"Old Rube restoration part 9"

This document was written by Paul Naylor in autumn 2025 and is the eighth article in a restoration project. The articles were published more or less simultaneously in the Frimley and Ascot Locomotive Society newsletter.

Having discovered the slack wheel on its axle, I set about measuring what the slack might be. I arranged a dial gauge to measure between the backs of the wheels on this axle, at tread diameter. The offending wheel rocks to produce 0.025" of movement at the tread, and this (using similar triangles) equates to clearance in the joint of 0.19mm (c 0.01"). The specification for Loctite 638 says that the maximum gap is 0.25mm. Since the 0.19mm is total rock (ie difference in diameters), it appears that the actual gap is around 0.1mm, and so it may be that Loctite 638 on its own will be sufficient to fix the wheel (with the screw for security). To make sure, I need to split the two and measure again directly.

Next step is to remove the wheel. The socket grub screw came out easily, but the wheel would not budge off the axle. On closer inspection, the rock in the wheel appeared to be around a pivot point, so I cleaned the paint off the hub and saw what looked like a pin driven in aslant into the hub and into the axle. It presented as a circular hammer beaten top flush with the hub (and then painted). The only thing to do, after considering wildly trying to inject Loctite into the gap and leaving the wheel on the axle, was to drill it out, so guessing the angle it went in at and going up in drill stages I got to 6mm drill size before I could see what was happening and there was more movement. If I supported the wheel now in my vice and used a drift on the axle end, the wheel appeared to slightly come off. A few more biffs and it eventually came off. The pin was a taper pin all the way through the axle, and out the back hidden by the axlebox. When it came off, this took a piece of wheel casting with it, fortunately just a small piece to allow the taper pin narrow end to leave the wheel. You can see the holes in the photo. I suppose that is one way to make sure your wheel stays on, but it is not recommended. It does not look like any Loctite was used for this, presumably being a press fit originally, unless the taper pin is original and to cure a poor fit – although given that this wheel is the worn one and the one getting the main force of cornering it is more likely that it is to rectify a later problem.

I have cleaned up the axle and wheel hole, smoothed any burrs and reassembled it to see how good the fit is. It is as the estimate above, so my first stance is to use Loctite as planned. I roughed up the mating surfaces a little and used plenty of Loctite 638 after cleaning everything with meths. I am afraid to say that I matched the taper pin 'from stock' and fitted this in the original hole: at least you can now see the end of it to

knock it back out, and also refitted the socket screw. It is now curing, so we will see what happens then.

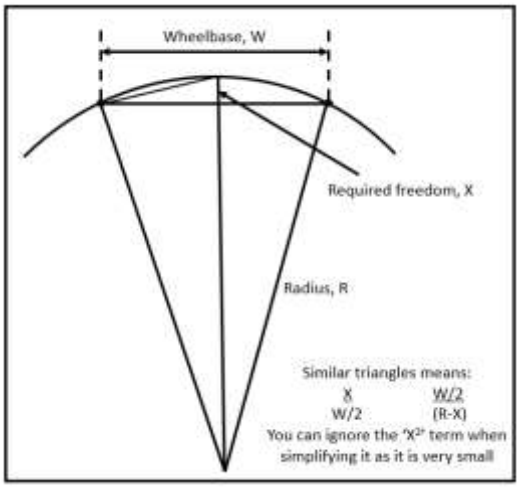
After 24 hours of curing, the wheel is firm and straight, so I am hopeful that this will suffice. It will not ‘fall off’ anyway, and if I can remove some of the stress on the wheel (see below), it should be OK.

I have re-turned the other wheel on this axle, and found a local CNC machine shop to make me a tyre. When this comes, I can return to this wheel set. While waiting, I had better tackle the second axle with the longer crank pin.

After much thought (and a natural abhorrence of modifying lathe accessories), I decided to open the hole out in the faceplate to take the extended crankpin. The lathe did not have a faceplate when I got it second hand 15 years ago, and I wanted one, so I found the nearest old one I could from a car boot sale (which did not have the right mandrel thread of course) for £10, bored it out and made an insert that I cut a matching thread for (first screw cutting exercise for me on this lathe). This was loctited into the faceplate and had a couple of screws half in each (like a loco wheel) to make sure it did not move. The whole thing was then skimmed in situ to make it flat etc. That contraption has been used now on many occasions without problems and it does not really owe me anything. The hole opened out OK using the milling machine without drama and I was able then to turn this wheelset. The crankpin at the other end *just* missed the cross slide.

I now have re-turned and black painted all of the wheelsets except the wheel waiting for the tyre, and can turn my mind to other things for a week or two until this arrives. This one is on the far left in the photo.

The thoughts over the flange wear and how a new tyre will fare has led me to consider the theory at least of the loco’s cornering ability. I am sure more erudite souls than I will provide more sophistication regarding the following, but here is my stab at it.



If the ‘unbending’ wheelbase length of the loco (that is, in this case, the wheelbase of the eight main driving wheels) is W, and you want it to go round a curve of radius R, then for the two outer wheels to remain on the track (!), the centre wheel (at least for an 0-6-0) will need to move laterally an amount X where:

$$X = W^2/4R$$

See the diagram for explanation.

Plugging the numbers for Old Rube into this formula (W = 715mm), along with the track radius to go round (c18 metres), means that X = 5.8mm.

Now, I said that this was theory, and assumed no lateral movement on track gauge. ‘Gauge widening’ helps, as do thinner flanges, both before you need to start worrying about the freedom of movement of the axle boxes in the horns and other sources of latitude. As far as I can tell from measuring the bits of Old Rube, there is 3mm of movement sideways in each axle anyway ‘designed in’, plus one wheel set with no flange, and the remaining central wheel set not in the centre of the wheelbase where the need would be greatest but towards the front. This suggests that with the first and fourth wheel flanges hard up to the rail on one side, the other with a flange will move to the other side and the total will be no less than 6mm, and probably more. This seems to mean that the loco, as designed, will go round an 18-metre radius curve without needing to allow

for wheel wear or gauge widening. This is supported by the fact that only the front wheelset (and only one wheel on it) had thin flanges caused by wear and that wheel was loose on its axle. If the loco was tight on the radius, I would have expected the wear to be more even on the trailing pair of wheels too. So, what caused the wear and tear on the front wheel set? I assume that this is caused by the heavy loco taking a turn with no side control on the front bogie to assist guiding the outer front wheel round a curve. This means that this wheel ‘did all the work’ and suffered excessive wear as a result.

I said that this is theory based on measured dimensions, so the next step will be to finish the wheels and put them back in the chassis temporarily, then push them over to their positions going round a bend and measure the freedom of movement in practice. If this comfirms that the design is OK for this radius without gauge widening, then I probably ought to add some bogie side control to help reduce wear. How to do this appears to be a lot easier, looking at the chassis arrangements, than trying to increase the lateral movement of axles, which all have constraints caused by the design – such as crosshead/crankpin proximity, suspension components, firebox sides etc.