LMS/BR IVATT 4mt 2-6-0 (Mucky Duck).

Historical Notes

This 4mt 2-6-0 was the last design produced by H. G. Ivatt, and the last new loco to be introduced under the LMS prior to nationalisation. They were needed as modern replacements for the numerous 0-6-0 freight loco's, including Fowlers standard type. The new class 4 broke away from LMS convention and had the running plate high on the sides of the boiler completely exposing the wheels and frames. This footplating was attached to the boiler flanks, instead of the frames, and the regulator was operated by external rodding along the boiler side from below the dome to the cab. The firebox was supported on a single bracket at the bottom of the backplate. Everything about the new design had ease of maintenance and operation in mind. The tender had a cab and inset bunker for clear vision when running tender first. A large double chimney was fitted which had the exhaust ports splayed outwards. This arrangement, however, proved inefficient and all the double chimneys were replaced with a far better looking single chimney.

FIG. 1. CHASSIS CONSTRUCTION

Before starting you must decide if you are building a compensated or rigid chassis.

Take the main chassis frames (1) either; solder the six 1/8th chassis bearings (16) into the axle openings – or remove the sections from the front and middle axle openings to make way for the compensating beams (15) and solder two bearings into the rear openings.

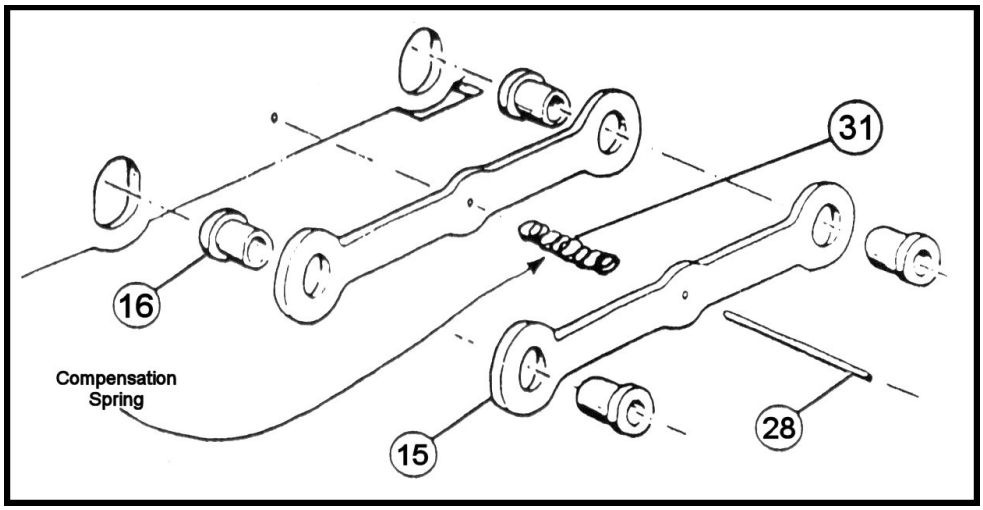
Fold the front of the chassis out at 90 degrees and then at the next line fold it back at 90 degrees. Fold the chassis sides up and fit the centre frame spacer (2), but only solder it in place if using the portescap motor option. If using the branchline gearbox option the centre spacer will have to be removed. Fit the front spacer (3) and the rear spacers (4). Solder a 10BA screw into the front spacer. **NOTE -** Refer to Fig. 6. for motor fitting options

Take the front running plate (6) and slide it into place locating the two back tabs in their slots and solder in position. Punch through the rivets on the bufferbeam (7) and solder it in place. Solder the rear frame section (5) onto the tabs at the rear of the frames. File the tabs flush. Turn the chassis upside down and remove the lower rear frame stretcher which would otherwise obstruct the motor. Fold the side pieces on the front frame steps down and then fold the steps themselves down.

Fold the cylinders (8) to shape and fit them into the recess at the front of the chassis (make sure the side with the holes for the slidebars faces the rear). Solder the front cylinder covers (32) in place. Curve the cylinder sides (9) to shape and fold down the cylinder drain cocks. Fold the top section to form the steam pipes. Solder the cylinder sides to the cylinders. Use four pieces of scrap fret to make the sides of the steam pipe and file to shape.
Solder the front and rear of the smokebox saddle (10 & 11) into the slots and recesses in the front footplate. Fold the saddle sides (12 & 13) to match the saddle front and rear and

slide them down the sides of the front and rear. Solder them in place. Form the Saddle top (14) with the lines on the concave side and solder it onto the saddle sides, front and rear.

COMPENSATING – Solder the 1/8th axle bearings (16) into the compensating beams (15). The compensating spindle should be cut from the brass wire (28). The beams are held apart by the compensation spring (31). It is very important that no parts of this mechanism are soldered in a fixed position other than the spindle to the mainframe (take care also when fitting the brake rodding). Both beams must move independently of each other. The assembly of the beams is otherwise very simple. Make sure that the beams have the cut out section at the bottom. Fit the wheels so you can test the compensating mechanism and when satisfied that it works O.K. remove the wheels and put them to one side.



Fold down the ends on the front motion bracket (17). Strengthen the fold with a small fillet of solder. Solder the bracket into the two recesses in the top of the frames. Solder the main motion bracket overlays (19 & 20) onto the main motion bracket (18). Fold the large flaps down facing forward and fold the small 'V' shaped brackets to the rear. Fit the assembled motion bracket into the two vertical slots in the top of the frames.

Solder the brake blocks (26) to the brake hangers (25) making three L/H and three R/H. Feed 3 x 1" pieces of brass wire (28) through the pilot holes in the frames and solder in place. Attach the centre and rear brakes to these 2mm from the frame sides and the front brakes against the chassis side. Feed wire through the bottom of the brakes on one side and then through the two brake pull rods (27) and the brakes on the other side. Solder all joints.

Solder the two side brackets (21) and the cab support brackets (22 & 23) [note that these are L/H & R/H] in place.

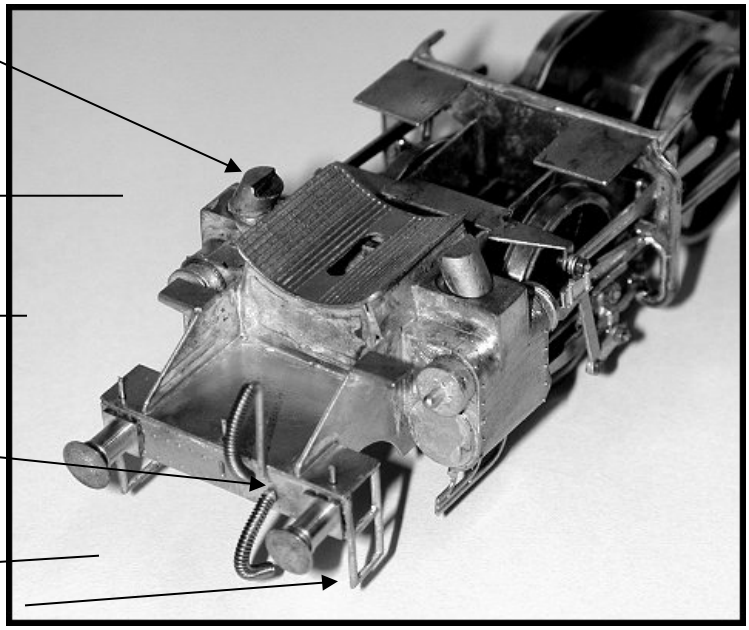
Glue the upper steam pipes (33) to the top of the cylinders.

Fit the cylinder end covers (34) into the holes in the cylinders noting that the two with tail rods go at the front.

Solder the front ladders (35) behind the bufferbeam.

Solder the vacuum pipes (36) into the holes in the bufferbeam.

Fit the buffer shanks (37) into the bufferbeam. Don't fit the buffer heads until after painting.



Glue the reversing bar (38) to the back of the main motion bracket.

The chassis can now be painted (make sure that moving parts don't get gummed up). Refer to Figs. 4 & 5. for coupling rod and valve gear assembly.

FIG. 2. LOCO BODY CONSTRUCTION

Take the cab unit (41) and fold into shape starting with the floor first (fallplate inside) and then the angles and sides. The sides butt up to the cab floor. Fold the handrail plates back and the cab doors the opposite way. Solder around the seams when you are satisfied that everything is square. Fit the cab side overlays (42 & 43) in place. Fill in the slots down the side of the spectacle windows with solder. Form the cab roof (44) to match the profile of the cab front. A piece of dowel or bar approximately 17 - 19mm in diameter is ideal for the curved sections and then minor adjustments can be made by hand. Check the fit of the running plate (40) into the cab front. Make sure it sits square and solder it in place. When this is done you must cut out the centre 11mm from the rear of the running plate as this would otherwise obstruct the motor.

Screw an 8BA nut onto the end of the 8BA threaded rod. Solder this into the hole in the running plate stretcher as you would an ordinary screw. Check the fit of the running plate/cab unit onto the chassis. Fold up the reversing bar bracket and solder the reversing bar (65) into the slots in the running plate and cab front.

Clean the mould marks from the back of the resin boiler (47) and any other marks that may be present. Drill the handrail holes with a 0.85mm drill and the washout plug holes with 1.8mm drill. Note that the centre of the boiler is drilled to accept a 1219 motor, or if you wish, extra weight. You will have to open out the bottom opening of the firebox to allow the motor in. Check the fit of the boiler to the running plate. The rear slots locate over the rear piece of running plate and the front cut away over the stretcher and 8BA nut. Glue it in place when it is positioned correctly.

Turn the assembled body over and drill three or four holes into the resin boiler along the underneath of the running plate. Glue brass wire into these and solder the wire to the running plate. This will help keep the running plate rigid.

Glue the dome (48), top feed (49) and chimney (50) in place.

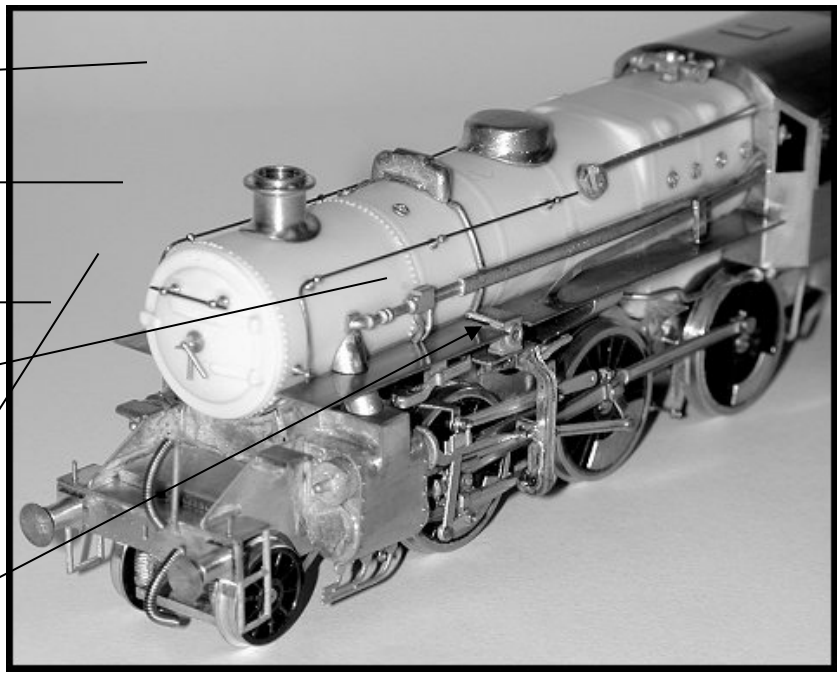
Glue the washout plugs (51) into their holes.

Glue the steam pipes (52) in place.

Glue the ejector ducting (53) and the ejector (54) in place.

Form the top feed pipework from the thicker wire (55).

Glue the mechanical lubricators (56) into the recesses on the running plate.



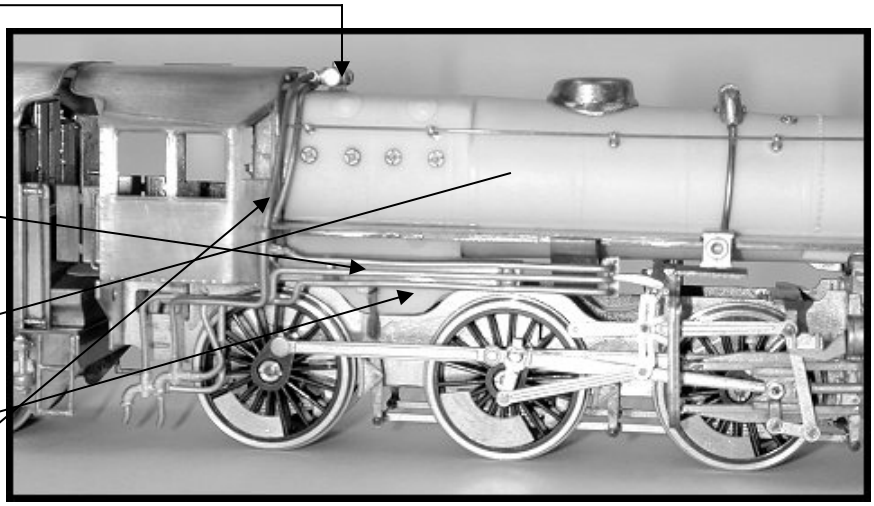
Drill the hole for the throttle rod mounting (57) and fit it in place. Glue the throttle rod (58) onto the lug on the mounting and to the front of the cab. Due to the limitations of the casting process the rod section is thicker than it should be, so you may want to replace this with brass wire.

Drill the hole for the manifold (59) and fit it in place.

Glue the fire iron tunnel (60) to the firebox on the R/H side. (It's behind the pipework, honest!)

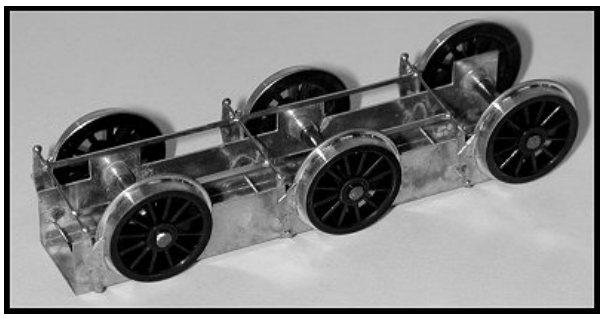
The large sandbox (61) fits under the boiler.

The main pipework (62) casting fits onto the fire iron tunnel.



Make the pipework that joins the manifold and main pipework together from the thicker wire.
Add the handrails (63) and the smokebox door handle (64). Fit the backhead (66) into the cab.

FIG. 3. TENDER ASSEMBLY



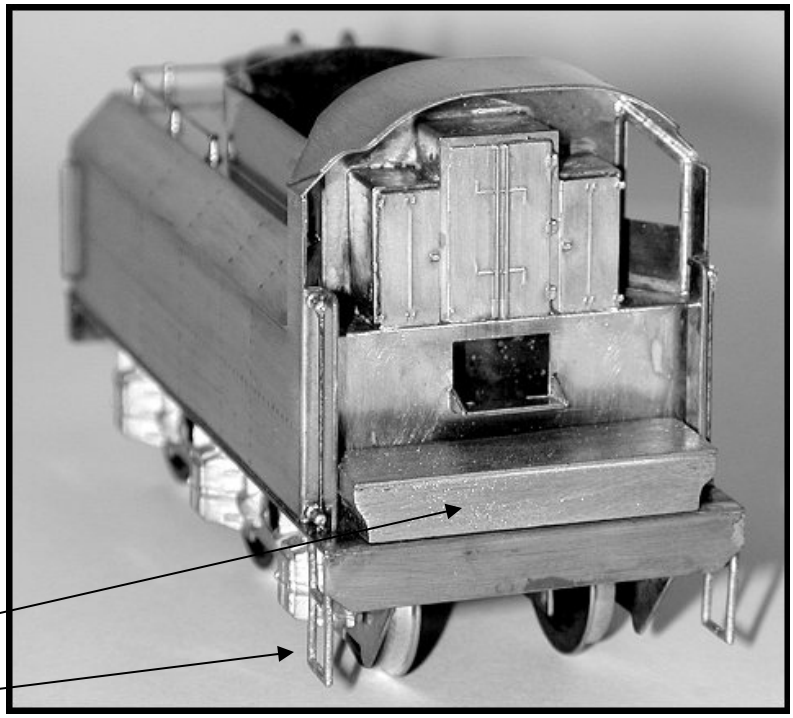
Solder the 2mm bearings (67) into the tender inside frames (68). Fold the frames as shown with the fold lines inside. Fit the brake gear (69, 70 & 71) in the same way as on the loco chassis. This is ready to paint.

Solder the frames (72) into the slots in the baseplate (73). Fit the dragbeam (74) at the front and the bufferbeam (75) at the rear. Fit two 8BA screws into the baseplate. Solder a 10BA screw (39) into the drawbar mounting (81) and solder behind the drag beam.

Punch through all the rivets on the tender rear (76), sides (77 & 78) and top (79). Some distortion will occur so you will have to flatten them out. Fold the handrail plates into position. Solder the tender rear into its slots. Solder the sides into the baseplate. Take the front bulkhead (80) and fold the spectacle plates forward so that the bulkhead is a snug fit between the sides. Solder it in place.

Fold the side angles on the tender top down at 45 degrees. Check the angle against the tender rear. The edges should meet the top of the sides. If the top does not sit down properly shamfer the edges or make adjustments to the rear. When O.K. solder in place.

Form the tender roof (82) as with the loco cab and fit in the same way. Solder the bunker sides (83 & 84) and rear (85) in place. Note that the rivet lines have to line up with those on the tender top. Fit the coal space bottom (86) into the bunker.



Fold the lower bulkhead (87) to shape and solder in place. Solder the coal chute (88) into the recess at the bottom of the coal hole. Fold the locker frame (89) and solder it to the front bulkhead. Solder the locker front (90) on to the frame.

Solder the L/H locker door (91), R/H locker door (92) and the centre locker door (93) onto the locker front.

Glue the tender front running plate (94) in place.

Solder the tender/cab ladder (95) behind the drag beam.

Locate the axleboxes (96) in the holes in the frames.

Solder the rear ladder (97) in place.

Solder the vacuum pipes (36) into the bufferbeam.

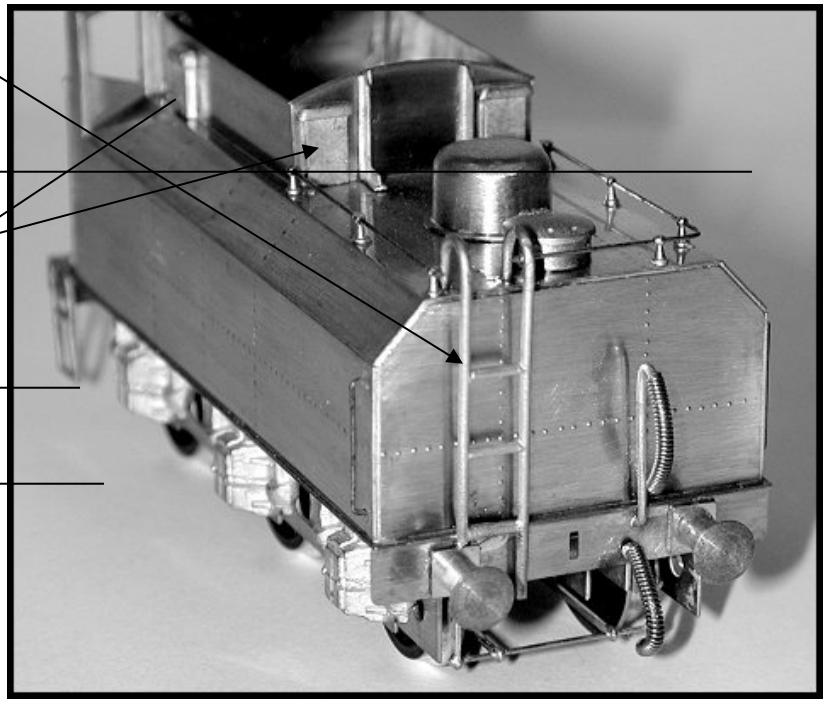
Glue the tank vents (98) to the bunker sides and rear.

Glue the bunker rear brackets (99) to the rear.

Glue the water dome (100) and water filler (101) in place.

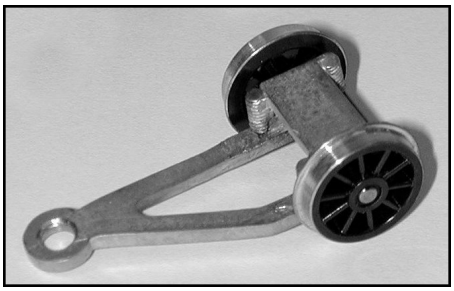
Fit all the handrails (63).

Fit the buffer shanks (37).



BOGIE ASSEMBLY

Glue the bogie top (102) onto the main bogie casting (103). Check that an axle will fit through holes and clear with a 2mm drill if necessary.



COUPLING RODS

With the chassis painted the wheels can be fitted permanently. Fit the crank pins and assemble the coupling rods (108) as shown. Take care in this as the rods need to move freely, both for sideplay and compensation.

VALVE GEAR

Refer to Fig. 4. and assemble the valve gear. Rivet together the parts and attach them to the motion brackets with the 16BA screws and nuts.

Fig. 5. Coupling Rods.

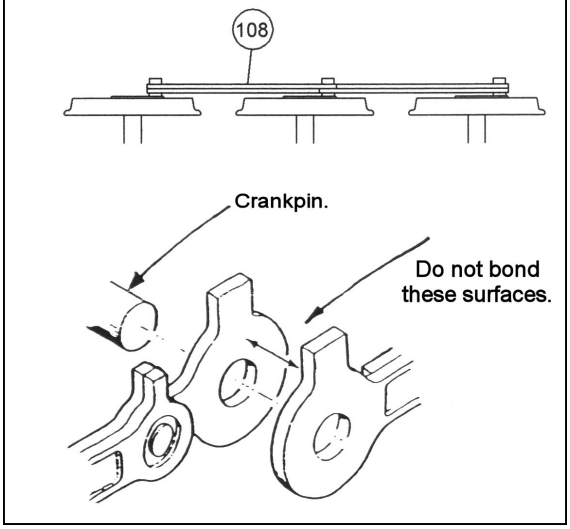


Fig. 1. Chassis Construction.

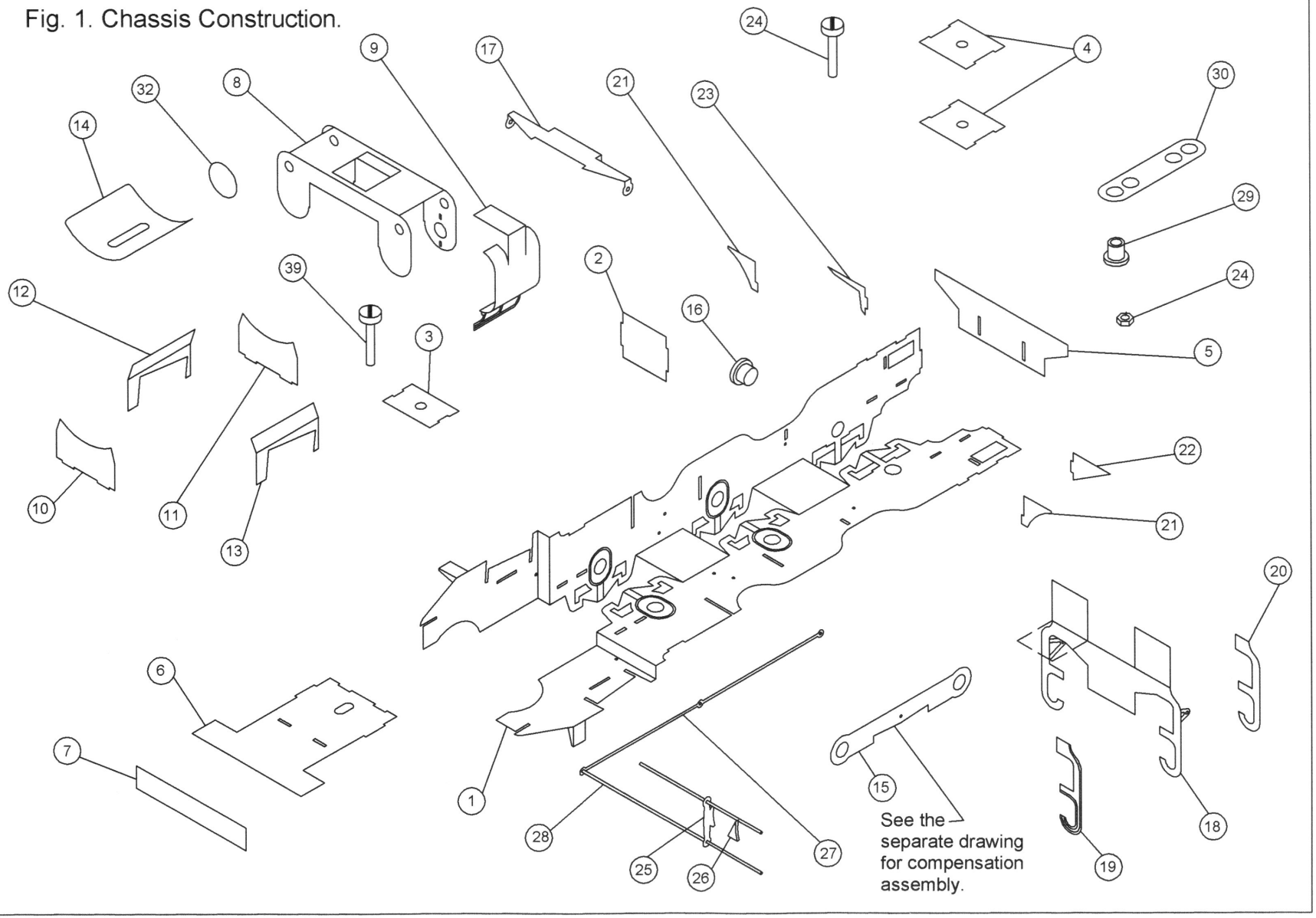
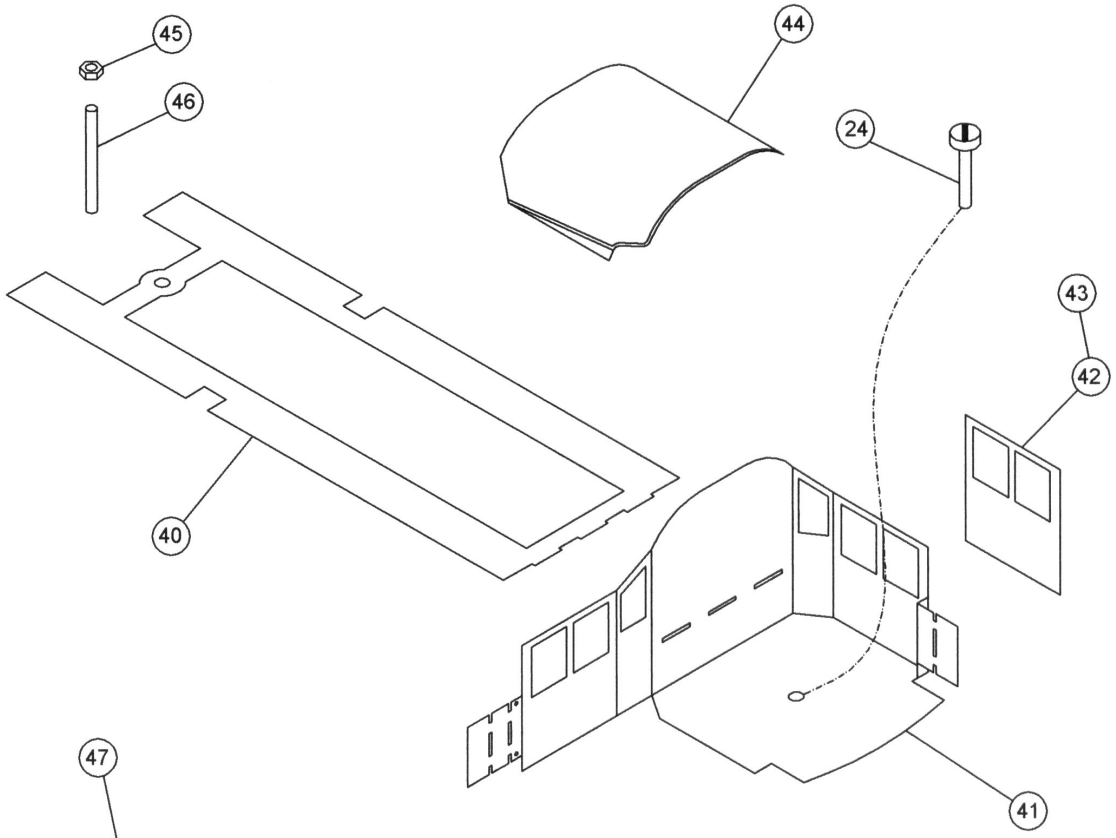
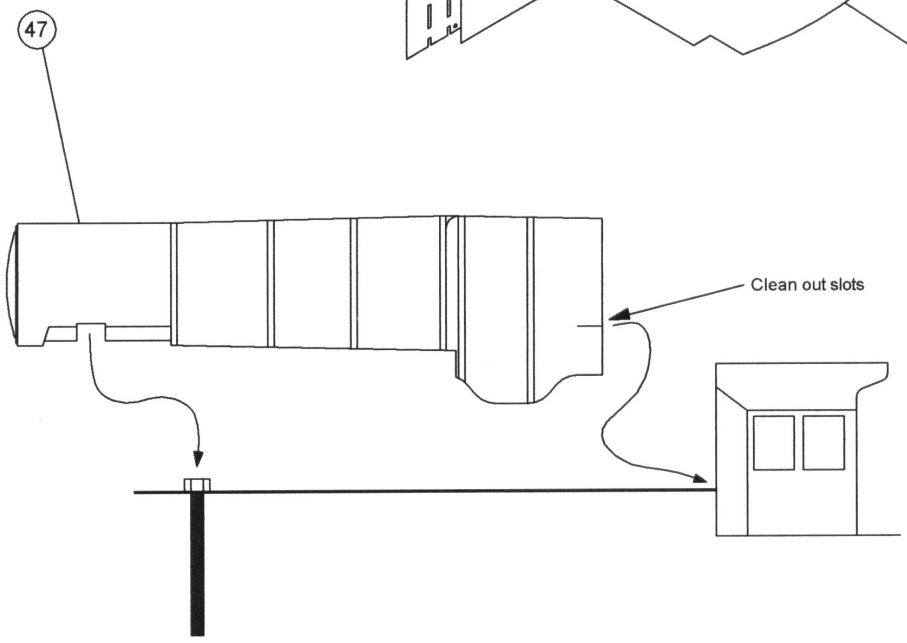
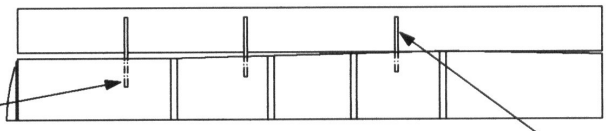


Fig. 2. Body Construction.







Drill into the boiler under the running plate and insert brass wire into the holes so that the running plate is supported by the wire. Solder the wire to the running plate.

Fig. 3. Tender Instructions.

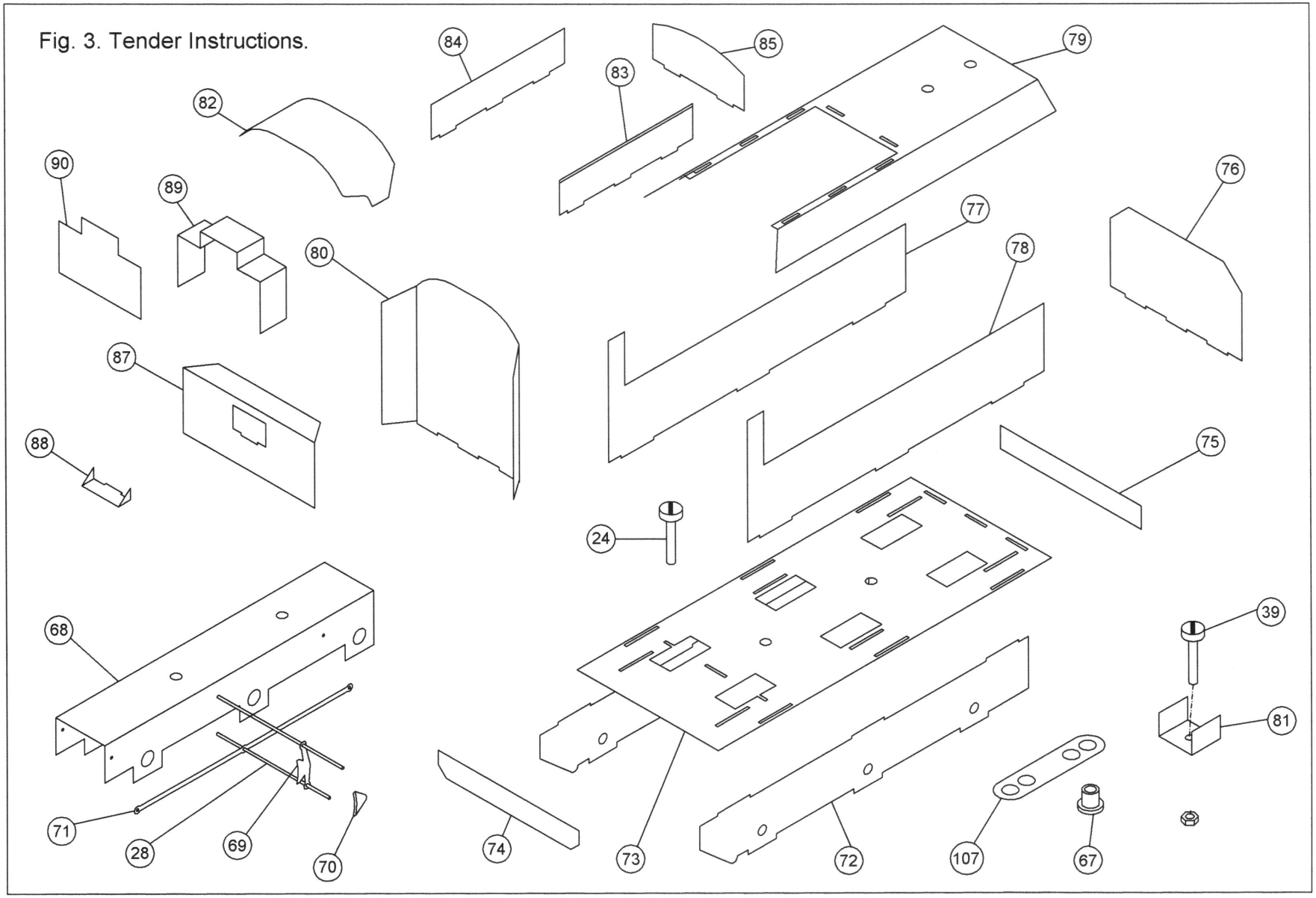
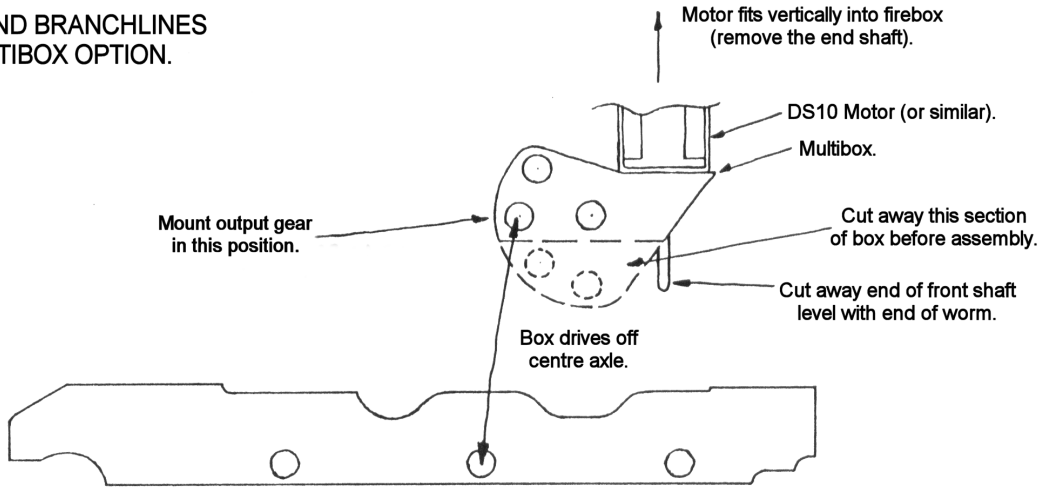


FIG. 6. MOTOR FITTING.

A. DS10 AND BRANCHLINES MULTIBOX OPTION.



B. PORTESCAP 1219 WITH REPLACMENT GEARBOX SIDES.

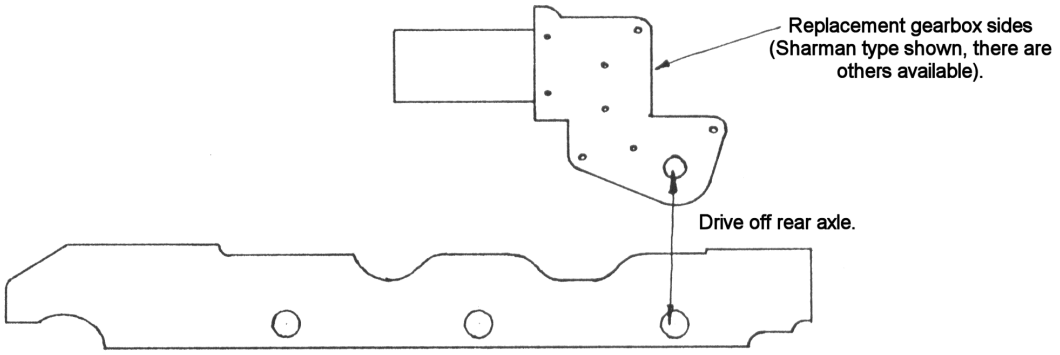
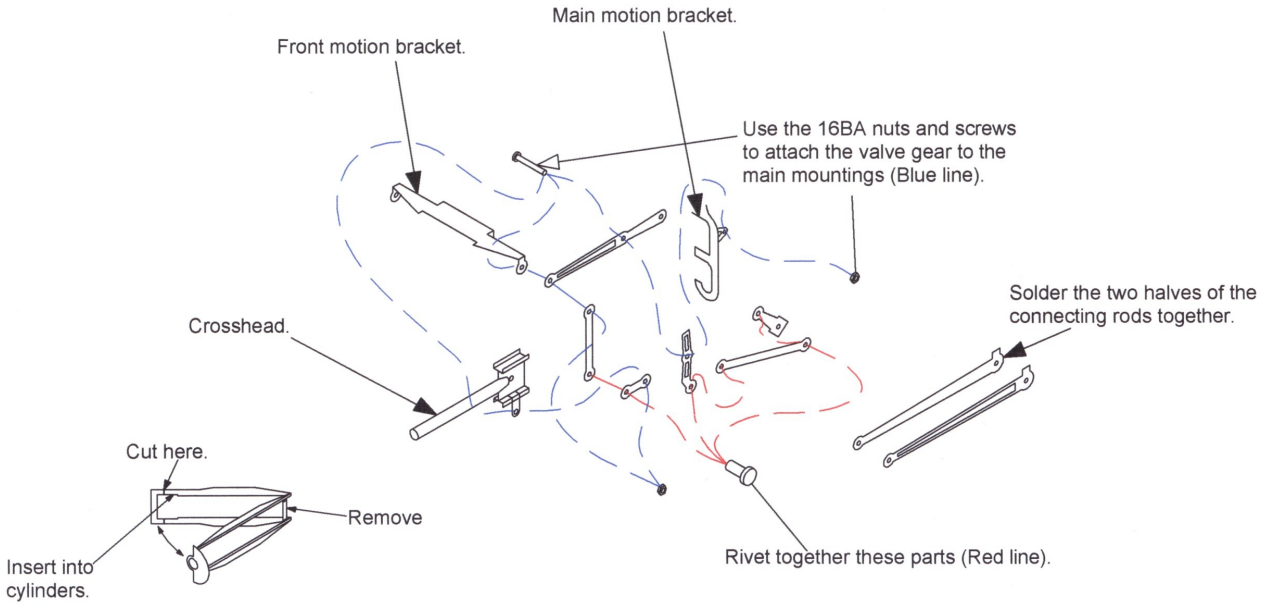


Fig. 4. Valve Gear Assembly.



PARTS LIST

1. Mainframes.
2. Centre frame spacer.
3. Front frame spacer.
4. Rear frame spacer.
5. Rear frame section.
6. Front running plate.
7. Bufferbeam.
8. Cylinders.
9. Cylinder sides.
10. Saddle front.
11. Saddle rear.
12. Saddle sides.
13. Saddle sides.
14. Saddle sides.
15. Compensating beams.
16. 1/8th Axle bearings.
17. Front motion bracket.
18. Main motion bracket.
19. Main motion bracket overlays.
20. Main motion bracket overlays.
21. Side brackets.
22. L/H cab support bracket.
23. R/H cab support bracket.
24. 8BA screws and nuts.
25. Brake hangers.
26. Brake blocks.
27. Brake pull rods.
28. Brass wire.
29. Drawbar pivot.
30. Drawbar.
31. Compensating spring.
32. Cylinder front covers.
33. Upper steam pipes.
34. Cylinder end covers.
35. Front ladders.
36. Vacuum pipes.
37. Buffers.
38. Reversing bar.
39. 10BA screws and nuts.
40. Running plate.
41. Cab unit.
42. L/H cab side overlay.
43. R/H cab side overlay.
44. Cab roof.
45. 8BA nut.
46. 8BA threaded rod.
47. Resin boiler.
48. Dome.

49. Top feed.
50. Chimney.
51. Washout plugs.
52. Steam pipes.
53. Ejector ducting.
54. Ejector.
55. Copper wire.
56. Mechanical lubricators.
57. Throttle rod mounting.
58. Throttle rod.
59. Manifold.
60. Fire iron tunnel.
61. Large sandbox.
62. Main pipework & injectors.
63. Handrail knobs.
64. Smokebox door handle.
65. Main reversing bar.
66. Backhead.
67. 2mm bearings.
68. Tender inside frames.
69. Tender Brake hangers.
70. Tender brake blocks.
71. Tender brake pull rods.
72. Tender main frames.
73. Baseplate.
74. Dragbeam.
75. Bufferbeam.
76. Tender rear.
77. R/H side.
78. L/H side.
79. Tender top.
80. Front bulkhead.
81. Drawbar support.
82. Tender cab roof.
83. L/H bunker side.
84. R/H bunker side.
85. Bunker rear.
86. Coal space bottom.
87. Lower bulkhead.
88. Coal chute.
89. Locker frame.
90. Locker front.
91. L/H locker door.
92. R/H locker door.
93. Centre locker door.
94. Tender front running plate.
95. Tender/cab ladder.
96. Axleboxes.
97. Rear ladder.
98. Tank vents.
99. Bunker rear brackets.
100. Water dome.
101. Water filler.
102. Bogie top.
103. Main bogie casting.
104. Valve gear.
105. Slidebars.
106. Crossheads.
107. Drawbar.
108. Coupling rods.
109. 16BA screws and nuts.
110. Rivets.

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