

GREAT SHOP LAYOUT
Tips & Tricks

TIME-SAVING TOOL
For Smooth Results



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Vol. 23 Issue 133

Table Saw Technique: ***Raised Panels*** ***Made Easy***

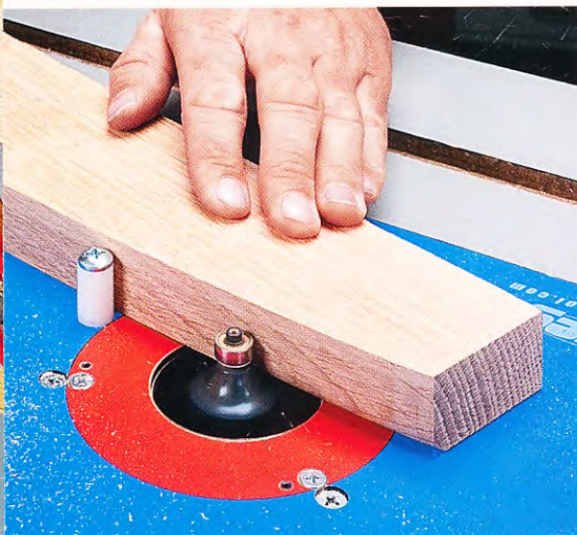


Plus:
Top-Notch
Router Table Cuts
Panel Clamps:
Great Glueups Guaranteed!
Don't Visit the Lumberyard
Until You Read This!

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Cutoffs

A couple of issues back, we featured an article on CNC woodworking. At the time, I asked you to let me know what you thought about the article and CNC woodworking in general. Well, you weren't shy about expressing your opinions on the subject.

The comments ranged from those who enjoyed the article and were hoping to learn more, to those who had no interest in it whatsoever. But what surprised me were the comments on how CNC woodworking isn't "real" woodworking. This got me thinking, what is it that makes any type of woodworking "real?" And how much technology should we have in the shop?

Do you have to use hand tools to be a real woodworker? For that matter, do you have to make the tools you use? Some would say that many of the tools we use are manufactured with industrial machines — and most likely a CNC machine — so haven't we already passed the line of being a real woodworker?

I'm not sure there's a definitive answer. So the debate will continue (just as it does on our own staff). Each of us has to choose what works best for us. For most of us, that's going to mean a combination of power tools and hand tools. The power tools take care of the grunt work, like breaking down stock and prepping parts — and maybe even using a CNC machine to take care of the dull, repetitive tasks. Then, the hand tools can come out to clean up, refine, and fit those parts.

As long as we're happy with the journey and the final results from all our work, isn't that what counts?

Bryan

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from our
Readers

Tips for Your Shop

THE
WINNER!

Add-on Dust Shroud

Last year, I built the 4-in-1 Belt Sander that was featured in ShopNotes No. 126. I really enjoy the sander, but I realized that the machine could benefit from dust collection. So I designed and built the dust shroud you see here. It allows a shop vacuum to be attached to the machine and catches most of the dust created

while sanding wood. (It shouldn't be used when working with metal.) The shroud bolts securely to the sander and doesn't require altering the existing plans as published in the magazine.

The only addition to the sander is a threaded insert that's used to securely attach the shroud

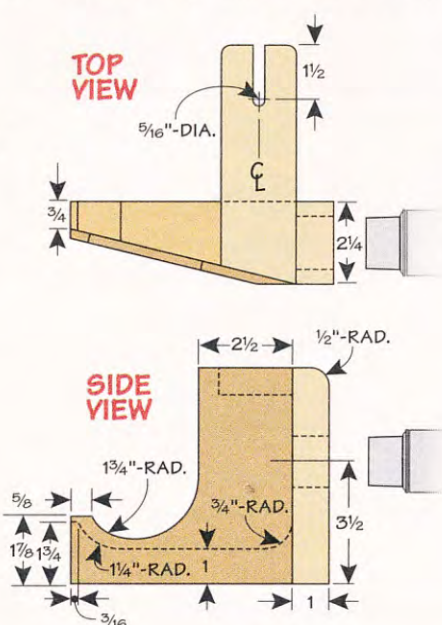
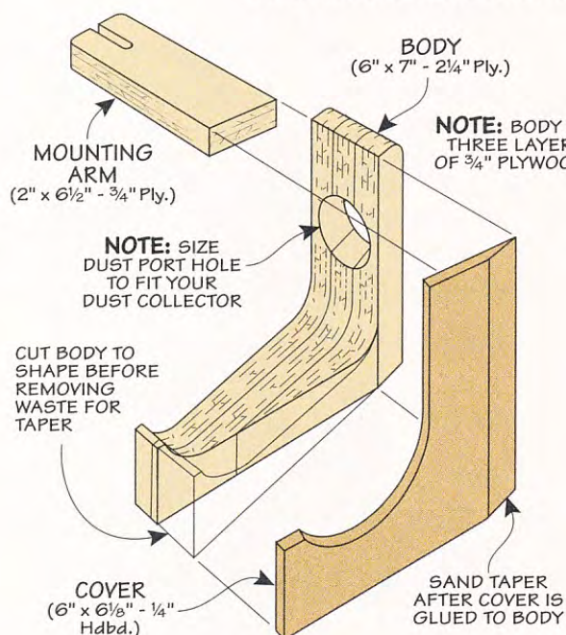


with a studded knob (inset photo above). Use the slot in the mounting arm to help mark the location for the insert.

Construction. You can see in the drawings that the shroud consists of a main body and mounting arm made from Baltic birch plywood. A hardboard cover closes off the outside. The cutout in the cover allows for quick sanding belt changes without removing the shroud. I used a hole saw to cut the curves in the body and cover. The rest of the cuts were made with a band saw.

The mounting arm gets glued to the body after drilling the hole for the dust collector hose. Then the cover is glued in place. The sander was used to create the taper on the back edge of the cover.

Steve French
Lakeland, Florida



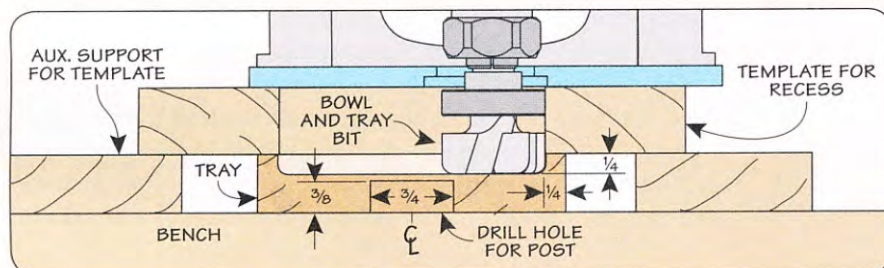
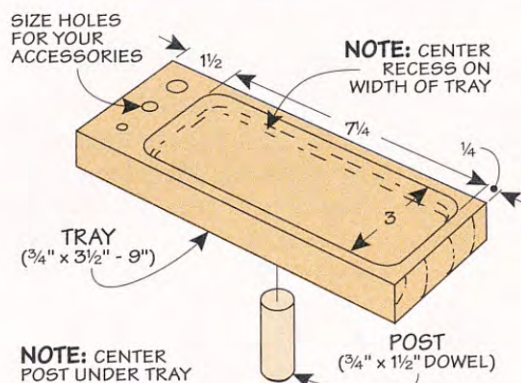
Bench Tray

There always seem to be small parts and tools on my bench from any number of projects I'm working on. Inevitably, they end up either rolling off or getting knocked onto the floor.

To fix that once and for all, I made a tray that keeps everything in place (photo, right). A post on the bottom of the tray drops into a dog hole to keep the tray in place on the bench. It's perfect for pencils, small tools, and other items. I even drilled a few holes on one end of the tray for frequently used bits.

I used a bowl and tray bit with a shop-made template to rout the recess. The drawings to the right and below show all the details you need to make your own.

*Jim Moorehead
Barrigada, Guam*



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



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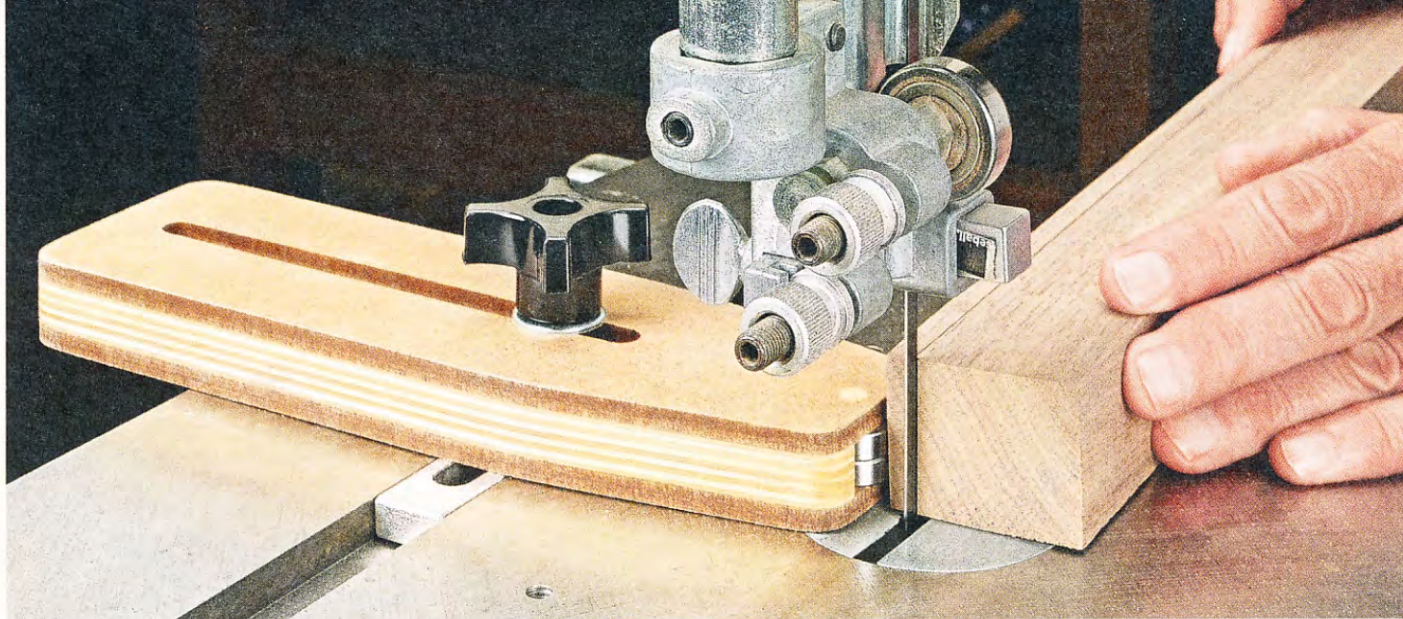
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Versatile Roller Guide

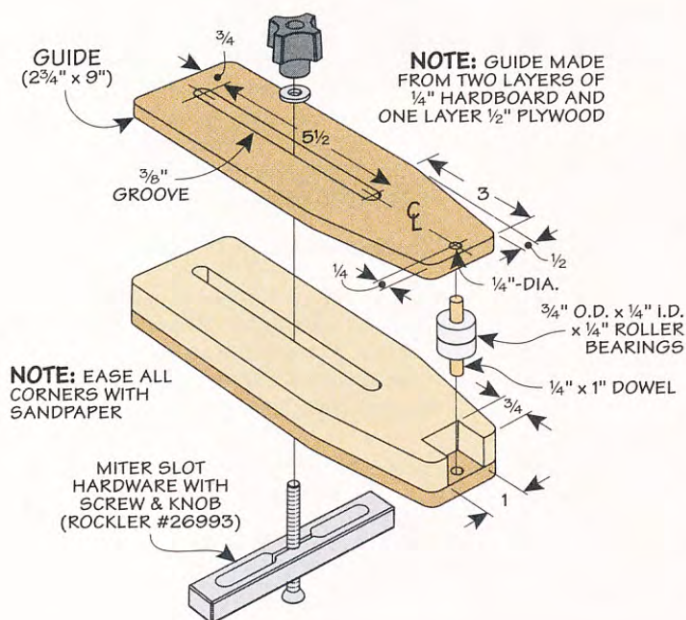
I use a lot of thin stock in my projects. But it can be difficult to rip thin stock to a consistent thickness. That's why I came up with the roller guide you see here. It's designed to work at the band saw or any other tool with a miter slot, like a table saw or router table.

It works great as a stop for ripping thin strips or to help keep a workpiece against a rip fence. Switch out the miter slot hardware for a flange bolt and it can be used as a hold-down when attached to a fence with T-track.

Building it is simple. It's just a piece of plywood sandwiched between a couple layers of hardboard. I glued oversized pieces together, then cut and sanded them to shape after the glue dried.

I drilled the ends of the slot next and used a jig saw to remove the waste. A file and sandpaper helped smooth the cut lines. Now you can add the bearings. Just insert a short length of dowel into a hole drilled in the end of the guide.

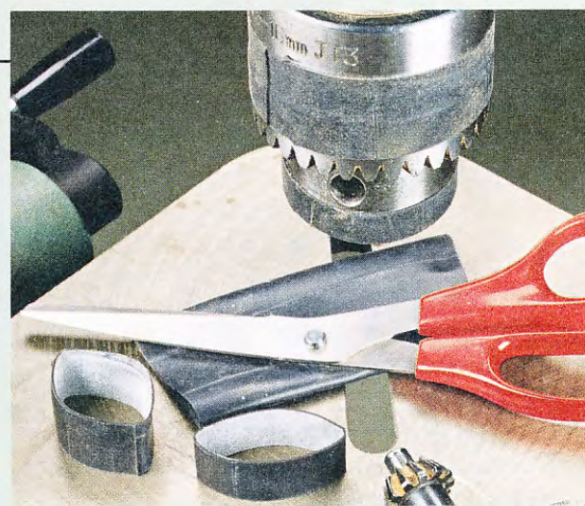
*Steve French
Lakeland, Florida*



Quick Tips



▲ **Glenn Bradley** of Moreno Valley, CA, discovered convenient storage containers he already had in his shop. When changing grits on his drum sander, he realized that the rolled-up abrasives fit perfectly in the lid of a discarded spray can.



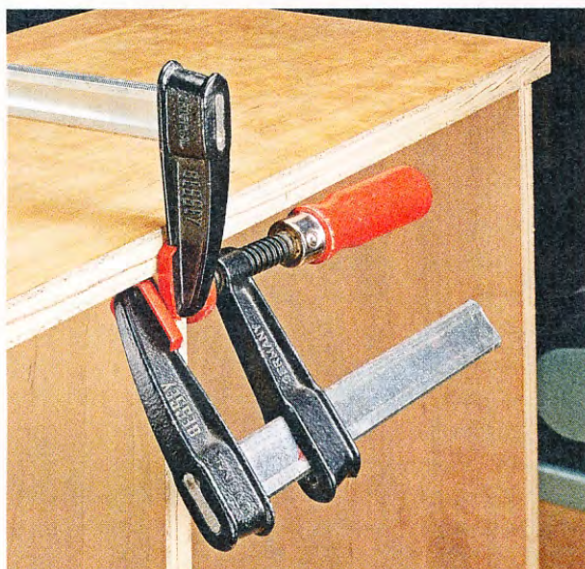
▲ Before tightening a bit with the chuck key, it's convenient to snug it up by hand. **Charles Mak** of Calgary, Alberta, made this easier by adding sections of a bicycle inner tube for better grip.

Low-Profile Board Jack

When I clamp a long board in my face vise, the unsupported end of the board tends to sag towards the floor. To solve this, I added a couple support pins to my workbench. One centered on the front edge of the bench, and the other near the end of the bench, as shown in the photo to the right.

Each pin is just a $\frac{5}{16}$ "-18 x 6" bolt with a smooth shank that's screwed into a threaded wing knob (Reid Supply #DK-167). After cutting off the head of the bolt, it slides into a hole in the edge of the bench drilled at the same height as the face vise guide rods. To use the pins, I grab the knob and pull the bolt out just far enough to support my workpiece. When done, the pin slides back in.

*Shannon Medley
Crosby, Texas*



Assembly Helper

One of the biggest problems I have when assembling deep cabinets is centering a long clamp on a somewhat small surface, like the edge of plywood. After going back and forth several times to each end of the clamp to keep it centered, I thought there had to be a better way.

The solution I came up with uses another clamp as a third hand. I use a small clamp to center and capture one end of the clamp, as in the photo to the left. This allows me to accurately position and tighten the clamp from the opposite end. Then I can remove the small clamp and move on to the next one.

*Art Kassel
Layton, Utah*



▲ **Randy Maxey** of Urbandale, IA, uses a rubber mallet to help during assembly. The mallet started to leave black marks on his projects, so he covered the head with a sock.



▲ Tired of wasting time and energy getting plugs out of hole saws, **Serge Duclos** of Delson, Québec, sprays each one with a dry lubricant.

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safe & accurate **Router Table Cuts**

You only need a few accessories to set up your router table to get smooth, consistent cuts and improve safety.

■ As handy and versatile as a router table is, it can be tempting to make a few quick cuts without thinking much about the setup. This mindset makes it easy to overlook an important ingredient for getting smooth, consistent results. And that's controlling the workpiece throughout the cut.

Paying attention to this will make a dramatic improvement in the quality of cuts you get. A side benefit is that taking the extra time to set up your router table usually makes the process safer, too. That's a win-win in my book.

Equipping your router table to make safer cuts isn't difficult. Nor are the accessories that I show on these pages expensive. The real challenge is getting in the habit of using them regularly.

Small Bites. Before I get into the equipment for making accurate and safe cuts, there's one element that's important to mention. Taking too heavy of

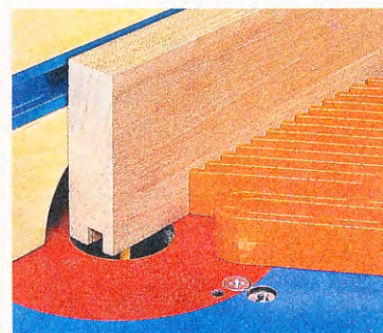
a cut can lead to burning, uneven cuts, or possibly kickback.

I remove large amounts of material in a series of light passes. The density of the material usually dictates just how much can be cut. But a good starting point is to increase the depth of cut by no more than $\frac{1}{4}$ " per pass.

Fence. The first piece of equipment I want to talk about is the fence. Since it's a standard part of most router tables, it may seem strange to include it as a safety device. My reasoning for including it comes from experience.

I use the fence as often as possible. The long infeed and outfeed faces act as runways to guide the workpiece into and away from the bit — even if it has a bearing.

Featherboards. The fence also serves as the mounting point for other safety gear. For example, a featherboard works as a third hand to prevent a workpiece from lifting off the table



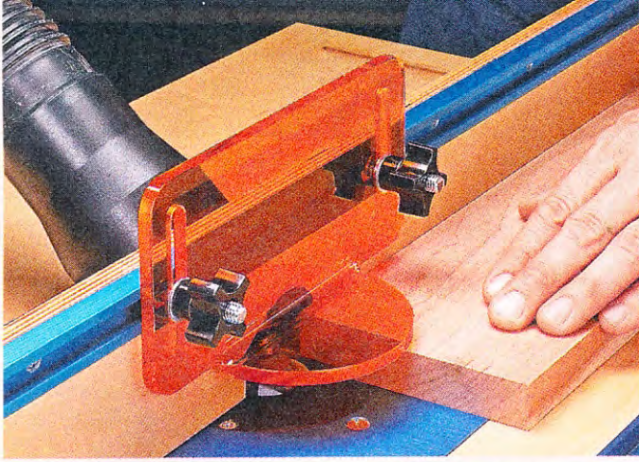
▲ **Featherboard.** A featherboard prevents the workpiece from shifting while routing.

or drifting away from the fence, causing an inconsistent cut.

The flexible, angled fingers of a featherboard act like springs to hold the workpiece against either the table or the fence. In addition, they prevent a workpiece from kicking back toward you.

It's possible to set up several featherboards to apply pressure both against the fence and against the table. But it isn't necessary. Instead, I like to set them up to suit the workpiece and the routing task at hand.

For wide or thin stock, a featherboard (or two) attached to the fence works best, as shown in the main photo above. This way I can concentrate on holding the



▲ **Bit Guard.** Set just above the workpiece, this clear bit guard forms a physical barrier (and a visual reminder) to keep your fingers clear of the router bit.



▲ **Starting Pin.** Use the starting pin as a pivot point to increase your control of a workpiece when routing curved parts on the router table.

workpiece against the fence and moving it forward.

When the workpiece is on edge, as shown in the inset photo, I attach a featherboard to the table to keep the workpiece safely against the fence.

Bit Guard. Another fence addition is a bit guard, as in the upper left photo. The idea behind it is to create a physical barrier between the bit and your fingers. This is especially helpful at the beginning and end of the cut.

The size of the bit guard should be greater than the size of the bit. And you should position it so your hands can't fit between the workpiece and the guard.

For better visibility, I like to set the fence and bit height without the guard in place. Then I'll attach it when I'm ready to rout.

Starting Pin. I mentioned earlier that I use the fence on

the router table whenever possible. But when a workpiece has a curved edge, a fence just won't work. The problem in this situation is starting the cut safely. Without some kind of support, the bit can grab the end of the workpiece and spoil the cut.

That's where a starting pin like the one shown in the upper right photo comes in. The pin acts as a fulcrum to give you more control. (Many router table insert plates come equipped to accept a pin.)

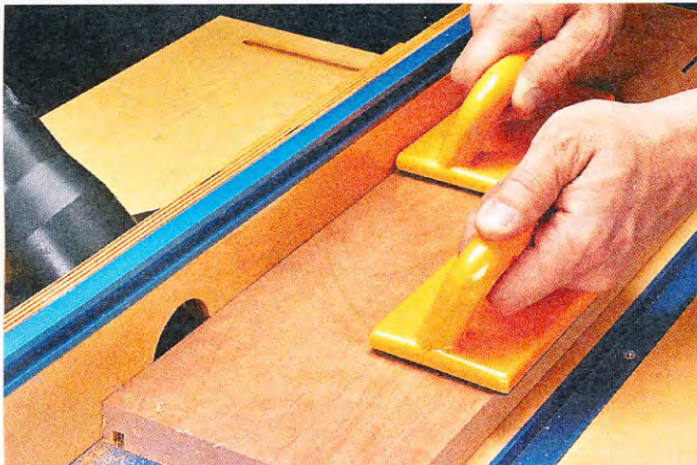
To use it, brace the workpiece against the pin and gently ease the workpiece into the spinning bit. Once the workpiece is fully engaged with the bit, you don't need to hold it against the starting pin any longer.

Push Pads. The previous items are all accessories that physically attach to the router table surface or fence. But that's not

the only way to increase safety and control over the workpiece. I keep a pair of rubber-bottomed push pads near my router table (lower left photo). They provide a wide, slip-resistant bearing surface. With these, I can apply firm downward pressure on the workpiece for consistent results.

On narrower workpieces, you can use a push stick like the one shown in the lower right photo. It has a long angled shoe on the bottom that holds the workpiece against the fence and down on the table at the same time. A heel on the back of the push stick catches the end of the piece to help you push it past the bit safely.

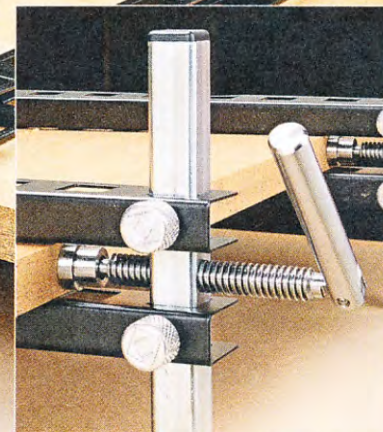
Making safe and accurate cuts doesn't have to involve complicated setups. In fact, all it takes is using one or more of these simple accessories. The results you get will speak for themselves. 🛠️



▲ **Push Pads.** Wide, flat push pads make it easy to provide even pressure against the tabletop. The cushioned foam bottoms give them a sure grip.



▲ **Push Stick.** The angled shoe on this push stick lets you apply pressure down and in on a narrow workpiece. A heel at the back pushes the workpiece past the bit.



▲ **Damstom Panel Clamp.** A simple design takes the hassle out of panel glueups.

working with **Panel Clamps**

With these handy clamps, you can eliminate the frustrations of gluing up wide panels.

■ One of the fundamental tasks in woodworking is edge-gluing boards to make a wide panel. The panel could be for a tabletop or the centerpiece of a frame and panel door. The challenge is keeping the boards aligned as you apply the clamps.

To make gluing up panels easier, I found a few products that are worth a look. These panel

clamps share similar features. They all utilize rails that work to keep the boards aligned as you apply clamping pressure. Some rails are shop-made. Other rails are included in the kits and made out of sturdy steel or aluminum.

Each of the systems includes a clamp screw that applies the pressure to the edge of the boards. All of them are heavy enough to apply plenty of clamping power for a solid panel assembly.

And these clamps can be used for more than gluing up panels. They work great for gluing up frame and panel doors, too.

DAMSTOM D300

One of the newcomers to the panel clamp market is *Damstom*.



◀ **Veritas.** All you need for this system are a few shop-made rails.

Their D300 panel clamp (\$70) has a 36"-wide panel capacity. It consists of two black powder-coated black rails, as you can see in the photos above. The coating helps prevent glue from sticking.

The rails are perforated with square holes that hold a pair of vertical bars. One bar (the clamp head) holds the clamp screw. The other bar simply serves as a stop when clamping the panel.

To use the clamp, you slide the bottom rails over one end of each clamp head. Then adjust the position of the rails so the edge of your boards are centered on the clamp screw. Lock the rails in place on the clamp head using the knurled knobs.

After applying glue to the boards, stack them on the bottom rails, snug against the clamp head. At the back of the panel, insert the metal stops in the holes nearest the panel. Slip the top rails onto the vertical bars, tighten the knurled knobs, then start tightening the clamp screw.

The rails will keep the boards aligned as you apply pressure.

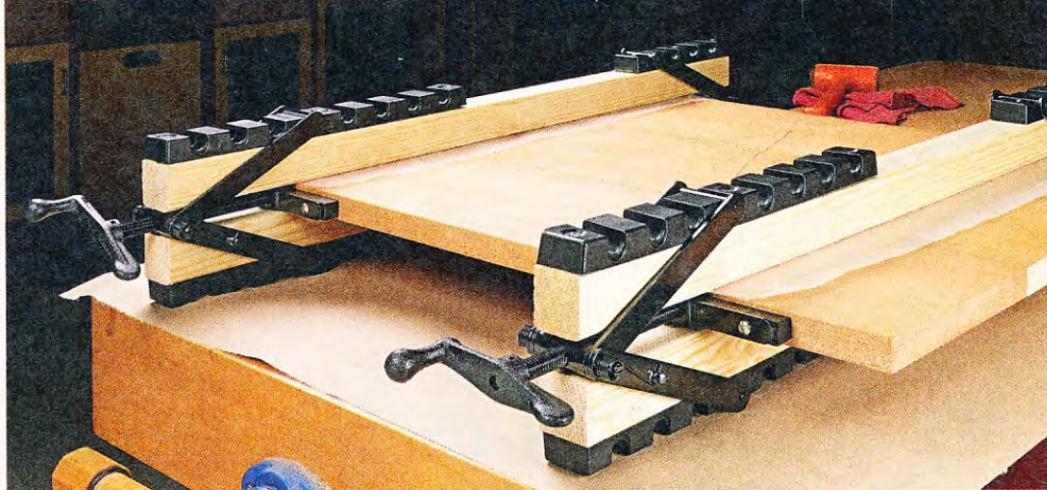
VERITAS PANEL CLAMPS

The *Veritas Panel Clamps* (\$50 each) work on a similar principal. They consist of a tail block and clamp head. These components each have a serrated post that fits into holes drilled in shop-made rails (lower photos, opposite page). The rails are made from "two-by" stock, which means you can make them as long as needed. A rubber O-ring on the bottom posts allows you to set the height to center the clamping pressure on the panel.

The process of using the clamps is similar to the *Damstom* system. You'll want to use strips of waxed paper on the rails to prevent glue from sticking to them. Then insert the clamp heads in the first hole of the rails before laying the boards across them. Once all the boards are in place, insert the tail block and then add the top rails before tightening the clamps.

WOODRIVER CLAMPS

The *WoodRiver Clamping System* (\$30) shown above is sold by *Woodcraft* and utilizes a clamping system that has been around for a lot of years. This system



▲ **WoodRiver Clamping System.** You supply the wood rails and attach the notched plastic strips. Tightening the clamp screw applies 4-way pressure to the assembly, aligning the boards and drawing them together to create a flat panel.

also relies on shop-made rails. But instead of holes, the clamps engage notches on the edges of the rails. Included in the kit are heavy-duty, notched plastic strips you attach to the rails.

The great thing about this system is the scissor action of the clamp head and tail clamp. As you apply pressure to the edge of the panel with the clamp screw, the system draws the rails tight to the panel to keep the boards aligned. You'll want to use waxed paper between the rails and panel here, also.

The Bottom Line. Any of the three systems shown here go a long way toward helping with

gluing up wide panels. I like the *WoodRiver* system for a couple of reasons. It's inexpensive plus it works better to keep the boards aligned as you apply pressure. With the *Damstom* and *Veritas* systems, you need to be more aware of the alignment of the rails, making sure they are tight to the panel as you tighten the clamping screws.

If you glue up a lot of panels, check out the box below. The *Panel Max* system steps it up a notch with high-quality aluminum rails. Whichever system you choose, adding a set of panel clamps to your clamping arsenal can be a wise investment. 🛠️

panel max Glue Press System

If you find yourself gluing up panels fairly often, you may want to consider the *Panel Max Glue Press System* sold by *Peachtree Woodworking Supply* (\$350). It's a wall-mounted system, so it won't take up your valuable bench space. Pairs of heavy-duty aluminum extrusion pressure bars trap the panel and keep it flat as the glue dries.

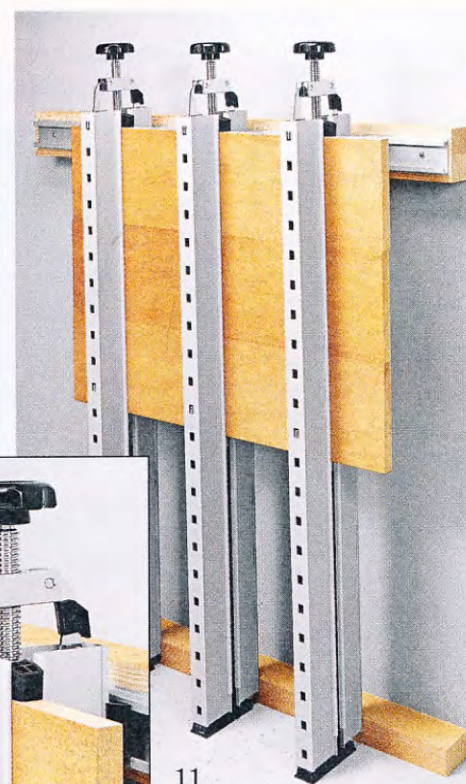
The pressure bars fit onto a mounting rail which in turn is screwed to a wood rail on the wall. At the bottom of the pressure bars, another wood rail keeps the pressure bars vertical.

Each pair of pressure bars is connected with a top and bottom pressure block. These assemblies have spring-loaded arms with tabs on the ends that ratchet to

engage the square holes in the pressure bars. This allows you to position the bottom pressure blocks for locating the panel close to the top pressure block for clamping. The upper blocks include a clamping screw with a large knob.

After inserting the boards of your panel, tightening the clamp screw also draws the pressure bars tight to the workpieces, resulting in a flat panel. Non-stick strips keep glue from adhering to the bars.

► **Clamping Pressure.** Heavy-duty components guarantee flat panels.



MATERIALS & Hardware choosing **Washers**

The right washer can improve the look and performance of a project. Here are a few of our favorites.



▼ Flat Washers.

The basic flat washer helps distribute the force and load of a fastener for a stronger hold.

We're all familiar with the washers you can buy in the fastener section of the hardware store. Their purpose is to provide a larger bearing surface and distribute the force or load of a fastener over a wide area. They're so common that we don't really give them much thought. But as you'll find out, there's more to these humble fasteners (and their many cousins) than meets the eye.

Beyond the basic flat washer, there are a few that are quite useful for woodworking projects. They can dress up the look of a project or solve common problems.

Flat Washer. The most common, go-to washer is the ordinary flat washer. Its primary function is to provide a bearing surface for a fastener such as a nut or bolt.

You'll find two types of flat washers: SAE (formerly called Society of Automobile Engineers) & USS (United States Standard). SAE washers are made to tighter dimensional tolerances than USS washers.

I always use a flat washer under a bolt head or nut (left photo below). They also come into play when the fastener hole is slightly oversized or when assembling sheet metal components. If there's a chance the hole could be deformed when tightening the fastener, a flat washer is the easiest solution.

Wood Washer. The problem with flat washers is they aren't meant for use with flathead screws, especially for wood applications. For that, you'll want to use a *Wood Washer* from *FastCap* (photo at right). Though it looks a lot like a flat washer, the *Wood Washer* is

countersunk to accept a flathead screw and is larger to distribute the load better. They're great for securing materials that might crush under a normal washer.

Expansion Washer. A common challenge in woodworking is dealing with seasonal wood movement. Solid-wood tabletops and benchtops come to mind. They're usually fastened to aprons or cleats that run crossgrain to the wide panel.

One of the solutions for fastening a wide panel is shown in the upper right photo, opposite page. This expansion washer allows



Wood Washers.

Designed for flathead screws, these washers are great for wood applications.



the panel to expand and contract to prevent splitting. All you need to do is drill or rout a couple of slots in the apron or cleat. A large slot houses the washer while the narrow clearance slot allows the screw to move as the panel moves with the seasons.

Finish Washers. Some projects, like shadowboxes or display cases, occasionally need to be disassembled. To make this task easy and dress up the wood-screws, you can use finish washers. They come in a variety of finishes to complement the project.

The stamped finish washers (sometimes called cup washers) you see below are designed to be used with flathead or oval-head screws. They're donut-shaped with a countersunk center. This eliminates the need to drill a countersink for the screw. They sit on the surface of the project to add a decorative touch.

For a sleek, clean look, you can use *Lee Valley's* countersunk washers shown in the main photo. They're designed to fit into a counterbored hole with the top of the washer flush with the surface. Like cup washers, they're countersunk to accept a flathead or oval-head screw.

Tooth Washers. For permanent assemblies that are subject to vibration (like a tool stand), I rely on tooth washers (also referred

to as lock washers). You can see several types in the right photo below. These washers are made for roundhead screws. The idea is, as you tighten the fastener, the teeth grab the adjacent surfaces to prevent the fastener from working loose over time.

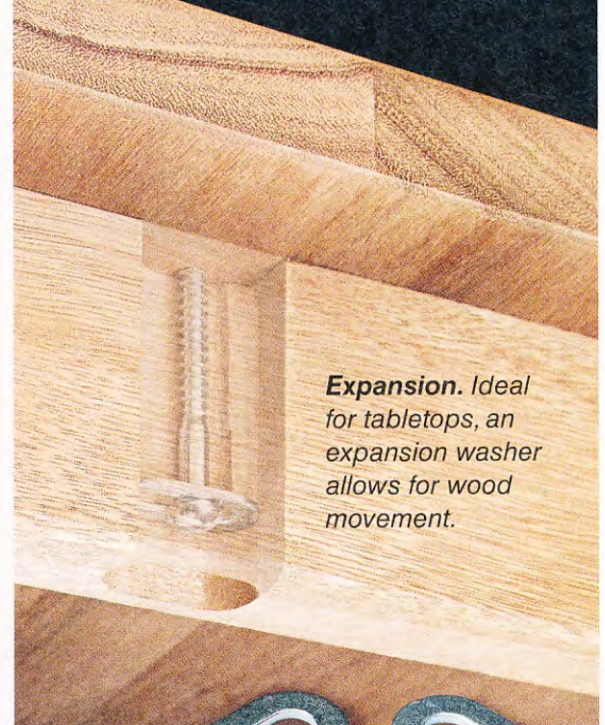
Tooth washers are designed for one-time, permanent assemblies. The reason for this is that the teeth on the washer can damage the mating surfaces as the fastener is removed.

Your choice of internal, external, or external/internal tooth washers really depends on the fastener you're using. You just need to make sure the teeth on the washer engage the surface when installing them.

Split Washers. Another popular type of washer is the split washer. A few examples are shown in the right margin.

Split washers were originally designed as lock washers. The intent was that their spring action and sharp cut edges would help prevent loosening of fasteners. But if you torque the fasteners down too hard, a split washer can act just like a flat washer and doesn't really work as a lock washer.

But I still find split washers useful in the shop. I use them under knobs on jigs and fixtures. They help prevent the knobs



Expansion. Ideal for tabletops, an expansion washer allows for wood movement.



from working loose. The great thing is, you can slightly loosen the knob to make adjustments, yet the split washer keeps it from spinning free. In these light-duty applications, they work great. And unlike tooth washers, split washers can be used on fasteners that are repeatedly loosened and tightened, which is why they're great for shop jigs.



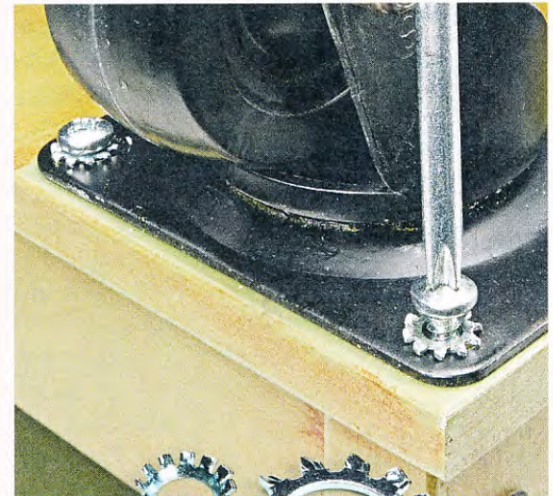
Split washers

Whether for decoration or function, there's a washer for every application. It's time the humble washer got a little respect. 🛠️



◀ **Finish Washers.** Add a decorative touch to any project with these simple washers.

▶ **Tooth Washers.** For permanent assemblies, a tooth washer locks fasteners securely.





shop-built Cabinet Scraper

This classic scraper is the perfect tool for smoothing wood surfaces. Plus, it looks great doing it.

■ There is nothing quite like the look and feel of a glass-smooth surface on a cherished project. But getting that finished surface isn't always so easy. This is especially true when working with highly-figured woods like the birds-eye maple in the photo above. That's where a cabinet scraper comes in handy.

I designed and built the one you see here based on an antique example. It's not difficult to build and it works great. Plus, it can be customized for your own personal comfort. A block of hardwood and some off-the-shelf hardware are all you need to get started.



▲ **Using the Scraper.** Apply firm, downward pressure and skew the scraper slightly while smoothing the face of a workpiece.

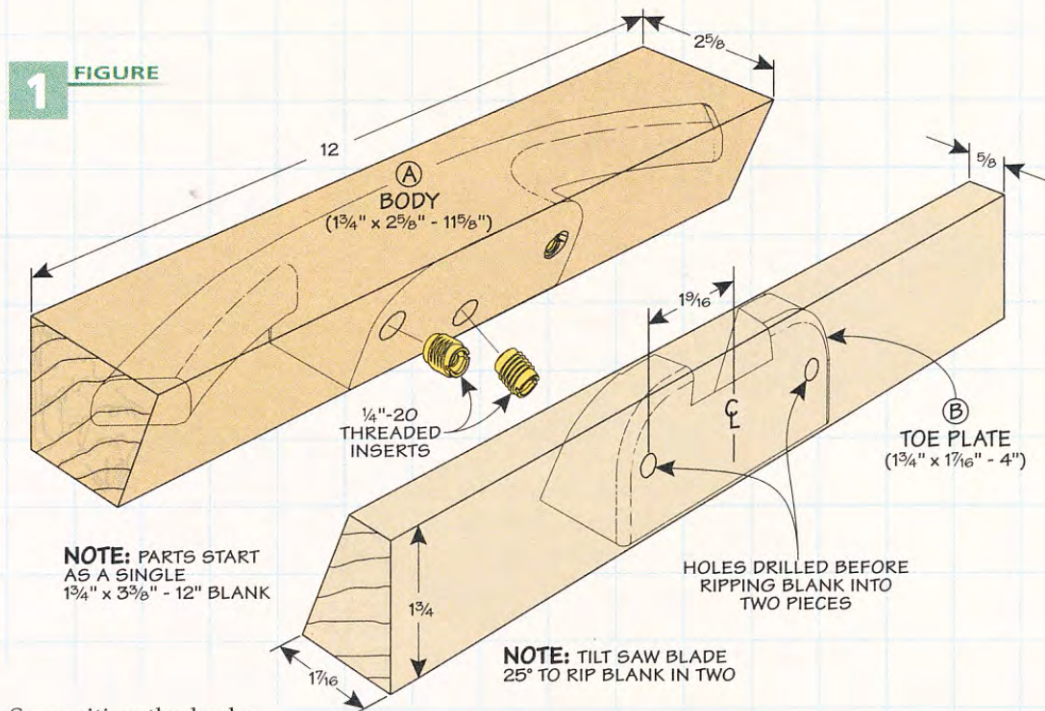
preparing a Blank

The scraper starts out as a single block of 8/4 hardwood. It's eventually ripped at an angle to separate the body and toe plate (Figure 1). I used maple for my scraper both for appearance and to add some weight to the tool. These two parts are held in place with a pair of wing screws. A third screw is used to set the curve of the blade.

Drill, Rip, Drill. Drilling the holes for the screws is a lot easier to do before cutting and shaping the blank, so that's where I started. This is pretty straightforward, but it's important to drill the holes in the correct sequence. I have a few tips to help you along the way.

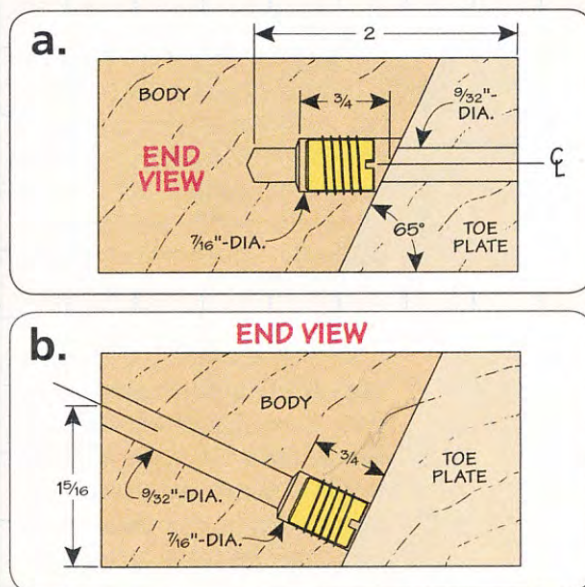
The two wing screws that will hold the body and toe plate together are parallel to the sole of the scraper. So it makes sense to drill those holes before cutting the blank into two separate parts (Figure 1a). The left drawing below shows the details. Once those two holes are drilled, you can bevel-rip the toe plate from the body at the table saw.

The hole for the adjustment screw is perpendicular to the beveled face of the cut (Figure 1b).

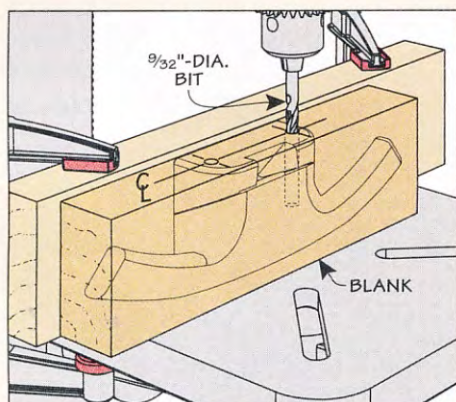


So position the body blank under the drill press as shown in the middle drawing below. Keep in mind that the hole is drilled at an angle to the face, so you may need to start the hole with a 1/4" Forstner bit, then complete the hole with a twist bit.

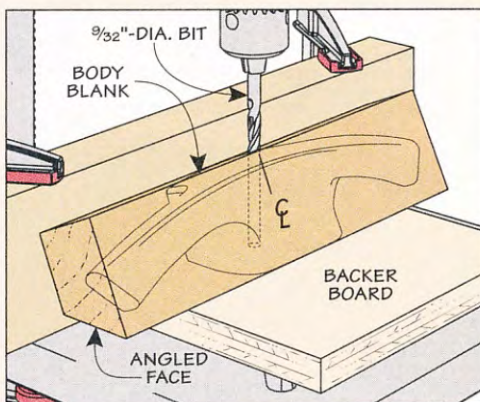
Inserts. The counterbored holes for the threaded inserts are a breeze except for the adjustment screw hole as in Figure 1b. To get the correct angle, you need to position the toe plate blank under the body blank as in the right drawing below. The setup is difficult to clamp, so just keep a firm grip on the parts as you drill the hole.



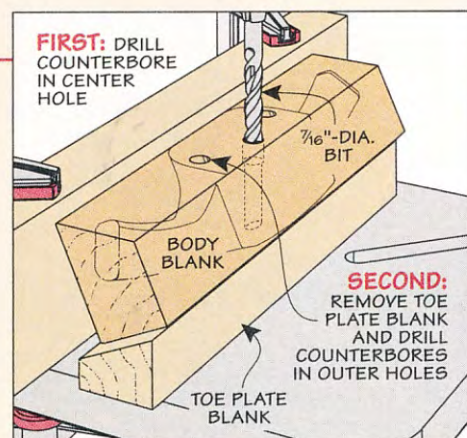
Drilling Details



▲ **Attachment Screw Holes.** Drill a pair of holes for the attachment screws before bevel-ripping the blank in two.



▲ **Adjustment Screw Hole.** Set the body blank on its beveled edge, then drill the through hole for the adjustment screw.



▲ **Counterbores.** Set the toe plate blank under the body blank to counterbore the adjustment screw hole. Remove the blank to drill the counterbores for the attachment screws (not shown).

cutting the parts to Shape

The work you've done so far hasn't resulted in anything that looks like a scraper, but that's about to change. The two parts of the scraper will be cut and sanded to shape together to form one, complete unit.

The toe plate will then be separated from the body to fit the blade and to remove the waste for the mouth and throat. I'll make sure to point out the important details as we go along.

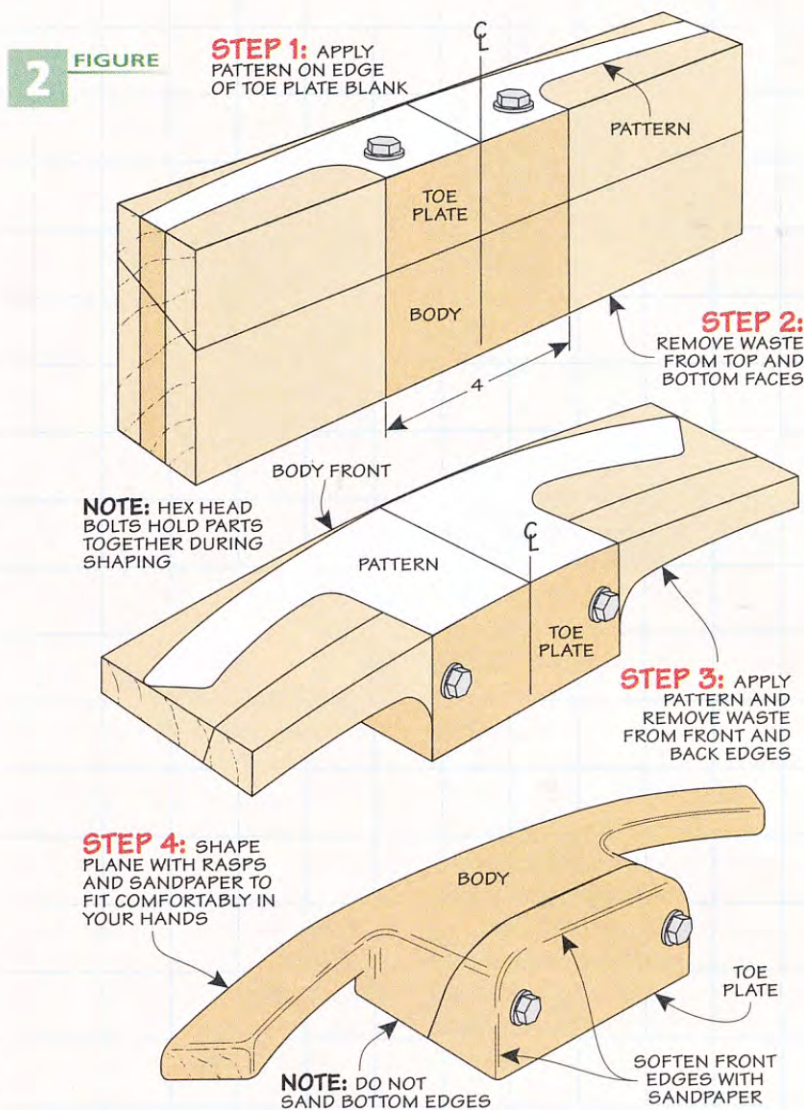
SCRAPER PROFILE

As you can see in Figure 2, I bolted the two parts together before cutting them to shape. The heads on the wing screws can get in the way during this process, so I used a couple of hex-head bolts instead. I then attached the pattern for the scraper on the front edge and top face of the two-part blank.

Here is where you have some leeway to modify the shape of the scraper to fit comfortably in your hands. The patterns I used are available at ShopNotes.com. Keep in mind that you will be pushing the scraper in the direction of the toe plate during use.

Cut to Shape. The parts are cut to rough shape at the band saw. I found it was easier to cut the edge profile first, then remove the waste to bring the face profile to shape. Just make sure you stay to the outside of the layout lines.

The shape of the scraper will probably look pretty rough once



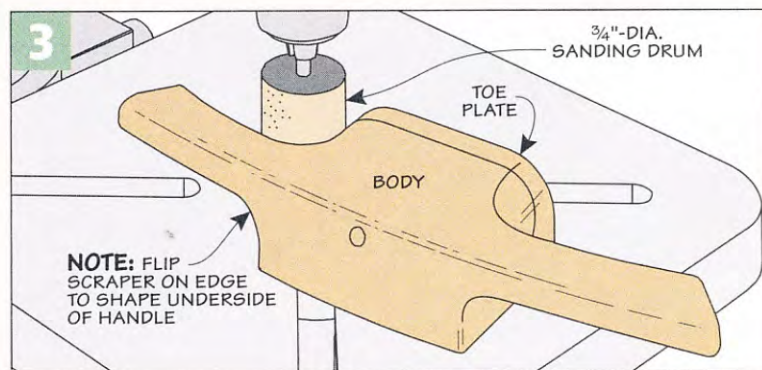
you're finished making the cuts. The next few steps will bring the scraper to its final shape.

Sand and File. Fine-tuning the final shape of the scraper is really where it comes down to personal comfort. I used rasps and sandpaper to remove the rest of the waste and smooth all of the cuts. A sanding drum helps smooth the curves where the handles meet the main part of the body, as you can see in Figure 3.

BLADE & THROAT

Now you're ready to get to the business end of the scraper. That means creating the throat and fitting the blade. This is where the details are important. But a little patience here will ensure your scraper works at its best.

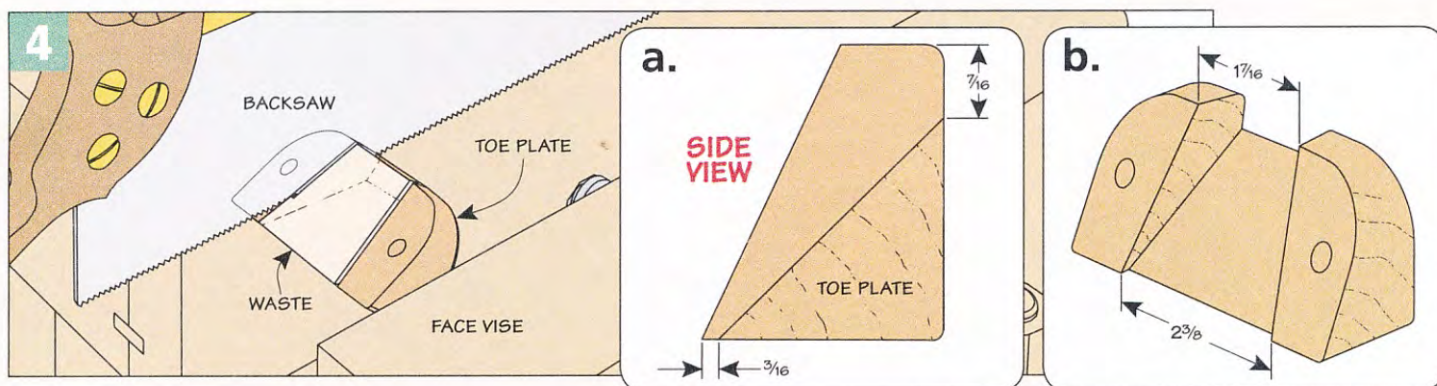
Make the Throat. The throat of the scraper is designed to allow the shavings to exit the scraper. Start by marking the layout lines on both edges of the toe plate as



Materials & Hardware

A	Body (1)	1 3/4 x 2 5/8 - 1 1/8
B	Toe Plate (1)	1 3/4 x 1 7/16 - 4

- (3) 1/4"-20 Threaded Inserts
- (2) 1/4"-20 x 2" Wing Screws
- (1) 1/4"-20 x 2 1/2" Wing Screw
- (2) 1/4" SAE Steel Washers
- (1) #80 Cabinet Scraper Blade



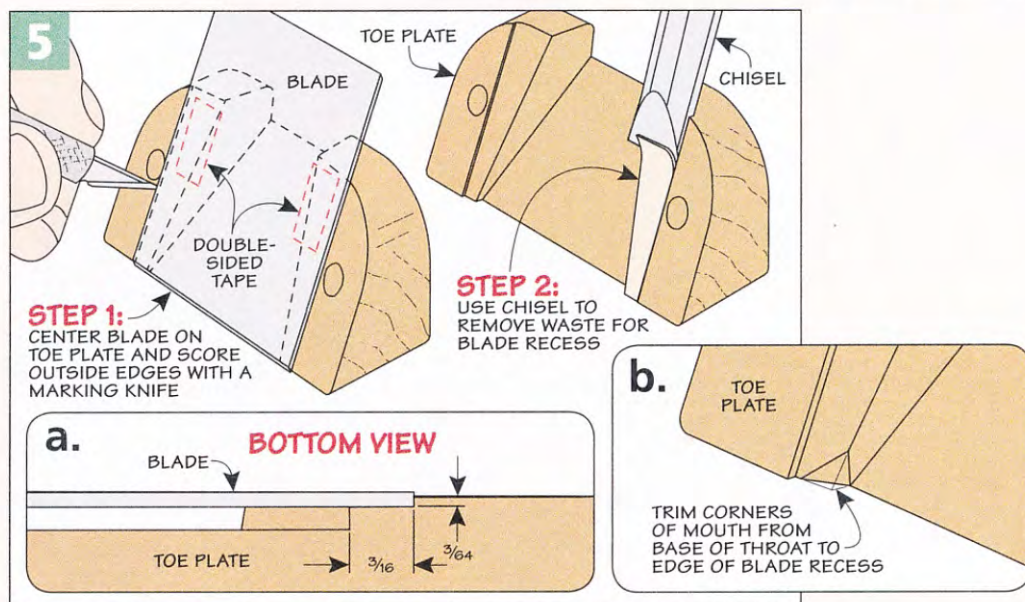
well as on the top and bottom faces. Ensure clean lines by scoring the edges of the throat opening with a marking knife. Figures 4a and 4b show the details.

I clamped the toe plate in a face vise and used a fine-toothed backsaw to make the cuts along the inside edge of the toe plate (Figure 4). Then I used a chisel to remove the waste between the layout lines.

Fit the Blade. The cutting edge of the blade should sit flat with the base of the scraper to work properly. The best way to ensure this is to use the blade as a gauge to lay out a shallow recess where the blade will sit (Figure 5).

To do this, I set the toe plate on a flat surface and centered the blade on the throat opening. With the cutting edge of the blade flush against the bottom edge of the plate, score the outside edges with a marking knife. Then remove the small amount of waste between the layout lines on each side of the throat.

The depth of the cut should be slightly less than the thickness of the blade (Figure 5a). This ensures



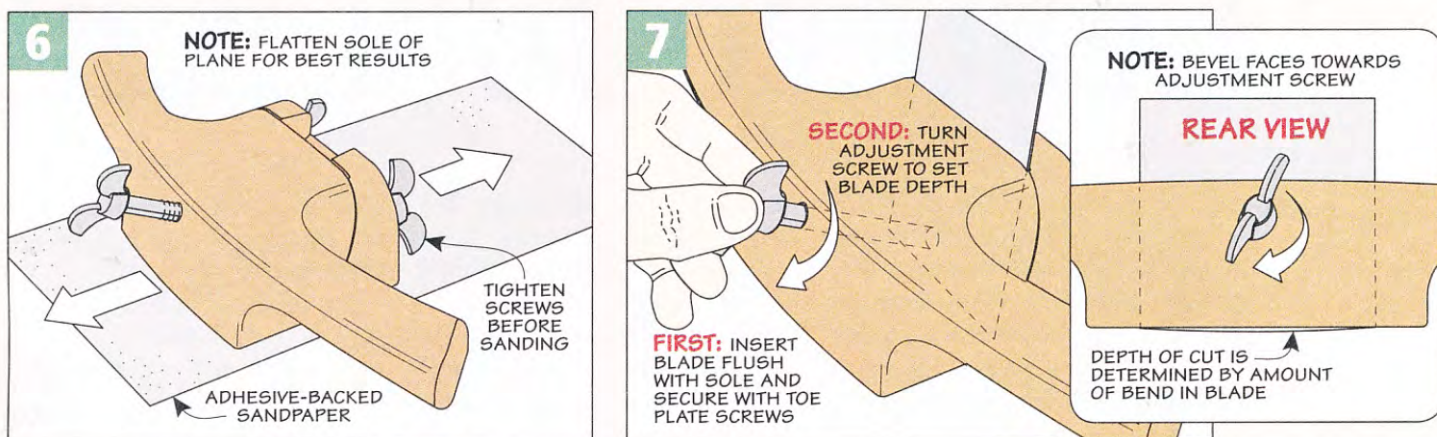
that the blade will be held securely when the scraper is assembled.

You're almost done. The inside corners of the throat still need to be opened slightly, as shown in Figure 5b, to allow clearance for the full width of the blade. This is best done with a chisel. Finish up the scraper by assembling all the parts and sanding the sole of the scraper flat if necessary.

Now you're ready to install the blade. Insert it so that the cutting

edge is flush with the sole. Then use the adjustment screw to slightly curve the blade so that a portion extends below the sole (Figure 7). See Shop Short Cuts on page 27 for details on how to sharpen the blade.

Give your scraper a few tries on a scrap board while you fine-tune the amount of flex in the blade. Soon you'll wonder how you ever got along without your new favorite tool. 🛠️



fine tools

Carry your tools in style with this rugged bag. You can make it in a few days using simple tools and techniques.



classic Leather Tool Bag

■ I don't know what it is, but there's something about the look and feel of leather that has a certain charm. Team that with durability, and you've got a perfect combination for a tool bag. And the best part is, you can make it with a few inexpensive supplies

from a leather-craft store. The easy-to-follow steps will be a relaxing change of pace for an enjoyable time in your shop.

Simple Design. As you can see in the photo above, the tool bag consists of two end pieces and a large body piece that forms

the bag. A pair of straps serve as the handles, and a belt buckle keeps the bag closed.

Supplies. Before you get started, you'll need to round up some supplies and build a jig. The supplies are all listed in Sources on page 51. The bag

requires about eight square feet of 8-ounce, vegetable-tanned leather. This leather is roughly $\frac{1}{8}$ " thick.

Some other supplies needed include a leather sewing kit with an awl, needles, a grooving tool, and an overstretch wheel for marking thread spacing (right photo). A kit like this will run about \$60.

For cutting the leather, a utility knife works great. Just make sure to install a sharp blade. And for trimming during the assembly process, a sharp chisel and block plane come in handy.

You'll also want to have some contact cement on hand. It's used to temporarily hold the parts together as you sew them. You can buy water-based cement from the leather store, but any contact cement will work.

For creating the holes for the rivets and buckle, you can simply use a $\frac{1}{8}$ " twist drill bit. But for cleaner holes, I prefer a rotary punch and a $\frac{1}{8}$ " hollow punch.

A Form. The two ends of the tool bag create the overall shape of the bag. They're formed, or molded, with a flange that connects to the edge of the main body of the bag. To create these flanges, mold the leather with a shop-made form (shown below).



The form is made from $\frac{3}{4}$ " plywood. The details are shown in Figure 1. It starts with a rectangular base. To that, you add the outside form and make a press block. The form and press block can be cut from the same piece of plywood. The key is that the resulting gap between the press block and form is slightly wider than the thickness of the leather.

To prevent sharp bends in the leather, I rounded over the bottom edges of the press block.

This creates a slight radius on the outside face of the end pieces that form the flanges.

Cutting Leather. Your next step is to lay out the pieces for the tool bag. You can download a cutting diagram online from ShopNotes.com. Every piece of raw leather will be a different shape, so the process is to lay out the parts of the tool bag wherever they fit best.

Since you'll be pressing the ends into a form, cut those pieces oversize, about 11" x 14". For the straight cuts on the 20" x 32½" body, I use a framing square to guide the knife. For clean cuts, it's best to cut through the leather in one firm stroke rather than several light strokes.

▲ Supplies.

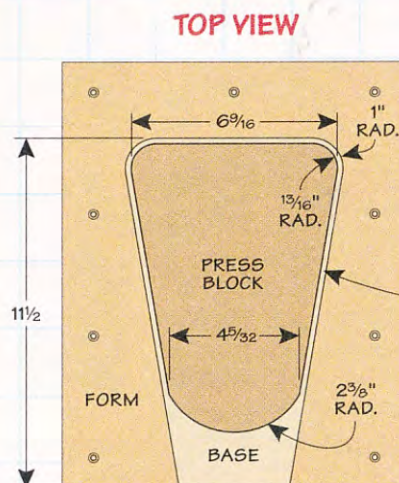
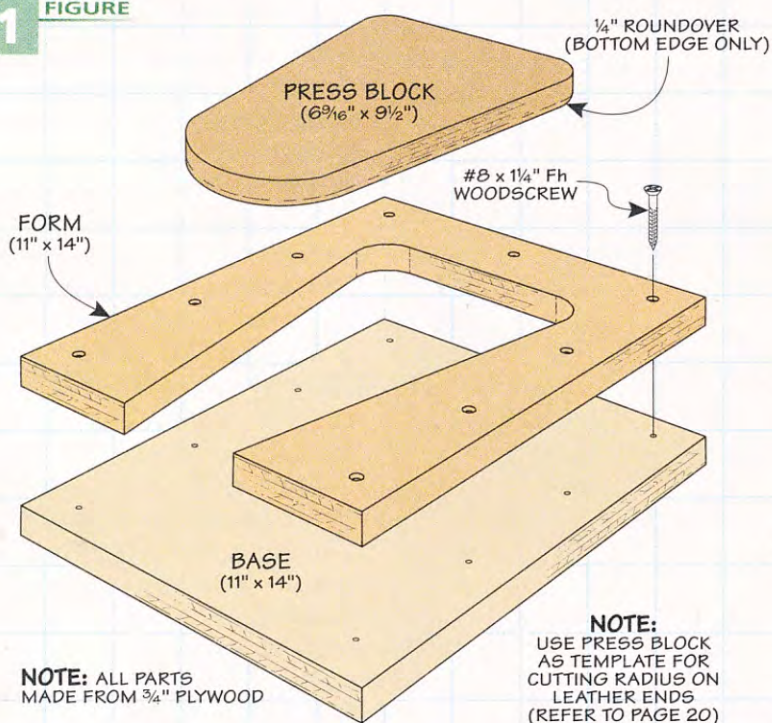
Some basic tools and supplies make the leatherwork easy.

ShopNotes

GO ONLINE EXTRAS

To download a cutting diagram for the tool bag go to: ShopNotes.com

1 FIGURE



forming & sewing the Ends & Body



▲ **Rivets.** A simple tool sets the burr on the rivets before they're peened.

After building the form and cutting the leather, the first order of business is to create the end pieces. You'll wet the leather before placing it in the form. Then it requires a little patience since you need to let the leather dry completely. This could take two or three days for each piece.

Forming the Ends. The photos below step you through the overall process of making the ends. Soak the leather in water for about 30 seconds, and then place it over the form with the smooth side up. After that, it's just a matter of tapping and clamping the press block into place and setting

it aside for a couple of days before trimming the leather.

Shaping the Ends. Once you're sure the leather is dry, you need to mark the arc at the top of the end piece using the press block as a template. You'll cut this to final shape after removing the excess leather.

To trim a square edge, I used a sharp chisel with the bevel side down. Use a slicing action with the chisel edge tight against the press block. Leave a little excess at the top, rounded end.

Now you can remove the leather from the form and finish trimming the arc. Form the



flange at each end of the arc by making a 90° cut. The photo above shows the final transition between the flange and the end of the arc.

Gluing. By now you should have the body and ends cut to shape. The next steps bring the three pieces together to create the final shape of the bag.

To get started, you'll need a large worksurface to lay the body flat with the smooth side down. Contact cement works great to temporarily hold the ends and body together in preparation for the stitching process.

To mark where to apply the contact cement on the body, I placed the flange of an end piece at the bottom of the body and "rolled" it along the edge. Then I marked the top of the flange on the edge of the body. The photos at the top of the next page show the basic steps.

At this point, you can apply the contact cement to the flanges on the end pieces and the edges of the body up to the marks. After the cement tacks up, press the ends onto the body, rolling the ends as you go.

Riveting. To secure and reinforce the corners at the top of the flanges on the ends, I installed copper rivets (left margin). The rivets include a "burr" that looks like a washer. To install the rivet, punch $\frac{1}{8}$ " holes in the leather. Slip the rivet in place and install



▲ **Forming the Ends.** After soaking the leather in room-temperature water, place it in the form, rough side down.



▲ **Press Block.** Seat the press block firmly by tapping it in place with a mallet, making sure the rounded edge is face down.



▲ **Clamp & Dry.** Clamp the press block securely and allow to dry for two or three days before removing the clamps.



▲ **Trim to Shape.** After tracing the outline of the arc on the leather, trim the excess with a sharp chisel, bevel side down.



▲ **Gluing the Ends.** Apply contact cement to the ends and body, then roll the ends to bond them (inset).

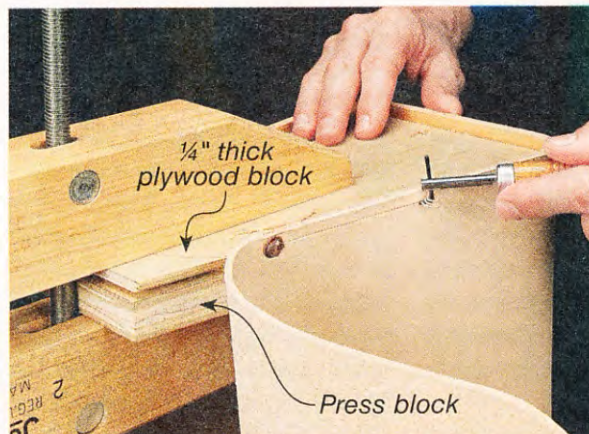


▲ **Installing Rivets.** Use a rivet-setting tool to set the burr on the rivet before peening the rivet shaft over the burr.

the burr on the outside of the bag. Using your machinist's vise as an anvil, seat the burr with a rivet-setting tool (or a steel rod with a hole drilled in the end). I used a ball-peen hammer to flatten the end of the rivet over the burr.

Trimming & Stitching. A block plane works great to trim the ends of the bag flush before starting on the stitching. To clamp the bag in place for stitching, you can use the press block (from the form) as a clamp block. I cut another matching piece from $\frac{1}{4}$ " plywood to sandwich the end of the bag between the blocks.

Use a grooving tool to create a guideline for the stitching



▲ **Creating a Groove.** The grooving tool creates a shallow recess for the thread to prevent unnecessary wear and tear on the stitches.



Overstitch Wheel. The wheel marks the stitch locations.



Awl. Use the awl to create holes for the stitches.

and help protect the thread from wear. You only need to groove the outside of the bag.

The overstitch wheel makes evenly spaced impressions in the

groove, which you can then use to punch needle holes through the leather with the awl. The box below shows you how I saddle stitched the ends to the body.

two-needle Hand-Sewn Saddle Stitch

Stitching leather isn't as difficult as it may appear at first. And it goes pretty quickly.

Traditional saddle stitching is strong and easy to do. The first step is to thread a needle at each end of the thread. You'll need about six feet of thread to stitch all the way around each end.

Double Stitching. Saddle stitching involves passing each end of the thread through the same hole as you work your way around. To start, pass one needle through the first hole, then pull both needles together to tighten

and center the thread. Pass each needle through the second hole, pulling the thread tight. Repeat the process all the way around until you reach the last hole.

Locking the Stitch. When you get to the last hole, you can't simply cut the threads and call it done. You need to "lock" the stitching to prevent it from unraveling. To do this, pass each needle through the previous hole and pull the thread taut. This locks the stitching in place. At this point, you can cut the threads flush on each side.



▲ **Double Stitching.** Saddle stitching is a strong and easy way to secure leather. Simply pass each end of the thread through each hole.

adding the Straps & Bottom

The basic bag is complete, so now is the time to make the straps, apply a stain and finish, and then attach the straps and buckle. The last thing you'll need to do is add a plywood bottom.

Before doing anything else, it's time to cut the straps that form the handles and buckle. Here again, the online cutting diagram provides the details for these pieces.

Finishing Leather. To add some color and character to the bag, I used a two-step finishing process. I applied a stain first. Once that was dry, I applied a clear sealer. The article on page 24 shows you how.

Installing the Handles. After the finish dries, you can attach the handles with rivets. A single rivet anchors each end of the straps on the bottom of the bag. A second rivet secures the strap to the side of the bag. See the photos below to get an overview of the process.

In order to create a smoother surface on the bottom of the bag, I installed all of the bottom rivets from the *outside* of the bag.



▲ **Stain & Sealer.** Prior to fastening the handle and buckle straps to the bag, apply a stain and clear coat. To learn more about the fundamentals of finishing leather, turn to page 24.

The smooth head of the rivet is less likely to leave scratches behind on tabletops or other surfaces. The remainder of the rivets are installed as before, with the burr end to the outside of the bag.

Punch & Rivet. To create clean holes for the rivets, I used a $\frac{1}{8}$ " punch. After fastening the rivets at each end of the handle strap, pull the strap tight to mark the rivet location on the side of the bag. Then you can install these rivets to finish up the handles.

Buckle. Adding the strap with a buckle is the last step that will complete the leatherworking part of the project. The buckle assembly consists of two straps — a buckle strap that holds the metal buckle and a closure tab that engages the buckle. The closure

tab has a series of holes that allow for adjusting the fit of the body when closing the bag.

The photos at the top of the next page show how easy it is to attach these two straps. It's a good idea to punch all the holes and create the slot for the buckle beforehand. To create the slot, I simply punched a hole at each end and then cut out the waste between the holes with a knife.

The closure tab is secured with a pair of rivets. This is old hat by now and should be a quick task. Again, I used the machinist's vise as an anvil when peening the rivets over the burrs.

The buckle strap is also secured with a pair of rivets, but there are a couple of things I need to point out. The first is that the



Start with the Ends. Secure each end of the strap handles with rivets installed from the bottom side of the bag.



Second Set of Rivets. Stretch the strap handles over the bag to mark the position of the second set of rivets.

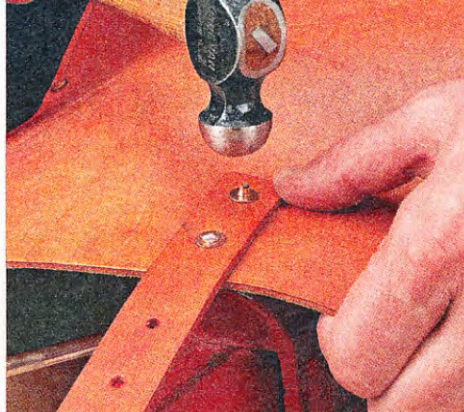
▼ **Punch.** Use an $\frac{1}{8}$ " hollow punch to make holes for installing the handle and buckle straps.

buckle strap is folded over onto itself to trap the buckle in place. Make sure the clasp of the buckle is through the slot in the strap when you secure the strap.

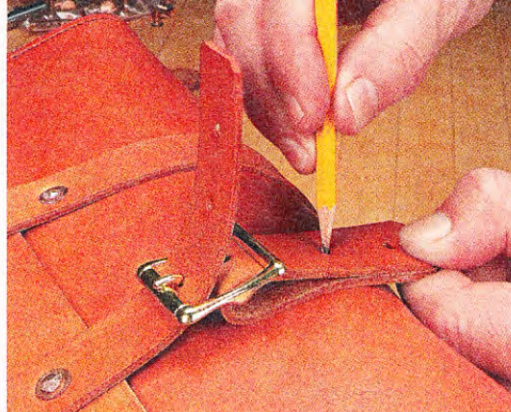
Since this calls for installing a rivet through three thicknesses of leather, you'll need to use longer ($\frac{3}{4}$ ") rivets. Other than these minor differences, however, the process is the same.

A Plywood Bottom. After the bag was complete, I decided to add a plywood bottom to the inside of the bag. I did this for a couple of reasons. First, I didn't want any sharp edges or the point of a tool eventually poking through the leather bottom. And the other benefit is that the plywood helps create and maintain the flat-bottom shape of the bag. This helps keep the bag stable and upright when it's sitting on the floor or a worksurface.

The $\frac{1}{4}$ " plywood bottom starts out as a blank 6" wide by $18\frac{1}{2}$ " long. It's held in place with a rivet at each corner. The Online Extra at ShopNotes.com



▲ **Closure Tab.** Peen short rivets in place to install the closure tab in the center of bag's overlapping top cover.



▲ **Buckle Strap.** Use the closure tab to assist in marking the location for the extra-long rivets in the double-thick buckle strap.

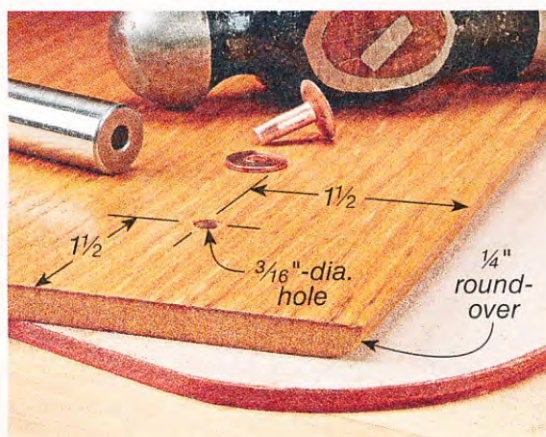
provides all the details, but the left photo below will help you with laying out the hole locations at each corner.

I also rounded over the long, bottom edges of the plywood at the router table. This prevents the bottom edge from bearing against the leather as the bag is loaded down with heavy tools.

Once again, you'll need to use the longer rivets to secure the bottom to the bag. You can use the plywood bottom to mark the four locations for the rivets on the leather before punching

the holes. Remember to insert the rivets from the bottom of the bag to maintain a smoother surface. Then you can set the burr and peen the rivets from inside the bag. If you'd like to provide your tools some extra protection, you can cut a piece of leather to fit over the plywood. Use contact cement to hold it in place.

If you've never tackled a leatherworking project before, this bag is a great way to get started. And with your own leather bag, you can tote your tools and supplies around with style. ▲



▲ **Plywood Bottom.** Cut the plywood to size before rounding over the long edges on the bottom and drilling the holes for the rivets. Finally, peen the rivets flat on the inside of the bag.

Materials & Hardware

- | | |
|---------------------|--|
| A Body (1) | 20 x $32\frac{1}{2}$ - $\frac{1}{8}$ Leather |
| B Ends (2) | 11 x 14 - $\frac{1}{8}$ Leather |
| C Handle Straps (2) | 1 x 39 - $\frac{1}{8}$ Leather |
| D Closure Tab (1) | 1 x $6\frac{3}{4}$ - $\frac{1}{8}$ Leather |
| E Buckle Strap (1) | 1 x $6\frac{3}{4}$ - $\frac{1}{8}$ Leather |

- | | |
|---|--|
| F Bottom (1) | 6 x $18\frac{1}{2}$ - $\frac{1}{4}$ Ply. |
| • (9) #8 x $1\frac{1}{4}$ " Fh Woodscrews | |
| • (14) #9 x $\frac{1}{2}$ " Copper Rivets and Burrs | |
| • (6) #9 x $\frac{3}{4}$ " Copper Rivets and Burrs | |
| • (1) 1" Belt Buckle | |



fundamentals of **Finishing Leather**

Create a custom look and provide lasting protection for your leather projects.

■ The great thing about making a project from vegetable-tanned leather is that it's easy to customize the color with dyes or stains. Adding a clear protective finish keeps it looking good.

For the leather tool bag (page 18), I used a wipe-on stain followed by a clear matte topcoat, as in the photo below. You can

find out where to buy them in Sources on page 51.

Applying a Stain. A leather stain gives the leather a deep, rich color. It's easy to apply, but there are some things I need to point out before you start.

To apply the stain, you'll need some sponges, like the round ones you see below. I purchased them from a leather store, but you can use any handy sponge, as long as it's clean. And you'll want to wear some gloves to protect your hands.

I like to pour the stain into a disposable plastic container. This way, you can daub your sponge into the stain as you apply it. Just make sure to shake the stain bottle thoroughly before you begin pouring.

Circular Motion. The best results come from applying the stain in circular motions rather than in long, straight strokes

the way you would stain wood. And it's important to keep the leather damp as you go. Start by dipping your sponge into the stain. There's no need to squeeze out all the excess — you want the sponge to be pretty wet. But you never want to pour stain directly onto the leather. This could leave a dark spot that can't be removed.

Start applying the stain in one corner and widen the area as you add more stain to your sponge. Work quickly and maintain tight, circular motions to keep the area damp and the color even (upper left photo, opposite page). Work the stain into the stitched areas for complete coverage.

I applied the stain to the outside of the bag only. But since both sides of the straps are visible, I stained the entire strap. Take special care to coat the edges too, as in the upper right photo.

The important thing to remember is that you're working the stain all the way into the leather.





▲ **Apply a Stain.** The trick to applying a stain to leather is to move quickly and keep the sponge wet while moving in tight, circular motions. Keep working the stain into the leather for an even color.

You don't wipe off the excess as you might do with a wood stain. Once you have the entire area covered and the stain worked well into the leather, you're done.

You'll need to allow the stain to dry completely (at least overnight), and buff the surface with a clean, smooth, and dry cloth. Then you can apply a clear finish.

Added Protection. To seal the leather, I applied a clear matte sealer. But for the sealer to work effectively and prevent the stain from bleeding out, you need to make sure the stain is completely dry before applying it.

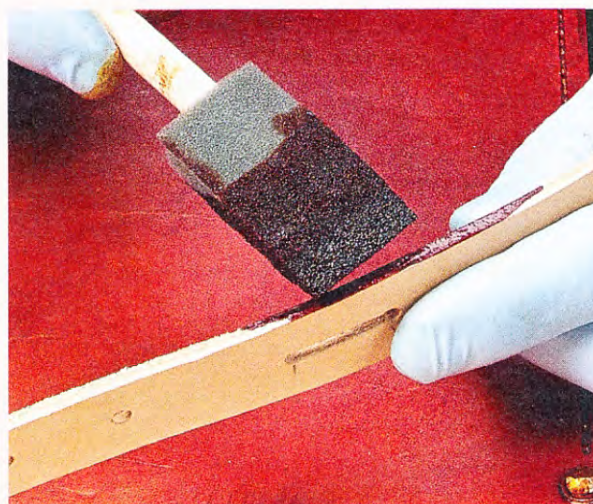
You start by lightly dampening the sponge with a little water. Then pour a little of the clear

finish onto the sponge. Like the stain, you don't want to pour it directly onto the leather.

Use a circular motion to work the finish into the leather, as shown in the lead photo on the opposite page. I applied the finish to the same areas where the stain was applied, including the straps. The clear finish will dry within an hour or two. Then you can buff it out with a cloth.

Caring for Leather. With a clear finish on the leather, it should last for a good long time. But there are some things you can do periodically to keep it looking great for years to come.

The first thing to keep in mind is that extremes in temperature



▲ **Stain the Edges.** Since the entire strap is usually visible, I like to apply stain to both sides and the edges for an even finish all around.

and humidity can take their toll on leather. So you'll want to try to avoid getting the leather wet. If it's exposed to excess moisture, wipe off what you can and allow the item to air-dry.

Likewise, excess heat can dry out the leather and cause cracks to form. It's a good idea to occasionally apply a conditioner (the box below has the details). These help restore the natural oils and help the leather to remain supple.

Finally, if the leather starts to get dirty take some time to clean it first. The box below shows one popular cleaner — saddle soap. After it's clean, condition the leather to give it many more years of service. 🐾

cleaning & conditioning Leather



There are a variety of cleaners available for leather, but one of the most popular is saddle soap. It contains oils, lanolin, and other ingredients to gently clean the leather without drying it out. You never want to use harsh soaps on leather.

Likewise, an abundance of conditioners exist to preserve the leather. One I like is shown at right. Apply a conditioner periodically to nourish, soften, and protect the leather to keep it looking great.





Shop Short Cuts

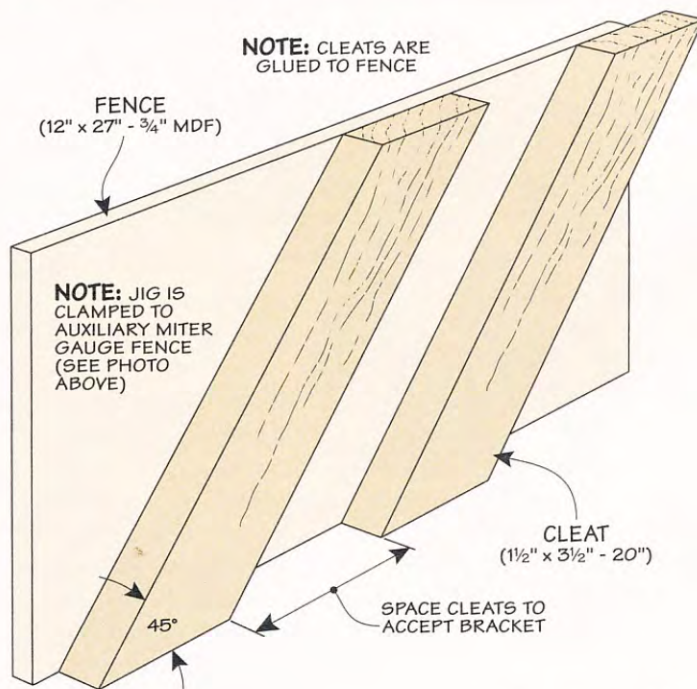
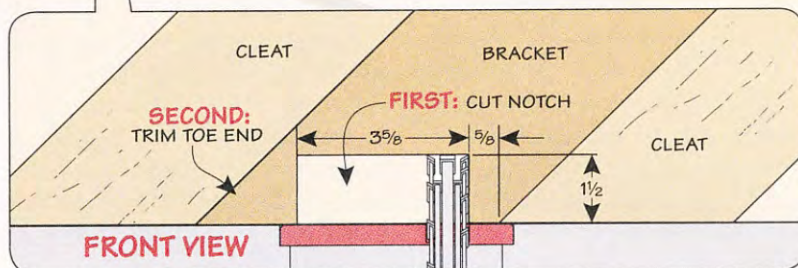
Notching End of Bracket

■ The brackets for the workbench on page 34 have a notch cut in the "heel" to rest on the ledger. There are two challenges facing you: cutting an accurate notch and controlling a large workpiece. The answer to both is the simple notch-cutting jig shown in the drawing at right.

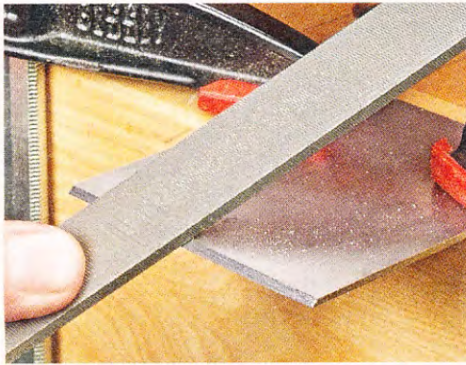
The jig has a pair of angled cleats that capture the bracket and hold it in the correct position during the cut. The jig is clamped to a long auxiliary fence on the miter gauge (photo above).

To cut the notch, clamp a bracket to the jig and position it so the shoulder of the notch aligns with the blade. Now you can clamp the jig in place and make the first cut.

After making the same cut on the other bracket, shift the jig over for the next cut. Repeat this process to complete both notches.



Sharpening a Scraper Blade



▲ **File the Bevel.** Use a smooth mill file to create a flat 45° bevel on the end of the scraper blade.



▲ **Hone the Edge.** An oilstone removes the mill marks left by the file and creates a razor-sharp edge.



▲ **Roll a Hook.** The real cutting edge of the blade is the hook. Use a burnisher at the tip of the blade (see detail below).

The blade used in the cabinet scraper on page 14 came with a 45° bevel already ground on both ends. But, like most blades and plane irons, it still needed some work for it to function at its best. Fortunately, sharpening the blade only requires three steps.

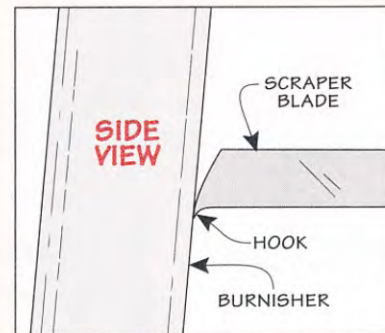
File. You start by filing the end of the scraper with a smooth mill file at 45° (left photo above). Clamp the blade securely to your bench and use a smooth, even motion, pushing the file along the length of the cutting edge. Five or six passes with the file is just about right.

Hone. The file works great to make sure the bevel is smooth. But to get a razor-sharp edge, you need to hone the back side of the blade and the bevel. This polishes the surface and removes the wire edge left by the file.

I used an oilstone for this as shown in the middle photo above. The technique is similar to using the file. Just make several passes until you've removed the mill marks left by the file.

Add a Hook. Next you'll need to create a hook on the bevel. As you can see in the far right photo above, I did this by drawing a

burnisher over the end of the bevel. The idea is to "turn" a slight hook away from the bevel to form the cutting edge of the blade. The drawing below shows a close up view of the finished results. 🛠



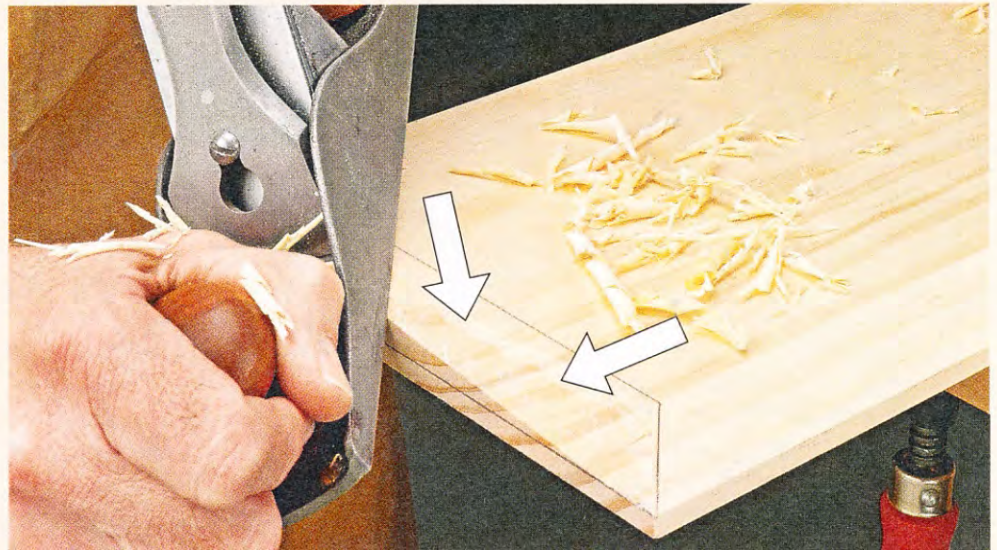
◀ **Burnisher.** Any smooth, hardened steel can be used to roll a hook on the edge of the scraper blade.

Planing Bevels on Long Workpieces

I used a combination of tools to create the beveled cap on the wall shelf on page 39. The long bevel on the front edge can be cut at the table saw. But the part is too long to cut the bevels on the ends safely.

Instead, I used a hand plane. With the front bevel as a guide, I marked the bevel on the front and back edges as well as the face and end, as shown in the photo.

Cutting across end grain can cause tearout if you aren't careful. The solution is to work in from each side and move the plane down and along the workpiece while skewing the plane.



best-built
jigs & fixtures

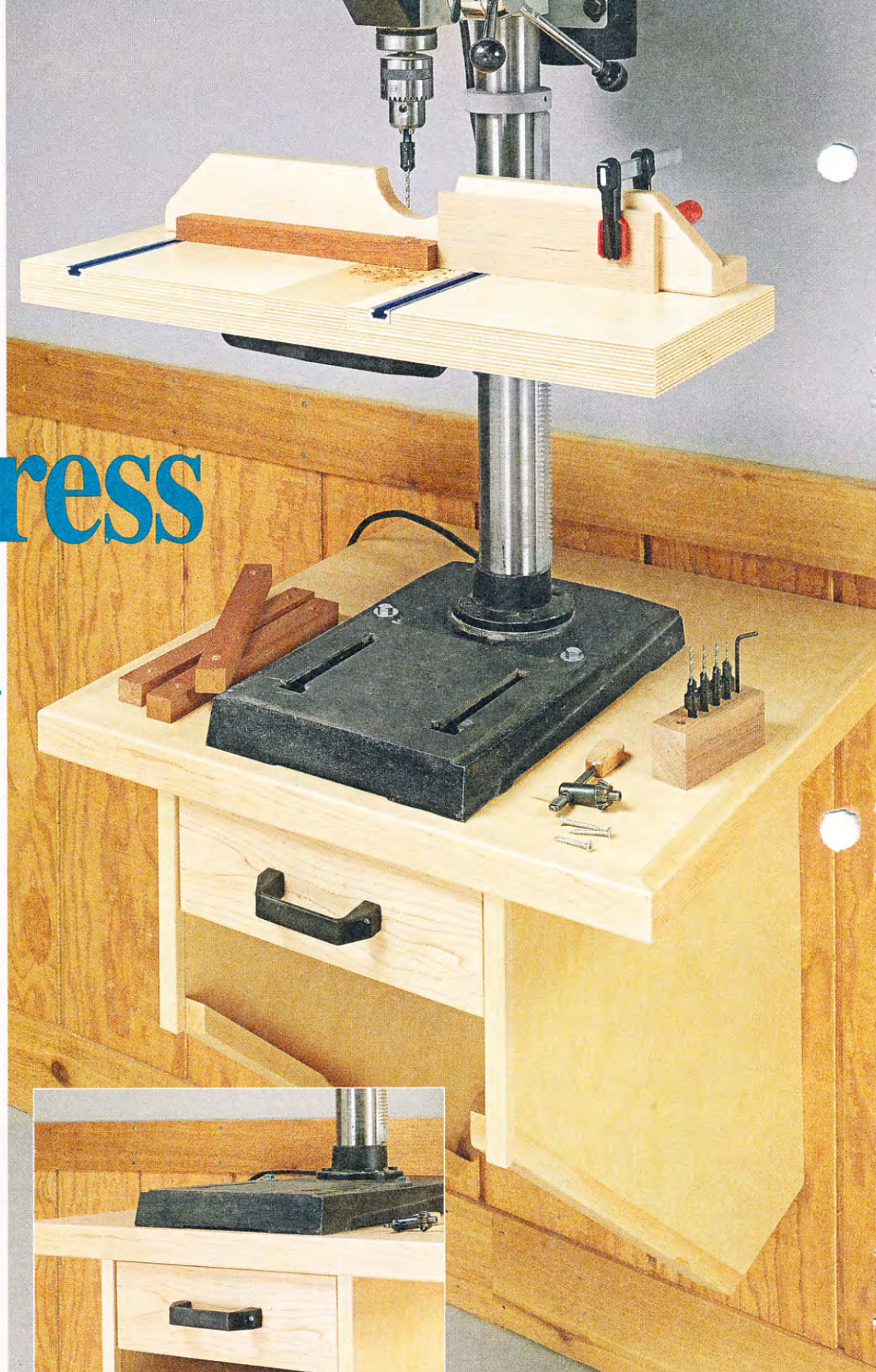
benchtop Drill Press Station

This two-part upgrade adds accuracy and storage in a small footprint.

■ A benchtop drill press packs a lot of accuracy and versatility into a compact package. It does have a few shortcomings, though. First, you need a stand or some spare bench space to use it. Throw in the fact that the stock table is pretty small, and you have a tool that's just begging for some upgrades.

The workstation you see here solves those problems. A stout shelf with a drawer creates a platform for the drill press and offers some valuable storage as well.

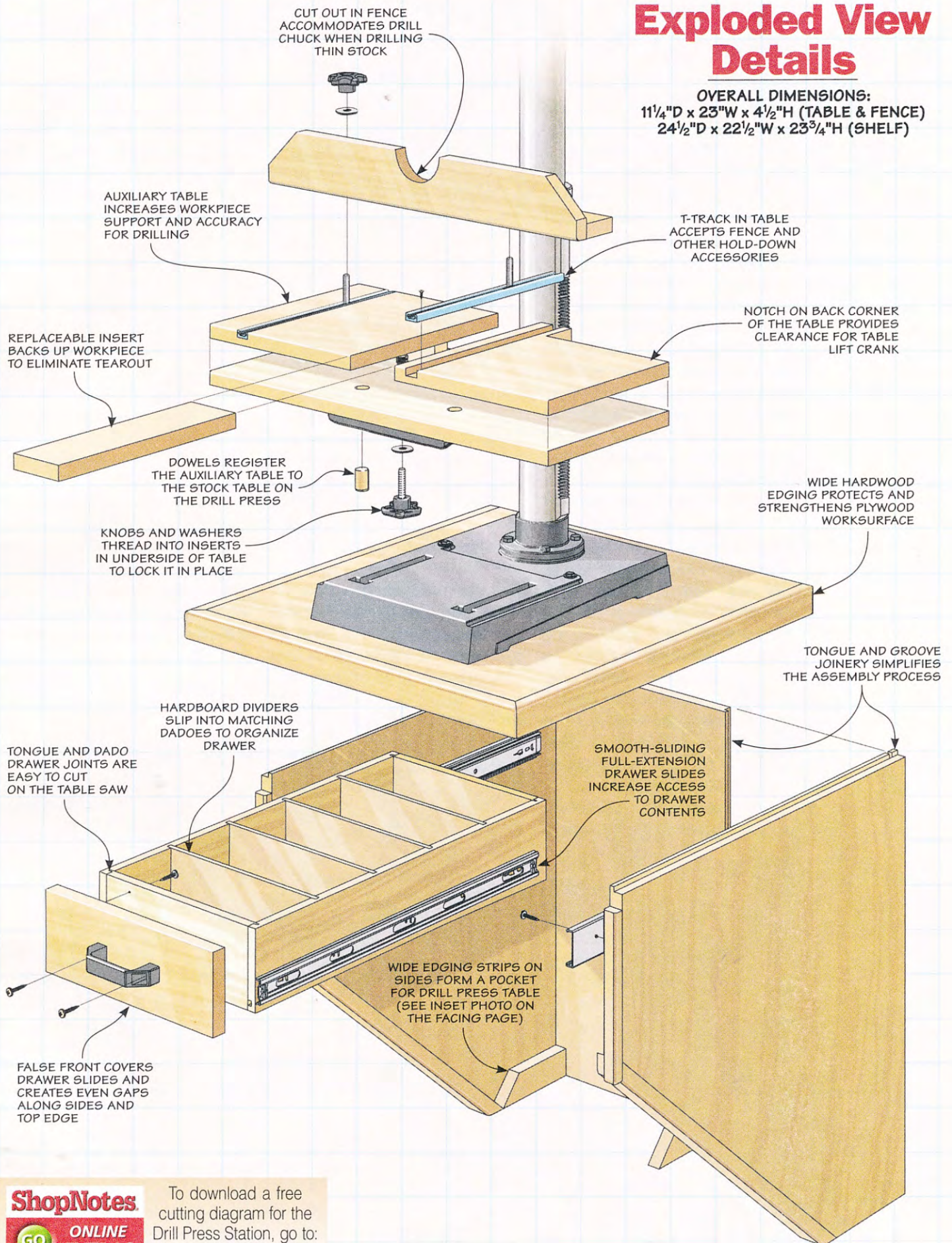
Then an easy-to-build table and fence system adds accuracy. When you don't need the table, it stows in a pocket under the shelf.



◀ **Stowaway Table.** You can quickly remove the table by loosening a couple knobs. Then slip it into a pocket under the drawer for handy storage.

Exploded View Details

OVERALL DIMENSIONS:
 11¼"D x 23"W x 4½"H (TABLE & FENCE)
 24½"D x 22½"W x 23¾"H (SHELF)



To download a free cutting diagram for the Drill Press Station, go to:
ShopNotes.com

a rigid Shelf

1 FIGURE

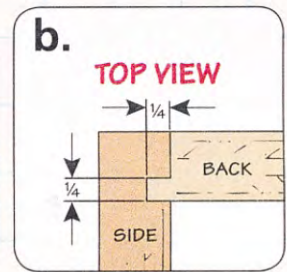
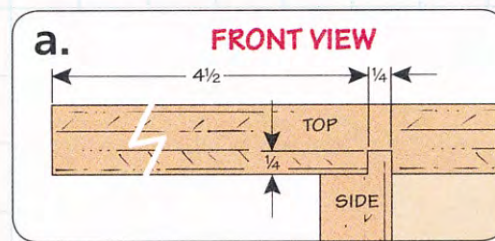
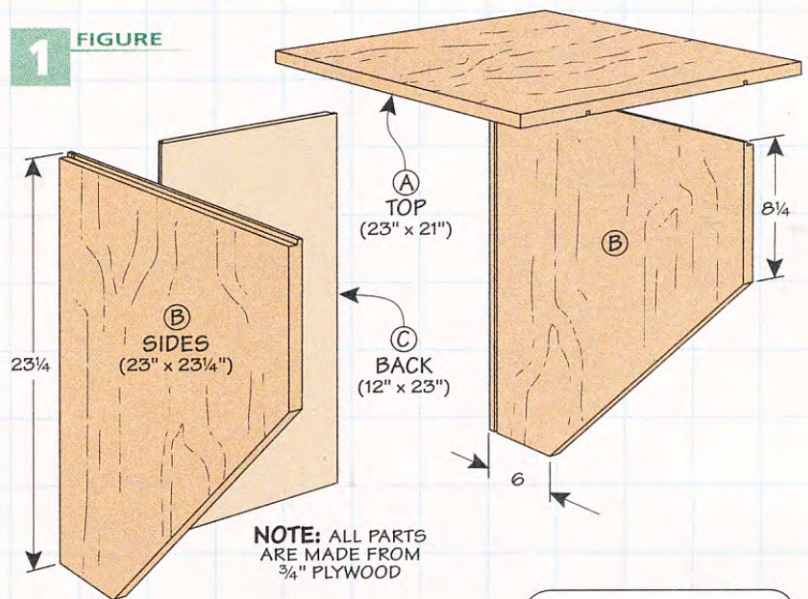
The main benefit of this project is that it creates a dedicated place to use a benchtop drill press in your shop. It isn't elaborate, but I still managed to squeeze in a few nice features. When it comes right down to it, the drill press workstation is nothing more than a large shelf to hold the drill press at a convenient working height.

Simple, Sturdy Construction. The four plywood parts shown in Figure 1 interlock to create a rigid platform for the drill press. Despite the small number of parts, I found there's a specific order to the construction that makes it easier to build.

I began with the top. It has a pair of dados cut across the bottom face, as shown in Figure 1a. Those dados accept tongues cut along top edge of the sides. This simple detail serves to tie the parts together and registers the sides for a square assembly.

A couple more details are needed on the sides. You can cut grooves along the back edge of the sides to capture the back. Then cut a large bevel on the lower corner to lighten the appearance.

Take a moment to dry assemble the top and sides. This gives



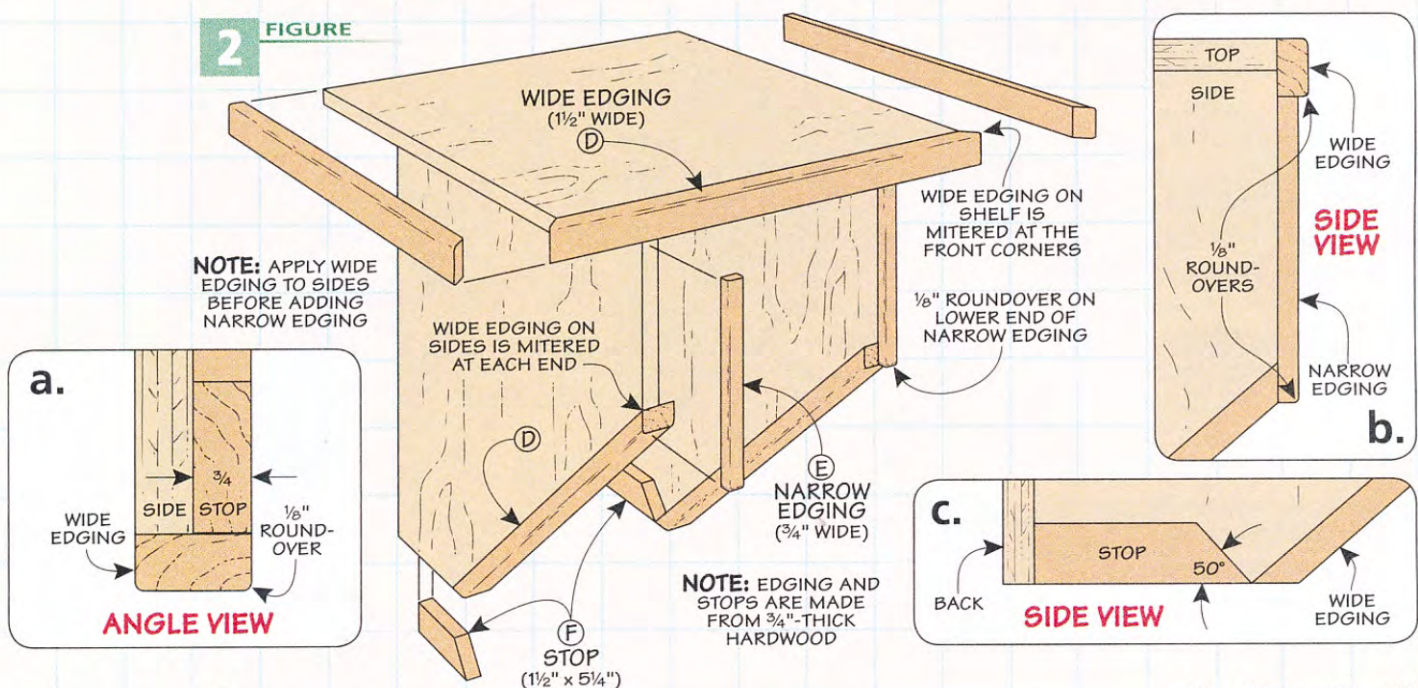
you the final dimensions for the width of the back and the size of the tongues along each edge, as you can see in Figure 1b.

Edging. Even for a shop project, bare plywood edges just won't cut it. The exposed edges are vulnerable to dents and prone to chipping. So I like to cover the edges with hardwood strips. In addition, I think the strips improve the look.

I applied wide edging to the shelf top to add stiffness, as in Figure 2. The same wide edging is applied to the angled section of the sides. Its purpose is to create a lip to store the table and fence when they aren't needed. (Just be sure to round over the edges before attaching it to the shelf.)

Narrow edging covers the front edges of the sides. It's sized to match the thickness of the

2 FIGURE



plywood and features the same roundover detail.

There's one final detail to point out. I glued small, angled stops on the inside bottom face of the sides, as shown in Figures 2 and 2a. The table rests on these stops when it's in the stowed position.

DRAWER

The drawer sits just below the top of the shelf. It rides on full-extension drawer slides to make the most of the available storage space. Dadoes cut in the drawer sides allow you to divide the drawer into compartments to keep small bits and accessories protected and easy to find.

In Figure 3, you can see the component parts. The place to begin is with the basic drawer box, which consists of the sides, front, back, and bottom. The corners are assembled with tongue and dado joinery.

The drawer sides have dadoes near the ends to accept tongues on the front and back. I also cut

a few dadoes to hold hardboard drawer dividers. It's a good idea to tweak the size of your dado blade so it's a close match to the thickness of the divider stock. Aim for an easy sliding fit.

The trick in making the front and back isn't in cutting the tongues on each end. Instead, it's sizing the length of the parts. You need to take into account the joinery and the gap needed for the drawer slides ($\frac{1}{2}$ " per side).

The tongue can be cut with a dado blade in the table saw. I made this cut in a series of passes. Start with the dado blade set low and raise it slightly between cuts until the tongue that's formed just slides into the dado. The drawer bottom fits in a groove cut in the sides, front, and back.

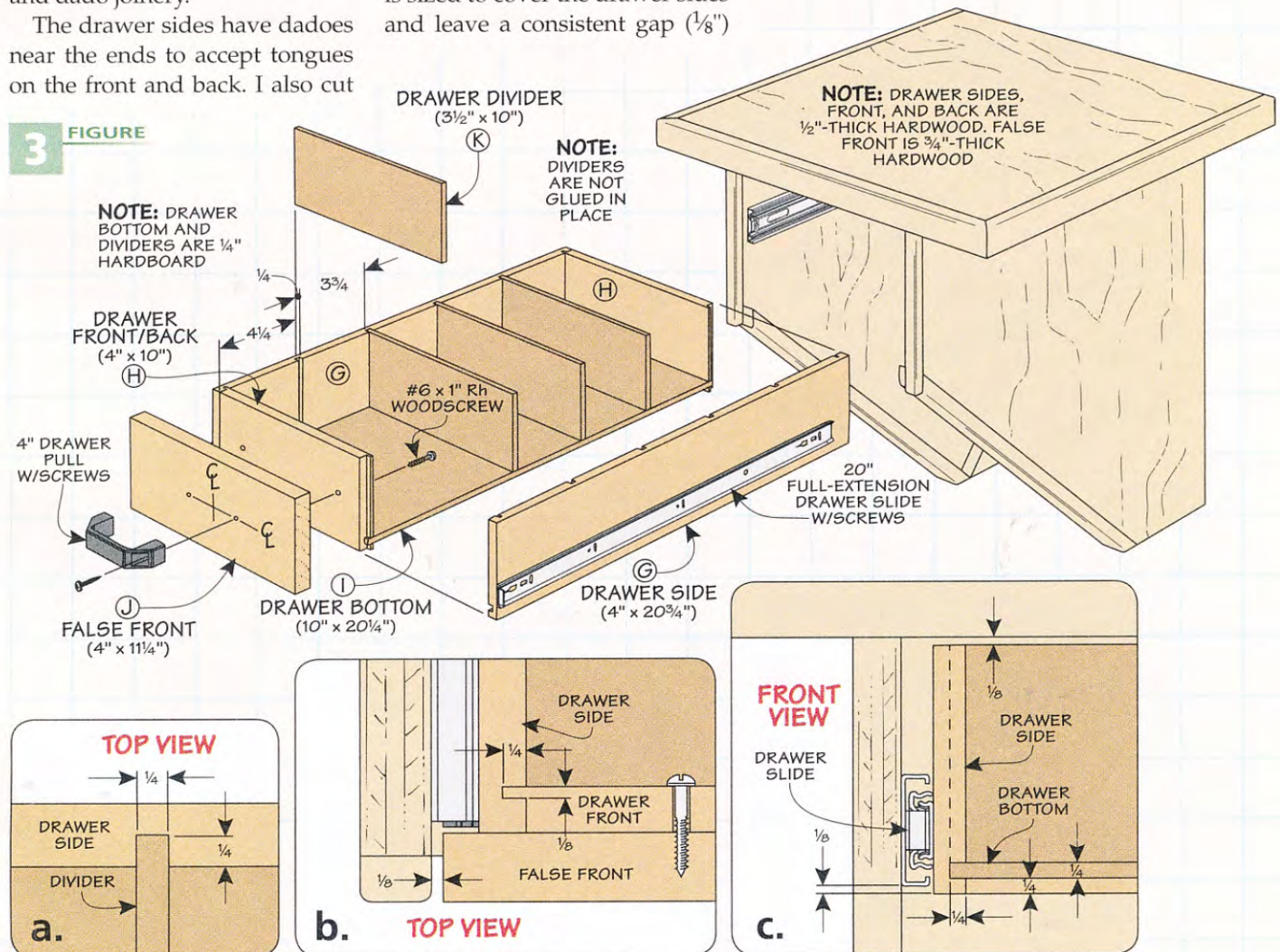
You can assemble and install the drawer box in the shelf before adding the false front. The front is sized to cover the drawer sides and leave a consistent gap ($\frac{1}{8}$ "



▲ **Drawer Organizers.** Slip hardboard dividers into dadoes in the drawer sides to organize the contents and make items easier to find.

on each side and along the top edge, as shown in Figure 3b.

I made enough dividers for each pair of dadoes. This way, I'll have them on hand, no matter how I choose to organize the drawer down the road.

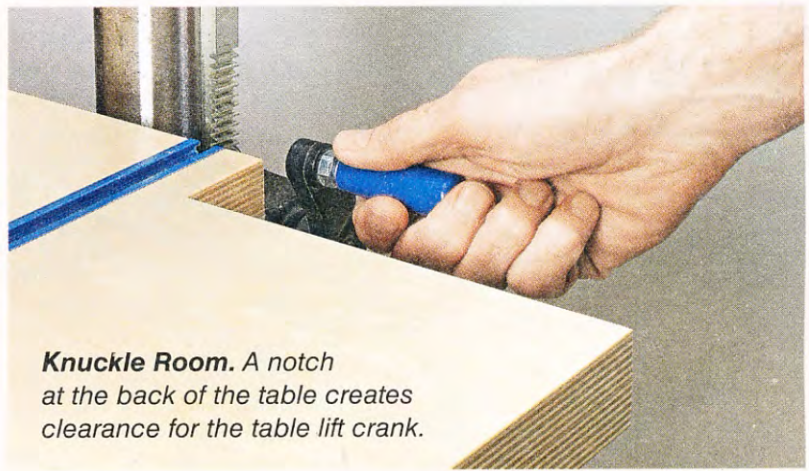


add a Table

Now that you have a home for your benchtop drill press, the next part of the project is to add an auxiliary table and fence system. This increases the capability and accuracy of the drill press.

Most drill presses come with a small metal table. And on benchtop models, these can be especially puny. The table doesn't provide a lot of support for long pieces. In addition, the workpiece isn't backed up to prevent tearout. To overcome these problems, I made a large auxiliary table.

Plywood Construction. The table is built up from two layers of plywood, as shown in Figure 4. The lower layer consists of a single piece. The upper layer is in



Knuckle Room. A notch at the back of the table creates clearance for the table lift crank.

three segments. The outer wings of the table are glued to the lower layer and help create a thick, rigid worksurface. A pair of T-tracks is installed in dadoes cut in the wings to accept a fence or other accessories like hold-downs.

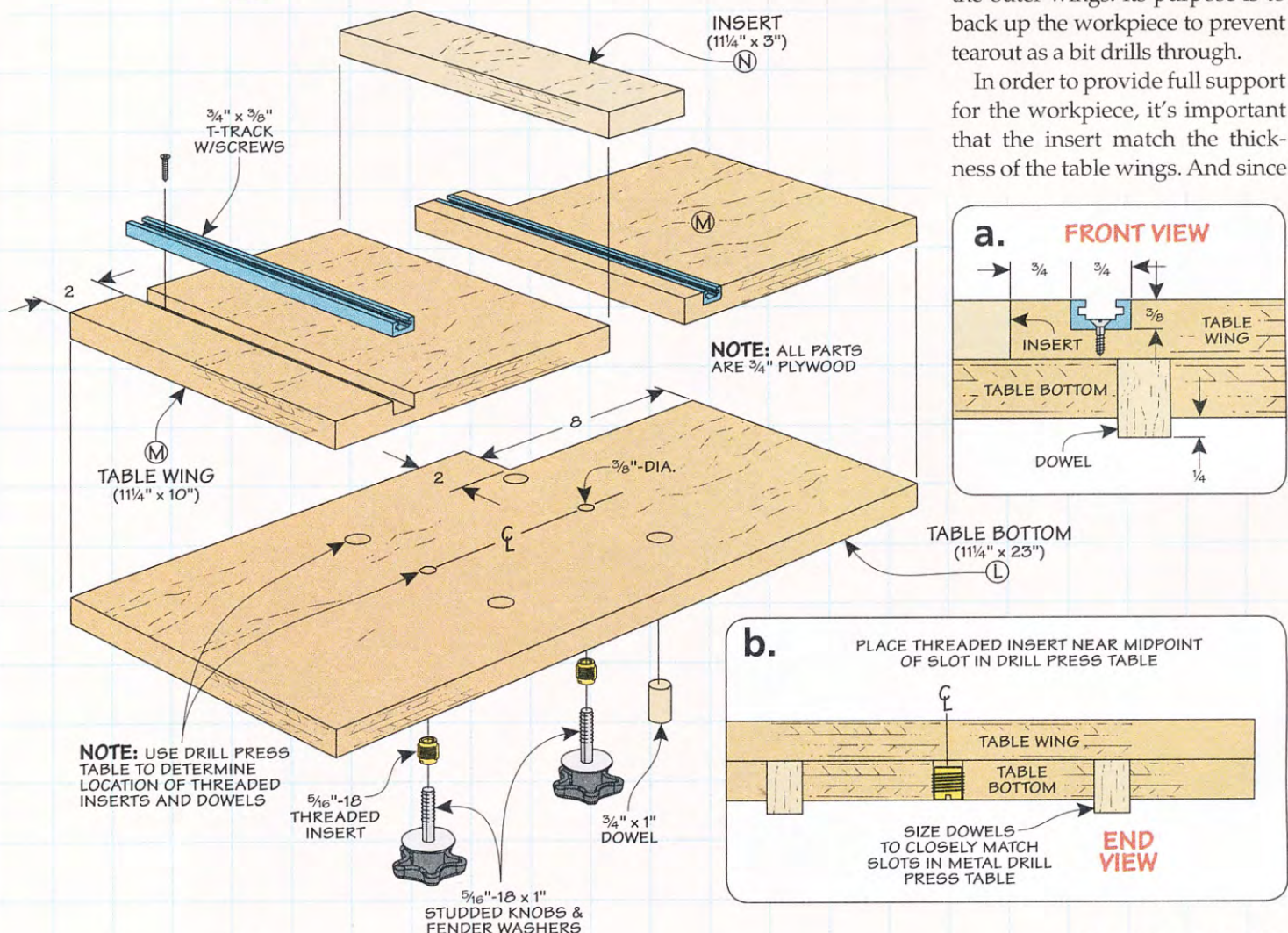
There's an important detail I want to point out about the table. There's a wide notch cut in the back corner. This notch provides

clearance for the table lift crank, as you can see in the photo above. Because of this notch, I offset the location of the T-track on the right side of the table, as illustrated in Figure 4a. Otherwise, the range of the fence would be limited.

Insert. The center part of the upper layer is a removable insert. It isn't glued in place. Instead, it just rests in the space between the outer wings. Its purpose is to back up the workpiece to prevent tearout as a bit drills through.

In order to provide full support for the workpiece, it's important that the insert match the thickness of the table wings. And since

4 FIGURE



the insert is going to get chewed up in use, I decided to make several of them to have on hand using the same plywood I used for the other parts. (You can store the extras in the drawer.)

Attaching the Table. As handy as the table is, there are times when I need to remove it — like when I want to tilt the table or drill metal. So I wanted a way to quickly install and remove it. The answer is shown in Figure 4b.

Four dowels index the auxiliary table by slipping into the large holes in the metal table. The table is secured by studded knobs and washers that fit into threaded inserts installed in the underside of the table.

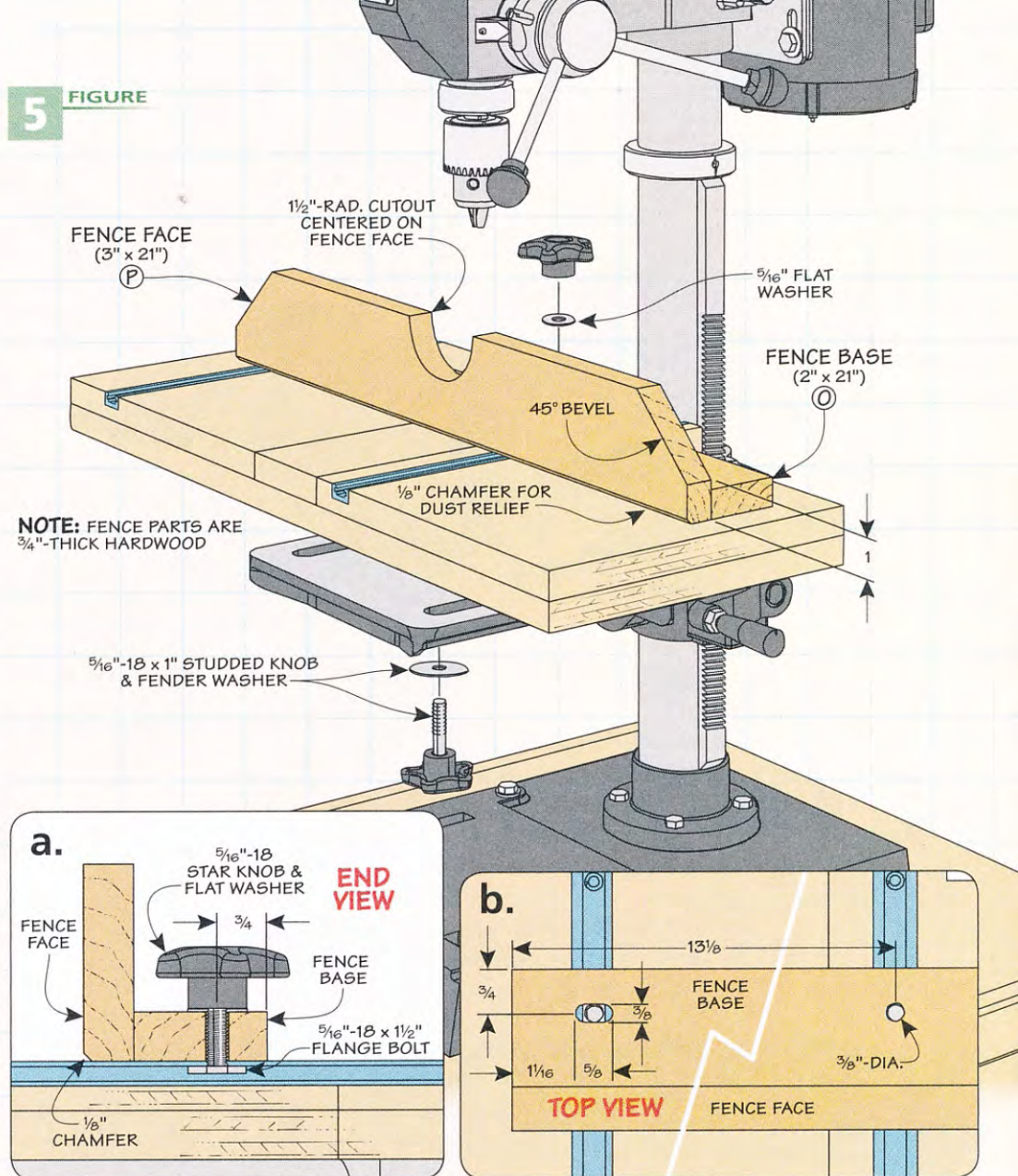
The stock tables on drill presses vary among manufacturers. So your arrangement of dowels and inserts may not match this one. To determine the layout, clamp the auxiliary table to the stock table. Then trace the slots in the metal table onto the auxiliary table. Choose dowels that are a close match to the width of the slots and install inserts along the slots.

ESSENTIAL FENCE

The final piece of the puzzle is the fence. And while it's important for drilling accurate holes safely, that doesn't mean it needs to be overly complicated.

You can see in Figure 5 that there are only two parts — a face and a base. The base has a hole on one end and a short slot on the other end that align with the T-track in the table. The slot provides some wiggle room for the

5 FIGURE



flange bolts, washers, and knobs. This way the fence won't bind as you adjust it (Figure 5b).

The fence face has a centered notch cut in it to provide clearance for the drill chuck when you're drilling thin stock close to the fence. The final detail is that

the upper corners of the face are beveled. This is an easy task to complete at the table saw.

I used long lag screws to attach the shelf securely to a wall stud. Once the drill press is bolted in place, your drilling center is ready to go for your next project.

Materials & Hardware

A	Top (1)	23 x 21 - 3/4 Ply.	J	False Front (1)	3/4 x 4 - 11 1/4	• (2) #6 x 1" Rh Woodscrews
B	Sides (2)	23 x 23 1/4 - 3/4 Ply.	K	Drawer Dividers (4)	3 1/2 x 10 - 1/4 Hdbd.	• (2) 3/4" x 3/8" x 11 1/4" T-Track w/Screws
C	Back (1)	12 x 23 - 3/4 Ply.	L	Table Bottom (1)	11 1/4 x 23 - 3/4 Ply.	• (2) 5/16" - 18 Threaded Inserts
D	Wide Edging	3/4 x 1 1/2 - 116 rgh.	M	Table Wings (2)	11 1/4 x 10 - 3/4 Ply.	• (2) 5/16" - 18 x 1" Studded Knobs
E	Narrow Edging	3/4 x 3/4 - 17 rgh.	N	Table Insert (1)	11 1/4 x 3 - 3/4 Ply.	• (2) 5/16" Fender Washers
F	Stops (2)	3/4 x 1 1/2 - 5 1/4	O	Fence Base (1)	3/4 x 2 - 21	• (4) 3/4" - dia. x 1" Dowels
G	Drawer Sides (2)	1/2 x 4 - 20 3/4	P	Fence Face (1)	3/4 x 3 - 21	• (2) 5/16" - 18 x 1 1/2" Flange Bolts
H	Drawer Front/Back (2)	1/2 x 4 - 10				• (2) 5/16" - 18 Knobs
I	Drawer Bottom (1)	10 x 20 1/4 - 1/4 Hdbd.				• (2) 5/16" Flat Washers

dream shop project

Transform a few feet of wall space into a workshop with these three simple projects.

wall-mounted Workbench

A few key ingredients are required for setting up a workshop. Two important ones are a worksurface and some storage for tools and supplies. The three projects shown here prove that all it takes is a few feet of wall space to create a comfortable shop.

The thick, rugged workbench can withstand heavy use. A simple rack keeps your tools close at hand and off the benchtop. And a wall shelf holds supplies and small tools overhead.

Bevels and chamfers give the three projects a classic look. And they're built from common, low-cost construction lumber.



Exploded View Details

OVERALL DIMENSIONS:

7½"D x 72¾"W x 11¼"H (WALL SHELF)

2"D x 70¾"W x 5½"H (TOOL RACK)

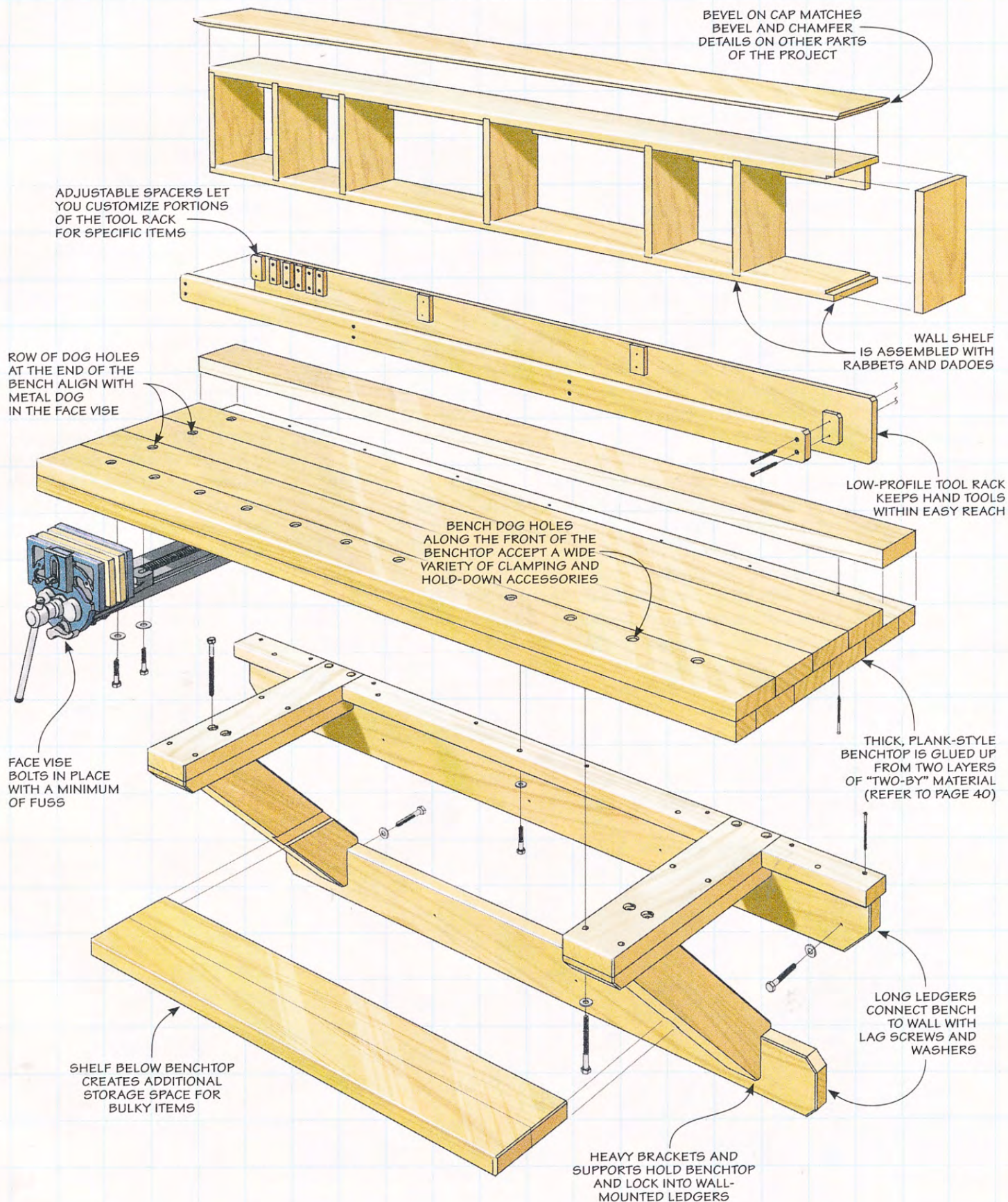
29"D x 78"W x 25¾"H (WORKBENCH)

NOTE: WALL SHELF
AND TOOL RACK ARE
MADE FROM "ONE-BY"
CONSTRUCTION LUMBER

ShopNotes

GO ONLINE
EXTRAS

To download a free
cutting diagram for
these projects, go to:
ShopNotes.com



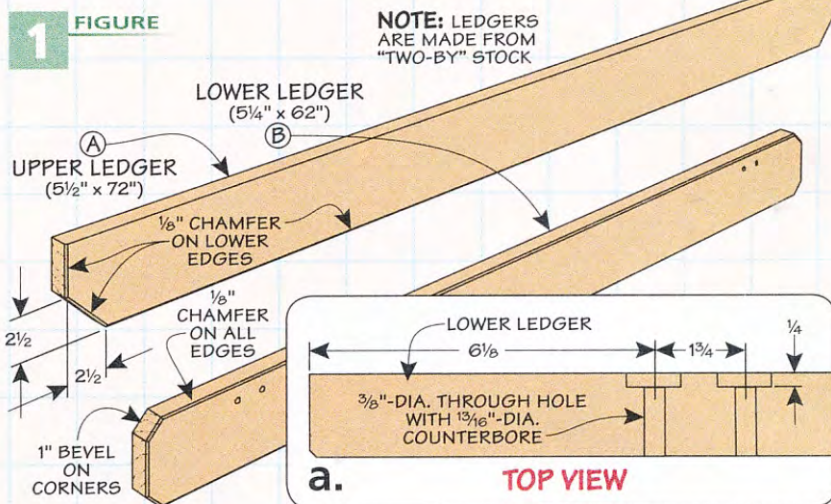
low-cost, rugged Workbench

Building a wall-mounted workbench like this one offers a few advantages. Perhaps the biggest is that you “borrow” strength from the wall to create a more sturdy worksurface.

Strong Support. In order to make the most of that benefit (and stand up to heavy use), the benchtop and its support structure need to be stout. The bench is attached to the wall with two large ledger strips, as shown in Figure 1. These allow you to connect the whole assembly to a number of wall studs.

The upper ledger has the lower corners beveled. Then the ends and lower edges receive a small chamfer. (I used these bevel and chamfer details throughout the project to tie the components together visually.)

The lower ledger is slightly narrower. All four corners are beveled and all edges are chamfered. In addition, the lower ledger has a set of counterbores on the back face for attaching the



brackets that support the top, as illustrated in Figure 1a.

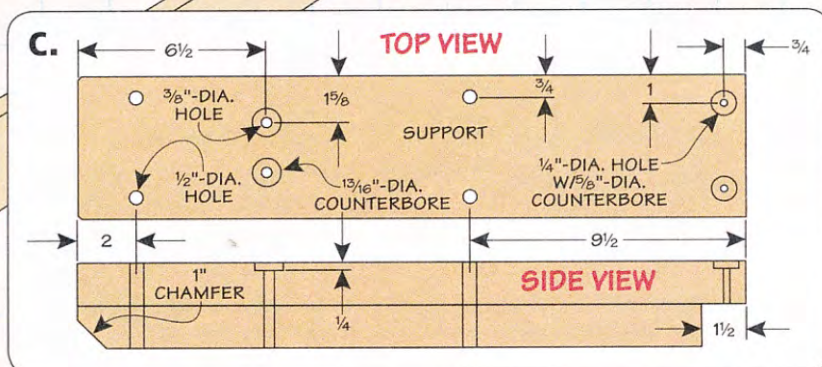
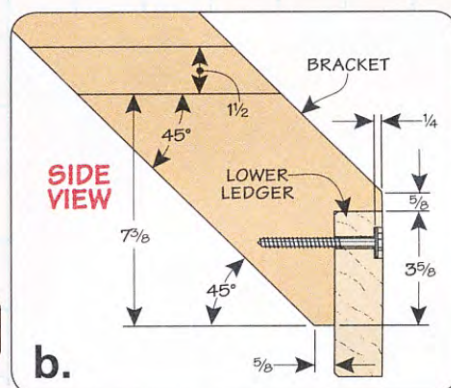
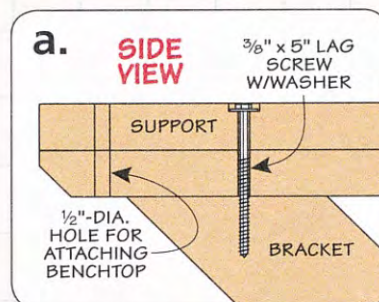
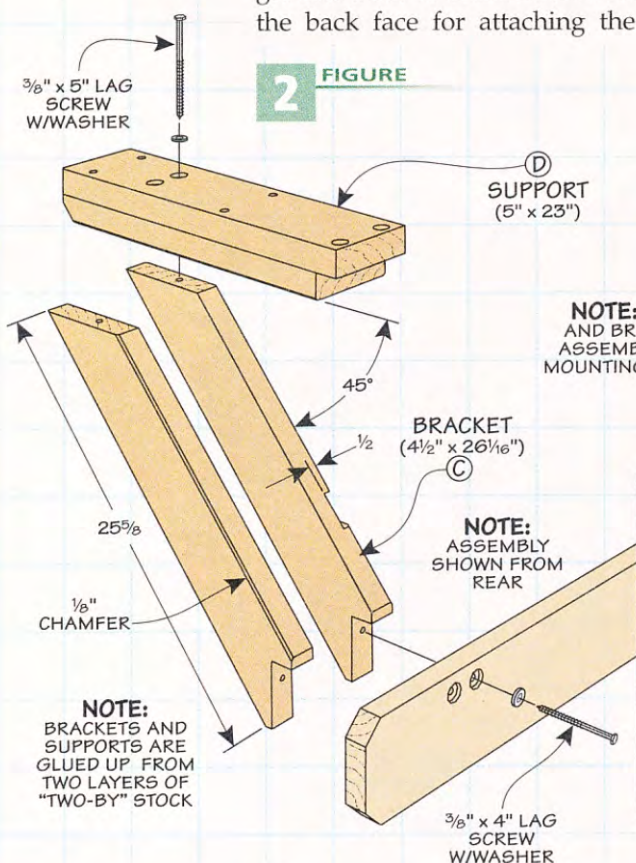
Brackets. Two angled brackets rest on the lower ledger. The brackets are made by gluing up two layers of “two-by” stock, as you can see in Figure 2. Each bracket has a miter cut on

both ends. The lower end has a notch cut in it to catch the lower ledger (Figure 2b). The depth of the notch matches the thickness of the lower ledger.

The real trick is cutting identical notches on the large pieces. The solution is an auxiliary miter gauge fence that has a pair of angled cleats. You can learn how to make and use it in Shop Short Cuts on page 26.

The final detail on the brackets is an angled dado cut on the inside faces. It’s sized to accept a shelf.

The Supports. The benchtop mounts to a thick support on top of each bracket.



A rabbet at the back end allows the support to rest on the upper ledger. The width of the rabbet matches the thickness of the ledger, as in Figure 2c.

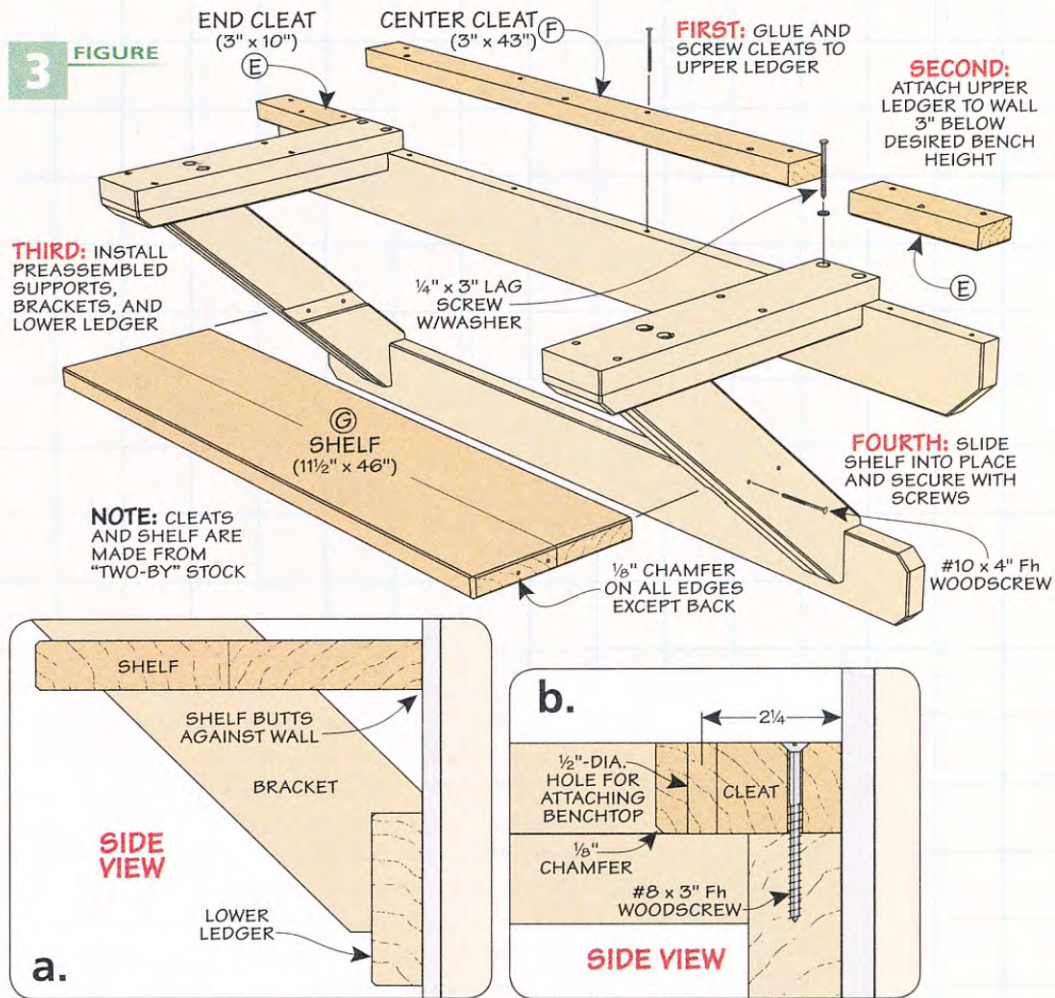
In the same drawing, you can see the mounting holes in each support. These serve to connect the support to the bracket, upper ledger, and the benchtop.

Cleats. I added a set of cleats to the upper ledger to secure the back edge of the top. They have mounting holes drilled from each face. One set attaches the cleats to the ledger with glue and screws. An outer row of holes (from the bottom face) makes it easy to attach the benchtop (Figure 3b).

Assembly. At this point, you can do a little assembly. The steps in Figure 3 guide the way.

Shelf. The final part of the support structure is the shelf. It's sized to slide into the dadoes in the brackets. Long screws hold it in place, as in Figures 3 and 3a.

Benchtop. The workbench top is made in a laminated, plank style to match the simple, rugged look of the support system. Two layers of "two-by" lumber create a thick, solid work surface, as shown in Figure 4. The two layers are glued and screwed together, but the individual boards aren't edge glued. Once the individual boards are cut to final size, the assembly of the top goes quickly. You can read more about the

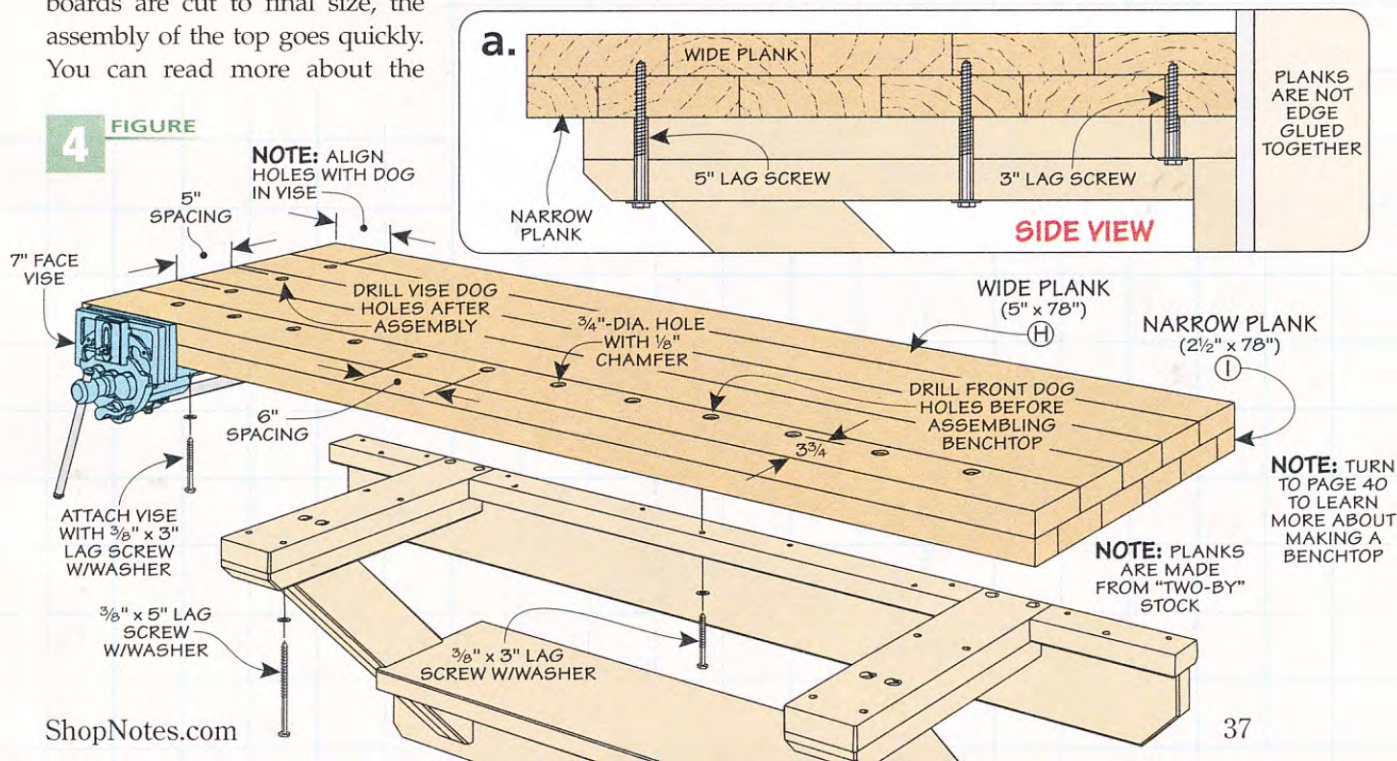


process I used to make the benchtop in the article on page 40.

Dog Holes. Before gluing up the top, I drilled the row of dog holes in the front board of the upper layer. This way, I could drill accurate holes at the drill press.

Once the top is assembled, the holes then serve as guides to drill through the lower layer.

There's another row of dog holes that aligns with the vise. These are drilled after cutting the top to length so they would be accurate.



options for tool Storage

A solid bench gives you a place to work. But to do that effectively, you need easy access to your tools and supplies. That's where the other two parts of this project come into play. Like the workbench, both the tool rack and shelf are wall mounted.

The tool rack is a versatile solution for holding hand tools within easy reach. The simple design makes organizing your tools nearly foolproof.

For larger tools and other supplies, the wall shelf provides six cubbies. The shelf isn't very deep, so items can't get lost in the back.

While I sized the tool rack and shelf to go with the bench, the designs are flexible enough to alter the length to suit your needs.

Tool Rack. Simplicity is the name of the game when it comes to making the tool rack. In Figure 5, you can see there are just a few parts necessary to build it.

There are two long rails and a handful of spacers. The gap between the spacers is where the tools go. What's surprising



Tool Rack. Spacers between front and back rails make for a flexible storage solution.



▲ **Wall Shelf.** Rabbets and dados make building this shelf a quick and easy task.

is how just a basic design like this can hold such a wide range of tools without making a lot of intricate, custom holders.

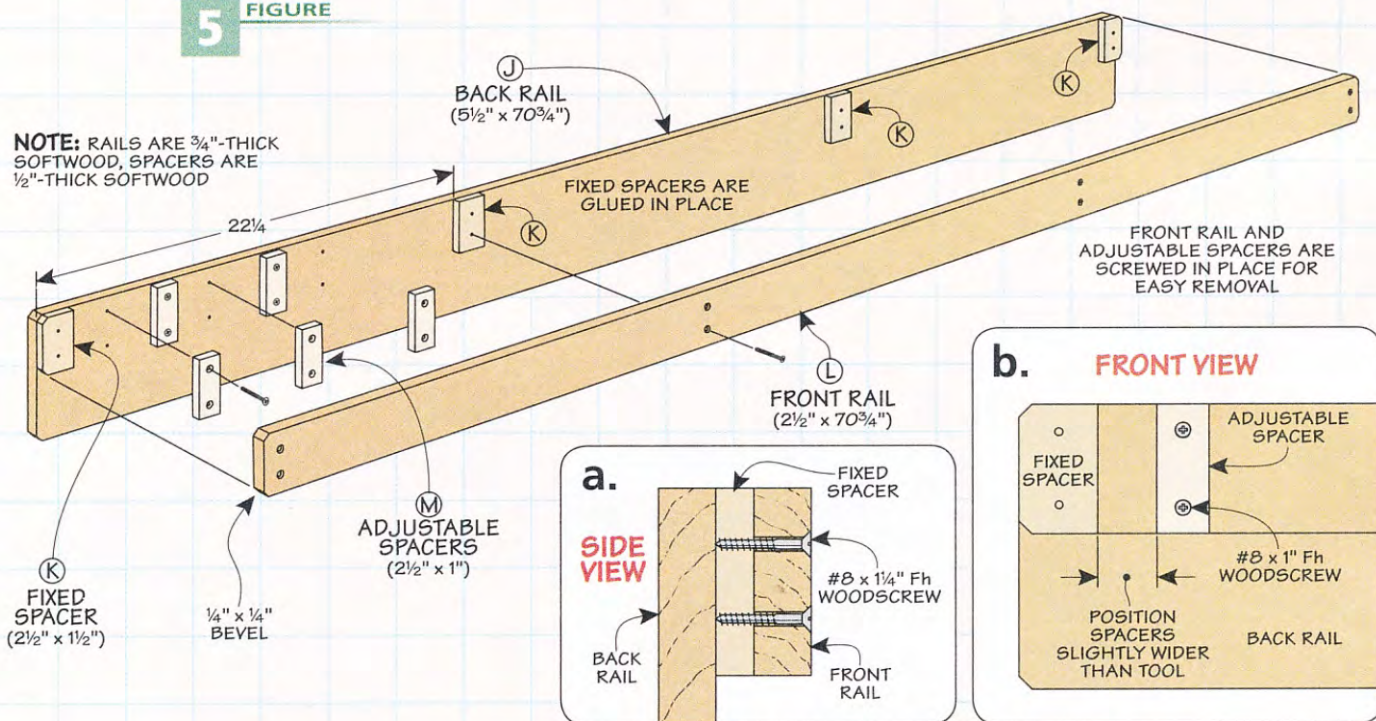
The wide back of the tool rack is cut to size with the corners "dog-eared" to match the details in the bench. A set of wide, fixed spacers are glued to the back, as shown in Figure 5a. The back can then be mounted to the wall. The front of the tool rack is a narrow rail that's just screwed to the spacers.

Adjustable Spacers. The three long slots in the tool rack will

work fine for storing and organizing many tools. However, if you'd like to keep some tools together (a set of chisels, for example), you can make smaller adjustable spacers. These are simply screwed to the back anywhere you like. This allows you to reposition, add, or remove spacers without much hassle.

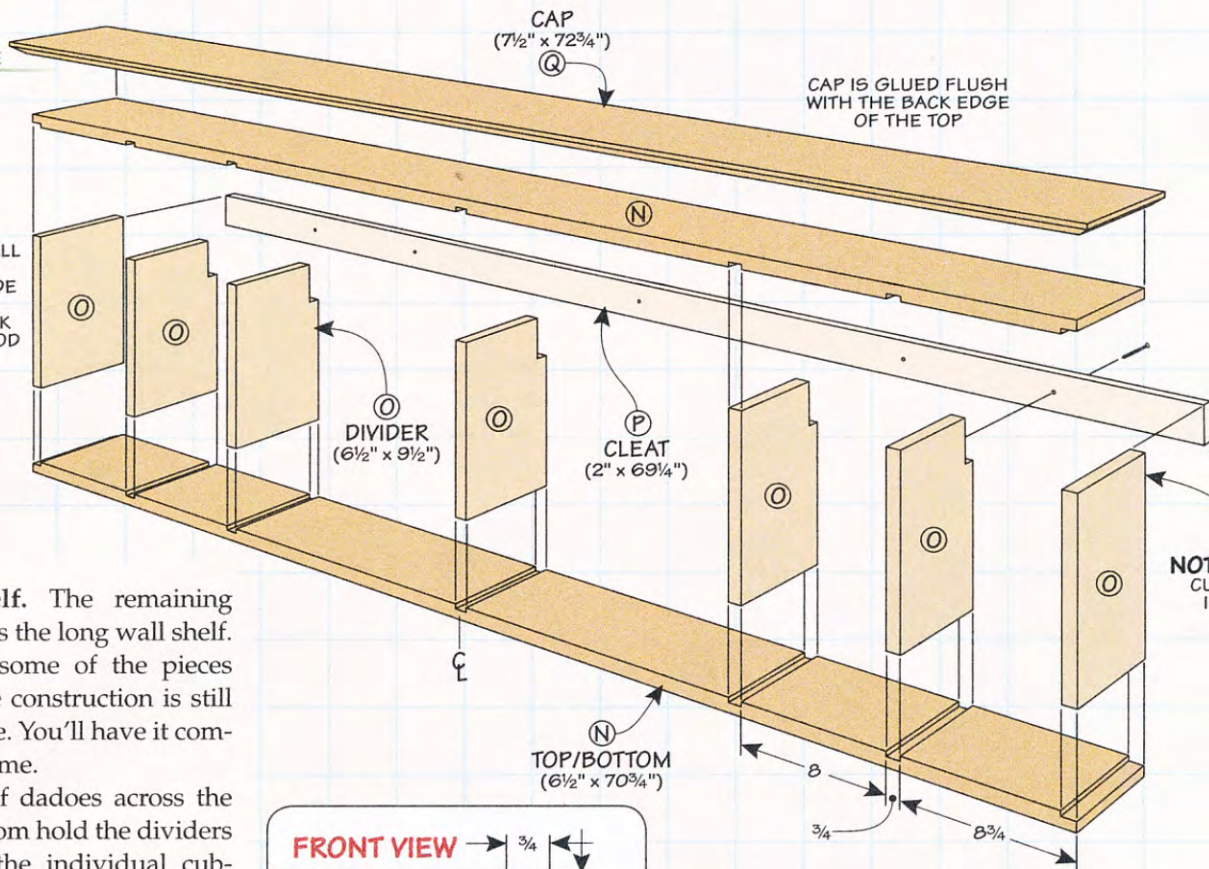
To make sliding the tools in and out easier, size the gaps between the spacers to be slightly larger than the width of the tool, as shown in Figure 5b.

5 FIGURE



6 FIGURE

NOTE: ALL PARTS ARE MADE FROM 3/4"-THICK SOFTWOOD



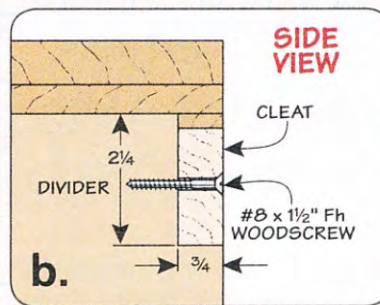
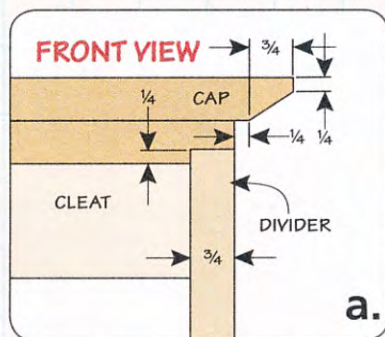
NOTE: DO NOT CUT NOTCH IN ENDS

Wall Shelf. The remaining component is the long wall shelf. And while some of the pieces are long, the construction is still pretty simple. You'll have it complete in no time.

A series of dadoes across the top and bottom hold the dividers that create the individual cubbies, as shown in Figure 6. I cut the dadoes with a router, straight bit, and clamp-on fence. Clamp the parts edge to edge before routing, so the dadoes will align.

The ends and dividers are identical in size. The only difference is that the dividers have a notch on the back to accept a cleat, as illustrated in Figure 6b. The cleat is glued and screwed into the dividers when you assemble the main part of the shelf.

I topped off the shelf with a cap. It has a bevel on the front and ends. Cutting the bevel on the long front edge isn't a big deal. Simply stand the workpiece



on edge and make the cut. However, there's no good way to support such a long piece on end (and it would be too tall for my shop anyway). Instead, I used a hand plane to shape the bevel. When cutting across end grain, it's important that the blade is very sharp. You can read more

about the technique I used in Shop Short Cuts on page 27.

The three parts of this project can turn a small space into a well-organized, enjoyable workshop. Best of all, it doesn't cost a lot or take much time to build. 

Materials & Hardware

WORKBENCH

A Upper Ledger (1)	1 1/2 x 5 1/2 - 72
B Lower Ledger (1)	1 1/2 x 5 1/4 - 62
C Brackets (2)	3 x 4 1/2 - 26 1/16
D Supports (2)	3 x 5 - 23
E End Cleats (2)	1 1/2 x 3 - 10
F Center Cleat (1)	1 1/2 x 3 - 43
G Shelf (1)	1 1/2 x 11 1/2 - 46
H Wide Planks (9)	1 1/2 x 5 - 78
I Narrow Planks (2)	1 1/2 x 2 1/2 - 78

TOOL RACK

J Back Rail (1)	3/4 x 5 1/2 - 70 3/4
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K Fixed Spacers (4)	1/2 x 2 1/2 - 1 1/2
L Front Rail (1)	3/4 x 2 1/2 - 70 3/4
M Adjustable Spacers (5)	1/2 x 2 1/2 - 1
WALL SHELF	
N Top/Bottom (2)	3/4 x 6 1/2 - 70 3/4
O Ends/Dividers (7)	3/4 x 6 1/2 - 9 1/2
P Cleat (1)	3/4 x 2 - 69 1/4
Q Cap (1)	3/4 x 7 1/2 - 72 3/4

- (12) 3/8" x 5" Lag Screws
- (21) 3/8" Flat Washers
- (4) 3/8" x 4" Lag Screws

- (4) 1/4" x 3" Lag Screws
- (4) 1/4" Flat Washers
- (8) #8 x 3" Fh Woodscrews
- (4) #10 x 4" Fh Woodscrews
- (5) 3/8" x 3" Lag Screws
- (1) 7" Face Vise
- (70) #8 x 2" Fh Woodscrews
- (10) #8 x 1" Fh Woodscrews
- (8) #8 x 1 1/4" Fh Woodscrews
- (5) #8 x 1 1/2" Fh Woodscrews



building the **Rugged Benchtop**

Low-cost materials and straightforward techniques combine to create a heavy-duty benchtop.

■ One of the main requirements of a workbench top is it be tough enough to stand up to years of hard use, no matter what it's made from. I'd like to share my method for building a plank-style workbench that uses inexpensive construction lumber from the home center and goes together in a short time.

The benchtop consists of two layers of material glued and screwed together. The finished top is heavy and nearly 3" thick.

Since it's made from softwood, it will naturally accumulate some dents and dings over time. But this will only add to the rough-and-ready look of this hard-working bench.

Even though the construction steps are straightforward, a few tips will help you get the best result. A big part of the success of this workbench top happens before you do much work in the shop. The two keys are a discerning eye and a little patience.

It Pays to be Choosy. At the home center, spend some time sorting through the stacks to find the best boards. Weed out any boards that show twist, crook, and severe cupping. Spending some extra time at the store will definitely speed up gluing and flattening the benchtop later on.

I've found that wider boards — 2x8s, 2x10s, or even 2x12s — can be easier to work with. If you look at the end of the boards near the edges, you'll see grain lines that run between 60° and 90° to the faces. This is a much more stable grain pattern and

minimizes the amount of movement in the completed top.

Now Wait. Construction lumber is usually wet compared to hardwood lumber. So once you bring it into your shop, it's a good idea to stack it as shown in the left margin photo so that it can acclimate for a few weeks. A moisture meter, if you have one, comes in handy to see when it has reached equilibrium.

Prep Work. After the lumber has acclimated, you can prepare the boards. This involves cutting parts to rough length and width. Then joint one face flat and plane the boards to a consistent thickness. These steps can often release internal stress in the boards, so it's a good idea to let the boards sit overnight to see if they'll distort. If they do, you can re-mill the parts.

When you're ready to start gluing up the benchtop, you can



▲ **Dry & Stable.** Construction lumber needs to dry before you can use it in a bench.

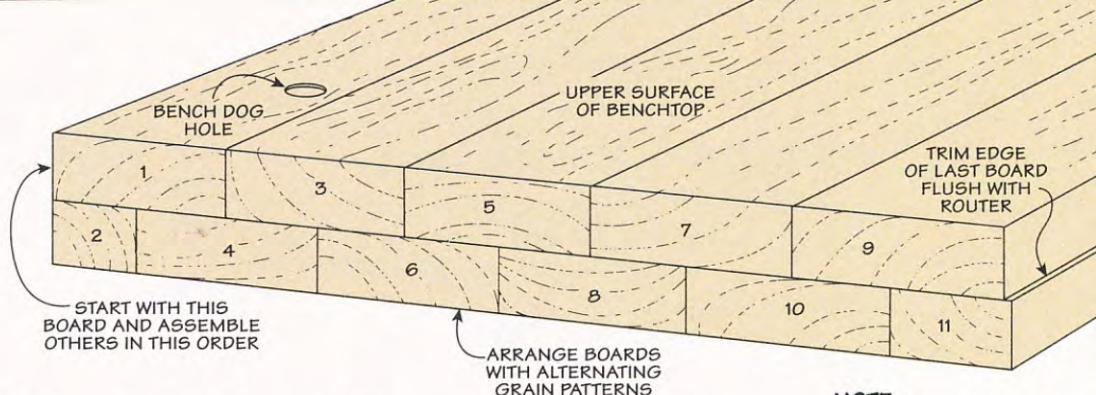
rip the boards to final width, but leave them extra long.

You need a flat, level area to glue up the top. All it takes to do this is to set up a pair of sawhorses and make sure they're level.

Since the upper layer of the bench is the most visible, I take some time to select the best-looking boards. I alternate the grain pattern in a "smiley-face, frowny-face" arrangement to even out any cupping. You can see this in the upper right drawing.

One Board at a Time. Since, the bottom layer is glued and screwed to the top, it makes sense to assemble the benchtop upside down. To make the process easier to manage, I glue it up one board at a time, alternating adding a board to each layer.

It starts by gluing and screwing a narrow board to the first upper layer board, as shown in the lower



NOTE: DRILL BENCH DOG HOLES IN FIRST BOARD AT DRILL PRESS. COMPLETE HOLES BY HAND AFTER ASSEMBLY

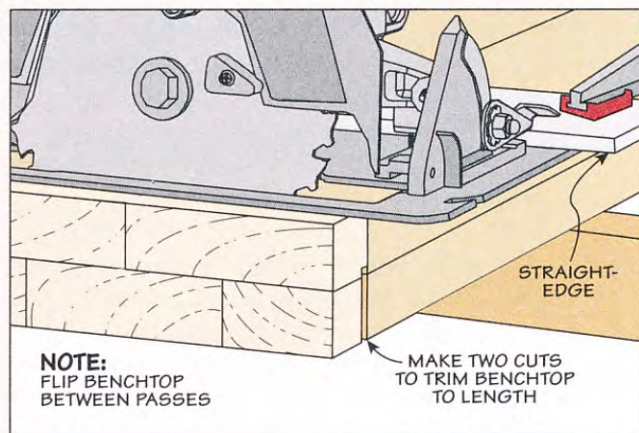
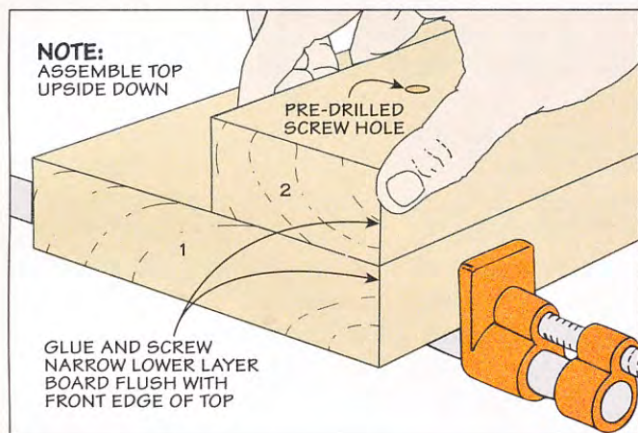
left drawing. From here, you can clamp the next upper layer board in place and glue and screw the lower board to it, as you can see in the main photo on the facing page.

I don't glue the edges of the boards together. This way the top has a little flexibility to reduce cupping, and I can pull it flat to the supports from below.

Finishing Up. Completing the benchtop is just a matter of repeating this alternating sequence until you reach the end. These steps go quickly since you don't need to wait for the glue to dry.

I leave the last board of the lower layer a bit wide. Then once it's glued in place, I can trim it flush with a router. A top like this is too large and awkward to cut on the table saw, so I cut the ends to length with a circular saw (lower right drawing).

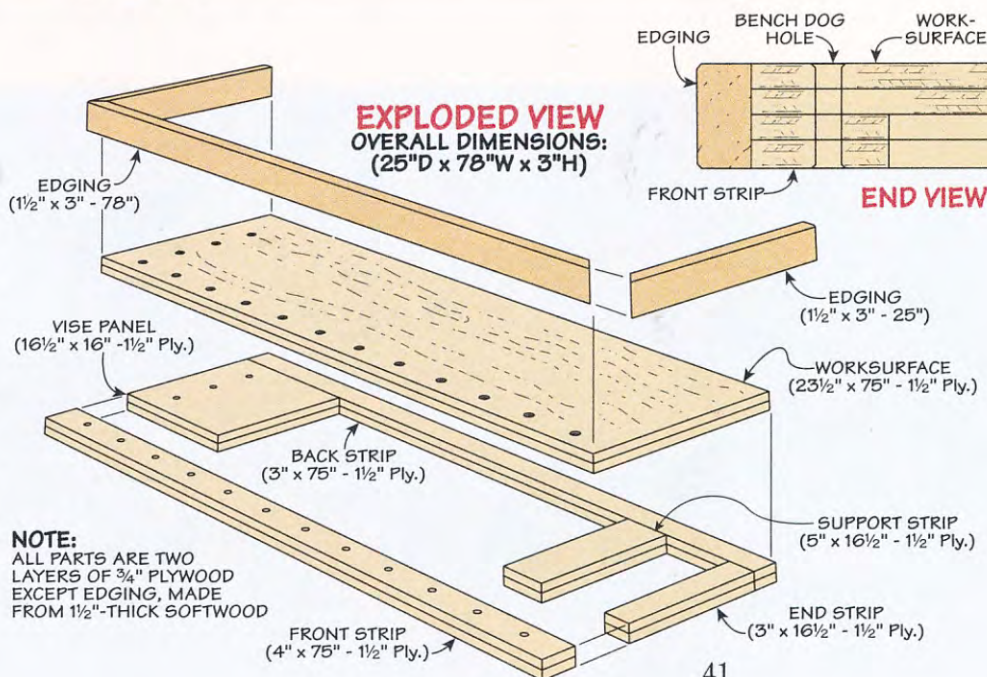
A little work with a sander will smooth out any uneven joints. I routed a chamfer on the front and ends to ease the edges. After you apply a finish, the result is a rugged benchtop that will stand up to a lifetime of service. 



a plywood Benchtop

Construction lumber isn't your only choice for building a low-cost benchtop. You may consider using plywood. And like the solid-wood top, this plywood top is also built in layers.

The surface of the bench is two layers thick. Then I added two more layers along the front and back edge. A wide panel on the vise end creates a robust work area. Blocking strips on the opposite end add support above the bracket. Finally, I wrapped the benchtop with 1½"-thick construction lumber edging.



NOTE: ALL PARTS ARE TWO LAYERS OF ¾" PLYWOOD EXCEPT EDGING, MADE FROM 1½"-THICK SOFTWOOD



at the Lumberyard

These tools and tips will make your next trip to the lumberyard quicker, safer, and more productive.

AN INSIDE JOB

The lower left photo shows the items I take inside the store. The idea with these is to help me find the best material for my project and in the right amount.

Materials List & Pencil. It may seem like a no-brainer, but the materials list is the most important item here. I use it like a shopping list to keep track of the material I have on hand and what I still need to get.

Gloves. While they don't exactly help me pick out better lumber, I keep a pair of work gloves in my back pocket. Even with surfaced lumber, it's all too easy to get a splinter or cut while moving stock around.

Tape Measure & Chalk. As I sort through the stacks and set aside the keepers, I use a tape measure and chalk to label the boards

One key to getting a good start on a project is selecting the right materials. Just as important is getting everything back to your workshop without any major dents and dings. To make the trip as hassle-free as possible, it pays to do a little prep work.

Just like any other step required to build a project, you need the

right equipment. Over time, I've assembled two sets of "tools" that I take with me when I head out to the home center or lumberyard to purchase materials.

One set of tools I bring inside to help me pick out stock. The other set stays in my vehicle until I'm ready to load things up and head back to the shop.



for specific project parts. Back in the shop, this visual reminder helps me remember which part comes from each board.

Calculator. Hardwood lumber is often priced by the board foot. So a calculator (or one on your smartphone) makes keeping an eye on your costs easier. Take a look at the box below for a refresher on the formulas.

Mineral Spirits. You can generally get a good idea of the color of most boards. But a rough-cut surface may be trickier to decipher. So I like to apply a dab of mineral spirits with a rag to show what the board will look like with an oil-based finish. And it can help determine if different boards will be a good color match.

BACK AT THE VEHICLE

Once you've selected and purchased your materials, you need to get them back to your shop. To protect your investment, you want the materials to be safe and secure for the trip home.

Break It Down. Some lumberyards and home centers will break down long boards and sheet goods for little or no cost. My initial thriftiness kept me from taking advantage of this in the past. But I've found that it's money well spent. It's much easier to pack and transport smaller items than manhandle large pieces myself — especially when I get back to the shop.

If you don't have the boards cut down in the store, you can do the job yourself. With a small hand saw, you can quickly



▲ **Items Stowed in the Car.** A moving blanket, ratchet straps, bungee cords, stretch wrap, utility saw, and a warning flag with C-clamp simplify transporting your materials back to the shop without causing damage to the wood or your vehicle.



Safe Travels. Plastic stretch tape holds boards together while strap clamps secure them to the vehicle. Clamp on a warning flag for other drivers.

break down long boards into more manageable lengths.

Protection. Before you load up, it's a good idea to spread out a moving blanket or two on the roof of the car (if you don't have a rack) or in the back of your truck. This cushion prevents damage to plywood veneers and also protects the finish on your vehicle.

Secure the Load. Whether the material is going inside or on the top of your vehicle, you want to secure it to prevent shifting and causing damage during travel.

One way to do this is by gathering boards together into bundles.

I use a roll of plastic stretch tape or short bungee cords to tie a small number of boards together. This also prevents long boards from bouncing during travel.

When it comes to securing the load to the vehicle, I've given up on ropes. Managing long, loose ends and tying and untying knots became too much of a hassle. Instead, I use ratcheting straps. The wide straps are less likely to mar boards. With a few throws of the lever, you're sure to have a firm grip on the material.

Caution Flag. When boards extend past the back end of your vehicle, it's a good idea to attach a caution flag for other drivers. Rather than staple or tie a flag on (and hope it stays put), I use a C-clamp to attach a red cloth. It's quick, and I know that it won't fly off during the drive home.

It just takes a few minutes to gather the tools you need before heading out to the lumberyard. The payoff for this small investment is getting a jumpstart on a great-looking project. 🛠️

calculating Board Feet

Formula

For lumber thicker than 1/2":

• **Board Foot** = $T'' \times W'' \times L'' \div 144$
(in inches)

For lumber 1/2" thick and thinner:

• **Square Foot** = $W'' \times L'' \div 144$
(in inches)

For hardwood boards thicker than 1/2", the quantity is listed as board feet. On the other hand, boards that are 1/2" thick or thinner the quantity is listed as square feet.



tips & tricks for Shop Layout

A clever division of space plus mobile tools create a smart setup in a two-car garage.

■ Setting up a woodworking shop can be as simple as finding an open place to build projects. However, turning a utilitarian room into an efficient workshop where you enjoy spending time involves juggling a range of details.

Those details include the basics of choosing the right tools. But you also need to consider flooring, lighting, and storage, among other things. It's certainly a good idea to look at those topics in detail, but I think it's even more

important to step back and see how they work together.

One way to do that is to take a peek into the workshops of other woodworkers. Bob Kemp, one of the editors here, has a shop that offers a good example. At first glance, Bob's shop is a pretty familiar setup — a basic 20' x 20' two-car garage.

Start with a Table Saw. When Bob got into woodworking, the first big tool he purchased was a table saw. Combined with a

few portable power tools (router, circular saw, and jig saw), he built quite a few projects. He also started doing more home improvement projects. Those kinds of projects lead to him adding a miter saw to his shop.

Sharing Space. Woodworking isn't the only thing going on in the garage, however. Bob needs to share the space with the family car. In addition, the garage is home to a variety of bikes, toys, home and garden tools,

and supplies. So the real trick is finding space for all of these and keeping the layout flexible.

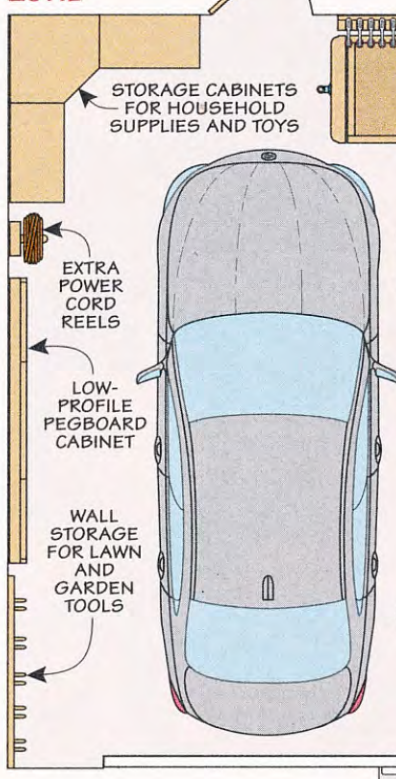
He did this by dividing the garage into zones. One side of the garage has storage cabinets for the household items. The other side is devoted to woodworking, as shown in the drawing at right.

Multiple Worksurfaces. The woodworking zone features the workbench, a drill press, and a miter saw station. Most of the time, Bob is working at the bench. But he also uses the miter saw station as a secondary work-surface and an ideal place to use benchtop tools, such as a grinder.

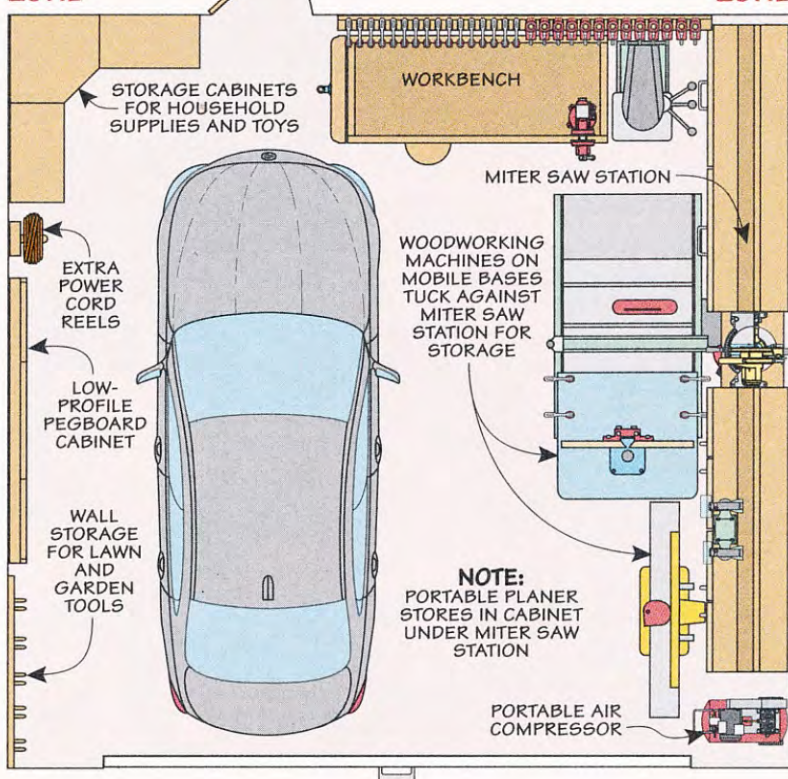
Storage Solutions. A key component of any shop is storing and organizing tools and supplies. And that's another reason for the miter saw station. Large cabinets that support the extension tables have a number of drawers on full-extension slides. These help keep the garage neater and prevent dust buildup on tools.

Clamp racks above the workbench put wall space to use without interfering with stuff on the bench. On the opposite wall, Bob managed to squeeze

HOUSEHOLD ZONE



WOODWORKING ZONE



in a shallow pegboard cabinet to store other tools and accessories.

That takes care of the "fixed" part of the shop. But it doesn't tell the whole story.

Flexible Middle. The zoned arrangement leaves plenty of room for the car. When the car

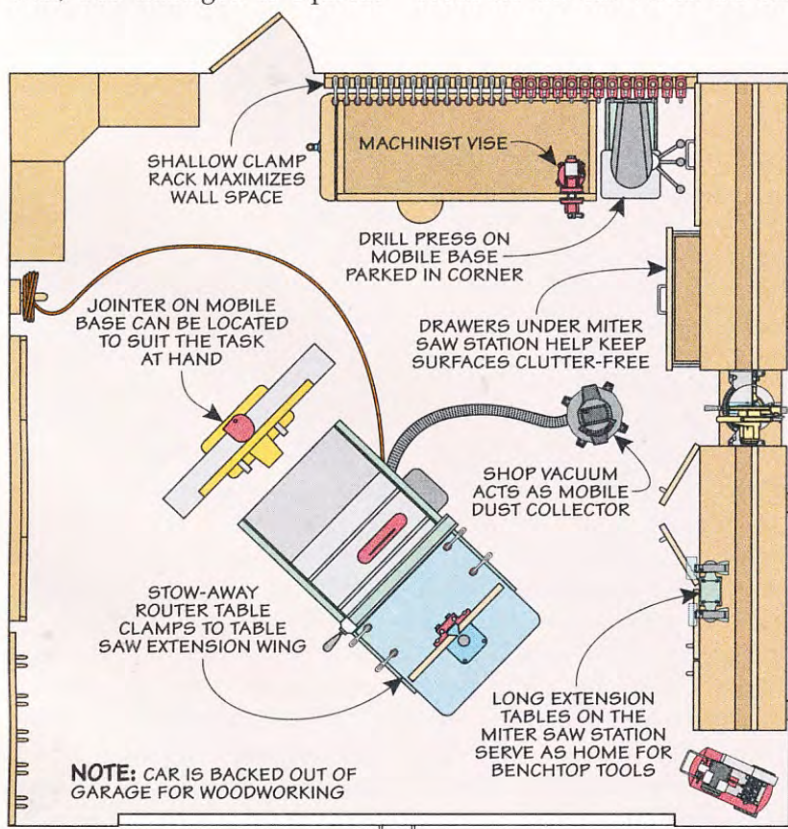
is backed out, the space can be used for the larger power tools: the table saw, jointer, and drill press. Mobile bases on each of these tools allow Bob to configure the tools to match the task, as shown in the drawing at left and on the facing page. When the work is done, he can park the tools against the miter saw cabinets to make room for the car.

Next Steps. As handy as his shop space is, Bob has a few plans to upgrade some tools and improve the space. One place for improvement is dust collection.

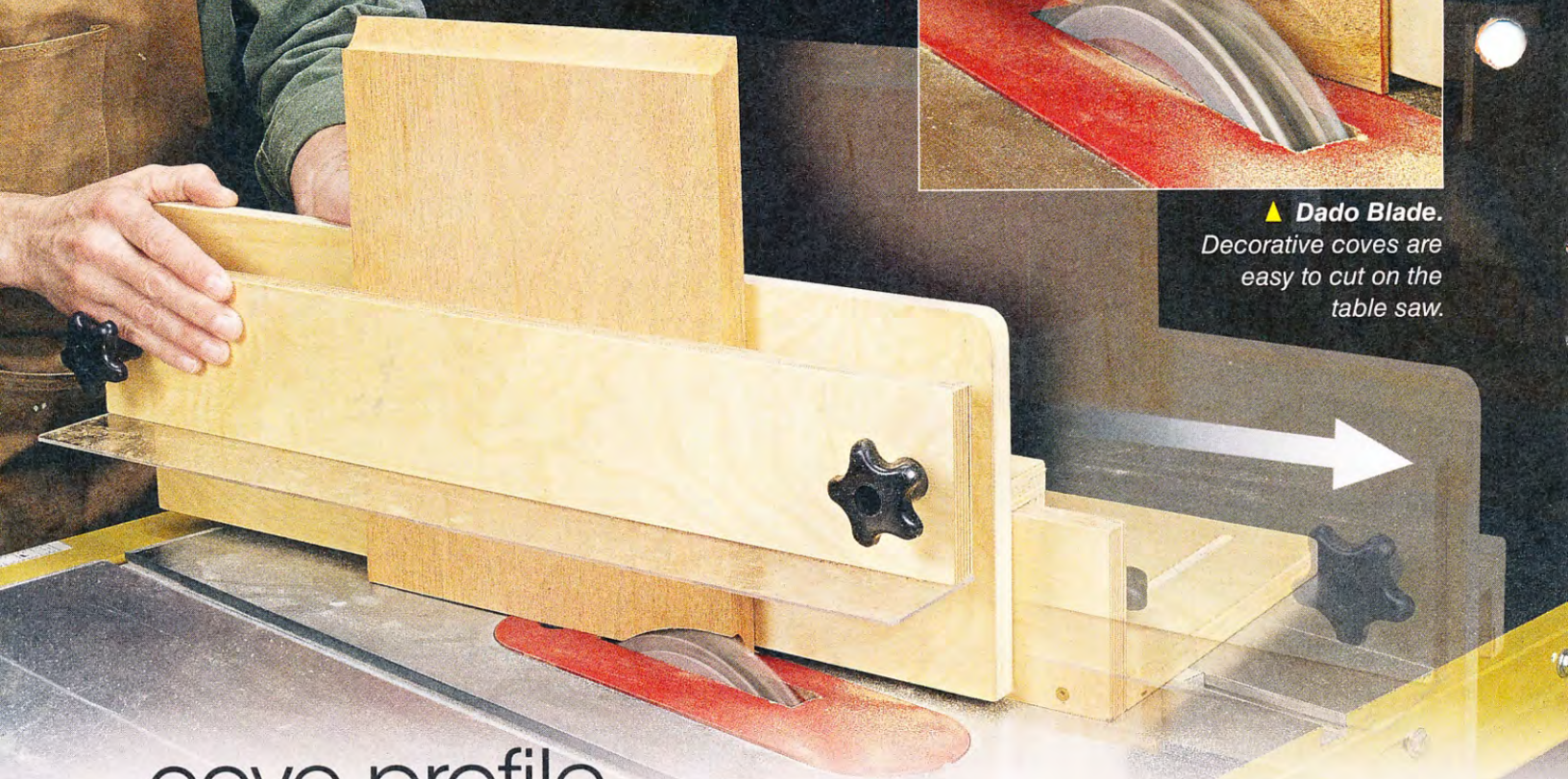
Right now, the shop vacuum works as the dust collector. It's an okay solution. But it isn't up to the task for his planer. So Bob tries to do most of his planing outside whenever possible.

Another upgrade he's looking for is a stand-alone router table. His current router table clamps to the table saw. He has been looking at some plans, and wants to see how and where he can fit it in.

The reality is you're never really done setting up shop. Like your skills, your shop is a work in progress that's always changing and evolving.



MASTERING THE Table Saw



▲ **Dado Blade.**
Decorative coves are easy to cut on the table saw.

cove profile **Raised Panels**

A simple jig and a dado blade are all you need to make attractive raised panels.

■ Making coved raised panels usually requires a router table and an expensive bit. But there's a way to do it at the table saw with just a dado blade and a simple jig.

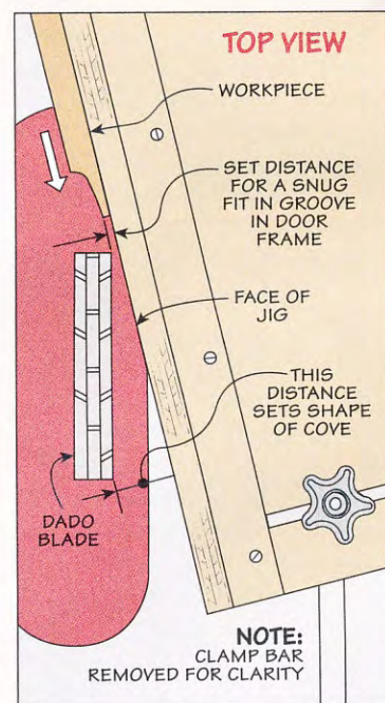
Start with a Jig. There's an old table saw trick that's been around for years — cutting coves by running the workpiece diagonally across the blade. To cut coves on the edge of a workpiece, all you need is a safe, reliable way to support the panel as you pass it across a dado blade at an angle. The jig you see in the main photo above and in the drawings on the opposite page fills the bill.

The jig consists of two main assemblies — an L-shaped base

that's fixed to your saw's table and a tall, sliding fence that carries the workpiece.

The wide base of the jig has a pair of slots that hold miter slot hardware. This hardware fits in the miter slot of your saw and expands to lock the base in place as you tighten the knobs.

The sliding portion of the jig that holds the workpiece is pretty simple. A pair of cleats on the back side of a tall face wrap around the rail on the base. You'll want this to be a smooth, sliding fit over the rail. A little paste wax helps the sled slide easily along the rail. A wide clamp bar on the face of the fence secures the workpiece with a pair of carriage bolts and star knobs.



The jig works by presenting the workpiece to the blade at an angle. To help you decide which angle gives you the desired shape of the cove profile on the edges of the panel, see the drawing above and the margin photos on the opposite page.

▲ **Raised Panel.**
Decorative coves are easy to cut on the table saw.

Dado Blade. The first thing to do is install a dado blade. I use an 8"-dia. blade and install all of the chippers to ensure there's plenty of width to cut the profile. A 6"-dia. blade works too, but you'll end up with a smaller radius on the cove profile.

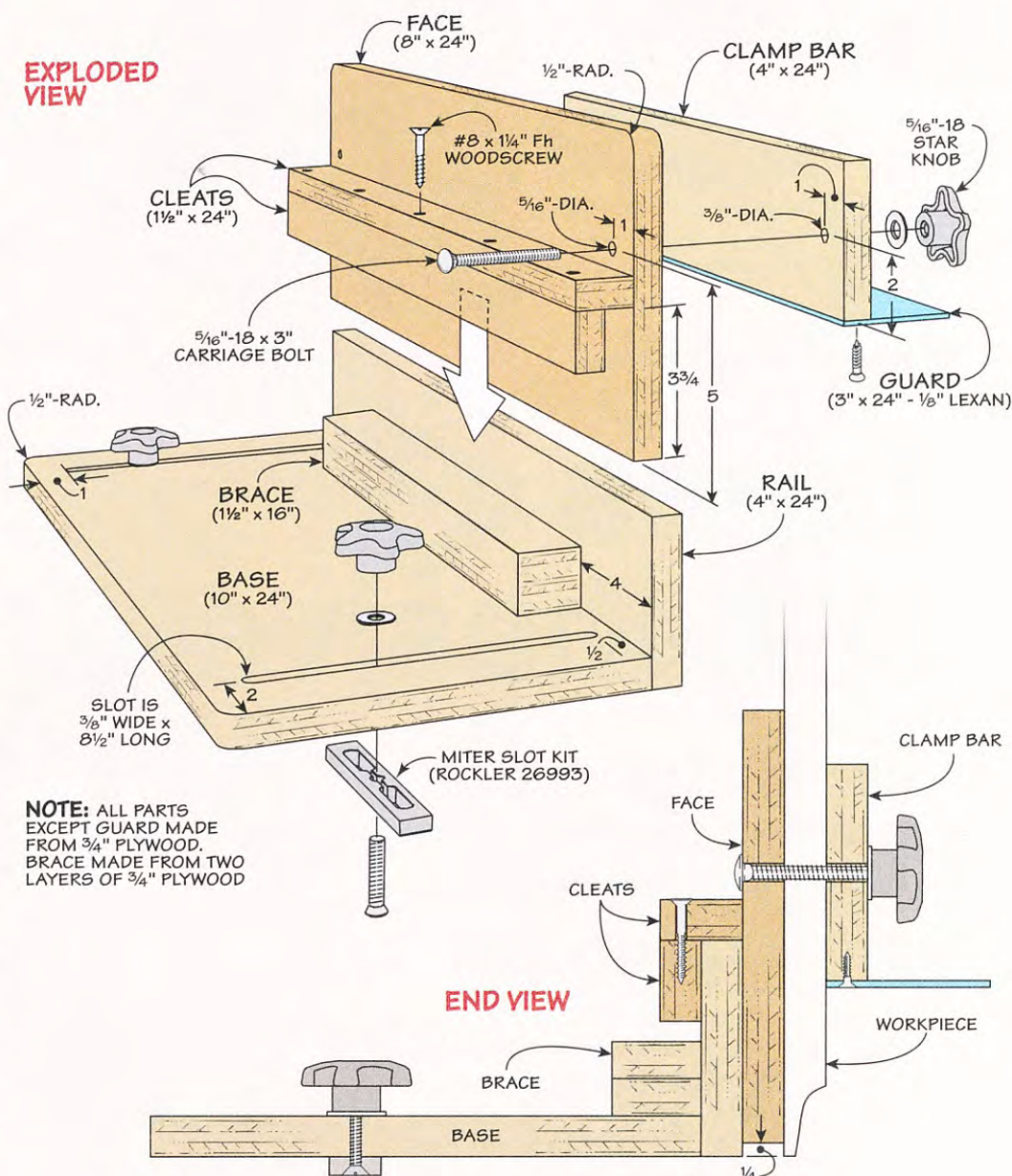
Setup. Now you can work on installing and setting up the jig on the saw. The one constant in setting up the jig is that the edge of the raised panel has to fit into a groove in the door frame. So this is where I start making adjustments. I place the jig on the miter slot and lightly clamp it down. Before you place the workpiece in the jig, you'll want to make a couple of measurements.

To set up the jig for cutting, raise the blade to the full height of the profile you want to cut. Then slide the jig toward the front edge of the blade to set the thickness of the panel edge. In my case, this was $\frac{1}{4}$ " to fit into a $\frac{1}{4}$ " groove of my door frame.

The next measurement is at the rear edge of the blade and determines the shape of the cove profile, as you can see in the right margin. You'll have to experiment to get a profile you like, but you can use the measurements shown in the photo as a guideline. You'll have to work back and forth between the front and back edges of the blade to keep the jig aligned with your desired measurements. Then you can lock it in place with both knobs.

Here's something to note: The distance between the miter slot and blade may vary depending on your saw. If you can't adjust the base enough to cut the desired profile, rotate the jig 180° and use the opposite miter slot.

Using the Jig. Before you turn the saw on, there's something I need to mention. For small or narrow profile cuts, you might be able to get away with making the cut in one pass. If your dado stack is nice and sharp, this won't be a problem. But for larger cove profiles, you'll want to make



several lighter passes. If that's the case, lower the blade for the first pass then raise it about $\frac{1}{4}$ " or so between cuts until you reach the full height of the finished profile.

It's a good idea to make a test cut before cutting your final panels. To do this, simply clamp the workpiece to the face of the jig with the clamp bar. It's important that the bottom edge of the workpiece is resting on the saw table.

Making the Cut. You'll want to start with the ends of the panels first. You'll get some tearout as the back edge of the workpiece crosses the blade. But this will be cleaned up as you make the final cuts along the edges of the panel.

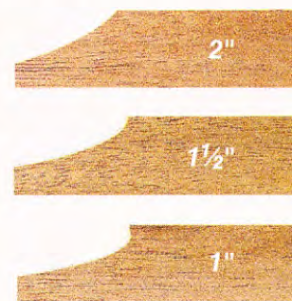
To start, make sure the workpiece is pulled back away from

the blade. Turn the saw on and slowly slide the assembly across the blade, making sure the panel's edge remains in contact with the saw's table.

Now you can flip the workpiece 180° to make the cut on the opposite end. Repeat the process to cut the two edges along the edge grain. If you're making multiple passes, raise the blade slightly and repeat the process. The important thing to remember is to always cut the end grain first to end up with clean profiles.

Cleanup. After a little sanding to remove saw marks, you can apply a finish. You can see how quick and easy it is to create a perfect raised panel, as shown in the margin, opposite page.

▼ **Profiles.** By adjusting the distance from the back edge of the blade, you can create a variety of edge profiles.



GREAT
Gear

5 handy Tapes & Adhesives

Having a few specialty supplies in your shop may be exactly what you need for your next project.

■ I have a variety of tapes and adhesives around my shop for various tasks. Once I find the ones that work for me, I generally stick with them for years. But recently, some new products in these categories have made me take notice. Here are a few that have made the must-have list. See Sources on page 51 for purchasing details.



▲ **Scotch 233+.** This stretchy masking tape is great for tasks like gluing on edging.



FASTCAP SPEEDTAPE

I've used the same brand of double-sided tape for years. So when *FastCap* introduced *SpeedTape*, I wasn't sure it would have a place in my shop. But after putting it to use, I'm a convert.

This tape is different from other double-sided tapes in that it is much thinner than most. That means if you use it to temporarily hold down a template for routing, the template will sit flat on a workpiece rather than slightly above.

The tape can also be used to permanently bond two surfaces together in light-duty situations. A good example is when adding edging to plywood. The tape can easily be trimmed to size,

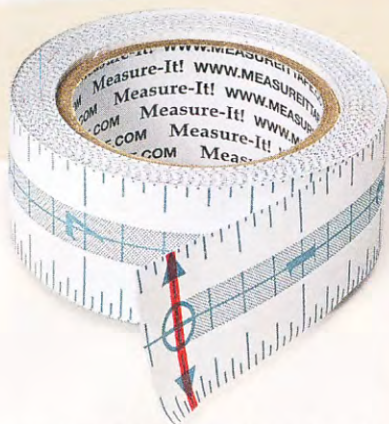
and as you can see in the photo above, the tape is clear, so it is completely hidden.

The tape is available in four different widths: 1", 1½", 2", and 6½". Custom widths are available by contacting *FastCap* directly.

SCOTCH 233+ MASKING TAPE

If you've been looking for a solution to help hold small or difficult-to-clamp parts in place, look no further than *Scotch 233+* tape. Originally designed for the automotive collision repair industry, it works great as a binding tape.

When pulled, the tape stretches slightly and has a relatively high tensile strength compared to other masking tapes. This allows



you to pull the tape down firmly over your workpieces, creating a significant amount of clamping force (margin photo, opposite page). The tape's strong adhesive sticks immediately. But once your glue has dried, it can be removed easily without transferring any of the adhesive to your project.

MEASURE-IT TAPE

It's not uncommon for me to build projects that will hang on a wall. Trying to mark the location for multiple wall anchors can sometimes be tricky. I normally just use my tape measure and transfer measurements to the wall. Recently, though, I've been using *Measure-It Tape*.

This handy tape has inch markings laid out along its length that repeat every twelve inches. Its paper-like surface makes it easy to write on with a pen or pencil. And best of all, its low-tack adhesive allows it to be repositioned multiple times. To help identify stud locations, a red line has been included at 16" intervals (top photo, above).

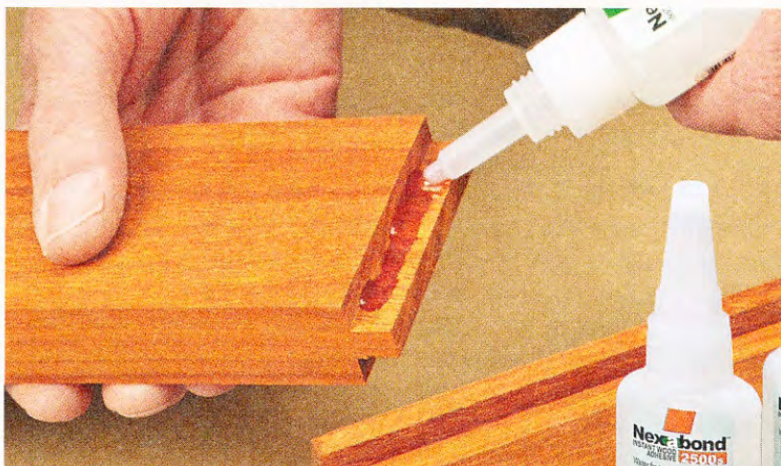
J-B WOOD WELD

J-B Weld recently introduced *Wood Weld*, a product designed for filling gaps and bonding wood. You can see in the middle photo above that I used it to fill cracks in a knot. There's about a six-minute working time after mixing the two-part epoxy. But it goes on easily and after a couple hours, the entire area can be sanded smooth.

▲ **Measure-It Tape.** Locating studs is a breeze with this removable and reusable measuring tape. The low-tack adhesive makes it easy to stick to almost any surface. (Wall studs shown "ghosted" through for clarity.)



▲ **J-B Wood Weld.** This two-part epoxy fills cracks or voids in your workpieces. It dries to a light tan color and creates a permanent bond with the surrounding wood that can be sanded and stained.



▲ **Nexabond CA Glue.** Use glue when working with oily tropical hardwoods. Choose from three different handling times: short, medium, and long.

NEXABOND

The oils in some exotic hardwoods can make it difficult to use standard, water-based wood glues. That's when I turn to cyanoacrylate (CA) glue. But most CA glues cure quickly, allowing very little working time before the glue sets. That's where *Nexabond* comes in. This brand of CA glue comes in short,

medium, and long handling times (photos above).

With the "long" glue, you have up to five minutes to position your parts, depending on the wood species and relative humidity. And since CA glues don't contain water, they won't swell your workpieces. This means you can cut tighter joints to secure your workpieces. 🛠️



questions from Our Readers

dealing with Color Change

I notice that a lot of my woodworking pieces darken in color over time. What causes this and is there a way to prevent this color change?

*Riley Lee
Delaware, Ohio*

Freshly Planed	2 Weeks	4 Weeks	6 Weeks
Cherry			
Red Oak			
Douglas Fir			
Poplar			
Pine			
Mahogany			
Walnut			

▼ **Aged.** The cherry on this old cabinet has mellowed to a deep, warm color.



I'd wager that most woodworkers have had similar experiences. To get the answer as to why these color changes occur, I contacted Robert Wallace, Ph.D., Associate Professor of Botany at Iowa State University in Ames, Iowa.

Why? According to Dr. Wallace, some species of wood, like cherry and mahogany, are photo-reactive. This means that exposure to light, particularly ultraviolet (UV) light from the sun, causes changes in the molecules of the wood that give the wood its distinctive color.

In other wood species, the color change can be a result of oxidation or other chemical changes that affect how light is absorbed. Our perception of the

color is dependent on how light is absorbed and reflected on the wood's surface.

An Experiment. To find out how sunlight affects various species of wood, I conducted an experiment. It wasn't meant to be scientific, but you can see the results in the photo above. I exposed portions of each board to sunlight for a period of 2, 4, and 6 weeks. Some of the results I expected, like the darkening of cherry. (The same thing happened to the cabinet on the left.) But the yellowing of the walnut was a bit of a surprise.

The bottom line is that all woods will, over time, change in color, some more than others. Even brightly colored woods like paduak and purpleheart will eventually turn to a duller hue. So what can you do about it?

Slowing It Down. Finish manufacturers attempt to stop or slow down this color change by adding UV inhibitors or stabilizers to

their products. You'll find these mostly in finishes designed for use outdoors.

The problem is, UV light also eventually takes its toll on the finish. The resins in the finish break down with age and the UV additives lose their effectiveness. So while you might be able to slow down the color change, there's not much you can do to stop it.

Take Advantage of It. You can't completely prevent your project from changing color as it ages, but there are some ways you can take advantage of the sunlight. For example, I like to build some projects from poplar. But I don't care for the green streaks running through it. If you expose the wood to sunlight for a day or two, the greenish tint turns to a nice tan color.

Likewise, when I build a project from cherry, I expose it to sunlight for several days. This gives it a jump start on that deep cherry color I'm looking for.

Sources

Most of the materials and supplies you'll need to build the projects are available at hardware stores or home centers. For specific products or hard-to-find items, take a look at the sources listed here. 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 Central Time, Monday through Friday.

PANEL CLAMPS (p.10)

- **Damstom**
Panel Clamp D300
- **Lee Valley**
Veritas Panel Clamp... 05G16.01
- **Woodcraft**
Clamping System 125392
- **Peachtree**
Panel Max Pro 2952

WASHERS (p.12)

- **Rockler**
FastCap Wood Washers... 49034
Black Finish Washers 70573

Brass Finish Washers 70581
Nickel Finish Washer 70565

- **Lee Valley**
Brass Finish Washers varies
#10 Exp. Washers 50K35.01
Countersunk Washers varies

CABINET SCRAPER (p.14)

- **Lee Valley**
#80 Scraper Blade 05P31.80
Threaded Inserts 00M90.01
- **McMaster-Carr**
2" Wing Screws 91404A550
2½" Wing Screw 91404A552

LEATHER TOOL BAG (p.18)

- **Tandy Leather Factory**
8-oz. Leather varies
Handstitching Set. 11190-00
Contact Cement 2532-01
Rotary Punch 3220-00
Waxed Thread 11207-02
#9 ½" Rivets & Burrs .. 11280-00
#9 ¾" Rivets & Burrs .. 11281-00
Belt Buckle 1546-00

LEATHER FINISHING (p.24)

- **Tandy Leather Factory**
Tan Stain 2800-05
Matte Finish 2806-01
Round Sponges 3447-11
High-Density Sponge... 3453-00
Saddle Soap 2221-00

Leather Conditioner 21977-01

DRILL PRESS STATION (p.28)

- **Reid Supply**
4" Drawer Pull KHO-5
- **Rockler**
T-Track 22104
5/16"-18 Insert Knobs 23812
5/16"-18 Studded Knobs ... 23846
5/16"-18 Flange Bolts 83311

WORKBENCH (p.34)

- **Rockler**
7" Bench Vise 68888

RAISED PANEL JIG (p.46)

- **Rockler**
Miter Slot Kit 26993
- **U.S. Plastic Corp.**
¾" Polycarbonate 43049

GREAT GEAR (p.48)

- **Rockler**
Fastcap 1" SpeedTape 45846
Nexabond 2500M 44197
- **Lee Valley**
3M Binding Tape 25U03.30
- **Amazon.com**
Measure-It Tape .. B004BDP0NY
J-B Wood Weld ... B004NB3OMS

MAIL ORDER SOURCES

Woodsmith Store
800-444-7527

Rockler
800-279-4441
rockler.com

amazon.com

Damstom
800-824-1592
damstom.com

Lee Valley
800-871-8158
leevalley.com

McMaster-Carr
630-600-3600
mcmaster.com

Peachtree Woodworking
Supply
888-512-9069
ptreusa.com

Reid Supply
800-253-0421
reidsupply.com

Tandy Leather Factory
877-532-8437
tandyleatherfactory.com

U.S. Plastic Corp.
800-809-4217
usplastic.com

Woodcraft
800-225-1153
woodcraft.com

ShopNotes Binders



As you build your ShopNotes library, here's a way to keep your issues organized. Each binder features durable vinyl covers and easy-to-read perforated number tags. Snap rings with a quick-open lever make it easy to insert and remove issues. And there's an extra pocket inside for storing notes. Each binder holds a full year (6 issues) of ShopNotes.

Visit **ShopNotes.com** to order
or call **1-800-444-7527**.

ShopNotes Binder

○ SB (Holds 6 issues).....\$12.95

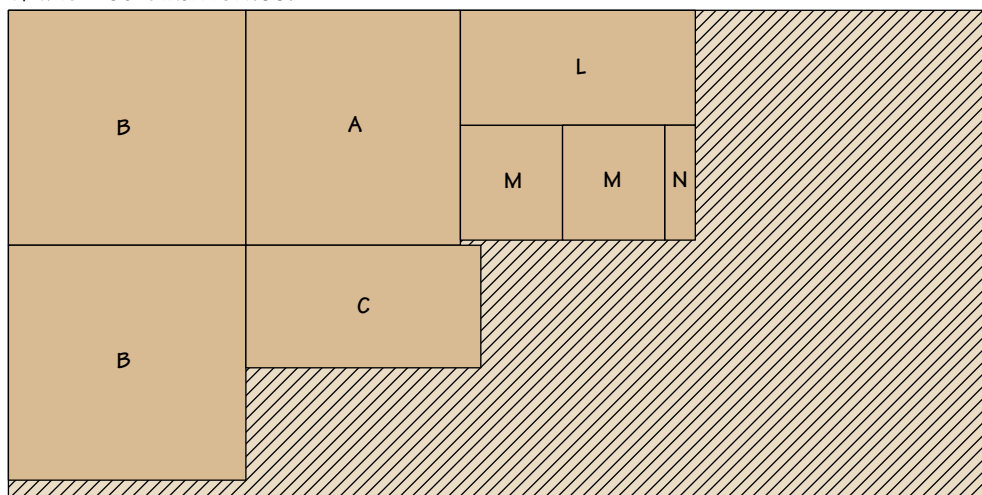
Drill Press Station

Materials List

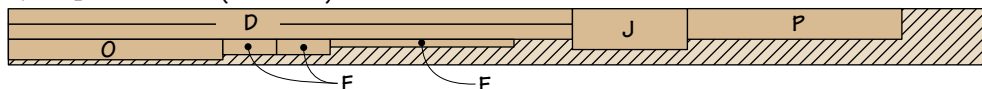
A	Top (1)	23 x 21 - 3/4 Ply.	J	False Front (1)	3/4 x 4 - 11 1/4	• (2) #6 x 1" Rh Woodscrews
B	Sides (2)	23 x 23 1/4 - 3/4 Ply.	K	Drawer Dividers (4)	3 1/2 x 10 - 1/4 Hdbd.	• (2) 3/4" x 3/8" x 11 1/4" T-Track w/Screws
C	Back (1)	12 x 23 - 3/4 Ply.	L	Table Bottom (1)	11 1/4 x 23 - 3/4 Ply.	• (2) 5/16"-18 Threaded Inserts
D	Wide Edging	3/4 x 1 1/2 - 116 rgh.	M	Table Wings (2)	11 1/4 x 10 - 3/4 Ply.	• (2) 5/16"-18 x 1" Studded Knobs
E	Narrow Edging	3/4 x 3/4 - 17 rgh.	N	Table Insert (1)	11 1/4 x 3 - 3/4 Ply.	• (2) 5/16" Fender Washers
F	Stops (2)	3/4 x 1 1/2 - 5 1/4	O	Fence Base (1)	3/4 x 2 - 21	• (4) 3/4 "-dia. x 1" Dowels
G	Drawer Sides (2)	1/2 x 4 - 20 3/4	P	Fence Face (1)	3/4 x 3 - 21	• (2) 5/16"-18 x 1 1/2" Flange Bolts
H	Drawer Front/Back (2)	1/2 x 4 - 10				• (2) 5/16"-18 Knobs
I	Drawer Bottom (1)	10 x 20 1/4 - 1/4 Hdbd.				• (2) 5/16" Flat Washers
						• (1) 4" Drawer Pull w/Screws
						• (1 pr.) 20" Full-Extension Drawer Slides

Cutting Diagram

3/4" x 48" - 96" BIRCH PLYWOOD



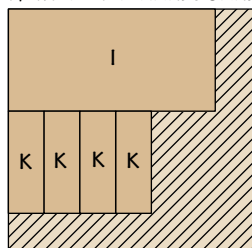
3/4" x 5 1/2" - 96" MAPLE (3.7 Bd. Ft.)



1/2" x 5" - 96" MAPLE (3.3 Sq. Ft.)

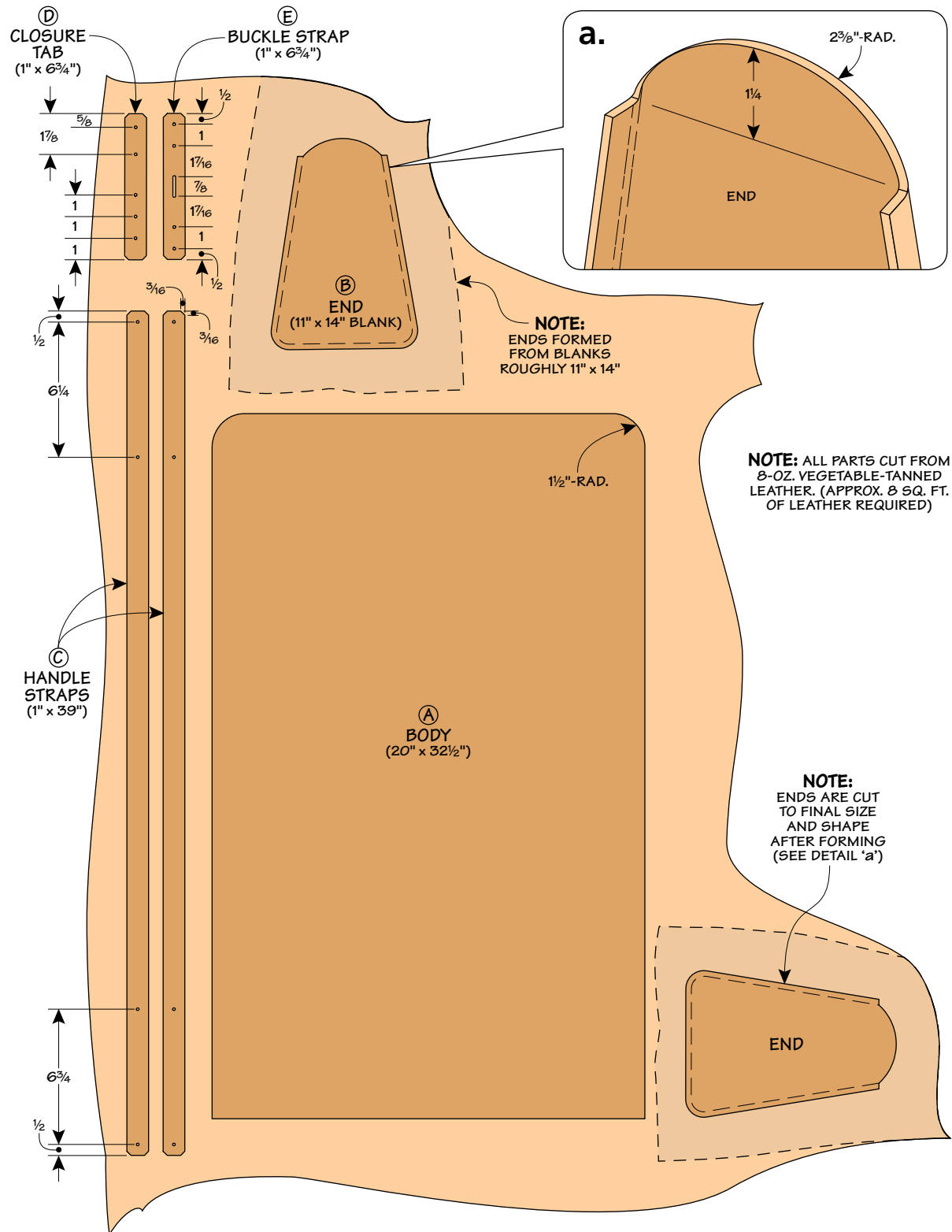


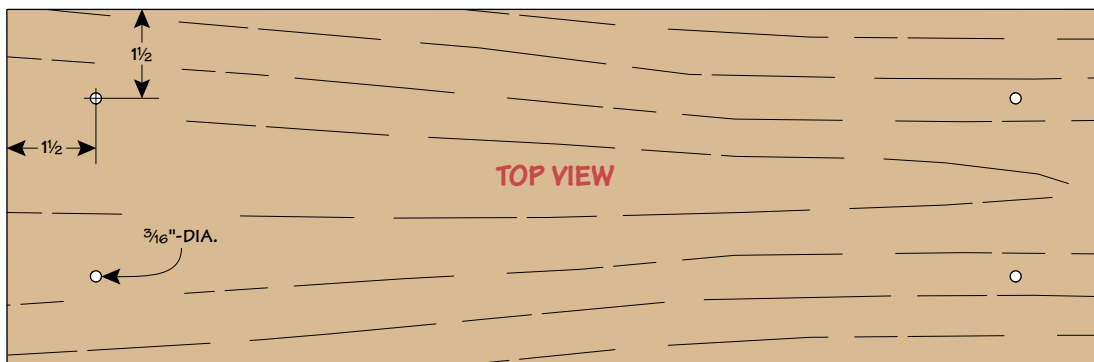
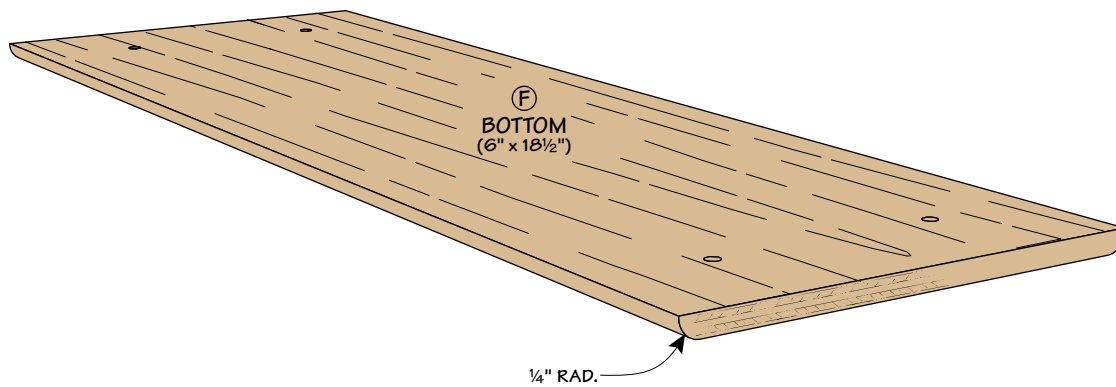
1/4" x 24" - 24" HARDBOARD



Leather Tool Bag

Cutting Diagram

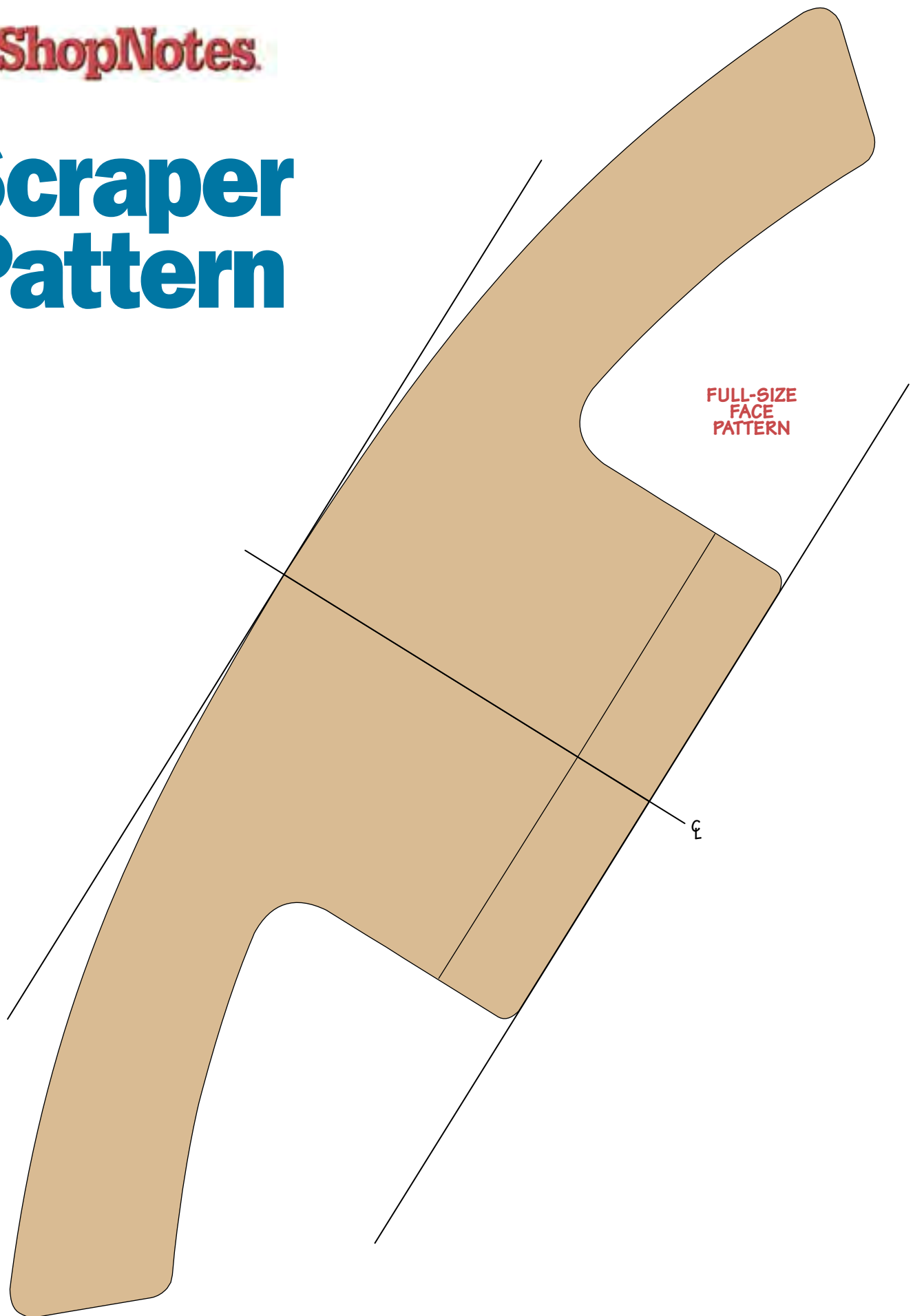


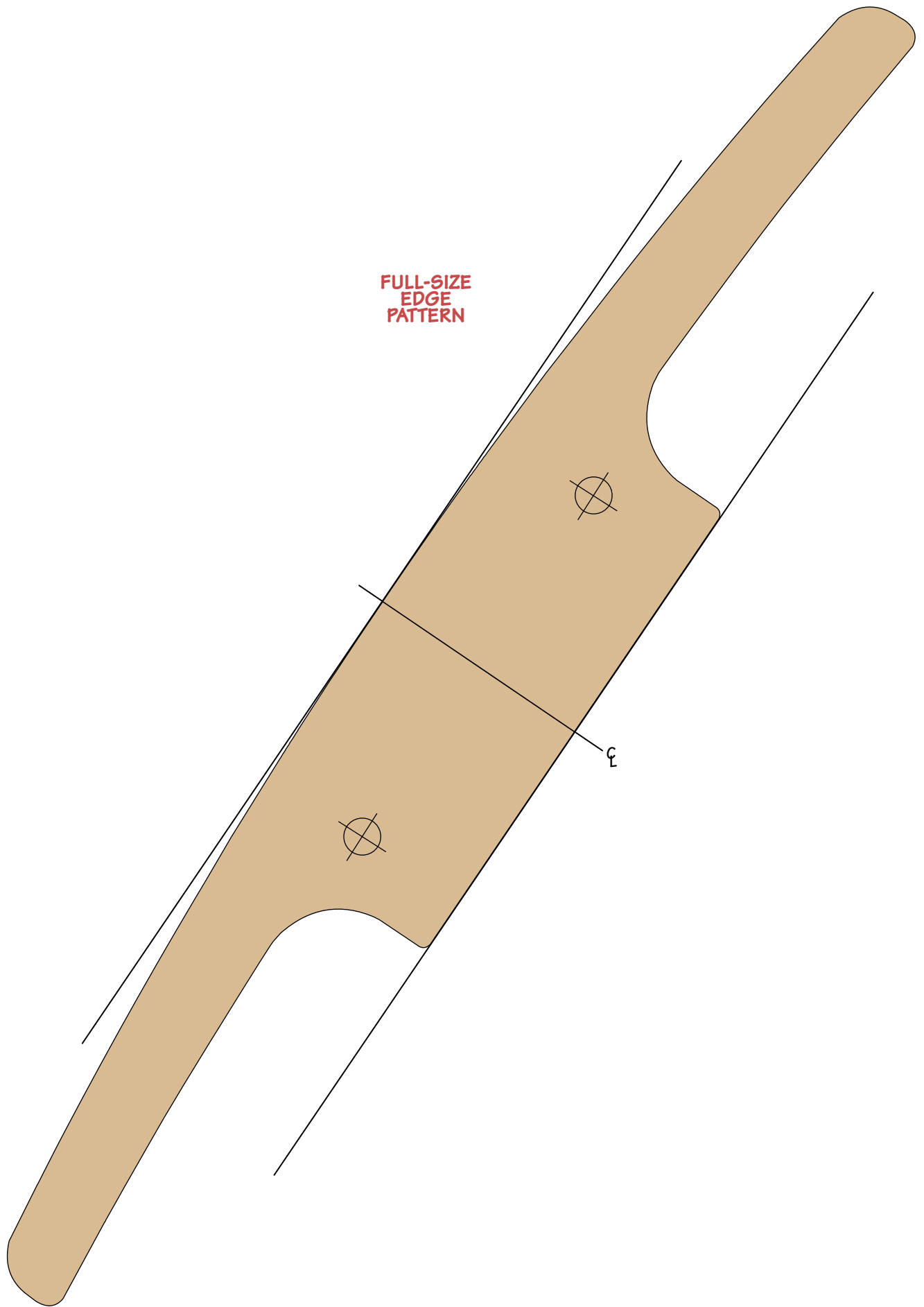


Materials & Hardware

A	Body (1)	20 x 32 1/2 - 1/8 Leather	F	Bottom (1)	6 x 18 1/2 - 1/4 Ply.
B	Ends (2)	11 x 14 - 1/8 Leather		• (9) #8 x 1 1/4" Fh Woodscrews	
C	Handle Straps (2)	1 x 39 - 1/8 Leather		• (14) #9 x 1/2" Copper Rivets and Burrs	
D	Closure Tab (1)	1 x 6 3/4 - 1/8 Leather		• (6) #9 x 3/4" Copper Rivets and Burrs	
E	Buckle Strap (1)	1 x 6 3/4 - 1/8 Leather		• (1) 1" Belt Buckle	

Scraper Pattern





FULL-SIZE
EDGE
PATTERN

C

Wall-Mounted Workbench

Materials & Hardware List

WORKBENCH

A Upper Ledger (1)	1 1/2 x 5 1/2 - 72
B Lower Ledger (1)	1 1/2 x 5 1/4 - 62
C Brackets (2)	3 x 4 1/2 - 26 1/16
D Supports (2)	3 x 5 - 23
E End Cleats (2)	1 1/2 x 3 - 10
F Center Cleat (1)	1 1/2 x 3 - 43
G Shelf (1)	1 1/2 x 11 1/2 - 46
H Wide Planks (9)	1 1/2 x 5 - 78
I Narrow Planks (2)	1 1/2 x 2 1/2 - 78

TOOL RACK

J Back Rail (1)	3/4 x 5 1/2 - 70 3/4
-----------------	----------------------

K Fixed Spacers (4)	1/2 x 2 1/2 - 1 1/2
L Front Rail (1)	3/4 x 2 1/2 - 70 3/4
M Adjustable Spacers (5)	1/2 x 2 1/2 - 1

WALL SHELF

N Top/Bottom (2)	3/4 x 6 1/2 - 70 3/4
O Ends/Dividers (7)	3/4 x 6 1/2 - 9 1/2
P Cleat (1)	3/4 x 2 - 69 1/4
Q Cap (1)	3/4 x 7 1/2 - 72 3/4

- (12) 3/8" x 5" Lag Screws
- (21) 3/8" Flat Washers
- (4) 3/8" x 4" Lag Screws

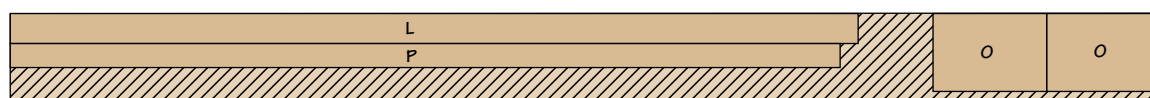
- (4) 1/4" x 3" Lag Screws
- (4) 1/4" Flat Washers
- (8) #8 x 3" Fh Woodscrews
- (4) #10 x 4" Fh Woodscrews
- (5) 3/8" x 3" Lag Screws
- (1) 7" Face Vise
- (70) #8 x 2" Fh Woodscrews
- (10) #8 x 1" Fh Woodscrews
- (8) #8 x 1 1/4" Fh Woodscrews
- (5) #8 x 1 1/2" Fh Woodscrews

Cutting Diagram

1" x 8" - 8' PONDEROSA PINE



1" x 8" - 8' PONDEROSA PINE



1" x 8" - 8' PONDEROSA PINE (2 BOARDS)



1" x 8" - 8' PONDEROSA PINE

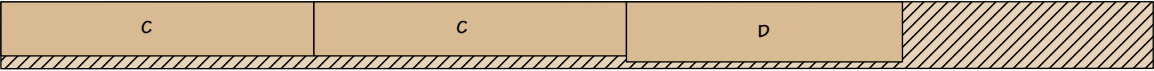


Cutting Diagram cont.

2" x 6" - 8' DOUGLAS FIR



2" x 6" - 8' DOUGLAS FIR (2 BOARDS)



2" x 8" - 8' DOUGLAS FIR



2" x 8" - 6' DOUGLAS FIR



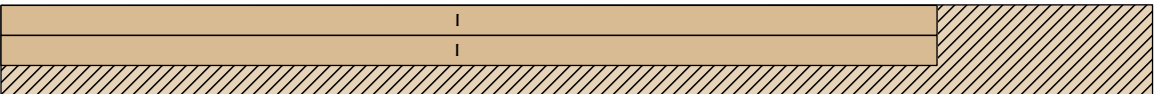
2" x 8" - 6' DOUGLAS FIR (2 BOARDS)



2" x 8" - 8' DOUGLAS FIR (9 BOARDS)



2" x 8" - 8' DOUGLAS FIR





Scenes from the Shop



Create an inviting shop with just a few feet of wall space. This collection of projects features low-cost building materials and straightforward joinery. Find detailed plans beginning on page 34.

This laminating technique lets you transform common softwood planks into a thick, rugged workbench top. Best of all, the assembly process is remarkably quick. Take a look at the article on page 40.