

Shay Plumbing VII - Engine Steam & Exhaust Pipes

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Initial: 11/18/03 Last Revised: 06/06/2004

Fabricating the engine steam and exhaust pipes seem to be the last items that require moving the boiler around; hopefully when these are completed the boiler can be secured and I can move on to less weighty subjects.

Cass No 5: Some of the photos from Cass were examined before starting this part of the project. This is a photo of Cass No 5. The steam pipe comes out of the boiler just below the steam dome and the exhaust pipe goes into the side of the smoke box. Kenneth's design has the steam pipe coming out the side of the steam dome and the exhaust going into the bottom of the smoke box.



Cass No 10: This photo shows both the steam and exhaust pipes on Cass 10.



This is the front of the exhaust pipe on Cass No 10; it goes to the bottom of the smoke box.



Flanges: Kenneth specified flanges on each end of the 1/2" steam pipe that runs from the steam dome to the steam header. His drawings seemed to indicate that the 3/4" exhaust pipe is to be soldered to the exhaust manifold at the engine end and to the flange in the bottom of the smoke box at the front end. The prototype had the exhaust pipe as a separate piece with flanges that bolt to exhaust manifold at the rear and the pipe from the smoke box at the front (previous photo). This seems to be a more prudent arrangement --- easier to disassemble. So, I made the four flanges shown on the right for the exhaust system. The ID matches the OD of the 3/4" copper exhaust pipe. A similar pair of flanges were made for the 1/2" steam pipe.



The flanges were made from 1/8" CFS. They were sawed from bar stock and then squared up on the mill. The four were stacked and 1/16" holes drilled in the corners and roll pins driven into the holes to keep the pieces aligned and together. A 1/4" hole was then drilled in the center and the pieces mounted in the lathe 4-jaw chuck and centered using the setup on the right ---- a length of 3/8" rod was center drilled on one end and a short length turned to 1/4" on the other end. The rod was then inserted between the tailstock and flanges and the chuck adjusted so that the rod was centered. The flanges were then drilled and bored to the correct ID. Later, the four attachment holes were drilled to the correct size for 4-40 screws.



Exhaust Pipe: The exhaust line between the engine exhaust manifold and the exhaust inlet in the bottom of the smoke box was done first. The flanges were silver soldered to the elbows as was the elbow to the big flange at the bottom of the smoke box. I was afraid that these joints would come apart if the 45 degree elbow was silver soldered into the 90 degree elbow connected to the big flange. Instead, that joint was soldered with 550 degree solder (98.5% tin, 1.5% silver). This solder doesn't flow easily so the joint was tinned with a thin coat of solder in flux paste. The solder then flowed easily and the temperature of the combination seemed about the same as the 550 degree solder alone.



The photo above shows the rest of the exhaust run. All the joints were silver soldered except the one indicated. The pipe was kept away from the boiler by 5/16". The lagging will be 1/4" so the pipe will be right next to the boiler jacket.

Steam Pipe: Kenneth's design was followed for the steam pipe.

This photo shows the steam pipe just after the joints were silver soldered (all joints were silver soldered). The block at the end of the steam inlet header was made from 1.5" diameter brass. There is a 1/8" MTP threaded hole in the end for the pipe from the lubricator.

The photo below shows the finished pipes. Gaskets were fitted to all flanged joints to insure a seal.

Next task is to layout the steam turret.



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