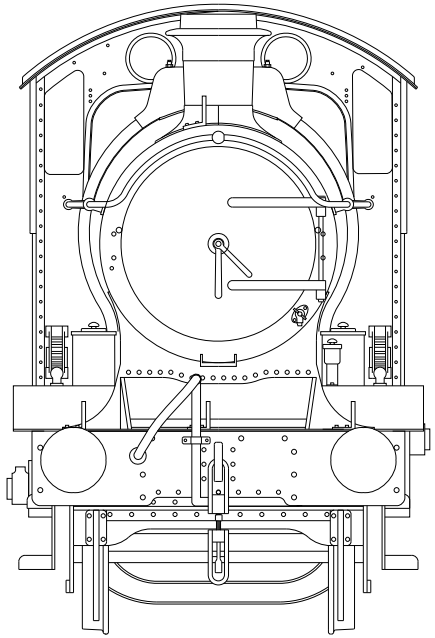
GWR DUKE



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

For a detailed history of this long-lived class of 60 engines Part Seven of 'The Locomotives of the Great Western Railway' published by the RCTS is essential reading. Also useful are A Pictorial Record of Great Western Engines Vol 1 & 2 by JH Russell, Standard Gauge Great Western 4-4-Os by OS Nock, Small Wheeled Double Framed 4-4-0 Tender Locomotives by David Maidment & Locomotives Illustrated No. 50, GWR Double-framed 4-4-Os.

The engines were built under five lots as follows:

Lot	Old Numbers	Built/rebuilt	Original boiler
97	3252/53	5/95	S4
101	3254-61	7/95-9/95	
102	3262-71	4/96-7/96	
105	3272-91	8/96-3/97	
113	3312	10/98	BR4#
113	3313-27	3/99-7/99	S4
113	3328-31	7/99-8/99	BR4

The boiler on this engine was much larger and was Churchward's prototype Standard No. 2. This engine looked more like a Bulldog than a Duke and in March 1906 it was rebuilt into a Bulldog with an orthodox Standard No. 2 boiler. Similarly nineteen further Dukes were rebuilt and became Bulldogs between 1902 and 1909.

In December 1912 the forty remaining Dukes were renumbered into a continuous sequence between 3252 and 3291; 3252 retained its original number. By 1946 eleven Dukes were still in service and these were renumbered again in the 90xx series. The last two digits were unaltered, thus 3254 became 9054.

With a life of over fifty years, many detail modifications to the locomotives took place. Many of these are covered by including alternative components in the kit, however it is essential to have a photograph of the individual locomotive you propose to construct to enable an authentic model to be built.

VARIATIONS POSSIBLE WITH THE KIT

Outside frames. In original condition the outside frames have mostly flush rivets. Snap head rivets soon appeared after visits to the shops. From 1904 about half of the engines received frame strengthening plates around the horns with some also acquiring tie bars.

Balance weights. A bewildering variety - we have attempted to include all the different permutations.

Coupling rods. Originally fluted. Replacement rods from c1908 onward were of plain section.

Bogies. Originally of the swing hanger type with shallow frames, with splasher beading and the small lower splashers. Many replaced with deeper frames. Some were rebuilt to 'De Glehn' type without swing hangers and fitted with strengthening patches.

Small footplate steps. Eight small steps were fitted to the platform, two in front of each splasher from an unknown date.

Boilers. As shown above, most were built with a S4 boiler having a flush round top firebox. The last of these boilers was removed from 3279 in 1917. From 1903 new standard domed Belpaire (type B4) boilers were fitted.

Chimneys. Originally copper capped without a capuchon. Soon a capuchon was fitted. At an unknown date the chimney was moved forward. From 1920 cast iron tapered chimneys were introduced for replacements.

Boiler feed. Lots 97, 101, 102 & 105 were built with very large clack boxes which are not provided in the kit. Lot 113 were built with the smaller clack boxes supplied with the kit. Photographs suggest many of the earlier engines were soon fitted with the smaller clack boxes. The B4 boilers fitted from 1903 had the clack boxes fitted on the back plate inside the cab. From 1913 onward, about half of the boilers had the boiler feed moved from the back plate to a position in front of the dome on the top of the boiler.

Smokebox. The early smokeboxes had a plain front with a square front edge and ringed door. Later snap head rivets were used and from c1920 the smokeboxes had a pressed front with a rounded front edge and Churchward type door without the ring.

Cabs. The original cabs were very narrow and fitted with a canvas covered wooden roof. Many of the Dukes were given large wide cabs when first fitted with B4 Belpaire boilers, others at various times thereafter. These wide cabs were fitted with steel roofs with two patterns of rain strip. Most of the wide cabs had standard Churchward windows, but several had wider 'L' shaped windows. The small circular windows above the firebox were blanked off after about 1926. When fitted with standard Churchward 3500 gallon tenders from 1930 the cab side sheets were set outwards at the back.

Initially some locomotives retained the narrow low cab when fitted with B4 boilers. The larger firebox necessitated the fitting of very small cab windows which clearly provided a less than satisfactory forward view. This problem was subsequently overcome by raising the roof of the narrow cabs to allow the fitting of larger windows. They also received new steel roofs with two patterns of rain strip.

Cab side handrails. The original narrow cabs had no side handrails. When the cab roofs were raised handrails were fitted. The wide cabs had handrails in at least three different positions.

Beading. Much of the decorative beading from the splashers and bogies was removed during the Great War.

ATC Equipment. Put on all but 3252/7/9/62/77 between 1930 and 1931.

Vacuum pipe. Originally tall - later a shorter pattern was introduced.

Whistles. In their last years, a few of the engines had their whistles removed from the cab roof to a position on top of the firebox and some acquired a whistle shield.

VARIATIONS NOT NOT POSSIBLE WITH THE KIT

Boilers: The domed, raised Belpaire BR4 boilers fitted to 3312 and 3328-31 when built are not provided. Other members of the class carried these boilers after repair and the last of these was removed from 3291 in 1913.

Ten engines at one time or another carried domeless boilers with raised Belpaire fireboxes (type BR0). The last of these was removed from 3278 in 1929.

From 1926 five engines (3254/69/71/72/79) had the boiler pitch increased by 5" to accommodate a new pattern of piston valve cylinders.

TENDERS

Lots 97, 101, 102 & 105 were built with very small tenders of 2000 gallon capacity. Larger 2500 gallon tenders were fitted to Lot 113. Later, most were paired with standard Dean 2500 gallon or 3000 gallon tenders. From around 1930 many of the class acquired standard Churchward 3500 gallon tenders.

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.

Before construction can commence you have to decide which particular chassis you are going to construct. The options are:

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.

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.

Split axle/frame. We leave this to you! Some useful information can be found at http://www.euram-online.co.uk/tips/splitaxle/splitaxle.htm.

COMPONENTS NOT SUPPLIED

Wheels.

Driving wheels - 5’ 8", 18 spoke, 3/16" diameter axle (2). Slater's Ref. 7868O/C

Until the Finney7 cranks are available we recommend fitting the MOK outside cranks.

Bogie wheels - 3'7”, 10 spoke, general pattern. Specify 2mm outside journals when ordering. Slater's Ref. 7843MF

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

Crankpins. Heavy duty crankpins are available from Finney7.

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

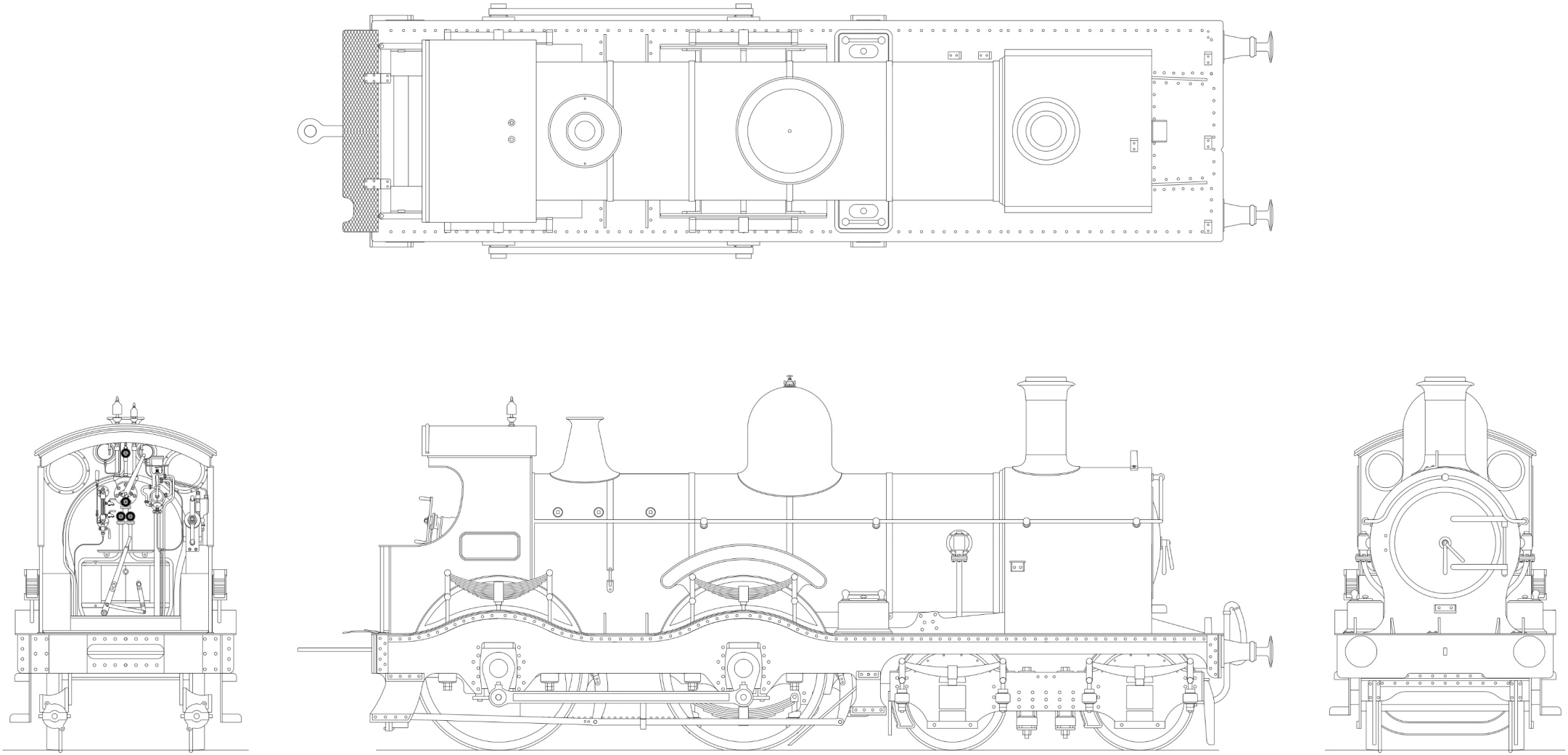


Fig 1. S4 Boiler Duke Class GA

Parallel chimney without capuchon, narrow cab, boiler clack boxes, fluted coupling rods, shallow frame bogie with splashers.

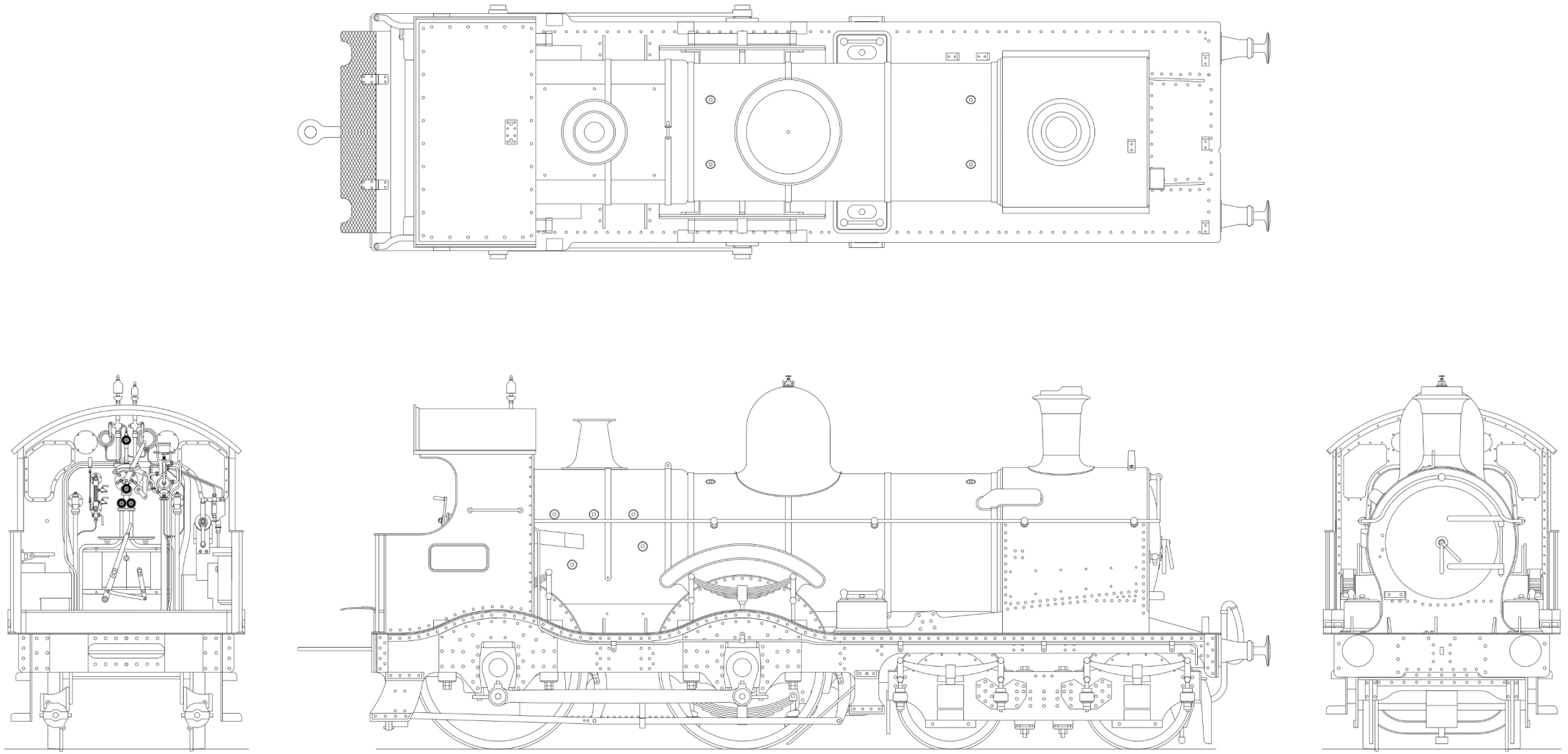


Fig 2. B4 Boiler Duke Class GA

Circa 1935, wide cab with L shaped windows, backplate clack boxes, plain coupling rods, deep frame bogie, tapered chimney, splasher and bogie beading removed, ATC fitted.

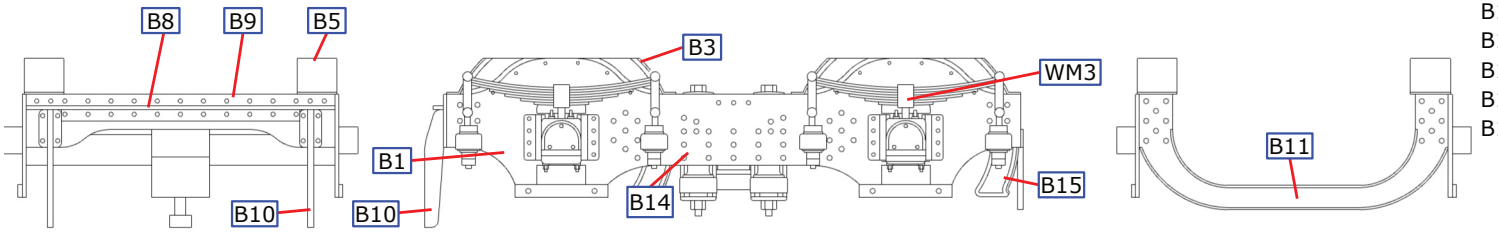
BOGIE

There are several bogie options available and careful study of photographs is needed before you start. The options are:

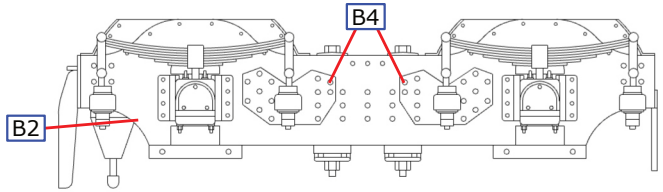
Different rivet patterns - emboss those wanted.
Shallow frames (B1) or deep frames (B2).
Bogie frame patches (B3).
Splashers below the frame - remove for later period.
Splasher beading - remove the riveted splasher fronts and solder the splasher beading in their place.
Swing hanger suspension or De Glehn type - omit the swing hanger castings for the De Glehn type.

If you are fitting splasher beading remove the splashers as shown. First emboss all appropriate rivets including those in the hornguide ties. Solder the splasher beading (B3) in place to the rear of the frames. Fold over the hornguide ties through 180° and attach the strengthening patches (B4) if needed. Solder in the axle bearings.

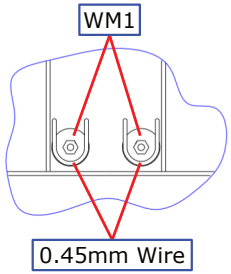
No.	Description	Sheet
B1	Shallow bogie frame (L & R)	5
B2	Deep bogie frame (L & R)	4
B3	Bogie splasher beading (2)	4
B4	Frame strengthening patch (2L & 2R)	1
B5	Bogie Splasher tops (8)	5
B6	Bogie splasher rear cover (2)	5
B7	Bogie stretcher	4
B8	Bogie front angle strip	4
B9	Bogie front stretcher	1
B10	Bogie guard iron (L & R)	1
B11	Bogie rear stretcher	1
B12	Bogie pivot washer (6BA)	1
B13	ATC mounting bracket	4
B14	Bogie front wheel splasher rear cover (2)	5
B15	Bogie rear wheel splasher rear cover (2)	5



Shallow Frame With Beading



Deep Frame With No Beading



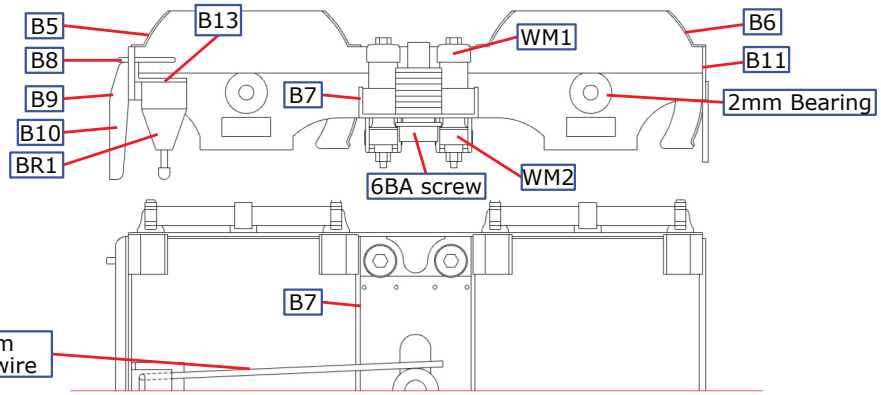


Fig 3. Bogie Construction

Form the splasher tops (B5) to shape. First mark a fold line 2.0mm from one end, then fold to the required angle using the frame side as a guide and then solder in place removing any excess from the top edge. If you have left the lower splashers in place solder the splasher rear cover (B6) to the rear splasher.

Fold the stretcher (B7) into a 'U' section and solder it to one frame locating it in the half etched groove. Now solder the second frame in place remembering to have the wheelsets in place at the same time. Check that the bogie is square and level.

Insert the front angle strip (B8) through the slots in the front stretcher (B9) and attach the guard irons (B10) likewise. Solder the complete front stretcher in place. Repeat for the rear stretcher (B11).

Form the spring wire for the bogie side control as shown in the diagram, thread it through the two outer holes in the projecting tab in the front crossbeam and solder it in place. The side control wire will then act on either side of the bogie pivot and can be adjusted by bending the wire suitably.

Attach the upper swing hanger castings (WM1). Attach the lower swing hanger castings (WM2) through the larger holes in the spacer and make flush with the upper surface of the spacer. Fit the axlebox and spring castings (WM3). Form the safety brackets from 0.45 mm wire and solder in place through the small holes in the spacer.

If required, attach the ATC shoe (BR1) and ATC mounting bracket (B13) to the front stretcher as shown.

COUPLING RODS AND FRAME PREP

Coupling Rods. The coupling rods are now made so that they can be used as a jig to align the leading coupled axle hornblocks accurately. Choose between fluted (M1 & M2) or plain (M3 & M4) coupling rods.

First drill out all the crankpin holes to a convenient size which is undersized for the crankpins. Remove all burrs caused by the drilling. Now drill the same drill into a suitable 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 two laminations of each rod.

Tin well the front face of all the inner laminates and the back face of the outer laminates and place them over the mandrel. Using plenty of solder and flux, solder the two laminates together. You should now have a rod with the bosses on each laminate perfectly aligned.

The rods have been deliberately etched too large so that the thin etched edges can be carefully filed so that the 'laminated' effect is lost and the rods appear to be made from one piece of metal.

No.	Description	Sheet
M1	Fluted coupling rod outer lamination (2)	1
M2	Fluted coupling rod inner lamination (2)	1
M3	Plain coupling rod outer lamination (2)	1
M4	Plain coupling rod inner lamination (2)	1
F1	Left inside frame	1
F2	Right inside frame	1

Frames. Having decided which chassis to construct you can now start construction by preparing the inside frames (F1 & F2). Emboss the rivets marked by half etched holes. Form the frame joggle to narrow the frames from the rear of the bogie forward. Make the first bend inwards through 30° along the rear half etched line and strengthen the bend with a fillet of solder. Then make the second bend outwards in the same way.

Now open up the following holes in the frames:

- P only if plunger pick-ups are being used
- B for brake hanger pivots - 0.8mm
- R for reversing lever cross shaft - 1.6mm
- A for compensation beam pivot - 1/8"
- S Steam brake cylinder mountings - 0.8mm.

If you are fitting compensation now is the time to build the hornblocks from the HB2 GWR Small Hornblocks kit using the instructions in the kit.

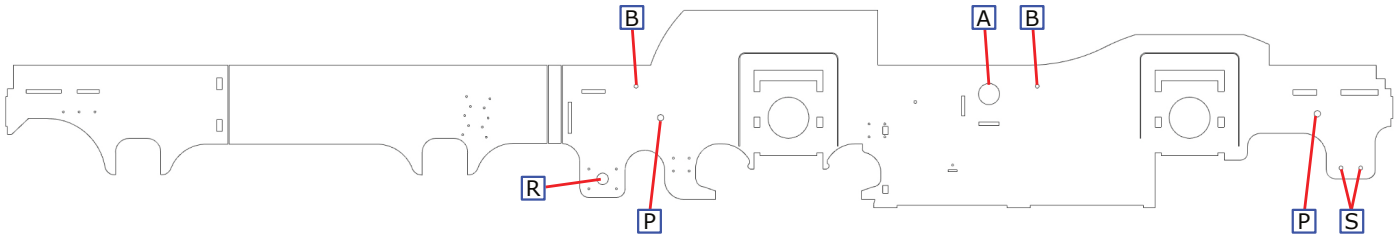


Fig 4. Frame Preparation

INSIDE FRAMES CONSTRUCTION 1

Frame Spacers and Assembling the Chassis. Remove the stretchers (F3, F4, F5 & F6) to suit your chosen gauge. If you are fitting inside motion open up the slots in the cylinder block stretcher (F5) to the rear edge using the half etched lines as a guide and check the fit of the 3/32" brass cylinder tube in the inside motion kit. Tap the cylinder fixing hole 6BA. Solder the 6BA bogie pivot nut in place on F5 and then fold up parts F3 & F5 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. Bend the frames inwards slightly at the front along the half etched lines to match the shape of the front frame stretcher.

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 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 stretchers to the frames. It is important to check constantly that the chassis is square and that the frames are straight.

Fitting the Compensation Beams. Cut a piece of 1/8" brass rod so that it fits through the holes A and is flush with the outside face of the chassis frames. Prepare two pieces of 5/32" brass tube. Each should have a length of 3.5mm for the widest spacers or 2.5mm for the middle width of spacers. Open up the hole to accept the brass tube in each of the compensation beams (F11) and solder the beams to the pieces of tube 1 mm from one end. Place the compensation beams in place in the chassis and thread the brass rod through the frames and chassis. Now solder the pivot rod securely to the frames. Cut away the centre section of the pivot rod so that gearbox will fit in the chassis. Select the appropriate outside frame stretchers (F9 & F10) and fold along the half etched line, before soldering in place. The compensation beams can now be retained, by folding down the long tabs on the centre outside frame spacers.

Fit all the wheels and axles temporarily so that the beams are resting on the axle bearings and the bogie is mounted on its pivot supported by a suitable number of pivot washers (B12). Confirm that the compensation works properly and check that the chassis is sitting level.

If required, solder the ABC gearbox anchor (F7) in place to form the support for the chosen motor/gearbox.

Inside Motion. If you are fitting inside motion construct it now following the separate instructions. There is a packing piece (F29) on the main etch to help fit the motion.

Inside Springs. The inside springs can be fitted now but they will trap the leading axle axleboxes in the hornguides. Solder together the three laminations of the inside frame springs (F33 & F34) before fixing in place inside the spring hangers (See Fig 5).

No.	Description	Sheet
F3	Rear frame stretcher, two widths	1
F4	Firebox front frame stretcher, two widths	1
F5	Cylinder block frame stretcher, two widths	1
F6	Front frame stretcher, two widths	1
F7	ABC gearbox anchor	1
F8	Compensation beams (2)	1
F9	Centre outside frame stretcher, two widths (2)	5 & 6
F10	Front outside frame stretcher, two widths (2)	6
F29	Inside motion packing piece	5
F33	Spring middle lamination (2)	1
F34	Spring outer lamination (4)	1
B12	Bogie pivot washers	1

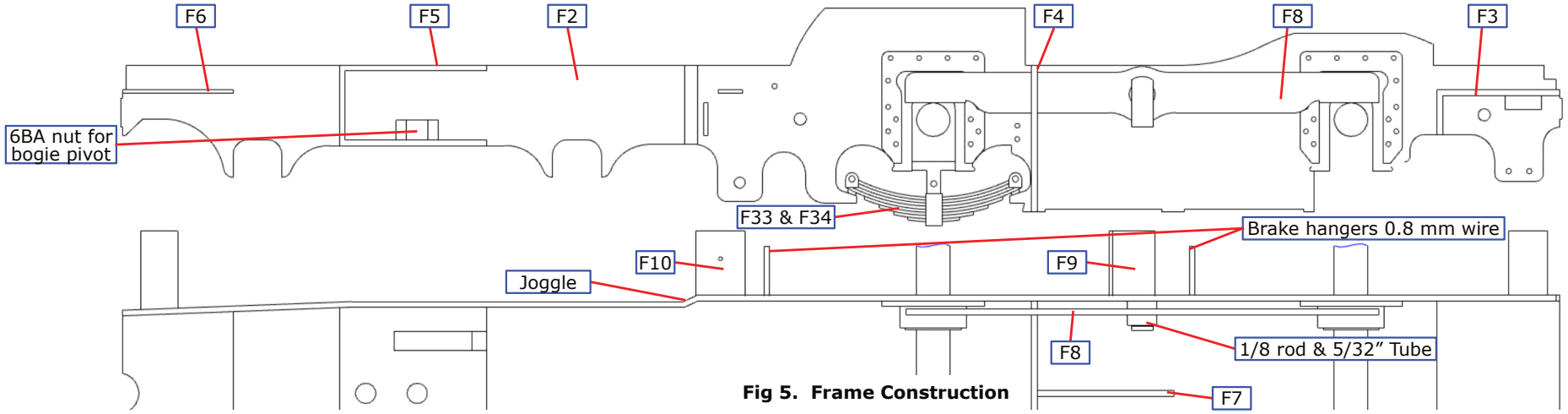


Fig 5. Frame Construction

OUTSIDE FRAMES

Fold the outside axle boxes (F18) through 180° with the fold line outside and carefully solder together. Open out the axle holes to be a sloppy fit on the axle. These axle boxes are simply cosmetic.

Select the appropriate outside frames early or later (F11 & F12 or F13 & F14). If you are fitting the strengthening plates (F17) remove the rivet and horn guide detail from that part of the frames which will be behind the strengthening plates. Check that the axle boxes are an easy fit in the horn guides in the outside frames, or the strengthening plates if these are to be used, and ease if necessary.

Attach the rivet strips (F15 & F16) to the top of outside frames. Solder the strengthening plates in position carefully checking that each one is in the correct position by trying the outside frame in place over the outside frame axleboxes on the axles. If your chosen prototype has strengthening plates without the strengthening tie bar then modify their shape as shown in Fig 2.

Solder short lengths of 0.8mm wire to the inside lower edge of the outside frames at each spring damper position to mount the spring dampers. The positions are given by the distinctive rivet patterns.

No.	Description	Sheet
F11	Early outside frame, left	1
F12	Early outside frame, right	1
F13	Later outside frame, left	1
F14	Later outside frame, right	1
F15	Left outside frame rivet strip	6
F16	Right outside frame rivet strip	6
F17	Outside frame strengthening plates (4)	1
F18	Outside frame axlebox (4)	1

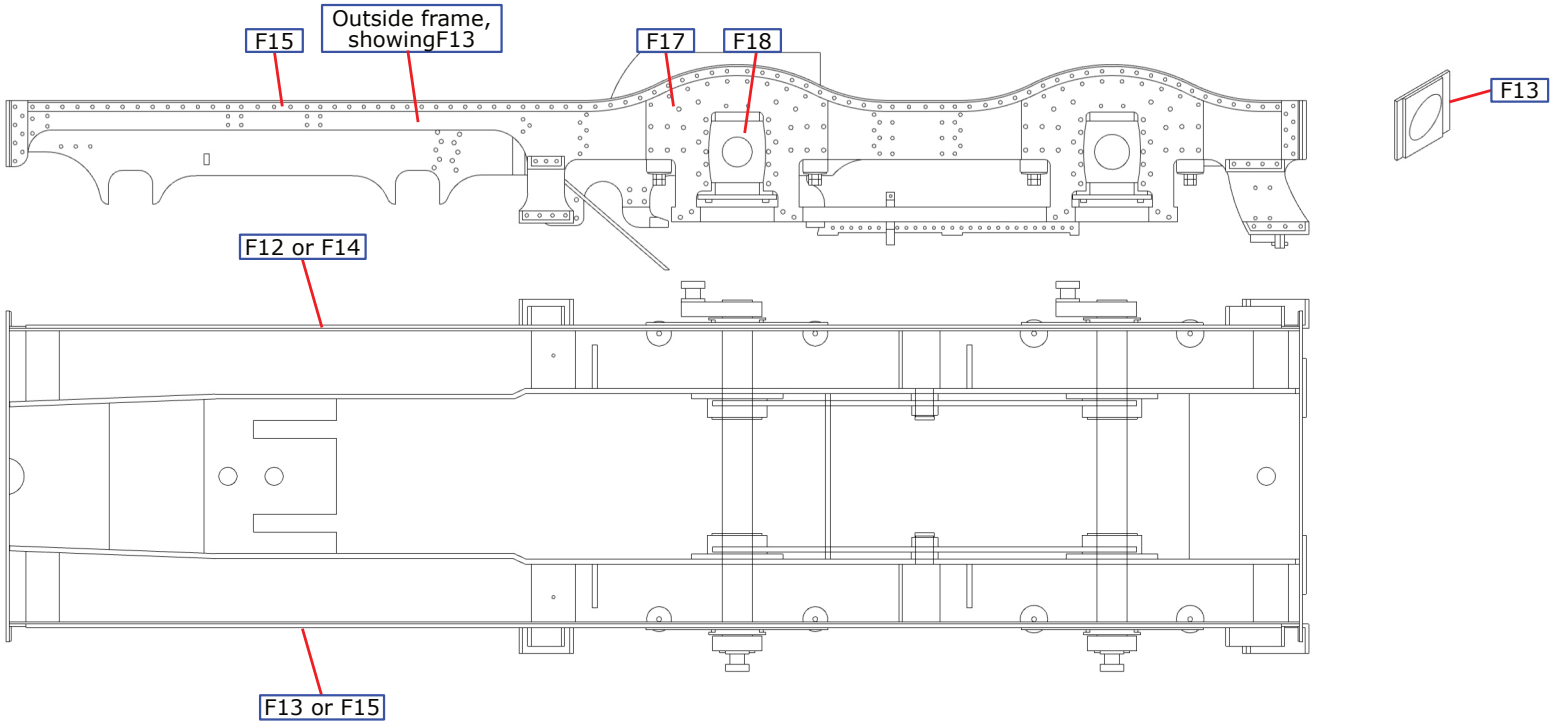


Fig 6. Outside Frames

OUTSIDE FRAMES, BUFFER BEAM & DRAG BEAM

Emboss the rivets on the drag beam (F19) and attach the rubbing plates (F20).

Solder the buffer beam (F21) and drag beam to the frames locating the frames in the appropriate half etched slots. Their upper edge must be .018" (0.45mm) above the upper edge of the frames so that they will be flush with the footplate when it is fitted. Any piece of .018" material placed on top of the frames will help ensure correct alignment.

Align the top of the outside frame with the buffer beam and drag beam and tack solder in place. Ensure the axles move freely and when satisfied solder the outside frame to the stretchers. Attach the angle brackets (F22) between frames and buffer beam and (F23) between frames and drag beam.

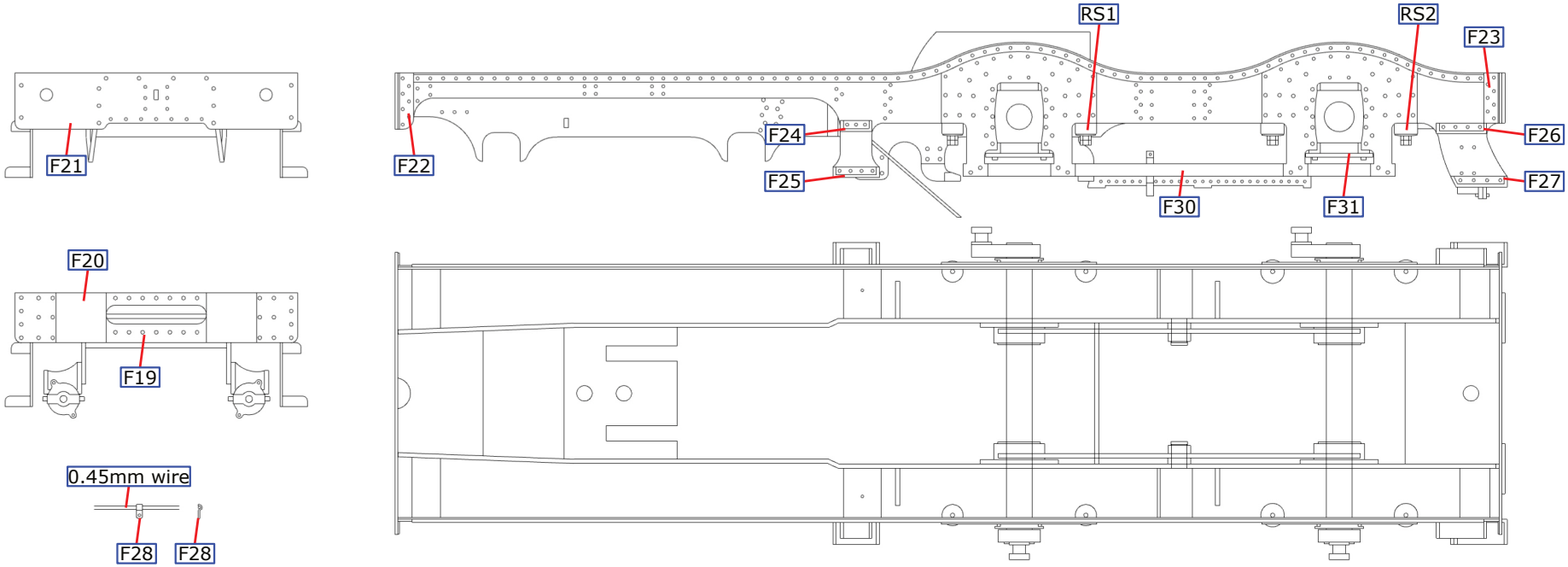
Fold up steps (F24, F25, F26 & F27) and attach to frames. The etched rivets on the frames locate in the holes in the steps to give accurate alignment.

There is a choice of balance weights, the original (F40 & F41), a later style (F42 & F43) and the last style (F44 & F45); these are depicted on page 11. Secure the appropriate balance weights in position.

Assemble the axleboxes, axles, wheels, motor and side control washers (F32). Fit the outside frame hornblock ties (F31); this ties the wheels and axles into the chassis. If required, fit the strengthening tie bars (F30).

Fix the resin spring dampers, leading and trailing (RS1 & RS2) in place on the previously fitted wires. The smaller dampers are used for the leading coupled axle.

No.	Description	Sheet
F19	Drag beam	6
F20	Rubbing plates (2)	6
F21	Buffer beam	6
F22	Frame to buffer beam angle bracket (2)	6
F23	Frame to drag beam angle bracket (2)	6
F24	Front upper step (2)	5
F25	Front lower step (2)	5
F26	Rear upper step (2)	5
F27	Rear lower step (2)	5
F28	ATC Conduit clips (5)	5
F29	Inside motion packing piece	5
F30	Frame strengthening tie-bar (2)	5
F31	Outside frame hornblock tie (4)	1
F32	Coupled wheel side control washer	1, 4



ATC Conduit

Fig 7. Outside Frames, Buffer & Drag Beams

BRAKE & CHASSIS FINISHING

Brake Gear. Assemble the brake hangers (F35) from two laminations using a block of wood and an old drill to align the laminations. The front of each hanger is detailed with a brake shoe pin retainer (F36), as shown in the diagram, the small hole in the back of the retainer locating on the previously embossed rivet.

Fit the steam brake cylinders, left and right (BR2 & BR3) to the frame as shown. Emboss the rivets on each outside brake pull rod (F37). Fit the inner pull rods (F38), as shown in the diagram, attaching them either side of the steam brake cylinders. Fix the brake hangers in place using 0.8mm wire for the hanger pivots and for the cross shafts. Form and fit the brake pull rods safety brackets (F39) through the small slots in the ashpan sides and under the pairs of pull rods.

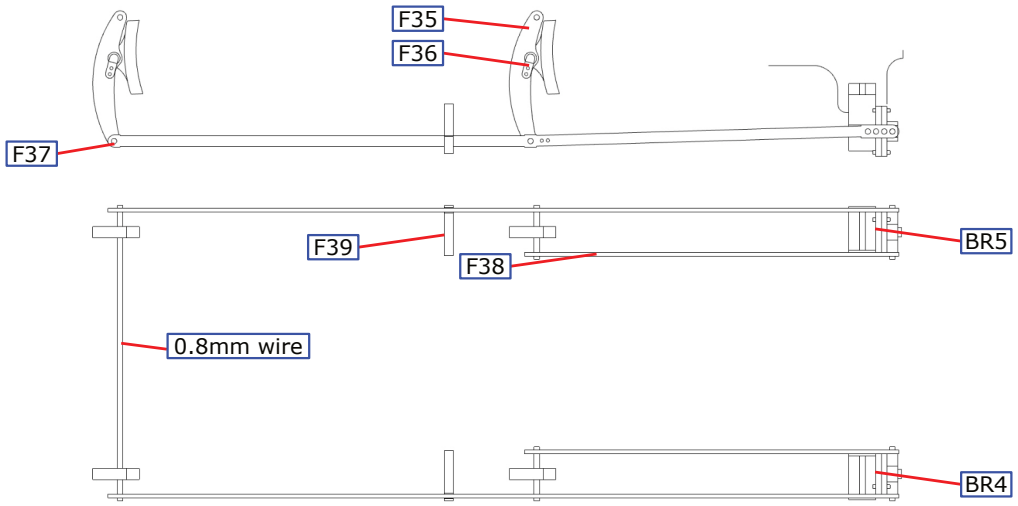


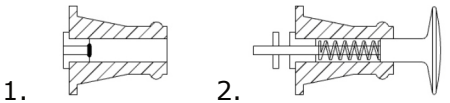
Fig 8. Brake Construction

No.	Description	Sheet
F35	Brake hanger/shoe lamination (8)	1
F36	Brake shoe pin retainer (4)	5
F37	Outer brake pull rod (2)	5
F38	Inner brake pull rod (2)	5
F39	Brake pull rod safety bracket (2)	4
F40	Original front balance weight (2)	1
F41	Original rear balance weight (2)	1
F42	Later front balance weight (2)	6
F43	Later rear balance weight (2)	4
F44	Last front balance weight 92)	4
F45	Last rear balance weight (2)	4
F46	Drawbar (2)	1
F47	Washer for drawbar pivot (5)	?

There is a choice of balance weights, the original (F40 & F41), a later style (F42 & F43) and the last style (F44 & F45). Secure the appropriate balance weights in position.

Form sand pipes from 0.8mm wire and attach through the holes in the front outside frame stretchers.

Construct the buffers (WM5) as shown below; fit the buffers. Attach the tall early vacuum pipe (BR4) or the short later vacuum pipe (BR5) and the vacuum pipe dummy (BR5) to the buffer beam (See the appropriate GA).



1. Drill the casting through 2mm. Fit the bush into the casting.

2. Fit the spring onto the buffer and place into the casting. Secure with a small (16BA) washer

Buffer Construction

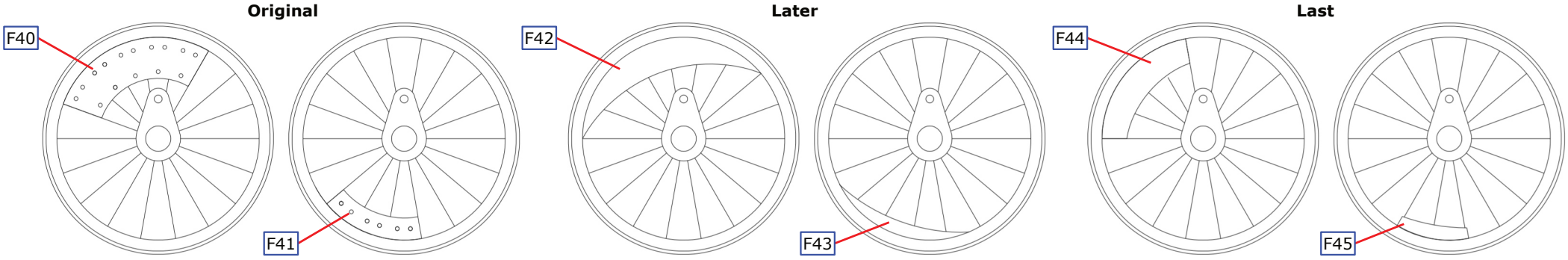


Fig 9. Balance Weights

NARROW FOOTPLATE 1

Emboss the rivets on the footplate (U1) inside frame extensions. Fold the footplate edges all round and solder the corners. The right side lamp bracket folds through 180° and is soldered to the outside face. Form the joggle in the inside frame extensions before folding up and soldering to the footplate. Fold up the remaining lamp brackets. Solder the footplate strengthening plates (U4) to the edge of the footplate. The half etched slots will accommodate the springs and spring hangers later so ensure the plates are accurately aligned.

Prepare the narrow footplate overlay (U2) by embossing the rivets under the lamp brackets. Form the curves in the footplate overlay. Start with the main convex curves, which are centred on the holes for the spring castings, followed by the smaller concave curves using the splasher faces as a guide. Note the curves in the overlay start before the splasher openings: this means that when the overlay is soldered to the footplate it will not be soldered to the footplate in the area immediately adjacent to the ends of the splashers.

Place the front overlay over the footplate so the lamp brackets pass through the holes provided and the body fixing holes align. Tack solder the overlay at the front edge then work evenly along the sides towards the rear. **Do not attach the area around the motor cut-out until last**.

If you are fitting inside motion remove the section of footplate under the smokebox saddle as shown.

No.	Description	Sheet
U1	Footplate	5
U2	Footplate overlay, narrow cab	5
U4	Footplate strengthening plate (2)	1

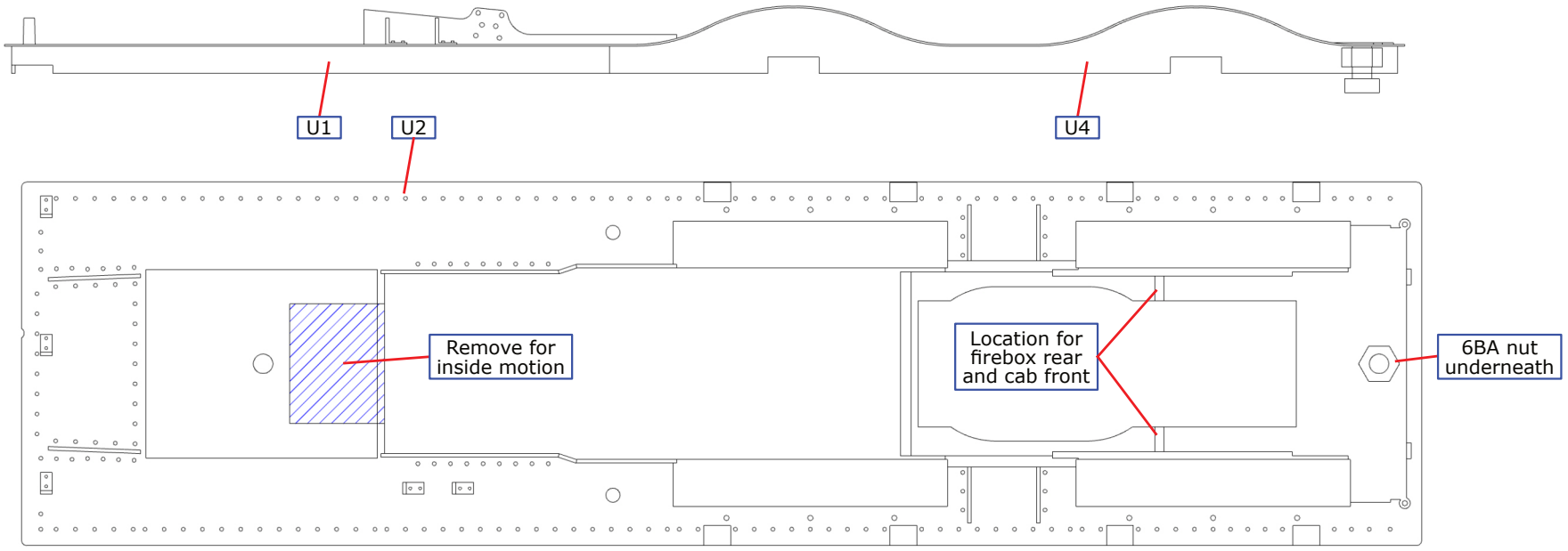


Fig 10. Narrow Footplate Construction 1

NARROW FOOTPLATE 2

Fit the front frame extensions (U6). Solder the splasher faces, with beading or with rivets (U7 or U8) inside the footplate edge so that their bottom edge is level with the bottom edge of the footplate side. If appropriate, modify the right riveted rear splasher top (U11) as shown below. Curve the splasher tops, riveted or unriveted (U9 & U11 or U10 & U12) by rolling underneath a suitable rod or dowel on a piece of rubber sheet and solder them in place. Securely solder a 6BA nut under the rear body fixing hole. Solder the nameplate brackets (U13) in place. Fit the footplate small steps (U14) to the footplate.

Springs. While we await the delivery of the cast spring shackles, the original method of construction will need to be used.

Original: Form the etched spring shackles (U15) and solder on a short length of 0.8mm wire. Fix the shackles through the holes in the footplate soldering the wire in the grooves in the footplate strengthening plate. Attach the springs (WM5). The 'legs' on the footplate edge should now be removed

Cast Spring Hangers: Solder the spring hangers (BR) into the slots in the footplate strengthening plate. Ensuring that they line up so that the springs slide in. Attach the springs (WM5).

No.	Description	Sheet
U6	Front frame extensions (2)	6
U7	Splasher face with beading (2)	6
U8	Splasher with rivets (2)	6
U9	Unriveted front splasher top (2)	5
U10	Riveted front splasher top (2)	5
U11	Unriveted rear splasher top (2)	5
U12	Riveted rear splasher top (2)	5
U13	Nameplate brackets (6)	5
U14	Footplate small steps (8)	5, 6
U15	Spring shackle (8)	5

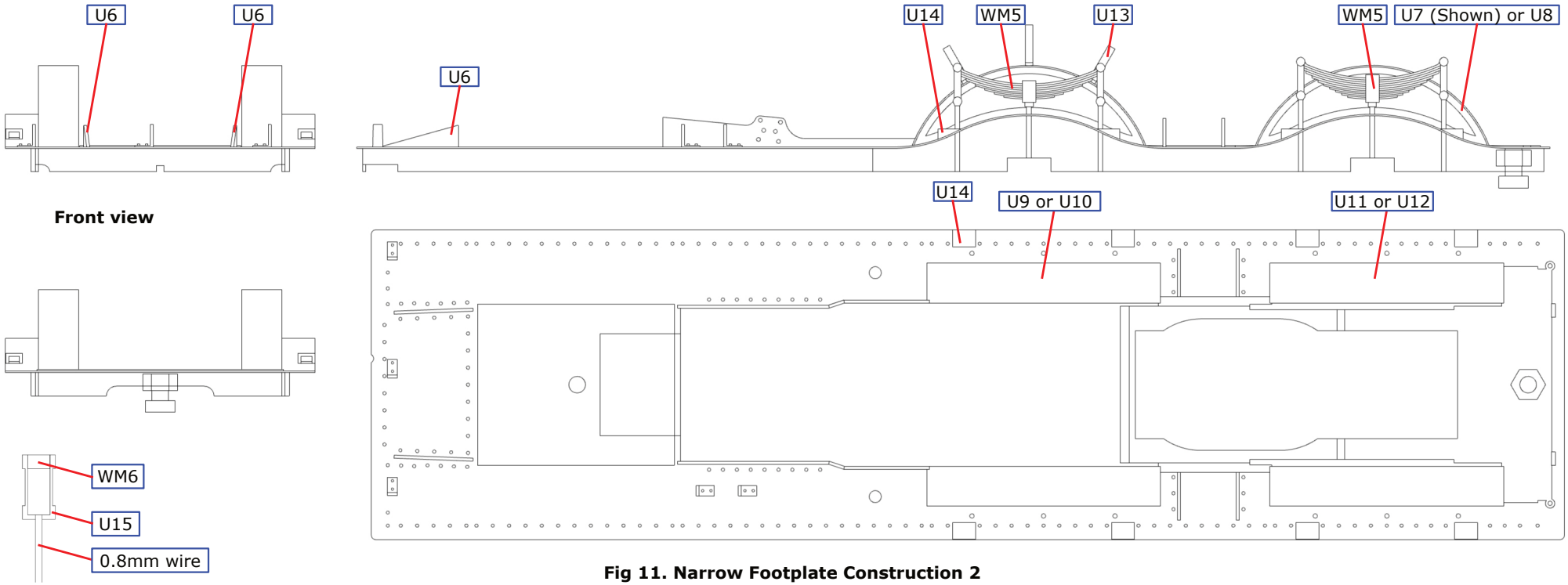


Fig 11. Narrow Footplate Construction 2

LOW NARROW CAB, S4 BOILER

Emboss the rivets on the S4 boiler cab front (C1). Attach the large window frames (C4) on the inside. Solder the cab front in position on the footplate.

Prepare the cab sides (C6) by embossing any rivet detail you wish and attaching the cut-out beading (C8) fitting the etched groove over the edge of the cab side. Cut off the beading flush with the upper rear edge of the side. Solder the cab sides in position. They are correctly aligned when the cab side handrails are vertical. Fit the vertical handrails from 0.8mm wire.

Solder the cab roof support (C9) between the rear edges of the cab sides.

Wood Roof. Curve the cab roof (C10) and solder the large and small whistles (BR7 & 11) to the roof. Solder the roof in place. Curve a piece of 0.8mm wire and solder to the wood roof in the etched groove to represent the fixing batten. The mouldings for the side, front and rear (C11 & C12) are fixed under the edges of the roof to the sides and rear.

Steel Roof. Curve the cab roof, parallel or sloping rain strips (C13 or C14) and solder the large and small whistles (BR7 & 11) to the roof. Solder the roof in place. Solder the rear angle in place. Add the appropriate rain strip, parallel or sloping (C16 or C17) to the steel roof.

The cab floor (C52) and splasher/toolbox (C19) may need reducing in width to allow for the gauge modelled; use the half etched lines as a guide. Fold up the step in the floor and check that it locates in the slots in the cab front. Fold up the splasher/toolboxes and solder on top of the floor. To the side of the toolbox add the toolbox hasp (C20) and padlock (C21); the padlock can be added after painting. Add the drain cock lever (C22) and sanding lever (C23) with some wire pivots to the toolbox side. Solder the splasher/toolboxes in place on the floor. Slightly curve the fall plate (C24) and hinge it in place as shown in below.

Glue the reverser base (WM8) in place. Attach the screw reverser handle (BR9) to the screw reverser (WM7) and then glue it in place on top of the base

No.	Description	Sheet
C1	Narrow cab front, S4 boiler	6
C4	Narrow cab large window frame (2)	5
C6	Narrow cab side (2)	4
C8	Side cut out beading (2)	5
C9	Narrow cab roof support	6
C10	Wood roof	6
C11	Wood roof side moulding	6
C12	Wood roof front and rear moulding	6
C13	Steel roof with parallel rain strips	6
C14	Steel roof with sloping rain strips	6
C15	Steel roof rear angle	6
C16	Steel roof parallel rain strip	6
C17	Steel roof sloping rain strip	6
C19	Splasher/toolbox	6
C20	Toolbox hasp (2)	5
C21	Toolbox padlock	4
C22	Drain cock lever	5
C23	Sanding lever	5
C24	Fall plate	4
C52	Narrow cab floor	6

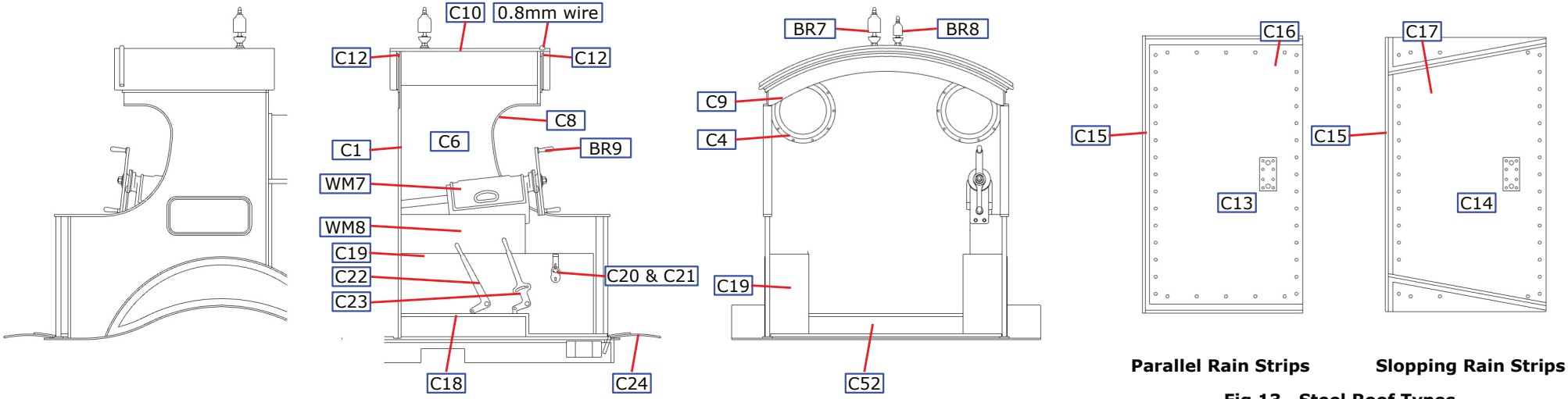


Fig 12. Narrow Cab, S4 Boiler, Wooden Roof

Parallel Rain Strips Slopping Rain Strips

Fig 13. Steel Roof Types

LOW NARROW CAB, B4 BOILER

Emboss the rivets on the B4 boiler cab front (C2). Attach the small window frames (C5) on the inside. Solder the cab front in position on the footplate.

Prepare the cab sides (C6) by embossing any rivet detail you wish and attaching the cut-out beading (C8) fitting the etched groove over the edge of the cab side. Cut off the beading flush with the upper rear edge of the side. Solder the cab sides in position. They are correctly aligned when the cab side handrails are vertical. Fit the vertical handrails from 0.8mm wire.

Solder the cab roof support (C9) between the rear edges of the cab sides.

Wood Roof. Curve the cab roof (C10) and solder the large and small whistles (BR7 & 11) to the roof. Solder the roof in place. Curve a piece of 0.8mm wire and solder to the wood roof in the etched groove to represent the fixing batten. The mouldings for the side, front and rear (C11 & C12) are fixed under the edges of the roof to the sides and rear.

Steel Roof. Curve the cab roof, parallel or sloping rain strips (C13 or C14) and solder the large and small whistles (BR7 & 11) to the roof. Solder the roof in place. Solder the rear angle (C15) in place. Add the appropriate rain strip, parallel or sloping (C16 or C17) to the steel roof.

Cab Interior. The cab floor (C52) and splasher/toolbox (C19) may need reducing in width to allow for the gauge modelled; use the half etched lines as a guide. Fold up the step in the floor and check that it locates in the slots in the cab front. Fold up the splasher/toolboxes and solder on top of the floor. To the side of the toolbox add the toolbox hasp (C20) and padlock (C21); the padlock can be added after painting. Add the drain cock lever (C22) and sanding lever (C23) with some wire pivots to the toolbox side. Solder the splasher/ toolboxes in place on the floor. Slightly curve the fall plate (C24) and hinge it in place as shown in below.

Glue the reverser base (WM8) in place. Attach the screw reverser handle (BR9) to the screw reverser (WM7) and then glue it in place on top of the base

No.	Description	Sheet
C2	Narrow cab front, B4 boiler	6
C5	Narrow cab small window frame (2)	6
C6	Narrow cab side (2)	4
C8	Side cut out beading (2)	5
C9	Narrow cab roof support	6
C10	Wood roof	6
C11	Wood roof side moulding	6
C12	Wood roof front and rear moulding	6
C13	Steel roof with parallel rain strips	6
C14	Steel roof with sloping rain strips	6
C15	Steel roof rear angle	6
C16	Steel roof parallel rain strip	6
C17	Steel roof sloping rain strip	6
C19	Splasher/toolbox	6
C20	Toolbox hasp (2)	5
C21	Toolbox padlock	4
C22	Drain cock lever	5
C23	Sanding lever	5
C24	Fall plate	4
C52	Narrow cab floor	6

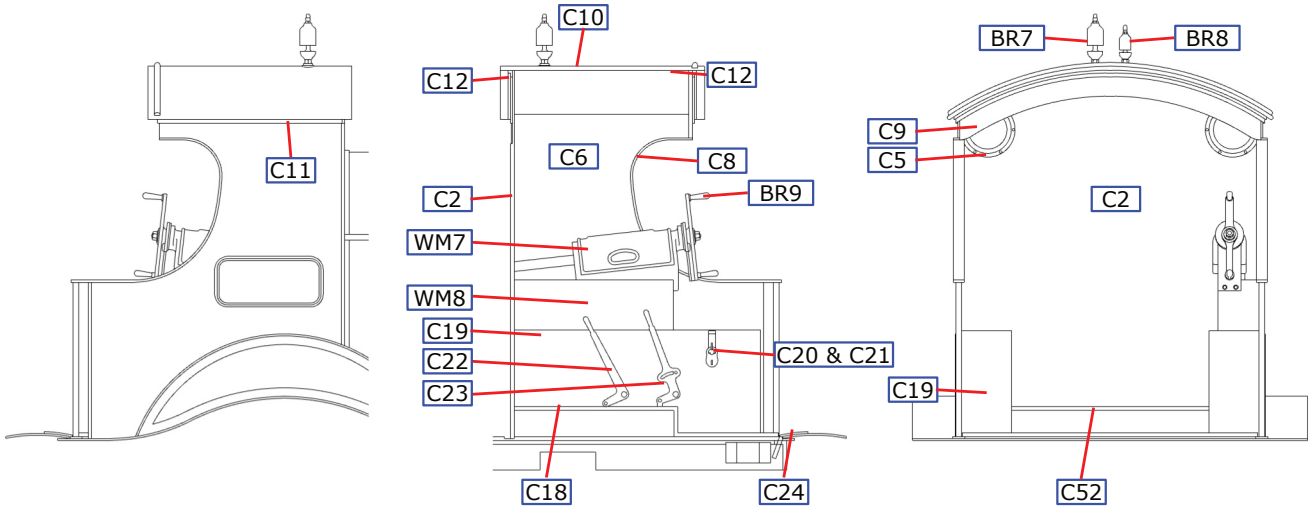
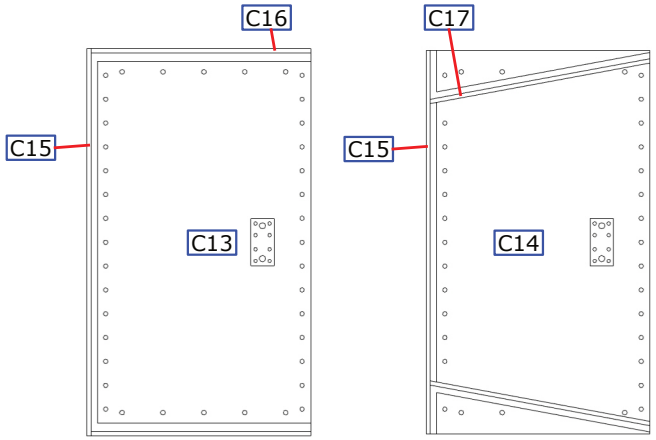


Fig 14. Narrow Cab, B4 Boiler, Wooden Roof



Parallel Rain Strips **Slopping Rain Strips**

Fig 15. Steel Roof Types

RAISED NARROW CAB

Emboss the rivets on the cab front with raised roof (C3). Attach the window frames (C4) on the inside. Solder the cab front in position on the footplate. Prepare the cab sides (C7) by embossing any rivet detail you wish and attaching the cut-out beading (C8) fitting the etched groove over the edge of the cab side. Cut off the beading flush with the upper rear edge of the side. If appropriate, form and fit the cab side handrails from 0.45mm wire and file off smooth on the inside. Solder the cab sides in position. They are correctly aligned when the cab side handrails are vertical. Fit the vertical handrails from 0.8mm wire.

Solder the cab roof support (C9) between the rear edges of the cab sides.

Wood Roof. Curve the cab roof (C10) and solder the large and small whistles (BR7 & 11) to the roof. Solder the roof in place. Curve a piece of 0.8mm wire and solder to the wood roof in the etched groove to represent the fixing batten. The mouldings for the side, front and rear (C11 & C12) are fixed under the edges of the roof to the sides and rear.

Steel Roof. Curve the cab roof, parallel or sloping rain strips (C13 or C14) and solder the large and small whistles (BR7 & 11) to the roof. Solder the roof in place. Solder the rear angle (C15) in place. Add the appropriate rain strip, parallel or sloping (C16 or C17) to the steel roof.

Cab Interior. The cab floor (C52) and splasher/toolbox (C19) may need reducing in width to allow for the gauge modelled; use the half etched lines as a guide. Fold up the step in the floor and check that it locates in the slots in the cab front. Fold up the splasher/toolboxes and solder on top of the floor. To the side of the toolbox add the toolbox hasp (C20) and padlock (C21); the padlock can be added after painting. Add the drain cock lever (C22) and sanding lever (C23) with some wire pivots to the toolbox side. Solder the splasher/toolboxes in place on the floor. Slightly curve the fall plate (C24) and hinge it in place as shown in below.

Glue the reverser base (WM8) in place. Attach the screw reverser handle (BR9) to the screw reverser (WM7) and then glue it in place on top of the base

No.	Description	Sheet
C3	Narrow cab front with raised roof	6
C4	Narrow cab large window frame (2)	5
C7	Narrow cab side with raised roof (2)	4
C8	Narrow cab side cut out beading (2)	5
C9	Narrow cab roof support	6
C13	Steel roof with parallel rain strips	6
C14	Steel roof with sloping rain strips	6
C15	Steel roof rear angle	6
C16	Steel roof parallel rain strip	6
C17	Steel roof sloping rain strip	6
C19	Splasher/toolbox	6
C20	Toolbox hasp (2)	5
C21	Toolbox padlock	4
C22	Drain cock lever	5
C23	Sanding lever	5
C24	Fall plate	4
C52	Narrow cab floor	6

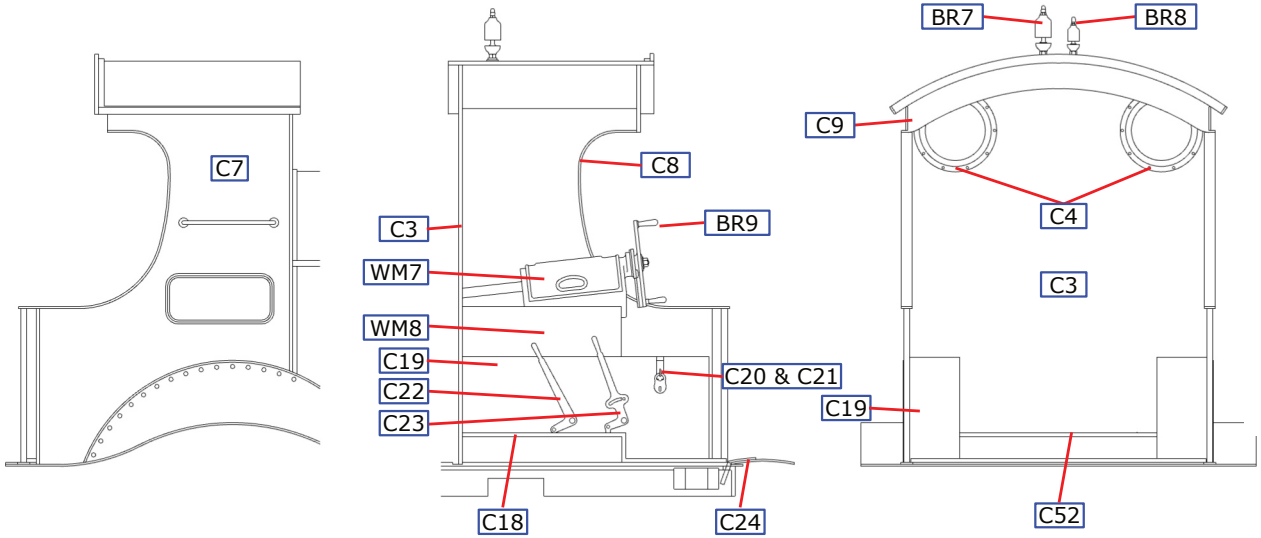
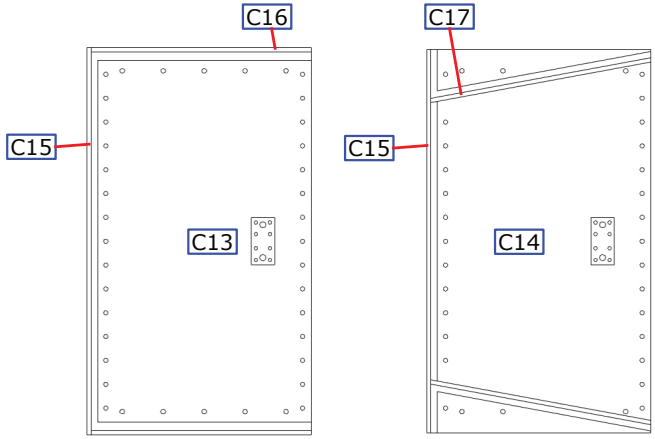


Fig 16. Narrow Raised Cab, S4 Boiler



Parallel Rain Strips Slopping Rain Strips

Fig 17. Steel Roof Types

WIDE FOOTPLATE

If you are fitting inside motion remove the section of footplate under the smokebox saddle as shown below.

Emboss the rivets on the footplate (U1) inside frame extensions. Fold the footplate edges all round and solder the corners. The right side lamp bracket folds through 180° and is soldered to the outside face. Form the joggle in the inside frame extensions before folding up and soldering to the footplate. Fold up the remaining lamp brackets. Solder the footplate strengthening plates (U4) to the edge of the footplate. The half etched slots will accommodate the springs and spring hangers later so ensure the plates are accurately aligned.

Prepare the footplate overlay (U3) by embossing the rivets under the lamp brackets. Attach the jig (U5) to the underside of the footplate, using a 6BA nut and bolt, and drill holes for the appropriate cab handrail stanchions.

Form the curves in the footplate overlay. Start with the main convex curves, which are centred on the holes for the spring castings, followed by the smaller concave curves using the splasher faces as a guide. Note the curves in the overlay start before the splasher openings: this means that when the overlay is soldered to the footplate it will not be soldered to the footplate in the area immediately adjacent to the ends of the splashers.

Place the font overlay over the footplate so the lamp brackets pass through the holes provided and the body fixing holes align. Tack solder the overlay at the front edge then work evenly along the sides towards the rear. Do not attach the area around the motor cut-out until last.

No.	Description	Sheet
U1	Footplate	5
U3	Footplate overlay wide cab	5
U4	Footplate strengthening plate (2)	1
U5	Jig for drilling hand rail stanchion holes in wide cab	6

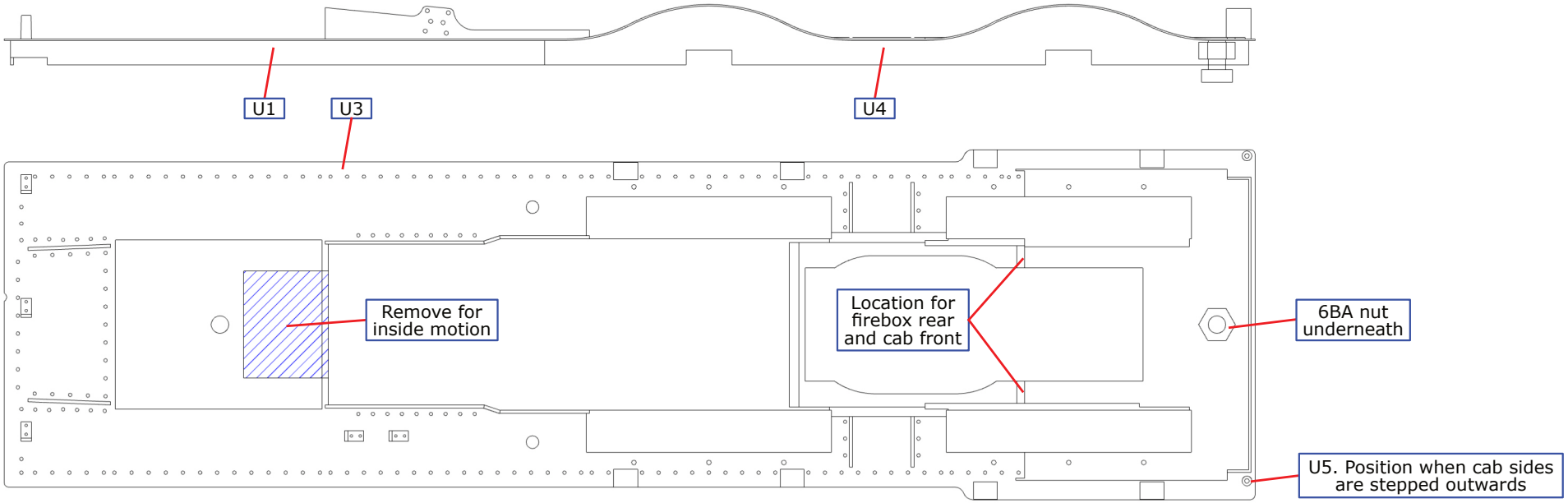


Fig 18. Wide Footplate Construction 1

WIDE FOOTPLATE

Fit the front frame extensions (U6). Solder the splasher faces, with beading or with rivets (U7 or U8) inside the footplate edge so that their bottom edge is level with the bottom edge of the footplate side. If, appropriate, modify the right riveted rear splasher top (U11) as shown below. Curve the splasher tops, riveted or unriveted (U9 & U11 or U10 & U12) by rolling underneath a suitable rod or dowel on a piece of rubber sheet and solder them in place. Solder a 6BA nut under the rear body fixing hole. Solder the cab floor support (U16) in place. Solder the nameplate brackets (U13) in place. Fit the footplate small steps (U14) to the footplate.

Springs. While we await the delivery of the cast spring shackles, the original method of construction will need to be used.

Original: Form the etched spring shackles (U15) and solder on a short length of 0.8mm wire. Fix the shackles through the holes in the footplate soldering the wire in the grooves in the footplate strengthening plate. Attach the springs (WM5). The 'legs' on the footplate edge should now be removed

Cast Spring Hangers: Solder the spring hangers (BR) into the slots in the footplate strengthening plate. Ensuring that they line up so that the springs slide in. Attach the springs (WM5).

No.	Description	Sheet
U6	Front frame extensions (2)	6
U7	Splasher face with beading (2)	6
U8	Splasher with rivets (2)	6
U9	Unriveted front splasher top (2)	5
U10	Riveted front splasher top (2)	5
U11	Unriveted rear splasher top (2)	5
U12	Riveted rear splasher top (2)	5
U13	Nameplate brackets (6)	5
U14	Footplate small steps (8)	6
U15	Spring shackle (8)	5
U16	Cab floor support	6

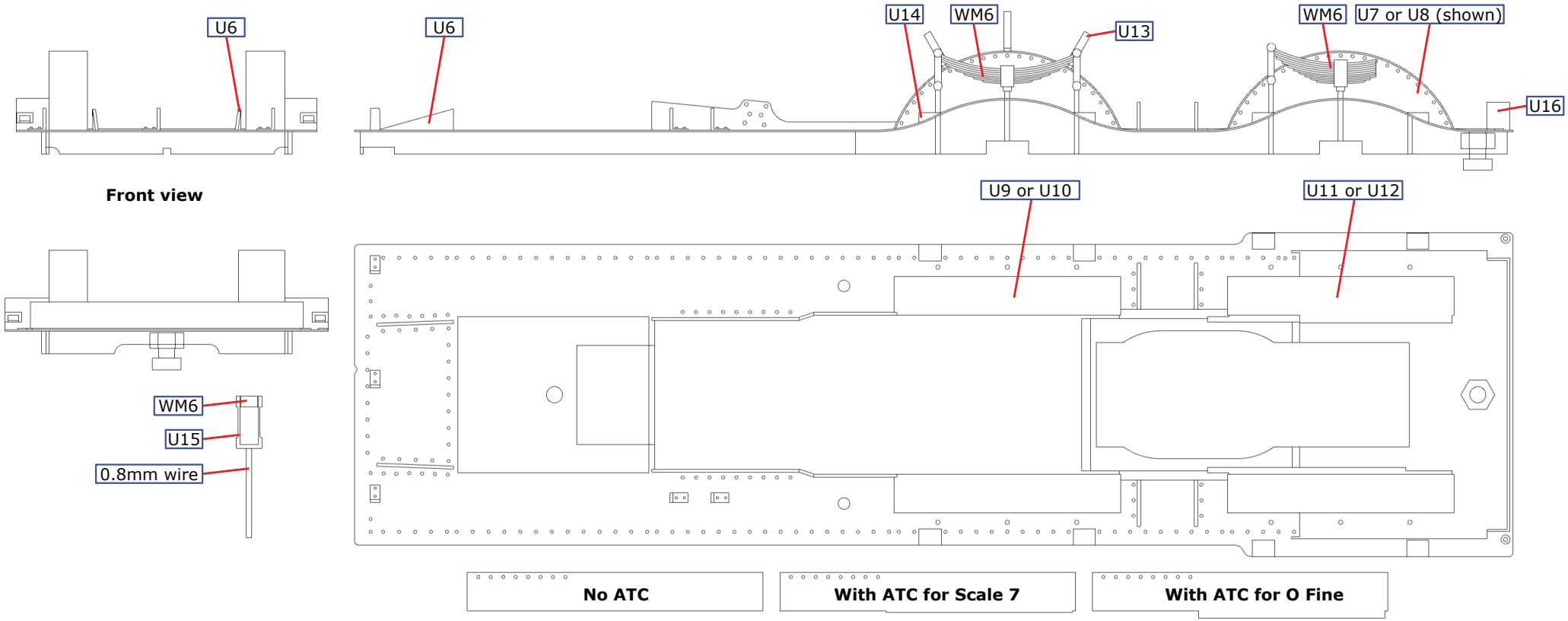


Fig 19. Wide Footplate Construction 2

WIDE CAB WITHOUT ATC

Emboss the rivets on the chosen wide cab front, straight or L shaped windows (C25 or C26). Attach the window frames, straight or L shaped (C27 or C28) on the inside. Fit the porthole windows or blanking plates (C29 or C30). For whistles on the cab front , the whistle plate (SB17) should used as a guide to drill holes in the cab front for the whistles. Solder the cab front in position.

Prepare the cab sides (C32) by embossing any rivet detail you wish and drilling for the cab side handrails; use C7 as a jig to drill the holes. As appropriate either use the straight cut out beading (C8) or flare the rear of the cab sides to match the groove in the side cut out beading (C33); attach the cut-out beading fitting the etched groove over the edge of the cab side. Leave the beading over length. Form and fit the cab side handrails from 0.45mm wire and file off smooth on the inside. Solder the cab sides in position. They are correctly aligned when the cab side handrails are vertical. Fit the vertical handrails from 0.8mm wire using C34 to represent the flange at the base.

Solder the cab roof rear support (C35) between the rear edges of the cab sides. If you are mounting whistles on the roof, use the narrow roof (C13) as a jig to drill holes the wide cab roof, either with parallel or sloping rain strips (C36 or C37). For roof mounted whistles solder the roof whistle plate (C38) in place on the cab roof. Curve the cab roof and solder in place. Solder the large and small whistles (BR7 & 11) to the roof. Solder the rear angle (C39) in place and then add the appropriate rain strips, parallel or sloping (C40 or C41) to the cab roof.

Cab Interior. The cab floor (C42) and splasher/toolbox (C43) may need reducing in width to allow for the gauge modelled; use the half etched lines as a guide. Fold up the step in the floor and check that it locates in the slots in the cab front. Fold up the splasher/toolboxes and solder on top of the floor. To the side of the toolbox add the toolbox hasp (C20) and padlock (C21); the padlock can be added after painting. Add the drain cock lever (C22) and sanding lever (C23) with some wire pivots to the toolbox side. Solder the splasher/ toolboxes in place on the floor.

Slightly curve the fall plate (C24) and hinge it in place as shown below. Use 0.45mm wire to form the hinge staples

Glue the reverser base (WM9) in place. Attach the screw reverser handle (BR9) to the screw reverser (WM7) and then glue it in place on top of the base.

No.	Description	Sheet
C20	Toolbox hasp (2)	5
C21	Toolbox padlock	4
C22	Drain cock lever	5
C23	Sanding lever	5
C24	Fall plate	4
C25	Wide cab front, straight window	6
C26	Wide cab front, L shaped windows	6
C27	Straight windows frames	5
C28	L shaped windows	5
C29	Porthole windows	6
C30	Porthole window blanking plates	6
C31	Cab front whistle plate	5
C32	Wide cab side	6
C8	Side cut out beading (2)	5
C33	Side cut out beading, flared sides	5
C34	Vertical handrail flange	5
C35	Wide cab roof rear support	6
C36	Wide cab roof, parallel rain strips	6
C37	Wide cab roof, sloping rain strips	6
C38	Roof whistle plate	5
C39	Roof rear angle	6
C40	Parallel rain strips (2)	5
C41	Sloping rain strips (2)	6
C42	Wide cab floor	6
C43	Wide cab tool box (2)	4

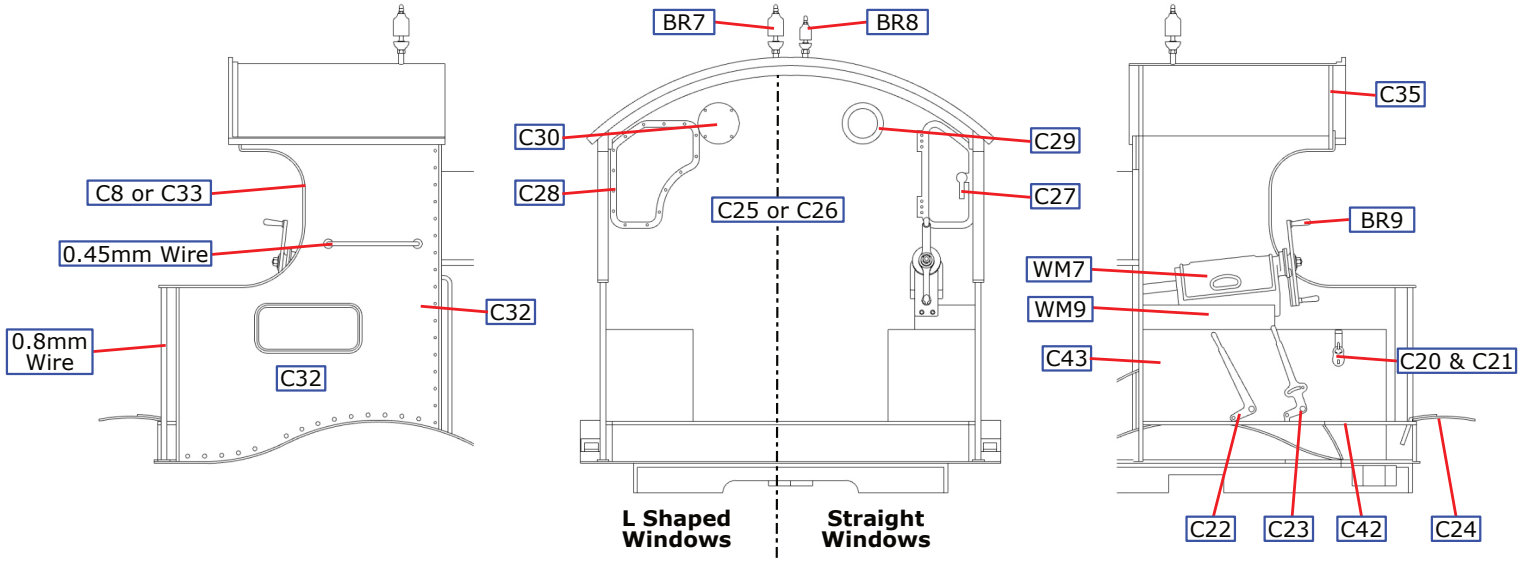


Fig 20. Wide Cab Without ATC 1

For details of the Steel Roof, refer to Fig 17 on page 16.

WIDE CAB WITH ATC

Emboss the rivets on the chosen wide cab front, straight or L shaped windows (C25 or C26). Attach the window frames, straight or L shaped (C27 or C28) on the inside. Fit the porthole windows or blanking plates (C29 or C30). For whistles on the cab front , the whistle plate (SB17) should used as a guide to drill holes in the cab front for the whistles. Solder the cab front in position.

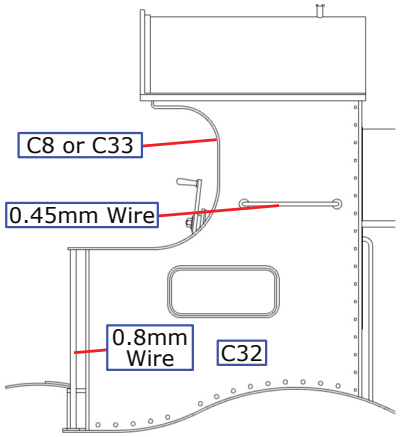
Prepare the cab sides (C32) by embossing any rivet detail you wish and drilling for the cab side handrails; use C7 as a jig to drill the holes. As appropriate either use the straight cut out beading (C8) or flare the rear of the cab sides to match the groove in the side cut out beading (C33); attach the cut-out beading fitting the etched groove over the edge of the cab side. Leave the beading over length. Form and fit the cab side handrails from 0.45mm wire and file off smooth on the inside. Solder the cab sides in position. They are correctly aligned when the cab side handrails are vertical. Fit the vertical handrails from 0.8mm wire using C34 to represent the flange at the base.

Solder the cab roof rear support (C35) between the rear edges of the cab sides. If you are mounting whistles on the roof, use the narrow roof (C13) as a jig to drill holes in the wide cab roof, either with parallel or sloping rain strips (C36 or C37). For roof mounted whistles solder the roof whistle plate (C38) in place on the cab roof. Curve the cab roof and solder in place. Solder the rear angle (C39) in place and then add the appropriate rain strips to the cab roof.

Cab Interior. The cab floor (C44) and splasher/toolboxes, left and right (C45 & C46) may need reducing in width to allow for the gauge modelled; use the half etched lines as a guide. Fold up the step in the floor and check that it locates in the slots in the cab front. Fold up the splasher/toolboxes; the splasher/toolbox should be made to fit inside the edge of the floor so that the lower edge is flush with the underside of the floor. Solder in place.

Slightly curve the fall plate (C34 and hinge it in place as shown in Figs. 15 & 16.

Attach the screw reverser handle (BR9) to the screw reverser (WM7) and then glue it in place on top of the base.



No.	Description	Sheet
C24	Fall plate	4
C25	Wide cab front, straight window	6
C26	Wide cab front, L shaped windows	6
C27	Straight windows frames	5
C28	L shaped windows	5
C29	Porthole windows	6
C30	Porthole window blanking plates	6
C31	Whistle plate	5
C32	Wide cab side	6
C8	Side cut out beading (2)	5
C33	Side cut out beading , flared sides	5
C34	Vertical handrail flange	5
C35	Wide cab roof rear support	6
C36	Wide cab roof, parallel rain strips	6
C37	Wide cab roof , sloping rain strips	6
C38	Roof whistle plate	5
C39	Roof rear angle	6
C40	Parallel rain strips (2)	5
C41	Sloping rain strips (2)	6
C44	Wide cab floor, ATC fitted	6
C45	Left splasher/toolbox, ATC fitted	6
C46	Right splasher/toolbox, ATC fitted	6
C47	Left hand seat bracket	5
C48	Left hand folding seat	6
C49	Right hand fixed seat	1
C50	Drain cock lever	5
C51	Sanding lever	5

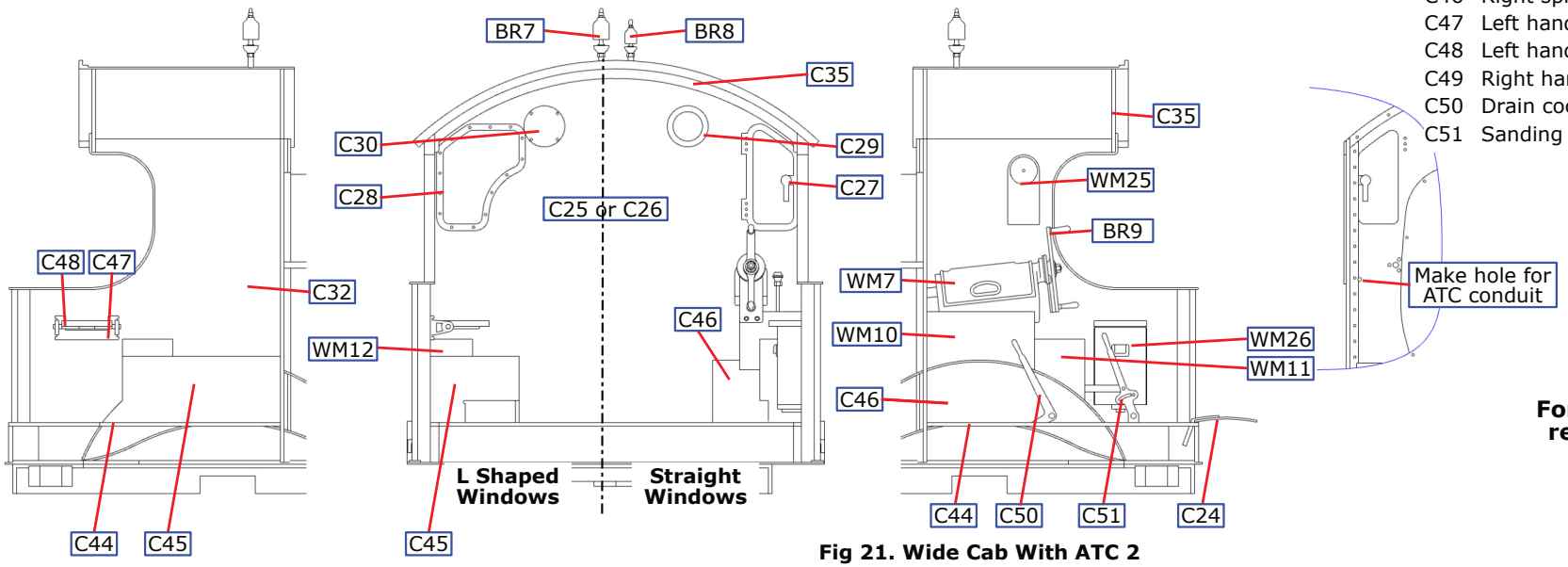


Fig 21. Wide Cab With ATC 2

For details of the Steel Roof, refer to Fig 17 on page 16.

S4 BOILER

Before rolling the boiler the holes for individual washout plugs (SB8) can be drilled as can boiler clackbox and top feed holes, if needed. Use the template provided on page 22. The boiler rear former is missing the alignment mark at the top of the rear face. This can be marked by using dividers pivoted on the 0.8mm alignment dowel holes.

Emboss the rivets as needed on the S4 Boiler and firebox wrapper (SB13) on the dome boiler band and firebox band. Form the boiler by rolling around suitable sized rod or dowel. Solder the S4 Boiler washout plugs (SB14) in place inside the firebox. Ensure that the fit is correct over the boiler front and rear formers (SB9 & SB10). Solder a 6BA nut over the hole in the centre of the front former to allow the smokebox to be screw fixed to the boiler.

Bend the boiler band joining brackets on the boiler joining strip (SB11) and fit through the small slots from inside the boiler. If the fit is good and the formers fit, then solder the wrapper ends together with the boiler joining strip. The formers are now soldered in place flush with the back and front of the boiler section with the notch on the top of the rear former in line with the mid line of the wrapper. Solder two short pieces of 0.8mm wire into the two holes in the rear former to act as dowels to align the boiler and firebox. Solder the S4 Boiler firebox front and rear formers (SB15 & SB16) in place. Solder two short pieces of 0.8mm wire into the two holes in the rear former to act as dowels to locate the firebox onto the cab front

Drill a 1.2mm hole in the boiler clackboxes (BR10) to take the copper wire. Fit the clackboxes in the previously drilled holes with the boiler clackbox flanges (SB20) as shown. Curve the copper wire to match the drawing.

No.	Description	Sheet
SB4	Firebox band joining brackets	6
SB8	Individual boiler washout plugs (4)	6
SB9	Boiler front former	1
SB10	Boiler rear former	1
SB11	Boiler joining strip	6
SB13	S4 Boiler and firebox wrapper	5
SB14	S4 Boiler washout plugs (2)	5
SB15	S4 Boiler firebox front former	1
SB16	S4 Boiler firebox rear former	1
SB20	Boiler clackbox flange (2)	6

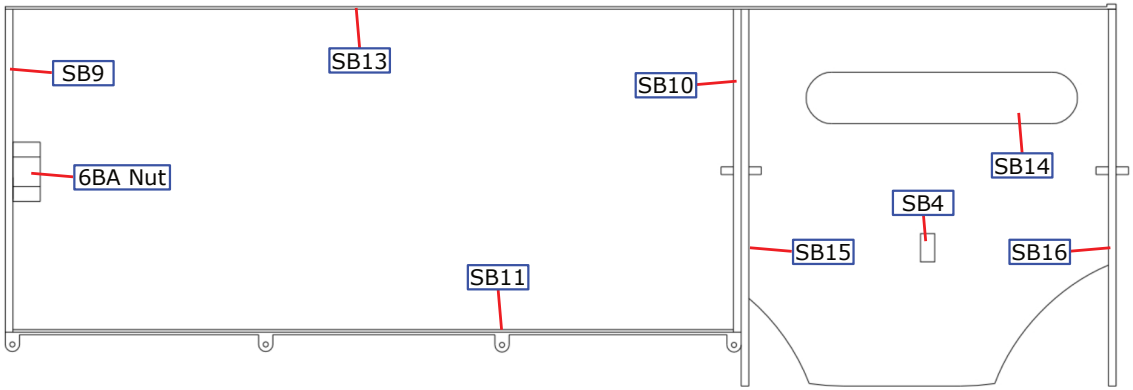


Fig 22. S4 Boiler & Firebox Construction

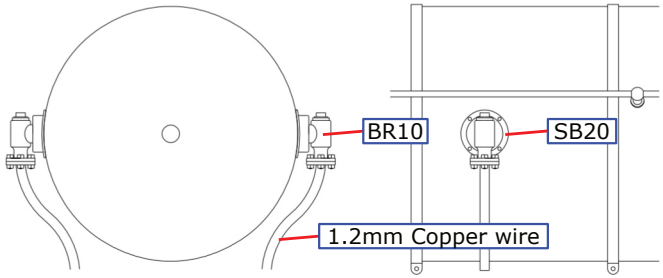


Fig 23. S4 Boiler Clack Boxes

S4 BOILER SQUARE FRONT SMOKEBOX

The early smokeboxes had a plain front with a square front edge and ringed door. Later snap head rivets were used and from c1920 the smokeboxes had a pressed front with a rounded front edge and Churchward type door without the ring

Fold the smokebox base (SB21) into an inverted tray and solder a 6BA nut over the hole for the body fixing screw. If required emboss the rivets in the smokebox front plate (SB24). Solder the smokebox front former and plate (SB22 & SB24) together before fixing them to the base. Solder the smokebox rear former (SB23) to the rear. Roll to shape the smokebox wrapper, either flush riveted or snap head riveted (SB26 or SB27) and solder in place with its edges flush with the front and back formers. Round the edge of the smokebox rear plate (SB25)and solder to the rear. Similarly round the edge of the smokebox and boiler ring (SB30). Open out the holes in the rear former, rear plate and the smokebox and boiler ring to clear 6BA.

If required, bend up the smokebox steps, front and side (SB28 & SB29) and solder in place.

No.	Description	Sheet
SB20	Boiler clackbox flange (2)	6
SB21	Smokebox base	4
SB22	Smokebox front former	6
SB23	Smokebox rear former	4
SB24	Smokebox front plate	6
SB25	Smokebox rear plate	4
SB26	Flush riveted wrapper	4
SB27	Snap head riveted wrapper	4
SB28	Smokebox front step	4
SB29	Smokebox side steps (2)	4 & 5
SB30	Smokebox and boiler ring	1

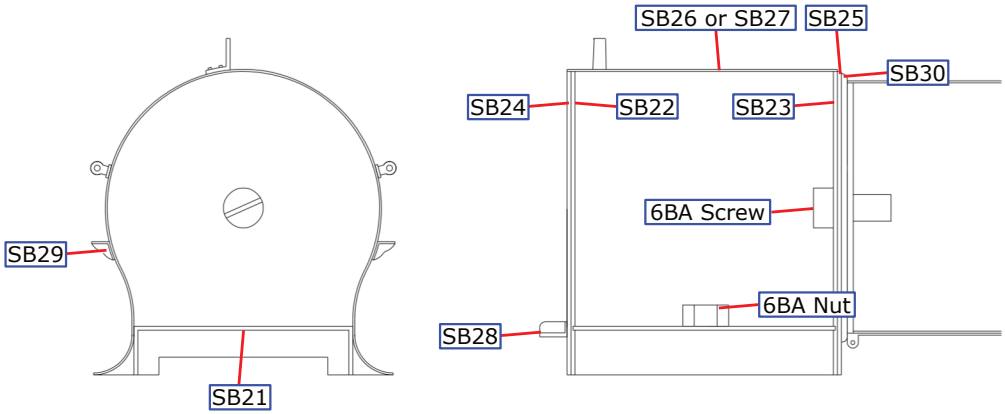


Fig 24. S4 Boiler & Firebox Construction

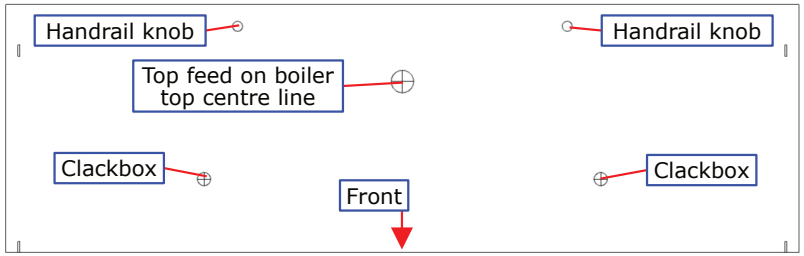


Fig 25. Clackbox & Top Feed Drilling Template

FORMING THE BELPAIRE FIREBOX 1

The photographs show the construction of a 47XX firebox. The construction of the Bulldog firebox follows the same procedures.

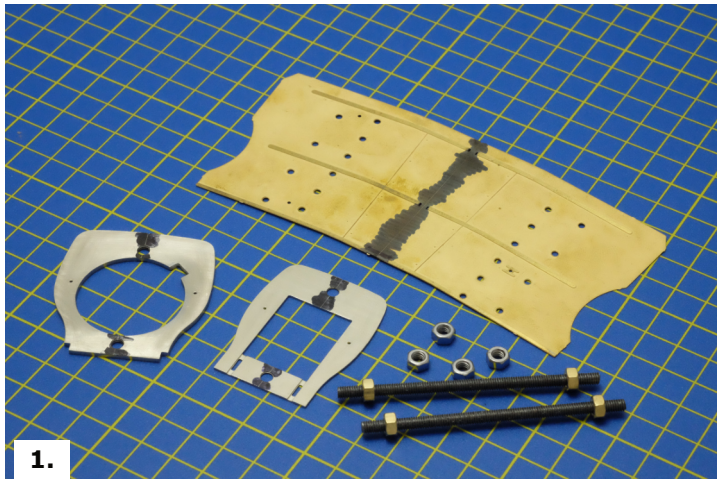
Photo 1. Solder together the two laminations of the firebox front (SB2) Clean the cusp off all parts, including the firebox rear former (SB1). Reduce the width of the lower faces of the firebox rear former so that it will fit between the frames in the locating groove in the footplate. Using the small 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 38.4mm. 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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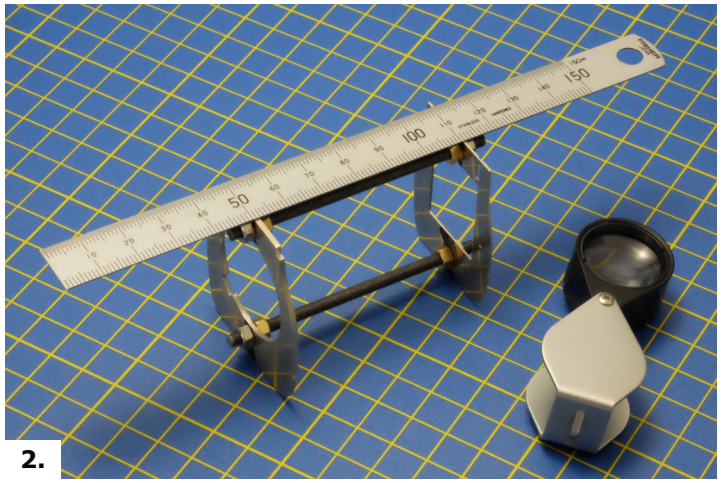
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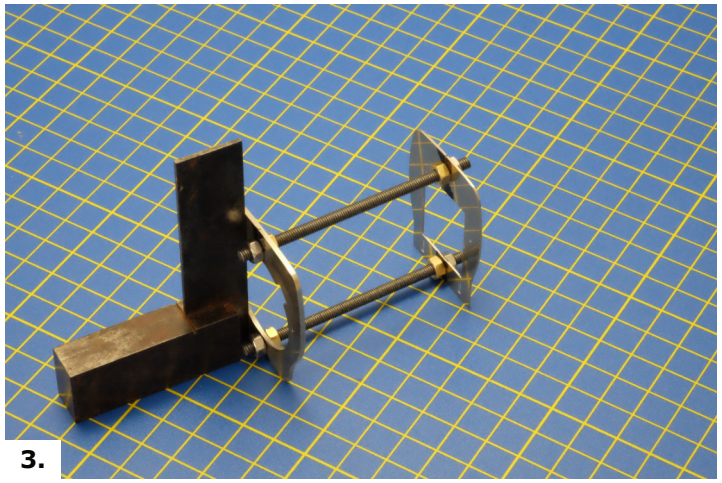

3.

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.

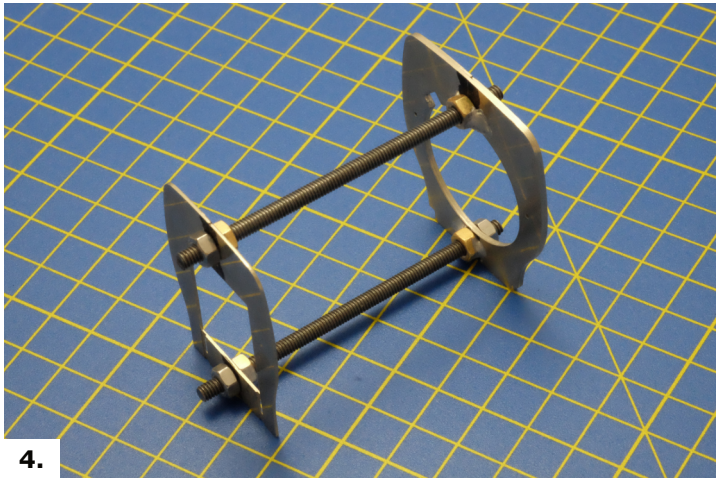
Photo 6. Tack the outside of the firebox at the centre and corners, both front and rear. Again, take care and check that the centres retain the alignment that we've worked so hard to achieve. Now work down the spacers alternating tacks left/right and front/rear to even out any expansion of the wrapper. 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 (WM24) in place on the firebox.



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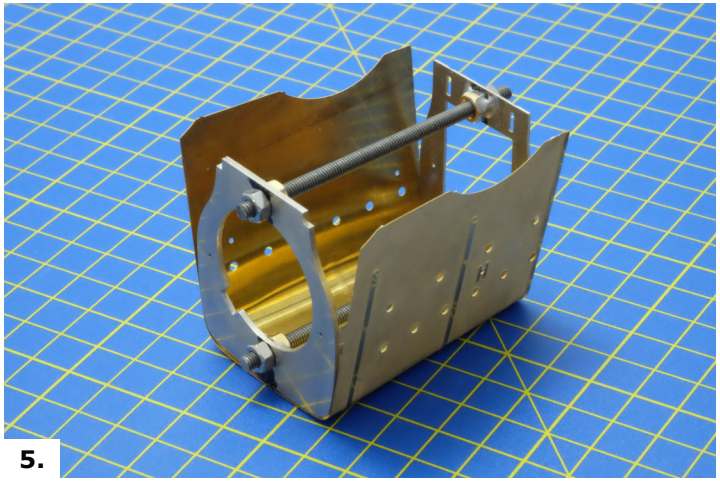

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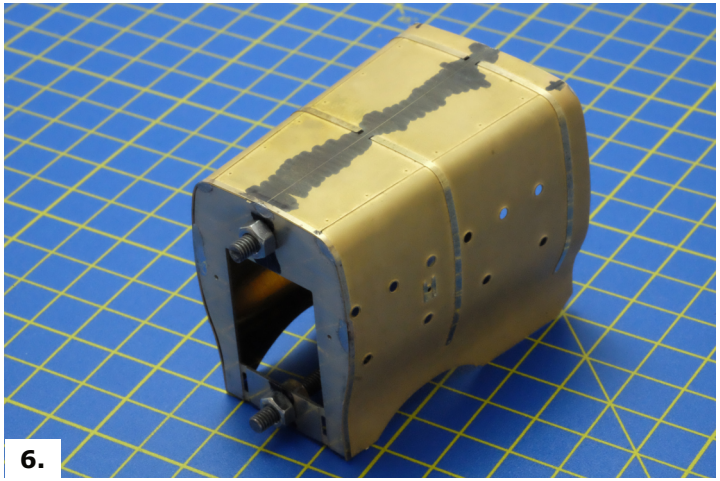


6.

B4 BOILER

Before the boiler (SB7) is rolled the boiler washout plugs can be drilled out and replacement individual wash out plugs (SB8) can be soldered in place if you prefer. Use the template on page 22 to mark and drill the appropriate holes for the boiler clack boxes and top feed where needed. Roll the boiler around suitable rods. Check the rolled boiler wrapper for fit around the formers, front and rear (SB9 & SB10). An etched groove was not included at the top of the rear boiler former; this mark should be scratched into the former. The position can be determined by using a pair of dividers pivoted in the dowel holes. Solder a 6BA nut over the hole in the centre of the front former to allow the smokebox to be screw fixed to the boiler.

Bend out the boiler band joining brackets on the boiler joining strip (SB11) and fit through the small slots from inside the boiler. If the fit is good, the formers fit with the marks aligned with the groove in the wrapper and the cut outs clear of the jointing strip, then solder the wrapper ends together with the jointing strip. Solder the formers in place so that they are almost flush with the ends. 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 to firebox fit. Represent the bolts in the boiler band joining brackets using 0.45mm wire.

If appropriate, roll the top feed pipe overlay (SB12) to the correct curvature and solder in place on the boiler using the central hole to aid location. Do not solder the section which will be under the top feed casting (WM16) to the boiler. When the overlay is soldered in place remove this section by cutting through with a sharp blade. Attach the top feed casting and form the top feed pipes from 1.4mm wire so that they disappear behind the sand boxes.

No.	Description	Sheet
SB7	B4 boiler wrapper	5
SB8	Individual boiler washout plugs (4)	6
SB9	Boiler front former	1
SB10	Boiler rear former	1
SB11	Boiler joining strip	6
SB12	Top feed pipe overlay	5

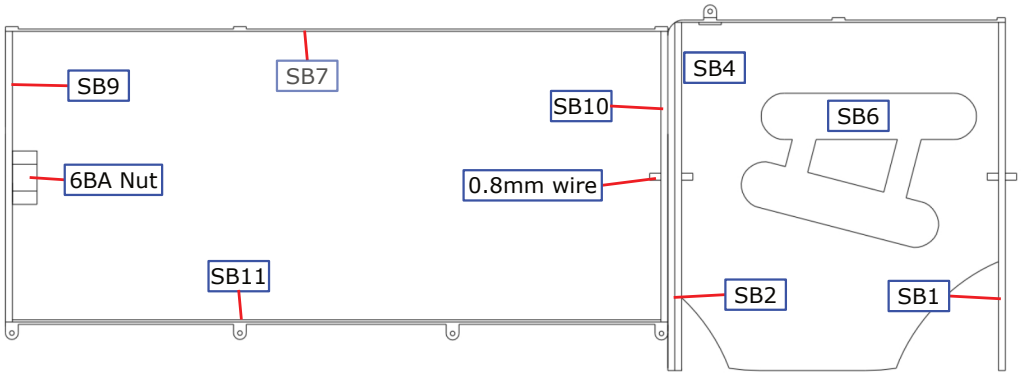


Fig 26. B4 Boiler & Firebox Construction

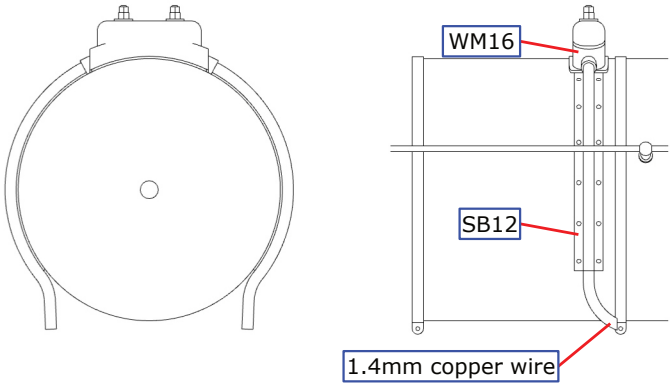


Fig 27. Top Feed

B4 BOILER SMOKEBOX WITH A ROUNDED FRONT PLATE

Solder the smokebox front and rear formers (SB22 & SB23) to the base. Roll to shape the smokebox wrapper, either flush riveted or snap head riveted (SB26 or SB27) and solder in place with its rear edge flush with the back former; the front edge will overhang by the thickness of the front plate (SB24). Carefully file the wrapper back to be flush with the front plate. Now round most of the edge (not the lower edge on each side) of the front plate before soldering it in place on the smokebox front. Round the edge of the smokebox rear plate (SB25)and solder to the rear. Similarly round the edge of the smokebox and boiler ring (SB30). Open out the hole in the rear former, rear plate and the rear plate to clear 6BA.

If required, bend up the smokebox front step (SB28).

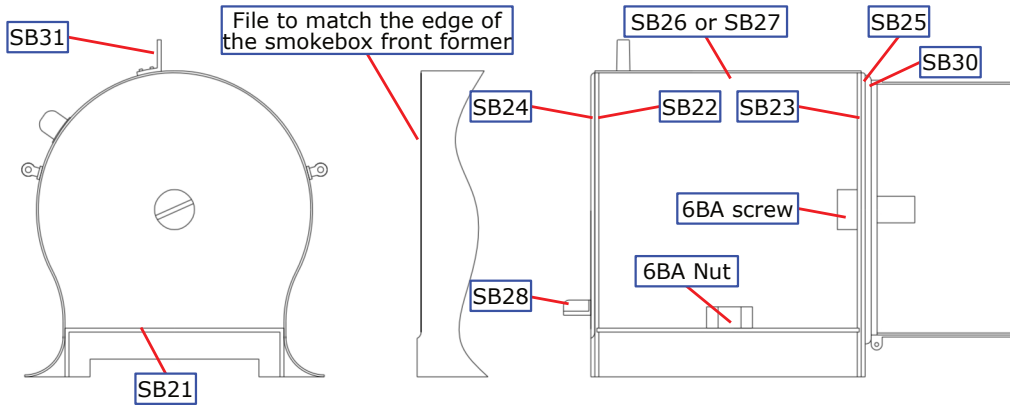


Fig 28. Smokebox With a Rounded Front Edge

No.	Description	Sheet
SB7	B4 boiler wrapper	5
SB8	Individual boiler washout plugs (4)	6
SB9	Boiler front former	1
SB10	Boiler rear former	1
SB11	Boiler joining strip	6
SB12	Top feed pipe overlay	5
SB21	Smokebox base	4
SB22	Smokebox front former	6
SB23	Smokebox rear former	4
SB24	Smokebox front plate	6
SB25	Smokebox rear plate	4
SB26	Flush riveted wrapper	4
SB27	Snap head riveted wrapper	4
SB28	Smokebox front step	4
SB30	Smokebox and boiler ring	1

S4 BOILER FINISHING DETAILS

With a 6BA screw, bolt the smokebox to the boiler. Fix the boiler to the firebox by soldering the wire dowels to the firebox from inside.

Locate the smokebox/boiler/firebox on the footplate and check the fit and alignment. You will have to remove some material from the inside edge of the leading splasher to enable the boiler to sit horizontally. When satisfied with the alignment tack solder the smokebox and the firebox to the footplate before completing the soldering.

Fit the firebox side brackets (SB18) to the firebox sides.

Fix medium handrail knobs in the four holes in the boiler and four small knobs in the holes in the smokebox. Form the handrail to shape, thread on the front medium knob, and fix the handrail in place, checking its location in the holes in the cab front. Solder the lamp bracket (SB31) in place.

Fit the original smokebox door (WM21). Fit the smokebox door handles (BR28). Fit the steam lance cock (BR29).

Fit the inside of the dome (WM18) and the safety valve base (WM19) ensuring that both are vertical. Polish and fit the dome (BR23) and the dome lubricator (BR24). Fit the safety valves (BR25) to the top of the safety valve base. Polish and fit the safety valve casing (BR26).

Fit the a set of handrails to the top of the sandboxes (WM20) and then fit the sandboxes in place on the footplate.

No.	Description	Sheet
SB18	Firebox brackets (4)	5
SB29	Smokebox side steps (2)	4 & 5
SB31	Lamp bracket	5

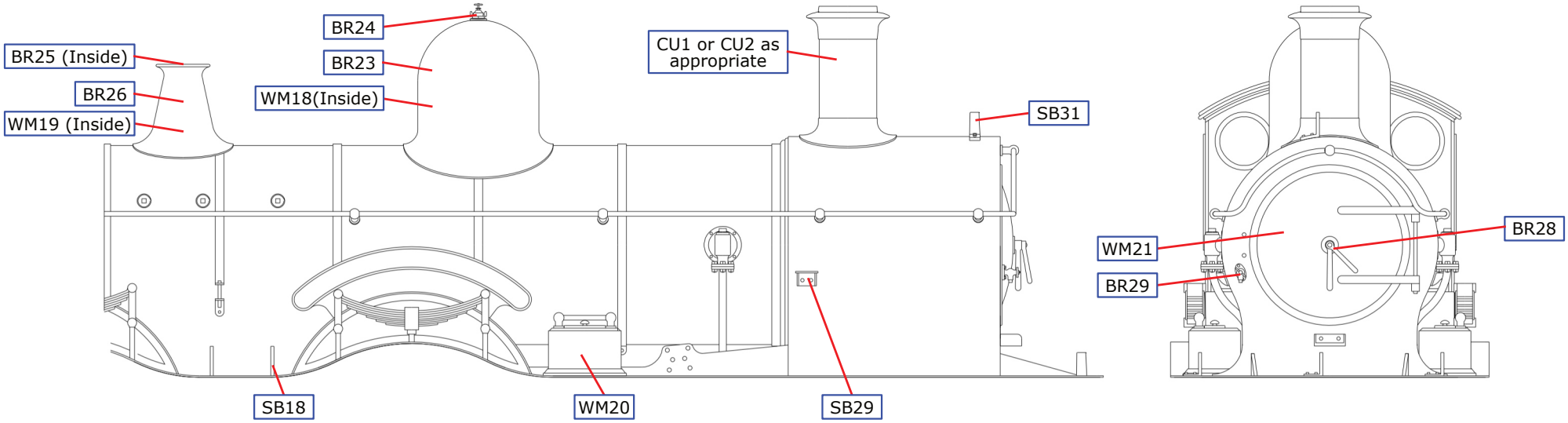


Fig 29. S4 Boiler Finishing Details

B4 BOILER FINISHING DETAILS

With a 6BA screw, bolt the smokebox to the boiler. Fix the boiler to the firebox by soldering the wire dowels to the firebox from inside.

Locate the smokebox/boiler/firebox on the footplate and check the fit and alignment. You will have to remove some material from the inside edge of the leading splasher to enable the boiler to sit horizontally. When satisfied with the alignment tack solder the smokebox and the firebox to the footplate before completing the soldering.

The firebox side bracket (SB18) and, if appropriate, the cover plates (SB19), visible in later years, are soldered in place on the firebox sides between the splashers as shown below. If appropriate, fit mud hole doors to the firebox,

Fix medium handrail knobs in the four holes in the boiler and four small knobs in the holes in the smokebox. Form the handrail to shape, thread on the front medium knob, and fix the handrail in place, checking its location in the holes in the cab front. Solder the lamp bracket (SB31) in place.

Fit the original smokebox door (WM21). Fit the smokebox door handles (BR28). Fit the steam lance cock (BR29).

Fit the inside of the dome (WM18) and the safety valve base (WM19) ensuring that both are vertical. Polish and fit the dome (BR23) and the dome lubricator (BR24). Fit the safety valves (BR25) to the top of the safety valve base. Polish and fit the safety valve casing (BR26).

Fit the a set of handrails to the top of the sandboxes (WM20) and then fit the sandboxes in place on the footplate.

If required, fit the mud hole covers (WM24).

Fold the whistle shield (SB17) to shape. Thread the whistles through the shield and solder in place on the cab front. Attach the whistle shield to the firebox top.

No.	Description	Sheet
SB17	Whistle shield	6
SB18	Firebox brackets (4)	5
SB19	Firebox cover plate (2)	11
SB31	Lamp bracket	5

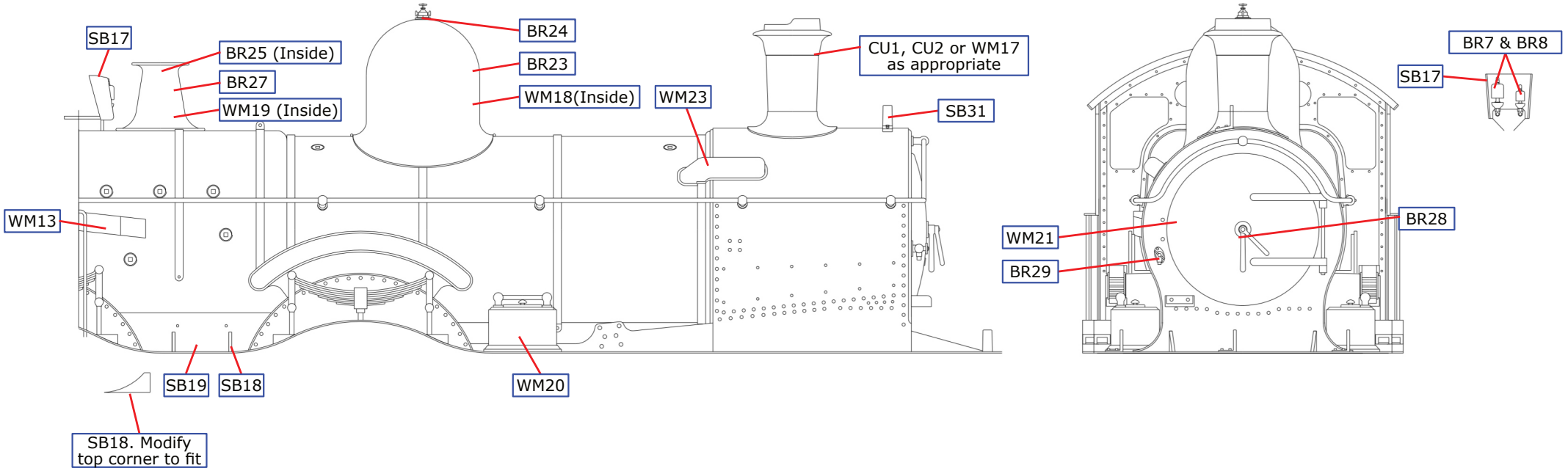


Fig 30. B4 Boiler Finishing Details

S4 BACKHEAD

Use the drawing of the cab interior to assemble the backhead and the cab interior detail. Use copper wire of a suitable size for the pipes. Solder the backhead to the cab floor to make a removable unit.

The back plate mounted clack boxes (BR20) will not be required if you have fitted the boiler clack boxes or top feed.

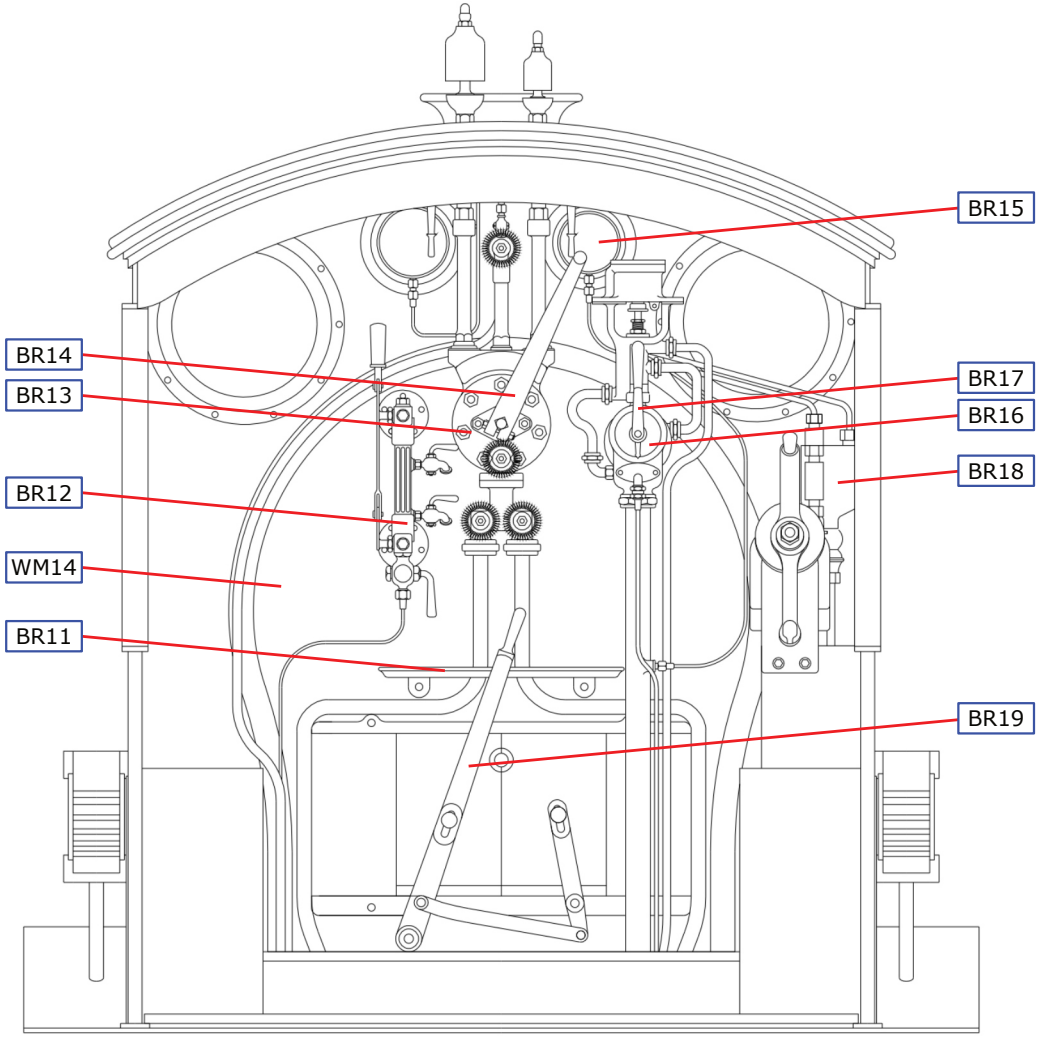
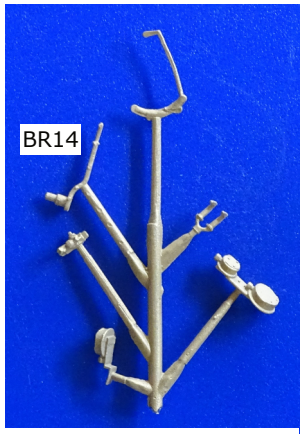
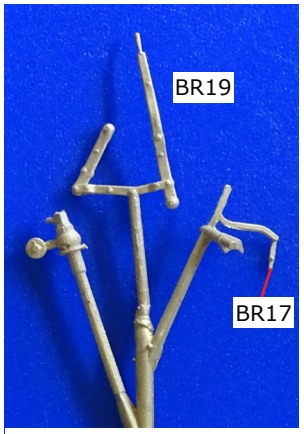


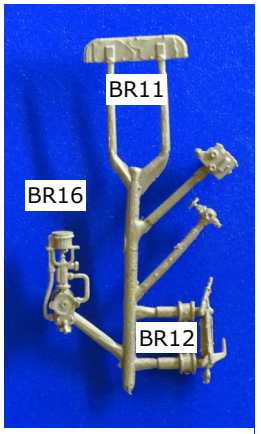
Fig 21. S4 Boiler Cab & Backhead



Backhead/1



Backhead/2



Backhead/3

B4 BACKHEAD

Use the drawing of the cab interior to assemble the backhead and the cab interior detail. Use copper wire of a suitable size for the pipes. Solder the backhead to the cab floor to make a removable unit.

The back plate mounted clack boxes (BR20) will not be required if you have fitted the boiler clack boxes or top feed.

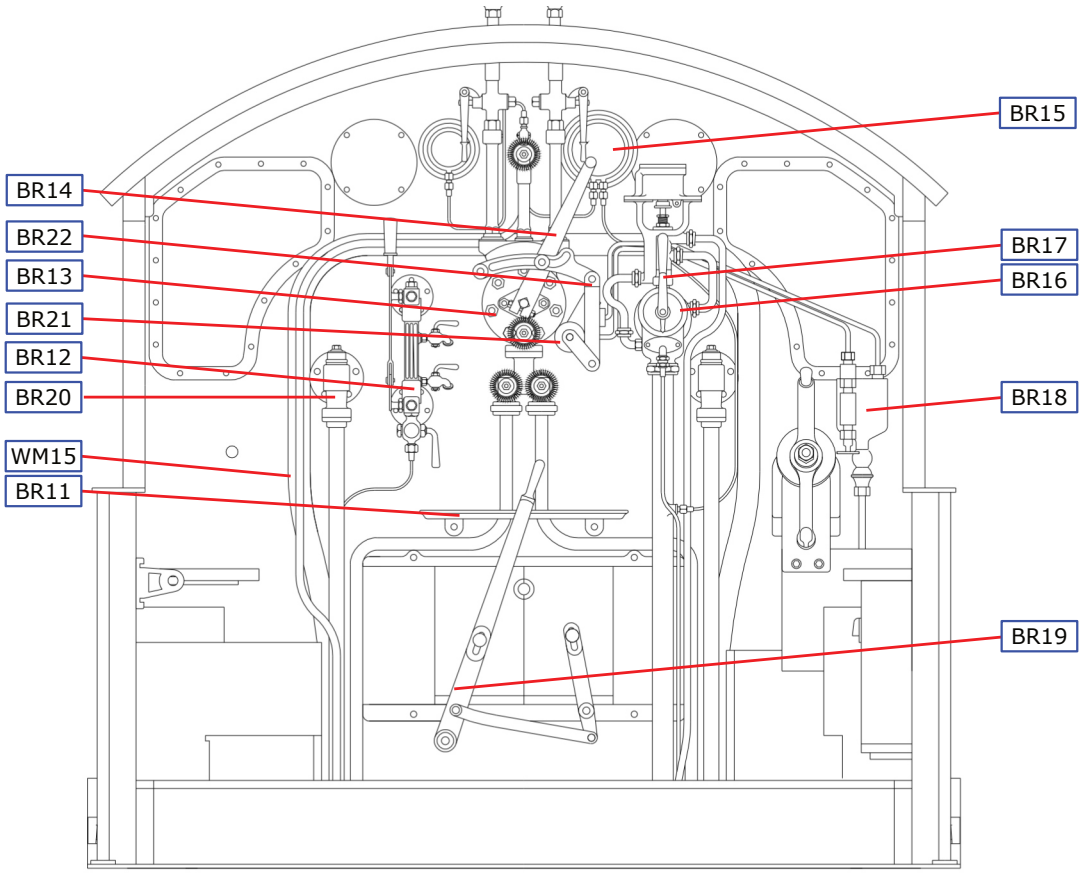
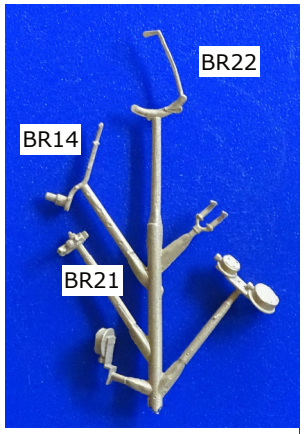
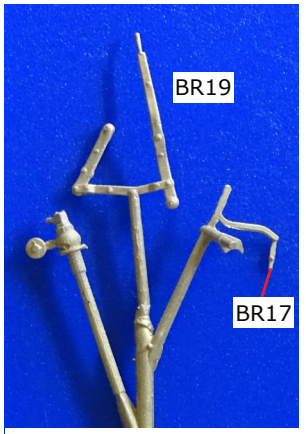


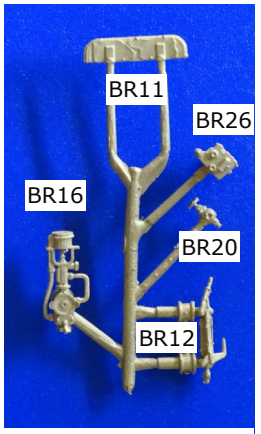
Fig 24. B4 Boiler Cab & Backhead



Backhead/1

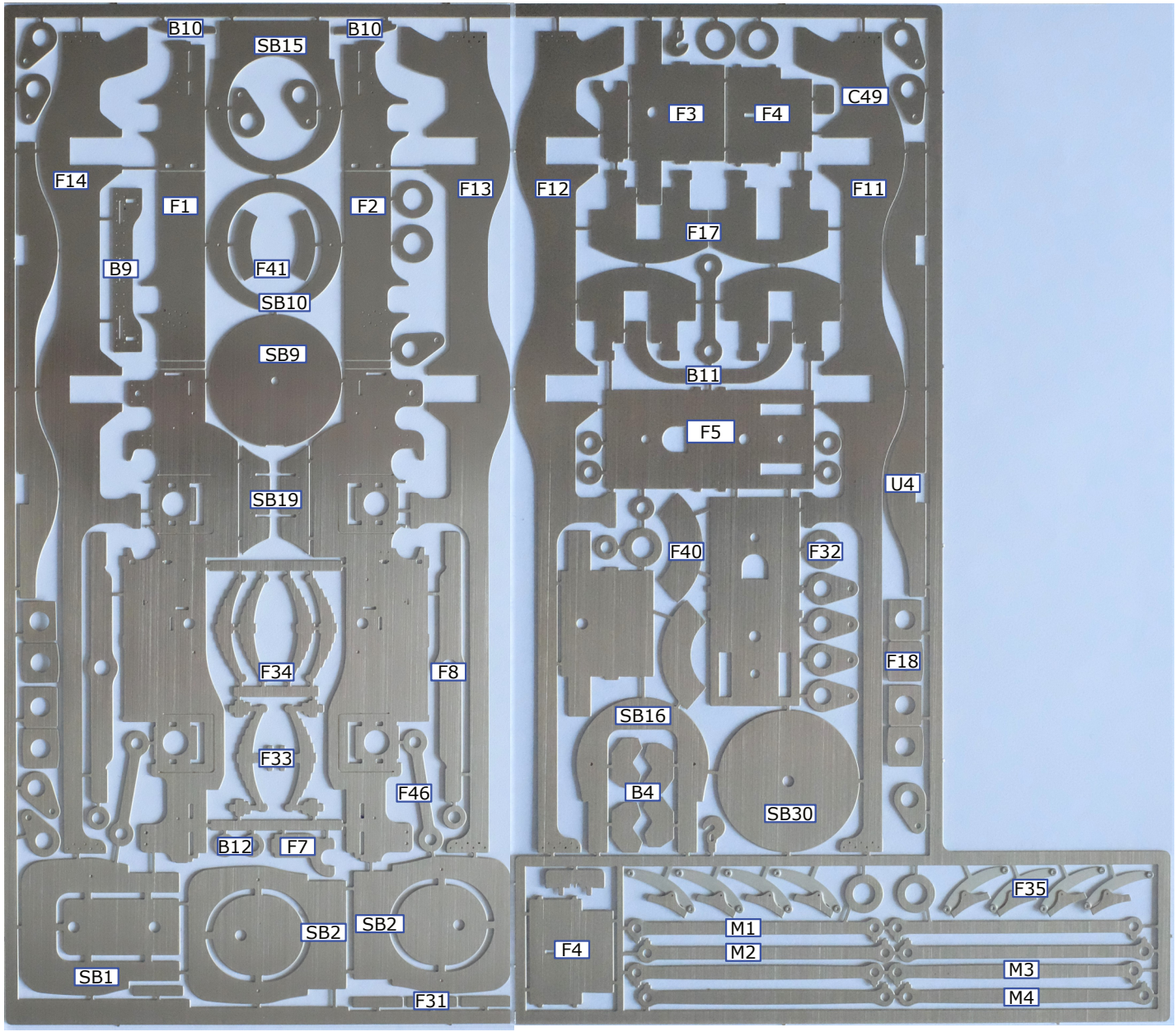


Backhead/2

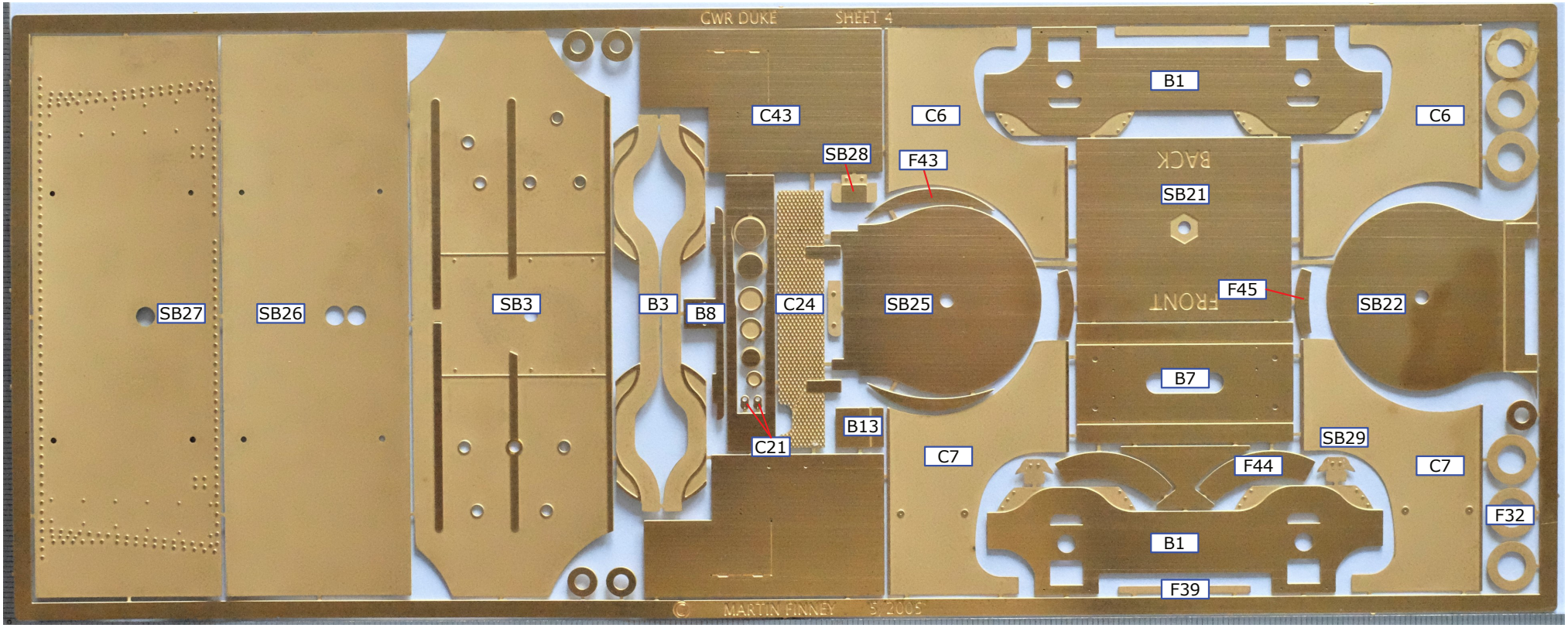


Backhead/3

NICKEL SILVER ETCH 1



BRASS ETCH 4


GWR DUKE
SHEET 4
B1
C6
C43
C6
SB28
F43
BACK
SB21
SB27
SB26
SB3
B3
B8
C24
SB25
FRONT
F45
SB22
B7
B13
C21
C7
SB29
F44
C7
F32
B1
F39
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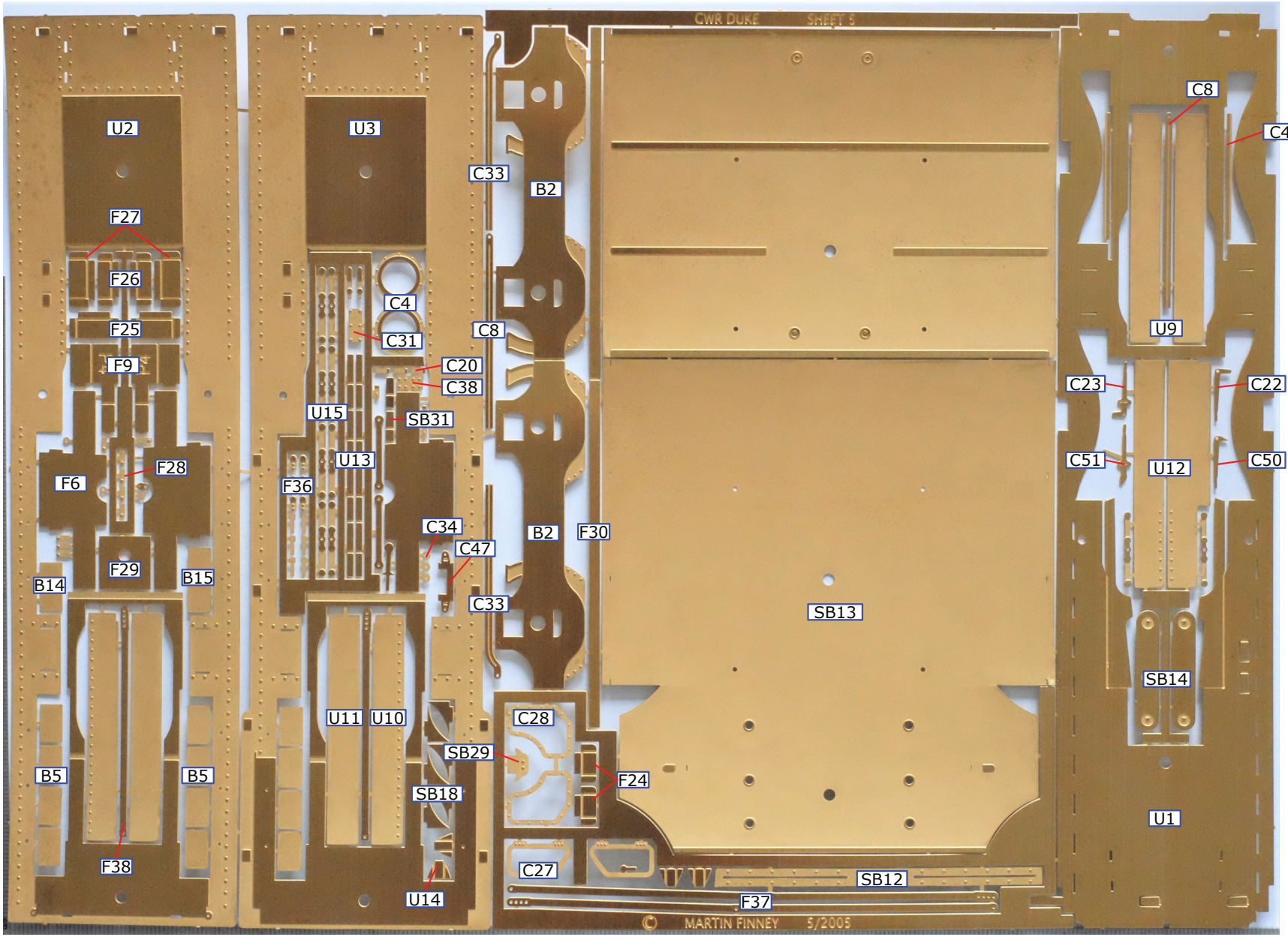
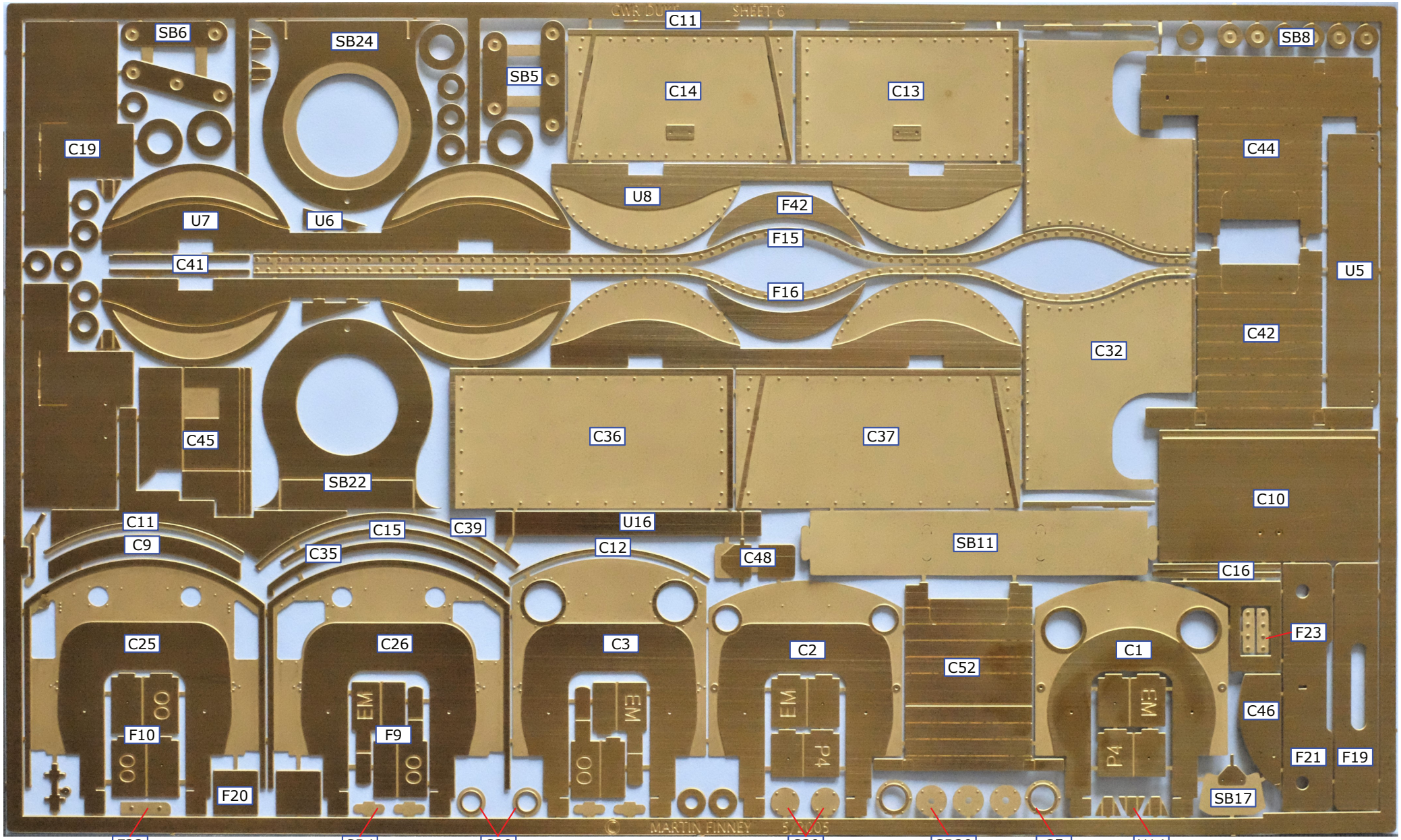
BRASS ETCH 5


GWR DUKE
SHEET 5
U2
U3
C33
B2
C8
C40
F27
F26
C4
C31
C8
U9
F25
F9
C20
C38
C23
C22
U15
SB31
U13
C51
U12
C50
F28
F6
F36
C34
B2
F30
C47
F29
B15
B14
C33
SB13
SB14
U11
U10
C28
SB29
F24
B5
B5
SB18
U1
F38
C27
SB12
U14
F37
© MARTIN FINNEY 5/2005

BRASS ETCH 6


GWR DUKE
SHEET 6
SB6
SB24
SB5
C11
C14
C13
SB8
C19
C44
U8
F42
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U6
F15
C41
F16
U5
C42
C32
C45
C36
C37
SB22
C10
C11
C9
C15
C39
U16
C12
SB11
C35
C48
C16
C25
C26
C3
C2
C52
C1
F23
EM
OO
EM
EM
P4
EM
P4
C46
F10
F9
F21
F19
F20
SB17
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F22
SB4
C29
C30
SB20
C5
U14

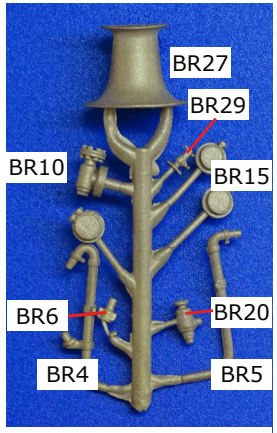
BRASS CASTINGS

CU1	Parallel chimney	Duke 1	BR10	Boiler clack box (2)	Duke/3 & 5	BR21	Jockey valve	Backhead/1
CU2	Taper Chimney	3232/1	BR11	Backhead shelf	Backhead/3	BR22	Regulator and jockey valve linkage	Backhead/1
BR1	ATC Shoe, footplate mounting	Duke/4	BR12	Water gauge	Backhead/3	BR23	Dome	Duke/2
BR2	Steam brake cylinder, left hand	Cab/1	BR13	Regulator mounting	Duke/4	BR24	Dome lubricator	Duke/5
BR3	Steam brake cylinder, right hand	Cab/1	BR14	Regulator handle	Backhead/1	BR25	Safety valve (2)	Details/1
BR4	Tall early vacuum pipe	Duke/3	BR15	Cab pressure gauges	Duke/3	BR26	Safety valve casing, round top firebox	Duke/6
BR5	Short later vacuum pipe	Duke/3	BR16	Combined ejector/brake	Backhead/3	BR27	Safety valve casing, Belpaire firebox	Duke/3
BR6	Vacuum pipe dummy	Duke/3	BR17	Combined ejector/brake handle	Duke/5	BR28	Smokebox door handles	Duke/5
BR7	Large whistle	Duke/5	BR18	Sight feed lubricator	Duke/5	BR29	Steam lance cock	Duke/3
BR8	Small whistle	Duke/5	BR19	Firebox door handle	Backhead/2	BR	Spring hangers (8)	Aberdare/2
BR9	Screw reverser handle	Duke/4	BR20	Back plate clack box	Duke/3 & 5			

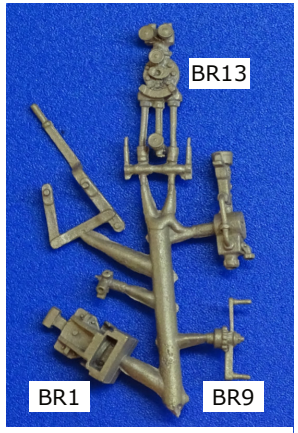
MF7/DUKE/1

MF7/3232/1

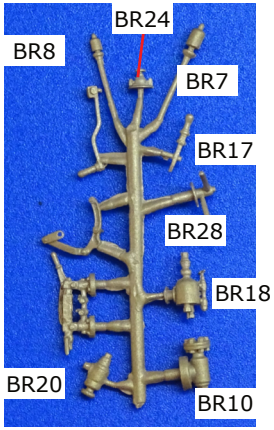

MF7/Duke/2



MF7/Duke/3

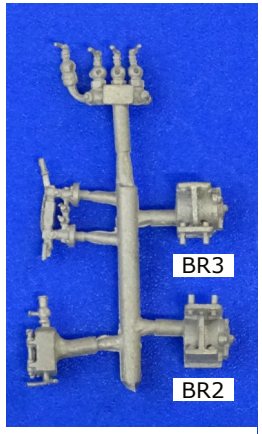


MF7/Duke/4

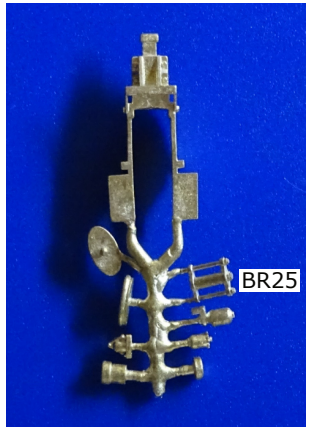


MF7/Duke/5


MF7/Duke/6



Cab/1



Details/1

Awaiting Delivery

Aberdare/2

WHITEMETAL CASTINGS

WM1	2	Bogie upper swing hanger
WM2	4	Bogie lower swing hangers
WM3	4	Bogie axlebox & spring
WM4	1	ATC Shoe, bogie mounting
WM5	2	Dean taper buffer (2)
WM6	4	Main springs
WM7	1	Screw reverser
WM8	1	Narrow cab reverser base
WM9	1	Wide cab reverser base
WM10	1	Wide cab with ATC reverser base
WM11	1	Right hand splasher box
WM12	1	Left hand splasher box
WM13	1	Firebox screw reverse cover
WM14	1	Round top firebox backplate
WM15	1	Belpaire firebox backplate
WM16	1	Top feed
WM17	1	Tapered chimney
WM18	1	Inside of dome
WM19	1	Safety valve base (tall)
WM20	2	Sandbox
WM21	1	Original smokebox door with ring
WM22	1	Later smokebox door
WM23	1	Smokebox pipe cover
WM24	4	Mud hole covers
WM25	1	ATC Bell
WM26	1	ATC Battery box

OTHER COMPONENTS

3/16" bore bearing (4)
2mm bearing for bogie (4)
6BA x 3/4" screw (2)
6BA x 5/16" screw (2)
6BA nut (3)
Buffer head, bush, washer & spring (2)
Short handrail knobs (8)
Medium handrail knob (5)
Vacuum pipe hose
4mm studding (75mm x 2), 4 brass & 4 stainless nuts
1/8" brass wire for compensation beam pivot
5/32" brass tube for compensation beams
0.8mm steel spring wire for bogie side control
0.45mm Brass wire for ATC conduit and cab side handrails
0.8mm Brass wire for brake hanger pivots, sand pipes and handrails
1.4mm Brass wire for top feed pipes
0.8mm, 1.2mm & 1.5mm (220mm & 20mm) Copper wire
Note. Screws may be supplied over-length and may require cutting to length..


WM1


WM2

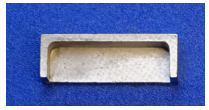

WM3


WM4

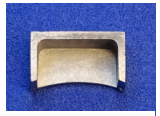

WM5


WM6


WM7

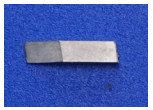

WM8


WM9


WM10


WM11


WM12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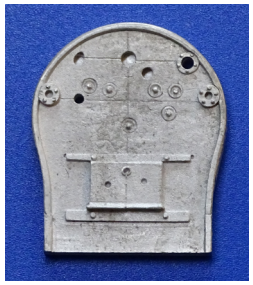
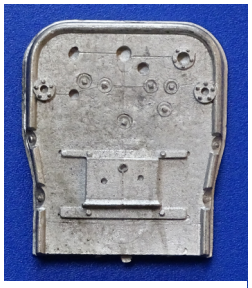
WM16


WM14


WM15


WM17


WM18


WM19


WM20


WM21


WM22


WM23

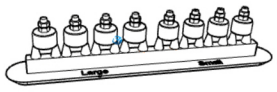

WM24


WM25


WM26

RESIN CASTINGS

RS1 Leading small spring damper (4)
RS2 Trailing (large) spring damper (4)


RS1 RS2

DUKE PACKING LIST

ETCHES

1 Frames Duke A7
1 Body Duke B7

SPRUES

1 F7/GW/Cab/1
1 F7/GW/Details/1
1 MF7/Duke/1
1 MF7/Duke/2
1 MF7/Duke/3
1 MF7/Duke/4
1 MF7/Duke/5
1 MF7/Duke/6
1 MF7/3232/1
1 Backhead/1
1 Backhead/2
1 Backhead/3

WHITEMETAL

2 Dean taper buffer
1 Backhead shelf
4 Mud hole covers
1 Safety valve base (tall)
1 Smokebox pipe cover
1 Original smokebox door with ring
1 Later smokebox door
1 Inside of dome
1 Top feed
4 Bogie axlebox & spring
4 Bogie lower swing hangers
2 Bogie upper swing hanger
1 Tapered chimney
1 Firebox screw reverse cover
2 Sandbox
4 Springs
1 Screw reverser
1 Narrow cab reverser base
1 Wide cab reverser base
1 Wide cab with ATC reverser base
1 Right hand splasher box
1 Left hand splasher box
1 Round top firebox backplate
1 Belpaire firebox backplate

OTHER COMPONENTS

4 3/16" Bearing
2 6BA x ¾” Screws
2 6BA x 5/16” Screws
3 6BA Nuts
2 Dean Taper buffer head, bush, washer & spring (1mm bore)
8 Short handrail knobs
1 Medium handrail knob
4 Long handrail knob
2 Vacuum & steam heat pipe hose
2 4BA Steel studding (75 mm ea)
4 4BA Brass nuts
4 4BA Stainless nuts

WIRE

35mm 1/8" Brass wire
35mm 5/32" OD brass tube
150mm0.45mm Brass wire
2 x 458mm 0.8mm Brass wire
120mm1.4mm Brass wires
200mm0.8mm Copper wire
50mm 1.6mm Copper wire
100mm0.8mm Spring steel wire
60mm 1.2mm Copper wire

INSTRUCTIONS