



*This article is provided by FMES for your interest thanks to the kindness of the original publishers. FMES makes no representations or warranties of any kind, express or implied about the completeness, accuracy or reliability with respect to this document and any sentiments expressed are not necessarily supported by FMES. Any reliance you place on this document is therefore strictly at your own risk*

## Sight glasses and water gauges

This document was written by Nick Driver and was originally published by Halesworth & District MES and republished by the Southern Federation in the December 2007 Newsletter

In the beginnings of steam, boilers were fitted with petcocks or small taps that when opened showed if water was high or low in the boiler. Such cocks are still used sometimes on 0 gauge and Gauge 1 models. Because cocks of this kind often got blocked, with resultant very bad things happening, the water gauge or sight glass was invented. I'm sure that most are very familiar with these devices on their miniatures, but at a risk of boring I will go into some detail.

Together with the pressure gauge and the safety valves, the water gauge is a vital piece of safety equipment on any miniature that is in steam. Indeed, the glass requires constant observation and reading to steam successfully and safely. It is therefore essential that they work correctly and are correctly fitted. Even though visual scale may dictate a small and slender glass, internal measurements should try and be a minimum of 3/16" and of course larger, as the miniature increases in size. Very thin glass can even give a false, higher reading due to capillary action.

Glasses supplied these days tend to have a thicker wall than they used to, keeping up with tighter safety requirements. Older glasses may have very thin walls and be prone to accidental breakage. When a miniature comes out of service for the winter it is a good idea to replace the glass. Not only does scum and scale build up on the inside making the glass more difficult to read at a glance, but constant high temperatures can weaken the glass. Full scale practice usually changes the glass as often as every two weeks for these reasons.

If you take over a new miniature, it is advisable to check that the glass or glasses have been correctly fitted. A simple rule is that the bottom entry point of the fitting should clear just above the crown of the boiler. If this is the case, then when water just shows at the bottom of the glass there should be a reasonable margin of water covering the crown.

A point here. I have seen some people pay scant attention to the water level and run with little or no water showing, especially on track gradients or road gradients. If water gets so low, it vanishes it should be treated as an immediate priority to get water in; if it can't be done quickly the fire should be dropped. If you can't see water and haven't checked frequently then you have no idea just how little there is. If a fusible plug is fitted, as in some larger boilers, it might melt out. If not, damage may be done to the crown and crown stays by extreme overheating. This can lead to future boiler failure either on hydraulic test or even when running. Good driving keeps the glass at one half to three quarters full.

Though seen as acceptable on very small-scale miniatures, I have never been in favour of one cock water gauges. That is with only a blow down cock. It is quite possible to buy or make very attractive three cock gauges for most scales. The top and bottom cocks have a definite purpose. Not only do they permit the gauge to be shut off in the event of a glass fracture, but they should always be used to test that the boiler passages are clear when raising steam. Close both cocks when at normal pressure and open the blow down cock, the glass should empty. Open the top

cock and see it blow down, close it and open the bottom cock and observe the same and close again. Close the blow down cock and open both main cocks and see the glass fills quickly. Blow the glass down at regular intervals to check that the level shown is not a false reading ... it does happen.

Some protection is a very good idea for the gauge glass as it is easy to hit it with a poker or shovel. On smaller miniatures one can make a three-sided protector that protrudes a little beyond the glass in folded brass. Certainly, on say a 4" scale traction engine a fully working glass protector should be fitted. A broken glass at this scale could cause serious burns.

I am also a believer in the use of black and white chevrons behind the glass usually as part of some sort of protector. They have an important safety function as the water distorts the lines clearly showing its presence. It is otherwise very difficult to know if a glass is full or empty, one leads to priming the other to trouble. For this reason, I do not like glasses sold with white backs as they prevent the use of chevrons.

For those who have never fitted a new glass I make the following suggestions. Cutting glass tube is always difficult, especially on say thick walled 10mm large tube. To get the correct length experiment with a piece of dowel of the same diameter. You need to be able to slip the glass right up into the top fitting so that it just clears the bottom fitting, sometimes the bottom fitting must be angled a little to achieve entry. When you have the right length and can fit your dowel, then with a triangular Swiss file slowly cut a groove around the glass at the length you need. You must work with a much longer length. Drill a hole in a block of wood a little bigger than the glass diameter and insert the glass into this hole with the cut line level with the surface of the block. Use a protective glove on the hand and snap the glass off. If the break has any uneven ends nibble them off with a small pair of end nippers. The ends should be smooth. Either lightly sand a chamfer with a sanding drum or with a small gas flame slightly melt the ends. Check for any hair-line cracks before fitting. Today the easy way to fit a glass and have it steam tight is to use the very thin O-rings that are available, I suggest a 9mm on a say a 10mm glass. I also coat the glass below the O-ring with a plumber's silicon, like Fernox. Of course, the union nuts should be fitted on the tube first. These should be tightened only very lightly.

It is essential that the top and bottom fittings line up very well, check this carefully and use crushable washers to aid tightening of the fittings to the correct place.

One last point, good gauge fittings provide a small cleaning plug, routinely prod this through to clear any scaling up of the boiler passage