



*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*

## Locomotive tenders

This document was written by Mike Wheelhouse and was originally published by Worthing and District SME in their newsletter in the Spring of 2010.

### A Tender Matter

Unusually for a novice my first locomotive was not a tank engine. Beginners tend to choose them as there is obviously less work involved and the locomotive is that much sooner finished, however I was taken by Don Young's (then) recently published Derby 4F design and being a tender engine, it seemed to produce a more substantial model for not an awful lot more work. That was nearly 30 years ago and I have never regretted the decision, but at the time I wanted to avoid the situation of rushing the tender to get the model running so once the chassis had progressed to the air-test stage I turned my attention to the tender. Model No. 2 was also a tender engine, and like its predecessor it was built strictly according to the drawings. After a 15-year gap and with a few years' experience of running under my belt I returned to making another tender engine, but this time to my own (model) design. In general, we pay much less attention to the tender than to the engine, clearly it is much simpler nevertheless it is worthwhile thinking things out carefully, and having completed two quite different tenders in the last 5 years I have developed some design standards.

Let's have a look at the real thing, especially as most enthusiasts are quite vague when it comes to the water cart behind the engine, even when it is a favourite locomotive. As in almost all locomotive features Rocket established the pattern. The means of supplying water and fuel to Rocket was low down the list of priorities at the South Street works in Newcastle, in fact they didn't bother to provide anything, instead a fuel and water wagon was built in Liverpool and joined the engine there before being sent on to Rainhill. Pretty logical really since of course there was no railway system and Rocket was first sent to Carlisle by cart then continued to Liverpool by lighter. More or less any workshop could fit 4 railway wheels to a wooden cart and mount a cask on it but they cut things a bit fine because it was reported that the paint on the tender was not quite dry at the first test. See how easy it is to end up having to rush things with the tender! The tenders we know are direct developments from the original wooden cart with cask, although the limited capacity of the barrel (about 200 gallons) made itself felt very quickly and the following L&M engines had an iron tank in the shape of a forward facing "U" mounted on the cart with space for the coke inside the "U". The L&M was absorbed by the Grand Junction Rly which in turn became part of the LNWR. There was so little interest in tenders (cost money, do very little) that over 70 years later at Webb's retirement the standard

LNWR tender was still a wooden framed minimal vehicle, albeit elongated to 6 wheels with a 2000-gallon tank, still U-shaped. The only changes made had been to fit brakes, add a steel sub-frame between the wooden baulks to take the increased drawbar pull and equip it with the all-important Ramsbottom water scoop. As befitted the 20<sup>th</sup> century the subsequent tenders were enlarged to 3000 gallons with frames and buffer beams of steel; in 1910 as a final gesture to modernity with its soft youngsters the coal space was inclined towards a shovelling plate and provided a degree of self-trimming (see the tender on my LNWR No. 650).

Broadly speaking our model tenders have only 3 requirements to meet: carry water, carry coal, transmit the tractive effort to the train. The outline design is governed by the shape of the prototype tender as are the details such as brakes, steps, lamp irons (or sockets), shape of springs and axle boxes, but inside, so to speak, we can do as we choose. It is in this area where I have developed standards. However, don't treat the outside shape and details too lightly if you want a really representative model, it's all too easy to spend years getting the engine right only to mate it to a beautifully finished tender the like of which it never met in real life. Every company had its own tender policy, personally I am only acquainted with the vagaries of the LMS and

its English constituents, but that is sufficient for me to recommend modellers to search deeply into which tenders were used at what time on the locomotive they are modelling: photographic evidence of a particular engine is a must. As an example, although Crewe coupled the next available overhauled tender to engines coming out of works, thereby producing only temporary engine-tender combinations, there were relatively few types of tender, all well-defined, and recognisable from photographs. Derby on the other hand had an almost unlimited number of tank-chassis-rails-coal plate combinations, yes there were standards but a quick look at pictures reveals a "make-do and adapt" policy. Although I had seen hundreds of photos of MR engines it was not until I got involved with the Johnson Compounds that I realised I had taken almost no notice of MR tenders, to me they seemed to be either 6-wheel standards in low and high sided form or bogie tenders. Oh, that it were that simple!

Now to the working bits. The shape of the coal space is inherited from the prototype and of course it is not designed for firing from the back, either a temporary retaining plate at the front is needed for shovelling against, or better, a sheet steel bunker made to fit in the coal space when running the locomotive.

The frames will be as per prototype but I pay special attention to the design and attachment of the drag boxes: they are invisible so it is prudent to construct things chunky enough not only to take the normal drawbar pull (about 40 lbf max in 5" g) but also the incredible jolt borne by the tender when a derailed trolley rapidly brakes 170 lb of engine from 10 mph. Screw down handbrakes appeared fairly early on full size tenders, just as well as engine brakes were a later idea, and it not a good idea to omit them or have them only as decorative items on the model as they are the only means of holding a locomotive stationary out of steam. The most important part of the tender lies in the water arrangements: typically, the front  $\frac{2}{3}$  of the tank has a fixed top, indeed on a self-trimming bunker the slope has of necessity to be sealed, and but at the rear the top plate behind the coal bulkhead can be loose: everything to be "got-at" must be located at the back. I fit the emergency hand pump in the centre of this space and very often it is necessary to raise the pump off the floor on a fabricated brass plinth in order to allow for a full pump stroke with the extension handle. The normal water feed to injectors or engine pump must be taken through filters, many published designs show flanges in the floor fitted with brass mesh filters of a wind-sock shape, usually somewhere near the front; unfortunately, I have two tenders like this. There are two requirements: the filter must be accessible for cleaning and the shorter the pipeline to the injector the better the suction feed flow. I provide a flange on the floor in the accessible zone about  $\frac{3}{4}$ " diameter and  $\frac{1}{8}$ " high leading to a 12mm copper tube forward under the floor, at the front of the tender the individual flexibles connect to the tube, the flow resistance to the front is negligible. The filter is a "top hat" 1" high with mesh in the sides and the "brim" is an easy fit over the flange in the floor. Finally, unless you choose to wash the inside of the car on the way home it is useful to drain the tender: a  $\frac{1}{4}$ " screw-out plug in a back corner does the trick, just slightly raise the front and watch it drain. It doesn't take much time to paint the inside of the visible part of the tank white but it is invaluable for keeping it clean after draining.

So, there you have it, tenders are basically simple things but a bit of forethought makes running that much simpler.