Modelling the Great Central Railway

GCR Class 8G

Version 1.2 March 2019

Assembly Instructions
## Robinson GCR Class 8G LNER B9

### Numbering

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<th>GCR</th>
<th>Manufacturer</th>
<th>Built</th>
<th>LNER(1924)</th>
<th>LNER(1946)</th>
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### Additional Notes

The LNER numbers shown above are the first renumbering, there were two more in short order after this with the B1s claiming the space. Refer to the RCTS 2B for these details.

### Important Note

This kit has been designed for P4 standards. There are plenty of spare parts for the smaller items. Considerable additional work will be needed to build this kit to ‘EM’ or ‘00’ standards. Remember that ‘EM’ and ‘00’ wheels will cut into the boiler space. For EM modellers care must be taken not to increase the upward movement of the wheels if sprung or compensated by filing out the axle slots in the frames.

This kit can be built to represent the original GCR Class 11B which became the LNER D9 on Grouping, although most had been superheated by that time.

### Notes on the kits and constituent parts

The etched parts in this kit have been designed using a CAD program (TurboCAD 2017 DL) to ensure accuracy when fitting the parts together. Included in these notes are:-

- A list of etched and cast parts
- A list of additional and optional parts
- Drawings of the etch fret
- Detailed step-by-step instructions with the drawings extracted from the CAD originals

The original CAD drawings were prepared from GA drawings obtained from NRM and scaled at 12” to 1’. During the design process a number of compromises had to be made (such as the frame widths) because of the materials and parts available to the modeller and the P4 standards. These compromises were used to draw a full size CAD drawing which was then used to provide the instructions and construction drawings and the final etch parts. The etch parts of the drawing were scaled down very accurately to produce etches for the 4 mm modeller.

The kit prototypes were built by the designer. The first trial etch was used as a feasibility project and to write outline instructions. The second test etch was used to test the assembly, write instructions and produce the assembly diagrams as well as a viable model. A modeller familiar with etch brass kit construction should be able to build an accurate model if these instructions are followed, generally as written. However, fine-scale modellers being who we are, other ways of building the kit will be tried!

### The Instructions

More years ago than I care to remember I was involved in validating and writing Master Work Sheets for the Royal Air Force. These were sets of instructions that had to be followed to the letter by technicians world-wide even though they may never have met that particular piece of equipment before. Deviations were never permitted to the...
technicians – given that the machines being tested were vital to safe flying – and any permission to be deviant had to be granted by senior authority and was subject to a very close monitoring process.

However, senility and pending obsolescence have taken their toll – nobody is perfect – so if you find anything in these instructions you feel to be wrong it will be examined closely and amended where appropriate. Likewise, with the measurements of the parts, if there is something which you feel may be wrong then, please let me know. It would be nice if this was supported by drawings, or copies of drawings with time stamps if possible. Photographs are useful as well. But be warned, the available drawings are neither consistent nor accurate if my research means anything at all and there were so many cosmetic changes made to these locomotives over nearly 50 years that photographs without a date stamp must be treated with some caution.

**Things to note**

In a few areas there are alternative ways of doing things. For this kit the springs have been printed using 3D CAD technology as an option, they are fitted to the frames in the same way as the traditional metal springs. Note that these are heat sensitive and will melt as quickly as white metal castings. Using these means that the wheels can also be removed for ‘servicing’.

Continuous Springy Beams (CSBs) may be fitted - they seem to be all the vogue these days. I am a little uncomfortable with the idea and prefer to stick with the prototype idea where each axle is sprung by itself. Short handrail knobs are used for the spring mounts.

Inside connecting rods and frames and the Stephenson’s Valve Gear would have been visible only by looking very carefully. Extra parts are provided so you can experiment with the way it fits together. If you are tempted to try this then please do remember not to solder the parts in situ ‘after’ you have fitted your plastic centred wheels. The valve gear may be fitted in working order or as a very loose fit on the front axle. In the second case this means they will be visible but will not move except around the axis of the axle.

The Stephenson’s Valve Gear is tricky to get working well and may be left out. The rest of the engine will still look good.

Rear and centre frame spacers - those supplied on the etch are to scale and may be fitted if desired - you can create frame spacers which are a good representation of the originals but these are difficult to see when the model is completed. In practice the rear spacer construction was used to steady the front of the fire box but this may be omitted without weakening the whole chassis. P4 versions of these spacers are supplied. These are not standard widths though. Spacers may be added if needed for extra electrical pickups.

There is substantial current collection capability in the tender. I was tempted not to have pick-ups in the locomotive since they would detract from the scale frame spacers and the valve gear and since there is plenty of space in the tender with or without the optional DCC chip this may be a good option. The two wires for the motor may then represent the vacuum and heating pipes.

The part numbers and descriptions (where space permits) are half etched on the frets as near to the parts as sensible and match the description that appears in the Parts List. These annotations will appear in the form “212”, or “223,224” or 213-217” or 218-225+3”. Where the “+” appears in the part number it shows that additional parts have been included and the number following shows that 3 additional parts are on the fret. This allows for two possibilities

a) losing very small parts in the carpet after cutting them from the fret

b) practising the assembly in cases where some difficulty may be expected

Refer to photographs to check if parts were actually riveted early in life, Robinson abominated ‘proud’ rivets and there is some photographic evidence to show that they may not have been used in the early days

The instructions also use the Part Number and Full Description. This may seem a little pedantic but can help where there may be some uncertainty. I also list all parts separately and do not group sets of parts together (i.e. Springs Qty 7) so that you will find the parts list will show each layer in a built up assembly as an individual item.

**Assembly Instructions**

The frets are made from 12’ (0.3 mm) brass and 15’ (0.38 mm) N/S. They are fragile and the edges are sharp. Take care when assembling and especially when drilling out holes. Rotating brass or N/S will cause a lot of skin and tissue damage if the drill sticks and tears. For preference use a hand drill or pin chuck.
You may also find it easier to drill out all the locating holes while the parts are still within the main etch, and even to assemble some of the parts together - simply because this helps to hold at least one of the parts firmly in place.

Do not use force at any time, you are likely to bend the parts beyond repair. The tabs and slots are designed to be a semi-tight fit and on occasion a little easing with a strip of wet & dry sandpaper may be needed, especially on the slots in the smaller parts. If needed, where parts fit into a slot, very lightly dress the mating edges with a fine file.

Unless otherwise stated, the folds are all done with the half etch on the inside.

**TAGS**, which are usually half-etched, are on the fret and hold the individual parts in place when the fret is etched. **TABS** are on the parts to fit into **SLOTS** in the corresponding parts. In many areas on the fret **TAGS** have been arranged so that they fit onto **TABS** solely to help minimize any possible damage to the component when the **TAGS** are removed since the **TABS** will all in the end be invisible.

**Do not confuse TAGS and TABS and file off any TABS!**

It may be easier to do a number of preparatory jobs before removing parts from the main etches. The smoke box wrapper was flush riveted when built but as the LNER super-heated the locomotives they would normally have been replaced by the usual, highly visible rivets. Front buffers sometimes had rivets added after superheating but not necessarily at the same time. The smoke box wrapper may also have had further rivets added as well as the smoke box front around the door, which seemed to have happened in the late '30s and early 40s.

As always, if you are really keen on authenticity then the best thing to do is to examine a photograph of the engine you are modelling.

**Decision time**

The kit has been designed to use frame spacers that approximate to the frames on the original engines, which means that stiffeners are also added to the inside and outside of the frames.

Cosmetic spring mechanisms are provided. These are removable using screws for those of us who like to be able to remove the wheel sets easily.

Sufficient parts are included to make this kit to P4.

The kit as designed will go around a 1250 mm radius curve.

There are three wheel sets available, from Alan Gibson, Ultrascale and Exactoscale. For P4, the Alan Gibson wheels have a rear boss which is 0.5 mm deep. This will impact side play, especially for P4 modellers. This rear boss should be removed from Alan Gibson wheels. There are alternative horn blocks on the market which allow wheels to sit more closely to the frames, such as those from 'High Level'.

**Soldering**

I use ‘Nealetin’, a liquid solder with its own flux. This allows very close control of the initial solder joint. Most initial joints will be secure using this (or a similar liquid solder). Motion parts should be soldered with a higher temperature solder. Once you are convinced things are square then it is possible to run a small fillet of solder along critical joins by first priming with a little ‘Nealetin’.

I have never used lead free solder for making models.

**Square Frames**

There are a couple of mechanisms, neither of which I have used, which have been acclaimed for the ease with which they permit a square frame to be built. While these are expensive to start, many modellers have sung their praises.

**Under Etched parts**

On occasion some parts may be a little under etched. The individual frets have outer frames which are the same width as the vast majority of the slots - just use a short section of this to free up any dubious slots. In any event it is always wise to prepare parts before assembly, using a very fine file to remove any bits of ‘cusp’ left from the etching process.

**Health & Safety**

Experienced modellers will know all this already but -
The frets are made from 12' brass and 15' nickel silver. They are fragile and the edges are sharp. Take care when assembling and especially when drilling out holes. Rotating brass (which tends to grab drill bits, especially near the end of their cut) or nickel silver will cause a lot of skin and tissue damage if the drill sticks and tears. For preference use a hand drill or pin chuck.

Soldering entails the use of toxic materials such as lead and acid flux. Observe the warning notices that come with these products and especially use adequate ventilation. Wear suitable eye protection where needed.

Solder also gets very hot when melted, as do the parts when heated to solder them together. Take care to hold parts carefully with insulating material where needed and to let them cool properly before handling. This is especially true if annealing parts so they can be bent into shape more easily. It is also true where several layers may have been used to build up an assembly such as the boiler and firebox assemblies.

When painting, ensure proper ventilation, especially if using a two part etch solution. Some of these carry hazardous chemicals.

On a few occasions there will be a wire across the frames or bogie soldered at both ends. Do not be tempted to cut this after assembly with the normal wire cutters, this will force the frames apart and cause some damage. Use something like a triangular file or a disc cutter to make the first cut!

**Note on bending parts with half etched lines**

Tighter bends may be achieved as follows if thought to be necessary (notes extracted from some thoughts by Will Litchfield).

1. Deepen the fold line with a triangular 4 cut needle file till a witness line shows though to the other side.
2. Hold the etch on a flat surface with a your trusty steel rule along the fold line.
3. Run a craft knife blade along under the etch to start the fold on it way.
4. When the edge stands well way from the flat surface, use another steel rule to complete the fold.

You get a sharper bend this way, because a of step 1 and it is accurately placed on the centre of the fold line. I use a sharpened scriber to achieve the same effect.

**Notes on wheel choices**

The frames on this kit are set to a design width of 16.15 mm for P4 so that with cusp removal on the spacers 16.05 mm is the approximate final frame width. This is slightly less than some kits, but more than others, especially those which were designed for the ‘00’ market and then had options added for the finer scale gauges of ‘P4’ and ‘EM’. To this width must be added the outer flange of the horn blocks, which will vary depending on horn block supplied - the ones supplied are from Markits.

For the fine scale gauges, side play can be an important issue especially where small radius curves of less than 1200 mm are to be tackled.

Potential purchasers in the fine scale gauges are urged to consider these points. There are, as always, strategies to ameliorate such issues. Further reading on these points are in :-

- **Side Play Supplementary Notes**
- **Design Notes**

Both of which are available on the web site at [https://traders.scalefour.org/greatcentralmodels/](https://traders.scalefour.org/greatcentralmodels/) on the ‘instructions’ page.
**Locomotive Chassis**

**0.015' 0.375 mm Nickel Silver**

**Locomotive Frame**

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2. Frame Right - Sheet 4
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6. Front Buffer Beam Overlay - Sheet 4
7. Front Buffer Beam Draw Bar Plate - Sheet 4
8. Front Buffer Beam Draw Bar Plate - Sheet 4
9. Buffer Mount - Sheet 4 +opt
10. Buffer Mount - Sheet 4 +opt
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15. Rear Buffer Beam Draw Bar Plate - Sheet 4
16. Rear Buffer Housing Plate - Sheet 4
17. Rear Buffer Housing Plate - Sheet 4
18. Cab Base Support - Sheet 5
19. Firebox Base - Sheet 5
20. Firebox Side Right - Sheet 5
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25. Rear Frame Spacer Stiffener Left - Sheet 5
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37. Slide Bar Support Stiffener - Sheet 5
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64. Brake Pull - Sheet 4
65. Brake Pull Rear Bracket - Sheet 4
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67. Brake Pull Centre Bracket - Sheet 4
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69. Brake Pull Front Bracket - Sheet 4
70. Brake Pull Front Bracket - Sheet 4
71. Vacuum Cylinder Link - Sheet 4
72. Brake Mount - Sheet 4
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101. Coupling Rod Left Rear - Sheet 4
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**Common Parts**

1. Reversing Axle Tube 1/16" x 1/32" (1.6 mm x 0.8 mm) Eileen's BRT0201G (50 mm supplied)
2. Reversing Axle Rod 1/32" (0.8 mm) Eileen's BSW080A (50 mm supplied)
3. Valve Rod Tube (2.0 mm x 1.0 mm) Eileen's BRT0210G (20 mm supplied)
4. Valve Rod (1.0 mm) Eileen's NSW100A (120 mm supplied)
5. Brass Wire 0.3 mm Eileen's BSW031A (250 mm 2 supplied)
6. Brass Wire 0.45 mm Eileen's BSW045A (250 mm 2 supplied)
7. Brass Wire 0.7 mm Eileen's BSW070A (250 mm 1 supplied)
8. Coupling Rod Rivet Eileen's 08MBV07C Dome Head Brass Rivet 0.8 mm x 7 mm (2 supplied)
9. Vacuum Pipe Markits RVACTB (1 supplied)
10. Steam Heating Pipe Markits RVACSHTB (1 supplied)
11. Brass Round Tube 0.8 mm x 0.4 x 305 mm (MT2) Eileen's BRT0804D (smoke box hinges) (20 mm supplied)
12. 14 BA C/S (12 supplied)
13. Drwg. 211 Counter Weight (1 supplied)
14. Drwg. 212 Cylinder Front Early (2 supplied)
15. Drwg. 213 Cylinder Rear (2 supplied) or
16. Drwg. 351 Cylinder Front Later (2 supplied)
17. Drwg. 214 Drag Link Pin (1 supplied)
18. Drwg. 215 Eccentric Plate (4 supplied)
19. Drwg. 216 Rear Buffer (2 supplied)
20. Drwg. 217 Reversing Axle assembly guide see Drawing #24 in these instructions
21. Drwg. 218 Vacuum Cylinder (1 supplied)
22. Drwg. 219 Bogie Pivot (1 supplied)
23. Drwg. 224 Spring Hanger (6 supplied)
24. Drwg. 225 Bogie Axle Box (4 supplied)
25. Drwg. 226 MarkitsRAXF8sq601 axle boxes (6 supplied)
26. Drwg. 277 Drag Link (1 supplied)
27. Drwg. 323 Works Plates 19011906 (2 supplied)
28. Drwg. 346 8G Brakes (3 pairs supplied)
29. Hand Rail Knobs WD Short Markits M4HRKWDS 1.7 mm Pkt 12 £2.40 (12 supplied)
30. Spring Wire Ernie Ball Gauge 12 (2 x 200 mm supplied)
31. M1.6 Nut (2 supplied)
32. M1.6 Washers (2 supplied)
**Locomotive Body**

**0.012’ 0.3 mm Brass**

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**Common Parts**
- 1. Cab Roof Front Brace (‘L’) HobbyHolidays SSA1 M1 Equal Angle 1/32” (80 mm)

**Additional Parts Required not part of the kit**
- Wheels, motors and gears are a personal choice these were the ones used by the designer
- 23. Wheels Alan Gibson 4862E 5’ 2.5” Dia.
- 24. Crank Pins 4M42B Alan Gibson
- 25. Bogie Wheels G4842 3’ 6” Dia. Alan Gibson
- 26. High Level Gear Box HighFlier 40:1 2 mm shaft
- 27. Mashima Motor 2 mm shaft
- 28. Buffers AG 4M4901 £5.00 set of four or 4M4909 or Markits LNER Stepped
- 29. Markits Double Slide bar and Crosshead (M4CRHDns)
- 30. Markits Screw Couplings MCOUP/S

**Recommended Tool**
- 31. If 14 BA bolts are used to fix the cosmetic springs CSTB141 Carbon Steel Taper Tap 14BA

**Recommended little helpers**
- 32. Wood 100 mm x 20 mm x 45 mm
- 33. Balsa 3-4 mm thick
- 34. Dress Makers Pins
- 35. Miniature Bulldog Clips
Preparing the Frames (Fig. 01)

**Note**

Leave the main frames in the fret while preparing them. This a lot easier, only remove the frames from the fret when ready to join the frames together. This also applies to all small components such as those forming the motion.

**Note**

Note that the frames for this locomotive have a distinct bend inwards under the smoke box.

Measure the short (WD style) handrail tails which will be used for the springs (they will be about 0.7 mm diameter) and then drill out the 12 spring mount positions shown (and marked as 0.65 mm in the picture on the right) if you require active springing.

Push these WD handrails supplied into place on the inside of the frames, using a length of 0.3 mm steel wire through the holes to align them and solder them into place. Carefully file off the protruding tails on the outside of the frames.

**Tip**

Cover the tails to be filed with a piece of masking tape, then file over this tape until the handrail knob tail is the same level as the masking tape. Remove tape and finish off more carefully.

Drill out the holes for the cosmetic, removable springs, 6 each side, (located either side of the horn block slots) to 0.80 mm to clear 16 BA c/s bolts or 1.00 mm to clear 14 BA c/s bolts. Carefully countersink the outer face very slightly for the fixing bolts.

**Note**

The 14 BA option is advised.

Drill out the brake shaft holes, 3 each side, to 0.7 mm.

Drill out the reversing axle to 0.8 mm.

Solder #58-61 Brake Frame Mounts (front and centre axles only), #25, #26 Rear Frame Stiffeners, #28, #29 Centre Frame Stiffeners, 31,32 Valve Guide Support Stiffeners. Add spare #58 Brake Frame Mounts to the left frame only for the reversing axle, drill through 0.8 mm to clear.

Solder #20, #21 Fire Box Sides to the frames, using 0.45 mm NiSi wire - add a #58 Brake Frame Mount to each frame - see Figure 03.

Clean up cusp edges only where they will be visible - there are very few. Clean up the frames before starting to join them together.

**Joining the frames**

**Note**

Check progressively that the design width of 16.15 is not exceeded and remove the cusp as needed. Minimum width should be 16.05 mm. It may be necessary to leave one side part unsoldered until everything is in place and the measurements are acceptable. To help, there are frame gauges on the etch, #228, #229 P4 Spacers if needed although a digital micrometer will be better at showing where adjustments might be needed.

Starting from the rear, solder in place in the following order.
#18 Cab Base Support (Fig. 02) - this forms the box at the rear of the locomotive. Once this is solid the semi-curved tabs can be filed flat so that the body can sit on top of this.

#19 Fire Box Base (Fig. 04) - in the model this is the base for the motor etc. The holes are there for cables or ties.

#23, #24 Rear FrameSpacer & Brace (Fig. 05) - in the prototype locomotive this ties the frames together and provides support for the firebox

#27 Centre Frame Spacer (Fig. 06) - hole for spring wire to be near to the bottom - in the prototype this stops flexure of the frames by tying them together

#30 Valve Guide Support Spacer (Fig. 07) - coming towards the front of the locomotive this supports the two rods that go from the eccentric on the centre driver and into the cylinder block.

#39 Smoke Box Base (Fig. 08)

Add optional 8 BA nut to #39 Smoke Box Base underneath to enable screwing body and chassis together through the chimney. A more secure version is one which has a lip at one end which sits inside the smoke box etch.

#41 Footplate Fixing Bracket (Fig. 09) - it is easier to fit the buffer beam supports at the same time since the fixing bracket rests under the TAB on the buffer beam support. There are no other locating tabs for this part.

#40 Bogie Mount Fig. 11- solder into place - this should be the last frame spacer.
Now solder up all the internal frame parts checking that the outside measurements are 16.15 mm for P4. The lowest measurement is approximately 16.05 but anything more than 16.15 may impinge on the side play necessary for some curves.

Note
Clean the frames, inside and out, before the following step - the next parts are fitted from the outside of the frames

#37, #38 Slide Bar Stiffeners and #35, #36 Slide Bar Supports are fitted outside the frames using the two slots. Slot #35, #36 Slide Bar Supports in place and solder - see Fig. 10

#33 & #34 Cylinder Spacers (Figs. 12 & 13) - insert these into the frames, making sure they are the right way round, large hole at the rear. Lock these in place by threading a piece of 0.3 mm NiSi wire through the outer holes drilled to 0.35 mm (the inner holes are for EM frames) and solder in place. Remove the locking wire if possible

Insert Valve Rod Tube (2.00 mm x 1.00 mm) into the two larger holes at the centre so that they are 1 mm over at the back and 2 mm over at the front. Solder in place at one end. Ensure this is free for 1.0 mm NiSi rod, ease out if needed.

Solder the #50 - #53 Cylinder Heads in place between #33, #34 Cylinder Spacers making sure the ones with the larger holes are fitted to the rear spacer - see Fig. 13.

Before testing the fit for the front buffer beam assembly, check that the holes for the cylinder assembly and the parts for either Drwg. 212 Cylinder Front (early) or Drwg. 351 Cylinder Front (later) and Drwg. 213 Cylinder Rear are a good fit. Roll #54, #55 Cylinder Covers and test the fit but do not solder in place yet.

#44 & #45 Brake Cylinder Supports (Fig. 14)
Solder #44, #45 Brake Cylinder Supports in place and fold #56, #57 Safety Loops. Secure with a short length of 0.45 mm NiSi wire. These should be free to move.

Fit #96 & #97 Brake Cylinder Link on 1.0 mm NiSi wire and solder across #38, #39 Brake Axles. Add a small washer at each end and file to represent a rounded nut and washer.

Araldite Drwg. 218 Vacuum Cylinder in place using hole in #18 Cab Base as a guide, drill the centre hole and add #71 Vacuum Cylinder Link, using a short length of 0.45 NiSi wire to connect to #101 Brake Cylinder Link.

Note

Drwg. #218 Vacuum Cylinder should fit exactly between #44, #45 Brake Cylinder Supports.

#42 & #43 Sandboxes (Fig. 15) - fold to shape and solder in place, these will be a snug fit under the footplate

Rear Buffer Beam Assembly (Fig. 16)
The rear buffer beam has two layers, test fit #13 Rear Buffer Beam over the two TABS on the rear frames, making sure it is the correct way up and solder firmly into place. File this absolutely flat ready for the overlay.

Prepare #14 Rear Buffer Beam Overlay, #16, #17 Rear Buffer Beam Housing Plates and ensure that Drwg. 216 Rear Buffers will fit in the larger holes.

Solder #15, 16 Rear Buffer Beam Housing Plate over the centre of #14 Rear Buffer Beam Overlay.

Use 0.45 mm NiSi wires to locate #15, #16 Rear Buffer Beam Housing Plates and #14 Rear Buffer Beam Overlay onto #13 Rear Buffer Beam. Solder all together and trim the wires at front and rear. At the rear they will represent the heads of the fixing bolts.

Fit Drwg. 216 Rear Buffers in place and solder or glue.

Front Buffer Beam (Fig. 17)
The front buffer beam is two layers. Solder #7, #8 Front Buffer Beam Draw Bar Plates to the centre of #6 Front Buffer Beam Overlay.

Note
The AG Buffers have a rear turned piece to centre the spring wire, this is not really needed because similar holes have been etched in the buffer beams. A second buffer mount was added some time after the first prototypes were built when it was discovered that the buffers were too short.

If using the Alan Gibson 4M4901 buffers then solder one each of #9, #10 Buffer Mounts to the rear of these and drill through the 0.45 mm holes.

Fit #5 Front Buffer Beam over the ends of the frames soldering #11, #12 Buffer Beam Supports in place. File this absolutely flat ready for the overlay.

Clean the front face then if using two buffer mounts, drill out the holes in #5 Front Buffer Beam.

Thread some 0.45 mm NiSi wire through these holes them and solder in place. Ensure these are about 5 mm proud at the front.

Assemble #6 Front Buffer Beam Overlay over the front of #5 Front Buffer Beam carefully drawing this into place and solder. Use as little solder as possible.

Add #37 Footplate Fixing Bracket (if not already done), (see Fig. 09), this should rest under the over-large TABS on #11, #12 Buffer Beam Supports. The opening at the front is to allow space for a sprung coupler if needed.

**Brake Axles**

Insert 0.7 mm brass wire to act as the brake axles, these will need to be long enough to reach the outer edge of the wheels.

**Coupling Rods - see Fig. 18**

**Note**

There are several things to note here.

Bosses should be added to suit the model, at the rear to prevent the coupling rods touching the wheel rims and at the front to allow the connecting rod to traverse correctly.

The hole on the front coupling rods may need to be increased before soldering to the overlay on the back, this will allow the usual Alan Gibson nut to be fitted in reverse to the normal way and if done very carefully, it will be level with the front face of the coupling rod.

The coupling rods have a hinge, this is behind the centre driver.

Remove #100 - #119 Coupling Rods, Overlays and Coupling Bosses from the etch and solder together taking into account the above note. The hinges are 0.8 mm brass rivets and should be a loose fit after soldering to allow a modicum of side play in the coupling rods as well as some loose vertical movement.

**Connecting Rods - see Fig. 19**

Remove #120-#127 Connecting Rods and Overlays from the etch as well as #136 - #139 Connecting Rod
**End Overlays** from the etch and solder together.

**Valve Motion**

**Note**

The valve motion assemblies are mirror images about the centre line. Study the pictures carefully before soldering anything. This fitting is a definite optional item.

Assemble the left hand lower valve rod so that from the outside of the left rod, the fitting is #162 Outer Rod End Strip, then #158 Valve Rod Left Outer, then #166 Outer Rod End Spacer, then #163 Outer Rod End Strip.

Repeat this process for the similar parts on the right outer valve rod except that this is done as a mirror image.

Assemble the left hand inner rod so that from the outside of the inner rod, the fitting is #168 Inner Rod End Strip, #159 Valve Rod Left Inner, #172 Inner Rod End Spacer then #169 Inner Rod End Strip.

Repeat this process for the similar parts on the right inner valve rod except that this is done as a mirror image.

Drill Drwg. 215 Eccentric Plates (NiSi parts) so that they fit together either side of each pair of valve rods, ensuring that they are a good fit and can rotate easily with a little oil. The hole drilled can be either for a brass rivet, or 16 BA c/s bolts. Do not be over generous with the solder or everything will lock up solid! Ideally they should be 1.0 mm in overall width.

**Eccentrics**

**Note**

The main eccentric etching has a block on the rear with two holes, these are used to locate all the eccentric parts together. This can be filed to the usual semi-circle shape when completed.

Assemble the set #178 Eccentric Bracket, #182 Eccentric Short Bracket, #174 Eccentric

#175 Eccentric, #183 Eccentric Short Bracket and #179 Eccentric Bracket as a back-to-back pair, using the holes (drilled to 0.45 mm) and some NiSi wire to locate the parts exactly. Ensure the slot at the front is clear for a 0.38 NiSi to slide through it, this will be for the connection into the Steam Chamber.

Once satisfied with the assembly and the clearances, file the rear of the eccentric to the correct shape.

The front of the rods are fitted to the eccentric assembly with a short piece of 0.45 mm NiSi wire, check that the rods line up correctly and you have not reversed the rods. Use oil soaked paper to prevent solder seeping into the joint (Rizla).

The whole assembly should rotate freely. Ease out the main hole to 1/8" for the driving axle.

Repeat this for the right hand side.
Valve Rod and Tubes

#168, #169 Valve Rod Ends fit on the end of the 1.0 mm Valve Rod. The two remain together with the half etch in between and this wraps round the end of the rod, after drilling through the rod and filing the rod slightly flat. After soldering the arms of this assembly should then be able to slide inside the eccentric arms.

The hole at the pointy end of the #186, 187 Valve Rod Ends should then be aligned with the channel in the eccentric. It should be possible to link through these holes to join the Valve Rod and the Eccentric.

Lifting Arms

Note

This is what ‘should’ happen. While this whole assembly is highly visible, there are a number of compromises that can be made here where some motion is still achievable once the main rods (those connecting the third axle to the top and bottom holes in the eccentric) are added.

Assemble the #204 - #205 Lifting Arms and #192 - #203 Rotation Arm Assembly as shown in the diagram. The joint should be moveable (use the conventional Rizla Paper and oil).

The bottom end of the #204, #205 Lifting Arms fit on the outside of the Eccentric Assemblies and these joints should be moveable as well. The Valve Rod Assembly should still slide through the Eccentric Assemblies.

Repeat this for the other side.

Reversing Axle

Note

191 Reversing Arm Actuator is repeated on the left side of the diagram opposite just to aid the measurements, in real life there is no actuator on the left side.

The 0.8 mm reversing axle may be strengthened using 1.5 mm tubing, the measurements are shown in the drawing. Qty 2 tubes at 2.125 mm long for the outer parts and Qty 2 at 4.25 mm long for the inner parts. The left side will need a spare #58 Brake Frame Mount on the inside of the left chassis frame so that the same length part can be used, this is easier than having different length parts.

Reversing Rod

#188 - #189 Reversing Rod has two bends in it to avoid upsetting the boiler. At the front it connects to #191 Reversing Arm Actuator on the outside, free movement if possible. At the rear and inside the cab with #190 Reversing Arm Cab Arm the two arms fit either side of the Cab Reverser.

Assemble the reversing rod as shown in the diagram.

Brakes

Note

There is a choice between the whole metal brake and one which has a base of metal, on top of which is a 3D FED
brake shoe or a full Drwg. 346 Professional Plastic Brake Shoe Assembly.

This brake frame is extremely easy to bend out of shape - take care.

Add #69 Brake Pull Front Bracket, #67 Centre Brake Pull Bracket and #65 Rear Brake Pull Bracket to #64 Brake Pull to top and underneath.

Use 0.45 NiSi through all the holes to represent fixing bolts.

**Cylinders Front and Rear**

*Note*

The Cylinder Fronts had a ‘tail rod’ which was meant to help balance the main cylinder inside the cylinder block. These were removed at indefinite times and replaced by a cover with a rounded front face.

Push the previously curved cylinder covers over the cylinder spacers and first try the front cylinder cover in place, pushing it rearwards so that it is in contact with the cylinder spacer. Now add the rear cylinder cover and glue or solder these three parts in place.

**Slide Rails**

*Note*

An alternative to the solid bars recommended is to use the layers on the etch #209 - #220 Slide Bars, which will need filing to shape

The slide rails (or bars) are better made from NiSi rectangular filed to shape. Four are needed. Absolutely accurate measurements are not needed but there should be an obvious peak in the middle.

At the front, solder a pair to the top and bottom of the small cylinder at the back of the rear cylinder cover. At the rear, solder to #35 Slide Bar Support near to the outer end. Adjust these to match the centre line of the cylinder which is at 40” or 13.33 mm.

Check that the cross head will slide easily along the rails but not too loose.
Cosmetic Springs

There are two options. You can use the etch fittings as in the diagram, in which case drill the outer two holes for 14 BA or 16 BA C/S ¾" bolts and the centre one for a dummy 0.45 mm NiSi rod bolt. These can be as wide as needed, 5.5” is the normal width on the prototype.

The second option is the 3D printed version, Drwg. 355 Cosmetic Springs 8G, which are separately bolted to the chassis and may be removed individually as needed. They will be too wide for EM and ‘00’ modellers usually.

And finally

Note

All that remains now for the chassis is to fit eccentrics, wheels and springing to the chassis, add a motor when ready and do some tests of the running. Add brakes and cosmetic springs when confident that all is in good running order.
Preparing the body

Note

Many parts will be easier to fit with the part still attached to the main etch. The sequence of fitting various parts of the footplate, the cab and the valence is fiddly and may require adjustment later.

Footplate

Remove #9 Rear Footplate from the main etch, fit to a flat surface such as ¼ inch balsa, using sellotape. Fold up the centre section, these fit into the cab floor. Bend the two outer sections so that they are the same as the valence rear.

Remove #11 Footplate Main from the fret. Use a 1/8" sheet of balsa under it to bring it to the correct level for #9 Footplate Rear. Bend up the front curved sections to match the valence.

Footplate Front

The top of #10. Footplate Front may need annealing, it has a very sharp bend into the front of the smoke box.

Fit two short lengths of 0.45 mm brass wire on #10. Footplate Front to represent the opening handles. Bend up approximately to shape

Add three hinges along the front join. These will need a kink on one side to allow for the slope.

Cab Floor

Remove #63 Cab Floor from the etch and fold to shape, insert into the #9 Footplate Rear. Bend up the two side pieces by approximately 40 degrees, these will slot into the part of the fire box that protrudes into the cab.

Cupboards

Note

There is some doubt about the actual configuration of these cupboards, but allowing for the Class 8A being very similar in most respects to the Class 8, the same
versions have been used. These are also the slightly slimmer versions, by 1 mm approx., correcting earlier errors made before a good quality and scaleable picture was acquired.

Before removing #74, #75 Cupboards from the main etch, solder into place the two hinges, #76 - #77 Door Hinge, on each side. Add a piece of 0.45 mm brass wire for the door knob.

Remove #74, #75 Cupboards, #80, #81 Footboards and #82, #83 Shelves from the etch and bend to shape. Solder #74, #75 Cupboards into #63 Cab Floor so that it lies completely flat. Leave the shelves and footboards until later when the cab sides are in place.

**Cab Front**

Remove #64 - #67 Cab Window Overlays from the etch, carefully clean up any TAGS and solder into the front of #62 Cab Front while that is still attached to the main etch. Clean up extra solder overflow and then remove from the main etch.

If fitting a Ramsbottom 4-column safety valve then open up the two rectangular holes (half etched from the inside) to take the #112, #113 Ramsbottom Actuators from the etch, not the ones supplied with the casting.

**Cab Gauges**

Clean the rear of the cab gauges so they will lie flat on the inside. Turn #62 Cab Front over and solder the three cab gauges in place, as shown in the diagram, Drwg. 279 Cab Gauges. Do a serious clean up now as it will be impossible to do this once the cab is fully built.

These gauges are in the positions for the Class 8F, but are unlikely to be different across the Class 8 series.

**Fire Box**

While still in the main etch, measure and drill out in #41 Fire Box the holes for the Washout Plugs and the rear 2 mm handrail, solder these in place making sure you are soldering on the inside!

Score the half etch lines and fold to shape. Then, using a 3 mm rod (approximately), roll the half etch section from the inside taking care not to create a line at the join with the full etch top and side. This is very visible.

Remove #48 Fire Box Braces from the etch, file off any excess TAGS on the outer edge and using 0.45 brass wire, locate 5 or 6 of these inside the #41 Fire Box.

Fit this assembly into the front of #62 Cab Front, using all six TABS and SLOTS. File flat any TABS protruding from the rear or the fire box section inside the cab will not fit.

Test fit this assembly into the #11 Footplate Main, using the TAB on the fire box side it should be flat against the floor of the footplate at the rear.
Use a length of 0.45 wire, align the hand rail knob with the hole which is just under the rectangular windows.

Do not solder to footplate just yet.

**Fire Box inside Cab**

Remove #42 Fire Box Cab from the etch, score the half etch lines and fold to shape. Then, using a 3 mm rod (approximately), roll the half etch section from the inside taking care not to create a line at the join with the full etch top and side.

Remove #8 Fire Box Braces from the etch, file off any excess TAGS on the outer edge and using 0.45 brass wire, locate 3 or 4 of these inside the #42 Fire Box Cab.

Use a goodly amount of solder to secure these parts. Check the accuracy and squareness.

File the TAB so that the fire box will lie flat against the inside of the cab front and such that it will fit into the central slot on the inside of the #62 Cab Front.

Tack solder a couple of places where it will not be visible when added to the cupboards/cab floor assembly.

**Cab Sides**

The cab sides have a half etch hole located approximately at the centre, for builders who want a brass GCR number plate, this will need to be drilled through from the inside and the outside filed flat for the number plate.

In this case, draw vertical and horizontal pencil lines through the hole to locate the number plate. The lines should line up with the rivets on the number plate. Solder into place and clean up.

Insert the grab handle using 0.45 NiSi and clean up.

Solder #56, #57 Cab Sides into the footplate, getting it as tight to the back of the cupboards as possible, then run a bit of solder where the cupboard meets #56, #57 Cab Sides.

Now fit and solder the cab front assembly and fire box to the footplate, locate it with the cab sides and tack solder in place. At this stage there will be a virtually solid box for the back of the engine. Ensure the curved part of the #9 Footplate Rear are positioned correctly.

Add #80, #81 Footboards and #82, #83 Shelves to the cupboards, either solder or use superglue. The cab sides should be right up against the cupboards and the shelves should fit right against the back of the cab front.

Add #60, #61 Edging Strip, using 0.45 mm NiSi rod to locate it. Note the edging strip has the half edge which sits on the cab side right to the end at the top only. This allows it to sit properly along the top edge.

**Boiler**

**Note**
An alternative to rolling the boiler is to use 21 mm brass tube but the holes for the handrail knobs will have to be worked out. Any cut-outs for the motor and gear box will have to be done before assembly.

Roll #1 Boiler, ensuring that the location marks are on the outside. Check the measurements since rolling on modellers tools will not produce a perfect cylinder. The best measurement is to put it against the firebox and look for any overlap. If needed, file length and equally, the join before soldering up.

Add #2 Boiler Front and #3 Boiler Rear to the boiler at a convenient position, these are not really needed but may look reassuring.

Fold up #4 Smoke Box Frame. At this point laying it on the supporting balsa will allow a check to be made of the boiler position, which should match the top of the fire box as well as rest on the smoke box frame.

Roll #5 Smoke Box to shape, this will be easier if it is annealed since it is a complex shape.

Note

Use the holes at the top and the holes for the handrails with some wire to hold these in the correct position.

Roll #6 Smoke Box Wrapper to shape, this is half etched so will be easier than the main wrapper. If superheated or any boiler repairs have been done use the riveted version #7 Smoke Box Wrapper Riveted

Both #5 Smoke Box and #6 Smoke Box Wrapper are slightly longer than needed, this will make it easier to assure a good joint which then will be filed across the base of the finished smoke box assembly so it can rest in good contact with the footplate.

Before test fitting the smoke box assembly, slot #3, #4 Upper Frames into the foot plate.

Now check that the Smoke Box Assembly will fit comfortably between #3, #4 Upper Frames without forcing them sideways. File the bottom end of #4 Smoke Box Frame just enough to ensure this or ease out the slots for the #3, #4 Upper Frames. Add #259 Upper Spacer behind Smoke Box which slots into #3, #4 Upper Frames. The holes in the NiSi smoke box top on the chassis and the bottom of the brass smoke box should align.

Then solder up the smoke box assembly. At this stage is should be a tight fit onto the main boiler yet still be able to slide into position using the location mark on the boiler. If the boiler has been rolled the solder join may/will be slightly out of shape and the rear of #4 Smoke Box Frame will need filing to suit.

Add 2.0 mm handrail knobs to the main boiler and 1.6 mm handrail knob to the sides (not the top) of the smoke box assembly.

**Splashers**

Solder #14 - #17 Splasher Sides to footplate. Roll #18 - #21 Splasher Tops Rear shape and solder in place.

Add 0.45 mm NiSi wire to form the hand rail on top of the centre splashers.

**Steps & Footplate Supports**

There are two pairs of steps. The rear steps are identical to those on the tender but use the supporting brace from the etch for the centre steps.

Fold #22 - #25 Footplate Support and insert #26 - #29 Footplate Support Brace. Four of these will support the footplate, two behind the centre steps and two by the gaps between the centre and rear splashers. These are optional, and if soldered to the footplate care should be taken to make sure they fit over the frames on the chassis.

Note that the rear steps are handed.
46. Footplate Completed

#84 Centre Step Plate and #90 Rear Step Plate are bent very slightly inwards (just the thickness of the brass) just under the valence. Lay these parts flat on a piece of the balsa and bend just enough so that a spare piece of 0.3 mm brass sheet will lie under the top sections.

Choose which steps are required, the ones with an edge on them (only introduced later when the builders discovered that feet could slide off the steps in bad weather conditions) or the earlier version.

Fold the steps counter-intuitively, i.e. so that the half edge slot is on the outside. This gives solder a better chance of creating a supporting sliver for supporting these fragile parts. It is also worth while soldering a ‘D’ section wire or similar to the rear of the centre steps to give some extra resilience. Use heat sinks!

Clean up and put on one side until the valence has been fitted.

Fixing the boiler

While the footplate is still fixed to the balsa mounts, solder the boiler to the firebox using the location marks. Slide the smoke box assembly onto the front of the boiler and tack solder it to the footplate, again ensuring that the two holes in the smoke box assembly and the footplate are aligned. The location mark on the boiler should be showing to make sure the insertion is at the correct depth.

Roof

Roll #68 Roof to shape with the half etch holes on the inside. Decide how many Drwg. 229 Whistles to have and select the correct blanking plate to suit, so the roof can have 0, 1 or 2 whistles. Very early there were two whistles, later there was only one and in LNER days the whistle was on the front of the cab.

Early - 2 whistles - no blanking plate
Later - 1 whistle - use blanking plate with single hole
LNER - whistle moved to front of cab - use blanking plate with no holes

The top of the roof had 2” braces, ‘L’ and ‘T’ shaped. Just inside the rear of the can there was another ‘L’ brace.

**Chimney, Dome and Safety Valves**

*Note*

*When drilling the following holes, do it by increments, do not use a power tool, a hand held pin chuck will be best. Any exuberance here will tear the metal.*

Fit the Ramsbottom Safety Valves (AG 4M778) by drilling out the centre hole in the fire box. The tail on the safety valve can be shortened to 0.5 mm. Use Araldite to fit it permanently.

If Ross Pop Valves are to be fitted, use the two outer holes only.

Slowly drill out the fixing hole for the Drwg. 202 Dome, this will normally be 5 mm. Normal rolling of the boiler for a 5 mm hole will leave a lump here which is difficult to hide, so it is best to start small and edge up using a broach - using a small file to clear any humps. The tail of the dome will be the 5 mm insert into the dome itself with a larger part from the lathe work.

Cut this tail about 2 mm from the base of the dome at the centre. Use Araldite to fit it permanently. Taking care that there is no glue between the base of the dome and the top of the boiler.

#342 Chimney Original 8G may not need a larger hole unless you wish to fix the body to the chassis through a fixing nut on #39 Smoke Box Base. If a larger hole is needed, take extra care since the smoke box wrapper is very thin.

Use Araldite to secure all three parts, for the chimney it should be for preference a fast acting (<5 minutes) Araldite. Again ensure there is no glue between the base of the chimney and the top of the smoke box.

Smoke Box Door

Solder #255 Smoke Box Hinge to Drwg. 258 Smoke Box Door, using the half etch extensions to create the fixing part of the hinge. The fixing rod is 0.45 mm NiSi and the bolts are 0.8 mm tube, two short lengths.

Araldite GCR SmokeBox Door Handle in place. Choose #256. Smoke Box Door Rim, the half etch. This forms the polished rim around the smoke box before the LNER found their paint brushes. The half etch version is more accurate.

Do not fit these in place for the pre-grouping paint work until everything has been painted, then Araldite will be best.

**Inspection Covers**

#43 - #47 Inspection Covers are fitted on the centre line of the fire box curve and should be curved to suit. There are three on the left and two on the right. The dimensions for these are not available on the GA, nor is the spacing, but translating from pictures gives, from the front of the fire box, 3 mm, 14 mm and 22 mm for the left side and therefore 8 mm and 18 mm on the right side. Check pictures!

These should be fitted on the mid-point of the curved section. If soldering, it may be useful to make with a soft pencil the drilling points and then very gently drill 0.45 mm holes in these places and fit a short piece of wire, remembering this section is half-etched.

**Lamp Holders**

*Note*
The etched #121-123 Lamp Brackets for the footplate are fragile. It is common to replace these with staples cut to shape, soldered through the footplate and only the flat bit of the etched component used to finish the look. If using staples, postpone this until after the body has been removed from the balsa support.

**Smoke Box Side Cover (Drwg. #203)**

Solder or Araldite the Smoke Box Side Covers in place, they fit right up against the front splasher cover. If soldering, it may be easier to ‘tin’ the footplate first.

**Oil Boxes (Drwg. #205)**

Fit six oil boxes around the front splasher. (Remember there are also two more on #36 Smoke Box Base.)

**Now for the “Big Moment”**

Carefully separate the body from the balsa, preferably cutting along the sellotape, removing this later. Although the risk of a serious bend is now much reduced and the footplate should be level, it is still possible to cause damage which will now be difficult to correct.

**Valence & Steps**

The valence is difficult to solder correctly. Towards the front there are a couple of half-etched dots which mark the curve start and end points, these should be on the inside of the bend. It is best to connect the body to the chassis so that the front of the valence will act as a starting point.

The outside of the #12 - #13 Valence should be 0.5 mm from the edge of the footplate.

Soldering is best done by heating the footplate - not the valence - which will mitigate any untoward expansion. Tack solder at small intervals towards the rear. After only a few of these tacks it is better to let things cool down before continuing. A 6” ruler is a good aid to getting things straight.

Fit the steps behind the valence using heat sinks to stop the steps falling off. Tack solder the back plate to the footplate first then gently tidy up, being careful not to let the assembly too warm. Pour stiff drink!

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50. Valence and Steps

- **#13 Valence Left**
- **Centre Step Assembly**
- **Frame Support Assembly**
- **Rear Step Assembly**
- **Curve outwards at the point where the footplate raises**