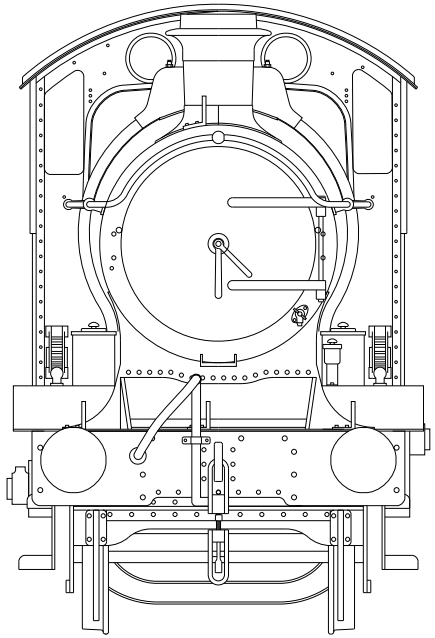
GWR STRAIGHT FRAMED BULLDOG



CAUTION.

This product contains etched parts with very sharp edges and castings that may contain lead. Neither the Manufacturer, Distributor or Retailer can accept any liability for illness, injury or consequential damage caused when handling or building this product.

Read any instructions before assembly. Do not eat or drink whilst handling. Wash hands after use.

BRIEF HISTORICAL DETAILS

For a detailed history of this large (156 engines) and long lived class Part Seven of 'The Locomotives of the Great Western Railway' published by the RCTS is essential reading. Also useful are GW Engines Vol 2 by J.H.Russell, Standard Gauge G.W. 4-4-Os by OS Nock & Locomotives Illustrated 50, GWR double-framed 4-4-Os.

From this kit any of the straight framed engines (the last 115 built) can be built from circa 1904 to 1951.

The following Swindon drawings were used in designing the kit:

16116	2/1900	Lot 124/137 Frame plan
36557	1/1909	Lot 177 Frame plan
25816	9/1904	Lot 124 Front elevation
36774	6/1908	Lot 177 Cab & splashers
115623	10/1940	Inside motion

The straight framed engines were built in seven Lots as follows:

Lot	Old Nos	New Nos	Built	Cab	Boiler	Frames	Nameplate
124	3353-72	3341-60	1 /00-12/00	1	DO	Std 1	Oval
137	3413-32	3361-80	12/02-5/03	2	DO	Std 2	Standard
142	3443-52	3381-90	9/03-10/03	2	D2	Std 2	Standard
148	3453-72	3391-3410	1/04-4/04	2	D2	Std 2	Standard
162	3701-15	3411-25	4/06-6/06	2	D3	Std 2	Standard
163	3716-30	3426-40	7/06-9/06	2	D3	Std 2	Standard
177	3731-45	3441-55	5/09-1/10	2	D3	Deep	Standard

The locomotives built in Lots 124,137,142,148, 162 & 163, with the standard depth of outside frame, will be referred to as Bulldogs and to Lot 177, with the deep frames, as Birds. Lot 124 differed from the later Bulldogs because of the smaller cab cutout (Cab 1) and curved rear steps (Frames Std 1). Two boilers are provided in the kit, the half cone D2 and the three-quarter cone D3. This means that Lots 124 and 137 cannot be built in their original condition with the DO parallel boiler.

Because the outside frames of the kit have half etched snap head rivets, Lots 124,137 & 142 cannot be built in their original condition with flush frame rivets. The first Lot that can be built in original condition is Lot 148. 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. Lot 163 was built with the frame strengthening plates and the Birds also were built with them but only on the rear axle.

Bulldogs originally had Dean swing-hanger bogies, fluted coupling rods, steam brake and steam reverse whereas the Birds were built with De Glehn type bogies, plain coupling rods, vacuum brake and screw reverse. It is believed that all of the Bulldogs were later rebuilt with screw reverse.

There are also many detail differences both between individual locomotives and as the class changed through time.

VARIATIONS POSSIBLE WITH THE KIT

The following are possible with the kit.

Chimneys. Three different types provided.

Safety valve casing. With or without top-feed.

Bogies. Many rebuilt to De Glehn type without swing-hangers and fitted with strengthening patches. Some were built with bogie splashers.

Smokebox. Originally quite short and later front and back rings riveted.

Smokebox saddle. Early flush rivets, later snap head rivets.

Sandboxes. Originally below footplate on leading coupled wheels only, later larger and above footplate on all wheels. The Birds were built with the larger type.

Cab roof. Early canvas covered wood, later steel.

Splashers. Built with beading which was later removed with rivets visible.

Cab spectacle windows. Plated over during the late 1920s.

ATC Equipment. Fitted from 1928

Vacuum pipe. Originally tall, later a shorter pattern was 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.

CHASSIS OVERVIEW

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. Components are not always identified left/right separately but with care and common sense no problems should arise.

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

Gauge.

For Finescale, where little sideplay is required, the widest spacers can be used but they will need careful filing to make their width 26.0 mm. If you require your engine to negotiate sharp curves then the middle width spacers should be used.

The widest frame spacers supplied are suitable for Scaleseven and care will be needed to allow sufficient sideplay, especially in the leading axle to enable the model to negotiate moderate curves.

Suspension.

Rigid. The kit is supplied with top hat bearings to build a rigid chassis. Open out the main axle holes to accept top hat bushes and solder them in place.

Sprung. If you are going to fit sprung horn blocks, you should open out the frame slots by cutting up the half etched lines and follow the manufacturers instructions.

Compensated. The simplest and most reliable suspension system is beam compensation and the necessary compensation beams are provided in the kit. Not provided are the hornblocks and bearings which are available as an extra item which includes instructions for aligning the hornblocks accurately.

Pickups. No pickup material is provided. The options are:

Scrapers. Attached to the middle frame spacer using printed circuit board.

Plunger. Open out holes P and fit according to the manufacturers instructions. It may not be possible to use plunger pickups if you wish to fit the inside motion because they may foul each other.

Split axle/frame. We leave this to you! Some useful information can be found at http://www.euram-online.co.uk/tips/splitaxle/splitaxle.htm.

COMPONENTS NOT SUPPLIED

WHEELS

Driving wheels - 5’ 8", 18 spoke, 3/16" diameter axle (2). Slater's Ref. 7868O/C

Until the Finney7 cranks are available we recommend fitting the MOK outside cranks.

Bogie wheels - 3'7”, 10 spoke, general pattern. Specify 2mm outside journals when ordering. Slater's Ref. 7843MF

MOTOR/GEARBOX

A Canon motor with a SDMP 40L/15 gearbox (available from Finney7) or an alternative such as an ABC VML2 gearbox.

CRANKPINS

Heavy duty crankpins are available from Finney7.

INSIDE MOTION

A separate kit is available from Finney7 to construct the working inside motion.

NAMEPLATES

We can supply some of the oval name and works plates fitted to some of the locomotives.

	Old No.	New No.
BLASIUS		3341
CAMELOT		3343
DARTMOUTH		3344
LYONESSE		3349
PENDRAGON	3364	3352
TRELAWNY	3369	3357
TREMAYNE		3358
TREGEAGLE		3359

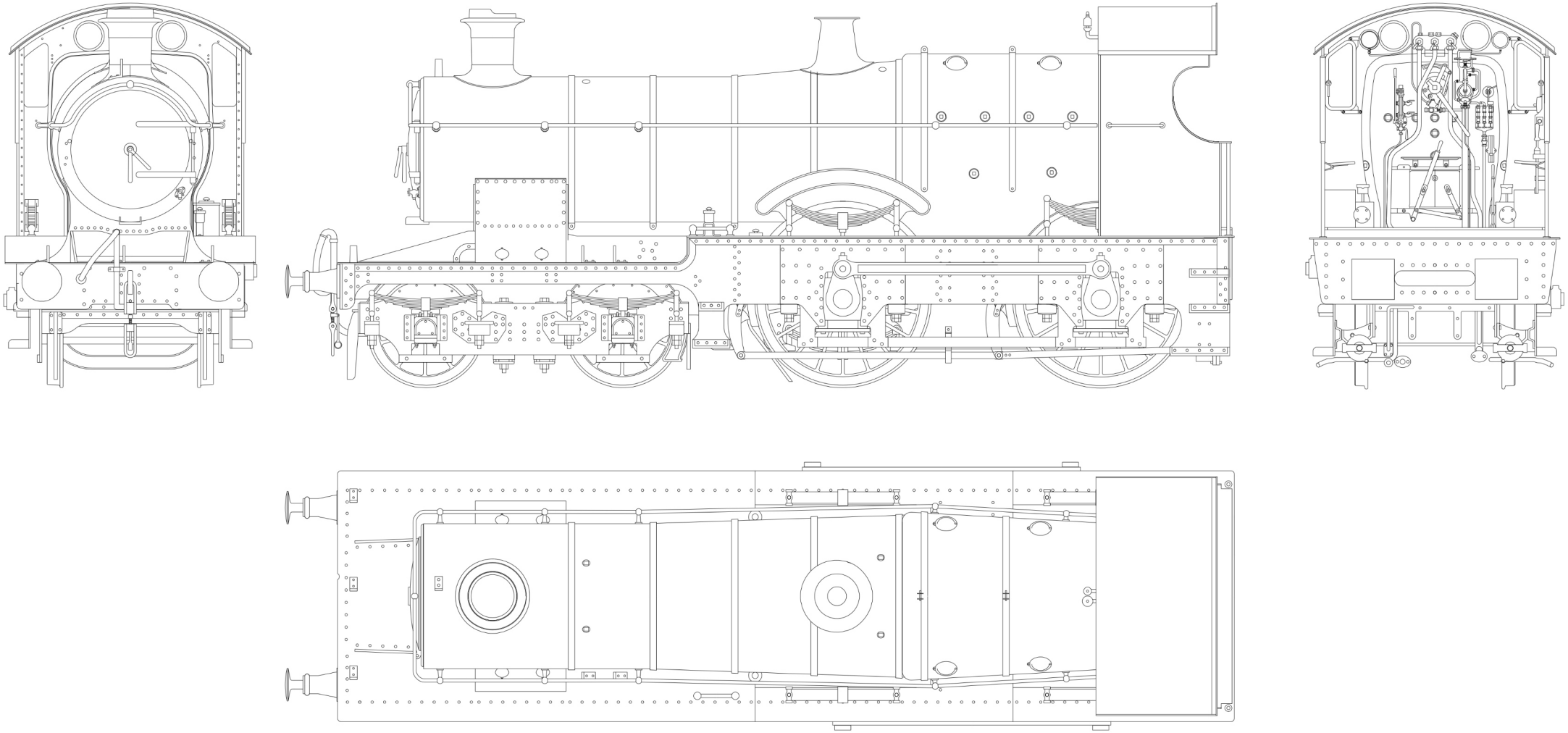


Fig 1. Straight Frame Bulldog, showing D2 boiler, no top feed, short non-superheat smokebox, fluted coupling rods, small cab cut-out (Lot 124), steel roof with side rain strips, single sandbox inset into footplate, screw reverse.

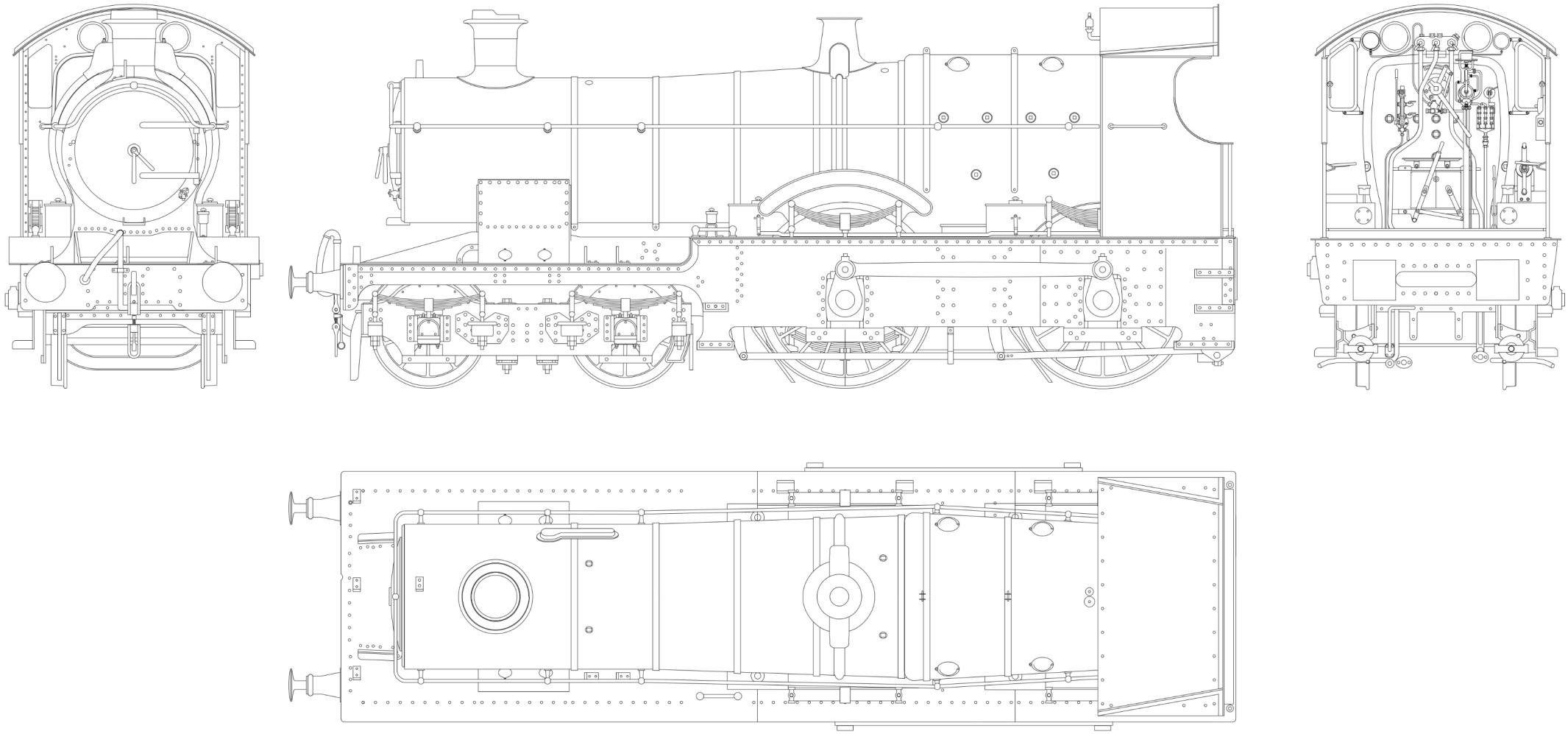


Fig 2. Bird, showing D3 boiler, long smokebox, top feed, steam reverser, deep frame bogie, plain coupling rods, large cab cut-out, steel roof with slanting rain strips, four sandboxes on footplate.

BOGIE

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

Deep frames or shallow frames - remove the metal marked by the half etch line on the inside face.
Different rivet patterns - emboss those wanted.
Bogie frame patches (B3).
Splashers below the frame - remove for later period.
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 (B3) if needed. Solder in the axle bearings. Form the splasher tops (B4) to shape. First mark a fold line 2.0 mm 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 splashers in place solder the splasher rear cover (B5) to the rear splasher.

No.	Description	Sheet
B1	Bogie left frame	B2
B2	Bogie right frame	B2
B3	Frame strengthening patch (2L & 2R)	A2
B4	Splasher tops (8)	B2
B5	Bogie splasher rear cover (2)	B2
B6	Bogie stretcher	B2
B7	Bogie front angle strip	B2
B8	Bogie front stretcher	A2
B9	Bogie guard iron (L & R)	A2
B10	Bogie rear stretcher	A2
B11	Bogie pivot washer (6BA)	A1

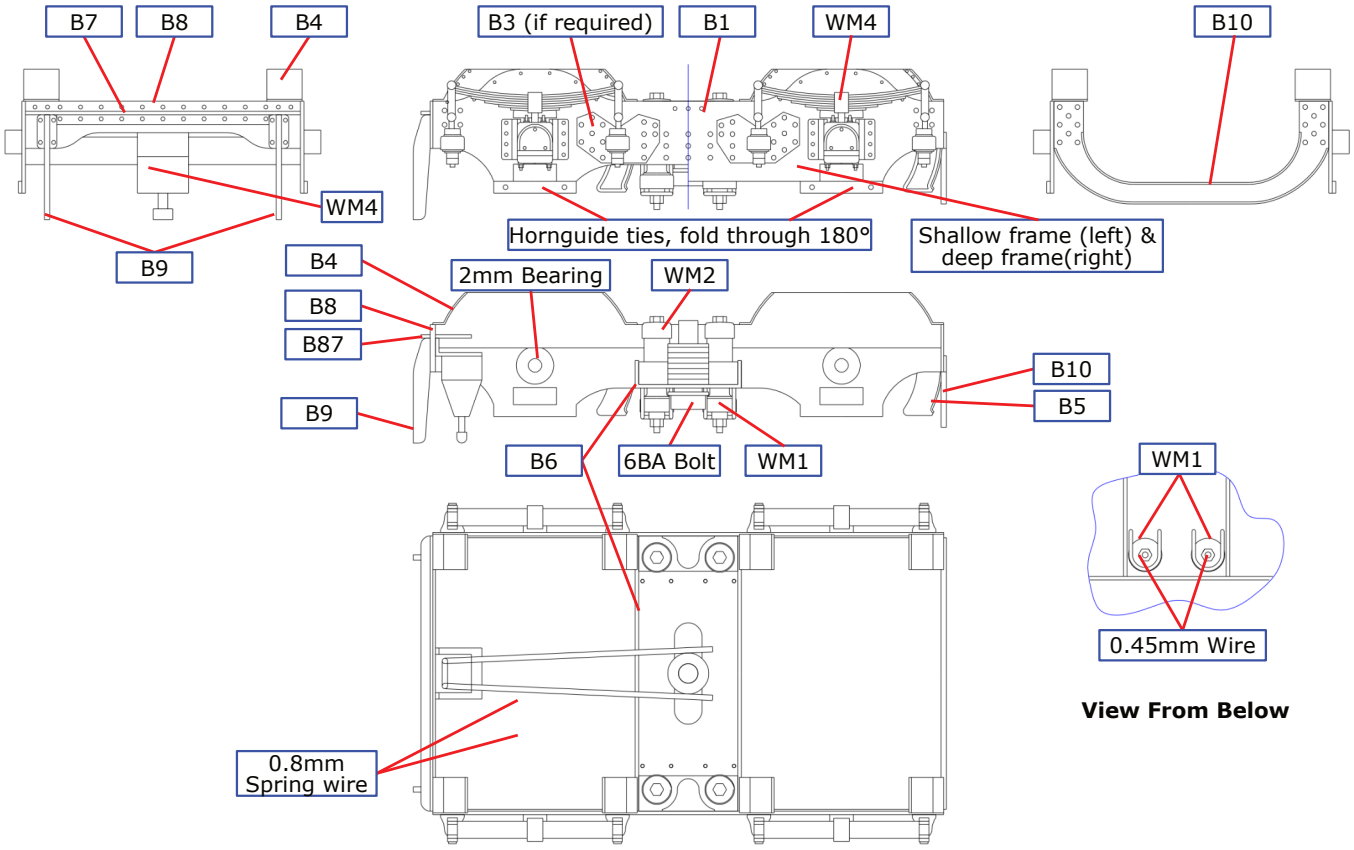


Fig 3. Bogie Construction

Fold the stretcher (B6) 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 the front angle strip (B7) through the slots in the front stretcher (B8) and attach the guard irons (B9) likewise. Solder the complete front stretcher in place. Repeat for the rear stretcher (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 (WM1) through the larger holes in the spacer and make flush with the upper surface of the spacer. Attach the upper swing hanger castings (WM2) and the axlebox/spring castings (WM3). Form the safety brackets from 0.45 mm wire and solder in place through the small holes in the spacer.

Lastly if you are modelling the ATC gear attach the shoe (WM4) under the tab projecting from the front stretcher.t.

COUPLING RODS AND FRAME PREP

Coupling Rods. The coupling rods are now made so that they can be used as a jig to align the leading coupled axle hornblocks accurately. Choose between fluted (M1 & M2) or plain (M3 & M4) coupling rods.

First drill out all the crankpin holes to a convenient size which is undersized 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.

Frame Preparation. Having decided which chassis to construct you can now start construction by preparing the inside frames (F1 & F2). If you are building a Bulldog, remove the blue shaded area marked by the half etch; keep for a Bird. 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.

Now open up the following holes in the frames, as shown in Fig 4:

- P only if plunger pick-ups are being used
- B for brake hanger pivots 0.8mm. Upper hole for Bulldog, lower for Bird.
- R for reversing lever cross shaft 1.6 mm
- A for compensation beam pivot 1/8"
- C If required, for mounting the steam reversing cylinder in the inside motion kit.
- S Bulldog steam brake cylinder mountings 0.8mm. (Unfortunately MF did not provide marks. The holes are 3mm apart and 2mm up from the bottom of the frame)

The last job on the frames is to emboss the rivets marked by half etched holes. If you are fitting the strengthening plates, do not rivet those parts of the frames that are covered by the strengthening plates (F42 & F52); also remove any hornblock detail that will be covered by the strengthening plates.

No.	Description	Sheet
M1	Fluted coupling rod outer lamination (2)	A1
M2	Fluted coupling rod inner lamination (2)	A1
M3	Plain coupling rod outer lamination (2)	A1
M4	Plain coupling rod inner lamination (2)	A1
B1	Bogie left frame	B2
B2	Bogie right frame	B2
B3	Frame strengthening patch (2L & 2R)	A2
B4	Splasher tops (8)	B2
B5	Bogie splasher rear cover (2)	B2
B6	Bogie stretcher	B2
B7	Bogie front angle strip	B2
B8	Bogie front stretcher	A2
B9	Bogie guard iron (L & R)	A2
B10	Bogie rear stretcher	A2
B11	Bogie pivot washer (6BA)	A1
F1	Left inside frame	A1
F2	Right inside frame	A1

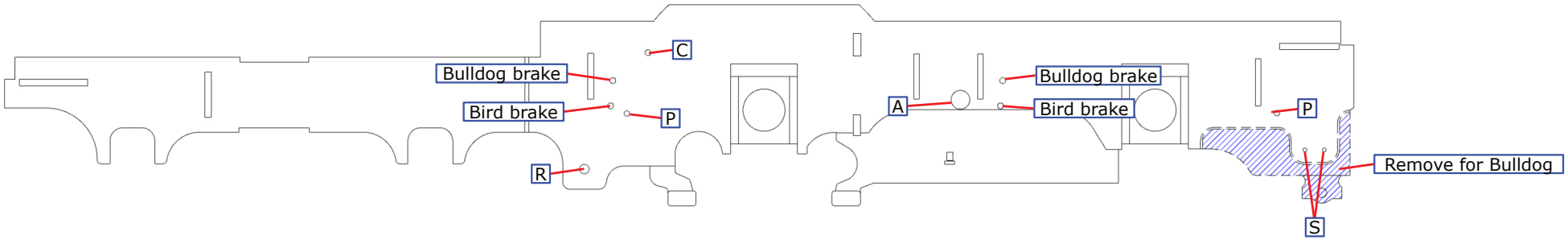


Fig 4. Frame Preparation

INSIDE FRAMES CONSTRUCTION 1

Assembling the Chassis. Remove from the etches the stretchers, rear (F3), firebox (F4), cylinder block and bogie pivot (F5) and the front (F6) to suit your chosen gauge. If you are fitting inside motion open up the slots in the cylinder stretcher to the rear edge using the half etched lines as a guide and check the fit of the 3/32" brass cylinder tube in the slots. Tap the cylinder fixing hole 6BA.

Solder the 6BA bogie pivot nut in place on the cylinder block and bogie pivot stretcher. Fold up the cylinder block and front stretchers 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 edge of the spacer is hard up against the inside of the frames. Match the shape of the frames to the front stretcher.

To assemble the frames start by tack soldering the rear spacer to both sides. Check that everything is square and that the spacers are hard against the frames. Put an axle (or better a longer piece of 3/16" 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 spacers 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 (F7 & F8) (those marked 18.83 if you have used the widest spacers or those marked EM if you have used the middle width spacers) and fold along the half etched line. The long tab on the rear stretcher folds down, after it is soldered in place, to retain the compensation beam.

No.	Description	Sheet
F1	Left inside frame	A1
F2	Right inside frame	A1
F3	Rear frame stretcher	A2
F4	Firebox frame stretcher	A2
F5	Cylinder block and bogie pivot frame stretcher	A2
F6	Front frame stretcher	A2
F7	Centre outside frame spacer	A2
F8	Front outside frame spacer	A2

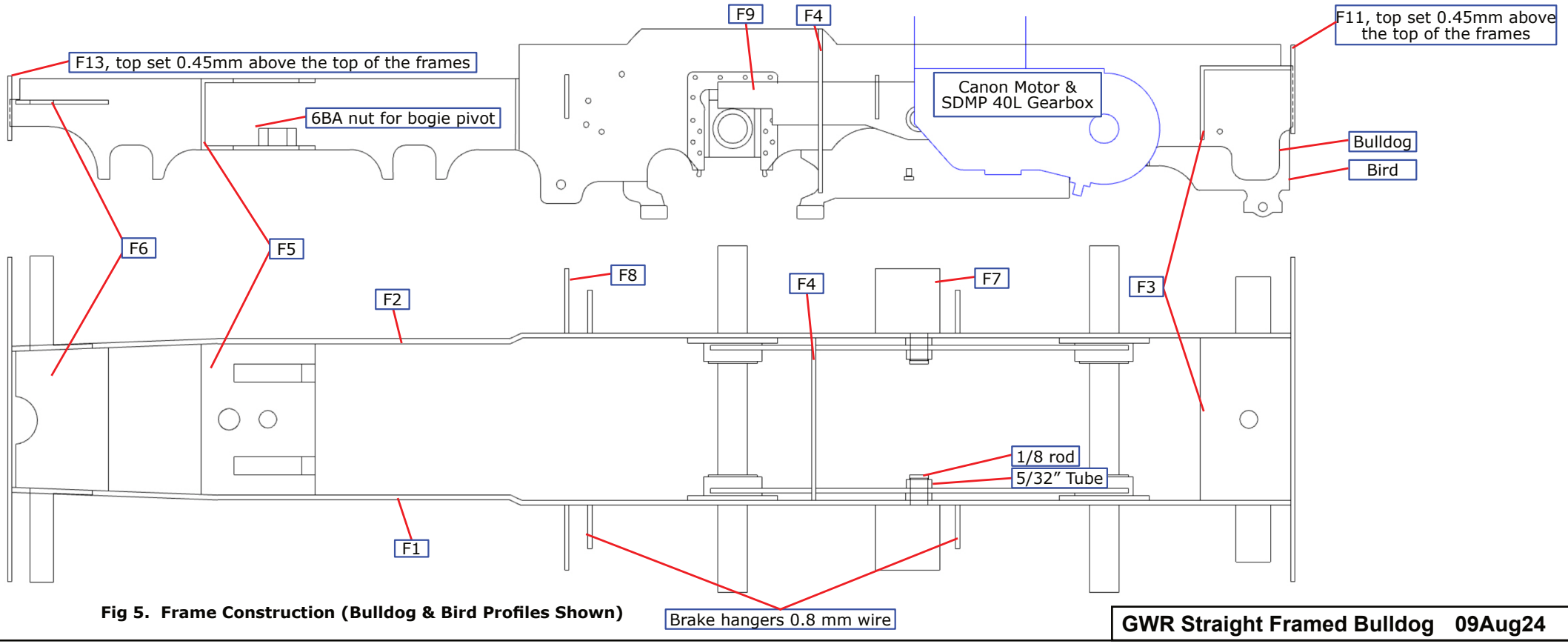


Fig 5. Frame Construction (Bulldog & Bird Profiles Shown)

INSIDE FRAMES CONSTRUCTION 2

Compensation. Cut a piece of 1/8" 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 5/32" brass tube. Each should have a length of 4.5mm if you have used the widest spacers or 3mm if you have used the middle width of spacers. In each compensation beam (F9) open up the hole to accept the brass tube and solder the beams to the pieces of tube 1mm from one end.

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 (B11). Confirm that the compensation works properly and check if the chassis is sitting level.

To retain the beams first dismantle the chassis. Refit the beams and thread through the pivot rod with a paper washer between the beam and the frames, the beam, a paper washer and then a compensation beam washer (F10), repeat for the other side. Securely solder the beam to the frames, ensuring that the beams still move freely. Cut away the centre section of the pivot rod. Solder the compensation beam washers to the pivot rod to retain the beams.

Inside Motion. If you are fitting working inside motion then build it next following the separate instructions.

Drag & Buffer Beams. Emboss the rivets on the drag beam (F11) and attach the rubbing plates (F12).

Solder the buffer beam (F13) and drag beam to the frames locating the frames in the appropriate half etched slots. Their upper edge must be .018" (0.45mm) above the upper edge of the frames so that they will be flush with the footplate when it is fitted. Any piece of .018" material placed on top of the frames will help ensure correct alignment.

Springs. Solder together the three laminations of the inside frame spring, inner and two outer (F26 & F27) before fixing in place inside the spring hangers (See Fig 6).

No.	Description	Sheet
F1	Left inside frame	A1
F2	Right inside frame	A1
F3	Rear frame stretcher	A2
F4	Firebox frame stretcher	A2
F5	Cylinder block and bogie pivot frame stretcher	A2
F6	Front frame stretcher	A2
F7	Centre outside frame spacer	A2
F8	Front outside frame spacer	A2
F9	Compensation beam	A2
F10	Compensation beam washers	B2
F11	Drag beam	A1
F12	Rubbing plates (2)	A2
F13	Buffer beam	A1

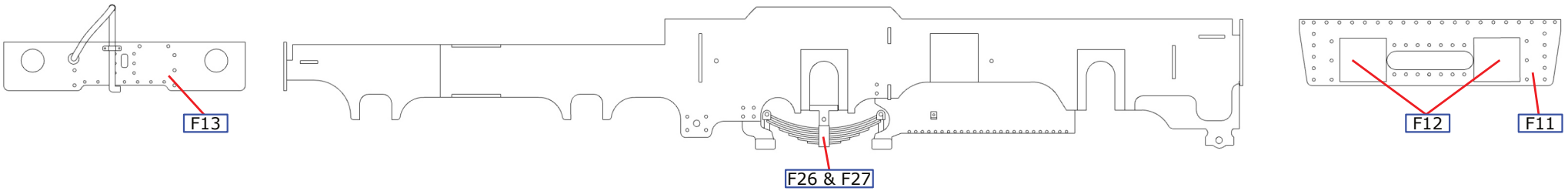


Fig 6. Buffer & Drag Beams

BULLDOG OUTSIDE FRAMES

Fold the outside axle boxes (F14) 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 and the strengthening plates, if these are to be used, and ease if necessary. If you are fitting strengthening plates (F42) to the outside frames (F40 & F41), remove the rivets and the hornblock detail from the area that will be behind the plates. Attach the rivet strips, front (F15 & F16) and rear (F17), to the top of outside frames. The rear rivet strip will need shortening to clear the angle bracket if you are building a Lot 124 locomotive.

Solder the strengthening plates (F42) in position carefully checking that each one is in the correct position by trying the outside frame axleboxes. Solder short lengths of 0.8mm wire to the inside lower edge of the outside frames at each spring damper position to mount the spring dampers later. The positions are given by the distinctive rivet patterns.

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. Bend and attach the frame to buffer beam bracket (F18) and the frame to drag beam angle (F19).

No.	Description	Sheet
F14	Outside axleboxes (4)	A2
F40	Bulldog left outside frame	A1
F41	Bulldog right outside frame	A1
F15	Left front outside frame rivet strip	B1
F16	Right front outside frame rivet strip	B1
F17	Outside frame rear rivet strip (2)	B1
F42	Bulldog outside frame strengthening plates (4)	A1
F18	Frame to buffer beam bracket (2)	B1
F19	Frame to drag beam bracket (2)	B1

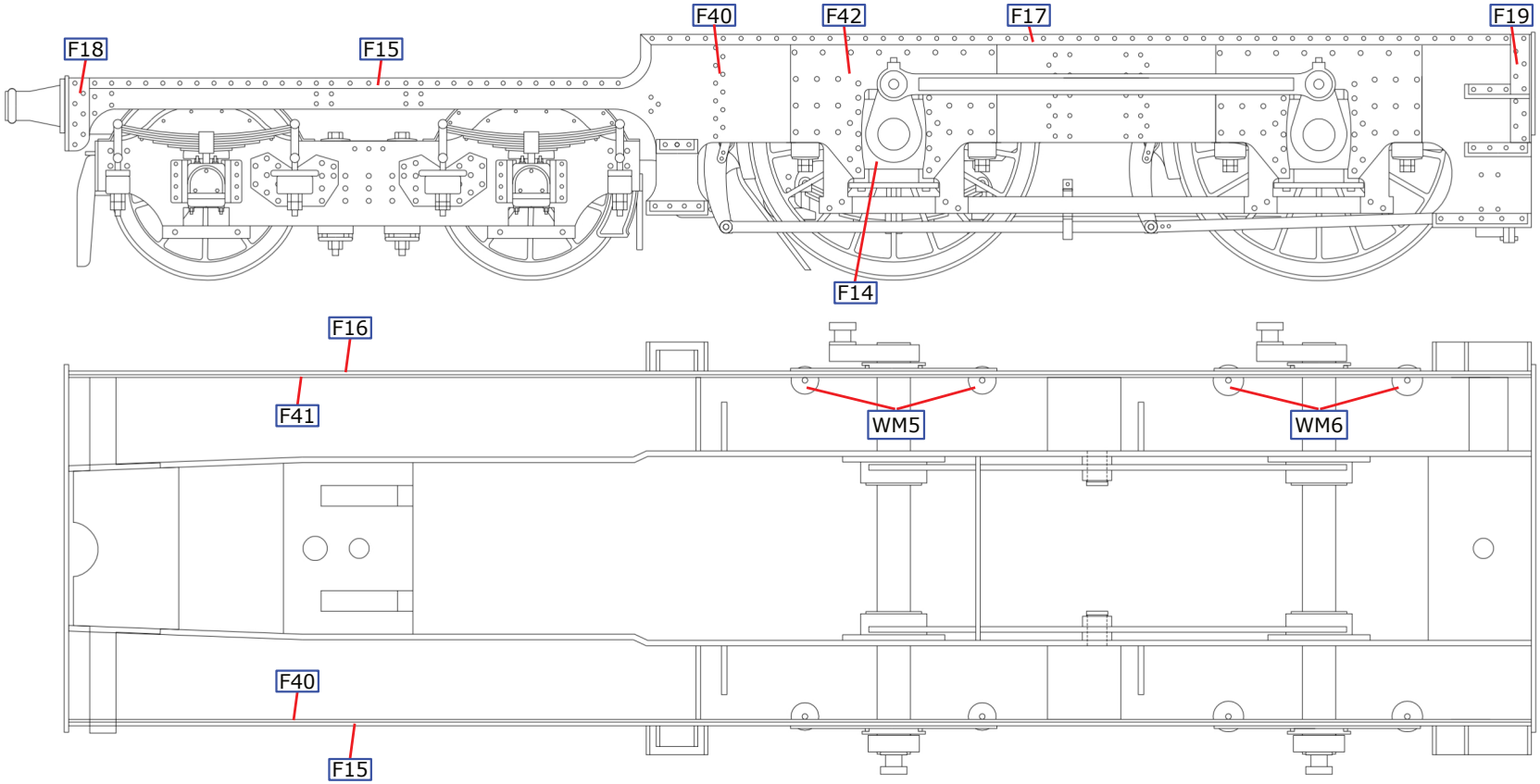


Fig 7. Frame Detailing

BULLDOG OUTSIDE FRAMES

Secure the balance weights in position, original (F22 & F23) or balanced (F24 & F25). Now fit and assemble the axles, wheels and motor. Retain the axleboxes in the inner horns with lengths of 0.8mm wire. Check that everything moves freely. When satisfied fit the cranks to the axle ends. Fit the coupling rods and confirm that everything still moves smoothly.

Fix the cast spring dampers, leading and trailing (WM5 & WM6) in place on the previously fitted wires. The smaller dampers are used for the leading coupled axle.

Emboss the rivets on the outside frame hornblock tie (F20) and attach to the frames under the horn guides. Solder the frame tiebars (F21) in place.

Now build the brake gear as detailed on page 12 and then return here,

Form sand pipes from 1.2mm wire and attach through the holes in the font and centre spacers. Note the Bulldogs only had sanding on the leading wheels before they were fitted with the large sandboxes.

Fit the either the early tall vacuum pipe (BR3) or the later short vacuum pipe (BR4). Fit the dummy (BR5) to the front buffer beam. Build the buffers as shown below and fit the Dean taper buffer housings (WM7).

Fold up the front steps (F31 & F32) and attach to frames. The etched rivets on the frames locate in the recesses in the steps to give accurate alignment. Fold the rear steps (F33, F34 & F35) and solder in place; the inset drawing to the right gives details of the Lot 124 rear steps.

No.	Description	Sheet
F20	Outside frame hornblock tie (4)	A1
F21	Frame tiebar (2)	B2
F22	Original front balance weight (2)	A1
F23	Original rear balance weight (2)	A1
F24	Balanced crank front balance weight (2)	A1
F25	Balanced crank rear balance weight (2)	A1
F31	Front upper step (2)	B2
F32	Front lower step (2)	B2
F33	Rear upper step (2)	B2
F34	Rear middle step (2)	B2
F35	Rear lower step (2)	B2
F47	Lot 124 rear lower step (2)	B2

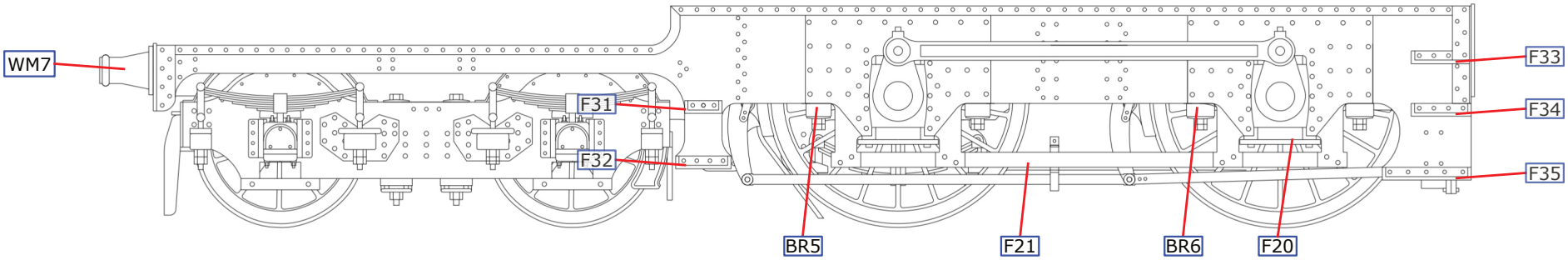


Fig 8. Bulldog Frame Detailing

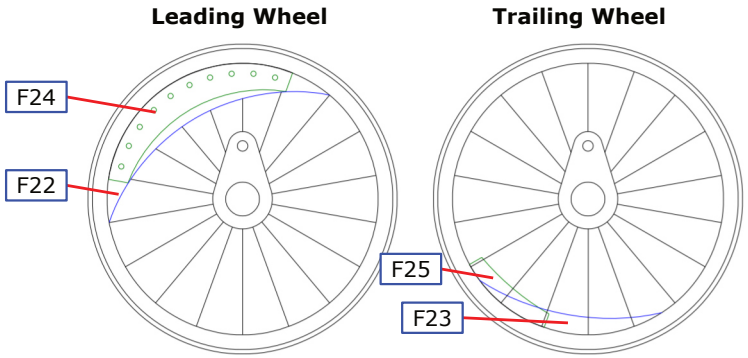
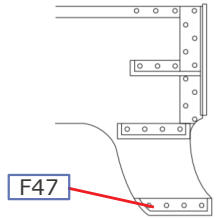


Fig 9. Wheel Balance Weights



Lot 124 Rear Steps

BULLDOG BRAKES

Brakes. Emboss two rivets on each outer brake hanger. Assemble the brake hangers and shoes (F43, F44 and WM8 or F28) using 0.8mm wire. Attach the brake hangers to the pivot wires.

Attach the steam brake cylinders (BR1 & BR2) to the chassis. Assemble the brake gear as shown in Fig 10. Emboss the two rivets on each outside rear brake pull rod (F45). Now fit the brake pull rods, front (F29) and rear inner and outer (F45 & F46) using 0.8mm wire as shown in the diagram. The pull rods are also attached either side of the steam brake cylinders.

Form and fit the brake pull rods safety brackets (F30) through the small slots in the ash-pan sides and under the pull rods.

No.	Description	Sheet
F28	Brake shoe (4)	A1
F29	Front brake pull rod (2)	A2
F30	Brake pull rod safety bracket	B2
F43	Bulldog outer brake hanger (4)	A1
F44	Bulldog inner brake hanger (4)	A1
F45	Bulldog rear outer brake pull rod (2)	A1
F46	Bulldog rear inner brake pull rod (2)	A1

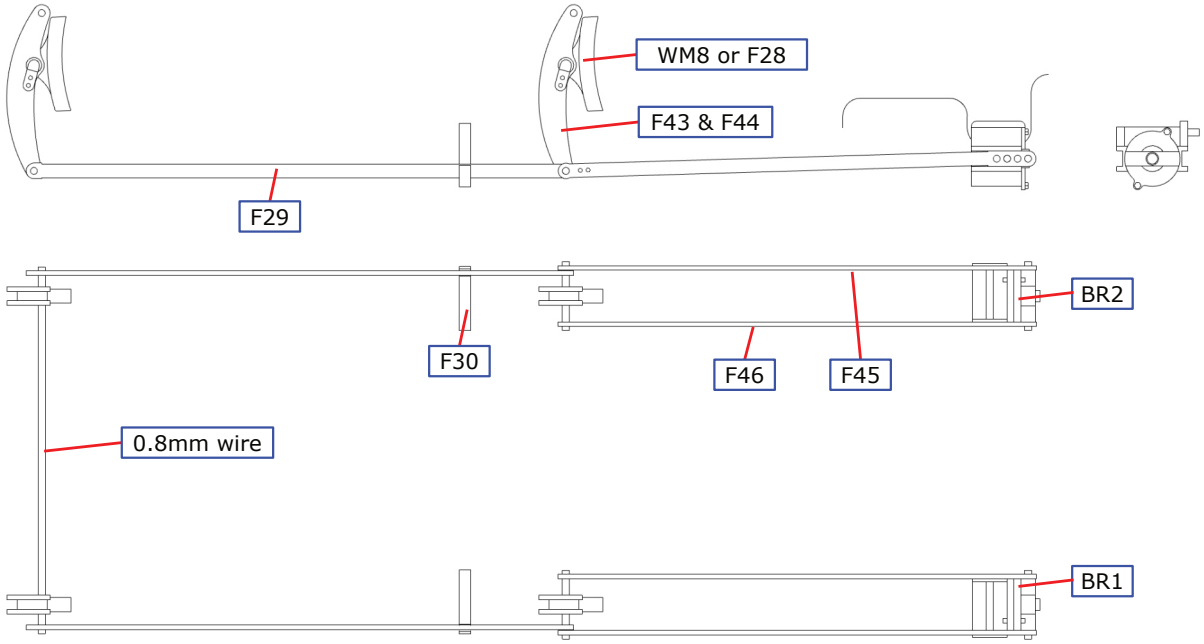


Fig 10. Bulldog Brake Construction

BIRD OUTSIDE FRAMES

Fold the outside axle boxes (F14) 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. Attach the rivet strips, front (F15 & F16) and rear (F17), to the top of outside frames.

Solder the strengthening plates (F52) in position carefully checking that each one is in the correct position by trying the outside frame in place over the outside frame axleboxes. Solder short lengths of 0.8 mm wire to the inside lower edge of the outside frames at each spring damper position to mount the spring dampers later. The positions are given by the distinctive rivet patterns.

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. Bend and attach the frame to buffer beam bracket (F18) and the frame to drag beam angle (F19).

Secure the balance weights in position, original (F22 & F23) or balanced (F24 & F25); these are shown in Fig on page 14. Now fit and assemble the axles, wheels and motor. Retain the axleboxes in the inner horns with lengths of 0.8mm wire. Check that everything moves freely. When satisfied fit the cranks to the axle ends. Fit the coupling rods and confirm that everything still moves smoothly.

Emboss the rivets on the outside frame hornblock tie (F53) and attach to the frames as shown in Fig 11.

Form sand pipes from 1.2mm wire and attach through the holes in the font and centre spacers. Fit the either the early tall vacuum pipe (BR3) or the later short vacuum pipe (BR4). Fit the dummy (BR5) to the front buffer beam. Build the buffers as shown below and fit the Dean taper buffer housings (WM7).

Fold up the front steps (F31 & F32) and attach to frames. The etched rivets on the frames locate in the recesses in the steps to give accurate alignment. Fold the rear steps (F33. F34 & F35) and solder in place.

No.	Description	Sheet
F14	Outside axleboxes (4)	A2
F50	Bird left outside frame	A1
F51	Bird right outside frame	A1
F15	Left front outside frame rivet strip	B1
F16	Right front outside frame rivet strip	B1
F17	Outside frame rear rivet strip (2)	B1
F52	Bird outside frame strengthening plates (2)	A1
F53	Bird outside frame hornblock tie (4)	A1
F18	Frame to buffer beam bracket (2)	B1
F19	Frame to drag beam bracket (2)	B1
F22	Original front balance weight (2)	A1
F23	Original rear balance weight (2)	A1
F24	Balanced crank front balance weight (2)	A1
F25	Balanced crank rear balance weight (2)	A1
F26	Inside spring inner lamination (2)	A2
F27	Inside spring outer lamination (4)	A2
F31	Front upper step (2)	B2
F32	Front lower step (2)	B2
F33	Rear upper step (2)	B2
F34	Rear middle step (2)	B2
F35	Rear lower step (2)	B2

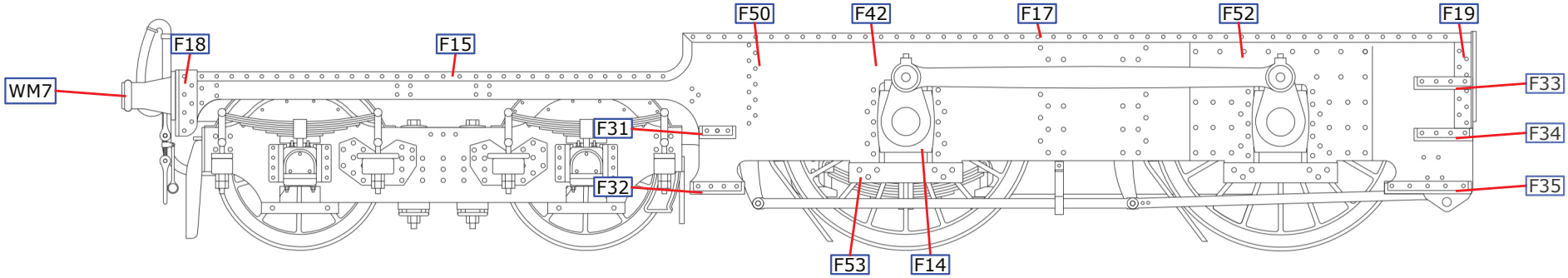


Fig 11. Bird Frame Detailing

BIRD BRAKES

Emboss two rivets on each outer brake hanger. Assemble the brake hangers and shoes (F54, F55 and F28 or WM8) using 0.8mm wire. Attach the brake hangers to the pivot wires.

Assemble the brake gear as shown in Fig 12. Make the brake cross shaft from 1.6mm wire and fit the brake cylinder levers (F57) and cross shaft levers (F58) as shown below. Fit the shaft through the holes in the frames under the rear steps. Fit 1.2mm wire to the brake cylinder levers to represent the brake piston rods. Fit the pull rods (front F29 and rear F56) on the 0.8mm cross shafts outside the wheels with the rear rod outside the front rod. Attach the rear pull rods to the brake cross shaft levers with small pins of 0.8mm wire, Form and fit the brake pull rods safety brackets (F30) through the small slots in the ash-pan sides and under the pull rods.

No.	Description	Sheet
F54	Bird outer brake hanger (4)	A1
F55	Bird inner brake hanger (4)	A1
F28	Brake shoe (4)	A1
F56	Bird rear brake pull rod (2)	A1
F29	Front brake pull rod (2)	A2
F30	Brake pull rod safety bracket	B2
F57	Bird brake cylinder lever (4)	B3
F58	Bird brake cross shaft lever (4)	B3

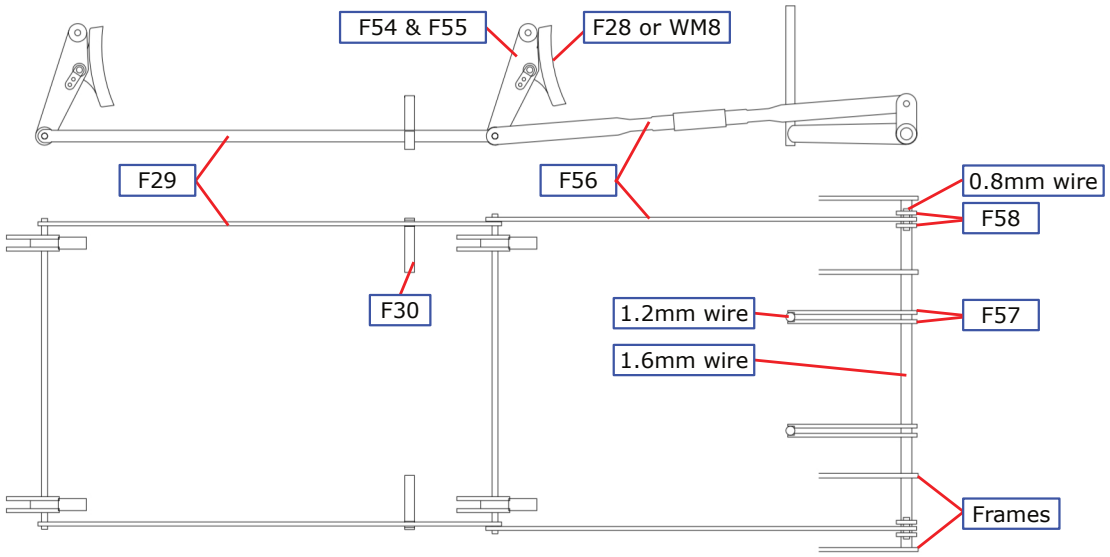


Fig 12. Brake Construction

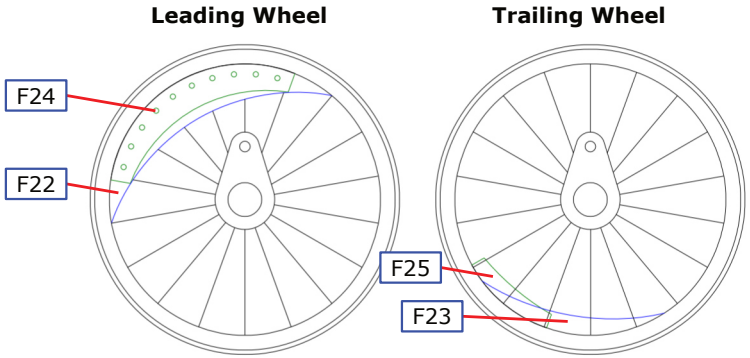


Fig 13. Wheel Balance Weights

FOOTPLATE 1

Prepare the footplate (U1) by embossing the rivets on the inside frame extensions. Fold the drop plates all round and then make the footplate step folds ensuring that the front drop plates are outside the rear drop plates. Solder the corners and the drop plates where they overlap. The four legs on the rear side edges ensure that the footplate will stand level on a flat surface. At the rear fold the drop plate doubler over to the outside and solder in place.

Fold up the inside frame extensions, the front angle and the lamp brackets and solder the drop plates together at the bottom of the step. Fold up the cab floor supports.

Prepare the footplate overlays (U2 & U3) by embossing the rivets under the lamp brackets and folding up the cab floor supports. The curve in the rear of the front overlay is formed over a 3.5mm drill shank. Place the font overlay over the footplate so the lamp brackets pass through the holes provided and the body fixing hole aligns and solder together all round. Similarly solder the rear overlay in place.

If you are fitting inside motion remove the section of footplate under the smokebox saddle as shown in blue in the diagram

No.	Description	Sheet
U1	Footplate	B1
U2	Footplate front overlay	B1
U3	Footplate rear overlay	B1

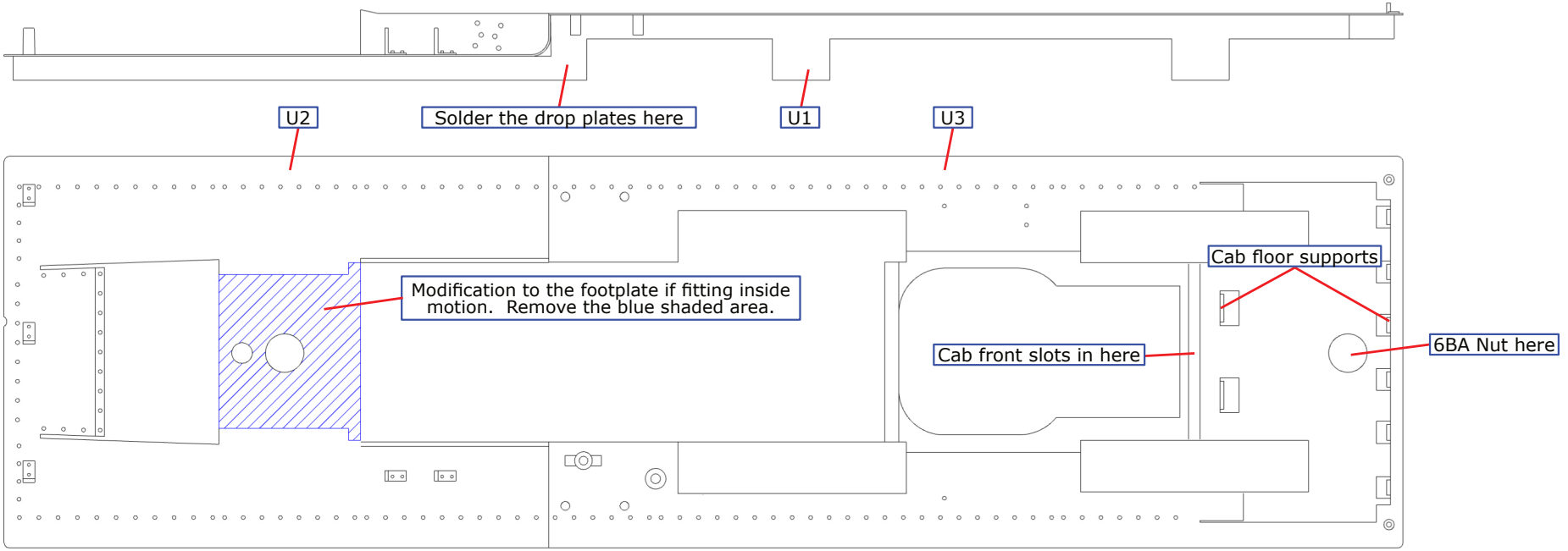


Fig 14. Footplate Construction

FOOTPLATE 2

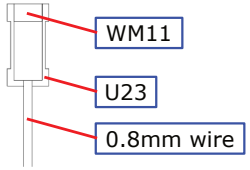
Solder the splasher fronts , with beading or rivets (U4 & U5 or U6 & U7) to the footplate edge so that their bottom edge is level with the bottom edge of the footplate side. Curve the splasher tops, front and rear (U8 & U9) by rolling underneath a suitable rod or dowel on a soft surface - a piece of rubber sheet or carpet, and solder them in place. For the earlier period when splashers fronts had no beading and no rivets use the splasher tops upside down.

Solder a 6BA nut over the rear body fixing hole and reduce its thickness so that the cab floor will fit..

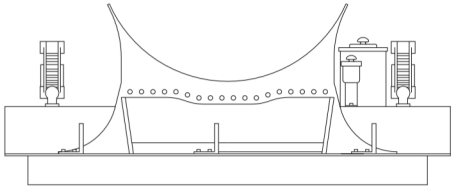
Make the handrails above the front steps from 0.8mm wire and short handrail knobs. Depending on the loco modelled, either fix the sandbox lids (BR8) to the footplate behind these handrails or use the large sandboxes (left WM7, right WM8) and the operating levers (left U10 and right U11). If needed, bend up the footplate mounted lubricator bracket (U12) and attach. Fit the lubricator (BR9).

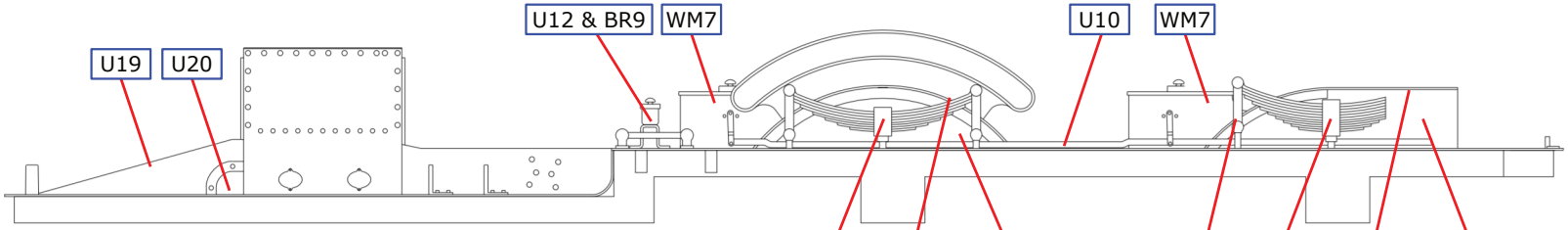
Springs 1. While we await the delivery of the cast spring shackles, the original method of construction will need to be used. Form the spring shackles (U23) and solder on a short length of 0.8mm wire. Fix the shackles through the holes in the footplate soldering the wire in the grooves in the footplate strengthening plate. Attach the springs (WM11). The 'legs' on the footplate edge should now be removed.

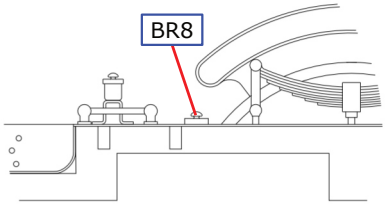
Springs 2. Solder the spring hangers (BR7) into the slots in the footplate strengthening plate ensuring that they line up so that the springs slide in. Attach the springs (WM11). The 'legs' on the footplate edge should now be removed.



No.	Description	Sheet
U4	Front beaded splasher face (2)	B1
U5	Rear beaded splasher face (2)	B1
U6	Front riveted splasher face (2)	B1
U7	Rear riveted splasher face (2)	B1
U8	Front splasher top (2)	B1
U9	Rear splasher top (2)	B1
U10	Left sandbox operating lever	B2
U11	Right sandbox operating lever	B2
U12	Footplate mounted lubricator bracket	B3
U19	Front frame extensions	B1
U20	Cylinder cover overlay (2)	A1
U21	Firebox mounting brackets (2)	A2
U22	Name plate brackets (6)	B2







Early footplate arrangement with only one sandbox and filler on each side ahead of the leading driver

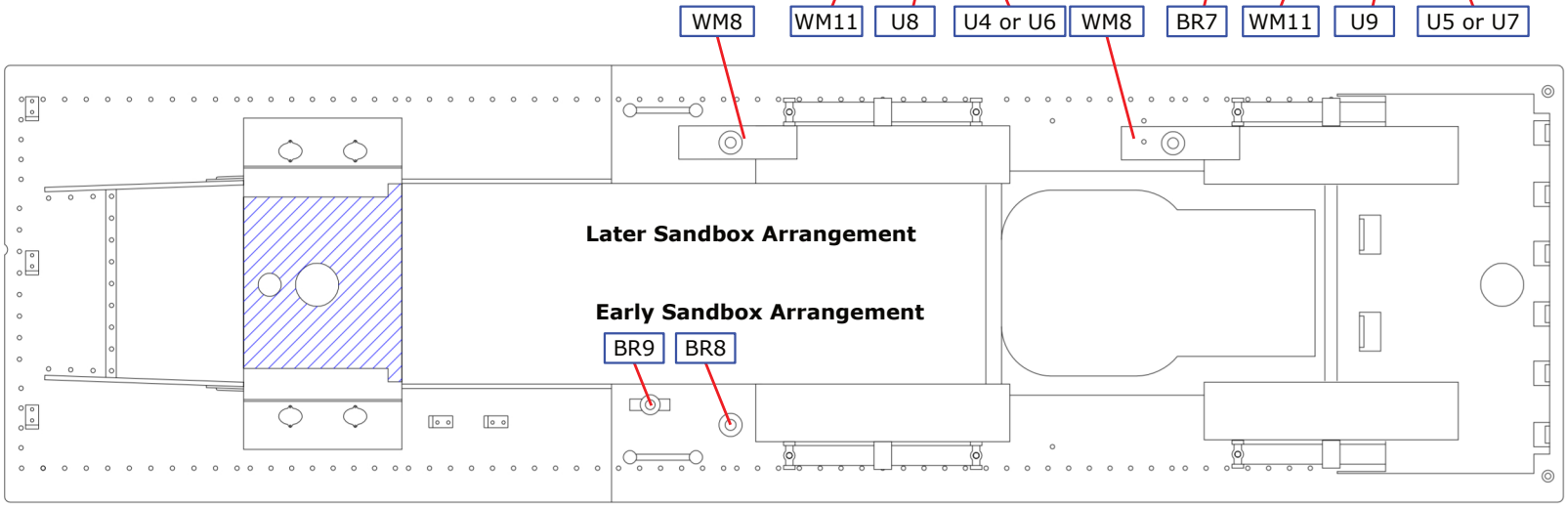


Fig 15. Footplate Construction

SADDLE

Saddle. For reasons of space the construction of the saddle is described here. Fitting is described on the appropriate page on boiler construction.

Fold up the smokebox saddle stretcher (U13). Emboss the rivets on the saddle front (U14) 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 (U15). Solder the saddle together and solder a 6BA nut over the hole on the saddle spacer. Attach the saddle to the footplate with the 6BA mounting screw. Pause construction of the saddle now until the boiler is ready to fit to the footplate. Fit the saddle using the instructions on page 23 or 25 and then return here.

Attach the smokebox saddle side plates, plain or riveted (U16 or U17). Note the rivet patterns are not symmetric.

Detail the cylinder front plate, straight or shaped top (U18) as shown in Fig 16 and attach it to the saddle front with its top edge level with the top of the front frame extensions. The snifting valve (BR6) goes in the central hole towards the top of the plate. Make the rod covers from 0.8mm and 1.6mm wire as shown in Fig 16.

Attach the front frame extensions (U19) locating them in the slot provided in the footplate and then attach the cylinder cover overlays (U20).

Solder the nameplate brackets (U22) in place on the top of the leading splashers.

No.	Description	Sheet
U13	Smokebox saddle stretcher	B2
U14	Smokebox saddle front	A1
U15	Smokebox saddle rear	A1
U16	Plain smokebox saddle side plate	B1
U17	Riveted smokebox saddle side plate	B1
U18	Cylinders front plate	B1

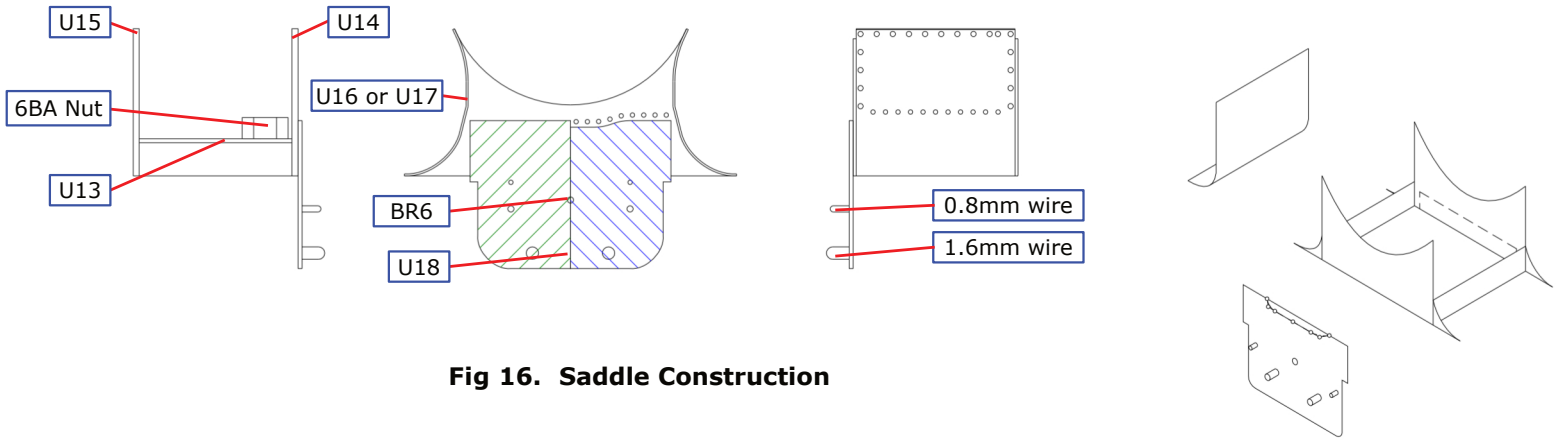
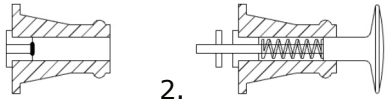


Fig 16. Saddle Construction



1. Drill the casting through 2mm. Fit the bush into the casting.

2. Fit the spring onto the buffer and place into the casting. Secure with a small (16BA) washer

Buffer Construction

CAB

Emboss the rivets on the cab front. Fit either the porthole window frame (C2) or the porthole blanking plates (C3) from the inside. The whistle plate (C5) appears on photographs of locomotives in later life; if required, solder in place. Solder the cab front in position.

Prepare the cab sides, Lot 124 (C5) or the remainder (C6) by embossing any rivet detail you wish and attaching the cut-out beading, for flat or flared cabs (C7 or C8) fitting the etched grove on the edge of the cab side. Form and fit the cab side handrails from 0.45mm wire and file off smooth on the inside. Assemble the cab seats (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. Refit the seat. Solder the cab sides in position. They are correctly aligned when the cab side handrails are vertical. Fit the vertical handrails from 0.8mm wire..

The width of the cab splashers (C11 & C12) may need adjusting to accommodate your choice of gauge. Use the half etched lines as a guide. Fold up the splashers and then solder in place. Solder the roof rear support (C13) between the rear edges of the cabsides.

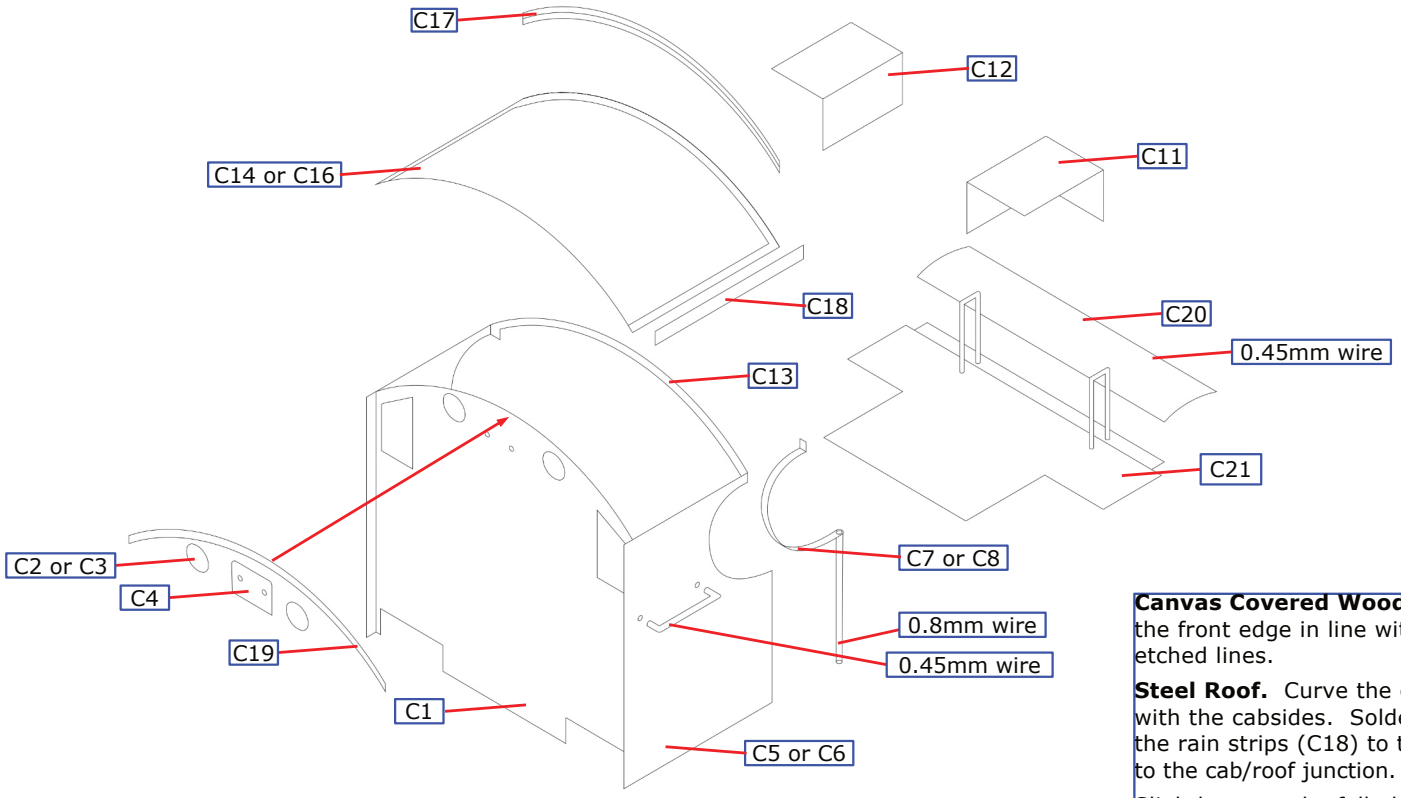


Fig 17. Cab Construction

No.	Description	Sheet
C1	Cab front	B1
C2	Cab porthole window frames (2)	A2
C3	Cab porthole blanking plate (2)	B2
C4	Whistle plate (60)	A1
C5	Lot 124 cab side (2)	B1
C6	Cab side for the remaining Lots (2)	B1
C7	Cab cut out beading for flat sided cabs(2)	B1
C8	Cab cut out beading for flared cabs (2)	B1
C9	Cab seat bracket (2)	B2
C10	Cab seat (2)	B2
C11	Cab left splasher	B1
C12	Cab right splasher	B1
C13	Cab rear roof support	B1
C14	Canvas covered wooden roof	B1
C15	Wooden roof fixing battens (2)	B2
C16	Steel roof	B1
C17	Steel roof rear angle	B1
C18	Steel roof rain strips (2)	B1
C19	Cab front rivet overlay	B1

Canvas Covered Wooden Roof. Curve the cab roof (C14) and solder in place with the front edge in line with the cabsides. Solder the battens (C15) between the half etched lines.

Steel Roof. Curve the cab roof (C16) and solder in place with the front edge in line with the cabsides. Solder the rear angle (C17) to the rear edge of the roof. Solder the rain strips (C18) to the side edges of the roof. Fit the cab front rivet overlay (C19) to the cab/roof junction.

Slightly curve the fall plate (C20) and hinge it to the floor (C21) as shown in Fig 17.

Fit the whistles, large and small (BR10 & BR11) to the cab front, the large whistle is on the left.

BACKHEAD

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 the drawing to assemble the backhead and the cab interior. Use copper wire of a suitable size for the various pipes.

If you are fitting ATC apparatus fit the bell (WM27) high on the right side of the cab and the battery box (WM28) either inside the cab under the right seat or on the right outside frame in front of the leading coupled axle.

No.	Description	Sheet
C20	Fall plate	B2
C21	Cab floor	B1
C22	Drain cocks lever	A2

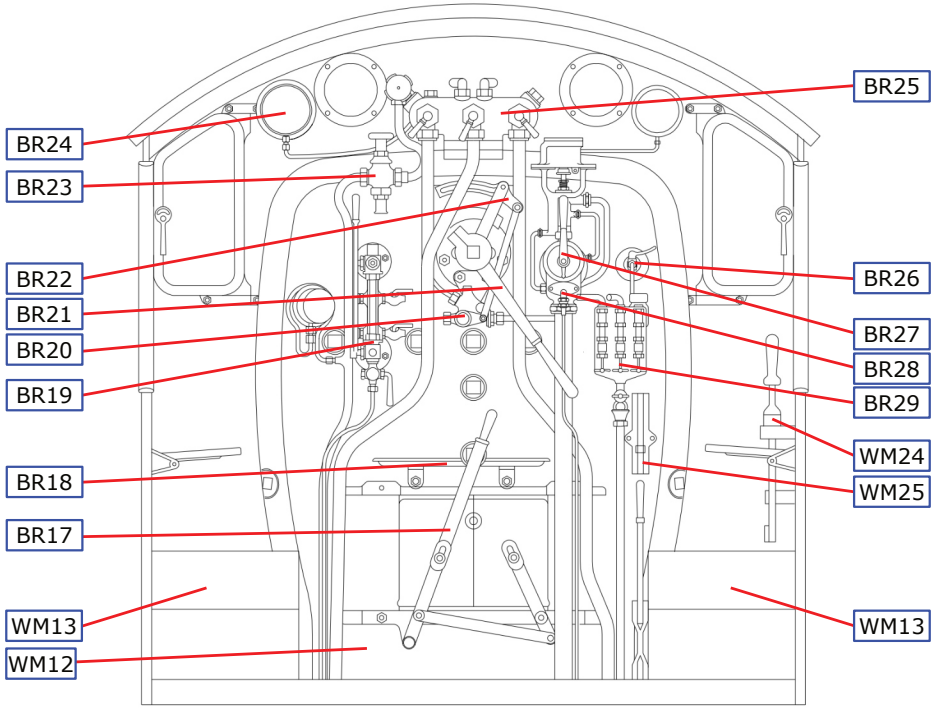
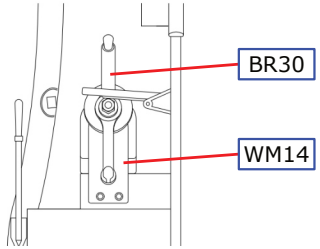
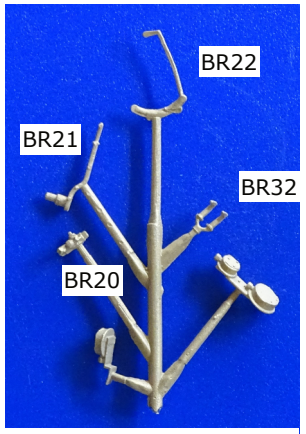


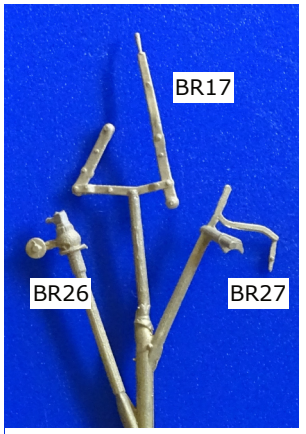
Fig 18. Backhead With Steam Reverse



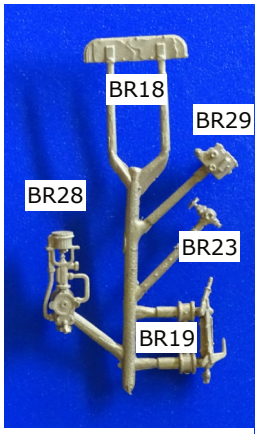
Screw Reverser



Backhead/1



Backhead/2



Backhead/3

Backhead/4

FORMING THE BELPAIRE FIREBOX 1

The photographs show the construction of a 47XX firebox. The construction of the Bulldog firebox follows the same procedures.

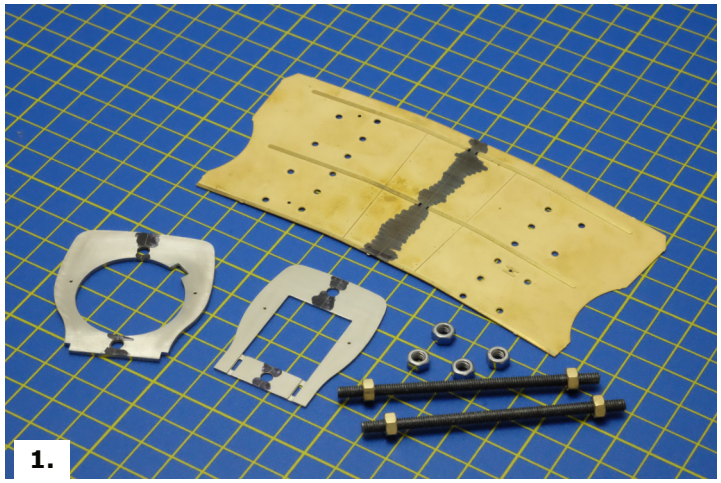
Photo 1. Solder together the two laminations of the firebox front (SB1) with top lamination (SB2). Clean the cusp off all parts, including the firebox rear former (SB3). Reduce the width of the lower faces of the firebox rear former so that it will fit between the frames in the locating groove in the footplate. Using the small dimples provided mark the centre lines on the outside and the inside of each part. Solder two 4mm lengths of 0.8mm wire into the holes on the cab front (C1)

To assemble the firebox two 100 mm pieces of 4BA studding will be required with four brass nuts and four stainless steel nuts. Thread the brass nuts on to the studs.

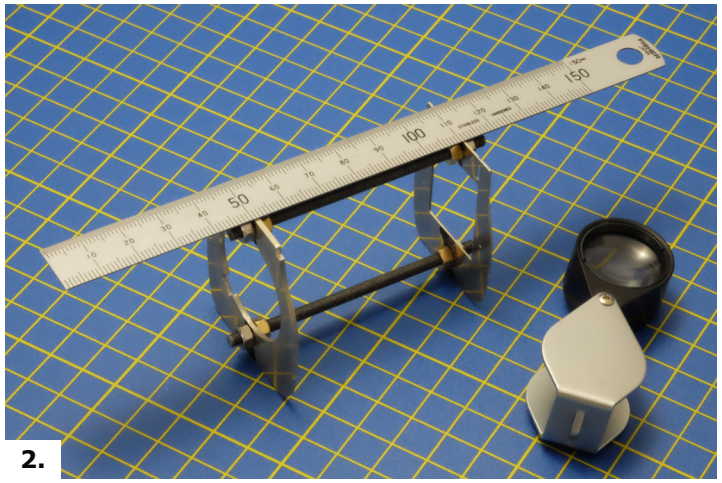
Photo 2. Set the two spacers on to the studs, retain them with the stainless steel nuts. Ensure the length of the assembly over the formers is 46.4mm. Always measure the distance from the bottom of the firebox; even using a steel rule and eyeglass you can get pretty close to this sort of dimension with care. Take your time, measure and check it a few times. It's easier to use a vernier or similar gauge to get a precise measurement and to check that the spacers are parallel.

Photo 3. Check that the spacers are square, both front and rear; do this on a decent flat surface. When correctly spaced apart the front will fit in the half etched recess in the footplate and the rear, pinned to the cab front, will fit with the tabs on the lower edge of the cab front (C1) in the footplate slots.

No.	Description	Sheet
SB1	Firebox front laminations (2)	A2
SB2	Firebox front top lamination	A2
SB3	Firebox rear U15	A2
SB4	Firebox wrapper	B2
SB5	Firebox band joining clips (4)	B2
C1	Cab front	B1



1.



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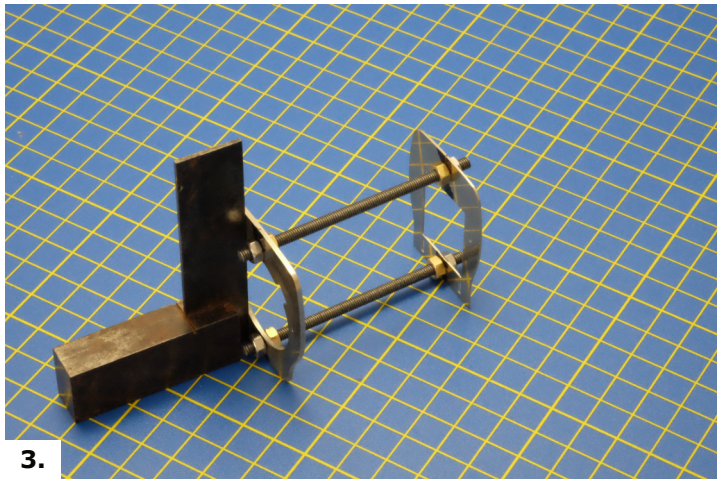


3.

FORMING THE BELPAIRE FIREBOX 2

Photo 4. Tighten the stainless steel nuts up tightly and then solder the brass nuts to the spacers. A good blobby tack will be fine:

Note: From this stage the spacers form a pretty strong assembly. Any attempt to twist the assembly results in one stud tightening as the other slackens. Just make sure the nuts are tightened up and you've checked the assembly is square again before moving on to the next stage.

Photo 5. Emboss the rivets for the ends of the cladding fixing bands on the firebox wrapper (SB4).

Align the centre line marks, the top can be formed to a gentle radius. This is a simple rolling job, using a length of dowel and finger pressure. An old round file has a taper that is useful on GWR fireboxes which don't have a constant radius. Ensure that the centre lines are maintained while forming the second shoulder.

On waisted fireboxes, such as this one, start forming the concave sections; this might be easier to do off the spacers. The final job is to pull in the waisted section, by putting a gentle curve on the sides of the firebox; again this is dowelling and finger pressure. As can be seen, it's not a perfect match to the spacers, but gentle finger pressure is enough to get the wrapper to meet the spacers without distortion.

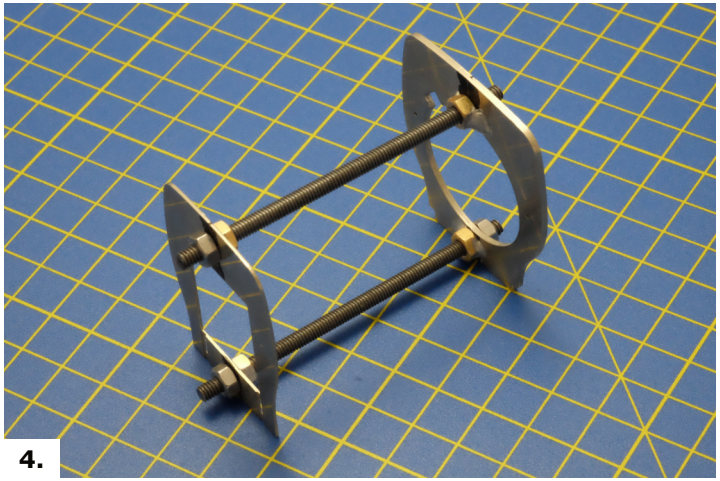
Photo 6. Tack the outside of the firebox at the centre and corners, both front and rear. Again, take care and check that the centres retain the alignment that we've worked so hard to achieve. Now work down the spacers alternating tacks left/right and front/rear to even out any expansion of the wrapper. Finally run the seams round at both ends.

With the wrapper now firmly attached to the spacers, the stainless steel nuts can be undone and the studs spun out.

Run an extra fillet of solder into the internal front shoulders of the firebox to support the area which will be filed back. The brass nuts can be heated and removed. Remove the rear scrap section of the spacer.

The base, front and rear are now rubbed down on a sanding board to keep them flat, this will remove the cusps from the wrapper and leave the firebox ready for the final shaping and fitting to the rest of the loco. Round the front edges of the firebox with a file referring to photographs for the correct shape.

Fold the firebox band joining clips (SB5) into a 'U' shape, fit through the slots in the firebox top and solder in place from inside. Complete with a short piece of 0.45mm wire to represent the tightening bolt. Fix the mudhole doors (WM23) in place on the firebox.



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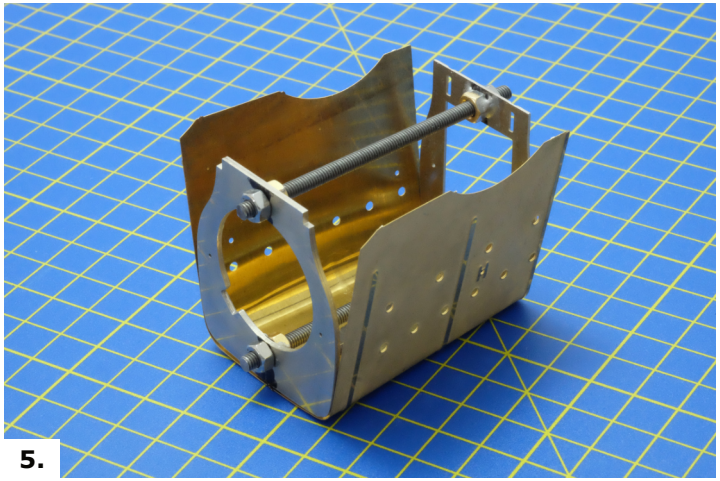

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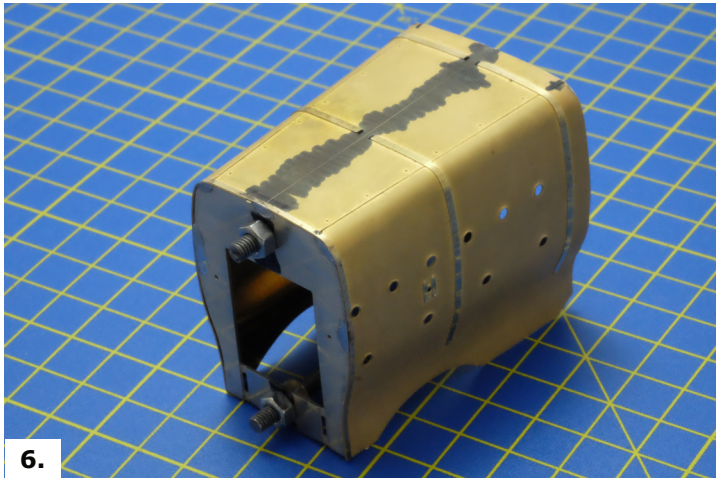


6.

D2 BOILER AND SMOKEBOX 1

Boiler. Roll the D2 half coned boiler wrapper (SB6) and check for fit around the front and rear formers (SB7 & SB8). Reduce the length of the boiler jointing strip (SB9) and then bend the boiler band joining brackets 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. The cutouts 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. Fit the formers so that they are **almost** flush with the ends and solder in place. 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 and firebox fit. Represent the bolts in the joining brackets using 0.45mm wire.

Roll the top feed pipe overlay (SB10) 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 casing and form the top feed pipes from 1.4mm wire so that they disappear behind the splashers.

Smokebox. For the early condition prepare the smokebox/boiler wrapper (SB11) by shortening the smokebox to the half etched line. If required, emboss the rivets in the wrapper. Roll the wrapper and check the fit it on the formers (SB12 & SB13). Solder the wrapper ends together using the jointing strip (SB14). Solder in the formers absolutely flush with the back and front of the wrapper with the notch in the bottom of the front spacer in line with the wrapper join. The upper hole in the front outer former is for the handrail knob and the other two holes are alternative positions for the steam lance cock. Emboss the four rivets on the smokebox front (SB15), and attach to the front of the smokebox aligning the handrail knob holes. Bend up the smokebox step (SB16) after first embossing the rivets and solder in place under the smokebox front.

No.	Description	Sheet
SB6	D2 Boiler wrapper	B2
SB7	Boiler cone front former	A2
SB8	Boiler cone rear former	A2
SB9	Boiler cone jointing strip	B2
SB10	D2 Boiler top feed overlay	B2
SB11	Boiler/smokebox wrapper	B2
SB12	Boiler/smokebox parallel section rear former	A2
SB13	Smokebox front former	A2
SB14	Boiler/smokebox jointing strip	B2
SB15	Smokebox front	A2
SB16	Smokebox step	B2
SB17	Lamp bracket (2)	B3
SB20	Angle between firebox and cab front	B2

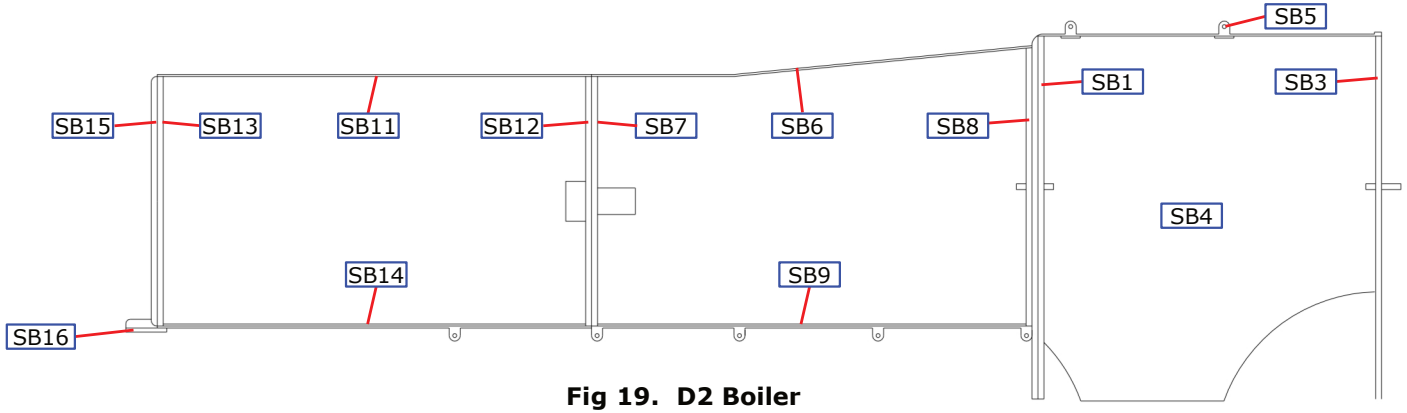


Fig 19. D2 Boiler

D2 BOILER AND SMOKEBOX 2

Assembly. Attach the saddle to the footplate with the 6BA mounting screw. Tap 6BA the hole in the boiler front former and open out the hole in the smokebox rear former to clear so that the smokebox and boiler can be screwed together. Now check fit of the boiler and smokebox to the firebox and saddle. 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 happy with the alignment solder the smoke box to the boiler permanently. Then fix the boiler to the firebox by soldering the wire pins from the inside. Finally solder the smokebox to the saddle. Now return to page 10 to finish the saddle and then return to here.

Solder the smokebox lamp bracket in place (SB17). Attach the smokebox door (WM15) to the smokebox. Fit the smokebox door handle (BR15) to the smokebox door. If required, the steam lance cock (BR16) can go in either of the positions shown in the drawing. Refer to your prototype photograph.

Solder four small knobs in the holes in the firebox and six medium knobs in the boiler/smokebox holes. Form the handrail to shape from 0.8mm wire, thread on the front medium knob, and fix the handrail in place.

Fit the appropriate smokebox pipe cover, early or later (WM16 or WM17). Fit the choice of chimney, either the original cast iron chimney (WM18), the tapered cast iron chimney (WM19) or the parallel copper capped chimney (CU1). Fit either the safety valve base no top feed (WM21). After painting fit the safety valves (BR12) and then fit the safety valve casing no top feed (BR14).

Fit the firebox screw reverse cover (WM22). Fit the mud hole doors (WM23).

No.	Description	Sheet
SB6	D2 Boiler wrapper	B2
SB7	Boiler cone front former	A2
SB8	Boiler cone rear former	A2
SB9	Boiler cone jointing strip	B2
SB10	D2 Boiler top feed overlay	B2
SB11	Boiler/smokebox wrapper	B2
SB12	Boiler/smokebox parallel section rear former	A2
SB13	Smokebox front former	A2
SB14	Boiler/smokebox jointing strip	B2
SB15	Smokebox front	A2
SB16	Smokebox step	B2
SB17	Lamp bracket (2)	B3
SB20	Angle between firebox and cab front	B2

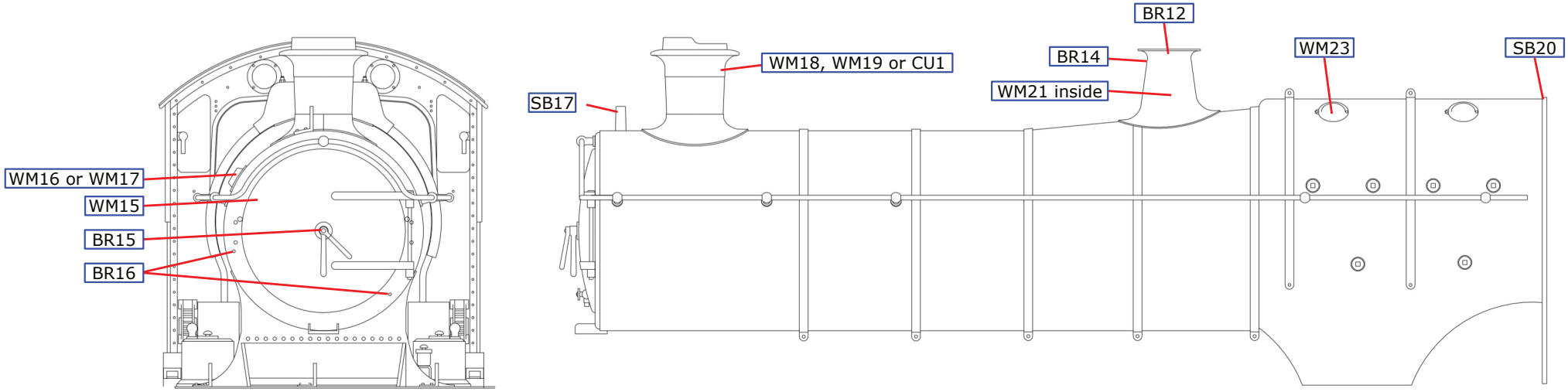


Fig 20. D2 Boiler Fittings

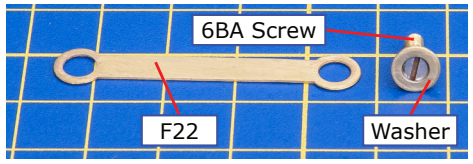


Fig 16. Drawbar

D3 BOILER AND SMOKEBOX

Boiler. Roll the D3 three-quarter coned boiler wrapper (SB18) and check for fit around the front and rear formers (SB7 & SB8). Bend the boiler band joining brackets 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 SB9). The cutouts 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. Fit the formers so that they are **almost** flush with the ends and solder in place. 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 and firebox fit. Represent the bolts in the joining brackets using 0.45mm wire.

If required roll the top feed pipe overlay (SB19) 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 casing and form the top feed pipes from 1.4mm wire so that they disappear behind the splashers.

Smokebox. Prepare the smokebox/boiler wrapper (SB11) by removing the rear section as shown in the diagram by scoring adjacent to 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. If required, emboss the rivets on the wrapper.

Roll the wrapper and check the fit it on the formers (SB12 & SB13). Shorten the boiler/smokebox jointing strip (SB14) to fit. Solder the wrapper ends together using the jointing strip. Solder in the formers absolutely flush with the back and front of the wrapper with the notch in the bottom of the front spacer in line with the wrapper join. The upper hole in the front outer former is for the handrail knob and the other two holes are alternative positions for the steam lance cock. Emboss the four rivets on the smokebox front (SB15), and attach to the front of the smokebox aligning the handrail knob holes. Bend up the smokebox step (SB16) after first embossing the rivets and solder in place under the smokebox front.

No.	Description	Sheet
SB7	Boiler cone front former	A2
SB8	Boiler cone rear former	A2
SB9	Boiler cone jointing strip	B2
SB19	D3 Boiler top feed overlay	B2
SB11	Boiler/smokebox wrapper	B2
SB12	Boiler/smokebox parallel section rear former	A2
SB13	Smokebox front former	A2
SB14	Boiler/smokebox jointing strip	B2
SB15	Smokebox front	A2
SB16	Smokebox step	B2
SB17	Lamp bracket (2)	B3
SB18	D3 Boiler wrapper	B2
SB20	Angle between firebox and cab front	B2

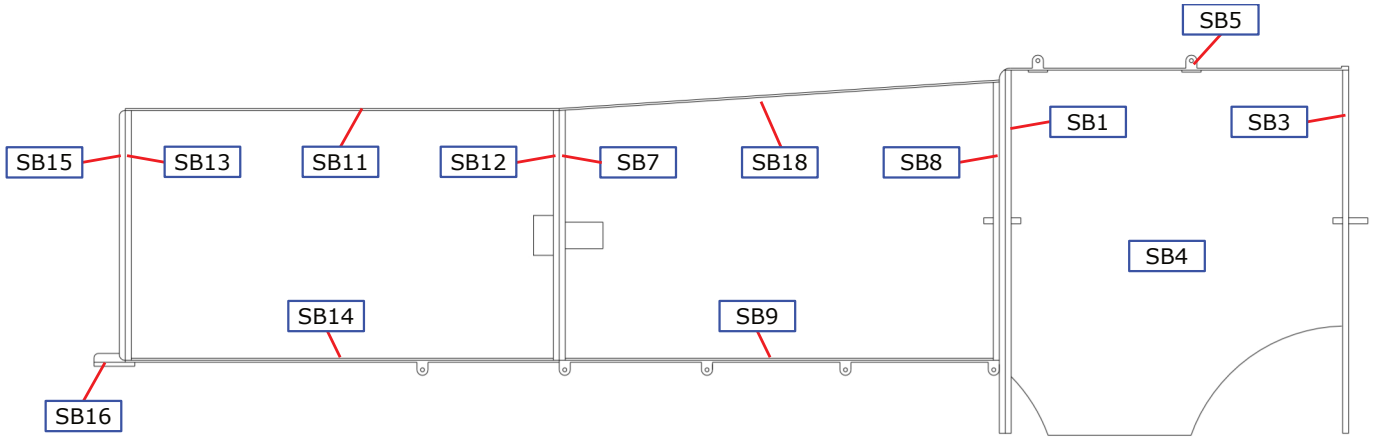


Fig 21. D3 Boiler Construction

D3 BOILER AND SMOKEBOX

Assembly. Attach the saddle to the footplate with the 6BA mounting screw. Tap 6BA the hole in the boiler front former and open out the hole in the smokebox rear former to clear so that the smokebox and boiler can be screwed together. Now check fit of the boiler and smokebox to the firebox and saddle. 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 happy with the alignment solder the smoke box to the boiler permanently. Then fix the boiler to the firebox by soldering the wire pins from the inside. Finally solder the smokebox to the saddle. Now return to page 10 to finish the saddle and then return to here.

Solder the smokebox lamp bracket in place (SB17). Attach the smokebox door (WM15) to the smokebox. Fit the smokebox door handle (BR15) to the smokebox door. If required, the steam lance cock (BR16), it can go in either of the positions shown in the drawing. Refer to your prototype photograph.

Solder four small knobs in the holes in the firebox and six medium knobs in the boiler/smokebox holes. Form the handrail to shape from 0.8mm wire, thread on the front medium knob, and fix the handrail in place.

Fit the appropriate smokebox pipe cover, early or later (WM16 or WM17). Fit the choice of chimney, either the original cast iron chimney (WM18), the tapered cast iron chimney (WM19) or the parallel copper capped chimney (CU1). Fit either the safety valve base with top feed (WM20) or the safety valve base no top feed (WM21). After painting fit the safety valve springs (BR12) and then fit the polished safety valve casing with top feed (BR13) or the safety valve casing no top feed (BR14).

Fit the firebox screw reverse cover (WM22). Fit the mud hole doors (WM23)

No.	Description	Sheet
SB7	Boiler cone front former	A2
SB8	Boiler cone rear former	A2
SB9	Boiler cone jointing strip	B2
SB19	D3 Boiler top feed overlay	B2
SB11	Boiler/smokebox wrapper	B2
SB12	Boiler/smokebox parallel section rear former	A2
SB13	Smokebox front former	A2
SB14	Boiler/smokebox jointing strip	B2
SB15	Smokebox front	A2
SB16	Smokebox step	B2
SB17	Lamp bracket (2)	B3
SB18	D3 Boiler wrapper	B2
SB20	Angle between firebox and cab front	B2

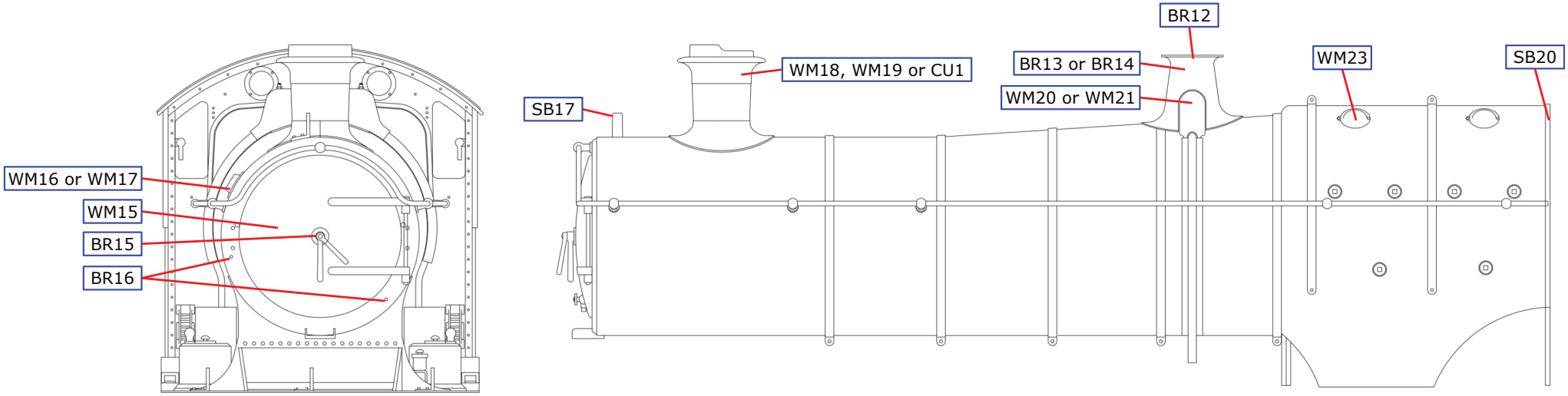


Fig 22. D3 Boiler Fittings

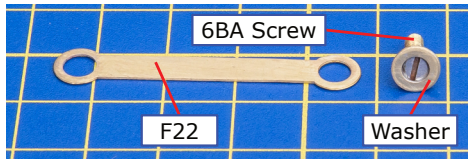
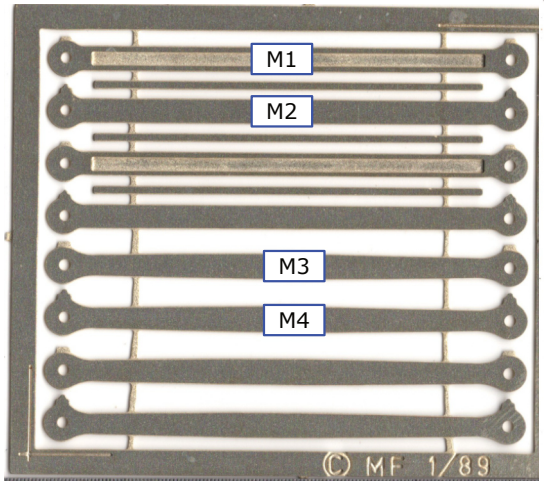
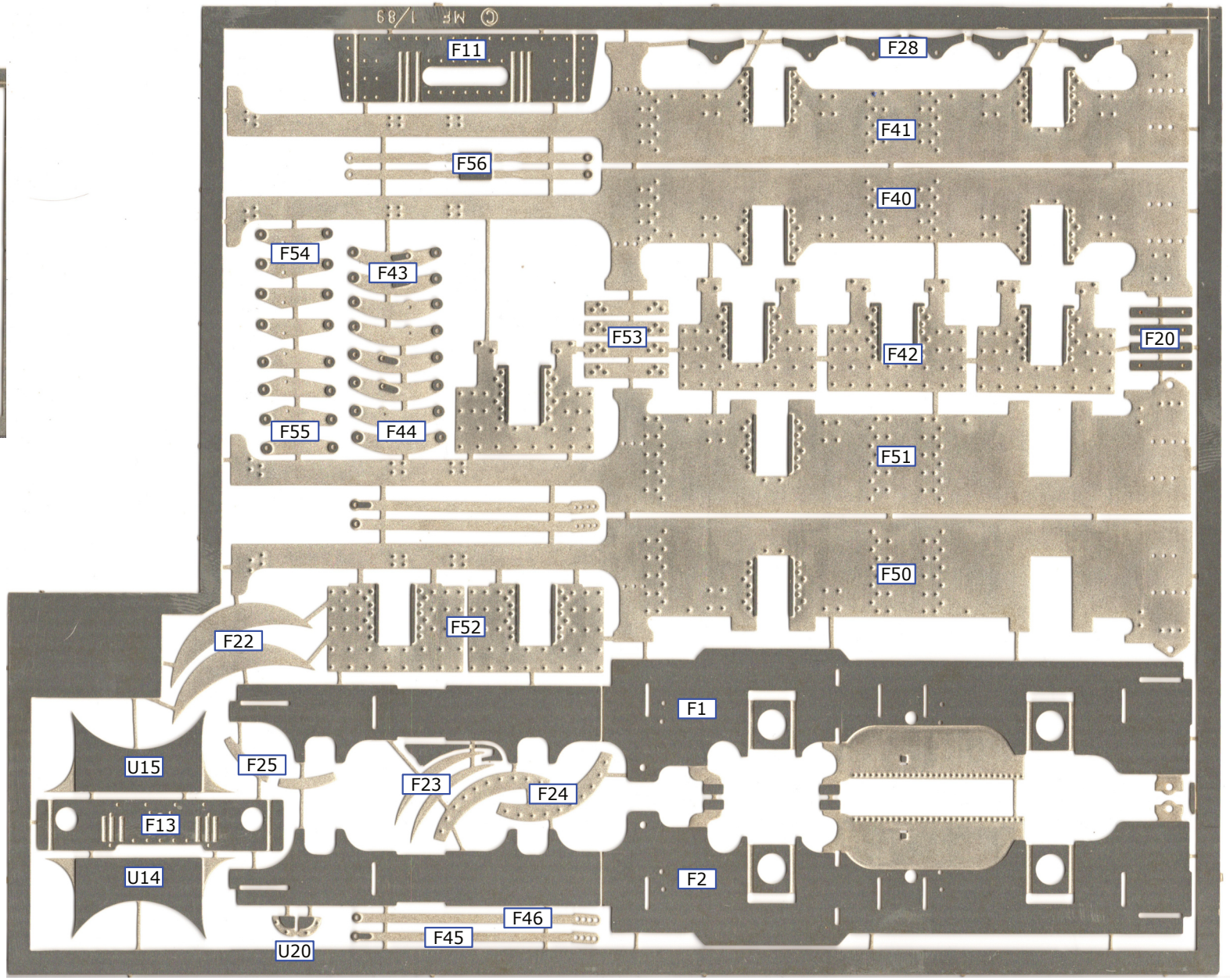


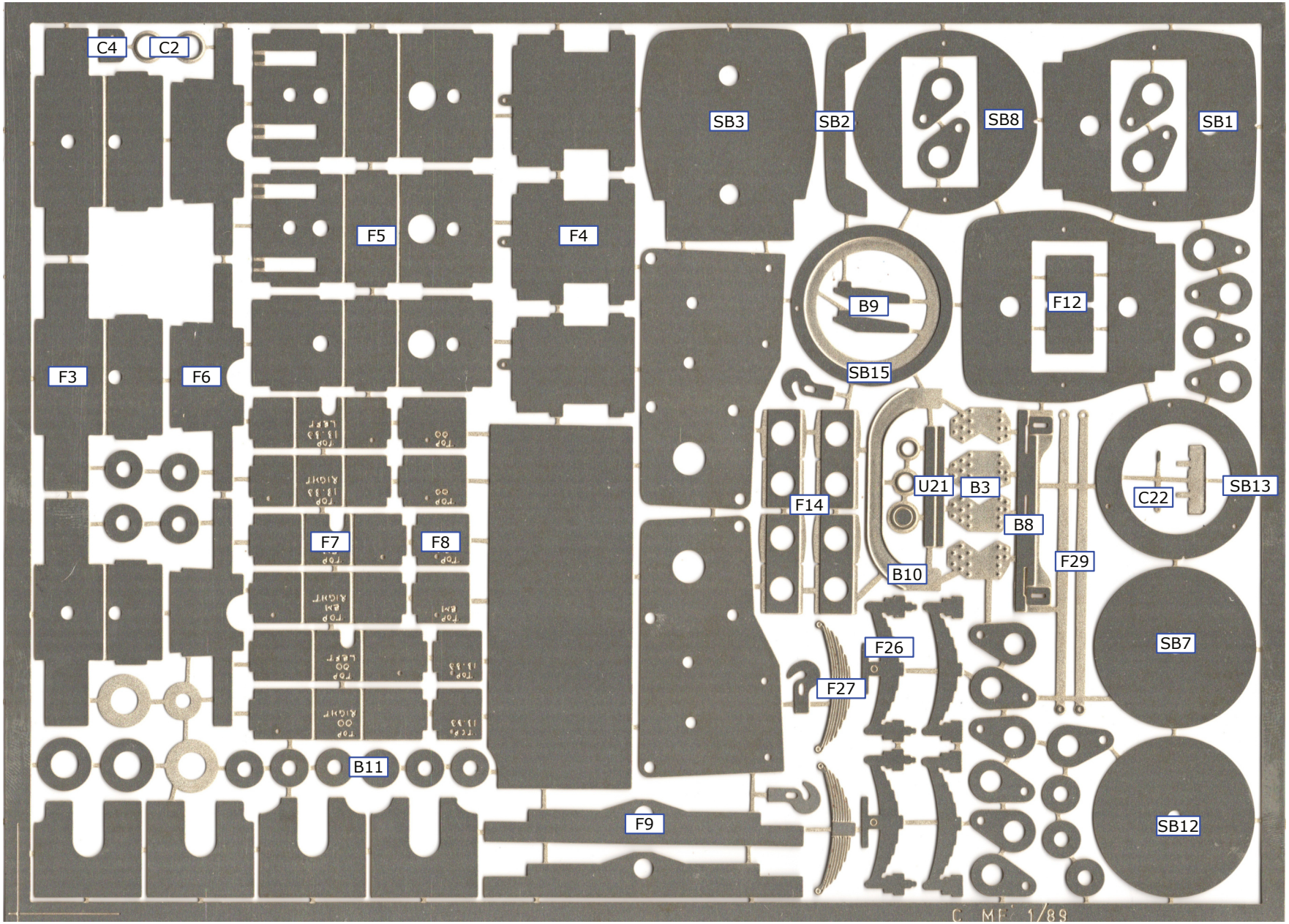
Fig 16. Drawbar

NICKEL SILVER ETCH A1 AND MOTION ETCH

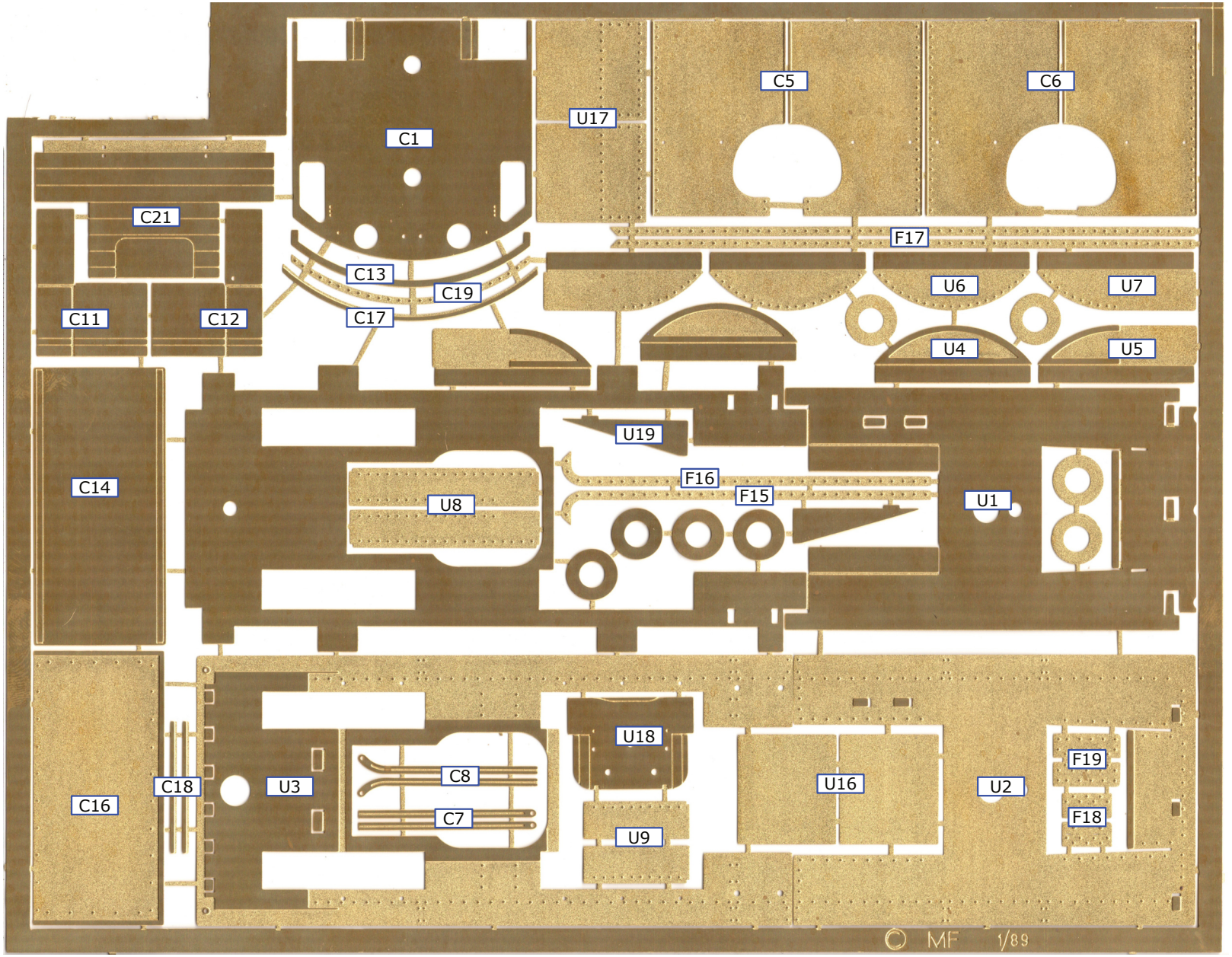




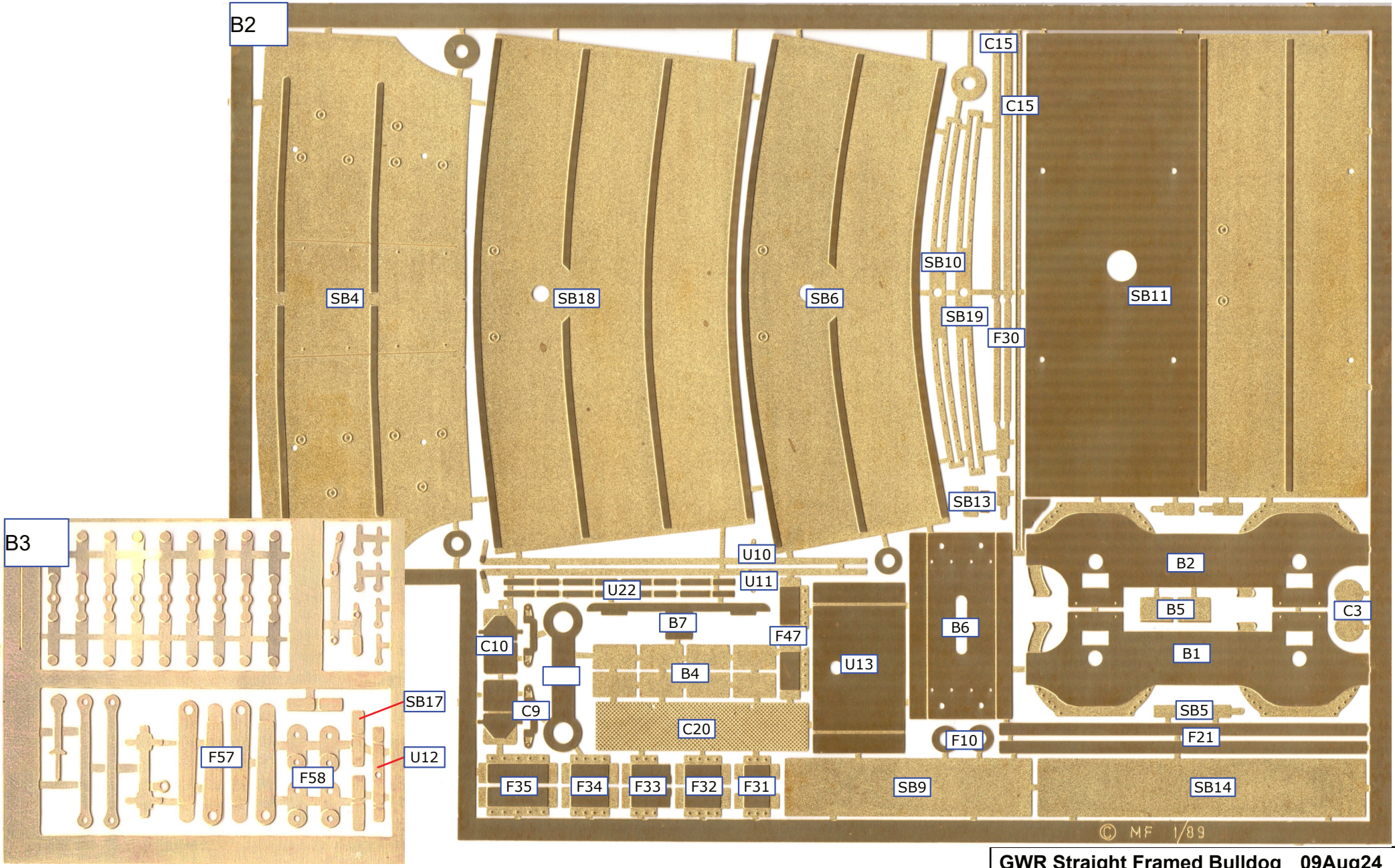
NICKEL SILVER ETCH A2



BRASS ETCH B1



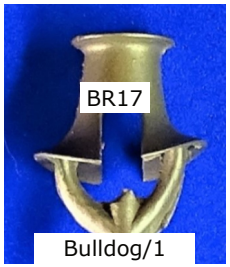
BRASS ETCH B2 & B3



BRASS CASTINGS

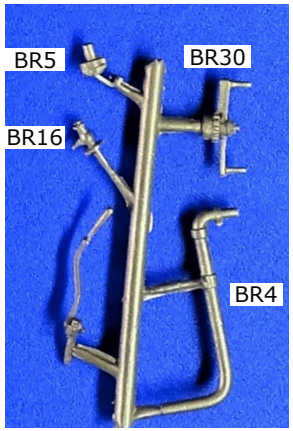
CU1	Parallel chimney	Atbara/2	BR11	Small whistle		BR22	Jockey valve and regulator linkage	Backhead/1
BR1	Left steam brake cylinder	Cab/1	BR12	Safety valves	Details/1	BR23	Steam heat valve	Backhead/3
BR2	Right steam brake cylinder	Cab/1	BR13	Safety valve casing, with top feed	Bulldog/1	BR24	Cab pressure gauges (3)	Loose
BR3	Tall early vacuum pipe	47XX/8	BR14	Safety valve casing, no top feed	Bulldog/3	BR25	Steam fountain	Backhead/4
BR4	Later short vacuum pipe	Bulldog/2	BR15	Smokebox door handles	Loose	BR26	Blower valve	Backhead/2
BR5	Vacuum pipe dummy	Bulldog/2	BR16	Steam lance cock	Bulldog/2	BR27	Combined ejector/brake handle	Backhead/3
BR6	Snifting valve	Details/1	BR17	Firebox door handle	Backhead/2	BR28	Combined ejector/brake	Backhead/3
BR7	Spring hangers (8)	Aberdare/2	BR18	Backhead shelf	Backhead/3	BR29	Sight feed lubricator	Backhead/3
BR8	Sandbox lid (2)	Details/1	BR19	Water gauge	Backhead/3	BR30	Screw reverser handle	Bulldog/2
BR9	Vacuum pump lubricator (2)	Details/1	BR20	Jockey valve	Backhead/1	BR31	Firebox flap	Backhead/4
BR10	Large whistle		BR21	Regulator handle	Backhead/1	BR32	Whistle stand	Backhead/1

Atbara/2

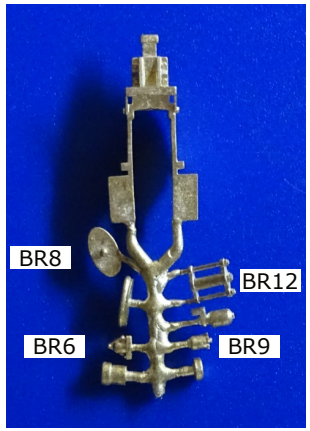


Bulldog/1

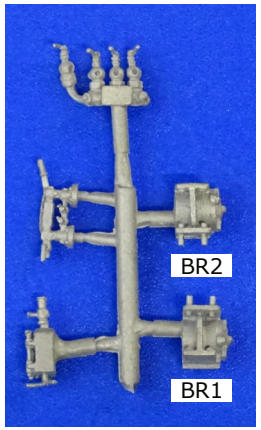
Bulldog/3



Bulldog/2



Details/1



Cab/1

Awaiting Delivery

Atbara/1 Aberdare/2

WHITEMETAL CASTINGS

WM1	4	Bogie suspension lower swing hangers	WM15	1	Smokebox Door
WM2	2	Bogie suspension upper swing hangers	WM16	1	Early pattern smokebox pipe cover
WM3	4	Bogie axlebox & spring	WM17	1	Late pattern smokebox pipe cover
WM4	1	ATC Shoe	WM18	1	Original cast iron chimney
WM5	4	Leading small spring damper	WM19	1	Tapered cast iron chimney
WM6	4	Trailing (large) spring damper	WM20	1	Safety valve base with top feed
WM7	2	Dean taper buffer	WM21	1	Safety valve base no top feed
WM8	4	Brake shoe	WM22	1	Firebox screw reverse cover
WM9	2	Left sandbox	WM23	4	Mud hole covers
WM10	2	Right sandbox	WM24	1	Steam reverse lever
WM11	4	Main springs	WM25	1	Steam reverse indicator
WM12	1	Backhead	WM26	1	ATC plunger switch
WM13	2	Splasher box	WM27	1	ATC Bell
WM14	2	Screw reverser	WM28	1	ATC battery box

OTHER COMPONENTS

3/16" bore bearing (4)
2mm bore bearing for bogie (4)
6 BA x 3/4” Brass screws (2)
6BA x 5/16” Brass screws (2)
6 BA nuts (3)
Buffer head, bush, washer & spring (2)
Short handrail knobs (8)
Medium handrail knob (7)
Vacuum pipe hose
4mm studding and nuts for firebox assembly

1/8" brass wire for compensation beam pivot
5/32" OD brass tube for compensation beams
0.8mm Spring steel wire for bogie side control
0.45mm Brass wire for fallplate hinges and cab side handrails
0.8mm Brass wire for brake hanger pivots and handrails
1.4mm Brass wire wire for top feed pipes
0.8mm & 1.5mm Copper wire for backhead pipes
Note. Screws may be supplied over-length and may require cutting to length..

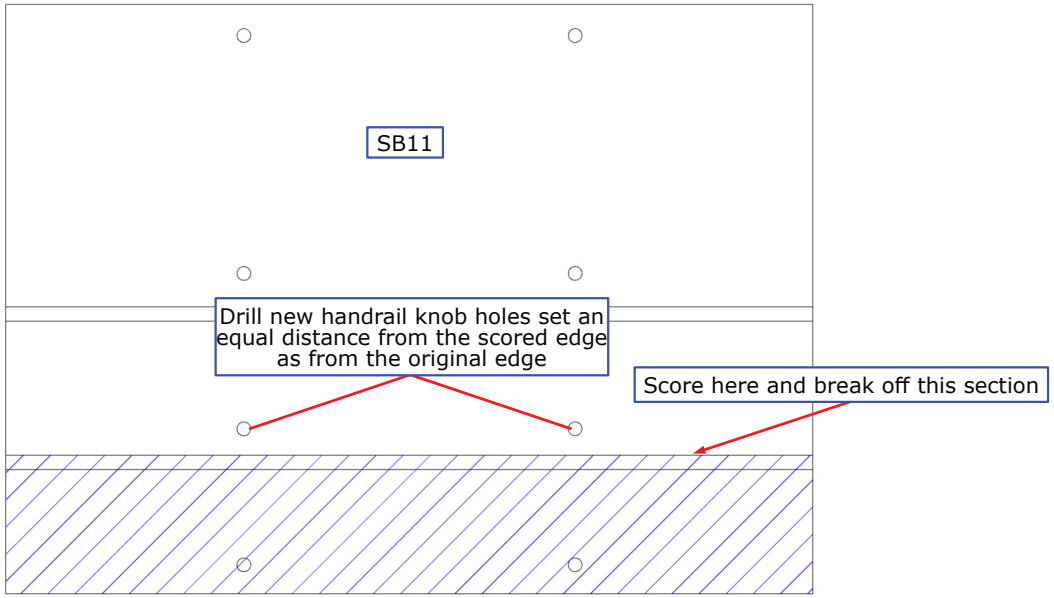


Fig 18. Boiler/Smokebox Wrapper Modification