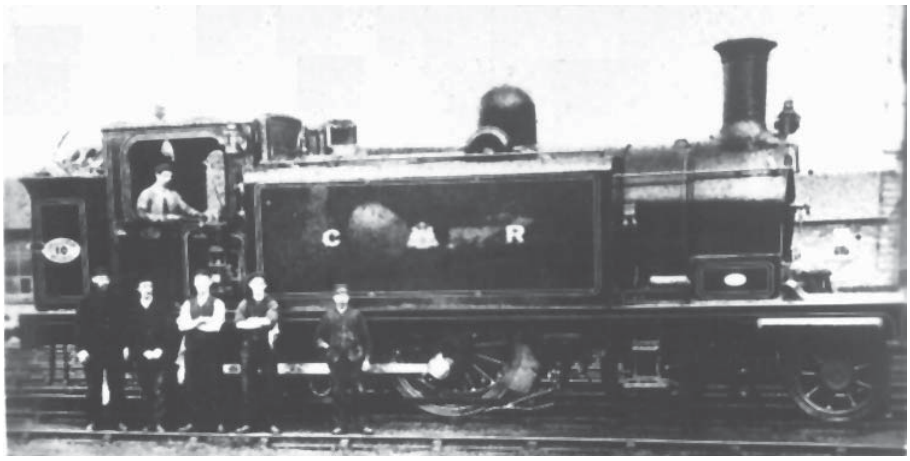
CALEDONIAN RAILWAY CLASS 1 4-4-0T

Jim Smellie

C.R. numbers 1-12; L.M.S. numbers 15020-15031



Number 10 in Caledonian livery with a proud crew and engine shed staff.

General Description

Built to the design of John Lambie who had been appointed the locomotive superintendent of the Caledonian Railway in June 1891, the 12 engines which comprised the Class 1 were constructed at the Railway's St. Rollox works under order number Y34. Delivered to traffic between July 1893 and January 1894, the cost of £1614 per engine was charged to the revenue account. They were built for use on the Lanarkshire and Dumbartonshire Railway and on the Glasgow Central Railway which were both then under construction and were fitted with steam condensing gear as these two lines were to share a long underground section through the heart of Glasgow between Dalmarnock and Stobcross. The condensing gear was an effort to minimise pollution in the tunnels.

The frames, bogies and springs were very similar to the contemporary 4–4–0 tender engines albeit with a reduction on the bogie wheelbase by 6" and the bogie-wheel diameter by 4" giving the slightly unusual size of 3'2". The front end with 17" by 24" cylinders and undivided ports were of a new design but otherwise the motion was very similar to preceding Drummond designs including 5' diameter driving wheels. Fore-end lubrication was achieved using a sight-feed lubricator in the front left-hand corner of the cab and by a pair of lubricators mounted on the smokebox front.

The boiler was basically a Drummond design although modified by his successor Smellie who replaced the Drummond elliptical roof inner firebox with a flat top design and made changes to the crown stays and by Lambie himself who moved the safety-valves from their (then) traditional place on the top of the dome to on top of the firebox and brought the dome further forward than before. Internally Lambie favoured slightly smaller diameter tubes at 1⅝", a reduction of ⅛". On the Class 1, the boiler was fed by a Drummond injector on the right-hand side and by a crosshead pump on each side, the right hand clack-valve being double. Steam supply to the injector was taken from a cock on the faceplate. At the base of the blastpipe there was an intercepting valve which diverted exhaust steam into the bottom of the tanks via an oblong box on the top of the footplate and some pipework below. From the base of the tanks, a pipe rose to an inverted U bend on the top of each tank before discharging the exhaust into the tanks. Any uncondensed steam was allowed to vent to the atmosphere through a standpipe in front of the cab on each side. When built, the intercepting valve was operated by a wheel and screw at the rear of the right-hand tank with the control rod

passing through the main handrail to a crank on the smokebox side but the wheel and screw were soon replaced by a lever operated rack and pinion.

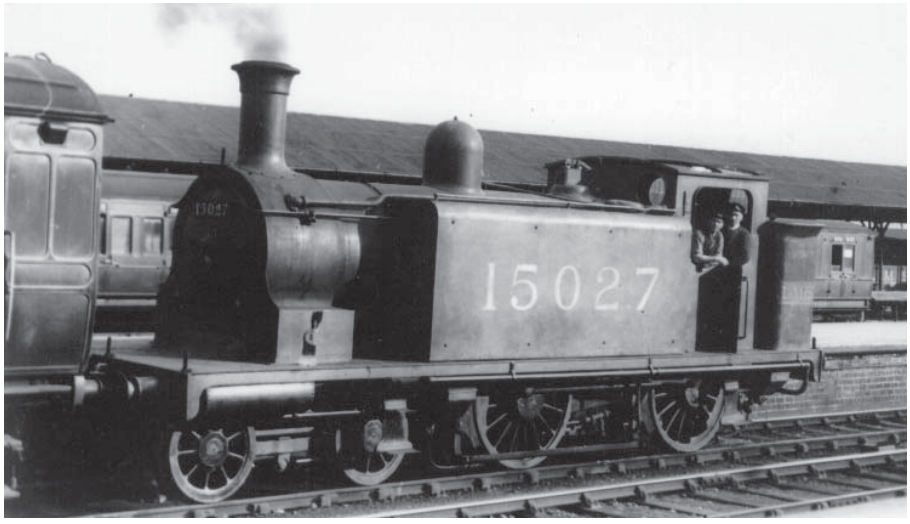
The two main Westinghouse reservoirs were located below the footplate at the front of the engine while the brake cylinder and auxiliary Westinghouse reservoir lay below the footplate at the rear below the cab and were linked to the brake blocks in front of each coupled wheel by outside brake rods. The brakes were controlled by the driver via a valve attached to the faceplate. Reverse was by lever.

Three of the class including Number 10 were fitted with Gresham and Craven steam sanding gear which utilised a two-way cock below the injector steam cock to allow sand to be applied to either the leading or trailing coupled wheels. The other 9 members of the class had gravity sanding front and rear. The rear sandboxes were inside the cab and operated by a horizontal sector on top of the left-hand box. The front pair were operated from a vertical lever and quadrant on the left-hand side of the footplate.

The condensing gear was not popular with the engine crews since it tended to raise the temperature of the water in the tanks so much that the injector and sometimes the crosshead pumps were unable to maintain a supply of water to the boiler causing steam pressure to fall. Frequently hot water had to be discharged from the tanks and the tanks replenished with cold water before the boiler could be filled. Despite management strictly enforcing the use of the condensing gear on the low-level section many drivers disregarded the rule — so much so that 15 drivers were reported within a three week period and the 6 worst offenders were suspended (without pay) for a day. At several meetings the drivers protested that so much time was spent filling up the tanks that they didn't have time to eat on the job. How long the gear remained in use isn't clear but it was not until 1917 that it began to be removed with most but not all of class (see photograph of Number 1 in 1925 for exanple) being so treated by the Grouping.

When new, two of the class were allocated to Airdrie and the rest probably went to Polmadie. When the lines for which they were designed were opened in 1896 the Polmadie engines were transferred to Dawsholm — their main employment was the Maryhill-Airdrie service which at that time comprised of a daily service of 39 trains in each direction. The 8.21 ex-Airdrie had an express passenger rating but the others were considered as locals. The Airdrie pair also shared these duties as well as operating the Airdrie-Newhouse branch service of 16-18 trains in each direction per day. The engines were not confined to these services even after the arrival of (the generally better regarded) condensing 0–4–4T types on the low-level but they were generally not so widely spread as the latter.

The tramway system in Glasgow made drastic in-roads into the services over the low-level section reducing the number of trains on



15027 at Dundee on 28/07/31 in its "goods black" livery with the company initials displayed on a panel on the bunker.

Locomotive Dimensions

Height above rail :	
Chimney	: 12'11"
Boiler centre line	: 7'3"
Width over :	
Running plate	: 8'6"
Cab sides	: 6'6"
Length over buffers	: 33'1¼"
Total weight in working order	: 50T 6¾cwt.
Total adhesive weight in working order	: 34T 17¾cwt.
Tractive effort (@ 85% WP)	: 14 730lb.
Water capacity	: 1 000 gallons
Coal capacity	: 2T
Frames and motion :	
Frame length	: 33'0"
Frame thickness	: 1"
Coupled wheelbase	: 9'0"
Bogie wheelbase	: 6'0"
Total wheelbase	: 24'10"
Driving wheel diameter	: 5'0", 16 spoke
Crankpin stroke	: 18"
Crankpin arrangement	: In line with spoke
Bogie wheel diameter	: 3'2", 9 spoke
Cylinder size	: 17" by 24"
Cylinder centres	: 2'3"
Port length	: 15"
Steam port breadth	: 1⅜"
Exhaust port breadth	: 3"
Connecting rod length	: 6'6"
Eccentric length	: 5'6"
Driving journal length	: 7½"
Driving journal diameter	: 8"
Boiler :	
Max. external diameter	: 4'4⅛"
Length between tubeplates	: 10'4"
Tubes	
Diameter	: 1⅝"
Number	: 224
Outer firebox casing length	: 5'5"
Depth of firebox below boiler centre line	
Front	: 5'6"
Rear	: 5'0"
Working pressure	: 150 $lb.in^{-2}$
Heating surface :	
Tubes	: 985 $feet^2$
Firebox	: 111 $feet^2$
Total	: 1 096 $feet^2$
Grate area	: 17 $feet^2$

CR Number	LMS Number	Built	Boiler Number	Allocation c 1921	Allocation c 1933	Year Firebox Renewed	Mileage At Renewal	Date LMS Record card started			
1	15020	04/1893	249	Dawsholm?	Dawsholm	1918	745722	15/07/26			
2	15021	04/1893	250	Dawsholm?	Dawsholm	1920	771441	14/11/27			
3	15022	04/1893	251	Dawsholm	Dawsholm	1916	648626	04/02/26			
4	15023	05/1893	257	Dawsholm		1920	746250	23/09/32			
5	15024	05/1893	253	Perth	Perth	1918	721149	13/08/28			
6	15025	06/1893	255		Polmadie	1916	895518	16/01/32			
7	15026	06/1893		Perth	—						
8	15027	07/1893	256	Lockerbie	Perth	1920	727254	03/03/28			
9	15028	07/1893		Dumbarton	Oban						
10	15029	08/1893		Dawsholm	—						
11	(15030)	08/1893		Airdrie	—						
12	(15031)	08/1893			—						

Maryhill-Airdrie service to 16 in each direction by 1921. The Class 1 were still employed on these and on some unusual turns which seem unique to Dawsholm. Having started the day by working a workmen's train to Rutherglen and disposing of the stock, the engine would proceed to a goods yard to shunt and make up a train which it would then take to one of the larger yards in the area. Others were employed at the larger stations around the system as pilots spending most of their time moving empty stock to and from carriage sidings although the Perth based engines at least were allowed to venture further on local passenger duties.

Baxter notes Number 4 as having an accident at Whinknowe on 02/01/1906 and Number 12 as having one at Glasgow Central on 24/01/1925 but no details are known to me.

Withdrawal started in 1927 with Number 11 which is thought to have never carried its L.M.S. allocated number of 15030. All the others except for Number 12 are thought to have carried their L.M.S. numbers.

In comparison with many C.R. designs the class was withdrawn relatively quickly after grouping but given that, by L.M.S. accounting practise at least, an engine was considered to be life expired after 50 years they did not fair too badly with most managing 40+ years before succumbing to the L.M.S. standardisation policy. The class always was relatively non-standard and perhaps not an outstanding success given that the wheel arrangement was never repeated on the Caledonian and the fact that they were "put out to grass" working as station pilots etc. so early withdrawal was always on the cards. The L.M.S. standardisation policy held that big (numerically) was beautiful and certainly cheaper to run. Spares for the larger [Northern Division] standard

classes (such as the Class 439 0-4-4T) could be economically held at the works allowing for a quicker turn around at overhauls etc. and so generally better availability for traffic.

L.M.S. Boiler Records

A valuable primary source of information on Caley locomotives are the Locomotive Boiler Repair sheets which are available for inspection at The Scottish Record Office, Edinburgh having been deposited there by the late Alan Dunbar, the first President of the Caledonian Railway Association. In the case of the Class 1 the boilers were classified N16 by the L.M.S. and the relevant SRO reference is GD344/4/25.

The cards start at various dates between 1926 and 1932 (see table) and probably represent the date of the first major overhaul by the L.M.S. when the old Caley records would be copied to the new company's standard form. Cards for locomotive Numbers 7, 9, 10, 11 and 12 appear not to exist. Apart from Number 9, the lack of cards and their relatively early withdrawal probably means that they were never given a major overhaul by their new owners. The lack of a card for Number 9 must remain a mystery — perhaps it has simply been lost.

It is worth noting that visibly riveted smokebox wrappers began to appear around the same time as these overhauls. Although accurately dated photographs are scarce, it seems reasonable to assume that the locomotives acquired this feature during the overhaul—it was no doubt cheaper if less aesthetically pleasing than the flush riveting of the Caley.

The records allow us some derive some useful statistics showing, for example, that each engine covered an average of 25 000 per year giving an average total mileage of a little over 1 037 000 miles. While the mileage covered by each engine was in rough proportion to its number of years in service — Number 3, withdrawn in 1933 covered the least number of miles (among those engines for which record cards exist) at 896 625 while the last survivor, Number 6, covered 1 340 717 miles — use of the engines varied somewhat during their lives. Taking Number 6 as an example it was very busy in Caley days covering an average of 39 000 miles per year up to its firebox renewal in 1916, after that its life became less frenetic averaging about 22 000 miles per year in the period between the renewal and the date its L.M.S. record card started and less than 15 000 after that. Those busy early years meant that it still managed to record the highest overall average at nearly 30 000 miles per year — it must have covered the Maryhill-Airdrie line countless times! The other engines had an average annual mileage in the high 20 thousands in the period to their firebox renewal which occurred after each had run an average of 750 000 miles. In the period dealt with by the record cards Numbers 1 and 3 had a lazy time of it each averaging less than 10 000 miles per year while Numbers 4, 5 and 8 were still clocking up around 25 000 miles per year showing they still finding good employment. The allocation of Number 4 around this time isn't known but the other two were at Perth — use on local services rather than pure station pilot type duties probably accounts for the mileages.

Number 15021 showing the L.M.S. red livery with full lining.

Livery

The first three or four were out-shopped in the full blue passenger locomotive livery but it became apparent that the operating conditions in the tunnels would not be conducive to keeping the locomotives smartly turned out in blue and so the remainder of the Class (and all subsequent tank locomotives fitted with condensing gear) were painted in the more practical goods black livery. The blue engines had all been repainted by 1898.

A.B. MacLeod writing over 50 years ago when the pre-group liveries were much fresher in people's minds (although still some considerable time after they had disappeared) described the blue as "indigo blue of a shade lighter than that used by Drummond on his engines." — I am not prepared to enter a discussion on Caley blue and so will leave it at that! Lining, consisting of a black band 1⅜" wide edged either side by a white line 3/16" wide, was applied to the bunker sides and rear, cab sides, front and rear, cab opening, gangway doors, tank sides front and rear, condensing gear box at the smokebox, Westinghouse pump and boiler bands (note that the width of the black band effectively meant the bands were painted black and edged with a white line). The cab roof, smokebox, chimney and bunker interior were all painted black. Polished parts included the smokebox door hinges, handle and wheel, the whistle, handrails and cab spectacles although it was not uncommon for individual crews to polish other parts such as the edges of the wing plates. The buffer beams, valance and step brackets (but not the steps themselves which were black) were painted crimson lake and lined white inside black. The buffer housings were also painted crimson lake with a band of standard lining near the front end. The upper half of the cab interior was painted a creamy yellow colour and the lower half black.

The outside of the frames were painted black with vermilion used for the insides. The motion plate, and axles were also vermilion. The bosses, spokes and rims of the wheels were painted blue to match the superstructure and sometimes, after 1919, white lined tyres were to be seen.

A vermilion panel, edged with white, was applied to the front buffer beam between the buffers and the letters C.R. (with a square full stop between them) appeared on this panel to the left of the hook and the number to the right in gilt with a red shading below and to the left. The number also appeared in gilt (shaded red) on the centre of the bunker rear. The crest was applied to the tank sides flanked by the letters C and R. The number plate was carried on the bunker side and surrounded on the bunker panel by a black border which was edged with a white line to the outside. These number plates were of the "Drummond" style which was an engraved brass oval plate 17" by 11" with sunken figures and lettering which was filled with black wax, The plate was bordered by a sunken line which was also filled with black wax. Each digit of the number was 2½" wide by 3¾" high while the letters of the company name were each 1⅛" wide by 2" high

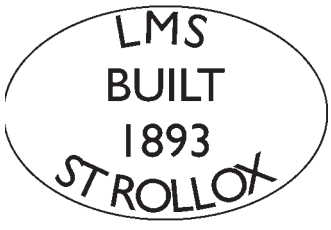
Works plates were carried on the side of the small condensing gear box either side of the smokebox.

The lining treatment of the goods black livery was very similar to that outlined above except that "standard goods lining" was a 3/16" red line (to the outside) and a 3/16" white line spaced 1⅜" apart with the black base colour showing between. The boiler bands were given a red line down the centre and edged with white and the valances were black lined red outside white. All the parts which were crimson lake on the passenger specification were now black as were the wheels. The buffer beams were all vermilion edged in black with a white line between the two colours. Insignia was the same as for the blue livery except that the number plates were simply surrounded by a white line.

Engines Numbers 3, 7, 8 and 9 were repaired by the Yorkshire Engine Company after the 1914-18 war and were returned from them in

blue livery. Number 7 had its condensing gear removed in 1922 and was repainted in the blue passenger livery at Perth where it found employ as a station pilot. A photograph of the engine at this time was published in A.B. Macleod's article in The Model Railway News of July 1944 (see bibliography) and it appears that it had been fitted with vacuum brake — perhaps this was to ease the shunting of foreign stock at a cosmopolitan station like Perth.

After the grouping in 1923 most of the engines were graced with the standard L.M.S. passenger tank livery of lined crimson lake. The entire superstructure of the locomotive was painted crimson lake with the exception of the smokebox, footplate and splasher tops and cab roof which were all black and the buffer beams and shanks which were vermilion. Lining was yellow with black edging and was applied to the bunker sides and rear, cab sides and opening, gangway doors, tank front and rear, boiler bands, Westinghouse pump, footplate valance, condensing gear boxes (at the smokebox) and buffer beams. Below the running plate everything was painted black. The locomotive number was carried in 18" high gold leaf figures on the tank side with the L.M.S. crest carried on the bunker side above new L.M.S. works plates. These were rather anachronistically lettered as illustrated below with the third row being the year of building— i.e. many a year before the formation of the L.M.S. !



Smokebox number plates were normally carried at this time. Locomotives confirmed as carrying this livery are 15020/1/2/4/5/9. However Number 7 (later 15026) skipped this livery altogether going straight from Caley livery into the black livery described below. For some reason 15027 was not treated as a passenger tank engine by the paintshop being turned out in plain black during this period. The number was still carried on the tank side in 18" numerals but the company designation was carried on a round cornered panel which had a red background on the bunker side.

In 1928, the L.M.S. instigated a policy change which was no doubt designed to save money. The crimson lake livery was now reserved for the large "top link" express passenger engines and everything else was painted black with red lining for passenger engines including those of Class 1. The lining was now a single red line, generally where there had previously been a yellow one but this is difficult to corroborate as photographic emulsions of the day were not very sensitive to red light and it is usually difficult to detect lining on photographs of engines in this livery. It can only be presumed it was there since it should have been there and St. Rollox normally went by the book in such things. St. Rollox did however have to improvise on the placing of the insignia. The new standard mandated that the loco number was placed on the bunker side with the company initials L M S on the tank side. There was however no room on the bunkers of these engines for either the number or the company initials so the insignia carried was exactly as that previously carried by the red engines. This can make it very difficult to determine wither an engine is red or black in an undated photograph and was a scheme which was unique to this class although St. Rollox, in a bid to use up old transfer stocks, often used large tank side numbers on other classes but always with the initials L.M.S. on the bunker. Smokebox numberplates were officially dispensed with at this time and the "1P" power classification mark began to appear in 2¼" figures just below the cab-side lamp bracket. Numbers 15023/4/5/6 are all believed to have carried this livery and there may be others. In 1931 Number 15028 was shopped with a variation of this livery which employed 14" red countered shaded numerals in place of the standard plain gold 18" ones.

Drawings

Two 4mm scale drawings of the locomotives accompany these notes, one showing the class as built which was scaled from copies of the St. Rollox works drawings numbers 7487 and 7506. The other depicts various modifications

which have largely been derived from photographs. The modifications can be summarised as follows :-

1) Rear window guard bars—almost certainly fitted in C.R. days to prevent coal smashing the glass,

2) Steam heating pipes—scaled from St. Rollox works drawing number 20101, Arrangement of Steam Heating Pipes for Engines 1 To 12 Class, signed by Pickersgill on 13/09/1919. The flexible hoses were always removed during the summer months when the heating was not in use. In L.M.S. days the flexible hoses were taken off by June 17th and sent to the works for overhaul. They had to be refitted by September 1st.

3) Lamp-irons—these are to the standard L.M.S. pattern and would be fitted soon after the grouping to bring the locomotives into line with their new owner's standards. (The Caley relied on the cab-side lamp-irons, normally reserving the single lamp-iron front and rear for a semaphore route indicator.)

4) Vacuum piping and ejector—the L.M.S. adopted the vacuum brake system as a standard over the Caley's (superior) Westinghouse air-brake system and thus fitted the engines with the necessary equipment. The arrangement drawn is scaled from St. Rollox works drawing number 22065, Vacuum Brake Arrangement for Two Engines 1 To 12 Class. Which two engines the drawing doesn't say but judging from photographs 15020/2/4/5 used this arrangement while 15023 and 15027 had a similar one but the ejector pipe emerged from the firebox lower down just above the handrail.

   The pipe on the right hand side of the firebox is a mystery to me — I don't believe it was fitted to other classes and its function is unclear but locomotives numbers 15021/3/5/6/8/9 are known to have caried it.

5) Visibly riveted smokebox wrapper—this feature appears to date from the late 1920s/early 1930s and is most likely to be associated with each loco's first major overhaul by the L.M.S. (See section on L.M.S. Boiler Records.)

6) External rear sandboxes. When and why these sandboxes were fitted isn't known but most members of the class seem to have been so fitted from an early date.

Bibliography

B. & D. Baxter. British Locomotive Catalogue 1825-1923 Vol 4. (Moorland, Ashbourne, 1984)

H.J. Cambell Cornwell. 40 Years of Caledonian Locomotives 1882-1922. (David & Charles, Newton Abbot, 1974)

E.F. Carter. Britain's Railway Liveries 1825-1948. (Harold Starke, London, 1963)

A.G. Dunbar. The Lambie 4-4-0 Tanks of the Caledonian Railway. In Railway World Volume 24, October 1963. (Ian Allan, London)

R. Essery & D. Jenkinson. L.M.S. Locomotives Vol. 1 : General Review and Locomotive Liveries. (Oxford Publishing Co, Oxford, 1981)

R. Essery & D. Jenkinson. L.M.S. Locomotives Vol. 3 : Absorbed Pre-Group Classes, Northern Division. (Oxford Publishing Co, Poole, 1986)

C. Hawkins & G. Reeve. L.M.S. Engine Sheds Vol. 5 : The Caledonian Railway (Wild Swan, Didcot, 1987)

H.M.R.S. A Livery Register of the Historical Model Railway Society : No. 1 The Caledonian Railway Locomotives 1883-1923. (H.M.R.S., London)

A.B. MacLeod. The Lambie Locomotives of the Caledonian Railway. In The Model Railway News Volume 20, July & August 1944. (Percival Marshall, Maidenhead, 1944)