

## Hornby Duke of Gloucester EM Finescale Conversion.



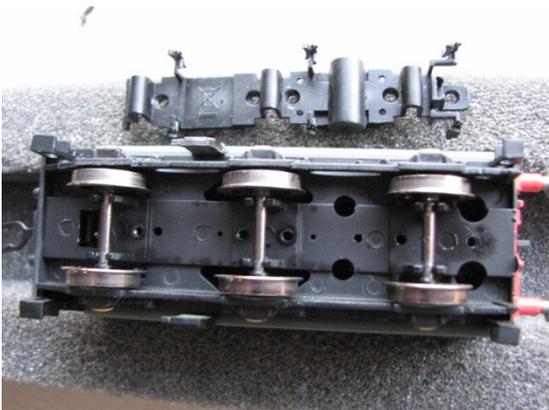
Before you start, it is a good idea to have some small containers or snap top poly bags to put screws and components in for safe keeping.....much better than crawling about on the floor trying to find lost bits!

We converted the tender first, not that this will be needed to test the loco chassis later because there is no electrical engine/tender connection plug and socket, nor any tender pickups.

### TENDER CONVERSION

Just a word of caution. The tender chassis is a one piece metal casting. The side frames are just far apart enough for EM wheels, the clearance being measured in Rizzlas..... So if you were thinking about P4 conversions, you may well have some difficulties with this tender.

1. Invert the tender, and hold in a suitable device. We use a foam cradle – the Peco loco service cradle being ideal.
2. Unclip the brake gear, if fitted, and place to one side.
3. Undo the five screws holding the keeper plate – which are all visible and easily undone.



Keeper plate removed and one Gibson wheel set installed.

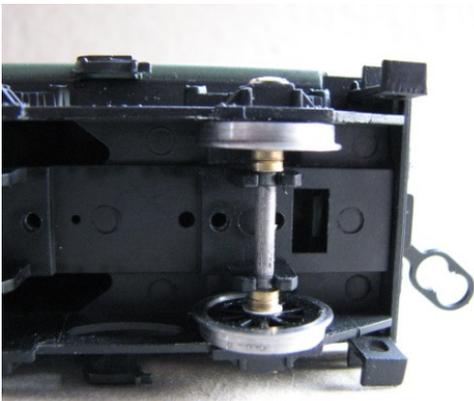
4. Lift out the 3 Hornby wheel sets.

5. Because of the narrow space between the side frames, the wheel boss as supplied needs careful removal, otherwise the wheels will not fit between them.



Carefully remove wheel boss – mind your fingers!

6. Then assemble the Gibson wheel sets onto the appropriate plain axle supplied with the wheels. We used 2x1mm 2mm bore spacing bushes each side, plus a Peco 2mm bore fibre washer to limit side play. In point of fact, this is more to prevent the metal tyres from touching the metal side frame and potentially causing shorts. We also cut small rectangles about 10mm x 15mm of black plastic insulation tape and stuck to the inside of the frames as belt and braces. You could smear a thin layer of PVA or even Araldite on these inside surfaces prior to installing the wheels.



Enlarged view showing spacers on Gibson wheel set.

7. Place wheel sets into the chassis.

8. Before replacing the keeper plate, chamfer the back of the brake shoes with a needle file to provide clearance with the wheel tyre/flange.

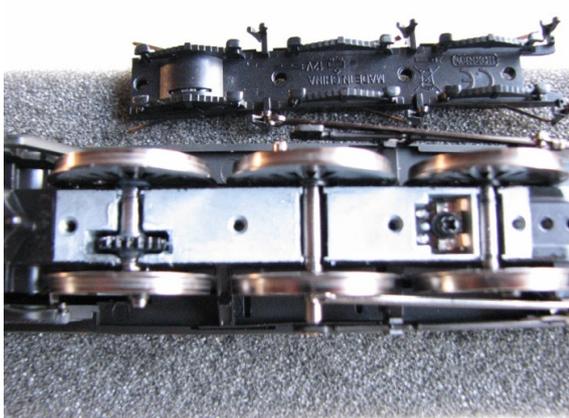


Brakes chamfered to clear flanges.

9. Replace the keeper plate and screws. Push test the tender through some track work to ensure all is well.
10. Clip brake rods back into position.

### **LOCO CONVERSION**

1. Remove the loco bogie by undoing the two screws behind the rear of the bogie on the loco chassis, and place to one side.
2. Undo and remove the crankpin screws, remove the valve gear drive cranks and connecting rods and leave them dangling. Recover the coupling rods and place to one side. Make sure you know which rod is from which side!
3. Undo the 4 cross head screws in the keeper plate - store these safely – and gently tease the keeper plate upwards, and away from the chassis. There are no wires connecting the keeper plate to the chassis.



Keeper plate removed.

4. The wheel sets should now lift out.
5. Remove the wheels from the rear driven axle – we need to recover the gear wheel. The gear needs to be pushed off. Simply support the axle end on a solid surface, pushing straight down with your thumbs. The gear should slide off. Do not TWIST the gear, as it sits on a knurled part of the axle and you may damage the inside surface of the gear bore.

6. The Gibson wheels can now be prepared – crankpins inserted and any balance weights made up and glued on. We make these from 10thou plasticard and use a compass cutter. The supplied axles were reduced to 21.6mm.



Balance weights cut from plasticard.



Wheels complete with weights and crankpins.

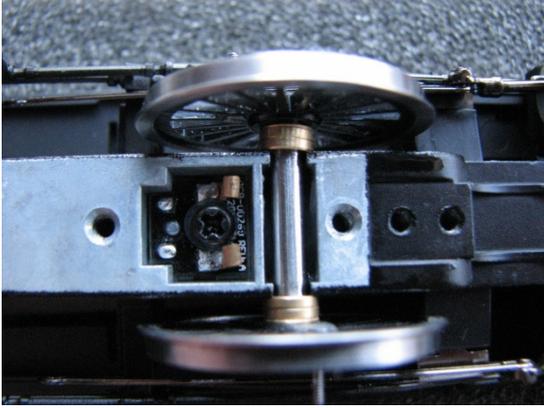
7. Now begin to assemble the front and rear wheelsets. We will need some spacing washers to take up the side play, we used 2 x 1mm thick washers each side, plus 1 x 0.25 washer per side as well.

8. We use a GW Models wheel press for assembly, which will also quarter the wheels as well as press them on square.



Assembled wheels for front or centre. Note from left to right on the axle; 1x0.25mm spacer plus 2x1mm spacers. And the same on the other side of the axle.

9. These two wheel sets can now be placed in the chassis.



Front wheel set installed.

10. The rear axle needs to be “knurled” for the gear wheel first. We place the plain axle into the chassis, measuring the overhang each side to make sure it is central. Take a permanent marker pen, and mark the position of the gear on the axle.



The black dot marks the spot!

11. Place the axle on a cutting mat or similar. Take a small hand file, we use a 4inch second cut file, and using the file on Edge, roll it with firm downward pressure over the axle where you marked the gear position. Do not stray away from this narrow area, as the axle revolves in the chassis casting close to the gear, and knurling in this area won't help good running!



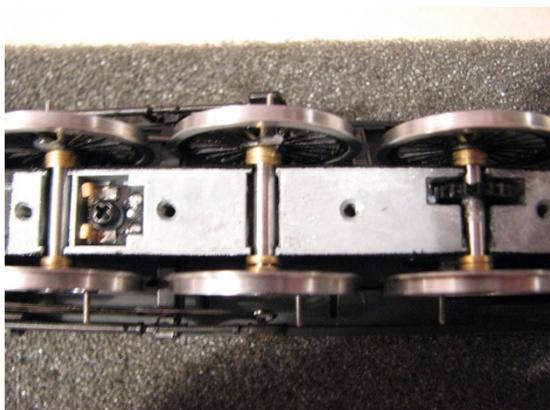
Not too neat....but it works!

12. The gear can now be slid onto the axle and pressed over the “knurling”. We found that the side of the gear was 7.5mm from the axle end (shorter end!) Place in the chassis and check...if all is well you can slide the gear to one side, and apply a little Loctite, replace and check gear is in the correct position. Leave alone to cure. Treat yourself to a cuppa or similar.....or deal with the loco body or bogie (see later)



Assembled axle and Hornby gear.

13. Once the Loctite has cured, assemble the driven axle in the press with spacers to the same type and number as the other two axles.



Centre and rear axles installed.

14. Before we replace the keeper plate, chamfer the rear of the leading brake shoes with a needle file to make sure the brakes don't foul the wheels. The centre and rear brakes are fine as they are.

15. Lift the keeper plate back into position, trying not to let the two parts of it separate, and fasten down with the four screws. You can now place on the track and apply a little power to make sure the driven axle revolves freely.

16. Next we tackle the coupling rods and the connecting rod big ends. The Hornby holes are too large for Gibson crankpins, so we need to bush them with the Gibson bushes available just for this purpose. First, file the plating back to the brass base metal on the rear of the rods. Place a bush in the rod hole, and solder in position. Do this for all 6 coupling rod holes, and do the connecting rods by laying the engine on its side, working on the rear of the rod which is face down on the work surface. If you fill the bush completely with solder.....don't panic! As the solder sets, it contracts slightly, leaving a dimple in the centre – use this to as your centre for drilling out. A suitable drill twiddled with fingers in a pin vice is all that is needed.



Bush in rod ready for soldering.



The resulting central dimple after over enthusiastic soldering.

17. The bushes then need a gentle opening out to be a good running fit on the crankpin bushes....simply use a suitable cutting broach and use one of the Gibson bushes as a guide.

18. Assemble the rods onto the wheels. Use a long crankpin bush on the centre wheels, and short ones front and rear. Fasten with crankpin nuts on the front and right hand rear only. Tighten and trim back the front crankpins, and file the nuts to about half their thickness, in order to give clearance for the connecting rod. The rear pin can be left for now if you wish.

19. The left hand rear wheel has the speedo crank acting as a crankpin retaining nut. We used an Alan Gibson cast brass crank to replace the Hornby one. This should tighten to align with the axle centre, not be offset as Hornby have done! (See below how to prepare this crank)

20. The centre crankpins have the valve gear drive crank to retain the rods. The Hornby crank can be re used if you wish by soldering a 14BA nut into the Hornby crank slot, but this will need widening slightly first.

21. The alternative is to use Alan Gibson cast brass return cranks, and as mentioned above, you will need 3 of these. Two for the centre crankpins and one for the speedo drive on the left hand rear wheel pin.

22. The new Gibson return cranks need tapping 14BA, and we do this with the cranks still attached to their sprue as it makes holding easier. The tap is held in a pin vice rather than a normal tap wrench – much easier to use. Once tapped, they can be cut from the sprue and cleaned up.



Return cranks as supplied with a prepared pair and tap alongside.

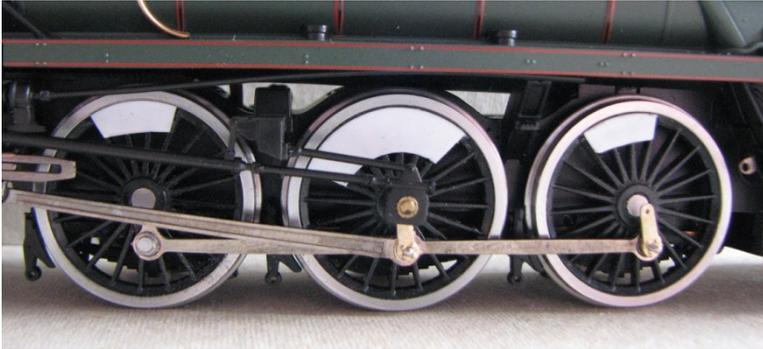
23. Wind a crank onto one of the centre crankpins, and naturally it will go tight and stop in the wrong position! Undo, file a small amount from the rear face of the crank boss, and try again. It will now be tight at a point further round, so by trial and error, we get it to tighten in line with the axle centre. There is no offset with Caprotti valve gear. Repeat for the opposite side. Remove the centre cranks, but make sure you know which is for which side!



Fitting the drive cranks.

24. With the coupling rods fitted, we can fit the connecting rods. Place another one of the coupling rod bushes we used to reduce the hole size in the rods earlier as a spacer on the crankpin before fitting the rod. Then wind on the crank so it aligns when tightened with the axle centre.

25. Repeat for the opposite side.

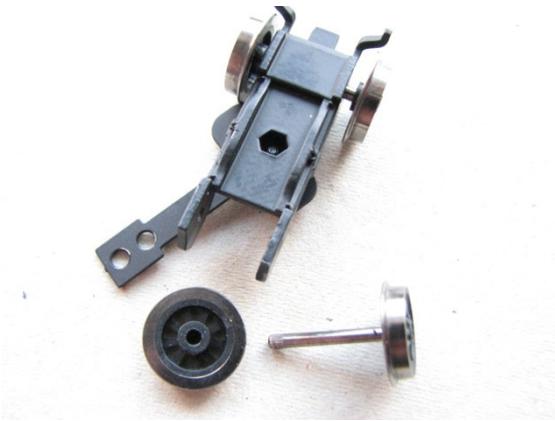


What the valve gear should now be like!

26. At this point, you should be able to track test the completed valve gear. Gently apply power, checking to ensure no parts are going to hit other parts or bind. If all is well, admire your engine moving around!

### THE BOGIE

1. Simply twist and pull one Hornby wheel from its axle, and slide the remaining wheel and axle out the other side.
2. Repeat for the other Hornby wheel set.



Removing Hornby wheels.

3. Assemble one Gibson wheel onto its axle, and then slide the appropriate spacing washers on, thread through the bogie casting hole, adding the appropriate spacing washers and remaining wheel. Repeat for the second axle. We used 2 x 1mm 2mm bore brass spacing washers each side.



Re wheeling the bogie.

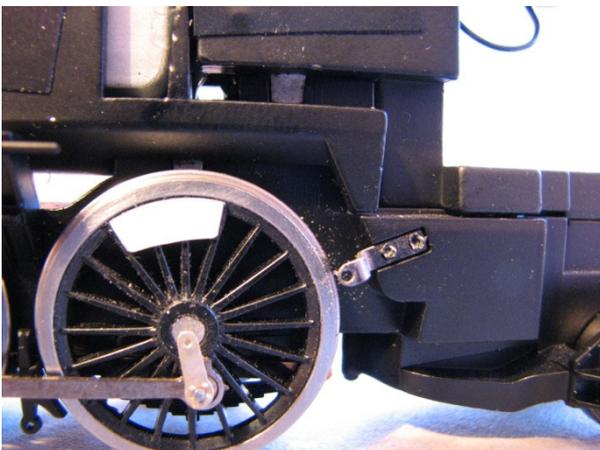
### **SPEEDOMETER DRIVE.**

1. As we replaced the Hornby speedometer drive crank, we need to consider how to replace the drive cable. You could re use the Hornby one, but a better looking drive can be achieved using the Alan Gibson casting.



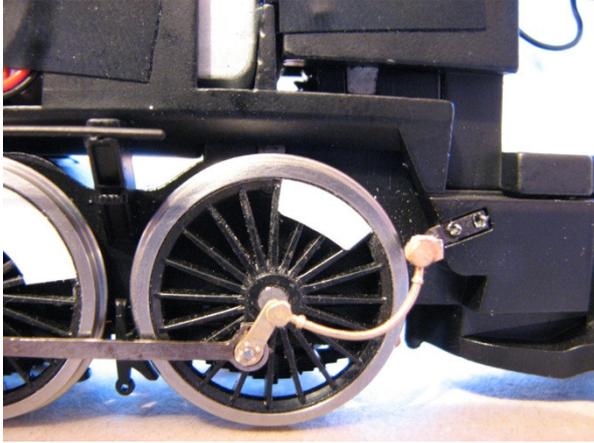
Gibson casting 4M813.

2. The Hornby drive cable is removed by snipping through the rivet holding it to the chassis bracket.



Hornby drive removed, bracket cleaned ready for soldering.

3. The casting is cleaned up, and then soldered to the bracket on the chassis, so that the opposite end rests over the end of the drive crank.
4. The end over the drive crank should rest just clear of the crank.....not connected in any way. To all intents, it looks connected!



Drive soldered in place.

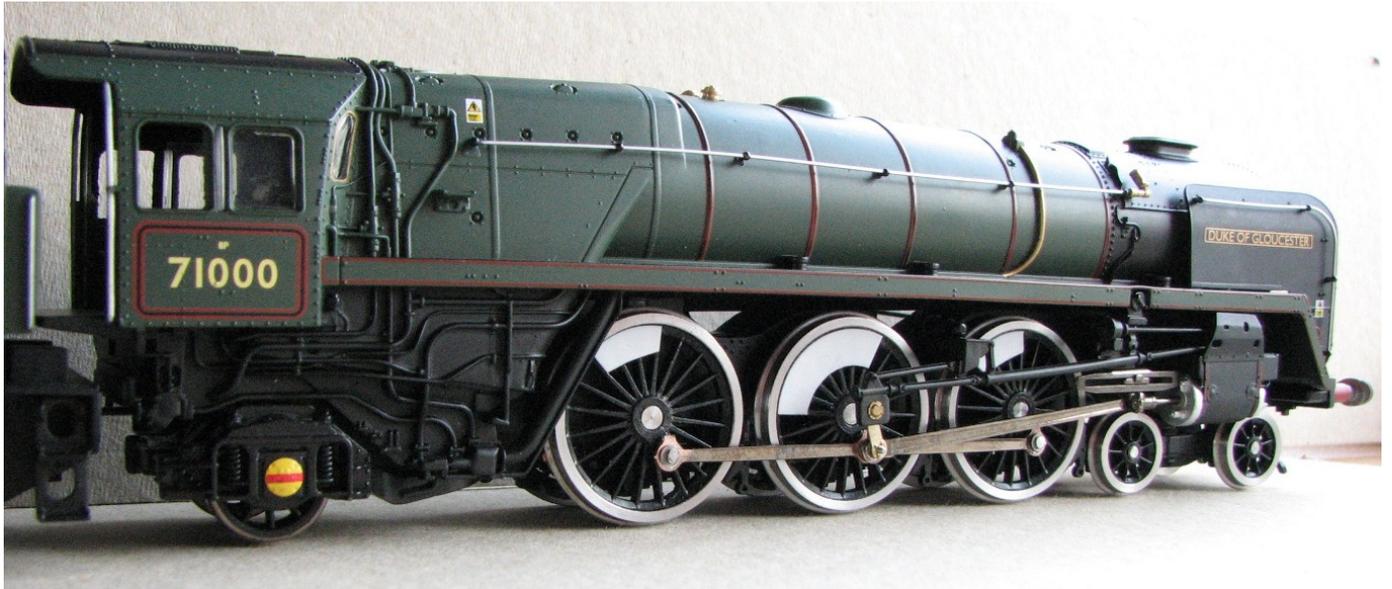


Completed speedometer drive.

## FINAL ASSEMBLY

Fasten the bogie back to the chassis, couple up to the tender and you should have a completed loco.

Don't forget to lubricate it!



Pete Hill

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