

## A Classic Design Illuminated

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I turned two prototypes from which I was able to design and construct a couple of jigs that made the process much easier, more accurate and less time consuming. This project covers the candleholders themselves and the jigs I used to make them. I chose mahogany for its color and workability, but any wood will do. My prototypes were turned from hard maple.

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The basic holder consists of three pieces: a base, a stick, and a handle. The base begins as a 6"-square by 1"-thick piece. The stick is a 2"-square by 4-½"-long piece. And the handle starts life as a ½"-thick piece whose finished size is 1-¼" in diameter (only three sides are rounded). The finished holder stands 5-½" tall, and the base diameter is 5-3/8". The base is tapered on the underside and dished on the face. The design of the stick includes tapers, a bird's beak and beads.

### Prepare the stock

Once the base and stick stock are dimensioned, flattened and squared, find the center on both sides of the base and both ends of the stick (Fig. 1). The handle can be laid out and finished later. Using a compass, draw a 5-3/8" circle on one side of the base; this will be the "up" side. Use an awl to dimple the centers on both sides of the base and both ends of the stick.

A 3/8" piece of dowel centers and holds the base to the stick when gluing up (Fig. 2). Chuck a 3/8" bit in the drill press and drill a center hole on the base about 3/4" deep. Then cut it circular, keeping the blade just to the outside of the circle you marked.

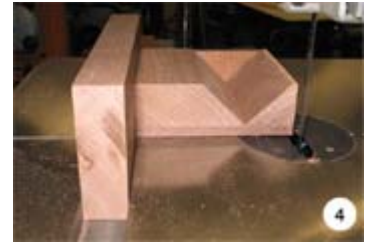
Now drill one end of the stick 3/4" to 1" deep (Fig. 3). To make turning easier, cut



the corners off the stick to form an octagon before gluing up the base and the stick. At 4-½" long, this piece is a little small for running through the table saw. And it's awkward to run through a bandsaw with the table tilted to 45°. I used a sled on the bandsaw to cut the corners. Taking the time to build a sled to cut the corners off is well worth the effort.

I already had a sled since I turn quite a few bottle stoppers which are cut to an octagonal shape before mounting on the lathe. For my sled I used some scrap 1"-thick walnut that had already been cut on a 45° angle. The two pieces were only 3" wide, but would work to cut blanks as long as 5". If you make a sled from two pieces of wood, cut a base from ¼" hardboard that's longer than the distance from the blade to the miter slot and as wide as the wood you're using. Glue the two pieces to the hardboard base so the 45° angles form a V. Once dry, measure 11/16" from the center of the V and cut off the excess on the table saw. Place this edge against the bandsaw blade and put a mark on the other end where it crosses the miter slot (the side of the slot closest to the blade). Then cut off the excess on the table saw.

Next, mill a piece of hardwood that's about 6" long and at least 2" wide to the thickness of your miter slot. Slide this into the miter slot. With the two pieces on the bandsaw (to ensure correct alignment) glue them together and use screws or brads to reinforce the joint. Glue a small piece of scrap to the back of the block with the V as a stop, and you're in business (Fig. 4). The square stock rides on a 45° angle through the blade. Just keep flipping the block until all four corners are cut (Fig. 5).



## Secure the base in the lathe

With the stick cut into an octagon, glue it to the base using a piece of dowel. While this is drying is a good time to fabricate a special faceplate to hold the base in the lathe. The tailstock holds the end of the stick. My custom faceplate started with an aluminum 3" plate (Fig. 6). I screwed a piece of 1"-thick hard maple that had been cut to a 3¼" circle to it and turned it down to just over 3" in diameter next to the metal plate and just under 3" on the other end.



Drill a 3/16" hole in the center while the faceplate is still mounted on the headstock. Cut a piece of 3/16"-diameter steel rod to about 1-½". Chuck it in the drill press and file or grind the tip to a very sharp point while the rod is spinning. Epoxy this rod in the hole in the faceplate so that only 1/8" to 5/32" of the point is proud of the surface.



The metal plate I used has two sets of mounting holes. I used the outer holes to screw the plate to the wood face. I drilled holes through the wood face through the inner set of mounting holes. Then I ran 1-¼" long pan head screws through these hole so that the points of the screws protruded 3/32" or less beyond the surface of the wood face (Fig. 7). If your screws are too long, use washers to adjust them so that very little of the point shows. The center rod, which should protrude farther than the screws, and these four screws act much like a spur center.

It takes a little pounding with a mallet to mount the blank to the faceplate. But you don't want to pound directly on the metal plate; you'll want to use a piece of scrap to protect it. I drilled a 1-¼" hole in a small scrap of 8/4 stock 1" deep for this purpose. Set the blank with the stick end down on your workbench and align the pointed center rod with the awl dimple in the base of the blank. Slip the scrap over the metal plate and give it a couple of good whacks with a mallet to seat the faceplate to the blank. The pressure from the mallet is distributed on the back of the metal plate and the pan head screws, not on the threaded collar.





## Start shaping the candlestick

Mount the whole assembly on the lathe and run the tailstock up into the dimple on the end of the stick.

Start the process by turning the base down to the 5-3/8" mark you made earlier on the face of the base (Fig. 8). Then turn the stick round to just over 1-1/2" (Fig. 9). With the lathe turning (I like to turn these at around 1500 RPM), put three marks on the stick: one at the bottom of the candle cup, one at the top of the lower bead and one at the bottom of the lower bead (Fig. 10).



Turn the space between the bottom of the candle cup and the top of the lower bead down to 1" in diameter (Fig. 11). Then use your parting tool to turn a groove below the lower bead down to 1" also (Fig. 12). Next, turn the lower bead area down to 1-1/4".



Now turn your attention (and your tool rest) back to the base. With the piece spinning, mark a line on the edge of the base 5/16" from the face (Fig. 13). The base is tapered on the underside from this mark down to the faceplate (Fig. 14), leaving a lip that's about 1/16" high (Fig. 15).

Next, reposition the tool rest parallel with the face of the base and start roughing out the dish profile (Fig. 16). My favorite tool for this is the Skewchigouge by Crown Tools, which can work as both a skew chisel and a gouge.



The profile should start 1/4" from the edge and the deepest point of the dish should be 3/8", about 1-7/16" from the outer edge. The bottom of the stick completes the dish, so moving back and forth from base to stick is necessary to get the right profile (Fig. 17).

Before leaving the base, round over the edge. The underside roundover is quite shallow because of the taper. The topside roundover should be a pleasant profile that ends in a point on the face where the dish profile began.



Move back to the stick and turn a rough profile of the candle cup, then use a parting tool to turn the 1/4" bead area below the cup to 3/4" in diameter (Fig. 18). Now mark the center of the bird's beak and turn the underside, tapering it to the lower bead. Again, I used my Skewchigouge for this. Then finish turning the profile.

The top of the candleholder need not be flat. I used a parting tool to sneak in around the live center on the tailstock and taper it from about 1/16" from the edge to as close as I could get to the live center without running metal against metal. The taper I put on the top is very slight, starting about 1/16" from the edge, about 1/16" deep at 3/8" from the edge. This leaves a flat lip on the top the same size as the fl at part on the side of the candle cup at the very top edge.

Sand your candleholder and burnish it with wood shavings while it's turning. Then apply your favorite finish while it's still mounted on the lathe. I used Behlen Master Woodturner's Finish (Fig. 19).



## Build a jig for cutting the handle slot

The next step is to cut a slot in the base for the handle. For this, you'll need to build another jig. The taper on the bottom of the base is pretty close to 28°. Our jig will have a 28° slope and will be wide enough to accommodate the base of a router. It also must straddle the candleholder (Fig. 20).

My lathe has a tube rail, so this jig is designed to fit over the rail and index to a baseplate that is clamped to the table on which my lathe is mounted (Fig. 21). Different lathes will require a different design for this jig, but the common elements are that the top of the jig has to slope 28° and the slot in the top of the jig has to be in the exact center and must be sized to accommodate a guide bushing on the router baseplate (Fig. 22).

This jig is made of plywood, both 1/2" and 3/4", and 3/4" MDF for the top. I chose MDF because the slot in which the guide bushing runs is smoother than it would be if cut through plywood. The jig is basically a box with slots cut into the front and back so it slips down over the turned candleholder. The front of the jig faces the headstock and slips over the faceplate collar so it is behind the faceplate. The back of the jig slips over the candleholder below the candle cup. The sloped top is higher at the front (Fig. 23).

However you build this jig to fit your lathe setup, it is imperative that it not move. And there must be about 1/8" clearance between the top of the jig and the base of the candleholder. Mine is a two-piece jig: the box and a baseplate. The baseplate slips beneath the lathe tube and has four 1/4" holes drilled in it. These holes are aligned with dowels that are glued into the bottoms of the four "legs" of the box. First I slide the base under the tube to the cleat that is glued to the bottom of the base and then slide the box over the workpiece. Next I align the holes in the base with the dowels in the box and set both pieces together, then clamp the base to the table. Nothing moves. Before you set your jig over the workpiece, lock the headstock. You don't want your nicely finished candleholder turning wildly when you introduce your router into the base.

To cut the slot where the handle will be mounted, set your router up with a 1/2" straight bit and a 3/4" guide bushing. You'll have to do some measuring to get the depth of your cut just right. The cut should not be deeper than the point that you established on the face of the base when you rounded over the edge where it meets the beginning of the dish profile. Now make one pass from the high part of the top of the jig to the lower part of the top (Fig. 24). Going in the other direction could cause the jig to tip out of the index holes in the base.

The handle is attached to the base of the candleholder with a dowel. The next step is to drill a hole in the center of the cut you just made in the base to accommodate a short length of dowel.

Make a drill guide for this procedure. All that's needed is a 3/4" square of hardwood and another piece of hardwood that's 1" wide and 5/8" thick. Both should be between 2-1/2" and 3" long. I made mine 2-3/4", a comfortable size to work with. Glue the two pieces together with the top piece overlapping the bottom by 1/8" on each side. Then drill a 1/4" hole exactly in the center. What you've got now is a T-shaped guide with the 1/4" hole running through the top of the T.

This drill guide fits into the slot on the top of the jig you built for routing a slot in the base of the candleholder. With the jig still in place, mark the center of the slot you routed in the base. Measure for the center very carefully (because there's not much material on the top and bottom of the base at the edge) and use an awl to punch a hole in the center mark. Place a 1/4" brad-point bit in a drill and slide the drill guide up onto the bit. Put the brad point in the center mark and slide the guide down the bit and into the slot on the top of the jig. Drill a hole about 1/2"



deep.



### Smooth the underside with another jig

Whew! The lathe work is over. Remove the jig and take the candleholder out of the lathe. Now turn it over, and what do you see? Five holes in the bottom of the base; an unsightly mess. You've got a few options to deal with the holes. You can leave them; you can glue felt to the bottom to hide them (hmmmm); or you can construct another very simple jig to eliminate them. I'll take door number 3; I prefer a more finished look even on surfaces that will seldom, if ever, be seen.



Again, using sheet goods ( $\frac{3}{4}$ " MDF was my choice because it would not mar the finished edge of the base), I cut a piece that was 12" x 15". I also cut a piece of  $\frac{1}{4}$ " hardboard to the same size and glued them together. My router table insert is 12" wide, so making the jig 12" wide makes it easy to index it to the exact center of the table. The jig should be 1" thick since the base of the candleholder is 1" thick, although the part of the base that will ride against this jig is only around  $\frac{7}{8}$ " high. Two pieces of  $\frac{1}{2}$ " material will also work if you don't have a 1"-thick piece of sheet goods.



The size of this jig was determined by the size of my router table and the position of the miter slot in the table. Yours may differ. I cut a dado the same width as my miter slot  $1\frac{1}{4}$ " from one end (the hardboard is on the underside). Then I milled a piece of walnut  $\frac{1}{2}$ " high and sized to slide in the miter slot. The sheet material will have a large hole cut into it, centered over the router bit. To find the center, insert the walnut strip into the dado on the sheet goods and slip it into the miter slot. Slide the assembly over so the edge is bisecting the bit hole in your router table. Mark the center of the hole on the edge of the sheet goods and transfer this mark across the width of the sheet goods. Using a compass, draw a  $7\frac{1}{4}$ " circle.



Remove the walnut strip and cut out the hole with a jigsaw or a scroll saw. Sand the hole smooth and up to the circle that you drew. An oscillating drum sander works best. When you're satisfied that the hole is smooth and round, glue the walnut strip in the dado. If you made this jig the width of your router table insert, all you need to do is set it down into the miter slot, position it over the insert and clamp it to the table (Fig. 25). The hole is now centered over the router.

Chuck a  $\frac{3}{4}$ " straight bit in your router and set it for a  $\frac{3}{32}$ "-deep cut. Then turn it on. Hold on to the candleholder tight and set it down in the middle (Fig. 26). Without turning the candleholder, make clockwise turns inside the jig until the edge of the base is rubbing on the jig, then make a couple more passes to ensure all the material you want to remove has been removed.

All that should remain is a very small hole where the center rod penetrated the wood. And that's not unsightly at all. If all went well, you have a hollowed-out bottom with about a 1/4" fl at surface between the hollow and the taper that will sit nicely on any [img]Fig. 27[/img]. Now you can put some finish on the bare wood.

Only one step remains before getting to the handle: drilling a hole for the candle. The size of the hole will be determined by the kind of candle you intend to use. My choice was an 8" Federal candle, which is straight. I chucked a 13/16" bit in the drill press and drilled to a depth of 3/4" (Fig. 28).

## Make the handle

Finally, it's time to make the handle. The handle is 1/2" thick to fit the groove that was routed in the edge of the base. It is 1 1/4" round (on three sides) and has a 7/8" hole in it. Since the edges of the hole need to be rounded over I started with a piece of mahogany that was 2 3/4" wide and 12" long. I laid out the outer diameter at a square corner and marked the center of the handle. First drill the 7/8" hole. Then, using a 1/8" roundover bit with a bearing guide in your router that's mounted in a router table, ease the edges of the hole on both sides.

On the table saw, crosscut the piece of wood at about 1 1/2". On the long grain end of the square corner, put a mark on the edge that corresponds with the center of the hole you drilled in the base. With a 1/4" bit in the drill press and a fence to steady the thin piece of wood, drill a hole 1/4" deep. Now cut the handle out on the bandsaw. Remember only three corners get rounded; the fourth corner with the hole in the long grain remains square. Sand it smooth and ease the edges leaving them square where the handle and the base intersect.

Put a finish on the handle, but not on the area where you'll glue it to the base. Cut a piece of 1/4" dowel to length and glue the handle to the base.

While this whole process seems like it may take weeks to finish given the special jigs and faceplate needed, it can actually be accomplished in a weekend. And once the jigs are built to fit your equipment, making candleholders by the dozen will be quick and enjoyable.

