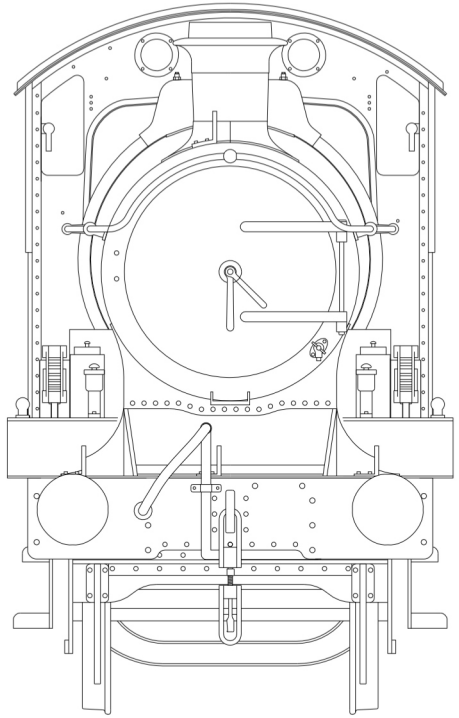
GWR ATBARA



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 these classes Part Seven of 'The Locomotives of the Great Western Railway' published by the RCTS is essential reading. Also useful are G.W.Engines Vol 2 by J.H.Russell, Standard Gauge G.W. 4-4-Os by O.S.Nock & Locomotives Illustrated 50, GWR Double-Framed 4-4-Os.

The following Swindon drawings were used in designing the kit:

17849	3/1901	Lots 126,141	General arrangement
35157	1/1908	Lot 176	Frame plan
1/1910	Lots 125,126,141		Frame plan
58098	8/1919		Arrangement of smokebox
115623	10/1940		Inside motion

The locomotives were built under three Lots as follows:

Lot	Original No.	1912 No.s	Cab	Built	Rear Step	Original Boiler	Nameplate
125	3373-3382	4120-4128+	1	1900	1	D0	Oval
125	3383-3392	4129-4138	2	1900	1	D0	Oval
126	3393-3395	4139-4141	3	1901	2	D0	Oval
126	3396-3412+	4142-4148	3	1901	2	D0	Standard
176	4101-4120	4149-4168	3	1908	2	D3	Standard

+ No.3382 cut up after the Henley-in Arden accident in 1911.

* Nos. 3400-3409 were rebuilt, becoming members of the City class, between 1902 and 1909.

The first locomotive, No. 3373, was named Atbara and all the locomotives of Lots 125 & 126, which have the standard depth of framing, are known as the Atbara class. The later engines of Lot 176, which have deeper frames, were given the names of flowers and are known as the Flower class.

The first ten engines of Lot 125 had a very high cab (Cab 1), whereas the remaining members of this lot had a standard height cab with a much smaller cut-out in the side sheets (Cab 2). Lots 126 and 176 had a standard height cab (Cab 3).

Lot 125 differed from the later locomotives because of the curved rear steps (Rear Steps 1).

Two boilers are provided in the kit the D2 half coned and the D3 three-quarter coned. This means that Lots 125 and 126 cannot be built in their original condition with the DO parallel boiler but can be built in slightly later condition, from 1904 when they were fitted with the D2 and D3 boilers. Lot 176 were built with the D3 boiler although several subsequently carried D2 boilers, including Nos. 4155 & 4164 as late as 1920. The engines rebuilt as Cities, with the larger No. 4 boiler, cannot be built from the kit in that form although several were fitted with the D2 or D3 boilers provided, before they became Cities, and so could be built in this form from the kit.

Atbaras originally had Dean 'swing-hanger' bogies with shallow framing, fluted coupling rods, steam brake and steam reverse whereas the Flowers were built with 'De Glehn' type bogies, plain coupling rods, vacuum brake and screw reverse. It is believed that all of the Atbaras were later rebuilt with screw reverse, the RCTS book stating 'quite a number' had been fitted by 1924.

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

VARIATIONS POSSIBLE WITH THE KIT

Chimneys. Three different types are provided.

Safety valve casing. Caters for with or without top-feed.

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

Frame strengthening. The locomotives acquired frame strengthening plates surprisingly quickly, probably during their first major shopping. Atbaras were first fitted with separate plates for each axle. Later larger, one piece plates were fitted to some of the class. The Flowers quickly acquired plates to the rear axle only.

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

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

Sandboxes. Originally fitted below the footplate on the leading coupled wheels only. Later, all except No. 4138, larger sandboxes were fitted above the footplate on all driving wheels. The Flowers were built with the larger type.

Cab roof: Initially a canvas covered wood affair, later changed to steel with two designs of rain strip.

Splashers: Initially built with beading, later the beading was removed and rivets visible.

Leading coupled wheel splasher: The Atbaras were built with a beaded splasher, below the footplate, on the leading coupled axle which were gradually removed by WW1.

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

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

TENDERS

When built most of the Atbaras were fitted with standard Dean 3000 gallon tenders with a few fitted with Dean 4000 gallon tenders. The Flowers were built with Churchward 3500 gallon tenders and some of the Atbaras subsequently acquired these tenders whilst a few of the Flowers received 3000 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

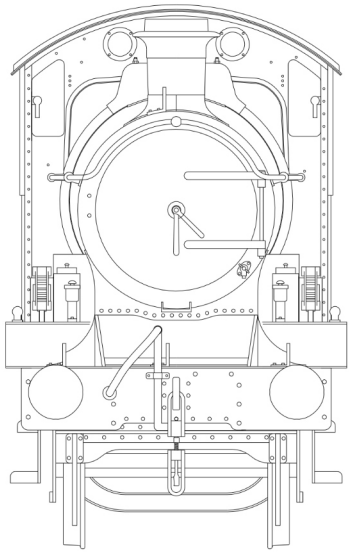
Motor/Gearbox. A Canon motor with a SDMP 40L/15 gearbox (available from Finney7) or an alternative such as an ABC VML2 gearbox.

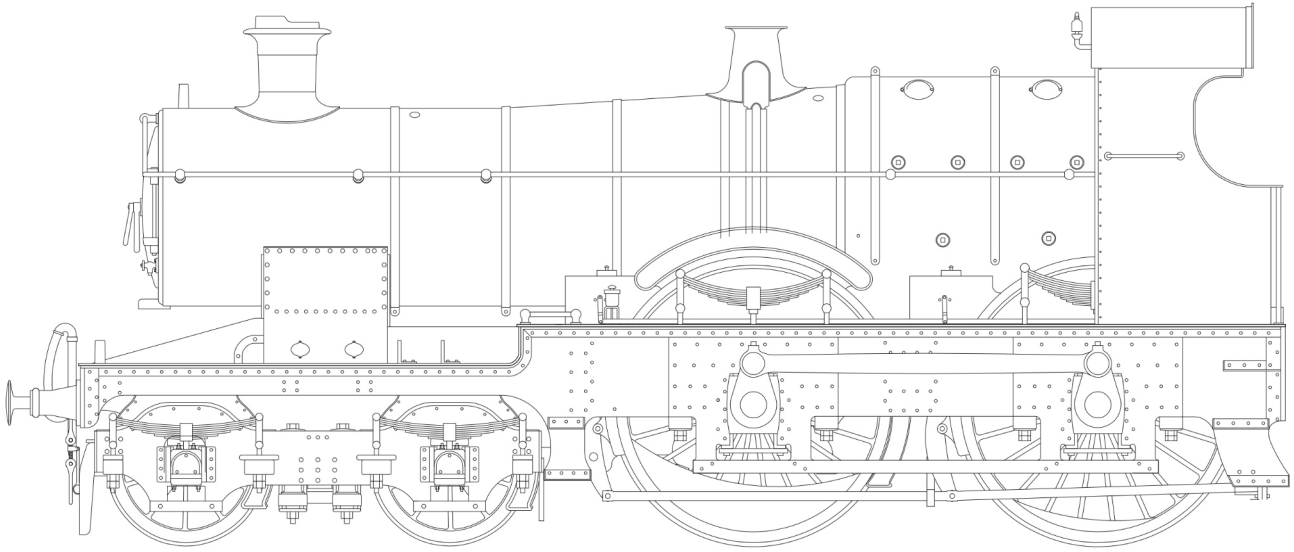
Crankpins. Heavy duty crankpins are available from Finney7.

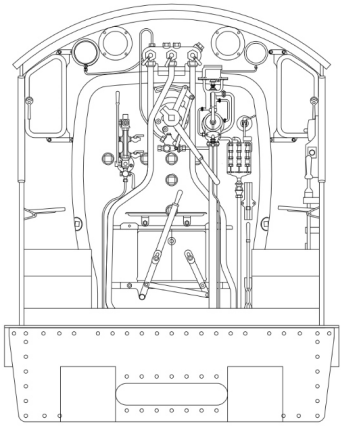
Inside motion. A separate kit is available from Finney7 to construct the working inside motion.

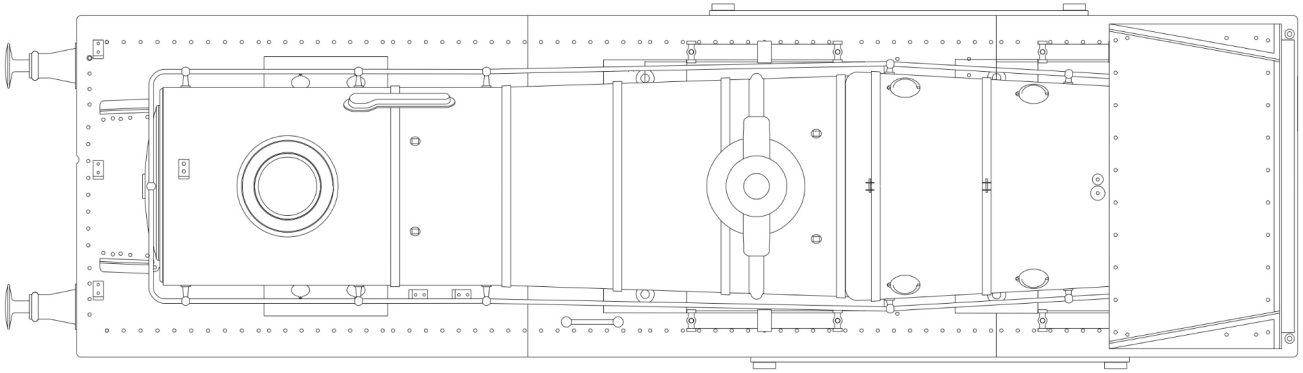
Nameplates. We can supply some of the oval name and works plates fitted to some of the locomotives.

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

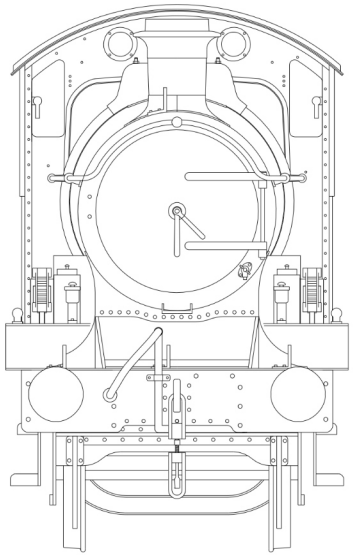


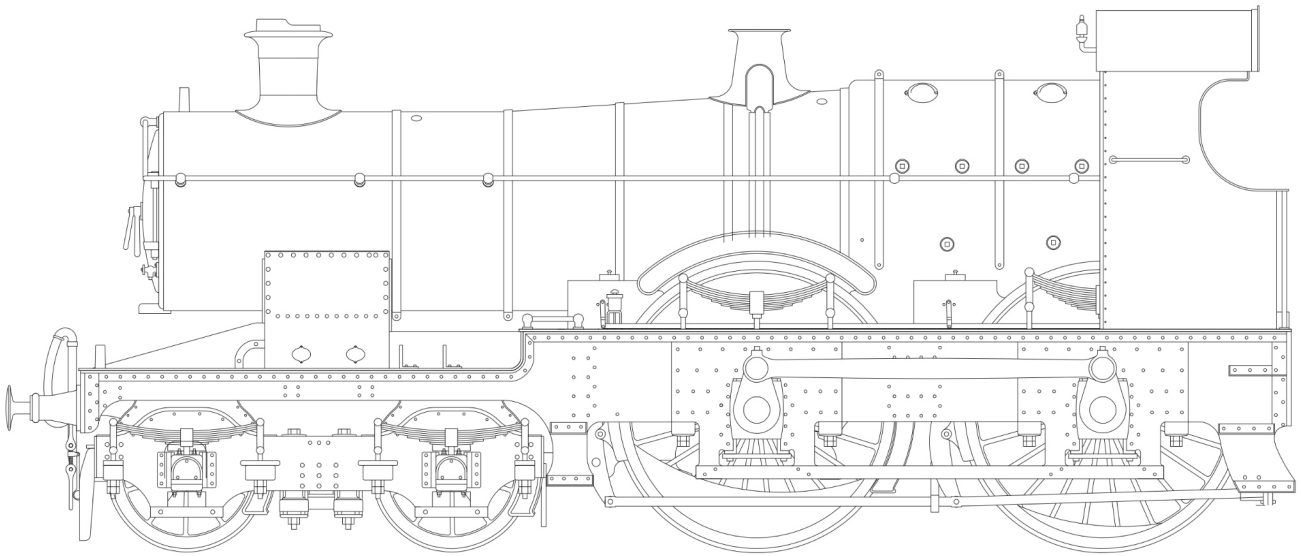


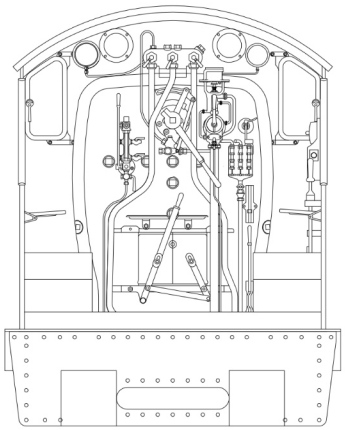


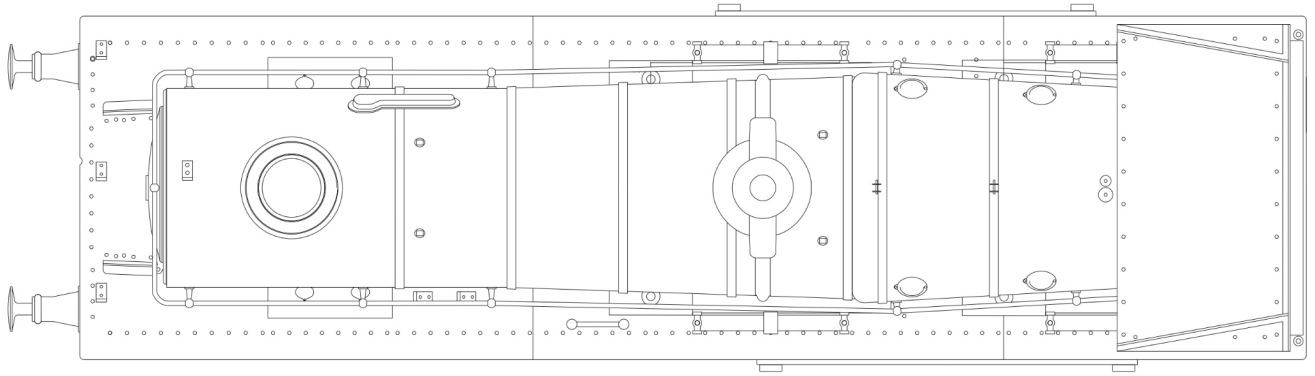


Atbara as running circa 1904, showing D2 boiler, no top feed, short non-superheat smokebox, fluted coupling rods, no frame reinforcement plates, original cast iron chimney, original bogie with splashers and full beading, wooden cab roof.

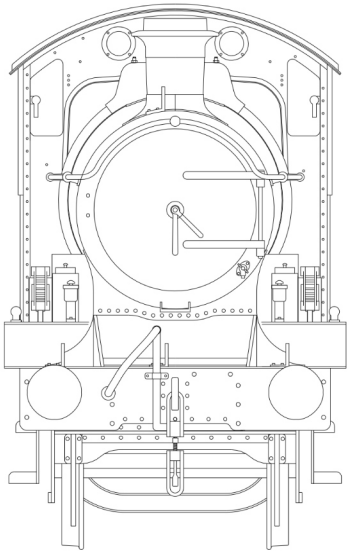


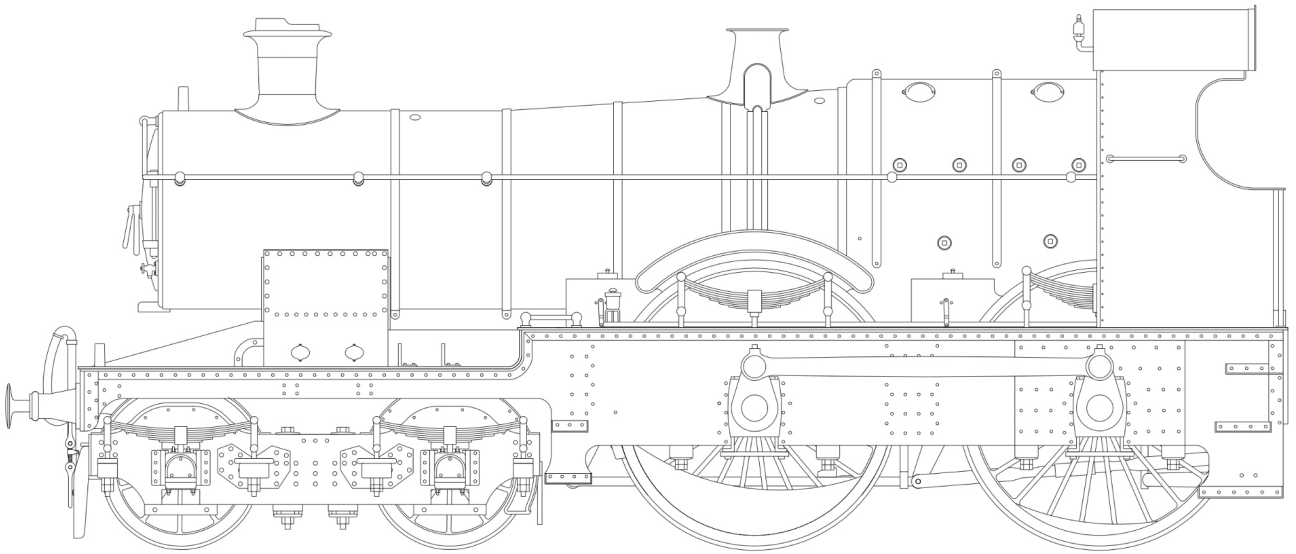


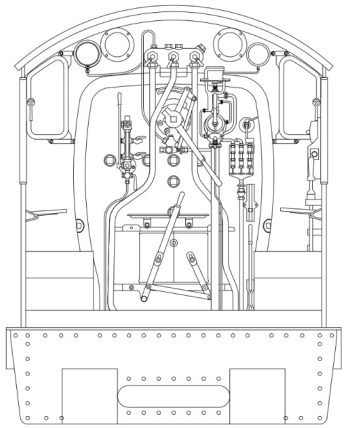


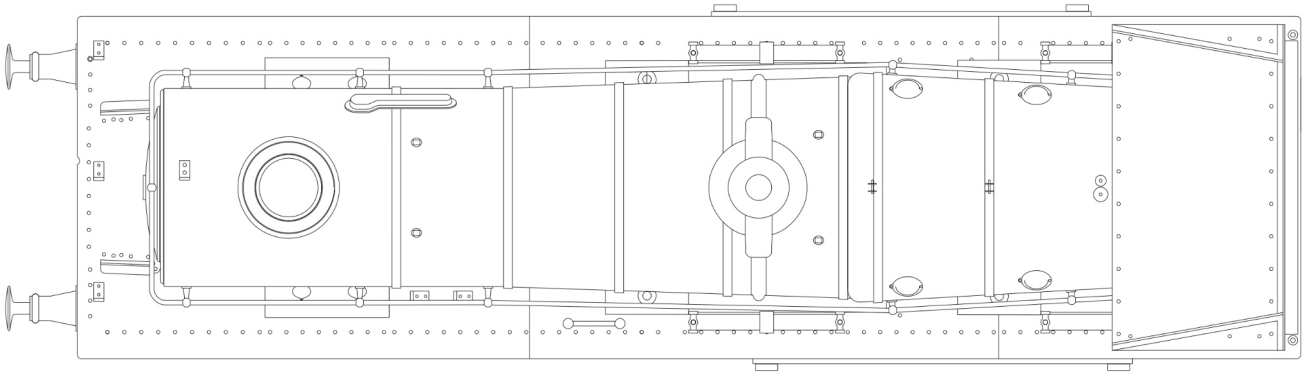


Atbara Class as running in the 1920s, showing D3 boiler with top feed, Lot 125 First Series with high cab and curved rear steps, separate frame strengthening plate for each axle, large sandboxes above the footplate, later deep framed bogie with strengthening patches.









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.

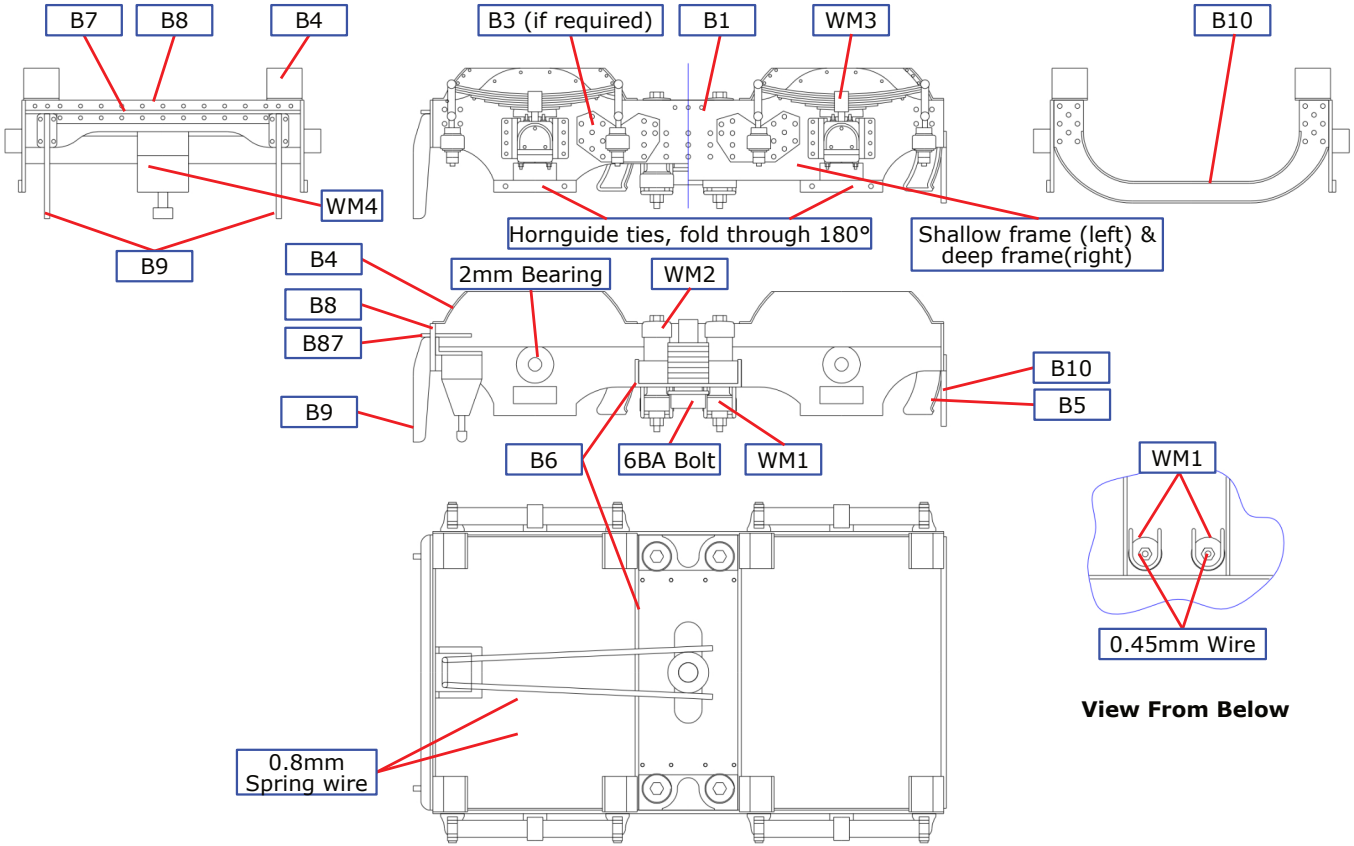
BOGIE

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



View From Below

Fig 3. Bogie Construction

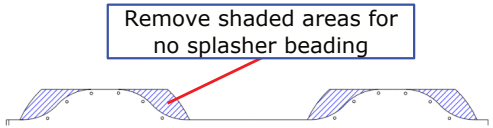
Fold the stretcher (B6) into a 'U' section and solder it to one frame locating it in the half etched groove. Now solder the second frame in place remembering to have the wheelsets in place at the same time. Check that the bogie is square and level.

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.

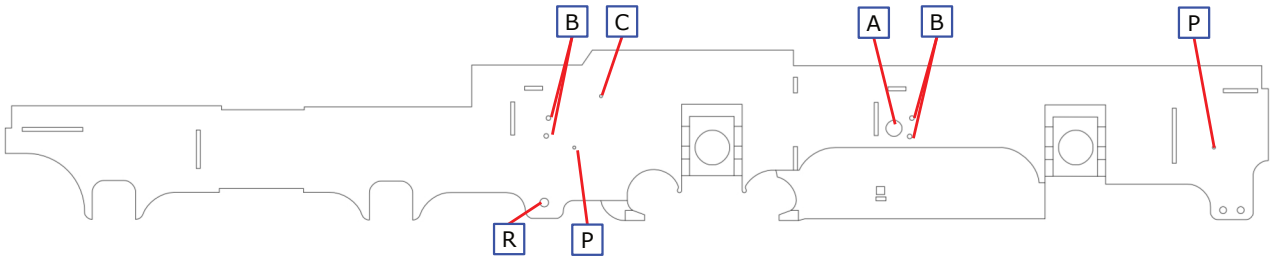
No.	Description	Sheet
M1	Fluted coupling rod outer lamination (2)	A1
M2	Fluted coupling rod inner lamination (2)	A1
M3	Plain coupling rod outer lamination (2)	A1
M4	Plain coupling rod inner lamination (2)	A1
F1	Left main frame	A1
F2	Right main frame	A1

Frame Preparation. 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 4:

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.



INSIDE FRAMES CONSTRUCTION 1

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.

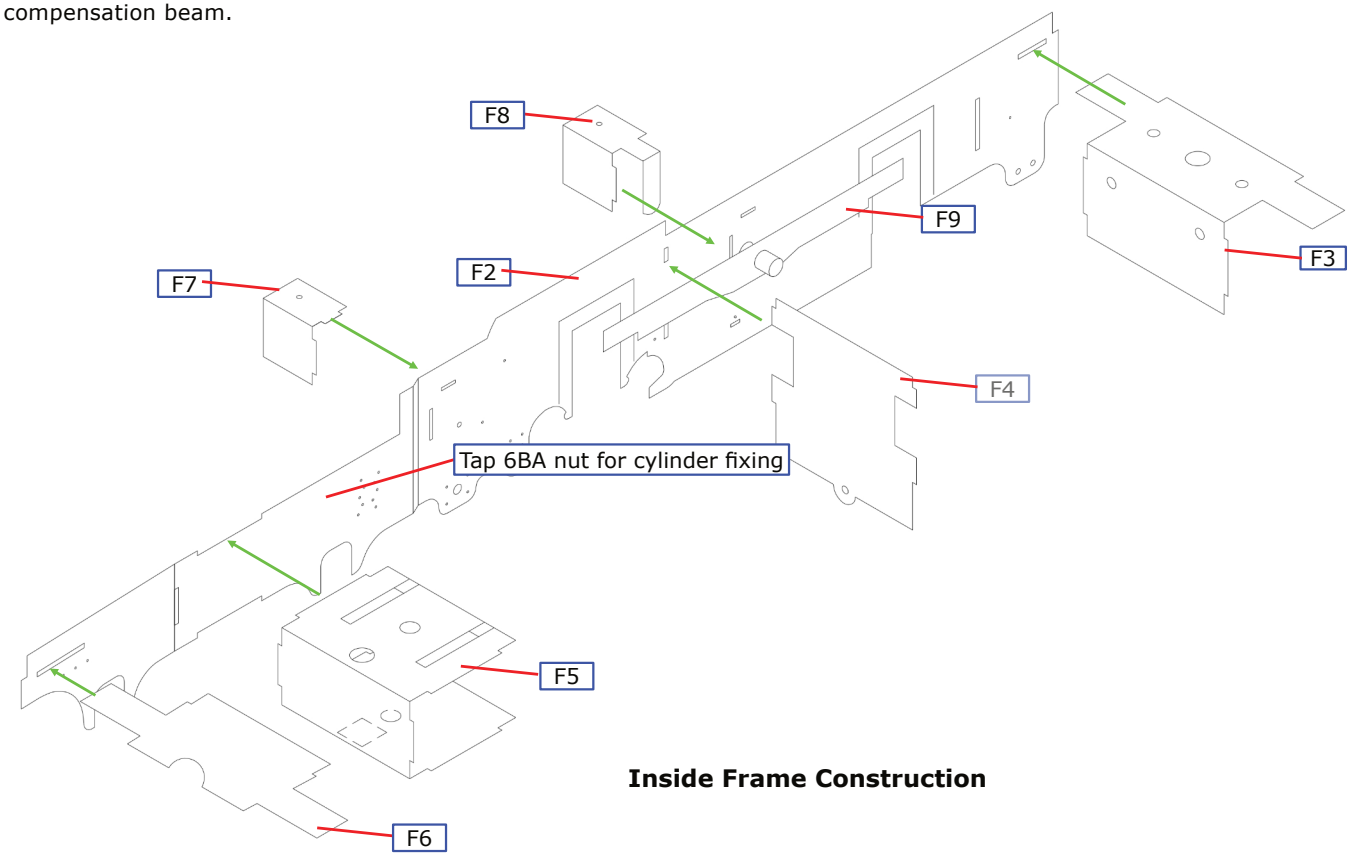
Solder the 6 BA bogie pivot nut in place on the cylinder block and bogie pivot stretcher. Fold up the cylinder block and front stretchers carefully, making sure that the half etched fold line is on the inside and that each bend is a right angle. Check that all tabs on the stretchers fit properly in their 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.

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
F3	Rear frame spacer, 3 widths 9	A2
F4	Firebox frame spacer 10	A2
F5	Cylinder block frame spacer 11	A2
F6	Front frame spacer 12	A2
F7	Outside frame front spacer (2) 50	B1
F8	Outside frame rear spacer (2) 49	B1
F9	Compensation beam 15	A2
F10	3/16” Half etched spacer washer 47	B3
F11	3/16” Spacer washer 152	B3



Inside Frame Construction

INSIDE FRAMES CONSTRUCTION 2

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.

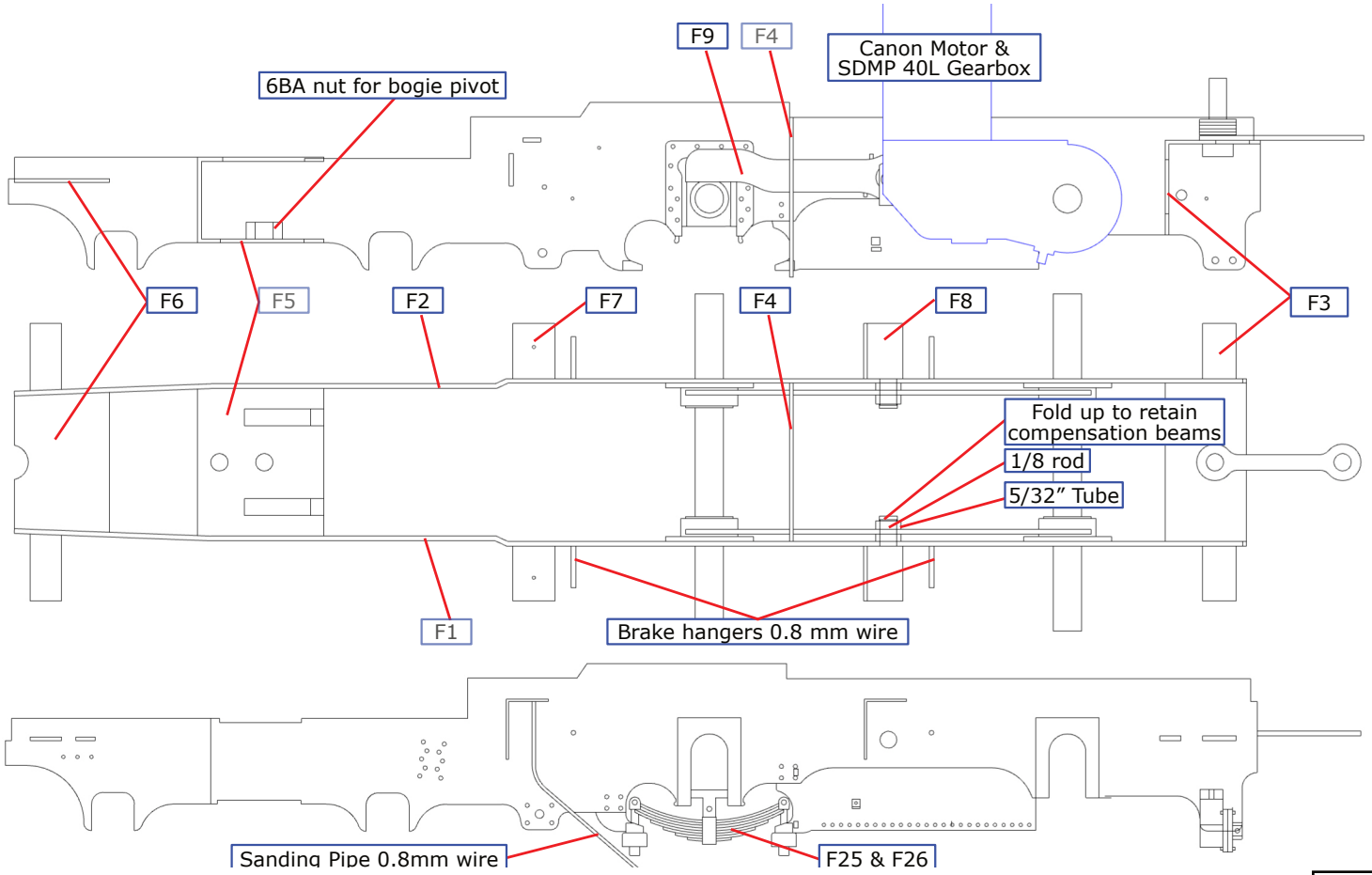
Prepare two pieces of 5/32" brass tube. Each should have a length of 4.5mm if you have used the widest spacers or 3mm if you have used the middle width of spacers. Open up the hole to accept the brass tube in each of the compensation beams (F9) and solder the beams to the pieces of tube 1mm from one 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
F3	Rear frame spacer, 3 widths 9	A2
F4	Firebox frame spacer 10	A2
F5	Cylinder block frame spacer 11	A2
F6	Front frame spacer 12	A2
F7	Outside frame front spacer (2) 50	B1
F8	Outside frame rear spacer (2) 49	B1
F9	Compensation beam 15	A2
F10	3/16" Half etched spacer washer 47	B3
F11	3/16" Spacer washer 152	B3



ATBARA OUTSIDE FRAMES 1

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.

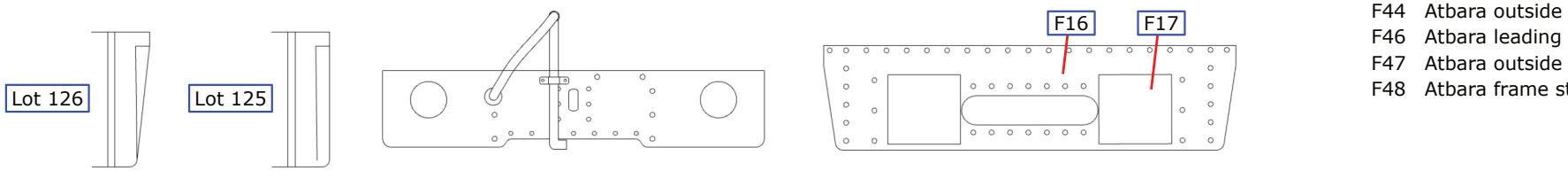
Fold the outside axle boxes (F13) through 180° with the fold line outside and carefully solder together. Open out the axle holes to be a sloppy fit on the axle. These axle boxes are simply cosmetic. Shape the rear steps to the correct shape for the locomotive you are building. If you are fitting the 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.

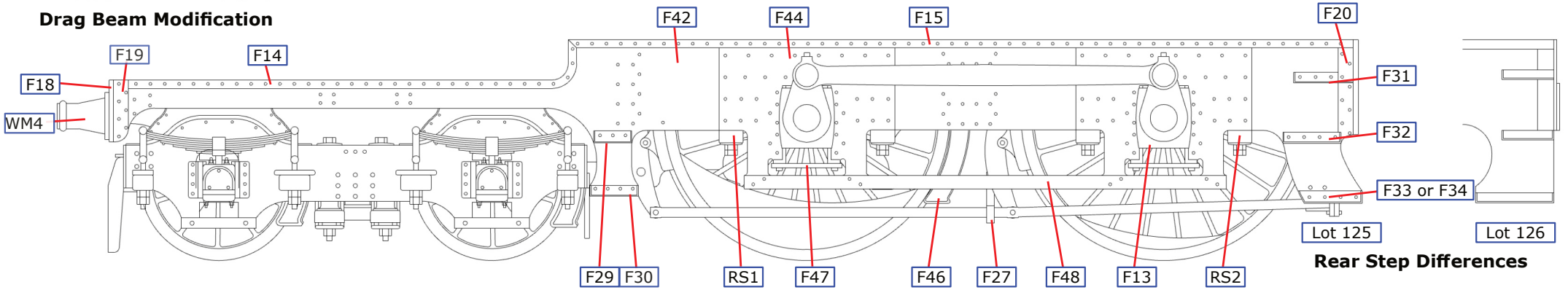
For a Lot 125 locomotive, modify the drag beam as shown below. Emboss the rivets on the drag beam (F16) and attach the rubbing plates (F17). Use a piece of .018" material placed on top of the frames to ensure the upper edge of the drag and buffer beam (F18) are 0.018" (0.45mm) above the upper edge of 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) and the frame to drag beam angle bracket (F20).

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.

No.	Description	Sheet
	Common Parts	
F13	Outside frame axlebox (4)	A1
F14	Outside frame rivet strip front (2)	B3
F15	Outside frame rivet strip rear (2)	B3
F16	Drag beam	B3
F17	Drag beam rubbing plate (2)	B1
F18	Buffer beam	B3
F19	Frame to buffer beam angle bracket (2)	B1
F20	Frame to drag beam angle bracket (2)	B3
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
	Atbara Parts	
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
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



Drag Beam Modification



Rear Step Differences

ATBARA OUTSIDE FRAMES 2

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.

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

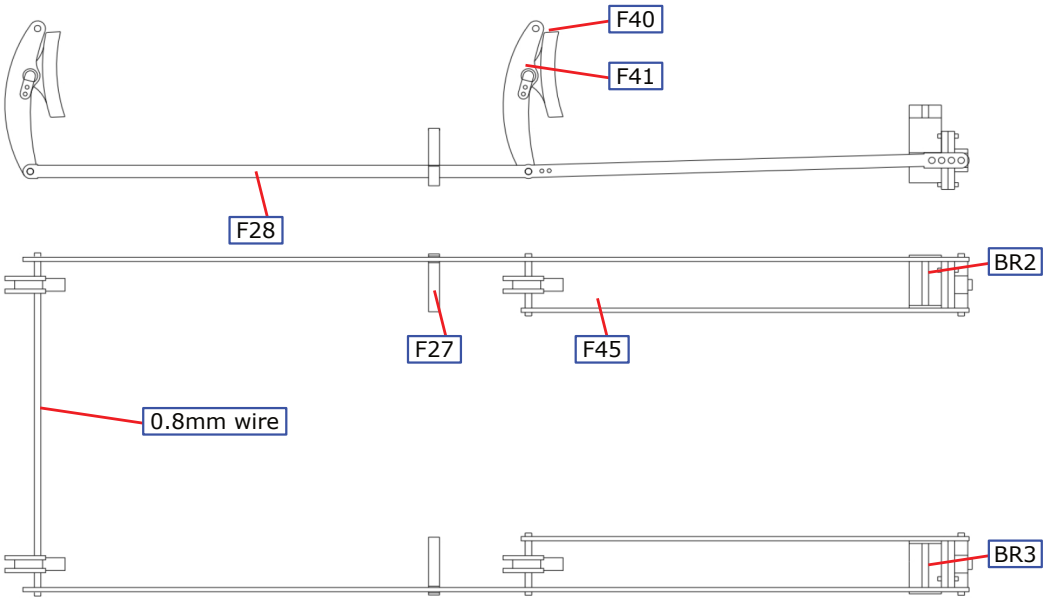
Fix the leading and trailing spring dampers, (RS1 & RS2) in place on the previously fitted wires. The smaller ones are used for the leading coupled axle.

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).

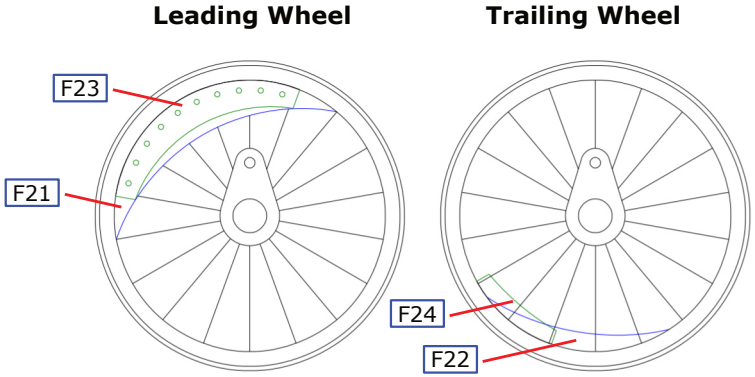
Form the sandpipes from 1.2mm wire and attach through the holes in the outside spacers. Note: before the fitting of large sandboxes the engines only had sanding to the leading wheels.

Fit the either the early tall vacuum pipe (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 buffer housings (WM4).

No.	Description	Sheet
	Common Parts	
F21	Original front balance weight (2)	B3
F22	Original rear balance weight (2)	B3
F23	Balanced cranks front balance weight (2)	B2
F24	Balanced cranks rear balance weight (2)	B3
F25	Spring inner lamination (2)	A1
F26	Spring outer lamination (4)	A2
F27	Brake pull rods safety brackets (2)	B1
F28	Atbara outer brake pull rod / Flower front pull rod (2)	B3
F35	Inside motion bracket packing piece	A1 & B3
	Atbara Parts	
F40	Atbara brake hanger & shoe lamination (8)	A1
F41	Atbara brake hanger safety bracket (4)	B1
F45	Atbara inner brake pull rod (2)	B3
F45	Atbara inner brake pull rod (2)	B3



Brake Construction



Wheel Balance Weights

FLOWER OUTSIDE FRAMES 1

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

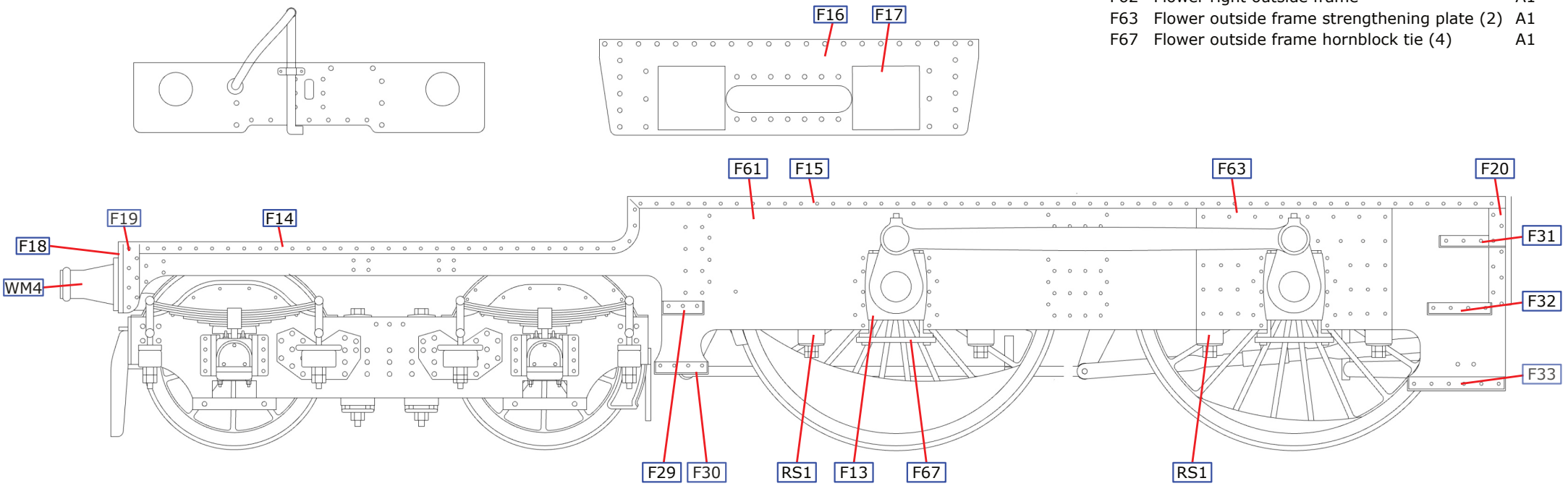
Fold the outside axle boxes (F13) through 180° with the fold line outside and carefully solder together. Open out the axle holes to be a sloppy fit on the axle. These axle boxes are simply cosmetic. Shape the rear steps to the correct shape for the locomotive you are building. If you are fitting the 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) and the frame to drag beam angle bracket (F20).

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.

No.	Description	Sheet
	Common Parts	
13	Outside frame axlebox (4)	A1
F14	Outside frame rivet strip front (2)	B3
F15	Outside frame rivet strip rear (2)	B3
F16	Drag beam	B3
F17	Drag beam rubbing plate (2)	B1
F18	Buffer beam	B3
F19	Frame to buffer beam angle bracket (2)	B1
F20	Frame to drag beam angle bracket (2)	B3
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
	Flower Parts	
F60	Flower brake hanger/shoe lamination (8)	A2
F61	Flower left outside frame	A1
F62	Flower right outside frame	A1
F63	Flower outside frame strengthening plate (2)	A1
F67	Flower outside frame hornblock tie (4)	A1



Flower Frame Construction

FLOWER OUTSIDE FRAMES 2

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

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.

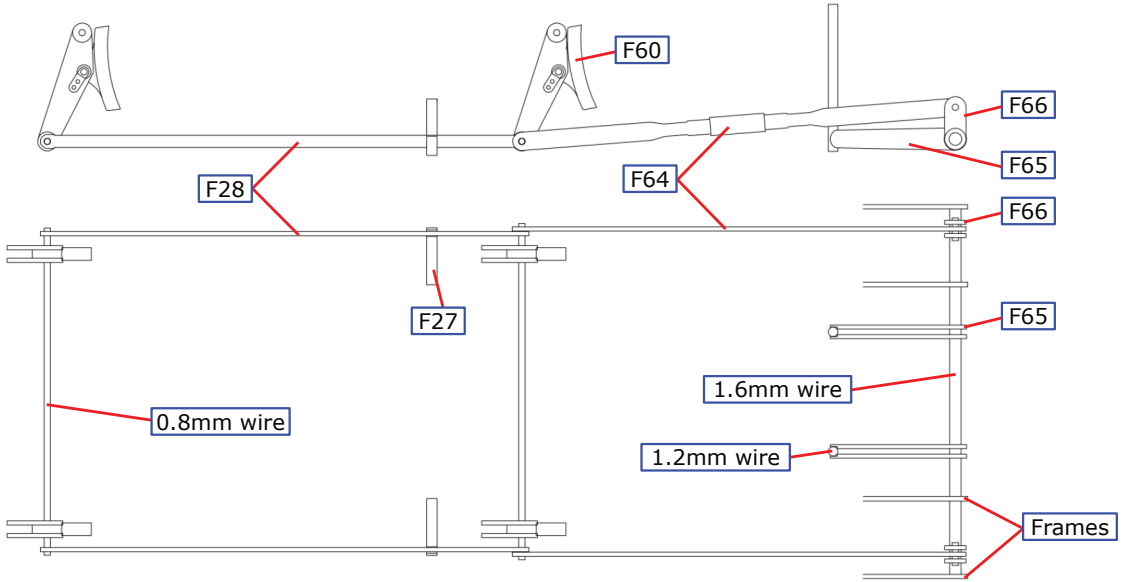
Fix the leading and trailing spring dampers (RS1 & BRS2) in place on the previously fitted wires. The smaller ones are used for the leading coupled axle.

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

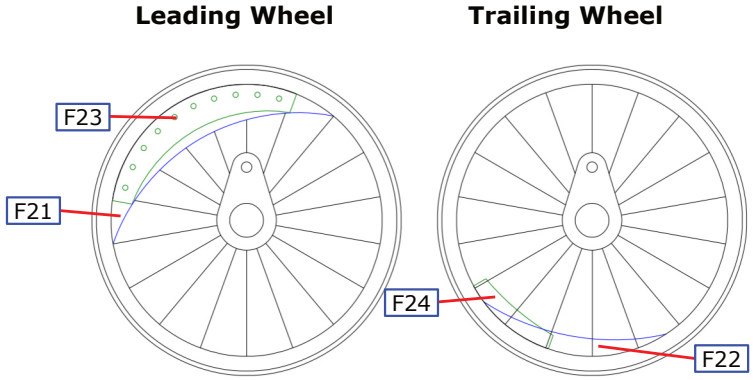
Form the sandpipes from 1.2mm wire and attach through the holes in the outside spacers.

Fit the either the early tall vacuum pipe (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 buffer housings (WM4

No.	Description	Sheet
	Common Parts	
F21	Original front balance weight (2)	B3
F22	Original rear balance weight (2)	B3
F23	Balanced cranks front balance weight (2)	B2
F24	Balanced cranks rear balance weight (2)	B3
F25	Spring inner lamination (2)	A1
F26	Spring outer lamination (4)	A2
F27	Brake pull rods safety brackets (2)	B1
F28	Atbara outer brake pull rod/ Flower front pull rod (2)	B3
F35	Inside motion bracket packing piece	A1 & B3
	Flower Parts	
F60	Flower brake hanger/shoe lamination (8)	A2
F64	Rear brake pull rod (2)	B3
F65	Brake cylinder lever (4)	B3
F66	Brake cross shaft lever (4)	B3



Flower Brake Construction



Wheel Balance Weights

FOOTPLATE 1

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 font 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.

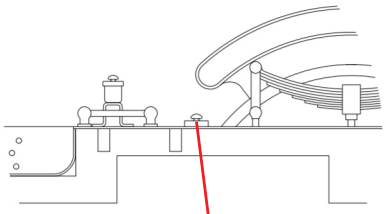
Solder the splasher faces, with beading or rivets, (U5 or U6) inside the footplate edge so that their bottom edge is level with the bottom edge of the footplate side.

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.

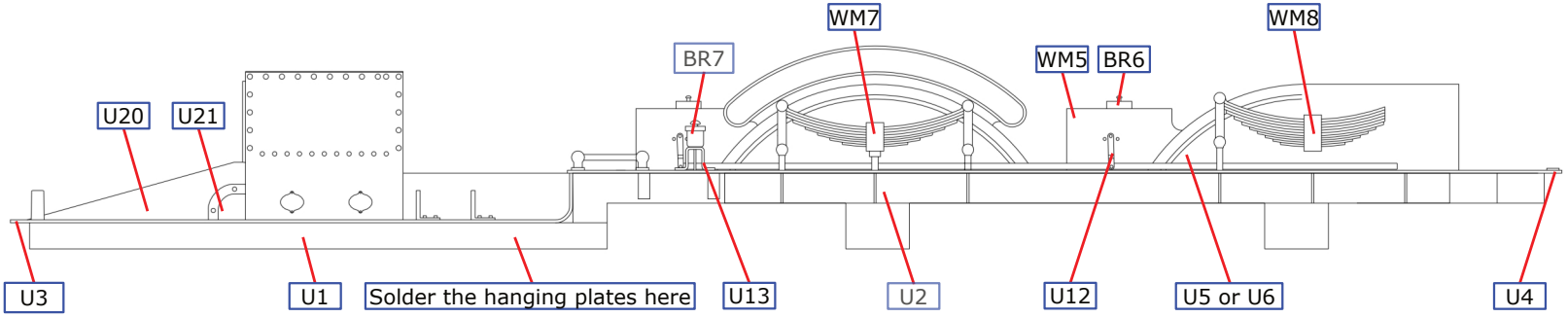
Solder the cab floor support (U11) in place and solder a 6BA nut over the rear body fixing hole and reduce its thickness so that the cab floor will fit.

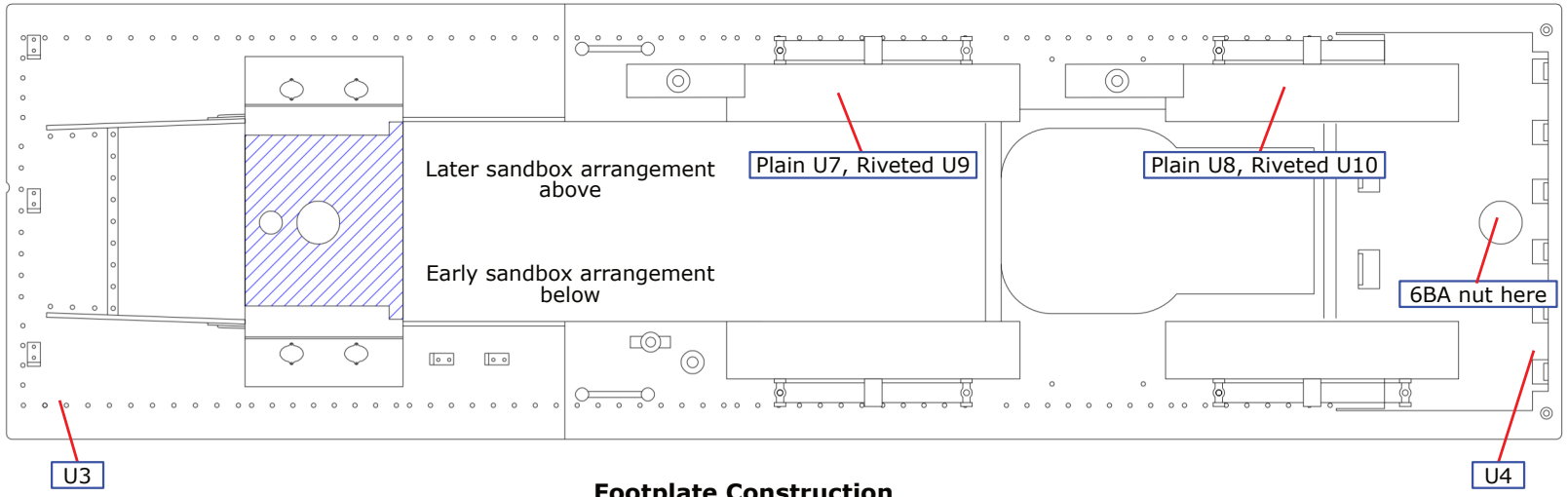
Make the handrails above the front steps from 0.8mm wire and short handrail knobs. Depending on the loco modelled, either fix the sandbox lids (BR6) to the footplate behind these handrails or use the large sandboxes (left WM5, right WM6) and the operating levers (U12). If needed, bend up the footplate mounted lubricator bracket (U13) and attach. Fit the vacuum pump lubricator (BR7).

No.	Description	Sheet
U1	Footplate	B1
U2	Footplate strengthening plate (2)	A2
U3	Footplate front overlay	B1
U4	Footplate rear overlay	B1
U5	Splasher face with beading (2)	B3
U6	Splasher face with rivets (2)	B3
U7	Plain front splasher top (2)	B3
U8	Plain rear splasher top (2)	B3
U9	Riveted front splasher top (2)	B3
U10	Riveted rear splasher top (2)	B3
U11	Cab floor support	B1
U12	Sandbox operating rod (2)	B3



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





Footplate Construction

FOOTPLATE 2

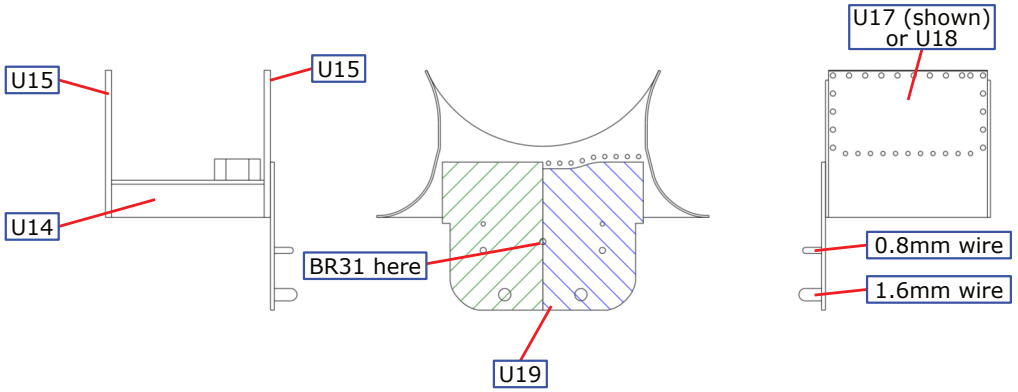
Saddle. For reasons of space the construction of the saddle is described here. Fitting is described on the appropriate page on boiler construction. Fold up the smokebox saddle spacer (U14). Emboss the rivets on the saddle front (U15) if needed (appeared in later years) and if you have fitted inside motion 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 (BR31) 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.

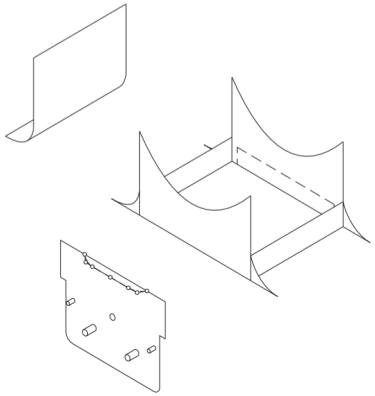
Attach the front frame extensions (U20) locating them in the slot provided in the footplate and then attach the cylinder cover overlays (U21) (see Fig 13).

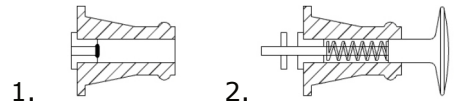
Solder the nameplate brackets (U22) in place on the top of the leading splashers.

No.	Description	Sheet
U13	Footplate mounted lubricator bracket	B1
U14	Saddle spacer	B3
U15	Saddle front	A2
U16	Saddle rear	A2
U17	Plain saddle side plates (2)	B3
U18	Riveted saddle side plates (2)	B3
U19	Cylinder front plate	B3
U20	Front frame extensions (2)	B1 & B3
U21	Cylinder cover overlay	A1
U22	Nameplate brackets	B1
U23	Etched spring shackles (8)	



Saddle Construction



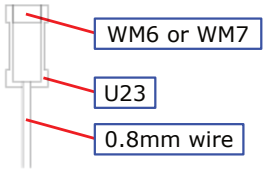


1. Drill the casting through 2mm. Fit the bush into the casting.

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

Buffer Construction

Springs. 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 small leading springs (WM7) and the large trailing springs (WM8). The 'legs' on the footplate edge should now be removed.

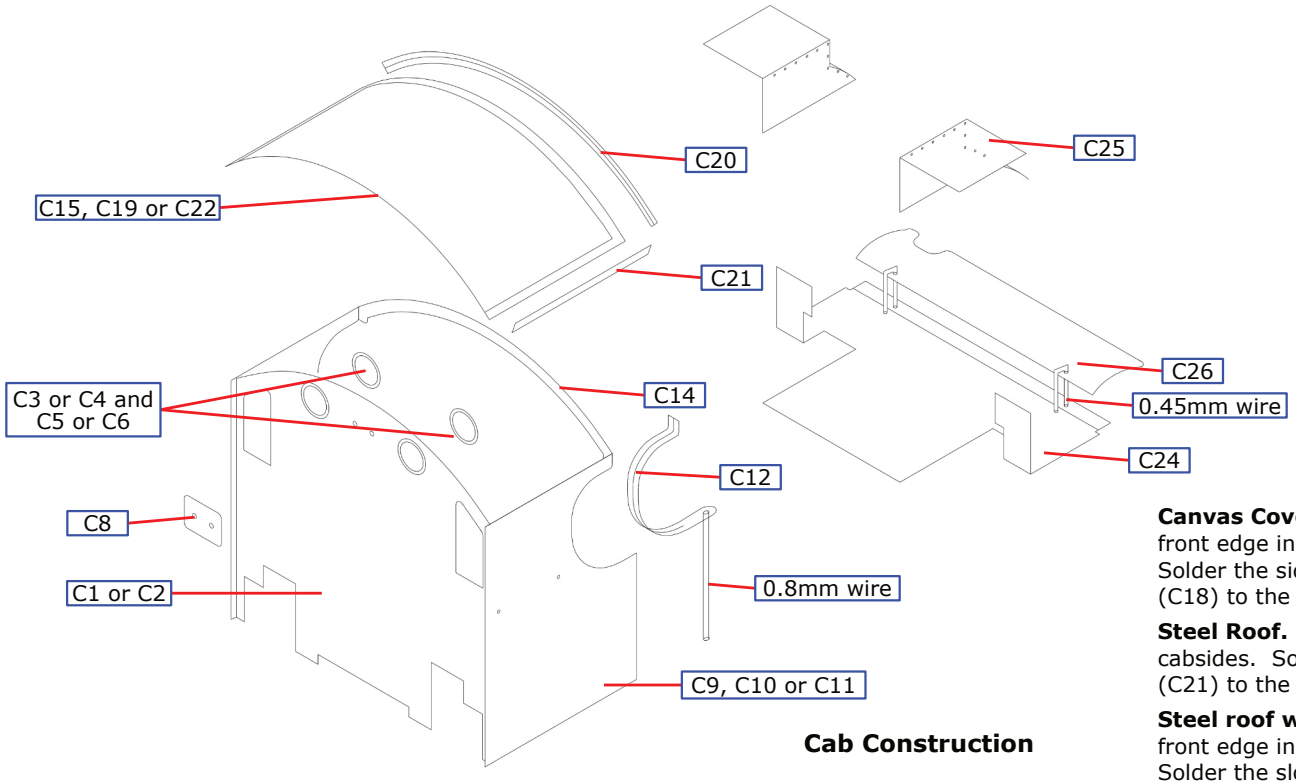


CAB

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 grove 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.



Cab Construction

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

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.

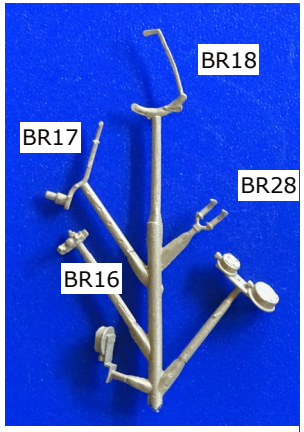
Steel Roof. Curve the cab roof (C19) and solder in place with the front edge in line with the cabsides. Solder the rear angle (C20) to the rear edge of the roof. Solder the rain strips (C21) to the side edges of the roof.

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.

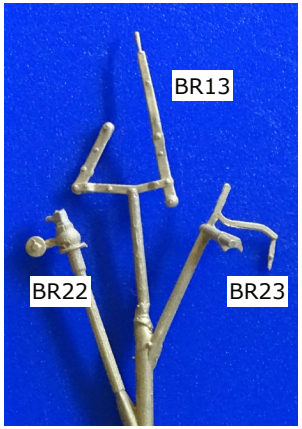
Fold up the cab splasher rear section from the cab floor (C24). Fold up the cab splashers (C25) and then soldered in place. Slightly curve the fall plate (C26) and hinge it to the floor as shown in the diagram before soldering the floor in place.

CAB BACKHEAD

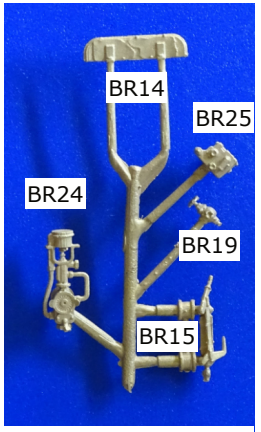
The cab interior is largely based on the photograph in Great Western Engines Vol.2 - J.H.Russell - page 2 showing an engine with steam reverse. Using the photograph and the drawing the backhead can be assembled and the cab interior detailed. Use copper wire of a suitable size for the various pipes.



Backhead/1

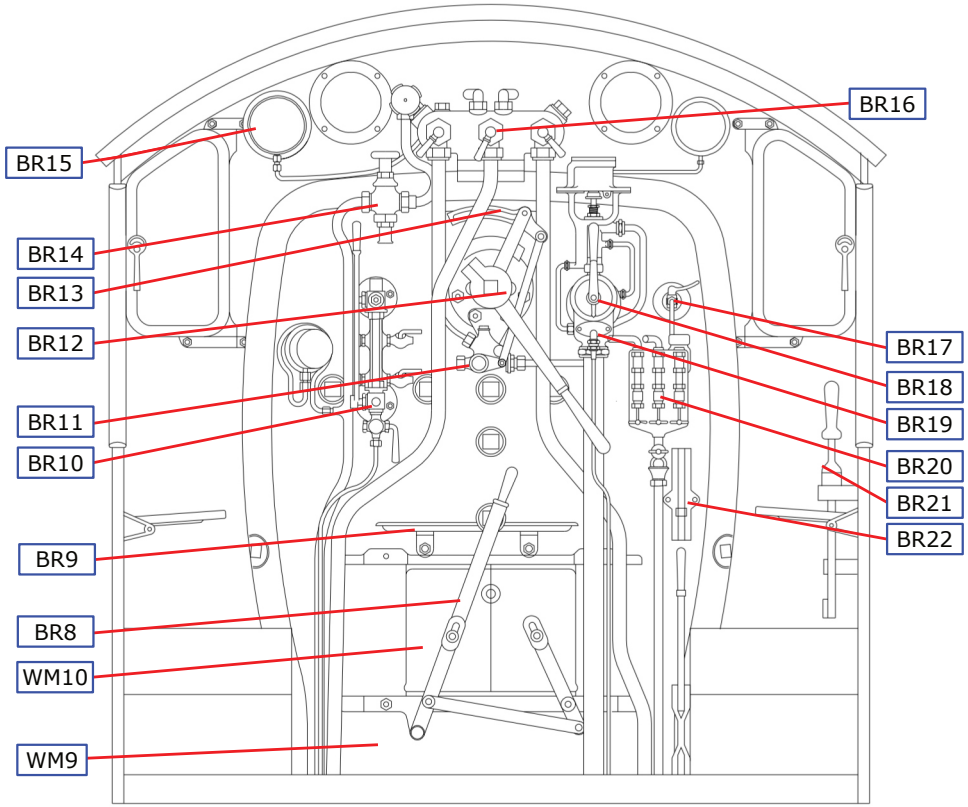


Backhead/2

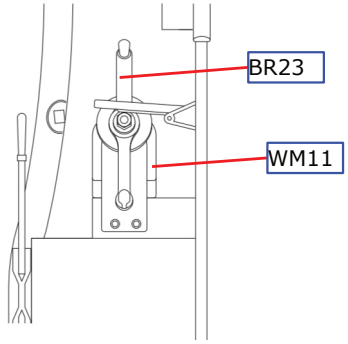


Backhead/3

Backhead/4



Backhead With Steam Reverse



Screw Reverser

FORMING THE BELPAIRE FIREBOX 1

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

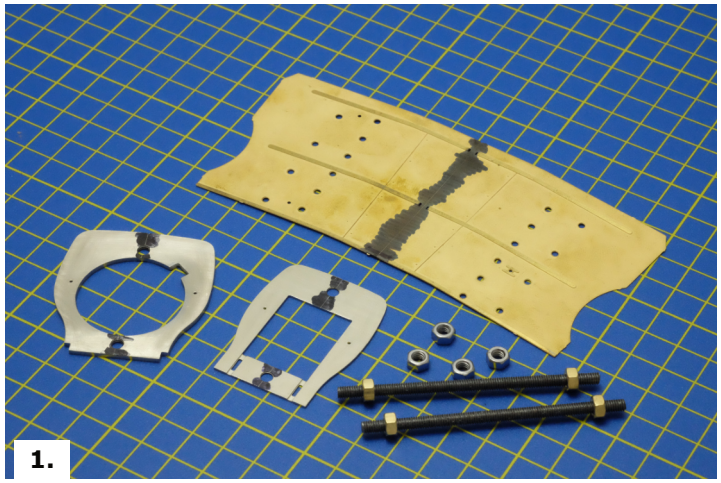
Photo 1. Solder together the two laminations of the firebox front (SB1) with top lamination (SB2). Clean the cusp off all parts, including the firebox rear former (SB3). Reduce the width of the lower faces of the firebox rear former so that it will fit between the frames in the locating groove in the 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.

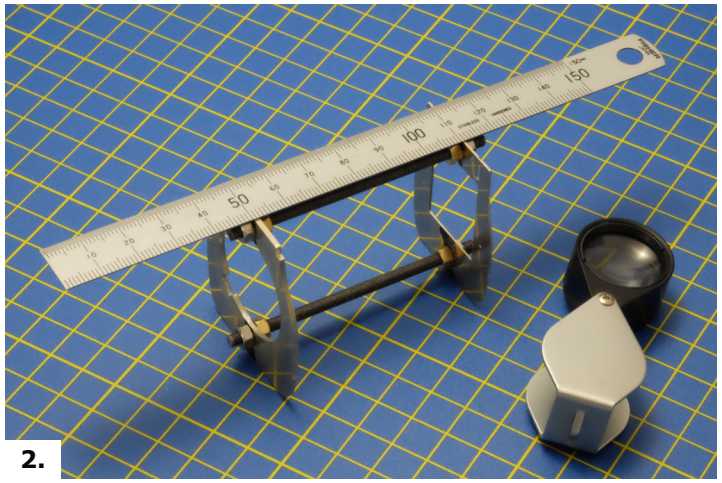
Photo 2. Set the two spacers on to the studs, retain them with the stainless steel nuts. Ensure the length of the assembly over the formers is 46.4mm. Always measure the distance from the bottom of the firebox; even using a steel rule and eyeglass you can get pretty close to this sort of dimension with 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.

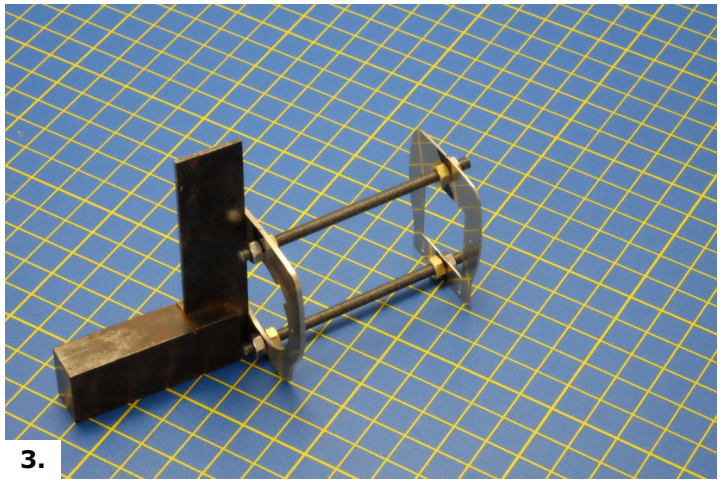
No.	Description	Sheet
SB1	Firebox front laminations (2)	A2
SB2	Firebox front top lamination	A2
SB3	Firebox rear U15	A2
SB4	Firebox wrapper	B2
SB5	Firebox band joining clips (4)	B2
C1	Cab front	B1



1.



2.



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.

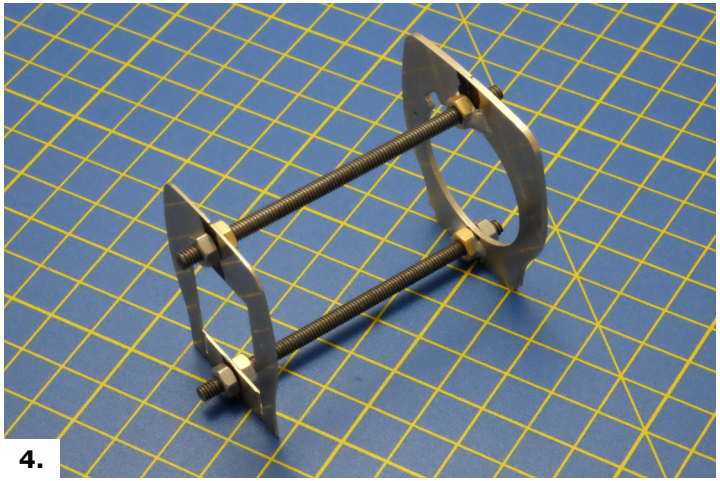
Photo 6. Tack the outside of the firebox at the centre and corners, both front and rear. Again, take care and check that the centres retain the alignment that we've worked so hard to achieve. Now work down the spacers alternating tacks left/right and front/rear to even out any expansion of the wrapper.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

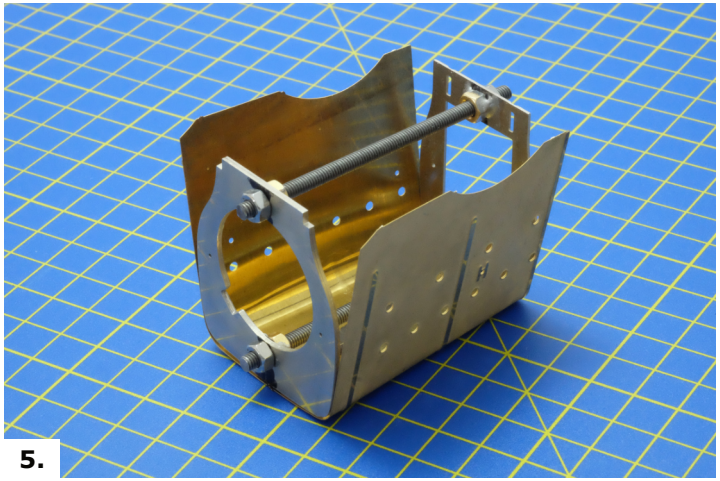
Run an extra fillet of solder into the internal front shoulders of the firebox to support the area which will be filed back. The brass nuts can be heated and removed. Remove the rear scrap section of the spacer.

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.

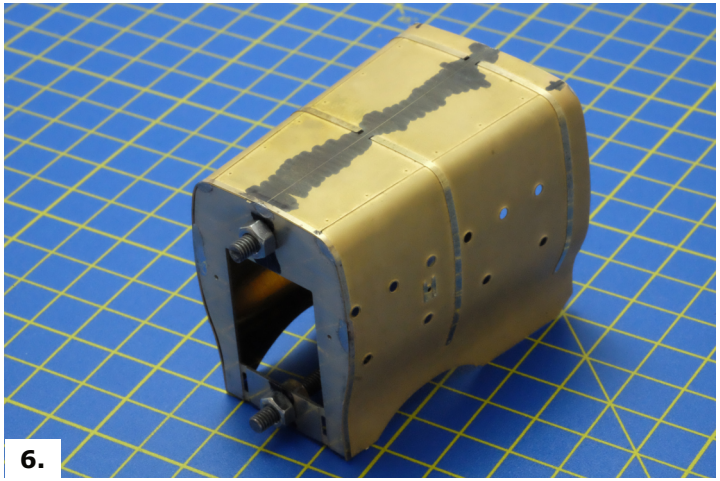
Fold the firebox band joining clips (SB5) into a 'U' shape, fit through the slots in the firebox top and solder in place from inside. Complete with a short piece of 0.45mm wire to represent the tightening bolt. Fix the mudhole doors (WM23) in place on the firebox.



4.



5.



6.

D2 BOILER AND SMOKEBOX 1

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.

No.	Description	Sheet
	Common Parts	
SB7	Boiler washout plugs	B1
SB8	Boiler cone rear former	A2
SB9	Boiler cone front former	A2
SB10	Smokebox and parallel boiler rear former	A2
SB11	Smokebox and parallel boiler front former	A2
SB12	Smokebox and parallel boiler jointing strip	B3
SB13	Smokebox front overlay	A2
SB14	Smokebox step	B1
SB15	Boiler cone jointing strip	B3
SB16	Upper lamp bracket	B3
F29	Drawbar	B3
	D2 Boiler (Half Cone) Parts	
SB20	D2 boiler cone wrapper	B2
SB21	Overlay for top feed pipes	B3
SB22	Plain smokebox and parallel boiler wrapper	B2
SB23	Upper lamp bracket	B3

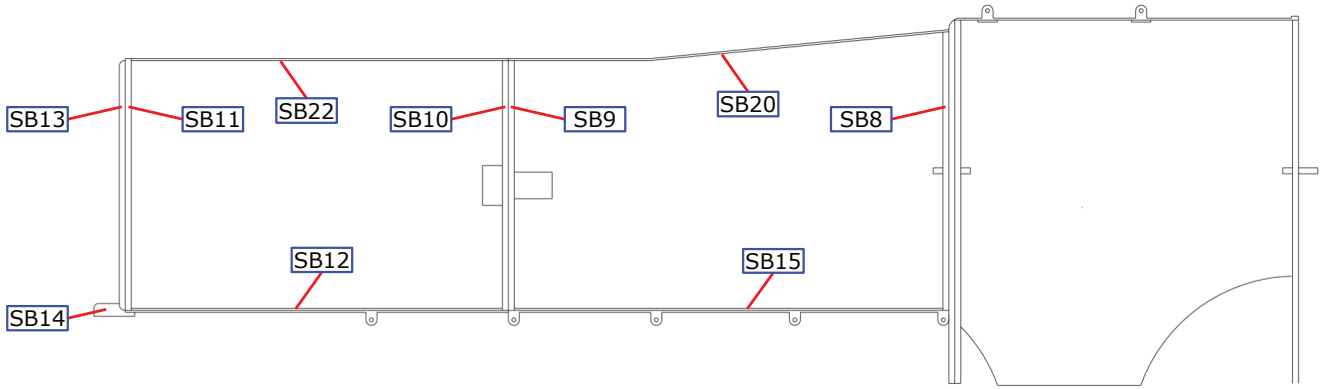


Fig 16. D2 Boiler Construction

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 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 (WM12) in place on the firebox corners.

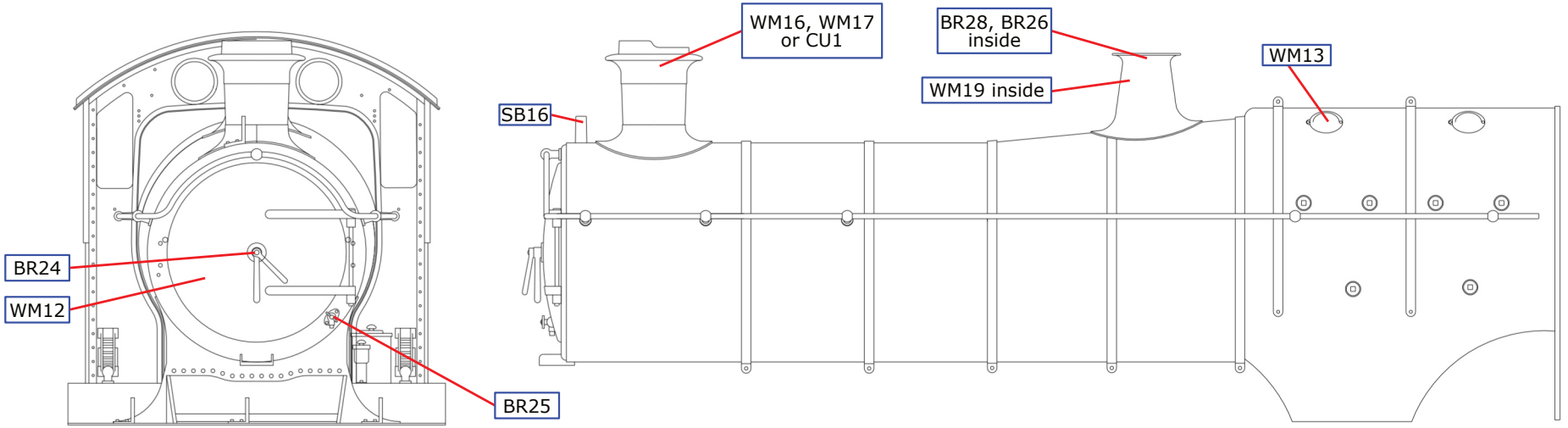
Attach the smokebox door (WM12) to the smokebox. Fit the smokebox door handle (BR24) to the smokebox door. If required, the steam lance cock (BR25) can go in either of the positions shown in the drawing. Refer to your prototype photograph.

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 (BR26) and then fit the polished safety valve casing no top feed (BR28).

As shown in the GA, fit the large whistle (BR30) and the small whistle (BR29).

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



D2 Boiler Construction

D3 BOILER AND SMOKEBOX 1

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.

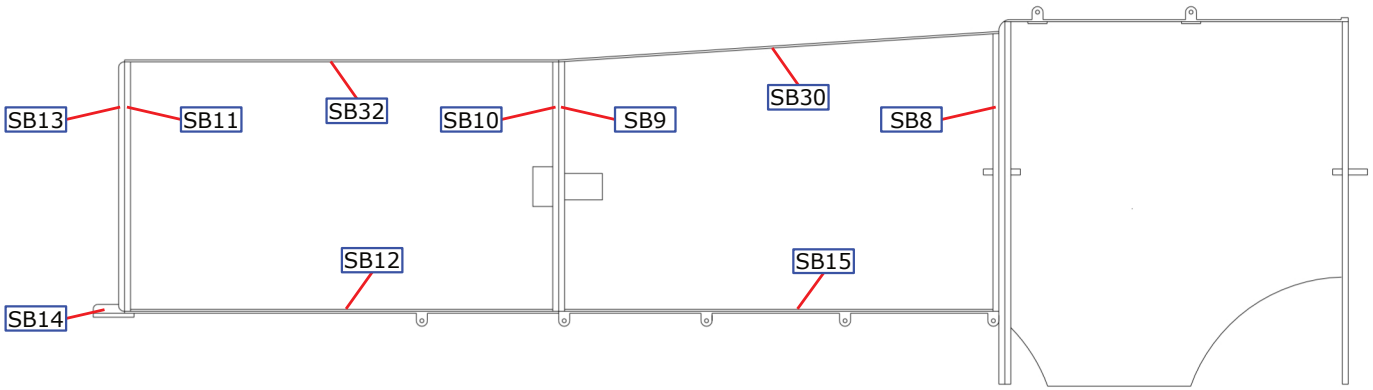
Roll the wrapper and check the fit on the formers (SB10 & SB11). Solder the wrapper ends together using the smokebox and boiler jointing strip (SB12), representing the fixing bolts as before. Solder in the formers flush with the back and front with the notch in the bottom of the front former in line 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.

Common Parts

SB7	Boiler washout plugs	B1
SB8	Boiler cone rear former	A2
SB9	Boiler cone front former	A2
SB10	Smokebox and parallel boiler rear former	A2
SB11	Smokebox and parallel boiler front former	A2
SB12	Smokebox and parallel boiler jointing strip	B3
SB13	Smokebox front overlay	A2
SB14	Smokebox step	B1
SB15	Boiler cone jointing strip	B3
SB16	Upper lamp bracket	B3
F29	Drawbar	B3

D3 Boiler Parts

SB30	Coned (D3) boiler wrapper	B1
SB31	Overlay for top feed pipes	B3
SB32	Smokebox and boiler riveted wrapper	B2



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 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 (WM12) in place on the firebox corners.

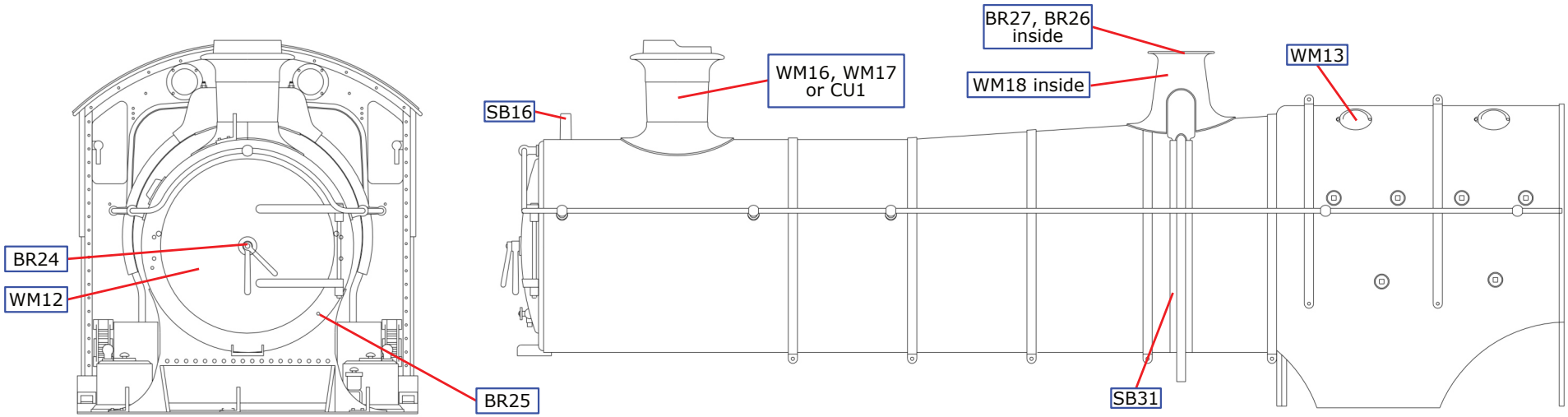
Attach the smokebox door (WM12) to the smokebox. Fit the smokebox door handle (BR24) to the smokebox door. If required, the steam lance cock (BR25) can go in either of the positions shown in the drawing. Refer to your prototype photograph.

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 (BR26) and then fit the polished safety valve casing with top feed (BR27).

As shown in the GA, fit the large whistle (BR30) and the small whistle (BR29).

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



D3 Boiler Construction

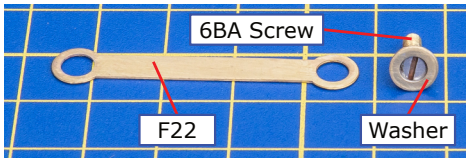
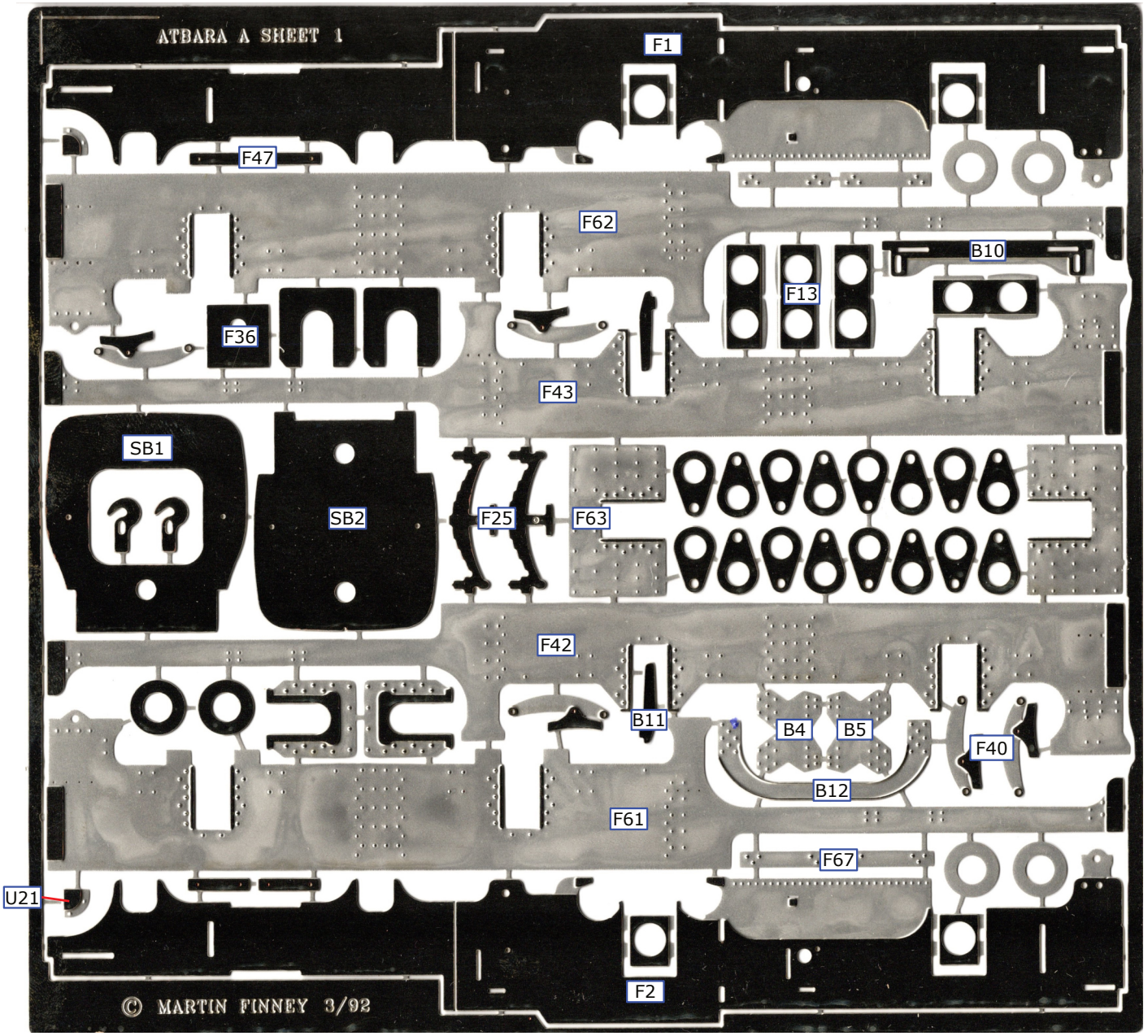
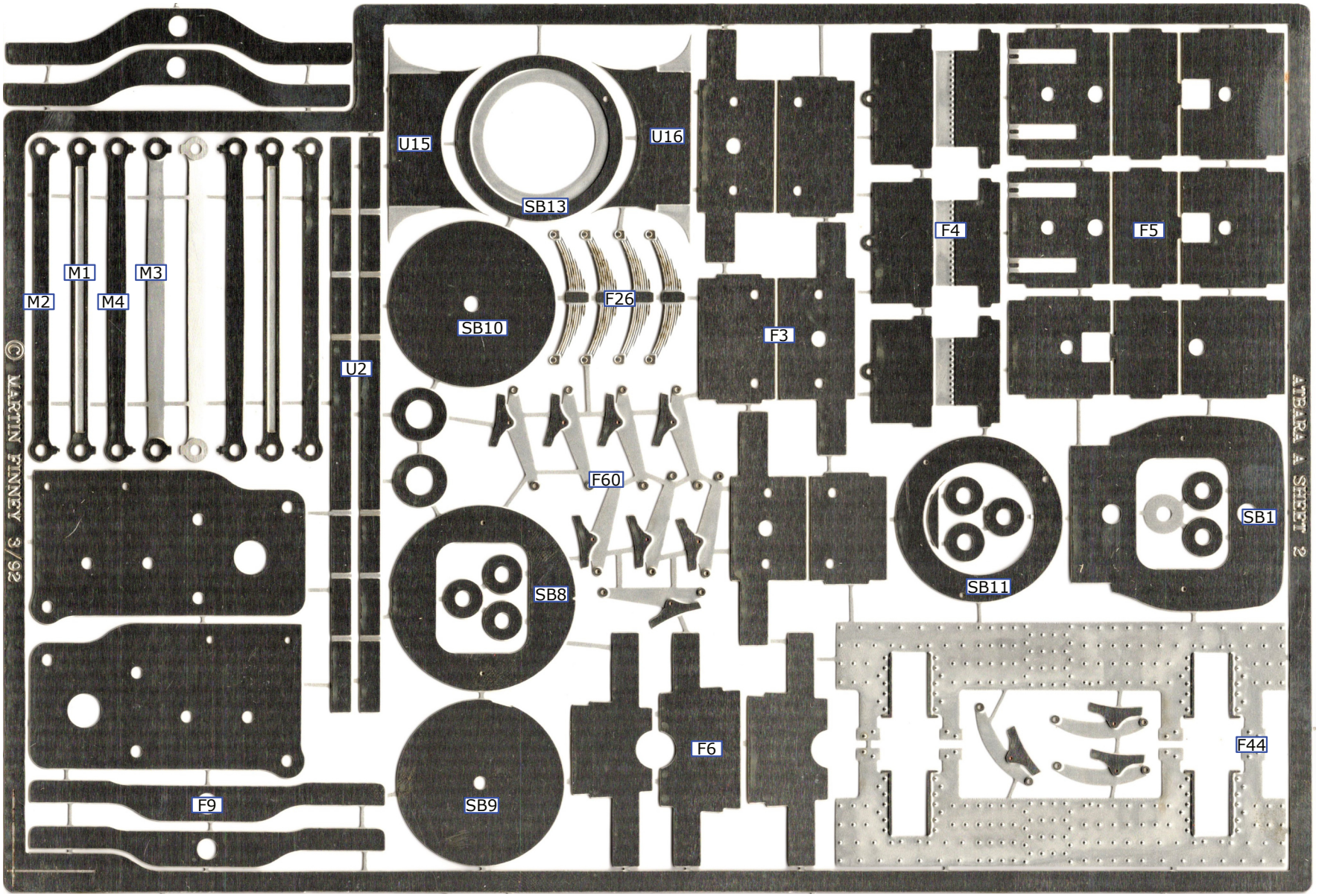


Fig 16. Drawbar

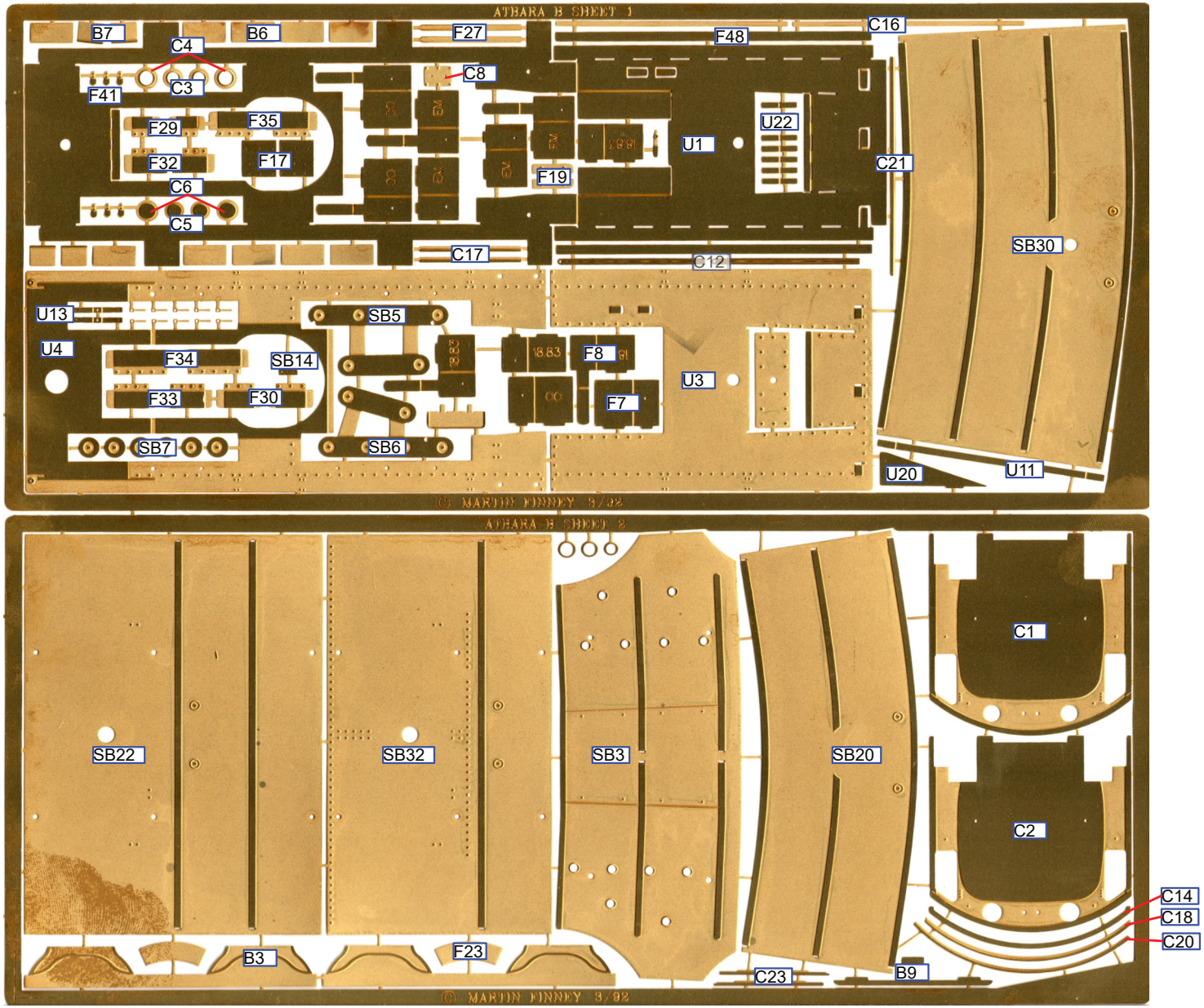
ATBARA/FLOWER ETCH SHEET A1



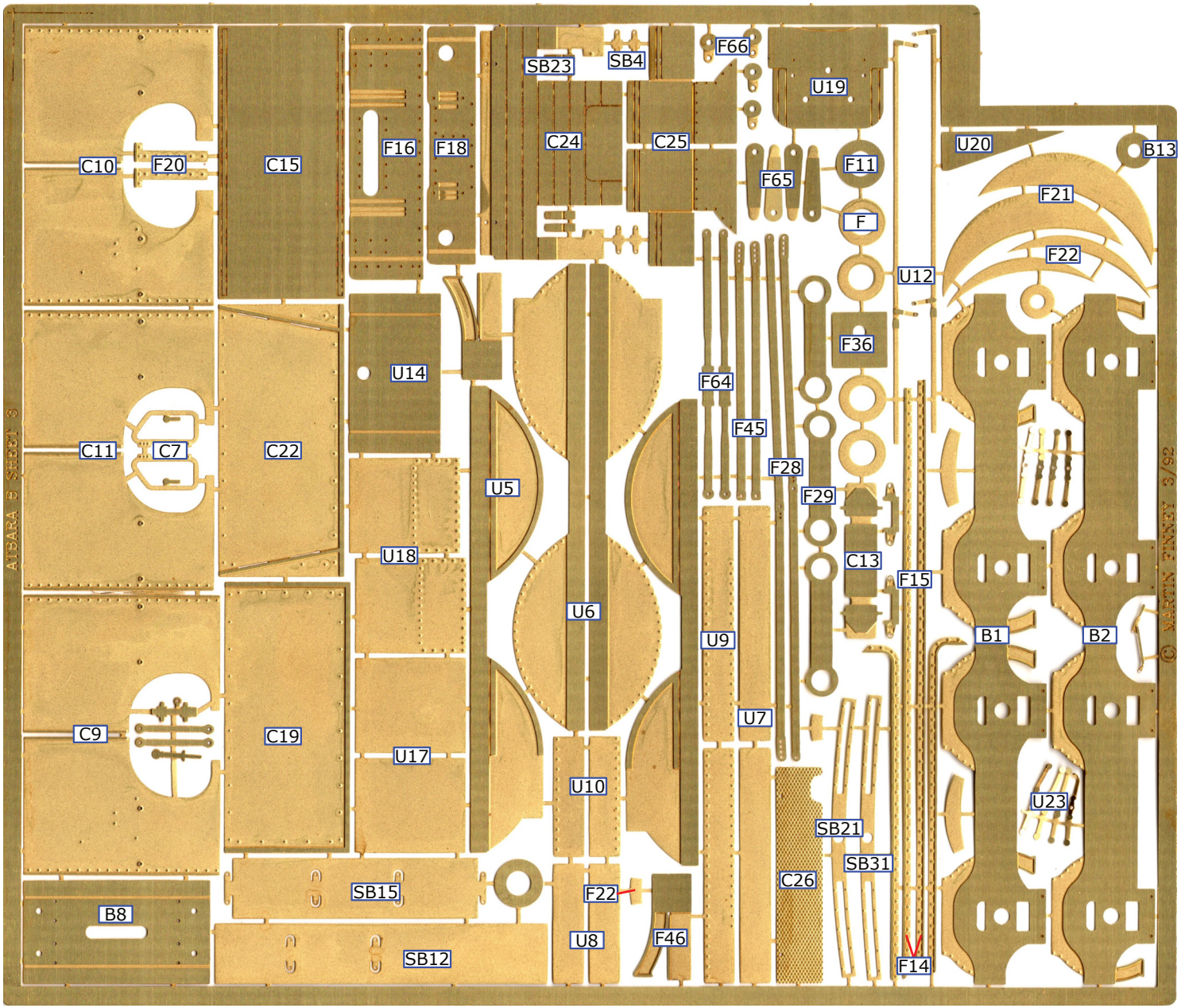
ATBARA/FLOWER ETCH SHEET A2



ATBARA/FLOWER ETCH SHEET B1 & B2

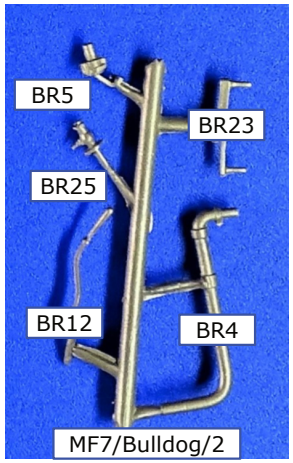


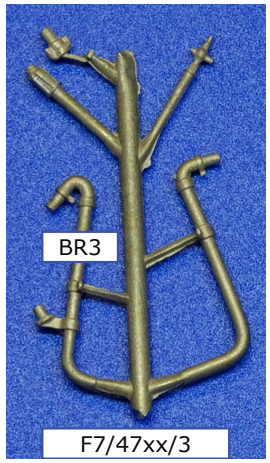
ATBARA/FLOWER ETCH SHEET B3

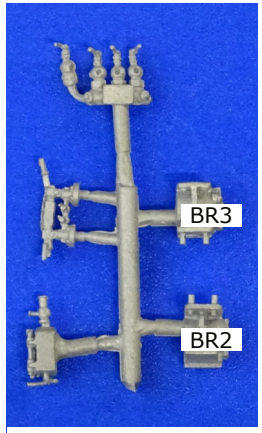


ATBARA/FLOWER BRASS CASTINGS

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

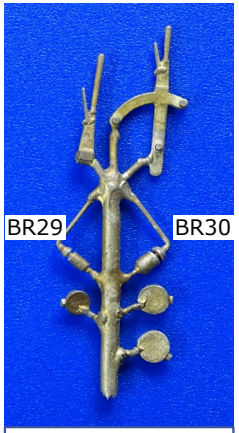






Cab/1

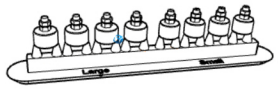

Details/1



Atbara/1

RESIN CASTINGS

RS1	Leading (small) spring damper (4)
RS2	Trailing (large) spring damper (4)


RS1 RS2

WHITEMETAL CASTINGS

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	4	Spring
WM8	1	Backhead
WM10	1	Screw reverser
WM11	1	Smokebox Door
WM12	4	Mud hole doors
WM13	1	Smokebox pipe cover, early pattern
WM14	1	Smokebox pipe cover, later pattern
WM15	1	Chimney, original cast iron
WM16	1	Chimney, tapered cast iron
WM17	1	Safety valve base with top feed
WM18	1	Safety valve base without top feed
WM19	1	Firebox screw reverse cover

OTHER COMPONENTS

3/16" bore bearing - (4)
2mm bore bearing for bogie
6 BA x ¾" 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.

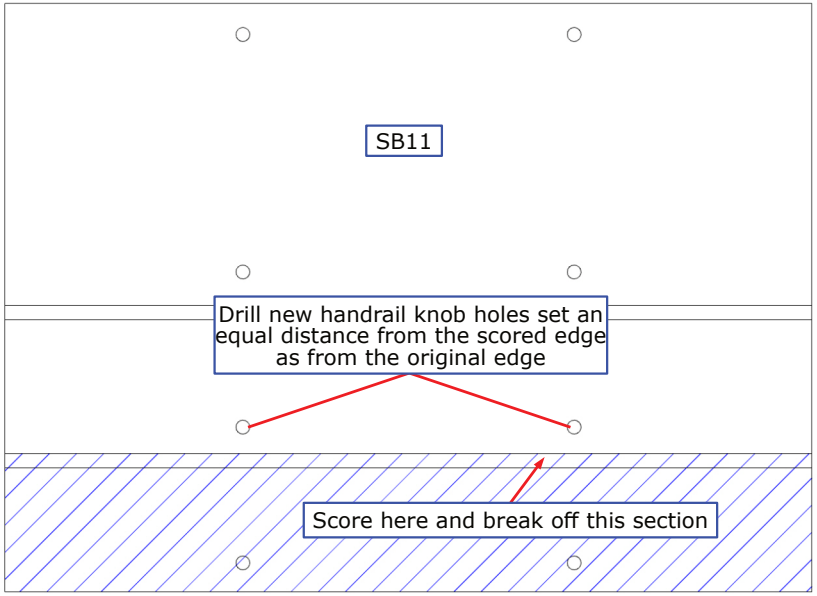


Fig 18. Boiler/Smokebox Wrapper Modification

PACKING LIST

ETCHES

1 Atbara Frames AtbaraA7 PT 78764
1 Atbara Body AtbaraB7 PT 78744

SPRUES

1 MF7/Bulldog/1
1 MF7/Bulldog/2
1 MF7/Bulldog/3
1 F7/GW/Atbara/2
1 MF7/51XX/2
1 F7/GW/Details/1
1 F7/GW/Backhead/1
1 F7/GW/Backhead/2
1 F7/GW/Backhead/3
1 F7/GW/Backhead/4

WHITEMETAL

2 Bogie lower swing hanger (4)
4 Bogie axlebox & spring (4)
2 Dean taper buffer
2 Sandbox, left
2 Sandbox, right
2 Spring, leading
2 Spring, trailing
1 Backhead
1 Firebox door
1 Screw reverser
1 Smokebox Door
4 Mud hole doors
1 Smokebox pipe cover, early pattern
1 Smokebox pipe cover, later pattern
1 Chimney, original cast iron
1 Chimney, tapered cast iron
1 Safety valve base with top feed
1 Safety valve base without top feed
1 Firebox screw reverse cover

OTHER COMPONENTS

4 3/16" bore bearing
4 2mm bore bearing for bogie
2 6 BA x ¾" Brass screws
2 6BA x 5/16" Brass screws
3 6 BA nuts
2 Dean Taper buffer head, bush, washer & spring
8 Short handrail knobs
7 Medium handrail knob
1 Vacuum pipe hose
2 x 75mm 4mm studding, 4 brass & 4 stainless nuts

WIRE

35mm 1/8" Brass wire
35mm 5/32" OD brass tube
100mm 0.8mm Spring steel wire
150mm 0.45mm Brass wire
2x 458mm 0.8mm Brass wire
120mm 1.4mm Brass wires
50mm 1.5mm Copper wire

INSTRUCTIONS