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VICTORIAN RAILWAYS J CLASS 2-8-0 LOCOMOTIVE AND TENDER KIT

Introduction

The J class 2-8-0 was designed by the VR in the early 1950s as a modernised version of the K class 2-8-0, first introduced in 1922. The J and the K shared nominally the same boiler pressure, driving wheel diameter and cylinder bore and stroke, and consequently the same tractive effort. That is where the similarity ended, as the J was designed and constructed to allow for conversion to standard gauge, should that prove necessary at some time in the future. A key feature of the design was a boiler with a high-pitched centre line and the grate placed above the frames and driving wheels. Other changes included cylinders re-designed to make the steam passages more direct and SCOA-P driving wheel centres with U section spokes. At the time the design was completed the VR didn't have sufficient workshop capacity to construct the locomotives, so the Vulcan Foundry of Newton-Le-Willows, Lancashire, England were contracted to build the class of 60 locomotives, consisting of 30 coal burners, numbered 500 to 529 and 30 oil burners, numbered 530 to 559. They were shipped from England fully assembled as deck cargo and were the last steam locomotives constructed for the VR. They entered traffic during 1954, being utilised on branch line and light main line passenger and goods work. As new diesel locomotives became available the Js were withdrawn from main line traffic, but still found work on the branch lines and local goods workings as well as shunting duties. The class remained intact until 17 November 1967, when J523 was the first to be scrapped. Others followed, although a number were put into store at various depots and saw occasional use during heavy wheat harvests. J515 was the last to be employed in any sort of regular traffic, being restored to workshops shunter at Newport during March 1976. This engine is now preserved and operates from the Seymour Railway Heritage Centre. A number of other J class locomotives have been preserved at various locations around the state, including oil-burning J549 on the Victorian Goldfields Railway at Maldon.

Please read instructions carefully before commencing assembly.

Assembly methods

The two main construction methods are:

- i) Low-melt solder. Low-melt solder is an excellent medium to use with white metal kits. It is quick and provides a stronger joint than can be achieved with glue. Joint strength is achieved as soon as the solder solidifies, enabling the next step in construction to be undertaken without waiting for adhesive to set. It has the added advantage of allowing repairs to minor casting flaws, and because of the relatively low temperature, many parts can be held in the fingers while soldering. To join white metal to brass or nickel silver it is first necessary to 'tin' the brass with normal solder. The white metal casting can then be attached to the tinned brass with low-melt solder. Low-melt soldering requires the correct type of soldering iron (e.g. Dick Smith T2000 or Duratech TS1380). These irons have temperature control, as low-melt solder only requires around 150 degrees Celsius. Do not use the same iron for low-melt and normal solder as solder mixed in this way has poor strength. Suitable low-melt solder and flux is available from Carr's. **Do not attempt to solder white metal castings with a standard soldering iron.**
- ii) Glue. Superglue and five minute Araldite are two types of adhesive suitable for use with this kit. Some modellers prefer to superglue major joins first and then fillet the joint with Araldite. Small detail parts are best attached with superglue. Solder must be used for electrical connections such as the wiring from the pick-ups to the motor.

Whichever method you choose, 'dry fit' all parts to ensure a good fit before attaching them permanently.

TOOLS REQUIRED OR RECOMMENDED

Sharp knife, such as Stanley knife, knife with snap-off blades or a scalpel.

Fine pointed tweezers.

A set of needle files in assorted shapes.

A set of tapered broaches for enlarging small holes in sheet metal.

Wooden pegs and/or Blu-Tac, for holding parts during soldering.

Wire cutters.

Needle nose pliers.

Round nose pliers.

Small model makers vice with smooth jaws.

Pin vice for holding twist drills.

Pin vice with larger collet, for holding the M1.4 tap.

A 150mm single cut mill file.

A set of small screwdrivers.

Jeweller's piercing saw.

Glass fibre burnishing tool.

Soldering iron for electrical connections.

Temperature controlled soldering iron if the model is to be assembled by solder.

Emery paper, in various grits from 240 to 600.

A range of small twist drills from #80 or 0.35mm up to 5/64" or 2.0mm.

A 'Hold and Fold' device (4" or 100mm size) is also useful for bending some of the etched parts to shape.

CONSTRUCTION

It is important that all cast parts are free of "flash" (excess metal along the part line.) and fit properly. Flash may be removed from the white metal castings by scraping gently with a sharp knife. Files are required for cleaning up the brass and nickel silver detail castings.

All locating holes for wire piping and fixing details should be drilled prior to assembly. It is often simplest to drill holes in etched parts while they are still part of the etch sheet. "Tinning" of etched parts (eg. where they are required to be attached to white metal castings) can also be done while the part is still attached to the main sheet.

Etched items can be removed from the sheet by placing it on a scrap of hard timber (eg masonite) and cutting the tabs with a large Stanley knife. Take care not to distort the parts while cutting them free. Trim the remains of the tab off the part with needle files. All etched parts feature a "cusp edge". This cusp may require smoothing with needle files to allow parts to fit accurately. Etched parts that require folding incorporate half etched lines to locate the bends. As a general rule, the half etch line goes *inside* the fold. The only exception is when a part must be bent double, at 180°, when the half etch line is to the *outside* of the fold.

A number of parts (such as the cab roof) have rivet locations half etched on the back of the part. To form these rivets place the part, with the smooth side facing down, on a sheet of lead. Use a sharp pointed instrument, like a scribe, to press down in each recess, which will raise a bump that represents a rivet on the smooth side.

Always check the fit of the parts prior to fixing. Adjust as necessary before fixing them in place. In many cases it is possible to solder details from *behind* the surface to which they are fixed. When attaching white metal castings with low melt solder, use plenty of flux. The flux acts as a heat transfer medium and helps the solder to penetrate the joint.

As with all classes of V.R. locomotives, individual J's varied in minor details over the years. Modellers are therefore advised to refer to photographs of the prototype if they wish the model to reflect a particular class member at a particular point in time.

During construction refer to the drawings at all times. Parts should be as drawn on the illustrations, so be careful that you have the right part.

**Cast parts are identified on the drawings with a prefix: W for White metal castings,
L for Lost wax brass or nickel silver castings**

Etched parts are just identified by a number, which is etched into the fret adjacent to each part.

The instructions sometimes refer to the right-hand (R/H) and left-hand (L/H) sides. This is taken as viewing the model from above and looking forward. The L/H side is the driver's side and the R/H side the fireman's.

A number of holes need to have a thread cut in them with an M1.4 tap. The tap is included in the package with the various screws and other machined metal parts. Hold the square end of the tap in a pin vice fitted with a suitable collet. Use only gentle pressure when using the tap and back the tap half a turn anti-clockwise after each full turn clockwise.

As well as lengths of straight brass wire in various diameters, two pieces of insulated, multi-strand copper wire are included. Strip the insulation from the red and black wires to provide 0.25mm and 0.20mm diameter strands, for making clips and fine piping where noted.

To minimise the risk of losing parts, do not remove them from the etched sheets or plastic packing until they are required. It is recommended that construction start with the tender, to develop your skills before tackling the locomotive.

TENDER

Refer to drawings 1 to 7

Before starting construction it is necessary to decide whether the model will be fitted with the tender shunter's steps. These steps were not fitted until mid to late 1959 and then to only some of the oil burners, but all of the coal burners. Of the numbers supplied with this kit, all of the coal burners were fitted with the shunter's steps, of course, but only numbers 532 and 556 of the oil burners. If the shunter's steps are to be fitted, find the half etched holes located in the backs of the side sills of the tender underframe (118) and drill them out #80 or 0.35mm. Also locate the half etched holes in the back of the tender sides (54) and drill them out #78 or 0.4mm.

Underframe (Both Versions)

Refer to figure 1 for an inverted view of the underframe.

Bend the side sills of the underframe (118) to shape. Place the underframe front deck (95) face down on a sheet of lead and press out the half etched rivets along the front edge. Bend the two tags on the front deck at 90° and solder this part to the underframe, locating the tags in the two slots on top of the main section of the underframe. Form the centre sill unit (71), the brake cylinder support (108) and the two bogie mountings (74 and 83) to shape. Add the M2 x 5mm screw, washer (106) and M2 hex nut to the front bogie mount. Add the nut retainer (125) to the rear bogie mount, locating the tags on two edges into the slots in the coupler support. Locate an M2 hex nut in the recess and then attach the two bogie supports, the centre sill unit and the brake cylinder support to the underframe, soldering the various tags from the top surface of the underframe.

SAFETY FIRST These models are not toys and are not suitable for young children.

The white metal castings are lead-free pewter, but solder contains LEAD and modellers are advised to wash their hands after working on construction.

When using superglue, solder or when spray-painting, ensure the work area is well ventilated.

Solder the two M2 threaded bushes (M109) into the bogie supports. Add the front and rear headstocks (45 and 53), locating the tags on the ends of the side sills into the slots at either end of each headstock and soldering from behind. Bend the hand brake lever support (81) to shape, locate the tags in the slots in the centre sill unit and the floor and solder in place. Solder the brake cylinder casting (L10) to its support. Check the fit of the hand brake lever casting (L5A) and shorten the pull rod, so that it butts up against the brake lever cast with the brake cylinder. The support cast in the centre of the hand brake lever should lie parallel to the centre sill unit. When a satisfactory fit is achieved solder the lever in place. Form three brake lever supports from 0.4mm wire and solder them to the centre sill unit, locating them in the holes provided. Solder the foot guards (103) to the small tags projecting from the front corners of the front deck.

Finally, if the shunter's steps are to be fitted to the model, bend four lengths of 0.3mm wire into large 'U' shapes and locate the ends in the holes drilled in the side sills earlier. Solder the centre of each U to the floor and bend the ends slightly so that they project from the side sills at 90°.

Refer to figure 2 for a view of the top of the underframe.

Bend the sides of each step frame (78A, B and C) at about 90° and locate two step treads (66) in each frame. Once the treads are in place, bend the sides firmly at 90°. Locate a support (109) under each step tread, allowing the excess length of each support strip to project from the step frame. The parts are most easily soldered together with the assembly face down on a hard surface and small amounts of solder paste applied to the joints from behind. After each step assembly is soldered together, trim the excess length of each support (109) flush with the sides of the frame. Solder steps 79B and C to the front of the underframe, on the fireman's and driver's sides respectively, locating the tag on one side support in the slot in the side sill and soldering from behind. Solder the step 78A to the rear corner on the driver's side, locating the tag in the slot in the side sill. The right hand end of the toe guard above the top step will need to be soldered to the back of the headstock.

If you are fitting the shunter's side steps, bend the step frames (104) to shape. After the side angles are bent at 90°, bend a slight joggle in each side support, as shown on figure 2. Solder the bottom step (55) to each step frame. Locate the steps over the ends of the wires projecting from the side sills and solder them in place. Trim the wires so that they only project from each step frame by about 0.2mm, representing the fixing bolts.

Add a towing hitch (L5C) to each side sill, soldering from behind. Add the buffers (L6B), guard irons (L9A&B) and brake hose (L27) to the rear headstocks, soldering from behind.

The conduit junction boxes (L6A) have holes cored in place, although it pays to clear the holes with a 0.4mm drill. Solder a junction box into the hole at the front end of the left side of the underframe, so that one of the holes points directly downwards. Form a 'U' shape from 0.4mm wire with an internal radius of about 1.5mm. Solder the 'U' into the junction box so that the other end curves behind the front step and disappears behind the side sill. Solder a second junction box into the hole at the rear of the underframe. Thread a length of 0.4mm wire under the mouse hole provided in the rear side step frame and trim to length, so that the end butts up against the front junction box near the top edge. When a satisfactory fit is achieved, add four clips to the 0.4mm wire conduit, formed from 0.2mm copper wire. Thread the clips through the holes etched in the side sill, pull tight and solder from behind.

Form an uncoupling lever from 0.3mm wire to the shape shown on figure 2. The overall width should be just greater than that of the half etched supports projecting from the rear edge of the floor. Thread the pin lifter (85) onto the uncoupling lever. Place the underframe upside down on a hard surface and position the uncoupling lever on the half etched supports, with the pin lifter located in the notch in the centre of the floor's rear edge. Wrap each half etched tag around the wire of the uncoupling lever, as shown in the detail view on figure 2. Finally use a very small amount of solder paste to attach the pin lifter to the uncoupling lever.

Tender Tank (Coal Burner)

Refer to figure 3.

If the tender is to be fitted with the side shunter's steps, locate the half etched holes on the inside face of the tank body (54) and drill them out #78 or 0.4mm, if you haven't done so already.

Locate the three pairs of half etched holes on the inside face of the rear and drill them out #80 or 0.35mm. These holes will be used for the wire 'U' clips, which secure the lighting conduit on the back of the tender.

Bend the base at the rear of the body at 90° and then bend the base of each side at 90°. It is quite correct that the outside faces of these bends should have a radius. Stand a 1/8" drill upright in a vice and form the rear corners of the tender around the drill shank, using the half etched lines on the inside face as a guide. Carefully file the bottom edge of each corner to match the radius at the base of the sides and end. Check the fit of the top deck (40) to ensure that the corner bends have the correct radius and are correctly located. Form handrails from 0.4mm wire, insert the ends in the respective holes near the front in the sides of the tank and solder from inside. Use a packer that is 0.025" thick (solder together pieces of fret waste from the 0.015" and 0.010" brass etchings) to space the rails off the tank body. Trim the ends of the wire flush on the inside. Bend the tags attached to the bottom return of each side over at 180° and solder. Now tap the holes in these tags M1.4. Bend the tags on the top edge of each support (112) over at 90° and tack solder one support to each side of the tank towards the rear. Attach the body to the underframe, using four M1.4 x 2.0mm screws.

Place the bunker front (121) face down on a sheet of lead and press out the half etched rivets directly below the two lifting eyes on the top edge. Bend the two locker drip strips (82) at 90° and insert the narrow portion of each through the slots in the bunker front. These parts are handed, so make sure that they are orientated as shown on figure 3. Solder in place from behind. Tin the backs of the locker doors (97 and 105) while they are still attached to the fret. Remove them from the fret and sweat the appropriate door to each side of the bunker front, with the top of each door butting up against and centred below their respective drip strip.

Form the bunker floor (111) to shape and use a block of wood to set it up at 90° to the bunker front. Solder the bunker floor and front together, applying the solder from below and behind, where it won't show. Now form the joggle in the front for the hand brake recess and the joggle at the very top on the fireman's side. Form the access steps (102) to shape and insert them through the openings in the front. Solder from behind.

Form the driver's side locker (93) to shape and solder the joints at the back corners from inside the locker. Place the tags in the bottom edges of the locker in the slots in the bunker floor and solder from underneath. Also solder the top of the locker to the top edge of the bunker front and the narrow strip to the side of the opening in the bunker front. Place the tag on the end of the locker floor (73) in the slot in the locker (93) and solder from underneath. Once the floor is soldered in place, bend the attached tag back and forth until it breaks off. File any remaining tag so that the edge of this floor is flush with the edge of the bunker front.

Repeat for the fireman's side locker (96) and locker floor (69). Solder the hand brake wheel (L5B) and the water tap (L7B) to their respective holes in the bunker front.

Form the coal doors (110) to the shape shown on figure 3. Bend the return angles at the bottom and top of the coal doors first, so that the angles face towards the back at the top and towards the front at the bottom. Form two handles from 0.3mm wire and solder them in the holes etched in the doors. Make a catch from 0.3mm wire and attach to the doors with two clips of 0.2mm copper wire, soldering from behind. Trim any excess wire, flush on the inside of the doors. Slightly increase the vee in the doors so that the tags on either edge will locate in the slots at either side of the opening in the bunker front. Decrease the vee so that the doors are a tight fit in the opening and solder from behind. Add one small tag (107) to each side, locating them in the slots provided. Solder the two latch bars (101) to the doors, located so that the rounded end is centred over the half etched dot on each door.

Add a handrail of 0.3mm wire to the top of the fireman's side locker. The front of the rail overhangs the locker to provide about 0.6mm of knuckle clearance. Bend the two legs of the oil can cage (70) into a 90° joggle, as shown in the detail view on figure 3, before bending the rest of the cage to shape, so that the two legs meet in the centre. Solder the join in the back corner and reinforce the bends with a small amount of solder before soldering the cage to the top of the driver's side locker.

Install the subassembly of bunker front and floor into the tender tank, so that the front is flush with the sides and the angle of the bunker slope sheet roughly matches the rivet pattern on the outside of the tank wrapper. There is a tag at the bottom of the bunker front that locates in a slot etched into the top of the underframe. Tack-solder the bunker front to the tank wrapper and, when satisfied, remove the four screws and separate the tank from the underframe. Complete soldering the joints. Take the tender top deck (40) and bend the rear bulkhead up at 90°. Position the top deck on top of the supports (112) and press the bunker slope sheet down so that it meets the vertical section of part 40. Fix the top deck and the bunker slope sheet in place, soldering from below.

Bend the support for the rear fire iron bracket (91) to about 45° and solder the short leg to the half etched recess on the inside of the coal bunker. Form the fire iron brackets to shape from three strips (92) and solder one to the edge of the bunker and to the support (91). Solder the other two to the top of the locker on the fireman's side. The handles of the fire irons (100) should be threaded over the front strip, so that the irons lay in the trough formed by the other two strips.

Form the support (94) for the tender footplate into a channel section and solder six gussets (77) in place, locating them in the slots provided in the support. Bend up the tags at either end of the support at 90° and position the slots at either end of the tender footplate (113) over the tags. Make sure that the rounded corners of the footplate are at the front. Place this assembly upside down and solder the footplate to its support. Trim the tags flush on the top surface. Position the short round pin on the end of each outer footplate support leg (L1C) in the hole etched in the underside of the support. Use the jig (72) to hold the cast legs in correct alignment and solder the legs to the footplate, so that they are parallel and stand perpendicular. Solder the pins on the inner footplate support legs (L1B) to the holes in the underframe, so that the legs are perpendicular to the underframe.

Attach the tank to the underframe with four M1.4 x 2mm screws. Remove the jig and thread the pins on the outer footplate support legs through the holes in the underframe and solder from underneath.

Tender Tank, (Oil Burner)

Refer to figure 4.

If the tender is to be fitted with the side shunter's steps locate the half etched holes on the inside face of the tank body (54) and drill them out #78 or 0.4mm, if you haven't done so already.

Locate the three pairs of half etched holes on the inside face of the rear and drill them out #80 or 0.35mm. These holes will be used for the wire 'U' clips, which secure the lighting conduit on the back of the tender.

Bend the base at the rear of the body at 90° and then bend the base of each side at 90°. It is quite correct that the outside faces of these bends should have a radius. Stand a 1/8" drill upright in a vice and form the rear corners of the tender around the drill shank, using the half etched lines on the inside face as a guide. Carefully file the bottom edge of each corner to match the radius at the base of the sides and end. Check the fit of the top deck (40) to ensure that the corner bends have the correct radius and are correctly located. Form handrails from 0.4mm wire, insert the ends in the respective holes near the front in the sides of the tank and solder from inside. Use a packer 0.025" thick (solder together pieces of fret waste from the 0.015" and 0.010" brass etchings) to space the rails off the tank body. Trim the ends of the wire flush on the inside. Bend the tags attached to the bottom return of each side over at 180° and solder. Now tap the holes in these tags M1.4. Bend the tags on the top edge of each support (112) over at 90° and tack solder one support to each side of the tank towards the rear. Attach the body to the underframe, using four M1.4 x 2.0mm screws.

Bend the two locker drip strips (82) at 90° and insert the narrow portion of each through the slots in the bunker front (121). These parts are handed, so make sure that they are orientated as shown on figure 4. Solder in place from behind. Tin the backs of the locker doors (97 and 105) while they are still attached to the fret. Remove them from the fret and sweat the appropriate door to each side of the bunker front, with the top of each door butting up against and centred below the respective drip strip.

Form the bunker floor (111) to shape and use a block of wood to set it up at 90° to the bunker front. Solder the bunker floor and front together, applying the solder from below and behind, where it won't show. Now form the joggle in the front for the hand brake recess and the joggle at the very top on the fireman's side. Form the access steps (102) to shape and insert them through the openings in the front. Solder from behind. Form the driver's side locker (93) to shape and solder the joints at the back corners from inside the locker. While the narrow strip to the left of this locker is still free, make two loops from 0.2mm copper wire and solder them in the holes etched in the strip, forming supports for the sand funnel (W5). Trim any excess wire flush on the back surface. Place the tags in the bottom edges of the locker in the slots in the bunker floor and solder from underneath. Also solder the top of the locker to the top edge of the bunker front and the narrow strip, which also locates in a slot etched in the floor, to the side of the opening in the bunker front. Place the tag on the end of the upper locker floor (73) in the slot in the locker (93) and solder from underneath. Once this floor is soldered in place, bend the attached tag back and forth until it breaks off. File any remaining tag so that the edge of the floor is flush with the edge of the bunker front.

Repeat for the fireman's side locker (96) and upper locker floor (69). Solder the hand brake wheel (L5B) and the water tap (L7B) to their respective holes in the bunker front.

Drill two 0.35mm holes in the sand box (W2) and fashion a handle from 0.3mm wire. Tin the area at the front, fireman's side of the bunker floor with standard solder and then use low melt solder to attach the sand box, positioned as shown on Fig 4.

Add a handrail of 0.3mm wire to the top of the fireman's side locker. The front of the rail overhangs the locker to provide about 0.6mm of knuckle clearance. Bend the two legs of the oil can cage (70) into a 90° joggle, as shown in the detail view on figure 4, before bending the rest of the cage to shape, so that the two legs meet in the centre. Solder the join in the back corner and reinforce the bends with a small amount of solder before soldering the cage to the top of the driver's side locker. While they are still attached to the fret, place the two lifting eyes (130) face down on a sheet of lead and use a sharp pointed instrument to press out the half etched rivets, before tinning the back face. Remove the parts from the fret and sweat one lifting eye centrally to the back of each locker.

Install the subassembly of bunker front and floor into the tender tank, so that the front is flush with the sides. There is a tag at the bottom of the bunker front that locates in a slot etched into the top of the underframe. Tack-solder the bunker front to the tank wrapper and, when satisfied, remove the four screws and separate the tank from the underframe before completing soldering of the joints.

Take the top deck (40), bend the sides of the bunker down at 90° and then bend the small tags about 45°, using the half etched lines as a guide. Add the rear bulkhead (44), soldering from behind and below. Place the top deck on top of the supports and locate the tags on the front sections in the slots in the rear of the crew lockers. Fix the top deck to the tank body, soldering from inside the tank.

Form the support (94) for the tender footplate into a channel section and solder six gussets (77) in place, locating them in the slots provided in the support. Bend up the tags at either end of the support at 90° and position the slots at either end of the tender footplate (113) over the tags. Make sure that the rounded corners of the footplate are at the front and the notch at the back edge is positioned towards the driver's side. Place this assembly upside down and solder the footplate to its support. Trim the tags flush on the top surface. Position the short round pin on the end of each outer footplate support leg (L1C) in the hole etched in the underside of the support. Use the jig (72) to hold the cast legs in correct alignment and solder the legs to the footplate, so that they are parallel and stand perpendicular. Solder the pins on the inner footplate support legs (L1B) to the holes in the underframe, so that the legs are perpendicular to the underframe.

Attach the tank to the underframe once more with four M1.4 x 2mm screws. Remove the jig and thread the pins on the outer footplate support legs through the holes in the underframe and solder from underneath.

Oil Tank (Oil Burning Version, only)

Refer to Figure 5.

Tin the inside face of the tank wrapper (149) at each end with standard solder and then add a thin layer of low melt solder. Position an end casting (W1) at each end, so that the lug cast on the perimeter engages in the slot etched in the bottom centre of the wrapper. Wrap some heavy copper or iron wire around the tank at each end and twist the ends of the wires to draw the wrapper tightly to the cast ends. When you are satisfied with the fit, apply flux and heat the tank with a hot air gun (a hair dryer set to high will do) to heat the tank until the low melt solder flows. Allow the tank to cool.

Solder three pairs of handrail supports (131) in the slots etched towards the front of the tank and at the rear on the driver's side. Solder handrails of 0.4mm wire to the supports and trim the ends of the rails so that they overhang the supports by 0.15mm. Add a pair of supports (138) to the fireman's side of the tank. Cut a 24mm long piece of 0.5mm wire and solder this centrally to the two supports.

Drill a #78 or 0.4mm hole at the mark on the filler hatch (W4) and add a breather pipe from 0.4mm wire. Solder the hatch to the tank, orientated as shown on fig4.

Bend the 90° joggles in the front ladder stiles (133) and solder the front railings (139) and the ladder stiles (132 and 133) to the tank. Make sure that the ladder stiles are parallel and add ladder rungs from 0.4mm wire. The rungs should be cut over length and soldered in place in the little notches in the outer edges of the stiles. Trim the rungs flush with the stiles after they are securely soldered in place.

Two alternative walkway platforms are provided. The simple version (146) is etched in one piece and just needs the sides to be folded down, the ends folded around at 90° and then soldered in place. The more detailed version has the grid mesh platform as a separate part. Stand the sides of the framing (147) up at 90° and bend the ends at 90°, but leave the strips attached to the etched fret, so the two sections are orientated as shown on figure 5. Position the platform on top of the framing and solder it in place. Now the completed platform can be cut free from the etched

fret and any remaining tags carefully removed. Locate the framing of whichever walkway platform you have chosen to use in the slots in the tank wrapper and solder in place.

Locate the pins on the main tank supports (L8) in the holes in the tank wrapper and solder from below. Solder the sump (W3) in place at the bottom front of the tank and drill out the hole marked with #76 or 0.5mm drill. Add the oil tap and piping (L25B).

Check the fit of the oil tank in the tender body. The main supports should rest on top of the ledges formed by the top deck on each side of the bunker well and the oil pipe should be threaded down through the mouse hole in the back edge of the tender footplate. It may be necessary to trim the length of the oil pipe and/or adjust the angle at which the pipe emerges from the sump.

It is probably simplest to just glue the oil tank in place, although it is also possible to remove the tender body from the underframe and solder the under side of the tank to the small tags incorporated in the top deck at either side of the bunker opening.

Detailing the Tender (Both Versions)

Refer to Figure 6.

Remove the tender body from the underframe, so there is access to the inside. The result will be much neater if all the details that include a mounting pin are soldered from the inside. Place the tender body down on a hard surface, such as a piece of masonite, and position the two tank anchors (L9C) against the back of the tank. Solder the anchors in place so they are evenly displaced from the centre line and 10.5mm apart. Form the two large handrails from 0.4mm wire and solder one into the holes on each rear corner. Space each handrail off the tank by 0.025". Add the tail disc, either open (122) or closed (123), the steps (116 and 117), the water tap (L1A), the back up lamp (L1D), the rear lamp bracket (L7A), the right side electric plug (L6C) and your choice of marker lamps. Two styles of marker lamps (L7C&D) are provided. Most Js were fitted with the round 'Pyle National' style, but a number had the square 'Newport' type.

Clear out all three holes in a conduit junction box (L6A) and thread it onto a length of 0.4mm wire. Bend one end of the wire at 90° and trim it, so that the wire lines up with the top centre of the right side electrical plug when the junction box is located in its hole on the back face of the tender. Bend the other end part way around the bend at the left rear corner of the tender body and then down at 90°. Temporarily fit the tender body to the underframe and check that the conduit runs to the junction box at the rear of the tender underframe. When satisfied, remove the body from the underframe and secure the conduit to the body with two clips of 0.25mm copper wire threaded through the holes drilled earlier. Check that the short length of conduit cast on the top of the left side electrical plug (L6D) will butt up against the horizontal conduit and trim as necessary before soldering the plug in place. Run a short length of 0.25mm copper wire in a U shape from the hole cored in the end of each electrical plug to the bottom of each marker lamp. Form an 'L' shaped piece of conduit from 0.4mm wire and run it from the hole in the top of the junction box to the dimple in the right side of the back up lamp. Secure the conduit with a clip of 0.25mm wire threaded through the holes drilled earlier.

Thread the two tags on part 76 up through the slots in the left rear corner of the deck and solder from below. Form a rear handrail from 0.3mm wire and solder it in the notches half etched to the inside face of the tank body. Allow about 0.65mm of knuckle clearance and angle the projecting part of the railing at about 30° to vertical.

Drill two #80 or 0.35mm holes in the filler hatch (W7) and add a handle formed from 0.3mm wire. Drill two #70 or 0.7mm holes in the water treatment box (W8) and add two lengths of 0.7mm wire so that their top ends are level with the top of the main part of the box. Add the treatment box, the filler hatch and the tool box (W9) to the top deck of the tender, soldering with a generous dollop of low melt solder applied to each locating peg from underneath the top deck.

Pickups, Wiring and Final Assembly (Both Versions)

Refer to Figure 7.

Provision has been made for adding electrical pickups to one or both of the tender bogies. It is not essential that these pickups be added, but they will improve the operation of the model and will have minimal effect on the haulage capacity if they are correctly adjusted with only light side pressure on the wheels. Holes have been pre-drilled in the bolsters of the bogies, which should be tapped M1.4. Bend the long strip of each pickup (165) at 90° and solder a piece of hook-up wire to one tag attached to each pickup, ensuring that you finish up with two LH and two RH sub-assemblies. Attach the pickups to the bogies with M1.4 x 2mm screws and adjust the ends of the wipers to rub gently on the back of each wheel flange. Attach the bogies to the tender with M2 x 5mm screws and washers (13). If a small burr is formed on the thread of each M2 bogie screw, by squeezing the thread lightly with a pair of pliers, the screw will bind in the threaded hole in the underframe and won't work loose. Bend each hook-up wire down towards the track, up in a gentle curve and through its respective hole etched in the underframe. Link each side's wires together and out through the holes etched towards the front of the tender, as shown on Fig.7. Trim the plastic body from two electrical sockets and then cut the socket section shorter. Solder a socket to the end of each wire, so that the wires will be long enough to loop from the tender to the rear of the locomotive chassis, representing the two water connections between locomotive and tender.

When the wiring is complete, add a Kadee coupler (either No5 or No58) to the rear of the tender with a single M2 x 5mm screw. Finally install the tender body back on the underframe and secure with four M1.4 x 2mm screws.

Locomotive

Refer to drawings 8 to 15

Because the locomotive chassis has many moving parts, some of which have only minimal clearance great care needs to be taken at each stage of assembly. Check for free movement after adding each part and at each stage of assembly. A flat surface plate such as a 200mm square of glass is useful for checking the chassis is correctly aligned.

Frames

Refer to figure 8.

Start construction by lightly countersinking all the holes in the top surface of the fibreglass circuit board keeper plate. This step is necessary to prevent a short circuit from the tracks on the circuit board to the horn blocks. Temporarily assemble the frame plates (14 and 15) using two spacers (M118) and four M1.4 x 4.5mm nickel silver screws. Cut four 25mm pieces of 0.5mm wire and thread them through the mouse holes in the frame plates. Solder each wire centrally to a plated pad on the top surface of the keeper plate. Remove the central section of the rearmost wire to allow clearance for the gearbox.

Remove the keeper plate and install the third spacer (M118). Slacken the screws to allow the etched spacers (20, 21 and 22) to be installed in their respective slots and re-tighten the screws, making sure that the frame plates are parallel and square. Solder the etched spacers in place. Bend the rear headstock (10) double and solder to the rear of the frames, ensuring that the top edge is horizontal. Tap the two holes in the headstocks and the small hole in the rear frame spacer M1.4. Add the two headstock castings (L14E and L14D) and the two injectors (L4A and L4B). The drain pipe from each injector should be soldered in the notch in the bracket hanging below the headstocks. Solder the brake cross shaft and its support brackets (L14C) to the frames.

Two drawbars are provided (4). One is scale length and the other is 1mm longer to facilitate operation on tighter than scale curves. Choose the drawbar to be used and solder the two layers together. Thread the drawbar onto the M2 x 8mm screw, then the spring and an M2 nut. Tighten the nut so about 3.5mm of screw projects and put the screw through the hole in the frame spacer, through the small piece of circuit board and secure with a second M2 nut. Push the electrical sockets through the holes in the rear frame spacer so that the square plastic sections locate in the square holes in the rear frame spacer. Solder the projecting pins to the holes in the circuit board and trim the excess pin.

Bend the shoe (17) for the gearbox torque reaction arm to shape, but leave the tag upright for the time being. Secure the shoe to the rear spacer with an M1.4 x 2mm screw.

Drill 0.4mm holes in the sockets cast into the main reservoirs (W6) and form a connecting pipe into an omega shape from 0.4mm wire. Position the rear reservoir in the frames and solder in place from below, then add the connecting pipe and the second reservoir. Solder the second reservoir from below and secure the connecting pipe with a touch of super glue.

Remove the cusp edges from the pony truck frame (3), so that when it is formed to shape the side plates can stand vertical, parallel to each other. Solder the side plates to the front section of the frame and reinforce the bend in the drawbar section with a fillet of solder. Tap the hole in the bottom of the truck frame M1.4 and check that the axle will rotate freely. Carefully remove any cusp edge from the axle opening if need be. Solder a spring and axle box detail casting (L3) to each side plate and check again that the axle can rotate freely. Install the axle, so that there is one spacer washer on each side and secure with the keeper plate (7) and an M1.4 x 2mm screw.

Motor, Wheels and Gearbox

Refer to figures 9, 10 and 11.

File the cusp off the edges of the gearbox (11) where the sides will join. Fold the gearbox to shape and temporarily attach it to the motor with two M2 x 2mm screws. Check that the basic box is square and that the sides are parallel before soldering the corner joints. Remove the gearbox from the motor. Bend the tags that are used to secure the cover plate, as well as the torque reaction arm, at 90° and reinforce the corners with a fillet of solder. Tap the two holes M1.4.

Take the driving axle that is fitted with the driving gear and check the fit of the horn blocks in the axle slot. It will be necessary to carefully remove the cusp from each slot, by draw filing (i.e. rubbing the file **along** the edge, rather than across) each opening with a round needle file. Check the fit often, to ensure that each horn block is a neat fit in its respective opening, with no excess play or slop. Bend the tags on each edge of the cover plate (6) at 90° and attach it to the gearbox with two M1.4 x 2mm screws. Check that the axle will still rotate freely and, if necessary, remove the cusp from the edges of the tags on the cover plate. Add small angle brackets, bent from strips of 0.010" fret waste, to each side of the gearbox to prevent the axle hornblocks from rotating, as shown on fig 9.

Once the axle will rotate freely, remove the cover plate and axle from the gearbox and attach the motor with two M2 x 2mm screws. Install the axle once more and test the motor operation in both directions. Lubricate the gear with suitable grease. Finally, form the cover (68) to shape and solder it across the opening in the gearbox keeper plate.

Take each driving axle, one at a time, and check the fit of the hornblocks in the frame slots. Remove the cusp from each axle slot, as for the gearbox. Temporarily attach the keeper plate with two M1.4 x 4.5mm screws and check that each driving axle will rotate freely. Use the M4 grub screw as a spanner to screw the hex-head crank pins into the crank bosses of the first, second and fourth driving wheels. The screws will self tap in the wheel centres, but take care that each screw enters the crank boss perpendicular to the wheel hub. It will help in this regard if the grub screw is filed shorter, so that the hex recess is only about 0.8mm deep. Secure the counterweight detail to the appropriate driving wheel with super glue. Note that the weights for the third driving wheel are laminated from parts 2 and 64 to achieve the correct thickness.

Install the motor and gearbox on the fourth axle and use a toothpick to place a small blob of silicone sealant on the shoe attached to the rear frame spacer and prop the motor in a vertical position. Add more silicone on top of the torque reaction arm projecting from the gearbox and fold the tag over on the shoe. Allow the silicone to cure. Once cured, the silicone provides a resilient attachment for the gearbox torque reaction arm. The gearbox should now be removed for assembly of the motion gear.

Bend the pickups (166) to shape, as shown on figure 10, taking care to make four pickups of each hand. Solder the pickups to the pads on the underside of the keeper plate, but leave the wipers clear of the wheels for now. Cut shallow notches in the cross shaft at the rear of the frames and install the brake pull rods (19) on pieces of 0.5mm wire located in the brake levers. Solder the pull rods to the wires and the wires to the ends of the brake levers. Trim any excess wire so that it only projects from each brake lever by about 0.2mm but do not solder the pull rods to the large cross shaft at the back of the chassis. The keeper plate needs to be removable.

Motion Gear

Refer to figure 11.

Drill 0.5mm diameter holes at the two marks on each brake shoe casting (L11A and L11B). Solder each brake shoe onto a wire projecting from the keeper plate and trim the excess wire.

Tin the back surface of each coupling rod (8 and 12) and fold the two layers of each part double. The tags connecting the two layers will help to keep them correctly aligned. Place each rod face down on a hard surface and sweat the two layers together. Clear out the holes adjacent to the second and third crank pin holes so that a valve gear rivet can be installed in each. Solder each rivet from behind and trim the excess flush with the back face of the rods. Repeat the exercise with the connecting rods (9 and 18) and add the brass bearing detail (65) to the big end of each connecting rod. Remove the cusp edges from each rod, although keep in mind that the forward section of each coupling rod will be obscured by the crossheads and guides.

Use a taper broach to carefully clear the crank pin holes in the coupling rods so that the respective crank pins are a neat fit. Now install all the driving axles in the frames and secure the coupling rods with just the rearmost crank pin screws. Use the M4 grub screw as a socket spanner to tighten the hex head crank pins. Check that the third and fourth driving axles will rotate together without binding. If need be, carefully enlarge the holes for the third crankpins. Pay particular attention to the coupling rod that binds with crank at 3 or 9 o'clock position. Only move on to the second driving axle when third and fourth axles rotate freely together. Add the crank pins to the second driving axle. Check for free movement and if necessary enlarge the holes for the second crank pins. As before, pay particular attention to the rod that binds at 3 or 9 o'clock position and **do not** enlarge the holes for the fourth crank pins. Only when the three rearmost driving axles will rotate freely together should the exercise be repeated with the leading driving axle. Carefully reduce the thickness of the hex' head on the crankpin of each leading driver, by about 0.2mm, to provide extra clearance for the crossheads.

Clear out the hole in the piston rod gland (L26) with a 1.0mm drill and polish up the crosshead guides by draw filing and burnishing with a fibreglass eraser. Clean up the crosshead and piston rod casting in the same way and check that each crosshead can move freely up and down its guide casting. Trim any excess piston rod, so that the rod will only enter the gland by about 1mm when the crosshead is at the outer end of the guides. Also check the fit of the spigot on the guide casting with the hole that is cast in the rear cover (W12).

Note that both crossheads and connecting rods are handed, so take care to install the small end of each connecting rod over the gudgeon pin cast into the back of the appropriate crosshead. Fit the retainer plate (80) over each gudgeon pin and secure with a minimum of solder where the plate meets the top and bottom slippers of the crosshead casting.

Drill a 1.5mm hole down the centre of each cylinder casting (W10) and drill a 0.7mm hole down the valve guide (W13). Make up L/H and R/H cylinder assemblies with parts W10 to W14 and L2A and L2B. Note that there is a left and right hand version of W14, so make sure that the fixing bolt patterns are orientated as shown in the detail view on figure 9.

The J class locomotives had tail rod covers when first built, but they were removed fairly quickly and can be left off any model from mid 1950s onwards. Brass castings (L23D) are provided for these parts and it will be necessary to drill a 1.0mm hole centrally in each front cover (W11) if they are to be fitted.

Attach the cylinder assemblies to the frames with low melt solder, after first tinning the frames with standard solder. Tin the spigot on the guide casting with standard solder and then again with low melt solder. Apply flux and sweat the guide casting to the rear cylinder cover. Make sure that the two guides are directly above each other and are parallel to the frame plates.

Drill a 0.7mm hole through the support brackets for the expansion link cast with the motion bracket (L12). Use a fibreglass eraser and needle files to clean up the return cranks and expansion links (L29R and L29L) that are already riveted to the eccentric rod. Check that the expansion link will swing freely in the support brackets cast with the motion bracket. Also check that the rear end of the radius rod, which is the last part of the linkage assembly riveted to each crosshead, will pass through the slot in the expansion link. Clear out the slot by judicious use of a piercing saw, if need be.

Place two spacer washers (5) over the main crank pin, thread the crosshead into its guides and the valve extension of the radius rod into the valve guide. Place the big end of the connecting rod on the main crank pin and retain it with the return crank (L28R) and an M1.4 x 4mm screw. Check that the driving wheels will revolve freely and the crosshead moves up and down the guides without restriction. Once you are satisfied that everything is moving freely, the motion bracket (L12) can be soldered to the frames with the radius rod passing through the window and between the support brackets on the back. The crosshead is now captive in the guides. Thread the expansion link onto the radius rod and position it between the support brackets on the back of the motion bracket. Retain the expansion link with a short length of 0.7mm steel wire through the holes in the support brackets, the expansion link and radius rod and secure on the back with a touch of super glue. Check that everything still moves freely and that the expansion link oscillates as the wheels revolve.

Repeat the exercise on the left side of the locomotive.

Once all the motion gear is operating satisfactorily the pickups can be bent to rub on the backs of the driving wheel tyres and pieces of the fine black hook-up wire can be run from the keeper plate and the small circuit board to the motor terminals, as shown on figure 8.

Footplate and Details

Refer to figure 12.

Make a start by drilling all the necessary holes, to the diameters noted on figure 11. Locating marks are cast into the footplate. If you are building an oil burner, the mark for the hole which locates the oil control valve is on the underside of the footplate, right side. Solder the atomizer and terminal check valves (L17B&C or L21C&D) in their respective positions.

Tin the three tags on the etched lubricator plumbing (160), fold the tags double and solder them, taking care to keep the holes clear. Lay this plumbing etch in place on the footplate and across the bridge between the two sandboxes. Locate the etching temporarily with the mechanical lubricator (L2D) and form the etching to shape so that it conforms to the changes in level. Use a dress maker's pin to mark through the two outer holes of the etching into the centre line of the bridge. Remove the etching and drill these locations 0.35mm. Solder short lengths of 0.3mm wire into these holes and position the etching over the projecting wires and put the mechanical lubricator in place. Solder the lubricator from underneath and use a touch of low melt solder to secure the etching to the wire pins on the bridge. Trim the wires so that only 0.2mm projects, representing a fixing bolt. Position the outer ends of the etching at the atomizers, as shown on figure 11. The branches, marked A and B on Fig 12 should be poked into the holes immediately in front of the clusters of check valves/atomisers on each side of the footplate. Solder the steam manifold (L21B or L22B) in place. Carefully bend up the two curved portions near the centre of etching 160, so that the steam pipe etching (161) will fit underneath, but the ends of 161 should be positioned **above** the lubricator pipe etching. Use a tiny spot of solder paste and a hot iron to attach the left hand ends to the projections on the front of the manifold casting. Place the second steam etching (164) in place and solder the ends to the steam manifold. Carefully solder a clip (67) over the etched piping just to the left of the left side sand box filler.

Bend the main reservoir support angles (90) to shape and secure to the footplate with low melt solder and short lengths of 0.3mm wire. Trim the wires short so that they represent fixing bolts.

There are three location marked at the front of the distributing reservoir (L13C). Carefully drill 0.35mm by about 1.0mm deep at each location before soldering the reservoir to the footplate. Form wire plumbing to shape, as shown on figure 11 and secure it in place with 0.2mm wire clips and etchings (162), through pairs of 0.35mm holes drilled in the footplate. The plumbing should stop part way through the opening in the step in the footplate behind the reservoir. The two centrifugal dirt collectors (L22D) are most easily attached to their respective pipes by making a cut with jeweller's saw in the top of each casting, placing the wire in the slot and pinching the cut closed with pliers. The pipes that run to the reservoir can be secured in the holes drilled earlier. The branch from the brake pipe to the distributing reservoir should actually branch off the brake pipe with a tee, but it is easier and stronger to just drill a hole in the footplate casting beside the brake pipe and solder the branch into the hole. The brake pipe runs forward of the reservoir, past the reversing gear and is bent off the inner edge of the footplate and down between the frames.

Solder the reversing gear casting (20) in place on the footplate. Make a slot with a jeweller's saw in the back of each reverser cover (W28L and 28R) to provide clearance for the arms projecting forward from L20. Note that the castings W28 are handed and the part with the long locating pin is for the left side. When a satisfactory fit is achieved solder the covers in place and trim the excess pin flush on the underside..

Solder the turbogenerator (L15C) to the footplate, orientated as shown on figure 11. If you are building an oil burner also solder the oil control valve (L25A) to the footplate near the turbogenerator.

Drill a 0.5mm hole in the footplate behind the lamp support at the front on the left side. Solder the lamp bracket (42) in the hole and, if desired, add the oil lamp (W27).

Form the front section of the frames (1) to shape, including the joggles in the guard irons and solder it in place under the front section of the footplate.

Front Headstocks and Details.

A cowcatcher is provided in the kit, but after about 1965 most J class locomotives had the cowcatcher removed. Tin the back of the headstock (52) and, if the cowcatcher is to be fitted, solder short lengths of 0.3mm wire into the holes along the lower edge. Form the cowcatcher (114) to shape, with all of the fold lines on the back of the cowcatcher. Place the holes along the top edge of the cowcatcher over these pins and solder the cowcatcher in place, before trimming the pins to about 0.2mm long, representing the fixing bolts.

Drill a 0.7mm hole down through the coupler pocket (2C) before soldering it to the headstocks. Also drill a 0.7mm hole through the shank of the dummy auto coupler (W26), or you may choose to drill a similar hole through the shank of a Kadee No5 or No58 coupler. Secure your choice of auto coupler in the bottom opening and the dummy screw coupler (L23B) in the upper opening of the coupler pocket with a short length of 0.7mm wire.

Solder the buffers in place and trim the excess mounting pin from behind the headstocks. Solder the folded tail disc and bracket to the headstocks, to the left of the coupler pocket.

Bend an uncoupling handle to shape from 0.3mm wire, form the three brackets (61 or 84) to shape and thread the brackets and the pin lifter (63 or 85) onto the handle. Solder the brackets to the headstocks and carefully solder the pin lifter in the centre of the handle.

Finally solder a coupling hose (L27) in the hole to the left of the coupler pocket before attaching the headstocks to the front of the footplate casting with low melt solder.

Boiler

Refer to figures 14 and 15.

Drill holes for the handrails, marker lamps and headlight in the smokebox front (W16). Form the small handle for the door from 0.25mm wire and solder from behind. Form a larger handle from 0.3mm wire and insert it in 0.35mm holes drilled on the marks in the lower door hinge and solder from behind. Form a curved handrail from 0.4mm wire and thread 4 short handrail knobs onto the wire. Insert the shanks of the handrail knobs in the holes drilled earlier and solder from behind. Use a touch of solder paste and a hot iron to carefully solder the wire handrail to the knobs before trimming the excess as shown on fig 14. File the excess shank of each handrail knob flush with the back of the smokebox front. Finally solder your choice of marker lamps (L13A or L13B) into the brackets on each side and the securing handle (L21A) in the centre of the door.

Drill a 1.8mm hole at the mark on the bottom of the smokebox and then drill the rest of the holes in the boiler, to the sizes noted on figures 14 and 15. Also drill pairs of 0.35mm holes at the points marked on the boiler casting for attaching pipe clips, which will be used to secure the wire 'plumbing'. Check the photos for locations as well. Use a 'Dremel' tool or a half round file to remove some metal from inside the front of the firebox, to provide extra clearance for the motor.

File a flat on the flange of an M2 threaded insert so that it can be pressed into the hole in the saddle casting (W17). Use the #2 x 1/2" self-tapping screw to temporarily attach the boiler and smokebox saddle to the footplate. The lugs on the sides of the firebox should be underneath the rear sections of the footplate. Tack solder the smokebox front to the smokebox and check that it is correctly orientated, with the hinges horizontal and the hole for the headlight centred at the top. When you are satisfied, remove the boiler from the footplate and complete soldering the smokebox front to the boiler.

Drill two 0.35mm holes in the cover for the pony truck centre pin (W20) and fit a handrail formed from 0.3mm wire, as shown on fig 12. Place this casting in position at the front of the footplate and place the cylinder saddle so that the tongue at the back of part W20 is covered. Reattach the boiler to the footplate and check that the two dry pipes (W18) stand vertically when located in the holes in the footplate and the recesses in the sides of the smokebox. The rear edge of the boiler band at the rear end of the firebox should be just forward of the rear end of the footplate by about 0.2mm. When you are happy with the position, tighten the screw and file about 0.25mm from the head of the screw, so that it won't interfere with the chassis when it is fitted. Solder the rear sections of the footplate to the firebox, secure W20 with low melt solder from underneath the rear edge and solder the dry pipes to the footplate.

Cab

Refer to figure 13.

Make a start by pressing out the rivets on the left side of the cab and in the cab roof. Form the cab walls to shape and place the cab on a hard, flat surface to correctly align the left rear corner. Note that the cutout for the staff exchanger extends slightly higher in the rear wall than in the side wall and the edge of the rear wall should be located in the half etched rebate on the back of the side. Solder the corner joint.

File the cusp edges from the floor (46) and, if building a coal burner, solder a short length of 0.5mm wire into the groove to represent the floor treadle. After soldering it in place, file the wire so that it only stands above the floor by about 0.1mm. Now bend the long tags double under the floor and bend the cab support down at 90°, as shown in the inverted detail view. Solder the tags to the underside of the floor and reinforce the 90° bend with a fillet of solder. Spring the cab sides apart slightly so that the floor can be snapped into position, located by the half etched grooves in the backs of the sides. Solder the floor in position.

Form handrails from 0.4mm wire and solder them in the locating holes in the back wall and the sides. Solder the rear window covers (119) to the rear wall, directly below the window openings. Tin the back of the fireman's front door (98) and solder it to the cab front, aligning the window in the door with the window in the cab front.

Use a jeweller's piercing saw to carefully separate the staff exchanger operating lever where it is attached to the housing (L16B). Drill a 0.4mm hole through the mark on the staff exchanger arm. Form a staff exchanger horn from 0.4mm wire and solder it in the hole. Solder the staff exchanger recess into the cutout in the rear corner of the cab.

Solder the speed recorder drive gearboxes and their mounting bracket under the front corner of the cab. Locate the pin on the back of the conduit junction box (L23C) in the hole on the front wall of the cab and solder it in place.

Place the cab roof down on a hard, flat surface and solder lengths of 0.4mm wire along each edge, to represent the gutters. Use two short lengths of 0.5mm wire as locating dowels and solder the vent panel (124) centrally on top of the roof. Trim the wires flush, form the cab vent cover (120) to shape and solder it in the locating slots in the roof. Form curves in the ends of pieces of 0.25mm fret waste about 1.5mm wide, so that they match the curvature of the roof. Solder them in place as shown in figure 14 and trim them, so that they extend below the cab by about 2mm at the front and 1mm for the rear tags. Check the fit of the roof on the cab. The tags should mean that roof is a tight fit on the cab walls. Solder the rolled up cab curtain (W30) under the rear edge of the roof, spaced in about 1mm from the edge.

Make a down spout for the driver's side from 0.3mm wire and secure it to the front corner of the cab side with loops of 0.25mm wire, twisted and soldered on the inside. Leave the fireman's side down spout for later, because it needs to be attached in conjunction with the exhaust from the blow down muffler.

Bend the tags attached to the fall plate (60) at 90°, with the bend about 0.5mm forward of the edge. Thread the tags through the slots in the back edge of the cab floor and bend them over, forming hinges for the fall plate. Use a touch of solder paste and a hot iron to solder the tags to the underside of the fall plate. Take care that no solder gets near the floor, so that the fall plate can hinge up and down freely.

Install the cab on the firebox. The front wall should be pushed up against the ends of the footplate and ensure that the front is parallel with the last boiler band on the firebox before soldering the cab in place with a fillet of low melt solder across the top of the firebox inside the cab. Also solder the front of the cab to the underside of the footplate.

Check the fit of the backhead (W31) and file the lower edge until a good fit is achieved. Drill locating holes for the fire door and the regulator handle and solder these items in place. Leave the backhead separate for now, so that access to the interior of the boiler is not impeded.

Drill holes in the driver's platform casting (W23). Solder the reverser wheel (L18A) to the lug attached to the brake valve (L16C) and then solder the brake valve and driver's seat to the platform. Drill a hole on the fireman's side platform and attach the fireman's side seat. Do not install either platform at this stage.

Detailing the Boiler

Refer to Figures 14 and 15.

Solder the injector starting valves (L19A), the check valves (L19C), the safety valves (L19D and E), the whistle (L24A) and the reverser guide (L19B) to the firebox and boiler. Note that the slot in the reverser guide points downwards. Drill 0.7mm holes at the marks on each side of the turret cover (W19) and solder it to the top of the firebox, hard up against the cab front. Solder a 0.3mm wire control rod to the operating arm of the whistle with the other end located in the hole etched in the centre of the cab front.

If you are building an oil burner, drill 0.35mm holes about 1.5mm deep at the four marks on the funnel that will be used for attaching the cover and its operating linkage. Also drill 0.35mm holes at the marks on the smokebox and on the footplate for the operating linkage.

Check the fit of the funnel and the dome and solder them in place with low melt solder. Drill a 4mm hole down the through the funnel and into the smokebox and then use a burr in a Dremel tool to carefully open up the hole in the funnel until the rim is about 0.7mm wide.

Drill holes for the plumbing in the air pump (W15), to the sizes noted on fig 14. Solder the suction strainer (L24B) in place, orientated as shown on figure 14. Form the bracket (75) to shape and solder the air pump and its bracket to the boiler.

Check the fit of the driver's side plumbing (L17A). The pipes at the front should finish part way through the cut out in the step in the footplate when the hatch is located in the cutout in the cab. Solder the plumbing in place, using low melt solder to attach the pipe bracket to the underside of the footplate.

Boiler Piping

Refer to figures 14 and 15 and photos 1 to 4.

Various pipes that run on the boiler are to be represented with pieces of wire. On the prototype these pipes were secured with saddle clips that are represented with small pieces of phosphor bronze (162). Bend each piece into a 'U' and insert the legs through the pairs of holes drilled earlier and bend them over inside the boiler.

Carefully examine the photos and the drawings and start with pipes closest to the boiler and work outwards.

Run a length of 0.25mm copper wire and two lengths of 0.2mm copper wire from the opening on the front of the driver's side of the cab and then down the boiler towards the smokebox, securing them with four clips. Trim the 0.25mm wire and solder the end to the inner end of the steam manifold (L21B) located on the footplate in front of the mechanical lubricator. The second wire goes to the hole in the tag on the centre of the lubricator plumbing (160) that runs across the bridge between the sand boxes. The bottom pipe should just be soldered underneath the centre of that bridge.

Bend lengths of 0.7mm wire to represent the pipes that run from under the footplate up to the boiler feed check valves. Now make the lighting conduit from 0.4mm wire. Clear out the holes in the conduit junction boxes (L6A) with a 0.4mm drill, so that the conduit from cab to smokebox can be made in one piece, as can the piece running across the top of the smokebox. Secure the conduit with clips of 0.2mm copper wire, inserted in pairs of 0.35mm holes drilled at the marks cast into the boiler. The branch from the junction box below the dome can be soldered at the bottom centre of the boiler. Solder the headlight in place centrally on top of the smokebox front. Also solder the marker lamp plugs (L6d or L1E) in 0.5mm holes drilled in each side of the smokebox. Run lengths of 0.25mm copper wire from each plug to the bottom of the adjacent marker lamp.

If you are building an oil burner, install a 0.3mm wire control rod, from the oil control valve up to the cab on the fireman's side. Also run two lengths of 0.2mm copper wire from the cab front along the fireman's side of the firebox to the control valve, secured with a phosphor bronze clip (162). The oil pipe, formed from 0.5mm wire, runs from the inner end of the control valve to the bottom centre of the firebox, as shown on photo 4.

Install the operating rods for the blowdown valves (99) on each side of the firebox. Solder the bottom end of the operating crank to the front of the blow down valve on the front bottom corner of the firebox, below the footplate.

Drill a 0.5mm hole in the fireman's side of the turret cover, just below the location for the pipe that runs to the injector starting valve on the fireman's side of the firebox. Run a supply formed from 0.5mm wire from the turret cover down to the air pump, with the pump governor (L22A) threaded onto the pipe just before the pump. Also run an exhaust pipe from the front of the pump to the hole in the footplate drilled earlier, adjacent to the sand box. The delivery pipe runs from the front of the pump round to the brass angle (90), running over the top of the main reservoir. On the prototype the pipe runs to the main reservoir, but needs to remain separate on the model.

Run a 0.3mm wire to represent the blower supply, from the cab front, adjacent to the fireman's side of the turret cover, to the smokebox. This pipe terminates in a hole drilled just below the bottom rear bracket for the smoke deflector. Also run two pieces of 0.2mm copper wire from the same hole in the cab front to the air pump governor and secure these pipes with clips (162).

Run a supply pipe of 0.3mm wire, from the opening cast in the front of the turret cover, down to the turbo generator. The exhaust pipe, formed from 0.5mm wire, runs parallel with the supply and ends, pointing up at 45°, adjacent to the safety valves.

Poke the end of the reverser reach rod (50) into the hole in the front of the driver's side of the cab, position the centre of the rod in the slot in the guide (L19B) on the side of the firebox and solder the front to the casting (L20).

Run an operating rod of 0.3mm wire from the back of each injector starting valve to the hole in the front of the cab. Also run pipes of 0.7mm wire from each side the turret cover to the starting valves and from each starting valve to the slot in the footplate below.

The next pipes bridge from the chassis to the body, so it is necessary to temporarily install the body on the chassis. Use a piercing saw to cut the M2 x 8mm screw down to 6.5 to 7mm long and thread it through the underside of the chassis into the smokebox saddle to attach the front end. Use two M1.4 x 2mm screws, through the plate under the cab, to attach the rear end to the lugs on top of the rear headstocks.

Form injector delivery pipes from 0.7mm wire, running from the outlet on the front of each injector to the underside of the footplate near the front of the firebox. Thread a pipe flange (L23A) onto each pipe and solder in place as shown on photos 1 and 2. Solder the fireman's side pipe to the underside of the footplate and the underside of the cab. The driver's side pipe can be soldered to the underside of the footplate and the side of the speed recorder drive bracket (L16B). Do not solder the pipes to the injectors, so the upper works can still be removed from the chassis.

A short piece of 0.5mm wire should be soldered into the hole cored in the tee piece at the bottom of the cab plumbing (L17). Bend this wire down towards the bottom of the frames, as shown on fig 15 and photo 1. Cut it short as it reaches the frames, so that the body can still be removed from the chassis.

The blow down mufflers have plumbing that attaches to the boiler and cab, so it is best if the mufflers are not actually attached to the chassis. File the locating pin on the back of each blowdown muffler quite short and then attach each muffler temporarily with a little piece of Blu-Tac. There are holes etched in the chassis plates to locate them. Form inlet pipes from 0.5mm wire that run from the blowdown valves, on the front bottom corners of the firebox, to the mufflers. Carefully solder these pipes to the blowdown valves, the underside of the cab, the speed recorder gearbox supports on the driver's side and the mufflers. Also form exhaust pipes from 0.7mm wire, running in one piece from each muffler and up the cab. Solder these pipes to the blowdown mufflers and the cab. On the fireman's side, the blowdown exhaust and the down pipe from the roof gutter are secured to the cab with pieces of 0.25mm copper wire, inserted in the holes etched in the cab. It will be necessary to cut the gutter shorter on the fireman's side of the roof. After removing the screws it should be possible to separate the body from the chassis by springing the blowdown mufflers away from the frames and lifting the body straight up.

Now that the plumbing is completed the back head can be soldered to the boiler and the driver's and fireman's platforms can be installed in the cab. If you are building a coal burner, add the grate rocking gear (L18C), locating the castings in the holes in the floor at the base of the backhead. Finally, add the handrails using 0.4mm wire, long handrail knobs on the boiler and short knobs at the smokebox.

Funnel Cover, (Oil burning Version, only)

Refer to figure 14.

Tin the various parts while they are still attached to the fret. Spares are provided of nearly all parts because they are quite small and easily lost. Use a pin to mark through the holes in part 148 into a block of wood. Drill two 0.35mm holes in the block, each about 2mm deep and insert lengths of 0.25mm wire in the holes. Place item 148 over the wires and solder the bracket to the wires. Use a similar technique to add a handle made from 0.25mm wire to the operating crank (135). Bend the brackets (141, 142 and 137) to shape and solder them in place on the smokebox and footplate respectively. Also bend the bracket 148 to shape and solder it and parts 144 and 145 to the holes drilled in the funnel. Make up the operating rods from three lengths of 0.3mm wire and solder them where they join. Add two spacer washers (134) to the top rod and then solder the cover (140) to the bracket 148 and the rod. Use low melt solder to attach the cover to the back edge of the funnel, for additional reinforcement.

Smoke Deflectors

Refer to figure 15.

Drill 0.35mm holes at the marks on the inside face at the front edge of each smoke deflector. Bend handrails to shape from 0.3mm wire and solder them in place with about 0.7mm knuckle clearance. Trim and file the excess wire flush on the outside face of each deflector. Form large handrails from 0.3mm wire and solder them in the holes on the face of each deflector, with about 0.9mm knuckle clearance. Solder a builder's plate to each deflector, centred between the handrails and with the top edge in line with the handrails.

Form the brackets (43 and 51) to shape and solder each bracket to the back of its respective deflector. Attach the deflectors to the smokebox, using superglue or low melt solder.

Painting and Finishing

Now that assembly is complete, disassemble the boiler and footplate from the locomotive chassis and remove the motor and gearbox. Also remove the body of the tender from the underframe. Give each section a wash in methylated spirits to remove flux residue from the solder paste and then a wash in warm water and 'Ajax' liquid or similar, scrubbing with an artist's bristle brush. Rinse and allow everything to dry. Avoid handling the model in bare hands, because oils deposited on the model from your skin can interfere with paint adhesion. Wear some rubber gloves while the motor and gearbox are returned to the chassis.

Spray all parts with a mixture of grey and black self-etch primer, with power connected to the motor leads so that the driving wheels are turning while painting. Paint can be removed from the wheel treads and pickups with a small brush dipped in methylated spirits and/or a fibreglass eraser.

Remove the cab roof and paint the interior cab walls above window sill height a biscuit colour. Paint the reverser wheel, regulator handle and the handwheels along the top of the backhead red and paint the seat cushions dark green. Cut small pieces of clear plastic to glaze the cab front windows.

Smoke deflectors, footplate valance, front headstocks and the tender underframe were painted red, but were often covered in grime, making the colour indistinguishable.

Lubricate the model sparingly with grease on the gears and light oil on driving axles as well as the motion gear pivots.

Number Plates

Select a number from the plates provided and cut them from the sheet. Paint them with grey etch primer and allow them to dry before painting them with white enamel. Allow the enamel to dry for at least a week before painting the background of each plate with Indian ink. Use a damp cloth to remove any Indian ink that strays onto the surface of the raised letters or plate surround.

Attach the plates to the model with a touch of silicon sealant. Single 'J' goes to the left of the front coupler, with the number to the right. A combined J and number plate goes on the centre of the tender rear, with the bottom edge 8mm above the headstocks. Combined J and number plates go on the cab sides, with the bottom edge 9mm above the bottom edge of the cab and the rear edge 6mm in front of the back of the cab.

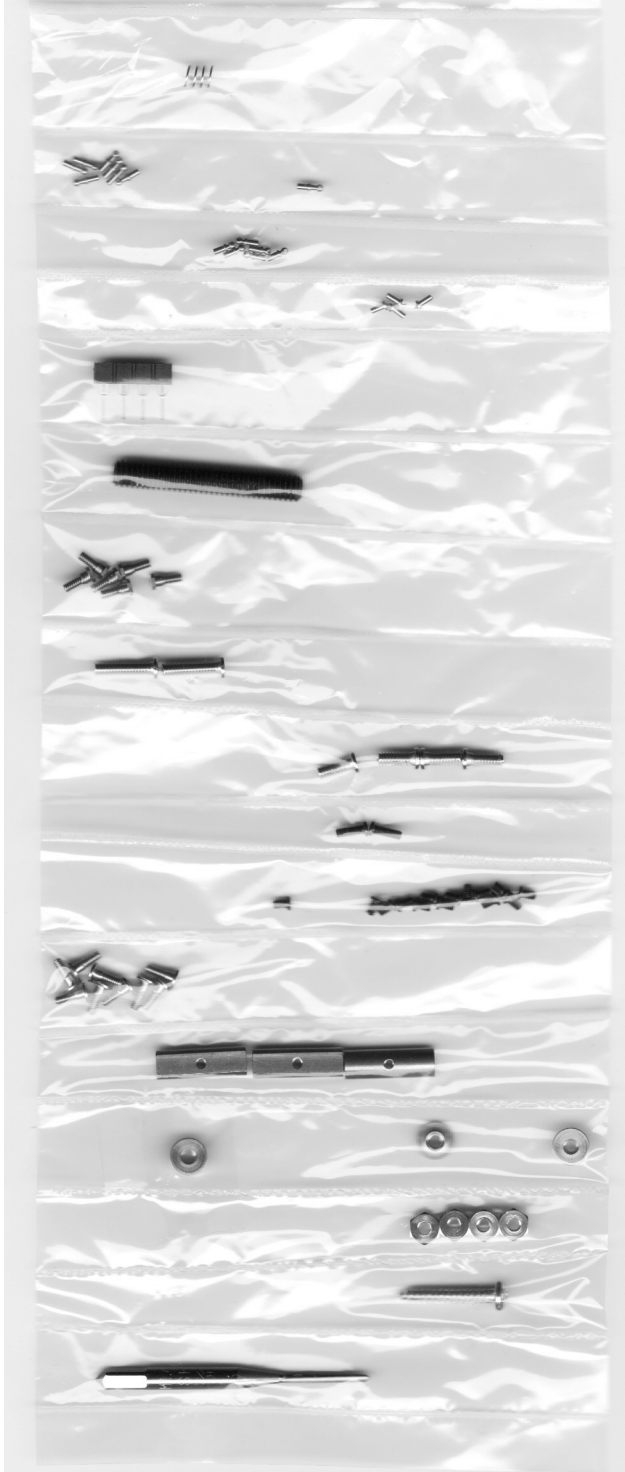
Storage

Foam blocks are provided for storing the model in the wooden box. The 20mm thick piece of foam should be placed in the bottom of the box, then the 32mm piece with the cut-out. Wrap the model in a plastic freezer bag to protect the detail before laying it in the foam. If you trim one corner of the 8mm thick sheet that goes on top, it will be easier to remove.

Kit Contents

1. Nickel silver etched fret, 0.018" thick, containing parts 1 to 22.
2. Brass etched fret, 0.015" thick, containing parts 40 to 55.
3. Brass etched fret, 0.010" thick, containing parts 60 to 126 (coal burners) or 60 to 149 (oil burners).
4. Phosphor bronze etched fret, 0.005" thick, containing parts 160 to 166.
5. Bag containing straight brass wire 0.25mm, 0.3mm, 0.4mm, 0.5mm and 0.7mm, steel wire 0.7mm, multi-strand wire of 0.2mm copper, multi-strand wire of 0.25mm copper and fine multi-strand hookup wire.
6. Fibreglass circuit board.
7. Bag of fixings and other hardware, as detailed on following sheet.
8. Bag of brass investment castings, as detailed on following sheet.
9. Bag containing valve gear parts.
10. Bag of white metal castings, containing parts W1 to W31.
11. Boiler casting.
12. Footplate casting.
13. Bag containing the motor, fixing screws, tender bogies, driving wheel sets and pony truck wheel set.
14. Bag containing preformed brass smoke deflectors, cab roof and, for oil burners only, the pre-rolled oil tank.
15. Set of foam blocks for cushioning the completed model in the wooden presentation box.

FIXINGS AND HARDWARE



Qty	Part No.	Description
1	-	Coil Spring
8	-	Long Handrail Knob
6	-	Short Handrail Knob
4	-	Valve Gear Rivet
4	-	Electric Plug
1	-	M4 Grub Screw
6	M86	M1.4 Hex Head Screw
2	11208-5	M2 x 8 Screw
4	11205-5	M2 x 5 Screw
2	31144-5	M1.4 x 4 Screw
14	31142-5	M1.4 x 2 Screw
9	M58	M1.4 x 4.5 Screw
3	M118	Frame Spacer
3	M109	M2 Threaded Bush
4	11020-5	M2 Hex Nut
1	-	#2 x 1/2 Screw
1	-	M1.4 Taper Tap

BRASS INVESTMENT CASTINGS

