

Fig 0. GA Semi smokebox

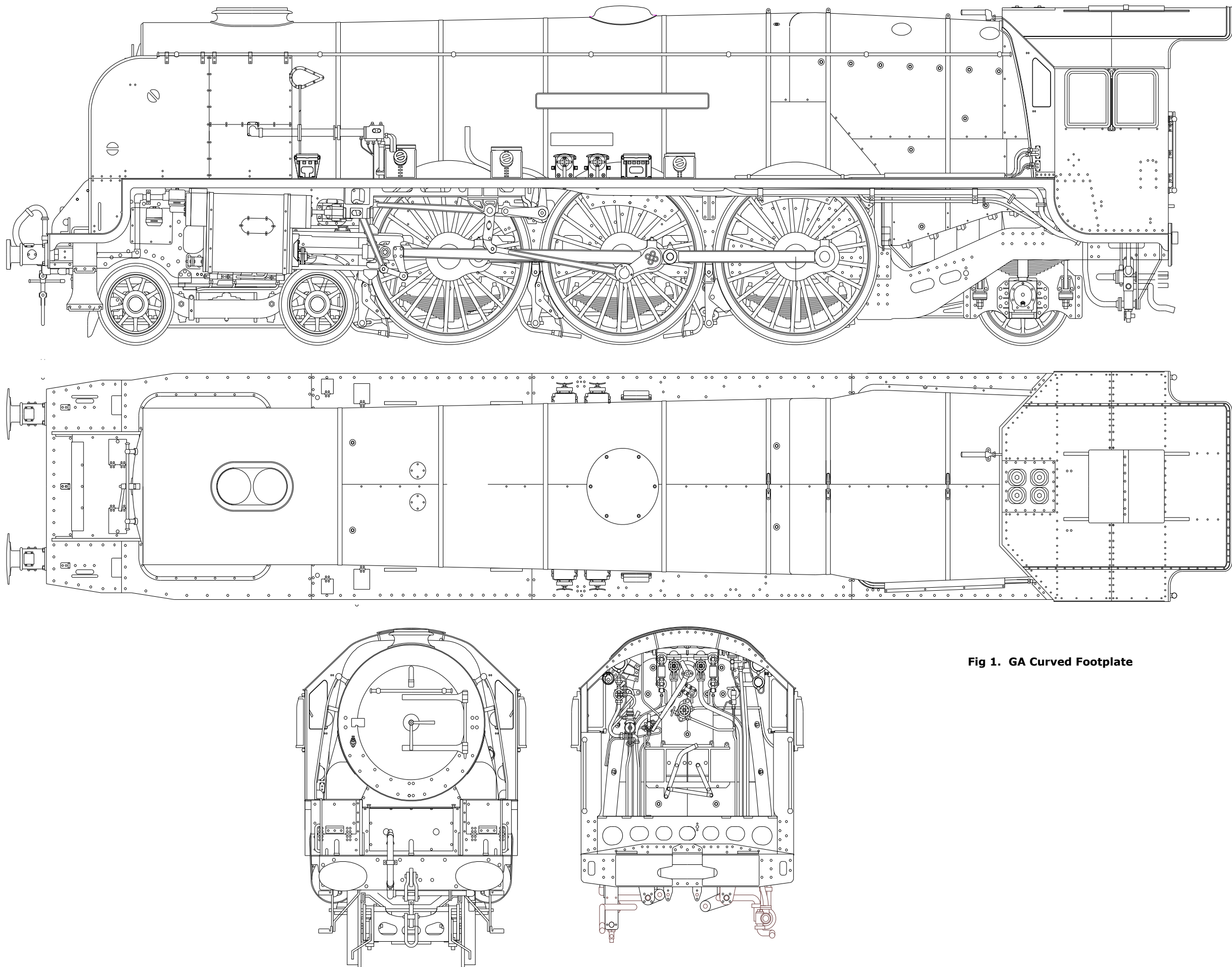


Fig 1. GA Curved Footplate

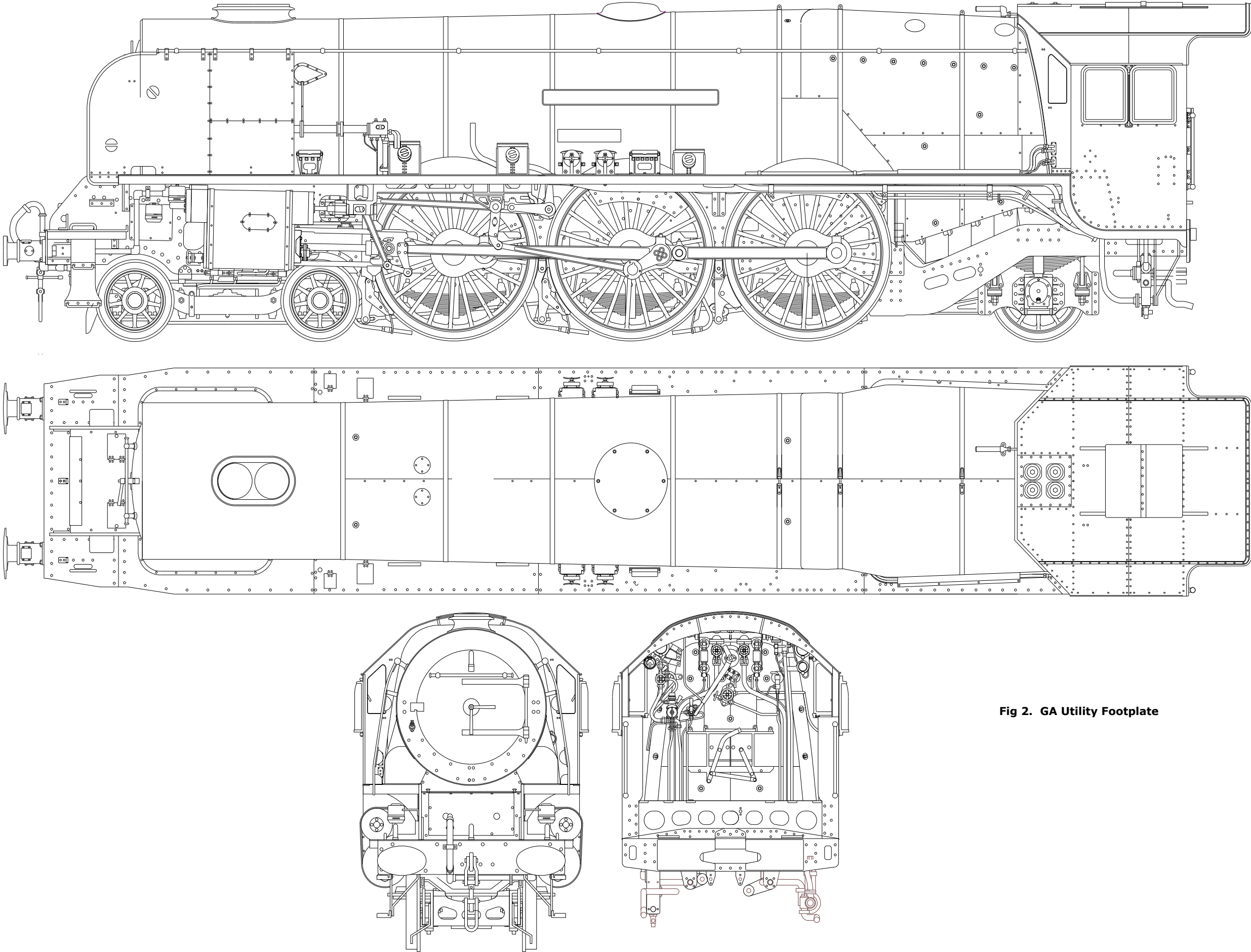


Fig 2. GA Utility Footplate



COUPLING RODS & FRAME ASSEMBLY

COUPLING RODS.

The coupling rods are now made 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 undersize for the crankpins and the fork joint holes. 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 or Tufnol 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.

Place the laminates over the mandrel and, using plenty of solder and flux, solder the two laminates together. You will now have rods with the crankpin and fork joint holes aligned. Carefully file the edges 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 1.6 mm 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.

FRAMES ASSEMBLY

Having decided which chassis to construct you can now start construction by preparing the frames (F1 & F2). Remove the etched cusp from the edges, open up all holes to the required size and emboss all the rivets (except for the hole and two rivets in a vertical line on the right side rear frame for some engines - see Fig 1). Open up to 0.9 mm the holes for the sand pipes in the sandbox bases and fold out as shown in Fig 4. Form the bends in the rear outside frames over a 1/4rod. Clean up the edges of the rear inside frames (F5 & F6) and bend to shape.

To construct the kit as designed with a compensated chassis open out the frame slots for the hornblocks by cutting up the half etched lines. Assemble the hornblocks and solder one of the front hornblocks to the inside of the frame aligning it with the half etched line.

Select the stretchers for your chosen gauge O Fine or Scaleseven . Remove the following stretchers - rear truck pivot (F11 or F12), brake cylinder (F13 or F14) and front compensation beam (F17 or F18). Open out the holes for the front compensation beam in part F17/F18 to 1/16". Fold up the stretchers making sure the 1/2 etched fold line is on the inside and that each bend is a right angle.

Check that all the tabs on the stretchers fit properly in their corresponding chassis slots so that the rest of the stay is hard up against the inside of the frames. Tap 10BA the motion bracket fixing holes in F17/F18. Solder an 8BA nut over the hole in F11/F12, for the rear truck pivot. Solder the brake shaft bracket (F15) in place in the slots in F13/F14.

Now assemble the frames and stretchers. Start by tack soldering F17/F18 to both frames. Check that everything is square and that the stays are hard against the frames. Put an axle (or better a longer piece of 3/16" rod) through the front bearings, together with the second hornblock and spring as shown in the hornblock instructions. 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 second hornblock to the frame and the remaining stretchers to the frames checking constantly that the chassis is square and the frames are straight.

Open up all the holes in the rear stretcher (F7) before making all the bends. Add the loco/tender hose connection spigots from 0.8 mm and 1.2 mm wire. See page PC-15. Tack solder the rear truck rubbing plate (F8) in the slots in the inside rear frames. Now assemble the inside rear frames together with parts F7, F8 & the fillet between the rear frames (F9). Make the bends in the firebox base (D1) and clip it in place over the tabs on the top edges of the inside rear frames to ensure their correct spacing. Place the assembly inside the main frames to check for errors before making all the soldered joints. Do not solder part D1 in place yet.

COMPENSATION

The front beam is a piece of 1/16" steel wire through the holes in F17/F18 with a piece of 3/32" tube added as shown below. For the rear beams cut a piece of 1/8" brass rod so that it fits through the holes in the frames and is flush with their outside face. Cut two equal pieces 5/32" tube which together fit between the frames and solder the rear beams (F16) to the 5/32 tubes 1 mm from one end. Temporarily fit the beams.

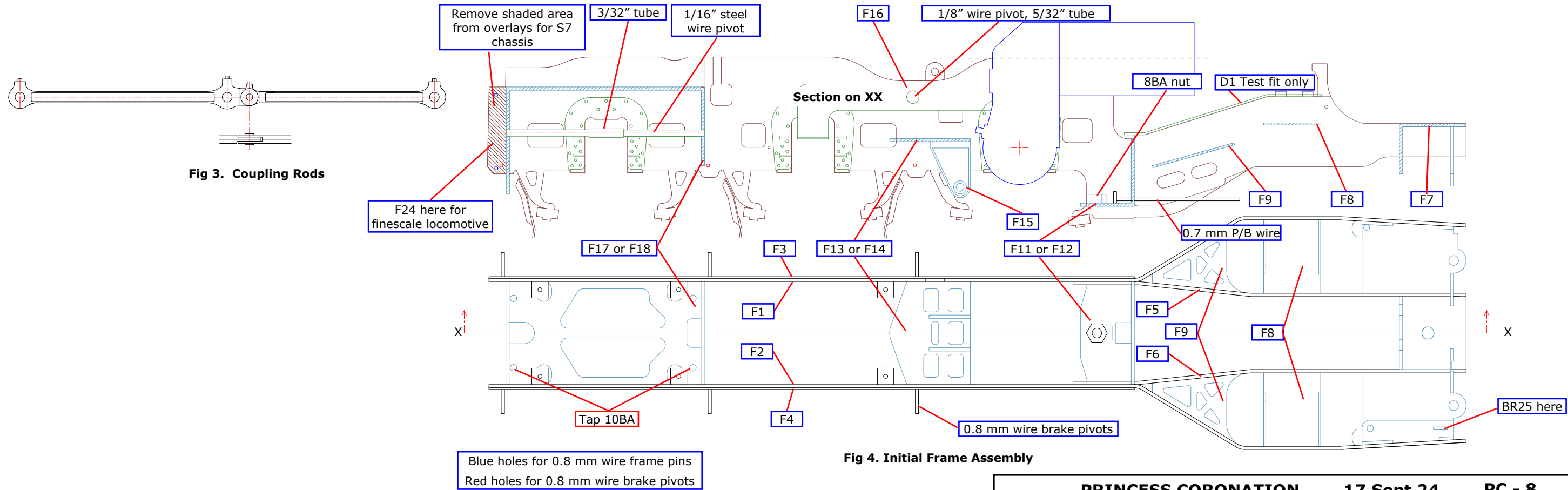
Temporarily fit all the wheels and axles and confirm that the compensation works properly and check that the chassis is sitting level. The height of the top of the frames above rail level, between the coupled wheels, should be 45.8 mm.

FRAME OVERLAYS

For Scaleseven remove the front section of the frame overlays (F3 & F4) as shown in Fig 4. If you are not fitting the BR Smith-Stone speedometer remove the mounting bracket that folds down from the left side frame bracket and reshape the lower edge of the bracket so that it matches the right side bracket. Emboss all the rivets before folding up the frame brackets. These brackets will need shortening for Scaleseven to compensate for the wider frame spacing.

Solder in place lengths of 0.8 mm wire for the brake hanger pivots. These then serve to accurately locate the overlays which then only need tack soldering around their edges.

No.	Description	Sheet
D1	Firebox base	4
F1	Frame, left	6
F2	Frame, right	6
F3	Frame overlay, left	3
F4	Frame overlay, right	3
F5	Rear inside frame, left	6
F6	Rear inside frame, right	6
F7	Stretcher, rear	7
F8	Rear truck rubbing plate (2)	3
F9	Fillet between rear frames (2)	2
F10	Washer - injector exhaust pipe (2)	1
F11	Stretcher, rear truck pivot OF	7
F12	Stretcher, rear truck pivot S7	7
F16	Compensation beam (2)	7
F17	Stretcher, front compensation beam OF	7
F18	Stretcher, front compensation beam S7	6
M12	Coupling rod rear inner lamination (2)	8
M13	Coupling rod rear outer lamination (2)	8
M14	Coupling rod front inner lamination (2)	8
M15	Coupling rod front outer lamination (2)	8



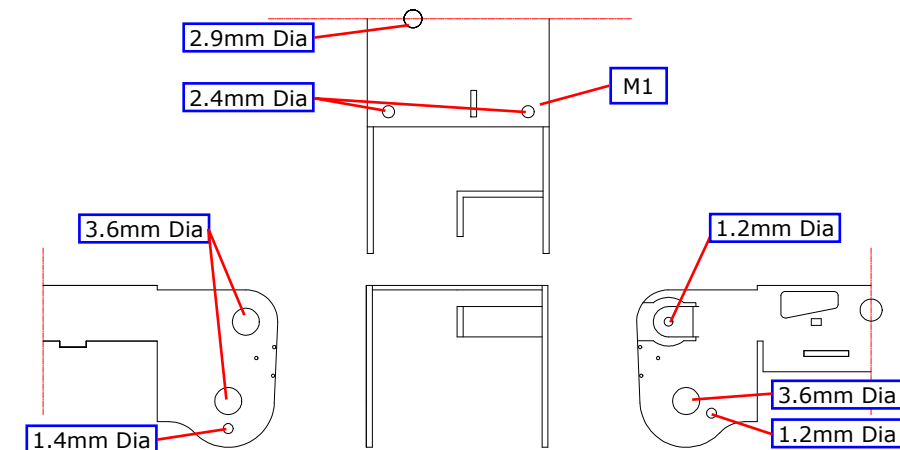
## UTILITY FRONT END

Form the slight bend in the cylinder flange plate webs (F40) and solder in place in the slot in the cylinder flange plate (F39). Now solder the flange plate and web to the frames against the front face of the cylinders taking care not to solder them to the cylinders. The rest of the detail shown in Fig 5, except the angle on the footplate below the smokebox door (U28), can now be added to the front frames although you may prefer to leave this until later.

No.	Description	Sheet		
F24	Packing between frames and front frames (2)	3	F50	Bogie splasher top
F35	Front frame left	6	F51	Bogie splasher front
F36	Front frame right	6	F52	Bracket, frame to footplate (2)
F37	Valve rocking lever pivot upper bracket (2)	7	F47	Front step stay (2)
F38	Valve rocking lever pivot bracket overlay (2)	7	M1	Outside cylinders
F39	Cylinder flange plate (2)	7	U15	Front bufferbeam
F40	Cylinder flange plate web (2)	1	U21	Utility front footplate
F41	Stretchers bogie mounting	7	U22	Utility front footplate, frame support bracket
F42	Stretchers inside cylinders	7	U23	Utility front footplate, small step
F43	Bufferbeam and frame webs (2)	3	U24	Utility front footplate, side valence (2)
F44	Front step assembly	4	U25	Utility front footplate, inside cylinder cover
F45	Front step, lower (2)	4	U26	Utility front footplate, inside cylinder cover overlay
F46	Front step, upper (2)	4	U27	Utility front footplate - angle between cylinder cover and footplate
F47	Front step bracket (2)	4		
F48	Lifting hole strengthening plate (2)	1	U28	Angle on footplate beneath smokebox door
F49	Bogie wheel splasher frame overlay	2		

Attach the lifting hole strengthening plates (F48) to the inside of the frames.

Solder the step assembly to the front frames, then add the front footplate and then the inside cylinder cover.



**Fig 5. Utility Front Frames**

## CURVED FRONT END

Remove the etched cusp from the edges, open up all holes to the required size and emboss all the rivets on front frames, left and right (F35 & F36). For locomotives with a curved front plate modify the front profile of frames to that shown in Fig 8. Tap 10BA the motion bracket fixing holes in the cylinder mounting brackets and rocking arm pivot brackets. Fold out the cylinder mounting and rocking arm pivot brackets.

Open up the holes in the valve rocking lever pivot upper bracket (F37) to 1.7 mm to clear the 10BA screw. Cut two pieces of 3/32" tube 3.4 mm long. Fit part F37 in place together with the tube and screw and solder to the frames on the inside. Ensure that the tube and screw are removable. Fit valve rocking lever pivot bracket overlay (F38). Solder a 8BA nut and a 6 mm long length of 2 mm wire in place on the stretcher for bogie mounting (F41). Emboss the rivets on inside cylinder stretcher (F42) and fold up. Fold up the front steps, lower and upper (F45 & F46) and solder in place in the recesses in the front step assembly (F44) before folding the step assembly up.

Open up all the holes in the outside cylinders (M1), emboss the rivets and fold the bends including the bracket which supports the valve rod. Assemble the frames, stretchers and step assembly, by screwing the cylinders in place. Check that the assembly fits together with the main frames with two lengths of 0.8 mm wire through the holes shown in red on Fig 8 pinning them together. For Finescale part F24 fits between the frames; outside the main frames and inside the front frames (See Fig. 4). It is very important that the joining pins are a tight fit in the frame holes so that the alignment is accurate. If all is well then solder the stretchers in place. Do not solder the front frames to the main frames yet (See P-12).

Form the slight bend in the cylinder flange plate webs (F40) and solder in place in the slot in the cylinder flange plate (F39). Now solder the flange plate and web to the frames against the front face of the cylinders taking care not to solder them to the cylinders. The rest of the detail shown in Fig 8 can now be added to the front frames although you may prefer to leave this until later.

No.	Description	Sheet
F35	Front frame left	6
F36	Front frame right	6
F37	Valve rocking lever pivot upper bracket (2)	7
F38	Valve rocking lever pivot bracket overlay (2)	7
F39	Cylinder flange plate (2)	7
F40	Cylinder flange plate web (2)	1
F41	Stretcher bogie mounting	7
F42	Stretcher inside cylinders	7
F43	Bufferbeam/frame webs (2)	3
F44	Front step assembly	4
F45	Front step, lower (2)	4
F46	Front step, upper (2)	4
F47	Front step bracket (2)	4
F49	Bogie wheel splasher frame overlay	2
F50	Bogie wheel splasher top	2
F51	Bogie wheel splasher front	2
F52	Bracket, frame to footplate (2)	5
F47	Front step stay (2)	4
M1	Outside cylinders	7

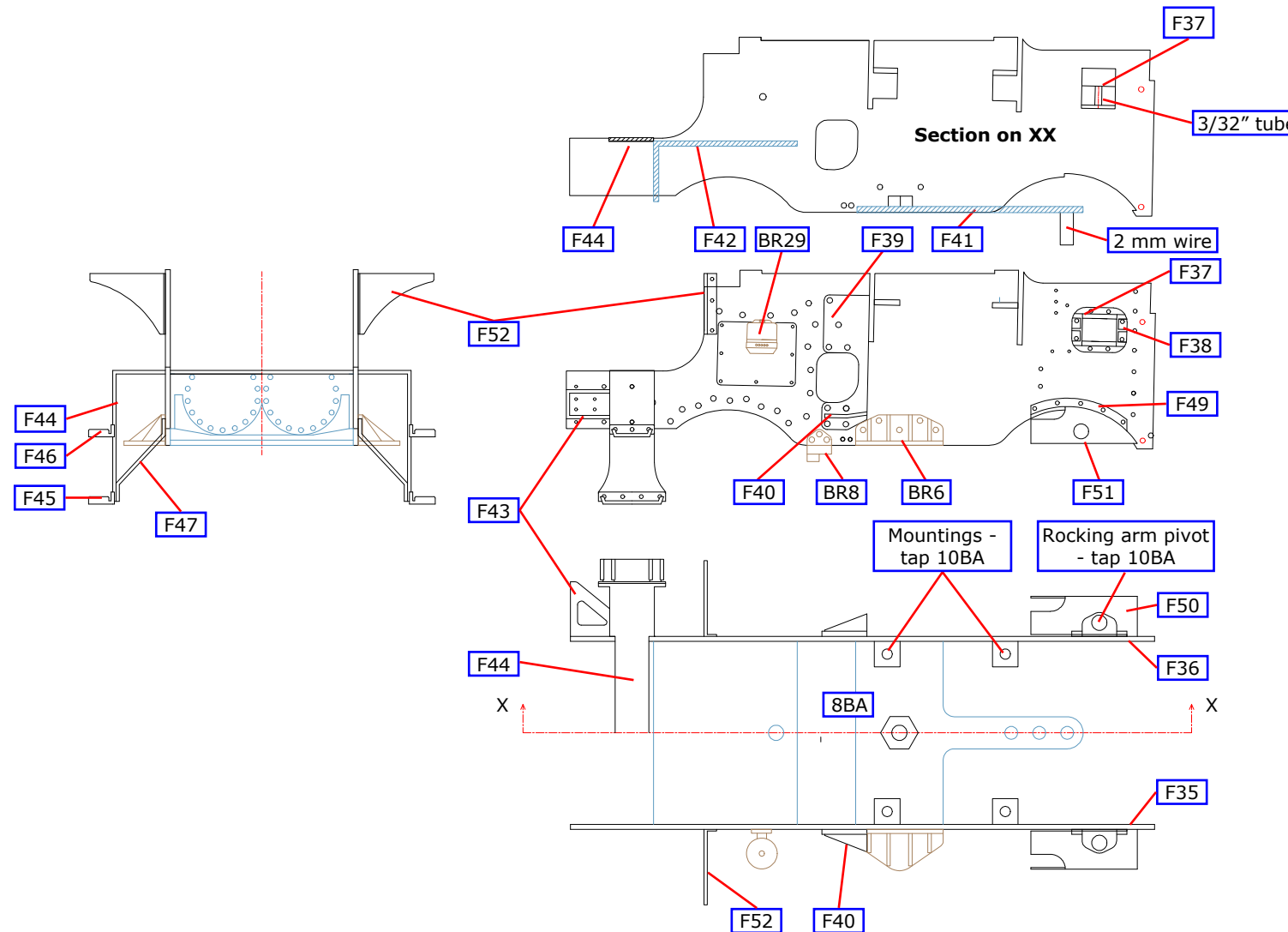


Fig 7. Curved Front Frames

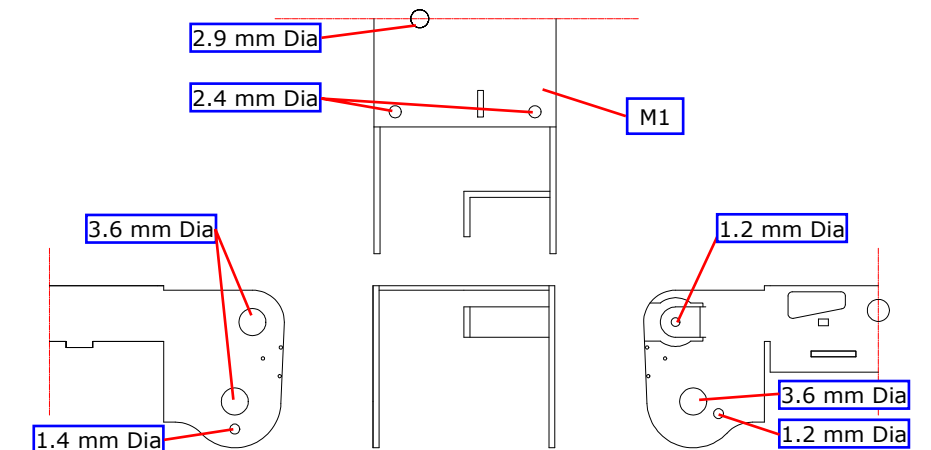


Fig 8. Outside Cylinder Folds



## BOGIE

The bogie is a rather complex design and because of its relatively long wheel base there is provision for three point compensation. This is achieved by fixing the bearings on the right side and equalising the bearings on the left side by allowing them to move in elongated holes in the frame. The movement of these bearings is controlled by the equalising beam/spring assembly rocking about a point shown in the drawing.

The bogie can be allowed to move freely in the slot in the stretcher but this results in rear wheels fouling the brake gear and splashers on all but the gentlest of curves. This problem is solved by pivoting the bogie towards the rear. There are three alternative positions for this pivot on the stretcher for bogie mounting (F41) and the most appropriate position can only be determined by experimentation.

Solder the spring laminations (B6 & B7) together using 0.8 mm wire through the bolt holes to ensure accurate alignment. The easiest approach is to use the method described for aligning the coupling rods. Open up the holes in the equalising beams (B5) to fit the bearings and emboss the rivets. Note the rivets closest to the centre of the beam serve to locate the equalising beam/spring clamp (B8) and should only be embossed if this part is appropriate for your chosen locomotive. Solder the beams to the springs and add the equalising beam/spring clamp, if required, as shown in the drawing. Add a length of 1 mm wire through the holes in the clamp. Add 16BA nuts over the 0.8 mm wire.

Drill out all the small holes, in the side frames, left and right (B1, B2) and the side frame lower bars (B3) to accept short pieces of 1 mm wire to represent the frame bolts. Open up the holes in the frames to fit the bearings. The bearings should be an easy fit in the elongated holes in the left frame (B1). Emboss the rivets which will locate the guard irons. Fold up the frame angles and the small tabs which locate the stretcher. Solder pieces of 1 mm wire for the outermost bolts in each frame. Make the bends in the side frame lower bars and check that it fits in place over the bolts. **Do not solder in position yet.**

Fold up the centre stretcher bottom layer (B10) and solder together with the centre stretcher top layer (B9) and the bogie bearer pad casting (BR7). Open out the slot in the centre stretcher so that the 1/8 tube is an easy fit. Solder the stretcher and frames

together. Make the front and rear stretchers (B11 & B12) and solder them to the frames. Slide the right side beam/spring assembly over the right side frame and solder the bearings to both the beam and frame. **Note the bearings fit from the inside.** Similarly fit the left side beam, fit the wheels and check that the compensation works and that the bogie is level before soldering the bearings to the beam but **not the frames**. Solder the side frame lower bar in place and add the remaining bolts. Rivet and fold up the guard irons (B4) and solder in place. Using appropriate washers (B14) fit the wheels so that there is a minimum of side play. The bogie is retained with a 8BA screw and washer (B13) through a 6 mm long piece of 1/8 tube.

Note that the centre stretchers beyond the bearer pad casting may need to be filed back and the bearer pad casting reduced in height to give clearance when running.

No.	Description	Sheet
B1	Side frame left	7
B2	Side frame right	7
B3	Side frame lower bar (2)	7
B4	Guard iron (2)	3
B5	Equalising beam (4)	6
B6	Spring lamination 0.45 mm thick (4)	4
B7	Spring lamination 0.7 mm thick (4)	7
B8	Equalising beam/spring clamp (4)	4
B9	Centre stretcher top layer	7
B10	Centre stretcher bottom layer	7
B11	Front/rear stretcher (2)	5
B12	Front/rear stretcher top angle (2)	5
B13	Bogie retaining washer	4
B14	Axle washer (4)	4

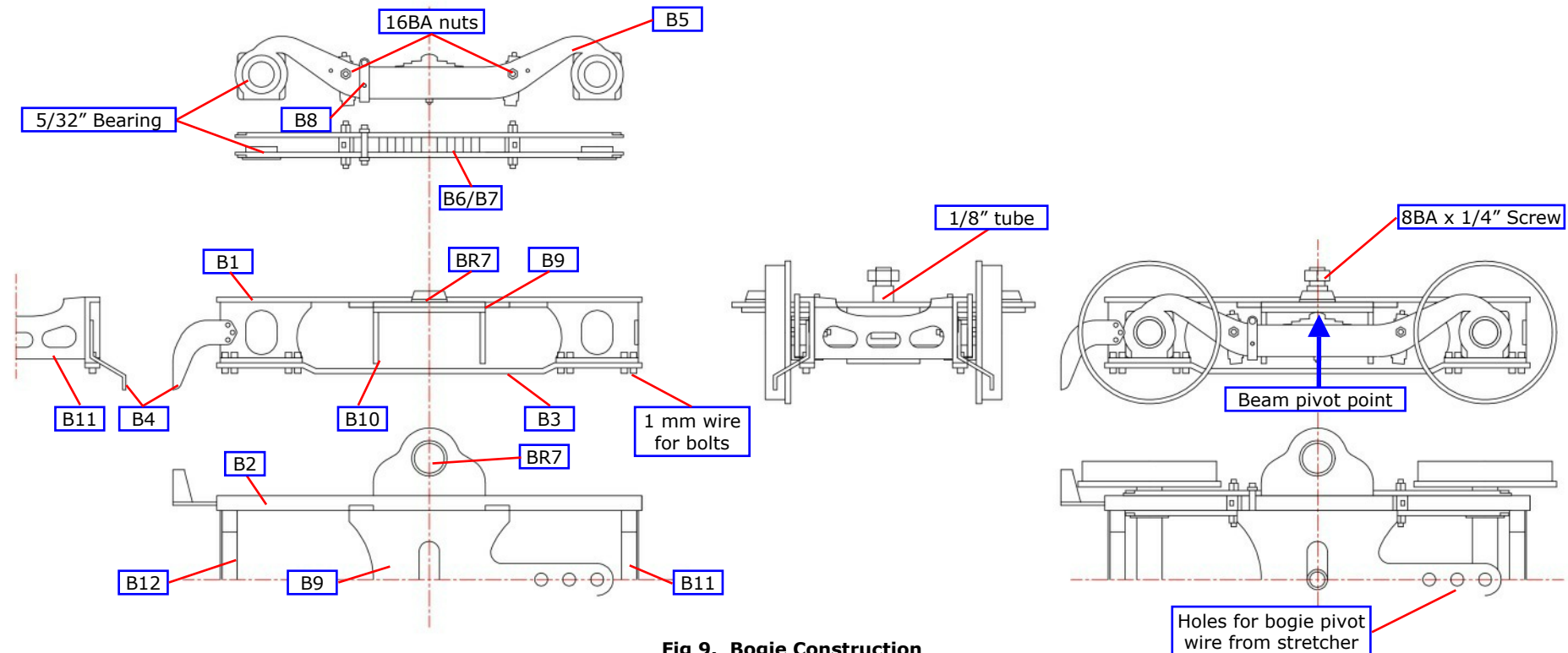
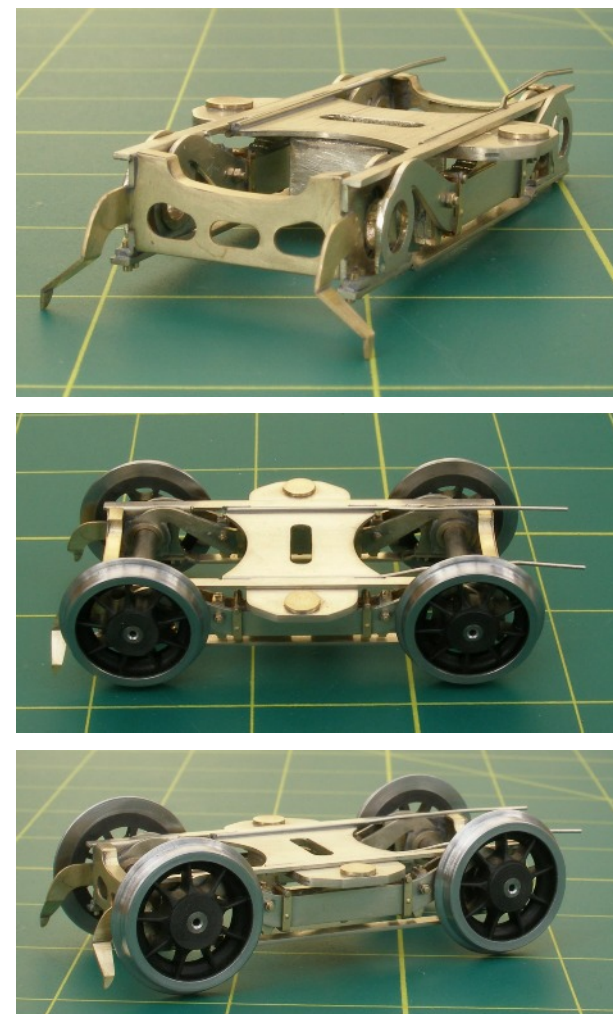


Fig 9. Bogie Construction

## REAR TRUCK

Open up the slots in the inside frames (T1) so that the bearings are a good fit. Fold out the bearing retaining brackets and check that the 0.8mm wire through these brackets holds the bearings in place. This system will allow the wheels to be removed from the completed truck. Fold up the inside frames and insert the wheels using the axle washers (T12) to give minimum side play.

Emboss the rivets on the outside frames, either original (T4) or later shape (T5) and solder together with the front and rear frames (T2 & T3). Now solder the inside frames in place so that the bottom edges are level. Emboss the rivets on the A frame ribs (T8) and solder in place in the groove in the A frame lower plate (T6). Add the A frame transverse rib (T9) and then the A frame upper plate (T7). Solder the completed frame into the slots in the front stretcher. Open out the pivot holes in the A frame lower plates to be an easy fit for the 1/8 tube (2.2 mm long). The spring hangers on part NS1 are too long which is not difficult to overcome. Cut off the spring hangers close to the spring and clean up the spring. Mark and drill new holes to accommodate the spring hangers. Fit the axlebox (WM5) and the spring then add the spring hangers which will need shortening to fit in the new holes.

Solder the rear truck spring wire (0.7 mm phosphor bronze) into the holes in part F11 or F12 so that it locates in the hole in the truck front stretcher T2.

No.	Description	Sheet
T1	Inside frames	4
T2	Front stretcher	2
T3	Rear stretcher	4
T4	Outside frame original (2)	2
T5	Outside frame later (2)	2
T6	A Frame lower plate	3
T7	A Frame upper plate	3
T8	A Frame rib (2)	4
T9	A Frame transverse rib	2
T10	Pivot spacing washer	4
T11	Truck retaining washer	4
T12	Axle washer (2)	4

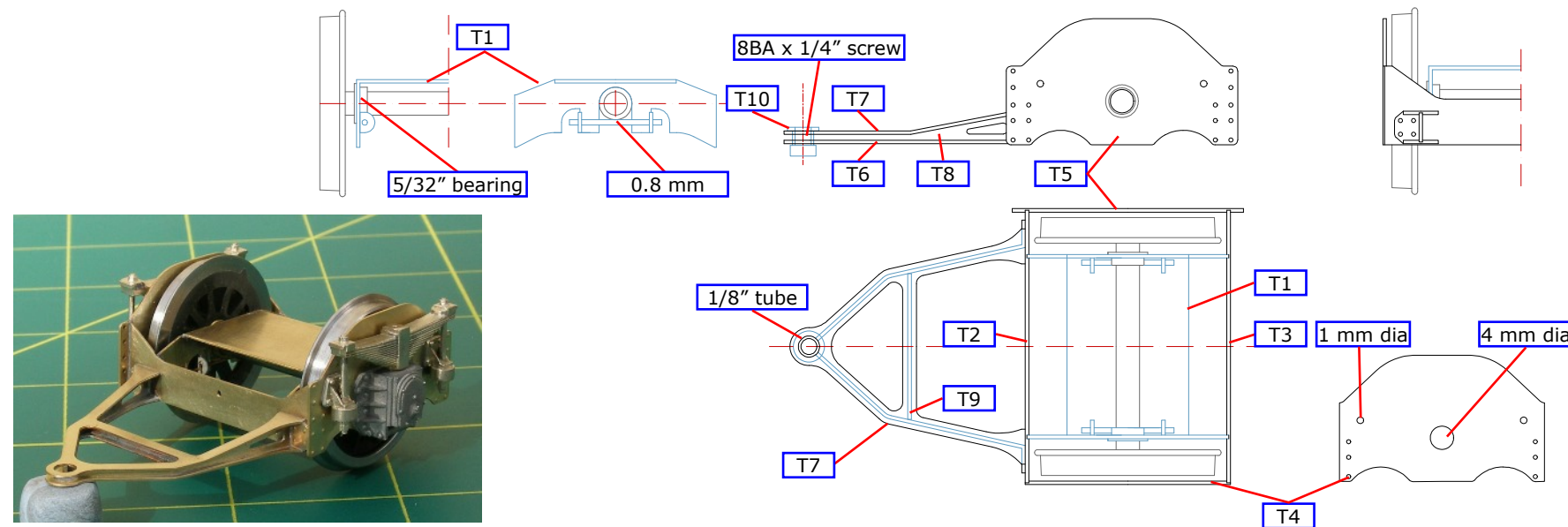


Fig 10. Pony Truck Construction

### VALVE GEAR JOINT ASSEMBLY

All the valve gear joints, with the exception of the eccentric arms/eccentric rods, are made with wire pins soldered on the inside (back). This clearly runs the risk of soldering the joint solid. To minimise this:

- ensure the pin is a tight fit in the hole.
- use oil or a proprietary solder mask, or chemically blacken the part of the rod that will be inside the joint..
- use plenty of flux, a small amount of solder, and be quick!

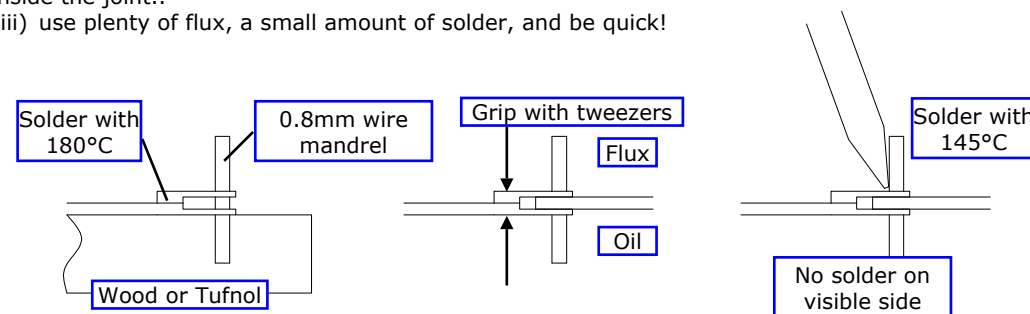


Fig 11. Valve Gear Joint Assembly



## CYLINDERS AND MOTION BRACKET

### CYLINDERS 1

Open out to 0.6 mm the slide bar locating holes in the rear cylinder cover/stuffing box (NS10) and check that the small pins on the slide bars locate correctly. Drill 1.4 mm through the holes marked on the inner face of rear cylinder cover/stuffing box to fit the cylinder relief valves (BR30) ensuring that you produce a handed pair. Open out to 2 mm the holes for the piston rods in the rear cylinder cover/stuffing box and solder the cylinder covers in place taking care to orientate them accurately. Solder the rear valve chest (NS8) in place and check that the valve rods (NS13) are a nice fit through both the rear valve chest and the valve rod bracket.

The detailing on the front of the cylinders consists of the front cylinder cover (NS11), the front valve chest (WM10), the front valve chest cover (NS9), the outside cylinder valve tail rod cover (BR31), the valve chest snifting valve (BR29) and the cylinder relief valves (BR30). Many of these components had a polished finish and this detailing can be applied now or it can be done after painting,

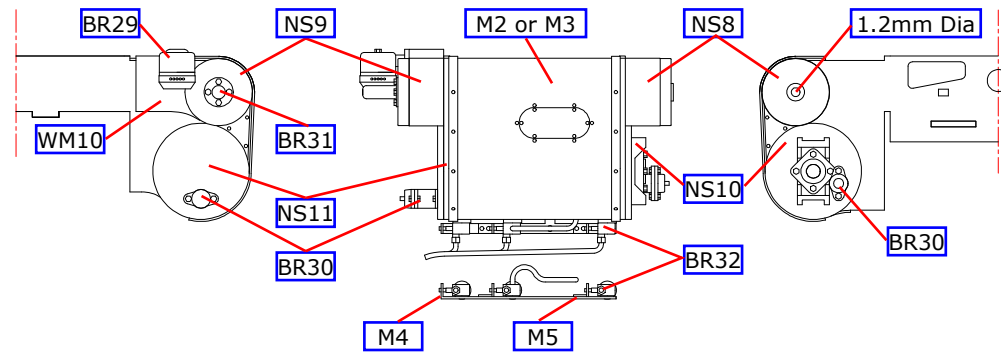


Fig 11. Cylinder Assembly

### CYLINDERS 2

Clean up the slide bars, upper and lower (NS6 & NS7) and check their fit between the cylinders and motion bracket. Add the slide bar lubricator (BR28) in the hole in the upper slide bar. Drill 1.25 mm through the holes for connecting rod pivot wire in the crossheads (NS12) and reduce the thickness of the cast on nut by 0.3 mm. Check the fit between the slide bars and crosshead for free and smooth, but not sloppy movement before soldering the slide bars in place.

Emboss the rivets and form to shape the cylinder wrappers, oval or circular cover plate (M2 or M3). Solder them in place making sure the drain cock holes are on the bottom centre line. Open up the small holes in the drain cock linkage (M4) and the drain cock linkage bracket (M5) to fit the forward facing spigot on the drain cock castings (BR32). Emboss the rivets on the drain cock linkage and fold over the front edge through 90° to make a small bracket with the small hole at its centre. Attach the drain cock castings together with the drain cock linkage and then solder the small brackets (M5) over the spigot on the front of the drain cocks and against the linkage as shown in the drawing. Make the drain pipes from 0.6 mm brass wire

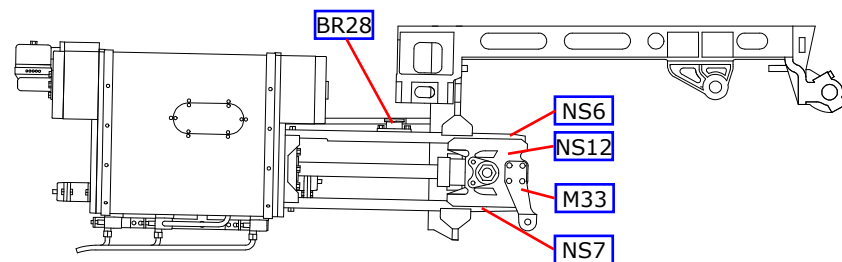


Fig 12. Slide Bars and Crosshead



No.	Description	Sheet	No.	Description	Sheet
M2	Cylinder wrapper oval cover plate (2)	1	M8	Motion bracket longitudinal (2)	7
M3	Cylinder wrapper circular cover plate (2)	1	M9	Motion bracket longitudinal overlay (2)	7
M4	Drain cock linkage (2)	1	M10	Weigh shaft bearing overlay outer (2)	6
M5	Drain cock linkage bracket (4)	1	M11	Weigh shaft bearing overlay inner (2)	6
M6	Motion bracket front	7	M27	Radius rod (2)	8
M7	Motion bracket rear	7	M28	Radius rod fork joint (2)	8

### MOTION BRACKET

Open out to clear 10 BA the holes in the fixing brackets on the motion bracket front and rear (M6 & M7) and fold out the brackets. Carefully form the joggles in the motion bracket front and fold up the stretcher which fits in the slot in the back of the cylinders. Screw both brackets in place on the frames. Open up the holes for the weigh shaft and expansion link pivot in the motion bracket longitudinal (M8), motion bracket longitudinal overlay (M9), the weighshaft bearing overlay, outer and inner (M10 & M11). Fold up the motion bracket longitudinal and solder on the overlays.

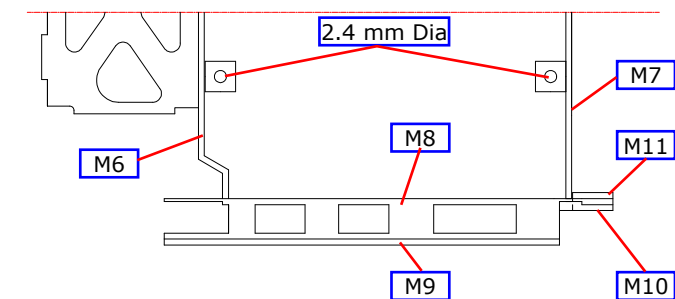
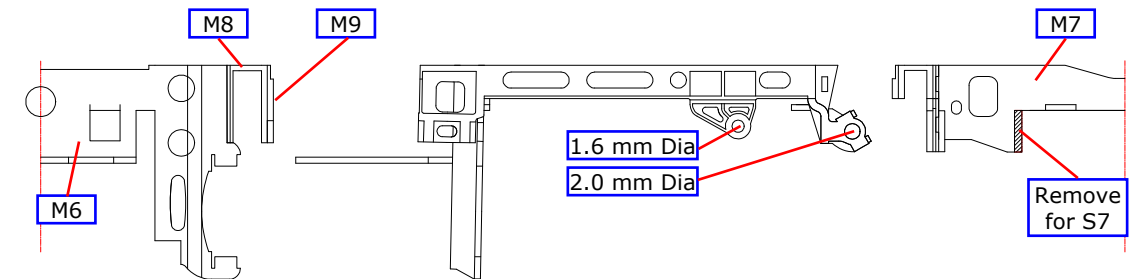


Fig 13. Motion Bracket

### ASSEMBLY 1

Now using the 0.8 mm wire pins, and for finescale the spacing pieces (F24), permanently join together the front and rear frames. Trim the wire pins flush on both the inside and outside.

Assemble and screw in place the cylinder and motion bracket assemblies threading the valve rods into place. Check for correct alignment and free movement of the valve gear. If all is well solder the cylinders and motion bracket assemblies together.

### MOTION PARTS PREPARATION

**Radius Rod.** Solder the radius rod fork joint (M28) and a short length of 1 mm N/S wire to the radius rod (M27) as shown below. This piece of wire runs in the slots in the expansion link centre link (M24) and the ends must be flush with the surface of these slots. Ensure that the slot in the radius rod clears a 1.25 mm wire.

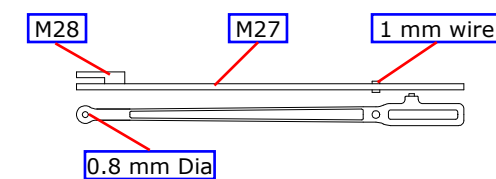


Fig 14. Radius rod

MOTION

**Expansion Link.** Drill out 0.7 mm the holes in the expansion link laminations, centre and outer (M24 & M25) to take pieces of 0.7 mm N/S wire which align the laminations and represent the bolt heads. Drill 1.6 mm in the expansion link outer laminations (M25) for the expansion link pivots. Emboss the rivets on the outer laminations. Assemble the centre laminations over the radius rod with the 0.7 mm wire and solder the laminations together. The radius rod should now move smoothly in the link. Now solder the outer laminations in place and cut off the 0.7 mm wire to represent the bolt heads.

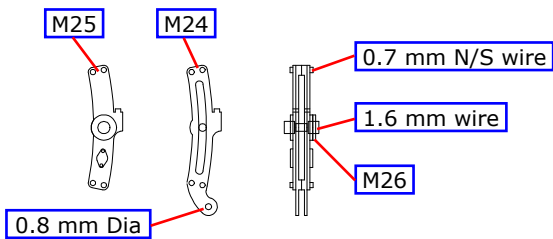


Fig 15. Expansion Link

**Eccentric Rod & Return Crank.** Solder the eccentric rod bearing overlay (M22) to the rear of the boss on the eccentric rod (M21) as shown in the drawing. Rivet the eccentric rod to the return crank (NS14) and add the eccentric rod bearing front cover (M23). The return crank is retained on the crankpin in two different ways depending on the design of the crankpin being used as follows:

**For a threaded screw crankpin** (Slaters) drill and tap the crankpin hole in the return crank.  
**For a tubular crankpin** (Model Signal Engineering from F7, ref. Loco 7CP) the recess in the back of the return crank simply fits over the end of the crankpin.

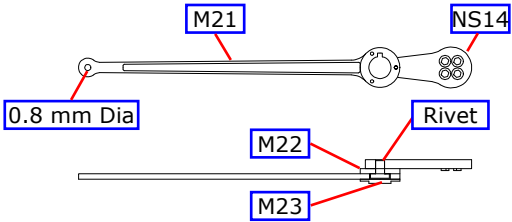


Fig 16. Eccentric rod and Return Crank

**Valve Rocking Arm.** Bend up the valve rocking arm laminations (M34) and solder together over the already cut piece of 3/32" tube as shown in below. Shorten the inside valve rods (M37) by 2.5 mm and pin them to the rocking arms with 0.8mm wire. Check that you can fit the rocking arms in their pivot brackets securing them with the 10 BA x 5/16" screw. Open up the holes in the compensating links (M35 & M36) as follows:

Upper and lower links (parts M35 and M36) small hole 0.8 mm, large hole tap 14BA.

Solder short lengths of 0.8mm N/S wire through the small holes in the compensating links so that it protrudes by 2 mm on one side and is completely flush on the other. Pass the 0.8mm wire end of the compensating link through the open end of the valve rocking arm and retain with a 16BA washer. Solder the washer to the 0.8mm wire only so that the compensating link is free to rotate.

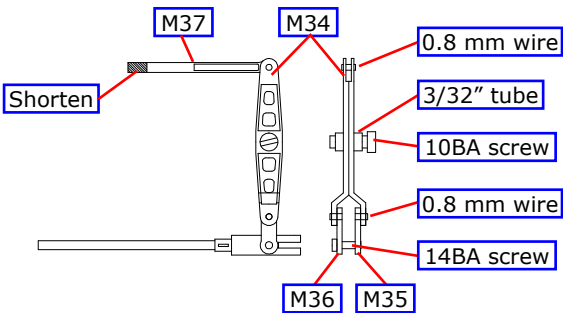


Fig 17. Valve Rocking Arm

**Combination Lever.** Form the joggles in the combination levers (M31) as shown in the drawing.

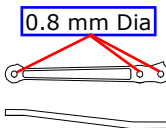


Fig 18. Combination Lever

No.	Description	Sheet		
M16	Connecting rod inner lamination (2)	8	M28	Radius rod fork joint (2)
M17	Connecting rod outer lamination (2)	8	M29	Weigh shaft arm lamination left side (2)
M18	Connecting rod big end boss inner lamination (2)	8	M30	Weigh shaft arm lamination right side (2)
M19	Connecting rod big end boss outer lamination (2)	8	M31	Combination lever (2)
M20	Connecting rod small end boss lamination	7	M32	Union link lamination (4)
M21	Eccentric rod - (2)	8	M33	Crosshead arm (2)
M22	Eccentric rod bearing overlay (2)	8	M34	Valve rocking arm lamination (4)
M23	Eccentric rod bearing front cover (2)	1	M35	Valve rocking arm compensating link, upper
M24	Expansion link centre lamination (4)	8	M36	Valve rocking arm compensating link, lower
M25	Expansion link outer lamination (4)	8	M37	Inside valve rod (2)
M26	Expansion link spacing washer (4)	1 & 8	M38	Reach rod
M27	Radius rod (2)	8	M39	Reach rod fork joint

**Final Assembly.** Solder together the connecting rod laminations (M16 & M17) and add the rod big end boss laminations, inner and outer (M18 & M19) to the big end and the small end boss lamination (M20) to the small end. Drill the big end to fit the crankpins and the small end 1.25 mm. Form the joggle in the crosshead arms (M33) before soldering them in place on the crossheads. Attach the connecting rods to the crossheads using 1.25 mm nickel silver wire as pins.

Pin the eccentric rod to the bottom of the expansion link. Pin the union link (NS15) to the bottom hole and the radius rod to the top hole of the combination lever, and then add the valve rod NS13 below the radius rod. Pin the union link to the crank pin arm. Check that there is sufficient movement in all the joints, and that they move without binding.

To fit the motion to the cylinders and motion bracket, feed the crosshead piston and the valve rod into the holes in the cylinder rear, spring the pins on the expansion link into the holes in the bracket and fit the return crank to the crankpin such that the offset of the end of the return crank is 4.4 mm. Check that there is free movement throughout.

Fit the weigh shaft arms, left and right (M29 & M30) to the reversing weigh shaft made from 2.0 mm N/S wire as below. Add the pins through the ends of the cranks and through the slots in the radius rods from 1.25 mm N/S wire. If you wish to make the valve gear removable, the 1.25 mm wire can be replaced with a 12BA bolt which is screwed from the inside into the tapped hole in the arms. By rotating the weigh shaft you should now be able to reverse the motion!

You now should be able to assemble the complete motion and valve gear. Place the cylinders/motion bracket assembly in position but do not tighten down the screws. Pass the rocking arms beneath the valve rods, fit the compensation links into the rocking arms and slide them over the valve rod. They are retained by the 14 BA screw. Now fit the rocking arm pivot screws and tighten down the cylinders/motion bracket retaining screws. All rather fiddly, but possible.

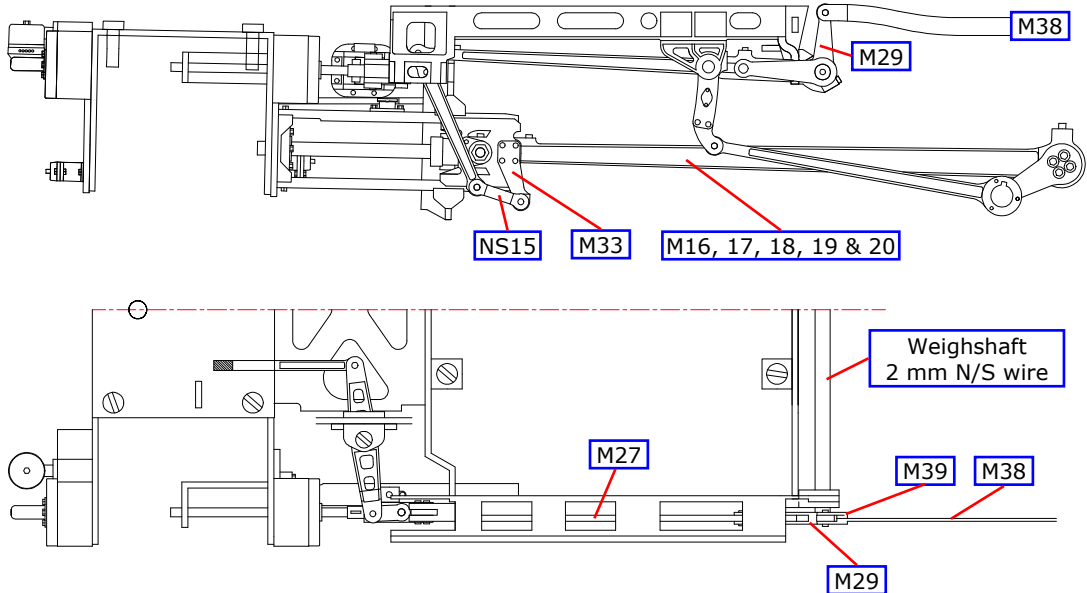


Fig 19. Valve Gear Final Assembly

INSIDE CYLINDERS

If you are fitting the working inside cylinders they should be constructed at this point following the separate instructions.

CHASSIS SUB-ASSEMBLIES

WHEELS

Attach the balance weights to the wheels as in Fig 20 - note the leading axle balance weights are handed left/right. Assemble the wheel sets, bearings and motor/gearbox selecting part F31 of appropriate thickness to control side play. The cranks on the right hand side should lead the left by 90°. Now connect the motor to your pick-ups and test run.

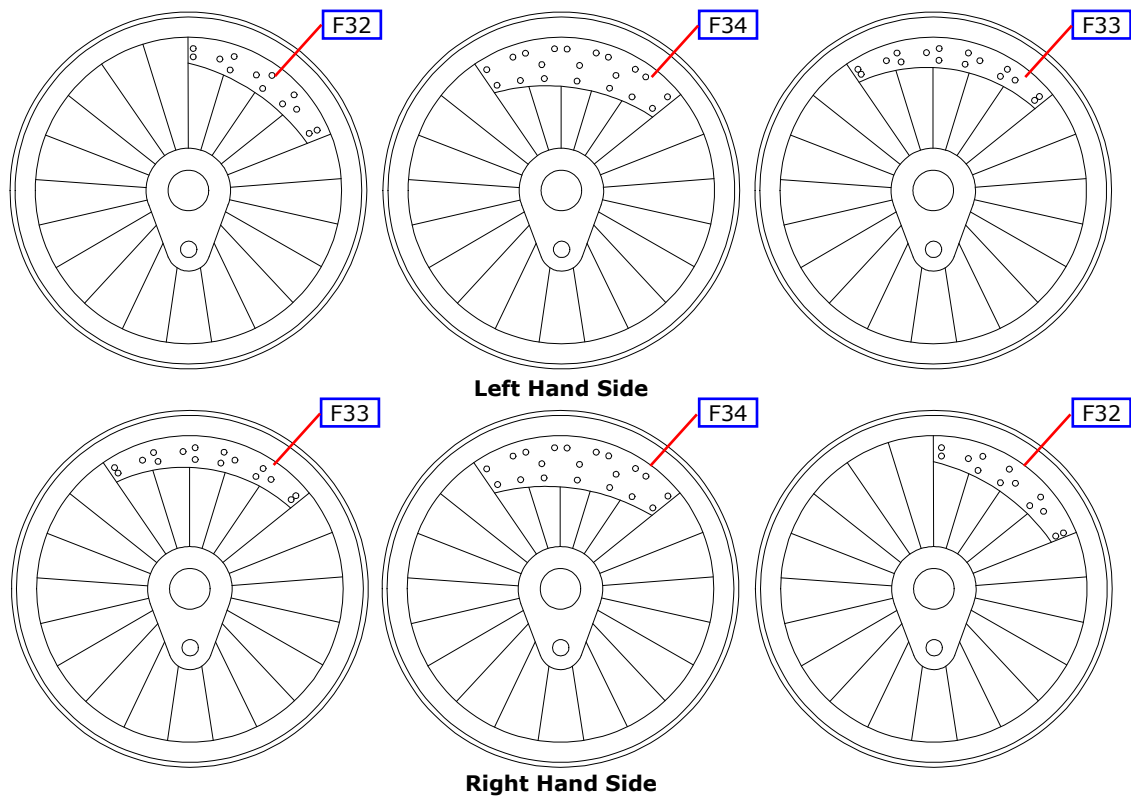


Fig 20. Wheels

SPEEDOMETERS

The LMS speedometer is fitted as follows. Fold up the mounting bracket (D16) and the gearbox bracket (D17). Solder the gearbox bracket in place between the lower ends of the mounting bracket. Solder the drive arm (D19) to the spindle wire and trim the wire so that it is flush with the front face of the gearbox bracket. Retain the spindle in place by soldering the collar (a short piece of 1/16" tube) to the spindle. This should give a free spindle with no slop. A small hole may need to be drilled to give access for the soldering iron. Solder the gearbox front (D18) in place. Glue the dynamo casting (BR18) in place. Attach the bracket to the frame brackets as shown below. Solder the drive peg through the hole in the crankpin arm (D20) and attach the arm to the crankpin.

The BR speedometer is fitted as shown in the drawing.

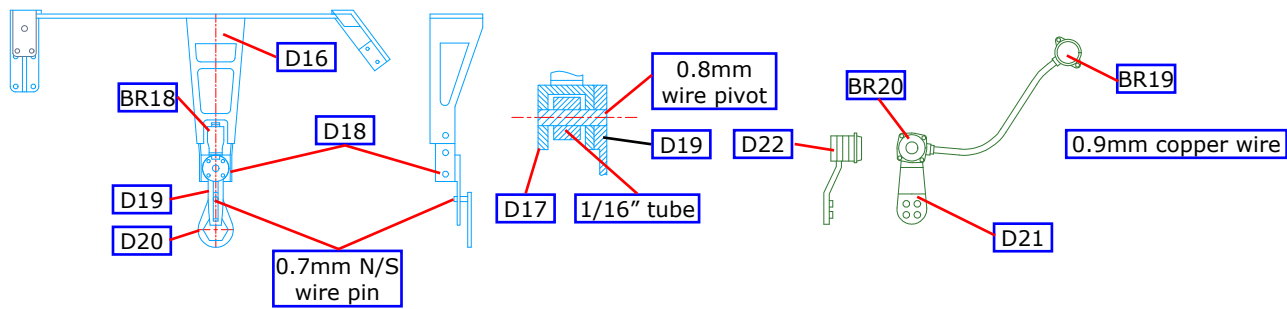


Fig 21. Speedometer

No.	Description	Sheet		
D6	Front brake hanger and double shoe lamination (4)	8	D17	LMS speedometer, gearbox bracket 1
D7	Centre and rear brake hanger and double shoe lamination (8)	8	D18	LMS speedometer, gearbox front 1
D8	Front brake hanger and single shoe lamination (4)	8	D19	LMS speedometer, drive arm 8
D9	Centre and rear brake hanger and single shoe lamination (8)	8	D20	LMS speedometer, crankpin arm 8
D10	Brake pull rod	7	D21	BR speedometer, drive arm 8
D11	Front brake cross shaft	6	D22	BR speedometer, drive arm washer 8
D12	Centre and rear brake cross shaft (2)	6	F13	Stretchers, brake cylinder OF 7
D13	Centre brake cross shaft pull rod bracket (2)	1	F14	Stretchers, brake cylinder S7 7
D14	Rear brake cross shaft pull rod bracket (2)	1	F15	Brake shaft bracket (2) 6
D15	Brake cylinder crank lamination (2)	7	F31	Axle washer (12) 4, 5 & 7
D16	LMS speedometer, mounting plate	4	F32	Balance weight, leading axle (2) 6
			F33	Balance weight, trailing axle (2) 6
			F34	Balance weight, centre axle (2) 6

BRAKES

Attach the steam brake cylinder (WM9) and the brake cylinder crank laminations (D15) as shown in Fig 22. Provision is made for both single brake shoes (D8 & D9) or double brake shoes (D6 & D7). Select the required parts and emboss the rivets. Laminate together using a pair of old drills in a piece of wood to align the parts.

Emboss the bolts in the centre and rear brake cross shaft (D12) and solder together to the brake pull rod (D10) as a separate assembly. Add the centre brake cross shaft pull rod bracket (D13) and then the front brake cross shaft (D11). Add the rear brake cross shaft pull rod bracket (D14). Finally assemble the brake gear as shown in Fig 22.

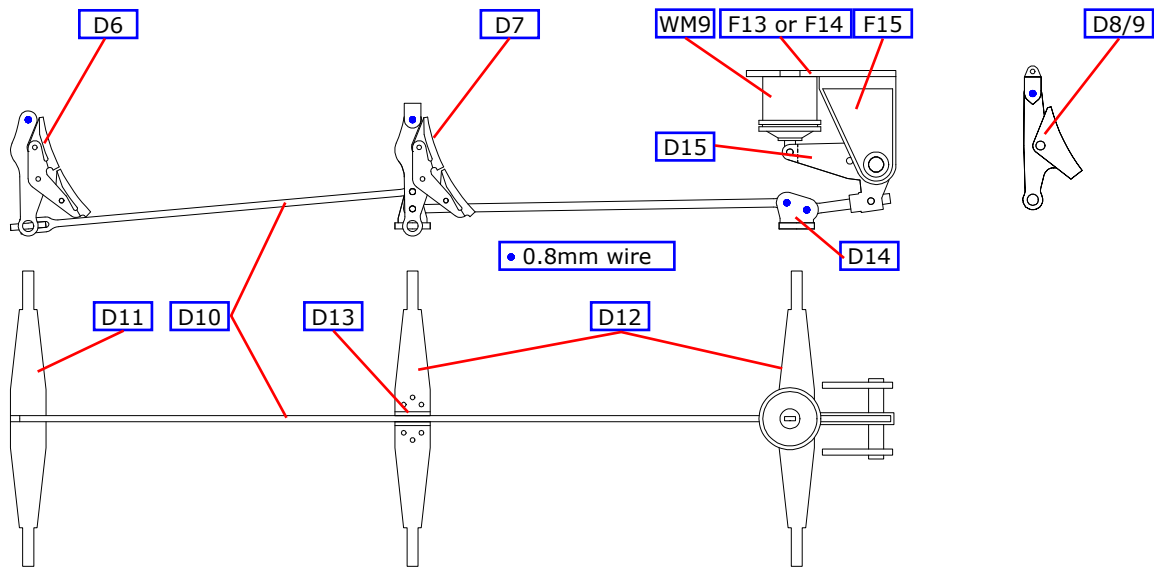


Fig 22. Brakes



## FINISHING THE CHASSIS

Attach the damper operating rod (D5) as shown in the drawing. Form the corner bends in the firebox sides/front (D2) and overlays (D3) before soldering together and to the firebox base (D1). Fold up ashpan hopper (D4) and fix in place under the firebox base in the etched groove. Add the mud hole door clamps (BR27) before attaching the complete lower firebox to the inside rear frames.

Rivet and fold up the brackets - rear outside frame to footplate, left and right (F19 & F20) and solder them over the appropriate rivets on the rear frames as shown in the drawing. Similarly fit the footplate bracket, left (F26), the reach rod support bracket (F27) after drilling the hole to take a 0.8 mm wire pin and the footplate bracket, right (F28). Because of the increased frame spacing those building to Scaleseven standards will need to reduce the length of these brackets.

Attach the reach rod fork joint (M39) to the reach rod (M38). The end of the fork joint must be bent over, through 180°, as shown. The reach rod can now be temporarily fitted in place as shown below with pins through part M29 and F27.

Fit the injectors (parts BR25 & BR26) together with their associated pipe work from 1.5 mm copper wire as shown below. The remaining pipe work shown in Fig 23, which runs under the main footplate, can now be fitted although it may be better to wait until the footplate has been constructed.

The loco/tender pipe connections detailed in below are made from flexible tubing. I have provided rubber tubing for the larger pipes (over the 1.2 mm spigots) but cannot obtain similar material for the smaller pipes. I suggest you look out for some insulation from electrical wire of suitable size.

Fold out the brackets for the steam sander nozzles which are on the end of the brackets attached to the spring hangers. Note once this is done the wheels are difficult to remove. The axles are now retained by the springs, formed from a triple lamination of parts F21, F22 & F23 as shown in Fig 23.

Complete the chassis detailing by fitting the steam sanders (BR21) as shown in Fig 23.

No.	Description	Sheet		
D1	Ashpan floor	4	F23	Spring, outer lamination (12) 8
D2	Firebox sides and front (2)	5	F25	Bracket live steam injector 5
D3	Firebox sides and front overlay (2)	5	F26	Footplate bracket, left 5
D4	Ashpan hopper (2)	2	F27	Reach rod support bracket 1
D5	Damper operating rod	7	F28	Footplate bracket, right 5
F19	Bracket, rear outside frame to footplate- left	3	F30	Top feed pipe bracket (3) 5
F20	Bracket, rear outside frame to footplate - right	3	M38	Reach rod 7
F21	Spring, leading & centre axles (4)	8	M39	Reach rod fork joint 8
F22	Spring, rear axle (2)	8		

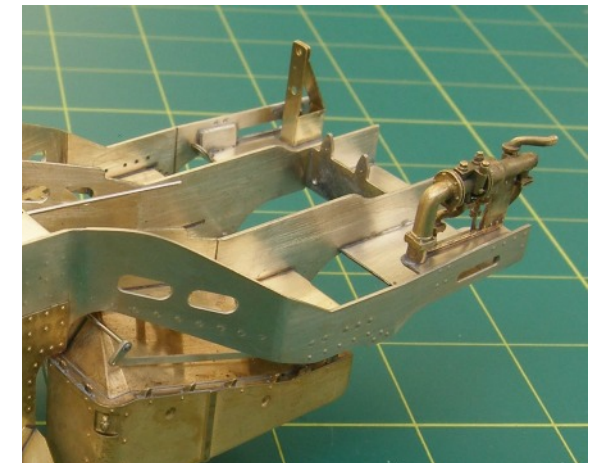
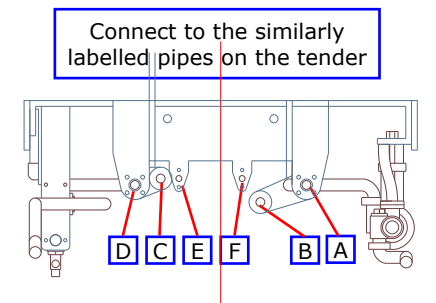
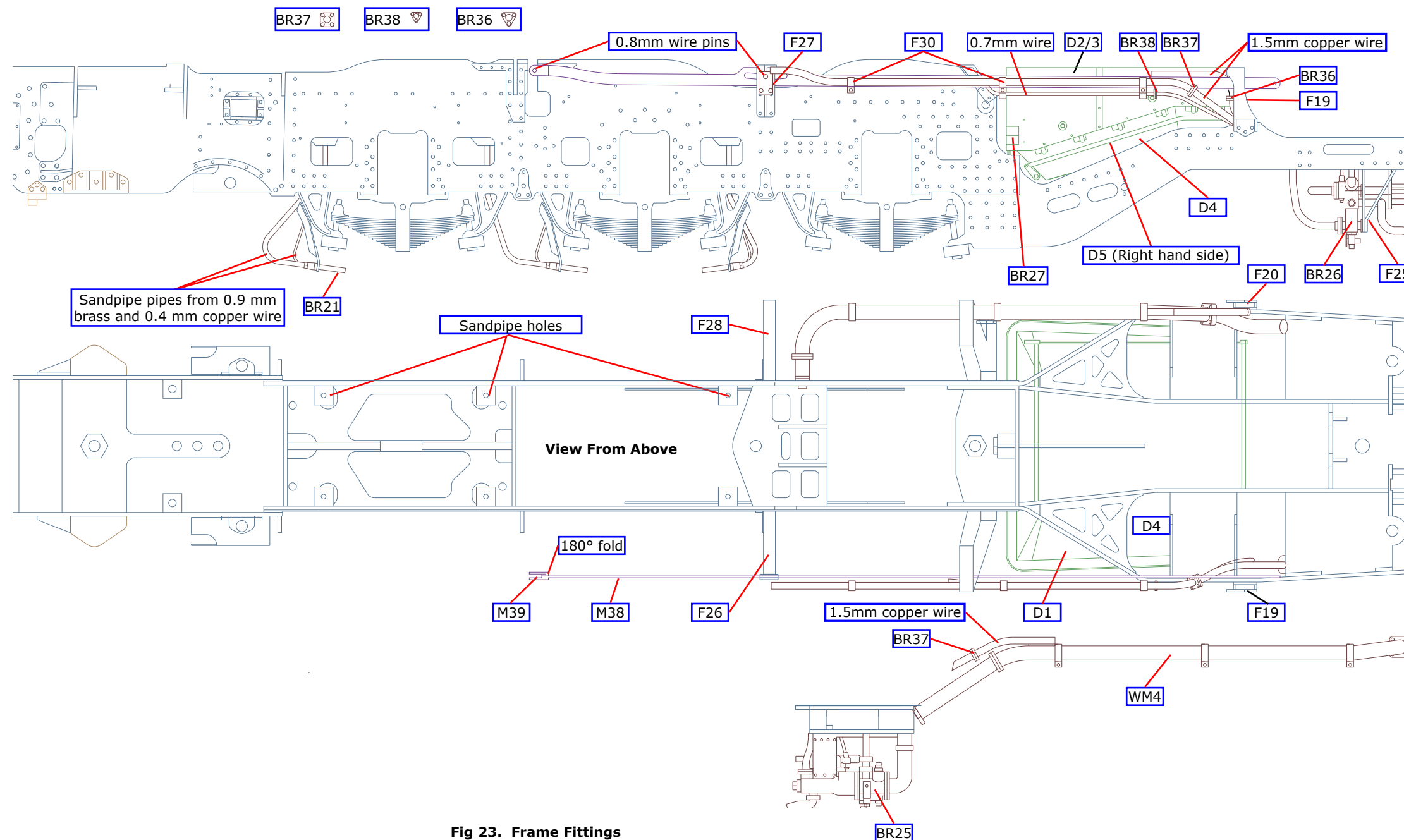


Fig 23. Frame Fittings

UTILITY FRONT FOOTPLATE

Make the appropriate bends in the front valence before folding up and soldering together the jig. Solder the jig corner fillets (U3) in the etched grooves to strengthen the jig and to ensure that the jig is square.

Fold down the front edges of the footplate (U1).

If you are fitting smoke deflectors then drill out the holes shown below to fit the pegs on the lower edges of the smoke deflectors.

Emboss the rivets in the footplate as shown below and fold up the splasher fronts. Carefully form the bend in the rear footplate (U32) by bending over a rod of suitable size.

Now emboss the rivets on the drag beam overlay (U34) and then solder the overlay onto the drag beam (U33), before soldering the rear footplate (U32) into the slot in the drag beam. Solder this assembly in place on the jig. Solder the footplate (U1) in place.

Now add the splasher tops, front, centre and rear (U12,U13 & U14).

Add the following footplate overlays - under the smokebox (U4), around the front splasher left (U5), around the front splasher right (U6), around the centre splashers (U7), around the rear splasher left (U8), around the rear splasher right (U9), under the firebox (U10) and the top feed pipe flange (U11). The rear left splasher footplate overlay has two extensions that fold up as pipe clips for the 0.6 mm copper wire. Make the four access flap hinge pins from 0.4 mm copper wire. Solder two 6 BA nuts over the body fixing holes.

Cut through the two bracing strips which cross the footplate and snap off the unwanted pieces along the half etched lines. This now gives a sturdy platform upon which to fit the smokebox, boiler/firebox and cab. The excess metal is not broken away until these are fitted onto the footplate.

No.	Description	Sheet			
U1	Footplate	5	U13	Centre splasher top	3
U2	Footplate/valence jig	1	U14	Rear splasher top	3
U3	Footplate/valence jig corner fillet (4)	7	U18	Curved front footplate, small step (2)	1
U4	Under smokebox footplate overlay	5	U27	Utility front footplate, angle between cylinder cover and footplate	3
U5	Front left splasher footplate overlay	1	U32	Rear footplate	5
U6	Front right splasher footplate overlay	1	U33	Drag beam	2
U7	Centre splasher footplate overlay (2)	1	U34	Drag beam overlay	2
U8	Rear left splasher footplate overlay	1	U35	Front left sandbox filler plate	1
U9	Rear right splasher footplate overlay	1	U36	Front right sandbox filler plate	1
U10	Under firebox footplate overlay	4	U37	Centre sandbox filler plate	1
U11	Top feed pipe flange footplate overlay	1	U38	Rear sandbox filler plate	1
U12	Front splasher top	5			

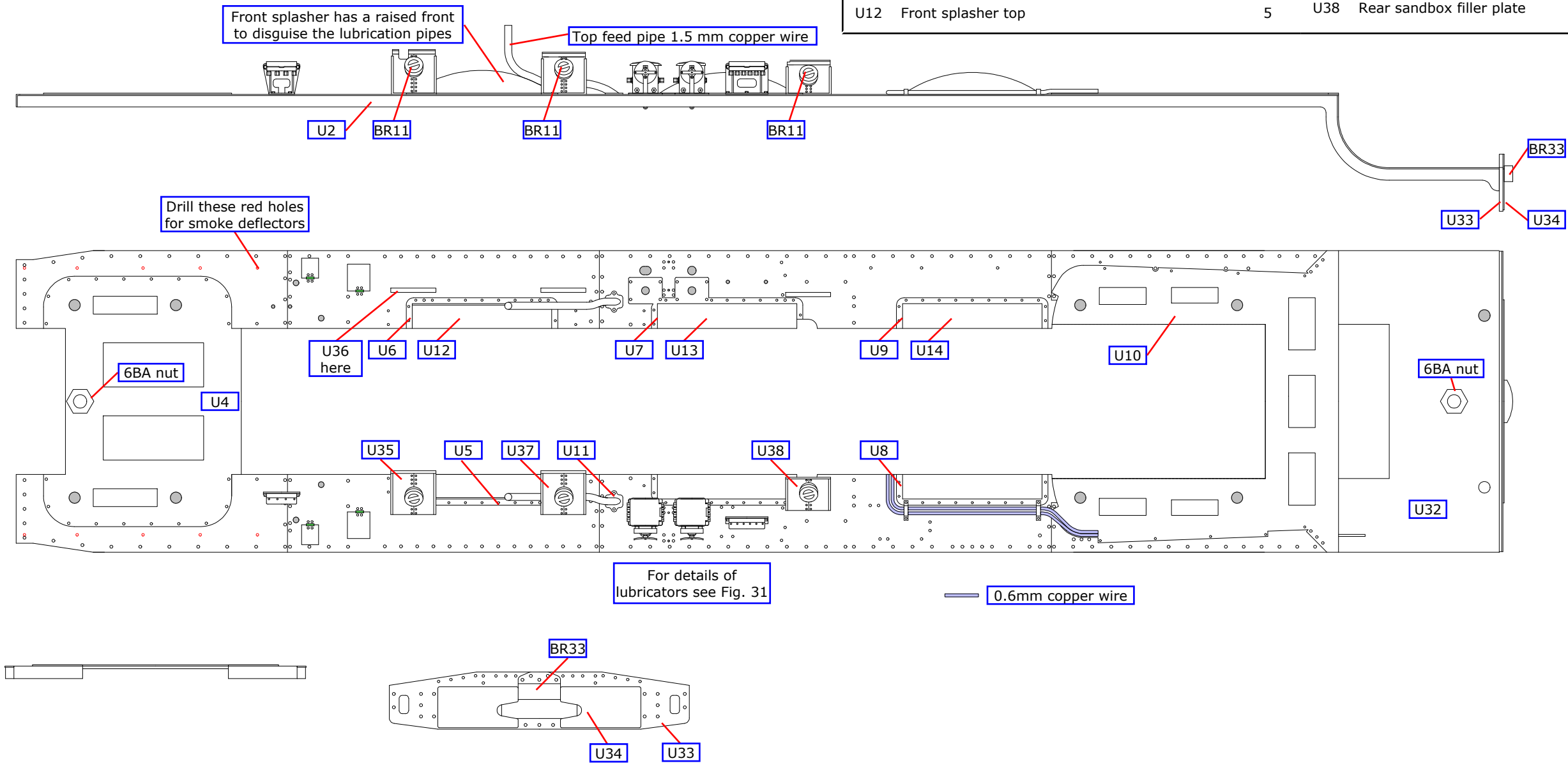


Fig 24. Utility Footplate

CURVED FRONT FOOTPLATE

To build a curved front footplate, modify the shape of the front valence on the footplate/valence jig (U2) by removing the portion shown in shaded red on the drawing below. Make the appropriate bends in the front valence before folding up and soldering together the jig. Solder the jig corner fillets (U3) in the etched grooves to strengthen the jig and to ensure that the jig is square. Break off, along the half etched line, the front edges of the footplate (U1).

If you are fitting smoke deflectors drill out the holes shown in the drawing to fit the pegs on the lower edges of the smoke deflectors. If you are not fitting smoke deflectors drill out the holes shown in the drawing for the small handrails on the front footplate.

Emboss the rivets in all the footplate parts as shown in the drawing and fold up the splasher fronts. Carefully form the bends in the curved front footplate (U16) and the rear footplate (U32) by bending over a rod of suitable size. Now emboss the rivets on the drag beam overlay (U34) and bufferbeam (U15). Note which bufferbeam rivets to emboss as shown in Fig 25. Solder the bufferbeam to the curved front footplate (U16) and solder in place on the jig.

Solder the drag beam overlay (U34) onto the drag beam (U33), before soldering the rear footplate (U32) into the slot in the drag beam. Solder this assembly in place on the jig.

File back the front edge of the footplate until it fits behind the curved front footplate (U16) before soldering it in place. Form the curved front footplate inside cylinder cover (U19) to shape, checking that it fits in the recesses in curved front footplate front frames (U17). Form inside cylinder cover overlay (U20) so that it fits over the inside cylinder cover and that the holes for inside cylinder valve tail rod covers (BR34) align. Solder the two parts together before soldering between the front frames. Solder this assembly in place.

Now add the splasher tops, front, centre and rear (U12,U13 & U14).

Add the following footplate overlays - under the smokebox (U4), around the front splasher left (U5), around the front splasher right (U6), around the centre splashes (U7), around the rear splasher left (U8), around the rear splasher right (U9), under the firebox (U10) and the top feed pipe flange (U11).

The rear left splasher footplate overlay has two extensions that fold up as pipe clips for the 0.6 mm copper wire. Make the access flap hinge pins from 0.4 mm copper wire, the hinges are coloured green on the drawing.

Solder two 6 BA nuts over the body fixing holes. Cut through the two bracing strips which cross the footplate and snap off the unwanted pieces along the half etched lines. This now gives a sturdy platform upon which to fit the smokebox, boiler/firebox and cab.

No.	Description	Sheet			
F48	Lifting hole strengthening plate (2)	1	U12	Front splasher top	5
U1	Footplate	5	U13	Centre splasher top	3
U2	Footplate/valence jig	1	U14	Rear splasher top	3
U3	Footplate/valence jig corner fillet (4)	7	U15	Front bufferbeam	4
U4	Under smokebox footplate overlay	5	U16	Curved front footplate	5
U5	Front left splasher footplate overlay	1	U17	Curved front footplate, front frame (2)	7
U6	Front right splasher footplate overlay	1	U18	Curved front footplate, small step (2)	1
U7	Centre splasher footplate overlay (2)	1	U19	Curved front footplate, inside cylinder cover	5
U8	Rear left splasher footplate overlay	1	U20	Curved front footplate, inside cylinder cover overlay	5
U9	Rear right splasher footplate overlay	1	U32	Rear footplate	5
U10	Under firebox footplate overlay	4	U33	Drag beam	2
U11	Top feed pipe flange footplate overlay	1	U34	Drag beam overlay	2

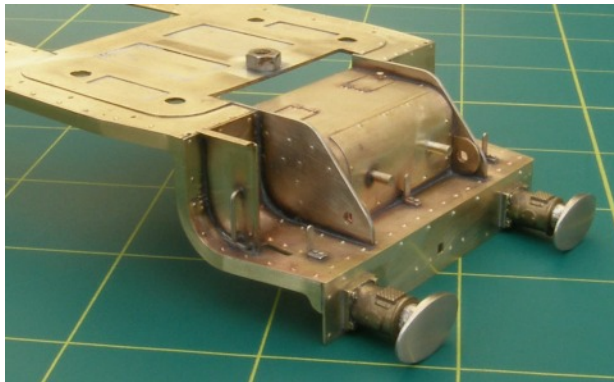
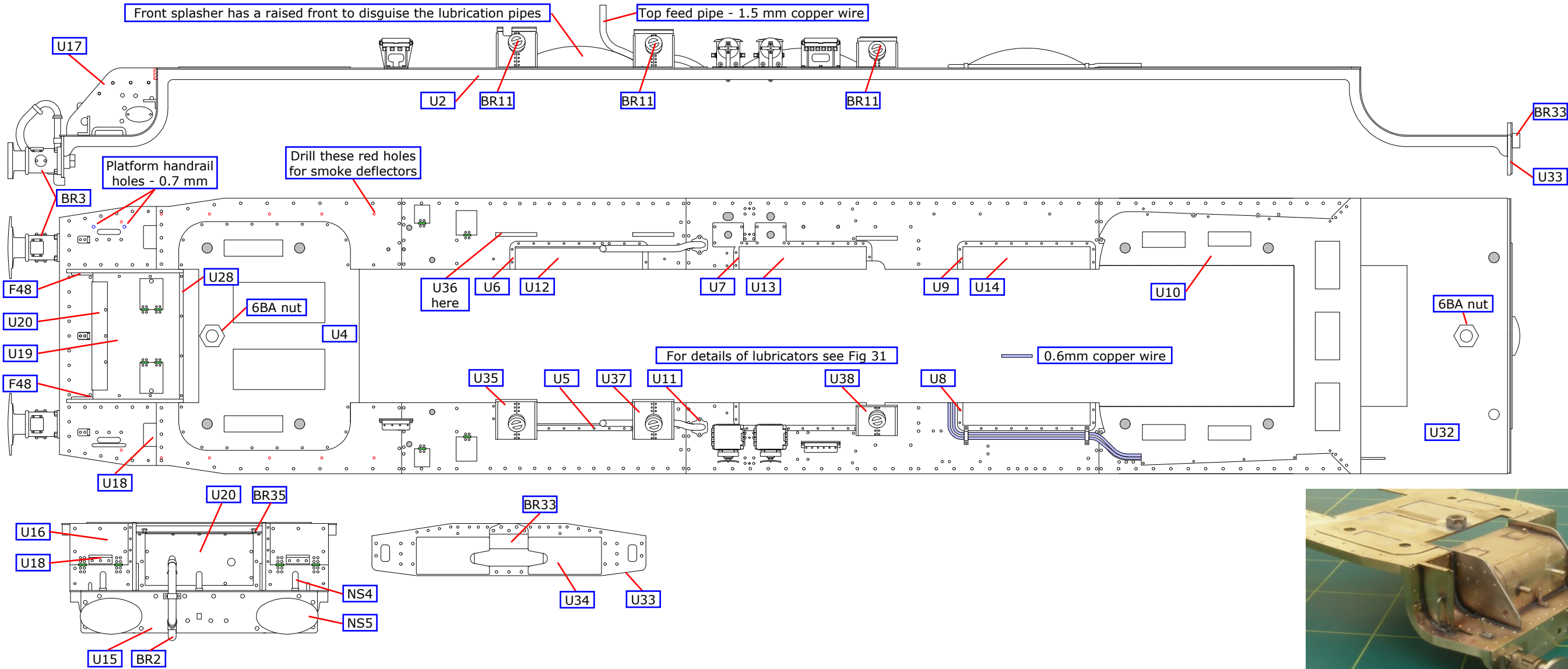


Fig 25. Curved Footplate



## CAB

Emboss the rivets on the cab sides/front (C1 or C1s). Use photographs of your chosen prototype to determine which rivets to emboss.

Solder the window beading (C2) into the recesses around the window openings. Fold the rear cab corners and then curve around the small rear wings which support the cab doors. Add the following door parts, the hinge (C11), stop (C12) and spring overlays (C13) as shown in the drawing.

Fold up the edges of the window frames and rivet strip (C14) and check that the sliding rear windows (C15) can be sprung in and out. Solder the window frames and rivet strip in place on the inside of the cab sides aligning the small holes for the cab side windscreens (C3). Fold up the cab seat brackets (C35) and seats (C34) and solder the brackets in place on the cab sides. Solder the front window frames (C5 or C5s) in place on the inside, it may be necessary to trim the outer edge where it meets the cab side to ensure the overlay is central to the opening..

Form the bends between the cab sides and the cab front. Cut a slot in the cab floor (C7) to clear the reach rod - use the slot in the rear footplate (U32) as a guide. Solder two 8BA nuts to the brackets on the cab floor before folding them up. Reinforce each bend with a fillet of solder. Complete the folding of the cab floor before soldering it in place between the cab sides.

Form the firebox inside the cab (C16) to shape and solder in place in the slots in the cab front. Clean off the cab front. Complete the fold lines in the front overlay (C4) by scoring deeply, fold to shape and solder in place on the cab front. If you are fitting the sand gun, drill out 0.6 mm the hole for the sand pipe in the sand bin/locker (C18) as shown in the drawing. Rivet and fold up the screw reverse base (C17) and the sand bin/locker (C18) and solder in place. Fold up the damper levers (C8) and the drain cock levers (C9) and solder in place as shown in the drawing. Curve the fall plate centre (C19) and sides (C20) and fold down the tabs which fit in the slots along the rear edge of the cab floor to give a hinge effect. Unless the curves are very generous the three parts of the fall plate will need to be soldered together to avoid the outer parts dropping between the tender and loco when going around curves. Solder the cab handrails in place.

Anneal the hinges on the cab doors (C10), by heating in a flame and bend to shape around a 0.8mm piece of wire. The hinge pins have been made too long so that they can be bent over to stop the doors falling off.

Solder the safety valves (BR22) in place in the holes in the fire box inside the cab (C16).

No.	Description	Sheet		
C1	Side/front	2	C12	Door stop overlay (2)
C1s	Side/front Semi cab	Sup	C13	Door spring bracket overlay (2)
C2	Window beading (2)	1	C14	Window frame and rivet strip (2)
C3	Side windscreen (2)	2	C15	Sliding rear window frame (2)
C4	Front overlay	5	C16	Fire box inside cab
C5	Front window frame (2)	5	C17	Screw reverse base
C5s	Front window frame Semi cab	Sup	C18	Sand bin for sand gun/locker
C6	Handrail bracket (6220-6226) (2)	6	C19	Fall plate centre
C7	Floor	5	C20	Fall plate side (2)
C8	Damper levers	1	C34	Seat (2)
C9	Drain cock lever	1	C35	Seat bracket (2)
C10	Door (2)	1	C36	Fire Screen
C11	Door hinge overlay (4)	1		

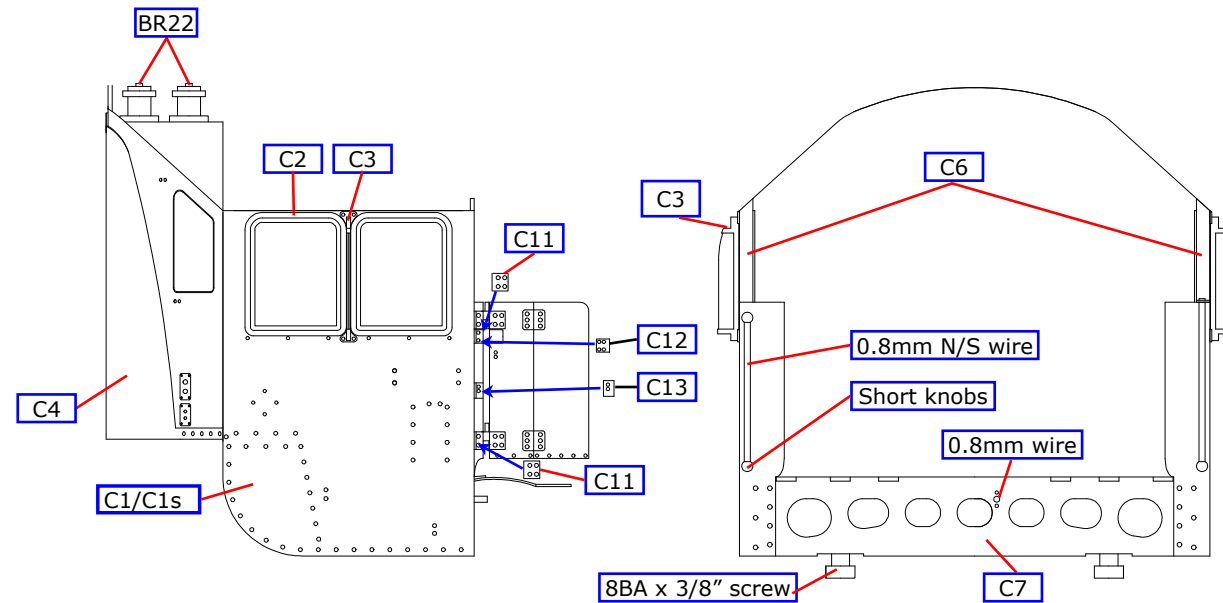


Fig 26. External View of Cab

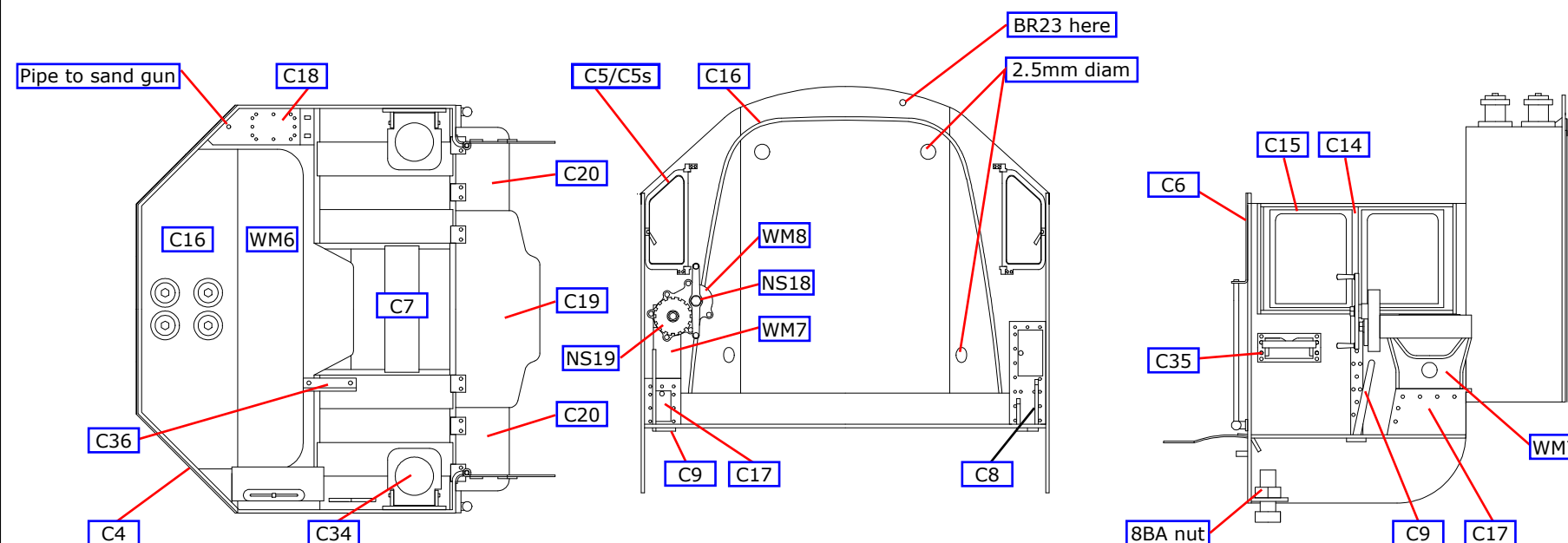
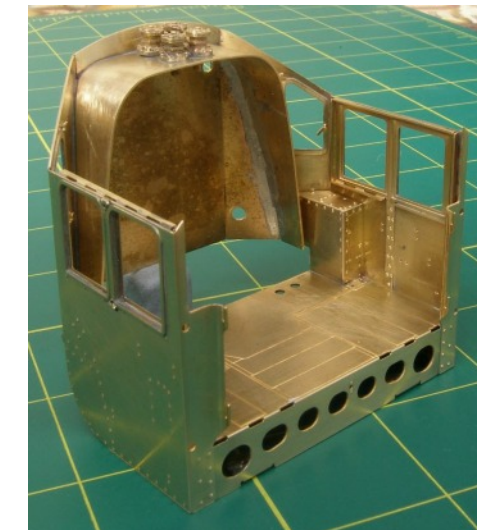


Fig 27. Internal View of Cab

CAB ROOF & BACKHEAD

Fold up the back and front roof ribs of the roof jig (C21), to give a solid base upon which to build the removable cab roof. Bend up the whistle levers on the roof ribs (C22) before soldering them in place as shown in the drawing. Form the cab roof (C23) to shape before soldering the roof in place on the assembly jig. Complete by adding the rain strip (C24) and roof ventilator front and rear (C25 & C26).

Now using a carborundum disc in a mini-drill cut through the unwanted parts of the jig and snap off the redundant parts along the half etched lines. The edges of the jig will now need cleaning up.

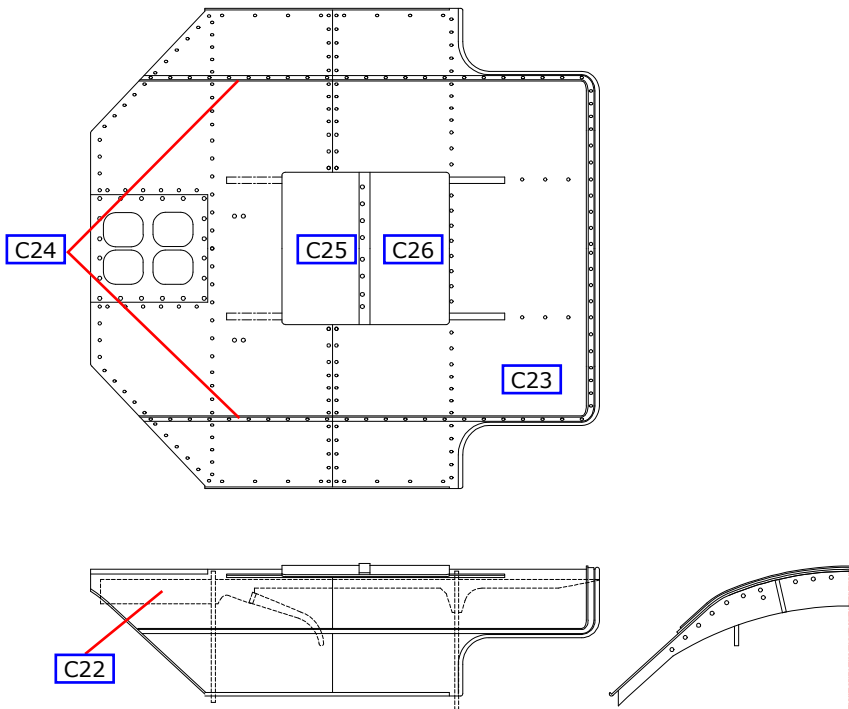
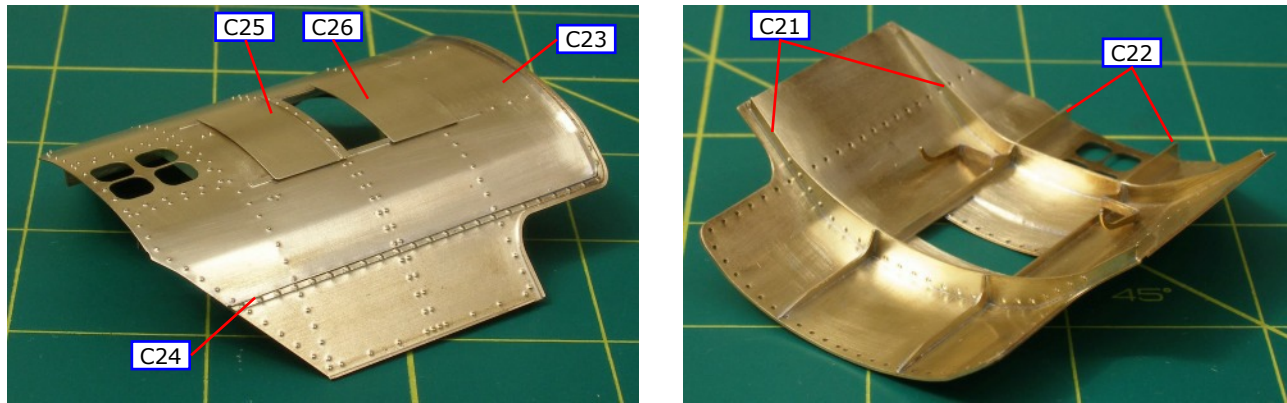
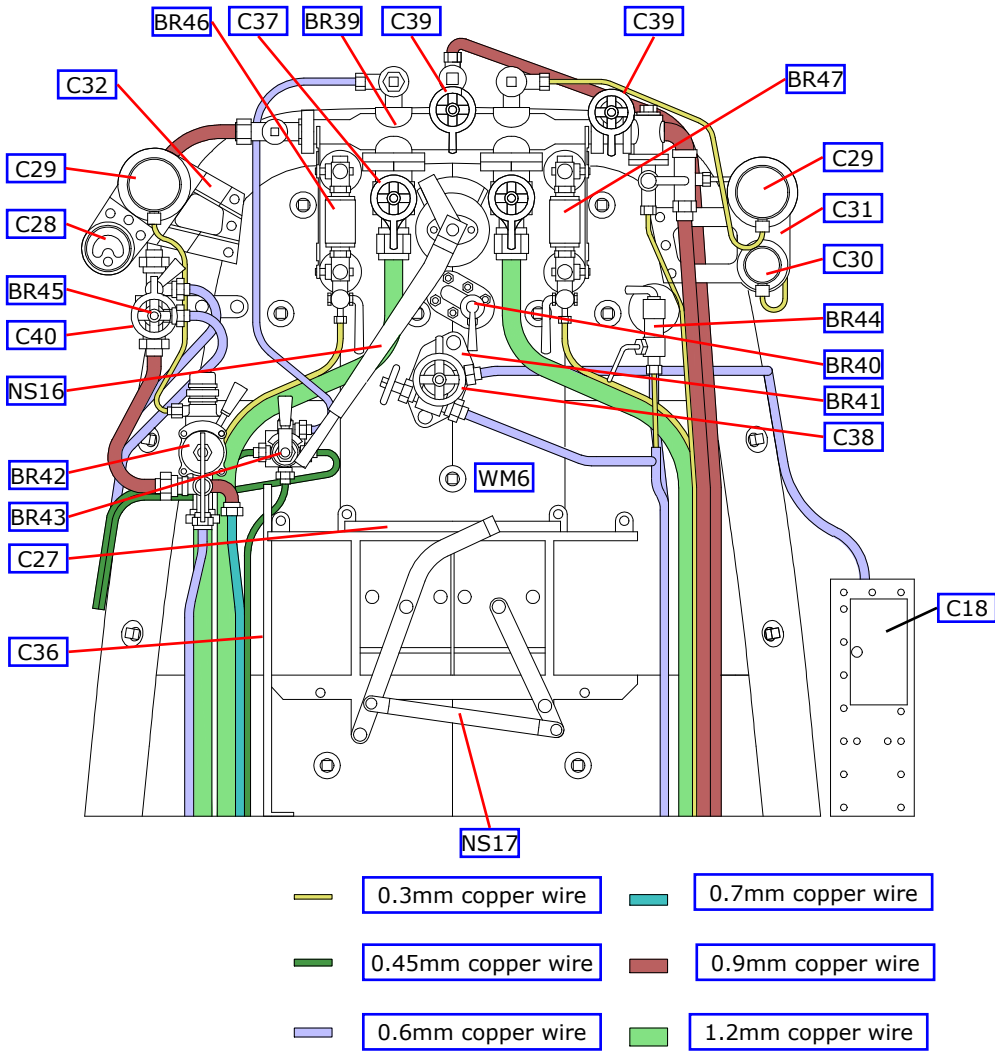
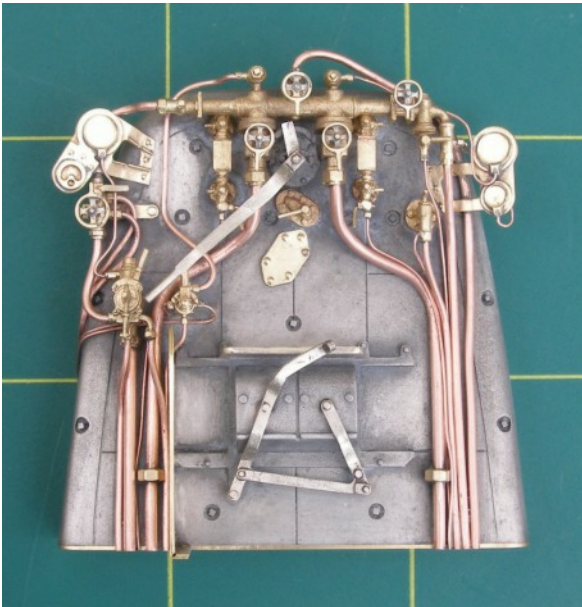


Fig 29. Cab Roof

No.	Description	Sheet		
C21	Roof jig	2	C30	Carriage warming pressure gauge 1
C22	Roof rib (2)	3	C31	Bracket for C29 & C30 5
C23	Roof	2	C32	Bracket for C29 & C28 5
C24	Roof rainstrip	2	C33	Water gauge cock lever (2) 2
C25	Roof ventilator front	5	C36	Fire screen 4
C26	Roof ventilator rear	5	C37	Handwheel, injector steam valve 1
C27	Backplate shelf	7	C38	Handwheel, sand gun 1
C28	Speedometer	1	C39	Handwheel, steam fountain 1
C29	Boiler pressure/vacuum gauge (2)	1	C40	Handwheel, large ejector 1



- 0.3mm copper wire
- 0.45mm copper wire
- 0.6mm copper wire
- 0.7mm copper wire
- 0.9mm copper wire
- 1.2mm copper wire

Fig 32. Backplate



## BOILER, FIREBOX AND SMOKEBOX

Before starting work on the resin castings (parts R1 & R2) please bear in mind the following:

- The castings should require very little finishing. They are best wet sanded, ideally using fine-grade wet and dry paper.
- **The dust should not be inhaled and hands should be washed after work.**
- Bonding is best done with epoxy adhesive to allow for adjustment.
- Wash the casings in warm water with a mild soap/non-lanolin washing-up liquid, and then rinse well before painting.
- Painting may be carried out with enamels, cellulose or acrylics. Of the latter two, acrylic plastic primer (Hycote brand available from car accessory shops or Halfords own brand - used for priming car plastic parts - bumpers etc.) is easier to apply than cellulose and 'keys' well.

Drill the holes for the 12 self tapping screws (1/16") which secure the castings to the cab and footplate. Be very careful not to drill the holes for cab fixing screws too deep and break through the side of the firebox. Wrap a piece of tape around the drill at the correct depth of 6 mm to use as a guide. Drill the holes for handrail knobs (1.2 mm), vacuum ejector, steam lance cock, smokebox door handles and to clear the 6BA nut under the smokebox. All holes should be perpendicular to the surface except the rearmost hole for the vacuum ejector, which is horizontal.

Attach the cab to the footplate with the 8BA screws ensuring that the curve of the cab side is hard against the curve of the footplate. Test fit the resin castings in place and check there is no gap between the rear of the firebox and the cab front. If there is a gap, remove 1 mm from the rear of the front bar underneath the smokebox and elongate the holes in the footplate for the self-tapping screws towards the cab until the holes in the smokebox and firebox are fully visible. It is important that the resin castings can be screwed to the footplate without a gap between cab and firebox or the screws through the cab front will pull the cab and rear footplate out of true.

Screw the smokebox and boiler/firebox to the footplate and cab and check that the footplate is square and level and that the cab is vertical. Note that to get the boiler to sit properly on the footplate, you will need to file the inside of the splashers as indicated on the etch, particularly the middle and rear splashers. The moulded bars on the underneath of the smokebox (standard and semi) casting will need 0.7 mm carved off the ends so that it will sit between the frames. **See additional note below in red regarding the semi casting.**

Once you are satisfied with the fit of all components, mark across the underside join between the smokebox and boiler with a pen, remove the smokebox casting and glue the smokebox and boiler/firebox together with epoxy adhesive such that the pen marks are aligned. Immediately screw the smokebox back in place and check again that all is square while there is time for adjustment. Set aside to cure.

Now remove the unwanted material from the footplate jig in the same way as for the cab roof, and check the fit of the footplate on the chassis. It is likely that the resin boiler will need clearances made for the rear wheel flanges.

Now permanently attach the cab/firebox/boiler/smokebox to the footplate. It is possible to arrange a non permanent fixing to make painting the model easier by making the handrails removable but care will be needed in handling the footplate.

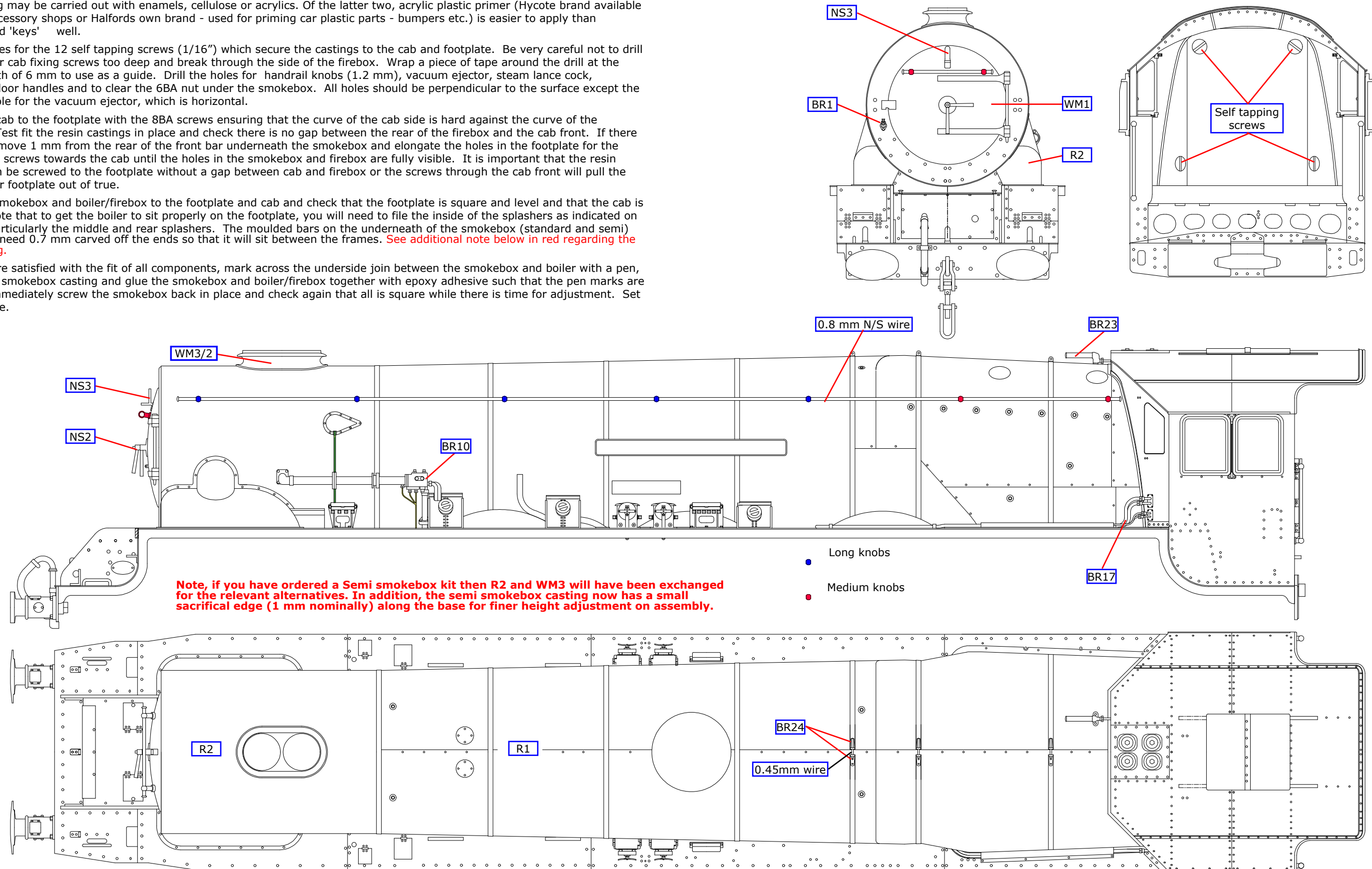


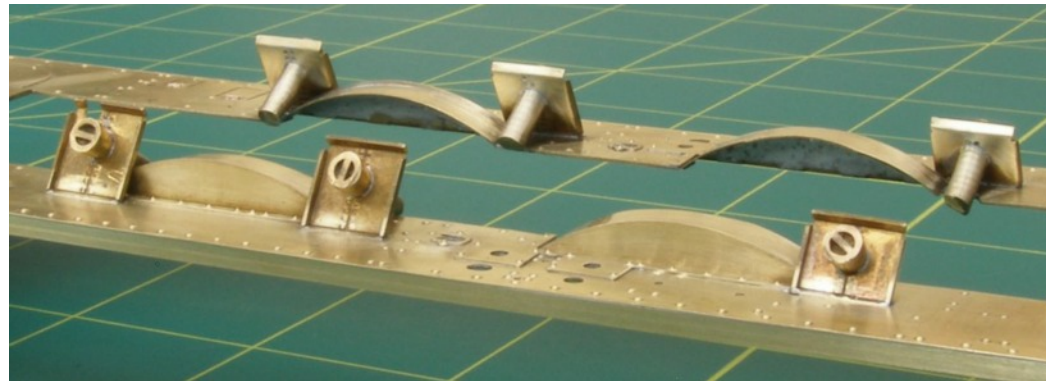
Fig 30. Boiler, Firebox and Smokebox



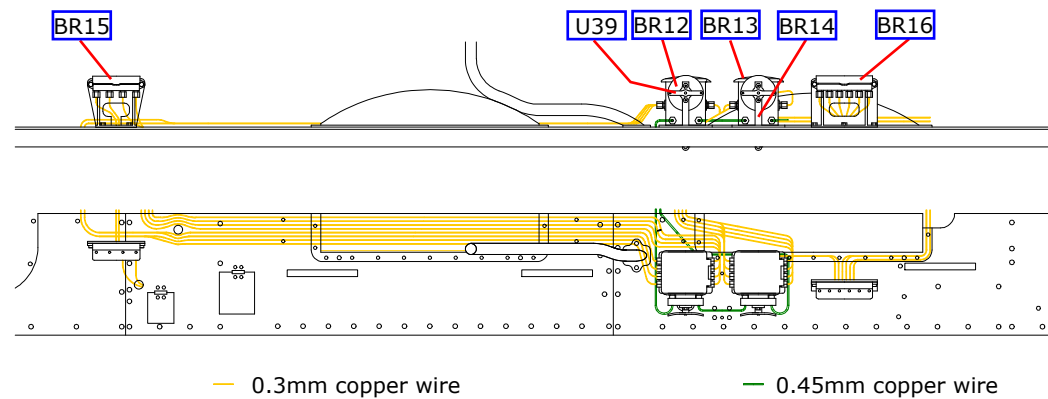
## FOOTPLATE DETAILING AND SMOKE DEFLECTORS

### FOOTPLATE DETAILING

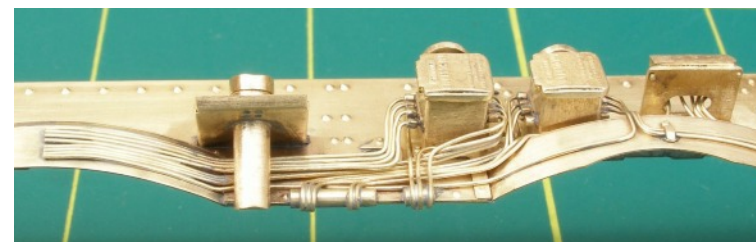
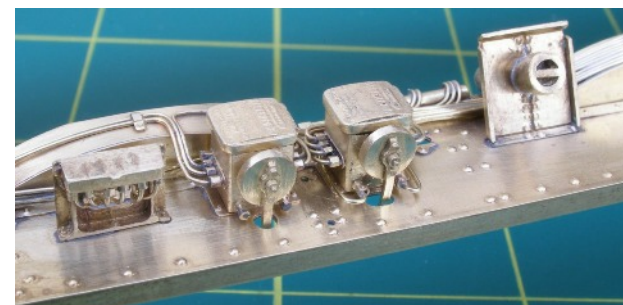
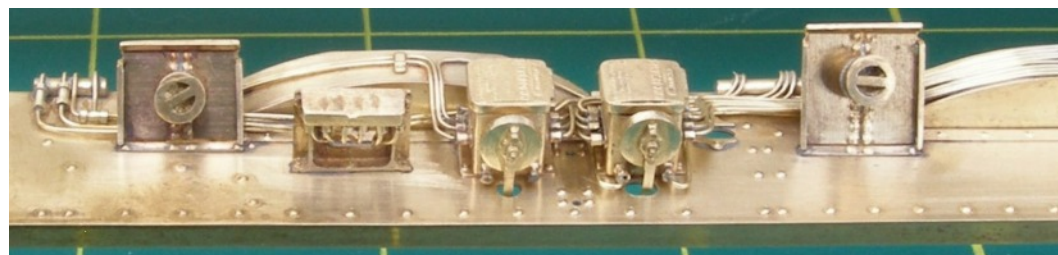
Refer to Fig 24 & 25. Fit riveted strip U28 on top of the inside cylinder cover against the bottom of the resin smokebox. Fit the sandbox filler plates, front left (U35), front right (U36), centre (U37) and rear (U38) to the footplate with their top edges against the boiler. Then fit the sandbox filler pipe and lids (BR11). Add the top feed pipe from 1.4 mm brass wire.



The lubrication system (Fig 31) is problematic but achievable as the photograph shows. The castings are provided with threaded pins (14BA and 10BA) so that they can be made removable. Suitable nuts are not provided. The lubricators on the right hand side are turned around through 180° so that the lid hinges from the forward side. The pipe runs need not be continuous - breaks can be disguised behind the sand box filler plates. The splashers behind the three central lubricators is painted body colour and lined.



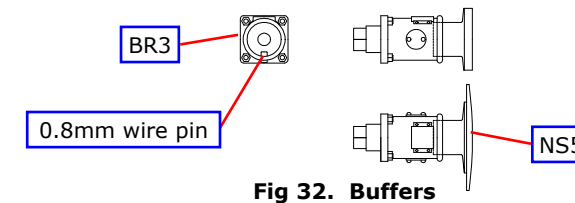
**Fig 31. Lubricators**



Now permanently attach the cab/firebox/boiler/smokebox to the footplate. It is possible to arrange a non permanent fixing to make painting the model easier by making the handrails removable but care will be needed in handling the footplate.

Attach all the remaining parts as shown in the diagrams. The buffers are prevented from rotating by a 0.8 mm wire pin which locates in the slot in part NS5, as shown in Fig. 32.

No.	Description	Sheet			
U28	Middle cylinder rivet strap	3	U40	Smoke deflector, curved front footplate (2)	3
U35	Sandbox filler plate front left	1	U41	Smoke deflector, curved front footplate lower section (2)	5
U36	Sandbox filler plate front right	1	U42	Smoke deflector, utility front footplate (2)	3
U37	Sandbox filler plate centre	1	U42s	Smoke deflector, Semi	Sup
U38	Sandbox filler plate rear	1	U43	Smoke deflector, bracket to smokebox (2)	4
U39	Silvertown lubricator hand lever (4)	4			

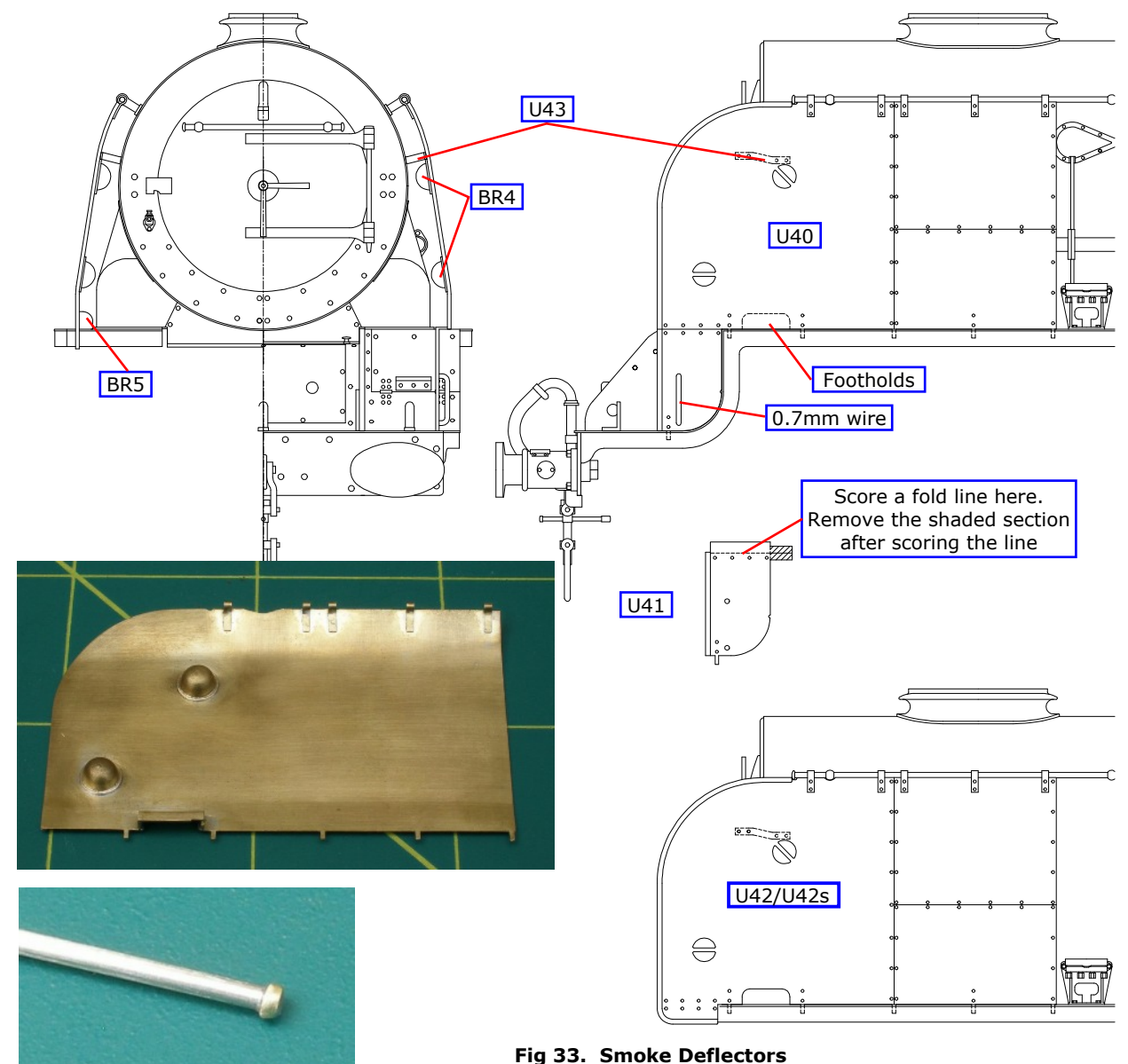


**Fig 32. Buffers**

### SMOKE DEFLECTORS

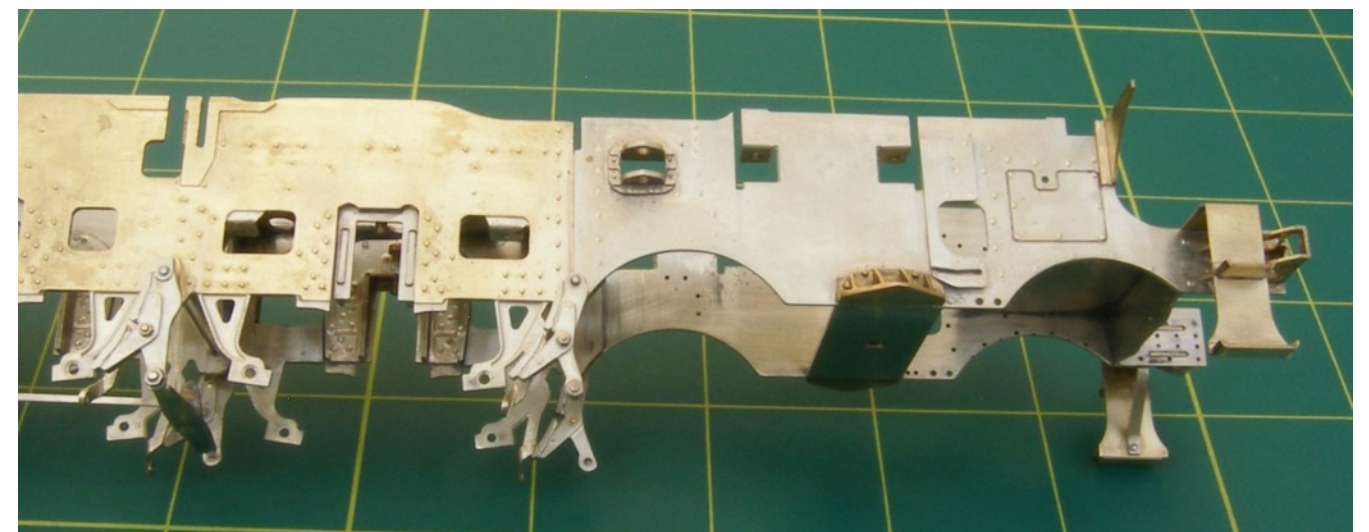
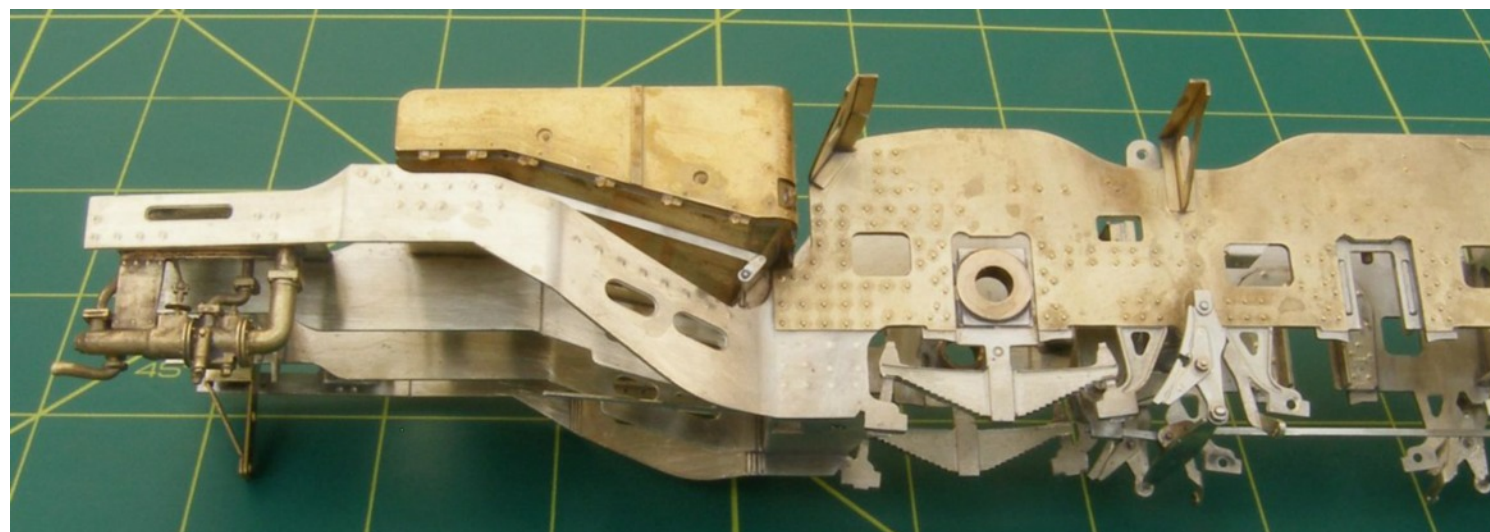
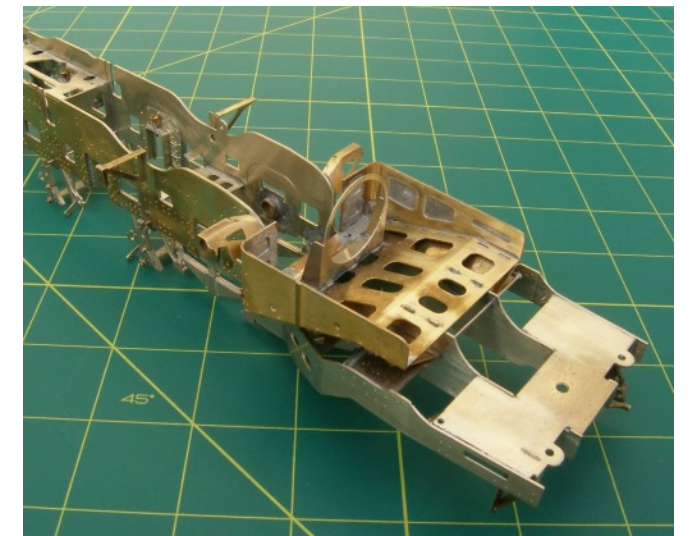
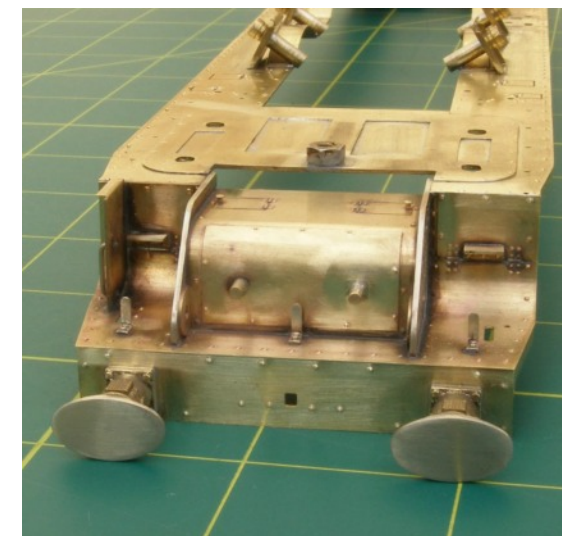
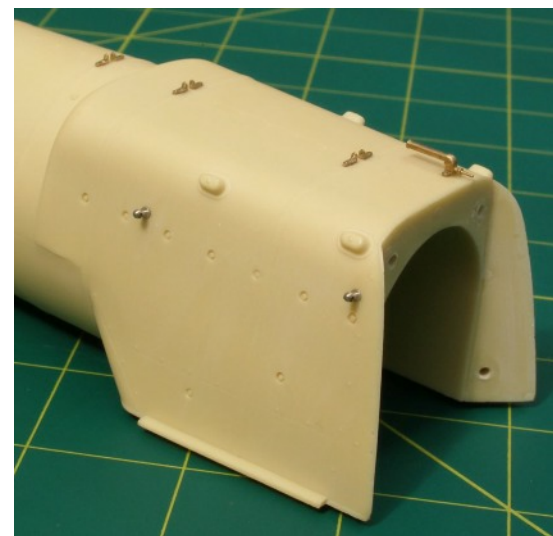
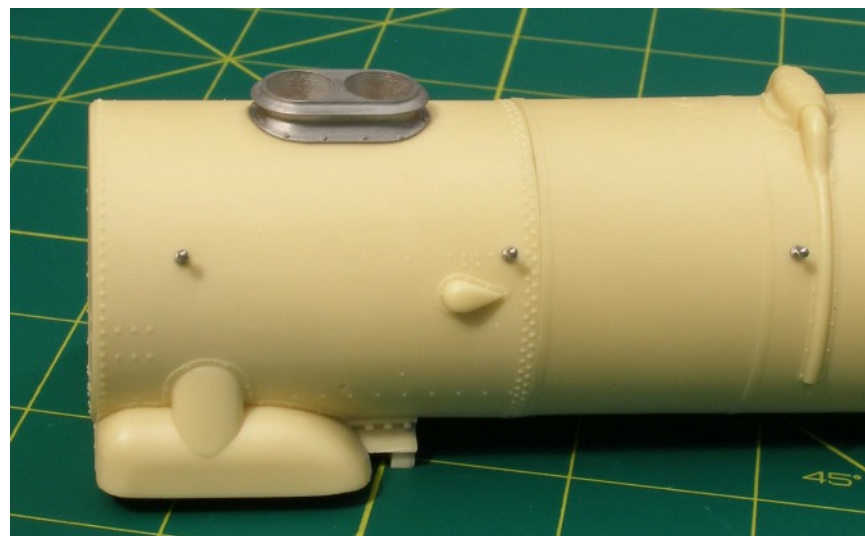
If appropriate fit the smoke deflectors as shown in the drawing. To ease painting they can be made removable by arranging for the handrails to slide out. The brackets which bend over the handrails and are soldered on the inside, should be annealed in the same way as the cab door hinges. After May 1955 the smoke deflectors fitted to most of the curved front locomotives have footholds fitted. Use the Utility smoke deflector (U42) as a template to cut the foothold.

For Semi smokebox engines use U42s which has no foothold.



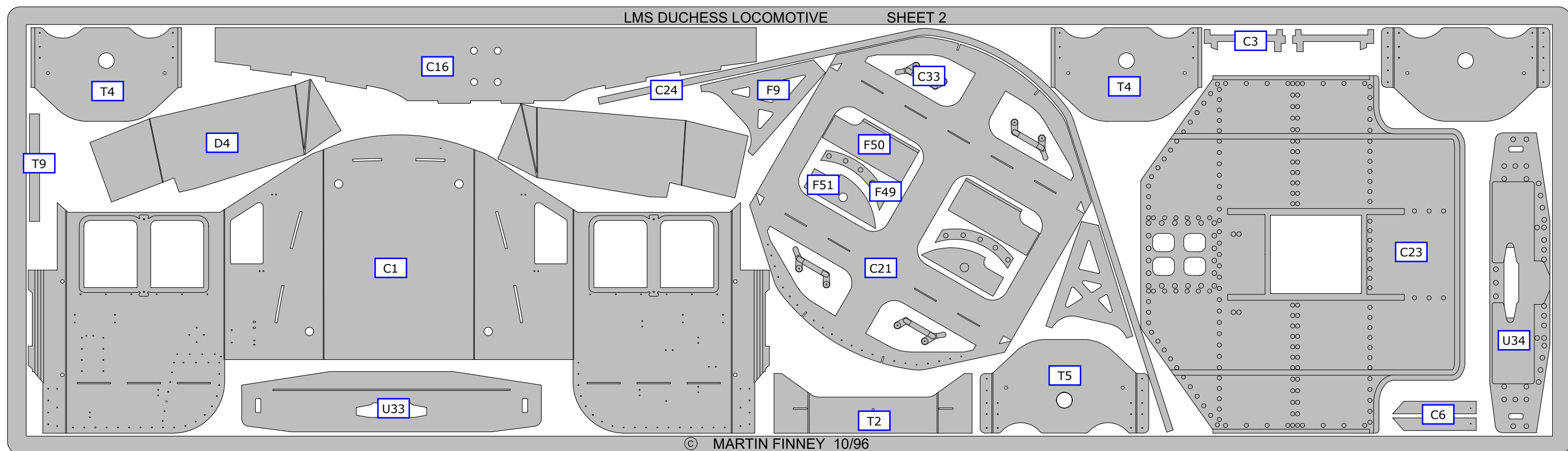
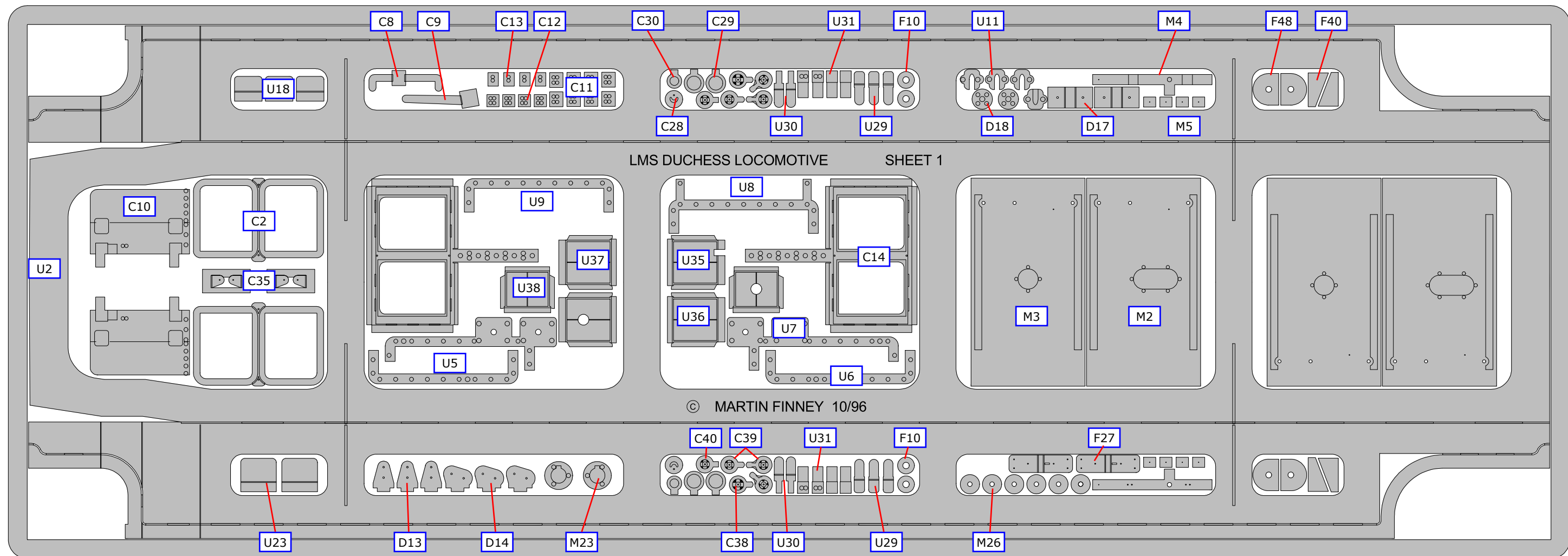
**Fig 33. Smoke Deflectors**





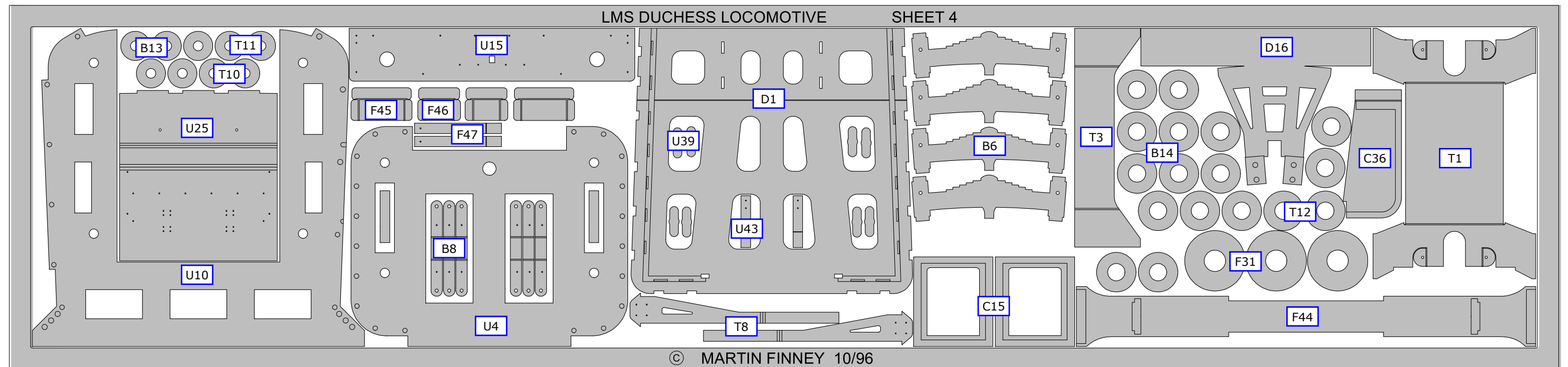
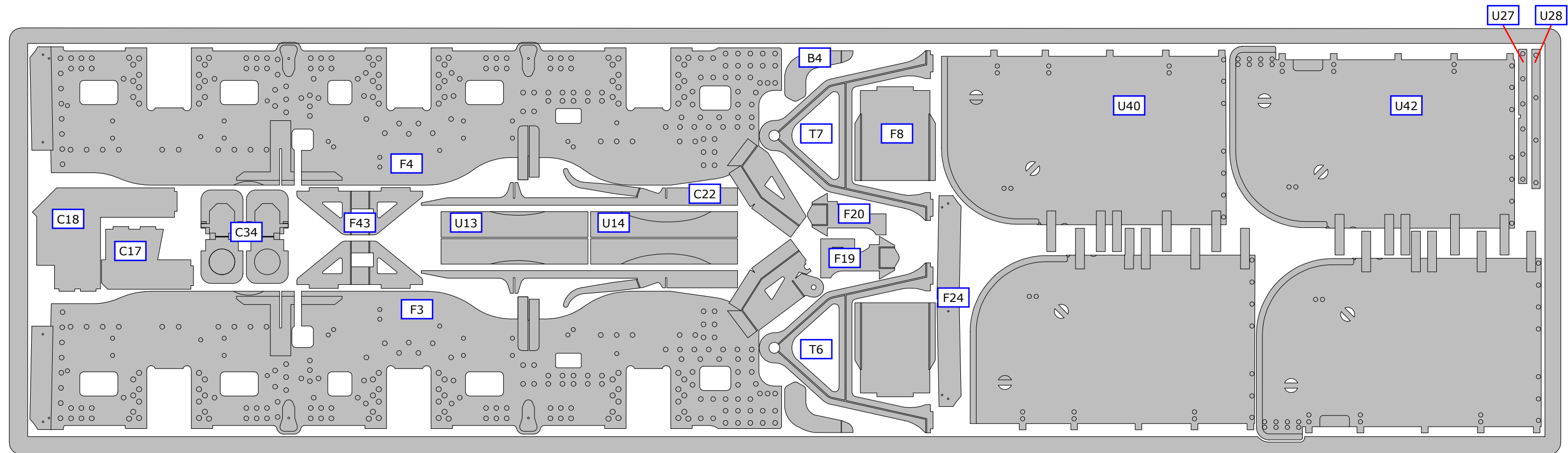


## ETCH SHEET 1 & 2



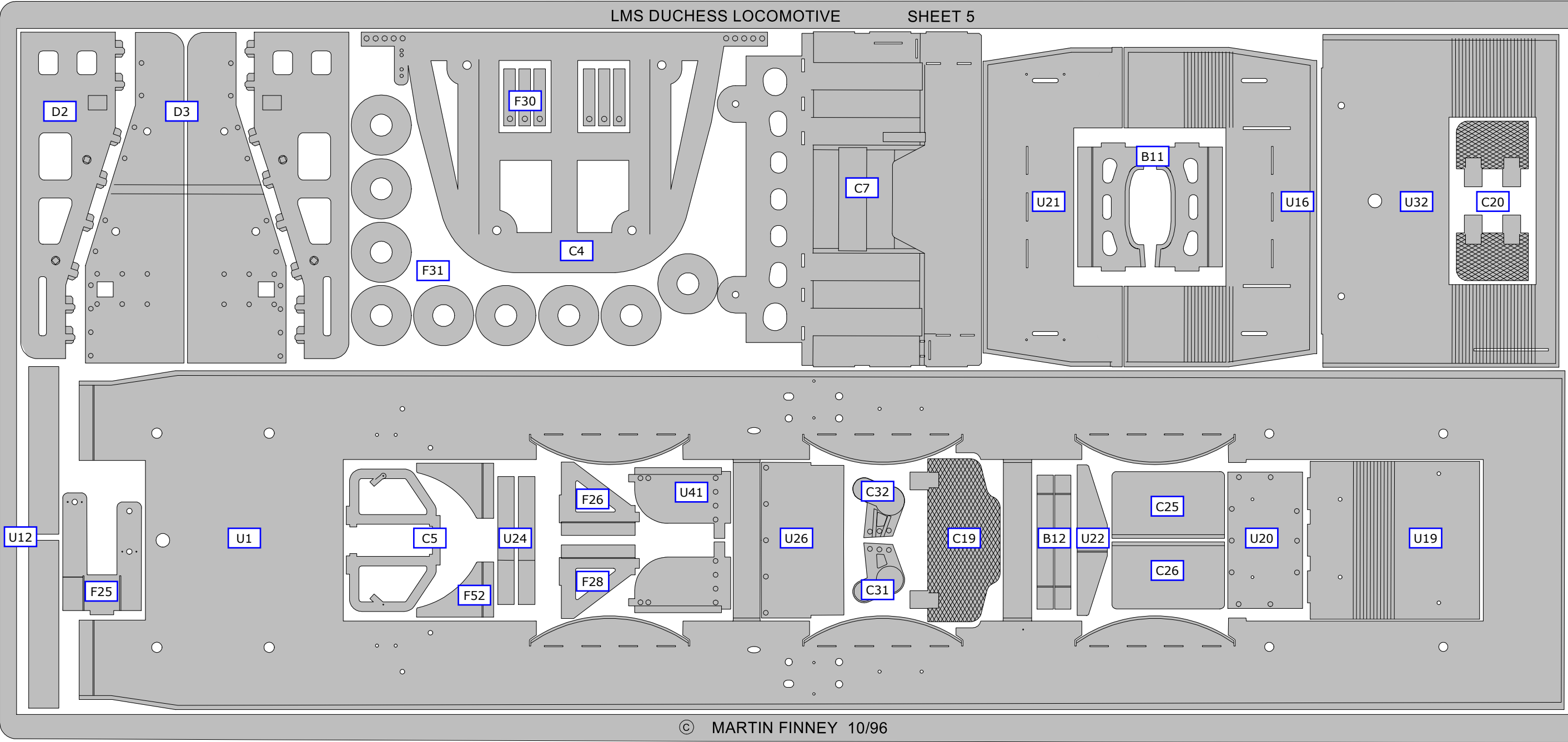


## ETCH SHEET 3 & 4

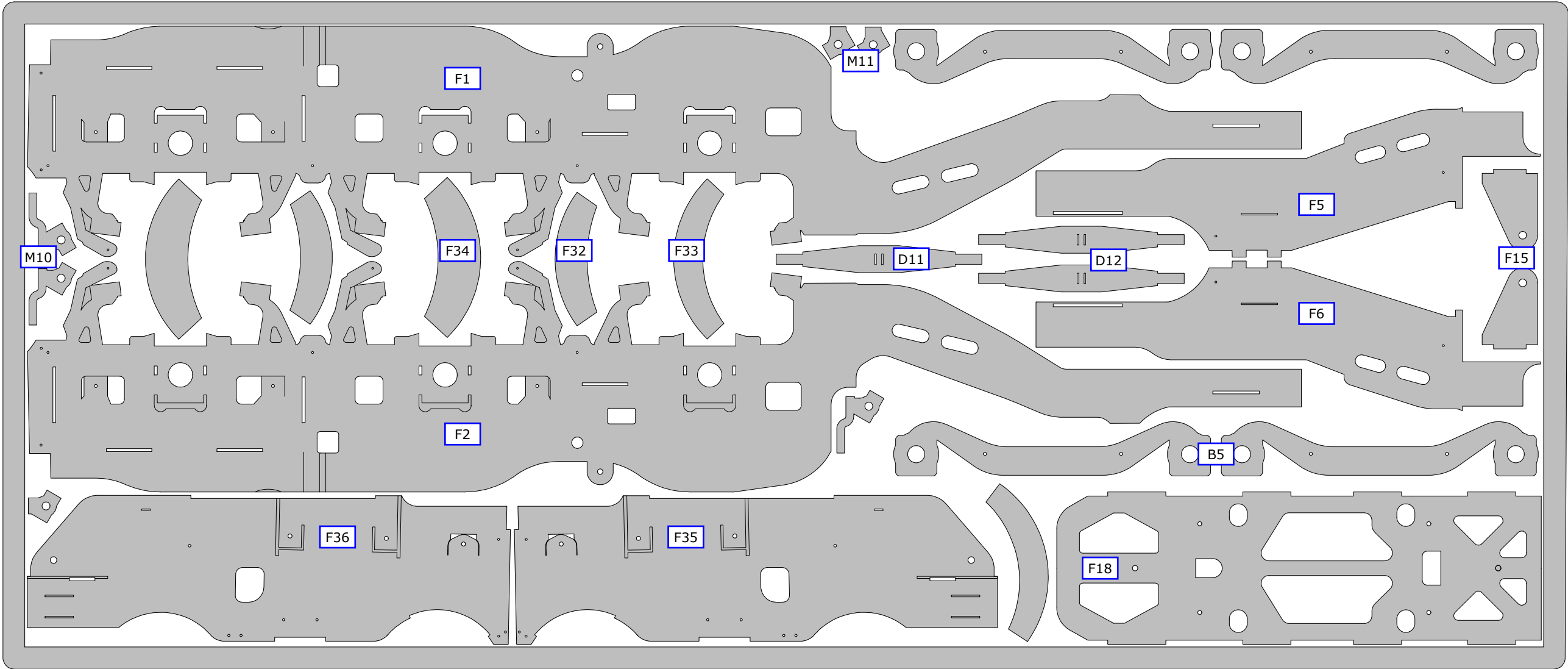


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ETCH SHEETS 5

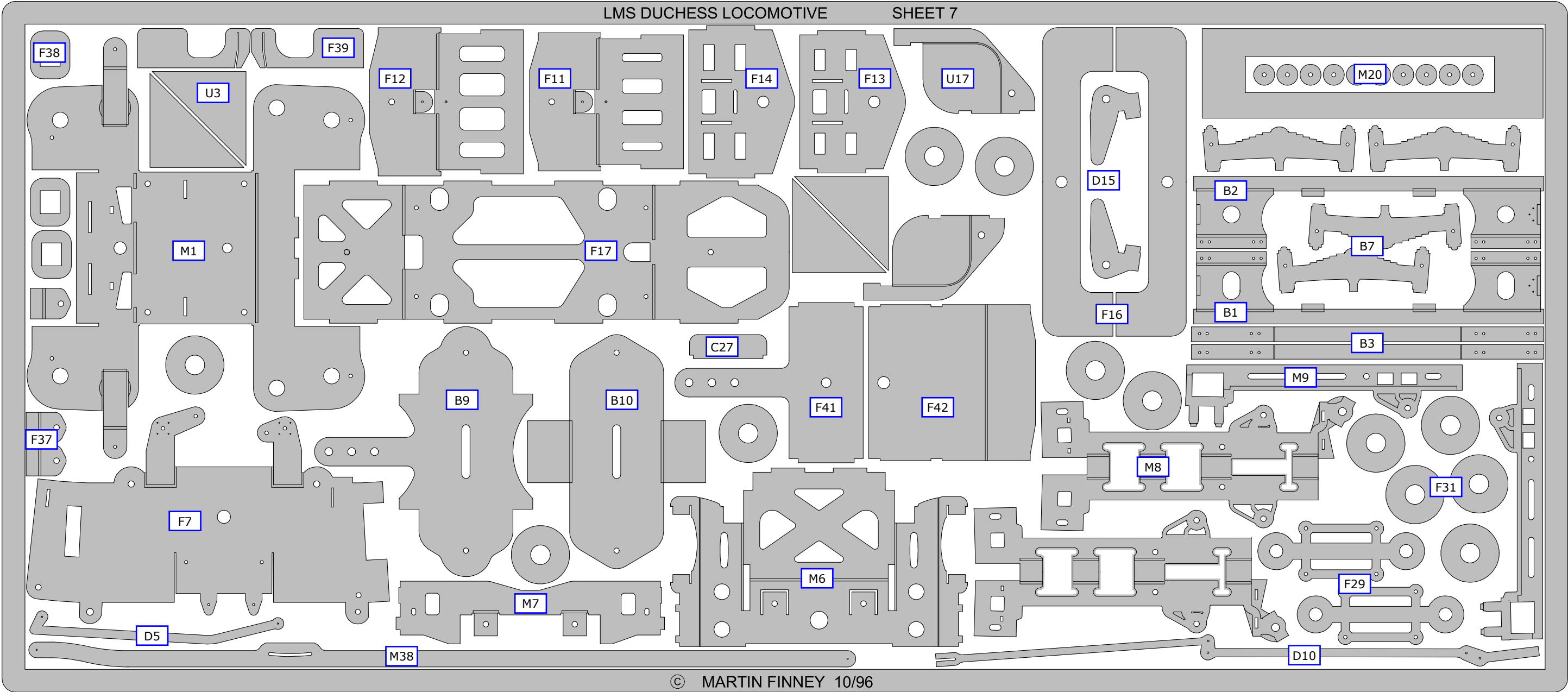


ETCH SHEET 6





ETCH SHEET 7



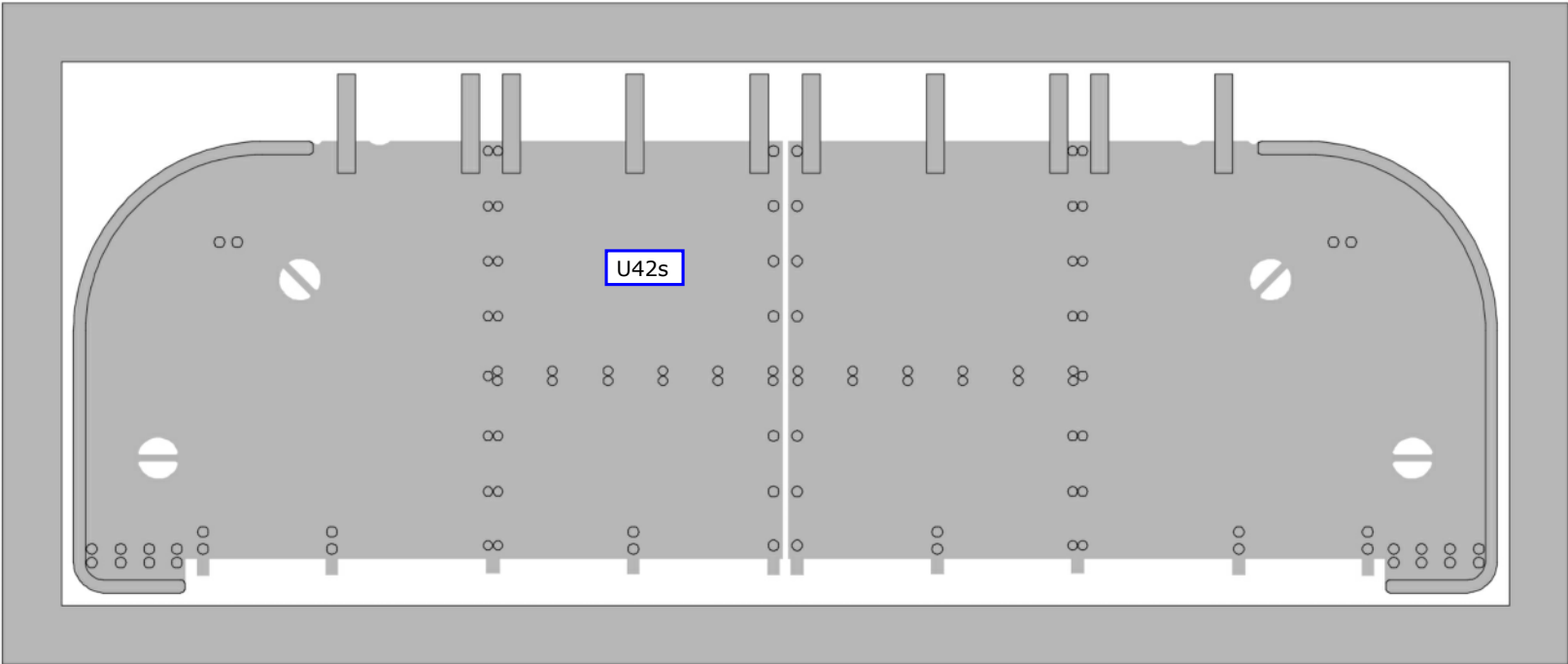
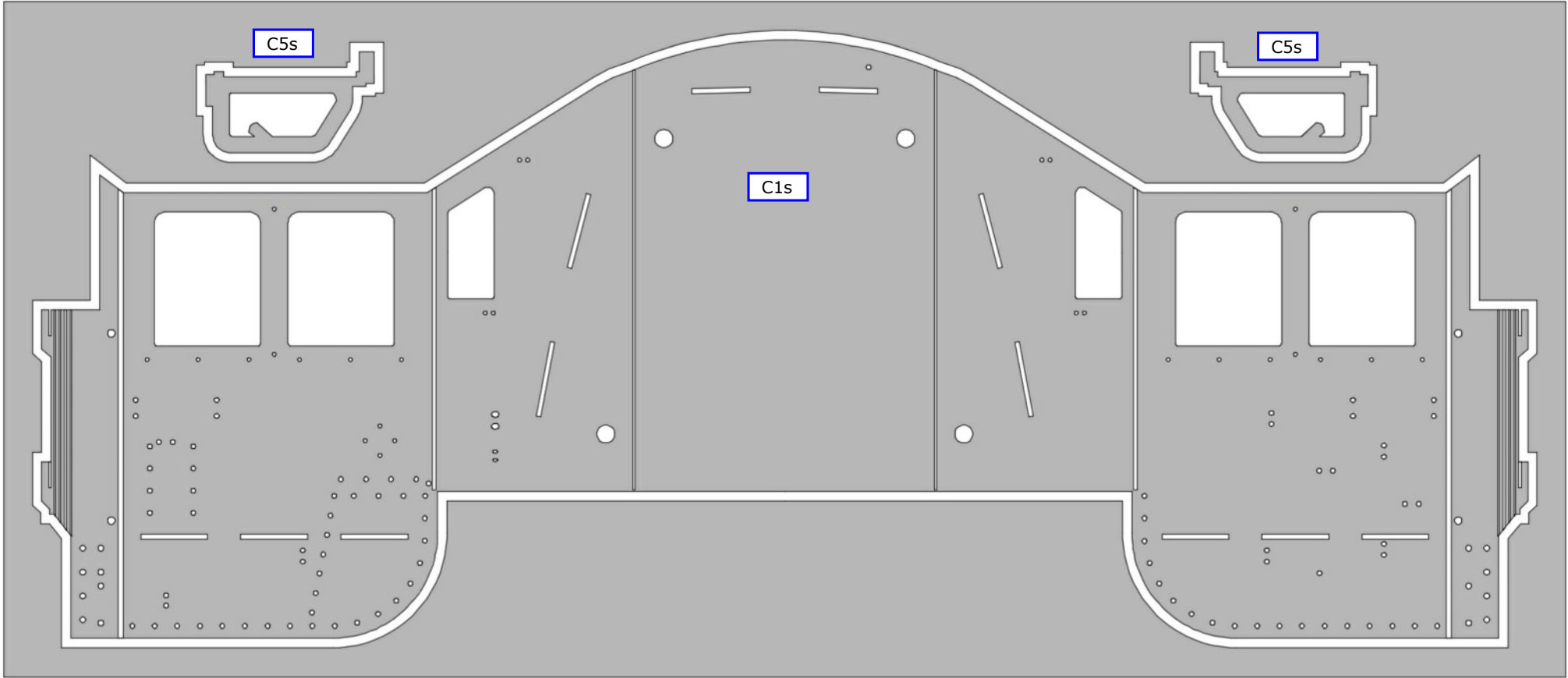
ETCH SHEET 8

LMS DUCHESS LOCOMOTIVE

SHEET 8

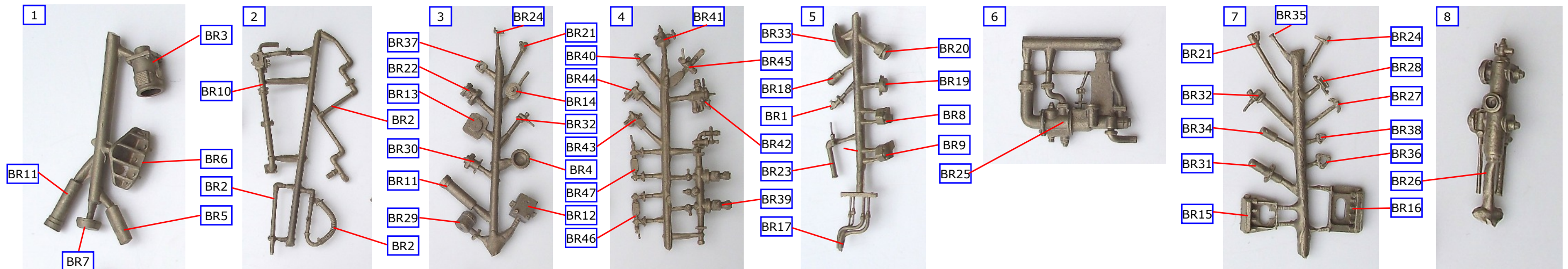
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ETCH SHEET SUPPLEMENTARY



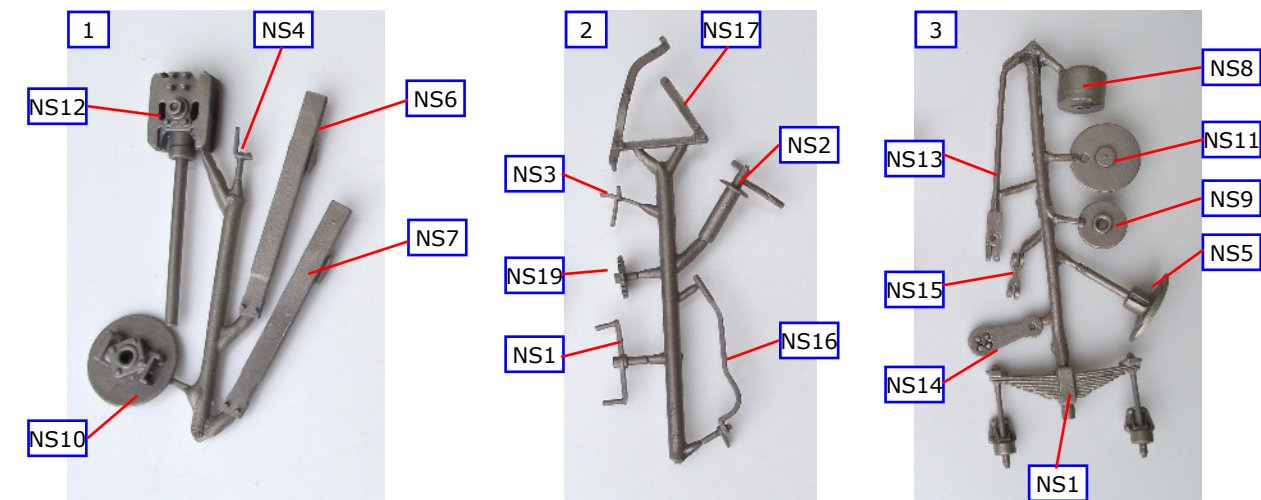


## CAST PARTS



### BRASS CASTINGS

BR1 Steam lance cock	5	BR12 Mechanical lubricator (4)	3	BR24 Boiler band joining bracket (6)	3, 7	BR36 Vacuum pipe flange	7
BR2 Vacuum pipe - 3 parts	2	BR13 Mechanical lubricator lid (4)	3	BR25 Exhaust steam injector	6	BR37 Feed pipe flange (2)	3
BR3 Buffer housing (2)	1	BR14 Mechanical lubricator arm (4)	3	BR26 Live steam injector	8	BR38 Exhaust injector control pipe flange	7
BR4 Smoke deflector hand hold (4)	3	BR15 Front lubricator (2)	7	BR27 Mud hole door clamp (2)	7	BR39 Steam fountain	4
BR5 Smoke deflector foot hold (2)	1	BR16 Rear lubricator (2)	7	BR28 Slide bar lubricator (2)	7	BR40 Blower valve	4
BR6 Bogie bearer bracket (2)	1	BR17 Pipes from cab front	5	BR29 Valve chest snifting valve (4)	3	BR41 Sand gun	4
BR7 Bogie bearer pad (2)	1	BR18 LMS speedometer dynamo	5	BR30 Cylinder relief valve (4)	3	BR42 Combined steam & vacuum brake	4
BR8 Bogie side control stop - left	5	BR19 BR speedometer - upper gearbox	5	BR31 Outside cylinder valve tail rod cover (2)	7	BR43 Steam sanding control	4
BR9 Bogie side control stop - right	5	BR20 BR speedometer - lower gearbox	5	BR32 Cylinder drain cock (6)	3, 7	BR44 Continuous blow down valve	4
BR10 Vacuum ejector	2	BR21 Steam sander - (6)	7	BR33 Drag beam rubbing plate	5	BR45 Ejector valve	4
BR11 Sandbox filler pipe and lid (6)	1, 3	BR22 Safety valve - (4)	3	BR34 Inside cylinder valve tail rod cover (2)	7	BR46 Water gauge - left	4
		BR23 Whistle	5	BR35 Inside cylinder inspection cover knob (2)	7	BR47 Water gauge - right	4



### NICKEL SILVER CASTINGS

NS1 Trailing truck spring (2)	3	NS10 Rear cylinder cover/stuffing box (2)	1
NS2 Smokebox door handles	2	NS11 Front cylinder cover (2)	3
NS3 Smokebox lamp bracket	2	NS12 Crosshead/ piston rod (2)	1
NS4 Footplate lamp bracket (3)	1	NS13 Valve rod (2)	3
NS5 Buffer (2)	3	NS14 Return crank (2)	3
NS6 Slide bar - upper (2)	2	NS15 Union link (2)	3
NS7 Slide bar - lower (2)	2	NS16 Regulator handle	2
NS8 Rear valve chest (2)	3	NS17 Firebox doors handle	2
NS9 Front valve chest cover (2)	3	NS18 Screw reverse handle	2
		NS19 Screw reverse indexing plate	2

### WHITE METAL CASTINGS

WM1 Smokebox door
WM2 Single chimney
WM3 Double chimney
WM4 Exhaust steam injector pipe
WM5 Trailing truck axle box (2)
WM6 Back plate
WM7 Screw reverse stand
WM8 Screw reverse gear case
WM9 Steam brake cylinder
WM10 Front valve chest - left
WM11 Front valve chest - right

### RESIN CASTINGS

R1 Boiler/firebox
R2 Smokebox

