Water-Gauge, Water Level Test Valve and Boiler Blow Down Valve

Troubles from the get go on the water gauge. While modeling the upper fitting for the water gauge I encountered a problem with the side hole in the upper fitting.

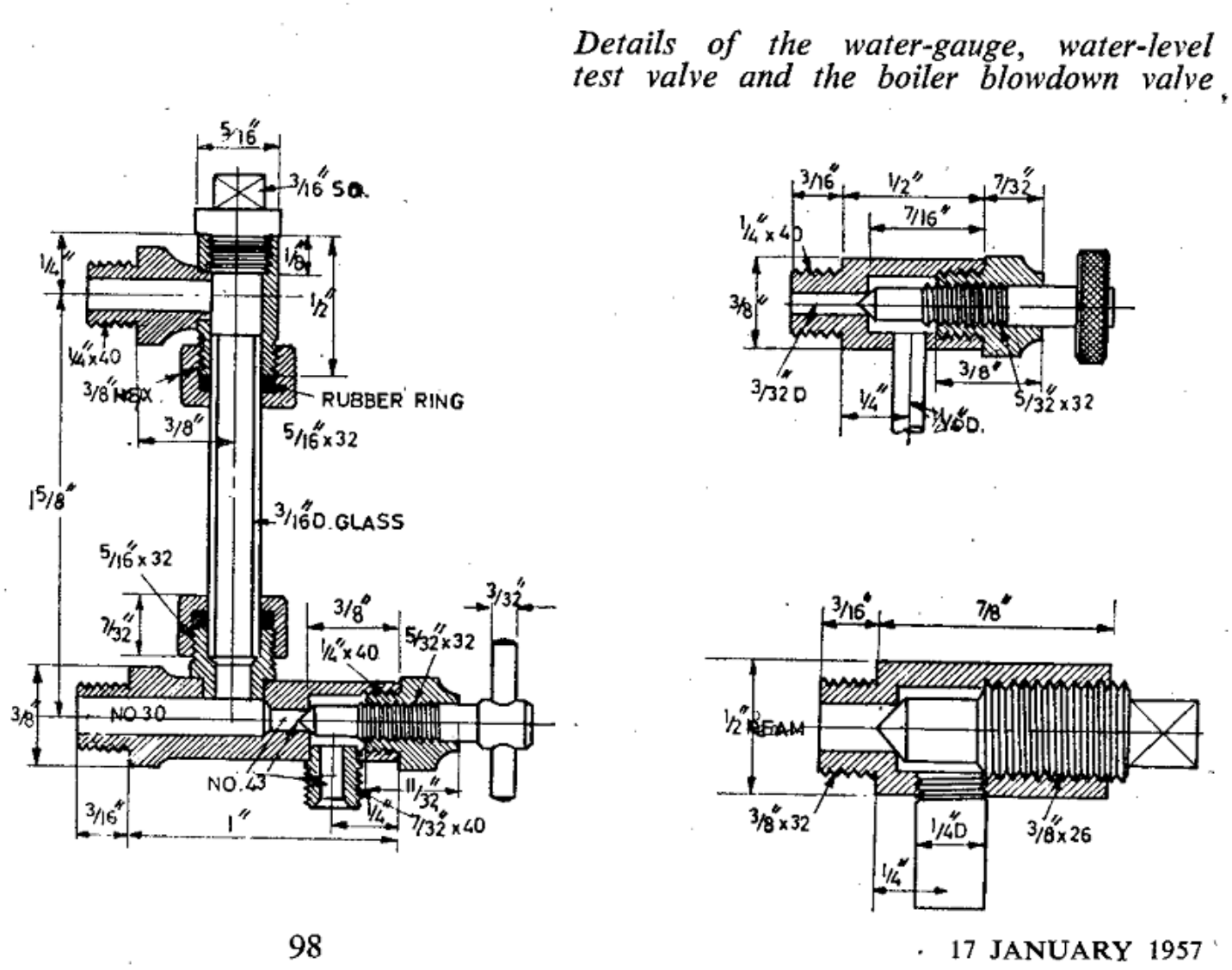

Figure 1: LBSC's details of the Water Gauge, left side.

The problem encountered is with the vertical side hole dimension from the top of the fitting. The upper fitting itself is ½ (16/32) inch long, the threads on the bottom of the piece come up 5/32 of an inch, this leaves 11/32 inches for the hex vertically. If we measure down from the top to the location of the center of the hole, which is ¼ (8/32) inch we are now left with 3/32 of an inch, which is half the specified 3/16 inch hole diameter. If you were to drill this hole in the specified location, you will wind up cutting thru the bottom of the hex where it meets the threads on the bottom of the part or the wall will be so thin there it may contribute to a failure (leak) under pressure.

Figure 2 shows the error. SolidWorks would not cut the hole at the specified .250 location; it gave me an error saying “open %s”. I tried to look up the specific error but could not find it. I am however sure that it means it cannot cut the hole directly on the bottom line of the hex surface; the cut must be either a bit above it or a bit below it. What I wound up doing to graphically show the problem was to use .251 inches instead of the .250 inches specified, if I were to use .249 we would see a .001-inch thin surface at the bottom of the hex.

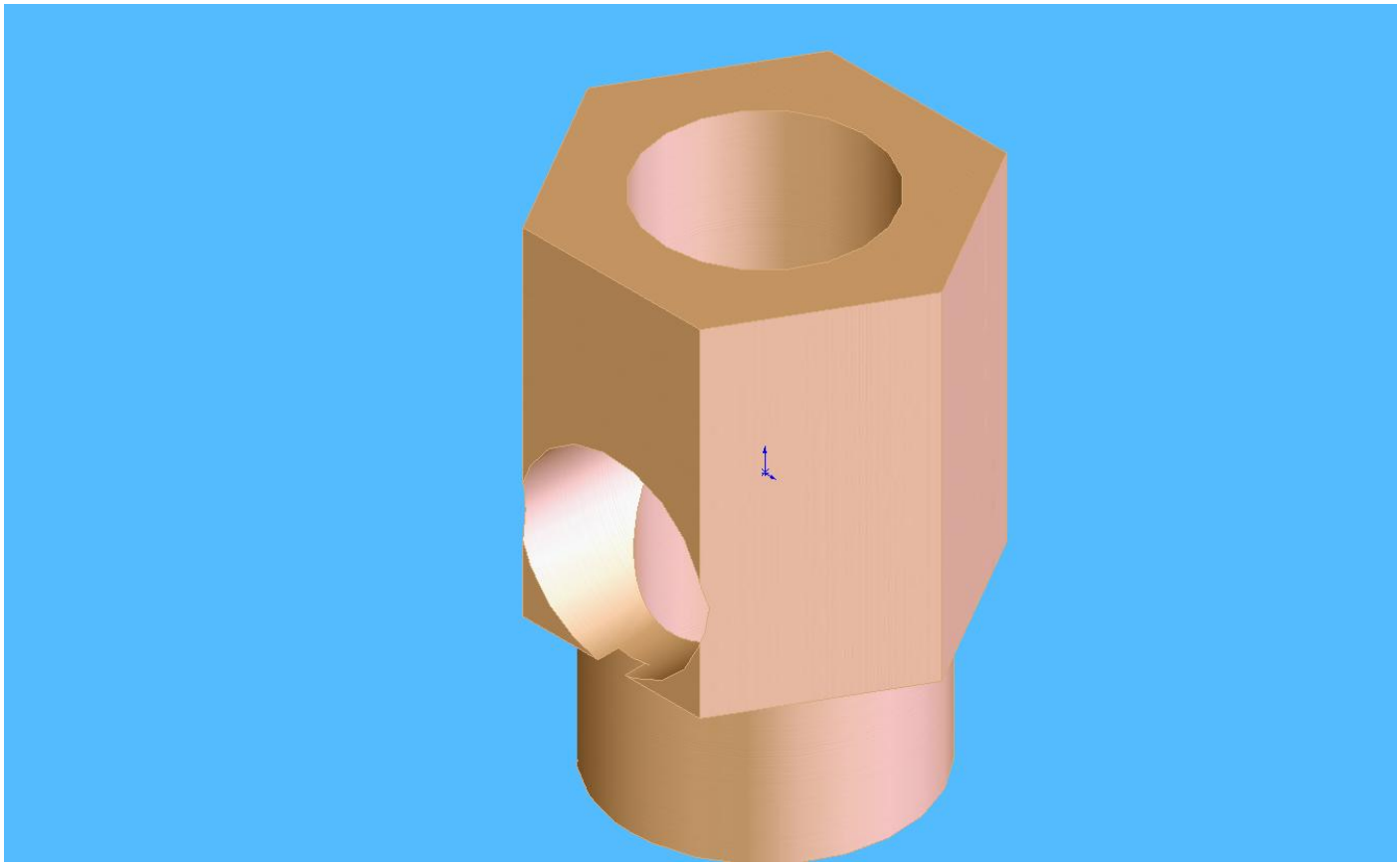

Figure 2: Side hole problem in upper water gauge fitting.

I think what I will do to correct this is to just extend the length of the piece by about a 1/8-inch, so instead of having the upper fitting at ½-inch total length it will be 5/8; this should provide plenty of surface area for the hole. I will of course have to remember to shorten the glass tube to maintain the vertical hole-to-hole distance of 1 5/8 inches. Figure 3 shows the updated part.

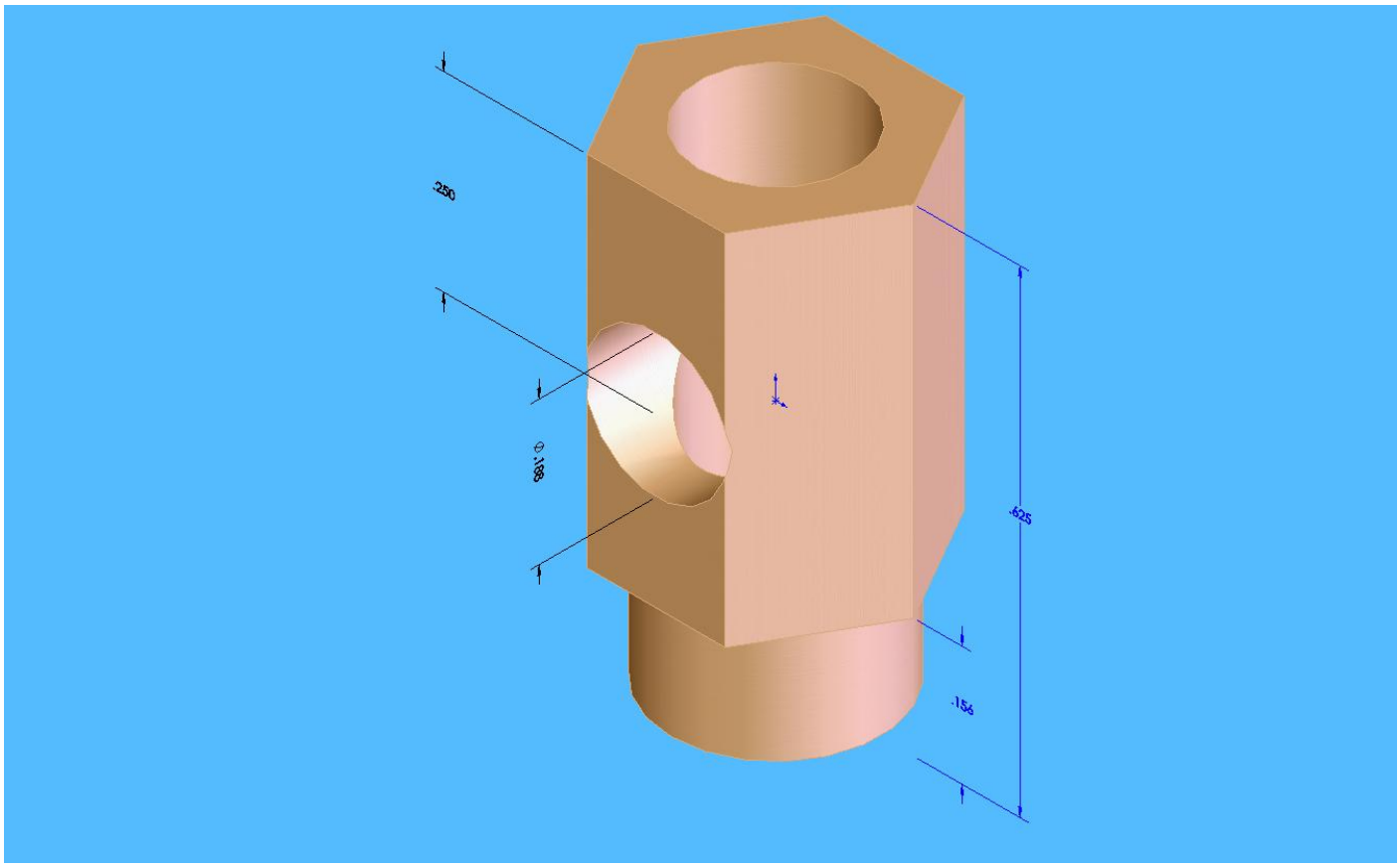

Figure 3: Redesigned upper fitting for the water gauge.

After my encounter above I was pleasantly surprised that, no other issues came up. The rest of the water gauge went together quite well. Figure 4 shows the completed assembly and figure 5 show the water gauge cross sectional view.

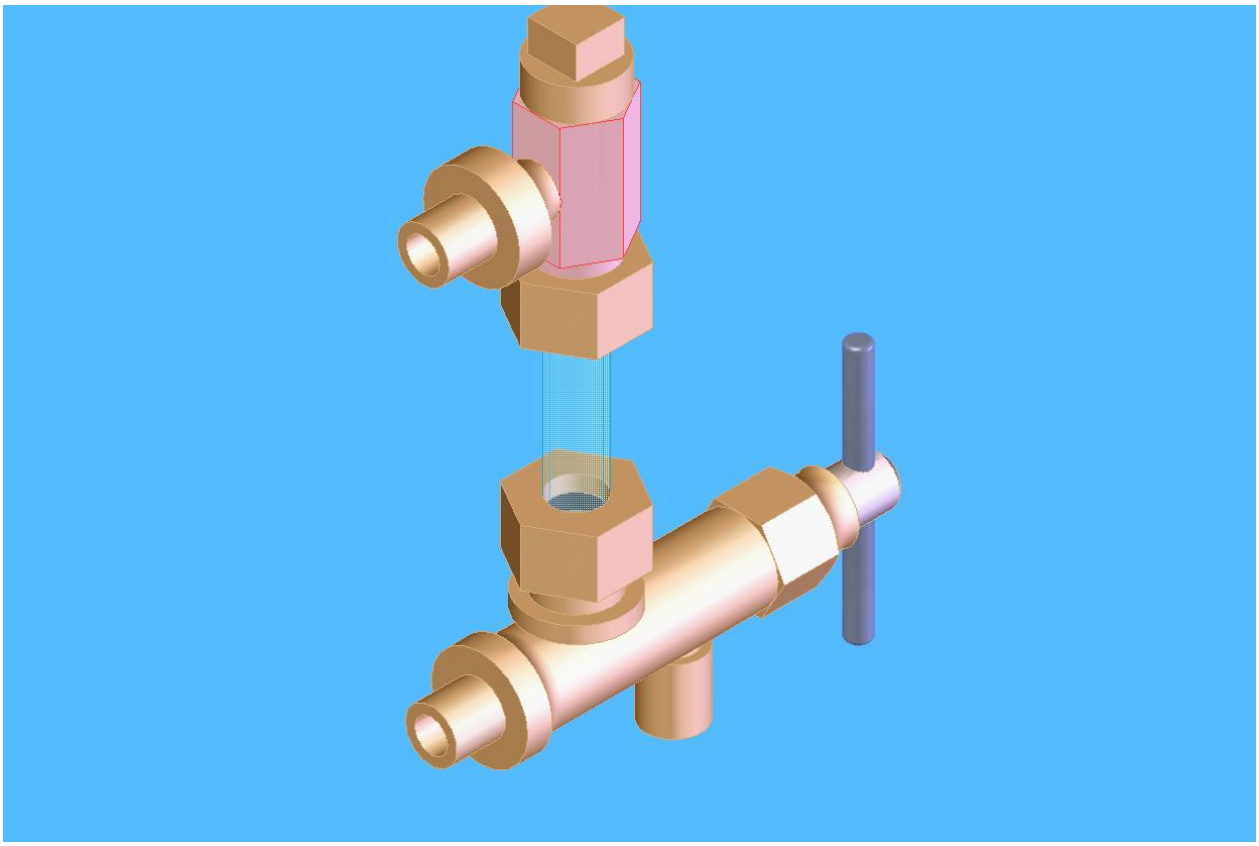

Figure 4: Water Gauge assembly.

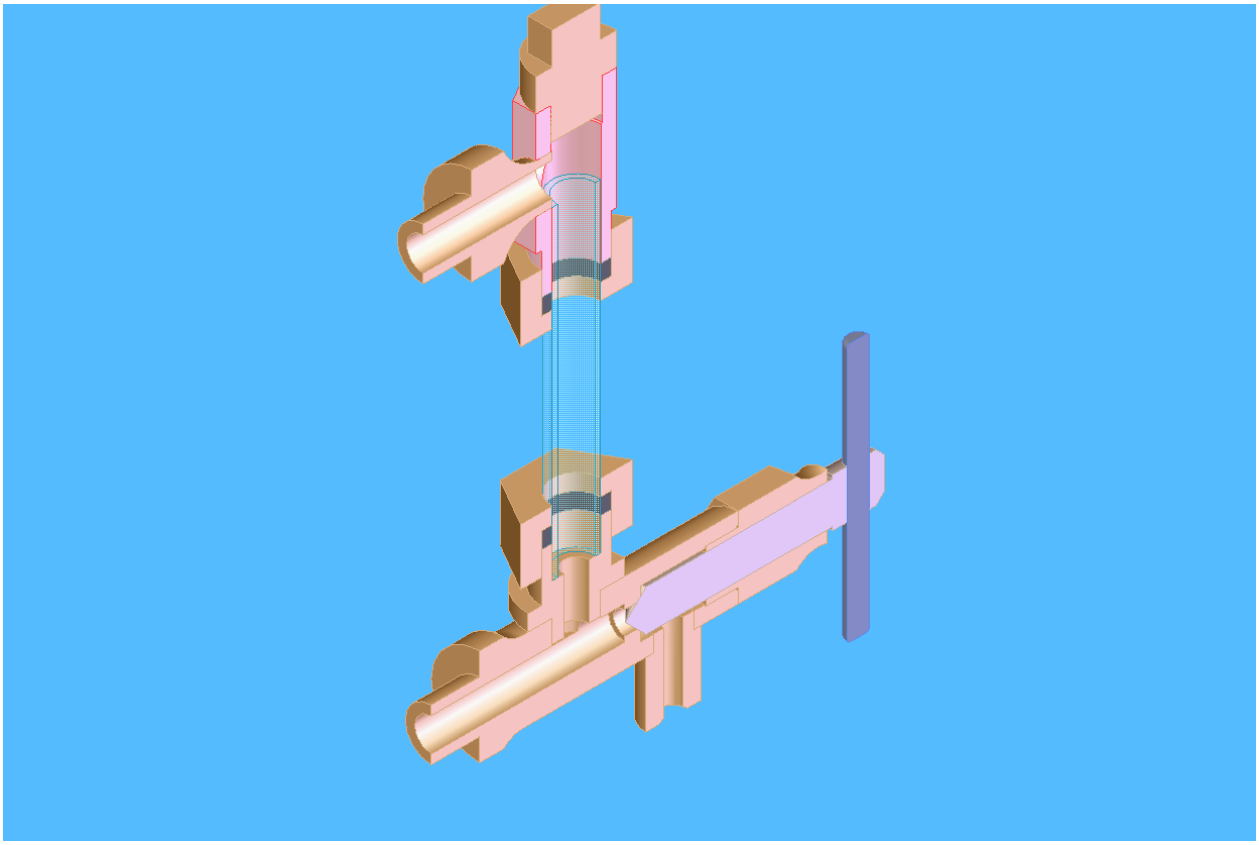

Figure 5: Cross section of the Water Gauge.

LBSC describes how to fit the water gauge to the back head in the article that I have by placing it 7/8 of an inch to the left of the centerline of the back head and then 3/16 of an inch from the edge of the back head. I can only assume that he means from the nearest top edge, which is what it looks like to me in his drawing. Figure 6 shows the installation of the water gauge per LBSC direction. Though there is clearance between the water gauge and the throttle lever, it is minimal and it looks to me like there is ample room to move the water gauge a bit more to the left as well as down a bit, so that's what I am going to do. I will center it between the injector steam valve and the throttle, that way there will be no question as to any interference occurring between the water gauge and the throttle; it is just to close for my liking.

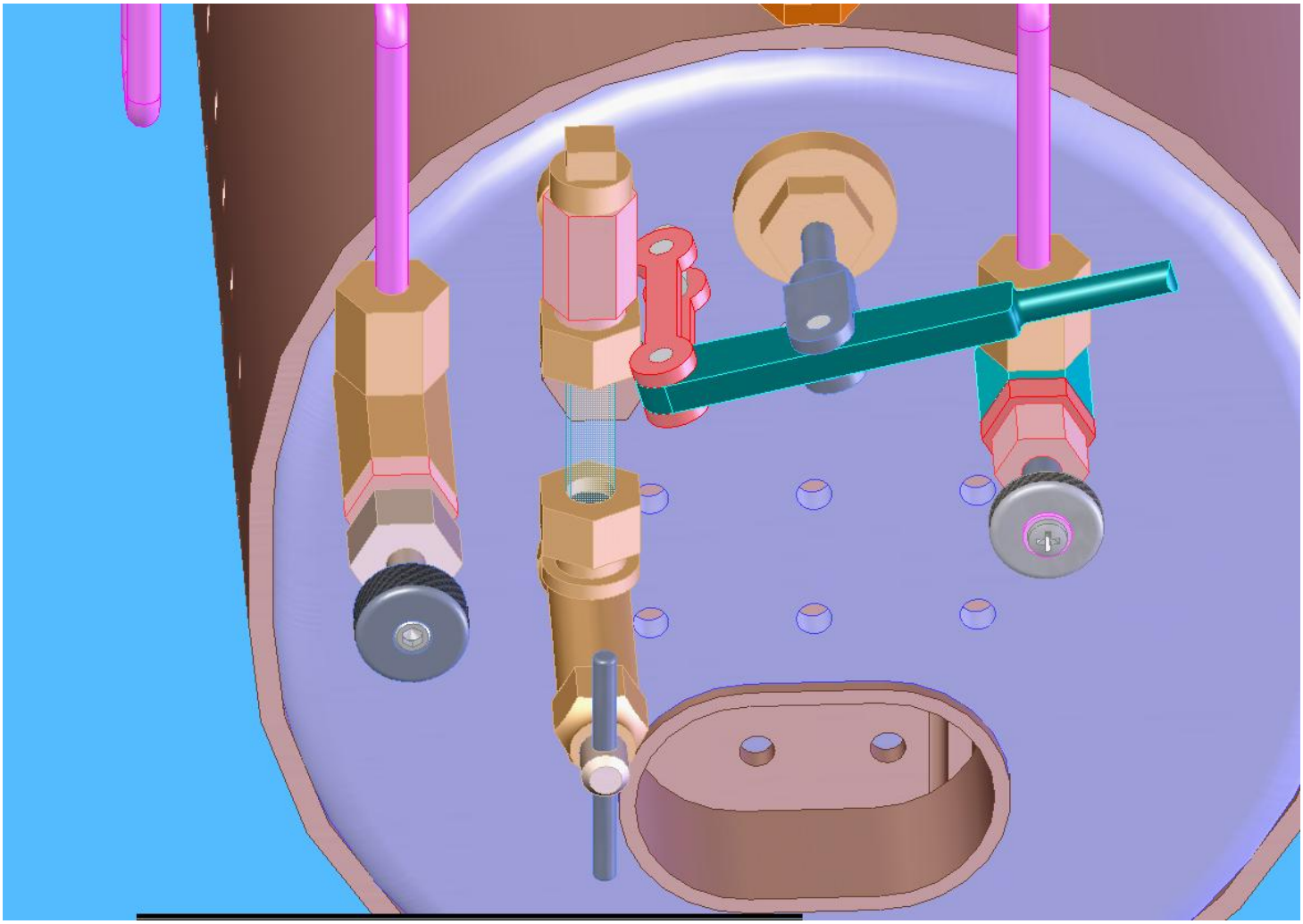

Figure 6: Water gauge installed on the back head.

What I wound up doing was to go 1-1/16 inches to the left of the centerline and then I kept the height of the top hole of the water gauge in line with the left most hole of the throttle. It is pretty much centered and I am much happier with it here than were it was before. Figure 7 shows the new placement of the water gauge.

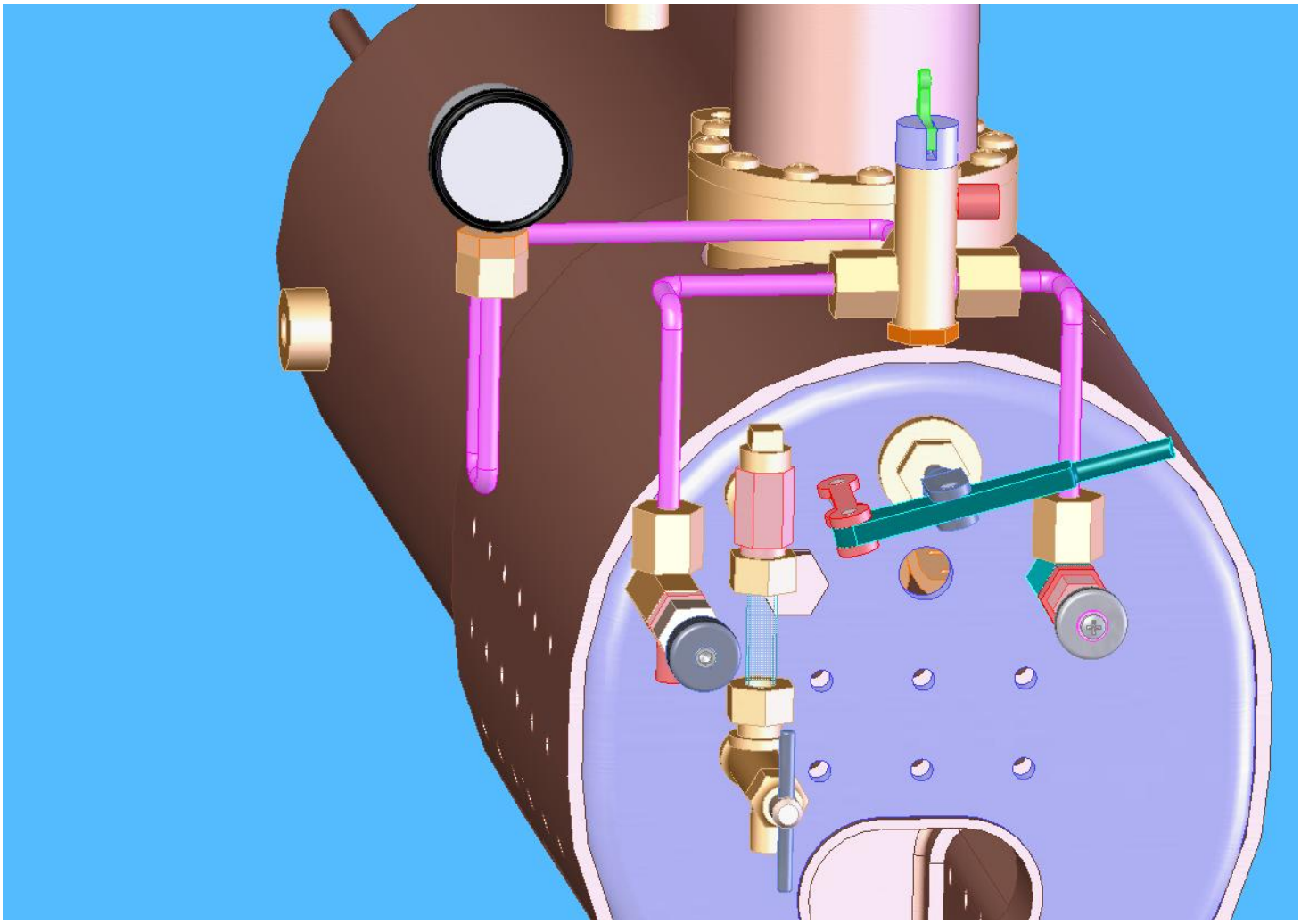

Figure 7: New placement of water gauge assembly.

The Water Level Test Valve was the next item to be done. The test valve went together very well though I was not sure how long a piece of copper tubing was needed, LBSC did not say, I made mine ½ long and if it needs to be longer or shorter, I shall modify it later.

Since I modified the boiler the placement of all the fittings on the back head are a bit off, with this in mind I shall try to keep to LB's plan as best I can but some things will just have to be put in different places and the test valve is but another exception.

The location I chose is about the same height from the top as per LBSC but as far as the distance to the right of the centerline goes, I am at about 5/16 where as LBSC wanted 7/8. It should still perform its job well though. Figure 8 shows the placement of the water level test valve right above the fire door. I also shortened the ½-inch length of the copper drainpipe down to ¼-inch. Figures 9 and 10 show the test valve in fully assembled and cross sectional views.

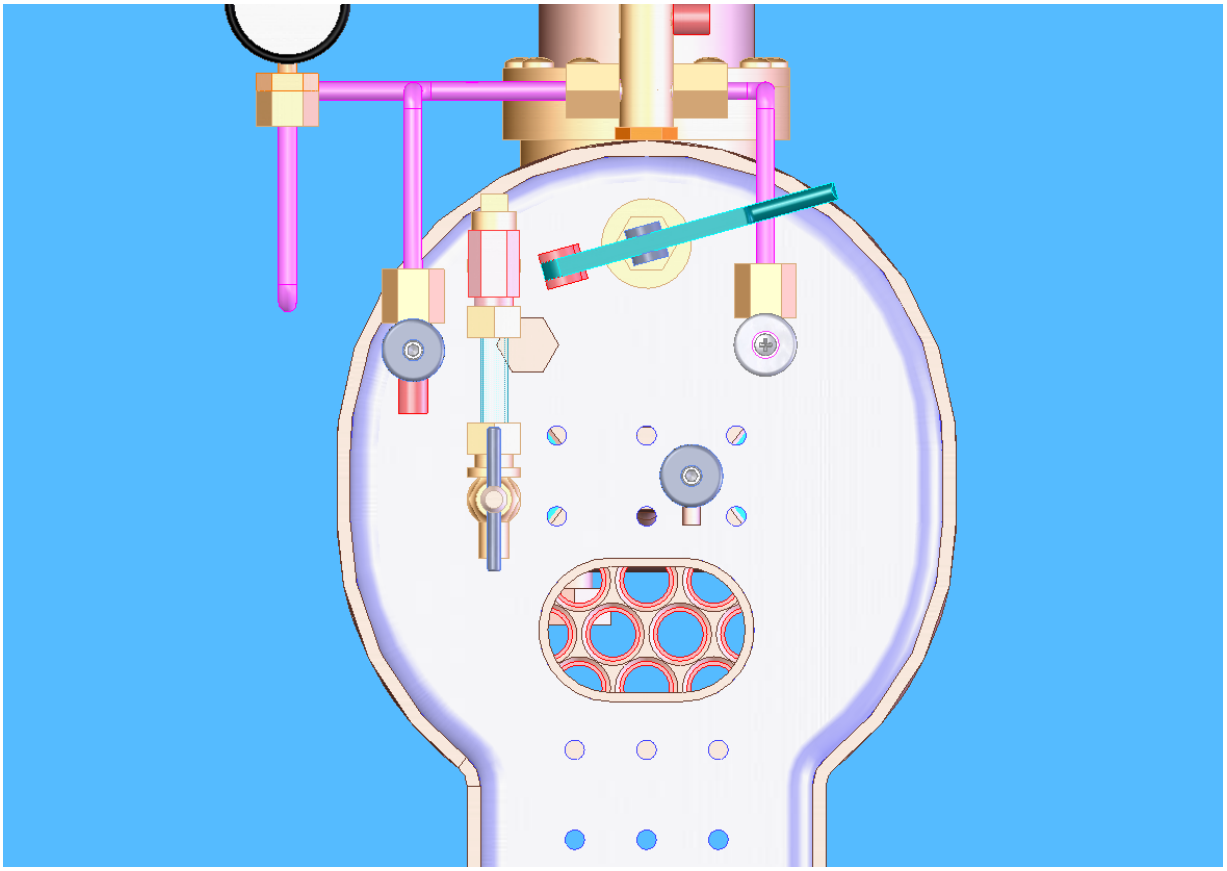

Figure 8; Placement of Water Level Test Valve.

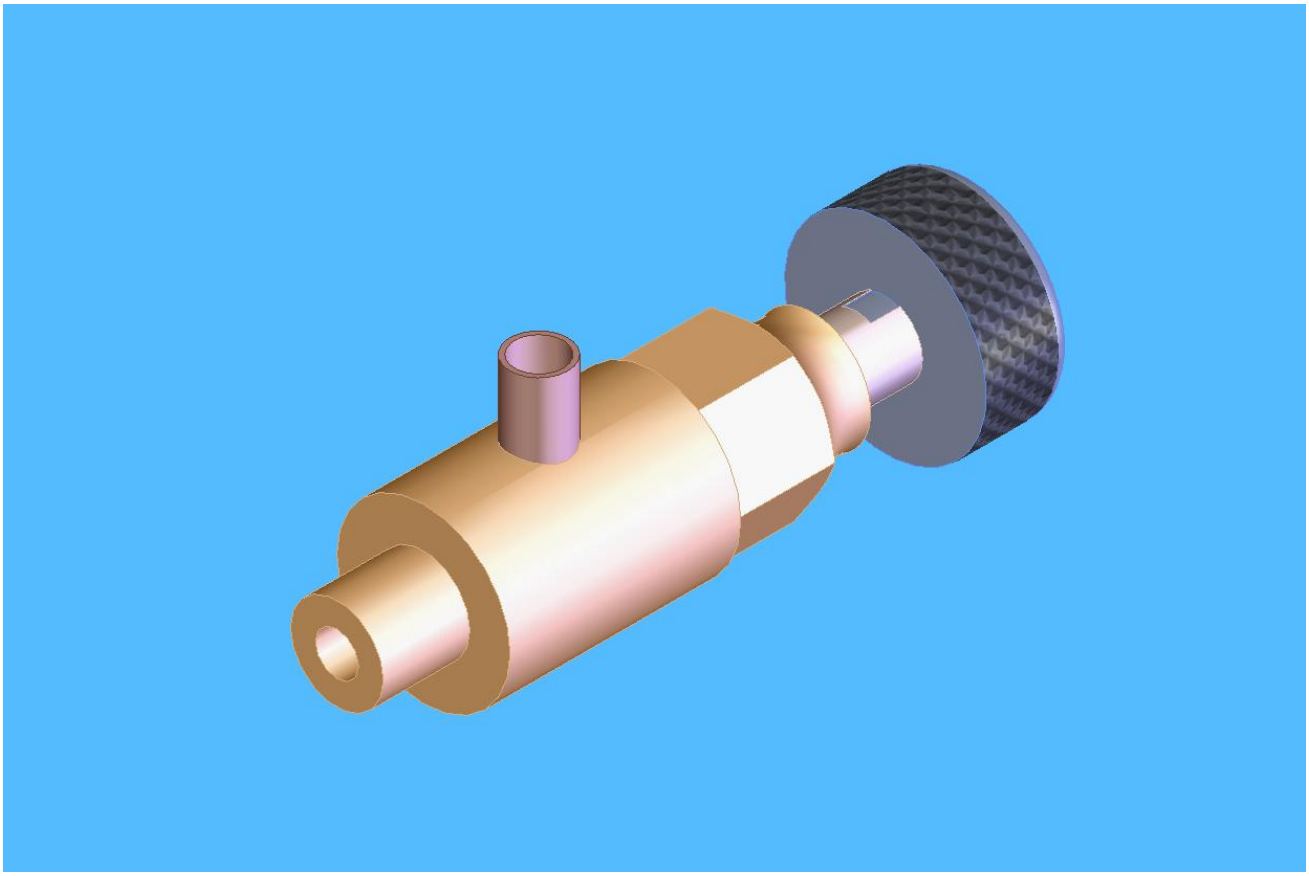

Figure 9: Water Level Test Valve.

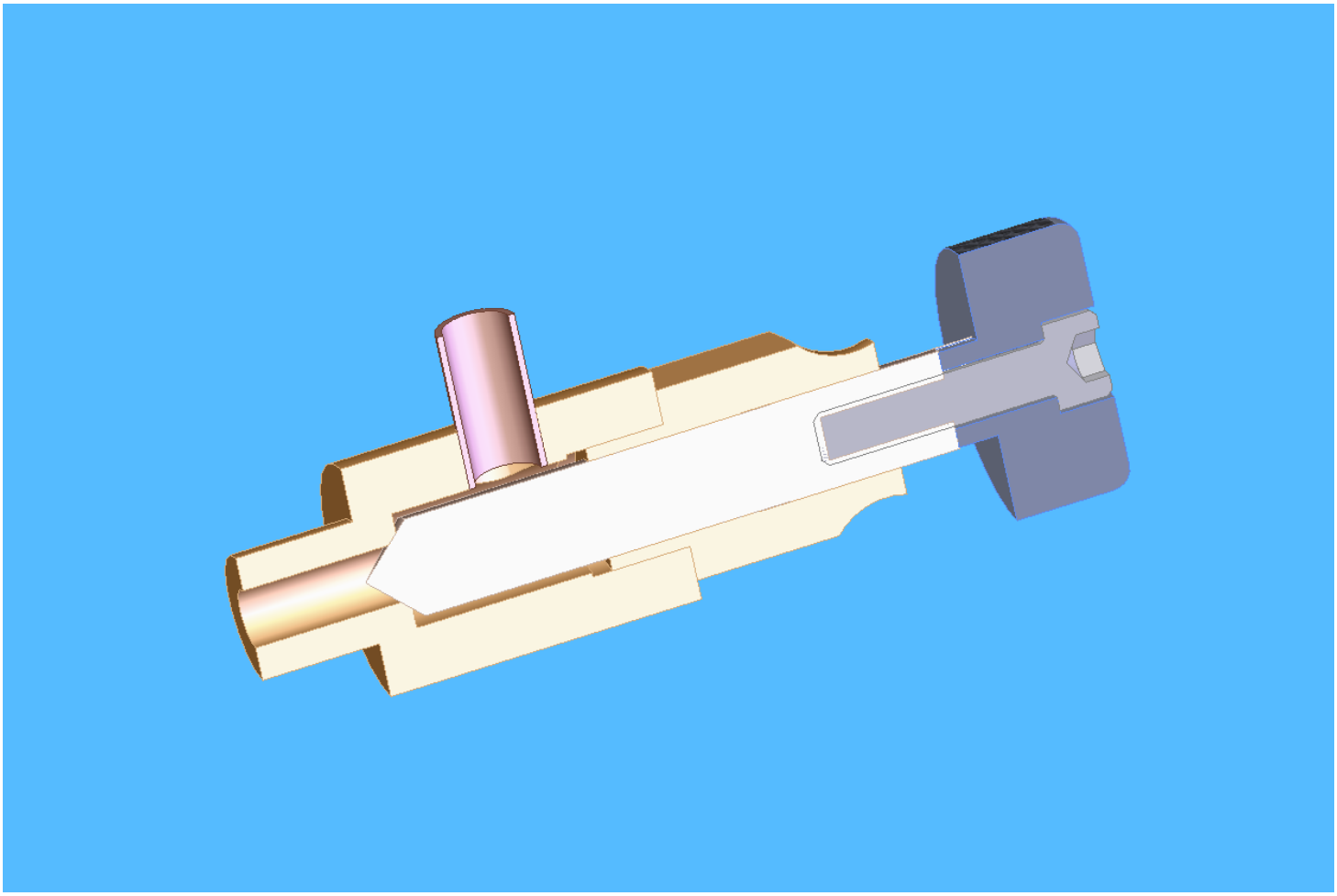

Figure 10: Water Level Test Valve cross section.

Boiler Blow down Valve

The boiler blow down valve went together very well, however the article that I have does not have a placement location for the valve so I put it on the lower right hand side of the back head plate. Figure 11 shows the assembled valve and figure 12 shows the placement on the boiler.

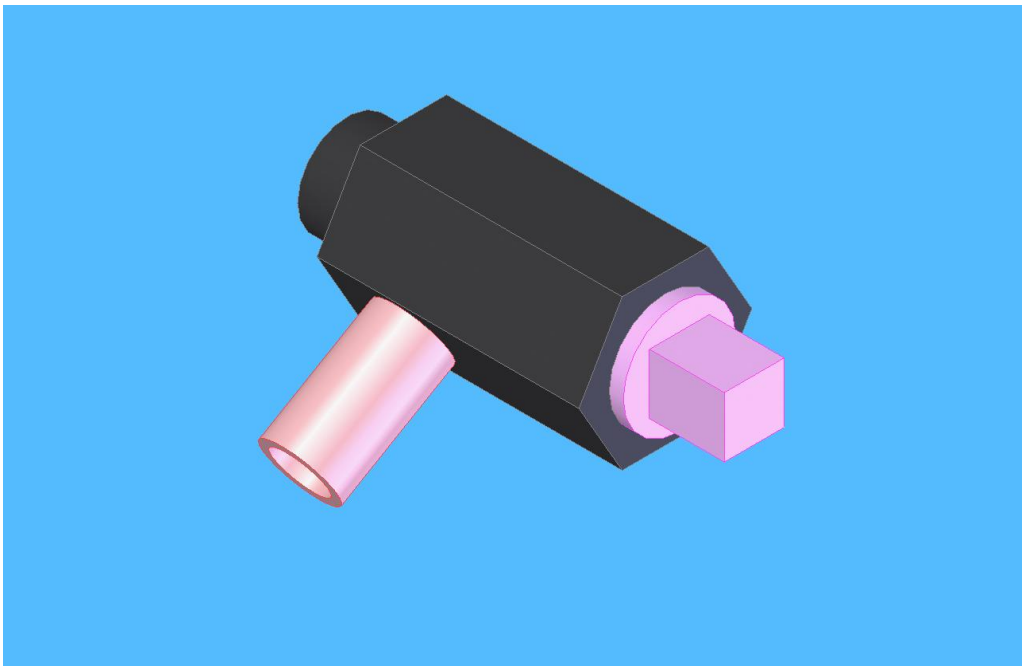

Figure 11: Assembled Boiler Blow Down Valve.

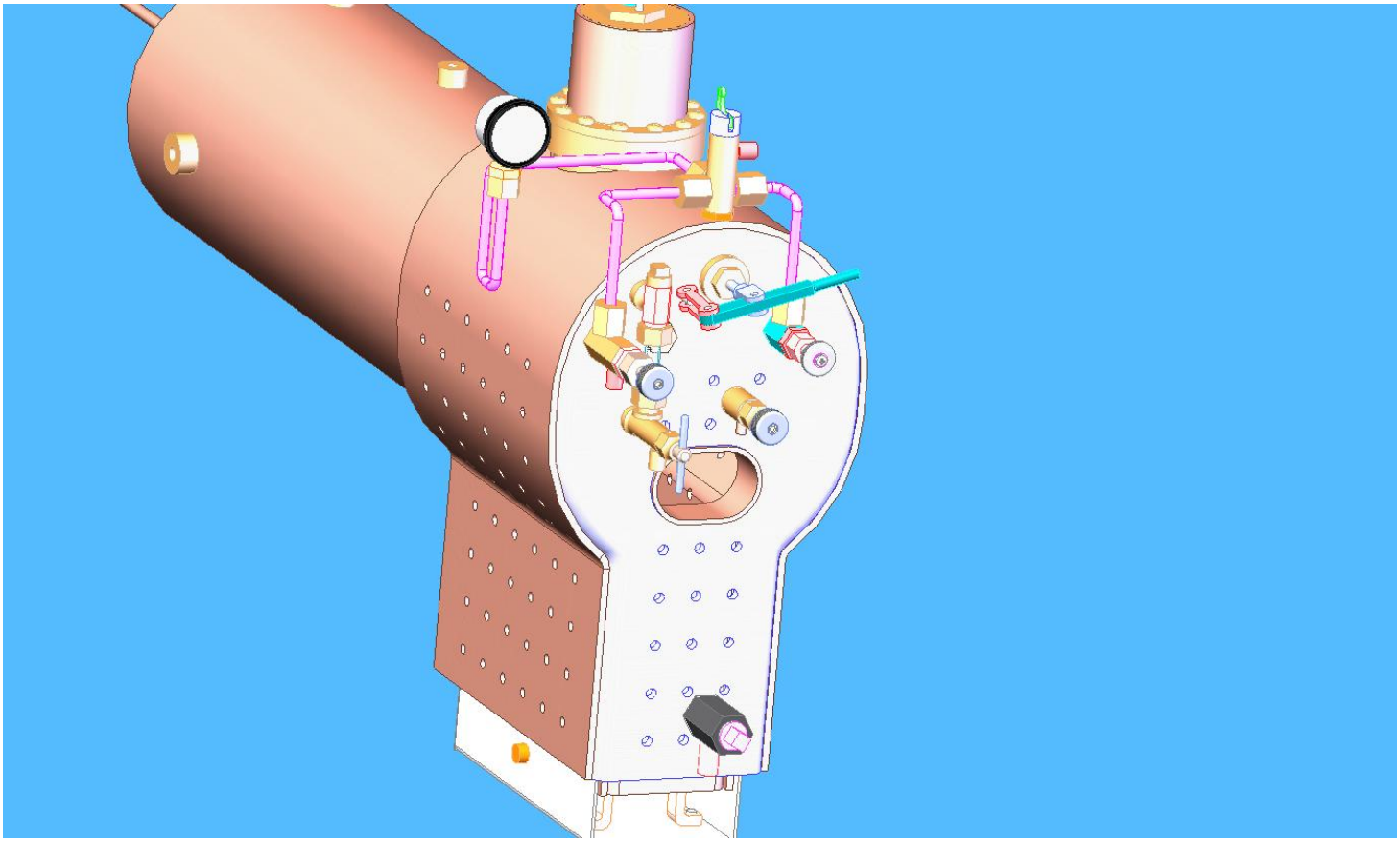

Figure 12: Boiler Blow Down Valve Installed.

Next will be the fire-hole door, reamer stop, reamers for injector cones, and the injector.