

# Garage Nickel Plating 101

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Dog Who Saved My Life

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# Examples of My Woodworking



# Hand Planes in My Work



## Nickel Plating v Chrome Plating and History

- Stanley began nickel plating in 1888, and afterwards nickel plating was the standard for plating steel tool parts until about 1955.
  - Chrome largely replaced nickel plating around 1956.
  - The initial standard for chrome plating was “show plate”: first a thin layer of copper, highly polished, then nickel, then chrome.
  - To save money on the process and labor, most tool parts were plated with chrome directly onto steel beginning in the 1980s.
  - To save even more money on labor later, industry stopped polishing steel tool parts before chrome plating, and chrome was plated directly onto machining marks.
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## Chrome Stripping and Plating is Not Worth the Hassle

- Chrome stripping and plating involves significant toxins and harsh chemicals, e.g., hexavalent chromium.
  - Stripping chrome show plate: First a lye bath to strip chrome, then nickel stripper, then industrial peroxide (40%) to strip copper.
  - Replating chrome show plate: You can't electroplate copper directly to steel, you must either use a flash copper process or first plate nickel, then copper, then nickel, then chrome.
  - Chrome plating involves a process of up to a dozen chemical baths and electroplating steps, depending on what you are starting with and the quality you want to achieve.
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## Home Chrome Plating is Not Feasible or Worth the Hassle or Expense

- Most vintage tools worth preserving were manufactured with nickel plating between the late 1800s and 1955. So just about anything you will want to restore for your collection has parts plated with nickel rather than chrome.
  - It's usually not worth attempting to strip a newer chrome part and replate it with nickel to "age" the tool.
  - The cost to professionally strip, prep and replate a rusty chrome plated part may exceed the value of the restored tool.
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## Types of Nickel Plating

1. Inexpensive, using mostly non-toxic, non-harsh chemicals; great authentic looking results for vintage tool parts; with the complete set costing less than \$100: What we are covering today in this presentation.
  2. Electroless nickel plating: See <https://caswellplating.com/> for more information.
  3. Professional, high end bright nickel plating that yields mirror bright, perfect looking, grainless, near show chrome results: Discussed in two slides at the end of this presentation.
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## Nickel Electroplating: Cleaning Your Parts

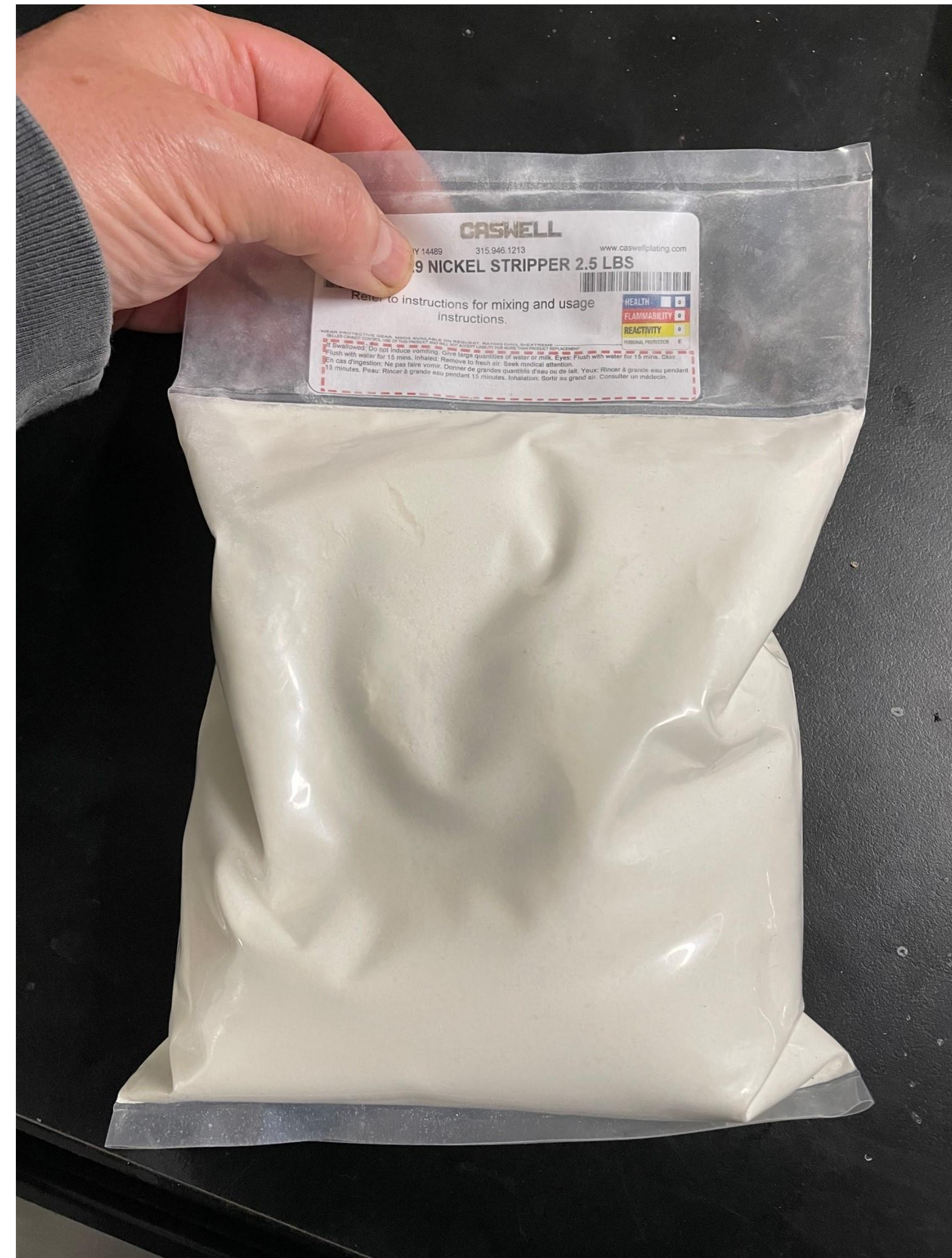
Use an alkaline-based paint stripper or acetone to remove paint, glue, and oil residue, then thoroughly clean with Simple Green to avoid contaminating the stripper solution.



## Nickel Electroplating: Stripping Your Parts

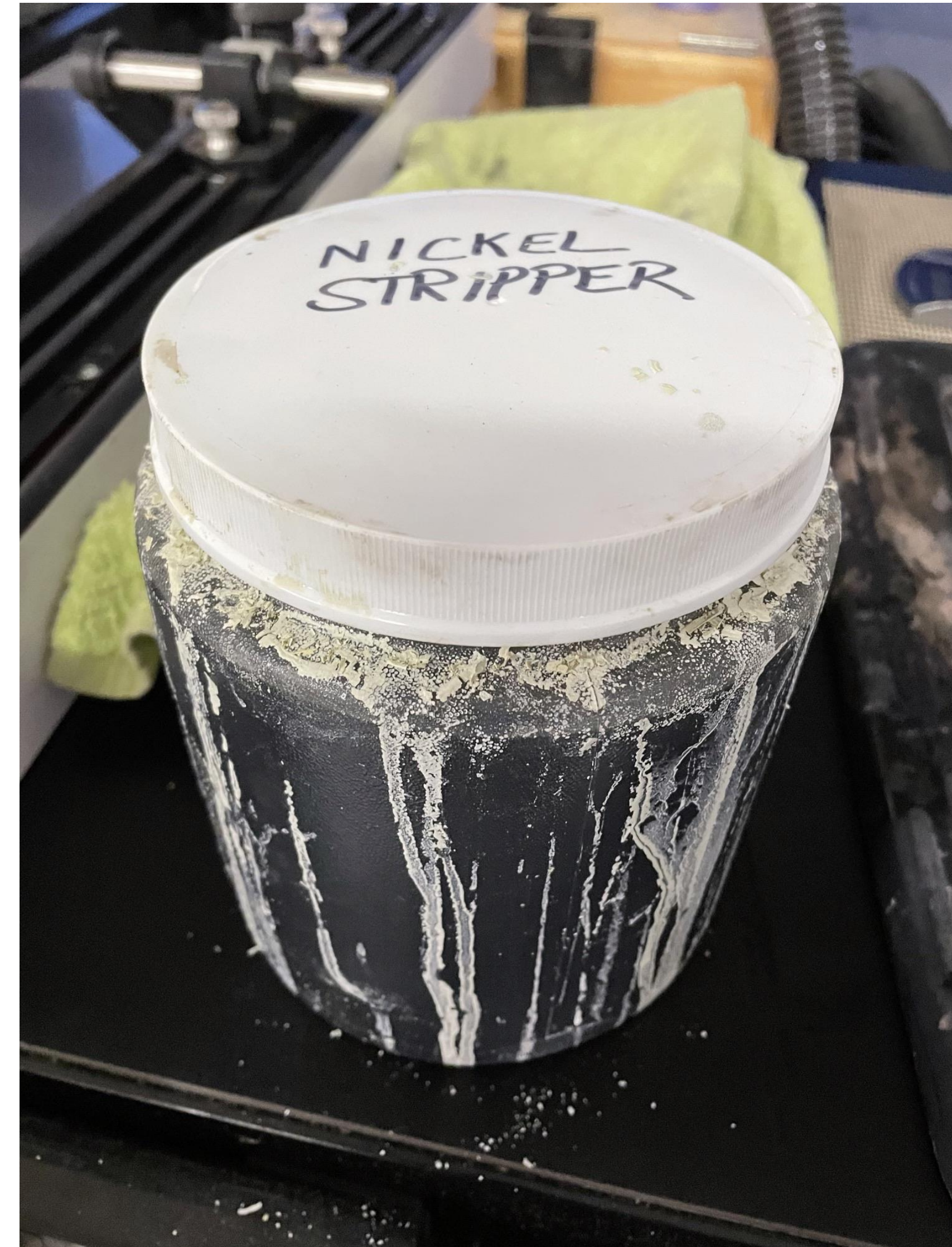
At \$29, Caswell B9 Nickel Stripper is the only one step nickel stripping solution on the market and the amount provided will strip more than 100 lever caps.

<https://caswellplating.com/metalx-b-9-nickel-stripper-2-5lb.html>



## Nickel Electroplating: Stripping the Old Nickel

- The nickel stripper solution must be heated to 150 degrees F (65 C) and maintained at that temperature for the duration of the bath.
- I mix half the provided Caswell product in a half gallon microwave safe plastic container, fill almost to the brim with water, mix, then microwave the container for 10 minutes to achieve the initial temp. DO NOT SEAL THE CONTAINER WHEN MICROWAVING.
- I then immerse 4-5 lever caps in the solution and maintain the temp for about 2 hours.



## Nickel Electroplating: Stripping the Old Nickel

- I place a radiant heater on high directly in front of the microwave container with solution to maintain the 150 degree F temp for the duration of my bath.
- You **MUST** stir the solution during the bath. I do so about every five minutes using a simple stick, and occasionally reposition the lever caps in the bath with the stick.



## The Product of Nickel Stripper is Smut

- After the nickel stripper bath, let the solution cool and put it back into your paint cabinet. After my first 5 uses, I replenish with about  $\frac{1}{4}$  cup of additional powder each following use, and one order lasts me about a year.
  - Smut is the technical name for the dense black residue that remains on your parts after the nickel stripper bath.
  - You can remove smut with various harsh chemicals, but the best way to remove it AND all rust from your part at the same time is with reverse electrolysis.
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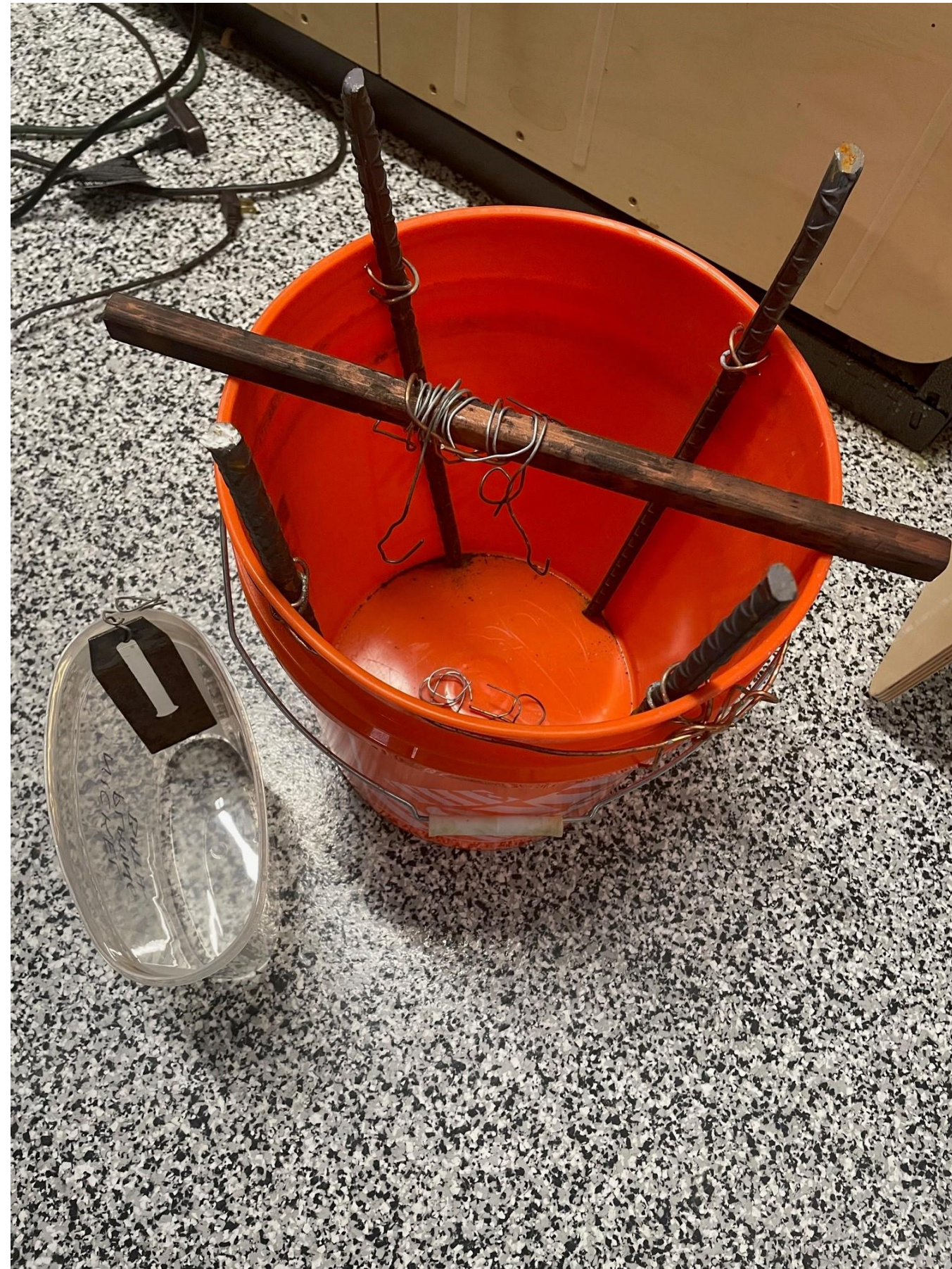
- Iron corrosion (rust) is formed by oxidation through a naturally occurring electrochemical process.
  - The process to remove rust from iron involves reduction rather than oxidation so it is reverse electrolysis.
  - Reduction involves the gain of electrons, which is a decrease in the oxidation state of an atom.
  - In reverse electrolysis, water is oxidized at the iron anode (positive, red); which produces  $O_2$  as the anode corrodes and ions from the metal enter the electrolyte solution.
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## Reverse Electrolysis: A Chemistry Lesson

- At the iron cathode (negative, black), the DC power source drives the ions to the rusty iron part which accepts the ions (electrons) and produces hydrogen bubbles.
  - Two types of rust: orange ( $\text{Fe}_2\text{O}_3$ ) and black ( $\text{Fe}_3\text{O}_4$ ).
  - During reverse electrolysis, the orange rust is exfoliated into the solution, while some of the black rust is reclaimed and reduced back to metallic iron!
  - Pits in the iron/steel were formed by the orange rust and cannot be restored. But surface black rust will be stabilized and hardened with new electrons to reform the iron/steel.
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## Reverse Electrolysis: The Bottom Line

- Reverse electrolysis is the best way to remove smut, stabilize the surface of your part, and best prepare it for plating.





## Reverse Electrolysis: What You Need

- For an electrolyte solution, use  $\frac{1}{2}$  cup of sodium carbonate (NOT sodium bicarbonate) in about 4.5 gallons of water
- Run DC power supply current at about 1 amp for about two hours.



### Sodium Carbonate

<https://amzn.to/3wjNmQS>

### Inexpensive power supply

<https://amzn.to/39vEQ7B>

### Better power supply for plating

<https://amzn.to/2PuSLUD>



## Don't Connect the Polarity Backwards!

- For both reverse electrolysis and electroplating, the red/positive/anode is ALWAYS connected to your sacrificial item.
- The black/negative/cathode is ALWAYS connected to the part you want to derust or plate.
- If you reverse the polarity, you will destroy your part.



## Cleaning After Reverse Electrolysis

- Immediately after removing parts from the electrolysis bath, clean them avoid flash rusting. Get oil on your parts and clean them using a handheld brass brush or ultrafine scotch brite pad. I use CRC 3-36 solvent/oil.



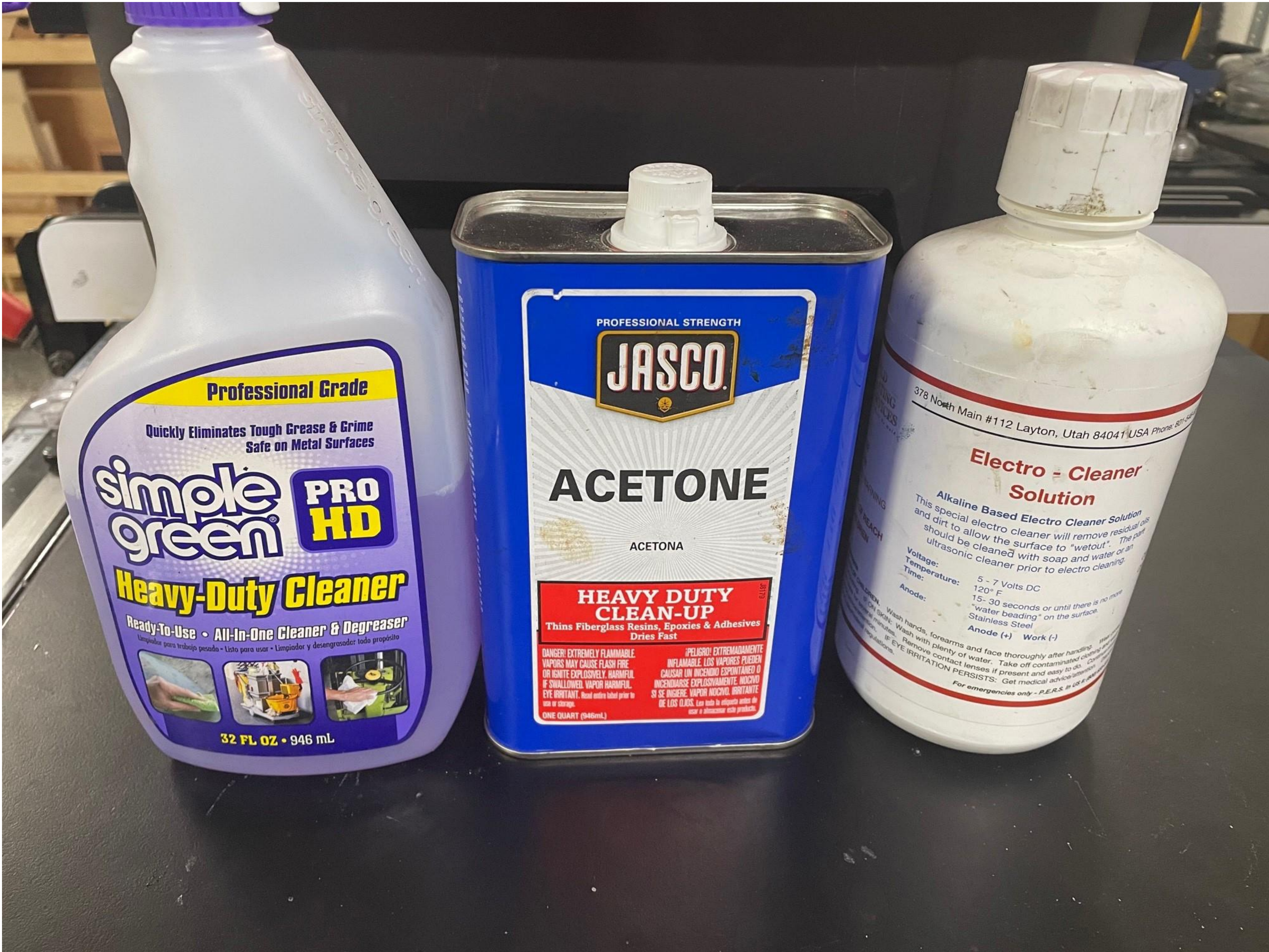
## Resurfacing Lever Caps: GIGO



Resurfacing Lever Caps: Lap and Polish Steel to at Least 2000 Grit



# Cleaning After Resurfacing and Polishing 1-2-3



## Cleaning After Resurfacing 1-2-3

- Electroplating will not adhere to oil, buffing compound, fingerprints, or other contamination.
  - Start by putting on gloves, scrub your part with a toothbrush or other soft brush in Simple Green. Dip in a tub of water and dry.
  - Dip part in acetone, scrub with a soft brush, and immediately dip in water to prevent flash rusting.
  - Finally, immerse part in Electro-Cleaner solution <https://amzn.to/3wjihg4> or a lye solution for about one minute, then immediately dip in water. When removed from water, the water should “wet out” and not bead on the surface of the part.
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## Making Your Plating Solution

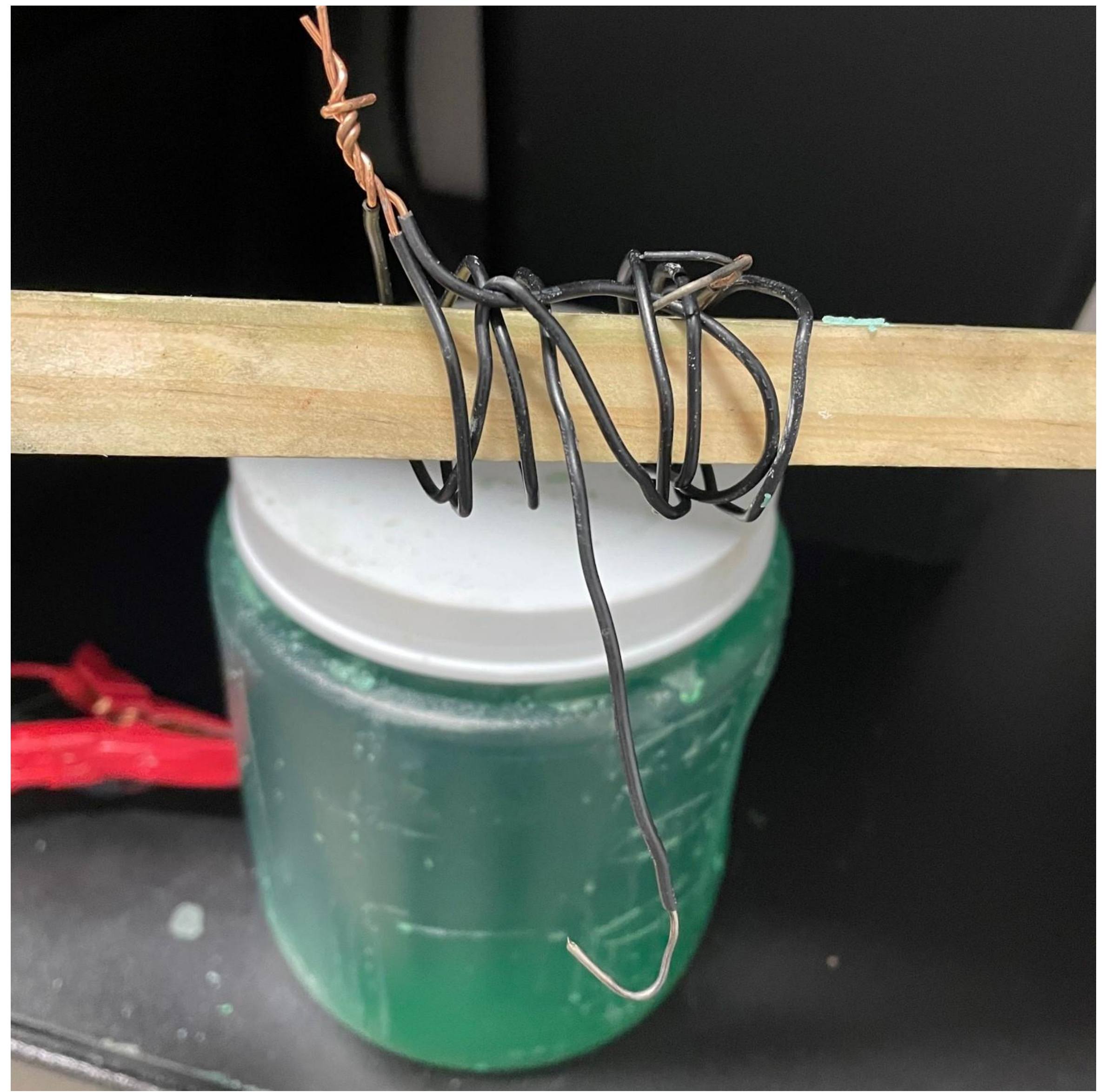
- Fill a one-gallon clear plastic container near the top with vinegar. Add about a rounded tablespoon of plain table salt for an electrolyte (NaCl) (not sea salt or salts with minerals).
  - Bend the edges of two nickel anodes <https://amzn.to/2Odn29J> so they will hang on the inside of your container in the solution.
  - Connect one lead from your power supply to one nickel anode, and the other to the other one - polarity doesn't matter at this step. Set current to about 2 amps. DO NOT allow alligator clips or any copper or other metal than nickel to enter your solution or you will contaminate it.
  - Let this run overnight or until the nickel anode connected to the red terminal has completely dissolved. Solution should now be bright green.
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## Make Your Plating Solution and Set Your Power Supply

- Using two new nickel anodes, drill holes in one end of each, bend ends so they will hang in the nickel solution, then connect with copper wire so they will hang on opposite sides of your container. DO NOT allow copper wire from your anode to enter solution or you will contaminate it.
  - Wrap a copper wire around a stick, expose end of wire, bend it to a hook, then use the hook to hang your part in the solution. It's ok for the copper hook to enter the solution because it is functioning as a cathode and will become nickel plated.
  - Set your DC power supply. At 70 degree ambient temps, I get best results at 600 mA. Current is what matters here, so set your amp ceiling at 600 mA and your voltage at max.
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# Plating



# Plating



## Plating

- At 70 degrees ambient temp, I will reposition my part in the solution (wearing gloves!) at least 3 times, letting the system run about 30 minutes per position.
- If significant black streaks form on your part, your solution is contaminated and you might as well start over.
- At the end of your plating session, immerse the part in water to neutralize the vinegar solution on it.



## Logo Painting After Plating



## Fine Detailing After Plating



## Final Detailing: Buffed Shiny or Brushed?



## Multi-Process Professional Show Chrome-Like Nickel Plating

- After all resurfacing, buffing and pre-plating cleaning steps above, use Caswell flash copper process to direct plate copper onto steel. Buff copper to a mirror shine.
- <https://caswellplating.com/electroplating-anodizing/copper-plating-kits/flash-alkaline-copper-plating-kits.html>
- Smear Solder-It Solder Paste <https://amzn.to/3sY3x4p> onto your part to fill scratches and corrosion marks, then melt it onto your part using a butane torch. Buff residual solder from your part.
- Nickel plate using Caswell Bright Nickel Electroplating Kit <https://caswellplating.com/nickel-electroplating-kit-1-5-gal.html>







# Thank you!

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