Brassmasters Scale Models

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G.E.R./LNER/BR

J19/2 0-6-0

Locomotive and Tender

Designed For EM and P4 Gauges

Designed by David Barham

Instructions

1. Introduction

This kit consists of etched nickel-silver parts for the locomotive and tender chassis, etched brass parts for the footplate, cab and tender frames and 3D-printed resin parts for the boiler/firebox and tender body, which would otherwise require complex bending and rolling. The intention is that the etched parts should be relatively simple to assemble and provide strength where needed while keeping the parts thin.

The chassis is designed to use Brassmasters' rectangular EasiChas 1/8" bearings utilising the 'Continuous Springy Beam' principle.

2. Motor and gearbox

The kit is designed to use a High Level motor and gearbox. A High Level LoadHauler PLUS is the ideal configuration.

3. General Notes

There are three etches for the kit containing parts for both locomotive and tender. Numbers shown in square brackets [ ] in the instructions refer to the etch. The part number appears on the etch diagram at the end of these instructions. Certain items, e.g. bearings, buffers, bolts, wire, springs, are not numbered.

A number of the parts are small and easily damaged, so do please take care. Parts should be removed from the sheets as and when needed by use of a small scalpel etc., and the tabs and etch cusp removed with a small fine-cut file.

Some parts (e.g. the brakes) are designed to be held as a group by part of the surrounding etch for assembly, take care where this is noted in the instructions as removing the individual parts from the etch before assembly can make assembly more difficult.

All folds and bends are made with the half-etched line on the inside unless otherwise stated.

4. Before you start

Tools required:
A selection of cross-head and flat blade miniature screwdrivers
Small pliers
Small files
Soldering iron
A steel rule or set of bending bars to help with the long bends
Back to Back wheel gauge
For wheels without automatic quartering, e.g. Alan Gibson, the use of a GW wheel press and quartering tool is recommended.
A set of taper broaches to enlarge any etched holes as required
A variety of drill bits and a pin vice
Superglue and epoxy resin (24 hour and 5 minute)

5. Health and Safety

Different materials are used as appropriate for the detail and strength requirements of the individual components. **NOTE: DO NOT WORK ON THE 3D PRINTS NEAR A NAKED LIGHT, BECAUSE THE PRODUCTS OF COMBUSTION ARE HIGHLY POISONOUS.**
When sanding, take the usual precautions to avoid breathing in the dust.
Etched brass and nickel-silver can have sharp edges from the etching process, take care when handling.

6. Prototype notes

The Great Eastern Railway built thirty-five of these A.J. Hill designed locomotives between 1912 and 1920. The initial ten were fitted with super-heated 'Claud' type boilers and were designated as Class E72, the LNER reclassified them as J18. The remaining twenty-five differed from the original ten, dispensing with the piston rod end supports which had required a rather ungainly overhang to the footplate. The later locomotives were classified as T77, later J19. Between 1934 and 1939 all were rebuilt with round-topped boilers and fitted with vacuum brakes in addition to the original steam brakes, being reclassified as J19/2 as they were rebuilt. Un-rebuilt locomotives were classified as J19/1. After 1947, as all the locomotives had been converted, the '/2' designation was unnecessary and so was dropped with the locomotives simply being referred to as J19.

Initially allocated to March and Peterborough for use on heavy goods trains, they could later be found in all corners of the East Anglia including the M&GN. The first of the class was withdrawn in 1958 and the entire class had gone by September 1962. Sadly, none were selected for preservation.

The RCTS 'green book' on the J18/19 provides a comprehensive history of the class and can be accessed free of charge from https://archive.rcts.org.uk/locomotives-of-the-lner/. (Register on this page to gain access to the material). For more specific details on individual engines a copy of Yeadon's Register of LNER Locomotives Volume 41 covers the classes J18 and J19 and is available from Book Law Publications.

The Great Eastern Railway Society has excellent drawings of both the locomotive and tender available from their 'Files Emporium' – under references: LG019 GER and LG027 GER Tender (Standard, Large). These are available to purchase online from https://www.gersociety.org.uk/ and are available for non-members, but joining the Society is highly recommended as the resources available are excellent and the quarterly journal is one of the best from any of the 'line' societies. Prototype photos are essential if you wish your model to be accurate because there are several variations of both classes. We recommend the Rail-Online web site (http://www.rail-online.co.uk) where digital downloads or prints can be purchased.

Builders who want a J18 or J19/1 will need to purchase the additional parts etch from Brassmasters and swap the round topped boiler provided with this kit for the Belpaire version. **Please read the additional instructions provided with the conversion etch**

7. Order of construction

The instructions outline building the kit in several stages. Individual preference may mean the builder may wish to complete these stages in a different order.

Locomotive chassis - sections 9 to 24

Locomotive body - sections 25 to 29

Tender construction - sections 30 to 36

8. Notes on handling the 3D prints

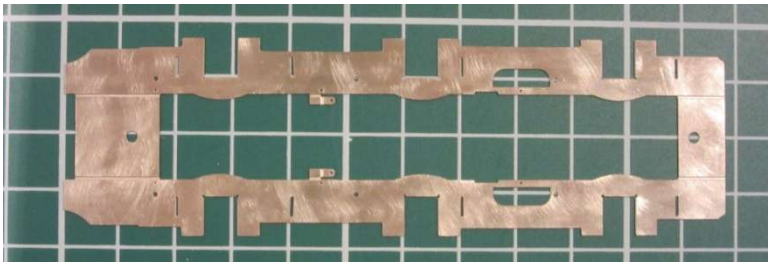
Several of the parts are supplied still on the printer support material and need to be removed. **The best method is to use a piercing saw to cut just above the flat plate of the support. Once removed the individual support pins can be cut off with a pair of side-cutters. The resin, while strong, can be brittle. Avoid trying to cut the resin with a knife as this will tend to make it shatter being more easily cut with a piecing saw or file**. The resin can also be drilled or holes enlarged with broaches. It can be glued using high viscosity superglue or two-part epoxy. Fine wet and dry paper and any epoxy based filler can be used for finishing.

9. Frame design

The locomotive mainframes are designed to fold-up to give a dimension over the frames of ~14.8mm. This width is a compromise because the most popular choice of wheels is likely to be those from Alan Gibson which have a quite substantial boss on the rear of the wheel. Parts are included to allow for the chassis to be built with wider frames ~15.8mm that is nearer to scale which can be used in P4 if you have wheels which do not have such a large wheel boss. The fold-up width should be suitable for EM too but check the rear-of-the-wheel to rear-of-the-wheel (which may be less than the back-to-back) dimension before committing. Parts are also included if you need a narrower frame for EM or OO.

The functional tender chassis is designed to accommodate P4 or EM gauge wheels and will be too wide for OO. However, it is relatively straightforward to remove the central section from the etch and re-adjust the width, just soldering the sides to the frame spacers.

10. Locomotive main frames



a. Remove main frames [L1] from the nickel-silver etch.

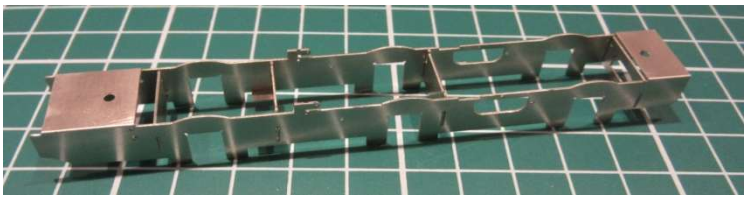
b. Remove the frame spacers [L2-5], frame braces [L6], guard-irons [L7], regulator handles [L8] from inside the main etch part

c. Remove the etch cusp from the outside of the parts (**leave the inside of the hornguides for now**)

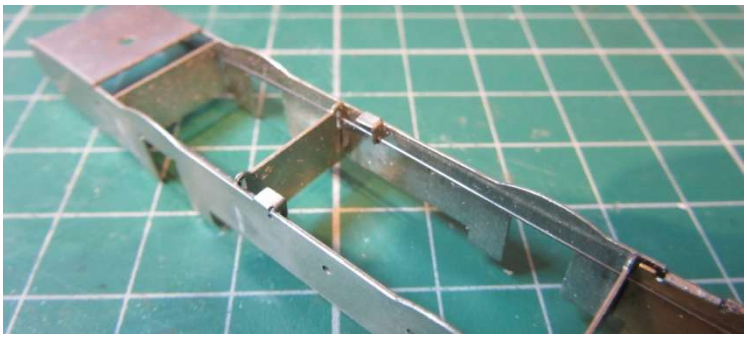
d. Fold the etch so that the sides are at right angles to the two middle spacers, ideally do this with a pair of long bending bars but if you don't have a pair long enough then just bend each end a little bit at a time until they create the desired right angle. Once bent the frames should sit on a flat surface without rocking.

NOTE. The frames fold up to give a width of 14.8mm, if you want a wider frame spacing for P4 or narrower frame for EM or OO then the alternative spacers [L2a-L5a] should be used. The recommended approach is to cut the rear folder frame spacer in part [L1] by cutting a slot through the middle of it 4-5mm wide. Then fold up the frames around the front spacer. Solder the rear spacer[L5a] in place, this will mean the frames are bending slightly inwards but will remain aligned. Then cut the front folded spacer, removing a 5mm slot down the centre and replace it with the narrower version [L2a].

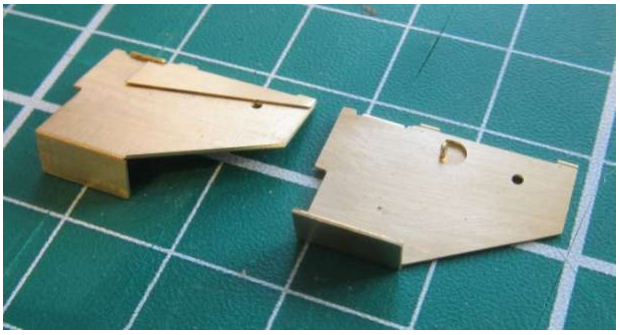
NOTE. The Alan Gibson wheels may be supplied with a large boss behind the wheel. This may reduce the amount of side-play available and in some cases necessitate using the narrower frame spacers. An alternative is to remove most of the boss by gentle sanding the rear of the wheel.



e. Fit the frame spaces [L2-5] (or alternatives [L2a-L5a] into position). [L2 and L5] are at the ends of the frames and have round holes for the spring wire, take care when positioning these that the holes are at the top. [L2], which is at the rear, has a central hole for routing wires. The two with slots [L3 and L4] are towards the centre of the chassis. The slots are positioned at the top of the frames, these allow the spring wire to move vertically for the suspension. The spacer with the half-etched bend line [L4] goes in behind the front axle with the horizontal bent section facing forwards.



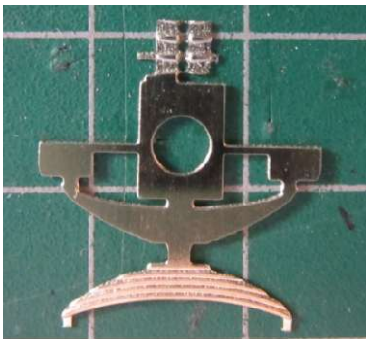
Fold down the two suspension brackets on the top of the frames, strengthen the bend with a touch of solder but **take care not to fill the hole for the wire**.



f. The final spring suspension point is part of the detailing for the firebox. Remove parts [LB1]and [LB2] from the brass etch 2. Fold the spring mounting eye and the firebox base inwards (half-etch on the inside), the location tab outwards and then the half-etched triangular section fully round back on itself. The parts can be located in the frames using the location tab you folded down and the slot on the top of the frame. You can also thread a length of 0.8mm wire through the hole for the brake pivot. The front of these smokebox details should fit against the frame spacer.

g. Test fit a length of spring wire through the supports on each side of the chassis. The wire should fit through the supports in a straight line, parallel to the top of the chassis in the horizontal direction and the side of the chassis in the vertical.

11. Horn block preparation



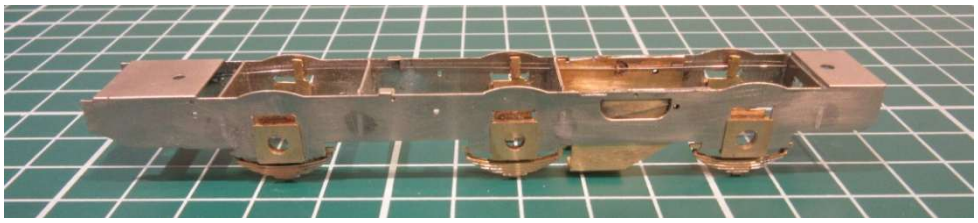
a. The Brassmasters bearings should be a sliding fit in the horn guides on the chassis etch. This should be achieved with some gentle filing with some fine emery/grit paper. Do this a few strokes at a time on each side of the horn guide so that the amount of material removed from each side is even.

b. Remove the locomotive springs [LB5] from the brass etch 2 (there is one spare).

c. Fold over (180 degrees) the cosmetic spring detail on the bottom **with the half-etched spring detail on the outside**. The spring carrier on the top is also folded over **but with the half-etched slots facing each other** to give a route for the spring wire. Apply some solder to the cosmetic spring but **leave the spring carrier clean** as you do not want to clog the wire holes with solder.

d. The Brassmasters bearings have a thick side and a thin side. For EM it is recommended to **solder the spring etch to the thick side of the bearing** so that the thinner bearing side is outside the chassis frame and hence gives more side-play. For P4 the two out axles are best to be soldered to the thin side as this removes the side-play. Alternatively, just use the bearings with the thin side nearest the wheel and control the side-play using some of the included etched washers. Tin the area around the central hole and then solder the Brassmasters bearing so that the holes are central and the sides of the bearing are parallel with the rectangular section of the etch.

e. The hornblocks can be fitted into the chassis and a length of spring wire slid through the pivot points and carriers to check that the bearings will spring smoothly.

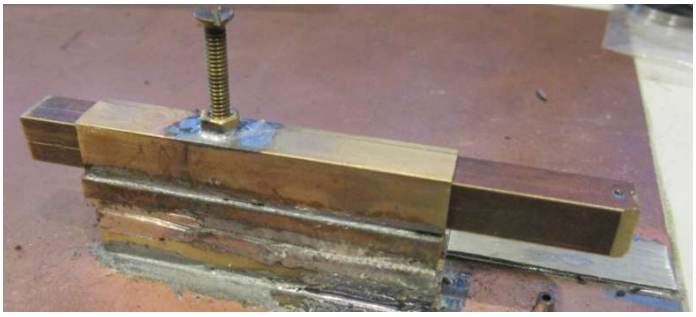


12. Motor and Gearbox

a. The motor and gearbox should be assembled as per the High Level Kits' instructions and tested. The 'Plus' part of the LoadHauler should be fitted at a downward angle such that, when fitted, the motor will sit in the centre of the boiler.

13. Preparing the wheels

a. The Alan Gibson 4'10" wheels appear to be some of those which come with the crank pin hole pre-drilled however you may find that the crankpin hole needs to be drilled out using a 0.65mm drill. **The hole must be perpendicular to the wheel.** If you need to drill them yourself, it is worth making a little jig to ensure that all the holes are drilled perpendicular and the same distance from the wheel centre. This is useful for all wheels where the crankpin holes need to be drilled and is re-usable on future projects.



The Gibson wheels have quite a large boss on the rear which fouls the head of the crank pin bolt, ensure that you cut away a section of this boss around the crankpin hole otherwise the countersink of the crankpin will tend to twist it 'off true' when it hits the boss.

b. The following will prevent problems with loose crankpins. Countersink the rear of the crankpin screw holes using a 3mm drill and half screw the 12BA screws home. Using 24-hour epoxy smear the remaining thread and screw the 12BA screws home. Smear a little epoxy over the head for additional security, but there should not be a big blob that will catch on wheel rotation. Leave in a warm place for 24 hours to set. This will retain the screws and stop them from rotating.

14. Wheel fitting

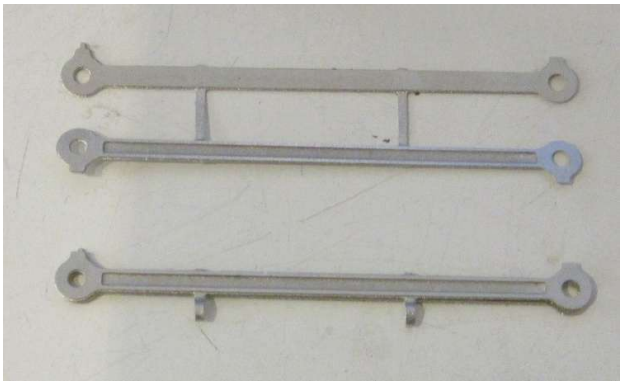
a. Check your axles are a smooth fit in the bearings, if tight ream them out to 1/8” using a reamer or, if you do not have one, a small round file, a precision drill or a broach.

b. If you are using Alan Gibson wheels you may find the axles are slightly over length for P4. They need to be approximately 22.6 mm long.

c. Ensure that the axles are free from sharp edges on the ends and that the ends are slightly rounded. Use a drill bit of around 5mm diameter to slightly chamfer the rear of each wheel axle hole. These two actions help the axle to ‘centre’ in the wheel when they are pressed on. Mount the bearings on all axles the correct way round, adding any spacing washers required. Finally, press the wheels on the axles. Use of a GW wheel press/quartering tool is highly recommended if you are using Gibson or other wheels which require manual quartering. Don't forget to install the gearbox and final spur wheel on the rear axle!

d. Press the wheels home with a back-to-back gauge between the wheels. This gauge should be an interference fit between the wheel backs with no ‘slop’. Ensure this is so by turning each wheel through 90 degrees to check for wobble, and, if present, twist the wheel. Quarter the wheels with the right-hand wheel leading the left-hand wheel by 90 degrees when travelling forwards. If you don’t have quartering tool, this can be done by setting the driven axle first, so that a wheel spoke is horizontal on one side and vertical at the other, then each other wheelset fitted is lined up with the horizontal spoke, the chassis turned over very carefully, and the spoke on the other side lined up by eye against those on the driven axle.

15. Coupling rods



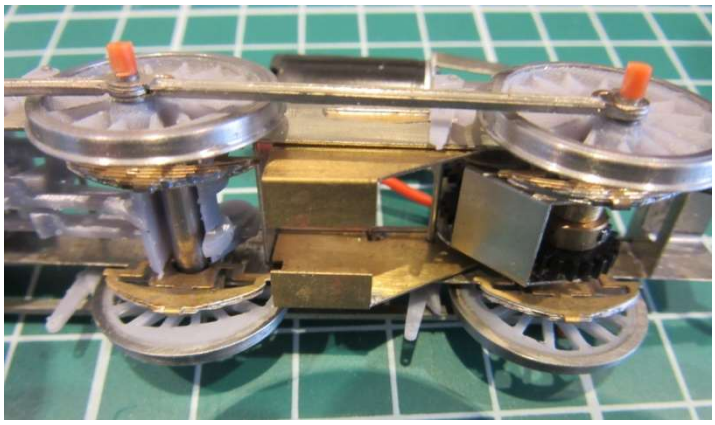
a. The rods [L9-L12] are designed to be jointed in the prototypical manner, the 'tongue' and 'forks' for the joint being formed by half-etching. On the J19 this joint was on the centre crankpin. One hint to aid construction is to remove the two main parts of each rod from the fret but leave the tabs in place. The rods can then be folded back on each other which means that the alignment can be set and held in place while the parts are soldered together.

b. Each rod has half-etched overlays [L9a-L12c] which can be fitted to the ends to make a thicker crank boss. It is easiest to align these parts if the rods are assembled with a suitable rod (e.g. 1.5 drill bit) threaded through the crankpin hole. Take care not to get solder into the slotted part of the joint as it will make the pivot stiff. If you do get solder into the slot then de-soldering wick is the ideal way to remove it.

c. Check each of the crankpin holes in the rod is a good fit over your crankpin washers. You will need to open the holes out slightly to get a good close fit. At this stage it is better to err on the 'too tight' side rather than 'too loose'.

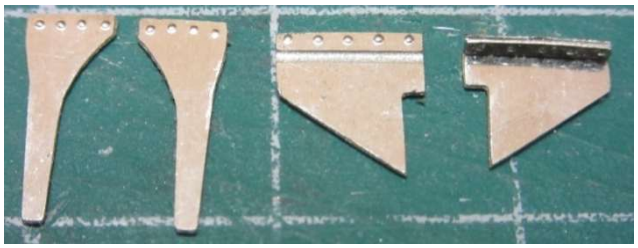
d. Fit your crank pin washers, rods and crankpin nuts to the wheels. At this stage you could also use a small piece of electrical wire sleeve (this does not come unscrewed unlike a proper 14BA nut! If your wheel quartering is correct, then you should be able to roll the resulting chassis along the bench without it binding. If it is binding check the quartering and check each crankpin in turn to see which one is stuck. If required, then slightly open up the crankpin hole in that rod. Do this carefully and a bit at a time - you can easily remove material while putting it back is much harder!

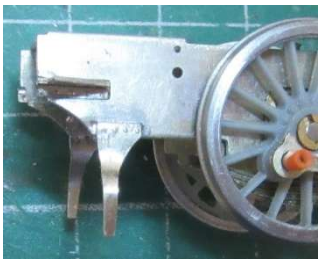
16. Locomotive pick-up



Using the locomotive wheels for electrical pickup is optional. Picking up from the tender wheels is perfectly adequate, particularly if you are using DCC and providing a 'stay-alive' capacitor on the decoder (for which there is plenty of room in the tender). If following this route all that is needed is to provide wires from the motor to the tender. If you feel locomotive pickups are necessary, then the bottom of the firebox provides a suitable flat surface on to which to glue a piece of copper-clad paxolin to solder wire pickups to. Another piece of copper-clad paxolin could be glued under the frame spacer between the two front axles but take care not to block the movement of the front wheel bearing.

17. Guard-irons and frame braces

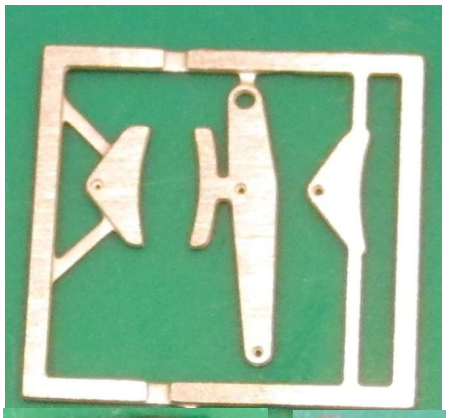




a. Press out the half-etched holes in the frame braces [L6] and bend up. Solder into the half-etched section at the front of the frames with the riveted section toward the bottom of the chassis.

b. Solder the guard-irons [L7] to the sides of the frame fronts and bend to position ending above the rail.

18. Locomotive brake blocks



There are two options for the brake blocks, the kit provides a combined 3D printed brake block and brake hanger or etched parts if you would prefer. The etched version will cope with heavier handling, but the 3D printed version has the advantage of being non-conductive and can't cause short-circuiting issues against the wheel rims.

Etched option:

a. Locate and remove the locomotive brake components [LB13] from the etch, there are 8 of these, you need 6 (2 are spares available as offerings to the carpet monster). Ensure that you can get a piece of 0.45mm wire through the central holes of the brake block and hanger, also that the top hole is opened to 0.8mm, doing this while the component is still flat is easiest using either a drill or small broach. The brake assemblies are 'handed' - four are available for each side of the locomotive.

b. For each set, bend the etch in a Z-shape using the half-etch lines on the frame with the half-etch **ON THE OUTSIDE**. Then flatten between the jaws of a small pair of pliers (use a set with smooth not serrated jaws as these could mark the metal). This will align the three components over each other for soldering. You can tweak the position if necessary.

c. Thread a length of 0.45 mm brass rod through the hole in the brake block, this will align the components together and form the bolt detail on the brake block. Cut this roughly off so it doesn't get in the way while soldering.

d. Apply some flux and solder from the curved face of the brake block, this will run in between the components and join them securely.

e. Remove the assembled brake from the surrounding etch with a sharp scalpel. Don't worry if the diagonal tabs on the rear brake don't come off too cleanly, they are totally hidden when on the locomotive or a small file will remove them.

f. Lightly run a small file around the hanger to remove the cusp and using a half-round file smooth the surface of the brake block where the 3 thickness of brass are laminated. If you slightly slant the file back from the front of the brake block you can give slightly more clearance between the rear of the block and the wheel tread which will help prevent any short circuits once the brakes are mounted on the chassis.

g. Locate the brake hanger brackets [L14] on the etch. Ensure that each of the holes is opened to 0.8mm, doing this while the components are still on the main etch is easiest using either a drill or small broach. The etch contains eight of these parts, giving two spares.

h. Separate one of the brackets and fold the pointed end into a U-shape, ensuring that the sides are parallel and perpendicular to the end. The distance between the short side needs to fit a thickness of etch so you could fold the part around one of the frames which surround the brake components. Then fold the end back on to the U-shape to form two layers of etch.

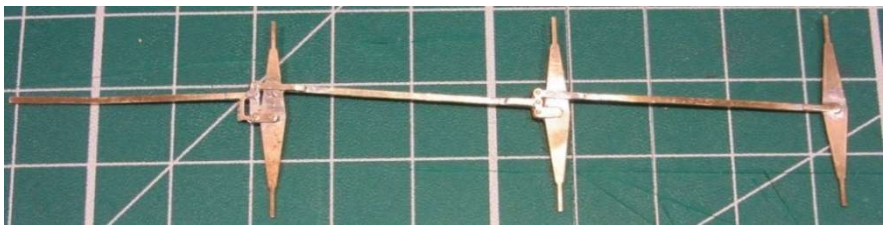
i. Apply a small quantity of solder to the part and then clean out the hole again to fit the 0.8mm wire. Feed a length of wire through the part and use this to hold it while you remove the cusps and any rough spots where the etch tabs joined.
Note that these hangers are handed, the more angled face is orientated towards the outside of the chassis.

j. Repeat this process six times until you have a complete set of brake blocks which can slide onto a length of 0.8mm rod. Ensure that you have three of each hand brake block.

3D printed option:

Four pairs of locomotive brakes are provided. The hole in top of the hanger should be opened up to 0.8mm and the bottom to 0.5mm. It is easiest to do this **prior to removing the parts from their base plate**.

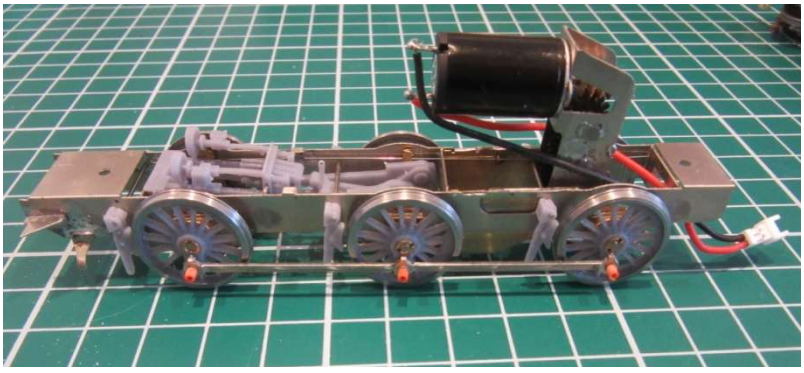
a. Remove the brakes from the base plate, this is best done by using a piercing saw to cut just above the base plate and then remove the remaining support material with a pair of flush side cutters.
b. The rear of the brake hanger is thickened to put the brake blocks in line with a P4 wheel set. EM modellers may want to sand a little off the back of these parts to bring the brake blocks back in line with the narrower gauge.



19. Locomotive brake pull rods

a. Locate the locomotive brake pull rod [LB7], there are overlays for each side of the joints [LB8,9,10). It is best to tin the joint detail parts and the areas of the main rod where these will be applied before removing them from the etch.
b. Solder the overlays onto the main pull rod. Leaving the main pull rod attached to the rest of the etch makes soldering the overlays on easier. Once assembled remove the rod from the etch and clean up the edges of the rod where the half-etch tabs supporting it were joined. Use a file to round the ends of the cross beams so they will fit into the holes in the brake hangers.

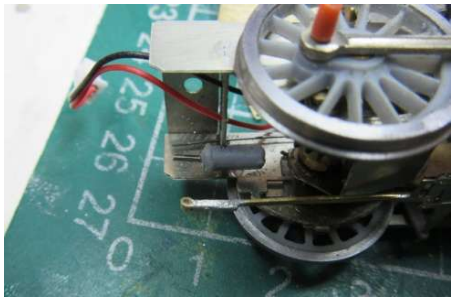
20. Assembling the locomotive brakes



a. Cut three lengths of 0.8mm rod 22mm long, thread these into the holes in the frames in front of each wheel. Solder in place. The rear rod will foul the gearbox and the middle one the cosmetic inside valve gear, but it is easiest to put it in place and solder to the frames and then remove the central sections of these rods.
b. Thread the brake blocks onto the ends of these rods. For the 3D printed brake blocks ensure that the face of the brake block clears the rear of the coupling rod, remove more of the rear of the brake hanger if required. At this stage <u>don't</u> solder/glue the brake blocks in place
c. Take the brake pull rod and, starting at the front, gently slide the ends of the pull rods into the bottom of the brake hangers. You may need to slightly open up the holes with a tapered broach. When fitted in place adjust the rod so that each of the brake hangers is the same distance from the tapered central section of the rod.
d. Adjust so that the brake blocks are the correct distance from the wheels and then solder or stick the top part of the brake hanger to the 0.8mm rod through the chassis. Remove the extra length of the cross beams, which is protruding from the hanger, leaving just a little of the metal to represent the bolt head.
e. The fit between the pull rods and the brake hangers is sufficient to hold the pull rod in position (especially once the end of the pull rod is secured to the rear of the chassis). Leaving this unglued/soldered will make it possible to removing the wheels later for painting or service.

21. Brake cylinder and linkage

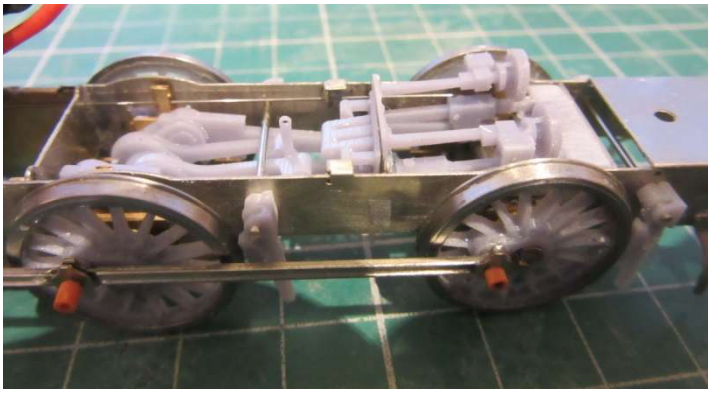
a. Drill a 0.8mm hole in the rear of the brake cylinder 3D print LD13. Insert a short length of 0.8mm rod into it, stick this to the rear frame spacer in line with the brake pull rod.
b. Stick the cylinder in place on the rear frame spacer in line with the brake pull rod.
c. Fold the end 5mm of the brake pull rod 180 degrees back on itself around a piece of 0.45mm wire bit to form a loop and solder together.
d. Thread the two brake pull cranks [LB11] onto the wire using the centre hole and solder.


e. The top of the brake pull cranks sit either side of the rod coming from the rear of the brake cylinder.

22. Inside motion

There are three 3D prints which can be used to represent the inside motion and valve gear. While these are not highly visible under the boiler, their absence is very noticeable. These parts are too wide to fit between the frames if set for OO.



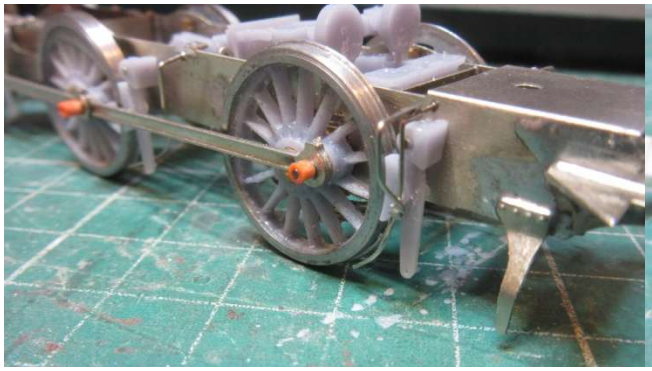
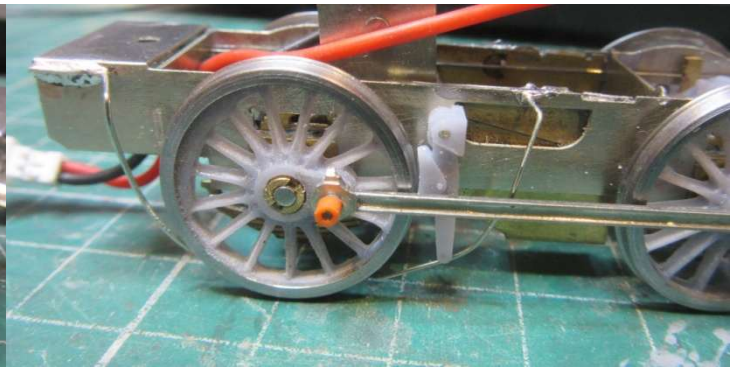
a. The central axle cranks fit around the middle axle and is glued onto the frame spacer between the front and middle axle. Care should be taken that the part is centred on the frame spacer and that adequate space is maintained for the axle to move and rotate. The part must not rub on the axle.

b. The valve gear fits between the two front frame spaces. The part should be centred on the spaces and aligned with the top of the spacers.

c. The front cylinder part sits in front of the front frame spacer and has a hole for the body fixing bolt. This part may need narrowing if you are using the narrower frame spacers. The top corner of the rear of the part may also need filing to clear the rod connecting the front brakes.

23. Sand pipes and sand pipe bracket

Sand pipes ran from the centre of each sandbox to just in front of the wheels above rail level and to the rear of the rear wheel. These pipes should be fabricated from 0.45mm wire and soldered to the top of the frames so that they are separate from the footplate. The front pair of sand pipes ran in front of the brake block and had a bracket which was level with the front brakes.

24. Locomotive wheel balance weights

a. There are two sizes of balance weight provided [LB42] are the larger weights for the centre axle and [LB43] the smaller weights for the front and rear axles. Check the position of these weights relative to the crankpin on your photographs and stick to the wheels. You may want to fill the area behind the balance weight to give a more solid appearance as the weights were cast as part of the wheel.

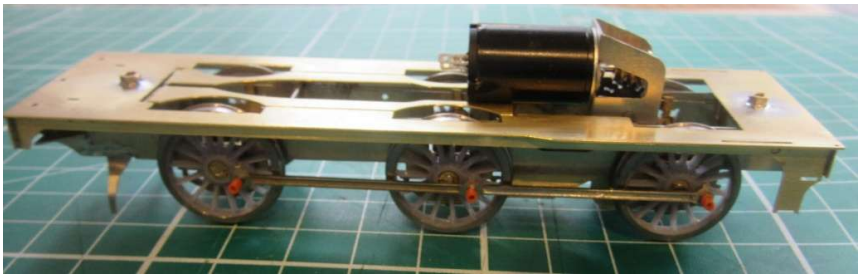
25. Footplate

a. Locate and remove from the footplate [LB14]. Remove [LB38] (not used on J19/2) and the frame fronts [LB32]. The top of the footplate is the one with two half-etched lines. Do not fold up the frame sides at this point as it is easier to solder on the valancing while the footplate is still flat.

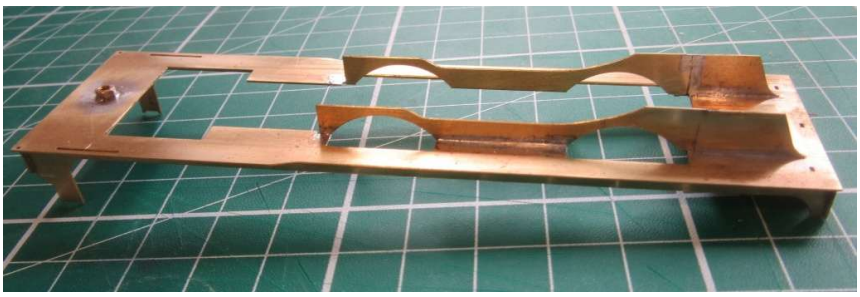
b. Locate and remove the two valance sides [LB15] and [LB16]. LB16 has a half-etch hole at the rear which needs to be drilled out if you are modelling the vacuum braked version of the engine which has the vacuum pipe running along the valance. Solder the valance onto the bottom of the footplate, inset by 1mm from the side of the footplate. On the J19/2 the footplate widens around the cab, but the valancing stays straight. The footsteps on the valance are at the rear. Ensure that the valance is straight and central on the footplate so that there is an equal amount of space at either end for the buffer beams. Double check you have the footplate the right way up, The valances solder to the side without the half-etched fold line. It is recommended that some small tack solder joints be created first at the ends and middle to position the parts prior to applying solder over the whole length.

c. Locate the front buffer-beam [LB19] and rear drag beam [LB20], remove from the etch and clean up. Solder the buffer-beams at the ends of the valances, they should be inset from the ends by about ½ mm. Ensure you get a good solder joint between the vertical back of the buffer-beam and the end of the valance.

d. Check for fit against the chassis, you might have to file a tiny bit off the end of the frames to get it to fit between the buffer beams. Solder a pair of 10BA nuts over the top of the holes at either end of the foot plate for securing the chassis. The best approach to this is to tin the top surface of the brass and then secure the nut tightly with a well-oiled bolt. With the nut secured down tightly it should be possible to solder the nut without getting solder into the threads.

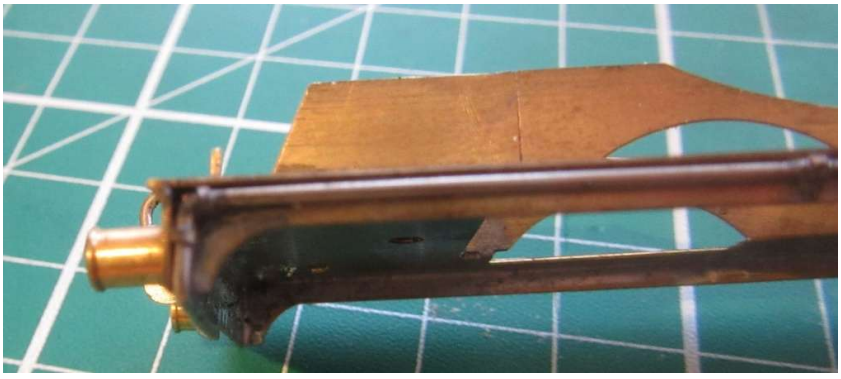


e. Now the valancing has strengthened the footplate the frame tops should be folded up vertically. Then the front of the frames [LB32] can be fitted into the slots in the front of footplate. These frame parts have a half-etched overlap for strength. A fillet of solder can be added along the bend line of the frames. Much of this frame is covered by the 3D printed sandboxes and wheel splashers later. The space between the frames needs to accept the bottom of the 3D printed smokebox so the solder joint on the inside needs to be kept neat.



f. Solder the buffers onto the buffer beam. The Alan Gibson buffers have a shank and a stepped washer; the washer can be fitted inside the buffer beam with its thinner diameter protruding through the buffer beam hole used to locate the buffer shank.

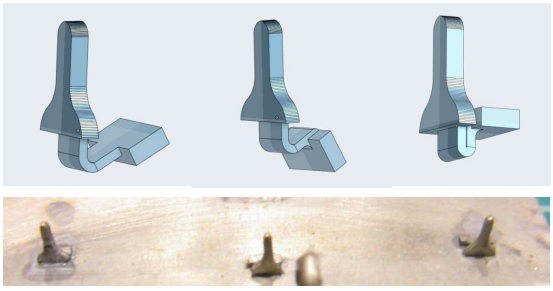
g. Depending on your prototype you may want to add the vacuum and steam heating pipe runs down the outside of the valance. The vacuum pipe (use 0.8mm rod) comes out of the hole in the valance at the rear and then runs along the LHS valance before curving down the back of the buffer beam. The joints in the pipe can be fabricated using off-cuts of the half-etch sprue between the lamp-irons [LB22] or fine wire. The wire can be bent into the shape of the flexible pipe on buffer beam.



h. A few J19/2 were fitted with steam heating for operating banana trains. The steam heating pipe on the RHS (use 1mm rod) was lagged and was a plain pipe down the right-hand side of the locomotive. The pipe ended short of the front buffer beam and a smaller diameter section (use 0.8mm rod) including a T-joint ran down just before the back of the buffer-beam.

i. Locate the four cab footstep treads [LB17], bend up the ends of each footstep and solder into the slots on the valance. The tender footstep detail strips [TB8] can be used to add the thickness of the metal above the step treads but this is very fiddly and virtually invisible.

j. Remove the three lamp irons [LB21] from the etch. These should be bent up so that the half-etched plate is at right angles to the top of the lamp iron leaving a tab which slots into the footplate. If you can't get the bend right, they can be cut into two and the two parts fitted into the slot. You just have to hold both parts while you solder. Solder the lamp irons to the footplate using the tab created by the fold to locate them.



k. Attach the coupling hook [L13] to the front buffer beam.

26. Cab

a. The hole etched for the whistle is too low, a new hole 0.7mm needs to be drilled 4mm below the edge of the roof curve in the centre of the cab front.

b. Start with the cab front [LB24], soldering the window beading overlays [LB26] into the half-etched recesses. The two sections in the middle of the cab front should be folded forward and the bend strengthened with solder, but it is better to do this after the sides have been attached.

c. The left-hand cab side [LB23] is fitted with overlays [LB27] and the right-hand cab side [LB25] with overlays [LB28].

d. Solder the cab sides to the cab front. The front goes inside the sides. Tack solder at a few points and ensure everything is square before finishing the joint with a bead of solder.

e. Next fit the two beading pieces [LB30] to the curved parts of the cab entrance. Start by creating a bend at the bottom end of the beading such that the hole for the hand rail will give the correct distance between the handrail and the cab side ~0.6-0.7mm. Using a round tool such as a small round file press the beading to take the curve of the bottom of cab entrance. Then move up the beading gently pushing the half etch groove into the cab entrance before making the top bend tight with your round file. The beading is deliberately over-length and should be cut off flush with the rear of the cab once it has been soldered into place.

f. The cab roof [LB4] needs to be rolled over. If you have a set of rolling bars this is very easy. However, if you do not have access to them, it is not too difficult to roll by using a relatively hard surface (hard rubber or even your knee) and a large round bar or tube. Just take your time and check regularly that you are getting even pressure and an even bend. Check the fit against the cab front.

g. Solder the cab roof to the front first, just apply a few solder tacks first ensuring that the roof protrudes from the cab front by 1mm and equally over each of the sides. Next apply a couple of tacks to the cab sides where the roof meets the back of the cab. The roof should protrude 1mm out over the very rear of the cab. It is very important to keep the sides of the cab parallel as if they bend inwards at the top this will result in the cab roof sinking towards the back. If they bend outwards, then the rear of the roof would be too high. It can be useful to position the cab sides into the slots in the footplate to hold the bottoms square, but you should still be careful not to squeeze them inward.

h. Attach the roof vent [LB4a] and plated section [LB4b] as appropriate, the plated section will need a fair amount of heat to sweat in place. The rain strips [LB29] should be soldered onto the roof. These sit with their thin edge against the roof, fitted into the half-etched arc on the roof on the J19/2. This is another instance where you should just tack with solder in a couple of places and adjust the position before flowing a bead of solder along the length.

i. Attach the cab front footstep into the slot on the RHS of the cab.

j. Add the cab side handrail knobs (short) and the cab side handrails made from 0.45mm wire.

k. It is best not to solder the cab to the footplate until after the boiler has been fitted, that way it is easiest to fit the boiler butted up against the end of the frames and the cab butted up against the end of the boiler. Otherwise, you have to wiggle the boiler in between the frames and cab. The small bit of soldering needed to fasten the tabs will not damage the boiler.

27. Footplate detailing

Some of this detailing is done more easily if parts are completed before the main boiler is attached.

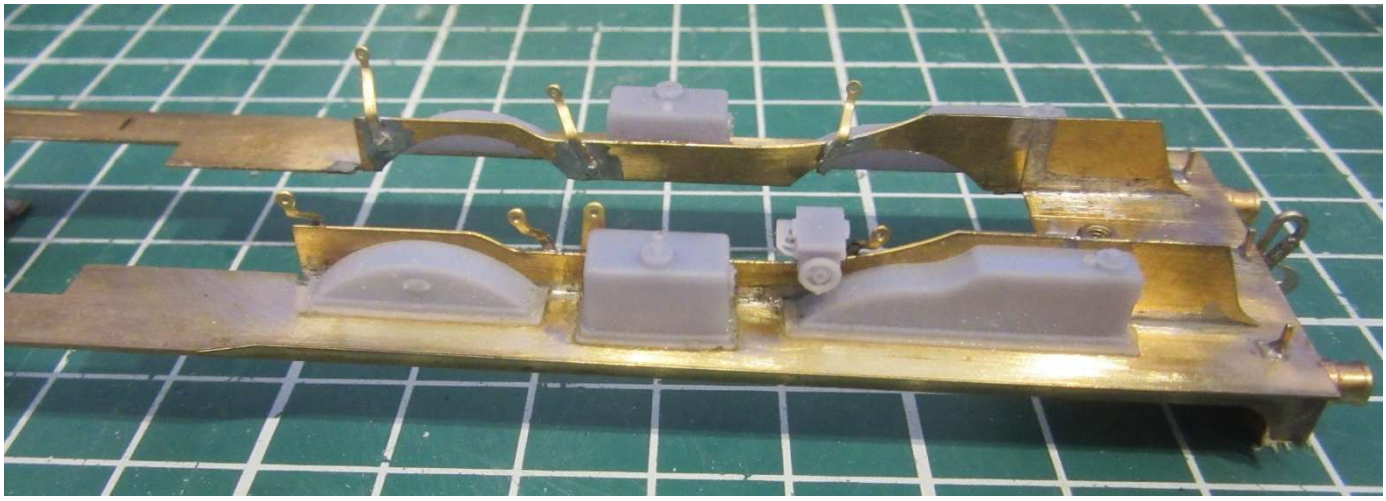
a. Sanding gear levers

The linkage from the cab to the sandboxes was relatively complex. On the left-hand side there were three rods which extended out from the cab, these had bends in them to provide access to the boiler wash-out plugs. The frames had little levers which connected to these rods and transferred the movement to opposite side of the locomotive. At this stage soldering these cranks to the inside of the frames is easy as the boiler isn't in the way. These cranks are bend outwards such that the top of the crank is roughly in-line with where the end of the crank arm on the sandbox will be.

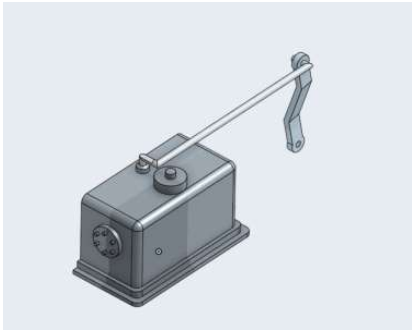
b. The final crank for the reversing lever [LB12] can also be soldered to the frames at this point.

c. Locate the front and centre wheel splashers and the centre sandboxes [3D15], [3D16], [3D17], (ensure that the holes for sanding gear rods in the tops can accept a 0.45mm wire). These are best attached to the footplate with epoxy and this will give you time to adjust the position.

d. The mechanical lubricator has a number of options, you can either use the version with 3D printed pipe runs or, for a more detailed look, use the version with 3D printed holes to accept fine wire.

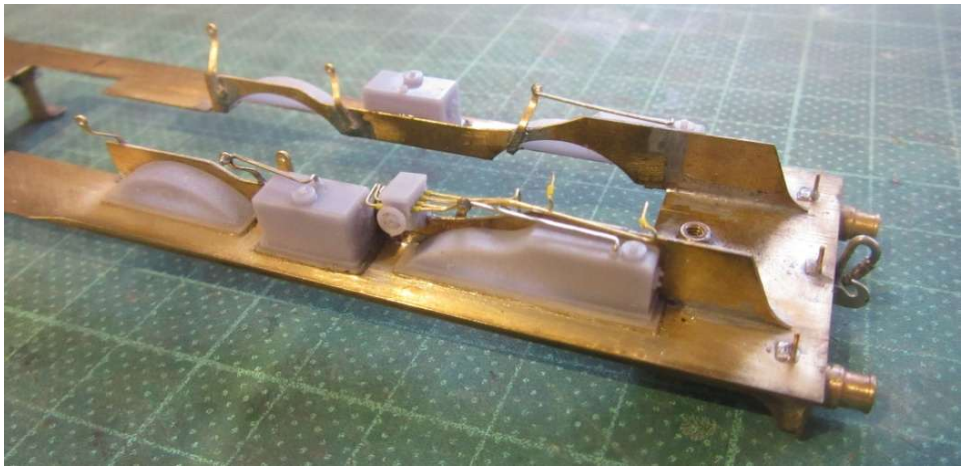


e. The linkage to the front and centre sandboxes can now be completed, again this is easier before the boiler is in the way. The linkage for the sandboxes is bent up from 0.45mm brass wire in a manner similar to the diagram shown depending on the orientation of the sandbox. The centre sandbox on the side with the main linkage can be done later.

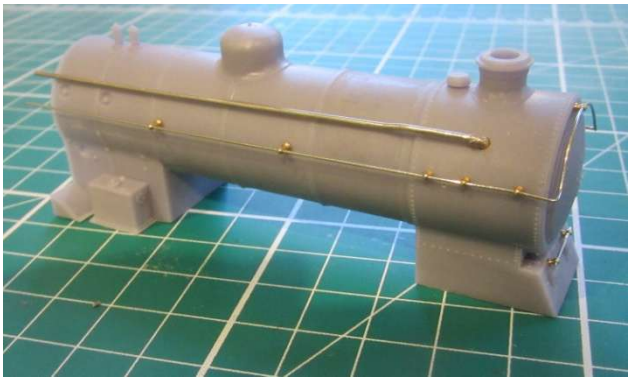


f. If you are adding the lubricator pipework from wire, rather than just using the 3D printed option, feed the wire through the holes in the lubricator and bend to shape. 0.3mm brass wire is a bit over-scale but smaller diameters are hard to obtain. As it is not possible to 3D print the flanges on the lubricator with a hole for the wire these can be represented by threading a tiny section of wire insulation over the wire. Insulation from DCC chip wires is extremely fine and suitable for this purpose. You can just see these (in yellow) in the picture below.

g. Depending on your prototype there may be two additional lines of plumbing from the bottom of the smokebox running in front of the sandbox and disappearing into the footplate. If these are present, then you will want to drill a pair of 0.5mm holes in the footplate just in front of the sandbox and into the smokebox saddle on the 3D print, 1mm up and 1mm forward of the two existing holes.



28. Boiler/smokebox/firebox



This part is provided as a single 3D print [3D1]. As provided, there are four strengthening pieces across the bottom of the firebox and it is recommended that these are only removed once the part has been stuck to the footplate.

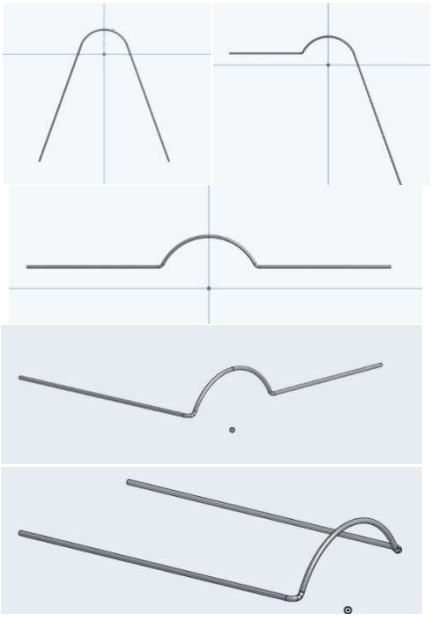
Modellers in OO and EM should check the clearance for the front wheels as it will be necessary to remove some of the bottom of the smokebox saddle to clear the rear of the flanges.

a. Gently sand the bottom of the 3D parts until you have a smooth surface without the remains of any print support pins. The underside of the boiler will benefit from some sanding because it needed to have some support structure when printed.

b. Open up the handrail knob holes to fit the shank of your handrail knobs, typically 0.8-0.9mm. There are two holes on each side of the boiler, two on one side of the smokebox and three on the other. On the smokebox front there is one above the smokebox door.

c. There are also two holes on the smokebox fall-plate just below the smokebox. Not all locomotives had these fitted, some appear just to have the remains of the handrail knob present and no rail. These are difficult because there isn't enough material to drill them out to .9mm. It is recommended to try and file down the shank of two of the short handrail knobs to ~0.6mm (put the knob in a mini-drill and spin the shank against a file).

d. It is easiest to bend the locomotive handrail at this stage before the cab and footplate get in the way. Take a piece of 0.45mm wire about 210mm long and start by making the bend the radius of the smokebox in the middle.
Next make the bend that would bring the wire back to the horizontal



At this stage thread the handrail knob for the front of the smokebox into place (one short handrail knob). It is easiest to do this before the tight bends have been made.

Then make a matching bend on the other side.
Then bend one side at right angles to run down the boiler side.
Finally bend the other side to match.

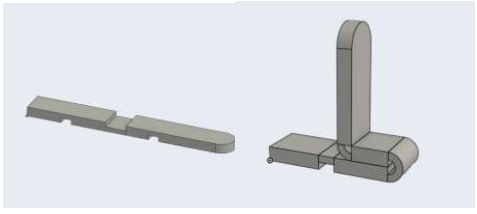
Thread through the remaining handrail knobs, short for the smokebox and two medium on each side for the boiler. Leave the rod overlong at this point; there are holes in the front of the cab into which the handrail should protrude by a few millimetres.

Stick the smokebox fall plate handrails into place with a short length of 0.45mm wire between them. This wire over-hangs the two knobs by about 0.5mm each side.

e. The G.E.R. used the hollow handrail to hide the rod used to control the damper in the smokebox. A small lever fitted through the smokebox and the rod ran behind the handrail. Use one end of a crank [LB33] cutting off to suit the required length and a short length of 0.45mm wire to make this little lever. Drill out the hole on the smokebox beneath the handrail to fit the rod and insert this part, rotating so that it points forwards and terminates under the handrail. You should shorten and round the end to suit.

f. Smokebox dart
Drill out the hole in the centre of the smokebox and fit the smokebox dart

g. Smokebox lamp iron
Drill out the hole in the smokebox above the smokebox door, fold up the smokebox lamp iron [LB22], strengthen with a touch of solder and stick into the slot in the top of the smokebox.



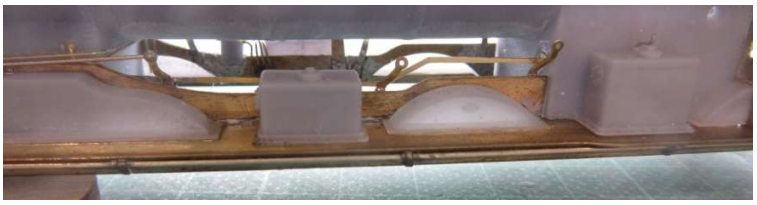
h. The smokebox/boiler/firebox print is best stuck to the footplate with epoxy.

Apply a thin bead of glue to the base and rear of the 3D printed part. Position the cab on the footplate, locating the two tabs on the bottom of the cab sides into the slots in the footplate. Position the boiler so that it is tight against the cab and ensure that it is centred along the footplate. Any glue which seeps out onto the footplate can be wiped off before it sets.

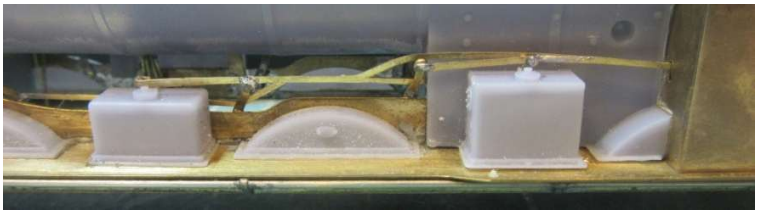
i. Solder the cab in position. Add the cab entrance handrails running from hole in the cab beading to the hole in the foot plate.

j. Locate the reversing lever [LB34], the end cover [LB37]. Bend up the end cover and solder over the lever, using a pin of 0.45mm wire to pin the front end of the lever into the crank soldered to the frames earlier. Solder the rear end into the cab.

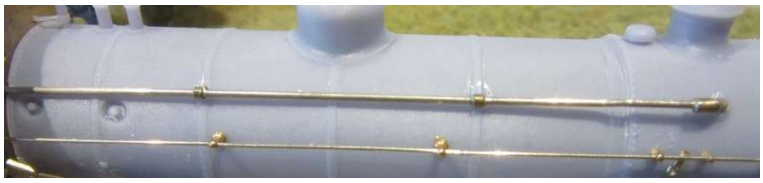
k. With the boiler in place the additional pieces of sandbox linkage can be fitted. The linkage to the front sandbox came behind the firebox lagging. This is the part with the steepest bend in it. [LB39] which ran from the front of the cab to the front pivot, running just above the level of the frames.



The remaining two rods ran from the hole in the cab front, the bent rod runs to the centre sandbox linkage and also connects with the central pivot lever. The final, straight, rod runs to the rear pivot and also connects to the rear sandbox linkage.



l. Use a piece of 0.8mm rod to make the vacuum pipe which runs between the hole in the front of the cab and hole in the smokebox. The rod needs to be bent at right angles to fit into the smoke box and kinked slightly at the rear of the smokebox so that it continues to run horizontally and parallel with the boiler. The brackets where the pipe is fastened to the boiler bands can be added from scrap etch or fine electrical wire.

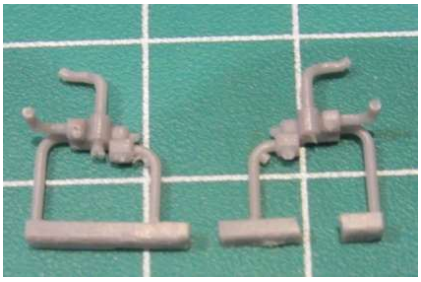


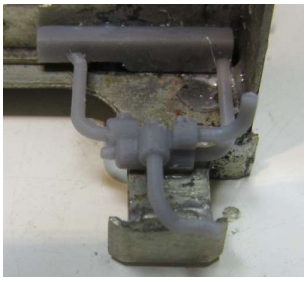
m. Whistle

A 3D print has been supplied to fit in the holes in the top of the firebox and the cab front. Alternatively, a commercially available turned whistle can be fitted.

n. Injectors

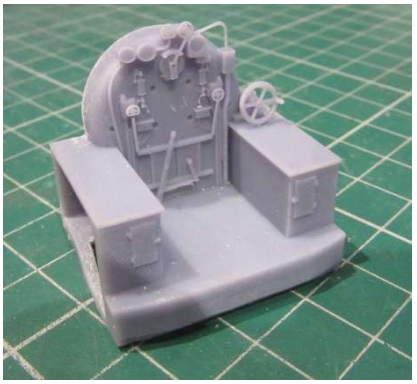
The injectors [3D11] and [3D12] are glued behind the cab footsteps, tight into the rear corner of the footplate. If you have fitted the vacuum pipe into the valance, then you may need to cut away the central section to clear.





29. Locomotive backhead and cab detail

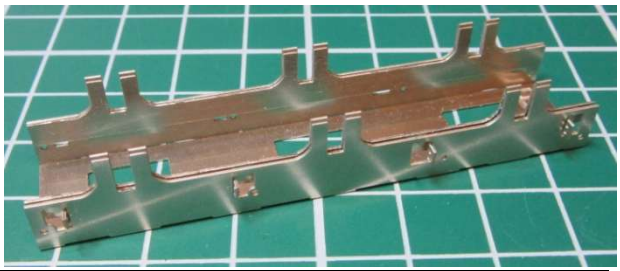
The boiler backhead and cab detail is a 3D print which slides into place in the cab. This part is intended to be removable because it needs to be fitted after the motor/gearbox has been manoeuvred into place in the boiler as the chassis and body are put together.



a. The 3D print [3D2] has space either side which are suitable places to put some lead weight over the rear axle. Weight can also be placed under the floor **but ensure that the centre is kept clear of the nut on the footplate** (and the end of the bolt which will stick through it).

b. Etch [L8] forms the regulator handle, the sharp edges of the handle should be rounded off with a file. The hole in the backhead should be drilled to fit the regulator.

c. The completed assembly slides into the cab and needs to be removable to allow the motor/gearbox space to be positioned into the boiler. Take care with the reversing wheel on the cab valancing which may need to be eased out to get past. Modellers in OO will need to remove some of the front of the part to clear the rear wheels.



30. Tender chassis

a. Remove the tender chassis [T1] from the etch and cut off the washers and brake handles [T3]. Put these somewhere safe.

b. The sides fold back on themselves along the outer fold line with the

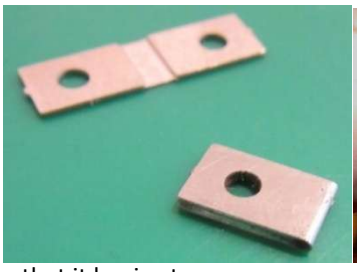
half-etch on the wheel guides **ON THE OUTSIDE**. Before they are firmly press together push out the spring carriers so that they protrude out of the side. Finally bend the two sides at right angle to the top to form the chassis. EM modellers may need to thin down the ends of the spring carriers to clear the narrower back-to-back gauge.

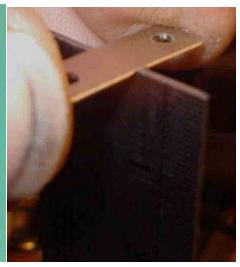
Modellers in OO will need to adapt the frames, removing the folded central section and soldering the frames back on these spacers at a suitable narrower width.

c. Solder the two thicknesses of nickel-silver which now form each side together, ensuring that the holes in the spring carriers do not get clogged with solder.

d. Using a small file or emery board ensure that the slots for the axles are smooth and wide enough for your axles.

e. Locate the bearing etches [T2]. There are seven of these so there is a spare available. Open the axle hole out to 2mm using a reamer or 2mm drill bit.





f. These bearings need to be folded over and soldered. **The half-etch side must be on the inside of the bend and the middle of the bend must be at the middle point of the half-etched section.** This allows the top of the bearing to be formed of a half-etched loop through which the spring wire can pass. This is best done by placing the etch with the half-etched middle section perpendicular to the edge of a rule, or similar, to form a 'T' shape. Push down on each end of the etch so that it begins to wrap over each side of the rule. See photo.

g. Ensure that the two holes in the bearing line up by placing an axle through the two holes before finishing the bend.

h. Once folded run some solder into the joint from the non-folded end, just use a little solder and ensure that the folded slot at the top of the bearing remains clear of solder as the spring wire passes through this fold.

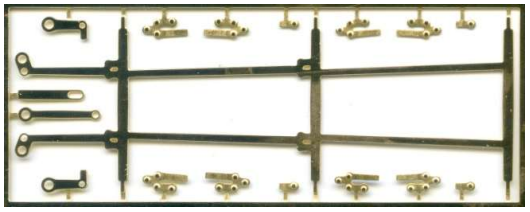
i. Fit the wheels through the bearings, you will probably want a couple of washers on the outer axles to reduce side-play, setting the back-to-back.

j. Thread the spring wire through the supports on the chassis and through the bearing. There are two options for the holes in the support brackets, use whichever suits your wheel size and desired weight.

31. Tender pick-ups

The inside of the frames provides a useful base onto which to glue a strip of copper-clad paxolin. A piece of sleeper strip being suitable. The strip will need to be shaped to clear the holes for the brake rods. Phosphor-bronze wire can be bent to rub on the wheel rims or threads, depending on your preference. Alternatively, a piece of paxolin can be stuck to the top of the cosmetic frames(see instruction 34) and the pickup wire bent to rub on the top of wheel treads through the holes in [TB1].

32. Tender brakes



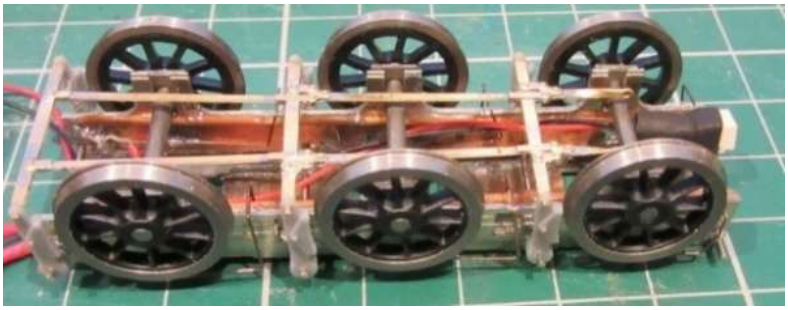
As with the locomotive, two options are provided, etched or 3D printed. Prepare in the same way using part [TB18] or 3D9.

33. Tender brake rigging

a. Cut three lengths of 0.8mm wire. Feed these through the holes behind the tender wheels.

b. Position your chosen brakes onto these wires.

c. Assemble the tender brake rigging [TB11] and the joint detail overlays [TB12-15] in a similar way to the locomotive brake rigging.



d. Twist the front ends of the brake rigging through 90° in front of the added etch overlays and the crank end so that the cranks point upward. Fit a short length of 0.45mm wire between the lower part of the crank and a length of 0.8mm wire between the two holes in the top of the crank threading the cranks [TB15] and [TB16] onto it. [TB16] should align horizontally with the brake standard, while one of [TB15] aligns with the brake pull rod on the locomotive. The other [TB15] can be used to link to the where the brake cylinder would be on a vacuum braked tender (not provided as it is hidden).

e. [TB17] provides the link from the end of [TB16] up to the brake standard. They can be soldered together with a length of 0.45mm wire providing the pivot.

f. Fit the rigging into the bottom holes in brake hangers.

34. Tender cosmetic frames

a. Locate the tender outside frames [TB1] in the etch. Remove and put aside the connected parts [TB5-TB9]. Fold up the sides, **ensuring that they are at right-angles**.

b. Locate the front tender buffer beam/tender footplate [TB2], remove and fold up the part and locate on the tabs on the front of the tender frames. Solder in place.

c. Locate the rear tender spacer [TB3] and the buffer beam. [TB4]
Solder the rear tender spacer [TB3] in place. This fits into the tabs on the rear of the tender frames.

d. Solder the rear tender buffer beam [TB4] onto the rear of the tender, **the beam should be inset from the edge of the flat rear plate** [TB3] by ~1mm.

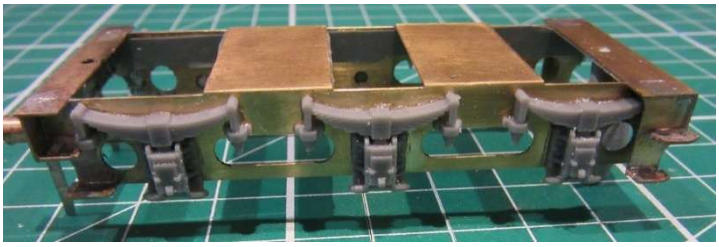
e. Solder the remaining pair of Alan Gibson buffers onto the buffer beam. You will need to file a flat on the washer part of these to clear the inside of the frames. (The frames were only very slightly wider that the centre of the prototype buffers.)

f. Solder the rear coupling hook [T4] into the buffer beam.

g. Solder the tender guard irons [TB10] into the slots in the buffer beam, add the rivet detail [TB10a] to the inward side of the guard iron

h. Locate the rear tender footstep treads [TB7] and the detail strips [TB8]. Turn up the ends of the treads. Solder the treads in place in the slots on the outside frames and add the detailing strips.

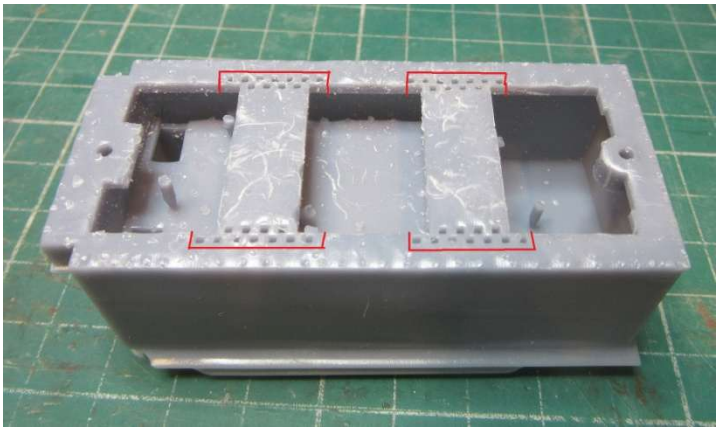
i. Solder the front footstep backs [TB5] into the slots on the top of the tender frames. Then turn up the ends of the treads [TB6] and solder the front treads into the slots on the footstep backs and add the detailing strips [TB8]



j. Glue the tender axleboxes [3D8] into the holes in the frames, the front pair tuck in behind the footsteps. **Ensure that the tops of the springs are parallel to the top of the frames and that the axleboxes are vertical**.

35. Tender body

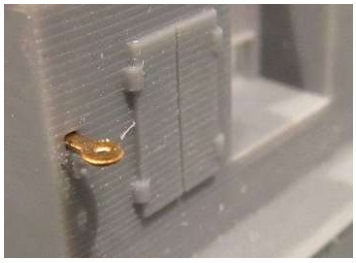
The tender body is another 3D print [3D7] The bottom of this should be sanded smooth and it may be necessary to lightly sand the flat tank sides to remove any artefacts of the 3D print process. The bottom of the tender, particularly at the sides may have a slight 'wobble' caused by the support structure, the base has been printed with a little extra depth so that this can be sanded away while retaining the right height of the tender side. The top surface of the tender rear also has layer lines on it which will benefit from some sanding, even just a wipe with a fibre-glass pencil.



a. Drill out the two mounting holes in the bottom of the body and cut the heads off one short and one long 10BA bolt. Glue the remaining threaded shaft into the holes, the long front one protruding by about 7mm (to act as part of the tender/locomotive coupling) and shorter one at the rear by 5mm. The bolts should align with the holes in the tank frames and also with the tender chassis.

b. Using the cosmetic frames as a guide and the chequer-plate holes in the 3D print, remove the two central parts of the tender base to clear the central sections of the cosmetic frames so that the ends sit flush under the 3D print. This cutting can be done using a short length of piecing saw blade held in a pin vice.

36. Tender detailing

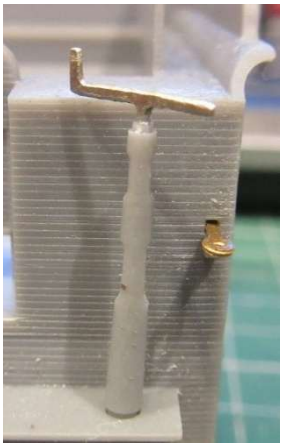


a. Locate the tender handrail brackets [TB9] (there is one spare). These fit into the holes on either side of the tender front. These holes may need drilling out slightly to make these fit. Glue these brackets into the tender body, the centre hole in the bracket needs to line up with the holes in the etched tender footplate so as the handrails on the front of the tender will end up vertical. The photographs show a straight bracket but the J19/2 bracket bends outwards to match the wider cab end.

b. Checking the photographs of your prototype to see if the area behind the handrail was plated in. If so, fix the plating [TB21] in line with the handrail by drilling two holes into the 3D print and gluing in place.

c. Drill out the holes for the handrail knobs on the rear of the tender and on the side at the rear. Drill the holes on the sides at the front 0.5mm for short bent up handrails which do not feature knobs on the ends.

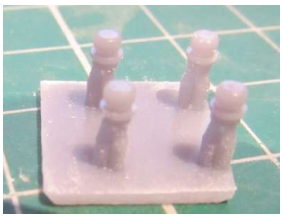
d. Fit the tender handrails. The horizontal handrail on the back requires three short handrail knobs and the handrails towards the rear of the sides two short handrail knobs each. Bend two lengths of 0.45mm wire to form the short handrails on the front of the tender sides.



e. If you would prefer to have etched lamp irons rather than the 3D printed ones on the rear of the tender these are included as [TB19]. File the 3D printed ones off the rear of the tender and fold up and stick the etch ones on instead.

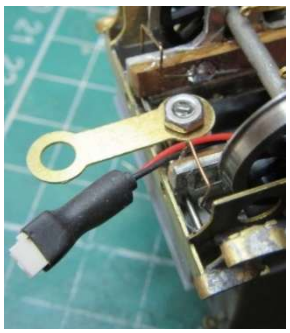
f. Fold up the etched centre lamp-Iron [TB20] and attach onto the centre of the rear flare.

g. The kit includes parts for the tender brake standard [3D10] and [T3]. Drill a hole into the top of the tender brake standard and smooth out the hard edges of the etch handle to make the material look more like a round section. Alternatively use one of the commercially available brake standards. Stick the brake standard into the hole on the tender footplate.



h. The front of the tender has two holes into which 3D printed parts [3D10a] are fitted to represent the small buffers between the tender and the locomotive.

37. Locomotive to tender coupling



a. There are two coupling bars [LB3], these are two different lengths which can be chosen depending on the tightness of the curves you need to negotiate.

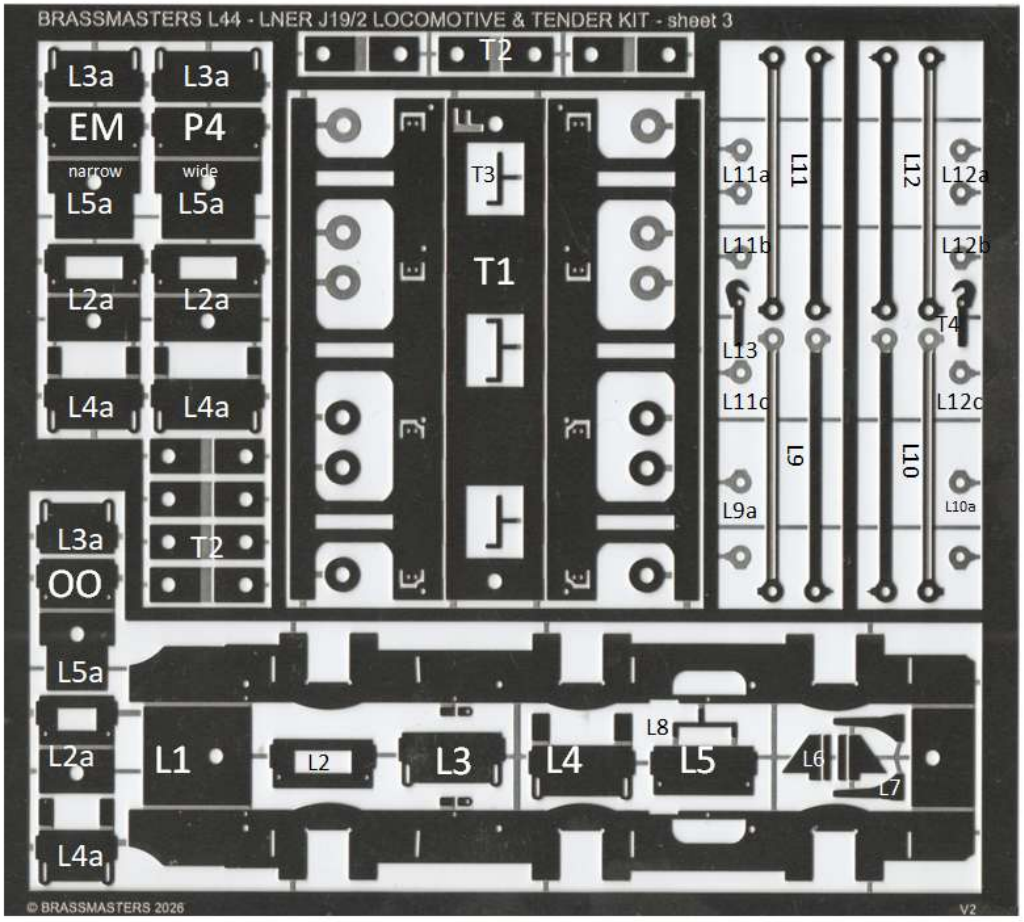
b. Cut two lengths of 1/8" brass tube 5mm long, use these to go around the bolts which fasten the tender body and locomotive body onto their chassis.

c. The coupling bar is slid over the brass tubes and the nuts are then attached. This will clamp onto the tube holding the chassis and bodies firmly while leaving the coupling bar free to rotate.

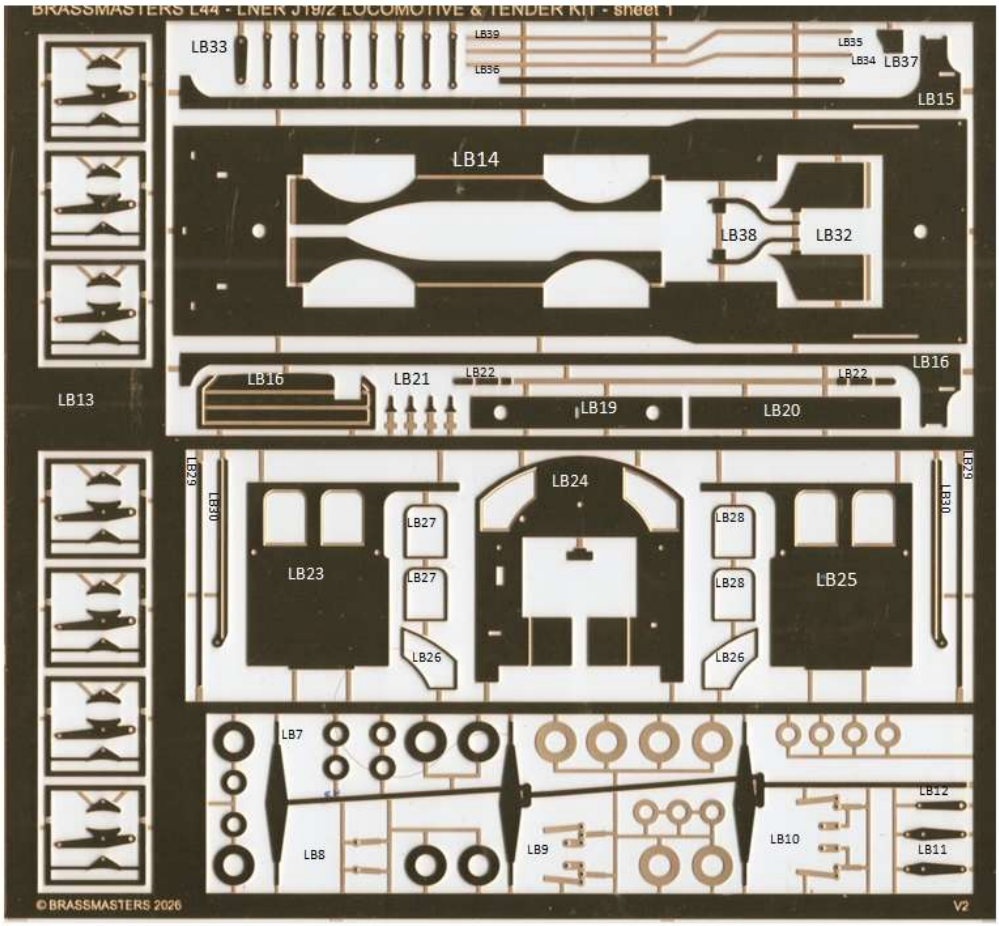
38. Priming and Painting

The 3D printed components will take conventional primer. Humbrol No.1 works well. **Avoid using an etch primer** which is designed to bond itself to a metal surface as this may damage the 3D prints.

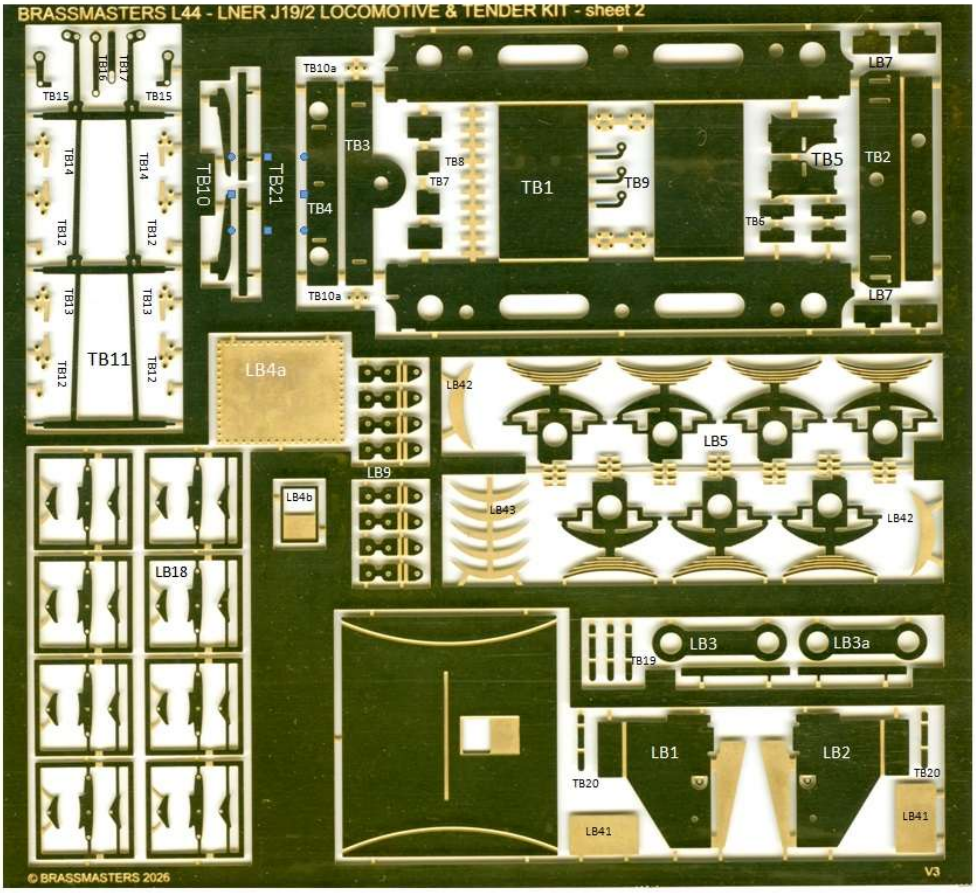
J19/2 locomotives were only ever painted black. Humbrol No.85 satin black gives a good surface for transfers.



Part number	Description	Quantity/notes	Part number	Description	Quantity/notes
L1	Locomotive mainframe		L13	Front coupling hook	
L2	Rear frame spacer	3 alternative widths	T1	Tender functional chassis	
L3	Centre-rear frame spacer	3 alternative widths	T2	Tender wheel bearing	7 (1 spare)
L4	Centre-forward frame spacer	3 alternative widths	T3	Tender brake handle	2 (1 spare)
L5	Front frame spacer	3 alternative widths	T4	Tender coupling hook	
L6	Frame braces	2		Full etched 2mm I/D washers	6
L7	Locomotive guard-irons	2		Half-etched 2mm I/D washers	6
L8	Regulator handle	2 (1 spare)			
L9	Rear-Right coupling rod				
L9a	Boss for above				
L10	Rear-Left coupling rod				
L10a	Boss for above				
L11	Front-Right coupling rod				
L11a	Bosses for front of above				
L11b	Boss for rear of above				
L11c	Boss for rear of above				
L12	Front-Left coupling rod				
L12a	Bosses for front of above				
L12b	Boss for rear of above				
L12c	Boss for rear of above				



Part number	Description	Quantity/ notes	Part number	Description	Quantity/ notes
LB1	Firebox RHS		LB23	Cab LHS	
LB2	Firebox LHS		LB24	Cab front	
LB3	Loco-tender coupling bar	2 options	LB25	Cab RHS	
LB4	Cab roof		LB26	Cab front window frames	2
LB5	Locomotive springs	7 (1 spare)	LB27	Cab LHS window frames	2
LB6	Locomotive brake hangers	8 (2 spare)	LB28	Cab RHS window frames	2
LB7	Locomotive brake pull rod		LB29	Cab roof rain strip	2
LB8	Front detail for above		LB30	Cab beading	2
LB9	Centre detail for above		LB32	Front frame extensions	2
LB10	Rear detail for above				
LB11	Locomotive brake pull crank	2	LB33	Sandbox levers	8 (2 spare)
LB12	Locomotive reverser crank		LB34	Reversing lever	
LB13	Locomotive brakes	7 (1 spare)	LB35	Sanding gear rod (centre)	
LB14	Footplate		LB36	Sanding gear rod (rear)	
LB15	Footplate valance RHS		LB37	Reversing lever end cover	
LB16	Footplate valance LHS		LB38	Ramsbottom safety valve levers (not required on J19/2)	2
LB17	Locomotive foot step treads	4	LB39	Sanding gear/drain cock rods	
LB18	Footplate fall-plate		LB40	Sand pipe support bracket	
LB19	Locomotive front buffer-beam		LB41	Not required	
LB20	Locomotive rear drag beam		LB42	Centre wheel balance weight	2
LB21	Front footplate lamp-irons	4 (1 spare)	LB43	Front/Rear wheel balance weight	4
LB22	Front smokebox lamp-iron	2 (1 spare)			

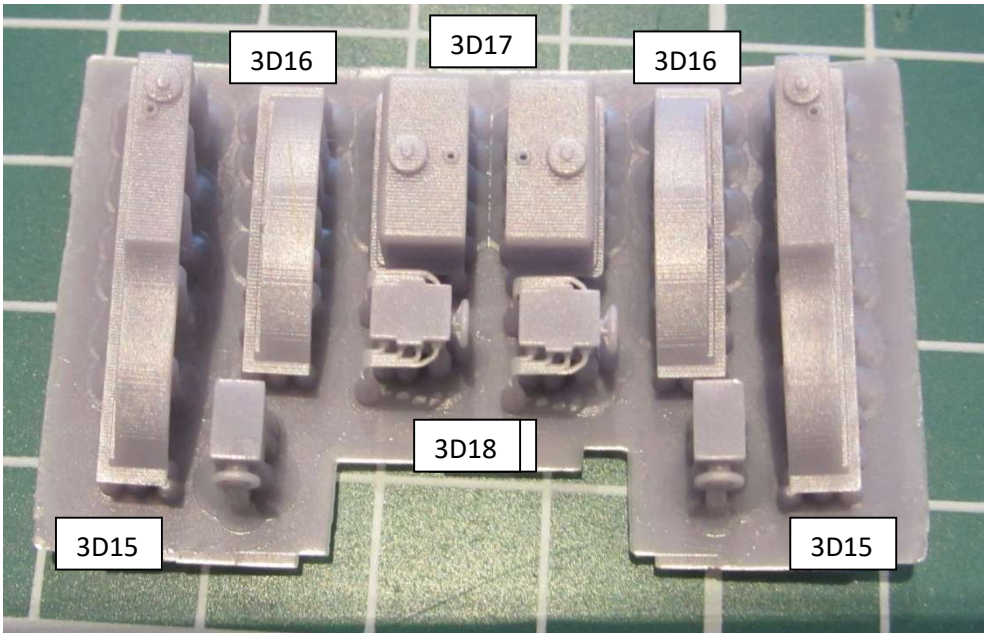


Part number	Description	Quantity/ notes	Part number	Description	Quantity/ notes
TB1	Tender outside frames		TB11	Tender brake pull rods	
TB2	Tender front buffer beam		TB12	Tender brake pull rod rear detail	4
TB3	Tender rear		TB13	Tender brake pull rod centre detail	4
TB4	Tender rear buffer beam		TB14	Tender brake pull rod front detail	4
TB5	Tender rear footsteps	2	TB15	Tender brake cranks	2
TB6	Tender rear footstep treads	4	TB16	Tender brake drive crank	
TB7	Tender front footstep treads	4	TB17	Tender brake lever crank	
TB8	Tender footstep tread detail	10	TB18	Tender brakes	8 (2 spare)
TB9	Tender front handrail supports	3 (1 spare)	TB19	Tender rear bottom lamp irons	3 (optional)
TB10	Tender guard-irons		TB20	Tender rear top lamp iron	2 (1 spare)
TB10a	Tender guard-iron detail		TB21	Tender handrail plates	2 (optional)

3D printed Part No.	Description	Comments
3D1	Smokebox/boiler/firebox	
3D2	Cab interior/backhead	
3D3	Inside motion (rear)	
3D4	Inside valve gear (front)	
3D5	Cylinder block	
3D6	Locomotive brake blocks	Eight provided
3D7	Tender tank	
3D8	Tender springs	One spare provided
3D9	Tender brake blocks	Eight provided
3D10	Tender brake standard	Two supplied
3D10a	Tender front buffers	
3D11	Injector (left)	
3D12	Injector (right)	
3D13	Brake cylinder	
3D14	Whistle	
3D15	Front splashers	Left and Right
3D16	Centre splashers	Left and Right
3D17	Centre sandbox	Left and Right
3D18	Mechanical lubricator	Alternatives provided
3D19	Boiler feed valves	Left and Right, required for Belpaire boilers only

Misc. items	Description	Comments
19	Short hand rail knobs	(12 for loco, 7 for tender)
4	Long hand rail knobs	(for boiler)
4	Sprung buffers	Gibson 4909
1	Smokebox door dart	
4	10BA nuts and bolts	
1	0.45mm wire for hand rails (300mm)	
1	0.8mm rod for brake and pipework	
1	1mm rod for vacuum braking pipework	vacuum braked versions only
1	1/8” brass tube for tender coupling	

Needed to complete (not supplied)	Description	Comments
1	High Level Kits LoadHauler PLUS	68:1, 1.5mm Worm bore 1/8" axle bore
1	High Level Kits 1219C	HLPower Coreless motor
3	Alan Gibson Ref 4S58 4'10" 16 spoke or 4S60 5'0” 15-spoke driving wheels	(prototype were 4'11"), the 5'0” are meant for a 9F and aren't really the right proportions
3	Alan Gibson Ref 4S47 3'11" 10-spoke or 4S48 4'1½" 12-spoke tender wheels	(prototype were 4'1" 10-spoke)
4	Alan Gibson Ref 4M42 Crankpin set	
1	Phosphor-bronze wire for pickups	
1	Short length of copper-clad paxolin for fixing pick-ups	
1	Fine insulated wire for motor	
1	2-pole connector for wires from locomotive to tender	(Optional)


3D16
3D17
3D16
3D18
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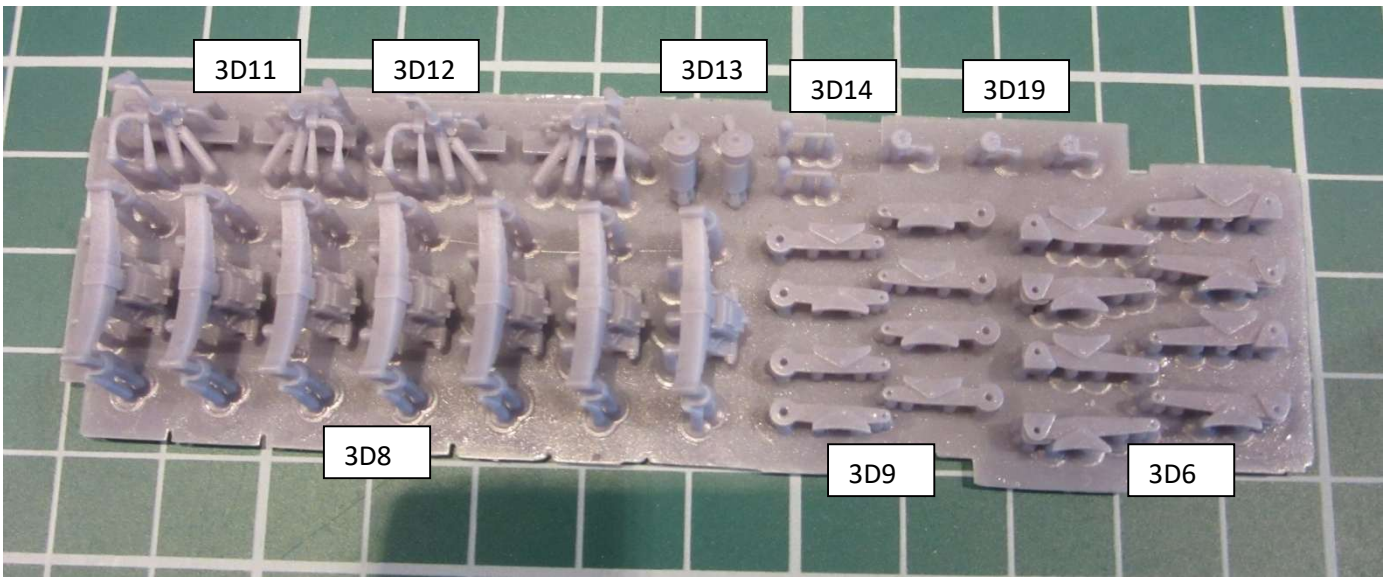
3D11
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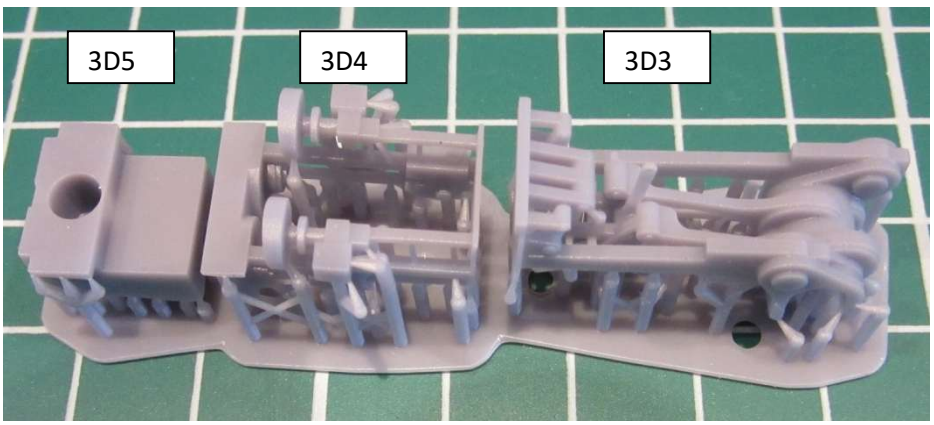
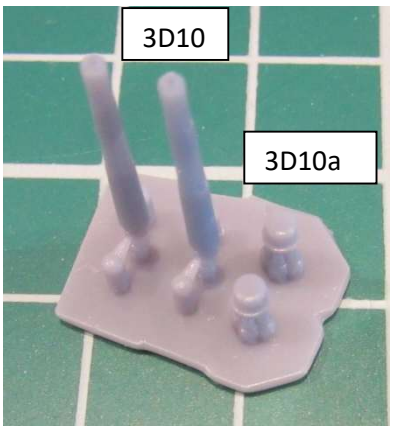
3D6


3D5
3D4
3D3


3D10
3D10a