

# Chasing Punches

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## Tools & Supplies Needed

- 3 4" lengths of .25" square W-1 tool steel.
- Torch & 2 big firebricks.
- Various files
- Bench grinder or belt sander
- Small bucket of used motor oil.

## Background

Chasing and repoussé are two allied techniques. Chasing refers to working metal from the front by way of small punches, while repoussé means to work it from the back. In practice, the two techniques are used in tandem. English is the only language I'm aware of that makes a distinction between the two. The German word, *metall-treiben* is perhaps more accurate. It means "to move or drive metal", and makes no distinction about which side is being pounded upon. In trade usage, sometimes repoussé is used to talk about the rough volumetric forming operations, while chasing refers to the delicate operations of refining the lines and shapes.

To practice chasing or repoussé, one takes a sheet of metal, imbeds it onto the surface of a bowl or block of pitch. Pitch is a soft, sticky supporting material, usually mostly composed of pine pitch. Once the metal is supported on the pitch, the worker uses a series of small hammers or punches to form the metal into whatever shape is desired. The usual procedure is to rough the main forms in from the back, and then reverse the metal and chase in the details from the front.

In practice, the metal cares about the shape of the toolface, not the exact nature of the tool itself, so repoussé in particular can be performed with a variety of implements, from small hammers, to punches, to miniature jackhammers. Frequently small punches are used to aid in precise targeting of where the tool will impact the metal. Sub-millimeter accuracy with a hammer is much harder than holding a steel tool in the



*A fistfull of chasing punches of various sorts. Some are chisels, some are liners and others are formers.*

right spot.

## Procedure

### STEP ONE:

*Ponder your needs.* The first thing you must do is figure out what sort of work you're intending to do, and thus what sort of punches you need. Someone who is intending to make a plaque with letters will need different punch shapes than someone else who's intending to create a miniature face. Anyone who chases for any length of time will end up with a large collection of punches of various shapes. For your first three punches, I would suggest a short liner, a soft nosed punch and a simple round nose punch. Those will get you started, and familiarize you with how to make punches, so that you can proceed from there to make whatever shapes you think you may require.

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1. Adolph Steines, *Moving Metal: The Art of Chasing and Repoussé* (Blue Moon Press, 2001) 5.

## STEP TWO:

**Purist Roundhead.** The first punch is the easiest: the round nosed punch. This is just a very small ballpeen hammer face on a stick. Take one of your tool blanks, and file or grind the end until it's a nice round hemisphere. You may wish to sand it with 220 grit sandpaper to even out the surface and save time at the buffer. We will rough grind all three punches before moving on to buffing and hardening.

## STEP THREE:

**Sand in Line.** The next two are tapered. The small liner is to make lines, while the soft nosed punch is for pushing areas inward. Take your other two blanks out back to the bench grinders. (Wear safety glasses!) Grind a taper onto two sides of the working end of the punches. The idea is to start about an inch above the tip, and grind an angle down to the tip so that the tip ends up about 1/3 as thick as it was. Do this on two opposite sides, so that tip of the punch ends up as a thin rectangle a bit under 1/8" thick. The belt sander will be helpful to you in getting a nice straight taper. You may wish to dunk the tool in a cup of water periodically to cool it down so it doesn't burn your fingers.

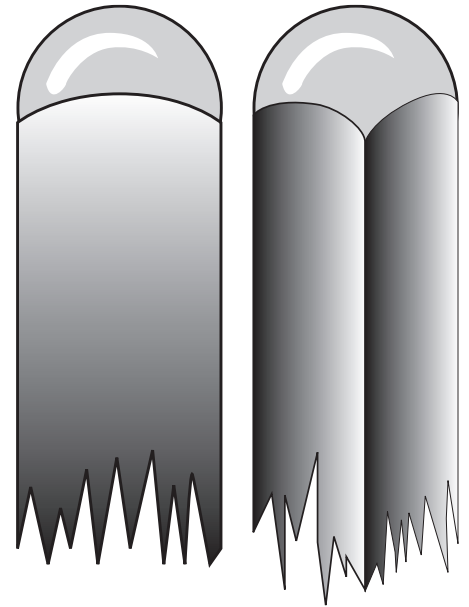
Now take one of the punches, and grind a taper onto the other two sides of the tapered end so that the narrow rectangle becomes shorter. Remove 'a bit' from each of the new faces. The idea is to have the narrower punch be the same width, and about 1/2 the length of the other one.

## STEP FOUR:

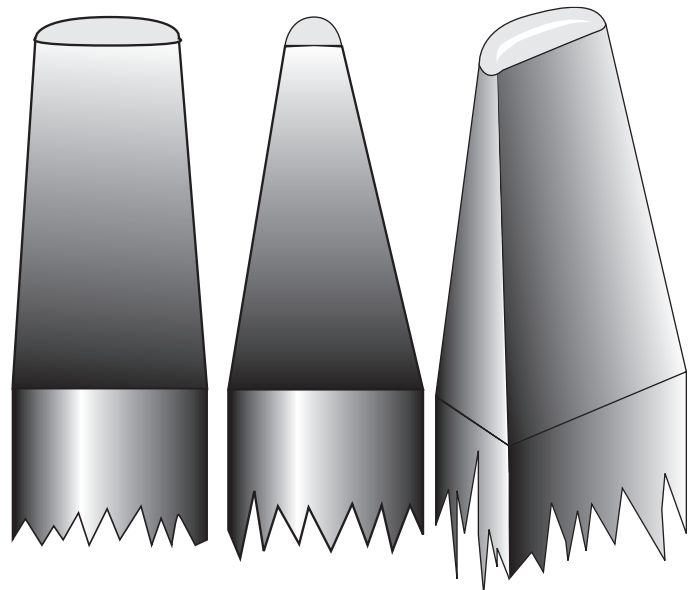
**Profile.** Once the two tapered punches have been roughed out, it's time to profile them. The smaller one should end up with a tip that resembles a sugar-loaf with a ridge down the middle, while the longer one will just get rounded over, to be a nice soft ridge.

## STEP FIVE:

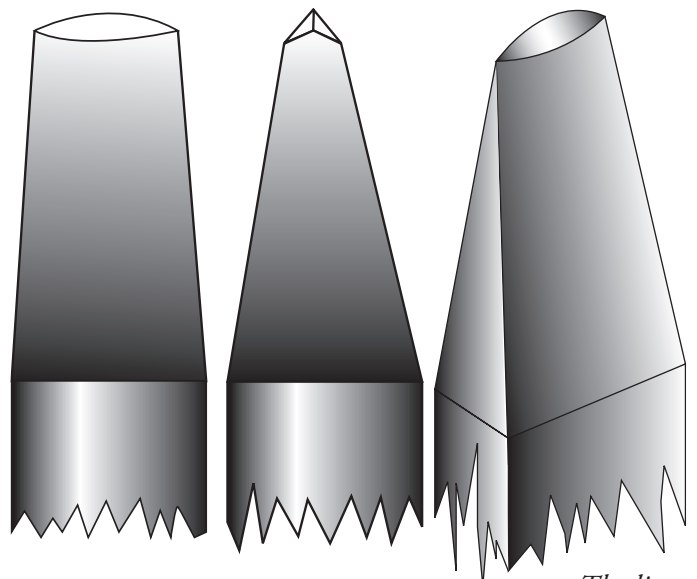
**Polish.** Once the rough shaping is done, polish all three punches with 220 grit sandpaper, then buff with stainless compound. (There will be special buffs for it out back.)



*The round nosed punch*



*The soft nosed punch*



*The liner*

## STEP SIX:

*Harden.* Once the punches are polished, it's time to harden them. There will be a special soldering station set up with bricks and a deep trough of water. Use the big tip in this station. Rub the working end of one of the tools across the block of handsoap. Then set it in the angle of the firebricks. Using a very large neutral flame heat the working end of the tool to bright red. Aim the torch at a point about 1/2" back from the working end of the tool. It is possible to overheat the end if you focus too close to the end of the tool. Once the end is bright red, grab the back end in heavy pliers, and immediately quench the tool point down into the deep water bowl. Swirl the tool gently to insure even cooling. It is critical that the tool be quenched immediately as soon as it hits red heat. Do not take time to shut down the torch until the tool is in the water and cooling. Normally, I can manage the torch in my left hand while I'm quenching with my right. If you don't feel comfortable trying to do both things at once, ask a friend to help out by quenching the tool when its ready. Repeat this procedure for all three tools. This will give you fully hardened tools. They're now harder than files, and brittle as glass. If you drop them on the floor in this state, they'll likely shatter.

## STEP SEVEN:

*Tempering.* The tools are now fully hardened, but very brittle. This means they need a little stress relief, which we will supply by way of a blowtorch. The purpose of the handsoap was to provide a flux to prevent the steel from oxidizing, and forming a thick black coating on the working end. If your ends are clean and grey, just rub one side of the hardened end with a bit of 320 sandpaper to shine it up. If they're dark, sand one side back to bright with 220. It is critical to the success of the tempering that you have at least one side with clean bright metal.

Tempering is just a form of controlled annealing. We want to get these tools to a temperature of 450-475°F to achieve the optimum mix of toughness and flexibility. The way we figure out the temperature is by watching the rainbow of heat colors as they flow across the bright side of the tool. The color you're looking for is the first bit of purple as it hits the tip.

Normally, I do the next step with the tool held in a pair of pliers in my right hand, while I hold the torch left-handed. It is utterly critical that the tool gets into

the quench water at the exact instant when the proper color reaches the tip. These tools are so small that the heat moves very quickly. Two or three seconds delay will make a big difference. If you don't feel comfortable trying to handle the torch with one hand and quench the tool with the other at the same time, ask a friend to hold the torch for you. (On my own, I've been known to clamp the body of my torch very gently in a vise to hold it in place.)

Hold the tool point up in one of the vice-grip pliers. Make sure you have a good view of the shiny side. Use a medium sized neutral flame with the big tip, and gently heat the tool from the middle of the body. Do *not* blast the hardened end. Work from the middle. The idea is to heat the middle, and let the heat flow down the body of the tool, slowly heating the working end. You will notice that as the body heats up, the tip will heat faster. It's smaller, and has less thermal mass, so once it starts to move, it will move very quickly compared to the body of the tool. That's why speed is important when it comes to quenching.

As the body heats up, you will notice a rainbow of colors slowly marching down the tool, centered at the point where you're hitting it with the torch. First will be a very light yellow, followed by brown, fading into purple, followed by blue. It's the first blush of purple that you're after for the tool tip. Once the colors get close to the tip, they'll speed up. (The tip's smaller) Don't let this catch you off guard. Start moving the tool towards the water when the first brown gets to the tip, and get it into the water (tip down) the instant the purple gets there. Swirl it in the water to insure even cooling.

To slow down the speed of the colors, I find it useful to blast the middle of the torch, then take the torch away for a few seconds, evaluate the colors, and then heat the middle of the tool again for a few seconds. Keep heating in cycles, and your colors will move more slowly.

## STEP EIGHT:

*Finish.* Once the tools have been tempered, it's just a matter of going back to the buffs and buffing them to a high-shine using stainless compound.

I also find it helpful to grind a 45° angle around the back end of the tool to knock the edge off the tool. It keeps the end from getting sharp as it gets pounded by the hammer.