No 245 *LIVERPOOL* - THE CRAMPTON

by Harry Jack and Nick Baines. Photos by Nick Baines

No 245 *Liverpool*, as represented by the 7mm scale model by Nick Baines

It was the world's biggest and most powerful locomotive. Built for the LNWR in 1848, it cost about twice as much as a normal express passenger engine. Put on show at the 1851 Great Exhibition in the Crystal Palace it was awarded a medal. It was the first engine known to be decorated with the LNWR crest, which may be the earliest use of this so-called 'cauliflower' device anywhere.

Photographs of *Liverpool* must surely have been taken but none are known. Drawings were published when the engine was new; unfortunately they contain detail differences. There are later illustrations aplenty, which are mostly unreliable. But now, in this beautiful model by Nick Baines, we can see what *Liverpool* really looked like when it first astonished the public in the late 1840s and can see more clearly several curious features which hitherto have only been discernible in two-dimensional working drawings.

Liverpool was built as a 'narrow-gauge' reply to the threat from the Great Western Railway, whose big broad-gauge engines were setting new records, and which was pressing for a broad-gauge line northwards into Birmingham and beyond. This was encroaching on LNWR territory!

It seemed that Thomas Russell Crampton might have the answer. He had patented a design of locomotive for the 4ft 8½in gauge with a large boiler, pitched low to obtain the low centre of gravity, which was then thought necessary for safety, but with driving wheels which could be very big - for high speeds - because the driving axle was not under the boiler but behind it.

Eleven days after Daniel Gooch's new engine *Great Western* took a train from Paddington to Exeter and back at the startling average speed of over 55mph, the London & Birmingham Railway ordered a Crampton engine on 12th June 1846; the engine arrived a year later on what was now the Southern Division of the LNWR. It was named *London* and was given the impressive number 200. No other railway had so many engines at that time.

Meanwhile Crampton's very first engine, *Namur*, although built for a Belgian railway, was used by the LNWR from February to April 1847, when its designer claimed it had reached 75mph.

Like almost all Southern Division engines, *London* was built by an outside firm, but on the Northern Division the superior facilities of Crewe Works allowed the LNWR to build their own Crampton. This was No 176 *Courier*, which was completed in November 1847.

With this unique experience of testing three Crampton engines, all of them outside-cylinder 4-2-0s with large driving wheels behind the firebox, the LNWR must have known more than anyone about the practicality and success - or lack of it - of Crampton's design. Early in 1848 another was ordered; it was to be 'of great power ... a power as nearly as possible corresponding to the large [engine] on the GWR'. This materialised as the enormous 6-2-0 *Liverpool*.

Built by Bury, Curtis & Kennedy as their works number 355, it arrived on the LNWR in September 1848. It was mounted on double iron frames, with 18in outside cylinders positioned above the frameplates and midway between the front end and the driving-wheel axle, which lay across the driver's footplate just behind the firebox. The heating surface was 2290 sq ft, satisfyingly almost 20% more than the latest GWR engine, which was obtained from a large divided firebox and no fewer than 300 tubes packed into a boiler over 12ft long. The boiler in cross-section had two diameters: the smaller lower part fitted between the inside frames, while the upper part swelled out above the carrying wheels.

Performance on the line was very satisfactory, at least according to Crampton, but little can be found in

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the LNWR records until the Permanent Way Report of April 1849, which included it in a list of 36 'engines complained of'. The report went on to say that as the speed contests were 'now happily over ... there exists no reason why such engines as ... *Cornwall* ... and *Liverpool* should not be put in store and kept there until, by the adoption of a suitable kind of road, it becomes economical - which at present it is not - to use them'. *Liverpool* had a reputation for distorting the track, which is unsurprising when so much of it still consisted of the original rails set on stone blocks, thus more liable to spreading than wooden sleepered track.

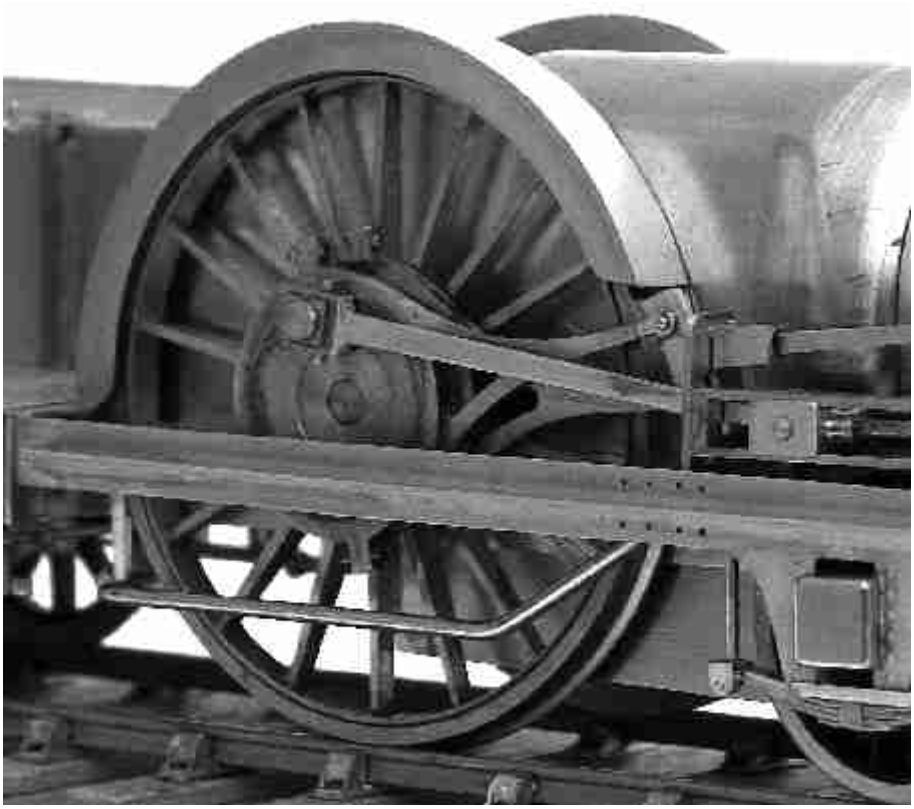
So the engine was put into store and probably remained there until its appearance at the Crystal Palace. It returned to stock after the Exhibition but in its entire career to the end of 1851 it had run a total of only 9,303 miles, equivalent to 42 return trips between London and Birmingham.

After lying stored in Camden roundhouse it made its last trip to Wolverton Works in August 1858. It reappeared in April 1859, after having been 'rebuilt' as a standard Wolverton Express Goods 0-6-0, with its old number 245 and bearing its old name. How much of the old Crampton could have been used in this alleged 'rebuild' is a mystery.

Another cause for speculation is the apparent success of Crampton locomotives in mainland Europe, where about 300 were built, including at least a couple in France with *Liverpool*'s 6-2-0 wheel arrangement. It seems probable that the answer lies in the track. If the London & Birmingham line had been built later than it was, with more modern trackwork, maybe the Cramptons would have had a longer career in Britain, perhaps influencing - for a time - locomotive development on the LNWR.

One hundred and fifty years later, *Liverpool* appeared again, although this time 1/43rd the size of the original. The construction of the model actually resembles that of the prototype to a much greater extent than is usual and there is a lot in the prototype to interest the model builder.

The Stephenson's valve gear is outside the driving wheels and driven by a pair of huge eccentrics and this feature is so obvious that it just has to be modelled correctly. The driving wheels themselves, eight feet in diameter, are striking and there is an odd collection of leading and carrying wheels. The two front axles have wheels of different diameter and the centre wheels are flangeless.



The outside frames with all their rivets and bolts are another obvious feature. It is not apparent in the side elevation but the boiler was not circular. It was egg-shaped, being formed of two semicircles (or almost semicircles), the upper being of larger diameter than the lower, joined together. Clearly the intention was to make the largest possible boiler but one that also had to fit between the wheels. Internally, the boiler is most interesting to the engineer, but thankfully irrelevant to the modeller as it had a huge number of narrow boiler tubes, a split firebox and a

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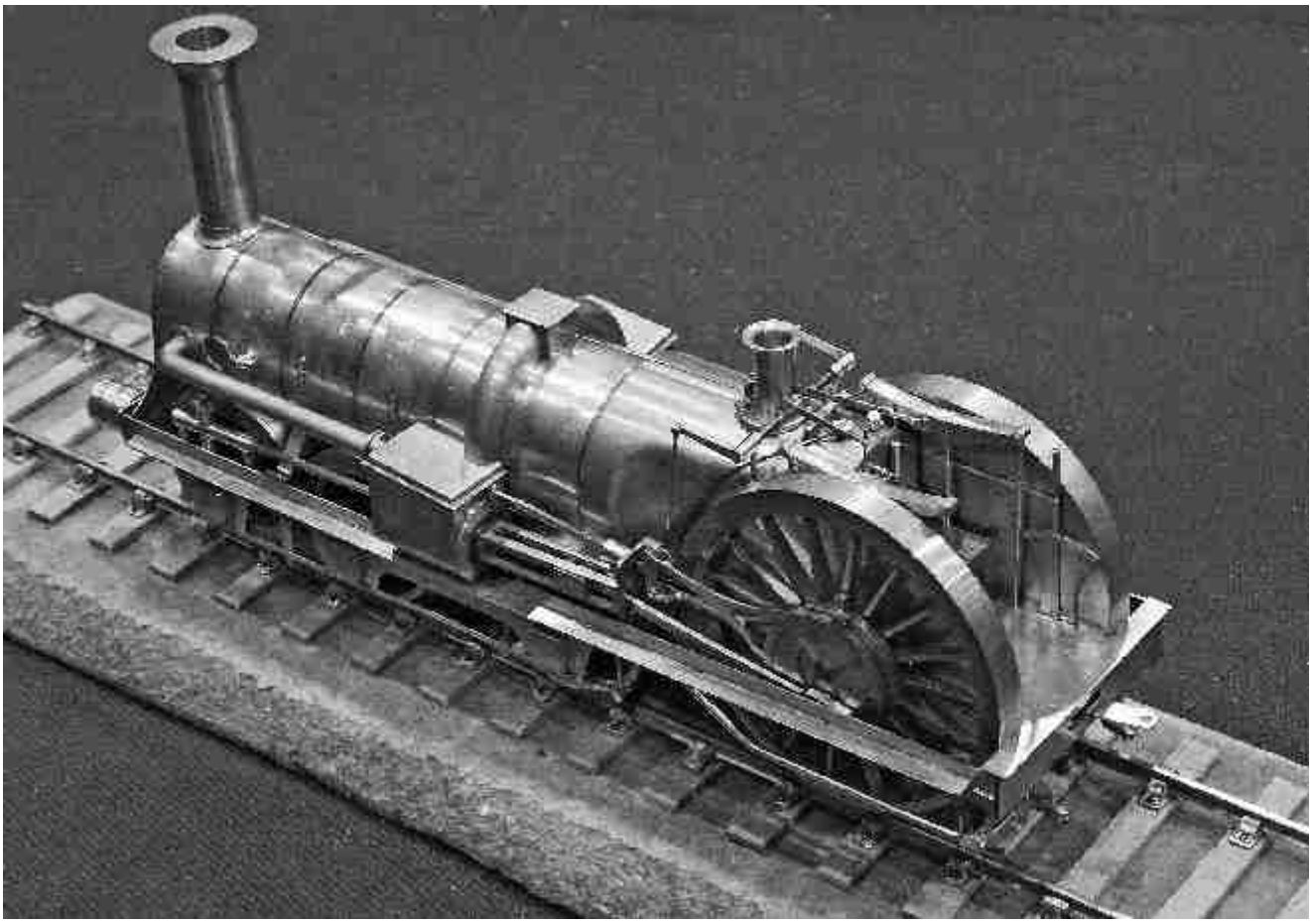

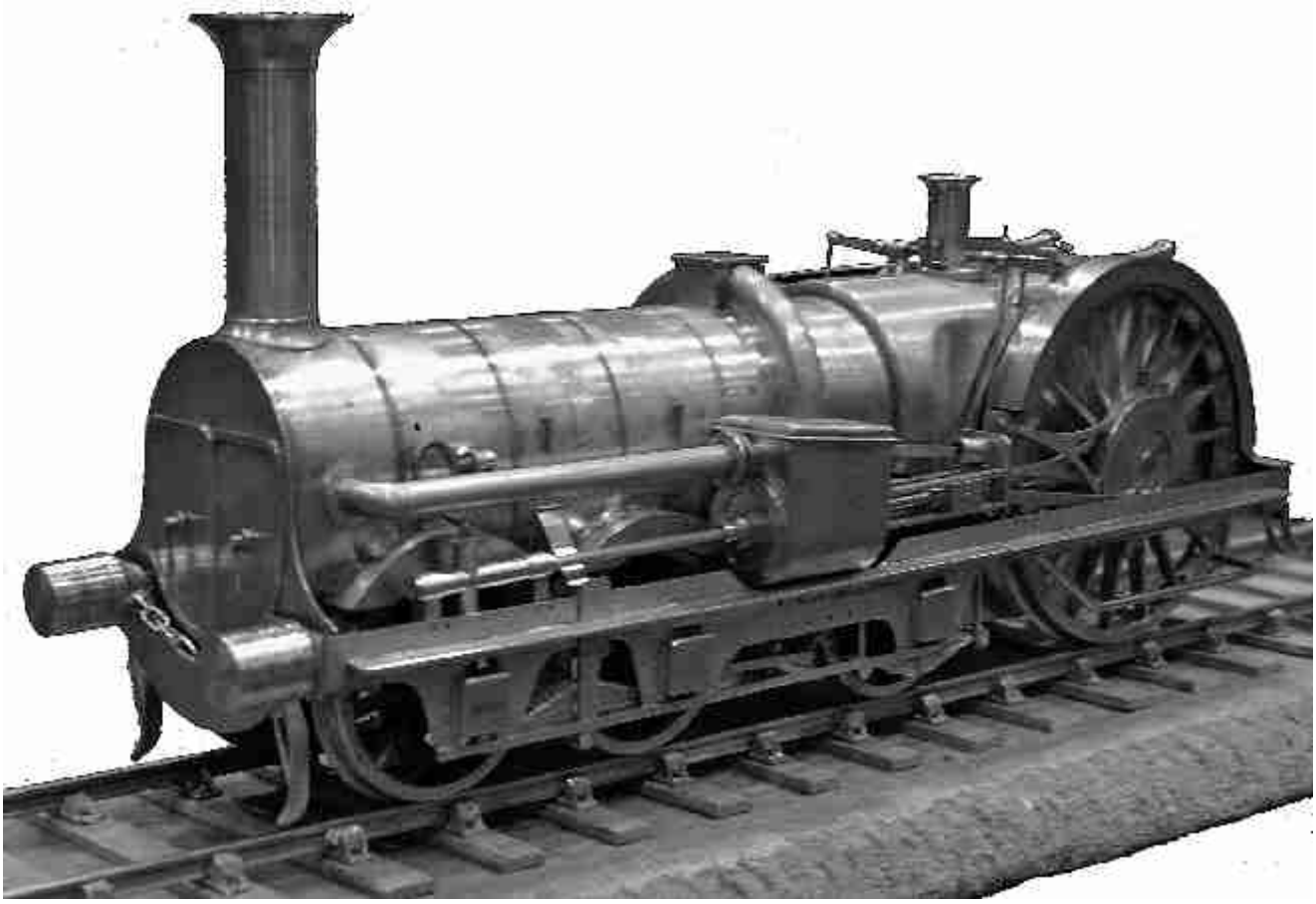

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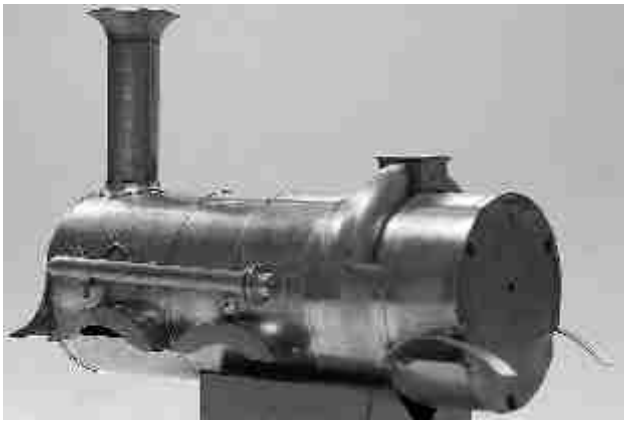
species of thermic siphon, the last of these dating almost a century before Mr Bulleid fitted them to his Pacifics! The firebox too was an odd shape, waisted to fit between the driving wheels, then expanding at the front end where it met the boiler.

Altogether it represented something quite out of the ordinary and the model required a lot of thought and planning. Conventional ideas about a separate chassis and body, the way model locos are usually made, went out straight away. There is not really a footplate at which to split the model at all. The final solution involves a number of subassemblies, bolted together. The 'backbone' of the locomotive is the inner frames, spacers, buffer beam, and drag beam. The outer frames and cylinders are attached to this. Other subassemblies comprise the piston rods and slidebars, and the valve gear. The smokebox, boiler, and firebox form another subassembly that bolts directly to the inner frame assembly. The final major components are the driving wheel splashers and the footplate between them.

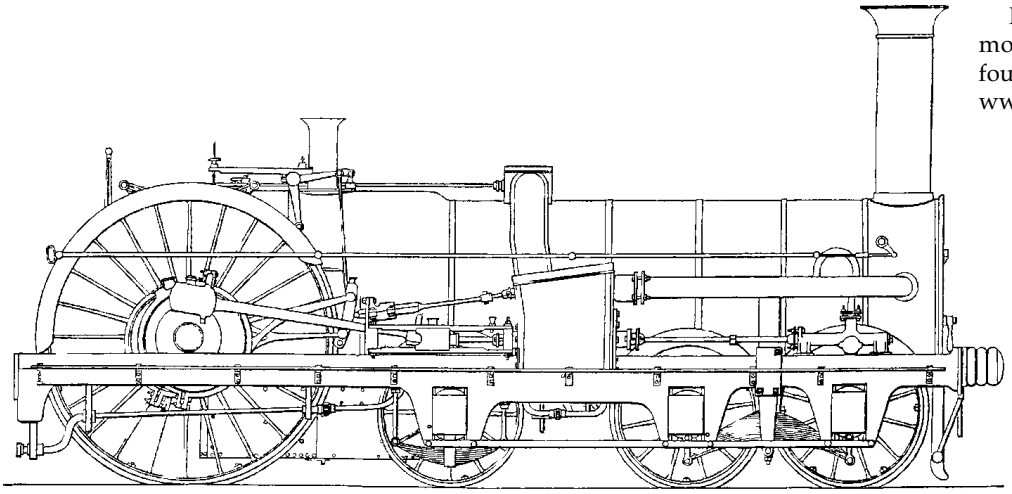
The carrying wheels are Slater's products. I doubt if the spoke profile is quite right, but they are hardly visible behind the outer frames and life is too short for some things. One set of wheels was mounted in the lathe and the flanges were carefully removed, but the coning was preserved.

The driving wheels are something else entirely. Of course nobody makes an eight foot diameter, eighteen spoke wheel with extended boss, so there was nothing for it but to make them myself. If I had needed a lot of them, it would have been worth making a master for the wheel centre and having it cast in brass (I doubt that whitemetal would have the necessary strength), but I needed so few that I chose to machine them.

Originally I was assured that the tender was pure North Western, but Harry Jack put me right on that. What we know of Liverpool's tender did not correspond to LNW tenders of the time. It, like the loco, is unique, but much less obviously ◀▶



More about Nick Baines' modelling activities can be found by going to his website, www.ncbaines.co.uk



This side view of *Liverpool* in the text volume of Clark's *Railway Machinery* corrects an error in the Tredgold side view, which showed a wooden buffer beam. Colburn included a similar but more crudely drawn view.

The first comprehensive set of drawings of *Liverpool* is probably the series of engravings which appeared in the third edition of Thomas Tredgold's *Tredgold on the Steam Engine,* which appeared about 1853. Side and end elevations, sections and plans were included for each of the locomotives described. The Tredgold engravings appear to have been the basis for E W Twining's drawings reproduced by Mike Sharman in his book *The Crampton Locomotive.* The side view used above comes from D K Clark's *Railway Machinery.*

Zerah Colburn, in his *Locomotive Engineering and the Mechanism of Railways,* describes *Liverpool* as follows:

'Late in 1848 one of [Crampton's] engines, made by Bury, Curtis and Kennedy, commenced working upon the London and North-Western Railway. This engine, the *Liverpool*, shown in Fig. 84, was undoubtedly the largest ever constructed for passenger traffic, and it settled the question of the admissibility of the largest engines upon the narrow gauge. It had 18-inch cylinders, 24-inch stroke, 8-feet driving wheels, a boiler containing 300 tubes 2 3/16 inches in diameter and 12 feet 3 inches long, while the total heating surface was 2,260 square feet. The extreme wheel base was 18 feet, and the total weight, in working order, 35 tons. The fire grate, it may be noted, was 21½ square feet in extent, and the heating surface in the fire box was 154 square feet. The *Liverpool* was reckoned equal to a load of 180 tons at 50 miles an hour, but its great weight and length told seriously upon the permanent way, which, in 1848, was not fish-jointed as now, while steel rails were unknown. The Liverpool class of engine did not, therefore, meet with favour in England, but it was taken up by the French engineers, and the American makers returned, in some instances, to their former practice of placing a single pair of driving wheels behind the fire box.'

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