

Fig 1. Hall GA

## COUPLING RODS AND BOGIE

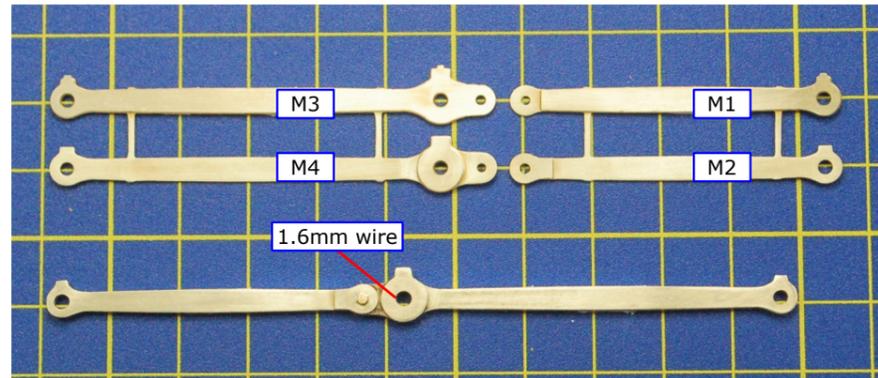
### COUPLING RODS.

The coupling rods are made now so that they can be used as a jig to align the remaining hornblocks accurately. First drill out all the crankpin holes to a convenient size which is well undersize for the crankpins and the fork joint holes 1.6mm so that the 1.6mm nickel silver wire is a tight fit. Remove all burrs caused by the drilling. Now drill a hole, with the drill used for the crankpin holes, in a 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 laminations of each rod.

Tin well the front face of the inner laminates and the rear face of the outer laminates and place them over the mandrel. Using plenty of solder and flux solder the two laminates together. You will now have rods with the crankpin and fork joint holes 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.

The crankpin holes now need carefully opening out until they just fit, with no free play, the ends of the hornblock alignment jigs.

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



No.	Description
M1	Front coupling rod inner lamination (2)
M2	Front Coupling rod outer lamination (2)
M3	Rear coupling rod inner lamination (2)
M4	Rear coupling rod outer lamination (2)
BO1	Bogie frame
BO2	Bogie top plate

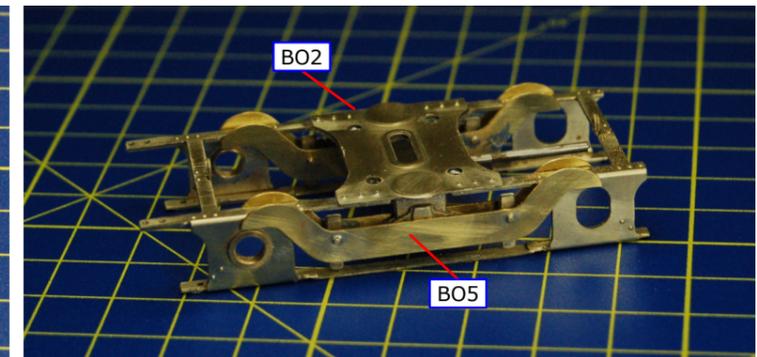
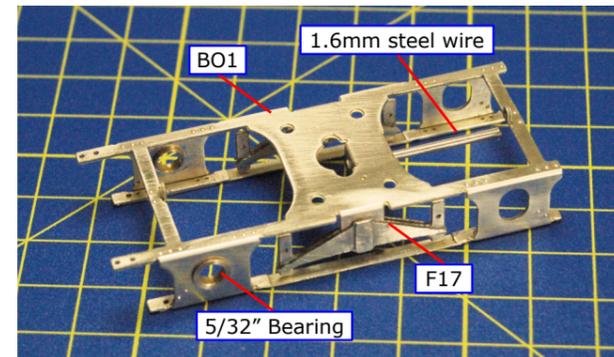
Sheet	No.	Description	Sheet
A3	BO3	Bogie lower frame overlay	A2
A3	BO4	Bogie side control washer	B1
A3	BO5	Bogie compensation beam (4)	B2
A3	BO6	Bogie transverse brace (2)	B2
A2	BO7	Bogie guard iron and front bracing (2)	B3
A3	F17	Main spring /bogie spring outer lamination (16)	A2

### BOGIE.

Choose the appropriate width frame (BO1). Open up the axle holes to accept the 5/32" top hat bearings and the holes for the compensation beam 1.6mm. Emboss all the frame rivets.

Solder the bogie spring outer lamination (F17) to both sides of the main spring on both sides of the frame. Deepen the fold lines with a four square file and carefully fold up the frame. Solder the 1.6mm steel wire compensation beam in place. Solder the front bearings in place and using appropriate washers (BO4) fit the wheels and rear bearings so that there is a minimum of side play. Check that the compensation works and that the bogie is level. Now remove the wheels.

Solder the bogie compensation beams (BO5) in place (one each side of each side frame) using 0.8mm wire both for alignment and to represent the fixing bolts. Solder the top plate (BO2) in place.



Add the transverse bracing (BO6). Attach the bogie lower frame overlay (BO3) to the underside of the half etched area at the bottom of the frames. Fold up the guard iron and front bracing (BO7) making the uppermost bend with the fold line on the outside before attaching in place locating them with pieces of 0.8mm wire through the holes in the frame. Form the guard irons to shape. Solder four pieces of 0.8mm wire in the half etched slots in underneath of each side frame to represent the stretchers. Replace the wheels

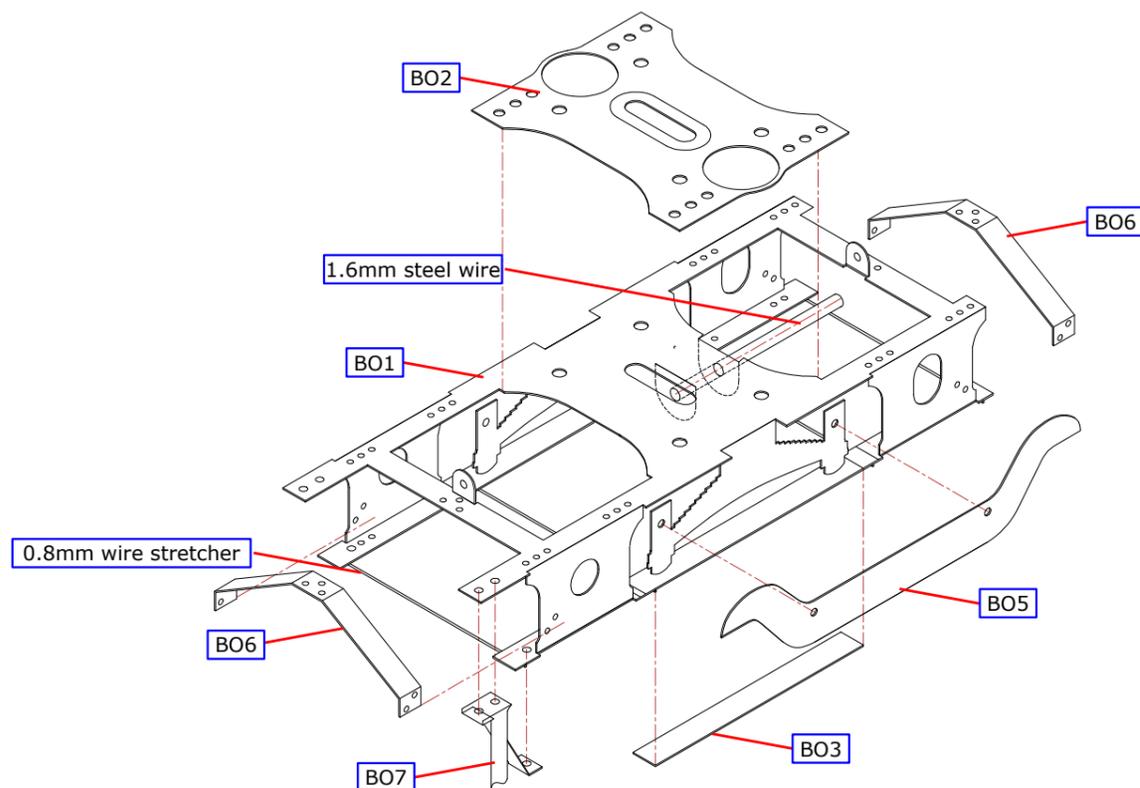
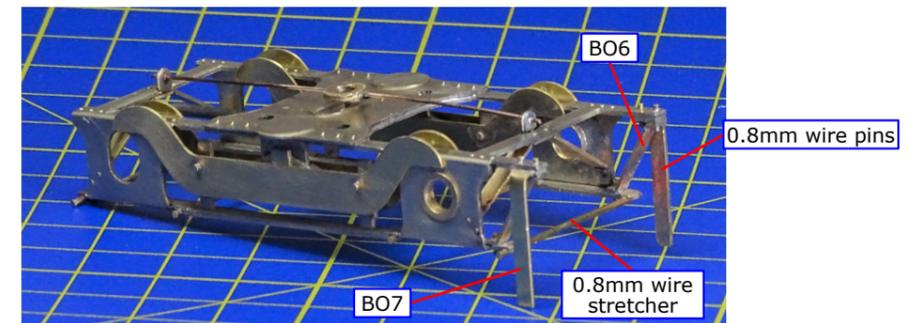


Fig 2. Bogie Construction



Solder the both washers (BO4) to the middle of the spring wire, locating the half etched slot in each washer over the wire. Now file away the wire inside the hole in the washers. This assembly then fits over the 6BA bogie pivot bolt and through the holes in the small brackets attached to the upper bogie stretchers. By suitably bending the wire both side control springing and slight downwards springing is achieved. The bogie is attached with a 6BA nut.



## FRAME CONSTRUCTION

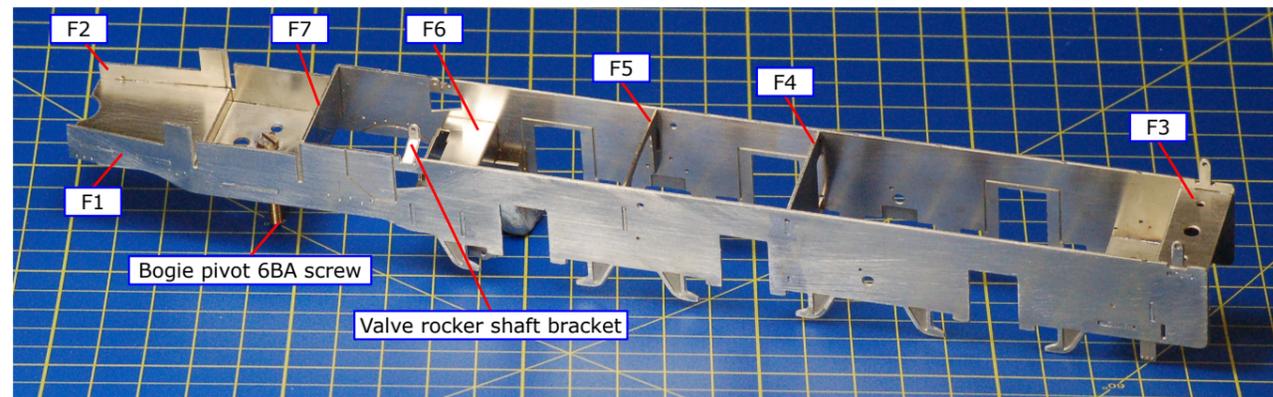
### FRAMES

To construct the kit as designed with a compensated chassis remove the axle holes by cutting up the half etch lines on the inside of the frames (F1 & F2). Follow the instructions in the hornblock pack. Open out the following holes in the frames.

- B for brake hanger pivots - 0.8mm
- R for reversing shaft - 1.6mm
- C for compensation beam pivot - 1/8"
- V for valve rocker shaft bracket - 1.2mm
- P as required if fitting plunger pick ups.

Bend the valve rocker shaft brackets along the 1/2 etched fold lines at right angles and strengthen with a fillet of solder. Similarly bend the brackets for the rear sand pipes; remove these brackets if fitting the later rear sandboxes.

Engines fitted with spring compensation beams in the original condition will need the four innermost spring hangers removing from the bottom of each frame before soldering the compensation beams (F8 & F9) in place.



### FRAME SPACERS AND ASSEMBLING THE CHASSIS.

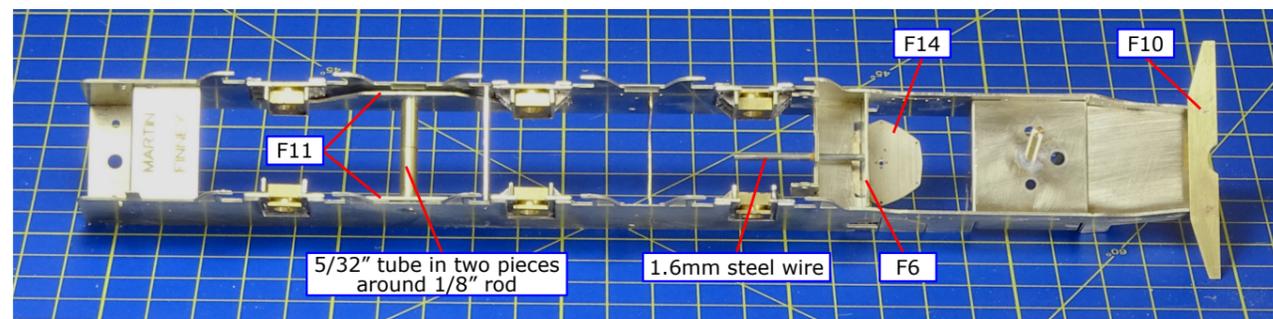
Remove the spacers to suit your chosen gauge, the rear (F3), the firebox front (F4), the boiler cradle (F5), the compensation mounting (F6) and the front spacer (F7). Open out the holes in the compensation mounting spacer for the front compensation beam to 1.6mm and the holes for the brake cross shaft 1.6mm. Fold the remaining spacers making sure the 1/2 etched fold line is on the inside and that each bend is a right angle. Emboss all the frame rivets. If your model will need to negotiate tight radius curves then it will be necessary to cut away the frames above the rear bogie wheels to allow them to pass under the frames. The piece to remove is indicated by a half etched line.

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. Bend the frames inwards slightly along the fold lines in front of the cylinder opening using the front spacer as a guide. Solder one of the longer 6BA bolts through the hole in the front spacer to act as the bogie pivot. Emboss the rivets on the vacuum cylinder top (F14) and solder in place over the tab on the top of the compensation mounting spacer.

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

Build and solder in place the hornblocks as detailed in the instructions included in the hornblock kit.

Solder the buffer beam spacer (F10) in place in the notches under the frames at the front.

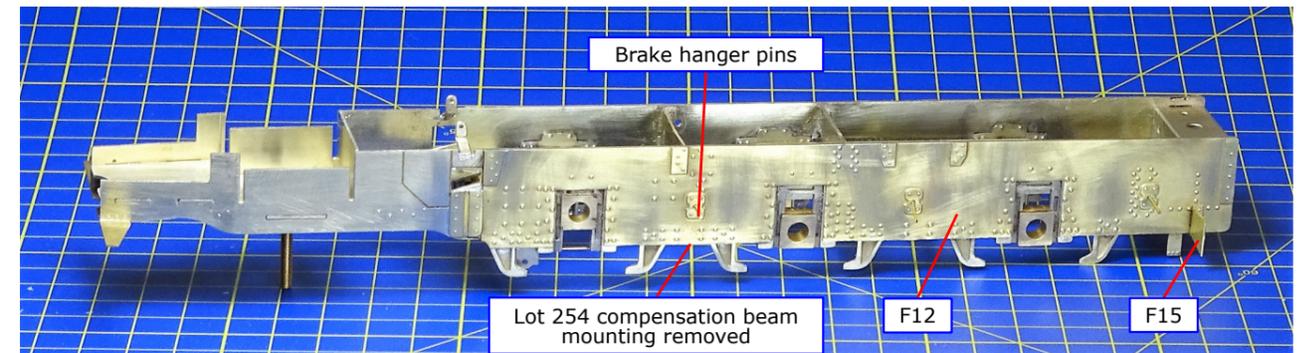


No.	Description	Sheet	No.	Description	Sheet
F1	Frame left	A1	F9	Front Lot 254 compensation beam	A2
F2	Frame right	A1	F10	Buffer beam spacer	B1
F3	Rear spacer	A1	F11	Compensation beam (2)	A2
F4	Firebox front spacer	A1	F12	Frame overlay left	B2
F5	Boiler cradle spacer	B2	F13	Frame overlay right	B2
F6	Compensation mounting spacer	A1	F14	Vacuum cylinder top	A1
F7	Front Spacer	A1	F15	Rear step brackets, three widths (L & R)	B1
F8	Rear Lot 254 compensation beam	A2			

### FITTING THE COMPENSATION BEAMS.

Thread a 30mm long piece of 1.6mm steel wire through the holes in the front compensation beam mounting (F6) and solder to the mounting.

For the rear beams cut a piece of 1/8" brass rod so that it fits through the holes C and is flush with the outside face of the chassis frames. Cut two equal pieces of 5/32" tube which together fit between the frames and solder the compensation beams (F11) to them close to one end. Temporarily fit the beams and rod and then fit all the wheels and axles and confirm that the compensation works properly and check that the chassis is sitting level.



### FRAME OVERLAYS.

Emboss all the rivets in the frame overlays, left and right (F12 & F13). If the model has the original rear sanding brackets attached to the frames, file a small slot in each overlay to clear the bracket. If the model is not a Lot 254 locomotive, remove the compensation beam mountings from the overlay.

Solder in place lengths of 0.8mm wire for the brake hanger pivots. These then serve to accurately locate the overlays which only need tack soldering around their edges. Solder the rear step brackets (F15) in place in the slots in the frames; the bracket with the small hole (to attach the live steam injector) fits on the right side.

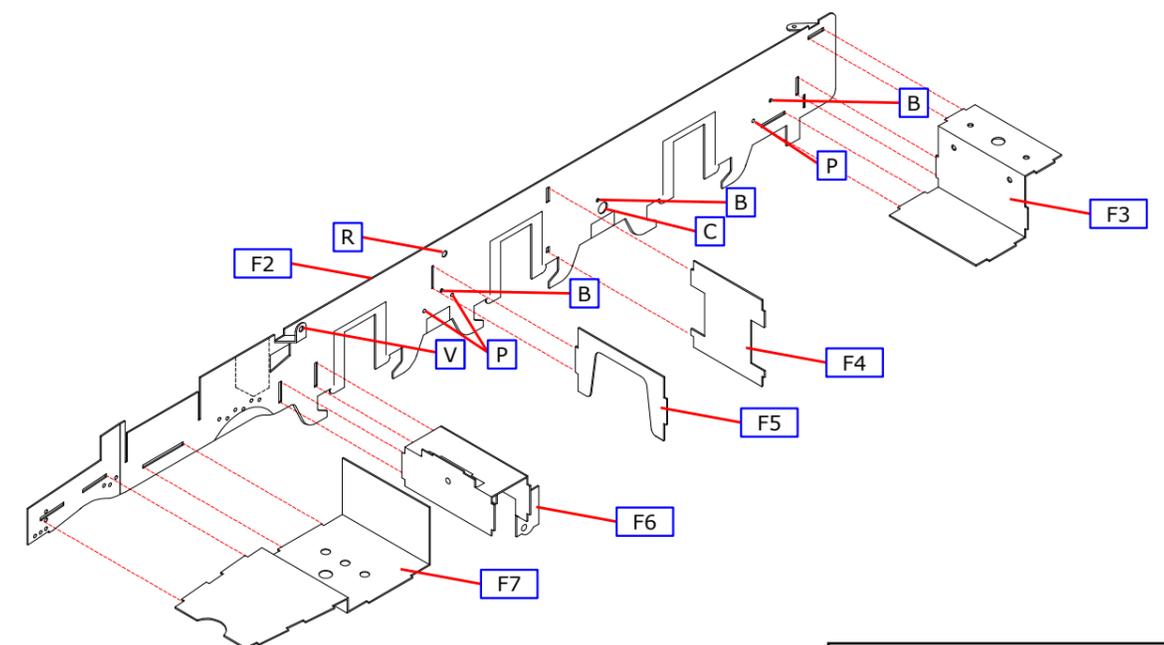
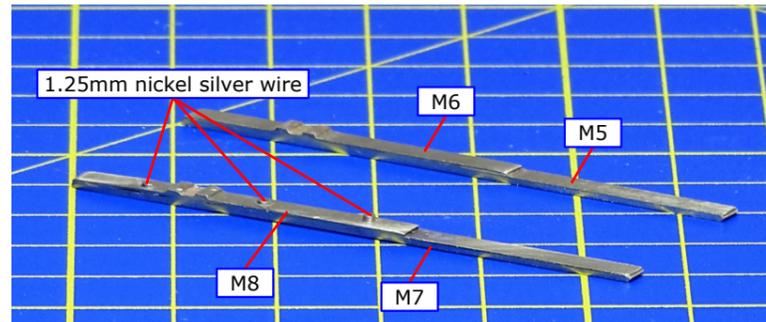


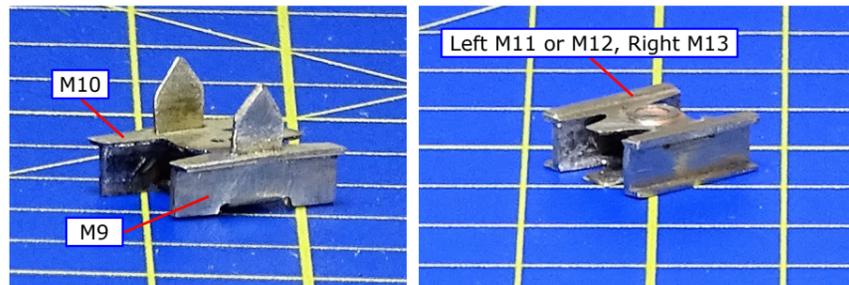
Fig 3. Frame Construction

## CYLINDER ASSEMBLY

**Slidebars.** Emboss the rivets in the lower slide bar lamination (M6) and solder to the lower slidebar (M5) aligning the sides and rear end. Carefully file the edges smooth and taper the outer surfaces at the rear. Repeat for the upper slide bar (M8 & M7). Open up the oil cup holes in the upper slidebars and solder in short lengths of 1.25mm nickel silver wire.

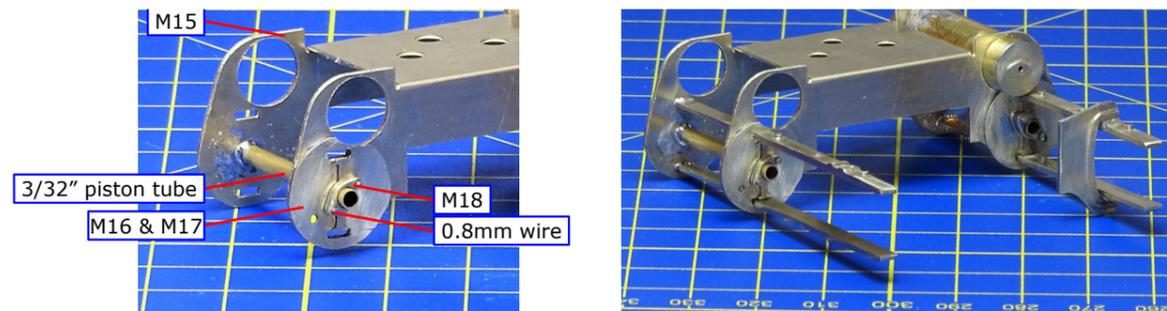


**Crossheads.** Fold the crosshead slippers (M9) through 90° on the half etched lines. The holes in the crosshead back (M10) need to be enlarged with a scalpel to allow the spikes on the slipper through the crosshead back. Ensure that the back sits flat and true on slipper and solder together. Drill a 1.25mm hole in the appropriate left side crosshead front (M11 or M12) and the hole in the crosshead back. Mount a 1.25mm drill vertically in a block of wood to act as a mandrel and thread the front over the slipper/back assembly. Ensure all is square and carefully solder together. Remove the two prongs at the rear and finish smooth. Repeat the sequence for the right crosshead with the crosshead front (M13) and then solder the crosshead vacuum pump bracket (M14) to the front face.

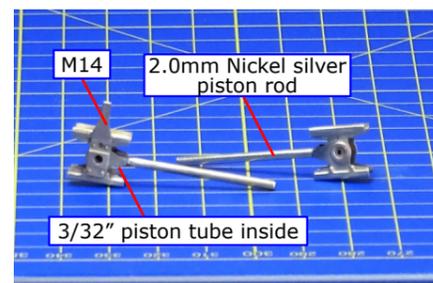


**Cylinders.** Open out the piston tube and valve chest holes in the cylinder former (M15) until the tubing fits snugly. Reduce the width of the inside cylinder faces to the etched lines provided so that the cylinders are a good fit into the slots in the frames. The holes for the 11/32" valve chest are etched too small and will need to be opened out carefully. Fold up the cylinder faces making sure they are square.

Fit the 3/32" piston tube flush at the front with 2.5mm projecting at the rear. Place the cylinder rear cover (M16) over the projecting tube, align and solder in place. The slots for the slidebars will need opening out and we suggest the careful use of a scalpel (the Swann Morton brass handled type). When all the slide bars fit, remove the slidebars and place the cylinder rear cover overlay (M17) and piston rod gland (M18) over the projecting tube passing short lengths of 0.8mm wire through to represent the fixing studs. Solder the assembly in place. Now solder the slide bars in place. Check the crosshead for fit between the slide bars.



**Crossheads.** Cut a 3.5mm piece of the 3/32" piston tube and solder to a piece of the 2.0mm nickel silver piston rod. Bend in slightly the small projections at the front of the crosshead so that the tubing is a tight fit between them. Place the piston rod in the piston and slide the crosshead in place with the tubing between the projections; not too far or it will foul the small end of the connecting rod. Now solder the crosshead to the piston rod and the result should be a perfectly aligned and free moving assembly.

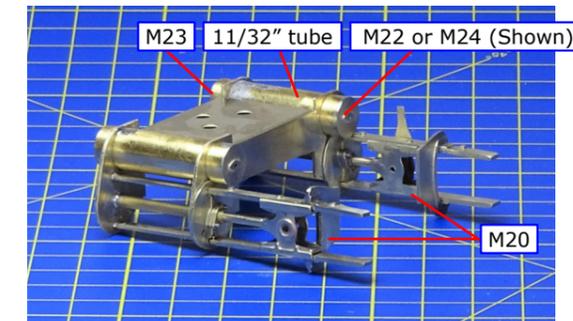


No.	Description	Sheet	No.	Description	Sheet
M5	Lower slide bar (2)	A3	M19	Cylinder front cover (2)	A2
M6	Lower slide bar lamination (2)	A3	M20	Slide bar bracket lamination (4)	A3
M7	Upper slide bar (2)	A3	M21	Valve spindle cross head guide (4)	A2
M8	Upper slide bar lamination (2)	A3	M22	Valve chest cover for valve spindle cross head guide (2)	A2
M9	Crosshead slipper (2)	A3	M23	Front valve chest cover (2)	A2
M10	Crosshead back (2)	A1	M24	Rear valve chest cover (2)	A2
M11	Left crosshead front, original style	A1	M25	Cylinder wrapper (2)	B3
M12	Left crosshead front, later style	A1	M26	Drain cock linkage (2)	B3
M13	Right crosshead front	A1	M27	Drain cock lever (6)	B3
M14	Crosshead vacuum pump bracket	A1	M28	Front valve spindle lamination (2)	A1
M15	Cylinder former	A1	M29	Rear valve spindle lamination (2)	A1
M16	Cylinder rear cover (2)	A2	M30	Connecting rod inner lamination (2)	A3
M17	Cylinder rear cover overlay (2)	A1	M31	Connecting rod outer lamination (2)	A3
M18	Piston rod gland (2)	A1	M32	Connecting rod boss lamination (4)	A3

**Assembly.** Insert the slidebar into the cylinders and tack solder in place. Check all is square and parallel and then solder in permanently. Clean off the cylinder front flush. Attach the front covers (M19) with the hole for the relief valve vertically below the centre of the cover. There is no hole etched for the front cylinder relief valves in the cylinder etch. Drill out the relief valve holes, back and front and solder the castings (BR1) in place.

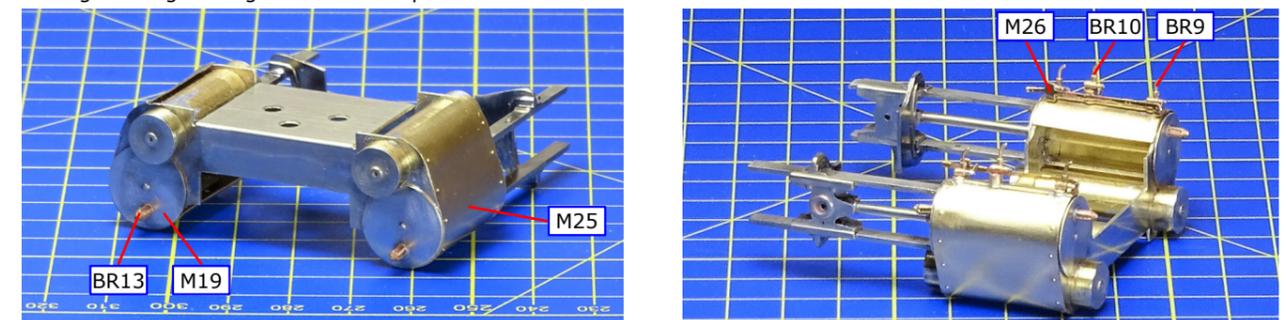
Solder the slide bar bracket laminations (M20) together back to back. Fit them to the slide bars checking the crossheads for free movement and that when the cylinders are mounted on the frames they slide into the slot in the front extension to the frame overlay.

**Valve Chest.** If you are fitting valve spindle crosshead guides, fold up the valve spindle crosshead guides (M21) with the fold line on the outside and solder together. File the guide surface flush with the half etched fold line before soldering in place in the slots in the valve chest cover (M22). Now solder the valve chest covers, front and rear (M23 & M21 or M24) to the 11/32" valve chest tube and attach in place with equal amounts of tube protruding back and front.



**Wrapper and Drain Cocks.** Form the cylinder wrappers (M25) to shape and solder in place making sure the drain cock holes are on the bottom centre line. The wrappers in the photo are on the wrong way round for the vast majority of locos, the long drain cock should be towards the front. The wrappers are designed very slightly too long and need a small amount of trimming. Emboss the rivets on the drain cock linkage (M26) and fold it along the half etched lines. Attach the drain cock castings, short and long (BR2 & BR3) together with the drain cock linkage to the cylinders. Then solder the (very!) small levers (M27) over the spigot on the front of the drain cocks and against the linkage. On the outer drain cocks these levers angle up and on the centre one down. File off the piece of the drain cock spigot in front of each lever.

**Valve Spindles.** Emboss the rivets in the valve spindle laminations (M28 & M29) and solder them together. If you are not constructing working valve gear fix them in place in the valve chest.



**Connecting Rods.** Solder together the connecting rod laminations (M30 & M31) and add the rod boss laminations (M32) to the big end back and front. 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. Drill the big end to fit the crankpins and the small end 1.25mm. Fit the connecting rod to the crosshead using 1.25mm wire for the pin. Carefully solder the pin from the rear and file flush.

The cylinders will be held in place when the body is attached but if you require a separate fixing then two 6BA bolts can be used through the outside holes and into tapped holes in the front spacer.

Working valve gear should now be built following the separate instructions supplied in the valve gear kit.

## FINISHING THE CHASSIS

**Balance Weights.** Attach the balance weights (F18 & F19) to the wheels using photographs as a guide to position. Assemble the wheel sets, bearings and rods selecting 3/16" axle washers of appropriate thickness to control sideplay. Check that all wheels and motion move smoothly at this stage.

**Springs.** Laminate a main spring outer lamination (F17) either side of a centre spring inner lamination (F16). The axles are now retained by the springs when soldered to the spring hangers on the frames. The springs can be made detachable for painting by bolting through from the spring hangers.

**Brakes.** First emboss the rivet on each of the brake hanger outer laminations (B1). Assemble the brake hangers with the inner lamination (B2). The outside of each hanger is detailed with the overlay (B3), one of the small holes in the back of the overlay locating on the previously embossed rivet. Adjust the length of the pivot wires so that the outside face of the brake hanger lines up with the outer face of the wheel.

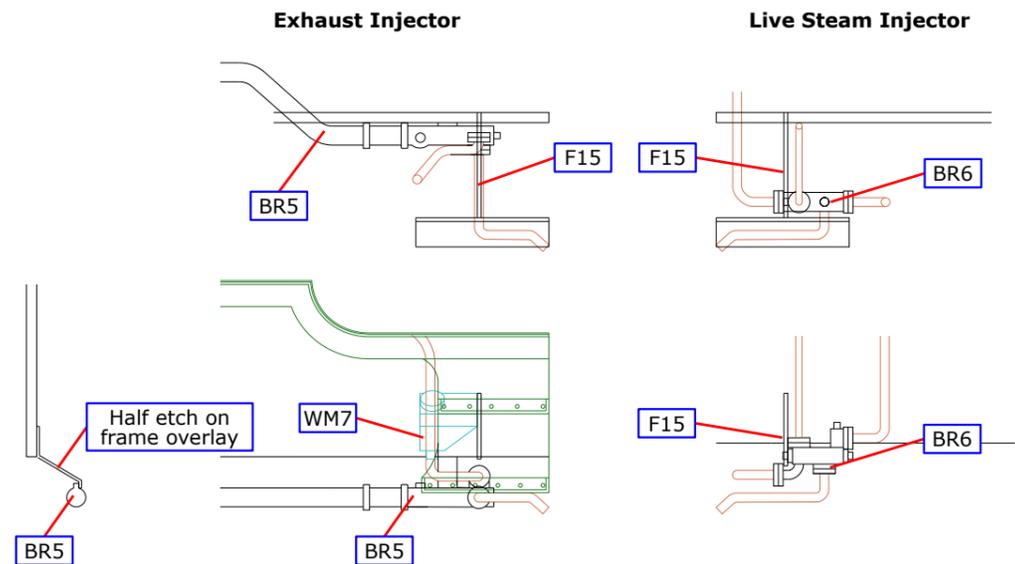
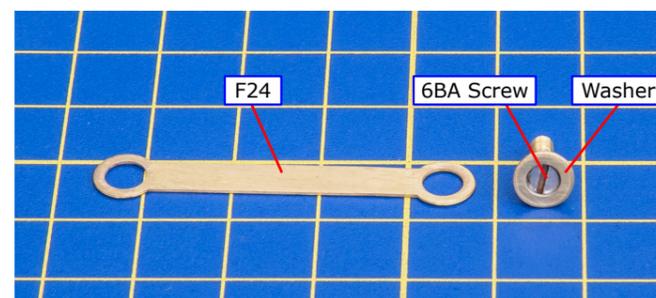
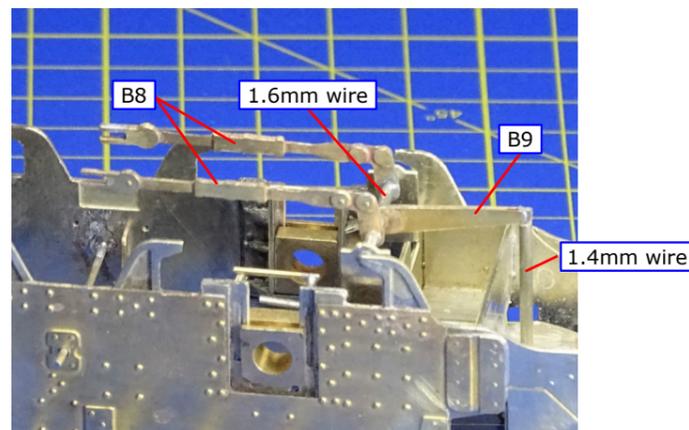
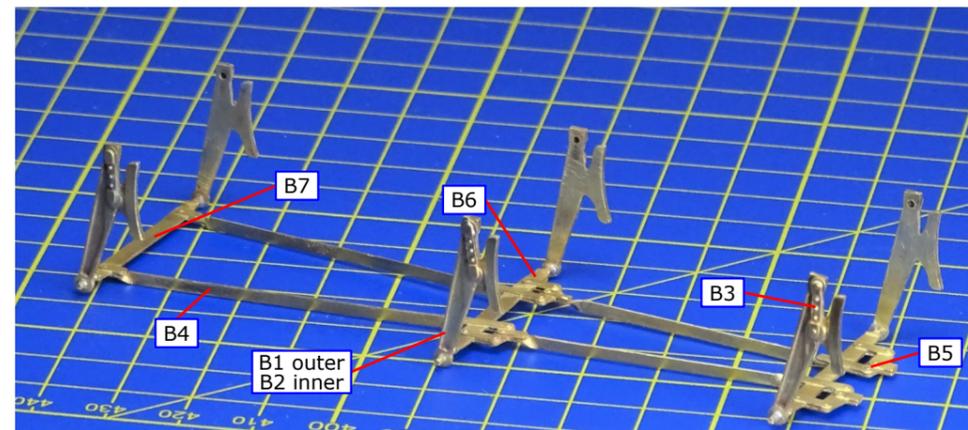
Emboss the bolts in the pull rods (B4) and the cross shaft overlays, front middle and rear (B5, B6 & B7). Solder the cross shaft overlays onto the top of the cross shafts. The pull rods need to be twisted into the vertical on the half etched section between the cross shafts; use two pairs of pliers with one of them an offset pair to allow access. The brake hangers and pull rods can either be soldered in place permanently or can be soldered into a detachable unit that fits over the pivot wires and into the slots in the pull rods.

Complete the brake gear by first embossing the rivets on the pairs of front pull rod laminations (B8) and then solder them together. Solder together the brake shaft vacuum cylinder lever laminations (B9). Fit the pull rods over the front cross shaft with the vacuum cylinder lever in the centre and align with a length of 1.6mm wire through the brake hangers on the frames. Fix a piece of 1.4mm wire into the vacuum cylinder; the end that meets the lever will need two parallel flats filing for the lever to fit. Solder the brake shaft, the lever and the pull rods in place.

No.	Description	Sheet	No.	Description	Sheet
B1	Brake hanger outer lamination (6)	B3	F16	Main spring centre lamination (6)	A2
B2	Brake hanger inner lamination (6)	B3	F17	Main spring/bogie spring outer lamination (16)	A2
B3	Brake hanger overlay (6)	B1	F18	Leading & trailing wheel balance weight(4)	B3 & B1
B4	Brake pull rods/cross shafts	B2	F19	Centre wheel balance weight (2)	B3
B5	Front brake cross shaft overlay	B2	F20	Washer	B1
B6	Middle brake cross shaft overlay	B1	F21	Washer	B2
B7	Rear brake cross shaft overlay	B2	F22	Washer	B2
B8	Front brake pull rod lamination (4)	B1	F23	Washer 3/16"	A1
B9	Brake shaft vacuum cylinder lever lamination (2)	B1	F24	Drawbar, 3 lengths	B1

Drill 0.8mm holes for the sand pipes in the front sandboxes (WM8) and then mount on the frames where indicated by the half etch lines. If appropriate, drill 0.8mm holes for the sand pipes in the rear sandboxes, left and right (WM6 & WM7). The rear sandboxes are mounted to the front face of the step brackets.

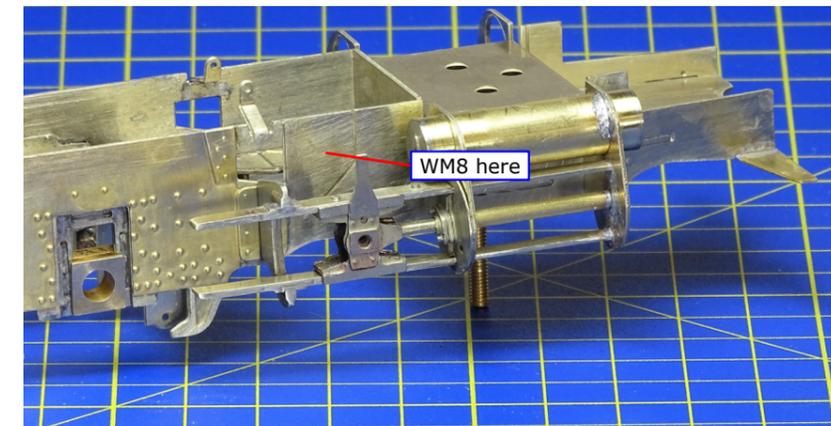
Fit the injectors as shown in Fig. 4. The two part exhaust stem injector (BR4) goes on the left and mounts on the drop down plate. The right live steam injector (BR5) mounts on the front of the left step bracket.



**Fig 4. Injectors and Rear Sandboxes**

If appropriate, fit the ATC shoe (BR6) with the plunger switch (BR7) at the front under the buffer beam spacer.

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



## CONSTRUCTING THE FOOTPLATE

Emboss the rivets on the footplate (U1) on the rear steps, the rear drag beam and on the frame extension between the splashers. Fold up the footplate by first folding the valance edges and then the rear drag beam. Now form the footplate step at the front followed by the splashers and the frame extensions. Solder the seams joining these pieces. Now try the chassis for fit and make any adjustments needed. Fold up the frame extensions, the sanding rod brackets and the cab floor supports. Solder the footplate strengthening pieces (U2) flat under the footplate on each side at the rear; it fits through the slot in the valance extension.

Emboss the rivets in the front drop plate overlay (U3) then curve to shape. Fold up the front drop plate lamp brackets and solder the front overlay in place. Trim the top edge of the overlay down so that the top to the footplate is flush. Curve the front drop plate access doors (U4) to match the overlay and solder in place.

Prepare the footplate overlay (U5) by ensuring that it clears over the splashers with the fronts vertical; this needs to be a sliding fit to allow for expansion when soldering. Emboss the rivets under the lamp brackets, around the splashers, under the reversing rod support, under the sand rod bracket and under the bases of the front sandbox pivots. Fold up the footplate lamp brackets. Place the overlay in place and temporarily join to the footplate with a screw through the body fixing holes at the front. Now solder together all round. Solder a 6BA nut over the front fixing hole. From underneath drill through the appropriate holes for the top feed pipes in the footplate (1.4mm).

No.	Description
U1	Footplate
U2	Footplate strengthening piece (2)
U3	Front drop plate overlay
U4	Front drop plate access door (2)
U5	Footplate overlay
U6	Rear drop plate (2)
U7	Left valance overlay
U8	Right valance overlay (with ATC brackets)
U9	Right valance overlay (plain)
U10	Rear drop plate rivet strip (2)

Sheet	No.	Description	Sheet
B1	U11	Buffer beam	B1
A2	U12	Valance to buffer beam bracket (2)	B1
B3	U13	Drag beam rubbing plates (2)	B3
B1	U14	Front & centre splasher front overlay (4)	B1
B3	U15	Rear splasher front overlay (2)	B1
B1	U16	Front splasher top (2)	B1
B1	U17	Centre left splasher top	B1
B1	U18	Centre right splasher top	B1
B1	U19	Rear splasher top (2)	B3

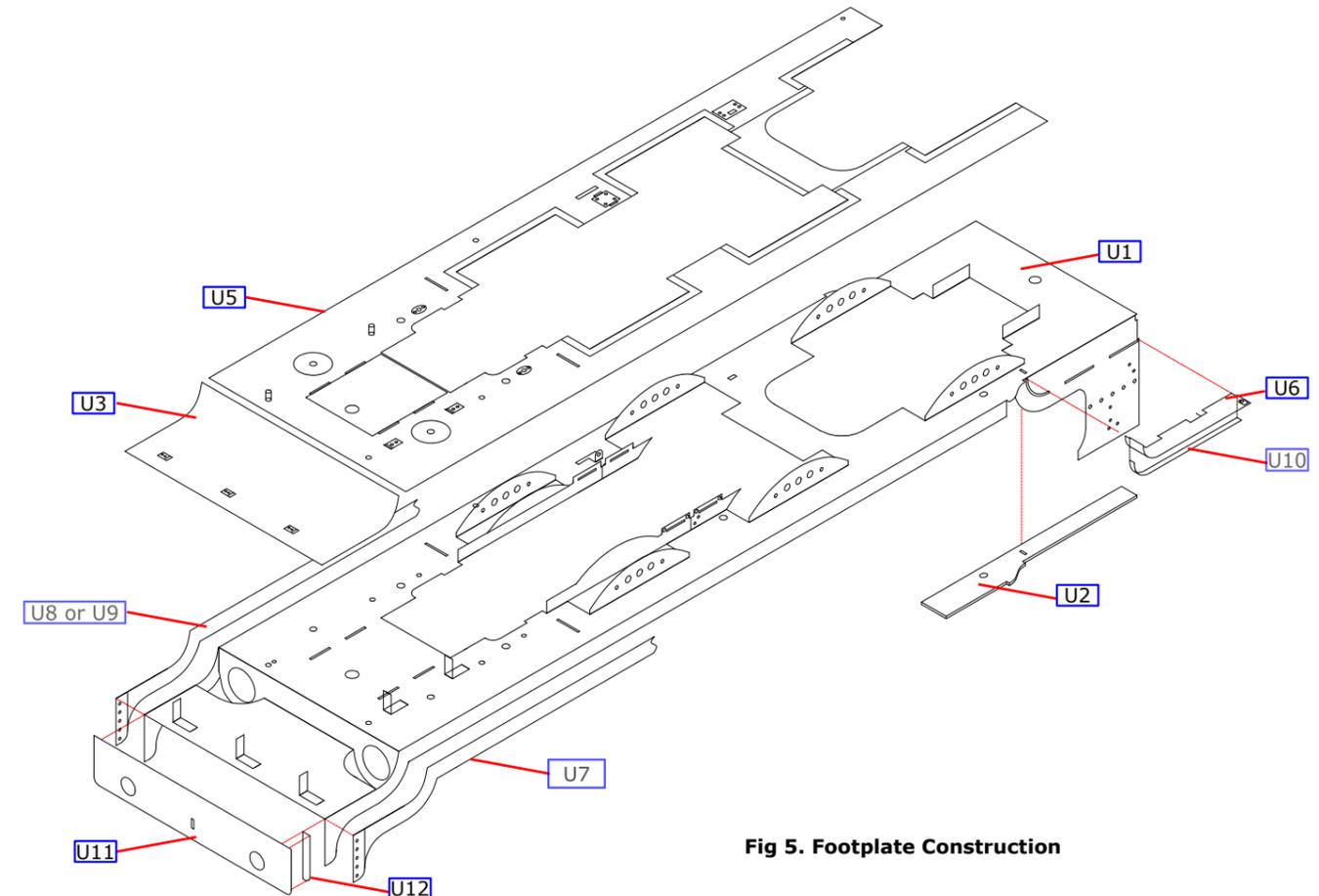
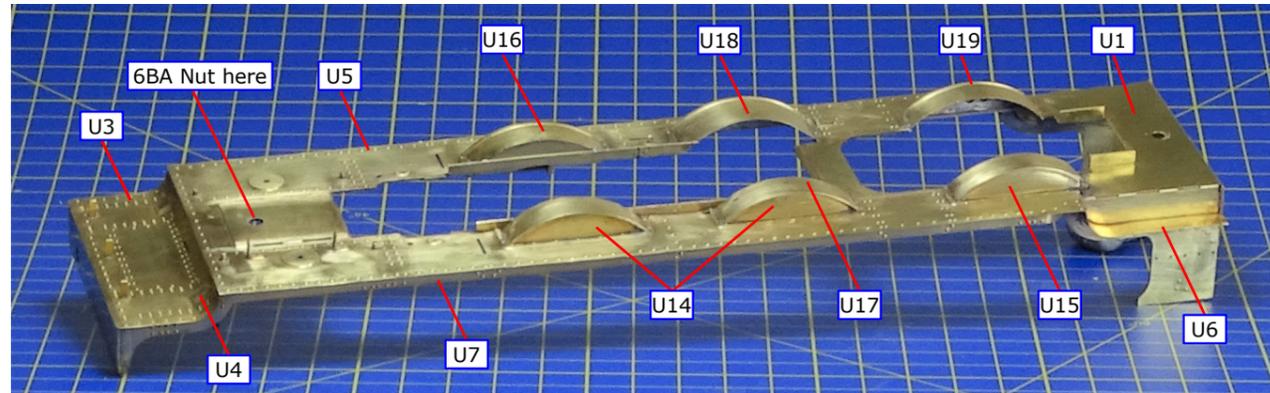


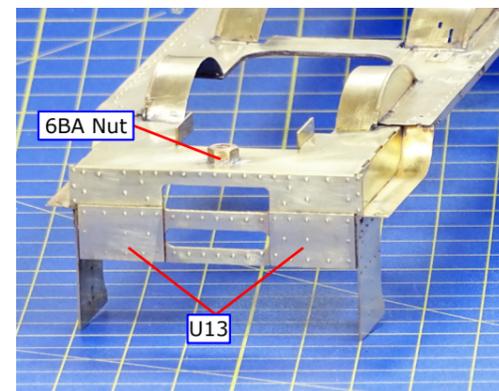
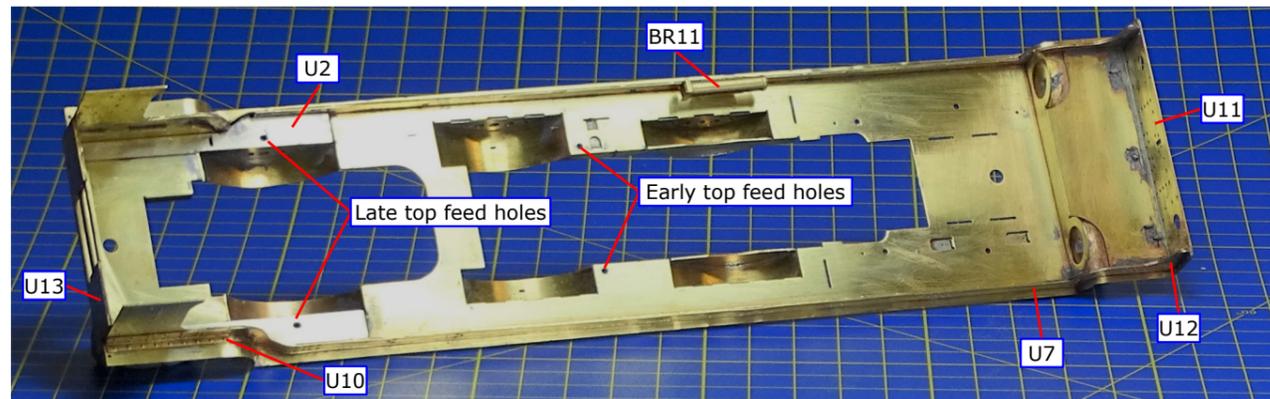
Fig 5. Footplate Construction

Solder short lengths of 1.2mm wire into the holes in the footplate at the front to represent the oil cups. Fit the rear drop plate (U6). Carefully curve the valance overlays, left (U7) and right with ATC Brackets (U8) or right plain (U9), as it narrows at the rear. Solder in place. Fit the rear drop plate rivet strip (U10) under the rear footplate.

Emboss the rivets on the bufferbeam (U11) and solder in place. Add the valance to buffer beam brackets (U12). Emboss the rivets on the rear drag beam rubbing plates (U13) and add in the position indicated by the half etched lines.

The splasher front overlays, front & centre and rear (U14 & U15) need not be attached until they have been painted and lined; glue them into position if following this path. Alternatively solder in place. Curve the splasher tops, front, centre left, centre right and rear (U16, U17, U18 & U19) to shape by rolling underneath a suitable rod or dowel on a resilient surface (a piece of rubber sheet). Adjust for fit and solder in place.

Drill the pump rod hole 0.8mm in the end of the vacuum pump (BR8) and solder in place in the half etched recesses in the edge of the footplate. Solder a piece of 0.8mm wire to the crosshead bracket for the pump rod and trim as short as possible so that the footplate can be removed by a slight movement forward.



## FORMING THE FIREBOX

Solder together the two laminations of the firebox front former (SB1). 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)

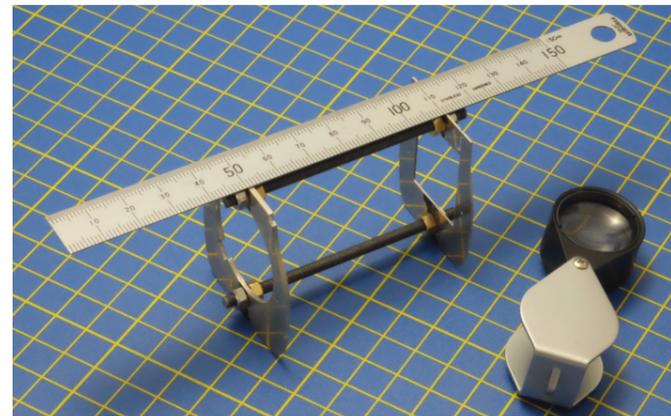
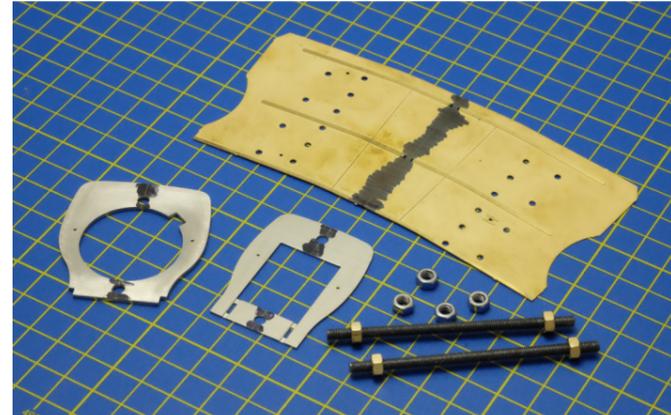
To assemble the firebox two 100mm pieces of 4BA studding will be required with four brass nuts and four stainless steel nuts. Thread the brass nuts on to the studs.

Set the two formers on to the studs, retain them with the stainless steel nuts. Ensure the length of the assembly over the formers is 56.8mm. 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 formers are parallel.

Check that the formers 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.

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

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



No.	Description
SB1	Firebox front former (2)
SB2	Firebox rear former
C1	Cab front
SB3	Firebox wrapper

Emboss the rivets for the ends of the cladding fixing bands and for the 4-cone ejector bracket on the firebox wrapper (SB3).

Align the centre line marks, the top can be formed to a gentle radius. This is a simple rolling job, using a length of dowel and finger pressure. An old round file has a taper 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 formers. 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 formers, but gentle finger pressure is enough to get the wrapper to meet the formers without distortion.

Tack the outside of the firebox at the centre and corners, both front and rear. Again, take care and check that the centres retain the alignment that we've worked so hard to achieve. Now work down the formers 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 formers, the stainless steel nuts can be undone and the studs spun out.

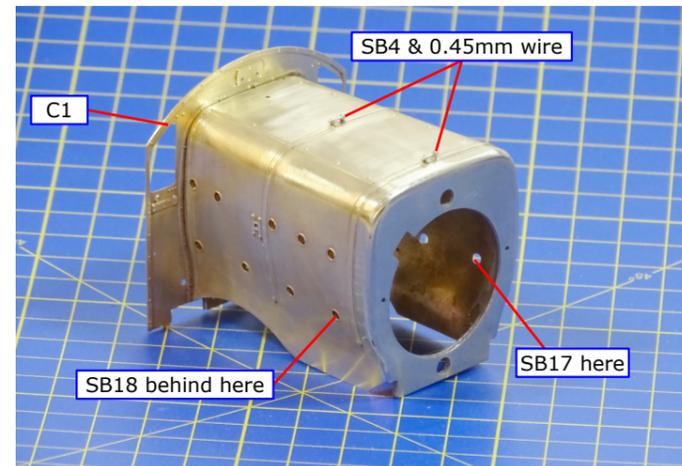
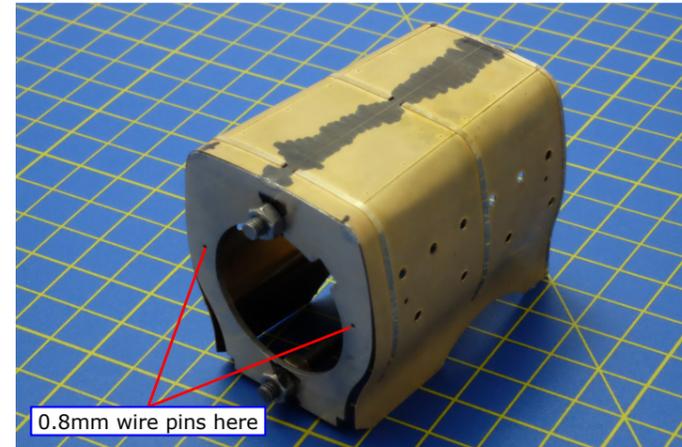
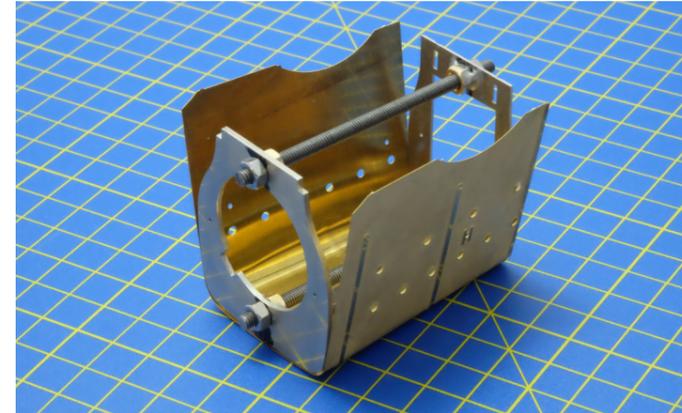
Run an extra fillet of solder into the internal front shoulders of the firebox to support the area which will be filed back. The brass nuts can be heated and removed. Remove the rear scrap section of the formers.

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.

Fold the firebox band joining brackets (SB4) into a 'U' shape so that they fit through the slots in the firebox top and solder in place from inside. Complete with a short piece of 0.45mm wire to represent the tightening bolt. Solder the washout plugs (SB5 & SB6) in place inside the firebox and attach the mudhole doors (WM16) in place on the firebox corners.

Solder two 0.8mm wire pins into the rear former, from the inside, to align the cab front onto. Push the cab onto the pins and check for fit on the footplate. Emboss the rivets on the cab front and solder the window frames (C14) in place on the inside; they can be glued in after painting and glazing. Now fix the firebox and cab front in place on the footplate; solder the cab onto the pins and finish off flush.

Sheet	No.	Description	Sheet
A1	SB4	Firebox bands joining brackets (2)	B3
A1	SB5	Firebox left hand washout plugs	B1
B3	SB6	Firebox right hand washout plugs	B1
B3	C14	Cab window frames (2)	B2



## CONSTRUCTING THE CAB

Fold up the cab side hand rails from 0.45mm wire and solder in place on the cab sides (C2). Attach the cut-out beading (C3) to the cab sides fitting the etched groove over the edge of the cab side. The beading will need to be trimmed to fit under the cab roof. Solder the cab side strengthening rib (C4) in place flush with the top of the cab side; ensure that there is space to slip the cab floor in place under the strengthening rib. Assemble the cab seats (C5) which are designed to be working. Now remove the seat from the bracket and solder the brackets to the inside of the cabsides. Attach the ATC bell mounting (C6) inside the right side window, alternatively this can be glued in place after painting and glazing.

File slots in the cab floor support (C7) to clear the rear splashers then fold it up and solder in place on the footplate together with the 6BA nut. Curve the cab floor support corners (C8) to match the cut-outs in the corners of the floor support and solder in place. Solder the cabsides in position and fit the rear handrails from 0.8mm wire. The sides are correctly aligned when the rear handrails are vertical and the sides slightly overlap the cab front.

Solder the cab floor (C12) in place. Drill through the holes in the cab floor for the fall plate hinges. These are staples of 0.45mm wire. Slightly curve the fall plate (C13). Pass the staples through the fall plate and solder in place in the cab floor. If required, drill through the holes in the cab floor (C12) for the cab sandbox lid (BR25).

Solder the cab roof rear frame (C9) between the rear edges of the cabsides ensuring the cab roof line will be horizontal. Form the cab roof (C10) to shape and solder the cab roof rear and side angle (C11) to the rear edge by starting in the middle where it has the correct shape and carefully bending/soldering around the sides. The angle is over length so that accurate alignment is not essential. Solder the roof in place.

At this point continue to page 12 and the footplate detailing. The backhead and other cab detailing can be completed later.

### BACKHEAD

To soften the castings to drill holes for the copper wires, heat the castings to red on an asbestos board. Drill holes to match the wires shown in Fig 6. Solder the wires to the castings with a high melting point solder. Build the backhead as shown in Fig 6.

No.	Description	Sheet	No.	Description	Sheet
C2	Cab side (2)	B3	C11	Cab roof rear & side angle	B3
C3	Cab cut out beading (2)	B2	C12	Cab floor 1	B1
C4	Cab side strengthening rib (2)	B1	C13	Fall plate	B1
C5	Cab seats (2)	B2	C14	Cab window frames (20)	B2
C6	ATC Bell mounting	B3	C15	Top feed pipe unions (4)	B2
C7	Cab floor support	B1	C16	Vacuum gauge bracket	B3
C8	Cab floor support corner section (2)	B2	C17	Pressure gauge bracket	B2
C9	Cab roof rear frame	B3			
C10	Cab roof	B1			

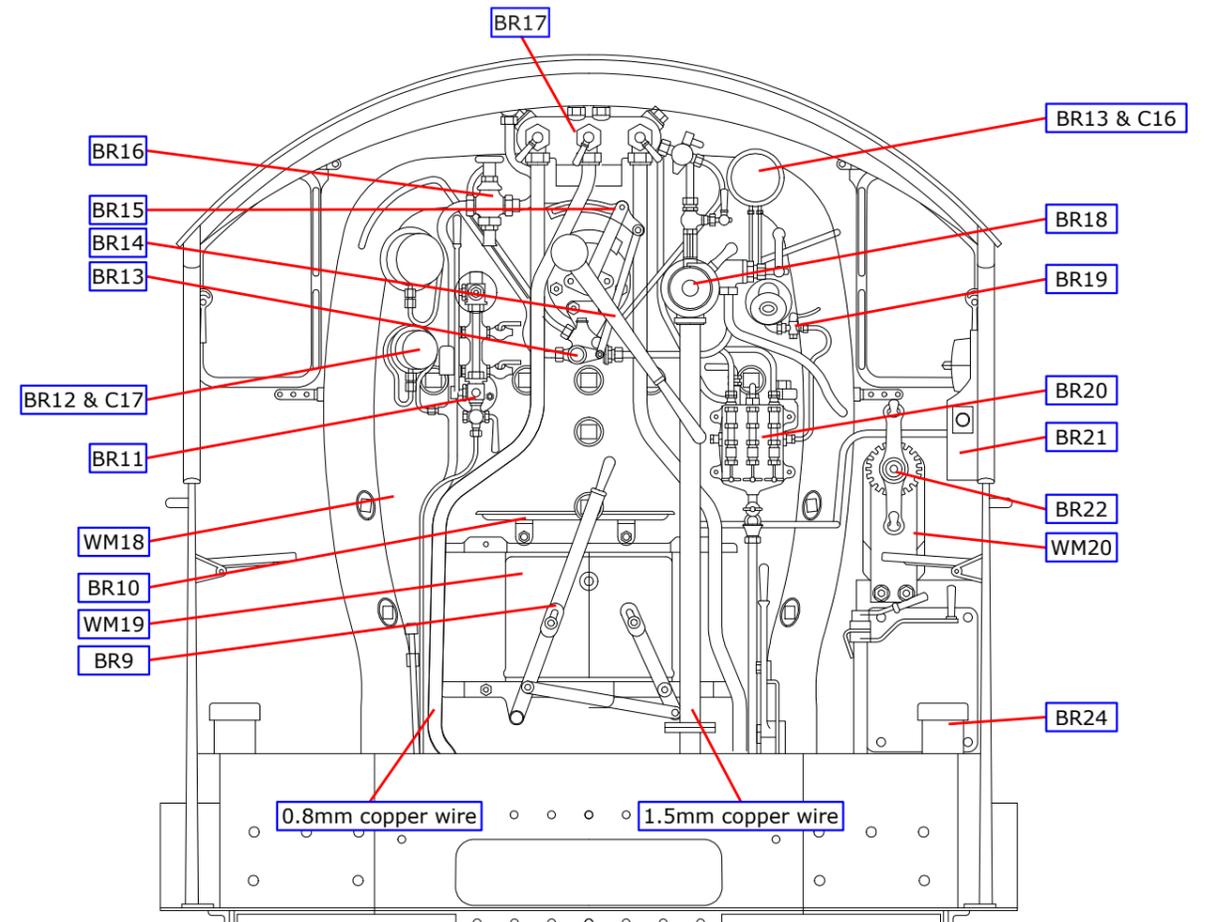
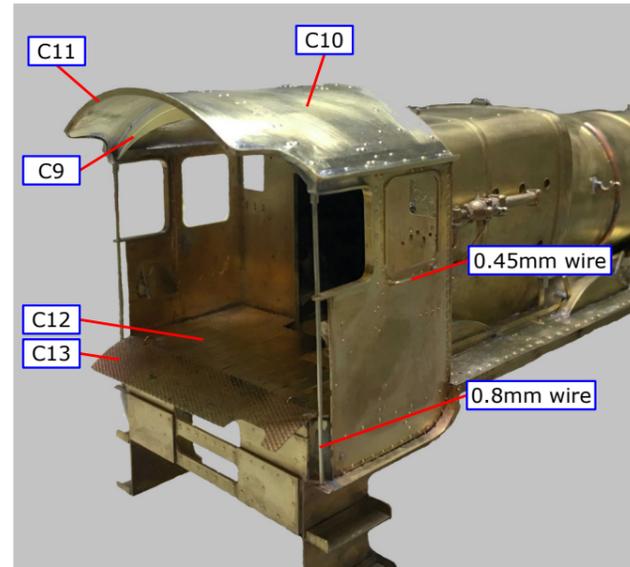
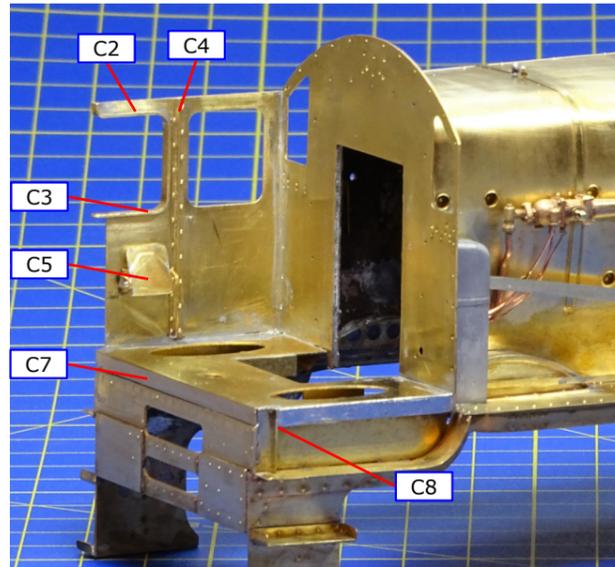
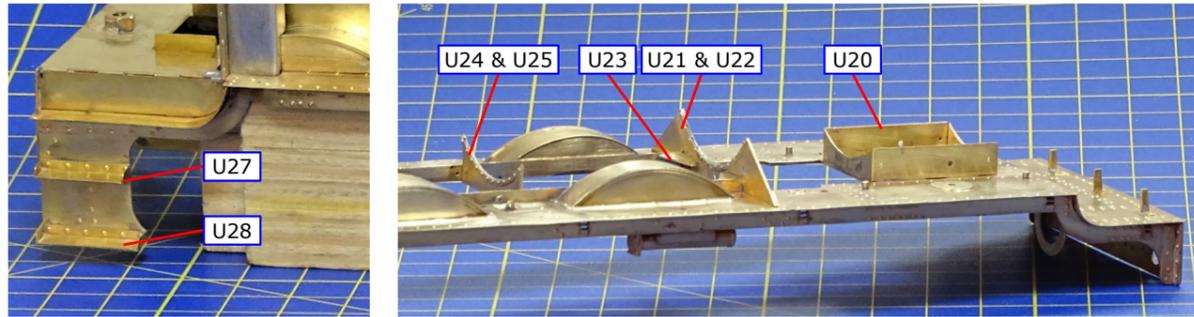


Fig 6. Backhead Construction

## FOOTPLATE DETAILING

Emboss the rivets in the smokebox saddle (U20). Fold to shape and solder in place on the footplate. Emboss the rivets on the motion bracket & boiler support (U21). Solder together with the motion bracket & boiler support overlay (U22) to the rear. Solder the motion bracket & boiler support brace (U23) into the slots in the motion bracket. Check the fit of the motion bracket/boiler support in the footplate slots - it must sit down tight on the footplate to ensure correct boiler fit later. When satisfied solder in place. Solder together the boiler cradle and boiler cradle overlay (U24 & U25) with the overlay at the rear and fix in place in the half etched grooves in the frame extensions.

Fold up and fit the upper and lower rear steps (U27 & U28). Fit the firebox side cover (WM5), these appear in the photos on page 13.



**Sanding Rods.** Solder a 2mm long length of 0.5mm wire into the left sanding rod footplate flange and a 4mm length into the right sanding rod footplate flange. To make the sanding rod pivot place a 7mm length of 0.5mm wire into the two brackets on the right side of the footplate with equal overhang on the outside of the brackets.

The appearance of the sanding gear can be improved by placing a 1mm length of 1.4mm tube over the 0.5mm wire to represent the body on top of the flanges. Solder the transverse sanding rod (U31) onto the wire. If possible, fix a 16BA washer over the left sanding gear and file the wire to 0.5mm proud. On the right hand side add a 2.5mm long spacer on top of the transverse rod.

Bend the front sanding rod (U30) to match the drawing and the photograph. Thread it through the hole in the motion bracket and place it over the right hand sanding gear and the sanding rod pivot. Solder in place. Again, if possible, fix a 16BA washer over the sanding gear and file the wire to 0.5mm proud.

Thread the rear sanding rod (U29) through the middle splasher and onto the pin of the sanding rod pivot. Solder the rear and front rods to the pivot, ensuring that the rear rod is horizontal. Solder the rear rod to the rear splasher to keep it horizontal.

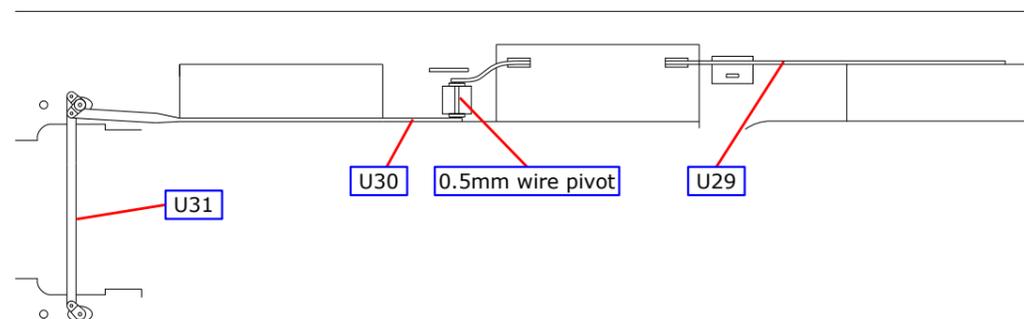
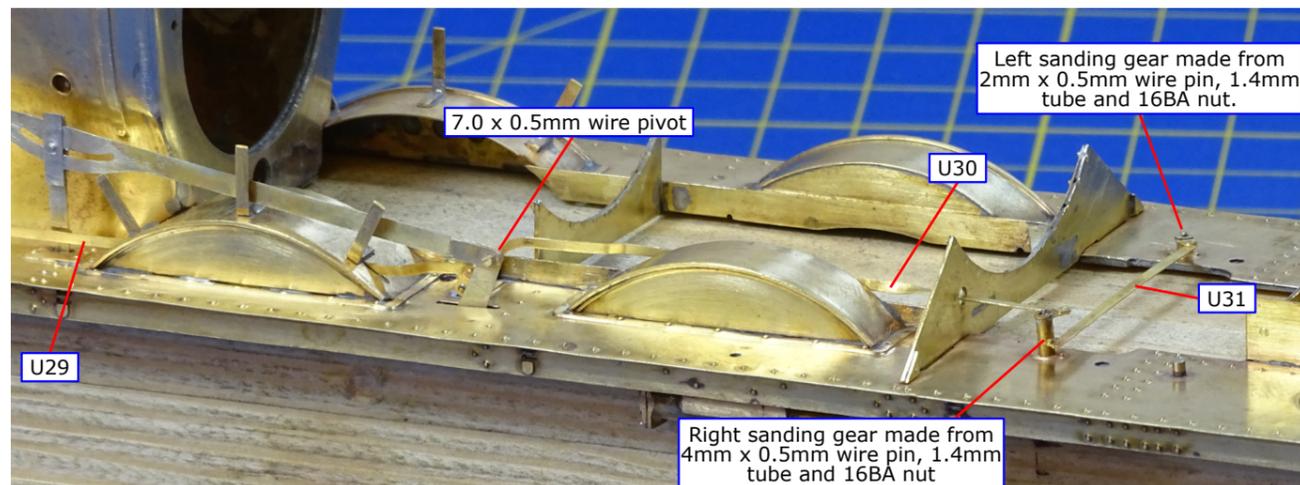


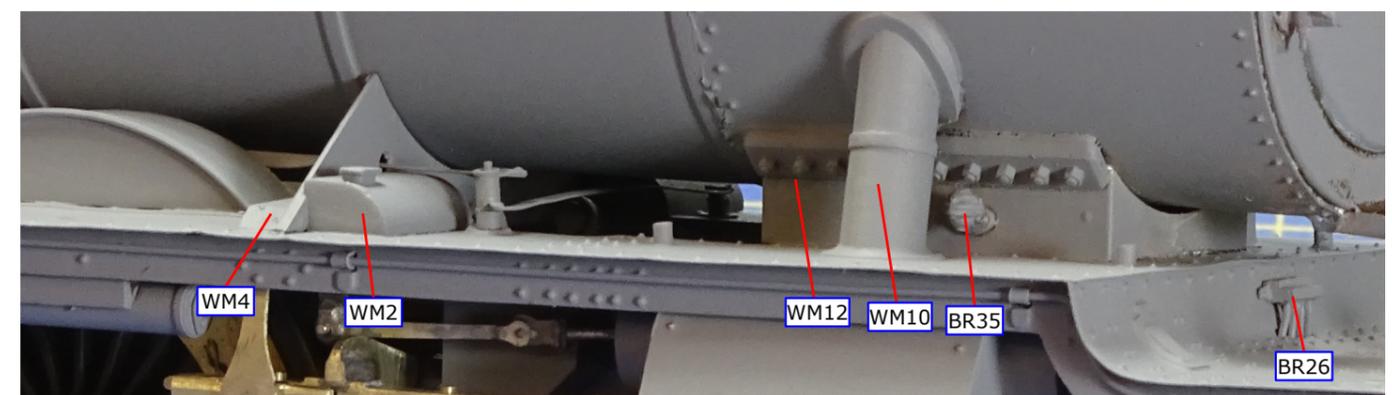
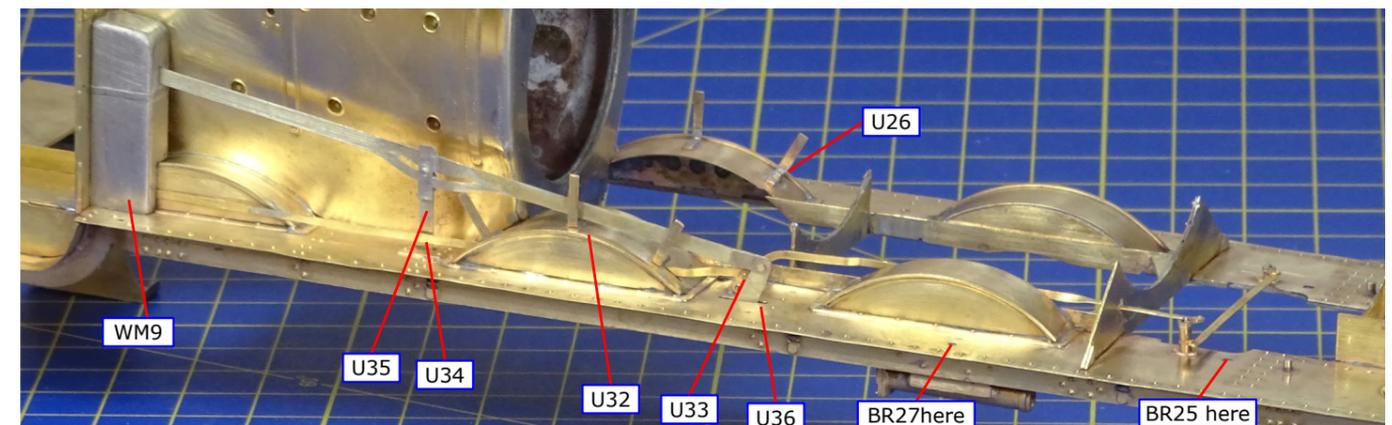
Fig 7. Sanding Rods

No.	Description	Sheet	No.	Description	Sheet
U20	Smokebox saddle	B1	U30	Front sanding rod	B1
U21	Motion bracket & boiler support	B1	U31	Transverse sanding rod	B1
U22	Motion bracket & boiler support overlay	B3	U32	Reversing rod	A1
U23	Motion bracket & boiler support brace (2)	B2	U33	Reversing rod fork joint	A1
U24	Boiler cradle	B2	U34	Reversing rod support	A1
U25	Boiler cradle overlay	B3	U35	Reversing rod support front cover	A1
U26	Name plate bracket (6)	B1	U36	Reversing shaft arm	A1
U27	Lower rear steps (2)	B1	U37	Reversing shaft arm lower arm	B2
U28	Upper rear steps (2)	B1	U38	Regulator lever extension	A1
U29	Rear sanding rod	B1	U39	ATC Conduit fixing strip	B1

**Reversing Rod.** First attach the screw reverse cover (WM9). Fold up the flange on the reversing shaft arm (U36), open the hole to 0.8mm and solder in place in the slot in the footplate. Do the same for the reversing rod support (U34). Solder the reversing rod fork joint (U33) to the reversing rod (U32) using an old drill to align the holes. Place the reversing rod into the slot in the screw reverse cover and pin into the reversing shaft arm with 0.8mm wire.

Fix the castings for the valve rocker shaft covers, left and right (WM1 & 2), the motion bracket top sections, left and right (WM3 & 4), the front sandbox lids (BR25) and the axle journal and bogie lubricators (BR26) in place. Solder the vacuum pump lubricator (BR27) to the footplate in the hole above the vacuum pump. If you have fitted the ATC shoe and the right valance overlay (with ATC brackets) make the ATC conduit from 0.45mm wire; this runs along the right side valance through the footplate and into the cab through the cab front. Cut the strips (U39) into six pieces and use them to attach the conduit through the pairs of small slots in the valance.

The last job on the footplate should be the name plate brackets. Fold up the brackets (U26) and solder in place with the shorter end through the slots in the splasher tops; ensure that there is a good fillet of solder to support the uprights of the brackets. The piece which protrudes into the splasher should be removed using a pointed grinder in a mini-drill.



## CONSTRUCTING THE BOILER AND SMOKEBOX

**Boiler.** Emboss the rivets either side of the top feed pipe on the boiler wrapper (SB7) and around the 4-cone ejector pipe brackets. The washout plugs can be drilled out and the separate etched washout plugs (SB8) can be used if you prefer. Form the boiler by rolling and check for fit around the front and rear formers (SB9 & SB10). Bend the boiler band joining brackets on the boiler joining strip (SB11) and fit through the small slots from inside the boiler. If the fit is good and the formers fit then solder the wrapper ends together with the boiler joining strip. Solder the firebox & boiler band joining brackets (SB4) through the slots in the top of the boiler. Solder the boiler formers in place so that they are almost flush with the ends. The cut-outs 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 notch in the wrapper.



Solder two short pieces of 0.8mm wire into the holes in the rear former to act as dowels to locate the boiler and firebox. Check the boiler/firebox fit. Represent the bolts in the joining brackets using 0.45mm wire. Form the top feed pipes from 1.4mm copper wire and solder in place in the 'slot' in the overlay. Solder the 4-cone ejector bracket laminations (SB12) together and solder in place. Solder a medium length handrail knob in the hole on the left side.



**Smokebox.** Emboss the rivets around the 4-cone ejector bracket on the smoke box wrapper (SB13). Roll the wrapper and check-fit it on the formers, front and rear (SB14 & SB15). Solder the wrapper ends together using the smokebox joining strip (SB16) and solder in the formers flush with the back and front with the notch in the bottom of the front spacer aligned with the wrapper join. The upper hole in the front former is for the handrail knob and the other hole is for the steam lancecock. Emboss the four rivets on the smokebox front overlay (SB17), and attach to the front of the smokebox aligning the handrail and lancecock holes. Bend up the smokebox step (SB18) and solder in place under the smokebox front.

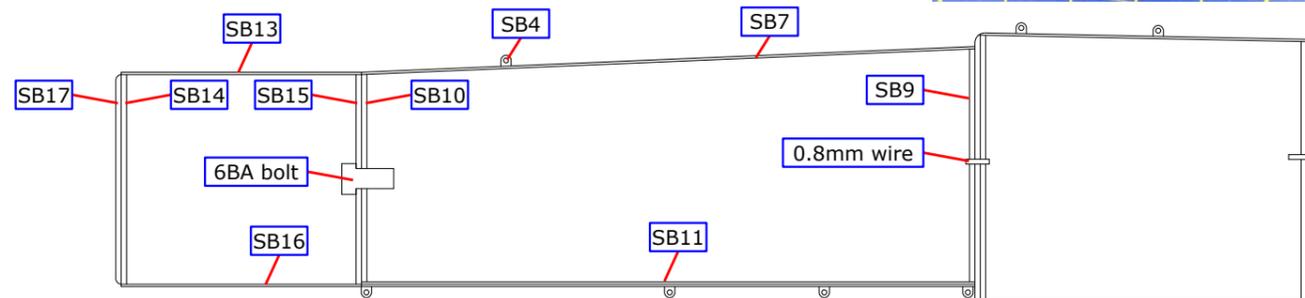


Fig 8. Boiler Construction

**Assembly.** Tap 6BA the hole in the boiler front former so that the smokebox and boiler can be screwed together. Now check-fit the boiler/smokebox to the firebox and saddle. Remember the bottom of the boiler is horizontal and so parallel to the footplate. When happy with the alignment solder the smokebox to the boiler permanently. Now tack solder the smokebox to the saddle and once again check. If all is well complete soldering of smokebox to saddle and boiler to firebox. Fit the snifting valves (BR35) to the saddle. Fit the smokebox saddle bolt strip (WM12). Fit the outside steam pipes (WM10).

Fit the top feed casing (WM15) to the boiler. Clean up and fit the safety valve casing (BR28) and then glue the safety valves (BR29) in place on the top feed casting.

No.	Description	Sheet	No.	Description	Sheet
SB4	Firebox & boiler band joining brackets (3)	B3	SB14	Smokebox front former	A1
SB7	Boiler wrapper	B3	SB15	Smokebox rear former	A1
SB8	Boiler washout plug (4)	B1	SB16	Smokebox joining strip	B1
SB9	Boiler rear former	A1	SB17	Smokebox front overlay	A1
SB10	Boiler front former	A1	SB18	Smokebox step	B2
SB11	Boiler joining strip	B1	SB19	Lamp bracket smokebox top	B1
SB12	Four cone ejector bracket laminations (4)	B1	SB20	Lamp bracket smokebox door	B2
SB13	Smokebox wrapper	B3	SB21	Whistle shield	B2

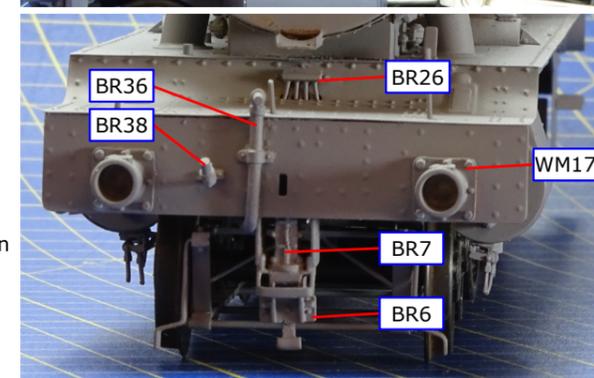
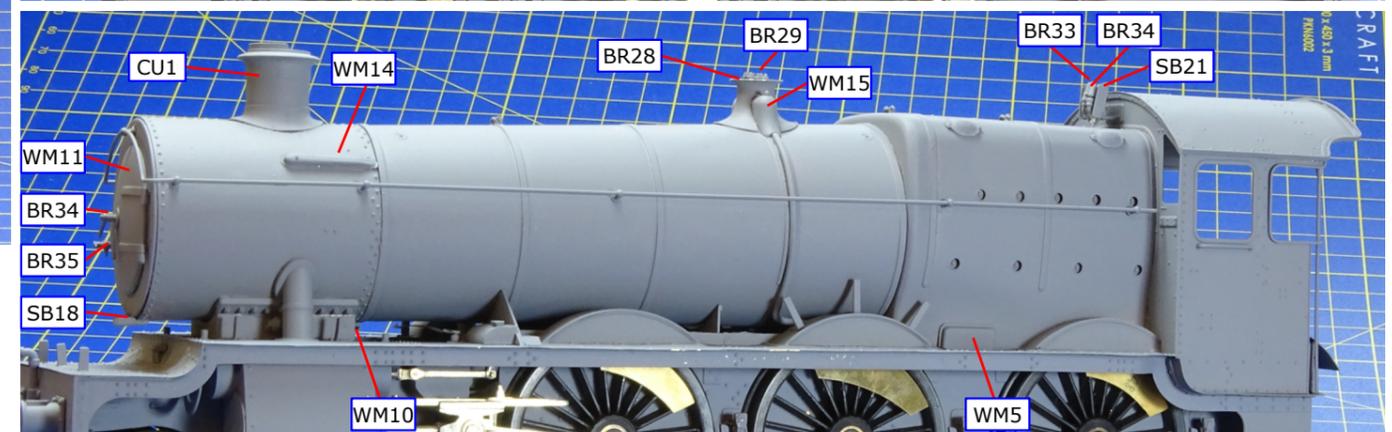
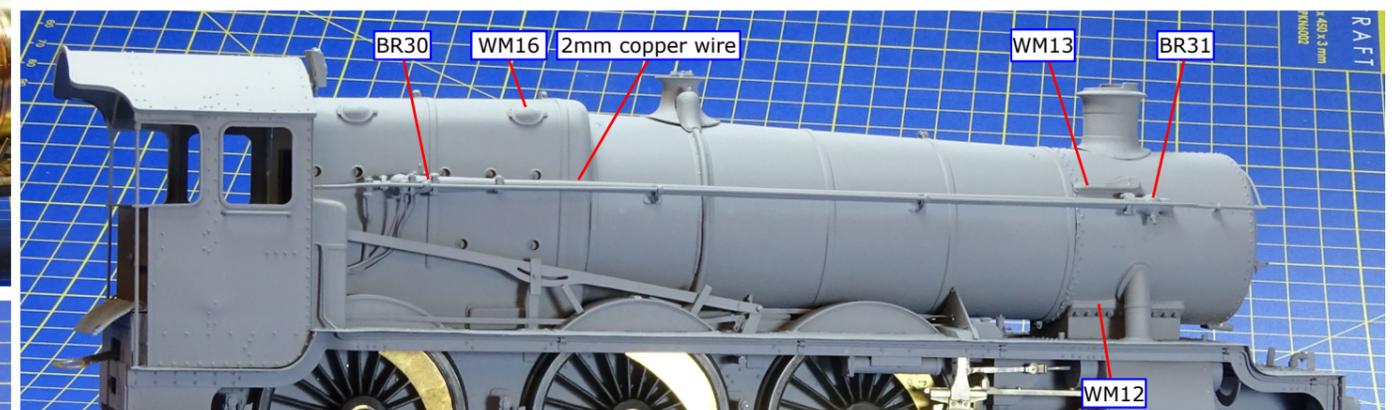
Solder the 4-cone ejector casting (BR30) in place on the firebox side adding the pipes from 2.0mm copper wire. Cut the ejector pipe to length and fit in place together with the four cone ejector front elbow (BR31). Solder two small handrail knobs in the holes in the firebox and three medium knobs in the smokebox holes and one medium knob in the 4-cone ejector casting. Form the handrail to shape from 0.8mm wire, thread on the front medium knob, and fix in place.

Fit the smokebox door (WM11) and attach the smokebox door handles (BR23). Fit the steam lance cock (BR32).

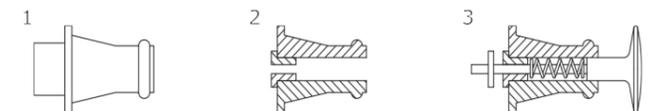
Solder the smokebox lamp bracket in place (SB19 or SB20). Fit the whistle shield (SB21) into the hole in the firebox top and solder in place with the holes in the shield lining up with the holes in the cab front. Fit the whistles, large (BR33) on the right and small (BR34).

Fit the smokebox pipe covers, right (WM13) and left (WM14). Fit the top feed & safety valve base (WM15) followed by the safety valve springs (BR29). If the safety valve casing (BR28) is to be painted, fit it now, otherwise wait until painting is complete. Form the top feed pipes from 1.4mm wire and solder in place in the 'slot' in the boiler overlay. Fit the mudhole doors (WM16) as shown.

Fit the vacuum pipe (BR36) and the dummy (BR37) to the front buffer beam. Build the buffers as shown below and fit the Collett taper buffer housings (WM17).



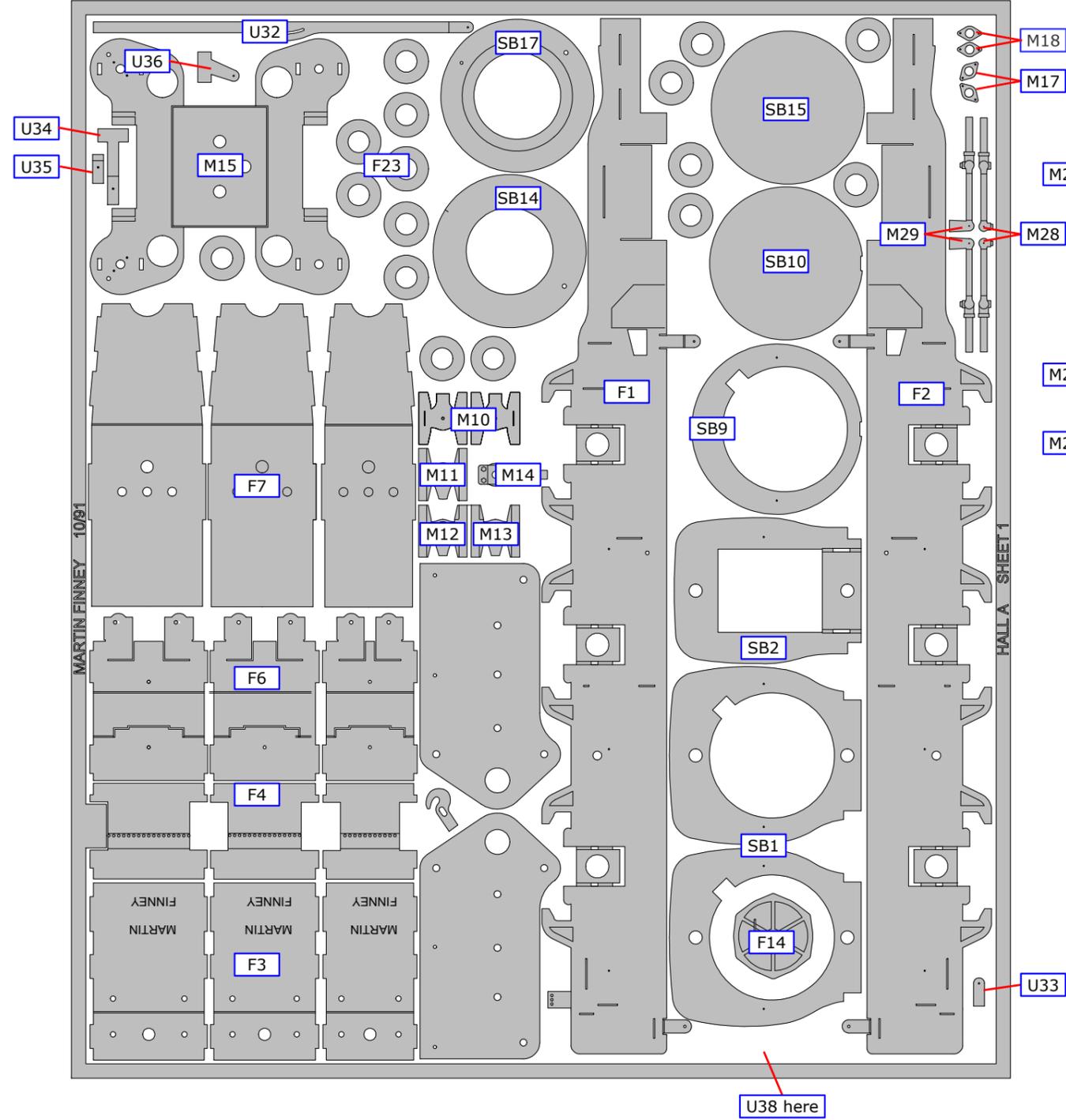
### Buffer Construction



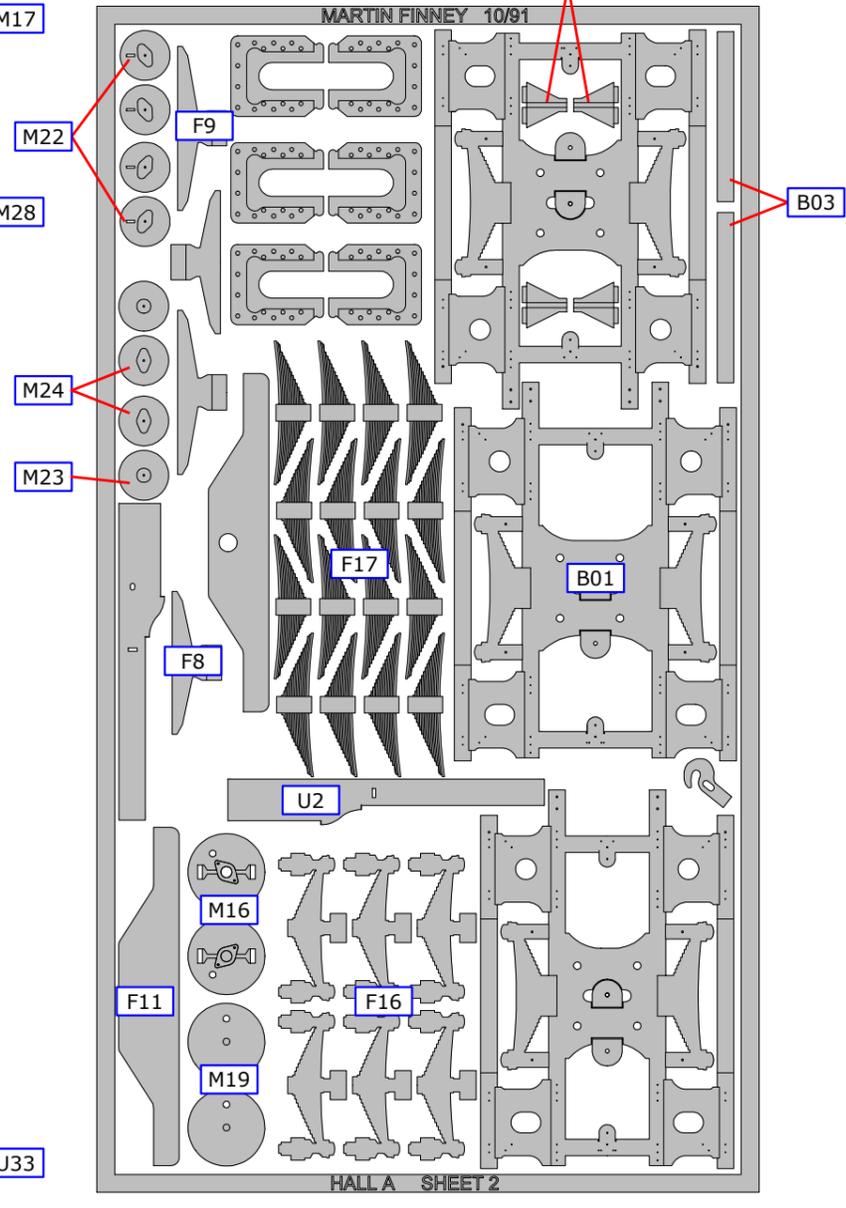
1. Drill casting (WM17) 2mm.
2. Remove rear of casting and glue bush in place.
3. Assemble with spring and retain with washer.

## NICKEL SILVER ETCHES

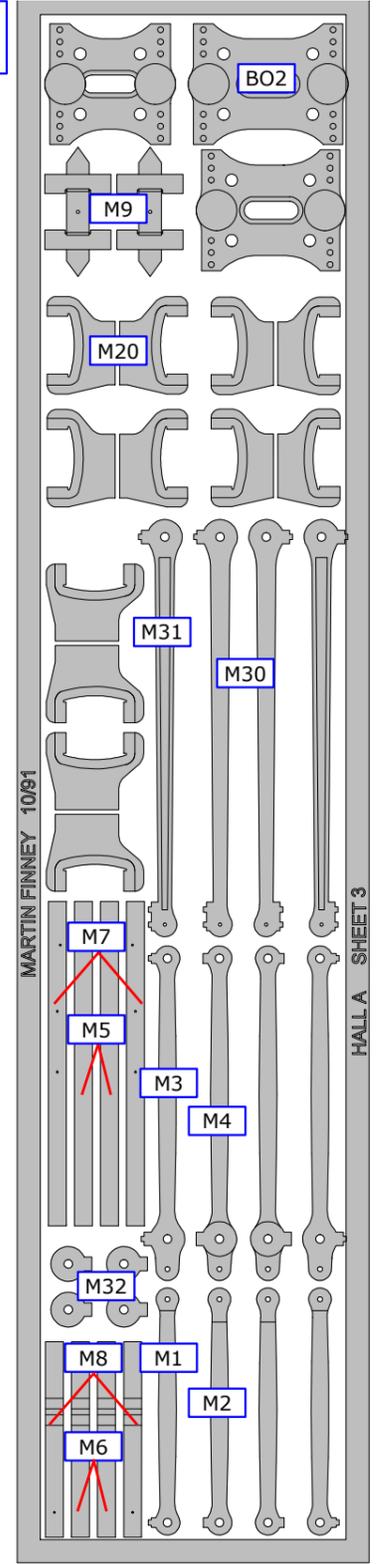
A1



A2



A3





## CASTINGS

### BRASS CASTINGS

CU1	Chimney	
BR1	Cylinder relief valve (4)	Hall/2&3 47XX/5&6
BR2	Short cylinder drain cock (4)	Hall/2
BR3	Long cylinder drain cock (2)	Hall/2
BR4	Left exhaust steam injector (2 parts)	Hall/3
BR5	Right live steam injector	Hall/3
BR6	ATC shoe	ATC/1
BR7	ATC shoe plunger shoe	ATC/1
BR8	Vacuum pump	47XX/5
BR9	Firebox door handle	47XX/7
BR10	Backhead shelf	Details/1
BR11	Water gauge	47XX/7

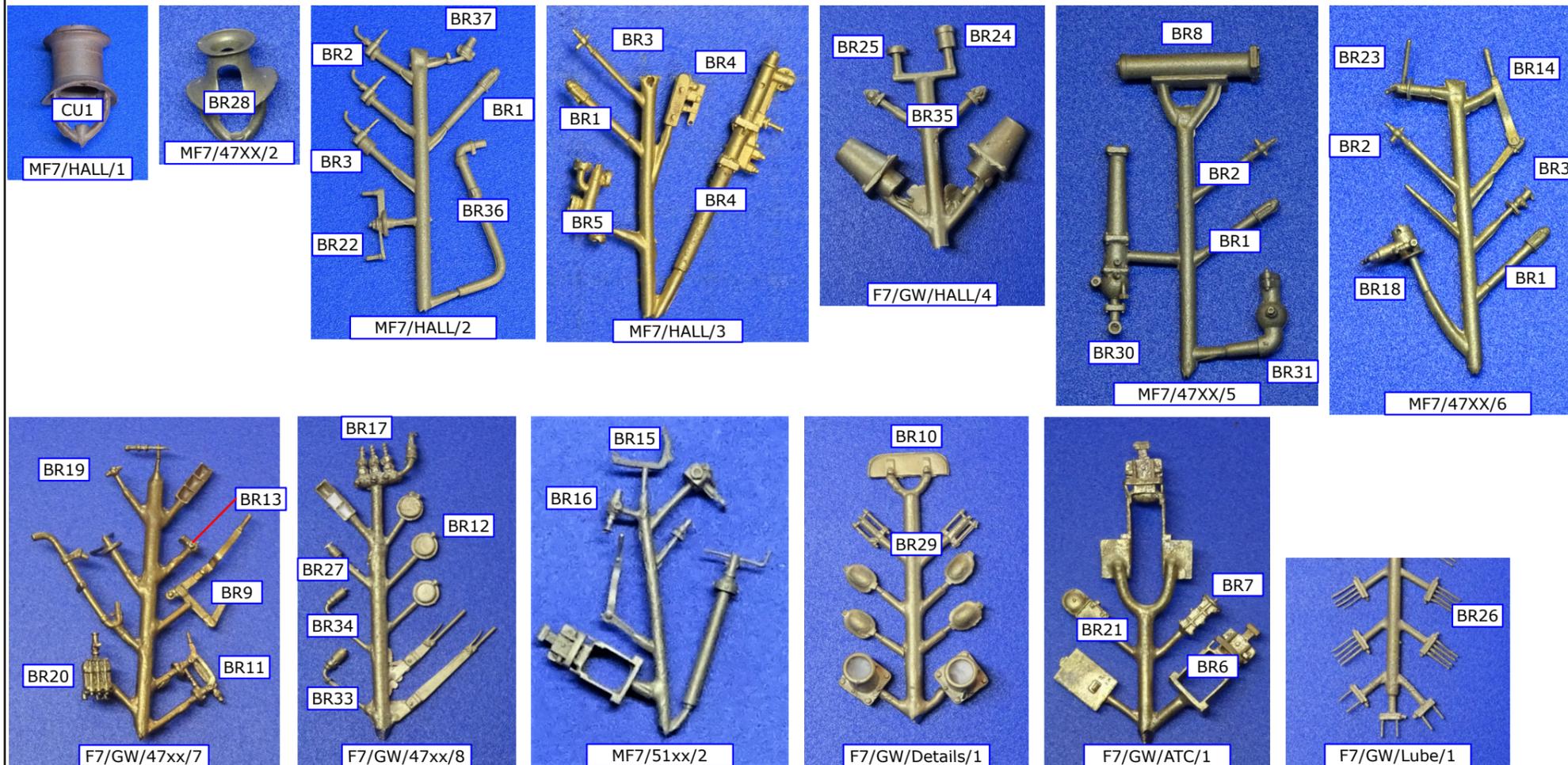
BR12	Cab pressure gauges (3)
BR13	Jockey valve
BR14	Regulator handle
BR15	Linkage to jockey valve
BR16	Steam heating valve
BR17	Steam fountain
BR18	Ejector/brake valve
BR19	Blower valve
BR20	Sight feed lubricator
BR21	ATC bell
BR22	Screw reverse handle
BR23	Smokebox door handles
BR24	Cab Sandbox lid (2)
BR25	Front sandbox lid (2)

47XX/8	BR26	Axle journal and bogie lubricator (5)	Lube/1
47XX/7	BR27	Vacuum pump lubricator	47XX/8
47XX/6	BR28	Safety valve bonnet	47XX/2
51XX/2	BR29	Safety valves (2)	Details/1
51XX/2	BR30	Four cone ejector	47XX/5
47XX/8	BR31	Four cone ejector front elbow	47XX/5
47XX/6	BR32	Steam lance cock	47XX/6
47XX/7	BR33	Large whistle	47XX/8
47XX/7	BR34	Small whistle	47XX/8
ATC/1	BR35	Snifting valve (2)	Hall/4
Hall/2	BR36	Vacuum pipe	Hall/2
47XX/6	BR37	Vacuum pipe dummy	Hall/2

### OTHER COMPONENTS

3/16" bearing (6)  
 5/32" bearing (4)  
 6BA x 1" Brass screw (1)  
 6BA x 5/16" Brass screw (2)  
 6BA nut (3)  
 Short handrail knobs (2)  
 Medium handrail knobs (6)  
 Buffer, nut and spring (2)  
 Vacuum pipe hose  
 4mm studding and nuts for firebox assembly

1/8" brass wire for compensation beam pivots  
 5/32" brass tube for compensation beams  
 1.6mm Steel wire for front compensation pivot  
 0.5mm Phosphor bronze wire for bogie sidle control  
 1.25mm Nickel silver wire  
 1.6mm Nickel silver wire for coupling rod pins and piston rods  
 3/32" Brass tube for piston tube  
 11/32" (2) Brass tube for valve chests  
 0.45mm Brass wire for cab handrail and ATC conduit  
 0.8mm (2) Brass wire for handrails  
 1.2mm Brass wire for oil cups  
 1.4mm Brass wire for top feed pipes  
 1.6mm Brass wire for brake shaft  
 2.0mm Brass wire for 4 cone ejector pipe  
 0.8mm & 1.5mm Copper wire for backhead pipes



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

### WHITEMETAL CASTINGS

WM1	1	Valve rocker cover, left
WM2	1	Valve rocker cover, right
WM3	1	Motion bracket rear plate, left
WM4	1	Motion bracket rear plate, right
WM5	2	Firebox side covers
WM6	1	Left rear sandbox
WM7	1	Right rear sandbox
WM8	2	Front sandbox
WM9	1	Screw reverse cover
WM10	2	Outside steam pipe

WM11	1	Smokebox door
WM12	2	Smokebox saddle bolt strip
WM13	1	Right smokebox pipe cover
WM14	1	Left smokebox pipe cover
WM15	1	Top feed casing
WM16	4	Mud hole covers
WM17	2	Collett taper buffer
WM18	1	Backhead
WM19	1	Firebox door
WM20	1	Screw reverse base

