

Fig 1. A4 GA Drawing

COUPLING RODS & FRAME PREPARATION

Coupling rods. The coupling rods are made so that they can be used as a jig to align the horn blocks accurately. First drill out all the crank pin holes to a convenient size which is undersize for the crank pins and the fork joint holes. Remove all burrs caused by the drilling.

Now drill a hole, with the drill used for the crank pin 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 crank pin 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 crank pin holes now need carefully opening out until they just fit, with no free play, the ends of the horn block 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. Construct the hornguides using the instructions in the separate kit.

Using photographs as a guide, emboss the appropriate rivets.

Full Compensation. For a fully compensated or fully sprung chassis, open out all of the frame slots for the hornguides by cutting around the half etched lines.

Drill out the holes marked P1 for plunger pick-ups (the size of hole will depend on your choice of pick-up supplier) and C1 (1/8") for the compensation beams. Solder the rear hornguides to the inside of the frames aligning them with the half etched line and with the bottom of the frames.

Drill the B holes 0.8 mm for the brake hanger pivots. If you are not fitting the front guard irons drill out the four holes marked G to 0.8 mm, if guard irons are fitted then use the drill indents marked G to punch out rivets on the inside of the frames.

Partial Compensation. For a partially compensated chassis open out the frame slots for the hornguides by cutting around the half etched lines on the front and centre axles only.

Drill out the holes marked P2 for plunger pick-ups (the size of hole will depend on your choice of pick-up supplier) and C2 (1/8") for the compensation beam. Solder top hat bearings in place for the rear axle.

Drill the B holes 0.8 mm for the brake hanger pivots. If you are not fitting the front guard irons drill out the four holes marked G to 0.8 mm, if guard iron are fitted then use the drill indents marked G to punch out rivets on the inside of the frames.

Detailing. Solder the reversing lever bracket overlays (F10), radius link bracket frame overlay (F12) and slide bar bracket frame overlay (F13) in place. If frame guard irons (F16) are required then emboss the rivets and solder to the outside of frames, ensure the front edge is straight and the rivets face outward.

Fold up the centre sandbox base and rear as shown in Fig 3 or use the updated white metal middle sandboxes (WM12) after first drilling a 0.8mm hole in the base. If using the white metal sandboxes then remove the tabs and make good the edges. Note the middle sand box will conflict with the partial compensation bean if fitted, other holes may require opening once the casting is fitted.

Drill a 0.8 mm hole in the centre of the base of the white metal sand box (WM5), solder to the outside of each frame side as shown in Fig 4.

No.	Description	Sheet
F1	Frame LH	A1
F2	Frame RH	A1
F10	Reversing lever bracket overlay (2)	B2
F12	Radius link bracket overlay (2)	B5
F13	Slide bar bracket frame overlay (2)	B5
F16	Frame guard irons (2)	B5
M1	Coupling rod, front inner lamination (2)	A2
M2	Coupling rod, front outer lamination (2)	A2
M3	Coupling rod, rear inner lamination (2)	A2
M4	Coupling rod, rear outer lamination (2)	A2

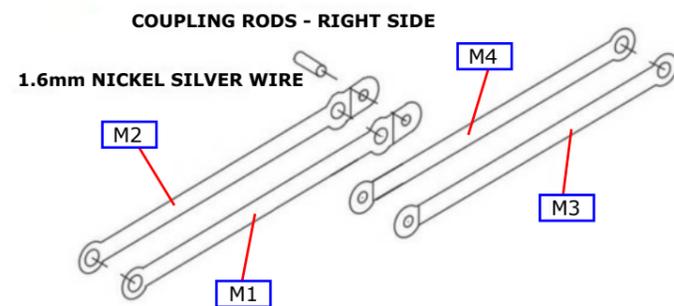


Fig 2. Coupling Rods

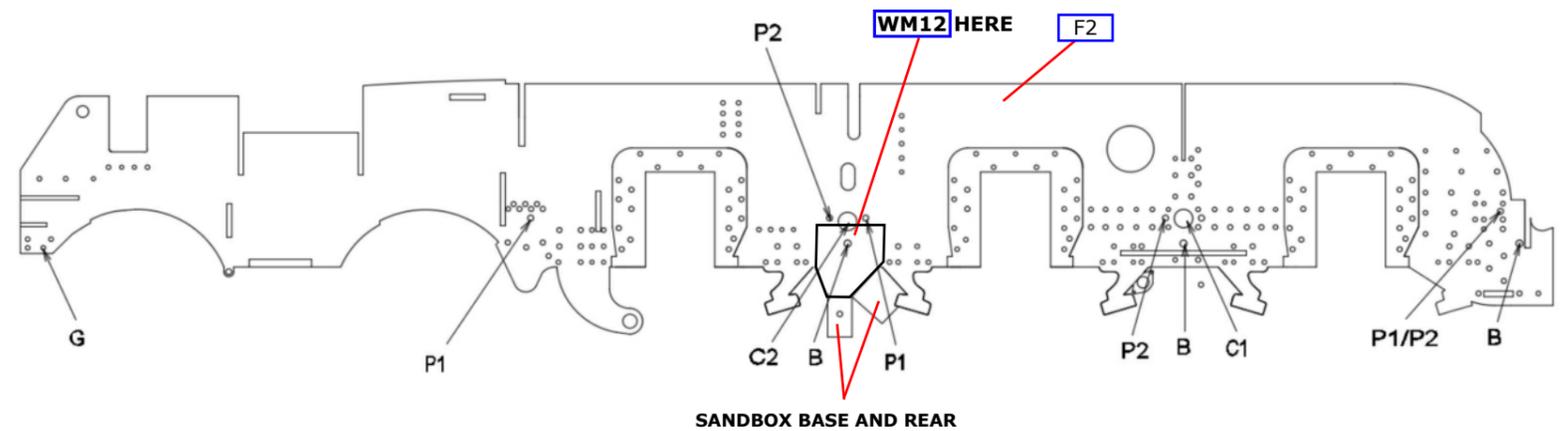


Fig 3. Frame Preparation

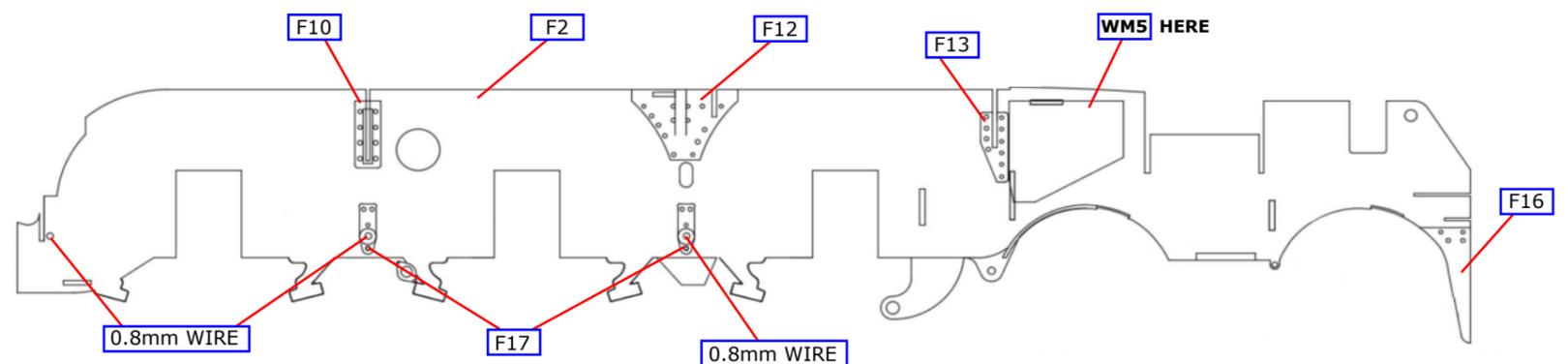


Fig 4. Frame Details

BOGIE AND CHASSIS FINISHING

Frames. Select the following frame stays for your chosen gauge - the firebox bracket (F3), the horizontal (F4), the compensation beam (F5), the cylinder mounting (F6), and the reversing lever bracket (F7). Open out the holes for the 1/16" steel wire compensation beam in F5 for a full compensation chassis.

Fold up the brackets making sure the 1/2 etched fold line is on the inside and that each bend is a right angle.

Check that all tabs on the stays fit properly in their corresponding chassis slots so that the rest of the stay is hard up against the inside of the frames. Tap 6BA the cylinder fixing holes in the front cylinder mounting.

Solder one of the longer 6 BA bolts through the hole in the cylinder mounting, for the bogie pivot.

Now assemble the frames and stays. Note the arm with the hole on reversing lever bracket (F7) is on the left side of the engine. Start by tack soldering the front compensation beam mounting bracket F5 to both sides.

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 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 stays to the frames checking constantly that the chassis is square and the frames are straight and checking that the rear of the rear firebox bracket is vertical.

There are several ways to align the hornguides, one way is detailed in the hornguide kit, other ways use a hornguide alignment jig (there are several commercial varieties available). Please follow the relevant instructions to install the remaining hornguides to the frames.

Solder in place the brake hanger pivots from 0.8 mm wire. The middle wire will need to cut flush with the inside of the frames to allow the compensation beams to go in place.

Attach the bogie splashes, front and rear (F14 & F15) in the frame cut-outs.

Add the reversing lever bracket ribs (F11) to the lower edge of the middle reversing lever bracket (F7) and trim to length.

Full Compensation. Solder a piece of 1/16" wire through the holes in the front compensation rod mounting. For the rear beams cut a piece of 1/8" brass rod so that it fits through the holes C1 and is flush with the outside face of the chassis frames.

Cut two equal pieces 5/32" tube which together fit between the frames and solder each compensation beam (F9) to the tubes close to one end. Temporarily fit the beams.

Partial Compensation. For the simpler system fix both beams (F9) centrally to a piece of 5/32" tube as shown in Fig 6.

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 the rails, between the coupled wheels should be 44.0 mm. Attach the brake hanger pivot overlays (F17) to the front and centre axle hangers as shown in Fig 4. The compensation beam pivot is retained by the centre brake hanger pivot overlay.

Drain cocks & pipework. Attach the two drain cock valves (BR2) to the cylinder mounting stay F6 with the spring units facing forward. Emboss the rivets on the drain cock linkage (F40) and fold over the end of the bracket at the rear as shown in Fig 6A, attach to the inside of the drain cocks.

Add a short length of 0.45mm wire to the linkage and pass through the fixing in the frame to the linkage the other side. Emboss and fold part F41 and attach to the linkage at the rear of the front drain cock.

Using copper wire form the drain pipes, from 1941 onward the middle cylinder pipes were routed outside to join the two outside ones, one to the left, one to the right. Solder two pipe clips (F43) back to back in the locations shown in Fig 6A and a guard iron clip (F42). The pipes are set in (jogged) close to the front guard iron so as to provide clearance for the front bogie wheel.

When the frame guard irons were removed the drain pipes were cut back as shown.

No.	Description	Sheet
F1	Frame LH	A1
F2	Frame RH	A1
F3	Frame stay rear - Firebox	A3
F4	Frame stay middle - Horizontal	A3
F5	Frame stay front - Compensation beam	A3
F6	Frame stay front - Cylinder mounting	A3
F7	Frame stay middle - Reversing lever bkt	B2
F9	Compensation beam (2)	A2
F11	Reversing lever bracket rib (2)	B2
F14	Bogie wheel splasher front (2)	B5
F15	Bogie wheel splasher rear (2)	B5
F17	Brake hanger pivot overlay (4)	B2
F40	Drain cock linkage (2)	B2
F41	Drain cock linkage - Front bracket (2)	B2
F42	Drain pipe clip - Guard irons (2)	B1
F43	Drain pipe clip - Around pipes (4)	B2

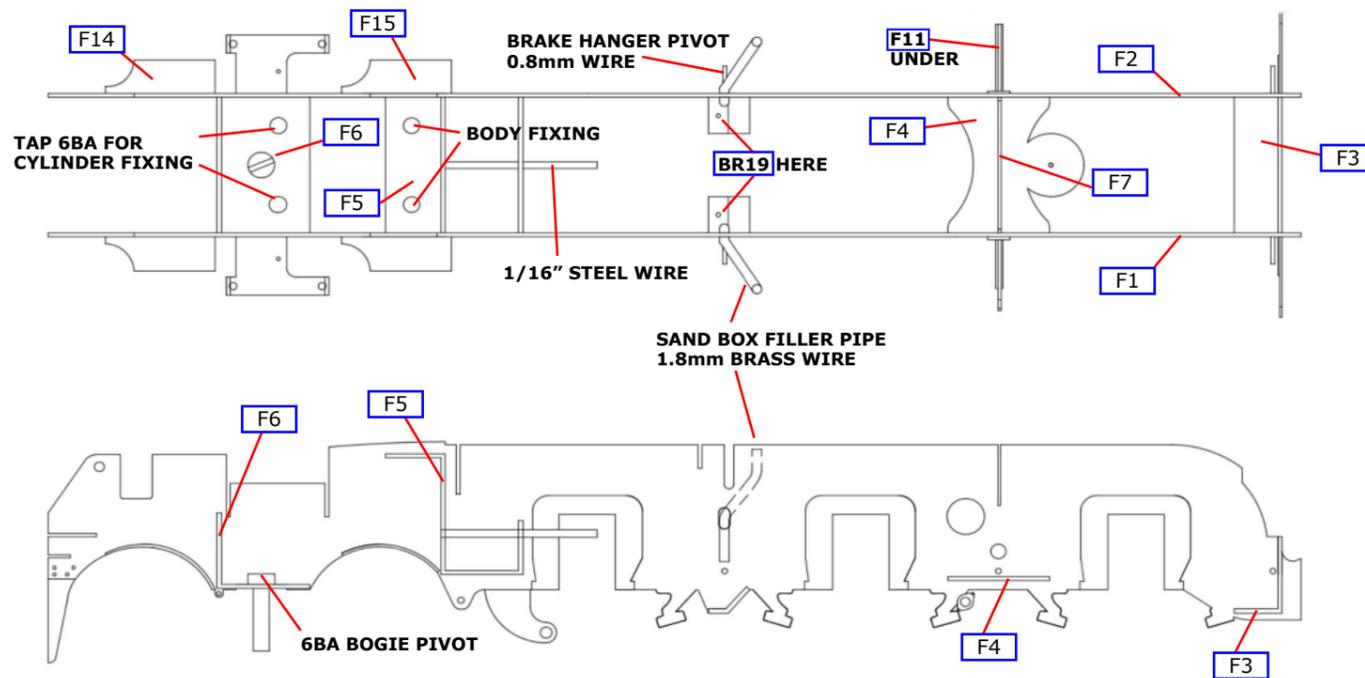


Fig 5. Frame Erection

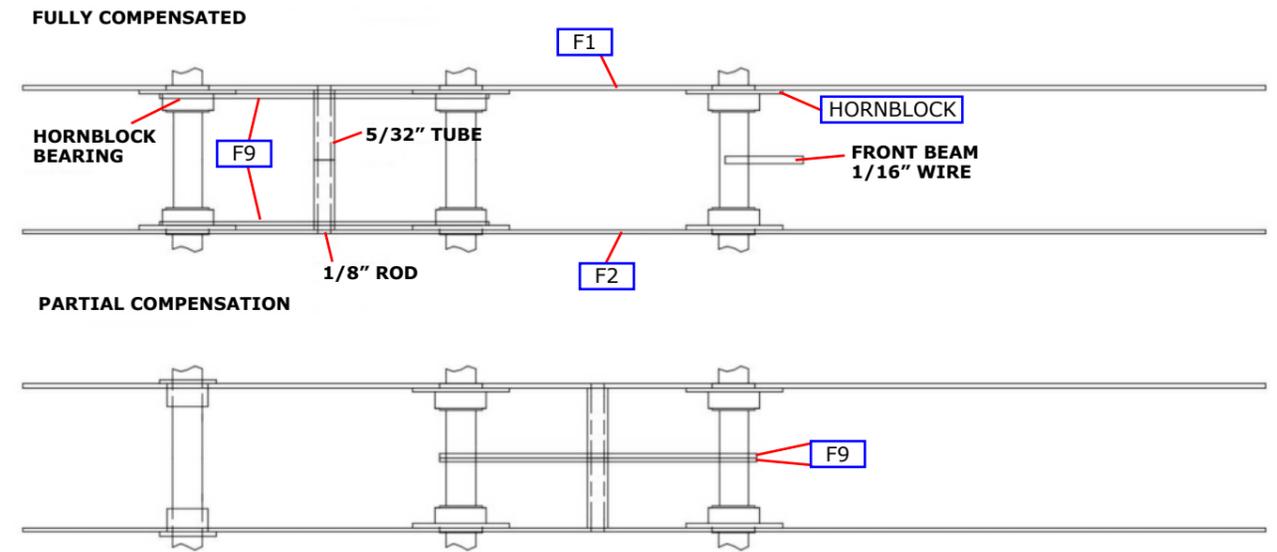


Fig 6. Frame Compensation

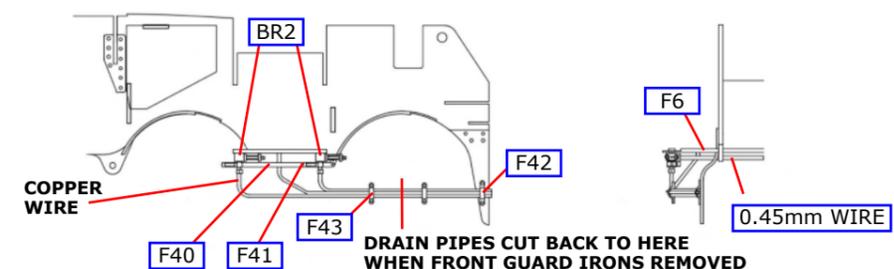


Fig 6A. Drain Cocks & pipework

REAR FRAMES AND RADIAL TRUCK ASSEMBLY

Rear frames. Fold in the radial truck horn guides on the rear inner frame extension (F18). Now make all the bends on the inner frame extension, all 90° and with fold lines inside, then solder in place on the rear of the frame stay (rear firebox bracket F3) ensuring that the rear frame will be level.

Fold the rear frame spacer (F19) and solder into place as shown, ensuring that the rear frames remain square and true.

Emboss the rivets on the rear outer frame extensions (F20) and form to fit. Check everything fits correctly before soldering the rear frames in place.

Fit the rear steps (F21 & F22).

Add the Cartazzi axle boxes (WM3 & 4 - note they are handed), the springs (NS7) and rear spring retaining brackets (F25), see Fig 7 and 1 for placement reference.

Finally add the rear frame drag beam bracket overlays (F27), rear frame footplate bracket ribs (F39), rear frame footplate bracket overlay (F26), together with the Cartazzi axlebox ties from 1.25 mm wire.

Bend the firebox below footplate wrapper (F29) to shape and fit to the rear frames. Pass a length of 0.8mm wire through the rocker grate bearings and on the right side add the grate operating rod (F44). Add a short length of 0.8mm wire to the rear end and attach the grate rod to the frames.

Detail the lower firebox with 1.0 square rod for the washout plugs and add the mud hole door clamps (BR7) and blowdown tap (BR6).

Add the reversing rod (F28) to the model once the reversing lever bracket has been fitted (Fig 13), secure under the cab with a short length of 0.8mm wire soldered to the rear frames (Fig 7)

Radial truck. Choose the appropriate matching width radial truck parts (F30 - F31). Fold up the spring wire brackets and side play stops on the radial truck top plate (F30).

Fold up the radial truck bottom and ends (F31) and attach the top plate (F30).

Check for free, but not sloppy, movement in the horn guides.

Solder the small 5/32" top hat bearings in place and fit the radial truck wheels using the washers to eliminate any side play. Bend up the spring wire to give some downward pressure and solder in place through the bracket on the inner frame extension and the hole in the rear firebox bracket.

The radial truck is retained with lengths of 1 mm square wire.

No.	Description	Sheet
F18	Rear frame extension - Inner	A3
F19	Rear frame spacer - Body fixing	A3
F20	Rear frame extension - Outer (2)	B3
F21	Rear steps upper (2)	B1
F22	Rear steps lower (2)	B1
F25	Rear spring retaining bracket (4)	B2
F26	Rear frame footplate bracket overlay (4)	B2
F27	Rear frame drag beam bracket overlay (2)	B2
F28	Reversing rod	A1
F29	Firebox below footplate	B1
F30	Radial truck - Top plate	A3
F31	Radial truck - Bottom & ends	A3
F39	Rear frame - Footplate bracket rib (2)	B2
F44	Grate operating rod	A3

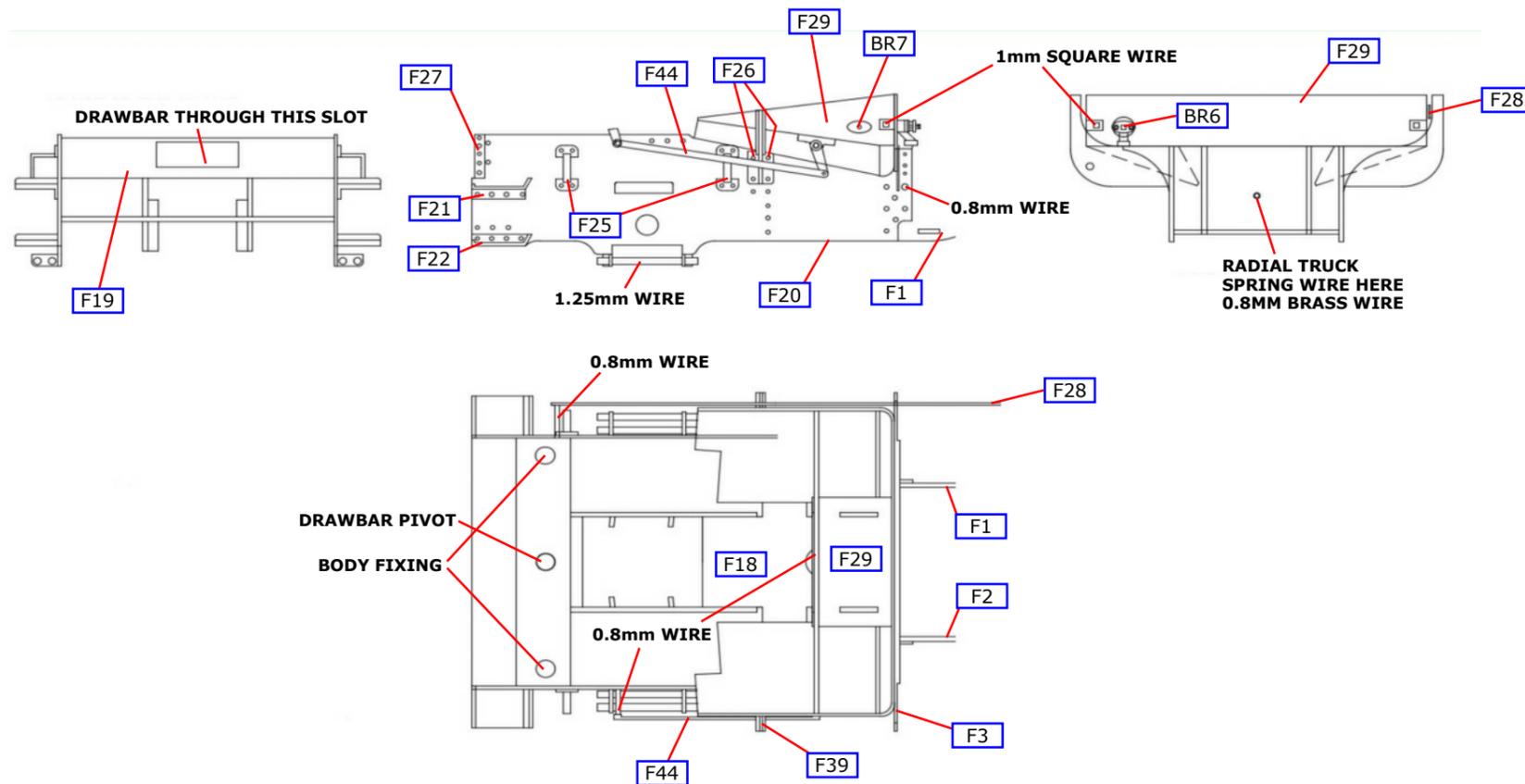


Fig 7. Rear Frames

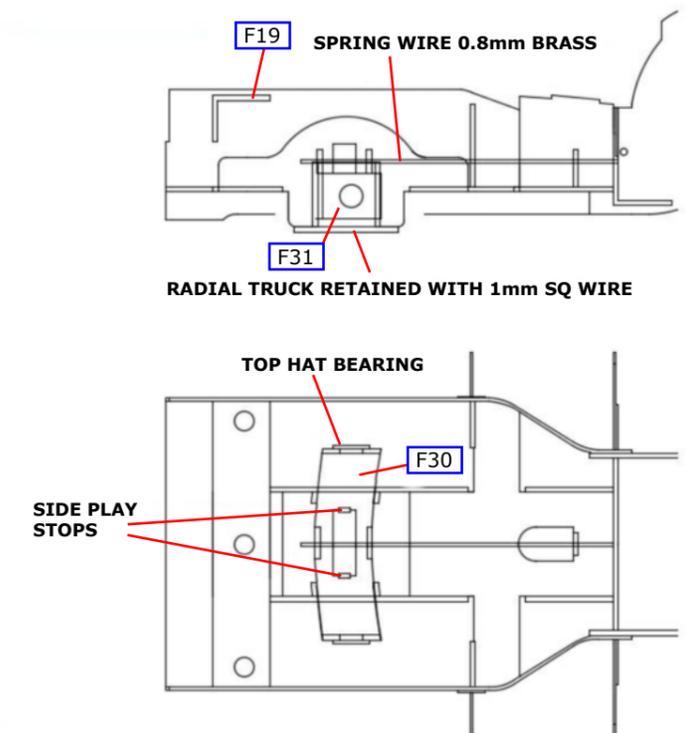


Fig 8. Radial Truck

BOGIE AND CHASSIS FINISHING

Bogie. Emboss all the frame rivets on the bogie frames (B01), fit the top hat bearings in place and then drill out the three 1.0mm holes on each side shown in Fig 9. There are two choices of bearing, plain top hat bearings or detailed white metal bearings (WM13), gently open out the holes in the side frames and fit the bearing of choice.

NOTE; top hat bearings are inserted from the outside, white metal bearings are on the inside. Once satisfied with the fit, solder the bearings in place. Use an appropriate reamer to ease the holes in both bearings to give a free rolling chassis once the bogie assembly has been completed.

Fold up the guard irons (B02) and solder in place on the inside of the frames. Fold up the centre frame stay (B03) and reinforce the spring wire retaining brackets with a fillet of solder.

Solder the frames and frame stay together and add the front and rear frame stays (B05 & B04). Form the dust shields (B06 or B07) to shape and solder in place.

Using appropriate washers (F51) fit the wheels so that there is a minimum of side play. Bend up the spring wire to give some downward pressure and solder in place through the holes in the frame spacer F5. The bogie is retained with a 6 BA nut.

Completing the chassis. Assemble the wheel sets, bearings and motor/gearbox, selecting 3/16" axle washers (F51) of appropriate thickness to control side play. Side play on the leading axle should be kept to a minimum to avoid clearance problems with the valve gear and connecting rod.

The cranks on the right hand side should lead by 120°, attach the coupling rods and test for free running, fettle where appropriate.

Once running smoothly add the balance weights (F34 & F35) as shown in fig 10.

Drill the holes in the buffer beam (F38) 2.6mm to fit the buffer spring gaiters (BR21). Fold up F38 whilst inserting BR21 at the same time, then solder the complete assembly to the frames. See Fig 11.

Add the front gravity sand pipes from 0.8mm wire and route down between the bogie rear splasher and leading wheel to just above the rail head in front of the leading wheel, use prototype photos to assist.

Bend and fit the middle sand box filler pipe from 1.8mm wire as shown in Fig 5.

Finally add the steam sanding pipes (BR19) to the middle sand box (see Fig 5) and adjust the end to sit above the rail head in front of the middle wheel.

The axles are now retained by the springs, formed from a triple lamination of F31, F32 and F33.

No.	Description	Sheet
B01	Bogie frame (2)	A1
B02	Bogie guard iron (2)	B3
B03	Bogie centre frame stay	B3
B04	Bogie rear frame stay	A3
B05	Bogie front frame stay	A3
B06	Bogie dust shield - Original (2)	B1
B07	Bogie dust shield - Full width	B5
F31	Spring lamination - Centre (6)	A2
F32	Spring lamination - Outer (6)	A2
F33	Spring lamination - Inner (6)	A2
F34	Centre axle balance weights (2)	B5
F35	Leading/trailing axle balance weights (4)	B5
F38	Buffer beam	B1
F50	5/32" washers	B1
F51	3/16" washers	A1,A3,B1,B2

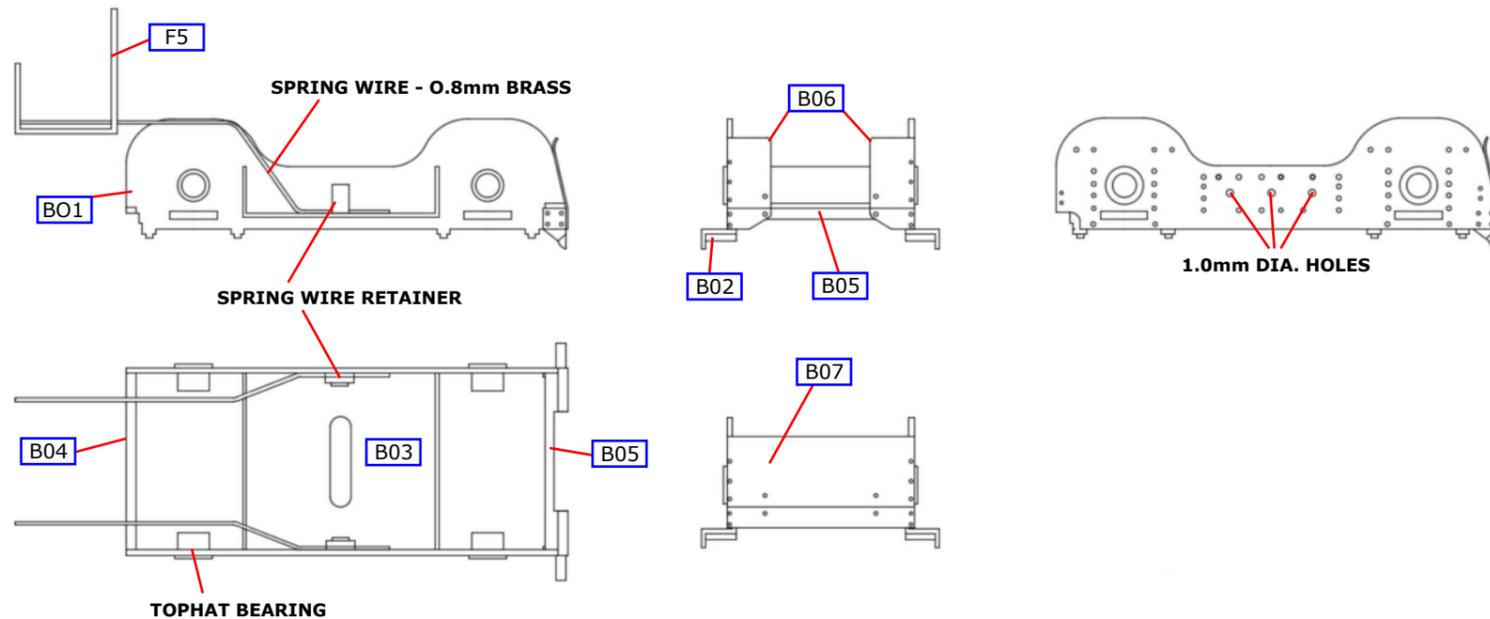


Fig 9. Bogie

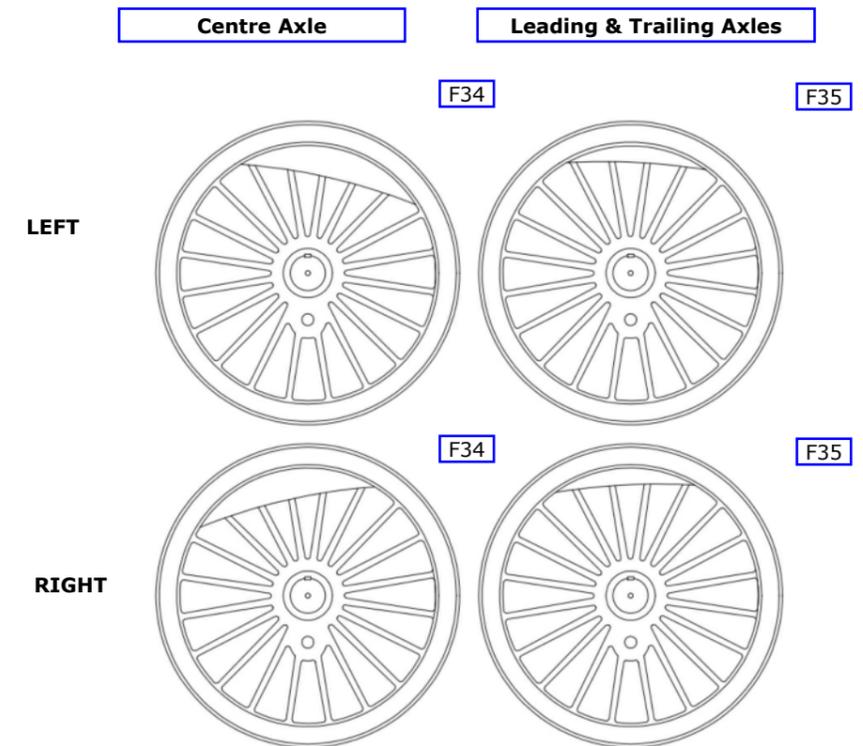


Fig 10. Balance Weights

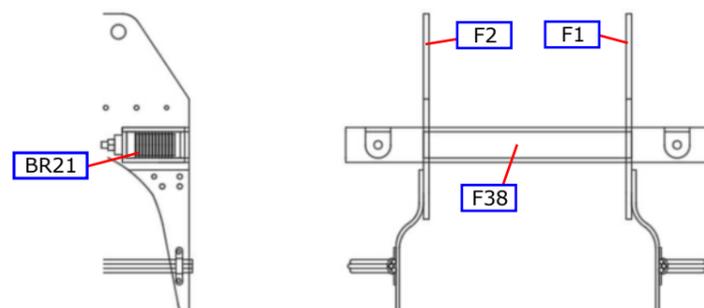


Fig 11. Buffer Beam

CYLINDERS AND MOTION BRACKET

Cylinder assembly. Check all the holes in the cylinders (M5) against the appropriate components and open up the holes if necessary. Reduce the width of the inside cylinder faces to the etched lines provided as appropriate, so that the cylinders are a good fit in the slots in the frames.

Fold up the cylinders making sure they are square and fold out the 2 to 1 arm bracket.

Construct the slidebars (M6) as shown in Fig 14. Build the stack of laminations with layer 6 on the bottom up to layer 1 on top. Use plenty of solder whilst applying pressure to keep the laminations together. Clean off the front and rear faces and remove the rear section.

The crosshead slot will need cleaning out so that the crosshead left and right (NS2) is a good fit. This can be done with a thin file or by using a piece of emery paper over a scrap piece of brass etch. The appearance of the slidebars is much improved by carefully filing the top smooth.

Insert the slidebars in the cylinders and tack solder in place. After checking all is square and parallel they can be permanently attached. Attach the piston rod gland castings (NS3) and check that the crosshead slides properly.

Solder the valve crosshead guides (BR17 & BR18) in place aligning them with a piece of 1.4 mm wire passed through the valve rod holes. Note there are two types of front crosshead guide (BR17 & BR20), check your prototype before fitting the relevant variant.

Drill out the holes for the relief valves on the front cylinder covers, left and right (NS4 & NS5), marked on the inside, so that the relief valves (BR3) fit. Attach the front covers and fit the relief valves.

Add slide bar front flanges (M7) as shown in Fig 12 inside and outside of the slidebars. Solder the slide bar bracket laminations (M9 & M9A) together back to back.

Tap the hole in M9A 6BA as shown in Fig 12.

Solder a 1.6 mm wire pin in place in the bracket attached to the cylinders, make the pin just long enough so that the 2:1 arm can be sprung in place over the washer (M39) and pin, see Fig 12.

Attach the cylinders to the chassis with two 6 BA bolts. Fit the slide bar bracket through the frame slots and solder to the slidebars.

Motion bracket. Bend up, in a Hold and Fold or vice, the motion brackets (M10) centring the bends on the etched slot.

Solder the motion bracket inner (M11) in the slot in the motion bracket ensuring that the holes for the radius link pivot align horizontally and vertically. The etched boss faces outward.

Solder the motion brackets to the motion bracket stretcher (M12) as shown and check the assembly fits in the frame slots. Solder short pieces of 1.8 mm wire to the brackets for the expansion link pivots and then add the washer (M23) to the insides of M10 over the wire stubs.

Laminate the two reversing cranks (M33 and M34) together to form the two cranks. The L shaped crank (M34) is on the left hand side of the engine. Fit the cranks to a length of 1.8mm wire passed through the motion bracket assembly. Ensure both cranks are parallel with each other and centred between M10 & M11 before fixing securely to the rod. See Fig 13.

Once the motion bracket is secured attach the reversing rod F28.

Add the slide bar packing pieces (M8) once the valve gear has been fully assembled.

No.	Description	Sheet
M5	Cylinders	A1
M6	Slide bar laminations (12)	A2
M7	Slide bar front flange plate (4)	A2
M8	Slide bar rear packing piece (2)	A2
M9	Slide bar bracket lamination - Front	A1
M9A	Slide bar bracket lamination - Rear	A3
M10	Motion bracket (2)	A2
M11	Motion bracket inner (2)	A2
M12	Motion bracket stretcher	A2
M23	Radius link bracket washer (4)	A2
M33	Reversing crank lamination - RH (2)	A2
M34	Reversing crank lamination - LH (2)	A2
M39	2:1 lever washer	A2

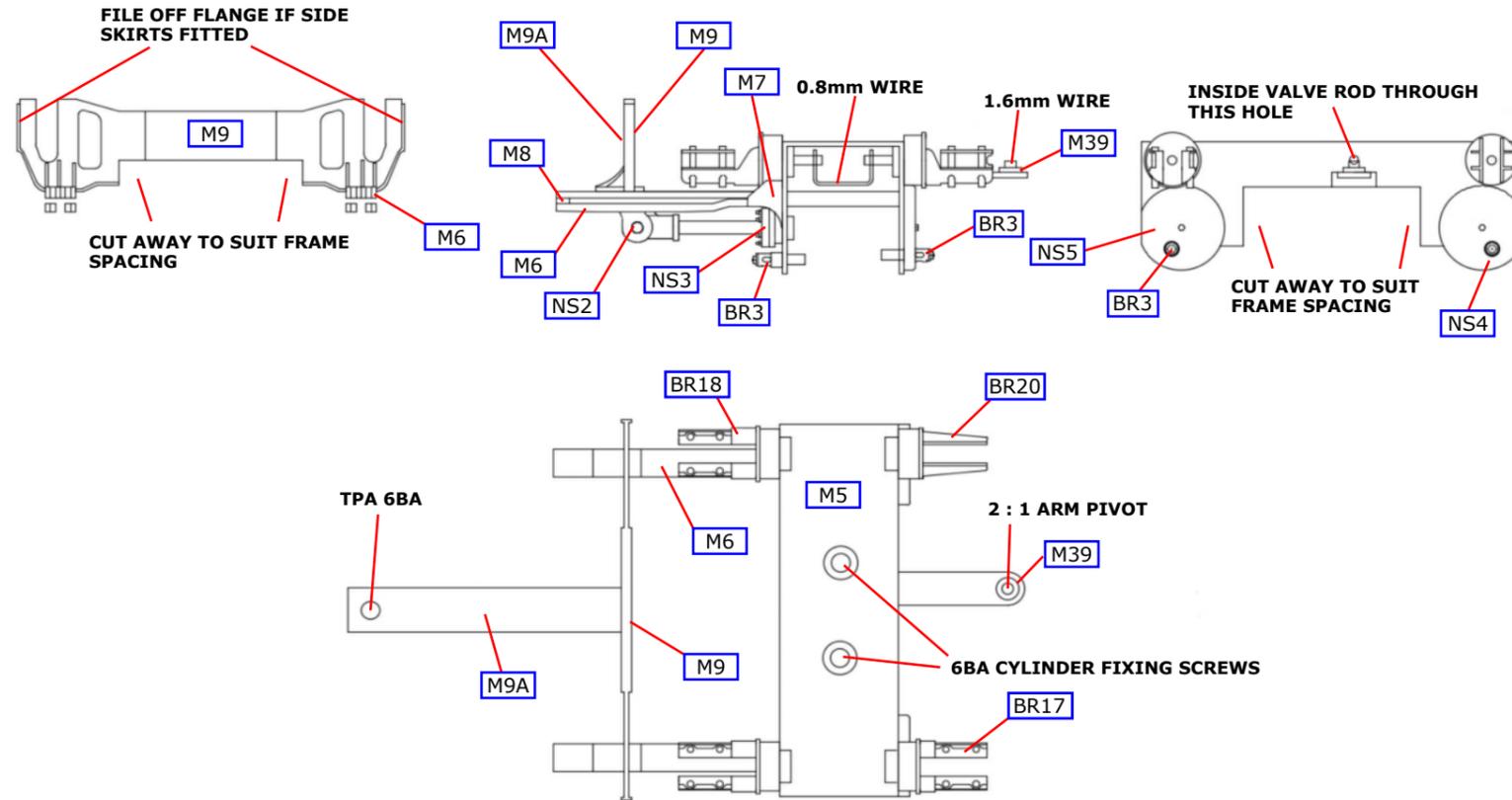


Fig 12. Cylinders

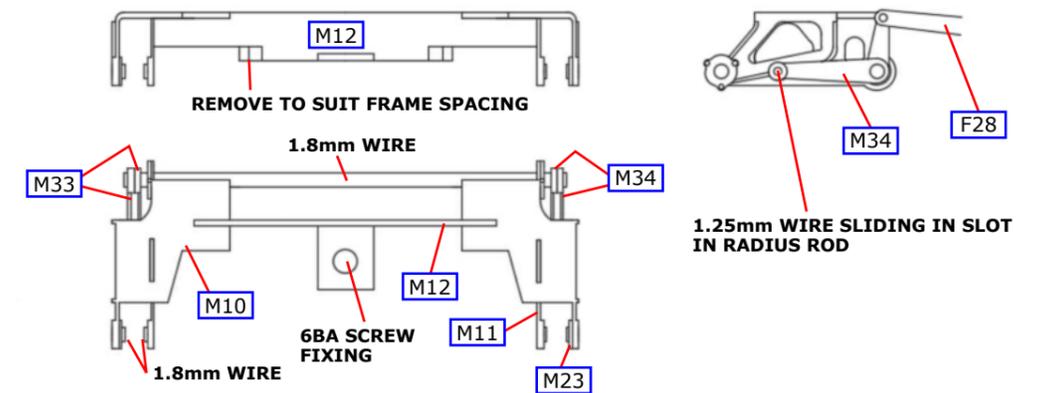


Fig 13. Motion Bracket

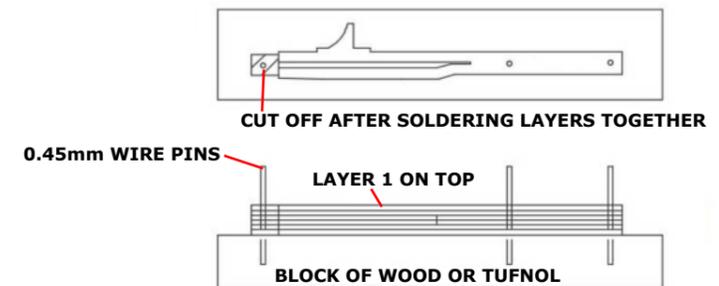


Fig 14. Slidebars

MOTION

Expansion Link. Drill out the holes in the expansion link laminations (M14 & M15) to take the 0.45 mm wire pins which align the laminations and represent the bolt heads.

Solder the inner laminations together with 4 lengths of 0.45 mm wire as shown. Check that the slot in the inner laminations is a sliding fit with the 1.25 mm wire.

Radius Rod. Place the radius rod (M16) and radius rod rear lamination (M17) over the expansion link, align with a piece of 1.25 mm wire, and solder the lamination to the rod.

Solder the 1.25 mm wire pin in place and clean off flush. The radius rod should now move smoothly in the link. Add the fork joint (M18) to the front of the radius rod. Open out the holes in the expansion link outer lamination (M14) to 1.8 mm so that they are a good fit on the pivot wires on the motion bracket.

Solder the outer laminations in place and cut off and dress the 0.45 mm wire to represent the bolt heads. Gently spring the links in place in the motion bracket, ensure that the links pivot freely and are vertical.

Combination Lever, Union Link and Valve Rod. Form the joggle in the combination levers (M19) with the fold lines inside reinforcing the bends with solder. Assemble the union link (M20 & M21) and rear valve rod connecting link (M22). Attach a length of 1.4mm wire to each flange approximately 20 mm long (trimmed later).

Make the valve rods as long as possible so that they just go in past the slide bar bracket. Pin together the combination lever, union link, valve rod and radius rod.

Connecting Rods and Crossheads. Solder together the connecting rod inner and outer laminations (M24 & M25) and add the rod boss laminations (M26) to the big end back and front. Drill the big end to fit the crankpins and the small end to 1.6 mm. Solder the crosshead arm (M27) to a piece of 1.6 mm wire as a pin.

Fit the connecting rod to the crosshead, ensuring the crosshead arm is vertical, carefully solder the pin from the rear and file flush.

Fit the connecting rods with a thin washer between the coupling rods and connecting rods and check the clearance of the connecting rod and the leading axle crankpin nut. You will possibly have to reduce the thickness of the nut.

Eccentric Rod and Arm. Add the eccentric rod fork joint (M30) to the eccentric rod (M29). Reduce the diameter and thickness of the rivet heads so that they will fit in the recess in the back of eccentric rod bearing overlay (M32).

Tap the crankpin hole in the eccentric crank (M31) for the crankpin. Fit the arms on the crankpin and tighten so that the offset is 4.4 mm ahead of the main axle bearing with the crank at Bottom Dead Centre (BDC), see Fig 1. Rivet the radius rod to the arm and add the bearing overlay (M32).

Now pin the remaining two joints between the union link and crosshead arm and between the radius link and eccentric rod. Check that the motion works smoothly. Add the pins through the ends of the reversing cranks and through the slots in the radius rods. By rotating the cross shaft you should now be able to reverse the motion.

2:1 Lever. Assemble the 2:1 lever (M35 & 36) and the front valve rod connecting link (M37) as shown in Fig 17. Pin the valve rods, 2:1 lever and 1:1 lever (M38) together with 0.8 mm wire. Fix the 1:1 lever into the 2:1 lever with a 1.25mm pin, ensure the 1:1 lever is free to move.

Adjust the valve rods to length so that they do not interfere with the rear valve rods and check for free movement. Now link the valve rods together with hoops of 0.8 mm wire (see Fig 12) checking that you have equal backward and forward movement on the conjugated valve gear arms.

This now means that the valve gear is permanently fixed to the cylinders but the complete unit can be removed by unscrewing the eccentric arms and cylinder bolts.

No.	Description	Sheet
M14	Expansion link outer lamination (4)	A2
M15	Expansion link inner lamination (4)	A2
M16	Radius rod (2)	A2
M17	Radius rod rear lamination (2)	A2
M18	Radius rod fork joint (2)	A2
M19	Combination lever (2)	A2
M20	Union link inner lamination (2)	A2
M21	Union link outer lamination (2)	A2
M22	Valve connecting link lamination - Rear (4)	A2
M24	Connecting rod inner lamination (2)	A2
M25	Connecting rod outer lamination (2)	A2
M26	Connecting rod boss lamination (4)	A2
M27	Crosshead arm (2)	A2
M29	Eccentric rod (2)	A2
M30	Eccentric rod fork joint (2)	A2
M31	Eccentric crank (2)	A2
M32	Eccentric rod bearing overlay (2)	B5
M35	2:1 lever	A2
M36	2:1 lever lamination (2)	A2
M37	Valve connecting link lamination - Front (6)	A2
M38	1:1 lever	A2

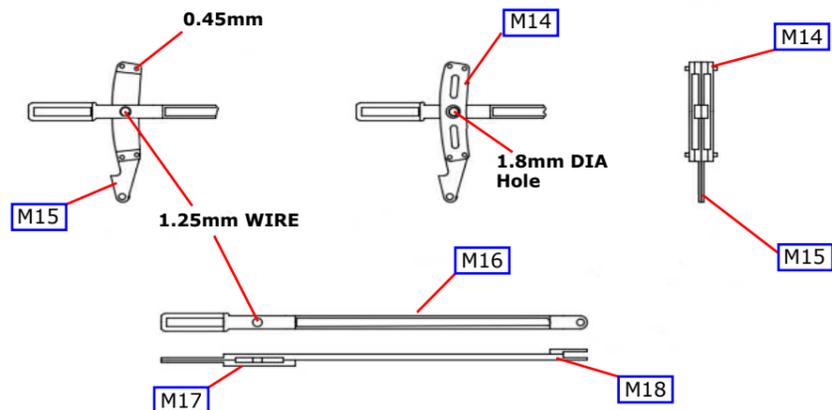


Fig 15. Expansion Link and Radius Rod

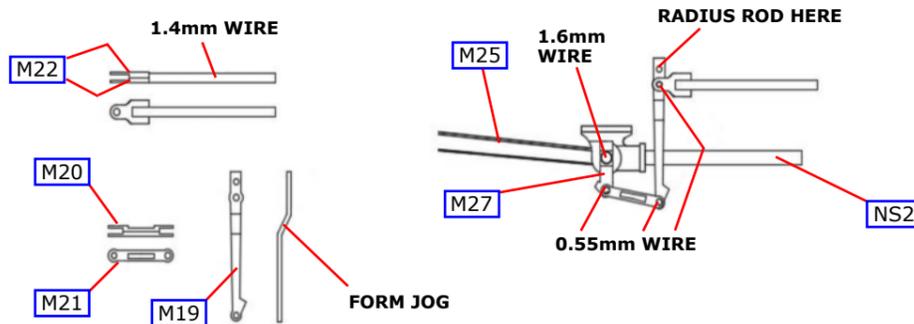


Fig 16. Combination Lever, Union Link and Valve Rod

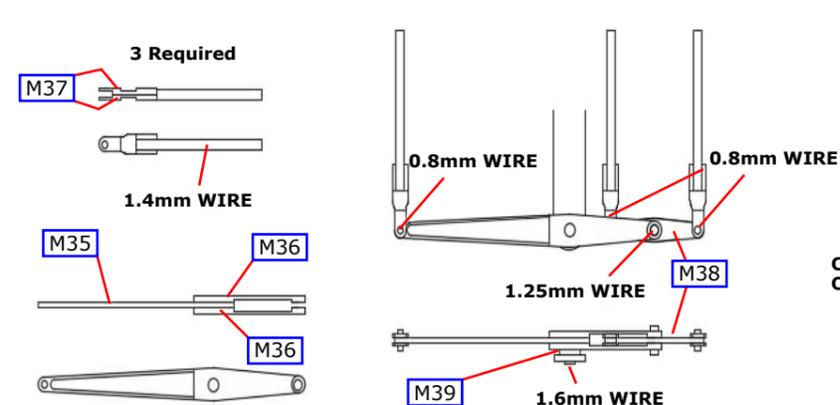


Fig 17. 2:1 Lever

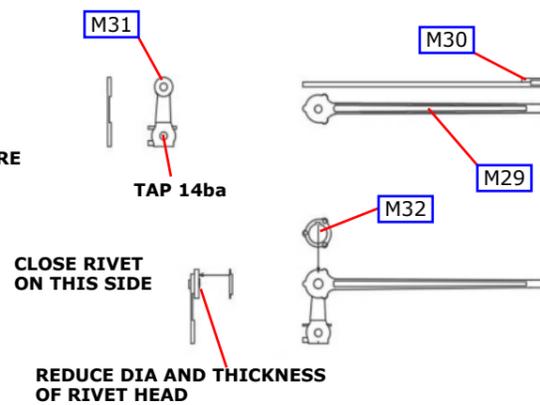
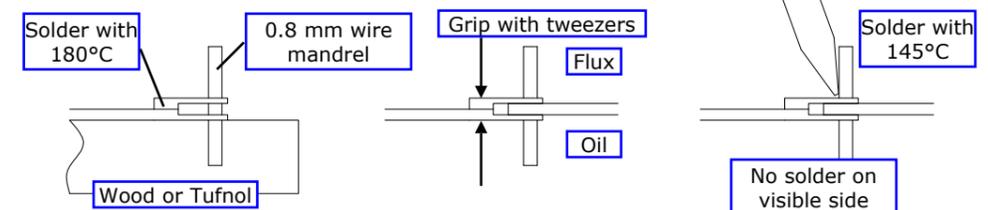


Fig 18. Eccentric Rod and Arm

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.
- use plenty of flux, a small amount of solder, and be quick!



CASING & CAB 1

Casing, general construction. Before starting work on the resin casing please bear in mind the following points.

- 1). The casting should require very little finishing apart from cleaning up the lower faces, it is best wet sanded with fine grade wet and dry paper.
- 2). The dust should not be inhaled and hands should be washed after working on the resin.
- 3). Bonding is best done with epoxy or a cyanoacrylate adhesive.
- 4). Wash the casing in warm water with a mild detergent and rinse well before painting.
- 5). Painting may be carried out with enamels, cellulose or acrylics. Hycote or Halfords branded plastic primer for car parts (bumpers etc) keys well to the resin.

Clean the lower faces of the casing and then drill the following holes.

- 0.4mm Anti carboniser valve pipe
- 0.8mm Ejector exhaust pipe brackets
- 1.1mm Lamp brackets
- 1.2mm Handrail knobs, Anti carboniser valve
- 1.8mm Ejector exhaust pipe elbow
- 2.2mm Buffer clearance

If you are not fitting the extra front access door, see Fig 20, (C8) then fill the recess with a suitable filler (Milliput) and sand flush, if the short extra front access door (C7) is to be fitted then only the front 1/3 needs filling.

Emboss the rivets on the footplate/dragbeam (C10) dragbeam section and fold down. Fold the cab floor support up and the strengthening ribs each side of the front body fixing (See Fig 21) and strengthen with solder, then affix two 6BA nuts over the front holes.

Place the footplate under the casing and with the front end aligned centrally with the casing, carefully mark through the two front self tapping holes. Remove the footplate and carefully drill one of the marked holes 1.6mm. Secure the footplate with one of the self tapping screws, ensuring it is central and as far forward as possible. Once satisfied mark and drill the remaining holes and secure with self tapping screws. Finally secure the footplate to the casing with an adhesive.

Once bonded remove the three bracing strips (Fig 21) and clean up the edges.

Remove the screw opposite the lubricator opening as it will foul part F7, other screws can be removed if required as they will be visible at low viewing angles.

Make the bends under the cab in the footplate overlay (C11), test fit onto the footplate and trim or adjust to give a neat fit to the casing, taking care around the firebox. Carefully form and fit the lubricator angle (C12) to C11 and a 6BA nut to the middle hole under the cab. See Fig 21.

Test fit the cab and using the holes in the cab front mark through into the casing the drill points for the self tapping screws.

Remove the cab and taking care not to drill through the side of the fire box, open out the holes with a 1.6mm drill. A tip is to wrap tape around the drill bit marking the cutting length the same as the screw length

Place the assembled cab onto the footplate overlay and secure the cab to the casing with four self tapping screws. The top of the cab should sit level with the top of the casing, the short lip at the front of the central cab roof ventilator (C38) should sit on top of the resin casing.

When satisfied, solder together C9 and C11 along the edges clamping the two pieces firmly together as the joint is made.

Casing detailing, LNER. Offer up the full skirt inner lamination (C14) and carefully bend the rear end inside the rear drag beam (Fig 21), emboss the rivets for the access doors and score the plate lines as noted in Fig 19. Attach the outer overlay (C15) and shape the lower front edge to match the cylinders and front casing before fixing the complete skirt to the footplate.

Add the dragbeam overlay (C10) to the dragbeam and lubricator inner wall (C13).

Fit the early style casing access doors (C1, C2, C3) to the body, then fix the single chimney (WM1) to the casing after making a small nick in the base of the chimney to just fit around the whistle stem. See prototype pictures. The chimney should be fitted so that the rear casing is just short of the first cladding band. Drill the casing where the small nick is and add the whistle (BR9)

Add the lamp irons (NS8, NS9 & NS10) along with the vacuum hose (NS6) to the front end, see Fig 19 for placement details.

On the left side (see Fig 20) fit the anti carbonising valve (BR8) and add the short length of 0.3mm wire as shown

Fit the ejector exhaust elbow (BR10) to a length of 1.8mm wire, ensure the wire is long enough to pass through the cab front once the elbow is fitted. Fit the elbow to the casing and secure the pipe with the five pipe brackets (C20). See Fig 20.

No.	Description	Sheet
C1	Access door rear - Early (2)	B1
C2	Access door middle - Early (2)	B1
C3	Access door front - Early (2)	B1
C9	Footplate/dragbeam	B3
C10	Dragbeam overlay	B3
C11	Footplate overlay	B3
C12	Angle around lubricator opening	B3
C13	Inner wall - Lubricator compartment	B3
C14	Skirt inner lamination - Full skirt (2)	B5
C15	Skirt outer lamination - Full skirt (2)	B5

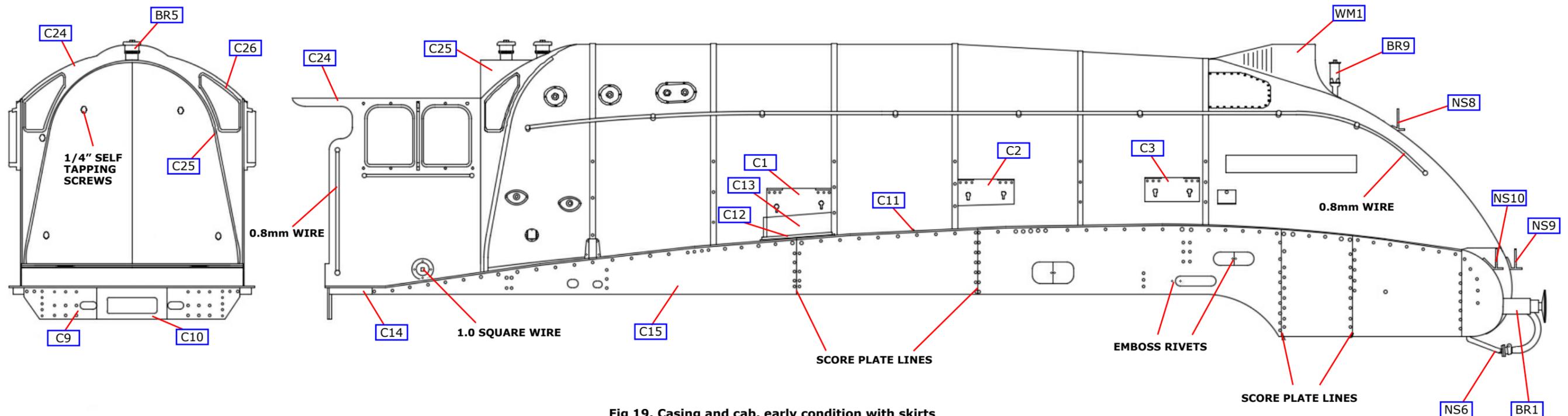


Fig 19. Casing and cab, early condition with skirts

CASING & CAB 2

Casing, late. Offer up the valance (C16) and carefully bend the rear end inside the rear drag beam (Fig 21), emboss the rivets and attach to the footplate. Carefully form the lower front edge of the cylinder cover (C17) to match the cylinders and secure to the footplate.

Add the dragbeam overlay (C10) to the dragbeam and lubricator inner wall (C13). See Fig 19.

Fit the later style casing access doors (C4, C5 & C6) to the body, if required fit the appropriate extra front access doors (C7 or C8). Add handles from 0.45mm wire formed to an L shape.

Before attaching the double chimney clean up the edges and drill the small hole for the whistle stem. Attach the double chimney if appropriate (many engines had no skirts with single chimneys for many years) so that the rear edge just meets the first casing band.

Drill through the previous hole in the chimney casing into the resin casing and attach the whistle (BR9) Use prototype photos to assist in accurate fixing of the chimney and whistle.

Add the lamp irons (NS8, NS9 & NS10) along with the vacuum hose (NS6) to the front end, see Fig 20 for placement details.

If required (AWS fitted) add the coupling plate (C18)

On the left side (see Fig 20) fit the anti carbonising valve (BR8) and add the short length of 0.3mm wire as shown

Fit the ejector exhaust elbow (BR10) to a length of 1.8mm wire, ensure the wire is long enough to pass through the cab front once the elbow is fitted. Fit the elbow to the casing and secure the pipe with the five pipe brackets (C20).

No.	Description	Sheet
C4	Access door rear - Later (2)	B1
C5	Access door middle - Later (2)	B1
C6	Access door front - Later (2)	B1
C7	Extra front access door 2 hinges (2)	B1
C8	Extra front access door 3 hinges (2)	B1
C16	Valance - Skirts removed	B5
C17	Cylinder cover - Skirts removed	B1
C18	Buffer beam coupling plate	B1
C20	Ejector exhaust pipe bracket	B1

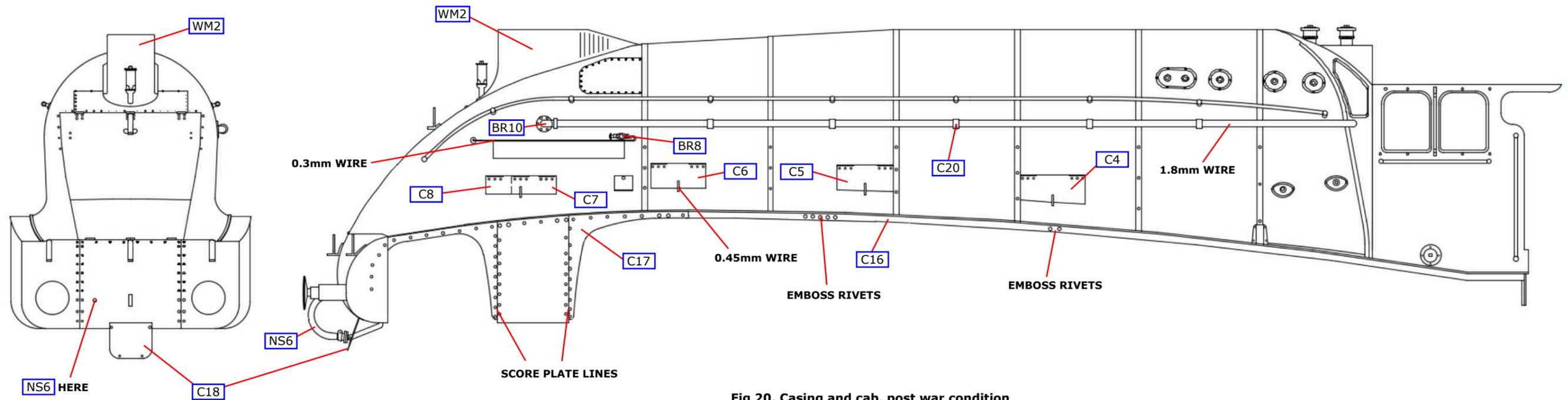


Fig 20. Casing and cab, post war condition

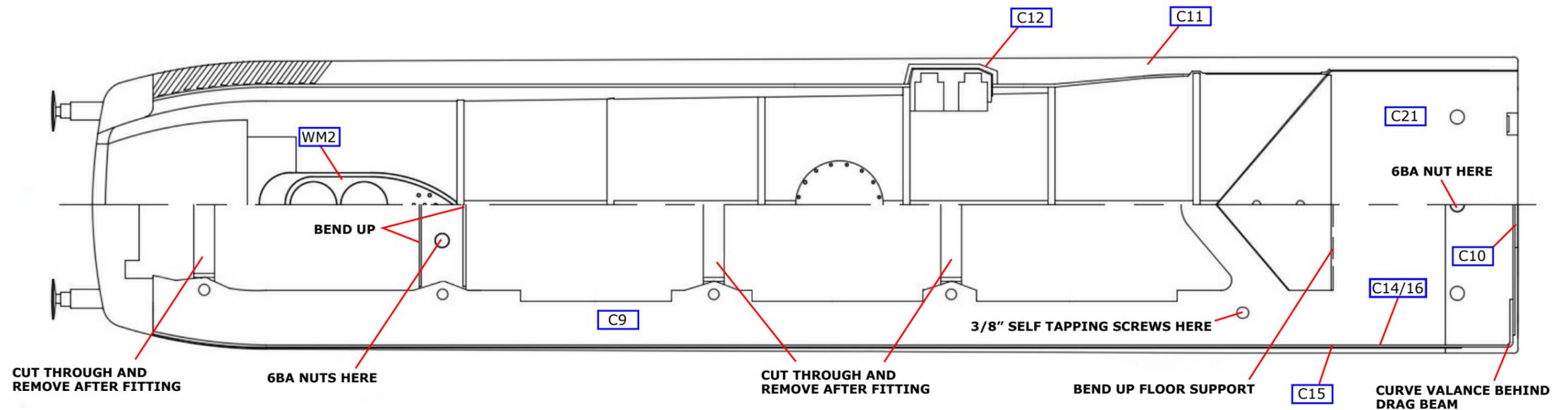


Fig 21. Casing top view

CAB

Cab. Solder the inner cab window frames (C29) into place, ensuring the holes line up. Solder the middle layer (C30) onto the outer layer and then break off the rear section once secure. The outer layer (C31) which retains the sliding window frame (C32) cannot be fitted until the cab is complete and painted.

Solder the rear cab beading (C27) into place and then attach both of the cab hand rails (See Fig 19 & 20). Fit the cab spectacle window frames (C26), See Fig 19, to the inside of the cab and form the cab seat brackets (C47). Attach the brackets to the seats (WM8) and then fit the brackets to the cab side as shown in Fig 23.

Fold up the cab floor support (C21) add the 1.0m square wire to the washout plug holes. Add the cab floor (C22) and then fit the two 6BA nuts over the holes marked in Fig 23.

Now form the bend between the cab sides and cab front (C24). To do this, first scribe, with a sharp point or skrawker the fold lines on the inside. The fold lines run from the slots in the top and bottom projections. File off the projections once the bend lines have been made.

Fold the sides and front to match the pre assembled cab floor.

Test fit the folded cab sides/front to the casing and add the cab floor, the cab front top should sit level with the casing top, once satisfied everything is square and correctly fitted, tack solder the floor to the cab sides/front. Remove and strengthen the joint between the floor and cab sides/front from below.

Form the inner firebox sheet wrapper (C25) using the white metal backhead (WM7) as a guide, fit the wrapper to the front of the cab and then secure the safety valves (BR5) into the two holes provided.

Emboss the rivets on the fallplate (C23) and bend the front tabs down so that they fit in the slots in the floor, to give a hinge effect.

Anneal the hinges on the cab doors (C28) and carefully form around a 0.8mm drill shank, fit the doors and gently bend over the top of the pin to stop the doors from falling off.

Cab roof. Fold up the back, front and central rib on the cab roof former (C34), this will give a solid base upon which to build the cab roof. Roll the cab roof (C35) and interior detail (C36) and test fit on the frame. Once satisfied attach the inner detail to the underside of the cab roof using the ident mark as shown in Fig 22.

Test fit the jig onto the cab sides/front and carefully bend the rear strips in so that they fit between the cab sides (Fig 22). Now test fit the cab roof and once satisfied tack solder the roof to the jig. Remove from the cab assembly and complete the fixing of the jig to the cab roof.

Roll the raised central ventilator front and rear sections (C38 & C39) so that they fit the jig and secure to the cab roof. The front panel should just overhang the cab front, this will sit on top of the casing.

Gently roll the raised roof vents (C40), there is a choice of two positions, and fit to the cab roof.

Attach the two rear vents (C42), if modelling post 3/1937, and rain strips (C37) to the cab roof.

Using a carborundum disc in a mini drill carefully remove the cab roof jig and break off the redundant parts along their half etched lines, clean up all the edges once the jig is removed.

Test fit the roof onto the cab and ensure the holes in C38 are centred over the safety valves, enlarge or adjust as necessary and then gently curve the safety valve cover (C41). Align the cover directly over the safety valves below and secure.

In the following section there are some gauges that are required to be fitted to the underside of the cab roof, the dotted line in Fig 22 indicates their alignment. It is recommend to not fit the cab roof until all the painting has been completed.

No.	Description	Sheet
C21	Cab floor support	B1
C22	Cab floor	B1
C23	Fall plate	B2
C24	Cabsides/front	B2
C25	Firebox - Inside cab	B2
C26	Cab spectacle window frame (2)	B1
C27	Cabside inner beading (2)	B2
C28	Cab door (2)	B2
C29	Cab window - Inner layer (2)	B3
C30	Cab window - Middle layer (2)	B3
C31	Cab window - Outer layer (2)	B3
C32	Cab window - Sliding frame (2)	B3
C34	Cab roof former assembly	B2
C35	Cab roof	B1
C36	Cab roof - Interior detail	B2
C37	Cab roof - Rain strip (2)	B2
C38	Cab roof - Central ventilator front	B2
C39	Cab roof - Central ventilator rear	B2
C40	Cab roof - Central ventilator vents	B5
C41	Cab roof - Central vent'r safety valve cover	B3
C42	Cab roof - Side ventilator (2)	B2
C47	Cab seat brackets (2)	B2

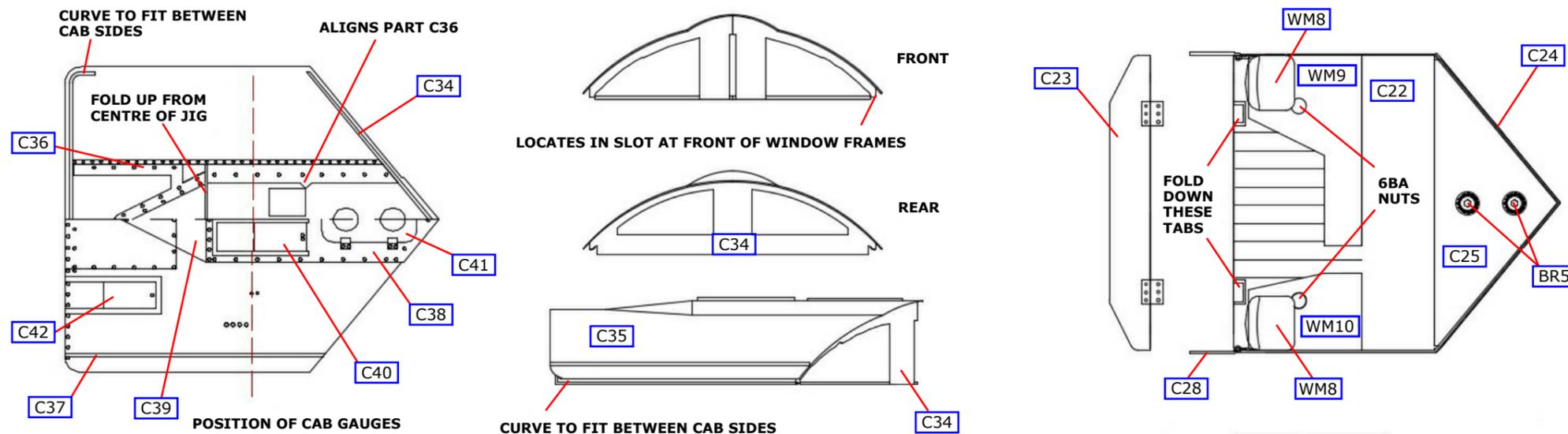


Fig 22. Cab roof

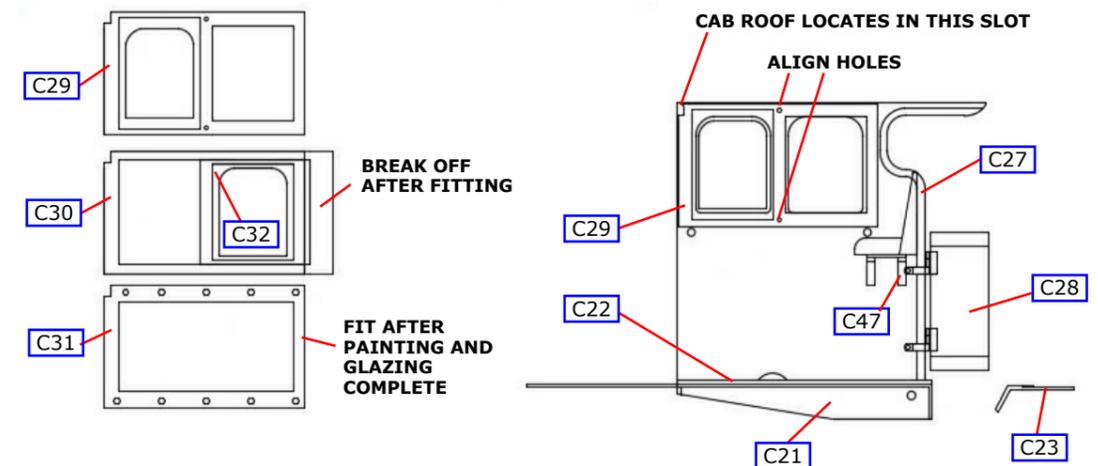


Fig 23. Cab

CAB BACKHEAD

Backhead. Drill out the holes in the backhead casting (WM7) to accept the steam manifold (BR15) and the two Injector valves (BR13 & 14) and the water gauges (BR16).

Carefully drill the backhead regulator brackets to accept the regulator rods made from 1.0 mm wire and fit the rods in place. It is easier to make these as two rods rather than trying to drill the centre casting to take a single rod across the backhead. Make sure there is enough rod protruding from the left and right brackets to attach the regulator levers (C44) on each side.

Drill the whistle lever brackets with a 0.5mm hole, fit the cut off indicator (C50) and then pass an 0.45mm wire across the backhead, attach the whistle handles (C45) to each side.

Attach the water gauges (BR16) over the regulator rods and fit the steam manifold (BR15). Add four lengths of 1.2mm copper wire to the base of the injector valve castings (BR13 & 14) bend to match Fig 24 and trim to fit then attach the two castings to the backhead.

Punch the rivets on fire hole door (C43) and fold the heat shield out through 90° and attach to the backhead. Fit the heater gauge bracket (C58) and appropriate cab gauge (C54) to the backhead and fit to the backhead, use the drawing Fig 24 as a reference.

Fit the backhead shelf (C48) onto the backhead.

Attach the vacuum injector valve (BR12) to the left side of the backhead, a small groove in the casting marks the fitting location; attach the handle (C53) and fit a short piece of 0.45mm wire at the end to complete the handle assembly. Attach a length of 0.6 mm copper wire to the top of the valve and route up the left hand side of the backhead and terminate behind the steam manifold.

A similar length of 0.6mm wire is added to the base of the vacuum injector and runs down the right side of the firebox to the base.

Attach lengths of 0.3mm copper wire to the base of the water gauges for the drain pipe work and run down the backhead past the tray and fire hole door guards to the floor.

Fix a short length of 1.2mm copper wire to the base of the firebox/floor for the Mason reducing valve feed and fit the casting (BR11) on top, the height is not critical as pipe work in service varied, use the drawing as a general reference. Fit a length of 0.6mm copper wire to the relevant gland (see drawing) on the Mason valve and route up the backhead, over the left hand side regulator rod and up behind the distribution box. Finally a length of 0.3 mm copper wire runs from the Mason valve to the heater gauge previously mounted, see drawing.

Fit the two large (C51) and three small (C52) hand wheels to the steam manifold and the two injector hand wheels (C46).

Place the backhead into the cab and fit the raised floor platforms (WM9 & 10) there should be a small gap for any pipe work to pass between the backhead and raised floors.

Complete the cab fittings by attaching the screw reverser column (WM11) to the raised cab floor (WM9) and attaching the handle (NS1) on top.

Select the left hand and right hand cab roof gauge plates (C55, C56 or C57), early engines had the single gauge bracket C57, later the bracket was changed to a dual type C56. Attach to the cab roof as shown in Fig 24 and noted in Fig 22, fit the relevant gauges (C54) as shown in in Fig 24. Use prototype photos to add the detail pipe work from 0.3mm copper wire.

A choice of five works plates (C49) are provided, these should be added to the outside of the cab sides once painted as can the two cab side windscreens (C33).

No.	Description	Sheet
C33	Cab side windscreen frame (2)	B5
C43	Fire hole door and screen	B1
C44	Regulator levers	B5
C45	Whistle lever (2)	B5
C46	Injector hand wheel (2)	B5
C48	Backhead shelf	B5
C49	Works plates - Five choices of engine	B2
C50	Cutoff indicator	B2
C51	Steam manifold hand wheel - Large (2)	B5
C52	Steam manifold hand wheel - Small (3)	B5
C53	Vacuum ejector handle	B5
C54	Cab gauges (5)	B5
C55	Bracket - Vacuum/Steam chest pressure	B3
C56	Bracket - Boiler pressure/pyrometer	B3
C57	Bracket - Boiler pressure gauge	B3
C58	Bracket - Heater gauge	B5

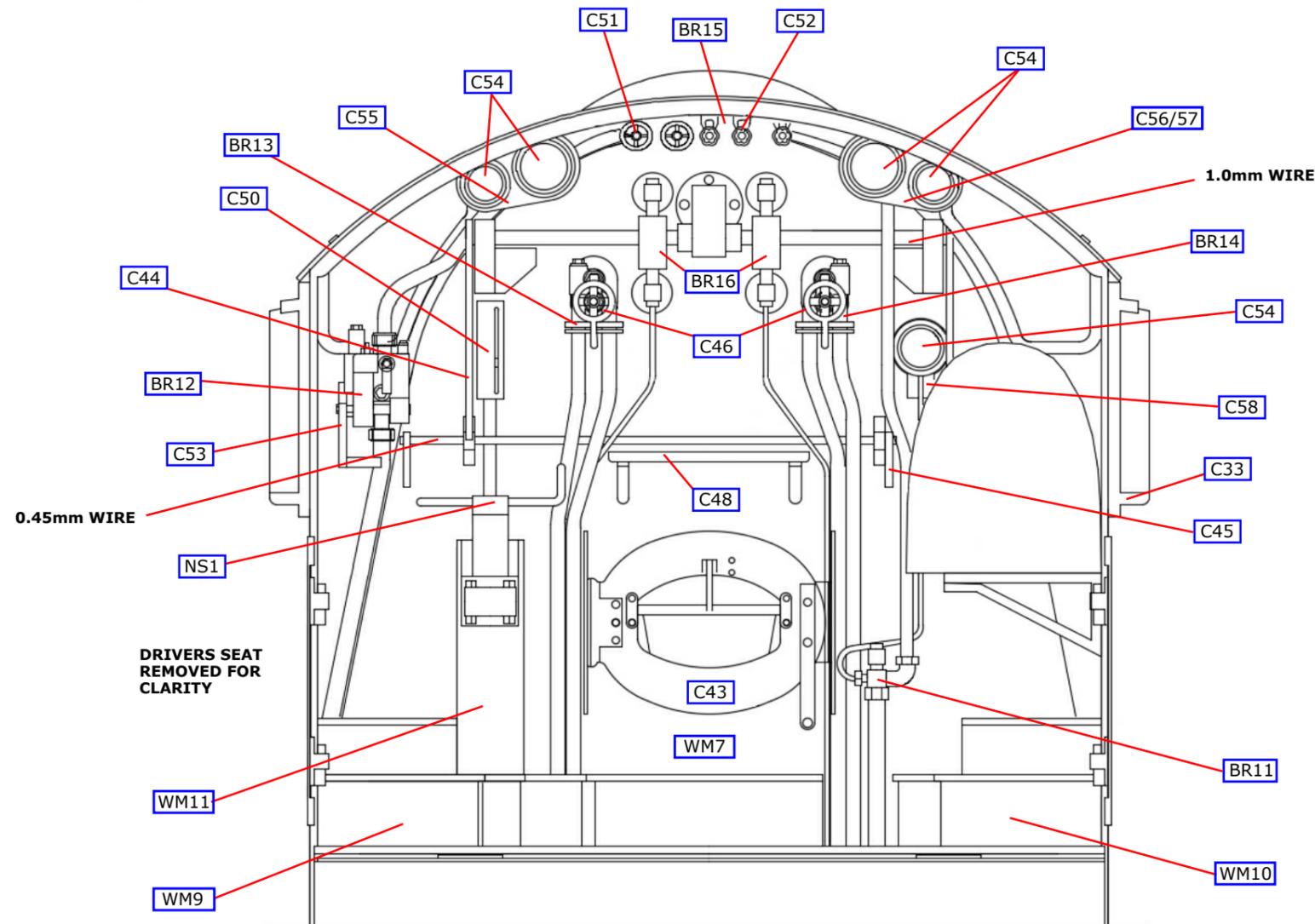


Fig 24. Cab backhead

FINISHING THE MODEL

Brakes. Emboss the rivets on the brake hanger laminations (B6) rear and (B7) middle and front and attach the hangers to the pivot wires.

Emboss the bolts on the brake pull rods (B1) and overlays (B2) and solder the overlays to the top of B1 and fix this assembly loosely to the brake hangers.

Drill a 0.8mm hole in the middle of each brake cylinder at it's base. Attach the two brake cylinders (WM6) to the chassis stay F5.

Laminate the front lower brake pull rod (B4) to the longer pull rod shaft (B3) which runs from front to rear. Laminate the rear brake cylinder lever (B5) halves together.

Insert a length of 2.0mm wire (trial measure first and cut to length to save taking it out again later) through the front bearing hole in the frame and thread on the two upper level pull rods (B3). Pass the wire right across the frames and secure to each frame side.

Carefully clip the lower slack adjuster section (B4) laminations to the previously installed lower brake pull rods B1. Inserting short lengths of 0.8mm wire into the base of the brake cylinders will help locate these pull rods as it passes through the front levers.

Pass a precut length of 1.6mm wire through the rear frame brake shaft bearings and thread the loose rear ends of B3 on and in the middle the rear brake lever assembly B5, secure the shaft to each side of the frame.

Secure the two pull rods B3 to the rear brake shaft ensuring they are straight and parallel along the length of the engine.

Insert a short length of 0.8 mm wire into the frame stay F4 to centralise the rear brake lever, adjust the angle of the lever as shown in Fig 25 and secure the lever in position.

With everything in place fix permanently all loose joints to form a rigid structure.

Buffers. Assemble the buffers as shown in Fig 27 and attach to the front casing.

Drawbar. Attach a washer to the head of a 6BA screw (see Fig 28), remove the cusp from the insides of the pivot holes so that the drawbar (F45) fits over the head of the screw. Pass the drawbar through the rear drag beam and use the screw to retain.

Lubricator linkage. Use Fig 26, for reference.

Full working. Begin by attaching a length of 0.8mm wire to the top of the outer drive lever (M44), shorten the wire on the front so that 0.8mm stub protrudes. Slide the longer end through the mounting bracket (F8) and fold up the bracket so that the outer hole fits over the 0.8mm wire stub. Solder the inner drive lever (M43) to the wire on the inside, ensure M43 and M44 are parallel and align with each other.

Fit the lubricators (BR4) and attach the arms (M47) to the shafts, retain with the handwheels (M48), ensure the arms are free to move. Laminate the two halves of the drive links (M45 & M46) and using 0.55 pins attach the links to the two lubricator arms M47 and outer drive lever M44. Next laminate the eccentric rod fork joint (M42) to the eccentric rod (M41) and with an 0.55mm pin attach the rod to the inner drive lever M43.

Static. Use one of the small rivets to attach the fixed linkages (M49) to the mounting bracket (F8), attach the lubricators BR4 and add the hand wheels M48. Add a short length of 0.8mm wire to the inside of the bracket F8 and fit the inner driver lever (M43), ensure it is free to move. Fit the laminated eccentric rod as detailed above.

Both. Attach the eccentric crank (M40) to the eccentric rod with a small pin. Fit the completed assembly and bracket F8 to the bracket F7 and then finally fix the crank onto the rear driving wheel retaining nut. The crank/eccentric rod bearing should face toward the wheel centre.

No.	Description	Sheet
B1	Brake pull rods/cross shafts	B3
B2	Brake cross shaft overlays (3)	B3
B3	Brake pull rod lamination - Front to rear (2)	B5
B4	Brake pull rod lamination - Front (2)	B5
B5	Rear brake cylinder lever lamination (2)	B5
B6	Brake hanger lamination - Rear (4)	B3
B7	Brake hanger lamination - Mid/front (8)	B3
F8	Mechanical lubricator mounting bracket	B3
F45	Drawbar	B1
M40	Lubricator eccentric crank	A2
M41	Lubricator eccentric rod	A2
M42	Lubricator eccentric rod fork joint	A2
M43	Lubricator drive lever - Inner	A2
M44	Lubricator drive lever - Outer	A2
M45	Lubricator drive link - Inner lamination (2)	A2
M46	Lubricator drive link - Outer lamination (2)	A2
M47	Lubricator arm (2)	A2
M48	Lubricator handwheel (2)	A2
M49	Lubricator linkages - Fixed	A2

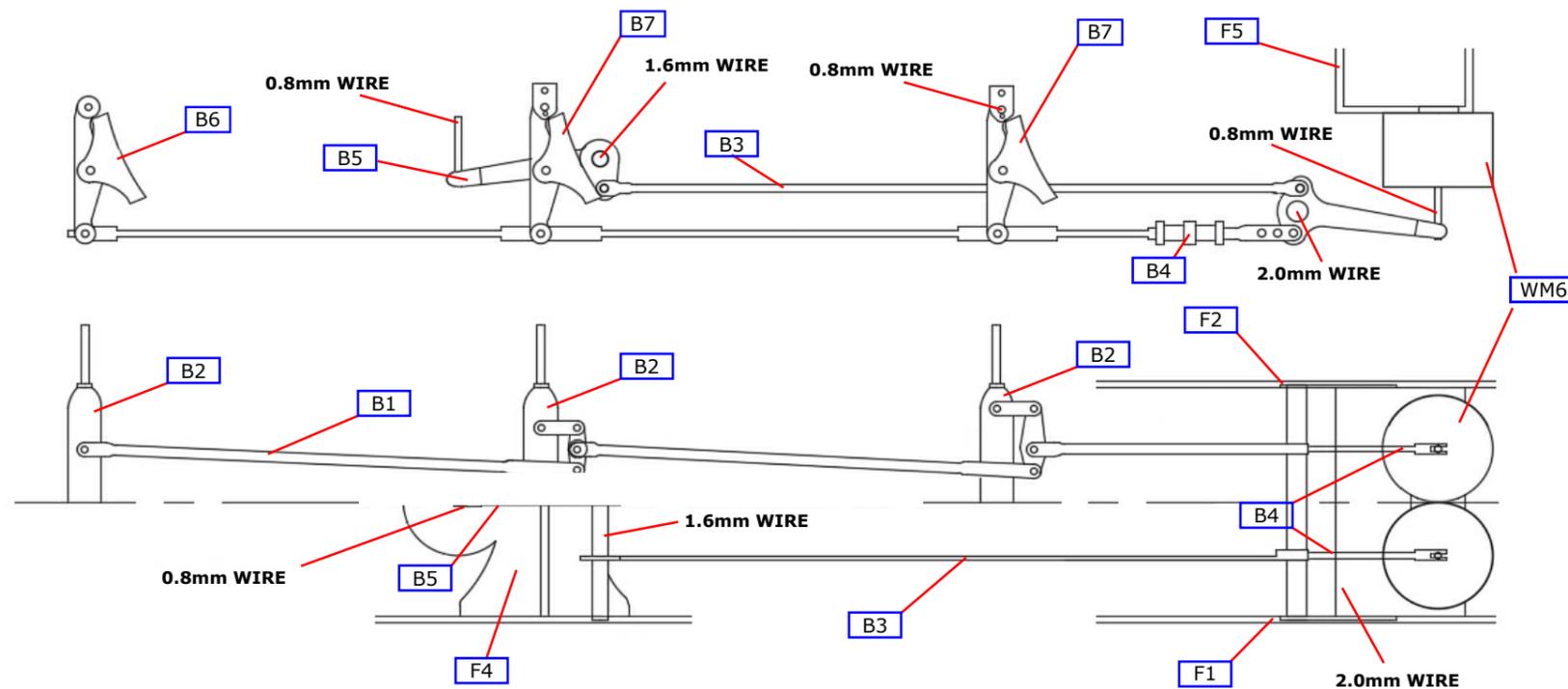


Fig 25. Brake Rigging

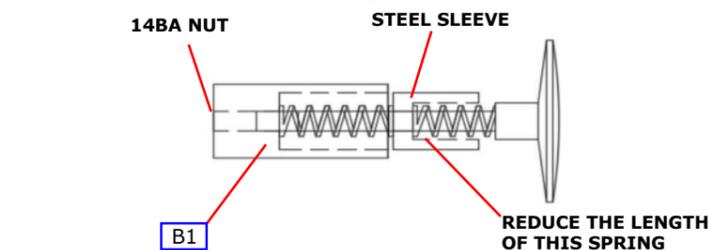


Fig 27. Buffers



Fig 28. Drawbar

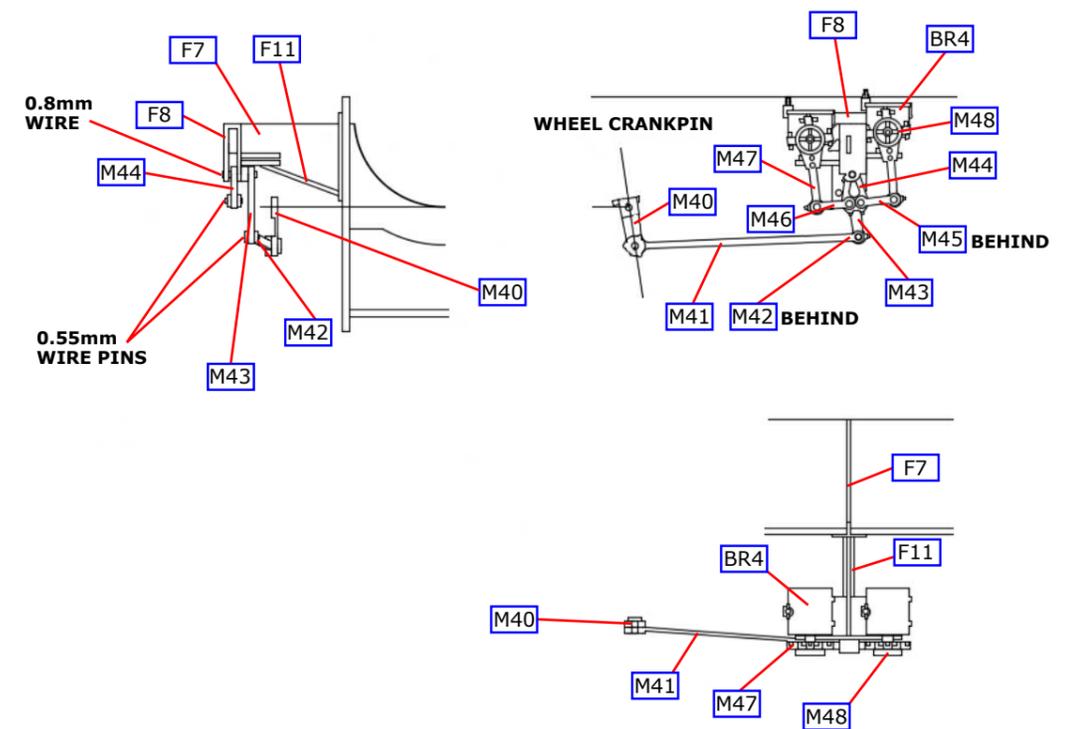
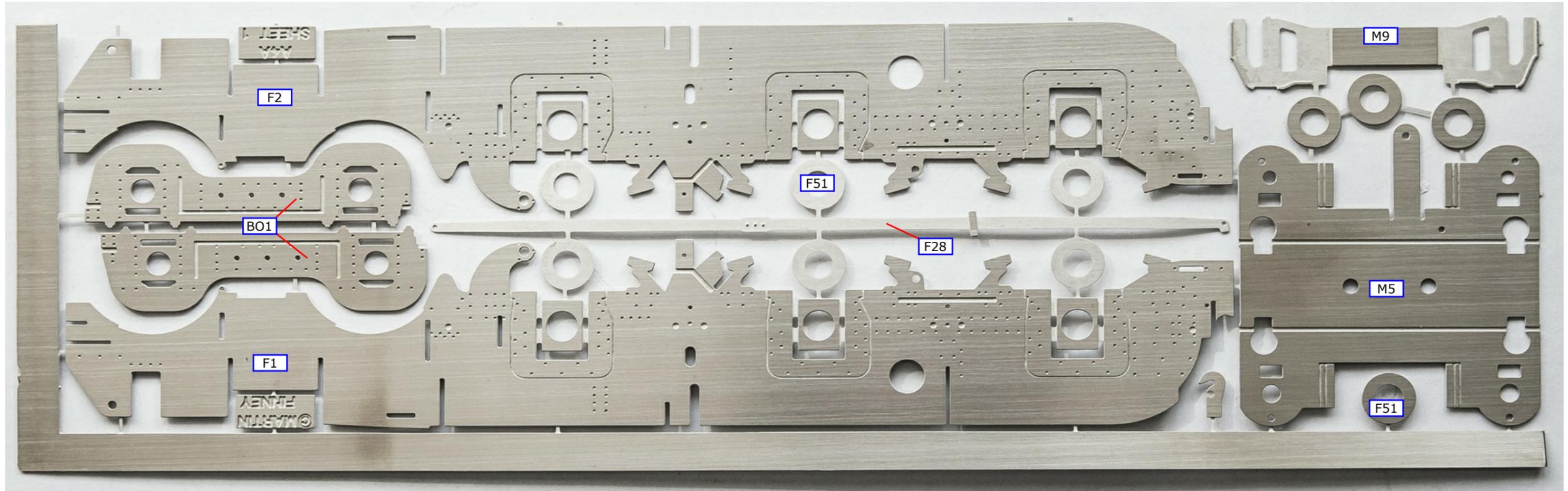
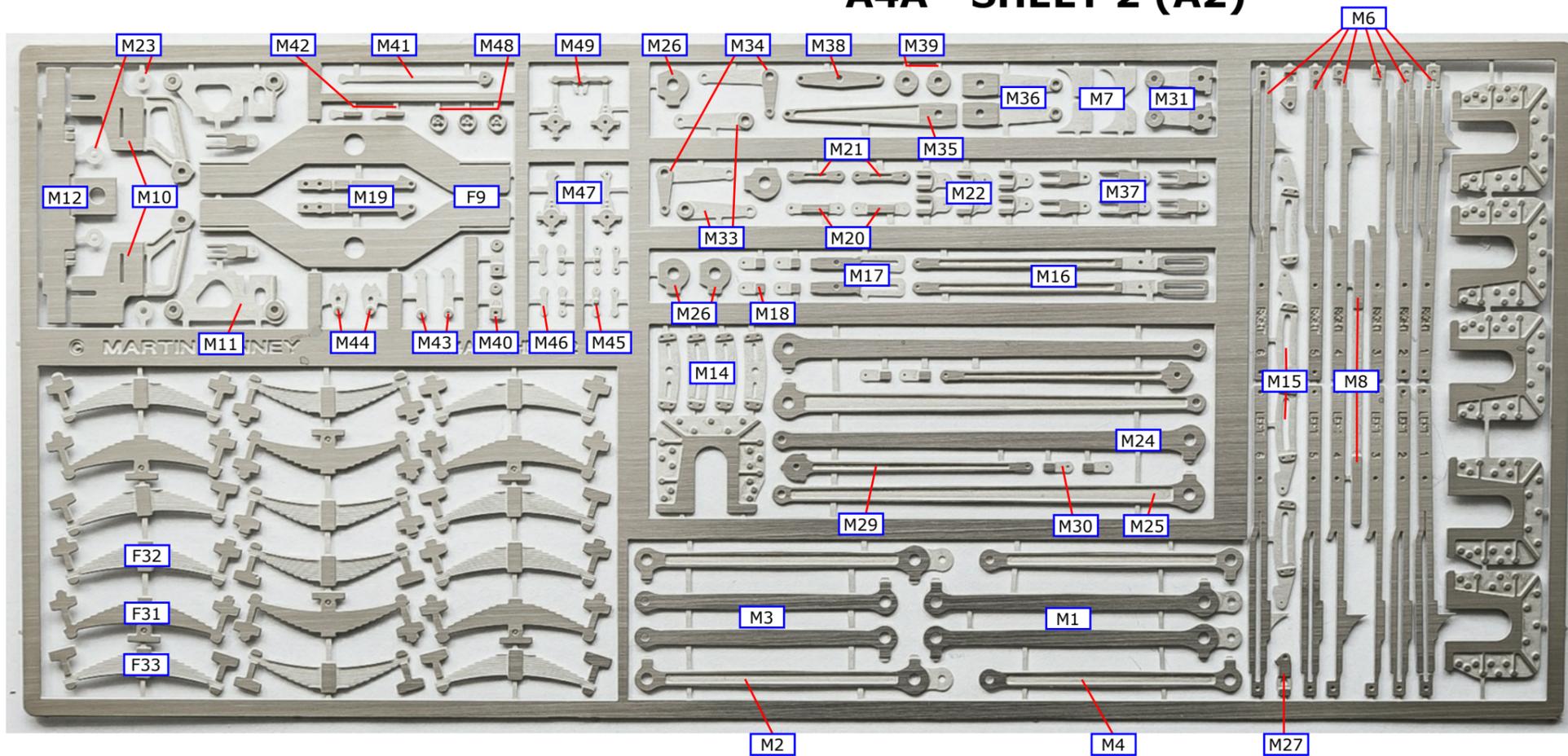


Fig 26. Lubricator Linkage

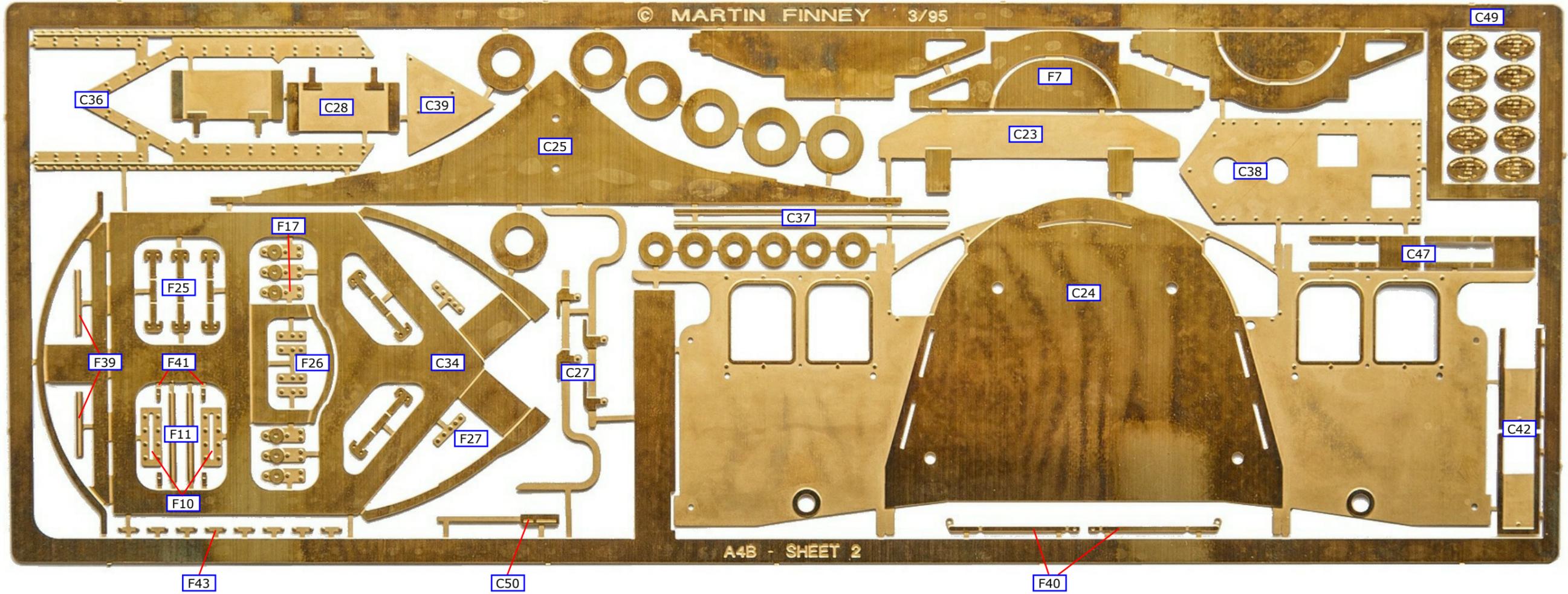
A4A - SHEET 1 (A1)



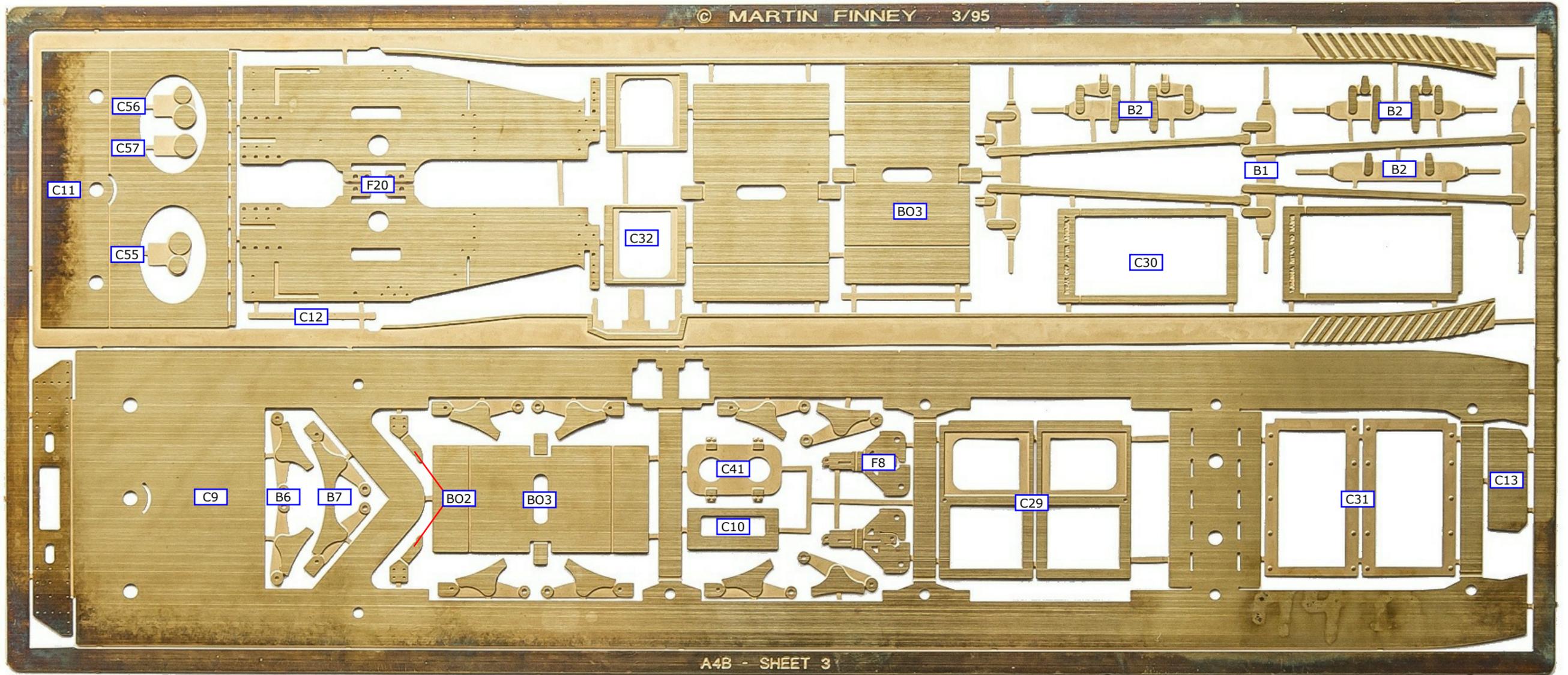
A4A - SHEET 2 (A2)



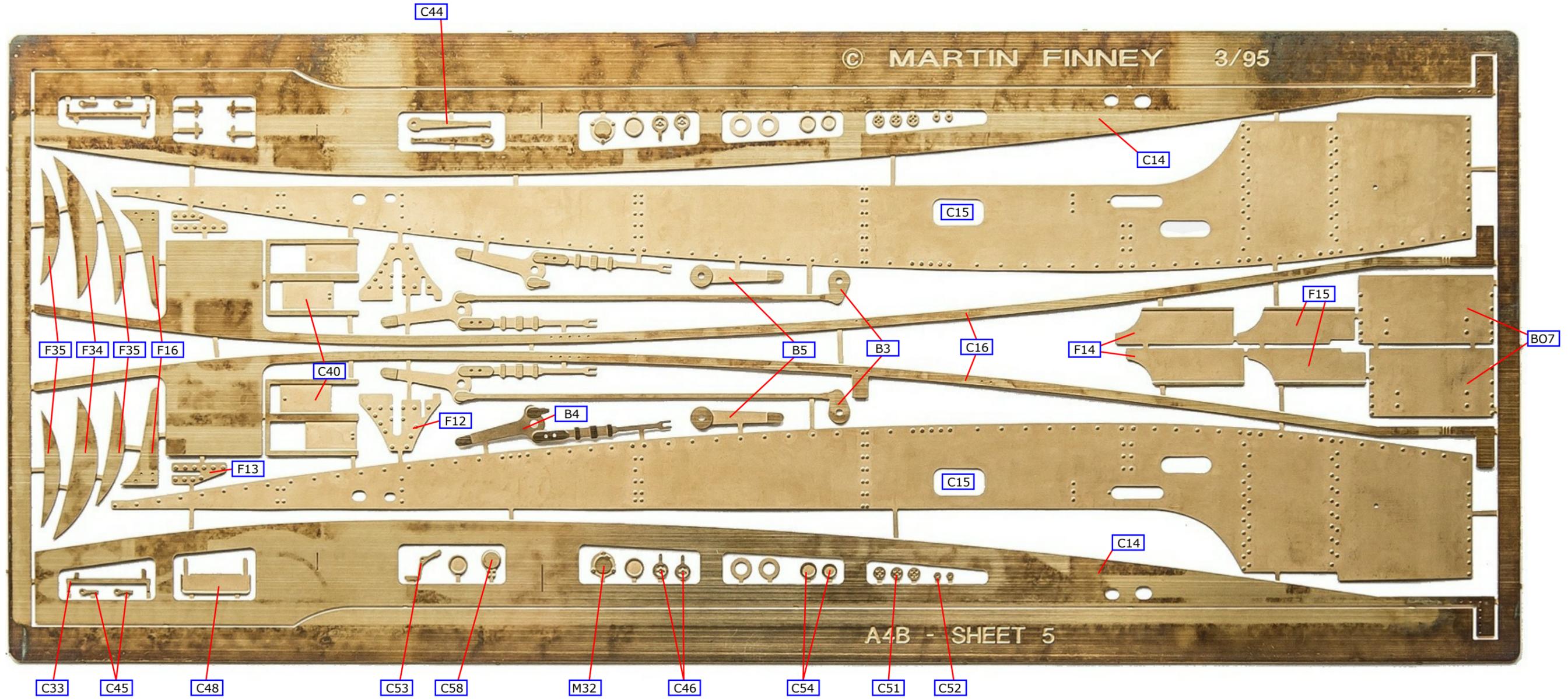
A4B - SHEET 2 (B2)



A4B - SHEET 3 (B3)



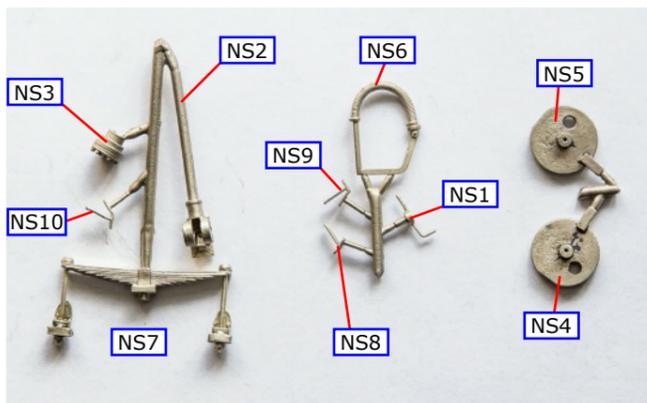
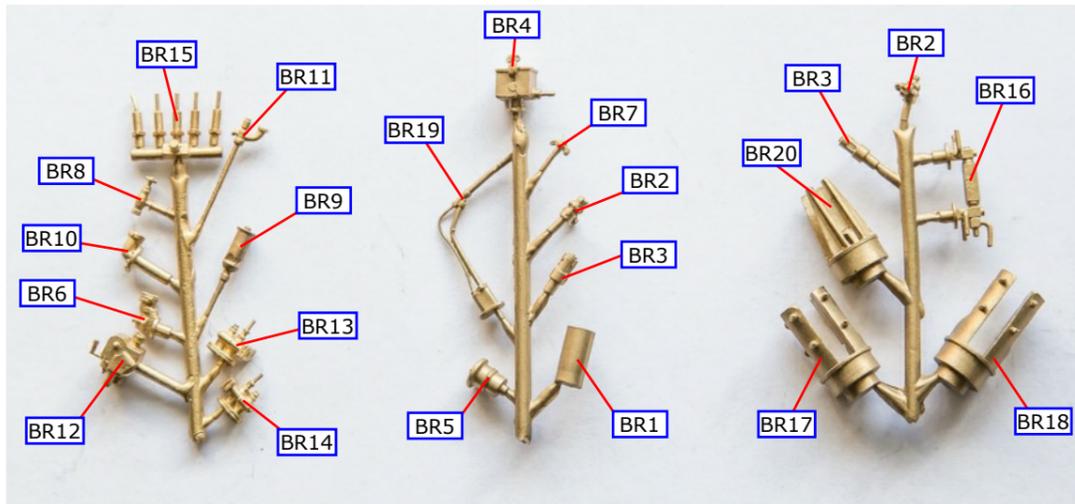
A4B - SHEET 5 (B5)



CAST PARTS

BRASS CASTINGS

BR1	Buffer housing (2)	BR12	Vacuum ejector
BR2	Drain cock (4)	BR13	Injector valve, left
BR3	Cylinder relief valve (4)	BR14	Injector valve, right
BR4	Mechanical lubricator (2)	BR15	Steam manifold box
BR5	Safety valve (2)	BR16	Water gauge (2)
BR6	Blowdown tap	BR17	Valve crosshead guide, front (2)
BR7	Mudhole door clamp (2)	BR18	Valve crosshead guide, rear (2)
BR8	Anti carbonising valve	BR19	Steam sanding pipes (2)
BR9	Whistle	BR20	Valve crosshead guide, front - old type (2)
BR10	Ejector exhaust pipe elbow	BR21	Buffer spring gaiter (2)
BR11	Mason reducing valve		



OTHER COMPONENTS, CHASSIS

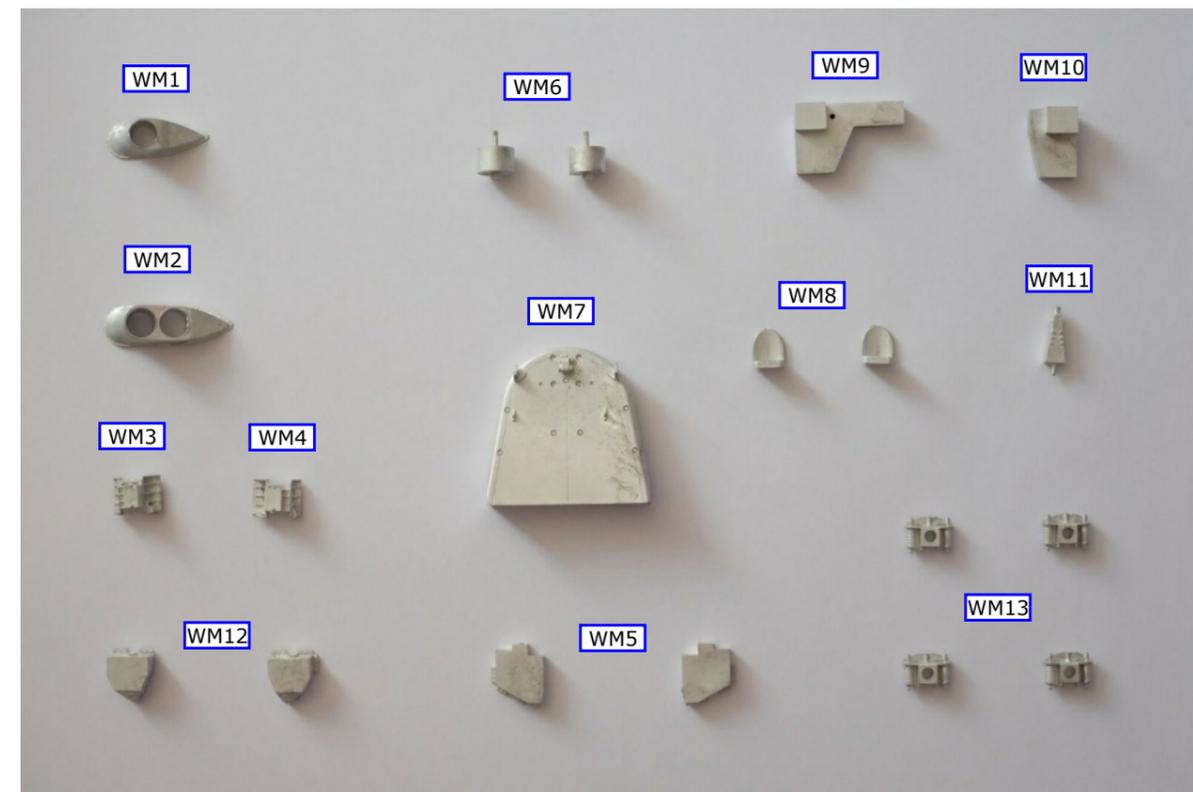
- 3/16" bearing (6)
- 5/32" top hat bearing (6)
- 6BA Cheese head screw 1" (6)
- 6BA nut (6)
- Nickel silver wire - 1.6mm - for coupling rod pins, crosshead pins, radius link pivots & 2 to 1 lever pivot
- Nickel silver wire - 1.4mm - for valve rods
- Nickel silver wire - 1.25mm - for Cartazzi axlebox ties & radius rods
- Nickel silver wire - 0.8mm - for valve gear pins
- Brass wire - 1/8" - for compensation beam pivots & exhaust steam injector pipe
- Brass tube - 5/32" outside diameter - for compensation beams
- Steel wire - 1/16" - front compensation beam
- Brass wire - 0.45mm - for radius link bolts
- Brass wire - 0.8mm - for brake hanger pivots, sand pipes & spring wire
- Brass wire - 1.8mm for sandbox fill pipes & reversing cross shaft
- Brass wire - 2mm - for brake cross shaft
- Valve gear rivet (2)

NICKEL SILVER CASTINGS

NS1	Screw reverser handle
NS2	Crosshead & piston rod (2)
NS3	Piston rod gland (2)
NS4	Cylinder front cover, left
NS5	Cylinder front cover, right
NS6	Vacuum pipe
NS7	Cartazzi axlebox spring (2)
NS8	Lampbracket - Upper
NS9	Lampbracket - Lower centre
NS10	Lampbracket - Lower outer (2)

WHITE METAL CASTINGS

WM1	Single chimney
WM2	Double chimney
WM3	Cartazzi axlebox, left
WM4	Cartazzi axlebox, right
WM5	Front sandbox (2)
WM6	Brake cylinder (2)
WM7	Backhead
WM8	Cab seats (2)
WM9	Cab footplate platform, left
WM10	Cab footplate platform, right
WM11	Screw reverser column
WM12	Middle sandbox (2)
WM13	Bogie axle boxes (4)



OTHER COMPONENTS, BODY

- Nickel silver wire - 0.8mm - for handrails
- Brass wire - 1.8mm - for vacuum ejector exhaust pipe
- Brass wire - 1mm square - for washout plugs
- Brass wire - 1mm - for cab regulator shaft
- Brass wire - 0.3mm for lubricator pipes
- Copper wire - 0.3mm for cab pipework
- Copper wire - 0.6mm for cab pipework
- Copper wire - 1.2mm for cab pipework
- Handrail knob (32)
- Self tapping screw 1/4" (13)