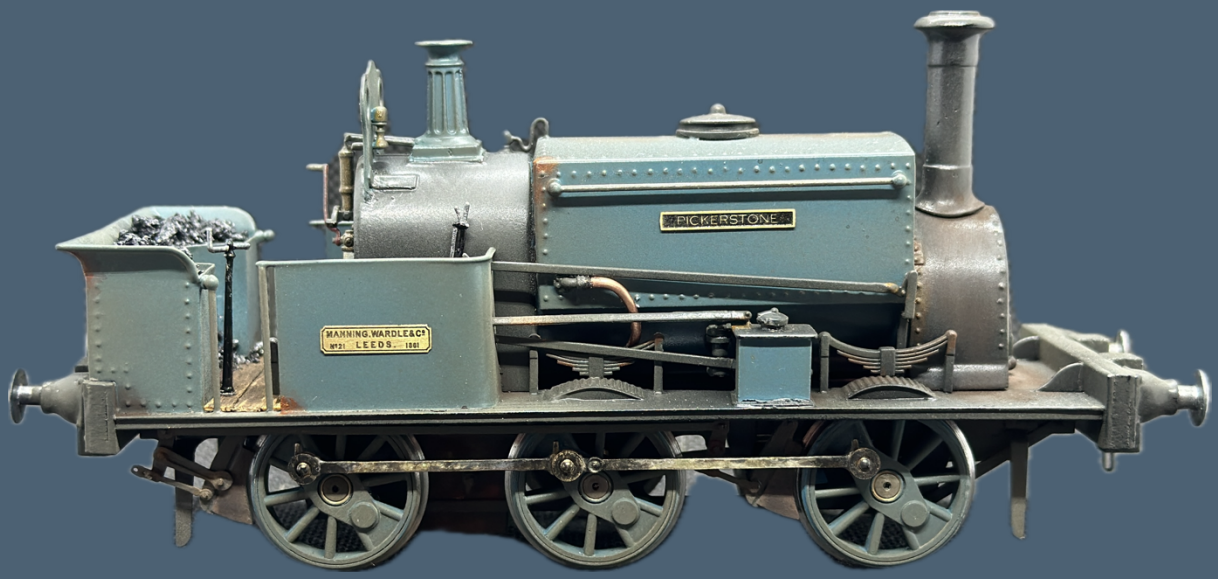
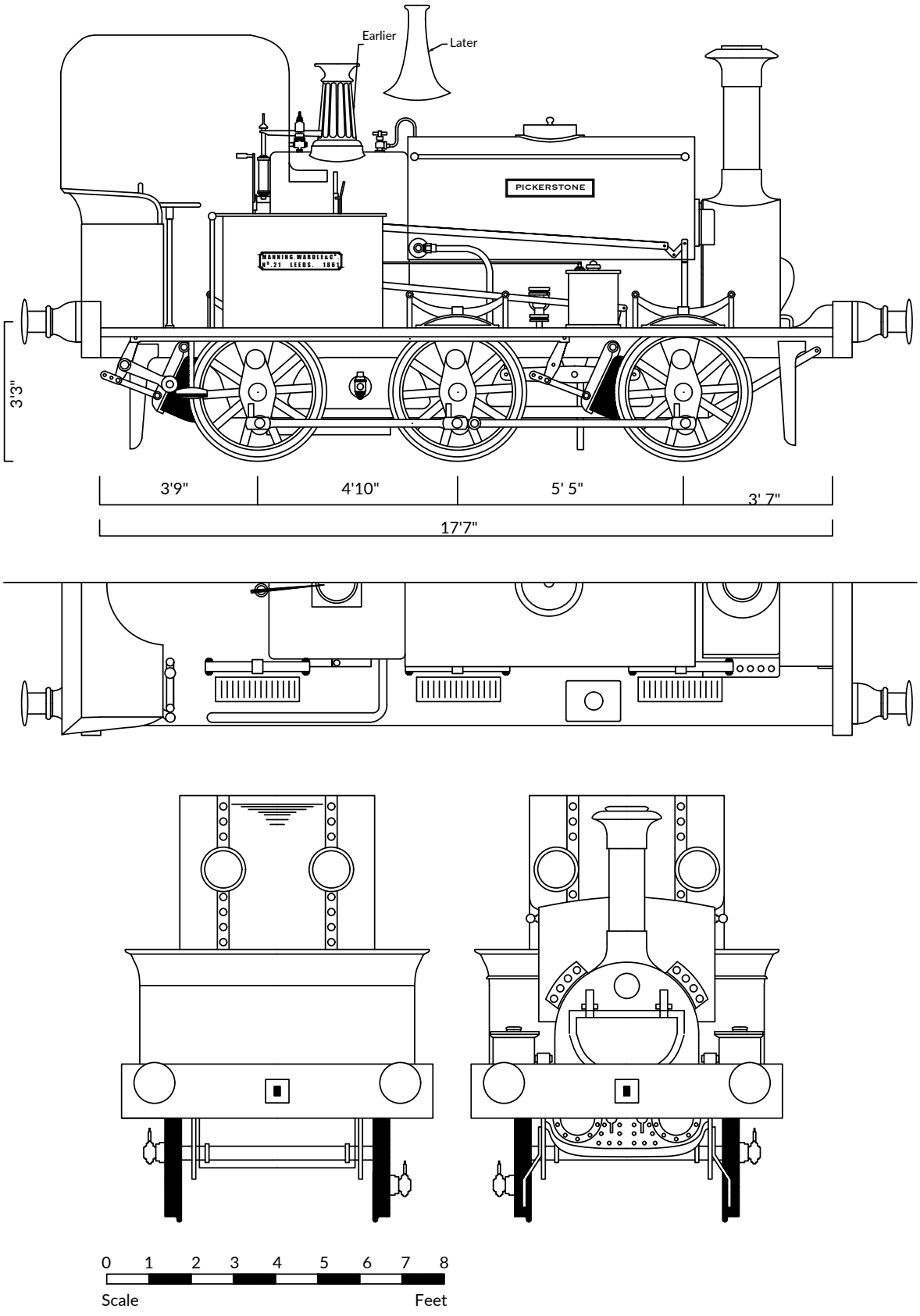
ENGINE- IOUS MODELS



Manning Wardle Old Class i 0-6-0

www.engine-ious.co.uk
hello@engine-ious.co.uk

General Arrangement Drawing



** Please note this drawing is produced to 7mm scale, however it should not be relied upon for accurately measuring parts against.*

Manning Wardle Old Class i 0-6-0

Manning Wardle and Company were based in the Hunslet area of Leeds, and were formed in 1858 when A. Campbell, J. Manning and C. Wardle (a local vicar) formed a partnership which bought out a large part of the failing E.B. Wilson locomotive manufacturing company. They acquired much of their premises, patterns and tools.

Throughout their existence, Manning Wardle focused almost solely on 4 and 6 wheel saddle tank engines, supplying contractors on large construction projects, such as railways, docks, canals and reservoirs, as well as quarries, collieries and factories.

The Old Class I was one of the first of the 6 wheel designs from Manning Wardle, built between 1859 and 1887. As with most of their products, the exact design and finish of the Old Class I's varied greatly from loco to loco depending on the requirements of the client. Many were almost identical to the Class K.

The standard class dimensions are as follows:

Cylinders (diameter & stroke)	11in. x 17in or 12in. x 17in.
Wheel Diameter	3ft 1½in.
Wheelbase	5ft 5in. + 4ft 10in.
Boiler Diameter	2ft 9in.
Length	7ft 3in.
Total Heating Surface	345ft^2
Water Tank Capacity	420 Gallons
Length Over Buffer Beams	18ft 6in.
Height (Rail to chimney top)	9ft 9in.
Weight Empty	15T
Weight Loaded	16T

This kit provides some of the more common options seen on various prototypes, but is not representative of any one particular locomotive. If the modeller has a specific prototype in mind, a degree of modification and scratch building may be necessary. Please email if you would like anything specific producing – any (reasonable!) request will be considered.

General Advice

Growing up, and even now, I was never much of an instruction reader. I took more of a 'how hard can it be?' approach, and paid the (financial) price on more than one occasion. So piece of advice #1: read these instructions before you start, and use the photos and diagrams in conjunction with the written instructions ☺

The etched frets are nickel silver (0.4mm) and brass (0.3mm). Although relatively thin, the etching process still leaves a cusp on the edge of the parts which will more than likely need removing to ensure a perfect fit between parts. A gentle waft of a file or other abrasive will do the trick in no time.

Prior to soldering, all metal must be cleaned with a gentle abrasive to remove dirt and tarnish, in order to get a strong, neat joint. Use minimal amounts of solder. Our preference is to use 145º solder, however you will almost certainly have your own favourites. Remove flux residues after each modelling session with soap and hot water to prevent corrosion of the metal. Something like Viakal is great for removing tarnish, but wash thoroughly before painting.

We pride ourselves on the quality of our castings. Our modern approach involves each part being 3D printed using a castable resin, before being investment cast in brass under vacuum. This results in beautifully detailed, crisp castings, however there may still be some cleaning up of small 'pips', where supports from the 3D printing process were placed. Fig 0.1 illustrates what they look like straight off the printer. These supports are removed before casting, but can sometimes still need a clean-up before attaching to the model.

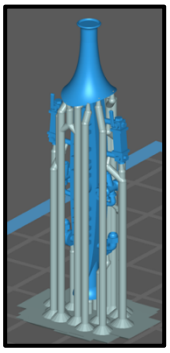


Fig 0.1

When constructing the chassis, it's ideal to use a jig (Master Chassis, Poppy's Woodtech, Avonside Super Pro for example), or at least a set of elongated dummy axels and plate glass to ensure the frames are square. If the chassis is not square, or the centres of the axels do not match the centres of the coupling rods, the chassis will not run freely.

Throughout the instructions, you will find a QR code that links to a time-lapse of this stage of the build. These are not meant to be instructional videos, but are there to simply accompany these instructions with a visual reference (along with the pictures printed here), which may help make anything clear that you are unsure about.

YouTube
Part 1

The kit requires wheels, motor and gearbox to complete. Examples of compatible parts are as follows:
Wheels: Engine-ious Models MW 3'1½" (W001), Slaters 3'1" Drivers (7837MW)
Gearbox: High Level Kits Hump Shunter (GB9)
Motor: High Level 1219C HL Power Coreless (M3)

Ready to go? Let's build.....

1.0 – The Chassis

Be careful with the chassis sides – Manning Wardle didn't give much meat to play with on the frames of their early locos, and these can be easily bent. Rest assured, they will be nice and strong once everything is fixed in place.

First, let's prepare a few parts prior to assembling everything:

1.1 – Coupling rods. For the right hand side coupling rods, laminate 25f (front layer), 26m (middle layer) and 27b (back layer) together. The rods are constructed in 2 halves. The knuckle joint is towards the front. Once soldered, file the edges smooth and polish with fine grit emery paper. If making the rods articulated, carefully solder a short length of 0.45mm wire through the holes in the knuckle joint (Fig 1.1). To avoid solder from flowing inside the joint and binding it up, use permanent marker or similar on the protruding part of the rear half, and use minimal solder. If making the rods fixed (no articulation), align the knuckle joint holes with 0.45mm wire and solder the whole joint. Repeat the above using 28f, 29m & 30b to make the left hand side rods. The knuckle joint is towards the front of the locomotive.

YouTube Part 2

Finally, open out the holes to accept the crankpin bushes, using a cutting broach. Take care with this, as if the broach catches and you bend the rod, you'll need a new fret, as repairing them to still achieve good running is very difficult. Sensible advice would be to use a honed broach and cutting oil. If using a jig for constructing the chassis, the completed coupling rods can be used to set the jig. Don't be tempted to use the chassis frames to set the jig; although every care has been taken to ensure accuracy, and the rods are next to the frames on the fret, the etching process is not always quite enough of an exact (tenths of a mm) science for this to be a reliable method!

1.2 – Motion bracket. Sweat the 2 layers of the motion bracket (103 & 104) together. When you are removing the cusps & fret tabs, be careful not to remove the locating tabs on the rear layer (104). They are very small, and easily missed. They are important for getting the angle of the plate relative to the frame correct. Please note part 103 does not have any tabs. Also, take care not to bend the top of the bracket when you remove it from the fret. (Fig 1.2) If using inside motion, check that the ends of the slide bars fit into the space the ends rest on. If they don't, file a small amount of the bottom support on the motion bracket; it's much easier to do this now that when the chassis is soldered up.

1.3 – Ashpan. Punch out the rivets on the firebox/ashpan assembly (24). Using a vice & something straight and sturdy, bend along the half-etched lines so that the ashpan 'steps inwards' from the bottom of the firebox. Fold the locating tabs outwards – these will sit in a recess on top of the frames. (Fig 1.3)

YouTube Part 1

1.4 – Cylinder Heads. Solder together 16f and 101. Use 1mm wire in the holes to align the pieces. 101 is slightly smaller than 16f, so when aligned correctly, the top edges should be flush with each other, but there should be a recess along the sides and bottom (Fig 1.4). This allows the cylinder chest wrapper (18) to be accurately formed and soldered to the front and back of the chest in the next step. Repeat for the rear of the chest with parts 16b and 102. If you will be including the inside motion into your model, it is a good idea to solder the valve rod glands in place at this stage, as it will become more difficult to do later without unsoldering everything! Finally, Solder the cylinder head covers (15 x 2) to the front (16f), using a short length of 0.5mm wire through the holes to align them. Solder wire in place to fill the holes and file flush.

1.5 – Cylinder Chest. Using the front and back covers of the cylinder chest constructed in the previous step, carefully shape and solder the cylinder chest wrapper (18) to match and wrap round 16f/101 & 16b/102 (Fig 1.5). To do this, measure and mark the centre line of the wrapper (18) and front/back of the chest and tack solder in position. Gently bend and form along the curve and sides, tack soldering as you go, all the way to the end of the chest on each side, before finally soldering the seams. The wrapper should fit into the recess as detailed in step 1.4/Fig 1.4. Check the orientation of part 18 – the slot (there to provide access to the screws holding the chassis and body together) is not located centrally on the part. The wider area of metal is towards the front of the cylinder chest. See Fig 1.5

YouTube Part 3

1.6 – Hornguide cut-outs. If using sprung hornguides & blocks, cut out along the half-etched guides on the frames. It's much easier to do this in the flat than once the chassis is assembled. Don't attach the hornguides themselves just yet (Fig 1.6) as they might interfere with the chassis jig. If using fixed bearings, open out the holes with a little bit of clearance so your chassis jig can guide them to where they need to be. Set any chassis jig you might be using by using the completed coupling rods (step 1.1). Once on the jig, solder in place.

1.7 – Constructing the chassis. Use Fig 1.7 to identify the locating holes in the frames for the following parts. It is crucial that the frames are assembled square and true in order to achieve good running. Two sets of frames are provided, depending on whether you choose to use 1/8" axles (31b – left side, 32b right side), or 3/16" axles (31a – right, 32a – left). The kit is primarily designed to be used with 1/8" axels.

YouTube Part 4

Fold up the rear frame spacer (12) to 90°. Cut out the perforated section to allow clearance for your gearbox if needed. This can always be removed later once the chassis is completed if you're not sure how big your chosen gearbox is yet.

Fit the rear frame spacer (12), motion bracket (completed in step 1.2 – part 103 with the locating tabs towards the front of the loco), cylinder chest (completed in step 1.5) and the front spacer (14) between the frames and solder in place. The cylinder heads on the chest should be facing forwards, and on the front spacer (14), the holes, which are not central across the part from front to back, are towards the rear (see Fig 1.7). This stage is fiddly, and needs about 3 pairs of hands, but it's easier if using a chassis jig. Check for free running with a set of axels & wheels. Adjust if necessary. Once happy, the firebox/ashpan (24) can be dropped in between the frames, the lugs resting in the recesses in the top of the frames. Fill in an gaps in the locating holes with low melt solder, and file/sand flush and smooth.

YouTube Part 5

1.8 – Packing washers. This is used to add strength where the screw will eventually join the chassis to the body at the front and rear of the loco. Without it, over tightening of the screw could lead to bending of the smokebox. Solder together the two packing washers (98), and solder these to the front frame spacer (14). With the holes aligned, the 'flat' of the washer sits flush with the edge of the spacer (Fig 1.8). Solder 2 of the back right packing washers (99) and back left packing washers (100) over the holes in the rear frame spacer (12).

Depending on your chosen method of assembling your chassis to ensure squareness, you might be able to complete stages 1.8-1.11 whilst the frames are in the flat, however if a jig is being used, you will need to complete them after putting the chassis together.

1.9 – Frame supports. Solder frame supports (5) to front of frames (31 & 32), on the outside (Fig 1.8 for location). Use 0.75mm wire to solder them into position, leaving a short length visible to represent a bolt head (Fig 1.7 for location).

YouTube Part 7

1.10 – Spring balance arms & brackets. Solder the spring balance arm bracket (19 & 20, left & right) to the frames 32 & 31 respectively, centrally over the half-etched marks next to the motion bracket, but on the outside of the frames (Fig 1.10). Solder the right hand spring balance arm (21) to it's bracket (20) via a length of 0.7mm wire. The arm should sit inside the frame (Fig 1.10). Repeat for the left hand side spring balance arm (22). Make a 90° bend in 0.7mm wire and solder vertically into the holes at the end of the balance arm to represent the connection between the arm and the springs.

1.11 – Hornblocks/Bearings. The kit is designed to use SpaceSaver hornblocks from High Level Kits (product code HB2) and can be used if using 1/8" axels. They produce excellent quality modelling products – please support them! If using hornblocks, cut out the perforated sections of the frames (31 & 32) and file to size. If using fixed bearings instead, open out the axel holes using a tapered reamer to ensure the hole does not wander off-centre (Fig 1.11).

1.12 – Guard irons. Open out the holes in the front (53) and rear (54) guard irons to accept 0.75mm wire, best done whilst still attached to the fret. Using the half-etch lines, fold the guard irons to form a joggle (Fig 1.12). Fold in towards the half-etch lines, and fill and gaps left with solder and file smooth. Using 0.75mm wire, solder to the frames, leaving a short length of wire protruding at the front to represent bolts. File smooth at the back so as not to interfere with the cylinder chest once fitted.

YouTube
Part 7

1.13 – Brake Blocks & Mechanism. This stage is made much easier to get everything in the right position if the wheels are installed into the frames. Laminate x2 of rear brake blocks (38) and x1 of the detail layer (10R/10L), making a block that is 3 layers thick. File the edges smooth and put to one side. Repeat for the front brake blocks (39) and detail layer (11a/11b). For the various brake linkage parts (6, 7, 8 and 9), open out the holes in each part: the larger holes to accept 0.7mm wire, and the smaller holes to 0.5mm. It's easier to do this whilst the parts are still attached to the fret. Solder a length of 0.7mm wire into the hole in the chassis frame immediately behind the front wheel, perpendicular to the frame. Thread the top hole of the front brake block (11a/b as the top laminated layer). Align the outer face of the brake block with the outer face of the wheel and allow a small (1-2mm approx.) gap between the brake block and the wheel. Next, solder a length of 0.7mm wire into the hole in the dropped bracket on the frame between the front and middle wheel. Tack-solder the brake linkage (6) to the 0.7mm wire through the middle hole in the linkage, just off vertical (top leaning forwards slightly) It should be level with the outer face of the brake block. Use minimal solder for this as the angle at which it needs to sit will need to be adjusted. Finally, attach the brake linkage arm (9) by soldering the end of part 9 with the single hole to the bottom hole of the brake block (11a/b), using a 0.7mm piece of wire to connect them. Solder the inner of the two holes at the other end of part 9 to the bottom hole of part 6, using a piece of 0.5mm wire. Trim any wire just proud of the parts to represent bolt heads. Repeat for the rear brake blocks, with the addition of the brake block bracket (7), for which the larder rounded end should be soldered to the middle hole of the brake block using 0.7mm wire, and the other end to the central mounting hole on part 6. Also, whereas part 9 was used for the front brake linkage arm, part 8 should be used on the rear. Finally, using 0.7mm wire, solder the brake pull rod (55) to the top holes of part 6. Ideally, this should be positioned as close to the wheel as possible, but a compromise will likely need to be made here as you will need to leave space to slide the wheel off the axel when removing them. Move it too far out, and there's a chance that the oil pots on the coupling rods will foul the brake pull rod when at the top of their arc. There is a sweet spot, I promise! I suggest lightly tacking the parts in place and checking you can manoeuvre the wheels as necessary. Repeat the steps above for the brake gear on the opposite side of the loco. (Fig 1.13).

1.14 – Packing Washers (Rear). This is used to add strength where the screws will eventually join the chassis to the body at the rear of the loco. Without it, over tightening of the screws could lead to bending of the footplate and bunkers. Laminate 2 of the right hand side packing washers (99), and 2 of the left hand side packing washers (100). Align the holes, with the 90º corner against the back of the spacer (12) and the frame (31/32) (Fig 1.14).

1.15 – Castings. Locate the blowdown valves (x2 #C01). Open out the holes in the sides of the ashpan (24) and solder in, with the outlet pipe pointing down (Fig 1.14).
The slide bars (x2 #C02) have 4 supports near the end of the bars. They are there to prevent the slide bars from getting bent before use, and will need removing with a piercing saw or a cutting disc. File smooth, before soldering the cross slides into the holes in the back of the cylinder chest at one end, with the end of the bars resting on the motion plate at the other end. Solder the valve glands (#C03) into the rectangular hole in the cylinder chest between the two slide bars.

1.16 – Wheels. If you are using our own Engine-ious Models wheels, please see section 3.0. Otherwise, please follow the instructions of your chosen when manufacturer.

If you are including working inside motion in your model, follow the separate instructions provided with the inside motion castings. This locomotive used Stephenson's link motion, and can be purchased either with this kit at the time of purchase (as an option when adding to basket), or as a separate purchase from our online shop in the 'Castings' section. Please note that this kit provides the slide bars regardless of whether you are including the inside motion or not, as they form part of the structure to give the chassis rigidity.

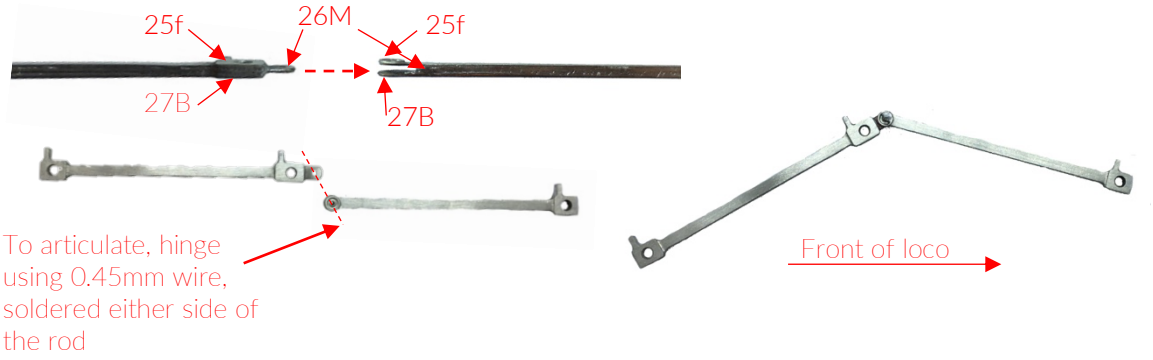


Fig 1.1 – The coupling rods are made by laminating 3 layers, and either articulating the knuckle joint, or soldering it solid.

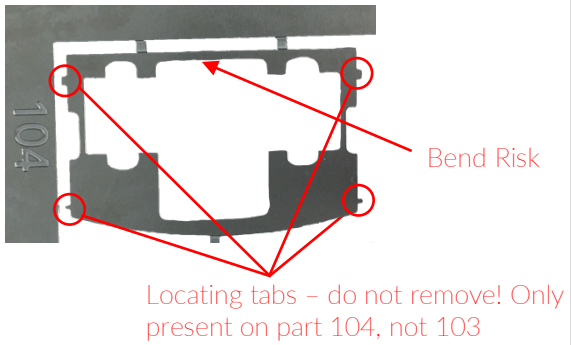


Fig 1.2 – The top of the motion bracket is very thin and easily bent. Sprue cutters often push the part inwards, so take so when removing from the fret

Fig 1.3 – Completed Firebox/ashpan assembly

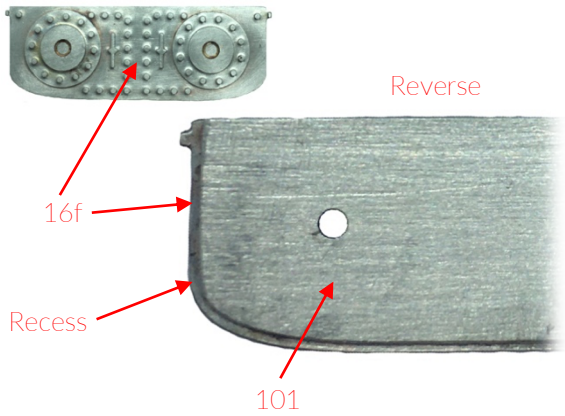


Fig 1.4 – Cylinder chest covers front and back (16f&b, & 101/102). Note the recess after sweating parts 16f/b, & 101/102 together. This will guide bending/placing the cylinder head cover when soldering together

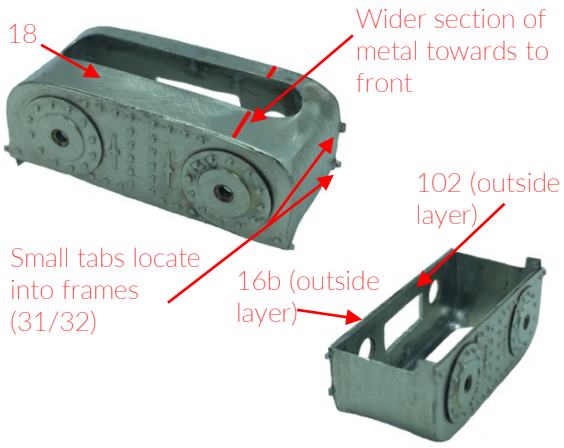


Fig 1.5 – Cylinder chest wrapper having been formed to the shape of the cylinder chest covers and soldered in position. The slot provides access to the screws that fix the chassis to the loco body.

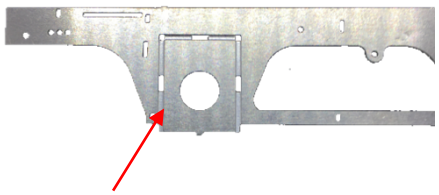


Fig 1.6 – Cut outs guides for hornblocks are marked with a half-etched lines. Cut with a piercing saw, or open hole out with a tapered reamer if using fixed bearings.

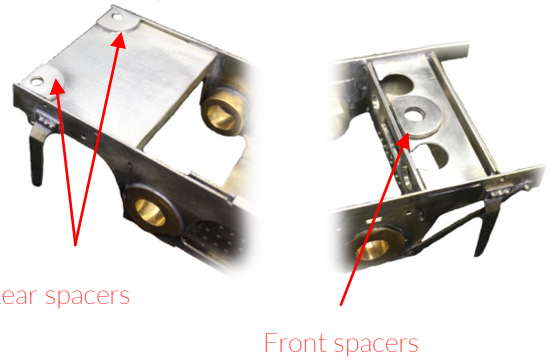


Fig 1.8 – Packing washers front and back.

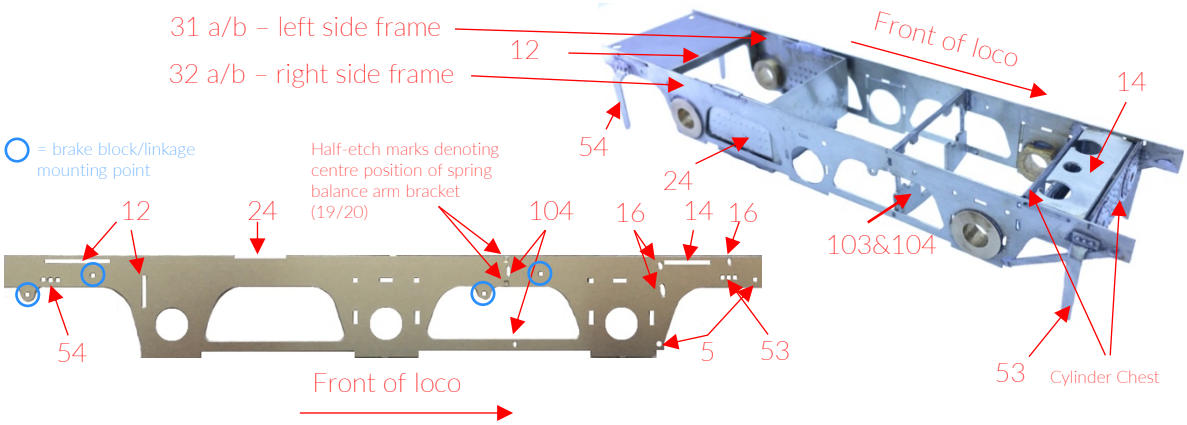


Fig 1.7 – Reference for locations on chassis frames of: rear frame spacers (12), frame supports (5), motion bracket (103/104), ash pan (24), front & rear guard irons (53 & 54), cylinder chest (16f/b, 101,102,18) and front frame spacer (14), brake blocks (10, 11), brake linkage (8, 9)

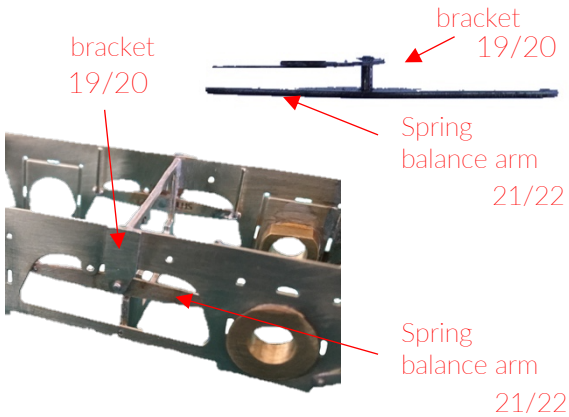


Fig 1.10 – Placement of the spring balance arm (21/22) and mounting bracket (19/20).

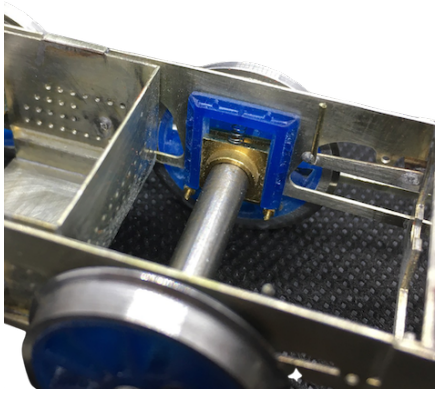


Fig 1.11 – Glue hornblocks into cut out (Fig 1.6). Detail on inside of frames.

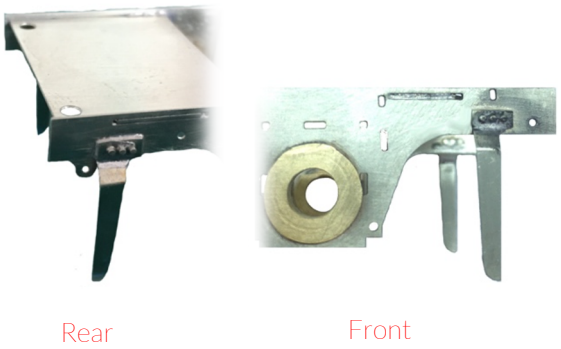


Fig 1.12 – Guard irons attached with N/S wire which doubles as representations of bolts

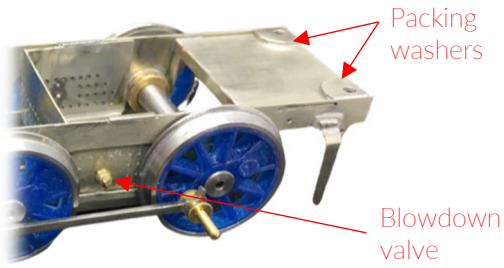


Fig 1.14 – Location & orientation of rear packing washers

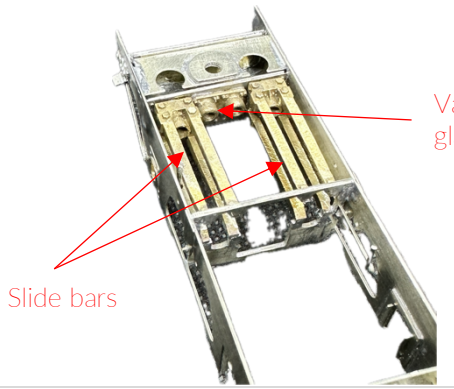
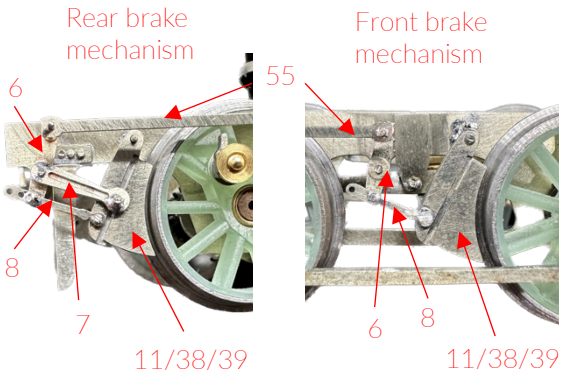


Fig 1.15 – Slide bars and valve gland location



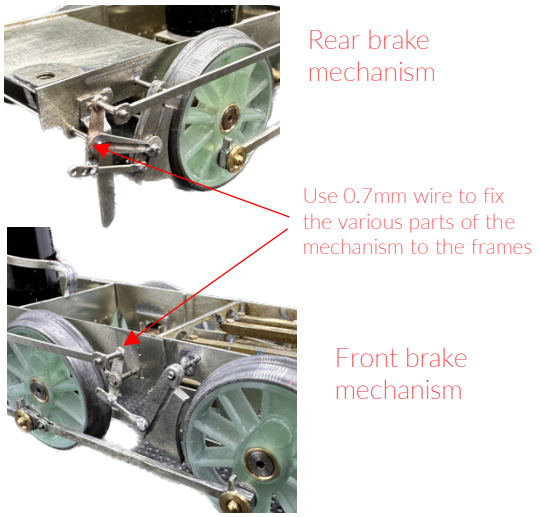


Fig 1.13 – Brake blocks & mechanism.

2.0 – The Loco Body

The body components are a mixture of 0.4mm Nickel Silver, and 0.3mm brass. Be careful with the brass – it seems quite thin when the parts are in isolation, but rest assured once everything is soldered together, everything will be more than sturdy.

2.1 – Splasher Sides. Remove the running plate (48) from the fret and clean up the cusps & tabs. Fold up the splasher sides so they are vertical. It is wise to use a steel rule or similar to place just below the fold lines when bending – as it's a small part on a tough material, this will prevent the footplate itself from distorting (Fig 2.1).

YouTube Part 8

2.2 – Splasher Trims. Be careful when removing the splasher trims (42) from the fret – they are only half-etched at 0.15mm thick, and can be distorted very easily if removing from the fret with cutters. The best option is a VERY sharp knife blade. Tin one side with solder, place over the splasher sides folded up in the previous step, and solder to the footplate. Clean up any excess solder to leave a crisp edge (Fig 2.1).

2.3 – Splasher Tops. Options for plain tops (41) or ribbed (40) are provided in this kit. Form a bend in each one around a 12.75mm diameter (or close) rod. The parts are easily formed though, so the diameter isn't too critical – I used the shaft of a tapered reamer, but a 13mm drill shaft would work equally as well. Look out for the notches in 4 of them – these are to avoid fouling the smoke/fire boxes. Solder centrally onto the splasher sides from underneath. Use minimal solder as the tight corners are hard to clean up. There should be a slight overhang at each side (Fig 2.1).

2.4 – Buffer beams. On the prototype, the buffer beams were two steel plates with a wooden beam sandwiched in between. Sweat together 2 of the rear portion of the buffer beam plates (57), taking note of which edge is the top (see arrow on 57), and ensuring the holes are exactly aligned. Sweat together one each of parts 58 & 59 to form the front portion of each buffer beam. Solder the buffer housings (#C04) and the coupling chain bracket (#C05) to part 59. 2mm thick hardwood is provided for the middle portion of the buffer beam. Holes will need to be drilled in this to accommodate the back of the buffer housing castings - use the holes in the front plate (58 & 59) to mark the position of holes onto the wooden strip and drill a 5mm diameter hole. Go slowly, and maybe in incremental stages so it doesn't split. Use superglue or epoxy to stick the front plate to the wooden strip. Cut the wooden strip to slightly oversize and sand the bottom edge and one side edge flush with the from plate. Attach the rear plate with superglue (arrow inside the buffer beam and pointing up), matching up the sanded bottom and side edges. Sand the remaining side edge and top edge flush. Repeat the above for the 2nd buffer beam. As they are identical, it doesn't matter which you use for the front or back. Use the slots in the rear buffer beam plate (57) to locate onto the tabs at each end of the footplate (48). Solder in place, ensuring they are square to the footplate. Solder buffer beam supports at the front by adding part 23 (x2) into the recesses on the footplate, vertical side against the buffer beam. (Fig 2.4)

YouTube Part 9

2.5 – Valances. Locate the valances (56) in the half-etch groove on the underside of the footplate between the two buffer beams. Solder from behind. (Fig 2.5)

2.6 – Retaining Nuts. Check that the holes match up with the holes in the chassis (there is some 'play' in the slot & tab arrangement Solder a 6BA nut centrally over the hole near the front of the footplate, and two 10BA nuts over the holes near the rear. (Fig 2.1)

2.7 – Bunker. The bunker is made from one single part (65), folded and soldered together in the middle of the curve. Begin by punching out the rivets. Curve the two end sections of 65 by forming them round a suitable cylinder. The finished curve should have a radius of 10.5mm. The nickel silver tube provided for the boiler can be used to achieve this, especially if you anneal the curved portion of the bunker piece first, as the boiler has a diameter of 20mm. Fold up the bunker along the half-etched lines. Check it aligns with locating holes on the footplate and solder the overlapping half-etched join on the curve. Use plenty of solder to fill any gaps in the join, and dress back to a smooth curve. Solder to the footplate. Add the sliding coal doors (64) by curving and soldering around the cut-outs in the curved section of the bunker. Use 0.5mm wire for the handles. Glue (superglue or epoxy) a spare strip of hardwood across the rear panel of the bunker – this will give added strength and protect from damage as the back of the bunker isn't as yet fixed to anything. (Fig 2.7)

YouTube Part 10

The half-etched lines at the top of the bunker are to seat the bunker flare in. The flare is made from parts 66 (left), 67 (right) and 68 (middle). The each part should be shaped along its length around a 5mm drill bit shank or similar. One method for this is to clamp the flare parts between the drill bit and thick leather (3.5mm/9oz) in a vice and squeeze. If you line things up correctly, you get a nice, even curve along the length of each part. Beginning with the two side sections of the flare, solder them into the half-etch recess at the top of the bunker (curved section towards the front). At this point, there will be some of the half-etched metal sticking up from inside the flare – fill this gap with solder and this can be filed off later. The side sections have been deliberately made too long and will need to be filed back later as well. For the middle section of the flare (68), you'll need to file a curved profile at each end to match the curve of the side flares (66&67). The aim is to produce a snug fit to form a nice square corner. Solder this piece in place. Now dress back the half-etch on the inside of the flare to form a smooth curve, with no visible join. Finally, solder half-round brass beading along the underside of the flare. File down the ends of the beading to taper off flush to the sides of the bunker.

Personally, I found the flare the trickiest part of the build, and so a spare set of these parts have been provided on the fret.

2.8 – Firebox. Punch out the rivets on the backhead (72), and solder the backhead surround (73) around to it. At this point, the casting details can be added: the safety valve cover (#C07 for the earlier cover, or #C08 for the later cover), the regulator bracket/salter springs (#C09), firebox door (#C11), gauge glasses (#C12 – Left, #C13 - Right) and regulator handle (#C14). Use a short piece of 1mm wire to attach the regulator handle. The castings can be left until later if you wish, but access to solder from the rear of the backhead is much easier before the firebox is all put together. Sweat together the 3 layers of the front of the firebox (75). Bend the firebox wrapper (74) around a suitable cylinder to match the curve of 72 & 75. Solder the wrapper across the top of 72 & 75. Note that there are small triangular markers on the wrapper – a central marker to align centrally with the apex of 72&75, and two further markers to align with the end of the curve/beginning of the straight section. To enable the loco to be dismantled for painting, the firebox (and smokebox) are screwed onto the footplate. The fixing brackets (69, left & 70, right) need a 10BA nut soldering centrally over the holes. The flat side of the nut needs to be parallel to the firebox wrapper. Now solder the fixing brackets (nuts inside the firebox) within the firebox, flush with the bottom. With the structure complete, round off the front edge of the firebox with a file. Do the same for the back of the firebox around the backhead surround (73) but with a smaller radius. Lastly, solder the lubrication heating valve (#C15) into the small hole at the front of the firebox wrapper, and connect to the tank with 0.7mm wire, as per the GA drawing. (Fig 2.8)

YouTube Part 11

2.9 – Smokebox. Punch out rivets on the smokebox front (77) and the smokebox wrapper (78). Solder 2 M2 nuts centrally over the two outer holes in the base plate (79) – these will be used to attach the smokebox to the running plate later in the build. Note: *It's important that the base plate is oriented correctly, otherwise the smokebox will locate in the wrong place on the running plate. The holes are not equidistant from front to back – the holes should be closer to the front of the loco (See fig 2.9).* Solder the smokebox front (77) and back (76) to the outside edges of the base plate (79), ensuring they are square, and that half-etched fold lines for the locating tabs are facing down. Note that the wrapper is wider than the base plate (width of base plate + thickness of 77 & 76) so the wrapper can sit on top of 76 & 77. Bend down the front locating tabs. Pre-form the smokebox wrapper round a suitable diameter rod to match the smokebox curve. The boiler tube can be used for this, although it is a little undersized. Solder (from inside where possible) the wrapper (78) to the top edge of 76 & 77. Finally, smooth out the chimney (#C16) and smokebox door (#C17) castings with emery paper where needed, and either solder or epoxy in place. A handle/dart for the door is also provided (#C18).

YouTube Part 12

2.10 – Cab Sides. On both the left (63) and right (62) cab sides, there are small triangular markers on the top and bottom edge. The middle of these markers denotes the centre of the bend, with the outside markers denoting the start and end of the bend. Lightly scribe the centre line on (use a permanent marker so as not to scratch the metal) the outside of the cab sides. Now files off the markers from the top edge. Solder half-round brass beading centrally across the top of each of the cab sides whilst still flat. End the beading flush with the edge of the panel at the firebox end, but leave over-long at the can entrance end as the vertical handrail will need to be soldered to it later on. Bend the cab side through 90°, using a 5mm drill bit to achieve the required radius. File the triangular markers from the bottom edge off, and solder to the footplate. See Fig 2.1 for which slots to use. Finally, use 0.7mm wire to add the vertical cab handrails through the hole in the footplate next to the cab sides. Solder to the over-hanging half-round beading and trim the rest of the beading, leaving 0.5mm of over-hang after the handrail. On the bunker side of the cab entrance, solder a handrail knob to the top of a length of 0.7mm wire. Pass the wire through the hole in the footplate next to the bunker, and solder, attaching the end of the handrail knob to the top of the bunker. See GA drawing for position.

YouTube Part 13

2.11 – Tank. Punch out the rivets along the sides and top of the tank (82), as well as the two end panels (80) of the tank. Pre-form the curve on the top face of the tank to match the end panels (80) and the inside former (81). Solder the former (81) roughly halfway down the inside of the tank starting at the top of the curve. Fold sides of the tank (80) down and solder to the former. Solder the end panels (80) in place, and fold and solder the undersides of the tank. Check it sits on the boiler tube nicely – simply file a little off the inside edge of the underside of the tank if it's too tight. Using the short handrail knobs provided, solder them into the two holes near the top of the tank, using 0.7mm wire for the rail itself. Mirror on the opposite side of the tank. Solder the injector to the bottom left on each side of the tank – earlier valve (#C19) and later (#C20) options for injectors are provided as castings. Finally, add the filler cap, centrally over the larger hole. Lead shot can be added to the tank to add extra weight at this point – mixing with epoxy glue and adding equal amounts to each side of the tank is recommended.

YouTube Part 14

2.12 – Installing tank & fixtures.

To ensure the smokebox and firebox are the correct distance apart, screw them both to the footplate with the boiler tube (20mm nickel silver tube) slung between them. The tube

should slide nicely into the holes at the front of the firebox, and rear of the smokebox. If not, a few twists of emery cloth around the tube should solve this. The tube is provided over-long – position the tube so there minimal stick-out into the firebox, as this could prevent the motor from fitting vertically inside the firebox as intended. The tank should fit nicely between the smokebox and firebox. Solder the boiler tube to tank from below – just tack to start with, check everything is aligned, tank vertical etc., then solder a bead along the joint between the boiler and the tank bottom. Close any gaps between the smokebox and firebox using the play in the fixing holes as leeway. Solder boiler to firebox & smokebox. Add the tank fixing brackets (90&91) into gap between rivets on the smokebox (90), and the front of the tank (91).
Finally, add the tank filler cap (#C21) the clack valves centrally to the boiler under the tank (#C22) and the lubrication heating valve (#C15) to the top of the firebox above the hole. Use 0.5mm wire to form the pipe to the tank – see GA drawing for shape.

2.13 – Weatherboard (optional). Solder full thickness spectacle plate rims (84) to the front of the weatherboard around each 'window'. Also add half-etch rim (85) to the back of the weatherboard. Solder the weatherboard vertically and centrally to the top of the firebox, about 1mm forward from the curved edge. Bend support brackets (94) and solder to the weatherboard and firebox wrapper. They should be positioned so the shorter section is against weatherboard, with the top left corner of the bracket aligned with the edge of the weatherboard.

2.14 – Roof (optional). First, ensure you identify the inside & outside of the cab roof (83) correctly: the outside has 2 half-etched recesses for retaining strips (86), whilst the inside of the roof has 3 half-etched recesses for retaining strips (86). Solder full thickness spectacle plate rims (84) to the outside of the cab around each 'window'. Also add half-etch rim (85) to the inside of the cab around the windows. The curved edge of the roof etch (83) sits on the firebox, and the opposite, straight edge sits on top of the bunker flare. The GA diagram is drawn in 7mm scale, so in theory can be used to determine where the curves need to be made in the part to get the roof to the correct length and height. In reality, some careful measurement will be needed, as it's likely that everyone will end up forming the flare *slightly* differently. When forming the bends in the roof, they should be made with a 7mm radius (form around a 15mm diameter cylinder). Test fit, and once happy, punch out the rivets on the retaining straps (86) and solder x5 into the half-etch recesses on both the outside and inside of the roof. Trim/file to length. Bend support brackets (94) and solder to the front of the cab roof. They should be positioned so the shorter section is against front of the cab roof, with the top left corner of the bracket aligned with the edge of the cab roof. Solder the whistle (#C23) into the hole in the front of the roof. Also, the roof fixing brackets (94) need bending through 90° and soldering flush with the bottom of the front of the cab roof, and the top of the firebox. Finally, the cab support stays (#C24) should have the ends bent at suitable angles to solder to the top of the cab roof, and the top of the tank. See fig 2.14. At this stage, assuming the model is to be painted, it's recommended not to solder the roof to the rest of the model yet, but epoxy in place after the painting & weathering of the loco is complete.

2.15 – Buffers. Open out the 0.7mm holes in the sides of buffer the housing. The holes are part of the casting, but as they are so small, they don't always cast very well and may need drilling out completely. 2 springs are supplied, which both need cutting in half to fit inside the buffer housings. Drop these into the bottom of the housing (#C04), and insert buffer heads (#C06) with slots in the shanks to the sides. Push 0.7mm wire through the holes in the side of the buffer housing and through the slot in the shank of the buffer head, and out through the hole in the opposite side of the housing to retain buffer. Cut the wire to length,

solder to the housing, and file & polish smooth. The buffer should be held firmly, with little sidewards movement, but should still push in and out with the spring action. (Fig 2.15)

2.16 – Misc parts. This section deals with the remaining detailing parts.
Firstly the sandboxes: Fold the sides and bottom (89) into a cuboid and solder together (join at the back). Solder the top and bottom (87) centrally over/under the box. These parts are a little oversized, so file to size and round corners so roughly 1mm overhangs the box sides. Attach to the footplate by soldering 36mm from the back of front buffer beam to the front edge of the sand box. Solder or glue the sandbox filler cap (#C25) Repeat for both sides.
Reverser reach rod (33): Drill out holes to accept 0.45mm wire at either end. Use a short 4mm length of 1mm brass tube between the reach rod and the reverser bracket (fold up to vertical) on footplate. Thread 0.4mm wire through hole in bracket, through the tube, and through hole in end of reverser arm, before soldering together.
Draincock reach rod (49): Drill out holes to accept 0.45mm wire in reach rod (49), bracket (47), vertical section (50), as well as the hole at the bottom right of r/h tank side. Fold the vertical section of the rod (49) to create a joggle so it fits beneath the tank. Reinforce the folds with solder. Use 0.45mm wire to join everything together, leaving the wire just proud of the joints to represent bolt heads.
The sand box operating rod (51): Using 0.45mm wire, make a 90^{o} bend. Use this to connect 51 to the top of the sandbox. Note that you need to pass the operating rod through the hole in the cab side first.
The cab steps are made up of 3 parts. Curve the bottom of the step back (95) to match the tread (96) and solder the tread in place. Bend the top of 96 through 90^{o} at the half-etched part, and solder the cab step support piece (97) in the half-etched recess to provide strength. Finally, the suspension springs (#C26), positioned at the back edge of the splashers. Solder these to the footplate.

2.17 – Cab floor. To preserve the natural grain of the wood, it's recommended that this step is left until after the loco has been painted. Using the 0.5mm oak veneer provided in the kit, cut strips (lengthways down the grain) 6mm wide. Trim and cut to shape around the features in the cab so they lay perpendicular to the direction of travel. Attach with superglue. Painting is best achieved using either brown washes or wood stain. You. Want to still be able to see the gain through the colour (Fig 2.17). Final, glue the handbrake stanchion (#C27) to the near the right hand side of the bunker, and the reverser lever (#C28) to the right hand side of the cab beside the firebox.

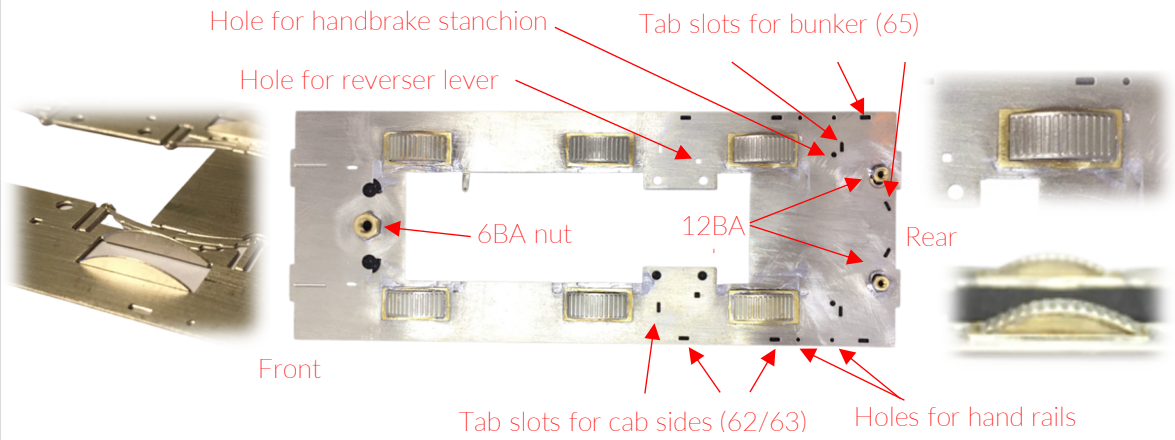


Fig 2.1 – Splasher sides, trims & tops

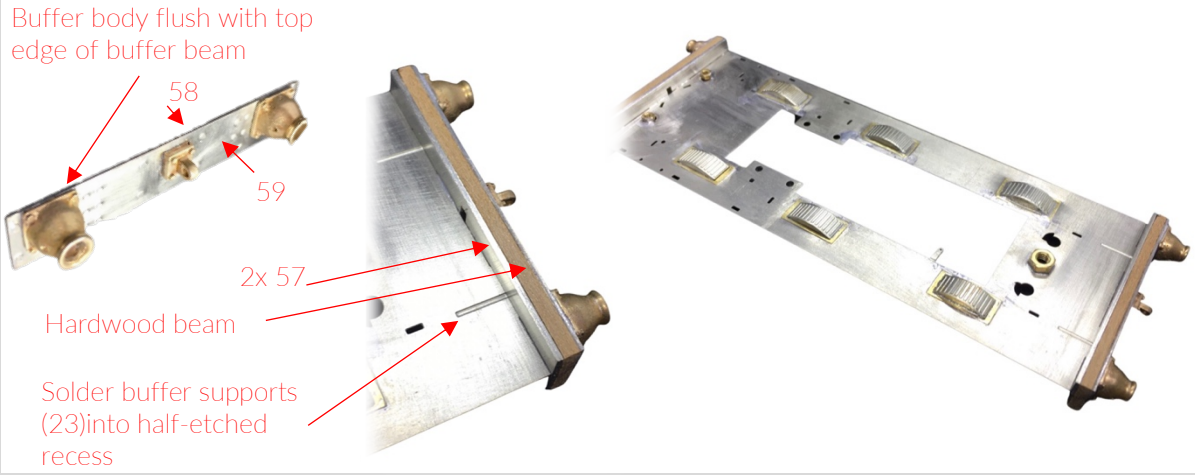


Fig 2.4 – Buffer beams. Front and back buffer beams are identical

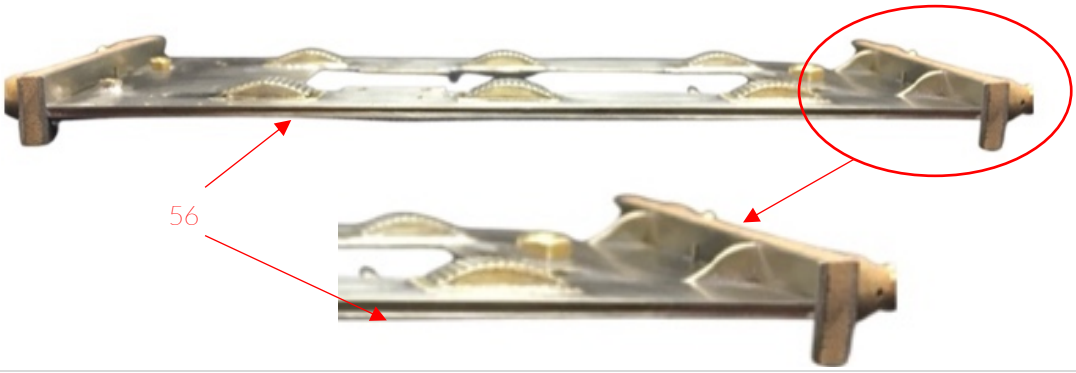


Fig 2.5 – Valances

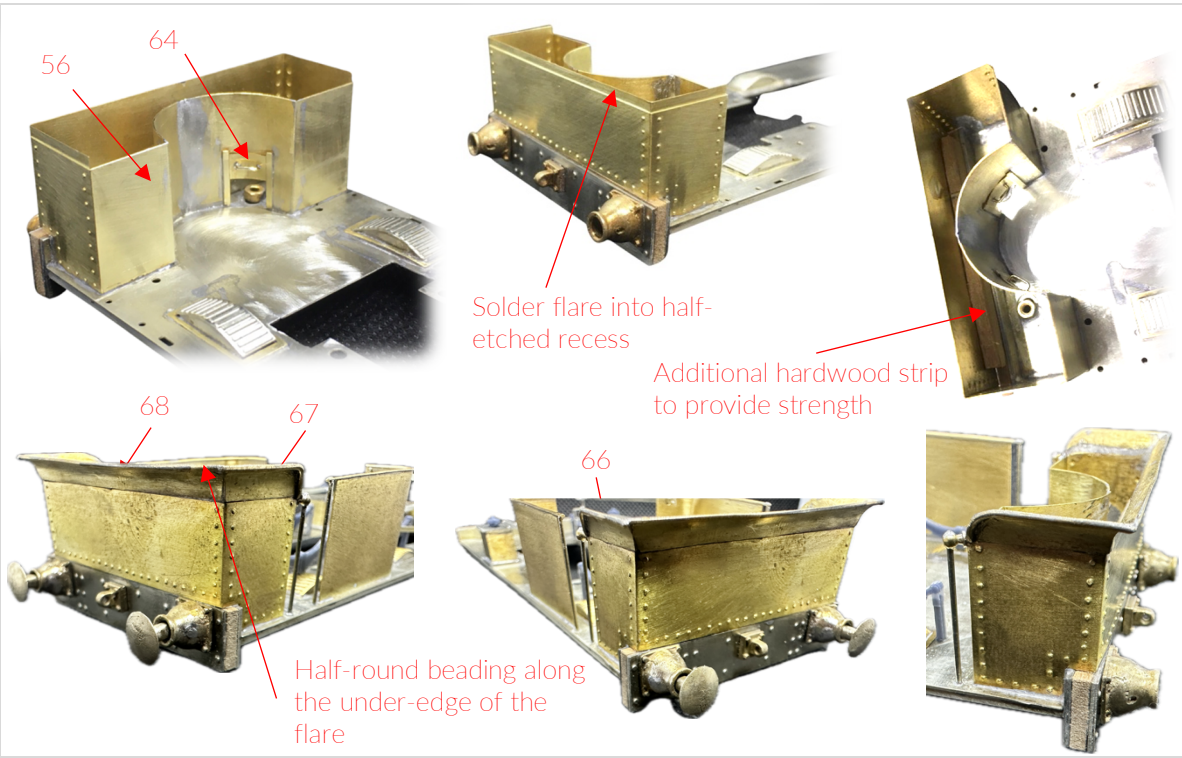


Fig 2.7 – The bunker is seated around the buffer beam, and should sit flush with the outer face.

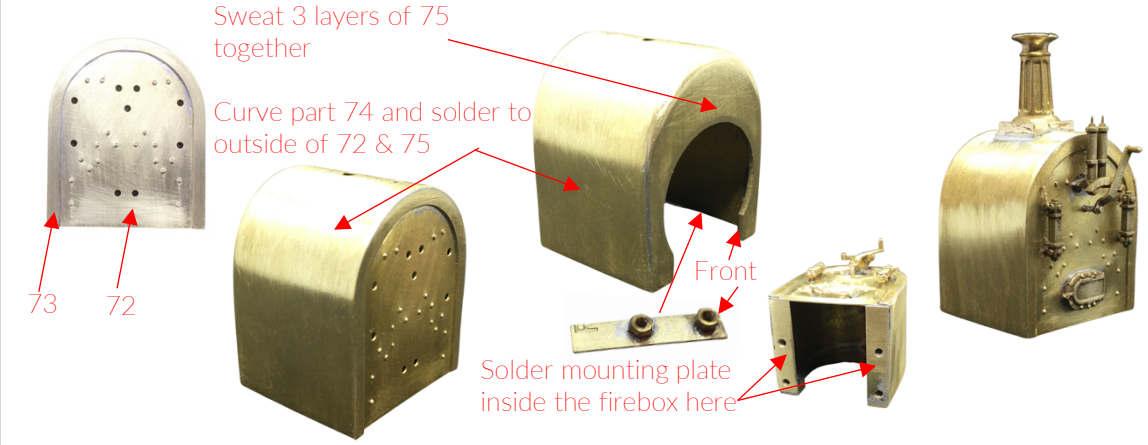


Fig 2.8 – The firebox & backhead

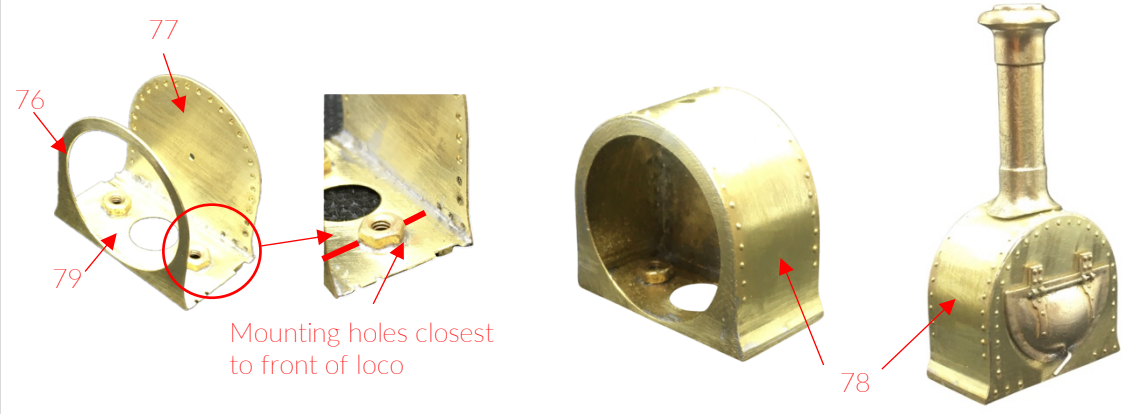


Fig 2.9 – The smokebox

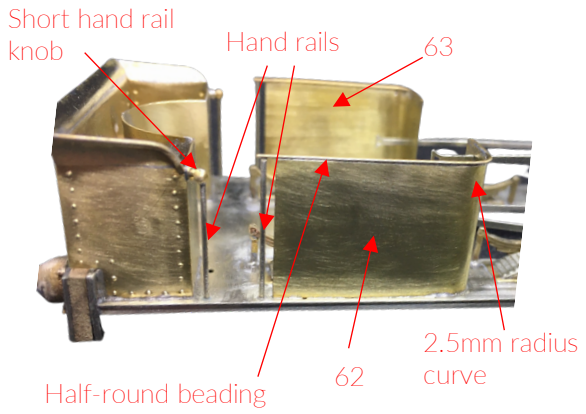


Fig 2.10 – Cab Sides

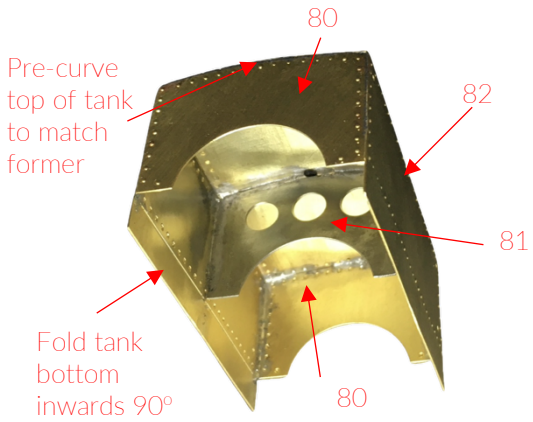


Fig 2.11 – Tank

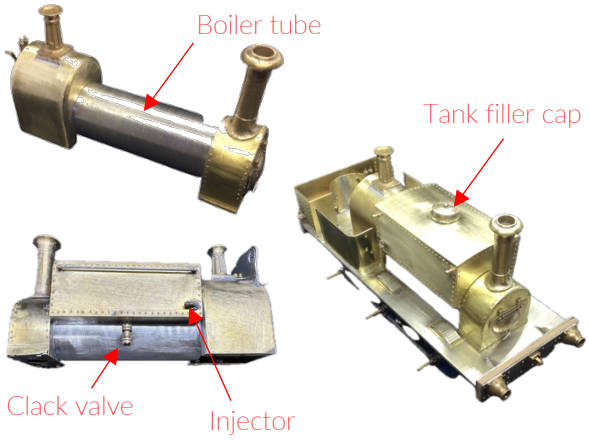


Fig 2.12 – Installing tank & fixtures

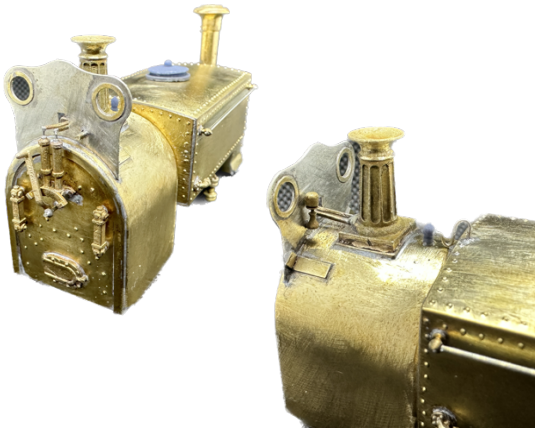


Fig 2.13 – Weatherboard

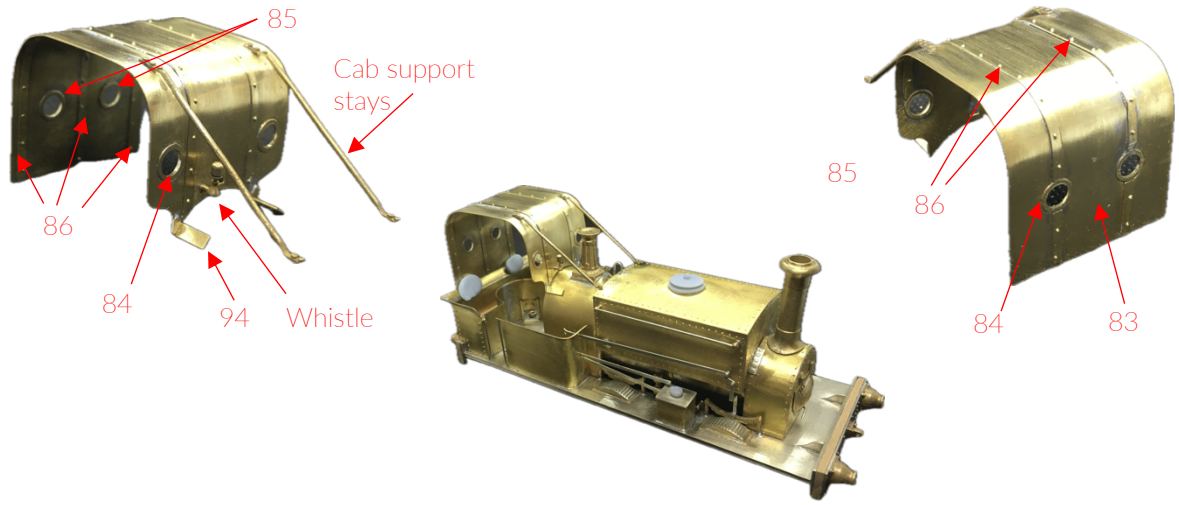


Fig 2.14 – Roof

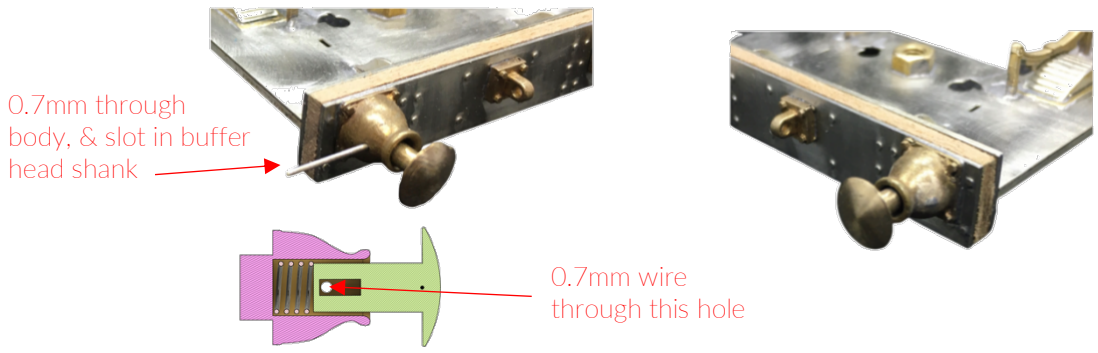


Fig 2.15 – Buffers

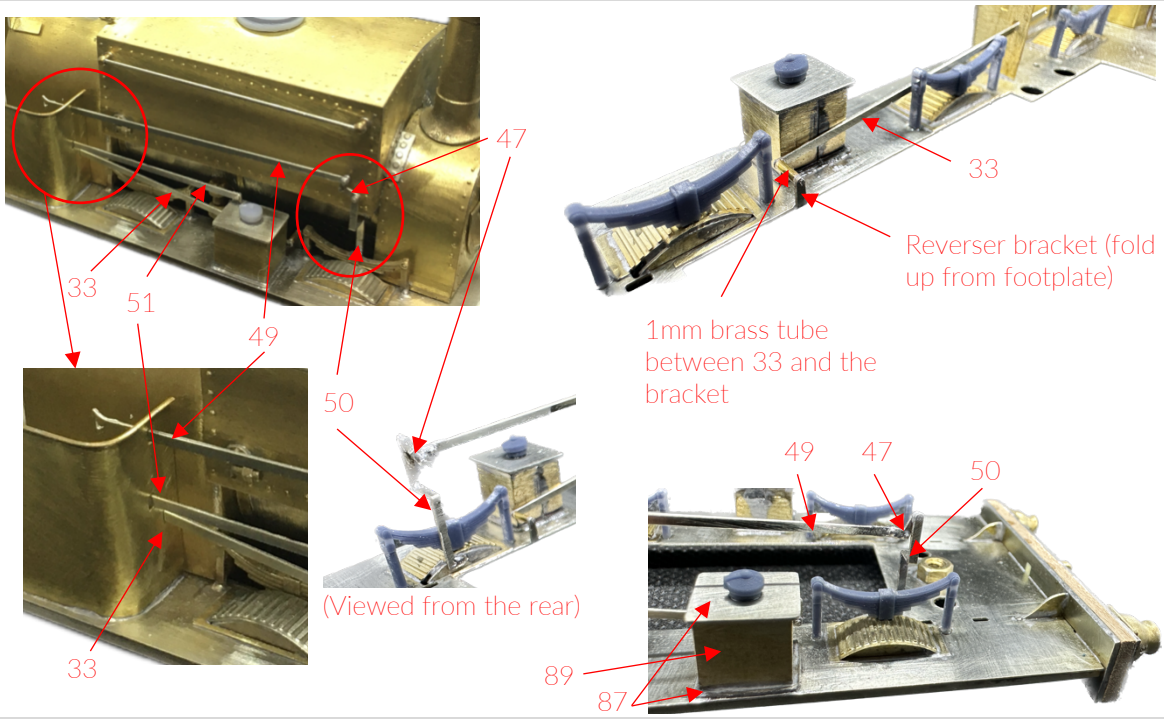


Fig 2.16 – Misc. items

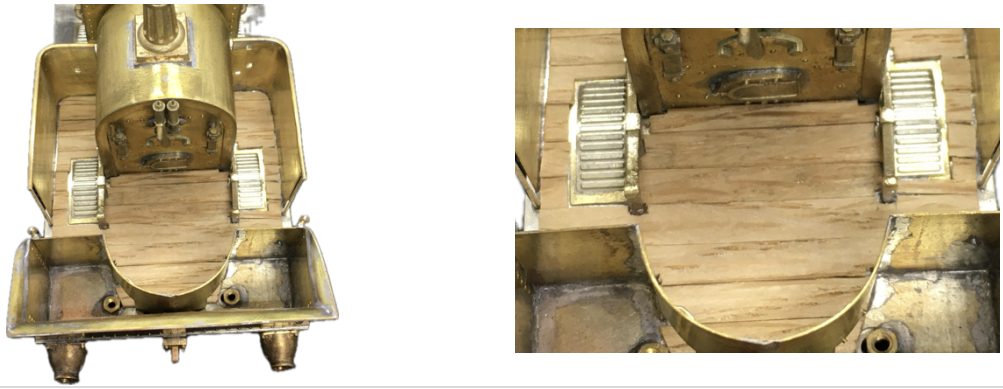


Fig 2.17 – Cab Floor

The finished model

3.0 – Wheels

This section is for wheels purchased from Engine-ious Models. If other manufacturers wheels are being used, please follow their instructions. Our wheels are designed to fit Slaters square-ended axels.

4.1 – Preparation. The wheels may need some preparation depending on your preferred method of fitting the crank pins. Our preferred method is to tap the crank pin hole in the wheel for 10BA, and thread the screw through from the back. For 10BA screw, there is no need to drill out the hole – it is pre-sized and ready to tap, with a counter-sunk hole ready to accept the crew head.

4.2 – Assembling. De-burr the square ended axels to ensure an easy push fit into the boss of the wheel. Screw a 10BA screw through the threaded hole from the back. Use a dab of glue to fix the screw in place. It may be necessary to lightly sand the back of the wheel to make sure the screw does not stand proud. When assembling with the coupling rods, place a washer over the crank pin screw, place the coupling rod over the crank pin, and secure in place with either a bush or a nut, depending on your preferred method. (Fig 4.2)

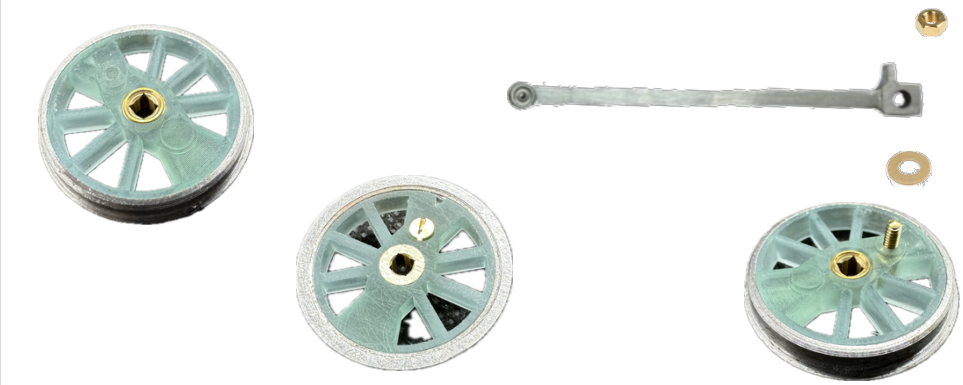
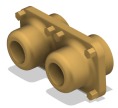
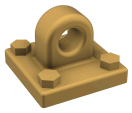


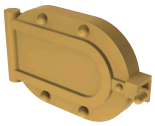
Fig 4.2 – Wheel assembly

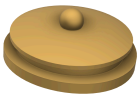
Appendix

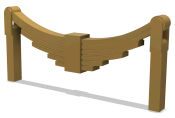
Castings Reference Guide

We've all come across unidentifiable, sub-standard castings before. We are confident that Engine-ious Model's castings don't fall into that category, but it's helpful to know what you're looking for in the little pile of brass goodies. Below is a guide to identifying the castings. Each casting has a reference number, which is referred to in the kit instructions. If you think you're missing one (hopefully not!), or it's not up to standard, please get in touch at hello@engine-ious.co.uk.

Ref#	Casting	Part	Qty
#C01		Blowdown Valves	2
#C02		Slide bars	2
#C03		Valve Glands	1
#C04		Buffer Housing	4
#C05		Coupling Chain Bracket	2
#C06		Buffer Head	4
#C07		Safety Valve Cover – Early Style	1
#C08		Safety Valve Cover – Later Style	1
#C09		Regulator & Salter springs bracket	1
#C010		Salter Spring linkage arm	2

Ref#	Casting	Part	Qty
#C11		Firebox Door	1
#C12		Gauge Glass - Left	1
#C13		Gauge Glass - Right	1
#C14		Regulator Handle	1
#C15		Lubricating Heating Valve	1
#C16		Chimney	1
#C17		Smokebox Door	1
#C18		Smokebox Door Handle	1
#C19		Injector Valve – Early Style	2
#C20		Injector Valve – Later Style	2

#C21		Tank Filler Cap	1
#C22		Clack Valves	2
#C23		Whistle	1
#C24		Cab Roof Supports	2

#C25		Sandbox Filler Cap	2
#C26		Suspension Springs	6
#C27		Handbrake Stanchion	1
#C28		Reverser Lever	1

Etched Parts List

Each etched part on the frets are all referenced in each step of the instructions, but here is a list for easy reference.

Sheet 1 - 0.4mm Nickel Silver

Part Number	Item
5	Chassis supports
6	Brake linkage lever
7	Brake block bracket (rear)
8	Brake block linkage arm (rear)
9	Brake block linkage arm (front)
18	Cylinder chest wrapper
19	Compensation rocker bracket
20	Compensation rocker bracket
21	Compensation rocker arm (right)
22	Compensation rocker arm (left)
23	Buffer beam supports
24	Fire box & ashpan
33	Reverser reach rod
34	Reverser linkage (spare)
38	Rear brake block laminating layers
39	Front brake block laminating layers
47	Draincock valve bracket
48	Running plate
50	Draincock arm vertical
51	Sandbox operating levers
53	Guard Irons (front)
54	Guard Irons (rear)
55	Brake pull rod
56	Vallances
57	Buffer Beam rear laminating layers
58	Buffer beam front laminating layers
59	Buffer beam front detail layers
81	Tank former
87	Sandbox top & bottom
88	Sandbox lid handle
90	Tank bracket (Smokebox)
91	Tank bracket (tank)
92	Smokebox door - flat option
93	Smokebox door hinges
101	Cylinder chest front laminating layer
102	Cylinder chest rear laminating layer
106	Firebox packing pieces
10a	Rear right brake block detail layer
10b	Rear left brake block detail layer
11a	Front right brake block detail layer
11b	Front left brake block detail layer
16b	Cylinder chest rear detail layer
16f	Cylinder chest front detail layer
31b	Chassis frame right (1/8" bushes)
32b	Chassis frame left (1/8" bushes)
107	Weatherboard

Sheet 2 - 0.4mm Nickel Silver

Part Number	Item
12	Frame spacer rear
14	Framer spacer front
15	Cylinder covers front
17	Cylinder covers back
31a	Chassis frame right (3/16" bushes)
32a	Chassis frame left (3/16" bushes)
49	Draincock reach rod
52	Flange covers
98	Packing washers front
99	Packing washers rear left
100	Packing washer rear right
103	Motion bracket/plate (front layer)
104	Motion bracket/plate (back layer)
25f	Coupling rod detail layer (right)
26m	Coupling rod middle laminating layer (right)
27b	Coupling rod rear laminating layer (right)
28f	Coupling rod detail layer (left)
29m	Coupling rod middle laminating layer (left)
30b	Coupling rod rear laminating layer (left)
95	Cab Steps

Sheet 3 - 0.3mm Brass

Part Number	Item
40	Splasher covers ridged
41	Splasher covers plain
42	Splasher surrounds
60	Dumb buffer facing plate
62	Cab side right
63	Cab side left
64	Bunker doors
65	Bunker
66	Bunker flare left
67	Bunker flare right
68	Bunker flare back
69	Firebox footing (left)
70	Firebox footing (right)
71	Regulator flange
72	Backhead
73	Backhead surround
74	Firebox wrapper
75	Smokebox front laminating layers
76	Smokebox back
77	Smokebox front
78	Smokebox wrapper
80	Tank front & Back
82	Tank
83	Cab Roof full
84	Spectacle plate rim
85	Spectacle plate rim Half etch
86	Roof strapping
89	Sandboxes
94	Cab roof fixing brackets
96	Cab step tread
97	Step reinforcement
105	Drop links
79	Smokebox Base
106	Horn block catch plate

Notes

ENGINE-IOUS MODELS

www.engine-ious.co.uk
hello@engine-ious.co.uk