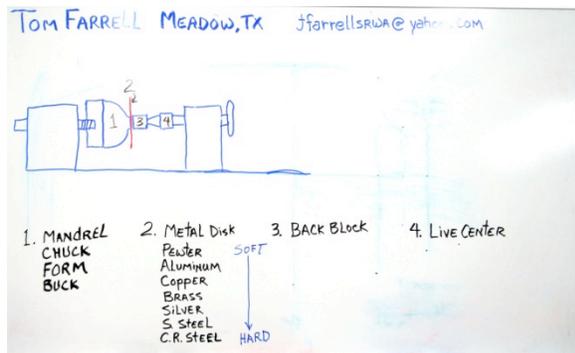


Metal Spinning

Presented by: Tom Farrell

At the Thursday, March 26th meeting of the Woodturners of North Texas, Tom Farrell will present a demonstration on Metal Spinning. As demonstrated by Tom, metal spinning is performed on a standard wood lathe with a few additional tools and forms most of which can be shop fabricated.



In the above diagram, one can see the basic elements needed for holding and shaping the sheetmetal disk. Mounted on the headstock is the mandrel (chuck, form, buck) upon which the metal is to be spun or formed. The metal disk (2) is held against the mandrel by the Back Block (3) which is mounted on a live center (4). The mating surfaces of the mandrel and the back block have matching complementary surface shapes.

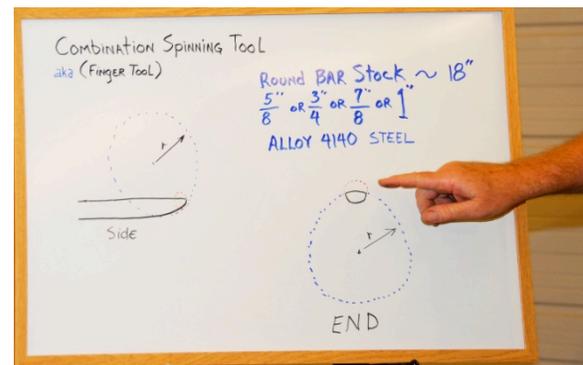
By using a live center with interchangeable tips, one can make custom shaped back blocks to accommodate each situation.

The mandrel is turned from wood to create the internal shape of the part to be spun. You should use a wood that has fine uniform grain without hard and soft spots. Any imperfections in the surface of the mandrel will also show up on the surface of the final spun metal shape. Some woods, such as olive and pine have hard

and soft areas corresponding to spring and fall growth. These hard and soft areas may show up as ripples in the final spun piece. There are several alternatives to wood for mandrels. Tom has had good results from using Corian, the same material used for counter tops. Often scraps are available from Installers but you may need to glue several layers together to get the size you need.

When designing and turning your mandrel, be sure that the diameter of the form never decreases when moving from right to left, the direction the material is spun. If a smaller diameter is encountered, the metal will flow into it thus locking the metal onto the form. (Some times this technique is used to make a weighted lamp base.)

The metals used for spinning include: pewter, aluminum, copper, brass, silver, stainless steel, and cold rolled steel. For the demo, Tom used the aluminum alloy 1100-0 which was 16 gauge or 0.050 inches thick.



The tool used by Tom to form the aluminum onto the mandrel is called a Combination Spinning Tool or sometimes called a Finger Tool. A large radius is needed on both the top and bottom of the tool. Its basic shape is shown in the diagram above. He made his own Finger Tool out of 4140 alloy round bar stock about 18 inches long. (Drill stem sucker rod also works

well.)It was mounted in an old shovel handle giving it a total length of around four feet. This long length is necessary to allow placing the non-working end under his arm pit so that his whole body could be used to leverage the tool during the spinning process.

He made his own tool rest from stock steel about one inch square and one foot long. It has a series of holes spaced along the top that are fitted with a pair of movable steel pins. In usage, Tom uses the pins to leverage the finger tool against the spinning aluminum.

While spinning the metal, it must be lubricated to prevent galling or damage.



There are a lot of different recommendations as to what should be used but Tom has found that one of the best and yet economical lubricants is the wax from a toilet bowl seal obtained from your local hardware store. (Be sure to get an unused one.)

For first projects, Tom recommends that the mandrel should be designed to make an object that is twice as wide as it is high.



This shows Tom using the finger tool and tool rest to flow the metal down and around the mandrel.



The top of the bowl is trimmed up using a trimming tool, a steel bar fitted with a 1/4 steel lathe cutting tool. Another shop made tool. [I found a box of five carbide tipped 1/4" cutting tools at Harbor Freight for around \$5. JIG].



The bowl is then reversed and final trimming of the top is performed



This is what the finished bowls look like.

When spinning the metal, use less pressure as you move further out on the mandrel.



Too much pressure too far out on the mandrel can cause cockling (wrinkling of the metal). If the cockling is not too bad, the end of the finger tool can be used to lift up the edge and move it slightly back toward the tailstock. Then using a

backing stick in your left hand, put it under the cockled metal and use the finger tool to iron out the wrinkles. Yes, you are using the backing stick in the left hand and the finger tool in the right hand at the same time. Both tools are across the toolrest prying against the pivot pins trying to iron out your mistake. And yes, you will be very busy at this time. If is not cockled too bad and if you are lucky (good) you will be able to salvage the work, otherwise start over.

After spinning the bowl, Tom sprayed it with WD-40 and wiped it down with a rag to remove all of the wax lubricant.

There are a lot of different style tools available for metal spinning and a lot of opportunities for our incorporating it into our woodturning.

References given by Tom:

Book: The Art of Metal Spinning: A Step by Step Guide to Hand Spinning By Paul G. Wiley, Available from Amazon.com for about \$17.00.

Terry Tynan is a professional metal spinner with over 20 years of experience. He is the host of a web site named <http://www.metalspinningworkshop.com>. The phone number for the Metal Spinning Workshop is 610-277-7460

Metal spinning tools, tool rests, metal disks, videos and polishing compounds are available from

Tom also has a handout, 'Metal Spinning Tutorial' he downloaded from the internet.

V1.0 Metal Spinning Peter Rubin Fletcher •perf• 11.10.95, I found it at:

<http://www.fdp.nu/mikelldevice/spinning.pdf>

Tom Farrell
Medlow, TX
tfarrellsrwa@yahoo.com
(806) 548-4621

Metal Spinning

By Tom Farrell, South Plains Woodturners, Lubbock, Texas

Safety

All the safety rules that apply to woodturning apply to metal spinning.

Eye protection is essential. Use safety glasses always. Do not touch the spinning metal with your hand to check your progress until the metal is smoothed down to the form and then, only do this very carefully if you must. If you feel uncertain about any operation or would like personal instruction, please ask for help.

Instruction

Book: *The Art of Metal Spinning: A Step by Step Guide to Hand Spinning* By Paul G. Wiley, Available from Amazon.com for about \$17.00.

In the book *The Art of Metal Spinning*, Paul Wiley guides you through spinning several objects step by step. The objects include a sphere and a street lamp. The book is well written and illustrated. It is spiral bound for easy to use in the shop. Paul Wiley is a professional metal spinner.

DVD: *Metal Spinning Workshop DVD. Double Disc Set (part 1) and Double Disc Set (part 2)* By Terry Tynan, Available from Amazon.com for \$39.95 per part. The DVD's are also available directly from Terry Tynan on his web site at a small discount if you buy both parts at once. A new DVD has been recently released about metal spinning on the Mini-Lathe.

Terry Tynan is a professional metal spinner with over 20 years of experience. He is the host of a web site named <http://www.metalspinningworkshop.com>. The phone number for the Metal Spinning Workshop is 610-277-7460. I consider this the best resource of information and instruction I have ever seen on metal

spinning. If you have any desire to learn more on the subject, this is the information to have. Everything I will cover in this demo is covered in much greater detail on the DVD's.

Spinning Metal Sources

Roofing copper is available locally in 16 or 20-ounce weights.

Atlas Metal Sales, www.atlasmetal.com, the best price I found on lead free pewter. They carry aluminum ingots and bronze, brass and copper sheet.

T. B. Hagstoz, www.hagstoz.com carries brass, bronze, copper, gold and gold filled, nickel silver, fine silver, sterling silver, pewter, and platinum. They sell jewelry findings and a special low temperature solder for pewter.

<http://Onlinemetals.com/> for copper and brass, telephone (800) 704-2157

One available source I have found for dead soft pure aluminum (1100 – O) in quantities affordable to craftsmen is from Moor Metals. My last order was about \$600 and was split several ways among our club members. Check out their web site at <http://www.moormetals.com/index.html>. Their phone number is 508-429-9446. Ask to speak to Paul Maloney. Moor Metals also handles copper and brass.

Metal Gauge related to decimal thickness

14 gauge	0.062" About 1/16 th "
16 gauge	0.051"
18 gauge	0.040"
20 gauge	0.032" A little over 1/32 nd "
22 gauge	0.025"

24 gauge 0.020" ///////////////
26gauge 0.016"

Lubrication

The best lubricant I have found is sticky part of a toilet gasket. You can get these rings at any hardware store. The gaskets used to be made of soft wax. All the new gaskets are made from synthetic grease. This is very good lube and sticks to the metal very well. When you are finished with your spun part, use a little spray of WD-40 and a soft rag to clean off all the grease. You will find many suggestions of exotic lubricants in older written material, and truly, anything that is slick will work. A toilet gasket is much easier to find than mutton tallow, lanolin laundry soap and a lot cleaner than wheel bearing grease. You may choose to carefully melt the ring and mix in a small quantity of light vegetable oil to thin the material for easier use. Use a piece of rolled up denim stuck together with wood glue to apply the lube to the metal.

Spinning Tools

Metal spinning tools, tool rests, metal disks, videos and polishing compounds are available from <http://www.cuttingedgetools.com/>. I made the tools and tool rest I use. They are different from what is sold by The Cutting Edge. I use a combination tool made along the lines of that made by Terry Tynan. Terry Tynan has metal spinning tools and metal circles for spinning for sale at his website, www.metalspinningworkshop.com 610-277-7460. Everything you need to make a combination-spinning tool is available at the lumberyard. You will need 18" of steel rod 3/4" diameter, wood for the handle, a grinder with rough and fine wheels, a short piece of metal pipe to reinforce the end of the wood, a file, a lathe, sand paper and a buffer to polish the end of the tool. The combination tool is also known as a "finger" tool because it is shaped much like the end of a finger. If you want a

more durable tool, use steel alloy 4140 or oil field "sucker rod". You can get 4140, and almost anything else you can imagine, from McMaster-Carr. Their web site is <http://www.mcmaster.com/>. From the index choose RAW MATERIALS subcategory STEEL. Tool making is covered in detail on the Metal Spinning Workshop DVD part 1.

Mandrels, Chucks and Forms

The words mandrel, chuck and form have the same meaning in metal spinning. The terminology changes from book to book. Wood, metal or composite material may be used for a form.

Wood is the best choice for non production use. The best wood to use is Hard Maple. Cut wood disks and stack laminate them with wood glue. Prior to gluing, cut a hole in the center and use a close fitting dowel to line up the pieces and hold them in position under clamps until the glue dries. Without the dowel, the pieces are very hard to clamp.

There are 3 methods to mount the form on the lathe.

1. Use a 4-jaw scroll chuck with dovetail jaws
2. Use a faceplate
3. Drill and tap a hole in the base of the form the same size as the spindle nose of your lathe. Traditionally, metal spinners prefer to drill and tap a hole in the form. One advantage to this method is avoiding misalignments from using the scroll chuck. The 2nd advantage is not placing and replacing the faceplate from form to form. Drilling and tapping is less expensive in the long run and your forms will not suffer from misalignment. Turn the wooden blank in your lathe to the shape you desire for the form. **REMEMBER**, if your form is not ever expanding (continuously opening), your spun piece will be locked on the form. It cannot be removed without either cutting the metal or cutting the form. I have seen

pieces intentionally locked on the form. An example of this would be something like a lamp base where the extra weight of the wood is needed to stabilize the lamp.

Follow Blocks

Make a follow block of hard wood that matches the size and shape of the base of the form. You may use a live center with a 60 degree point if you cut a matching cone in the back of the follow block. A handy way to cut a cone in a follow block is to use a 60 degree center drill available from a machine tool supplier or Harbor Freight. An easier to use follow block can be made using a live center that has replaceable points. In your lathe, turn a shank that will fit your live center hole using hard wood. Reverse the follow block and turn the face of the block to match the base of the form. Fit this follow block turning into the live center body and you are ready to go.

Back Sticks

Use the back stick to help iron out wrinkles in the metal, support the back of the metal disk while spinning and to support the disk while applying lubrication. The back stick is made of any hard wood. Use a short back stick with small diameter spinning and a longer back stick with bigger projects. Dimensions of the back stick are not critical. A stick of hard wood approximately $\frac{3}{4}$ " thick by 2" wide by 18" long is a handy size. Taper the business end of the stick back about an inch on each side or more as it suits you.

Trim Tool

Using the trim tool is one of the more dangerous operations in metal spinning. If this tool is not used correctly, you will ruin your work and you may require urgent medical care. Use this tool only when it is properly supported on the rest and prevented from sliding by a fulcrum pin. Do not over reach, move the rest closer. Trim the edge only at the point the spinning is almost

completed. Use a firm grip. If your spinning is very out of round, dismount the work and trim it with tin snips. A heavy scraper with a square edge can be used to trim.

Annealing, in metallurgy is a heat treatment wherein the microstructure of a material is altered, causing changes in its properties such as strength and hardness. It is a process that produces equilibrium conditions by heating and maintaining at a suitable temperature, and then cooling. It is used to induce softness, relieve internal stresses, refine the structure, and improve cold working properties.

Pewter and pure aluminum (1100 – O) do not easily work harden and will very rarely need to be annealed. Copper and brass will work harden and need to be annealed.

To anneal copper and brass, place the disk on a fire proof support that will not draw heat away from the metal. Use steel rods set on end to form a support on which the disk will be heated or use a short section of large diameter steel pipe set on a fire proof platform. Do not heat metal on a concrete floor. Heat the metal with a propane torch in a darkened work area. When the metal turns just a dull red, maintain the dull red color for 20 or 30 seconds, then remove the flame. As quickly as conveniently possible, drop the heated metal disk into a metal bucket filled with cold water. In a few seconds the metal may be removed, dried off and go back on the form. Be very careful in this process not to burn yourself or burn your shop down. Have a fire extinguisher handy and do your annealing well away from flammable materials. If you are using aluminum alloy such as 3003 H14 you must anneal it prior to forming. Heat the aluminum until it will just char the end of a pine stick and quench it immediately in cold water. You may have to re-anneal it several times to get it down to the form. Small

disks can be annealed with a small torch. Hold the metal disk at the edge with pliers. Do not use your good pliers for this operation.

Pickling

Pickling is the immersion of metals in an acid solution for the purpose of removing surface fire scale and oxides caused by heating, annealing, casting, soldering etc. This is a dangerous operation. I prefer to simply use very fine sand paper to remove the scale. The metal can still be polished using buffing compound.

Polishing

If your metal is rough, try a medium grit sand paper. Work towards finer and finer grits until the surface is uniform. Steel wool works well also. Both sand paper and steel wool will leave a brushed surface. For a polished surface, use metal polishing compounds. Tripoli polishing compound in stick form is available and works well. Finer compounds are also available for a higher shine.