

Shay Fire - First Fire

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The burner was lit and steam generated for the first time on December 3, 2003. That's about 14 months after work started on the locomotive. The following is a brief description of that first firing.

The transporter with locomotive was rolled out of the workshop onto the board walk behind the house. The boiler was filled about halfway up the water gauge and fuel tank was filled about one third with kerosene. Compressed air was connected and the boiler was cut off from the compressed air. The blower valve was opened some to give good draft, the atomizer valve opened and the regulator set to 10 psi. The fuel valve was then opened and the fire lit with a propane torch.



After some fooling with the controls stable flame was achieved with 10 psi atomizer pressure and about 45 degrees rotation of the fuel valve. The photo above shows the burner flame. When the blower was turned down some the flame would start to come out the front opening in the fire pan indicating insufficient draft. (The value of the blower pressure gauge is now clear. I may temporarily substitute an air pressure gauge while waiting for the correct gauge to arrive.)

Adjustment of the fuel valve around the 45 degree opening seemed to have little effect. The valve could be opened to at least 90 degrees and the flame was still fairly stable. There was no noticeable smoke from the smokestack ----- maybe the flame was a bit lean. The temperature of the exhaust was such that I could hold my hand over the smoke stack (having never fired a

locomotive before, wasn't sure what to expect).

After about 10 minutes steam started to come out around the engine plumbing ----- I had opened the throttle slightly to bleed off any compressed air and failed to close it. So --- had water boiling in about 10 minutes. That is faster than expected. Closed the throttle and the pressure climbed to 100 psi in about another 5 minutes. The safety valves then operated as shown in next photo.



When the safety valves operated the pressure dropped to about 80 psi and it took a bit for the valves to shut off. My guess is that the safety valve exhaust holes are too big. Will experiment with that in the future.

The next step was to open the throttle. The engine started, a lot of steam around the engine, and the fire went out. Fooled around a bit and then stopped to think (if all else fails). The engine exhaust creates more draft which would tend to lean the flame. Try more fuel. It worked, at about 90 degrees on the fuel valve the flame stayed lit. During this process, the fire had to be relit several times, each with a little (or not so little) poof. The fire pan had been just pushed on and was retained by the sides pressing against the inside walls of the firebox. One of the relights generated more of a bang than a poof causing the fire pan to exit the firebox. A couple bricks under the fire pan solved that problem.

Next, the transition from air to steam for the atomizer and blower was tested. The first attempt there seemed to be no pressure. Now suspect there was water in the line. Another relight and then adjusted the air regulator to 40 psi and opened the valve between the boiler and the atomizer/blower manifold. The check valve kept the steam out of the air line and the transition went smoother and flame didn't seem to change.

Next, took a closer look at the steam exiting around the engine.



Noticed that the screws on the steam pipe connection at the right end of the steam header hadn't been tightened. That was the biggest leak. After those screws were tightened, the engine was at least visible.



There are still leaks around the piston rods and the valve stems so the packing glands need to be tightened. (The engine was finished nearly a year ago; at that time steam leaks were a faint hope.) This first test was a success ---- better than expected. Now, it's time to fix the leaks, clean up a number of open items and then make some more controlled tests. Some of the immediate tasks are:

- Fix engine leaks.
- Get a blower pressure gage
- Drill and tap holes in the center of the upper heads so that W40 can be squirted into the cylinders after use.
- Drill and tap hole for and then mount blowdown valve (needed to fill boiler).

- Move upper water gauge input from turret to boiler.
- Move pressure gauge to top center of backhead. (Friend Dan Staron said that is where he wants his pressure gauge. One of the Cass engines has the gauge in that location. The gauge in that position will allow the cab roof to extend further to the rear.)
- Install and plumb the steam brake valve.
- Install adjustable covers over the hole in the front of the fire pan. As mentioned earlier, I wasn't able to make the flame too rich. Maybe it's just right, but want to test with a richer flame and then back off.
- Install the studs to retain the fire pan (probably works better than a couple bricks).
- Install the lubricator.
- And many more things I can't think of at the moment.

Now that it works, it'll be easier to tackle these tasks with more patience. Should have them completed and be into more controlled tests by Christmas.

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