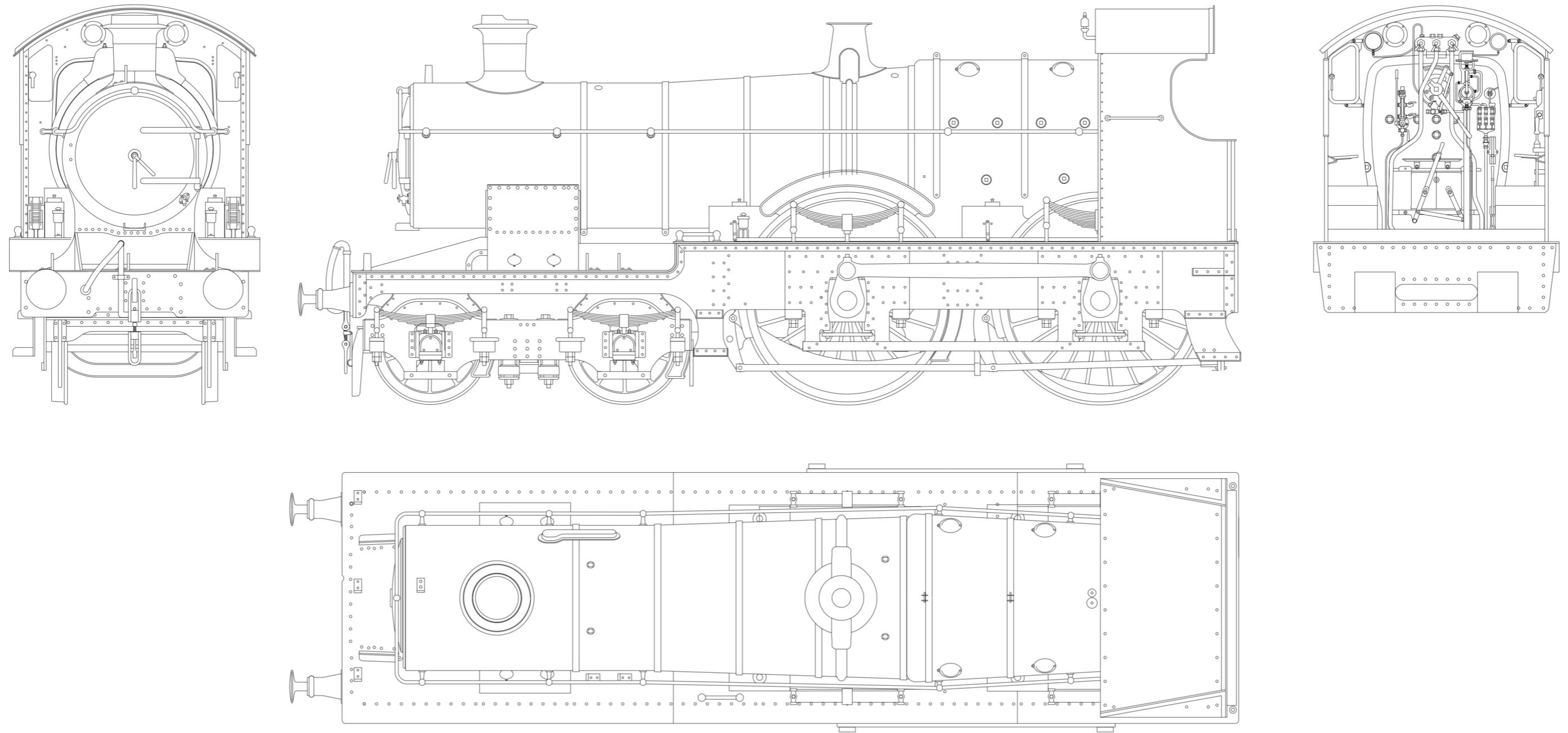
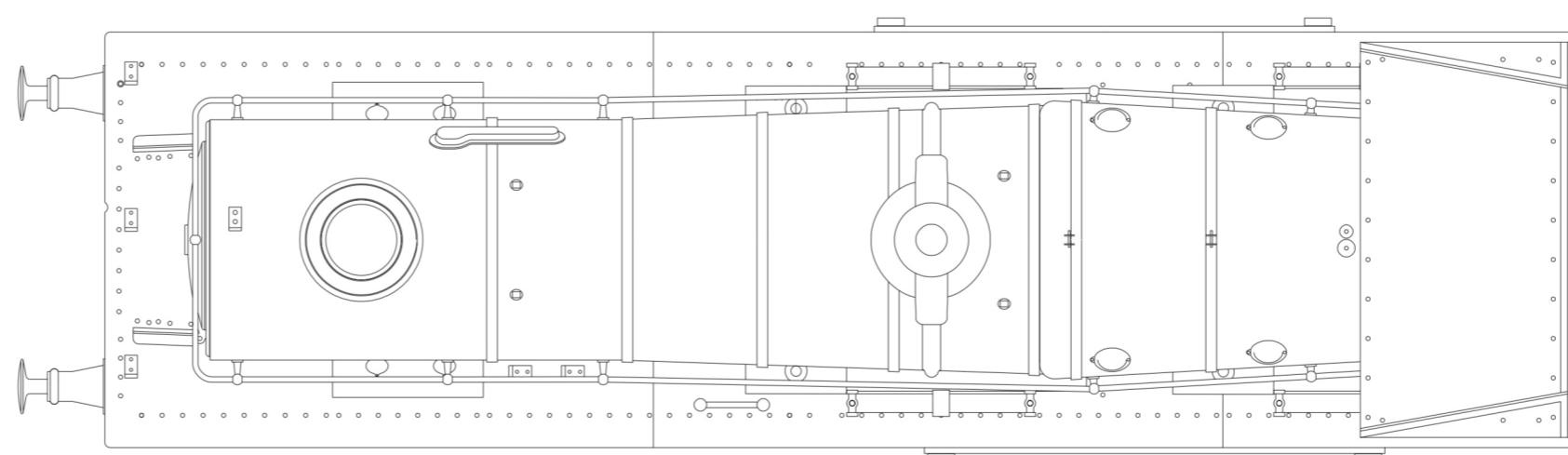
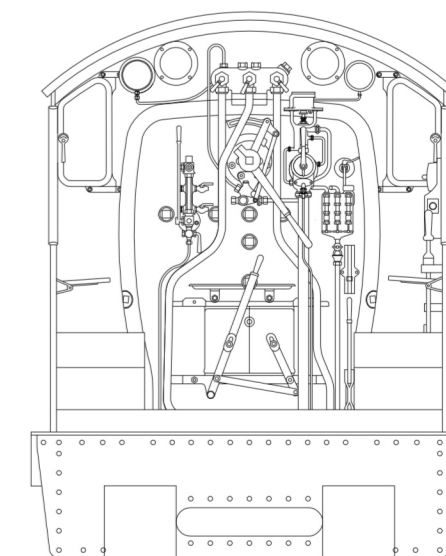
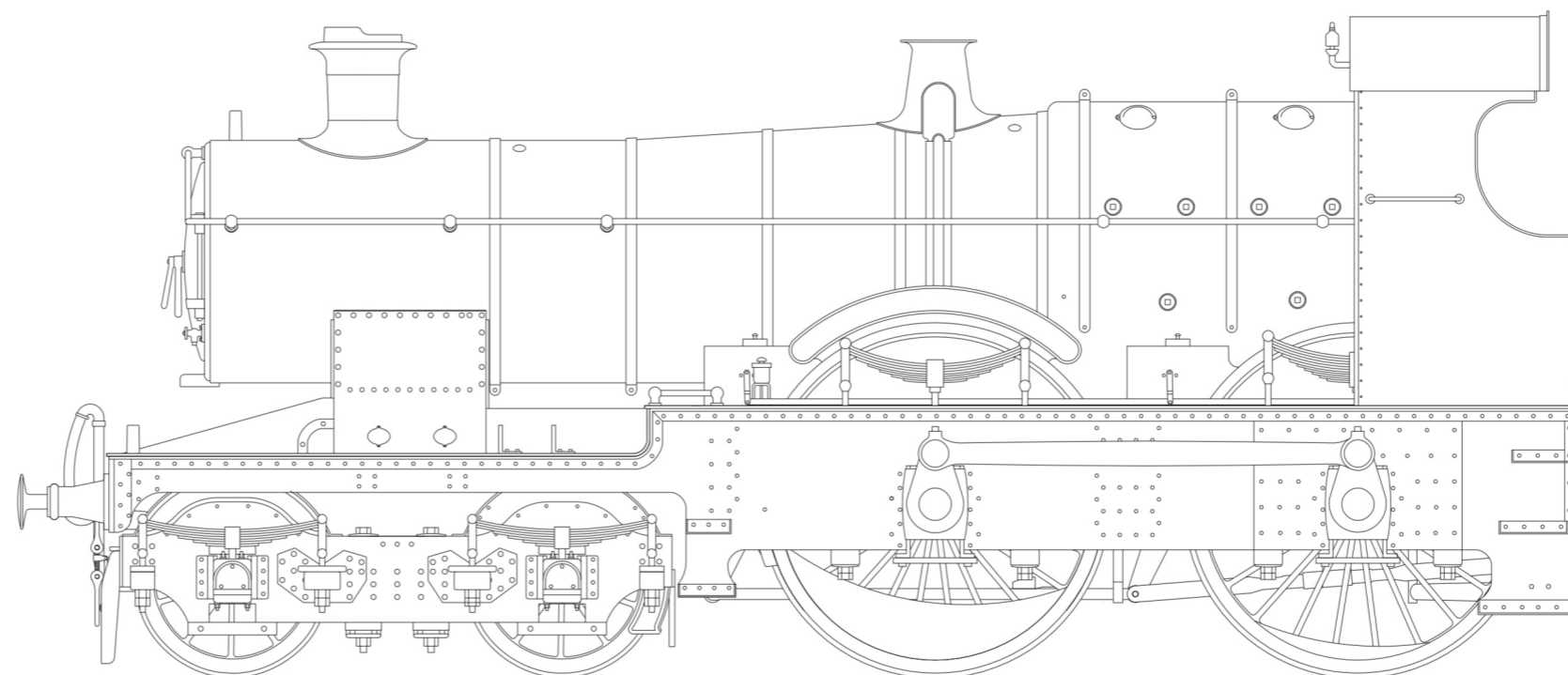
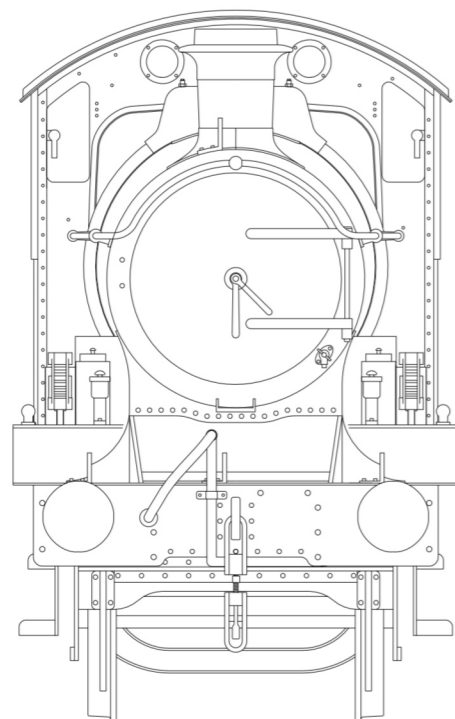


**Fig 1. Atbara as running circa 1904, showing D2 boiler, no top feed, short non-superheat smokebox, fluted coupling rods, no frame reinforcement plates, original cast iron chimney, original bogie with splashers and full beading, wooden cab roof.**



**Fig 2. Atbara Class as running in the 1920s, showing D3 boiler with top feed, Lot 125 First Series with high cab and curved rear steps, separate frame strengthening plate for each axle, large sandboxes above the footplate, later deep framed bogie with strengthening patches.**



**Fig3. Flower Class as running in the 1920s, showing D3 boiler with top feed, frame strengthening plate for the rear axle, large sandboxes above the footplate, later deep framed bogie with strengthening patches, vacuum brakes.**

## BOGIE CONSTRUCTION

### 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 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.

### 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 (B1) or deep frames (B2).
- Bogie frame patches (B4 & B5).
- Splashes below the frame - remove for later period.
- Splasher beading - remove the riveted splasher fronts and solder the splasher beading in their place.
- Swing hanger suspension or De Glehn type - omit the swing hanger castings for the De Glehn type.

If you are fitting splasher beading remove the shaded area as shown below. First emboss all appropriate rivets including those in the hornguide ties. Solder the splasher beading (B3) in place to the rear of the frames. Fold over the hornguide ties through 180° and attach the strengthening patches (B4 & B5) if needed. Solder in the axle bearings. Form the splasher tops (B6) to shape. First mark a fold line 2.0mm 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 (B7) to the rear splasher.

Fold the stretcher (B8) 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 (B9) through the slots in the front stretcher (B10) and attach the guard irons (B11) likewise. Solder the complete front stretcher in place. Repeat for the rear stretcher (B12).

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 (WM2) through the larger holes in the spacer and make flush with the upper surface of the spacer. Attach the upper swing hanger castings (WM1) and the axlebox/spring castings (WM3). Form the safety brackets from 0.45mm wire and solder in place through the small holes in the spacer.

No.	Description	Sheet	No.	Description	Sheet
M1	Fluted coupling rod outer lamination (2)	A2	B1	Shallow bogie frame (L & R)	B3
M2	Fluted coupling rod inner lamination (2)	A2	B2	Deep bogie frame (L & R)	B3
M3	Plain coupling rod outer lamination (2)	A2	B3	Bogie splasher beading (2)	B2
M4	Plain coupling rod inner lamination (2)	A2	B4	Bogie side frame patch, left	A1
			B5	Bogie side frame patch, right	A1
			B6	Splasher tops (8)	B1
			B7	Bogie splasher rear cover (2)	B1
			B8	Bogie spacer	B3
			B9	Bogie front angle strip	B2
			B10	Bogie front stretcher	A1
			B11	Bogie guard iron (L & R)	A1
			B12	Bogie rear stretcher	A1
			B13	Bogie pivot washer (6BA)	B3

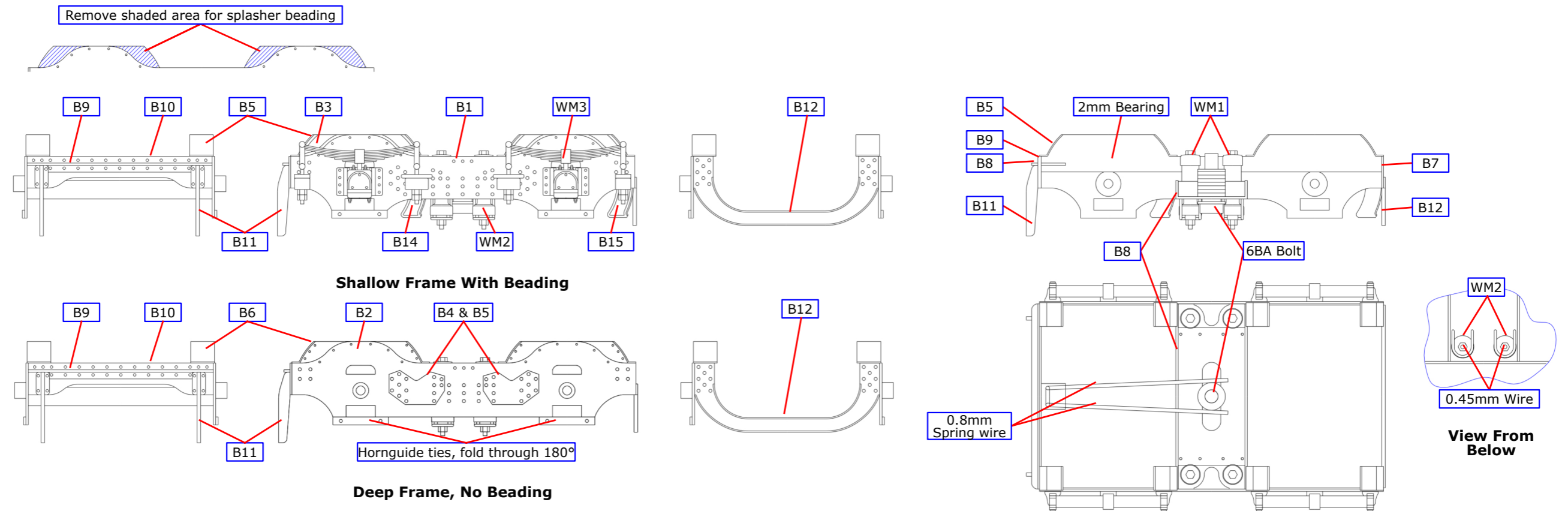


Fig 4. Bogie Construction

## INSIDE FRAMES CONSTRUCTION

### FRAMES

Having decided which chassis to construct you can now start construction by preparing the inside frames (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.

Now open up the following holes in the frames, as shown in Fig 5:

- P only if plunger pick-ups are being used
- B for brake hanger pivots 0.8 mm
- 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.

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

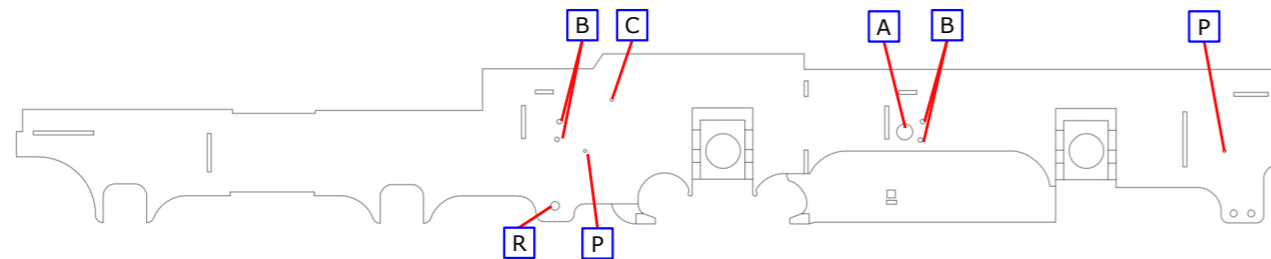


Fig 5. Frame Preparation

### FRAME SPACERS AND ASSEMBLING THE CHASSIS,

Remove the stretchers, rear (F3), firebox front (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 6 BA 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.

Now assemble the frames and stretchers. Start by tack soldering the rear spacer to both sides. Now 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.

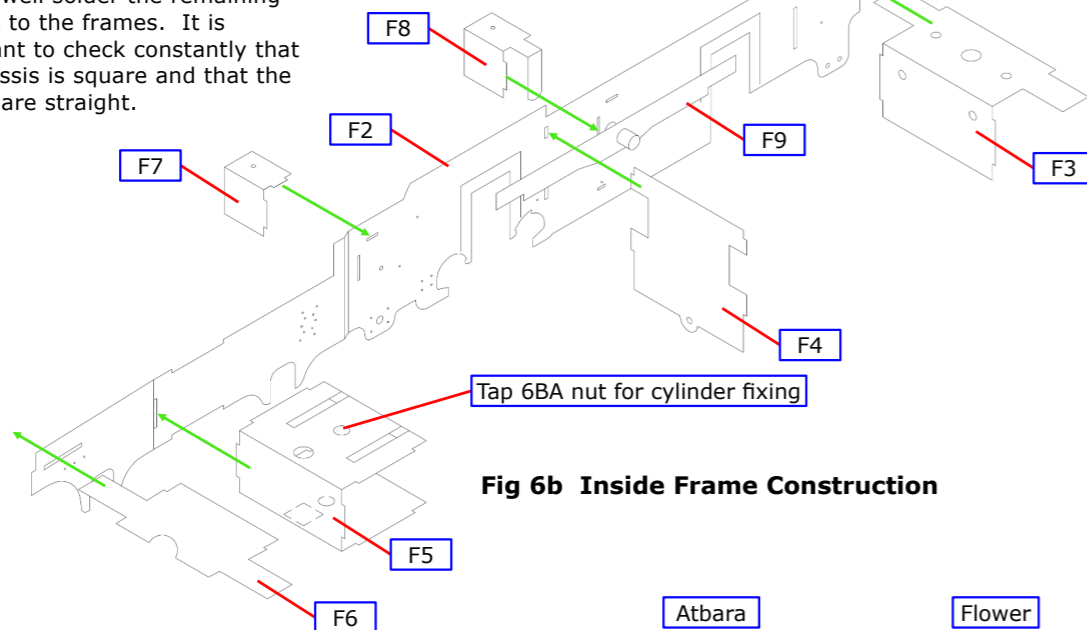


Fig 6b Inside Frame Construction

Lot 126

Lot 125

Fig 7a Drag Beam Modification

Atbara

Flower

Lot 125

Lot 126

Lot 176

Fig 7b Rear Step Differences

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.

### FITTING THE COMPENSATION BEAMS.

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. Open up the hole to accept the brass tube in each of the compensation beams (F9) 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 (B13). 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 the centre outside frame spacer.

### INSIDE MOTION.

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

No.	Description	Sheet	No.	Description	Sheet
F1	Left main frame 1	A1	F8	Outside frame rear spacer (2) 49	B1
F2	Right main frame 2	A1	F9	Compensation beam 15	A2
F3	Rear frame spacer, 3 widths 9	A2	F10	3/16" Half etched spacer washer 47	B3
F4	Firebox frame spacer 10	A2	F11	3/16" Spacer washer 152	B3
F5	Cylinder block frame spacer 11	A2			
F6	Front frame spacer 12	A2			
F7	Outside frame front spacer (2) 50	B1			

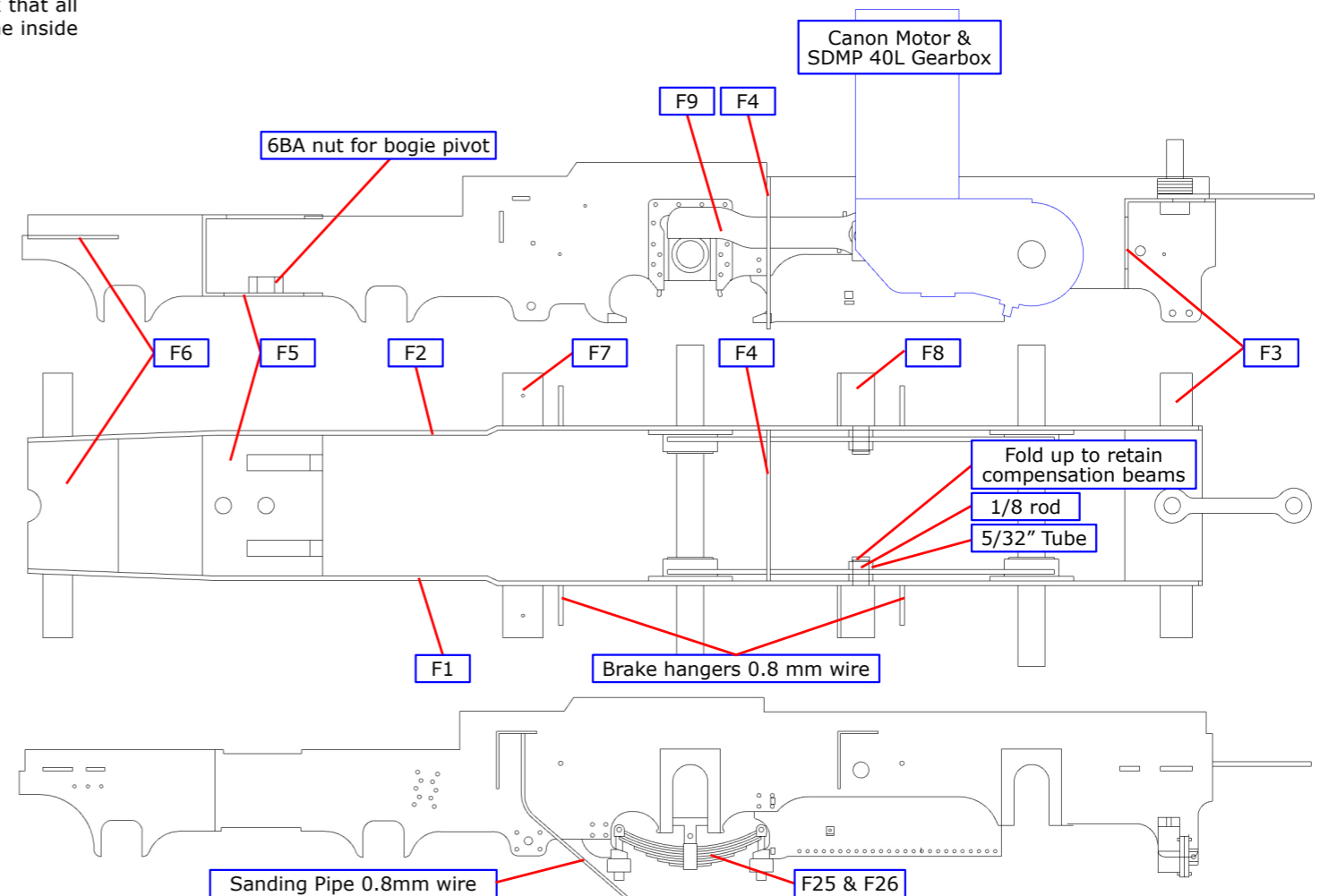


Fig 6a Inside Frame Construction

## ATBARA OUTSIDE FRAMES

Assemble the brake hangers (F40) first embossing the rivet on each lamination. The front of each hanger is detailed with the brake hanger safety bracket (F41), as shown in the diagram, one of the small holes in the back of the safety bracket locating on the previously embossed rivet. Attach the hangers to the pivot wires.

Fold the outside axle boxes (F13) 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. Shape the rear steps to the correct shape for the locomotive you are building (Fig 7b, Page 8). If you are fitting the frame strengthening plates (F44) the outside frames (F42 & F43) will need the rivets and horn block detail removing from behind where the strengthening plates will sit. Check that the axle boxes are an easy fit in the slots in the outside frames (and the strengthening plates) and ease if necessary. Attach the outside frame rivet strips, front and rear (F14 & F15) 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. 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.

For a Lot 125 locomotive, modify the drag beam as shown in Fig 7a, page 8. Emboss the rivets on the drag beam (F16) and attach the rubbing plates (F17). Use a piece of .018" material placed on top of the frames to ensure the upper edge of the drag and buffer beam (F18) are 0.018" (0.45mm) above the upper edge of the frames; this will ensure that the frames fit the footplate. Tack solder the drag and buffer beams in place. Ensure the axles move freely and when satisfied solder the outside frames to the spacers. Attach the frame to buffer beam angle bracket (F19) between the frame and buffer beam and the frame to drag beam angle bracket (F20) between frame and drag beam.

Secure the balance weights, Original (F21 & F22) or Balanced Crank (F23 & F24), in position using photographs as a guide to position. 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 (BR1) to the axle ends. Fit the coupling rods and confirm that everything still moves smoothly.

Solder together the three laminations of the inside frame springs, inner and outer laminations (F25 & F26) before fixing in place inside the spring hangers (See Fig 6a).

Attach the steam brake cylinders, left and right (BR2 and BR3) to the frames. Note the cylinders are handed. Emboss the two rivets on the outer brake pull rods (F28) and fit together with the inner pull rods (F45) using 0.8mm wire as shown in the diagram. They are also attached either side of the steam brake cylinders. Form and fit the brake pull rods safety brackets (F27) through the small slots in the ash-pan sides and under the pull rods. If appropriate fold up the leading wheel splasher (F46) and solder in place on the front of the outside frame front spacer

Fix the leading and trailing spring dampers, (BR4 & BR5) in place on the previously fitted wires. The smaller ones are used for the leading coupled axle.

Fold up steps (F29, F30, F31, F32, F33 or F35) and attach to frames. The four holes correspond to the four rivets attaching the upper steps and should be used to aid alignment.

Emboss the rivets on the outside frame hornblock tie (F47) and attach to the frames under the hornguides. If you have fitted strengthening plates fit the tie bar between frame strengthening plates (F48).

Form the sandpipes from 1.2mm wire and attach through the holes in the outside spacers. Note: before the fitting of large sandboxes the engines only had sanding to the leading wheels.

Fit the either the early tall vacuum pipe (BR6) or the later short vacuum pipe (BR7). Fit the dummy (BR8) to the front buffer beam. Build the buffers as shown below and fit the Dean buffer housings (WM4).

No.	Description
<b>Common Parts</b>	
F13	Outside frame axlebox (4)
F14	Outside frame rivet strip front (2)
F15	Outside frame rivet strip rear (2)
F16	Drag beam
F17	Drag beam rubbing plate (2)
F18	Buffer beam
F19	Frame to buffer beam angle bracket (2)
F20	Frame to drag beam angle bracket (2)
F21	Original front balance weight (2)
F22	Original rear balance weight (2)
F23	Balanced cranks front balance weight (2)
F24	Balanced cranks rear balance weight (2)
F25	Spring inner lamination (2)
F26	Spring outer lamination (4)
F27	Brake pull rods safety brackets (2)
F28	Atbara outer brake pull rod / Flower front pull rod (2)

Sheet No.	Description	Sheet
F29	Front step upper tread (2)	B1
F30	Front step lower tread (2)	B1
F31	Rear step upper tread (2)	B1
F32	Rear step middle tread (2)	B1
F33	Rear step lower tread (2)	B1
F34	Lot 125 rear step lower tread (2)	B1
F35	Inside motion bracket packing piece	A1 & B3
<b>Atbara Parts</b>		
F40	Atbara brake hanger & shoe lamination (8)	A1
F41	Atbara brake hanger safety bracket (4)	B1
F42	Atbara left outside frame	A1
F43	Atbara right outside frame	A1
F44	Atbara outside frame strengthening plate (2)	A2
F45	Atbara inner brake pull rod (2)	B3
F46	Atbara leading driven wheel splasher (2)	B3
F47	Atbara outside frame hornblock tie (4)	A1
F48	Atbara frame strengthening plates tie bar (2)	B1

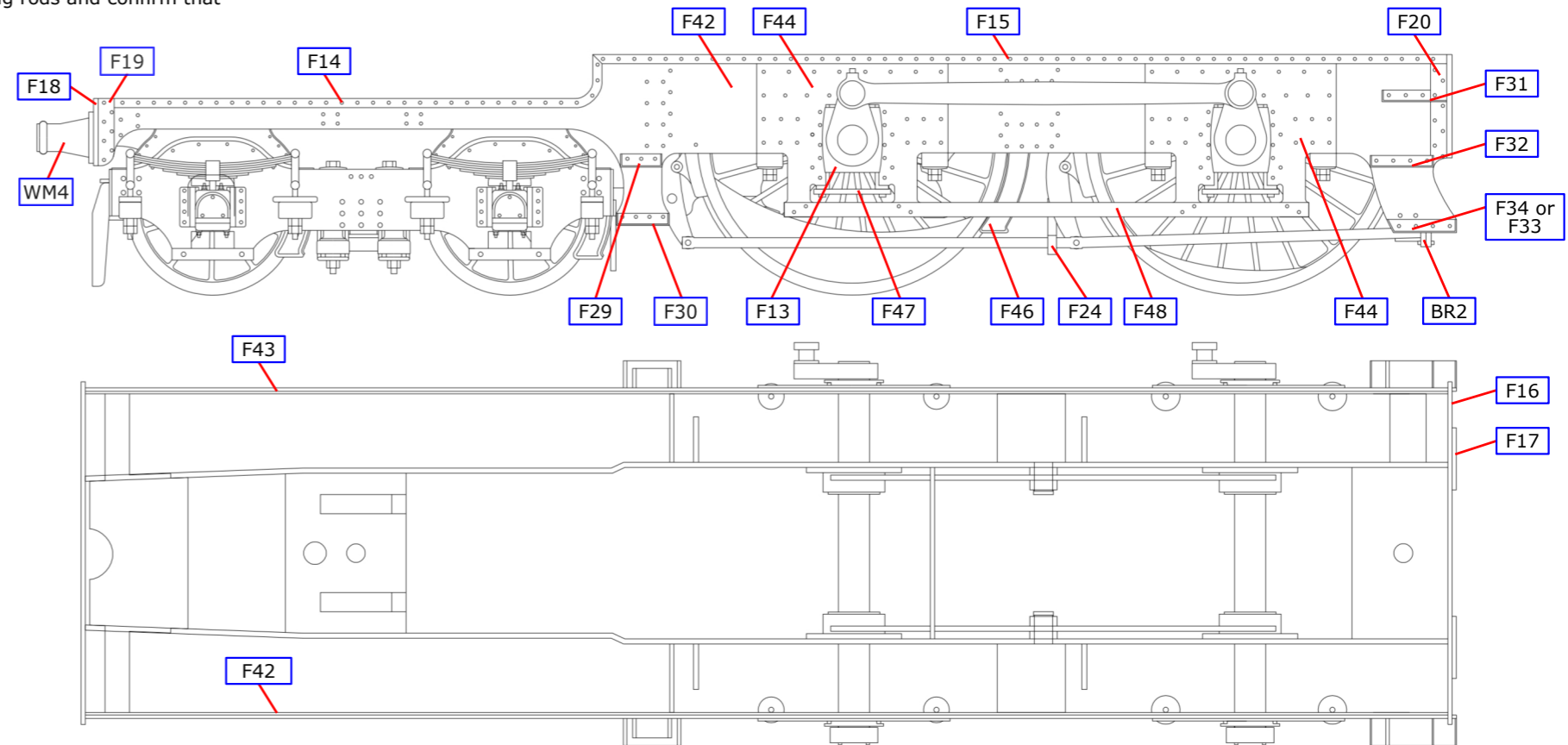


Fig 7. Atbara Frame Detailing

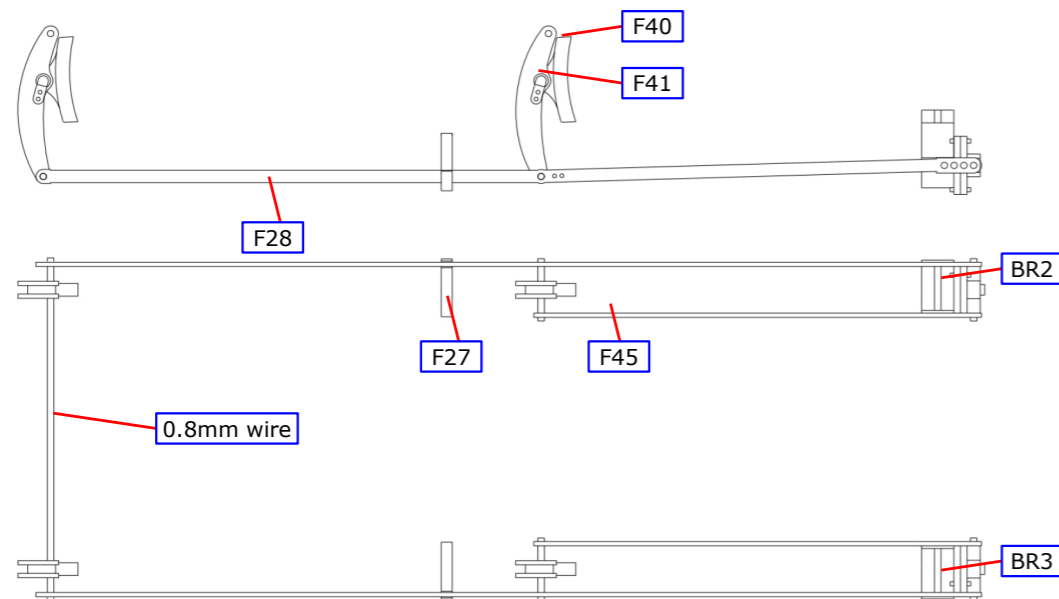


Fig 8. Brake Construction

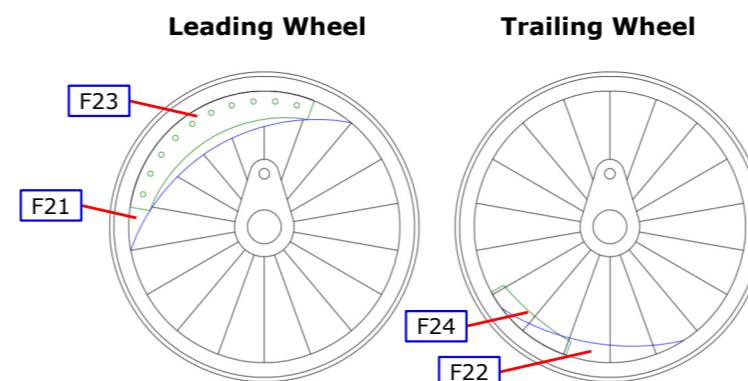
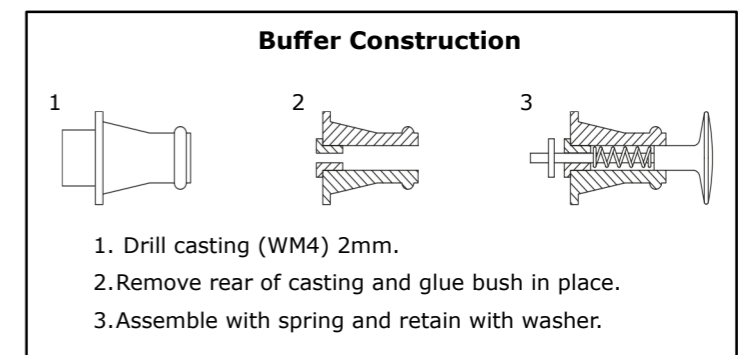


Fig 9. Wheel Balance Weights



## FLOWER OUTSIDE FRAMES

Assemble the brake hangers (F60) first embossing the rivet on each lamination. Attach the hangers to the pivot wires.

Fold the outside axle boxes (F13) 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. Shape the rear steps to the correct shape for the locomotive you are building. If you are fitting the frame strengthening plates (F63) the outside frames (F61 & F62) will need the rivets and horn block detail removing from behind where the strengthening plates will sit. Check that the axle boxes are an easy fit in the slots in the outside frames (and the strengthening plates) and ease if necessary. Attach the outside frame rivet strips, front and rear (F14 & F15) 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. 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.

Emboss the rivets on the drag beam (F16) and attach the rubbing plates (F17). Use a piece of .018" material placed on top of the frames to ensure the upper edge of the drag and buffer beam (F18) are 0.018" (0.45mm) above the upper edge of the frames; this will ensure that the frames fit the footplate. Tack solder the drag and buffer beams in place. Ensure the axles move freely and when satisfied solder the outside frames to the spacers. Attach the frame to buffer beam angle bracket (F19) between the frame and buffer beam and the frame to drag beam angle bracket (F20) between frame and drag beam.

Secure the balance weights, Original (F21 & F22) or Balanced Crank (F23 & F24), in position using photographs as a guide to position. 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 (BR1) to the axle ends. Fit the coupling rods and confirm that everything still moves smoothly.

Solder together the three laminations of the inside frame springs, inner and outer laminations (F25 & F26) before fixing in place inside the spring hangers (See Fig 6a).

Make the brake cross shaft from 1.6mm NS wire. Thread the brake cylinder levers (F65) and the brake cross shaft levers (F66) onto the wire and thread the wire through the holes in the frames. Modify the Atbara outer brake pull rod / Flower front pull rod (F28) by removing the rear section. Thread this onto the two 0.8mm wire brake spreader wires, and then add the rear brake pull rod (F64). Connect these to the brake cross shaft levers with 0.8mm wire. Form and fit the brake pull rods safety brackets (F27) through the small slots in the ash-pan sides and under the pull rods.

Fix the leading and trailing spring dampers, (BR4 & BR5) in place on the previously fitted wires. The smaller ones are used for the leading coupled axle.

Fold up steps (F29, F30, F31, F32, F33 or F35) and attach to frames. The four holes correspond to the four rivets attaching the upper steps and should be used to aid alignment.

Emboss the rivets on the outside frame hornblock tie (F67) and attach to the frames under the hornguides.

Form the sandpipes from 1.2mm wire and attach through the holes in the outside spacers.

Fit the either the early tall vacuum pipe (BR6) or the later short vacuum pipe (BR7). Fit the dummy (BR8) to the front buffer beam. Build the buffers as shown below and fit the Dean buffer housings (WM4).

No.	Description	Sheet	No.	Description	Sheet
<b>Common Parts</b>					
F13	Outside frame axlebox (4)	A1	F29	Front step upper tread (2)	B1
F14	Outside frame rivet strip front (2)	B3	F30	Front step lower tread (2)	B1
F15	Outside frame rivet strip rear (2)	B3	F31	Rear step upper tread (2)	B1
F16	Drag beam	B3	F32	Rear step middle tread (2)	B1
F17	Drag beam rubbing plate (2)	B1	F33	Rear step lower tread (2)	B1
F18	Buffer beam	B3	F34	Lot 125 rear step lower tread (2)	B1
F19	Frame to buffer beam angle bracket (2)	B1	F35	Inside motion bracket packing piece	A1 & B3
F20	Frame to drag beam angle bracket (2)	B3	<b>Flower Parts</b>		
F21	Original front balance weight (2)	B3	F60	Flower brake hanger/shoe lamination (8)	A2
F22	Original rear balance weight (2)	B3	F61	Flower left outside frame	A1
F23	Balanced cranks front balance weight (2)	B2	F62	Flower right outside frame	A1
F24	Balanced cranks rear balance weight (2)	B3	F63	Flower outside frame strengthening plate (2)	A1
F25	Spring inner lamination (2)	A1	F64	Rear brake pull rod (2)	B3
F26	Spring outer lamination (4)	A2	F65	Brake cylinder lever (4)	B3
F27	Brake pull rods safety brackets (2)	B1	F66	Brake cross shaft lever (4)	B3
F28	Atbara outer brake pull rod / Flower front pull rod (2)	F67	F67	Flower outside frame hornblock tie (4)	A1

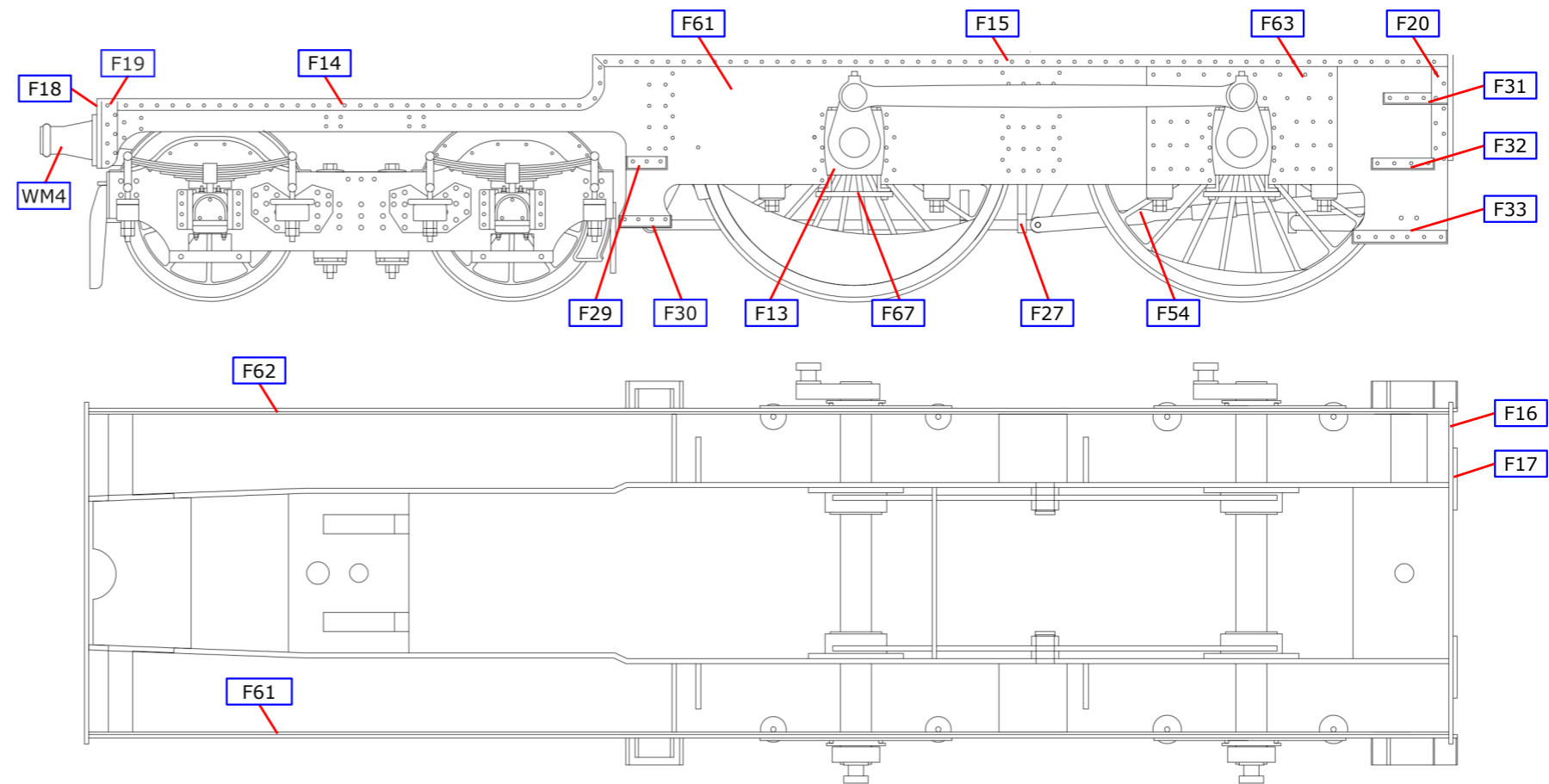


Fig 10. Flower Frame Construction

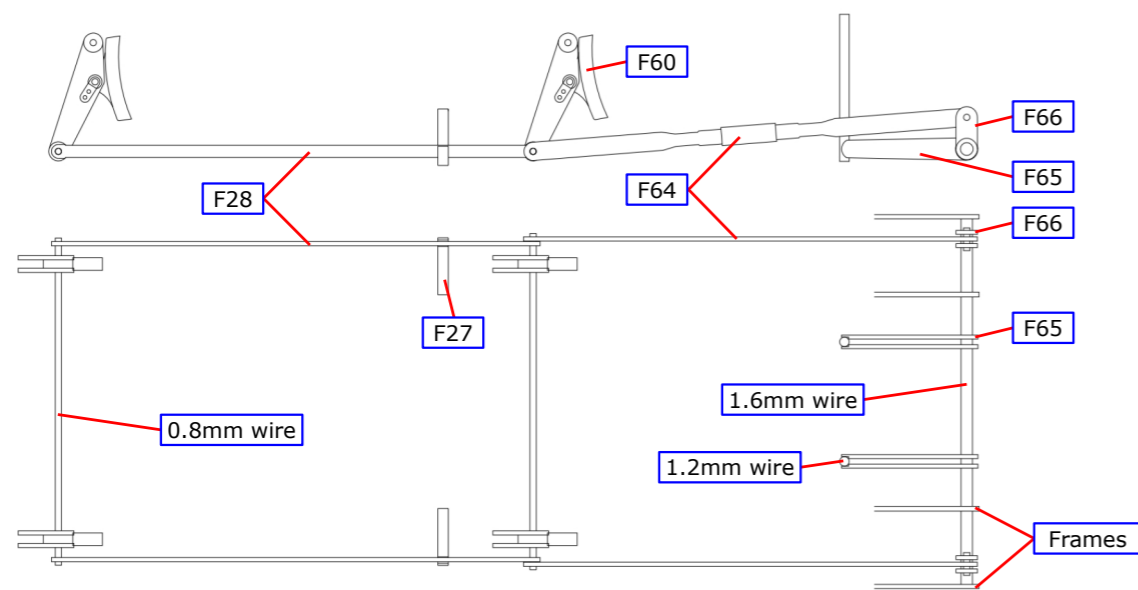


Fig 11. Flower Brake Construction

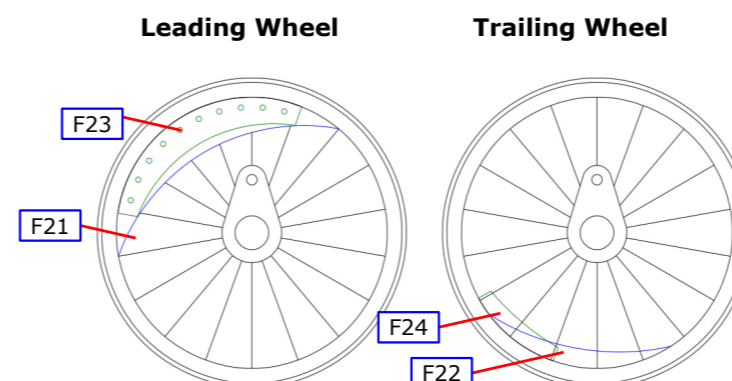
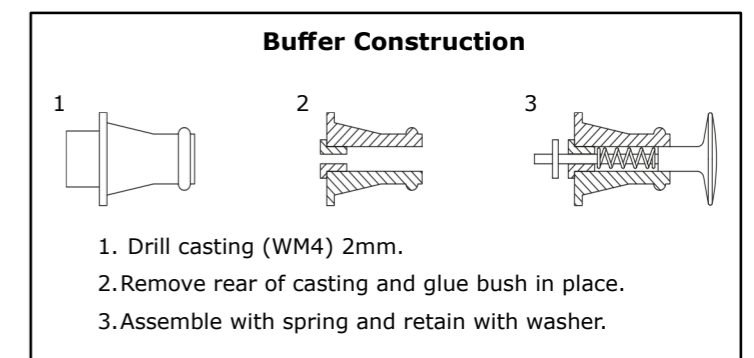


Fig 12. Wheel Balance Weights



## FOOTPLATE

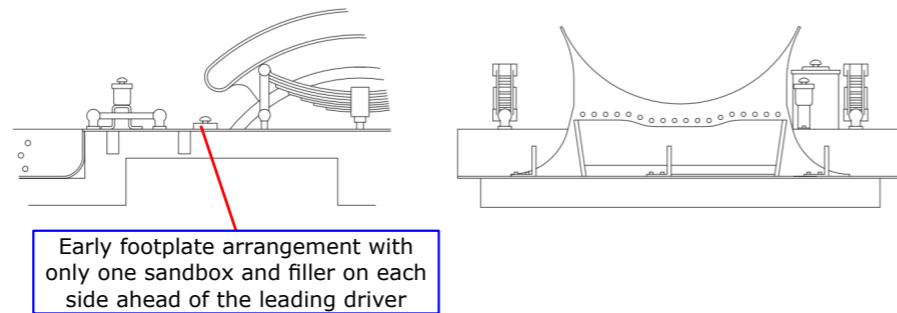
Fold down the hanging plates (valances) on the footplate (U1) and then fold the footplate step ensuring that the front hanging plates sit outside the rear hanging plate. Solder the corners and the hanging plates where they overlap at the step. The four 'legs' on the rear side edges ensure that the footplate will stand level on a flat surface during construction. Solder the footplate strengthening plates (U2) to the drop plates. The half etched slots will accommodate the springs and spring hangers later so ensure the plates are accurately aligned. File the top edge of the strengthening plates flush with the surface of the footplate.

Fold up the inside frame extensions, the front angle, the cab floor support and the lamp brackets.

Prepare the footplate overlays (U3 & U4) 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 front overlay over the footplate so the lamp brackets pass through the holes provided and the body fixing hole aligns and solder them 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 drawing.

No.	Description	Sheet	No.	Description	Sheet
U1	Footplate 85	B1	U13	Footplate mounted lubricator bracket 97	B1
U2	Footplate strengthening plate (2) 34	A2	U14	Saddle spacer 132	B3
U3	Footplate front overlay 86	B1	U15	Saddle front 42	A2
U4	Footplate rear overlay 87	B1	U16	Saddle rear 43	A2
U5	Splasher face with beading (2) 90	B3	U17	Plain saddle side plates (2) 133	B3
U6	Splasher face with rivets (2) 91	B3	U18	Riveted saddle side plates (2) 134	B3
U7	Plain front splasher top (2) 92	B3	U19	Cylinder front plate 89	B3
U8	Plain rear splasher top (2) 93	B3	U20	Front frame extensions (2) 88	B1 & B3
U9	Riveted front splasher top (2) 94	B3	U21	Cylinder cover overlay 44	A1
U10	Riveted rear splasher top (2) 95	B3	U22	Nameplate brackets 96	B1
U11	Cab floor support 128	B1	U23	Etched spring shackles (8) 98	B3
U12	Sandbox operating rod (2) 99	B3			



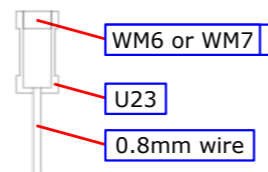
Solder the splasher faces, with beading or rivets, (U5 or U6) inside the footplate edge so that their bottom edge is level with the bottom edge of the footplate side.

Curve the splasher tops, plain (U7 & U8) or riveted (U9 & U10), by rolling underneath a suitable rod or dowel on a piece of rubber sheet. Solder in place.

Solder the cab floor support (U11) in place and 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 (BR10) to the footplate behind these handrails or use the large sandboxes (left WM5, right WM6) and the operating levers (U12). If needed, bend up the footplate mounted lubricator bracket (U13) and attach. Fit the vacuum pump lubricator (BR10).

**Springs.** While we await the delivery of the cast spring shackles (BR12), 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 small leading springs (WM7) and the large trailing springs (WM8). The 'legs' on the footplate edge should now be removed.



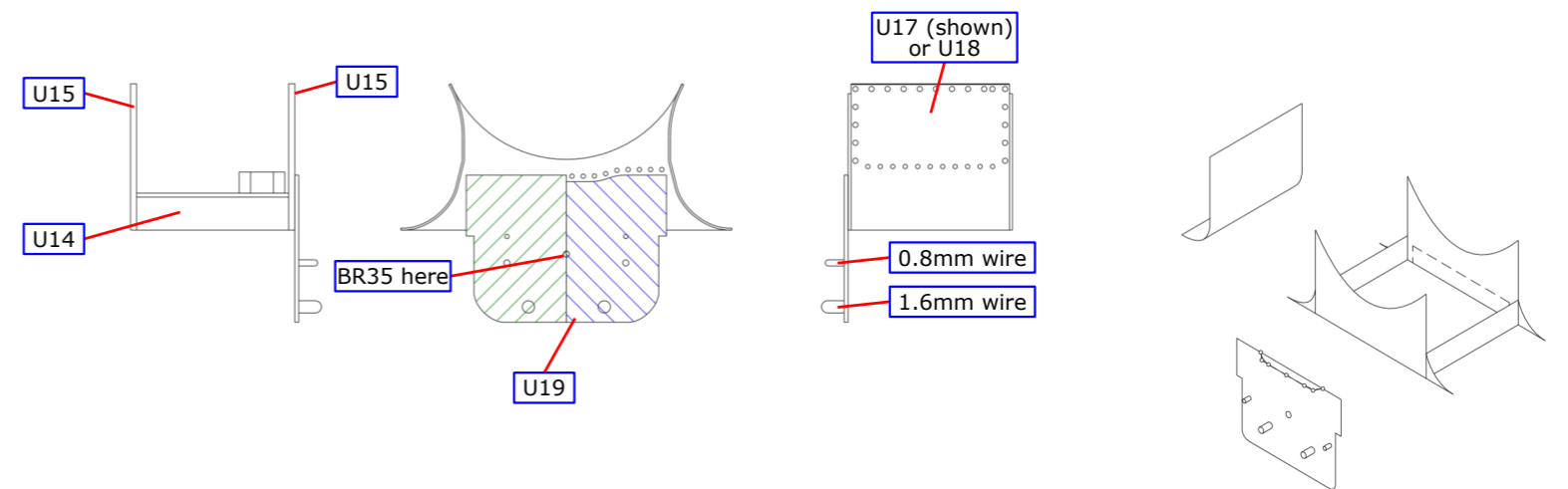
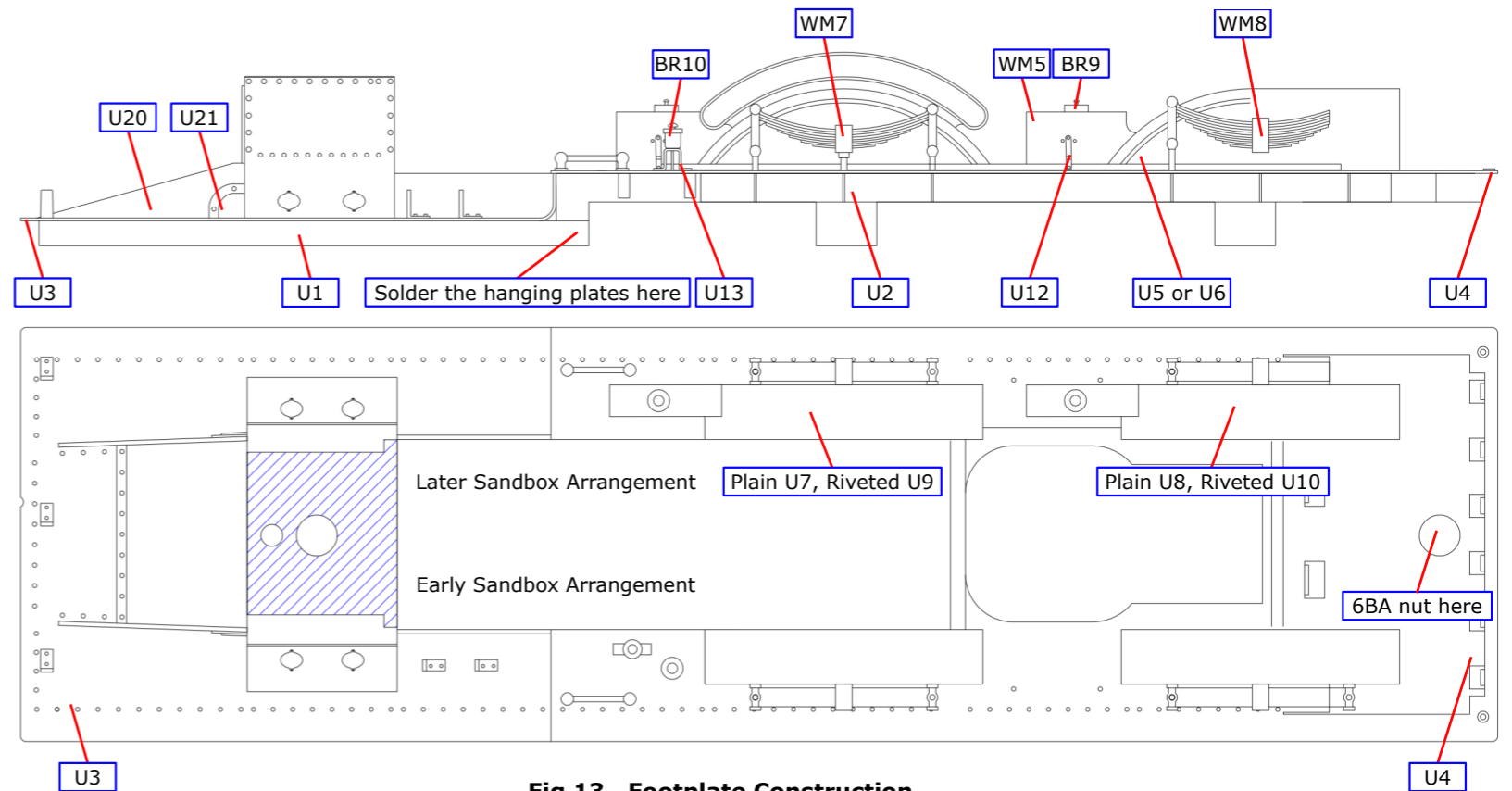
Solder the spring hangers (BR11) into the slots in the footplate strengthening plate ensuring that they line up so that the springs slide in. Attach the small leading springs (WM7) and the large trailing springs (WM8). The 'legs' on the footplate edge should now be removed.

**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 spacer (U14). Emboss the rivets on the saddle front (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 (U16). 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 13 or 14 and then return here.

Attach the smokebox saddle side plates, plain or riveted (U17 or U18). Note the rivet patterns are not symmetric. Detail the cylinder front plate, straight or shaped top (U19) as shown in Fig 14 and attach it to the saddle front with its top edge level with the top of the front frame extensions. The snifting valve (BR35) 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. 12.

Attach the front frame extensions (U20) locating them in the slot provided in the footplate and then attach the cylinder cover overlays (U21) (see Fig 13).

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





## CAB

**4120-4128.** Emboss the rivets on the cab front (C1). Fit either the porthole window frame (C3) or the porthole blanking plates (C5) from the inside. Attach the window frames (C7) on the inside. The whistle plate (C8) appears on photographs of locomotives in later life; if required, solder in place. Solder the cab front in position.

**4129-4168.** Emboss the rivets on the cab front (C2). Fit either the porthole window frame (C4) or the porthole blanking plates (C6) from the inside. Attach the window frames (C7) on the inside. The whistle plate (C8) appears on photographs of locomotives in later life; if required, solder in place. Solder the cab front in position.

Prepare the cab sides for 4120-4128 (C9), for 4129-4138 (C10) or for 4139-4168 (C11) by embossing any rivet detail you wish to have. Attach the cut-out beading (C12) fitting the etched groove over 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 (C13). 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 or leave until after painting. Solder the cabsides in position. They are correctly aligned when the cab side handrails are vertical. Fit the vertical handrails from 0.8mm wire. Solder the cab roof rear support (C14) between the rear edges of the cab sides.

**Canvas Covered Wooden Roof.** Curve the cab roof (C15) and solder in place with the front edge in line with the cabsides. Solder the battens (C16) between the half etched lines. Solder the side mouldings (C17) to the cab side under the roof. Solder the rear moulding (C18) to the roof rear support under the roof.

**Steel Roof.** Curve the cab roof (C19) and solder in place with the front edge in line with the cabsides. Solder the rear angle (C20) to the rear edge of the roof. Solder the rain strips (C21) to the side edges of the roof.

**Steel roof with sloping rain strips.** Curve the cab roof (C22) and solder in place with the front edge in line with the cabsides. Solder the rear angle (C20) to the rear edge of the roof. Solder the sloping rain strips (C23) into the slots in the roof.

Fold up the cab splasher rear section from the cab floor (C24). Fold up the cab splashers (C25) and then soldered in place. Slightly curve the fall plate (C26) and hinge it to the floor as shown in the diagram before soldering the floor in place.

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 the backhead can be assembled and the cab interior detailed. Use copper wire of a suitable size for the various pipes.

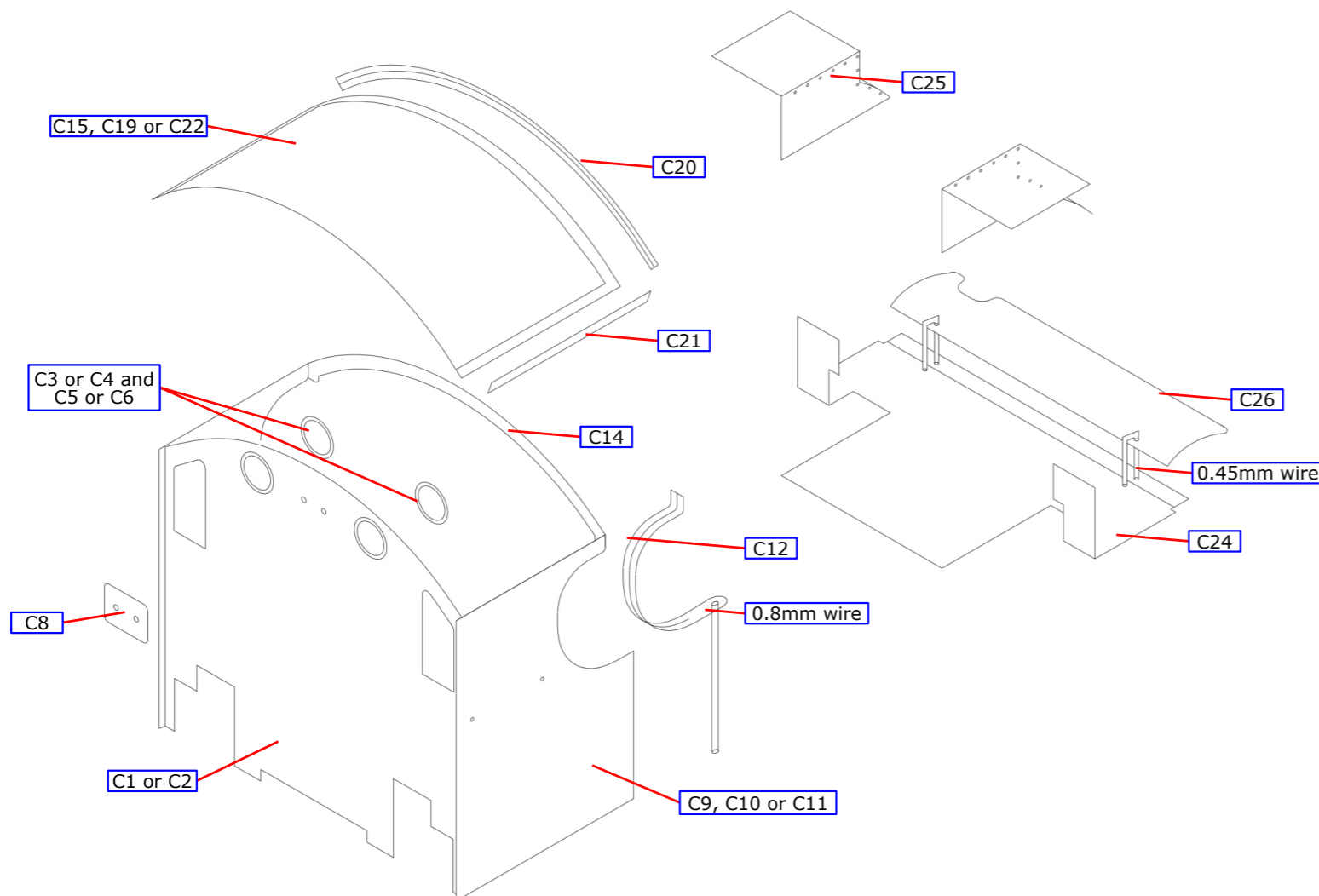


Fig 15. Cab Construction

No.	Description	Sheet	No.	Description	Sheet
C1	Cab front (4120-4128)	B2	C15	Canvas covered wooden roof	B3
C2	Cab front (4129-4168)	B2	C16	Wooden roof battens (2)	B1
C3	Cab porthole window frames (4120-4128) (2)	B1	C17	Wooden roof side mouldings (2)	B1
C4	Cab porthole window frames (4129-4168) (2)	B1	C18	Wooden roof rear moulding	B2
C5	Cab porthole blanking plate (4120-4128) (2)	B1	C19	Steel roof	B3
C6	Cab porthole blanking plate(4129-4168) (2)	B1	C20	Steel roof rear angle	B2
C7	Cab window frames (2)	B3	C21	Steel roof rain strips (2)	B1
C8	Whistle plate	B1	C22	Steel roof with sloping rain strips	B3
C9	Cab side (4120-4128) (2)	B3	C23	Sloping rain strips (2)	B2
C10	Cab side (4129-4138) (2)	B3	C24	Cab floor	B3
C11	Cab side (4139-4168) (2)	B3	C25	Cab splashers (2)	B3
C12	Cab side cutout beading (2)	B1	C26	Fall plate	B3
C13	Cab seat (2)	B3			
C14	Cab roof rear support	B2			

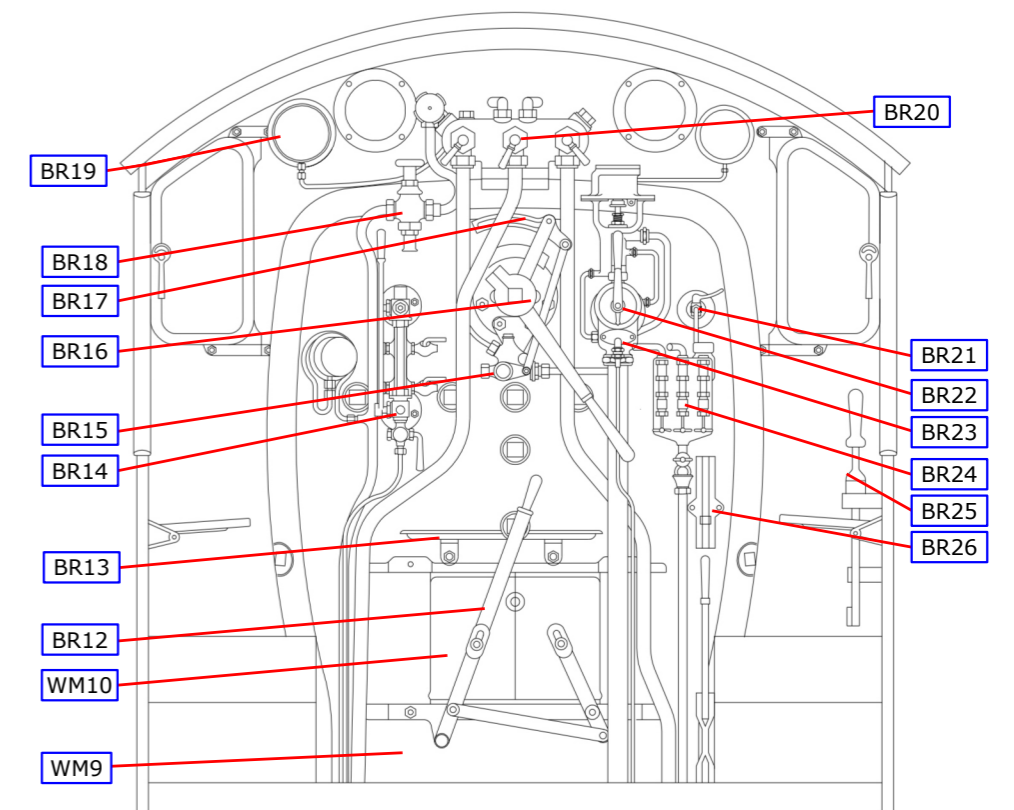
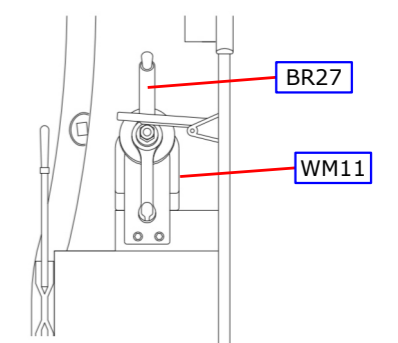


Fig 16. Backhead With Steam Reverse



Screw Reverser

## FORMING THE FIREBOX

The photographs show the construction of a 47XX firebox. The construction of the Atbara/Flower firebox follows the same procedures.

Solder together the two laminations of the firebox front (SB1). Clean the cusp off all parts, including the firebox rear former (SB2). 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 or C2)

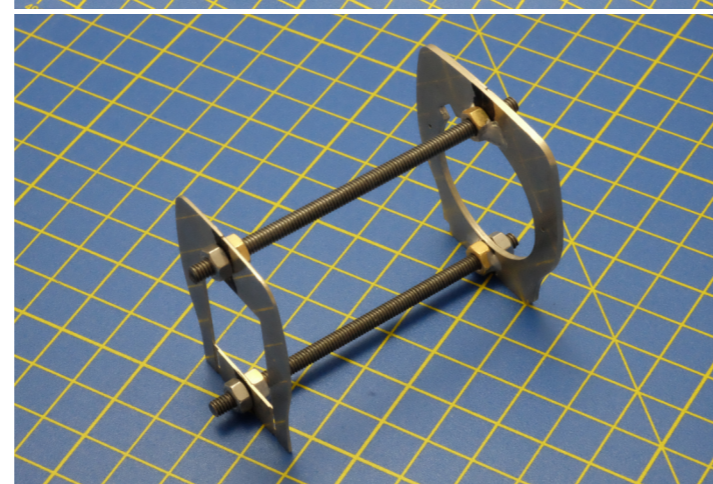
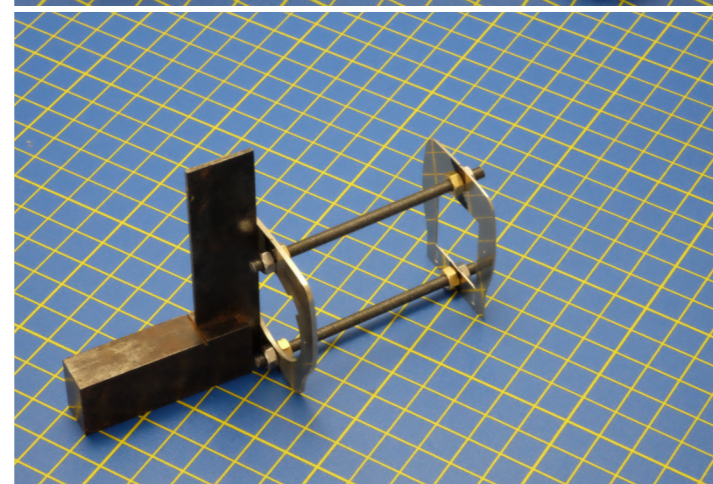
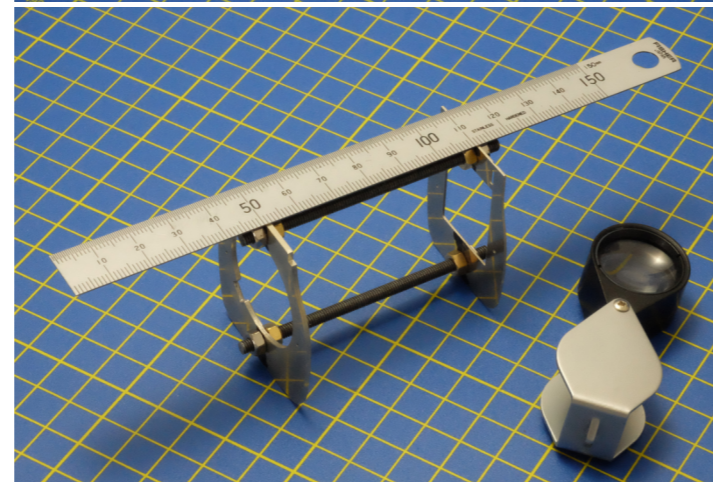
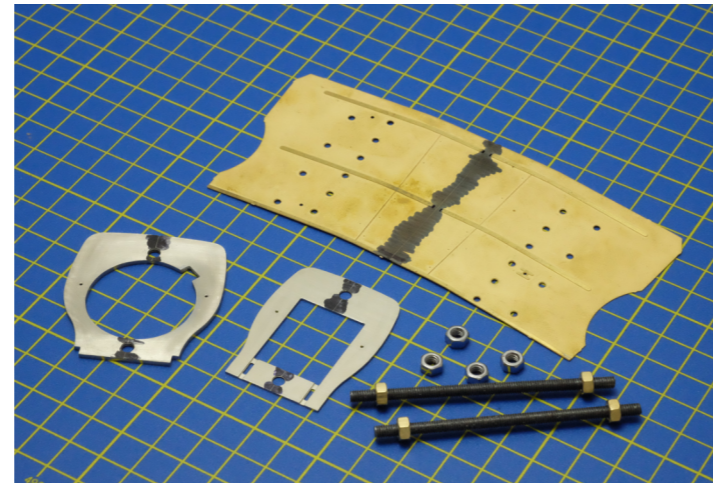
To assemble the firebox two 100mm pieces of 4BA studding will be required with four brass nuts and four stainless steel nuts. Thread the brass nuts on to the studs.

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.

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 or C2)) in the footplate slots.

Tighten the stainless steel nuts up tightly and then solder the brass nuts to the spacers. A good blobby tack, as here, will do 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.



No.	Description	Sheet
SB1	Firebox front laminations (2)	A1 & A2
SB2	Firebox rear	A1
SB3	Firebox wrapper	A2
SB4	Firebox band joining clips (2)	B3

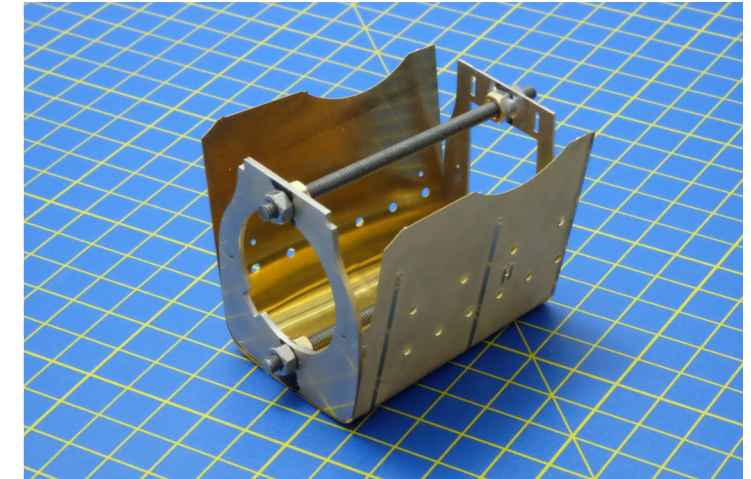
No.	Description	Sheet
SB5	Firebox left washout plugs (2)	B1
SB6	Firebox right washout plugs (2)	B1
C1	Cab front, 4120-4128	B2
C2	Cab front, 4129-4168	B2

**Photo 5.** Emboss the rivets for the ends of the cladding fixing bands on the firebox wrapper (SB3).

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



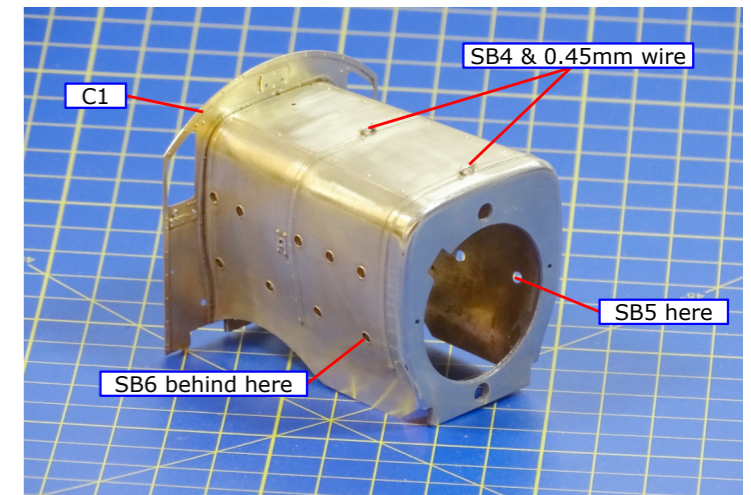
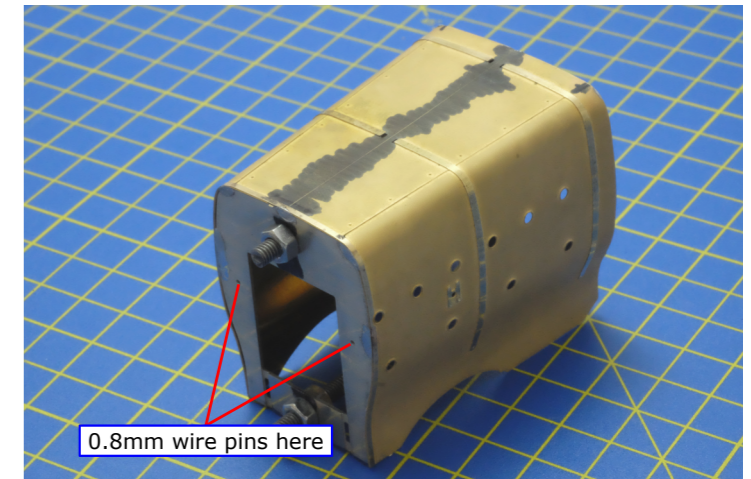
Tack the outside of the firebox at the centre and corners, both front and rear. Again, take care and check that the centres retain the alignment that we've worked so hard to achieve. Now work down the spacers alternating tacks left/right and front/rear to even out any expansion of the wrapper. Finally 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 brackets (SB4) into a 'U' shape so that they fit through the slots in the firebox top and solder in place from inside. Complete with a short piece of 0.45 mm wire to represent the tightening bolt. Solder the washout plugs (SB5 & SB6) in place inside the firebox and attach the mudhole covers (WM12) in place on the firebox corners.



## D2 BOILER AND SMOKEBOX

**Boiler Cone.** Before rolling the boiler cone wrapper (SB20) the boiler washout plugs can be drilled out and the separate boiler wash out plugs (SB7) soldered in place. Check for fit around the formers, rear and front (SB8 & SB9). Bend out the boiler band joining brackets on the boiler jointing strip (SB12) and fit through the small slots from inside the boiler. 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. 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. Solder two short pieces of 0.8mm wire into the holes in the rear former to act as dowels to locate the boiler and firebox. Check the boiler to firebox fit. Represent the bolts in the joining brackets using 0.45mm wire.

Roll the top feed pipe overlay (SB21) 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.

**Smokebox and Boiler.** For the early (non-superheated) condition prepare the smokebox/boiler wrapper (SB22) by shortening the smokebox on the wrapper by 5.25mm and then drill two new handrail knob holes 2.9mm from the front edge.

Roll the wrapper and check the fit on the formers, rear and front, (SB10 & SB11). Solder the wrapper ends together using the smokebox and boiler jointing strip (SB12), 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 lancecock. Emboss the four rivets on the smokebox front overlay (SB13), drill through the appropriate lancecock hole and attach to the front of the smokebox aligning the handrail and lancecock holes. Bend up the smokebox step (SB14) after first embossing the rivets and solder in place under the smokebox front.

**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 11 to finish the saddle and then return to here.

Solder the upper lamp bracket (SB16) on the smokebox after first embossing the rivets.

Fix medium handrail knobs in the six holes in the boiler and 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. Attach the mud hole doors (BR28) in place on the firebox corners.

Attach the smokebox door (WM12) to the smokebox. Fit the smokebox door handle (BR28) to the smokebox door. If required, the steam lance cock (BR29) 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 (WM14 or WM15) See the GA). Fit the choice of chimney, either the original cast iron chimney (WM16), the tapered cast iron chimney (WM17) or the parallel copper capped chimney (CU1). Fit the safety valve base without top feed (WM19). After painting fit the safety valve springs (BR30) and then fit the polished safety valve casing no top feed (BR32).

As shown in the GA, fit the large whistle (BR34) and the small whistle (BR33).

If required, fit the firebox screw reverse cover (WM20) on the right side of the firebox in front of the cab.

No.	Description	Sheet	No.	Description	Sheet
<b>Common Parts</b>					
SB7	Boiler washout plugs 142	B1	SB14	Smokebox step 138	B1
SB8	Boiler cone rear former 37	A2	SB15	Boiler cone jointing strip 141	B3
SB9	Boiler cone front former 38	A2	SB16	Upper lamp bracket 131	B3
SB10	Smokebox and parallel boiler rear former 39	A2	F29	Drawbar 65	B3
SB11	Smokebox and parallel boiler front former 40	A2	<b>D2 Boiler (Half Cone) Parts</b>		
SB12	Smokebox and parallel boiler jointing strip 137	B3	SB20	D2 boiler cone wrapper 139	B2
SB13	Smokebox front overlay 41	A2	SB21	Overlay for top feed pipes 143	B3
			SB22	Plain smokebox and parallel boiler wrapper 135	B2
			SB23	Upper lamp bracket 131	B3

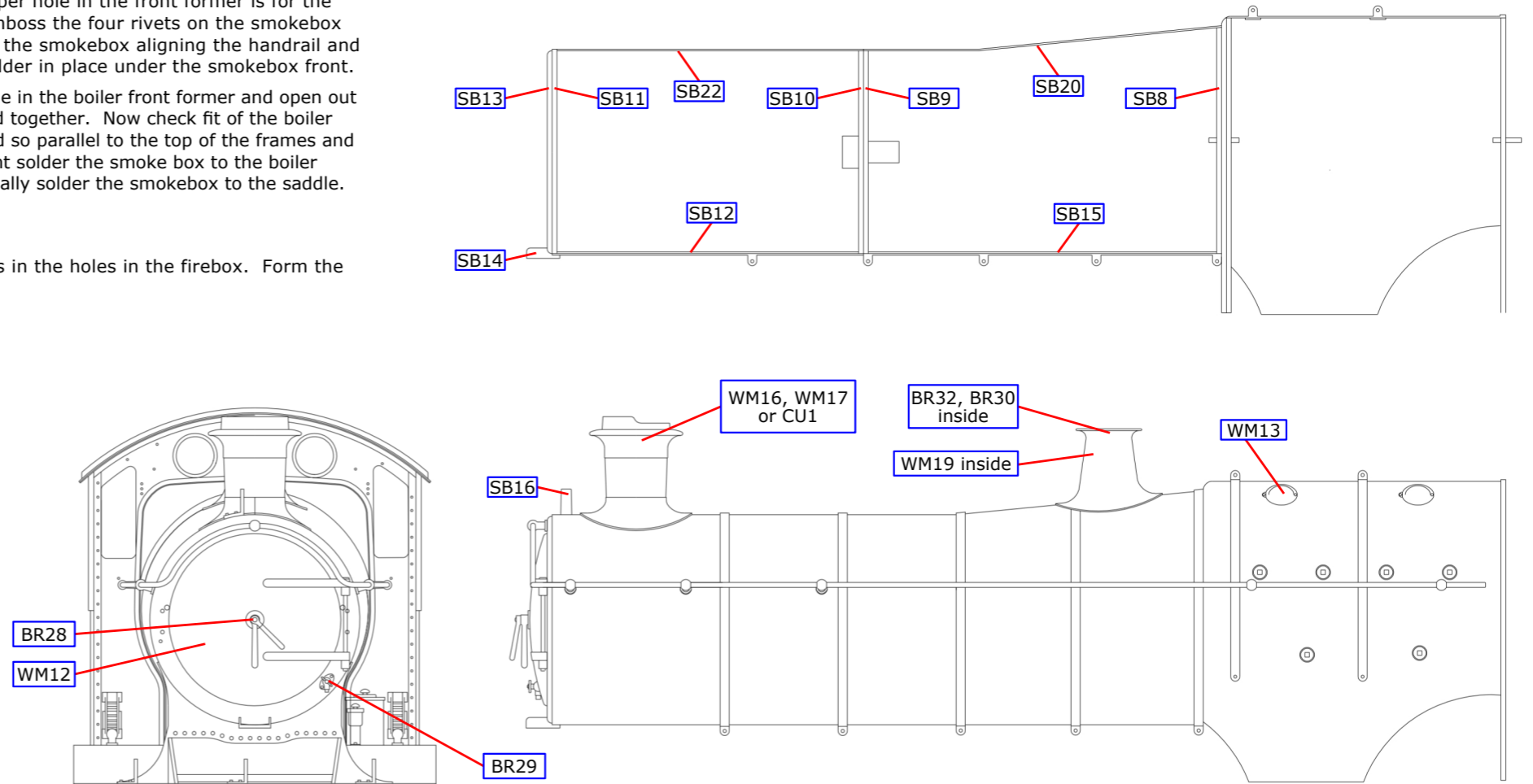
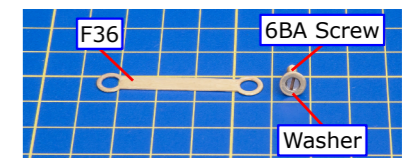


Fig 16. D2 Boiler Construction



## D3 BOILER AND SMOKEBOX

**Boiler Cone.** Before rolling the coned section of the boiler (SB30) the boiler washout plugs can be drilled out and the separate boiler wash out plugs (SB7) soldered in place. Check for fit around the formers (SB8 & SB9). Bend out the boiler cone jointing strip brackets on the boiler jointing strip (SB12) and fit through the small slots from inside the boiler. 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. If the fit is good, and the formers fit, solder the wrapper ends together with the jointing strip. Solder the formers in place so that they are almost flush with the ends. Solder two short pieces of 0.8mm wire into the holes in the rear former to act as dowels to locate the boiler and firebox. Check the boiler to firebox fit. Represent the bolts in the joining brackets using 0.45mm wire.

Roll the top feed pipe overlay (SB31) 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.

**Smokebox and Boiler.** Prepare the smokebox and boiler wrapper (SB33) by drilling two new handrail knob holes 2.9mm from the front edge. If you wish to have a flush riveted smokebox, remove the rear section of SB22 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 (SB10 & SB11). Solder the wrapper ends together using the smokebox and boiler jointing strip (SB12), 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 lancecock. Emboss the four rivets on the smokebox front (SB13), drill through the appropriate lancecock hole and attach to the front of the smokebox aligning the handrail and lancecock holes. Bend up the smokebox step (SB14) after first embossing the rivets and solder in place under the smokebox front.

**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 12 to finish the saddle and then return to here.

Solder the upper lamp bracket (SB16) on the smokebox after first embossing the rivets.

Fix medium handrail knobs in the six holes in the boiler and 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. Attach the mud hole doors (BR28) in place on the firebox corners.

Attach the smokebox door (WM12) to the smokebox. Fit the smokebox door handle (BR28) to the smokebox door. If required, the steam lance cock (BR29) 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 (WM14 or WM15) (See GA). Fit the choice of chimney, either the original cast iron chimney (WM16), the tapered cast iron chimney (WM17) or the parallel copper capped chimney (CU1). Fit the safety valve base with top feed (WM17). Form the top feed pipes from 1.4mm wire so that they disappear behind the splashers. After painting fit the safety valve springs (BR30) and then fit the polished safety valve casing with top feed (BR31).

As shown in the GA, fit the large whistle (BR34) and the small whistle (BR33).

If required, fit the firebox screw reverse cover (WM20) on the right side of the firebox in front of the cab.

No.	Description	Sheet	No.	Description	Sheet
<b>Common Parts</b>					
SB7	Boiler washout plugs	B1	SB14	Smokebox step	B1
SB8	Boiler cone rear former	A2	SB15	Boiler cone jointing strip	B3
SB9	Boiler cone front former	A2	SB16	Upper lamp bracket	B3
SB10	Smokebox and parallel boiler rear former	A2	F29	Drawbar	B3
SB11	Smokebox and parallel boiler front former	A2	<b>D3 Boiler Parts</b>		
SB12	Smokebox and parallel boiler jointing strip	B3	SB30	Coned (D3) boiler wrapper	B1
SB13	Smokebox front overlay	A2	SB31	Overlay for topfeed pipes	B3
			SB32	Smokebox and boiler riveted wrapper	B2

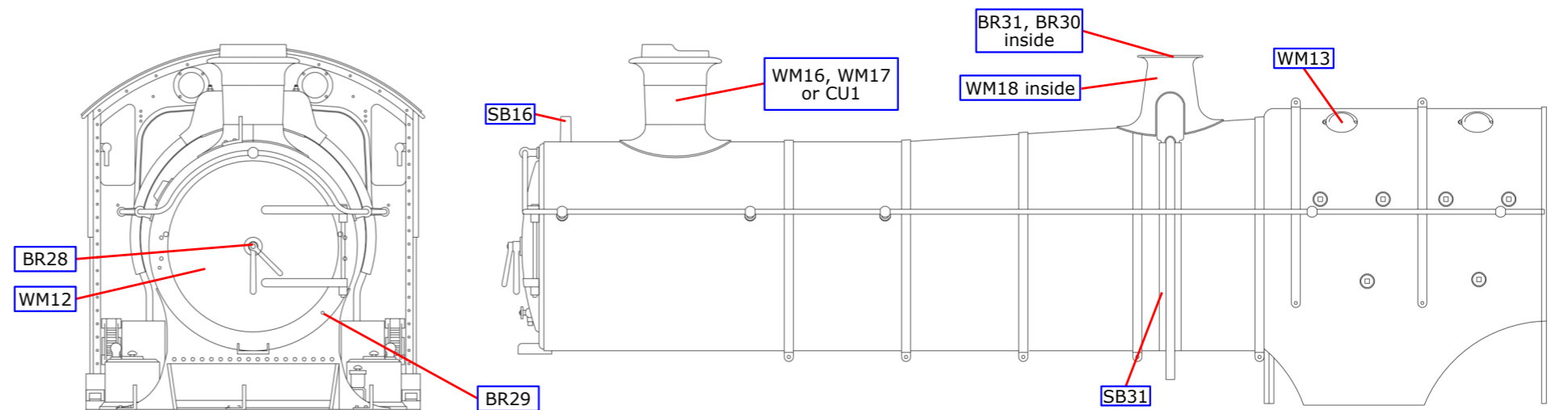
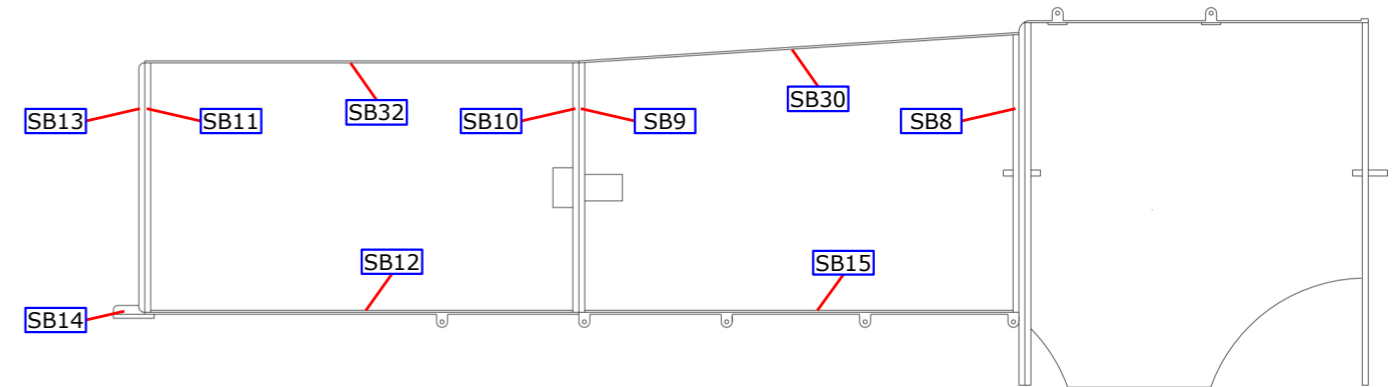


Fig 18. D3 Boiler Construction

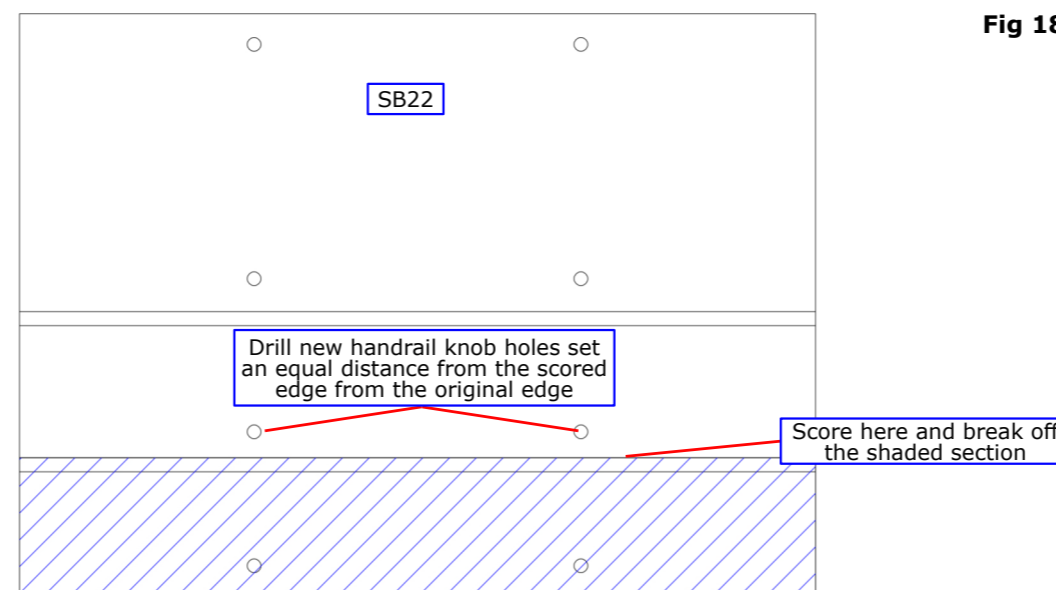
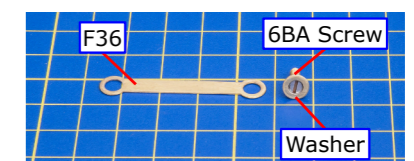
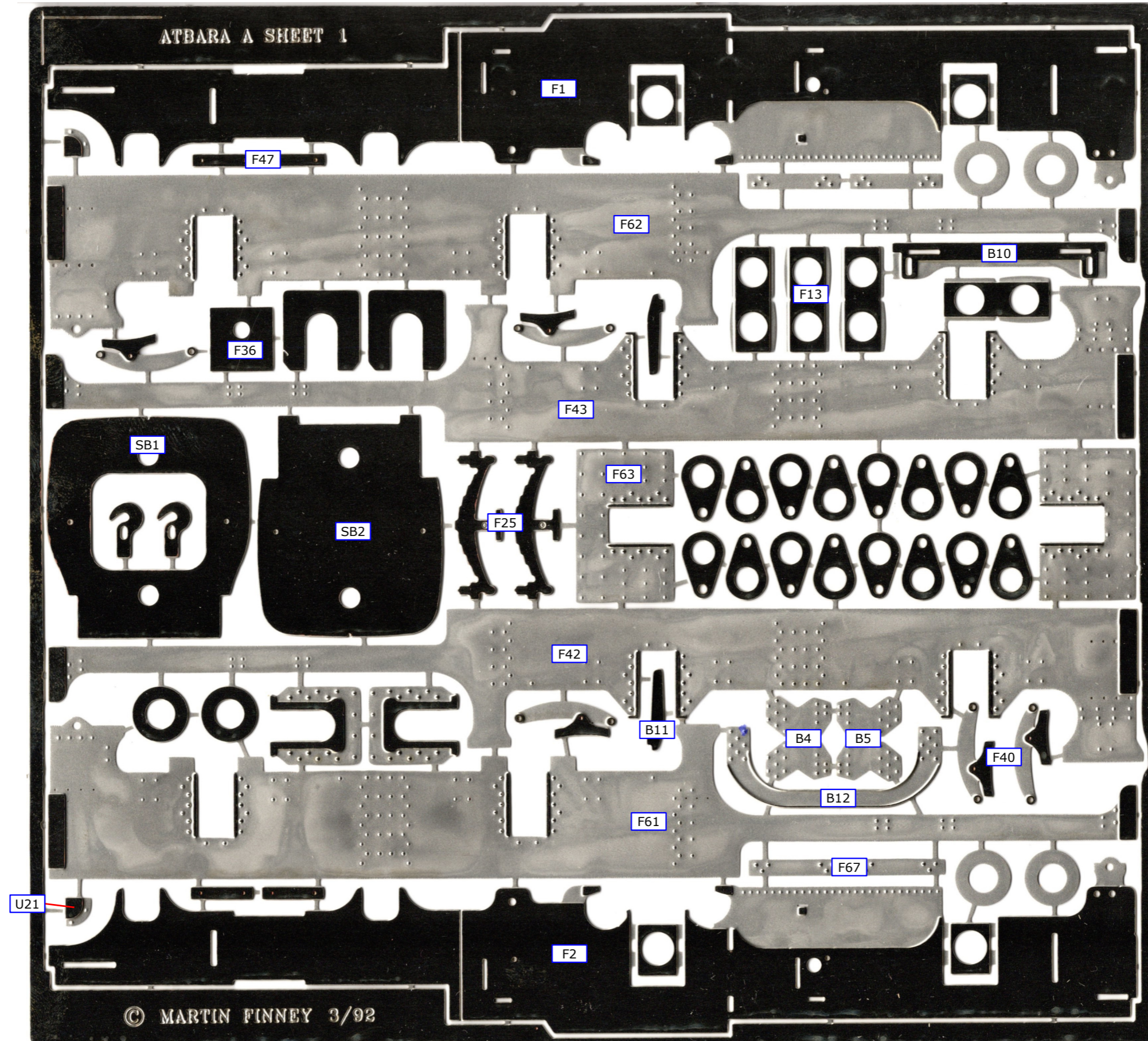


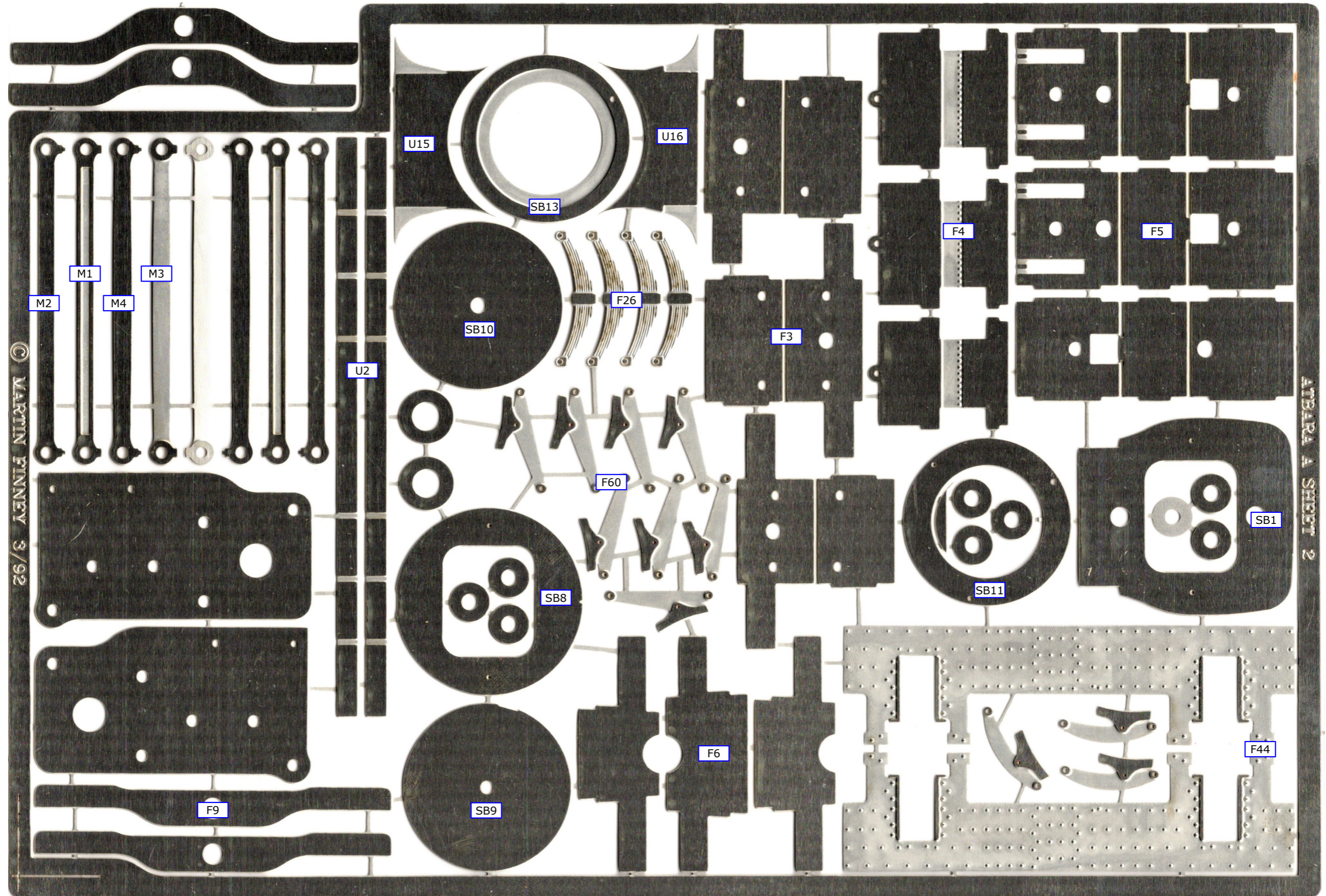
Fig 19. Smooth smokebox D3 Boiler Modification



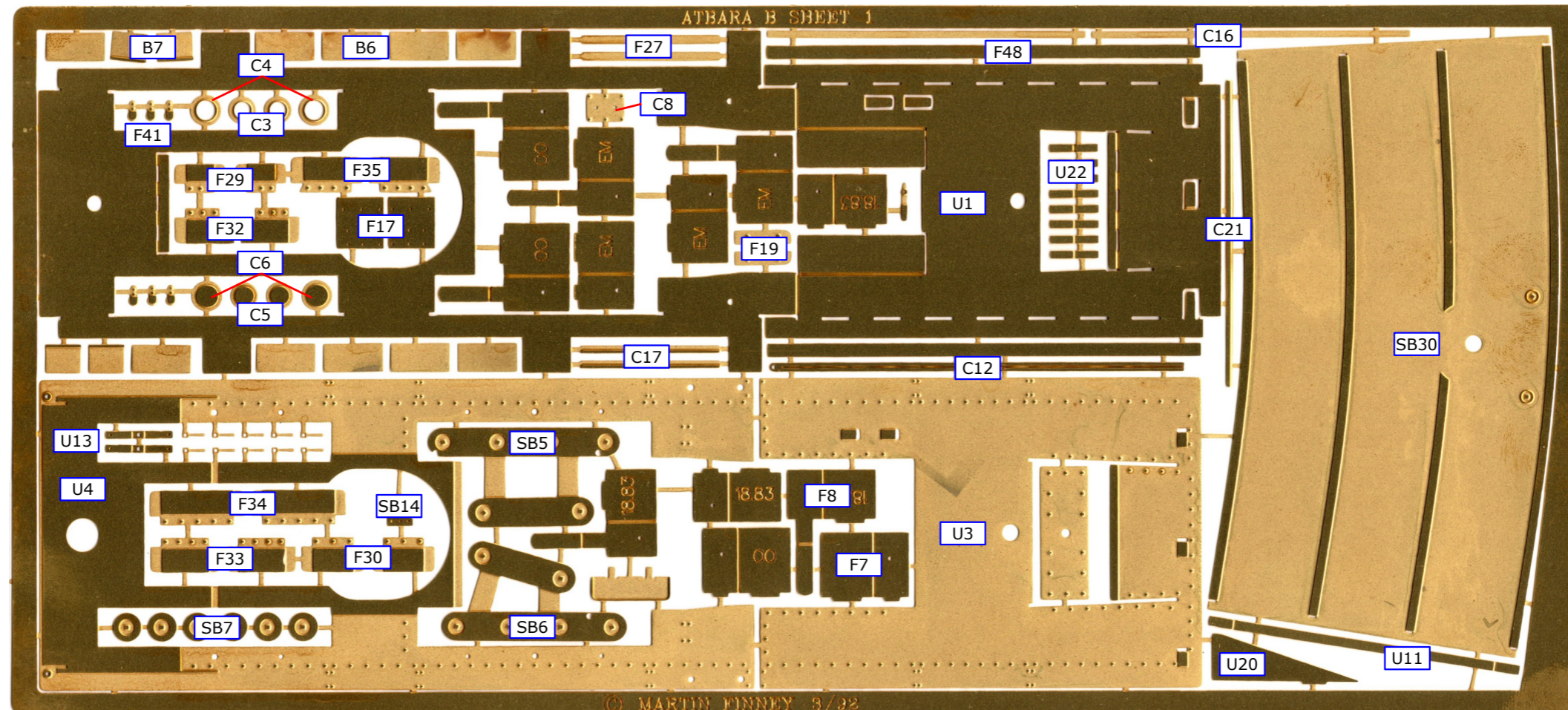
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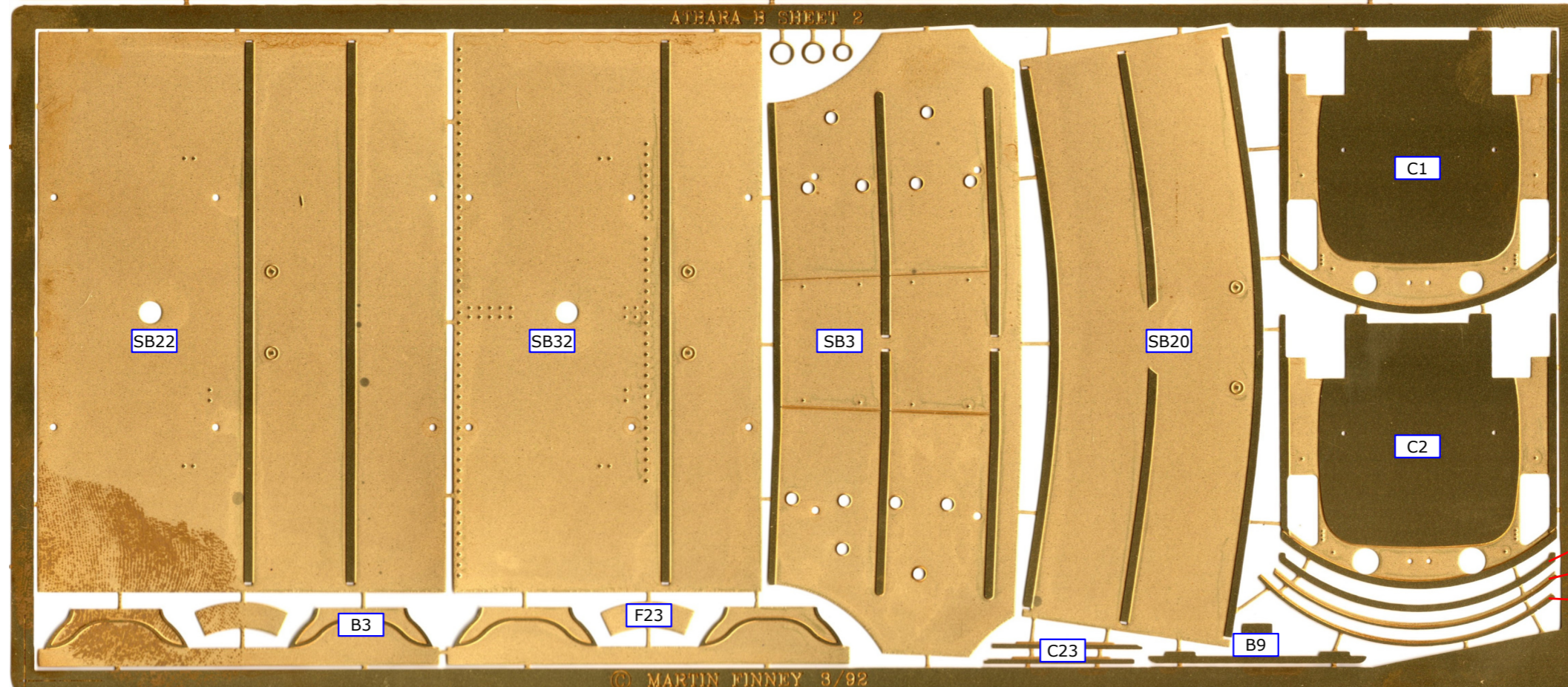
ATBARA/FLOWER ETCH SHEET A2



ATBARA/FLOWER ETCH SHEET B1 & B2

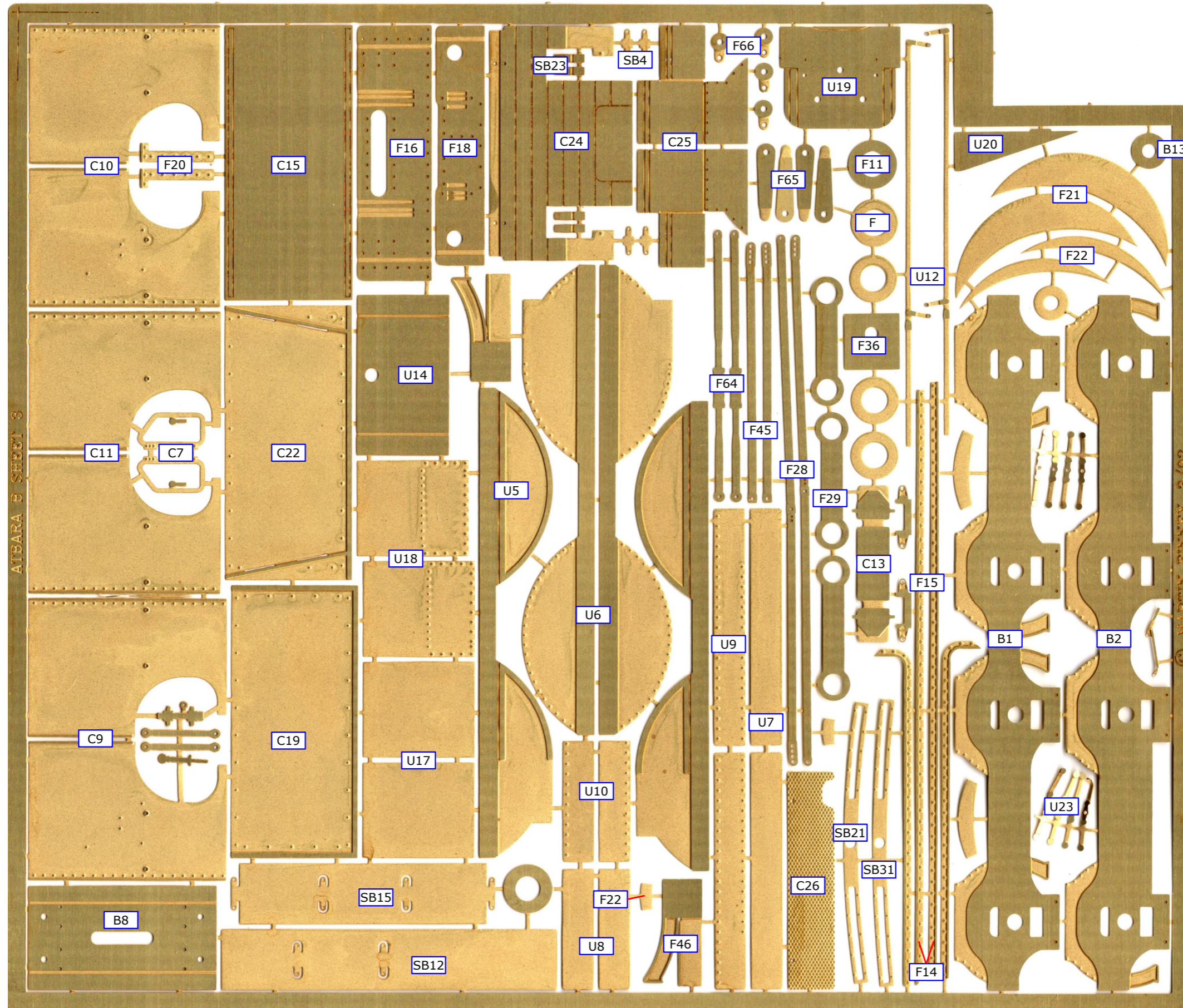


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ATBARA/FLOWER ETCH SHEET B3





## ATBARA/FLOWER CASTINGS

### BRASS CASTINGS

CU1	Parallel chimney	Atbara/2
BR1	Cranks	Cranks/2
BR2	Left brake cylinder	Atbara/1
BR3	Right brake cylinder	Atbara/1
BR4	Trailing (large) spring damper (4)	Atbara/1
BR5	Leading (small) spring damper (4)	Atbara/1
BR6	Tall early vacuum pipe	47xx/7
BR7	Short later vacuum pipe	Bulldog/2
BR8	Vacuum pipe dummy	Bulldog/2
BR9	Sandbox lid (2)	Details/2
BR10	Vacuum pump lubricator (2)	47xx/8
BR11	Spring hangers	Aberdare/2

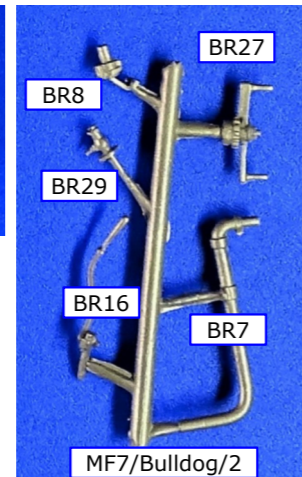
BR12	Firebox door handle	47xx/7
BR13	Backhead shelf	Details/1
BR14	Water gauge	47xx/7
BR15	Jockey valve	47xx/7
BR16	Regulator handle	Bulldog/2
BR17	Regulator and jockey valve linkage	51XX/2
BR18	Steam heating valve	51xx/2
BR19	Cab pressure gauges (3)	47xx/8
BR20	Steam fountain	47xx/8
BR21	Blower valve	47xx/7
BR22	Combined ejector/brake handle	47xx/7
BR23	Combined ejector/brake	51xx/2
BR24	Sight feed lubricator	47xx/7

BR25	Steam reverse lever	Atbara/1
BR26	Steam reverse indicator	Atbara/1
BR27	Screw reverser handle	Bulldog/2
BR28	Smokebox door handles	47xx/7
BR29	Steam lance cock	Bulldog/2
BR30	Safety valve springs (2)	Details/1
BR31	Safety valve casing, with top feed	Bulldog/1
BR32	Safety valve casing, no top feed	Bulldog/3
BR33	Small whistle	47xx/8
BR34	Large whistle	47xx/8
BR35	Snifting valve	Hall/4



BR32

MF7/Bulldog/1



BR8

BR29

BR16

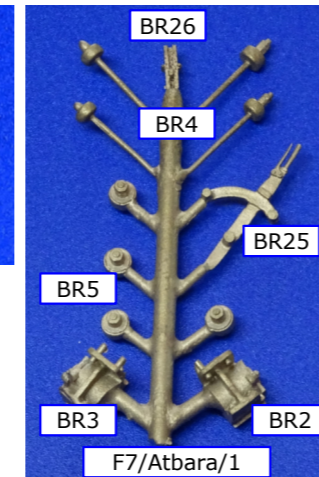
BR7

MF7/Bulldog/2



BR31

MF7/Bulldog/3



BR26

BR4

BR5

BR25

BR3

BR2

F7/Atbara/1



CU1

F7/Atbara/2

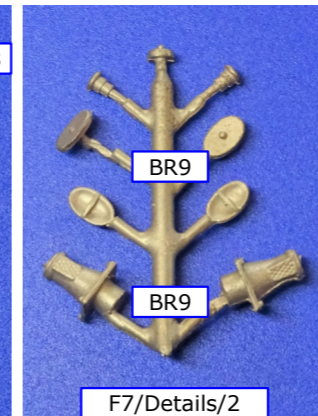


BR13

BR30

BR28

F7/Details/1



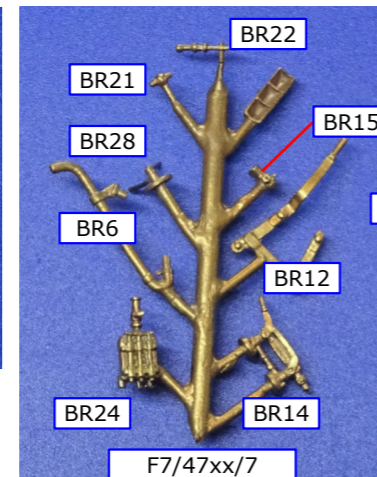
BR9

F7/Details/2



BR35

Hall/4



BR22

BR21

BR28

BR6

BR24

BR15

BR12

BR14

F7/47xx/7



BR20

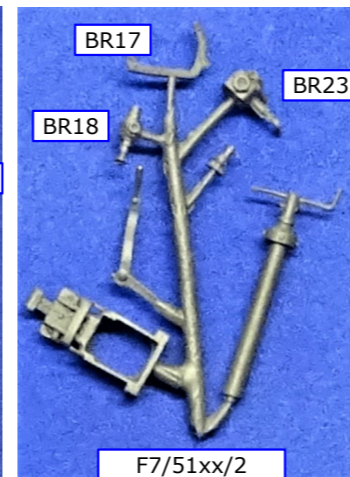
BR10

BR33

BR34

BR19

F7/47xx/8

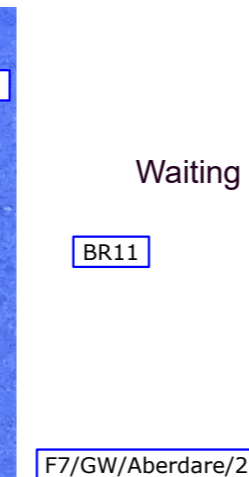
Need 2<sup>nd</sup> Lubricator

BR17

BR18

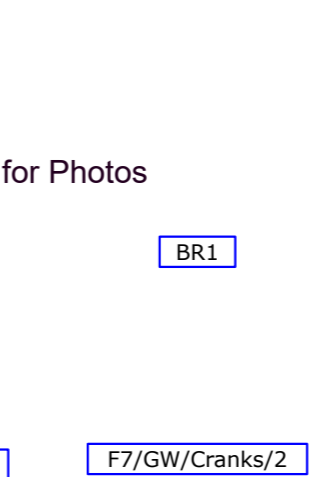
BR23

F7/51xx/2



BR23

F7/GW/Aberdare/2



BR1

F7/GW/Cranks/2

Waiting for Photos

BR11

**DUE TO SUPPLY ISSUES, SOME PARTS MIGHT BE SUPPLIED AS WHITE METAL**

### OTHER COMPONENTS

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

- 1/8" brass wire for compensation beam pivot
- 5/32" brass tube for compensation beam pivot
- 0.8mm 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 wires 1.4mm wire for top feed pipes
- 0.8mm & 1.6mm Copper wire for backhead pipes

**Note.** Screws may be supplied over-length and may require cutting to length.

### WHITEMETAL CASTING

WM1	2 Bogie upper swing hangers (2)
WM2	2 Bogie lower swing hanger (4)
WM3	4 Bogie axlebox & spring (4)
WM4	2 Dean taper buffer
WM5	2 Sandbox, left
WM6	2 Sandbox, right
WM7	2 Spring, leading
WM8	2 Spring, trailing
WM9	1 Backhead
WM10	1 Firebox door
WM11	1 Screw reverser
WM12	1 Smokebox Door
WM13	4 Mud hole doors
WM14	1 Smokebox pipe cover, early pattern
WM15	1 Smokebox pipe cover, later pattern
WM16	1 Chimney, original cast iron



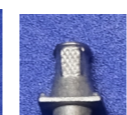
WM1



WM2



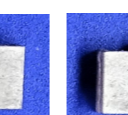
WM3



WM4



WM5



WM6



WM7



WM8



WM10



WM11



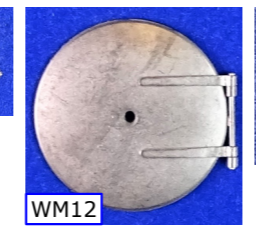
WM12



WM13



WM14



WM12



WM13



WM14



WM15



WM17



WM16



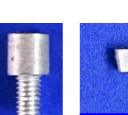
WM17



WM18



WM19



WM20



WM8

WM17	1 Chimney, tapered cast iron
WM18	1 Safety valve base with top feed
WM19	1 Safety valve base without top feed
WM20	1 Firebox screw reverse cover