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GER G40/LNER Y5 Loco Kit

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West Midlands
B65 9SH

GER G40/LNER Y5 Loco

History

The GER purchased two locomotives from Neilsons in 1874, of their 12" Mineral design and two more in 1876, being described as '209 class'. These open cab locos were fitted with cast iron wheels, handbrake only and with spring buffers, which were soon replaced. Rebuilding in 1894 with new boilers and cabs produced a design (G40 class) that was copied by Stratford in 1897/1904 adding 4 more locos to the class. Steam brakes were fitted to the first 6 locos from 1903-1908 (the 1904 pair being fitted from new). All surviving locos were classed Y5 by the LNER

Loco	built	1 st rebuild	2 nd rebuild	LNER no.	2 nd LNER	Withdrawn
209	1874	1894	1907	7209 (2/25)		11/1926
210	1875	1894	1908			9/1914
228	1876	1894	1906	07228 (1/24)		6/1927a
229	1876	1894	1906			2/1917b
226	1897					8/1911
227	1897					12/1911
230	1903			7230 (10/25)	8081	4/1948
231	1903			7231 (3/26)		7/1931c

- a: To duplicate list and renumbered 0228 in July 1914
- b: Sold to Fairfield Shipbuilding, Chepstow and now preserved
- c: Fitted with tram plates & cowcatcher in late GER period, but removed mid 1920's

Livery

First two locos originally light green, lined white/black/white with chocolate frames, second two probably black with red lining. From 1890 GER black livery with red lining, later plain grey. At withdrawal 209 and 0228 were in grey livery with yellow lettering as LNER 7209 and 07228. 7230/1 were repainted black (lined red for 7230) in the LNER style around 1924/5, 7230 received plain black with the company initials abbreviated to NE In 1944 and was renumbered 8081 in December 1946

References

Locomotives Illustrated no. 122
Model Railways August 1972 – detailed article by John Gardner
RCTS Locos of the LNER part 9B
Yeardons register of LNER locos vol.32
Great Eastern Society notes and drawings by John Gardner

WEB info

Detailed photos of No 229 -
<http://www.flickr.com/photos/demu1037/sets/72157635476355693/>

Info on the GE in general (and some specific to 209/G40 class) on the online blog - Basilica fields: <http://basilicafields.wordpress.com/>

Also the GE society:
<http://www.gersociety.org.uk/>

Kit scope

This kit will build Neilson built 209 class locos 228/229 (from their 1894 rebuild) and Stratford G40 class 226/227 (1897) and 230/231 (1903)

Add on packs and parts are available for some of the variations:

Early type frames fitted to 209/210 which enables these two locos to be modelled in their 1907 onwards condition with steam brake. Prior to this date these two retained wooden brake blocks so are not currently covered by the parts available

GER taper or parallel buffers fitted to 228 & 230 from 1919

Tramway plates and cowcatchers fitted to 231 in the late GE/early LNER period.

Air and vacuum brake fittings fitted for brake testing to 228 (from 1919) & 230 from 1916-44

Wheels

The first four locos had 3'6" cast iron T section 8 spoked wheels until at least their second rebuild in the 1900's. These wheels did not carry balance weights. Most received cast steel wheels with balance weights at this time, although it is believed that 229 at least retained the cast iron type. The Stratford built engines had cast steel wheels with balance weights from new. To complete the kit appropriate wheels are required, Slaters produce a 3'7 wheel ref 7843Y, but this has the crank pin in line with the spokes rather than between. Their 7842W is better, which, despite being described as 3' 6" is not noticeably smaller. They also produce a cast type wheel ref 7844T which is a good match for the Neilson series pre 1908. Walsall ref D69 may also be appropriate if you prefer a metal wheel.

Notes on earlier versions

If modelling 209/210 you need the appropriate add on pack containing the additional old style frames (25), Coupling rods (26), boss (27) and handbrake lever (28). Post 1908, the frames and rods replace the appropriate parts in the standard kit and with the handbrake shaft bearings removed, the cast brake shaft bracket is used (over the rear hole in the frames) to support the shaft in a similar position to that on the other locos.

With some scratch building it is possible to create a model of 209/210 prior to rebuilding. The pack includes parts for the early type handbrake mechanism (28) which is fitted to the shaft between the frames pointing forward and lined up with a hole for the handbrake column drilled where marked by a half etch circle. Wooden brake blocks need to be made by you.

Earlier cab less versions are also possible as an etched fire box wrapper is available, but again, further parts will be needed to complete a model in this condition.

Notes for 7230 as running in the 1930's as carriage testing & exhibition loco

This loco was equipped with vacuum/air brakes and steam heat, plus sprung buffers for testing overhauled coaches at Stratford. Parts for these need to be purchased separately but the kit includes coal rail inserts and safety valve shields which remained on the loco when the other parts were removed in 1944.

Additional parts required

Motor

In these instructions I describe the fitting of a Mashima 1833/Roxey 40:1 gear box (as I had one!) so adjust the process dependant on the actual unit you decide to fit - this simple solution (available from Roxey, Connoisseur etc.), requires a portion of the lower boiler and some of the lower firebox to be removed to provide space. A more elegant solution would be to obtain a tall narrow gearbox from one of the specialists (ABC or MSC), remove the locating flanges from the boiler bottom and secure this to the springs. It would then provide a cradle for the motor, providing a drive that was almost fully hidden.

Pick ups

The frames have holes to accommodate Slaters' plunger type (ref 7157), but other types can be accommodated.

Springing/hornblocks

The frames are marked on the inside to take the Slaters etched type (12mm cut-out); however this would severely weaken them and for this type of loco are not necessary. They are also marked on the outside with the outline of the actual horn guides – don't mix these lines up. Note: some other hornblocks use a 10.5 mm cut out, if you do decide to use hornblocks, check carefully before cutting the frame.

Crankpin bushes

Due to limited clearance behind the crosshead, conventional crank pin arrangements can cause problems, conventional assembly using a washer and nut is also problematic. A budget way is fit the washer to the wheel, with the bush outwards and secure with a dab of solder. A better solution is to use 10ba tapped crankpin bushes available from Gladiator models which involves replacing the Slater's components supplied with their wheels with a 10BA nut/bolt/washer and in some cases reversing the bush so that the flange holds the rod in place, giving a stronger assembly and more clearance when compared to the original 12ba.

Introduction to kit building

Etchings

Cut the brass parts from the fret using a *sharp* craft knife (or similar) on a firm surface rather than using tin snips as these can distort the delicate etchings. The etching process leaves a small 'cusp' on the edge of the parts which should be gently filed to remove, along with any remains of the tab. This is essential to enable the parts to locate accurately as well as providing a smooth edge, which as well as looking better, provides a better surface for the paint to stick to.

Castings

These are supplied either attached to sprues or loose, if the former carefully cut from the sprue and (in both instances) clean up the remaining feed and any area you intend to solder to. If the casting forms a moving part, the relevant surfaces will need smoothing to ensure free running. Using fine files and emery cloth or other fine abrasive sheet to give a polished finish will pay dividends in reliable operation.

Folds

Generally all fold lines are on the inside of the bend, if not this is stated in the instructions. Folding can be performed in a number of ways, such as using smooth jawed pliers up elaborate folding bars. Clamping the part to a flat surface with a steel rule and using a second one to perform the folding action can be very effective. Long folds are ok as they are, but any shorter than about 10mm, and especially very small ones (less than 3mm), will benefit from a reinforcing fillet of solder.

Solder

This kit is designed for solder assembly using either 188 degree solder (brass to brass), 145 degree (brass to whitemetal) or 'lowmelt' 70 degree for whitemetal only joints. Where the term 'solder' is used in these instructions it will refer to any of these methods. It is up to you to decide the appropriate type and use the correct flux and iron for the job.

Glue

Some small parts can be added with glue. Use a good quality product and follow the manufacturers' instructions.

Cleaning

Keeping the model clean is a vital part of a good final finish. Flux residues and metal filings build up so always wash this off at regular intervals, especially at the end of a modelling session when you are not going to resume for a day or two. Occasionally I will wash the model during a session if it gets particularly bad. Several products such as lime scale remover or scouring cleaners can be used, but some, such as most washing up liquids do contain chemicals to give added shine which then need to be removed before painting.

Paint

Before painting the model should be thoroughly cleaned to remove any remaining flux, dirt or other construction debris. Allow to dry completely before painting. It is best to use some sort of etch primer, but providing the model is completely grease free, acrylic car paint (Grey primer, then black, in spray cans) will provide a good finish.

Photographs

These instructions are a guide to assembling the kit, but in order to get an accurate model, due to the number of variations, reference photographs are essential (see section on page 2). I have also included my reference set of no229 as preserved online:

<http://www.flickr.com/photos/demu1037/sets/72157635476355693/>

These help with many of the details not visible in period shots, but note that the loco does not have all its fittings and some details changed during industrial service.

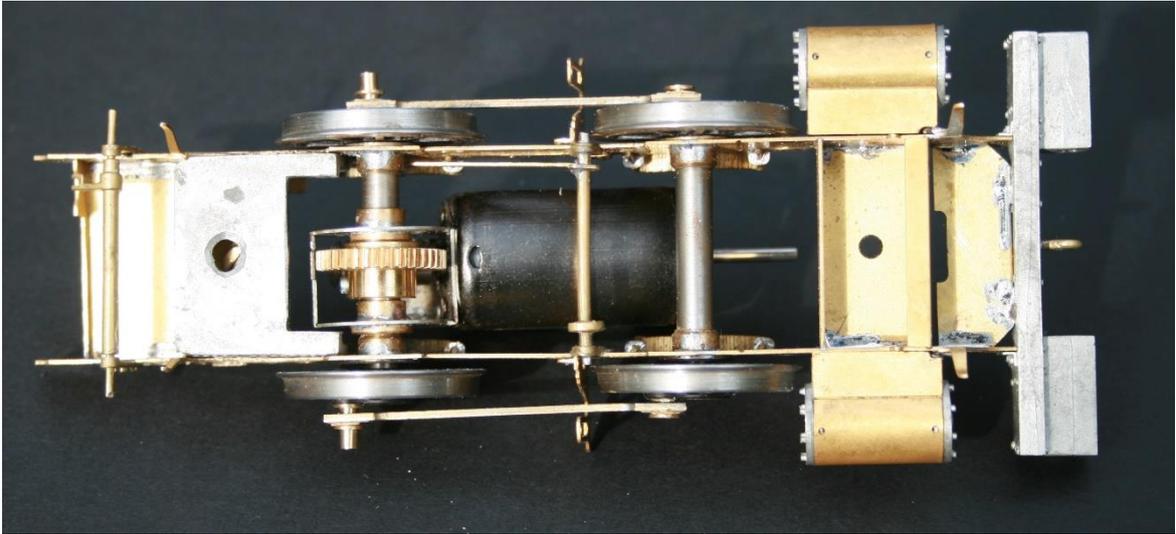
Orientation

When referring to left/right hand it is as looking forward from the cab – the right hand side is the driver's side with a cut out in the floor and cab front for the reversing lever on this side. The round hole for the handbrake is on the left/fireman's side rear of the footplate.

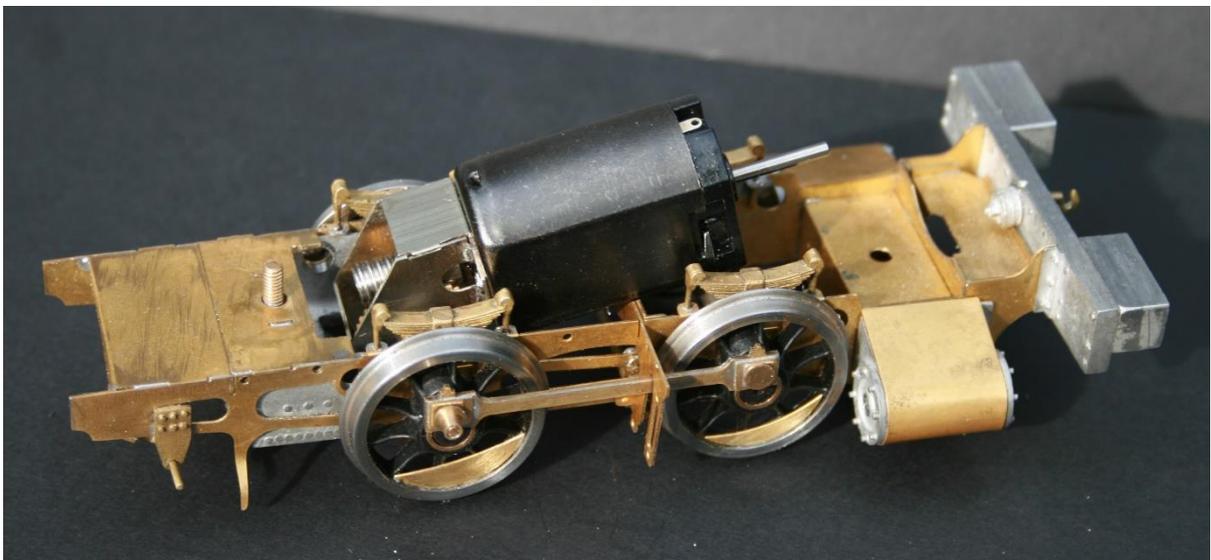
Construction

Frames

1. Remove frames (1) from fret. Fold spring brackets and reinforce with solder. Form rivets on guardirons (12/13) and attach to frames. Add a short (3mm) piece of 0.7mm wire to the hole behind the spacer slot on the drivers side frame – the draincock rocker lever (16) fits on this but will need trimming if using plunger pickups. A half etch mark is provided so a second piece of wire can be added to form a support strut if required.
2. Fit cast reverser shaft brackets to inside bottom edge where shown by 2 short half etch lines. Fit one brake shaft bracket, etch part 10 for handbrake only, or cast part for steam braked locos. This locates just outboard of the guardiron. The other bracket and shaft is best left until the frames are assembled. If producing a handbrake only loco, remove the crank from the brake shaft or replace with tube/wire. Drill holes in brake and reverser shaft brackets to match the appropriate shaft.
3. Assemble reversing lever (69) and rod (68) using a small piece of 0.9mm wire. Check lever fits on shaft – it locates on the right hand side with the balance spring to the left side but leave loose on shaft until axle bushes are fitted.
4. Check axle bush holes and open out if needed. Assemble frames with two front spacers (2F & 2R), reverser shaft and rear spacer (6) and tack joints.
5. Fit axle bushes to frames. Before fixing check that the width is less than the distance between the backs of the wheels you are using - thin the bushes if required so the wheels do not bind. Assemble bushes with wheels and check chassis is level and square. Remove wheels to keep them away from flux etc. Fix loose end of reverser shaft to top of the rear axle bearing, then fix lever to the shaft.
6. Form rivets, fold and fit motion bracket gusset plate (8) – using a piece of scrap etch through the motion plate slots to position the gusset plate forward of the slots. Be careful not to solder the scrap plate to anything.
7. Fold flanges on Part 3 (a or b - depending on loco being modelled). Ensure a smooth fit between frames by filing the outer sides of the flanges if required, then fit between the front frames, level with the bottom of the coupling hole in the bufferbeam (use the cast buffer beam as a guide), usually flange downwards but in some cases it appears the flange was on top (especially the one with the half etch). If fitting this way up, a half moon cut-out will be required in the front flange to clear the coupling spring.
8. In order to access the body retaining screw the lower firebox casting needs a hole drilled in the bottom – see photo 3. Place casting in the frames, hard up to the rear spacer and from the top mark the position of the body securing hole through from the top of the spacer. Drill to about 4mm, depending on your available screwdriver. It is best to drill the hole in stages, starting with a small (1mm) drill as larger drills have a tendency to wander in whitemetal.
9. Most gearboxes will require some metal to be removed from the front of the lower firebox casting, to fit the Mashima/Roxey combination, I removed a section 6mm deep, 20 mm wide as per the photo below.



10. Fold captive screw plate (5) and fit a 6ba bolt and nut, but do not fully tighten. Solder nut to bolt and plate to fixing spacer (4). This enables the body to be easily removed from the chassis, but without the difficulty of locating a screw in a very inaccessible place. Leave spacer loose for now as it may need trimming to fit the motor.
11. Bufferbeams - both front and back beams are the same, but some castings have an extra rivet on the top corners that is only present when spring buffers are fitted, remove this if fitting dumb buffers as supplied in the kit. If you are fitting spring buffers (7230) and don't have the rivet, please contact us for replacement beams with them on. Solder a cast coupling hook into the slot in the bufferbeams then add the cosmetic spring casting (round) to what will be the front beam and the spring cover (D shaped, flat side down) to the rear one. Add two buffer blocks to the front beam. Put the rear beam and blocks aside for later and fit the front one to the frames – buffer blocks upwards, top level with the upward extensions and frames between angle brackets on beam. Note – if constructing 231 with tramway skirts, it is best to fit the front beam to the body as it makes removing the chassis easier.
12. Fit with your chosen motor/gearbox assembly in place on an axle and test fit fixing spacer (4) (and lower firebox casting), removing metal to create clearance as required. Once happy, remove motor/gearbox and fit fixing spacer to the frames followed by the firebox casting. If using plunger pickups drill the holes out 3.8mm and the holes for the rear brake hangers and sandpipes 1.0 mm.



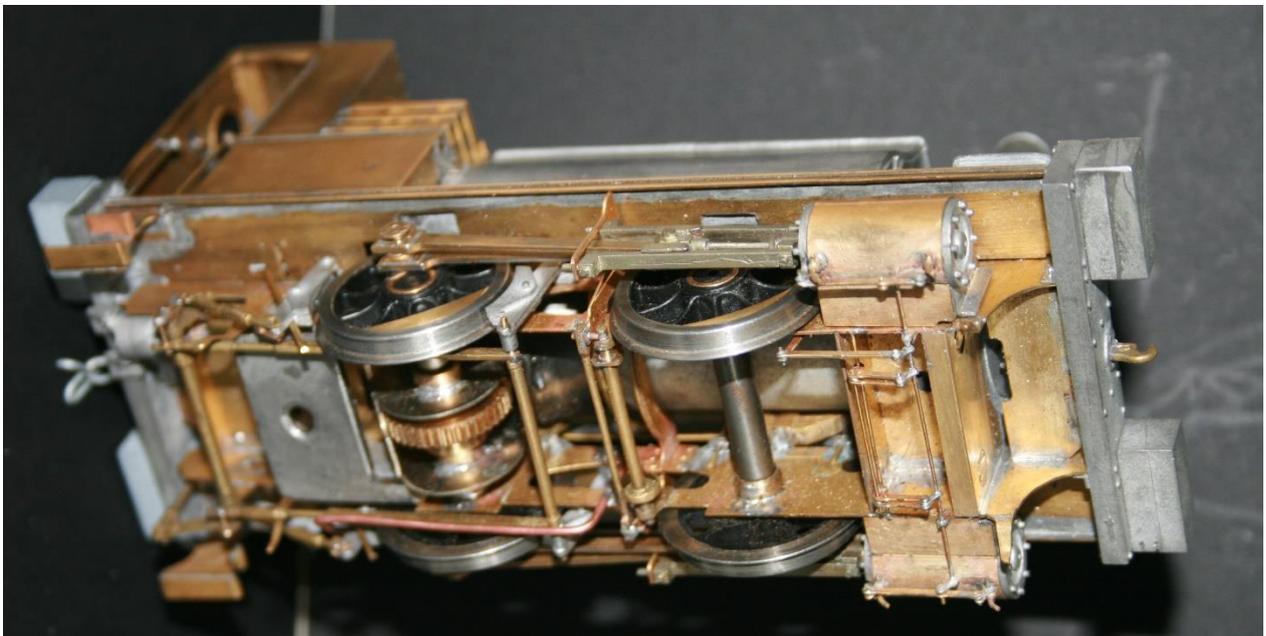
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13. Add cast springs to the mounting points on the frames, ensuring they do not stick out past the outside of the frames. When fitting the lower boiler there may be some trimming required to the top inner corners to get everything fitting snugly.
 14. Laminate coupling rods 2x (20) and add 2 crankpin bosses (20a), one each end over the crankpin holes. Clean up edges and drill holes 2.4 mm (if using Slaters crankpin bushes). Washers (20b) are used if required to space the rods on the rear bushes which helps keep the connecting rod parallel with the frames.
 15. If you have not already done so assemble wheels/axles and crankpins according to the manufactures instructions. There is very little clearance between the front crankpin and the crosshead so the front bush will need shortening as much as possible. One way to do this is to place the bush on a flat surface, hold the bush with the coupling rod and file the bush down until it is almost flush with surface of the rod. Conventional assembly using a washer and nut is also problematic, a budget way is fit the washer to the wheel, with the bush fitted flange outwards and secured with a dab of solder. A better solution is to use the 10ba tapped crankpin bushes available from Gladiator models.
 16. Fit wheels with coupling rods, motor gear box and pick ups, then test run the assembly to ensure no problems, you may need to remove some of the gearbox sides to provide clearance for the pickup housings – the motor needs some movement when fitting the body.
 17. Add motion plate (7 or 7a), motion plate (7) is to scale width and will cause clearance problems, (7a) is widened by 1.5 mm which provides sufficient clearance for normal running. Check running clearances but do not fix this plate in place until the complete chassis has been test run. The shape of the coupling rod cut seems to vary – a half etch line is provided to assist if you wish to alter this.

Cylinders and motion (not necessary on Tram loco)

18. Cylinder wrappers (14), these have half etched lines inside to assist forming the curve. Form round piece of rod (approx 6mm dia) using the whitemetal ends as a guide and when happy fix to the ends. They are a sliding fit on the front spacer extensions – don't fix until the running of the chassis has been checked (it is possible to leave until after painting & fix with an appropriate adhesive). There is a small overlap on the wrapper which should be gently filed (if necessary) to achieve a fit once the wheels are assembled – the cylinder centres should be as close as possible to the connecting rod and motion bracket centres, but to maintain clearances this may not always be possible . Note a small part of the front flange & wrapper should be filed to clear the front Guardirons.
19. Clean up slidebar/crosshead castings and drill piston rod hole 1.3mm, then polish rubbing surfaces to achieve a smooth sliding fit. Check fit of slidebars to back of cylinders, slightly open out the hole to fit if required. Laminate connecting rods 2x (21) and add big end brasses (22) to one side only. Clean up and drill big end 2.4mm. Brass pins are used to retain the little end in the crosshead with washers (21a) if needed. Depending on the wheels used, a small amount of metal may need to be removed from the inner faces of the end of the slidebars to avoid any binding on the connecting rods.
20. The draincock rod (15) runs between the springs and the wheels on the right hand (drivers) side, parallel with and approx 2 mm above the top of the frames. The wheels

will have to be removed so this can be soldered to the springs, but take care to avoid shorting the wheels; alternatively, if soldered to the spring hangers it can then be cut away between the splashers to avoid this. The rear end should line up with the sanding lever in the cab, the front with the top of the combination lever, if you trimmed this off to clear the pick ups, attach the cut section to the front end with wire and solder the cut end to the top of the frames.

21. Fit a 44mm length of 0.45mm wire through the small extensions at the front of the frames, with three draincock links (18) between the frames. Secure one of these links 1mm in on the right hand (drivers side) pointing down and rear, about 45 deg. Add rocker lever (16) to pin fitted in step 1 and join to link (18) with rod (17) and another 44mm piece of 0.45mm wire passed through all 3 links (18) A valve drain rod (19a) is also fitted to each side of the 2 not connected to rod 17 (they should point to the rear of the loco in line with draincock rod (17) when fixed). If trimming rocker lever (16) to clear pick ups, retain the end to fix to draincock rod (15) in the next step, it may also bend it slightly to clear the housing. The two links (18) are secured so they are at the same angle as the first link (using the wire as a jig), but spaced to line up with the valve rod holes in the rear of the spacer.; finally add a link (18) to each end of the wire in line with the other three links and solder these at both ends
22. Add draincock castings to the holes in the bottom of the cylinder wrappers with the curved pipe pointing forwards, locate cylinders on the frame spacer extensions and add a link (18) to the inner pin on each drain cock, pointing to the rear of the loco, parallel with the links on the end of the cross rod. Join these with link (19), the centre hole should fit on the end of the jig wire next to the outer link (18). Don't fix this joint until final assembly as you won't be able to remove the cylinders. The jig wire can then be removed by cutting out the portions between the various links

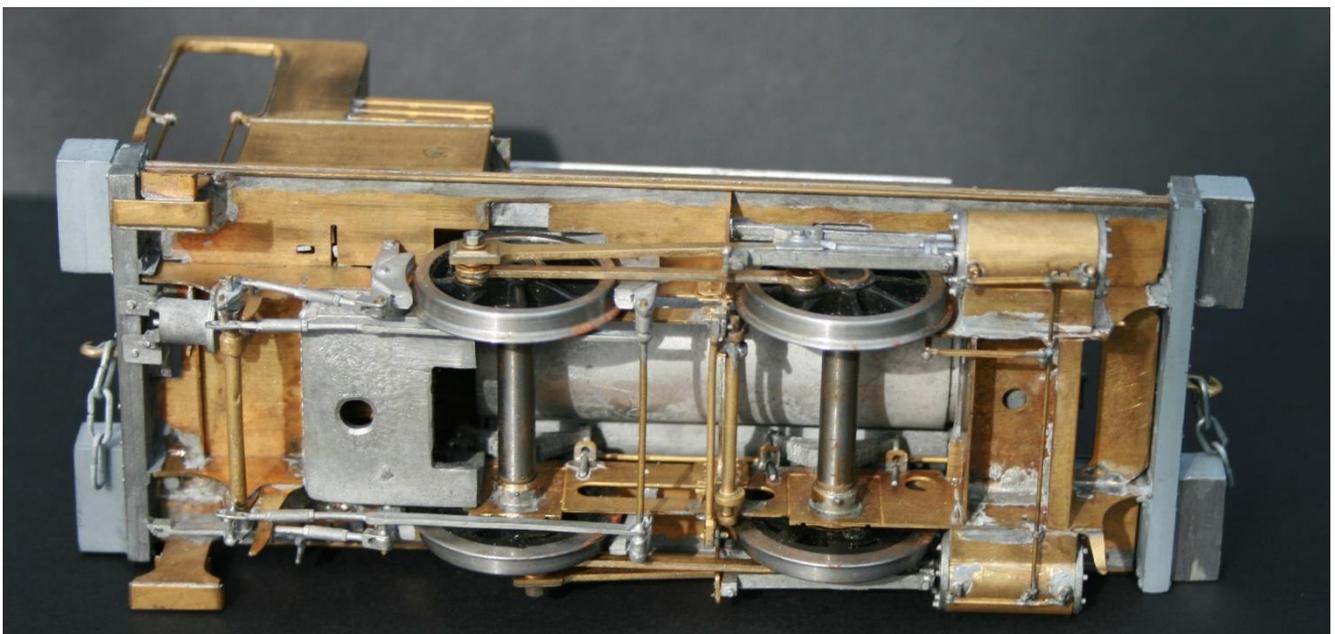


23. Some locos also had oil pot (Furness) lubricators on the cylinder fronts, fit these if required.
24. Fit balance weights (23 &24) to wheels – (23) to rear driving wheels and (24) to front, in both cases opposite the crankpin.
25. Fit coupling/connecting rods to chassis, with cylinders, slidebars and motion plate and test run. Once happy fix motion plate 7a to gusset/frames and add brace rod casting

to the bottom. Riveted brackets (9) fit either side of the frames to the rear of the motion plate. Use the ones on the small sheet with part 7a and ensure that the top is 0.4mm below the top of the frames otherwise the footplate will not fit correctly. Final fixing of cylinders and slidebars is left until the chassis is painted, so that the wheels can be removed and replaced

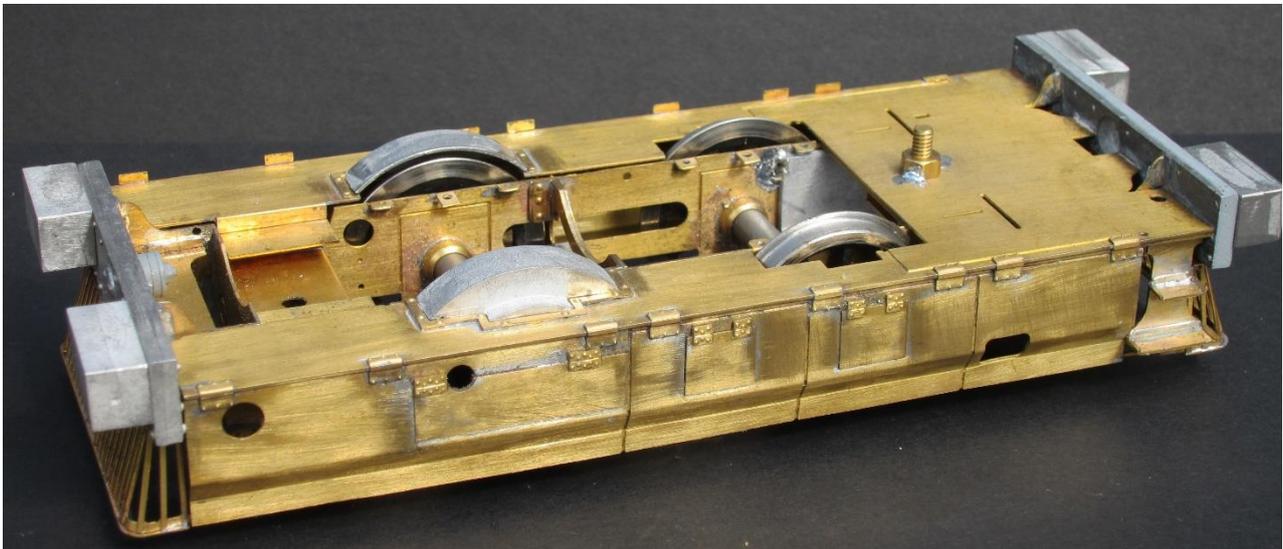
Brake gear and details

26. Add brake shaft with second shaft bracket (to match the one fitted earlier) to rear of frames, ensuring the shaft is level and square. Leave the shaft free but add the cranks to each end, so when vertical, the crank on the shaft is slightly towards the rear of the loco. The crank with the handbrake arm goes on the left (fireman's) side, pointing back.
27. Add cast brake hangars and shoes to the holes either side of the rear driving wheels, the front ones have an inward lower extension/spacer and these should have the long pull rods and cross bar inserted before fitting the second hangar (adjusting holes at the crank end. Fit the other end of the long pull rods to the (inside) lower end of the cranks with 0.7mm wire – there is a gap so start with a length of wire between both cranks, line up and fix, then remove the middle section. The short pull rod similarly fits between the rear brake hangars and top of the cranks. You may find it helpful to carve some of the blocks away to avoid shorts with the wheels, with careful adjustment it is possible to set the block so as to be able to remove the wheels.
28. Fit rear sandpipe using 0.9mm wire to hole in rear of frames, and bend downwards and at an angle towards the wheel at approx 45 degrees, it usually passes over the lower part of the rear brake hangar, but the shape varies and gets more bent as the years go by. Form rivets on brace (11) this fits approx halfway down the pipe and braces it to the frames (riveted end). Front sandpipes are similar but they follow the front of the cylinders before curving towards the wheel (and without the brace).
29. Fold front lampirons (63) to shape and add to bufferbeam. Alternatives are provided on supplementary etch (GE501) along with route discs. The other parts on this fret are not used on this model, although it does include spares of part 64. If constructing the tramway version, complete steps 30 – 32 before fitting the lamp irons

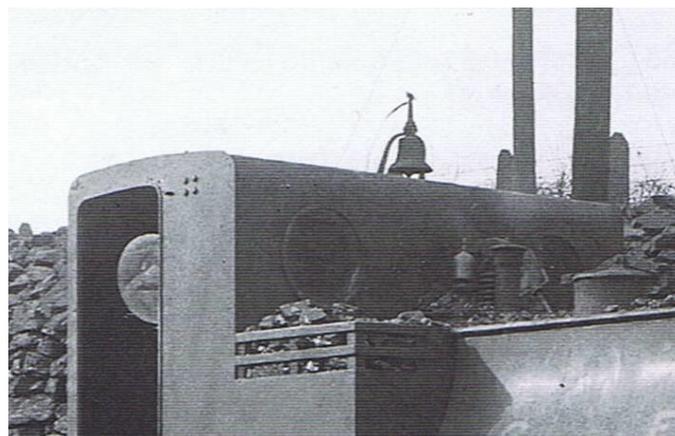


Tramway version

30. The cowcatchers (60) are delicate until assembled so handle carefully! Form rivets in the cow catchers and remove the four outer tabs. Bend the ends to approximate shape and tack to top (61) and bottom plates (62) with the four remaining tabs in the locating holes. Tack the ends, to create the basic shape and then solder outwards from the centre making sure the grille locates snugly to the top/bottom plates. Fit to cast buffer beams after these have been fitted to the loco.
31. Form side plates (56) to shape, the distance over the lower edges should be just wider than the width of the cowcatchers. Form hinge rivets on inspection cover overlays (57/58) and attach to side plates over the marked outlines. Fit side plates to footplate. Hinges (59) fit where marked with the half etch slot over the lip of the footplate. Once securely fixed to the side plate the top can be bent over 90 deg. to the top of the footplate (the fold is automatically in the outer half etch).
32. Fit front buffer beam to footplate, using the chassis to a guide for position – the top of the buffer beam is level with the upward extension of the frames.



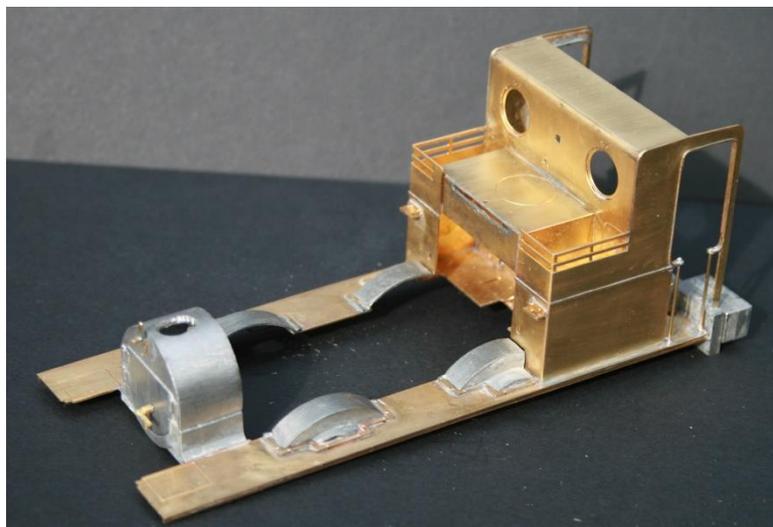
33. The loco was fitted with a bell on the top of the cab (not provided) – a possible source for this is <https://www.mantuamodel.co.uk/> - they have various sizes of bell available:
32380 5x6 mm, 32381 5x6.5 mm, 32390 6x8 mm, 32400 8x10 mm, 32401 3x4 mm
32401 seems about right, a suspension arm etc can be made from brass strip.



Footplate & cab

34. Note the cab handrail hole on the left (fireman's) side has been missed from the footplate, with reference to the hole on the other side, mark its position and drill 0.7mm. Fit splashers (32/33) and valances (31a) (or side plates) to footplate (31). Place on chassis and lightly tighten a 6BA nut on the retaining screw and solder the nut to the footplate (a small amount of oil/Vaseline on the thread will help avoid soldering the screw to the nut).
35. Remove cab sides (34/35) from fret (leave the reinforcing strut but remove small fret in the opening) and form any rivets required on your particular loco. Study a photo for complete accuracy, but as a generalisation, no rivets were present early on, the upper 4 (attachment for rear sand rod linkage inside the cab) appeared first on the Stratford built locos, possibly from new, and appearing later on Neilson Locos. On the fireman's side the lower 4 (lubricator) appeared around 1910 and the lower 4 on the drivers side on some locos about this time. 7230 had all of them by the time it received LNER livery. Fold bunker fronts and add bunker/side beading strips (48) to recesses on sides. Form to shape cab opening beading strips (39) to shape and fit to the openings with the thinner lip outwards.
36. Remove cab front (36) and form small rivets for cab windows & coal doors with a fine punch (I used a blunt sharp scriber, but a compass point will do the job). Note - the line of half etch dots at the top of these parts are not rivets but ventilation holes. (Neilson engines only) if modelling 209/210/228/229 open out with a 0.7 mm drill after forming the rivets.
37. Form rivets on coal doors (40 – note L&R are reversed!), fit to the inside cab front but match them to the half etch line on the outside - leave 0.5mm between the edge of the front and the hinges so that the cab front will locate in the sides correctly.
38. Fit inner window frames (41), fixing only the hinge to the top (with the 5 rivets) and the catch to the bottom (3 rivets & retaining pin). There will then be a small gap around the rest of the frame – hold it to a light to check it is even all round. The outer frames (without hinges) fit after painting, so keep these safe until then.
39. Remove cab rear (37) and form small rivets for cab windows (and drill ventilation holes if required) as with the front. Before bending the bottom angle, lay it centrally on the buffer beam casting with the main part of the back pointing outward, mark through the four small holes on to the top of whitemetal beam (buffer holes are uppermost) and drill 0.7mm. Fold lower flap and fit 4 locating pegs (from 0.7mm wire). Fit inner window frames (as you did with the front).
40. Form cab front/roof by laying part face down on a flat surface and bending roof section upwards, the curve should form naturally, check against sides as you go. Repeat with cab rear. There will be a small outward flare develop on the outer edges which may need to be *gently* smoothed to obtain a snug fit when assembling ends to sides.
41. Fit beading strips (42) to the opening in the cab back – note there is an inside piece and an outside piece – the inside piece being shorter. Add 3 handrail knobs and handrail from 0.7mm wire. This handrail was originally outside, but on several locos (notably 7230) was later fitted inside the cab! Fold and fit 3 lampirons (64)(x fold outside) to the rear of the cab where marked.

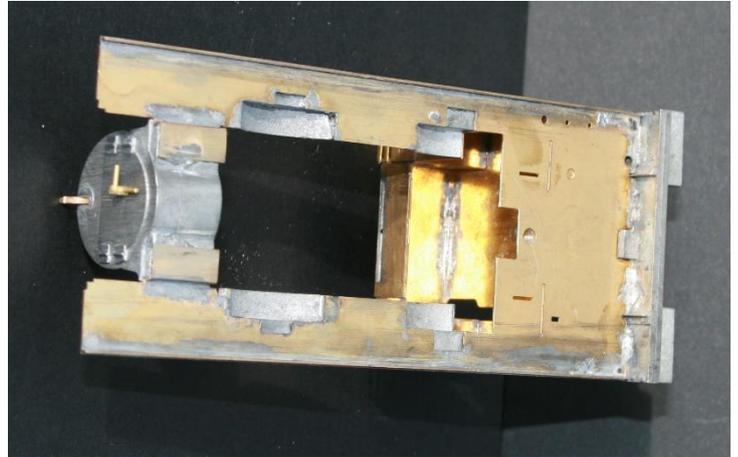
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42. Bunker/firebox top (38) – double fold front flap (fold line outside) and solder in place, especially the thin strip at the top, then bend to 90 deg. Make sure the slot is clear & will take the lip on the tank rear casting. Bend sides to match half etch line on cab front and solder front edges of bunker top to the front noting that only the inner layer of the front is inside these as it forms a rebate for the bunker fronts. The outer layer will then be flush with the bunker fronts on the cab side etch when assembled.
 43. Neilson locos only – remove bunker sides/fronfs above the beading strip and add the coal rails (50). The bunker top will require small slots to clear these so trial fit these parts and file 0.5mm deep slots to match the coal rail supports on the inside of the bunker sides.
 44. Front to sides - fit bunker top to cab front (do not solder yet) and tack sides to front, a small dab of solder around the area of the bend will do. Place the assembly on the footplate & check sides locate in ½ etch lines. Once happy solder cab to footplate and sides to front. Ensure bunker top is level and solder to bunker sides.
 45. Add steps (44) to bunker fronts – edge flush with side, rivets inboard and bottom of step level with ½ etch line. Fit cast splashers to bases.
 46. Fold and fit inner bunker/sandbox supports (43). These locate in the half etch line on the inside of the cab front but will require trimming on the top corner to clear the tab of the bunker top.
 47. Fit Rear bufferbeam (with coupling/spring protector attached) holes uppermost to rear of footplate with the top touching the bottom of the rear of the sides. Trial fit the cab rear, noting that the lip on the roof will need angling down slightly to match the downward slope of the front section. Mark the position of the rear of the cab sides and remove cab rear, then solder rear sides to the beam, leaving the rebate on inner edge clear of solder for the cab back to be fitted later.
 48. Add upper frames (31b) to floor where marked, inside the angles on the bufferbeam – this is one occasion where glue is the best option! Fixing the cab rear is left until later – it can be permanently fitted after cab detailing is complete (prior to painting) or left loose and fitted after the cab interior has been painted.
 49. Remove cab opening reinforcing and add handrails from 0.7 wire, the bottom of the rear ones attaching to the footplate/front of the rear buffer beam. Fit buffer block to buffer beam.



Tanks and smoke box

50. Fold the two footplate front flaps to provide a recessed ledge for the smokebox and temporarily fit body to chassis. Fit lamp iron (64) to centre of the raised circle on smokebox front and door lock to small hole on the front (in one door - which may need drilling out). Before fitting smokebox to the chassis, check the fit of the lower boiler in the smoke box and adjust as required to give a smooth fit.

51. Locate the smokebox on the ledge so that the front is hard up against the front chassis spacer. Once happy with the position fix to the ledge – there should be a small amount protruding at the rear of the smokebox enabling this to be tack soldered, test fit the tank to check all is square. Once chassis is removed, the smoke box can be soldered from underneath. A fixing hole can now be drilled 3mm and a 6ba nut fitted inside – however, I have found this fixing is not strictly necessary.



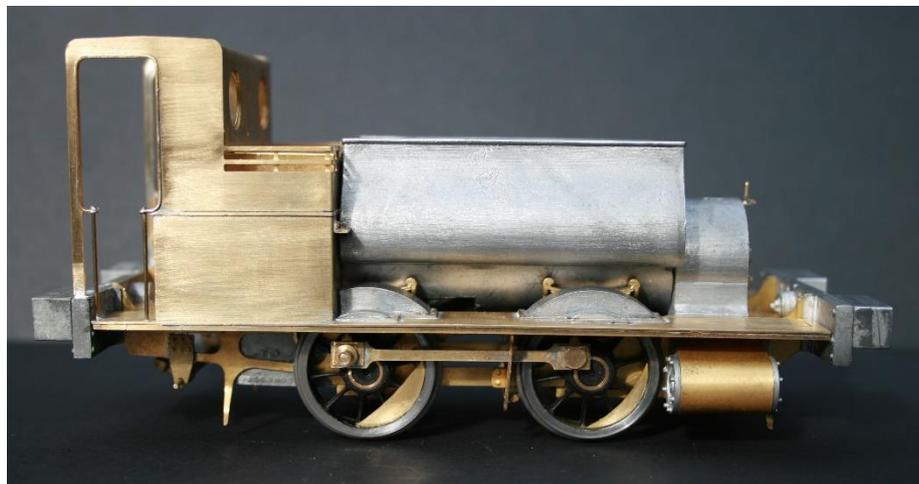
52. With the motor in place attach cab smokebox assembly to the chassis, establish what needs to be removed from the boiler, depending on the motor used (i.e. for a Mashima/40:1 set up, remove the thinned area at the rear of the boiler). Test fit the boiler, the lip at the front of the boiler should rest in the smokebox, with the boiler between the springs. Once the tank is assembled, you will need to check clearances.

53. Clean flash and burnish tank sides, ends, top and lower boiler castings. Drill two 1.2mm holes in the bottom lip of the tank for the balance pipe 2.5 mm in from the inner (straight) edge of the tank side casting. From period photos it appears that Stratford locos had this pipe 36mm from the front, just behind the clack and Neilson locos had it 45mm, just in front of the rear springs, however 229 has it in the forward position!

54. Assemble tank by fitting one end to one side. Check that the parts are at 90 deg and repeat with the other end and side – making sure you construct 2 identical 'L' assemblies. Join these together with the lower boiler loosely in place (make sure it's the right way round) and check they are square using the tank top, but do not fit this yet. Drill 4 holes for lubricators on tank fronts 0.9 mm and (if required) a 0.9mm hole for a pipe which only seems to be on 7230 in later years, 3.5mm down and 3.5mm offset to the fireman's side (strangely this pipe is also on 229 in preservation, but I have not noticed it on any other period photos).



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55. Test fit tanks/boiler to smokebox/bunker and check the motor clears the tank top, remove more metal from the lower boiler to clear the motor if not. Check that the assembly sits level with the rear lug in the slot at the front of the firebox. Gently remove some metal from the underside of the tank front if needed (Often it seems that it is the lower corners that need to be attended to, the test fit should leave 'witness' marks to guide you) There is a small (approx 1 inch = 0.58mm) gap between the tanks and bunker fronts.

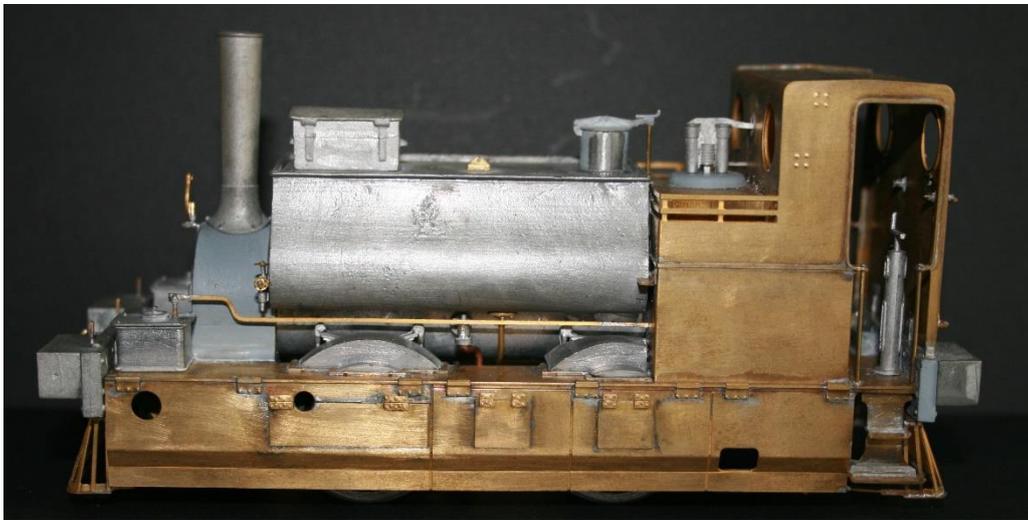


56. When happy all is square and level, and that tank top will fit, remove chassis and solder tanks to firebox and smoke box. Check the front end of the lower boiler is correctly located in the smoke box and solder to tanks, the tank top should left off for now.
57. Drill out a hole centrally in the top of the smokebox for the chimney and fit, the flare of the base should just fill the space, without touching the tank front or overhanging the smokebox front. Before fixing the chimney, thin the top edge from the inside to give a finer appearance by gently running a blade around the inside of the casting.

Body details

58. Mark the exact centre of the tank top and drill a 1.3mm hole for the lift lug and fit so that the lift lug is pointing across the tank.
59. Bend a 4mm leg on a 15mm piece of 0.7mm wire, push up through the hole in the firebox top and solder. Then:
On Stratford locos, the tank filler fits in the hole to the rear of the tank, with the securing clamp pointing towards the cab. Test fit and trim the wire so that the clamp rests on top of it.
On Neilson locos – the filler is almost flush with the tank top so open out the hole to suit and fit filler to tank top, with the securing clamp pointing towards the cab. Test fit and trim the wire so that the clamp rests on top of it.
60. The usual position for the toolbox is 3.5mm from the front edge of the tank, placed longitudinally on the centre line but 227 (at least) had it placed across the tank. Note that on 7230 (and probably the other carriage shunters) it was moved back and turned 90 degrees so as to fit an air reservoir in front.
61. The tank top can now be fitted in place.

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62. Add safety valve to the round base and fit to the top of the firebox (hole for whistle on drivers side) and whistle hole so that it sits level with the tail through the hole in the cab front. The whistle can be fitted now or left until after painting.
63. Attach upper (47) and lower (46) footsteps to back plate (45) and fit. The back plates are handed and fit against rear bufferbeam with the F to the front of the loco and the back plate in line with the hand rails– approx 1mm in from the valance.
64. Fit a small piece of copper wire to clack, form to shape as per photo below and fit to locating hole in boiler. The balance pipe can now be fitted to bottom of boiler/tank assembly – if there is room for it with the motor in place. Fit injector casting underneath the cab/footplate on the left (fireman's) side. The delivery pipe goes down, then inwards, before turning 90 deg. to run under the long pull rod and before turning upwards to meet the pipe fitted to the clack – this is made from copper wire, fit as much of this pipe as you like, but remember you have to be able to remove the chassis.



65. Drill front sandboxes 0.7mm and fit a piece of wire that protrudes 2.5mm from the top and fit sandbox to the footplate. Attach a crank (51a) so that it points inwards and back towards the cab. Sanding rods (51) thread through the holes in the bunker and cab fronts so that the end lines up with the cranks on the backplate in the cab, this can then be soldered to the cranks at the front and to the inside of the coal bunkers.
66. Fit lubricators to holes in tank fronts. Note they are handed. Spare wheels are included – part (70).
67. Coal shields (67) & coal rail infill's (49) are seen on 7230 in later (LNER) period. If required add these coal shields to top of the firebox either side of the safety valve and coal rail infill strips to the outside of the coal rails, noting the lower infill is slightly thinner than the upper one.

Cab detail & Boiler back

68. Laminate the two halves of the sanding lever (53), crank (54) and draincock lever (55). Drill holes in backhead to suit parts to be fitted (the two small holes for the sanding shaft may need to be drifted outward by 0.25mm or so to match the rod. Drill and fit regulator gland to central hole in backhead and fit regulator arm. Fit sanding shaft with the long end to the left. Add part 53 to the left hand end lining it up with the slot in the cab front. Part (54) fits to the extreme right hand end, but before fitting, the draincock

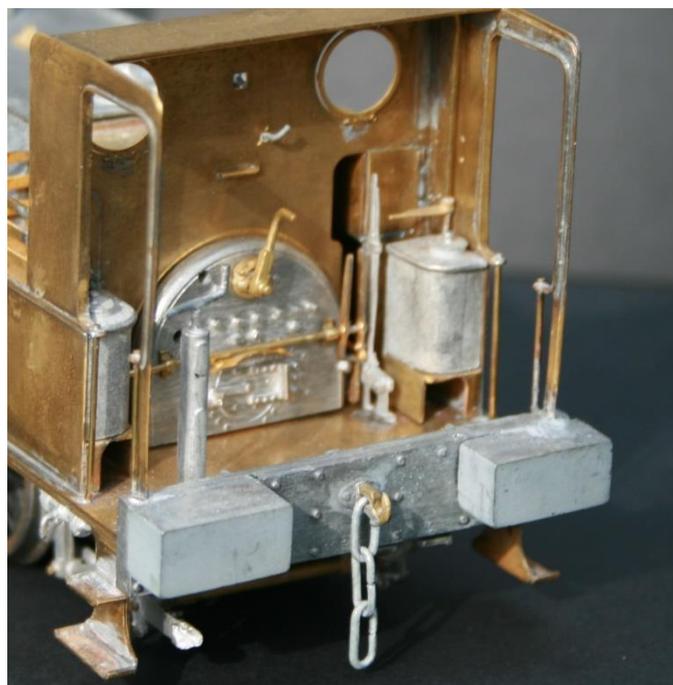
lever should be cranked so that when the top of the draincock lever lines up with the washout plug at the bottom, the bottom of this lever is in line with the sanding lever. Once happy with bends, fit both levers to the shaft

69. Fold brackets on drip plate (52) and form curve so that it matches the curve of the top of the firebox door with brackets uppermost. Fit to backplate with the brackets tucked under the sanding shaft. The gauge glass can be fitted now or left until the assembly has been painted.

70. Drill cab sandboxes 0.7mm (there is a small pilot hole in the casting) for rear sand operating rod. Form from 0.7mm wire a Π shape in 30mm x 47mm x 30mm. Fit sand boxes on supports with the wire in the holes running up/across/down (with the top of the linkage just above the upper rivets on the cab side) and adding the small cast lever just above the sandbox on the right hand (driver's) side.

71. Fit handbrake column to locating hole in cab floor, note squared corners on the base where it abuts the bufferbeam and angle. You may wish to drill a small hole in the spigot for the slotted link to locate in. Fit reverser to slot in cab floor, leaving the tail protruding below the footplate.

72. Two gauges are provided, although only one was fitted. Fit the larger gauge to the inside of the cab front between the whistle hole and left (fireman's) side window. The spare one is for use on 7230 (etc) when fitted for brake testing. Add coupling links to rear coupling.



Additional step required for 7230 as running in the 1930's (note: parts not included but available from our range of detailing parts.)

73. Fit brake/steam heat pipes to bufferbeams, Westinghouse pump to left (fireman's side) of the smokebox, Vacuum reservoir to front of tank top and brake ejector pipe from front of cab (through bunker), along tank side and curve to meet and enter the side of the chimney. As ever, refer to photographs to get the details correct.

Completion

74. Complete the chassis (steps 30-32), test run to confirm the loco performs satisfactorily, then dismantle and paint. Once the paint is completely dry, reassemble and fit whistle etc that have been left off.

75. Fix outer window frames to the clear acrylic sheet (having first removed the protective layer) with 'Spray mount' (or similar). Trim the clear sheet to match the frame and fix to the inner frame from the outside. Add coal/crew (not supplied) and enjoy the loco.

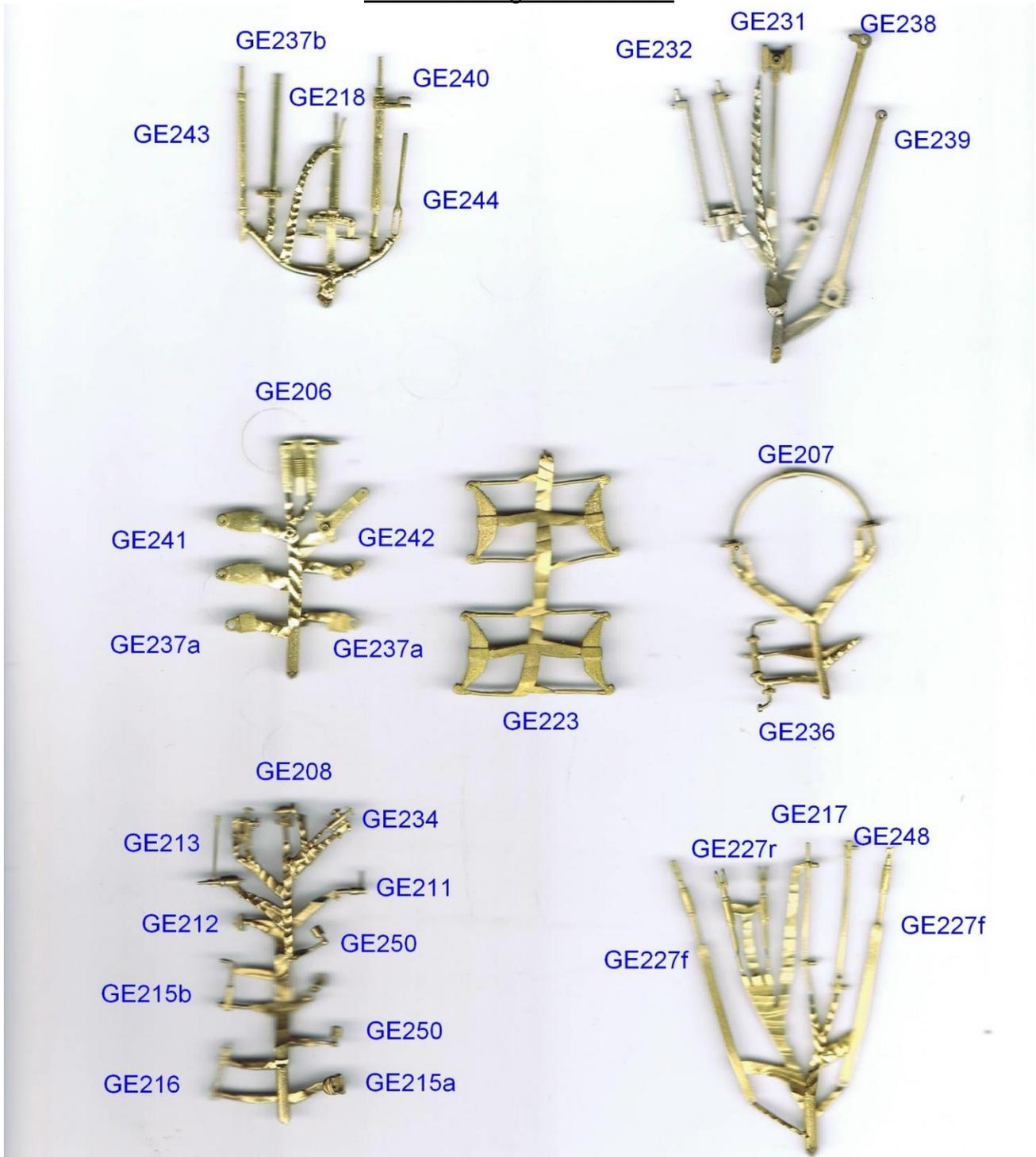
Parts List

Etch

	<u>Chassis</u>		<u>Body</u>
1	Fames	31	Footplate
2F	Front spacer	31a	Footplate valance
2R	Front spacer	31b	Rear frame
3a	Front footplate	32	Front splasher base
3b	Front footplate	33	Rear splasher base
4	Rear fixing spacer	34	RH Cabside
5	Captive bolt plate	35	LH cabside
6	Rear spacer	36	Cab front
7	Motion bracket (S7)	37	Cab rear
7a	Motion bracket	38	Firebox top
8	Motion bracket gusset plate	39	Cab door beading
9	Riveted brackets	40	Coal door
10	Brakeshaft bearing (handbrake only)	41	Window brasses
11	Sandpipe brace	42	Cab rear beading
12	Rear guardirons	43	Sand box support/bunker
13	Front guardirons	44	Tank front step
14	Cylinder wrapper	45	Cab step backplate
15	Cylinder draincock rod	46	Lower cab step
16	Cylinder draincock rocker lever	47	Upper cab step
17	Cylinder draincock rod	48	Cab/bunker beading
18	Cylinder draincock link	49	Coal rail infill strips
19	Cylinder draincock link	50	Coal rails (209/10/)
19a	Cylinder draincock valve drain link	51	Sanding rod
20	Coupling rod	51a	Sanding rod crank
20a	Coupling rod boss	52	Drip tray
20b	Washer	53	Sanding lever crank
21	Connecting rod	54	Sanding lever
21a	Fixing washer	55	Draincocks lever
22	Connecting rod boss	63	Front lampirons
23	Rear balance weight	64	Rear lampirons
24	Front balance weight	66	
68	Reverser rod	67	Coal shield
69	Reverser arm	70	Lubricator wheel (not required)
		GE501	Headcode discs & lampirons
	<u>Kit LK6a</u>		<u>Kit LK6b</u>
	Alternative parts - no's 209 & 210		Additional parts no 231
25	Frames	56	Side plates
26	Coupling rods	57	Access cover
27	Coupling rod boss	58	Access cover
28	Handbrake lever	59	Hinge
		60	Cow catcher
	<u>Also available separately:</u>	61	Top strip
65	Firebox wrapper (open cab locos)	62	Bottom strip

Castings

Brass Casting Identification



<u>Whitemetal</u>		<u>Lost wax brass/nickel silver</u>	
Bag A			
GE247	Firebox lower	1	GE237a Reverser shaft brackets 2
GE226	Brake shoes & hangars	4	GE237b Reverser shaft 1
GE229	Cylinder front/back (LH/RH)	4	GE248 Brace rod 1
GE225	Steam brake cylinder	1	GE241 Brake shaft bearings 2
Bag B			GE240 Brake shaft 1
GE200	Buffer beam	2	GE242 Brake crank 2
GE203	Buffer block	4	GE244 Handbrake slotted link 1
GE201	Coupling spring	1	GE227f Long pull rod - front 2
GE202	Coupling cover	1	GE227r Short pull rod – rear 2
Bag C			GE243 Front crossbeam 1
GE204f	Front splashers	2	GE223 Springs 4
GE204r	Rear splashers	2	
GE221	Front sandbox	2	GE231 Crosshead 2
GE214	Boiler back plate	1	GE232 Slidebars 2
GE222	Cab sandboxes	2	GE238 Coupling rod 2
GE219	Handbrake column	1	GE239 Connecting rod 2
Bag D			GE249 Draincocks 4
GE210	Smokebox	1	
GE233s	Tank side	2	STA130 Coupling hook 2
GE233f	Tank front	1	
GE233t	Tank top	1	GE217 Sanding lever rod 1
GE233r	Tank rear	1	GE215a Regulator gland 1
GE235	Boiler	1	GE215b Regulator 1
Bag E			GE216 Gauge glass 1
GE209	Water filler	1	GE218 Reversing lever 1
GE206	Safety valve base	1	
GE013	Toolbox	1	GE206a Safety valve 1
GE205	Chimney	1	GE213 Whistle 1
<u>Other Parts</u>			GE212 Lifting lug 1
			GE211 Smokebox door lock 1
			GE207 Balance pipe 1
STA907	Bearings	4	GE236 Injector 1
STA918	Coupling links	6	GE220 Gauges 2
STA911	Handrail knobs (short)	3	GE208 Clack valve 1
W0.7	Handrail wire (120mm)	2	GE234 Lubricator 2
W0.45	Draincock roding (120mm)	1	GE245 Rear sanding lever 1
W1.2	Copper wire (100mm)	1	GE250 Oil pot 2
1/32"	Brass pins	2	
0.020"	Clear sheet	1	
6ba	Screws	2	
6ba	Nuts	3	

Parts required

2x	3' 7" wheels – see notes	Paint
1x	Motor (Mashima 1833)	Transfers
1x	40:1 Gear set and mount for above	Number plates – GER nos 209 &
6x	Tapped 10ba crankpin bushes (optional) available from Gladiator models	230 and GER transfers are available from Guilplates