

## Throttle and Super-Heater

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Next on the list of things to do from the article are the Throttle and the Super-Heater. A nifty design is described for the Throttle that sits in the Steam Dome and one that should work quite adequately considering its simplicity. Figure 1 shows the Throttle Assembly.

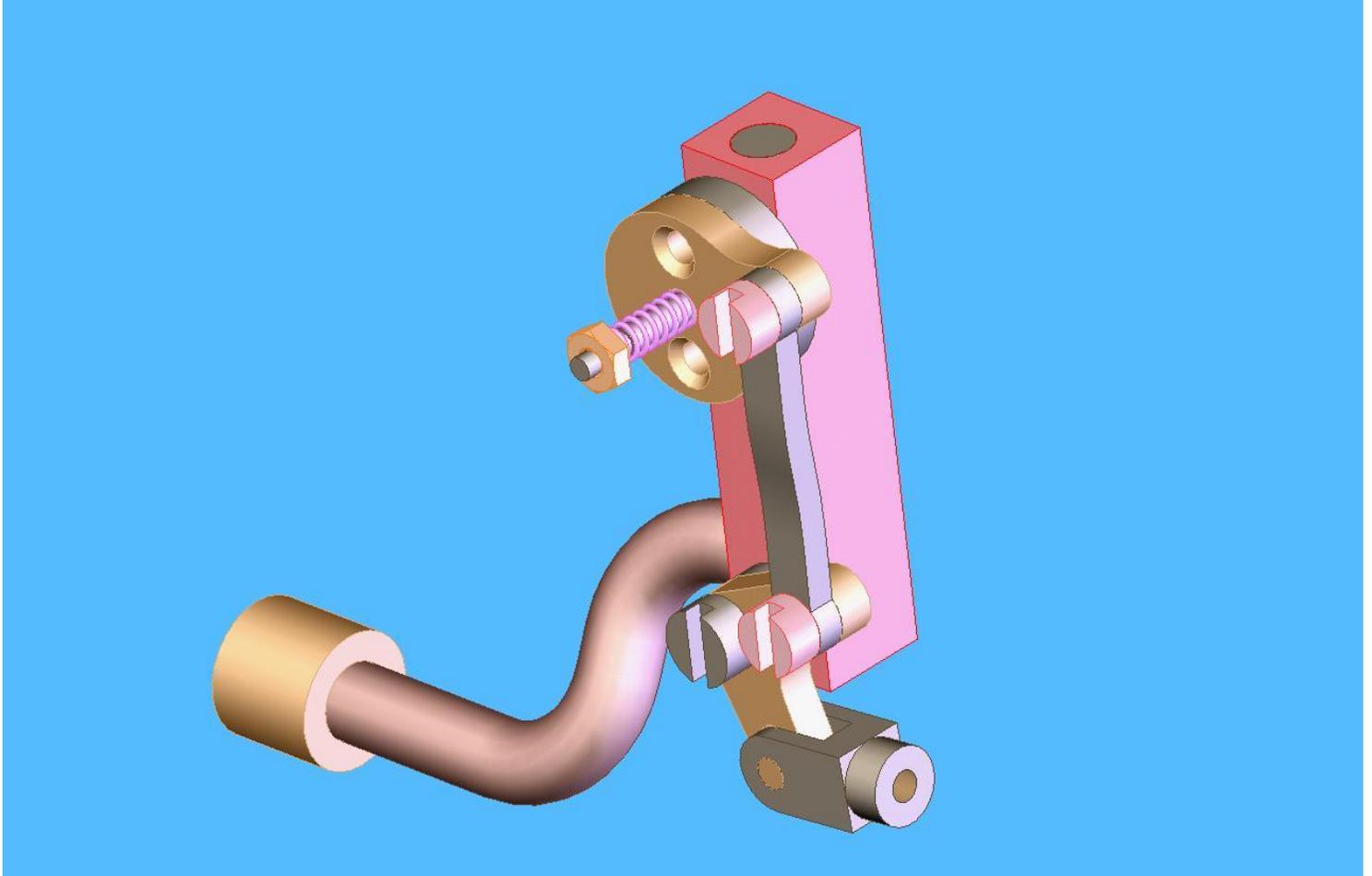


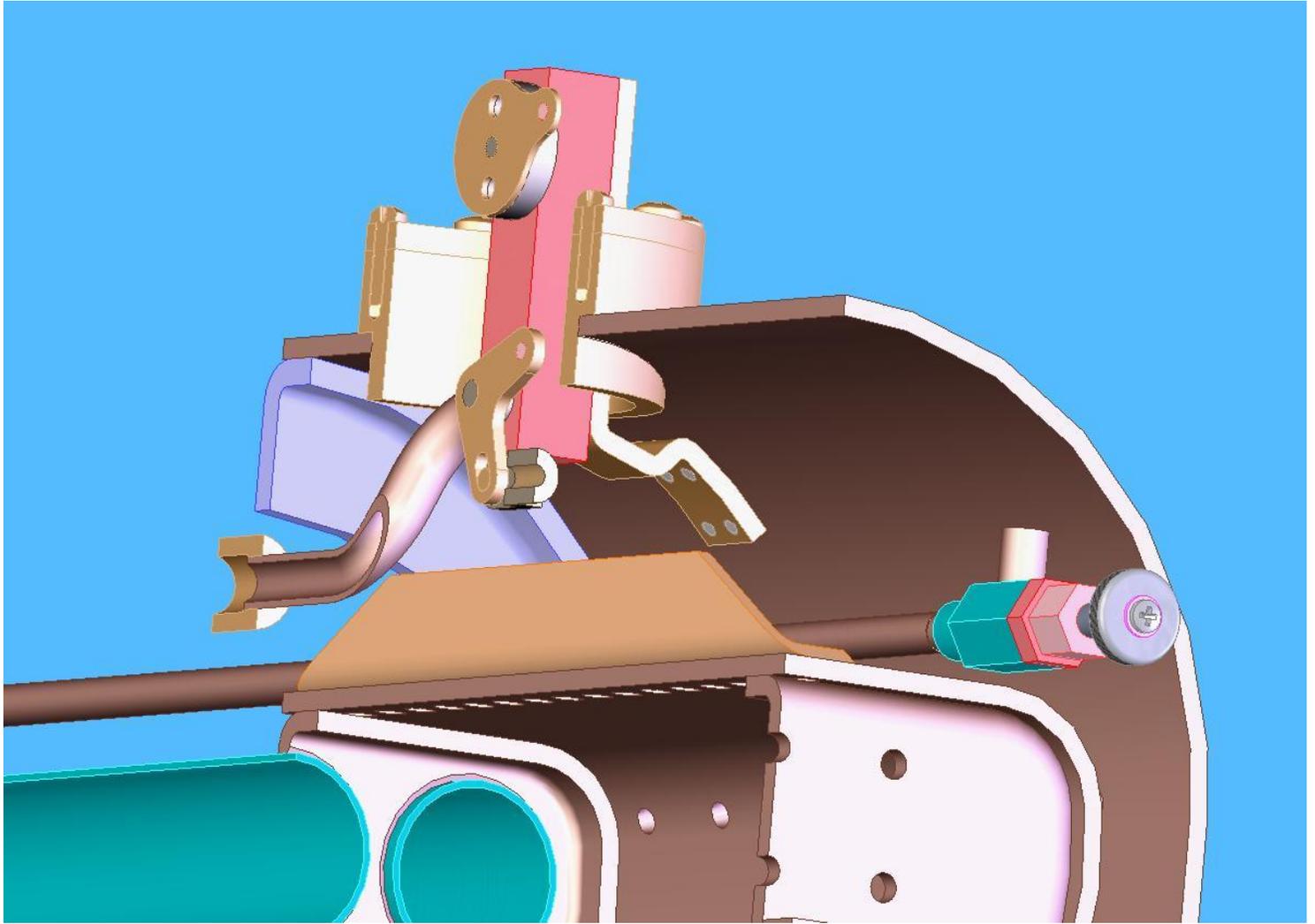
Figure 1; Throttle Assembly

As can be seen from the figure, I have slightly modified the inlet holes with a 1/32 inch countersink on the port face. My reason for doing this is to slightly increase flow of steam through the ports by creating a slight venturi effect.

Next will be the Bracket for the Throttle, I must say that this does not look like an easy task. Number 1, the opening for the Steam Dome is only 1 1/2 inches in diameter. Number 2, the bending for the bracket holds the key to good alignment. Number 3, you must line up not only the Throttle Rod Fork with the Throttle Gland in the Throat Plate so the rod operates smoothly in a horizontal plane but, you have also got to make sure the steam pipe is in the right position as well so that you can fit the dry pipe that is attached to it also in a horizontal plane and lines up with the Gland in the back plate of the Barrel. Number 5, you have to do all this with the boiler already assembled.

Hind site being 20-20, I think I would have done a dry run with all this first and by that I mean making sure everything fit before the Boiler was assembled. One could somewhat easily devise a way to hold the critical parts of the boiler in place, the Wrap, Throat Plate, and Barrel ECT. And not be hindered by the rest of the assembly. One would also be able to see a lot more and have a

little more room to work to ensure a proper fit so that when final assembly time does come around you keep your grunts and groans minimalized when putting the throttle assembly in while working through a tiny 1 ½ inch hole.



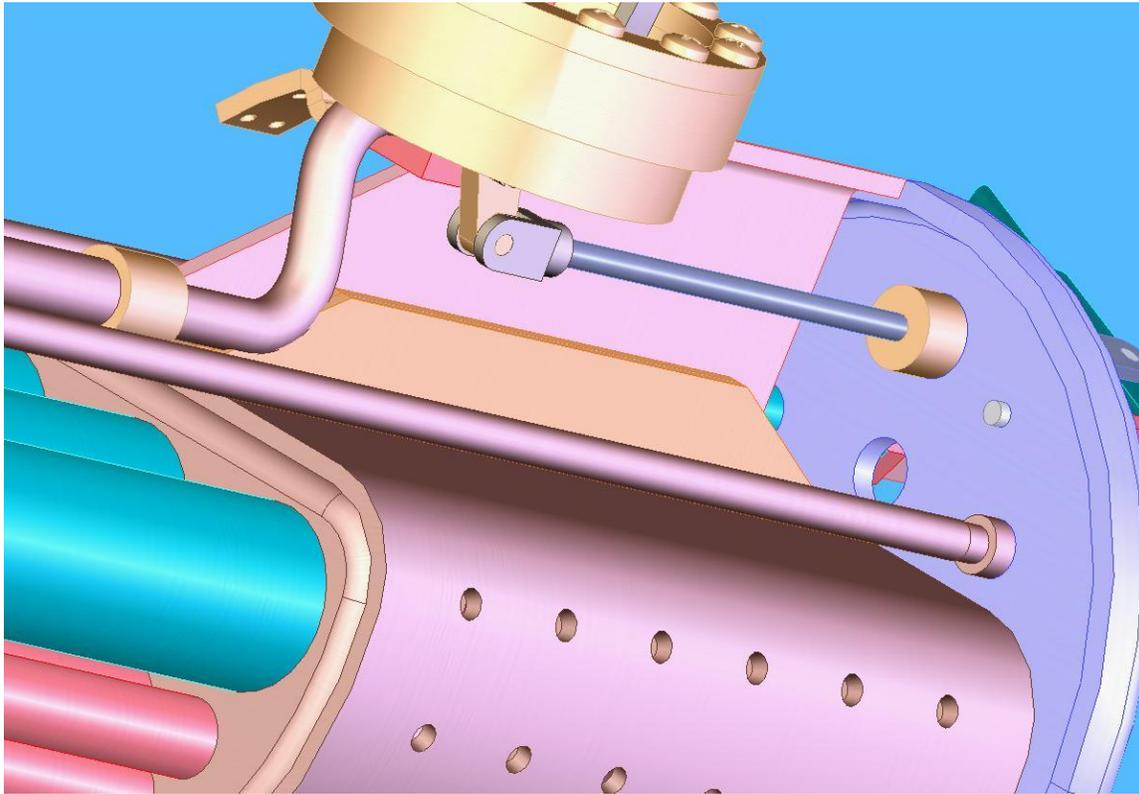
**Figure 2: Section View of the Throttle assembly attached to the outer Boiler wrap. Please disregard the holes in the top of the firebox, these will be used for a stress analysis of the boiler and will be taken out afterward.**

The next item to make on the list was the gland assembly for the throttle rod that is attached to the back-head. One of the first things that I noticed is that the base part of the gland that attaches to the throat plate back-head is called out in the drawing with a 7/32 inch thread on the outside of the piece while the anchoring lug hole is called out as 1/4-40, this cannot possibly work. Both pieces also call for 3/8 inch hex on the drawing. So after reading a bit more in the article, LBSC says to use 7/16-32 thread to attach it to the back-head while still retaining the 1/4-40 inside thread and that this piece is to be made from 5/8 rod. OK, I'm good with that. Figure 3 top right of sectioned boiler shows the gland and thread callouts to watch out for in the drawing.

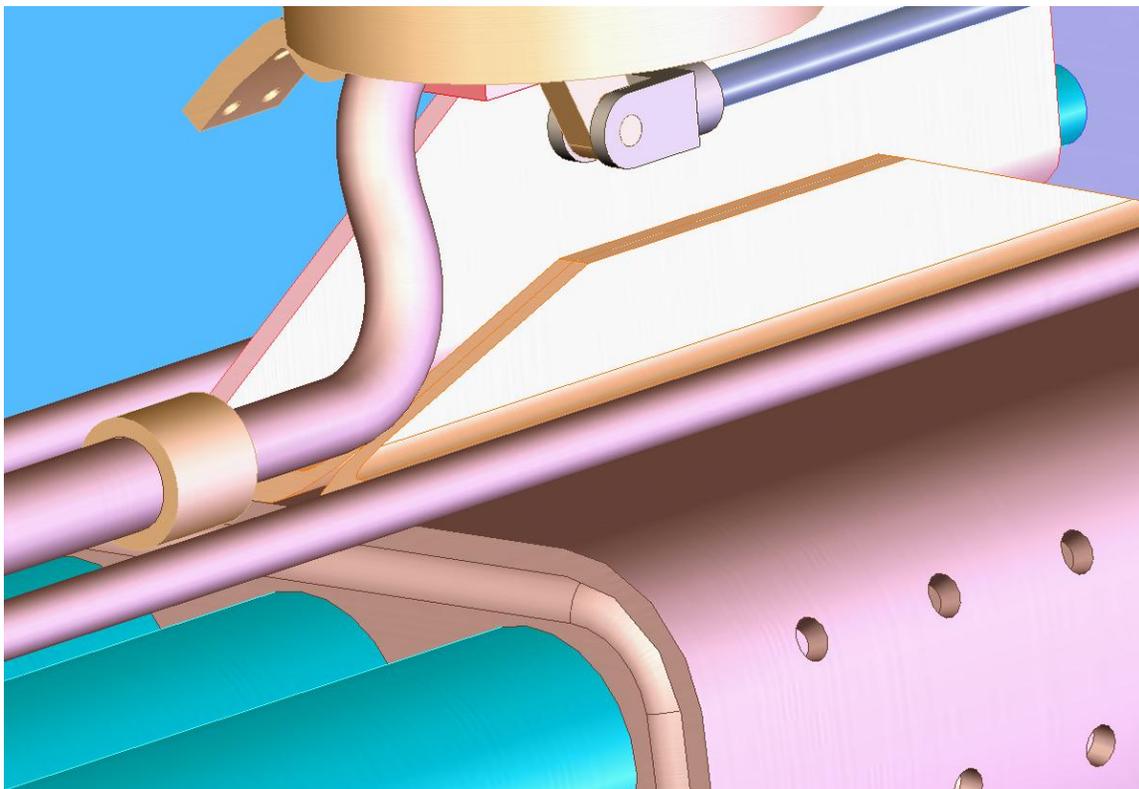


With the throttle stand and lever complete it is now time to work on the super-heater.

The next item to do was to fit the dry pipe for the super heater and wouldn't you know it I ran into an interference issue between the drop pipe from the throttle and the middle angle iron stays atop the firebox, see figure 5.



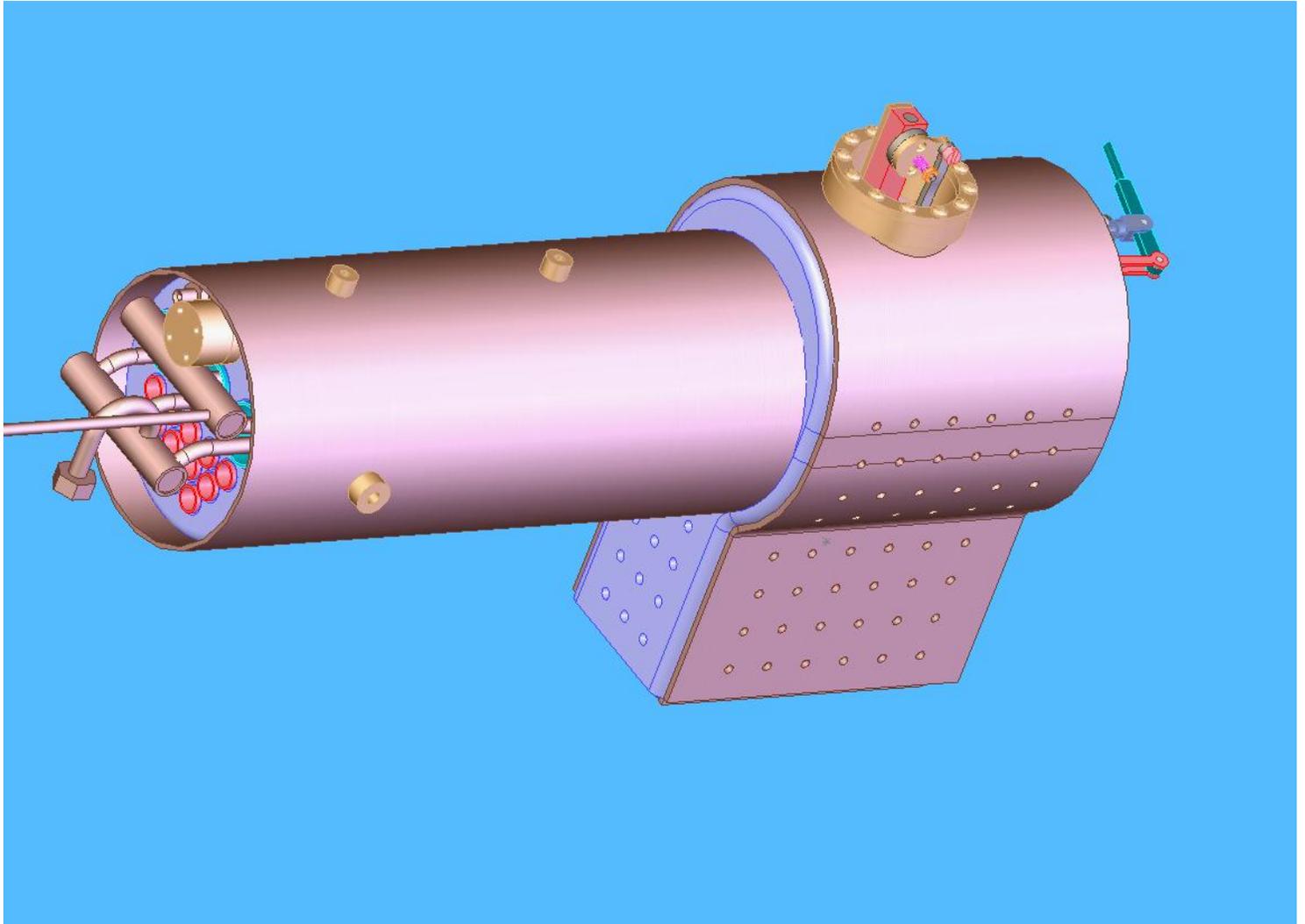
**Figure 5: Interference between drop pipe and angle iron stays.**



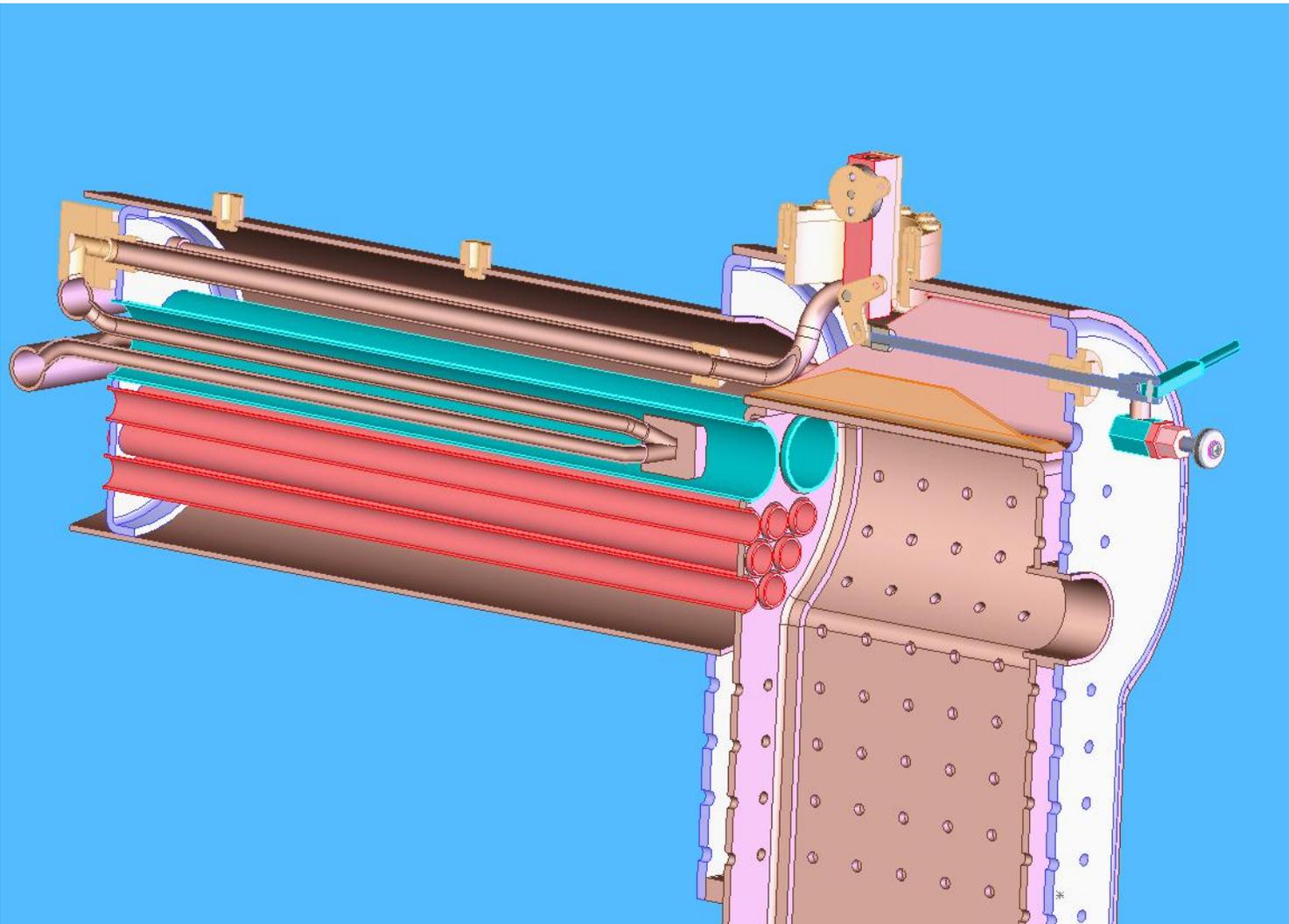
**Figure 6: Drop pipe fixed**

I quickly remedied the problem with a combination of a bigger radius for the drop pipe bend and cutting back the angle iron more on the top, what was once a 30 degree cut is now 20 degrees. Figure 6 shows the modifications.

The super-heater elements went together fairly easily, the instructions for this were straight forward and easy to understand for me. I put the swan neck to the recommended 2 1/8 inches from the back-head, but as of this writing have not checked to see how things line up, I may have to modify a length or a fitting to make things fit and will address any of those issues at that time. Figure 7 shows the super-heater as well as the throttle assembly in place and figure 8 shows a cross sectional view of the super-heater & throttle.



**Figure 7: Super-heater & throttle in place.**



**Figure 8: Cross sectional view of Boiler with super-heater and Throttle installed.**