

Brassmasters

Scale Models

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GREAT WESTERN RAILWAY

**CURVED FRAME 'BULLDOG' 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 forty one 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 2' by J.H.Russell, 'Standard Gauge G.W. 4-4-0s' by O.S.Nock and 'Locomotives Illustrated 50, GWR double-framed 4-4-0s'.

From this kit any of the curved framed engines can be built from circa 1904 to 1948.

The curved framed engines were built in as follows:

Lot	Old Nos	New Nos	Built/ Rebuilt	Original Boiler	Nameplate
118	3332-51	3320-39	11/99-3/00	D0	Oval
120	3352	3340	10/99	D0	Oval
___*	Various	3300-19 3253-3331	3/06-12/08	D3#	Standard

* Rebuilds of 'Duke' class engines built under Lots 97,101/2/5/13.

Except 3273 'Armored' rebuilt in 2/02 with a D0 boiler.

VARIATIONS/MODIFICATIONS INCORPORATED INTO THE KIT

Outside frames: Because the outside frames of the kit have the snap head rivets half-etched, Lots 118 & 120 cannot be built in their original condition with flush frame rivets. The early Lots can of course be built in slightly later condition as they appear to have acquired frame strengthening plates and snap head rivets surprisingly quickly, probably during their first major shopping.

Boilers: Two boilers are provided in the kit the D2 half coned and the D3 three-quarter coned. This means that Lots 118 and 120 cannot be built in their original condition with the D0 parallel boiler.

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

Cab cut-out: the two sizes of cut-outs are provided.

Chimneys: three different types provided.

Bogies: originally of the swing hanger type with shallow frames, splashers 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.

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

Reverser: Originally steam reverse operated by a lever attached to the right hand cab side. Most were later rebuilt with screw reverse disclosed by the small casing at the front of the cab on the right side.

Superheating: Began in 1909, disclosed by the lengthening of the smokebox by 9".

Top feed: In most cases top feed was fitted at the same time as superheating.

Smokebox saddle: early flush rivets - later snap head rivets.

Cab roof: early canvas covered wood - later two types of steel roof.

Cab spectacle windows: plated over from 1926 onwards.

A.T.C. equipment: put on all but 3302/9/20/34 between 1928 and 1931.

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

TENDERS: When built the locomotives were fitted with standard Dean 2500 gallon or 3000 gallon tenders. Later 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.

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.

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"
- C for steam reversing cylinder mounting pin (only if you are modelling a locomotive with steam reverse).

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 11 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 10BA.

Solder the 10 BA bogie pivot nut in place on part F5 and then fold up parts F3 & F5 carefully, 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 and stretchers. Start by tack soldering the rear stretcher to both sides. Now 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.

Select the appropriate outside frame stretchers parts F21 & F22 and fold along the half-etched line (Note they are handed). The long tab on the rear stretcher folds down, after it is soldered in place, to retain the compensation beam.

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.

Tin well the front face of all the inner laminates and the back face of the outer laminates and place them over the mandrel. Using plenty of solder and flux, solder the two laminates together. You should now have a rod with the bosses on each laminate 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.

SECTION 7: CHANGING THE PORTESCAP GEARBOX

If you are using a Portescap motor and gearbox, the gearbox side plates will need replacing.

Disassembly of the existing gearbox

Remove the two screws which hold the motor to the gearbox and put the motor to one side. Using a 1.7mm drill countersink the ends of the three brass spacers **ensuring that no swarf contacts the gears**. Using firm pressure prise the gear box side plates apart. Note the order of the three gear sets and lift them off their axles, then drift the axles out of the side plates.

Preparing the new side plates. (part F9)

Using the diagram identify the different holes and open out as follows:

Spacer centres	: 1.5mm (drill size #53)
Gear axle centres	: 1.5mm (drill size #53)
Final drive centre	: 4mm

On one side plate open motor mounting holes to clear the motor mounting screws. On the other side plate carefully open holes enough to enable the steel screws to self tap a thread (or tap 12 BA). Using a piece of fine emery paper

remove all burrs from the side plates, then solder the 1/8" bearings (removed from the old side plates) into the final drive holes ensuring that the side plates present two mirror images.

Reassembly

Place the 3 brass spacers into their corresponding holes in one of the new side plates. Insert the three axles into their respective holes. The axles should be a tight fit, if not use a small drop of Superglue to locate one end of the axle only, then fit the second side plate temporarily in place to align the axles while the Superglue dries. Place the gear sets back onto their axles and fit the second side plate. Centre punch the spacers to retain them. Attach the motor to the gearbox using the old steel screws.

SECTION 8: 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 pinpoint axle bearings. Form the splashers tops (part B13) to shape and solder in place on the top of the frames - very fiddly! 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 wheelsets 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 shoe (part W10) under the tab projecting from the front stretcher.

SECTION 9: FITTING THE COMPENSATION BEAMS

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

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. Open up the hole to accept the brass tube in each of the compensation beams (part F11) and solder the beams 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 B16). Confirm that the compensation works properly and check if the chassis is sitting level.

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. The beams can now be retained, by folding down the tabs on part F21.

SECTION 10: INSIDE MOTION

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

SECTION 11: 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 F33) 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 12: BUFFER BEAM, DRAG BEAM AND OUTSIDE FRAMES

Emboss the rivets on the drag beam (part F39) and attach the rubbing plates (part F40).

Solder the buffer beam (part F35) and drag beam (part F39) to the frames locating the frames in the appropriate half-etched slots. **Their upper edge must be .012" (.3mm) above the upper edge of the frames so that they will be flush with the footplate when it is fitted.** Any piece of scrap .012" brass placed on top of the frames will help ensure correct alignment.

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

Attach rivet strips (parts F25 & F26) 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.

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 F36 between frame and buffer beam and part F41 between frame and drag beam.

Fold up steps (parts F29, F30, F31 & F32) and attach to frames. The etched rivets on the frames locate in the holes in the steps to give accurate alignment.

SECTION 13: FINISHING THE 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 W4 & W5) 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 hornblock tie (part F34) and attach to the frames under the hornguides. Solder the tie bars (part F28) in place.

Attach the steam brake cylinders (W17 & W18) to the chassis. Assemble the brake gear as shown in Fig. 4.

Form sand pipes from 0.45mm wire and attach through the holes in stretchers part F22.

Attach the buffers, vacuum pipe, coupling hook (part F37) and coupling (part F38).

SECTION 14: 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 front angle and 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 footplate overlay (part U2) by embossing the rivets under the lamp brackets. **For a locomotive built new as a Bulldog remove the rivets that will be underneath part U22 as shown in Fig.5.** 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.5.

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. Curve the splasher tops (parts U7 or U8 & U9 or U10) by rolling underneath a suitable rod or dowel on a piece of rubber sheet and solder them in place. Solder a 10 BA nut over the rear body fixing hole and solder the cab floor support (part C2) in place.

SECTION 15: FIREBOX AND BOILER

Reduce the width of the lower faces of the firebox rear (part U27) 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 U26). 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 (26.4mm outside), the front should fit in the half-etched recess in the footplate and the rear (part U27), pinned to the cab front (part C11) 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 U28). In pencil mark the wrapper centre on its inside and outside. Using the notch in the top of the formers 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 spacers.

Round the front edges of the firebox with a file referring to photographs for the correct shape. Fold up firebox band joining clips (part U31) into a 'U'-shape and solder them in place, from the inside, through the four slots in the top of the firebox. Complete by using a short piece of .3mm wire through the holes to represent the tightening bolt. Solder the washout plugs (parts U29 & U30) in place inside the firebox and attach the mud hole doors in place on the firebox corners.

Before rolling the coned section of the boiler (part U36 or U39) the boiler washout plugs can be drilled out and part U48 used if you prefer. Check for fit around the formers (parts U34 & U35). Bend out the boiler band joining brackets on part U38 or U41 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 notch at the top of the rear former must align accurately with the notch in the wrapper. Solder two short pieces of 0.45mm 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 0.3mm wire.

Roll the appropriate top feed pipe overlay (part U37 or U40) 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 casing 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 .8mm wire so that they disappear behind the splashers.

Prepare the smokebox/boiler wrapper (part U45 or U46) as follows:

Shorten the smokebox on part U45 by 3mm for the early (non-superheated) condition. Drill two new handrail knob holes 1.7mm from the front edge.

If you are fitting the three quarter cone (D3) boiler and wish to have a flush riveted smokebox then remove the rear section of part U45 by scoring in front of the boiler band with a sharp blade and snapping of the unwanted rear section. File clean the edge and drill two new handrail knob holes.

Roll the wrapper and check the fit on the formers (parts U42 & U43). Solder the wrapper ends together using part U47, which must be shortened if you are fitting the (D3) boiler, representing the fixing bolts as before. Solder in the formers flush with the back and front with the notch in the bottom of the front former in line with the wrapper join. The upper hole in the front former is for the handrail knob and the other two holes for alternative positions for the steam lance cock. Emboss the four rivets on the smokebox front (part U44), drill through the appropriate lance cock hole and attach to the front of the smokebox aligning the handrail and lance cock holes. Bend up the smokebox step (part U49) after first embossing the rivets and solder in place under the smokebox front.

Tap the hole in part U35 10 BA and open out the hole in part U42 to clear 10 BA. With a 10 BA screw, bolt the two boiler sections together and fix the boiler to the firebox by soldering the wire dowels to the firebox from inside.

Fold up the smokebox saddle spacer (part U17). Emboss the rivets on the saddle front (part U15) if needed (appeared in later years) and if you have fitted inside motion remove the section below the half-etched line on the saddle rear (part U16). Solder the saddle together and solder a 10 BA nut over the hole on the saddle spacer. Attach the saddle to the footplate with the 10 BA mounting screw. Locate the boiler/firebox and check the smokebox to saddle fit and alignment. Remember the bottom of the boiler is horizontal and so parallel to the top of the frames and the rear of the saddle is in line with the rear of the smokebox. When satisfied with the alignment tack solder the saddle to the smokebox and footplate and the firebox to the footplate before completing the soldering.

Attach the smokebox saddle side plates (parts U18 or U19). Note the rivet patterns are not symmetric. Attach the front frame extensions (part U20) locating them in the slot provided.

For a locomotive rebuilt from a Duke class attach the cylinder cover overlays (part U21).

For a locomotive built new as a Bulldog solder parts U22 & U23 in place.

Solder the upper lamp bracket (part U14) on the smokebox after first embossing the rivets.

Fix medium handrail knobs in the six holes in the boiler/smokebox and four small knobs in the holes in the firebox. Form the handrail to shape, thread on the front medium knob, and fix the handrail in place. If appropriate solder the nameplate brackets in place and bend up the footplate mounted lubricator bracket (part U12) and attach.

SECTION 16: CAB

Emboss the rivets on the cab front. The portholes can be blanked off using part C14 or part C13 can be fitted from inside. Attach the window frames (part C12) on the inside. The whistle plate (part C15) appears on photographs of locomotives in later life. Solder the cab front in position.

Prepare the cab sides (parts C6 or C7) by embossing any rivet detail you wish and attaching the cut-out beading (part C8) fitting the etched groove over the edge of the cab side. Form and fit the cab side handrails from .3mm wire and file off smooth on the inside. Assemble the cab seats (part C9 & C10). They are designed to be working. Now remove the seat from the bracket and solder the bracket to the inside of the cab side. Solder the cab sides in position. They are correctly aligned when the cab side handrails are vertical. Fit the vertical handrails from 0.45mm wire.

Solder part C16 between the rear edges of the cab sides. Curve the cab roof (part C17, C21 or C24) and solder in place with the front edge in line with the cab sides. Parts C18 are first soldered to the canvas covered wood roof between the half-etched lines to represent the fixing battens. Parts C22 & C23 are soldered to the edges of the steel cab roof (part C21) to form the strengthening angles and part C25 in the slots in part C24 together with part C22 on the rear edge. For the canvas covered wood roof the fixing mouldings (parts C19 & C20) are fixed under the edges of the roof to the sides and rear.

Depending on the gauge modelled the width of the cab splashers (parts C4 & C5) can be reduced. Use the half-etched lines as a guide. Fold up the splashers and then solder in place. Slightly curve the fall plate (part C3) and hinge it to the floor as shown in Fig.9 before soldering the floor in place.

SECTION 17: FINAL DETAILING.

Form the spring shackles (part U13) 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 U3. Attach the springs - 2 sizes - the smaller ones are for the leading axle.

Detail the cylinder front plate (part U24 or U25) as shown in Fig.7 and attach it to the saddle front with its top edge level with the top of the front frame extensions.

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

The cab interior is largely based on the photograph in Great Western Engines Vol.2 - J.H.Russell - page 2 showing an engine with steam reverse. Using the photograph and Fig.8 the backhead can be assembled and the cab interior detailed. Use copper wire of a suitable size for the various pipes.

If you are fitting ATC apparatus fit the bell high on the right side of the cab and the battery box inside the cab under the right seat.

Best wishes

Martin Finney
September 2001

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

PARTS LIST

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 Portescap gearbox side - (2) - 4mm
F10 Support bracket for gearbox - 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 Washer - 1/8"
F17 Spring - inner 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
F24 Outside frame - right
F25 Outside frame rivet strip - left
F26 Outside frame rivet strip - right
F27 Outside frame strengthening plate - (4)
F28 Tie bar between frame strengthening plates - (2)
F29 Step - front - upper - (2)
F30 Step - front - lower - (2)
F31 Step - rear - upper - (2)
F32 Step - rear - lower - (2)
F33 Outside frame axlebox - (4)
F34 Outside frame hornblock tie (4)
F35 Buffer beam
F36 Angle bracket - frame to bufferbeam - (2)
F37 Coupling hook
F38 Screw coupling - (4 parts)
F39 Drag beam
F40 Drag beam rubbing plate - (2)
F41 Angle bracket - frame to dragbeam - (2)
F42 Drawbar
F43 Washer -10 BA - for drawbar pivot
F44 Brake hanger/shoe lamination - (8)
F45 Brake shoe pin retainer - (4)
F46 Brake pul1rod - outer - (2)
F47 Brake pul1rod - rear - inner - (2)
F48 Brake pul1rod safety bracket - (2)
F49 Balance weight - front - original- (2)
F50 Balance weight - rear - original- (2)
F51 Balance weight - front - balanced cranks - (2)
F52 Balance weight-rear-balanced cranks - (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 Washer -10 BA - for bogie pivot

CAB

C1 Cab floor
C2 Cab floor support
C3 Fallplate
C4 Cab splasher - left - (2)
C5 Cab splasher - right - (2)
C6 Cab side - Built new as Bulldogs - (2)
C7 Cab side - Rebuilds of Dukes - (2)
C8 Cab side cutout beading - (2)
C9 Cab seat bracket - (2)
C10 Cab seat - (2)
C11 Cab front
C12 Cab window frames - (2)
C13 Cab porthole window frames - (2)
C14 Cab porthole blanking plate - (2)
C15 Whistle plate
C16 Support - rear of cab roof
C17 Cab roof - canvas covered wood
C18 Cab roof - canvas covered wood - transverse batten - (2)
C19 Cab roof - canvas covered wood - side moulding - (2)
C20 Cab roof - canvas covered wood - rear moulding
C21 Cab roof - steel
C22 Cab roof - steel- rear angle
C23 Cab roof - steel- side angle - (2)
C24 Cab roof - steel with sloping rainstrips
C25 Cab roof - steel - sloping rainstrips - (2)
C26 Gauge glass lever - 4mm
C27 Brake lever - 4mm
C28 Steam fountain & blower levers - (5) - 4mm
C29 Backhead shelf - 4mm
C30 Cab pressure gauge - (3) - 4mm

PARTS LIST (cont'd)

ETCHED COMPONENTS

UPPERWORKS

- U1 Footplate
- U2 Footplate overlay
- U3 Footplate strengthening plate - (2)
- U4 Small footplate step - (8)
- U5 Splasher faces - with beading - (2)
- U6 Splasher faces - riveted - (2)
- U7 Splasher top - unriveted - front - (2)
- U8 Splasher top - riveted - front - (2)
- U9 Splasher top - unriveted - rear - (2)
- U10 Splasher top - riveted - rear - (2)
- U11 Nameplate brackets - (6)
- U12 Bracket - footplate mounted lubricator
- U13 Spring shackle - (6)
- U14 Lamp bracket
- U15 Smokebox saddle-front
- U16 Smokebox saddle-rear
- U17 Smokebox saddle spacer
- U18 Smokebox saddle side plates - unriveted - (2)
- U19 Smokebox saddle side plates - riveted - (2)
- U20 Front frame extension - (2)
- U21 Cylinder cover overlay - Rebuilds of Dukes - (2)
- U22 Front frame extension angle - horizontal section - Built new as Bulldogs - (2)
- U23 Front frame extension angle - vertical section - Built new as Bulldogs - (2)
- U24 Plate - front of cylinders - straight top edge
- U25 Plate - front of cylinders - shaped top edge
- U26 Firebox front lamination - (2)
- U27 Firebox rear
- U28 Firebox wrapper
- U29 Firebox washout plugs - left
- U30 Firebox washout plugs - right
- U31 Firebox band joining clip - (2)
- U32 Firebox brackets - with casting - (4)
- U33 Firebox brackets - without casting - (4)
- U34 Boiler former (coned section) rear
- U35 Boiler former (coned section) front
- U36 Half coned (D2) boiler wrapper
- U37 Overlay for top feed pipes - D2 boiler
- U38 Coned boiler jointing strip- D2 boiler
- U39 Three quarter (D3) coned boiler wrapper
- U40 Overlay for top feed pipes - D3 boiler
- U41 Coned boiler jointing strip- D3 boiler
- U42 Boiler/smokebox former (parallel section) rear
- U43 Smokebox front former (inner)
- U44 Smokebox front (outer)
- U45 Smokebox/boiler (D2) wrapper - unriveted
- U46 Smokebox/boiler (D3) wrapper - riveted
- U47 Smokebox - parallel boiler jointing strip
- U48 Boiler washout plugs - (4)
- U49 Smokebox step

WHITE METAL CASTINGS

- W1 Steam brake cylinder - left hand
- W2 Steam brake cylinder - right hand
- W3 Steam reversing cylinder
- W4 Spring damper - leading - (4)
- W5 Spring damper - trailing - (4)
- W6 Bogie axlebox & spring - (4)
- W7 Bogie suspension swing hangers - upper - (2)
- W8 Bogie suspension swing hangers - lower - (4)
- W9 Buffer - (2)
- W10 ATC shoe
- W11 ATC battery box
- W12 Snifting valve
- W13 Chimney - original
- W14 Chimney - tapered
- W15 Safety valve base - top feed
- W16 Safety valve base - no top feed
- W17 Safety valve springs - (2)
- W18 Spring - leading - (2)
- W19 Spring - trailing - (2)
- W20 Sandbox-(2)
- W21 Lubricator
- W22 Firebox side cover - (2)
- W23 Casing to cover screw reverse on firebox side
- W24 Smokebox Door
- W25 Smokebox pipe cover - early pattern
- W26 Smokebox pipe cover - later pattern
- W27 Steam lance cock
- W28 Cab splasher extension piece - (2)
- W29 ATC bell
- W30 Screw reverser
- W31 Screw reverser handle
- W32 Steam reverse lever
- W33 Backhead
- W34 Combined ejector/brake
- W35 Regulator handle
- W36 Water gauge
- W37 Firebox door handle
- W38 Sight feed lubricator
- W39 Steam heating valve

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 - tall - early
- BR5 Vacuum pipe - short - later
- BR6 Smokebox door handles
- BR7 Whistles-(2)

PARTS LIST (cont'd)

OTHER COMPONENTS

1/8" Flexichas bearing - (4)
Pinpoint bearing for bogie - (4)
Crankpin, bush & nut - (4)
10BA screw - (4)
10BA nut -(3)
3/32" brass tube for compensation beams
1/16" brass wire for compensation beam pivot
0.8 mm brass wire for top feed pipes
0.45mm brass wire for brake hanger pivots, handrails & sandpipes
0.3mm brass wire for cab side handrails
0.3mm phosphor bronze wire for bogie side control
Buffer head, bush & spring - (2)
Short handrail knobs - (8)
Medium handrail knobs - (7)
Mud hole door cover - (4)

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
- Branchlines
- Portescap 1219 (available second hand only)
Suitable pickups