Of all the materials that can be mixed with wood, it’s hard to beat steel. Strong, sleek, and versatile, steel has its own proud tradition. A growing number of woodworkers are combining wood and steel. Evidence of this creative combination is abundantly available online and in furniture catalogs. If you want to join in, the tools and techniques in this article will get you started.

I haven’t welded since trade school, but I’ve been making wood furniture for 20 years. I needed an intense refresher course in welding, and I found exactly the right instructor. Kari Merkl (Merkled.com) has been a professional welder for 16 years, teaching the craft for six. Follow Kari’s expert advice on welding safety, tools, and techniques. I’ll provide the construction details for a small table that’s an excellent starter project for combining wood and steel.

**Expert advice.** Based in Portland, Oregon, Kari Merkl teaches welding and takes on a variety of projects, including furniture that combines wood and metal.
Steel + wood = strength, beauty, and plenty of design possibilities

If you’re new to welding, it’s smart to stick to mild steel, which comes in standard profiles like rectangular tubes, L-shaped angle, and flat bar stock. The projects shown here are all made with these standard profiles. Make sure to remove any rust or oily residue from steel before welding. Finishing options for steel can be as simple as paste wax or spray enamel.

This outdoor table is by David Bertman of Portland, Oregon. (DavidBertmanDesigns.com).

Our welding expert, Kari Merkl, made this rolling kitchen cart from tubular steel and a section of butcher block.

This side table, made from walnut and powder-coated steel, is by Audi Culver and Ivy Siosi (siosidesign.com) of Bloomington, Indiana.

These side tables are by Matthew Philip Williams (matthewmatthewmatthew.com) of Portland, Oregon. The legs are powder-coated, which is a very durable color finish.

Jacob Wener, of Modern Industry in Chicago, built this low stool (modernindustrydesign.com).

Photos: Asa Christiana
There are some important safety issues that won’t be familiar to “wood-be” welders. To avoid accidents, pay attention to the following safety guidelines.

⚠️ **Don’t work in a combustible environment.** If you can’t set up a separate welding space apart from your woodshop, you can hang plastic welding curtains to isolate your welding area from combustible items. Alternatively, you can do your welding outside.

⚠️ **Get a metal welding table.** This welder’s work surface gives you a platform that’s safe, stable, and flat. The all-metal table makes it easy to ground your work and keep joining parts aligned for welding.

⚠️ **Wear protective gear.** Merkl recommends a welding helmet with an auto-darkening lens, a leather apron, work boots, and gloves designed for MIG welding.

⚠️ **Protect your lungs.** To avoid inhaling welding fumes, use a half-mask respirator with P100 filters.

⚠️ **Get the right fire extinguisher.** For working around electrical equipment, like a welder, get the dry-chemical type, rated ABC.

⚠️ **Clean steel before welding.** Simple Green or similar cleaning solutions will remove grease and grime for cleaner welds.

⚠️ **Avoid welding these materials:** plated, galvanized or painted steel.

Protection against light, sparks, and fumes. Gearing up for welding calls for the basic safety items shown at left.

- **Leather apron** ($25)
- **Helmet with shade 10 or auto-darkening lens** ($50-200)
- **Thick cotton sleeves** ($10)
- **Half-mask respirator** ($20)
- **Welding gloves** ($15)
Metalwork 101:
cutting steel

Before beginning to weld, you need to gain proficiency in cutting mild steel and doing some basic metalwork. Don’t mount a metal-cutting blade because a wood-cutting bandsaw runs at least 10 times too fast for cutting steel. Your least-expensive option for clean cuts is a metal cutoff saw, a metal-friendly chop saw equipped with a built-in work clamp and an abrasive wheel. You can find new models for under $100, but expect to pay a bit more for quality and durability. Abrasive wheels leave a good-sized burr on cut edges, which you’ll have to sand or file off afterward.

The best option for clean, square cuts on steel is a horizontal bandsaw (see photo, top right). A basic model costs around $300. For drilling and shaping mild steel, a drill press and stationary belt sander will work as well on metal as they do on wood, but remember never to combine sparks and sawdust. You probably have a lot of the other tools you’ll need: files, pliers, squares, etc. You can even use woodworking clamps with metal jaws to hold workpieces in place while you weld.

MIG: the best way to start welding

There are different ways to weld, and each technology has its advantages and limitations. For basic welding of mild steel, you can’t beat MIG (metal inert gas), a form of wire-feed arc-welding that works by causing a consumable wire electrode and the metal workpiece to melt and fuse together.

A solid, entry-level MIG welder costs around $500, and will do both MIG (with gas) and flux-core (without it). This type of welding rig will work on common 115-volt power. Kari has had good results with Hobart and Craftsman welders; she doesn’t recommend super-cheap welders from bargain outlets.

Cutting and drilling. A horizontal bandsaw excels at cutting tubular steel (top photo). To drill mild steel, clamp the work, use a slow speed, and lubricate the bit with machine oil.

Key components. Most welders include a spool gun that feeds the wire (and gas in MIG mode) and a ground clamp that attaches either to the metal table or the parts being welded. It’s helpful to buy a few extra tips for the gun, as these degrade over time and start adhering to the weld.
Welding is a simple process: An arc of electricity creates high heat that melts the wire and the steel on both sides of a seam. The parts are fused together when the molten puddle cools. It takes practice to master the movement and learn to see through the helmet lens. Before working on a welding project, practice your welding techniques on some scrap steel, as shown below. To learn more about welding, check out video instructions on YouTube, and the free instructional content at hobartwelders.com.

Practice straight lines first.
Hold the nozzle and protruding wire at a 60° angle. Pull the trigger and drag the gun in a straight line to dial in your pace and the rate the wire is being fed. The photo shows the results of different feed rates.

Add the swirl. Welders build up a strong bead by swirling the tip of the gun as they drag it along. Some use a half-moon swirl, while others prefer a drag-and-loop method. Try both and pick your favorite.

Use welding magnets.
You can use metal woodworking clamps and braces to hold parts in place for welding. But the welding magnets shown here are quick and effective to use on a steel-topped table.

Tack joints, then weld in between.
Since the heat of a full-on weld can cause metal to expand and throw a joint out of alignment, start by tack-welding all the joints in an assembly. Then return to each joint to complete the welds.

Weld the end assemblies. Brace the 3-part assembly square, and tack-weld each leg-rail joint together at tubing corners. Then weld to fill in between tack welds.

Starter project: build
To put some basic welding techniques into practice on a typical frame, Kari and I built a project together. Kari welded the base for a Parson's-style coffee table, and I added a solid wood top. To make the table frame, Kari went with the most basic
a Parson’s-style coffee table

version of arc welding, using wire with a flux core to eliminate the need for an argon gas supply. Flux-core welds are a bit rougher than MIG welds, but this type of welding is a better choice if you’re working outdoors, where there’s a breeze.

Prepare the ends. Deburr the ends of your parts with a metal file or stationary belt sander, and make a small chamfer that will be filled by melted metal during the welding process.

Drill for attaching the top. Drill and countersink the aprons while they are still separate. Slightly oversize holes allow for seasonal movement of the top.

Join long rails to end assemblies. Use clamps to keep parts aligned. Start with tack welds to lock parts in place. Let the heat dissipate before returning to do the full welds.

Clean up your work. It’s normal for a welded joint to have heat discoloration, as well as small beads of splatter and a residue of “slag.” Remove the splatter with a dull chisel. Then clean the weld area with a wire brush. Turn the page to finish the table.
There are as many wonderful ways to finish metal as there are wood, maybe more. From industrial-quality paint to powder-coating to chemical treatments for beautiful patinas—try BirchwoodCasey.com for those. But we’ll go with clean and simple: a basic cleanup and buffing, followed by two coats of paste wax.

**Final cleaning.** Use abrasive pads—rough, then fine—to remove the rest of the heat marks and scratches.

**Basic protection.** A couple of coats of paste wax provide a measure of rust projection and give the metal a dull sheen. Apply the wax generously, then buff off the excess.

**Top it off.** I made the top from Port Orford cedar, a hard type of cedar native to the Northwest and known for its beautiful grain. I made it 1\(\frac{5}{8}\)" thick, with a ¼" rabbet on the underside to make the top appear to float. That left 1\(\frac{1}{2}\)" of visible thickness to match the metal parts.

**Caps and feet.** There are different caps and feet available online for all sorts of steel tube sizes and shapes. We used the type that tap in firmly with a mallet and are threaded for leveling feet.