Mixed Media Additions to Woodworking

1. Non-Wood Materials
2. How to Integrate Soldered Metals with Rivets
3. How Jewelry Soldering Works

Glendale Woodturning Guild

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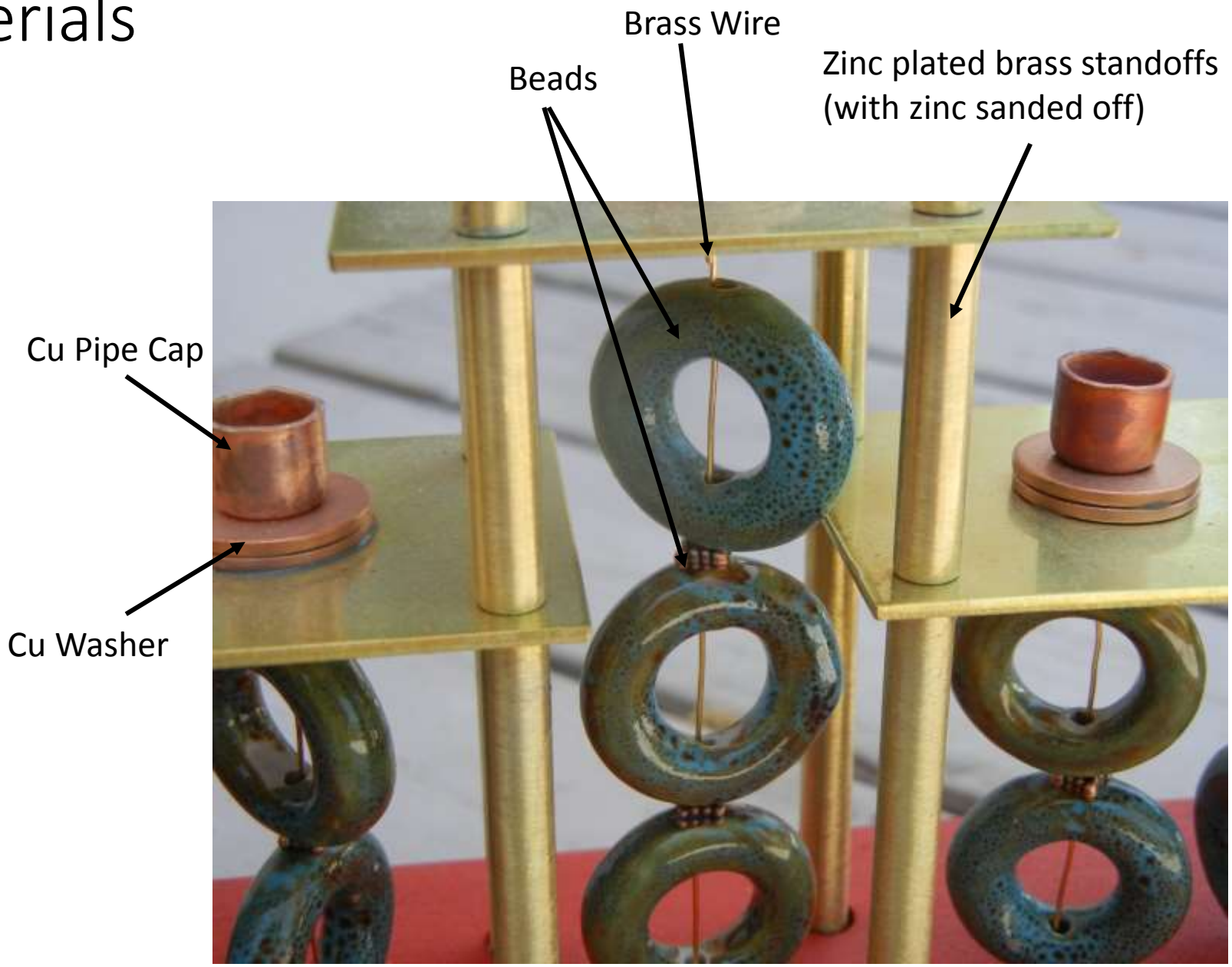
1. Alternative Materials

- Shell & Stone–Talk to Bill Loitz
- Ceramic & Metal Beads
- Found Objects
- Plumbing pipe caps & copper plated tube rivets
- Standoffs (posts that separate circuit boards)
- Steel bailing wire
- Copper pipe
- K&S Metal shapes—brass/copper/aluminum extrusions

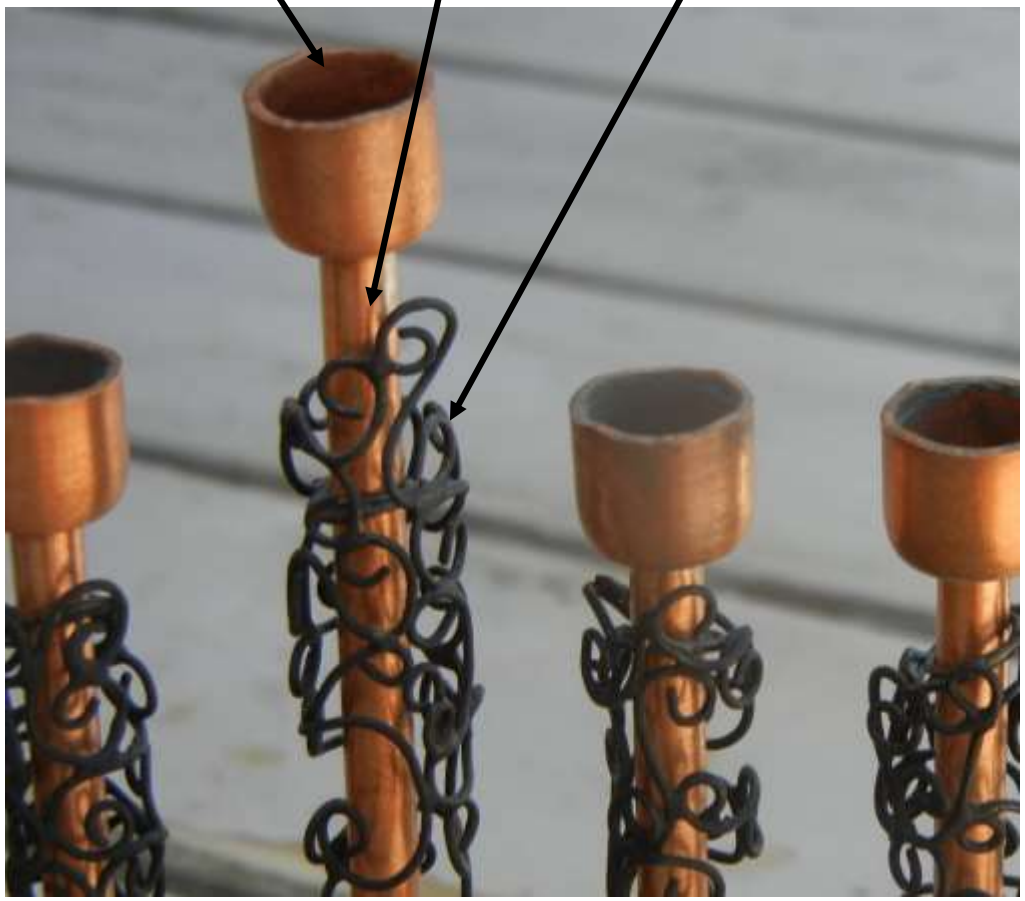


Cu Tube,
threaded internally
on bottom

Brass sheet

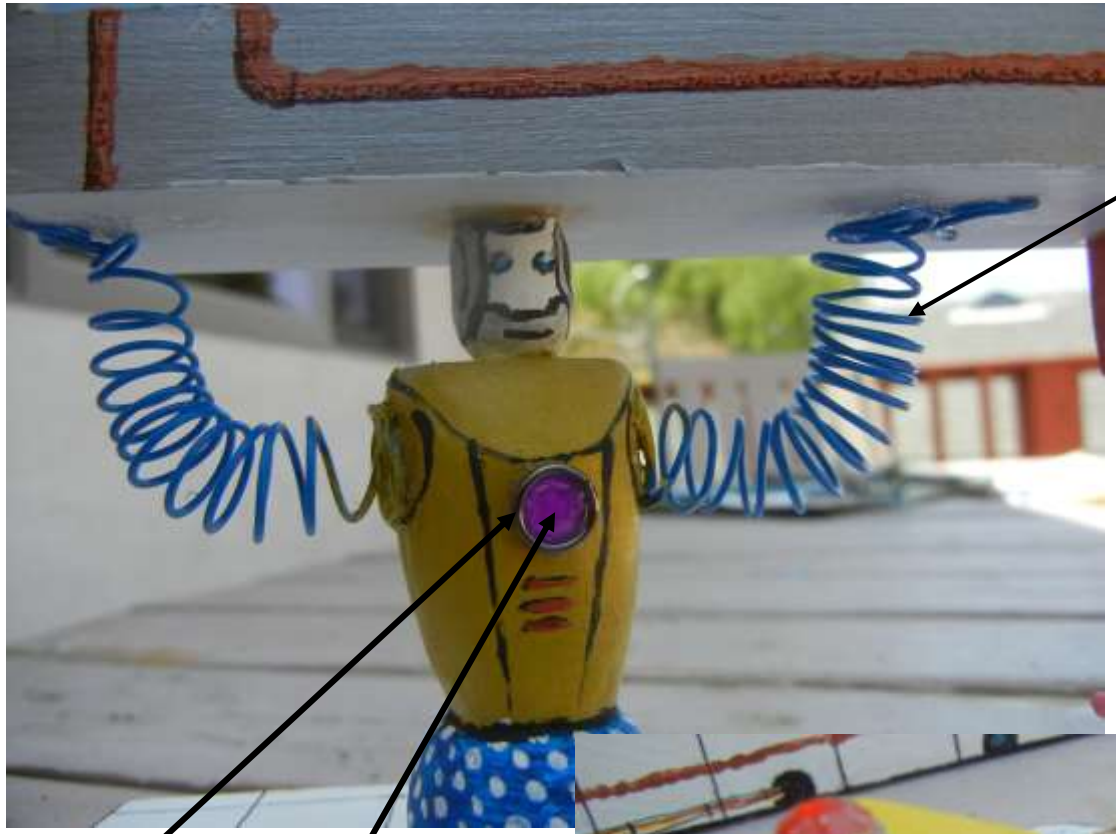
Cu Pipe Cap,
Silver soldered

Steel Bailing Wire,
Brazed



Mini brass
hinge (painted
w/ enamel)

Cu Wire (from rewiring
garage), silver soldered



Craft/
hookup wire

jump ring
(craft)

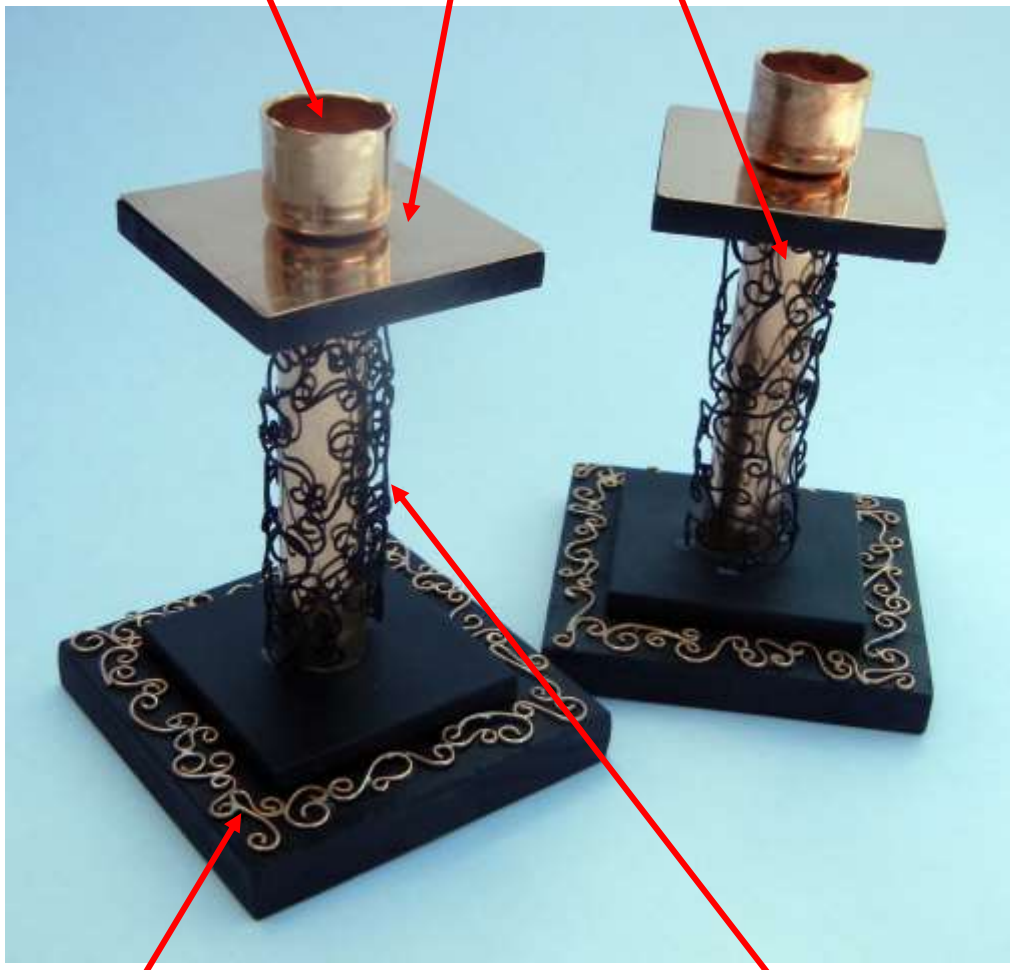
Plastic rhinestone

Electrical Cable
Overwrap

Cu Pipe Cap

Cu Sheet

Cu Plumbing Pipe



Cu Wire,
Silver Soldered

Steel Bailing Wire,
Brazed, Pickled, & Painted

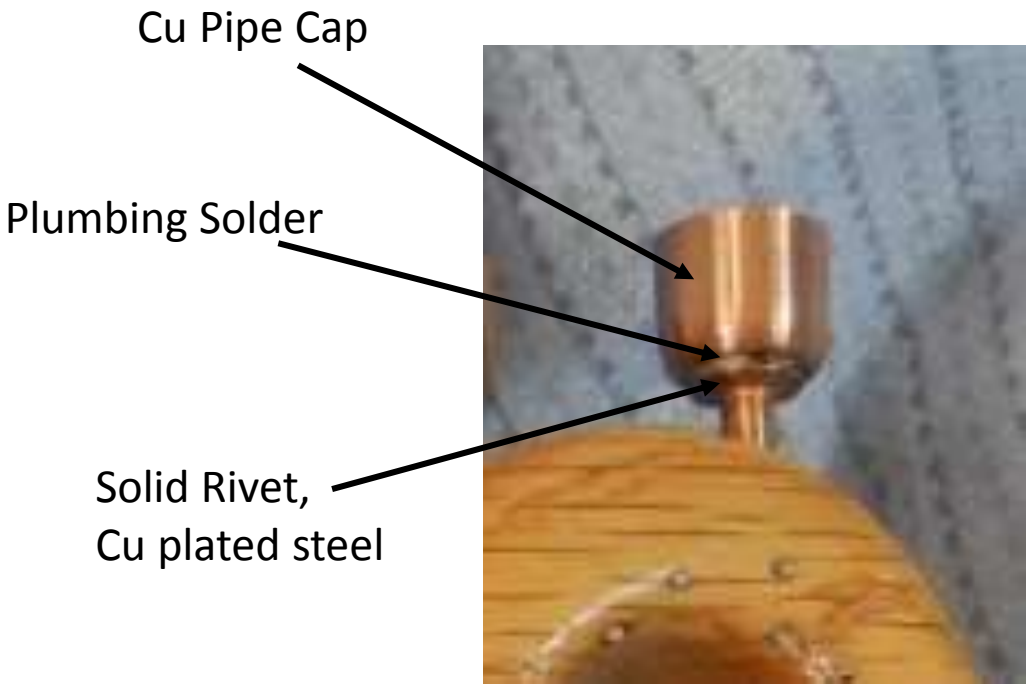
I love McMaster Carr…

The Secret to My Candle Cups:

- Copper “Pipe Caps” (sized for candles)
- Copper plated steel rivets
- Plumbing flux and solder (water safe)

Invert, flux, solder carefully with plumbing torch—the solder is way too large for the application, so this will be challeng. Clean up solder and firescale with scotch brite (and a power drill).

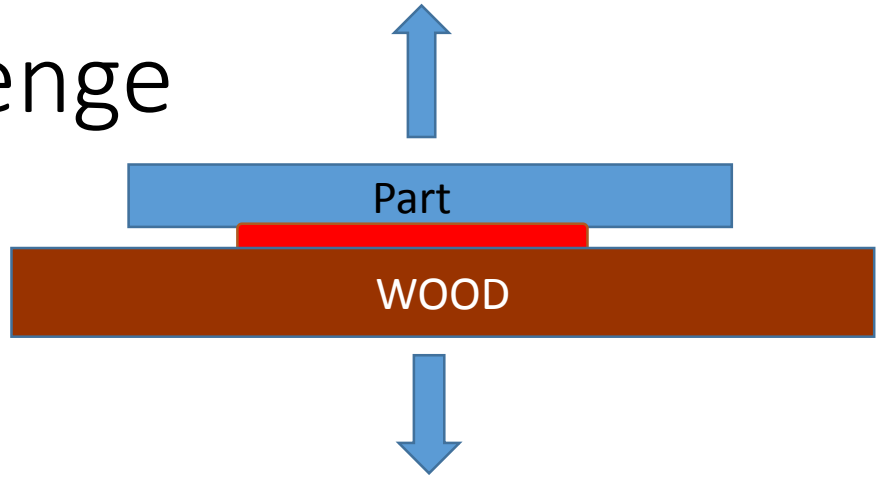
Expect significant attrition (buy extra hardware).



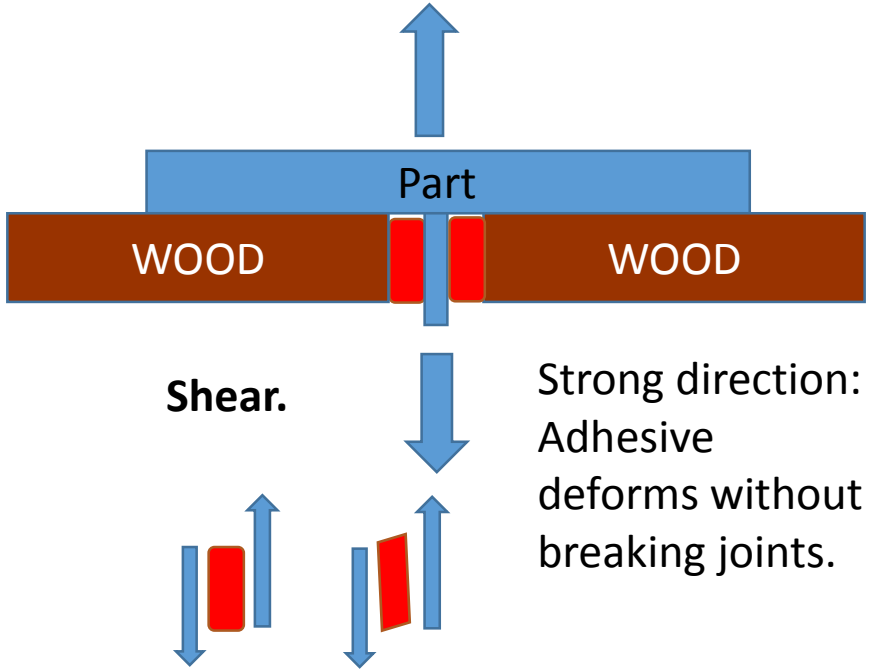
Though sometimes I use screws...

Getting them to “stick” is my challenge

- Parts that see heat –no CA. CA and Loctite can be removed with heat. Use a higher temp silicone or epoxy.
- Glass—Abrade & apply silicone, or use specialty epoxy (with etchant).
- Plastics—many plastics react (craze) from CA, Loctite, and some silicones. Use “foam safe” CA or other plastic safe (ex. aquarium safe) silicone. Test on scrap piece first.
- Metals to Wood—The metals and wood will expand at different rates with heat, making parts delaminate. Mechanical fastening recommended. If gluing, abrade metal, clean, and bond with epoxy. Loctite and CA may work in areas that have mechanical locking, but may stain wood. **Adhesives work best in shear (not tension).**
- Metal to Metal—Best is mechanical attachment (riveting, soldering, screwing). **I prefer soldering for exposed parts.** To bond, abrade and clean prior to bonding. JBWeld epoxy or other epoxys for metal.



Tension. Adhesives are weak in tension & unlikely to hold.

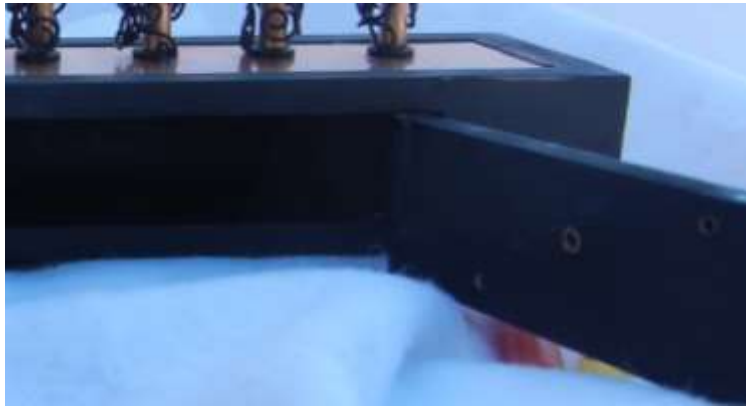


Shear.

Strong direction: Adhesive deforms without breaking joints.

How I like to attach metal to wood

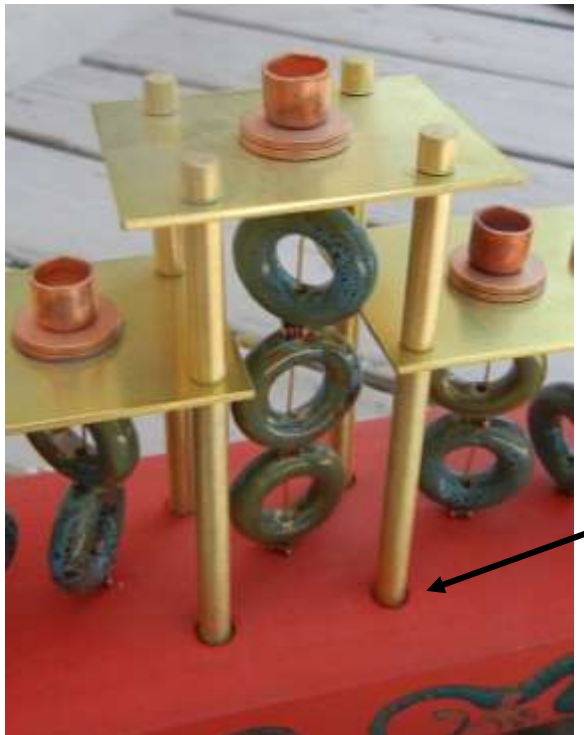
- Screws –ugly, but works. Use thread lock (Loctite).
- Screws or threaded studs into hidden epoxy bonded hex nuts (hand made threaded inserts) in the wood.
- Riveting. ←more on this in a bit.
- Gluing when all else fails.



Back side of riveted Cu on wooden door.

Screw holds candle cup.

Screws from below join internal threads cut in Cu tubing.



Hidden screwing method failed. Lots of CA holds threaded rod in place.

2. Riveting Metals Through Wood

General idea…

- Put wire or tube posts on the back of your metal.
- Run the posts through tight fitting holes in the wood.
- Flatten the back of posts into a rivet, or flush fit and glue the posts into the holes.
- This hides the attachment, and provides a lot of contact area for (optional) glue.

I do this with copper.

Start here

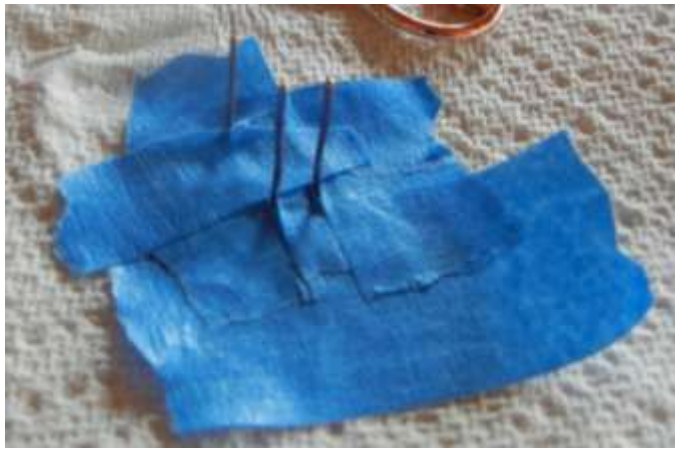
End here

Riveting

Solder wire or tube posts to the back of the part. Use same diameter or smaller than your piece. Spread out 3+ posts (assume some will break). Posts should be 1-2 mm longer than the thickness of the wood.

Silver solder was tinted Cu-color, and then parts tumbled. See later on how to do tinting.

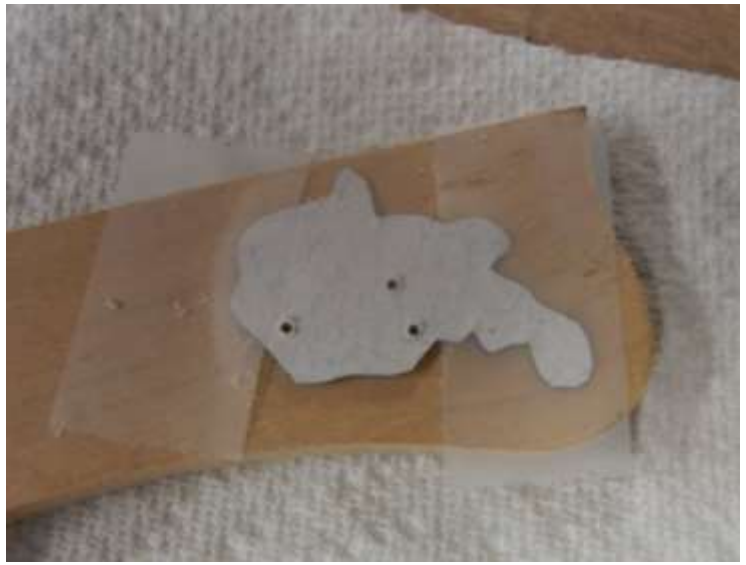
Finish your wood and metal separately. It's a pain to do this once assembled. Do not spray finish the posts. This is a great time to tumble finish metal, since it will work harden the piece. Clean up any extra solder on the back where the posts attach.



Make a tape template with tape on the back of your piece to locate the holes. Trace the outline of the piece on the tape. Remove the template and cut around the outline.

Stick the template on poster board, and cut it out. Write “back” on the tape. Drill holes the same size or just larger than your post diameter through the cardboard at the hole locations in the tape.

Test fit the sculpture through the poster board template. You’ll need to bend the wires a little, but it should fit fine when fully flush with the poster board.



Locate and tape the template onto your wood (best on the front side to avoid tearout). Double check this is right.

Drill through the template into the wood, using same hole size as before (the tighter around the wire, the better).

Trim posts if you need to. Goal is 1-2 mm past the wood, but results will vary. File post ends smooth.

Test fit piece into wood. If it looks ok, press it in firmly using a flat block of wood or a table. (Copper is soft--it will happily move for you).

Rivet or Glue

1. If you glue, put CA or epoxy into the tiny holes in the back. You have a nice shear joint.

2. To rivet, do the following…

Place some felt/leather/etc on a steel block.

Place the piece metal on the block, so the posts are up.

Insert a flaring tool (or nail with smoothly filed conical tip) into tube and tap lightly with a metal hammer to **flare the tube**. For wire, skip this step.

Use the rounded face of a ball peen hammer to **lightly tap the wire or tube to flare it until it is flush** and the sculpture is snug to the wood. Parts that don't rivet well can be trimmed.

3. Soldering Copper, Brass, & Silver with Silver Solder

Cut & shape. Wire, tube, sheet, etc. Trim & file sharp edges.

Apply Boric Acid dissolved in Denatured Alcohol to copper or brass to prevent **fire scale,** and help solder flow. Treated parts will look dull as the alcohol boils off.

Not needed for silver and gold.

See Rio Grande for Boric Acid.

Flux & Place Solder

Silver solder comes in sheet, wire, and paste, and at different melting points. Select by application.

This is NOT plumbing solder.

*I use Handy Flux and med or easy solder (see Rio Grande).

Apply flux* <u>only where you want the solder to go</u>. Flux prevents oxidation while you heat the metal, which allows the solder to flow. The Boric Acid from before will help prevent firescale.

Flux the solder chips and place them carefully on the joints.

Solder with a Torch

Heat the metal (not the solder) to just below annealing temperature (look up what color your metal anneals at). The solder will flow. Then remove heat.

This is actually a lot harder than it looks, but with practice you get it right.

Torches can be….

- Butane micro torches (NOT FROM HARBOR FREIGHT) ~$25-40

- Propane + Oxygen mini torch
- Acetylene + Oxygen mini torch
- Larger torches…

I usually use a Smith Mini Torch with Propane & Oxygen.

Quench, Pickle, Clean, Polish, & Done

With tongs, **drop your piece into a warm pickle** (acid bath) to quench and remove fire scale.

Then **scrub with a stiff brush** with a mixture of dish soap and a drop of ammonia until fire scale is gone, and then manually polish….or…

Tumble it with stainless shot. This burnishes and work hardens the part.

Pickle Options:

Best: Sodium Bisulfate (eg. Rio Pickle).

Cheaper: "pH Minus" Sodium Bisulfate pool chemical.

Safer & slower: Lemon juice & sea salt.

To get a **copper color** **on silver solder**, wrap parts in very fine steel bailing wire, and pickle in a separate container. Pull out the part when the solder color matches.

Source of Supply & References

McMaster

www.mcmaster.com

Hardware bits & pieces.

Rio Grande

www.riogrande.com

Jewelry tools, chemicals, & metals

How to videos.

FDJ Tools

www.fdjtool.com

Metal working tools.

Industrial Metal Supply (IMS)

Sun Valley, CA

Scrap metals (see artists corner) including Copper, Aluminum, Brass Sheet

K&S Metals mini extrusions (brass and copper tubing for model making)

Happy Mango Beads

www.happymangobeads.com

Beads of various materials.

Books:

Tim McCreight. *Complete Metalsmith*. 2005.

Joanna Gollberg. *The Art & Craft of Making Jewelry*. 2006.

Local Instructors:

- Bon Paphatsarang:
  www.bonsilverdragon.com
  Jewelry & metal work.
- Cathi Milligan:
  http://theglassstudio.net/
  Jewelry & glass work
- Adams Forge:
  www.adamsforge.org
  Blacksmithing & metalwork