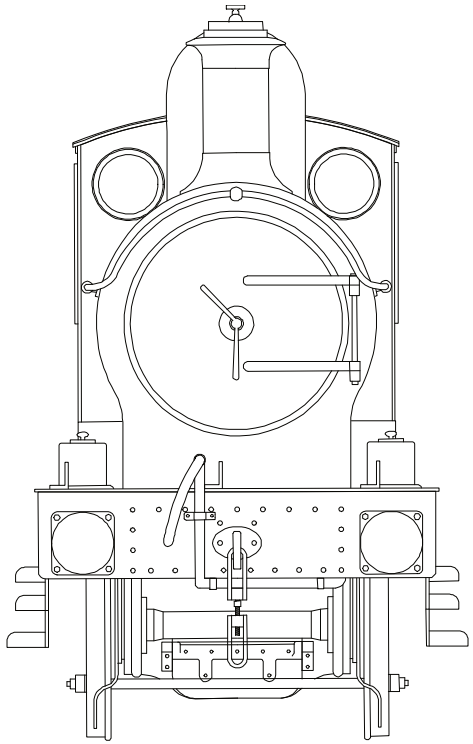
# GWR DEAN GOODS



**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

The 260 engines of the 2301 class, designed by William Dean, were built over a period of 16 years, on 12 lots, as follows:

| Lot | Numbers | Built | Original Boiler | Footplate | Coupling rods |
|---|---|---|---|---|---|
| 61 | 2301-2320 | 1883 | S0 | Narrow | Oval |
| 62 | 2321-2340 | 1884 | S2 | Narrow | Plain |
| 63 | 2341-2360 | 1885 | S2 | Narrow | Plain |
| 82 | 2381-2400 | 1890 | S2 | Narrow | Plain |
| 87 | 2401-2430 | 1891-92 | S2 | Narrow | Plain |
| 92 | 2431-2450 | 1893 | S2 | Narrow | Plain |
| 99 | 2451-2470 | 1895-96 | S4 | Wide | Plain |
| 100 | 2471-2490 | 1896 | S4 | Wide | Plain |
| 104 | 2491-2510* | 1896 | S4 | Wide | Fluted |
| 107 | 2511-2530 | 1897 | S4 | Wide | Fluted |
| 108 | 2531-2550 | 1897 | S4 | Wide | Fluted |
| 111 | 2551-2580 | 1897-89 | S4 | Wide | Fluted |

* Between 1907-1910 all the engines in this lot were rebuilt by Churchward as 2-6-2 tank engines becoming the 3901 class.

With such a large number of locomotives, built over a long period and lasting in service for over sixty years, there are considerable variations between individual engines many of which we have attempted to cover by including alternative components in the kit.

As is usual for Great Western engines the most obvious variation is in the boilers. The first twenty were built with domeless SO boilers with flush smokeboxes. The next 110 had S2 boilers fitted. The remainder were constructed with the S4 boiler included in the kit. From around the turn of the century rebuilding began with the B4 Belpaire boilers until by 1927 all were so fitted. For a detailed history of this class, including details of boiler changes, Part Four of 'The Locomotives of the Great Western Railway' published by the RCTS is essential reading. From this kit any of the class can be built from circa 1900 to withdrawal.

The following Swindon drawings were used to design the kit:

8573 Frame plan Lots 82,87,92,99,100,107,108 & 111

11476 4/1940 General arrangement - 2301 class

11532 8/1940 Arrangement of motion - 1700, 2301, 2700 classes

G.W.Engines - Vol 1 by J.H.Russell on pages 79 - 87 has some useful photographs

## VARIATIONS POSSIBLE WITH THE KIT

**Footplate.** Two different width footplates were fitted as above detailed above.

**Coupling rods.** Plain or fluted coupling rods were fitted as detailed above. Photographic evidence suggests that many of those built with fluted rods subsequently acquired plain rods.

**Cab.** The cabsides of the first sixty engines had a large sweeping cutout whereas the later engines had a standard two arc opening. With the fitting of Belpaire fireboxes the cabs were raised to allow the spectacle windows to be refitted and there were two distinct cab roof profiles. Cab roofs were latterly of steel replacing the earlier canvas covered wood.

**Smokebox.** The early smokeboxes had a plain front with ringed door. Later snap head rivets were used and from c.1920 the smokeboxes had a pressed front with Churchward type door without the ring.

**Firebox.** Two different B4 firebox wrappers are provided with alternative positions of the washout plugs.

**Steps.** The front step and upper rear step were different on the first sixty engines.

**Reversing rod.** The first sixty had a straight rod whereas the remainder were fitted with a curved rod.

**Chimney.** Early built up parallel type. From 1919 tapered cast iron type began to be fitted.

**Top feed.** From about 1913 some forty on the class carried B4 boilers with top feed.

**Balance weights.** Changed from large type with visible rivets to a smaller plain design.

**ATC.** A large number of the class were fitted with ATC equipment most between June 1930 and August 1931.

**Lamp brackets.** Most have the front lamp brackets attached to the buffer beam but a few have the outer brackets fixed to the sandboxes.

Variations Not Not Possible With the Kit

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## TENDERS

Many of the earlier engines appear to have come out with second-hand iron frame or double frame Armstrong tenders which were to be found on the class up to about 1912. Later engines

were paired with standard Dean 2500 gallon tenders. In later years a significant number acquired larger Dean tenders of 3000 gallons capacity. At least one (2398) was paired with a diminutive Dean 2000 gallon tender.

## 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 wheel - 5’ 2", 16 spoke, 3/16" diameter axle Slater's Ref.7862GW

Available from Slaters' (Plastikard) Ltd’

## MOTOR/GEARBOX

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

## CRANKPINS

Steel crankpins are available from Finney7.

## INSIDE MOTION

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

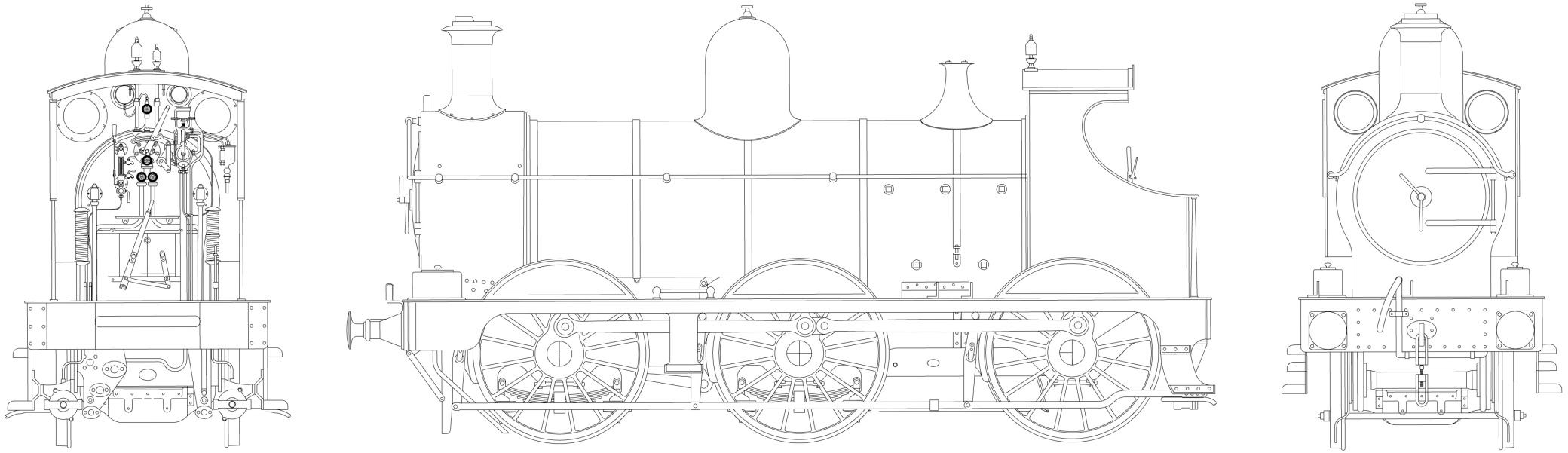


**Fig 1. Round Top Firebox 2301 (Dean Goods) Class GA.**

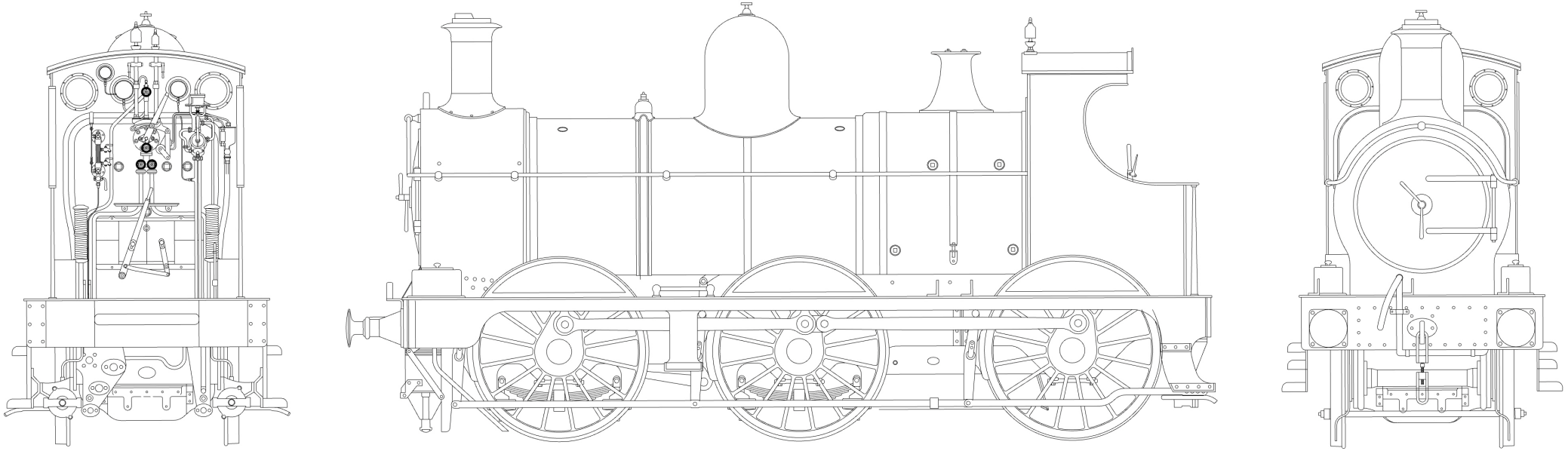


**Fig 2. Belpaire Firebox 2301 (Dean Goods) Class GA**

# COUPLING RODS AND FRAME PREP

**Coupling Rods.** The coupling rods should now be made up to use as a jig for fitting the coupled wheels hornblocks accurately into place.

First drill out all the crankpin holes to a convenient size which is well undersized for the crankpins. Remove all burrs caused by the drilling. Now drill a hole with 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 mandrill to accurately align the two laminations of each rod.

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. Repeat with the other pair of laminates.

The rods have been deliberately etched too large so that the thin etched edges can be carefully filed so that the 'laminated' effect is lost and the rods appear to be made from one piece of metal.

The fork joints are now pinned using the 1.6mm nickel silver wire. Retain the pins, which should be a tight fit, by lightly soldering on the inner face of the rods. The correctly assembled rods should now have a completely flush inner face.

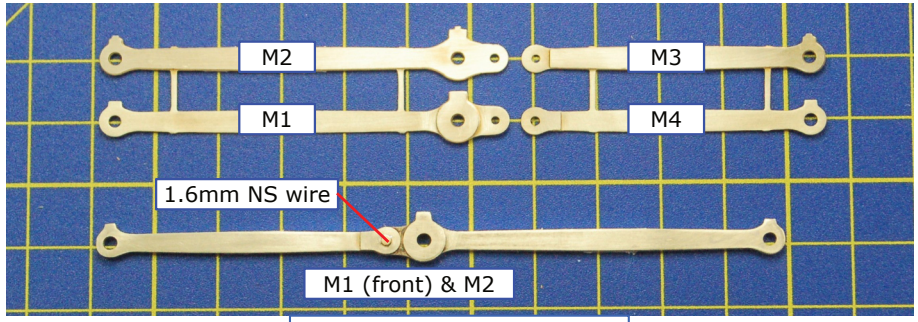



**Fig 3. Coupling Rods**

| No. | Description | Sheet |
|---|---|---|
| M1 | Plain coupling rod front inner lamination (2) | A1 |
| M2 | Plain coupling rod front outer lamination (2) | A1 |
| M3 | Plain coupling rod plain rear inner lamination (2) | A1 |
| M4 | Plain coupling rod plain rear outer lamination (2) | A1 |
| M5 | Fluted coupling rod front inner lamination (2) | A1 |
| M6 | Fluted coupling rod front outer lamination (2) | A1 |
| M7 | Fluted coupling rod rear inner lamination (2) | A1 |
| M8 | Fluted coupling rod rear outer lamination (2) | A1 |
| F1 | Left frame | A1 |
| F2 | Right frame | A1 |

**Frames.** Having decided which chassis to construct you can now start construction by preparing the inside frames.(F1 & F2).

First open up the following holes in the frames:

- P only if plunger pickups are being used
- B for brake hanger pivots - 0.8mm
- R for reversing lever cross shaft - 1.6mm
- A for compensation beam pivot - 1/8"
- S to fit the steam brake cylinders.

Emboss the rivets on the ash-pan sides and then fold the ash pan sides along the half etched lines to match the firebox front frame spacer (F5).

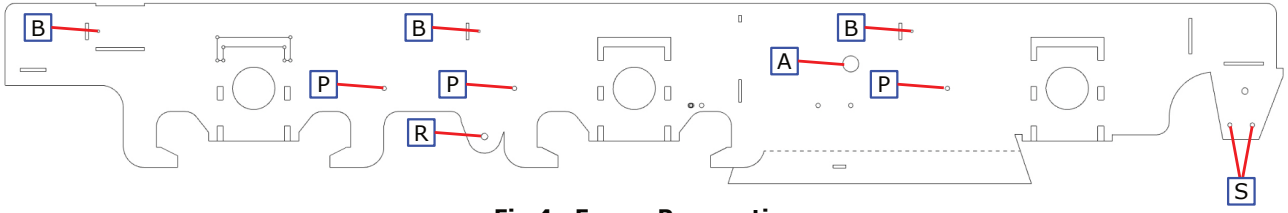



**Fig 4. Frame Preparation**

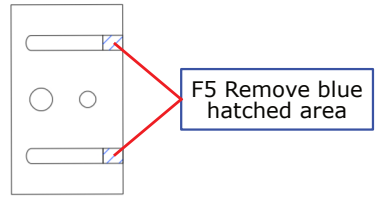



**Fig 5. Inside Motion Mod**

# FRAMES CONSTRUCTION

**Assembling the Chassis.** If you are fitting inside motion modify the front frame spacer (F6 )as shown in the diagram and tap the hole for the inside motion fixing screw 6BA. Fold up the small tabs on the front spacer and solder the 1.6mm steel wire front compensation beam in place.

Fold up the front and rear spacers (F6 & F4) making sure the half etched lines are on the inside of the bend and that each bend is a right angle. Check that all tabs on the spacers fit properly in their corresponding chassis slots so that the rest of the spacer is hard up against the inside of the frames.

Now assemble the frames and spacers. Start by tack soldering the rear spacer to both sides. Check that everything is square and that the spacers are hard against the frames. Put an axle (or better a longer piece of 3/16" rod) through the rear bearings and place the chassis on a piece of graph paper to check that the axle is square to the frames. If all is well solder the remaining spacers to the frames. It is important to check constantly that the chassis is square and that the frames are straight.

If you are fitting compensation, build the hornblock mini-kit (HB2) following the instructions in the mini-kit. Then fit the hornblocks using the coupling rods as jigs.

Solder 0.8mm wire through the frame holes marked B to form the brake hanger pivots.

| No. | Description | Sheet |
|---|---|---|
| F3 | Rear frame spacer | A1 |
| F4 | Firebox front frame spacer | A1 |
| F5 | Front frame spacer | A1 |
| F6 | ATC shoe mounting frame spacer | A1 |
| F7 | Compensation beams (2) | A1 |

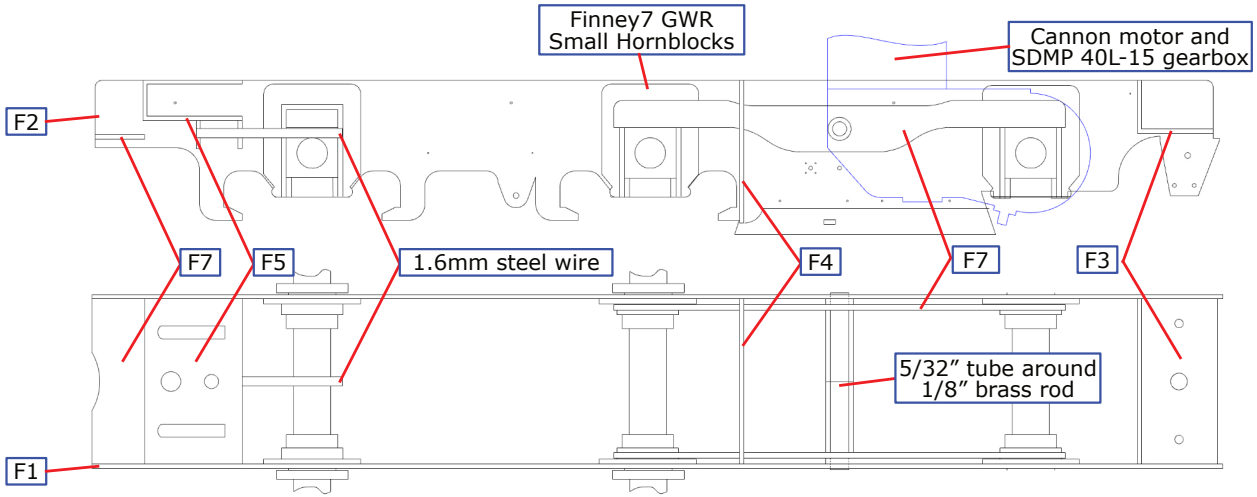



**Fig 6. Frame Construction**

**Compensation.** Cut a piece of 1/8" brass rod so that it fits through the holes marked A and is flush with the outside face of the chassis frames.

Prepare two pieces of 5/32" bore brass tube. Each should have a length of 3mm. On the compensation beam (F10) open up the hole to accept the brass tube and solder the beams to the pieces of tube close to one end of the tube. Slide the rod through one frame, through a tube & beam, a paper washer, the two washers, a paper washer, a tube & beam and then through the other frame. Solder securely to each frame. Push the beam into place and then push the paper washer and brass washer in to hold the beam in place. Solder the the washer in place. Repeat on the other side. Remove the rod from between the two beam assemblies to leave space for the motor and gearbox.

The third beam is the piece of 1.6mm steel wire soldered to the front spacer. The front of the engine is supported on this beam resting on the leading axle. Fit all the wheels and axles temporarily so that the beams are resting on the axle bearings. Confirm that the compensation works properly and check if the chassis is sitting level.

Make a Bracket to Support the Motor/Gearbox from Scrap Brass and Solder It to the Rear of the Centre Frame Spacer.

# DETAILING THE CHASSIS

**Frame Overlays.** Emboss all the rivets in the frame overlays, left and right (F8 & F9). Use the brake hanger pivots to accurately locate the overlays onto the frames and then tack solder around the edges. Fold down the sand pipe mounting brackets and strengthen with a fillet of solder. Fit the guard iron struts (F10) using 0.8 mm wire as pins. Fix the steam brake cylinders (BR1 & BR2) to the frames. Fit the mud door clamps (BR3) on the ash-pan sides and make the pipe from the right side ash-pan as shown in the Fig 3.

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

Laminate the spring laminations (F16 & F17) and clean up to remove the laminations. The two leading axles are now retained by the springs and the rear axle by the rear axle hornblock tie (F18). Fit the motor and gearbox. Fit the wheels and axles and then fit the coupling rods. Check for full and free movement.

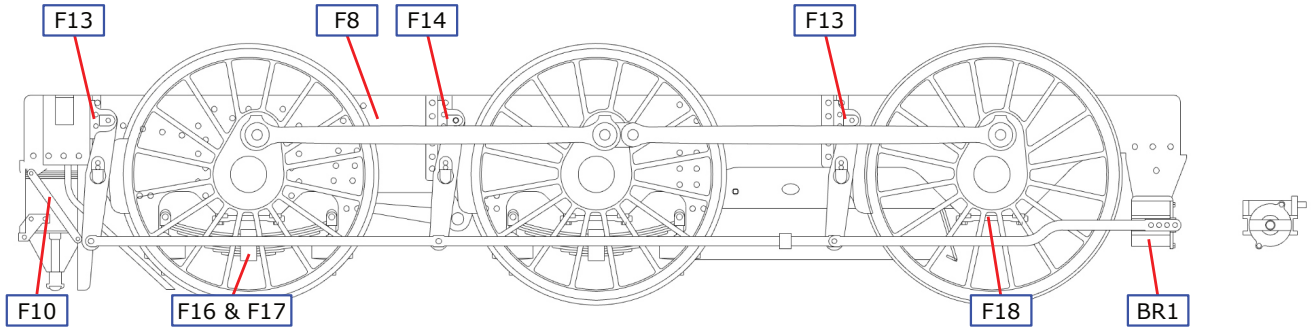



**Fig 7. Frame Detailing**

| No. | Description | Sheet |
|---|---|---|
| F8 | Left frame overlay | B3 |
| F9 | Right frame overlay | B3 |
| F10 | Guard iron strut (2) | A1 |
| F13 | Brake hanger bracket, leading & trailing axle (4) | B3 |
| F14 | Brake hanger bracket, centre axle (2) | B3 |
| F15 | Mud door clamps (2) | B2 |
| F16 | Spring middle lamination (4) | A1 |
| F17 | Spring outer lamination (8) | A1 |
| F18 | Rear axle hornblock ties (2) | A1 |
| F20 | Brake hanger/shoe lamination (12) | A1 |
| F21 | Brake hanger overlay (6) | B1 |
| F22 | Front brake pull rod (2) | B3 |
| F23 | Rear inner brake pull rod (2) | B3 |
| F24 | Rear outer brake pull rod (2) | B3 |
| F25 | Brake pull rod safety bracket (2) | B1 |
| F26 | Early balance weight, leading & trailing axle (4) | A1 |
| F27 | Early balance weight centre axle (2) | A1 |
| F28 | Later balance weight, leading & trailing axle (4) | B2 |
| F29 | Later balance weight, centre axle (2) | B2 |
| F30 | Drawbar | B3 |
| F31 | Axle spacing washer | A1 & B1 |

**Brakes**. Fit the brake cylinders (BR1 & 2) to the frames. Assemble the brake hangers (F20) by first embossing the rivet on each lamination. Laminate a pair of hangers together using a pair of 0.8mm drills in a piece of wood to align the laminates. The front of each hanger is detailed with the brake hanger overlay (F21), as shown in the diagram, the small hole in the back of the overlay locating on the previously embossed rivet. Slide the brake hangers onto the pivot wires. Solder the brake hanger pivot bracke (F13 & F14) into the slots in the overlays as shown in Fig 3 to keep the hangers in place.

Make the brake cross shafts from 0.8mm wires. Fit the brake pull rods, the front (F22) and the rear and outer (F23 & F24); the rear brake pull rods fit to either side Fit the brake rod safety bracket (F2 the ashpan. Again, check for full and free movement. Remove the sections of wire between the fra

Fit the sand pipes from 1.2mm wire; the mountings are shown on Fig 5.

Attach the balance weights to the wheels using photographs as a guide to the appropriate weight an position.

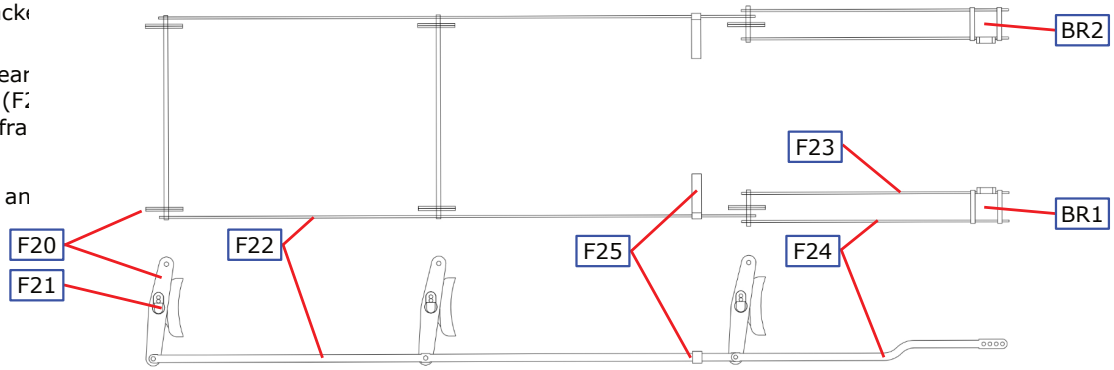
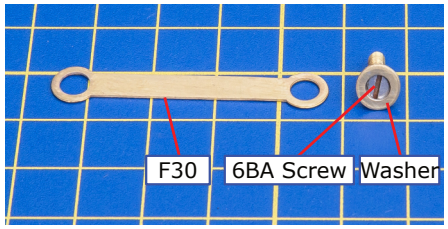



**Fig 8. Brakes**

Make the drawbar up by soldering a washer around the top of a 6BA screw head as shown below. The drawbar fits under this washer when the screw is screwed into the chassis.



# FOOTPLATE

Fold the edges of the footplate (U1) at right angles and fold up the splasher fronts, reversing lever and lamp brackets. Prepare the footplate overlay, narrow (U2) or wide (U3) by embossing the rivets under the lamp brackets. Place the overlay in place and fix to the footplate with a screw through both the body fixing holes. Now solder together, fix the rear body fixing nut in place under the footplate. If you have fitted inside motion remove the section of footplate shown by the half etched line to clear the mounting bracket.

On the valence overlays, left (U4) and right without (U5) or with ATC (U6), emboss the rivets behind the steps and the rivets for each pipe clip. Fold down the pipe clips and fold up the steps.

**Steps 2301-2360.** Remove the front step tread from the valance overlay. Emboss the rivets on the front step overlay (U7) and fold up the tread. Solder the overlay over the step back on the valance. Emboss the rivets on the rear step upper tread (U8), fold up and solder in place on the rear step back on the valance. Solder the valances in place.

**Steps 2381-2580.** Emboss the rivets on the rear step upper tread (U9), fold up and solder in place on the rear step back on the valance. Solder the valances in place.

Emboss the rivets on the bufferbeam (U10) and then add the coupling pocket (U11). Solder the buffer beam in place. Emboss the rivets on the drag beam (U12) and then add the drag beam rubbing plates (U13). Solder the drag beam in place.

By referring to photographs bend the vacuum pipe on the valance to shape using 1.2mm wire and attach it by bending the clips into the small slots and soldering inside. Use either the circular (U14) or oval (U15) pipe unions to represent the flanges of the pipe joints.

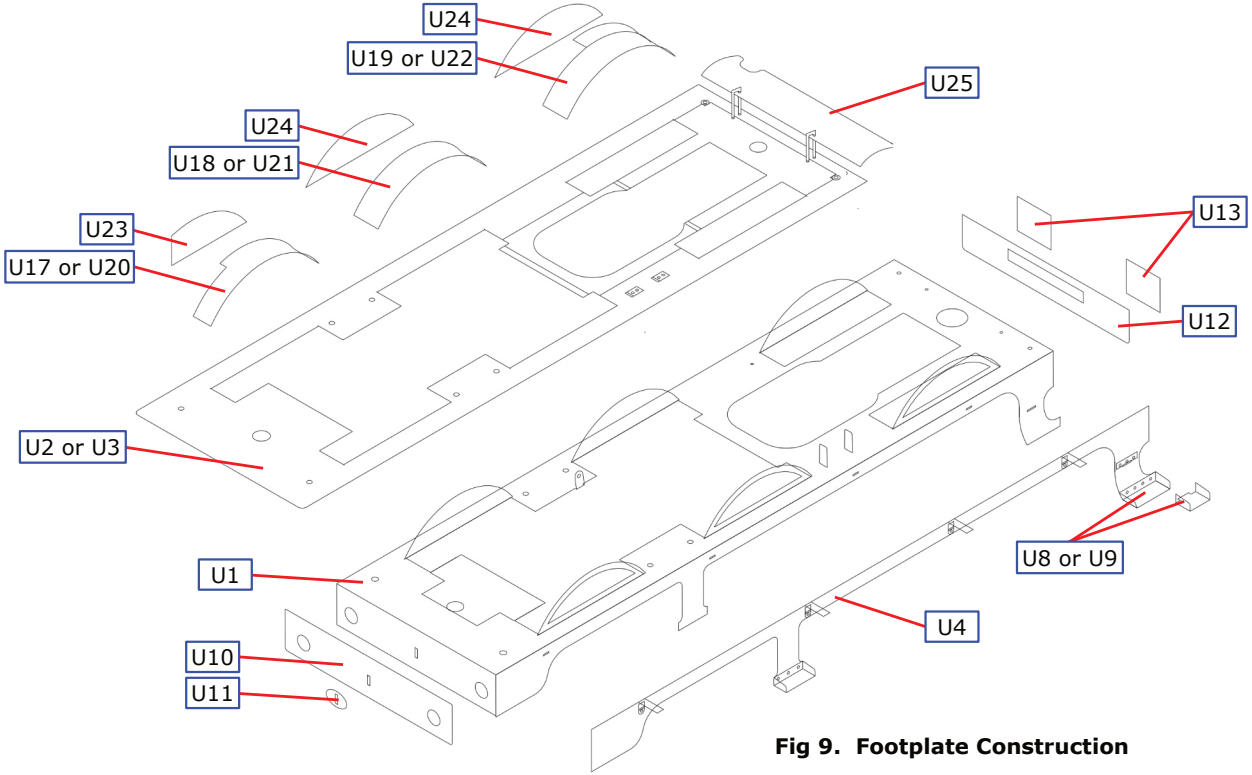



**Fig 9. Footplate Construction**

| No. | Description | Sheet |
|---|---|---|
| U1 | Footplate | B3 |
| U2 | Narrow footplate overlay, 2301-2360 & 2381-2450 | B1 |
| U3 | Wide footplate overlay, 2451-2580 | B1 |
| U4 | Left valence overlay | B3 |
| U5 | Right valence overlay right | B3 |
| U6 | Right valence overlay with ATC conduit brackets | B3 |
| U7 | Front step overlay, 2301-2360 (2) | B1 |
| U8 | Rear step upper tread, 2301-2360 (2) | B1 |
| U9 | Rear step upper tread, 2381-2580 (2) | B1 |
| U10 | Buffer beam | B2 |
| U11 | Coupling hook pocket | B3 |
| U12 | Drag beam | B2 |
| U13 | Drag beam buffer rubbing plate (2) | B3 |
| U14 | Circular pipe union (4) | B3 |
| U15 | Oval pipe union (6) | B1 |
| U16 | ATC conduit bracket strip | B2 |
| U17 | Leading splasher top, flush rivets, (2) | B3 |
| U18 | Centre splasher top, flush rivets (2) | B3 |
| U19 | Trailing splasher top, flush rivets (2) | B3 |
| U20 | Leading splasher top, snap head rivets (2) | B3 |
| U21 | Centre splasher top, snap head rivets (2) | B3 |
| U22 | Trailing splasher top, snap head rivets (2) | B3 |
| U23 | Leading splasher back (2) | B3 |
| U24 | Centre & trailing splasher back (4) | B3 |
| U25 | Fallplate | B3 |

**Flush Rivet Splashers.** Curve the splasher tops, leading, centre and trailing (U17, U18 & U19) to shape by rolling underneath a suitable rod or dowel on a resilient surface - a piece of rubber sheet. The rear splasher tops should be narrowed to match the width of the cab floor as shown in the diagram. Solder the centre and rear splasher tops in place followed by the splasher backs, leading (U23) and centre and trailing (U24).

**Snap Head Rivet Splashers.** Curve the splasher tops, leading, centre and trailing (U20, U21 & U22) to shape by rolling underneath a suitable rod or dowel on a resilient surface - a piece of rubber sheet. The rear splasher tops should be narrowed to match the width of the cab floor as shown in the diagram. Solder the centre and rear splasher tops in place followed by the splasher backs, leading (U23) and centre and trailing (U24).

# CAB

Parts are supplied for the round or Belpaire firebox cab front, for the different cab side cut-outs for 2301-2360 or 2381-2580, both with or without rivets, and for steel or canvas covered roofs.

**Round Top Firebox Cab.** Emboss the rivets on the cab front (C1) and then attach the window frames (C2). Solder the cab front in place. Select the appropriate cab sides from (C3, C4, C5 or C6) and reduce in height to match the cab front. Attach the cab cut out beading (C7) to the cab side, fitting the etched groove over the edge of the cab side. If required, fold up the cab seat bracket (C8) and solder to the inside of the cab side, Assemble the seat (C9) into the bracket; the seats are designed to work. Solder the cab side into place on the footplate with a small overlap to the cab front; the handrail holes on the beading should match the handrail holes in the footplate. Attach the rear handrails from 0.8mm nickel silver wire. Solder the cab roof support (C10) between the rear edges of the cab sides ensuring the cab roof line is horizontal.

**Belpaire Firebox Cab.** Emboss the rivets on the cab front, high (C11) or low roof (C12) and then attach the window frames (C13). Solder the cab front in place. Select the appropriate cab sides from (C3, C4, C5 or C6) and attach the cab cut out beading (C7) to the cab side, fitting the etched groove over the edge of the cab side. If required, fold up the cab seat bracket (C8) and solder to the inside of the cab side, Assemble the seat (C9) into the bracket; the seats are designed to work. Solder the cab side into place on the footplate with a small overlap to the cab front; the handrail holes on the beading should match the handrail holes in the footplate. Attach the rear handrails from 0.8mm nickel silver wire. Solder the cab roof support, high (C14) or low roof (C15) between the rear edges of the cab sides ensuring the cab roof line is horizontal.

| No. | Description | Sheet |
|---|---|---|
| C1 | Cab front, round top firebox | B2 |
| C2 | Window frame for round top firebox (2) | B3 |
| C3 | Cab side without rivets, 2301-2360 (2) | B2 |
| C4 | Cab side with rivets, 2301-2360 (2) | B2 |
| C5 | Cab side without rivets, 2381-2580 (2) | B2 |
| C6 | Cab side with rivets, 2381-2580 (2) | B2 |
| C7 | Cab side cutout beading (2) | B2 |
| C8 | Cab seat bracket (2) | B1 |
| C9 | Cab seat (2) | B1 |
| C10 | Cab roof support, round top firebox | B2 |
| C11 | Cab front, Belpaire firebox & high roof | B2 |
| C12 | Cab front, Belpaire firebox & low roof | B2 |
| C13 | Window frame for Belpaire firebox (2) | B3 |
| C14 | Cab roof support, Belpaire firebox & high roof | B2 |
| C15 | Cab roof support, Belpaire firebox & low roof | B2 |

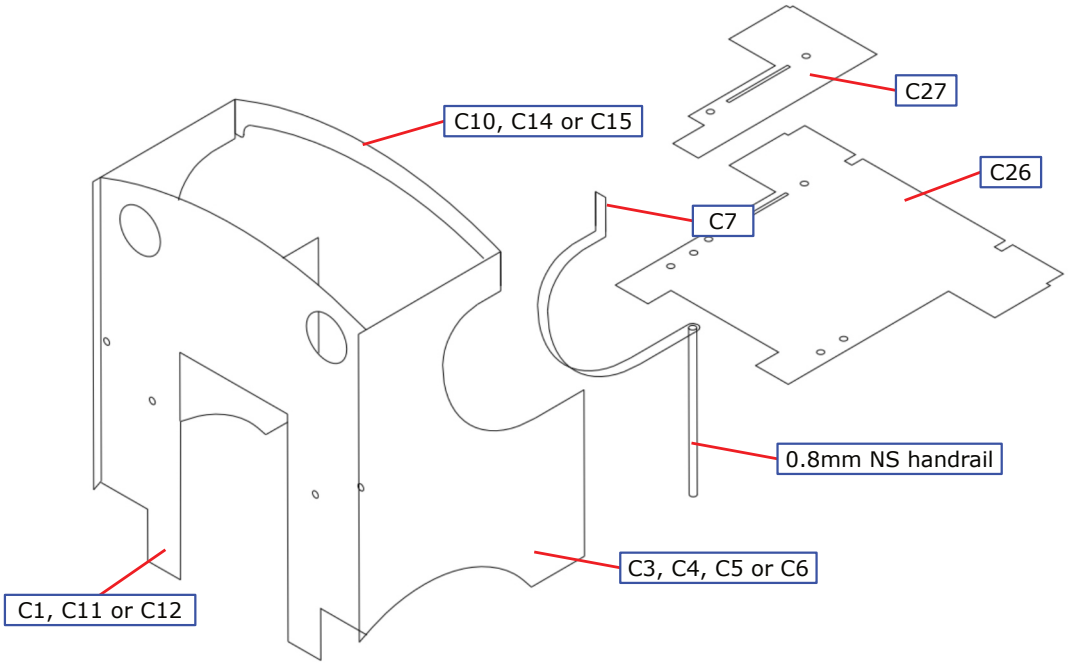
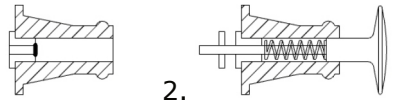



**Fig 10. Cab Construction**




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

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

**Buffer Construction**

# CAB

Parts are supplied for the round or Belpaire firebox cab front, for the different cab side cut-outs for 2301-2360 or 2381-2580, both with or without rivets, and for steel or canvas covered roofs.

**Round Top Firebox Cab.** Emboss the rivets on the cab front (C1) and then attach the window frames (C2). Solder the cab front in place. Select the appropriate cab sides from (C3, C4, C5 or C6) and reduce in height to match the cab front. Attach the cab cut out beading (C7) to the cab side, fitting the etched groove over the edge of the cab side. If required, fold up the cab seat bracket (C8) and solder to the inside of the cab side, Assemble the seat (C9) into the bracket; the seats are designed to work. Solder the cab side into place on the footplate with a small overlap to the cab front; the handrail holes on the beading should match the handrail holes in the footplate. Attach the rear handrails from 0.8mm nickel silver wire. Solder the cab roof support (C10) between the rear edges of the cab sides ensuring the cab roof line is horizontal.

**Belpaire Firebox Cab.** Emboss the rivets on the cab front, high (C11) or low roof (C12) and then attach the window frames (C13). Solder the cab front in place. Select the appropriate cab sides from (C3, C4, C5 or C6) and attach the cab cut out beading (C7) to the cab side, fitting the etched groove over the edge of the cab side. If required, fold up the cab seat bracket (C8) and solder to the inside of the cab side, Assemble the seat (C9) into the bracket; the seats are designed to work. Solder the cab side into place on the footplate with a small overlap to the cab front; the handrail holes on the beading should match the handrail holes in the footplate. Attach the rear handrails from 0.8mm nickel silver wire. Solder the cab roof support, high (C14) or low roof (C15) between the rear edges of the cab sides ensuring the cab roof line is horizontal.

**Canvas Roof.** Curve the cab roof (C16) to match the cab structure and then solder in place. Add the side mouldings (C17), the front and rear mouldings (C18) and the transverse strip (C19), if required.

**Steel Roof With Side Rain Strips.** Curve the cab roof (C20) to match the cab structure and then solder in place. Add the side rain strips (C21).

**Steel Roof With Angled Rain Strips.** Curve the cab roof (C22) to match the cab structure and then solder in place. Add the angled rain strips (C23).

Solder the whistles to the cab roof; the large (BR4) on the left, the small (BR5) on the right.

| No. | Description | Sheet |
|---|---|---|
| C1 | Cab front, round top firebox | B2 |
| C2 | Window frame for round top firebox (2) | B3 |
| C3 | Cab side without rivets, 2301-2360 (2) | B2 |
| C4 | Cab side with rivets, 2301-2360 (2) | B2 |
| C5 | Cab side without rivets, 2381-2580 (2) | B2 |
| C6 | Cab side with rivets, 2381-2580 (2) | B2 |
| C7 | Cab side cutout beading (2) | B2 |
| C8 | Cab seat bracket (2) | B1 |
| C9 | Cab seat (2) | B1 |
| C10 | Cab roof support, round top firebox | B2 |
| C11 | Cab front, Belpaire firebox & high roof | B2 |
| C12 | Cab front, Belpaire firebox & low roof | B2 |
| C13 | Window frame for Belpaire firebox (2) | B3 |
| C14 | Cab roof support, Belpaire firebox & high roof | B2 |
| C15 | Cab roof support, Belpaire firebox & low roof | B2 |
| C16 | Canvas covered wood cab roof | B3 |
| C17 | Canvas covered roof side moulding (2) | B1 |
| C18 | Canvas covered roof front & rear moulding (2) | B3 |
| C19 | Canvas covered roof transverse strip | B2 |
| C20 | Steel cab roof with side rain strips | B3 |
| C21 | Side rain strip (2) | B1 |
| C22 | Steel cab roof with angled rain strips | B3 |
| C23 | Angled rain strip (2) | B1 |
| C24 | High steel cab roof rear angle | B3 |
| C25 | Low steel cab roof rear angle | B3 |
| C26 | Cab floor | B2 |
| C27 | Cab floor platform | B3 |

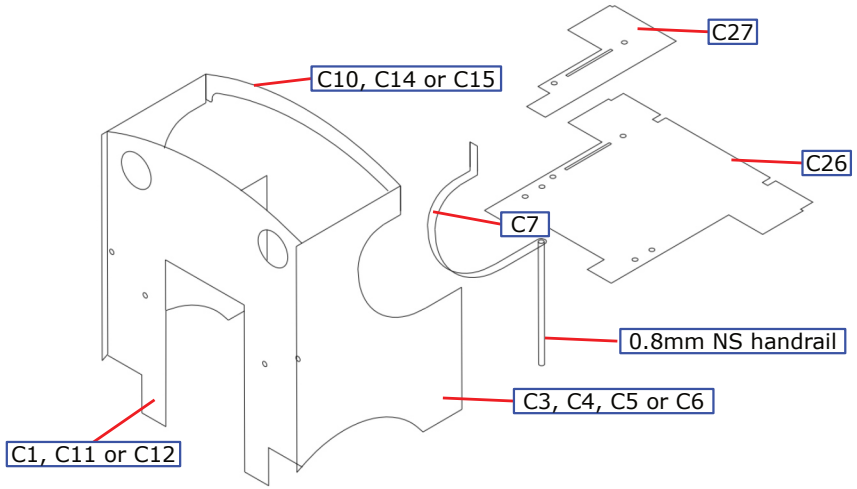
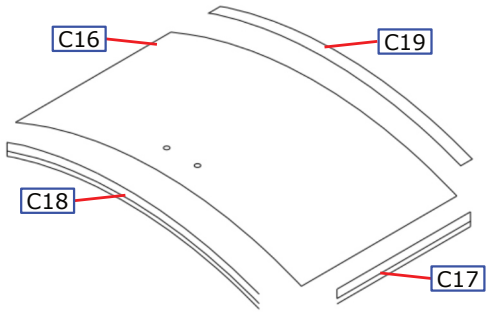
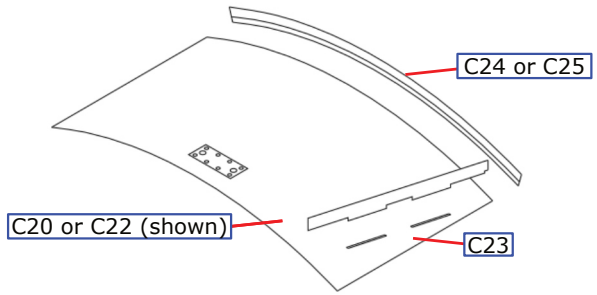



**Fig 10. Cab Construction**




**Canvas Covered Wooden Roof**




**Steel Roof (Angled Rainstrip Shown)**

# BACKHEAD

There is a choice between an early reversing lever quadrant (C28) and a later cast quadrant (WM1). Emboss the rivet at each end of the reversing lever quadrant lamination (C28) and solder them together leaving a slot in the middle then solder the assembly in place in the holes in the cab floor. If required, add the cast quadrant in place. Add the lever reverse handle (BR7). The rear springs (WM2) mount in the holes in the footplate.

**Backhead.** Select the appropriate backhead either round top (WM3) or Belpaire (WM4). The backhead is designed to be soldered to the cab floor; this can be done before or after detailing to suit. Detail, as appropriate, to the drawings below.

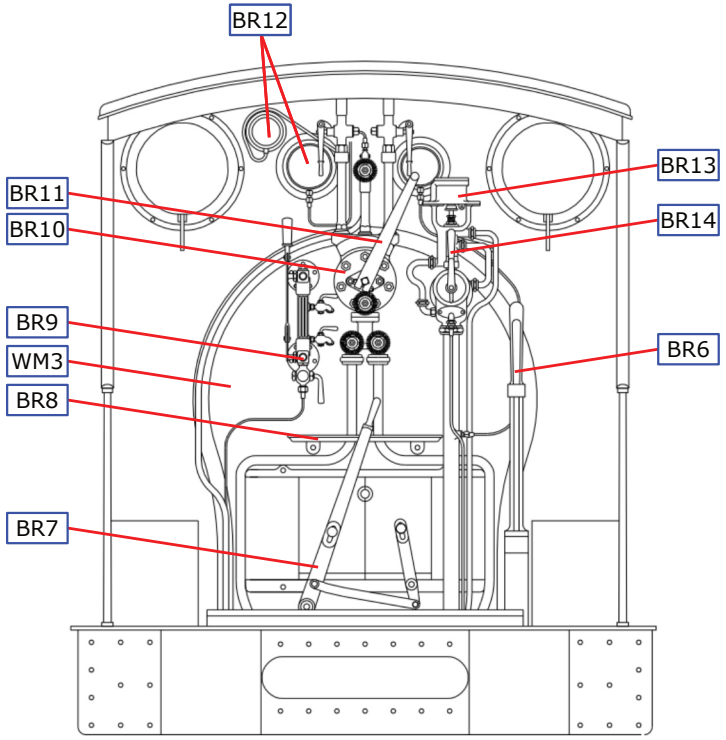



**Fig 11. Round Top Backhead**

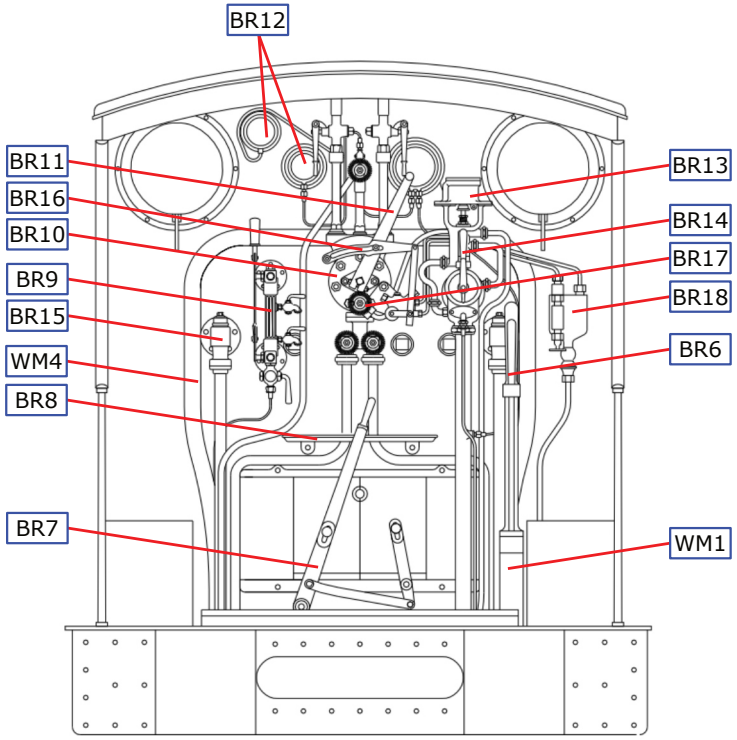
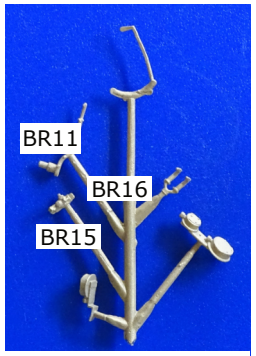
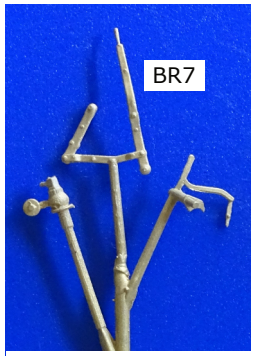



**Fig 12. Belpaire Backhead**

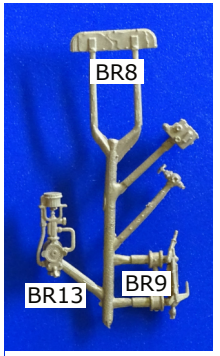
| No. | Description | Sheet |
|---|---|---|




Backhead/1




Backhead/2




Backhead/3

# ROUND TOP (S4) FIREBOX, BOILER AND SMOKEBOX

**Boiler & Firebox.** Emboss the rivets as needed on the boiler and round top firebox wrapper (SB1) on the dome boiler band and firebox band. Some early boilers appear to have no boiler washout plugs so, if necessary, file the boiler washout plugs flush and smooth. Form the boiler by rolling around suitable sized rod or dowel. Ensure that the fit is correct over the boiler front (SB2) and rear formers (SB3). Solder a 6BA nut over the hole in the centre of the front former to allow the smokebox to be screw fixed to the boiler.

Bend the boiler band joining brackets on the boiler joining strip (SB4) and fit through the small slots from inside the boiler. The cutouts in the rear former are to clear the boiler joining strip and the etched notch at the top of the rear former must align accurately with the small slot in the inside of the wrapper. If the fit of the joining strip and formers is good, solder the wrapper ends together with the joining strip and fit and solder the formers so that they are almost flush with the ends. Solder two short pieces of 0.8 mm wire into the two holes in the rear former to act as dowels to locate the firebox front former. Represent the bolts in the joining clips using 0.45 mm wire.

Solder the round top firebox washout plugs, upper row of three (SB5) and lower row of two (SB6) in place. Fit the round top firebox front (SB7) and rear formers (SB8) in place ensuring that the firebox does not become twisted, ensure that the slot for the reversing lever is on the right hand side. Solder two short pieces of 0.8mm wire into the two holes in the rear former to act as dowels to locate the firebox onto the cab front. Fold the firebox band joining clips (SB9) by bending near the small hole, solder in place from inside and complete with a short piece of 0.45mm wire to represent the tightening bolt.

**Smokebox.** Fold the smokebox base (SB15) into an inverted tray and solder a 6BA nut over the hole for the body fixing screw. Early fireboxes have a square front edge whilst later they have a pressed front plate giving a rounded edge. The position of the smoke box door also changed. All smokebox variations are possible with the components supplied.

For a square front edge use the early smokebox front (SB16) to the front of the base and for a rounded front edge use either the early or the later front (SB17). Emboss the four rivets on the front former and drill through the hole for the steam lancecock if needed. Solder the selected front former and the rear former (SB18) to the base. Roll the smoke box wrapper, flush riveted (SB19) or snap head rivets (SB20) to shape and solder in place with its edges flush with the front and back formers.

Round the edge of the second rear former (SB19) and solder to the rear and do the same for the front if appropriate. Fold up and fit the two smokebox side steps (SB22). If required, curve the top feed overlay (SB23) to match the boiler and fit to the boiler.

If you have fitted inside motion remove the section between the half etched lines on. the lower edge of the smokebox rear so that it will fit over the cylinder front.

Round and polish the edge of the smokebox and boiler ring (SB21). Screw the smokebox to the boiler with the ring sandwiched between. Now check fit the boiler/smokebox to the firebox. Remember the bottom of the boiler is parallel to the footplate. When happy with the alignment solder the boiler/smokebox to the firebox and solder the firebox to the footplate.

| No. | Description | Sheet |
|---|---|---|
| SB1 | Boiler and round top firebox wrapper 117 | B2 |
| SB2 | Boiler front former | A1 |
| SB3 | Boiler rear former | A1 |
| SB4 | Boiler joining strip | B3 |
| SB5 | Row of three washout plugs (2) | B3 |
| SB6 | Row of four washout plugs (4) | B3 |
| SB7 | Round top firebox front former | A1 |
| SB8 | Round top firebox rear former | A1 |
| SB9 | Firebox band joining clips (4) | B2 |
| SB15 | Smokebox base | B2 |
| SB16 | Early smokebox front former | B3 |
| SB17 | Later smokebox front former | B3 |
| SB18 | Smokebox rear former (2) | B3 |
| SB19 | Flush riveted smokebox wrapper | B1 |
| SB20 | Snap head riveted smokebox wrapper | B1 |
| SB21 | Smokebox and boiler ring | B2 |
| SB22 | Smokebox side step | B2 |
| SB23 | Top feed overlay | B2 |

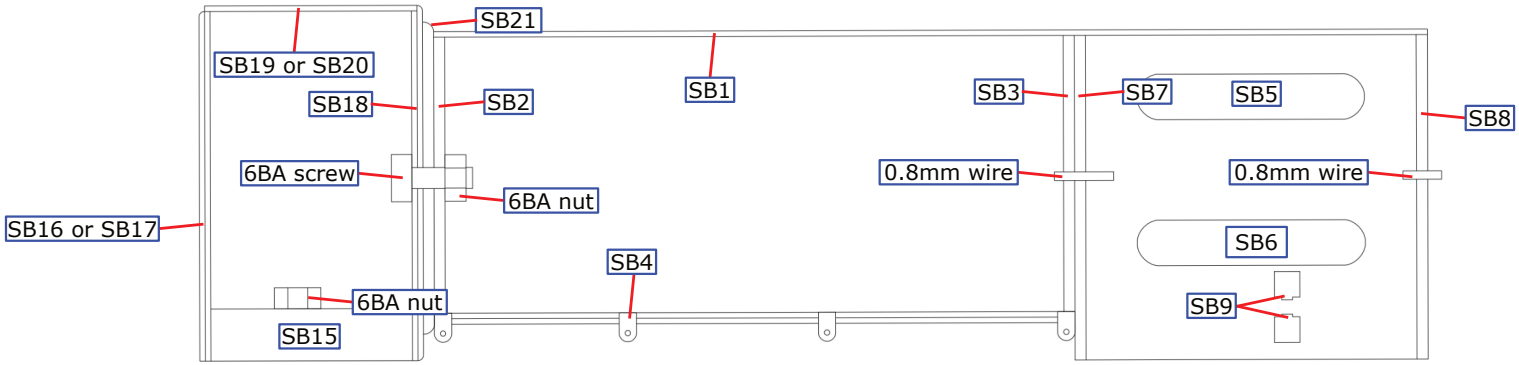



**Fig 13. S4 Boiler**

# FORMING THE BELPAIRE FIREBOX 1

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

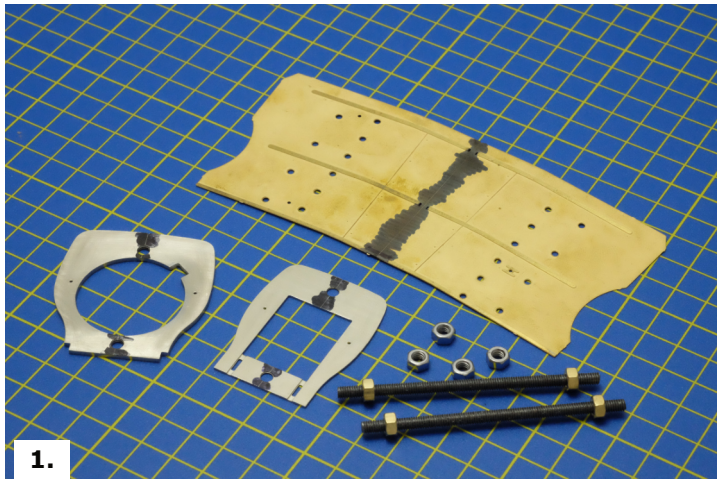
**Photo 1.** Solder together the two laminations of the firebox front (SB1) with top lamination (SB2). Clean the cusp off all parts, including the firebox rear former (SB3). Reduce the width of the lower faces of the firebox rear former so that it will fit between the frames in the locating groove in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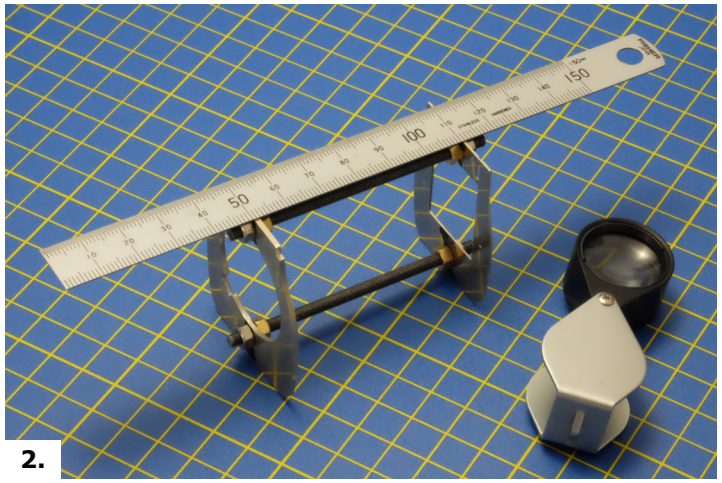
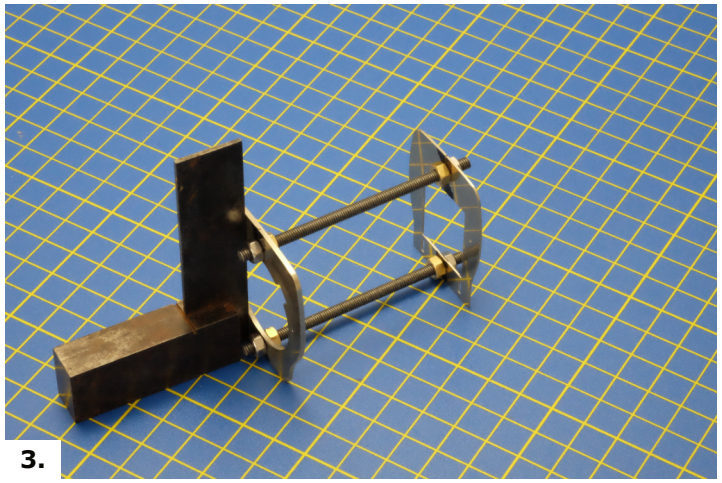


2.


3.

# FORMING THE BELPAIRE FIREBOX 2

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

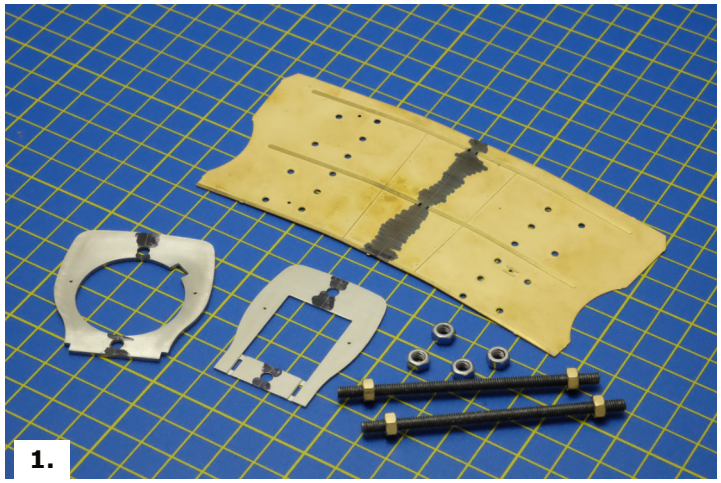
**Photo 1.** Solder together the two laminations of the firebox front (SB1) with top lamination (SB2). Clean the cusp off all parts, including the firebox rear former (SB3). Reduce the width of the lower faces of the firebox rear former so that it will fit between the frames in the locating groove in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



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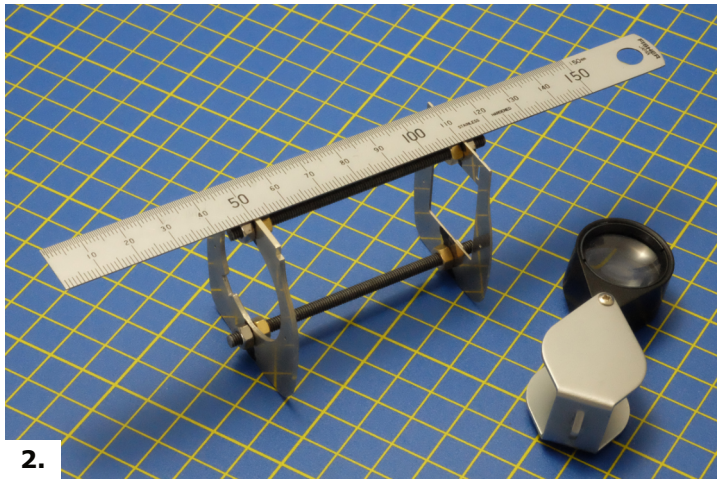

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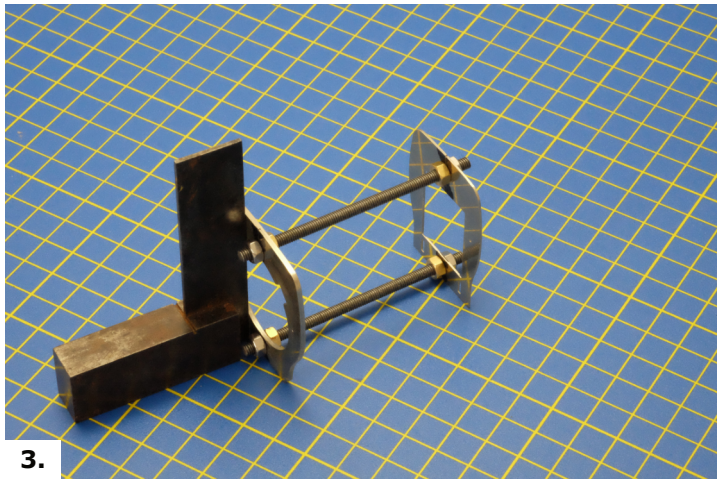


3.

# BELPAIRE (B4) BOILER AND SMOKEBOX

Solder together the two laminations of the firebox front former (SB10). The firebox front and the rear formers (SB11) must now be spaced apart by using suitable long bolts and washers through the pairs of holes in both front and rear. Some old brass chassis spacers joined together with studding would be suitable. When correctly spaced apart (35.3mm inside, 37.1mm outside) the front will fit in the half etched recess in the footplate and the cab front (pegged to the firebox rear with 0.8mm wire) will fit in the half etched slot in the footplate. File a little from the lower edge of the firebox rear former so that it rests in front of this slot.

Emboss the rivets for the ends of the cladding fixing bands on the firebox wrapper, early (SB12) or late (SB13). In pencil mark the wrapper centre on its inside and outside. Using the notch in the top of the formers as a guide, centre the wrapper and mark in pencil the position of the top bends.

Form the bends over a suitable rod held in a vice. When happy with the forming solder the wrapper to the formers ensuring a large fillet of solder around the front join. Remove the temporary spacers and check the fit on the footplate. Round the front edges and corners of the firebox with a file using photographs as a guide. Fold the firebox band joining clips (SB9) by bending near the small hole, solder in place from inside and complete with a short piece of 0.45mm wire to represent the tightening bolt. Solder the firebox washout plugs in place using a suitable combination of the three row, two row or individual washout plugs (SB5, SB6 or SB14).

Remove the boiler from the boiler and firebox wrapper (SB1) by cutting behind the rearmost boiler band. This is best done with a sharp knife on a hard surface. Emboss the rivets on the dome boiler band. If you wish to fit the separate boiler washout plugs (SB14) drill out the half etched ones in the boiler wrapper. Form the boiler by rolling. Solder a 6BA nut over the hole in the centre of the boiler front former (SB2) to allow the smokebox to be screw fixed to the boiler. Check the boiler wrapper for fit around the front (SB2) and rear formers (SB3). Bend the boiler band joining clips on the boiler joining strip (SB4) and fit through the small slots from inside the boiler. The cutouts in the formers are to clear the boiler joining strip and the etched notch at the top of the rear former must align accurately with the small slot in the wrapper. If the fit of the joining strip and formers is good, solder the wrapper ends together with the joining strip and fit the formers 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 with the firebox. Check the boiler/firebox fit. Represent the bolts in the joining clips using 0.45mm wire.

**Return to page 12 for the smokebox construction instructions.**

| No. | Description | Sheet |
|---|---|---|
| SB1 | Boiler and round top firebox wrapper 117 | B2 |
| SB2 | Boiler front former | A1 |
| SB3 | Boiler rear former | A1 |
| SB4 | Boiler joining strip | B3 |
| SB10 | Belpaire firebox front former (2) | A1 |
| SB11 | Belpaire firebox rear former | A1 |
| SB12 | Early Belpaire firebox wrapper | B1 |
| SB13 | Later Belpaire firebox wrapper | B1 |
| SB14 | Individual washout plugs (4) | B1 |
| SB15 | Smokebox base | B2 |
| SB16 | Early smokebox front former | B3 |
| SB17 | Later smokebox front former | B3 |
| SB18 | Smokebox rear former (2) | B3 |
| SB19 | Flush riveted smokebox wrapper | B1 |
| SB20 | Snap head riveted smokebox wrapper | B1 |
| SB21 | Smokebox and boiler ring | B2 |
| SB22 | Smokebox side step | B2 |
| SB23 | Top feed overlay | B2 |

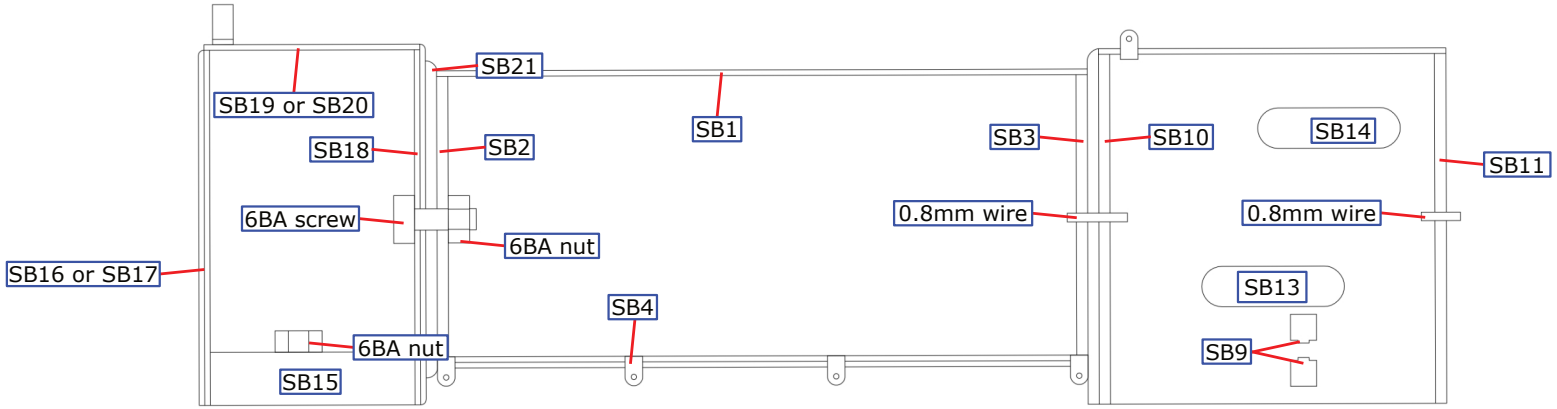



**Fig 14. B4 Boiler**

# FINAL DETAILING

**See Fig 15 on page 17.**

Add the handrails above the front step using short handrail knobs and 0.8mm wires. Add the sandboxes (WM5) as shown in Fig. 15. Solder the vacuum pipe (BR19) to the buffer beam and then add the vacuum pipe dummy (BR20). Construct the buffers as shown below and add the buffer housings (WM6) to the buffer beam. Fold the lamp brackets, centre (U29) and outer (U30), and solder in place on the buffer beam. Attach the ATC plunger switch (WM15) to the ATC shoe casting (BR21) and then solder the shoe casting to the back of the buffer beam.

With the boiler mounted on the footplate, now is the time to detail it. Add the appropriate smokebox door, early (WM7) or late (WM8) to the smokebox. Add the smokebox door handles (BR22). If required, add the steam lance cock (BR23) to the smokebox front in the position indicated by your prototype photograph. Again, if required, add the smokebox pipe cover (WM9) on the right hand side. Add the cylinder cover flap (SB26).

Choose the correct chimney, either tapered (WM10 ) or parallel (BRCU1) and fit it over the hole in the smokebox. If required, add the top feed (WM11 )and the pipes. Ensure that the inside of the dome (WM12 ) fits inside the dome and the attach it to the boiler. Polish the dome (BR24) and then solder the dome lubricator (BR25) in the hole on top. Fit the dome to the boiler. Fit the safety valve base (WM13) to the firebox. Fit the safety valves (BR26) to the base. Polish and the attach the appropriate safety valve cover, round top (BR27) or Belpaire firebox (BR28).

Fit the firebox side bracket (SB24) or the firebox side bracket cover (SB25) as required.

Slightly curve the fall plate (U25) and hinge to the footplate with staples of 0.45mm wire as shown in Fig 5.

Similarly, if required, fold up the ATC conduit from 0.45mm wire and attach to the valance using lengths of the ATC conduit bracket strip (U16), see Fig. 16.

Fix the ATC tank (WM14) and the ATC battery box (WM17) to the inside of the right hand cab sheet as shown.

| No. | Description | Sheet |
|---|---|---|
| SB24 | Firebox side bracket (2) | A1 |
| SB25 | Firebox side bracket cover (2) | A1 |
| SB26 | Cylinder cover flap | B3 |
| U25 | Fallplate | B3 |
| U26 | Straight reversing rod, 2301-2360 | B3 |
| U27 | Curved reversing rod 2381-2580 | B3 |
| U28 | Smokebox Lamp bracket 105 | B3 |
| U29 | Lamp bracket, buffer beam centre | B1 |
| U30 | Lamp bracket, buffer beam outer (2) | B2 |

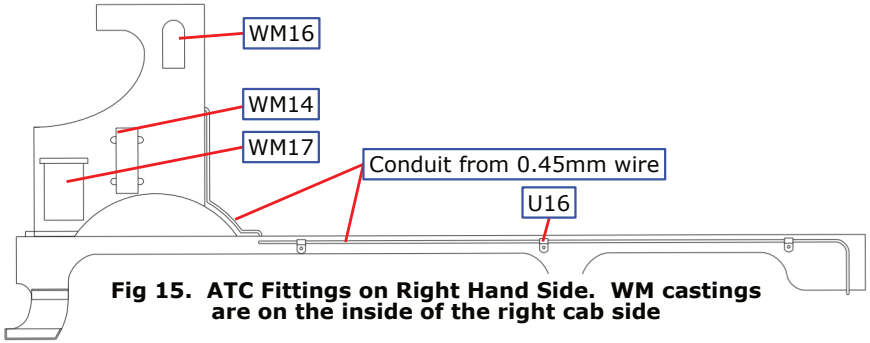



**Fig 15. ATC Fittings on Right Hand Side. WM castings are on the inside of the right cab side**

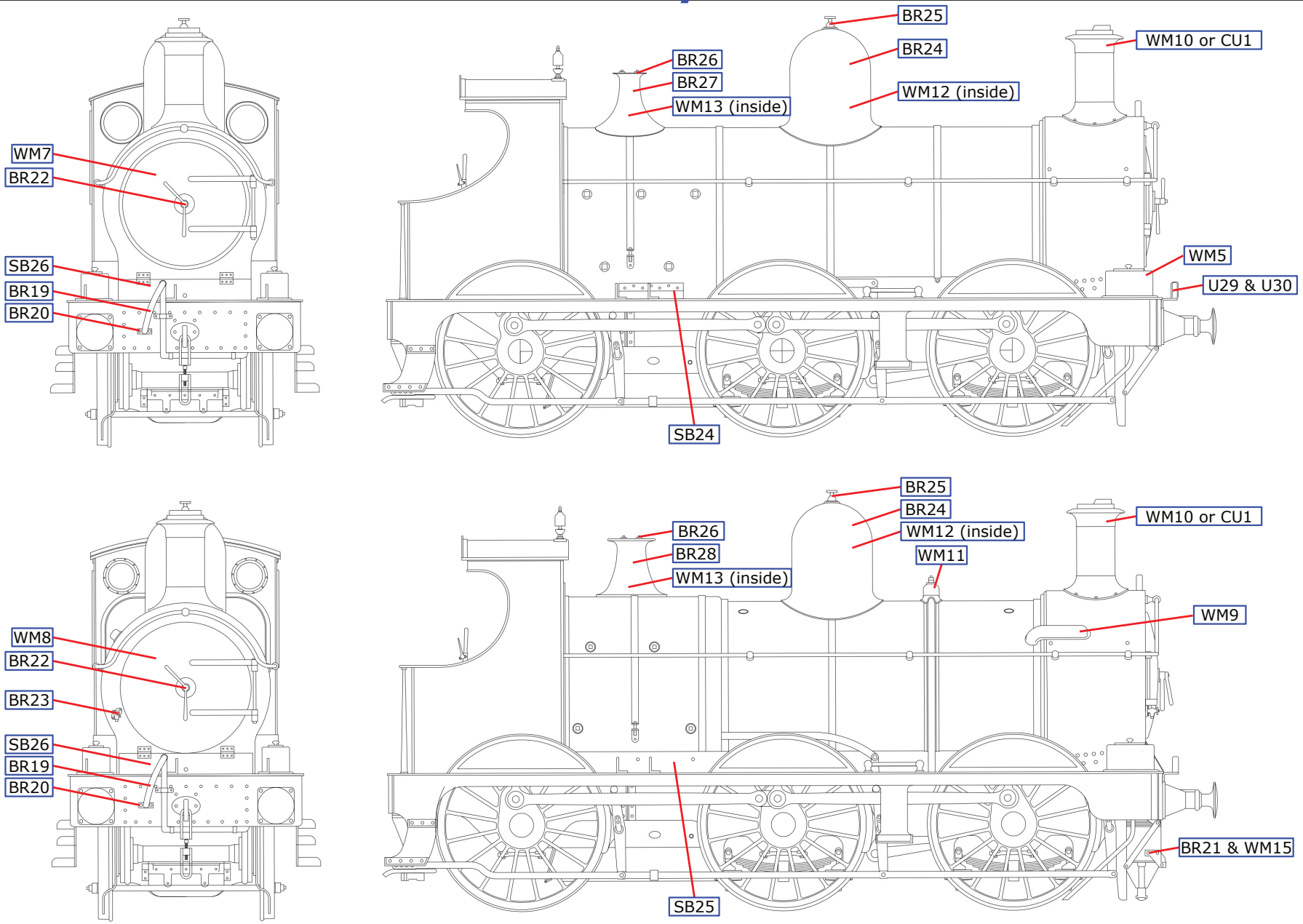
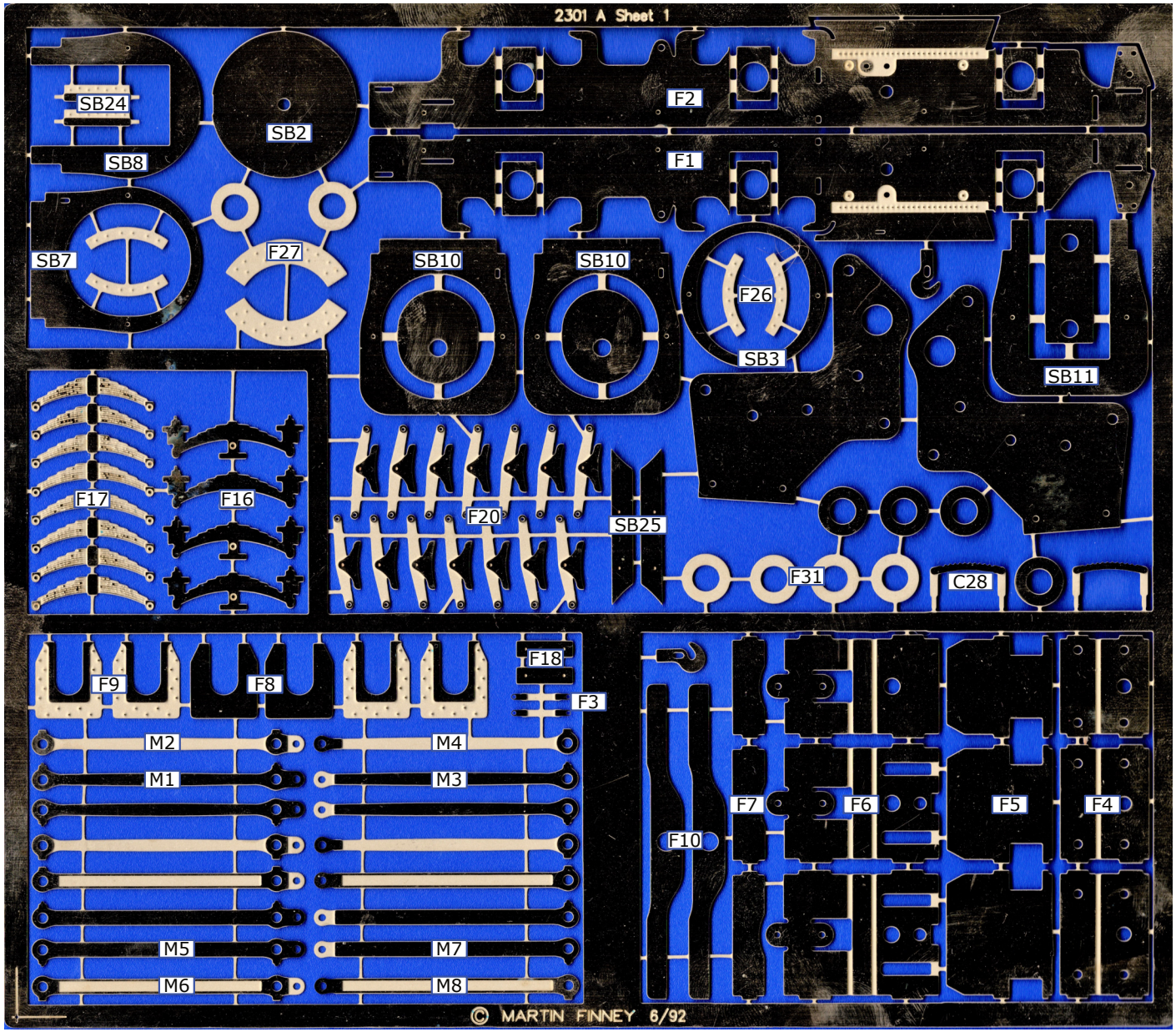
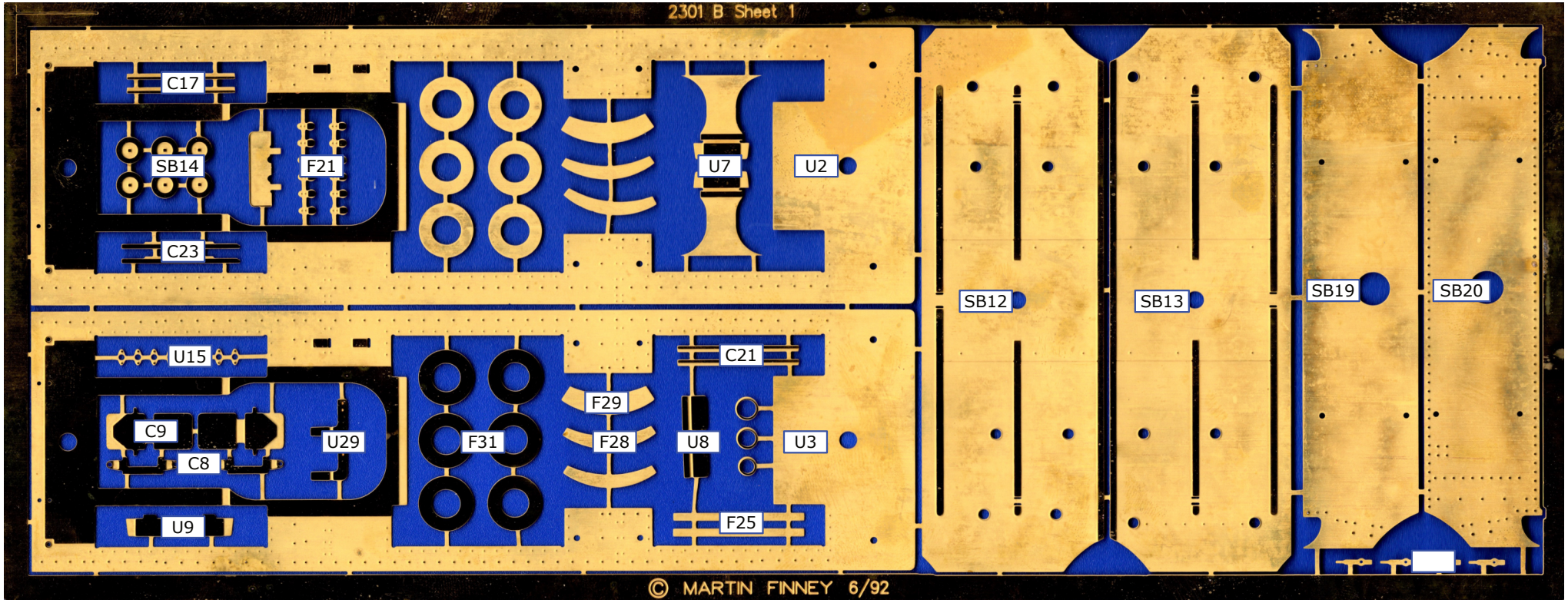



**Fig 16. Final Details**

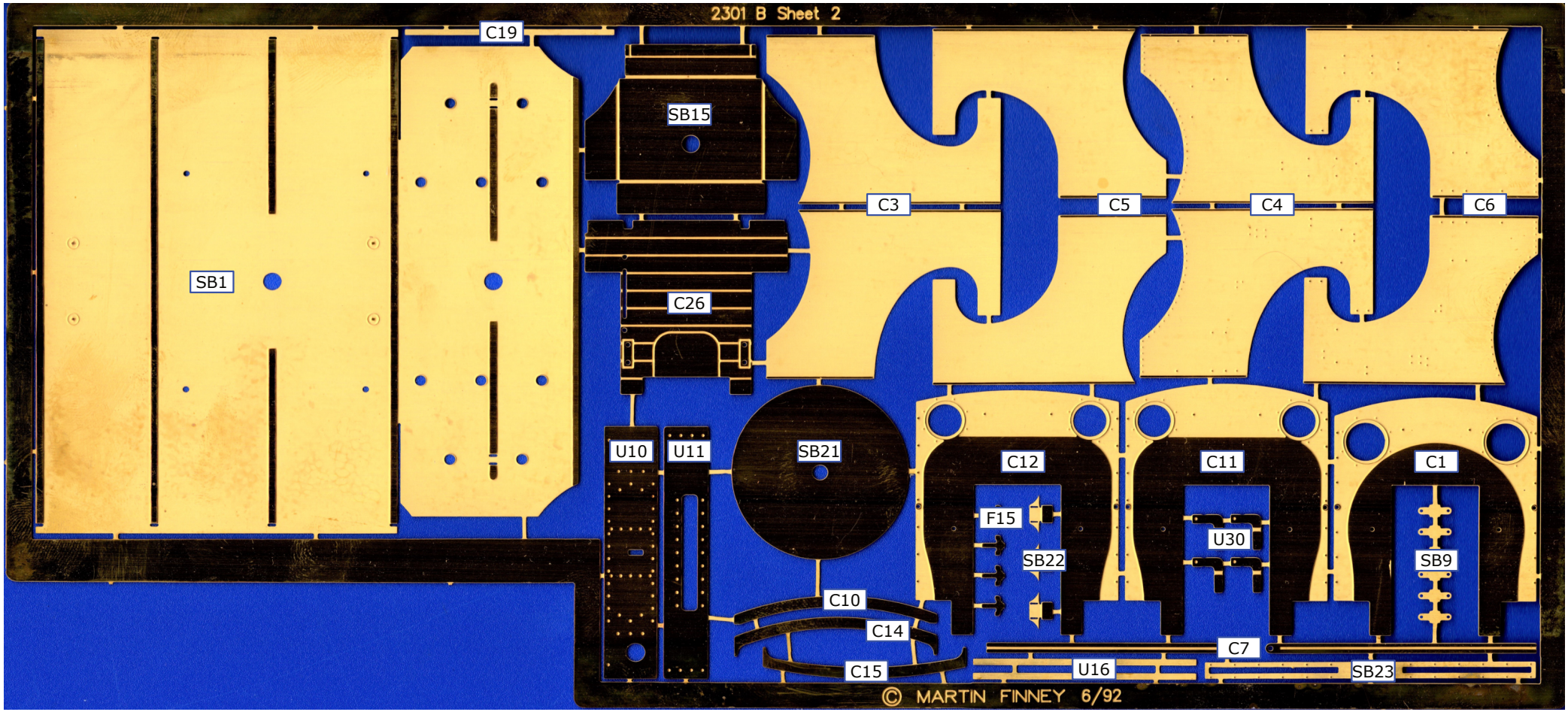
# NICKEL SILVER ETCH A1



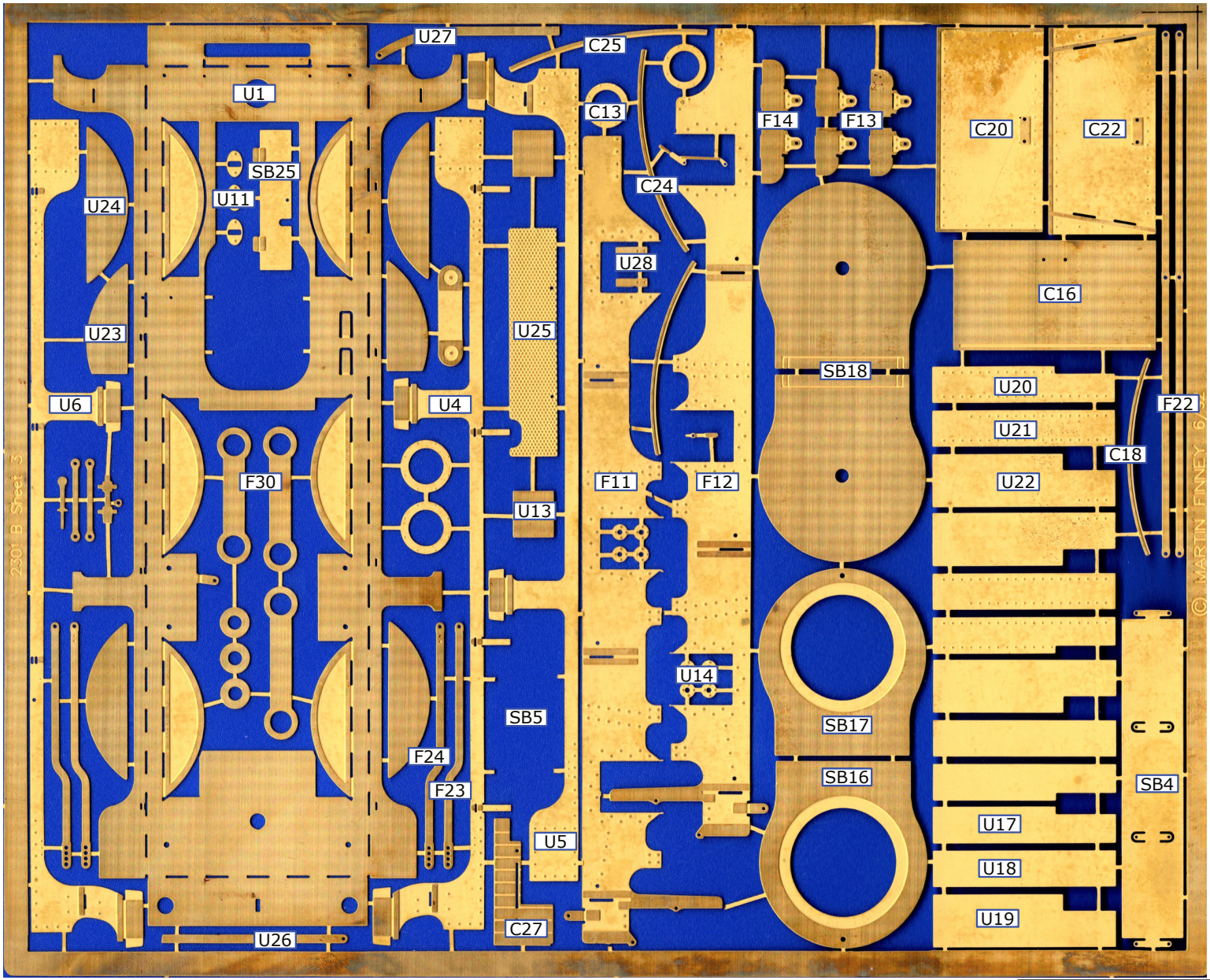
# BRASS SHEET B1 & B2



# BRASS ETCH B2



# BRASS ETCH B3



# Finney7

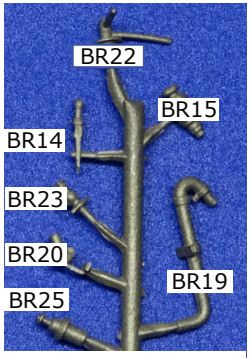
# BRASS CASTINGS

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| CU1 | Parallel chimney | 3232/1 | BR10 | Regulator mounting | Stella/3 | BR20 | Vacuum pipe dummy | Stella/2 |
| BR1 | Left steam brake cylinder | Cab/1 | BR11 | Regulator handle | Backhead/1 | BR21 | ATC Shoe | Details/1 |
| BR2 | Right steam brake cylinder | Cab/1 | BR12 | Cab pressure gauges | Stella/3 | BR22 | Smokebox door handles | Stella/2 |
| BR3 | Mud hole clamps | Loose | BR13 | Combined ejector/brake | Backhead/3 | BR23 | Steam lance cock | Stella/2 |
| BR4 | Large whistle | 1854/2 | BR14 | Combined ejector/brake handle | Stella/2 | BR24 | Dome | Stella/1 |
| BR5 | Small whistle | 1854/2 | BR15 | Clackbox (2) | Stella/2 & 3232/5 | BR25 | Dome lubricator | Stella/2 |
| BR6 | Lever reverse handle | Stella/3 | BR16 | Jockey valve and regulator linkage | Backhead/1 | BR26 | Safety valves | Details/1 |
| BR7 | Firebox door handle | Backhead/2 | BR17 | Jockey valve | Backhead/1 | BR27 | Round top firebox safety valve bonnet | Duke/6 |
| BR8 | Firebox shelf | Backhead/3 | BR18 | Sightfeed lubricator | 3232/5 | BR28 | Belpaire firebox safety valve bonnet | 1854/2 |
| BR9 | Water gauge | Backhead/3 | BR19 | Vacuum pipe | Stella/2 | | | |

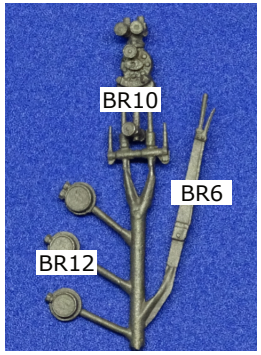
3232/1

Stella/1

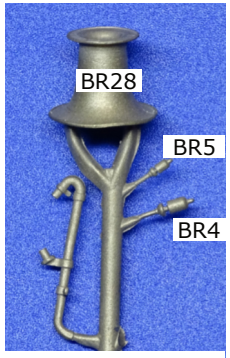
Duke/6

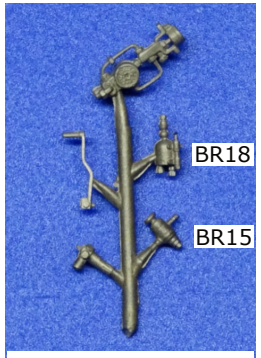
Stella/2



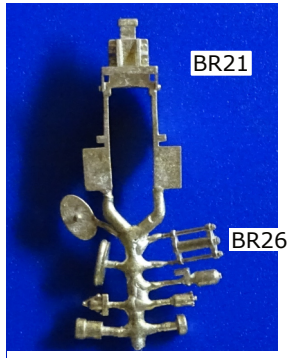
Stella/3



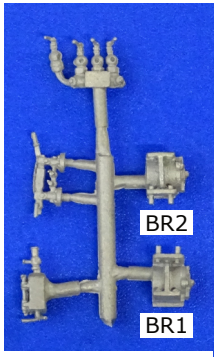
1854/2



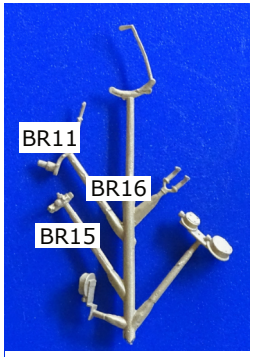
3232/5



Details/1

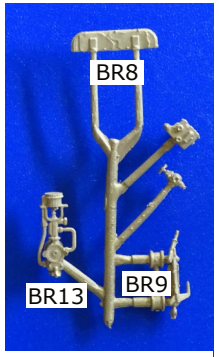


Cab/1



Backhead/1

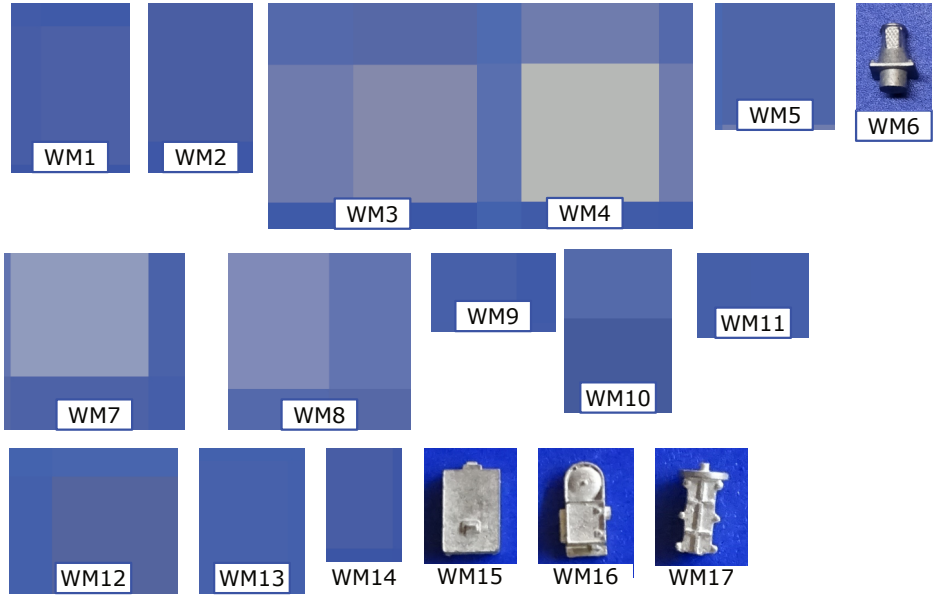
Backhead/2



Backhead/3

# WHITEMETAL CASTINGS

| | | |
|---|---|---|
| WM1 | 1 | Lever reverse base |
| WM2 | 2 | Rear springs |
| WM3 | 1 | Round top backhead |
| WM4 | 1 | Belpaire backhead |
| WM5 | 1 | Sandbox |
| WM6 | 2 | Dean taper buffers |
| WM7 | 1 | Early smokebox door with ring |
| WM8 | 1 | Later smokebox door |
| WM9 | 1 | Smokebox pipe cover |
| WM10 | 1 | Tapered Chimney |
| WM11 | 1 | Top feed |
| WM12 | 1 | Inside of dome |
| WM13 | 1 | Safety valve base |
| WM14 | 1 | ATC Tank |
| WM15 | 1 | ATC Plunger switch |
| WM16 | 1 | ATC Bell |
| WM17 | 1 | ATC Battery box |




## OTHER COMPONENTS

3/16" bore bearing (6)
6BA x ¾" Brass screws (1)
6BA x 5/16" Brass screws (2)
6BA nuts (2)
Short handrail knob (8)
Medium handrail knob (1)
Long hand rail knob (4)
Buffer head, bush, washer & spring (2)
Vacuum pipe hose

1/8" brass wire for compensation beam pivot
5/32" OD brass tube for compensation beams
1.6mm Steel wire for front compensation beam
0.45mm Brass wire for fallplate hinges and ATC conduit
0.8mm Brass wire for brake hanger pivots and handrails
1.2mm Brass wire for vacuum pipe and sand pipes
1.4mm Brass wire for top feed pipe
0.8mm Nickel silver wire for cab hand rails
1.6mm Nickel silver for coupling rod fork joints
0.8mm & 1.5mm Copper wire for backhead pipes