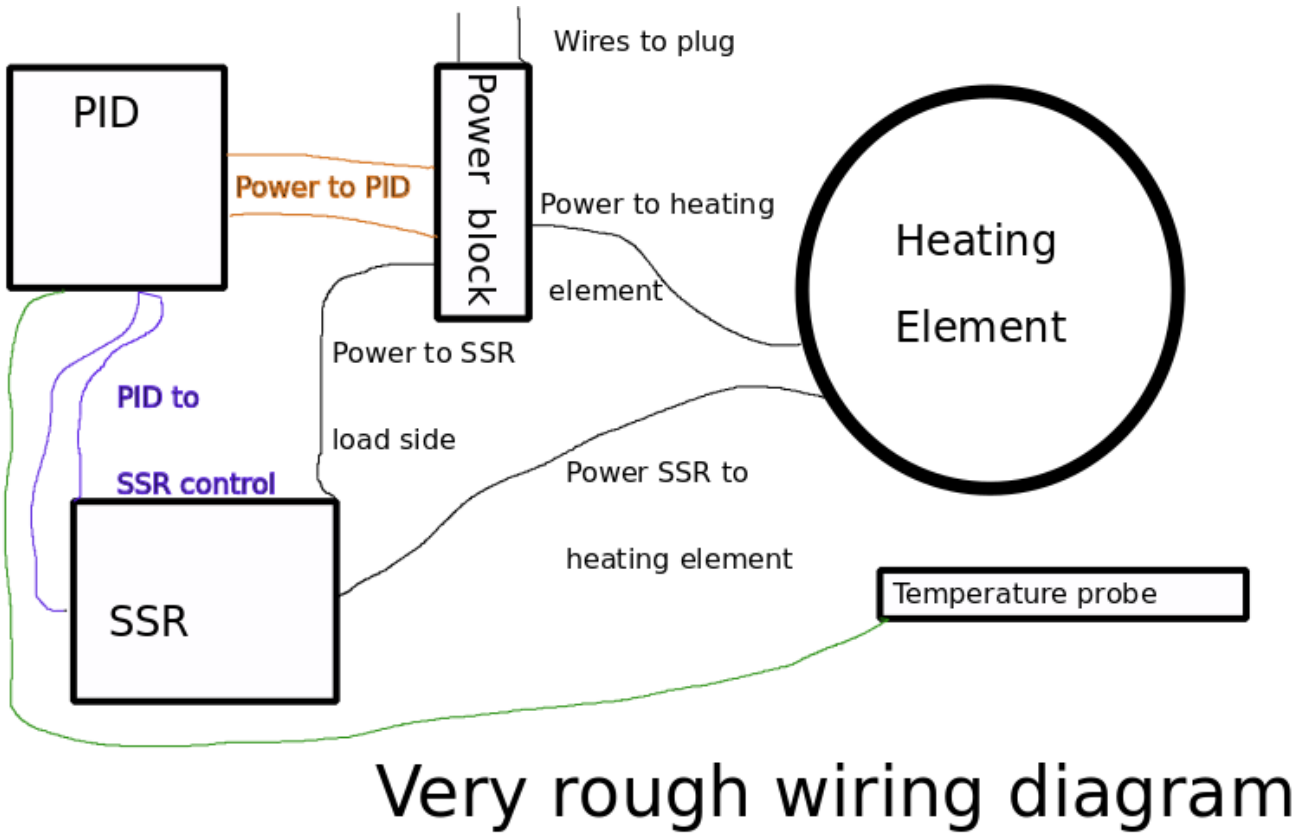
I forget where exactly I first found a parts list to build one of these, so I can't send you straight to the source I used, but I can try to explain the basics enough that someone else could build one.

The heating element in the Lee lead pot is pretty basic, and in the original is controlled by a rheostat that regulates how much current goes through it, and therefore regulates the temperature. If you just supply power without the rheostat, it just tries to get as hot as possible. Before I put the PID in place, it would swing the temperature around a lot. The one I use for actual lead varies by around 25C from where it was "set", which in my mind works for keeping lead molten, but isn't consistent enough for annealing brass.

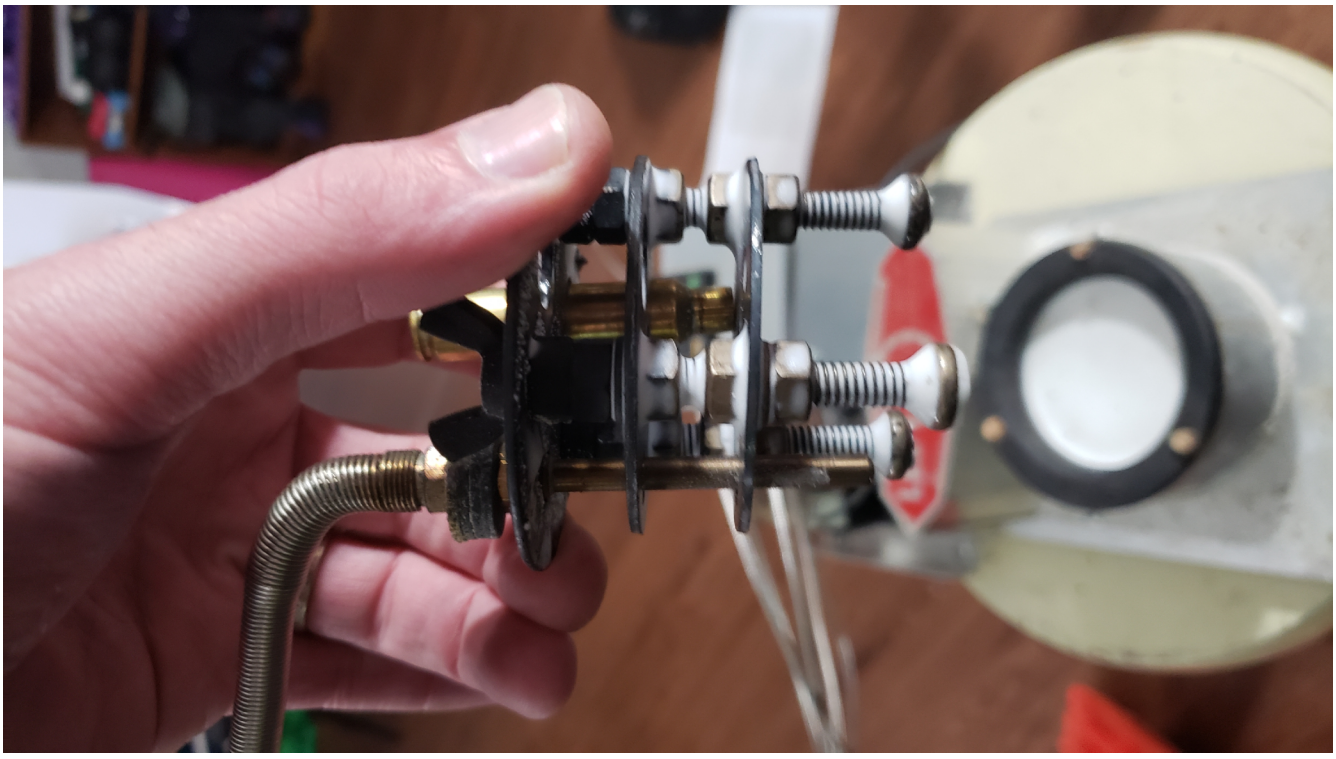
Hooked up with the PID, the system works differently. Instead of regulating the temperature by regulating the current, this system does it by cycling the temperature on and off like your home thermostat by controlling the solid state relay. With the PID, I am seeing about 2C, which is pretty good. If I really try to rush the process along, i.e., get more cases done as fast as possible, it can cool the bath by about 5C, but mostly I don't go that fast as it seems more likely to result in mistakes. I don't want to make mistakes with a liquid at 500C (932F).

This is my salt bath annealer. The salt bath in the pot is pretty obvious, and the temperature probe (thermocouple) is sitting on the salt block. The PID is installed into the grey box (top left), which also houses a circuit block that I used to make hooking up the wires easier and avoid making soldered connections. The solid state relay (SSR, bottom left) sits on its heat sink, with the control wires on the left and the load circuit (power to the heating element) on the right.



Very rough wiring diagram

The other part of this system is the case holder, which sets the depth that the case goes into the bath and supports the case. I also have mine supporting the temperature probe.



I keep the salt bath at the level of that middle plate (fender washer). This has holes for two cases and the temperature probe, but for the amount of shooting I get to do, one at a time is fast enough and much easier to keep straight. This is the one I use for 284Win, 7mm-08, etc. I also have one for 223 and 223AI.

The process is fairly simple. Plug it in and give it about 15 minutes to get to temperature. My PID remembers its setting, which is convenient. Once it is up to temperature, I can start dipping cases. The case goes into the holder and is left there for a set amount of time; I run 7 seconds on my larger brass and 4 seconds on the 223 size brass. Consistency is key. At the end of the time, I pull the case our and immediately drop it into a bucket of water, which stops heat from continuing to travel from the case mouth toward the case head. This also helps wash off any salt that sticks to the case. The salt is very water soluble. I do this bare-handed, and the case heads and bodies near the case head stay at a temperature where it feels warm but doesn't burn. This means that the case head and body stays well below the temperature that annealing begins (somewhere around 260C, or 500F).

Some notes:
I run my brass through an ultrasonic cleaner before and after annealing, mostly to prevent contamination of the salt and then guarantee that all salt is removed (though it is soluble enough that it should all be removed when dumped into the water).

Do NOT allow water to splash into the salt bath. Think about the horror stories of exploding lead pots… and no, I didn't learn from personal experience. Likewise, make sure to deprime the cases so that the air inside can escape as it very quickly heats up. Definitely do NOT try this with live primers...

Make sure you get the low temperature salt (yes, in the heat treating world, 500C is low temp). Keep this salt below 550C as it is a nitrate salt.

Experiment with some pieces of brass that you aren't worried about. The salt transfers heat to the brass at a rate determined by the difference in temperatures and the specific heats of the two materials. What this means is that the mass of brass being heated (the portion in the salt bath) is probably more important that the minor variations in brass thickness, so you can use cheap brass from the same or similar sized cases to determine how long to soak your brass.

As to needing to reach a specific hardness, I am not as convinced that getting to a certain hardness reading is as critical as being consistent from one case to the next and from one firing to the next, provided that it becomes soft enough so that spring back after sizing is reduced effectively. With the 284, annealing like this keeps the case base to shoulder measurements consistent to a greater degree than not annealing like this, and sizing and seating bullets feels much more consistent. I don't know if I am reaching any certain hardness, just that it makes a positive difference.

PID: https://smile.amazon.com/gp/product/B0195V53X8/ref=ppx_yo_dt_b_search_asin_title?ie=UTF8&psc=1

Probe: https://smile.amazon.com/gp/product/B07MQTSPNV/ref=ppx_od_dt_b_asin_title_s00?ie=UTF8&th=1

Solid state relay:
https://smile.amazon.com/gp/product/B074FT4VXB/ref=ppx_od_dt_b_asin_title_s00?ie=UTF8&psc=1

Low Temperature Salt: https://www.hightemptools.com/salts.html