2 EASY-TO-BUILD JIGS For Bending Metal

BETTER CHISELS – THE SEARCH IS OVER

ShopNotes

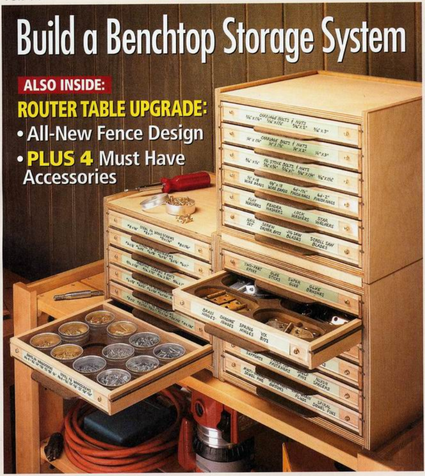
Vol. 11 www.ShopNotes.com Issue 69

Build a Benchtop Storage System

ALSO INSIDE:

ROUTER TABLE UPGRADE:

- All-New Fence Design
- **PLUS 4** Must Have Accessories



A Publication of August Home Publishing

ShopNotes

Issue 69 May 2003

ShopNotes® (ISSN 1062-9696) is published bimonthly (Jan., March, May, July, Sept., Nov.) by August Home Publishing, 2200 Grand, Des Moines, IA 50312.

Subscriptions: Single copy: $4.95. One year subscription (6 issues), $27.95. Canada/International add $10 per year, U.S. funds.
Periodicals Postage Paid at Des Moines, IA and at additional mailing offices.
Postmaster: Send change of address to *ShopNotes*, P.O. Box 37103, Boone, IA 50037-2103.
Subscription Questions? Write to: *ShopNotes* Customer Service, P.O. Box 842, Des Moines, IA 50304-9961. Or call 1-800-333-5854, 8:00 am to 5:00 pm, Central Time, weekdays. FAX 515-283-0447
Email: ShopNotes@shopnotes.com
Internet: http://www.shopnotes.com

PRINTED IN U.S.A.

EDITOR'S NOTE

Cutoffs

Metal — as woodworkers we don't give it much thought. But from cutting to clamping, metal plays an important role in everything we do in the shop.

It certainly played a big part in several of the projects in this issue. Take the router table fence featured on page 16 for instance. From the start, we wanted a fence with adjustable, sliding faces. This makes it easy to adjust the opening in the fence for different size router bits. Which makes a lot of sense.

However, there's a drawback to a two-piece face design — alignment. If one (or both) faces shrink, swell, or move in any way, you can end up with an inaccurate cut.

The solution to this problem was to use metal in the fence design. By adding a piece of aluminum angle to the bottom of the fence, we created a rail for the faces to slide along. This metal rail keeps the fences aligned.

Now I know that using aluminum in a project isn't all that unusual. We've used it quite often in the past because it's a relatively "soft" metal that's easy to work with. And it's commonly available — most home centers and hardware stores have a rack filled with various shapes and sizes of aluminum.

In addition to the aluminum, you'll find steel bars and rods in the same rack. Because steel is so hard, about the only thing we've done with it in the past is to take a straight piece and cut it to length with a hacksaw. But I've often wondered if there would be a way to form those pieces of steel into different shapes.

Bending Jigs - That's the idea behind the two bending jigs in this issue. First, there's the scroll-bending jig on page 22. It's used to bend steel into smooth, graceful shapes. We've also included a press for bending steel at precise angles.

With one (or both) of these jigs in your shop you'll be able to turn out steel handles, hangers, S-hooks and brackets in dozens of different sizes. Best of all, these jigs can be built with a few scraps of wood and — you guessed it — metal.

Terry

Be included, as a part of the

Woodworking Shop Tours

On the Web

Visit other *ShopNotes* subscribers' workshops and see photos of the shop projects they've built. It's all online at Woodworking Shop Tours on the *ShopNotes* web site:

www.ShopNotes.com

We want you to be part of our shop tours! To submit photos of your favorite *ShopNotes* projects or views of your shop, just follow the instructions you'll find on our web site.

Contents

Features

Small Parts Storage 6

Bits and pieces. Odds and ends. This shop-built storage system solves the problem of how to organize them.

Japanese Chisels 12

If you're looking for a chisel with the ultimate edge, you owe it to yourself to take a look at these chisels.

Router Table Fence & Accessories 16

An all-new, shop-built router table fence that never needs aligning. Plus, some handy accessories to go along with it.

Scroll-Bending Jig 22

This simple jig allows you to bend metal rods and bars into decorative shapes and useful objects with ease.

Bending Press 26

With this easy-to-use bending press, you don't have to be a blacksmith or ironworker to create angled bends in metal.

Set-Up Gauge 30

You'll find many uses around your shop for this simple set-up gauge. And you can build it in an evening or afternoon.

Departments

Readers' Tips 4

Shop-tested tips to solve common woodworking problems.

Shop Talk 32

Learn why cast iron is the material of choice when it comes to power tools. Plus some tips for keeping it in shape.

Tool Chest 34

A dial caliper can be one of the most useful tools in the shop. Here's a look at our favorite one.

Sources 35

Mail-order sources and supplies to help you complete the projects featured in this issue.

Small Parts Storage *page 6*

Japanese Chisels *page 12*

Router Fence *page 16*

Scroll-Bending Jig *page 22*

Readers' Tips

Round Stock Clamp

■ The machinist's vise in my shop gets a lot of use. Unfortunately, it isn't very good at holding round stock. Its metal jaws tend to gouge wood and soft metals. To solve this problem, I made a set of auxiliary faces for my vise.

The auxiliary faces have three sets of grooves to help the vise get a firm grip on round materials. Two sets of grooves run vertically in the jaw faces, as shown in the photo at right. Another set of grooves runs horizontally (inset photo). The V-shaped grooves allow the jaws to hold a variety of stock sizes without marring the workpiece.

Each face is made by gluing a hardboard cleat to a hardwood jaw. Then the grooves can be cut on a router table with a V-groove bit. The faces fit over the jaws and are held in place with rubber bands. Now I'm able to clamp round pieces securely without marring them.

Dana Craig
Norwood, Massachusetts

Rotary Tool Tackle Box

■ My rotary tool comes in handy for a variety of jobs around the house. The trouble I have is what to do with all the accessories. They're so small that they can easily get lost or broken in my toolbox.

What I needed was a place to keep the tool, as well as organize all the extra stuff that goes with it. I found the answer at a local sporting goods store — a fishing tackle box.

The tackle box I bought comes with small compartments and adjustable dividers that let me customize the space inside. There's one large spot for the rotary tool and power cord and others for bits, extra sanding sleeves, and accessories, as shown in the large photo.

To keep the bits, grinding wheels and other accessories from getting damaged, I stuck them into some *Styrofoam* that's cut to fit in the divided sections (inset photo). The bits don't "rattle" around and they're easy to find and pull out of the box.

Eric Corn
Ewa Beach, Hawaii

Quick Tips

▲ *Jackson Huber of Kansas City, KS made a switch guard for his router table by screwing a 1"-dia. PVC pipe clamp to the switch plate.*

▲ *To see hole locations on dark-colored stock, Roland Weisser of Midland, GA uses a correction fluid pen from an office supply store.*

▲ *Willie Stecker of Hilbert, WI hangs his oily finishing rags on a folding clothes drying rack. Once dry, he can safely dispose of them.*

Planer Set-Up Gauge

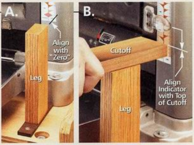
■ My benchtop thickness planer is a great tool that's saved me time and money in getting quality, surfaced lumber. The problem is that setting it up for the first pass on rough stock can be a guessing game.

If I only know the approximate thickness of my stock, I have to make a guess when setting the cutter height. Many times, the cutter is set too high and nothing happens. Other times, it's set too low and the planer takes too big of a bite.

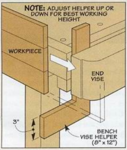
To save time and get more accurate setups, I made the gauge shown in the photo. The gauge is nothing more than a hardwood "leg" attached to a $\frac{1}{4}$" hardboard "foot" that rests on the planer table. The length of the leg is determined by the distance from the top of the foot to the "zero" mark on the planer's thickness gauge, as you can see in photo A. The gauge can then be screwed to the planer table.

Now when I want to adjust the planer, I just set a cutoff from the piece that I'm surfacing on the gauge and lower or raise the cutter head until the indicator is even with the top of my material (photo B). This way, I know at a glance the planer is set to remove a thin slice from the stock on the first pass.

Rick Manzie
North Las Vegas, Nevada



Bench Vise Helper



■ ShopNotes No. 67 had a bench vise helper for supporting long stock clamped in a vise. I thought I'd share another version. As you can see in the drawing, it's nothing more than an L-shaped piece of $\frac{3}{4}$" plywood that gets clamped in the end vise of your workbench.

It's easy to adjust the helper to match the width of the workpiece, depending on its size, by sliding it up or down in the end vise.

Len Arnold
Brevard, North Carolina

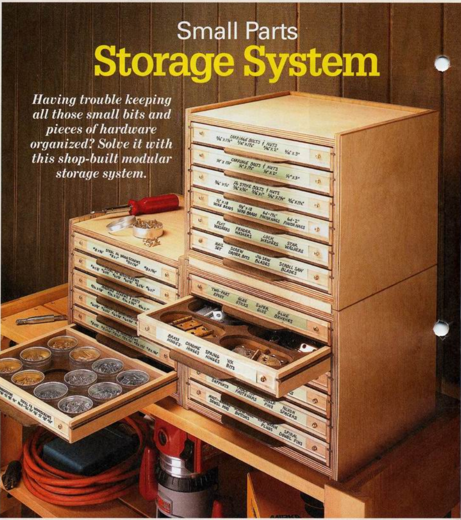
Send in Your Shop Tips

If you have a unique shop tip, we'd like to consider featuring it in one or more of our print or electronic publications.

We'll pay up to $200 for a tip we publish. Just write down the tip and mail it to *ShopNotes*, Attn.: Readers' Tips, 2200 Grand Ave., Des Moines, IA 50312. Or FAX it to 515-282-6741, or send us an email at shopnotes@shopnotes.com. Please include your name, address, and daytime phone number in case we have any questions.

Small Parts
Storage System

Having trouble keeping all those small bits and pieces of hardware organized? Solve it with this shop-built modular storage system.



The last time I needed to find a couple pieces of hardware I had to dump out a coffee can and sift through the contents. When I had first started storing things in the can, it seemed like a great way to "organize" all the bits and pieces of hardware accumulating around the shop.

Unfortunately, it didn't take long before the coffee can was full. And sorting through the mess was taking too much time. The problem was that the can was filled with just a few pieces of a lot of different kinds of hardware.

Storage System – What I needed was a storage system that was flexible enough to handle a wide variety of hardware — whether there were a few items of each or a hundred. The system shown above was the answer.

Changing Needs – So how does it adapt to meet your needs? To start with, the design is simple — each case and the drawers inside are identical. And since the joinery is easy, building a number of them is an easy task. You can add more later as your needs change.

Inside each drawer you'll find a drop-in insert. The insert has openings that form "holders" for your hardware. Even though each insert is identical in size, you can create a number of different configurations simply by changing the size of the openings. (Refer to page 10 to see the different options.)

If you need to change the arrangement in the future, it's simple. Just lift out the insert and move it to a different drawer. Plus, you can modify an existing insert or make a completely new one to suit your needs.

Case – As you can see in Figure 1, the case is just a box made from 1/2" plywood. Because the sides require the most work, it's tempting to start cutting them to size right away, but that's not what I did.

The reason? The sides have matching dadoes for accepting the top and bottom as well as a series of kerf-wide dadoes that accept the runners from the drawers. To make sure all these dadoes and kerfs line up later, it's better to start with an oversized piece, as in Figure 2.

Kerfs – The kerf my saw cuts is sized perfectly for the 1/8" hardboard drawer runners. This makes for a great fit if you're gluing them into the sides of the drawers.

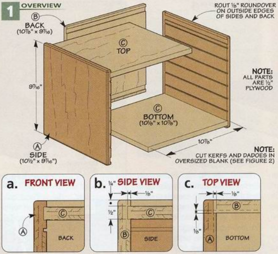
But for the runners to slide smoothly in and out of the case, the kerfs in the sides need to be just a "hair" wider. Adjusting the position of the saw blade slightly to widen each kerf would have been a hassle. So instead, I turned my standard saw blade into a "wobble" blade. For more on this, see the box below.

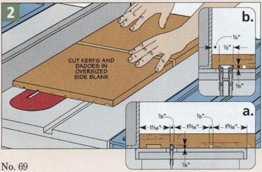
Cut Dadoes – After cutting all the kerfs, switch to your dado blade and size it to match the thickness of your plywood. Then cut a set of dadoes at the top and bottom of the *sides (A)* and *back (B)* to accept the *top* and *bottom (C)* of the case, as illustrated in Figures 1a and 1b.

After completing the joinery, you can cut the sides to final size and be assured that the dadoes and kerfs are perfectly aligned. And before assembling the case, you'll also need to cut rabbets along the back edge of each side to accept the back. You can see this in Figures 1 and 1c.

Assembly – All that's left to do now is to glue up each case. There's not much to worry about here. The joinery and the back help keep everything square.

While the cases dry, you're ready to move on to the next step — building the drawers.





"Wobble" Blade

▲ *To make a saw kerf just a "hair" wider, turn your standard saw blade into a "wobble" blade. The secret — a piece of masking tape near the top of the arbor flange. This will "tilt" the blade slightly, widening the kerf a tiny amount.*

Drawers

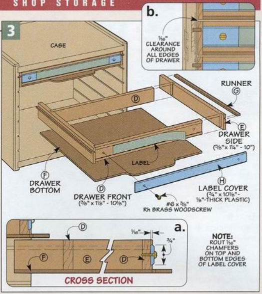
▲ *Drawers. Six "full-extension" drawers fill up each case. Hardboard runners support the drawers and built-in pulls makes it easy to slide the drawers in and out.*

For each storage case you'll need to build six drawers, like the ones shown at left. But don't worry, building that many drawers isn't a problem. Just like the cases, all of the drawers are identical. This way, you can mass-produce all of the parts. And simple joinery holds the drawer parts together — rabbets, dadoes, and grooves.

Front, Back, & Sides – I started on the drawers by planing to final thickness ($^3/_8$") enough stock to make the *drawer fronts/backs (D)* and *sides (E)*. The next step is to cut the pieces to final length and width.

To size the drawer parts accurately, you'll need to allow $^1/_{16}$" clearance around each drawer. For the length of the drawer sides, all you have to do is measure the depth of the case. And finally, for the length of the drawer fronts and backs, you'll need to allow for the joinery used to assemble the drawer, as in Figure 4.

For the width, it's important to note that the bottom of the drawer fits into a rabbet cut along the inside edge of each side. This means that the front and back of the drawer rest *on* the $^1/_8$" hardboard drawer bottom. So the front and back are $^1/_8$" *narrower* than the sides (Figure 3).

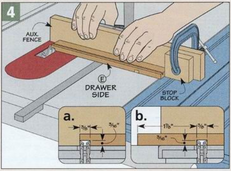


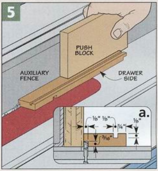
Joinery – Once all the drawer parts are sized, you're ready to complete the joinery. This is really straightforward. The front fits into a rabbet (Figure 4a) and the back fits into a dado, as shown in Figure 4b.

One thing to note is that the *back* is positioned a bit forward of the back edge of the drawer (Figures 3 and 3a). This effectively creates "full-extension" drawers, like you see in the margin photo. Now you can easily reach the entire contents of the drawer without having to pull it out of the case.

To ensure the rabbets and dadoes were located identically in each piece, I used a stop block clamped to an auxiliary fence (Figure 4). The fence also prevents chipout along the back edge of each piece.

Then to accept the drawer bottom that's added later, a rabbet is cut along the bottom edge of the sides. The





rabbet just matches the thickness of the hardboard (Figures 5 and 5a). Also, the *outside* face of each side has a kerf cut near the top edge to accept the runners that support the drawer.

One last thing. To provide a recess for the plastic that covers the label at the front of each drawer, you'll need to cut a shallow ($^1/_{16}$") groove in all the drawer fronts. You can see this in Figures 3 and 3a.

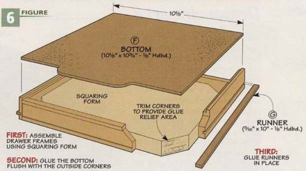
Assembly – When it came time to assemble the drawers, I didn't try to do everything at once. I found it worked best to follow a three-step process, as shown in Figure 6.

The first step is to assemble the drawer frames. To keep the frame square while the glue dried, I used a squaring form made from $^3/_4$" plywood, as in Figure 6.

Drawer Bottoms – Once you've glued up all the frames, you're ready for the second step — adding the bottoms. As I mentioned earlier, the bottom features a pull that's formed by shaping the front edge.

But before you do this, you'll need to size the $^1/_8$" *drawer bottoms (F).*

6 FIGURE



They fit between the rabbets cut in the sides, and they're $^3/_4$" longer than the sides to provide material for the built-in pulls shown in Figure 3.

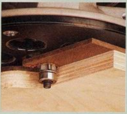
Since there are a number of bottoms to shape, I found it easiest to make a template for routing the pull. For more on this, see the box below.

Once all the pulls are routed, you can glue the bottoms flush with the outside corners of each drawer.

Runners – The last step is to add *runners (G)* and *label covers (H)* to each drawer. The runners are narrow strips of $^1/_8$" hardboard that are glued into the kerfs you cut in the sides of the drawers. After cutting the runners to size, I squeezed a little glue into each kerf and simply pressed the runners in place.

Finally, $^1/_8$"-thick plastic label covers are cut to fit the grooves in the drawer fronts. After routing a chamfer along the top and bottom edges, the covers are screwed in place, as detailed in Figure 3.

Template Routing



The next time you have to make a number of identical parts with curved areas, you can speed up the entire process by using a template, a flush-trim bit, and a hand-held router.

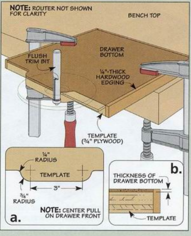
That's what I did when it came time to make the drawer bottoms with the "built-in" pulls.

Template – I started by making a template from a piece of $^3/_4$" plywood that's sized to match the overall length and width of the drawer bottom (Figure 6 above).

After cutting and sanding a pull on the front (detail 'a'), I added edging to the sides and back to trap the drawer bottom in place, like you see in the drawing at right. The edging extends above the top of the template and matches the thickness of the drawer bottom (detail 'b').

With the template complete, all that's left to do is cut all the drawer bottoms to final width and length, and then rout the pull. To provide clearance for the router, I clamped the entire assembly to the corner of my workbench so it extended over the edge (see drawing).

With a bottom in place, creating the pull is just a matter of routing across the template from left to right, as you can see in the photo above.



Drawer Inserts

Although you could use the drawers (and cases) as is, they wouldn't be ideal for storing small parts. Like in my coffee can, everything would mix together. To make them more useful, I added a drop-in insert to each drawer. The insert has cutouts in it that form pockets.

To maximize the depth of the pockets, I made the insert from two layers of material — a bottom layer of $^3/_4$" MDF and a top layer of $^1/_4$" hardboard. This is a great way to use up any scraps you've been saving and it makes the inserts inexpensive.

As you can see in the photos below, you can customize the inserts any way you want by changing the size and shape of the cutouts. Another option is to use purchased containers. For more on this, check out the box on the opposite page.

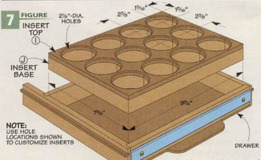
Inserts – Each insert consists of a *top (I)* and *base (J)* glued together. Considering the number of inserts that are required, it's faster to make the inserts by starting with an extra-wide blank, that's also extra long, as shown in Figure 8.

The extra width and length allows you to glue up a set of blanks without worrying about having to keep all the edges aligned. Cutting the blank to final width is just a matter of first trimming one edge (Figure 8) and then flipping the blank around to trim the opposite edge (Figure 8a).

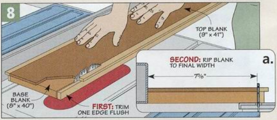
At this point, cutting the inserts to final length is just a matter of "slicing" them off the long blank, as you can see in the Figure 9. To prevent the blank from shifting as you make the cuts, it's a good idea to attach an auxiliary fence to your miter gauge. And a stop block attached to the rip fence ensures each insert is cut to the same length.

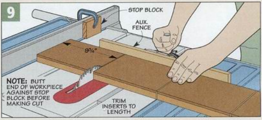
Customize – With the inserts sized, the next step is to customize each one to suit your storage needs. Regardless of the patterns you need, the process for making them is identical. You lay out the centers for each hole as shown in Figure 7, and then drill them out.

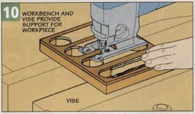
After laying out the holes, I started drilling them out with a hole saw. But after just a few holes, the bit started

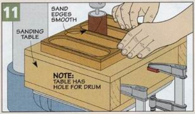


▲ *Insert Options. Although the overall size of each drawer insert is identical, you can create a wide variety of storage options by varying the openings in each insert.*









to dull and began smoking. After a short search, I ran across an inexpensive multi-spur bit that worked just great. For more information on this, refer to Sources on page 35.

Remove Waste – After drilling out the holes, the next step is to connect the holes by removing the waste with a jig saw. I used my workbench and opened the vise to provide solid support, like you see in Figure 10 above.

Cleaning up the cuts is just a matter of sanding. Because I had a lot of sanding to do, I used my drum sander in the drill press, like you see in Figure 11. A shop-made table allows you to "bury" the sanding drum in the top of the table.

Once you've sanded all the inside edges smooth, take a little time to ease the top edges of the cutouts by sanding a small roundover.

CLEATS

If you plan on stacking the storage cases in your shop, it's a good idea to add a set of cleats to "lock" the cases together. You can see how this works in Figures 12 and 12a below.

The system consists of a pair of 1/2"-thick hardwood *top cleats (K)* that are screwed to the lower case. The cleat at the front fills in the gap between the cases and prevents side-to-side movement.

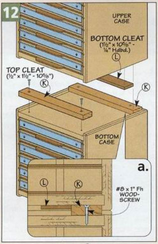
To prevent front-to-back movement, the other top cleat fits into a pocket that's formed by the back of the upper case and a 1/4" hardboard *bottom cleat (L)* attached to the bottom of the upper case (Figure 12a).

Once you have the cleats in place and the cases stacked in your shop, you can spend an afternoon getting all those small pieces of hardware organized once and for all.

Materials

A	Sides (2)	10 1/2 x 9 7/16 - 1/2 Ply.
B	Back (1)	10 7/8 x 9 7/16 - 1/2 Ply.
C	Top/Bottom (2)	10 1/8 x 10 7/8 - 1/2 Ply.
D	Drawer Frts./Backs (12)	3/8 x 1 1/8 - 10 1/8
E	Drawer Sides (12)	3/8 x 1 1/4 - 10
F	Drawer Bottoms (6)	10 1/8 x 10 3/4 - 1/8 Hdbd.
G	Runners (12)	5/16 x 10 - 1/8 Hdbd.
H	Label Covers (6)	3/4 x 10 1/8 - 1/8 Plastic
I	Insert Tops (6)	7 3/8 x 9 3/4 - 1/4 Hdbd.
J	Insert Bases (6)	7 3/8 x 9 3/4 - 3/4 MDF
K	Top Cleats (6)	1/2 x 1 1/2 - 10 5/8
L	Bottom Cleats (3)	1 1/2 x 10 5/8 - 1/4 Hdbd.

Except for the cleats, the materials shown are for one case and a set of six drawers and inserts.

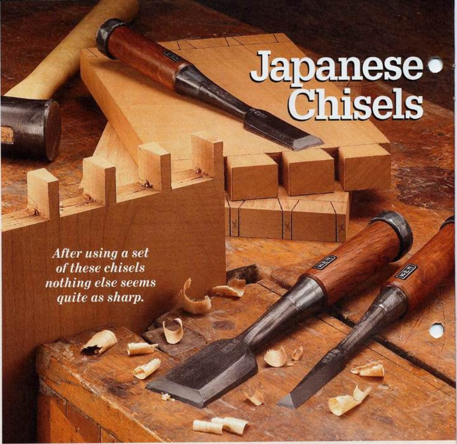


Watchmaker's Cases

Another option for storing hardware is to use a set of watchmaker's cases, like the ones from *Lee Valley* shown above.

These glass-topped aluminum containers are perfect for organizing all kinds of small parts. To keep them in place inside the drawer, I used a single layer of 1/4" hardboard and drilled a set of 12 holes using the layout shown in Figure 7. For sources, see page 35.

Japanese Chisels



After using a set of these chisels nothing else seems quite as sharp.

"Once you use one, nothing else will seem sharp." That's what a woodworking friend told me about Japanese chisels a few years ago. It sounded like a pretty bold statement. And while I'd heard that Japanese chisels are supposed to be sharper than anything you've ever used, I've always considered my "western" chisels to be just fine.

But you know what? My friend was right. I used one of his chisels and was impressed. Since then, I bought a few and learned a lot about what makes them so sharp.

Reading about Japanese chisels in a tool catalog can be a little intimidating. The descriptions use a lot of Japanese words and strange terms like "white steel" and "twisted shank construction," so it can be pretty confusing. But just like buying any other new tool, you'll need to wade through a little hype and some mystique to get at the real facts.

Hard Steel – What makes Japanese chisels so sharp and makes them stay sharp longer is the type of steel used in the cutting edge. Now there are a several ways to forge tool steel. And there are advantages and disadvantages to each. On one hand, you can make steel that is soft enough to sharpen quickly and is not easily chipped or cracked. The tradeoff is that it dulls quickly. This is the type of steel commonly used in western-style chisels.

Japanese toolmakers forge steel in a totally different way. This steel is much harder and holds an edge for a long time. But here's the tradeoff — this steel is more brittle and the extra hardness means it will take longer to sharpen.

But this doesn't mean that Japanese chisels will crack at the first mallet blow or take all day to sharpen. In fact there's a myth that says Japanese chisels can't be struck and are only good for soft woods.

The truth is that, used properly, they can do any job you ask them too.

That's because they're not made entirely of hard, brittle steel. If you look at the bevel of a Japanese chisel, you can see that there are two layers of metal. A thick, top layer of softer iron or steel is "forge-welded" to a thin, bottom layer of hard steel. This helps back up the steel to keep the blade from chipping or cracking.

Choices – When you read the catalogs, you'll see that some chisels are made of "white steel" and others are made of "blue steel." These are simply designations of different types of hard steel. The names actually come from the color of paper the steel is wrapped in at the foundry. But what makes this confusing is that you can't tell the difference between the two by looking at them.

White steel is just a high-carbon steel. It's a little more difficult for blacksmiths to work because the temperature range that it's tempered at is very narrow. This means that it takes more time and a lot of skill to work with this steel. Some woodworkers will tell you that white steel can get sharper than blue steel but it breaks down quicker.

Blue steel on the other hand, is a high-carbon steel with a couple of extra ingredients — mostly chromium and tungsten. These additions give blue steel a wider temperature range for tempering. But it also makes tougher steel, which is more suited to working with abrasive woods like teak. But sharpening takes longer than white steel.

Having just a thin layer of hard steel means that there isn't a lot of difficult material to remove when sharpening the bevel. And the hard steel is only on the cutting edge — right where you need it.

The other half of sharpening is flattening the back. Here too, chisel makers have made things easier. If you flip a chisel over, you can see why — the back of the chisel has been hollowed out, reducing the amount of steel to remove, as in the photo above right.

You may notice that some wider chisels have a single hollow in the back while others have two or three. Having more than one hollow doesn't really affect the strength of the chisel. Some woodworkers say it comes in handy when you're using a wider chisel on a narrow workpiece. The ribs help keep the chisel flat.

Length – Another thing you'll notice about Japanese chisels is their shape. The blades are often a lot shorter than the chisels you have in your toolbox. The reason for this difference is greater control when striking the chisel. Think of it like writing with a pen. When you're writing, you hold your pen close to the point where you have more control than if you were to grab it by the end.

The chisel handles are traditionally made of wood. There are four Japanese hardwoods commonly used in the handles: boxwood, white oak, red oak, and sandalwood, as in the margin photo below.

Style – Beyond their general shape, you can choose from a variety of chisel styles, as in the photo at left. The most common are *bench* chisels (also called cabinetmakers' chisels), which have flat-topped blades.

Dovetail chisels are similar in size to bench chisels. But the shape of the blade is what makes them unique. The top of the chisel comes to a point, like a pyramid. As the name implies, they're designed for cutting and fitting dovetails. The sloped edges can get into tight places that other chisels can't get to.

Mortise chisels are a third type. These beefy chisels look a lot like western mortise chisels with flat sides and long blades.

A final type is the *paring* chisel. Unlike the others, this type is made for pushing only. The blades and the handles are much longer for more control while pushing. They're used for trimming large mortises and tenons.

◄ *Hollowed-Out Back. Some chisels have only one hollow, while others have two or more. The hollows make it easier to flatten the back.*

▲ *Types of Chisels. Japanese chisels come in a variety of styles depending on their use. Bench chisels (bottom) are designed for everyday work. Long-handled paring chisels (top) are designed for pushing only.*

▲ *Handle Choices. These are the most common hardwood handles found in Japanese chisels.*

Twisted or Spiral Shank. ► Some tool makers claim that twisting the shank during forging increases its strength and rigidity.

▲ "Suminagashi" (Ink Pattern). Repeated folding of soft iron and nickel creates a decorative pattern in these more expensive chisels.

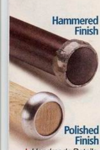
Buying Chisels

When it comes to choosing and buying a Japanese chisel, you might be surprised by the range in prices. Some cost about $14 and others can cost $200 or more. What makes Japanese chisels stand apart from western tools is that top-quality chisels are handmade.

We've been conditioned to think that the best quality, expensive tools have a uniform, highly polished, and "machined" look to them. But this isn't the case with Japanese tools. What this means is that the best chisels may not look as "shiny" as we're accustomed to seeing in western-style tools.

The best way to find out how much handwork has gone into a chisel is to talk with a reputable Japanese tool dealer. But there are a few other things you can look for.

Handmade Details – One of the easiest things to spot is the hoop and ferrule. Handmade chisels usually have handmade hoops and ferrules that have a "hammered" look. In fact, you may even be able to see the seam in the metal where it was welded together, as in the photo at left. Inexpensive chisels tend to have machine-made hoops and ferrules. Mid-range chisels may combine machinework and handwork.



▲ Handmade Details. The hand-hammered hoop on the top chisel, increases the cost of the tool.

Japanese chisel makers typically show off their artistic and metal-working abilities in the upper iron layer. On more expensive chisels, the surface of the metal may have a "Suminagashi" (ink pattern) or "Mokume" (wood grain). Both of these effects are the result of folding and hammering out the iron dozens of times. In the Suminagashi, nickel or another steel is folded in with the iron. Many times, when the chisel is finished, the iron is ground and then etched with acid so that the edges of the iron layers stand out.

Now some tool dealers will tell you that the folding makes the chisel stronger and more rigid, like a glue-laminated wood beam is more rigid than solid wood. And others don't think it affects the strength of the tool much at all. At any rate, it does make a great-looking chisel.

For some chisels, high-quality iron from old ship anchors, chains, and ironwork from temples (which may be 300 years old or more) is recycled into chisel iron, which also adds to the cost.

Another detail you may see in the chisel iron is a spiral or twisted shank. You can see in the inset photo above how the folds bunch together and spiral around the shank where it meets the handle. Like the Mokume, you'll get different opinions on whether there is any practical benefit to the twisting. If there is any added strength, it isn't noticeable to most woodworkers.

A less noticeable detail is the line where the soft iron and hard steel meet in the blade. Inexpensive chisels will have a pretty straight and flat line. If you look at the bevel of the handmade chisels above left, you'll see that the line between the two isn't very straight.

Reputation – Another factor that can affect the cost of the chisel is the reputation of the blacksmith who made it. Chisel makers go through a long apprenticeship before they can start making tools on their own. Who they studied under and how long they have been making chisels will add to their reputation as well. Chisel makers and some handle makers stamp their "signature" on the blade or handle to show who made it, as you can see in the photos on the opposite page.

This doesn't mean that all chisels by a particular craftsman cost a lot. They'll often produce chisels at several levels of quality to meet the needs and budgets of customers.

For top-quality chisel sets, the blacksmith will spend more time tempering the steel and will display more artistry in the iron to create a good-looking, high-priced tool. For other sets he may not spend as much time and the chisel won't have the same artistry, but it will still be an excellent tool at a more modest price. It's best to talk with a tool dealer to find out about a toolmaker's reputation and technique before buying a chisel.

Choosing a Chisel – If you've decided to take the plunge and get a Japanese chisel, how do you decide which one you should buy? The best way to answer that question is to ask yourself a couple of questions.

First, what types of projects do you build? If you're cutting a lot of dovetails, then your first chisel might be a dovetail chisel.

On the other hand if you're mostly using your chisels for fitting joints and cleaning up mortises, then you should consider a bench chisel.

Once you've decided on a style, the next question to ask is 'What size are you using most?' Since a full set of Japanese chisels can be a significant investment, the best way to start is to get one chisel in a size you use frequently. This way you'll get a chance to use it regularly to see if it's something that's going to work in your shop. I chose a 1"-wide chisel.

When it comes to picking a type of steel, I talked with some Japanese tool dealers as well as a few other woodworkers who use Japanese chisels regularly. I was told there really isn't much of a difference between white steel and blue steel. Both will give you a sharp edge that will last much longer than the chisels you're already using.

Bringing it Home – After I bought my first chisel, I was surprised to see that it looked a little unfinished. Depending on how much work the dealer does, there might be a few things you'll need to do before you can use your chisel.

The most important thing you'll need to do is hone the edge. In Japan, the chisels aren't sharpened at all. The reason for this is that most woodworkers prefer to sharpen their tools themselves to fit their own style of work. Thankfully, most of the Japanese chisels sold in the U.S. will come fairly sharp, so your chisel will only need light honing. Just like your other chisels, the first step is to make sure the back is flat. I do this using waterstones, as shown in the left photo below.

Honing the bevel is a little trickier. The top and back of the blade aren't parallel, and the blades are so short that most sharpening guides won't work. So I just sharpen by hand. And it really doesn't take that much to master this process.

Start by placing the heel of the chisel on the stone, then slowly tilt it forward until you feel the tip touch the stone. Then push the chisel forward one stroke, as in the middle photo below. Now lift the chisel off the stone and bring it back for another stroke on the waterstone.

Setting the Hoop – The other thing you may have to do is set the hoop on the handle. When you receive a Japanese chisel, the hoop may be lightly pressed on the handle or it might even be loose in the box.

To set the hoop, the first thing to do is compress the end of the handle with a hammer and slide the hoop on. The hoop should sit down on the handle about $\frac{1}{8}$".

Then the top of the handle is "mushroomed" over to hold the hoop in place. I've found the best way to do this is to soak the end of the handle in tung oil or water a few mintutes to soften the wood fibers. Next I set the chisel across the grain on a hardwood scrap and lightly rounded over the top with a mallet or hammer, as you can see in the upper photos at right.

Care – Rust is the enemy of steel tools, whether they're Japanese chisels or your western chisels. But with Japanese chisels it's a little easier for rust to get a foothold on the softer iron. To prevent this, just wipe a little light oil on your chisels after every use. The traditional rust preventer is camelia oil. A bottle comes with a soft brush, which makes it easy to wipe on a thin coat, as shown in the photo below.

Now you're not going to find Japanese chisels at your local hardware store. In fact, there are only a few dealers across the country. We've included a few of them in the margin. If you give them a call, they'll provide you with more information and answer any questions.

Setting the Hoop. After fitting the hoop on the handle, soak it in tung oil or water. Then set the chisel on a piece of scrap and lightly "mushroom" the top with a hammer.

Sources

- **Japan Woodworker:** japanwoodworker.com 800-537-7820
- **Tools for Working Wood:** toolsforworkingwood.com 800-426-4613
- **Hiraide America:** japanesetools.com 877-692-3624

▲ **Flatten the Back.** *Lap the back of the chisel on waterstones to make sure the back is flat.*

▲ **Honing the Bevel.** *Most Japanese chisels won't fit in a jig, so you'll have to hone the bevel by hand.*

Protecting the Tool. Wiping on a thin coat of camelia oil after every use can prevent rust from forming on your chisels.

Router Table
Fence & Accessories

Adjustable Stop Block

Auxiliary Jointing Face

Rock-solid, straight, and loaded with accessories, this fence is a must-have upgrade for any router table.

A couple months back we were discussing an upcoming project that involved router table fence accessories. A few of the guys mentioned that before adding any accessories, we ought to spend time building a better fence.

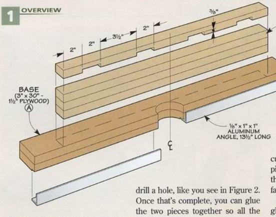
Why? Because most fences have problems. They never seem to stay straight. If they have sliding faces, they're often misaligned, preventing a workpiece from sliding smoothly along the fence. And finally, accessories are difficult to attach or adjust.

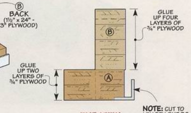
The fence shown above solves these problems. To keep the fence straight, the body is made from multiple layers of Baltic birch plywood. Plus, the faces stay in perfect alignment. That's because they're guided by aluminum angle attached to the bottom of the fence. And here's the best part — you can mount this fence to any router table with nothing more than a pair of clamps.

Accessories – Finally, the T-track installed in each sliding face makes mounting and adjusting accessories a snap, see insets above. The bit guard, stop blocks, featherboards, and jointing face shown on pages 20 and 21 are sure to see a lot of use since they mount quickly and easily.

Fence – Unlike a typical fence where a horizontal base is joined to a vertical face, this fence is made entirely of plywood strips that form a heavy, solid beam, as you can see in Figure 1. A pair of strips with a circular opening for the router bit forms the base. And a smaller set of four strips forms the back.

1 OVERVIEW





END VIEW

Base – I started by cutting the two strips of $^{3}/_{4}$" Baltic birch plywood for the *base (A)*. Before gluing them together, I made a circular cutout to provide clearance when using large-diameter router bits.

An easy way to do this is to clamp the two pieces edge to edge and then drill a hole, like you see in Figure 2. Once that's complete, you can glue the two pieces together so all the edges are flush.

Back – Like the base, the *back (B)* is made from $^{3}/_{4}$" Baltic birch plywood. But the four pieces are a little shorter and narrower, as illustrated in Figure 1.

Before gluing the strips together, there's one thing to do. And that's to cut a set of four notches in the top piece. These notches form slots for the fasteners that hold the fence faces in place.

Assemble Fence – Once the glue dries on the base and back, you're ready to stack them together to form the body of the fence, as in Figure 1. Just be sure to check that the front faces are flush and flat. Spend some time sanding them smooth if necessary, both before and after gluing them together.

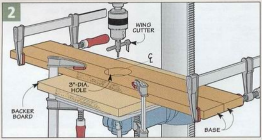
The next step is to prepare the body to accept the sliding faces of the fence. To do this, you'll need to cut a couple rabbets along the bottom front edge of the fence, as illustrated in Figure 3.

So you don't have to worry about the fence faces binding due to changes in humidity, the first cut provides clearance near the bottom of the sliding faces. To make this cut, I "buried" the blade in an auxiliary fence and made a wide, shallow cut, as in Figures 3 and 3a.

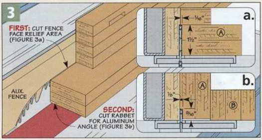
The second cut is for the aluminum angle that keeps the fence faces aligned as they slide back and forth (Figure 3b). This rabbet is sized to position the vertical leg of the angle in front of the base of the fence. You can see this clearly in the End View in Figure 1.

Finally, cut two pieces of aluminum angle to length. They end up flush with the ends of the fence and inside edges of the bit hole. Don't screw them in place just yet. They need to be off for the next step — adding the dust collection port.

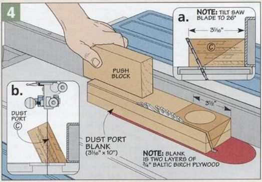
2



3



Dust Port



I can't think of a single routing operation that doesn't generate a lot of dust and chips. So I added a dust port to the fence, as shown in the photo above.

The port allows you to hook up your dust collection system or shop vacuum to the fence and remove almost all of the dust and chips generated when routing a workpiece.

Extra-Long Blank – As you can see, the dust port isn't all that complex. But it is small and odd-shaped. This makes it a challenge to safely cut it to size and shape.

To do this, I started with an extra-long blank, as illustrated in Figure 4. After gluing up a couple layers of plywood to form the blank, I trimmed it to finished width ($3^1/_{16}$"). Then you can tilt the saw blade 26° and cut a bevel along one edge, as in Figure 4a. This establishes the base of the dust port. The next step is to make a second cut at a right angle to the base to form a wedge-shaped blank. In Figure 4b, you can see how I did this using the band saw.

Cut Port to Length – All that's left at this point is to cut a $3^1/_2$"-long piece from the blank to form the *dust port (C)*. With the dust port complete, you can glue it to the back side of the fence body.

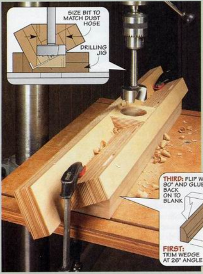
Dust Port Hole – To form a path for the dust and chips, you'll need to drill a hole through the dust port *and* the back of the fence. This will connect to the opening that already exists in the base for the router bit.

The problem is drilling a hole that's perpendicular to the face of the dust port. I tilted the drill press table, but there wasn't enough clearance between the drill bit and the column of the drill press to reach the dust port.

To solve this problem, I made a drilling jig like the one shown in the box at left. The jig holds the workpiece at the correct angle, making it easy to drill the hole.

Now you're ready to make the sliding faces for the fence.

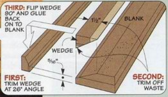
Drilling Jig



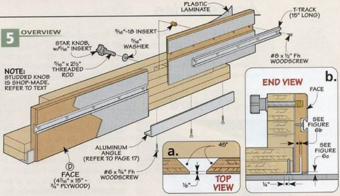
Drilling an angled hole can be a challenge, especially when the workpiece is large. But you can easily handle the task with a shop-made jig, like the one in the photo.

The Jig – The jig starts out as two layers of $^3/_4$" MDF (see detail below). The next step is to cut a 26° bevel along one edge (to match the angle of the dust port). By trimming the waste as shown below and gluing it back on the blank, you can form a cradle for the workpiece.

To drill the dust port hole, clamp the fence and jig in place, then drill the hole (upper detail).



Sliding Faces



The key to this router table fence is the pair of sliding faces shown above. They stay perfectly straight and aligned — all the time.

Faces – Each face looks identical, but they are mirror images, as shown in Figure 5. I used $^3/_4$" Baltic birch as the body of each *face (D)* because it's very stable. But I added a layer of plastic laminate to *both* sides of the face, like you see in Figure 5.

The laminate serves two purposes. On the front side it provides a smooth, durable surface. Adding a second layer to the back side ensures that the faces stay flat and stable.

To provide clearance for the router bit, I beveled the inside edge of each face (Figure 5a). While I was at it, I eased the top and outside edges, like you see in Figures 5 and 5b.

T-Track – To mount the accessories that start on page 20, I added a piece of T-track to each face. The T-track rests in a groove near the top of each face (Figure 6a). I used a dado blade and snuck up on the fit until the T-track just slipped into place.

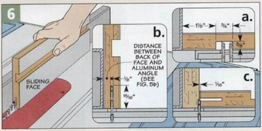
Mount Faces – At this point, you're ready to mount the faces to the fence. Keeping the faces aligned is the job of the aluminum angle. So the first step is to attach the pieces to the fence, as Figure 5b shows.

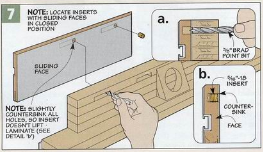
To allow the faces to fit over the aluminum angle and be flush with the back of the fence, you'll need to cut a kerf along the bottom edge of each face, as in Figures 6 and 6b.

Then to provide a $^1/_{16}$" gap for dust relief along the bottom edge, I trimmed a bit off the inside leg of each face, as illustrated in Figure 6c.

Finally, to lock each face in place, I used a pair of washers, studded knobs, and threaded inserts, like you see in Figure 7. A brad point bit makes quick work of locating the inserts (Figures 7 and 7a).

But I did have trouble finding a knob with a long enough stud, so I made my own. All you need to do is glue a piece of threaded rod ($2^1/_2$" long) into a knob with a blind insert (see page 35 for sources).



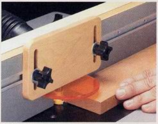


Accessories

A great fence makes routing easy. But for even more versatility, you might want to consider adding one or more of the accessories shown below and on the opposite page.

A bit guard, adjustable stop block, and featherboard will make your routing safer and more accurate. Finally, you can also use your router (and table) for jointing the edges of a workpiece. To do this, all you need to do is make an auxiliary jointing face, like you see at the bottom of the opposite page. Straight edges are simply a couple passes away.

1. Bit Guard

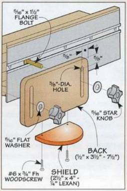


For safety, you should use a bit guard during any routing operation. The one shown above is designed to attach to the T-track installed in the faces of the fence. As you can see in the drawing at right, the guard is made of two pieces: a $1/2$"-thick hardwood *back*, and a plastic *shield*.

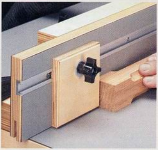
Back – To make the guard, start by cutting the back to size. Then to allow you to adjust the height of the guard to suit the thickness of the workpiece, you'll need to cut two $3/8$"-wide slots near each end of the back.

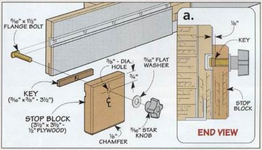
Shield – The shield is cut from piece of $1/4$"-thick *Lexan*. (*Lexan* is a better choice than *Plexiglas* since it's shatter-resistant.) After screwing the shield to the back, the guard is attached to the fence using flange bolts, washers, and knobs.

If you'd like to buy the *Lexan* or a ready-made guard (see page 16), refer to Sources on page 35.



2. Adjustable Stop Block



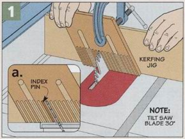


Another handy accessory for a router table fence is a stop block, like the one shown in the photo above. A stop block allows you to accurately repeat the starting and stopping points of a cut.

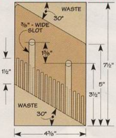
In the drawing above, you can see that the stop block starts out as a square of $1/2$" plywood. To prevent the stop block from pivoting as it's locked in place, I added a hardwood key. The key is sized to fit the opening in the T-track (detail 'a'). So you'll need to cut a groove in back of the stop block to position the block so it's flush with the bottom of the sliding face, as shown in detail 'a.'

Once the key is glued in place, all that's left to do is drill a hole through the face of the block and the key. The hole accepts a flange bolt so you can slide the stop block anywhere along the fence and then lock it firmly in place with a washer and knob.

3. Featherboard



FEATHERBOARD BLANK



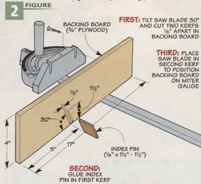
A featherboard is an important accessory for holding a workpiece firmly against the router table (see photo above). Plus, it helps prevent a workpiece from kicking back.

The featherboard starts out as a piece of $^1/_2$"-thick hardwood that's cut to the width shown in the drawing at the upper right. And the ends are crosscut at a 30° angle.

Kerfing Jig – The key to cutting the equally spaced fingers is to use an indexing jig (Figure 2). The jig has two saw kerfs that are spaced $^1/_8$" apart. One kerf has a hardwood index pin glued in it. And the other kerf lines up with the saw blade Note: Tilt saw blade to 30°.

To cut the first kerf, clamp the workpiece to the backing board so it's tight against the pin. Then make the first pass. After the first kerf is cut, unclamp the workpiece and shift it over onto the index pin. Then reclamp the workpiece and make another pass. Repeat this process to complete all the fingers (Figure 1).

Once you've completed cutting all the kerfs, all that's left to do is cut a pair of slots for mounting the featherboard to the fence, as shown in the drawing at the upper right.



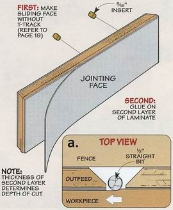
4. Auxiliary Jointing Face

Routers aren't typically associated with jointing the edge of a workpiece. But with an auxiliary jointing face and a $^1/_2$" straight bit, you can turn your router table (and fence) into a precision edge jointer (photo above).

The problem is the router table fence is one solid, straight face. The way a jointer works, the infeed and outfeed tables aren't aligned — they're offset from each other.

So how do you go about creating an "offset" on a straight fence? Simple. Glue a second layer of laminate to the "outfeed" face, like you see in the drawing at right. (I made a second face without a T-track and then added the laminate.) Adding the second layer of laminate creates an offset of about $^1/_{32}$" — perfect for jointing small workpieces.

Jointing the edge of a workpiece is just a matter of positioning the router table fence so the jointing face is aligned with the cutting edge of the bit, as in detail 'a.'



Scroll-
Bending Jig

At first glance, this jig looks like some kind of board game. You know, the one where you jump pegs and try to end up with a single peg in the middle hole. But in reality, this is a metal bending jig.

Why metal? – The answer is simple. As great as wood is for building furniture and shop projects, sometimes you need the extra strength of metal. And other times, it's just nice to incorporate metal into a project to give it a different look.

This jig allows you to bend metal rods and bars into curves by hand. With it, you can make your own hardware items such as shelf brackets, hooks, and handles. (There are some examples of the things you can make on page 24.)

The principle behind the jig is pretty simple. A number of holes are drilled in the base of the jig to hold steel pins. These pins serve as fulcrum points for bending the metal. You can bend the metal using a pair of pins, as you see in the main photo on the opposite page. Or you can bend it around a wood wheel using a single pin as a fulcrum point, as shown in the inset photo.

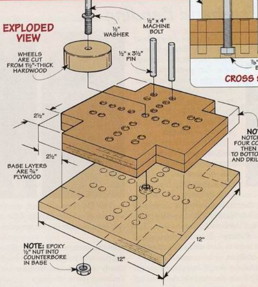
Base – To build the jig, start by cutting three identical pieces of $^3/_4$" plywood for the layers of the base. After gluing the two top layers together, you can cut a notch in each corner, as shown in the Exploded View. Once this is done, the bottom layer can be glued to the other two layers.

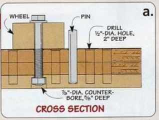
Holes – With all three layers glued together, you can begin laying out and drilling the holes. Start by drilling a counterbored hole in the center of the base. This is for a machine bolt that will be used to attach the wood wheels. A nut is then epoxied into the counterbore to hold the bolt, as shown in detail 'a' of the exploded view.

Next, lay out the four rows of holes for the steel pins and the four pairs of holes in the corners of the jig according to the dimensions shown in Figure 1 below.

You'll notice that each row of holes starts at a slightly different distance from the center hole. And the space between each pair of holes in the corners is also different. This allows you to bend various thicknesses of metal. Once you have all the holes laid out, go ahead and drill them. Then chamfer the edges with a countersink bit.

Wheels – In order to bend both small and large radius curves, I made up six different wheels, ranging from 1" to 5" in diameter, see photo below. Each wheel is cut from $1^1/_2$"-thick hardwood and has a $^1/_2$"-dia. hole drilled through the center.



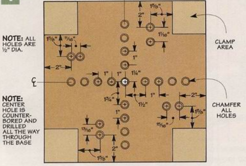


Steel Pins – The only thing left to complete the jig is to add a couple of pins. I cut these from a length of $^1/_2$"-dia. steel rod (detail 'a' above).

The pins fit rather tightly in the holes. To make it easier to insert and remove them, I chucked them up in the drill press and sanded them with emery cloth. Then I ground a slight chamfer on the ends of each pin.

▲ *Nylon Bushings. For diameters smaller than 1", you can use nylon bushings in place of the wood wheels.*

1 FIGURE



HOLE LOCATIONS

▲ *Wood Forming Wheels. Six wheels with different diameters (1", 1½", 2", 3", 4", and 5") allow you to bend both small and large radius curves.*

Freehand Bending

▲ *Pins. To create freehand bends, the metal is bent between a pair of steel pins.*

One of the nice things about this scroll-bending jig is that it can be used in two different ways. For gentle, sweeping bends and curves that have a changing radius, the jig is used in a "freehand" fashion. The metal is simply bent by hand between a pair of steel pins, as you see at left.

The scroll-work shelf brackets you see in the photos at right were all created by freehand bending. This isn't a difficult process, but it isn't entirely automatic either. It takes an eye for curves and a little bit of practice to get the right "feel" for bending the metal.

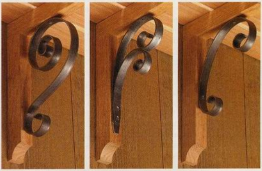
Pattern – To make things easier, it helps to start with a pattern of the scroll you wish to create. I just draw a full-size design on a piece of paper. This way you can hold the metal up to the pattern to check your progress as you are bending it. And if you're making multiple pieces, the pattern will help you keep them looking identical.

Setup – To set up the bending jig, begin by clamping the jig securely to the top of your workbench. Then insert the two steel pins into one of the pairs of holes near the corners of the jig. (Use the pair with the spacing that most closely matches the thickness of the metal you're bending.)

After determining the length of your stock and cutting it to size (see box below), insert the end of the metal between the two pins as shown in Figure 2a. Now you're ready to start bending. But don't try to bend the curve in one fell swoop. Instead, slowly create the curve by making a series of small bends, working your way along the length of the piece.

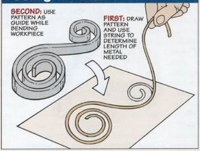
This allows you to fine-tune the shape of the curve to match your pattern. It's also important to start at the innermost part of the curve and work your way out, as shown in Figures 1b and 1c. (It helps to compare your work to the pattern as you go along.)

One other thing. As you're doing the bending, make sure that you keep the edge of the metal flat against the base of the jig. If you don't, you're likely to end up with a piece that looks more like a bedspring than a nicely-shaped scroll.

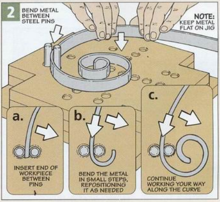


▲ *Shelf Brackets. All three shelf brackets shown above were created with the scroll-bending jig. After the metal was bent, holes were drilled and the brackets were screwed in place.*

Using a Pattern



▲ *Pattern. Drawing out a pattern will give you a guide as you are bending the metal. It can also be used to determine how long of a piece of metal you'll need.*



Form Bending

The freehand bending method works great for flowing curves. But if you want to create more controlled bends, it's easier to bend the metal around a wood form. That's where the wheels come in. They're used when you want to create a curve with a consistent radius.

All you have to do is mount one of the wheels to the jig using the machine bolt and then just "wrap" the metal around it. This is the technique I used to create a couple of different types of hooks for hanging up items in the shop.

J-Hooks – There's not much to making a J-hook. You start by selecting one of the wood wheels based on the size of hook you want to make. After attaching the wheel to the base of the jig with the machine bolt, insert one of the steel pins into a hole near the edge of the wheel. As with the freehand bending, the distance between the pin and the wheel should match the thickness of the metal you're bending (as close as possible).

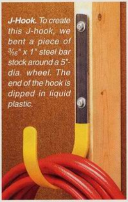
To make the bend, just slip the end of the metal in between the pin and the wheel. Then wrap the metal around the wheel, making sure to keep the edge flat against the base of the jig (Figure 3).

Wheel. To create perfect arcs, a wooden wheel is used as a bending form. The metal is held in place by a steel pin during the bending.

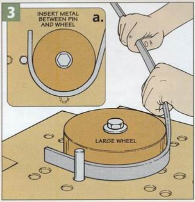
After you've made the bend, saw off the waste and file or grind the ends smooth. If you want, you can even dip the hook in liquid plastic to prevent it from marring items that hang on it, see photo at upper right.

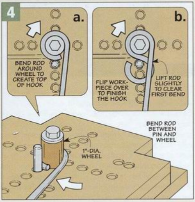
S-Hooks – Making an S-hook involves a couple of extra steps, but the technique is about the same. Using the 1"-dia. wheel (or nylon bushings, if you want a smaller hook), insert the end of the rod in between the pin and the wheel. Then bend the metal around until it forms a nearly complete circle (Figures 4 and 4a).

To bend the other half of the S-hook, you'll need to flip the rod over and place it back between the pin and the wheel, right where the first bend ends. Then simply wrap the metal around the wheel again to complete the S-shape. (You'll have to lift the rod slightly at the end in order to overlap the first bend, see Figure 4b.) Finally, use a hack saw to cut the hook free from the rod and file off any burrs on the ends of the hook.



J-Hook. To create this J-hook, we bent a piece of 3/16" x 1" steel bar stock around a 5"-dia. wheel. The end of the hook is dipped in liquid plastic.





▲ *S-Hooks. We bent this S-hook out of a piece of 3/16"-dia. steel rod.*

Bending Press

With just a few quick turns, this press can bend metal rods and bars into perfect, 90° angles.

In the past, whenever I needed to make an angled bend in a piece of metal, I would clamp the metal vertically between the jaws of a machinist's vise and whack it repeatedly with a hammer. Although this method works in a pinch, it's not the easiest (or most elegant) way to bend metal. So to "refine" the process, we came up with the bending press you see in the photo above.

Now the idea of a bending press isn't new. Factories have been using hydraulically-operated presses to bend metal for years. Essentially, the press squeezes the metal between two specially-formed jaws to create the desired bend. But the challenge here was to come up with a press for use in a home shop — one without the hydraulics. The answer actually turned out to be fairly simple. Instead of hydraulic pistons, we just used screwthreads. And for the jaws, we used angle iron and pipe.

The bending press uses a twin-screw mechanism to bend the metal. This slow, steady pressure gives you more control and accuracy.

Base – To build the bending press, you can start with the base. As you can see in the photo above, it's a piece of $^3/_4$" plywood that allows you

Hardware

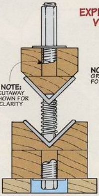
- (2) 5/8" x 9" Threaded Rod
- (2) 5/8" Nuts
- (4) 5/8" SAE Washers
- (2) 3/16" x 2" x 2" Angle Iron, 6" long
- (1) 3/4" x 6" Black Pipe
- (2) 7/8" x 3 1/4" Springs
- (2) 5/8" Coupling Nuts

to clamp the press to your workbench. After you've cut it to size, you can drill a couple of holes for the hardware that's added later (see the Exploded View drawing at right). Then set the base aside while you work on the jaws of the press.

Lower Jaw – Because there will be a lot of stress on the lower jaw, I made it out of a thick, hardwood blank. (Later, the jaw will be lined with a piece of angle iron.)

The blank is glued up out of two pieces of 1 1/2"-thick maple stock and then cut to size. Once this is done, the next step is to cut the V-groove as you see in Figures 1 and 1a.

Side Dadoes – After cutting the V-groove, I replaced my saw blade with a dado blade and cut a shallow (1/2"-deep) dado on each side of the jaw, as you see in Figure 1. The dadoes are for clearance when making reverse bends (see inset photo on opposite page).

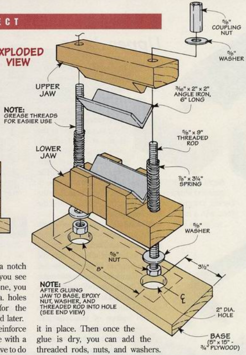


END VIEW

The next step is to cut a notch on each end of the jaw, as you see in Figure 2. Once this is done, you can drill a couple of 5/8"-dia. holes in the ends of the jaw for the threaded rods that are added later.

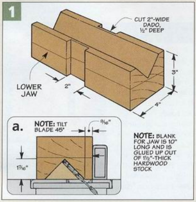
Angle Iron – Now to reinforce the jaw, I lined the V-groove with a piece of angle iron. All you have to do here is cut the angle iron to length and then glue it into place using a construction adhesive.

Hardware – With the angle iron glued down, go ahead and center the lower jaw on the base and glue

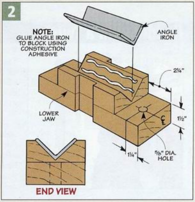


it in place. Then once the glue is dry, you can add the threaded rods, nuts, and washers. To do this, epoxy a nut on the end of each threaded rod. Then add the washers and slip the threaded rods up through the holes in the base. Finally, fill the holes completely with epoxy to hold the hardware in place.

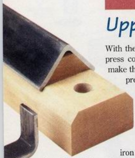
1



2



Upper Jaws



Angle Iron. For creating sharp bends, this jaw is fitted with a piece of angle iron.

Iron Pipe. A length of iron pipe is used to create a rounded bend.

With the base and lower jaw of the press complete, all that's left is to make the upper jaw. The upper jaw presses the metal against the angle iron of the lower jaw, creating the bend.

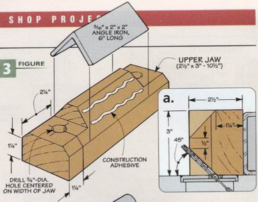
As you can see in the photos at left, I actually made two upper jaws. One jaw holds a piece of angle iron to make sharp bends. The other jaw holds a piece of pipe to make rounded bends. Switching the jaws is just a matter of removing the coupling nuts and washers.

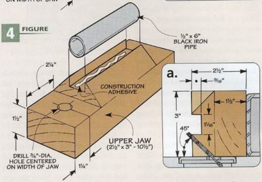
Making the Upper Jaws – Both of the upper jaws start out as 2½"-thick, glued-up blanks. To make the first jaw, I ripped a bevel along the top edges of the blank, just like you see in Figure 3a. This creates a flat-topped "peak" that will support the angle iron that is added later.

The second jaw holds a piece of iron pipe. To make this jaw, I cut a groove down the center of the blank to hold the pipe. Then I beveled the sides of the blank, as shown in Figure 4a.

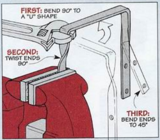
Before adding the angle iron and pipe, the ends of both jaws are notched and drilled for the threaded rods on the base. When this is done, you can cut the angle iron and pipe to length and then glue them in place using construction adhesive.

Adding the Upper Jaw – To add one of the upper jaws to the bending press, start by slipping a spring over each threaded rod. Then slide the jaw over the rods. Finally, secure the jaw by adding a washer and a coupling nut to each rod.





Handle with a Twist

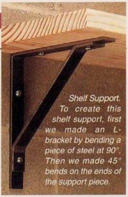


To create the handle shown in the photo at right, I started by using the bending press to make a couple of 90° bends in a piece of bar stock, creating a "U"-shaped handle.

Next, clamp one end of the handle between the jaws of a machinist's vise. Using an adjustable wrench, twist the handle 90°. Then repeat the process with the other end of the handle. Finally, to complete the handle, take it back to the bending press and bend the ends at 45°, as shown in Figure 6a.

SHOP PROJECT

Using the Bending Press



Shelf Support. To create this shelf support, first we made an L-bracket by bending a piece of steel at 90°. Then we made 45° bends on the ends of the support piece.

▲ *Handle. This shop-made handle has a reverse bend at each end.*

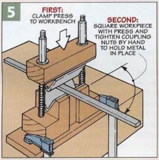
This bending press can bend steel bar stock up to ¼" thick (depending on the width of the stock). It can also be used for bending round stock (rods) up to 5⁄16" in diameter.

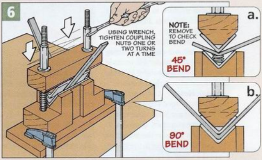
Setup – Using the bending press is pretty straightforward. To start with, clamp the press firmly to the top of your workbench. Then place the metal between the jaws of the press so the "corner" of the bend is centered in the opening, as you see in Figure 5. You'll also want to make sure the metal is square to the jaws of the vise.

To create a bend, start by evenly tightening down the coupling nuts, as shown in Figure 6. Alternate back and forth between the two nuts, giving each one a couple of full turns at a time. As the jaws come together, the metal will slowly start to bend.

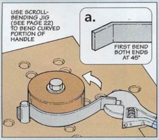
If you're creating a 90° bend, just keep tightening down the nuts until the metal bottoms out against the lower jaw, as you see in Figure 6b. Then you can back off on the coupling nuts and remove the metal from the press. (The springs will automatically lift the upper jaw as you back off the coupling nuts.)

Shallow Bends – One of the nice features of this press is that you can also use it to create bends that are less than 90°. All you have to do is stop bending when you reach the angle you want, see Figure 6a. (This is how we created the shelf bracket shown in the photo above.) And by combining the bending press with other types of bends, you can create some other interesting and useful shapes, see box below.





Handle with a Bend



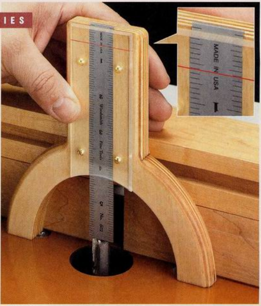
The pulls shown in the photos at right are made using both the bending press *and* the scroll-bending jig shown in the article on page 22.

Start by cutting a piece of bar stock to length and making a 45° bend on both ends. You can see how this is done in Figure 6a above.

To create the curved section of the pull, simply wrap the metal around a wood wheel in the scroll-bending jig. Shop Note: An adjustable wrench allows you to get a better grip and more leverage.

Shop-made Set-Up Gauge

Turn a piece of plywood and a small metal rule into a precision set-up tool.



Are you tired of constantly having to bend over to check the height of a bit or blade with a metal rule, or having to squint to "eyeball" a measurement? Well just grab a scrap of plywood, and you can turn a standard 6" metal rule into the precision, easy-to-read set-up gauge you see in the photo at right.

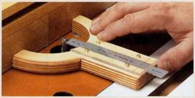
The gauge won't take long to make. (I made mine in about an hour.) But it's sure to see constant use around the shop. Positioning a router table fence (upper photo below) or drill press fence (lower photo) is fast and easy. And setting the height of a router bit or dado blade (photo at lower right) is just as easy — and extremely accurate.

Metal Rule – As I mentioned, this is a scrap wood project. But you will want to have your metal rule in hand before you start. (I used a 6" rule.) That's because the rule rests in a shallow groove cut in the gauge. This groove keeps the rule straight up and down during use.

What's important here is that the groove fits *your* metal rule. You're looking for a smooth, sliding fit. The easiest way to do this is to start with a $6^1/_2$"-square blank. (I used $^3/_4$" Baltic birch plywood.) This makes it easy to cut a centered groove for the rule, as in Figures 1 and 1a.

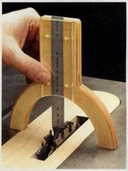
Lay Out Shape – The next step is to lay out the shape of the gauge on the plywood blank. As you can see in the photos and Figure 1, the shape is a little unusual.

The reason for this "bow-legged" stance is to span wide openings around a bit or blade. And the narrower body at the top provides a comfortable grip.



Router Table Fence. ► *Setting the position of a router table fence can be a hassle. But with the set-up gauge laying on its side, it's a simple, accurate task.*

Drill Press Fence. ► *In a similar manner, you can use the set-up gauge to position a drill press fence. This ensures that the drill bit is right where you want it.*



▲ *Dado Blade Height. The gauge also makes quick work of setting the height of a dado (or saw) blade.*

FIGURE 1

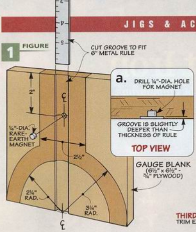
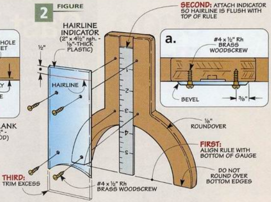


FIGURE 2



Cut to Shape – With the layout complete, a band saw makes quick work of removing the waste. Once this was completed, I routed a small roundover on a few of the outside edges, and then sanded everything smooth, like you see in Figure 2.

Magnet – Now what you need is a way to hold the rule in place. For this purpose I used a magnet. But not just any magnet. I chose a *rare-earth* magnet.

Rare-earth magnets are extremely strong for their size. As a matter of fact, I always keep a few different sizes on hand in the shop to use in jigs and projects. (For sources of rare-earth magnets, refer to the margin on page 35.)

The magnet rests in a small counterbore drilled in the center of the groove, as illustrated in Figures 1 and 1a. The counterbore is just deep enough so the magnet is flush with the bottom surface of the groove.

The magnet "locks" the rule in place when you're checking a setup, but still allows it to slide up and down when making a measurement. An added benefit is you can remove the gauge to check the reading — without having to worry about the rule shifting.

Hairline Indicator – The magnet holds the rule in place, but you still need a way to accurately make a measurement. That's where the hairline indicator comes in. It makes it easy to see the measurement on the rule, like you see in the inset photo on the opposite page.

As you can see in Figure 2, the indicator is nothing more than a line scratched into a piece of $^1/_8$"-thick clear plastic. (I used *Plexiglas*.)

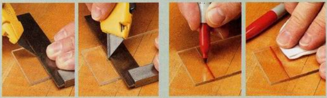
I started with an extra-long ($4^1/_2$") piece of plastic cut to final width (2"). Then I formed a hairline $^1/_2$" down from one end of the plastic using the procedure detailed in the box below.

Install Indicator – At this point you're ready to screw the indicator to the set-up gauge. To position the indicator properly, first rest the set-up gauge on a flat surface like the top of a table saw. Then slide the rule down the groove so it's resting against the surface.

After "zeroing out" the hairline with the top of the metal rule, clamp the indicator in place. Then drill a set of pilot holes and screw the indicator to the gauge, as in Figures 2 and 2a.

All that's left to do is trim the plastic flush with the inside edge of the gauge. I did this on the band saw. Then I eased the outside edges of the plastic by sanding a small bevel, like you see in Figure 2a. With the metal rule back in place, the set-up gauge is ready to go to work.

Making a Hairline Indicator



Making a hairline indicator for any project is just a simple two-step process.

Score Mark – The first step is to cut a couple angled score lines on the back side of the plastic, as in the photos above. These cuts form a *very* shallow, V-shaped channel.

Permanent Marker – To make the hairline visible, the second step is to fill in the channel with a permanent marker, as in the left photo above. When you wipe across the channel to remove the excess ink, you'll leave a small hairline visible across the indicator (right photo).

Shop Talk

Cast Iron

It may not be glamourous, but cast iron is still your best bet when buying woodworking equipment.

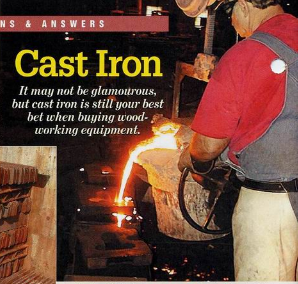


Photo courtesy of WMH Tool Group

▲ *Pouring. White-hot, molten cast iron is being ladled into molds. After the cast iron has cooled, the parts are removed from the molds and then allowed to "season."*

Photo courtesy of Delta Machinery

Seasoning. ► *A stack of jointer fences is left outside for several months. This allows the castings to stablilize before being machined.*

When it comes to woodworking equipment, many woodworkers will tell you that the more cast iron in a tool, the better. But have you ever stopped to wonder just why this is? What is it about cast iron that makes it so great for power tools?

Why Cast Iron? – When you think of all the modern metals and plastics that are available today, cast iron seems like an outdated relic from the industrial age. After all, manufacturers started using cast iron for woodworking equipment over a hundred years ago. But the truth is that no other material is better suited for this purpose.

Cast iron has several things going for it. First, it's heavy, so it absorbs and dampens any vibrations from the machine. Second, cast iron is stable. It's much less likely to expand, contract, or warp than other materials. This means that a tabletop milled out of cast iron will likely stay flat for years to come.

Although it may be hard to believe, one other reason for using cast iron is that it's still cheaper than many of the alternatives. The manufacturing start-up costs for cast iron are a lot less than for other materials. Since most woodworking tools are built in small numbers (thousands rather than millions), cast iron is often the most cost-effective choice.

There are places where you may notice manufacturers cutting back on cast iron. These areas are not as important from a functional standpoint. Knobs, hand wheels, and tool bases that used to be made out of cast iron are now usually plastic or stamped steel. But cast iron continues to be used on the parts where it really counts – machined tops and beds, trunnions, and gears.

Cast Iron Process – In the past, tool manufacturers typically cast machine parts in their own foundries. But with modern specialization, this is now the exception rather than the rule. Most manufacturers find it cheaper and more efficient to have their castings made by an outside source. But the process is still the same. First, a patternmaker creates a pattern of the desired part. Next, a mold is made to match the pattern. Then, white-hot, molten iron is poured into the mold. Once the casting has had a chance to cool off, it is removed from the mold and allowed to "season" (more on this later). Eventually, the casting is machined and finished.

Types of Cast Iron – There are several different types of cast iron. Most of the cast iron you'll find in woodworking equipment is gray cast iron. This type of cast iron is tough, stable, and machines well. The main drawback of gray cast iron is its brittleness. It can break or crack if subjected to a sudden shock or impact.

For tools or parts that are going to be getting a lot of abuse, manufacturers may use ductile cast iron instead. This is a more elastic form of cast iron that is less prone to breakage. You'll also see ductile cast iron used in hand tools, such as planes and clamps.

Even among gray cast iron, there can be differences in quality. To start with, some manufacturers are fussier than others when it comes to the quality of the castings. Poorer-quality castings may have voids or rough spots where the iron didn't completely fill in the mold. Instead of rejecting these castings, some manufacturers merely fill in the voids and paint over them. If you see evidence of this on a tool that you are considering for purchase, it could be an indication of poor quality control.

Another important step in the making of cast iron machinery is the "seasoning" of the castings. After the iron cools, the casting is removed from the mold and left to sit outside for several months to "age." This step is important since it allows the cast iron to move and settle before it is machined so that it will be less likely to warp later.

Unfortunately, it's impossible to look at a table saw in a showroom and tell if the castings were seasoned before being machined. But one thing you can do is examine the thickness of the castings. Better equipment will have thick-walled castings with plenty of ribbing and cross supports. This results in greater strength and an improved ability to dampen vibrations.

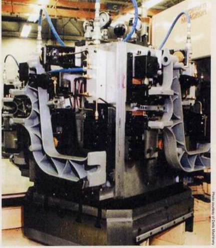
Meehanite – A couple of tool manufacturers (*Powermatic* and *General*) tout the fact that they use "Meehanite" cast iron in some of their higher-end power tools. Meehanite cast iron is made using a patented process that results in a dense, fine-grain structure that is superior to ordinary cast iron. It's more costly to produce, but is less likely to warp or twist over time.

Disadvantages – Of course, as good as cast iron is for woodworking tools, it's not perfect. The weight factor is great for dampening vibrations, but not so good if you have to move your tools around a lot (which is why you don't find much cast iron on portable power tools).

Cast iron also tends to rust fairly easily, so it requires regular maintenance to keep it in pristine condition. (See the box on this page for more information on this.)

Because cast iron is a relatively soft metal, it can be scratched and dented if you're not careful. And cast iron is also somewhat brittle. A misplaced blow from a hammer can easily crack or break a cast iron tool.

Despite these drawbacks, manufacturers haven't come up with a better substitute for cast iron. Where woodworking equipment is concerned, cast iron is still king.



▲ *Machining. Automated equipment is used to machine the upper arm castings for Delta's 14" band saw.*

Dealing with Rust

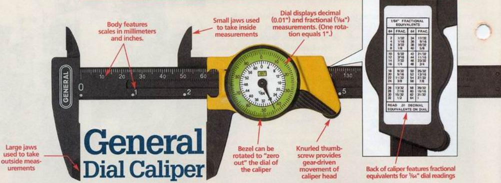
Rust is the chief enemy of cast iron. But with just a little maintenance, you can keep the cast iron surfaces of your tools looking as good as they did when new.

The best way to deal with rust is to prevent it from forming in the first place. To do this, I turn to a simple but effective solution — paste floor wax. Every week or so, I rub a coat of wax onto all the cast iron surfaces of the tools in my shop. The wax not only protects against rust, but it helps your workpiece to slide over the surface of the tool a lot easier.

You can usually find paste floor wax in the cleaning products section of your local supermarket. (Note: Avoid using car waxes on your power tools. These may contain silicones that can rub off on the wood and interfere with the finish on your completed project.)

Sooner or later, you'll probably encounter some rust on your tools. But unless the rust is severe, it's really nothing to get alarmed about. Light rust can be removed with steel wool or synthetic abrasive pads (like *ScotchBrite* pads). Recently, I've been using *Sandflex* blocks to remove rust (see photo on left). These rubber-like blocks are embedded throughout with abrasive particles. They remove the rust like a giant eraser. (See page 35 for sources.)

Once you've taken care of the rust, just apply the paste wax as usual. Or if you prefer, you can use a spray-on rust inhibitor like *TopCote* or *Boeshield* (see photo on right and page 35 for sources).



General Dial Caliper

Improve your woodworking with an inexpensive dial caliper.

I've owned an expensive, metal dial caliper for years. Unfortunately, it sits in a drawer in the box it came in and doesn't tend to get a lot of use.

The problem is it reads in thousandths of an inch (0.001"). Sure, it's accurate. But it's not a very useful measuring scale for woodworking where you're always dealing with fractions — and having to convert the measurement in thousandths to a fraction is a hassle.

But that all changed a few years ago when I ran across an inexpensive plastic dial caliper made by *General* (you can see it above). I use this caliper just about every day in my shop. You might be asking yourself what makes the *General* so different? One simple reason — the measuring scale on the dial.

Dial Readings – If you look closely at the dial, you can see two separate sets of markings. The first set (green ring) is graduated in hundredths of an inch (0.01"). I know, that's still not woodworker friendly.

But just inside that is a second ring with graduations in $^1/_{64}$" increments. If you look at the jaws above that are measuring the width of the title of this article, it's easy to read the measurement — $2^{28}/_{64}$". Not good at reducing fractions? Simply flip the caliper over and check the handy chart on the back to "convert" the measurement to $2^7/_{16}$" (see inset photo at upper right).

Making an "outside" measurement like this is what I use my dial caliper for most often. As a matter of fact, my dial caliper is a constant companion when I'm working at my planer. I use it to double-check the thickness of a freshly planed workpiece, as in photo A. Plus, a dial caliper works great for checking the size of router bits and drill bits — especially the small ones that don't have the size stamped on them.

Inside – In a similar manner, you can use the smaller jaws on the opposite side of the dial caliper. As you can see, the measuring edges face outward. This makes it easy to measure material that's "missing," like the width of a dado or groove, as shown in photo B.

Step Measurements – I often need to make a measurement where I don't have two "sides" to rest the jaw against, like the width or depth of a rabbet. Making this "step" measurement is easy because of the unique design of the jaws.

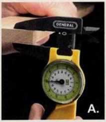
The smaller rear jaw on the inside of the dial caliper can be set against the edge of the rabbet, like you see in photo C. Then slide the head of the caliper against the inside step to make the measurement.

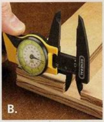
Depth Measurements – One last thing. Measuring the depth of small openings can be a real challenge — but not with the *General*.

As you extend the head of the caliper, a slender rod projects out from the opposite end. This rod makes it easy to measure the depth in places the jaws won't fit, like the mortise shown in photo D.

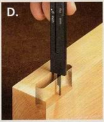
Cost – My *General* dial caliper (Model No. 142) cost around $27 — a small price to pay for taking accurate measurements in a variety of ways. For me it's the key to building a great project.

To order a *General* dial caliper, check the sources listed in the margin on the opposite page.


A.


B.


C.


D.

Sources

Router Table Fence & Accessories

■ There isn't much hardware required for the router table fence on page 16.

T-Track – To add the accessories to the fence you'll need a piece of T-track. T-track isn't often available locally, so sources are listed in the margin.

Knobs – The only piece of hardware that might be difficult to find is the knobs with built-in $\frac{5}{16}$"-18 inserts. Sources for these knobs, as well as the through knobs, are listed in the margin.

Accessories – Instead of making a bit guard or featherboard, you can buy them from the sources in the margin. Because the sizes may vary, it's best to have them on hand before locating the T-track in the sliding faces of the fence.

Aluminum – The aluminum angle is available at most home centers and hardware stores. But if you're having trouble locating it, *McMaster-Carr* carries a variety of aluminum angle products.

Drill Bit – Finally, for drilling the hole in the fence for hooking up your dust hose, the margin sources carry large-diameter drill bits like the multi-spur bit shown above.

Rust Prevention

■ If you have a garage or basement workshop, rust is a constant concern. Since you can't wrap your tools up enough to keep the rust out, you'll have to deal with minimizing it and removing it.

The products mentioned in the cast iron article on page 32 go a long way toward winning the battle of rust. Each *Sandflex* block is made from a semi-flexible rubber with grit impregnated throughout the block. As you "erase" away any rust, new particles are constantly being exposed — so it never clogs up. *Sandflex* blocks come in coarse, medium, and fine grits.

Once you have the rust removed, you can spray the surface with either *TopCote* or *Boeshield T-9*. Both products seal and protect the surface from rust while creating a smooth, slick surface.

Sources for the sanding blocks and the lubricants are listed in the margin.

Small Parts Storage

■ About the only thing you'll need to complete the storage system on page 6 is a $2\frac{1}{8}$"-dia. bit to drill the holes in the inserts. The margin lists a few sources for large-diameter drill bits.

Metal Cases – One option for keeping small parts in place inside the drawers is to use watchmaker's cases (see photo). These glass-topped aluminum containers come in five different sizes ($1\frac{1}{4}$" diameter to $2\frac{3}{4}$"). They're available from *Lee Valley*.

MAIL ORDER SOURCES

Similar project supplies may be ordered from the following companies:

Rockler
800-279-4441
www.rockler.com
Featherboards, Knobs, Router Bit Guard, T-Track

Reid Tool
800-253-0421
www.reidtool.com
Knobs

McFeelys
800-443-7937
www.mcfeelys.com
Forstner & Multi-Spur Bits, Sandflex Blocks, TopCote

Lee Valley
800-871-8158
www.leevalley.com
Rare-Earth Magnets, Multi-Spur Bits, TopCote, T-Track, Watchmaker's Cases

Woodsmith Store
800-835-5084
Dial Caliper, Knobs, Multi-Spur Bits, Sandflex Blocks, T-Track

McMaster-Carr
630-833-0300
www.mcmaster.com
Alum. Angle, Knobs, Lexan

Woodcraft
800-225-1153
www.woodcraft.com
Boeshield T-9, Dial Caliper, T-Track

Woodhaven
800-344-6657
www.woodhaven.com
Featherboards, Knobs, Router Bit Guard

SHOPNOTES PROJECT SUPPLIES

To order back issues or a hardware kit from *ShopNotes Project Supplies*, please use our toll-free order line, see below. It's open Monday through Friday, from 8 AM to 5 PM Central Time. Before calling, please have your VISA, MasterCard, Discover, or American Express card ready.

If you would prefer to mail in an order, please call the toll-free phone number below for more information concerning shipping charges as well as any applicable sales tax.

1-800-347-5105

ShopNotes on the web

- "Online Extras" - Plans, Patterns, & More
- Over 100 Woodworking Tips Online
- Visit Our Woodworking Shop Tours Gallery
- Project Plans You Can Download
- Catalog of Project Kits, Tools, Jigs, & Plans
- Forums for Woodworking, Tools, & Classifieds
- Links to Other Woodworking Sites
- Order *ShopNotes* & *Woodsmith* Back Issues

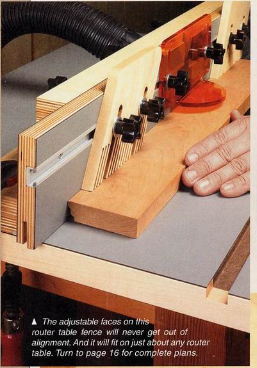
www.shopnotes.com

Online Customer Service

Click on Subscriber Services at ***www.shopnotes.com***

- Access your account status
- Change your mailing or email address
- Pay your bill
- Renew your subscription
- Tell us if you've missed an issue
- Find out if your payment has been received

Scenes from the Shop



▲ The adjustable faces on this router table fence will never get out of alignment. And it will fit on just about any router table. Turn to page 16 for complete plans.

▲ If you're searching for a better chisel, look no further. These chisels are razor sharp and will hold an edge for a long time. To learn more, see page 12.

▲ This scroll-bending jig allows you to bend metal into all sorts of curves and shapes. You can use it to create your own shop hardware, or dress up your next woodworking project by adding some decorative metal accents. Complete plans for the jig, as well as some tips on how to use it, can be found on page 22.