A Moravian Footstool

Angled dovetails for strength and beauty

by David Ray Pine

Cutting angled dovetails isn't any more difficult than cutting dovetails that meet at right angles, even though they look as if they would be. And angled dovetails can make very strong and attractive joints, as in the footstool shown in the drawing above. The stool is a reproduction of one that was very popular in the old Moravian town of Salem, N.C., in the late 1700s. The single-board top is joined to the two legs with through dovetails so the legs splay at 19° from perpendicular. This sturdy little stool is an excellent example of joinery that's been applied correctly to meet a specific function both visually and structurally. Visually, the angled dovetails present themselves nicely on the obtuse corner of the stool. Structurally, the splay of the legs keeps the stool from racking side to side and the shape of the tails cut on the top resists the outward force on the angled legs as weight is applied to the top of the stool.

All you need to build this stool is one ¾-in.-thick hardwood board, 30 in. long by 6½ in. wide. This will be the finished width of the top. The legs will be ripped down to 5⅞ in. wide after they're crosscut from the board. The ⅝-in. difference in width between the top and legs allows a 5/16-in. overhang for the molded edges on the top (see figure 1 above). For crosscutting the top and legs to length, tilt the sawblade to 19°. The angles on the opposite ends of the top both splay away from the upper face so that when the top is viewed from the edge, it's a trapezoid. Conversely, the opposite ends of each leg should angle in the same direction, forming a parallelogram when viewed edgewise. If the finished length and height of your stool is critical, cut the parts a bit long, 1/32 in. for legs and 1/16 in. for the top, so you can cut the pins and tails to protrude 1/32 in. past their mating surfaces when the joint is pulled up tight. Cutting the parts a little long is a common practice with dovetails because it's much easier to plane the ends of the pins and tails flush with the faces of the boards after glue up than it is to plane the faces flush with slightly undercut pins and tails.

Drawing: Bob La Pointe

The first step in making 90° dovetails is scribing a line around the end of each piece with a marking gauge set to the length of the tails and pins. But, with angled dovetails, a standard marking gauge won't work because the ends of the workpieces aren't square with the fence of the gauge. If you're only cutting one or two joints, you can use a square to scribe lines on the boards' faces and an adjustable T-bevel to transfer the angle across the edges. However, since I build these stools 6 or 12 at a time, I made a marking gauge specifically for 19° angle dovetails on ¾-in.-thick stock. By making the gauge with an obtuse angle (109° for the stool), I can use it to scribe the acute side as well by holding the beam of the gauge down on the surface of the board and running the inside corner of the gauge's angle along the acute angle on the end of the board (see the top photos at right). If you make a marking gauge for angled dovetails, don't forget that the depth of the pins and tails is measured along the angle so it will be greater than the thickness of the stock. My gauge for the footstool actually scribes a line 27/32 in. from the end of the board to allow for the angle plus 1/32 in. for the pins and tails to extend as mentioned earlier. Joining boards of two different thicknesses requires two gauges that have scribing points at different distances from the angle.

Next, lay out the ends of the pins on the legs just as you would a 90° joint, with a half-pin at each edge and the other pins evenly spaced between. Square the pin lines down to the scribed length, and then saw them with a backsaw, stopping at the scribed lines. If you love handwork, or only have a few joints to cut, you can chop out the waste between the pins with a mallet and chisel. As with any dovetail, chisel from both sides toward the center, to avoid splitting out the grain on the board's face, and slightly undercut toward the center of the board. Here's another place where I use a fixture to speed the work for the stools. I made a "pitchboard," which presents the pins at 19° to my bandsaw blade, so I can saw most of the waste away, as shown in the bottom photo at right. In this way, I have only to chisel out the triangular piece left alongside each pin and pare the bottoms of the tail sockets cleanly to the scribed lines. Be sure to make the ramp of your pitchboard long enough so that you can also use it to bandsaw the tails on the stool's top, which is the next step.

After the pins are done, lay out for the tails by standing the pins on the inside of the top board with the wide end of the pins on the scribed line. Now, trace around the pins with a knife, and square the lines from the pins across the end of the board. You can saw the tails out by hand for just a few joints, but if you're making multiples and you already have the pitchboard, you can use it to bandsaw the waste from between the tails. In either case, finish up the tails by paring to the scribed stop lines with a chisel and the joint is ready for assembly. Depending on how confident you are about your dovetail skills, you may need to test-fit the joints and fine-tune them.

All that's left are the finishing touches. Cut the molding profile on the edges of the top with a molding plane or shaper and lay out for the finger hole. Drill two 13/16-in.-dia. holes, 1¾ in. apart, and then with a coping saw or scroll saw, cut out a 1-in. by 1½-in. rectangle to connect them, as shown in figure 1. Draw and bandsaw the 2⅜-in.-radius gothic arch on the bottom of each leg and clean up the cut using a drum sander or by hand-sanding.

Now you can glue up the dovetails. Spread glue on all mating surfaces and, bracing the legs of one end piece against a stop fixed to the workbench, drive the top onto the pins with a rubber mallet. The original Moravian footstools, which this stool was patterned after, had triangular glue blocks nailed behind each joint for added reinforcement. Unfortunately, the grain of the blocks ran cross-grain to the stool's top and legs, leading to problems when the stool's boards expanded or contracted. On the reproductions that I build for Old Salem, I cut the blocks so their grain coincides with that of the stool, and glue and clamp them in place immediately after assembling the stool. Clamping from the base of the triangle to the outside corner of the stool ensures that when the glue sets, both legs will be at the prescribed 19° angle at which the triangles are cut. However, because angled dovetails are so mechanically strong, you might want to assemble your stool before gluing it up and give it a weight test. If your joints are well made, you may decide that the glue blocks are unnecessary. □

A shopmade marking gauge makes it easy to scribe lines for the pin and tail depth. Two blocks are glued and screwed together at the angle of the stool's joint and a nail scribes the line. The gauge's obtuse angle makes it possible to mark the same distance from the end on both sides of the board.

The author bandsaws most of the waste from between the pins using a pitchboard to support the leg at a 19° angle. The pitchboard can also be used to saw the tails on the stool's top board by removing the stop block that's screwed halfway up the ramp.

David Ray Pine builds period reproductions in Mt. Crawford, Va., and is the only person licensed by Historic Old Salem, Inc. to make this footstool for resale. However, a full-scale plan for the Moravian footstool, drawn by Carlyle Lynch, is available for personal use from T. Bagge Merchant, the museum store in Historic Old Salem, 626 S. Main St., Winston-Salem, N.C. 27101.