Some of the photos don't show very much contrast/detail due to the fact that these photos were taken after I had disassembled, cleaned and repainted the burner assembly. Black on black doesn't work out well in some of the photos. You might try ligtening them or adjusting the contrast to get more detail. In Word you can click on the photo and use the picture toolbar or Format/Picture menu selection.

These photos will make more sense if you have my "Burner Design" document that I mailed to those that requested it some time ago. If you don't have a copy and would like one just let me know. It gives fabrication details.

I hope you find this of use ....

Chuck Hackett

Photo 1

Photo 1 shows the burner from above. There are two 1 foot rulers on top of the burner mounting plate to give you an idea of size. The firebox is 12 inches by 20 inches. The holes you see around the edge are used to mount the burner to the firebox. The screws go into 1/2 inch by 1/4 inch steal bars tack welded to the bottom of the firebox water legs.

The gas jet (described later) is on the right and the pilot light and gas cutoff valve thermocouple can be seen in the lower left.

On the left you can see the manifold that connects the burner tubes and on the right is a strip brazed to the ends of the burner tubes. This strip is used to support the otherwise free ends of the burner tubes.

Photo 2

Photo 2 shows the burner tube support strip and the gas jet. You can also see (overexposed) part of the gas piping (more on this later).

Photo 3

Photo 3 shows a close-up of the gas manifold feeding the burner tubes. The holes are a number 40 drill.

Photo 4

Photo 4 shows the underside of the burner at the manifold end. Here we can see the large end of the tapered mixing tube where it turns 90 degrees up into the manifold. You can see the under side of the pilot light/thermocouple unit at the upper left.

The strips running the length of the burner limit the secondary air intake and cause it to flow around the burner tubes (each opening between the strips is located directly under each tube).

Photo 5

Photo 5 shows the gas plumbing, including the cutoff safety valve. All the gas plumbing is mounted below the cab floor.

The small tube at the lower right is the gas feed to the pilot light. The other small tube goes from the cutoff valve to the flame sensing thermocouple.

The needle valve in the line going to the gas jet is used to cause a restriction in the line. This restriction allows the burner gas pressure gauge to give a more usable pressure reading (0 - 10 psi as opposed to about 0 - 3 psi at the jet itself). Recent readings about burners would seem to indicate that a smaller jet orifice and a higher jet pressure (and hence higher gas jet velocity but the same gas volume) would promote more complete mixing but the burner works fine and has a complete blue flame so I hesitate to modify it.

The button on the top of the cutoff valve (on the bottom of the valve in this photo) is pressed by a plunger mounted in the cab floor allowing the burner to be lit.

Photo 6

Photo 6 shows a view of the gas piping from above. The red button at the upper left is the button that is pressed to light the burner.

The item in the top center is a coupling with set (grub) screws on top of a 1/4 turn ball valve used to control the burner firing level. When mounted below the cab floor there is a shaft that runs from this coupling to a burner control stand and valve handle (looks a little like a brake stand).

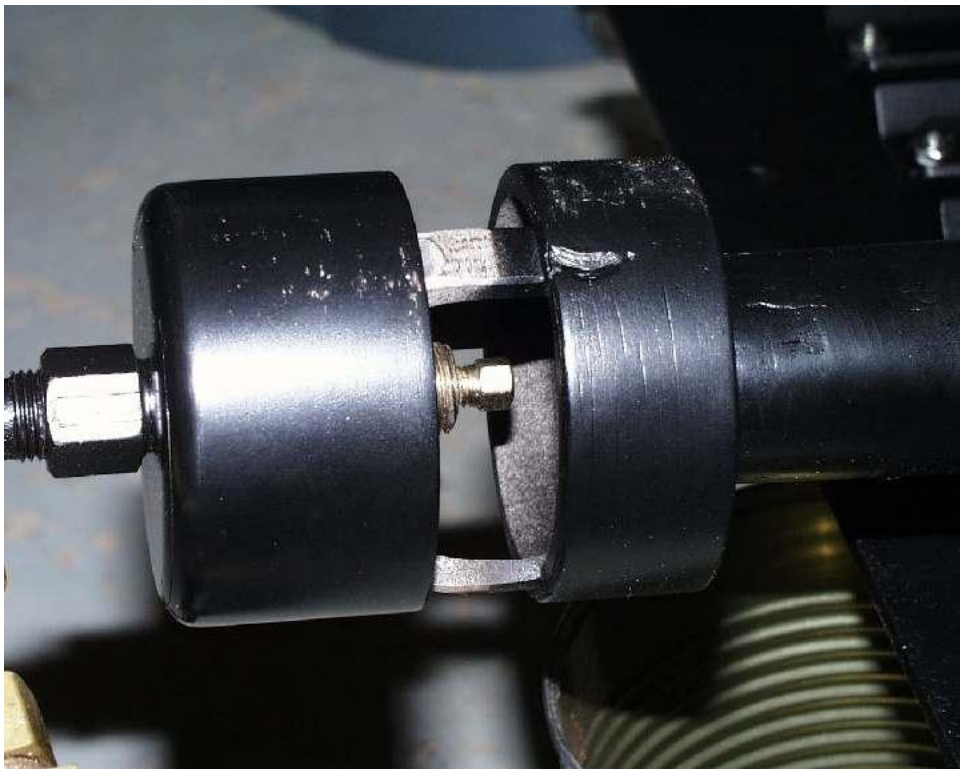

Photo 7

Photo 7 shows the gas jet. The shroud on the left can be rotated on the screw thread of the jet fitting to allow adjustment of the primary air gap (at center).

The threaded jet body is screwed into a three legged support (seen in the air gap) and allows the position of the orifice to be adjusted in relation to the air gap and mixing tube opening (on the right) at the small end of the tapered mixing tube.

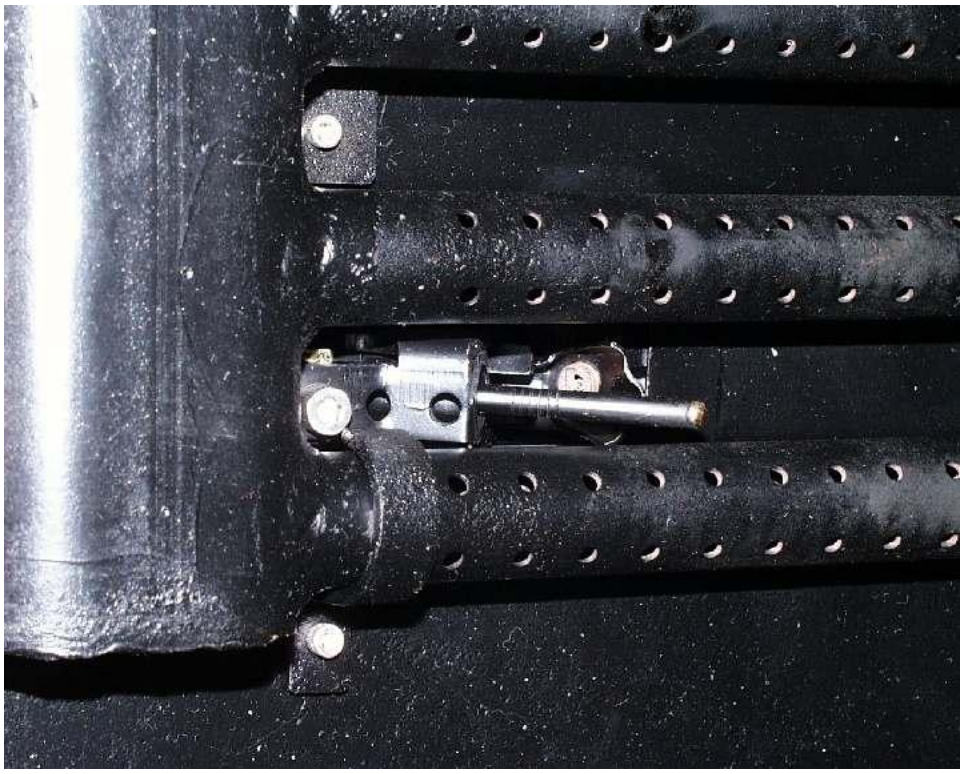

Photo 8

Photo 8 shows a close-up of the thermocouple (the small rod) and the pilot light whose exit is under the thermocouple tube.

You can also just see the end of a model airplane engine glow plug (round white circle below the thermocouple rod) that I'm going to try to use to light the burner (as yet untried).

Photo 9

Photo 9 shows the firebox from below. Note the burner mounting strips around the lower edge of the water legs.

The three tubes are siphons and mounted above them is a stainless steel arch that runs about half the length of the firebox.

It was scary taking this photo - I didn't much care for laying on my back under all that steel!

The manifold end of the burner is mounted under the arch. I have noticed that, in operation, the flame is higher at the manifold end and thus higher under the arch. I don't think this is bad because it causes the heat from the largest flame to have to travel the longest distance (towards the rear of the firebox, around the arch, and then forward into the flues).

I have thought about adding a second manifold at the opposite end of the burner tubes but I probably won't do this until I have a way of measuring its effectiveness. I will probably accomplish this by measuring the rate of temperature rise in the boiler during startup.

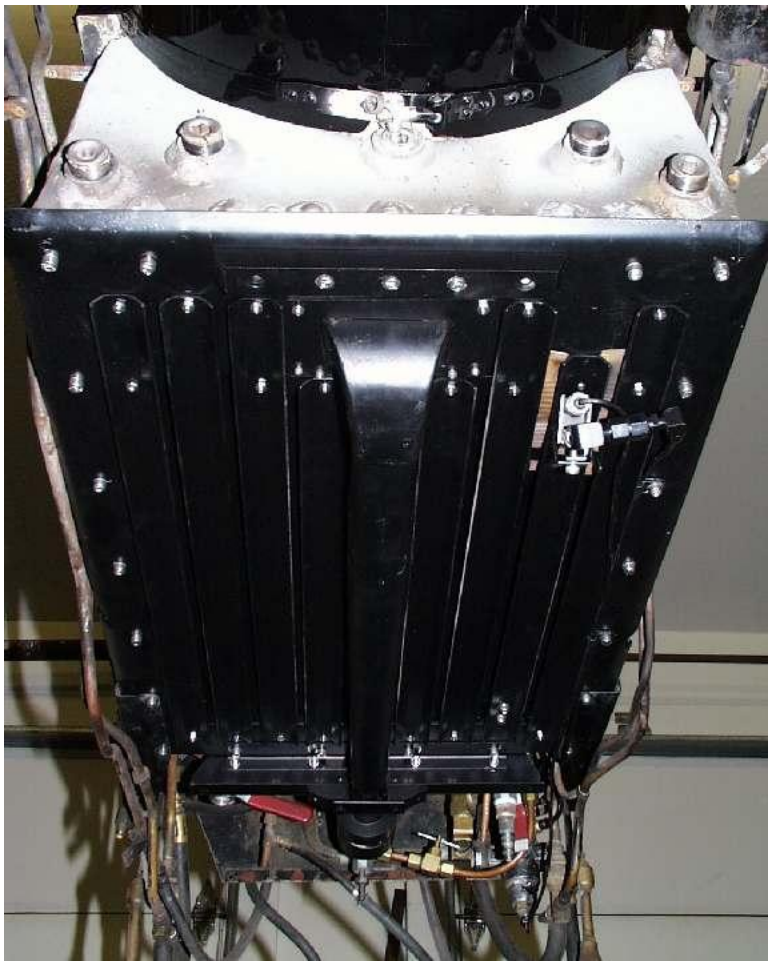

Photo 10

Photo 10 shows the burner after being mounted under the firebox (cab to the rear).

Photo 11

Photo 11 shows the mounted burner from the cab end. The cutoff valve is at the upper left.

The two ball valves on either side of the gas jet are connected to the backhead washout plugs and allow blowing down the rear water legs at the end of the day.

Photo 12

Photo 12 shows what the burner powers. 1.5 scale, 7.5 gauge, 2280 pounds ready to run, 14 feet long from engine coupler to tender coupler.

Photo 13

Photo 13 shows the proud owners!