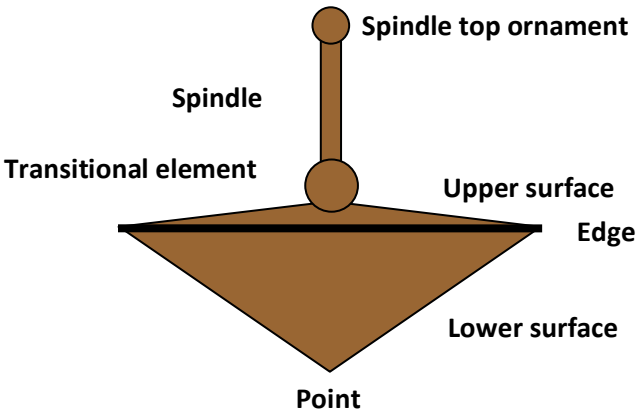
Fun With Spindles

This will be a fast-moving demonstration focused on spindle turning techniques and tools, resulting in a series of small objects. Each turned object will build on techniques demonstrated in preceding segment. Demonstration will see completion of; spin-tops, miniature spin-top, freehand sphere, small hollow vessel, and a multi-axis spice spoon. This is a skill building session for all levels of turners, and will emphasize the importance of practice as a path to perfection.

Tops

We will start with tops because tops are fun. Tops are also an excellent vehicle for creativity and disciplined repetition of fine detail. Turning techniques include effective use of the ¼" bowl gouge and ¼" detail gouge with a "ladyfinger" grind. Optimal cutting techniques yield a surface requiring little sanding, and as we all know, less sanding means more fun.

Practicing fine detail on spin tops will provide confidence when you step up to turn an extra-thin finial, or a refined bead that compliments a special bowl.
The attention to detail and very fine motor skills can open new avenues for turning, such as miniature bowls, hollow vessels, and lidded boxes.



The overall turning process is to turn the top starting at the point and ending with the spindle or optional spindle top ornament. The different parts of the basic top are; the point, lower surface, edge, upper surface, transitional element, spindle, and an optional spindle top ornament.

The demonstration starts with turning a full sized top.
These are generally 1 ½" diameter and 1 ½" tall. I turn a couple of these tops every time I go out to my shop, and over the decades have turned more than 12,000 of them. I try to make each one different, and am not bored of them yet. I'm mostly working with 1 ½" square stock, 2" – 4" long. I band saw straight grained spindle turning stock from leftover pieces of wood after I'm done chain sawing logs to dimension for turning big bowls and vessels. I pack all the roughly dimensioned stock in big boxes, and note year and month. By the time I need some more top turning stock the blanks are dry.

The first step is to firmly grip the spindle stock in the chuck (Figure 1). There are several good tool choices for roughing the square stock to a round cylinder. These days I use a 1" spindle roughing gouge. A small bowl gouge or a conventional spindle gouge would work nicely too. I like to stop the lathe and inspect the wood before I go ahead and turn the top (Figure 2). One reason to do this is to inspect the grain orientation and look for defects that may be revealed after removing some wood. If the wood has a fatal flaw (cracks, holes, bark, sideways grain, branch buds, heartwood and sapwood, etc), it goes in the burn bin. No sense wasting time and effort on bad wood. Another reason to inspect the wood is that sometimes I find something that is much better than expected. A nicely spalted blank may be more suitable for a mini hollow vessel.

The first cut is to establish the bottom surface of the top. After taking several cuts with the ¼" bowl gouge to establish the shape, I take a final pass with the ¼" spindle detail gouge. Then I take one light cut across the edge of the cylinder to define the edge of the top. At this stage, I slow the lathe (400 RPM?) and sand the bottom surface (220 & 320) for a few seconds each (Figure 3).

Figure 1. 1.5" x 4" billet of Yaupon

Figure 2. Billet rounded, check for defects.

Figure 3 Bottom surface and edge defined.

With the lathe back to regular speed (1500 RPM?) I start removing wood behind the upper surface. The first cut defines the edge (Figure 4). Three or four roughing cuts with the bowl gouge excavate some bulk from the cylinder and provide some room to work on the form (Figure 5).. The next cut or two are to establish the final thickness and profile of the upper surface of the top (Figure 6). I take these cuts with the detail gouge. Gently but firmly present the tool with the edge of point of the tool aligned vertically, and the flute facing the headstock. Initially the aim is to establish a bevel in the wood. Once the bevel is established, it acts as a guide for the shaping cuts. I initially cut a small step at the juncture between the top body and the spindle. This area should be a little thicker than the spindle for structural strength. Options here are many, from a simple step or beveled step to a bead element. This is good practice for those delicate spindles at the top of some lidded boxes and vessels. Time to sand again. Slow the lathe and briefly sand the edge, upper surface, and the transitional element.

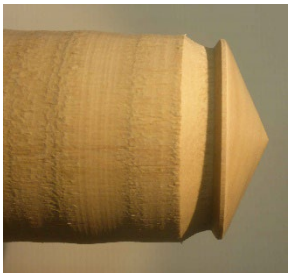


Figure 4. define the edge.

Figure 5. Remove bulk.

Figure 6. Detail upper surface

Figure 7. Stem roughed out.

Use the bowl gouge to reduce the diameter of the spindle area to ¼" or so (Figure 7). Now it's time to refine the spindle. This is where the detail gouge works especially well. The objective is to reduce the spindle thickness to approximately $^{1}/_{8}$ ". The cut is started with the spindle gouge positioned just left of the transitional element, and the flute of the spindle gouge pointing up. The gouge should be resting on top of the spindle and not cutting or pressing. Gently rotate the gouge counterclockwise until it starts to engage the wood and cut slivers. Gently move the tool to the left, cutting just below the point of the tool, cutting a thin even spindle. There should be no downward pressure on the wood; the downward pressure you exert on the tool should be directed onto the tool rest. This will take several light cuts. Then sand the spindle. I use a ¼" wide long strip of 180 grit cloth backed sandpaper. If your design intent is to apply color using permanent markers, this is the time (Figure 8).

The next step is step is to cut the top from the remaining spindle billet. I like to take this opportunity to practice turning a small bead at the end of the spindle (Figure 9). This cut is made with the $^1/_8$" detail gouge. In one continuous motion the point of the detail gouge cuts the "V" groove with a push cut, the right side of the bead is formed with a pull cut using the left edge of the end of the gouge, and the left side of the bead is done with a push cut, still using the left edge of the end of the gouge. This cut takes a lot less time to accomplish that it takes to read about how to do it. Stop short of cutting the top off the billet so that you can sand and color the bead. Now you can slice off the top and take it for a test spin. A coat of your favorite finish, and you're done (Figure 10).


Figure 8. Spindle cut + color.


Figure 9. End cut and colored.


Figure 10. The finished top.


Figure 11. Top and mini-top.

If you can turn a 1½ " top, you can try turning a much smaller version (Figure 11). My recommendation is to turn a number of full sized tops to become familiar with the tools, cutting techniques, and design options. The mini top is made the same way as the full sized top, with a few exceptions. First, you will likely start with a spindle that is ½" in diameter and maybe 1½" long. Second, I mostly use the $^1/_4$" detail gouge, as there is not much wood to remove at any stage of this project. Third, the final spindle might be only $^1/_{16}$" thick. The spindle top bead is still turned with the $^1/_8$" detail gouge. Since the mini top is made from a series of controlled cuts with a very sharp gouge, I just sand with 400 grit sandpaper. There's really not much wood to sand here. The last point is to practice…a lot. One turner may be turning out mini tops after making a dozen or so full sized versions, while another turner may need to make lots more before the process is easy and automatic. Oh, one last thing, try to not drop your finished mini top in a pile of shavings.

Freehand Spheres

There are lots of techniques and jigs out there that enable you to turn a perfect sphere. The point of this segment of the demonstration is not to turn a perfect sphere, the purpose is to learn to turn (and see) something round.

Start with your spindle blank chucked firmly as previously described (Figure 12). Reduce to an even cylinder using a spindle roughing gouge or similar tool. Take a last cut across the end grain on the exposed end of the blank. This ensures smooth grain at that end of the sphere. This cut is easiest with a freshly sharpened ¼" bowl gouge. Just establish a shoulder or step near the end of the blank and use it to support the bevel of the gouge as you cut across the grain. This cut can also be done with the skew or detail gouge, but the bowl gouge is just easier here. Do not use a parting tool as this leaves a very rough surface. With the lathe off, measure the diameter of your cylinder with an outside caliper, and transfer that length to the left end of your spindle (Figure 13). Extend this mark around the spindle, rotating the lathe by hand. Then mark half that length to establish the midpoint of the sphere in the horizontal axis. With lots of practice and confidence may find that you can eyeball this measurement.

Now for the part that may not be as easy as it sounds. Taking successive cuts with the bowl gouge, cut the exposed right corner off in a circular arc. Make successively longer cuts, starting closer to the midpoint line, and eventually ending exactly at the end of the spindle (Figure 14). Next, start cutting from the centerline towards the left side of the sphere (Figure 15).


Figure 12. Mulberry blank.


Figure 13. Diameter + width


Figure 14. Half of the sphere.


Figure 15. More shaping.

Using a parting tool, make a perpendicular cut just at the left edge of the pencil line that marks the full diameter (and length) of the sphere (Figure 16). Leave a central part of the spindle to support the partial sphere…maybe around $^{3}/_{8}$" to start. Now you have a remaining flange on the inboard side of the cylinder. Turning in a mirror image of the first set of cuts, remove successively longer circular arcs from the flat center of the spindle. Work back to the center line, and cut to just to the right of the parting tool cut on the remaining spindle (Figure 17).

At this point you should have a nearly complete sphere on a thin spindle. There will be some lopsided-ness while learning. Fortunately, most spheres can be made a lot more round during sanding. On these small forms it might be appropriate to start sanding with 100 – 150 grit sandpaper, and finishing with 320 grit (Figure 18). Once sanded, I use the detail gouge to cut the remaining sphere off the spindle. I usually leave a small protruding bulge in this area to be hand sanded. If you cut too close to the finished profile there is a high probability that the sphere will break or pull off from the spindle, pulling some long grain fibers out of the end of the sphere that are impossible to sand away without creating a prominent flat on your round form. The finished form should appear really round to the eye, and hopefully really round in the hand, which is generally more discriminating than the eye in this instance (Figure 19).


Figure 16. Parting cut.


Figure 17. Shaped sphere.


Figure 18. Sanded sphere.


Figure 19. Finished sphere.

Miniature Hollow Vessel

Turning very small hollow vessels offers an opportunity to practice fine-scale eye hand skills while designing on a small scale. So, what size qualifies as miniature? Let's just say less than two inches (Figure 20). There is not much invested in time or wood, so you can play…try out different forms, and maybe only complete the ones you like.

Figure 20. Three 1" tall hollow vessels; pecan burl, walnut, and spalted oak..

Turning miniature hollow forms may also present a challenge in finding properly scaled tools. While some effective tools are on the market, an inexpensive tool kit can be assembled from scraps of metal and wood on hand. An excellent tool making stock comes in the form of spade drill bits. These are flat bits designed to drill quick holes in rough carpentry **(A).** The flat end of the bit allows great versatility in the types of tools that can be made. The three basic shapes I use are an oval or teardrop shape with a rounded end **(B)**; an offset cutter with a 45^{o} angle **(C),** and an offset cutter with an 80^{o} angle **(D)**. These tools are not difficult to make, but the process does involve a bit of time at the grinder. Other useful tools include; small calipers, small flashlight, small depth gauge, and a flexible end straw or tube to blow out shavings.

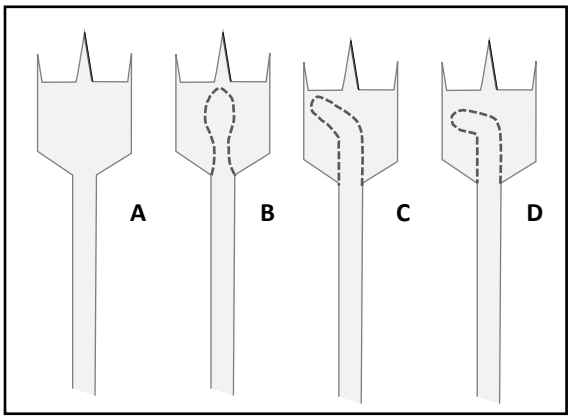


Figure 21. Options for homemade hollowing tools.

Turning a miniature hollow vessel can be broken down into six steps (Figures 22, 23):

1. Start with the spindle blank mounted in the chuck, with long grain parallel to the axis of rotation. Rough out a cylinder and make a clean cut across the grain at the end of the blank to ensure that the rim will have a clean cut across the fragile end grain while it is still well supported. Shaping the outside of the vessel involves cutting rounded shapes as with the freehand sphere. The ¼" bowl gouge is a good all-purpose tool here, although the ¼" detail gouge is good for refining the lower portion of the form. The aim is to establish most of the shape, while also leaving a ¼" – $^{3}/_{8}$" stub at the bottom. This should be strong enough to support the form while hollowing and sanding. The vessel should be fully shaped and ready to sand (later).

2. Using the teardrop scraper or similar tool, cut a cylinder down the axis of the vessel. This is primarily to establish the depth and provide access for the offset tools. Cut the cylinder in successively deeper stages, until it is almost at maximum depth. Be sure to measure carefully so that your vessel does not wind up with a hole in the base when you part it off later on.

3. Using the offset scrapers, gradually hollow out more of the vessel, starting below the rim and working both deeper and wider in successive cuts. Take light cuts and measure often. These forms are so small it is all too easy to inadvertently remove too much wood. As shavings accumulate in the vessel, stop and remove the shavings. Use your flexible straw, blowing into the long end.

4. Gently cut the interior to its final thickness, measuring regularly with small calipers. Listen to the wood. You may notice that the pitch of the vibrations of the tool against the wood gets higher as

the wall thickness gets thinner. After the wall is at the final thickness, you can smooth out the interior bottom of the vessel. There may be a residual bump, as it is hard to cleanly cut the center of the bottom with the offset scraper. Use the round ended scraper to locate the center of the interior, then lightly push into the wood for a fraction of a millimeter, and then sweep the tool to the left, feathering into the interior wall profile. Be sure to not cut too deep. Once you are done hollowing, take a final cut parallel to the axis of the lathe from the rim to the inside of the vessel. This should leave a straight sided interior profile from the rim to the inside, facilitating reverse chucking later on.. Now is the time to sand. You should be able to start with 180 or 220 grit sandpaper.

5. First, make a few shallow cuts with the parting tool, leaving enough wood to support the vessel during some light finish sanding. The idea with parting is to cut a clean surface that requires little if any sanding. At times like this, a super thin super sharp parting tool is called for. Make the first few cuts perpendicular to the axis of the lathe so that the base of the vessel is flat. Sand the lower portion of the vessel wall if needed. Now it is time to part the rest of the way across the stub. Start the cut about $^{3}/_{16}$" in from the outer edge of the perpendicular cut just made. Angle the cut about 15^{o} right of perpendicular, cutting a shallow cove in the bottom of the vessel. Do not cut all the way through as there is a substantial risk of pulling out the short end grain at the bottom of the vessel. Instead, stop short of cutting through and make a final through cut one tool width to the left of the angled cut just made. This will leave a small stub at the base of the vessel. This can be hand sanded or carved away with your small carving gouge, or optionally proceed to step 6.

6. The final step is to cut the part of the stub remaining in the chuck to form a mandrel for reverse chucking the vessel. Cut a straight sided mandrel that allows you to firmly fit the aperture of the vessel over the mandrel. The intent is to hold the piece firmly enough to be able to turn and sand the base of the vessel, but without splitting the vessel in two. Sadly, this is all too easy to mess up. Having cut parallel sides on the inside of the aperture in step 4 makes reverse chucking a somewhat lower risk endeavor. If you cut the mandrel too thin, a bit of tissue may take up the extra space. Once chucked, support the spinning vessel with one hand while turning the nub away with the tip of the detail gouge. Sand the base at this point, being careful to preserve the flat base of the vessel. Reverse chucking is the only way to ornament the base of the vessel. Use a small point tool to cut a few shallow grooves in the base of the vessel. Then lightly sand the bottom with 600 grit sandpaper. The miniature vessel is now ready to be finished.

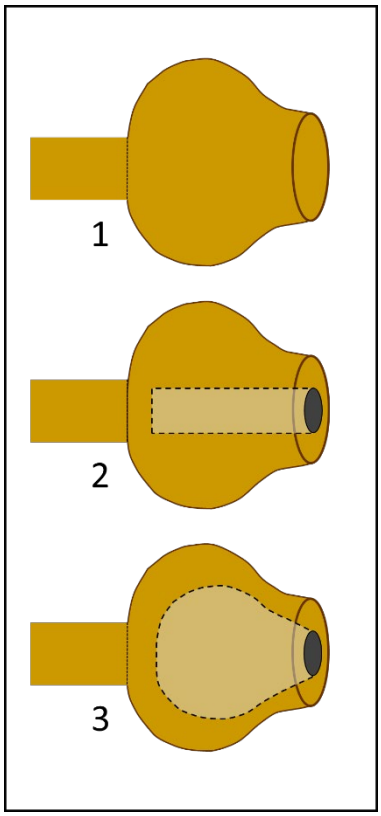


Figure 22. Steps 1 – 3.

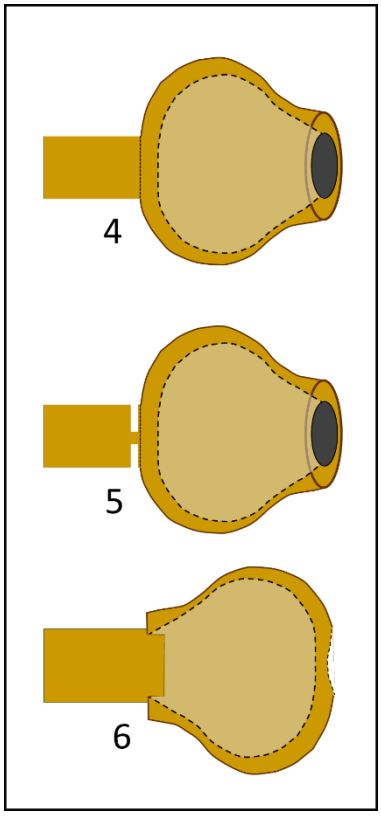


Figure 23. Steps 4 – 6.

Some final thoughts. To paraphrase David Ellsworth, …*You can't turn the inside of a vessel and see what you are doing at the same time*. To be effective, you have to visualize the cutting edge of the tool inside of the vessel, and think about what it is doing. I focus on cutting an inside profile that closely matches the exterior profile. This can be a bit of a Zen moment, making the essentially un-viewable inside of a vessel the best that it can be, just for the sheer pursuit of perfection. Finally, and I can't say this enough, there is no substitute for time spent at the lathe, working on problems and finding solutions. The only way to get better is to practice, practice, practice!

Multi-Axis Spice Spoon

The multi-axis spice spoon project brings together some of the manual skills encountered in each of the three previous demonstration segments, including turning thin spindles, turning round, and careful hollowing. This project does require a bit more careful planning. The blank will need to be straight grained without defects, and be short enough to clear the ways when mounted in the jam chuck. The small scale of the spice spoon is great for getting small amounts of spices from the bottom of a spice jar. Aside from being a great skill builder, the spice spoon is sure to find a home in your spice cabinet.

For this demonstration we will assume you're going to be working on a mini lathe. Start with a blank that is no longer than one inch longer than the swing of your lathe. Firmly grasp the blank with the chuck, and also secure the right side with light pressure from the tailstock live center (Figure 24). The purpose of using the live center is to cut down on vibration when turning the skinny shaft of the spoon. Using spindle roughing gouge, remove corners and reduce diameter to the intended outer diameter of the finished spoon. Mark a waste area for parting just outboard of the chuck. Then measure the diameter of the blank and mark that length to the right of the first mark to define the outline of the spoon (sphere). Moving to the right, mark a thin area for a transitional element, the thin shaft of the spoon, and a space for the handle or decorative touch. Remember to leave a waste area at the far end of the blank to avoid having the live center impression being part of your final design. (Figure 25).

Figure 24. Huisache blank, 5" x 1.5 square.

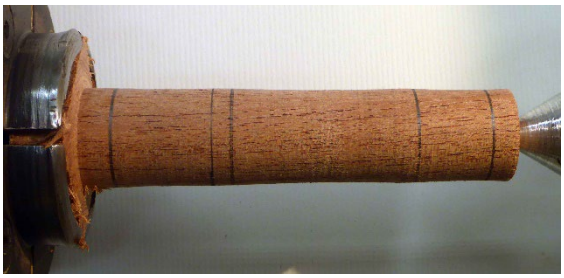


Figure 25. Rounded blank with major elements marked.

The spindle turning will proceed from tailstock to headstock. Start with parting away the waste area adjacent to the live center. Then work on refining the handle and shaft (Figure 26). I find it useful to do some initial sanding at this point, using 220 and 320 grits. While the initial shapes are established with a ¼ " bowl gouge, they are refined with the ¼ " detail gouge, which leaves a smoother, better defined surface. Then, use a parting tool to thin the area for the transitional element, and blend the shaft into a thin, smooth handle. The detail gouge planing cut works well here. A ½ " skew also does an excellent job on this planeing cut (Figure 27). Then sand the spindle shaft. (Note: this stage could also be turned with the handle on the headstock side and the spoon on the tailstock side)

Figure 26. Turned handle (thistle motif) and part of shaft.

Figure 27. Handle and spoon shaft completed.

The next step is to define the transitional area between the spoon shaft and the spoon. This can be decorative or just a simple step (Figure 28). The detail shown here should be reserved for tough and resilient woods. Less sturdy woods should have a thicker transitional element. Then cut a half sphere to define the right side of the spoon. Before cutting the left side of the sphere, part away a waste area to the left of the sphere defining line (Figure 29). This allows tool access to the left side of the sphere. Leave a stub about the diameter of a pencil for now. Sand the transitional element and sphere while spoon is still on the lathe. Then remove the spoon. It can be parted off or sawed off. Now gently hand sand the handle end and ball end of the spoon (Figure 31).

Figure 28. Transitional element and half sphere.

Figure 29. Waste area parted off.

Figure 30. Spoon sphere defined.

Figure 31. Spoon removed from lathe to sand ends.

Wood for the jam chuck should be straight grained, have uniform density (i.e. not pine) and generally less dense than the wood used for the spoon Figure 32). When fitting the sphere to the jam chuck, you want any resultant dents to be on the chuck, not the work piece. Use the spindle roughing gouge to remove the corners of the jam block, and then reduce the diameter of the cylinder to be ½ " thicker than the sphere. Move the tool rest to be perpendicular to the ways in order to cut the jam chuck recess. Initially, just cut a recess that is a tight fit for the sphere (Figure 33). One way to cut this recess is using a small teardrop shaped scraper like the one used for initial hollowing in the miniature hollow vessel demonstration. A faster procedure is to use the detail gouge, making a series successively wider peeling cuts from center to edge. This is an easy cut, but takes some practice. Insert the detail gouge into the center of the end of the chuck with the flute pointed up and the tool in line with the axis of rotation. Push the tip of the tool into the wood, cutting a divot (bevel) about $^{1}/_{8}$ to ¼ " deep, rotate the tool counterclockwise about 30 degrees, and engage the lower edge in a controlled peeling cut. Continue making small cuts until the sphere fits firmly into the end of the chuck.

There are a few more steps to follow. First, carefully drill out a hole through towards the headstock side of the jam chuck. Some will reach for a drill bit. I use the detail gouge to make this cut. As with cutting the initial divot, just push the tip of the tool into the center of the chuck, and drill out a hole. Pull out tool once or twice to remove shavings, and be sure to maintain axial tool alignment. The purpose of this hole is to be able to remove the work piece when it is really jammed into the jam chuck. Next, cut a slot for the spoon handle. I find that a coping saw is handy for this task, perhaps assisted by a small flat

carpenter's chisel. Before final fitting, select and mark the side of the sphere to be hollowed out. Cutting into the center of a flat grain side of the sphere is the preferred orientation (see Figure 31). Now, orient the sphere and fit firmly into the jam chuck recess (Figure 34). Some final adjustments may be necessary. A wood mallet does the job here.

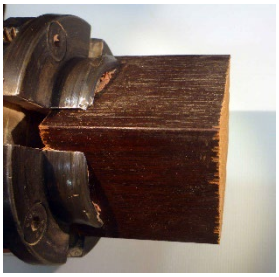


Figure 32. Mahogany 2x2x2.


Figure 33. Jam chuck recess cut.


Figure 34. Mounted in chuck


Figure 35. Spoon hollowed.

Carefully position the tool rest so that you can access the sphere to hollow out the spoon without snapping off the handle. The first few cuts off the top of the sphere will establish the rim of the spoon. A ¼" bowl gouge works well her, taking few millimeter-thick cuts. I hollow out the spoon with initial cuts from the ¼" detail gouge, followed up with finishing cuts from a freshly sharpened teardrop shaped mini scraper (Figure 35). Careful sanding can be done across the spoon rim. The interior of the spoon could also be sanded with a folded cylinder of sandpaper. Now remove the spoon from the chuck. I've tried lots of ways to do this, some good, some not so good. The best procedure I've found so far is to insert an unsharpened pencil, eraser first, into the back of the previously drilled hole to pop the spoon out. A coat or two of finish, and your good to go (Figure 36).


Figure 36. Full size image (3 1/2") of Huisache spoon shown in preceding images.