Shay Boiler

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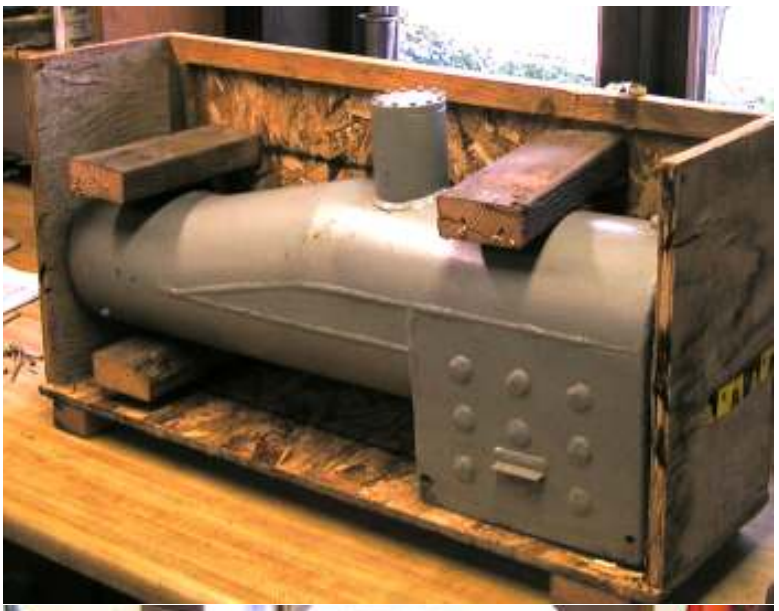
Early in the project I decided to contract the boiler fabrication to a professional. This was primarily because of limited welding skills and safety concerns. The boiler was ordered in early January with a promised delivery in the late April - early May timeframe. Unfortunately there were many delays. The boiler was finally finished in mid September but not shipped until early November, arriving on November 11. I was able to keep the project going by completing essentially everything else. However, this was less than efficient in many cases.

This is the shipping box, all 130 pounds of it. The was coming apart on the lower corner and something had started to poke through the top (steam dome?).



The box is a good design and the boiler was undamaged.

Kenneth suggested 21 tubes. This design has ---- count them --- 25 tubes. That should help a bit with the heat transfer. The two tubes at the top are stay tubes.

The boiler is constructed from 6" schedule 40 pipe (6.625" OD, 6.065" ID) and 1/4" steel plate. The tubes are 1/2" type K copper pipe silver soldered to the tube sheets.

This is the inside of the firebox (the boiler is laying on the right side). The square rods welded to each side of the fire box support a steel plate that goes from the front to about half way back and points up at about a 30 degree angle. The plate is to force the heat to go to the back and then up to the top before dropping down and out through the tubes.

This shows the backhead. The boiler is raised up and with the bottom setting on the cab floor.

The hole in the top is the 1/4" NPT fitting for the steam turret. The two tubes near the top of the backhead are the stay tubes. The two protrusions near the bottom of the backhead and the nine on the left side are the ends of 3/8" diameter stays.

The left rear support angle is visible on the side. The rear support angles set on the top of the frame I beam.

This photo shows a problem. The drain holes are a little over 1/4" higher than Kenneth's drawing. The channel is the same size as those used for the fame. It is positioned against the mounting angle and shows that the upper half of each drain hole will be obstructed by the frame. The solution to this problem is to grind off the mounting angles and weld on new angles 1/4" higher.).

The boiler is ready to be drilled for attachments and plumbing. The plan is to install everything needed to get the locomotive operational and then go back and install the lagging, boiler jacket and cosmetic details.

It's not surprising that several folks have inquired about who made the boiler and how much it cost; I had the same questions. This area is probably changing as many states are increasing regulation. The following information is general in nature to give one some idea of boiler costs and options.

The boiler described above was purchased from Ed Perry of Fresno California. The quality seems excellent. (Ed is well known and has an excellent reputation.) A few days after the boiler arrived Ed sent copies of metallurgical test reports on the material used and a certificate that he had tested the boiler to 450 psi. The only complaint I had was that delivery was promised and then delayed many times. This was in part due to some health problems Ed had. The cost was $2200 for the boiler, $50 extra for the plate in the firebox to deflect the flame and $125 UPS shipping from California to Ohio. Ed advertises in Live Steam

I had been discussing boilers with Ken Schroeder and he said he had asked for information from another boiler maker. The following is the information Ken emailed to me (November 2003): "*Just got a letter from Boschan Boiler today and wanted to pass on the information he sent me on the boiler. He priced two boilers, one to code and the other non-code, the only difference is steel tubes for the code boiler and copper tubes in the non-code. He will build it as I designed it using the same plate thickness I show on the drawings. The price for a code boiler rated for 100 psi is $3950.00 and $4625.00 for a boiler rated above 100 psi operating pressure. The added cost for a boiler operating over 100 psi is because the welds have to be examined using a radiograph. Code boilers will be stamped with a ASME Code S stamp and will be provided with an ASME P-2, manufacturer's data sheet. Data sheet will be filed with the National Board of Boiler and Pressure Vessel Inspectors. The price for the non-code boiler is $3515.00 which would have copper tubes. Prices are FOB Carson California and boilers would be ready 8-10 weeks after receiving a 50% deposit with the balance due upon inspection by an authorized inspector for the code boiler or after a hydro test of the non code boiler. I have not seen Boschan's work. In a subsequent conversation Paul Boschan said he rolls the tubes in on both code and non code boilers. If someone wants the copper tubes silver soldered in, he can do that also. He will heli-arc steel tubes if the customer wants."* Boschan advertises in Live Steam.

The next time I'll probably make the boiler. The biggest job seems to be cutting out the pieces and cutting the bevels on the edges that are welded. One possibility is to cut all the pieces, tack weld or screw them together and take them to a local welder for the actual welding.

There are two ways to install copper tubes, silver soldering or rolling. Silver soldering probably makes the more reliable joint but is more difficult to do --- the joints must be really clean for the solder to flow properly. The soldered joints are probably difficult to repair if they start to leak. The rolled joints are easiest to do once one makes a rolling tool. (Several rolling tool have been described Live Steam recently.) The rolled joints are probably more likely to leak but are easy to repair by rolling again. The rolled tubes seems to be the easiest for the novice.

Shay Home
NLW Home