Introduction
I milled quite a few more triangles for last years snowflake ornament than I needed, so, hating to waste wood and work I started playing around with using them to make another style of ornament. I had in mind some variant on an Inside/Outside technique. But, as triangles aren't the same rotated 180 degrees, I had a little trouble working it out. I tried turning a recess and then rotating the triangles 120 degrees, but that yielded a lopsided opening. Next I tried a therming variation--attaching the flats of the triangles to a spindle with a hexagonal cross section mounted between centers on the lathe. This sort of worked, but I didn't really like it. The webs between the openings were too thin with knife edges so it was nearly impossible to get evenly shaped openings as even a tiny error in mounting led to obviously different sizes.

I resigned my self to trying two "inside" turning steps, 120 degrees apart. I say resigned, because that meant doing two nearly identical inside turnings. But after I tried the technique it grew on me. The resulting web between the openings (hereafter called windows) was like a triangle with arced sides, much stronger than the knife edges of earlier attempts, and with some wiggle room for adjusting the final shape. It also allowed for some variations beyond the basic suggested globe that I really liked. And I think the method has a high "how did he do that" component. On the debit side, there are many opportunities for small errors to gang up on you, so if you’re on the obsessive compulsive side this procedure may drive you crazy. But I think they’re Ornaments, not art, and are perfectly fine.

This article will show how to use this technique to make the 6 Window Ornament. It starts with alternate ways to mill suitable triangles, depending on what equipment you have or like to use. Then it will discuss how to do the first and second Inside turnings, followed by assembly and then the third and final Outside turning. Last shown will be some variations on the design you can try after you master the basic ornament.

Milling Triangles
I wasn't entirely happy with the way I ripped the triangles on the table saw for the snowflake ornament. So of course I tried building a jig--in this case a rip sled. The first attempt led to another one with a hands free hold down. It ended up working pretty well, but it would take up too much space to show here, so I'll just show it in use in Fig01, and let you go to my web site for an e-article on how to make it. Since the triangles are fairly short (I usually rip a stick long enough for two segments, about16-1/2”) it's easily within the limits for a dedicated rip sled. The sled has an adjustable fence (60 degree on one side, 90 degree on the other (so that it can rip diamonds as well as triangles) and parallelism to the blade can be set using the table saw's standard rip fence rather than trial and error. As when ripping it's critical to keep the bed of the sled flat, there's a brace on the left side. There's a height adjustable hold down to keep hands well away from the blade.
You can also rip the triangles on a bandsaw. A really wide blade helps. Since my bandsaw has a 1" blade, I can use the rip fence attachment shown in Fig02 and still expect to get straight cuts without worrying about blade deflection. The fence has a 60 degree angle face with a small (1/8" or so) flat at the bottom of the angled face. A thin sheet of plastic is fastened to the bottom of the fence to cover up the blade slot in the table. I found that it worked better if the fence was downhill of the blade. I tried it uphill, but having to push the stock up against the fence tended to bind the kerf around the blade. My 60 degree fence is held on the saw's fence with blue tape and CA glue, but you could also use screws. Adjust the fence so that the 60 degree face if extended to the bottom intersects the side of the kerf.

Start with a board about 16" long and 1-1/4" or so thick. Home Depot has 5/4 pine that's good for practice. You may want to move up to maple or some other hardwood once you've practiced the procedure, as maple looks better, holds more detail, and allows for thinner finials. Plane or joint a straight edge on the board. Rip the first cut on a board with the straight edge against the small flat at the bottom of the fence. Then flip the board over, so that the now beveled edge of the board is against the 60 degree face of the fence and rip again. Flip the board each time and rip until you run out of board.

My 1" bandsaw blade cuts straight, but it certainly doesn't leave a glue ready surface--it will have to be planed smooth. There are several ways you could do this depending on your tools. If all you have is hand planes or a belt sander than you can use them--but it's rather difficult to plane a triangle with the pointy side down on a bench. Fig03 shows one solution to holding the triangle. A base slightly longer than the triangle has two adjacent triangles glued on it and a stop block on one end. If you're planing, the stop block goes away from you, if sanding the stop block goes towards you. The base is held in a vise, and the triangle to be planed is placed between the triangles of the base. Plane (or sand) one band sawn surface, then rotate the triangle so that the other band sawn surface can be planed.

If you are as fond of blue tape and glue as I am you can use the solution shown in Fig04. Two triangles are temporarily fastened directly to the workbench in front of a stop block. Put blue or other extended release masking tape on your workbench and both of the triangles. Then fasten the down using CA glue. If your bench doesn't have stop blocks you could glue down a temporary one in the same fashion. Plane the triangles
with a hand plane or belt sander in the same fashion.

If you have a power planer you can use a sled to plane the triangles. Start with a board slightly longer than your triangles and wide enough to fit four triangles side by side. Joint the board flat if it isn't already, then run it through the planer so that both surfaces are parallel. Glue 4 triangles to the board so that the vertexes of the pairs meet, then glue a stop block on one end. Add a shim with about 1/16" thickness (matt board, plastic etc) to one face of one of the triangle pairs. This will let you plane both band sawn surfaces without readjusting the planer height. The completed planer sled is shown in Fig05. To use the sled, place a triangle in the deeper channel against the stop block. Check to make sure the triangle doesn't rock side to side. Run the sled through the planer with the stop block end going through last as in Fig06. The first time you'll have to gradually sneak up on the thickness setting until you remove just enough to smooth the surface. Be sure to stand to the side of the planer and don't bend over to watch--there's at least a theoretical chance of the triangle being kicked back and out of the planer. After the first surface has been planed, transfer the triangle to the shimmed side to plane the second band sawn surface. You should be able to run two triangles through the planer at once (one for the first surface and one for the second) as the triangles are far enough apart to not share an anti-kickback pawl.

After you've planed the surfaces you can cross cut them to length. I suggest starting with a length of 8", then adjusting that for the design you adopt. Using a table saw sled with a stop block will yield uniform lengths and make the next steps easier. An optional step, which will make centering the bundles of triangles easier for all three turnings, is to nick the corners of the triangles as in Fig07. It's beneficial to have the nicks uniform in size so I'm using a leather tool (from another life?) for rounding the edge of leather. Veritas makes a similar tool for wood. Fig08 shows the difference between nicked (on the left) and un-nicked (on the right) bundles of triangles. The nicked version should virtually center itself on a cup center.
Fig07  Nicking the corners of the triangles to make centering of the bundles easier.

Fig08  The bundle on the left has nicked corners and the bundle on the right does not. It would be easier to center the left bundle on a cup center.

Fig09  The triangles taped into a bundle for the first turning.

The six triangles have to be assembled, or wrapped, into a hexagonal bundle for the first turning. Begin by snapping a couple of strong rubber bands around the bundle as this will help hold them in position while you wrap them more securely. Use Filament Tape (also known as strapping tape) to start wrapping around the bundle at one end. Take a turn of tape with moderate tension and adjust the fit of the triangles. Then take another turn or two at high tension. Repeat for the other end, and somewhere a little off center so that the bundle is well secured, but not taped where you’ll be turning the design. Fig09 shows the wrapped bundle.

There are lots of opportunities for small errors to gang up on you in a Murphy’s Law fashion in this design. To minimize them where you can, number the triangles clockwise and put an indicator mark on the outside face as in Fig10. This will let you keep triangles adjacent in the first step adjacent in the remaining ones, and rotate each piece the same way.

Fig10  After numbering and placing orientation marks on the triangles.

Determine the minimum diameter you can turn your design to. This depends on the size of the triangles and the width of the web between the windows you want (be generous for your first effort). You can do the math: My triangles are 1-1/8” on a side. I wanted a 1/8” web. My minimum diameter is the triangle side plus the web, or 1-1/8” + 1/8” = 1-1/4. You can also sketch it out on a triangle as in Drawing1. Draw a center line part way on one face. Then draw the thickness of web you want centered on the center line. Measure the distance from the side of the face to the web line across the center line. Double that measurement for your minimum diameter.

Mount a safety drive (cup center) in the headstock of your lathe and a cup center in the tailstock. Using these to mount the bundle holds each piece mechanically (whereas a spur center might only contact two triangles at the headstock) so your face is not entirely at the mercy of the filament tape. Use a pencil to indicate the planned extent of the turned design as in Fig11. For the photos I’m turning a cove 2” wide that starts about 1-1/8” from the tailstock end.

Drawing1  Figuring out the minimum diameter you can turn with as little math as possible.

First Turning
Fig11  The bundle of triangles mounted between cup centers for the first turning. The intended extents of the cove have been marked with pencil.

Turn on the lathe at a moderate speed (maybe a little slower than you usually would turn something of this diameter) and shape the cove with a spindle gouge, occasionally measuring to make sure you don’t cut deeper than the minimum diameter. Fig12 shows the result at this point. Whether because of the slower speed, the necessary overhang from the tool rest, or lack of practice, I wasn’t happy with the smoothness of my cove, so I cleaned it up with a cove tool as in Fig13. This cove tool is simply a ¼” diameter HSS drill blank sharpened at a 45° angle. It works as a shear scraper, and lets me even out the cove whilst leaving a nice surface.

Fig13  Refining the surface with a cove tool used as a shear scraper.

After you’ve turned the cove, sand it with progressively finer abrasives. Then apply a coat of friction polish (I used linseed oil/shellac/alcohol in equal proportions) or sanding sealer. Apply finish **only to the cove**. Fig14 shows the cove after sanding and applying finish.

Fig14  The cover after sanding and finishing. Don’t get finish on the unturned triangle faces as you’ll want glue to stick there.

**Second Turning**

Remove the bundle from the lathe and then remove the tape from the bundle. Turn each triangle piece 120° clockwise. The marks on the ends of the triangles should now look like Fig15. Snap rubber bands around the bundle to hold it together for taping. Do not place the rubber bands over the cove as in the bottom of Fig16, as this will pull the pieces out of alignment. Instead put one rubber band where the top tape will be as in the top of Fig16. Then add tape at the bottom and middle of the bundle as in Fig17, then remove the top rubber band and tape the top as in Fig18.

Fig15  The bundle after turning each triangle 120° clockwise.

Fig16  The bundle rubber banded together for taping. Don't put a rubber band over the cove area as it will pull the triangles out of alignment.
Mount the bundle between centers again. Use a pencil to mark on the faces of the triangles where the first cove started as in Fig19. This will make it easier to see the extents of the cove, and the better job you do matching the coves the more you will like the finished ornament.

Turn on the lathe at a moderate speed. Although, there is a ghost image, it tends to be confusing as in Fig20 and unreliable. If you try and caliper the depth with the lathe on you will find it to be a very uncomfortable experience. That leaves turning the lathe off to check. As you get near to the finished width and depth of the cove, turn the lathe off as in Fig21. Check the thickness of the web where indicated by the big red arrow, and make sure the edges of the cove meet at the same point. The edge indicated by the smaller blue arrow, where the curved faces of the web meet, is useful for judging if your coves (or other designs) match. When looking straight down at this edge it should appear straight and right in the middle of the web.

Sand the cove and apply friction polish only to the cove as you did for the first turning. The result is shown in Fig22.

Assembly

If you somehow managed to end up with absolutely perfect miters you could go ahead and spread some glue and bundle the triangles up but those of us that are mortal are better off gluing in stages. Separate triangles 1-3 from triangles 4-6. If you have Irwin Quick Clamps (or anything similar) you can glue up with just clamps. Take triangles 1 and 2 and arrange them clockwise with the web towards the rim of the clock. Spread some glue (ordinary wood glue is the best choice) on one mating surface and then...
line the triangles up. Pay attention to lining up the window openings and having the inner triangle vertexes match. Use three Quick Clamps as Fig23 to clamp the triangles together. The middle of the clamps pads should be at the triangle vertexes.

If you don’t have Irwin Quick Clamps, you can use C clamps with a bit of fussiness and the aid of some cauls. Use your band saw to cut out some 60° notch cauls out of ¾” plywood. Use the band saw to cut a notch for a rubber band in the face opposite the V opening. You’ll need 12 cauls. Divide them up into pairs with a rubber band holding each pair together.

Clamp a C-clamp open side up in your vise. Spread glue and assemble triangles as described for the Irwin clamps. Slip three pairs of V notched cauls around the assembly then hold the assembly in one hand and tighten the vise held C-clamp with the other. The result is shown in Fig24. While the first C-clamp is still in the vise you can add two more C-clamps across the other two pairs of cauls as in Fig 25.

After the glue has had a chance to cure remove the clamps. Add triangle 3 to the 1 & 2 pair so that the numbers continue to be clockwise with the webs towards the clock rim. Spread glue on one of the mating surfaces and line up triangle 3 with triangle 2.

If you have Irwin clamps clamp the assembly with 3 Irwin clamps as in Fig26. The vertex of triangle 3 should be slightly inboard of the middle of the clamp pad. The other clamp should bear on the flat of triangle 1.

If you are using C-clamps you’ll need to make 6 more cauls (or give up and order some Quick Clamps). Cut a P shape that’s a rectangle with an equilateral triangle on half of one long side out of ¾” plywood. Cut a rubber band slot lengthwise in the plain long rectangular face. Assemble pairs of a V notch and the new P cauls with rubber bands.

Clamp a C-Clamp in your vise. Arrange and spread glue on triangle 3 as above. Put pairs of rubber banded cauls on the assembly. The V notch caul goes on the vertex of triangle 3. The P caul nestsle around the intersection of triangles 1 and 2. Tighten the C-clamp in the vise around one of the caul pairs, then add the other two C-clamps. The result is seen in Fig27.
Fig27  Clamping a third triangle to an already glued up pair with C-clamps and cauls.

Repeat to glue triangle 6 to triangles 4 & 5. Let the glue cure, then remove the clamps.

Now flatten the faces of the two half ornaments to be joined together. You could use a disc sander, plane, belt sander, etc. You could also do the first two turnings for two ornaments at once end to end to get more than the minimum safe distance recommended for a jointer. If you choose the latter, Fig28 shows a modified push block for this. I’ve temporarily (with blue tape & CA glue) added a stop block at the rear and a 60° fence at the side to mate with the ornament half. Which ever way you flatten the halves, try to remove the same amount from both halves.

Fig28  A push block temporarily modified for flattening ornament halves on a jointer. You would have to do to ornaments at once to meet the minimum safe length for using a jointer.

Spread wood glue on the mating surface of one of the halves and then clamp the halves together as in Fig29. Any kind of clamp will do without cauls. Wait for the glue to cure and then remove the clamps.

Fig29  Clamping the ornament halves together.

Third Turning

The photos will follow mounting between two cup centers as in Fig30. If you are interested in trying some of the more complicated variations later you will probably find it easier to mount the blank, turn a tenon at the bottom of the ornament, and then mount the ornament in a collet chuck.

Fig30  The ornament blank mounted between cup centers for turning.

Turn the ornament blank round, as in Fig31, with a spindle roughing gouge. Now start rounding over the top of the globe with a spindle gouge. You should be able to follow the ghost image, as in Fig32, for much of the globe, with occasional stopping of the lathe to double check. Round over most of the globe as in Fig33, leaving the top finial area a little thick.

Fig31  After turning the ornament blank round.

Fig32  The ghost image of the globe at this step is reliable.

Fig33  After rounding over the top of the globe.

Now reduce the bottom icicle area somewhat with a spindle...
roughing gouge and then begin to round over the bottom of the globe as in Fig34. After the majority of the globe has been shaped return to the top finial area and shape the finial as in Fig35. If you wish a thinner or fancier finial, consider mounting the ornament in a collet chuck.

Now start reducing the diameter of the icicle as in Fig36. You will have to make light cuts at this point. I found it helpful to use a ½” roughing gouge (a narrower tool means less metal edge in contact with the wood which means less force on the spindle), made from regrinding a P&N deep spindle gouge (not a detail gouge) straight across. Fig37 shows the ½” roughing gouge in use. I have two fingers curled under the tool rest applying back pressure.

After reducing the size of the icicle, smooth out the surface with a spindle gouge or skew. The result is shown in Fig38. Now sand the ornament with progressively finer abrasives, starting at a grit that makes sense given your surface off the tool. When sanding the globe, especially the coarsest grit, you may find it helpful to back up the sandpaper with a sanding sponge as in Fig39. Fig40 shows the ornament after sanding. Remove the ornament from the lathe, cut off the nubs, and sand the ends of the finial and icicle off lathe.

 Attach a hanger of your choice to the ornament. I used homemade hangers made from 22 gauge brass wire. First bend thin steel wire (about .06”) into a recurved L shape and mount it in a variable speed drill. Cut a length of brass wire and clamp both ends together in a vise. Insert the steel wire L in the loop of brass wire and turn on the drill to twist the hanger as in Fig41. Remove the hanger from the vise and shape it as desired. The small loop on the end, as in Fig42, makes a nice non-sharp, finger friendly end.
spray lacquer). The finished ornament is shown in Fig43.

**Variations**

Once you’ve mastered the basic 6 Window Ornament you can explore variations. Here are a few pictures to get you started. The Oval 6 Window Ornament in Fig44 was turned with a cove with a bead at the bottom for the first and second turning. It’s not necessary to get carried away echoing the shape of the windows with the hanger like I did.

The Diamond 6 Window Ornament in Fig 45 was turned with a V shaped recess for the first and second turnings.
For the 6 Window Ornament in Fig46 I glued dark veneer to one triangle face and oriented the triangles with the veneer out for the first turning. This required a certain amount of luck and/or finagling for glue up, as you can’t glue and flatten halves or you would remove the veneer. I’ve tried several strategies, but I’m not quite happy with any of them yet. Perhaps by the time this is published it would pay to check my web site.

Fig46  6 Window Ornament with veneer in between the triangles.

**Tools**
- Tablesaw or Bandsaw and Planer or Plane or Belt Sander
- Spindle Gouge
- Cove Tool
- Irwin Quick Clamps or C-clamps & homemade cauls.
- Standard Spindle Roughing Gouge
- ½” Spindle Roughing Gouge
- Skew optional

**Materials**
- Wood about 1-1/4” thick
- Rubber bands
- Filament tape
- ⅜” plywood for cauls if using C-clamps
- Wood glue

**Author**
David Reed Smith has started down the slippery slope to retirement by going half time around the time this article was written. He is absolutely delighted so far, and even included a new, one time author picture to celebrate. This article, in a possibly more expanded form, will be available along with more than 50 others on his web site. He welcomes questions and comments via email at David@DavidReedSmith.com

The author, post-semi-retirement.