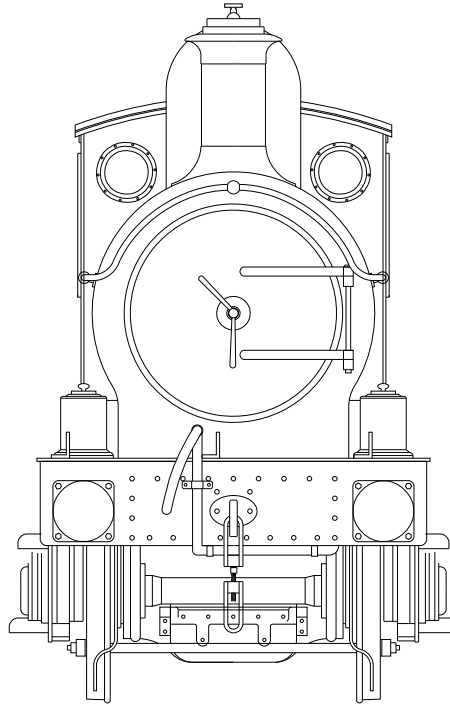


## GWR STELLA



### **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

Between 1884-87 Dean carried out a standardisation scheme involving four classes of engine, passenger 2-4-0 tender and tank locos and goods 0-6-0, tender and tank engines. Some of the locos were broad gauge and all had identical cylinders and motion, double frames of a neat design and coupled wheels of the same size with springs hung underneath the axles. They were all rebuilt into standard gauge tender engines.

| Lot | Numbers   | Built   | Original condition           | Date rebuilt |
|-----|-----------|---------|------------------------------|--------------|
| 65  | 3201-3205 | 1884-85 | Standard gauge tender engine |              |
| 64  | 3501-3510 | 1885    | Broad gauge tank             | 1892         |
| 64  | 3511-3520 | 1885    | Standard gauge tank          | 1894-1895    |

From 1895 there were 25 basically similar 2-4-0 tender engines with significant differences, depending on their origin. We have tried to accommodate this in the design of the kit. As is usual for Great Western engines the most obvious variation is in boilers. S2 boilers were fitted until the S4 and B4 boilers included in the kit were used from around the turn of the century.

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. G.W.Engines, Vol 1 by J.H.Russell on pages 151 - 156 has some useful photographs.

This kit will build any of the class from circa 1900 to 1933. The following Swindon drawings were used to design the kit:

|        |         |   |
|--------|---------|---|
| 16937  | 10/1900 | Lot 65 Standard boiler No.3 in lot 65 frames        |
| 61305  |         | Diagrams E,O & Y Maximum cross section              |
| 11385  | 1885    | Lot 67 Arrangement of boiler mountings (2361 class) |
| 114761 | 4/1940  | General arrangement- Dean goods (2301 class)        |
| 11532  | 8/1940  | Arrangement of motion-1700,2301,2700 classes        |

## TENDERS

3201-3205 were initially fitted with standard, Dean 2500 gallon tenders. 3510-3520 when rebuilt seem to have been given old iron frame Armstrong tenders. From the early years of the century many were paired with Dean 2000 gallon tender originally fitted to 'Dukes' and indeed some kept such tenders until withdrawal. In later years the majority had the Dean 2500 gallon type and at least one (3515) had a tender of 3000 gallons capacity.

## VARIATIONS/MODIFICATIONS

**Cabs.** The cabsides of Lot 65 had a very large cut-out whereas the cabs of the rebuilt engines had a smaller cut-out giving more protection to the crew. With the fitting of Belpaire fireboxes the cabs were raised to allow the spectacle windows to be fitted higher up. Steel cab roofs replaced the canvas covered wood.

**Steps.** Many different arrangements, determined by the origin of the engine.

**Smokebox.** Latterly many acquired new/overhauled smokeboxes with snap head rivets and some Churchward type smokebox doors without the ring.

**Frame patches.** Outside frame strengthening plates were fitted to many in later years.

**Firebox side brackets.** These were fitted with a cover on some engines in later years.

**Lower front wheel splasher.** Removed around the time of the Great War.

**Coupling rods.** Originally plain but some engines subsequently fitted with fluted rods.

## 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.

The chassis 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.

## COMPONENTS NOT SUPPLIED

### WHEELS

|  |                    |
|--|--------------------|
| Driving wheel - 5' 2", 16 spoke, 3/16" diameter axle (2)                                       | Slater's Ref. 7862 |
| Extended axles with outside cranks (X720052G). These cranks do not fit but you need the axles. |                    |
| Leading wheel - 3' 8" diameter, 10 spoke, 3/16"" diameter axle                                 | Slater's Ref. 7843 |

### MOTOR/GEARBOX

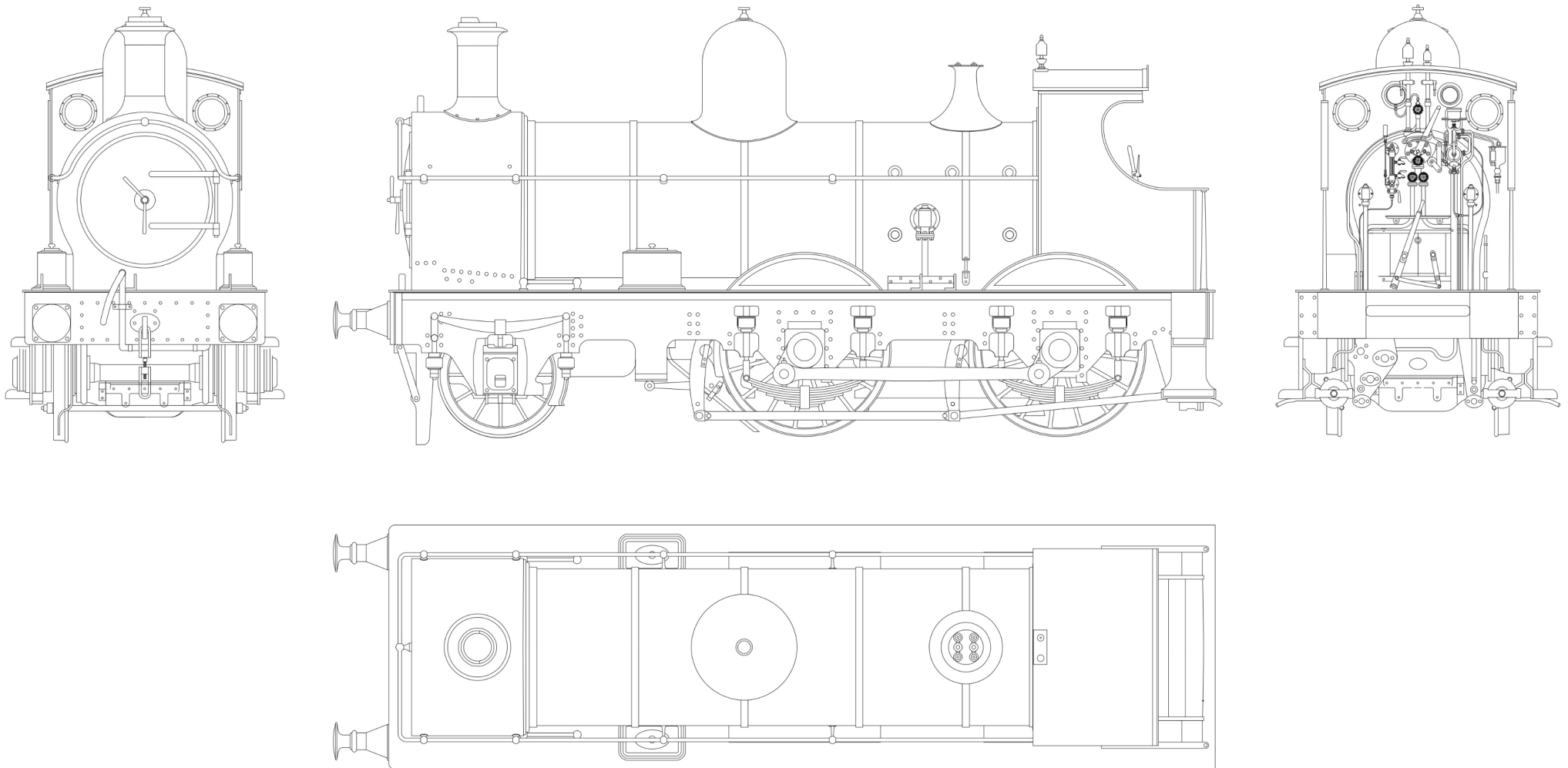
A Canon motor with a SDMP 40L/15 gearbox (available from Finney7) or an alternative such as an ABC VML2 gearbox.

### CRANKPINS

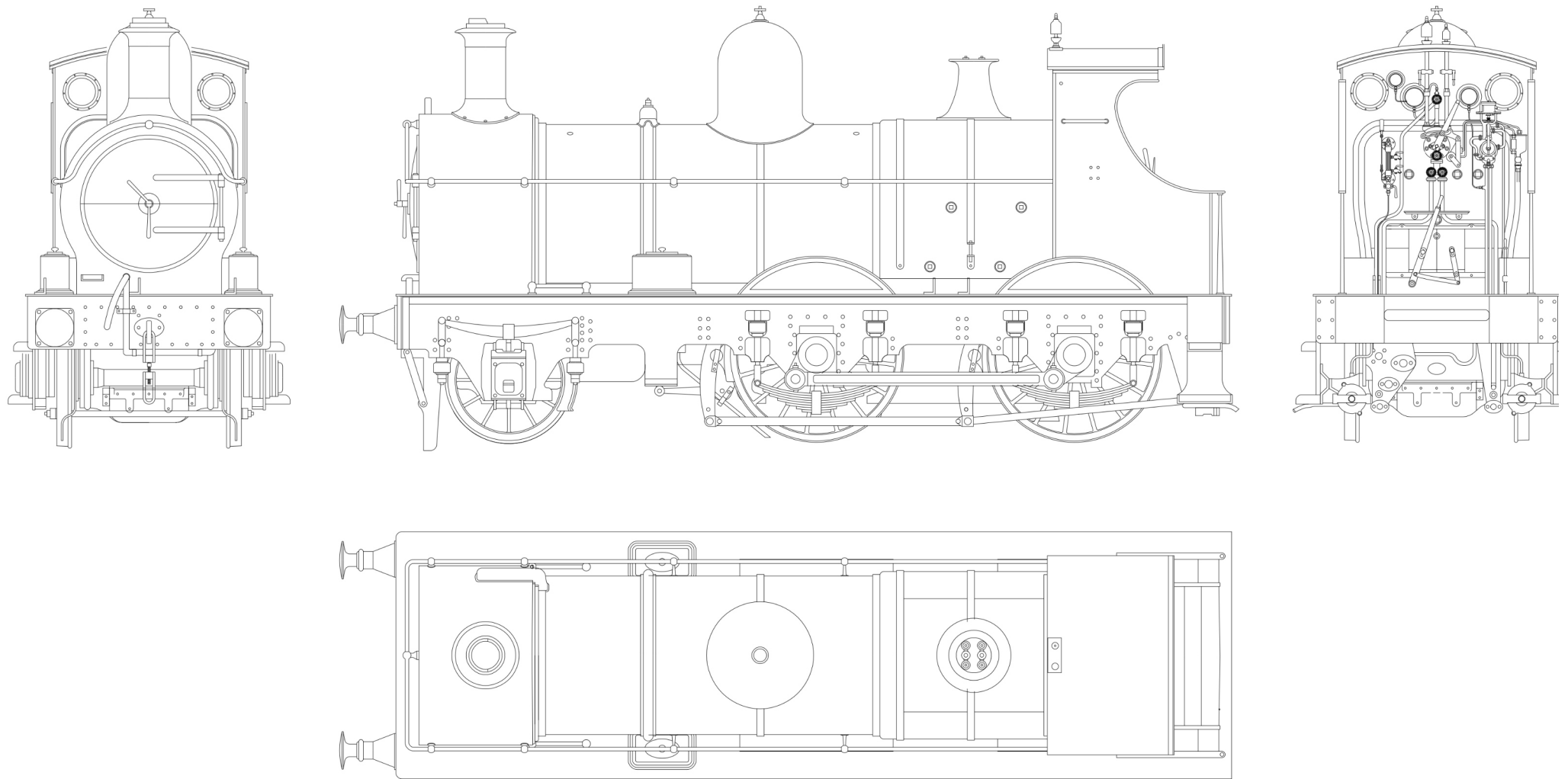
Steel crankpins are available from Finney7.

### INSIDE MOTION

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



**Fig 1. Stella GA. S4 Boiler, low cab, both firebox and backhead clack boxes are shown, fish belly coupling rods, leading wheel splasher.**



**Fig 2. Stella GA. B4 Boiler, high cab, top feed, fluted coupling rods, leading wheel splasher.**



## 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 lamination perfectly aligned.

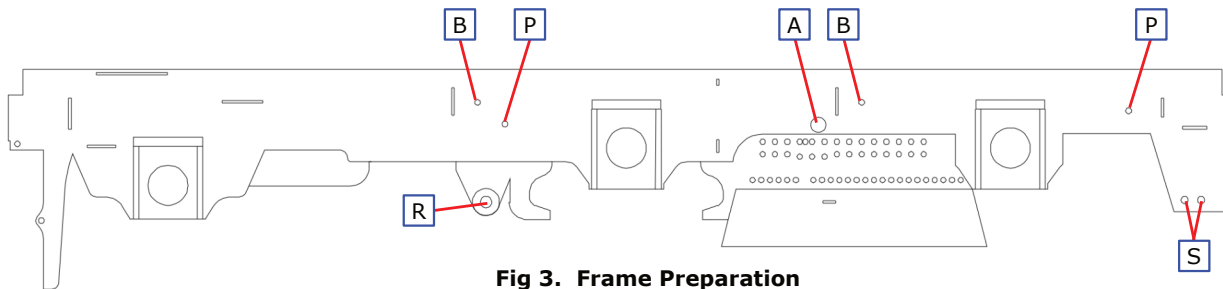
The rods have been deliberately etched too large so that the thin etched edges can be carefully filed so that the 'laminated' effect is lost and the rods appear to be made from one piece of metal.

Prepare the inside frames (F1 & F2). Open out the following holes in the frames:

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

Fold the ash pan sides along the half etched lines. The last job on the frames is to emboss the rivets marked by the half etched holes.

If you are fitting compensation now is the time to build the hornblocks from the HB2 GWR Small Hornblocks kit using the instructions in the kit.



**Fig 3. Frame Preparation**

**Compensation Beams.** Cut a 5mm piece of 1/8" brass rod for the pivot. Place the compensation beam (F6) in place in the hornblocks and then thread the rod through the frame hole A and the compensation beam. Solder the rod to the frames so that it is flush with the outside and there is no solder on the inside face of the frame. Some card packing might help.

Fit the tube to the compensation beams and solder in place central to the compensation beam. Place a paper washer over the rod to keep the 1/8" washer away from the tube and solder the washer to the rod. Ensure the beam rocks easily.

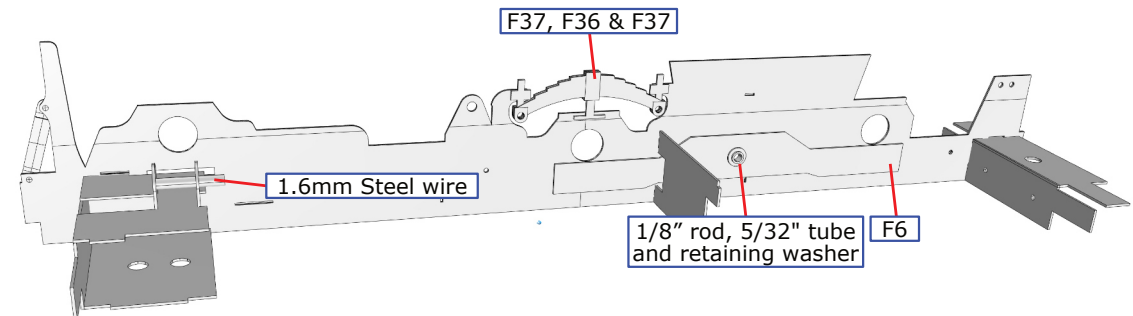
Repeat for the other frame.

Temporarily fit all the wheels and axles and confirm that the compensation works properly and check that the chassis is sitting level.

| No. | Description   | Sheet |
|-----|---|-------|
| M1  | Fluted coupling rod outer laminate                      | A1    |
| M2  | Fluted coupling rod inner lamination                    | A1    |
| M3  | Plain coupling rod outer lamination                     | A1    |
| M4  | Plain coupling rod inner lamination                     | A1    |
| F1  | Left inside frame                                       | A1    |
| F2  | Right inside frame                                      | A1    |
| F36 | Leading driven axle inner spring, middle lamination (2) | A2    |
| F37 | Leading driven axle inner spring, outer lamination (4)  | A2    |



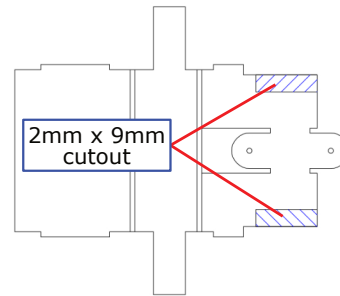
**Fig 4. Modification to the Compensation Beam**



**Fig 5. Compensation**

## INNER FRAMES CONSTRUCTION 1

If you have fitted working hornblocks, modify the front frame spacer (F3) as shown in Fig 4.

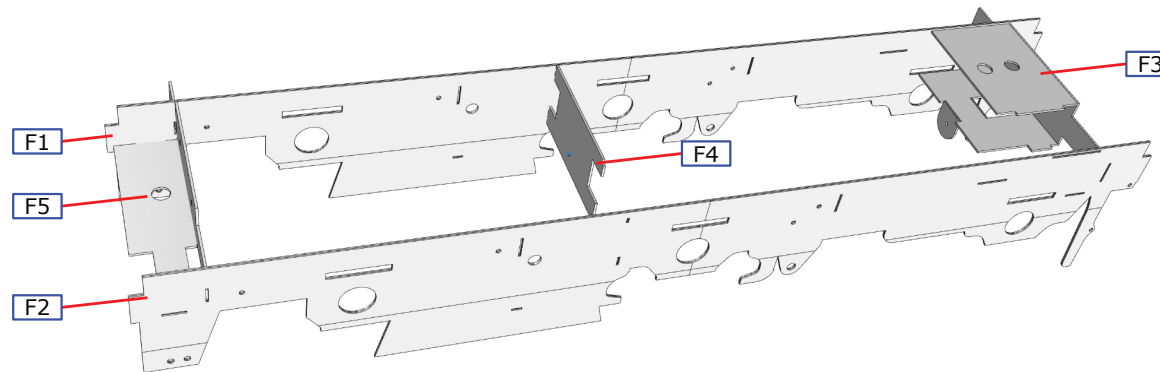


**Fig 6. Modification to the Front Frame Spacer**

Fold down the small tabs for the front compensation beam on the front spacer and solder the 1.6mm steel wire beam in place. Fold up the front and rear frame spacers (F3 & F5) making sure the 1/2 etched fold lines are on the inside 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 firebox frame spacer (F4) to the frames. It is important to check constantly that the chassis is square and the frames are straight.



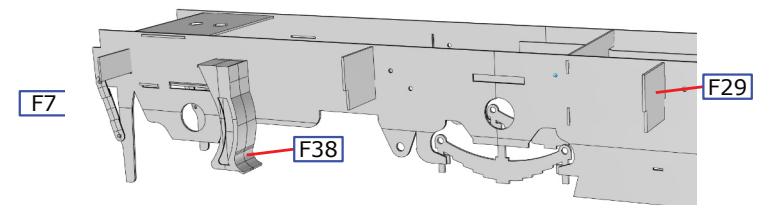
**Fig 7. Inner Frame Construction**

Laminate the leading driven axle inner spring etches (F36 & F37) together. Place the axleboxes in place in the hornblocks and mount the springs on the frames; this will prevent the axlebox from being removed.

At the front fit the guard iron struts (F7) using 0.8mm wire to represent the bolts, and then form the guard irons to shape.

Solder 0.8mm wire through the frame holes labelled B to form the brake hanger pivots and remove the sections of wire between the frames.

Solder the outside frame spacers (F26) in place. Fold the leading axle splashers (F38) as shown and then solder in place on the chassis.



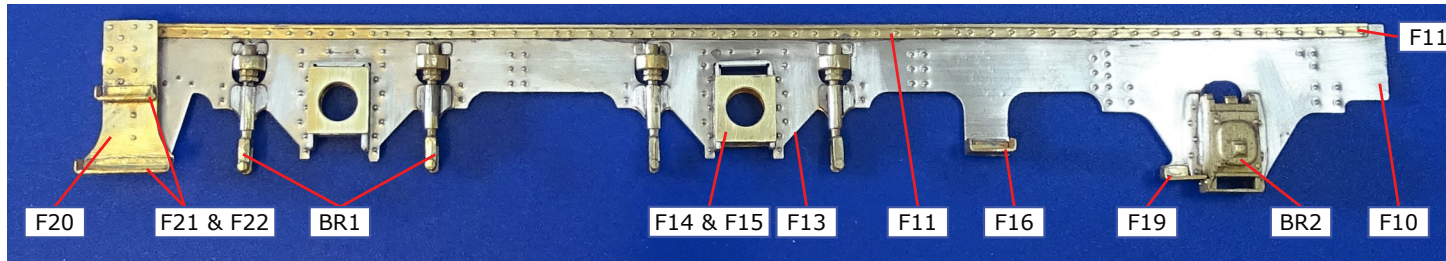
**Fig 8. Outside Frame Spacers**

| No. | Description                | Sheet |
|-----|----------------------------|-------|
| F3  | Front frame spacer         | A2    |
| F4  | Firebox frame spacer       | A2    |
| F5  | Rear frame spacer          | A2    |
| F6  | Compensation beams (2)     | A1    |
| F7  | Guard iron struts (2)      | A2    |
| F8  | Vacuum pipe union (4)      | C2    |
| F26 | Outside frame spacer (4)   | A2    |
| F38 | Leading wheel splasher (2) | C1    |

## OUTSIDE FRAMES, BUFFER BEAM & DRAG BEAM

Fold up the rear end of the outside frames, left and right (F9 & F10). Emboss the rivets; if fitting the outside frame strengthening plate (F12) omit the rivets which will lie behind the plate. Attach the outside frame rivet strips (F11) to the top of the outside frames, the left hand strip is the one with two unriveted extensions at right angles to the main strip and these extensions should be left free to hold the vacuum pipe free. If required, fit the outside frame strengthening plate (F12) on the outside of the frames between the driven wheels. Fold up the outside frame horn guides (F13) and solder in place in the outside frames so that they are flush at the back. Fold up the outside frame axle boxes (F14), place the outside frame axlebox front (F15) in place and solder together. Open out the axle holes to be a sloppy fit on the axle and check that they are an easy fit in the horn guides and ease if necessary. These axle boxes are simply cosmetic. Solder the underhung spring hangers (BR1) in place. Solder the leading axleboxes (BR2) onto the half relief on the horn guides with the keep plates touching the bottom of the frames. Fit the leading axle springs (BR3) and spring hangers (BR4) as shown in the GAs (Fig 1 & 2).

**Steps 3201-5 and 3501-10.** Solder the front step tread (F16) to the step back that forms part of the outside frames as shown. Fold up and then solder in place the step tread adjacent to the axleboxes (F19). Emboss the rivets on the rear step back (F20) and the solder it in place on the fold over support at the rear of the outside frames. Solder in place the upper and lower rear step treads (F21 & F22)



| No. | Description                                 | Sheet |
|-----|---|-------|
| F9  | Left outside frame                          | A1    |
| F10 | Right outside frame                         | A1    |
| F11 | Outside frame rivet strip (2)               | C2    |
| F12 | Outside frame strengthening plate (2)       | A1    |
| F13 | Outside frame horn guides (4)               | A1    |
| F14 | Outside frame axleboxes (4)                 | C2    |
| F15 | Outside frame axlebox front (4)             | C2    |
| F16 | Front step tread(2)                         | C2    |
| F17 | Front step back, 3511-20 (2)                | C2    |
| F18 | Front step stay, 3511-20 (2)                | C2    |
| F19 | Step tread adjacent to leading axlebox (2)  | C2    |
| F20 | Rear step back, 3201-5 & 3501-10 (2)        | C2    |
| F21 | Rear step upper tread, 3201-5 & 3501-10 (2) | C2    |
| F22 | Rear step lower tread, 3201-5 & 3501-10 (2) | C2    |
| F23 | Rear step back, 3511-20 (2)                 | C2    |
| F24 | Rear step upper tread, 3511-20 (2)          | C2    |
| F25 | Rear step lower tread, 3511-20 (2)          | C2    |

**Steps 3511-20.** Remove the step back that forms part of the outside frames. File a slot in the left front step stay (F18) through which the 1.2mm wire for the vacuum pipe can pass level with the rivet strip. Solder the front step back (F17) to the stay, solder this assembly to the outside frames where the portion of step back was removed. Solder the front step tread (F16) in place. Fold up and then solder in place the step tread adjacent to the axleboxes (F19). Solder the rear step back (F23) in place on the fold over support at the rear of the outside frames. Solder in place the upper and lower rear step treads (F24 & F25).

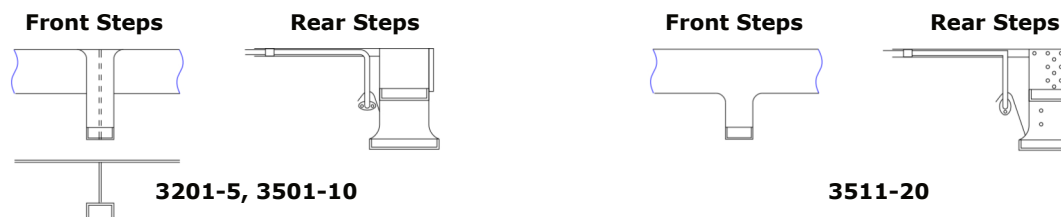
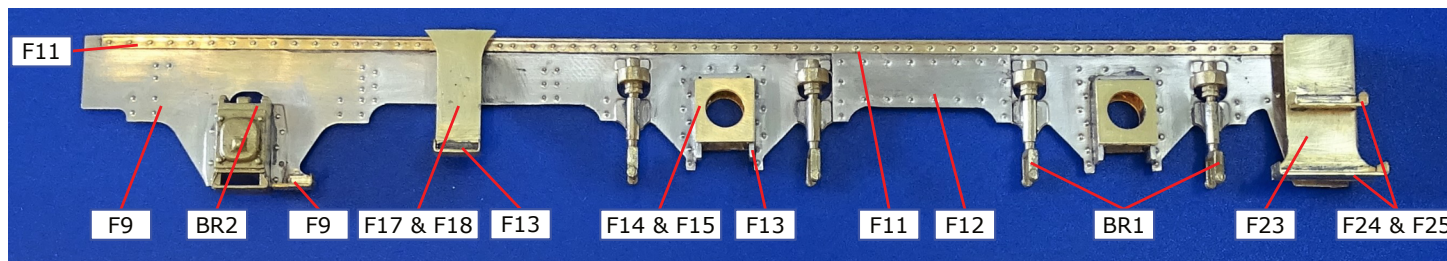


Fig 9. Arrangement of Steps

## FRAME ASSEMBLY

**Buffer Beam & Drag Beam.** Emboss the rivets on the buffer beam (F27) and fit the coupling pocket (F42). Emboss the rivets on the drag beam (F28) and attach the rubbing plates (F29). Solder both beams to the frames, locating the frames in the appropriate half etched slots; the beam upper edge must be 0.018" above the upper edge of the frames so that they will be flush with the footplate when it is fitted. Any piece of 0.018" material placed on top of the frames will help ensure correct alignment.

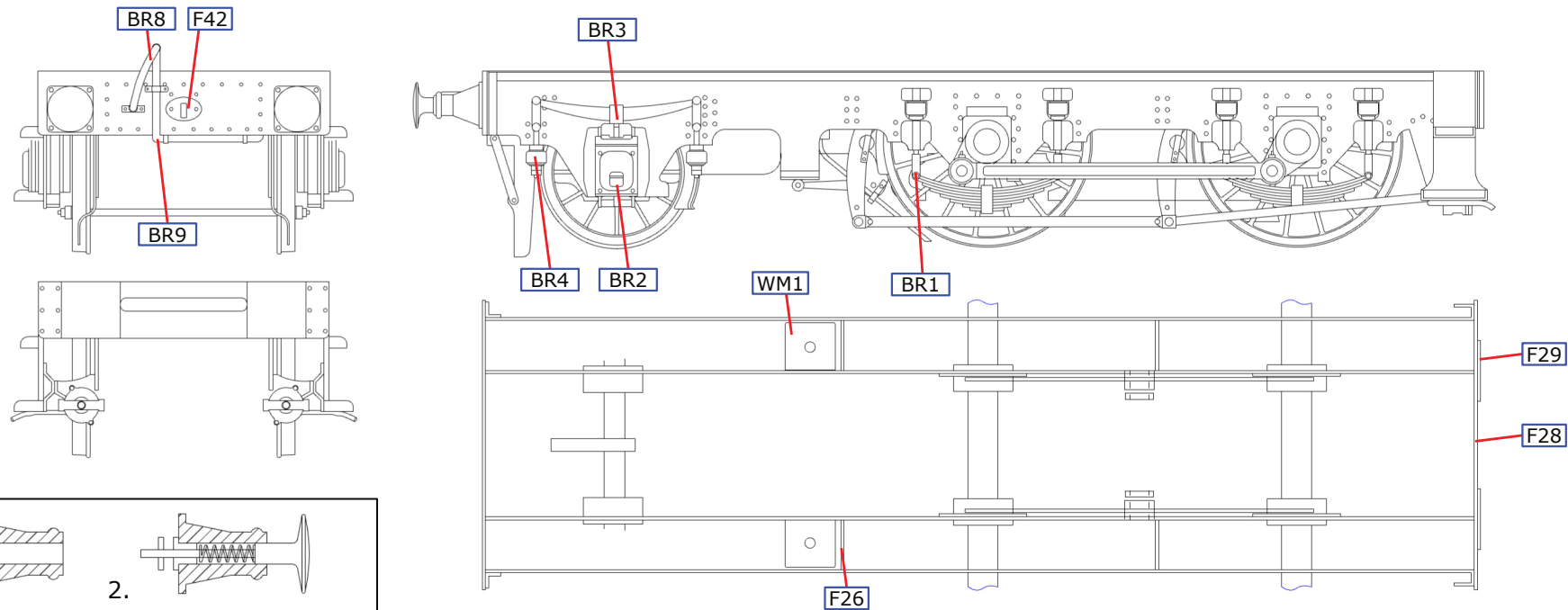
Align the top of the outside frames with the buffer beam and drag beam and tack solder in place. Fit the axles and outside frame axleboxes and ensure the axles move freely. When satisfied solder the outside frames to the spacers. Fold frame to buffer beam angle brackets (F30) at right angles along etched line and attach between frames and buffer beam.

Form and fit the vacuum pipe (1.2mm wire) to the left side retaining it with the clips attached to the lower edge of the rivet strip. Fit the sandboxes lower portion (WM1) to the frames (See Fig 1 and Fig 2.)

We have no information as to exactly where the balance weights fit on the wheels. We suggest opposite the cranks. (If you know better please let us know.)

Now fit and assemble the axles, wheels and motor. Retain the axleboxes in the horns with lengths of 0.8mm wire. Check that everything moves freely. When satisfied fit the cranks to the axle ends. Fit the coupling rods and confirm that everything still moves smoothly.

| No. | Description                              | Sheet |
|-----|--|-------|
| F26 | Outside frame spacer (4)                 | A2    |
| F27 | Buffer beam                              | A2    |
| F28 | Drag beam                                | C1    |
| F29 | Drag beam rubbing plates (2)             | C1    |
| F30 | Frame to buffer beam angle brackets (2)  | C2    |
| F39 | Leading driven wheel balance weight (2)  | A1    |
| F40 | Trailing driven wheel balance weight (2) | A1    |
| F42 | Coupling hook pocket                     | C2    |



**Fig 10. Frame Details**

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

# Finney7

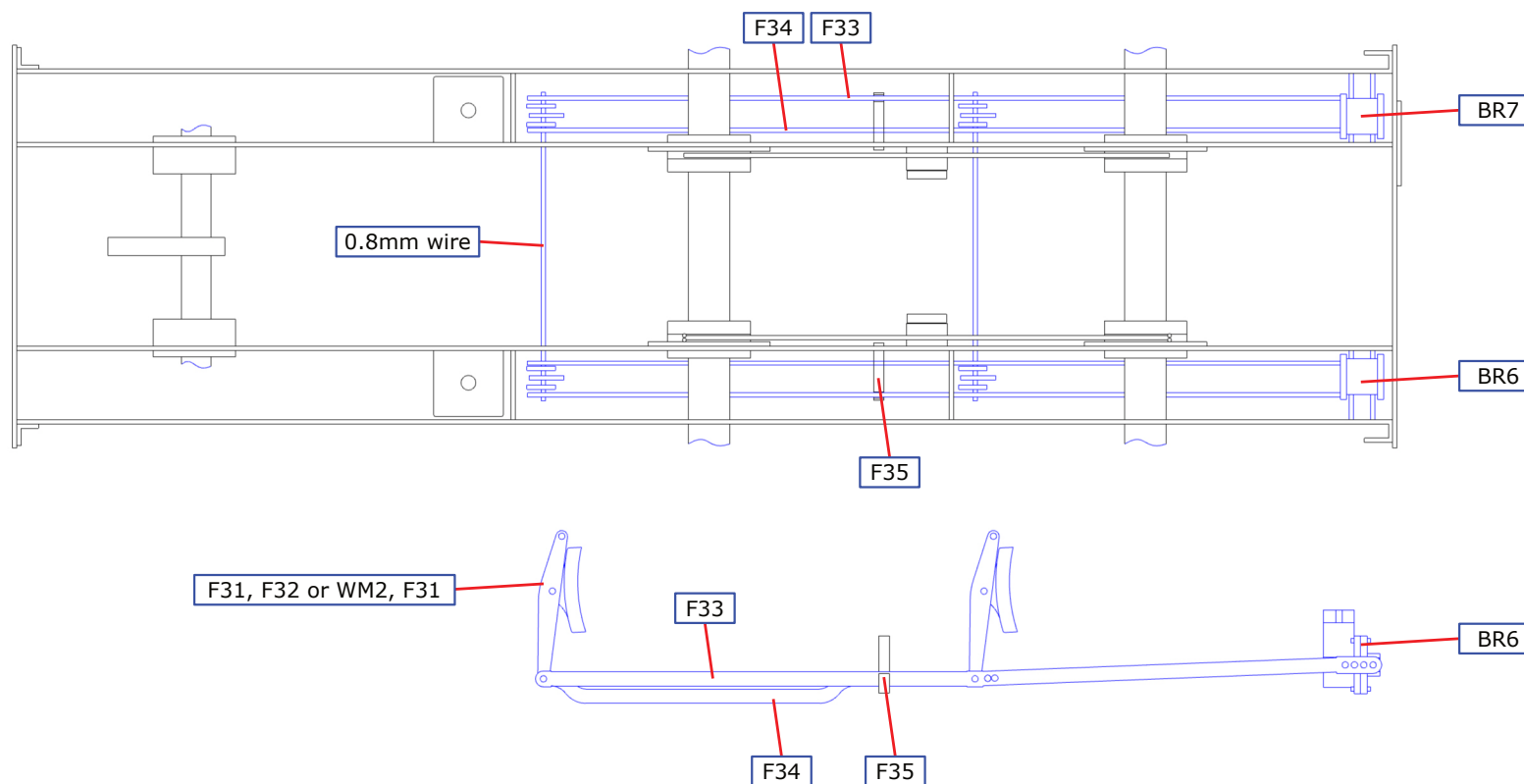
## BRAKES

**Brakes.** Assemble the brake hangers and shoes (F31 & F32 or WM2) using 0.8mm wire. Attach the brake hangers to the pivots and check alignment carefully ensuring no contact with the wheel treads. Fix the steam brake cylinders (BR6 & BR7) to the inside frames. Emboss the rivets in each brake pull rod (F33 & F34) and fit them in place. Form and fit the brake pull rod safety brackets (F35) through the small slots in the ashpan sides and under the pull rods.

Fix the balance weights, leading and trailing (F39 & F40) in position using photographs as a guide.

Fit the driven wheel underhung springs castings (WM3) to the spring hangers on the outer chassis. Laminate together the leading driven axle springs, middle and outer laminates (F36 & F37) and fit to the inner chassis. Use a piece of 0.8mm wire to retain the rear axle. Fit sand pipes from 1.2mm wire. If required, fit the leading wheel splasher (F38). Fit a lamp bracket (U10) to the centre of the footplate; some engines had this lamp bracket fitted to the buffer beam; in this case use SB25. Fit the vacuum pipe (BR8) and the vacuum pipe dummy (BR9) to the buffer beam. Build the buffers (WM4) as shown below and fix to the buffer beam.

| No. | Description                        | Sheet   |
|-----|------------------------------------|---------|
| F31 | Brake Hanger (8)                   | C2      |
| F32 | Brake shoe (4)                     | A1      |
| F33 | Outer brake pull rod (2)           | C1 & C2 |
| F34 | Inner brake pull rod (2)           | C1 & C2 |
| F35 | Brake pull rod safety brackets (2) | C2      |



**Fig 11. Brake Construction**

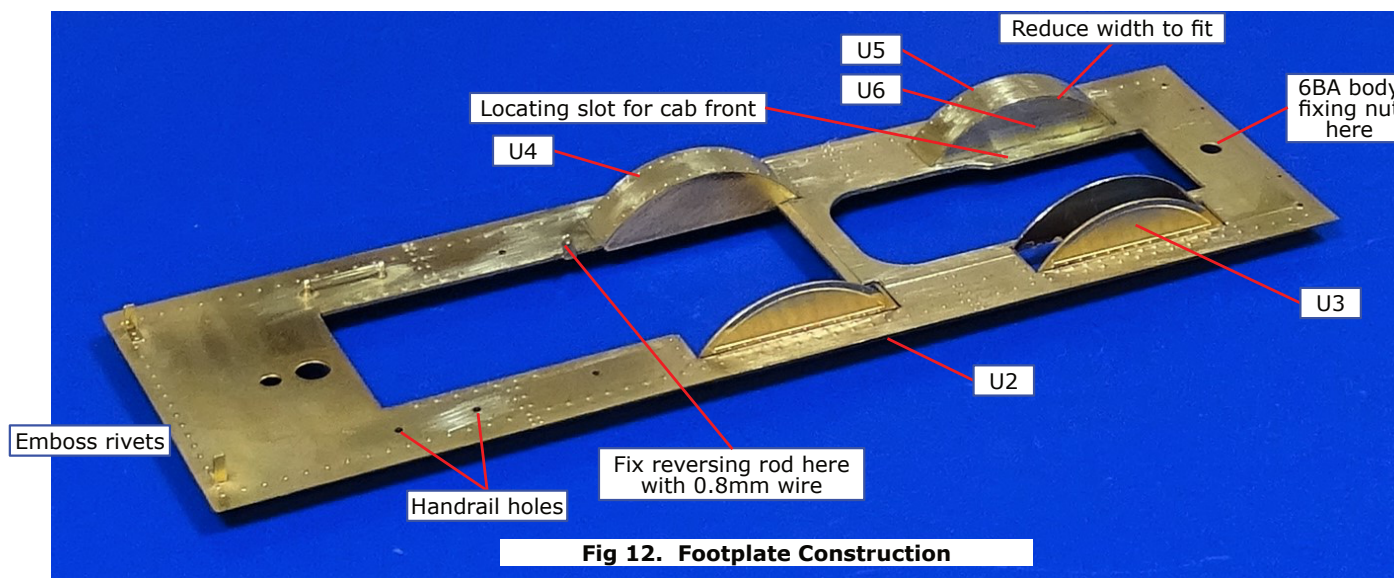


## FOOTPLATE

Fold the edges of the footplate (U1) at right angles and fold up the top of the reversing lever. Prepare the footplate overlay (U2) by embossing the rivets under the lamp brackets and temporarily join to the footplate with a screw through the body fixing holes at the front and rear. Now solder together all round and then file the footplate overlay in the splashers openings flush with the edges of the footplate.

Solder the splashers fronts (U3) in place so that their lower edge is flush with the lower edge of the footplate. The splashers tops are over length; roll the front tops (U4) to match the curve of the splashers front and then reduce the top to fit. Solder in place and add the splashers back (U6) to the front splashers. Reduce the width of the rear splashers tops (U5) to fit on the inside. Repeat the curving, reducing length to fit and soldering in place. Add the splashers backs to the rear splashers. Solder the 6BA rear body fixing nut, the footplate handrails and the lamp brackets, as appropriate to your prototype, in place.

| No. | Description         | Sheet |
|-----|---------------------|-------|
| U1  | Footplate           | C2    |
| U2  | Footplate overlay   | C2    |
| U3  | Splashers front     | C1    |
| U4  | Front splashers top | C1    |
| U5  | Rear splashers top  | C1    |
| U6  | Splashers back      | C1    |



## S4 BOILER CAB & CANVAS ROOF

There is a choice of the different cab side cut-outs for 3201-5 or 3501-20 and for steel or canvas covered roofs.

Emboss the rivets in the cab front for round top firebox (C1) and solder in place.

Reduce the height of the cab sides (C3 for 3201-5 or C4 for 3501-20) to match the cab front. Attach the cab cutout beading (C5) to the cabsides fitting the etched groove over the edge of the cab side. Form and fit the cab side handrails from 0.45mm wire. Assemble the cab seats (C6 & C7), fitted to some of the class in later years; these are designed to tip.

Remove the seat from the bracket and solder the bracket to the inside of the cab side. Solder the cab sides in position and attach the rear handrails from 0.8mm wire. Solder the cab roof rear support, round top firebox (C8) between the rear edges of the cabsides ensuring the cab roof line will be horizontal.

**Canvas Roof.** Select the appropriate cab roof (C10 for 3201-5 or C11 for 3501-20) and curve the cab roof to match the cab structure and then solder in place. Add the side mouldings (C12), the front and rear mouldings (C13) and the transverse rain strip (C14), if required. As they are very delicate, fit the whistles, large and small (BR10 & BR11) as a last step.

**Steel Roof.** See page 14 for details of the steel roof.

Slightly curve the fall plate (C20) and hinge to the footplate with small staples of 0.45mm wire. Using the drawing of the cab interior detail the backhead and the cab interior. Use copper wire of a suitable size for the pipes. Solder the backhead to the cab floor so that they become a removable unit.

| No. | Description                                    | Sheet |
|-----|--|-------|
| C1  | Cab front for round top firebox                | C2    |
| C3  | Cab side for 3201-5 (2)                        | C2    |
| C4  | Cab side for 3501-20 (2)                       | C2    |
| C5  | Cab cut-out beading (2)                        | C2    |
| C6  | Cab seat bracket (2)                           | C2    |
| C7  | Cab seat (2)                                   | C2    |
| C8  | Cab roof rear support, round top firebox       | C2    |
| C10 | Canvas covered cab roof, 3201-5                | C2    |
| C12 | Canvas covered roof side moulding (2)          | C2    |
| C13 | Canvas covered roof front & rear mouldings (2) | C2    |
| C14 | Canvas covered roof transverse strip           | C2    |
| C19 | Cab floor                                      | C2    |
| C20 | Fall plate                                     | C2    |

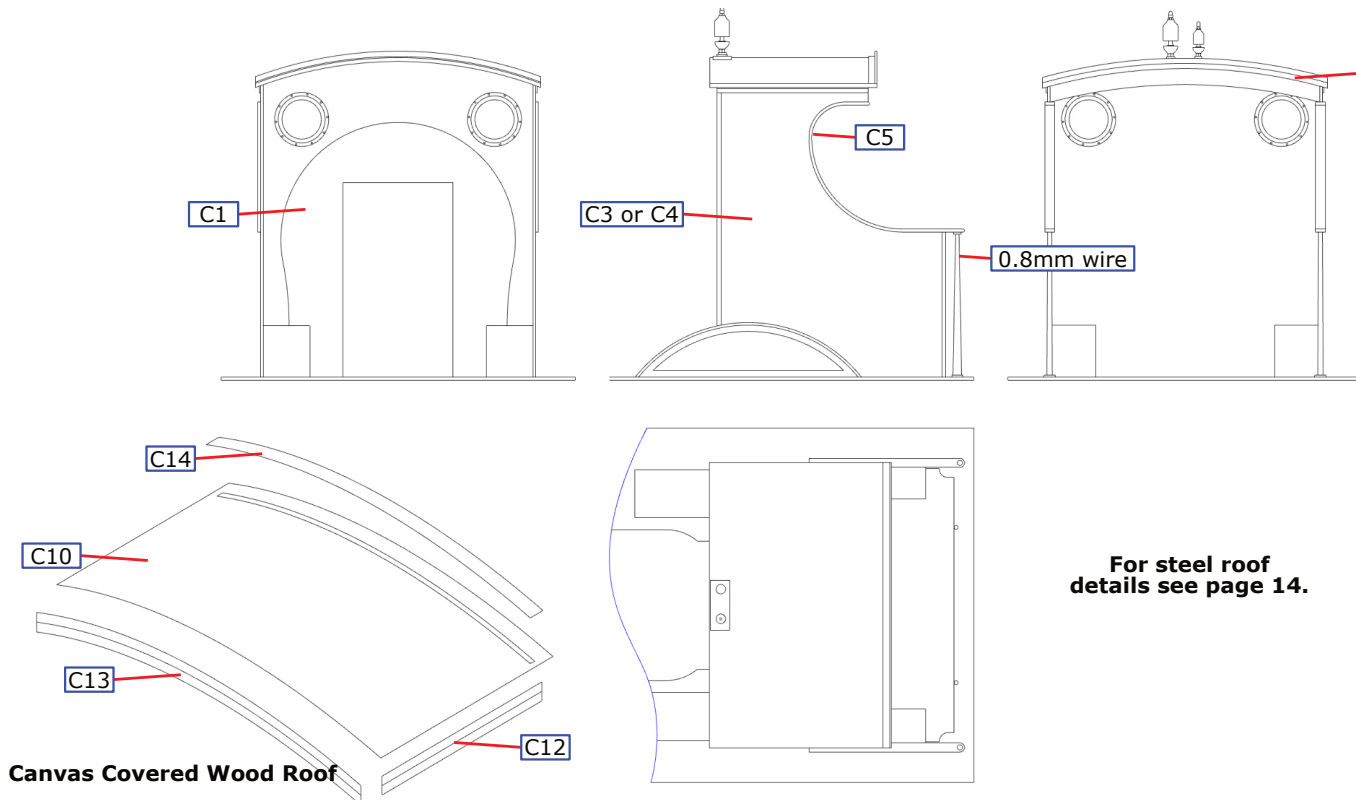


Fig 13. Cab Construction

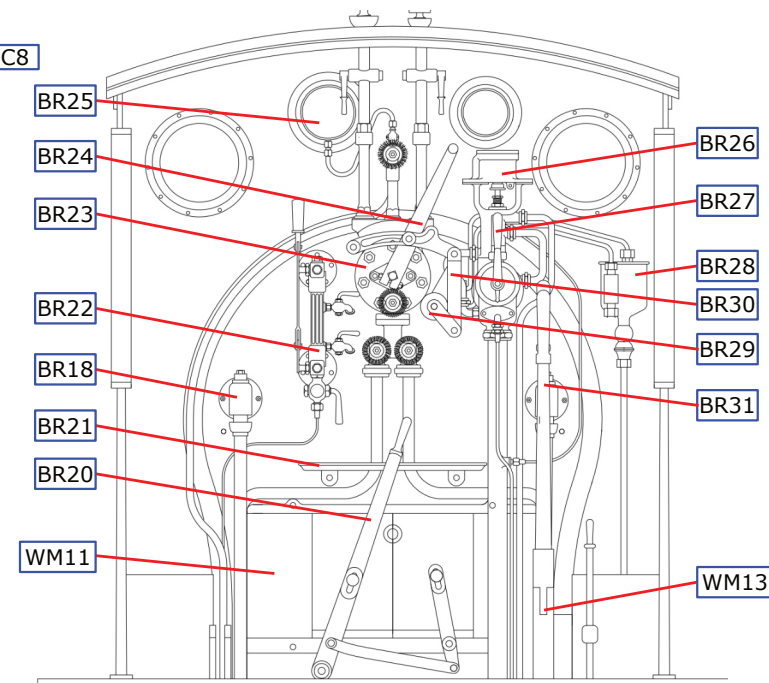


Fig 14. S4 Backhead

## ROUND TOP (S4) FIREBOX, BOILER

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 and rear formers (SB2 & 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 0.8mm 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 0.45mm wire.

Solder the round top firebox washout plugs, upper and lower (SB5 & SB6) in place. Fit the round top firebox front and rear formers (SB7 & 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 front and rear former (SB18) to the base. Roll the smoke box wrapper, flush riveted or snap head rivets (SB19 or 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 (SB18) and solder to the rear and do the same for the front if appropriate.

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 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.

Solder the smokebox lamp bracket (SB25) in place.

| No.  | Description                               | Sheet |
|------|---|-------|
| SB1  | Boiler and round top firebox wrapper      | C1    |
| SB2  | Boiler front former                       | A1    |
| SB3  | Boiler rear former                        | A1    |
| SB4  | Boiler joining strip                      | C1    |
| SB5  | Round top firebox upper washout plugs (2) | C1    |
| SB6  | Round top firebox lower washout plugs (4) | C1    |
| SB7  | Round top firebox front former            | A1    |
| SB8  | Round top firebox rear former             | A1    |
| SB9  | Firebox band joining clips (4)            | C2    |
| SB15 | Smokebox base                             | C1    |
| SB16 | Early smokebox front                      | C1    |
| SB17 | Later smokebox front                      | C1    |
| SB18 | Smokebox rear (2)                         | C1    |
| SB19 | Flush riveted smokebox wrapper            | C1    |
| SB20 | Snap head riveted smokebox wrapper        | C1    |
| SB21 | Smokebox and boiler ring                  | A1    |
| SB22 | Smokebox front step                       | C2    |
| SB23 | Smokebox side step                        | C2    |
| SB24 | Cylinder cover                            | C2    |
| SB25 | Smokebox lamp bracket                     | C2    |

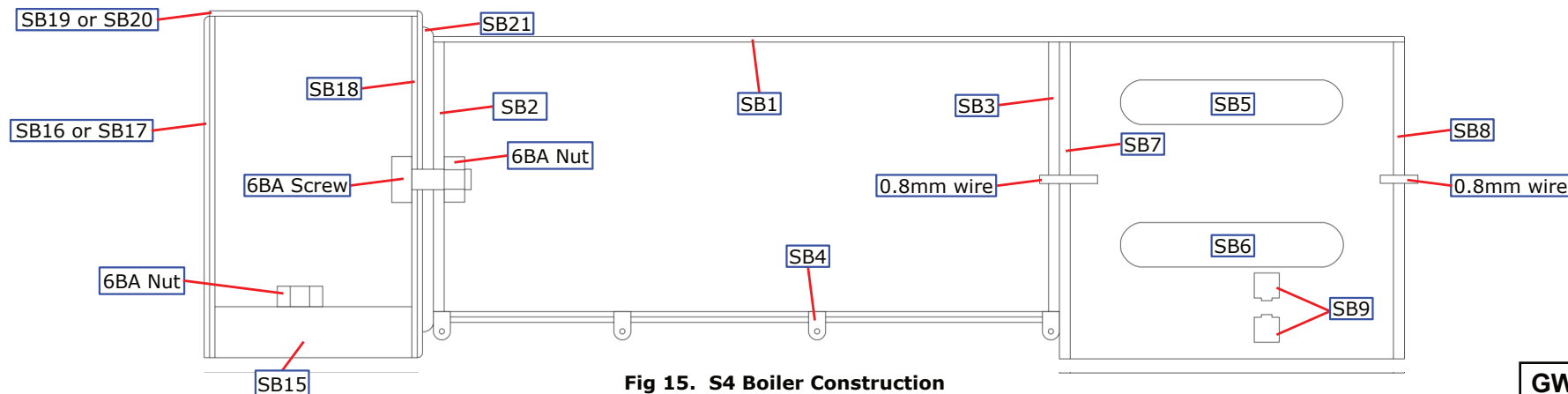


Fig 15. S4 Boiler Construction



## FINISHING ROUND TOP FIREBOX

Solder the firebox side bracket (U7) in place on the firebox side between the splashers. If appropriate, fit the clack valves (BR19) to the firebox side. Fit the sandbox (WM10) to the footplate. Fit the reversing lever (U9) locating it in the slot in the firebox front. Solder the smokebox lamp bracket (U10) in place. Solder the smokebox lamp bracket (SB25) in place. If appropriate, fit the clack valves (BR19) to the firebox side.

Fit the appropriate smokebox door, early with ring or later Churchward (WM5 or WM6). Fit the Smokebox door handle (BR12) and the steam lance cock (BR13) to the smokebox front. Fit the smokebox pipe cover (WM7) to the right hand side of the smokebox.

Fit the chimney (CU1). Fit the inside of the dome (WM8). Attach the dome lubricator (BR14) to the dome (BR15) and then fit the dome to the boiler over the inside of the dome. Fit the safety valve base (WM9) to the firebox and then fit the safety valves (BR16) to the base. Fit the round top firebox safety valve casing (BR17) over the base.

Solder four small knobs in the holes in the smokebox and four variable length knobs (and flanges) in the boiler holes. Form the handrail to shape, thread on the front medium knob, and fix the handrail in place checking its location in the holes in the cab front.

| No.  | Description                    | Sheet |
|------|--------------------------------|-------|
| U7   | Firebox side bracket (2)       | A2    |
| U8   | Firebox side bracket cover (2) | A1    |
| U9   | Reversing Lever                | C2    |
| U10  | Spare footplate lamp irons     | C2    |
| SB25 | Smokebox lamp bracket          | C2    |

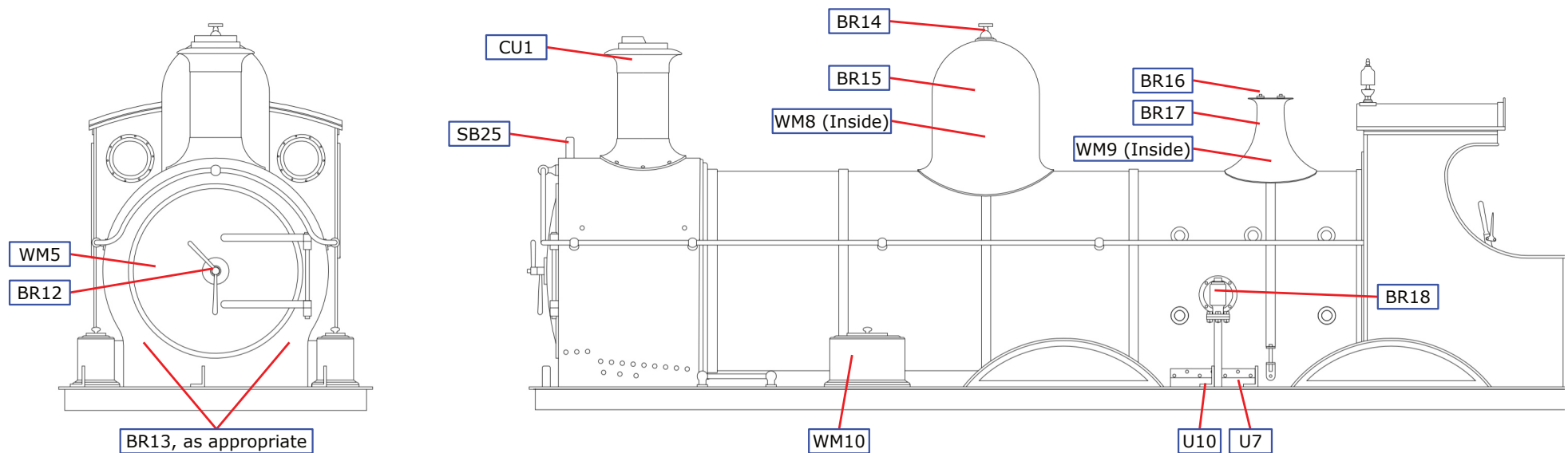


Fig 16. S4 Boiler Finishing Details

# Finney7

## B4 BOILER CAB

There is a choice of the different cab side cut-outs for 3201-5 or 3501-20 and for steel or canvas covered roofs.

Emboss the rivets in the cab front for Belpaire firebox (C2) and solder in place.

Attach the cab cutout beading (C5) fitting the etched groove over the edge of the cab side (C3 for 3201-5 or C4 for 3501-20). Form and fit the cab side handrails from 0.45mm wire. Assemble the cab seats (C7 & C7), fitted to some of the class in later years; these are designed to tip.

Remove the seat from the bracket and solder the bracket to the inside of the cab side. Solder the cabsides in position and attach the rear handrails from 0.8mm wire. Solder the cab roof rear support, Belpaire firebox (C9) between the rear edges of the cabsides ensuring the cab roof line will be horizontal.

**Canvas Roof.** For a canvas roof see the details on page 11.

**Steel Roof.** Select the appropriate cab roof (C15 for 3201-5 or C16 for 3501-20) and curve the cab roof to match the cab structure and then solder in place. Add the rear angle (C17) and the rain strip (C18). As they are very delicate, fit the whistles, large and small (BR10 & BR11) as a last step.

Slightly curve the fall plate (C20) and hinge to the footplate with small staples of 0.45mm wire. Using the drawing of the cab interior detail the backhead and the cab interior. Use copper wire of a suitable size for the pipes. Solder the backhead to the cab floor so that they become a removable unit.

| No. | Description                             | Sheet |
|-----|---|-------|
| C2  | Cab front for Belpaire firebox          | C2    |
| C3  | Cab side for 3201-5 (2)                 | C2    |
| C4  | Cab side for 3501-20 (2)                | C2    |
| C5  | Cab cut-out beading (2)                 | C2    |
| C6  | Cab seat bracket (2)                    | C2    |
| C7  | Cab seat (2)                            | C2    |
| C9  | Cab roof rear support, Belpaire firebox | C2    |
| C15 | Steel cab roof, 3201-5                  | C2    |
| C16 | Steel cab roof, 3501-20                 | C2    |
| C17 | Steel cab roof rear angle               | C2    |
| C18 | Steel cab roof rain strip (2)           | C2    |
| C19 | Cab floor                               | C2    |
| C20 | Fall plate                              | C2    |

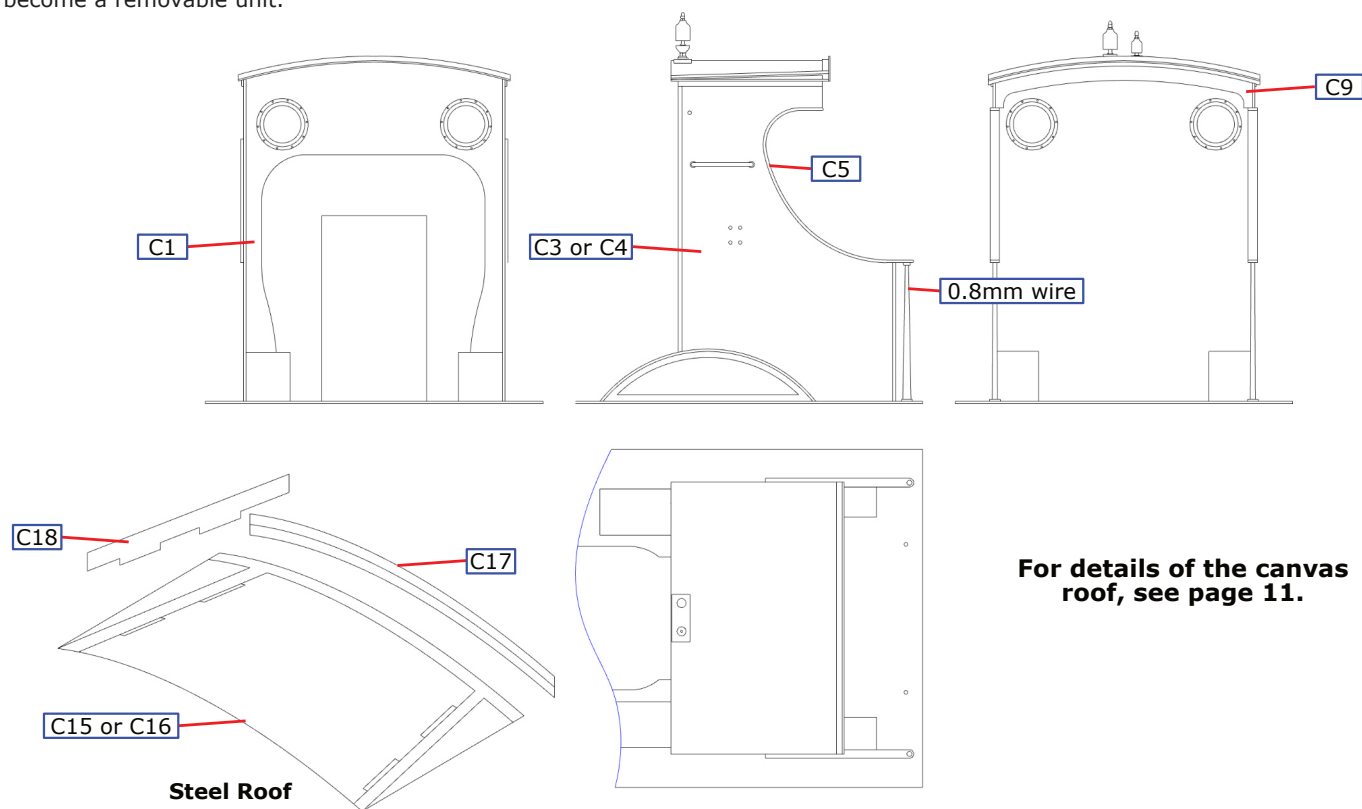


Fig 17. Cab Construction

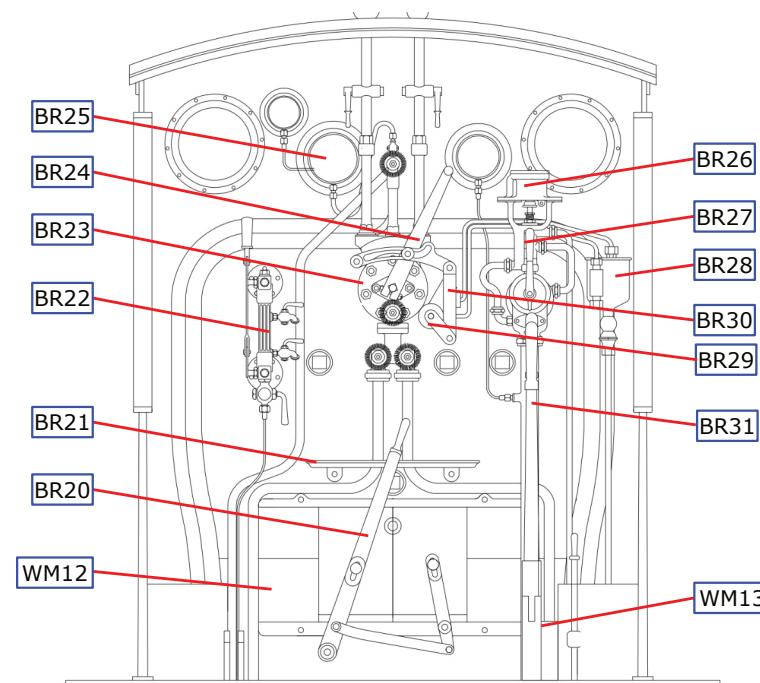


Fig 18. B4 Backhead

FORMING THE BELPAIRE FIREBOX 1

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

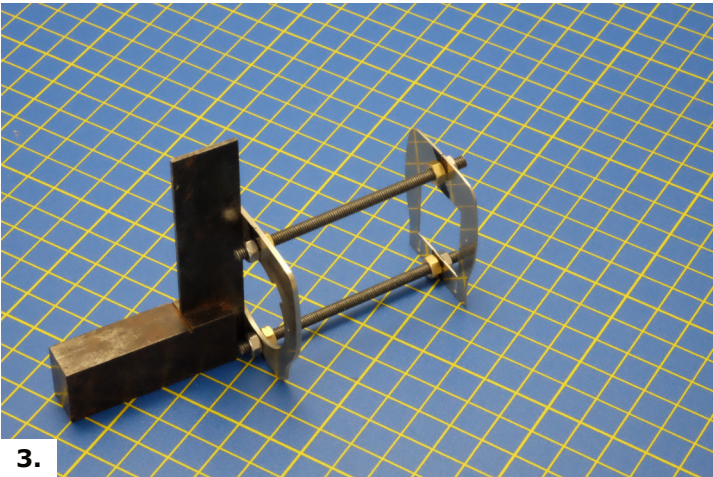
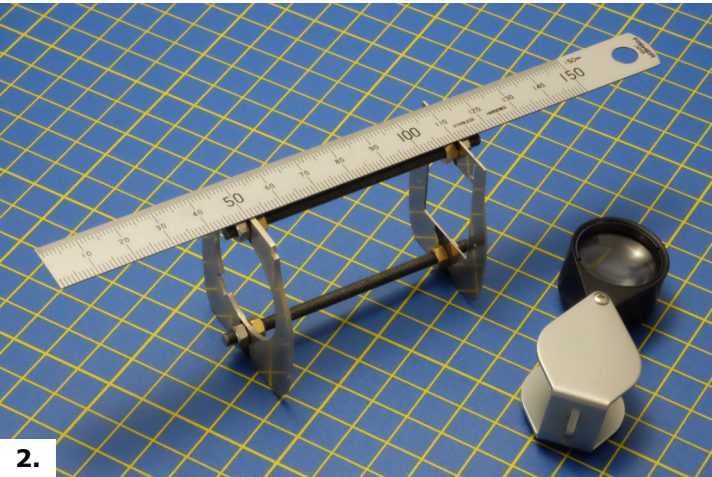
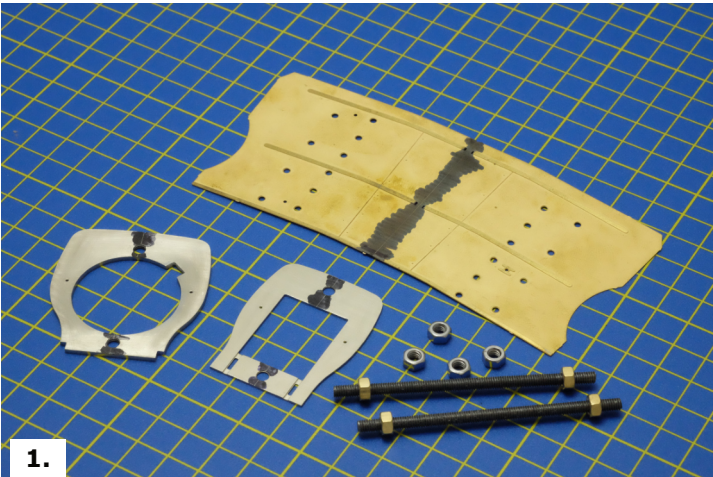
**Photo 1.** Solder together the two laminations of the firebox front (SB1) with top lamination (SB2). Clean the cusp off all parts, including the firebox rear former (SB3). Reduce the width of the lower faces of the firebox rear former so that it will fit between the frames in the locating groove in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





## 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.

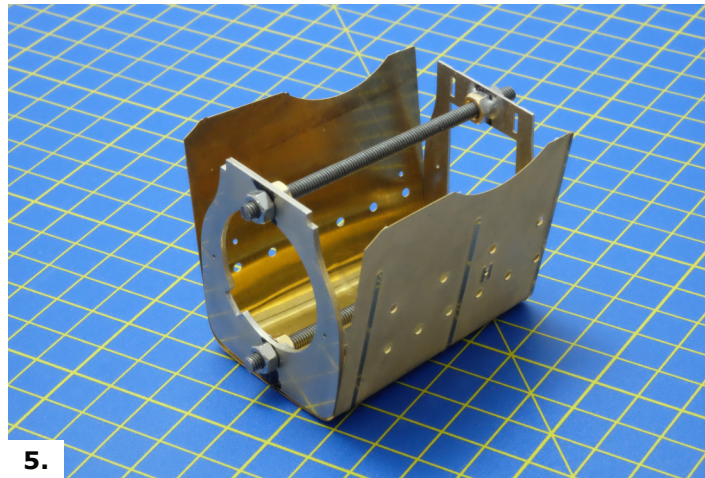
Run an extra fillet of solder into the internal front shoulders of the firebox to support the area which will be filed back. The brass nuts can be heated and removed. Remove the rear scrap section of the spacer.

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.

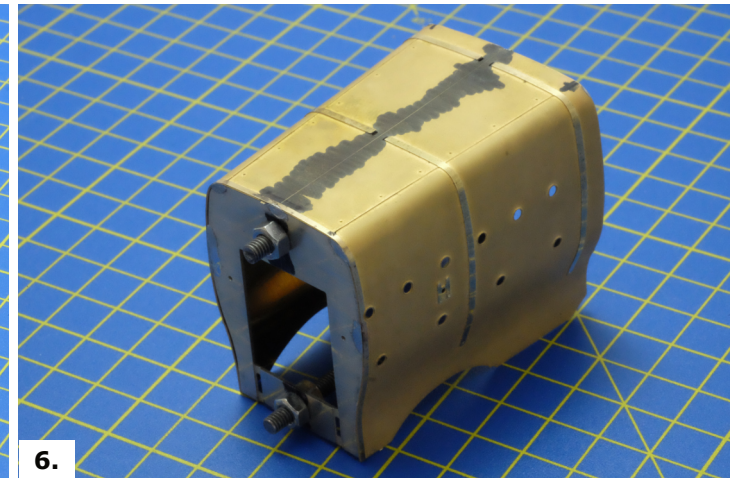
Fold the firebox band joining clips (SB5) into a 'U' shape, fit through the slots in the firebox top and solder in place from inside. Complete with a short piece of 0.45mm wire to represent the tightening bolt. Fix the mudhole doors (WM23) in place on the firebox.



4.



5.



6.

## BELPAIRE (B4) FIREBOX, BOILER AND SMOKEBOX

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 and rear formers (SB2 & 3). 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 0.8 mm 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 0.45 mm wire.

**Smokebox.** Fold the smokebox base (SB15) into an inverted tray and solder a 6 BA 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 front and rear former (SB18) to the base. Roll the smoke box wrapper, flush riveted or snap head rivets (SB19 or 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 (SB18) and solder to the rear and do the same for the front if appropriate.

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 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.

Solder the smokebox lamp bracket (SB25) in place.

| No.  | Description                          | Sheet |
|------|--------------------------------------|-------|
| SB1  | Boiler and round top firebox wrapper | C1    |
| SB2  | Boiler front former                  | A1    |
| SB3  | Boiler rear former                   | A1    |
| SB4  | Boiler joining strip                 | C1    |
| 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    |
| SB14 | Boiler washout plugs (4)             | C1    |
| SB15 | Smokebox base                        | C1    |
| SB16 | Early smokebox front                 | C1    |
| SB17 | Later smokebox front                 | C1    |
| SB18 | Smokebox rear (2)                    | C1    |
| SB19 | Flush riveted smokebox wrapper       | C1    |
| SB20 | Snap head riveted smokebox wrapper   | C1    |
| SB21 | Smokebox and boiler ring             | A1    |
| SB22 | Smokebox front step                  | C2    |
| SB23 | Smokebox side step                   | C2    |
| SB24 | Cylinder cover                       | C2    |
| SB25 | Smokebox lamp bracket                | C2    |

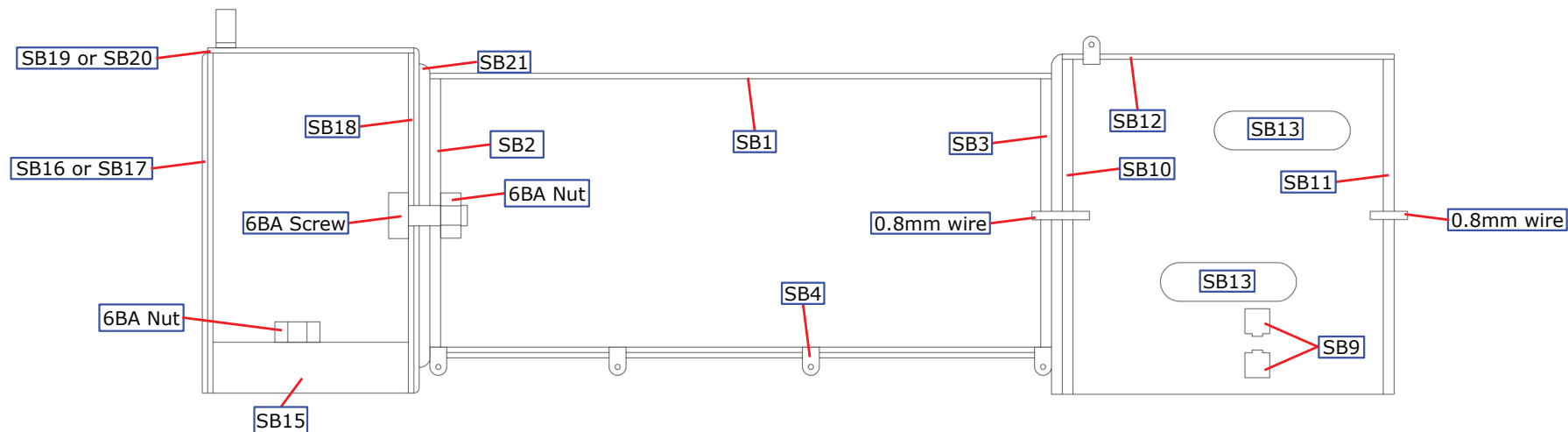


Fig 19. B4 Boiler Construction

B4 BOILER FINISHING DETAILS

Solder the firebox side bracket (U7) or the firebox side bracket cover (U8) in place on the firebox side between the splashers. Fit the sandbox (WM10) to the footplate. Fit the reversing lever (U9) locating it in the slot in the firebox front. Solder the smokebox lamp bracket (USB25) in place.

Fit the appropriate smokebox door, early with ring or later Churchward (WM5 or WM6). Fit the Smokebox door handle (BR12) and the steam lance cock (BR13) to the smokebox front. Fit the smokebox pipe cover (WM6) to the right hand side of the smokebox.

Fit the chimney (CU1). Fit the inside of the dome (WM8). Attach the dome lubricator (BR14) to the dome (BR15) and then fit the dome to the boiler over the inside of the dome. Fit the safety valve base (WM9) to the firebox and then fit the safety valves (BR16) to the base. Fit the Belpaire top firebox safety valve casing (BR19) over the base.

Solder four small knobs in the holes in the smokebox and four variable length knobs (and flanges) in the boiler holes. Form the handrail to shape, thread on the front medium knob, and fix the handrail in place checking its location in the holes in the cab front.

| No.  | Description                    | Sheet |
|------|--------------------------------|-------|
| U7   | Firebox side bracket (2)       | A2    |
| U8   | Firebox side bracket cover (2) | A1    |
| U9   | Reversing Lever                | C2    |
| U10  | Spare footplate lamp irons     | C2    |
| U10  | Spare footplate lamp irons     | C2    |
| SB25 | Smokebox lamp bracket          | C2    |

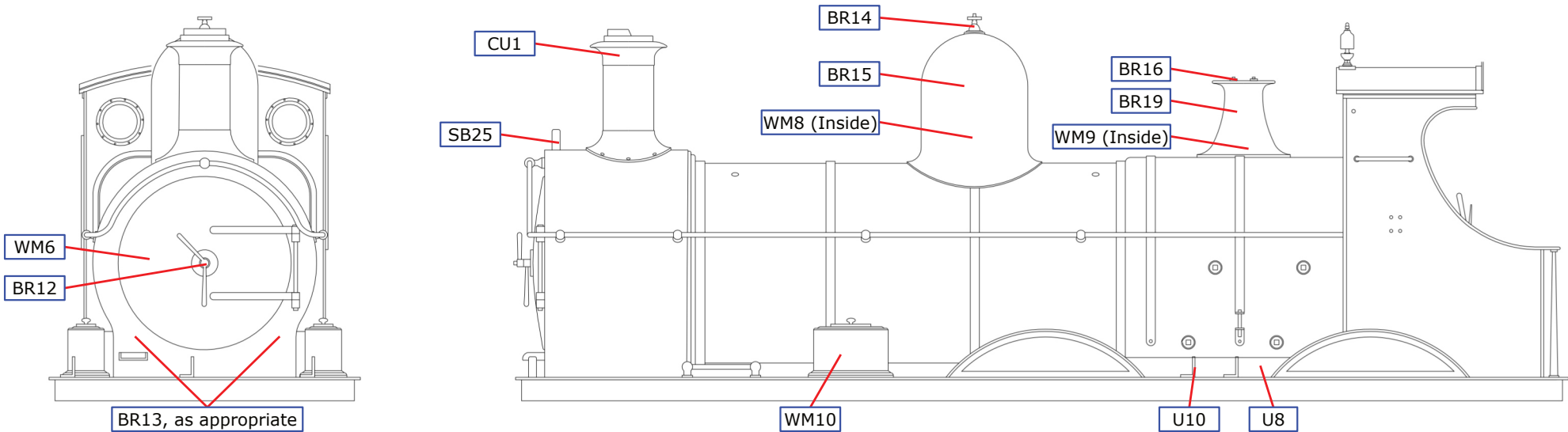
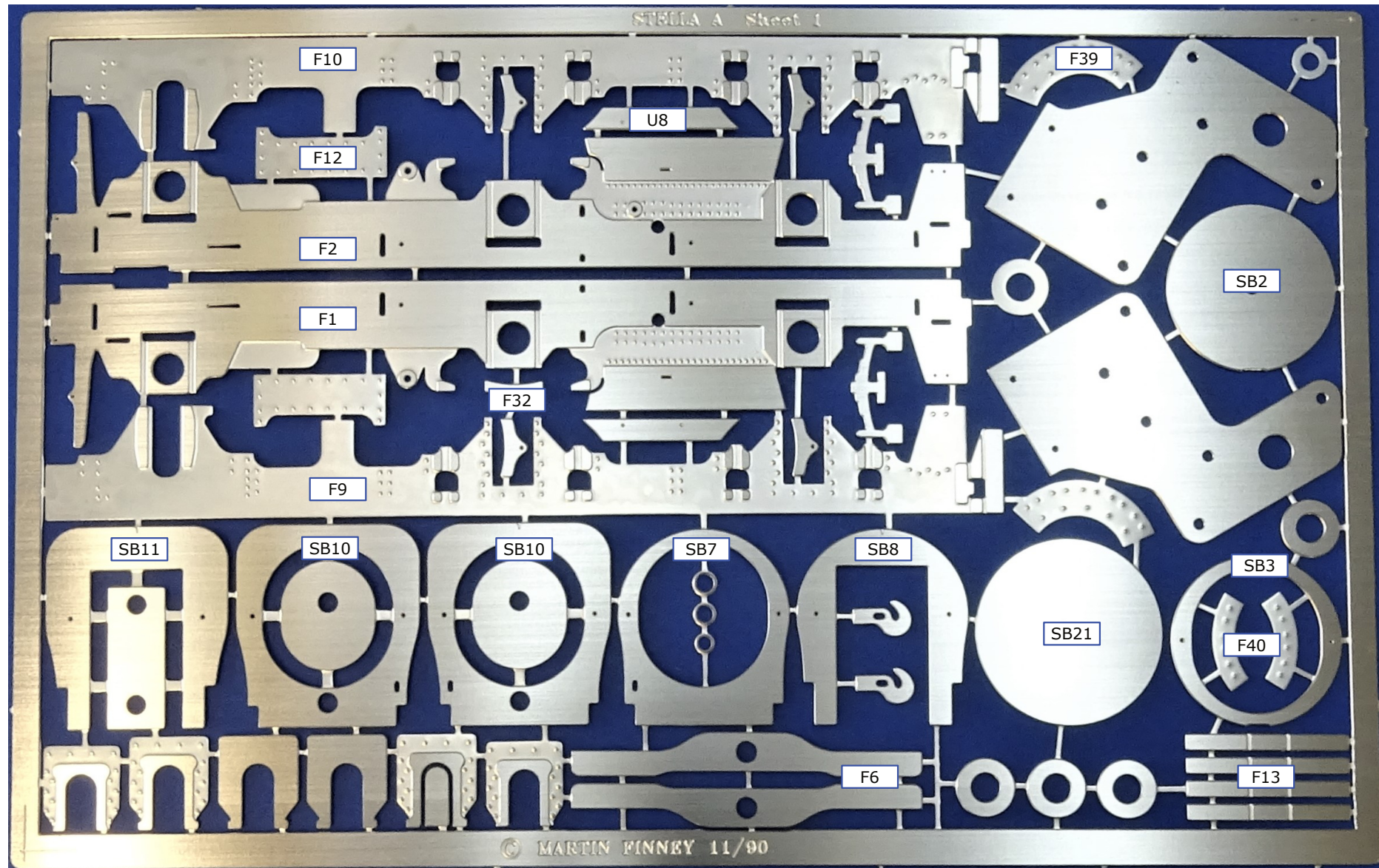


Fig 20. B4 Boiler Finishing Details

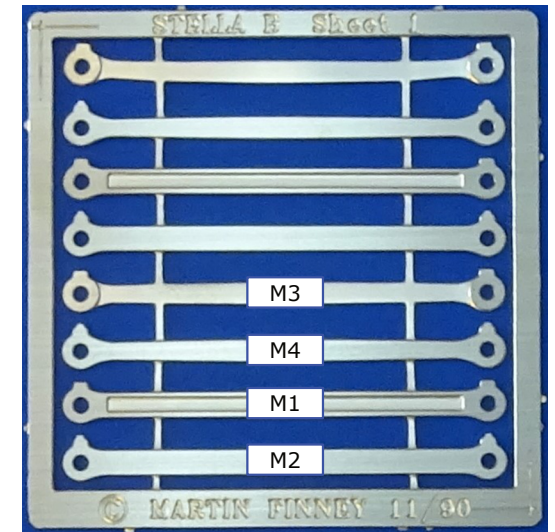
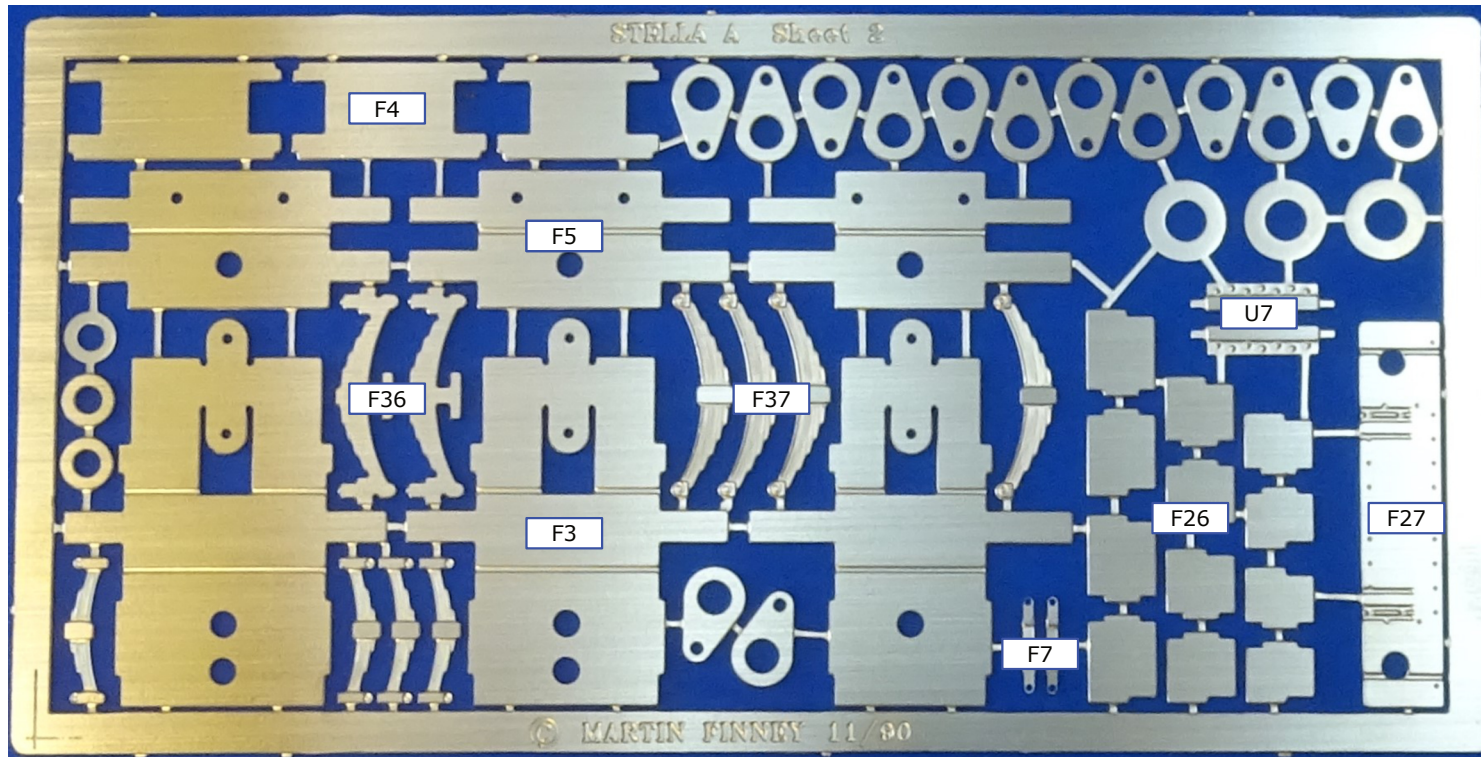


# NICKEL SILVER ETCH A1



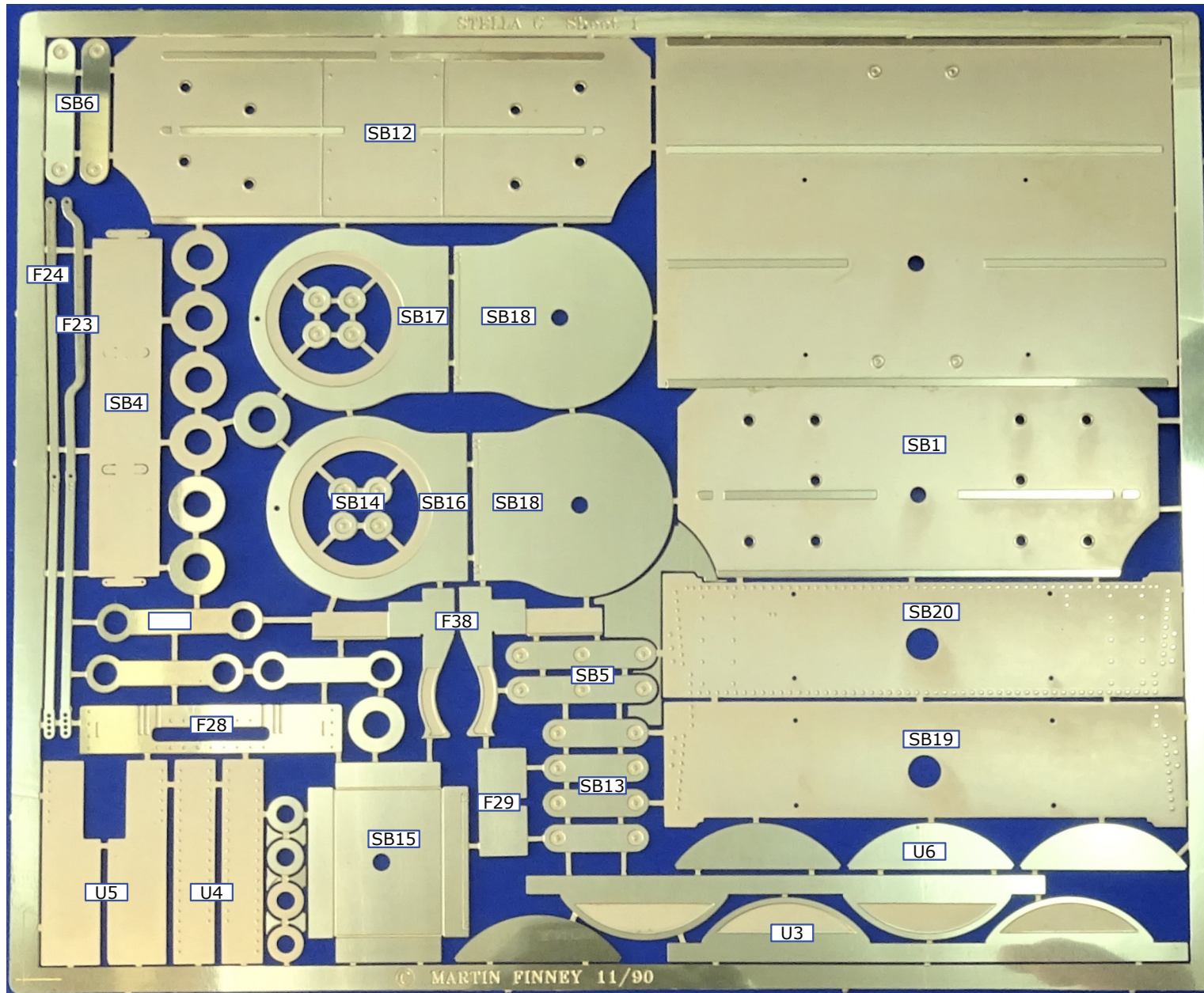


# NICKEL SILVER ETCH A2





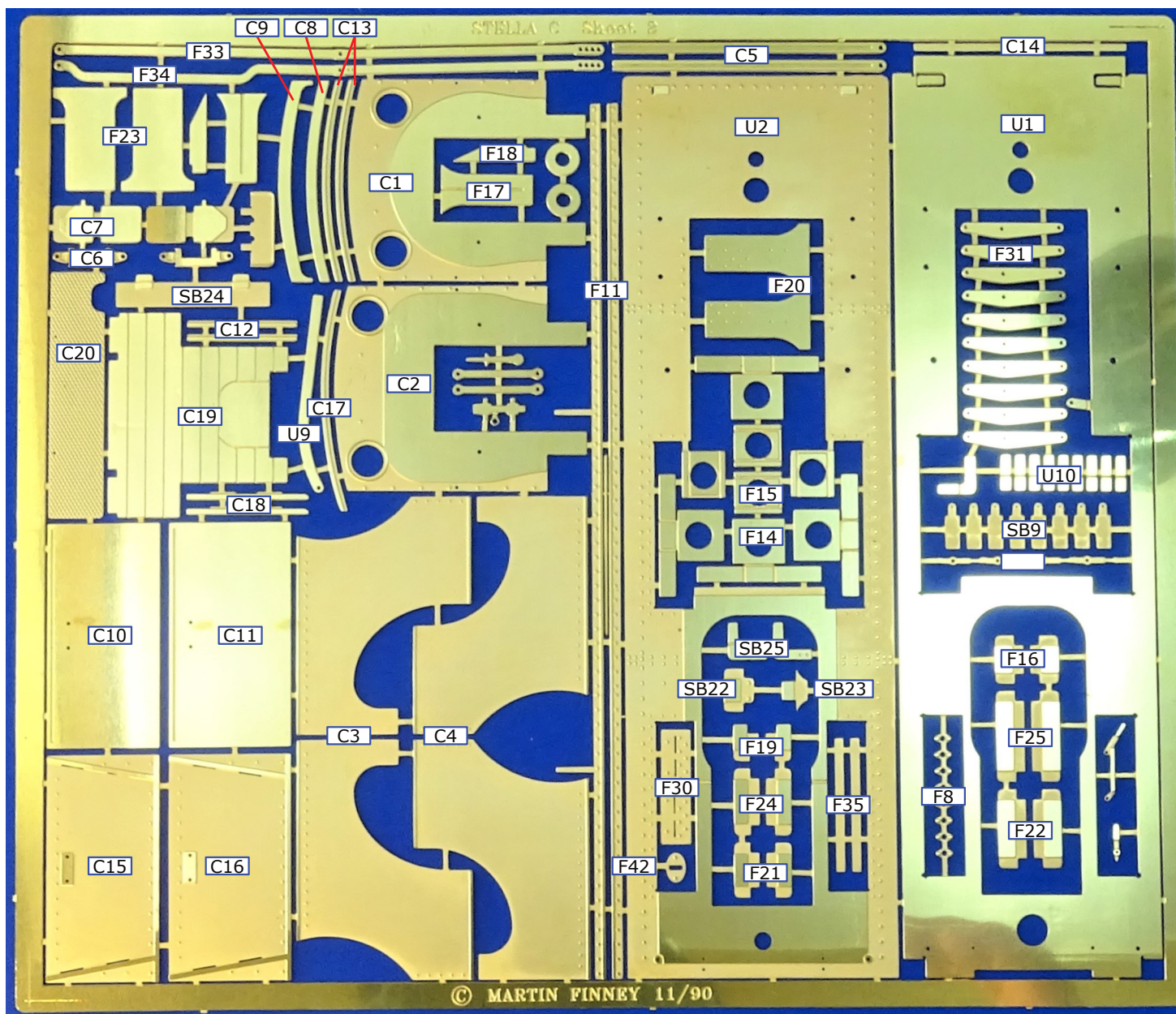
## BRASS ETCH C1





# Finney7

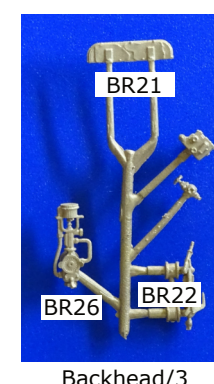
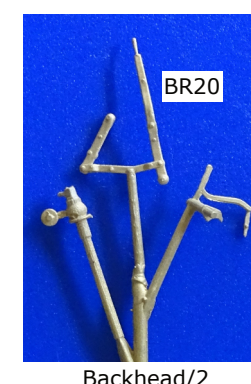
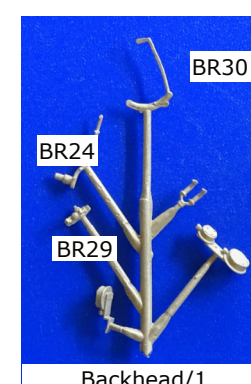
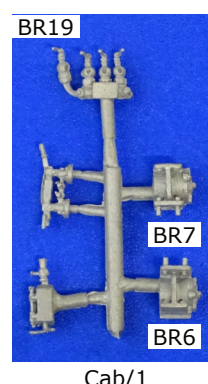
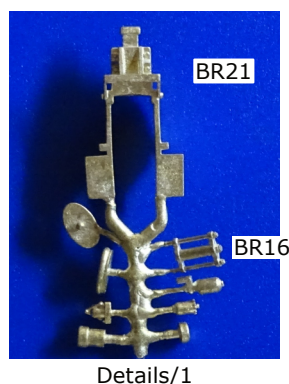
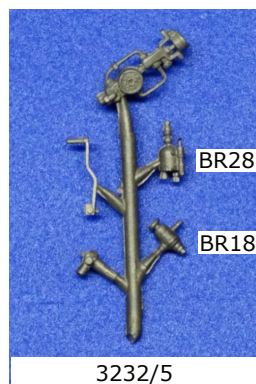
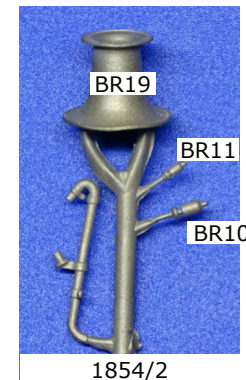
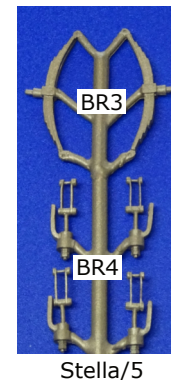
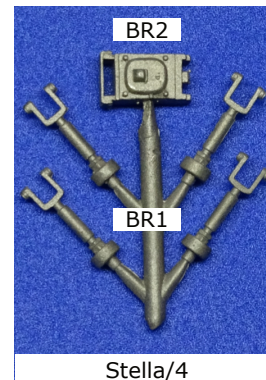
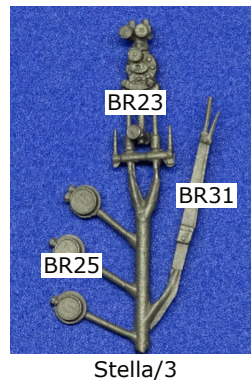
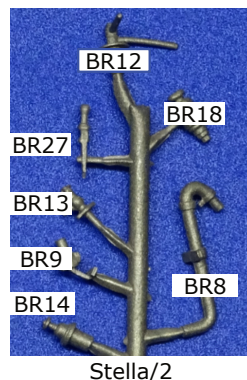
## BRASS ETCH C2





## BRASS CASTINGS

|      |                                  |          |      |  |            |      |                                    |            |
|------|----------------------------------|----------|------|--|------------|------|------------------------------------|------------|
| CU1  | Parallel chimney                 | 3232/1   | BR12 | Smokebox door handles                  | Stella/2   | BR23 | Regulator mounting                 | Stella/3   |
| BR1  | Underhung spring hanger (8)      | Stella/4 | BR13 | Steam lance cock                       | Stella/2   | BR24 | Regulator handle                   | Backhead/1 |
| BR2  | Leading axlebox (2)              | Stella/4 | BR14 | Dome lubricator                        | Stella/2   | BR25 | Cab pressure gauges (3)            | Stella/3   |
| BR3  | Leading axle spring (2)          | Stella/5 | BR15 | Dome                                   | Stella/1   | BR26 | Combined ejector/brake             | Backhead/3 |
| BR4  | Leading axle spring hangers (4)  | Stella/5 | BR16 | Safety valves (2)                      | Details/1  | BR27 | Combined ejector/brake handle      | Stella/2   |
| BR6  | Steam brake cylinder, left hand  | Cab/1    | BR17 | Safety valve casing, round top firebox | Duke/6     | BR28 | Sightfeed lubricator               | 3232/5     |
| BR7  | Steam brake cylinder, right hand | Cab/1    | BR18 | Clackbox (2)                           | 3232/5     | BR29 | Jockey valve                       | Backhead/1 |
| BR8  | Vacuum pipe                      | Stella/2 | BR19 | Safety valve casing, Belpaire firebox  | 1854/2     | BR30 | Regulator and jockey valve linkage | Backhead/1 |
| BR9  | Vacuum pipe dummy                | Stella/2 | BR20 | Firebox door handle                    | Backhead/2 | BR31 | Lever reverse handle               | Stella/3   |
| BR10 | Large whistle                    | 1854/2   | BR21 | Backhead shelf                         | Backhead/3 | BR32 | Mud hole door clamp (2)            | Loose      |
| BR11 | Small whistle                    | 1854/2   | BR22 | Water gauge                            | Backhead/3 |      |                                    |            |



## WHITEMETAL CASTINGS

- WM1 2 Sandbox lower portion
- WM2 4 Brake Shoe
- WM3 4 Driven wheel underhung spring
- WM4 2 Dean taper buffer
- WM5 1 Early smokebox door with ring
- WM6 1 Later Churchward smokebox door
- WM7 1 Smokebox pipe cover (Stepped)
- WM8 1 Inside of dome
- WM9 1 Safety valve base
- WM10 2 Sandbox
- WM11 1 Round top firebox backhead
- WM12 1 Belpaire backhead
- WM13 1 Lever reverse base



WM1



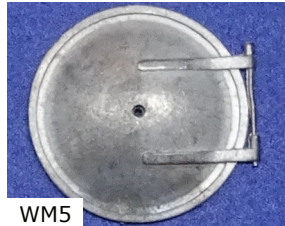
WM2



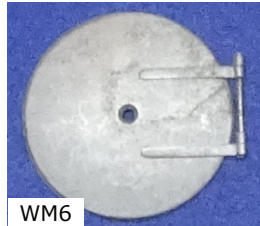
WM3



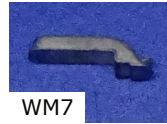
WM4



WM5



WM6



WM7



WM8



WM9



WM10



WM11



WM12



WM13

### OTHER COMPONENTS

- 3/16" bore bearing (6)
- 3/16" x 4.75mm Brass tube for leading axle (2)
- 6 BA x 3/4" Brass screws (1)
- 6BA x 5/16" Brass screw (2)
- 6 BA nuts (2)
- Short handrail knobs (12)
- Medium handrail knob (1)
- Variable length handrail knob & flange (4)
- Buffer head, bush, washer & spring (2)
- Vacuum pipe hose
- 4mm studding and nuts for firebox assembly
- 1/8" brass wire for compensation beam pivot
- 5/32" OD brass tubes for compensation beams
- 1.6mm Steel wire for front compensation beam
- 0.45mm Brass wire for fallplate hinges and cab side handrails
- 0.8mm Brass wire for brake hanger pivots and handrails
- 1.2mm Brass wire for vacuum pipe & sand pipes
- 0.8mm & 1.5mm Copper wire for backhead pipes