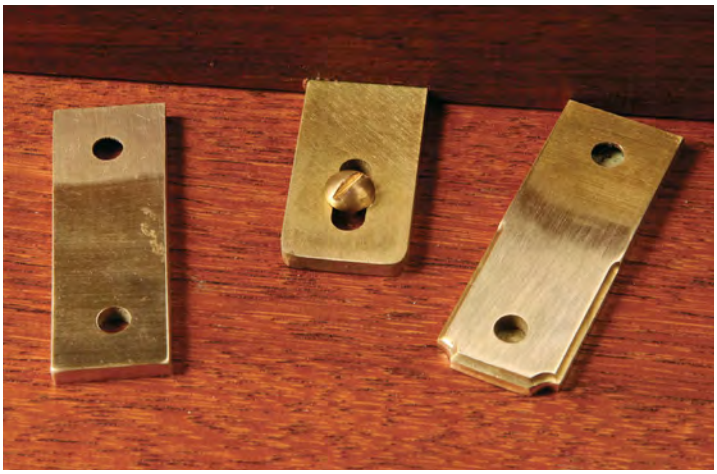
skills spotlight

Make custom hardware with basic tools

BY CLARK KELLOGG

TABLETOP TABS TEACH THE BASICS

Handmade from every angle. *Custom brass tabletop tabs make the underside of these tables look as handcrafted as the top.*



Match the look to the piece. *Kellogg uses simple polishing and shaping techniques to adapt the look of the tabs to the style of the furniture he's building. Note how age and oxidation have given the installed tab at center a warm, matte look.*

Although I like to think of myself as a woodworker, almost every project I build tends to involve at least a few metal components, if not by design then by necessity. Commercial hardware is generic in both style and function, and therefore often poorly suited to the task. If I'm going to spend months designing and building something intended to outlast me by 100 years, why settle for hardware that looks store-bought or mediocre?

The good news is that you already own many of the tools needed to make your own hardware, and it will only take another handful to start making beautiful, useful parts out of metal. To keep you from getting lost in a machinist's catalog that's the size of a phone book, I'll give you an essential list of tools and materials to get you up and running, along with a starter project—brass tabletop fasteners—that will let you develop many key skills.

Start with brass bar stock

Brass is the perfect material for furniture hardware. It's affordable, readily available, easy to work, and it ages to a warm patina that goes great with almost any wood. And like most metals brass comes in various sizes of flat and round bar stock, which you can simply cut to length for almost any hardware component, leaving you minimal shaping to do.

But you probably won't find what you need—such as ⅛-in.-thick brass bar stock—at a local hardware or art-supply store. Those tend to carry flat stock that's 1⁄16 in. or thinner. If you're in a city with an industrial base, you might be able to find a local dealer specializing in the "red" metals: brass, bronze, and copper. I've had good luck with Morris Metals here in Houston, as well as Metal Supermarkets, a nationwide chain. Online there are several very good sources that specialize in small orders, such as McMaster-Carr and onlinemetals.com. Be sure to order

Photos: Asa Christiana

#360 "ultra-machinable" brass. While brass can be milled with most woodworking machines, it is imperative that pieces be held securely. Brass tends to grab sawblades and drill bits, and there is a very real risk of your workpiece instantly becoming a propeller or projectile.

Wide range of easy finishes

You have a few finishing options. The simplest is just to sand everything to 400 grit, for a "brushed" finish. The best way to sand metal is to adhere the paper to a flat surface and rub the part on it. The other option is polishing brass to a bright finish: Start with 220-grit, follow with 400- and 600-grit wet-or-dry paper—all stuck to something flat—and then scrub with 0000 steel wool. Or buy a Scotch-Brite deburring wheel for your bench grinder. Then you can stop sanding at 400 grit, and polish the brass in a tiny fraction of the time. I use the wheel to soften hard corners, too.

To add final polish and protection, whether the finish is brushed or shiny, I follow with Nevr-Dull polishing compound, applied with wadding (it's in the can).

Wear gloves and a mask while sanding and polishing, since brass dust can contain lead.

Darken brass for a gunmetal look—One of my favorite finishes for brass is patination, which involves coloring the surface of the metal with a chemical reaction. For a dark, gunmetal finish on brass, I use "Brown-Black Darkener" for brass, bronze, and copper, by JAX Chemical.

To use any patination chemical, the first step is to remove all traces of dirt, oil, or other contaminants from the surface. Even a fingerprint can keep chemicals from bonding properly, so be sure to wear gloves throughout the process. After sanding and polishing, I scrub the hardware with acetone and a blue shop towel, followed by "No Name Patina Prep," a mildly abrasive powder made by Reactive Metals Studio (riogrande.com).

After that, rinse the parts with cold water and immediately submerge them in the patination solution. You'll see them start to change instantly. Give them a minute or two in the solution, remove them, and rinse again. Don't leave them in too long: After 5 or 10 minutes, the patinated surface will start flaking off. Finally, buff the parts gently with Renaissance Wax. Don't use Nevr-Dull, which reacts with the chemicals.

A few metalworking tools go a long way

Just as with woodworking tools, you get what you pay for in metalworking. Try to buy your tools from a local machinist supply house, or a reputable online retailer such as McMaster-Carr or Rex Supply. Most catalogs will offer a range of seemingly identical tools—usually relatively expensive "domestic" versions followed by one or two more affordable "import" tools.

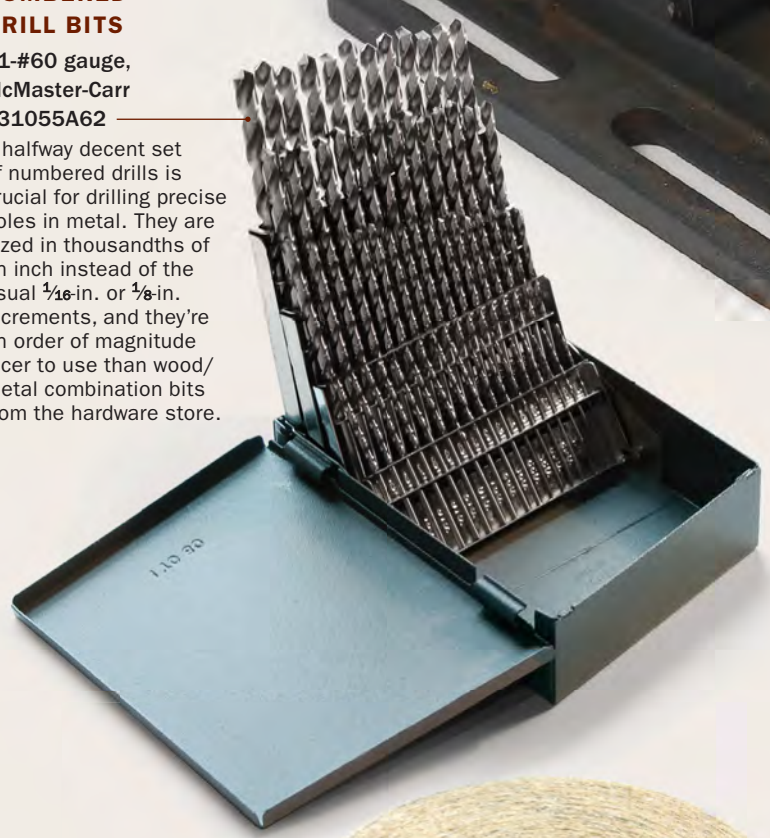
A few new tools and supplies

You can do beautiful work in metal by adding just a few specialty items to the woodworking tools you already have.

3-IN. DRILL PRESS VISE

McMaster-Carr #52855A21

When doing any sort of machining, it is essential that the work be held firmly in place, both for safety and accuracy. While an ultra-precise machinist's vise can run to thousands of dollars, Kellogg has had great luck with this little drill-press vise.



NUMBERED DRILL BITS

#1-#60 gauge, McMaster-Carr #31055A62

A halfway decent set of numbered drills is crucial for drilling precise holes in metal. They are sized in thousandths of an inch instead of the usual 1/16-in. or 1/8-in. increments, and they're an order of magnitude nicer to use than wood/metal combination bits from the hardware store.

Online Extra

For an expanded list of Kellogg's suggested metalworking tools, go to **FineWoodworking.com/287.**

ADHESIVE-BACKED SANDPAPER

3M Gold, 220-grit

Works great for flattening the edges and faces of brass stock, which comes with rolled edges and mill marks.

FREUD LU89M THICK NON-FERROUS TABLESAW BLADE

Rockler.com #22521

This blade has a negative rake angle designed for cutting through metal. Avoid using a regular tablesaw blade, as the forward-rake angle used for cutting wood is far too grabby and potentially dangerous for metal.

POLISHING WHEEL

3M Scotch-Brite Grade 8S "Fine Grit" EXL Deburring Wheel, amazon.com

It takes a little bit of practice, but this wheel turns an hour of polishing with steel wool and Nevr-Dull compound into a job of a minute or less.

LAYOUT FLUID

Dykem Steel Blue (or Red) Layout Fluid, Bass Tool

Makes layout marks clear and obvious, and wipes away with acetone.

SCRIBER

General Tools 85 Single-Point Scriber, amazon.com

Used in conjunction with layout fluid (see above), a scriber works like a marking knife for metal, offering a way to quickly and precisely lay out measurements on your workpieces.

6-IN. DIAL CALIPER

Metal (not plastic), with 0.001-in. graduations

Working with metal, you generally have very little room for error, particularly when it comes to machining small parts. Calipers allow you to measure and lay out distances in the thousandths of an inch—impossible to do with an adjustable square.

CENTER PUNCH

Stanley 58120 ⅛ in., amazon.com

Because metal drill bits don't have a spur center like brad-point bits, they can skate across the surface of your workpiece. A center punch leaves a tiny divot, which keeps the drill bit right on the mark as it engages.

3/8 X 82° 6-FLUTE HSS COUNTERSINK BIT

McMaster-Carr #27885A35

A lot of countersinks vibrate and leave chatter marks in metal, but this one doesn't, especially if you slow its speed.

MEDIUM FILES

Nicholson Flat-Smooth, 6-in., Amazon.com

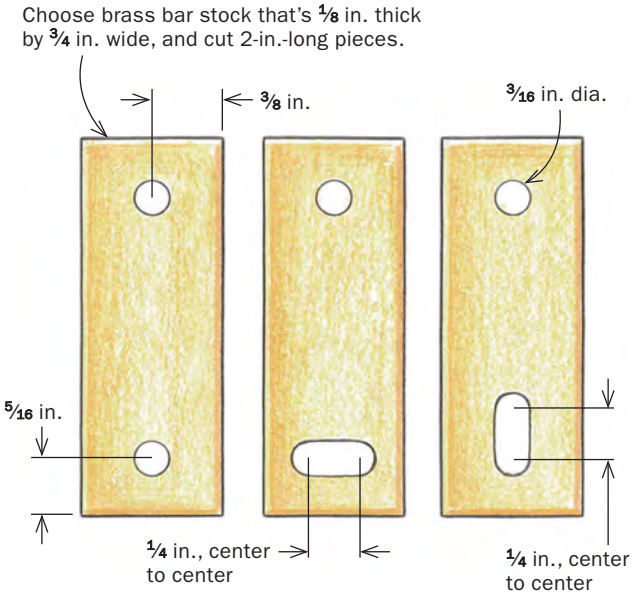
Fresh, high-quality files cut brass smoothly and efficiently. Like a freshly sharpened plane blade, they are a joy to use. Pretty soon, you'll want to add fine files, including a needle file.

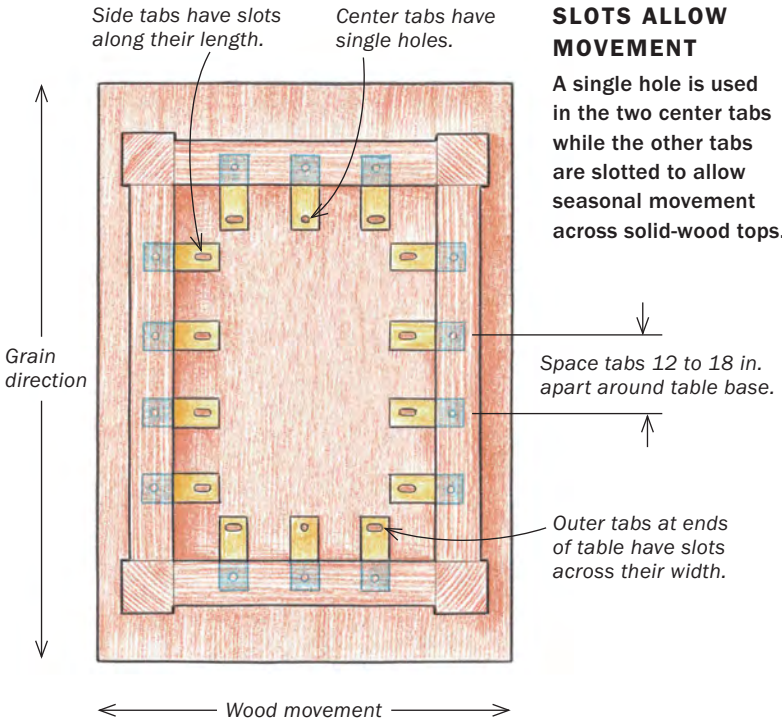
Making tabletop tabs

Custom table-attachment tabs, made from standard brass bar stock, will teach you many of the skills you'll need for more ambitious projects.

THREE VARIATIONS

Kellogg makes the tabs in three variations, to lock the tabletop in place or allow wood movement in two directions.





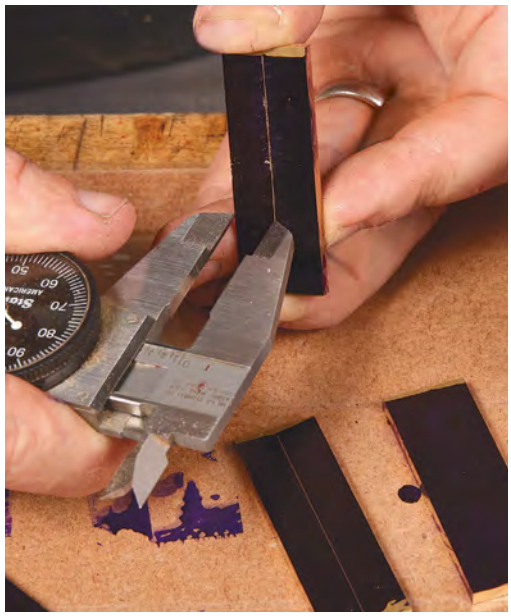
SLOTS ALLOW MOVEMENT

A single hole is used in the two center tabs while the other tabs are slotted to allow seasonal movement across solid-wood tops.

Cut brass bar stock to length. *Start with stock that's the width and thickness you need, and cut it to length using a tablesaw blade designed for non-ferrous metals, and a crosscut sled with secure hold-downs on both sides of the cut.*

LAY OUT THE HOLES AND SLOTS

Layout tricks. *For accurate, visible layout on metal, start with a quick coat of layout fluid. After that a dial caliper can be used like a marking gauge (right), and a metal scriber like a marking knife (below).*



Accurate holes start with a dimple. *A center punch leaves a small dent, which keeps the drill bit from wandering.*

Beyond the price, I haven't found much difference between the two. That said, be careful about buying metalworking tools from a hardware store or home center: These are usually of inferior quality, with all the attendant headaches. Finally, if you are willing to wait, Craigslist, estate sales, and flea markets can all be great sources for used tools, but *caveat emptor*, as they say.

Great first project for new metalworkers

I try to finish my pieces so the inside looks as good as the outside. To that end, when I build a table, I use shopmade brass tabs to attach the top to the base. Their design is based on plates James Krenov made for some of his cabinets, adapted to account for the seasonal movement of a solid top.

To accommodate movement in the top, I make a few variations of the tabs, two for small tables and three for large ones. Each has either a simple through-hole to accommodate a #8 or #10 screw, or a slotted hole running lengthwise or crosswise, with a brass round-head screw.

Cut bar stock to size—For tabletop tabs I use brass bar stock that is ¾ in. wide by ⅛ in. thick. I start by cutting it into 2-in. lengths, using the specialty blade on the tablesaw, in conjunction with a purpose-made crosscut sled with a built-in stop and—most importantly—integrated hold-down clamps.

Note to SawStop owners: Be sure to activate the brake override. I've been reminded of this the hard way.

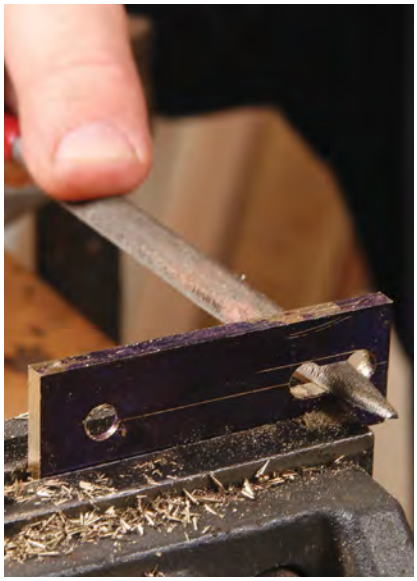
Lay out the holes and slots—Start by applying a thin coat of blue or red layout fluid to one face of each tab. Don't worry about being neat here; the fluid is easily removed with acetone. Once it dries, scribe a centerline along each tab (above).

Drill holes and cut slots—Clamp or bolt a small metalworking vise onto the drill-press table. If you don't have one, a wood hand-screw clamp will do. You can also make a plywood fixture with a fence, stop, and hold-down clamp.

DRILL HOLES AND CUT SLOTS

Two ways to hold work for drilling. *Metal parts must be held securely for all cutting activities, including drilling. If you don't yet have a drill-press vise (left), a hand screw will work (right). Use a very slow speed for drilling brass.*

Clean countersinks. *To avoid chatter in brass, keep the speed very slow and use a 6-flute bit like the one listed on p. 23.*



Turn holes into slots. *To make a slot, drill a hole at both ends, saw out the waste with a coping saw or jeweler's saw—threading a metal-cutting blade through the holes—and then use a flat or half-round needle file to flatten the sawcuts.*

TIP SLOT MORTISERS CAN MILL BRASS

These days, Kellogg cuts slots in one step—no pre-drilling required—on his Multi-Router, using a special hold-down and an all-carbide, up-spiral bit in a series of shallow passes.

Bring one of the punched center points in line with the drill chuck and slowly drill through the brass. Just as with wood tools, you should see chips or shavings rising, not dust. Drill all the holes.

Next, set up a countersink bit in the drill press and slowly feed the bit into the piece until it will accommodate a #8 or #10 screw head.

Cut out the slots with a coping saw and smooth them with a thin "needle" file. Be sure to use a metal-cutting (preferably non-ferrous) blade in your coping saw. Or buy a small jeweler's saw, which takes a range of thin metal-cutting blades and also works great for curvy cuts in thin brass, which you can finish smoothing and shaping with files.

For even faster slots, a slot mortiser will do the job in a single step, with no pre-drilling. I use my Multi-Router, set up with a ⅛-in.-dia. end mill bit, clamping the tabs down in a dedicated fixture and milling the slots in slow, shallow passes.

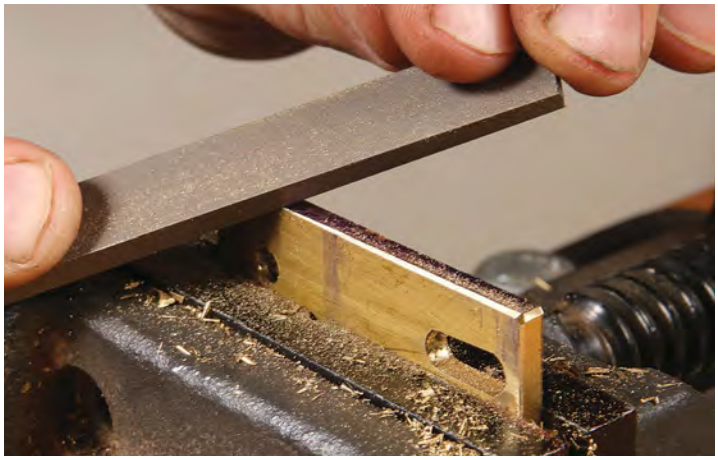
Clean up, polish, and install—Before the tabs are installed, get everything cleaned up and polished. Flatten each tab on 220- and 400-grit paper stuck to a flat surface. I usually detail the visible side of the pieces by breaking the sharp corners and filing a chamfer around the edges. Finally, I polish the tabs using the methods described above.

Installing the tabs is like mortising hinges. Lay out the finished tabs around your table base, with the countersunk holes centered on the thickness of each apron. Then attach each tab temporarily with a #8 or #10 flathead screw, and scribe around each one.

I use a trim router with a straight bit to cut the mortises, clean up the edges and corners with chisels, and install the tabs with flathead screws. Last, I flip the base onto the underside of the top, and install it with brass roundhead screws.

Clark Kellogg is a furniture maker in Houston, Texas.

CLEAN UP, POLISH, AND INSTALL



Break the edges. *Soften edges and remove sharp burrs with a flat, medium file. Kellogg often adds a distinct chamfer on the edges.*

Sand first. *Brass bar stock has slightly rounded surfaces. Flatten it on 200-grit sandpaper, stuck to a flat surface, and continue polishing on 400-grit paper. For a brushed finish, stop there.*

Polish second. *For a quick, bright polish and softened edges, buy a Scotch-Brite wheel for your bench grinder. If not all of the part will be visible, polish only as needed.*

Quick, accurate mortises. *Screw the tabs temporarily into position and scribe around them with a marking knife. Rout away most of the waste freehand and chisel to the lines.*

Install the tabs. *The tabs drop snugly into their mortises in the apron, held in place with flathead screws.*

Install the tabletop. *The tabletop attaches with round-head screws, which allow the slotted tabs to shift with wood movement.*