

Bachmann V2 EM Finescale Conversion



**Health Warning.....this conversion involves some fairly serious valve gear alterations!!
Not for those of a nervous disposition....**

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!

Tender Conversion.

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, and place to one side.
3. Spring out the Bachmann wheel sets.
4. Remove the Bachmann wheels from their axles, and replace with Gibson scale wheels onto the Bachmann axles, and replacing in the tender chassis having set the correct back to back.
5. Carefully replace the wheelsets back into the tender. Some force maybe needed to spring the frames far enough apart.

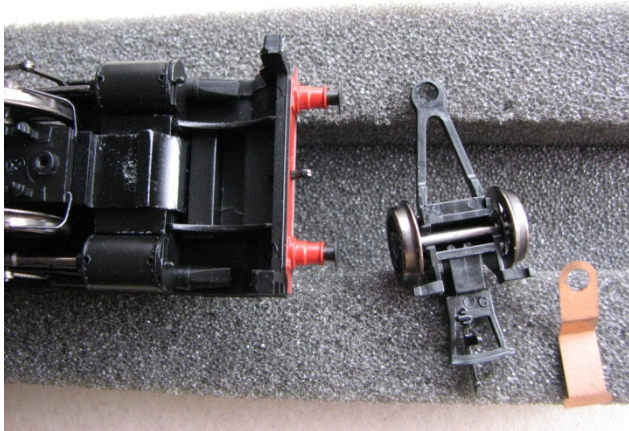


Gibson wheels fitted to Bachmann axles.

The option of fitting the wheels to pinpoint axles and using top hat bearings in the tender axle holes can be used, but the bearings need to be let well into the frames, as they are not quite wide enough apart.

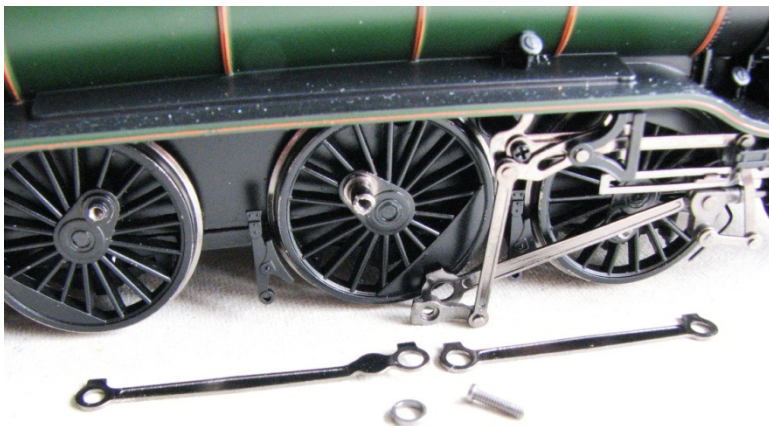
Loco Conversion.

1. Invert the loco in a suitable support. We use a foam cradle – the Peco loco service cradle being ideal.
2. Undo the pony retaining screw and remove the pony and spring. Store safely until later.



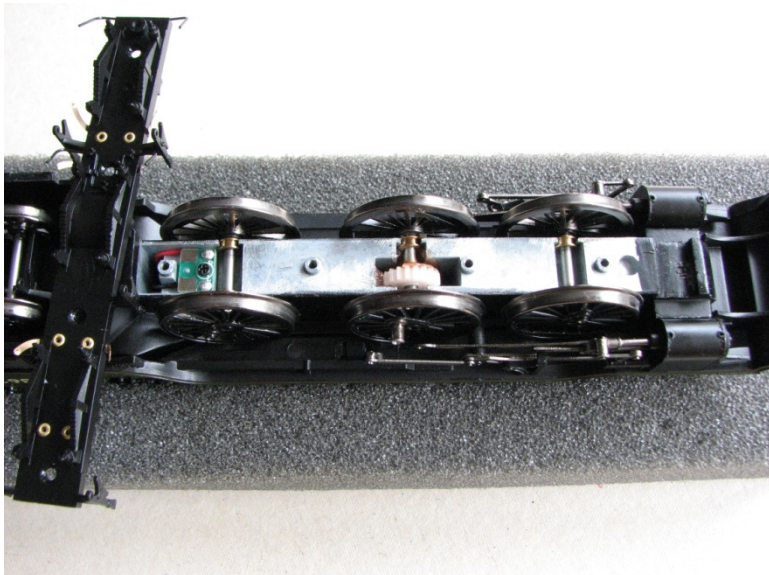
Pony truck removal..

3. Undo the crankpin screws, remove the return crank and connecting rod; leaving them resting where they droop as it were! Recover the coupling rods and store safely. The crankpin screws can go into the spares box; we have no further use for these!



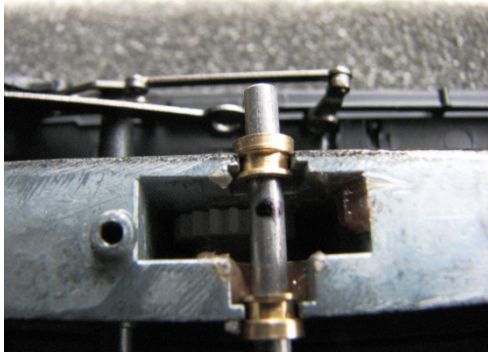
Rod removal.

4. Remove the screws holding the keeper plate and simply lift away. There are no wires to worry about.



Keeper plate removed.

5. Lift out the wheelsets. Remove the wheels from the axle by either twisting the wheels off by hand, or punching the axle through the wheels, then recover the gear by holding the axle vertically on a firm surface and pushing the gear straight down with your thumbs – DO NOT TWIST the gear as it is held on a splined surface and twisting may well damage the bore of the gear.
6. Take one of the replacement Gibson axles, and place into the inverted chassis centre axle slot above the drive gears. Measure each side to ensure you have it centralised, and mark with a pen (we used a permanent marker) directly above the gear in the chassis that the axle gear meshes with.



Marking axle for gear position.

7. Place the axle onto a cutting mat or similar, take a hand file of around 4 inches in length, and using the edge of the file with teeth, roll the axle across the mat using the file and a fair degree of pressure at the point where you marked the axle. This will provide a splined effect on the axle sufficient to grip the axle gear wheel we removed from the Bachmann axle. Do not allow the file to wander as we do not want any more splines on the axle other than underneath the gear itself. The gear can be pressed onto the axle by holding in your fingers until the splined effect is reached, then hold vertically on a firm surface and push down with thumbs either side until the gear reaches the desired position. This can be simply checked by placing in the chassis and measuring if in doubt. We found the plain side of the gear needed to be approx 7mm from the axle end.



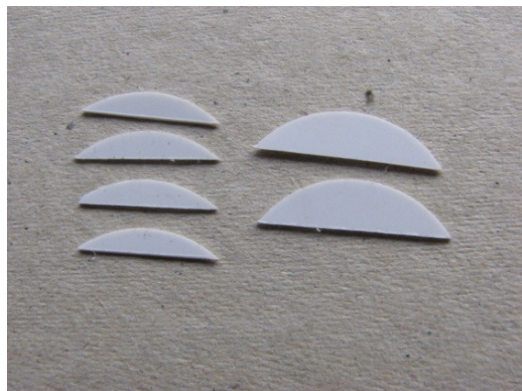
Axle "knurled"

The gear should be firm enough on our splines, but if you wish to apply some belt and braces loctite, now is the time, allow to cure and clean up before pressing wheels and spacers onto the axle.



Gear on new axle – note boss faces chassis centre.

8. The new wheels can now be prepared. Insert crankpin screws and apply balance weights if desired. We use 10 thou plasticard and a compass cutter to make these. The supplied axles were shortened to 22mm.



Balance weights cut from plasticard.



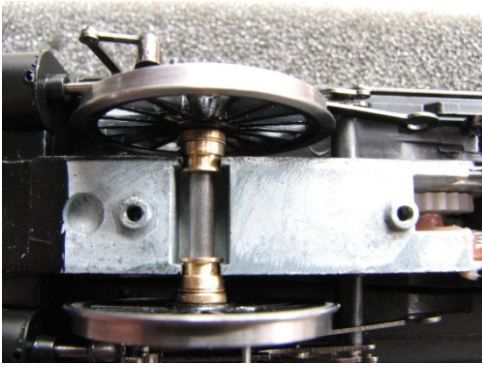
Wheel preparation.

9. Wheel set assembly can now begin. We quartered the wheels by sighting through the spokes as the usual wheel press will not deal with 2.5mm axles. Also you will need some spacing washers to take up side play, and we found that 1x1mm thick + 1x0.25 each side gives zero side play on the leading and centre axles, but allows free turning of the axle. On the trailing wheels we used 1x1mm each side. So push the axle just into one wheel, add one sides spacing washers, then the axle bushes, followed by the opposite side set of spacing washers. Then press home either with finger pressure or gently using a vice, making sure all is square from all directions!



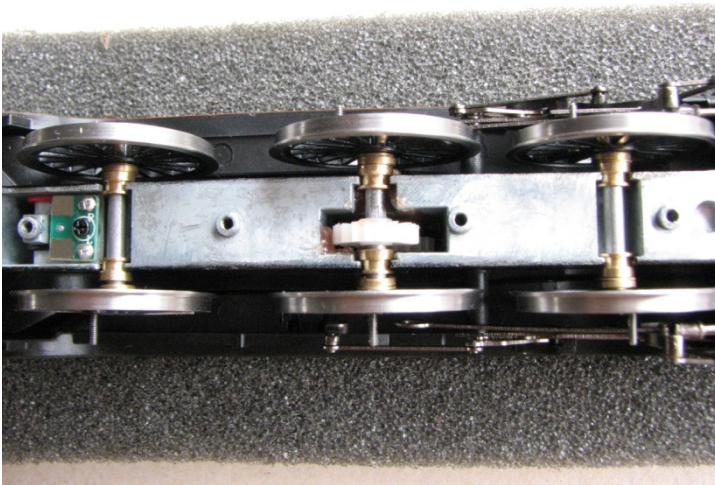
Leading wheelset with spacing washers and bushes.

10. Repeat this for the remaining axles.



Leading axle with spacing washers placed in chassis.

11. Once all 3 axles are assembled and placed into the chassis, the keeper plate can be replaced and screwed down. It is always worth placing on the track and applying power gently at this point, just to ensure that all is well and we have free running of the driven axle.



All installed. The eagle eyed will notice the bottom bush on the centre axle is the wrong way round.....something not noticed until later and had to be corrected!

12. Next are the coupling and connecting rods. The Bachmann rods require their large holes reducing in size by bushing. First, clean the rear of the rods around each hole by filing all plating off to expose the base metal. The Gibson rod bushes require some of the rod holes to be opened a bit further with a taper broach to allow the bushes to be pressed in. This also cleans the inside of the hole prior to soldering from the back of the rod. Solder each bush in turn. If you accidentally fill the bushes solid with solder, don't panic! Allow all to cool, and you should notice in the middle of your filled in hole there is a slight depression in the centre – use this as your centre mark to run a drill through – simply hold a drill in a pin vice and twiddle away with moderate pressure on a firm surface – not the polished dining table preferably!



Bush inserted into rod ready for soldering.

13. The last job on the rods is to make sure the bushed holes are a fairly slack fit over the Gibson crankpin bushes – ream out as required with a cutting broach.

14. Place a short Gibson crankpin bush over front and rear crankpins, place a long one on the centre pin on one side of the chassis. Place the correct coupling rods onto the bushed crankpins and retain with the crankpin nuts on the front and rear pins only. Remember, the front section goes on first and the rear overlaps it on the centre crankpin. Tighten these finally with fine nose pliers now, but ensure you have firm hold of the wheel so as any turning pressure from the pliers does not move the wheel on the axle, thereby upsetting the quartering. Trim off the excess pin and clean up on the leading axle. The trailing one may be left over length for now if you prefer. It is worth shortening the leading front bushes as much as possible.

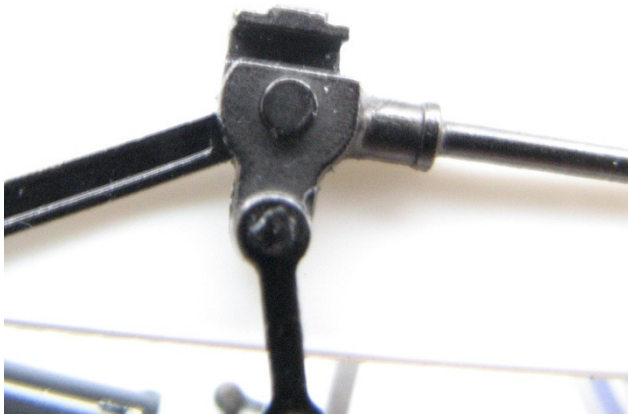
15. Repeat the previous step for the opposite side of the chassis.

16. It was after fitting the connecting rods over the centre crankpin and revolving the wheels the next problem was noticed. The Gibson wheels have a slightly greater crankpin throw than the Bachmann originals, meaning the crossheads were reaching the front end of the slide bars before front dead centre.

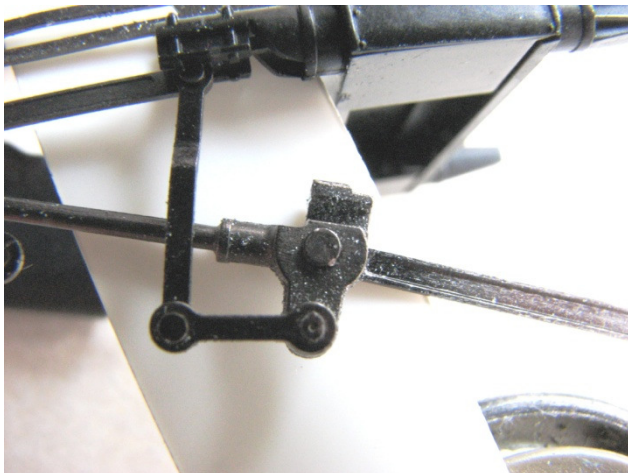
17. The next step was to remove the cylinder and slide bar assembly from the chassis. This is done by removing the one screw into the chassis in the middle of the cylinder moulding, and two small screws, one each side, at the rear of the radius rods. The whole cylinder/slide bar assembly then simply lifts off.

18. With a bit of a careful levering, it is possible to remove the crosshead from the slide bars. Do one side at a time.

19. We need to remove material from the front upper corner, about 1mm of metal needs filing away.



Unmodified right hand crosshead. Material needs removing from top right hand corner.



Modified left hand crosshead, showing metal removed from the top left corner.

20. Whilst out of the slide bar, it is worth thinning the rear of the rather obese crosshead to gain some more clearance. We slimmed it down by approx half.



Unmodified crosshead rear view.



Modified crosshead rear view.

It is worth repeating: Do all operations on one side and re assemble before doing the other. It just makes life easier with fewer parts flapping around!

21. The crossheads can now be reassembled and the whole cylinder/slide bar assembly reinstalled in the chassis, but only fasten the central screw in the cylinder block.

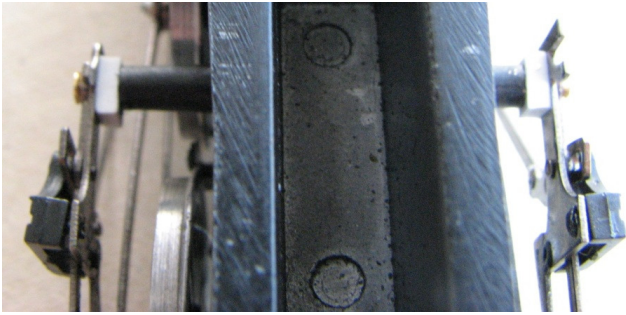
22. Having now extended the travel of the crosshead sufficiently, we find that there is still some collision in the crosshead/crankpin/connecting rod region, which is cured by pulling out the rear of the radius rods slightly where they screw into the chassis. The solution here was to pack out the radius rod with a small piece of 60thou plasticard, and replacing the now too short Bachmann screws with 12BA x approx 5mm screws. We had some countersunk ones to hand which seem to do the job quite ok.



60 thou packing piece, 3mm x 4mm, with a 12BA clearance hole.



Packing inserted behind radius rod and new 12BA screw.



Top view looking rearwards showing the packing pieces each side.

At last, the wheels should revolve without hitting anything.

23. The Bachmann cast return crank will not fit the Gibson crankpins, and it too needs changing. Cut the Bachmann crank from the rod by snipping through the rivet head.....averting eyes from flying rivet heads!



Return crank separated from lower rod.

24. We used Gibson brass casting 4M822 to replace these cranks. They will need tapping 14BA, and it is easier to hold them to do this with the castings still on the sprue. Use the tap in a pin vice.

Open out the hole at the little end of the crank to suit a valve gear rivet.



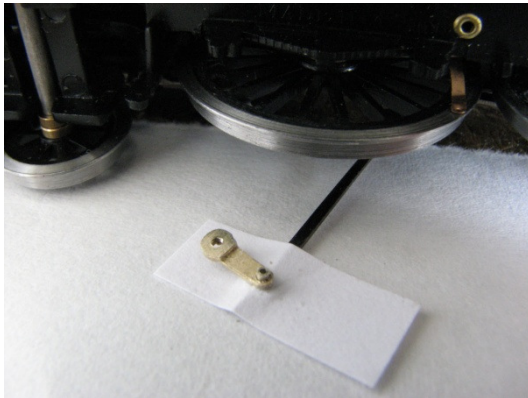
Packet of castings with a prepared pair alongside the tap.

25. Wind one of the cranks onto one of the centre crankpins, and naturally it will go tight and stop in the wrong position! Undo, and 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 at the correct angle. Repeat for the opposite side, then remove, but make sure you know which one fits which side.

26. Lay the chassis on its side, so that the rod is pointing away from the chassis. Place a valve gear rivet into the rod hole. Then place a small piece of paper over the rivet, with the correct return crank on top of that. Solder the rivet to the crank, and then tear out the piece of paper. Hopefully, the crank will be free to revolve.....



Rod placed over rivet.

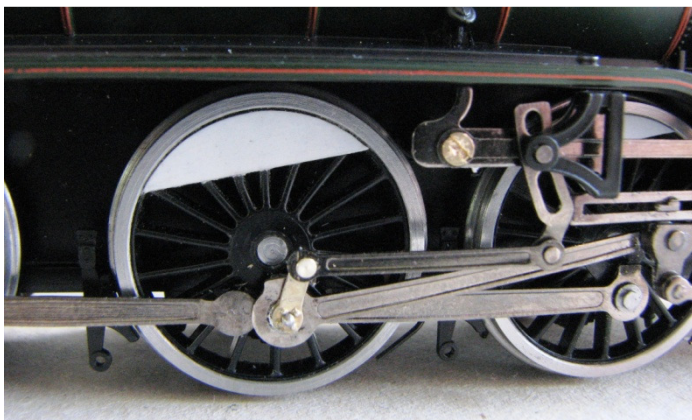


Paper placed between rod and crank prior to soldering.

27. Clean up the excess rivet and solder.

28. The connecting rod should be lifted onto the crankpin and bush, and the return crank can now be wound on and tightened. This is easier to accomplish with the wheels rotated so that the crankpins are halfway between six and seven o'clock.....so that the attached valve gear can move about without binding as the crank is tightened.

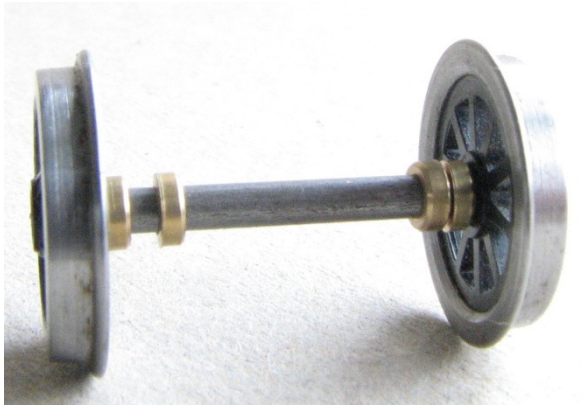
29. Repeat for the opposite side, and remember to move the wheels so the crankpins are at the six to seven o'clock position. You can gently, repeat gently! move the wheels the small amount required under power.



Completed valve gear.

The Pony and Trailing Trucks

30. These are the remaining jobs. The Bachmann wheels will spring out of the pony and trailing truck mouldings, and are replaced with Gibson wheels made up using 2 x 1 mm brass spacing bushes of 2mm bore.



The pony wheels assembled with spacers.



Leading pony wheels installed.

TRAILING AXLE

Similar to the pony wheels, the Bachmann trailing wheels will spring out of the trailing truck housing. Mount the Gibson wheels onto their axle with 2x1mm spacers each side, and simply spring into the axle housing.



Trailing wheelset.

Congratulations! If you have reached this point, then you should now be able to track test the completed chassis. Apply power gently and ensure nothing is binding, if all is well increase power slowly. Don't forget to lubricate the new bearings!



Pete Hill

August 2013.

Other parts used

4800 Coupling rod Bushes

4M42B Crank pins

4M822 Return Crank

4M67/3 1/8" Spacing Washers

4M67/2 2mm Spacing Washers

60 thou plasticard or similar spacing material

12BA screws 5mm (1/4"?) long

Valve Gear Rivets, ours are steel and difficult to solder, we do intend to produce a brass one in the near future, in the meantime Markits produce a Nickel Silver type

Fibre Washers

Loctite, Pete uses some of his precious stock of 601 and we wouldn't want to comment on the suitability of other products