

The magic of hot-pipe bending

BY MICHAEL FORTUNE

This is a very easy technique for bending thin strips of wood to virtually any shape. Better yet, the simple apparatus is made from a few hardware-store parts.

You hold a strip of wood against a section of metal pipe heated by a propane torch. On the side in contact with the pipe, the lignin bond between the wood fibers is softened by the heat until it is pliable enough to bend partially around the pipe. Unlike steam-bending, there is no need to construct a

large steambox or substantial bending forms.

The curved sides of musical instruments such as guitars and violins have traditionally been made this way, but I use the technique to bend door pulls, curved moldings, salad tongs (shown at right), back slats for chairs, and many other items.

Most woods bend if the piece is thin

Unlike steam-bending, where only domestic hardwoods bend to any appreciable degree, you can use the hot-

Distinctive curves. The five back slats on Fortune's signature chairs are bent on a hot pipe.

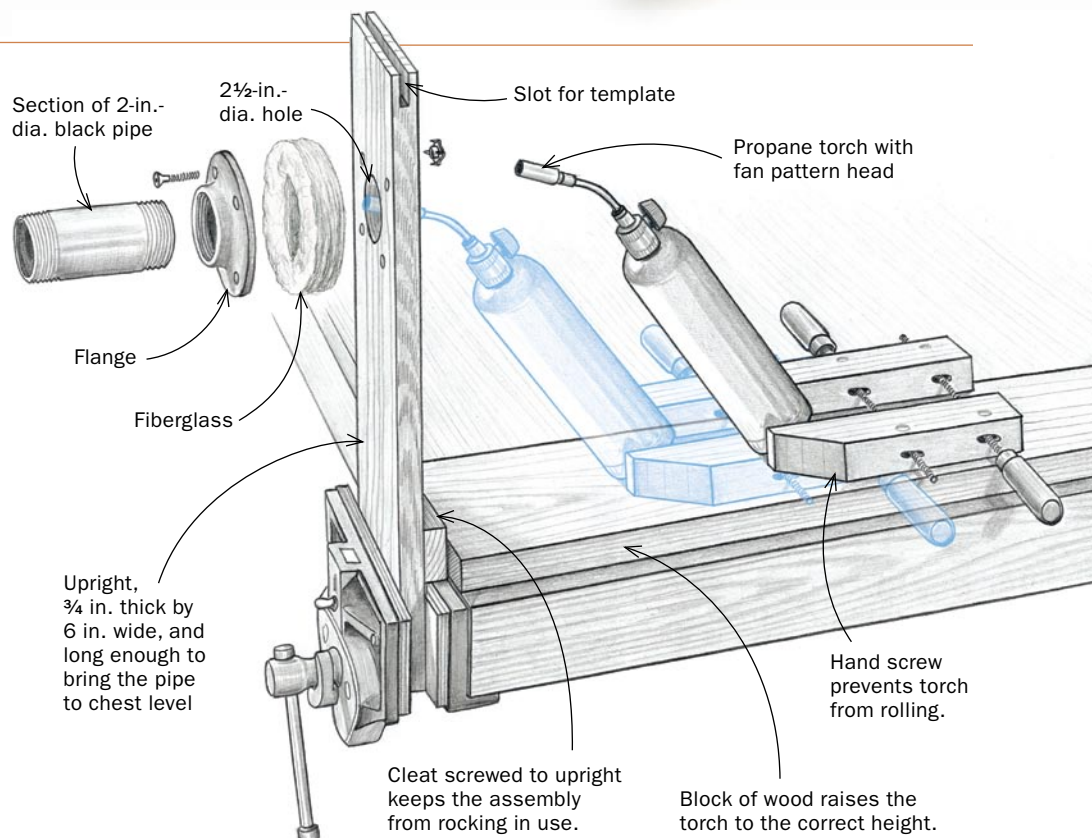


Getting set up

All the metal parts can be bought at your local hardware store, and you can make the bending jig in less than an hour.



Insulate the wood. A layer of thick fiberglass under the pipe flange keeps the board from burning. Cut away the fiberglass outside the flange (above). Sand off any protective coating (right) or heating the pipe will cause a lot of smoke.



Hot-pipe basics

pipe method to bend a broad range of species. As with steam-bending, straight-grained wood that has been air dried will bend faster, to tighter radii, and with fewer breakages than kiln-dried wood. You can use kiln-dried wood, just expect to break a few pieces and to take longer.

Woods that bend well on a hot pipe include red and white oak, ash, walnut, elm, hickory, and beech. Woods that bend with less success, particularly to tight radii, include cherry, maple, Australian lacewood, Macassar ebony, imbuia, East Indian rosewood, mahogany, domestic softwoods, and softer domestic hardwoods such as basswood and poplar. Avoid bending curly or figured wood and burls; they break easily.

The thickest piece that can be bent is $\frac{3}{8}$ in., and then only to a gentle curve.

This is due to the limited depth that the heat from the pipe penetrates the wood. Heating both sides won't help; it will just encourage the outside fibers to stretch and fail.

It is important to have consistent grain across the width of the piece. You might get lucky and find a wide board with consistently flawless grain, but I've found that 3 in. is about the practical limit in width. You need to make the blank only about $\frac{1}{8}$ in. wider and $\frac{1}{32}$ in. thicker



Light it up. Once the bending jig is complete, light the torch and slide the head into the pipe.



The right temperature. A stovepipe thermometer is a cheap and accurate way to tell when the pipe has reached 200°F, the right temperature to bend wood.



Wet the wood. To encourage air-dried wood to bend, soak it in water for about three hours. Fortune uses a section of roof gutter as a trough.



Hot and pliable. Once at the critical temperature, the wood is easy to bend around the pipe. For bends close to the end, grip it with Vise-Grip pliers designed for sheet metal.



Check your progress. Fortune attaches the bending templates to the top of the hot-pipe bending jig, making it easy to see when the workpiece has reached the desired radius.

Create a double-bent door handle in two stages



Check the first bend. Verify your accuracy by placing the first bend against the template.



Create the next bend. Being careful not to reheat the first bend, work on bending the second section.



Right all around. Check the second bend against the template. By the way, this handle works on doors and drawers.

than the desired finished piece, but if the piece is to be bent at the ends, it should be about an inch longer at each end to give locking pliers a place to grip.

Build the bending jig

I find it best to have the surface of the pipe at about chest level. This way it is easy to see the wood bend without straining your back. So, the length of the upright, which clamps into a bench vise, is determined by the height of the workbench and your own height. A cleat screwed across the back of the upright rests on top of the vise and eliminates the tendency for the jig to rock as pressure is applied to the pipe.

I advise starting with a 2-in.-dia. pipe and working down to tighter radii as you gain experience. Do not use galvanized pipe because it will give off a toxic gas when heated. Use regular black pipe, scraping or sanding off any protective lacquer or shellac. Cut a hole in the upright $\frac{1}{2}$ in. larger in diameter than the pipe. The heated flange must be separated from the wood with a gasket. I place a 2-in.- to 3-in.-thick wad of fiberglass insulation over the hole and then compress it as I screw the flange to the wood. After cutting around the outside of the flange to remove the surplus fiberglass, I turn the upright over and cut an X in the

fiberglass in the middle of the flange. I fold the fiberglass back and staple it to the edges of the hole. This protects the wood from heat.

The heat source is a propane torch, fitted with a head that shapes the flame into a fan pattern. Very little propane is used. The valve on the head is never opened fully, even when the pipe is being heated, and a $\frac{3}{4}$ -in.-long flame is sufficient to maintain the 200°F operating temperature of the pipe.

Have the tank sit at about 60° to the bench with the head about one-third of the way into the pipe. Secure the tank with a wooden hand clamp, if necessary using a block of wood to bring it to the right height. Make sure the tank cannot roll or slip out of place. An uncontrolled flame has no place in a workshop.

Coax the strips around the bend

Before lighting the torch, I make a profile of the shape I need from $\frac{1}{4}$ -in.-thick hardboard or plywood. It is then easy to overbend the wood strips and let them spring back to fit the pattern. With practice, it becomes easy to judge just how much and where to bend. If you are not using green wood, it helps to soak the strips thoroughly for about three hours before bending them.

Unlike laminating or steam-bending that relies on a form to provide the shape, this technique requires that you hand-form (coax, really) the part being bent to match the pattern. This can take from as little as a few minutes for $\frac{1}{8}$ -in.-thick strips to as long as 10 minutes

TIP

Holding a piece of nylon webbing on the outside of a piece reduces the risk of the outside fibers lifting and causing a split.



Lock down the pieces



A setting jig. Often, the template for checking the curve also serves this role.



Clamp lightly. If the workpiece has not been bent sufficiently while being heated, firm clamping will not finish the job. A few clamps or even masking tape should be all you need.

if you are bending $\frac{3}{8}$ -in.-thick material. Success means getting a feel for just how much surface area has to be heated and for how long, and how much overbending is required to achieve the correct result.

You can increase your success rate by holding a strap on the outside of the strip as it is being bent. This helps hold down wood fibers that want to lift and create a deeper split. The strap should be just wider than the piece being bent,

Online Extra

To watch Michael Fortune demonstrate his hot-pipe bending technique, go to FineWoodworking.com/extras.

and should not come in contact with the hot pipe. Nylon strap used for banding boxes is ideal and easy to find, while wider strips can be salvaged from old lawn chairs or a lawn-chair repair kit.

Let the wood dry in its new curve

Once the strip has been bent to the desired shape, it needs to maintain that shape while the wood cools and dries. This setting time can be as short as three hours for thin pieces or 24 hours for the thickest stock.

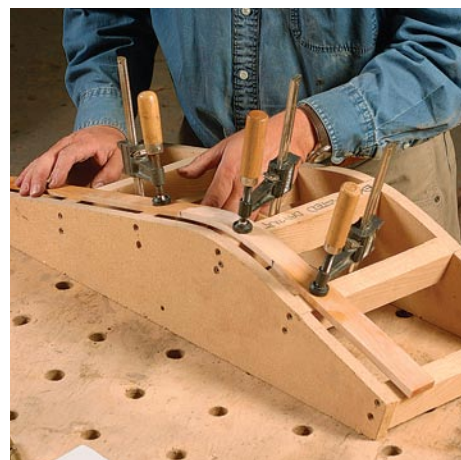
Ideally you want the piece to have a moisture content of 7% to 8% before starting to sand it or apply a finish. You can speed the process by placing the

pieces near, but not on, a radiator, or by having a fan blow air across them. Wood with pronounced medullary rays like red and white oak can develop checks on the plainsawn surface if it dries too quickly. I recommend putting a cloth or blanket over oak parts for the first 24 hours to retard surface drying.

You also need to maintain the curve while the piece dries. This can be as simple as a strip of tape across the bend, or you can build a wooden setting jig the same shape as the pattern. The bent part rests in the setting jig secured lightly with clamps or tape. One cautionary note: Because the bent wood is initially damp, metal clamps will leave a stain. This is particularly evident with woods high in tannin like oak and walnut.

Air needs to reach both surfaces of the drying workpiece to prevent warping or cupping. Therefore, the setting jig should be a frame rather than a solid surface. For simple “U” shapes, I just stick the piece in the open jaws of my wooden bench vise to hold the desired curve.

Once the parts have set to their new shape, they will have little memory of ever being straight. However, ends that are not restrained will have a tendency to move with changes in humidity. Parts bent this way also should not be immersed in water for any length of time, as they will straighten. □



Multiple parts. If you are making several identical parts such as chair back slats, it can be quicker to build a single large setting jig.



Held in a vise. You may be able to dry small parts by clamping them lightly in a bench vise.