

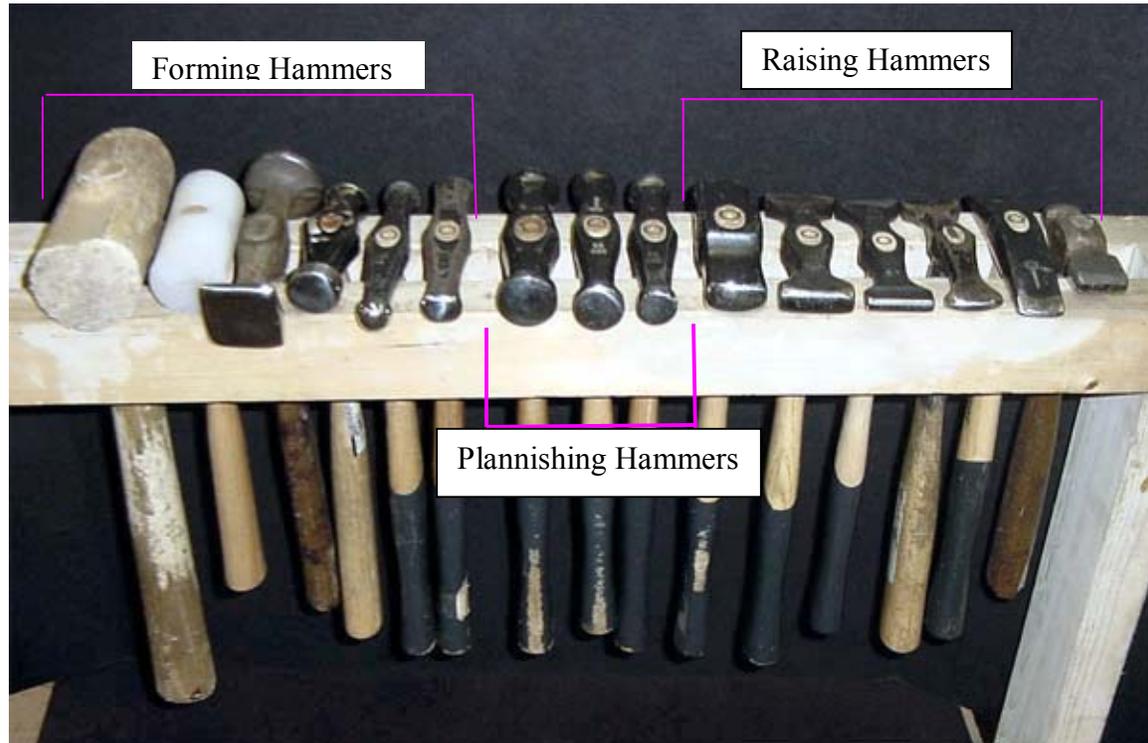


The Raising of Metal
By
Warren Townsend

Since I have been raising hollow vessels and other forms from sterling silver and copper for a few years I would like to share what I have learned. The information is from my experiences and how I raise. There maybe other options but I will not go into detail.

Raising is the shaping of metal from a flat sheet into a hollow form by using certain designed hammers, stakes, and proper placement of the hammer blows. It is the grunt work of making a hollow vessel. To explain this further, follow along.

Hammers



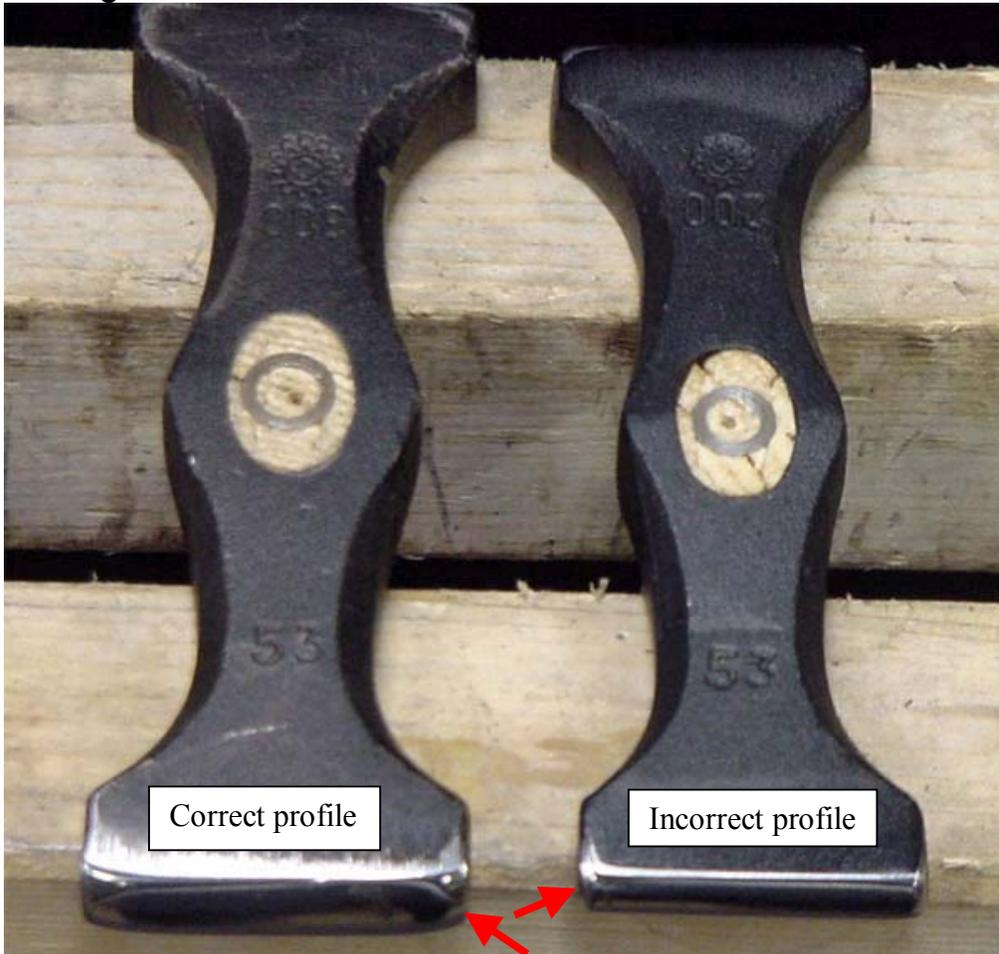
There are many styles of hammers used for making hollow forms. These are some of the hammers that I use.

Raising hammers – usually have a broader face with the ends rounded, one side may have a squarer face, come in different sizes to use on different size pieces and different thickness of metal. The hammer on the far right is a homemade hammer shaped from a ball peen hammer.

Plannish hammers – will have two distinct profiles, one end will be convex, which is used for the first plannishings, and a very flat end used for finish plannishing, come in different sizes to use on different size pieces and different thickness of metal.

Forming hammers – all sorts of sizes and shapes available, depends on what you are making and used where a raising hammer or plannishing hammer will not work, wooden hammers or plastic are necessary.

Raising Hammer



After purchasing a raising hammer the profile of the face requires correcting. It seems the hammer manufactures do not know the correct profile. As you can see on the correct profile the corners have been rounded and the face has just a very slight radius. The incorrect profile, which is a new hammer, the corners are too sharp and will leave nasty nicks. Remove the hammer head and using grinders, files, sanders, and polisher correct the profile. Test the hammer to see if the profile is correct, the corners of the face should not leave marks. This also will depend on the diameter size of the vessel and the disc size. When the hammer hits correctly on a smaller diameter disc, than it will also work on a larger diameter disc. Raising hammers are also available in plastic and wood. The plastic hammers I find are too light weight. The wooden hammers work okay but require maintenance to keep the profile correct.

Handles



Since the hammer head was removed for correcting the profile, now is a good time to modify the hammer handle. You probably noticed that when checking out the hammers in the store most of the heads were loose. This is from the hammer handle drying during shipping. With the hammer head remove, sand down the handle at the head area to allow the head to slide down about a half inch further than the original position. This will put the head of the hammer closer to the handle knob. It makes the hammer feel firmer when hitting but allows the handle to flex more. Drive the handle into the head securely. Cut the access wood sticking out then reinstall the original wedge ring.

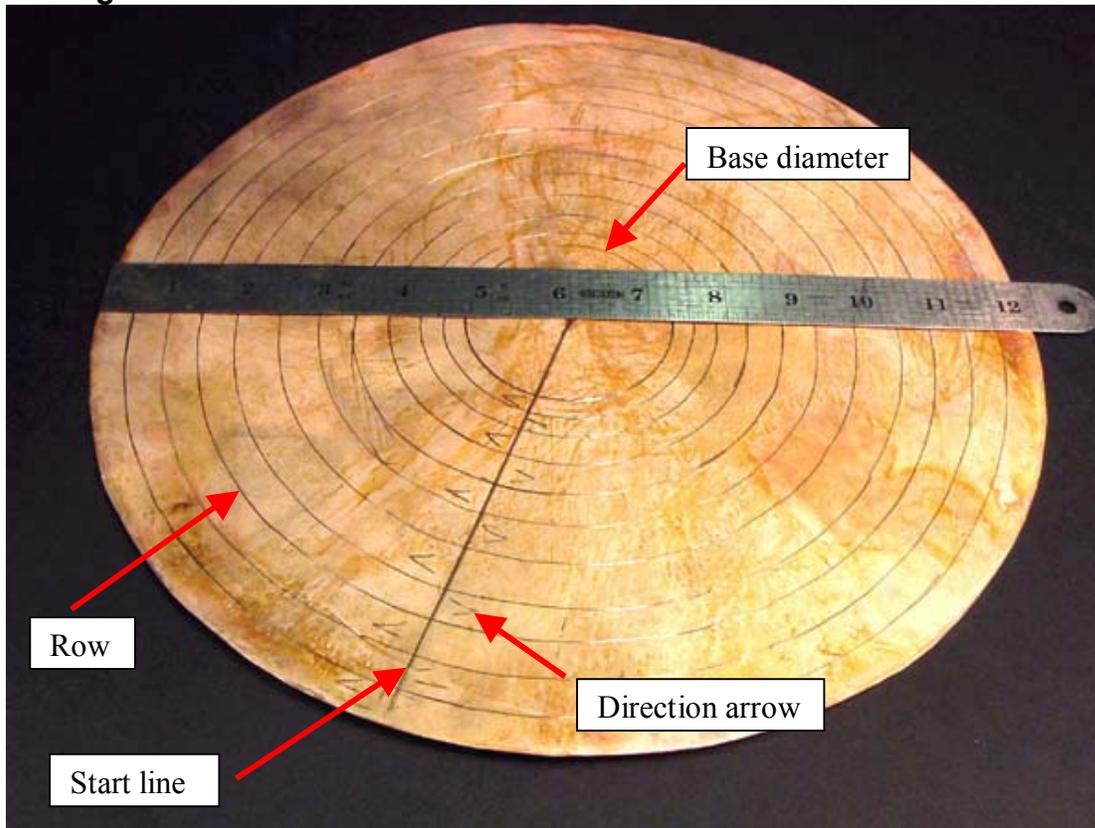
Stakes



Stakes come in many different shapes. Here is a typical raising T-stake. One end is square cut for working on hollow forms requiring a flat bottom. The other end is rounded to use on round bottoms. Stakes are very expensive to purchase. You can also purchase stake holders; I use a large vise most of the times. This is the only raising stake that I have purchased. I make a lot of my own stakes. These are very critical if making curved sides because you need an area for proper plannishing. If making stakes, pay attention to the profile of the stake. Notice how each end curves down. The curve allows you to hold the disc to the stake for the proper angle during raising.

Stakes can also be made from wood or plastic. Either one will work for the raising process, but are useless for plannishing.

Making The Disc



In order to choose what size of disc and what thickness of metal to use I suggest the following. If making from copper 24 oz (.032 in) is the thinness I will work. I prefer using 32 oz (.043 in) thickness of copper. The thicker copper will hold its shape better and you do not have to worry about cracking or tearing. For sterling silver 18 ga or 16 ga will work depending on the design of the vessel. Using thinner sterling silver is possible if making a small vessel.

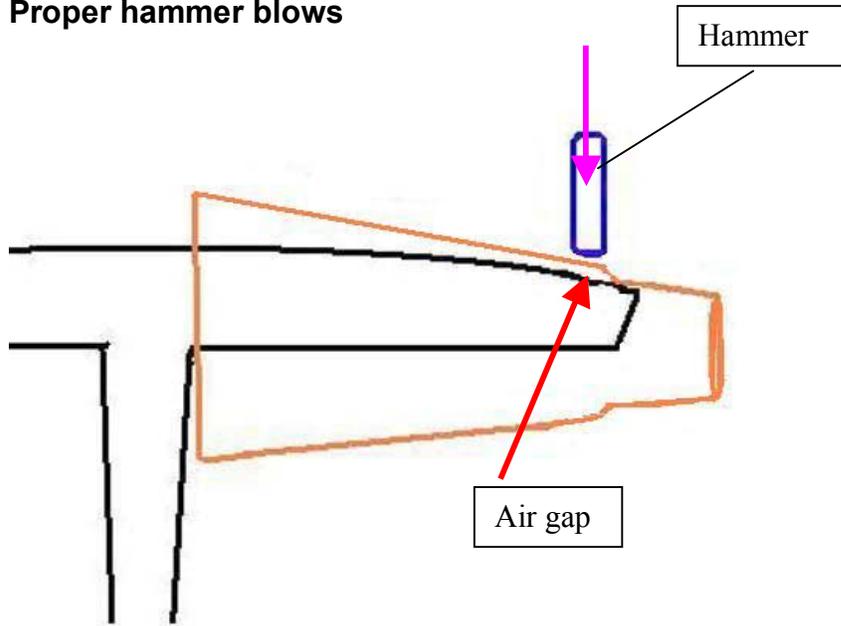
To figure out the size of the disc, you need the designed diameter size and the height for the finished vessel. Add the diameter to the height and this will give the proper size disc. For example if the vessel would be 3 inches in diameter and 9 inches in height than; 3 plus 9 equals 12 inch disc. This is an acceptable formula for most straight sided cylinder vessels. If the vessel will have a narrower top or bottom than the middle, you can add or subtract a little. It is better to make the disc a little on the larger side.

Mark the center of the disc before it is cut. If you are buying precut disc than find the center. Using a prick punch make a sharp indent. The prick punch indent will be used through out the process of raising. You want to make sure it is deep enough to prevent the center from being lost. Using a compass with pencil lead, draw your diameter for the base. Use a size of base that you can remember and be able to set the compass to for later markings.

Now you need to draw the rows. The rows are a complete circle around the disc/vessel. The rows are necessary to help you hammer in circles around the disc/vessel. The rows make it easy for keeping the disc/vessel true during hammering. After all of the rows are raised, the completion is called a round.

After drawing the rows make a start line. This is where you will begin hammering a row and finish a row. On each side of the start line make direction arrows, one arrow going one direction and the next row the arrow the other direction. Hammering around in different directions will aid in keeping the disc/vessel true.

Proper hammer blows



Proper hammer blows are a must. The raising hammer is struck straight down to the stake. As the hammer hits the metal the metal dents in, but yet at the same time the metal moves up or raises to the top of the vessel. The metal is struck so that you are hitting over the air gap between the stake and the vessel. Holding the vessel around a 20 degree angle ensures there is always the proper air gap. Do not change the angle of the vessel once a round is started. The rounds should all be raised at the same angle.

Things to watch out for:

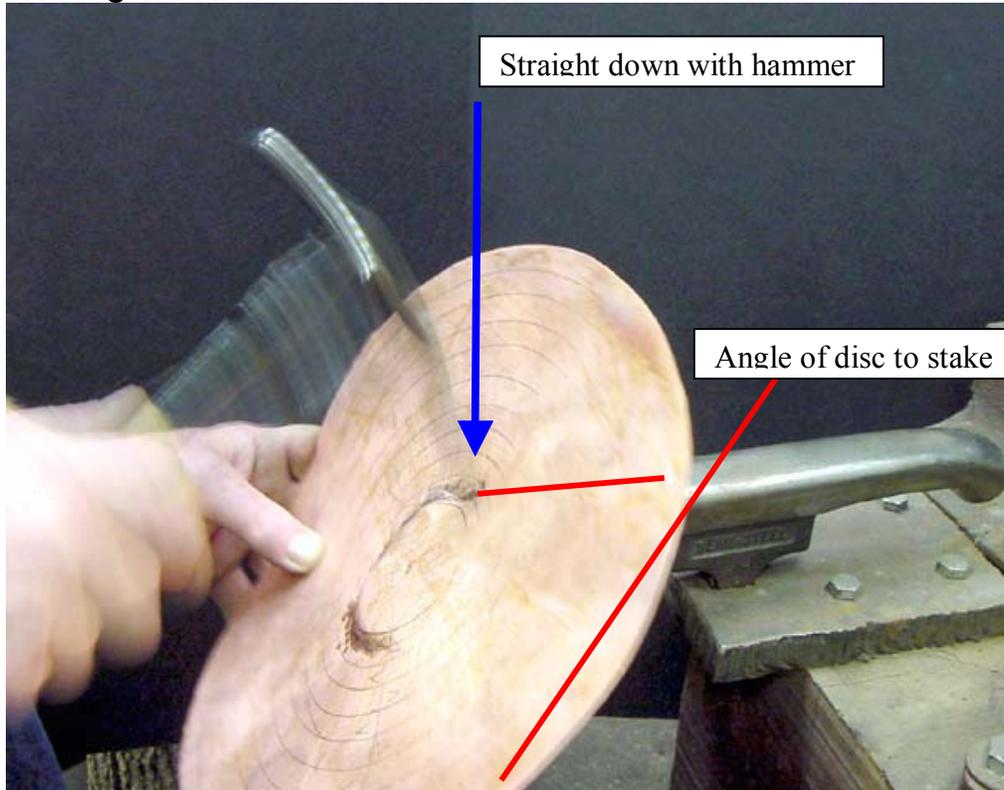
- If the vessel is not kept tight to the stake it can rock with the blows of the hammer and bulge or make the sides convex, curve out.
- If the hammer is titled back (top end closer to you) then this will stretch the metal
- If the hammer is titled forward it can shrink the metal
- The hammer head must be constantly kept perpendicular to the stake, any twisting of the head can leave hammer nicks or marks that will not plannish
- Always hit directly over the stake, if you hit to either side of the stake, it will make a large dent, which can be hard to correct
- There are two distinctive hammer sounds, a thunk and a twank. The thunk is hitting the air gap, which is good, the twank is hitting the hammer and metal to the stake, which is bad.

Correct hammer blows will give the following results:

- No excessive nicks or dings that require extra time to work out
- Metal kept at a constant thickness through out the vessel
- The vessel will remain round
- The sides will be true and straight
- No tears or cracks

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Starting



Since I am making a flat bottom vessel I am using the squared end of the T-stake. The hammer I am using is my smallest raising hammer. The smaller hammer enables a sharper base line. Hold the disc firmly to the stake at an angle. Keep the disc located on the stake where the diameter line is just above the stake. Using the hammer hit the disc a straight down blow. Do not hit forward, it will stretch the metal some. Follow along the line with the hammer blows while turning the disc. Do not hit hard and smash the metal, only dent the metal in the air away from the stake. It may take twice around the line to give a half-way clean base line. This process will be repeated many times so try to keep close to the line but do not do any excessive hammering. The base line or the bottom area will be trued after every three rounds.

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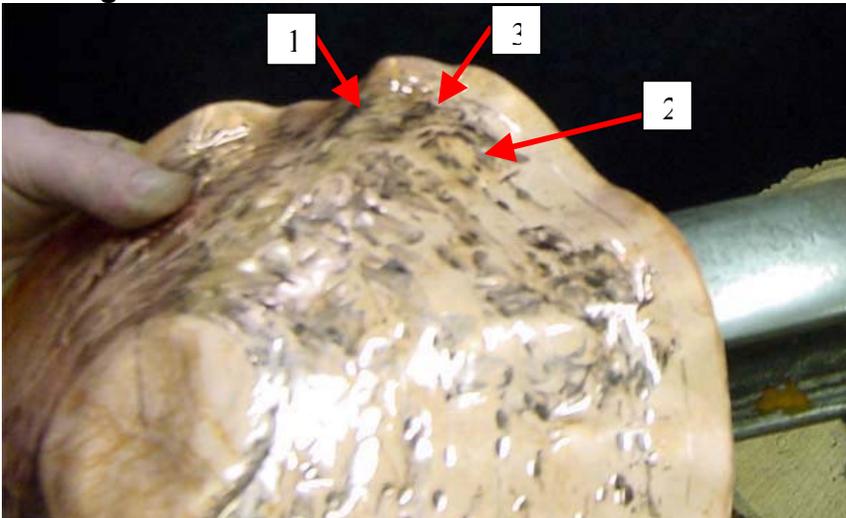
Folds



The first round on the disc looks pretty ugly and all ruffle. About 2/3 of the rows have been completed. You can see the disc is folding as it is being raised, which is normal. The important things to remember:

- Do not try to take too big of bite stay within the rows.
- Do not try to raise too fast, it is very easy to do when starting.
- Keep the disc close to the stake; hit the disc above where it contacts the stake, air gap.
- If working with sterling silver about this far up, the disc it will become very springy and stiff. This will require your holding hand to become very important. Raising requires more strength from the holding hand than the hammer hand. A heavier hammer may have to be used.

Closing Folds



Here the folds are being closed some. You do this as you work around the rows. Note how there is more hammer marks by the folds. You try to close the folds by hammering on each side than towards the center of the fold. I am using my large stake here because of the surface area of the folds in the disc. Do not kink or crimp the fold area.

Finish of Round One



Here is the disc after completing the first round. All of the folds have been closed. The disc is now only 1 1/2 inch diameter and the sides have been raised about 2 inches. Off to anneal and do some more rounds.

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Rough Plannishing



I am now going to switch over to a vessel that I have completed quite a few rounds of raising. After every three rounds or less, a rough plannishing is required. If this step is not performed routinely a lot of effort in the next rounds of raising will be lost. Rough plannishing will smooth out some of the waves and dents from the raising process and it allows you to see how true the vessel is to shape. I like to have the vessel freshly annealed and some what clean but you can also do this right after a round of raising.

Try to use as large as stake as possible, but make sure the stake diameter is not too large for the diameter of the vessel. A too large of a diameter stake will cause the vessel to have vertical lines or slight bumps up the vessel. The vessel will fill slack when hitting against a too large stake because the vessel is not touching the center of the stake. A polished straight piece of pipe also works. Also if the stake is not at the same profile as the vessel you will dent.

If using copper, a wooden or plastic hammer will work. I use this wooden hammer sometimes on sterling silver but I usually use my large plannishing hammer. If using a plannishing hammer use the convex side and hit lightly. You are just trying at this point to make the vessel somewhat flat, not remove any hammer marks.

Work the hammer over the vessel in a random circle pattern. Turn the vessel while working to make as flat as possible.

Setting The Bottom



As the vessel is being raised the stake should be resting against the bottom of the vessel. This will cause the bottom to bulge out and become irregular. Setting the bottom again straight will help keep the vessel true and at the designed diameter.

Using a compass with pencil lead, draw the diameter line the same size as the very first time. Draw a row line slightly away from the diameter line.

The stake I show here is from a wooden softball bat. I keep the end very flat and the edges knocked off to prevent cutting the metal. A metal stake will work but you must be very careful not to cut or stretch the metal. I wait until the final setting of the bottom before I switch to a metal stake.

Using the convex side of a large planishing hammer and a flat end stake, flatten out the bottom along the diameter line. Go around the edge first. The middle will probably bulge more. Now how the vessel off of the stake and hit in the middle. Concave the middle in a little. Also make sure none of the bottom is higher than the diameter line.

Rest the vessel now against the stake and from the center work out to the edge in a circular motion. If the steps were performed correctly the bottom metal has been shrunk and should be tight and flat. No oil canning.

Drawing Rows On A Vessel



I am a big believer in marking the vessels with the rows and the start lines. Using a compass will only allow you to go so far down the vessel. Here I am using a cheap magnetic base dial indicator and a steel plate. It may be a little time consuming to do the rows but if you want a vessel to stay true and round it is a must.

How Much Does A Round Change The Vessel?



The vessel is currently 6 inches high and the top diameter of 7 1/4 inches.

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A Round of Raising



1 – The first two rows have been raised.

2 – Note the angle of the hammer, it is hitting straight down to the stake.

3 – The hammer will leave nice dents as it raises. With thinner metal the dents can be larger but also the angle to the stake will make a difference. This is about as big as dent that I want to make. Hitting harder or more of an angle can cause the metal to crack.

4 – Moving up the rows the vessel is getting a little harder to hold. See the glove on the holding hand. Also notice that the hammer dents are the same depth and the “shelve” is about the same in each step. That is achieved by holding the vessel to the stake at a constant angle.

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Getting There



5 – Only two rows to go. Notice how the top diameter is wavy. This is from the metal folding as it is being raised. The folds will be less as the vessel gets smaller in diameter.

6 – The folding is more noticeable now at the top edge. Only process now is to make sure the vessel is still being held at the same angle and there is the air gap. With the correct blow of the hammer the folds will close and the diameter drawn in. If at this stage, if you try to close the folds by holding the folded area to the stake the top diameter will bow out and you have lost some of your labor of raising.

Completing the Round



One round of raising is completed. It is not a real fast method. For the time it took to do this one round the size has changed from:

“The vessel is currently 6 inches high and the top diameter of $7\frac{1}{4}$ inches.”

To now $6\frac{1}{4}$ inches high and 7 inch diameter, this was a gain of a quarter of an inch. A quarter of an inch is about normal. If real lucky a half inch is pushing the limits with copper. With 16 ga sterling silver a quarter to eighth of an inch is good. Well only 12 more rounds until I get to my desired diameter of 3 inches.

See too the nice straight side profile and it looks almost perfectly round, the signs of a good raising.

The final piece on the cover is 3 inch diameter and 8 inches high. Using various stakes I was able to make the shape I wanted. Using proper raising techniques it is possible to make many shapes.