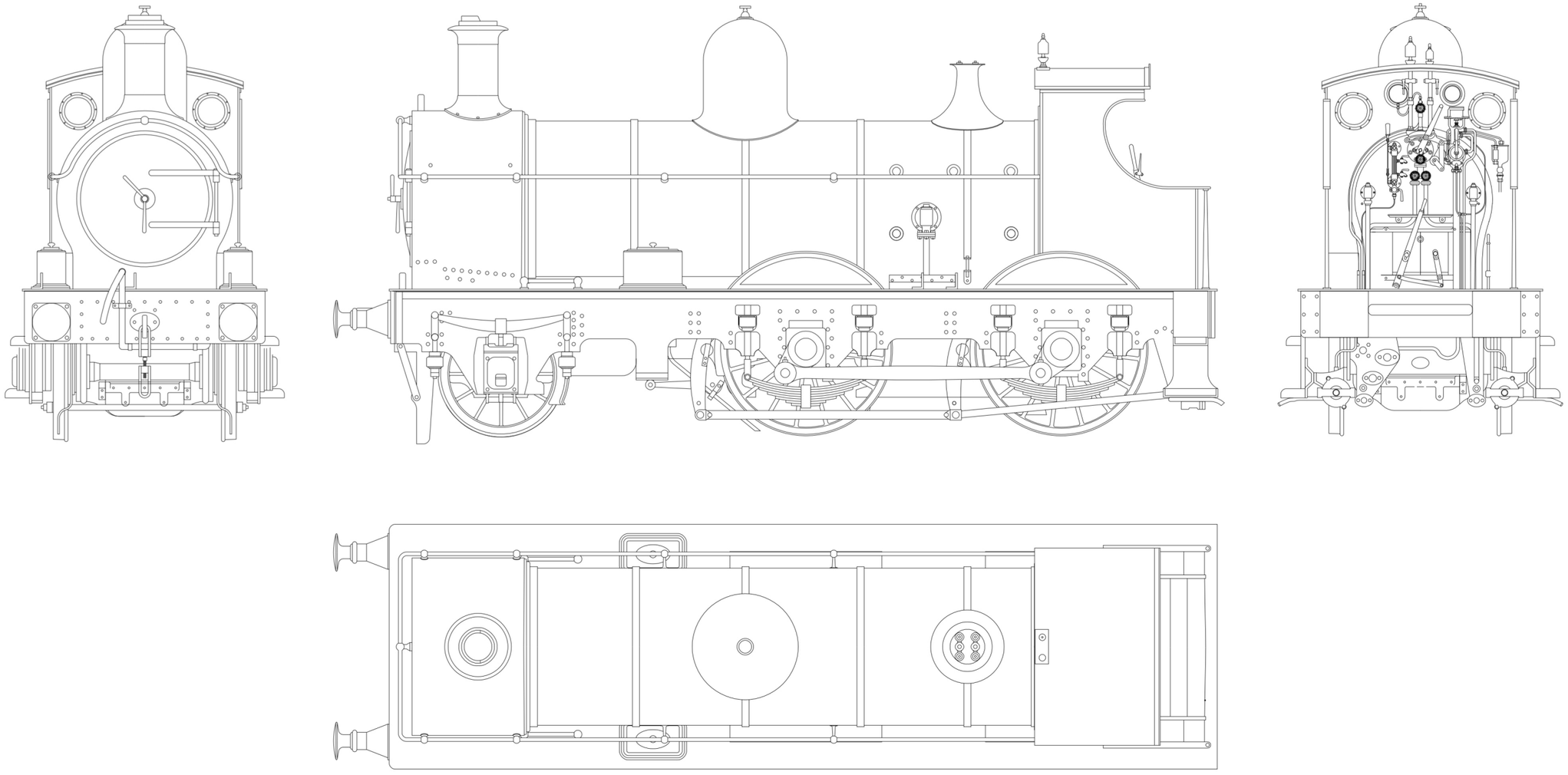


Fig 1. Stella GA. S4 Boiler, low cab, both firebox and backhead clack boxes shown, fish belly coupling rods, leading wheel splasher.

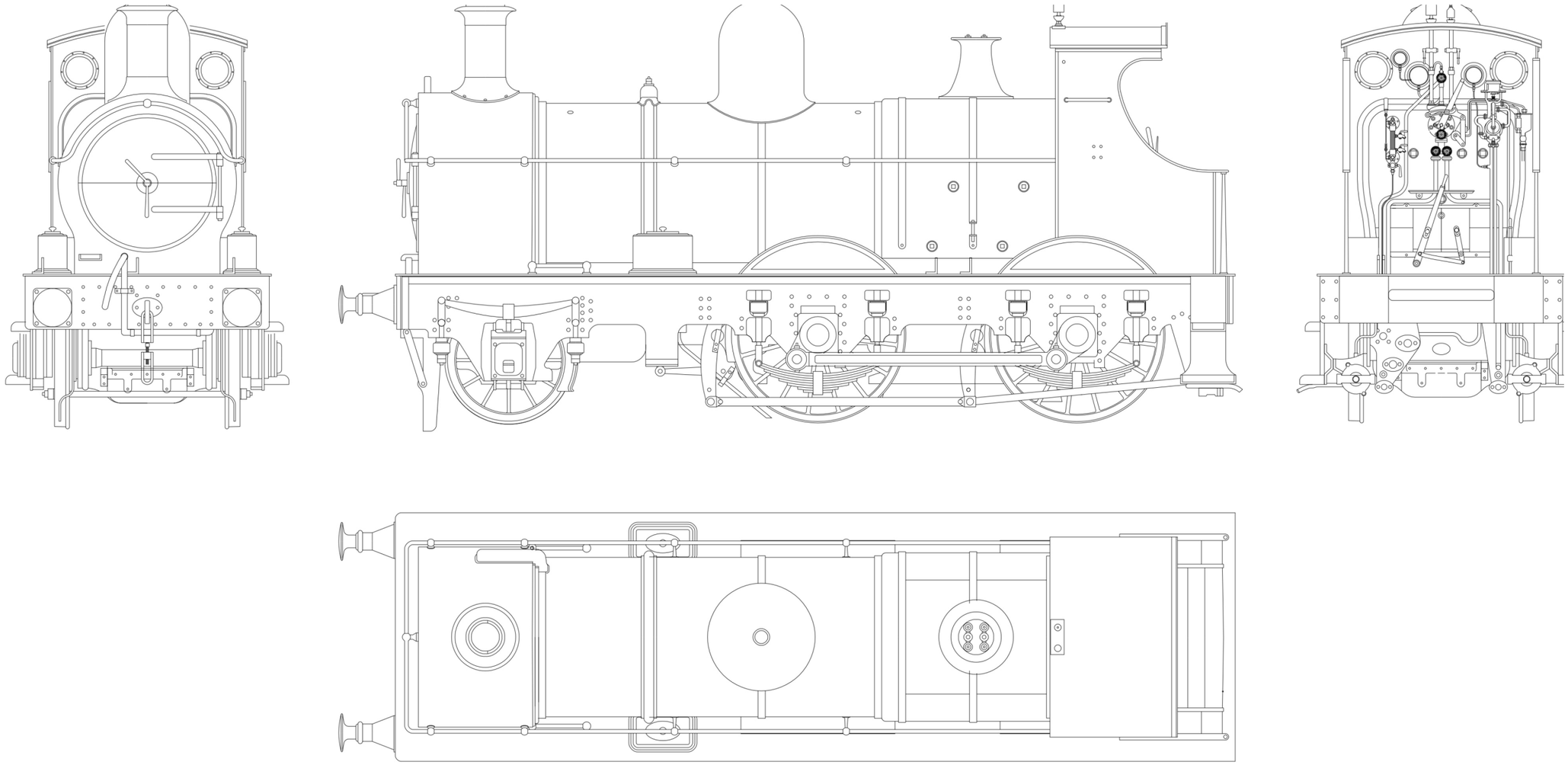


Fig 2. Stella GA. B4 Boiler, high cab, top feed, fluted coupling rods, leading wheel splasher.

CHASSIS CONSTRUCTION 1

COUPLING RODS.

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

First drill out all the crankpin holes to a convenient size which is undersize for the crankpins. Remove all burrs caused by the drilling. Now drill the same drill into a suitable small block of wood and leave the drill in the wood with its shank projecting. This projecting shank is used as a mandrel to accurately align the two laminations of each rod.

Tin well the front face of all the inner laminates and the back face of the outer laminates and place them over the mandrel. Using plenty of solder and flux, solder the two laminates together. You should now have a rod with the bosses on each laminate perfectly aligned.

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

FRAMES

Having decided which chassis to construct you can now start construction by preparing 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.

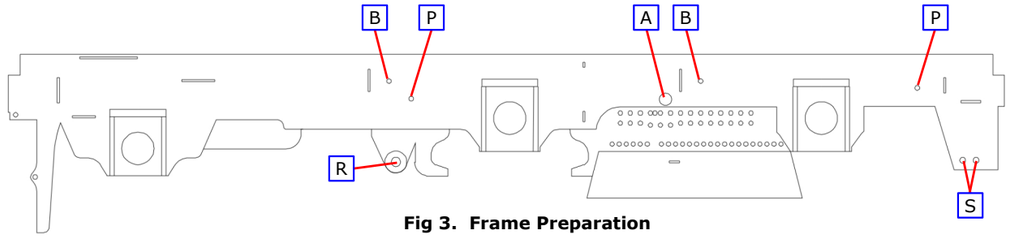


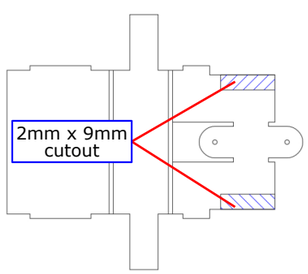
Fig 3. Frame Preparation

FRAME SPACERS AND ASSEMBLING THE CHASSIS

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



Modification to the Front Spacer

Modification to the Compensation Beam

Fig 4. Chassis Modifications

No.	Description	Sheet	No.	Description	Sheet
M1	Fluted coupling rod outer laminate	A1	F3	Front frame spacer	A2
M2	Fluted coupling rod inner lamination	A1	F4	Firebox frame spacer	A2
M3	Plain coupling rod outer lamination	A1	F5	Rear frame spacer	A2
M4	Plain coupling rod inner lamination	A1	F6	Compensation beams (2)	A1
F1	Left inside frame	A1	F7	Guard iron struts (2)	A2
F2	Right inside frame	A1	F8	Vacuum pipe union (4)	C2

FITTING THE COMPENSATION BEAMS

Modify the compensation beam as shown in Fig 4 by removing the metal shaded blue.

Cut a piece of 1/8" brass rod so that it fits through the holes A and is flush with the outside face of the chassis frames. Prepare two pieces of 5/32" bore brass tube. Each should have a length of 3mm. Open up the hole to accept the brass tube in each of the compensation beams (F6) and solder the beams to the pieces of tube close to one end of the tube.

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

To fix the rear beams in place first dismantle the chassis then refit the beams together with two washers and two paper washers. Push the beams inwards and then solder the pivot rod to the frames. A good strong joint is essential without soldering the beams to the pivot. Now push the beams firmly against the frames and carefully solder the retaining washers to the pivot using the paper washers to prevent the beam being soldered to the pivot. The pivot can now be cut away between the washers to leave space for the motor and gearbox.

Make a bracket, to support the motor/gearbox, from scrap brass, soldered to the rear of the firebox frame spacer.

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

INSIDE MOTION

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

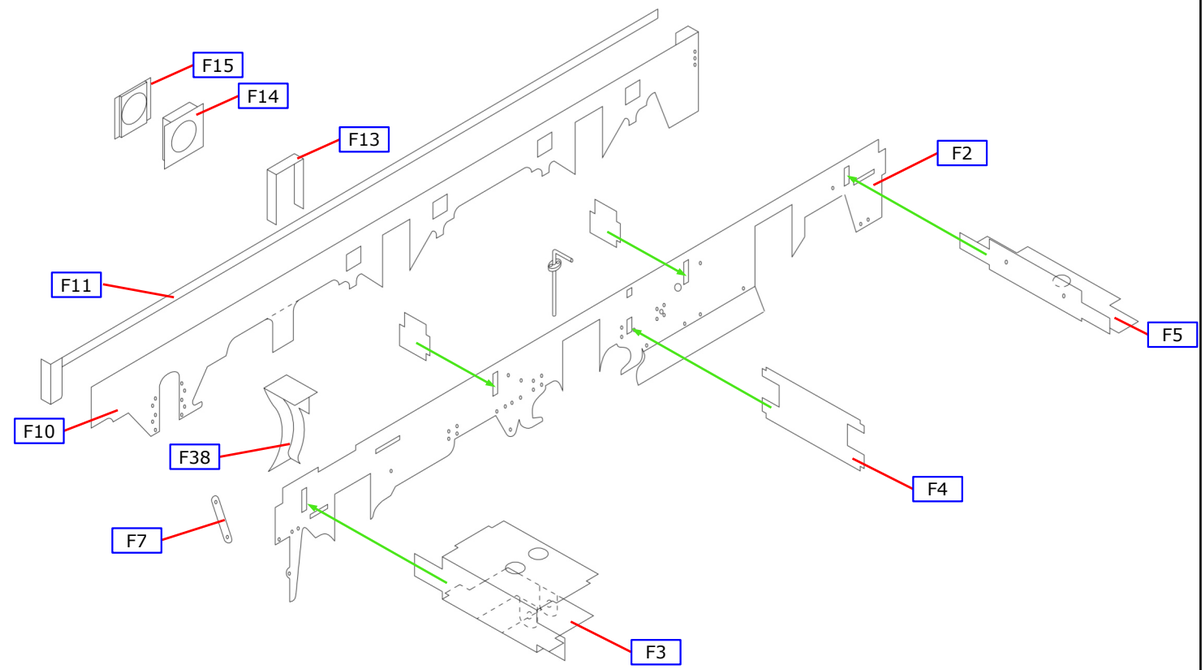
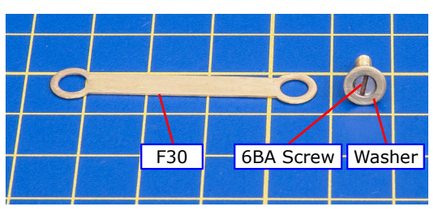


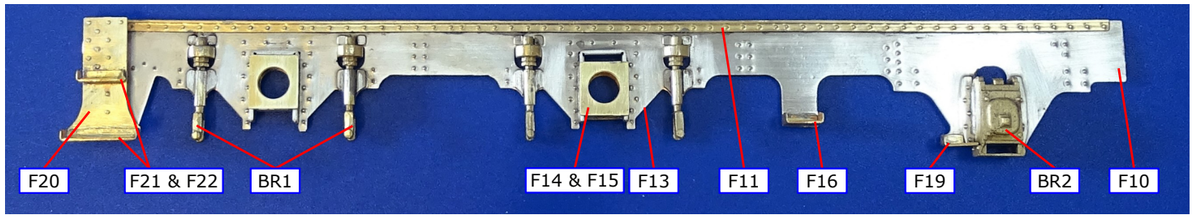
Fig 5. Chassis Construction



OUTSIDE FRAMES, BUFFER BEAM, DRAG BEAM & BRAKES

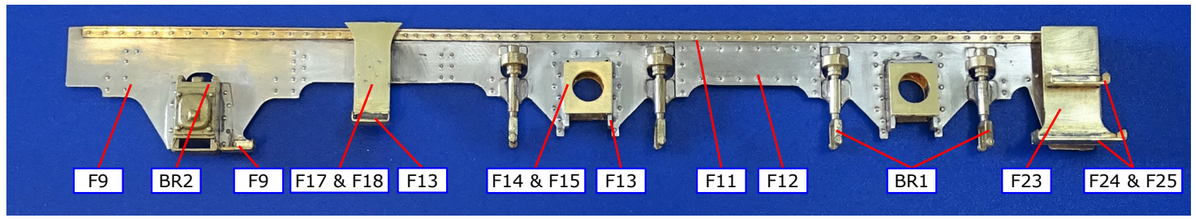
Fold up the rear end of the outside frames, left and right (F9 & F10). Emboss the rivets; if fitting the outside frame strengthening plate (F12) omit the rivets which will lie behind the plate. Attach the outside frame rivet strips (F11) to the top of the outside frames, the left hand strip is the one 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 hornguides (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 hornguides 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).



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).

Solder the outside frame spacers (F26) in place.



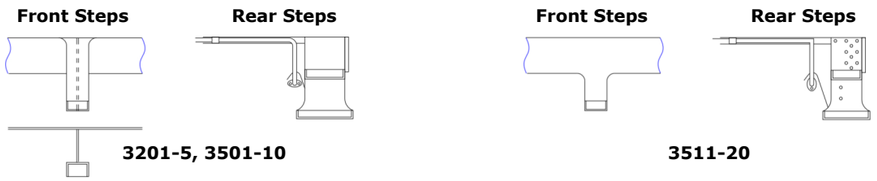


Fig 6. Arrangement of Steps

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.)

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 (BR5) to the axle ends. Fit the coupling rods and confirm that everything still moves smoothly.

No.	Description	Sheet	No.	Description	Sheet
F9	Left outside frame	A1	F27	Buffer beam	A2
F10	Right outside frame	A1	F28	Drag beam	C1
F11	Outside frame rivet strip (2)	C2	F29	Drag beam rubbing plates (2)	C1
F12	Outside frame strengthening plate (2)	A1	F30	Frame to buffer beam angle brackets (2)	C2
F13	Outside frame hornguides (4)	A1	F31	Brake Hanger (8)	C2
F14	Outside frame axleboxes (4)	C2	F32	Brake shoe (4)	A1
F15	Outside frame axlebox front (4)	C2	F33	Outer brake pull rod (2)	C1 & C2
F16	Front step tread(2)	C2	F34	Inner brake pull rod (2)	C1 & C2
F17	Front step back, 3511-20 (2)	C2	F35	Brake pull rod safety brackets (2)	C2
F18	Front step stay, 3511-20 (2)	C2	F36	Leading driven axle inner spring middle lamination (2)	A2
F19	Step tread adjacent to leading axlebox (2)	C2	F37	Leading driven axle inner spring outer lamination (4)	A2
F20	Rear step back, 3201-5 & 3501-10 (2)	C2	F38	Leading wheel splasher (2)	C1
F21	Rear step upper tread, 3201-5 & 3501-10 (2)	C2	F39	Leading driven wheel balance weight (2)	A1
F22	Rear step lower tread, 3201-5 & 3501-10 (2)	C2	F40	Trailing driven wheel balance weight (2)	A1
F23	Rear step back, 3511-20 (2)	C2	F42	Coupling hook pocket	C2
F24	Rear step upper tread, 3511-20 (2)	C2	U10	Spare footplate lamp irons	C2
F25	Rear step lower tread, 3511-20 (2)	C2	SB25	Smokebox lamp bracket	C2
F26	Outside frame spacers (4)	A2			

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 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.

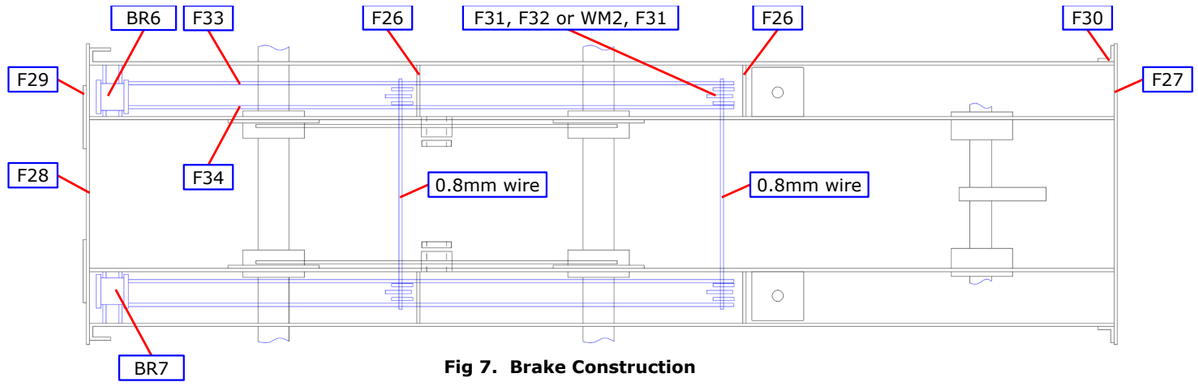
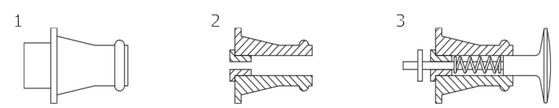


Fig 7. Brake Construction

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.

Buffer Construction



1. Drill casting (WM4) 2mm.
2. Remove rear of casting and glue bush in place.
3. Assemble with spring and retain with washer.

BUILDING THE FOOTPLATE

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 splasher openings flush with the edges of the footplate.

Solder the splasher fronts (U3) in place so that their lower edge is flush with the lower edge of the footplate. The splasher tops are over length; roll the front tops (U4) to match the curve of the splasher front and then reduce the top to fit. Solder in place and add the splasher back (U6) to the front splashers. Reduce the width of the rear splasher tops (U5) to fit on the inside. Repeat the curving, reducing length to fit and soldering in place. Add the splasher 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.

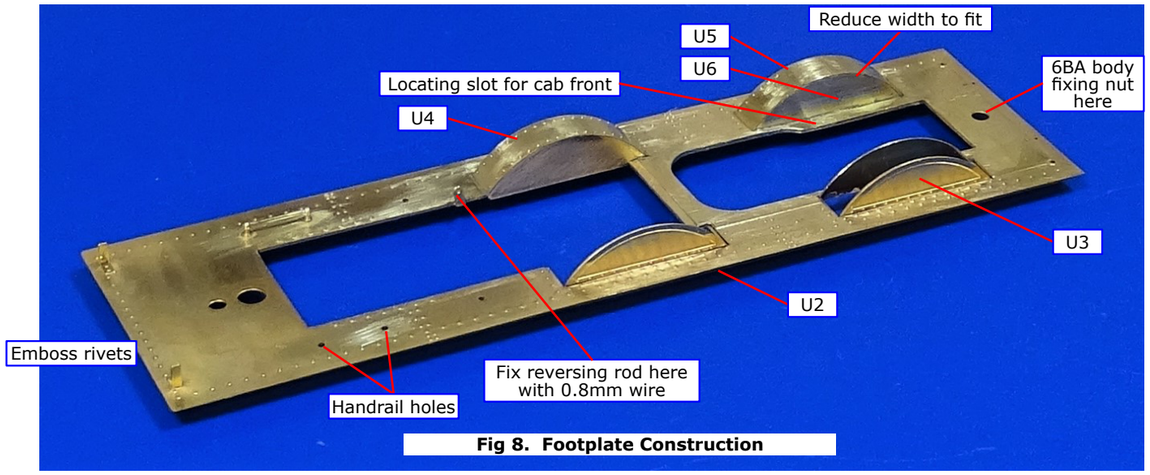


Fig 8. Footplate Construction

No.	Description	Sheet	No.	Description	Sheet
U1	Footplate	C2	U4	Front splasher top	C1
U2	Footplate overlay	C2	U5	Rear splasher top	C1
U3	Splasher front	C1	U6	Splasher back	C1

No.	Description	Sheet	No.	Description	Sheet
C1	Cab front for round top firebox	C2	C11	Canvas covered cab roof, 3501-3520	C2
C2	Cab front for Belpaire firebox	C2	C12	Canvas covered roof side moulding (2)	C2
C3	Cab side for 3201-5 (2)	C2	C13	Canvas covered roof front & rear mouldings (2)	C2
C4	Cab side for 3501-20 (2)	C2	C14	Canvas covered roof transverse strip	C2
C5	Cab cut-out beading (2)	C2	C15	Steel cab roof, 3201-5	C2
C6	Cab seat bracket (2)	C2	C16	Steel cab roof, 3501-20	C2
C7	Cab seat (2)	C2	C17	Steel cab roof rear angle	C2
C8	Cab roof rear support, round top firebox	C2	C18	Steel cab roof rainstrip (2)	C2
C9	Cab roof rear support, Belpaire firebox	C2	C19	Cab floor	C2
C10	Canvas covered cab roof, 3201-5	C2	C20	Fall plate	C2

CAB

Parts are supplied for the round or Belpaire firebox cab front, for the different cab side cut-outs for 3201-5 or 3501-20 and for steel or canvas covered roofs.

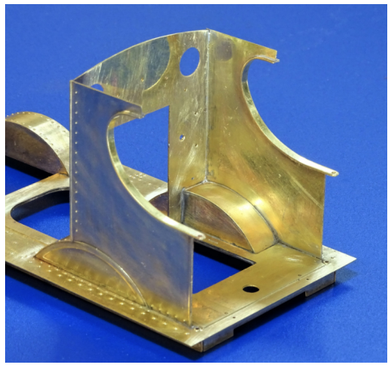
Round Top Firebox Cab. Emboss the rivets in the cab front for round top firebox (C1) and solder in place. Reduce the height of the cab sides (C3 for 3201-5 or C4 for 3501-20) to match the cab front. Attach the cab cutout beading (C5) to the cabsides fitting the etched groove over the edge of the cab 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. Now 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.

Belpaire Firebox Cab. 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. Now 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. 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 rainstrip strip (C14), if required. As they are very delicate, fit the whistles, large and small (BR10 & BR11) as a last step.

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.



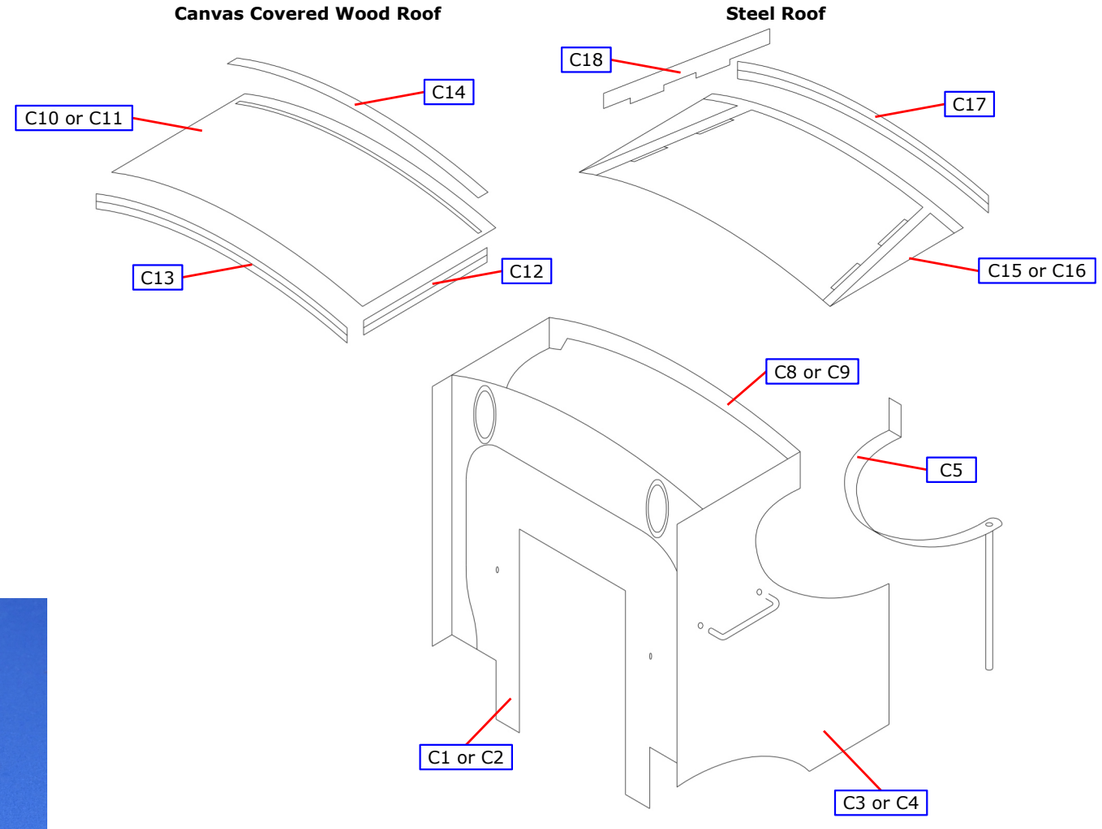


Fig 9. Cab Construction

S4 BOILER AND FINISHING

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 snaphead 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	No.	Description	Sheet
SB1	Boiler and round top firebox wrapper	C1	SB18	Smokebox rear (2)	C1
SB2	Boiler front former	A1	SB19	Flush riveted smokebox wrapper	C1
SB3	Boiler rear former	A1	SB20	Snaphead riveted smokebox wrapper	C1
SB4	Boiler joining strip	C1	SB21	Smokebox and boiler ring	A1
SB5	Round top firebox upper washout plugs (2)	C1	SB22	Smokebox front step	C2
SB6	Round top firebox lower washout plugs (4)	C1	SB23	Smokebox side step	C2
SB7	Round top firebox front former	A1	SB24	Cylinder cover	C2
SB8	Round top firebox rear former	A1	SB25	Smokebox lamp bracket	C2
SB9	Firebox band joining clips (4)	C2	U7	Firebox side bracket (2)	A2
SB15	Smokebox base	C1	U8	Firebox side bracket cover (2)	A1
SB16	Early smokebox front	C1	U9	Reversing Lever	C2
SB17	Later smokebox front	C1	U10	Spare footplate lamp irons	C2

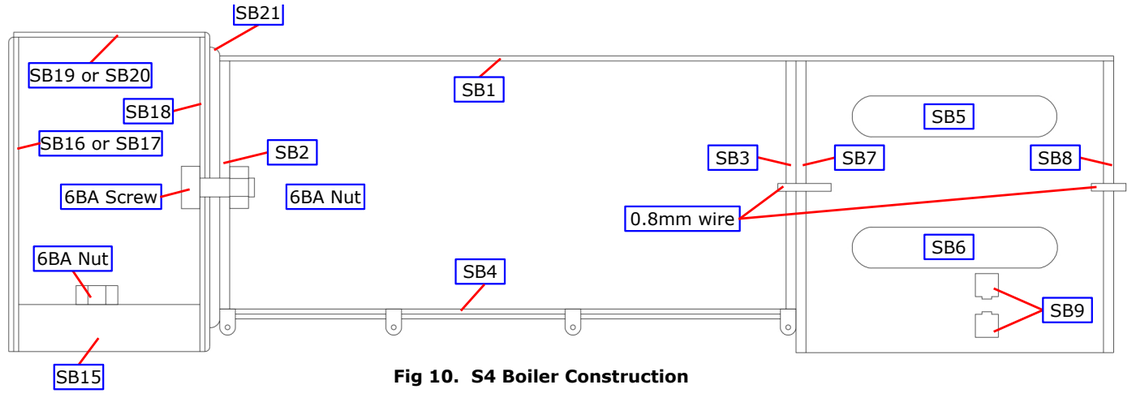


Fig 10. S4 Boiler Construction

FINISHING

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.

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.

Using the drawing of the cab interior detail the backhead and the cab interior detailed. Use copper wire of a suitable size for the pipes. Solder the backhead to the cab floor so that they become a removable unit.

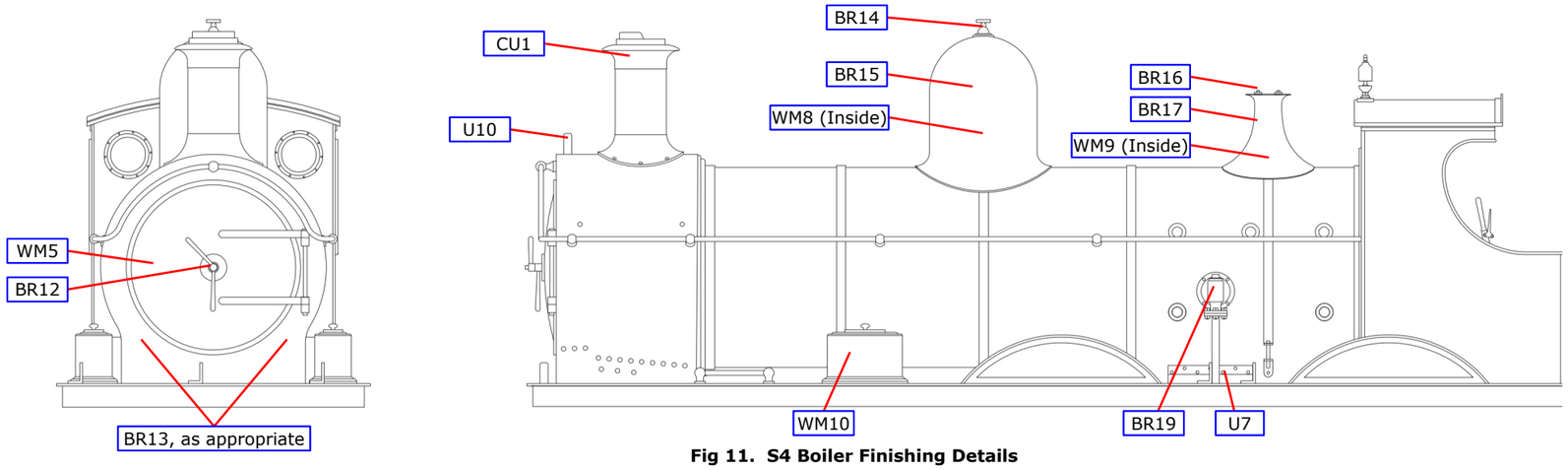


Fig 11. S4 Boiler Finishing Details

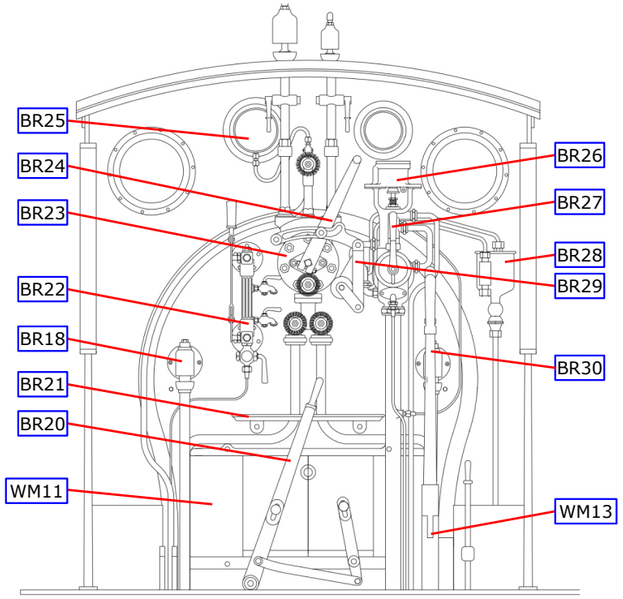


Fig 12. S4 Backhead

FORMING THE BELPAIRE FIREBOX

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

Photo 1. Solder together the two laminations of the firebox front (SB10). Clean the cusp off all parts, including the firebox rear former (SB11). 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). The cab front fits 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.

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

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 35.3 mm inside, 37.1 mm outside. 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 in the footplate slots.

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

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

Photo 5. Emboss the rivets for the ends of the cladding fixing bands on the firebox wrapper (SB12).

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 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.

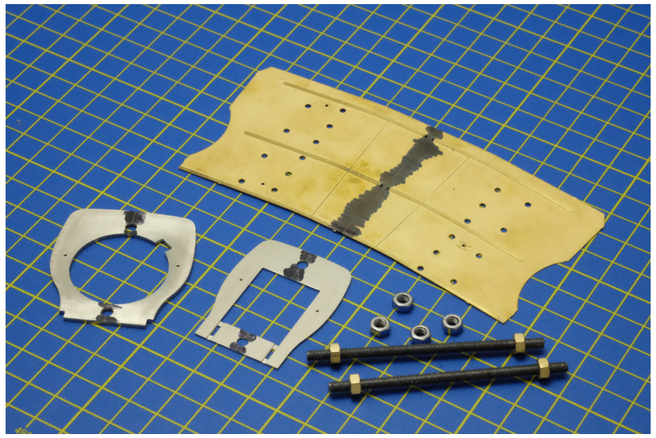
Run an extra fillet of solder into the internal front shoulders of the firebox to support the area which will be filed back. The brass nuts can be heated and removed. Remove the rear scrap section of the spacer.

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 (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 washout plugs in place (SB13).

No.	Description	Sheet	No.	Description	Sheet
SB9	Firebox band joining clips (4)	C2	SB12	Belpaire firebox wrapper	C1
SB10	Belpaire firebox front former (2)	A1	SB13	Belpaire firebox washout plugs (4)	C1
SB11	Belpaire firebox rear former	A1			

1.



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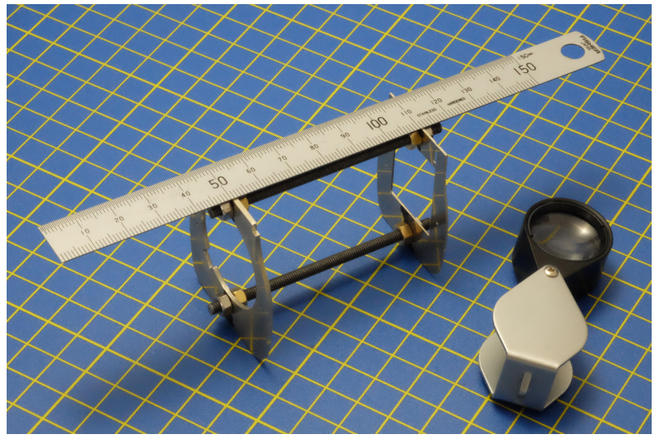

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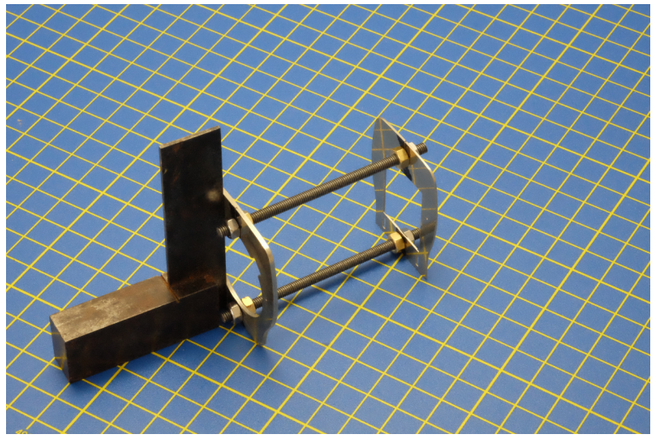

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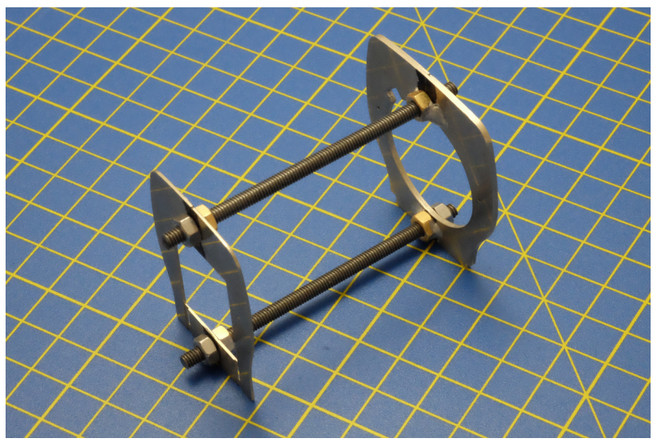

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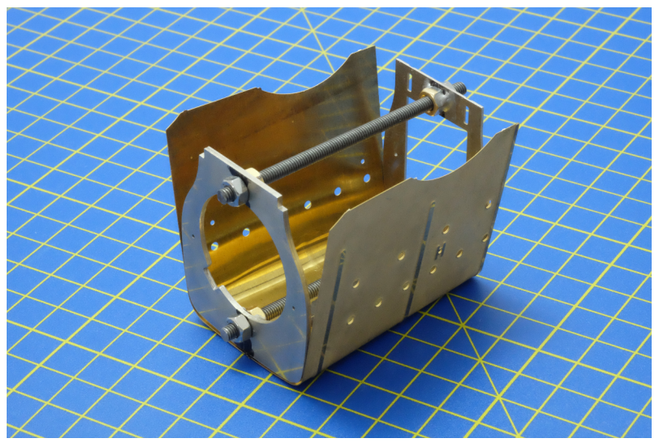

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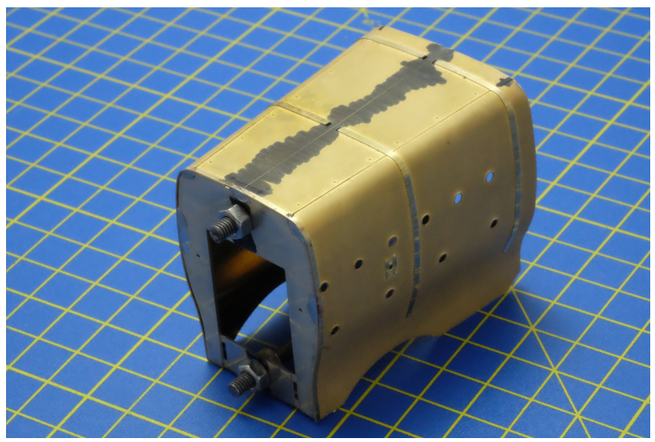


BELPAIRE (B4) BOILER AND FINISHING

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 snaphead 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	No.	Description	Sheet
SB1	Boiler and round top firebox wrapper	C1	SB20	Snaphead riveted smokebox wrapper	C1
SB2	Boiler front former	A1	SB21	Smokebox and boiler ring	A1
SB3	Boiler rear former	A1	SB22	Smokebox front step	C2
SB4	Boiler joining strip	C1	SB23	Smokebox side step	C2
SB14	Boiler washout plugs (4)	C1	SB24	Cylinder cover	C2
SB15	Smokebox base	C1	SB25	Smokebox lamp bracket	C2
SB16	Early smokebox front	C1	U7	Firebox side bracket (2)	A2
SB17	Later smokebox front	C1	U8	Firebox side bracket cover (2)	A1
SB18	Smokebox rear (2)	C1	U9	Reversing Lever	C2
SB19	Flush riveted smokebox wrapper	C1	U10	Spare footplate lamp irons	C2

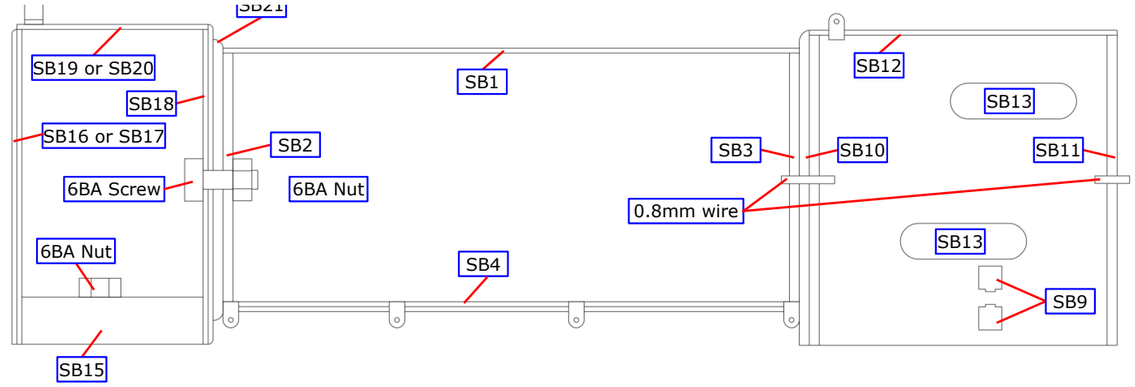


Fig 13. B4 Boiler Construction

FINISHING

Solder the firebox side bracket (U7) or the firebox side bracket cover (U8) 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.

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.

Using the drawing of the cab interior detail the backhead and the cab interior detailed. Use copper wire of a suitable size for the pipes. Solder the backhead to the cab floor so that they become a removable unit.

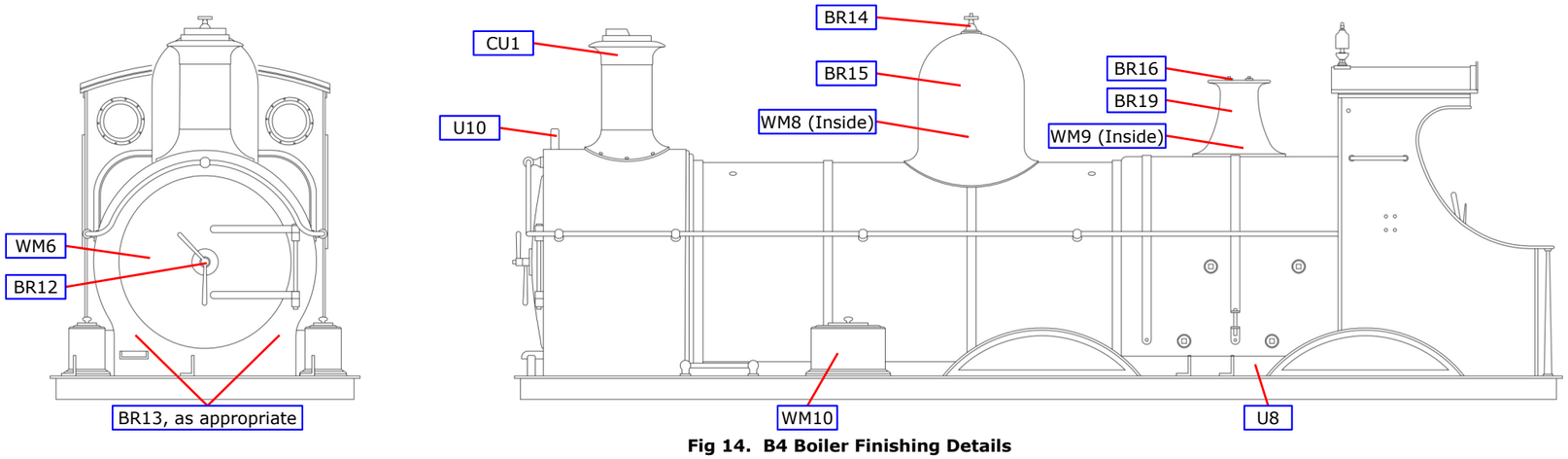


Fig 14. B4 Boiler Finishing Details

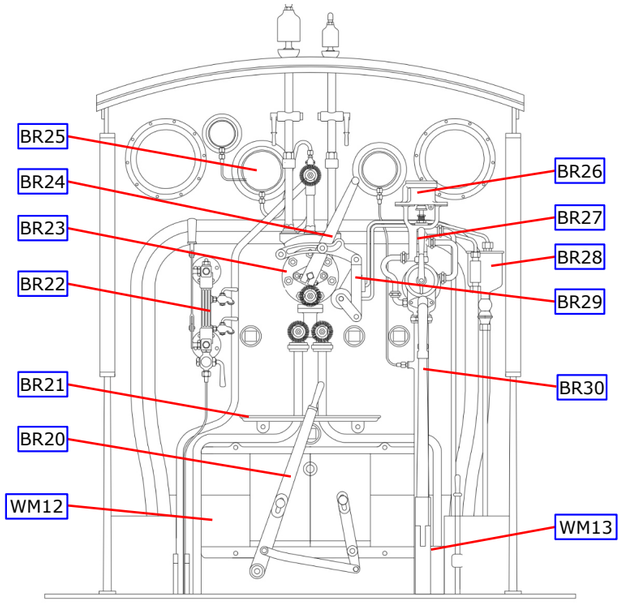
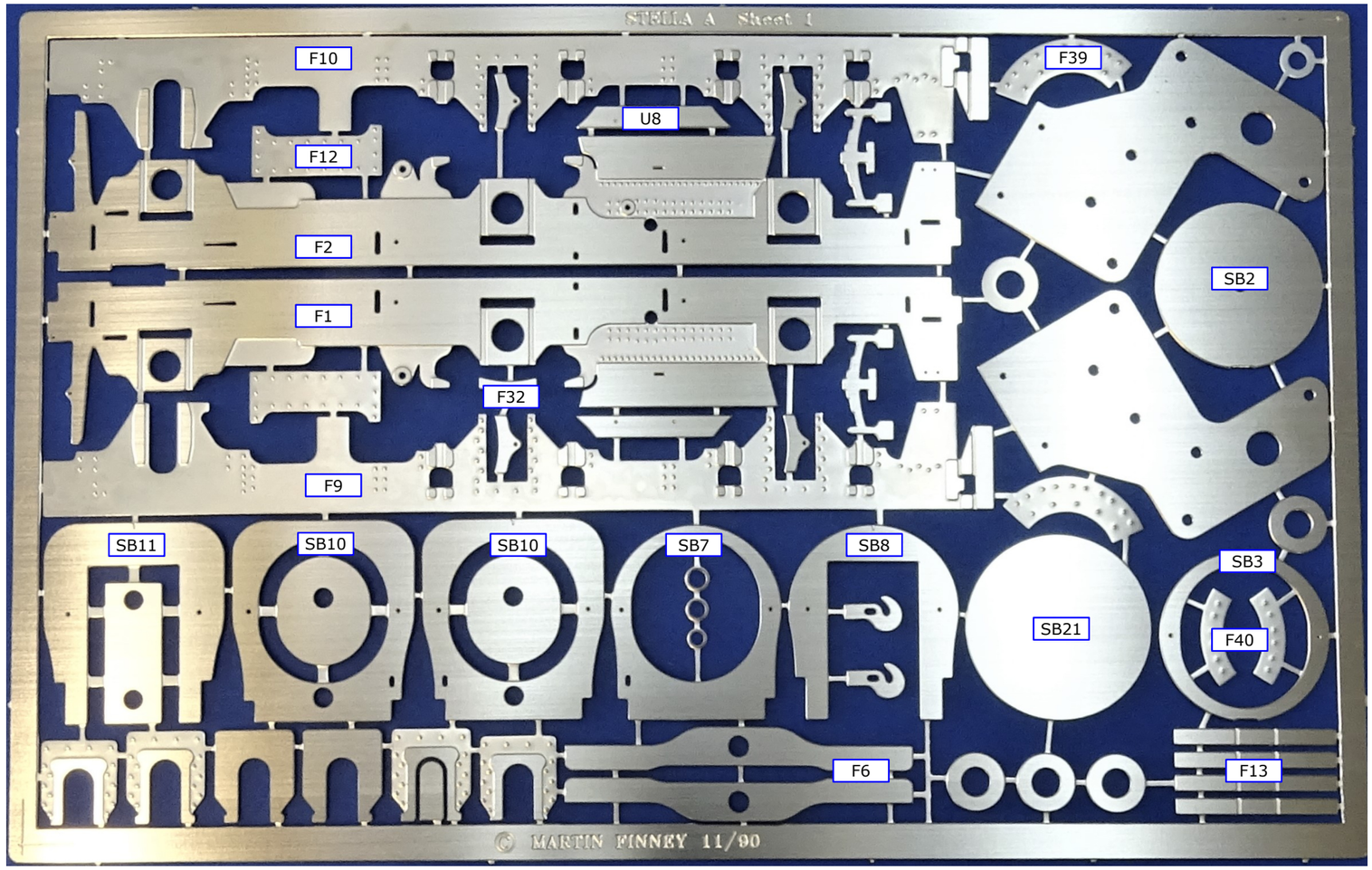
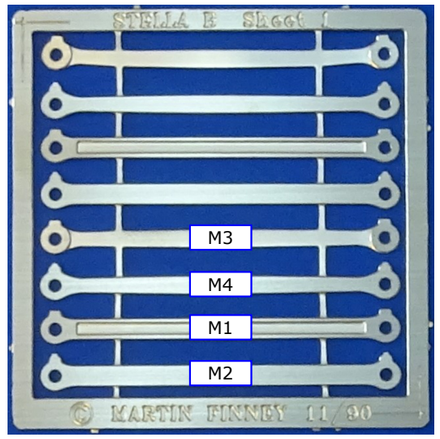
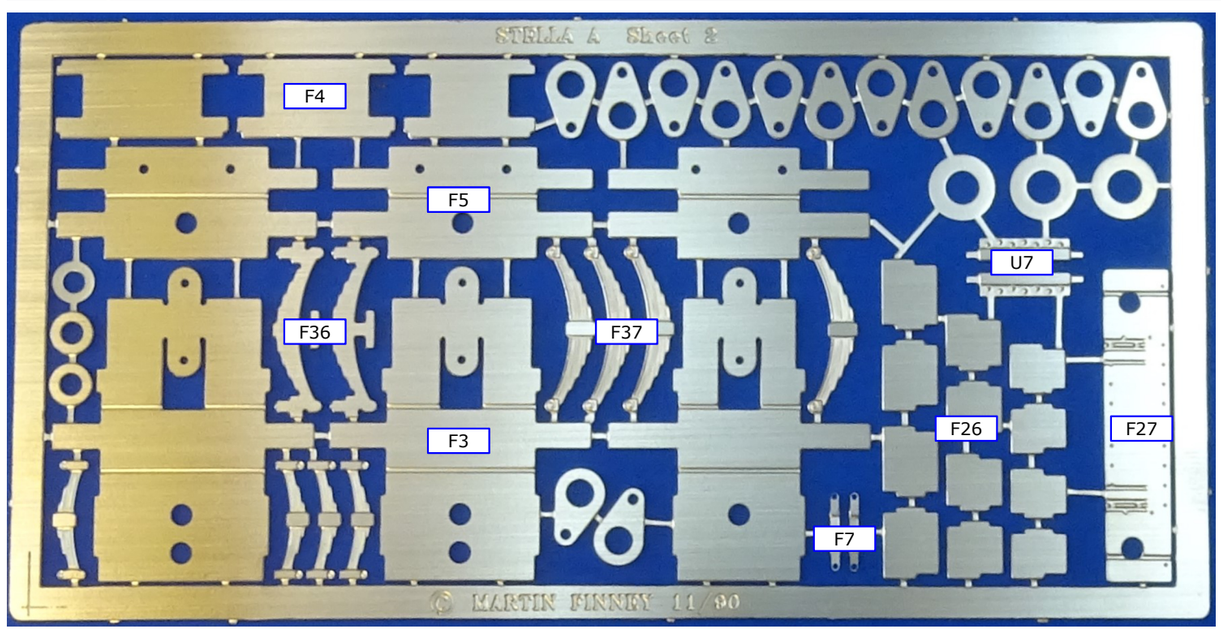


Fig 15. S4 Backhead

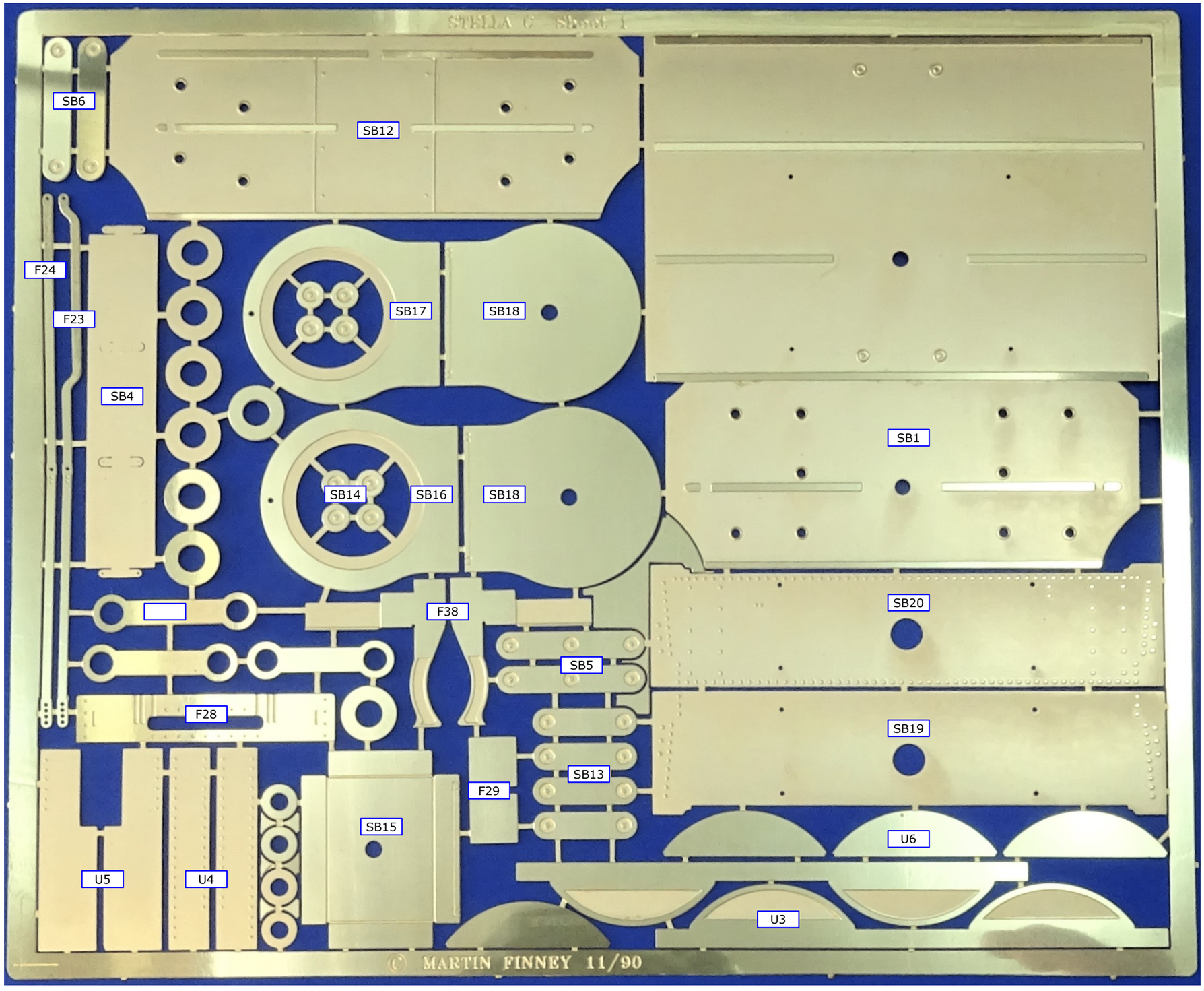
ETCH SHEET A1 & A2



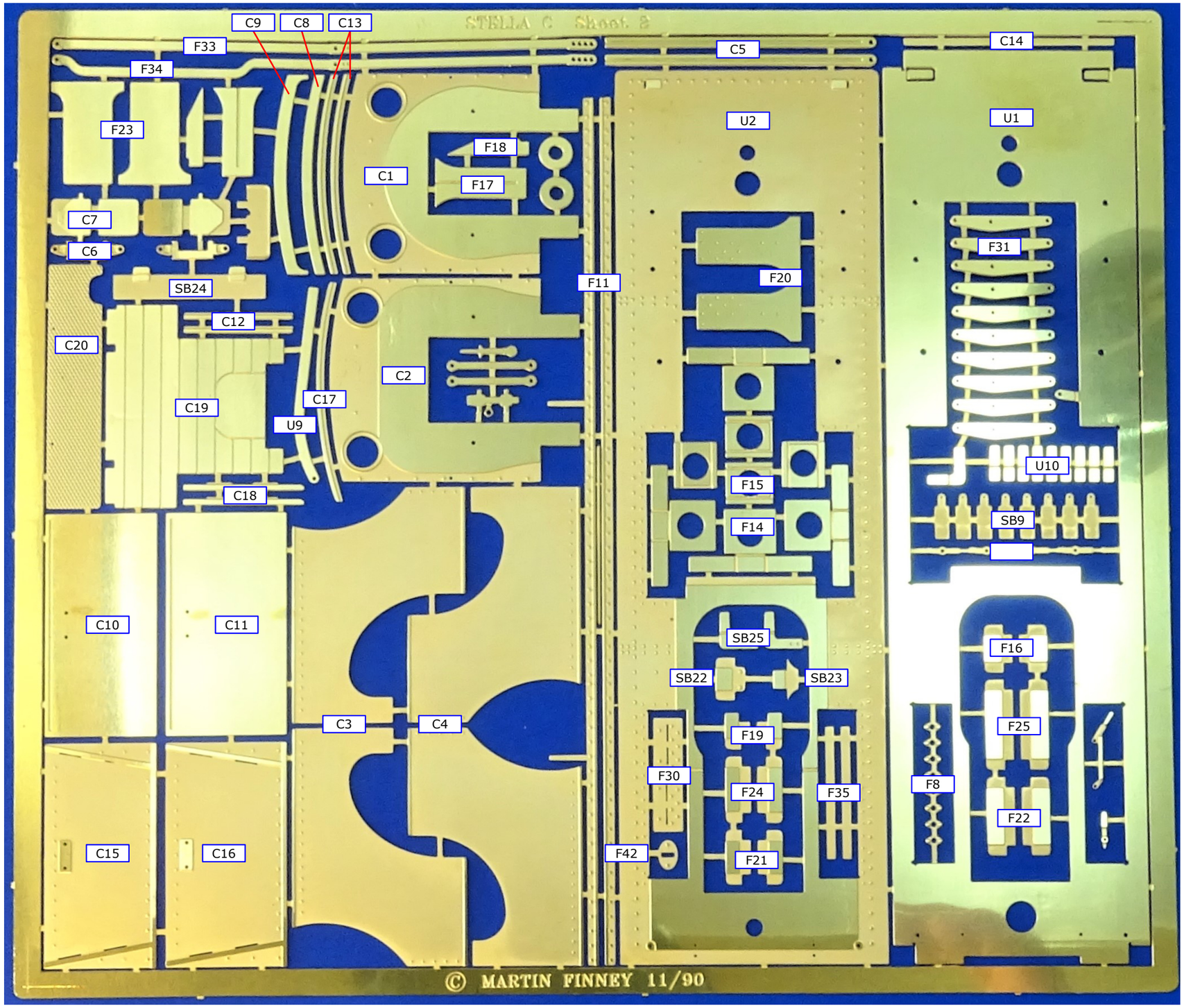




ETCH SHEET C1



ETCH SHEET C2



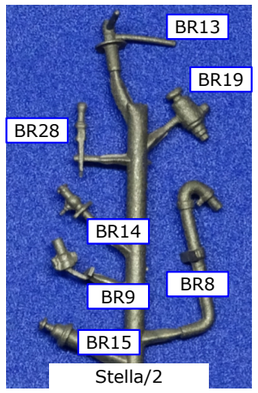
STELLA CASTINGS

BRASS CASTINGS

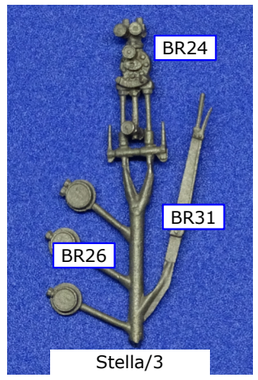
CU1	Parallel chimney	3232/1
BR1	Underhung spring hanger (8)	Stella/4
BR2	Leading axlebox (2)	Stella/4
BR3	Leading axle spring (2	Stella/5
BR4	Leading axle spring hangers (4)	Stella/5
BR5	Cranks (4)	Cranks/2
BR6	Steam brake cylinder, left hand	Atbara/1
BR7	Steam brake cylinder, right hand	Atbara/1
BR8	Vacuum pipe	Stella/2
BR9	Vacuum pipe dummy	Stella/2
BR10	Large whistle	1854/2
BR11	Small whistle	1854/2
BR12	Smokebox door handles	Stella/2
BR13	Steam lance cock	Stella/2
BR14	Dome lubricator	Stella/2
BR15	Dome	Stella/1
BR16	Safety valves (2)	Detail/1
BR17	Safety valve casing, round top firebox	Duke/6
BR18	Clackbox (2)	3232/5
BR19	Safety valve casing, Belpaire firebox	1854/2
BR20	Firebox door handle	3232/7
BR21	Backhead shelf	Detail/1
BR22	Water gauge	3232/7
BR23	Regulator mounting	Stella/3
BR24	Regulator handle	3232/5
BR25	Cab pressure gauges (3)	Stella/3
BR26	Combined ejector/brake	3232/5
BR27	Combined ejector/brake handle	Stella/2
BR28	Sightfeed lubricator	3232/5
BR29	Regulator and jockey valve linkage	3232/7
BR30	Lever reverse handle	Stella/3
BR31	Mud hole door clamp (2)	Loose48

3232/1

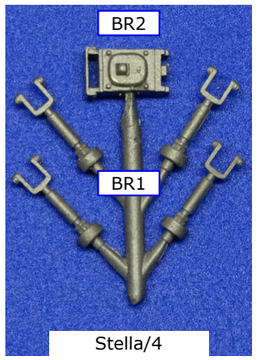
Stella/1



Stella/2

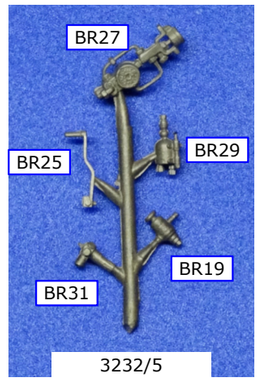


Stella/3

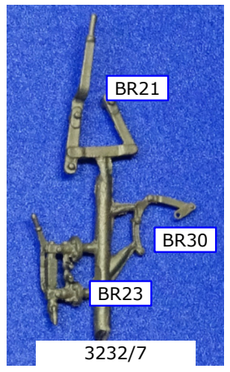


Stella/4

Stella/5



3232/5

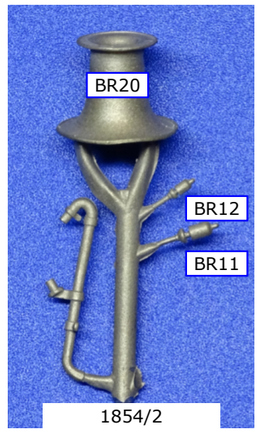


3232/7

Detail/1

Atbara/1

Duke/6



1854/2

Need Photo

BR5

Cranks/2

OTHER COMPONENTS

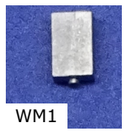
3/16" bore bearing (6)
3/16" x 4.75mm Brass tube for leading axle (2)
6 BA x ¾" Brass screws (1)
6BA x 5/16" Brass screw (2)
6 BA nuts (2)
Short handrail knobs (12)
Medium handrail knob (1)
Variable length handrail knob & flange (4)
Buffer head, bush, washer & spring (2)
Vacuum pipe hose
4mm studding and nuts for firebox assembly

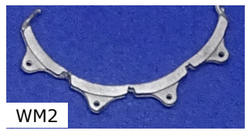
1/8" brass wire for compensation beam pivot
5/32" OD brass tubes for compensation beams
1.6mm Steel wire for front compensation beam
0.45mm Brass wire for fallplate hinges and cab side handrails
0.8mm Brass wire for brake hanger pivots and handrails
1.2mm Brass wire.for vacuum pipe & sand pipes
0.8mm & 1.5mm Copper wire for backhead pipes

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

WHITEMETAL CASTINGS

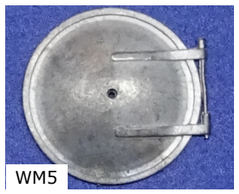
WM1	2	Sandbox lower portion
WM2	4	Brake Shoe
WM3	4	Driven wheel underhung spring
WM4	2	Dean taper buffer
WM5	1	Early smokebox door with ring
WM6	1	Later Churchward smokebox door
WM7	1	Smokebox pipe cover (Stepped)
WM8	1	Inside of dome
WM9	1	Safety valve base
WM10	2	Sandbox
WM11	1	Round top firebox backhead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

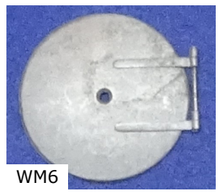

WM1

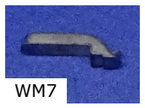

WM2


WM3


WM4


WM5


WM6


WM7


WM8


WM9


WM10


WM11


WM12


WM13