Bullet Plating using the Caswell Plating FLASH Copper Kit.

by Tom Sweazea (50 Cal Corral Exotic Bullets) –Round Rock, Texas.

My hobby and part time business is casting bullets. Specifically, I cast what are known as "Exotic Bullets" for the Smith & Wesson Model 500 and Magna Inc BRF 50 Caliber handguns. The term "exotic" would refer to their heavy weight which is over 600 Grains (aprox 1.38 oz) and are used for hunting large game animals such as rhino, elephant, elk, and the occasional T-Rex which might be found wandering about from Jurassic Park.
After my excellent experience with the Caswell Plating FLASH Copper Kit I was asked by Caswell to give them a photo essay of my experience and document my procedure as they have customers interested in this type of activity. In this article I will take you from the initial casting of the bullets through the plating process I have found to be very successful using the Caswell Plating material to the finished sized and polished bullets you can produce.

Why copper plate lead cast bullets ?

Essentially, there are three main reasons why one would want to copper plate bullets.
First, copper plating of bullets dramatically reduces the amount of lead residue left over in gun barrels after they are fired (Commonly referred to as 'leading' of the barrel). This residue, depending on the amount and thickness left over in the barrel, can be extremely hard to clean out. This residue builds up during any shooting session and can reduce the velocity and accuracy of the weapon as well.
Secondly, if the bullets are going to be used for hunting game animals, there are rules regarding the use of FMJ (full metal jacket) bullets on Game Preserves in both the US and Africa. By copper plating the bullet this brings the bullet into compliance with these regulations.
Finally, by copper plating the bullet they do not have to be 'lubed' before they are loaded into charged cartridges. Bullet lube comes in many types but is essentially a wax-based product, which is either excreted into the bullet groves during sizing, or has to be applied externally to coat the bullets. Once again, the aim of bullet lube is to lubricate the bullet so that leaves the casing cleanly and there is a reduction of the amount of lead residue in the barrel after firing.

Custom bullet molds vs. sizing bullets for proper plating dimensions.

My own experience with casting lead bullets, which I was intending to plate with copper, has shown two methods of obtaining bullets which are of the proper size for plating.
As you will read later in this article, the copper plate on the bullet needs to be at least **.002"** to **.004** " thick to allow for the hardness and durability the coating must have to fire from the gun properly.
The first method is called 'sizing down' and is simply done by ordering a custom sizing tube which allows for the bullets to be pressed thru the tube and reduces their diameter to accommodate for the copper plate. Beyond an additional sizing step this method comes with some restrictions and additional steps, which can lead to a poor copper plating experience. In order for the bullets to be reduced in diameter thru the sizing tube, the bullets themselves must be cast from a softer lead as well as lubed (unless you are using a carbide sizing tube and even then

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you will have to clean the tube due to lead residue). In addition, the softer lead in my experience does not hold the copper plate as well as a bullet made with a lead mixture to produce a harder bullet.
The second method is by obtaining a custom milled mold for casting bullets in the proper dimensions to allow for the copper plate thickness. In a comparison of prices for carbide sizing tubes vs. ordering custom bullet molds the cost are fairly equal with a custom sizing tube running around $50.00 and the custom mold (depending on number of cavities) running about $55.00 for a single cavity mold. The custom mode method is, in my opinion, superior as no resizing to has to be done after the initial casting and the cast material can be of a content to allow for an increased bullet hardness, which in turn tends to have a better plate coating on the bullet.

Where to obtain custom milled bullet molds for casting bullets designed for plating.

As the success of any plated bullet is going to depend on the quality of the bullet that is initially cast then the bullet mold itself is a prime ingredient for a successful plating experience.
I heartily recommend Mountain Molds for ordering custom or standard bullet molds of all shapes and calibers. (www.mountainmolds.com). They are always willing to lend their expertise on creating a mold to fit your design needs (see their “online bullet” design page) or modifying from their extensive inventory of molds.
The copper plating on the bullet is going to need to be between .002” to .004” thick. to withstand the post plating sizing as well as endure the heat and pressure it will encounter upon being fired from the weapon.
NOTE: When ordering custom bullet molds for casting bullets with the intent of plating you will need to have the mold milled to reduce the bullet size by two times (2x) the plate thickness.
In other words if you are planning to have a copper plate which is .002” thick then the mold will have to produce a bullet which is .004” smaller in diameter.
In example: I plate bullets to have a sized coating that is .002” thick after post plating sizing is done. My bullets are .500” in diameter (50 Caliber) but my mold produces a custom cast bullet with is .496” in diameter this allows for a .002” plate thickness all the way around the bullet.

The Casting Area

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Lead Furnace with ladle and preheating of the casting mold. Tin Foil is used to catch lead splash.

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In these pictures (above) you can see that I run a fairly small operation using a small lead furnace capable of melting about 11 pounds of lead stock at a time. I use the ladle method as a throw back to the early days of casting and I feel I have more control over the casting in general.

Freshly cast bullets

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I normally cast 100 bullets at a time during any single casting session. Here you can see that freshly cast bullets are very smooth (a **MUST** for plating) and the custom mixture of Lead (Pb) Antimony (Sb) and Tin (Sn) gives them a rather shiny surface. As noted this mixture produces an extremely hard bullet by design. (…and yes…they really are as big as they look)

Now that you have cast the bullets let's do some Caswell Plating.

Upon receiving the Caswell Plating Kit I would *strongly* recommend reading the manual they include for using their product. This will give you both a fundamental knowledge of electro-plating in general as well as the *"do's and don'ts"* of plating for your projects.

Step 1: The Plating Vat.

During my initial experiment with the Caswell Plating FLASH Copper Kit I used the vat that comes with the kit. After my initial experiment was very successful I expanded the vat size to accommodate for more material to be plated. The Caswell Plating Manual will give you the knowledge needed to determine both the vat size for your project as well (and most importantly) the placement of the Copper Anodes used in this plating process.

The new plating vat based on specs and requirement from Caswell Plating Manual.

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As the picture shows (above), my new plating vat will hold 25 bullets suspended in a 1.5 gallons of plating solution. As you can see there are 3 air lines which run to the both to either end of the vat as well as to the center. These lines provide the agitation needed during the plating process.

New valve installed in vat to help drain off plating solution after plating run is finished.

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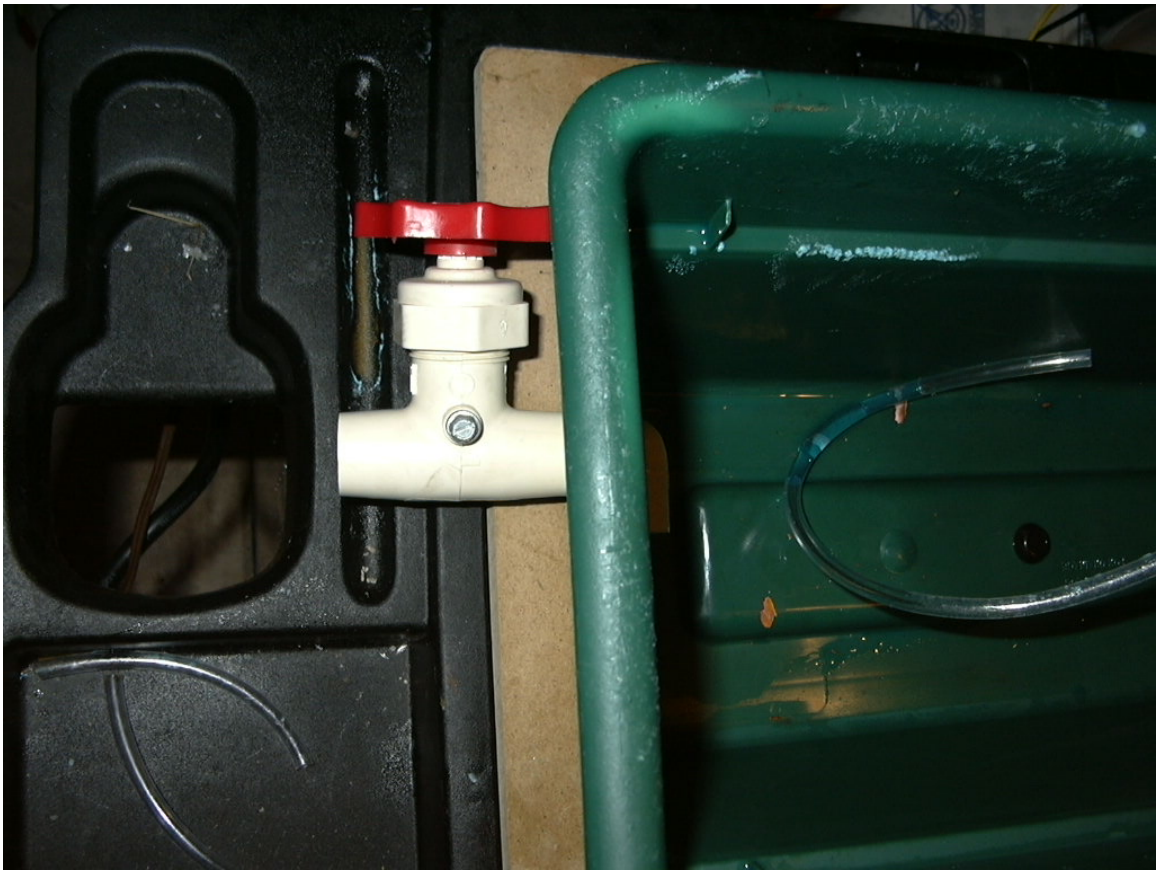

Valve

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As you can see in these pictures (above) I added a plastic valve to the side of the vat to help in draining off the plating solution once the plating run is completed. You should always store the plating solution properly when not in use, to keep it clean and free from dust and dirt.

Step 2: Holding the bullets in the plating solution.

As noted I can now plate 25 bullets at a time in the new vat configuration. The Caswell Plating Manual is fairly clear on what material needs to be used to hold the bullets in place to allow for current flow. This material prescribed in the manual is copper wire (not Steel). As the bullets I produce are fairly heavy I have gone to using solid copper #8 electrode (available at any home improvement center). I form them into a 'tong' shape that reduces the 'wire-mark' area (area which will go un-plated due to bad electrical connections). I then solder each tong to a #6 gauge copper electrode. I use solder flux as well as a NAP torch to get the copper hot enough to solder. This 'assembly' is contained within a light steel frame to give it added strength and stability.

Solid Copper Electrode bent into the same of 'tongs' to hold the bullets in place in solution.

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This set of holders has been thru about 4 plating cycles and is in need of cleaning and/or replacement. Note the build up of copper plate on the tongs as well as the crystallization of the plating solution material.

I solder these ‘tongs’ to a main bus of larger gauge Copper Electrode to give good electrical contact as well as a stable platform to hold the bullets in solution.

#8 Gauge ‘tongs’ soldered to #6 Guage bus.

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As you can see in this picture (above) the end of the bus is bent upwards to allow for the ground clamp to be applied to the bus. This picture also shows the solder joints to the bus.
This whole ‘tong’ / bus structure is contained inside of a steel frame to give it the strength to hold the bullets in place.

Additional picture of solder joints

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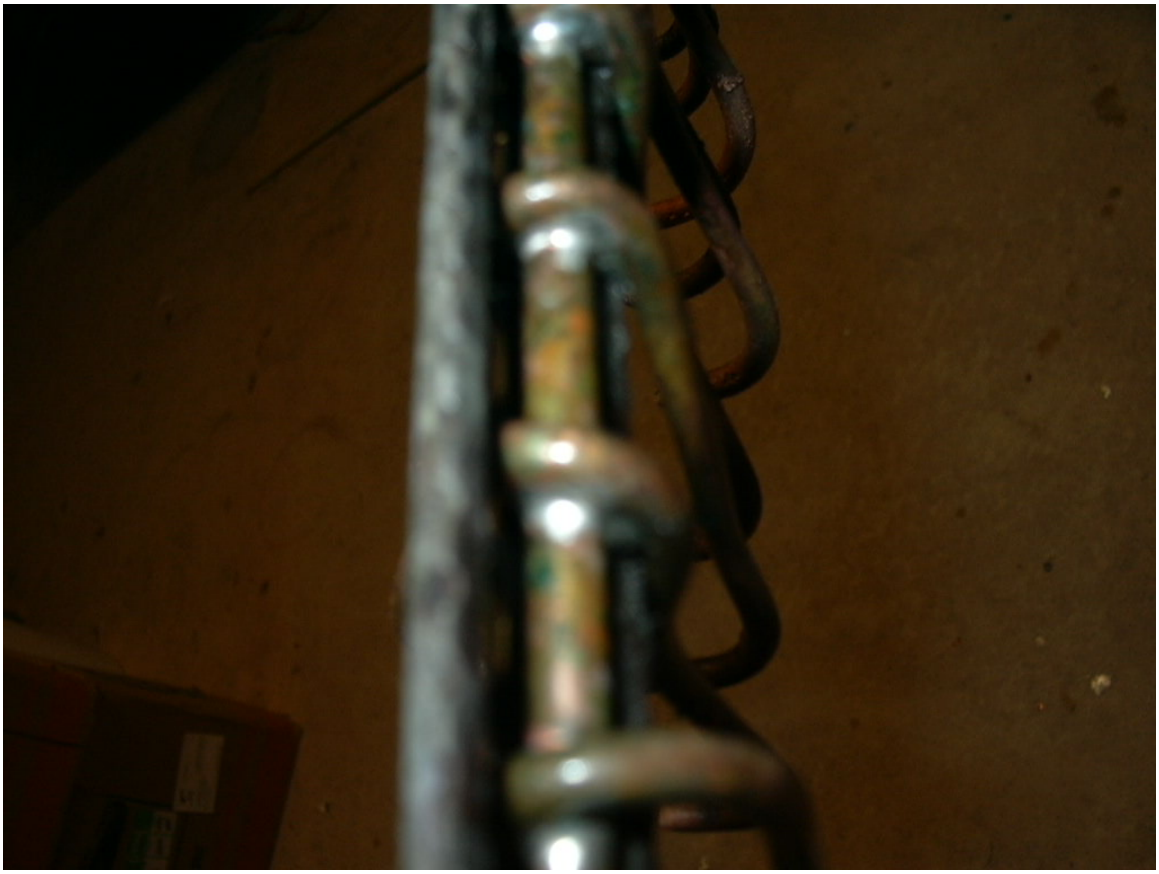

Plating rack placed for loading of bullets as they come out of the Distilled Water rinse.

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This picture shows the plating rack secured in a vise table to allow for loading of the bullets as they come out of the Distilled Water rinse.

Step 3: Preheat the Plating Solution.

Before you start the bullet preparation the plating solution needs to be pre-heated to 110 deg F. Failure to preheat the solution is going to give some very poor results and prolong the plating period. Make certain that the heater which came with the kit is completely immersed in the solution as well as having the agitator (aquarium pump) running as well to keep the solution flowing.

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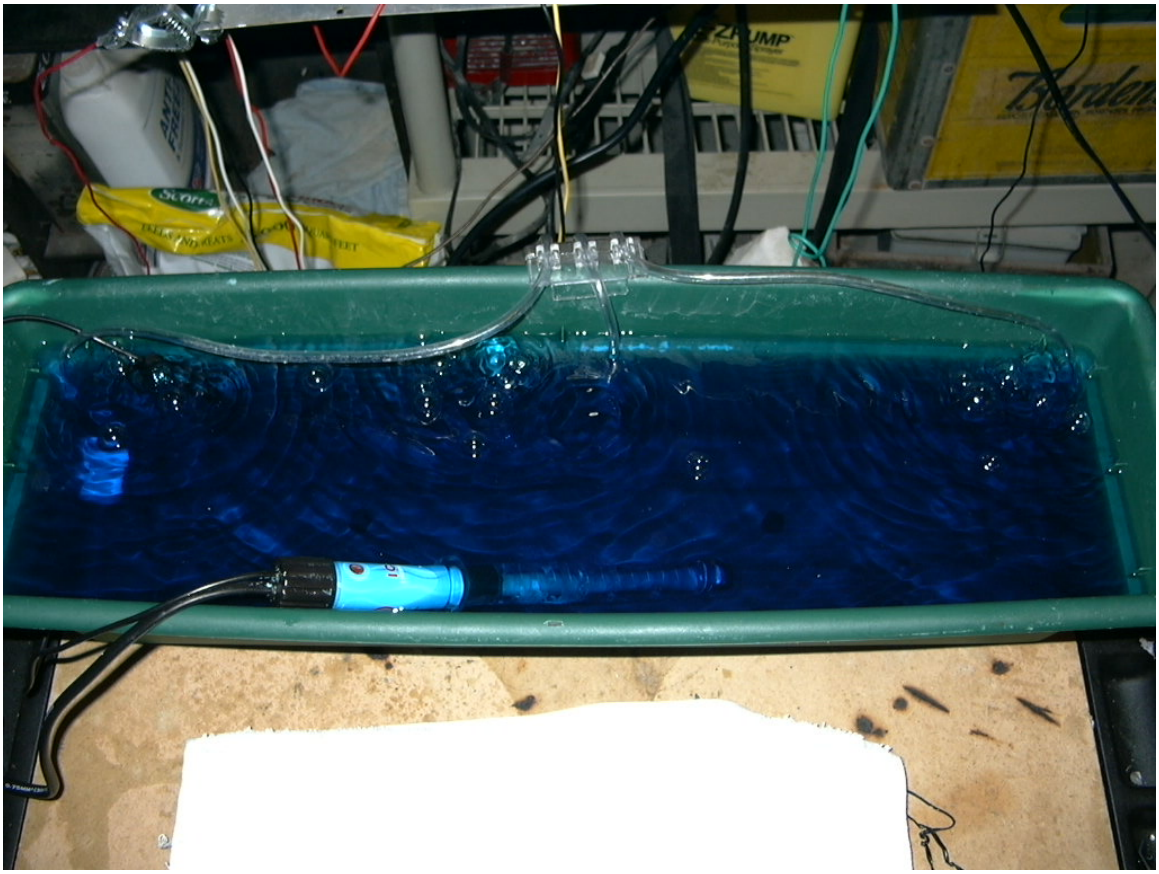
In this picture you can see the heater is installed and the agitation from the bubbles created from the aquarium pump to the airline noted earlier in the article.

Step 4: Copper Anode preparation and 'bandaging' the Anodes.

The next two steps (Anode prep and Bullet surface prep) are extremely critical steps which can make or break a good plating run. I use a ScotchBrite Pad to clean the copper anodes. As the anodes being to show signs of eroding on the edges, cut these sections away.
This may seem like a waste of material, but the jagged edges of the plates will tear at the bandaging wraps as well as leaving free floating copper bits in the solution.

Cleaned and cut copper anodes

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In this picture you can see the cleaned Copper Anodes and how I have had to cut away eroded sections. These Anodes are what remains of the original Anode plates sent with the Caswell Plating Kit and have shown good service with some 140 bullets plated. This though would be their last run.

Copper Anodes bandaged and ready to be placed in the pre-heated plating solution.

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Here is shown the copper anodes after they have been ‘bandaged’. Use the ‘smooth side’ of the bandage anode toward the bullets to be plated.

Step 5: Bullet surface preparation and loading the bullets into the plating rack.

The most important thing I have learned during my plating exercises and which is described in the Caswell Plating Manual is surface preparation. The manual prescribes that the surface needs to be properly prepared which would include de-oxidization of the material as well as activation. The time in the prep bath (I use the Pickle #4 because it does not use any extreme acids) is the only deviation that I have from the methods prescribed by the Caswell Plating Manual. This is not an oversight on their part as the surface area to be plated as well as the material I am plating would be hard for them to take into account when writing the manual. Essentially, the prescribed time in the Pickle #4 is 2 minutes. I have increased this time to 15 minutes in the Pickle #4 solution and then 5 minutes in a Distilled Water rinse. My initial experiments were with a very thin plating just to gauge how long the process was going to take in total. I noted that this thin copper plate was not holding up to testing and was not bonding well to the bullets (it was flaking off). The increased preparation time has aided in curing this issue. Once the bullets are put into the Distilled Water rinse they should not be removed until they are ready to be mounted in the rack and then placed into the plating solution as soon as possible to avoid oxidization from re-occurring.

Bullets in the Pickle #4 solution.

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This picture shows the bullets as they have just been placed in the Pickle #4 solution. I gingerly stir these bullets every 5 minutes during this de-oxidization and activation period to make certain that the entire surface of each bullet is ready to be plated. Once the 15 minutes are up the bullets are removed to a bowl of distilled water where they ‘rinse’ for 5 minutes.

Step 6: Mounting the bullets in the plating rack.

The bullets need to be held as firmly in the rack as possible. There is a trade off to be made in the in securing the bullets in the rack. You want to be certain of proper connectivity to allow for good current flow, but it must be kept in mind that there will be wire marks on the bullets.
As noted earlier, The bullets are secured in the teeth of these copper ‘tongs’. This reduces the wire marks on the bullets.

Bullets being mounted in the plating rack

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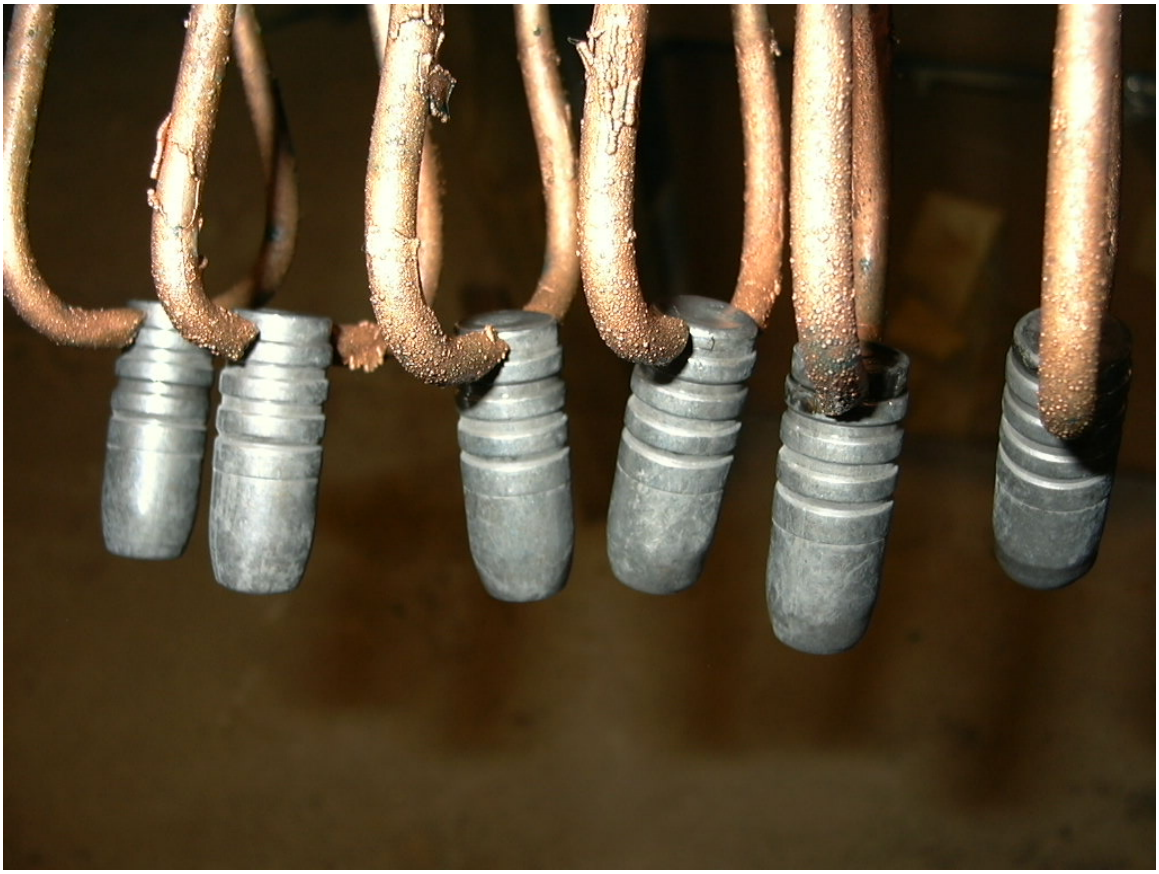

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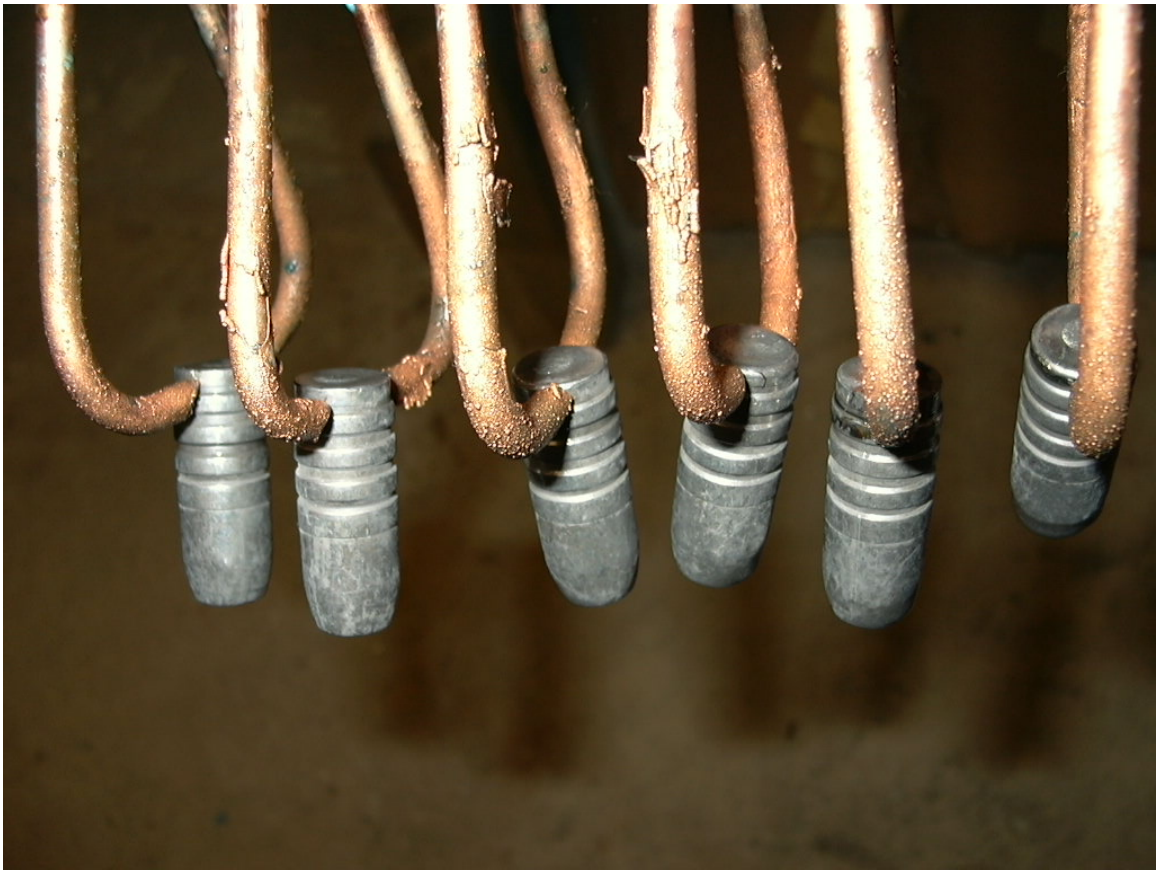

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From the picture above you can see how the bullets are placed in-between the 'teeth' of the tongs. In the final picture you can see a fully loaded rack of bullets and the 1 inch spacing between them. Note that the soaking in the Pickle #4 has dulled the bullets once shiny surface area. This is a good clue that they have been properly de-oxidized and activated.

Step 7: Let the plating begin….

After all the other steps and as quickly as possible after the bullets have been loaded into the rack the rack needs to be placed into the plating solution. As well then copper anodes need to then be placed in the solution and the wiring from the power source connected. I place the copper anodes directly across from one another (once again Anode placement is discussed in the Caswell Manual).

Bullets in the plating solution.

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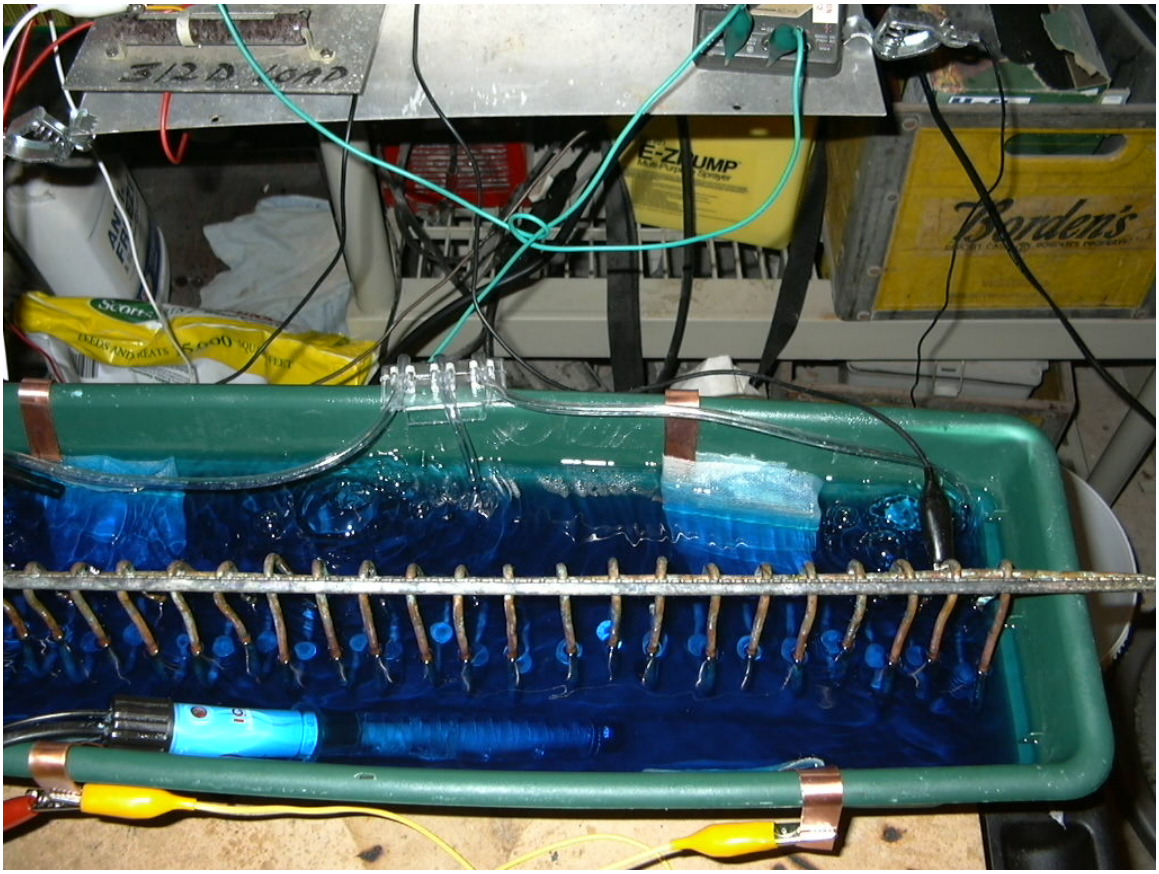

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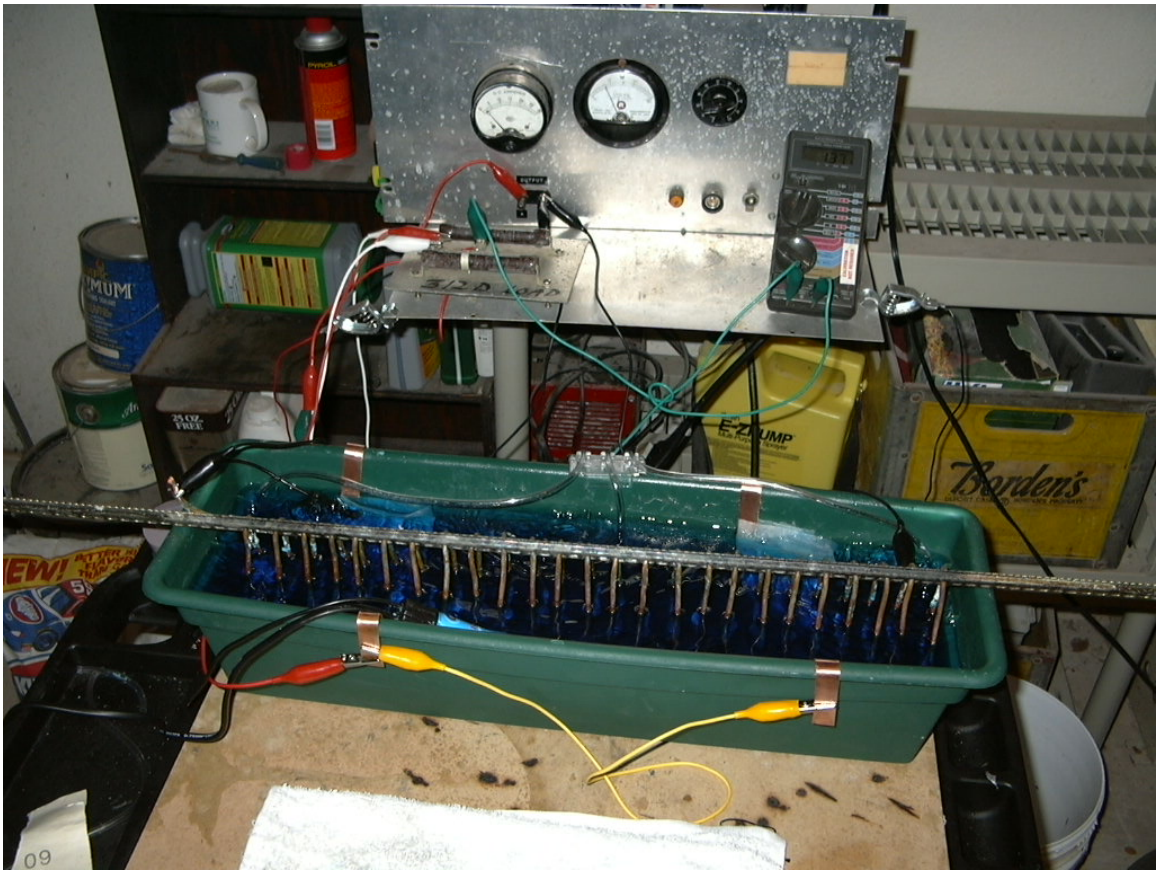

These pictures show the placement of the copper anodes as well as the initial wiring of the positive side of the supply to the anodes and the negative side of the supply to the plating rack bus.

Step 9: Controlling current flow – key here is 'keep it low'.

Now that all the preparation is completed and the bullets are actually in the plating solution and the wiring of the anodes and bus bar is completed the process can begin with the flick of a switch. The Caswell Plating Manual is very clear on the setup of varying types of methods for controlling current and voltage used during the plating process. In my case I use a 10V 30A DC Power Supply, which I found at used electronics store. This is really overkill on my part as I have found that the lower the current (to within reason) makes for a smoother/cleaner plate on the bullets. The thickness of the copper anodes is a leading indicator on how high the current can be raised. With fresh anodes I can raise the current to 1.5 Amps at 7 Volts. As the anodes wear out though I have to decrease the current to about 1.0 Amps at 7 Volts. The Caswell Manual does not recommend plating at any higher current than 1.5 Amps. The bullets will end up with 'knots' and little lightning rods coming off the surface of the bullets, besides the higher the current does not mean the faster the plating process. The amount of copper plate on my bullets (I plate on about .0035" of copper per bullet then size the bullet down to the proper diameter) takes roughly 24 hours to accomplish. So the key here is patience. Also, it is ok to check up on the plating about four hours by lifting one side of the rack from the solution and looking at the process., but in general the less you physically mess with the bullets the better the plating tends to be.

Variable resistor for controlling current

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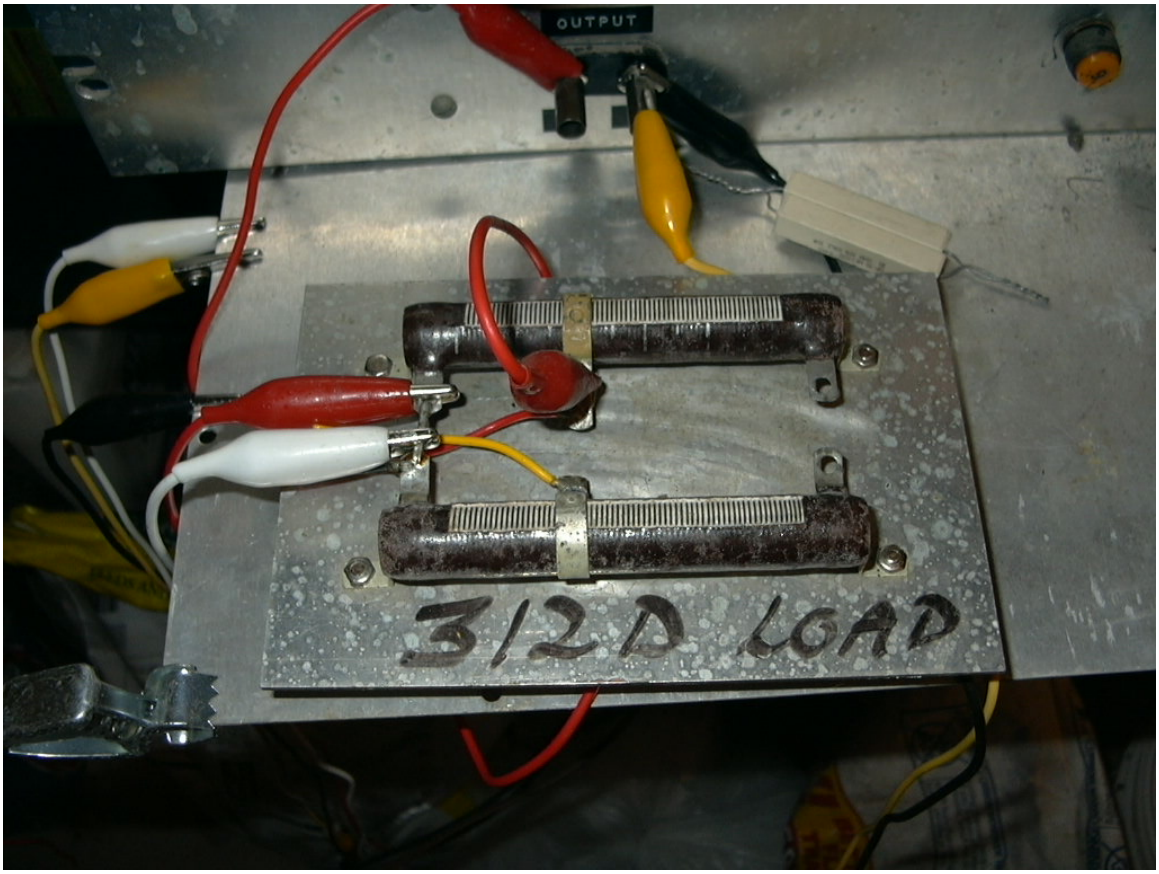

In this picture you can see the variable resistor that I incorporate in my plating equipment. You maybe lucky enough to find alittle gem like this at a used Electronic Store. If not the Caswell Plating manual is full of ideas on how to control current flow.

Step 10: Finishing the plating and polishing the bullets.

So the 24 hours is up and after taking one bullet from each end of the rack as well as one bullet from the middle of the rack for measurement with a dial caliper the plating is done. Do not be taken aback by the fact the bullets are going to look 'funny' when you remove them from the plating solution as the process is not quite complete yet. As noted earlier I plate out to about .0035" on my bullets. This provides a good, thick copper clad coating. I then attached a copper gas check (this style of bullet has a gas check) and run the bullet thru a .500" bullet sizing tube to get the proper diameter for on the bullet. I then use a good buffing wheel and mild copper polish to get the patina off the bullets and make them shine

Fresh bullets from the tank:

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Bullets after removal from the plating process prior to polishing.

The Finished Product…Caswell Plating does it again.

Here are shots of finished bullets, which have been lightly buffed and polished.

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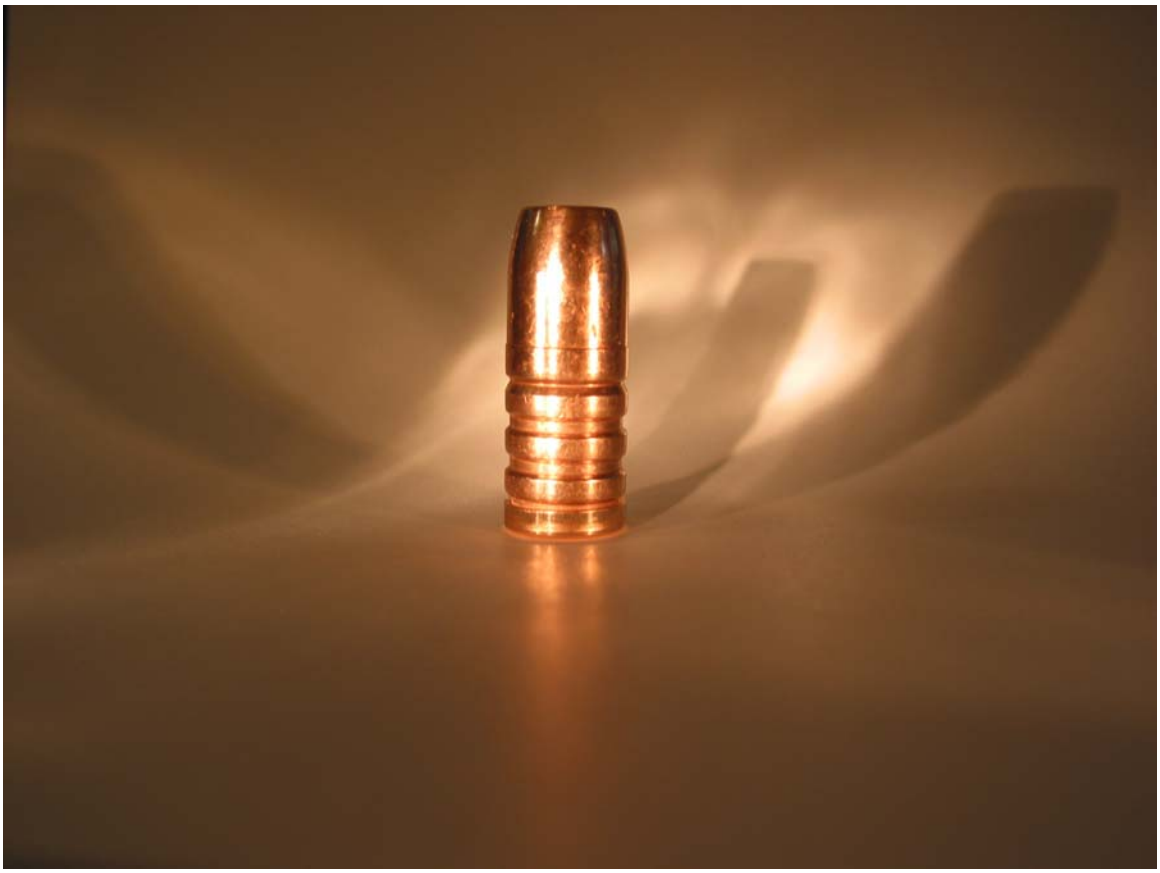

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SAFETY FIRST:
When dealing with lead bullets always wear either rubber surgical gloves or thick rubber gloves as lead can be absorbed thru the skin and heavy metal poisoning can cause brain and nerve

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damage. The Caswell Manual makes a number of notations to the care and use of the chemicals used in all their plating kits. Please follow the safety rules.

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