

Build a Curved-Leg Stool



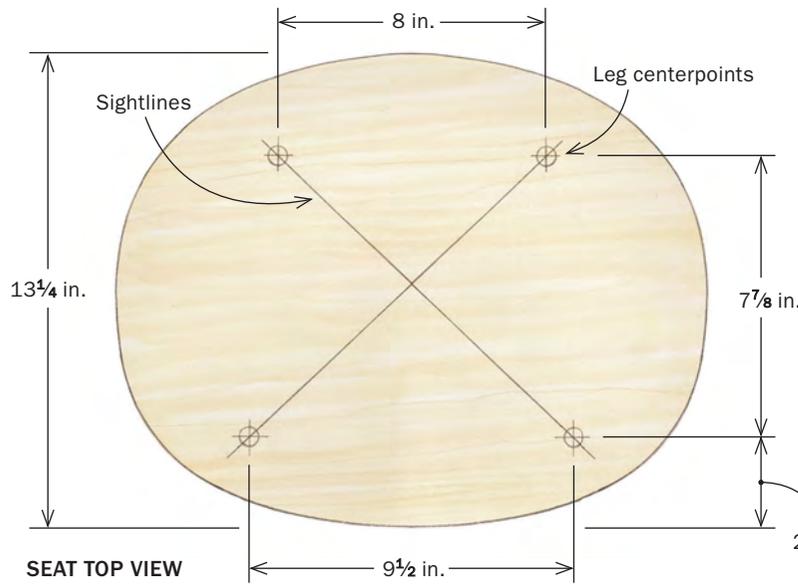
Simple bends provide stability and visual flair **BY PETER GALBERT**

Making my way into chairmaking was a long process, and between early chair attempts I built stools to help advance my turning, shaping, and joinery skills. Stools not only offered quick and invaluable lessons in the craft, but they also supplied my workshop and my house

with some of the most enduring and useful pieces that I've ever produced. Among my favorite designs is this curved-leg bar stool. It's comfortable, light, and useful, and its bent legs add an elegant flair, offering the stability of a larger footprint without affecting the slim silhouette of the piece.

Unlike most of my chairs, this stool can be made using wood from planks instead of logs, although care should be taken to select straight-grained material of a suitable strength and ability to bend. The bend is slight enough to be made in kiln-dried as well as air-dried wood.

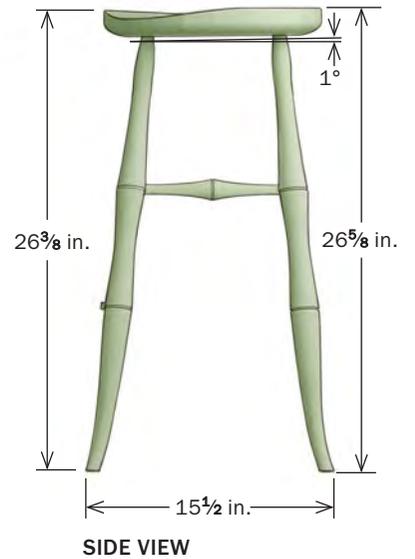
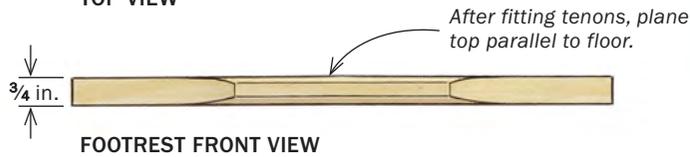
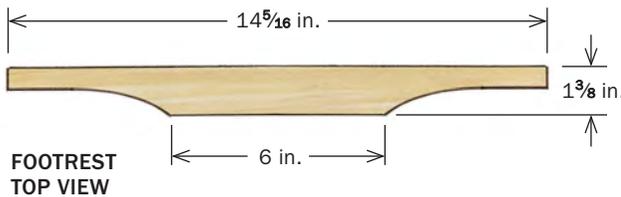
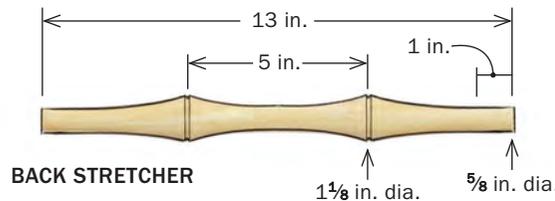
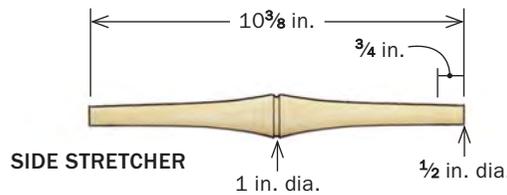
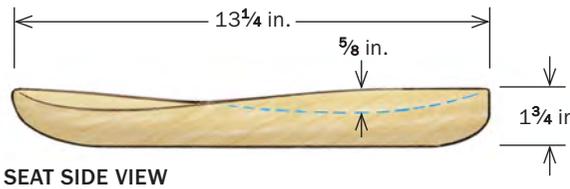
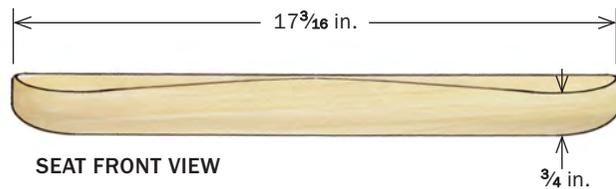
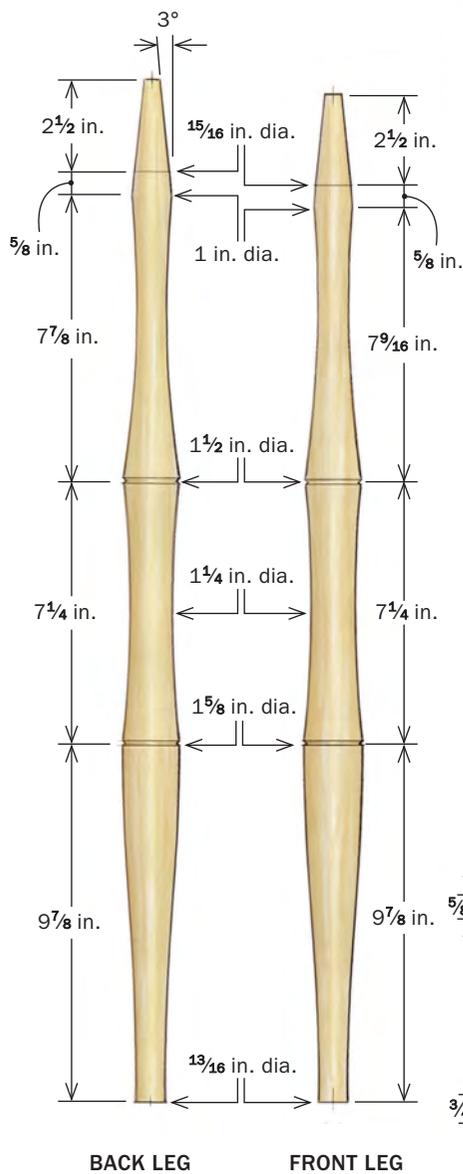
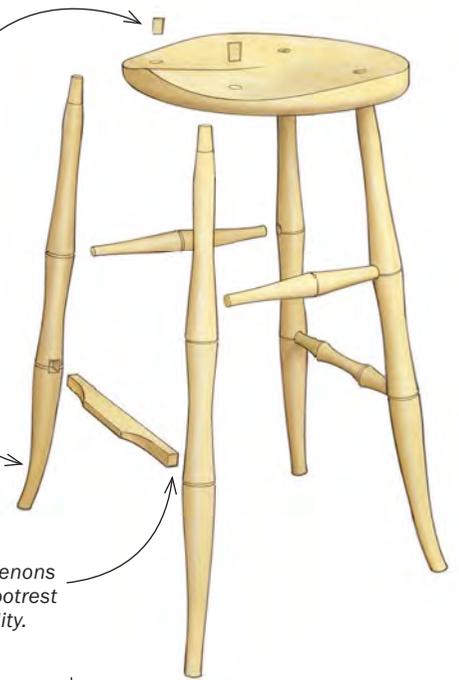
A STURDY, STYLISH STOOL



Wedged through-tenons attach the legs to the carved seat.

The legs are turned, then their bottoms are steam-bent.

Square tenons on the footrest add rigidity.



Begin with the legwork

GET THE LEGS TO THE LATHE



Sawn or split. If you don't have green wood to split from the log, you can saw your leg stock from lumber.

Turn and bend the legs

Turning the long, thin legs without letting vibration creep in takes patience and sharp tools. Be careful also with placement of the V-grooves, as they determine the location of the stretchers. And take care to get the shape of the lower portion of the leg just right. It's not a straight taper, but a slight reverse curve from convex to concave.

Once the legs are turned, it's time to build the bending form. It is made from two pieces of $\frac{3}{4}$ -in. plywood, each band-sawn to the shape of the leg's curve. Tilt the bandsaw table 25° for the cut, so when the two halves are screwed together, there's a channel along the curving edge to cradle the leg. I line the channel with $\frac{1}{2}$ -in. hard felt. When the leg goes into the form the felt compresses, conforming to the leg without making dents or flat spots. Three small clamping blocks, also V-shaped on the edge and lined with felt, are attached by swiveling arms to the main form.

Begin the bending by boiling 2 in. of distilled water in a tall pot. I make a plywood lid for the pot with a hole drilled in it for the leg. A rubber band wrapped around the leg acts as a stop and keeps the leg from getting stuck when it swells. Depending on the stock, as little as 45 minutes in the steam may suffice. When you pull the leg from the pot, insert the foot in the form and secure it with clamps. Then, using the length of the leg as a lever, draw the top of the leg to the form and clamp it in place. The leg can come out of the form once it has cooled (in an hour or so) or overnight if you want a more

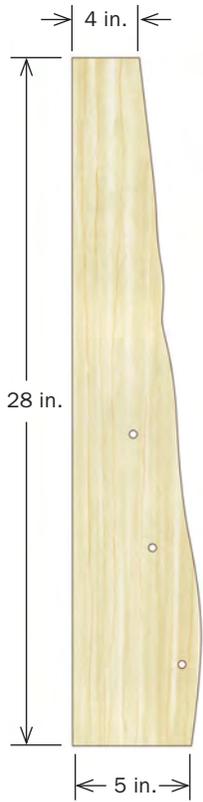


Tapered tenons. While turning the tapered tenons at the top of the legs, Galbert uses a template placed on the lathe bed with a 6° taper drawn on it as a guide.



Double curve. To turn the S-curved bottom section of the leg, where the bend will be, first make a long shallow concavity, then complete the shape by cutting downhill to create the adjoining convex section.

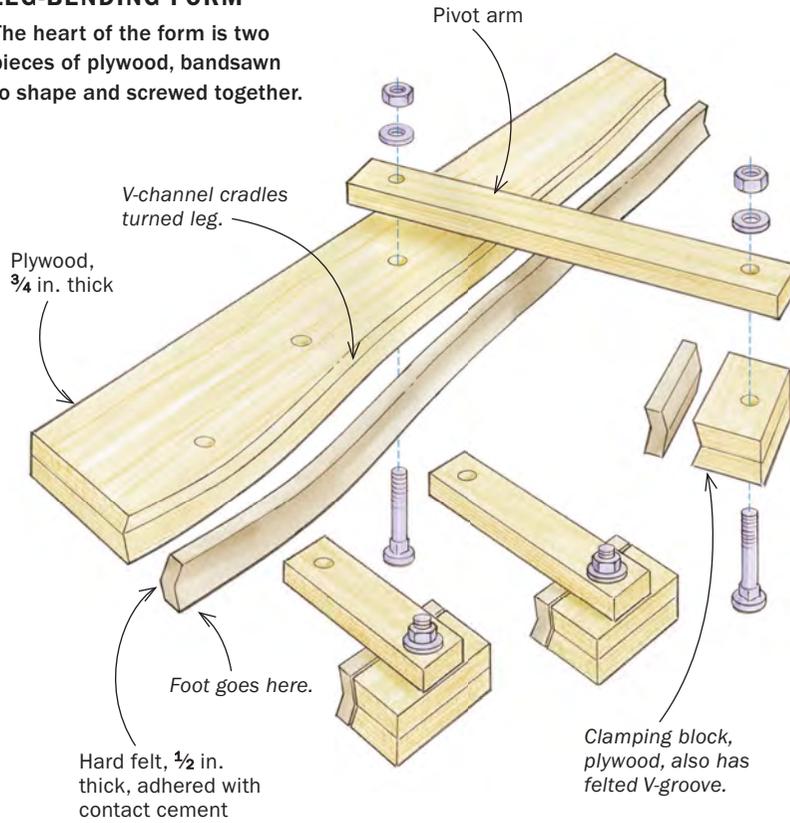
A GENTLE BEND



PLYWOOD PROFILE

LEG-BENDING FORM

The heart of the form is two pieces of plywood, bandsawn to shape and screwed together.



Bandsaw the bending form. With the bandsaw table tilted to 25°, Galbert saws a piece of 3/4-in. plywood to the shape of the leg bend. A second piece of plywood with the opposite angle will complete the bending form.



The form gets felted. After screwing the two halves of the form together, use contact cement to glue a strip of 1/2-in.-thick hard felt to the V-grooved edge.

One leg, well cooked. Boil 2 in. of distilled water in a good-sized pot with a lid you've drilled to accept the leg. A rubber band around the leg keeps it from getting stuck when it swells. In 45 minutes or so, the leg is ready to bend.



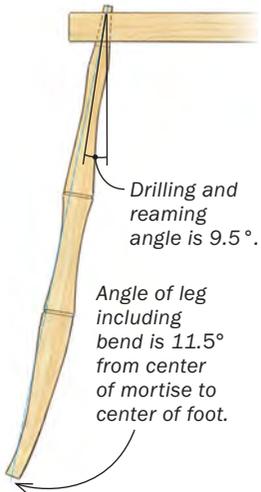
Foot first. After removing the leg from the steam, wrap the foot in plastic wrap (to keep it from losing moisture too quickly) and insert it into the bending form.



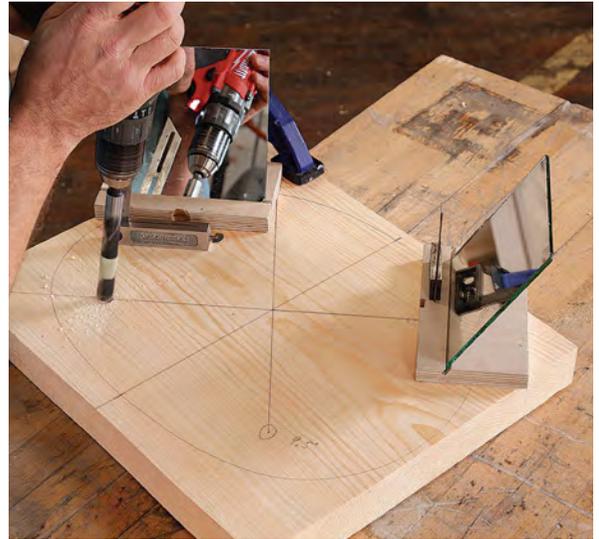
Clamp it to a curve. After clamping the foot in place, use the leg as a lever and make the bend, then lock the top end in place with a clamp. When placing it in the form, rotate the leg so the growth rings on the end grain are vertical.

Create the seat

DRILL AND REAM THE LEG MORTISES



Draw the drilling angles. To create the layout that will direct the drilling, connect the mortise center points on the top of the seat blank.



Two mirrors guide the drilling. To align the drill, place a bevel gauge set to 9.5° by the side mirror and a 90° square by the front mirror.

Online Extra

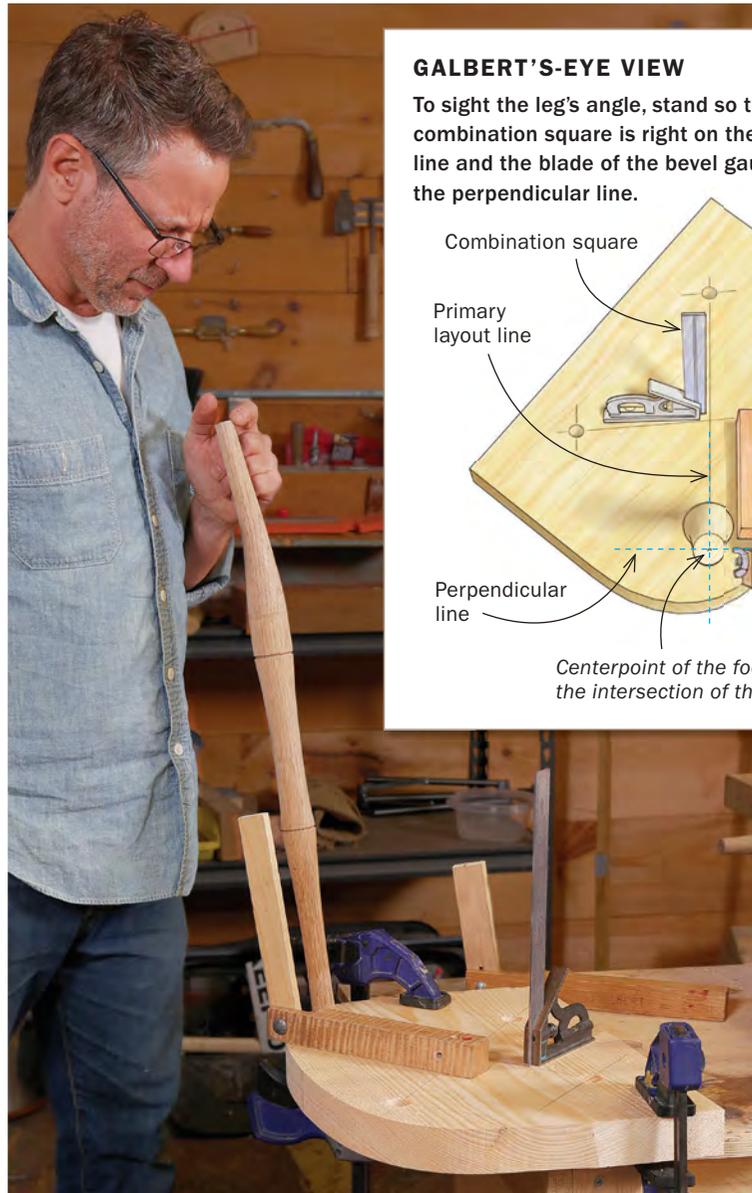
Learn how to ream mortises for a super-tight fit in a members-only video series at FineWoodworking.com/275.



Reaming comes next. After drilling through the seat blank from the top, then drawing sight lines on the underside, ream the mortises halfway home using the 9.5° angle.

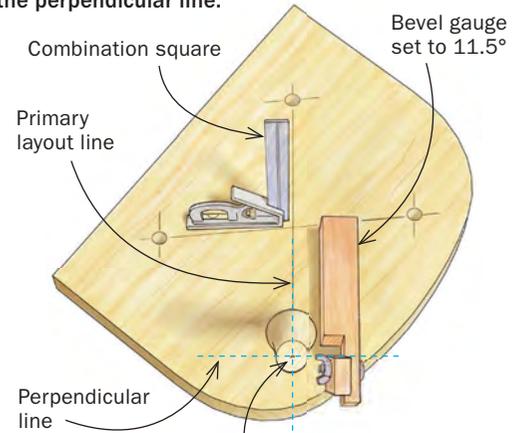


Aligning the leg. Sight down the leg, rotate it until the bent tip is pointing up, and mark the top end at that point. You'll use this to align the rotation of the leg with the seat's sightline.



GALBERT'S-EYE VIEW

To sight the leg's angle, stand so the blade of the combination square is right on the primary layout line and the blade of the bevel gauge just touches the perpendicular line.



Centerpoint of the foot should fall at the intersection of the two layout lines.

Finish reaming. After the first reaming, use the leg as a reference to finish up. The leg angle including the bend should be 11.5° . Galbert uses a larger shopmade bevel gauge set to 11.5° to confirm the angle.

SEAT SHAPING



First the dish. Using an inshave (or a large gouge) relieve a wide oval-shaped area toward the back of the seat. Galbert drills two $\frac{5}{8}$ -in.-deep holes to guide the depth of the dish.



Then the ramp. Use an inshave to carve an angled plane from the deepest part of the dish up to the front rim of the seat.

exaggerated bend. Dried wood—whether kiln- or air-dried—has the ability to hold a bend nearly instantly. But if you use green wood, leave the leg in the form longer.

If you are using white oak or have trouble with checking, consider wrapping the steamed section of the leg in clear wrap before inserting it in the form. This slows the loss of moisture and heat and helps prevent splitting. When the leg comes out of the form, wrap the foot in paper to slow the moisture exchange.

On to the seat

With all the legs turned and bent, it's time to drill and then ream the leg mortises in the seat blank. Lay out the center points of the mortises on the top of the seat, then draw sight lines by connecting the center points. The angles for all the leg mortises are the same— 9.5° . I drill them with a $\frac{5}{8}$ -in. drill bit using a two-mirror setup to guide me. Once the holes are drilled through the seat, transfer the sight lines to the underside of the seat so you can start reaming. Using a square and a bevel gauge to guide the tool, ream at the same 9.5° angle until the legs seat about halfway into the holes.

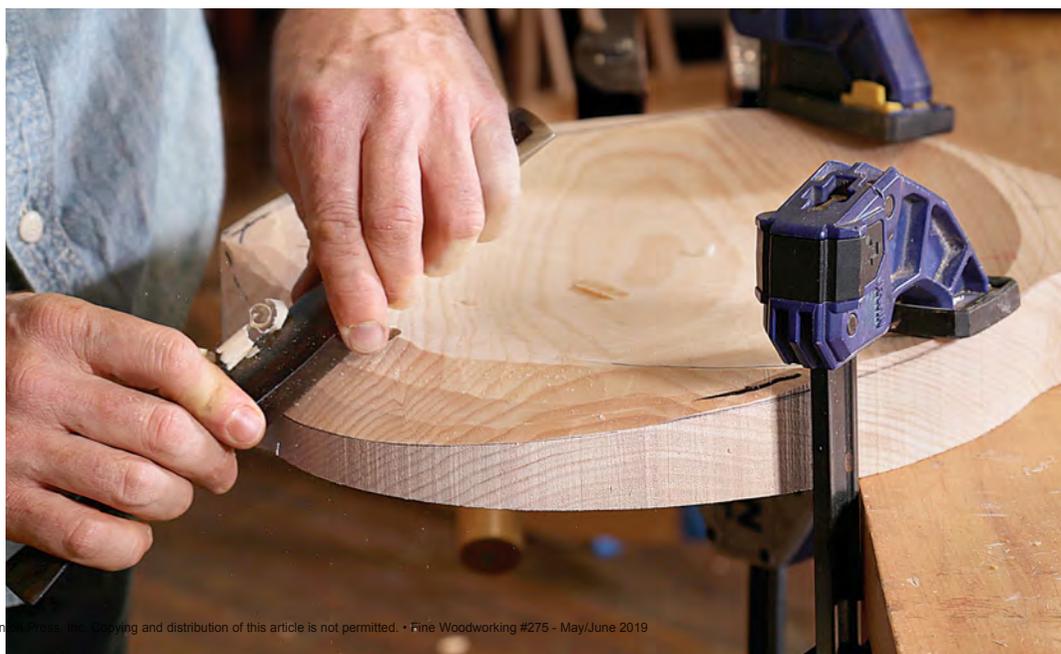
Next, to adjust for any variation in the leg bends, I finish reaming while using the leg as a reference. I set a large shop-made bevel gauge to 11.5° and use it to be sure the centerpoint on the tip of the leg aligns with the centerline of the mortise. If it doesn't, I tweak the reaming until it does.

With the legs fitted I move on to carving the seat. This can be done with gouges,



Edgework. Flexible thin plastic makes perfect template material for laying out the shaping at the edge of the seat (far left). To shape the edge, Galbert uses a drawknife to create a series of chamfers, first broad, then narrower.

Spokeshave blends the facets. After shaping the edge with drawknifed chamfers, blend them to a fair curve with a spokeshave.



Stretcher joinery

DRILL FOR THE STRETCHERS



Elastic guideline. Find the center point for the stretcher mortise by sighting between the two lines of a rubber band strung around the legs.



Extension for accuracy. An extension rod supported at the near leg makes it easy to drill accurate mortises. Before drilling, rotate the leg just enough to drill squarely into it.



Dowels determine distance. After drilling the mortises for the side stretchers, insert dowels and use the rubber band method to mark for the back stretcher and footrest mortises.



More mortises. With one dowel removed so he can rotate the leg, Galbert drills a centered hole. In place of the dowel, he clamps a board across the back to maintain the correct leg orientation.



From round to square. A V-block helps strike a square line at the top of the footrest mortise. Galbert colors the inside of the drilled hole with a marker to guide him as he chops the hole square. A shopmade cradle holds the leg level and wedges provide support beneath the chiseling.

spokeshaves, and scrapers, but traditional chairmaker's tools will speed the process and add to the fun. Two holes drilled $\frac{5}{8}$ in. deep locate the deepest part of the carving. With an inshave, I carve a bowl shape toward the rear of the seat, working almost to the bottom of the depth holes. Next I use the inshave to carve a plane angling up from the bottom of the bowl to the front of the seat. For both the dish and the plane, I follow up the inshave with a travisher. Then, using a drawknife, I relieve the front edge of the seat where the sitter's thighs pass over it. I refine this area with a spokeshave. The carving on the underside of the seat is all done with the drawknife and finished with the spokeshave. I leave a small flat at the front and back of the seat top to make clamping in a vise easier. Those flats are easily shaped after assembly.

Stretcher time

To simplify drilling the stretcher mortises, I attach a 16-in. length of $\frac{1}{2}$ -in.-dia. round steel stock to my drill bit with a motor-shaft coupling. I drill with the legs socketed into the seat, and there's no need for measuring angles. Start by orienting the legs in the seat and marking the center points of the side stretchers on each leg. To support the rod while drilling the mortise in a back leg, clamp a board to the front legs $\frac{1}{4}$ in. below the center point of the V-groove. This centers the $\frac{1}{2}$ -in. extension rod on the groove. Before you drill, rotate the leg just enough so the bit is pointing to the center of the leg. Then drill 1 in. deep.

After drilling for the side stretchers, I cut dowels the length of the stretchers and put them in the newly drilled mortises. This ensures accuracy as I mark for the front

TURN THE STRETCHERS AND SHAPE THE FOOTREST



Stretcher tenons. A Sorby sizing tool simplifies turning the tenons on the stretchers. Galbert makes a cut to full depth at the very end, but creates the rest of the tenon with a series of gradually deeper sideways slicing cuts.



Mill and shape the footrest. Galbert mills the footrest blank to a thickness that just fits the height of the mortise. After bandsawing the blank to shape, he fine-tunes the overall shape—and the tenon's fit—with a drawknife.



After fitting, make it flat on top. Because the legs are angled, the footrest tilts upward slightly. To make its top surface parallel to the floor, set a pencil to strike a line at the height of the top back edge.

SOURCES OF SUPPLY

REAMER

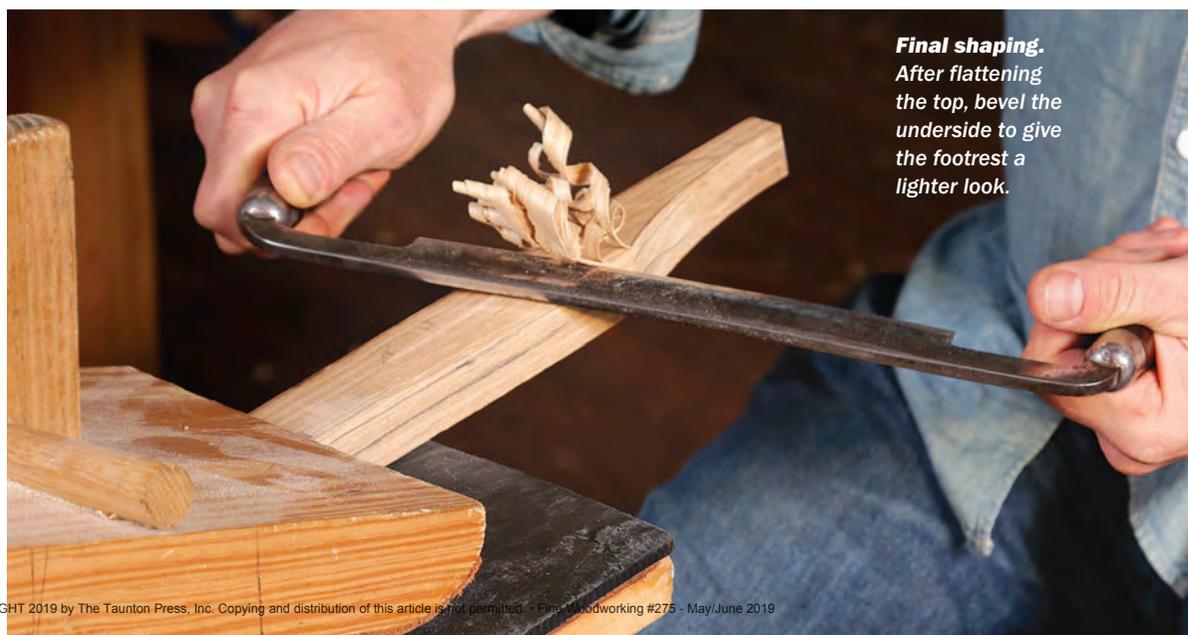
Made by Tim Manney
@tim.manney on Instagram
or via email at tmanney@gmail.com

HARD FELT

$\frac{1}{2}$ -in. off-white hard felt
durofelt.com

SHAFT COUPLING

amazon.com
grainger.com



Final shaping. After flattening the top, bevel the underside to give the footrest a lighter look.

Assemble the stool



Front and rear first. Using Old Brown Glue, which has a leisurely open time, Galbert begins assembly by gluing in the rear stretcher and the footrest.



Front to back. Connect the front and back assemblies by gluing in the side stretchers.

and rear stretcher mortises and repeat the drilling procedure. Then I square up the footrest mortises with a chisel.

To make the footrest, mill a board so its thickness matches the height of the square mortise. Cut the footrest to rough shape at the bandsaw, then use a drawknife to fit its tenons to the mortises. The rake of the legs will cause the footrest to angle upward slightly. I level its top to the floor with a drawknife and spokeshave. Then I taper the underside to lighten the look of it.

Stool assembly

I assemble the stool with liquid hide glue (from Old Brown Glue), which allows the very tight joints to seat without seizing. I start by gluing the footrest between the front legs and the back stretcher between the back legs. Then I join those two assemblies with the side stretchers. Once the



Dry tenons. Fit the legs up through the seat without glue, and make marks for tenon wedges perpendicular to the seat's grain direction.



Kerfs for wedges. After removing the legs from the seat, follow your layout lines to cut kerfs for the tenon wedges.



Glue and bang, then drive a wedge. To knock the legs home at final assembly, Galbert elevates the inverted stool on spacers. Then he flips the stool and glues and drives the wedges.

TRIM THE FEET



Dial in a slight cant. The front legs are shorter than the rear ones, angling the seat forward 1°. Galbert uses his iPhone to measure the angle and puts coins under the feet to adjust it. Then he marks each foot and saws at the pencil lines.

legs are all connected, I insert their tenons—unglued—into the seat and mark for wedges. After cutting slots for the wedges, I glue and wedge the legs in place.

Finally, I level the legs, trim the through-tenons, and finish off the top of the seat with spokeshaves. After a careful scraping, I apply milk-paint and an oil finish. □

Peter Galbert is a chairmaker and teacher in Rollinsford, N.H. Full-size plans for his stool are available at petergalbert.com.



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Watch Peter Galbert make this stool at Fine Woodworking Live 2019

FINISH THE SEAT



Flush to the seat. When the glue has cured, cut the through-tenons flush. Where the saw can't cut flush, follow up with a shallow gouge.



Finishing touch. With a spokeshave, Galbert cuts a defining chamfer around the back edge of the stool.