Super D and Austin 7 locomotives

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A FAIRY TALE OF TWO ENGINES.

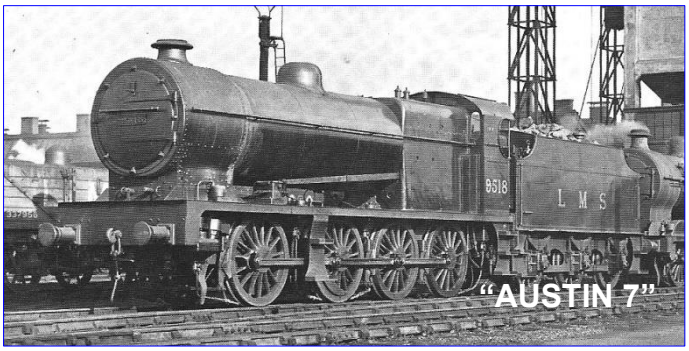
Until the middle of the 20th century coal occupied the position held by oil and gas in to-day´s world: huge amounts of it were consumed daily and handsome profits could be made by the businesses involved in its supply. Although the northern railways made much ado about their fast passenger services, it was the continuous procession of coal trains from mining areas to the large cities that underpinned the dividends paid to the shareholders. On the neighbouring (but not neighbourly) lines of the North Western and Midland Railways long trains of loose coupled coal wagons plodded along night and day at average speeds of less than 20 mph. On the latter railway they were almost literally nose to tail as the MR had a dedicated set of rails to London worked permissively so a single block section could contain several trains at a time.

Within 25 years of their birth the railways had settled on the simple 0-6-0 tender engine for goods working and apart from the shape of the chimney, dome, and cab there was little to differentiate one from another. In the case of the LNWR and MR, not even company initials on the tenders identified them, let alone fancy liveries as they were usually plain black. The motion was the universal British arrangement of two inside cylinders with common steam chest and flat valves between, driven by Stephenson gear, running on wheels of about 4´6" diameter, up to 5´3" for somewhat faster jobs. At the maximum 25 mph the coal engines turned at 150rpm, about half the rate of their elegant express sisters, so neither the motion nor the boiler was unduly pressed, in fact the critical feature of these engines was their brake power as they had to bring to rest several hundred tons of train with only the assistance of the brake van.

From 1873 Crewe turned out 500 "Coal Engines" that were essentially a 4' 5" version of Ramsbottom's DX 0-6-0 and by 1862, over at Derby, Kirtley had already standardised his version with 5´3" wheels spaced at 8´ + 8´6", dimensions that persisted for the next 100 years. This latter design was enlarged in stages, and after transformation with piston valves above the cylinders and Belpaire boiler it finally emerged as the MR / LMS "Big Goods" 4F. The MR response to increasing coal traffic was to marshal really long trains double headed by combinations of various classes of coal engines, but the LNWR went for something bigger, logically the next step was an extra axle and Webb built one prototype 0-8-0 in 1892. This was not simply an extension of the existing Coal Engine but a development of the current general purpose 0-6-0 (the "Cauliflower") fitted with eight 4' 6" wheels and larger 19½" x 24" cylinders combined with flat valves above driven by Joy valve gear. This arrangement was employed by Crewe for all the big cylinder Edwardian era engines as it avoided the use of rockers needed with link motion, but more importantly it eliminated eccentrics thereby freeing up axle space for big

bearings and it even accommodated a third axlebox in a central sub-frame for the crank axle. While such an arrangement might not have provided the best valve events (Joy gear is reasonably good for short travel valves but the timing suffers when springs sag), its sheer rigidity made it almost impossible for drivers to kill the engine. This looked like a good idea for a big coal engine but unfortunately it remained a sole example as the next 277 0-8-0s were turned out as compounds, but once their designer had moved on they were rebuilt as "simples" and successively improved with larger cylinders, piston valves and superheated boilers. By 1923 many more "simple" engines had been built from new and the LMS inherited a total of 511 locomotives in several classes with only minor differences, being collectively known as "Super Ds".

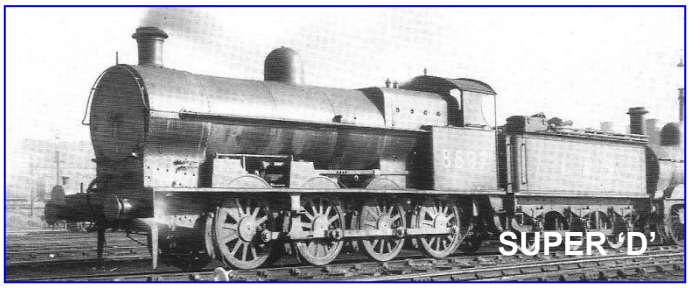
y 1929 the need for more heavy goods engines on the LMS was becoming urgent and as the engineering management at the time (in Derby) was not well disposed towards Crewe and all its ways, a decision was taken to go for a “modern” version of a Super D. By then some quite good replacement boilers with Belpaire fireboxes had been designed at Crewe for a number of ex-LNWR classes, including Super Ds, so this part of the engine was available “off-the-shelf”. The cylinders and motion of the Super D were somewhat dated but the case for a new design was rather weak considering that it was an engine working at low revs and relatively late cut-off, but Derby had, so to speak, just moved into the 20th century with a couple of successful classes fitted with long valve travel cylinders, narrow multiple rings and Walschaert valve gear so this combination was reconfigured for use inside the frames. The result was a 4´7” wheel 0-8-0 carrying the Belpaire boiler pressed to 200psi using standard running gear and platework from the 4F. The engines were classed as 7F, the same as the Super Ds, but they appeared considerably larger with their bigger smokebox and high pitched boilers, in fact they were monsters by the standards of the Midland and this prompted their sarcastic nickname, “Austin 7s”. In all 175 were constructed and they ran together with 518 Super Ds and were later joined by 852 Stanier 8Fs: such was the need for heavy freight locomotives on the LMS.



“AUSTIN 7”

SO HOW DID THE AUSTIN 7’S PERFORM?

Given that they were built as an improvement on the Super D what advantages were they supposed to offer? They had the same boiler and the cylinders were sized to give the same tractive effort despite the increase in pressure. Clearly, they were designed to work the same trains so the improvement lay elsewhere, presumably higher mileage between repairs and reduced coal consumption. The expected mileage increase turned out to be a delusion as the smaller bearing surfaces and undersized axleboxes from the 4F were ill suited to the harsh life of a 7F and repair costs were considerably higher. This is almost a built-in feature of inside cylinder 0-8-0s as the cranks and eccentrics leave insufficient space for adequate axleboxes, but the North Western and Lanky versions had got away with it as they were free of eccentrics. However as far as efficiency was concerned things turned out very well (said the story teller), a test was set up to compare performance against a Super D and the results were particularly heartening when the Austin 7 came in well ahead showing a 30% coal economy. This figure has been quoted in all the usual works on LMS engines published for enthusiasts without querying whether such an outstanding reduction could in fact be achieved. It is railway folklore passed down by generations. I certainly found difficulty in believing that the improvement made to cylinders and valves would give such a saving, 5 to 10% maybe, possibly less as the engines ran at low revs and relatively late cut-off.


SUPER ‘D’

I recently came across a publication dealing with LMS cylinders in which more detailed results of the 7F test runs are reproduced and sure enough the specific coal consumption of the Austin 7 expressed as “lb per DBHP-hr” is indeed 30% lower but on the other hand there are also figures for boiler efficiency, “lb of water evaporated per lb of coal burned”, showing the Super D to be 26% lower so its higher coal consumption was principally due to the boiler (which was the same) and not the new cylinders. End of Fairy Tale: in fact the Austin 7 used just 5% less steam to do the same job, a small advantage almost certainly gained from improved sealing of the valve rings. How did two engines fitted with similar boilers running similar trains on the same coal show an enormous difference in boiler efficiency? Perhaps somebody made a mistake with the data and as the erroneous result was just too favourable to disregard no questions were asked. When time ran out for coal engines the Austin 7s were the first to be scrapped while their older virtually indestructible North Western companions soldiered on to the end.