

5 Problem-Solving Tools
for Better Joinery

Smooth Surfaces —
Low-Cost, Low-Tech

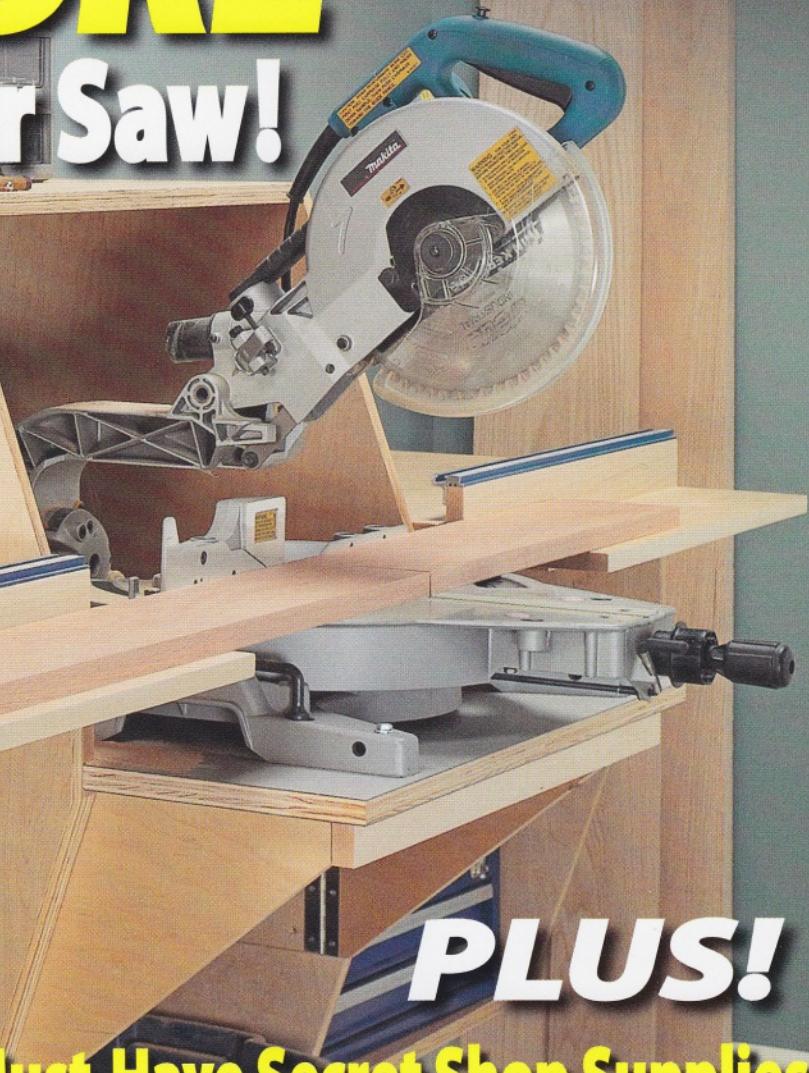
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Vol. 19 Issue 110

GET MORE From Your Miter Saw!

- Flip-Up Fence System
- Space-Saving Design
- Custom Dust Collection



PLUS!

- Must-Have Secret Shop Supplies
- Rock-Solid Table Saw Joinery
- Easy Technique for Solid-Wood Tops
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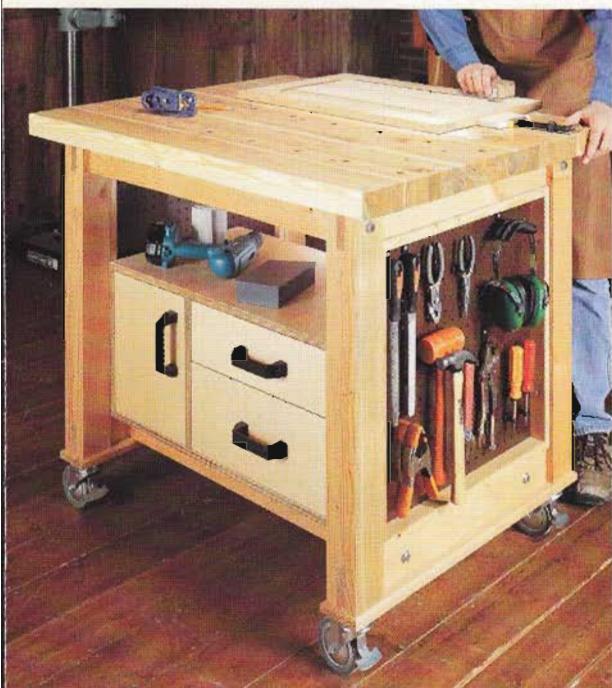
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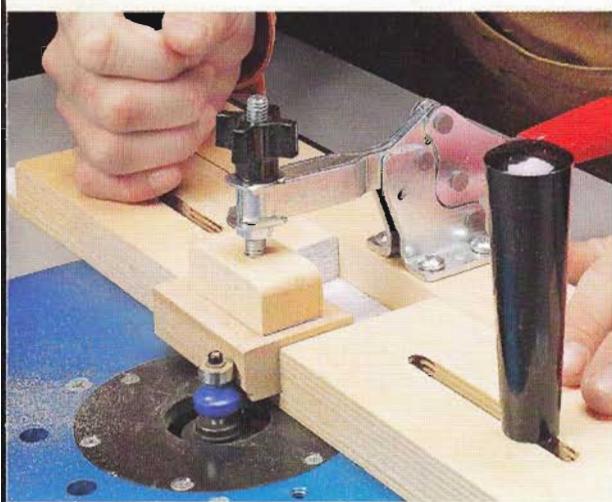
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dream shop project

Wall-Mounted Miter Saw Station

GO ONLINE EXTRAS

14

This unique design features flip-up fences, storage, and dust collection. And when the work is done, the fences fold down and the saw slides back to open up the worksurfaces for other uses.

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Multipurpose Shop Cart

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Tough and sturdy, you'll be making use of this shop cart on every project you build. It has built-in storage and a large worksurface for handling just about any task.

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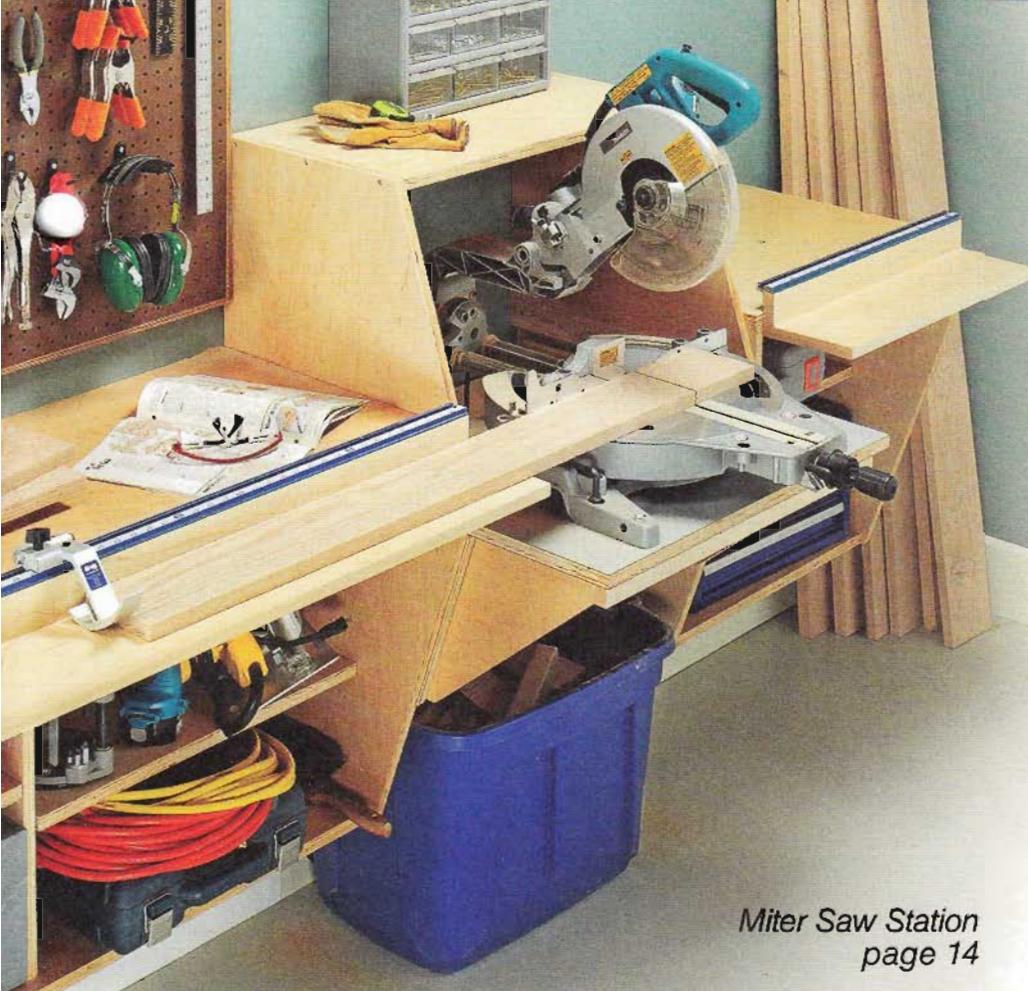
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A step-by-step process is all it takes to turn a set of wood strips into a flat, smooth top.

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These days, getting the most value for your money and getting more from what you already have has become more popular. But these are things woodworkers have always done. It's the reason I'm so excited about this issue. It contains a wide range of projects, tips, and techniques for improving your shop and getting more out of the tools you have.

Take the miter saw for example. In a lot of shops, it's used for rough-cutting material. But with the techniques shown on page 12, you can use it for making precision crosscuts. Another way to get more from it is to build a "station" around it. Now I've found many of them lacking for a variety of reasons. That's not the case with the miter saw station you see at left. The fences provide built-in accuracy for longer cuts and when you're done, the fences flip down and store underneath. This opens up the top for a wide range of uses. And you can't beat all the extra storage the station provides.

We even challenged the staff to identify some not-so-obvious shop supplies (page 10) they use every day that will help you get more out of the time you spend in your shop. And on page 44, you'll find a low-cost, low-tech kit for getting the best results when it comes to sanding any project. These articles just scratch the surface of what's inside to help you improve your shop and the projects you build in it.

Terry

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from our Readers



Tips for Your Shop

THE WINNER!

Push Block with Adjustable Heel

A lot of woodworkers make their own push blocks for use at the table saw. They often include a "heel" to help push the stock past the blade. The problem is, over

time the heel can get chewed up requiring a new push block.

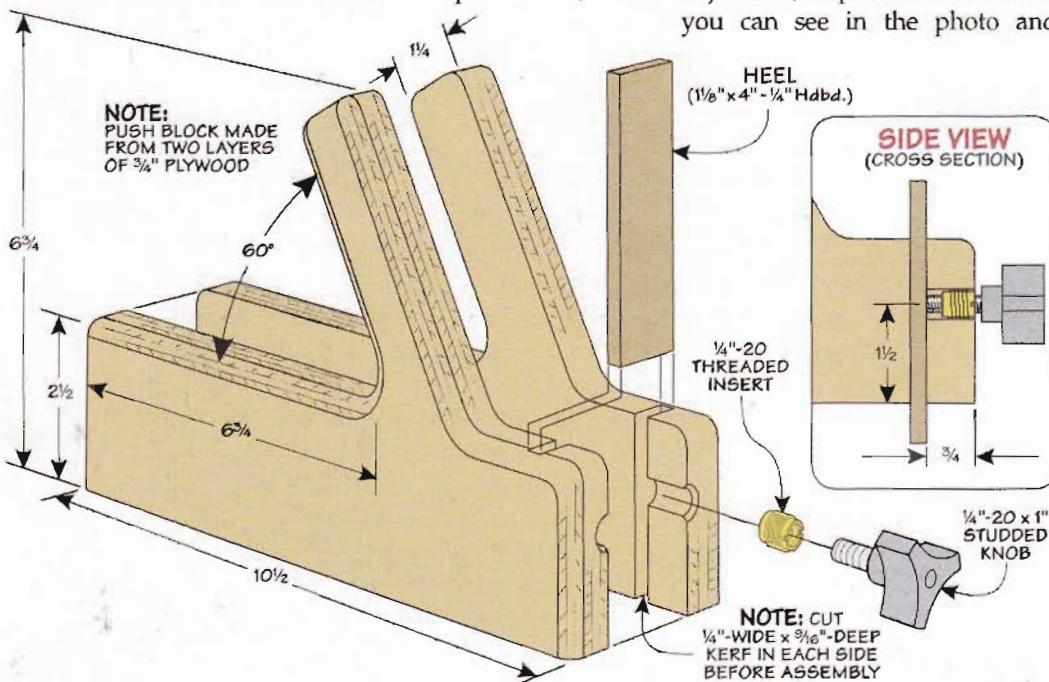
My design gets around this problem by incorporating an adjustable, replaceable heel. As you can see in the photo and

drawings, the heel is made from hardboard. The body of the push block has a slot for the heel and a studded knob to hold the heel in place. The knob also allows you to adjust the amount the heel projects beyond the bottom face.

The body of the push block is glued up from two layers of plywood. This way, you can cut the slot for the heel in the rough blanks before gluing them together. I used a piece of waxed hardboard to align the pieces during glueup. After the glue is dry, you can cut the push block to shape and round over the top edges and handle at the router table.

The last steps include drilling for and installing the threaded insert. Finally, after sliding the heel into the slot, thread in the knob to hold the heel in position.

*Jim Farris
Orange, California*

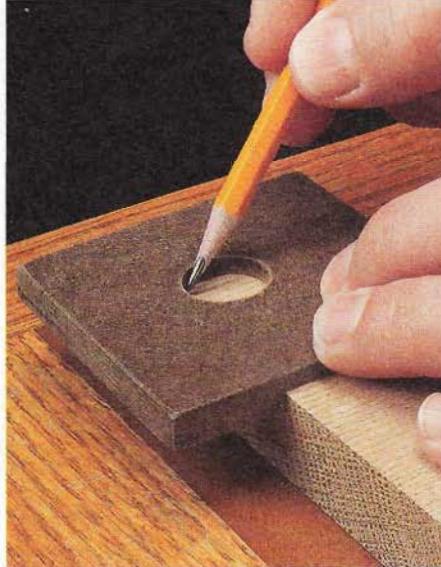


Layout Templates

For projects that require a corner radius or laying out a diameter, I've always found it a challenge. I never had anything that matched the exact radius.

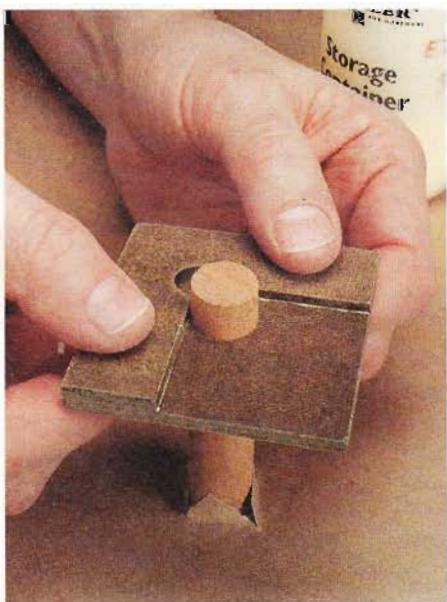
An easier way is to make and use a set of simple templates, as you can see here. They're made from two layers of $\frac{1}{8}$ " hardboard. The bottom layer forms right-angle "fences" that register against the corner of the workpiece for drawing a radius. The top is drilled with a hole sized to match the diameter needed and acts as a circle template.

To make the bottom layer, I first drilled a relief hole where the fence edges intersect. This ensures that the faces of the fences will butt tight against the workpiece. Then it's a simple matter to cut the right angle. An auxiliary fence on your miter gauge makes this task easier. Then, to align the fences with the hole



in the top layer, I used a dowel with the same diameter as the hole (left photo below). After gluing the two layers, use a marker to label the diameter, as shown in the right photo below.

Len Urban
Rancho Mirage, California



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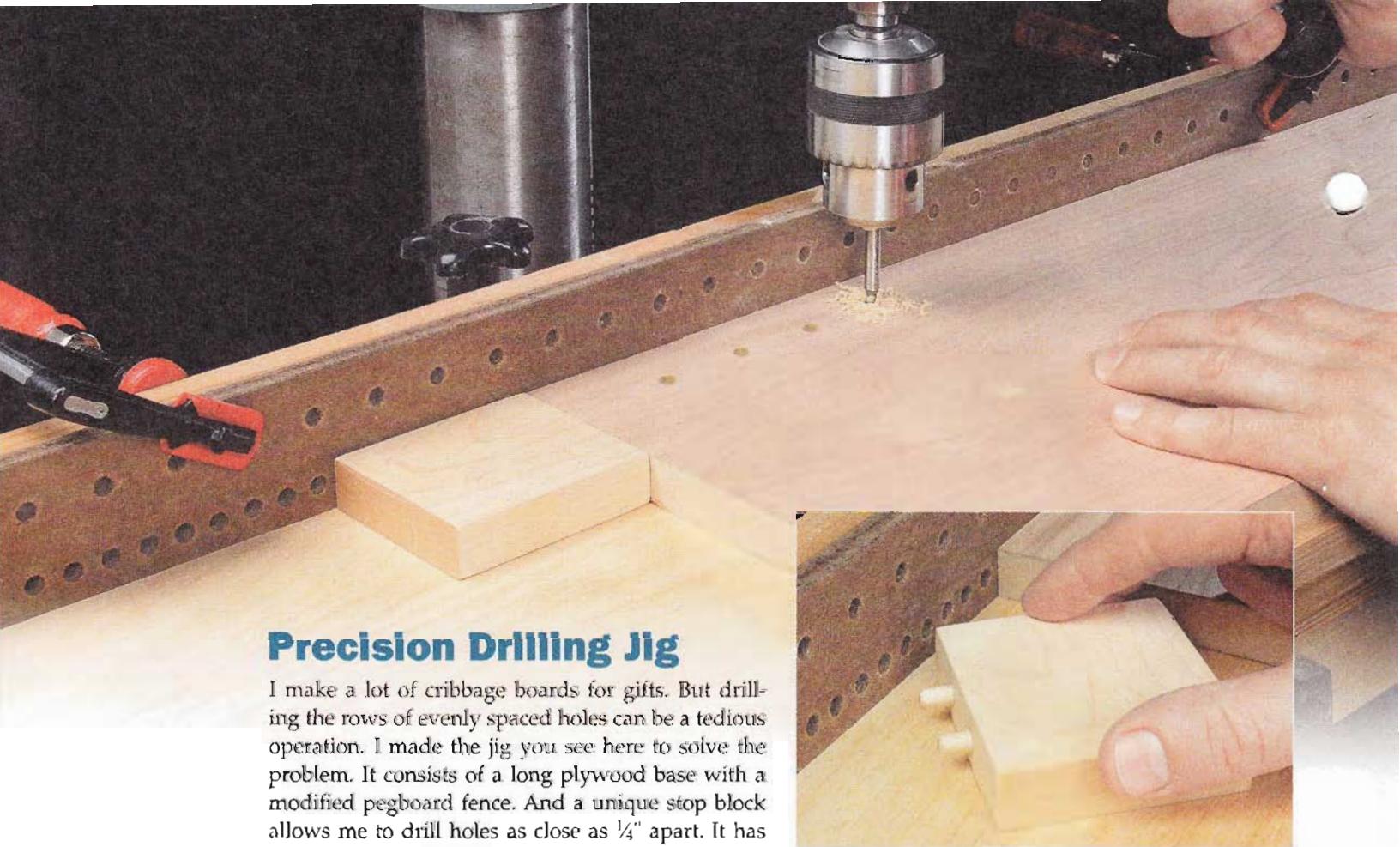
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Precision Drilling Jig

I make a lot of cribbage boards for gifts. But drilling the rows of evenly spaced holes can be a tedious operation. I made the jig you see here to solve the problem. It consists of a long plywood base with a modified pegboard fence. And a unique stop block allows me to drill holes as close as $\frac{1}{4}$ " apart. It has worked so well, I use it for almost every application requiring evenly spaced holes.

The key to the jig is the fence. As you can see in the drawing, it's made from two layers of $\frac{1}{4}$ " pegboard. During glueup, instead of aligning the holes, I offset them by half the distance between the holes ($\frac{1}{2}$ " in my case). Then I used each hole as a drill guide to drill through the second layer. You end up with a strip with holes spaced every $\frac{1}{2}$ ". Once that's done, you can rip the top and bottom edges straight and fasten it to the plywood base.

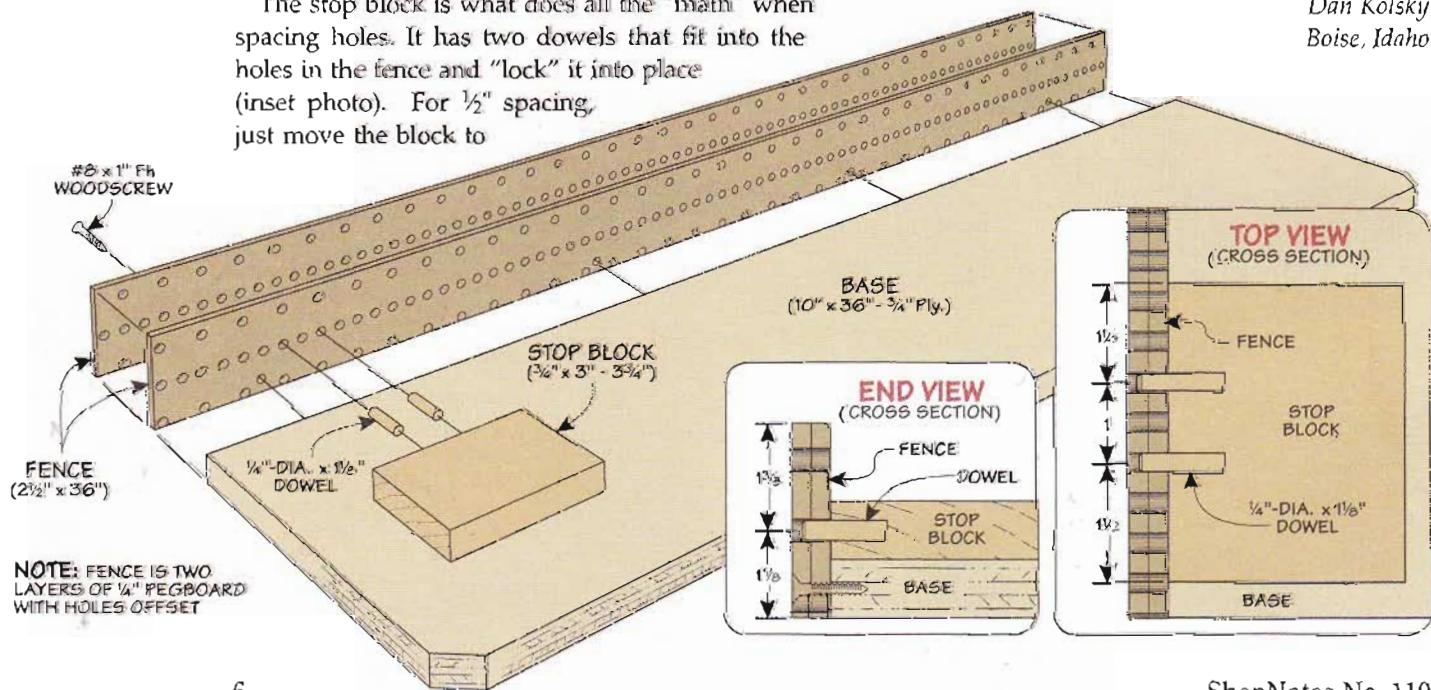
The stop block is what does all the "math" when spacing holes. It has two dowels that fit into the holes in the fence and "lock" it into place (inset photo). For $\frac{1}{2}$ " spacing, just move the block to



the next set of holes as you drill. But there's a trick you can use to drill holes spaced $\frac{1}{4}$ " apart.

You can see in the Top View below that the holes aren't evenly spaced from the block's edge. That's done to allow for $\frac{1}{4}$ " spacing. Here's how it works: After drilling a hole, flip the block over and insert the dowels into the same holes. After drilling the second hole, just flip the block over, move it over to the next set of holes, and repeat the process. Once you do it a few times, it becomes second nature.

Dan Kolsky
Boise, Idaho

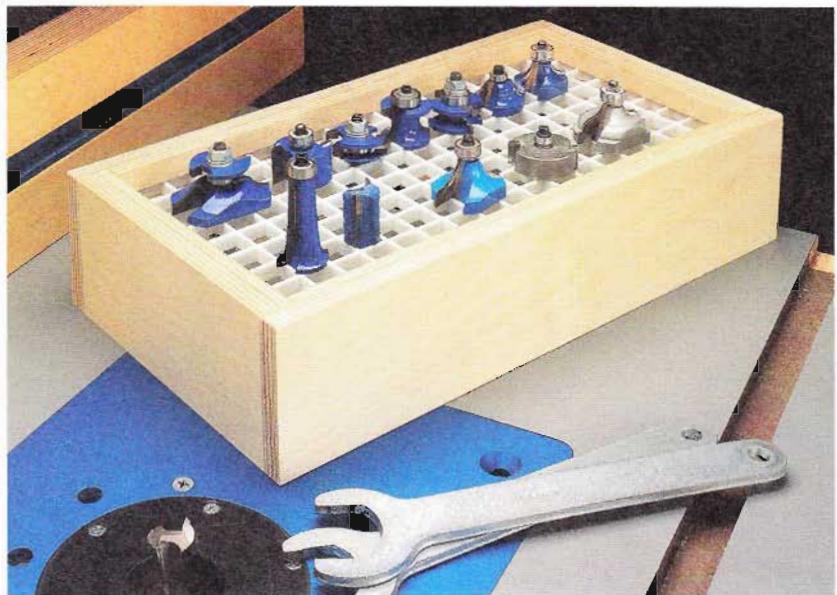


Router Bit Holder

My router bits used to be stored loose in a drawer. But they often rolled around, running the risk of damaging the cutting edges. While looking for a solution, I stumbled upon the rectangular grid diffusers for drop-ceiling light fixtures. The $\frac{5}{8}$ " squares will hold a lot of router bits.

To hold the grid, a small, portable box with a rabbeted frame is all you need. A groove on the inside supports the grid (photo at right). After cutting the grid to size, assemble the box around it. Now I can store and transport all my router bits without any worries of damage.

Jeffrey Fleisher
New Market, Virginia



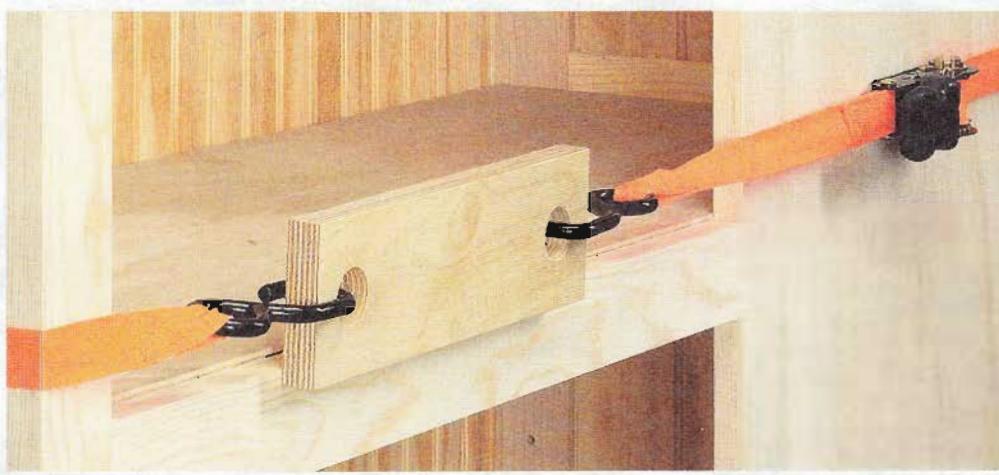
Quick Tips



For repeating rip cuts, **Leon Bridges** of Houston, Texas uses a parallel-jaw clamp as a stop on the guide rail. It's a sure-fire way to return the fence to the exact position as before.



► **Bruce Smith** of Kamloops, British Columbia uses empty pump dispensers for metering out small quantities of wood glue. Nozzle caps (from Lee Valley) keep the glue fresh.



▲ While gluing up a large cabinet, **Dave Corwin** of Delaware, Ohio suddenly discovered the tie-downs he was using as strap clamps weren't long enough to reach around the cabinet. Since the glue was already applied, his son **David Allen** suggested using a piece of scrap with a hole drilled in each end to complete the glueup.

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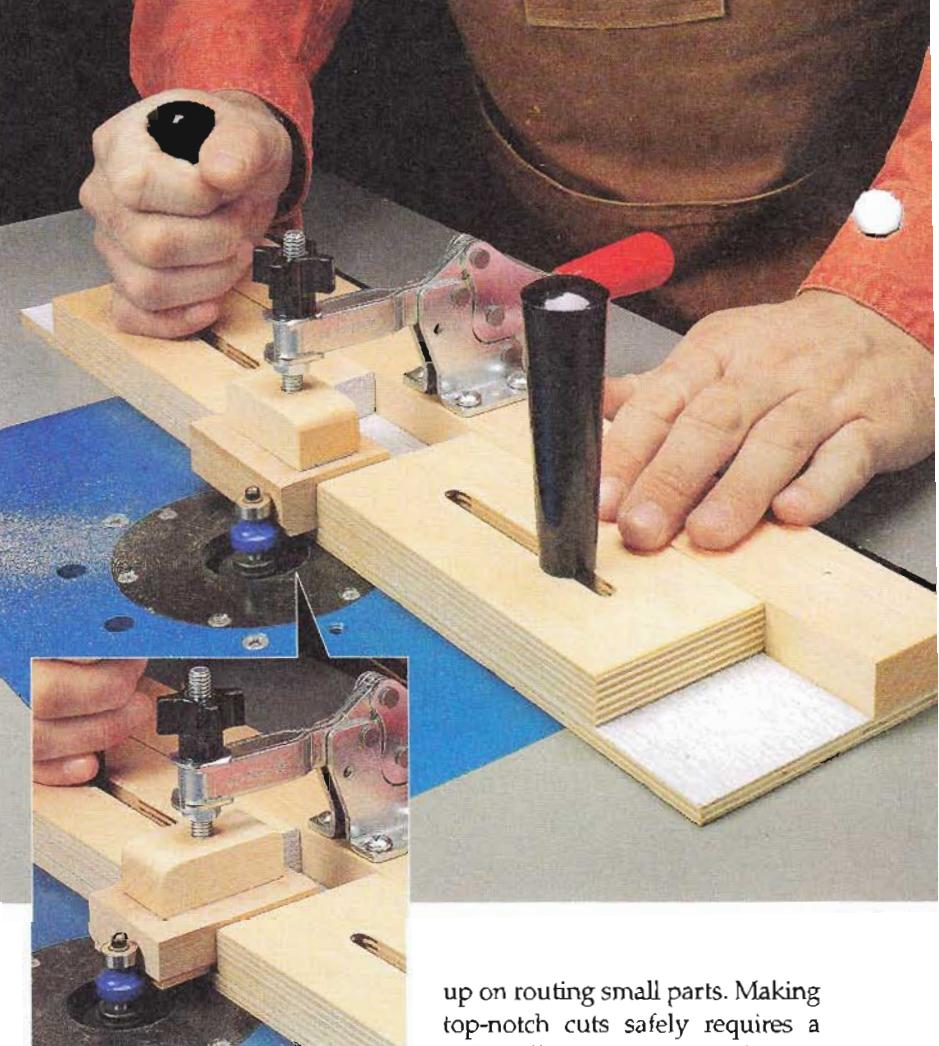
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routing **Small Parts**

A few router table accessories make it easy to get safe, accurate cuts.

The router table in my shop is the go-to tool for all kinds of profile and joinery work. With a large table and a flat fence, it can handle just about any size workpiece. However, one place where most router tables have trouble is routing small workpieces.



The problem is large openings in the tabletop and fence can cause a small part to catch or dip in. This can spoil the cut and be unsafe. But that doesn't mean you need to give

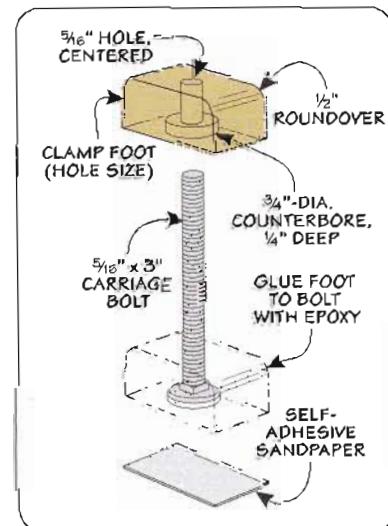
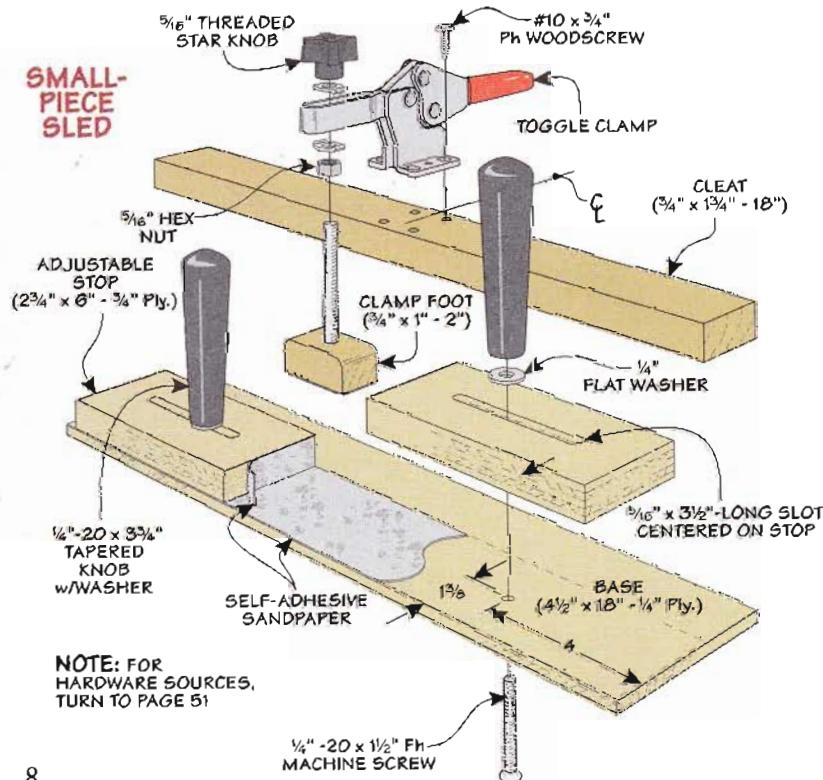
up on routing small parts. Making top-notch cuts safely requires a little different strategy and some simple, shop-built helpers.

The Right Approach. One of the keys to routing small parts safely is to avoid it as much as possible. Now that doesn't mean you can't use small parts. Instead, the strategy is to do the routing on a larger blank. Then cut the part to final size at the table saw (left margin photo).

It's a great solution, but there are times when it just isn't an option.



▲ Rout Then Rip.
If possible, rout the profile on a wide blank, then cut the part to final size at the table saw



When you do need to rout a detail or joint on a small part, try one of the shop-built router table accessories you see here.

SMALL-PIECE SLED

I mentioned earlier that small parts can be hard to control safely past a bit. That's where the sled you see in the upper photos on the opposite page comes in handy.

Basically, the sled holds the workpiece so that it acts like a larger workpiece. The larger size of the sled makes it easier to push the workpiece past the bit. Best of all, the sled keeps your fingers well clear of the bit.

Stops. The workpiece is captured between stops and then clamped securely to a long base. The stops are adjustable to accommodate a wide range of parts (drawing on the opposite page). This way, you can rout the edge of the part or the end.

The tapered knobs that lock the stops in position serve as handles to keep your hands clear. I also added some sandpaper to the base to provide extra grip.

Toggle Clamp. To hold the workpiece against the base, I used a toggle clamp. I replaced the small rubber end of the clamp with a wide wood "foot," as in the detail drawing on the facing page. This added surface area gives the clamp a firmer grip. I also replaced the

No Gaps. A piece of hardboard forms a smooth gap-free fence face around the bit.



upper nut with a star knob to make adjusting the height of the foot a quick and easy process.

ROUTER TABLE ADD-ONS

Besides building the sled, there are a couple other ways to modify your router table to better deal with small parts. Here you have a couple of goals. The first is to minimize any openings where a piece can shift. The second is to create a smooth surface for the workpiece to ride along without catching.

Auxiliary Fence. I start with the router table fence. If your fence has adjustable faces, the simplest solution is to position them as close to the bit as possible.

However, for fences with a fixed bit opening, you need to find another solution. I attached an auxiliary hardboard face with

double-sided tape, as shown in the photo above.

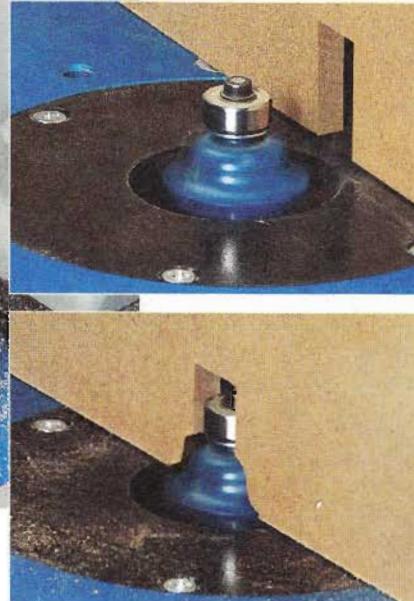
The fence has a pre-cut notch to accommodate the bearing on the bit. Then to create a zero-clearance opening, simply pivot the fence into the spinning bit (inset photos above). Since only a small part of the bit is exposed, the workpiece will always be fully supported.

Smooth Table. Many times, adding an auxiliary fence is enough. But you can also create a smooth, seamless tabletop and eliminate any gaps here as well.

After positioning the fence, I clamp a larger piece of hardboard to the tabletop tight against the fence. The spinning bit will create a small, perfect-fitting notch, as in the photo and inset below. Now you have a customized setup that's safe and accurate.

Finally, it's a good idea to use a push pad to guide the workpiece.

These solutions take the hassle out of routing small parts. And they let you concentrate on getting smooth, crisp profiles and tight-fitting joints. ■



▲ Custom Face.

Pivot the fence into the bit to create a zero-clearance fence face.



▲ Seamless Surface. An auxiliary tabletop made from $\frac{1}{4}$ " hardboard creates a smooth, zero-clearance work-surface around the router bit (inset).



must-have **Shop Problem Solvers**

These handy supplies are a great addition to every hardworking home shop.

■ Recently the conversation out in the shop turned to some of the not-so-common supplies we all keep around. I ended up learning about a few interesting products. And I let the editors and designers who use these products make a case for why they keep them on hand.

Here are a few "uncommon" supplies you can use in your shop to solve problems. They're all so handy, it's high time I let everyone else in on the secret.



PB BLASTER

Auctions are a great place to find inexpensive tools. One problem is that they're often coated with rust. So to remove rust and loosen up stuck nuts and bolts, I use *PB Blaster* (photo above). It's found at automotive stores. Using it is just a matter of spraying it on the rusted area and letting it do its thing.

PB Blaster is capable of breaking down a lot of rust straight from the can. But it can also be heat

activated, so you can use a torch on really stubborn areas. The fumes can be irritating, so I always use *PB Blaster* in a well-ventilated area.

—Vince Ancona, Managing Editor

LLOYD'S AKEMPUCKY

One way to speed up the process of installing lots of woodscrews is to use a lubricant called *Lloyd's Original Akempucky*, as shown in the photos at left. As you can see, it's available in either a small tub or as an applicator tube.

When installing screws with a cordless drill, *Akempucky* helps lower the torque required to drive them, resulting in fewer broken screws or stripped heads. It can also help save on battery life and reduce operator fatigue.

To use this product, dip the screw into the tub or rub it on with the applicator tube. I like to keep a tube in the pocket of my shop apron, so it's always close at hand.

—Joel Hess, Associate Editor



▲ **Screw Lubricant.** Akempucky also helps prevent stripped screw heads and snapped screws.



▲ Locked Tight.

Permatex prevents screws and nuts from loosening due to movement or excessive vibration.

PERMATEX

Some of my large woodworking tools are on mobile bases. These bases are held together with small machine screws and nuts that can loosen up over time. To solve this problem, I use *Permatex* thread-locker. It comes in three strengths to suit almost any application.

The green version penetrates so you can use it on pre-assembled fasteners. And red is a high-strength formula for heavy-duty use. But, the type that's most useful in my shop comes in a blue-labeled tube. I use it whenever I assemble a new base to keep nuts from loosening up. Just before assembly, place a drop of *Permatex* on the screw threads (photo above).

— Phil Huber, Senior Editor



BOESHIELD T-9

My garage shop isn't heated, so moisture and condensation often cause my tools to rust. To prevent it from starting, I use *Boeshield T-9* (photo above right). Originally designed to protect aircraft components, its combination of solvents, lubricants, and waxes displace moisture. It dries to a thin, waxy film and lasts for several months.

To use it, I just spray a little on any machine table or other area where rust is a problem. Simply wipe off the excess, or let it dry to create a heavy protective film.

— Randy Maxey, Associate Editor

TAP MAGIC & TAP-EASE

I'm an amateur machinist and blacksmith, so I often use steel

rods and bars in quite a few of my projects. To make the best use of these materials, I'll often need to do a little drilling and tapping.

I use *Tap Magic* cutting fluid to make cutting threads easier (left photo below). It provides lubrication to help tools cut more efficiently. It also reduces heat buildup and carries metal chips away.

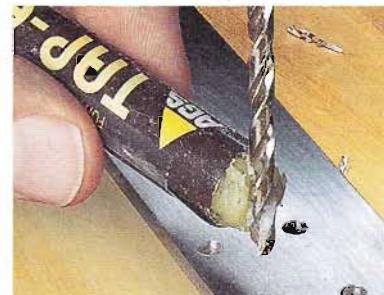
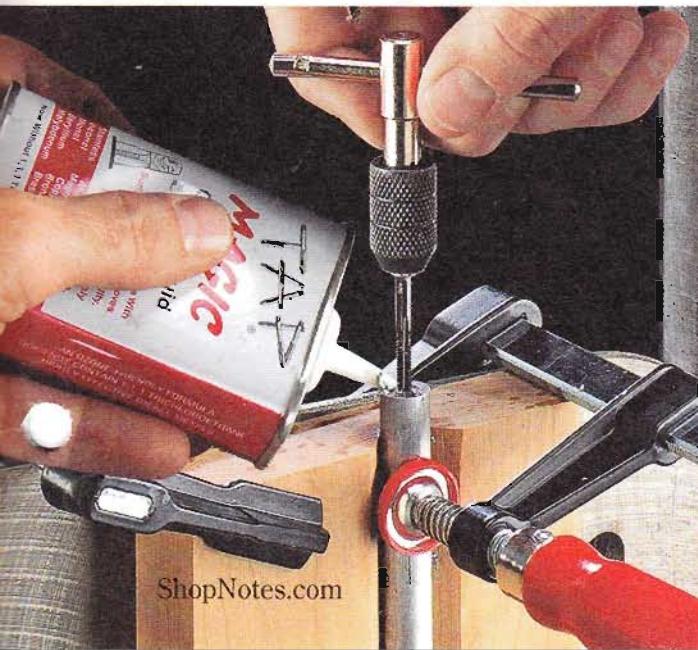
For drilling operations, I turn to a waxy lubricant called *Tap-Ease*. It comes in a convenient crayon-like stick (right photo below). Both products work on a wide variety of metals. Just apply it at the point of contact and start drilling.

— Chris Fitch, Sr. Project Designer



▲ Prevent Rust.

A quick shot of *Boeshield T-9* cleans and restores metal surfaces and helps stop rust from forming



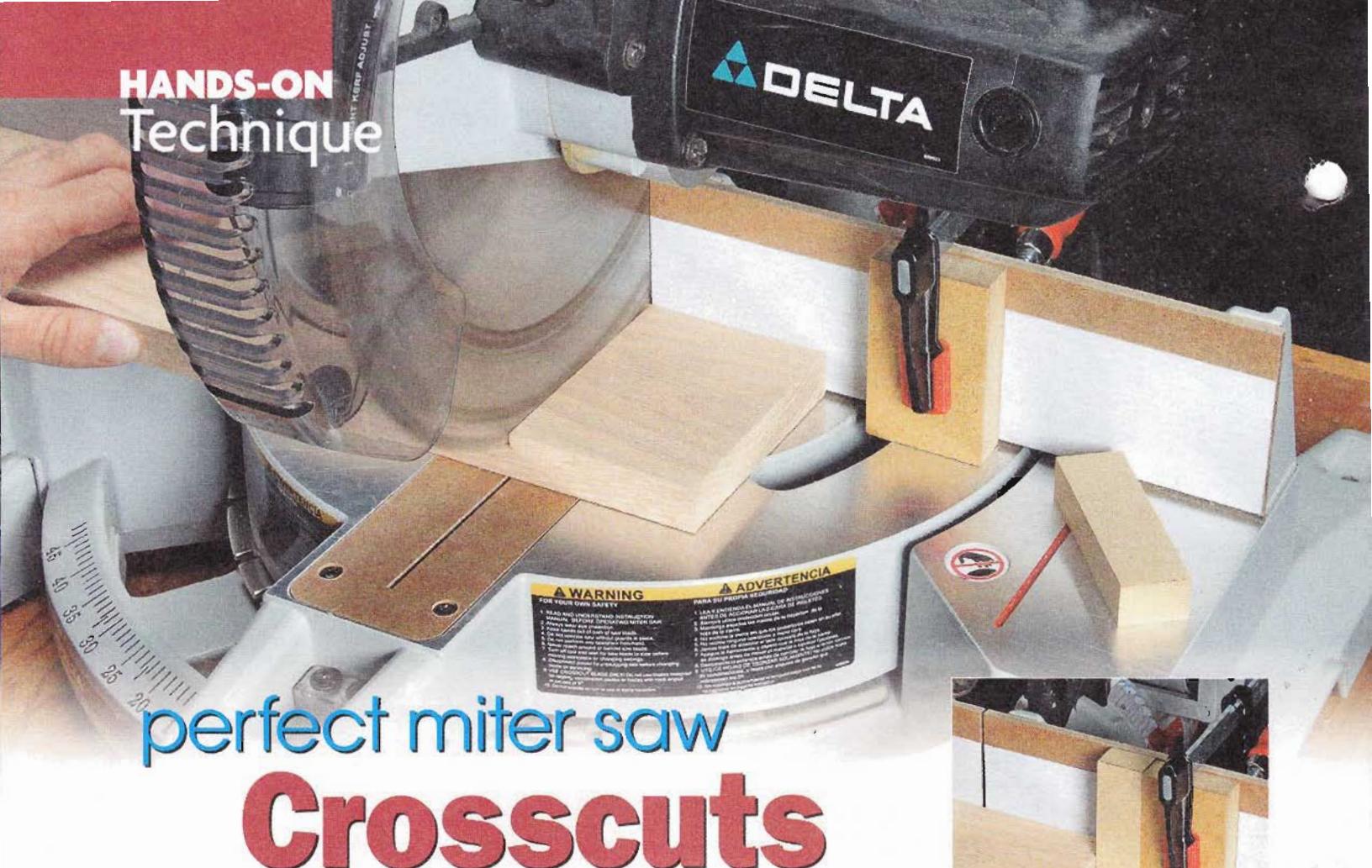
▲ Easy to Apply. Before you start drilling, simply rub *Tap-Ease* on the bit like a crayon

◀ Metalworking. Cutting fluid helps a tap cut more efficiently with less heat buildup.



◀ Two Great Choices. *Tap Magic* and *Tap-Ease* can each be used on a wide range of metals to make drilling and tapping easier.

HANDS-ON Technique



perfect miter saw Crosscuts

Transform your miter saw into a precision crosscutting tool with a few upgrades and some handy tips and techniques.

You'll find a miter saw in just about every woodworking shop. But I've found that most people use the saw mainly for rough-cutting long boards to length.

The truth is a miter saw can make clean, square crosscuts just as accurately as your table saw. All it takes are a few, simple techniques and these tips.

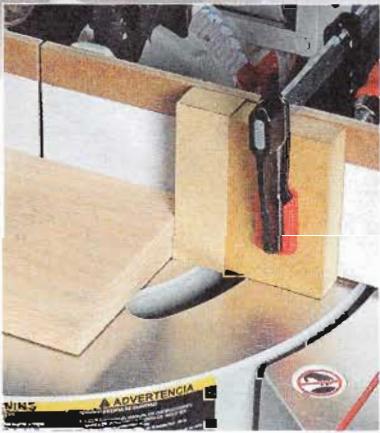
Set Right. Getting great crosscuts from your miter saw begins with making sure the saw is set up for the task. First, the fence should be flat and square to

the table. Next, the blade needs to be set square to the fence. Finally, check to see whether the blade is square to the saw table. (Follow the directions in your

owner's manual to make any necessary adjustments.)

Blade Upgrade. With the miter saw set up, you're ready for a few upgrades. One of the biggest things you can do to improve how your saw cuts is to get a fine crosscut blade. Depending on its size, a top-quality crosscut blade will have 60-100 teeth. And the shape of those teeth means almost as much as the quantity.

To start with, the top of the teeth are beveled to score the edges of the cut. Another thing to look at is the hook angle — how much the blade leans into the cut. Low or even negative hook angles are best. The teeth will slice clearly into the wood and are less likely to cause chipping. This also prevents the blade from grabbing the workpiece.



▲ Multiple Small Parts. A spacer between the piece and stop block keeps small parts from binding.

Taming Tearout. In order to get the cleanest cuts from any saw blade, you need to prevent tearout. This happens when the fibers of the wood are unsupported where the blade exits the workpiece. And there are two primary places where this happens when cutting with a miter saw — along the bottom face and back edge of the workpiece.

To stop tearout in its tracks, you need the table and fence of the saw to back up the workpiece right next to the blade. However, most saws aren't set up this way.

Zero-Clearance Insert. To create a zero-clearance opening in the table, you can make a new insert just like you would for a table saw

Better Blade. A top-notch blade with more teeth and a negative hook angle makes crisp, clean crosscuts.

(photo at right). A simpler version is shown in the inset photo. This is just an auxiliary table that matches the overall size of the saw table. To make it easy to replace, it's held in place with double-sided tape.

Auxiliary Fence. You can use a similar strategy to close up the large gaps found in the fences of most miter saws. To provide support here, I simply attach an auxiliary fence made from $\frac{1}{4}$ " hardboard.

I like to face the hardboard with adhesive-backed sandpaper. This keeps the workpiece from creeping during a cut. And I cut a small rabbet on the bottom edge for dust relief. Once again, use double-sided tape to make it easy to replace.

Basic Cuts. At this point, the saw is set up and ready to make cuts. However, there's more to it than simply starting up the saw and plunging into the workpiece.

For starters, use your hand to hold the workpiece while it's cut. (For smaller pieces, it's a good idea to use a clamp to keep your fingers clear of the blade.) And be sure to hold it back against the fence and down to the table to avoid applying side pressure on the blade.

To line up the blade with a layout mark, I make shallow nick cuts to sneak up the mark from the waste side of the line, as shown in the lower left photo. When you're there, lower the blade into the workpiece in a smooth stroke, letting the blade do the cutting.



Cut to a Line. Use shallow cuts to creep up on the layout line for an accurate cut.



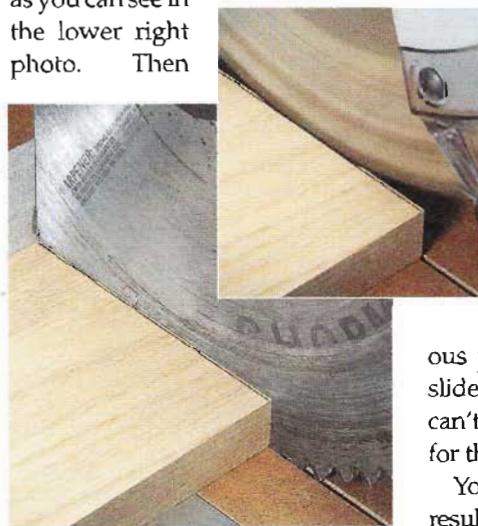
Fence and Table Add-Ons. An auxiliary fence and a shop-made zero-clearance insert back up the workpiece and stop tearout. A hardboard auxiliary tabletop is a quick and easy solution (inset).

After you complete the cut, wait for the blade to come to a complete stop (or slide the board away from the cutting zone) before lifting the saw. This way, the slowing blade can't spoil the cut edge.

This takes care of making basic crosscuts. But there are other crosscutting situations that require a slightly different technique.

Trim Cuts. Cutting a part to fit an opening can be a challenge. The key here is to start with an extra-long part then trim off small amounts until it fits just right.

To do that, lower the blade (with the saw off) and slide the workpiece against the saw blade plate, as you can see in the lower right photo. Then



Skim Cut. Butt the workpiece against the stopped saw plate to set up for a light, trim cut (inset).

raise the blade and make the cut without moving the workpiece. This shaves the piece the distance the teeth of blade extend beyond the plate (inset photo).

Identical Parts. Another common crosscutting task is making identical parts. Measuring and marking each piece is time-consuming and often leads to inconsistent results. A better way is to attach a long auxiliary fence to your miter saw and use a stop block (like the one on the miter saw station on page 14). It's a fast, accurate way to guarantee all the parts are the same.

Small Pieces. The final technique I want to talk about is cutting identical small pieces. Once again, a stop block makes this easier. The key is keeping the part from binding between the blade and stop block. Otherwise it could be thrown out.

The solution is to position a spacer between the workpiece and the stop block (main photo on the previous page). Before making the cut, slide the spacer out. Now the part can't bind. (Just be sure to account for the width of the spacer.)

You don't need to settle for rough results with your miter saw. All it takes are a few upgrades and the right techniques to get perfect cross-cuts every time.



Shop-Made Insert. Use the stock insert as a pattern for creating a custom zero-clearance insert for your miter saw.

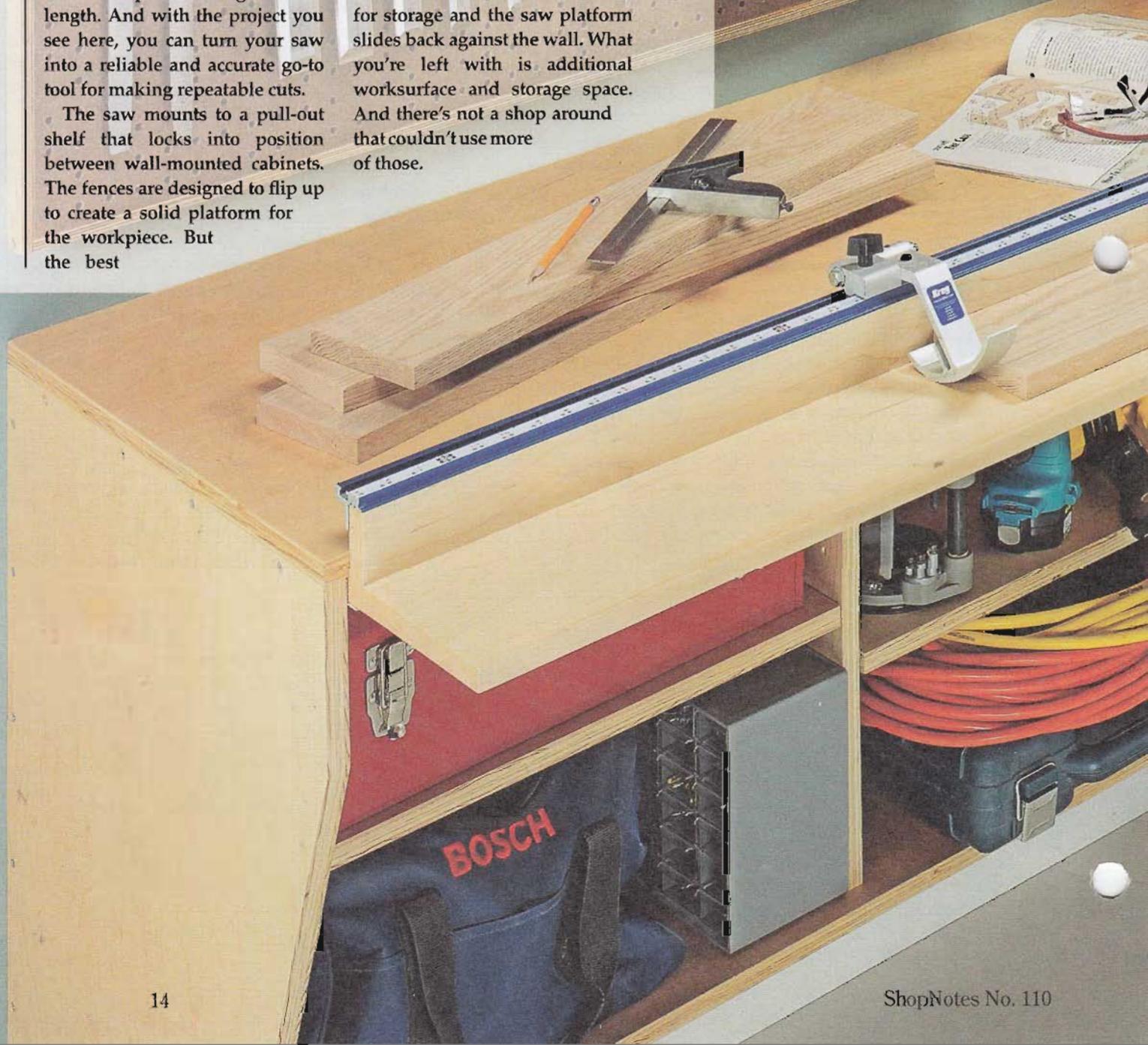
wall-mounted Miter Station

A rock-solid platform and a unique flip-up fence system team up with your miter saw for precise cuts.

A miter saw is a handy tool to have in the shop for cutting stock to length. And with the project you see here, you can turn your saw into a reliable and accurate go-to tool for making repeatable cuts.

The saw mounts to a pull-out shelf that locks into position between wall-mounted cabinets. The fences are designed to flip up to create a solid platform for the workpiece. But the best

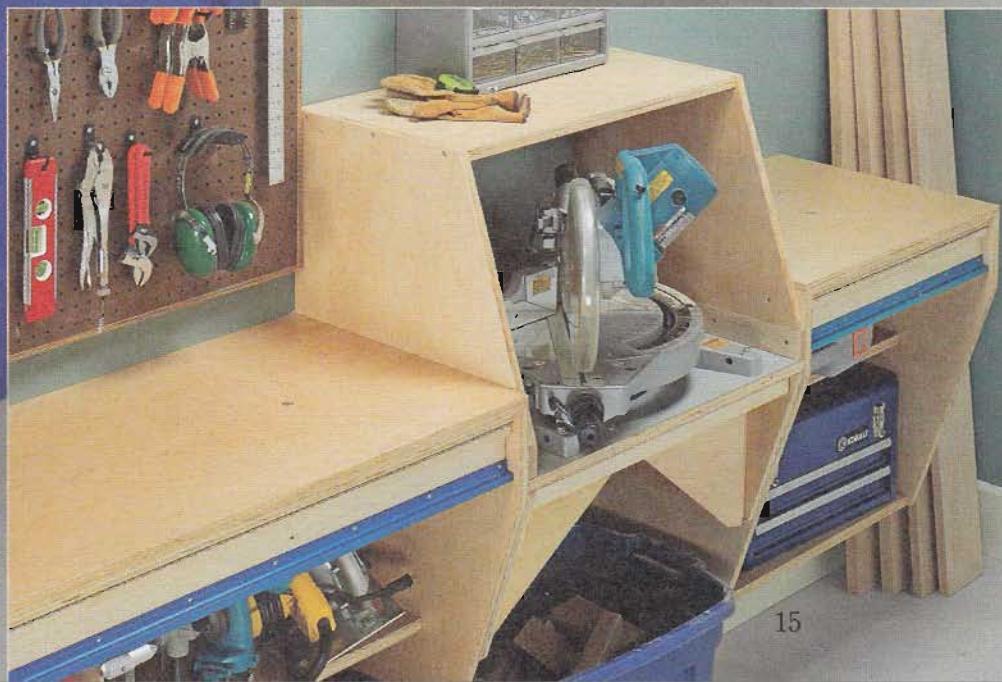
part is when you're finished, the fences fold back into the cabinet for storage and the saw platform slides back against the wall. What you're left with is additional worksurface and storage space. And there's not a shop around that couldn't use more of those.

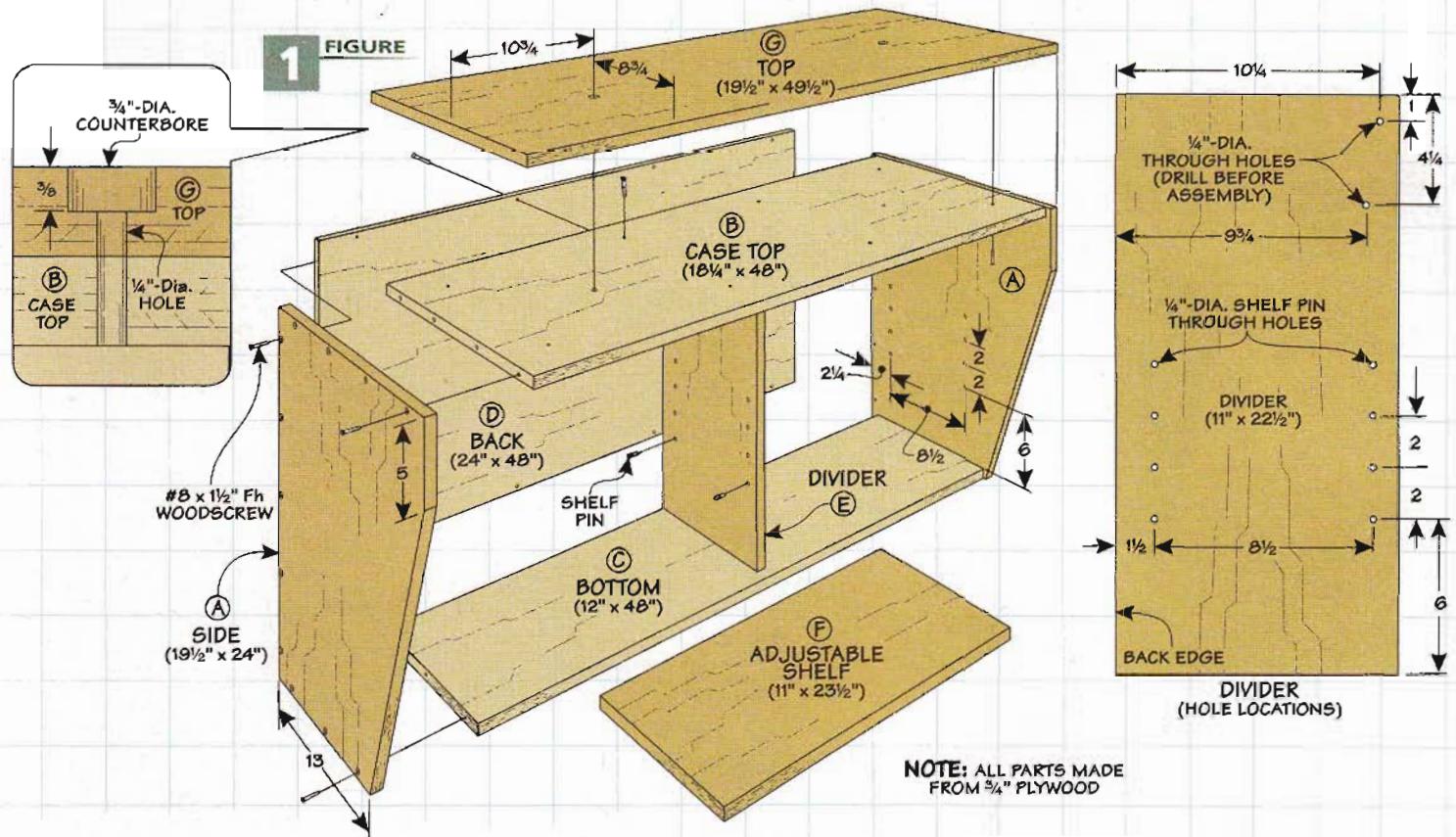


dream shop project



▼ **Space-Saving Storage.** You can fold the fences inside the cabinets and slide the saw platform back to create additional bench space and storage options.





large & small Cabinets

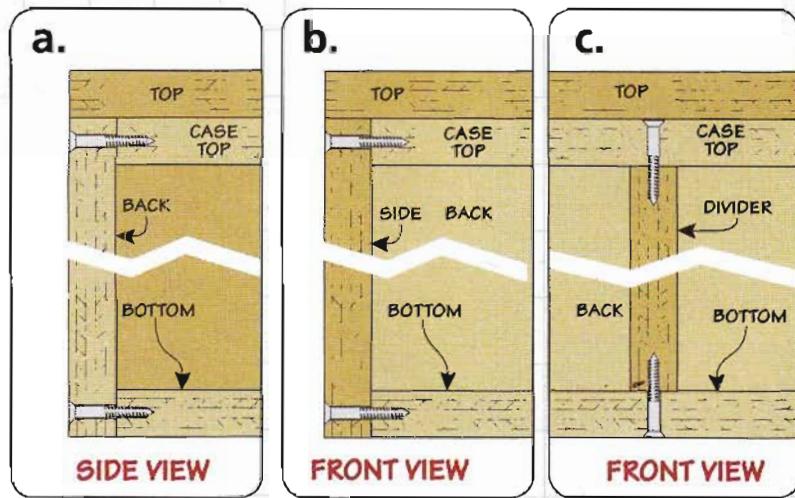
The miter saw station consists of three main components — a saw platform sandwiched between two sturdy, wall-mounted cabinets. The two cabinets are nearly identical in construction. The only difference is the larger one has a vertical divider (Figure 1).

Each cabinet is just a basic box with a back panel. You'll add a top after each cabinet is assembled.

Tapered Sides. If you glance at Figures 1 and 2, you'll notice that the sides of the cabinets are tapered. I did this to make them a little lighter for mounting on the wall and to create more leg room when you're using the saw. Since they're identical, it's a good idea to make the four sides now (a pair for each cabinet). After cutting the taper, sand the edges smooth.

LARGE CABINET

With the sides complete, you can concentrate on the large cabinet.



The next three pieces to cut are the case top, bottom, and back panel. After you drill the screw holes in the sides, use glue and screws to fasten them to the case top, bottom, and back panel. Just make sure to keep the assembly square as you drive the screws.

The back is also fastened along the back edges of the case top and bottom. The back holds the assembly square and provides plenty of area for the screws that will secure the cabinet to the wall.

Divider. As I said before, the larger cabinet has a vertical divider

to help support the top. Plus, it splits up the storage area for better organization. After sizing the divider, it's a good idea to go ahead and predrill the two holes that will be used for a movable catch (Figure 1). Finally, install the divider and then fasten it with screws through the top and bottom.

Shelf Pin Holes. Aligning shelf pin holes across a cabinet can sometimes be a challenge. You don't want an adjustable shelf to rock or wobble. Although you can predrill the holes before you assemble the cabinet, I prefer to

ShopNotes

GO ONLINE EXTRAS

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

make a template out of pegboard or hardboard and drill the holes after assembly. Doing it this way positions the holes identically and makes the task foolproof.

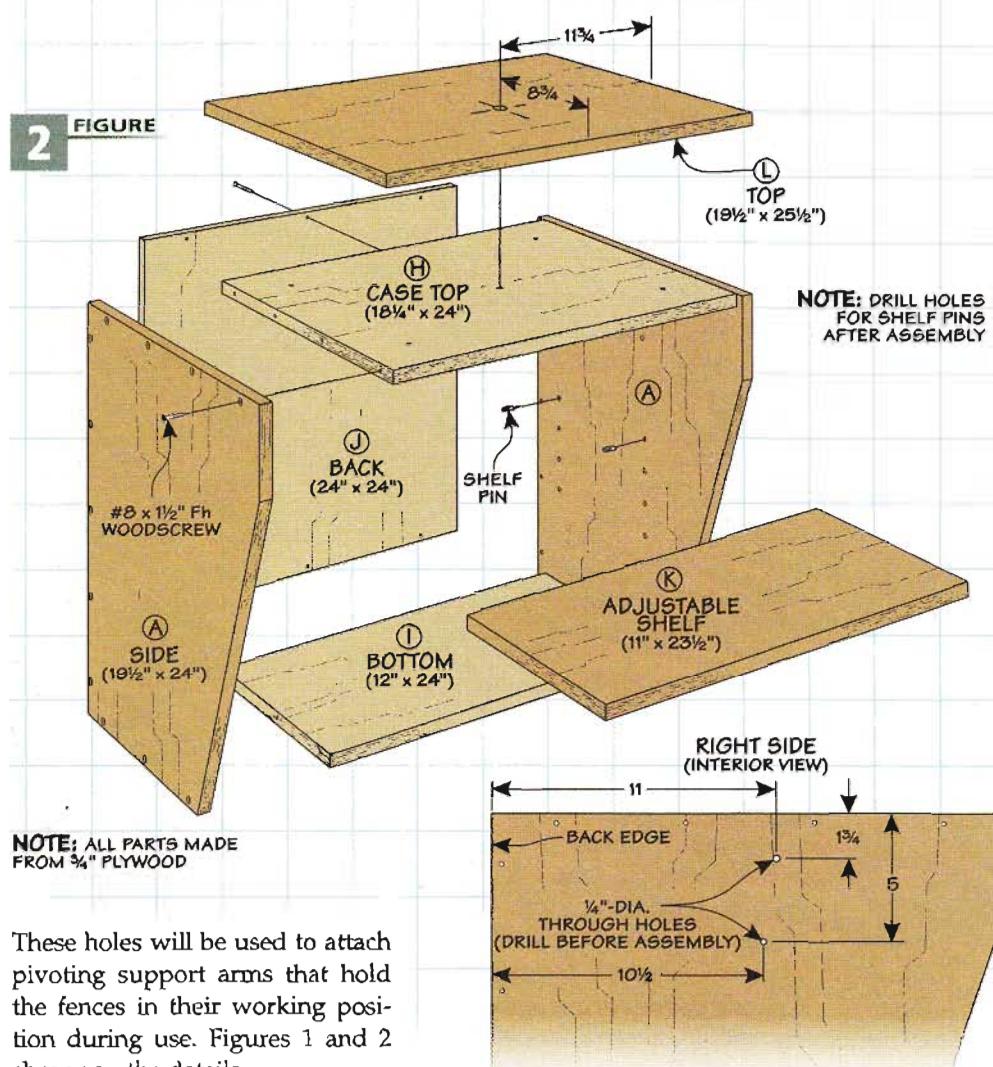
Adjustable Shelves. At this point, you can measure and cut the adjustable shelves to fit between the sides. You'll need two shelves for the large cabinet.

Adding the Top. To finish off the cabinet, I added a plywood top. As you can see in the details in Figure 1, the top matches the overall width of the cabinet. And it's flush with the front and back edges of the sides.

SMALL CABINET & DETAILS

Building the small cabinet should be familiar territory. The construction is the same as the larger cabinet (Figure 2). But there is one thing you'll need to do before assembly. The catch for the small cabinet is attached to the right side, as shown in the detail at right. Because they're so close to the top, it's a lot easier to locate and drill these holes before assembly.

Pivot Holes. The last step to complete before you work on the fences is to drill a few holes with counterbores through the tops of the cabinets (two in the large cabinet and one in the small cabinet).



These holes will be used to attach pivoting support arms that hold the fences in their working position during use. Figures 1 and 2 show you the details.

To make sure the counterbore and through-hole are aligned, I like to drill the counterbore first. In this case, the depth of the counterbore should allow the washer and head of the bolt to sit flush or

just below the surface of the cabinet top. (The drill bit will leave a dimple you can use to locate and drill the through hole.)

At this point, you're ready to work on the fence assemblies.

Materials & Hardware

LARGE CABINET

| | |
|--------------------------|----------------------------|
| A Sides (4) | 19 1/2 x 24 - 3/4 Ply. |
| B Case Top (1) | 18 1/4 x 48 - 3/4 Ply. |
| C Bottom (1) | 12 x 48 - 3/4 Ply. |
| D Back (1) | 24 x 48 - 3/4 Ply. |
| E Divider (1) | 11 x 22 1/2 - 3/4 Ply. |
| F Adjustable Shelves (2) | 11 x 23 1/2 - 3/4 Ply. |
| G Top (1) | 19 1/2 x 49 1/2 - 3/4 Ply. |

SMALL CABINET

| | |
|------------------------|----------------------------|
| H Case Top (1) | 18 1/4 x 24 - 3/4 Ply. |
| I Bottom (1) | 12 x 24 - 3/4 Ply. |
| J Back (1) | 24 x 24 - 3/4 Ply. |
| K Adjustable Shelf (1) | 11 x 23 1/2 - 3/4 Ply. |
| L Top (1) | 19 1/2 x 25 1/2 - 3/4 Ply. |

FENCES

| | |
|-----------------------|------------------|
| M Long Fence Base (1) | 3/4 x 7 - 48 |
| N Long Fence Back (1) | 3/4 x 2 1/8 - 48 |
| O Support Arms (3) | 1 1/2 x 2 - 22 |

SAW PLATFORM

| | |
|---------------------------|--------------------------|
| U Sides (2) | 11 x 18 1/2 - 3/4 Ply. |
| V Wear Strips (2) | 1/4 x 3/4 - 18 1/2 |
| W Shelf (1) | 19 1/2 x 30 - 3/4 Ply. |
| X Shelf Top/Bot. (2) | 19 1/2 x 30 Plastic Lam. |
| Y Rails (2) | 3/4 x 1 1/2 - 28 1/2 |
| Z Spacer (1) | 1/4 x 1 1/2 - 28 1/2 |
| AA Upper Guides (2) | 3/4 x 2 - 19 1/2 |
| BB Wing Blocks (2) | 5 x 11 - 3/4 Ply. |
| CC Support Wings (2) | 11 x 12 1/4 - 3/4 Ply. |
| DD Catches (2) | 3/4 x 2 1/4 - 3 3/4 |
| EE Deflector Supports (2) | 1 1/2 x 3 - 7 |

DUST HOOD & DEFLECTOR

| | |
|--|------------------------|
| FF Deflector (1) | 10 x 28 1/2 - 1/4 Ply. |
| GG Hood Sides (2) | 19 1/2 x 16 - 3/4 Ply. |
| HH Hood Top (1) | 14 x 28 1/2 - 3/4 Ply. |
| • (46) #8 x 1 1/4" Fh Woodscrews | |
| • (81) #8 x 1 1/2" Fh Woodscrews | |
| • (2) 1 1/4"-20 x 2" Hex Bolts | |
| • (3) 1 1/4"-20 x 3 1/2" Hex Bolts | |
| • (10) 1/4" Washers | |
| • (5) 1/4"-20 Nylon Lock Nuts | |
| • (1) 2" x 48" Continuous Hinge | |
| • (1) 2" x 24" Continuous Hinge | |
| • (2) 2" x 13" Continuous Hinges | |
| • (12) Shelf Pins | |
| • (1) 48" Kreg Top Trak | |
| • (1) 24" Kreg Top Trak | |
| • (1) Kreg Swing Stop | |
| • (1) Left-to-Right Self-Adhesive Tape | |
| • (1) Right-to-Left Self-Adhesive Tape | |

fence Assemblies

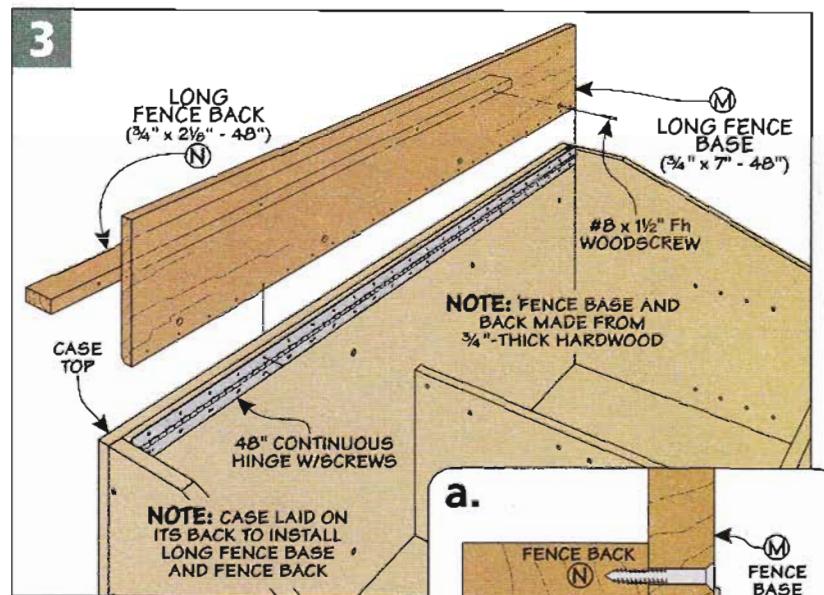
For me, the best feature of the miter saw station is the flip-up fence system. When you're ready to use each fence, just release the catch, flip up the fence, and pivot the support arms out to provide solid support. To store the fences and free up the storage and work area, rotate the support arm and tuck the fence inside the cabinet.

You can start with the fence assembly on the larger cabinet, but the process is almost the same on the smaller cabinet.

FENCE ASSEMBLY

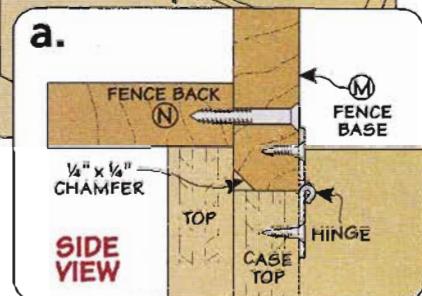
To make it easier to build the fence assemblies, I placed the cabinets on their backs. This makes the process of aligning and installing the fence base, back, and all of the related components foolproof.

Continuous Hinge. You'll start by attaching a continuous hinge to the cabinet (Figure 3). I centered the barrel of the hinge along the



edge of the case top, as shown in Figure 3a at right.

Assembly. You can see in the drawings above how the hinge forms a pocket for the fence base. All you need to do is cut the base to size then chamfer the top, back edge. This chamfer provides clearance for pivoting the fence into position for use. Just slip the fence base into the pocket formed by the hinge and attach the hinge.



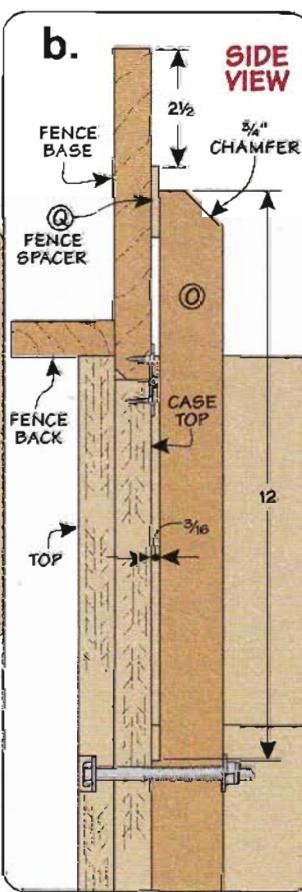
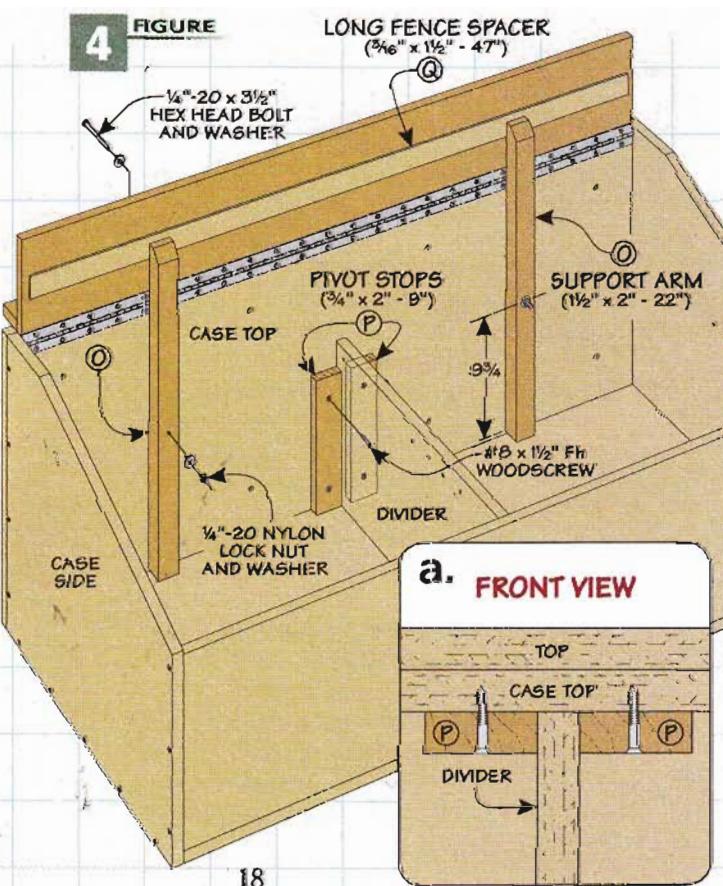
Adding the Fence Back. The most difficult part of building the fence is done. To add the fence back, simply lay it on the front edge of the top and clamp it to the base. The cabinet top and fence base automatically locate the back in the proper position.

With the back clamped in position, you can predrill the screw holes to attach it. Then, add some glue and fasten it in place.

SUPPORT SYSTEM

Now that the fences are in place, you can check the operation of each fence by swinging it into the cabinet and back out again. The next task involves putting together a system for supporting the fences during use. This includes installing pivoting support arms, stops, and spacers to ensure the fences stay level and square.

Support Arms. The large cabinet has two support arms while the small cabinet only has one. Figure 4 shows you how they're made. I started by cutting a blank to size and cutting a bevel on one end to knock off the sharp corner. To provide clearance for the hinge barrel when pivoting the arm, I



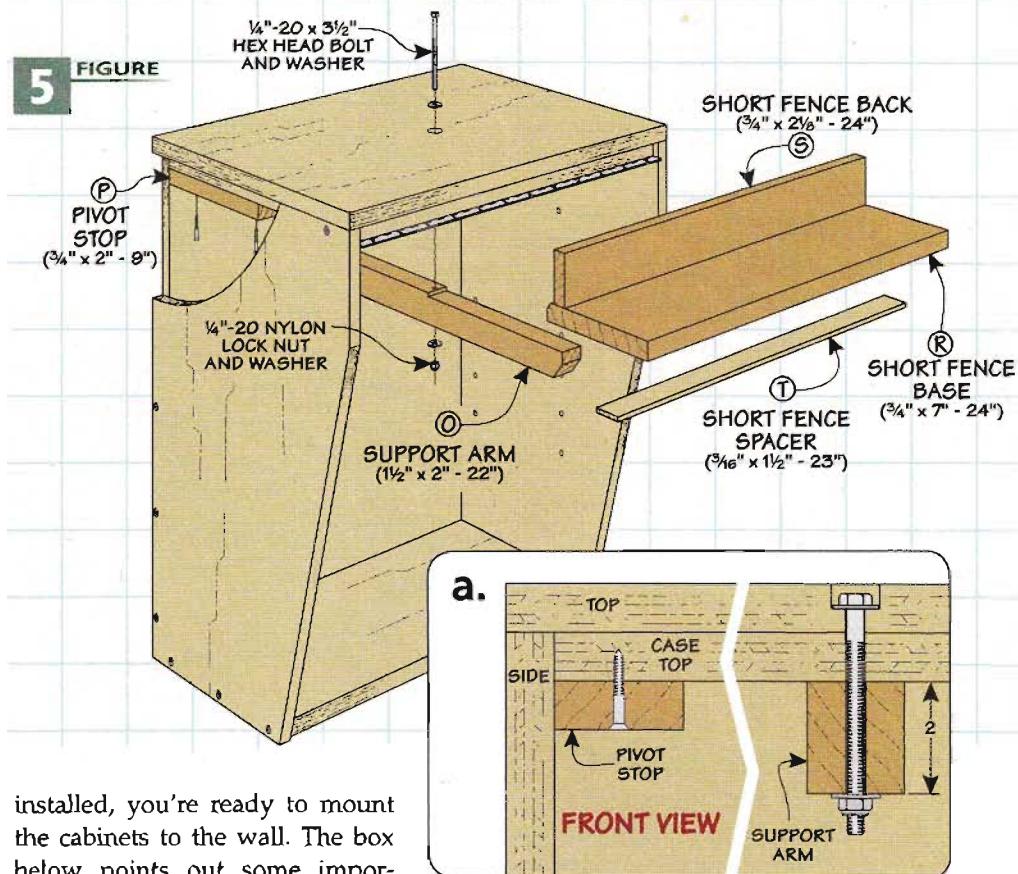
used a dado blade to cut the shallow relief on one end (Figure 4). After drilling the hole for the pivot bolts, mount each support arm into the cabinet with a hex bolt, washers, and lock nut.

Pivot Stops. Two simple blocks keep the support arms from rotating too far into the cabinet when lowering the fences. A couple of small pieces cut to size are all you need here. Then just fasten them in place with a couple of screws.

Spacer. The key to accurate and repeatable cuts with a miter saw lies in the fence assemblies. When they're locked in position, the base of the fence needs to be parallel to the cabinet top and the fence back should be aligned with the fence on your miter saw. (I'll talk more about this later.)

To ensure the fences are properly positioned and aligned, I added a thin spacer under the fence base. When the arms are extended, the spacer determines the final resting spot for the fence. So take your time to fine-tune the thickness of the spacer before attaching it to the fence base. (The thickness of my spacer was $\frac{3}{16}$ in.)

Installing the Cabinets. With the fence and support assemblies



installed, you're ready to mount the cabinets to the wall. The box below points out some important things to keep in mind as you mount the cabinets to a wall. You'll want to have a long, reliable straightedge and level handy.

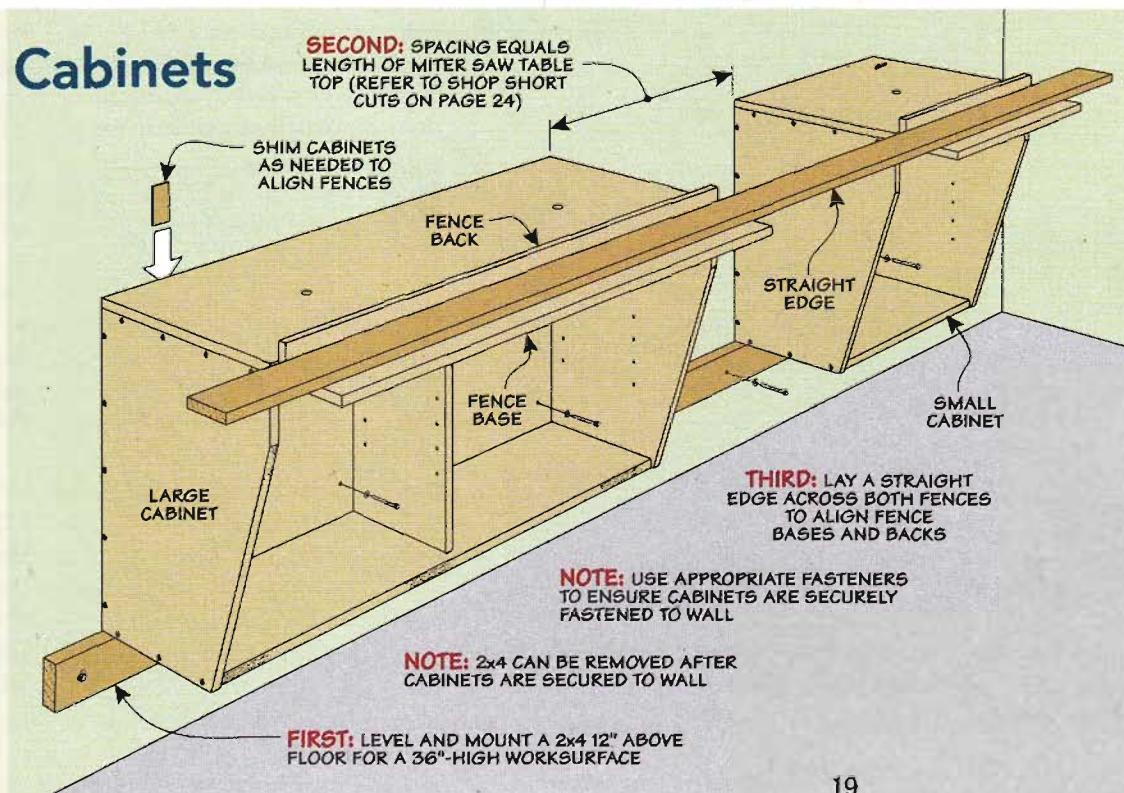
Here's the summary of what you're looking for: The cabinet tops should be level and aligned with one another. When the fences are rotated up and the support

arms engaged, the fence bases on the two cabinets should be aligned. This goes for the fence backs, as well. This becomes important later when you align the saw's fence to the cabinet fences. Use shims (if needed) to align everything before securing the cabinets to the wall.

Mounting the Cabinets

Before securely mounting the cabinets to the wall, there's one thing you need to know — the size of the platform needed to mount your saw between the cabinets. To help determine this dimension using your saw, refer to Shop Short Cuts on page 24.

With a long straightedge and level, take your time to shim and adjust the position of the cabinets until their tops and fences are aligned. This process may take some time, but the reward comes later when your saw is installed and you start using it. The accuracy will be built-in.



Miter saw Platform

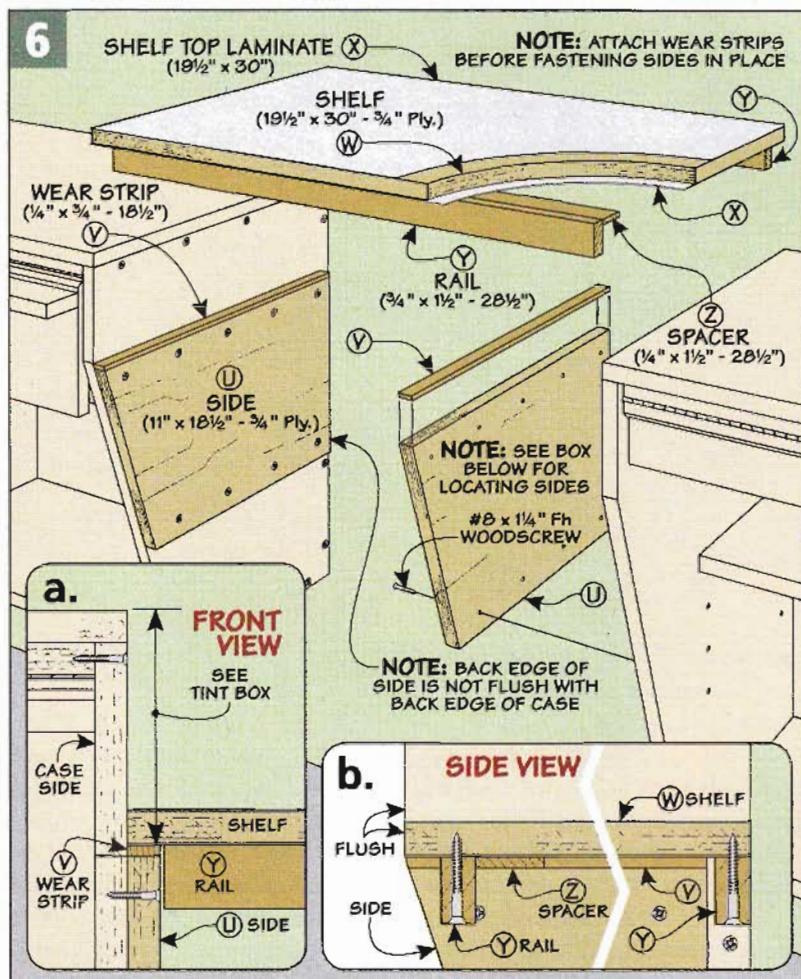
The two cabinets provide a solid foundation for the saw platform. The platform starts with a plywood shelf that holds the miter saw. It slides in slots formed by a pair of sides and upper guides, as shown in Figures 6 and 7.

When extended for use, the shelf aligns the fence on the saw with the backs of the cabinet fences. Two folding wings support the shelf and act as stops to lock it solidly in position. The shelf slides back against the wall for storage.

BUILDING THE PLATFORM

I'll step you through the process of building the platform, starting with the shelf assembly. Since it's custom-fit to your miter saw, the dimensions may vary. But if you take it one step at a time, you won't have any problems making it all come together. You'll start by making the sides, then adding the shelf and upper guides.

Making the Sides. The platform sides are tapered to match the taper of the cabinet sides, like you see in Figure 6. Before attaching them, I glued a thin strip of



hardwood along the top edge to act as a wear strip. I used maple.

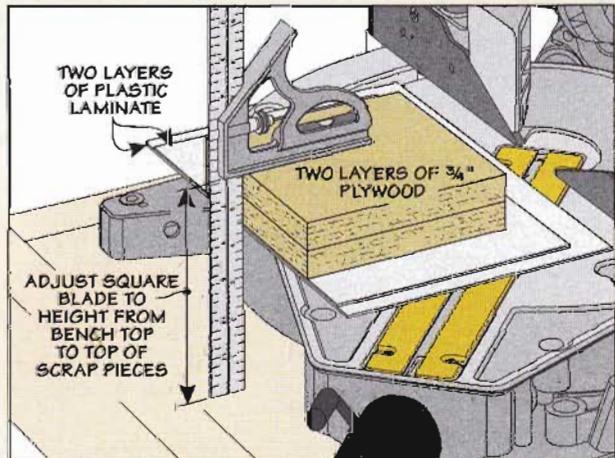
Custom Installation. There's one other dimension that will be determined by your saw — and that's the position of the sides. This is determined by the height of your saw's base, as you can see in

Figure 6. The box below shows a trick I used to arrive at this dimension. This process aligns the top of your saw table with the fence bases. It takes into account your saw's base plus the thickness of the shelf, laminate, and cabinet top.

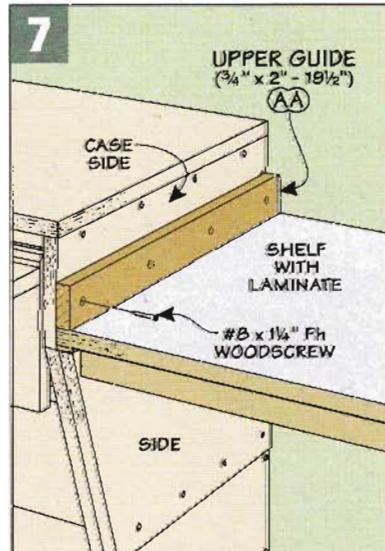
Attaching the Sides. Using this combination square setting, you can mark the location of the top edge of the sides on the cabinets. Then it's a simple matter of attaching the sides with screws, aligning the front edge flush with the cabinet. There should be a gap at the back for sawdust relief as you slide the shelf back for storage. And speaking of the shelf, you'll start on that next.

Sizing the Shelf. The width of the sliding shelf is determined by the saw, as shown in Shop Short Cuts on page 24. The width shown in the drawings was designed for a 10" saw. And the overall depth of the platform should be adequate

Locating the Sides



Accurate Measurement. Scraps of plywood and two layers of plastic laminate help determine the dimension needed to locate the sides for your saw.



for most sliding compound miter saws. The distance from the back of the saw carriage (when pushed back) to the front edge of the saw base is about 29" for my saw.

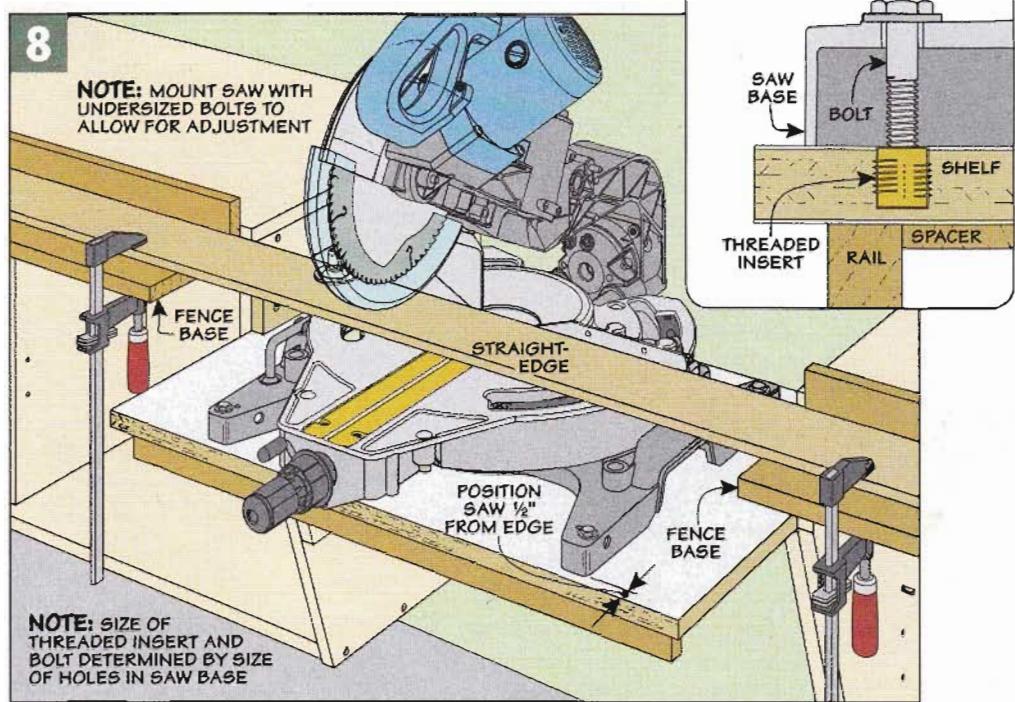
Laminated Construction. To allow the shelf to slide more easily, I added plastic laminate to the top and bottom before cutting it to size. You're aiming for a smooth, sliding fit between the cabinets.

Rails & Spacer. Attached to the bottom of the shelf are two support rails and a spacer. These parts are cut $1\frac{1}{2}$ " shorter than the width of the shelf to provide clearance for the sides. Now attach the rails and spacer to the shelf with screws.

Upper Guides. With the shelf in place, it's an easy task to install the upper guides. I simply rested them on the shelf while attaching them to the cabinets with screws, as shown in Figure 7.

MOUNTING THE SAW

At this stage, you're ready to mount the saw on the shelf. The first thing to do is place your saw on the shelf with the base



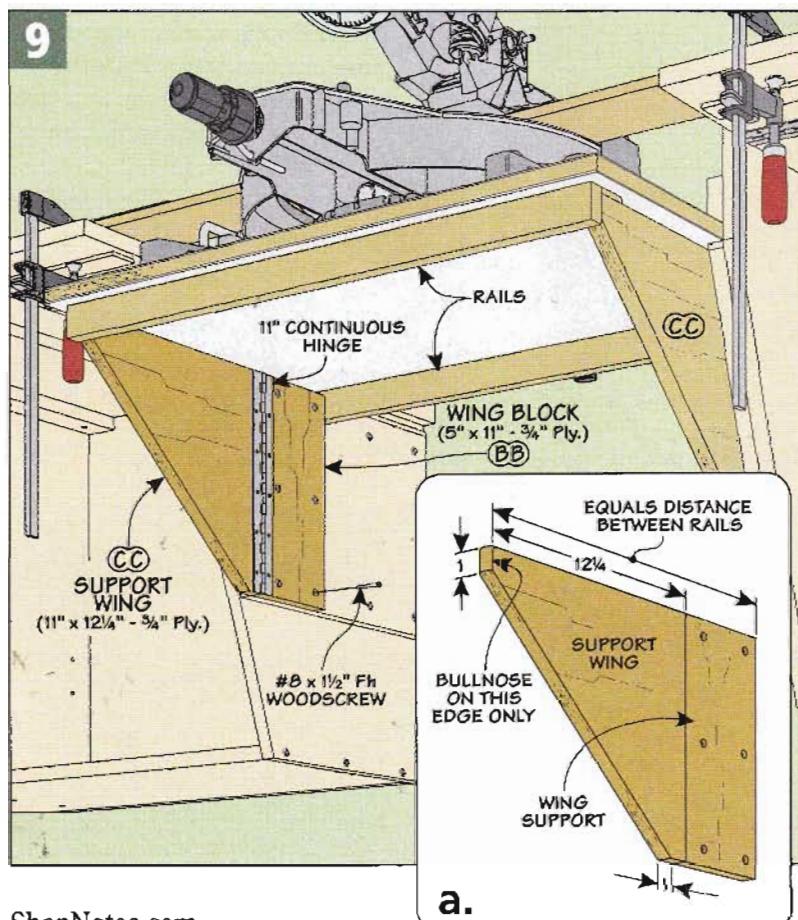
about $\frac{1}{2}$ " back from the front edge and centered left to right. Use a long straightedge to adjust the position of the shelf and saw so that the fences align (Figure 8). Note: You may need to clamp the table in position or add a temporary support for the front edge.

Mark & Drill. At this point you can use the holes in the saw base as a template to locate the threaded inserts. After installing the inserts, simply fasten the base with bolts.

Support Wings. In Figure 9 below, you see how the shelf is supported during use by a pair of wings. Plus, they act as stops to automatically position the saw's fence in line with the cabinet fences when extended.

Two-Piece Assembly. To make the wing assembly, cut the rectangular support block to size first. The wing is attached to this block with a continuous hinge. But before you cut the wing to size, you need to measure the distance between the rails on the underside of the shelf. The total width of the wing and support block should match this distance. After this is done, you can install the hinge that connects the wing to the block.

Wing Attachment. With the table extended (Figure 8), attach the wing assemblies to the sides, as shown in Figure 9. The only thing to keep in mind is that the wing should fit tight against the spacer and the assembly should be level. Now you can remove the clamps and test the operation of the wings and table assembly.

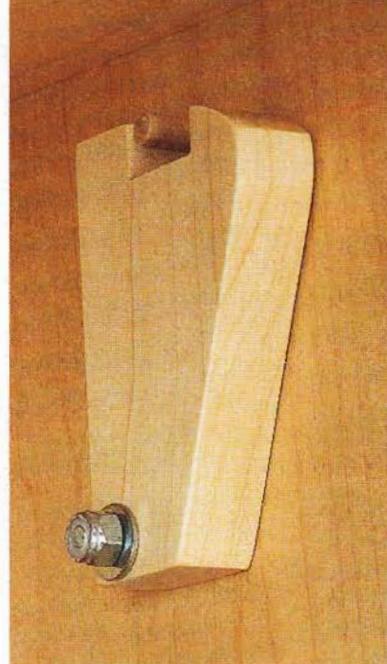
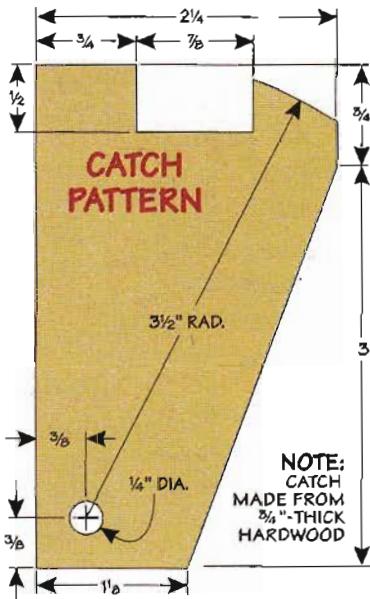


final Details

There are just a few things left to complete the fences. The first is to add a pivoting catch inside each cabinet. Then you'll add accessories to both fences to make using your miter saw more accurate. And if you're concerned about dust collection, you can add the dust hood shown on the next page.

Fence Catch. You'll start by adding the two fence catches. You can see one in the drawing and photo at right. It holds the fence inside the cabinet when stored.

The way the catch works is automatic. As you fold the fence into the cabinet, the fence forces the catch to pivot back. Then as the fence base rotates beyond the top of the catch, the catch pivots forward to trap the fence base. To release the fence, all you need to do is rotate the catch back slightly to



▲ **Automatic Catch.** The simple pivoting catch "grabs" and holds the fence in the stored position.

let the fence drop down. The lower drawing shows how it works.

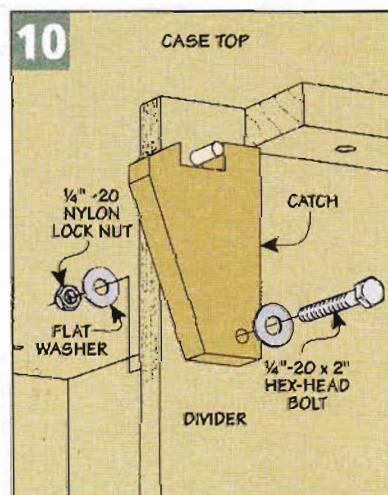
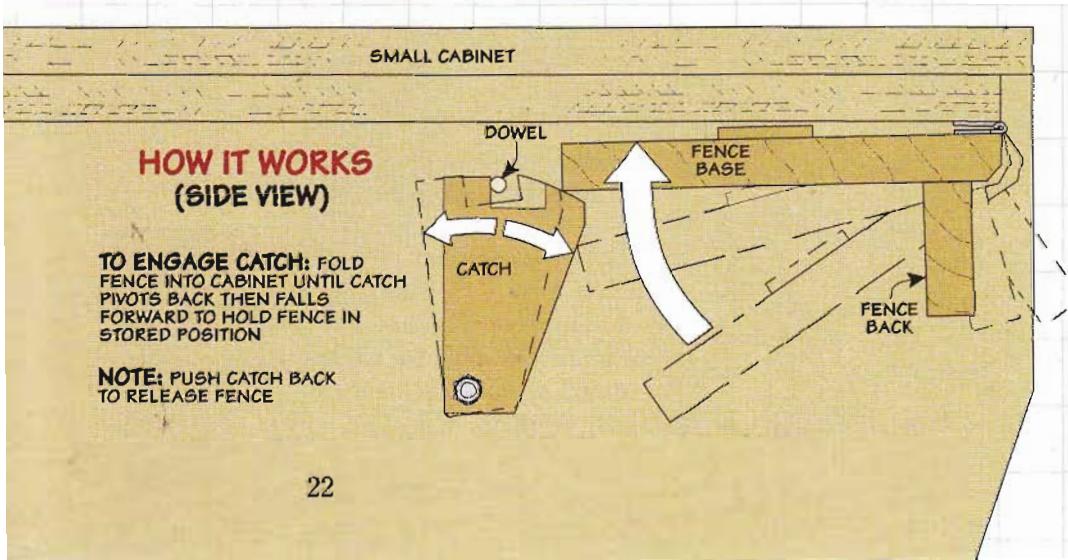
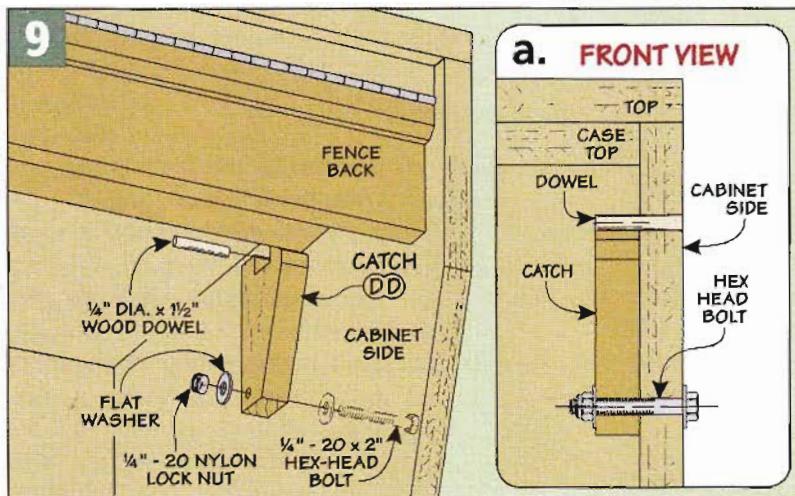
Shaping the Catch. The drawings on this page give you all the details for making and installing the two catches. I started with a rectangular blank and used a dado blade to cut the 7/8" notch. After drilling the pivot hole, the rest of

the shape was cut at the band saw and sanded smooth.

Mounting. You already drilled the two holes necessary to mount the catches. One catch attaches to the divider of the large cabinet. The other is mounted to the side of the small cabinet (Figure 9).

The upper hole is used for a short length of dowel. This dowel sits inside the notch of the catch to limit the catch's travel. When you install the bolt, washers, and lock-nut, you'll want to be sure the catch still pivots freely.

Fence Accessories. After the catches are installed and operating smoothly, you can turn your attention to the fence accessories. You can use any fence and stop



system, but the one shown here is made by Kreg. Their Top Trak and Swing Stop mounts to the fence backs (right photo).

After mounting the track, you'll want to install a measuring tape on each fence so the stop will correctly indicate the distance from the blade. I used a measured workpiece to align the tape and calibrate the cursor (inset photo).

Unbeatable Results. Finally, you're ready to put the system to the test. I think you'll find that having a dedicated workstation for your miter saw gives you better and more precise cuts with less frustration. And those are big benefits in my book. ☺



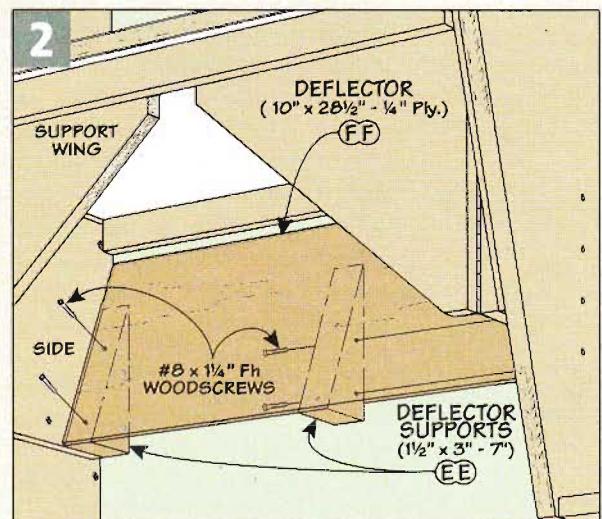
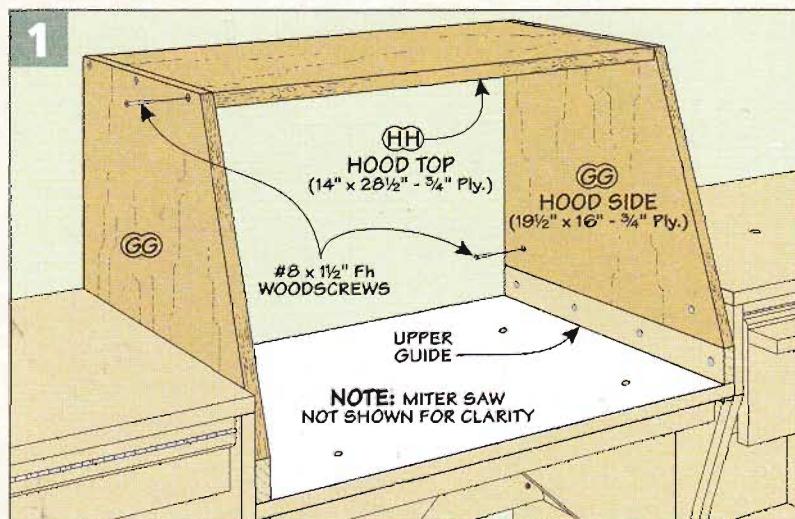
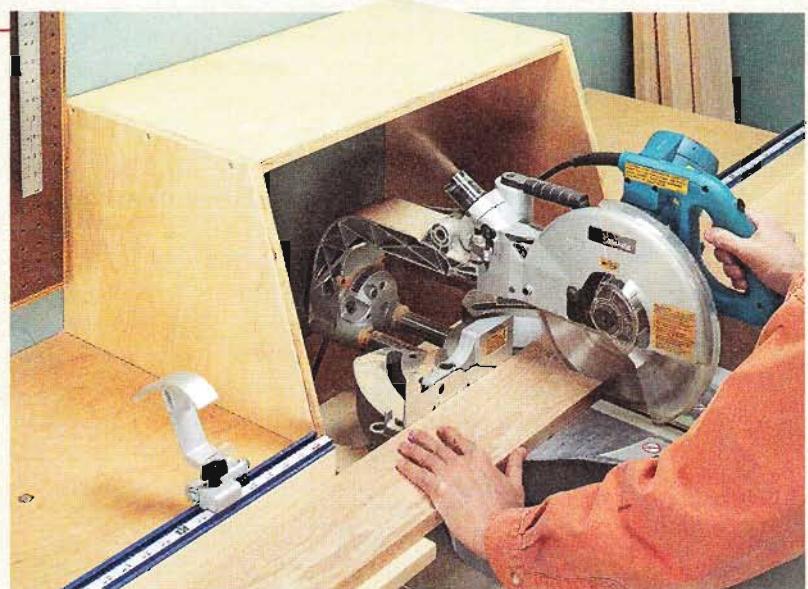
▲ **Adding a Tape and Stop.** Using a predetermined length of stock makes it easy to locate and install the measuring tape and stop. After that, the cursor can be calibrated to the blade.

Optional Dust Hood

One drawback with a miter saw is the volume of sawdust it creates. It doesn't take long before it's everywhere. To help control this, check out the two-part dust collection system shown here.

The first part of the system consists of a hood that sits between the cabinets and rests on the upper guides for the shelf. The idea here is to redirect the sawdust down below where it can be caught in an inexpensive plastic tote (refer to page 14 and Figure 1 below). Note: You may have to increase the height of the sides to provide clearance for your saw.

The second part of the system, the dust deflector (Figure 2), sits below the shelf. Two wedge-shaped supports are fastened to the sides and hold a plywood panel. As the sawdust falls from above, it's directed into the tote for easy disposal.



Shop Short Cuts

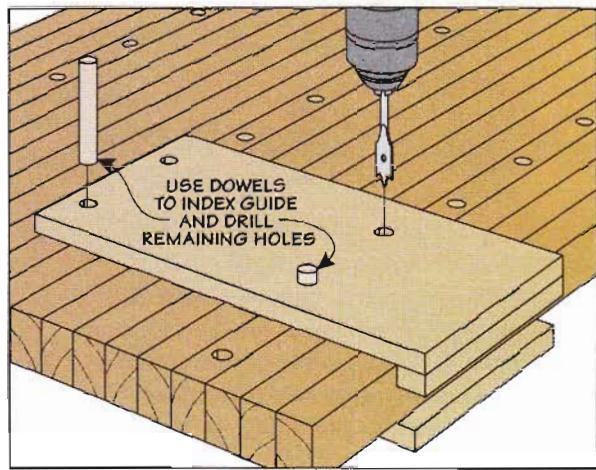
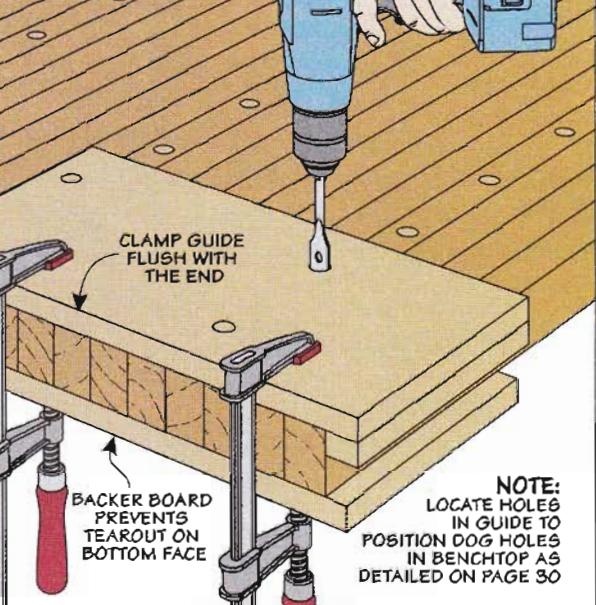
Drilling Bench Dog Holes

There are a few things to keep in mind when you drill holes in the benchtop on the shop cart on page 26. First, you want each of the three rows to be straight. Then the rows need to be parallel and each set of holes need to be aligned. Finally, the holes should be drilled square to the benchtop. That's a lot to keep track of.

To take some of the hassle out of drilling the holes, I made the drilling guide you see in the drawings above and at right. The guide helps keep the spade bit square to the surface and sets the spacing of both the holes and rows on the benchtop.

The guide is just a piece of plywood with two sets of guide holes. I drilled these at the drill press to make sure they'd be square. A cleat on one edge of the guide registers it against the side of the benchtop.

I used a couple of clamps to prevent the guide from shifting during use. And I placed another piece of

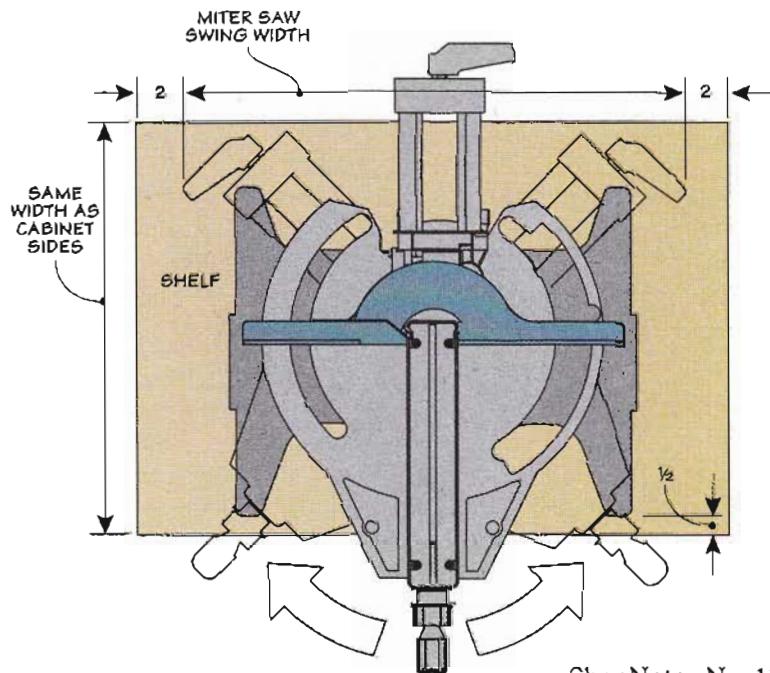


plywood on the bottom face of the benchtop to prevent tearout as the bit exits. To accurately position the guide after drilling the first set of holes, slip a couple of dowels through the guide (drawing above).

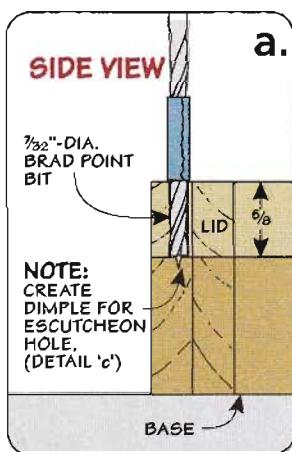
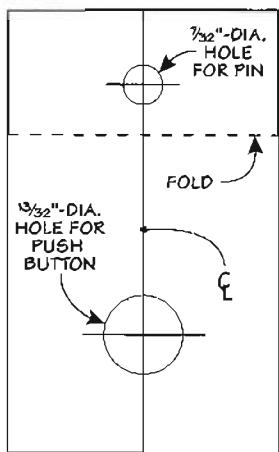
Shelf Size

Sizing the shelf (and therefore the distance between the cabinets) on the miter saw station (page 14) depends on the clearance needed for your miter saw. The drawing at right shows what I mean.

First, place the saw on a large, flat surface. If your saw is a slider, push the carriage all the way to the back. Now, pivot the carriage in each direction until it stops. Use a square to mark the furthest point from the center of the saw base. Now remove the saw and size the shelf using the distance between the marks, plus 4" for clearance.



FULL-SIZE TEMPLATE



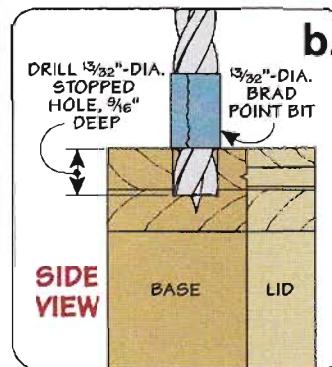
SECOND:
DRILL HOLE
FOR LATCH
PIN

FIRST: ATTACH
TEMPLATE WITH SPRAY
ADHESIVE CENTERED ON
CLOSED LID

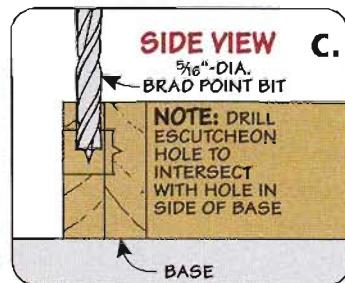
THIRD:
DRILL STOPPED HOLE
ON FRONT OF CASE
FOR PUSH BUTTON
(DETAIL 'b')

USE MASKING
TAPE AS DEPTH
STOP FOR
BIT

LATCH TEMPLATE



FOURTH: DRILL HOLE FOR
ESCUTCHEON USING DIMPLE,
REFER TO DETAIL 'c'



Latch Installation

The latch for the portable clipboard storage case shown on page 36 is easy to use and holds the lid securely. The only problem is, the installation instructions that came with it leave a little to be desired.

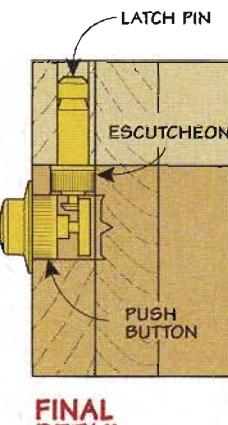
To make the installation easier, I came up with a paper template, as shown in the drawing above left. One other thing, you'll need to add the latch before the top and bottom frames are installed.

Template. The latch has three parts, as you can see in the margin drawing. But, the template only has holes for the pin and push button. As you'll see, when you drill the through hole for the pin, the brad point bit leaves a dimple in the edge of the base where the hole for the escutcheon is located.

Lay Out & Drill. To use the template, fold it as shown and attach it to the closed case with some spray

adhesive or tape (drawing above). Then drill a through hole that's slightly deeper than the thickness of the lid (detail 'a').

Before using the dimple to locate and drill the hole for the escutcheon, drill a stopped hole for the push button (details 'b' and 'c'). The push button and escutcheon are a friction fit, but I found it best to use a little epoxy on all the parts to secure them in place.

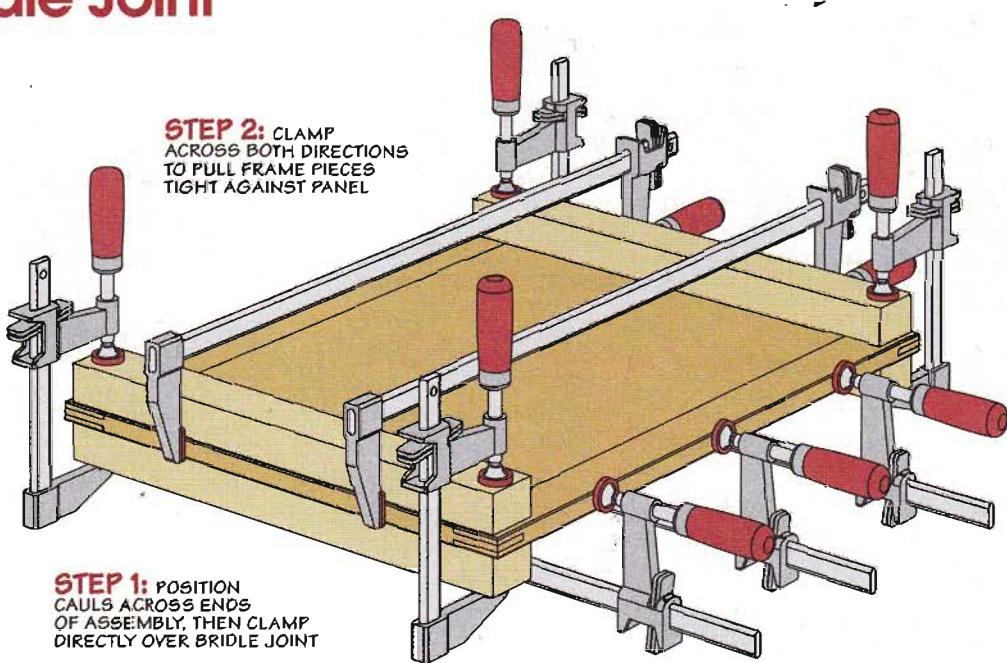


FINAL
DETAIL

Gluing Up a Bridle Joint

There are a few challenges with gluing up the top and bottom frame and panel assemblies for the clipboard case on page 36. First, you need to pull the frame pieces tightly against the edges of the panel. Second, it's important to clamp directly across the bridle joint. And finally, you need to avoid bowing the assembly as clamping pressure is applied.

The solution I used is shown at right. A pair of clamps in each direction pull the frame pieces tight to the panel. And to ensure that everything stayed flat while clamping the bridle joint, I added a pair of clamping cauls across each end of the assembly. ☐



storage solutions



multipurpose **Shop Cart**

Heavy-duty design, large worksurface, and loads of storage add up to a versatile project.

It's a good idea to have an extra worksurface in the shop for assembly, finishing, or just to have a place to stack parts and supplies. The trouble is you don't always need it in the same place every time. That's where this cart comes in. The solid-wood top provides a generous amount of space to work. It rests on a stout

base that's built to stay strong and stable for years. The heavy-duty casters allow you to smoothly roll the cart wherever you need it. And finally, it has a storage cabinet and a pair of pegboard racks to keep tools and supplies close at hand. In fact, this sturdy cart would be a great rolling workbench for a small shop.

Exploded View Details

OVERALL DIMENSIONS:
31½"D x 40¾"W x 36¼"H

LAMINATED, EDGE-GRAIN
TOP INCREASES STABILITY
AND WEAR-RESISTANCE

ENDS OF CART
ARE ASSEMBLED
WITH BRIDLE JOINTS

STORAGE CABINET
SLIDES INTO BASE AFTER ASSEMBLY

TOP OF CABINET
ACTS AS A SHELF FOR
ADDITIONAL STORAGE

NOTE: CART BASE AND
TOP ARE MADE FROM
INEXPENSIVE "TWO-BY"
CONSTRUCTION LUMBER

FULL-EXTENSION METAL
DRAWER SLIDES ALLOW
EASY ACCESS TO THE
ENTIRE DRAWER

THREE ROWS
OF BENCH DOG HOLES
GIVE YOU VERSATILE
CLAMPING OPTIONS

NOTE: WIDE OVERHANG
ON TOP ALLOWS YOU
TO USE CLAMPS TO
SECURE A WORKPIECE

NOTE: BACK OF CABINET
IS OPEN TO PROVIDE
KNEE ROOM WHEN SITTING
(PHOTO BELOW)

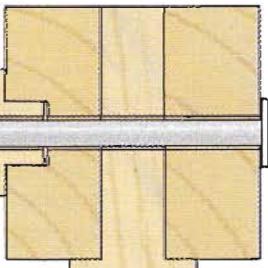
CART IS BUILT
WITH HEAVY-DUTY,
KNOCK-DOWN JOINERY
(DETAIL 'a')

FOOT
RAIL

LARGE, LOCKING CASTERS
ROLL OVER CRACKS
AND DEBRIS, YET LOCK
TO CREATE A STABLE
WORKSTATION

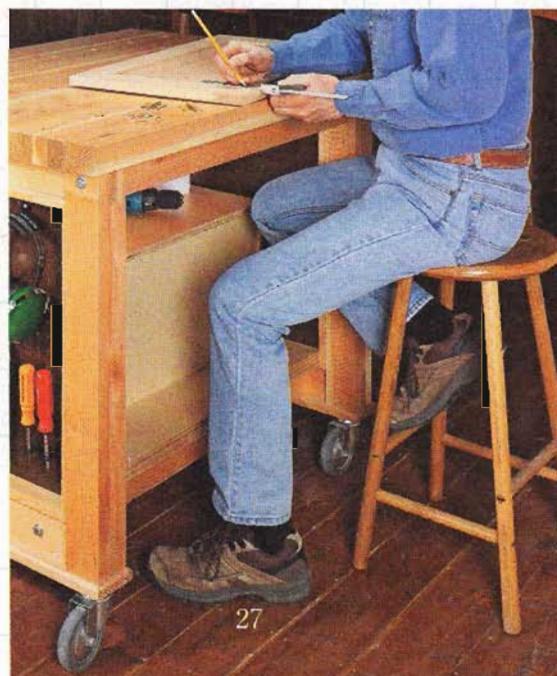
PEGBOARD RACK
PROVIDES
EASY-ACCESS
TOOL STORAGE

a. BED BOLTS THREAD
INTO CROSS DOWELS
IN STRETCHERS



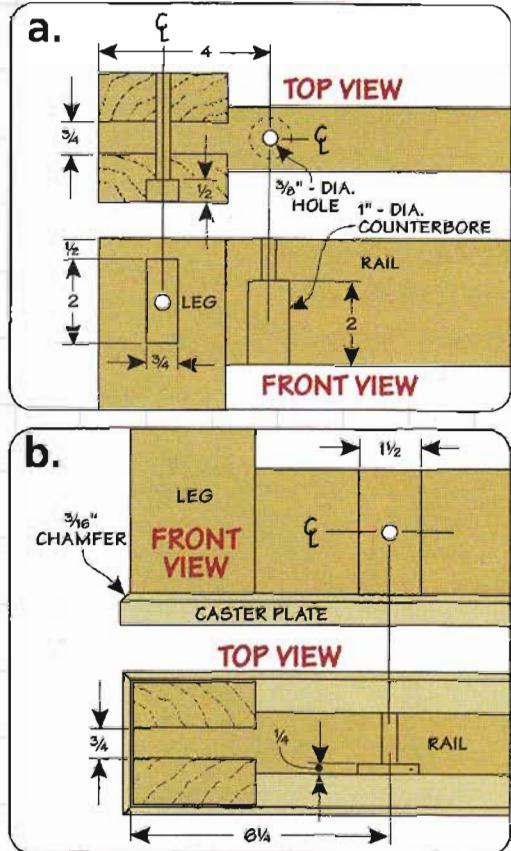
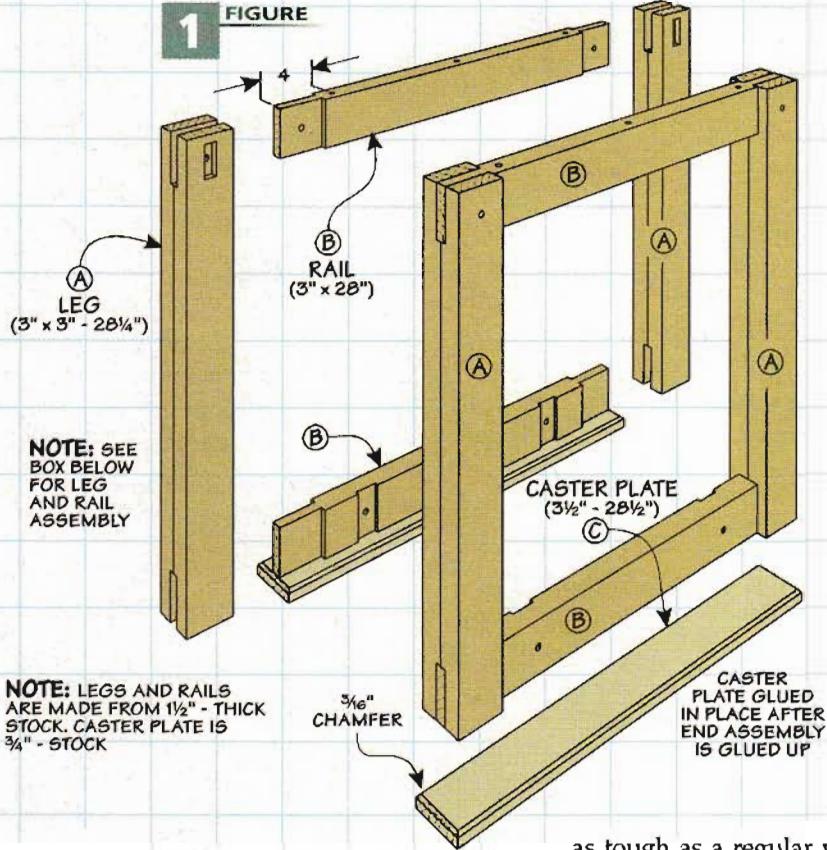
NOTE: FOR
HARDWARE SOURCES,
REFER TO PAGE 51

► **Open Back.**
Inset stretchers
and a shallow
storage cabinet
give you leg
room at the
back of the cart.



ShopNotes.
GO ONLINE
EXTRAS

To download a free
cutting diagram for the
Shop Cart, go to:
ShopNotes.com



heavy-duty Base

The core of the cart is the base. I had a few goals in mind when making it. The most important one is that it should be strong and rigid — and stay that way for years to come. As I said earlier, this cart can be a rolling workbench, so it should be just

as tough as a regular workbench, too. To do this, I made the base from thick solid-wood parts and traditional joinery — mortise and tenon, and bridle joinery.

Rolling around uneven floors puts a lot of stress on the frame of a cart. So my second goal was to make the base easy to tighten up if things start to get wobbly. To do this, I used a set of bed bolts to secure some of the joints instead of glue. With just a few twists of a

wrench, you can snug up the joinery if necessary. A side benefit of this system is that it makes assembling the base a breeze.

The final goal is that I didn't want to spend a lot of money on materials. So I used ordinary construction lumber (Douglas fir).

End Frames. In Figure 1, you can start to see how all this comes together. The base is made up of a pair of end frames that get connected by a set of stretchers and aprons. Each frame consists of a pair of legs and a pair of rails assembled with bridle joinery.

Thick Legs. The thick legs that support the cart are 3"-square posts. They have an open mortise cut on each end to accept the rails. To create the legs, I glued them up from two pieces. This also makes it easier to make the open mortises. For more on the joinery, take a look at the box at left.

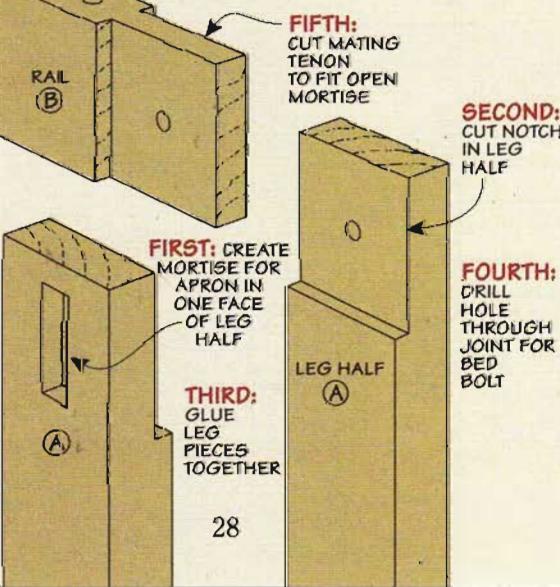
End Rails. Once the legs are complete, the next task is the connecting rails. Each end rail has a tenon on the ends that fits the open mortise in the legs.

In addition, the upper rails have some deep, counterbored holes

Leg & Rail Joinery Details

The key to creating the leg to rail joinery is doing things in the right order. It will make the joints tighter and more accurate to align.

Start by cutting a mortise in one leg half. Then cut a shallow notch on each half. When you glue the halves together, it will create the open mortise for the bridle joint. Next, you can drill the bed bolt hole through the mortise at the drill press. After cutting the mating tenon on the rails, you can complete the hole with a hand drill.



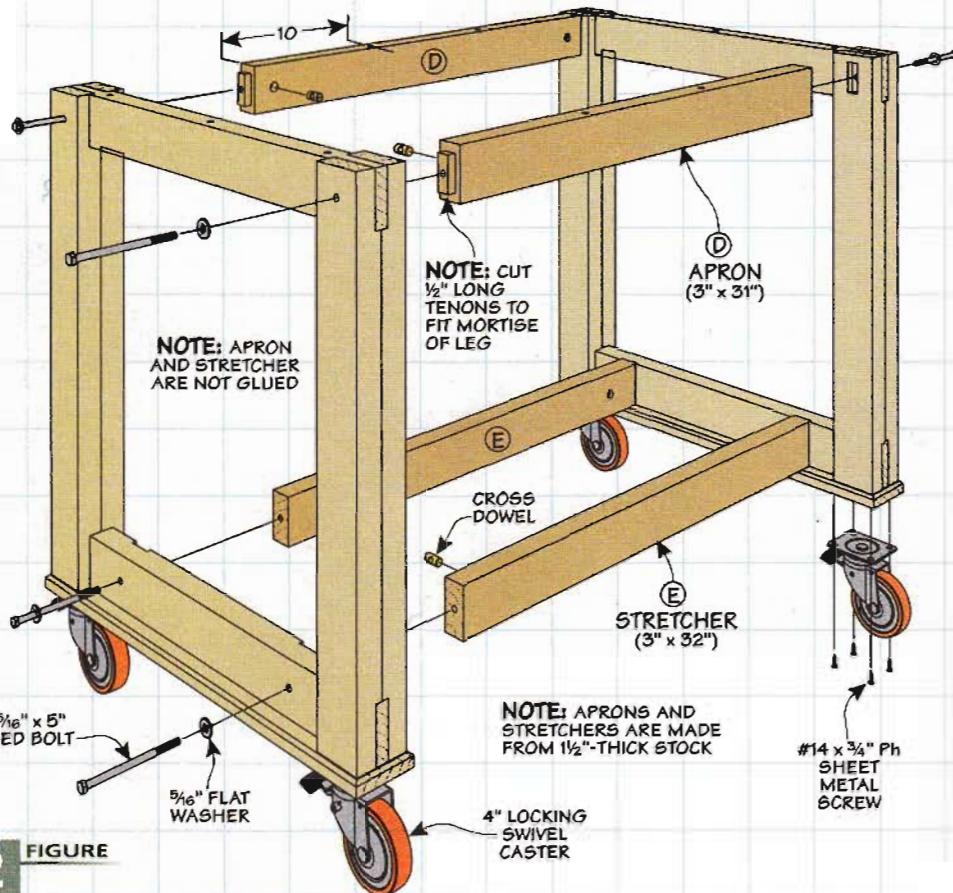


FIGURE 2

that are used to attach the bench-top later on, as in Figure 1a.

At the bottom, the lower rails have a pair of dadoes cut on the inside faces. These dadoes accept stretchers that stiffen the lower part of the cart. There's also a hole through each dado to hold a bed bolt, as you can see in Figure 1b. I drilled these holes at the drill press so they were straight.

When you're ready to assemble the end frames, there are a few things to keep in mind. First, make sure the rails seat snugly in the mortises and at the shoulders. Then check that the assembled frame is flat and square.

Caster Plate. The last item to complete on each end frame is to make and attach a plate. This provides a solid mounting surface for the casters, as in Figure 2. The only detail to note is a small chamfer on the top edges (Figure 1b).

Stretchers & Aprons. Connecting the end frames are a set of aprons and stretchers. They're held in place with bed bolts (Figure 2). This technique doesn't require glue or clamps. The aprons have a tenon on each end to fit the

mortise on the legs, as illustrated in Figure 2c. And like the upper rails, the aprons are drilled and counterbored to accept the bench-top. The stretchers at the bottom of the cart are simply sized to fit in the dadoes in the lower rails.

The next step is to drill the aprons and stretchers to accept the special bed bolt and cross dowel hardware, as shown in the

right margin. You can find sources for the hardware on page 51. What's important here is that the holes intersect in the right spot. The box at the bottom of the page shows you how it's done.

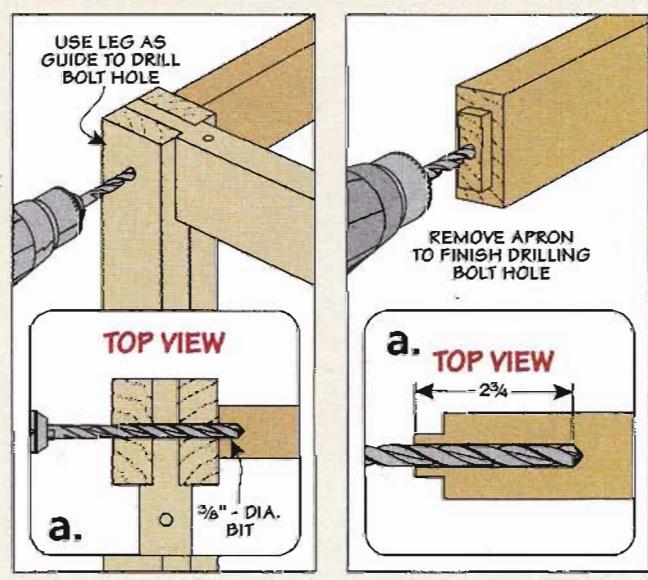
This completes the joinery work on the base. So the base can be assembled. The last thing to do is install the casters.

▲ Solid Assembly.
The base is held together with a set of bed bolts.

Drilling for Bed Bolts

Installing bed bolts to assemble the base of the cart involves nothing more than drilling a few holes. You just need to make sure they're aligned. To do this, you can use the holes you drilled in the legs and lower rails as a guide (detail 'a' in the left drawing at right).

The drill bit isn't long enough to complete the hole. So you need to remove the apron and continue drilling to final depth (far right drawing). Finally, at the drill press, drill the intersecting hole for the cross dowel.



you insert and remove bench dogs and other hold-downs.

Attaching the Top. Using solid wood for the top does have another challenge — accommodating seasonal wood movement. An edge-grain panel won't move as much as a plank-type top, but you still need to allow for it.

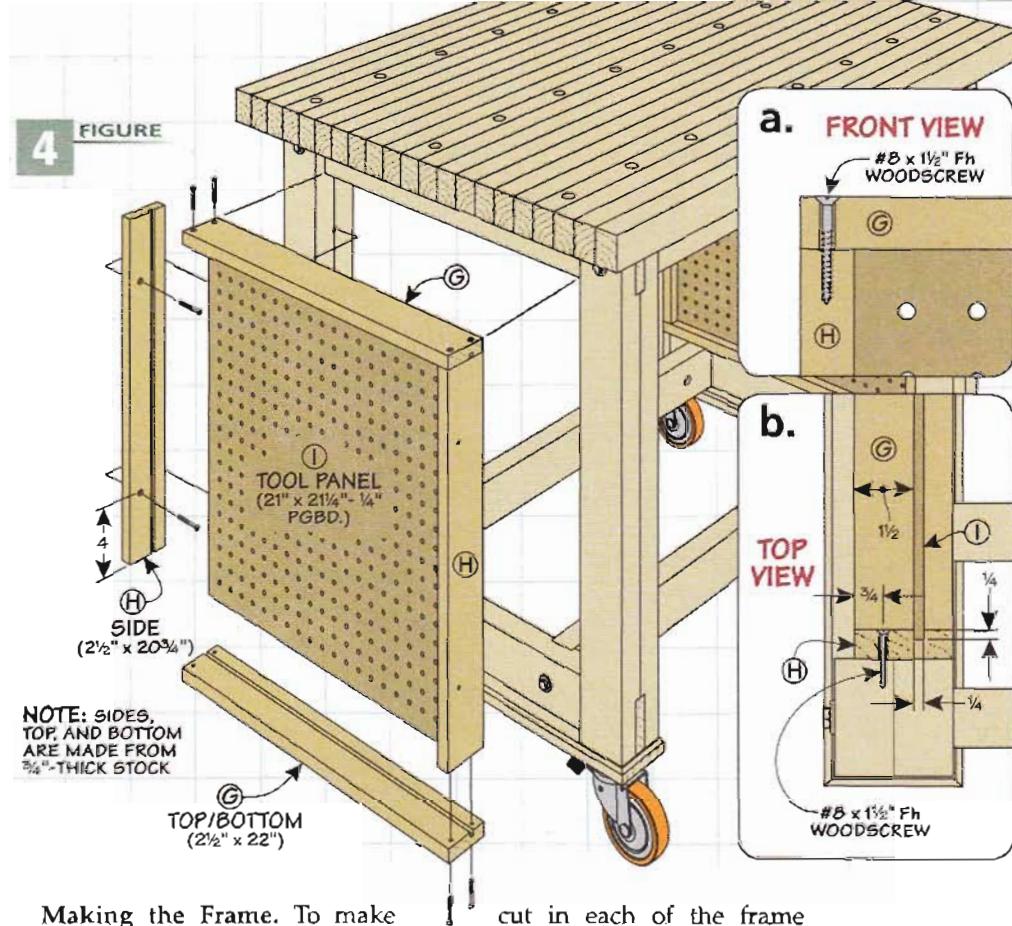
The top is secured to the cart base with long lag screws and washers. The screws are seated in the holes you drilled earlier in the rails and aprons. These holes are slightly oversized (Figure 3a). This allows the screws to move with the top as it expands and contracts.

That wraps up the major construction of the shop cart. And you can use it just as it is. But I wanted to take advantage of the space in the base to add some storage.

TOOL STORAGE RACKS

One way to build in some storage space is to add some pegboard tool racks to each end assembly. The racks are simply wood frames that wrap around a pegboard panel. The frame not only stiffens the panel but also provides an easy way to attach the rack to the base, as illustrated in Figure 4.

4 FIGURE



Making the Frame. To make the racks, size the frame pieces to create a snug fit in the opening in each end assembly. Then cut the top and bottom pieces to fit between the legs in the base. Finally, cut the sides to fit between the top and bottom. To accept the pegboard panel, there's a groove

cut in each of the frame pieces, as in Figure 4b. The rack is assembled with glue and screws (Figures 4 and 4a).

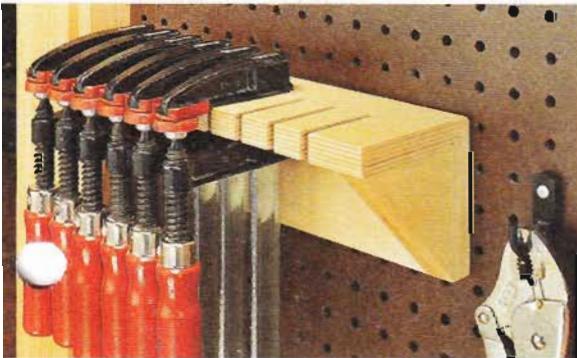
After assembly, the racks can be screwed to the base, as you can see in Figure 4b. In the lower photos below, you can see some options for storing tools and supplies.



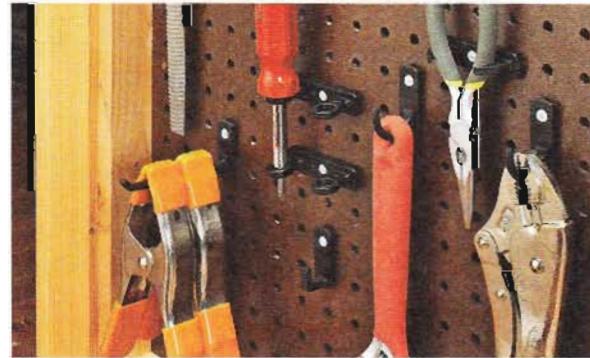
◀ **Clamping.** A round brass bench pup and a threaded Wonder Pup create a handy "bench vise."



◀ **Hold-Downs.** These cam-activated hold-downs secure a workpiece and allow you to reposition it quickly.



◀ **Racks.** You can make plywood shelves and racks to store all kinds of tools on the pegboard racks.



◀ **Hooks.** Reinforced plastic hooks lock into the pegboard so you never have to worry about them falling out.

storage Cabinet

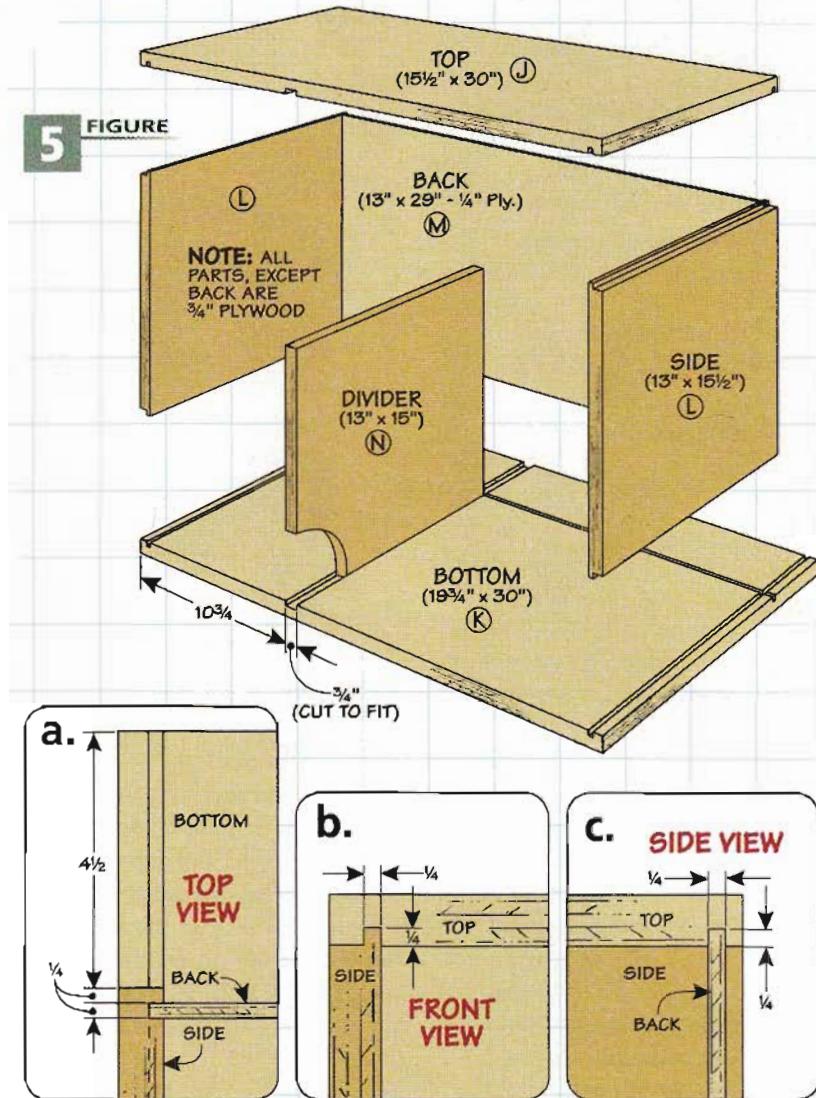
The open space created by the base of the cart is the perfect place for adding even more storage. The small cabinet you see in Figure 5 has a few interesting features. To provide several storage options, the cabinet contains two drawers and a door. And you can even use the top of the cabinet as a shelf to keep items within easy reach.

CASE

There's a lot of open space in the base, so it's tempting to fill it completely with a storage cabinet. But I built the case of the cabinet relatively shallow. There are a couple reasons for this. First, it's too easy for things to get lost in the back of the door side of the cabinet. And, it provides leg room on the back side to allow me to sit at the bench on a stool while I'm working.

Top & Bottom. I built the cabinet starting with the top and bottom. Each piece has a few dadoes and grooves to hold the sides, divider, and back, as in Figure 5.

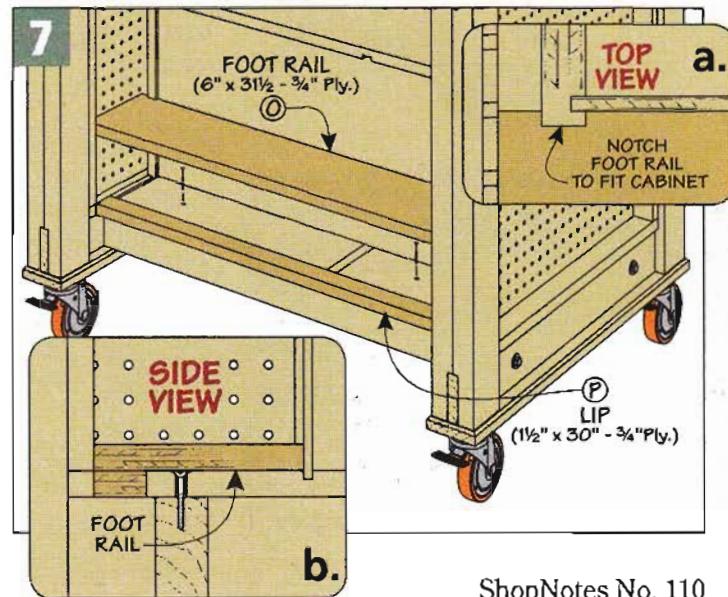
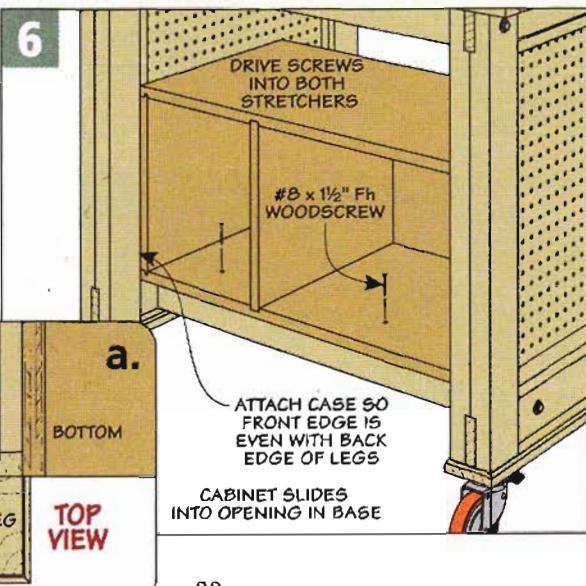
To keep the setup straightforward, I sized the dadoes for the sides and groove for the back to match the thickness of the $\frac{1}{4}$ " plywood that makes up the back. The dado for the divider, on the other hand, is sized to match the

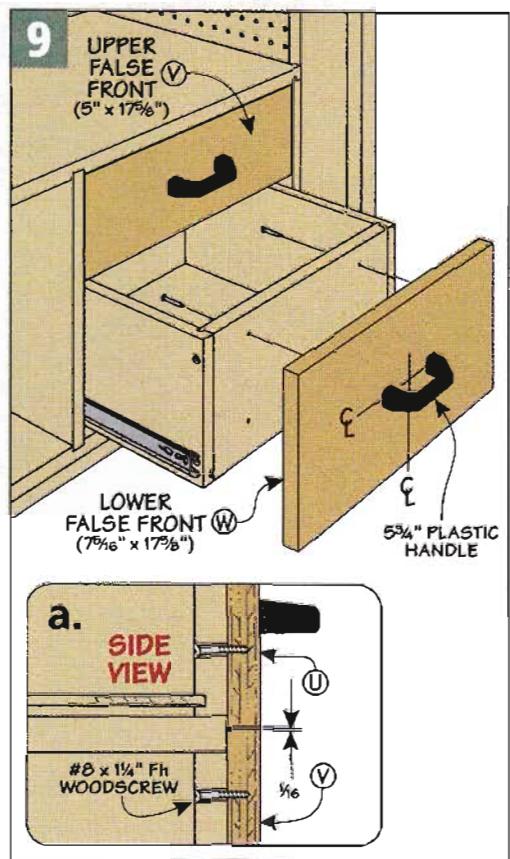
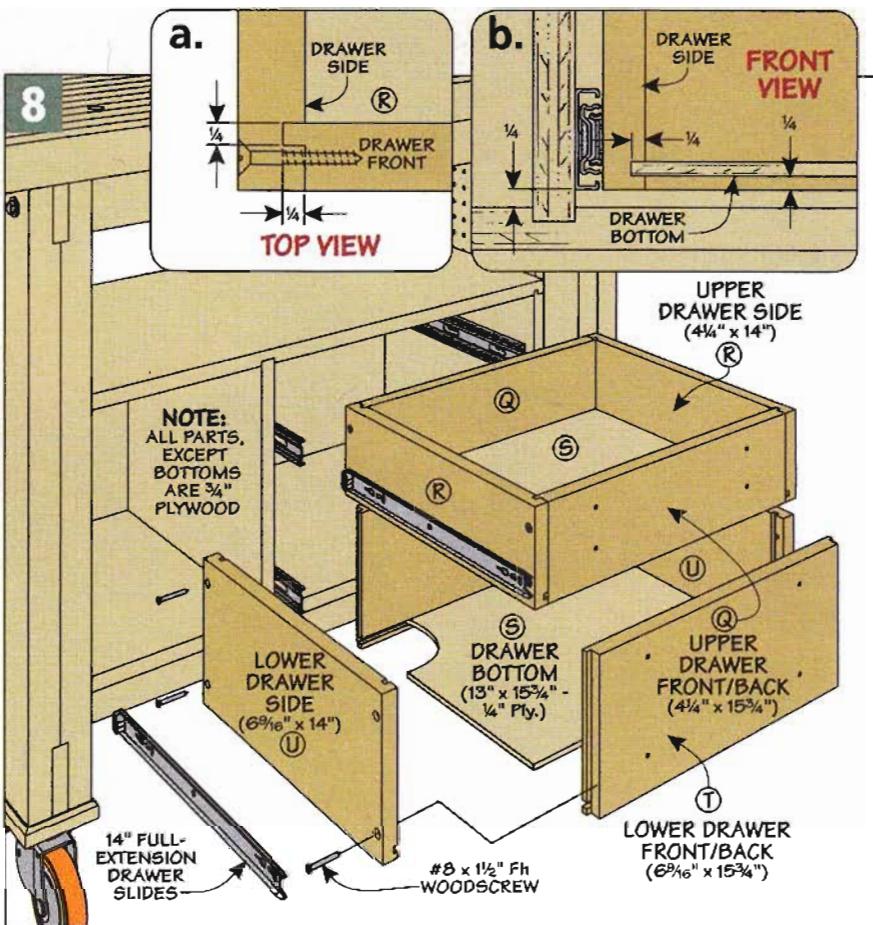


thickness of the $\frac{3}{4}$ " plywood I used for the other parts of the cabinet.

You'll notice that the bottom is wider than the top (Figure 5). This extra width allows the cabinet to rest on both stretchers in the base of the cart. And it provides a place to add a foot rail later on.

Sides & Divider. The next step is to make the sides and divider. The sides have a tongue cut on each end to fit the dadoes in the top and bottom, as shown in Figure 5b. (The divider simply slides into its matching dado.) I also cut and fit the case back.





Some Assembly. At this point, the case is ready to be assembled. Start by gluing the sides in place, add the divider, then the back. Finally, add the top and a few clamps to draw the joints tight.

In Figures 6 and 6a, you can see how the cabinet is attached to the base. I positioned the front edge of the case so that it's flush with the back edge of the legs.

Foot Rail. I mentioned earlier that the back of the case extends across both stretchers for stability. I wanted to cover the exposed dadoes on the back of the case bottom. So I added a foot rail and lip to cover the top face and back edge, as you can see in Figure 7. It also provides a footrest when working on this side of the cart.

DRAWERS & DOOR

That takes care of the case of the cabinet. Now you can turn your attention to the two drawers and door that divide the cabinet.

Drawers. The drawers on the right side of the cabinet are the perfect place to store frequently

used tools and supplies. They're slightly different sizes, but the construction process is the same, as shown in Figure 8.

Once the main drawer parts are cut to size, you can work on the joinery. The drawers are assembled with tongue and dado joinery, as shown in Figure 8a. The sides have a dado cut near each end. And a mating tongue is cut on each end of the front and back.

Next, a groove is cut in all the parts to hold the drawer bottom, as shown in Figure 8b. Once again, the groove is sized to match the thickness of $\frac{1}{4}$ " plywood.

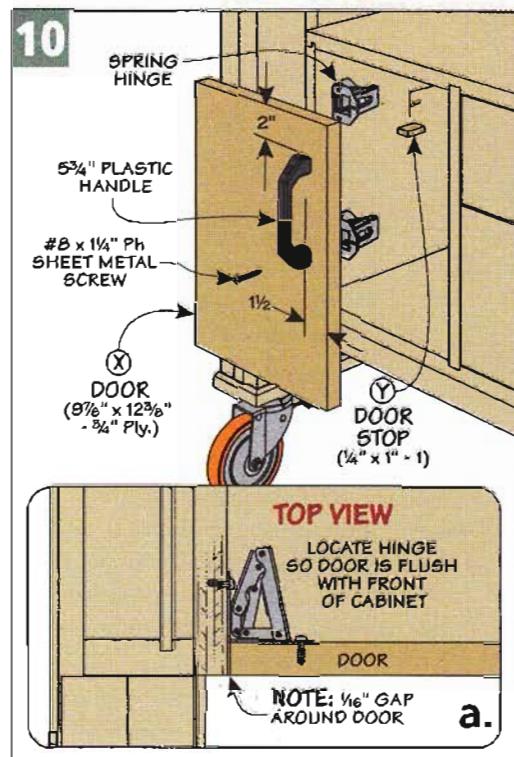
After gluing the drawer box together, I added screws to reinforce the joinery (Figure 8).

The final step on the drawers is to add a false front. This covers the end grain of the drawer sides and the exposed groove for the drawer bottom. And it gives the drawer a clean look, as illustrated in Figure 9. The false front is screwed in place and has a plastic pull attached.

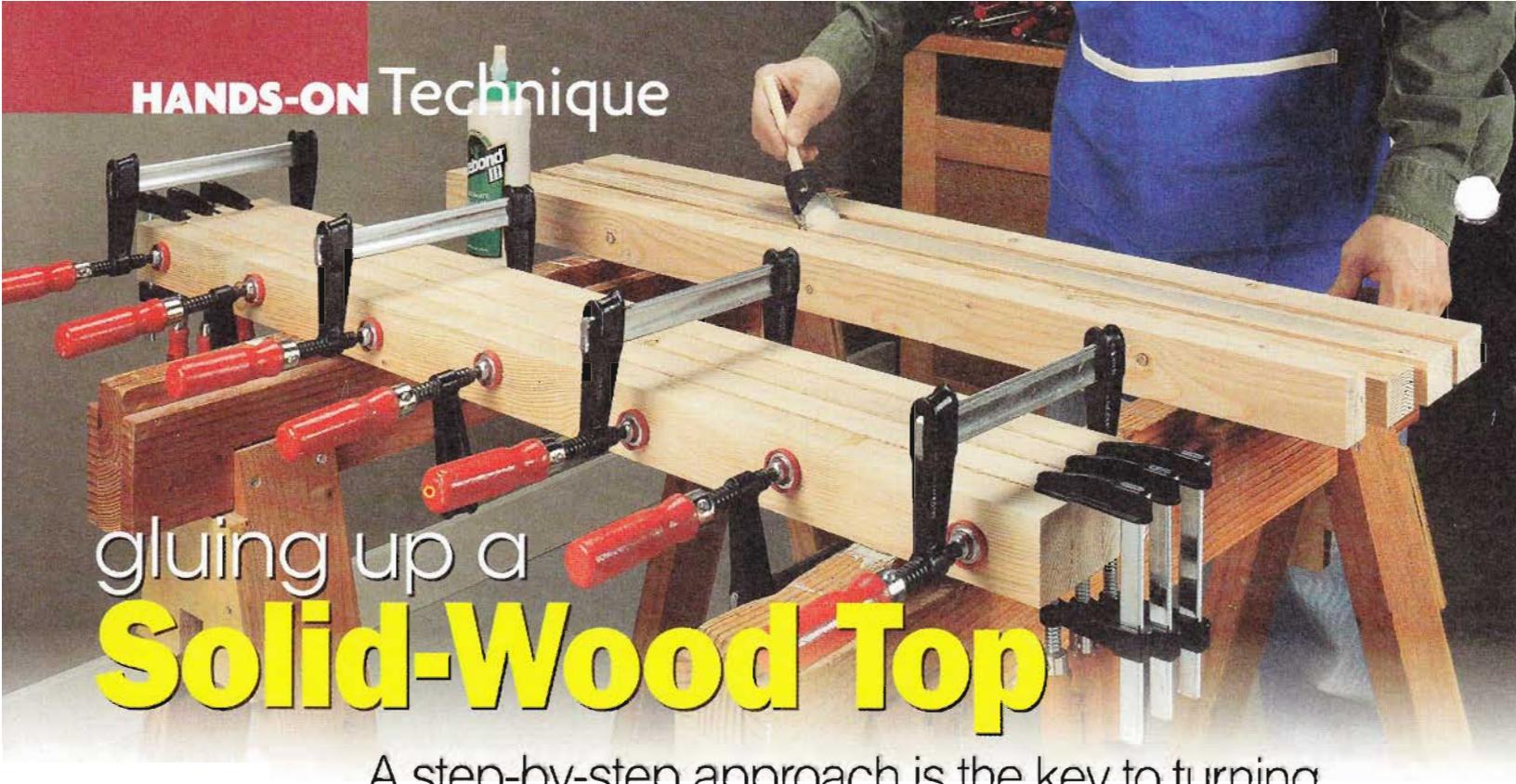
Door. The last part of the storage cabinet is the door, as shown

in Figure 10. It's simply a plywood panel that's sized to fit the opening with a $\frac{1}{16}$ " gap on all sides.

The cart can now be loaded up with supplies. And it will be a versatile addition to your shop. ■



HANDS-ON Technique



gluing up a **Solid-Wood Top**

A step-by-step approach is the key to turning ordinary wood strips into a flat, stable worksurface.

■ Building a laminated top, like the one on the multi-purpose cart on page 26, might seem intimidating at first. There are a lot of strips to glue together. So getting a flat, smooth surface with tight-fitting joints can be a challenge.

The key to success is breaking up the process into smaller, more manageable steps. You'll be surprised at how easy it is.

CREATING THE STRIPS

The first step in building a laminated top is selecting the right material for the strips. Since the top will see a lot of use, a durable material is a must. You could use hardwood, but cost is always a consideration. To solve both problems, I chose "two-by" Douglas fir (top board in margin) to make the top of the cart. Besides being hard and durable, it's relatively inexpensive and you can find it at most home centers and lumberyards.

▲ **Step-by-Step.**
Starting with basic
"two-by" stock
(upper photo) and
cutting it to rough
size (center), you
can create straight
consistent stock
ready for glueup
(lower photo).

As you select your material, be sure to spend some time finding straight boards with as few knots and defects as possible. It pays to be a little choosy here. Once you get the lumber home, it's a good

idea to let it sit for a few days to acclimate to your shop.

Rough Length & Extra Wide. The next step is to cut the lumber to rough length. I like to start with pieces that are a few inches longer than I need. And then I rip the boards into strips, like the center boards shown in the margin.

The main goal is to start with extra-wide strips. Then you can flatten one face and straighten one edge with your jointer. After running each strip through the planer and ripping the other edge straight, you'll end up with consistent strips ready for gluing (lower

boards in margin). Since I wanted my top about 2" thick, I ripped the strips down to 2 $\frac{1}{8}$ " wide. This provides a little extra thickness for jointing and planing later.

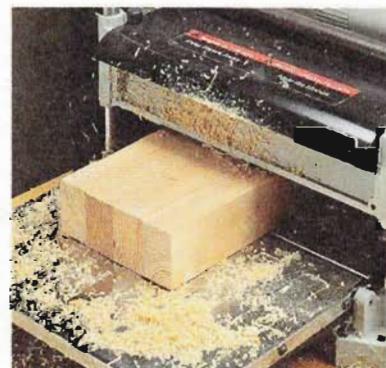
Once you have all the strips cut, you'll be turning them on edge when you glue them up. This exposed edge grain provides a couple of side benefits — a tougher surface and a more stable top.

START SMALL

At this point, you're ready to start gluing up strips. But the key to a flat top is to start small. Instead of trying to glue all the strips at once,



▲ **Flatten.** Once you've glued up a narrow section of strips, use a jointer to flatten one face.



▲ **Thickness.** With one face flat, a planer makes quick work of bringing each section to final thickness.

it's better to deal with just a few at a time. It's less hectic and you'll end up with better results.

Reference Surface. If you have a nice flat worksurface to use for the glue-up, that's great. But the sawhorses I used worked just as well. The first thing I did was sight across their tops and adjust them to make sure they were in the same plane. This minimizes any chance of introducing twist into the glueups.

Glue Up a Section. With the reference surface ready, apply glue and clamp a set of the strips together to form a small slab that's narrow enough to run across your jointer, like you see in the main photo on the opposite page. I also like to use a clamp across each joint line. Doing this keeps the surfaces as even as possible.

After scraping off the squeeze-out, flatten one face (left photo at bottom of opposite page). Finally, run the section through your planer to flatten the opposite face and bring the assembly to final thickness, like you see in the lower right photo on the opposite page. It's also a good idea to joint each edge to ensure it's flat, straight, and square to the surface.



Then you can simply repeat this process to create as many sections as you'll need for the top. (I ended up with five, four-strip sections and a single, three-strip section.)

FINAL ASSEMBLY

At this point, you're ready to glue the sections together into a full-width top. Here again, I keep things simple. Instead of gluing up all the sections at once, I only glue two together at a time (inset above).

Now comes the easy part, gluing the larger sections together to create the top. Again, clamping across the joint lines minimizes any flattening work once the glue dries.

Since the top is too wide to run across a jointer (or through a planer, for that matter), any flattening will have to be done with a belt sander or hand plane. But with the steps detailed here, don't be surprised if all you really need to do is scrape away a little excess glue. That's all I did for the top you see here.

TRIMMING TO FINAL SIZE

All that's left to do at this point is cut the top to final length. And that means trimming both of the ends straight and square.

Because of the size of the top, you won't be able to do this on your table saw. A simple solution is to use a circular saw and a straightedge clamped securely across the end (photo at left).

As you can see, the task of creating a solid-wood top that's smooth and flat isn't all that difficult. And by taking it one step at a time, you're sure to end up with a great-looking top — just like the one you see below. ■

▲ Final Assembly.

After gluing up pairs of narrow sections (inset photo at left), it won't take much effort to complete the final glueup of the top.

▼ Flat & Smooth.

Keeping each step of the process simple and concise is the key to creating a solid-wood top that will serve you for a lifetime.



▲ Trimming the Top to Size. A circular saw and a straightedge clamped square to the edge makes quick work of trimming the top to final length.

weekend project



portable clipboard Storage Case

Finger joints add classic styling and strength to this hardworking, take-along shop desk.

When I'm planning a project and putting together my materials list, it's nice to be able to keep all my drawings, pencils, and supplies in one place. The portable clipboard storage case shown above provides a perfect way for doing this. It's lightweight and easy to use. And it has plenty of room on the inside to hold everything I need to take with me.

A large, flat writing surface with a spring clip keeps things in order on the outside. And the lift-out storage tray with dividers is perfect for organizing the inside of the case. Best of all, sturdy finger joints look great, hold strong, and guarantee the case will stand up over time. With all these features, there's no doubt this project will really earn its keep in your shop.

Exploded View Details

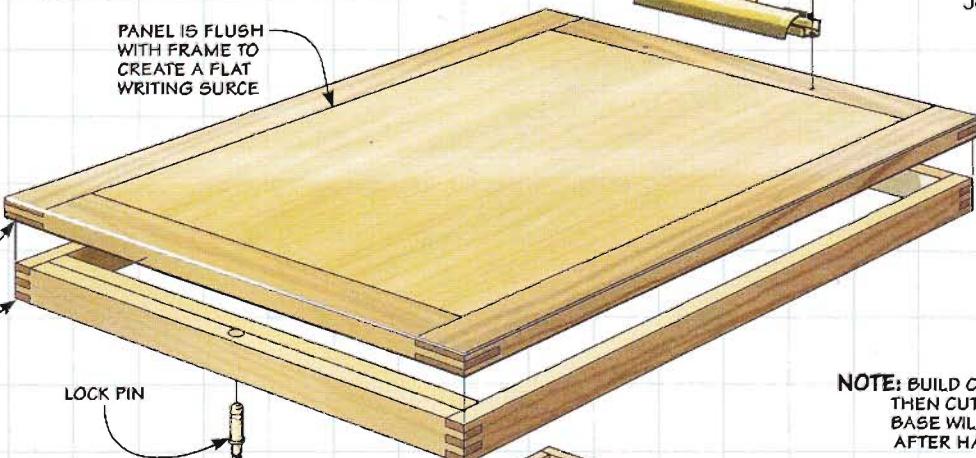
OVERALL DIMENSIONS:
13½" L x 10½" W x 3¼" H

UPPER AND LOWER
FRAME AND PANEL
ARE GLUED TO LID
AND BASE

PANEL IS FLUSH
WITH FRAME TO
CREATE A FLAT
WRITING SURFACE

BRASS-PLATED
SPRING CLIP
HOLDS NOTEPAD

FOR MORE ON
MAKING BRIDE
JOINTS, REFER TO
PAGE 46



NOTE: BUILD CASE AS ONE PIECE,
THEN CUT APART SO LID AND
BASE WILL ALIGN PERFECTLY
AFTER HARDWARE IS ADDED

LIFT-OUT STORAGE TRAY
WITH DIVIDERS KEEPS
SMALL TOOLS AND
SUPPLIES ORGANIZED

TRAY RESTS SUPPORT
TRAY AND PROVIDE
STORAGE SPACE BELOW

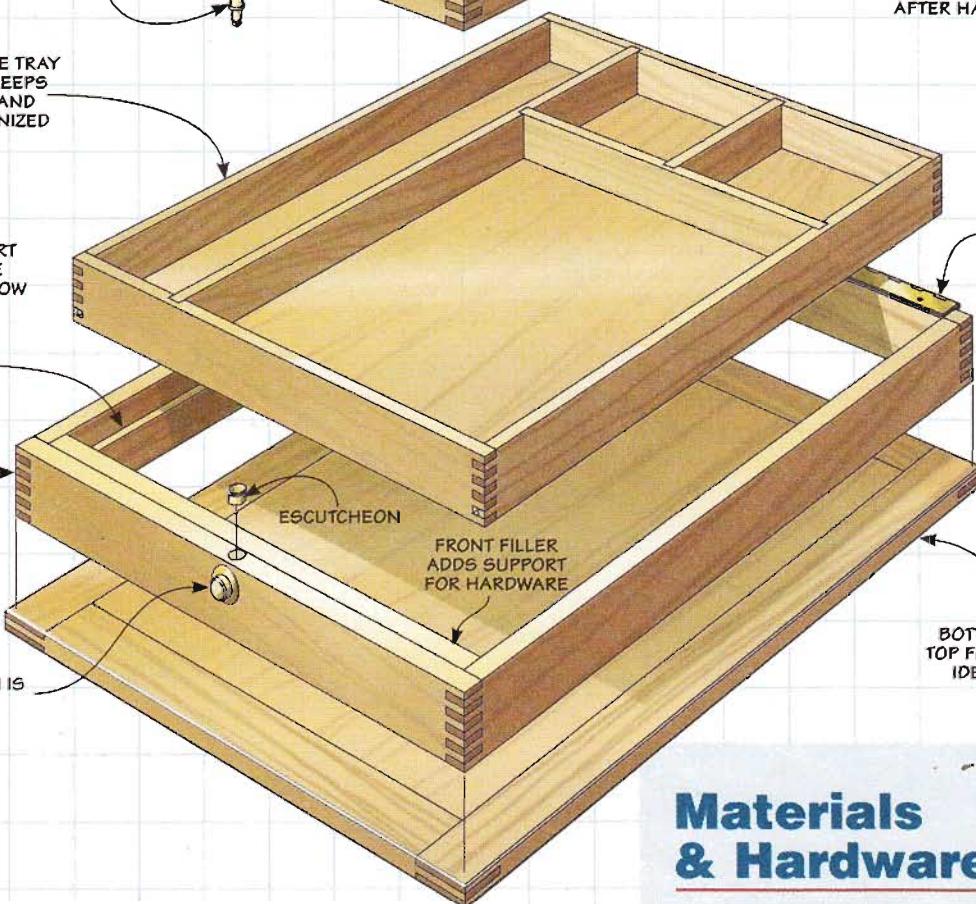
CONTINUOUS
BRASS HINGE
SET IN SHALLOW
NOTCH FOR
CLEAN LOOK

FINGER JOINTS ADD
STRENGTH AND A
CLASSIC LOOK TO
THE CLIPBOARD
STORAGE CASE

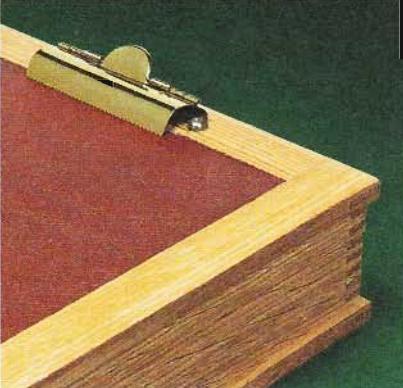
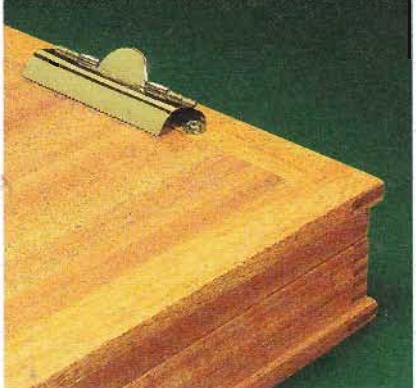
PUSH-BUTTON LATCH IS
SPRING-LOADED

FRONT FILLER
ADDS SUPPORT
FOR HARDWARE

BOTTOM AND
TOP FRAME ARE
IDENTICAL

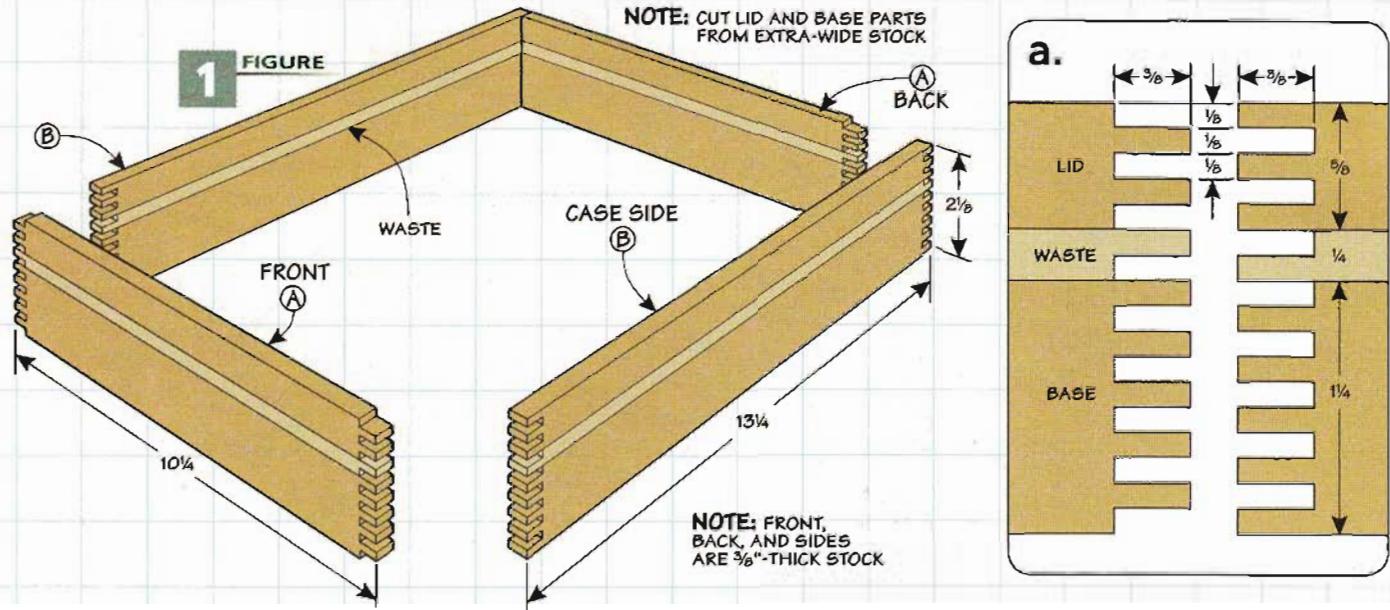


▼ **Panel Options.** Create a flush writing surface with a hardwood veneer panel. For a traditional look, you can replace the veneer with a piece of leather backed by a hardboard spacer to set it flush.



Materials & Hardware

| | | |
|--|--------------------|----------------------------|
| A | Front/Back (2) | 3/8 x 2 1/8 - 10 1/4 |
| B | Sides (2) | 3/8 x 2 1/8 - 13 1/4 |
| C | Lid Filler (1) | 3/8 x 5/8 - 9 1/2 |
| D | Base Filler (1) | 3/8 x 1 1/4 - 9 1/2 |
| E | Frame Rails (4) | 3/8 x 1 - 10 1/2 |
| F | Frame Stiles (4) | 3/8 x 1 - 13 1/2 |
| G | Frame Panels (2) | 9 x 12 - 1/4 Ply. |
| H | Tray Ends (2) | 1/4 x 1 1/8 - 9 1/2 |
| I | Tray Sides (2) | 1/4 x 1 1/8 - 12 |
| J | Tray Bottom (1) | 9 1/16 x 11 3/4 - 1/4 Ply. |
| K | Long Divider (1) | 1/4 x 7/8 - 11 1/4 |
| L | Medium Divider (1) | 1/4 x 7/8 - 6 15/16 |
| M | Short Divider (1) | 1/4 x 7/8 - 3 1/4 |
| N | Tray Rests (2) | 3/16 x 3/4 - 12 1/8 |
| • (1) 3/4" x 13" Continuous Hinge w/Screws | | |
| • (1) Push Button Latch | | |
| • (1) Low-Profile Steel Clipboard Clip, Brass Finish | | |



finger joint Cases

ShopNotes

**GO
ONLINE
EXTRAS**

To learn more about cutting finger joints, go to:
ShopNotes.com

The storage case starts out as an extra-tall, four-sided box held together at each corner with finger joints. Then the case is separated into two assemblies to make a lid and base. Later on, you'll add a pair of frames to enclose the case.

Even though it sounds like extra work, there's a good reason for building the two parts as one and then separating them later. This way, the lid and base are identical and, after a hinge is added, they'll line up perfectly.

Case Parts. Start by cutting the front, back, and sides to length. Remember, you're starting out with extra-wide workpieces. Then later on, after the finger joints are cut, you'll trim the case pieces to width, as you can see in Figure 1. For more on cutting finger joints, refer to *ShopNotes.com*.

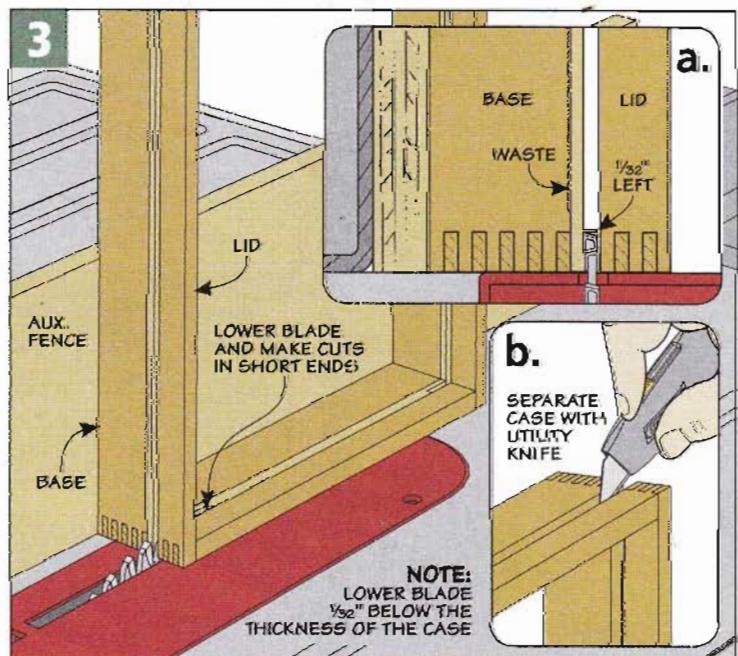
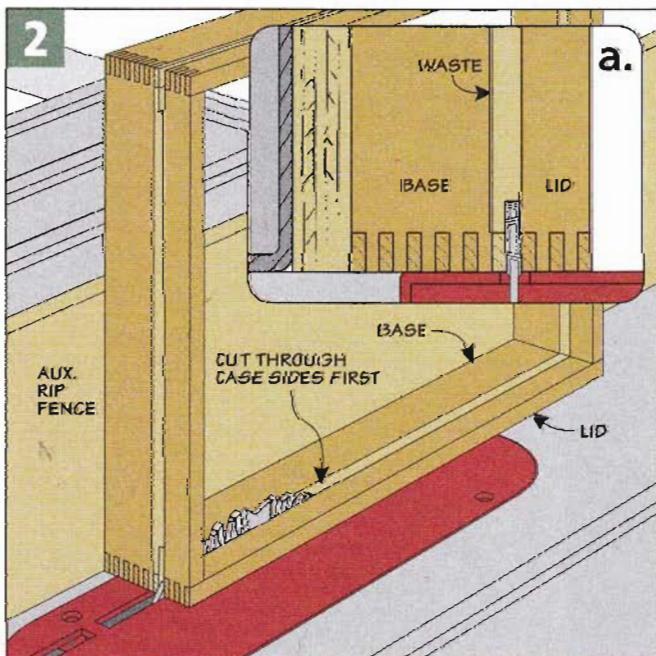
There's one other thing to keep in mind here. The extra width includes $\frac{1}{4}$ " of waste between the lid and base. You'll remove this waste after the joints are cut and the case is assembled.

Cut the Finger Joints. With the pieces cut to rough size, you're ready to cut the finger joints. The slots are only $\frac{1}{8}$ " wide, so you can

cut them with a standard rip blade. Once they're cut, you can glue up the case parts (Figure 1).

Cut In Two. Now make the cuts to create the lid and base. To end up with a full pin at the top and bottom when the lid is closed, you'll need to remove a full pin and a full slot (Figure 1a).

The safest way to do this is to remove the lid first by cutting through both long sides (Figures 2 and 2a). Just be sure to keep the lid to the outside of the blade. Then lower the blade to about $\frac{1}{32}$ " less than the thickness of the material and make a cut on the short sides (Figures 3 and 3a). This way, the kerf won't close up around the blade.



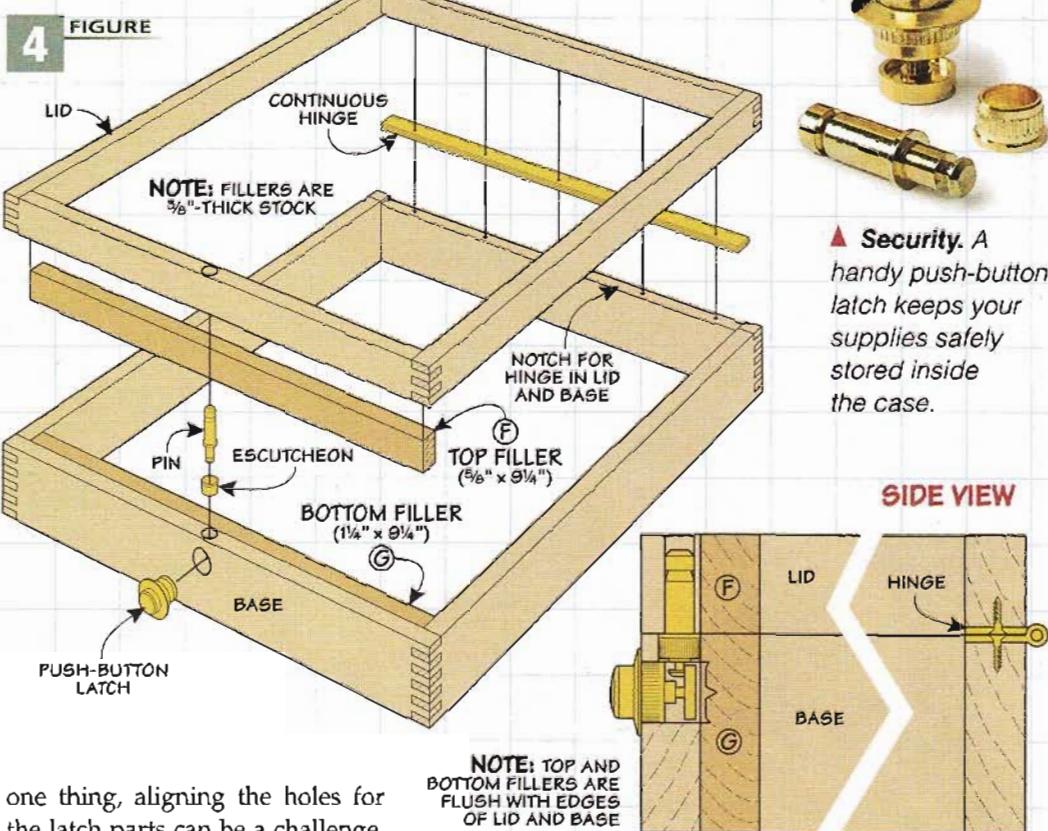
To complete the cut, all you need to do is use a utility knife to cut away the thin web on the short sides (Figure 3b). As I mentioned earlier, you'll still have to return to the table saw to remove the remaining waste from the top edge of the base.

Add the Hardware. With the case lid and base separated, you're ready to add a hinge and the latch hardware. To make it easy to get in and out of the case, I joined the lid and base with a sturdy continuous hinge. Then to keep the case closed, I added a push-button latch.

Notch for Hinge. The hinge fits in a shallow notch I cut in both the lid and base. An easy way to do this is to use the table saw and a dado blade. For more on how to make the notch, see the box below.

Filler Strips. Before you can add the latch, you'll need to add a pair of filler strips to the inside of the box. These strips are necessary to beef up the fronts for the latch mechanisms (Figure 4).

Push-Button Latch. Installing the latch takes some thought. For

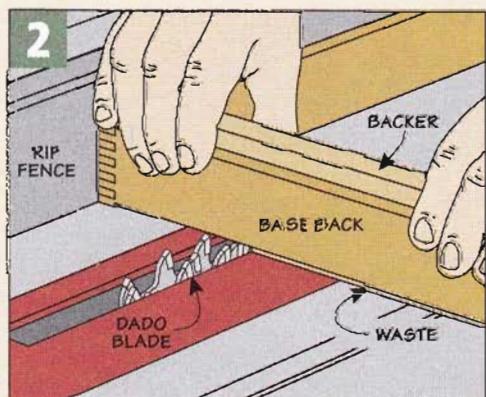
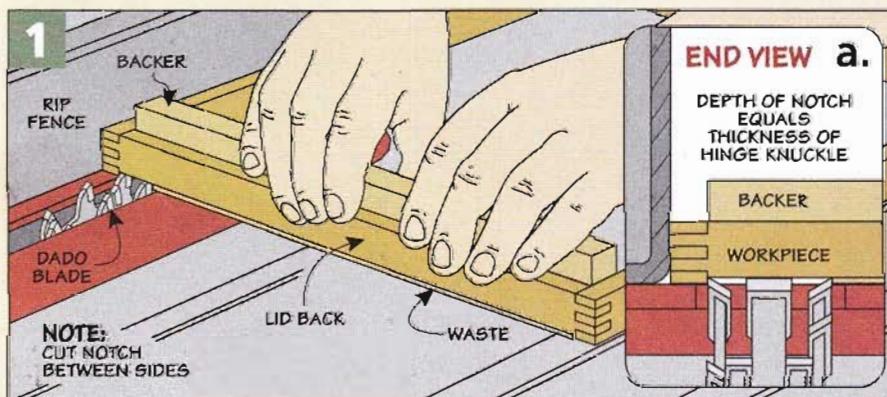
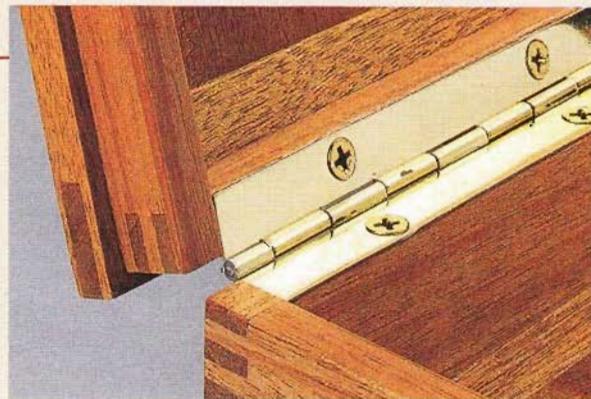


▲ Security. A handy push-button latch keeps your supplies safely stored inside the case.

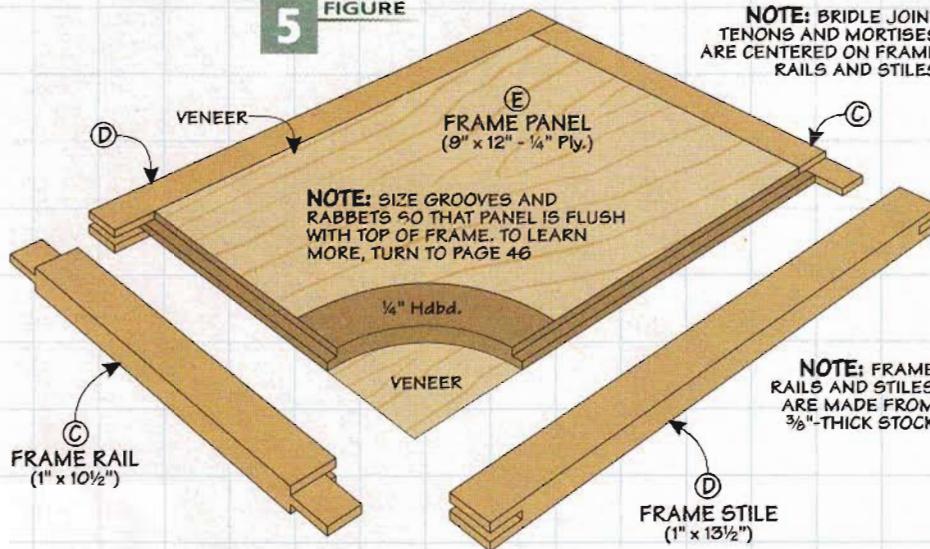
Cut Notch to Fit Hinge

A continuous hinge resists twisting and pulling, so it's perfect for a lid that gets opened and closed a lot. It's easy to install and it looks nice. To avoid having a gap between the case top and base though, I made a shallow notch in both pieces. As you can see in the photo at right, the notch also helps hide the ends of the hinge (Figure 1).

Cutting the notches in the case pieces is tricky since they need to be cut after the case is assembled. One way to do this is to use the rip fence to establish the shoulders. Then, simply nibble away the waste on both the lid and the base with a dado blade. A short piece of scrap helps back up the cuts to avoid splintering (Figure 1).



5 FIGURE



bridle joint Frames

With the case body complete, you can get started making the top and bottom frames. Both frames feature a pair of stiles and rails that surround a shop-made plywood panel. They're identical except for the clip that's added to the top.

To match the look of the fingers on the case, I used a bridle joint for the frames. I like this style of joinery because the rails and stiles are easy to size, since they match the width

and length of the frame (Figure 5). And the large glue surfaces on the bridle joint ensure a strong bond.

Get a Flush Panel. But it's the panel that drives the joinery. You want to have the panel face flush with the top of the frames, so you need to pay particular attention to the location of the groove.

If you look at Figure 5a and 5b, you'll see that the groove is perfectly centered for a $\frac{1}{4}$ "-thick panel. But plywood is rarely exactly $\frac{1}{4}$ " thick, in which case you may have to cut an off-center groove in the

rails and stiles to get your panel flush with the frame. For more on how to do this, refer to page 46.

Shop-Made Plywood. My case is made out of mahogany, but I had trouble finding matching plywood for the panel. So I ended up making my own "plywood" using $\frac{1}{4}$ " hardboard and veneer (Figure 5).

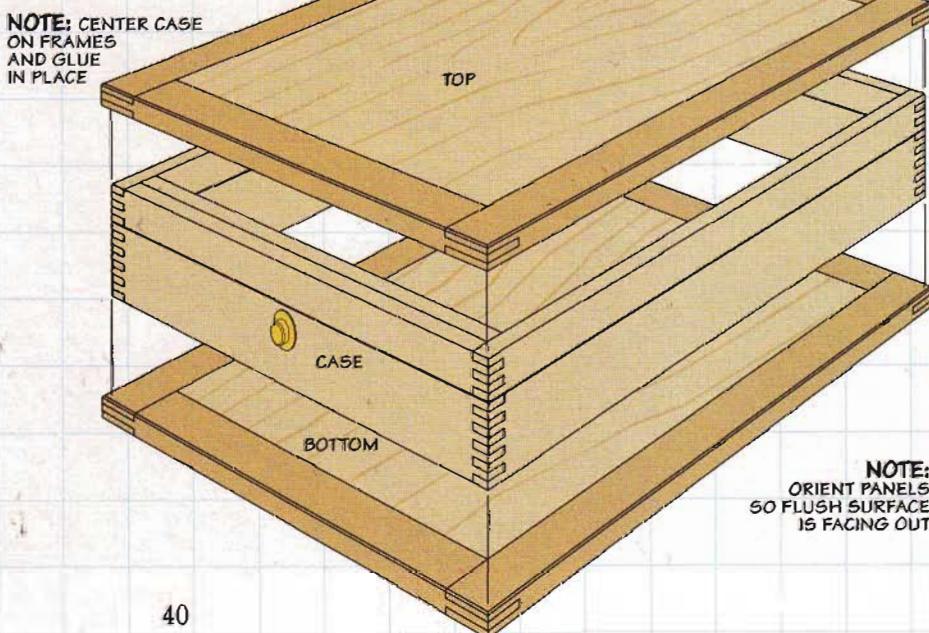
Glue Up. Now that all the joinery is cut, you need to glue everything together. Clamping a bridle joint can be a challenge, though. You'll find ideas for how to do it in Shop Short Cuts on page 25.

Finally, attach the frames to the case with glue. They're centered on the case for an even overhang all around. Now all that's left is to add the clipboard clip (Figure 6a).

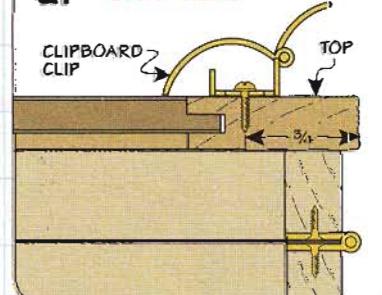
Alternate Surface. A flush panel provides a solid surface for taking notes, but there is another option you might consider.

As you can see in the inset photos on page 36, you can create an

6 FIGURE



a. SIDE VIEW



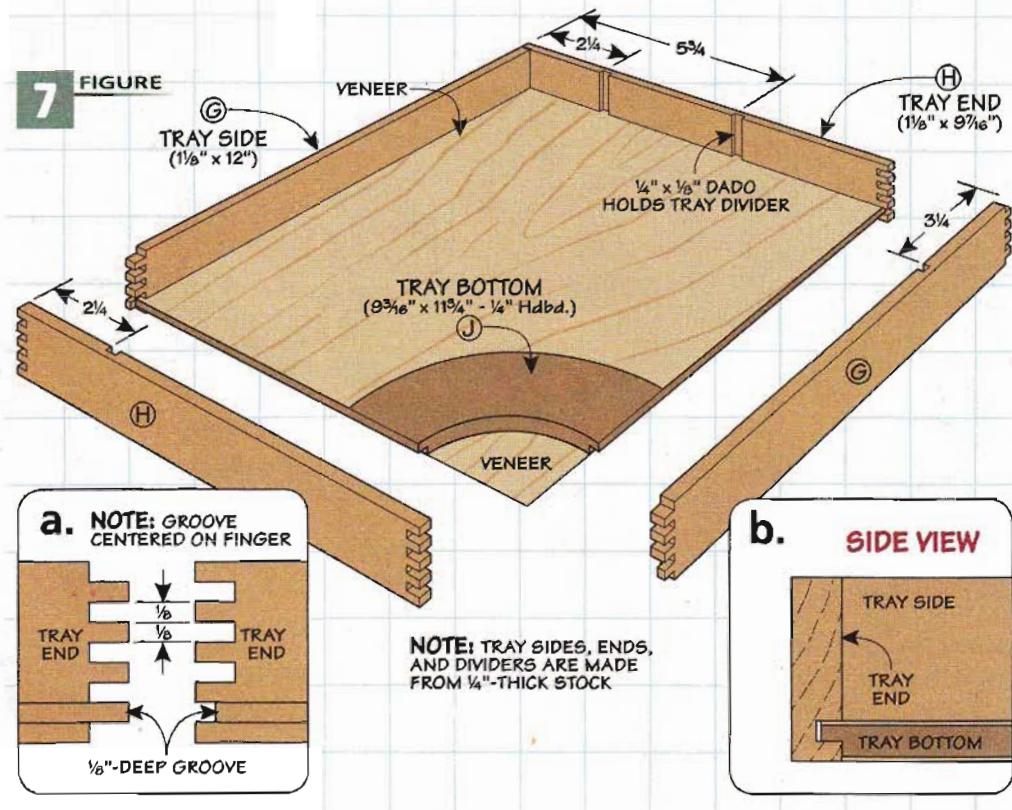
entirely different look by using a leather-covered panel. All it takes to do this is to flip the frame so the recess is facing up. Depending on the thickness of your leather, you may be able to glue it to the panel. If it's too thin, try using a piece of posterboard as a spacer. After making sure that everything lines up, glue the leather insert in place.

ADD A TRAY

Inside the case, things can easily get jumbled, so I broke up the space by adding a tray with dividers. It's sized to fit snug and the dividers help keep everything in place. As with the case, the tray sides and ends are held together with finger joints (Figure 7).

Rabbeted Bottom. Before the tray is assembled, you need to cut the grooves for a rabbeted bottom (Figure 7a). Just be sure to locate the groove so the bottom is flush. Plus, you also need to cut dadoes in the sides and ends for the divider compartments. Once that's complete, glue up the tray ends, sides, and bottom (Figure 7b).

Tray Dividers. The dividers create four small compartments for holding the supplies you use most often. Go ahead and cut the long divider to size, then add a dado to



match the one in the side and fit it in the dadoes you cut in the ends of the tray (Figure 8).

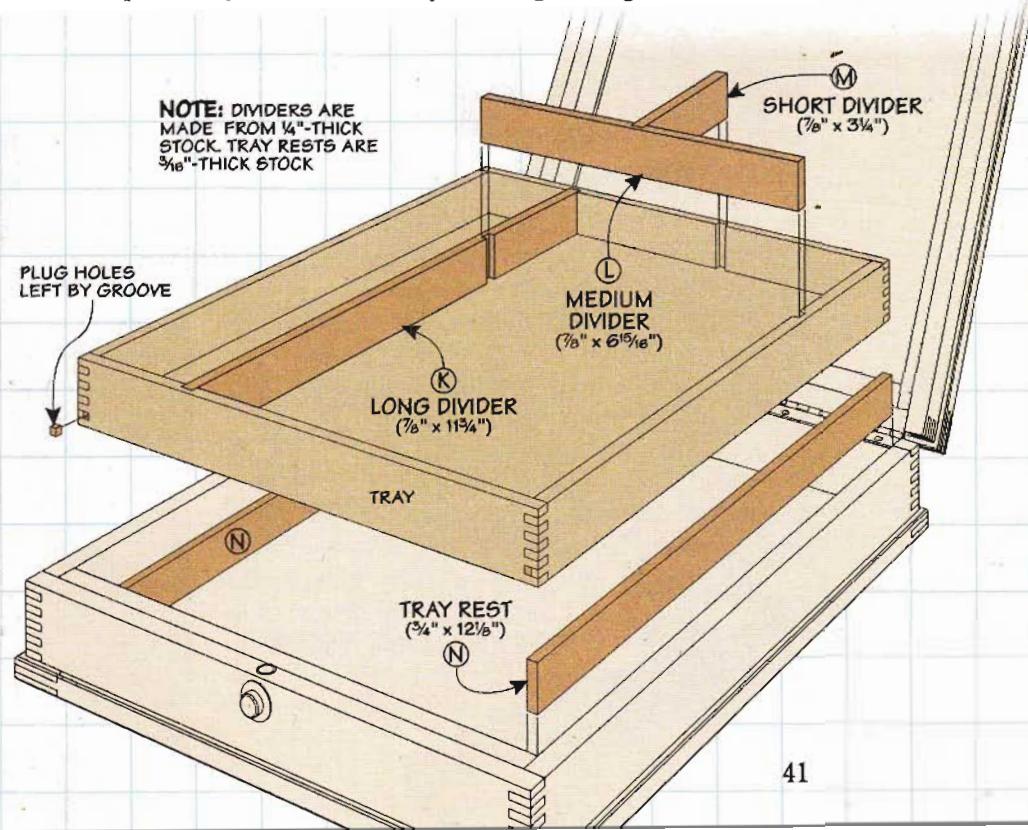
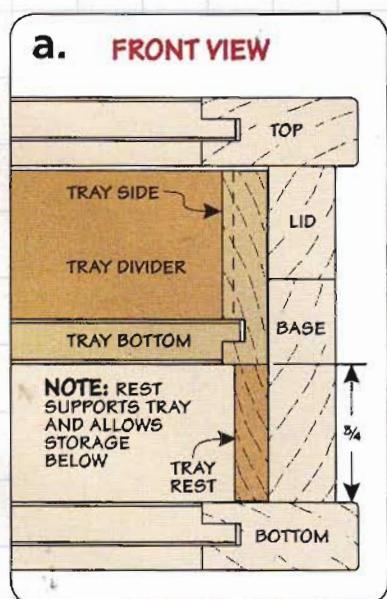
The rest of the dividers go together like a puzzle. After cutting the medium divider to fit between the long divider and the tray side, you'll need to add one last dado for the short divider. Once that's complete, cut the short divider to fit.

Tray Rests. Now all that's left is to make a pair of tray rests. The rests

hold the tray up from the case bottom to allow room in the main case. Size the rests so there's just enough clearance to close the lid and keep things inside from falling out of the tray, as detailed in Figure 8a.

If you're like me, the clipboard storage case is bound to get lots of use in and out of the shop. All in all, it's one of those handy little projects that you'll wonder how you ever got along without.

8 FIGURE



5 "super-hero" Chisels

Find out how these specialty chisels can help you work more efficiently and get better results.

Bench chisels are versatile tools. But there are some tasks that call for a little something more. It's those times when you need a "super-hero" chisel, like the ones you see here. I only pull these specialty chisels out of the tool cabinet when I need them for a particularly difficult situation. They generally excel at a single task and are often the only option to complete the job.

My list of specialty chisels includes a narrow bench chisel, a dovetail chisel, a corner chisel, a mortise chisel, and a pair of skew chisels. You'll find sources for all of these chisels on page 51.

2 MORTISE CHISEL There are lots of ways to cut a mortise. All of them have their benefits. But when I have just a few mortises to cut, I prefer to get out a mortising chisel. It's only designed to do one thing — chop out a mortise. The $\frac{1}{4}$ "-wide chisel shown in the margin photo at left is my favorite for making mortises in $\frac{3}{4}$ "-thick stock. It hogs out perfectly sized mortises quickly and easily.

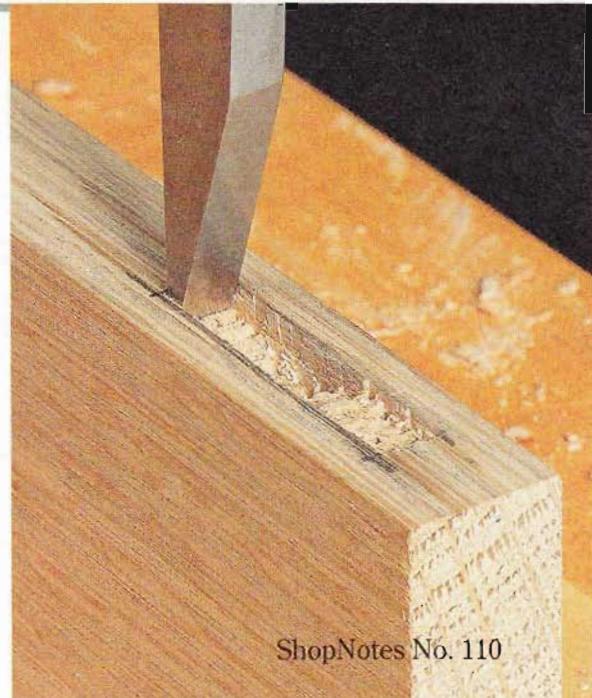
This tool is a real workhorse that can be whacked hard with a wood mallet. The back of the blade is slightly wider than the front, so you can "lever" out chips without damaging the sides of the mortise.

A shallow 20° bevel angle allows it to be driven deep and fast, but the tip is ground to 35° for longer life. This micro-bevel also keeps the edge from dulling.

1 NARROW BENCH CHISEL An essential chisel set for woodworkers includes an assortment of bench chisels, usually from $\frac{1}{4}$ " up to 1" wide. But once in a while, even a $\frac{1}{4}$ "-wide chisel is just too big. As you can see in the photo above, cleaning up glue squeezeout inside a narrow slot or groove is one of those times. That's when I turn to a $\frac{1}{8}$ "-wide bench chisel, like the one shown in the margin at left. It's perfect for getting into some pretty tight areas.

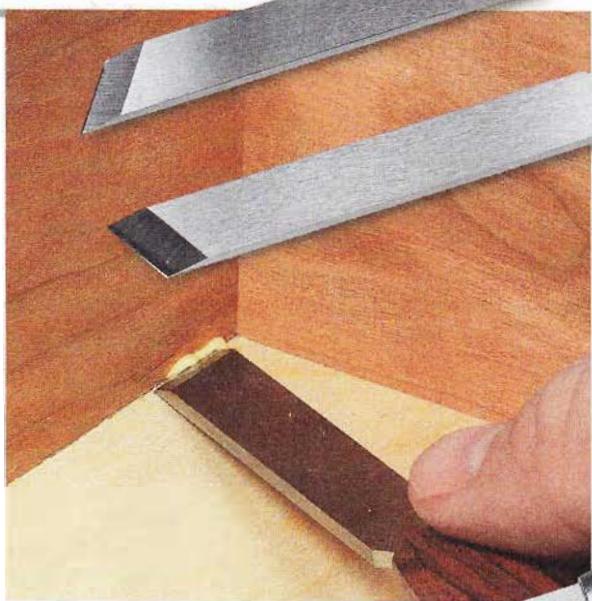
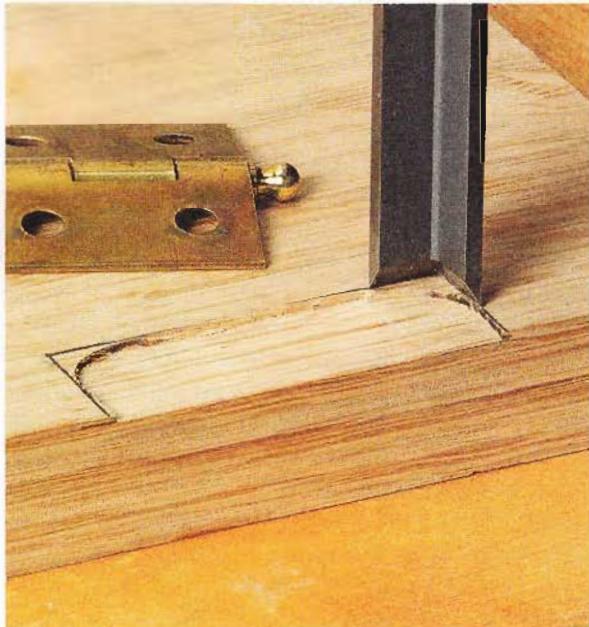
The sides of this narrow chisel are square and run parallel to each other. This way, you can use it to remove dried-on glue inside a finger joint slot and not worry about marring the sides of the joint. It also works great for trimming joinery.

Finally, the long blade and tapered handle on a bench chisel fits easily into your hand to provide a well-balanced feel when doing fine work.



3 SKEW GROUND CHISELS. Quite often situations come up when it's necessary to get right into the corner of an assembly with the full width of a sharp chisel blade. Unfortunately, the design of most bench chisels makes doing this almost impossible. That's because the cutting edge of the blade is square to its sides, so there's often no room for the handle or your hand. You could skew the chisel, but that takes away a lot of the blade's cutting edge. A better solution is to turn to a right- or left-hand skew ground chisel (margin photo at right).

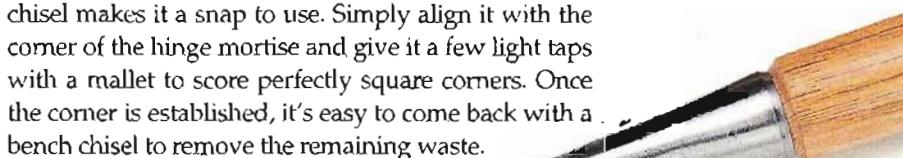
A skew chisel's blade features a low, 20° skew that allows you to get right up into the corner of a project. This makes it perfect for tasks like paring the pins in a through dovetail. I've even used one to pop out small beads of glue in the corners of a deep drawer, as you can see in the photo at right.



4 CORNER CHISEL.

Creating a shallow mortise for a hinge is easy to do. It's just a matter of roughing out most of the waste with a trim router equipped with a straight bit. But the bit leaves rounded corners that need to be squared. So, I square up the corners and clean up this last bit of waste by hand using a standard bench chisel and a corner chisel, like the one you can see in the photo at left.

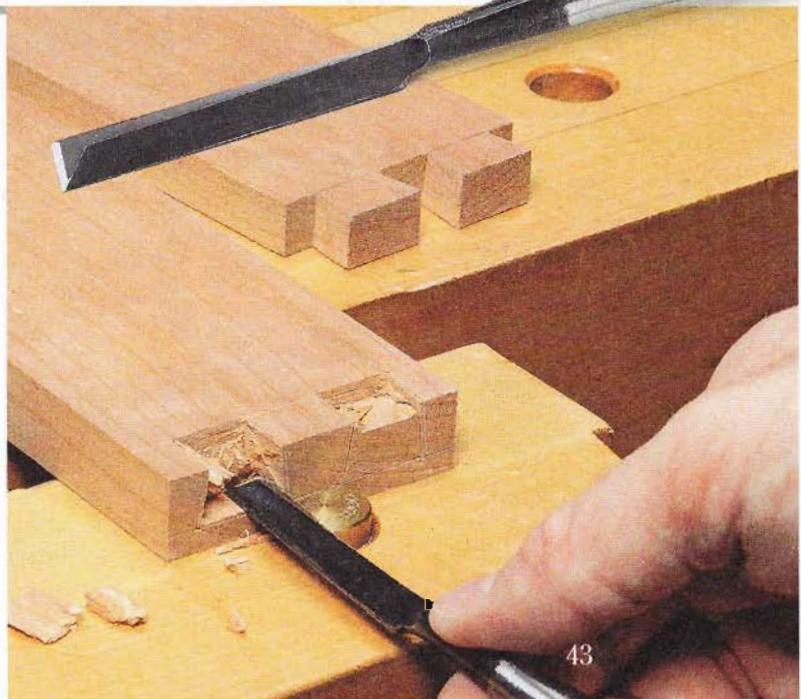
The unusual 90° blade found on this specialized chisel makes it a snap to use. Simply align it with the corner of the hinge mortise and give it a few light taps with a mallet to score perfectly square corners. Once the corner is established, it's easy to come back with a bench chisel to remove the remaining waste.



5 JAPANESE DOVETAIL CHISEL. Cleaning up hand-cut dovetails can be a challenge. The relatively thick blade and square sides on the shaft of my bench chisels make it impossible to get into tight spots. But that's not a problem with the last specialty chisel on the list — a Japanese dovetail chisel like the one shown in the margin at right.

There is a downside to this specialty chisel, it costs quite a bit more than a standard bench chisel. But I feel the benefits from this hand-forged chisel are worth it. It has extremely steep sides, making it just right for getting in tight on an angled surface to do some final trimming (photo at right). And, a canted handle provides you plenty of clearance for flush-trimming.

When it comes to most everyday tasks, a bench chisel can't be beat. But, it never hurts to have these super-hero chisels on hand — just in case. ☑



essential Sanding Kit

All it takes to get perfect, smooth surfaces is this set of low-cost, low-tech sanding supplies.

Sanding is a task that's all too easy to rush through. Maybe it's because sandpaper seems like such a basic "tool." Or the task can sometimes feel tedious. However, a good sanding can really bring out the best look in any project.

The key to sanding a project efficiently by hand is having the right sandpaper and sanding supplies close by. Over the years, I've put together a kit of essential tools and accessories that easily handles most of my hand sanding jobs.

A Basic Set.
Four grits of self-adhesive sandpaper will tackle most sanding tasks. A cork block guarantees smooth, flat surfaces.



As you can see in the photo above, the kit contains a surprisingly small amount of stuff. You'll find it doesn't cost much to assemble the kit, either. But don't be surprised when you turn to it for practically every project.

SANDPAPER

Preparing a project for finishing starts with the sandpaper. You can find sandpaper that ranges from very coarse 36-grit all the way up to very fine 2000-grit or more. Deciding on the appropriate grit isn't the only task. You'll need to choose the type of abrasive and the paper it's bonded to — sheets or rolls. So figuring out what you really need can be a challenge.

The Right Paper. I like to purchase rolls of self-adhesive sandpaper for hand sanding, as you can see in the photo at left. I feel it has a lot of benefits over ordinary sheets of sandpaper.

First of all, the adhesive backing makes it easy to apply the

sandpaper to a commercial sanding block or a custom sanding pad for a specific task. You can even attach long strips to your table saw to act as a large surface sander. It's perfect for flattening boxes, drawers, and other small parts.

I also like that I can tear off just as much as I need for the task at hand. So there's less waste.

Finally, the abrasive used on this type of sandpaper is high-quality aluminum oxide. It cuts quickly, lasts a long time, and resists clogging. So even though it costs more than most other types of sandpaper, it's worth the upgrade. It's available through most woodworking catalogs and websites.

Shaping Wood. As for the grits, my kit only includes four. The first is 100-grit. This coarse grit is what I turn to for shaping wood. With just a few strokes, it's easy to create a quick chamfer or roundover. Another handy application is removing blade marks left by a table saw, band saw, or jig saw.

Balance. The next grade is 120-grit. It strikes a "just-right" balance between removing material quickly and leaving a smooth surface behind. One common task that I use this grit for is leveling hardwood edging with a plywood panel. It also works well for fine-tuning a tenon so that it fits its mortise perfectly.

Final Smoothing. After any major shaping or heavy material removal, the goal is to smooth the wood and get it ready for finishing. That's where the remaining two grits come in.

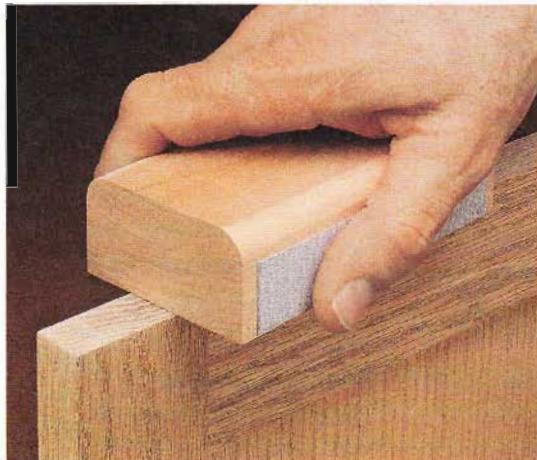
The first is 150-grit paper. It clears up the marks left by the coarser grits. Plus, it allows the grain of the wood to really stand out.

If the project is going to get a stain or a film finish, I stop after using 150-grit. But for projects that get an oil finish or for sanding end grain, I turn to 180-grit paper. This way the appearance of the face grain and end grain will match.

SANDING ACCESSORIES

Sandpaper is the main tool for getting a smooth surface. But for the best results, you need to back it up with some kind of support. The type depends on the task.

Cork Block. The tool I reach for most often is a cork block. The relatively soft cork provides a cushion that helps extend the life of



▲ **Keep A Square Edge.** Use a hardwood block to sand the edge of a workpiece smooth without rounding the corners.



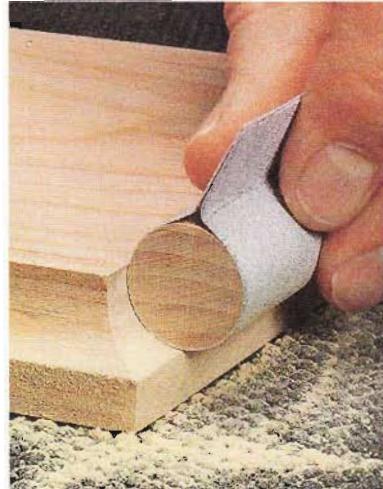
▲ **Flexible Blade.** Wrap sandpaper around the blade of a thin putty knife to get into tight corners for final sanding.

the sandpaper. I use it mainly for sanding flat surfaces, like panels.

Hardwood Block. If there's one downside to a cork block it's that you can end up rounding over the edge of a workpiece slightly. Most of the time that's not a big deal. But if a part needs crisp, square edges, I use a hardwood sanding block (left photo above). The face won't deform and you can sand right to the edge without worry.

Another handy use for a hardwood sanding block is shown in the photos below. By applying sandpaper to just the narrow edges, you can smooth a rabbet or fine-tune the fit of a tenon.

Putty Knife. One sanding challenge is getting into tight places.

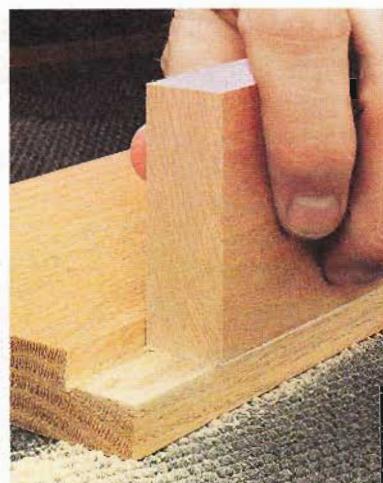
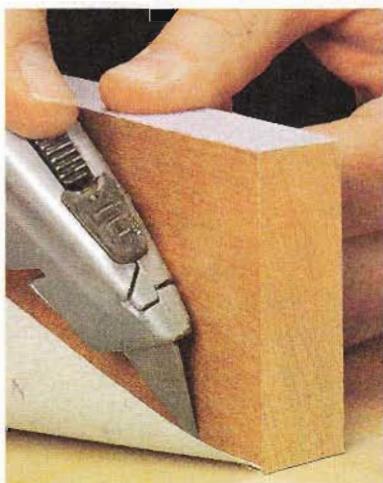


◀ **Consistent Profiles.** Match a dowel to a routed profile to remove bit marks and still keep the crisp details.

For example, sanding the inside corner of a frame and panel door, (upper right photo). In this situation my sanding "block" of choice is a putty knife. You can flex the long thin blade to get right where you need to sand.

Dowels. Not all the sanding I do is on flat surfaces or edges. To handle curves and profiles, I keep an assortment of dowels on hand. You can use them to smooth routed profiles. Simply wrap sandpaper around a matching diameter dowel, as shown in the lower photo above. Or you can attach a piece of sandpaper to one end of a dowel and use it like a file to sand curves.

Sanding shouldn't be an afterthought. With the tools you've gathered in this essential kit, you can quickly create profiles and flat, smooth surfaces. ☑



▲ **Fine-Tune Joinery.** Apply self-adhesive sandpaper to the edge of a hardwood block. After trimming it flush to the faces with a utility knife (left), you can use it to flatten rabbets and dadoes for a seamless fit.

MASTERING THE Table Saw

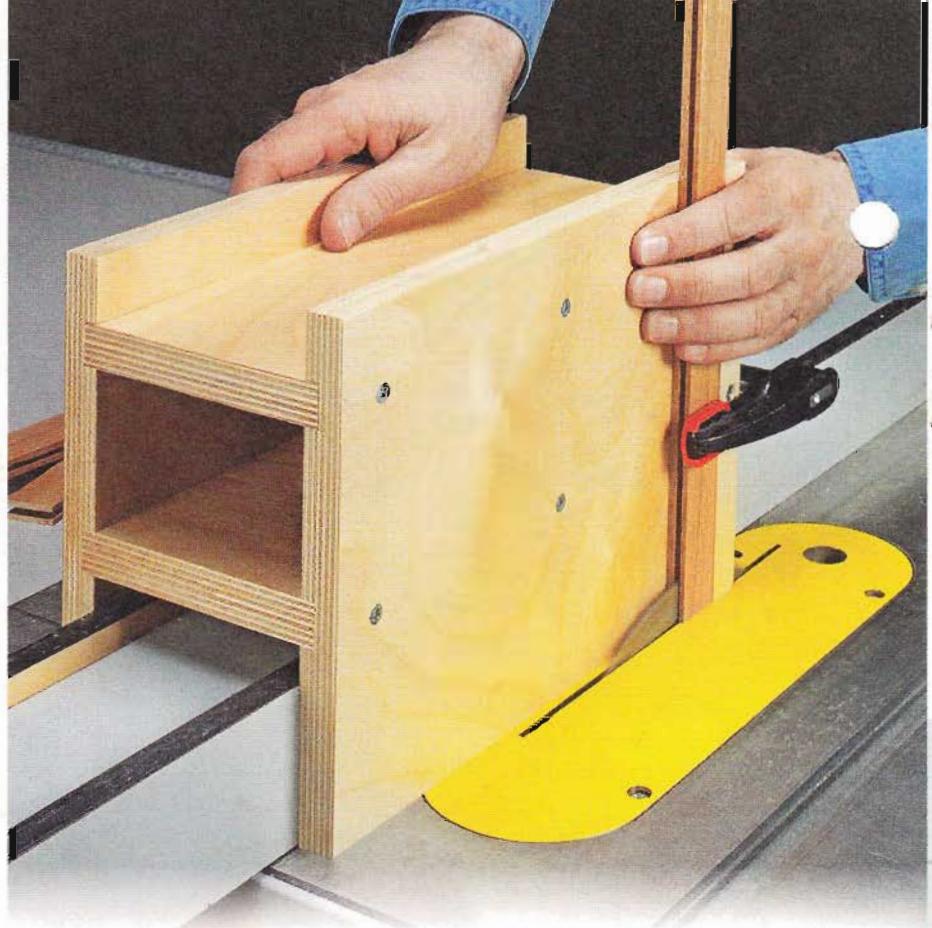
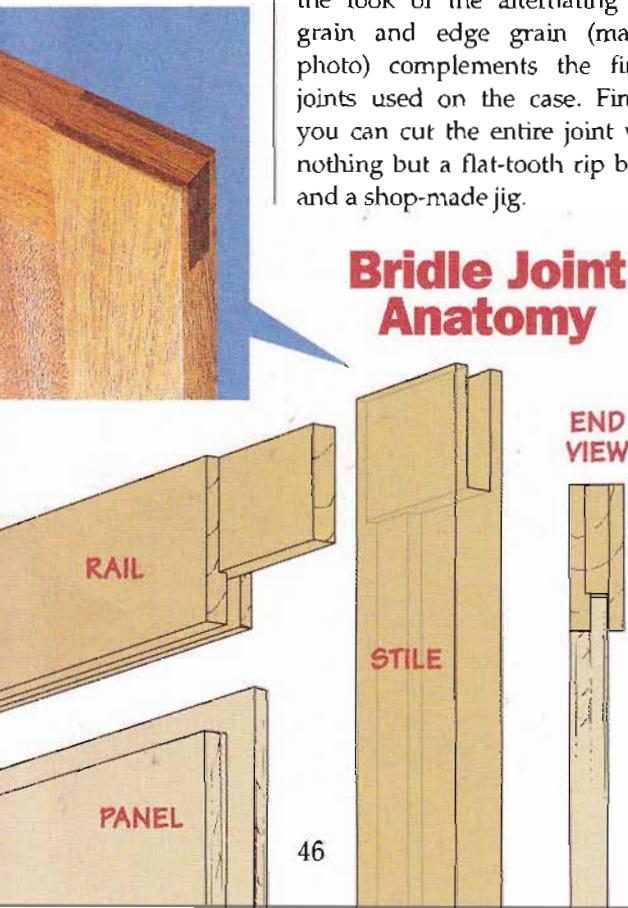
strong & sturdy **Bridle Joints**

Easy to make, it's the perfect joint for a frame and panel assembly.

Some joinery techniques are tailor-made for the table saw. The bridle joints used on the frame and panel assemblies for the top and bottom of the clipboard case on page 36 are a perfect example. You can see what this looks like in the anatomy drawing shown below.

For starters, the large glue surfaces ensure a strong joint. Plus, the look of the alternating end grain and edge grain (margin photo) complements the finger joints used on the case. Finally, you can cut the entire joint with nothing but a flat-tooth rip blade and a shop-made jig.

Bridle Joint Anatomy



The only challenge with cutting the bridle joints involves the panel that fits into the frame. The thickness of the panel affects the dimensions and look of the bridle joint. And that's a function of whether you use plywood, hardboard, or a veneered panel. The nice thing is, the technique that follows will ensure that the top face of the panel is flush with the frame.

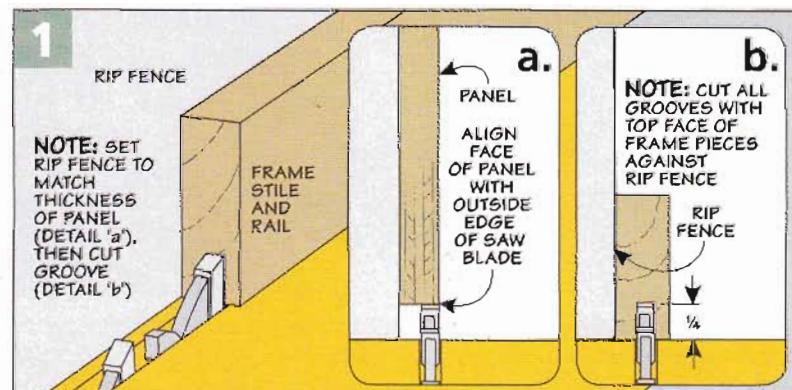
Sizing the Frame. One of the main things I like about a bridle joint is how easy it is to size the rails and stiles of the frame. The length of the rails matches the width of the frame and the length of the stiles matches the overall height of the frame. So you can cut

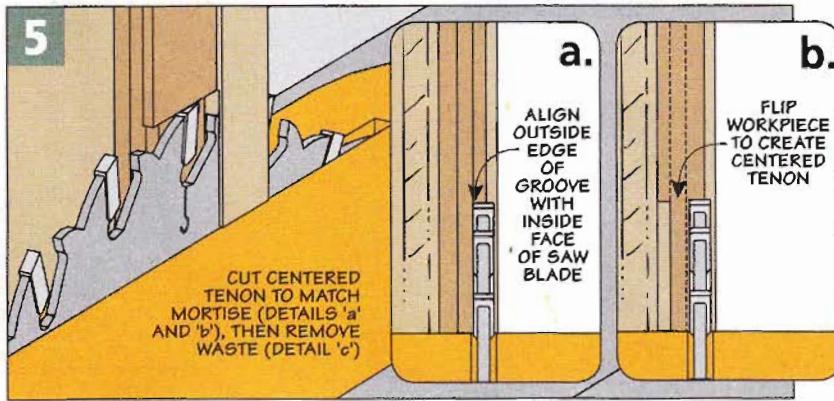
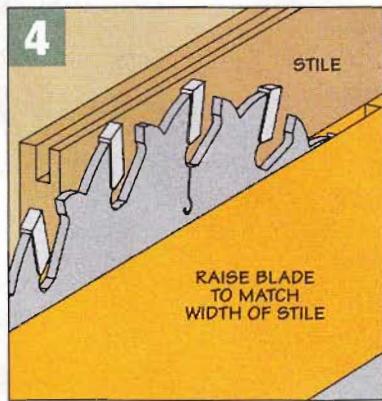
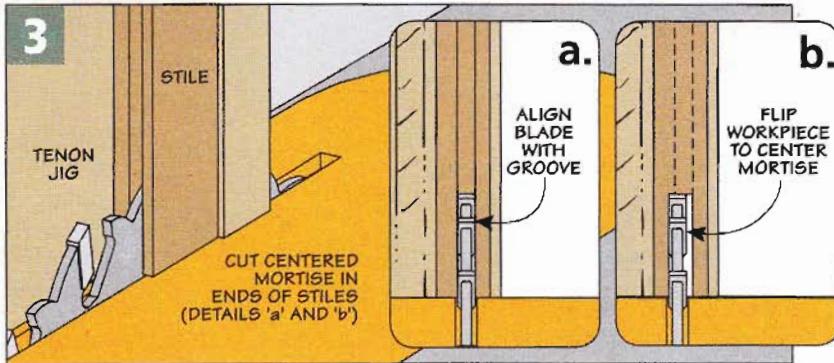
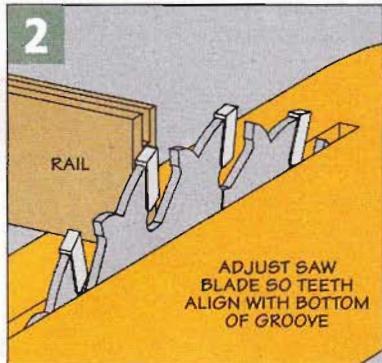
the frame parts to final size right at the start of the process.

POSITIONING THE PANEL

With the frame parts sized, you can turn your attention to the joinery. And that starts with cutting the groove for the panel. The goal is to have the panel flush with the frame's top (outside) face. So the groove needs to be located accurately.

Locating the Groove. What's critical here is the distance from the inside bottom shoulder of the groove to the top face of the frame. This dimension needs to match the thickness of the panel. You can see what I'm talking about in the End View in the drawing at left.





I find the easiest way to locate the rip fence is to use the actual panel to position the fence for the cut. By resting the panel on top of the blade and against the rip fence, you can feel when the outside edge of the saw blade is flush with the plywood, as in Figure 1a.

Cut the Groove. With the blade set for the depth of cut ($\frac{1}{4}$ "), you can cut grooves in all the frame pieces (Figures 1 and 1b). Be sure the top face of each frame piece is against the rip fence for the cut.

CUTTING THE BRIDLE JOINT

The next step is to cut the open mortise and the tenon that make up the bridle joint. You'll use the groove you just cut to locate and size the mortise.

A Simple Jig. Since the mortises are cut on the ends of the stiles, I use a tenon jig to make the cut. The one I like straddles the rip fence, like you see in the main photo.

Start with the Mortise. The first step is to adjust the depth of cut to match the width of the rail, less the depth of the groove, as in Figure 2. Then, after clamping a stile in place in the jig (top face against the

jig), position the rip fence to align the blade with the groove in the stile, as in Figures 3 and 3a.

After making a cut in each end of the stile, flip the stile around to cut a wider groove that's centered on the end, as in Figure 3b.

Next, the Tenon. That completes half of the bridle joint. The next step is to cut a matching tenon on each end of the rails.

For this step, you can use the tenon jig to create smooth tenon cheeks. After resetting the height of the saw blade (Figure 4), reposition the rip fence (Figures 5 and 5a).

One thing you'll notice after making the two cuts for the tenon is a small piece of leftover waste. A utility knife makes quick work of removing it (Figure 5c).

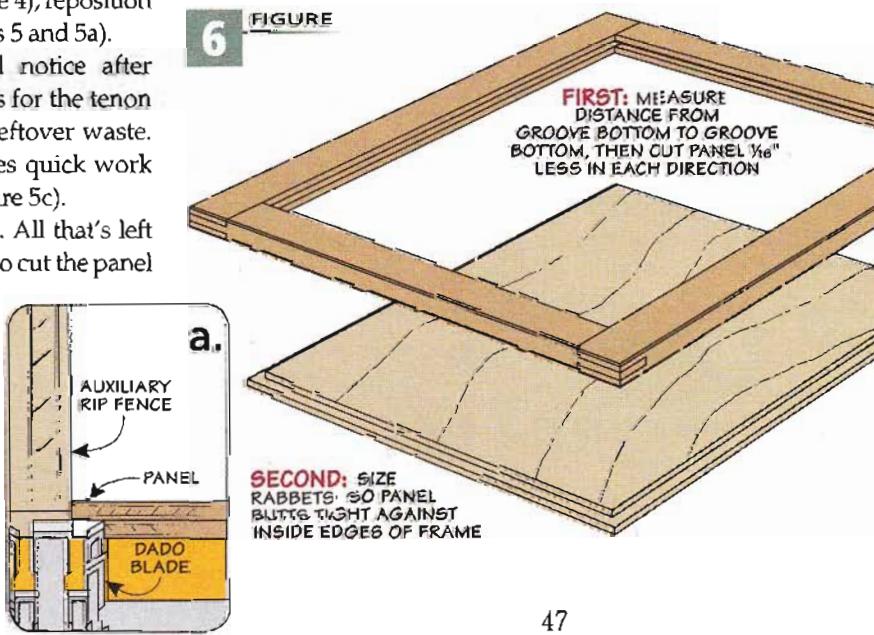
Finally, the Panel. All that's left to do at this point is to cut the panel to size. The overall size needs to match the distance from the bottom of one groove to the bottom of the opposite groove. As shown in Figure 6, I like to cut

the panel about $\frac{1}{16}$ " less overall to ensure a gap-free frame assembly.

To fit the panel in the frame, you'll need to cut a rabbet along each edge, forming a tongue that fits the groove, as illustrated in Figure 6a. The rabbets are sized so that as the frame comes together, the shoulders butt tight against the frame for a seamless fit.

Once you have the panel sized, the last step is assembly. For some handy tips on this, turn to Shop Short Cuts on page 25.

FIGURE 6



the new Super FMT Jig

Making tight-fitting mortise and tenon joints with your plunge router is quick and easy with this next-generation jig.



About a decade ago, *Leigh Industries* introduced their *FMT Jig* (now called the *FMT Pro*) for creating a wide range of mortise and tenon joints with a plunge router. The *FMT Pro* set the standard for quality with its precision-milled, aluminum components. But the

price (over \$900) was a barrier to a lot of woodworkers. (You can read an article about the *FMT Pro* at [ShopNotes.com](#).)

So *Leigh* went back to the drawing board to come up with the lower-cost *Super FMT Jig*. The key to reducing the cost was to use

less expensive sheet metal. But to maintain accuracy, the metal is cut, punched, and formed on computerized machines. The result is the same capability at half the cost.

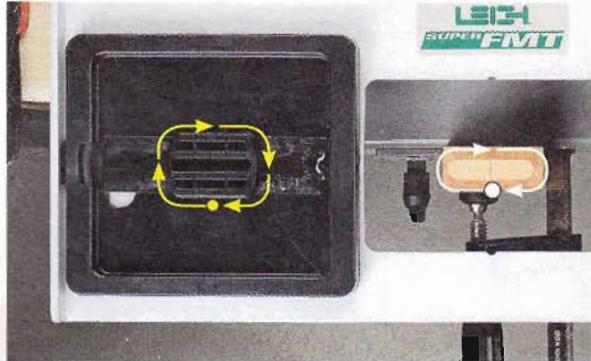
Simple Setup. Setting up and using the *Super FMT* isn't difficult. The user guide is very thorough.

ShopNotes **GO ONLINE EXTRAS**

To read about the original *FMT Jig* go to:
[ShopNotes.com](#)

Sub-base accommodates most plunge routers





▲ Following the Guide. Make a clockwise skim pass to establish the shoulders of the tenon. Then to complete it, finish up by routing counterclockwise.

It starts by showing you how to install and center almost any model of plunge router.

You also get step-by-step guidance on cutting joints and adjusting the fit. Once you run through the process, it's pretty simple.

BASIC SETUP

The basic setup is the same whether you're cutting a mortise or tenon. The first thing to do is determine the size of joint and install the appropriate guide.

Pick a Guide. The plastic guide you see above at right determines the size of the joint. The jig includes guides for $\frac{5}{16}$ "-thick tenons, but you can order other sizes. With the right guide and bit, you can create joints from $\frac{1}{16}$ " thick x $\frac{1}{8}$ " wide up to $\frac{1}{2}$ " thick x $2\frac{1}{2}$ " wide.

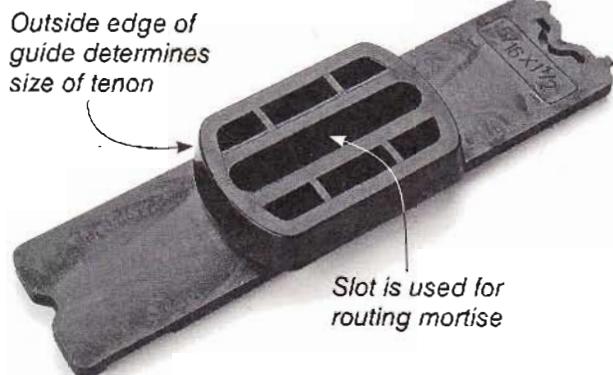
Layout. The next step is to mark the center of the joint on both

workpieces (left photo below). Then fasten the piece securely to the jig's clamp plate and against the fence using the F-style clamps.

Alignment: To align the table over the workpiece (and later center the router bit), the plastic sight snaps into the table opening (right and inset photo below). After adjusting the table to center it over the layout lines, you can remove the sight before routing.

Brass Pins. On the router sub-base, there are two tapered brass pins that thread into the base (photo above). The left pin rides against the outside of the guide to create a tenon. The right pin fits in a special guide track.

The tapered shape of the guide and pin allows you to fine-tune the fit of the joint by raising or lowering the pin. For the initial setup, you can adjust the pin for a loose,



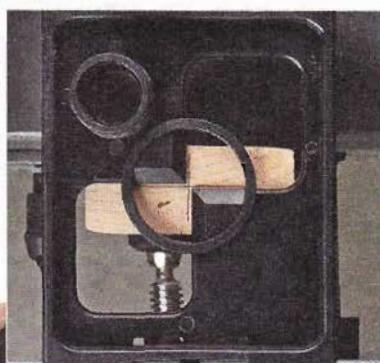
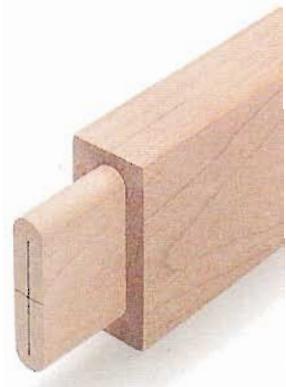
▲ Geometry. The tapered shape of the pin and guide plus the capability of adjusting the pin vertically work together for flawless joinery.

sliding fit in the slots of the guide and guide pin track.

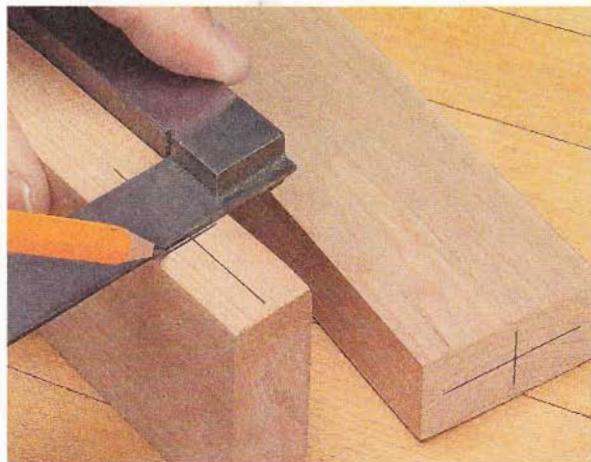
CREATING A TENON

With the router installed, you're ready to rout a tenon. Leigh includes a spiral upcut bit for making a smooth cut. After setting the depth of the bit for the tenon length, set the router and sub-base assembly in place.

Climb Cut First. The trick to getting sharp, clean shoulders on the tenon is to carefully make a skim pass in a clockwise direction first (left photo above). To finish up, rout in a counter-clockwise direction with the pin tight against the outside of the guide. This minimizes tearout (margin photo).



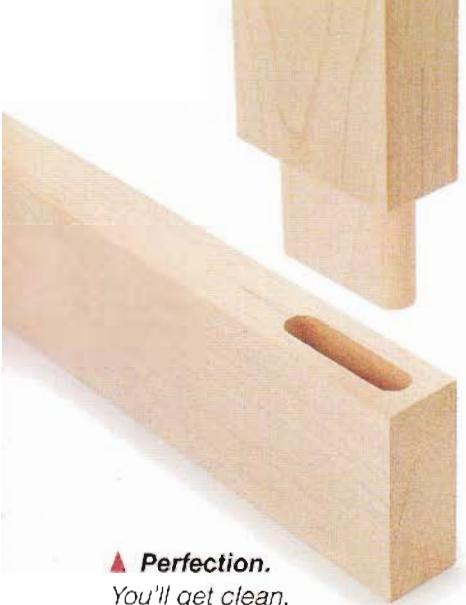
▲ Bull's-eye. The crosshairs on the sight guarantee accurate positioning of the joint.



▲ Accurate Layout Lines. Marking the centerline of the mortise and tenon on the workpieces is the first step to creating tight-fitting joints.



▲ Sliding Table. The table moves left and right and forward and backward to accurately position the router bit over the layout lines.



▲ Perfection.

You'll get clean, tight-fitting joinery every time with the Super FMT Jig



▲ Inside

Track. To cut a mortise, the pin rides on the inside of the guide.

CUTTING A MORTISE

The great thing about the *Super FMT Jig* is that you can cut a matching mortise to fit the tenon in no time at all. Just like you did with the tenon workpiece, all you need to do is clamp the workpiece securely. Then use the sight and reposition the table, if needed.

The technique for cutting the mortise differs slightly from cutting a tenon. When you rout the tenon, the pin on the router sub-base travels in contact with the *outside* edge of the guide. But when you rout a mortise, the pin rides on the *inside* of the guide, as you can see in the photo above. It's the length of the slot in the guide that ultimately determines the length of the mortise you'll be cutting.

A Note on Clamping. There's one thing I'd like to mention about clamping the workpiece to the

▲ Two Methods. To cut a mortise, you can make a series of full-depth plunge cuts with a final cleanup pass. Or you can make a series of passes at increasing depths until you reach the full depth.

clamp plate. If you're going to cut a mortise on the end of a workpiece, as shown in the main photo above, this task can be a little tricky. But with the wide array of holes on the clamp plate, it doesn't take too long to figure out how to position the clamps for effective clamping.

After the workpiece is secure, you're ready to cut the mortise. Since you've already routed the tenon, the depth of cut is already set. But to allow a little room for glue, I like to go just a little deeper when routing the mortise.

Two Routing Choices. There are a couple of other things I want to point out. As I was giving the jig a run-through, I tried two different methods of routing the mortise. The first (and what the user guide recommends) is to make a series of full-depth, overlapping plunge cuts. Then you make a final pass at full-depth to smooth up the sides.

The second method I tried was to make a series of shallow passes (about $\frac{1}{4}$ "') using the depth turret on my plunge router. By the time I reached the full depth of the mortise, the sides were smooth.

To be honest, I had more trouble getting good results using the method recommended in the

user guide. The bit had a tendency to grab the workpiece, resulting in a very rough-looking mortise.

I felt the process went a lot smoother making several shallow passes. But the bottom line is, with any new jig or tool you purchase, it's worth making a few practice cuts on test pieces. This is the best way to find out which method gives you the best results.

And while you're routing some test pieces, you can take the time to tweak the height of the pin to fine-tune the fit of the joint. Again, the user guide steps you through the simple process of making this adjustment.

Additional Options. Besides the array of bits and guides you can purchase, *Leigh* didn't forget about all that dust a router generates. They have an add-on vacuum box attachment that includes two hose adapters to make the connection to your shop vacuum easy.

Final Impression. Once I had some time to figure out the best way to clamp the workpieces in place and get the technique down, making a mortise and tenon was simple. Overall, I think *Leigh* hit the mark for an affordable, high-quality jig that's worth a look. ☐

worth a look

Leigh FMT Pro

This jig partners with most plunge routers to become an incredibly versatile mortise and tenon machine.

Until the advent of the Frame Mortise and Tenon Jig (now called the *FMT Pro*) from *Leigh Industries*, my technique for making mortise and tenon joinery involved a minimum of two large power tools and a great deal of time and effort.

Typically, I'd cut the mortises by drilling several holes with a Forstner bit and then square them up with a chisel. The tenons I cut on my tablesaw with a tenoning jig.

After a few large projects using this



method, I felt I'd become quite efficient setting up and cutting dead-on mortise-and-tenon joints. The *FMT Pro*, however, changed my idea of what efficient is.

Quite simply, the *FMT Pro* takes all the hard work and fussiness that's inherent to mortise and tenon joinery and very nearly eliminates it. If you can operate a plunge router and follow simple instructions, you can easily use the *FMT Pro* to build furniture using mortise and tenon joints.

Shown in action (above) and as a kit (below), the kit consists of a jig body that positions the workpiece and guides the router, a sub-base that will accept most brands of plunge router, a $5/16$ " spiral upcut bit, five guides that make over 20 sizes of mortise and tenon joints, and all the necessary tools, hardware, clamps, and accessories.

The most important component of this system, however, has to be the user's manual. This clearly illustrated and plainly-written manual guides you through the



Price: \$929 (as of Jan. 2010)

Requires: $1/2$ " plunge router

Dimensions: 8" x 12" x 14"

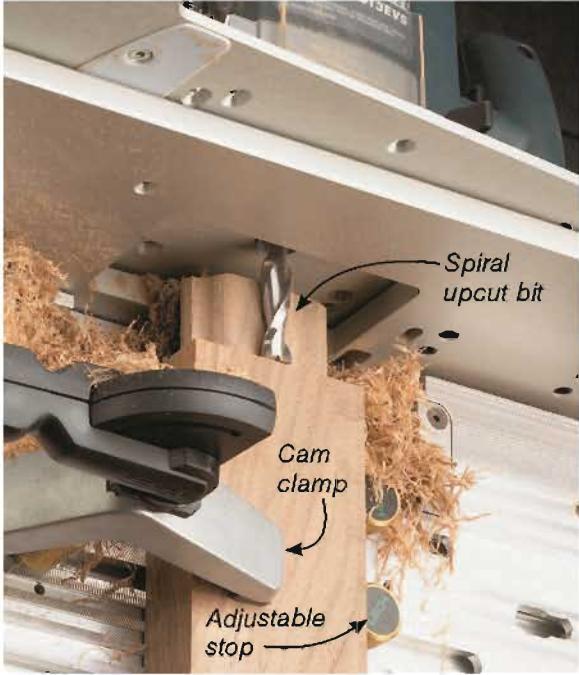
Max Tenon: $1/2$ " x $2\frac{1}{2}$ " x 5"

Warranty: 5 years

Virtues: Simplifies mortise and tenon joinery with inventive guide system and logical, clear instructions for use.

leighjigs.com

800-663-8932



▲ Cam-action clamps and adjustable stops ensure perfect and secure placement of the workpiece. Clamps and stops can be used in various locations to accommodate different stock sizes.

setup and operation of the jig with a perfect blend of theory and step-by-step instructions.

SETUP & OPERATION

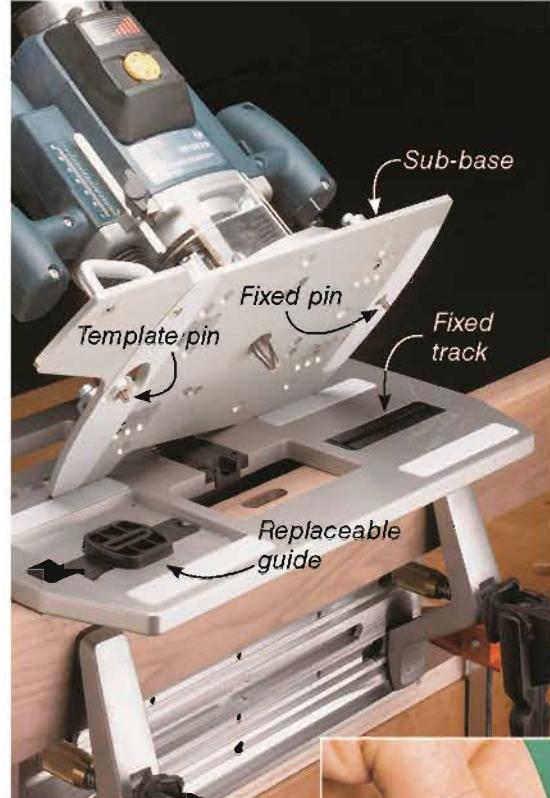
The *FMT Pro* requires you to do little more than decide the size of mortise and tenon you wish to cut and then match that to the appropriate bit and guide combination. From there, locate the center of the cuts. Then use the adjustable stops to position the workpiece and the cam clamps to hold it firmly in position (photo above).

Now, the *FMT Pro* pretty much takes over. A set of pins in the sub-base positions the router on the jig body, (photo above right).

One pin rides in a fixed track to control side-to-side movement. The second pin tracks around the perimeter of the guide to cut the tenon and inside the guide to cut the matching mortise (top margin photo). This pin is microadjustable for fine-tuning the fit of the joint.

VERSATILITY

The *FMT Pro* also receives high praise for the incredible array of



► Pins.
Two pins follow guides on the jig top to cut perfect-fitting mortise and tenon joints.

▼ Versatility. The *FMT Pro* comes with five guides that are capable of more than 20 sizes of mortise and tenon joints.

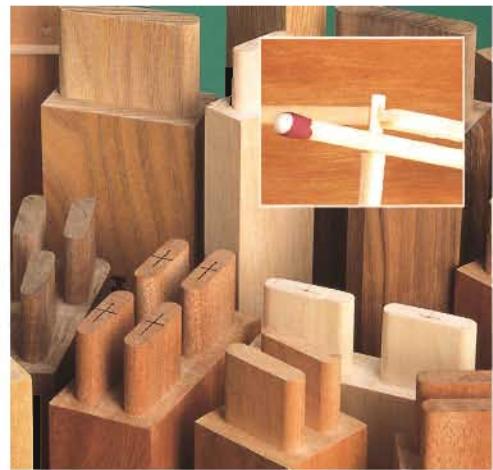


mortise and tenon joints it can cut — anywhere between a matchstick and a 3"-wide x 5"-long tenon is all in a day's work for this versatile jig. You can see a sampling of these joints in the lower right photo.

Likewise, the *FMT Pro* simplifies even very challenging variations of mortise and tenon joinery, including angled tenons and even double, triple, and quadruple mortise and tenon joints.

It's important to note here, however, that this range of versatility requires you to purchase additional templates and router bits. This adds significantly to the cost of the *FMT Pro* (over \$300 if you purchase every possible guide and bit variation).

There's no denying that the *FMT Pro* is a sizable investment. On the other hand, when I compare it to the price of the nearest alternative — that being a dedicated mortiser and a tenoning jig for the table saw — and then factor in how much faster and more accurate this system is than any other manner of cutting mortise and tenon joints, it looks like a bargain to me.



▲ A Variety of Joints. The *FMT Pro* offers almost endless possibilities for mortise and tenon joinery design.

Sources

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

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.

ROUTING SMALL PARTS (p.8)

- Reid Supply

- | | |
|---------------------|----------|
| <i>Toggle Clamp</i> | TC-227-U |
| <i>Star Knob</i> | DK-82 |
| <i>Tapered Knob</i> | BTH-14 |

SHOP SUPPLIES (p.10)

You'll find Permatex at hardware stores or home centers and can pick up PB Blaster at most automotive supply stores.

- McFeely's

- | | |
|----------------------------|---------|
| <i>Bench Lube Tub</i> | LA-0900 |
| <i>Fastener Lube, 3-pk</i> | LA-0300 |

- Rockler

- | | |
|----------------------|-------|
| <i>Boeshield T-9</i> | 53470 |
|----------------------|-------|

- Reid Supply

- | | |
|------------------|-----------|
| <i>Tap Magic</i> | TM-20004A |
| <i>Tap-Ease</i> | CE-1 |

PERFECT CROSSCUTS (p.12)

- Woodsmith Store

- | | |
|--------------------------|------------|
| <i>Forrest 12" Blade</i> | CM12905115 |
|--------------------------|------------|

MITER SAW STATION (p.14)

- Woodsmith Store

- | | |
|--------------------------------|--------|
| <i>Kreg 48" Top Trak</i> | 273734 |
| <i>Kreg 24" Top Trak</i> | 273733 |
| <i>Kreg Swing Stop</i> | 273729 |
| <i>Kreg Right-to-Left Tape</i> | 273739 |
| <i>Kreg Left-to-Right Tape</i> | 273740 |

- Rockler

- | | |
|------------------------|-------|
| <i>1/4" Shelf Pins</i> | 30437 |
|------------------------|-------|

SHOP CART (p.26)

- Lee Valley

- | | |
|---------------------------|----------|
| <i>4" Locking Casters</i> | 00K20.01 |
| <i>Bed Bolts</i> | 05G17.01 |
| <i>Veritas Pup Set</i> | 05G10.03 |

- Rockler

- | | |
|-----------------------------|--------|
| <i>14" Drawer Slides</i> | 32474 |
| <i>Spring Hinge</i> | .28845 |
| <i>Talon Pegboard Hooks</i> | 81351 |

- Reid Supply

- | | |
|-----------------------|--------|
| <i>Plastic Handle</i> | DUH-55 |
|-----------------------|--------|

- Woodcraft

- | | |
|--------------------------|--------|
| <i>Leigh Bench Clamp</i> | 149059 |
|--------------------------|--------|

- Rockler

- | | |
|----------------------|-------|
| <i>Boeshield T-9</i> | 53470 |
|----------------------|-------|

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

ShopNotes Binder

SB (Holds 6 issues).....\$12.95

CLIPBOARD CASE (p.36)

- Lee Valley

- | | |
|-------------------------|----------|
| <i>Push Button Lock</i> | 00D45.80 |
| <i>25mm Cont. Hinge</i> | 00D52.25 |

- Rockler

- | | |
|-----------------------|-------|
| <i>Clipboard Clip</i> | 75838 |
|-----------------------|-------|

CHISELS (p.42)

- Woodcraft

- | | |
|---------------------------------|-------|
| <i>Irwin 1/8" Bench Chisel</i> | 12G11 |
| <i>Sorby 3/8" Corner Chisel</i> | 03R32 |

- Lee Valley

- | | |
|--------------------------------|----------|
| <i>Veritas 1/2" Left Skew</i> | 05K04.76 |
| <i>Veritas 1/2" Right Skew</i> | 05K04.75 |
| <i>Pair of Skew Chisels</i> | 05K04.77 |
| <i>3/8" Dovetail Chisel</i> | 60S05.09 |

- Tools for Working Wood

- | | |
|------------------------------|-----------------------|
| <i>Ray Iles 1/4" Mortise</i> | MS-MORT $\frac{1}{4}$ |
|------------------------------|-----------------------|

SANDING KIT (p.44)

- Highland Woodworking

- | | |
|---------------------------|--------|
| <i>Cork Sanding Block</i> | 154901 |
|---------------------------|--------|

- Woodcraft

- | | |
|---------------------------|-------|
| <i>100-Grit Sandpaper</i> | 13R34 |
| <i>120-Grit Sandpaper</i> | 12B32 |
| <i>150-Grit Sandpaper</i> | 12H14 |
| <i>180-Grit Sandpaper</i> | 13W52 |

GREAT GEAR (p.48)

- Woodsmith Store

- | | |
|----------------------|--------|
| <i>Super FMT Jig</i> | 216749 |
|----------------------|--------|

MAIL ORDER SOURCES

Woodsmith Store
800-444-7527

Rockler
800-279-4441
rockler.com

Forrest
800-733-7111
forrestblades.com

Highland Woodworking
800-241-8748
highlandwoodworking.com

Kreg Tool Company
800-447-8368
kregtool.com

Lee Valley
800-871-8158
leevalley.com

Leigh Industries
800-663-8932
leighjigs.com

McMaster-Carr
630-600-3600
mcmaster.com

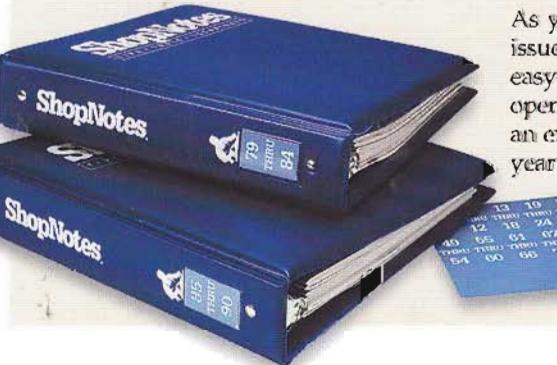
McFeely's
800-443-7937
mcfeelys.com

Reid Supply
800-253-0421
reidsupply.com

Tools for Working Wood
800-426-4613
toolsforworkingwood.com

Woodcraft
800-225-1153
woodcraft.com

Woodpeckers
800-752-0725
woodpeck.com



wall-mounted Miter Station

Materials List

LARGE CABINET

| | |
|--------------------------|--------------------|
| A Sides (4) | 19½ x 24 - ¾ Ply. |
| B Case Top (1) | 48 x 18½ - ¾ Ply. |
| C Bottom (1) | 12 x 48 - ¾ Ply. |
| D Back (1) | 24 x 48 - ¾ Ply. |
| E Divider (1) | 11 x 22½ - ¾ Ply. |
| F Adjustable Shelves (2) | 11 x 23½ - ¾ Ply. |
| G Top (1) | 19½ x 49½ - ¾ Ply. |

SMALL CABINET

| | |
|------------------------|--------------------|
| H Case Top (1) | 24 x 18½ - ¾ Ply. |
| I Bottom (1) | 12 x 24 - ¾ Ply. |
| J Back (1) | 24 x 24 - ¾ Ply. |
| K Adjustable Shelf (1) | 11 x 23½ - ¾ Ply. |
| L Top (1) | 19½ x 25½ - ¾ Ply. |

FENCES

| | |
|--------------------------|-------------|
| M Long Fence Base (1) | ¾ x 7 - 48 |
| N Long Fence Back (1) | ¾ x 2½ - 48 |
| O Support Arms (3) | 1½ x 2 - 22 |
| P Pivot Stops (3) | ¾ x 2 - 9 |
| Q Long Fence Spacer (1) | ¾ x 1½ - 47 |
| R Short Fence Base (1) | ¾ x 7 - 24 |
| S Short Fence Back (1) | ¾ x 2½ - 24 |
| T Short Fence Spacer (1) | ¾ x 1½ - 23 |

SAW PLATFORM

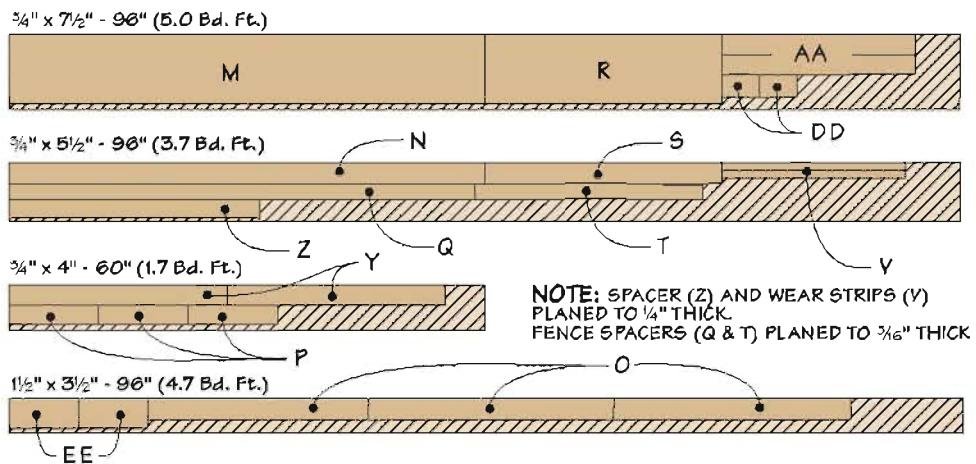
| | |
|----------------------|-----------------------|
| U Sides (2) | 11 x 18½ - ¾ Ply. |
| V Wear Strips (2) | ¼ x ¾ - 18½ |
| W Shelf (1) | 19½ x 30 - ¾ Ply. |
| X Shelf Top/Bot. (2) | 19½ x 30 Plastic Lam. |
| Y Rails (2) | ¾ x 1½ - 28½ |
| Z Spacer (1) | ¾ x 1½ - 28½ |
| AA Upper Guides (2) | ¾ x 2 - 19½ |
| BB Wing Blocks (2) | 5 x 11 - ¾ Ply. |
| CC Support Wings (2) | 11 x 12½ - ¾ Ply. |
| DD Catches (2) | ¾ x 2½ - 3½ |

DUST HOOD & DEFLECTOR

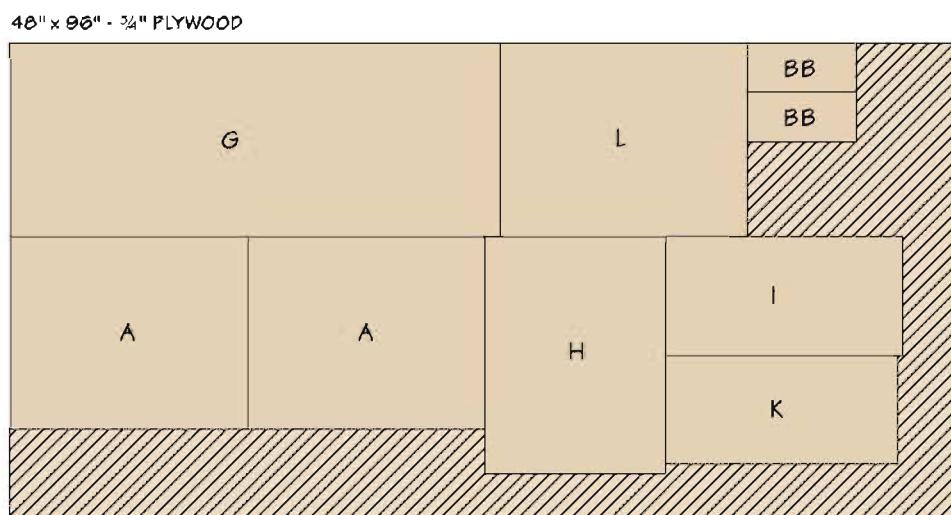
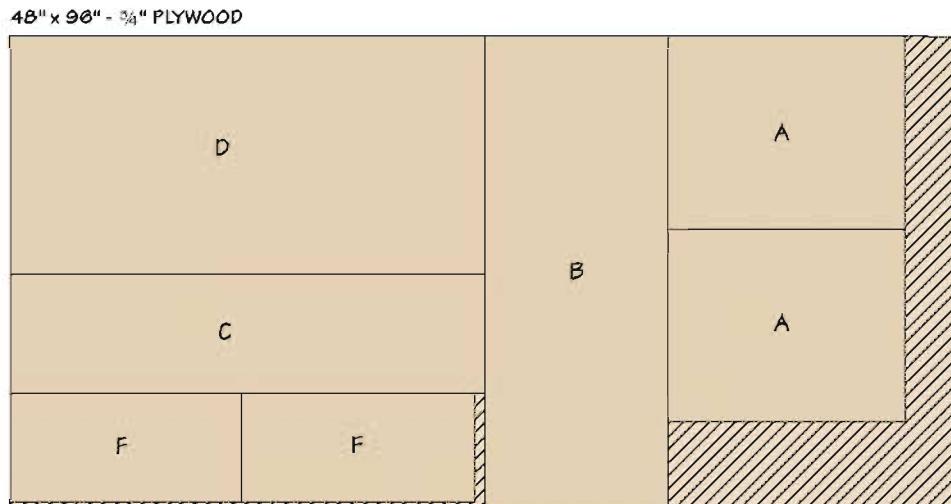
| | |
|---------------------------|-------------------|
| EE Deflector Supports (2) | 1½ x 3 - 7 |
| FF Deflector (1) | 10 x 28½ - ¼ Ply. |
| GG Hood Sides (2) | 19½ x 16 - ¾ Ply. |
| HH Hood Top (1) | 14 x 28½ - ¾ Ply. |

- (46) #8 x 1½" Fh Woodscrews
- (81) #8 x 1½" Fh Woodscrews
- (2) ¼"-20 x 2" Hex Bolts
- (3) ¼"-20 x 3½" Hex Bolts
- (10) ¼" Washers
- (5) ¼"-20 Nylon Lock Nuts
- (1) 2" x 48" Continuous Hinge
- (1) 2" x 24" Continuous Hinge
- (2) 2" x 13" Continuous Hinges
- (12) Shelf Pins
- (1) 48" Kreg Top Trak
- (1) 24" Kreg Top Trak
- (1) Kreg Swing Stop
- (1) Left-to-Right Self-Adhesive Tape
- (1) Right-to-Left Self-Adhesive Tape

Cutting Diagram

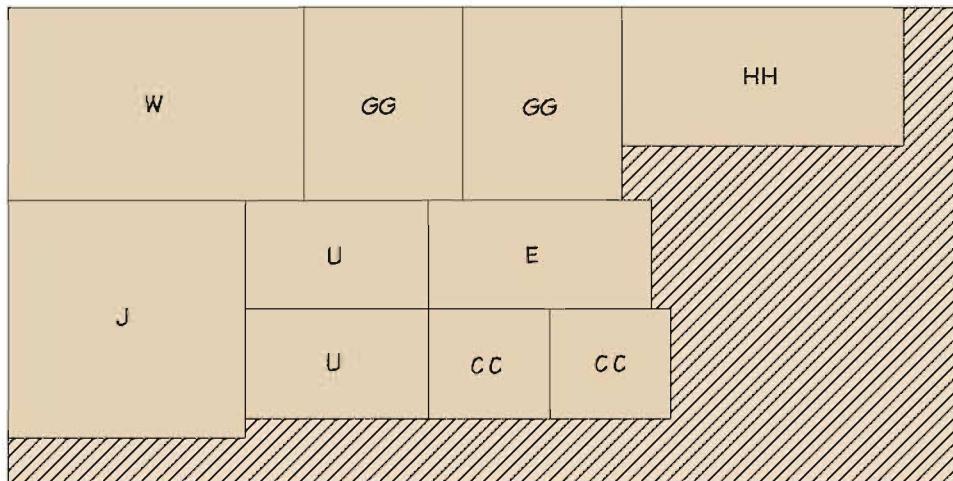


**NOTE: SPACER (Z) AND WEAR STRIPS (Y)
PLANED TO $\frac{1}{4}$ " THICK
FENCE SPACERS (Q & T) PLANED TO $\frac{3}{16}$ " THICK**



Cutting Diagram

48" x 96" - 1/4" PLYWOOD



24" x 48" - 1/4" PLYWOOD



ALSO NEEDED: 8.5 Sq. Ft. PLASTIC LAMINATE FOR SHELF TOP/BOTTOM (X)
(TWO EACH @ 19 1/2" x 30")

Scenes from the Shop



This multipurpose shop cart gives you a large, extra worksurface and versatile storage options. It's a handy addition you can use almost anywhere in your shop. Detailed plans start on page 26.



You can keep plans, notes, and layout tools close at hand in this clipboard storage case. It's constructed with strong, attractive finger joints. And best of all, you can build it in a weekend. You'll find complete plans starting on page 36.