Caley Coaches Ltd
'True Line' kits in etched brass
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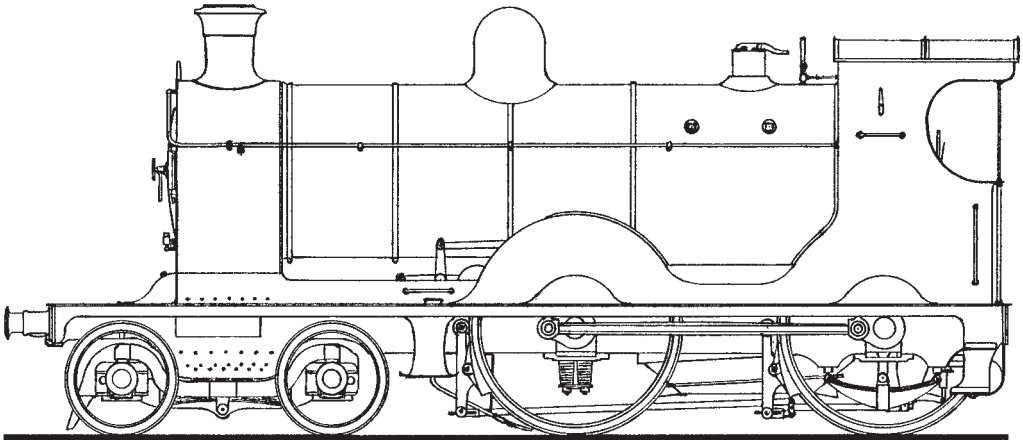


Building Instructions for kit CL5 Caledonian Railway Class 900 "Dunalastair III" 4-4-0 Locomotive

C.R. numbers	900-902, 887-899;
L.M.S. numbers	14337-48 (Saturated),
	14434-7 (Superheated).

Parts required to complete

1 Motor — Mashima 1220 "flat can" or similar recommended.

2 Gearbox — High Level Loadhauler recommended.
[High Level Kits, 14 Tudor Road, Chester-le_street, Co. Durham, DH3 3RY.
www.highlevelkits.co.uk]

3 Wheels — 3'6" diameter bogie wheels,
6'6" diameter, 22 spoke driving wheels [crankpin in-line with spoke, 10" stroke]
and either
3'6", 10 spoke tender wheels [Type M6, 8 wheel bogie tender]
or
4'0" diameter, 12 spoke tender wheels [Type M3, 6 wheel tender]

Caley Coaches recommends that Ultrascale Drummond style wheels be fitted to this kit — Romfords will fit but the Ultrascale wheels are so much closer to the look of the real thing that they make a tremendous difference. Ultrascale can be reached by phone at 01462 684763. Order a complete set [loco and tender] for an SR Class T9 [honest!] — specify wither you require wheels for a 6 wheel or 8 wheel tender and that pin-point axles are required for the latter.

4 Paint and transfers.

5 Couplings.

Section 1 Parts list

Please check the contents of your kit and inform me of any shortages. If for any reason you wish to purchase parts separately, I can give you a quote for any part unless it is on an etched fret. Normally complete frets only are available.

1 Locomotive Chassis Fret (nickel-silver) containing :-

Part #	Description	Quantity
1-6	Frame Spacers (P4, EM & OO)	1 of each
7	LH Mainframe	1
8	RH Mainframe	1
9	LH Bogie Sideframe	1
10	LH Bogie Compensator	1
11	RH Bogie Sideframe	1
12	RH Bogie Compensator	1
13	Bogie Stretcher	1
14	Coupling Rods (two layer)	2
15	Compensation Beam	1
16	Brake Hangers and Shoes	4
17	Brake Rigging	1
18	Brake cross Beams	2
19	Reversing Rod and Crank	1
20	Reverser Weight Shaft	2
20a	Reverser Weights	4
21	Brake Crank Support	1
22	Short Tender Coupling	1

23	Long Tender Coupling	1
24	Wheel Balance Weights	2
25	Brake Bell Crank	2
26	Front Coupling Hook	2
27	Smokebox Front — Saturated/Wingplates	1
28	Cab Details	1
29	Smokebox Front — Sans-wingplates	1

2 Locomotive Body Fret (brass) containing :-

Part #	Description	Quantity
31	Sub-footplate and Valance	1
31a	Rear Step Tread	2
32	RH Footplate, Cab Side and Splasher	1
33	LH Footplate, Cab Side and Splasher	1
34	Splasher Tops and Cab Front	1
34a	Firebox Locating Ring	1
35	Boiler/Firebox (rolled)	1
35a	Boiler Seam Butt Strap	1
36	Expansion Joint Covers	2
37	Smokebox Inner Wrapper	1
38	Smokebox Outer Wrapper — Saturated	1
39	Rear Buffer Beam	1
40	Cab Spectacles	2
41	Smokebox Front Superheated/Wingplates	1
41a	Smokebox Inner Front	1
42	Smokebox Front — Sans-wingplates	1
43	Smokebox Outer Wrapper — Superheated	1
44	Smokebox Rear cover	1
45	Frames Saturated	2
46	Frames Superheated	2
47	Cab Roof	1
47a	Cab Roof Angles	3
48	Cab Floor and Splashers	1
49	Cab Beading	2
50	Sand Boxes	2
51	Ashpan RH and LH	2
52	Front Bufferbeam	1
53	Wing plate Angles	2
54	Cab Lamp Irons	2
55	LMS Lamp Irons	6
56	Steamchest Cover — Superheated	1

3 Cast Fittings :-

CL5/1	Chimney	1
CL5/2	Dome	1
CL5/3	Ramsbottom Safety Valve	1
CL5/4	Ross Pop Safety Valve	1
CL5/5	Smokebox Door	1
CL5/6	Smokebox Door Dart	1
CL5/7	Westinghouse Pump	1

CL5/8	Cylinder Lubricators & Sandbox Filler	2
CL5/9	Westinghouse Pipe	1
CL5/10	Vacuum Pipe (underslung)	1
CL5/11	Steam Pipe	1
CL5/12	Backhead	1
CL5/13	Westinghouse Reservoir	1
CL5/14	Vacuum Injector Pipe Elbow	1
CL5/15	Reversing Lever	1
CL5/16	Steam Chest Cover	1
CL5/17	Leaf Spring	2
CL5/18	Coil Spring	2
CL5/19	Sniffing Valve	2
CL5/20	Lubricator	1
CL5/21	Coupling Rod Splasher	4

4 Turned Brass Fittings :-

Buffers	2
Short Handrail Knobs	3
Medium Handrail Knobs	6
Whistle	1

5 Miscellaneous Parts :-

0.45mm Wire (2),
0.3mm Wire,
0.7mm Wire,
2mm Rod,
Brass Rod,
Copper-clad Strip,
Phosphor-bronze Strip,
Nuts and Bolts (3),
Insulated Wire.

6 Compensation Components:-

Hornblocks and bearings (2)
Fixed bearings (2)

7 Printed Matter :-

Prototype Notes,
General Building Notes,
CL5 Building Instructions (this document !)

Section 2 General

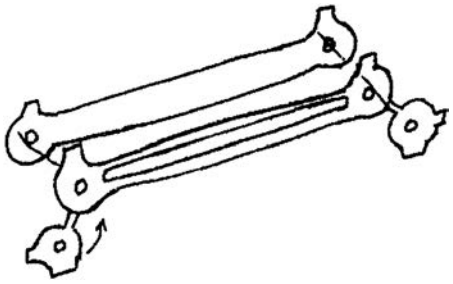
2.1 Read the instructions and identify all the parts.

2.2 Always refer to a photograph of your chosen prototype as you build the model. Small differences did exist between members of the class, especially as they got older.

2.3 Please study the General Building Notes if you are not familiar with etched brass kit construction in general and ***Caley Coaches*** products in particular.

Section 3 Coupling Rods

3.1 Each coupling rod (Part #14) is assembled shown below.

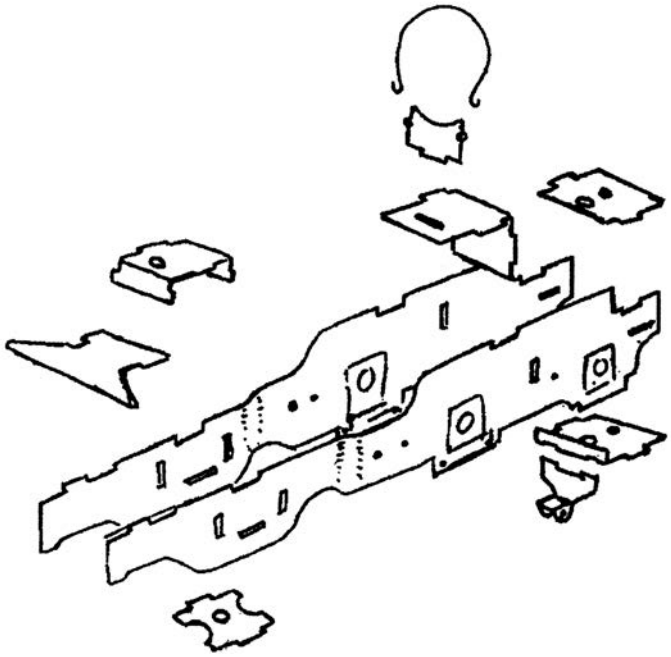


3.2 Solder each coupling rod outer to its inner 1/2 etched faces outwards, aligning on the front crankpin holes.

3.3 Fold up and solder the extra layer at the bosses then file off the remains of the tags.

3.4 Open out each crankpin hole until it is just a sliding fit on the crankpin of the wheels you intend to use.

Section 4 Chassis



4.1 Remove the mainframes (part #7 and 8) from the fret and press out the half-etched detail above the bogie pivot.

4.2 If you are using compensation, remove the sections around the bearing holes of the front coupled axle along the half-etch lines using a piercing saw. It helps to keep the saw edge close to the end of the work bench at all times, and press down hard on the frame with your fingers. Keep the saw vertical and let the blade do the work on every down stroke. Saw up to the top of the line only then saw up the other vertical. Release the blade and remove it. Using a pair of pliers, push the sawn part back (folding it on the top half etched line) and waggle it until it breaks off cleanly.

4.3 Check that the flexichas bearings can easily slide up and down in the sub-hornblocks. If not, gently and carefully open the slots until this can be achieved. Take **extreme care** not to overdo this as a bearing that is able to slide back and forth in its block is not conducive to good running. It is a good idea to pair bearings and hornblocks as small manufacturing differences can be present in

either.

4.4 Fold over the spring location plates below each axle.

4.5 Select the frame spacers (parts #1-6) appropriate to your gauge and bend parts #2-4 to shape along their half-etched lines.

4.6 Solder a bolt to spacer 6 such that its thread projects down to act as the bogie pivot.

4.7 Locate spacers #2 and 4 in the appropriate slots in one of the mainframes and solder in place.

4.8 Locate spacers #3 and 6 in the appropriate slots in the other mainframe and solder in place.

4.9 Now bring the two mainframes assemblies together locating spacers #2 and 6 in the slots of the opposite mainframe and solder in place. Now crank each mainframe out equally until spacers #3 and 4 can be located in their respective holes in the other mainframe and solder the rear of the chassis together.

4.10 Solder spacers #1 and 5 in place as shown in the diagram above.

4.11 Fold the brake crank support (part #21) to shape and fit to spacer #3.

4.12 Fit the motor support (part #3a) to spacer #3.

4.13 Locate the top-hat bearings in place for the driven axle, opening up the holes slightly if necessary. Take care to keep the holes circular. Use a Perseverance/Puffers axle/hornblock alignment jig to check the alignment of the bearings and when satisfied solder the bearings to the mainframes. Leave the jig in place.

4.14 Using the previously assembled coupling rods and a set of Perseverance axle/hornblock alignment jigs fit the hornblocks and bearings as follows :-

a) Locate the hornblocks and bearings for the other axle, using the spring of the jig to hold them in place,

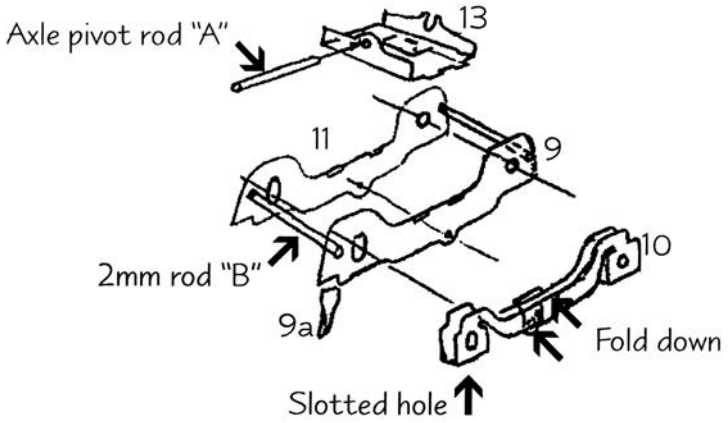
b) For each side, slip the coupling rod over the spigot of the jig in the fixed axle bearings and over the spigot of the jig in the other axle bearings adjusting as required,

c) Once happy with the alignment of both sides, solder the hornblocks to the mainframes,

4.15 Remove the coupling rods and jigs and solder the spring castings (leaf on rear, coil on front) onto the location plates.

4.16 Fit the ash pan sides (part #51 on the body etch) after pressing out the rivet detail.

4.17 The bogie is built essentially rigid with only the front axle pivoting on the rod "A" as shown. The "compensating beams" (parts #10 & 12) are cosmetic only.



4.18 Fold up the bogie stretcher (part #13) and solder each of the bogie sideframes (parts #9 and 11) to it taking care to keep every thing square.

4.19 Open up the holes front and rear on the bogie sideframes to accept the supplied 2mm rod and solder a length of the rod in place front and rear.

4.20 Similarly open up the hole on the front of the upright of the bogie stretcher and solder a length of 2mm rod between it and the front rod installed at step 4.21.

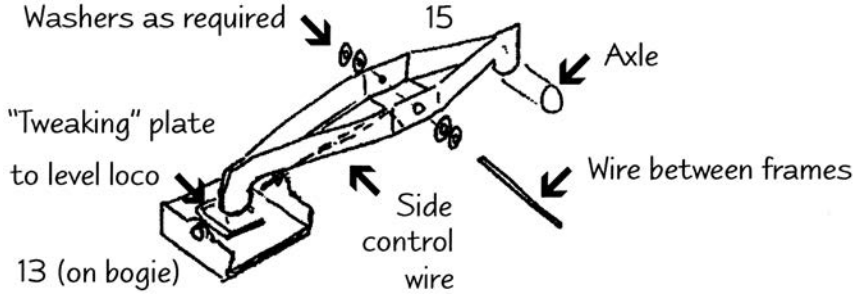
4.21 Fit 2mm bore bearing to the rear axle holes on the bogie sideframes.

4.22 Fold up the bogie compensation beams (parts #10 & 12) to form "U" shaped channels then fold down the central "flaps" to the outside of the "U" on both sides. Open out the rear holes and front slots to clear a 2mm axle.

4.23 Using the various holes and slots as an aid to alignment solder the compensation beams to the sideframes.

4.24 Solder the guard irons (parts #9a & 11a) to the sideframes.

4.25 The real compensation beam (part #15) folds up as shown below :-



After making the main fold gently tweak in the front and rear until the faces mate and solder together.

4.26 Solder a short length of 0.3mm wire to the underside of the compensation beam projecting forward — this will form the side control rod in due course.

4.27 The compensation beam pivots on a wire installed between the frames. Open out the holes just behind the crank in the frames to accept a 0.45mm wire. Thread a length of 0.45mm wire through one frames, thread 2 washers, the compensation beam and 2 more washers onto the wire and then pass the wire through the other side frame. Solder the wire to the frames then trim back flush. Centre the beam with the washers either side of it on the wire and solder the outer washers to the wire — take care not to bung everything up solid.

Note the orientation of the compensation beam — the longer arm is to the front with the "golf club head" projecting down.

4.28 Pass two lengths of 0.45mm wire through the frames to act as brake pivots.

4.29 Fold up the sandboxes (part #50) and fit to the frames — the top edge aligns with the top of the frames and the front edge aligns with the crank in the frames just ahead of the front brake hanger (i.e. they fit on the wider section of the frames). Add sand pipes made from wire bent to shape.

4.30 Fit the Westinghouse reservoir across the frames at the rear of the loco.

4.31 Fit the cast springs below the frames as shown in the G.A. drawing.

4.32 It is probably best to fit the brakes themselves after the wheels so clean up and paint the chassis now.

Section 5 Motor and Wheels

5.1 Ream any paint out of the axle bearings.

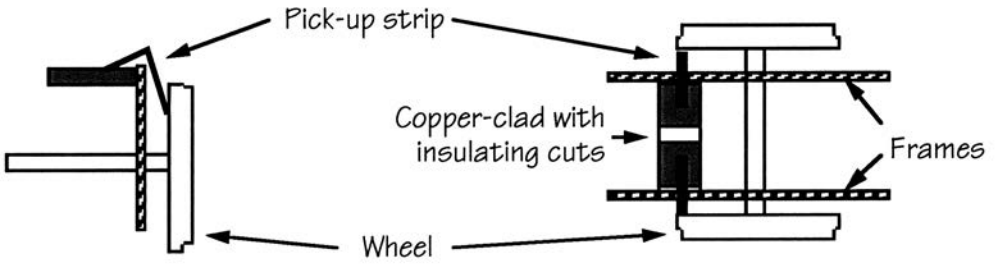
5.2 Mount the driven axle in its bearings, locating the gear box and final drive gear in place at the same time.

5.3 Fashion a loop of stiff wire round the motor locating its ends in the holes in the motor support (part #3a) to stop any tendency to rotate.

5.4 Mount the other driving wheel axle in its bearings and mount the driving wheels on the axles.

5.5 Cut two strips of the copper-clad fibreglass to be a tight fit between the frames. Remove a little of the copper at each edge to make sure of insulation from the frames.

5.6 Glue the strips to the inside to the chassis level with either the top or bottom edge of the frames, as allowed by the motor etc., in line with one edge of each wheelset. Then solder a phosphor bronze strip to the strip in line with one edge of the wheel. Stick a small piece of insulating tape over the edge of the chassis and then bend the pick-up strip over the chassis and down (or up) the face where it will bear on the back of the tyre. (See diagram.) Pick-up can be improved by soldering a small piece of brass (or gold!) wire to the business end of the phosphor bronze strip where it bears on the back of the wheel.



Pick-up arrangement

5.7 Link the strips together and to the motor with fine insulated wire.

5.8 Quarter the wheels as follows (unless you are using Romfords!) :-

a) Starting with the driven axle adjust all the wheels to approximately the correct quarter aligning by eye to the nearest spoke,

b) Fit the coupling rods and bushes to the driven and the other wheels,

c) Freewheel the chassis up and down and feel for binding,

d) If binding occurs, adjust **only** one wheel on the **non-driven** axle 1/2 a spoke clockwise,

e) Again freewheel the chassis up and down, repeatedly adjusting the quartering a fraction **anti-clockwise** on the same wheel until no binding occurs,

5.9 Glue the balance weights (part #24) in place on the wheels taking care not to cause a short between tyre rim and axle if you are using Romfords.

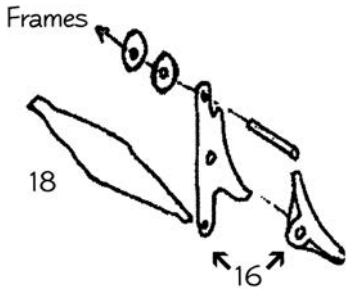
5.10 Mount the bogie wheels in position adjusting the gauge until correct then splay the guard irons to suit.

5.11 Mount the bogie assembly onto the bolt projecting from spacer 6, trapping the side contol wire projecting from the compensation beam in the slot at the rear and secure with a nut.

5.12 Place the chassis on a level surface — chances are it will be sitting either "nose low" or "nose high". This can be cured by adjusting the tweaking plate on the bogie stretcher (on which the end of the compensation beam rests) until everything is level.

Section 6 Brakes and Fittings

6.1 Mount the brake bell cranks (part #25) on a short length of wire passed through the pair of holes in the brake crank support (part #21). The long arm points to the rear of the loco but leave the cranks free to rotate if only slightly for the moment.



6.2 Solder the brake block overlays to the brake blocks (part #16)

6.3 Thread two of the small washers onto each of the brake pivot wire followed by one of the brake block assemblies. Adjust until level with the wheel rim and as close as possible to the rim while not causing the danger of a short — it is especially important to allow sufficient clearance on the compensated axle — and solder in place.

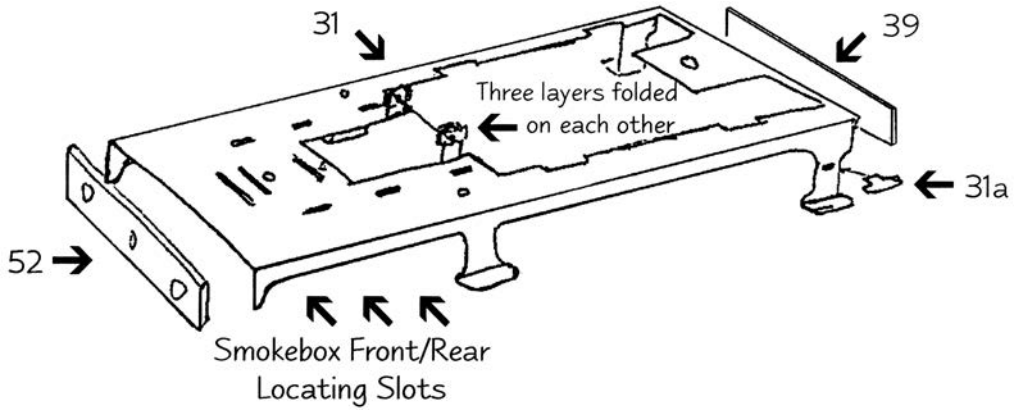
6.4 Position the ends of the brake cross beams (part #18) in the lower holes in the brake block assemblies then hook the forks of the brake rigging (part #17) onto the centres of the cross beams. Note that the rigging passes above the cross beams at the rear axle.

6.5 Trap the loose end of the rigging between the two bell cranks at the rear and when happy that all the brake parts mate properly solder the various loose parts together then trim back the brake pivot wires.

6.6 Clean up and paint the brake gear using a fine brush.

6.7 Your chassis is now complete.

Section 7 Body



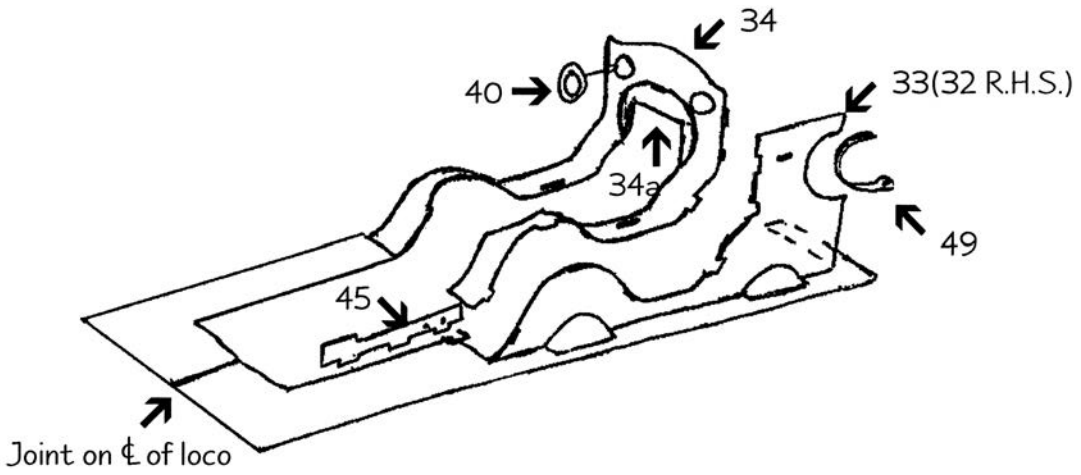
7.1 Fold down the valance from the sub-footplate (part #31) and fold up the reverser weight shaft supports — the top of these has a three layer construction so fold up the "sandwich" and file off the tabs after securing with a touch of solder.

7.2 Fold up the buffer beam (part #52) into a double layer assembly and solder to the front of the footplate. The top edge should be flush with the footplate and the overhang at each side of the valance equal.

7.3 Similarly fold up the drag beam (part #39) and fit to the rear of the footplate. Again the top edge should be flush with the footplate and the overhang at each side of the valance equal. The slot goes nearer the top.

7.4 Fold the lower step treads at 90^0 to the step brackets which are etched integrally with the valances. On the front steps, tweak up the outer edges of the tread slightly as shown on the G.A. drawing.

7.5 On the rear steps, fit the upper treads (part #31a).



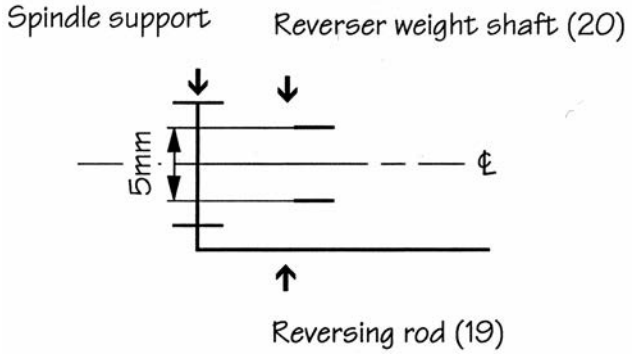
7.6 If you are building a superheated loco open up the smokebox front locating slot on the upper footplates (parts #32 and #33) with a fine saw — this slot is only half-etched on the underside since it would be visible if it were fully etched and you were building a saturated loco.

7.7 Fold up the cab and splashers sides from the upper footplates (parts #32 and #33).

7.8 Tin the underside and overlap sections of the upper footplate and position the two parts on the sub-footplate assembly. Taking great care that the overhang is equal along the length of the loco sweat the upper footplates in place joining the two halves in the process.

7.9 Tin one side of the reverser weights (part #20a) and sweat one onto each side of the two reverser weight shafts (part #20) to give a three layer construction.

7.10 Pass a short length of 0.45mm wire through one of the reverser weight shaft supports, thread on the reverser weight shaft assemblies then pass the wire through the other reverser weight shaft support. Secure as shown in the scrap plan below and trim off any surplus wire flush at the left-hand reverser weight shaft support but leave a length projecting to take the reversing rod at the other side.



7.11 Take the cab front/splasher tops (part #34) and gently bend (Do not make a sharp bend!) the section below the second tab (from the cab top) forward such that the cab front may be positioned between the sides and solder in place.

7.12 Working from the cab front forward, gently curve the splasher tops to the profile of the sides — the tabs at strategic locations aid in this — and solder in place.

7.13 Fold the locating tab in the firebox locating ring (part #34a) to 90^0, pass through the front of the cab and solder in place.

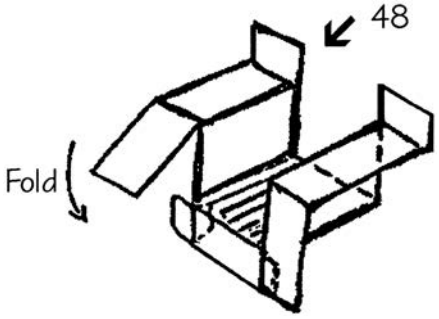
7.14 Fit the 4 cast sub-splashers in place at the base of the splashers.

7.15 Tin the cab spectacles (part #40) and sweat in place on the cab front.

7.16 Bend the arm of the cab lamp irons (part #54) forward to 90^0 and pass through the slots in the cab side-sheets securing on the inside. Using a piece of scrap brass as a spacer, bend the arms upwards parallel with cab side.

7.17 Form the cab-beading (part #49) to approximately the right shape then, starting at the bottom and leaving the end 1.5mm proud from the cab sheet, solder in place around the opening pushing it into the final shape as you do so.

7.18 Open out the holes at the chassis fixing points to clear the supplied bolts then solder a nut to upper side of the footplate around each taking care not to clog the threads with solder.

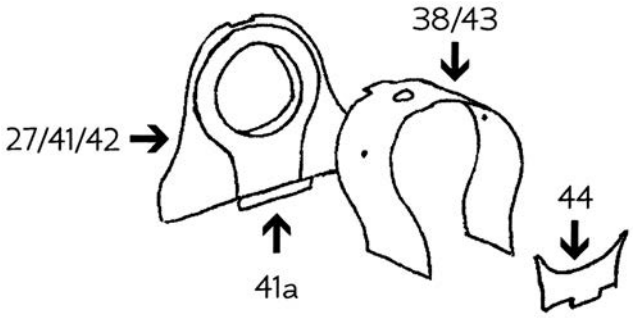


7.19 Fold up the cab floor and splashers (part #48) as shown above and fit in place inside the cab.

7.20 Its make your mind up time — basically there are four variations of smokebox, saturated or superheated, with or without wing plates. More variation is added by visible rivets in latter years. Any of the varieties can be modelled. The table shows the part number for each variety. The smoke box inner front (part #41a) and rear cover (part #44) are common to all variants. Rivets can be

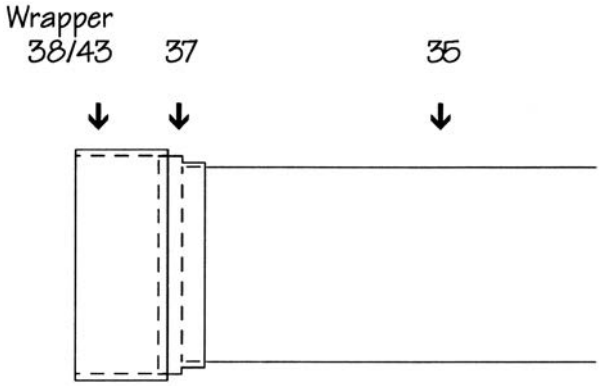
simulated by pressing out the indentations on the rear of the wrappers if required.

	Front with wingplates	Front sans-wingplates	Wrapper
Saturated	27	42	38
Superheated	41	42	43



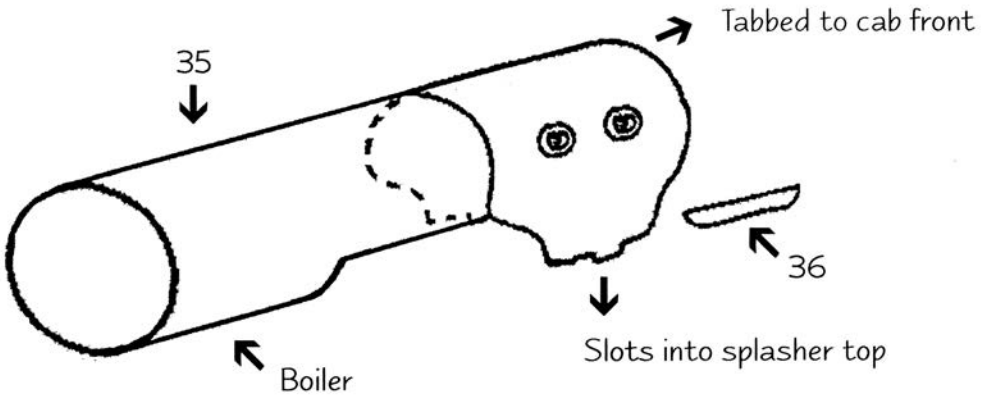
7.21 Press out any rivets required, then roll the chosen smokebox wrapper into a cylinder. Using the smokebox inner front (part #41a) as a template, bend back the lower edges of the wrapper until it matches the shape of the inner front. Solder the inner front inside the front (i.e. the end with the projecting tab) of the wrapper and the smokebox rear cover (part #44) inside the lower rear.

7.22 Solder the required smokebox front to the assembly using the tab on the wrapper for alignment.



7.23 Roll the smokebox inner wrapper (part #37) and solder it inside the inner wrapper such that it projects by 1.75mm as indicated by the half-etched line.

7.24 Press out the rivet detail on the rear of the required front frames (saturated — part #45; superheated — part #46) then solder into the tabs on the footplate in front of the splashers.



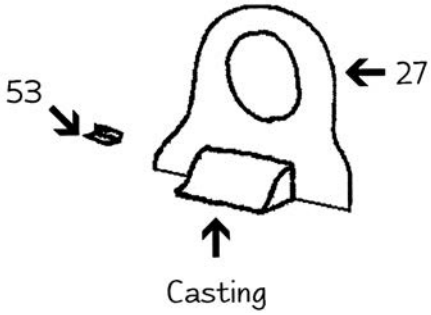
7.25 Tin the boiler seam butt strap (part #35a) and sweat in place along the seam on the inside of the

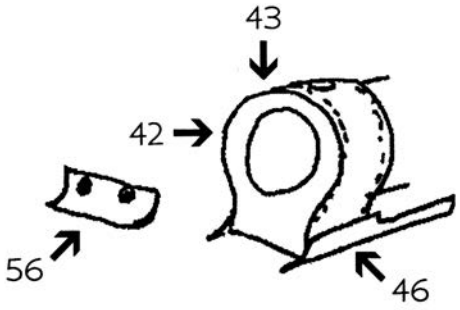
rolled boiler (part #35) and fold out the lower skirts of the firebox such that the tabs fit into the slots on the splasher tops. Fit the tabs into these slots and the one in the cab front and solder in place.

7.26 Slide the smokebox assembly onto the front of the body and seat into the slots in the footplate. Solder the assembly in place and to the boiler.

7.27 Tin the rear of the expansion joint covers (part #36) and sweat in place at the bottom of the firebox.

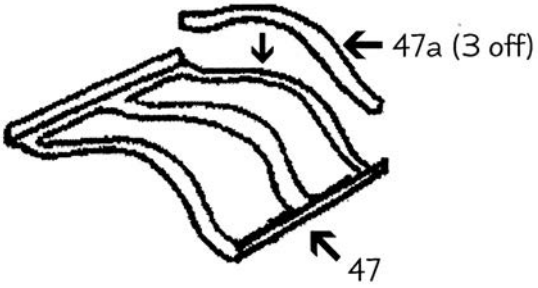
7.28 Position the reversing lever on the spidle left projecting from the reverser weight shaft support such that the free end butts up hard against where the boiler and splasher meet and secure in place.





7.29 Fit the steamchest cover in front of the smokebox (saturated — casting; superheated — part #56) and on a locomotive with wingplates fold up the wingplate angles (part #53) and solder in place.

7.30 Fit the backhead casting in place on the front wall of the cab. Fit the reversing lever casting hard against the left-hand splasher (looking from the rear) in the cab.



7.31 Form the cab roof (part #47) to a gentle arc then form a reverse curve at the outer edges — the roof angles (part #47a) serve as a useful template for these curves.

7.32 Fold up the lips at the outer edges of the roof then solder the roof angles in place, one in the centre and one at each end.

7.33 Fit the cab roof — you may prefer to leave this off until after painting.

7.34 Fit the chimney, dome, safety valve (check which type you require — most locos acquired the Ross Pop type in later days) and whistle to the boiler.

7.35 Fit the smokebox door and cylinder lubricators to the smokebox front then fit the door handle in place.

7.36 On a superheated loco add the cast sniffing valves to the lower smokebox sides and the lubricator to the footpate using a photograph as a positioning guide.

7.37 Fit the Westinghouse pump on the left-hand side (when looking from the front of the footplate just in front of the cab.

7.38 Fit the sandbox filler caps to the small holes in the footplate above the front steps

7.39 Thread a short handrail knob onto a length of 0.45mm wire than from the handrail. Thread one short and three medium knobs onto either side and fit to the boiler locating the stems of the knobs on the etched holes.

7.40 Fold up grab handles from 0.45mm wire and fit, one on each side of the cab below the lamp irons, one to each side of the cab above the rear steps and one to the each side of the frames above front steps.

7.41 Thread a piece of wire through the protruding hole in the cab beading and secure top and bottom to represent the rear stanchion.

7.42 Fit the buffer bases and any pipes you may require to the front buffer beam — the pipe arrangements varies over the years so a photograph is your best guide.

7.43 Many locos acquired a vacuum ejector pipe which ran from the smokebox along the side of the boiler to the cab. Positioning was variable so again a photo is your best guide. If required make up from the cast elbow and rod and fit in place.

7.44 Fit any pipes your loco may have been fitted with below the footplate, making these from brass rod. Once again photos are your best guide!

7.45 Finally (unless I've forgotten anything!) fit lampirons (part #55) as required — one at the base of the chimney (always) plus three along the footplate above the buffer beam in L.M.S. days.

Section 8 Final Assembly

8.1 Thoroughly clean the body to remove all trace of flux etc.

8.2 Paint, line and letter according to your chosen prototype and period.

8.4 Glaze the cab spectacles.

8.5 Fit the sprung buffer heads, adjusting the fixing nuts until the projection of the heads is correct.

8.6 Mate body and chassis using the supplied bolts.

8.7 Your loco is now ready to be coupled with the tender of your choice prior to entering service.

Acknowledgements

My thanks are due to Alistair Wright for the artwork and design. I must also thank you for buying the kit.

Other items in the *Caley Coaches* range

Caley Coaches now produces a wide range of kits and accessories exclusively for modellers of the Caledonian Railway and its successors. Please see the web site at **www.caley.com**

Jim Smellie