



Mark's Model Works

Vulcan 0-4-4-0
NZR E Class
Fairlie
Locomotive Kit

Rose 1872 - 1878
Josephine 1872 - 1917

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Vulcan Fairlie E Class Locomotive

This kit is a representation of a NZR E class Fairlie locomotive originally built by Vulcan Foundry of Newton-Le-Willows Lancashire in 1872

Brief Prototype History

Rose and Josephine as the two locomotives were named entered service with the Dunedin and Port Chalmers Railway Company in 1872. "Rose's" career finished abruptly as the result of an accident on the 20/09/1878 (understood to have been a collision at the old Shag Point Junction).

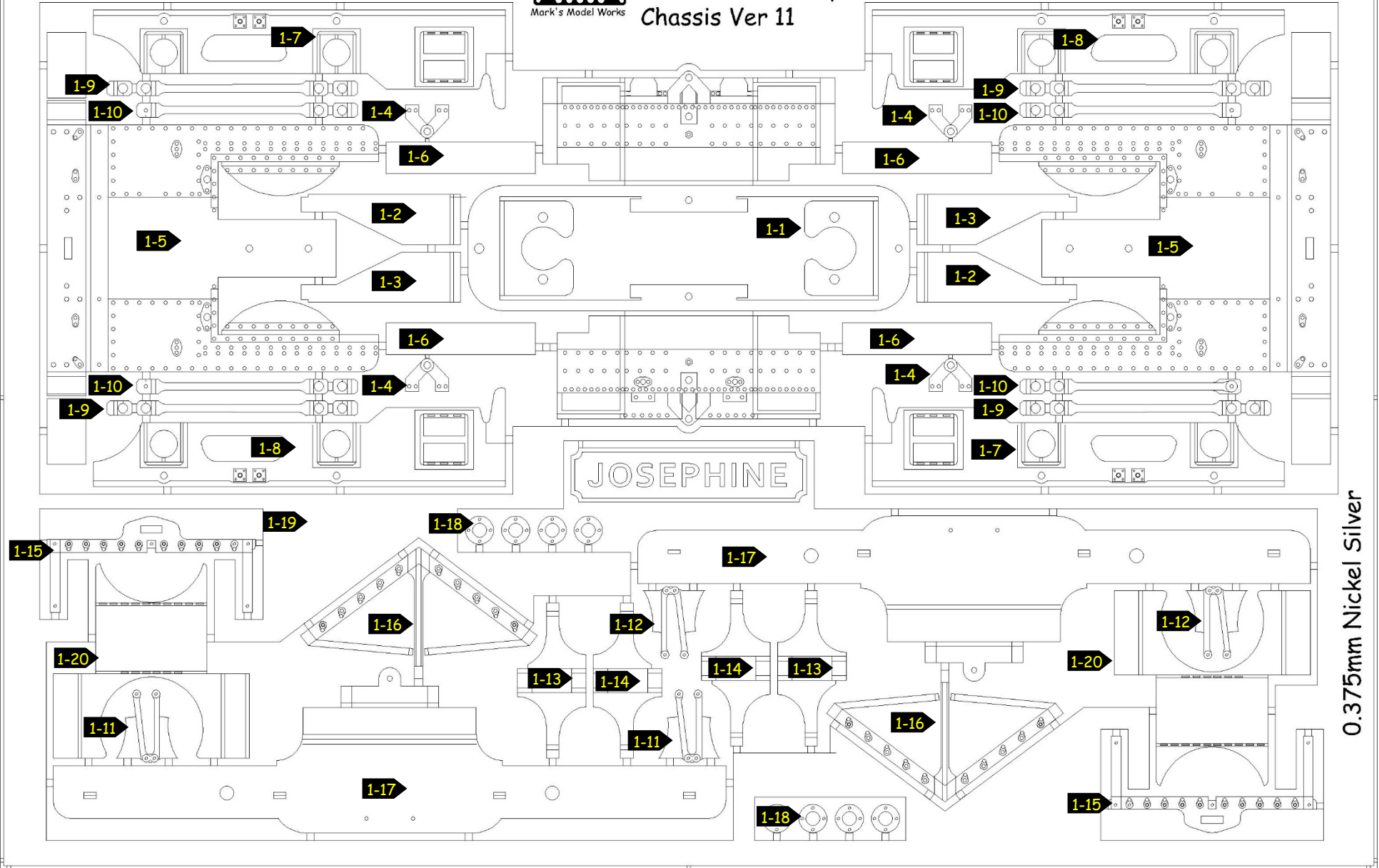
"Josephine" became E26 on the Hurunui-Bluff Section of the NZR. She transferred to the Wanganui Section in 1883 and became E24. With the 1890 re-numbering she became E175

In 1899 was sold to the PWD. That department numbered her E504 and transferred her to Dunedin in 1901 for use on the Otago Central Line. She went north again in September 1903 for use on the construction of the North Island Main Trunk and worked as far north as Ohakune. She returned to Dunedin in 1909 and was used on the Midland Line Broken river section until 1913, when she was used on the Roxburgh branch. On 8 September 1917 she was sold to the Otago Rolling Mills but was recused from scrap heap to be reconditioned and exhibited at the Dunedin and South Seas Exhibition in 1925

Year	Number/Name	Railway Company /NZR Section
1872	Rose (1) and Josephine (2)	Dunedin and Port Chalmers Railway Company
1873	Rose (6) and Josephine (7)	Otago Railways
1877	Rose (E27) and Josephine (E26)	Hurunui-Bluff Section
1878	Rose written off (used as spare parts for Josephine)	Hurunui-Bluff Section
1883	E24	Wanganui Section
1890	E175	Wanganui Section
1899	E504 Sold	PWD Wanganui
1901	E504	PWD Otago Central Railway
1903	E504	PWD NIMT
1909	E504	PWD Midland line Broken river section
1913	E504	PWD Otago Central Railway
1917	Written off sold	Otago Rolling Mills
1925	Reconditioned	Otago Early Settlers Museum




MMW 110-1 Josephine NZR E Class 0-4-4-0 Loco - Sheet 1
Chassis Ver 11

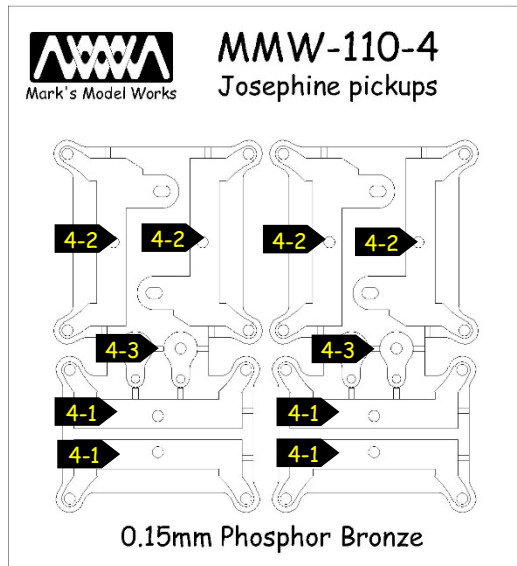
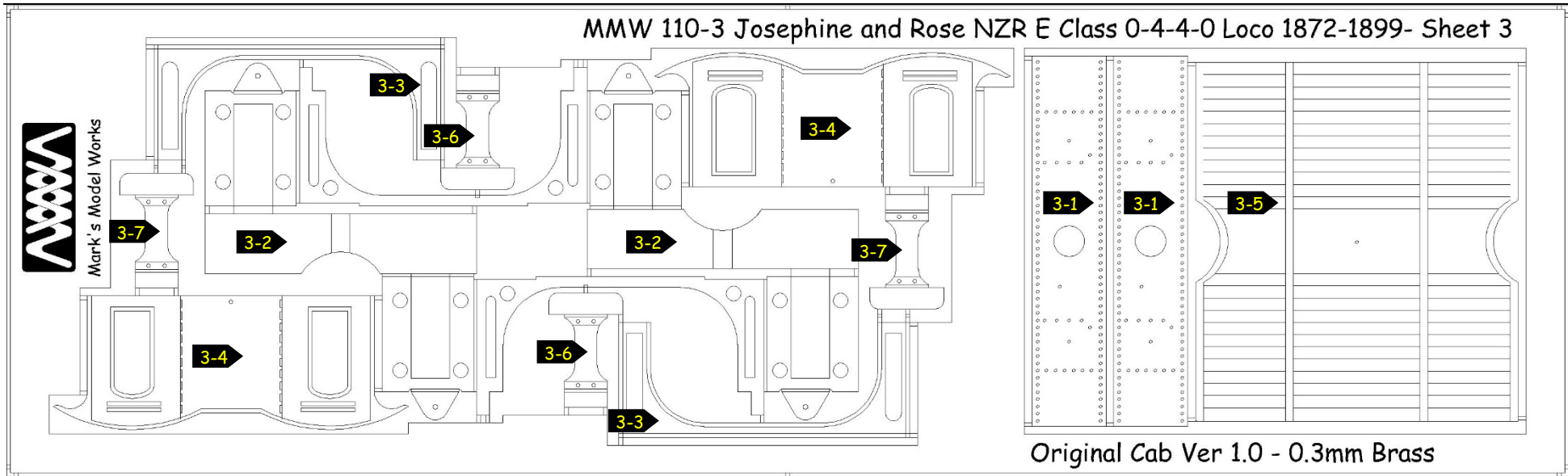


0.375mm Nickel Silver

Mark's Model Works Vulcan E Class Fairlie Locomotive kit instructions



 **MMW 110-2**
Mark's Model Works Josephine NZR E Class 0-4-4-0 Loco 1903-1917 - Sheet 2 Body Ver 6.1 - 0.3mm Brass



Mark's Model Works Vulcan E Class Fairlie Locomotive kit instructions

<p>MMW-110-C1 Cylinder casting parts (4 castings)</p>	<p>MMW225 (110-C2) Cast detail (2 castings)</p>	<p>MMW-110-C3 Cast detail parts (1 casting)</p>
<p>MMW-110-C4 Cast detail parts 1872 -1917 (2 castings)</p>	<p>MMW-110-C5 Cast detail parts 1872 -1909 (2 castings)</p>	<p>MMW-110-C6 Cast detail parts 1883-1917 (2 castings)</p>

Parts List

Etched Parts

Sheet 1 Chassis

0.375mm Nickel Silver

- 1-1. Fire box/motor frame
- 1-2. Motor mount brace RH (2)
- 1-3. Motor mount brace LH (2)
- 1-4. Brake pivot overlay (4)
- 1-5. Power bogie foot plate and headstock (2)
- 1-6. Splasher (4)
- 1-7. Power bogie side frame RH (2)
- 1-8. Power bogie side frame LH (2)
- 1-9. Coupling Rod (4)
- 1-10. Connecting Rod (4)
- 1-11. Brake shoes RH (2)
- 1-12. Brake shoes LH (2)
- 1-13. Cross head guide support bracket RH (2)
- 1-14. Cross head guide support bracket RH (2)
- 1-15. Cowcatcher rear part (2)
- 1-16. Cowcatcher front part (2)
- 1-17. Cab/body foot plate (2)
- 1-18. Pipe flanges (8)
- 1-19. Crosshead square washer (4)
- 1-20. Smokebox support bracket (2)

Sheet 2 Body

Cab 1883-1917

Smokebox 1909 -1917

0.3mm Brass

- 2-1. Side tank/boiler/cab structural frame (2)
- 2-2. Side tank outer wrapper RH (2)
- 2-3. Side tank outer wrapper LH (2)
- 2-4. Side tank drivers side (2)
- 2-5. Side tank fireman's side (2)
- 2-6. Side tank front under side wrapper RH (2)
- 2-7. Side tank front under side wrapper LH (2)
- 2-8. Name and number plates (14)
- 2-9. Side tank lids (4)
- 2-10. Smokebox wrapper (1909/1913 -1917) (2)
- 2-11. Smokebox front plate (2)
- 2-12. Cab structural frames (1883 -1917) (2)
- 2-13. Cab fronts (1883 onwards) (2)
- 2-14. Cab sides (1883 onwards) (2)
- 2-15. Pressure relief valve lever (2)

- 2-16. Cab roof (1883 -1925)
- 2-17. Firebox wrapper
- 2-18. Firebox detail
- 2-19. Firebox doors (2)
- 2-20. Reversing lever rack
- 2-21. Reversing lever wheels (4)
- 2-22. Reversing lever
- 2-23. Reversing lever rods (2)
- 2-24. Regulator mounting (3)
- 2-25. Regulator handles (2)
- 2-26. Sandbox (2)
- 2-27. Sandbox top and lids (6)
- 2-28. Toolbox (2)
- 2-29. Toolbox lid (2)

Sheet 3 Body

Cab 1872-1883

Smokebox 1872-1909

0.3mm Brass

- 3-1. Smokebox wrapper (1872-1909/1913) (2)
- 3-2. Cab structural frames (1872-1883) (2)
- 3-3. Cab sides (1872-1883) (2)
- 3-4. Cab fronts (1872-1883) (2)
- 3-5. Cab roof (1872-1883)
- 3-6. Bogie steps RH (1872-1883)
- 3-7. Bogie steps LH (1872-1883)

Sheet 4 Pickups

0.15mm Phosphor Bronze

- 4-1. Front wheel wiper (4)
- 4-2. Rear wheel wiper (4)
- 4-3. Solder lug (4)

Cast Parts

- C-1. Cylinder (4)
- C-2. Cylinder front (4)
- C-3. Crosshead (4)
- C-4. Crosshead guides and cylinder rear plate (4)
- C-5. Head lamps round (2)
- C-6. Sight glass lubricator (1883-1917)
- C-7. Whistle
- C-8. Brake Crank
- C-9. Hand Brake
- C-10. Displacement oilers (1872-1883) (4)

- C-11. Central Water Filler (1872-1883) (2)
- C-12. Steam Valves (4)
- C-13. Smoke Box Door Clock Handles (1872-1909) (2)
- C-14. Head lamps square (2)
- C-15. Coupler Surround (2)
- C-16. Straight funnel (1872-1883) (2)
- C-17. Steam dome (2)
- C-18. Smoke Box Door (1872-1909) (2)
- C-19. NZR cast funnel (1883-1917) (2)
- C-20. NZR cast Smoke Box Door (1909-1917) (2)

Miscellaneous Parts

- M-1. Driving wheels (8)
- M-2. Flanged bearings (8)
- M-3. Crankpins (8)
- M-4. Split axle set (4)
- M-5. 14:1 worm gear set (2)
- M-6. Flanged ball bearings (6)
- M-7. 1.5mm Worm shaft (2)
- M-8. Bogie gearbox/spacers/bearing retainers (2)
- M-9. PCB bogie insulation layer (2)
- M-10. Pully set (2)
- M-11. M1.0 x 3 screws (15)
- M-12. M1.0 x 5 screws (4)
- M-13. M1.0 x 7 screws (8)
- M-14. M1.4 x 2 screws (4)
- M-15. M1.4 x 3 screws (15)
- M-16. M1.4 washers (10)
- M-17. XBD 1219 coreless motor (2)
- M-18. O-ring belts (10)
- M-19. 0.3mm brass wire
- M-20. 0.4mm phosphor bronze wire
- M-21. 0.5mm brass wire
- M-22. 0.6mm brass wire
- M-23. 1.0mm stainless steel rod
- M-24. 1.5mm brass rod
- M-25. 2.0mm brass tube
- M-26. 7/32 brass tube
- M-27. 9/16 brass tube
- M-28. 19/32 brass tube
- M-29. Hand rail posts (12)
- M-30. Hook up Wire
- M-31. Brass pins (6)

General construction notes

The order these instructions are in is not necessarily the right order. They only follow a logical progression

When building the prototype model I have swopped between the body and the chassis and I tend to build both concurrently. Most of the chassis construction uses M1.0 or M1.4 screws.

Have a good read through the instruction first and pick and choose the pieces you feel comfortable starting on.

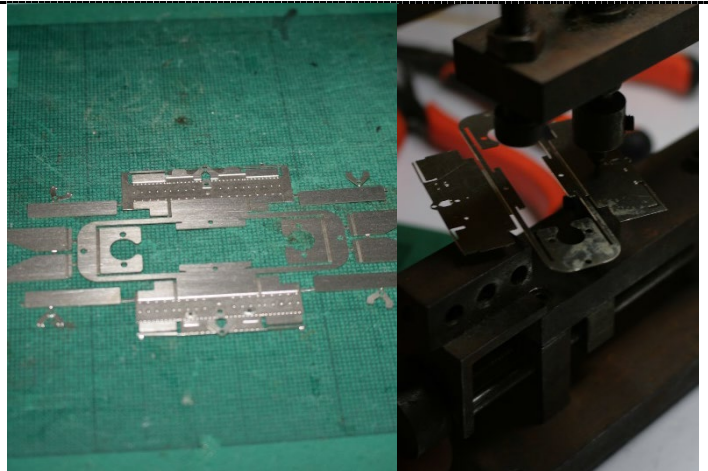
It is a good idea also if you feel the soldering is going to be your challenge. Start with the easy soldering jobs then as you build up your skill you will feel more comfortable tackling the more complex jobs

Etched fold line have been used to aid construction and guide you to where the folds are. Generally 90° folds are toward the etched line and 180° folds are away from the etched line. On this kit there are a number of 90° that are away from the half etched area. Plus a number of perforated fold lines.

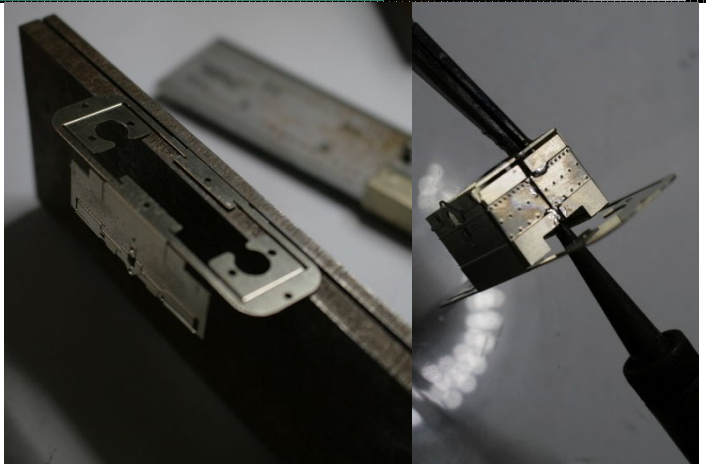
Chassis Construction

Firebox and motor mounting assembly.

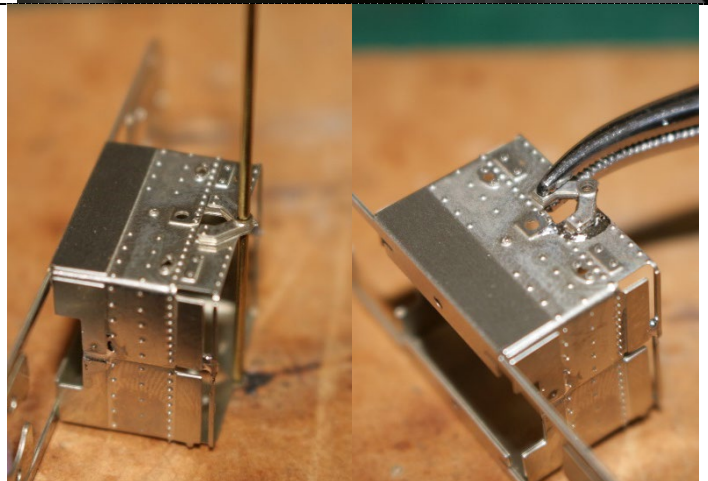
Remove firebox motor mount (1-1). Punch the rivet details on the side of the firebox. Use the half etched guide on the back to locate the rivet punch.



Fold the firebox sides 90° along the etched fold line then the ends 90° away from the etched fold line. The ends should meet under the motor mounts and overlap into the half etched areas. Solder the 2 halves of the end together.

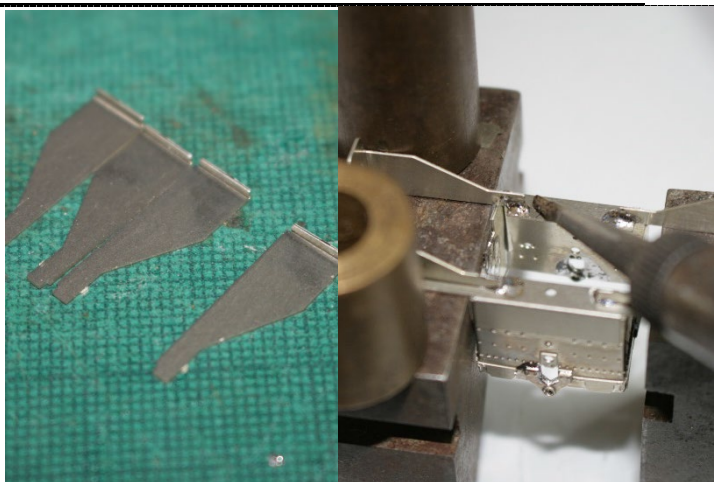


Overlay the brake pivot (1-4), there are 2 layers on each side with the half etched layer on the outside, use the hole to align these parts with a 1.0mm brass wire and solder them together



Mark's Model Works Vulcan E Class Fairlie Locomotive kit instructions

Remove motor support braces (1-2, 1-3). Fold the end of the braces 90° along the etched fold line. Fold the motor mounts 90° along the etched fold line. Insert the braces with the folded end around the motor mount and solder in place



Use the M1.4 x 1.5mm screws to mount the motors. Position the motors using the 2 of the 6 mounting holes so the tags align, Check the direction of rotation and turn if necessary.



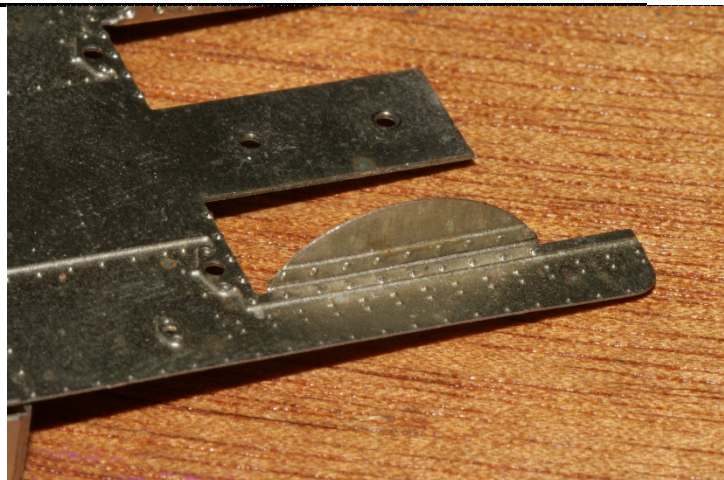
Power bogie footplate assembly

Remove the power bogie foot plate (1-5). Punch the rivets using the etched location guides on the underside.



Mark's Model Works Vulcan E Class Fairlie Locomotive kit instructions

. Fold the splasher sides 90° along the etched fold line, be careful not to crush the punch rivets



Fold the headstock 90° along the etched fold line and each end 90° along the etched fold line,



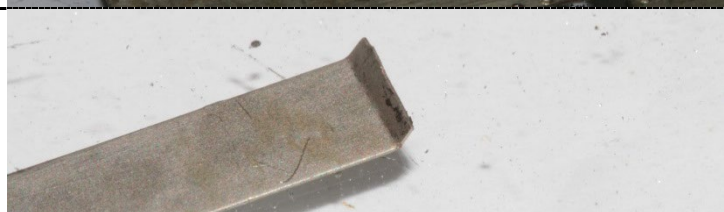
Use the 0.3mm brass wire to make the hand grabs on the front of the head stock. Solder in place from behind and run a filet of solder around the inside of the headstock



Fill the back of the head stocks with Solder to add weight to the front of the footplate.



Make a small fold in the end of the splasher to fit under the footplate.



Pre-shape the curve on the splashers (1-6) using a dowel and a yielding surface to approximately the curve of the splasher side



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Lay the splasher in place, align with the side and solder.



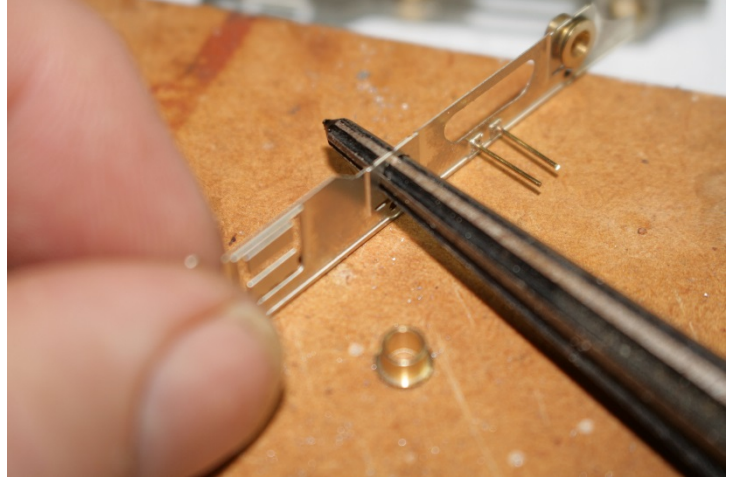
Power Bogie Assembly

Remove the Power bogie side frames (1-7 and 1-8) from etch sheet 1 and ream out the bearing hole until the flanged brass wheel bearing fit neatly. Punch the rivets around the brake mounts.

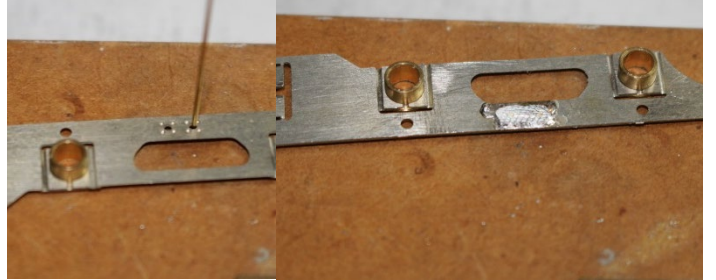
Notes on wheel bearings:

The kit is designed for 2 types of wheel bearings, round brass flanged bearing (supplied) or square horn block bearings (NY 373/8 Ø3x5sqx2.8 sintered bronze (8) not supplied).

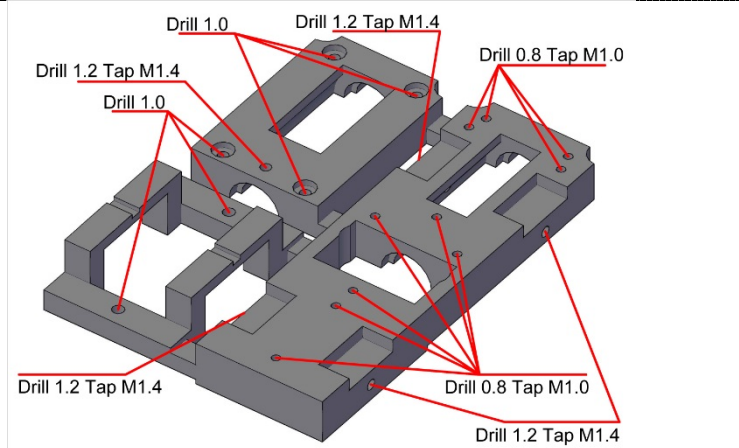
If you are using the square bearings then cut along the centre of the bearing holes at the half etched line and fold each side back 90°



Make a jig by drilling 2 x 0.5mm holes in a block of wood to approximately 10mm depth at the spacing of the brake mounts. Insert 15mm lengths of 0.5mm brass wire into the jig placing the side frame over then then solder these in place and file flush on the back. If you are using the round axle bearings solder these in place.



Drill out the holes in the (M-9) Bogie gearbox/spacer to 0.8mm, 1.0mm and 1.2mm then tap to M1.0 and M1.4.



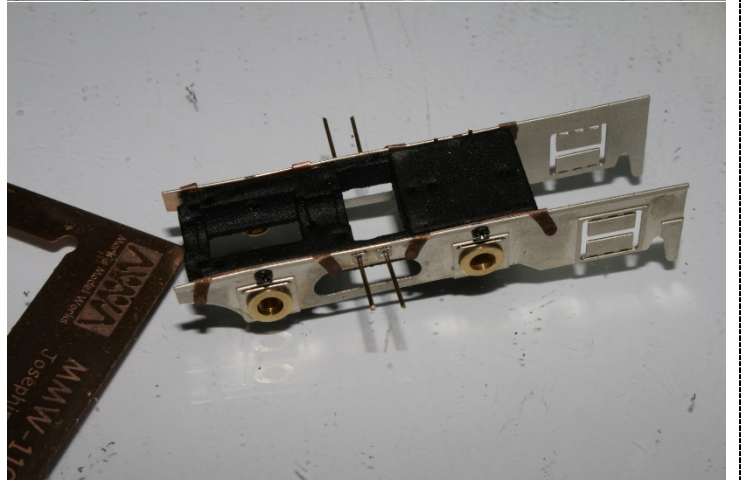
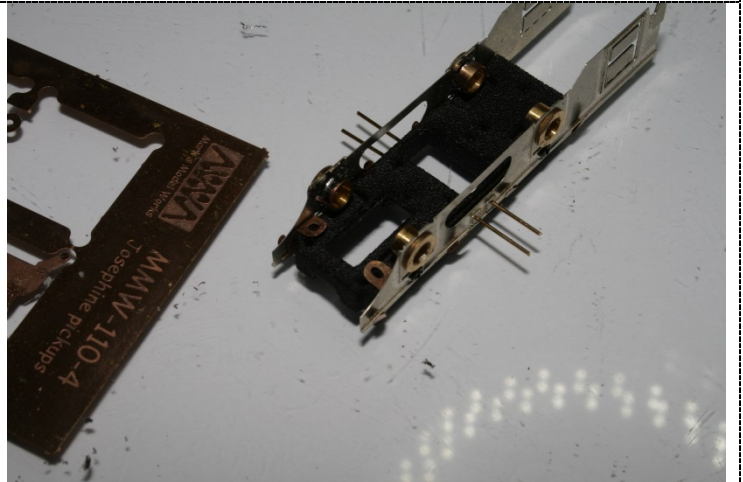
Cut the gearbox spacer and file the sides flat
Cut the square bearing retainer (if used)

Mark's Model Works Vulcan E Class Fairlie Locomotive kit instructions

Remove the front and rear wipers from the etch sheet 4, check half etched side is away from the side frame, the dimples on the ends will face the wheels when folded over the frames. Bend the connection lugs on the rear wipers at right angles so the M1.0 screw lines up on the bottom of the gearbox.

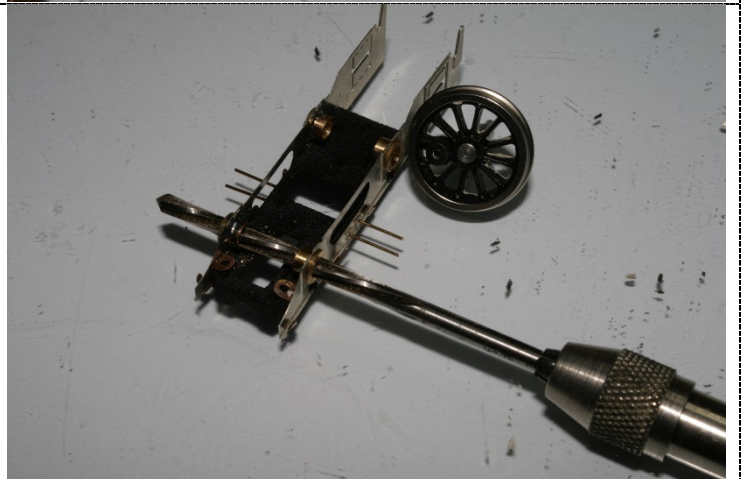


Screw a LH and RH side frames to the gearbox and the front and rear wipers (4-1, 4-2) with M1.4 screws, fold the wiper over the outside of the frame and fasten the connection lug underneath down onto bottom of the gearbox.



Ream the axle bearings to 3.0mm and check alignment. Take time to get the axles running smoothly in the bearings

Assemble the split axles, insert the acetal spacer into the female half axle then insert male axle press the male half axle into the spacer, a simple jig can be made from rod or tube cut to 20mm long.

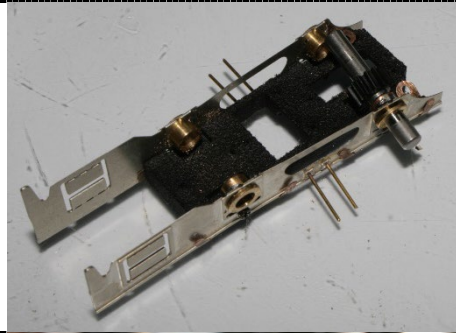


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Press the 14 tooth gear onto the rear axle and align about the centre, loosen the side frames and insert the axles through the bearings.

Retighten the side frame screws and ensure the axles turn freely, if they are tight go back to the reaming of axle bearings step until you are sure they turn freely.

This is important



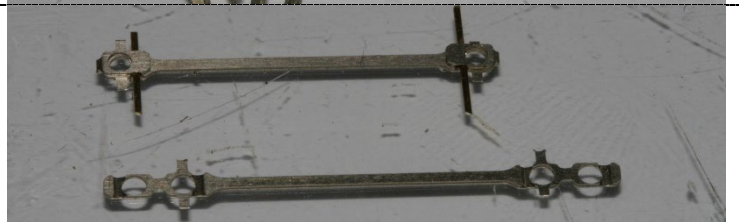
Press the wheels on to the axles and check the gauge and quartering, the parallax method of aligning the spokes. *right*



Remove the brake shoes (1-11, 1-12) Mount the brake shoes between the wheels. These can touch the wheels but should still run freely



Remove the coupling rod (1-9) from the etch keeping the tabs. Fold the ends over 180°, insert a short length of 0.5mm wire to represent the bolts and solder. Shape the tabs to represent the wedges.



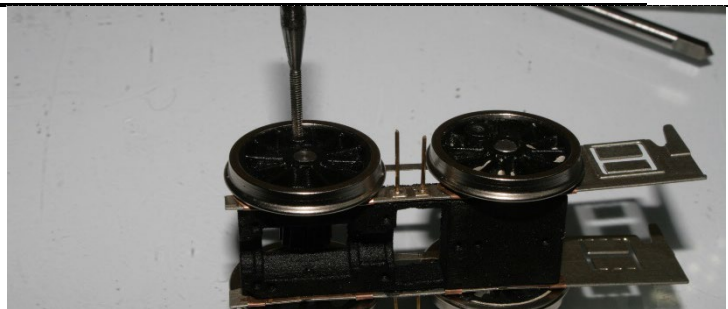
Check carefully that the 0.5mm is clear of the hole.

If the rod is intruding into the hole file the brass back to the edge of the nickel silver. Ream the holes in the coupling rods until the crankpins (M-4) fit neatly.



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Check the crankpin holes in the wheels are tapped to M1.4. Install the coupling rods and check for quartering. Ensure free running of the assembly.



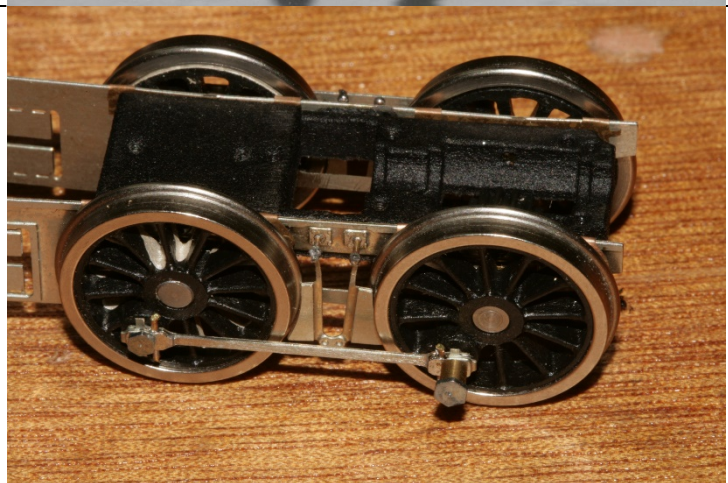
File the spacer on the long crankpin back until it is approximately 37.7mm long



Fit the coupling rods and check the chassis is smooth running.

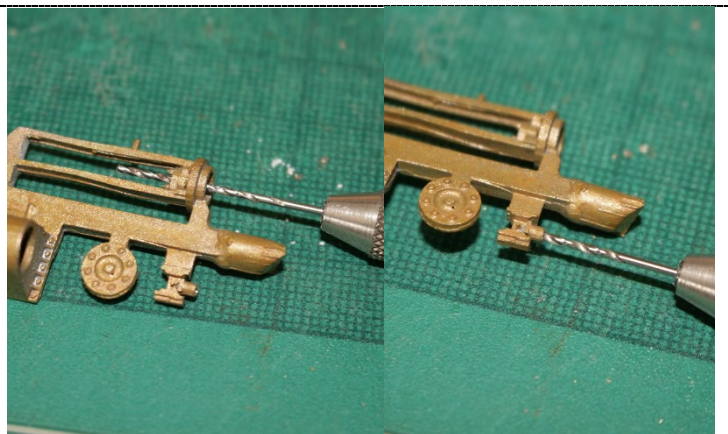
The wipers will cause a little friction, but the mechanism should still be free running.

Spend time getting this free and smooth and the quartering correct before moving onto adding the cylinders and cross heads.



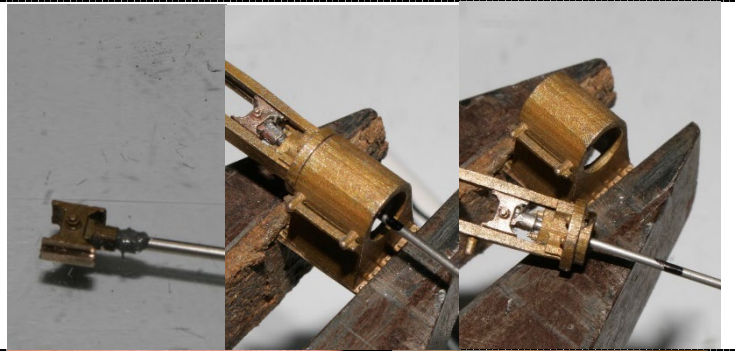
Cylinder and crosshead assembly.

Clear the holes in the Crosshead casting C-3 with a 0.9mm drill and in the Crosshead guides and cylinder rear plate casting C-4 to 1.0mm

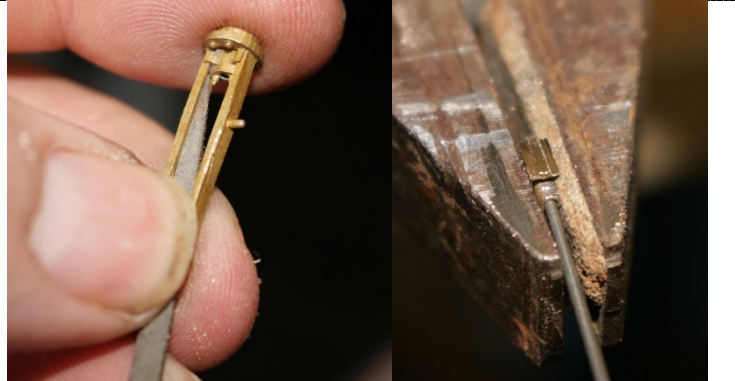


Mark's Model Works Vulcan E Class Fairlie Locomotive kit instructions

Remove the crosshead casting C-3 and solder in the 1.0mm stainless steel rod. Use solder paste on the end of the stainless steel rod. Cut the rod at 15mm from the cross head. This will also give you something to position the casting in a vice for cleaning up.



Remove parts C-2 and C-4. Clean off the sprues. Use a fine triangle needle file to clean the inside of the crosshead slides and a square needle file to clean the outside of the crosshead, Holding the crosshead in a vice with a soft jaw on one side will help.



These should be an easy sliding fit the length of the slide.
Use a little metal polish to finish the fit.
Spend time getting this right it will pay off later.



Clean around end of the casting (C-4) to fit the cylinder.

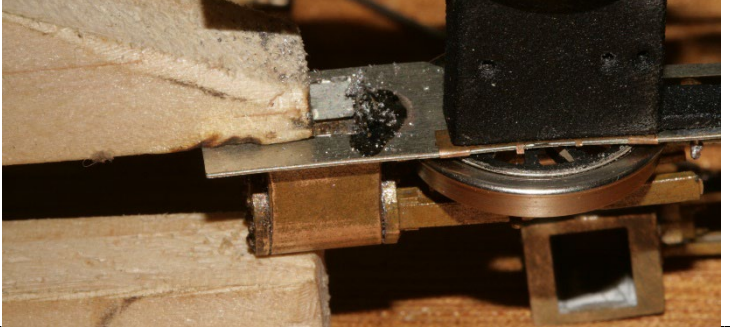


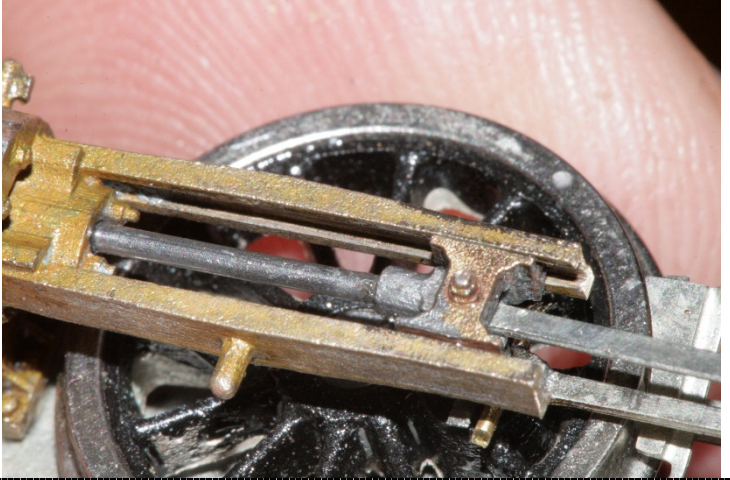
Remove the cylinder casting C-1 and clean off the sprue feed on the back of the casting. Check fit C-2 and C-4. Make a wooden jig to hold the cross head slides C-4 parallel with the back of the Cylinder C-1.
Tin the surfaces to be joined then apply heat to the cylinder casting to sweat solder the pieces together.






Cut the slide bars to 17mm long



Mark's Model Works Vulcan E Class Fairlie Locomotive kit instructions

<p>Use the tabs on the side frames to locate the cylinder castings and solder these onto the side frames.</p>	
<p>Remove the connecting rod (1-10) Fold the big end over 180°, insert a short length of 0.5mm wire to represent the bolts and solder. Shape the tabs to represent the wedges.</p>	
<p>Ream the hole in the crosshead end to 0.6mm. Mount the connecting rod on the crosshead spigot. Mount the square washer (1-19) on top of the spigot. Then solder the retaining washer.</p>	
<p>Use a solder mask on the joint.</p>	
<p>Insert the crosshead in the guides and check it slides free for the length of the guide. Use the longer of the 2 types of crank pin and the brass spacer to mount the connecting rod. File the spacer to allow the rods to move freely</p>	
<p>Remove the Solder mask from the PCB Drill the holes to 1.5mm. Mount this and the footplate to the front of the power bogie frame spacers with M1.0 screws. Solder the PCB to the frames to strengthen the front section</p>	
<p>Remove (1-13, 1-14) and fold these around the crosshead guides to form a box section. Note there are LH and RH versions. Position these over the pads in the PCB and solder in place</p>	
<p>Cow Catcher Assembly</p>	

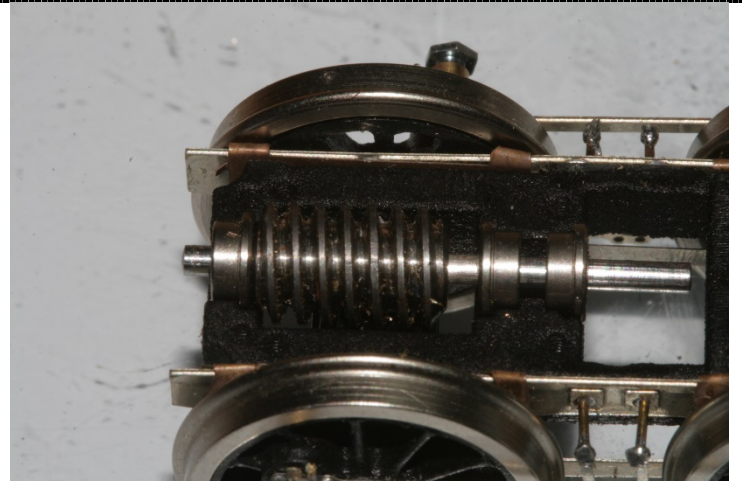
Mark's Model Works Vulcan E Class Fairlie Locomotive kit instructions

<p>Punch the rivets on the upper and lower parts of the cowcatcher (1-15, 1-16)</p>	
<p>Make the fold in the front of the point by holding one side close to the etched line on the back side and force the fold in on the edge of a solid surface, such as the engineers square in the picture. Bend until the rear ties come together</p>	
<p>Twist and bend the sides to line up with the lower part and the centre bar. Solder in place</p>	
<p>Ream out the holes with a broach to allow 0.4mm brass wire to be inserted. Feed the wire up through the lower section and bend the top to fit into the upper section. Solder in place. Work along all of the holes until all the wires are in place. Cut the wires flush at the back and file off the extra solder.</p>	
<p>Headstock mounting</p>	
<p>1.0mm wire braces back to headstock</p>	
<p>Coupler surround</p>	

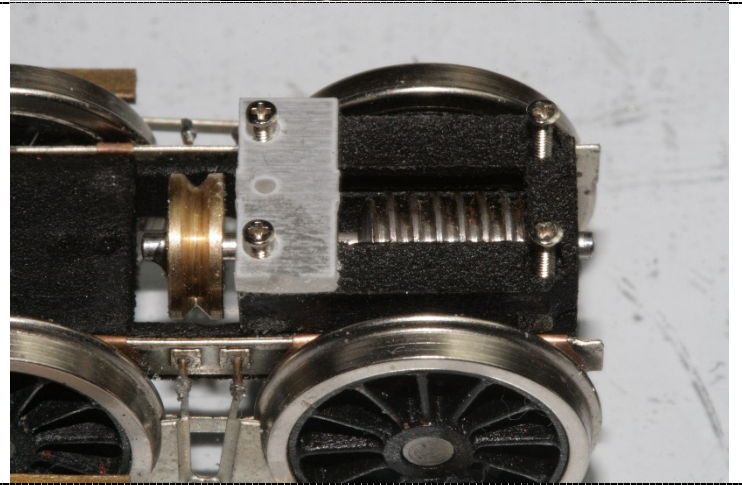
Mark's Model Works Vulcan E Class Fairlie Locomotive kit instructions

Gearbox Assembly

Assemble the gearbox parts with the (M-8) 1.5mm worm shaft, large pulley, 2 ball bearings facing flanges out, the worm, then the last bearing with the flange facing the worm. Test fit these in one half of the gearbox



Use 4 x M1.0 x 5 screws (M-13) to hold the gearboxes together. Mount the spacer on the front of the gearbox. Check the worm and pulley are free running and mesh with the 14 tooth gear on the axle.



Test fit the motor and firebox assembly

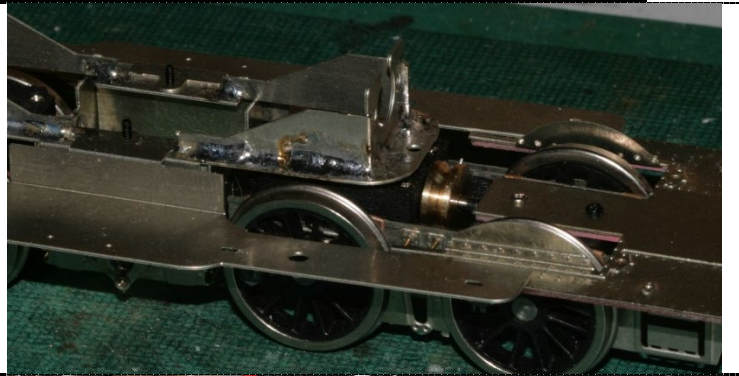
Chassis Assembly

Use the cab foot plate (1-17) to check the ride height. Tap the mounting hole in the foot plate to M1.0. Fold 90° at the etched lines in opposite directions to form it into a Z shape. Secure the plate to the firebox with a M1.0x3 screw from inside the firebox.

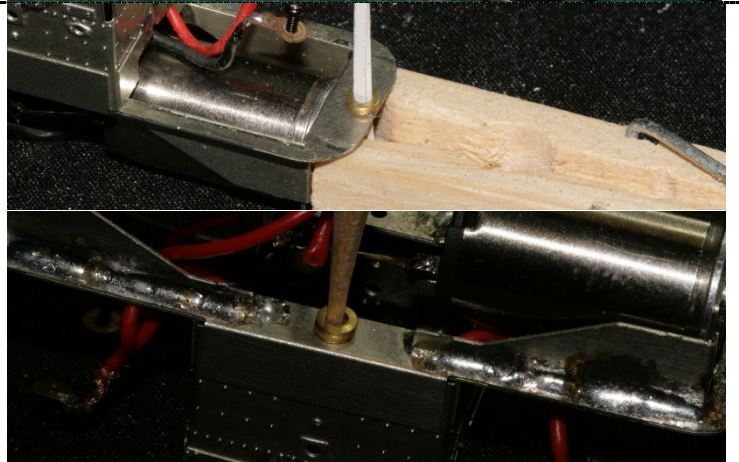


Mark's Model Works Vulcan E Class Fairlie Locomotive kit instructions

Add 1.4mm washers to the bogie pivot points and cab mounting points to control the ride height. The cab footplate should be just above the bogie footplate



Use a M1.4 x 5 screw to attach the firebox - motor mount to each power bogie assembly. The motor may need to be removed to install this screw.



When you have the right number of washer to get the body riding at the right point, solder then to the fire box

Remember if you are going use the loco on tracks with crests and hollows to allow more clearance

Install the small pulley on the motor shaft. Fix in place with Loctite. Install the O-ring drive belts and test run

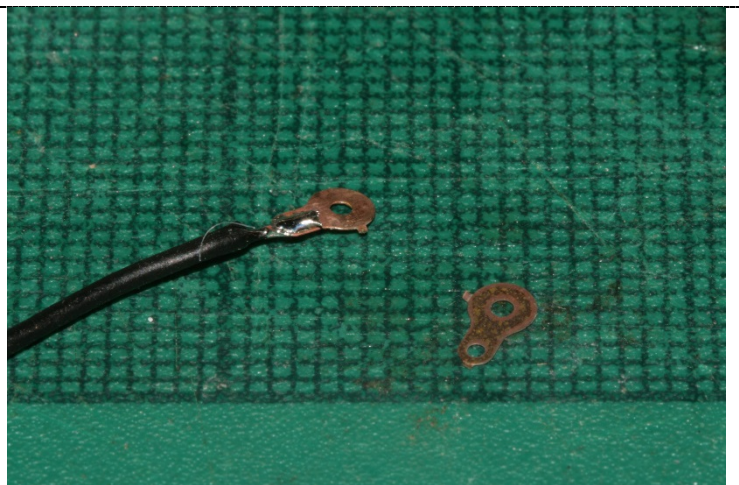
Care taken to ensuring the power bogies are free running will pay off at this point.

The O-ring does not need to be tight and the kit come with 3 sizes so try the largest size first

The number of M1.4 washer used will vary the distance between the pulleys

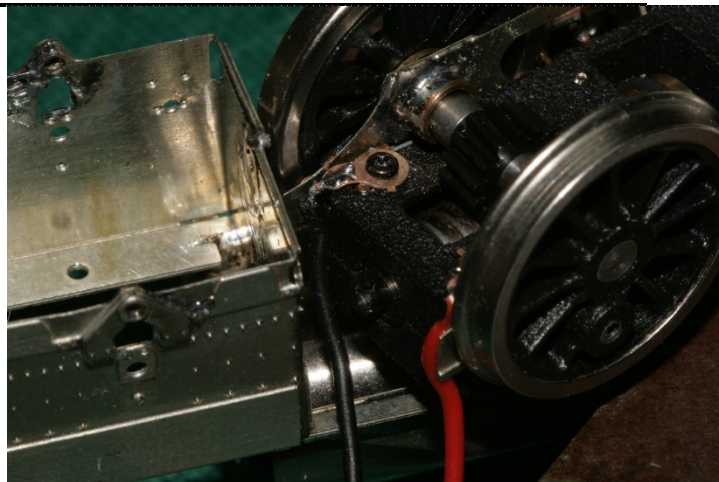
Wiring the motors

Solder the connection lugs (4-3) to flexible hook up wire.



Mark's Model Works Vulcan E Class Fairlie Locomotive kit instructions

Attach these to the rear pickup wipers with the screw on the underside of each power bogie.
Feed the wires through the gap in the top of the firebox and up to the motors



At this point you can choose to install DCC, Sound and stay alive circuits if you wish

Test run

Caution: Coreless Motors

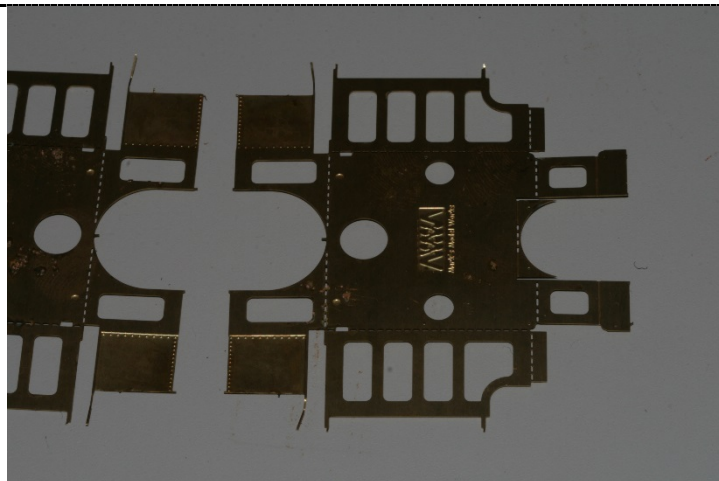
The Coreless motors DO NOT like pulsed DC at a frequency less than 10kHz, this also means you should not run them on a DCC system using the DC function, address zero. The AC waveform will overheat the motor. Pure DC from a 3 terminal regulator or batteries will be fine.

DCC CV should be set to PWM greater than 10kHz.

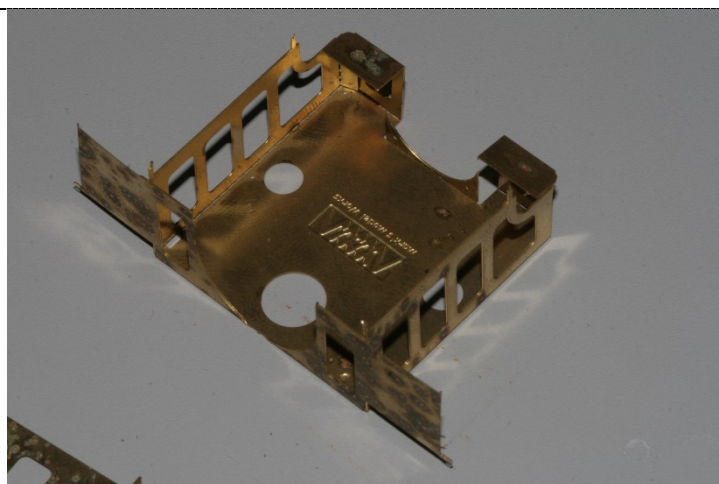
Body Construction

Side Tank Assembly

Remove the tank frames (2-1) from the etch. First fold to make is the small strip on the end of the cab side, roll this around a short length of 0.6mm wire and solder the end back to the side. The wire can be removed while the solder is hot. Drill out the holes on the top of the tanks, for the cab roof to 1.0mm



Fold the tank sides and the cab ends 90° along the dotted etched lines so the half etched tank tops are on the outside. Fold the tank front 90° and then fold the diagonal brace from the tank side to meet the front. Leave the cab side for now. Check all the angles are square and all the joints sitting tightly then solder from the inside

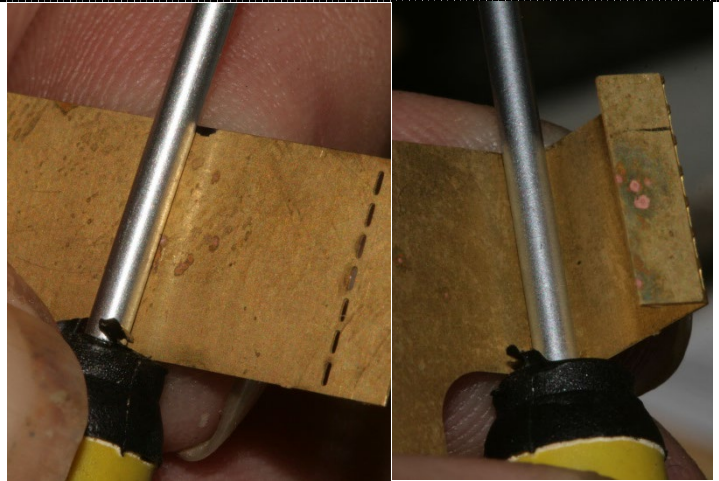


Remove the tank wrappers (2-2, 2-3). Align the tank wrapper with the cab side a mark the position of the roll for the corner.



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Form the wrapper to fit the tanks using a 2mm rod or drill shank for the front curve. Align the bottom of the wrapper with the bottom of the frame, this should leave a small overlap around the top edge. Tack in several places then flood with solder from the back, flood the dotted etched lines with solder then clean the outside with a wire wheel or fibreglass brush.



Remove the tank cab liners (2-4, 2-5) align these in the same manner as the tank side wrappers and solder in place from the rear. Note 2-4 is the driver's side and 2-5 is the fireman's side, the fireman's side of the tanks has the coal bunker lid. Insert a short length of 0.5mm wire for the coal bunker handle.



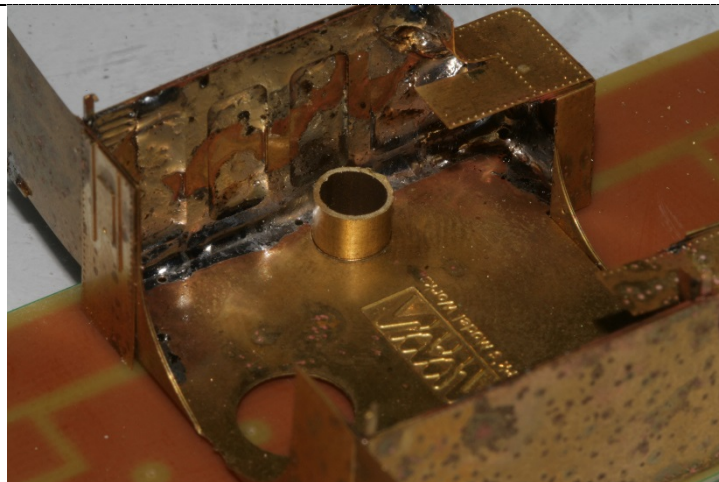
Remove the tank front undersides (2-6, 2-7) form these to fit under the front of the tanks, then solder in place




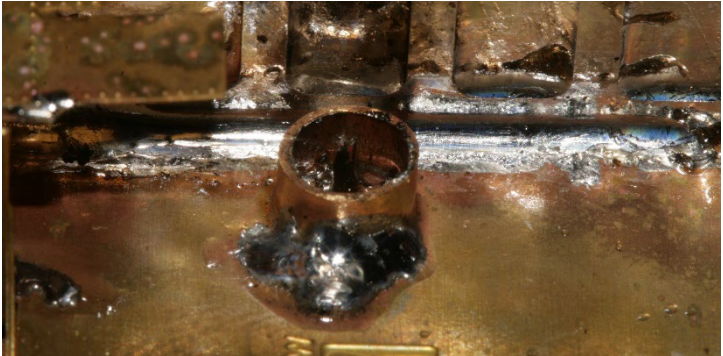

Tank details

Name and Number plates

Ream the hole in the tank to fit the 7/32 brass tube. Make this a tight fit then way it will be easier to install. Cut 4 short lengths of tube 10mm max, lay the tanks upside down on a small card spacer this will allow the tube to protrude above the top of the tanks. Solder in place



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<p>Place a tank lid (2-9) on the top of the tube and solder in place. Ream the hole in the lid to 0.5mm, drill a hole in a piece of wood the size of the pinhead to a depth of 2mm, cut a brass pin and insert for the hand knob, use the hole to solder the pins in each tank lid at the same height.</p>	 
<p>Drill out and ream the 3 holes along the top side of each tank to 0.8mm and insert turned hand rail knobs (M-30), line these up and insert a 0.5mm wire through the knobs. Solder the wire in place and clean up with a file</p> <p>If you are modelling the early era pre 1883 then add the extra hand rails on the front sides of the tanks above the steps on the bogies in the same way</p>	
<p>Tool box (2-28, 2-29). Punch the rivets on the hinges then fold these 180°. Fold the harsp and lock 180°, ream the holes in the harsp and lock to 0.3mm. Anneal a short length of 0.3mm brass wire with a flame (try not to melt it) bend into a staple and insert in the harsp lock, solder from the inside.</p>	
<p>Fold the tool box corners 90° and solder the half etched lap join</p>	
<p>Fold the lid to fit and solder from the inside. Place the tool box in the centre of the tanks and solder in place. Check the prototype photos some have 2 box some 1</p>	

Mark's Model Works Vulcan E Class Fairlie Locomotive kit instructions

Smokebox Assembly

Guidelines on the Smokebox changes during the Life of Josephine

Both locos started out with short smokebox so depending on the Era you are building in will govern which smokebox, funnel, door and oilers you should use

1872-1883 Otago early era, short smokebox with displacement oilers clock handle smokebox door and Vulcan funnel

1883-1909 Wanganui and North Island PWD era short smokebox, clock handle smokebox door and NZR funnel

1909-1917 South Island PWD era long smokebox, NZR cast smokebox door and NZR funnel

Remove the smokebox support bracket (1-20).
Fold the support bracket into a U shape, then fold the sides 90°.

Reinforce the folds with a solder filet.

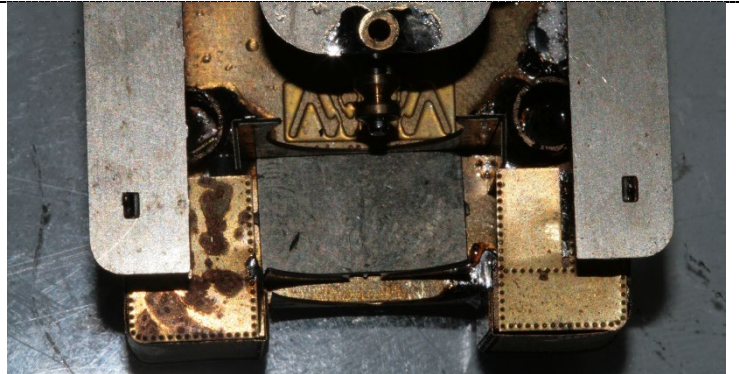


Test fit inside the chassis/body frame to ensure the motor pulley is clear of the support bracket. Some trimming will be necessary. The length of the 9/16 tube will need to be trimmed to allow the smokebox assembly to fit flush.

If using the short smokebox cut to 15mm long.

If using the long smokebox cut to 20mm long.

Test fit this into the side tank assembly to check the length



The boiler and smokebox have brass tubes for structural supports

There are two lengths of 19/32 tube for the smokebox and two of 9/16

The 19/32 is used for the smokebox and boiler and the 9/16 is used as the mounting

Insert the length of 9/16 tube into the support bracket

Slide the 17/32 tube over this to ensure alignment

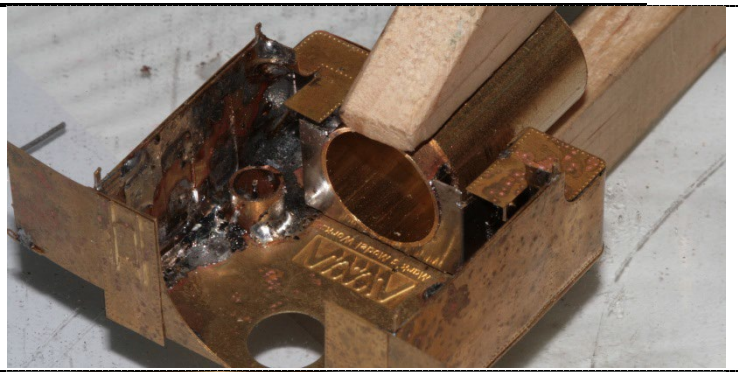
Only solder the 9/16 tube to the bracket at the back

The 17/32 tube is designed to slide off and around to ensure alignment of the funnels with the body and will be the last thing soldered in place once the body is complete



Mark's Model Works Vulcan E Class Fairlie Locomotive kit instructions

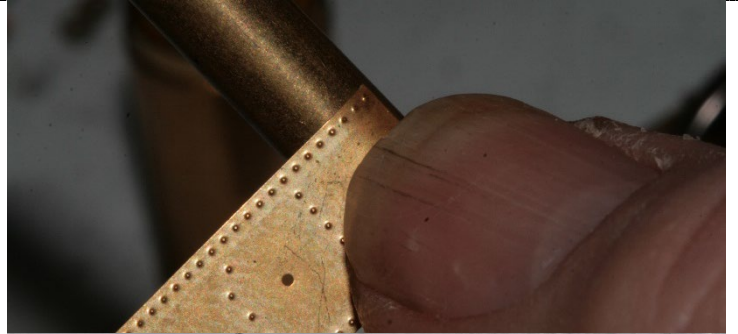
Turn the side tank assembly over and solder the smokebox support bracket flush with the front of the tanks



Choose the wrapper for your era
This is the short smokebox shown here

Start the ends of the wrapper around a small 6mm or so former

This should give you a curl at each end



Roll the wrapper around a larger former but something smaller than you want to end up with



Check the wrapper around the 19/32 tube for a snug fit



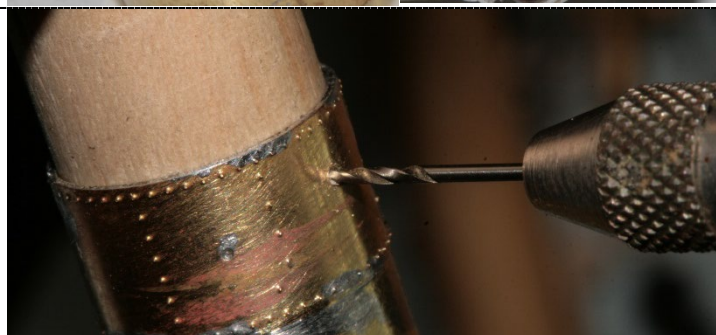
Mark's Model Works Vulcan E Class Fairlie Locomotive kit instructions

Wrap the etch onto the boiler tube and tie around with wire.
Use wire that is hard to solder
I used steel wire
Ensure the wrapper is on the correct way around with the hand rail knobs toward the front
Solder onto the tube,



Place the tube and wrapper onto a wooden dowel and drill out the hole for the funnel, the displacement oilers if you are fitting these and the hand rail knobs

Use a 0.8mm drill if you are using the displacement oilers or a 0.5mm drill if you are fitting oil pipes



Add the hand rail knobs

Align these before soldering in place



Add the smoke box oilers if you are modelling the pre 1880 era
Add the displacement oilers if they are being used.



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Choose the funnel casting you need, this can be drilled out down the centre if desired. Clean up the underside of the flange and test fit. Use solder paste on the join and a flame or other fast heating source on the casting to solder.



Remove the smokebox front (2-11) and solder this flush into the front of the smokebox.



Clean up the head lamp casting
File in an indent in the base to allow the wiring for the head light to pass through

Do the same the smoke box front etch



Solder the headlamp to the smokebox front so the base of the lamp is just above the smokebox door casting

This should let the holes for the head light wiring align

A wooden jig to hold the lamp is helpful



Mark's Model Works Vulcan E Class Fairlie Locomotive kit instructions

If using the clock handles drill out the smokebox door and insert the clock handle casting.

Align and solder the clock handles in place



If using the NZR cast door drill out the handle holes and form a length of 0.3mm wire into the door handle solder from the back



Add the smokebox door casting. Take care to align the door and the funnel, then solder in place.

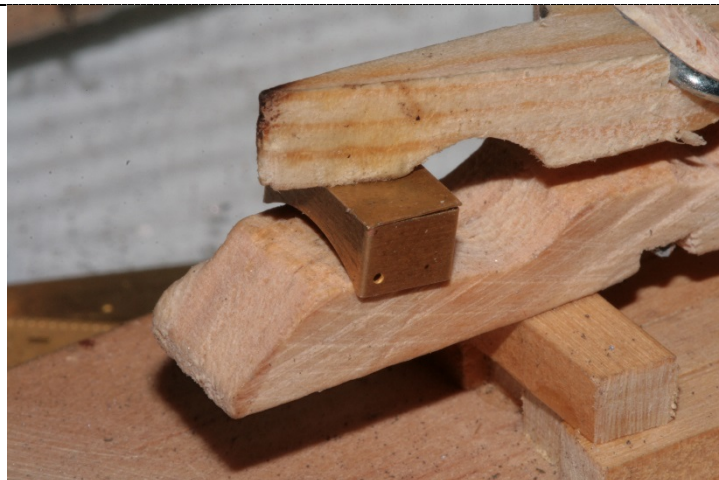
Using low melt solder for this join is helpful as the casting take a lot of heating for the solder to take

Add the oil pipes from sides of the smokebox.

Sand box

Fold up the sand box and solder the lid in place
Choose the type of sand box lid you wish to use

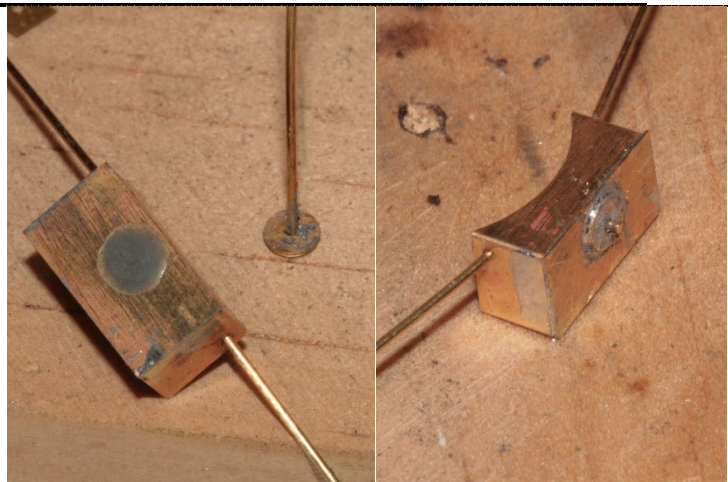
There is no data on when this lid changed shape
The original plan show a round lid and the lid on the preserved loco is square



Mark's Model Works Vulcan E Class Fairlie Locomotive kit instructions

Drill a 0.3mm hole into a piece of wood the align the lid and create a handle

Use solder paste on the lid and solder the wire from inside

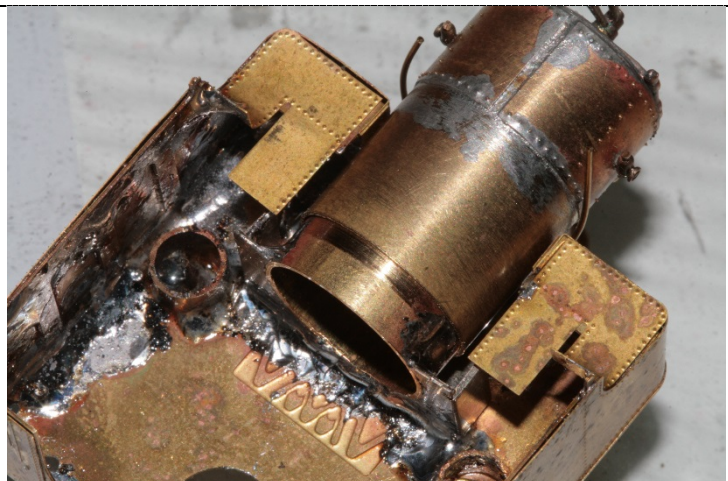


Add 0.5mm wire for the sand pipes cut these of about half way around the smoke box



The Smokebox assembly should slide on and stay in place but can still be rotated and removed

Leave this unsoldered for now



Mark's Model Works Vulcan E Class Fairlie Locomotive kit instructions

Cab Assembly

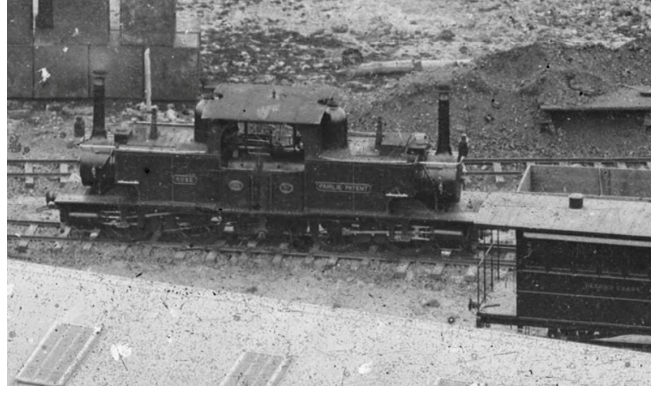
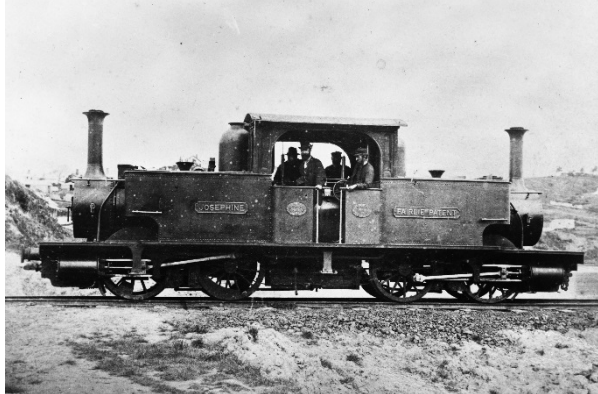
Guidelines on the cab changes during the Life of Josephine

Both locos started out with double roof cab so depending on the Era you are building in will govern which cab you should use, Note: I have not found a definite date for when the original cab was replaced and have assumed it was replaced when Josephine was shipped before heading to Wanganui in 1883. Evidence has shown that Rose may have had a single roof cab by 1873. (See photos below both from the Dunedin and Port Chalmers Railway era 1872-1873)

1872-1883 Otago early era, double roof cab with inlaid details

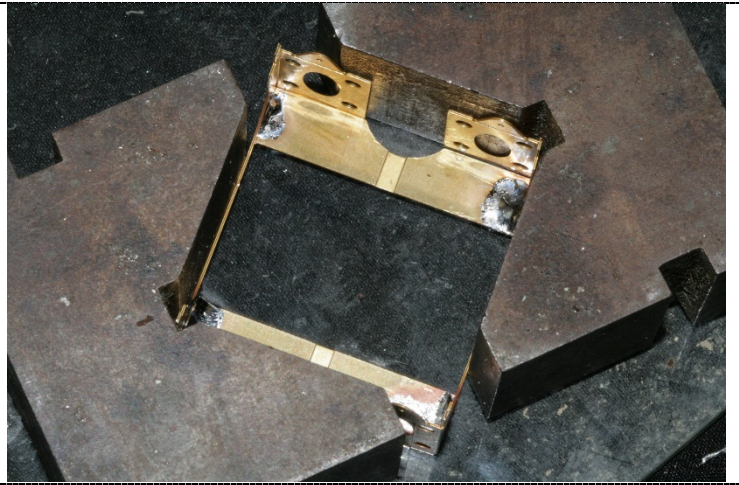
1883-1917 Wanganui and PWD single roof cab with plain sides

1925-present Avonside E cab (not part of this kit)



Both cab designs are made from the same basic parts. The cab structural frames (2-12 or 3-2), cab side (2-14 or 3-3), cab front (2-13 or 3-4) and cab roof (2-16 or 3-5).

Take the cab structural frame, tap the holes in the attachment tabs to M1.0, fold these, the corners and top at 90°. Check the angles are true and lay both frames on a flat surface top down, align the tops with the opposite corners then solder together.



Form the cab front into a curve to match the top of the frame, use a drill shank to make the curve then bend at the etched dotted lines for the cab front, test fit



Mark's Model Works Vulcan E Class Fairlie Locomotive kit instructions

then solder in place from the back through the laminating holes. Run a fillet of solder down the etched dotted line to fill in the holes.




Overlay the cab sides flush with the top of the frame, solder from the back through the laminating holes



Remove the pressure relief valve lever (2-15), only one side of this is required so remove the other side. Ream the hole in the eye for 0.3mm wire. Fold the lever at 90°, then twist the eye at the end by 90°, mount the levers on the half etched sections of the top of the cab frame, one on each front.

From the cab roof by rolling with a large radius on a soft surface. If building the pre 1883 version will the double roof use a piece of flat bar to protect the flat section in the centre while rolling the roof sections. Test fit and then solder the roof in place. As the cab is removable the roof does not need to be.

Mark's Model Works Vulcan E Class Fairlie Locomotive kit instructions

<p>Added the whistle to the centre of the roof</p> <p>Note: this is the double roof early era cab</p>	
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<p>Body Assembly</p>	
<p>Mount the cab onto the side tanks with the M1.0 screws. This will control the spacing of the tanks. Mount the tanks onto the Cab footplates while they are mounted to the firebox again to control the spacings. Solder the tabs under the footplate to secure the tanks in place. Remove the body from the firebox and remove the cab to allow access to the cab interior.</p>	
<p>Use a drill shank to form the curve in the cab sides and roll these around until the cab entry hand rails line up with the holes in the cab footplate, over bend these a little to make sure the cab side is at rest and in the correct spot. Run a fillet of solder along the bottom edge when satisfied. Insert a 0.5mm wire for the cab hand rails and solder in place.</p>	
<p>Solder the foot plate to the tanks and then file all the solder joins on the bottom of the footplate flush.</p>	

<p>Cab Interior</p>	
<p>Remove the firebox wrapper (2-17), Test fit in the central section of the cab. Adjustments to the length may be required, use scissors to trim if required. Form this with a rod and soft surface so the half etch surface is to the inside of the wrapper. This is a good point to test out how your wiring for the controls will fit around the motors, into the side tanks and to the power bogies. Before soldering the firebox wrapper in place.</p>	
<p>Fire box doors</p>	
<p>Reversing rack and handle</p>	
<p>Brake handle</p>	
<p>Regulator</p>	
<p>Steam valves</p>	
<p>Sight glass lubricator post 1883</p>	

Mark's Model Works Vulcan E Class Fairlie Locomotive kit instructions

Relief valve	
Final Assembly	
Steam Dome	
Central water filling pre 1883	

The End

This kit should give you all the basics parts to finish a