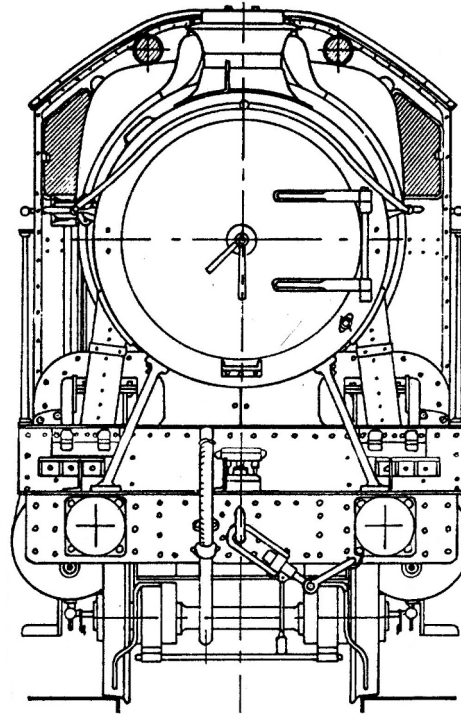


GWR 47XX LOCOMOTIVE



CAUTION.

This product contains etched parts with very sharp edges and castings that may contain lead.
Neither the Manufacturer, Distributor or Retailer can accept any liability for illness, injury or consequential damage caused when handling or building this product.

Read any instructions before assembly. Do not eat or drink whilst handling. Wash hands after use.

BRIEF HISTORICAL DETAILS

George Jackson Churchward's final engine design prior to retirement in 1921 was this mixed-traffic 2-8-O with 5' 8" wheels. They were to prove to be outstanding performers and most imposing to watch at speed.

For a detailed history of this class, Part Nine of 'The Locomotives of the Great Western Railway' published by the RCTS is essential reading. Railway World, January 1966, contains a very interesting article by R.C.Riley. The first edition of Great Western Railway Journal (Wild Swan) contains an article by John Copsey with many useful photographs and drawings.

The following Swindon Drawings were used in designing the kit:

60040	10/1920	Lot 214,221	General arrangement
60041	12/1920	Lot 214,221	Cross sections
60040	12/1920	Lot 214,221	Erecting plan

Part of drawing 60040 is reproduced in G.W.Engines - Vol 2 by J.H.Russell, on page 122.

The locomotives were built, with the Standard No. 7 boiler, under 2 Lots as follows:

Lot	Numbers	Built	Snifting valve position	4000 gal tender	Lined green livery
214	4700	5/1919	Steam chest	2/1932	7/1957
221	4701	1/1922	Steam chest	4/1932	11/1958
	4702	2/1922	Steam chest	6/1932	8/1959
	4703	3/1922	Steam chest	9/1932	9/1959
	4704	4/1922	Steam chest	4/1933	10/1957
	4705	4/1922	Smokebox saddle	6/1929	9/1958
	4706	3/1923	Smokebox saddle	11/1931	4/1958
	4707	4/1923	Smokebox saddle	8/1933	2/1959
	4708	4/1923	Smokebox saddle	3/1932	8/1958

No 4700 was built with a Standard No. 1 boiler. Rebuilt with Standard No. 7 boiler 5/1921.

VARIATIONS POSSIBLE WITH THE KIT

Cab roof. About 1927 the cab roofs were extended at the back.

Snifting valves. The position varied as indicated above.

Cab spectacle windows. These were plated over during the late 1920's.

ATC equipment. This was fitted to the entire class between 1/1930 and 7/1931.

Smokebox chin step. There are two different designs.

Lamp bracket. This was moved to smokebox door in 1934-37.

Vacuum pipe. Originally this was tall but later a shorter pattern was introduced.

Pony truck spring housing. Originally uncovered but subsequently fitted with a bell shaped cover.

TENDERS

When built the engines were paired with new (probably!) 3500 gallon tenders of standard Churchward design with visible, snap head rivets, on the tanks and coal plates. At least two (4704 & 4706) were subsequently fitted with Dean 4000 gallon tenders with flush rivets until all the class were paired with new Collett 4000 gallon tenders, which became standard for the class, on the dates given above.

CHASSIS OVERVIEW

Note that many of the components for both chassis and body are handed left/right and care must be taken to ensure the correct component is used. Components are not always identified left/right separately but with care and common sense no problems should arise.

Gauge.

For Finescale, where little sideplay is required, the widest spacers can be used but they will need careful filing to make their width 26.0 mm. If you require your engine to negotiate sharp curves then the middle width spacers should be used.

The widest frame spacers supplied are suitable for Scaleseven and care will be needed to allow sufficient sideplay, especially in the leading axle to enable the model to negotiate moderate curves.

Suspension.

Rigid. The kit is supplied with top hat bearings to build a rigid chassis. Open out the main axle holes to accept top hat bushes and solder them in place. If the leading axle is 5/32" diameter then reduce the bearing diameter accordingly by fitting a sleeve from short lengths of the 3/16" tubing provided.

Sprung. If you are going to fit sprung horn blocks, you should open out the frame slots by cutting up the half etched lines and follow the manufacturers instructions.

Compensated. The simplest and most reliable suspension system is beam compensation and the necessary compensation beams are provided in the kit. Not provided are the hornblocks and bearings which are available as an extra item which includes instructions for aligning the hornblocks accurately.

Pickups. No pickup material is provided. The options are:

Scrapers. Attached to the middle frame spacer using printed circuit board.

Plunger. Open out holes P and fit according to the manufacturers instructions. It may not be possible to use plunger pickups if you wish to fit the inside motion because they may foul each other.

COMPONENTS NOT SUPPLIED WHEELS

Pony Wheel - 3'2", 10 spoke, 5/32" diameter axle (1) Slater's Ref. 7837MF

Driving wheel - 5' 8", 18 spoke, 3/16" diameter axle (4) Slater's Ref. 7868W

Available from Slaters' (Plastikard) Ltd'

MOTOR/GEARBOX

A Canon motor with a SDMP 40L/15 gearbox (available from Finney7) or an alternative such as an ABC VML2 gearbox.

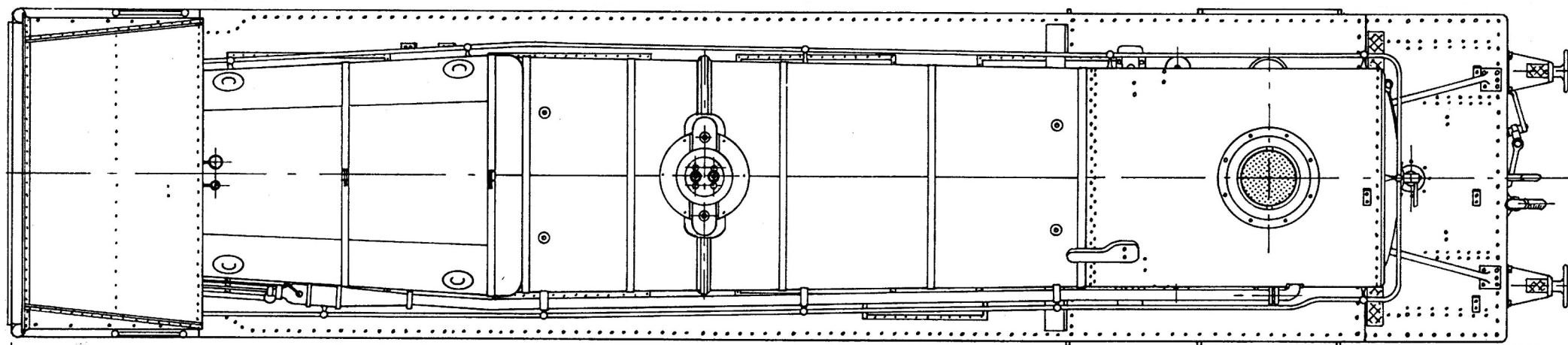
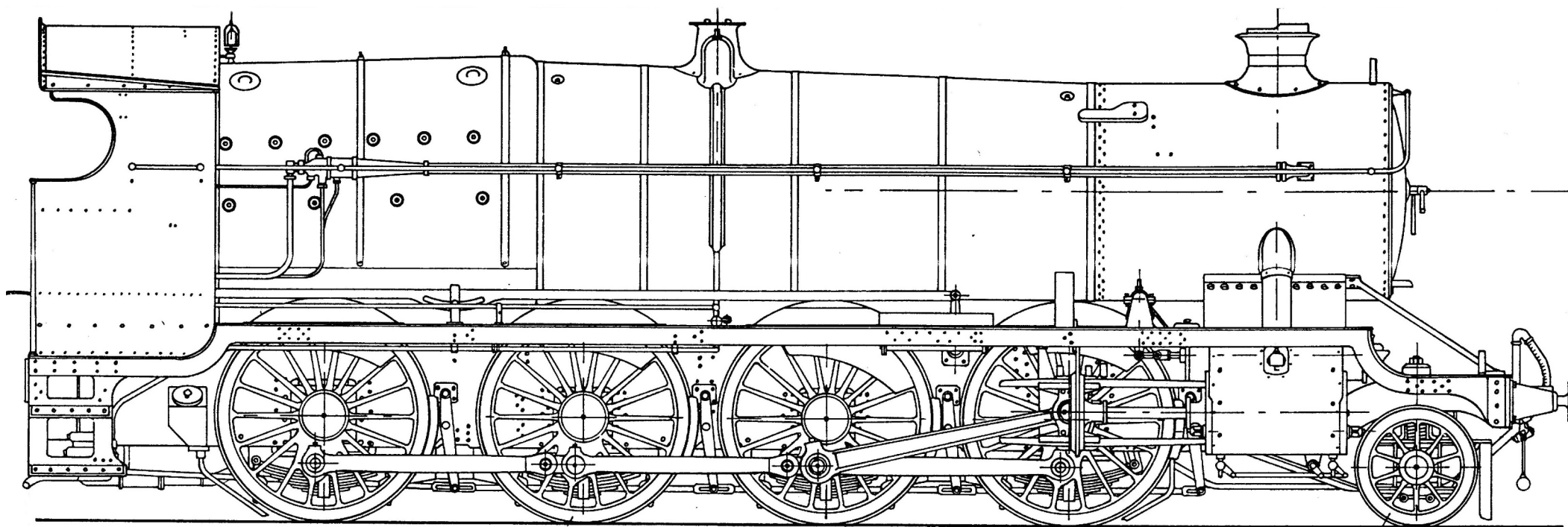
CRANKPINS

Steel crankpins are available from Finney7.

INSIDE MOTION

A separate kit is available from Finney7 to construct the working inside motion.

Finney7



FRAME CONSTRUCTION 1

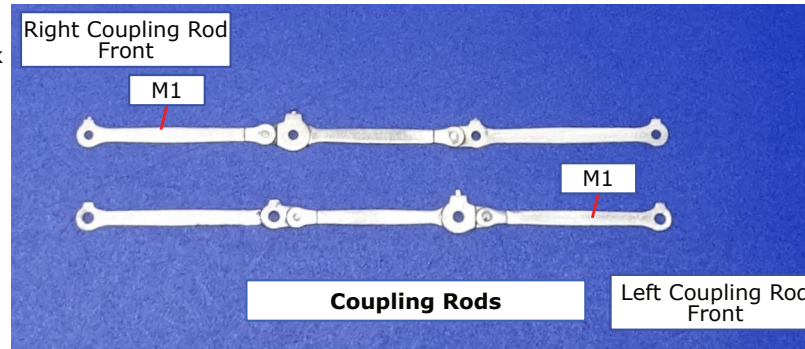
COUPLING RODS.

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

Tin well the front face of the inner laminates and the rear face of the outer laminates and place them over the mandrel. Using plenty of solder and flux solder the two laminates together. You will now have rods with the crankpin and fork joint holes aligned. The rods have been deliberately etched too large so that the thin etched edges can be carefully filed off so that the 'laminated' effect is lost and the rods appear to be made from one piece of metal.

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

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



No.	Description	Sheet
M1	Front coupling rod (2)	A3
M2	Front coupling rod fork joint (2)	A3
M3	Centre coupling rod inner lamination (2)	A3
M4	Centre coupling rod outer lamination (2)	A3
M5	Rear coupling rod inner lamination (2)	A3
M6	Rear coupling rod outer lamination (2)	A3
F1	Left main frame	A1
F2	Right main frame	A1

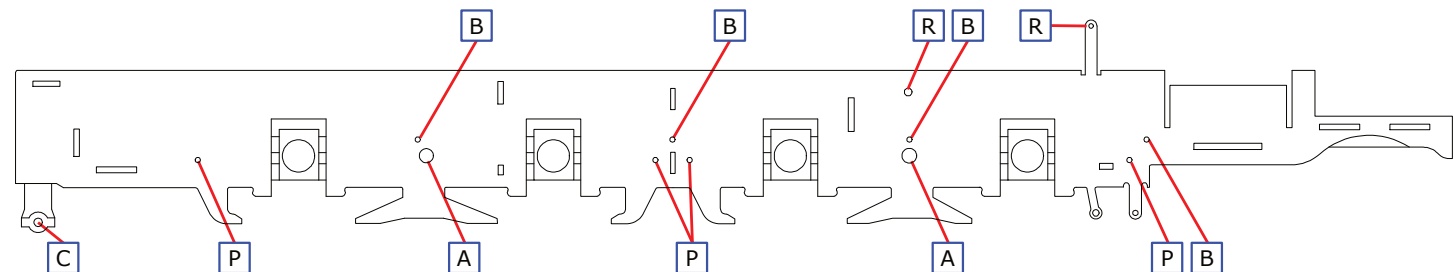
FRAMES

Having decided which chassis to construct you can now start construction by preparing the frames (F1 & F2). To construct the kit as designed with a compensated chassis:

Remove all the axle holes as described above. Solder the rear hornblocks to the inside of the frames aligning them with the half etched line and with the bottom of the frames. Now open out the following holes in the frames:

- B 0.8 mm for brake hanger pivots
- R 1.6 mm for reversing shaft
- A 1/8" for compensation beam pivot
- V 1.2 mm for valve rock shaft bracket
- C 1.6 mm for brake cross shaft

Bend the valve rock shaft brackets along the 1/2 etched fold lines at right angles and strengthen with a fillet of solder. Similarly bend the brackets for the front sand pipes.



Frame Preparation

FRAME CONSTRUCTION 2

Remove the spacers (F3, F4, F5, F6, F7 & F8). Fold up the small tabs on the pony truck pivot spacer (F5) and solder the 6BA pony truck pivot screw in place between the tabs. Check that the side control wire fits through the holes in the tabs and through the screw slot.

Fold up the rear frame spacer (F3) and the front spacer (F6) making sure the half etched fold line is on the inside and that each bend is at 90°. Check that all the tabs on the spacers fit properly in their corresponding chassis slots so that the spacer is hard up against the inside of the frames. Bend the frames inwards slightly along the fold lines in front of the cylinder opening using the front spacer as a guide.

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

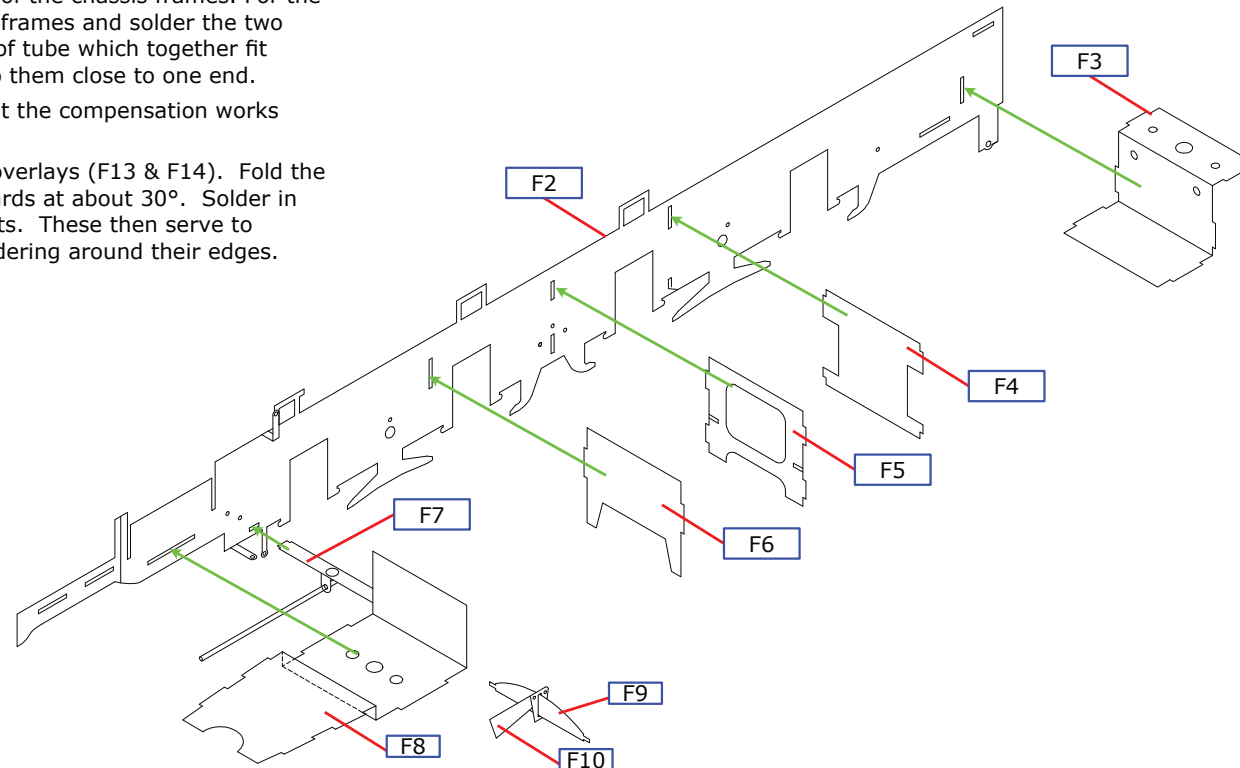
Build and solder in place the hornblocks as detailed in the instructions included in the hornblock kit.

Fitting the Compensation Beams. Cut two pieces of 1/8" brass rod so that they fit through the holes A and are flush with the outside face of the chassis frames. For the front beam cut a piece of 5/32" tube to fit between the frames and solder the two laminations (F11) to it centrally. Cut two equal pieces of tube which together fit between the frames and solder the rear beams (F12) to them close to one end.

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

Frame Overlays. Emboss all the rivets in the frame overlays (F13 & F14). Fold the rear step supports outwards so that they angle downwards at about 30°. Solder in place lengths of 0.8 mm wire for the brake hanger pivots. These then serve to accurately locate the overlays which only need tack soldering around their edges.

No.	Description	Sheet
F3	Rear frame spacer, 3 widths	A1
F4	Firebox spacer, 3 widths	A1
F5	Boiler cradle frame spacer	B2
F6	Middle frame spacer	B1
F7	Pony truck pivot frame spacer	B1 & B2
F8	Front frame spacer, 3 widths	A1
F9	Pony truck transverse compensation beam	A1
F10	Pony truck compensation beam lamination (2)	A1 & A2
F11	Front compensation beams (2)	A1
F12	Rear compensation beams (2)	A1
F13	Left frame overlay	B2
F14	Right frame overlay	B2

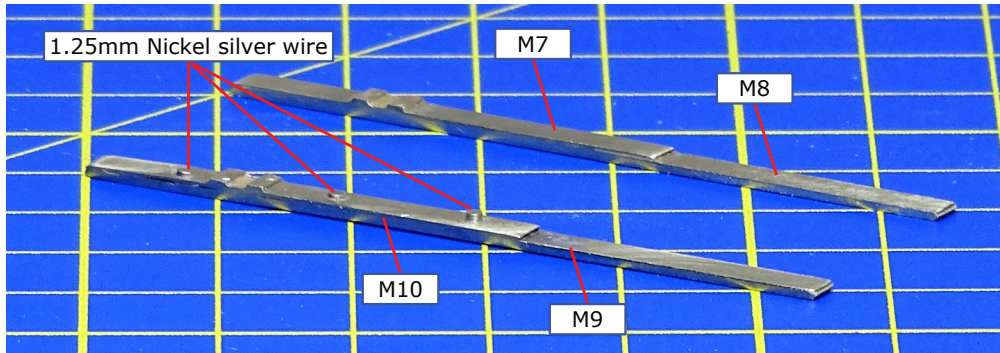


Chassis Construction

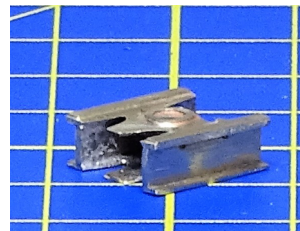
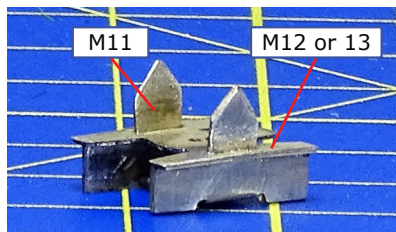
CYLINDER CONSTRUCTION 1

The following photos are of a Hall cylinder set. The 47XX is similar with only two cylinder drain valves per cylinder.

1. Slidebars. Emboss the rivets in the lower slide bar lamination (M7) and solder to the lower slidebar (M8) aligning the sides and rear end. Carefully file the edges smooth and taper the outer surfaces at the rear. Repeat for the upper slide bar (M9 & M10). Open up the oil cup holes in the upper slidebars and solder in short lengths of 1.25mm nickel silver wire.



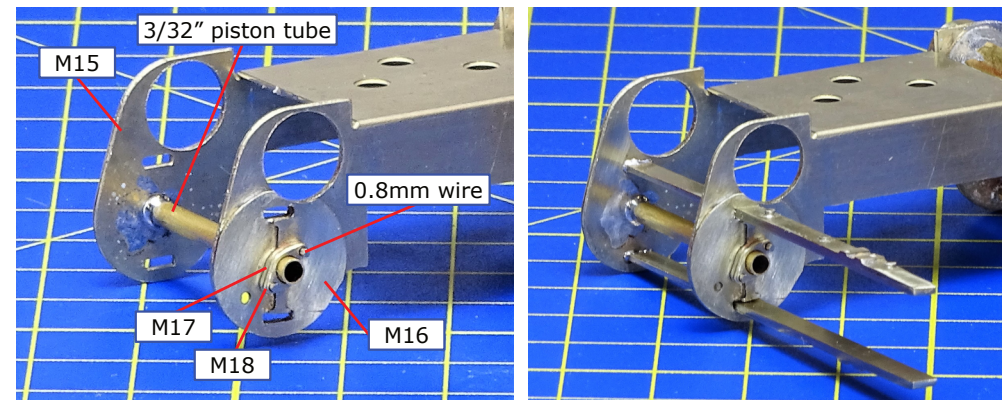
2. Crossheads. Fold the crosshead slippers (M11) through 90° on the half etched lines. The holes in the crosshead back, left and right (M12 & M13) need to be enlarged with a scalpel to allow the spikes on the slipper through the crosshead back. Ensure that the back sits flat and true on slipper and solder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



No.	Description	Sheet
M7	Lower slide bar lamination (2)	A1
M8	Lower slide bar (2)	A1
M9	Upper slide bar (2)	A1
M10	Upper slide bar lamination (2)	A1
M11	Crosshead slipper (2)	A2
M12	Left crosshead back	A2
M13	Right crosshead back	A2
M14	Crosshead front (2)	A2
M15	Cylinder former	A2
M16	Cylinder rear cover (2)	A1
M17	Cylinder cover rear overlay (2)	A1
M18	Piston rod gland (2)	A1

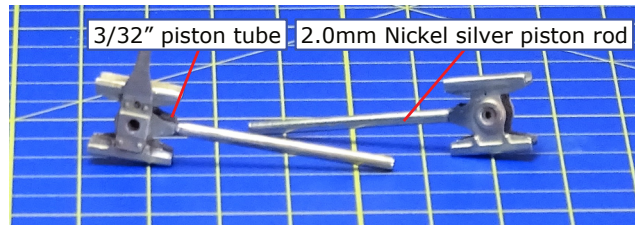
3. Cylinders. Open out the piston tube and valve chest holes in the cylinder former (M15) until the tubing fits snugly. Reduce the width of the inside cylinder faces to the etched lines provided so that the cylinders are a good fit into the slots in the frames. The holes for the 11/32" valve chest are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

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



CONNECTING RODS & CROSSHEAD

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



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

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

6. Valve Chest. Solder the valve chest covers, front and rear (M21 & M22) to the 11/32" valve chest tube and attach in place with equal amounts of tube protruding back and front.

7. Wrapper and Drain Cocks. Form the cylinder wrapper or the cylinder wrapper with snifting valve (M23 or M24) to shape and solder in place making sure the drain cock holes are on the bottom centre line. For the steam chest mounted snifting valves, first solder the snifting valve mounting plate (M25) in place behind the slot in the wrapper.

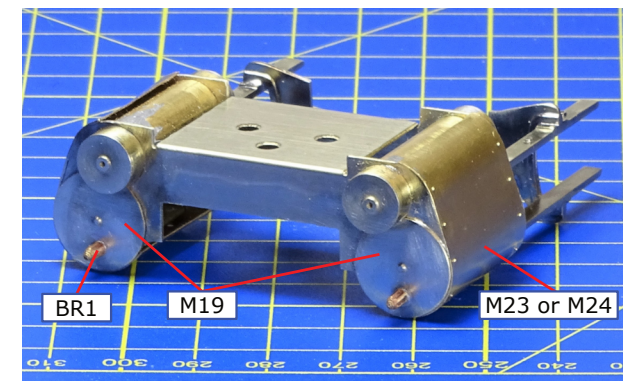
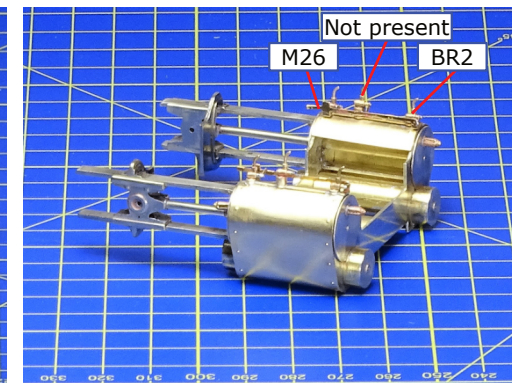
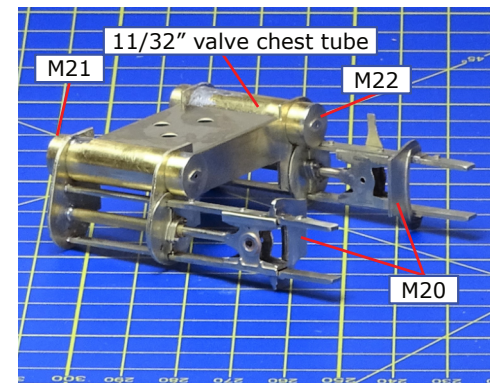
Emboss the rivets on the drain cock linkage (M26) and fold it along the half etched lines. Attach the drain cock castings (BR2) together with the drain cock linkages to the cylinders. File off the piece of the drain cock spigot in front of each lever.

8. Valve Spindles. Emboss the rivets in the valve spindle laminations (M27)) and solder them together. If you are not constructing working valve gear fix them in place in the valve chest.

Connecting Rods. Solder together the connecting rod laminations (M28 & M29) and add the rod boss laminations (M30) to the big end back and front. The rods have been deliberately etched too large so that the thin etched edges can be carefully filed so that the 'laminated' effect is lost and the rods appear to be made from one piece of metal. Drill the big end to fit the crankpins and the small end 1.25mm. Fit the connecting rod to the crosshead using 1.25mm wire for the pin. Carefully solder the pin from the rear and file flush.

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

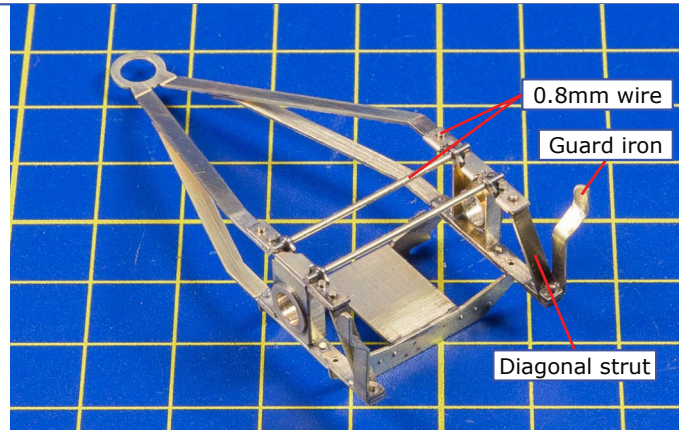
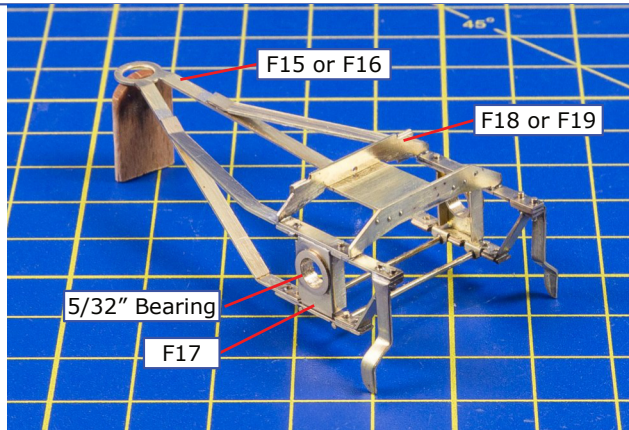
No.	Description	Sheet
M19	Cylinder front cover (2)	A1
M20	Slide bar bracket lamination (4)	A1
M21	Valve chest front cover (2)	A2
M22	Valve chest rear cover (2)	A2
M23	Cylinder wrapper (2)	B2
M24	Cylinder wrapper with snifting valve (2)	B2
M25	Snifting valve mounting plate (2)	A1
M26	Drain cock linkage (2)	B2
M27	Valve spindles (4)	A2
M28	Connecting rod inner lamination (2)	A3
M29	Connecting rod outer lamination (2)	A3
M30	Connecting rod boss lamination (4)	A3



FINISHING THE CHASSIS 1

Pony Truck. There is a choice of wide (F15) or narrow (F16) pony truck frame. Open up the axle holes in the frame to accept the 5/32" bore top hat bearings. The folding of the frame is quite complex as some of the folds are 90° with the fold line on the inside and others 180° with the fold line on the outside. First fold the lower frame sections and the guard irons over through 180°. The remaining folds can now be made as shown, forming the diagonal struts at the front last. Check that all the bends are square and solder all the pieces together. Form the guard irons to shape and solder the pony truck spring overlay (F17) in place with the 5/32" bore top hat bearings. Drill out all the small holes to accept short pieces of 0.8mm wire to represent the frame bolts.

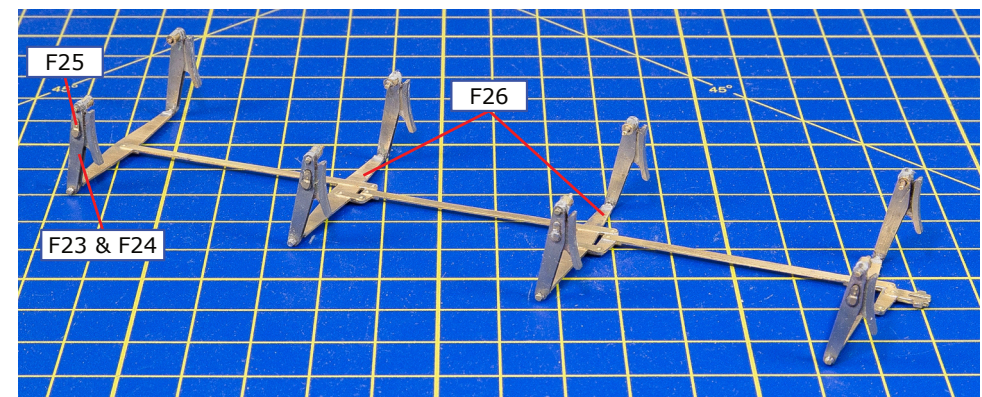
Bend the upper frame (F18 or F19) to shape folding the rear stays over through 180° and solder the two parts of the frame together. Solder two lengths of 0.8mm wire as stretcher bars in the brackets on the underside of the frame. Fit the wheels and form the rear of the frame and the struts so that when fitted to the chassis over the pivot the frame is level. Fit the pony truck side control wire so that it locates in the hole in the rear of the upper frame.



No.	Description	Sheet
F15	Wide pony truck frame	B2
F16	Narrow pony truck frame	B2
F17	Pony truck spring overlay (2)	A1
F18	Wide upper pony truck frame	B1
F19	Narrow upper pony truck frame	B1
F20	Spring centre lamination (6)	A2
F21	Leading axle spring centre lamination (2)	A2
F22	Spring outer lamination (16)	A2
F23	Brake hanger outer lamination (8)	A1 & A2
F24	Brake hanger inner lamination (8)	A1 & A2
F25	Brake hanger overlay (8)	B2
F26	Brake pull rods & cross shafts	B2
F27	Brake cross shaft overlay (4)	B2 & B3

Springs. The axles are now retained by the springs (F20, F21 & F22). The leading spring has the lamination with one end missing on the inside so as to clear the pony truck transverse compensation beam and is attached together with the pony truck compensation beam and the pony truck compensation beam lamination as shown in the diagram.

Brakes. Assemble the brake hangers (F23 & F24) first embossing the rivet on each lamination. The front of each hanger is detailed with the brake hanger overlay (F25) with the small hole in the back of the overlay locating on the previously embossed rivet. Attach the hangers to the pivot wires. Emboss the bolts in the brake pull rods & cross shafts (F26) and the brake cross shaft overlays (F27). Solder the cross shaft overlays to the top of F27, then carefully twist the pull rods between the cross shafts vertical. Fix this assembly to the brake hangers ensuring the pull rods are on the right side of the engine. Complete the brake gear by fitting the rear cross shaft and levers (F28 & F29).

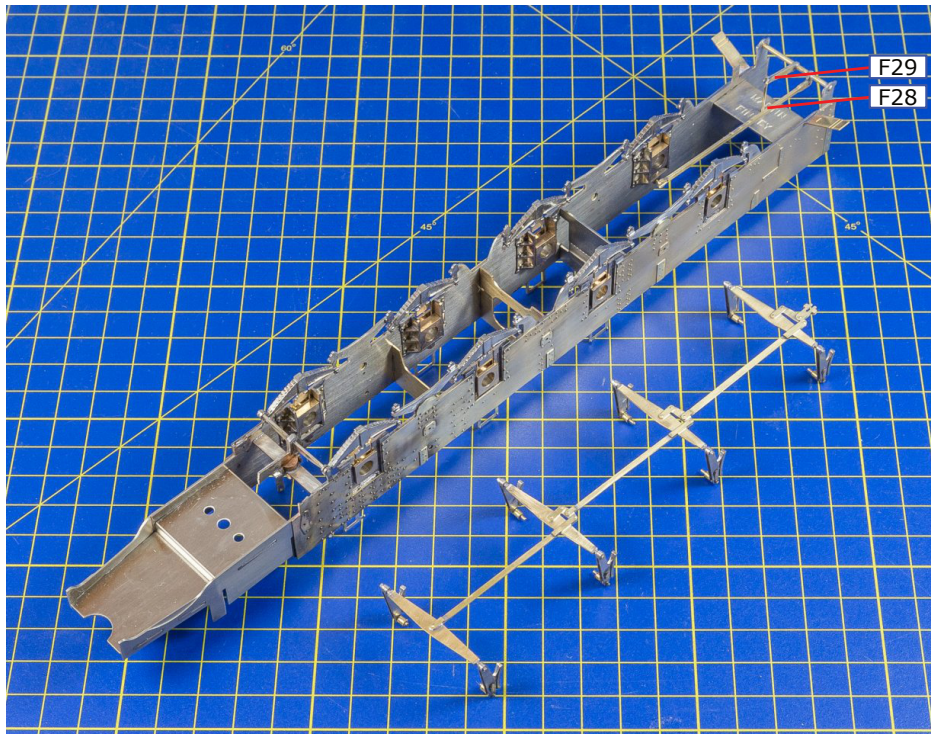


FINISHING THE CHASSIS 2

FINISHING THE CHASSIS

Attach the balance weights to the wheels using photographs as a guide to position. Assemble the wheel sets, bearings and rods selecting 3/16" axle washers of appropriate thickness to control sideplay. A thorough check of all clearances at this stage is important especially between the leading crankpin/crosshead.

Complete the chassis detailing by fitting rear sandboxes (left WM1 & right WM2). Fit the exhaust steam injector (BR3) to the left side and the live steam injector (BR4) to the right. Fit the sand pipes and if appropriate the ATC shoe (BR5) and ATC shoe plunger switch (BR6) at the front under the front cross member. Fit the axle journal lubricators (BR6) to the half etched brackets.

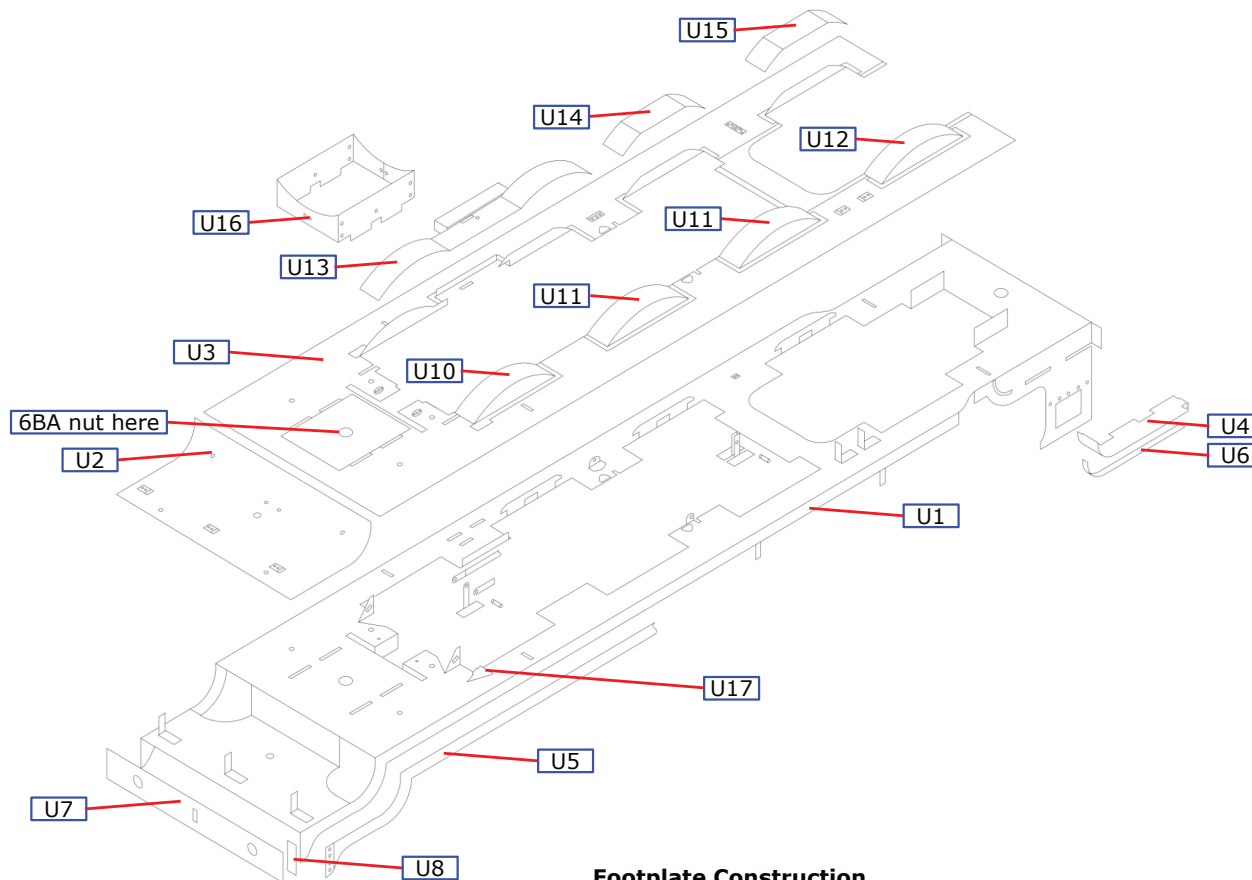


No.	Description	Sheet
F28	Rear brake pull rod lamination (2)	B3
F29	Brake shaft to vacuum cylinder lever (2)	B1
F30	Leading axle balance weight (2)	B2
F31	Driven axle balance weight (2)	B1
F32	Third and fourth axle balance weight (4)	B2
F33	Reversing arm lower end	B1
F34	Live steam injector mounting bracket	B2
F35	6BA Washer	B1
F36	Washer 5/32"	B3
F37	3/16" Washer, 0.6 mm thick	A2
F38	3/16" Washer, 0.38 mm thick	B3
F39	Draw bar, 3 different lengths	B1
F40	Slide bar splasher (2)	B3
F41	Rear sand box spindle overlay (2)	B3

FOOTPLATE CONSTRUCTION 1

Emboss rivets on the footplate (U1) on the rear steps and rear drag beam. First fold the edges and the rear drag beam then the step at the front followed by the front sandbox sides, half splasher fronts, lamp brackets, rocking shaft brackets and cab floor supports.

Form the curve in the front drop plate overlay (U2) and solder in place. Prepare the footplate overlay (U3) by embossing the rivets under the lamp brackets, around the splashers, under the reversing rod support, under the small sand rod bracket and under the front sandboxes. Fold up the splasher fronts and vacuum pump casing front. Place the overlay in place and temporarily join to the footplate with a screw through the body fixing holes at the front. Now solder together all round and solder a 6BA nut over the front fixing hole.



Footplate Construction

No.	Description	Sheet
U1	Footplate	B1
U2	Front drop plate overlay	B3
U3	Footplate overlay	B2
U4	Rear drop plate (2)	B2
U5	Valence overlay (2)	B3
U6	Rear drop plate rivet strip (2)	B2
U7	Buffer beam	B3
U8	Valence to buffer beam bracket (2)	B1
U9	Drag beam rubbing plates (2)	B1
U10	Front left splasher top	B2
U11	2nd & 3rd axle left splasher top	B1
U12	4th axle left splasher top	B2
U13	1st & 2nd axle right splasher top/vac pump cover	B1
U14	3rd axle right splasher top	B2
U15	4th axle right splasher top	B2
U16	Smokebox saddle	B1
U17	Rocking shaft bracket web (2)	B1

Drill the pump rod hole, 0.8mm, in the end of the vacuum pump (B23) and solder in place in the slots under the footplate and fix a piece of 0.8mm wire to the crosshead bracket. Trim the pump rod as short as possible so that the body can be removed by a slight movement forward.

Fit the rear drop plate (U4) and solder the valence overlays (U5) in place carefully curving the valence as it narrows at the rear. Fit the rear drop plate rivet strip (U6) under the rear footplate.

Emboss the rivets on the buffer beam (U7) and solder in place together with the brackets (U8). Emboss the rivets on the drag beam rubbing plates (U9) and add in the position indicated by the half etched lines.

Curve the splashers (U10 to U15) to shape by rolling underneath a suitable rod or dowel on a resilient surface (a piece of rubber sheet) and solder in place. The missing section in the top of the rearmost three splashers on the right side is to clear the reversing rod.

If required, drill holes for the snifting valves on the smokebox saddle (U16). Emboss the rivets in the saddle, fold to shape and solder in place on the footplate. Solder the rocking shaft bracket web (U17) in place.

FOOTPLATE CONSTRUCTION 2

Emboss the rivets on the motion bracket & boiler support (U18) and solder the motion bracket & boiler support overlay (U19) to the rear. Form the motion bracket & boiler support top angle section (U20) to shape and solder to the motion bracket. Add the motion bracket & boiler support front overlay (U21). Check the fit of the motion bracket in the footplate slots; it must sit down tight on the footplate to ensure correct boiler fit later. When satisfied solder in place.

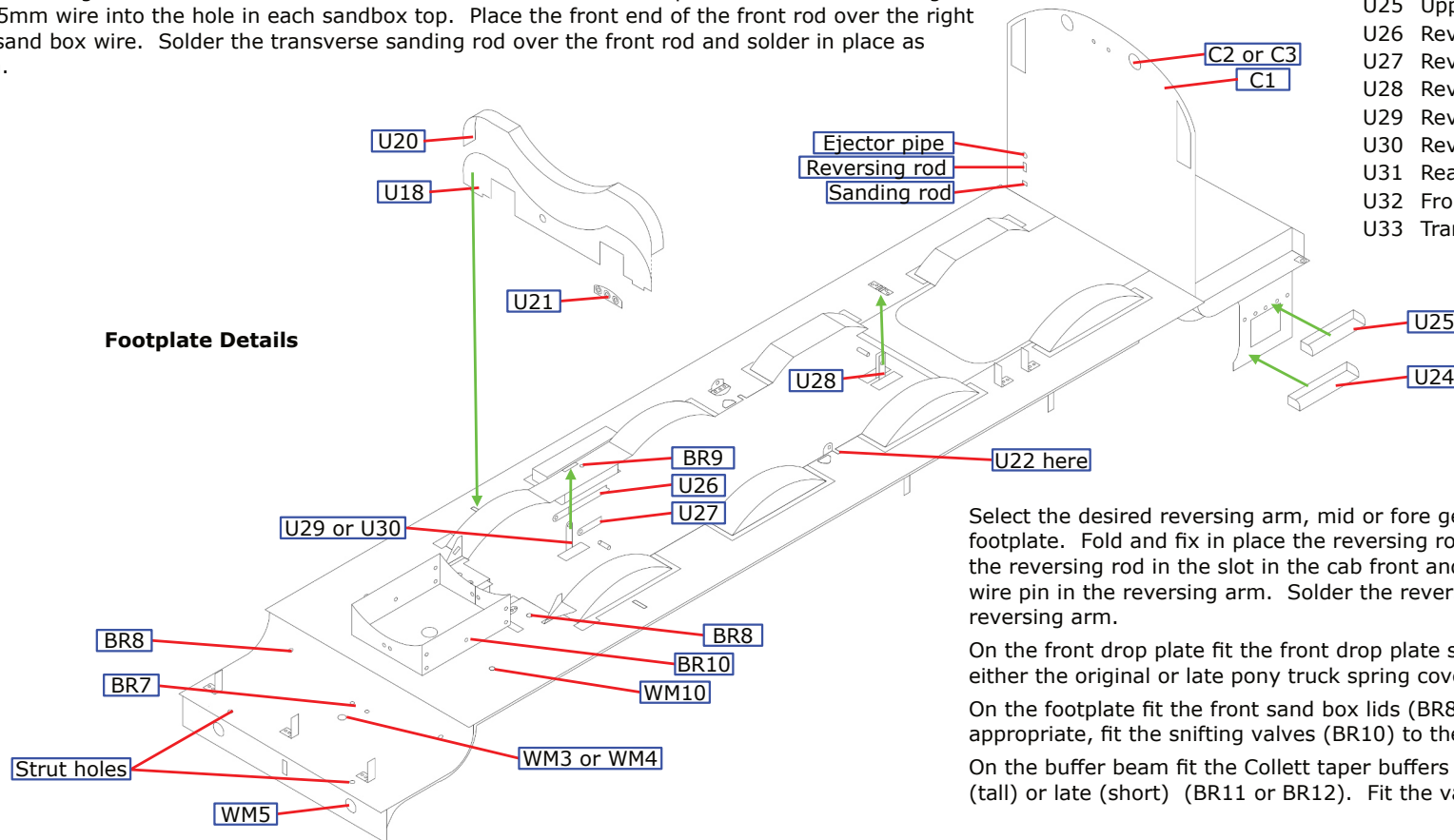
Solder together the boiler cradle and the boiler cradle rivet overlay (U22 & U23) and fix in place in the footplate slots with the overlay at the rear.

Emboss the rivets on the cab front and attach either the cab spectacle window frames or blanking plates (C2 or C3). Solder the window frames (C4) in place on the inside. Now fix the firebox and cab front in place on the footplate.

Fold up the lower and upper rear steps (U24 & U25) and solder in place.

Emboss the rivets on the rear sanding rod (U30) and twist through 90° as shown on the drawing. Twist the front sanding rod (U32) as shown. Mount the two sanding rods on a piece of 0.45mm wire threaded through the footplate mounting brackets; the front rod crank is above the wire. Insert the rear rod through the cab front and solder the riveted bracket to the footplate. Solder a short length of 0.45mm wire into the hole in each sandbox top. Place the front end of the front rod over the right hand sand box wire. Solder the transverse sanding rod over the front rod and solder in place as shown.

No.	Description	Sheet
U18	Motion bracket & boiler support	B1
U19	Motion bracket & boiler support overlay	B1
U20	Motion bracket & boiler support top angle section	B2
U21	Motion bracket & boiler support front overlay	A2
U22	Boiler cradle	B2
U23	Boiler cradle rivet overlay	B1
C1	Cab front	B2
C2	Cab spectacle window frames (2)	B1
C3	Cab spectacle window blanking plate (2)	B1
C4	Cab window frames (2)	B2
U24	Lower rear step (2)	B2
U25	Upper rear step (2)	B2
U26	Reversing rod	A1
U27	Reversing rod fork joint	A1
U28	Reversing rod support bracket (2)	A1
U29	Reversing arm, mid gear setting	A1
U30	Reversing arm, fore gear setting	A1
U31	Rear sanding rod	B2
U32	Front sanding rod	B2
U33	Transverse sanding rod	B23



Select the desired reversing arm, mid or fore gear (U29 or U30), fold and fix in the slot in the footplate. Fold and fix in place the reversing rod support bracket (U29 or U30). Place the rear of the reversing rod in the slot in the cab front and solder the front of the rod in place on a 0.8 mm wire pin in the reversing arm. Solder the reversing rod fork joint (U27) in place behind the reversing arm.

On the front drop plate fit the front drop plate steps (BR8) and the pony truck lubricator (BR7). Fit either the original or late pony truck spring cover (WM3 or WM4).

On the footplate fit the front sand box lids (BR8). Fit the vacuum pump lubricator (BR9). If appropriate, fit the snifting valves (BR10) to the saddle.

On the buffer beam fit the Collett taper buffers (WM5). Chose the appropriate vacuum pipe, early (tall) or late (short) (BR11 or BR12). Fit the vacuum pipe dummy (BR13).

FORMING THE BELPAIRE FIREBOX 1

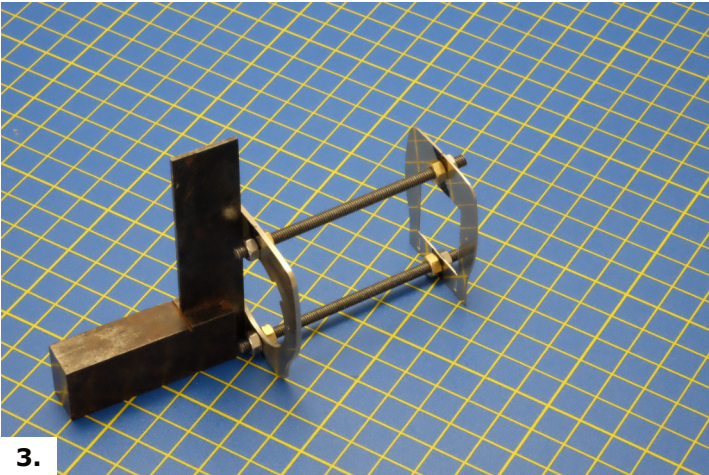
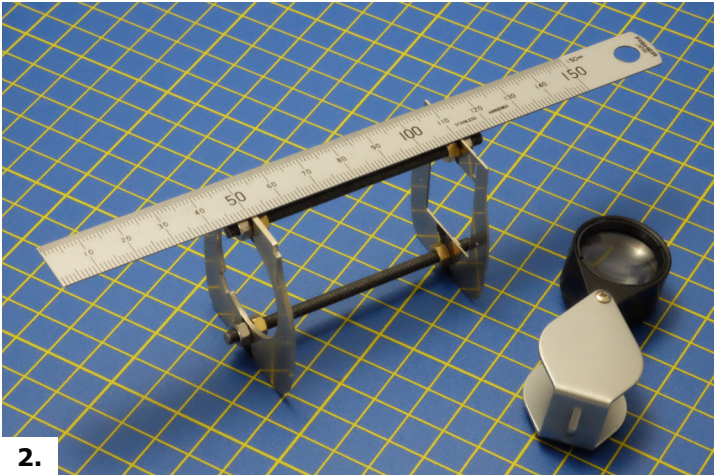
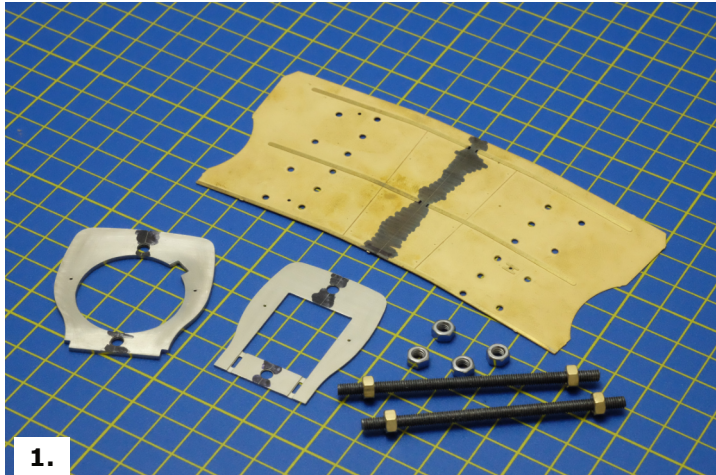
Photo 1. Solder together the two laminations of the firebox front (SB2) Clean the cusp off all parts, including the firebox rear former (SB1). Reduce the width of the lower faces of the firebox rear former so that it will fit between the frames in the locating groove in the footplate. Using the small dimples provided mark the centre lines on the outside and the inside of each part. Solder two 4mm lengths of 0.8mm wire into the holes on the cab front.

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

Photo 2. Set the two spacers on to the studs, retain them with the stainless steel nuts. Ensure the length of the assembly over the formers is 60.9mm. Always measure the distance from the bottom of the firebox; even using a steel rule and eyeglass you can get pretty close to this sort of dimension with care. Take your time, measure and check it a few times. It's easier to use a vernier or similar gauge to get a precise measurement and to check that the spacers are parallel.

Photo 3. Check that the spacers are square, both front and rear; do this on a decent flat surface. When correctly spaced apart the front will fit in the half etched recess in the footplate and the rear, pinned to the cab front, will fit with the tabs on the lower edge of the cab front in the footplate slots.

No.	Description	Sheet
SB1	B4 firebox rear former	1
SB2	B4 firebox front formers (2)	1
SB3	B4 firebox wrapper	4
SB4	Firebox band joining brackets	6
SB5	Firebox washout plugs, left	6
SB6	Firebox washout plugs, right	6



FORMING THE BELPAIRE FIREBOX 2

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

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

Photo 5. Emboss the rivets for the ends of the cladding fixing bands on the firebox wrapper (SB3).

Align the centre line marks, the top can be formed to a gentle radius. This is a simple rolling job, using a length of dowel and finger pressure. An old round file has a taper that is useful on GWR fireboxes which don't have a constant radius. Ensure that the centre lines are maintained while forming the second shoulder.

On waisted fireboxes, such as this one, start forming the concave sections; this might be easier to do off the spacers. The final job is to pull in the waisted section, by putting a gentle curve on the sides of the firebox; again this is dowelling and finger pressure. As can be seen, it's not a perfect match to the spacers, but gentle finger pressure is enough to get the wrapper to meet the spacers without distortion.

Photo 6. Tack the outside of the firebox at the centre and corners, both front and rear. Again, take care and check that the centres retain the alignment that we've worked so hard to achieve. Now work down the spacers alternating tacks left/right and front/rear to even out any expansion of the wrapper. Finally run the seams round at both ends.

With the wrapper now firmly attached to the spacers, the stainless steel nuts can be undone and the studs spun out.

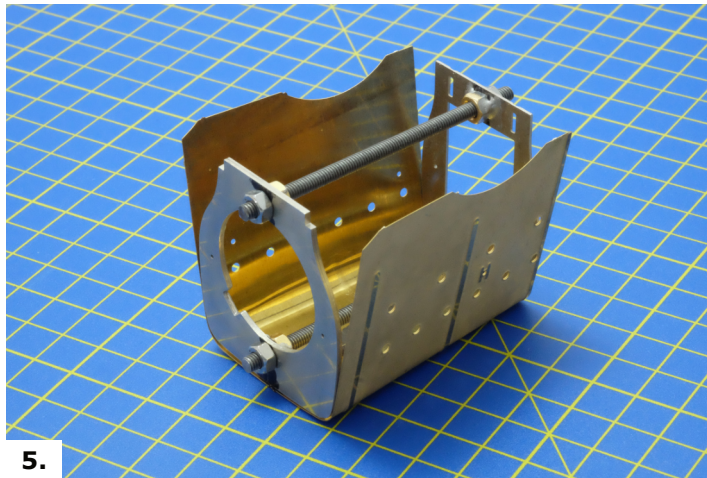
Run an extra fillet of solder into the internal front shoulders of the firebox to support the area which will be filed back. The brass nuts can be heated and removed. Remove the rear scrap section of the spacer.

The base, front and rear are now rubbed down on a sanding board to keep them flat, this will remove the cusps from the wrapper and leave the firebox ready for the final shaping and fitting to the rest of the loco. Round the front edges of the firebox with a file referring to photographs for the correct shape.

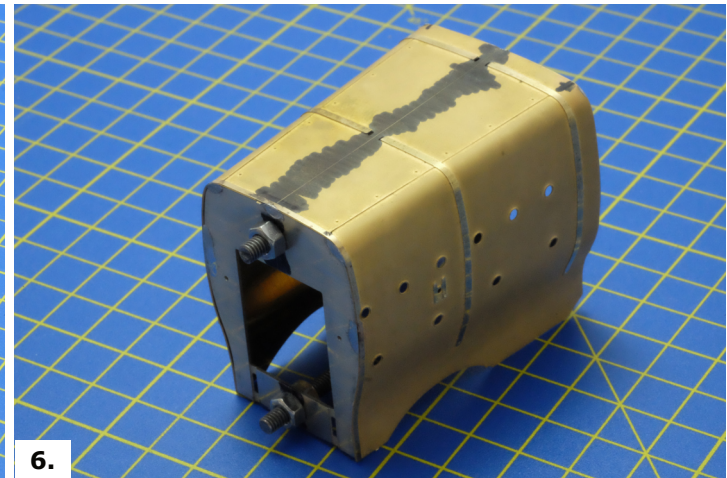
Fold the firebox band joining clips (SB4) into a 'U' shape, fit through the slots in the firebox top and solder in place from inside. Complete with a short piece of 0.45mm wire to represent the tightening bolt. Fix the mudhole doors (WM23) in place on the firebox.



4.



5.



6.

CONSTRUCTING THE BOILER AND SMOKEBOX 1

Emboss the rivets either side of the top feed pipe on the boiler wrapper (SB1) and around the 4-cone ejector pipe brackets. The washout plugs can be drilled out and individual wash out plugs (SB2) used if you prefer. Form the boiler by rolling and check for fit around the formers (SB3 & SB4). Bend the boiler band joining brackets on the boiler joining strip (SB5) and fit through the small slots from inside the boiler. If the fit is good and the formers fit then solder the wrapper ends together with the joining strip and fit the formers so that they are almost flush with the ends. The cutouts in the formers are to clear the joining strip and the etched notch at the top of the rear former must align accurately with the notch in the wrapper. Solder two short pieces of 0.8mm wire into the holes in the rear former to act as dowels to locate the boiler and firebox. Check the boiler and firebox fit. Represent the bolts in the joining brackets using 0.45 mm wire. Form the top feed pipes from 1.4mm wire and solder in place in the 'slot' in the overlay. Solder the 4-cone ejector bracket laminations (SB6) together and solder in place on the right hand side of the boiler. Solder a medium length handrail knob in the hole on the left side.

Open out the front strut holes (1.2 mm) in the smoke box wrapper (SB7) and emboss the rivets around the 4-cone ejector bracket. Roll the smokebox wrapper and check fit it on the formers, rear and front (SB8 & SB9). Solder the wrapper ends together using the smokebox joining strip (SB10) and solder the formers flush with the back and front with the notch in the bottom of the front spacer aligned with the wrapper join. The upper hole in the front former is for the handrail knob and the other two holes for alternative positions for the steam lance cock. Emboss the four rivets on the smokebox front overlay (SB11), drill through the appropriate lance cock hole and attach to the front of the smokebox aligning the handrail and lance cock holes. Bend up the smokebox step, early or later (SB13 or SB14), first emboss the rivets on SB16, and solder in place under the smokebox front.

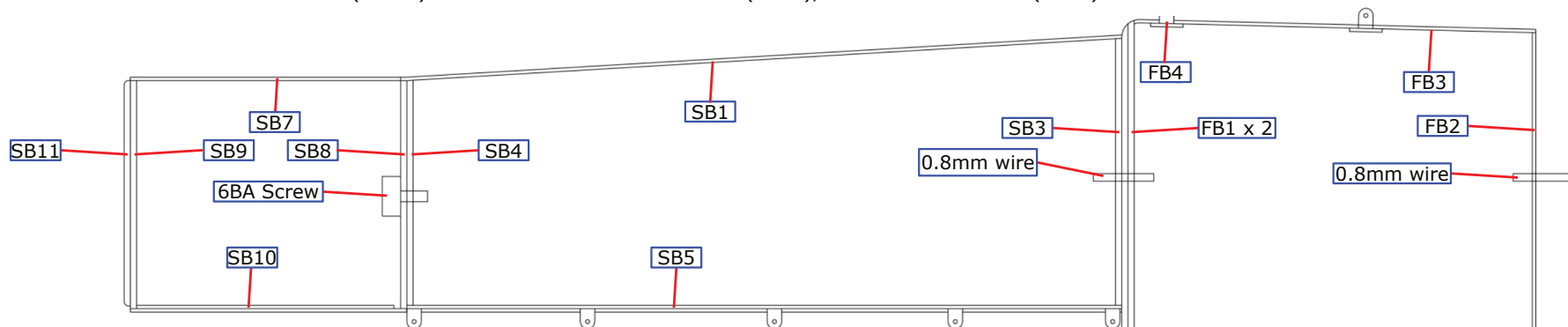
Tap the hole in the boiler front former 6BA so that the smokebox and boiler can be screwed together. Now check fit the boiler & smokebox to the firebox and saddle. Remember the bottom of the boiler is horizontal and so parallel to the footplate. When happy with the alignment solder the smokebox to the boiler permanently. Now tack solder the smokebox to the saddle and once again check. If all is well complete soldering of smokebox to saddle and boiler to firebox.

Fit the front struts from 1.2mm wire together with the strut footplate and smokebox plates (SB15 & SB16). Solder the smokebox lamp bracket in place (SB17 or SB18). Solder the 4-cone ejector casting (BR14) in place on the firebox right side adding the pipes from copper wire. Cut the ejector pipe (2.0mm) to length and fit in place together with four cone ejector elbow (BR15). Solder two small knobs in the holes in the firebox and three medium knobs in the smokebox holes and one medium knob in the 4-cone ejector casting. Form the handrail to shape, thread on the front medium knob, and fix the handrail in place.

Fit the 1.4mm wire for the top feed into the gaps on the half etch and route at the bottom to match photographs of your chosen engine. Fit the safety valve base and top feed casing (WM7) to the boiler. Clean up and fit the safety valve casing (BR16). Finally glue the safety valves (BR17) in place on the top feed casting.

Fit the smokebox saddle bolt strips (WM8), the smokebox door (WM9), the outside steam pipes (WM10) and the smokebox pipe cover (WM11) to the smokebox. Fit the firebox side covers (WM12). Fit the smokebox door handles (BR18), the steam lance cock (BR19).

No.	Description	Sheet
SB1	Boiler wrapper	B3
SB2	Boiler washout plug (4)	B1
SB3	Boiler rear former	A1
SB4	Boiler front former	A1
SB5	Boiler joining strip	B2
SB6	Four cone ejector bracket lamination (6)	B1
SB7	Smokebox wrapper	B3
SB8	Smokebox rear former	A1
SB9	Smokebox front former	A1
SB10	Smokebox joining strip	B2
SB11	Smokebox font overlay	A1
SB13	Early smokebox step	B2
SB14	Later smokebox step	B2
SB15	Front strut footplate plate (2)	B2
SB16	Front strut smokebox plate (2)	B2
SB17	Smokebox lamp bracket	B1
SB18	Smokebox door lamp bracket	B2
SB19	Top feed pipe unions (8)	B3



Boiler, Firebox and Smokebox Construction

CONSTRUCTING THE CAB

Attach the cutout beading (C5) to the cab sides (C6) fitting the etched groove over the edge of the cab side and solder the cab side internal strengthening rib (C7) in place flush with the top of the cab side. Form and fit the cab side handrails from 0.45 mm wire. Assemble the cab seats (C8) which are designed to be working. Now remove the seat from the bracket and solder the bracket to the inside of the left cab side. The other seat locates on the lever reverse.

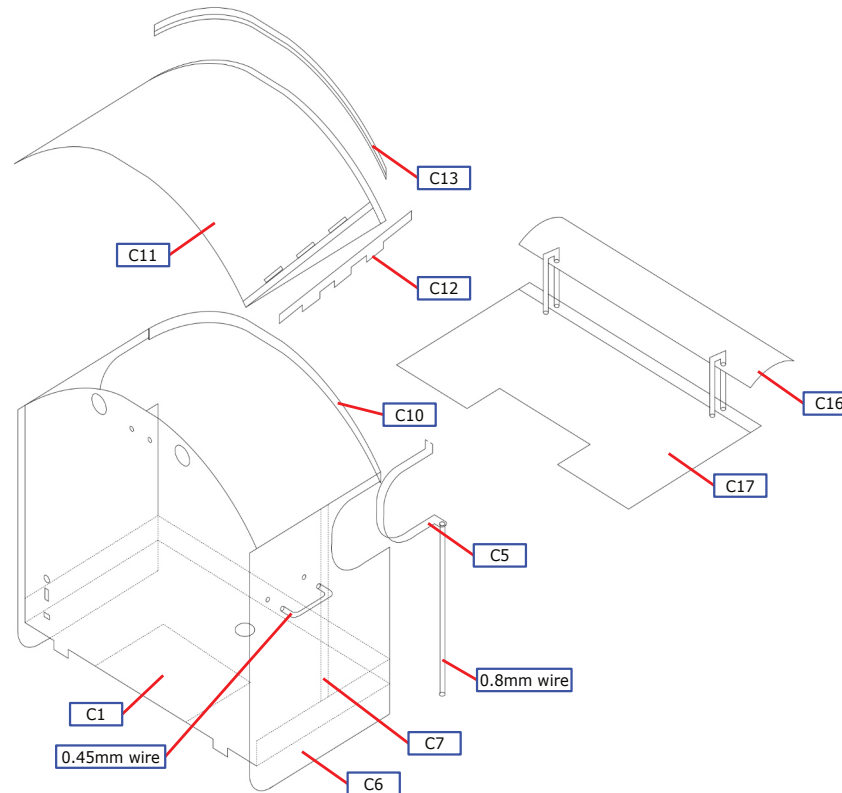
Fold up the cab floor support (C9) and solder in place on the footplate together with the 6BA nut. Solder the cabsides in position and fit the rear handrails (0.8 mm wire). Solder the cab roof rear frame (C10) between the rear edges of the cabsides ensuring the cab roof line will be horizontal.

Original Cab Roof. Form the cab roof (C11) to shape. Solder the sloping rain strips (C12) into the slots on the roof. Add the rear angle C13) to the rear of the roof with the roof nested in the half etch of the rain strip. Solder the roof in place.

Extended Cab Roof. Form the cab roof (C14) to shape. The roof rear and side angles (C15) is fitted by starting in the middle where it has the correct shape and carefully bending and soldering around the sides; it is over length so that accurate alignment is not essential. Solder the roof in place.

Slightly curve the fall plate (C16) and hinge to the cab floor (C17) with small staples of 0.45 mm wire as shown in the diagram.

No.	Description	Sheet
C5	Cab cutout beading (2)	B2
C6	Cab side (2)	B2
C7	Cab side internal strengthening rib (2)	B3
C8	Cab seats (2)	B1
C9	Cab floor support	B3
C10	Cab roof rear frame	B3
C11	Original cab roof	B3
C12	Original cab roof sloping rain strip	B2
C13	Original cab roof rear angle	B3
C14	Extended cab roof	B3
C15	Extended cab roof rear and side angles	B3
C16	Fall plate	B1
C17	Cab floor	B3
C18	Vacuum gauge bracket	B1
C19	Pressure gauge bracket	B1
C20	Regulator lever extension	A1



CONSTRUCTING THE CAB 2

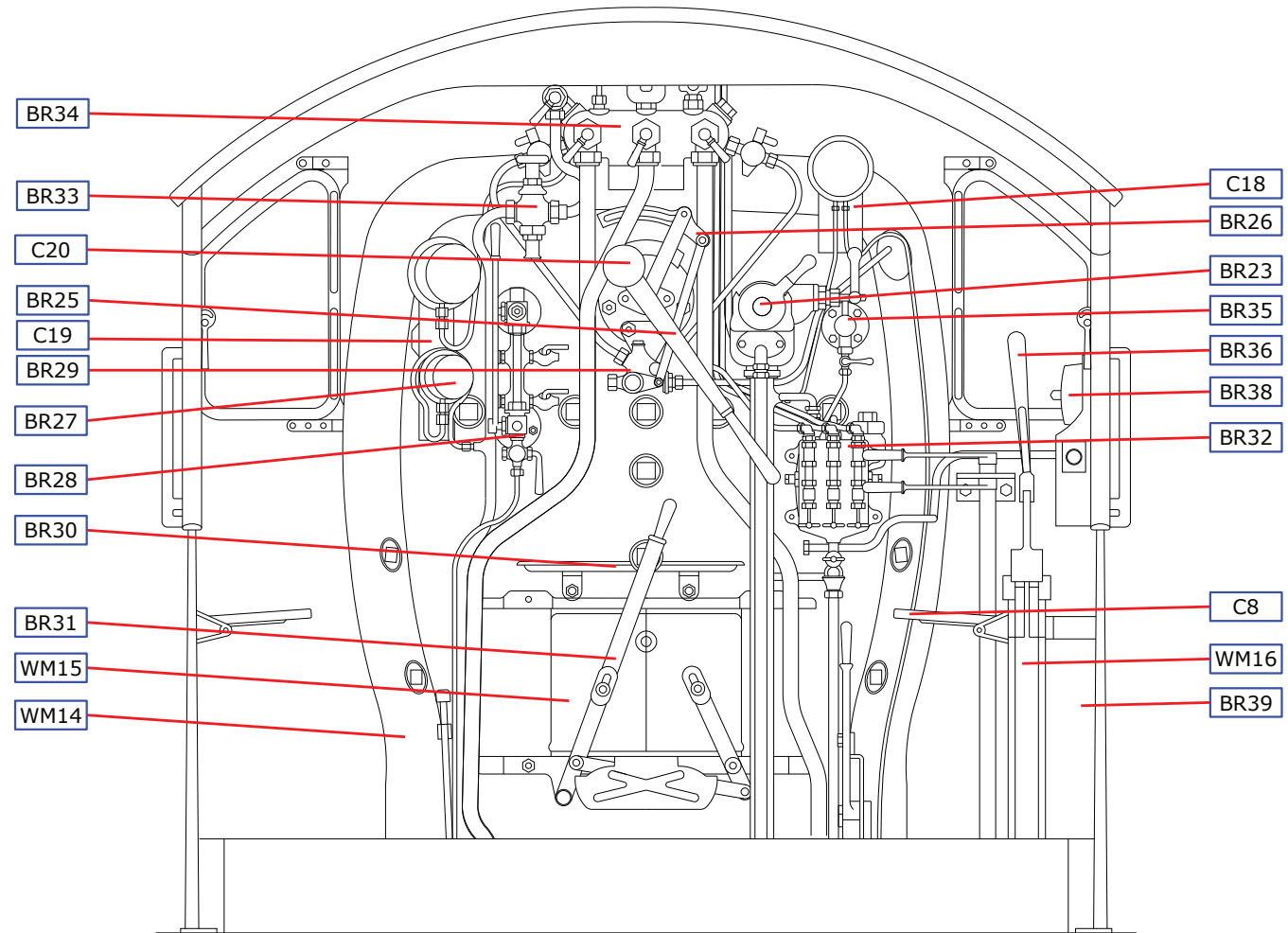
BACKHEAD

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

Using the drawing of the cab interior, the backhead can be assembled and the cab interior detailed. Use copper wire of a suitable size for the pipes. There are no known drawings of the 47XX backhead so the drawing is for the later 2884 class circa 1938 but the positions of the fittings would have been the same on the 47XX class. For the position of the steam heating valve see Russell fig. 4. The ATC battery box fits on the cab floor, against the cab side, in front of the lever reverser.

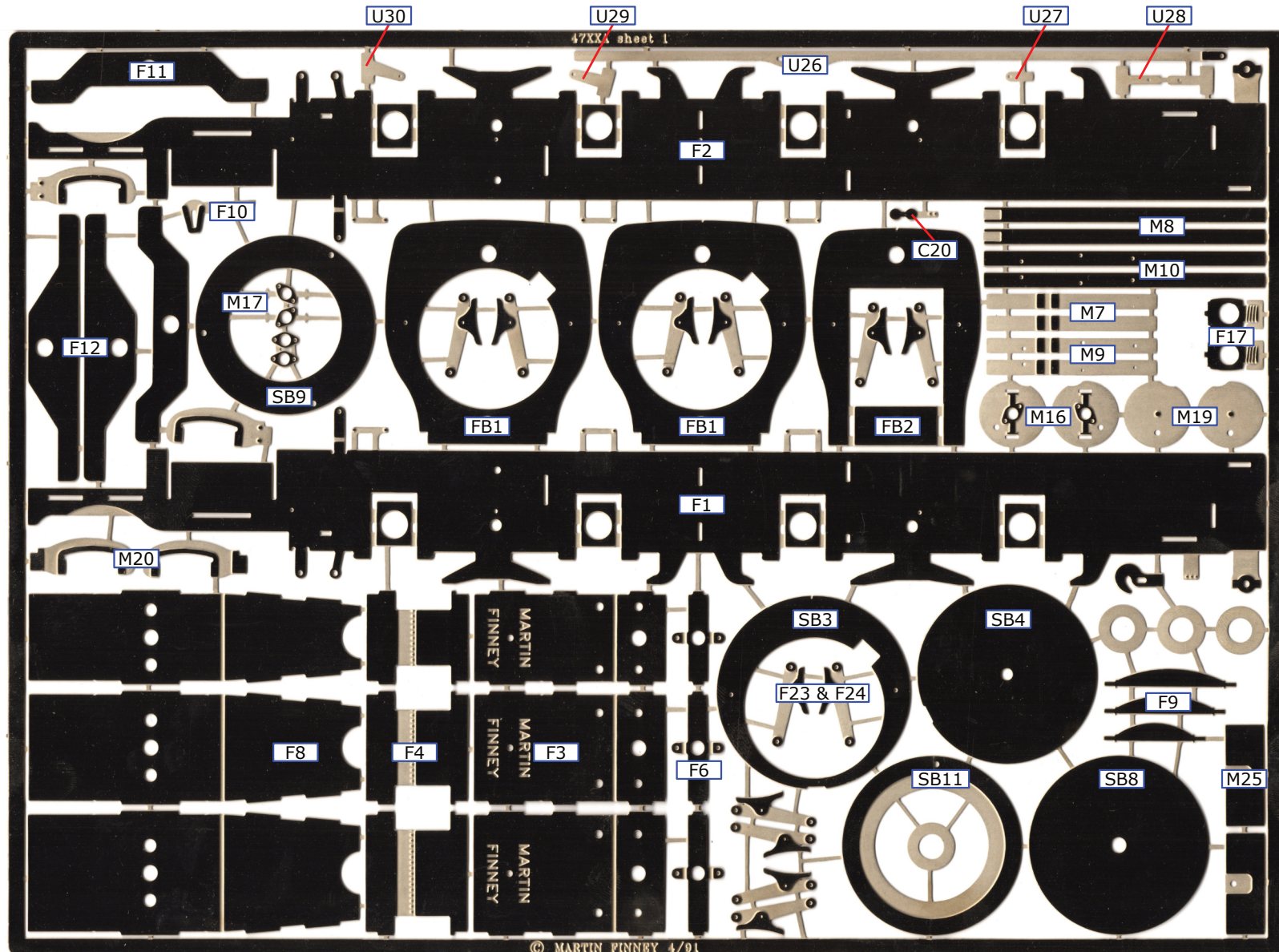
Differences for an engine in earlier condition could be:

- Gauges not bracket mounted
- No regulator lever balance weight extension
- No ATC bell.



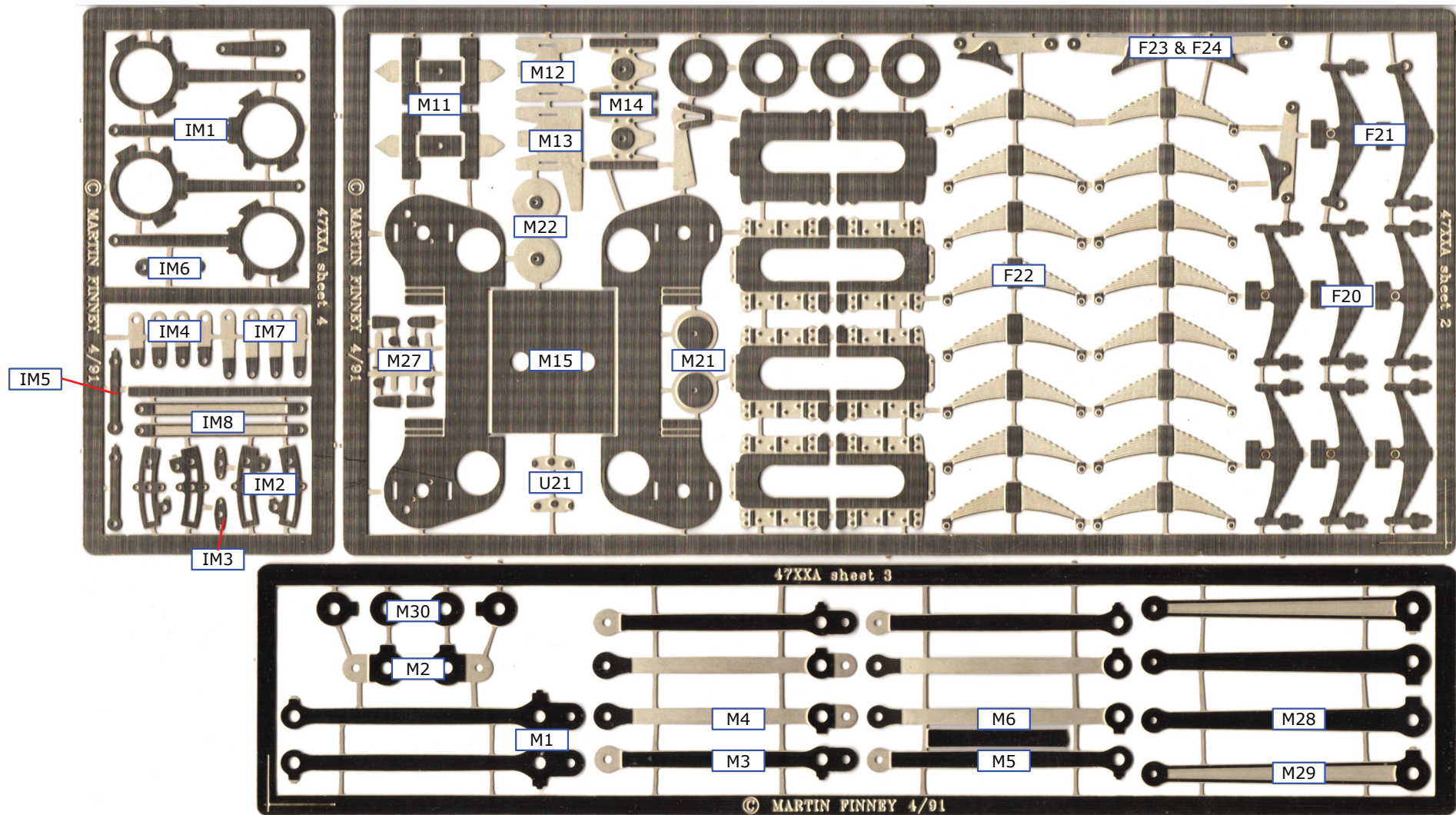
Backhead

47XX A SHEET 1

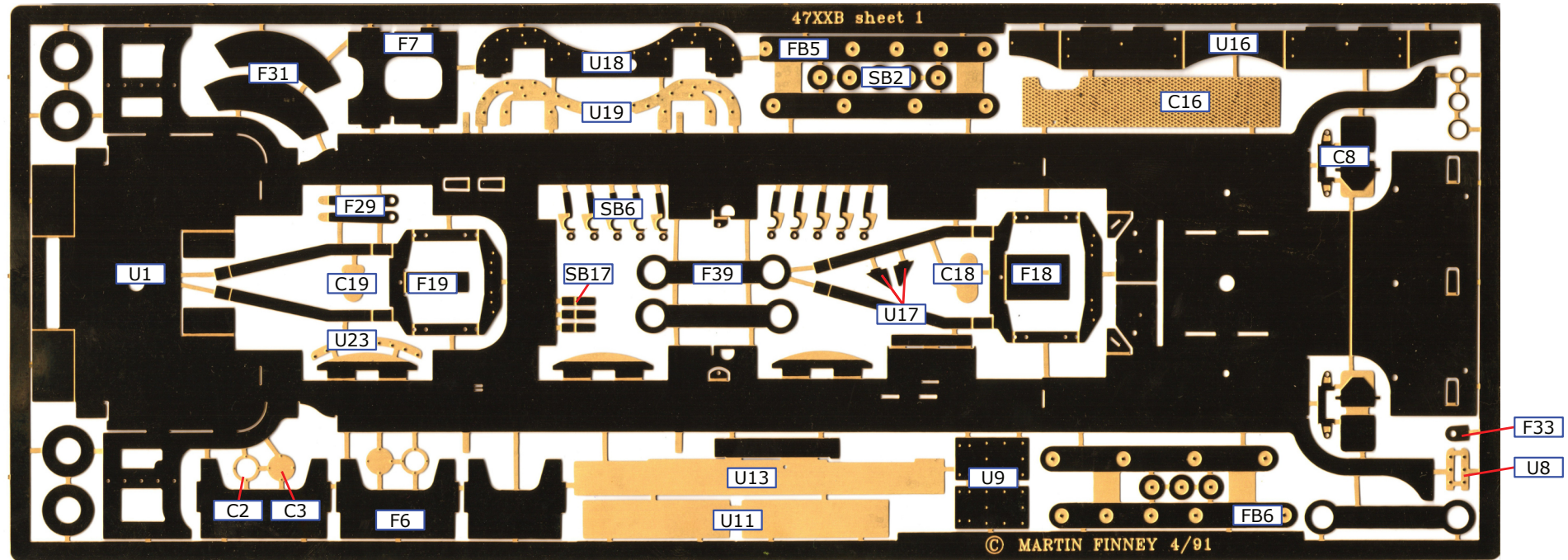


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47XX A SHEET 2,3 & 4



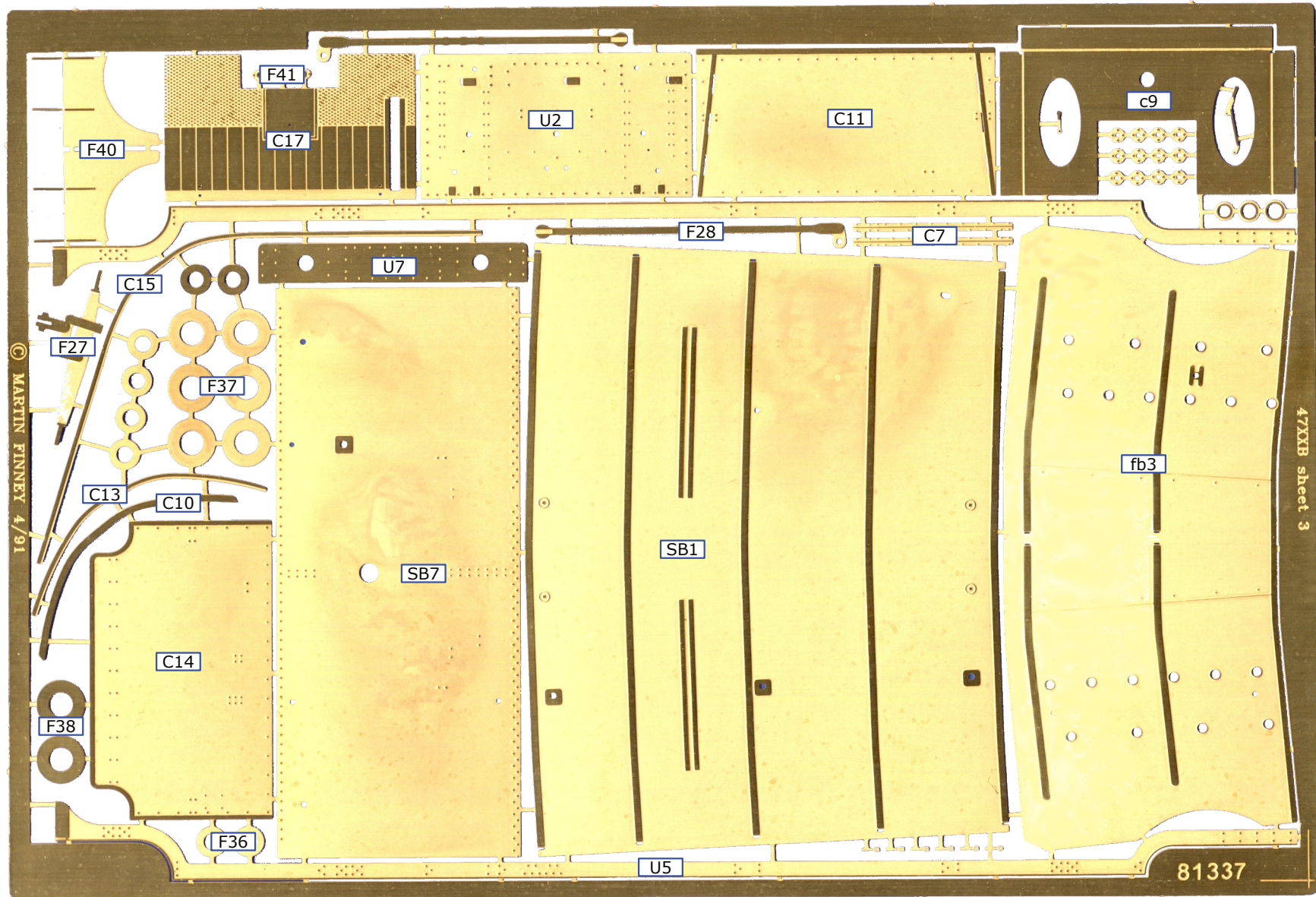
47XX B SHEET 1



47XXB SHEET 2



47XXB SHEET 3



Finney7

BRASS CASTINGS

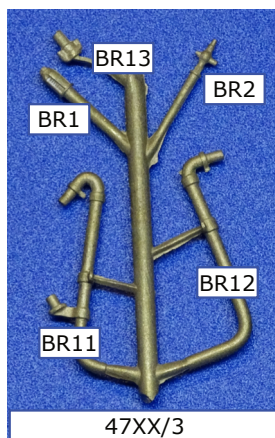
CU1	Parallel chimney	47XX/1	BR11	Early (tall) vacuum pipe	47XX/3	BR24	Combined ejector/brake	51XX/2
BR1	Cylinder relief valves (4)	47XX/3,4,5&6	BR12	Later (short) vacuum pipe	47XX/3	BR25	Regulator handle	47XX/6
BR2	Cylinder drain cock (4)	47XX/3,4,5&6	BR13	Vacuum pipe dummy	47XX/3	BR26	Linkage to jockey valve	51XX/2
BR3	Exhaust steam injector (left), 2 parts	47XX/4	BR14	Four cone ejector	47XX/5	BR27	Jockey valve	Duke/4
BR4	Live steam injector (right)	47XX/4	BR15	Four cone ejector front elbow	47XX/5	BR28	Water gauge	Cab/1
BR5	ATC shoe	Details/1	BR16	Safety valve casing	47XX/2	BR29	Cab pressure gauges	Atbara/1
BR6	Axle journal lubricator (6)	Lube/1	BR17	Safety valve spring (2)	Details/1	BR30	Firebox Shelf	Loose
BR7	Pony truck lubricator	Lube/1	BR18	Smokebox door handles	47XX/6	BR31	Firebox door handle	Duke/4
BR8	Front sandbox lid (2)	Details/1	BR19	Steam lance cock	47XX/6	BR32	Sight feed lubricator	Cab/1
BR9	Vacuum pump lubricator	47XX/8	BR20	Vacuum pump	47XX/5	BR33	Steam heating valve	51XX/2
BR10	Snifting valve (2)	Details/1	BR21	Small whistle	Atbara/1	BR34	Steam fountain	Cab/1
			BR22	Large whistle	Atbara/1	BR35	Blower valve	51/XX/2
			BR23	Combined ejector/brake handle	Loose	BR36	Lever reverse handle	Atbara/1



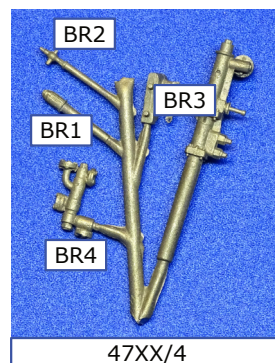
CU1
47XX/1



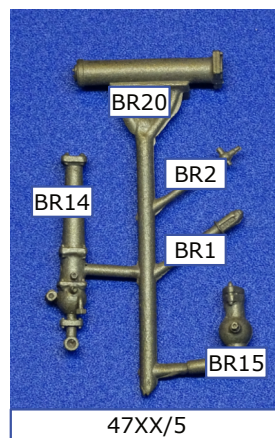
BR16
47XX/2



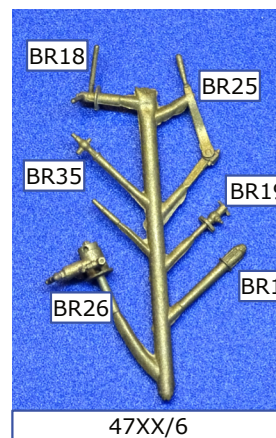
47XX/3



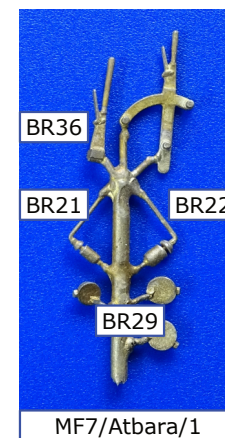
47XX/4



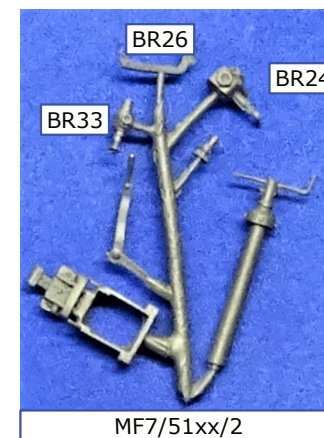
47XX/5



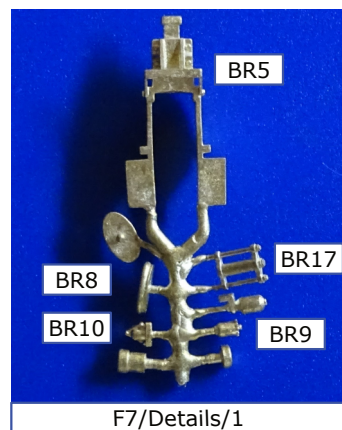
47XX/6



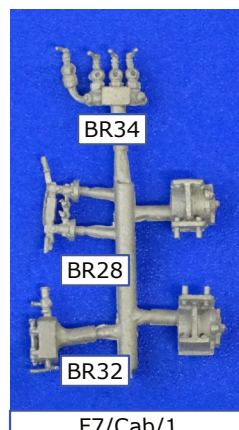
MF7/Atbara/1



MF7/51xx/2



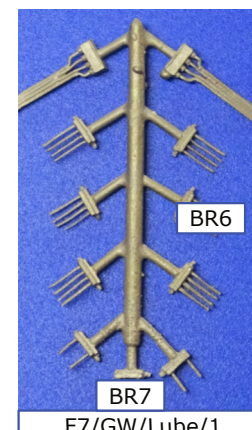
F7/Details/1



F7/Cab/1



F7/Duke/4



F7/GW/Lube/1

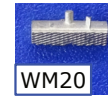
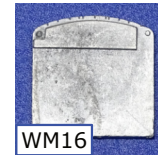
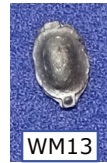
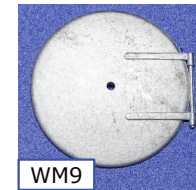
BR30

BR23

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WHITEMETAL CASTINGS

- WM1 1 Left rear sandbox
- WM2 1 Right rear sandbox
- WM3 1 Original pony truck spring cover
- WM4 1 Later pony truck spring cover
- WM5 2 Collett taper buffers
- WM6 2 Valve rocker shaft housing
- WM7 1 Safety valve base and top feed
- WM8 2 Smokebox saddle bolt strip
- WM9 1 Smokebox door
- WM10 2 Outside steam pipe
- WM11 1 Smokebox pipe cover
- WM12 2 Firebox side covers
- WM13 4 Mud hole covers
- WM14 1 Backhead
- WM15 1 Firebox door
- WM16 1 Lever reverse base
- WM17 1 ATC bell
- WM18 1 ATC battery box
- WM19 1 ATC shoe plunger switch
- WM20 2 Front drop plate step



OTHER COMPONENTS

- 3/16" bearing (8)
- 6BA x 1" brass screw (2)
- 6BA x 5/16" brass screw
- 6BA nut (3)
- Valve gear rivet (8)
- Short handrail knob (2)
- Medium handrail knob (6)
- Buffer head, bush, washer and spring (2)
- Vacuum pipe hose
- 4mm studding (75mm x 2), 4 brass & 4 stainless nuts

- 1.2mm Brass wire for front struts and link hanger pivot
- 1.4mm Brass wire for top feed pipes
- 1.6mm Brass wire for brake shaft and reversing shaft
- 2.0mm Brass wire for 4 cone ejector
- 1.25mm Nickel silver wire for oil cups & crosshead pins
- 1.6mm Nickel silver wire for coupling rod fork joints & piston rod
- 0.5mm Steel spring wire
- 0.8mm Steel spring wire for pony truck side control
- 0.8mm & 1.5mm Copper wire for backhead pipes

- 1/8" Brass wire for compensation beam pivots
- 5/32" OD Brass tube for compensation beams
- 3/32" OD Brass tube for piston tube
- 11/32" OD Brass tube for valve chests
- 0.45mm Brass wire for cab handrail
- 0.7mm Brass wire for pinning eccentrics
- 0.8mm Brass wire for stuffing box studs, brake hanger pivots, sand pipes, pony truck & handrail

47XX PACKING LIST 1

This list reflects the use of the new backheads and matching LW castings.

ETCHES

- 1 Frames 47XXA7 PT 81338
- 1 Body 47XXB7 PT 81337

SPRUES

- 1 MF7/47XX/1
- 1 MF7/47XX/2
- 1 MF7/47XX/3
- 1 MF7/47XX/4
- 1 MF7/47XX/5
- 1 MF7/47XX/6
- 1 MF7/51XX/2
- 1 MF7/Atbara/1
- 1 F7/GW/Details/1
- 1 F7/Cab/1
- 1 F7/Duke/4
- 1 F7/GW/Lube/1
- 1 Combined ejector/brake handle
- 1 Firebox shelf

WHITEMETAL

- 1 Left rear sandbox
- 1 Right rear sandbox
- 1 Original pony truck spring cover
- 1 Later pony truck spring cover
- 2 Collett taper buffers

- 2 Valve rocker shaft housing
- 1 Safety valve base and top feed
- 2 Smokebox saddle bolt strip
- 1 Smokebox door
- 2 Outside steam pipe
- 1 Smokebox pipe cover
- 2 Firebox side covers
- 4 Mud hole covers
- 1 Backhead
- 1 Firebox door
- 1 Lever reverse base
- 1 ATC bell
- 1 ATC battery box
- 1 ATC shoe plunger switch
- 2 Front drop plate step

OTHER COMPONENTS

- 8 3/16" bearing (8)
- 2 6BA x 1" brass screw (2)
- 1 6BA x 5/16" brass screw
- 3 6BA nut (3)
- 8 Valve gear rivet (8)
- 2 Short handrail knob (2)
- 6 Medium handrail knob (6)
- 2 Collett taper buffer head, bush, washer and spring (2)
- 1 Vacuum pipe hose

2x 75mm 4mm studding, 4 brass & 4 stainless nuts

WIRE

- 60mm 1/8" Brass wire
- 55mm 5/32" OD Brass tube
- 75mm 3/32" OD Brass tube
- 31.5mm 11/32" OD Brass tube
- 85mm 0.45mm Brass wire
- 100mm 0.7mm Brass wire
- 525mm 0.8mm Brass wire
- 333mm 0.8mm Brass wire
- 100mm 1.2mm Brass wire
- 333mm 1.4mm Brass wire
- 30mm 1.6mm Brass wire
- 175mm 2.0mm Brass wire
- 50mm 1.25mm Nickel silver wire
- 25mm 1.6mm Nickel silver wire
- 55mm 0.5mm Steel spring wire
- 50mm 0.8mm Steel spring wire wire
- 220mm 0.8mm Copper wire
- 50mm 1.5mm Copper wire

INSTRUCTIONS