

Shay - Painting & Assembling The Boiler

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The goal here is to:

- Paint the boiler, jacket, bands and walkways
- Apply lagging to the boiler
- Install jacket and bands on the boiler.
- Install blower and associated exhaust fitting to bottom of smoke box
- Install boiler in frame.

Painting Boiler: The first step was to give the boiler a quick final blast and then set it in the backhead and spray on the powder. I did this in front of the oven and then swept up any that fell to the floor. I also turned off the furnace and house ventilation to keep the stuff out of that system. Don't need to explain black dust all over the house.



After the front end and under side were powdered with the boiler upright, it was turned to the normal horizontal position with the smoke box end on the oven door. The powder was then sprayed on the back part of the boiler and the backhead. This photo shows the boiler after some more powder was sprayed, and the boiler slid part way into the oven. Note the thin areas on the rear side of the jacket spacers. More powder was sprayed so that everything was covered.

That is a handle in the front screwed on a threaded rod that is secured to a plate in the smoke box. The plate is held to the top of the smoke box with a couple screws through the smoke stack mounting holes. The threaded rod extends through the bottom of the smoke box to form a leg for the front. The rear handle is a couple nipples and an elbow screwed into the steam turret hole.



The anticipation was much like waiting for the Thanksgiving turkey to cook (or possum, if you're from that part of the country). Note the support under the oven door. The 20 ton jack was a bit of overkill, but it was handy.

The baking took a couple hours since the boiler has considerable mass. The smoke box part flowed fairly quickly but the backhead took over an hour to flow as it was the furthest from the burner.



The results on the backhead --- beautiful! The smoke box, the other area not covered by the jacket was also very smooth but had areas with no gloss. After some experimentation on another piece it was concluded that the front area was over heated (burned).

After a day of reflection, the smoke box was stripped (stripping the powder coat is no fun), blasted to get a good clean surface and it was then recoated. This time care was taken to keep the maximum temperature swing to below 400 degrees and the boiler was kept in the oven for only 20 minutes after the powder had flowed. The results this time was very nice--- glad I took the effort to redo it..



Painting the Jacket & Bands: The black stove pipe used for the jacket came with a painted surface --- I had thought it was an oxide coating. In any case, the paint was stripped using the cheap Wal-Mart stripper. The pieces were lightly blasted to remove any residue and to roughen the surface a bit. The photo shows the sloped jacket section hanging to cool after curing. The other jacket pieces and the bands were also powder coated.



Painting the Walkways: The clamps that secure the rear boiler mounts clamp over the walkways too, so the walkways were also painted at this point so that the boiler could be mounted permanently.



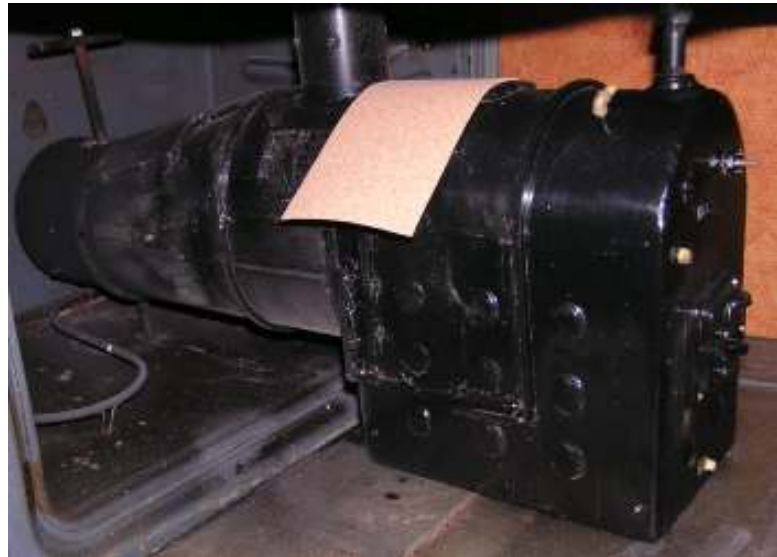
Lagging: The lagging used on the full size boilers is a hard material. I assume it contained asbestos in the early days . Suspect the current versions don't. I saw a freshly lagged boiler at Cass 20+ years ago. As I recall the lagging came in blocks about the size of bricks and was held in place by a plaster like material. I checked what McMaster-Carr and found a 1/4" alumina-silica fiber insulation (93315K61) that looked like it would work.

The day before I was set to apply the insulation Dan Staron called to talk about progress on our shays. When I mentioned boiler lagging he suggested that I consult [Chuck Hackett's](#) webpage. Chuck had run some tests on boiler insulation and concluded that lagging is no better than trapped air under a jacket. The lagging is however useful in preventing dents in the jacket. And here I was getting ready to install insulation that has little if any insulating value and is so soft it won't prevent dents.

I had asked Ed Perry for lagging advice some time back and he said that he had used cork sheets on a couple boilers. The McMaster-Carr site suggests cork is good for gaskets up to about 180 degrees F. Another section says cork insulation is good up to 266 degrees F. The maximum temperature inside the boiler will be about 340 degrees F (100 psi steam). There should be a gradient as one gets closer to the outside so that a guess is that the maximum temperature of the insulation will be about 300 degrees F. This is a little above the max operating temperature I'd found for cork, but should be in the operating margins (if the speed limit is 70, you can usually get by at 75).

Cork Test: I had been thinking about the lagging while preparing the smoke box area to be powder coated again. A piece of cork sheet was laid across the boiler while the smoke box area powder was cured. The temperature at the very back got to 300 degrees and the temperature at the front got to 375 degrees, so the cork probably made it to about 340 degrees. There was no noticeable effect on the cork.

The cork offers some insulation value and a fairly firm base for the jacket so I decided to use the cork. I had a few sheets of varying thicknesses on hand and a quarter inch thickness will easily be achieved using multiple layers. Maybe can sell that other stuff to the brother-in-law.



Had some 1/8" thick sheets so used two layers. The photo shows the first layer held in place with masking tap while the adhesive (Permatex No 2B) set.



This photo shows the middle section after the second layer of cork was applied and the adhesive set. Note that the front jacket section is in position.



This photo shows the boiler with jacket and bands in position on the frame.



The next task is to clean up the workshop, then on to painting and installing the plumbing and miscellaneous parts.

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