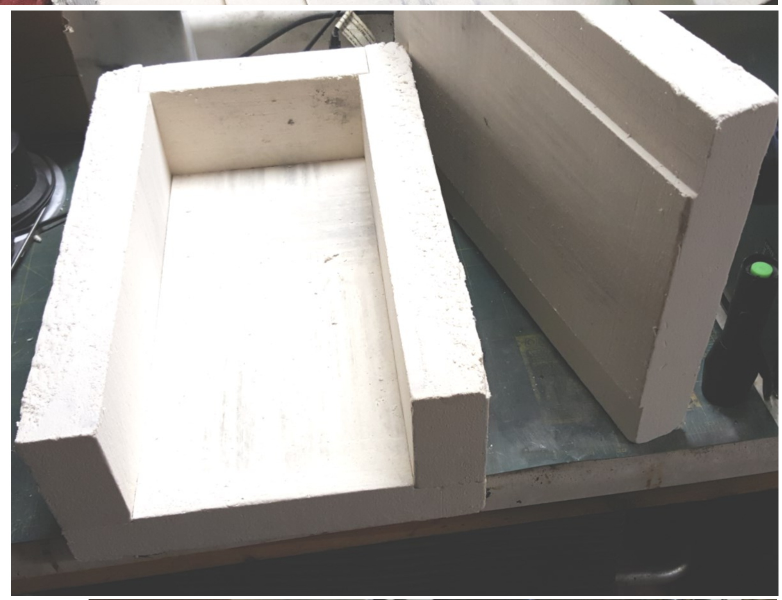
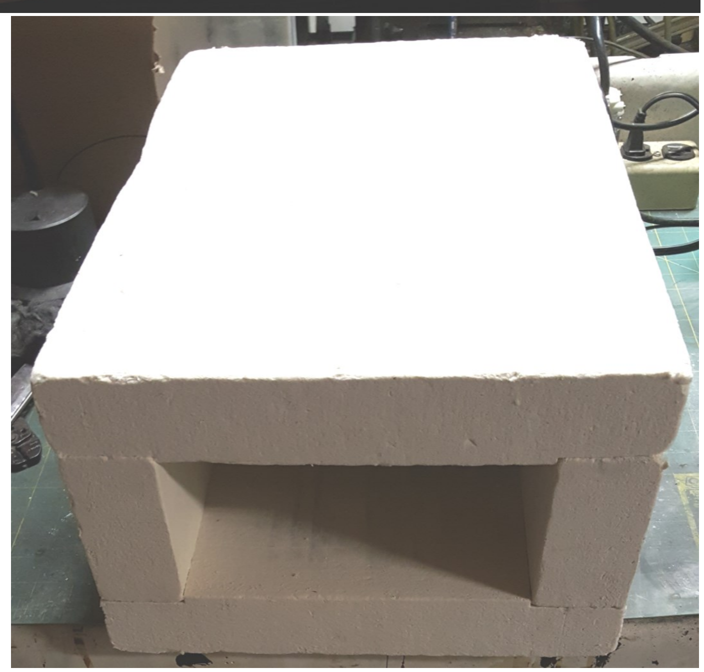
We built our forge with ceramic board—not fire brick!

Originally, we built a propane fired forge out of fire brick. We would assemble it, use it and disassemble it. Every time we used it we would find a cracked fire brick and repair it with forge cement. When researching construction of an electric forge we found ceramic board. This stuff has about the same heat specs (2300° F or 3000° F), is easier to work with, comes in larger sizes and does not crack.



We are fortunate to have a local supplier of this material. I picked up two 24” x 36” pieces of this stuff. One 2” thick and the other 1” thick (cost was $125 with tax). I used a bread knife, appropriated from my wife, to cut the basic sections. The joining recesses were cut with a router. Coil recesses were cut with a 3/8” round end router bit. The pictures show only the 2” sections. The 1” sections were added to the top, sides and back when placing the formed sections into the support frame.

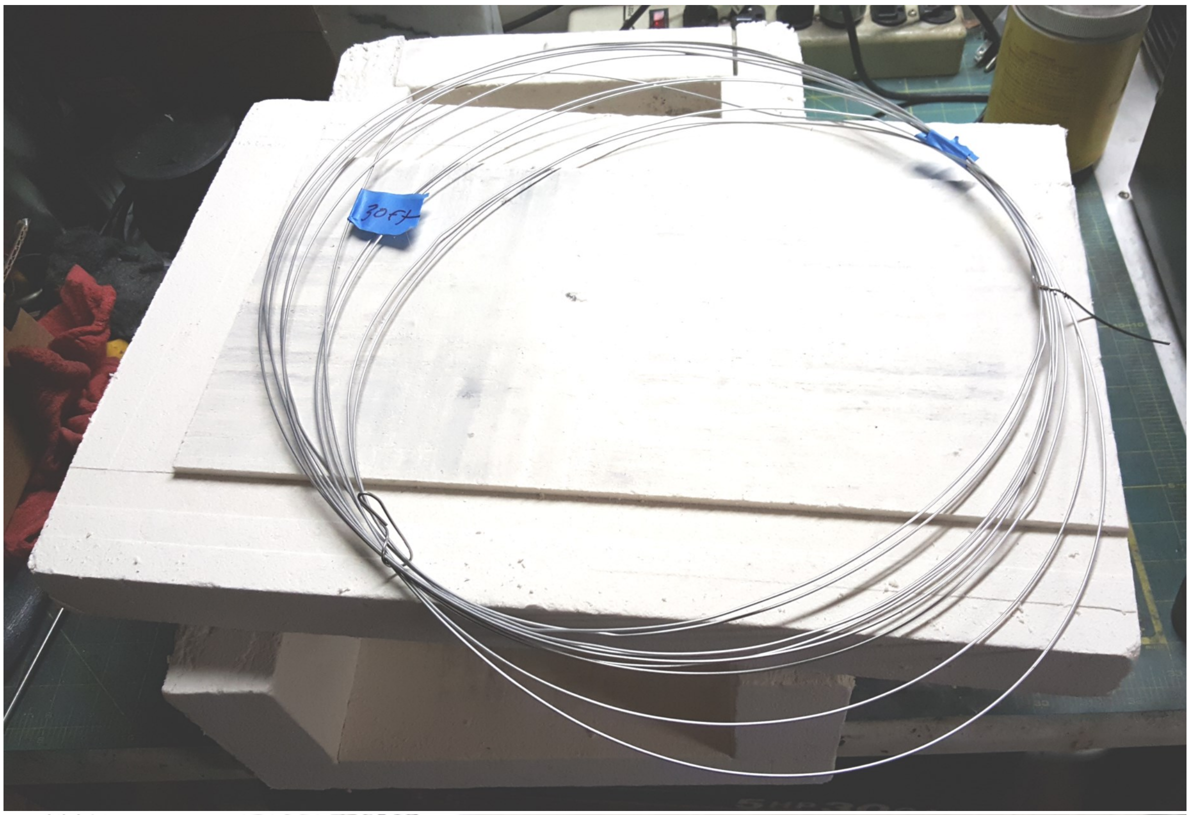


Since we were dedicating the forge to knife making, we sized it appropriately: Height 3.75”, Width 7.5”, Depth 16”

Total volume: 450 cubic inches (0.26 cubic feet).

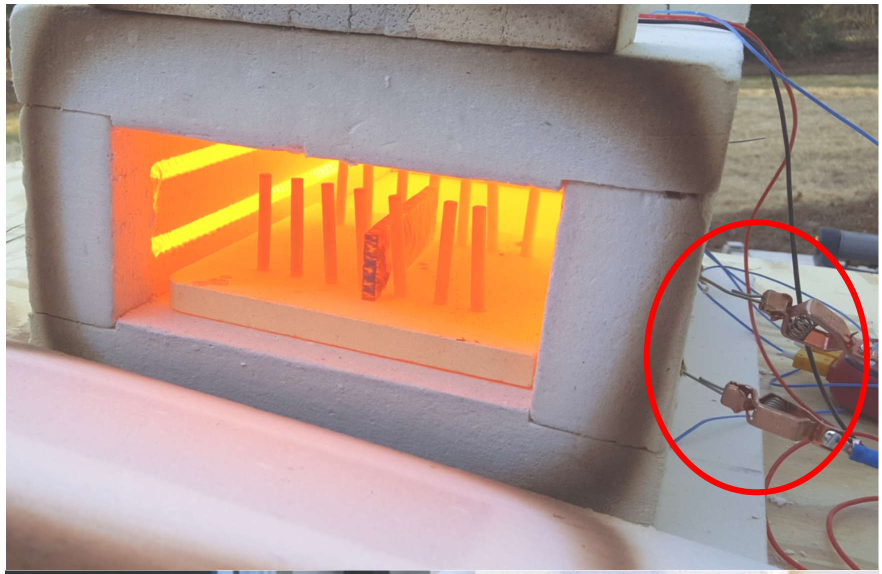
Given the forge volume (0.26 cu. ft.), I determined my target forge power should be ~1560 Watts (13 Amps @ 120 Volts). I built a spreadsheet to help in selecting the wire gauge and length to satisfy my target power. Given a total coil recess length of ~75" (four 15" plus two 7.5" recesses) and a required resistance of 9.23 Ω, I would need 27.87 ft. of 16 gauge Kanthal A1. Using a coil O.D. of 0.41" and spacing of 0.24" provided a total coil length of 75.8".

I wound the Kanthal wire on a 5/16" rod to attain the proper diameter. Each end had a 4" straight section for connection to power. Once wound, it was easy to press the coils into the ceramic board recesses for a snug fit.

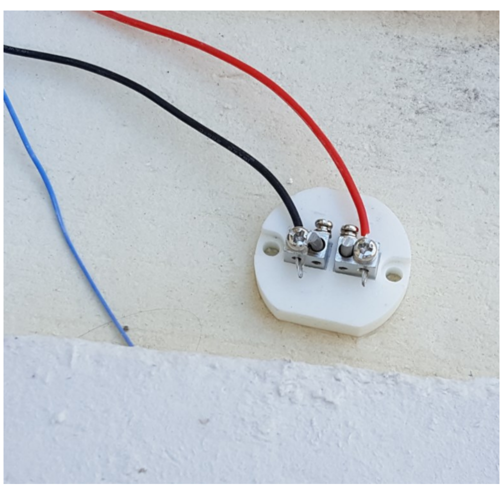


First test: Safety last!

One problem with the ceramic board is the requirement for "burn-out". This is the requirement to heat to around 1200° F to burn off organic material that went into making the ceramic board. You should do this outside—it's a bit foul smelling. The process causes the material to become snow white. Once it's done, you can use it inside. Notice that I pinned the pieces together for testing—another advantage of ceramic board.

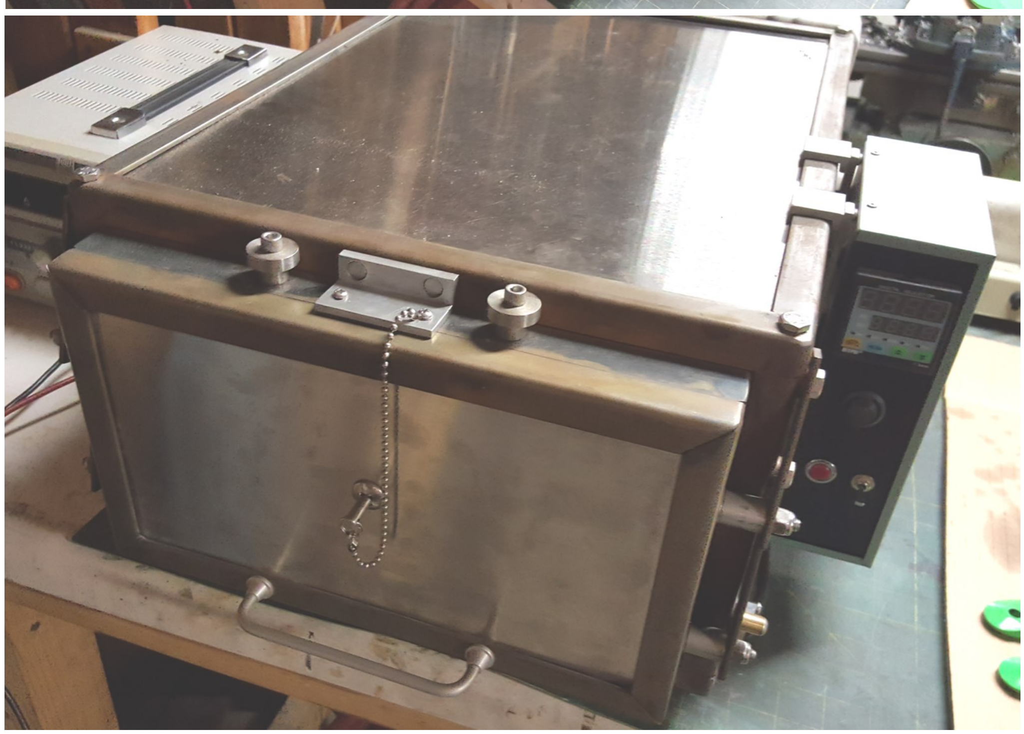


A word about the thermocouple. If you are stupid, like me, you will use plain old wire to connect the thermocouple to the PID (electronic temp controller). This is a mistake! It requires thermocouple extension wire! I found this out the hard way. While waiting for the forge to reach 1500° F, I got out my IR pyrometer and to my surprise it showed 1860° F. This made sense, since the test metal was glowing a very bright orange-yellow. Once I used the proper wire, the difference between the probe and IR pyrometer was about 20° F.

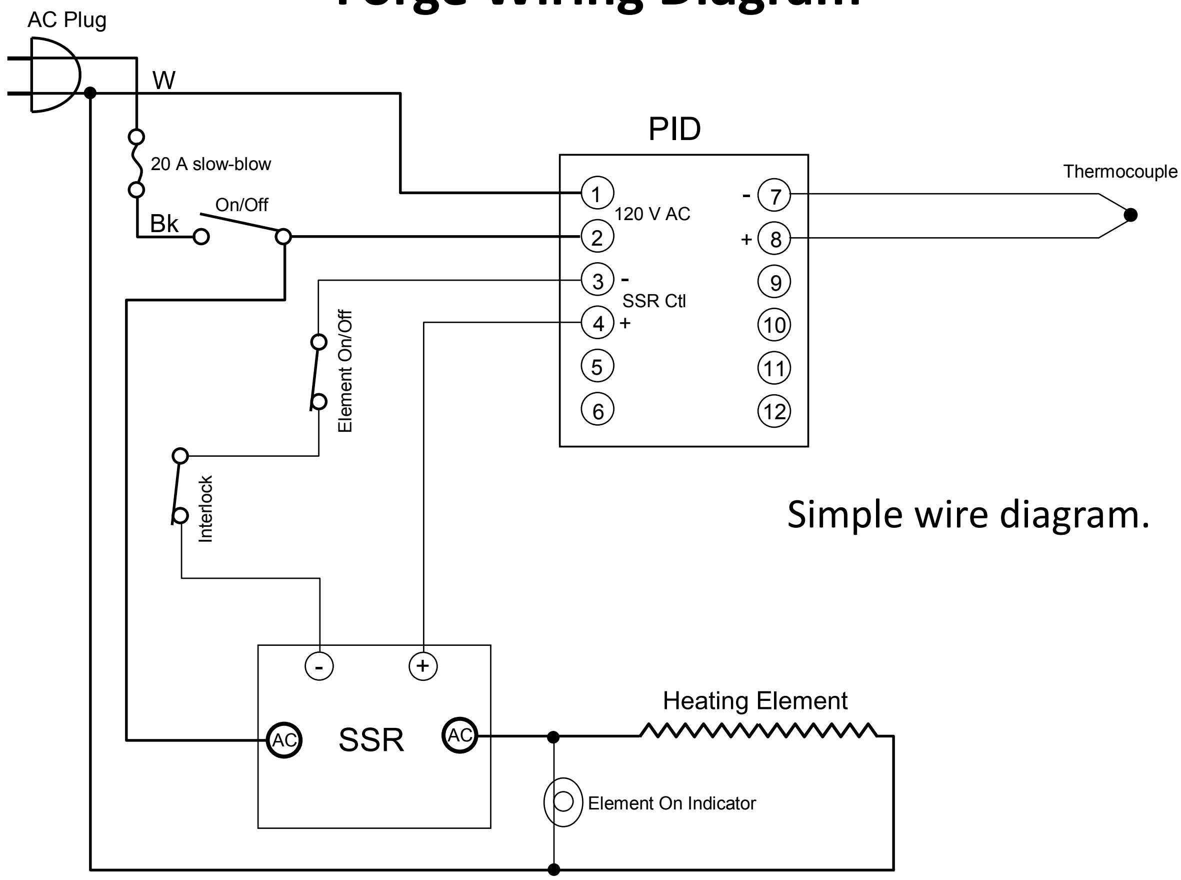


This is the sort of finished forge. I used stainless steel sheets for the top, sides, front and back and 3/4” angle for the frame. In order to reduce the forge footprint, I decided to go with a top opening door. This approach, combined with magnetic locks on top and bottom, allows for one-hand opening and closing without interfering with equipment and work spaces near the forge. I also added a hole through the 2” ceramic board door for external probes—calibration and low temperature reading. I may eventually get around to cleaning it up and painting the frame. But, for now, we use it too much to take it apart for painting.

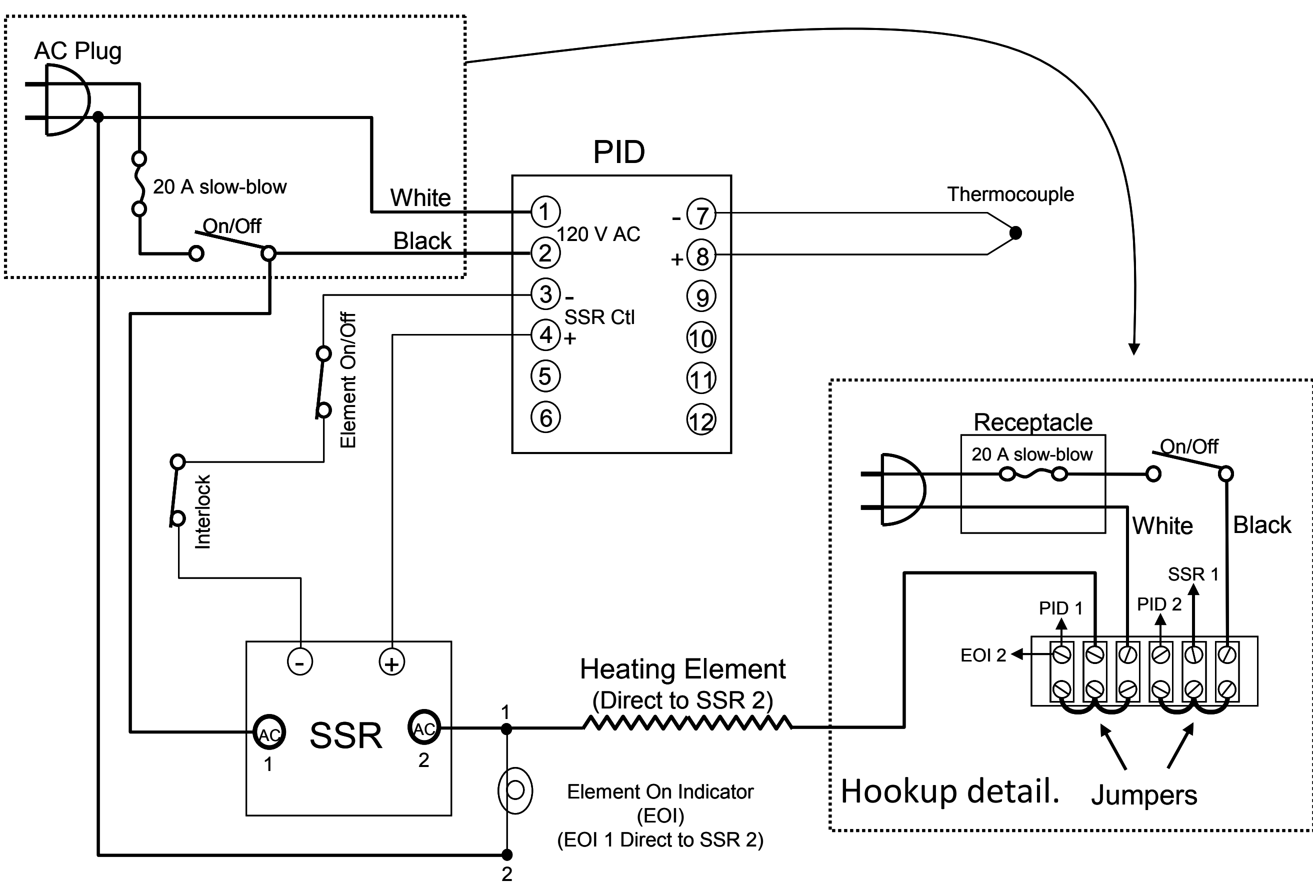
The forge cost around $300 to build. You can make it significantly cheaper with perforated angle and sheet steel. My wire selection and coil sizing spreadsheet contains a cost break down and sources for the various components. I can make the spreadsheet available to anyone who may be interested in constructing their own.



Forge Wiring Diagram



Simple wire diagram.



Hookup detail.