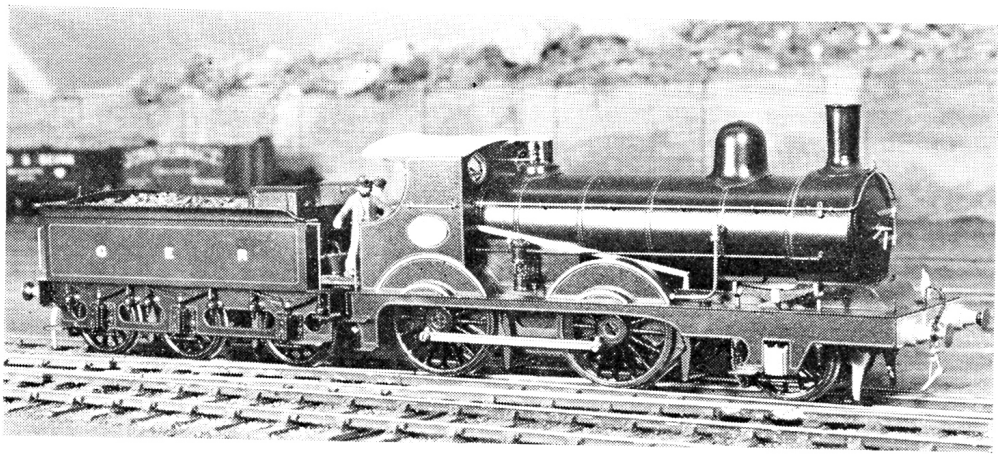
Quartering drivers

Robbo Ormiston-Chant deals with a vital point for all locomotive builders



The smooth running of a model locomotive, such as this fine 7mm scale GER 2-4-0 built by Wally Mayhew, depends on accurate quartering. (Photo: Brian Monaghan.)

ANYWAY, why should *you* worry? Let me put it this way: a novice model builder had on my advice obtained a lathe to machine the coupled wheels true for his locomotives, but alas he cometh to me with a sombre tale of woe, the wheels were still wobbly, or at least two of the four pairs were—it was to be an N.E.R. "T" class 0-8-0 (L.N.E. Class Q6). In talking it over he let slip the reason. He knew nothing of "quartering", he just set the wheels on axles to match, but when turning them in the lathe he did not observe this quartering but just popped the pairs of wheels on each axle. When he reached the model he found his mistake and cheerfully swopped the errant wheel about on the axle squares. The secret of machining the wheels is that you get them true to axle regardless of the square in the wheel (which is often out of true), and in changing the position of a wheel on its axle he had upset all his machining.

So I explained about quartering to him and he thought I should tell others, so I do so now, about 8 years later unfortunately, but better late than never.

Firstly, engine quartering—you may think an engine (railway) is a steam whatsit going chuff chuff along the track; it is by common usage, but really that is a locomotive, the *engine* is the gubbins that makes it chuff, namely a cylinder and valve chest, connecting rod, etc., valve gear, and finally the axle. The axle is also part of the undercarriage along with the wheels. The main thing is that with the above parts stuffed full of steam in the appropriate manner they will all function to rotate the axle, whether or not there happens to be wheels on it. All locos have two engines, some have three or four, we think only in terms of two, though some modellers delight in making all of the hardware about, say, a L.M.S. "Duchess" Pacific, which had four engines. Often we make a model with the engines purely imaginary, as on a typical 0-6-0 loco, but we still have to worry about quartering as the coupled wheels *ipso facto* repeat the quartering of the unseen engines. Even an inside "single" loco like the famous Dean single of G.W.R. has visible quartering on its one pair of driving wheels, these have balance weights which inevitably are quartered in sympathy with the engines!

So let us with no more ado look at quartering.

Most British railways used right-hand lead in setting their engines, but two, the L.N.W.R. and G.N.R., at least, used left-hand lead. One class of L.N.E.R. designed loco also had left-hand setting, I think because it began on the G.N.R. (the A3), but I cannot vouch for pure L.N.E.R. designs except that the B1 had right hand. I repaired a couple of B1 locos at Swindon, they had their usual complaint of hot boxes. [*LNER fans need not comment. A Swindon-trained engineer, like Robbo has his prejudices.—C.J.F.*].

May I say here that it being so typical of Crewe to differ from the general practice, bless it, I always carefully put left-hand lead on L.N.W.R. models. Moreover, if I should make up or handle a G.N.R. one or a A3 I would do the same.

Other railways *may* have used left-hand lead, the trouble is that nobody seems to mention this sort of thing in writing about them; I only knew that Crewe gave left-hand because I found it, to my surprise, on the "Dirty Dee" 0-8-0's at Buxton, before then I never suspected that Crewe did this, but was heartily assured so by the leading fitter, a Crewe man.

To me a detail like this is worth thousands on the model because it so nicely reflects the original subject and any idiosyncrasies of its creators; especially as it is achieved without any extra work at all.

The lead is determined as follows, for a model that is.

Hold the wheels on axle in front of you and across your body, imagine you are looking forward at them from the back of the loco. Turn the right-hand crank to the top position.

Now if the left-hand crank is pointing forwards, you have fitted the wheels for *left*-hand lead, if the left crank is pointing backwards, you have set them for *right*-hand lead. To prove this rotate the wheels away from you. As the cranks both go from the top to front dead centre the crank that is ahead is the leading crank. Once you have got the idea you will not need to go into these contortions to find out what is happening but will automatically set your wheels for the correct position regardless of their attitude.

Note that the cranks must be at right-angles, even on a model so that other coupled wheels in train will be smoothly turned along with the driving ones (those whose axle has the gearwheel on it), without any surging. A model could run with cranks in opposition but it would surge and perhaps even bind owing to both side-rods hitting a dead centre together.

In full size, inside engined locos usually had the side-rods (outside) set in opposition to the corresponding (inside) cranks, so that the swing of the rods balanced that of the connecting rods, but some builders did put the cranks in line, oddly enough with excellent results as it eliminated cross-stresses in the axle-boxes; however, heavy balance weights were needed, at the wheel rims and built onto the engine cranks. [*And the wheels were the very devil to roll round the works.—C. J. F.*].

With 4-cylinder locos, the inside engines were set at quarters and each outside engine was set in opposition to its inside partner.

Three-cylinder locos had the engines set in sequence across the machine, and I have a see-through picture of the A3 which clearly shows this machine to be left-hand lead, also the two Atlantics at York Museum have that lead—so comes my assumption of G.N.R. practice.

Unfortunately we do not know how the S.R. 4-cylinder locos were set. Mr. Holcroft relates how successively a "Paddlebox" and a "Nelson" were given staggered settings by shifting the inside cranks to be 135 degrees from their mating outside ones; in the first case it was a brilliant idea, but the coal usage of the "Nelson" shot sky high, and enthusiasm for the idea did the opposite thereafter. (This is a very odd contrast!)

Models of 3-cylinder locos must perchance have 90 degree crank setting; they just will not work with the two outside cranks set at 240 degrees like the full size (or 120 degrees if you look at it backwards!), and Romford or Bonds wheels will only allow 90 degrees anyway. Hamblings or Keyser wheels could be pressed on by hand to give 240 degrees but, as I said, do not try it.

In passing I might mention that Hamblings wheel press is drilled to give right-hand load so if you use their wheels you are stuck with that. Toolmaker types may like to redrill the anvils for left-hand but I leave them to it with thanks, and warn lesser mortals not to tinker.

Also in passing I find that though Mr. Holcroft describes the alteration of the S.R. locos in detail he does not say (a) what lead was given in the first place, and (b) which way the cranks were shifted, forwards or backwards, to get the new positions. Maybe some reader knows the answer to (a) as this will give the practice of S.R. for the guidance of modellers. The answer to (b) is purely academic though most interesting.

To finish off this saga, and make it of some use, I will pass on a hint or tip. Once the wheels have been machined on their axles one must be careful to keep things exactly so, see my opening tale. But there is a simple way of always knowing what wheel belongs to which end of what axle.

Before you machine, in pairing the wheels onto their axles, proceed as follows. On each axle-body, parallel with a square flat at the end and towards one end of the axle file a little notch with the corner of a needle file. Put one notch on the first coupled axle, two on the second and so on, along the wheelbase.

Now fit one wheel to each axle, the balance weight in line with the notch(es). Mark the inside of these balance weights with little "pop" marks to correspond with the number of notches in each case. Make only small pops with a fine punch or scriber point.

Next, choose the opposing wheels for each axle, and pop mark the *outside* of the balance weights to correspond.

Thus you know, what end of what axle any wheel fits, and you can have the lot in a heap on the bench and still put them back correctly, so long as you keep to the original quartering of the cranks.