodscrew and used epoxy to glue the ⅜"-long smooth shank into a countersunk hole drilled in the T-track.

The second groove holds two sections of T-track (one on either side of the pivot bar groove). A flange bolt, hold-down, and knob fit into the T-track to allow you to secure the workpiece during a cut.

Finally, installing a short section of self-adhesive measuring tape makes it a snap to set up the jig for a specific size circle. The tape is "zeroed" out at the edge of the jig that aligns with the saw blade.

ShopNotes GO ONLINE EXTRAS
To download a free 3-D model of the circle-cutting jig, go to:
ShopNotes.com

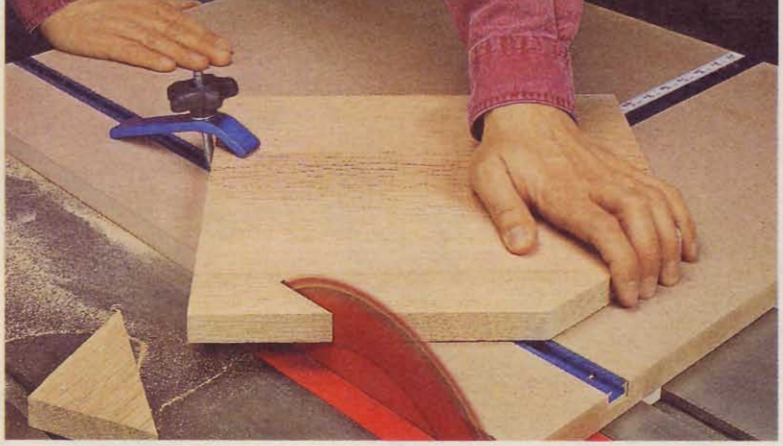


USING THE JIG

Once you have the jig made to fit your table saw, using it to cut a circle couldn't be simpler. It all starts by cutting a square blank slightly larger (about ⅛") than the final diameter of the circle you want.

With the blank cut to size, the next step is to drill a centered hole in the *bottom* face. Size the hole to fit over the pivot pin of the jig.

Size the Circle. At this point, you're ready to position the workpiece on the jig. The first thing to



▲ ***Knock Off the Corners.*** *After setting the blank over the pivot pin, clamp it in place with one corner hanging over the edge. Once you trim a corner off, simply repeat the process for the other three corners.*

▲ ***Continue Trimming.*** *At this point, you have an octagonal shape. The next step to creating a circle is to trim off the newly created "corners."*

do here is adjust the pivot bar (and pin) to match the radius of the circle. To do this, adjust the pivot bar so the distance from the center of the pivot pin to the edge of the jig matches the desired radius.

Next, rotate the workpiece so a corner overhangs the edge of the jig. Once you secure the workpiece with the hold-down, simply trim off the waste. Then, repeat the process for the other corners, like you see in the left photo above.

Completing these cuts results in a workpiece with a "rough" octagonal shape. The next step is to repeat the trimming process by knocking off the smaller waste "corners." You can see this in the photo at the upper right.

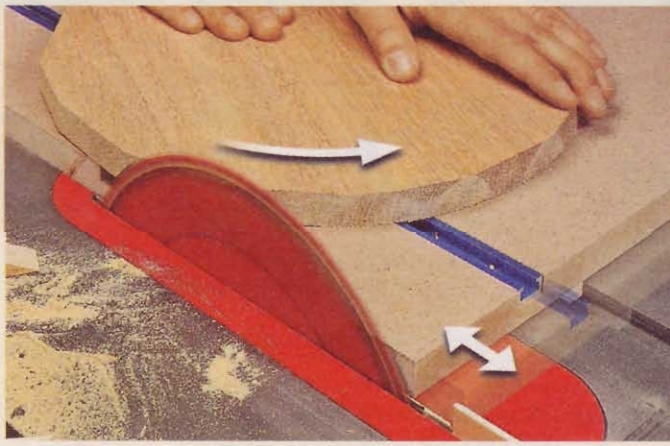
As you can see, the workpiece is beginning to look more like a circle. If you're cutting a large circle, you may need to repeat the trimming process a couple of times, clamping the workpiece in place for each of the cuts.

Final Shaping. The last step is to rotate the workpiece a number of times to trim away small amounts of waste with each rotation.

To do this, simply "nudge" the base forward slightly and then rotate the workpiece a complete 360°. This will trim off a small amount of waste near the lower edge of the workpiece. As you do this, be sure to keep your hands well away from the saw blade. (I keep my hands to the left of the clamping T-track at all times.)

To end up with an edge that's square to the face, you'll need to repeat this process, moving the jig forward a bit more, and then rotating the workpiece again. Do this as many times as necessary until the entire edge is smooth and square, like you see in the main photo.

Don't worry, the entire process of creating a circle takes just a few minutes. And the end result is a perfectly sized circle. For the smoothest edge possible, check out the box below.



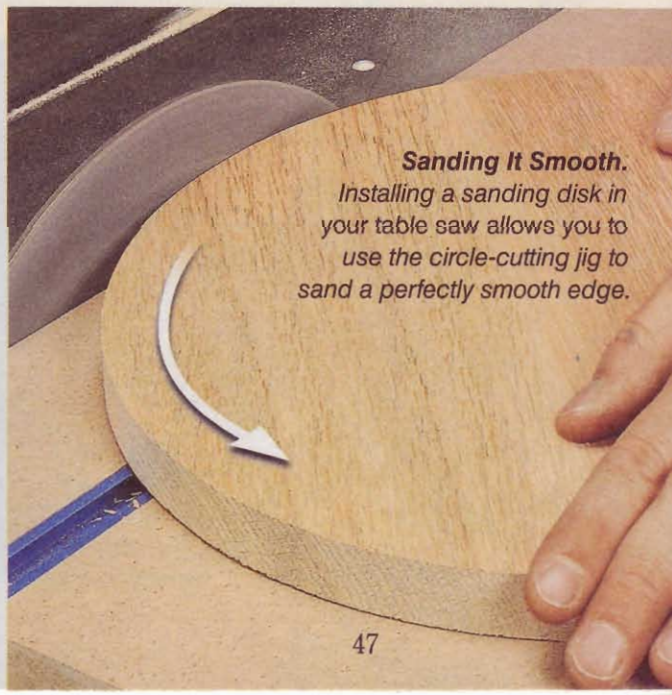
▲ ***Final Shaping.*** *Finally, rotate the workpiece as you trim away the final waste. You'll need to move the jig forward slightly after each rotation.*

smoother edges with a Sanding Disk

While a good table saw blade provides a clean edge, you may want to sand it even smoother. The solution is to install a sanding disk in your table saw, like the one below.

(It also doubles as a setup plate for tuning up your table saw.)

Just attach a self-adhesive sanding disk to the plate and the circle-cutting jig will work for sanding. After turning on the saw, simply adjust the pivot rod (and workpiece) until it just starts sanding and then lock the rod in place. With just a few turns of the workpiece, you'll end up with a smooth edge. For sources, turn to page 51.



Sanding It Smooth. *Installing a sanding disk in your table saw allows you to use the circle-cutting jig to sand a perfectly smooth edge.*

3 cool tools that provide Smart Solutions

The editors look at some new products that help make better use of the time you spend in your shop.

WORK SHARP 3000 WIDE BLADE ATTACHMENT

It's tough to beat the ease of use and great results you can get with the *Work Sharp 3000*. However, it did have one major limitation — wide plane irons wouldn't fit into the sharpening port. But the makers have addressed this with their new wide blade attachment.

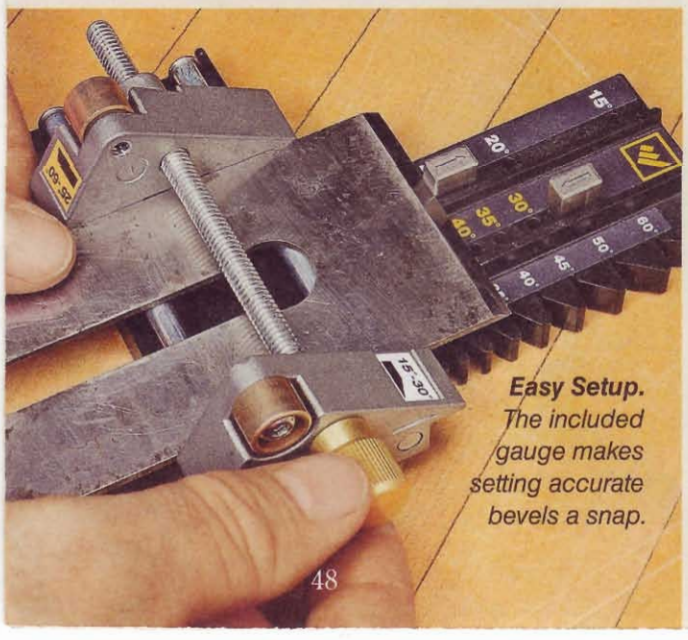
You get everything you see in the lower right photo. A large sharpening platform replaces the original tool rest on the *Work Sharp* (photo above). The platform provides a flat surface for a honing guide that holds the plane iron. The system works by letting you sharpen the blade on the top surface of the sharpening wheel.

Installing the platform is pretty simple. A couple of cap screws secure it in the *Work Sharp's* accessory slots. Then all you need to do is level it up with the four set screws on top. (The kit includes the two Allen wrenches you need for these tasks.) I used a straightedge to help level the platform with the grinding wheel.

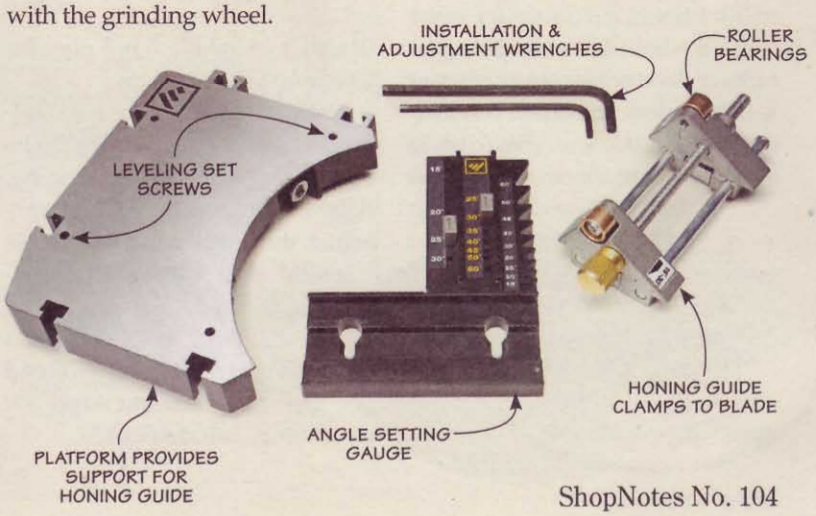
Once the platform is in place, all you need to do is clamp the plane iron in the honing guide. To help ensure it's set for the proper bevel angle, the included angle gauge comes to the rescue (left photo). You can even use the gauge to set a microbevel for final honing.

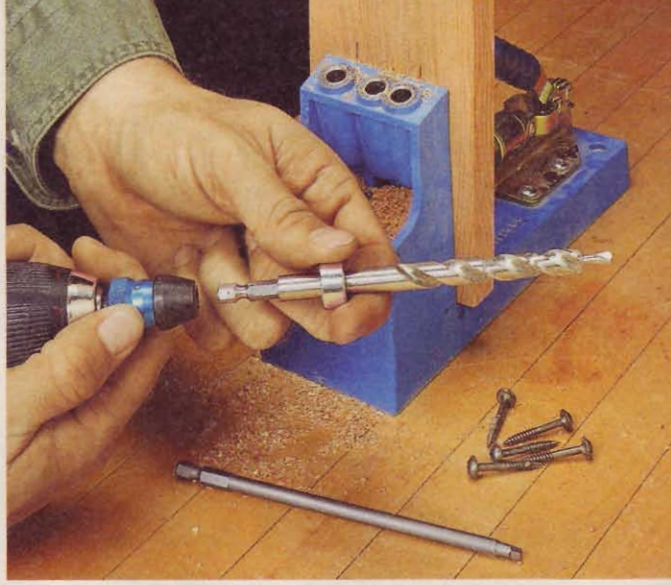
Sharpening is a quick and easy task. All you need to do is move the honing guide across the platform with small, back-and-forth movements for a razor-sharp edge.

Phil Huber
Senior Editor



Easy Setup. *The included gauge makes setting accurate bevels a snap.*





KREG QUICK-CHANGE POCKET-HOLE KIT

Using pocket-hole joinery to assemble face frames is about as fast and easy as it gets. Just drill pocket holes in the workpiece and drive the screws in place.

The only slow part about the process is swapping between the drill bit and the driver bit — especially the way I build face frames. I like to assemble the outside of the face frame first and then cut the interior rails and stiles to fit, drilling holes and assembling as I go.

After running across the *Kreg Quick-Change Pocket-Hole Kit* (photo above), the entire process is now even faster. The heart of the system is the quick-change chuck.

With the chuck installed in a drill, swapping between the drill and driver bits literally takes a few seconds. Just pull back on the anodized aluminum collar and remove whichever bit you're using (photo at upper right). Then simply "pop" the other bit in place.

The quick-change kit comes with everything you need to drill and drive pocket-hole screws (photo at upper left). And the hex-shank design of all the parts eliminates any possibility of the bits slipping. Plus, the hex chuck accepts any type of hex bits, whether they have a power groove or not. So you can practically leave the chuck installed in your drill all the time.

Bryan Nelson
Managing Editor

▲ ***Easy Operation.*** *The quick-change chuck speeds up the process of switching between drill and driver bits.*

WOODPECKERS MEASURING AND LAYOUT TOOLS

I have an affection for quality measuring and layout tools. So it's no surprise that I need to make room for a few tools from *Woodpeckers*, like the ones in the photos below.

Each of these products starts out as a precision-machined aluminum blank. Follow that up with pinpoint laser engraving and anodizing for durability and you have a quality instrument with guaranteed accuracy.

The rules and T-squares feature beveled edges that let you line up a pencil right on the mark. And a shallow relief on the back means they sit flat and solid on a workpiece without rocking.

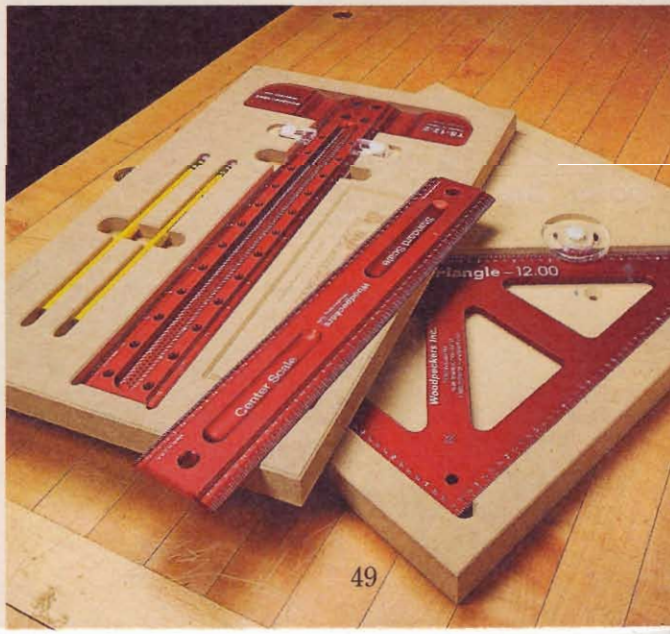
The *Woodworking Rules* are laser-engraved with 1/16" graduations and come in lengths ranging from 6" to 36". And one edge of each rule features a handy center scale.

The *T-Square* is drilled with 1mm holes every 1/16" for laying out consistent, precise lines with a pencil. But I discovered that the included pencils didn't fit the holes very well, especially as the point wears. You'll get better results using a mechanical pencil as shown in the photo below. The T-square also features additional holes that are machined on exact 1" centers for marking shelf pin locations.

Finally, the *Precision Triangle* is a heavy-duty tool you'll want to have handy for layout and assembly work. It's printed (not engraved like the other tools) with inch scales along the sides and a center scale on its long edge.

Randy Maxey
Associate Editor

▲ ***Accurate Layouts.*** *Small holes keep your pencil in place for accurate and straight lines.*



▼ ***Precision.*** *CNC-machined and laser-engraved tools are stored in custom-fit cases.*

Q&A

questions from
Our Readers

I'm designing cabinets that include drawers. How do I know what type and thickness of material to use for the drawer bottoms?

Matt Purtill
Des Moines, Iowa

sizing Drawer Bottoms

While there are no hard and fast rules for the type and thickness of drawer bottoms, there are some guidelines you can use to help you make a decision. The most important and perhaps the hardest thing to figure out is the weight of the items you're going to store in the drawer. Then you can narrow down your choices of material.

Drawer Size. But there's another key thing to consider. And that's the size of the drawer. The larger the drawer, the more the bottom will tend to sag under a load. To ensure I end up with a strong drawer, I tend to rely on my experience and common sense when choosing a material. By that, I mean the larger the drawer in width and depth, the stiffer or thicker the bottom I use.

Materials. The most common materials for drawer bottoms are ¼" hardboard or plywood. For small and medium-size drawers, hardboard will stand up to a moderate amount of weight. For a heavier load, you can step up to plywood. Baltic birch plywood is a great choice. It's made up of more veneers to make it stronger than most cabinet-grade plywood.

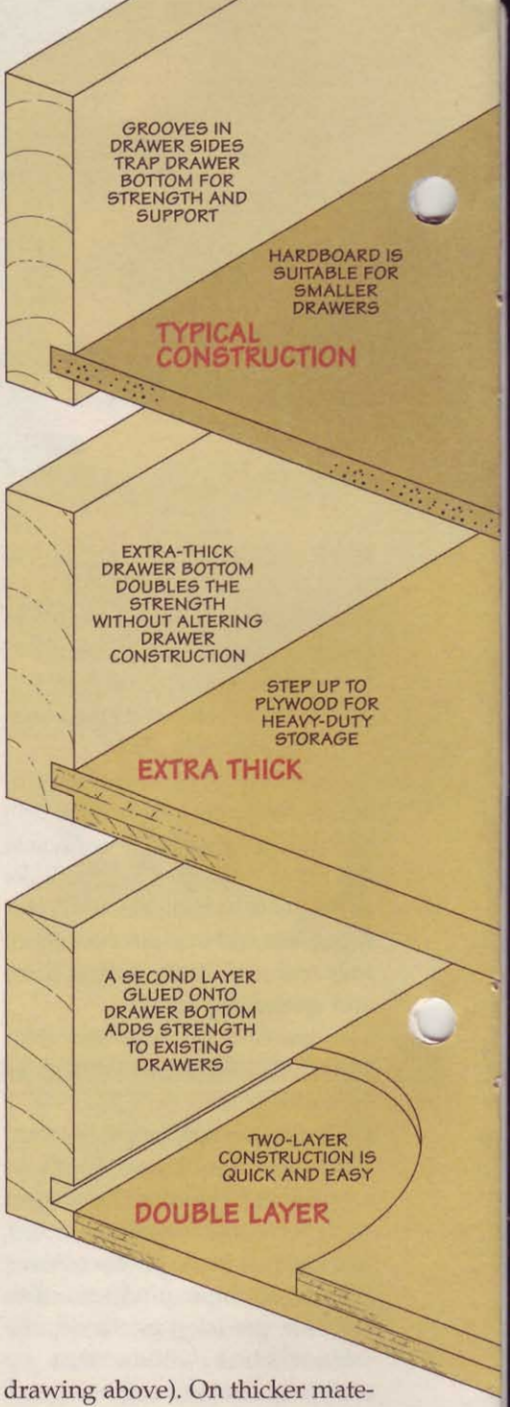
On larger drawers, I tend to go straight to plywood instead of hardboard. Here again, Baltic birch is my first choice. A single layer of ¼" plywood will bear a lot of weight before you see any noticeable sagging.

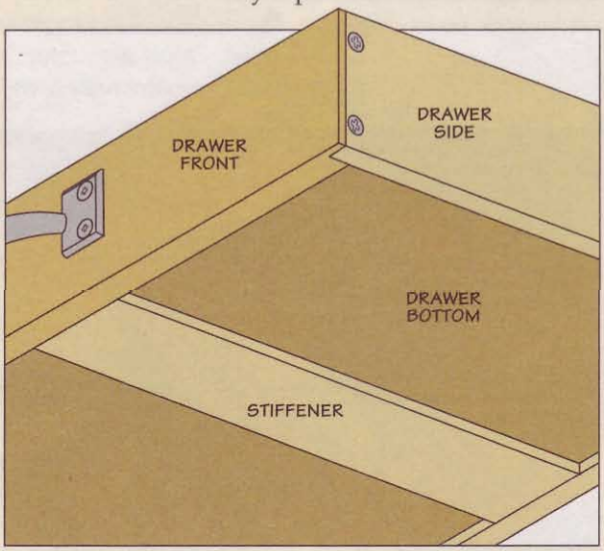
Thickness. For large, deep drawers, though, the potential for sagging is greater. This was the case when I added some drawer storage under my workbench. The drawers are 36" wide and 20" deep. And I wanted to store hand planes, routers, and jigs in them. So I chose to move up to ½" plywood for added strength.

Other Options. But there's more to it than the selection of material. How the drawer is assembled is also important. When using ¼" material for the drawer bottom, I glue it into a simple groove (top drawing above). On thicker material, I'll form a tongue along the edges of the drawer bottom to fit into a groove in the drawer sides (middle drawing above).

Reinforcements. One other option to strengthen a drawer bottom is to reinforce it. This can be done by gluing a hardwood strip down the center from front to back (left drawing). You can also glue another layer onto the existing bottom to add stiffness, as shown in the bottom drawing above.

While choosing a material for drawer bottoms isn't rocket science, making the right selection will result in a better drawer.





▲ ***Stiffener.*** *Gluing a hardwood stiffener to the bottom of a drawer is a great way to add strength to an existing drawer without a lot of effort.*

Sources

Most of the materials and supplies you'll need for 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 below. You'll find each part number listed by the company name. (See the right margin for contact information.)

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

GUIDE BUSHINGS (p.8)

- **Rockler**
  - *Brass Guide Bushings* 59031
- **Woodcraft**
  - *Steel Guide Bushings* 04F52

CONTINUOUS HINGES (p.8)

In addition to the sources listed below, *McMaster-Carr* also carries a wide variety of continuous hinges with and without predrilled holes.

- **Rockler**
  - *1½" x 36" Brass Plated* 19283
  - *1½" x 36" Stainless Steel* .. 36843
  - *1½" x 36" Charcoal Gray* ... 34938
  - *1½" x 36" Nickel* 30085
  - *1½" x 36" Rubbed Bronze* ... 23709
  - *Single Wrap-Around* 19423
  - *Full Wrap-Around* 19431
- **Lee Valley**
  - *Small Box Hinge* 00D80.04
  - *Small Brass Hinge* 00D80.62
  - *Small Brass Hinge* 00D80.69
  - *Brass Piano Hinge* 00D52.25
  - *1¼" x 3' Brass Hinge* ... 00N01.05
  - *¾" x 8" Piano Hinge* 00E28.08

ASSEMBLY AIDS (p.12)

- **Lee Valley**
  - *Right-Angle Assy. Clamp* ..50K38.01
- **McFeely's**
  - *FastCap Assy. Blocks* ... FSC-0055
- **Rockler**
  - *Clamp-It Assy. Square* 29190
  - *5" Clamp-It Bar Clamps* ... 61003
  - *8" Clamp-It Bar Clamps* ... 35335
- **Woodpeckers**
  - *Box Clamp* BC4
  - *Prec. Clamping Square* ... CS6075
  - *Phen. Clamping Sq.* ..CS6075PHEN

PROJECT WORKCENTER (p.16)

- **McMaster-Carr**
  - *Spherical Washer Sets* ... 91131A080
  - *⅝" Acme Nuts* 94815A108
  - *⅝" Acme Rods* 98935A829
  - *⅝" Washers* 98029A035
  - *3" Fixed Casters* 2724T45
- **Reid Supply**
  - *Socket Leveler* L-1
  - *½"-13 Plastic Knob* DK-94
  - *Crank Handles* JCL-1285
  - *Thread Lock* LOC-37684
- **Benjamin Moore Paints**
  - *Regal Eggshell*
  - *"Raspberry Truffle"* 2080-10

SAW CENTER (p.24)

- **Rockler**
  - *5/16"-18 Knobs w/Insert* 23812
  - *¼"-20 Knobs w/1" Stud* 23838
  - *Piano Hinges* 37750
  - *5" Locking Swivel Casters* ... 31845
  - *20" Full-Extension Slides* ... 21897

TABLE SAW CIRCLES (p.48)

- **Rockler**
  - *5-Star Knob w/Insert* 23812
  - *6' Measuring Tape (R to L)* ... 69124
  - *Hold-Down Clamp Kit* 21912
- **Woodsmith Store**
  - *Freud Calibration Disk* 222512

NEW PRODUCTS (p.48)

- **Woodpeckers**
  - *12" Woodworking Rule* ... WWR12
  - *24" T-Square* TS-24-2
  - *12" Precision Triangle* PTR12
- **Woodsmith Store**
  - *Work Sharp Wide Blade Att.* ... 206026
  - *Kreg Quick-Change Kit* ... 415596

MAIL ORDER SOURCES

Woodsmith Store
800-444-7527

Rockler
800-279-4441
rockler.com

Benjamin Moore
benjaminmoore.com

Freud
800-334-4107
freudtools.com

Kreg
800-447-8638
kregtool.com

Lee Valley
800-871-8158
leevalley.com

McFeely's
800-443-7937
mcfeelys.com

McMaster-Carr
330-342-6100
mcmaster.com

Reid Supply Company
800-253-0421
reidsupply.com

Woodcraft
800-225-1153
woodcraft.com

Woodpeckers
800-752-0725
woodpeck.com

Work Sharp
800-597-6170
worksharptools.com

Scenes from the Shop

This fold-up workstation gives small benchtop table saws some big-time features. You'll find complete plans starting on page 24.

Keep frequently used tools close at hand with this wall organizer. The shelves, tool holders, and peg rails can be customized to match your tools. Detailed instructions begin on page 36.

With a rugged, self-clamping top, this project workcenter can take on almost any task. Turn to page 16 for complete step-by-step plans.

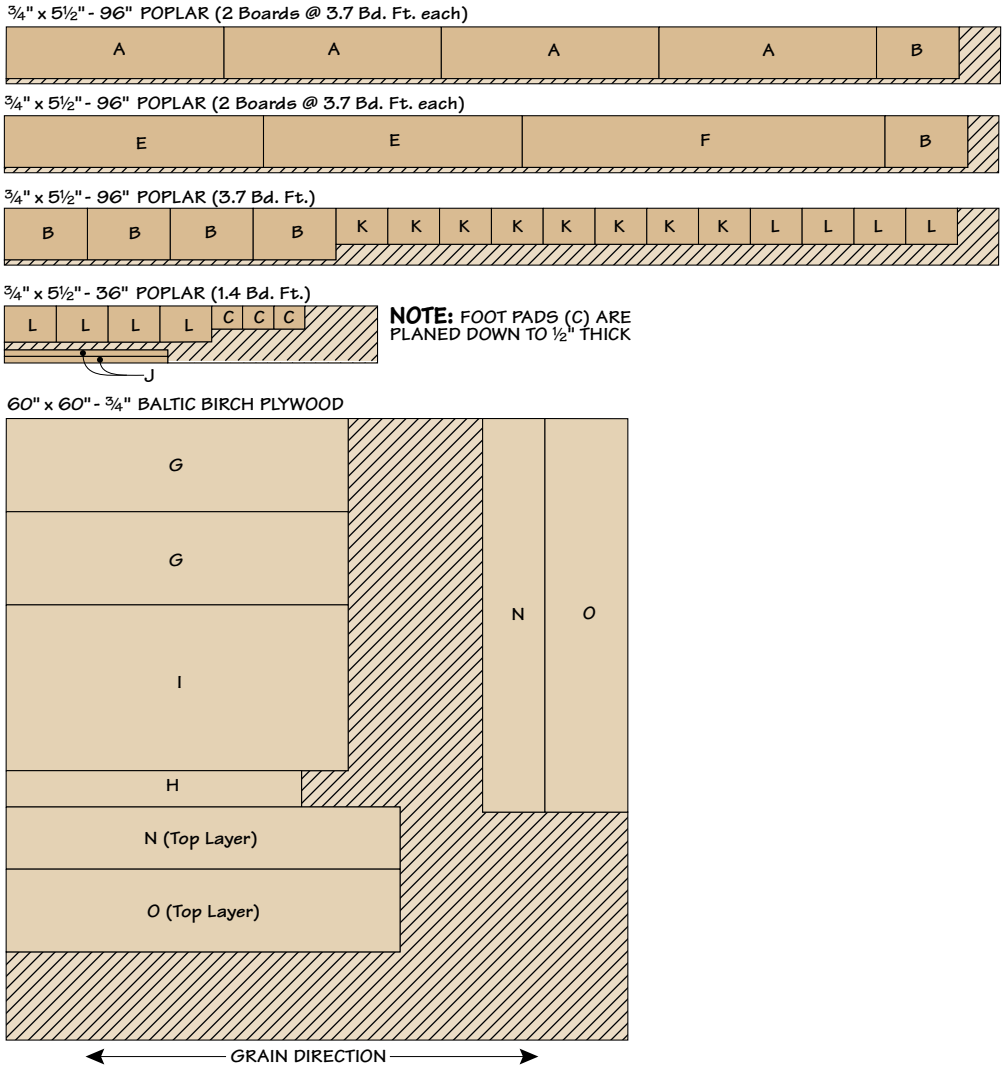
ShopNotes

project Workcenter

Materials & Hardware

A	Feet/Support Faces (8)	¾ x 5 - 21	• (42) #8 x 1½" Fh Woodscrews
B	Feet/Support Spacers (8)	¾ x 5 - 8	• (16) #10 x 4" Fh Woodscrews
C	Foot Pads (3)	½ x 2¼ - 3	• (8) #8 x ¾" Sheet Metal Screws
D	Leveler Rod (1)	½"-13 x 6	• (2) ½"-13 Hex Lock Nuts
E	Upright Faces (4)	¾ x 5 - 25	• (2) ½" Flat Washers
F	Upright Centers (2)	¾ x 5 - 35	• (2) ½"-13 x 5" Carriage Bolts
G	Box Sides (2)	9 x 33 - ¾ Ply.	• (2) 3" Rigid Casters
H	Box Bottom (1)	3½ x 28½ - ¾ Ply.	• (2) ⅝" Self-Aligning Washer Set
I	Shelf (1)	16 x 33 - ¾ Ply.	• (10) ⅝"-8 Acme Nuts
J	Runners (2)	⅝ x ¾ - 15¾	• (2) ⅝" Flat Washers
K	Anchor Blocks (2)	3 x 3½ - 5	• (1) Socket Leveler
L	Traveler Blocks (2)	3 x 3½ - 5	• (1) ½"-13 Hex Nuts
M	Clamp Rods (2)	⅝"-8 x 22⅞	• (1) ½"-13 Knob w/Insert
N	Fixed Top (1)	6 x 38 - 1½ Ply.	• (2) Crank Handles
O	Adjustable Top (1)	8 x 38 - 1½ Ply.	• (2) 3⁄16" x 1" Roll Pins

Cutting Diagram



ShopNotes

benchtop table saw Workstation

Materials & Hardware

A	Sides (2)	24 x 28½ - ¾ Ply.
B	Bottom & Shelves (5)	23¼ x 30 - ¾ Ply.
C	Back (1)	19 x 30 - ¾ Ply.
D	Lower Supports (2)	23¼ x 6¾ - ¾ Ply.
E	Middle Supports (2)	23¼ x 1¾ - ¾ Ply.
F	Upper Supports (2)	23¼ x 3½ - ¾ Ply.
G	Drawer Front/Back (2)	5½ x 26 - ¾ Ply.
H	Drawer Sides (2)	5½ x 22½ - ¾ Ply.
I	Drawer Bottom (1)	26½ x 21½ - ¾ Ply.
J	False Front (1)	6½ x 28¼ - ¾ Ply.
K	Cleats (2)	1½ x 24 - ¾ Ply.
L	Tops (2)	3 x 24 - ¾ Ply.
M	Right Wing (1)	24 x 20½ - ¾ Ply.
N	Left Wing (1)	24 x 25¾ - ¾ Ply.
O	Top Cover (2)	3 x 24 Plas. Lam.
P	Right Wing Cover (1)	24 x 20½ Plas. Lam.
Q	Left Wing Cover (1)	24 x 25¾ Plas. Lam.
R	Wing Tracks (4)	2¼ x 2 - 24
S	Wing Braces (2)	23¼ x 28 - ¾ Ply.
T	Support Cleats (2)	2 x 24 - ¾ Ply.
U	Infeed Supports (2)	6 x 24 - ¾ Ply.
V	Support Stops (2)	2 x 12 - ¾ Ply.
W	Legs (4)	¾ x 3½ - 34⅝
X	Rails (4)	¾ x 3½ - 30
Y	Tops (2)	¾ x 3½ - 32 rgh.
Z	Runners (4)	¾ x 3½ - 27

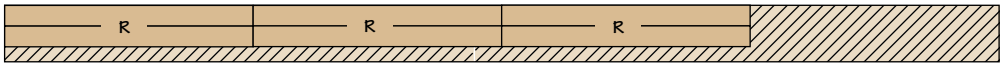
- (16) #8 x 2" Fh Woodscrews
- (16) #8 x 1¼" Fh Woodscrews
- (10) ¼"-20 Threaded Inserts
- (4) ¼"-20 x 3" Hex Head Bolts
- (4) ¼"-20 Hex Nuts
- (4) 5" Locking Swivel Casters
- (16) ¼" x 1" Lag Screws
- (2) 20" Full-Extension Drawer Slides w/Screws
- (2) 1⅛" x 24" Continuous Hinges w/Screws
- (1) 48" T-Track w/Screws
- (6) ¼ " Washers
- (6) ¼"-20 Star Knobs
- (1) ¼"-20 x 13" Threaded Rod

Cutting Diagram

¾" x 4" - 96" (FOUR BOARDS @ 2.7 Bd. Ft. EACH)

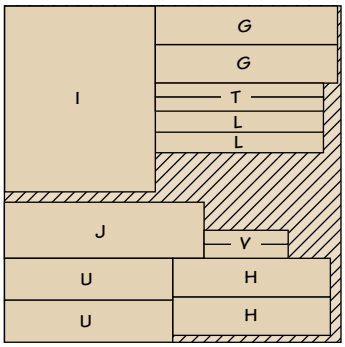
¾" x 4" - 72" (2 Bd. Ft.)

¾" x 6" - 96" (TWO BOARDS @ 4 Bd. Ft. EACH)

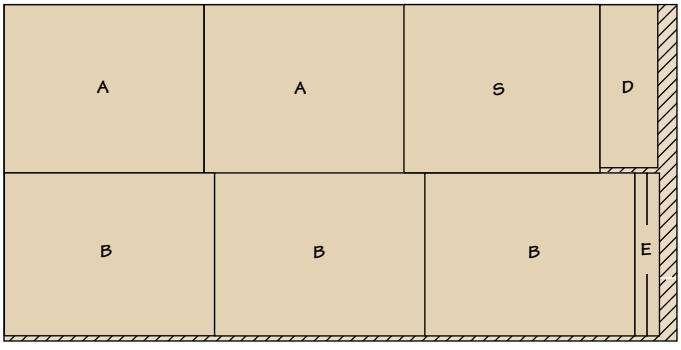


ALSO NEEDED: (1) 48" x 48" SHEET OF PLASTIC LAMINATE

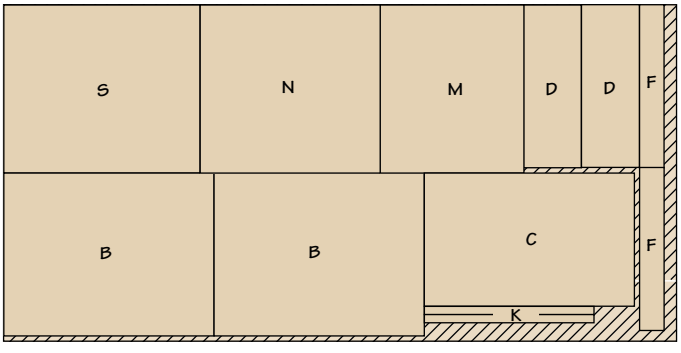
48" x 48" - ¾" BIRCH PLYWOOD



48" x 96" - ¾" BIRCH PLYWOOD



48" x 96" - ¾" BIRCH PLYWOOD



wall-mounted Tool Rack

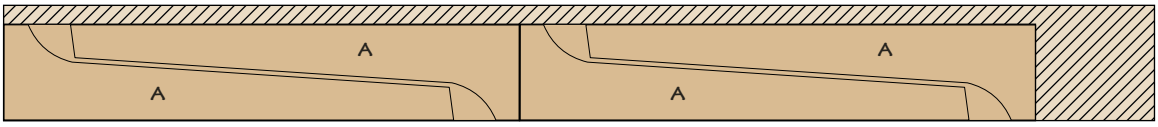
Materials & Hardware

A	Uprights (4)	1½ x 8 - 37
B	Upper and Lower Rails (2)	¾ x 3½ - 60
C	Center Rails (2)	¾ x 3½ - 21
D	Top (1)	¾ x 8¾ - 61½
E	Upper Adjustable Shelf (1)	¾ x 4 - 17⅞
F	Lower Adjustable Shelf (1)	¾ x 3½ - 17⅞
G	Angled Tool Holders (3)	1½ x 3½ - 18
H	Kick Strips (3)	¼ x ¾ - 18
I	Custom Faces (4)	¾ x 3½ - 18
J	Small Pegs	3/16"-dia. x 4½ rgh.
K	Medium Pegs	⅜"-dia. x 42 rgh.
L	Large Pegs	½"-dia. x 16 rgh.
M	Pencil Trays (2)	½ x 1¾ - 18

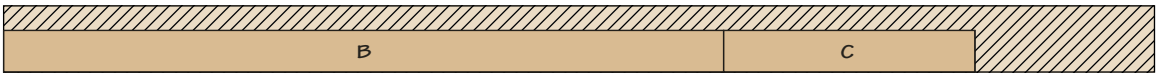
- (27) #8 x 1½" Fh Woodscrews
- (14) #8 x 2" Fh Woodscrews
- (8) #8 x 1¼" Fh Woodscrews
- (8) ¼"-dia. Shelf Pins

Cutting Diagram

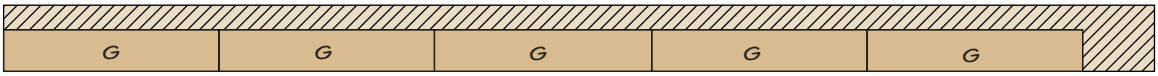
1½" x 9½" - 96" FIR (12.7 Bd. Ft. each)



¾" x 5½" - 96" FIR (2 Boards @ 3.7 Bd. Ft. each)

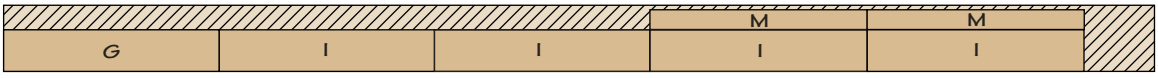


¾" x 5½" - 96" FIR (3.7 Bd. Ft. each)

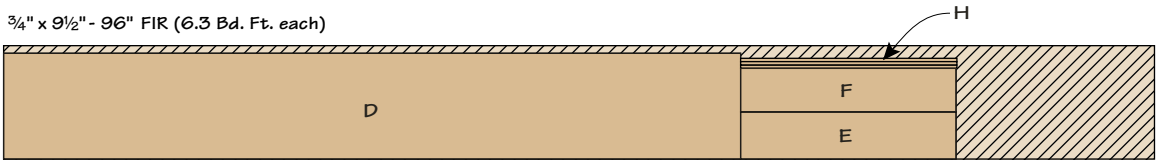


¾" x 5½" - 96" FIR (3.7 Bd. Ft. each)

NOTE: PENCIL TRAYS (M) ARE PLANED DOWN TO ½" THICK



¾" x 9½" - 96" FIR (6.3 Bd. Ft. each)



ShopNotes

workstation Accessories

Improve accuracy and increase rip capacity with these handy accessories.

▲ ***Crosscut Sled.*** *The sled lets you make accurate cuts on panels up to 20" wide. A T-track on the top lets you add a stop for cutting identical parts.*

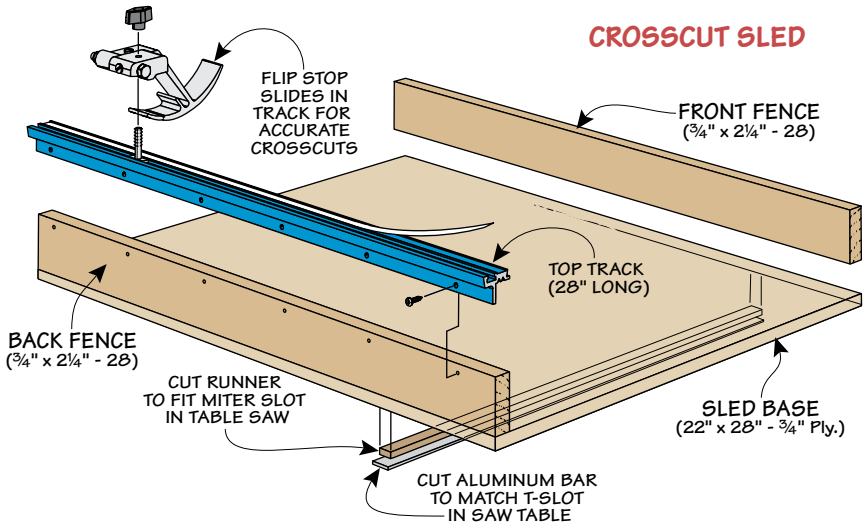
Crosscutting and ripping on most benchtop table saws can be challenging. The miter gauge is usually a little small and sloppy. And ripping capacity is limited.

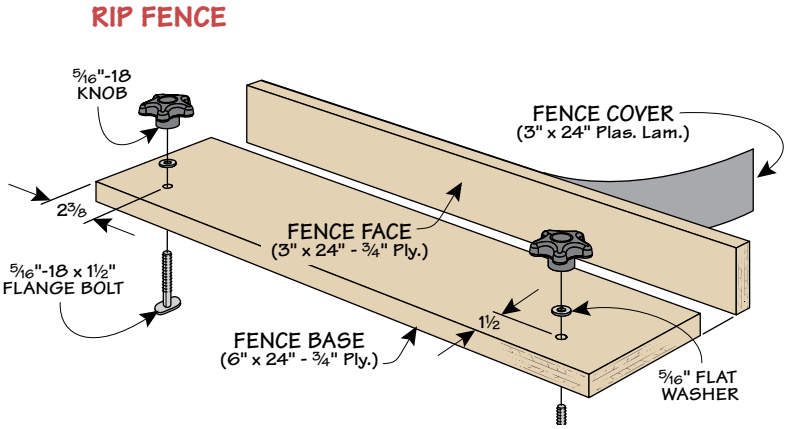
Crosscut Sled. To make accurate crosscuts every time, I turn to the sled shown below. It's a plywood base with hardwood fences on the front and back. A track along the back fence lets you add a stop block for repetitive cuts.

The sled runs on a shop-made miter bar. An aluminum strip holds the sled in the T-shaped miter slots found on some saws.

Rip Fence. The auxiliary rip fence (bottom drawing) runs in the T-tracks installed in the right wing of the workstation. It's just an L-shaped plywood assembly.

Note: When using the rip fence, it's important to make sure it's parallel to the blade.





Hardware

- (1) 24" Top Track (Kreg KMS7714)
- (1) Flip Stop (Kreg KMS7801)
- (1) ⅛" x 22" Aluminum Bar
- (2) 5/16"-18 Star Knobs (Rockler 23812)
- (2) 5/16"-18 x 1½" Flange Bolts (Rockler 36677)
- (2) 5/16" Flat Washers

▲ ***Auxiliary Rip Fence.*** *This fence rides in a pair of T-tracks in the right wing. It lets you rip wider pieces of plywood.*

► ***Arrow Photo Caption.*** *In this photo caption frame it begins with an arrow and a bold subhead.*

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