CUSTOM TOOL HANDLES:
Age-Old Technique

A SAW YOU CAN'T
Do Without!

# ShopNotes®

ShopNotes.com

Vol. 22 Issue 129

## Must-Have, Classic
# Layout Tools
## In An Afternoon

> **Miracle Material**
For Shop Projects

> **Problem-Solving**
Router Bits

> **Tips & Tricks**
For Smoothing Curves

> **Quick & Easy Ways**
To Hold Your Work

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# Cutoffs

Any time we ask woodworkers about their favorite *ShopNotes* articles, Readers' Tips always ends up at the top. I'll have to admit, tips are one of the first things I look at in any woodworking magazine. There are a lot of woodworkers out there who are finding inventive and inexpensive ways of doing things. And they're always willing to pass it along to the rest of us.

That's the case with the mobile planer stand that starts on page 34. It actually started out as a tip sent in by Mike Binder of Pickerington, Ohio. He came up with a solution to a problem he had in his own shop when it came to using his planer.

The challenge he had was making his planer mobile while incorporating a work-surface and storage close at hand. His design was more involved than we could feature as a tip, so we passed it along to our design group. They used it as the starting point for the project you see at left. I'd like to thank Mike and make a request to the rest of our readers. If you've solved any type of challenge in your shop, tell us about it, and maybe it'll end up as a future project in these pages.

You'll find a number of other great projects and departments in this issue. One of my favorites is the set of oval tool handles featured on page 14. It's a great way to customize your tools. I'll be dusting off my lathe in the next week or so to turn my own set.

*Bryan*

ShopNotes GO ONLINE EXTRAS

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

from our Readers

# Tips for Your Shop

THE WINNER!

## Drill Press Table

A lot of drill press tables I've seen seem to be overly complicated assemblies with fancy fences that are difficult to adjust. The version shown here has many of the same features as more elaborate tables but is a lot simpler to use.

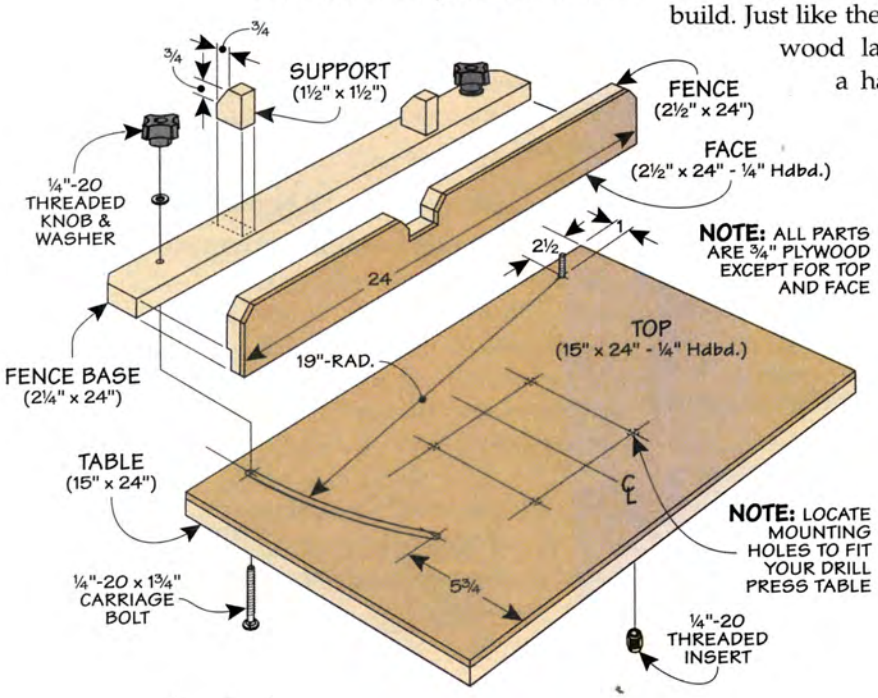
The plywood table has a hardboard top. But what's unique is the way I mounted the fence and how it's adjusted. Instead of using parallel slots or T-track to adjust the fence, my fence pivots on a carriage bolt. I routed a curved slot at the opposite end of the table for a bolt and star knob.

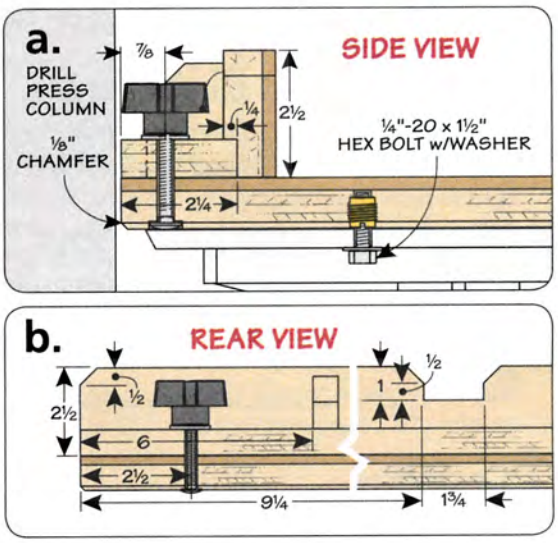
I also installed threaded inserts on the bottom face of the table to make it easy to attach to the table of the drill press. Studded knobs hold it securely in place.

Making the fence is an easy build. Just like the table, it's plywood laminated with a hardboard face. The fence is reinforced with a couple of bracket supports to ensure squareness. A pair of holes in the base align with the pivot hole and slot in the top.

Adjusting the fence is easy. And it doesn't bind like some conventional fences. Simply loosen the knobs, pivot the fence to set the distance from the drill bit, and then tighten the two knobs.

*Robert Shillis*
*Easton, Pennsylvania*



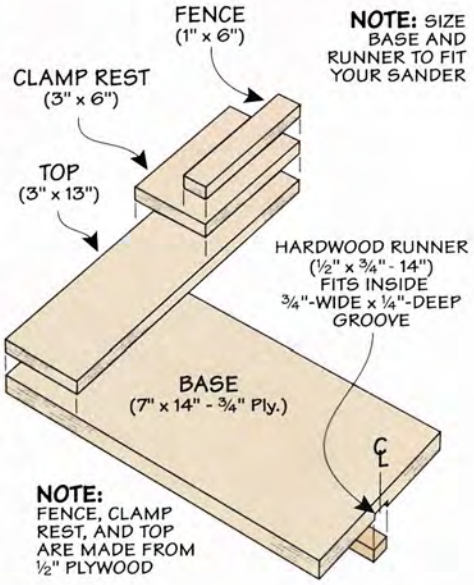



## Clamp Grinder

I found that the jaw faces on some of my F-style bar clamps weren't flat or square, causing them to slip during use. Not wanting to toss the clamps, I came up with this grinding jig for my disk sander.

The jig starts with a base and runner that fits the sander's table. The top, clamp rest, and fence align the clamp head parallel to the sanding disk. A couple of light touches are all you need to grind the clamp head square. Just keep checking your progress as you go until the face is square.

*Tom Brooker*
*Mount Vernon, Washington*




## Submit Your Tips Online!

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

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and click on the link
**SUBMIT A TIP**

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



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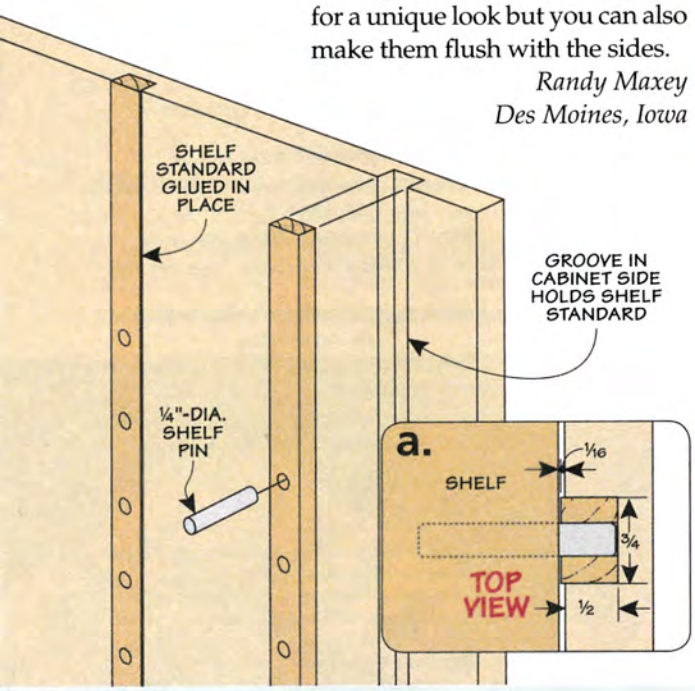
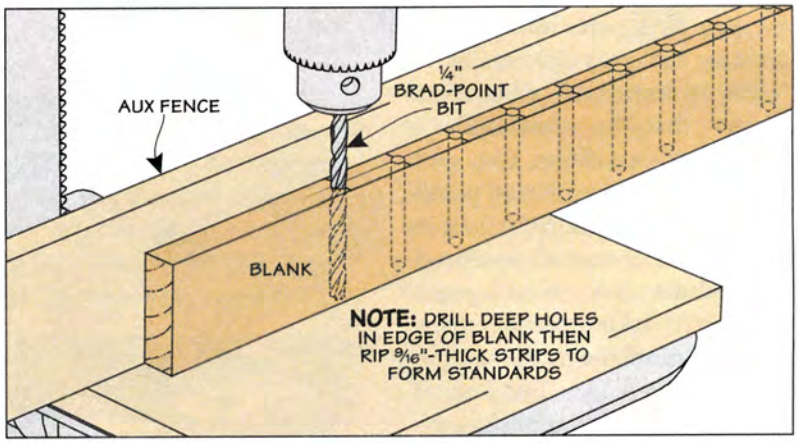
# Shop-Made Shelf Standards

My latest cabinet project called for a number of adjustable shelves. Rather than using typical steel shelf standards, I decided to make my own hardwood versions for a custom appearance.

To make them, I drilled deep holes in the edge of a ¾"-thick workpiece. Then it's a simple matter to rip strips to thickness. Before assembling the case, align the holes and fit the strips into grooves cut into the case sides. I left my standards a little proud for a unique look but you can also make them flush with the sides.

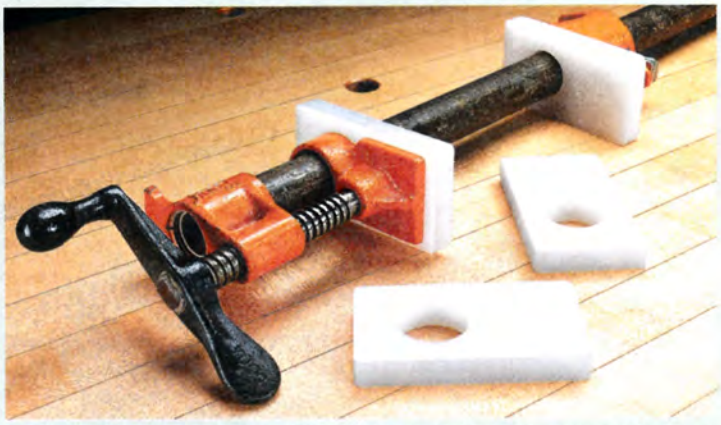
*Randy Maxey*
*Des Moines, Iowa*




## Quick Tips

▲ ***Wilbur Goltermann*** *of Denver, Colorado closes the gaps on his miter joints with a pair of hold-down clamps. He removes the bolt and knob and then clamps one to each workpiece. Another clamp brings the joint together.*



▲ *Pipe clamps can be difficult to stand up during a glue up.* ***Jack Dosenberg*** *of Delta, British Columbia solved this by sizing blocks of ½" UHMW plastic to match the clamp's feet. Double-sided tape secures the non-marring surface in place.*

## Auxiliary Top

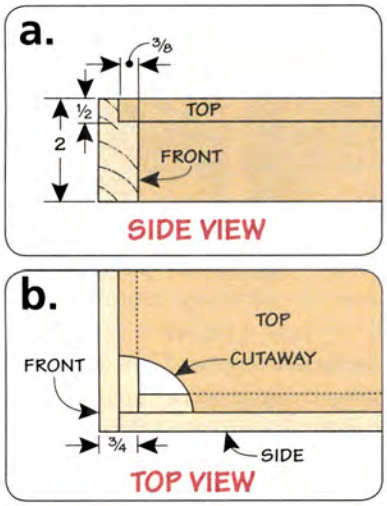
To create an additional worksurface in my shop, I made an auxiliary top that fits over my router table. Simple construction using MDF and hardwood make building it a breeze.

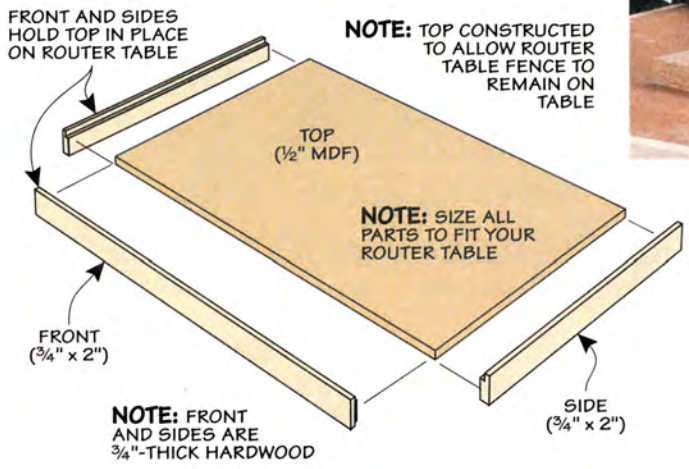
I started by measuring the width of my router table. The depth is measured with the fence moved all the way back. (The fence could also be removed.)

To size the top, I added 3/8" to the depth and 3/4" to the width to account for the rabbets in the three frame pieces (drawings below). After assembly, simply slide it onto your router table.

*William Aulick*
*Cincinnati, Ohio*

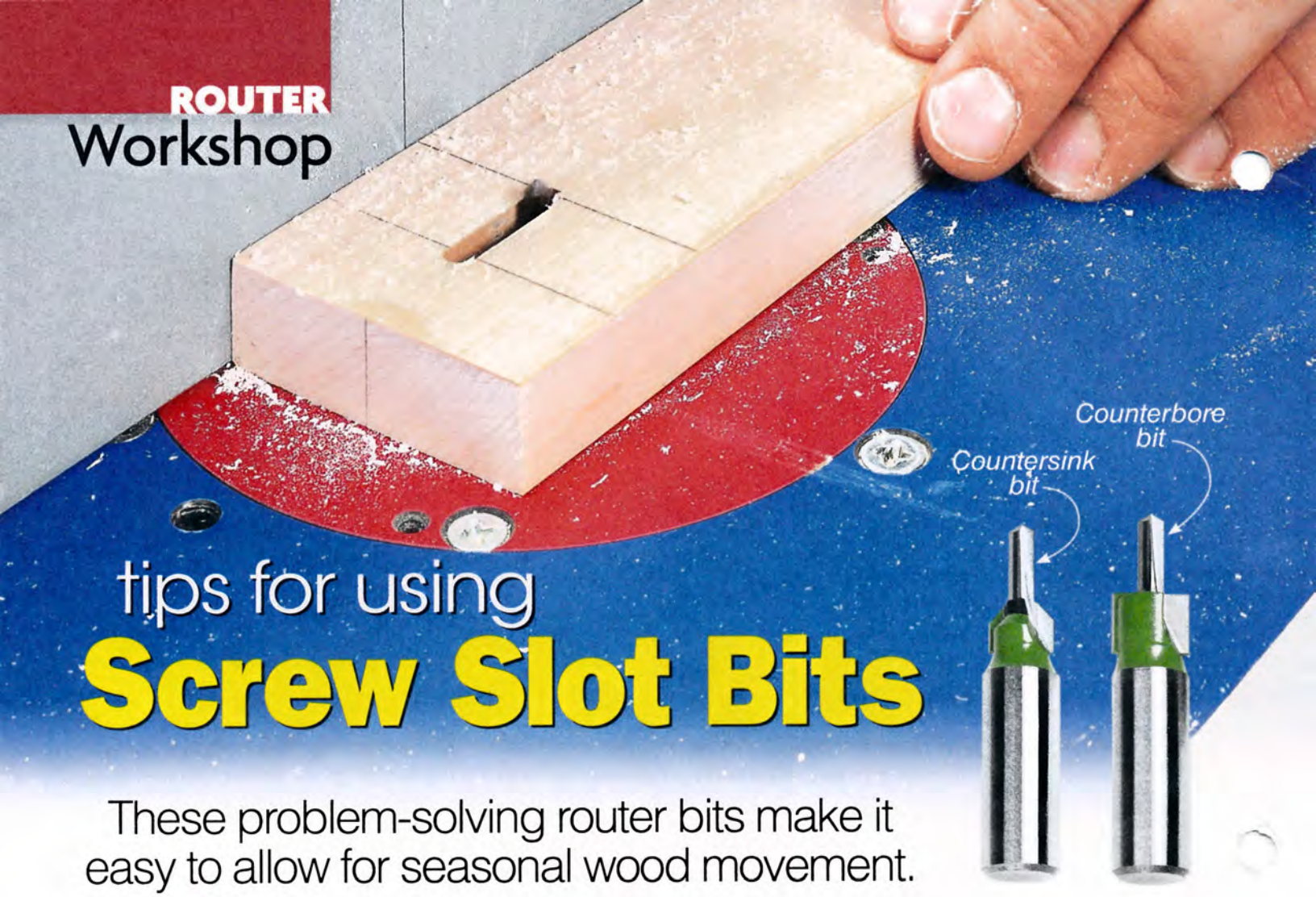
▲ *Maximize the working area in your shop by adding an additional worksurface to your router table top.*




▲ ***Gene Molenhauer*** *of Toddville, Iowa, reuses foam sanding blocks after the grit wears down by attaching adhesive-backed sandpaper to the face of the blocks.*

▲ *Ripping thin strips is no problem for* ***William Collett*** *of Bettendorf, Iowa. He uses the back side of his featherboard to set the width of each strip.*




# tips for using Screw Slot Bits

## These problem-solving router bits make it easy to allow for seasonal wood movement.

An important part of building projects with solid wood is accommodating wood movement. When the relative humidity is high (in summer, for example), wood absorbs moisture from the air and expands across its width. During dry seasons, the humidity drops and the wood shrinks in width.

If you fail to take this movement into account, the results can be dramatic. A tabletop can crack or joints can break loose.

The solution to keeping a project together requires a flexible connection between the wide wood parts that need to move and the other parts of a project.

**Two Router Bits.** One traditional solution is to drill an oversized or slotted hole to connect the parts with screws. Several router bit manufacturers have taken this idea a step further and developed a set of router bits to create precise screw slots quickly.

You can see what the bits look like in the photo above. At first glance, they look similar to pilot hole drill bits. The carbide cutting flutes enable them to cut smooth-sided slots with a router.

Both bits are designed to accept #8 size screws. One type creates a countersunk slot for ordinary flathead screws. The other bit forms a counterbored slot to hold a roundhead or panhead screw with a washer, as shown in the lower left photos.

The shank of the screw fits snugly in the slot created by the bit. So the movement of the workpiece is limited in the direction of the slot. This allows parts to stay in alignment throughout the seasons. The upper photos on the opposite page show a couple practical uses for these bits.

Screw slot bits can be used in material up to $^{13}/_{16}$" thick. One thing to keep in mind is that using thicker material results in a deeper countersink or counterbore.


***Two Types.*** *Cut slots with either a countersunk or a counterbored profile.*

### SIMPLE TECHNIQUES

There are two quick and easy methods to put these bits to work — at the router table and using a hand-held router. I'll discuss the router table method here.

To learn more about the hand-held method, take a look at the box at the bottom of the page.

The technique for creating a screw slot at the router table is pretty much the same as routing an ordinary straight-sided slot. You can see all the elements in action in the main photo on the opposite page.

**Some Setup.** The process begins with a little layout and setup. After installing the bit in the router table, mark the centerline of the bit on the router table fence. (In the main photo, I aligned the ends of the sliding fence faces with the center of the bit.) You use this mark as a gauge to know where to start and stop moving the workpiece.

**Layout.** On the face of the workpiece, draw lines to indicate the length of the slot. Remember, you're using the center of the bit as a reference. So you need to account for the radius of the bit when you mark the lines.

I also mark the location of the centerline of the slot on the end of one of the workpieces. This serves as a guide to position of the fence on the router table.

▲ ***Drawer Guide.*** *A slot in the drawer guide creates a secure connection to the side panel.*

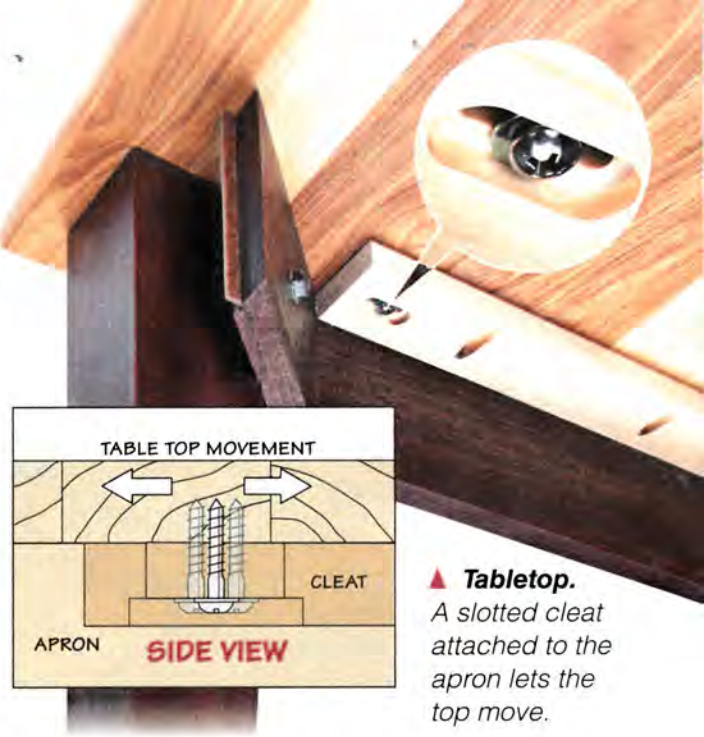
**On to the Routing.** Before turning on the router, you need to set the bit height. If you're routing a screw slot into material less than ½" thick, you can do it in a single pass. Thicker stock will require setting the bit low and raising it after each pass.

Turn on the router, brace the right end of the workpiece against the table, and line up the left layout line with the mark on the fence. Lower the workpiece down over the bit.

Push the workpiece down firmly against the table. The bit will offer some resistance at first. Then slide the workpiece along the fence until you reach the second mark. Now you can turn off the router and remove the workpiece after the bit stops spinning.

Repeat the process until the bit cuts through the upper surface, and the size of the countersink (or counterbore) matches the length and type of woodscrew you'll be using.

There's one final thing to mention. Don't drive the screws in too tightly. They should be snug enough to hold the assembly together without feeling loose. You want the solid-wood panel to expand and contract freely. The result is a solid, secure assembly you can depend on to last.




▲ ***Tabletop.*** *A slotted cleat attached to the apron lets the top move.*

# hand-held router Technique

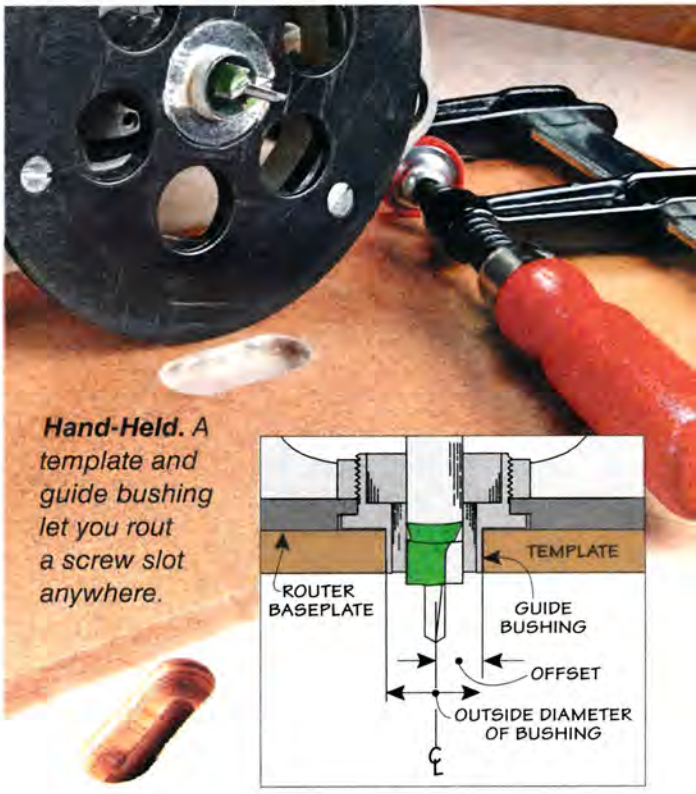
The router table technique handles most tasks for cutting screw slots. But there are times when the router table just isn't very practical. One good example is creating slots in plywood case sides to accept a solid-wood top.It would be difficult to control large workpieces on the router table.

The solution here is to bring the router (and screw slot bit) to the workpiece. The trick is guiding the bit accurately. For that, I turn to a guide bushing and a hardboard template.

A slot in the template matches the width of the ¾" O.D. guide bushing. I routed the slot in the template on the router table. You need to account for the offset from the edge of the bushing to the centerpoint of the bit when you size the slot in the template as in the detail drawing at right.

To use the template, clamp it in place. Then set the guide bushing in the template at one end of the slot. Now turn on the router, plunge the bit into the workpiece, and slide the router to the end of the slot in the template. Lower the bit and make multiple passes until the slot is formed.

I found that using a plunge router makes it easy to set the depth stop for multiple passes.




***Hand-Held.*** *A template and guide bushing let you rout a screw slot anywhere.*


# tips for using a Coping Saw


## Follow these tips and tricks for turning a basic saw into a tool you can't do without.

Shortly after I got into woodworking, I bought an inexpensive coping saw and the nearest package of blades from a "big box" store. The saw seemed like the kind of tool a woodworker should have for making detailed cuts.

▲ ***Install The Blade.*** *Push the the saw against your workbench to compress the frame to hook the blade in place.*

Back in my shop, I installed a blade and tried to make some cuts. The results were awful, to say the least. The saw cut slowly, wandered from the line, and my hand soon cramped up from the effort. After that frustrating attempt, the saw sat unused.

Since that time, I've picked up a few pointers from fellow woodworkers that have turned my coping saw into a valuable and versatile part of my tool kit. I think you'll come to the same conclusion. So think of this as a short owner's manual for setting your coping saw up right and learning to get the hang of using it.

**Better Blades.** The blade is where the rubber meets the road with a coping saw. And the wrong blade can ruin your experience. The blades I first bought had stamped teeth. A better choice is a blade with ground teeth. (I like *Olson* brand blades.) They cost a bit more, but they'll earn their keep with faster, smoother cuts.

**Blade Teeth.** The number of teeth on a blade plays a big role, too. An easy mistake is to use a blade with too many teeth for the task and thickness of material.

I find that the two blades shown in the left margin handle all my needs. For most cuts, I use a blade with 10 teeth per inch (tpi). This blade cuts quickly in pieces thicker than ½" and leaves a fairly smooth surface.

The other blade I use has 20 tpi. The finer teeth leave a smooth cut edge. So it's the right choice for making curved cuts in thin stock.

**Installing the Blade.** You can install a blade with the teeth facing in either direction. I prefer to have the teeth facing the handle.

This way, the saw cuts on the pull stroke and is less likely to flex.

The photo at the bottom of the previous page shows how to install the blade. Slip one end of the blade into the slotted blade holder. Then push the frame of the saw against something solid, like a workbench, to fit the other end. Turn the handle to increase the tension on the blade until you can't easily flex the blade with your finger.

**A Firm Grip.** Speaking of the handle, the wood handles found on most coping saws can be uncomfortable to use for any length of time. And when set to cut on the pull stroke, the resistance from the cut can pull the saw right from your grasp. Gripping the handle tighter often only makes things worse.

Thankfully, there are some quick remedies to this problem. One is to sand off the thick, slick finish on the wood. Getting down to bare wood may be all it takes.

A couple of other options for making the handle more comfortable are shown in the photos at right. Since the handle is wood, you can use files and sandpaper to reshape it into something easier to hold. I filed my handle to have a "milk bottle" profile, as shown in the upper photo.

Another approach is shown in the lower photo. Wrap the handle with grip tape that's used to wrap baseball bats or tennis rackets.

**Making Smooth Cuts.** With your saw set up just right, you're ready to put it to work. Start by clamping the workpiece so you're holding the saw parallel to the floor, as you can see in the main photo on the facing page. Clamp the workpiece close to the layout line to limit vibration. Now make the cut with long, smooth strokes.

Here's one other quick tip for using your coping saw. You can rotate the blade so it isn't in line with the frame (inset photos on the opposite page). This creates clearance to make long cuts.

All this sounds like simple advice. But sometimes that's just what it takes to turn a disappointing tool into a top performer.

▲ ***Create a Comfortable Shape.*** *Use files and sandpaper to reshape the handle so that it's more comfortable and less likely to slip.*

▲ ***A Better Grip.*** *Instead of reshaping the handle, you can add athletic grip tape to create a cushioned handle that's easier to grasp.*

# cutting table for Shaping Small Parts

When it comes to cutting thin parts with a coping saw, it isn't always practical to clamp the piece in a vise. A traditional solution is to use a cutting table like you see in the photo at right.

The downward cutting action of the blade keeps the workpiece firmly against the table top. The wide table provides support and prevents vibration. Think of it as a human-powered scroll saw. What's nice is that the table just clamps in place to turn any surface into a work area.

I made this table from an 18"-long piece of ¾" plywood. A V-shaped notch at the front of the table creates an opening for the blade.

In use, you hold the workpiece with one hand and move the saw up and down with the other. I focus on keeping the saw facing one direction and moving and turning the workpiece to guide the cut.

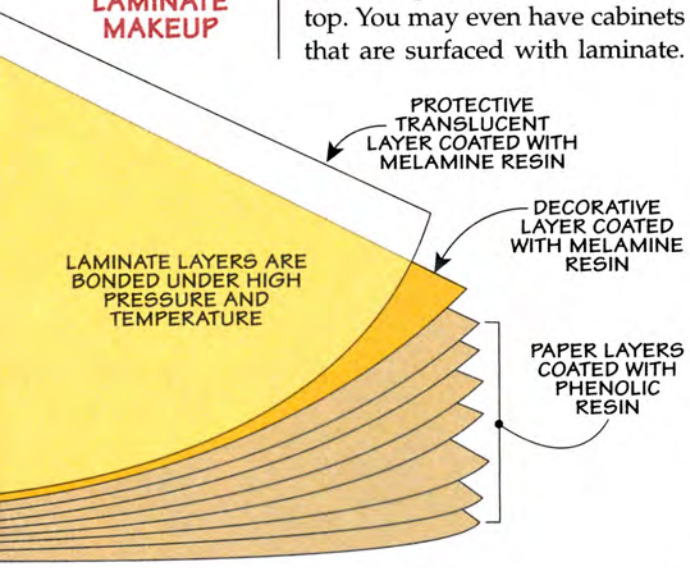
To make a cut-out shape like you see here, you can thread the blade through a starter hole drilled somewhere in the waste part of the pattern.

***V-Shaped.*** *The notch provides access for the blade, and the sides offer support for a thin workpiece.*

# working with Plastic Laminates

This versatile material can be a very practical shop solution.

Chances are good that somewhere in your home you have a surface covered with plastic laminate. Maybe it's a kitchen countertop or a bathroom vanity top. You may even have cabinets that are surfaced with laminate.




And there's a good reason for this. Plastic laminate is a hard, durable, and attractive material that's also moisture-proof as well as heat and stain resistant.

So it's no surprise that for these same reasons, plastic laminate is also a valuable shop material. In fact, laminate has a couple of extra attributes that make it ideal for the shop. Since most glue won't stick to the upper surface, it works great for assembly and utility tables. And its low-friction nature makes it a good choice for "sliding" jigs and surfaces such as router table tops and table saw extension wings. The real clincher is that plastic laminate is easy to work with. I'll give you a crash course on choosing and using plastic laminate.

**What is Plastic Laminate?** Believe it or not, the foundation of plastic laminate is nothing more than multiple layers (7 to 18) of kraft paper (think grocery sack). The bottom layers of paper are run through a vat filled with phenolic resins and allowed to dry. These saturated layers are next topped with a color or pattern layer coated with harder melamine resins. Finally, a thin, translucent layer, also coated with melamine resin, is added to the stack. This sandwich is then subjected to high pressure and temperature to bond the layers and create a smooth, flat sheet. As you would guess, the final thickness is determined by the number of layers.

**Types.** All plastic laminate has essentially the same composition, but there are several types meant for different purposes. As I mentioned, laminate comes in various thicknesses. The thickest (about 1/32") general-purpose type is designed for horizontal surfaces like countertops and tabletops where durability is the main consideration. A thinner type, often referred to as vertical surface, is appropriate for lighter-duty applications.

If you need to apply a backer or balance sheet to the reverse side of a panel, there's also a laminate specifically made for this purpose. This type is only laminated from phenolic-impregnated layers of paper and is consequently less durable and also plain in appearance. However, it's less costly and is a good choice when a surface won't be seen.

Laminate comes in a vast number of colors, patterns, finishes, and textures, as you can see from the samples shown on the opposite page. You'll even find laminates that are a dead ringer for many types of wood.

**Sizes.** Laminate is available in widths ranging from 30" to 60" and lengths up to 12'. This makes for ease of use as well as great flexibility. You can buy just what you need and you'll rarely have seams when using laminate.

## APPLYING LAMINATE

The main photo on the opposite page and those at right provide a primer on installing plastic laminate. It works best to apply laminate on a stable substrate like particleboard, MDF, or plywood using contact adhesive. Smooth, flat MDF is generally my choice for shop fixtures, however plywood is a more durable option when the edges won't be capped.

Laminate is always laid oversize and then trimmed flush with the substrate. Since the bond created by contact adhesive is instant, the extra size allows leeway during the installation.

Start by cutting your substrate to finished size. Then you can cut the laminate to size, allowing at least 1" extra in both dimensions. The easiest way to cut laminate is at the table saw. You'll want to install a zero-clearance rip fence to prevent the thin laminate from sliding beneath it.

**Spread Adhesive.** Contact adhesive bonds to itself. So the trick is to spread it on both the substrate and the laminate. But before doing this, you want to make sure both surfaces are free of dust and debris.

A foam brush or small roller works well for applying the adhesive. When it first goes on, it will be glossy and gooey. You need to wait until it dulls down and dries to the touch before adhering the two pieces.

Since the laminate and substrate will bond the instant they touch, aligning the pieces beforehand is a must. There's a tried and true method for this. First cut some strips of wood about 1/2" thick that span the width of the substrate. Lay them on the substrate spaced about 6" apart (main photo, opposite).

Next, lay the laminate on the strips and align it carefully. To create the bond, remove the strip of wood at one end and press the laminate onto the substrate. Then remove the remaining strips in order, pressing the laminate down as you go. Now, to ensure that the laminate is fully adhered, go over the surface with a rubber roller. Take care to avoid cracking the overhanging edges.

Finally, you can use a flush-trim bit in a palm router to trim the laminate flush with the substrate's edges. I make two counterclockwise passes — one to remove the bulk of the material and a final cleanup pass. If you're not adding a border, you'll want to soften the sharp corners with a fine file. It's always pleasantly surprising just how nice the finished panel looks and how fast the whole process goes.

▲ ***Cut to Size.*** *With an auxiliary rip fence fit tight to the saw's table, use a push pad to help feed the thin laminate and keep it flat.*

▲ ***Spreading the Adhesive.*** *You don't need to be fast but you need to be thorough. It's a good idea to double-coat porous materials like MDF.*

▲ ***Press in Place.*** *With the laminate aligned over the substrate, start at one end and remove the strips in order, pressing it down with your hand.*

***Roll & Trim.*** *Before flush trimming the laminate (inset photo), use a roller to make sure it's well adhered.*

weekend workshop

# turned Oval Tool Handles

Make a complete set of heirloom screwdrivers with this step-by-step lathe technique.

▲ ***Oval.*** *The shape offers a comfortable grip and keeps the tool from rolling off the bench.*

After buying a lathe, the first thing I did was practice by turning a set of round handles for files and rasps. Since then, I've learned a technique for turning oval handles. It sounds impossible, but it's really quite easy.

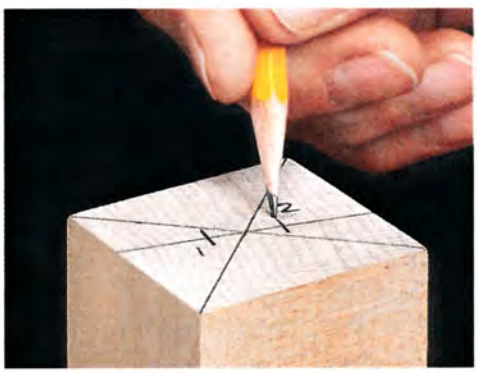
It's called "off-center" turning. Instead of one centerpoint on the end of the turning blank, there are three turning points. And the end result is a handle that's quite comfortable to hold.

When I saw a set of screwdriver shanks from *Lee Valley*, I thought it would be a perfect opportunity to put this turning technique to practical use. I turned three sizes of handles to fit the shanks and used sections of brass pipe to create the ferrules.

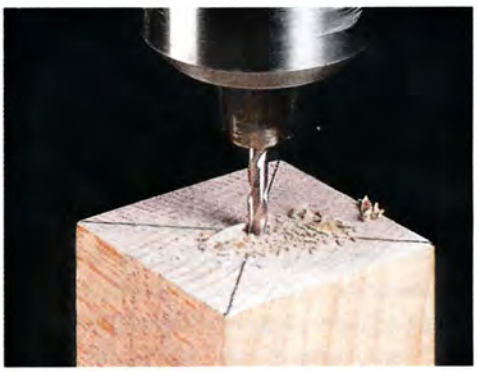
**Centerpoint Layout.** The process starts by cutting several blanks out of 8/4 (1¾"-thick) maple stock. The blanks are about 7" long. To mark the centers, take a look at the photos below.

Mark diagonals across each end to find the true centerpoint. Next, take a look at the grain direction. When turning oval handles, I want the "eyes" of the

▲ ***Mark the Centers.*** *Start by marking diagonals across each end of the blank to find the true center.*



▲ ***Offset Centers.*** *After drawing a line perpendicular to the grain, mark two ¼" offset centers on one end.*



▲ ***Pilot Hole.*** *On the opposite end of the blank, drill an ⅛"-dia. pilot hole for the shaft of the tool.*

face grain on the flatter side of the oval (main photo, opposite page). To accomplish this goal, strike a line through the true center perpendicular to the annular rings. Use dividers to mark and label two offset centers on this line ¼" from the true center.

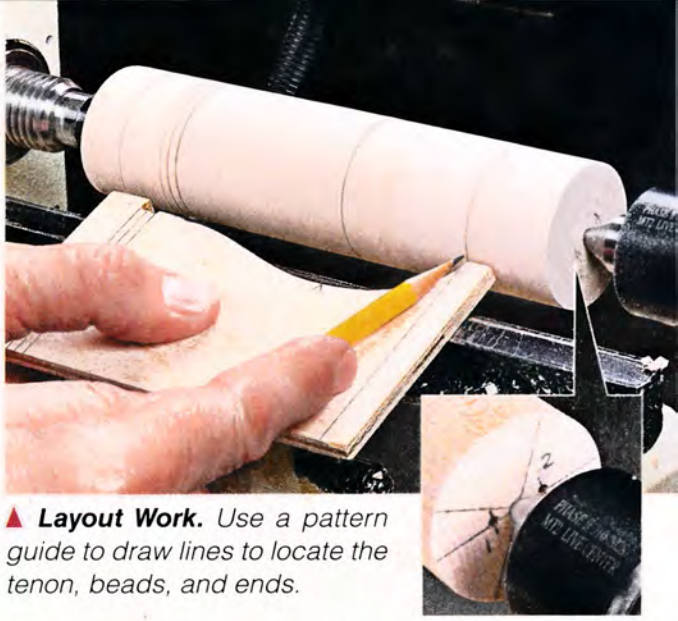
At the opposite end of the blank I drilled a centered ⅛"-dia. pilot hole using the drill press. This makes drilling the hole for the tool shank easier later on. The hole also makes it easy to register the drive center on the lathe.

**Patterns & Gauges.** Before heading to the lathe, you'll want to take some time to make the plywood guides shown in the box below. These help with laying out the profiles and guide you in shaping the handle.

The gauge, also shown below, contains a series of notches for sizing the beads, neck, and tenon for the ferrule for each of the three sizes of handles. While you're turning, you'll monitor your progress with the gauge by attempting to slip the notch over each feature of the handle. Your goal is a snug fit, especially the diameter of the tenon. The sizing of the tenon is important for a tight fit with the ferrule.

**Time for Turning.** Now you can mount the blank in the lathe with what will be the tenon end of the handle on the drive center. The "fat" end of the handle is mounted at the tailstock on the true center for now. This is so you can turn the tenon, beads, and neck of the handle round.

**Turn a Cylinder.** In order to lay out the features of the handle, you'll need to turn the blank round first. A roughing gouge makes this quick work. Then use the pattern as a guide to lay out the location of the tenon and beads. It's also a good idea to mark the top end of the handle. This is easy to do with a light touch of a pencil while the lathe is turning (photo above).



▲ ***Layout Work.*** *Use a pattern guide to draw lines to locate the tenon, beads, and ends.*

**ShopNotes GO ONLINE EXTRAS**

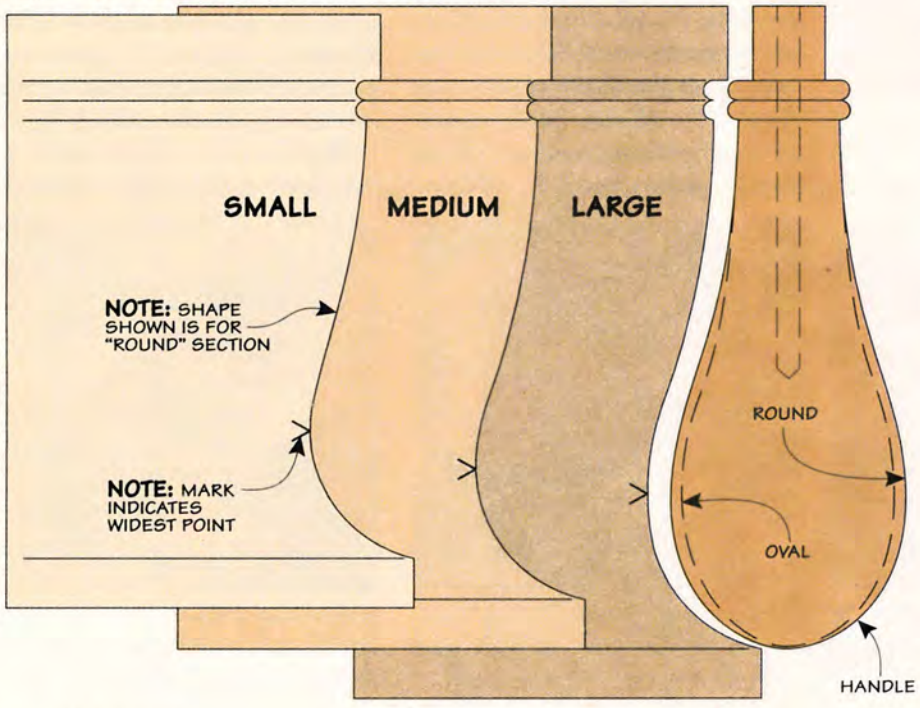
To download full-size patterns for the handles and gauge, go to: ShopNotes.com

# Pattern Guides & Gauge

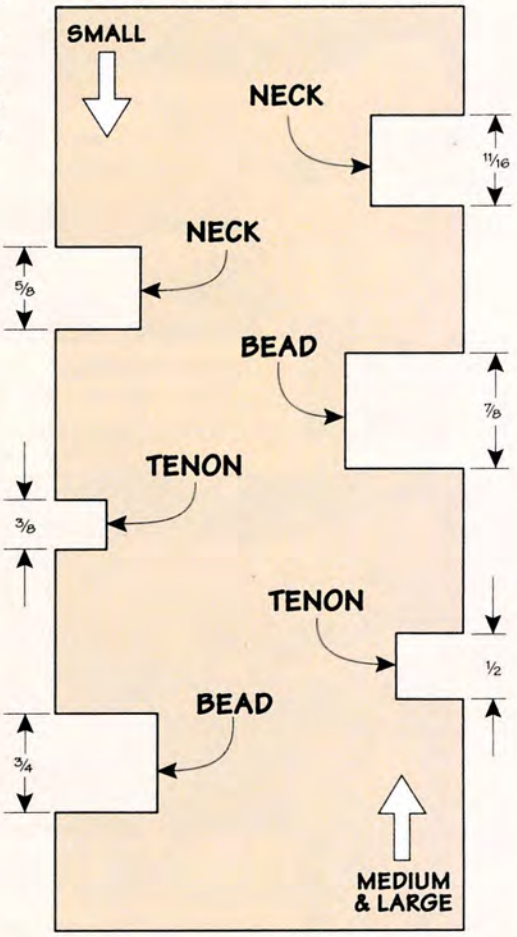
The patterns below help you lay out and shape each of the three sizes of handles while turning them on the lathe. I made mine out of ¼" plywood.

The gauge on the right is also made of plywood. It helps ensure key features of the handles are properly sized. The notches on one side are for sizing the small handles. The notches on the opposite edge apply to the medium and large handles. Just slip the notches over the features as you turn them.

**PATTERN GUIDES** (ENLARGE TO 150%)




**GAUGE** (ENLARGE TO 150%)



▲ ***Initial Shaping.*** *Mount the blank on true centers to turn the tenon, pair of beads, neck, and rough handle shape.*


▲ ***Gauge.*** *Monitor your progress by checking the diameter of the tenon, neck, and beads with the gauge.*


▲ ***Shaping.*** *Check the size and shape of the teardrop handle shape by using the pattern as a visual guide.*

# turning the Handle

With the blank turned round and the features marked out, you can begin the work of shaping the handle. You'll start by forming the tenon, beads, neck, and rough teardrop shape. These features are turned while the blank is mounted on the true centers.

▲ ***Offset Turning.*** *Switching to an offset center allows you to start forming the oval shape.*

Once those are done, you'll switch to the offset centers to form the oval shape of the handle. The photos above and below guide you through the process.

**The Details.** I started by turning the tenon to size with a parting tool. I made the tenon a little long so I could trim it to final length after installing the ferrule. Use your gauge to check the diameter of the tenon.

The neck is also turned round just above the beads before it starts to flare out into the shape of the handle. The parting tool and spindle gouge are the go-to tools here. Once you've turned it to size, you can form the beads.

The beads are part of what give the handle its classic charm. To create the beads, I used a skew chisel to define the edges of the beads and also form the rounded shapes. Here again, use the gauge to size the diameters of the beads (center photo above).

With these key features defined, you can use the pattern as a guide to finalize the teardrop shape. You can see this in the right photo above.

**One-Sided Oval.** Creating the "squashed," oval shape involves removing material from opposite sides of the teardrop portion. To help you see your progress during this shaping operation, it's a good idea to draw a row of lines along the blank with the lathe spinning, as in the photo at left.

The end goal is to remove about $\frac{3}{16}$" from each side at the widest part of the handle and taper it down to the neck. You do this by moving the blank at the tailstock to one of the offset centers (upper photo at left). This causes the blank to wobble while spinning. As your roughing gouge touches the blank, it will shave the prominent side only.

**Finishing the Oval.** Moving the blank to the opposite offset

▲ ***Completing the Shape.*** *Move the blank to the opposite offset center to complete the shape.*

▲ ***Sanding.*** *Remount the blank on its true centers to sand the handle smooth at low speed.*

▲ ***Cutting Off the Waste.*** *Use a hand saw to remove the waste at each end of the turning.*

▲ ***Drill Shank Hole.*** *Enlarge the pilot hole you drilled earlier to match the shank of the tool.*

▲ ***Chamfering.*** *A countersink bit makes quick work of forming a small chamfer.*

▲ ***Cut to Length.*** *Cut the ferrule to length and then press it onto the tool handle (photos below).*

and repeating the process will create a pleasing contour of the handle. (See the lower left photo on the opposite page.)

Remount the blank on its true centers and remove the tool rest for final sanding. At the lowest speed, sand with 80-grit paper and work your way up to 220 or finer. Take care to retain the crisp details of the beads.

**Cut, Sand, & Drill.** You're finished at the lathe, so you can remove the blank and cut off the waste. A little sanding will smooth the end of the handle.

The photos on this page step you through drilling for the tool shank and adding the ferrule. It starts by enlarging the pilot hole for a snug fit of the tool shank.

**Brass Ferrules.** To make the ferrules, first I clamped a section of brass pipe in a vise and chamfered the inside of one end. This end fits against the shoulder and beads of the handle. A countersink bit mounted in your hand drill makes this a quick task. A slight chamfer is all that's needed. Then it's just a matter of cutting the ferrule to length with a hack saw before pressing it onto the tenon of the handle.

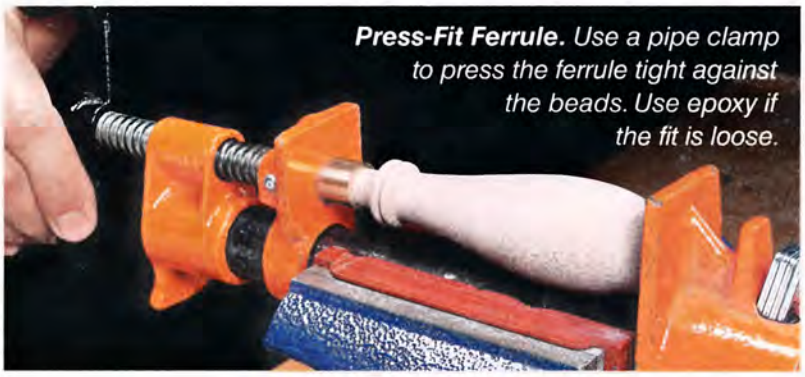
**Clamp Press.** The photos below show the press setup I used to attach the ferrule and tool shank. If the tenon is a little long, you can use a short piece of pipe in the clamp to help seat the ferrule tight against the beads of the handle. Then simply cut off the excess tenon before sanding it smooth and flush.

To install the tool shank, make a note of the orientation of the "business end" of the tool, especially the flat-blade screwdrivers. When the tool handle is resting on the workbench, you'll want the blade of the screwdriver to also sit flat. At this orientation, you'll press the shank into the handle as shown at left.

**Finishing.** Before applying a finish to the handles, I masked off the tool shank. I used an aerosol spray can to apply a clear varnish. The tool shank makes a convenient "handle" to spin the tool while spraying.

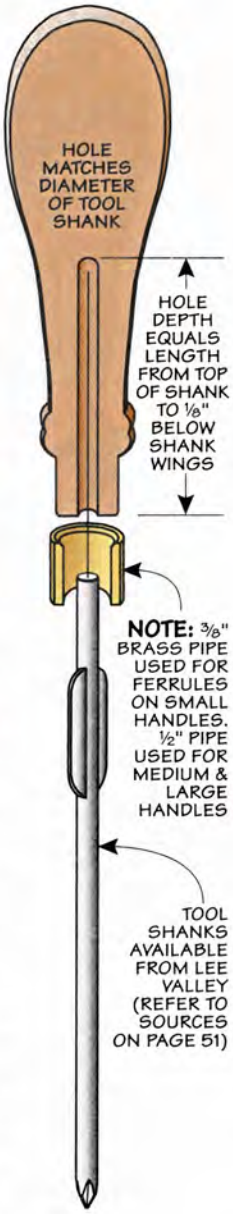
These handles are so quick and easy to make, I decided to make a few for my files and rasps, as you can see at right. To find out how to attach the handles, turn to Shop Short Cuts on page 28.

**Fit for Showing Off.** With a little practice, you'll soon discover that it's not hard to "turn" out a complete set of handles. Aside from their practical use, their heirloom quality means they'll last for generations.



***Press-Fit Ferrule.*** *Use a pipe clamp to press the ferrule tight against the beads. Use epoxy if the fit is loose.*

***Press-Fit Shank.*** *The pipe clamp makes it easy to press the tool shank into the handle.*




▼ ***File Handle.*** *To learn a technique for attaching your handle to a file, turn to page 28.*

shop-built machines

# carving Duplicator

## Recreating almost any pattern or carving with your router is easy with this shop-built fixture.

Everyone knows the router is a versatile tool. But our project designer, Chris Fitch, took the possibilities even further with this shop-built duplicator. It lets you recreate an object or pattern in wood with amazing detail.

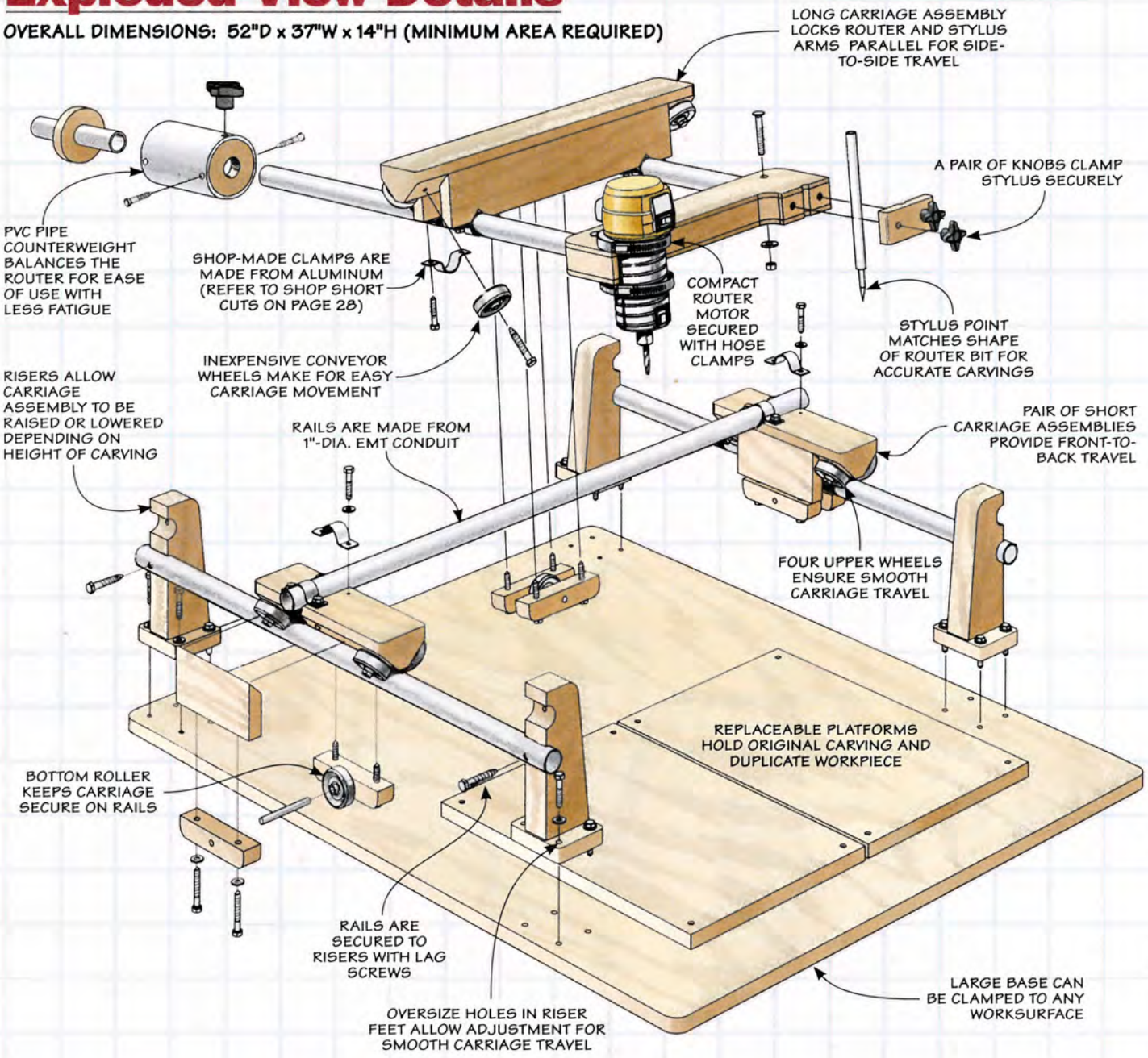
As you can see in the photo, it uses a compact router on a floating carriage assembly to make a replica of an original carving. By using special bits as small as 1/32" in diameter, you can carve the finest details. A light sanding is all it takes to clean up most carvings. Or, to mimic a hand-carved look, you can use carving tools to refine the details.

The router bit follows the path of a stylus you use to trace the outlines of the original workpiece. The shape of the stylus matches the profile of the router bit (refer to the article on page 29 for making a stylus). The router and stylus are counterbalanced to make the stylus easy to move.

If you have a creative bent, you're sure to find unlimited possibilities for your projects.

# Exploded View Details

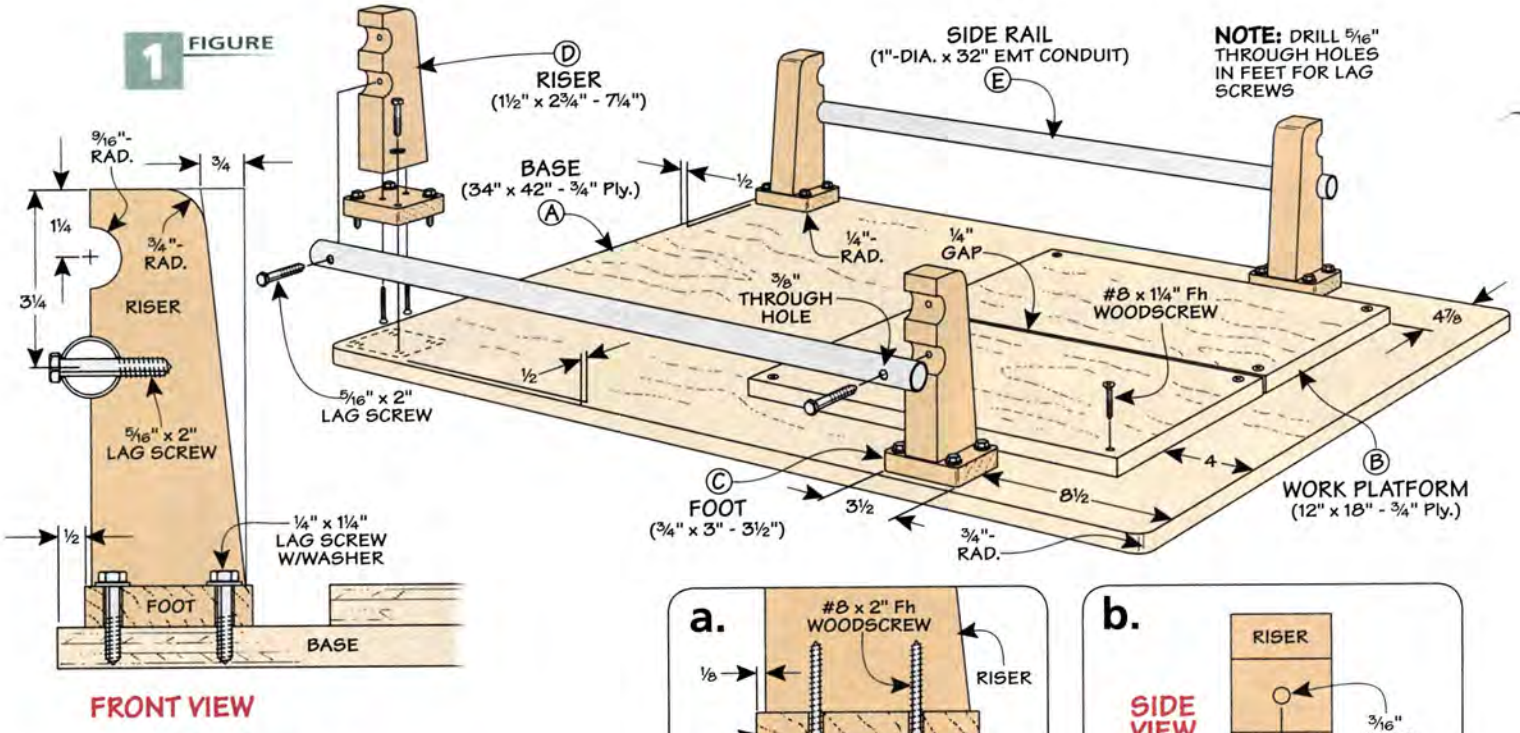
**OVERALL DIMENSIONS: 52"D x 37"W x 14"H (MINIMUM AREA REQUIRED)**




# Materials & Hardware

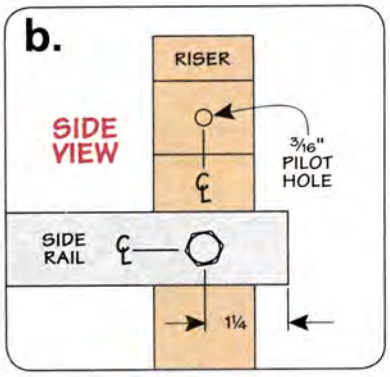
| | | |
|---|---|---|
| A | Base (1) | 34 x 42 - ¾ Ply. |
| B | Work Platforms (2) | 12 x 18 - ¾ Ply. |
| C | Feet (4) | ¾ x 3 - 3½ |
| D | Risers (4) | 1½ x 2¾ - 7¼ |
| E | Side Rails (2) | 1"-dia. x 32" EMT Conduit |
| F | Short Carriage Beds (2) | 1¾ x 3 - 10 |
| G | Short Carriage Sides (4) | ¾ x 2⅞ - 5¾ |
| H | Wheel Retainers (6) | 1 1/16 x 1 - 5 |
| I | Main Rail (1) | 1"-dia. x 37" EMT Conduit |
| J | Long Carriage Bed (1) | 1¾ x 3 - 20 |
| K | Long Carriage Sides (2) | ¾ x 2⅞ - 15¾ |
| L | Tool Support Core (1) | 1⅛ x 4 - 15½ |
| M | Tool Support Top/Bot. (2) | 4 x 15½ - ¼ Ply. |
| N | Clamp Blocks (2) | ½ x 2 - 3½ |
| O | Stylus Clamp (1) | ⅝ x 1⅝ - 3½ |
| P | Stylus Arm (1) | 1"-dia. x 20" EMT Conduit |
| Q | Router Arm (1) | 1"-dia. x 28" EMT Conduit |
| R | Counterweight Shell (1) | 3"-dia. x 7" PVC |
| S | Counterweight Core (1) | 1¼"-dia. x 7" PVC |
| T | Counterweight Ends (2) | ¾ x 3⅛"-dia. |

- (8) #8 x 2" Fh Woodscrews
- (15) 1 15/16"-dia. Wheels
- (32) ¼" x 1¼" Lag Screws
- (12) ¼" x 2" Lag Screws
- (44) ¼" Washers
- (16) 5/16" x 2" Lag Screws
- (1) 5/16" x 12" Steel Rod for Axles
- (6) ¾" x 36" - 1/16"-thick Aluminum for Clamps
- (2) 3"-dia. Hose Clamps
- (1) ½"-dia. x 8" Alum. Rod for each Stylus Body
- (1) ¼"-dia. x 12" Steel Rod for Stylus Points
- (8) #8 x 1¼" Fh Woodscrews
- (6) #8 x ¾" Fh Woodscrews
- (2) ¼"-20 Threaded Inserts
- (2) ¼"-20 Knobs w/ 1¼" Stud
- (2) 5/16"-18 x 2" Carriage Bolts
- (2) 5/16" Washers
- (2) 5/16"-18 Hex Nuts
- (1) 5/16"-18 Knob w/ 1½" Stud
- (4) #6 x ¾" Fh Woodscrews










# base & Risers

To accommodate the amount of travel required for the router and stylus, the duplicator requires a large base. Sacrificial work platforms hold the original and duplicate workpieces. And a pair of side rails are attached to four dual-position risers.

The risers, rails, and platforms work together to position the router and stylus for carving. The goal is to keep the router and stylus perpendicular to the workpieces for the best results.

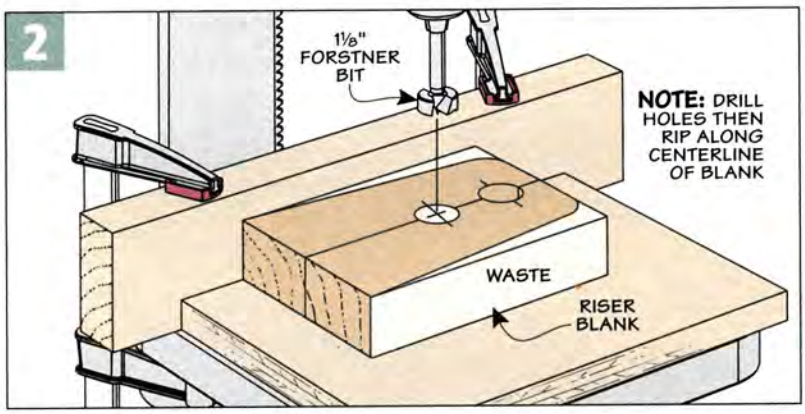
**Base & Platforms.** To get started, you'll make the base and two work platforms, as illustrated in Figure 1. The base is nothing more than a large rectangular piece of plywood.

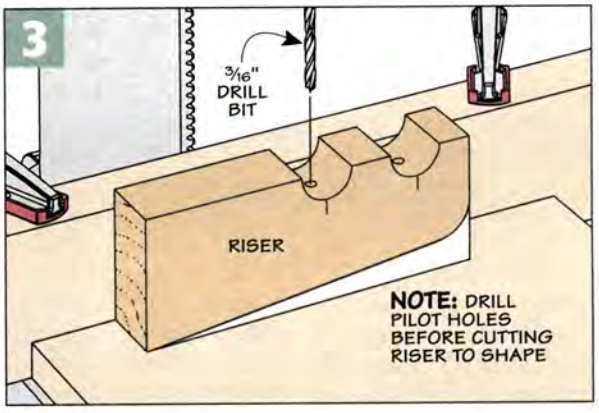
The two work platforms are meant to be replaceable. I've found that the ¾" thickness is suitable for most work, but you can use other thicknesses as needed to position the workpieces at the right height. A few screws hold the platforms in place on the base.

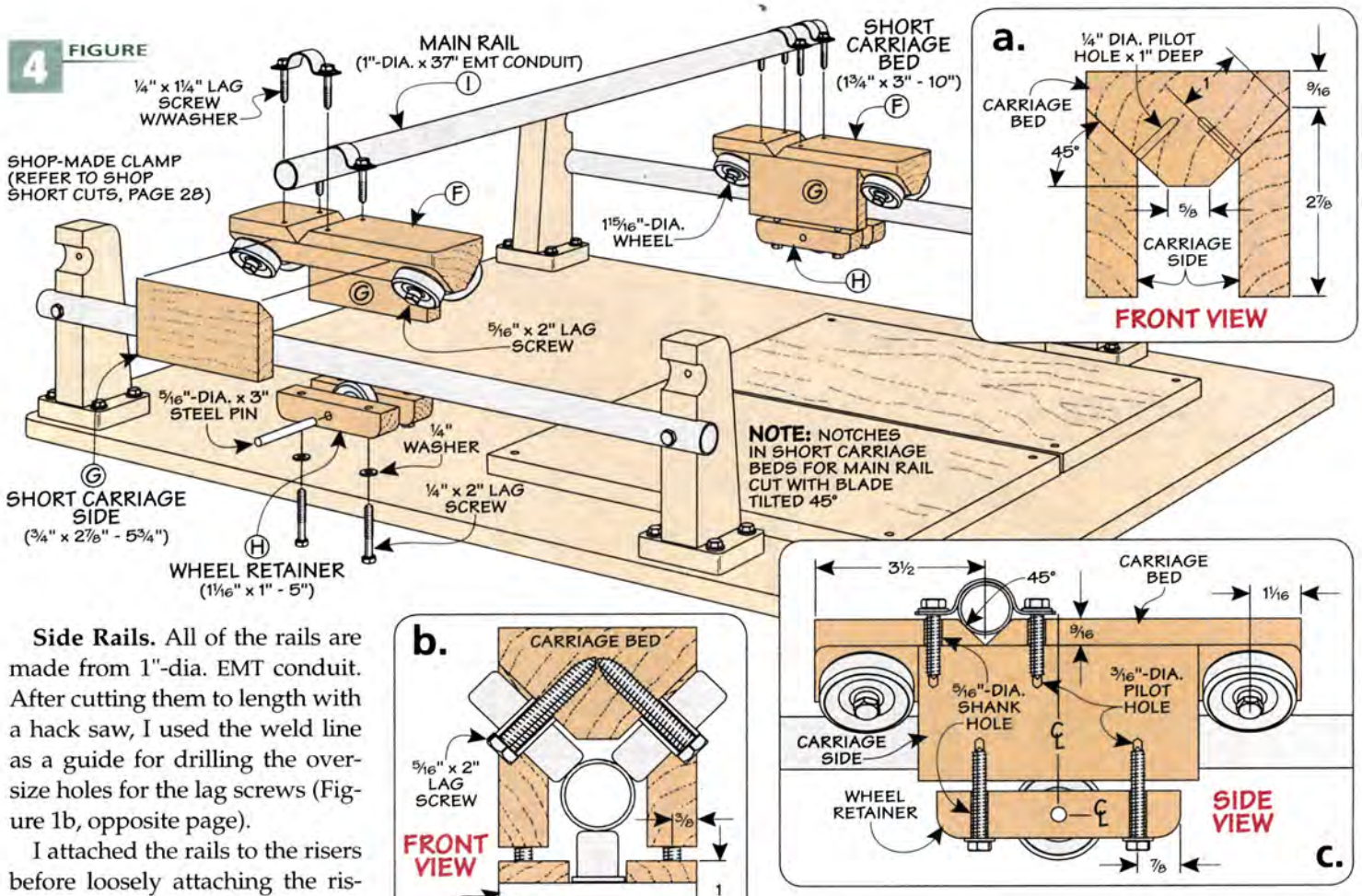
**Risers.** The four risers are notched to hold the side rails. There are two sets of notches to position the rails at different heights as needed. Figure 2 shows an easy way to make each pair of risers from a rectangular blank. After laying out the profile, drill the holes that form the notches and then rip the blank down the middle.

You'll use the drill press to drill the pilot holes for the lag screws that secure the rails, as in Figure 3. Then, the band saw makes quick work of removing the waste to complete the shape.

Each riser is attached to a square foot with screws. Oversize holes used to attach the riser assemblies to the base are drilled in each foot. These holes allow for slight adjustments to ensure the side rails are parallel for smooth front-to-back carriage travel.






**Side Rails.** All of the rails are made from 1"-dia. EMT conduit. After cutting them to length with a hack saw, I used the weld line as a guide for drilling the oversize holes for the lag screws (Figure 1b, opposite page).

I attached the rails to the risers before loosely attaching the risers to the base. You'll make final adjustments after the carriages are assembled and installed.

**Short Carriages.** The three carriage assemblies share the same construction techniques. You'll make two short ones now and a long one later. Figure 4 provides all the details you need.

The carriage beds are bevel-ripped to form mounting surfaces for the wheels. Use the cutoffs to position the bed at the drill press for drilling pilot holes for lag screws. These screws form the axles for the wheels. A quick trip to the table saw forms a V-notch on the upper face for attaching the main rail. You'll drill the pilot holes for the clamps later when attaching the main rail.

The pairs of carriage sides are also beveled to mate with the bed. The drawing below shows the process I used to assemble the carriage bed and sides.

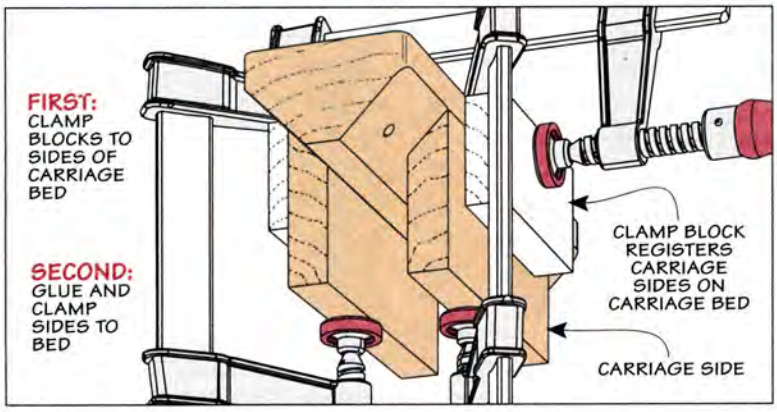
Each carriage rides on four wheels (right margin). A fifth wheel underneath serves to keep the carriage from lifting off the rails. A pair of wheel retainers and an axle secure the bottom wheel to the carriage and rail (Figures 4b and 4c).

After cutting the retainers to shape (you'll need a total of six), drill the mounting holes at each end. A hole through the sides secures the steel rod used as the axle for the wheel.

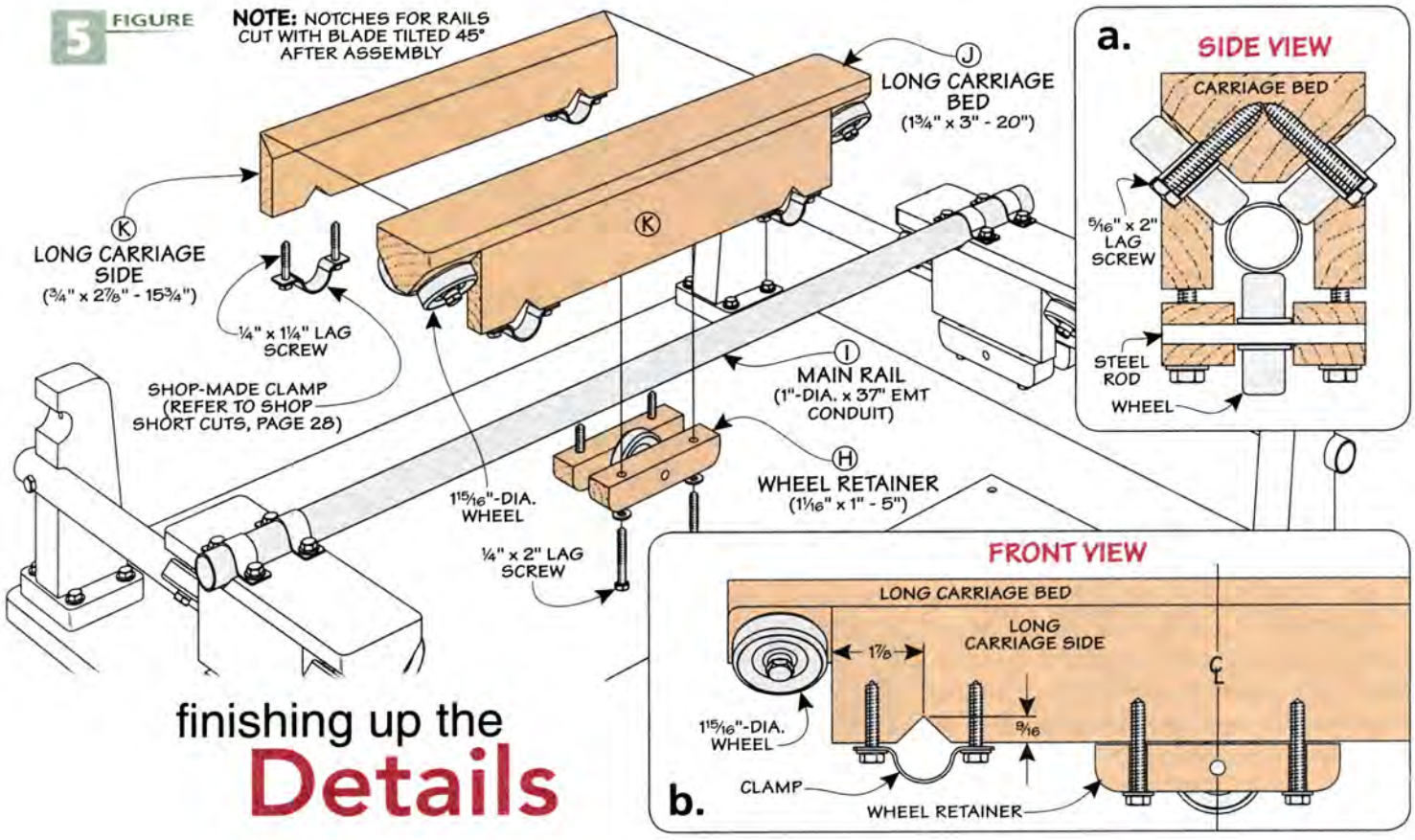
**Assembly.** To assemble the carriage onto the rails, install the four upper wheels with lag screws. Assemble the lower wheel between a pair of wheel retainers using a steel rod with a little epoxy. Use the holes in the retainers as a drill guide to fasten the bottom wheel to the carriage.

Now you can cut and attach the main rail. Turn to page 28 to make the clamps. Use the holes in the clamps to locate the screws.

## Clamping Tip




▲ ***Smooth.*** *Inexpensive conveyor wheels make ideal rollers for the carriages (refer to Sources, page 51).*




# finishing up the Details

With the short carriages and main rail attached, you'll add the long carriage and the two rails that connect the tool support. The tool support is the "business end" of the duplicator. It holds the router motor and stylus.

**Long Carriage.** After building the two short carriages, the process of making the long carriage should seem pretty familiar. Figure 5 provides all of the details. The only real differences from the short carriages are the locations for the rail notches and the lengths of the bed and sides.

I waited to cut the notches for the rails until after the sides were glued to the bed. Using the miter gauge at the table saw with the blade tilted to 45° ensures the notches will align to keep the router and stylus arms parallel to each other.

The final assembly of the wheels and clamps to the long carriage are the same as before. Once you attach the carriage to the rail, you can focus your attention on the tool support.

**Multi-Layered Design.** You can see in Figure 6 how the tool support is made up of three primary layers — a top, core, and bottom. The support is notched to form pockets for the router and stylus arms.

The thickness of the core is sized to match the outside diameter of the EMT conduit used for the arms. To make the core, I started with a blank cut to width and length. Size the width of the two notches for a snug fit with the conduit, as shown in Figure 7.

**Sandwiched Assembly.** The top and bottom of the tool support are made from ¼" plywood. I cut them to rough size and then glued them to the core, making sure the edges of the top and bottom were flush along the notched edge of the core. A router table outfitted with a flush-trim bit makes quick work of trimming the remaining three sides.

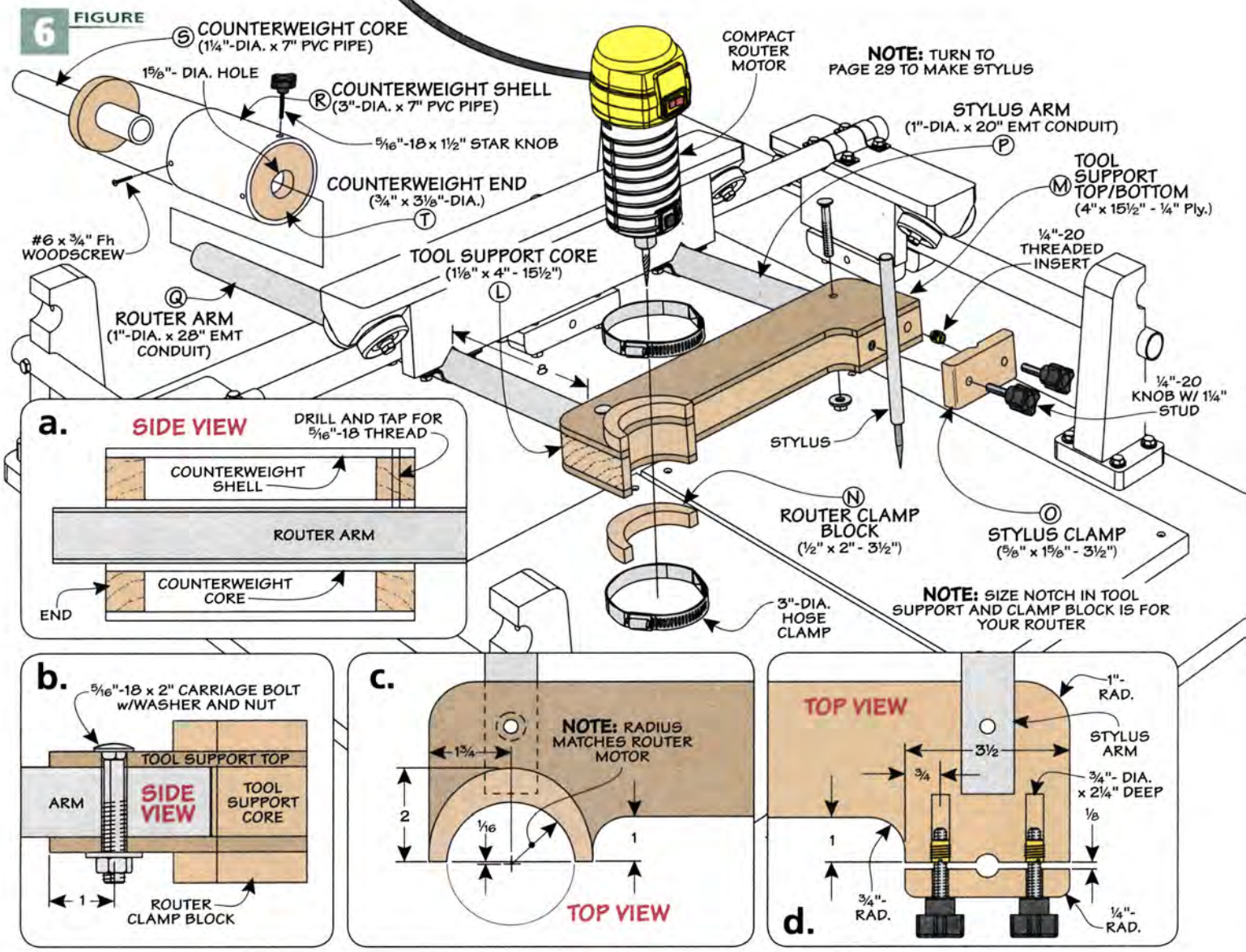
**Layout & Shaping.** Now that you've got a straight, squared-up assembly, you can lay out the final shape. Figures 6c and 6d show how the recess for the router and the long notch along the front edge are shaped. I used a band saw to rough out the shapes. A sanding drum is perfect for smoothing out the shape.

To secure the router, I decided to use hose clamps. A clamp block at the top and bottom of the router recess provides a bearing surface for the hose clamps. After cutting these crescent-shaped pieces at the band saw, you can glue them in place. A little sanding is all that's needed to make them flush with the router recess.

**Stylus Clamp.** You'll notice in Figure 6 that the stylus is held in place with a wood clamp attached with studded knobs and threaded inserts. I made the stylus clamp first, clamped it to the tool support, and then drilled the holes for the pair of studded knobs. After removing the stylus clamp, it's an easy task to enlarge the holes in the core for installing the threaded inserts (Figure 6).

To ensure the stylus is clamped securely, I used the trick shown

▼ ***Filling.*** *Add hardware and then sand to fill the counterweight.*




in Figure 8. Insert a thin spacer (about ⅛") between the clamp and tool holder before drilling the ½" hole. (For more on making a stylus, refer to Shop Short Cuts on page 29.)

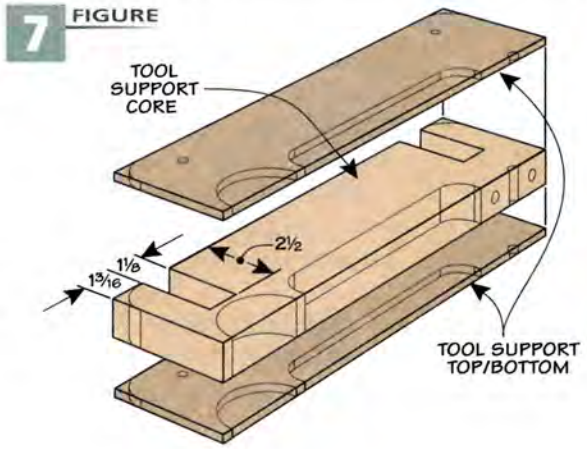
**Final Details.** At this point, you can cut the router and stylus arms to length and fasten them to the long carriage and tool support (Figures 6 and 6b). The proper distance between the tool support and carriage is shown in Figure 6 above. Then you can tighten the clamps on the arms.

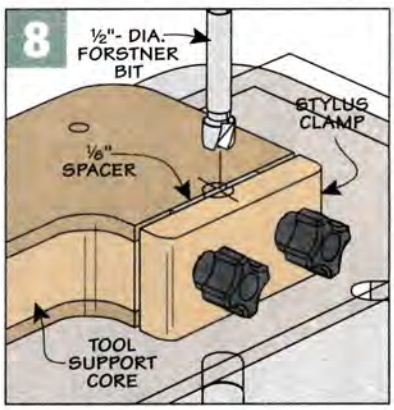
The counterweight at the back end of the router arm serves an important function. It offsets the weight of the router and tool support to reduce fatigue when moving the stylus over the workpiece you're duplicating.

The counterweight is made up of a PVC pipe core and shell with two wood end caps. The space between the core and shell is filled with sand and some hardware out of my junk drawer.

To fasten the counterweight to the router arm, I drilled and tapped a hole for a studded knob, as shown in Figure 6a. You can slide the weight along the arm to fine-tune the balance. The goal is for the router to rise slightly when the stylus is released. It's a trial-and-error process.

With the duplicator assembled, it's time to learn how to use it. For that, turn to page 24.



# using the Carving Duplicator

## A few basic techniques are all you need to duplicate carved or shaped objects in wood.

Using the carving duplicator is a lot easier than it might appear at first. Some basic setup guidelines and simple carving techniques will set you on the right path.

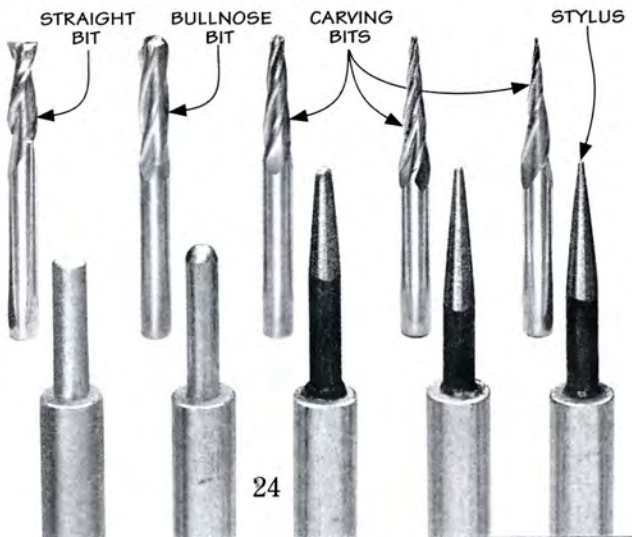
**The Right Bits.** The process starts by purchasing the right router bits to do the job. You can use any router bit (up to ½"-dia.) as long as it can make plunge cuts. By this, I mean that the end of the bit must have cutting edges to remove material as you lower it into the carving blank.

For finer detail work, I found bits designed for carving work best (left photo). They're solid carbide and tapered to remove material quickly and efficiently. You can find out where to buy them in Sources on page 51.

The bits I typically use include a ¼" straight bit, a ¼" bullnose bit, and tapered bits with tips ⅛", 1/16", and 1/32" in diameter. This range allows you to remove the bulk of the waste with the larger bits. Then, you can refine the details of your carving by using progressively smaller bits.

**Matching Stylus.** The key to making the duplicator work well is the stylus. You'll need a different stylus shaped to match the profile of each router bit you use (left photo). For instructions on how to make a stylus, turn to Shop Short Cuts on page 29.

For a large-diameter stylus, I simply grind a ½"-dia. aluminum rod to shape, as you can see in the photo at left. For the finer points, I use steel for strength and durability. A dab of two-part epoxy secures the steel points in a




◀ ***Matched Pairs.*** *For each router bit profile, you'll need a stylus shaped to match.*

centered hole drilled in the end of the aluminum rod.

**An Overview.** The drawings at right show how the router bit and stylus work together to duplicate a shape. As you guide the stylus over the workpiece to be copied, the router is carving away the waste on the blank.

I start with a large-diameter bit to remove most of the waste. To ensure I don't carve too deep, I set the point of the stylus a little lower than the end of the router bit. This leaves a thin layer of material for the smaller bits to clean up as you define the details.

After you remove most of the material with the large bit, you'll switch to the next smaller bit. For these final detail operations, the stylus and router bit are set at the same height. Depending on the level of detail desired, you'll end with the smallest bit (1/32").

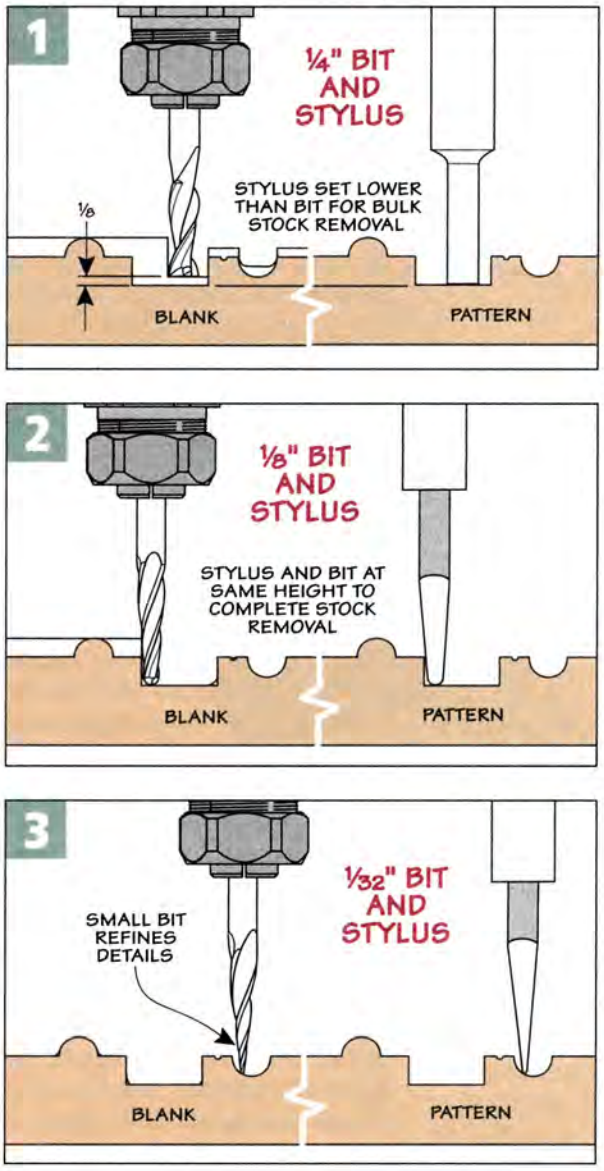
**Workpiece Placement.** Now that you understand the basic concepts of how the router bit and stylus work together, you can set up the pattern and carving blank. (I'll talk more about the actual carving process later.)

The key to accurate duplication is careful alignment of the original piece and carving blank. The box below shows you how to set up and locate a simple, rectangular carving and an irregularly shaped object on the work platforms.

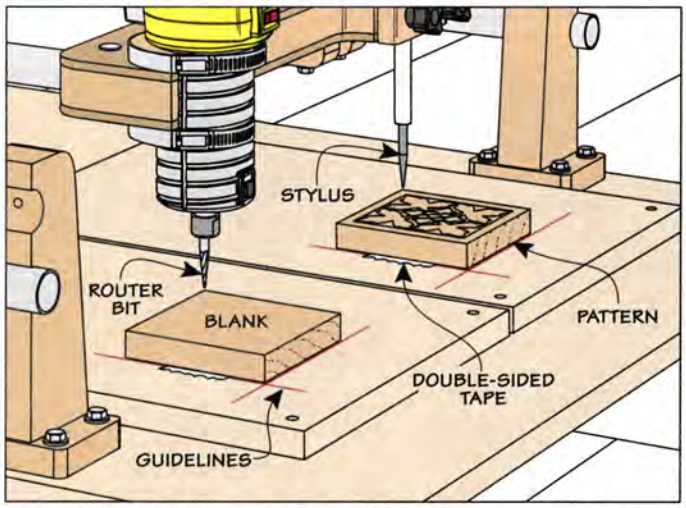
To help with alignment, I install a 1/32"-dia. bit and matching stylus. These serve as "pointers" to ensure that the original and blank are in the same position relative to each other before you start carving. The drawings below show you how this is done.

After checking the alignment of the original and carving blank using the router bit and stylus, you can switch to the larger bit and stylus before you start the carving process.

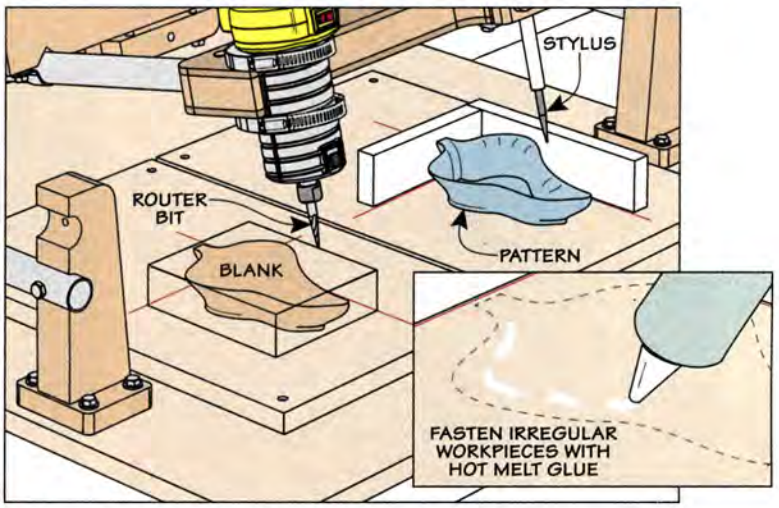
**Workpiece Attachment.** For objects and blanks with a flat surface, a few strips of double-sided tape are all you need to secure them to the work platforms. Irregularly shaped objects can be held securely with hot-melt glue, as illustrated in the right drawing in the box below. It's important to make sure the objects remain securely attached during the carving process.




# pattern placement Setup




▲ ***Flat Workpieces.*** *Use guidelines marked on the platforms to position the workpieces. Double-check their location using the stylus and router bit.*




▲ ***Irregular Shape.*** *For bulky or irregular objects, use temporary fences as well as the bit and stylus to help position them. Fasten each in place with hot-melt glue.*

# carving Techniques

There are three basic types of carvings you can create with the duplicator. You see a simple relief carving in the main photo on page 24. A related type is the repeating pattern shown at the top of the opposite page. A free-form shape, like the bowl on the right, is the third type. The only real limitations are your imagination and the cutting depth of the router bit. Regardless of the type of carving, the basic process is the same.

▲ ***A Duplicate.*** *Creating free-form shapes is easy to do with a few simple steps.*

**A Balanced Touch.** The carving process takes time and a little patience. It doesn't pay to be in a hurry. The goal is to maintain control without trying to remove too much material all at once.

The balance of the router and stylus are key to avoiding fatigue. It should require little effort to lower the stylus and guide it over the original piece. You can adjust the counterweight to fine-tune the balance before starting.

**Router Speed.** If you're using a variable-speed router, you'll want to start on a lower speed when removing a lot of material. Then as you progress through finer details, you can bump up the speed for a smoother finish.

▲ ***Freeform Shape.*** *After defining the external shape (inset photo), flip the workpiece to complete the interior (above).*

**Coarse to Fine.** I've already talked about how the stylus and bit work together to create a duplicate carving. The box below shows how to put it into practice.

As I mentioned, you'll start with the largest bit and stylus to remove the bulk of the waste. You'll find that your right hand instinctively guides the stylus to follow the contours of the original object. At the same time, your eyes are watching the router to ensure it's not taking too big a bite. You'll want to take it easy to reduce chipping and tearout.

For shallow relief carvings, like the ones shown in the two right photos below, you can usually skip the largest bit and start with a smaller bit. Regardless of the type of carving, the idea is to remove as much waste as possible before getting too concerned about refining the details.

## simple steps for Carving

▲ ***Bulk Material Removal.*** *Start with a larger bit and stylus set low to remove the bulk of the waste before refining the details.*

▲ ***Refinement.*** *Flat carvings benefit from a straight bit to relieve the pattern.*

▲ ***Detail.*** *Final refinement and detail work can be done using the smallest bits.*

You'll find that as you switch to the smaller bits, it takes more time to get a smooth surface. I don't get too hung up on aiming for a pristine, glass-smooth surface. You can do a lot of cleanup with sandpaper later on. The fine details are where you should concentrate your efforts. These can make your carving really attract a lot of attention.

## REPEATING PATTERNS

Creating a repeating pattern, like the one shown at right, on a long workpiece is a great way to add interest over a doorway, just to name one example.

**Make a Pattern.** To create an original pattern to copy, I turned to my scroll saw. First, I glued a printed pattern to ¼" Baltic birch plywood. (You can download the pattern we used by going online to ShopNotes.com.)

After cutting out the shapes of the design at the scroll saw, I cut a blank the same size as the overall pattern. Using the original design as a guide, glue your cut-outs to the blank. The inset photo at right illustrates this task. Now is the time to add any detail with carving tools or by sanding before setting up the pattern on the duplicator.

**Install a Fence.** You can use double-sided tape to fasten your original pattern to the work platform. However, to secure the long carving blank, you'll need to make and install a fence that includes a pair of toggle clamps.

The photo above and the drawing below show the fence I made to hold and guide a long blank. It's attached to the work platform and features clamps to secure the blank during the carving process.

You'll want to draw index marks on the long workpiece to help space the carving consistently along the blank. The space between the index marks should equal the length of your pattern plus any space you desire to leave between each section.

After carving one section, move the blank to the next index mark and secure the workpiece with the clamps. Repeat the process for each subsequent section.

**Finishing Touches.** After carving, you have a couple of options. To remove the "fuzzies" left from routing, I find that a detail flap sander on a rotary tool does a great job, as in the left photo below. It cleans up the carving without rounding over crisp edges. To create more of a hand-carved look, you can use your carving tools to refine details (right photo below).

**Endless Variety.** As I said, the projects you can create are limited only by your imagination. And the process is easy. In no time at all, you'll be creating fantastic carvings.

▲ ***Repeating Patterns.*** *By installing a fence with hold-down clamps, you can create repeating patterns on a long workpiece. Use index marks to locate each section.*

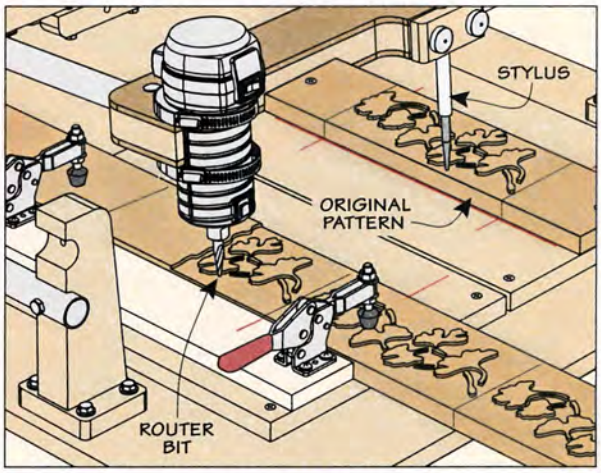
▲ ***An Original.*** *Scroll-sawn pieces glued to a blank create an original pattern to be carved.*

**ShopNotes GO ONLINE EXTRAS**

To download the repeating pattern for the router duplicator, go to: ShopNotes.com

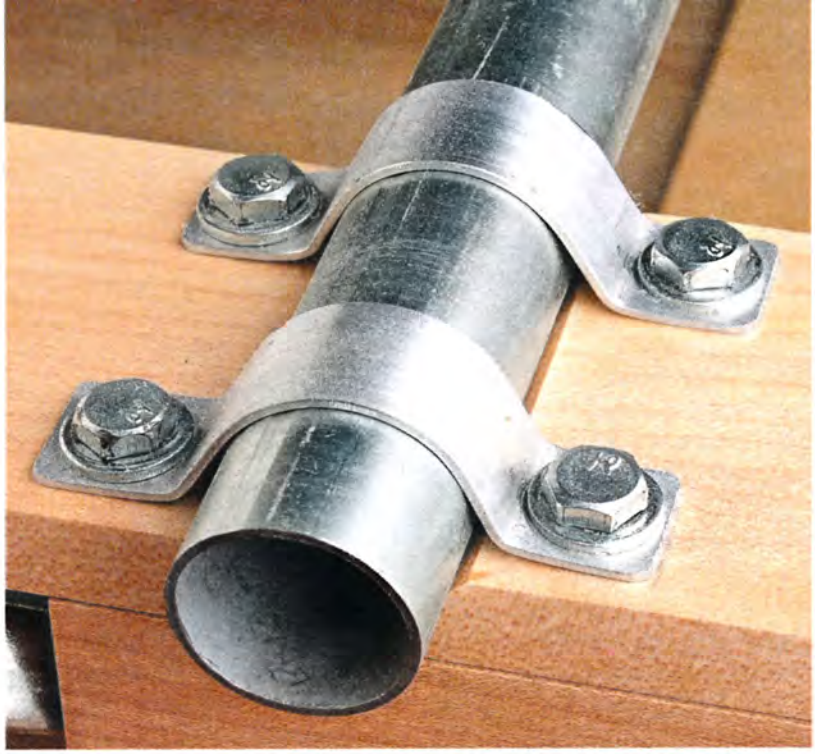
▲ ***Sanding.*** *A detail sander on a rotary tool removes any remaining fuzz.*

▲ ***Hand Work.*** *You can use carving tools to add detail and create crisp edges.*




▲ ***Indexing.*** *Index marks along the edge of the workpiece can help you accurately locate and space each repeating pattern.*

# Shop Short Cuts



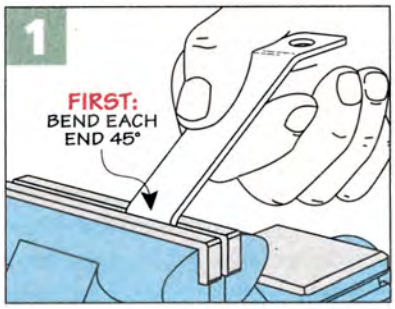

## Aluminum Clamps

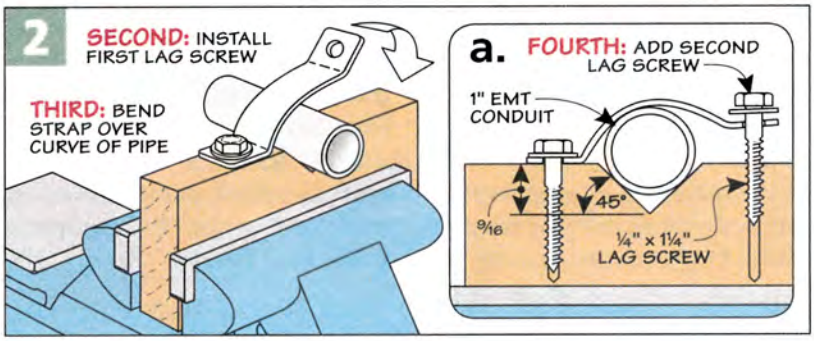
Making the clamps for the conduit rails on the carving duplicator (page 18) is easy to do. All it takes is a simple jig and a few aluminum strips. The drawings at right illustrate the process.

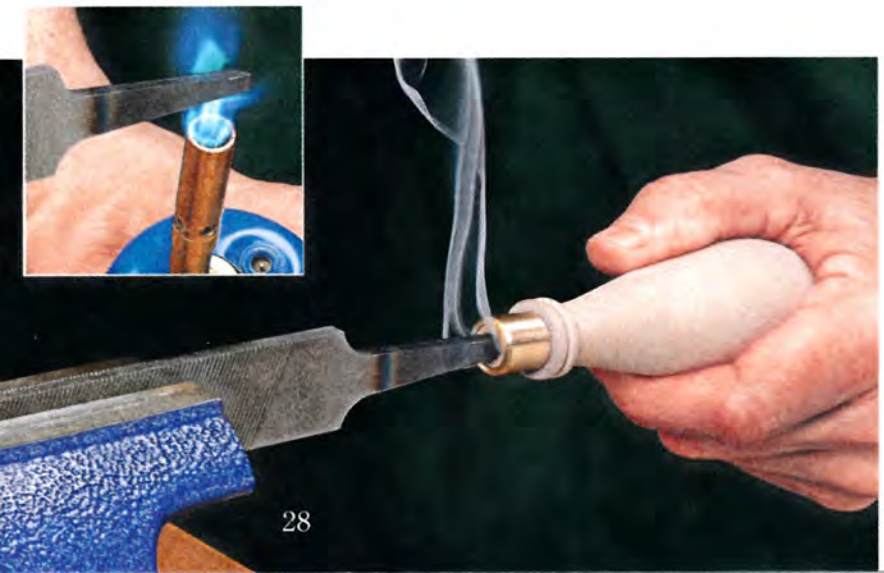
I started by cutting 3/4"-wide aluminum bar stock to length (left drawing). I used a center punch to locate the hole at each end before drilling them.

Next, mark a line 5/8" from each end. You'll use these lines as guides to bend tabs at each end of the strips. A machinist's vise is perfect for this task.

The bending jig used to form the curve of the clamp is made from a scrap piece of 1"-dia. conduit and a hardwood block with a V-notch cut into it. After drilling pilot holes in the block, use a socket wrench to drive lag screws and help bend the clamp around the curve of the conduit.



## Wood File Handle

Fitting a file into a turned wood handle involves drilling a hole the right size and applying heat to the file's tapered tang. To figure the size of the hole, I measure the width of the tang at it's midpoint. The depth of the hole matches the tang's length.

The next step involves a propane torch. The goal is to heat the tang hot enough to burn its way into the handle. This will produce a perfect, secure fit. Once the tang is hot (it doesn't have to be red hot), simply press and tap the handle home.

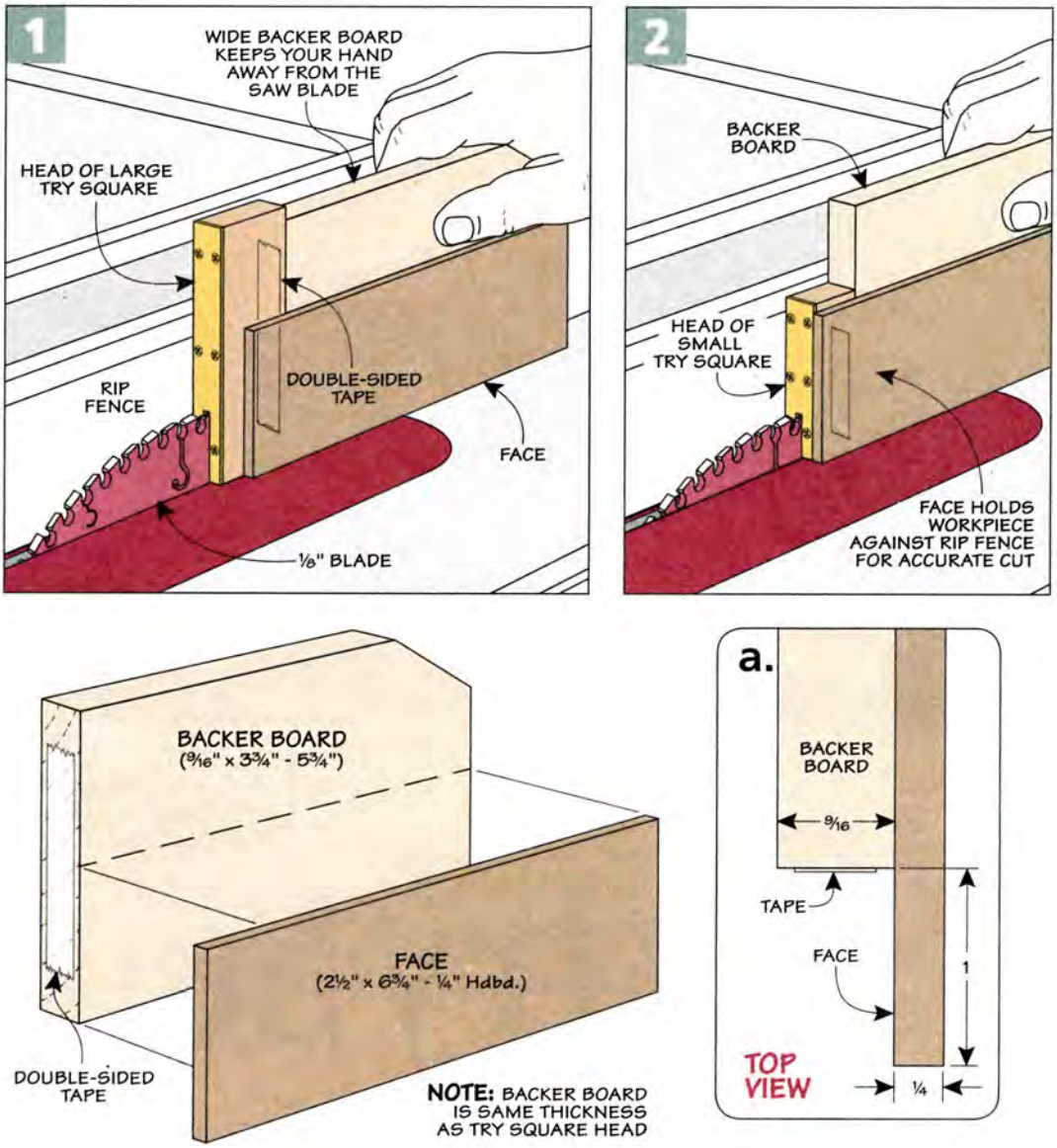
# Push Block

While there isn't anything complicated about making the try squares on page 30, one task presents a bit of a challenge. That's cutting the slot in the head to hold the blade of the square.

The problem is that the head pieces are fairly small. So I needed a way to hold each piece square to the table while keeping my fingers out of harm's way. The solution I came up with is a two-piece pushblock. The drawings at right show how it works for cutting each size of try square.

A wide backer board serves as a handle to guide the workpiece across the blade safely. The leading end holds the head square to the blade. As you can see in the lower right drawing, the backer is sized to match the thickness of the head of the square ($^{9}/_{16}$"). I also relieved the back corner for a more comfortable grip.

The other part of the push block is a hardboard face. Its purpose is to hold the workpiece firmly against the rip fence. I applied a strip of double-sided tape to the backer to keep the part from shifting during the cut.

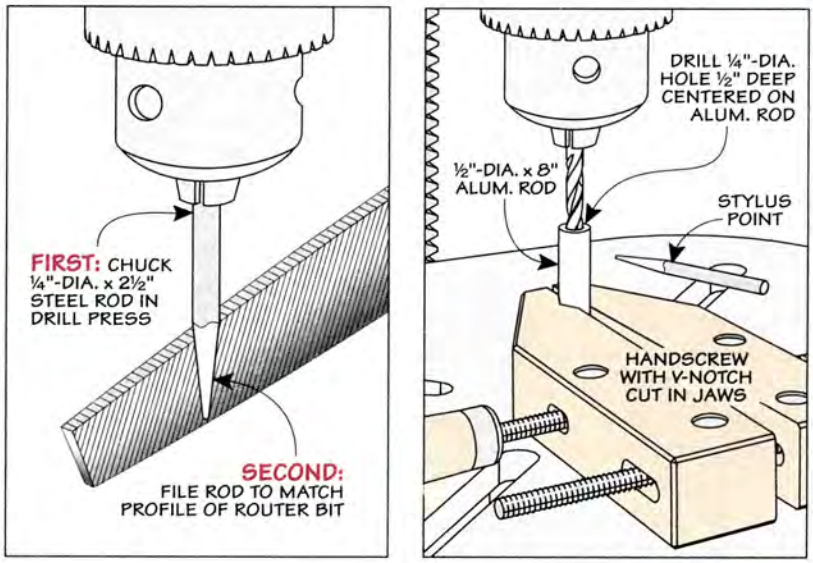



# shop-made Stylus

To create an accurate copy of an object, the carving duplicator (page 18) relies on a stylus whose shape matches that of the router bit. For a larger-diameter stylus, you can shape the end of an aluminum rod at the drill press.

For smaller, more fragile stylus points, I shape a length of steel rod to fit into the aluminum shaft. The steel is more durable than the aluminum and doesn't flex as easily. File the stylus to shape at the drill press and secure it into a centered hole in the aluminum shaft with a dab of epoxy.

▲ ***Stylus.*** *Shape the stylus point to match the profile of the router bit.*



# classic Try Squares

## All it takes to make a set of precision layout tools is a relaxing afternoon in the shop.

Try squares, like the ones shown here, look simple but play crucial roles in my shop. Primarily, they help me determine if something is perfectly square. This could be two parts in a project assembly, or the end of a board. I even use my square to make sure the saw blade is perpendicular to the table.

Another key task is laying out joinery across several parts, as shown in the photo above. You can also use it to accurately transfer a layout mark around all four sides of a workpiece.

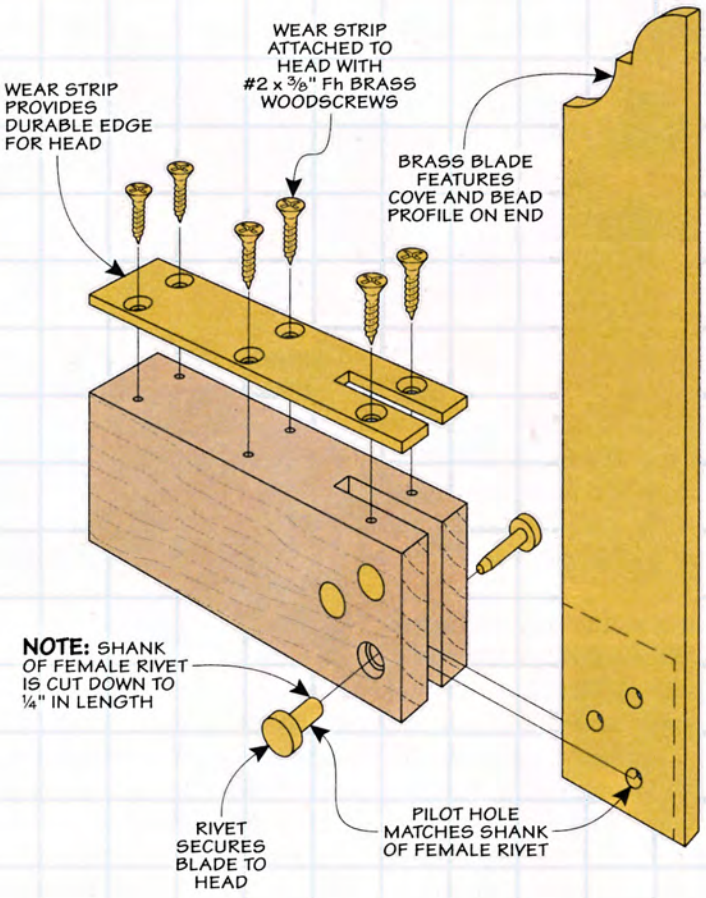
Although these are precision tools, try squares are surprisingly straightforward to make in the shop. There are just three basic parts held together by screws and rivets. In fact, with just a few hours of easy effort, you can have a pair of heirloom tools that work as great as they look.

The construction of each square is identical. The dimensions are on the facing page. Just follow the step-by-step photos to make your own classic tool.

▲ ***Pocket-Sized.*** *The small size of this square means you can keep it close at hand.*

# Exploded View Details

**OVERALL DIMENSIONS:**
**LARGE SQUARE: 9/16"T x 4 1/4"W x 7"L**
**SMALL SQUARE: 9/16"T x 2 9/16"W x 4 1/4"L**



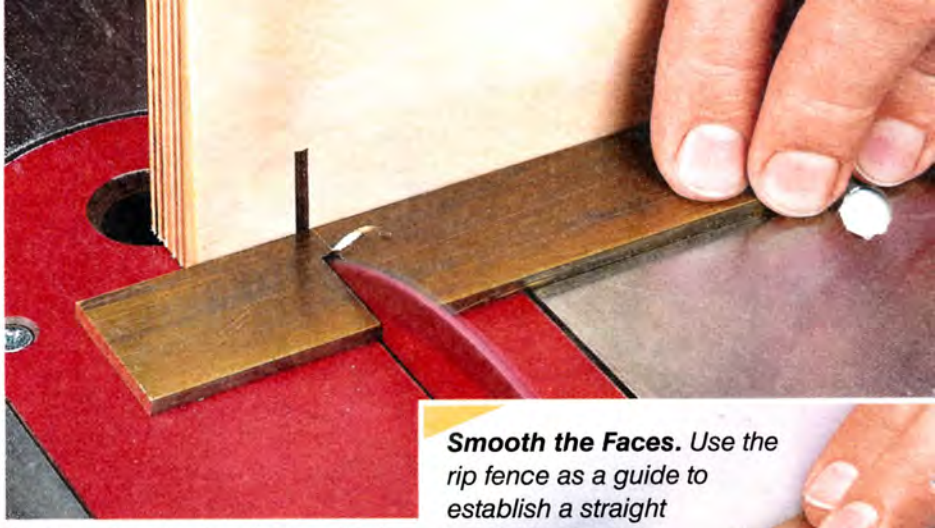
# making the Square

Making a try square isn't complicated, as you'll soon see. What it does require is attention to detail in a few key areas.

## THE BLADE

The starting point for making the squares is the brass blade. I chose flat bar stock that matched the width and thickness I was looking for. Note that the width of each blade is slightly different. (You can find where to purchase the brass in Sources on page 51.)

**Cut to Length.** I cut the blade to length at the table saw, as in the upper right photo. While it may seem surprising, the carbide teeth on an ordinary saw blade work just fine on soft metals like brass and aluminum. And a few short cuts won't dull the blade.



▲ ***Cut the Blade.*** *A standard, carbide-tipped table saw blade can easily cut the brass bar stock to final length.*

***Smooth the Faces.*** *Use the rip fence as a guide to establish a straight scratch pattern.*

**Smooth & Flat.** From there, I spent some time smoothing the blade. I applied a strip of self-adhesive sandpaper to the saw table. Take it easy here. Your goal is to simply remove any tarnish and create an even appearance.

You can see in the inset photo that the rip fence is set alongside the sandpaper. It serves as a guide to keep the scratch pattern made by the sandpaper in perfectly straight lines. Sand the blade up to 400 grit.

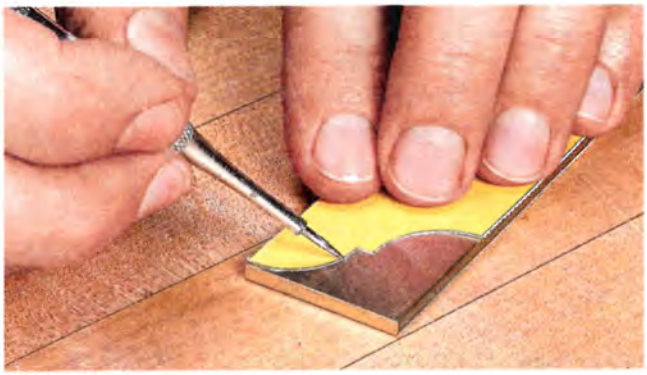
**Traditional Profile.** The profile I shaped on the end adds a little visual interest. It's a good idea to use a scribe to trace the profile (near left photo). This leaves a crisp line to work toward.

Shaping the profile is shown in the lower three photos. First, remove the bulk of the waste with a hack saw. You can get surprisingly close to the lines.

I used files to smooth out the cut edges. A round file tackles the concave portion and a flat file makes quick work of the convex "bead." Finish up with some sanding. Like before, the sanding scratches should flow along the length of the blade.

## THE HEAD

The other part of the square is the head. It's a hardwood block with a brass wear strip. The strip provides a smooth, durable surface to ride against the workpiece.



▲ ***Layout the Profile.*** *Make a photocopy of the blade pattern from the previous page as a guide. Then lay out the profile at the end of the blade with a scribe.*

▲ ***Shape the Profile.*** *I used a hack saw to quickly remove most of the waste from the end of the blade.*

▲ ***Refine the Shape.*** *Smooth saw marks with round and flat files. Gradually work your way to the layout marks.*

▲ ***Smoothing Edges.*** *Sand the edges up to 400 grit. The strokes should be along the edge, not across it.*

**Wear Strip.** The wear strip is attached to the block with small, brass screws. The trick is keeping these small parts aligned. The solution has two parts. First, start with a slightly oversize wear strip. This way, you don't need to fuss with a perfect alignment.

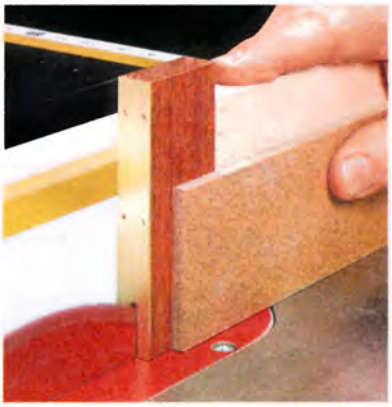
The second part is to use super glue to temporarily attach the wear strip. This prevents it from shifting while you drill holes and drive the screws for a permanent connection to the head.

In order to drill consistent holes and countersinks, I used the drill press, as in the upper right photo. Once the screws are in place, you can file and sand the screws and wear strip flush.


▲ ***Glue It On.*** *To keep the wear strip from shifting, use super glue to temporarily secure it to the handle.*

▲ ***Drill & Countersink.*** *At the drill press, drill the pilot holes and countersinks for the small screws that anchor the wear strip.*

**Slot.** The blade is housed in a slot cut across the end of the head. I did this at the table saw (left photo below). The key is centering the blade on the thickness of the head. Then to add safety and control during the cut, I made a push block to guide the part. You can find the details for the push block on page 29.



▲ ***Cut a Slot.*** *A simple push block guides the head to create the blade slot at the table saw.*

▲ ***Make It Square.*** *Glue the blade into the head using a square corner as a reference.*

**Adding Rivets.** The blade is secured to the body with three rivets. Before you drill the holes for the rivets, you want to make sure the blade is secure and square in the head.

Here again, you can apply super glue to the blade first. Then install it in the body using a square corner as a form until the glue dries. Once the glue is set, mark and drill the holes for the rivets. You need to trim the female part of the rivet to ¼" long so it can seat in the head, as shown in the right margin.

A few taps with a hammer fixes the rivets in place. After final sanding and a coat of oil, the try square is ready for use. For an afternoon's work, you have a tool that will last a lifetime.

*Trim the female end of each rivet so the shank is ¼" long*


▲ ***Rivet Holes.*** *Drill pilot holes for the rivet shank. Then drill shallow counterbores so head is slightly proud.*

▲ ***Peen the Rivets.*** *Using the anvil on the back of a bench vise, seat the rivets to permanently secure the blade.*

▲ ***Final Sanding.*** *Apply sandpaper to the saw table to smooth the faces and level the rivets with the fence as a guide.*


# best-ever Planer Cart

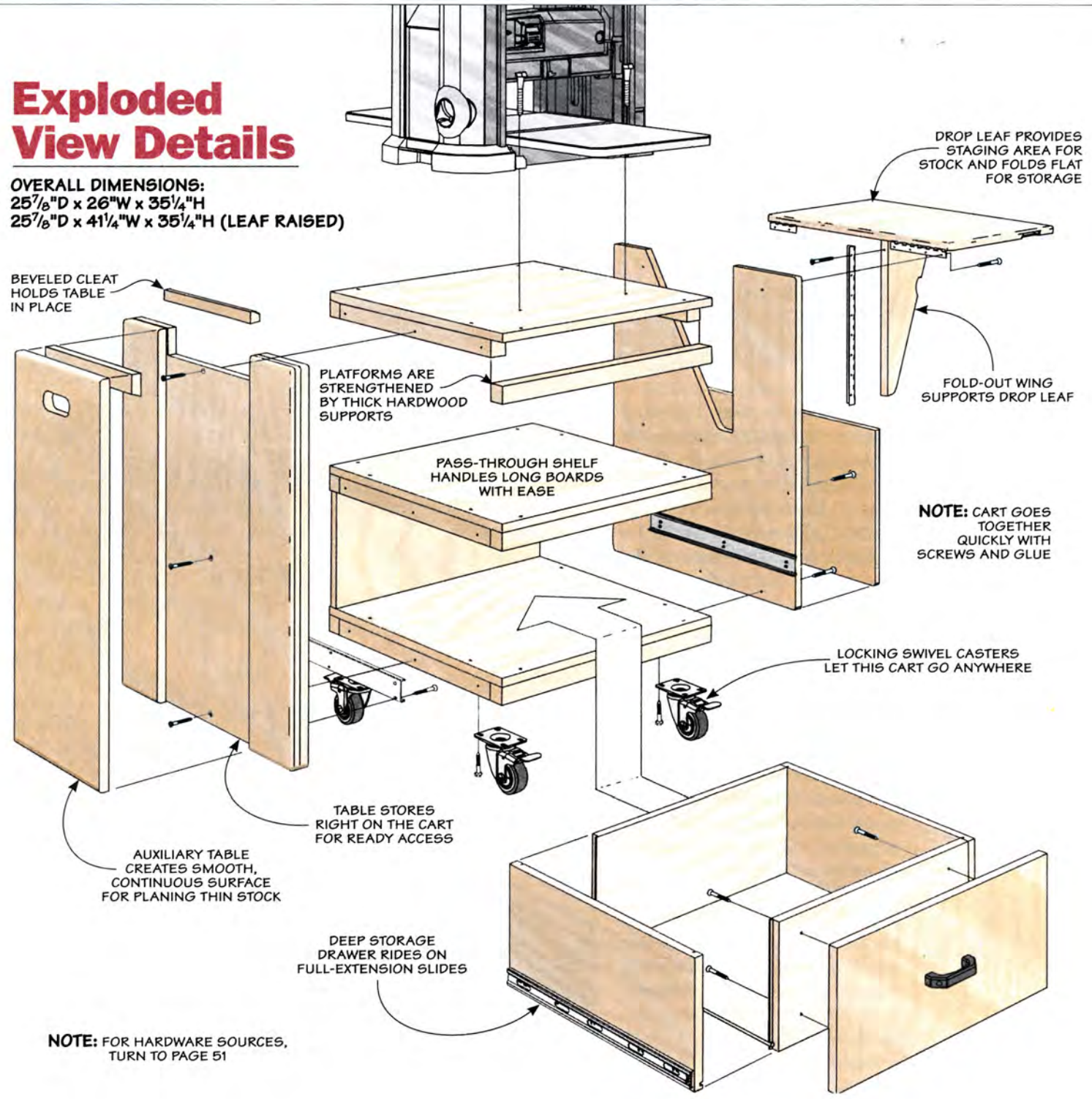
This easy-to-build cart turns a small benchtop planer into a compact workstation.

Having a small thickness planer in your shop opens up a lot of doors for improving your woodworking. It also allows you to use less expensive rough lumber, and mill stock to any thickness.

Even though these tools are marketed as "benchtop" or "portable," their size and weight make moving them around a hassle. The cart you see here is a great way to get more from this essential machine. The cart provides storage and an extra worksurface. As a bonus, there's a built-in auxiliary table for planing thin stock.

# Exploded View Details

**OVERALL DIMENSIONS:**
**25⅞"D x 26"W x 35¼"H**
**25⅞"D x 41¼"W x 35¼"H (LEAF RAISED)**




**NOTE:** FOR HARDWARE SOURCES, TURN TO PAGE 51

# Materials & Hardware

| | | |
|---|---|---|
| A | Platforms (3) | 24 x 23 - ¾ Ply. |
| B | Front/Back Supports (6) | 1½ x 1½ - 23 |
| C | Side Supports (6) | 1½ x 1½ - 21 |
| D | Corner Blocks (4) | 1½ x 4 - 4 |
| E | Sides (2) | 24½ x 31 - ¾ Ply. |
| F | Cart Cleat (1) | ¾ x ¾ - 13⅛ |
| G | Cart Back (1) | 23 x 10½ - ¾ Ply. |
| H | Auxiliary Table (1) | 13 x 31 - ¾ Ply. |
| I | Table Cleat (1) | ¾ x 1¾ - 13 |
| J | Side Fillers (2) | 5 11/16 x 31 - ¾ Ply. |
| K | Leaf Support (1) | 11¾ x 15⅞ - ¾ Ply. |
| L | Drop Leaf (1) | 24½ x 15⅞ - ¾ Ply. |
| M | Lower Filler (1) | 24½ x 15 - ¾ Ply. |
| N | Drawer Sides (2) | 9½ x 20 - ¾ Ply. |
| O | Drawer Front/Back (2) | 9½ x 21 - ¾ Ply. |
| P | Drawer Bottom (1) | 19 x 21 - ¼ Ply. |
| Q | False Front (1) | 10⅜ x 22⅞ - ¾ Ply. |

- (56) #8 x 1½" Fh Woodscrews
- (4) #8 x 1¼" Fh Woodscrews
- (4) 3" Locking Swivel Casters
- (16) #14 x 1" Lag Screws
- (16) ¼" Flat Washers
- (2) 36" Continuous Hinges w/Screws
- (1 pr.) 1½" x 20" Full-Ext. Drawer Slides
- (1) 4¾" Drawer Pull

ShopNotes GO ONLINE EXTRAS

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

## begin with the

# Case

One of the things to take into account when building the cart is the weight of the planer as well as the boards that will be stacked on it. So the cart needs to be sturdy. Plus, I wanted to add several features to make this cart as useful as possible.

The result is that I took a slightly different approach to the construction than a standard plywood case built with dadoes and rabbets. But that doesn't mean that the construction should be complicated or time-consuming.

In fact, as you'll see, the process boils down to cutting parts to size and fitting them together with glue and screws.

I want to highlight one item before getting into the construction. The dimensions shown here should accommodate most portable planers. But it's a good idea to measure the footprint of your planer to make sure it will fit. If necessary, you can adjust the part sizes slightly to suit your needs.

## A DIFFERENT CASE

The main part of the cart is a simple case made up of a set of shelves sandwiched between a pair of sides. Everything else builds off this structure.

**Platform Assemblies.** A good starting point is making the shelves. They're a little more involved than basic panels, as you can see in Figure 1. Each plywood panel is braced from below by a thick hardwood framework.

Apply a bead of glue along the top the hardwood support pieces. Then screw each platform in place, as shown in Figure 1a. This creates a stiff assembly that can bear a lot of weight. In addition, the hardwood supports provide a solid anchoring point for attaching the sides later on.

The bottom assembly has one difference from the other two. I glued triangular blocks into the corners to provide a smooth surface for attaching casters, as you can see in Figure 1b.

**Sides.** The platform assemblies are connected to a pair of plywood sides to create the basic case of the cart, as shown in Figure 2. But the sides aren't identical. They do start as identically sized panels, though.

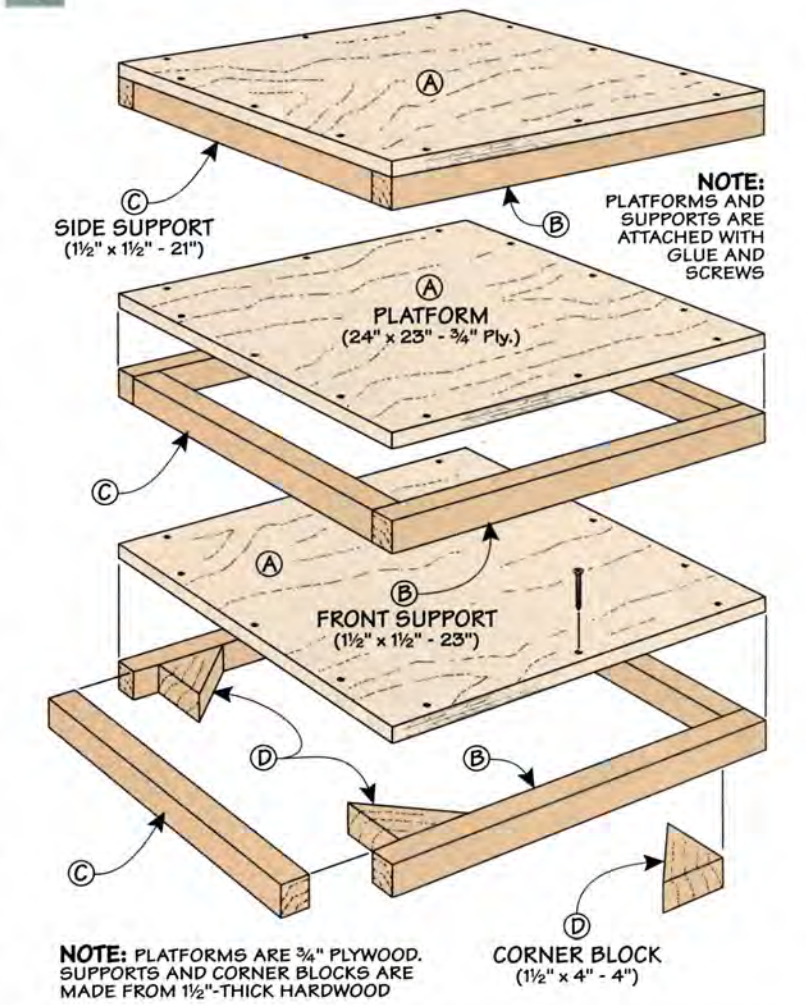
Each side has a unique cutout that houses one of the cart's important features — a drop-leaf shelf on the right, and a holder for the auxiliary table on the left.

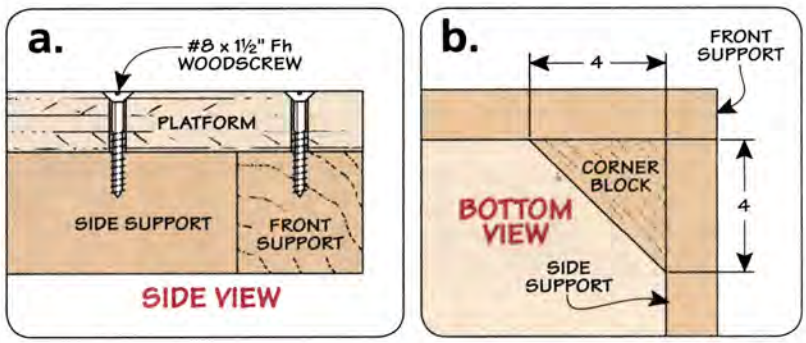
**Left Side.** One side has a long, shallow notch cut along the upper edge. This accepts the auxiliary planer table.

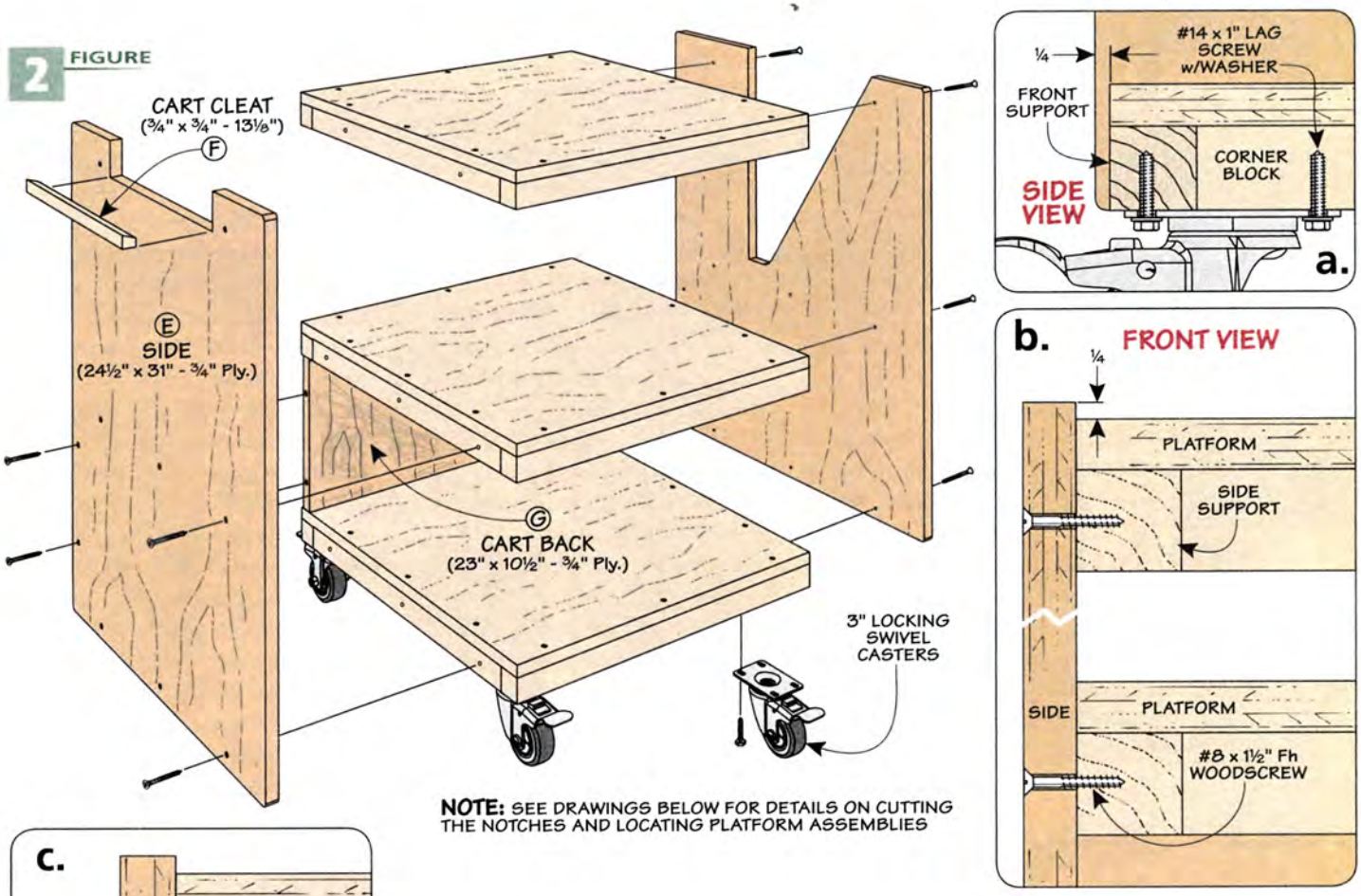
The dimensions are shown in the drawing on the bottom of the next page. The width of the notch should be ⅛" wider than the maximum width of your planer bed. (My planer bed is 13" wide.)

I made the notch using a jig saw. Start by cutting each end of

FIGURE 1






the notch. Then make a sweeping curve to cut along the lower edge of the notch. Finish it up by removing the triangular-shaped waste piece and sanding the bottom edge smooth.

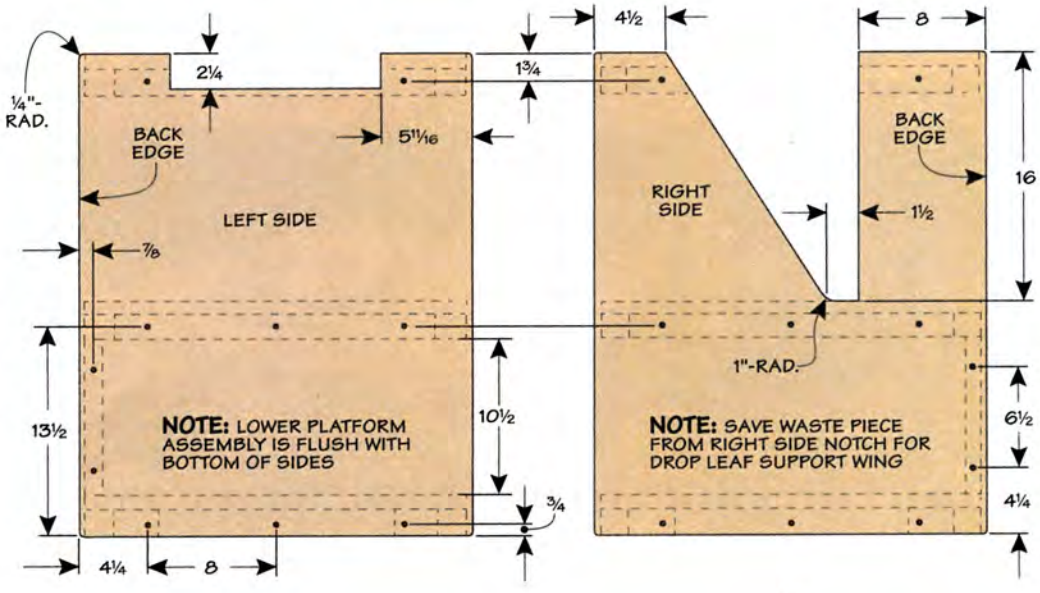
A hardwood cleat completes this side. It's beveled along the top edge, as shown in Figure 2c. It mates with a matching beveled cleat on the table.

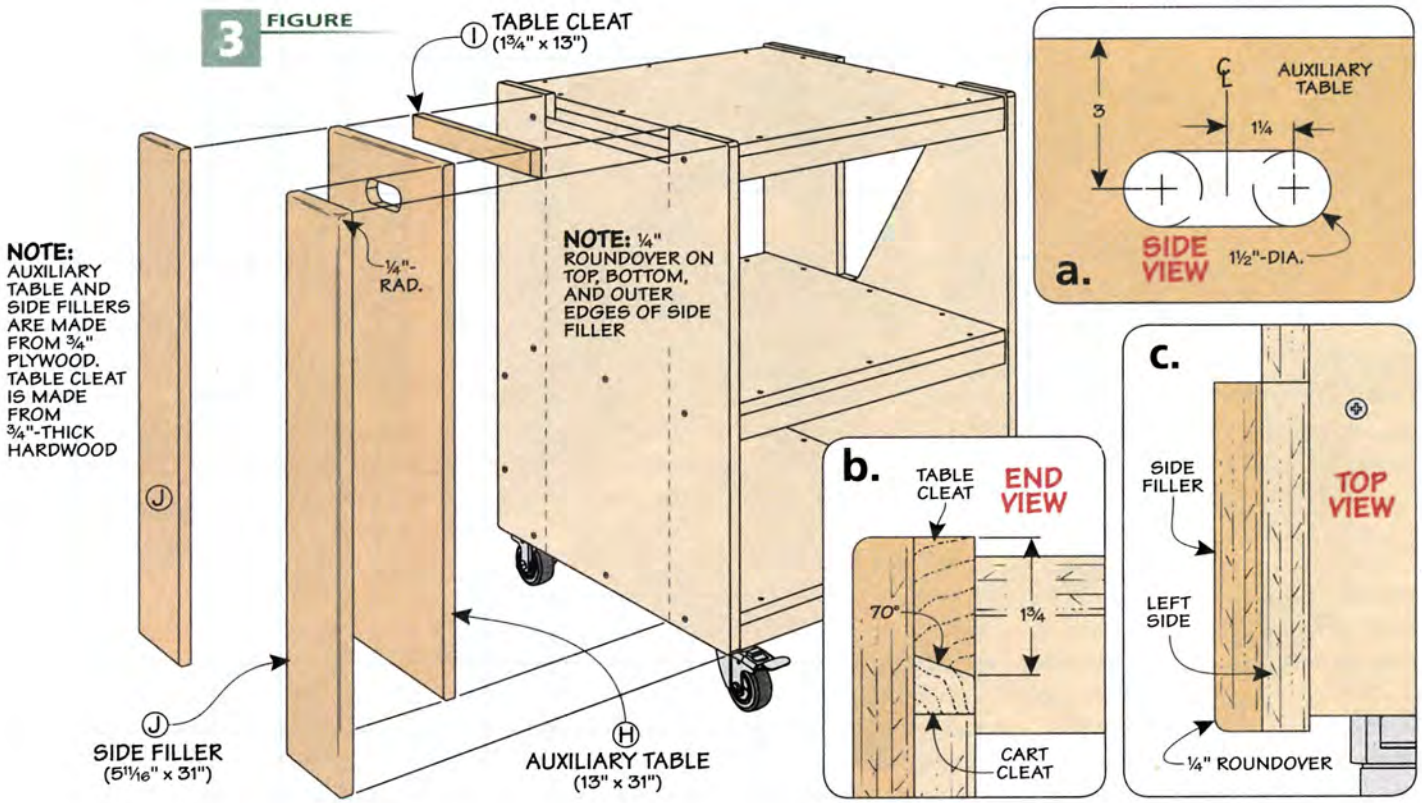
**Right Side.** The opposite side has a V-shaped cutout that holds a folding wing to support a drop-down side shelf. Here again, I made the cut with a jig saw. Take extra care here so you can keep the waste piece to use as the support wing for the shelf.

The angled side can just be sanded smooth. But I made sure that the straight side of the notch was square to the top of the side.

**Assemble the Case.** With the notches cut in each side panel, you can do some assembly work. Attach the sides to the platforms with glue and screws. The platforms are inset from the edge of the sides (Figure 2a). The drawings below shows you where to locate the screw holes. To install the platforms level, I attached the lower platform first. Then I cut a pair of plywood spacers to locate the middle platform. For the upper platform, you can use Figure 2b as a guide.

**Don't Forget the Back.** The final piece is a small back panel to close off the lower drawer compartment. The back fits between the middle and lower platforms, as shown in Figure 2. Simply slide it into place and secure it with a few screws through the sides of the cart.






## adding the
# Extra Features

Now that the basic case of the cart is assembled, it's time to add the features I mentioned earlier. Here again, each side of the cart is going to be a little unique.

**Planer Table.** The first of the details is the auxiliary planer table shown in the photo below. It fits over the bed of the planer and a cleat on the infeed side hooks it in place. The table serves two purposes. The cutterhead on some planers can't be lowered enough to plane stock less than ¼". So the table raises the workpiece for the cutterhead to engage the piece. The table's other job is to create a smooth, continuous surface for thin stock to slide on. This way, it can't catch and spoil the cut.

Figure 3a shows the table's cutout handhold. The handhold makes using the table a breeze. I rounded over the ends to relieve the sharp corners.

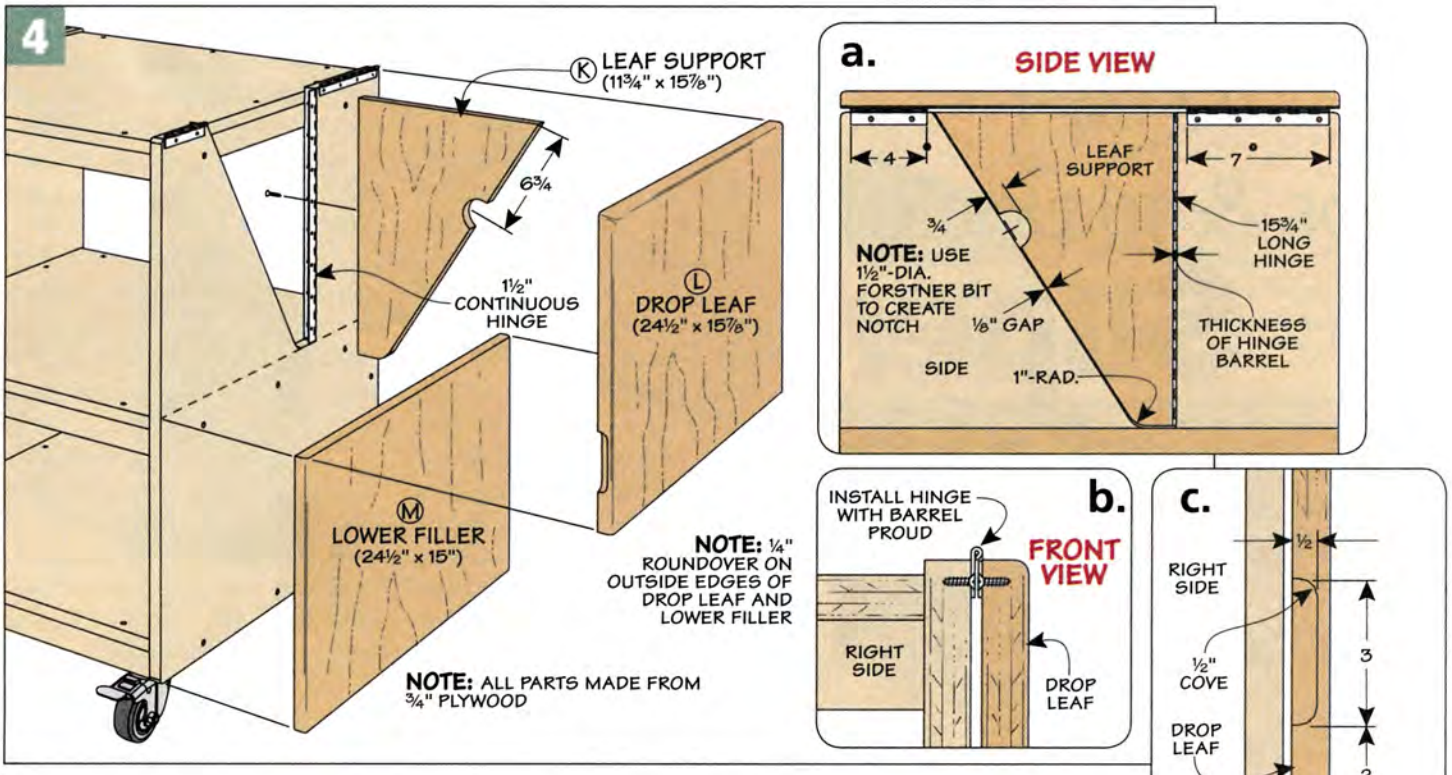
A hardwood cleat is glued to the back face of the table, as you can see in Figure 3b. It has a matching bevel to the cleat on the cart. This cleat serves a second purpose. It hooks over the planer table, so it won't shift in use.

Take some time to sand the surface of the table smooth and apply a couple coats of finish. In use, you want a workpiece to slide smoothly across it. Once the finish has cured, it's a good idea to apply a coat of wax.

On either side of the table, I glued a pair of long filler strips to the cart. This creates a pocket for the auxiliary table and a gives the cart a cleaner look, too.

**Drop-Leaf.** You can now turn your attention to the other side of the cart. Here, you'll add a drop-down shelf, as shown in Figure 4. Grab the wedge-shaped cut-out piece you made earlier. Take some time to clean up the edges and add a notch to the angled edge. This creates a finger grip to pull out the support, as illustrated in Figure 4a.

▼ ***Thin Stock.*** *The built-in table raises the workpiece and provides solid support for planing custom thin stock.*




On the square edge, attach a continuous hinge to mount the support on the cart. Check the fit of the support in its pocket.

The drop leaf is just a plywood panel cut to size. I routed a roundover on the top and sides. I also routed a stopped cove along each edge, as detailed in Figure 4c. This creates a pull to raise and lower the drop leaf without pinching your fingers.

The drop leaf is attached with two short lengths of a continuous hinge on either side of the notch, as illustrated in Figure 4a. A wide filler panel is glued to the cart below the drop leaf to create a flush surface, just like the other side of the cart.

Take some time here to add a slight radius to the corners of the cart, as you can see in Figures 3 and 4. And ease the outside edges with a slight roundover.

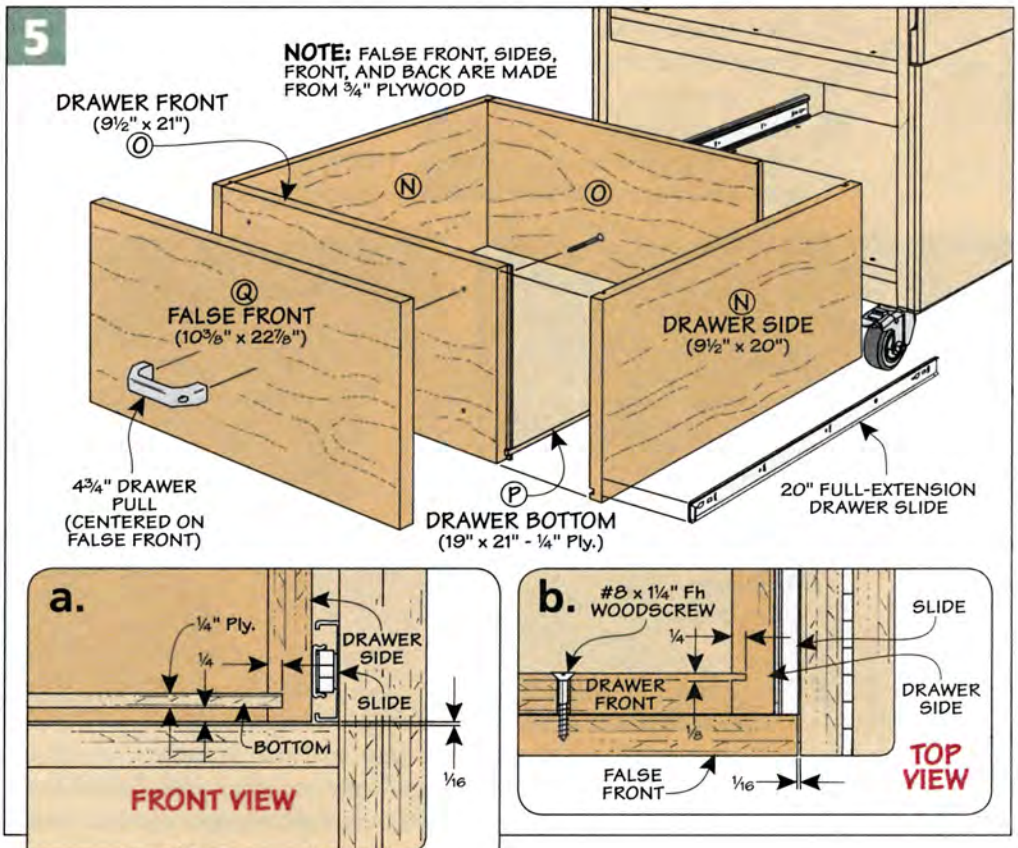
## DRAWER

The final piece of the puzzle is a drawer that fits in the space below the middle platform. The drawer runs on full-extension metal drawer slides.

The pieces of the drawer box are assembled using tongue and dado joinery, as shown in Figure 5b. A ⅛"-wide dado is cut near each end of the drawer sides. On the drawer front and back, you can cut a rabbet to form a tongue to fit in the dado.

The drawer bottom is captured in a groove cut in the front, back, and sides. A plywood false front conceals the gap and drawer slides, giving it a finished look.

I applied a few coats of finish for protection. Then the planer can be attached with lag screws driven into the top.



HANDS-ON
Technique

# tips & tricks for
# Super Smooth Curves

All it takes to create smooth curves are a few basic tools and a little know-how.

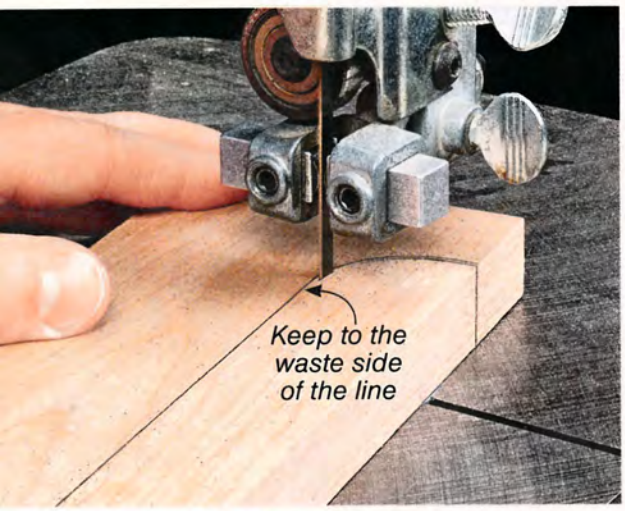
Shaping a graceful curve or even a simple radius on a project is a tried-and-true way to add visual interest. The trick is ending up with a smooth, even curve that flows seamlessly.

My approach usually involves two steps: First, I cut away most of the waste using a jig saw or band saw. Even with a practiced hand, you're still going to end up with blade marks. So the second step is to smooth and refine the edge.

I want to focus on the simple tools, tips, and techniques for smoothing curves, rather than cutting them. But there are a couple things you can do up front that will make smoothing out the curved edges so much easier.

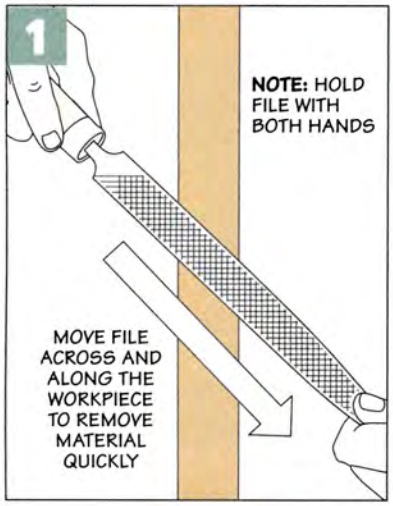
**Mark Clearly.** The first thing is to lay out the curve clearly. It sounds obvious, but I've noticed that on some materials, an ordinary pencil line can get lost in the grain. If you can't see the line, you'll have a hard time cutting to it. In this case, I switch to a thick carpenter's pencil or use a white-colored pencil on dark wood.

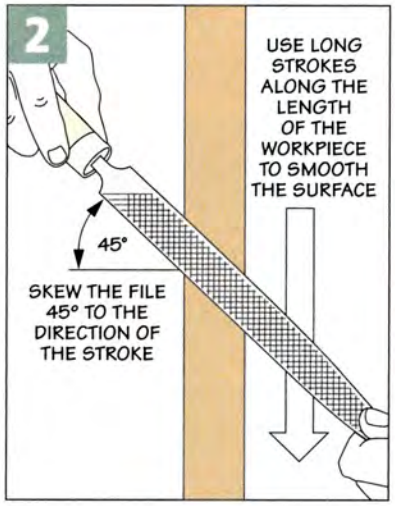
**Cut It Close.** While making the cut, you need to stay on the waste side of the line, so you won't spoil the edge. It's tempting to play it safe and stay well clear, but removing a lot of waste takes time. Instead, try to cut as close to the line as possible, leaving just 1/16" or less of waste, as in the far left photo. You may need to slow down or make a practice cut or two, but you'll still save time by reducing the cleanup work.




▲ ***Cut It Close.*** *To save time and effort while smoothing, cut as close as possible to the layout line. Aim for 1/32" to 1/16" of waste.*

▲ ***Use a Card Scraper.*** *The sharp hook on a card scraper quickly removes blade marks from curves.*




**Sanding Drum.** Once the curve is cut, you're ready to start smoothing the edge. For concave curves, my tool of choice is a sanding drum in my drill press, (main photo on the facing page).

Select the largest diameter drum that will fit in the curve to avoid creating a scalloped edge. Don't try to clean up the edge in one pass. You'll get a smoother curve if you take several light, sweeping passes to work your way down to the line. I also try to work "downhill" with the grain.

**Card Scraper.** Normally, you might think a card scraper is only useful for smoothing flat surfaces. But it can be just as effective on curved surfaces, too. I prefer to use one on outside curves. It's easy to adjust the angle of the scraper to follow the profile, as you can see in the lower right photo on the previous page.

**A Pair of Files.** My next best option is to use a couple files. These overlooked tools cut faster than sandpaper and make it easier to create smooth, flowing shapes. A half-round file will work in most instances. For a tight radius, I use a round file.

There are two distinct strokes I use when working with files. You can see these in the drawings above. To quickly remove material, move the file across and along the edge, as in Figure 1.

Once I'm close to the line, I finish up by draw filing. For this stroke, push the file along the edge with the file held at a fixed angle. This smooths out marks left by the first stroke, as illustrated in Figure 2.

▲ ***Half-Round.*** *Like two tools in one, a half-round file can help smooth convex and concave curves.*

**Sanding Block.** Sandpaper seems like an obvious choice for smoothing. But I find it's difficult to create an even curve. Instead, I save it for the finishing touches.

However, the photo below shows one way to make sandpaper work harder. Apply a strip of coarse sandpaper (80-100 grit) to a section of the waste piece from cutting the curve. The shape of this block allows it to remove high spots and even out the profile.

Seamless curves don't have to be a hassle. And these tips and techniques make the task easy.

***Save the Waste.*** *Apply sandpaper to a piece of the cut off waste to use as a sanding block for smoothing arcs.*

# quick & easy ways to Hold Your Work

## Here are a few simple solutions to turn any surface into a workbench.


Keeping a firm grip on a workpiece is crucial for getting good results with almost any operation. For many tasks, the heavy-duty vises found on traditional-style workbenches are a good choice. If you don't have vises like this, though, it doesn't mean you need to sacrifice the safety and accuracy provided by a well-secured workpiece.

Take a look at these inexpensive solutions. You're sure to find a few that will work no matter what kind of shop space you have. In fact, you can put these ideas to use even if you have a large, fully equipped workbench.

▲ ***Rubber Sanding Mat.*** *The textured rubber mat creates enough friction to keep workpieces and assemblies in place for sanding or routing.*

### HANDSCREWS

Wood-jawed handscrews may look like something you'd find in your grandfather's workshop. But I think every woodworker should have a few around. These versatile clamps act like small vises and can transform any worksurface into a workbench for a variety of tasks.

You can see one example in the photo above. A handscrew clamped to each end of a door frame provides stability. A short bar clamp holds the handscrew in place on the worksurface. I find that this arrangement works for a number of tasks. For example, it's a great way to hold long boards on edge. And a single handscrew and a bar clamp can be used to hold small parts for detailed operations.

### RUBBER MATS

It's easy to think that keeping a workpiece secure means it needs to be totally immobilized. But that isn't always necessary.

For instance, when you're using a random orbit sander, you only need to keep the workpiece from sliding around due to the rotation of the sander's pad. Clamps aren't really a good option here since they would get in the way of the sander.

Instead, I like to use an inexpensive mat, as shown in the left photo. They look like thicker versions of rubber shelf liners. The rubber feels a little tacky and creates enough friction to hold a workpiece well.


▲ **Bench Stop.** *A thin hardboard strip creates a low-clearance stop that won't get in the way of tools. Use it to keep parts from sliding off the worksurface.*

▲ **Bench Hook.** *Brace a workpiece against the fence to cut parts to size or plane a chamfer. The platform can serve as a backer for drilling holes, too.*

**Router, Too.** These mats aren't just for sanding. You can also use one with a router. The mat holds large panels in place while routing a profile around the edges.

**Renewable.** Be aware that over time, fine dust can reduce the grip of the mat. Washing it with warm, soapy water will bring it back to a like-new condition.

### STOPS & HOOKS

Another way to transform any worksurface into a workbench is to use shop-made stops. The idea behind them is basic. When planing, sawing, or sanding, a stop can be used to channel the force of the tool's motion to hold the workpiece in place.

**Bench Stop.** In the upper left photo, you can see a stop made from a thin strip of ¼" hardboard. The hardboard is durable enough to use as a stop and won't interfere with tools. The stop is held to the worksurface with a pair of bar clamps. A cleat on one end helps to keep it square and can act as another clamping surface.

**Bench Hook.** Another traditional stop is a bench hook, as you can see in the upper right photo. It's just a small platform with opposing cleats. The one on the top acts as a fence, so you can brace a workpiece for sawing or planing. The cleat on the bottom catches the edge of the worksurface to hold the bench hook in place as you work.

The platform serves double duty. You can use it as a sacrifical backer for drilling or chiseling.

Creative thinking and the right accessories can turn almost any flat surface into a place to enjoy a little woodworking time.

# ready-made Vise Solutions

◀ **Portable Vise.** *This small vise attaches to any surface with a few turns of a clamp pad.*

If you share your workspace with other activities, a full-size workbench with vises may not be an option. However, there are ways to add some of the same advantages vises offer.

**Clamp-On Vise.** One idea is to buy a small, clamp-on vise, like you see in the photo at left. It offers heavy-duty cast iron clamping in a compact package. (For sources, turn to page 51.) I added maple faces to the vise jaws to prevent marring a workpiece. Best of all, it tucks away when it isn't needed.

**Workmate.** A folding workbench, like the *Workmate* (at right) is an overlooked mini bench. The versatile top can clamp onto a wide range of workpieces. I even use one as a handy stand for benchtop power tools.

▲ **Instant Bench.** *The top of this bench forms a handy vise.*


CABINET SAW

# choosing the right Table Saw

Newer saws are safer, more accurate, and easier to use. Here's how to make the right choice.

Whether you're a veteran woodworker or just starting out, sooner or later you'll need to buy a table saw. And since it's a major investment that can last a lifetime, it pays to make the right choice. There are three primary types of saws on the market. These include benchtop or jobsite saws, hybrid saws, and cabinet-style saws. The trick is to determine which type is best for your woodworking needs.

**Safety.** Let's talk about safety first. All new saws are required to have blade guards and riving knives. These newer devices are easy to use and are nothing like the clumsy guard and splitter combinations on older saws. The newer devices are easier to install and can be used for most cutting operations. A riving knife travels at the same height as the blade for safer cuts.

## BENCHTOP SAWS

At the low end of the size scale are benchtop saws. They were designed for use by contractors on a job site. One example is shown at the top of the opposite page. They're lightweight and easy to transport. If your shop is cramped for space or if you work on smaller projects, a benchtop saw might be a good option.

In the $300 to $600 range (without a stand), they hit the low end of the price range. And they're small and light enough to move and store easily.

**Motor.** One feature that differentiates a benchtop saw from a hybrid or cabinet saw is the type of motor. These small saws use a universal motor (similar to what's used on your router). In many cases, the blade mounts directly to the motor's shaft.

A universal motor is less powerful and noiser than other types. For cutting soft framing lumber or thin hardwoods, they work great. But they aren't the best choice for making a lot of furniture, especially if you use your saw for hours at a time.

Despite these limitations, many woodworkers find that a benchtop saw with its small footprint suits their needs. Just bear in mind that it won't last as long and can't do all the things a larger hybrid or more powerful cabinet saw can do.

▲ **Kickback Prevention.** *A riving knife can be used during most cutting operations.*


◀ **Convenience.** *A lightweight benchtop saw can be the solution for cramped shop space.*

**BENCHTOP SAW**

## HYBRID SAWS

The next step up on the price and feature scale is a hybrid table saw. You can see one in the photo below. The term "hybrid" means it's a cross between the once-popular contractor-style saw and a cabinet saw. Contractor saws, the heart of many shops, are becoming harder to find. While you might still find them, manufacturers are focusing more of their attention on hybrid saws.

These saws start at around $1,000 and, at first glance, look like a full-size cabinet saw. The motor and blade mechanism (trunnion) are inside the cabinet. The larger table and beefier rip fence, also featured on cabinet saws, are a huge improvement over those on a benchtop saw.

The other critical differences between hybrid saws and benchtop saws are under the hood. First, hybrid saws typically feature a 1½-hp to 3-hp motor. This means plenty of power for cutting through thicker hardwoods.

The trunnion assembly on a hybrid saw is also a notch above the benchtop saw's mechanism. But it's not quite as robust as that on a larger cabinet saw.

A hybrid saw is a great choice for a hobbyist. It will do just about anything you ask of it.

## CABINET SAWS

If you expect a lot from your saw, you'll want to consider a cabinet saw like the one shown on the opposite page. These range in cost from about $1,500 up to $3,000 or more. Though the line is blurring between hybrid and cabinet saws, there are some important differences.

First, you'll find larger, heavy-duty motors on cabinet saws. They typically range from 3- to 5-hp. The down side is that they require 220-volt power.

What really makes a cabinet saw stand out is the beefy trunnion assembly. There's more cast iron to add mass, and that makes for a smooth cut. And you won't find a smoother operating blade raising and tilting mechanism.

**Making a Choice.** You can start down the road to choosing a saw by asking yourself what kind of woodworking you plan on doing. If your work is small scale, a cabinet-style saw is probably more than you need. On the other hand, if you work with a lot of sheet goods, you may become frustrated with a benchtop saw.

Knowing the key features of the types of saws, you can make the right choice for your shop.


◀ **Full-Featured.** *A hybrid saw is a great way to gain some of the features of a larger cabinet saw at a lower price.*

**HYBRID SAW**


# modular & mobile Tool Storage

## These plastic cases with expandable options add a modern twist to the typical tool chest.

***Kaizen Foam.*** *Make easy-to-create custom cut-outs that secure your tools in place.*

Whether you do your work in the shop or on the go, toolboxes are indispensable for keeping tools organized and easily accessible. Unfortunately, most toolboxes leave a lot to be desired.

The problem is, once loaded, many standard wood or metal tool chests become heavy and difficult to transport. Plus, when it comes to power tools, the various-sized containers that come with the tools make stacking and storing the tools difficult. Most of the time I find myself just throwing out the boxes or using them for some other purpose.

I recently found a solution that addresses these issues: modular plastic storage cases. A handful of options are available on the market. But companies like *Sortimo International* and *Tanos* have been producing these cases for years and are widely considered to be the best. Additionally, *Dewalt* recently added a new collection of cases to their product line. Each company has unique options.

All the open storage cases come empty, allowing you to customize them for your tools. And while pre-cut foam inserts are available, I prefer the ease and flexibility of using *Fast-Cap's Kaizen Foam* (main and margin photos).

### SORTIMO

*Sortimo* has been an storage solutions leader in Europe for decades. Until recently, though, their products were hard to find in the U.S. This German company produces a number of storage


▲ ***Tool Tray Insert.*** *Keep your tools and supplies organized when you're on the go. For transport and storage, the tool tray insert fits securely inside the L-BOXX-4.*

options, as well as custom rack systems that integrate within a vehicle for easy mobile transport. For more information on this and the products discussed, see Sources on page 51.

*Bosch Tools* has partnered with *Sortimo* to create a line of *Bosch*-branded cases they are calling their *Click & Go* system. You can see photos of these dark blue boxes on this page and in the main image on the opposite page. In addition to offering some of their power tools in these boxes, *Bosch* is also offering the boxes for sale separately in four different sizes (photo above).

When stacked on top of each other, the boxes are held in place with spring-loaded catches located on the sides of each box. A quick press on each catch and the cases separate, as in the right photo below. The boxes also lock into a four-wheeled dolly for easy mobility, as shown above.

Handles located on the sides and top of each box make carrying a breeze. And the smallest two sizes have briefcase-style handles, as well. *Bosch* also offers a couple other options (not shown here) for organizing smaller items like hardware or fasteners.

The complete *Sortimo* line is very extensive and includes products for all your organization and storage needs. The *T-BOXX* shown in the photo below left and the *Tool Tray Insert* shown above are just two examples. Not all products attach together, though, so keep that in mind when ordering.

▲ ***T-BOXX.*** *A durable, clear plastic lid makes it easy to see the contents. Colored bins in various sizes allow you to keep your hardware, fasteners, and other shop supplies neatly organized.*


▼ ***Click & Go.*** *The boxes lock securely together and can be separated for easy transport.*

◀ **Removable Cases.** *Carrying your fasteners with you is simple using the Rack Systainer.*


## TANOS

If you're familiar with *Festool* power tools, you may already be accustomed to the *Systainer* line of products from *Tanos*. These durable cases are made from 100% ABS plastic and are designed to hold a range of tools and other items to keep them safe and secure.

In addition to the simple, open boxes used for storing power tools, *Tanos* also offers a collection of *Systainers* with drawers and pull-out cases for storing smaller parts and accessories. A handful of these cases are shown in the photos here.

The cases with drawers come in a number of configurations depending on need. And dividers are included for each drawer so that your tools and supplies can be organized appropriately.

The bottom photo at left shows how this can be done.

As you can see in the photo above, *Systainers* are designed to be stacked and locked together regardless of their configuration. When stacked, each *Systainer* is connected to the one below it with either four latches or with a unique *T-Loc* system that allows the lid to be opened without having to remove the cases on top. Have a look at the near photo at left to see how this works.

*Tanos* has made sure that all their *Systainers* integrate with each other, so you never have to worry about product compatibility. For example, the small *MINI-Systainers* shown at left fit perfectly inside a standard-size model for comprehensive storage and ease of stacking.

Whatever your storage or mobile needs, I suspect there is a *Systainer* option that will work for you.

▼ **Box Systainer.** *Removable inserts allow you to easily organize your shop supplies.*

▲ **MINI-Systainers.** *Keep your power tool accessories close at hand using small Systainers with insert trays.*

◀ **Divided Drawers.** *Dividers allow you to organize the drawers to custom fit your tools and accessories.*

**Drawer Slides.** *Drawers open and close smoothly on ball-bearing slides.*

▲ **Removable Plastic Bins.** *Take your supplies with you using large and small plastic bins that hold fasteners, hardware, and more.*

## DEWALT

A relative newcomer to the scene of modular, stackable, interlocking storage is *DeWalt*. The company is often associated with jobsite construction tools, but their new line of *TSTAK* storage cases works very well and offers some unique features.

It's clear when picking up one of these boxes that they're intended for both the mobile contractor as well as for the home shop woodworker. The durable, polypropylene cases with beveled corners and edges give the feel and appearance they were designed to be knocked around in the back of a pickup truck. But the storage and utility they provide still work great in a woodworking shop. A rugged hand cart is also available that secures the stack for on-the-go transport.

There are currently four types of cases available, as shown in the photo below. Plastic latches attached to the lid of each case connect to the bottom of the case above it. This allows you to open a case while another case is still attached on top of it.

The top case shown below and in the photos at right allows you to store tools in the main compartment and any accessories within a divided lid. The two drawer-based cases use ball-bearing slides for easy access. And the large drawer includes removable plastic containers for on-the-job convenience.

The next time you need to declutter your tools and supplies, keep these cases in mind. Any one of these systems will help you get organized, whether you're working in or out of the shop.

▼ **Accessory Tray.** *Always have the attachments for your tools close at hand by storing them in the lid.*


▲ **Open Storage.** *You'll have plenty of room for storing your tools and accessories in these durable plastic boxes.*

Q&A

**questions from**
Our Readers

# introducing Kids to Woodworking

***My son's school no longer offers a woodworking "shop class." But I would like to teach him some of the basic woodworking skills I learned when I was his age. Do you have any tips on how to get started?***

*Byron Abler*
*Omaha, Nebraska*

The skills learned from woodworking go far beyond the finished project. This is especially true with young students.

During the late nineteenth century, the educational Sloyd method was practiced as a formative education. Its purpose was to develop "mental, moral, and physical powers of children" through a clearly defined system of educational handwork.

Otto Salomon, who helped popularize the Sloyd movement in Sweden stated that working with wood helps develop "manual dexterity, self-reliance, accuracy, carefulness, patience, perseverance, and especially does it train the faculty of attention and develop the powers of concentration." Some of the information I'll discuss here follows the principles of Sloyd.

**Safety.** Of course, one of the primary concerns when it comes to children and woodworking is safety. For this reason, power tools are best kept under the control of adults. But with proper guidance, older children can learn to use hand tools safely and with great results.

**Tools.** When it comes to selecting tools, children starting at ages nine to eleven should be able to use the same hand tools as adults. Not the largest ones, of course, but smaller tools typically used in a wood shop. The reason being that the weight of a tool often helps improve results. And tools designed for children are often of poor quality.

**Projects.** It probably doesn't come as a surprise that children, like adults, are much more likely to enjoy building a project if they see value in the end result. So when selecting projects, it's best to find ones that the child finds interesting or useful. The book *Woodworking*, by John Kelsey, is an excellent resource for project ideas and woodworking skills for kids.

As adults, it's important to remember that it can take time for a child to develop the dexterity needed to fully control a tool. So projects should start out simple to make, then gradually increase in difficulty. Each project should be a challenge, yet not too difficult that the child becomes overly frustrated.

And try to let the child do all the work on the project. If you need to teach a technique, perform it on another workpiece rather than on the child's project. Having completed a project all on your own instills a great sense of pride.

Most important, be supportive of the child's work. The end result doesn't have to look perfect in order for it to be done well.

# Sources

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

The *Woodsmith Store* in Des Moines, Iowa is an authorized *Rockler* dealer. And they ship nationwide. Their customer service representatives are available from 8am – 5pm Central Time, Monday through Friday.

## SCREW SLOT BITS *(p.8)*

- **Lee Valley**
  *Countersink Bit* . . . . . 16J11.60
  *Counterbore Bit* . . . . . 16J11.70

## COPING SAWS *(p.10)*

- **Woodcraft**
  *10-tpi Blades* . . . . . 141405
  *20-tpi Blades* . . . . . 141404

## OVAL TOOL HANDLES *(p.14)*

- **Lee Valley**
  *Screwdriver Shanks* . . . 88K98.30

## CARVING DUPLICATOR *(p.18)*

- **McMaster-Carr**
  *$1^{15}/_{16}$"-dia. Wheels* . . . . . 9960T31
- **PreciseBits.com**
  *$1/_{32}$" Bit* . . . . . CM304-0313-100B
  *$1/_{16}$" Bit* . . . . . CM404-0625-100B
  *$1/_{8}$" Bit* . . . . . CM404-1250-100B
  *$1/_{4}$" Bit* . . . . . CM404-2500-100B
- **Reid Supply**
  *$1^{1}/_{4}$"-dia. Knobs* . . . . . RST-47
  *$5/_{16}$"-18 Studded Knob* . . KBP-271

## SQUARES *(p.30)*

- **McMaster-Carr**
  *$1^{1}/_{4}$" Brass* . . . . . 8954K231
  *$3/_{4}$" Brass* . . . . . 8954K237
  *$1/_{16}$" Brass* . . . . . 8954K44
  *$3/_{16}$"-dia. Rivets* . . . . . 96082A100
  *$5/_{16}$"-dia. Rivets* . . . . . 96082A200

## PLANER CART *(p.34)*

- **Lee Valley**
  *3" Locking Casters* . . . . 00K21.31
- **Reid Supply**
  *$4^{3}/_{4}$" Pull* . . . . . DUH-50

## VISE ALTERNATIVES *(p.42)*

- **Woodcraft**
  *6" Portable Vise* . . . . . 154141

## STORAGE CONTAINERS *(p.46)*

- **Amazon.com**
  *L-BOXX-1* . . . . . B004323NLO
  *L-BOXX-2* . . . . . B004323NLY
  *L-BOXX-3* . . . . . B004323NMI
  *L-BOXX-4* . . . . . B004323NMS
  *L-DOLLY* . . . . . B00BD5G62W

*Sortimo* products are sold exclusively through *Knapheide* distributors. Visit *Sortimo.com* for more information or *Knapheide.com* to find your nearest location.

- **Sortimo**
  *Tool Tray Insert* . . . . . 121014894
  *T-BOXX* . . . . . 51012131

*Tanos SYS-CART* and *T-Loc MINI-Systainers* are new products with limited availability. Contact *LeeValley* for updates.

- **Lee Valley**
  *Systainer Toolbox* . . . . . 68K43.06
  *T-Loc Box Systainer 1* . 68K45.80
  *4-Drawer Systainer* . . . 68K44.04
  *9-Drawer Systainer* . . . 68K44.09
  *Rack Systainer* . . . . . 68K45.07
- **Amazon.com**
  *TSTAK-1* . . . . . B00B6K4VDK
  *TSTAK-2* . . . . . B00B6K4V80
  *TSTAK-3* . . . . . B00BF4VUKO
  *TSTAK-4* . . . . . B00BPI1TWO
- **FastCap**
  *Kaizen Foam* . . . . . 57mm B/W

## MAIL ORDER SOURCES

**Woodsmith Store**
800-444-7527

**Rockler**
800-279-4441
rockler.com

**Amazon.com**

**FastCap**
888-443-3748
fastcap.com

**Knapheide**
217-223-1848
knapheide.com

**Lee Valley**
800-871-8158
leevalley.com

**McMaster-Carr**
630-600-3600
mcmaster.com

**PreciseBits.com**
719-488-9640

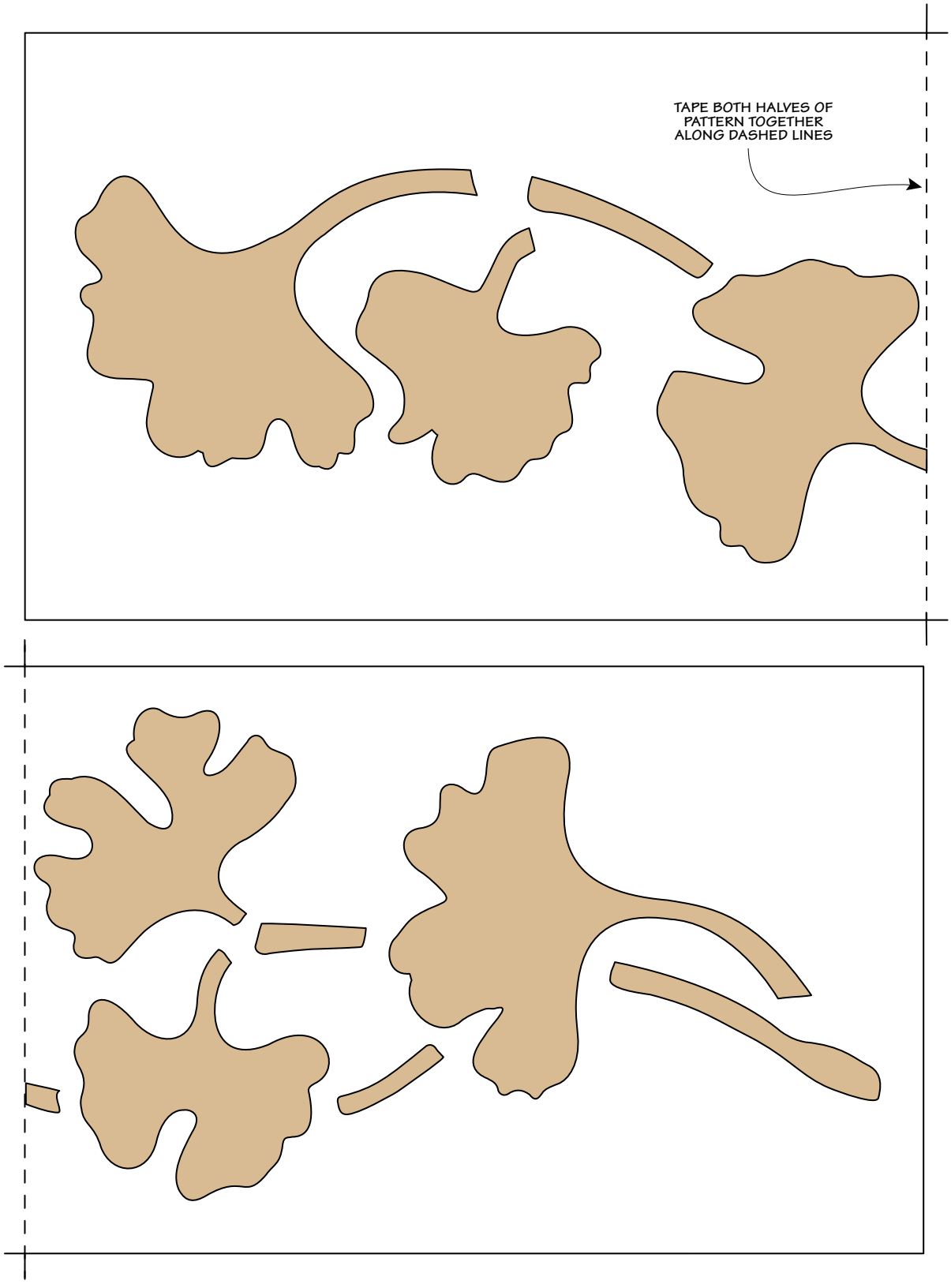
**Reid Supply**
800-253-0421
reidsupply.com

**Sortimo**
404-812-6994
sortimo.com

**Woodcraft**
800-225-1153
woodcraft.com

ShopNotes

# carving duplicator Pattern



ShopNotes

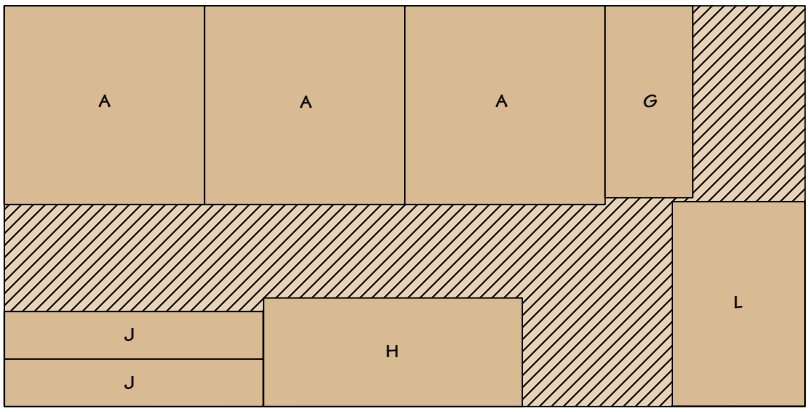
# best-ever Planer Cart

## Materials List

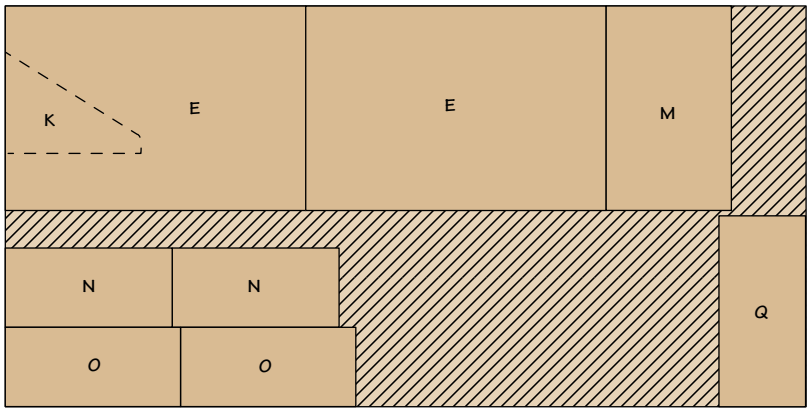
| | | | | | | |
|---|---|---|---|---|---|---|
| A | Platforms (3) | 24 x 23 - ¾ Ply. | L | Drop Leaf (1) | 24½ x 15⅞ - ¾ Ply. | • (16) ¼" Flat Washers |
| B | Front/Back Supports (6) | 1½ x 1½ - 23 | M | Lower Filler (1) | 24½ x 15 - ¾ Ply. | • (2) 36" Continuous Hinges w/Screws |
| C | Side Supports (6) | 1½ x 1½ - 21 | N | Drawer Sides (2) | 9½ x 20 - ¾ Ply. | • (1 pr.) 1½" x 20" Full-Ext. Drawer Slides |
| D | Corner Blocks (4) | 1½ x 4 - 4 | O | Drawer Front/Back (2) | 9½ x 21 - ¾ Ply. | • (1) 4¾" Drawer Pull |
| E | Sides (2) | 24½ x 31 - ¾ Ply. | P | Drawer Bottom (1) | 19 x 21 - ¼ Ply. | |
| F | Cart Cleat (1) | ¾ x ¾ - 13⅛ | Q | False Front (1) | 22⅞ x 10⅜ - ¾ Ply. | |
| G | Cart Back (1) | 23 x 10½ - ¾ Ply. | | | | |
| H | Auxiliary Table (1) | 13 x 31 - ¾ Ply. | • (56) #8 x 1½" Fh Woodscrews | | | |
| I | Table Cleat (1) | ¾ x 1¾ - 13 | • (4) #8 x 1¼" Fh Woodscrews | | | |
| J | Side Fillers (2) | 5 11/16 x 31 - ¾ Ply. | • (4) 3" Locking Swivel Casters | | | |
| K | Leaf Support (1) | 11¾ x 15⅞ - ¾ Ply. | • (16) #14 x 1" Lag Screws | | | |

## Cutting Diagram

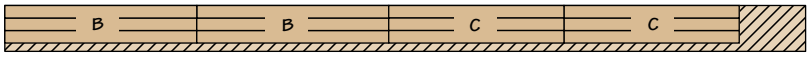
48" x 96"- ¾" BIRCH PLYWOOD



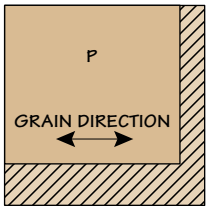

48" x 96"- ¾" BIRCH PLYWOOD



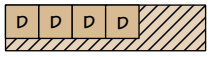

1½" x 5½" - 96" HARD MAPLE (7.3 Bd. Ft.)



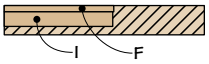

¼" x 24"- 24" BIRCH PLYWOOD




1½" x 5½"- 24" HARD MAPLE (1.8 Bd. Ft.)




¾" x 3½"- 24" HARD MAPLE (.6 Bd. Ft.)




**NOTE:** SAVE WASTE PIECE FROM SIDE (E) FOR MAKING LEAF SUPPORT (K)

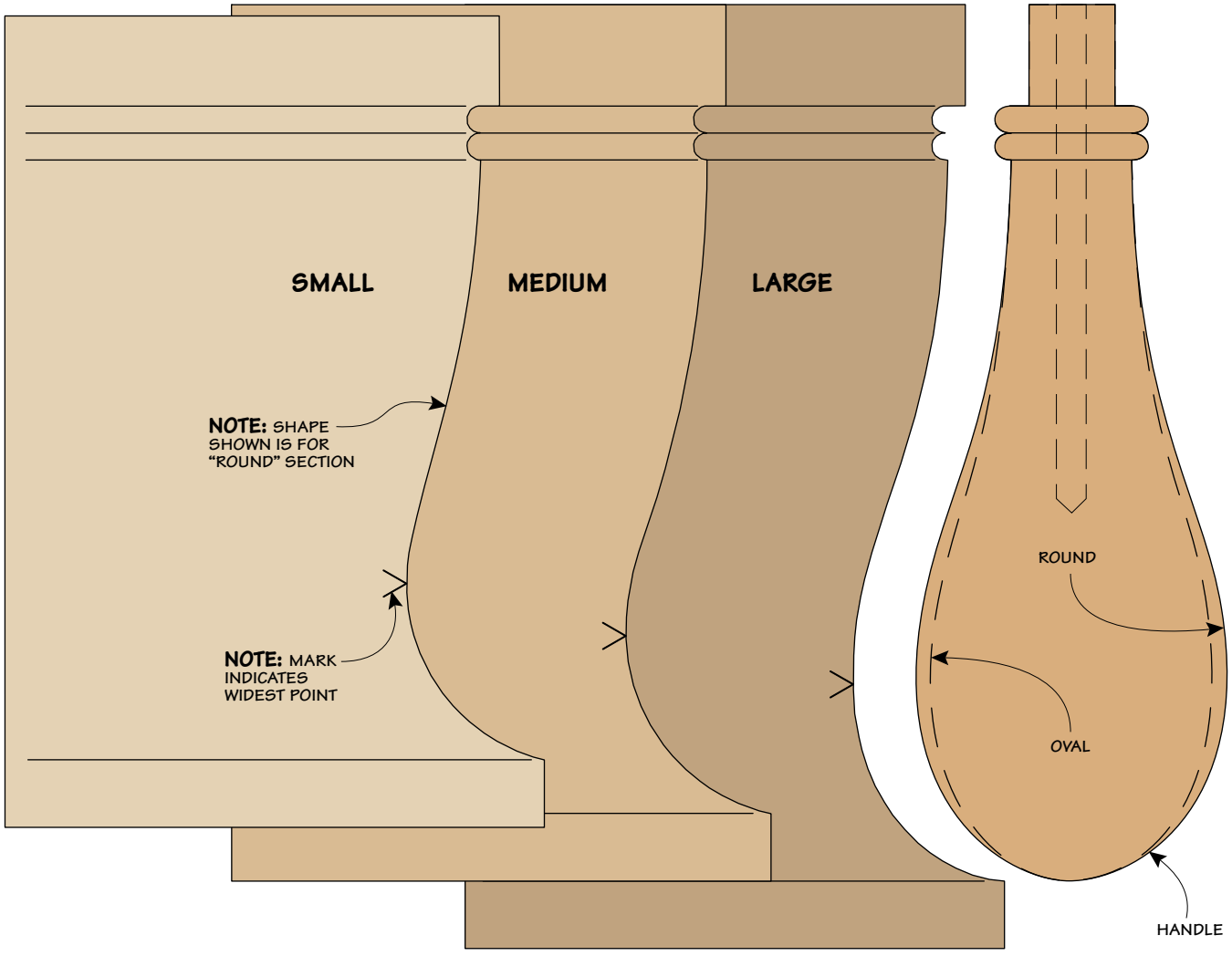
ShopNotes

# pattern guides & gauge for Oval Tool Handles

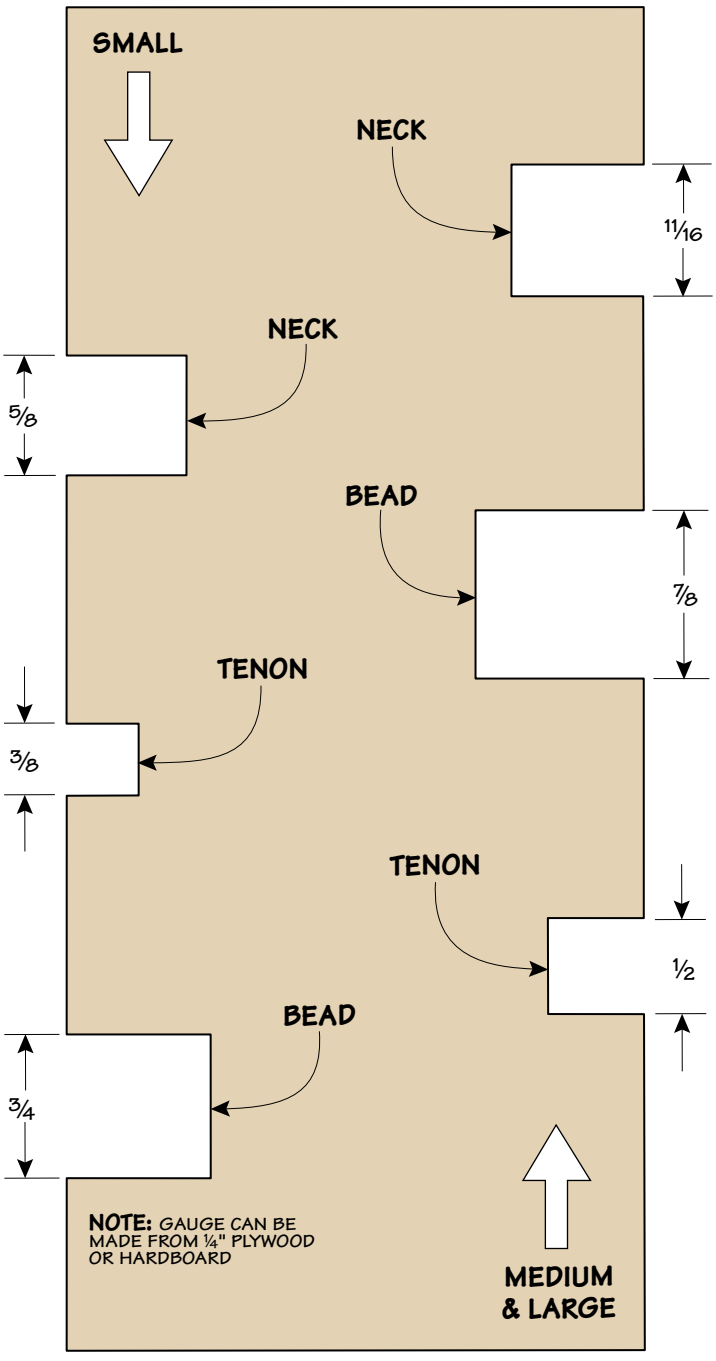
The patterns below help you lay out and shape each of the three sizes of handles while turning them. I used ¼" plywood to make the pattern guides.

The gauge on page 2 helps ensure key features of the handles are properly sized. The notches on one edge are for sizing the small handles. The notches on the opposite edge apply to the medium and large handles. Just slip the notches over the features as you turn them.

## PATTERN GUIDES (SHOWN ACTUAL SIZE)



## GAUGE (SHOWN ACTUAL SIZE)



# Scenes from the Shop

*Using a standard compact router, this fixture allows you to duplicate relief carvings as well as three-dimensional objects. You'll find complete plans starting on page 18.*