ENGINE & TENDER GA

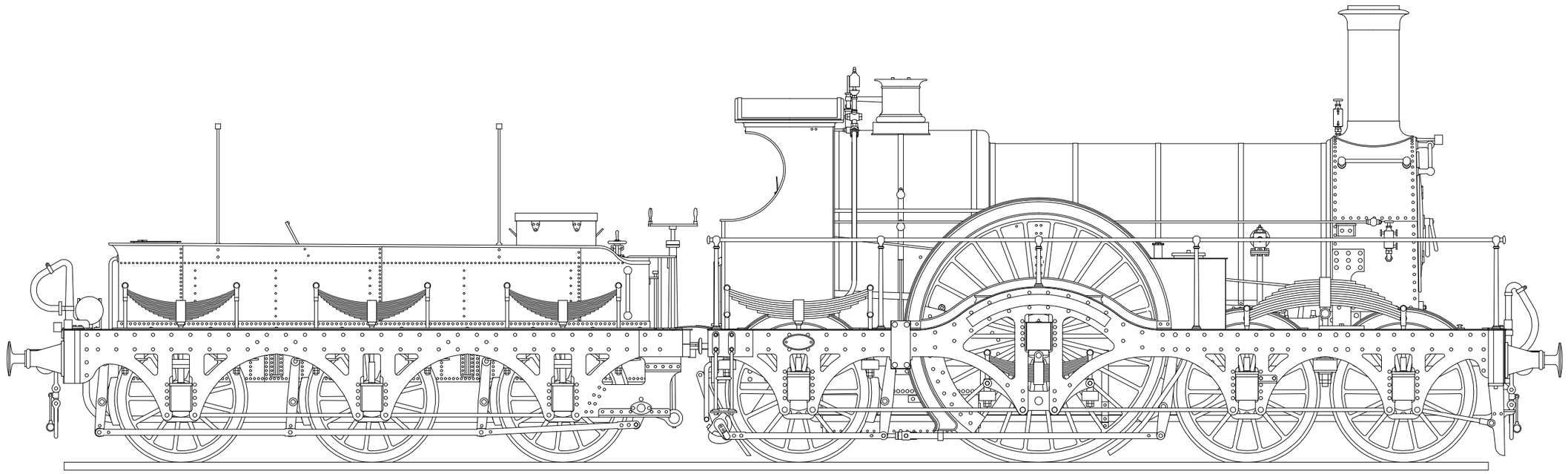


Fig 1. Emperor With 2700 Gallon Tender, Circa 1886

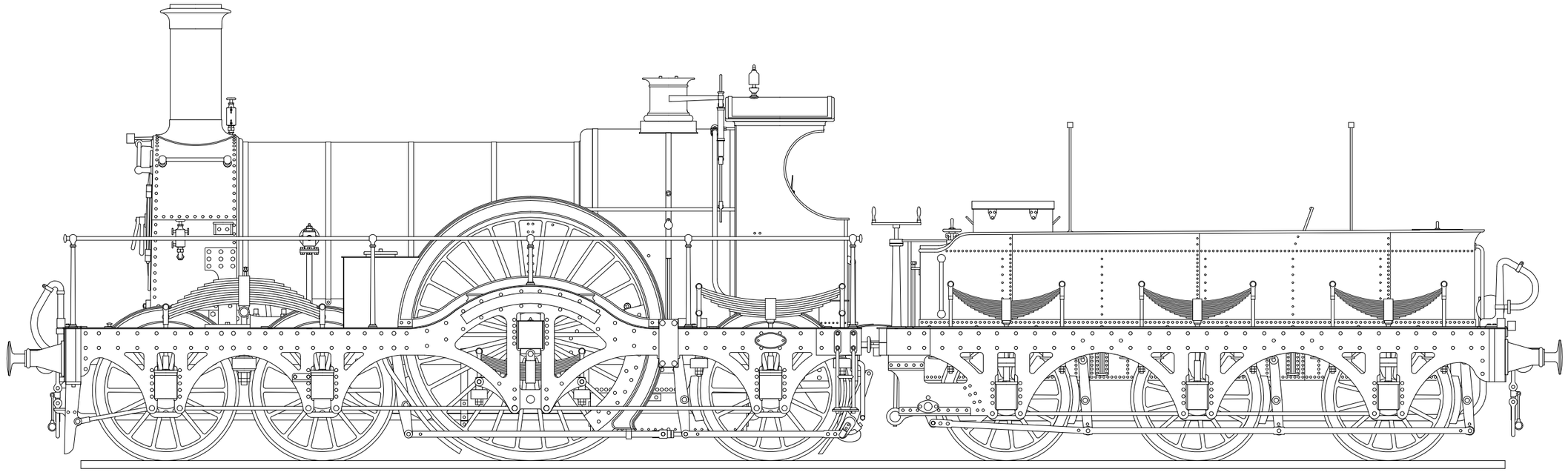
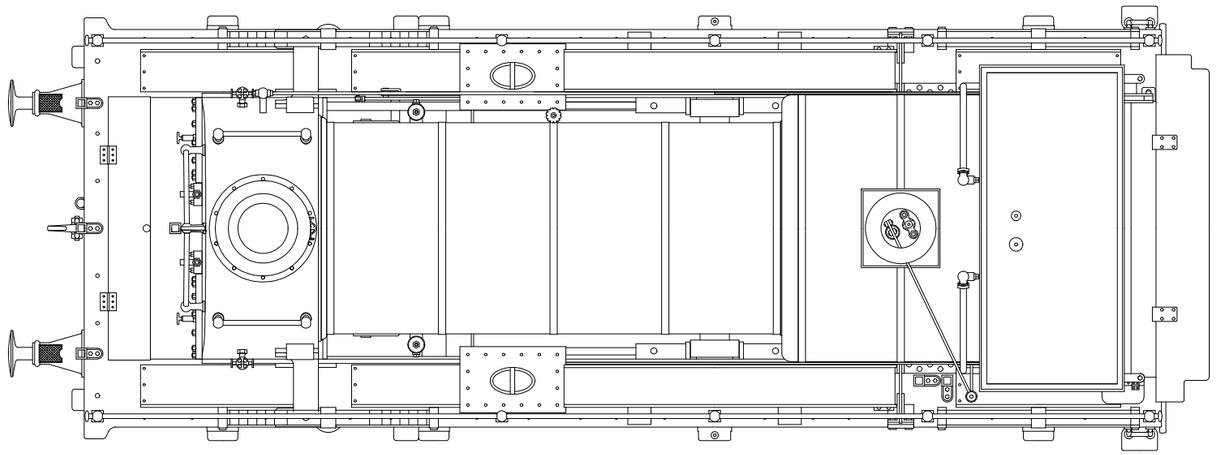


Fig 2. Bulkeley with 3000 Gallon Tender, Circa 1890

ENGINE GA



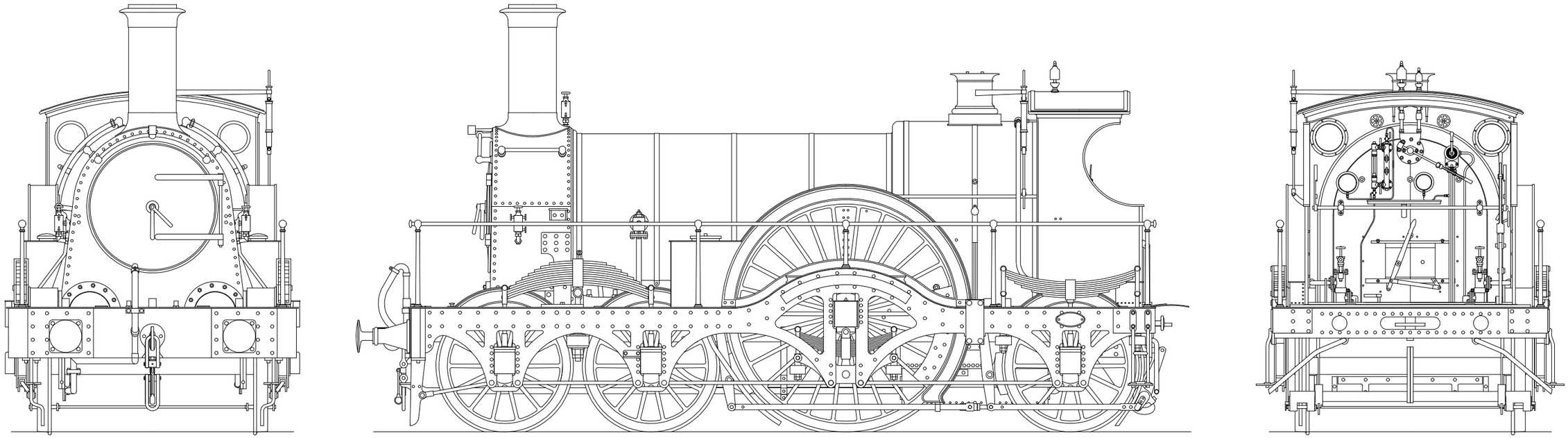


Fig 3. Engine GA, Circa 1890 with Whistles Moved to Cab Roof

INSIDE FRAME ASSEMBLY

FRAMES AND FRAME STRETCHERS.

Start construction by preparing the frames (F1 & F2) as shown in Fig 4.

Open up the following holes in the frames:

For plunger pick-ups if they are being used
For brake hanger pivots - 0.8 mm
Brake cross shaft - 1.6 mm
For compensation beam pivot – 1.6 mm

Emboss the rivets marked by half etched holes. Tap 12BA the holes used for attaching the splasher back. Fold over the axle slot reinforcing plates for the carrying wheels through 180^{O} with **the half etched line on the outside of the fold** and solder in place**.** Check the width of the slots so that the axles are a sliding fit. Temporarily fit the 0.7 mm wire wheel retaining pins.

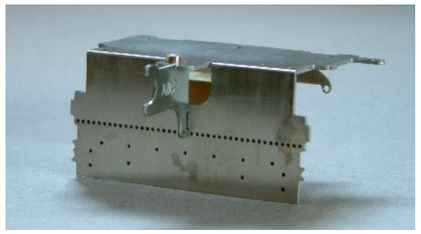
Fold up the horn guides (F10) and check the bearing for fit. Solder the horn guides in place in the slots in the frames. Cut through the bridging piece at the top of the horn guides with a carborundum disc in a mini drill and snap off the bridge to form the two separate guides. Tap 12BA the holes used attach the springs. Fold up the driving wheel springs (D7) and solder the driving wheel spring outer lamination (D8) to their outer face. Check that the springs fit correctly to the horn guides using 12BA x 3/32” screws.

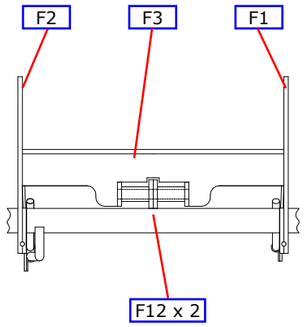
Carefully clean the edges of the frame stretchers , front, firebox front and rear(F3, F4 & F5) so that when fitted to the frames the width between the frames will be 42.64 mm.

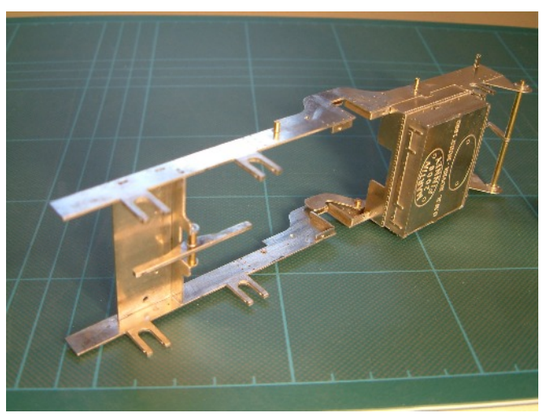
If appropriate, tap the inside cylinder fixing holes in the front stretcher 12 BA. Fold up the front and rear stretchers carefully, making sure that the half etched fold line is on the inside and that each bend is a right angle. Check that all tabs on the stretchers fit properly in their corresponding chassis slots so that the rest of the spacer is hard up against the inside of the frames.

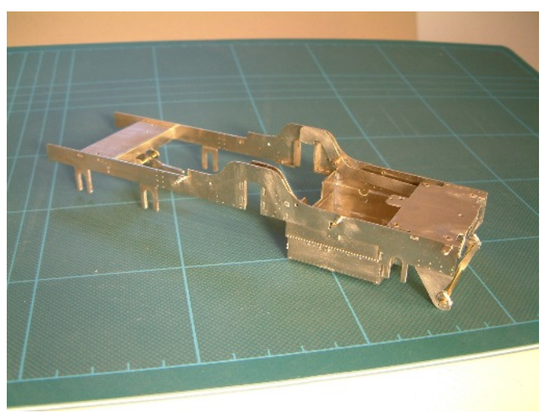
If appropriate, tap 10 BA the hole in the ABC gearbox anchor (F11). Fold up the gearbox anchor and check it fits correctly, using a 10BA x 9/64” screw, on the rear stretcher.

No.	Description	Sheet
F1	Inside frame, left	1
F2	Inside frame, right	1
F3	Frame stretcher, front	1
F4	Frame stretcher, firebox front	1
F5	Frame stretcher, rear	1
F6	Ash pan side, left	1
F7	Ash pan side, right	1
F8	Ash pan base	1
F10	Horn guides (2)	1
F11	ABC gearbox anchor	1
F12	Compensation beam, front (2)	1
F13	Compensation beam, rear (2)	1
F15	Driving wheel washer	1 & 3
F16	Carrying wheel washer	1 & 3
D7	Driving wheel spring (2)	1
D8	Driving wheel spring, outer lamination (2)	1









Now assemble the frames. Start by tack soldering the rear stretcher to both sides. Check that everything is square and that the stretchers are hard against the frames. Put an axle (or better a longer piece of 3/16" rod) through the horn block 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 stretchers to the frames. It is important to check constantly that the chassis is square and that the frames are straight.

Solder the ash pan sides, left and right and the ash pan base (F6, F7 & F8) in place. Solder 0.8 mm wire through the frame holes B to form the brake hanger pivots and remove the sections of wire between the frames.

FITTING THE COMPENSATION BEAMS.

Cut a 12.7 mm long piece of 1.6 mm brass rod so that it fits through the pivot bracket holes in the front frame stretcher. Prepare a 10.1 mm long piece of 3/32” tube so that it fits on the brass rod between the pivot brackets. Solder the two laminations of the front compensation beam (F12), centrally, to the tube.

Prepare two 3 mm long pieces of 3/32" brass tube. Solder rear the compensation beams (F13) to the pieces of tube 1.0 mm from one end. Cut a 44.6 mm long piece of 1.6 mm brass rod for the rear compensation beam pivots.

Temporarily fit all the wheels, axles and compensation beams. Confirm that the compensation works properly and check if the chassis is sitting level. The height of the top of the frames above the rail, both at the front and rear, should be 28.64 mm.

If you are fitting a motor then you must cut away a section of the rear compensation beam pivot. First dismantle the chassis and then solder the pivot rod **very** securely to the frames. A good solder fillet around the rod on the outside of the frames will not show on the completed model. Now cut away the centre section of the pivot rod as shown in Fig 4.

Reassemble the chassis, this time using suitable washers (F15 & F16) to limit wheel side play and fitting the ABC gearbox. Check that the gearbox anchor (F11) works correctly.

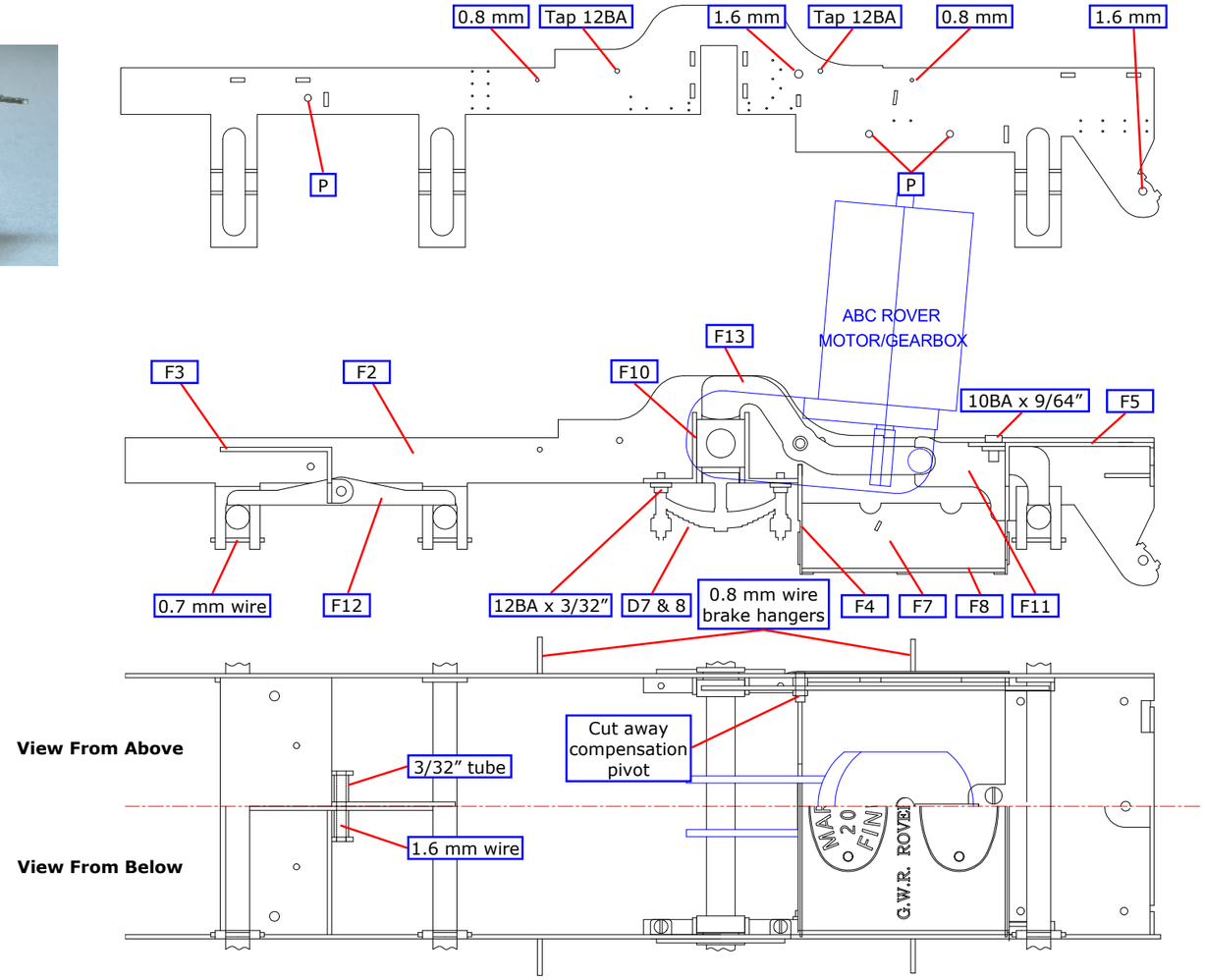


Fig 4. Frame Assembly

INSIDE MOTION 1

CYLINDERS & SLIDEBARS

Bend the slide bars (M4) at right angles and fit to the cylinder block front (M1) so that the slide bars with the six holes are upwards. Cut two 3 mm long lengths of 3/32" tube and insert in the piston rod holes so that they are perpendicular to the cylinder front. Emboss the rivets on the slide bar to cylinder block bracket (M5), fold up and solder in place over the tube as shown below.

Detail the cylinder fronts by attaching the rod glands (M2) using 0.7 mm wire to help alignment and represent the studs.

Fix the mounting bracket (M3) in place so that the tabs fit in the slots in the slide bars and the cylinders and slide bars are horizontal. Check the fit of this assembly between frames attaching it with the two 12BA x 3/32" screws.

MOTION BRACKET

Emboss the rivets on the motion bracket (M7). Fit in position on the ends of the slide bars together with the centre frame (M9) which fits in the slots in parts M1 & M7. Check the crossheads for clearance.

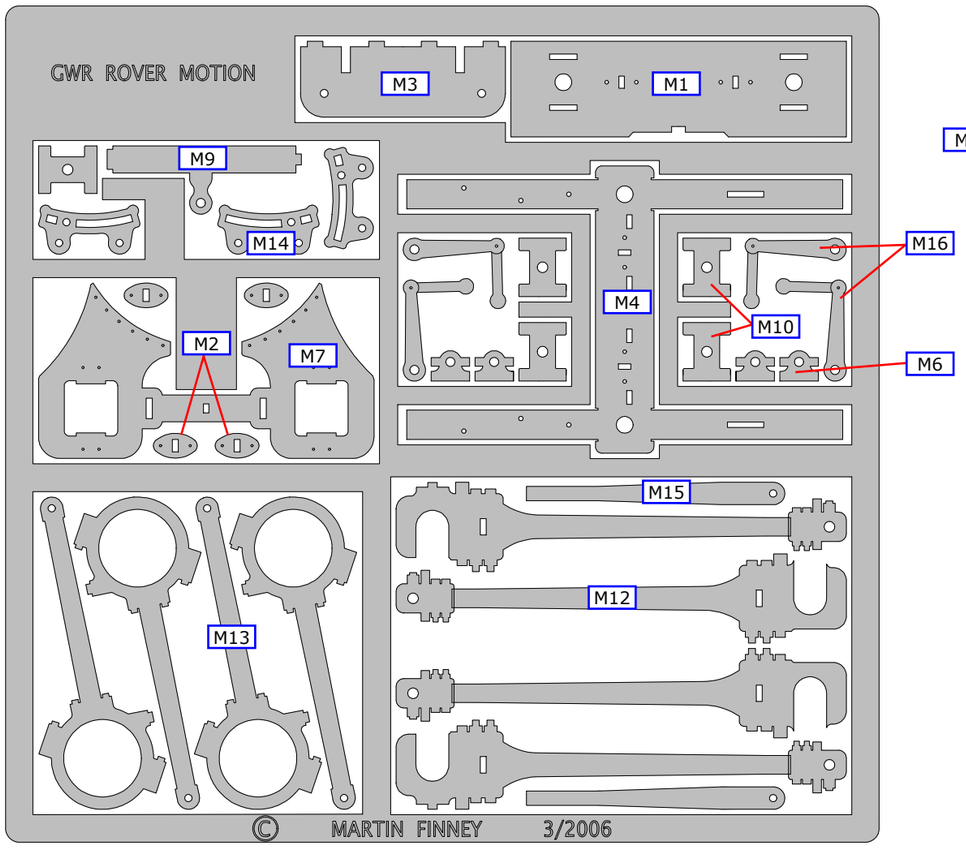
Emboss the rivets on the slide bar to motion bracket angle (M8) and solder in place as shown below. Attach the oil cups in the holes in the upper slide bar.

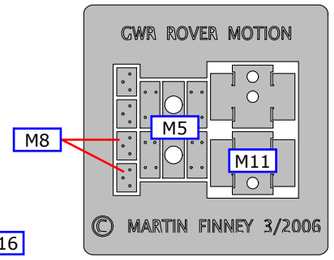
CROSSHEADS

Bend up a crosshead slipper (M11) as shown in below. Using a 1.6 mm drill in a block of wood as a mandrel, solder the crosshead faces (M10) in place. The completed crosshead should now be a nice close fit on the slide bars with minimal slop. Repeat for the other crosshead.

Cut two pieces of 1.6 mm nickel silver wire, 20.6 mm long, for the piston rods. Insert a piston rod into the cylinder front tube and slide the cross head into position on the piston rod, with the rod flush with the inside face of the slide bar. Carefully solder the piston rod to the crosshead and check the assembly for free but not sloppy movement.

No.	Description	Sheet	
M1	Cylinder block front	M9	Centre frame
M2	Valve rod gland (2)	M10	Crosshead face (4)
M3	Cylinder block mounting bracket	M11	Crosshead slipper assembly (2)
M4	Slide bar assembly	M12	Connecting rod (4)
M5	Slide bar to cylinder block bracket (2)	M13	Eccentric sheath (4)
M6	Weigh shaft bearing (2)	M14	Expansion link (2)
M7	Motion bracket	M15	Valve rod (2)
M8	Slide bar to motion bracket angle (4)	M16	Lifting link (4)





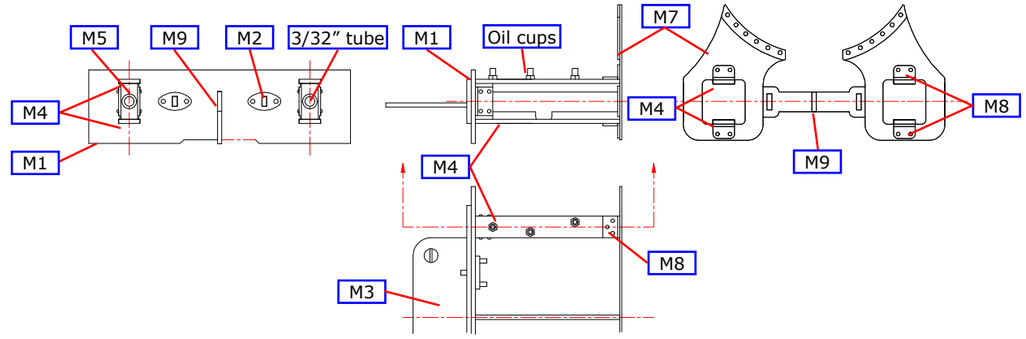


Fig 6. Cylinders, Slidebars & Motion Bracket

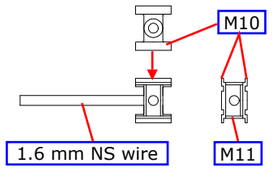
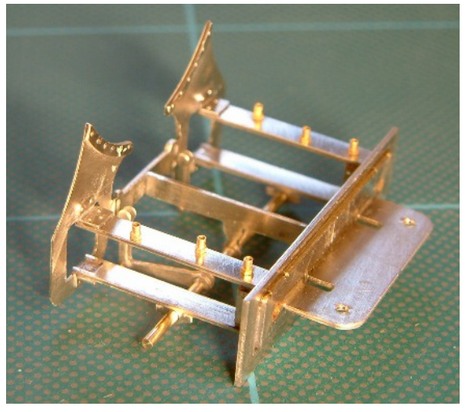
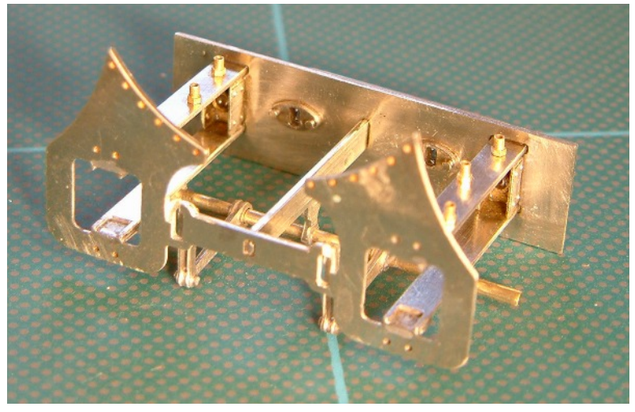


Fig 5. Crosshead





INSIDE MOTION 2

METHODS OF ASSEMBLING THE CRANK AXLE

The following methods may be used to assemble the crank axle:

a. Soft solder using 243° C solder and Fry's Powerflow flux..

b. Bond with either Loctite 242 or, for a more permanent bond, use Loctite 601 or 602.

Slide the eccentrics and motor to one side so that they are as far as possible from the crank to be soldered. Place the axle on a heat resistant surface. Apply flux and a small piece of solder on the axle between the crank webs. Using a small gas torch apply heat to the axle allowing the heat to pass along the axle and melt the solder. Inspect the soldered joints. It is essential that you have a complete ring of solder around the axle on both sides of the crank. When satisfied that the joint is good, slide the eccentrics and motor across and repeat on the other crank.

Using a Carborundum disc in a mini-drill, gently cut through the unwanted parts of the axle. After a thorough clean up of the axle permanently attach the eccentrics to the axle using Loctite.

THE CRANK AXLE

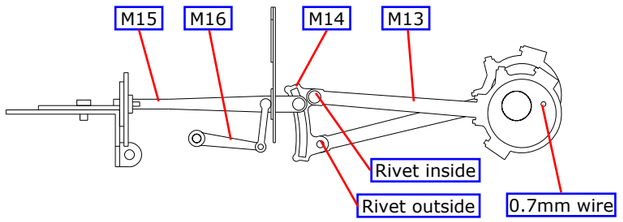
If you are making a crank axle using Slater's wheels you will need a pair of cast cranks. These are available from Finney7 (Ref. M7/8).

Clean up the crank castings and ream out the axle holes until they are a nice tight fit on the axle.

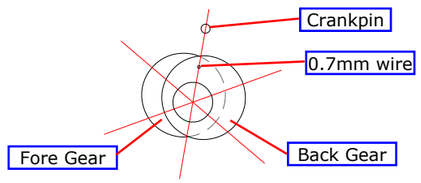
Check the fit of the eccentric sheaths (M13) on the eccentrics. Ream out the holes in the eccentrics so that they are a tight fit on the axle. Then carefully open out the small holes in the eccentrics, so that the 0.7 mm wire fits in the holes. Black the sliding faces of the eccentric sheaves and eccentrics.

Drill a 3/16" hole in a small block of wood, leaving the drill in the hole, to act as a mandrel to align the eccentrics. Using Fig 8 as a guide, assemble the eccentric sheaths, eccentrics and 0.7 mm wire pin in pairs over the mandrel and solder the wire pin to both eccentrics. Cut the wire flush with the face of the eccentrics.

Rivet the eccentric sheaths, expansion links (M14) and valve rods (M15) together paying particular attention to the direction of the rivets - see Fig 8. Make the left side a mirror image of the right.



Right Eccentrics From Centre Line



Left Eccentrics From Centre Line

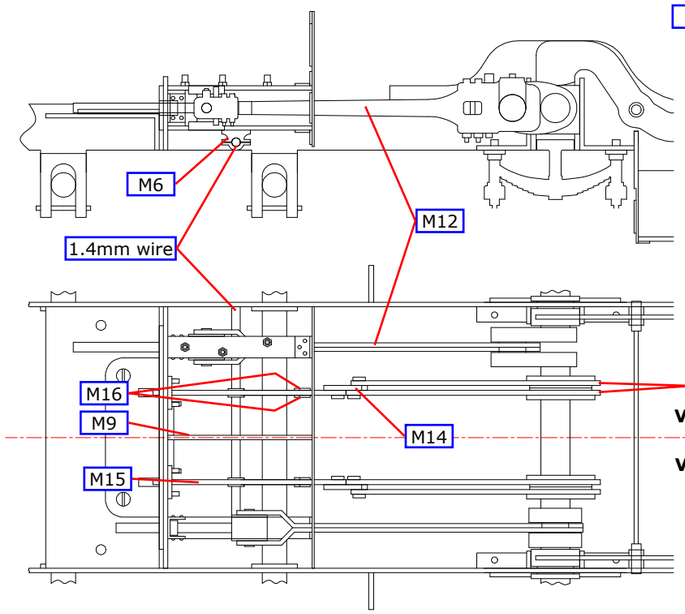


Fig 8. Valve Gear and Motion

Assemble the crank axle using the procedure above to the dimensions in Fig 7. If you are motorising the model include the ABC gearbox.

CONNECTING RODS

Form the joggle in the connecting rods (M12), with the fold lines on the inside, to make the fork around the crosshead as shown in Fig 8. Solder the rods together after first fitting them over the cranks. Attach the connecting rods to the crossheads using 1.6 mm nickel silver wire as pins.

Thread the crank axle assembly into the cylinders and check that everything works with no binding.

REVERSING MECHANISM

Emboss the rivets on part M16 and laminate back to back.

Cut a piece of 1.4 mm wire, 36.9 mm long for the weigh shaft. Thread the rod through the hole in the centre frame (M9) and thread the laminated lifting link (M16) and weigh shaft bearing (M6) on each end. Arrange the rod, brackets and lifting links as shown in the drawings. The lifting link laminations fit either side of the valve rod without being attached. The weigh shaft fits with one end against the right side frame. Solder all the components in place.

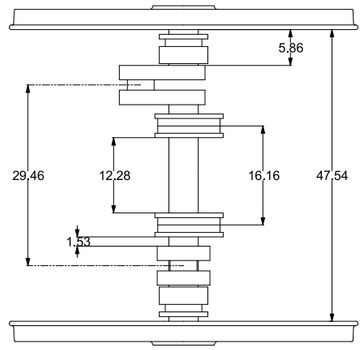
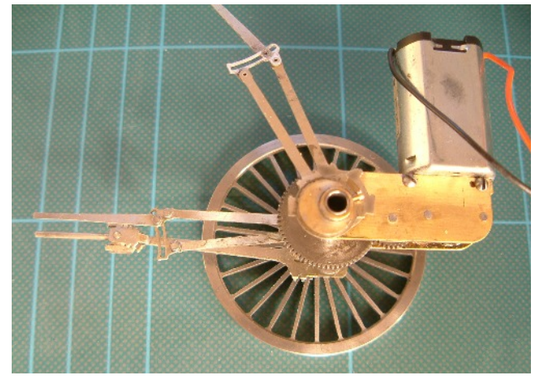
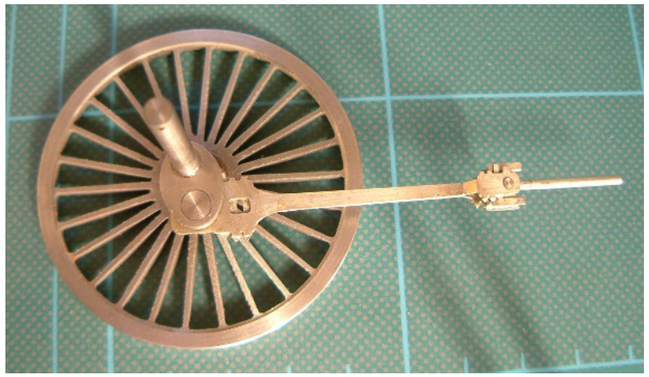
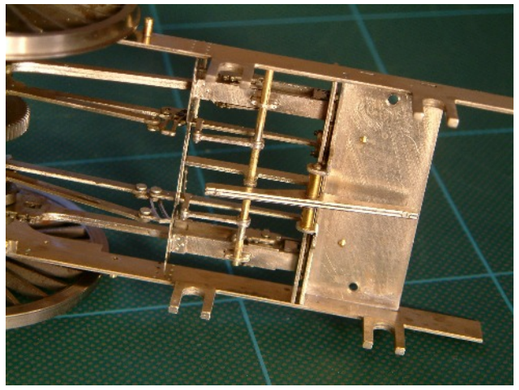
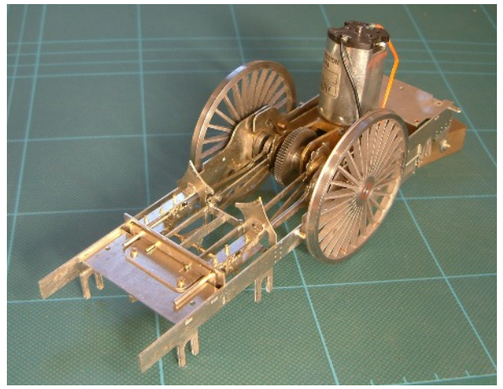


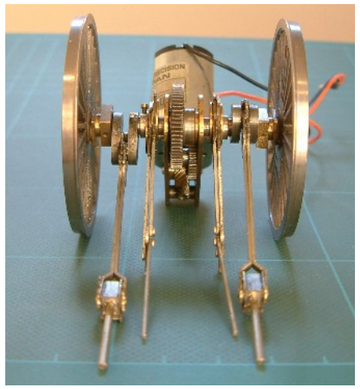
Fig 7. Crank Axle











BRAKE GEAR

BRAKES

The brake hanger /shoe assemblies are made of several laminations as shown below. These are assembled by making a jig by drilling suitable 0.8 mm and 1.0 mm holes in a small piece of hardwood or Tufnol. Use 0.8 mm drills mounted in the holes as mandrels to accurately align the laminations. A short piece of 1.0 mm wire is needed for the brake shoe pin. When the components are accurately aligned solder together. The steel drills are unlikely to be soldered to the nickel silver and can be removed after the complete assembly is taken off the jig.

When the brake hanger /shoe assemblies are complete assemble the brake gear as shown below. The design is complicated by the tie rods not passing through the hole in the bottom of the hangers. To make assembly possible, make the rods (0.8 mm wire) through the bottom hole in the hangers and the pull rods complete from side to side. Then fit the tie rods from 0.6 mm wire before cutting through the 0.8 mm wire as shown below.

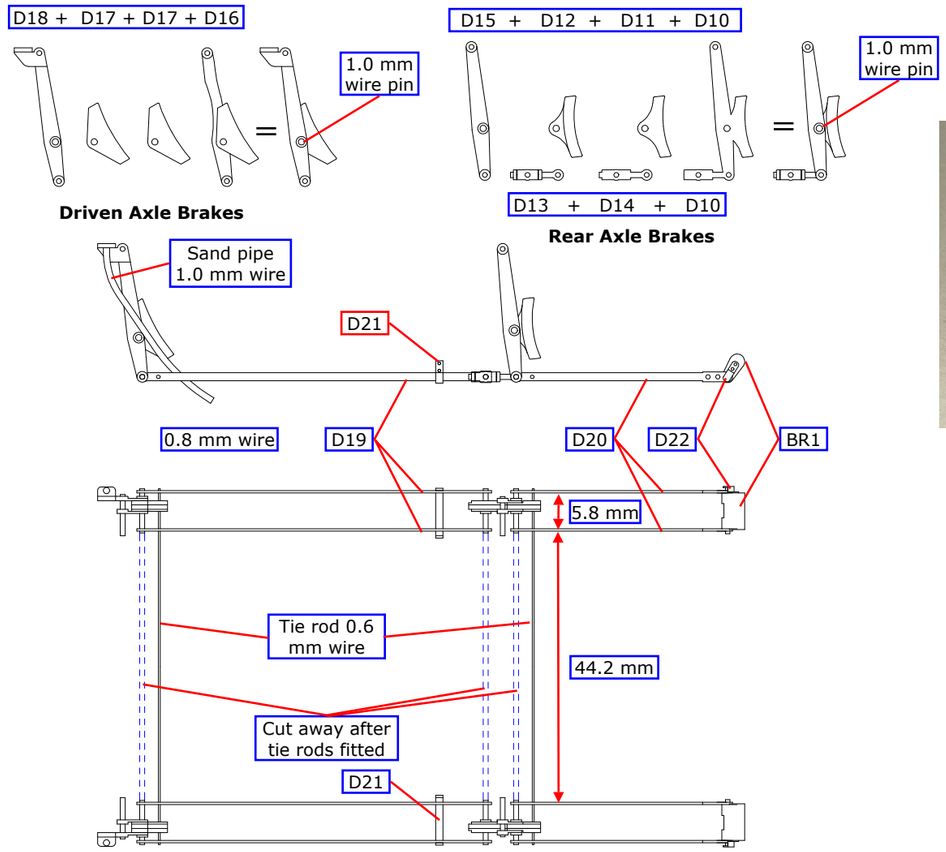


Fig 9. Brake Gear

BRAKE CROSS SHAFT

Construct the brake cross shaft across the rear using the dimensions shown below. Check that the pull rod crank (BR1) will fit on the ends of the shaft. By sliding the pull rod cranks off the ends of the cross shaft, the complete brake gear assembly shown below can be removed.

No.	Description	Sheet			
D10	Brake hanger, rear axle back lamination (2)	1	D18	Brake hanger, driven axle front lamination (2)	1
D11	Brake shoe, rear axle back lamination (2)	1	D19	Brake pull rod, front (4)	4
D12	Brake shoe, rear axle front lamination (2)	1	D20	Brake pull rod, rear (4)	4
D13	Brake adjuster, rear axle back lamination (2)	1	D21	Brake pull rod safety bracket (2)	4
D14	Brake adjuster, rear axle front lamination (2)	1	D22	Brake cross shaft crank pin retaining bracket (2)	4
D15	Brake hanger, rear axle front lamination (2)	1	D23	Brake cylinder crank lamination (2)	1
D16	Brake hanger, driven axle back lamination (2)	1	F9	Brake shaft bearing (4)	1
D17	Brake shoe lamination, driven axle (4)	1	D23	Brake cylinder crank lamination (2)	1

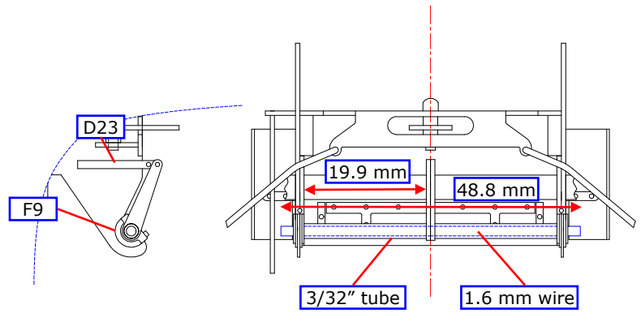
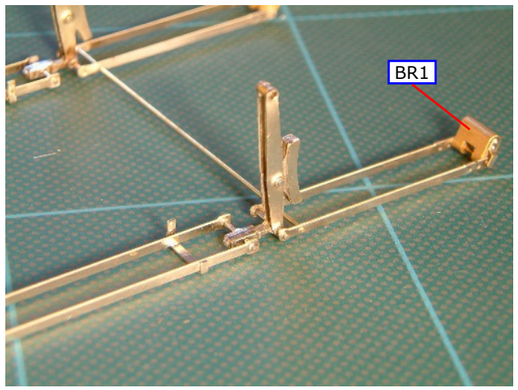
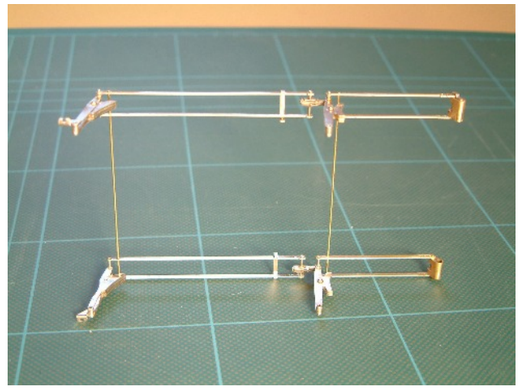
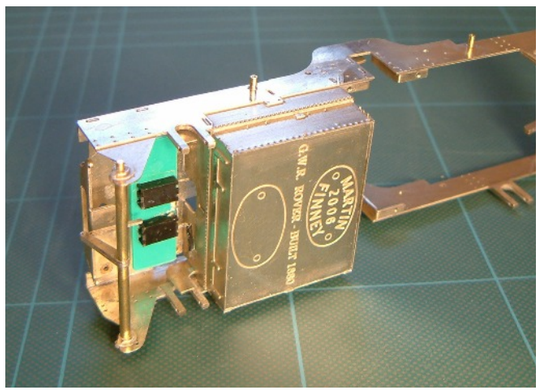


Fig 10. Brakeshaft







SANDWICH FRAMES.

Inner Sandwich Frames. If you have fitted inside motion open up the slots in the inner sandwich frames (S1), as shown below. Emboss the rivets in the inner frames before folding up as shown. First fold up the splasher backs [A] then fold out the small brackets [B] for the carrying wheel axle box rod (BR2), the brackets [C] for the spring dampers (P10 & P11) and the axlebox sides [D] on both sides of each frame slot. Now fold down the bufferbeam and drag beam, before folding down the frames.

Emboss the rivets in the driven axle horn tie/spring bracket, back (S19) and fold out the tie rod brackets. Locate the embossed rivets on S19 over the holes in the back of the corresponding rivets on the inner frames. The locating holes may need opening up slightly with a small drill. When you have accurately located the two components solder them together as shown.

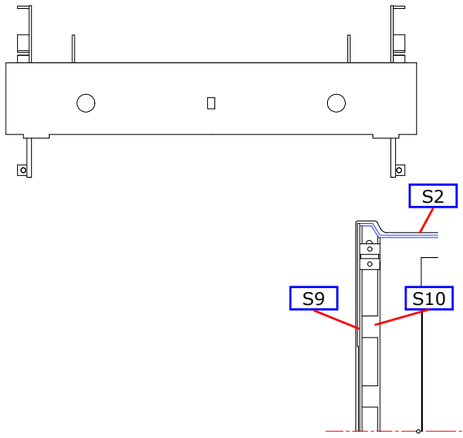
Outer Sandwich Frames. Emboss the rivets in the outer sandwich frame, left and right (S2 & S3), fold out the brackets for BR2 and form the bends to make the end of the buffer beam; these are shown in blue in the view from below. Attach the horn guide plates for the carrying and driven axles (S4 & S5) as shown using a 1.6 mm drill as an aligning mandrel. Attach the frame steps (S7).

Emboss the rivets in the horn ties, the leading, second and rear axles (S16, S17 & S18) and fold up as shown. Attach to the frames locating accurately using the embossed rivets. Open out the holes to take the 0.8 mm tie rods. Solder the carrying wheel axle box rods (BR2) in place as shown.

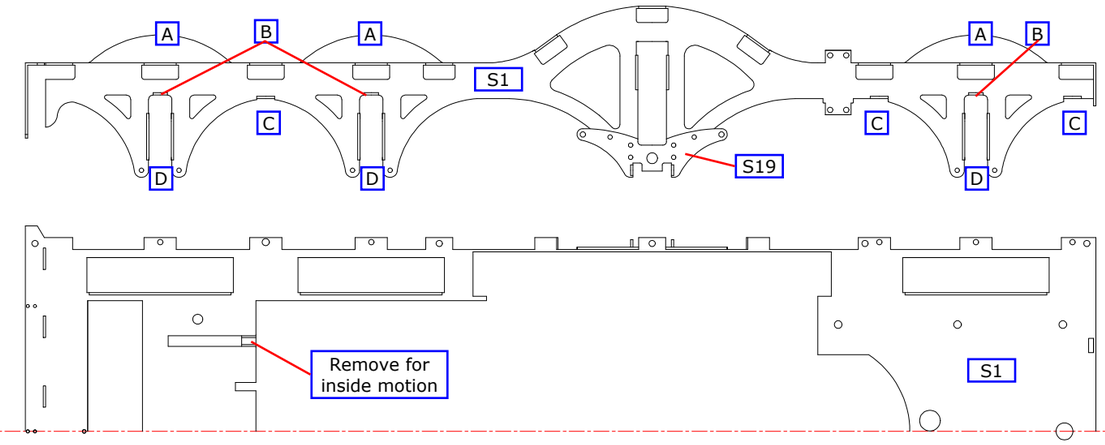
Fit the outer frames in place, threading the carrying wheel axle box rods up through the inner frame brackets. When satisfied that all is correctly located solder the frames together. Emboss the rivets on the frame/drag beam corner plate (S8), fold up, and attach as shown. Attach the driven axle horn guide top plate (S6). Fold down all the brackets on the lower edge of the buffer beam inner (S10) and solder in place in the slots in the inner sandwich frame and the brackets to the back of the bufferbeam. Solder the buffer beam outer (S9) in place.

Gently prize the frames apart to allow driven axle horn tie/spring bracket, front (S20) and the driving axle spring (P15) to be squeezed into place. Solder S20 to the frames.

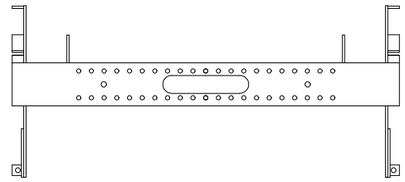
No.	Description	Sheet			
S1	Inner sandwich frames	4	S9	Buffer beam outer	4
S2	Outer sandwich frame, left	4	S10	Buffer beam inner	4
S3	Outer sandwich frame, right	4	S16	Leading axle horn tie (2)	5
S4	Carrying axle horn guide plate (6)	4	S17	Second axle horn tie (2)	5
S5	Driven axle horn guide plate (2)	4	S18	Rear axle horn tie (2)	5
S6	Driven axle horn guide, top plate (2)	4	S19	Driven axle back horn tie/spring bracket (2)	4
S7	Frame step (2)	4	S20	Driven axle front horn tie/spring bracket (2)	1
S8	Frame/drag beam corner plate (2)	5			

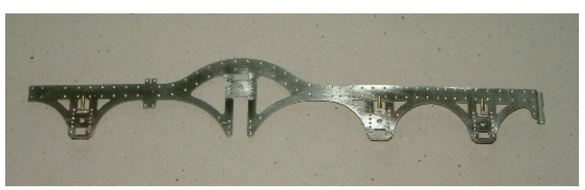


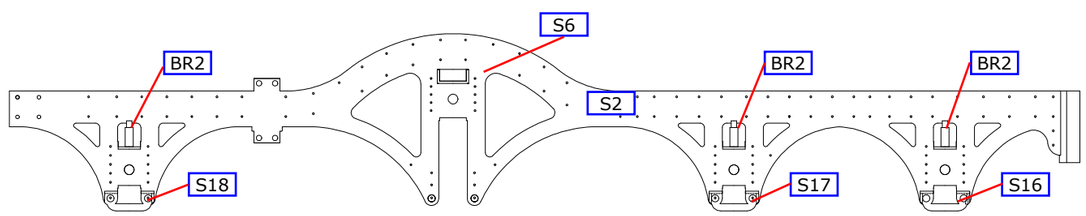
View from below



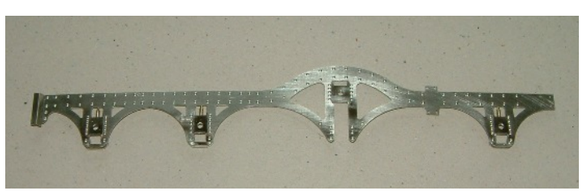
Inner Frame

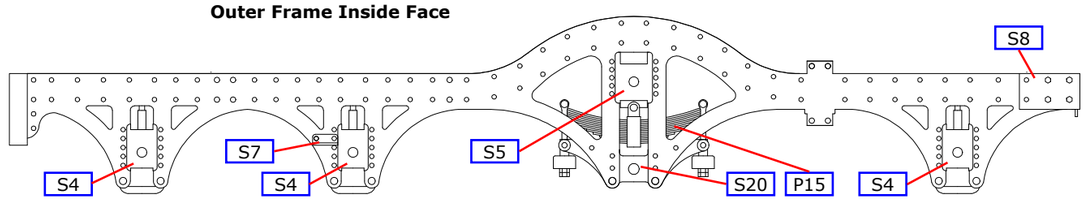






Outer Frame Inside Face





Outer Frame Outer Face

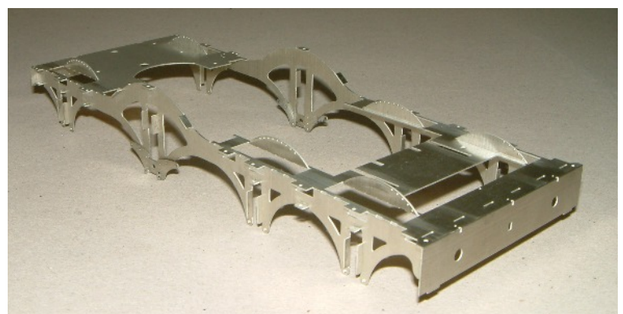
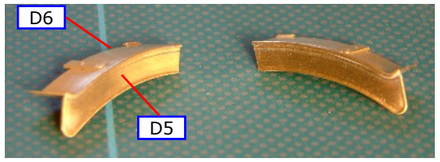


Fig 11. Sandwich Frames

FINISHING THE CHASSIS.

DRIVING WHEEL SPLASHERS & SANDPIPES

Make up the driving wheel splashers (D5 & D6). The splashers fit between the sandwich frames clear of the driving wheels and will be fitted at final assembly.



Form and fit the 1.0 mm wire sand pipes from the main sandboxes and attach through the holes in the bracket on the brake hanger (D18). Trial fit. The rear sand pipes are fitted during final assembly.

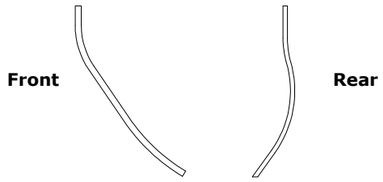
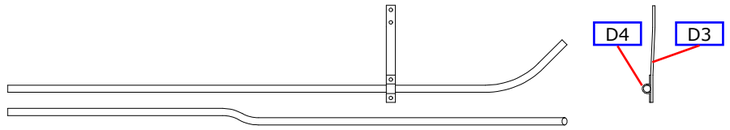


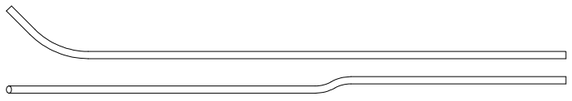
Fig 12. Sandpipes

VACUUM AND FEED PIPES

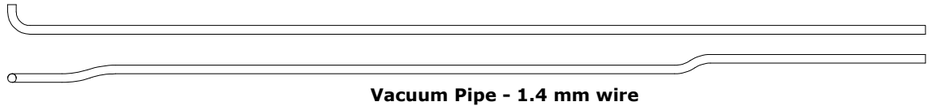
Make up the pipes as shown below. Trial fit, The pipes will be fitted at final assembly.



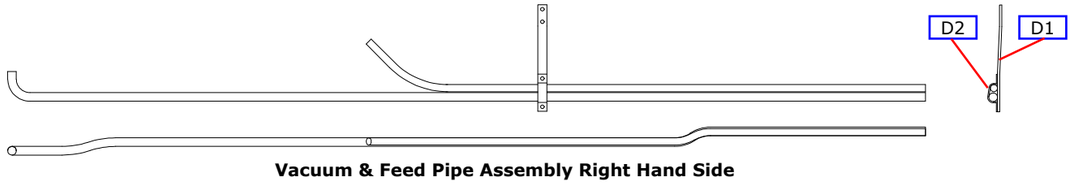
Left Hand Feed Pipe - 1.2 mm wire



Right Hand Feed Pipe - 1.2 mm wire



Vacuum Pipe - 1.4 mm wire



Vacuum & Feed Pipe Assembly Right Hand Side

Fig 13. Pipe Work

DRAWBAR

Make up the drawbar and pin as shown. The drawbar tube sits 1.7 mm above the drawbar.

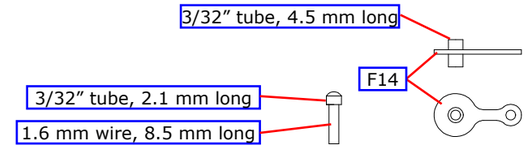


Fig 14. Drawbar Pin

BALANCE WEIGHTS

Secure the balance weights (D9) in position as shown below. The right side crank leads the left by 90 degrees.

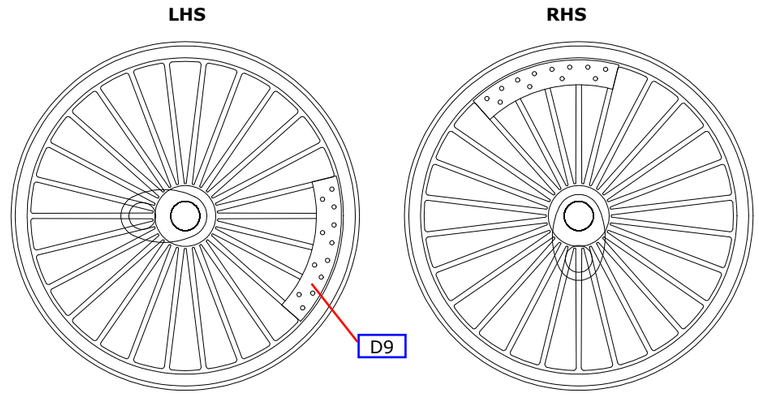


Fig 15. Balance Weights

No.	Description	Sheet	No.	Description	Sheet
D1	Vacuum pipe/boiler feed pipe bracket	4	D5	Driving wheel splasher face	3
D2	Vacuum pipe/boiler feed pipe clip	4	D6	Driving wheel splasher side	3
D3	Boiler feed pipe bracket	4	D9	Balance weight (2)	4
D4	Boiler feed pipe clip	4	F14	Drawbar, two lengths	1

RUNNING PLATE AND SPLASHERS

Score the outline of the hinged section of the running plate behind the bufferbeam on the running plate (U1), as shown below. Emboss the hinge rivets and add the hinge pin from 0.3 mm wire.

Open up the holes for the handrail stanchions (1.0 mm) in both the inner sandwich frames and the running plate (S1 & U1). Carefully form curves in the running plate (U1) constantly checking against the frames. Dismantle the chassis. Fit the basic chassis under the outside frame assembly with the running plate on top. Fix this assembly together with two 10BA x 3/8" screws and 10BA nuts at the front and four 12BA x 1/8" screws into the cab base at the rear. Check that all the handrail stanchions holes are correctly aligned by using a 1.0 mm drill. When satisfied solder the frames and running plate together. Start by making small tacks of solder at intervals along the sides ensuring the running plate is pressed hard into contact with the frames each time. Then gradually melt these tacks together keeping heat input to a minimum. Complete by soldering together along all remaining edges. Cut the four 12BA screws off flush with the top of the cab base.

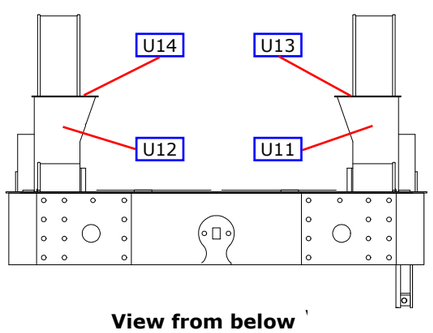
Solder the splasher fronts, front and rear (U2) and second axle (U3) in place on the inner sandwich frames against the opening in the running plate. Check that they are correctly aligned relative to the splasher back. Note carefully the relationship between the splasher front and top as shown in Fig. 16. Work with small files and emery paper on all beading will significantly improve its appearance.

Curve the splasher tops, front, second and rear axles (U4, U5 & U6) by rolling underneath a suitable rod or dowel on a piece of rubber sheet. Bend the ends to shape as shown in Fig 17 and solder them in place.

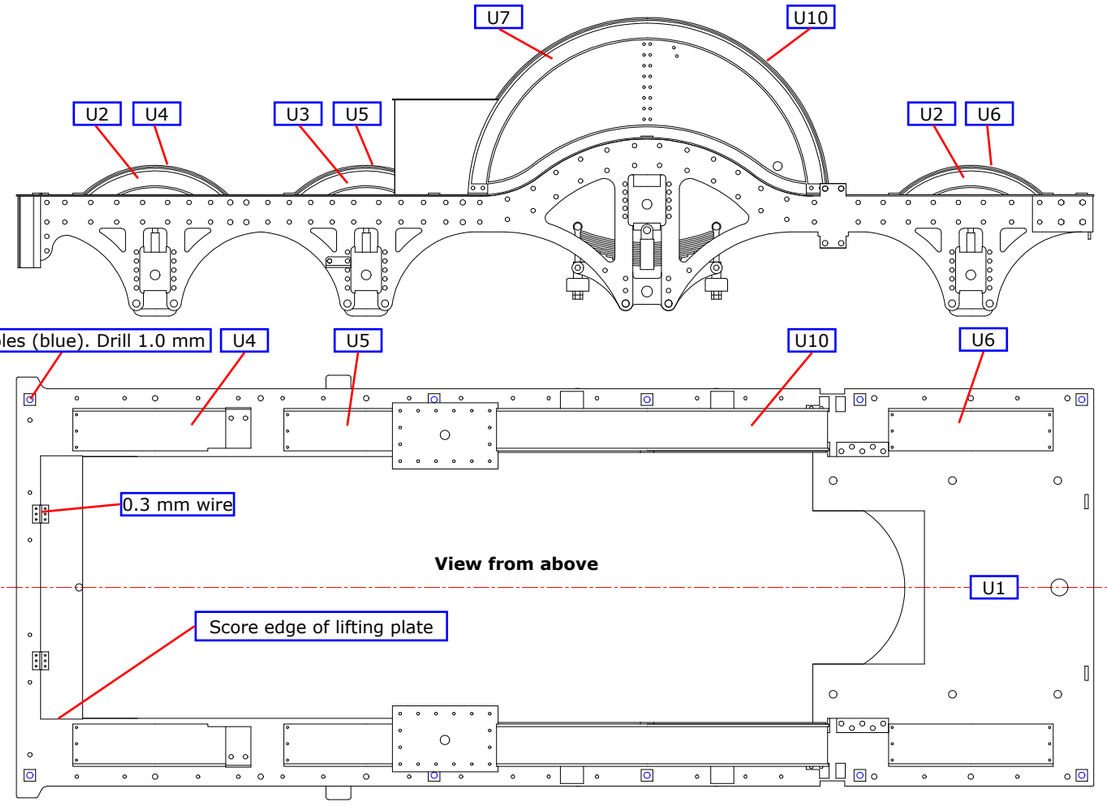
Emboss the rivets in the driven axle splasher backs, left and right (U8 & U9). Attach them to the chassis frames using 12BA x 3/32" screws. Emboss the rivets in the driven axle splasher fronts (U7) and solder in place on the running plate checking for accurate alignment with the splasher backs. Curve the driven axle splasher top (U10) to shape and solder in place. Now remove the screws holding the splasher backs to the chassis and remove the chassis. Solder the driven axle splasher backs to the running plate and inner frames.

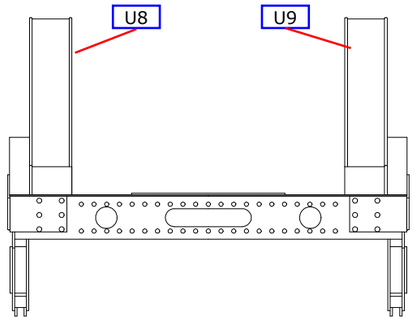
Fold up the main sandboxes sides, left and right (U11 & U12) and solder in place together with their tops left and right (U13 & U14). Before proceeding with the remaining detail on this assembly it is necessary to make the smokebox, boiler, firebox and cab assemblies.

No.	Description	Sheet			
U1	Running plate (2)	2	U8	Left driven axle splasher back	3
U2	Front axle and rear axle splasher front (4)	2	U9	Right driven axle splasher back	3
U3	Second axle splasher front (2)	2	U10	Driven axle splasher top (2)	2
U4	Front axle splasher top (2)	2	U11	Main sandbox sides, left	4
U5	Second axle splasher top (2)	2	U12	Main sandbox sides, right	4
U6	Rear axle splasher top (2)	2	U13	Main sandbox top, left	5
U7	Driven axle splasher front (2)	3	U14	Main sandbox top, right	5

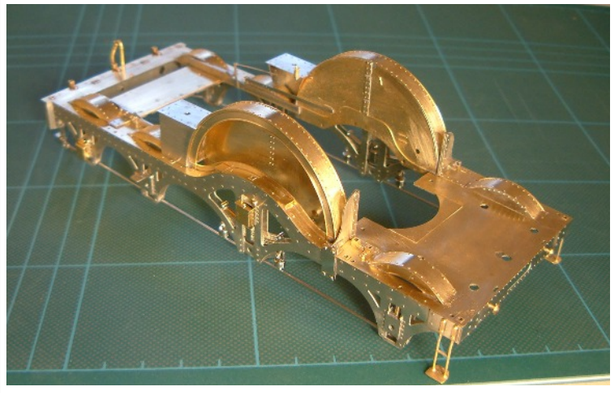


View from below





View from rear



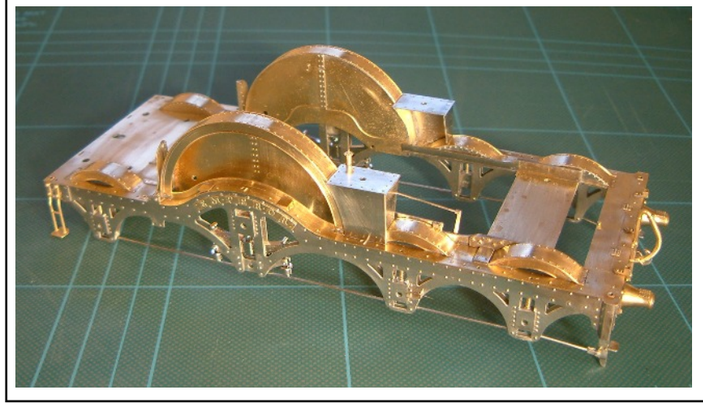
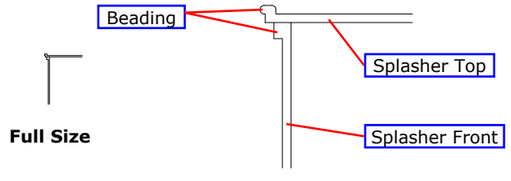


Fig 17. Running Plate and Splashers



Full Size

Six Times Full Size

Fig 16. Splashers

SMOKEBOX AND BOILER

BOILER

Tap 12BA the three holes in the boiler rear former (U33) and the four holes in the boiler front former (U32). Roll the boiler wrapper (U34). Roll the boiler joining strip (U35) to fit inside the boiler, bend out the boiler band joining brackets and fit through the small slots from inside the boiler. Solder the wrapper ends together with the jointing strip. Bend the boiler band joining clip (U36) to shape and solder in place in the slots in the boiler.

Solder the formers in place so that they are almost flush with the ends carefully aligning the etched marks at the top of each former with the etched marks on the inside of the wrapper. Represent the bolts in the joining brackets using 0.45 mm wire. Solder a length of 1.2 mm copper wire into the clack box (BR5) with high melting point solder and then attach each clack box to the boiler with low temperature solder.

SMOKEBOX

Refer to Fig 18 for the initial construction. Fold the smokebox base (U26) into an inverted tray and tap 10BA the holes for the fixing screws. The smokebox front (U27) is not vertical; it bends backwards along a line just above the cylinder covers. Make this bend then emboss the rivets. Solder the smokebox front and back in position on the smokebox base ensuring the back will be vertical.

Score the plate lines on the smokebox wrapper (U30) and then emboss the rivets. Roll the wrapper to shape and solder in place with the edges flush with the front and back formers. Round the edge of the smokebox rear plate (U29) as shown. Now attach, with four 12BA x 3/32” screws, the smokebox rear plate and the boiler front former (U32) to the smokebox assembly. Solder the smokebox rear plate to the smokebox. Now detach the smokebox from the boiler.

Start the detailing (Fig 19) with the cylinder fronts (P13) by soldering in place followed by the cylinder cover cocks (BR10). Then add the valve tail rod glands (BR11) to the smokebox front.

To fit the smokebox to running plate stay, first bolt the smokebox to the running plate. Emboss the rivets onto the stay (U16) and then fold up to fit. Solder the stay to the smokebox. Solder the smokebox stay bolt (BR8) into the base of the stay ensuring that it is not soldered to the footplate. Bend up the smokebox steps (U31) and solder in place locating the holes in the back of the embossed rivets over the etched ‘rivets’ on the smokebox wrapper.

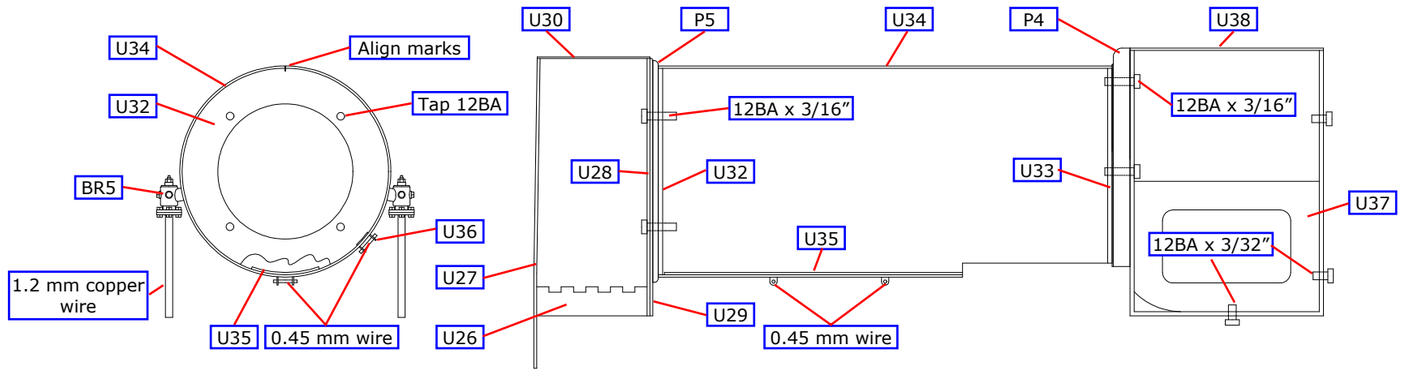
Solder the smokebox lamp socket (BR17) in place. The front handrail is made from three long handrail knobs and a curved length of 0.8 mm wire the side handrails require two short handrail knobs and length of 0.8 mm wire on each side.

Attach the Roscoe displacement lubricator cylinder (BR12) to the hole on the left and right hand side of the smokebox. Solder the lubricator hand wheel (U51) on the spigot on the top of the lubricator cylinder. Drill a 0.45 mm hole in the rear of the blower valve (BR14) for the 0.45 mm wire operating rod and then solder the blower valve into the hole on the right hand side of the smokebox. Fit the 0.45 mm rod during final assembly.

A 0.6 mm hole in the rear flange of the chimney (P9) needs to opened out. The hole and a matching hole in the smokebox is used to set the chimney true and to mount the the Roscoe displacement lubricator regulator (BR13). Either place a piece of wire to hold the the chimney true, solder the chimney in place, remove the wire and then solder the regulator in place, or place the chimney in place and use the regulator to set the chimney true and solder all in place; the regulator can then be set true with some localised heat.

Remove the smokebox from the running plate.

No.	Description	Sheet	No.	Description	Sheet
U16	Smokebox to running plate stay (2)	1	U33	Boiler former, rear	1
U26	Smokebox base	1	U34	Boiler wrapper	5
U27	Smokebox front	2	U35	Boiler joining strip	4
U28	Smokebox rear	2	U36	Boiler band joining clip	4
U29	Smokebox rear plate	2	U37	Firebox former	1
U30	Smokebox wrapper (2)	3	U38	Firebox wrapper	4
U31	Smokebox step (2)	4	U51	Roscoe lubricator hand wheel (3)	4
U32	Boiler former, front	1			



Front of Boiler **Section Through Smokebox, Boiler & Firebox**

Fig 18. Smokebox & Boiler Construction

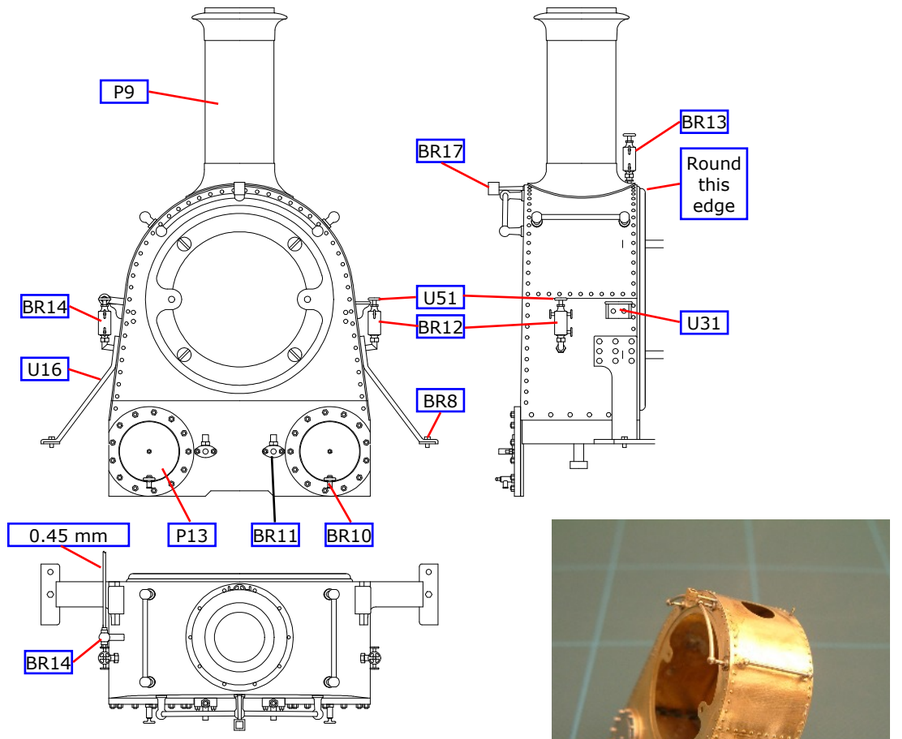
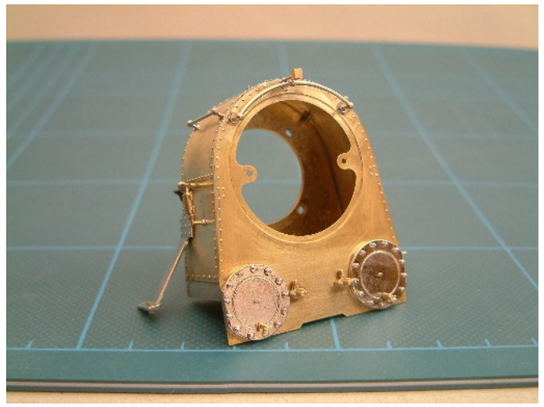
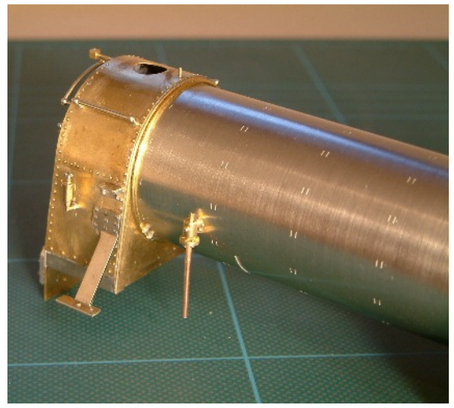


Fig 19. Smokebox Details





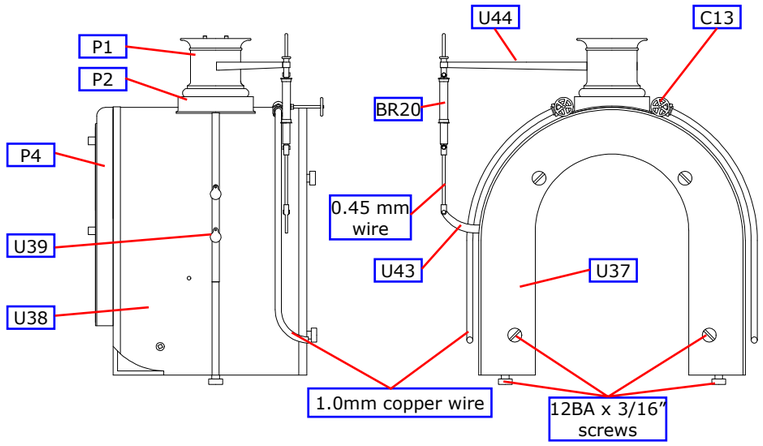
FIREBOX

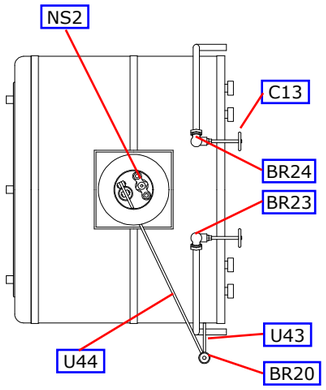
FIREBOX

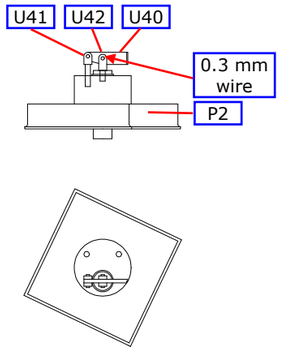
Tap 12BA the six holes in the rear and base of the firebox former (U37). Fold up and solder together the firebox former.

For whistles in the original position drill out the marked holes in the firebox wrapper (U38). Emboss the two rivets on the firebox wrapper. Roll the crown in the firebox wrapper and solder in place on the former. Add the washout plug covers (U39). In photographs some of these covers are missing.

Solder together the laminations of the safety valve spring firebox bracket lamination (U43) before soldering in the slot in the firebox side. The safety valves can now be constructed as shown below, although permanent fixing should wait until after painting. The safety valve assembly is built on the bonnet base casting (P2). The safety valve casting (NS2) mounts in the two holes in the base. The safety valve lever inside the casing is made from the lever (U40), the pivot overlay pieces (U41) which is attached to the hole in the base and the valve overlays (U42). The safety valve bonnet goes over this assembly. Note the safety valve bonnet (P1) will need the pilot hole drilling through at the correct angle with a 0.45 mm drill. The safety valve lever mounts into this hole and onto the safety valve balance. (BR20). The balance must have the pilot hole deepened to accept the 0.45 mm wire used to attach the balance to the safety valve spring firebox bracket lamination (U43).







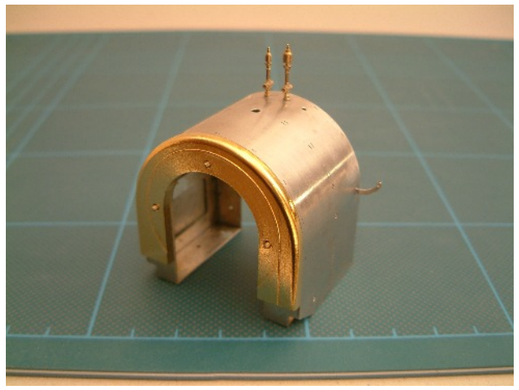
Safety Valves

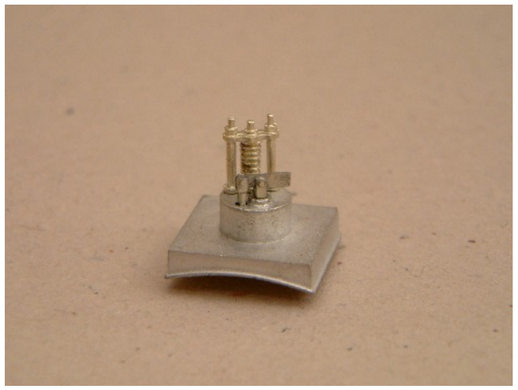
Fig 20. Firebox

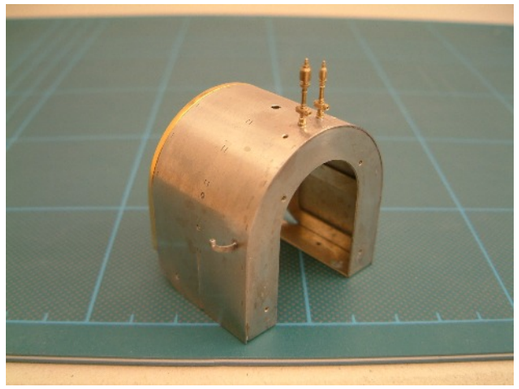
Assemble and screw together, with 12BA x 3/16" screws, the smokebox, the casing between the smokebox and boiler (P5), the boiler, the casing between the firebox and boiler (P4), the firebox. The elongated holes in the smokebox allow for any misalignment of the boiler formers to be corrected by rotating the smokebox until it aligns correctly with the firebox. Place the assembly on a flat surface before tightening the smokebox screws. Check for fit in the running plate.

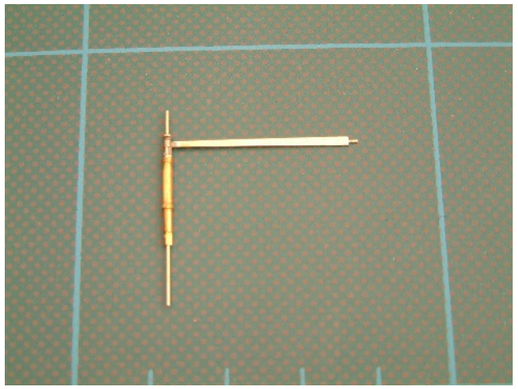
The two injector valves need a 0.45 mm hole drilling to accept the control rod from the cab and 1.0 mm hole drilling for the copper wire. Attach the valves, left and right (BR23 & BR24) to the firebox.

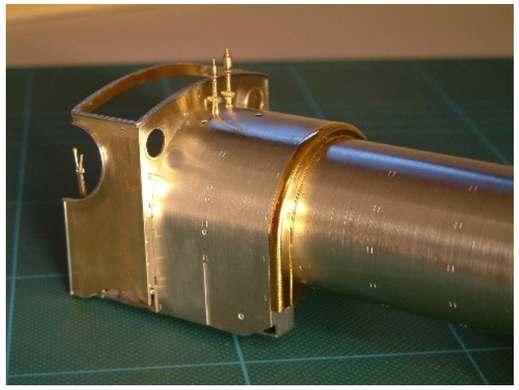
No.	Description	Sheet			
U39	Firebox washout plug cover (4)	4	U42	Safety valve lever, inside casing valve overlay (2)	4
U40	Safety valve lever, inside casing	4	U43	Safety valve spring firebox bracket lamination (2)	4
U41.	Safety valve lever, inside casing pivot overlay (2)	4	U44	Safety valve lever	4

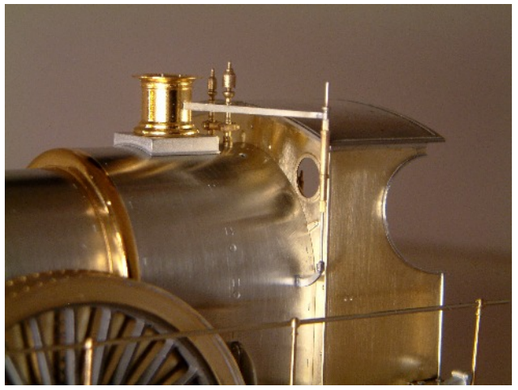












CAB

Fold up the reversing lever bracket on the cab base (C1) and tap the four holes 12BA.

Emboss the rivets on the cab front laminations (C5 & C6). For whistles on the cab roof add the whistle rod blanking plate (C7) as shown below. Screw the cab front laminations to the firebox using four 12BA x 3/32" screws. Now solder the laminations together around their edges. Place the assembly on a flat surface, set true and tighten the screws.

Attach this assembly to the frames/running plate assembly and the chassis with two 10BA x 3/16" screws into the smokebox and two 12BA x 3/32" into the base of the firebox. Screw the cab base (C1) in position behind the cab front. Tack solder (be quick!) the cab base to the cab front avoiding soldering the cab base and cab front to the running plate. Remove the cab front and cab base and carefully melt in the solder tacks. Replace the cab base/cab front on the running plate assembly.

Prepare the cab sides (C2) by attaching the cut-out beading (C4), fitting the etched groove over the edge of the cab side and attaching the rear stanchion from 0.7 mm wire. Cut off the beading flush with the upper rear edge of the side. Tack solder the cab sides in position again avoiding soldering to the running plate and rear splashers. Again remove the cab and complete the soldering.

Solder the roof rear support laminations, inner and outer (C8 & C9) together and attach between the rear edges of the cab sides. Fix the roof canvas fixing mouldings (C18 & C19) in place as shown in below. Add the splasher rivet strip (C3) to the inside of the cab sides. Solder the small fixed section of the cab floor (C20) in place as shown. Check that the large removable section of the cab floor (C21) will slide in and out. Attach the short and long damper levers (C22 & C23) to the removable floor as shown in the photograph. The small tab, on the end of each damper rod, folds under the edge of the opening in the cab floor.

Emboss the rivets in the rear sandbox sides (U23) and form the corners around a 1.0 mm drill. Solder in place on the left side cab side carefully checking the fit over the rear splasher. Add the splasher top (U24) and the hinges (U25).

Assemble the injectors (BR25 & BR26) as shown in below. Add the injector hand wheels (C24) to the top. The feed pipes from the valves on top of the firebox to the injectors (1.0 mm copper wire) are problematic. If you wish to have the cab removable from the firebox, as designed, these pipes will have to be split. The spilt should be made with the break flush with the cab front.

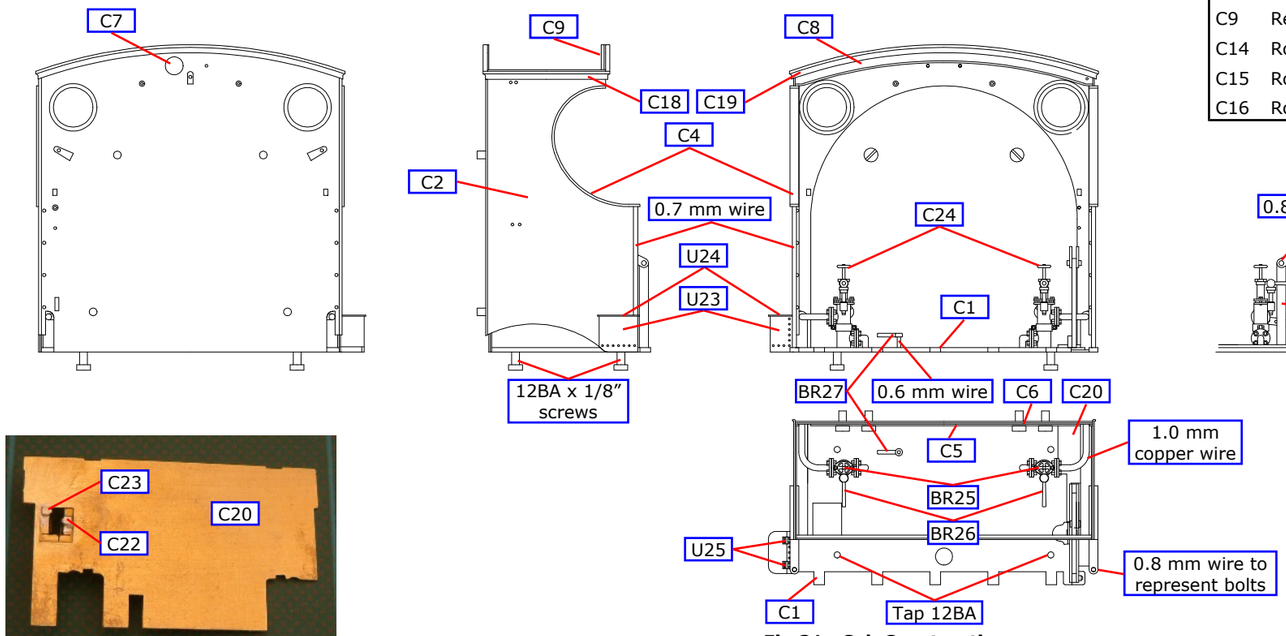
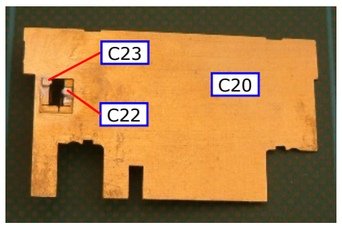


Fig 21. Cab Construction



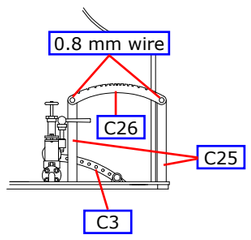
Add the two lever reverse frame legs (C25) to the cab base and then attach the lever reverse frame index quadrant (C26) to the legs fitting 0.8 mm wire pins to represent the bolts. One of the control handles (BR27) sits on a 0.6 mm wire pin on the cab floor as shown below.

Fold up the back and front of the roof assembly jig (C14) which gives a solid base upon which to build the removable cab roof (drawing below). Roll the cab roof laminations, the inner layer (C15), the outer layer with no whistles (C16) or the outer layer with whistles (C17) to shape and solder in place on part C14. If fitting whistles on the cab roof, open up the half etch holes on the underside of the cab roof and solder the whistles large and small (BR21 & BR22) into the holes.

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

The window frames (C11) are designed to provide a recess to trap the window glazing and will be fitted with the glazing.

No.	Description	Sheet			
C1	Base	1	C17	Roof outer layer, with whistles	4
C2	Side (2)	2	C18	Roof canvas retaining moulding side (2)	1
C3	Splasher rivet strip (2)	2	C19	Roof canvas retaining moulding front/rear (2)	1
C4	Side cutout beading (2)	4	C20	Floor fixed section	2
C5	Front inner lamination	2	C21	Floor removable section	2
C6	Front outer lamination	2	C24	Injector hand wheel (2)	4
C7	Whistle rod blanking plate (2)	4	C25	Lever reverse frame leg (2)	1
C8	Rear of roof support, outer lamination	3	C26	Lever reverse frame index quadrant (2)	4
C9	Rear of roof support, inner lamination	3	U23	Rear sandbox sides	4
C14	Roof assembly jig	3	U24	Rear sandbox top	4
C15	Roof inner layer	4	U25	Rear sandbox hinge (2)	4
C16	Roof outer layer, no whistles	4			



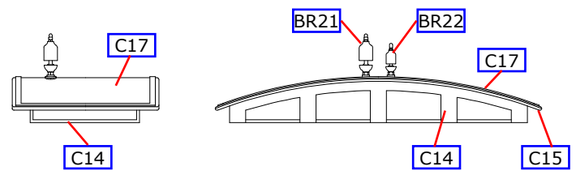
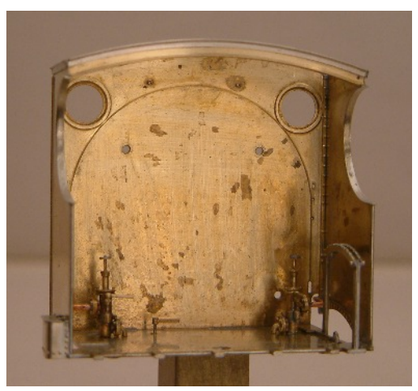
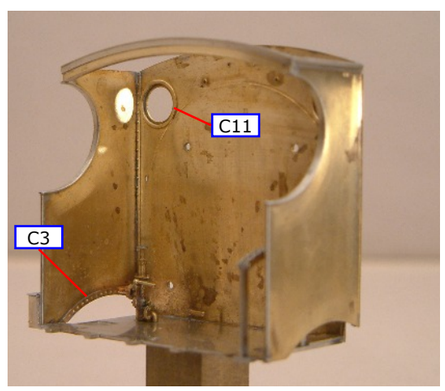
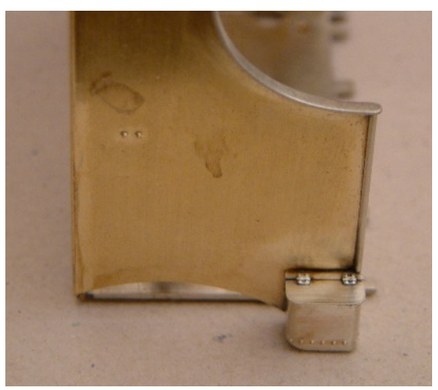
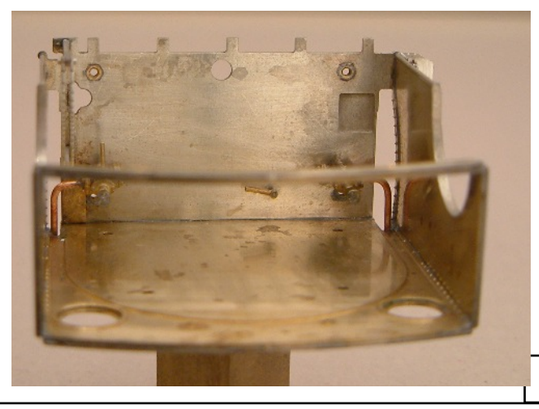


Fig 22. Cab Roof









BACKHEAD

BACKHEAD DETAILING.

Add the regulator mounting (NS3) to the backhead (P3).

Add the boiler steam pressure gauge (BR32) and the brake vacuum gauge (BR33) to the back head. Take the water gauge (BR30) and open out the 0.3 mm pipe holes and then solder to the backhead.

On the brake ejector casting (BR28) drill one 1.2 mm hole in the base, one 0.45 mm hole in the base and one 0.45 mm hole in the right hand side, as shown. Fit to backhead and then fit the brake handle (BR29). Fit the 1.2 mm pipe to the brake ejector first, then the 0.45 mm pipe along side, finally fit the 0.45 mm pipe to the side of the casting. These pipes should route down to the floor as shown.

Fit the 0.3 mm pipe to the top of the water gauge assembly, route down the backhead and across to the boiler steam pressure gauge (BR32). Add the 0.3 mm pipe to the base of the sight glass and route to the base of the backhead. Finally add the 0.3 mm pipe from the brake vacuum gauge (BR33) and route to and T into the 1.2 mm pipe.

Laminate together the back plate shelf upper and lower laminations (C28 & C29) and fit to the backhead.

Fit the sanding rod brackets (BR31) to the backhead and pass through a 48 mm length of 0.7 mm wire, centred on the backhead. Before fixing the sanding lever handles drill 0.45 mm holes for the brake rod pins and add a short length of 0.45 mm wire to the handles. Add the sanding lever handles (C27) and attach as shown in the diagram. The inside faces of the boss at the foot of the brake handles should be 43.8 mm apart such that the inside face of the brake handle arms line up on the holes in the cab front through which the sanding levers pass. The sanding rods will be fitted during final assembly.

Add the regulator handle (NS4) and the firebox doors handle (NS6).

CAB DETAILING

Add the reverser lever (NS5) to the quadrant, using 1.0 mm rod to pin the lever the base and a 1.0 mm stub for the fixing of the rear reach rod (U48) during final assembly.

Add the injector valve hand wheel (C13) to 0.45 mm rod from the injectors (BR23 & BR24).

No.	Description	Sheet			
C11	Window frame (2)	3	C22	Short damper lever	4
C12	Whistle lever (2)	4	C23	Long damper lever	4
C13	Injector valve hand wheel (2)	4	C27	Sanding lever (2)	1
C18	Roof canvas retaining moulding side (2)	1	C28	Back plate shelf upper lamination	1
C19	Roof canvas retaining moulding front/rear (2)	1	C29	Back plate shelf lower lamination	4

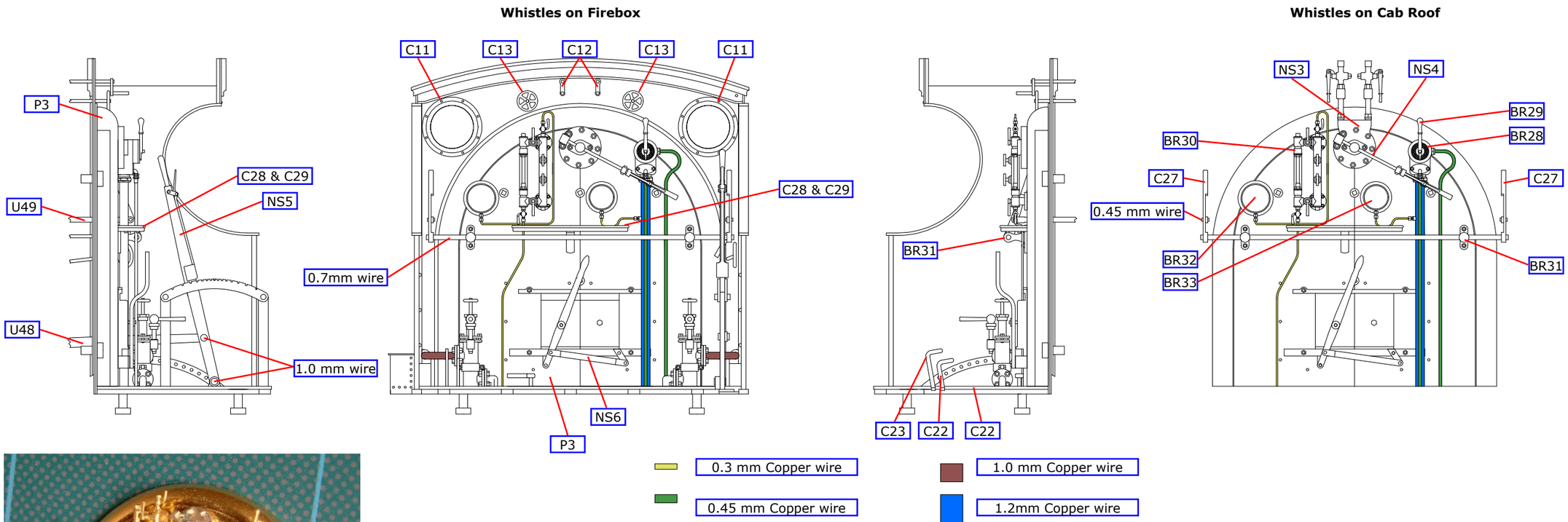


Fig 23. Back Head

FRAME BRACKETS AND FRAME EXTENSIONS

Reassemble the frames/running plate/smokebox/boiler /firebox/cab assemblies.

Front Frame Extensions. See page 18 for a drawing of the front frame extensions. Assemble the front frame extensions U15), frame to footplate bracket (U17) and smokebox stay bolts (BR8) as shown in Fig 24. Test the assembly for fit in position behind the smokebox stay before soldering in place.

Firebox Brackets. Emboss the rivets in the firebox to frames bracket (U18 & 20), the bracket angles (U19 & U21) and the outer angles (U22). Solder parts U19 & U21 to parts U18 & U20. Slide the brackets in place in the slots in the frames and the side of the firebox. Fold up the outer angles and place in position either side of the brackets as shown in Fig 24 before soldering to the frames and running plate.

Guard Irons. Form and detail the guard irons as shown below. Fit them into the slots in the buffer beam inner and solder in place. Add the frame tie rods from 0.8 mm wire below. Attach the front tie rod to the guard iron using the guard iron stay bracket (S15) and a 1 mm wire pin.

Assemble the buffers as shown below and fix in place. Solder the engine to tender buffers (BR7) to the drag beam. Solder the vacuum pipe (BR9) in place on the buffer beam.

Fit the sandbox lids (P18) to the two sandboxes. Solder the vacuum pump lubricator (BR15) to the right hand sandbox. Solder three running plate lamp sockets (BR16) to the front of the running plate and two to the left side of the running plate behind the left firebox bracket. Fit the knob for lifting plate (BR19) to the front running plate.

Fit the six driving wheel axlebox cover castings (P6) and the two driving wheel axlebox covers (P7). Fit the front springs (P16) and the rear springs (P17) to the running plate. Below the frames mount the dampers for the front springs (P10) and the dampers for the rear springs (P11).

Construct the handrails by soldering a handrail stanchion into the front hole of the running plate, ensuring that the hole is aligned correctly. Erect the remaining stanchions by threading over a piece of 0.8 mm nickel silver wire and mounting it on the holes in the running plate.

Slightly curve the fall plate (C10) as shown below and hinge it in place.

No.	Description	Sheet			
C10	Fall plate	4	U22	Firebox to frames bracket outer angle (4)	4
U15	Front frame extension (2)	1	S11	Buffer retaining washer (2)	4
U17	Frame to running plate bracket (2)	1	S12	Guard iron (2)	1
U18	Firebox to frames bracket, left	4	S13	Guard iron step bracket (2)	4
U19	Firebox to frames bracket angle, left (2)	4	S14	Guard iron stay bracket (2)	4
U20	Firebox to frames bracket right	4	S15	Guard iron stay bracket (2)	4
U21	Firebox to frames bracket angle, right (2)	4			

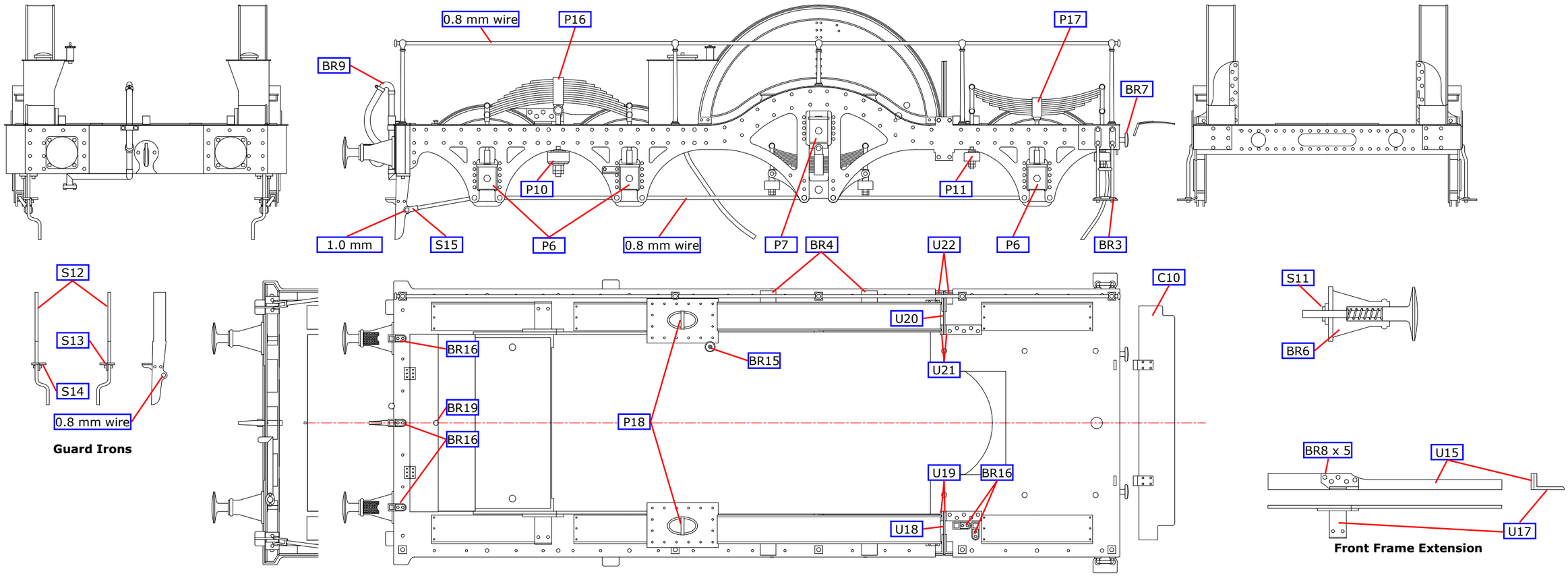


Fig 24. Running Plate Detailing

FINAL ASSEMBLY

Reassemble the frames/running plate/smokebox/boiler /firebox/cab assemblies.

CONTROL RODS

The drain cocks control is bent up from 0.45 mm wire. The front wire is attached to the drain cock lever lamination (U50).

Attach the sanding rods (U49) to the inside of each driving wheel splasher.

The reach rod is in two sections. The front is built from the front section (U45) the reversing arm (U47) and the fork joint (U46). A pin of 0.8 mm wire runs through the three pieces. The rear section (U48) is bent as shown and a 1.0 mm wire pin soldered into place.

FINAL ASSEMBLY

Whistles on the firebox. Drill out the whistles (BR21 & BR22) to accept the 0.45 mm control wire, fit the wire and trim so that it passes through the cab for the whistle levers (C12) to be fitted to the wire. Fit the whistle levers.

Fit the 1.0 mm copper wire to the injector valves.

The window frames (C11) are designed to provide a recess to trap the window glazing. Fit with the glazing.

Fit the previously made up driving wheel splashers (D5 & D6). The splashers fit between the sandwich frames clear of the driving wheels.

Fit the vacuum and feed pipes. The front end of the vacuum pipe rests inside the vacuum pipe casting (BR9). The pipes run on the inside face of the inside sandwich frames with the curved ends to the front and the flat end flush with the rear of the firebox.

No.	Description	Sheet	No.	Description	Sheet
U45	Reach rod, front section	4	U48	Reach rod rear section	4
U46	Reach rod, front section fork joint	4	U49	Sanding rod (2)	4
U47	Reversing arm	4	U50	Drain cock lever lamination (2)	4

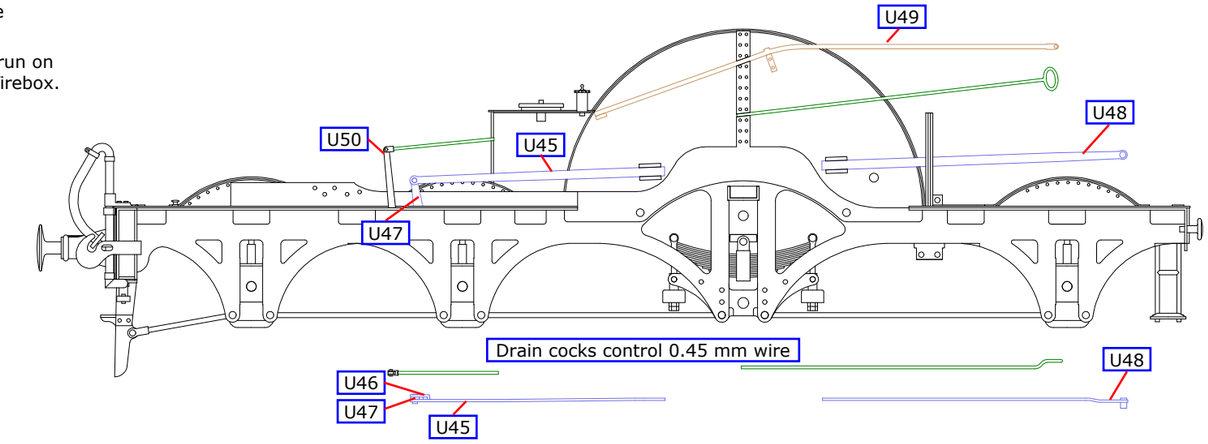
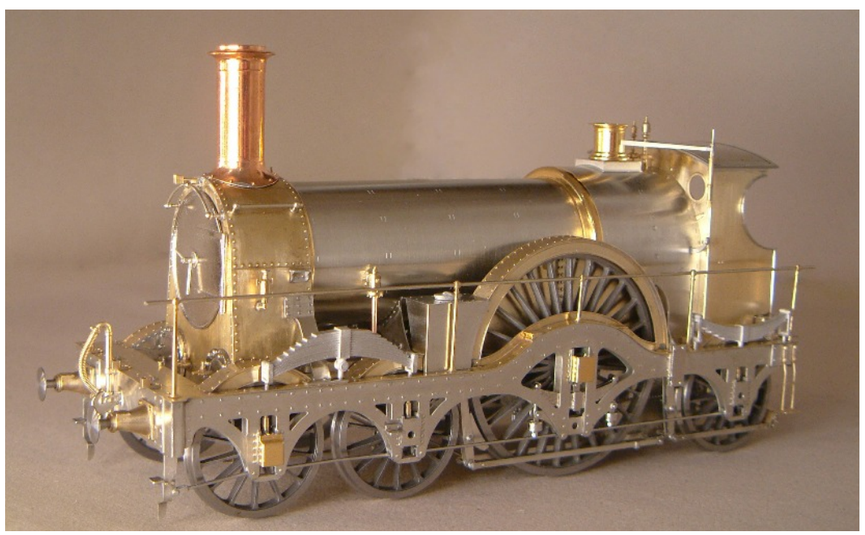
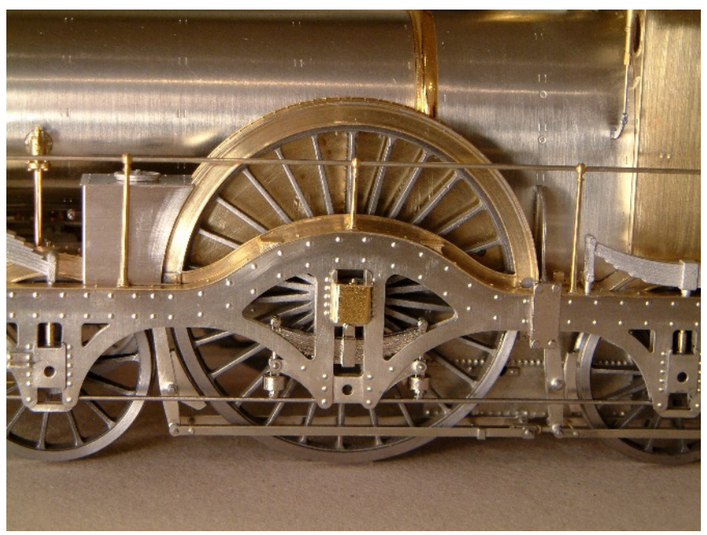
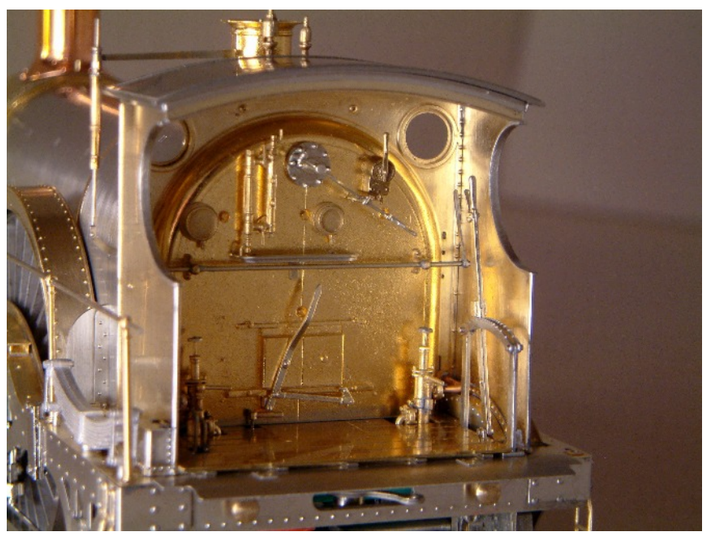


Fig 25. Control Rods







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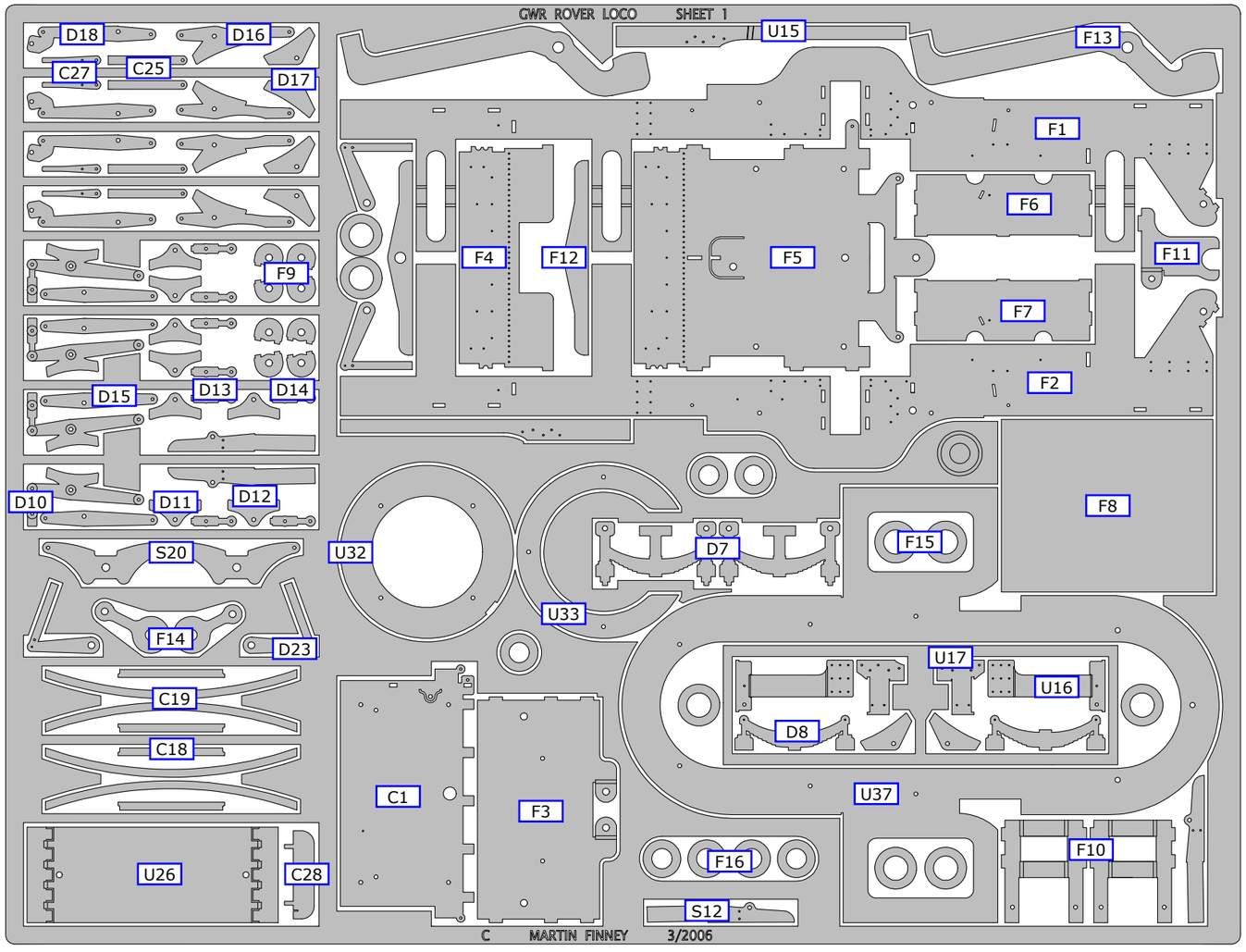
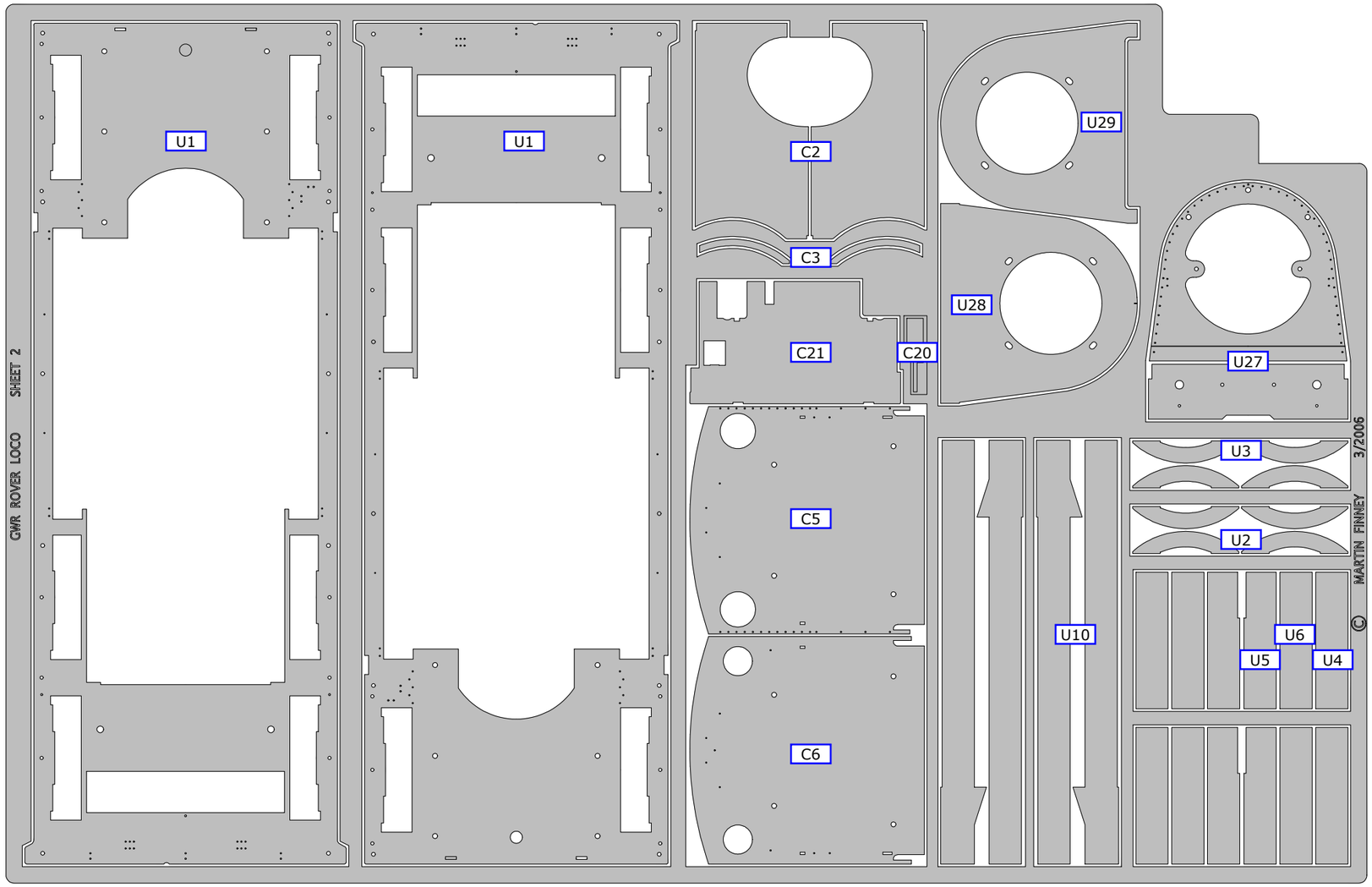
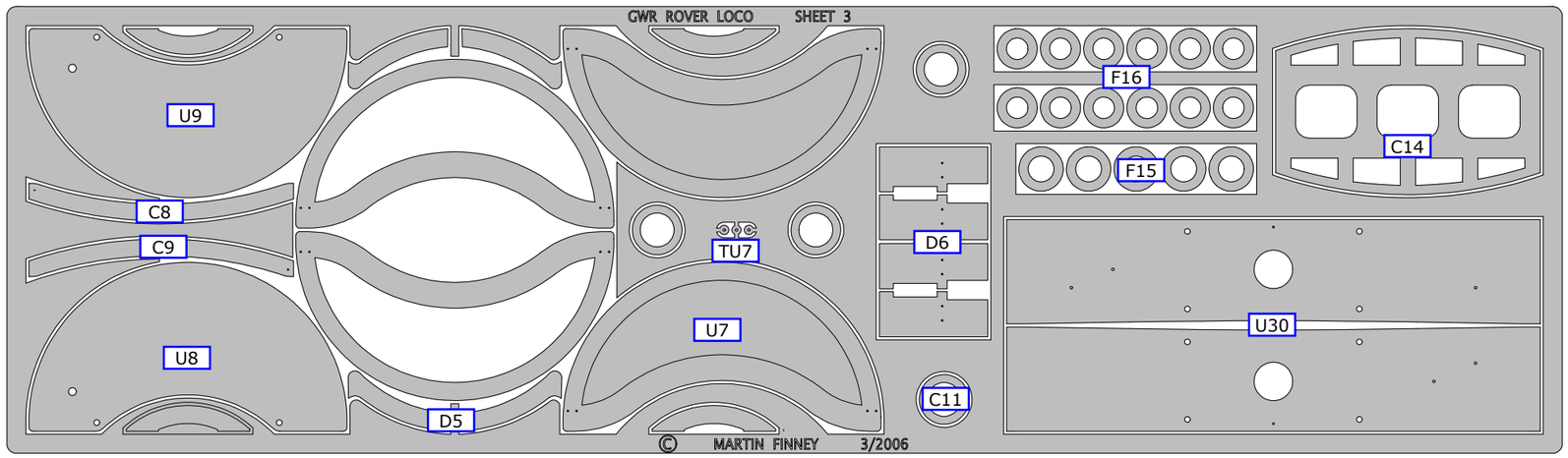
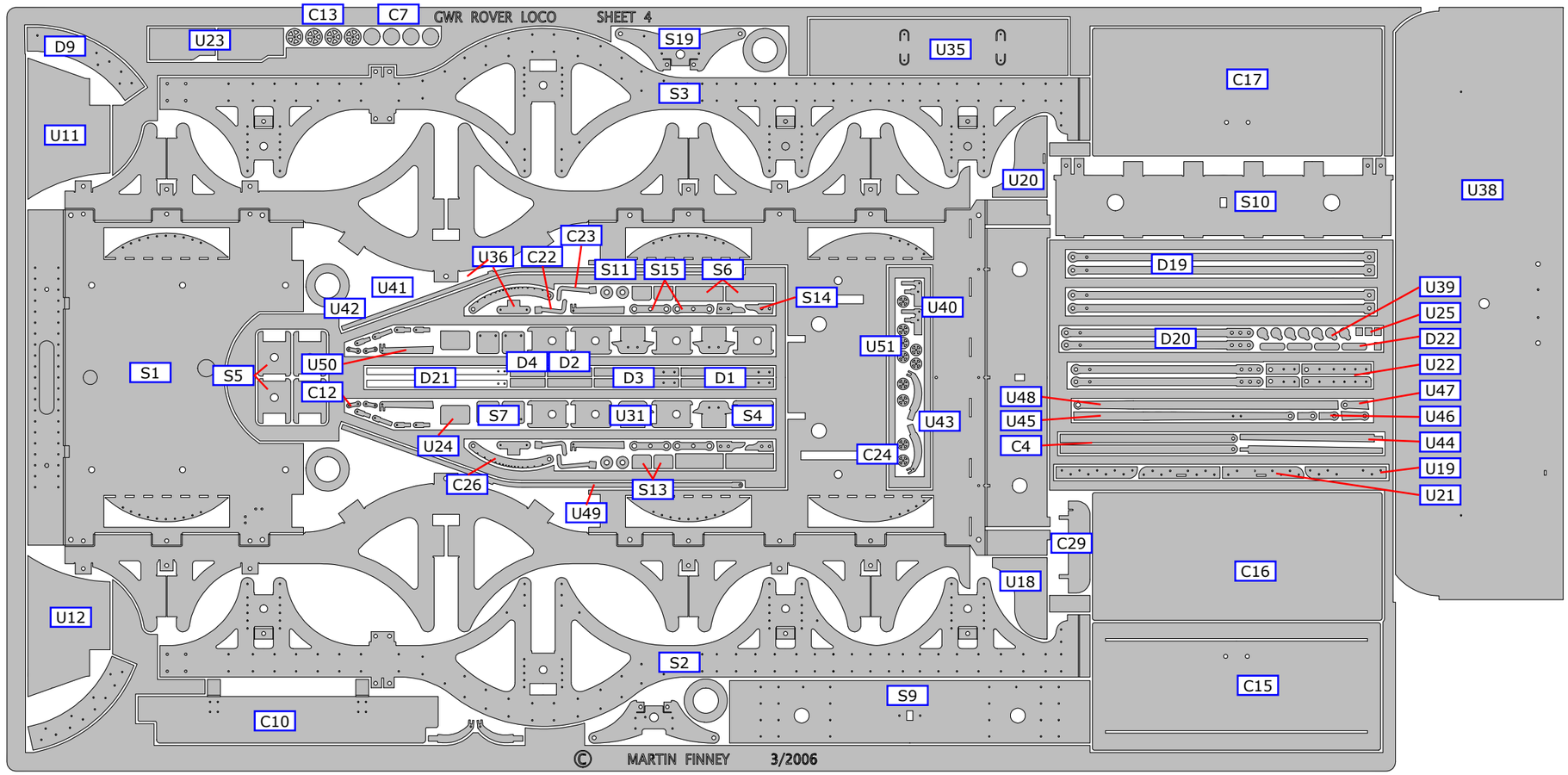

GWR ROVER LOCO SHEET 1
D18
D16
C27
C25
D17
F9
D15
D13
D14
D10
D11
D12
S20
F14
D23
C19
C18
U26
C28
C1
F3
U32
U33
U15
F13
F1
F6
F4
F12
F5
F11
F7
F2
F8
D7
F15
U17
U16
D8
U37
F10
F16
S12
C MARTIN FINNEY 3/2006

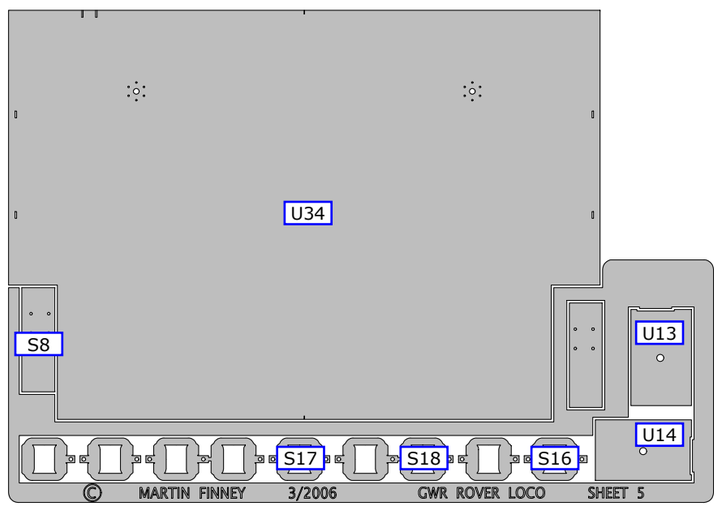
ETCH SHEET 2 & 3





ETCH SHEETS 4 & 5





OTHER COMPONENTS

10 BA x 5/16" screw (2)
10 BA x 9/64" screw (5)
12 BA x 3/32" screw (10)
12 BA x 1/8" screw (4)
12 BA x 3/16" screw (7)
10 BA nut (4)

Handrail stanchion, tall (8)
Handrail stanchion, short (2)
Handrail knob, short (8)
Handrail knob, long (3)
Hornblock bearing (2)
Buffer head and spring (4)
CPL products screw coupling (2)

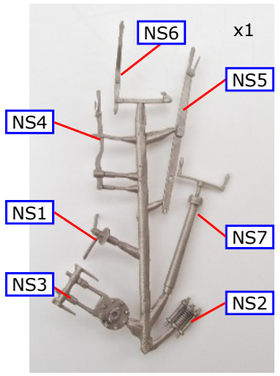
Brass tube - 1.2 mm
Brass tube - 3/32"

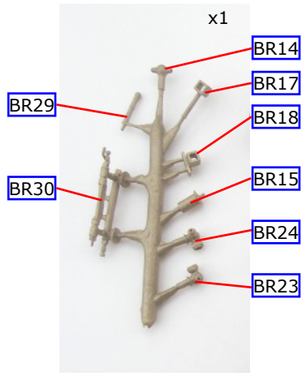
Nickel silver wire - 0.45 mm
Nickel silver wire - 0.7 mm
Nickel silver wire - 0.8 mm
Nickel silver wire - 1.0 mm

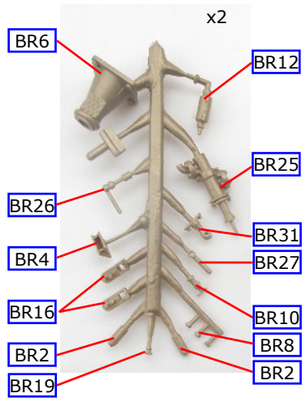
Brass wire - 0.3 mm
Brass wire - 0.6 mm
Brass wire - 1.2 mm
Brass wire - 1.4 mm
Brass wire - 1.6 mm
Brass wire - 1.8 mm

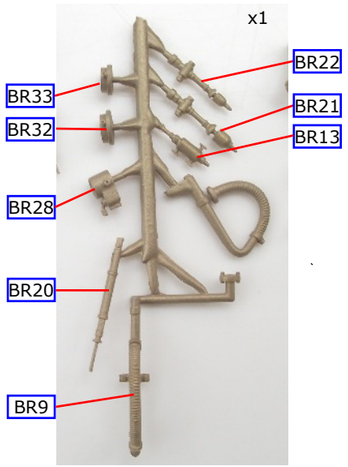
Copper wire - 0.3 mm
Copper wire - 0.45 mm
Copper wire - 1.0 mm
Copper wire - 1.2 mm

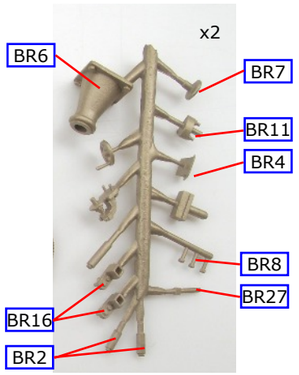
CAST PARTS

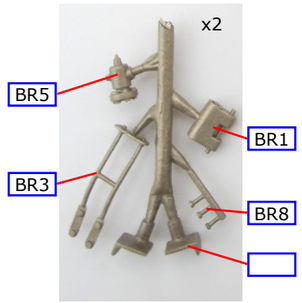












NICKEL SILVER

NS1	Smokebox door handles
NS2	Safety valve springs
NS3	Regulator mounting
NS4	Regulator handle
NS5	Reverser lever
NS6	Firebox doors handle

BRASS

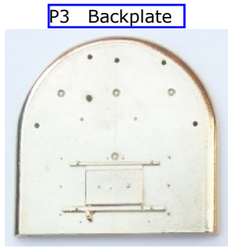
BR1	Pull rod crank (2)
BR2	Engine carrying wheel axle box rod (6)
BR3	Engine rear step (2)
BR4	Small step on engine running plate (4)
BR5	Clack box (2)
BR6	Buffer housing (2)
BR7	Engine to tender buffer (2)
BR8	Smokebox stay bolt (12)
BR9	Engine vacuum pipe
BR10	Cylinder cover cock (2)
BR11	Valve tail rod gland (2)
BR12	Roscoe displacement lubricator cylinder (2)
BR13	Roscoe displacement lubricator regulator
BR14	Blower valve
BR15	Vacuum pump lubricator
BR16	Lamp socket, running plate (7)
BR17	Lamp socket, smokebox
BR19	Knob for lifting plate
BR20	Safety valve balance
BR21	Large whistle
BR22	Small whistle
BR23	Injector valve, left
BR24	Injector valve, right
BR25	Injector (2)
BR26	Injector handle (2)
BR27	Control handles (3)
BR28	Brake ejector
BR29	Brake ejector handle
BR30	Water gauge
BR31	Sanding rod bracket (2)
BR32	Boiler steam pressure gauge
BR33	Brake vacuum gauge

PEWTER - PLATED GOLD & COPPER

P1 Safety valve bonnet

P2 Safety valve bonnet base

P3 Backplate



P4 Casing between fire box and boiler

P5 Casing between smoke box and boiler

P6 Engine axlebox cover carrying wheel (6)

P7 Engine axle box cover driving wheel (2)

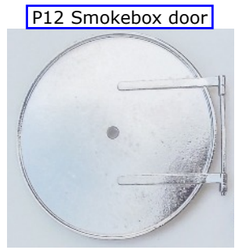
P9 Chimney

PEWTER - PLATED NICKEL

P10 Damper for front spring (2)

P11 Damper for rear spring (4)

P12 Smokebox door



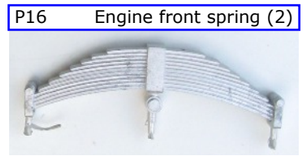
P13 Cylinder cover (2)

P14 Fire box stay frame plate (2)

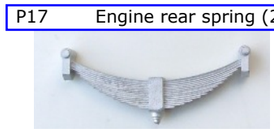
P15 Driving axle spring (2)

PEWTER - UNPLATED

P16 Engine front spring (2)

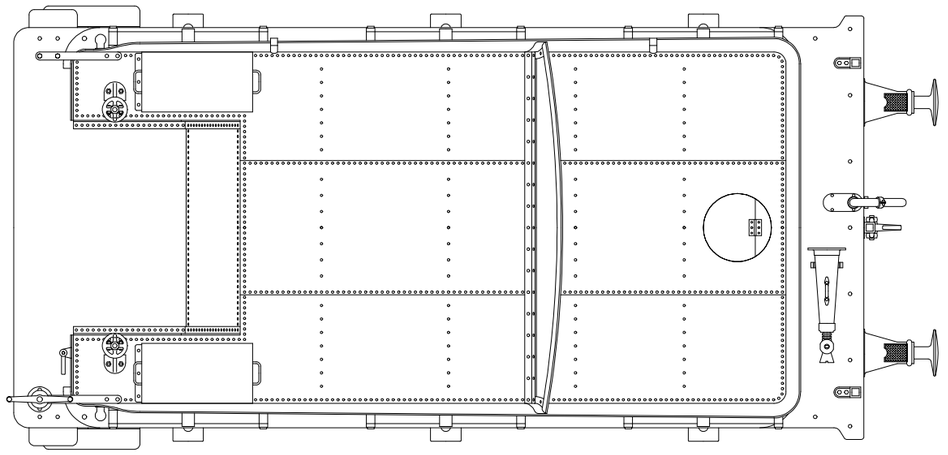


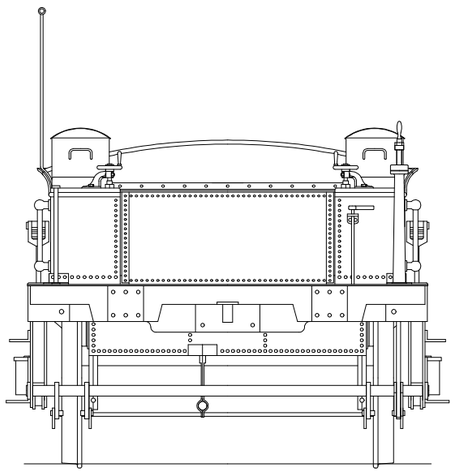
P17 Engine rear spring (2)

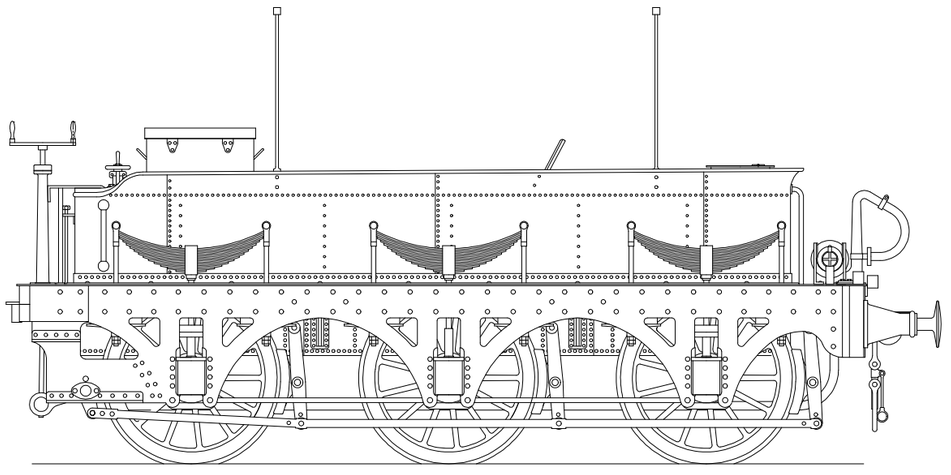


P18 Sandbox lid (2)

2700 GALLON TENDER GA







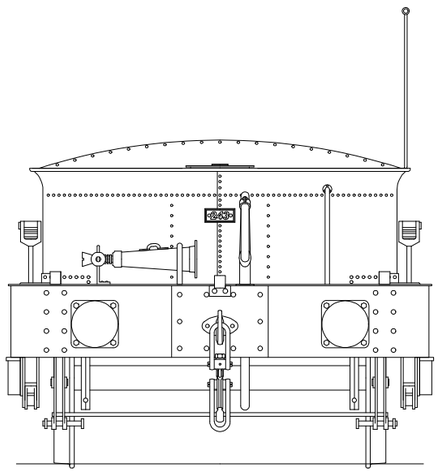
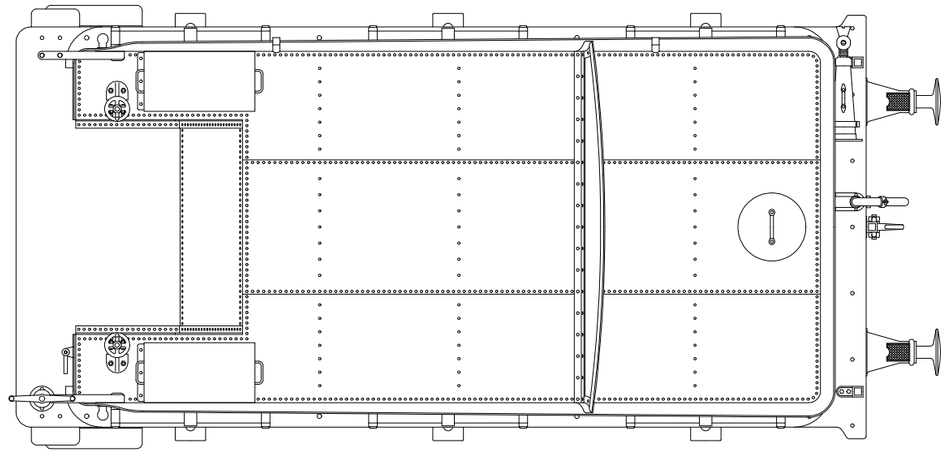


Fig 1. 2700 Gallon Tender, Circa 1890

3000 GALLON TENDER GA



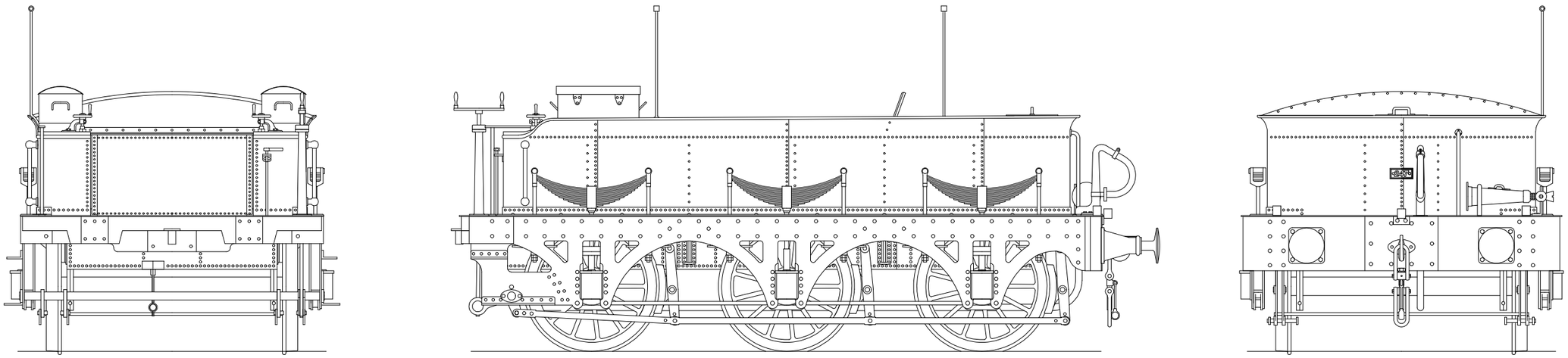


Fig 2. 3000 Gallon Tender, Circa 1890

CHASSIS

TENDER CHASSIS

Open up the following holes in the frames (TC1) 0.8 mm for the brake hanger pivots and 1.6 mm for the compensation beam pivot. Emboss the rivets and score to represent the joint lines between the plates as shown in Fig 3. Fold over the axle slot reinforcing plates and fold up the chassis.

Emboss the rivets on the well tank front (TC2) and the well tank rear (TC3) and fold out the vacuum pipe bracket on TC3 before soldering in place as shown below. Construct the compensation beams (TC4) as shown below. The 1.6 mm rod pivot must be made so that it is flush with the outside of the frames. The lengths of 3/32" brass are 21.8 mm long. Solder the two laminations of the compensation pivot (TC5) together and fix in place in the slot in the frames.

Temporarily fit the wheel sets and check that the chassis is level and works correctly. Wheel side control is limited by using the washers (TC6). Solder the front well tank bracket (TC7), the front well tank bracket angle plate (TC8), the rear well tank bracket (TC9) and the rear well tank bracket angle plate (TC10) in place as shown below. The compensation beam pin will be retained by TC9 & TC10. Solder 0.8 mm wire brake hanger pivots in place.

Form the vacuum pipe from 1.4 mm wire. Fold up the vacuum pipe bracket (TC11) and attach as shown. Final fixing of the vacuum pipe should be left until later as it will prevent wheel removal.

No.	Description	Sheet			
TC1	Frames	1	TC7	Front well tank bracket (2)	2
TC2	Well tank front	2	TC8	Front well tank bracket angle plate (2)	2
TC3	Well tank rear	2	TC9	Rear well tank bracket (2)	2
TC4	Compensation beam (2)	1	TC10	Rear well tank bracket angle plate (2)	2
TC5	Compensation pivot (2)	1	TC11	Vacuum pipe bracket	2
TC6	Wheel washer	1,2 & 3			

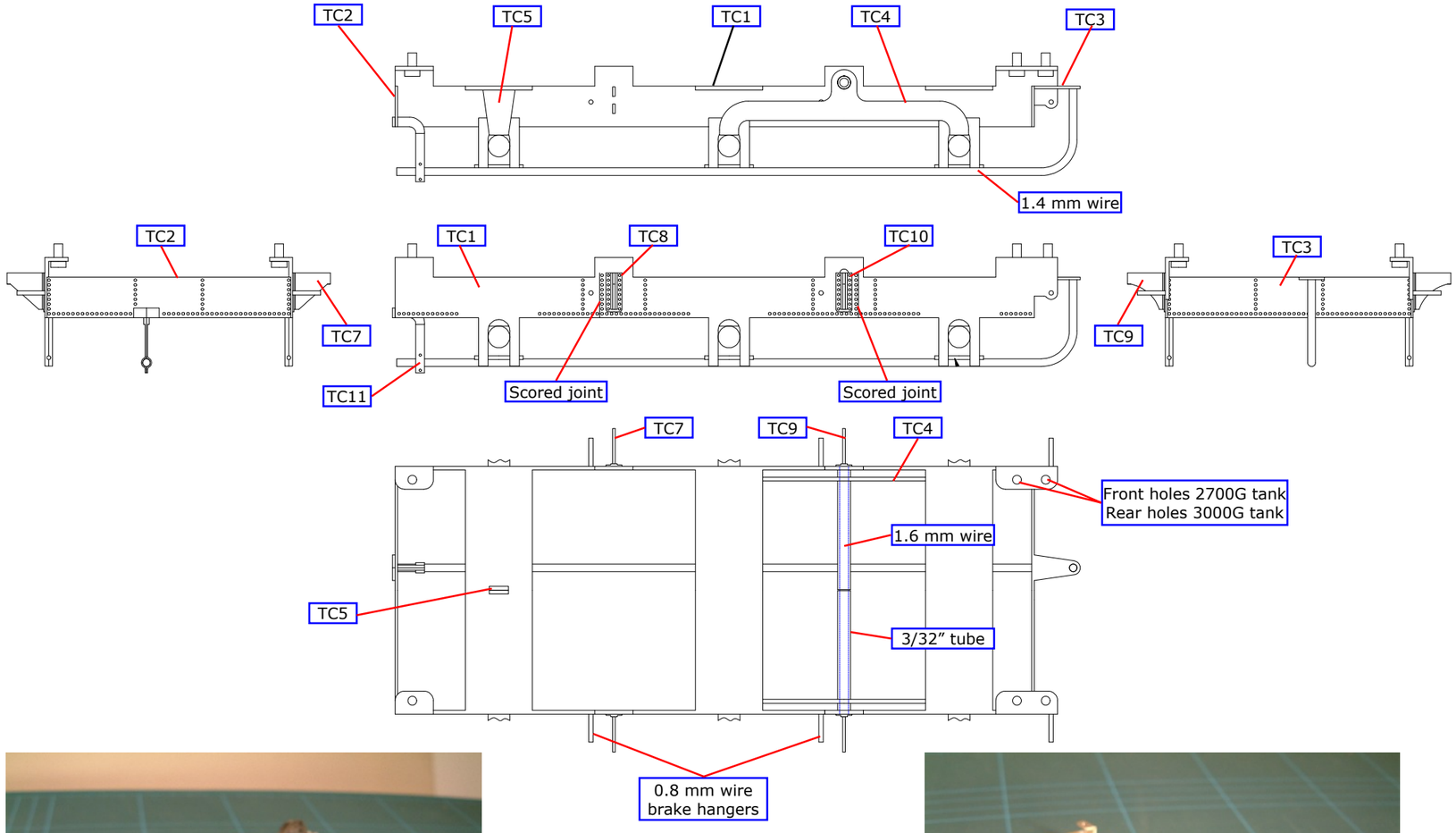
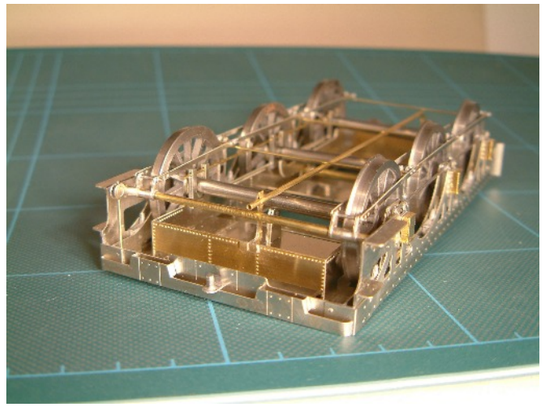
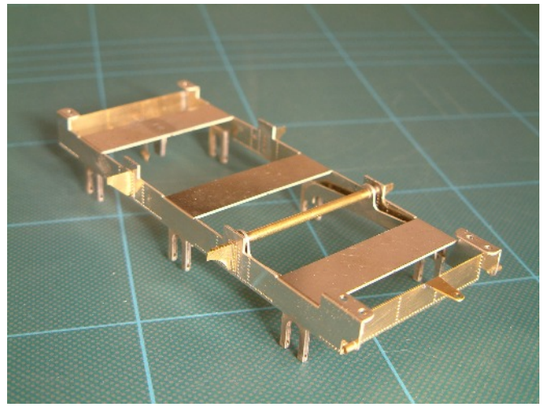
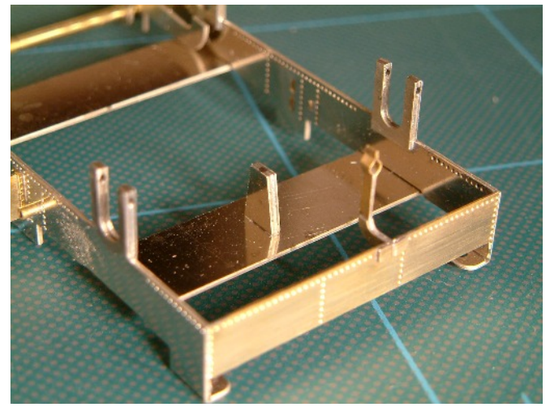


Fig 3. Tender Chassis







BRAKES

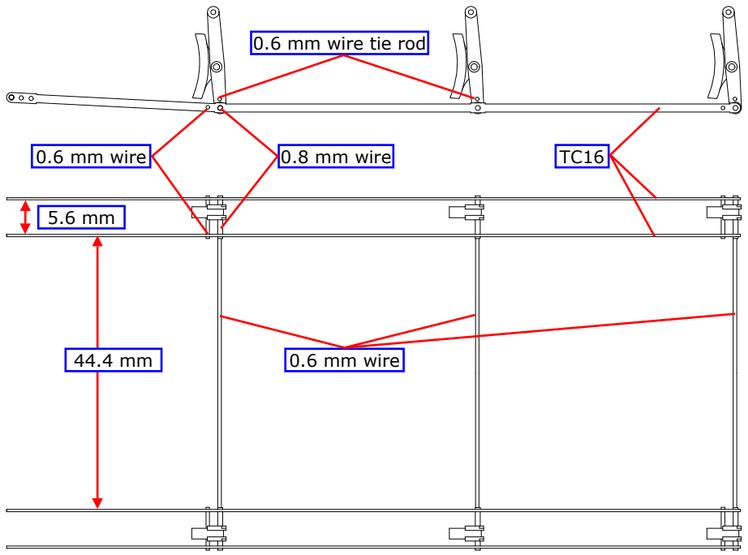
BRAKE SHAFT

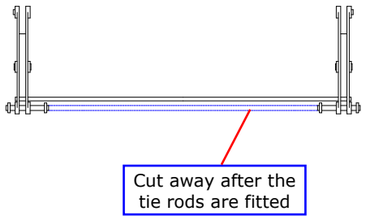
Make up the brake shaft from a 65.6 mm long piece of 1.8 mm wire as shown. The spacing of the cranks is a little tricky. The outside crank should be 4.2 mm in from the end of the shaft. To help space the cranks apart, make short lengths (4.2 mm & 3.8 mm) of 3/32" tube, bored out to 1.8 mm.

BRAKE RIGGING

The brake hanger /shoe assemblies are made of several laminations as shown below. These are assembled by making a jig by drilling suitable 0.8 mm and 1.0 mm holes in a small piece of hardwood or Tufnol. Use 0.8 mm drills mounted in the holes as mandrels to accurately align the laminations. A short piece of 1.0 mm wire is needed for the brake shoe pin. When the components are accurately aligned solder together. The steel drills are unlikely to be soldered to the nickel silver and can be removed after the complete assembly is taken off the jig.

When the brake hanger/shoe assemblies are complete build the brake gear as shown in the drawing. There two different tie rods - short ones made on 0.8 mm wire and long ones from 0.6 mm wire. To ease construction first build the brake rigging with the 0.8 mm wire running across the chassis. Then build in the 0.6 mm wire. Finally remove the 0.8 mm wire that sits between the two sets of brake hangers.





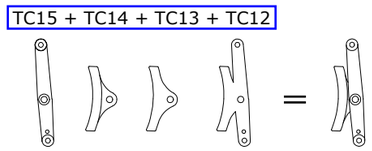


Fig 5. Brake Rigging

Locate the chassis and brake gear assembly in the frame assembly. Insert the cross shaft into the holes in the frames and clip the pull rods over the brake shaft crank pins. Solder the brake shaft to the frames on one side only – this will make subsequent adjustment possible. Add the handbrake rod from 0.7 mm wire as shown in Fig 4.

No.	Description	Sheet			
TC12	Brake hanger/shoe back lamination (6)	1	TC16	Brake pull rod (4)	3
TC13	Brake hanger/shoe second lamination (6)	1	TS16	Brake shaft crank (3)	1
TC14	Brake hanger/shoe third lamination (6)	1	TS17	Handbrake crank inner lamination	1
TC15	Brake hanger/shoe front lamination (6)	1	TS18	Handbrake crank outer lamination (2)	3

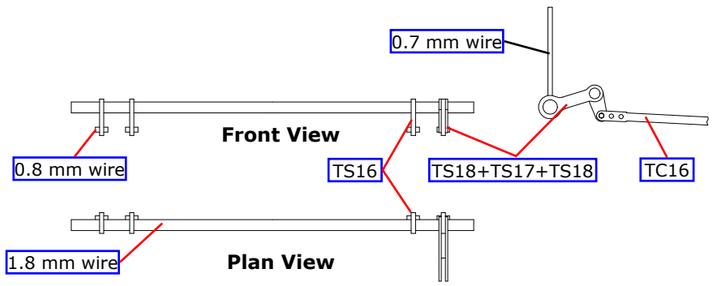
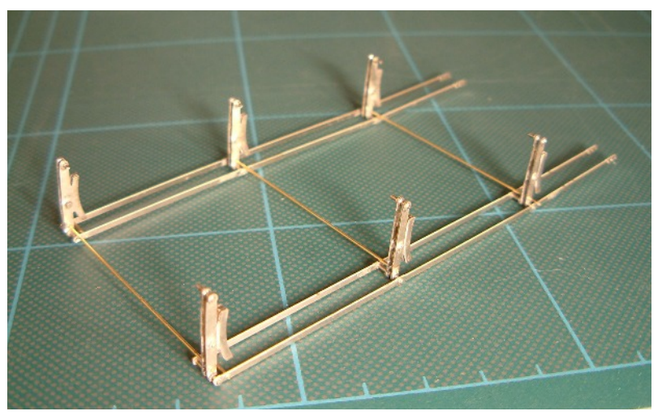
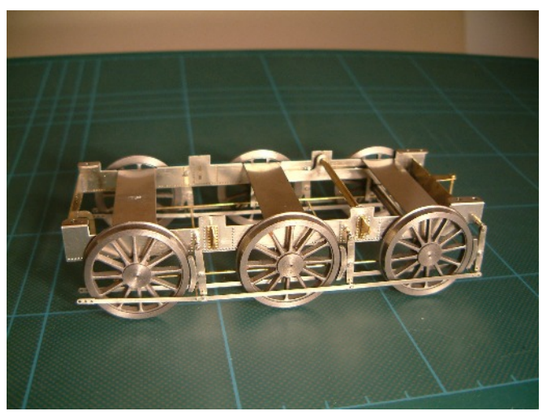


Fig 4. Brake Shaft





FRAMES

Emboss the rivets in the inner sandwich frames (TS1) before folding up as shown below. First curve the ends of the drag beam round a 3 mm drill and fold over the ends of the drag beam buffer rubbing plates. Fold out the small brackets for the Tender spring damper (BR34 & BR35) and the axlebox sides on both sides of each frame slot. Now fold down the bufferbeam and drag beam, before folding down the frames.

Check the fit in the frame holes of the tender spring dampers (WM1). Aim to get a push fit. They do not need to be fixed in place as they will be retained when the outer frames are fitted. Prepare the outer frames, left and right (TS2 & TS3), the horn guide plates (TS4), the horn ties,front/back and middle axles (TS5 & TS6), the front steps, upper and lower (TS7 & TS8), the brake shaft bearing (TS9), tender spring damper (BR34 & BR35) as shown below before soldering in place.

Emboss the rivets on the drag beam back (TS11) and fold down the drawbar pin bracket. Solder the drawbar pin (1.6 mm wire – 3.3 mm long) in place before soldering in place in the slots in the inner sandwich frames.

Emboss the rivets on frame/drag beam corner plate (TS10), fold up, and attach as shown below. Similarly attach the buffer beam back (TS13). Emboss the rivets on the buffer beam front (TS12)and the coupling pocket (TS14). Solder the coupling pocket and lamp socket (BR18) in place then solder the buffer beam to the inner sandwich frames. Add the tie rods from 0.8mm wire. Assemble the buffers as shown in Fig 6 and fix in place.

Locate the brake gear assembly in the frames. Insert the cross shaft into the holes in the frames and clip the pull rods over the brake shaft crank pins. Solder the brake shaft to the frames on one side only – this will make subsequent adjustment possible. Add the handbrake rod from 0.7 mm wire as shown below.

No.	Description	Sheet			
TS1	Inner sandwich frames	3	TS9	Brake shaft bearing (2)	2
TS2	Left outer sandwich frame	3	TS10	Frame/drag beam corner plate (2)	3
TS3	Right outer sandwich frame	3	TS11	Drag beam back	3
TS4	Horn guide plate (6)	3	TS12	Buffer beam front	3
TS5	Horn tie front/back axle (4)	3	TS13	Buffer beam back	3
TS6	Horn tie middle axle (2)	3	TS14	Coupling pocket	3
TS7	Front step upper (2)	3	TS15	Buffer retaining washer (2)	3
TS8	Front step lower (2)	3			

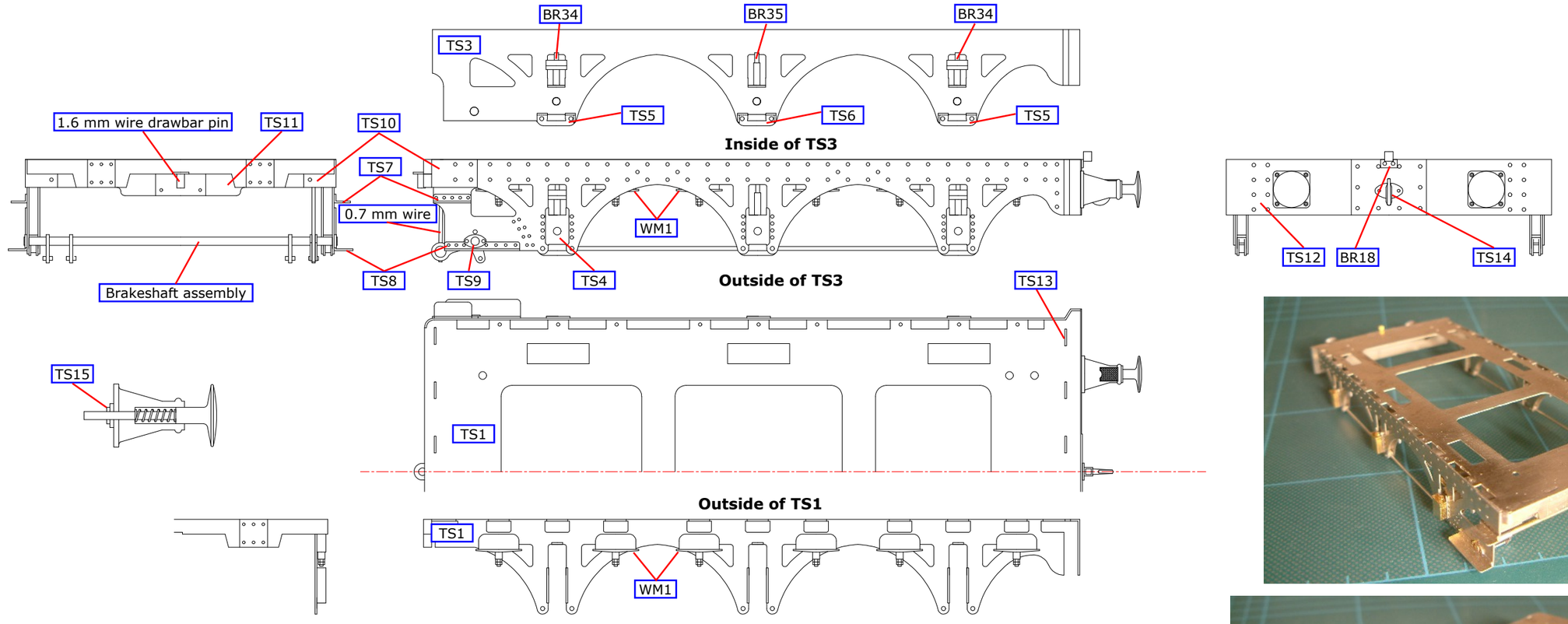
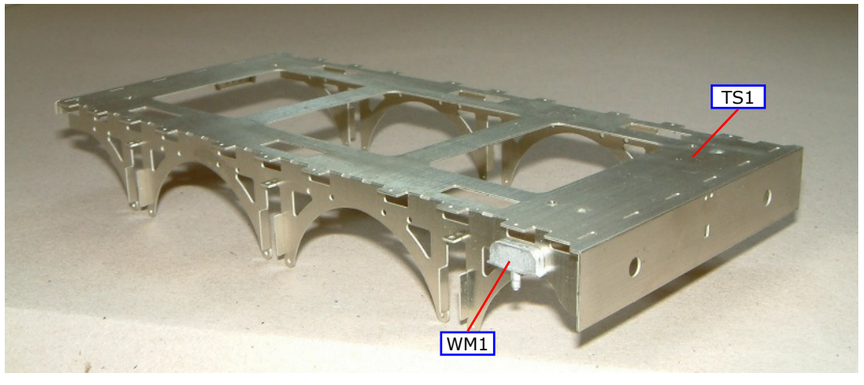
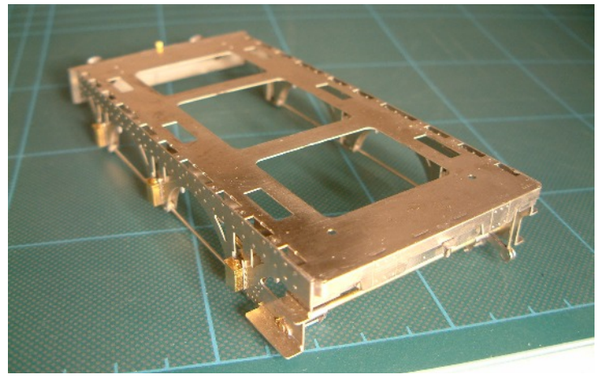
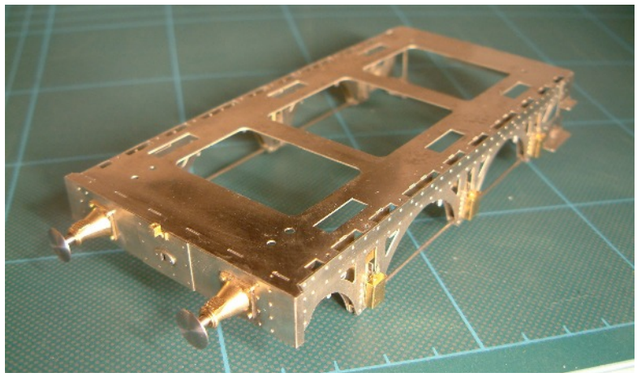


Fig 6. Frames







TANK FLARES

The 2700 gallon or 3000 gallon tender tanks differ but the forming of the flares is the same. Start by embossing the rivets in the platform and tank former (TU15 or TU 24) and soldering the four 10BA nuts in place. Select a flat piece of thin material (MDF, hardboard, Tufnol) slightly larger than the platform as a base on which to construct the tank. Drill holes in the base to match the nuts on the platform and screw the platform to the base using 10BA screws. Fold up the flaps with the large holes as shown in to the right. They act to locate the tank sides and the tank top.

Score the plate joint lines on the tank sides and back (TU16 or TU25) as shown in red in Fig 9 & 10. The forming of the flare along the top edge of the sides is made tricky because the flare rises from the front to the back of the tender and because of the etched rivets and beading. We recommend you use the following method to form the flare. We suggest you practise on the spare tank back and sides.

No.	Description	Sheet
TU13	Template for making flare forming jig	2
TU14	Template for checking flare	2
TU15	2700G Platform and tank former	2
TU16	2700G Tank sides and back	2
TU19	Coal space sides and back	2
TU24	3000G Platform and tank former	2
TU25	3000G Tank sides and back	2

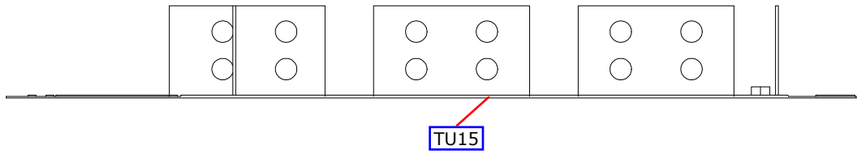


Fig 7. Platform and tank former

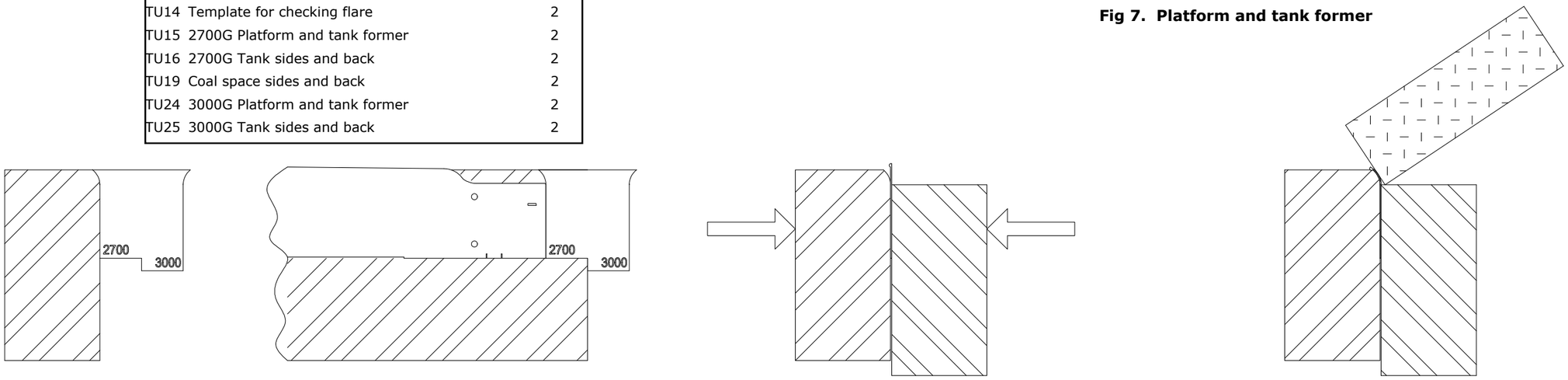


Fig 8. Flare Forming

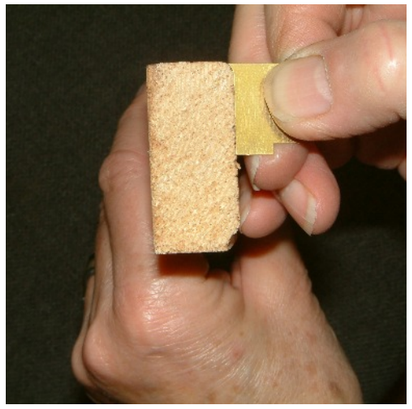
STAGE ONE. Obtain two lengths of 40 mm x 20 mm **softwood** 330 mm long. Round the best, knot free edge, using the template (TU13). One side of the template sets the 2700G tender, the other side sets the 3000G tender.

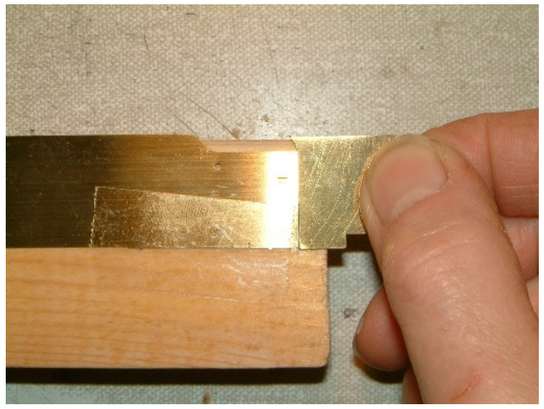
STAGE TWO. Using Sellotape attach the tank sides and back to the softwood accurately setting its' position by using the template.

STAGE THREE. Clamp part TU16 or TU25 and the two pieces of softwood together, either in a vice or between clamps to the bench.

STAGE FOUR. Obtain a **hardwood** block approximately 200 mm long.

Make sure one face of the block is smooth and the short edges on the ends are rounded off. The flare is now formed in three sections: front to rear corner – between rear corners – rear corner to front. Form the flare, working on one section at a time by hammering the hardwood block against the flare. Check the outcome by using the template for checking flare (TU14).





2700G TANK

Form the corner bends in tank sides and back (TU16) over a 1/8” rod or drill using the marks in the lower edge as a guide to position. Check the fit over the platform (TU15). If all is well then solder them together from the inside. Carefully form the corner bends in the rivet strip (TU17) over a 5/32” (4 mm) rod and solder in place. Form the drain pipe from 0.7 mm wire and fix in place together with the drain pipe flange (TU7) and file off flush with the inside of the tank.

Carefully curve to shape the small 'fingers' at the corners of the tank flare, fill the gaps with solder and then file to shape. Add the control handle bracket (TU1) through the slot in the platform and tank former, the control handle (BR27). We have no idea what it did.

Emboss the rivets in the tank top (TU18) and score the plate joint lines. Fold up toolbox to tank top bracket (TU6) and solder to the tank top together with the division plate angle strip (TU4) aligning with the etched dotted lines.

Emboss the rivets on and fold up coal space sides and back (TU19). Fit in place and check the fit of the tank top. Solder the coal space sides and back to the platform and tank front. Tack solder the tank top in place. Remove the assembly from the base and complete the soldering of the tank top from inside the tank.

Emboss the rivets on the division plate front lamination (TU2) and solder to to the rear lamination (TU3) to make the division plate. Solder the division plate in position setting the correct angle using the template (TU12). Add the angles between the division plate and side (TU20).

Carefully drill 0.7 mm holes in the tender springs (P19) to accept the 0.7 mm wire hangers. Solder the wire hangers in place in the platform ensuring that they are of similar length and are flush on the underside. Attach the springs.

Using a length of 0.8 mm wire and two short handrail knobs, solder the tank side handrails into place. Solder the brake standard (NS7) into place. Attach a length of 0.7 mm wire to the platform in the hole between the brake standard and the tank. Add the left front handrail bracket (TU22) over the wire and solder to the tank top and brake standard. The right hand handrail is made from two lengths of 0.7 mm wire and the right front handrail bracket (TU23).

Solder the water feed valve (BR37) into place on the tank top front. Attach the water feed valve hand wheel (BR38) to the valve.

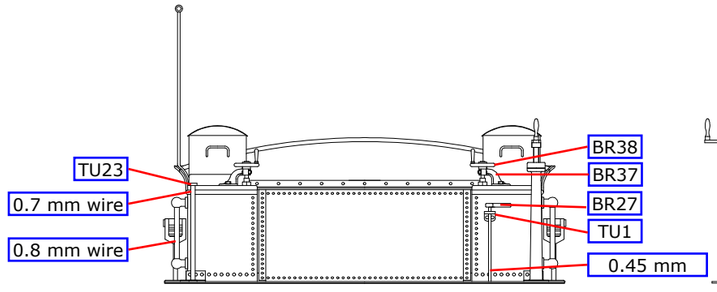
Drill two 0.3 mm holes in each side of the toolbox (P20). Bend two short lengths of 0.3 mm wire into a U shape to form the handles of the toolbox and attach into the holes. Attach the toolboxes to the tank top butting up to the tank top bracket (TU6). Attach the toolbox padlock (TU11) after the toolbox is painted.

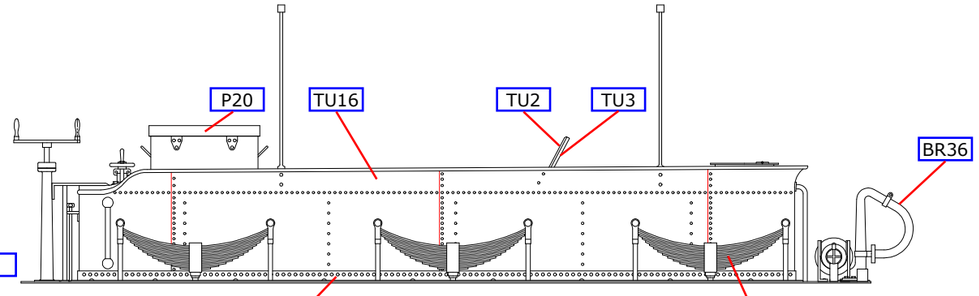
The water filler is made up of the base (TU5), the water filler body (P21) and the filler lid (TU21). Scribe the line shown in blue on the lid and make the hinge from a short length of 0.3 mm wire. Assemble and place in the fixing hole on the tank top.

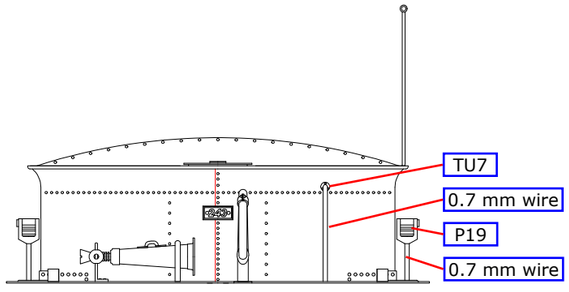
Solder two running plate lamp sockets (BR16) into place on the rear footplate. Solder the vacuum pipe (BR36) into the hole on the rear footplate. Make up the re-railing jack cradle as shown from TU8, TU9, and TU10. Attach the re-railing jack (P22) after making up a handle from 0.45 mm wire as shown below.

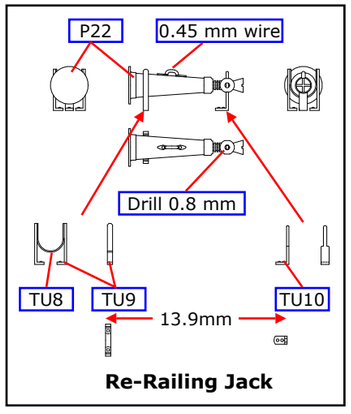
The davits are made from a length of 0.45 mm wire, with a flattened end for the bracket and a short length of 1.2 mm tube on top for the rope to route through.

No.	Description	Sheet			
TU1	Control handle bracket	3	TU12	Template for division plate angle	2
TU2	Division plate front lamination	2	TU15	2700G Platform and tank former	2
TU3	Division plate rear lamination	2	TU16	2700G Tank sides and back	2
TU4	Division plate angle strip	2	TU17	Rivet strip (2)	2
TU5	Water filler base	3	TU18	Tank top	2
TU6	Toolbox to tank top bracket (2)	3	TU19	Coal space sides and back	2
TU7	Drain pipe flange	3	TU20	Angle between division plate and side (2)	2
TU8	Jack cradle	3	TU21	Water filler lid	3
TU9	Jack cradle strut (2)	3	TU22	Left front handrail bracket	3
TU10	Jack support	3	TU23	Right front handrail bracket	3
TU11	Toolbox padlock (2)	2			









Re-Railing Jack

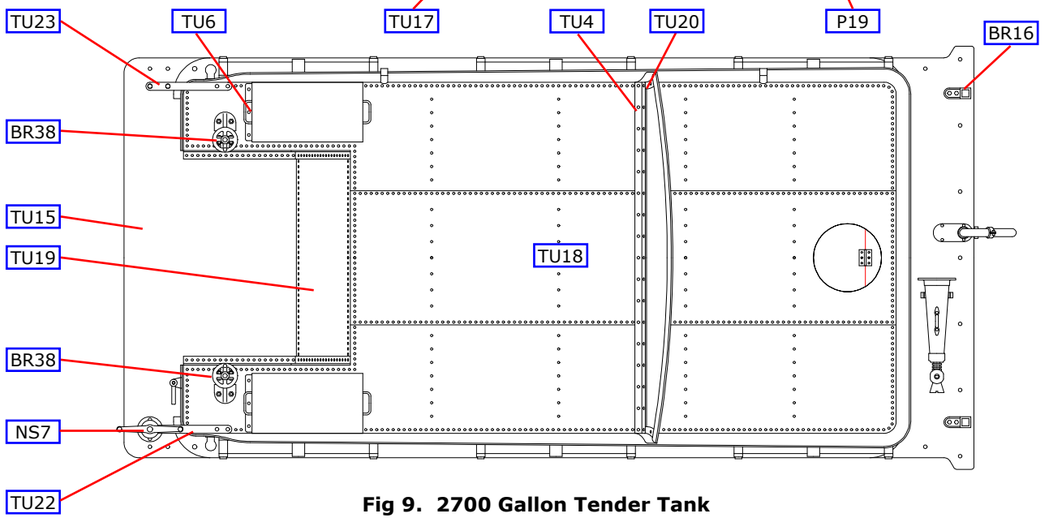
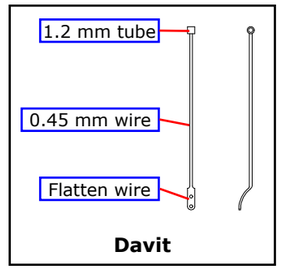
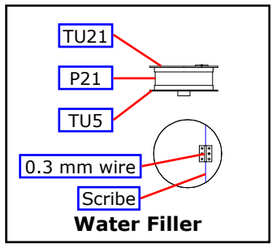


Fig 9. 2700 Gallon Tender Tank



Davit



Water Filler

3000G TANK

Form the corner bends in tank sides and back (TU25) over a 1/8" rod or drill using the marks in the lower edge as a guide to position. Check the fit over the platform (TU24). If all is well then solder the together from the inside. Carefully form the corner bends in the rivet strip (TU26) over a 5/32" (4 mm) rod and solder in place. Form the drain pipe from 0.7 mm wire and fix in place together with the drain pipe flange (TU7) and file off flush with the inside of the tank.

Carefully curve to shape the small 'fingers' at the corners of the tank flare, fill the gaps with solder and then file to shape. Add the control handle bracket (TU1) through the slot in the platform and tank former, the control handle (BR27). We have no idea what it did.

Emboss the rivets in the tank top (TU27) and score the plate joint lines. Fold up toolbox to tank top bracket (TU6) and solder to the tank top together with the division plate strip (TU4) aligning with the etched dotted lines.

Emboss the rivets on and fold up coal space sides and back (TU28). Fit in place and check the fit of the tank top (TU27). Solder the coal space sides and back to the platform and tank front. Tack solder the tank top in place. Remove the assembly from the base and complete the soldering of the tank top from inside the tank.

Emboss the rivets on the division plate front lamination (TU2) and solder to to the rear lamination (TU3) to make the division plate. Solder the division plate in position setting the correct angle using the template (TU12). Add the angles between the division plate and side (TU29).

Carefully drill 0.7 mm holes in the tender springs (P19) to accept the 0.7 mm wire hangers. Solder the wire hangers in place in the platform ensuring that they are of similar length and are flush on the underside. Attach the springs.

Using a length of 0.8 mm wire and two short handrail knobs, solder the tank side handrails into place. Solder the brake standard (NS7) into place. Attach a length of 0.7 mm wire to the platform in the hole between the brake standard and the tank. Add the left front handrail bracket (TU31) over the wire and solder to the tank top and brake standard. The right hand handrail is made from two lengths of 0.7 mm wire and the right front handrail bracket (TU32).

Solder the water feed valve (BR37) into place on the tank top front. Attach the water feed valve hand wheel (BR38) to the valve.

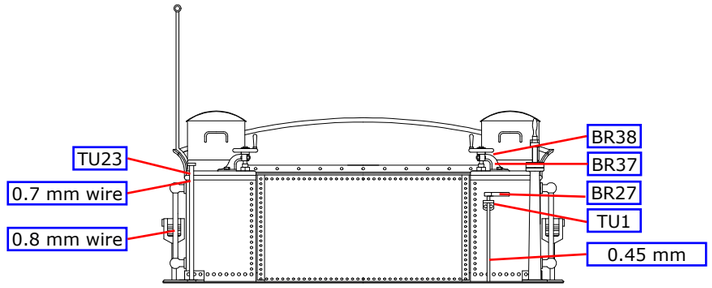
Drill two 0.3 mm holes in each side of the toolbox (P20). Bend two short lengths of 0.3 mm wire into a U shape to form the handles of the toolbox and attach into the holes. Attach the toolboxes to the tank top butting up to the tank top bracket (T6). Attach the toolbox padlock (TU11) after the toolbox is painted.

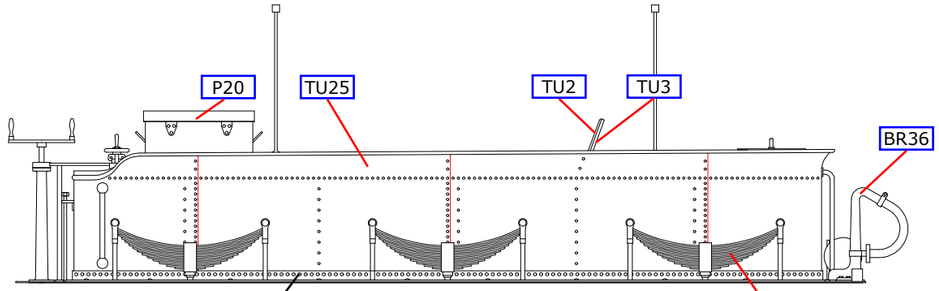
The water filler is made up of the base (TU5), the water filler body (P21) and the filler lid (TU30). Make the handle from 0.6 mm wire. Assemble and place in the fixing hole on the tank top.

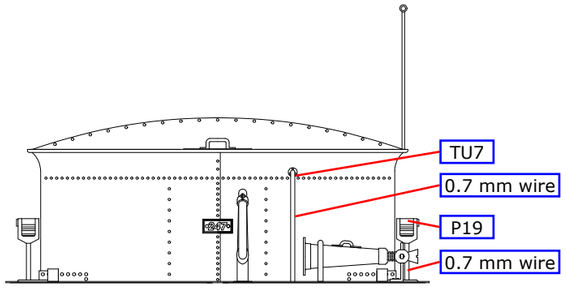
Solder two running plate lamp sockets (BR16) into place on the rear footplate. Solder the vacuum pipe (BR36) into the hole on the rear footplate. Make up the re-railing jack cradle as shown from TU8, TU9, and TU10. Attach the re-railing jack (P22) after making up a handle from 0.45 mm wire as shown below.

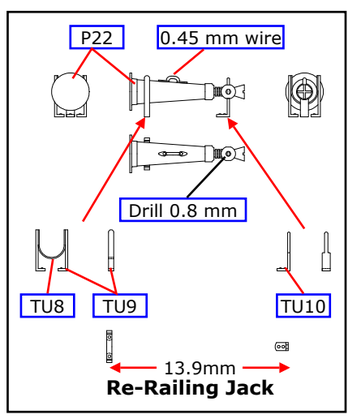
The davits are made from a length of 0.45 mm wire, with a flattened end for the bracket and a short length of 1.2 mm tube on top for the rope to route through.

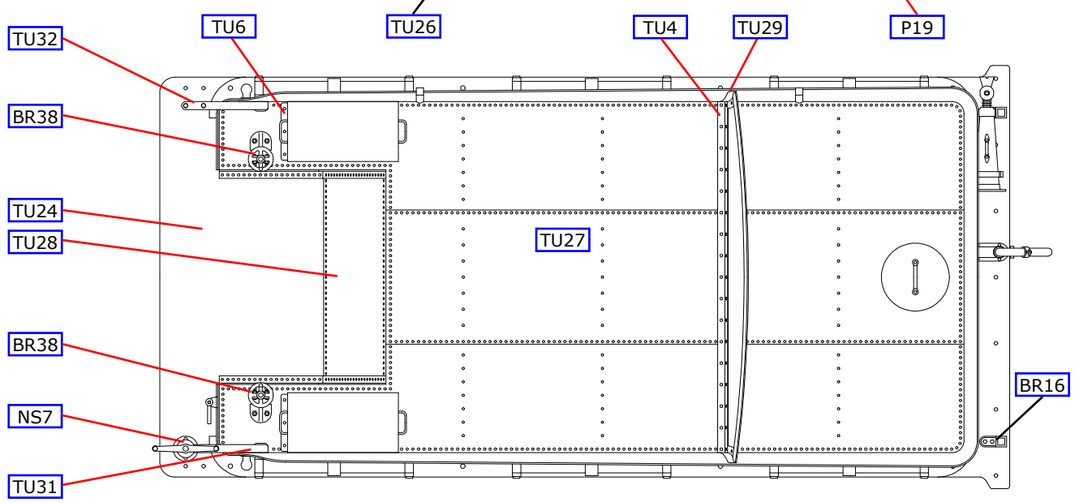
No.	Description	Sheet			
TU1	Control handle bracket	3	TU12	Template for division plate angle	2
TU2	Division plate front lamination	2	TU24	3000G Platform and tank former	2
TU3	Division plate rear lamination	2	TU25	3000G Sides and back	2
TU4	Division plate angle strip	2	TU26	Rivet strip (2)	2
TU5	Water filler base	3	TU27	Tank top	2
TU6	Toolbox to tank top bracket (2)	3	TU28	Coal space sides and back	2
TU7	Drain pipe flange	3	TU29	Angle between division plate and side (2)	2
TU8	Jack cradle	3	TU30	Water filler lid	3
TU9	Jack cradle strut (2)	3	TU31	Bracket, left front handrail to front of side	3
TU10	Jack support	3	TU32	Bracket, right front handrail to front of side	3
TU11	Toolbox padlock (2)	2			

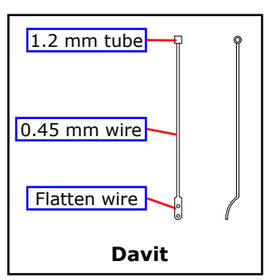












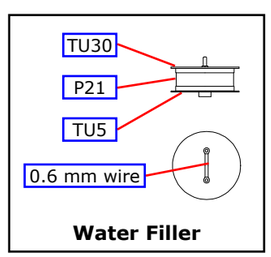
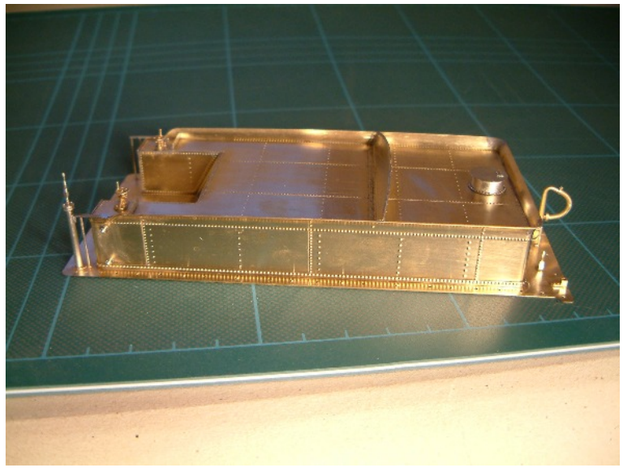
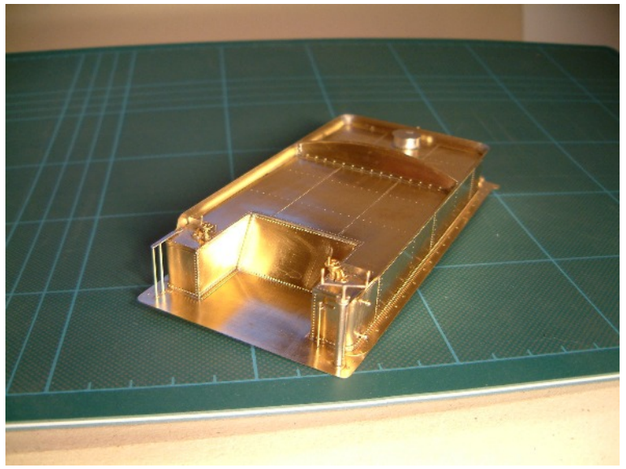
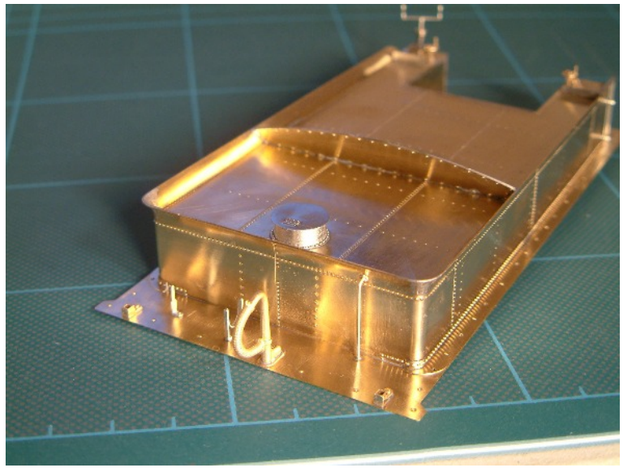
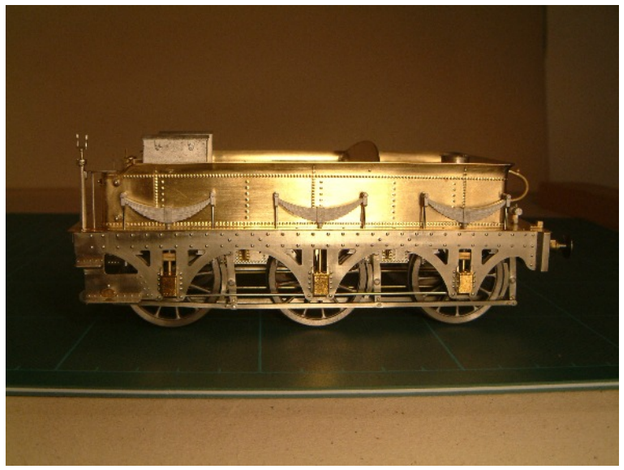


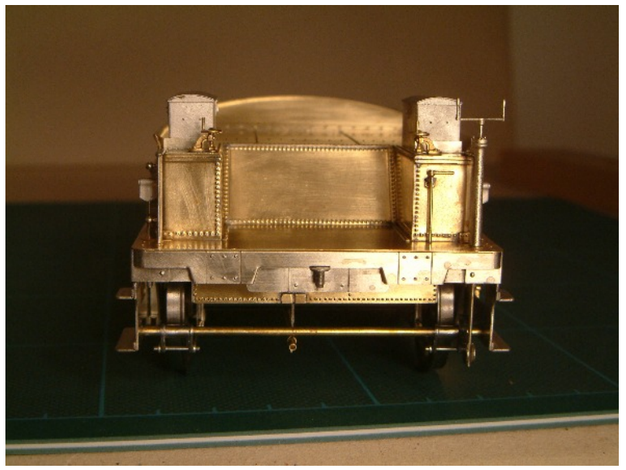
Fig 10. 3000 Gallon Tender Tank

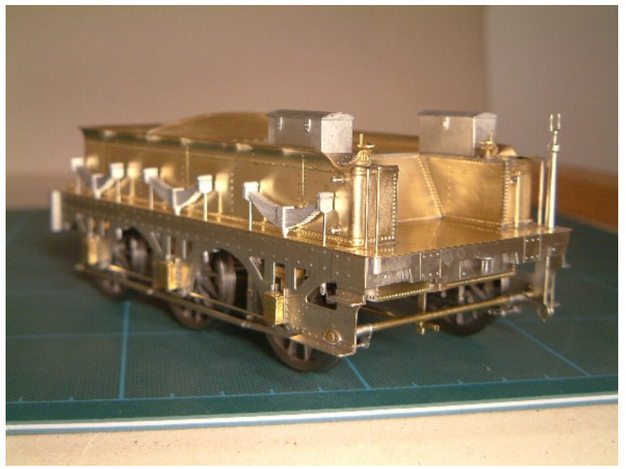


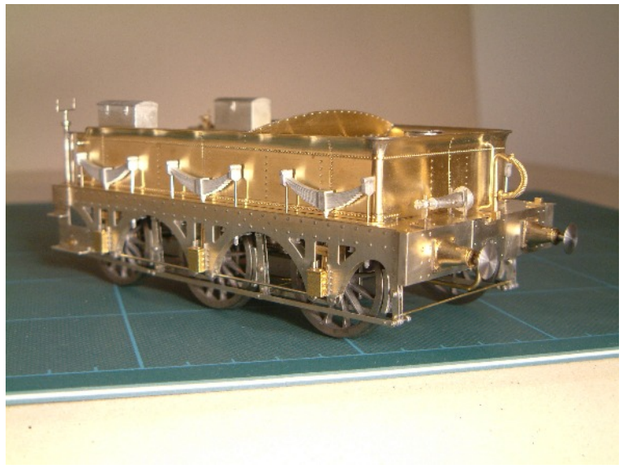




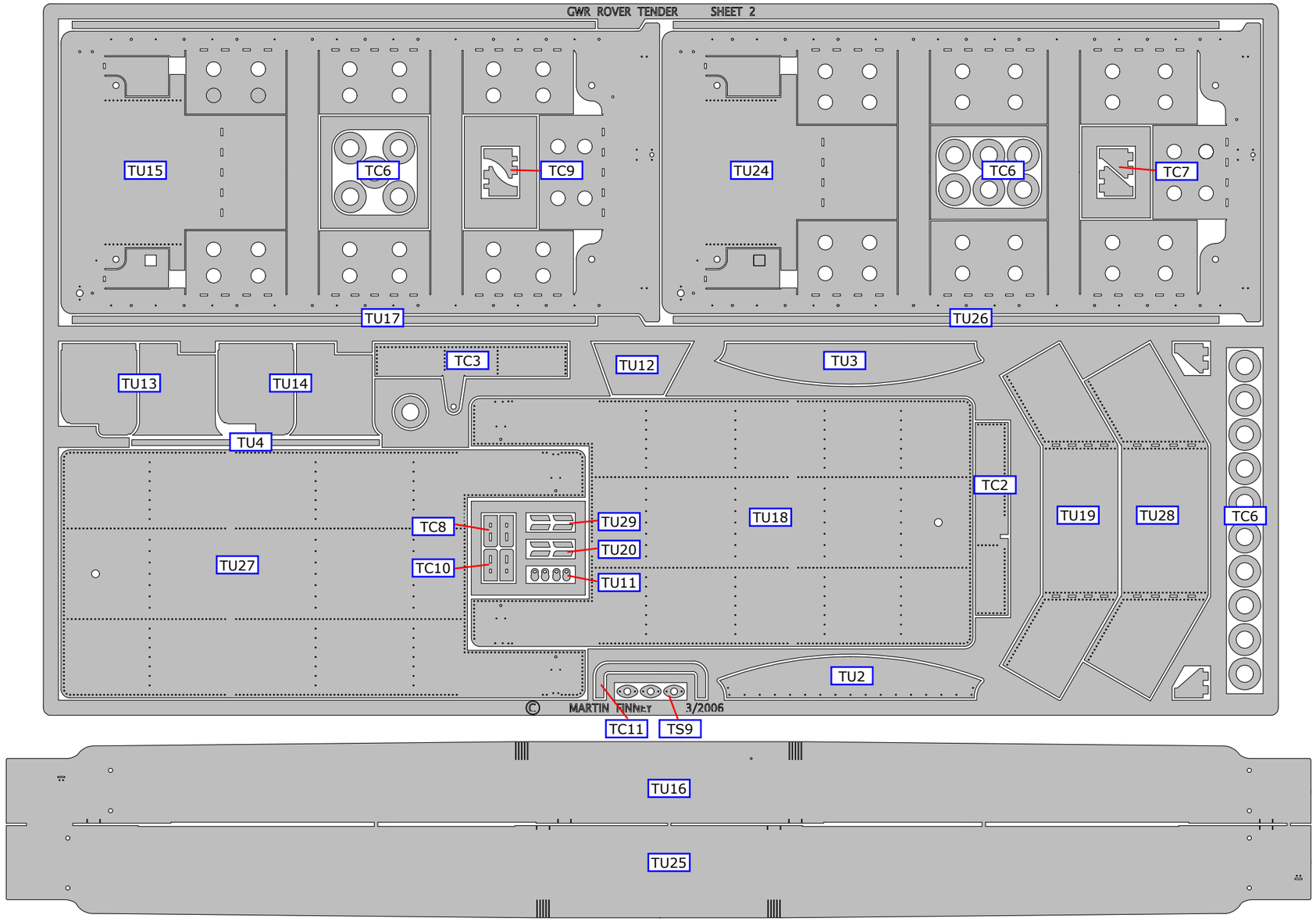








ETCH SHEET 2



OTHER COMPONENTS

10 BA x 9/64" screw (4)
10 BA nut (4)

Handrail knob, short (8)
Buffer head and spring (2)
CPL products screw coupling (2)

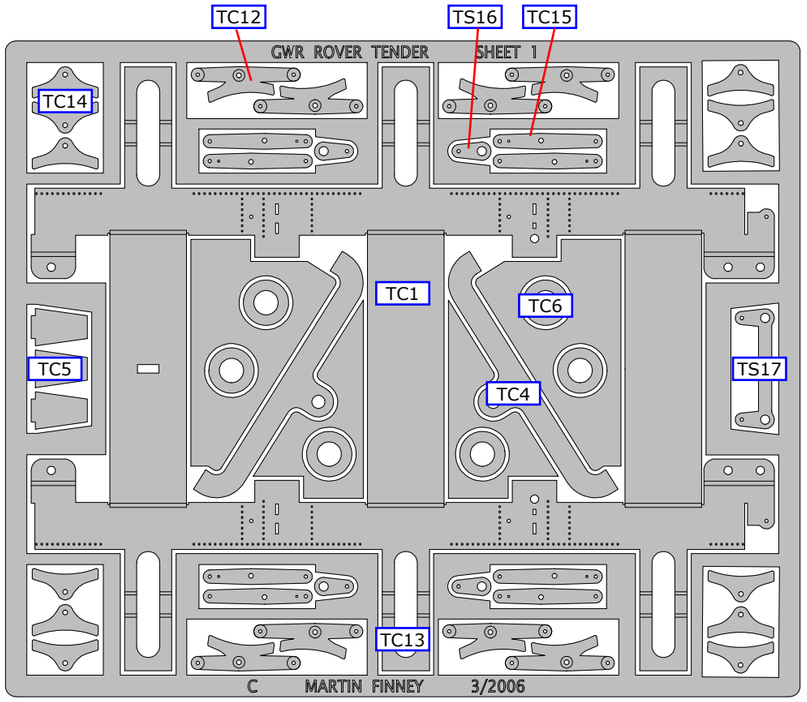
Brass tube - 1.2 mm

Brass tube - 3/32"

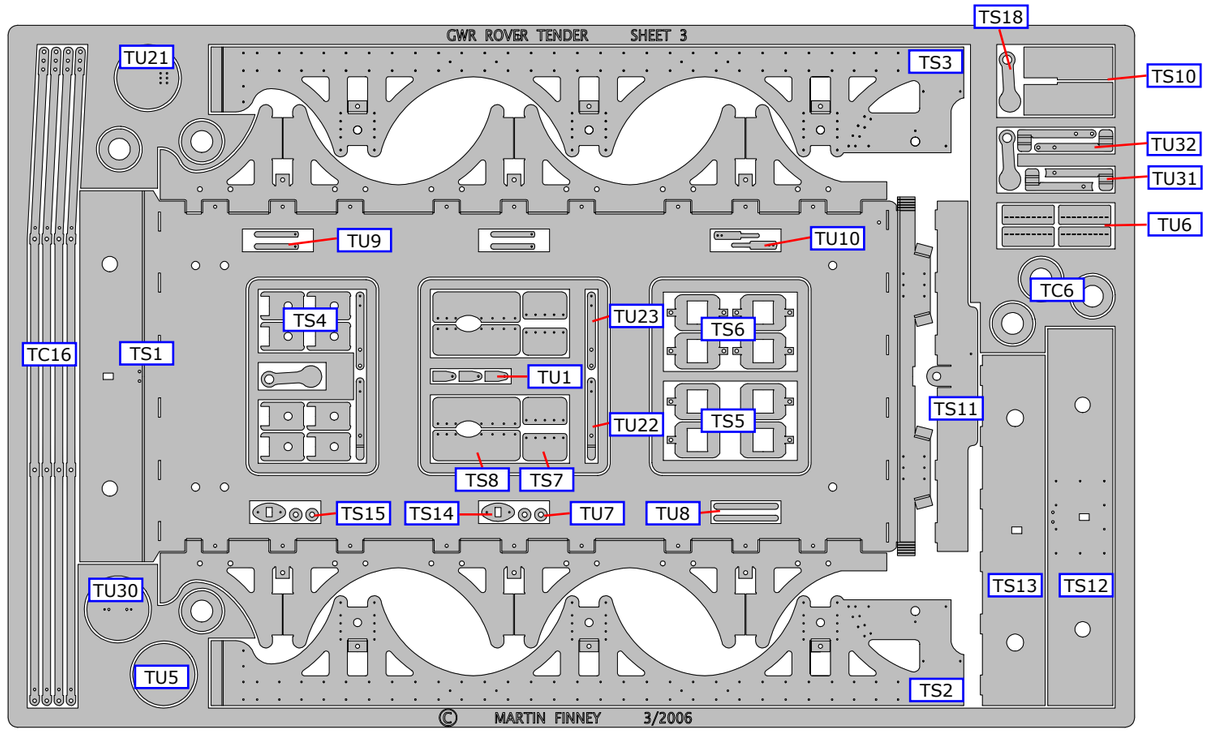
Nickel silver wire - 0.45 mm
Nickel silver wire - 0.7 mm
Nickel silver wire - 0.8 mm
Nickel silver wire - 1.0 mm

Brass wire - 0.3 mm
Brass wire - 0.6 mm

ETCH SHEET 1



ETCH SHEET 3



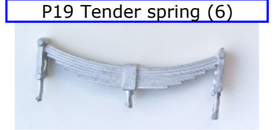
CAST PARTS

PEWTER - PLATED GOLD

P8 Tender axlebox cover (6)

PEWTER UNPLATED

P19 Tender spring (6)



P20 Tender toolbox (2)

P21 Tender water filler body

P22 Re-railing jack

NICKEL SILVER

NS7 Tender brake standard

WHITEMETAL

WM1 Tender spring damper (12)

BRASS

BR6	Buffer housing (2)
BR16	Running plate lamp socket (2)
BR18	Tender buffer beam lamp socket
BR27	Control handle (2)
BR34	Tender spring dampers, outer axles (4)
BR35	Tender spring dampers, middle axle (2)
BR36	Tender vacuum pipe
BR37	Tender water feed valve (2)
BR38	Tender water feed valve hand wheel (2)