

Brassmasters

Scale Models

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GREAT WESTERN RAILWAY

**DUKE 4-4-0
LOCOMOTIVE KIT**

Designed by Martin Finney

**4MM SCALE
OO - EM - P4**

**INSTRUCTIONS
AND PROTOTYPE NOTES**

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SECTION 1: BRIEF HISTORICAL DETAILS

For a detailed history of this long-lived class of 60 engines Part Seven of 'The Locomotives of the Great Western Railway' published by the R.C.T.S. is essential reading. Also useful are G.W.Engines Vol 1 & 2 by J.H.Russell, Standard Gauge G.W. 4-4-0s by O.S.Nock & Locomotives Illustrated 50, GWR double-framed 4-4-0s.

The engines were built under five lots as follows:

Lot	Original No	Built	Original boiler
97	3252/3253	5/95	S4
101	3254-61	7/95-9/95	S4
102	3262-3271	4/96-7/96	S4
105	3272-3291	8/96-3/97	S4
113	3312	10/98	BR4#
113	3313-27	3/99-7/99	S4
113	3328-31	7/99-8/99	BR4

The boiler on this engine was much larger and was Churchward's prototype Standard No.2. This engine looked more like a Bulldog than a Duke and in March 1906 it was rebuilt into a Bulldog with an orthodox Standard No.2 boiler. Similarly nineteen further Dukes were rebuilt and became Bulldogs between 1902 and 1909.

In December 1912 all, but 3252, of the forty remaining Dukes were renumbered into a continuous sequence between 3252 and 3291. By 1946 eleven Dukes were still in service and these were renumbered again in the 90xx series. The last two digits were unaltered, thus 3254 became 9054.

With a life of over fifty years, many detail modifications to the locomotives took place. Many of these I have attempted to cover by including alternative components in the kit, however it is essential to have a photograph of the individual locomotive you propose to construct to enable an authentic model to be built.

VARIATIONS/MODIFICATIONS INCORPORATED INTO THE KIT

Outside frames: In original condition the outside frames have mostly flush rivets. Soon, after visits to the shops, snap head rivets begin to appear. From 1904 about half of the engines received frame strengthening plates around the horns with some also acquiring tie bars.

Balance weights: A bewildering variety - I have attempted to include all the different permutations.

Coupling rods: Originally fluted. Replacement rods from c.1908 onwards were of plain section.

Bogies: Originally of the swing hanger type with shallow frames, with splasher beading and the small lower splashers. Many replaced with deeper frames. Some were rebuilt to 'De Glehn' type without swing hangers and fitted with strengthening patches.

Small footplate steps: Eight small steps were fitted to the platform, two in front of each splasher from an unknown date.

Boilers: As shown above most were built with a S4 boiler having a flush round top firebox. The last of these boilers was removed from 3279 in 1917.

From 1903 new standard domed Belpaire (type B4) boilers were fitted.

Chimneys: Originally copper capped without a capuchon. Soon a capuchon was fitted. At an unknown date the chimney was moved forward. From 1920 cast iron tapered chimneys were introduced for replacements.

Boiler feed: Lots 97, 101, 102 & 105 were built with very large clackboxes which are not provided in the kit. Lot 113 were built with the smaller clackboxes supplied with the kit. Photographs suggest many of the earlier engines were soon fitted with the smaller clackboxes. The B4 boilers fitted from 1903 had the clackboxes fitted on the backplate inside the cab. From 1913 onwards, about half of the boilers had the boiler feed moved from the backplate to a position in front of the dome on the top of the boiler.

Smokebox: The early smokeboxes had a plain front with a square front edge and ringed door. Later snap head rivets were used and from c.1920 the smokeboxes had a pressed front with a rounded front edge and Churchward type door without the ring.

Cabs: The original cabs were very narrow and fitted with a canvas covered wooden roof. Many of the Dukes were given large wire cabs when first fitted with B4 Belpaire boilers, others at various times thereafter. These wide cabs were fitted with steel roofs with two patterns of rain strip. Most of the wide cabs had standard Churchward windows, but several

had wider 'L' shaped windows. The small circular windows above the firebox were blanked off after about 1926. When fitted with standard Churchward 3500 gallon tenders from 1930 the cab side sheets were set outwards at the back. Those not fitted with wide cabs when fitted with B4 boilers initially retained the original low cabs. The larger firebox necessitated the fitting of very small cab windows which clearly provided a less than satisfactory forward view. This problem was subsequently overcome by raising the roof of the narrow cabs to allow the fitting of larger windows. They also received new steel roofs with two patterns of rain strip.

Cab side handrails: The original narrow cabs had no side handrails. When the cab roofs were raised handrails were fitted. The wide cabs had handrails in at least three different positions.

Beading: Much of the decorative beading from the splashers and bogies was removed during the Great War (c. 1914 - 1918).

A.T.C. equipment: Put on all but 3252/7/9/62/77 between 1930 and 1931.

Vacuum pipe: Originally tall - later a shorter pattern introduced.

Whistles: In their last years, a few of the engines had their whistles removed from the cab roof to a position on top of the firebox and some acquired a whistle shield.

VARIATIONS/MODIFICATIONS NOT INCORPORATED INTO THE KIT

Boilers: The domed, raised Belpaire BR4 boilers fitted to 3312 and 3328-31 when built are not provided. After the usual transfer to other members of the class the last of these was removed from 3291 in 1913.

Ten engines, at one time or another, carried dome less boilers with raised Belpaire fireboxes (type BR0). The last of these was removed from 3278 in 1929.

From 1926 five engines (3254/69/71/72/79) had the boiler pitch increased by 5" to accommodate a new pattern of piston valve cylinders.

TENDERS: Lots 97, 101, 102 & 105 were built with very small tenders of 2000 gallon capacity. Larger 2500 gallon tenders were fitted to Lot 113. Later most were paired with standard Dean 2500 gallon or 3000 gallon tenders. From around 1930 many of the class acquired standard Churchward 3500 gallon tenders.

SECTION 2: CHASSIS DETAILS

Note that many of the components for both chassis and body are handed left/right and care must be taken to ensure the correct component is used. I have not always identified left/right components separately but with care and common sense no problems should arise.

It is also sensible to open up all holes to fit the appropriate component/wire, and to emboss all appropriate rivets before that component is fitted.

Before construction can commence you have to decide which chassis you are going to construct. The options are:

1. Gauge 00, EM or 18.83
2. Suspension rigid, sprung or compensated
3. Pickups scraper, plunger or the 'American' system (using loco for one side and the tender for the other)
4. Inside motion whether with or without

No pick-up material is provided. The options are:

- (a) Wipers attached to printed circuit fixed between the frames.
- (b) Plunger - drill holes P and fit according to the manufacturer's instructions.
- (c) The 'American' system with the wheels on the loco are shorted out on one side and the tender on the other. I have produced some etched shorting strips, as an additional item, for this purpose. The drawbar between the loco and tender can be used to carry the current.

The working inside motion can only be fitted to the EM & 18.83 versions of the chassis.

It is not possible to use plunger pick-ups if you wish to fit the inside motion because they will foul the motion.

MOTOR - not provided

High Level Load Hauler+ 60:1 with Mashima 1024 motor recommended

SECTION 3: FRAMES

Having decided which chassis to construct you can now start construction by preparing the inside frames (parts F1 & F2). Form the frame joggle to narrow the frames from the rear of the bogie forward. Make the first bend inwards through 30° along the rear half etched line and strengthen the bend with a fillet of solder. Then make the second bend outwards in the same way.

For a rigid chassis open out the main axle holes to accept 1/8" top hat bushes (not provided) and solder them in place. If you are going to fit sprung horn blocks, you should remove the axle holes by cutting up the half-etched lines, leaving a standard 6mm wide slot and then follow the manufacturer's instructions.

To construct the kit as designed with a compensated chassis first remove all the axle holes as described above. Carefully widen the slot in the rear hornblocks (part F8) until the Flexichas bearings are a good fit. I find a significant variation in the bearings and once I have fitted a hornblock to a bearing I mark the bearing and hornblock so that they can be later assembled together. A good fit between hornblock and bearing is essential if the chassis is to run well.

Solder the rear hornblocks to the inside of the frames aligning them with the half etched line and with the bottom of the frames.

Now open up the following holes in the frames:

- P only if plunger pick-ups are being used
- B for brake hanger pivots - 0.45mm
- R for reversing lever cross shaft - 0.9mm
- A for compensation beam pivot - 1/16"

The last job on the frames is to emboss the rivets marked by half etched holes.

SECTION 4: FRAME SPACERS AND ASSEMBLING THE CHASSIS

Remove the stretchers (parts F3, F4, F5 & F6) to suit your chosen gauge. If you are fitting inside motion open up the slots in part F5 to the rear edge using the half etched lines as a guide and check the fit of the 1/16" brass cylinder tube. Tap the cylinder fixing hole 10 BA.

Solder the 10 BA bogie pivot nut in place on part F5 and then fold up parts F3 & F5, making sure that the half etched fold line is on the inside and that each bend is a right angle. Check that all tabs on the stretchers fit properly in their corresponding chassis slots so that the rest of the spacer is hard up against the inside of the frames. Bend the frames inwards slightly at the front along the half etched lines to match the shape of part F6.

Now assemble the frames. Start by tack soldering the rear stretcher to both sides. Check that everything is square and that the stretchers are hard against the frames. Put an axle (or better a longer piece of 1/8" rod) through the rear bearings and place the chassis on a piece of graph paper to check that the axle is square to the frames. If all is well solder the remaining stretchers to the frames. It is important to check constantly that the chassis is square and that the frames are straight.

SECTION 5: COUPLING RODS

The coupling rods should now be made up so that we can use them as a jig for fitting the front hornblocks (part F7) accurately in place. First drill out all the crankpin holes, to a convenient size, which is undersize for the crankpins. Remove all burrs caused by the drilling. Now drill the same drill into a suitable small block of wood and leave the drill in the wood with its shank projecting. This projecting shank is used as a mandrel to accurately align the two laminations of each rod.

Place the laminations over the mandrel and using plenty of solder and flux, solder the two laminations together. You should now have a rod with the bosses on each lamination perfectly aligned. The rods have been deliberately etched too large so that the thin etched edges can be carefully filed so that the 'laminated' effect is lost and the rods appear to be

made from one piece of metal. The crankpin holes now need carefully opening out until they just fit, with no free play, the ends of the hornblock alignment jigs (available from London Road Models or Markits).

SECTION 6: FITTING THE FLEXICHAS HORNBLOCKS

Prepare the remaining bearings and hornblocks as described in section 3 and slide them over the hornblock alignment jigs with the springs between the bearings. Carefully compress the springs and clip the hornblocks between the frames and place the prepared coupling rods over the ends of the jigs. Make sure the hornblocks are square to the chassis and that their bottom edge aligns with the lower edge of the frames and then solder them in place.

Solder 0.45mm wire through the frame holes B to form the brake hanger pivots and remove the sections of wire between the frames.

SECTION 7: BOGIE

There are several bogie options available and careful study of photographs is needed before you start. The options are:

- Different rivet patterns - emboss those wanted.

- Shallow frames (parts B3 & B4) or deep frames (parts B5 & B6).

- Strengthening patches (parts B7 & B8).

- Splashes below the frame - remove for later period.

- Beaded splashes - remove the riveted splashers and solder part B11 in their place.

- Swing hanger suspension or De Glehn type - omit the swing hanger castings for the De Glehn type.

First emboss all appropriate rivets including those in the hornguide ties. Fold over the hornguide ties through 180° and attach the strengthening patches if needed. Solder in the axle bearings. Form the splashers tops (part B13) to shape. First mark a fold line 1.2mm from one end, then fold to the required angle using the frame side as a guide and solder in place removing any excess from the top edge. If you have left the lower splashes in place solder parts B14 & B15 in place.

Fold the stretcher (part B2) into a 'U' section and solder it to one frame locating it in the half etched groove. Now solder the second frame in place remembering to have the wheel sets in place at the same time. Check that the bogie is square and level.

Insert part B12 through the slots in part B9 and attach the guard irons (part B1) likewise. Solder the complete front stretcher in place. Repeat for the rear stretcher (part B10).

Form the spring wire for the bogie side control as shown in the diagram, thread it through the two outer holes in the projecting tab in the front crossbeam and solder it in place. The side control wire will then act on either side of the bogie pivot and can be adjusted by bending the wire suitably.

Attach the lower swing hanger castings (part W8) through the larger holes in the spacer and make flush with the upper surface of the spacer. Attach the upper swing hanger castings (part W7) and the axlebox/spring castings (part W6). Form the safety brackets from 0.3mm wire and solder in place through the small holes in the spacer.

Lastly if you are modelling the A.T.C. gear attach the mounting bracket (part B16) and shoe (part W36) behind the front stretcher.

SECTION 8: FITTING THE COMPENSATION BEAMS

Cut a piece of 1/16" brass rod, for the compensation beam pivots, so that it fits through the holes A and is flush with the outside face of the chassis frames.

If you are using the recommended High Level Load Hauler+ gearbox or any other motor/gearbox combination that will clear the compensation beam pivot then proceed as follows: cut two equal pieces 3/32" tube which together fit between the frames and solder the compensation beams (part F11) to the pieces of tube 0.5mm from one end.

Otherwise for a motor/gearbox combination that will not clear the compensation beam pivot, prepare two pieces of 3/32" brass tube. Each should have a length of 2mm for an 18.83mm gauge chassis, 1.5mm for an EM gauge chassis and 1mm for an OO gauge chassis. Solder the compensation beams (part F11) to the pieces of tube 0.5mm from one end.

Modify the tops of the Flexichas bearings as shown in the drawing and temporarily fit the beams. Fit all the wheels and axles temporarily so that the beams are resting on the axle bearings and the bogie is mounted on its pivot supported by a suitable number of spacer washers (parts B17). Confirm that the compensation works properly and check if the chassis is sitting level.

If you are using the recommended High Level Load Hauler+ gearbox or any other motor/gearbox combination that will clear the compensation beam pivot, retain the compensation beam pivot rod by carefully soldering it to the frame at one end.

For a motor/gearbox combination that will not clear the compensation beam pivot, to retain the beams first dismantle the chassis and then solder the pivot rod securely to the frames. Cut away the centre section of the pivot rod so that the beams will fit with the rod flush.

Select the appropriate outside frame stretchers parts F21 & F22 and fold along the half etched line, before soldering in place. If appropriate, the compensation beams can now be retained, by folding down the long tabs on part F21, otherwise these tabs can be snapped off.

SECTION 9: INSIDE MOTION

If you are fitting inside motion construct it now following the separate instructions.

SECTION 10: OUTSIDE CRANKS AND MECHANICAL TEST

Open the large holes in part F19 to 2.6mm so that the shoulder on the end of the axle is a tight fit. Solder the three laminations together using the 2.6mm drill to align them accurately. Open up (0.8mm) and countersink the crankpin hole and solder in the crankpin. File flush any part of the crankpin screw head protruding.

Fold the outside axle boxes (part F36) through 180° with the fold line outside and carefully solder together. Open out the axle holes to be a sloppy fit on the axle. These axle boxes are simply cosmetic. Check that these axle boxes are an easy fit in the slots in the outside frames, or the strengthening plates if these are to be used, and ease if necessary.

Permanently fix the wheels to the axles, not forgetting the gearbox on the rear axle, and ensuring that the axles extend equally on each side. Thread the outside axle boxes on the axles. Solder both the outside cranks to the axles along one side of the locomotive. The outside crank on the crank axle is at 180° to the inside crank. Solder the other crank to the leading axle at 90° to the first crank with the right hand crank leading. Attach the second rear crank using "Loctite". This allows the crank to be adjusted whilst holding it firmly enough to allow the chassis to be tested.

Locate the axles and attach the coupling rods. Turn the wheels slowly and if any tight spots occur adjust the crank on the rear axle until they run smoothly. Solder the crank to the rear axle.

Connect the motor to the pick-up system you have chosen and test run the chassis.

SECTION 11: BUFFER BEAM, DRAG BEAM, BRAKE HANGERS AND OUTSIDE FRAMES

Emboss the rivets on the drag beam (part F42) and attach the rubbing plates (part F43).

Solder the buffer beam (part F38) and drag beam to the frames locating the frames in the appropriate half etched slots. **Their upper edge must be 0.012" (0.3mm) above the upper edge of the frames so that they will be flush with the footplate when it is fitted.** Any piece of 0.012" material placed on top of the frames will help ensure correct alignment.

If you are fitting the strengthening plates remove the rivet and horn guide detail from the part of the frames which will be behind the strengthening plates. Then widen the horn guides so that the outside frame axleboxes will pass through. This is done so that the outside frame axleboxes will slide in the horn guides in the strengthening plates.

Attach rivet strips (parts F27 & F28) to the top of outside frames. Solder the strengthening plates in position carefully checking that each one is in the correct position by trying the outside frame in place over the outside frame axleboxes. If your chosen prototype has strengthening plates without the lower tie bar then modify their shape as shown in fig.2.

Align the top of the outside frame with the buffer beam and drag beam and tack solder in place. Ensure the axles move freely and when satisfied solder the outside frame to the stretchers. Attach part F39 between frame and buffer beam and part F44 between frame and drag beam.

Fold up steps (parts F32, F33, F34 & F35) and attach to frames. The etched rivets on the frames locate in the holes in the steps to give accurate alignment.

SECTION 12: FINISHING CHASSIS

Secure the balance weights in position. Solder together the three laminations of the inside frame springs (parts F17 & F18) before fixing in place inside the spring hangers.

The cast spring dampers (parts W11 & W12) are in two sizes. The smaller ones are used for the centre axle. Shorten the attaching 'stems' to about 5mm and then file the 'stem' to a half round section. Attach the dampers behind the frames as shown in the drawing - the etched rivets give a good guide to position.

Emboss the rivets on the outside frame horn guide tie (part F37) and attach to the frames under the horn guides. If appropriate solder the tie bars (part F30) in place.

Attach the steam brake cylinders (BR7 & BR8) to the chassis. Assemble the brake gear as shown in fig. 6.

Form sandpipes from 0.45mm wire and attach through the holes in stretchers part F22. Attach the buffers, vacuum pipe, coupling hook (part F40) and coupling (part F41).

SECTION 13: FOOTPLATE

Emboss the rivets on the footplate (part U1) inside frame extensions. Fold the footplate edges all round and solder the corners. The right side lamp bracket folds through 180° and is soldered to the outside face. Form the joggle in the inside frame extensions before folding up and soldering to the footplate. Fold up the remaining lamp brackets. Solder the footplate strengthening plates (part U3) to the edge of the footplate. The half etched slots will accommodate the springs and spring hangers later so ensure the plates are accurately aligned.

Prepare the appropriate footplate overlay (part U2 or U3) by embossing the rivets under the lamp brackets. For a wide cab engine attach the jig (part U4) to the underside of part U3, using a 10 BA nut and bolt, and drill holes for the appropriate cab handrail stanchions.

Form the curves in the footplate overlay. Start with the main convex curves, which are centred on the holes for the spring castings, followed by the smaller concave curves using the splasher faces as a guide. Note the curves in the overlay start before the splasher openings: this means that when the overlay is soldered to the footplate it will not be soldered to the footplate in the area immediately adjacent to the ends of the splashers.

Place the front overlay over the footplate so the lamp brackets pass through the holes provided and the body fixing holes align. Tack solder the overlay at the front edge then work evenly along the sides towards the rear. **Do not attach the area around the motor cut-out until last.**

If you are fitting inside motion, remove the section of footplate under the smokebox saddle as shown in fig.8.

Solder the splasher faces (parts U5 or U6) inside the footplate edge so that their bottom edge is level with the bottom edge of the footplate side. If, appropriate, modify the right hand part U14 as shown in fig. 8. Curve the splasher tops (parts U11 or U13 & U12 or U14) by rolling underneath a suitable rod or dowel on a piece of rubber sheet and solder them in place. Solder a 10 BA nut under the rear body fixing hole and, if appropriate, solder the cab floor support (part C34) and nameplate brackets (part U15) in place.

SECTION 14: FIREBOX AND BOILER **B4 BOILER - BELPAIRE FIREBOX**

Reduce the width of the lower faces of the firebox rear (part U37) so that it will fit between the frames in the locating groove in the footplate. Solder together the two laminations of the firebox front (parts U36). The lamination with small

etched groove in the middle of the top edge must be the front lamination. The firebox rear and front must now be spaced apart by using long 10BA bolts and washers or studding through the pairs of holes in both front and rear. When correctly spaced apart (21.95mm outside) the front should fit in the half etched recess in the footplate and the rear (part U37), pinned to the cab front (part C7,C8,C11 or C13) with 0.45mm wire dowels, will fit in the footplate groove.

Emboss the four rivets for the ends of the cladding fixing bands on the firebox wrapper (part U39). Using the grooves at the top of each former, and on the underside of the wrapper, as a guide, centre the wrapper and mark in pencil the position of the top bends. Form the bends over a suitable rod or dowel held in a vice. Repeat to form the lower bends. When happy with the forming solder the wrapper to the formers ensuring a large fillet of solder around the front join. Check the fit on the footplate and then remove the temporary bolts/studding.

Round the front edges of the firebox; referring to photographs for the correct shape. Fold up the firebox band joining clip (part U44) into a 'U' shape and solder it in place, from the inside, through the two slots in the top of the firebox. Complete by using a short piece of 0.3mm wire through the holes to represent the tightening bolt. Solder the washout plugs (parts U42 & U43) in place inside the firebox.

Before rolling the boiler (part U38) the boiler washout plugs can be drilled out and part U40 used if you prefer. Also, using the template in fig.11 mark and drill holes, as appropriate for the boiler clackboxes and top feed.

Check the rolled boiler wrapper for fit around the formers (parts U28 & U29). Bend out the boiler band joining brackets on part U30 and fit through the small slots from inside the boiler. If the fit is good and the formers fit then solder the wrapper ends together with the jointing strip. Solder the formers in place so that they are almost flush with the ends. The cut-outs in the formers are to clear the jointing strip and the etched groove at the top of the rear former must align accurately with the groove in the wrapper.

Solder two short pieces of 0.8mm wire into the holes in the rear former to act as dowels to locate the boiler and firebox. Check the boiler to firebox fit. Represent the bolts in the joining brackets using 0.45mm wire.

If appropriate, roll the top feed pipe overlay (part U41) to the correct curvature and solder in place on the boiler using the central hole to aid location. Do not solder the section which will be under the top feed casting (part W5) to the boiler and when the overlay is located remove this section by cutting through with a sharp blade. Attach the top feed casting and form the top feed pipes from 0.8mm wire so that they disappear behind the sand boxes.

S4 BOILER - ROUNDTOP FIREBOX

This follows in a similar way as the Belpaire firebox except that boiler and firebox are in one piece and there is no need to use spacers between the firebox formers.

SECTION 15: SMOKEBOX

Fold the smokebox base (part U18) into an inverted tray and solder a 10 BA nut over the hole for the body fixing screw. If required emboss the rivets in part U20.

For a smokebox with a square front edge, (fig.9), solder parts U19 & U20 together before fixing them to the base together with part U21 at the rear. Roll the smokebox wrapper (part U23 or U24) to shape and solder in place with its edges flush with the front and back formers.

For a smokebox with a rounded front edge, (fig.10), **do not** solder parts U19 & U20 together. Solder parts U19 and U21 to the base. Roll the smokebox wrapper (part U23 or U24) to shape and solder in place with its rear edge flush with the back former. Its' front edge will overhang by the thickness of part U20. Carefully file the wrapper back to the profile shown in fig.10. Now round most of the edge (not the lower edge on each side) of part U20 before soldering it in place on the smokebox front. As appropriate, bend up the smokebox steps (part U25 & U26) and solder in place.

Round the edge of part U22 and solder to the rear. Similarly round the edge of part U27. Tap the hole in part U28 10 BA and open out the holes in parts U21, U22 & U27 to clear 10 BA. With a 10 BA screw, bolt the smokebox and the boiler together and fix the boiler to the firebox by soldering the wire dowels to the firebox from inside.

Locate the smokebox/boiler/firebox on the footplate and check the fit and alignment. You will have to remove some material from the inside edge of the leading splashers to enable the boiler to sit horizontally. When satisfied with the alignment tack solder the smokebox and the firebox to the footplate before completing the soldering.

The firebox side bracket (part U45) and if appropriate the cover plates (part U46) visible in later years are soldered in place on the firebox sides between the splashers as shown in fig.12. Attach the front frame extensions (part U8) locating them in the slots provided.

Fix medium handrail knobs in the four holes in the boiler and four small knobs in the holes in the smokebox. Form the handrail to shape, thread on the front medium knob, and fix the handrail in place, checking its location in the holes in the cab front.

SECTION 16: CAB

NARROW CABS

Emboss the rivets on the chosen cab front (part C6, C7 or C8). Attach the window frames (part C9 or C10) on the inside. Solder the cab front in position.

Prepare the cab sides (parts C1 or C2) by embossing any rivet detail you wish and attaching the cut-out beading (part C4) fitting the etched groove over the edge of the cab side. Cut off the beading flush with the upper rear edge of the side. If appropriate, form and fit the cab side handrails from 0.3mm wire and file off smooth on the inside.

Solder the cab sides in position. They are correctly aligned when the cab side handrails are vertical. Fit the vertical handrail stanchions from 0.45mm wire.

Solder part C36 between the rear edges of the cab sides. Curve the cab roof (part C37, C40 or C43) and solder in place. Curve a piece of 0.45mm wire and solder to the canvas covered wood roof in the etched groove to represent the fixing batten. Solder parts C41, C42 and C44, as appropriate, to the steel cab roof (part C40 or C43). For the canvas covered wood roof the fixing mouldings (parts C38 & C39) are fixed under the edges of the roof to the sides and rear.

Fold up the splashers/toolboxes (part C18). Depending on the gauge modelled the width of the cab splashers/toolbox and cab floor (part C31) are reduced. Use the half etched lines as a guide. The splashers/toolboxes should be made to fit **on top** of the floor.

Fold up the step in the floor and check that it locates in the slots in the cab front. Add parts C20, C21, C24 & C25 and solder the splashers/toolboxes in place on the floor.

WIDE CABS

Modify the rear spring castings (part W10) as shown in fig. 8 and attach as described in section 15.

Emboss the rivets on the chosen cab front (part C11 or C13). Attach the window frames (part C12 or C14) on the inside. The porthole windows can be blanked off using part C16 or part C15 can be fitted from inside. For whistles on the firebox the whistle plate (part C17) should be attached as shown in fig.15 and holes drilled to accommodate the whistles. Solder the cab front in position.

Prepare the cab sides (parts C3) by embossing any rivet detail you wish and drilling holes for the cab side handrails – use part C2 to help with alignment. If appropriate, flare the rear of the cab sides to match the groove in part C5. Attach the cut-out beading (part C4 or C5) fitting the etched groove over the edge of the cab side. Leave the beading over length – it is cut to size after part C45 is fitted.

Form and fit the cab side handrails from 0.3mm wire and file off smooth on the inside. Solder the cab sides in position. They are correctly aligned when the cab side handrails are vertical. Fit the vertical handrail stanchions from 0.45mm wire using part U5 to represent the flange at the base.

Solder part C45 between the rear edges of the cab sides. For roof mounted whistles solder part C51 in place on the cab roof (part C46 or C49). Use part C40 as a jig to first drill the whistle holes. Curve the cab roof and solder in place. Solder parts C47, C48 and C50, as appropriate, to the cab roof.

INTERIOR OF WIDE CAB – NO ATC

Fold up the splashers/toolboxes (part C19). Depending on the gauge modelled the width of the cab splashers/toolbox and cab floor (part C32) are reduced. Use the half etched lines as a guide. The splashers/toolboxes should be made to fit **on top** of the floor.

Fold up the step in the floor and check that it locates in the slots in the cab front. Add parts C20, C21, C24 & C25 and solder the splashers/toolboxes in place on the floor.

INTERIOR OF WIDE CAB – WITH ATC

Fold up the LHS splashers/toolbox (part C22). Depending on the gauge modelled the width of the LHS splashers/toolbox and cab floor (part C32) are reduced. Use the half etched lines as a guide. The LHS splashers/toolbox should be made to fit **inside the edge of the floor** so that its' lower edge is level with the lower face of the floor.

Similarly on the right side so that part C23, soldered so that its' lower edge is level with the lower face of the floor, fits under the edge of the modified part U14.

SECTION 17: FINAL DETAILING.

Slightly curve the fall plate (part C35) and hinge it in place as shown in figs.14 & 15.

Form the spring shackles (part U16) and solder on a short length of 0.45mm wire. Fix the shackles through the holes in the footplate soldering the wire in the grooves in part U6. Attach the springs - 2 sizes - the smaller ones are for the front axle.

Attach all the remaining castings using the drawings and photographs as a guide to position.

Assemble the back plate and detail the cab interior as shown in the drawings. Use copper wire of a suitable size for the various pipes. The back plate mounted clack boxes (part BR25) will not be required if you have fitted the boiler clack boxes or top feed.

Best wishes

Martin Finney
September 2005

If you have any problem with the kit or any criticisms or suggestions please feel free to contact Brassmasters.

ETCHED COMPONENTS

FRAMES

F1 Inside frame - left
F2 Inside frame - right
F3 Frame stretcher - rear
F4 Frame stretcher - firebox front
F5 Frame stretcher - cylinder block/bogie mounting
F6 Frame stretcher - front
F7 Hornblock - front - (2) - 4mm
F8 Hornblock - rear - (2) - 4mm
F9 ABC gearbox anchor - 7mm
F10 RG7 gearbox anchor - 7mm
F11 Compensation beam - (2)
F12 Coupling rod outer laminate - fluted - (2)
F13 Coupling rod inner laminate - fluted - (2)
F14 Coupling rod outer laminate - plain - (2)
F15 Coupling rod inner laminate - plain - (2)
F16 Coupled wheel washer
F17 Spring - middle lamination - (2)
F18 Spring - outer lamination - (4)
F19 Outside crank lamination - (12) - 4mm
F20 Inside motion mounting bracket packing piece
F21 Outside frame stretcher - centre - (2)
F22 Outside frame stretcher - front - (2)
F23 Outside frame – left - early
F24 Outside frame – right - early
F25 Outside frame - left - later
F26 Outside frame - right - later
F27 Outside frame rivet strip - left
F28 Outside frame rivet strip - right
F29 Outside frame strengthening plate - (4)
F30 Tie bar between frame strengthening plates - (2)
F31 ATC conduit clip – (5)
F32 Step - front - upper - (2)
F33 Step - front - lower - (2)
F34 Step - rear - upper - (2)
F35 Step - rear - lower - (2)
F36 Outside frame axlebox - (4)
F37 Outside frame hornblock tie 1 (4)
F38 Buffer beam
F39 Angle bracket - frame to bufferbeam - (2)
F40 Coupling hook
F41 Screw coupling - (4 parts)
F42 Drag beam
F43 Drag beam rubbing plate - (2)
F44 Angle bracket - frame to dragbeam - (2)
F45 Drawbar
F46 Washer -10 BA - for drawbar pivot
F47 Brake hanger/shoe lamination - (8)
F48 Brake shoe pin retainer - (4)
F49 Brake pull rod - outer - (2)
F50 Brake pull rod - rear - inner - (2)
F51 Brake pull rod safety bracket - (2)
F52 Balance weight - front - original- (2)
F53 Balance weight - rear - original- (2)
F54 Balance weight - front - later - (2)
F55 Balance weight - rear - later - (2)

F56 Balance weight - front - later still! - (2)
F57 Balance weight - rear - later still! - (2)

BOGIE

B1 Bogie guard iron - (2)
B2 Bogie stretcher - centre
B3 Bogie frame - shallow - left
B4 Bogie frame - shallow - right
B5 Bogie frame - deep - left
B6 Bogie frame - deep - right
B7 Bogie side frame patch - left - (2)
B8 Bogie side frame patch - right - (2)
B9 Bogie stretcher - front
B10 Bogie stretcher - rear
B11 Bogie splasher beading - (2)
B12 Bogie front angle strip
B13 Bogie splasher top - (8)
B14 Bogie splasher rear cover - front - (2)
B15 Bogie splasher rear cover - rear - (2)
B16 ATC shoe mounting bracket
B17 Washer for bogie pivot – (8)

UPPERWORKS

U1 Footplate
U2 Footplate overlay - narrow cab
U3 Footplate overlay - wide cab
U4 Jig for drilling handrail stanchion holes - wide cab
U5 Handrail stanchion flange - wide cab
U6 Footplate strengthening plate - (2)
U7 Small footplate step - (8)
U8 Front frame extension - (2)
U9 Splasher faces - with beading - (2)
U10 Splasher faces - riveted - (2)
U11 Splasher top - unriveted - front - (2)
U12 Splasher top - riveted - front - (2)
U13 Splasher top - unriveted - rear - (2)
U14 Splasher top - riveted - rear - (2)
U15 Nameplate brackets - (6)
U16 Spring shackle - (8)
U17 Lamp bracket
U18 Smokebox base
U19 Smokebox front former - inner
U20 Smokebox front - outer
U21 Smokebox rear former
U22 Smokebox rear plate
U23 Smokebox wrapper - flush rivets
U24 Smokebox wrapper - snap head rivets
U25 Smokebox step - front
U26 Smokebox step - side - (2)
U27 Smokebox/boiler ring
U28 Boiler former - front
U29 Boiler former - rear
U30 Boiler joining strip
U31 Round top firebox former-front
U32 Round top firebox former - rear
U33 S4 boiler/firebox wrapper

UPPERWORKS (cont'd)

U34 S4 firebox washout plugs - (2)
 U35 Boiler clack box flange - (2)
 U36 Belpaire firebox former - front - (2)
 U37 Belpaire firebox former - rear
 U38 B4 boiler wrapper
 U39 B4 firebox wrapper
 U40 Boiler washout plugs - (4)
 U41 Overlay for top feed pipes
 U42 B4 firebox washout plugs - left
 U43 B4 firebox washout plugs - right
 U44 Firebox band joining clip - (2)
 U45 Firebox brackets - (4)
 U46 Firebox cover plate - (2)
 U47 Whistle shield

CAB

C1 Side - narrow cab - (2)
 C2 Side - narrow cab with raised roof - (2)
 C3 Side -wide cab- (2)
 C4 Side cutout beading - (2)
 C5 Side cutout beading - flared side - (2)
 C6 Front - narrow cab - round top firebox
 C7 Front - narrow cab - Belpaire firebox
 C8 Front - narrow cab - with raised roof
 C9 Window frame- narrow cab - large - (2)
 C10 Window frame- narrow cab - small- (2)
 C11 Front - wide cab
 C12 Window frame- wide cab - (2)
 C13 Front - wide cab - 'L' shaped windows
 C14 Window frame - 'L' shaped - (2)
 C15 Porthole window frame - wide cab - (2)
 C16 Porthole blanking plate - wide cab - (2)
 C17 Whistle plate - front of wide cab
 C18 Splasher/toolbox - narrow cab - (2)
 C19 Splasher/toolbox - wide cab - (2)
 C20 Tool box hasp - (2)
 C21 Toolbox padlock - (2)
 C22 Splasher - wide cab - LHS - ATC fitted
 C23 Splasher face - wide cab - RHS - ATC fitted
 C24 Drain cock lever
 C25 Sanding lever
 C26 Drain cock lever - wide cab with ATC fitted
 C27 Sanding lever - wide cab with ATC fitted
 C28 Seat bracket - LHS
 C29 Folding seat - LHS
 C30 Fixed seat - RHS
 C31 Floor - narrow cab
 C32 Floor - wide cab
 C33 Floor - wide cab with ATC
 C34 Floor support - wide cab
 C35 Fallplate
 C36 Support - rear of roof - narrow cab
 C37 Roof - canvas covered wood - narrow cab
 C38 Roof - canvas covered wood - side moulding - (2)
 C39 Roof - canvas covered wood - rear/front
 moulding - (2)

C40 Roof - steel - narrow cab
 C41 Roof - steel - rear angle - narrow cab
 C42 Roof - steel - side angle - narrow cab - (2)
 C43 Roof - steel with sloping rainstrips - narrow cab
 C44 Roof - steel - sloping rainstrips - narrow cab - (2)
 C45 Support - rear of roof - wide cab
 C46 Roof - steel - wide cab
 C47 Roof - steel - rear angle - wide cab
 C48 Roof - steel - side angle - wide cab - (2)
 C49 Roof - steel with sloping rainstrips - wide cab
 C50 Roof - steel - sloping rainstrips - wide cab - (2)
 C51 Roof - steel - whistle plate
 C52 Gauge glass lever - 4mm
 C53 Brake lever - 4mm
 C54 Steam fountain & blower levers - (5) - 4mm
 C55 Backhead shelf - 4mm
 C56 Cab pressure gauge - (3) - 4mm

WHITE METAL CASTINGS

W1 Chimney - tapered
 W2 Inside of dome
 W3 Safety valve base
 W4 Safety valve springs - (2)
 W5 Top feed
 W6 Bogie axlebox & spring - (4)
 W7 Bogie suspension swing hangers - upper - (2)
 W8 Bogie suspension swing hangers - lower - (4)
 W9 Spring - leading - (2)
 W10 Spring -trailing • (2)
 W11 Spring damper - leading - (4)
 W12 Spring damper - trailing - (4)
 W13 Buffer - (2)
 W14 Sandbox - (2)
 W15 Smokebox door - original with ring
 W16 Smokebox door - later
 W17 Casing to cover screw reverse on firebox side
 W18 Smokebox pipe cover
 W19 Steam lance cock
 W20 Back plate - round top firebox
 W21 Backplate - Belpaire firebox
 W22 Screw reverser
 W23 Screw reverser base - narrow cab
 W24 Screw reverser base - wide cab
 W25 Screw reverser base - wide cab with A.T.C
 W26 Splasher casing extension - RHS - cab with A.T.C.
 W27 Splasher casing extension - LHS - cab with A.T.C
 W28 Combined ejector/brake
 W29 Regulator mounting
 W30 Regulator handle
 W31 Water gauge
 W32 Firebox door handle
 W33 Sight feed lubricator
 W34 Screw reverser handle
 W35 Back plate clack box - (2)
 W36 A.T.C. shoe
 W37 A.T.C. bell
 W38 A.T.C. battery box

PARTS LIST (cont'd)

BRASS/COPPER CASTINGS

- BR1 Chimney - parallel copper capped
- BR2 Safety valve casing - no top feed
- BR3 Safety valve casing - with top feed
- BR4 Vacuum pipe - tal1- early
- BR5 Vacuum pipe - short - later
- BR6 Smokebox door handles
- BR7 Whistles-(2)

COMPONENTS NOT SUPPLIED WITH THE KIT

Driving wheels with extended axles

(prototype - 5' 8" - 18 spokes, outside crank

- Ultrascale
- Alan Gibson
- Markits

Bogie wheels

(prototype -3' 8" diameter 10 spoke)

- Ultrascale
- Alan Gibson
- Markits

Motor and gearbox

Hi Level - Load Hauler+ with Mashima 1024 motor

There are other motor/gearbox arrangements available which may be suitable.

High Level Kits,14 Tudor Road, Chester-le-Street, Co.

Durham, DH3 3RY

Tel. 0191 3882112 <http://www.highlevelkits.co.uk/>

OTHER COMPONENTS

- 1/8" Flexichas bearing - (4)
- Pinpoint bearing for bogie - (4)
- Crankpin, bush & nut - (4)
- 10 BA x 1/4" screw - (4)
- 10 BA nut-(3)
- Brass tube - 3/32" - for compensation beams
- Brass wire - 1/16"- for compensation beam pivots
- Brass wire - 0.8mm - for top feed pipes
- Brass wire - 0.45mm - for brake hanger pivots, sandpipes and handrails
- Brass wire - 0.3mm - ATC conduit and cab side handrails
- Spring wire - 0.3mm phosphor bronze wire - for bogie side control
- Copper wire - 0.7mm - for feed pipes to clack boxes
- Buffer head, bush & spring - (2)
- Handrail knob - short - (8)
- Handrail knob - medium - (5)