

A mid-century style folding step stool

Michael T Collins takes a step up

There are hundreds of designs featuring stools that transform into step stools. Some are called library stools and others kitchen stools. But I have never seen a design quite like the one that our family has used for the last three decades. Over the years my children have used it as a highchair, side table, step stool, stool and part of an imaginary shop till.

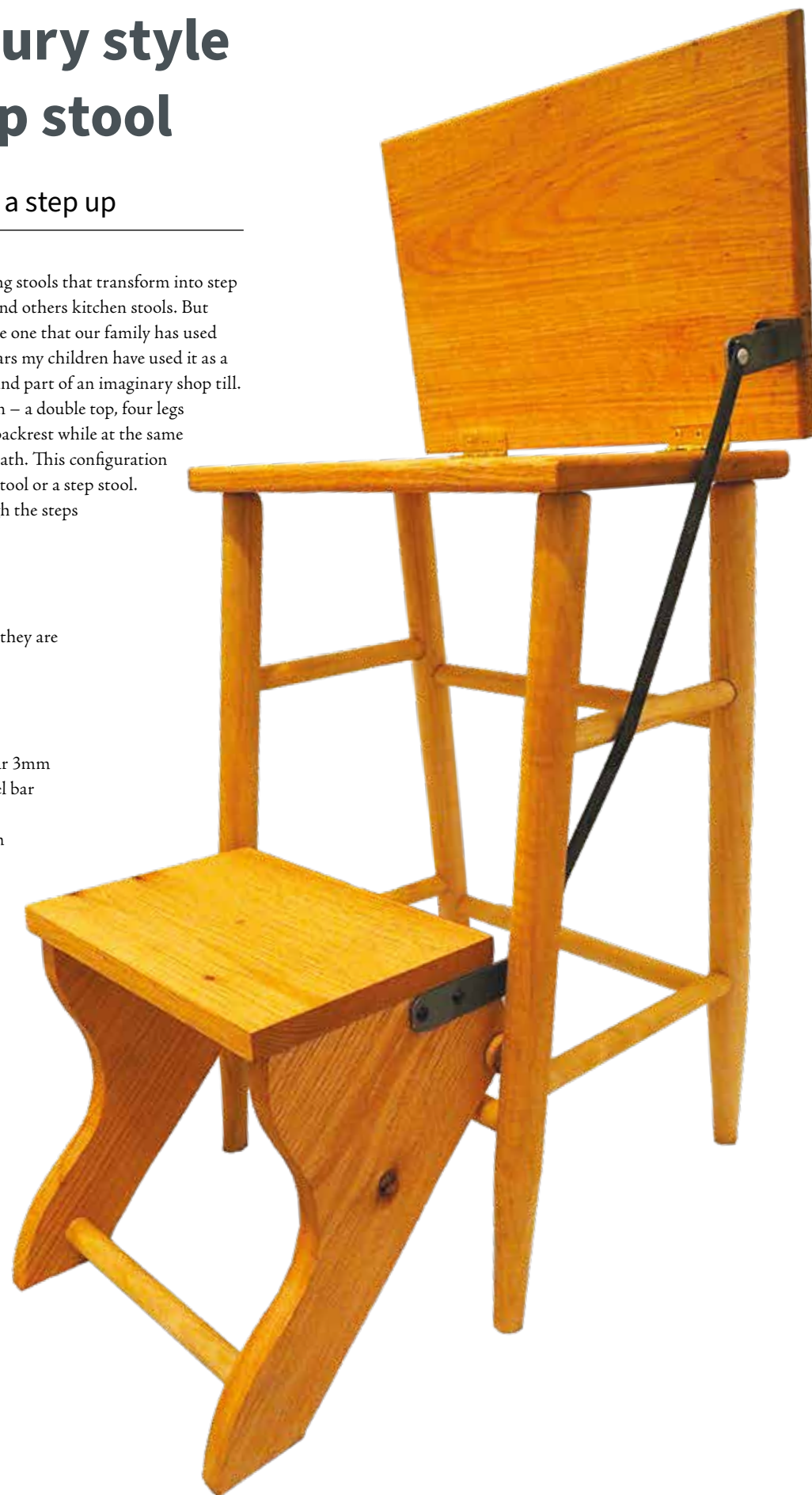
It's a very simple mid-century design – a double top, four legs and when the top is lifted it creates a backrest while at the same time lowers a small step from underneath. This configuration makes this an ideal child's highchair, stool or a step stool.

In this article I will take you through the steps (no pun intended) to make this stool.

YOU WILL NEED

- Legs – 4 x 35mm dowels, make sure they are longer than you need
- Rails – 1,000mm of 20mm dowel
- Fixed top – 355mm x 250mm
- Back top – 364mm x 265mm
- Close/open lever – 1 piece of steel bar 3mm x 10mm x 475mm and 1 piece of steel bar 3mm x 25mm x 250mm
- Step pivot – steel rod 310mm x 6mm

I chose to make the four legs using some hard maple that was just the right thickness. Alternatively, you could laminate boards to obtain the desired diameter. Failing both these options, there are many online stores that sell dowels in varying diameters.



PHOTOGRAPHS BY MICHAEL T COLLINS

- 1** The wood was first ripped to a rad larger than the required dimension and then the edges ripped to form an octagon. With less wood to remove, turning them is a little easier and faster. Proceed to turn the legs on a lathe. If you do not have access to a lathe, you can use a drawknife and spoke shave to bring the stock down to the required size and, there is nothing to stop you leaving the legs with an octagonal profile.
- 2** Once they are at the correct diameter, taper the last 140mm. The taper is a gentle cyma curve from the full 35mm diameter to about 20mm. It can even be a straight taper, or indeed fully concave.
- 3** The top of the legs has a 25 x 30mm turned tenon. If you do not have a lathe simply mark the diameter of the tenon and the length on the top of the leg. Then saw the shoulder of the tenon (a piece of masking tape on the blade will help with judging the depth of cut). Then with a chisel, chop the waste to the tenon's shoulder line and clean up with a rasp. Regardless of the method used, check the diameter – I typically use a spanner to check diameters.

THE SEAT AND BACKREST

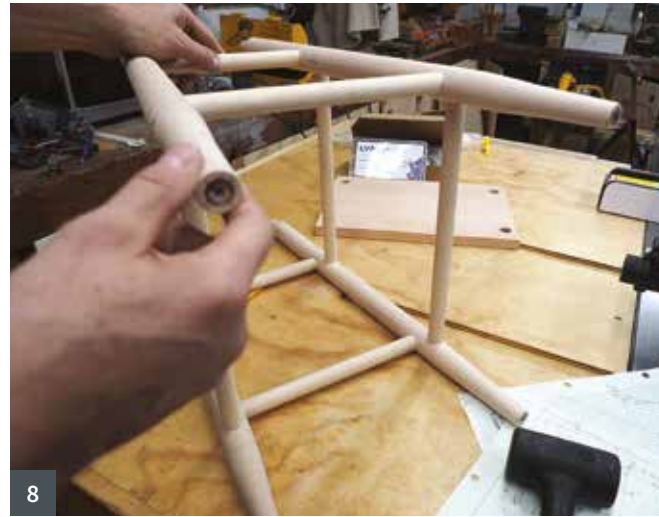
The top consists of two pieces of 20mm maple.

- 4** Cut the wood to size and with an appropriately sized roundover bit (I used a 9mm), rout the four top edges of the top/backrest.

The underside edges need only be eased to remove the sharp edge. The fixed seat just needs its edges eased. I generally use a block plane to ease edges.

THE MORTISES

- 5** Mark the location of the mortises. From the side the stool legs splay symmetrically at approximately 7° from the vertical. From the front the legs are vertical.
- 6** Drilling these mortises accurately involves a little angle work and the use of a bevel gauge. Set the bevel gauge to the splay angle and tape it in position in the corner of the seat. Now proceed to drill a 25mm hole from the top. It's a good idea to secure a piece of scrap wood on the underside of the board to prevent tear-out. Once all the holes are drilled, test fit the legs and position them so that the best face is forward. This is particularly true if you laminated the legs and do not want the seam to show from the front. With the stool assembled, mark the location of the seven rungs on the legs. The front of the stool only has one lower rung. The rungs are made from 20mm dowels and are seated into a 15mm mortise, again the bevel gauge will help with the angle for the side rungs – the angle is the complementary angle to the splay (90° – the splay angle). The front and back rungs are perpendicular to the legs.



7 To drill at the correct angle in the legs that splay, tilt the drill press table to the splay angle and hold the legs securely perpendicular to the tilt. Alternatively hold the legs in a vice at the required angle and drill by hand. Cut all the rungs to the required length adding the 30mm that goes into the mortises.

8 Dry fit the rungs into the leg mortises. These should be tight fitting (do not drive them home, they will be hard to take apart). The original stool had very simple rungs without any shaping, of course, there is nothing to stop you adding some embellishments to your rungs.

THE STEP

Because the step is pivoted between the front legs it needs to be made and assembled prior to putting the rest of the stool together. The step can be created using any joint you want. For simplicity, I opted to use butt joints held together with Dominoes, but a dowel joint would be just as strong. If you decide to do a different joint, such as a dovetail, you will need to allow for the additional 20mm height of the step legs.

9 Using the template, draw the outline on your stock so that the grain runs down the leg.

10 Cut out the legs on the bandsaw or use a coping saw.

11 Fine tune with a rasp and or spokeshave.

12 Once the two side pieces are done, drill a 6mm pivot hole through

the first leg of the step. Then use this as the guide to drill the hole in the other step leg. Now drill 6mm diameter pivot holes 20mm deep into the inside edge of the two front legs. It is important to get this pivot point in the correct location else the step will not open parallel to the floor and the mechanism will prevent the backrest from opening fully.

13 Ease the edge of all the parts with a block plane and sand all the parts of the step.

14 Using your joint of choice (I used Dominoes), assemble and glue the parts together.

Note: The legs are set back from the edge 3mm to create a small side reveal. If you used dovetails you will need to allow for this.

15 In order to glue this step together you may need to come up with some creative clamping techniques. Clean up any glue squeeze out.

MAKING A WOODEN WASHER

16 So that the step does not rub against the front legs when pivoted, you will need to place a 6mm washer between the stool legs and the step legs. I would suggest a couple of nylon washers, or if you feel adventurous turn them.

17 Drill a 6mm hole and then cut them apart.

18 Position them on the pivot rod.





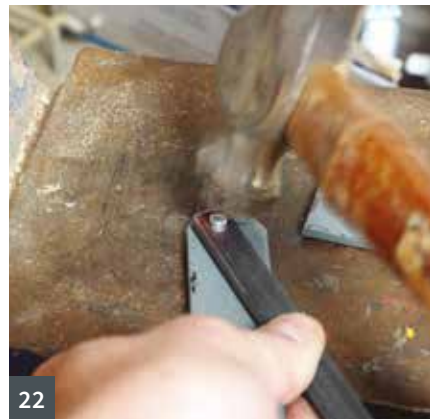
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PUTTING THE LEGS TOGETHER

It's now time to put the rest of the stool together. Assemble the back legs and rungs, and then add the side rungs and attach the fixed seat. You may have to persuade the tenons into place – fortunately the splay angle is such that inserting all four tenons is quite easy. Once hammered home, check that all the other joints are well seated in their mortises.

19 Most tenons are wedged onto the seat, but I wanted to use an unconventional method... I drilled a 6mm hole in the ends of each tenon and glued and hammered a dowel into the hole. This gave a very attractive appearance and did its job of forcing the tenon into the mortise walls.

ATTACHING THE BACKREST AND HINGE LOCATION

20 The backrest and the seat are flush at the back and overhang on the other three sides by approximately 5mm. The hinges are surface mounted. (As you can see, I did this step prior to assembling the stool). I like to position hinges as I do for cupboard doors, viz. each hinge is one full hinge length from the edge of the wood. Note: when using brass screws in hard wood always use a steel screw first to cut the threads, then use beeswax on the brass screw prior to driving it home with a hand held screwdriver. At this point I gave the whole stool a coat of Danish oil diluted 50:50 with mineral spirits. This was rubbed into the wood, left for a few minutes and then any excess was wiped off.

THE OPENING MECHANISM

21 Cut the steel bar into pieces as indicated by the diagram and then

with a file round each of the ends and remove any burrs. The middle section needs to be bent into a subtle 'S' (see diagram) so that it can negotiate the rungs when opening and closing.

22 Secure the ends by drilling 3mm holes in the centre of each end and rivet together.

Note: Make sure that you have secured the steel bar when drilling – it is all too easy for the drill to bind and you end up with dangerously spinning metal – ask me how I know... I used a ball peen hammer to rivet the pieces together. It is only necessary to round over the ends to stop them pulling back through the holes. Don't peen too hard as you will run the risk of cinching the bars together. You want them held together so that they move past each other without any play in the connection. An alternative method is to use round head machine screws and lock nuts. However, these may interfere with the rungs when the top is opened and closed. You will need to experiment a little if you have never used riveting.

23 Make an 'L' bracket. The steel I used could easily be bent, but to get a crisp 'L' I needed to heat the steel and then hammer into shape.

24 Once the linkage is made, drill two holes in the 25mm bar and the 'L' bracket and with the stool on a flat surface, open the backrest and the seat and, holding them in the correct location, secure the linkage mechanism in place with screws. I found it easier to secure the bar to the step first and then create the 'S' bend in situ.

THE FINISH

You can finish the stool with your finish of choice. Our original stool had many layers of paint that were cleaned off years ago to reveal the original maple. I chose to give this new stool a few more coats of Danish oil. And there you have it – a functional mid-century stool that children and adults will enjoy for generations to come.

