

# Shay Plumbing XI - Gauges

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Initial: 05/11/04 Last Revised: 06/06/2004

At the end of the first run I had trouble starting the burner and ended up with flames coming out the firebox door and up the backhead. The flames melted the pressure gauge lens and also damaged the gauge movement. The siphon tube hangs down below the gauge and is right above the firebox door so the flames probably boiled the water out of the siphon tube allowing steam to reach the gauge.

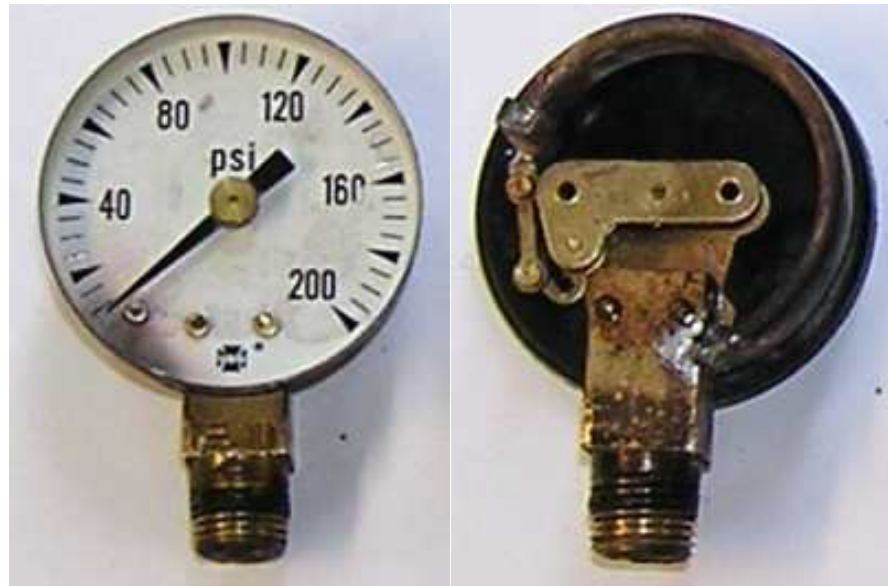
I later read Kozo Hiraoka's description of how to build a pressure gauge in [Building the Heisler](#) and decided that if he could build a gauge I should be able to repair one. I disassembled the gauge and found that the solder joints at each end of the bourdon tube were leaking. These joints were repaired and the gauge now works. Dick McCloy donated a glass lens so the gauge is like new except where I scorched the dial.

Before I repaired the gauge I ordered a replacement from McMaster-Carr. There was no mention that the replacement would work with steam however, it had a temperature range up to 150 degrees F. Listed on the same catalog page were large boiler pressure gauges that had a pressure range up to 140 degrees F so the siphon tube must do a great job of limiting the temperature (if you don't build a fire under it). Later I found some similar every inexpensive gauges at the MSC Industrial Supply website and decided to purchase a couple of them. After I disassembled all the gauges I realized that they were very similar and all would probably work on the shay. When I had everything apart I decided to take a few photos and pass on the information.

**None of these gauges are specified for use with steam and this note is not a recommendation that the gauges be used in a steam application. It is merely the data I collected and describes what I'm using.**

All the gauges listed are 1 1/2" diameter with steel case and have a male 1/8" NPT input connection at the bottom.

**US Gauge:** This is the gauge I damaged and later repaired. It was purchased from a supplier to the live steam hobby. It is listed as U S Gauge but no specifications are provided. The lens is polycarbonate (plastic) and the movement is brass. I suspect the bourdon tube is bronze. The price of this gauge was \$34.



**US Gauge from MSC:** This is the Ametek Series 500 gauge. The gauge box lists it as Ametek, U.S. Gauge division, made in China. The MSC catalog lists it as Bronze tube with Grade B accuracy (+or- 2% of full scale at mid scale). This is [MSC](#) part # 65303695. The lens is polycarbonate (plastic). The construction is nearly identical to the gauge above. Price \$4.33



**Utility Gauge from MSC:** This gauge is listed in the catalog as a Utility gauge with no brand name. The catalog says it has a bronze tube and brass movement and a max temperature of 160 degrees F. The accuracy is listed at +or- 5% of full scale at mid scale. This is [MSC](#) part # 65303695. The box indicated it is made in China. The lens turned out to be glass, not plastic. Price \$5.01



**Ashcroft Gauge from McMaster:** This is [McMaster-Carr](#) part number 3846K1. The catalog lists it as Grade B accuracy (+or- 2% of full scale at mid scale) with bronze tube, polycarbonate (plastic) lens and a max temperature of 150 degrees F. The little gear is plastic. This gauge appears to be made in USA. Price \$9.92



**Ashcroft SS Gauge from McMaster:** This is [McMaster-Carr](#) part number 4066K21. The catalog lists it as 304 stainless steel case and 316 stainless steel bourdon tube with welded connections. The lens is glass on the 1 1/2" diameter version. The max ambient temperature is listed as 150 degrees F and the max process temperature is 250 degrees F. (The specifications also cover larger gauges that have polycarbonate (plastic) lens. I suspect the plastic lens is the reason for the 150 degree ambient limit.) It has Grade B accuracy (+or- 2% of full scale at mid scale). This gauge appears to be made in USA. Price \$53.05



One can't help but wonder at the price disparity between the two US Gauges. One possible explanation is that Ametek moved production of this gauge offshore recently to achieve a significant cost reduction. The supplier to the hobby may be using higher cost made in the USA gauges from stock. Also, MSC is a much larger volume purchaser compared to the supplier to the hobby.

So, which gauge do I prefer? The Dial on the US Gauge is easiest to read and if everything else is equal, that is what I'll use. A glass lens would be nice since it is easy to clean. However, I suspect the polycarbonate (plastic) lens is used where possible to minimize broken glass risk. The Utility gauge from MSC has a glass lens but the gauge is less accurate than the other gauges (5% vs 2%) and the dual scale dial is harder to read. One could probably get some glass lenses from a local glass shop, but it might be cheaper to buy the Utility Gauge for \$5 from MSC, take out the glass lens and throw the rest away.

My second choice is the \$9.92 Ashcroft gauge from McMaster-Carr. The dial is slightly harder to read than the US gauge. The construction of the lens is different than the other four gauges in that the retaining ring is part of the lens and one can't remove the lens and replace it with glass or plastic from another gauge.

If I won the lottery I'd probably use the Ashcroft stainless steel Gauge form McMaster-Carr.

To find out more about the gauges from [McMaster- Carr](#) or [MSC](#), one can go to their website (click on the name), enter the gauge part number listed above which will bring up a description of the individual gauge. There is a link from that page to the catalog page which gives a more detailed description of the family of gauges and lists available pressure ranges for the family of gauges.

The gauges currently installed on my shay are:

- Boiler pressure: The \$9.92 Ashcroft Gauge (0-200 psi) from McMaster-Carr.
- Blower pressure: The \$4.33 US Gauge (0-60 psi) from MSC.
- Atomizer pressure: The \$34 US Gauge (0-30 psi) from supplier to the hobby.

I'll update this if any fail or if I switch gauges for any reason.

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