



THE LMS PRINCESS CORONATION PACIFICS 1937-1956

THEIR DESIGN & DEVELOPMENT



DAVID MAIDMENT



The LMS Princess Coronation Pacifics 1937–1956

Front cover photo:

6229 repainted maroon as LMS 6220 *Coronation* (number still to be applied), equipped with headlamp and bell for its visit to the New York World Fair, 1939. (Colour Rail)

Back cover photos:

46231 *Duchess of Atholl* ex-works at Crewe in the new BR light blue livery, 1951. (MLS Collection)



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Their Design and Development

DAVID MAIDMENT



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Other books by David Maidment:

Novels (Religious historical fiction)

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The Missing Madonna, PublishNation, 2012
The Madonna and her Sons, PublishNation, 2015
The Reluctant Traitor, PublishNation, 2021

Novels (Railway fiction)

Lives on the Line, Max Books, 2013
Steamy Stories, PublishNation, 2021 (Short stories)

Non-fiction (Railways)

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Non-fiction (Street Children)

The Other Railway Children, PublishNation, 2012
Nobody ever listened to me, PublishNation, 2012

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for setting these opportunities up. I thank Bob Meanley, the co-author of one of the definitive books on the class, for undertaking to review this manuscript and drawing my attention to errors and omissions and enabling me to correct them.

I am grateful once again to members of the Manchester Locomotive Society and in particular Paul Shackcloth, who has given me access to the vast collection of ‘Duchess’ photographs and slides in the archives of the clubroom on Stockport station and permission to publish them free of any fee as I am, as usual, donating all the royalties from the book to the Railway Children charity (www.railwaychildren.org.uk) which I founded in 1995 to support

street and runaway children on the railway and bus stations of the world as well as on our own UK railway stations. Many of the photographs do not bear the name of the photographer or copyright holder and whilst I have tried to contact those where possible I ask for forgiveness if I have missed any. If you are one of those, please contact the publisher and I will try to make amends.

I thank my editor Carol Trow and my Pen & Sword Production Manager, Janet Brookes, Commissioning Editor John Scott-Morgan and the whole Pen & Sword team for their professional work in producing once more a book of which I and they can feel proud.

INTRODUCTION

One of my earliest 'trainspotting' memories is of standing at the end of Euston's platform 13 peering through the arches of the bridges to catch a glimpse of the tender of an engine backing slowly down Camden bank and trying to see if it really was a pacific or just a 'Scot' or 'Jubilee'. Little did I know then that thirty-five years later I would be a guest on the footplate of 46229 *Duchess of Hamilton* on one of the *Cumbrian Mountain Expresses* or another thirty-five years later still staring at that same engine in all its streamlined crimson lake and gold glory in the National Railway Museum or talking to three of its former firemen and drivers at the Crewe Heritage Centre.

What makes me eligible to write yet another book about the 'Princess Coronation' pacifics – the 'Duchesses' as they were known to most or the 'Big Lizzies' or 'Big 'Uns' according to the Crewe drivers – when so many have already put pen to paper on the subject? I still own that thin little 64-page A5 size paperback written by Cecil J. Allen and published by Ian Allan in the series *Famous Locomotive Types* (No.3 *The Stanier Pacifics of the LMS*). It cost just 3/6d and I guess it was a Christmas

present in 1948 when I was just ten years old and about to embark that Spring on my first unaccompanied trip from my home in East Molesey near Hampton Court, to spend a day trainspotting round the London termini.

In one sense, I can claim a similar career ancestry to Sir William Stanier. I too spent the formative part of my career on the successor to the Great Western, BR's Western Region, before unexpectedly being invited by the management of the London Midland Region to join them in a senior post based at Crewe in 1982. But it was as an operator rather than engineer and it was with the LMS pacifics' successors, the AL5s, the AL6 electrics and then the 87s and 90s that I rode daily about my business. Three of the best were those 86/1s that were geared to give a higher power output, 86 101 being of course named *Sir William A. Stanier FRS* just like the 1947 pacific earlier and I had many a cab ride over the West Coast main line with it and its sisters as I made my way from Crewe to meetings in London or Glasgow or Manchester. I still see it lurking round its old haunts from time to time, as it has been preserved just as its earlier namesake should have been.

Why then am I adding another book to those tomes that are already in circulation? Well, it was a gap in the Pen & Sword 'Locomotive Portfolio' series and their book commissioning editor, John Scott-Morgan, pressed me to oblige. That company had already published Tim-Hillier Graves' superb book on Tom Coleman, the LMS Chief Draughtsman, who under Stanier's broad direction was responsible for the detailed design of the Duchess pacifics, but while his role was described in detail, it still left a gap in the full history of these locomotives. Some books cover the technical design in great detail and I commend the Wild Swan 2008 publication written by a team of five authors including my friend Bob Meanley, for whom the fullest technical description is paramount and for whom the detailed technical drawings are an essential requirement for those modelling or interested. Other books have been written concentrating in particular on two of the Duchesses that have been preserved and others have highlighted their performance on the road or are general histories, and others still are books of photographs. Many are now out of print.

I have therefore tried to bring together a comprehensive history

of this superb class of locomotives, drawing on my research from all these books – a general technical description, history of construction and appearance, operation and performance, brought up to date with the current situation of the three preserved engines and adding my own personal experience and that of firemen, drivers and works fitter of the engines, as well as finding a fresh source of many unpublished photographs in the archives of the Manchester Locomotive Society. I have treasured models of the class on my own ‘OO’ gauge layout – Hornby models that I repainted in BR green and

renumbered 46232 and 46250 after engines of which I had personal memories, similarly 46244 that was purchased after being ‘crownlined’ and finished in the 1958 red livery and most recently the new Hornby model of 46257. I also own a display model of the streamlined 6225 that was presented to me after I was the speaker a few years ago at the annual Crewe Dinner held in London – a reunion of past Crewe Engineering Graduates and their guests – I was substituting at the last moment for the planned speaker, Boris Johnson, who not unsurprisingly found he had another more pressing engagement!

I offer this book therefore to those interested in general railway history, to modellers and those just enthused by what even a GWR enthusiast has to admit was one of the very best of steam locomotives that graced the metals of the United Kingdom.

This volume covers the design, construction, operation and performance of these locomotives up until 1956. A second volume to be published in a few months will describe their operation, performance and preservation from 1957 until the present day.

David Maidment,
April 2023

Chapter 1

THE ENGINEERS

Sir William Stanier

William Arthur Stanier was born on 27 May 1876 at 10, Wellington Street, Swindon, the eldest child of W.H. Stanier. William's father had joined the Great Western Railway in the time of Daniel Gooch at Swindon and Joseph Armstrong at Wolverhampton Works and by 1871 was William Dean's confidential clerk. He had initiated technical education at Swindon and developed and managed this through to 1891.

After education at Wycliffe College, in Stonehouse, Gloucestershire, William, then aged 15, became an office boy at Swindon, beginning his apprenticeship in Swindon Works on 27 May 1892 on his sixteenth birthday, starting in the Saw Mill Fitting Shop. He thus saw the end of the broad gauge and conversion of many engines to the standard gauge. He worked on the Dean 4-4-0s Nos. 14 *Charles Saunders* and 16 *Brunel*. During his apprenticeship, his father moved from the inspection of materials to becoming the railway's Stores Superintendent. William was quickly spotted as having considerable potential and was moved around the different parts of the Works to gain experience.

At the end of his five-year apprenticeship, he was appointed

to work in the Drawing Office, where Churchward had increasing influence, especially in boiler design, and, after six months there as part of his further development, worked in the Pattern Shop. In 1900 he became Inspector of Materials – a post his father had held – and two years later was transferred as Technical Inspector to the Divisional Locomotive, Carriage & Wagon Superintendent based at Swindon, which gave him locomotive running experience. This offered him the opportunity to become well apprised of Churchward's developments as the post involved the running in of new locomotives built at the Works, which would have included Churchward's first revolutionary 2-cylinder 4-6-0, No.100, the precursor of the 'Saints', and the founding design that led ultimately to the GW 'Halls' and 'Granges', the LMS 'Black 5s', the LNER 'B1s' and BR 'Standard 5s'.

In 1903 he was sent by Churchward to manage the depot at Westbourne Park, the precursor to Old Oak Common, while its permanent manager, John Armstrong, the son of Joseph, was in America. When John returned in 1904, he became his Assistant and helped design and set up the new depot at Old Oak Common where he received all Churchward's new

4-6-0s and Atlantics, including the French DeGlehn engines. When some of Churchward's Atlantics developed steaming problems he diagnosed the problem as their ashpan design and personally brought it to Churchward's attention who promptly adjusted the design and solved the problem. In 1906 he moved back to Swindon as Assistant to the Works Manager and in that year married Ella Elizabeth Morse with whom he subsequently had a son and daughter. Within six months he was appointed Divisional Locomotive Superintendent at Swindon, aged just thirty, and for the next six years oversaw the running in of all Churchward's new locomotives – the 'Saints' and 'Stars', the 28XX heavy freight 2-8-0s, the large and small 'Prairie Tanks' and the 43XX moguls – the whole range of Churchward's standard classes with which he equipped the Great Western and which became a pattern for Stanier when he joined the LMS many years later. He saw the first superheater developments and experiments with mechanical lubrication, the constant developments in boiler design and the introduction of the country's first pacific, *The Great Bear*. During this period, he chaired the Swindon

Engineering Society and read many papers at its sessions.

In 1912 he became Assistant Works Manager to Charles Collett and was involved in tests of the GW's Automatic Train Control (ATC) system. At an Institute of Mechanical Engineers' Symposium he described the GW system which was the most advanced of those that had been considered and was being implemented on the company's main line from London to Reading. During the First World War Stanier adapted the machinery in the Works for the production of war munitions, working closely with Collett and afterwards, in 1920, was appointed Works Manager when Collett moved to the post of Deputy Chief Mechanical Engineer on the impending retirement of Churchward. In 1922, he became the Works Assistant to the CME and oversaw a number of important events in that role, including the display of the new Castles 4073 and 4079 at the Wembley Exhibitions in 1924 and 1925, the visit of George V to the Works in 1924, the involvement of the rebuilt 111 and 4082 at the Darlington Centenary Parade in 1925 and finally, accompanying 6000 to the Baltimore & Ohio Railroad centenary in 1927. Between 1928 and 1932 he was heavily involved in improving the workshop techniques at Collett's behest when the quality of work undertaken at Swindon was second to none, but cost cutting was essential in the years of the Depression.

Stanier was only five years younger than Collett and promotion to the senior post seemed remote when in 1931 he was headhunted by Sir Josiah Stamp, Chairman of

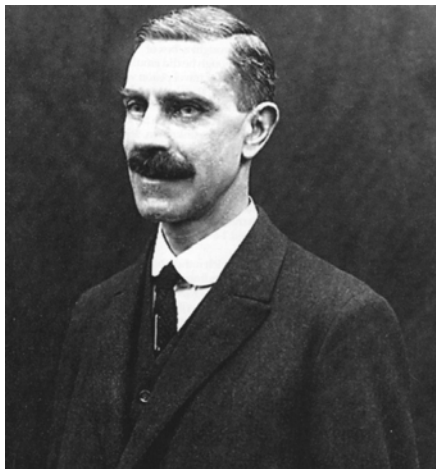
the London Midland & Scottish Railway. The LMS had been struggling with personality conflicts in trying to integrate the Crewe, Horwich and Derby contingents of the former L&NW, L&Y and Midland constituent companies and the locomotive policy had been constrained by the Motive Power Superintendent, J.E. Anderson's small engine policies. Sir Henry Fowler's ambitions to build a compound pacific had been thwarted and when William Stanier arrived to take command at both Crewe and Derby on 1 January 1932, the LMS had just seventy 3-cylinder 'Royal Scot' locomotives which had been built hurriedly by the North British Company and Derby, and were adequate power for most of the heavy Scottish and other West Coast expresses. Beyond that, the company was resorting to double-heading with both Midland and LMS-built Compounds of which there were 235, with an order for more on the construction programme for 1932, and Stanier found over 300 other classes for other duties.

Anderson was in effect dismissed at the end of the year and Stanier brought together a team of the best from Derby, Horwich and Crewe. He promptly cancelled the Compound order after a further five had been completed and, like Churchward had done in 1902, drew up a list of standard classes that would be needed to undertake most of the company's main workload – in particular the highly successful 2-cylinder taper-boilered mixed traffic 'Black 5s' and the '8F' heavy freight 2-8-0s, both reflecting their Churchward ancestry of the 'Saints', 'Halls' and '28XX'. Like

Churchward, he took great interest in steam engine developments elsewhere, especially Chapelon's developments in France and Wagner's high speed streamlined '05s' in Germany, as well as Gresley's work on the LNER.

Then in 1933 he produced his first two pacifics, 6200 and 6201, and went on to develop them into his masterpiece, the 'Princess Coronation' pacific (or 'Duchesses' as they are better known), the subject of this book. Whilst he may have been faced initially with disappointment and jealousy from some LMS men who were ambitious, he was firm but diplomatic and soon earned both acceptance and respect. He was a stickler for quality of work, having experienced Swindon Works precision experience, and pressed for improvement in machinery and accuracy of finish at the LMS workshops. An intention to rebuild earlier Crewe, Derby and Horwich designs with taper boilers was abandoned in favour of scrapping the older engines and replacing them with his new standard engines, most built between 1934 and 1937. He went in 1936 as a member of Sir Ralph Wedgwood's government committee of enquiry into the working of India's railways and led a further investigation in 1938 into derailment problems of a class of Indian pacifics.

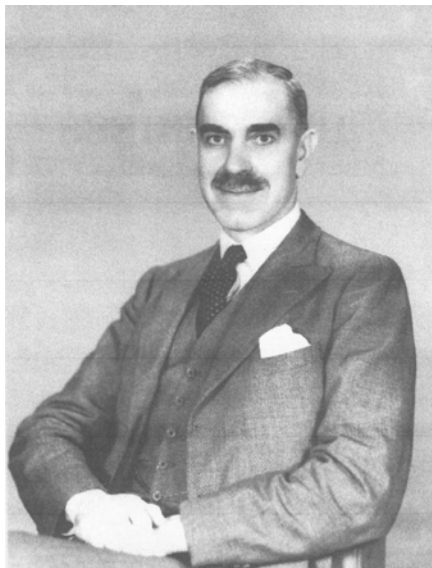
He was President of the Institution of Mechanical Engineers in 1941. He drove the production of munitions at the LMS Works and in 1942, in addition to his LMS CME role, was seconded as Scientific Adviser to the Ministry of War Production. In 1943 he became a member of the Aeronautical



A portrait of William Stanier taken around the time of his leaving Swindon for the LMS, 1932. (STEAM Museum Swindon)

Research Council. He was knighted in the 1943 Honours List for his services to engineering and his work in both world wars. He retired when he reached 68 years of age in 1944 when he was elected to the Fellowship of the Royal Society, only the second engineer to achieve this honour (the first was Robert Stephenson). He was still active in retirement, leading a UK Machine Tool Mission to India, being Chairman and Director of the government-owned Power Jets Ltd and in 1945 became an Honorary Member of the Institution of Mechanical Engineers. In 1947 two further pacifics were built to Stanier's design with minor developments by his successor and 6256 was named *Sir William A. Stanier FRS*.

Honours continued and in 1951 he was President of the Production Engineering Association of Great Britain. In 1957 he received the Gold Medal from the Institution of Locomotive Engineers and finally in 1963 he was awarded the James



An official photograph of William Stanier on his appointment to the post of Chief Mechanical Engineer, LM&SR, 1932. (LMS official photograph)

Watt International Medal of the Institution of Mechanical Engineers, their highest honour awarded every two years to a distinguished engineer from any country in the world. After retirement he lived at Rickmansworth and died there on 27 September 1965, aged 89. It is very appropriate that the main secondary school today in Crewe is named the Sir William Stanier Academy.

Tom Francis Coleman

Tom Coleman was born on 28 May 1885 in Horton, Gloucestershire, the first child of Tom senior, a local teacher, and Helena. In 1890 the family moved to Shere in Surrey. The boy showed an interest in drawing and photography and retained these activities when the family moved to Endon in Staffordshire on the edge of the five towns of Stoke-on-Trent. He became

an engineering apprentice at the locomotive building company of Kerr, Stuart in 1900 when he was just short of his fifteenth birthday and came to the attention of Port Vale football club which tried to recruit him as a professional footballer.

After training through the various workshops, he moved to the Drawing Office where his draughtsman skills were recognised. In 1905 he was taken on by the North Staffordshire Railway as a draughtsman and he continued his interest in sport playing football as an amateur for Port Vale from 1908-11. In 1911 he married Harriet Scarratt, the daughter of an ironworker, and set up home in Endon. As well as his Drawing Office work, Tom Coleman took an interest in locomotive running and performance and the NSR design work was very varied, covering equipment of machinery for limestone production during the First World War. He became the expert on the design of Belpaire boilers and superheater units for the company's locomotives and during the war remained in railway employment as a 'reserved' occupation. He became Chief Draughtsman in 1920 following the premature death of Arthur Tassell.

At the Grouping, the workshops at Crewe, Derby, Horwich and St Rollox were dominant in the newly formed LMS, and Coleman was frustrated by the low level of work allocated to Stoke. In 1926 he was appointed as Chief Draughtsman at Horwich and moved to Lancashire with his wife and two children. He was involved in the design of the Fowler 'Crab' 2-6-0 at Horwich and was very

aware of the Hughes and Fowler pacific proposals though he took no part in their design. Reorganisation took place in the LMS hierarchy between 1927 and 1932, the major change affecting Tom being the arrival of William Stanier as CME in January 1932. Stanier soon spotted Coleman's talents and transferred him to Crewe in 1933 but retaining his supervision of the Horwich Drawing Office as an outstation of Crewe. With Chambers, a Midland man, as Chief Draughtsman at Derby the design work was divided between the two.

The Crewe Drawing Office had been subservient under the previous CME and the Midland men, but it was revitalised under Coleman's leadership. He was given the detail design of the mixed traffic 2-cylinder 4-6-0 to work on (the 'Black 5') and the 2-8-0 8F. Derby would take the lead on the pacific and the 'Jubilees' although Coleman was also involved with the 4-6-2 as it would be constructed at Crewe. Stanier had a small design team at Euston but left most of the detail design to the Drawing Offices at Derby and Crewe. Chambers' health began to deteriorate, and Coleman was moved to the senior role at Derby in March 1935. He was now Chief Draughtsman for the LMS CM&EE Department.

At the age of fifty, he became involved in the development of the 'Princess Royal' pacific into the 'Princess Coronation', left very much to himself to progress while Stanier was seconded to a commission to review the Indian railways, as will be demonstrated in later chapters. One of Coleman's staff from the Euston office was E.S. Cox who described his new boss as:

a powerful personality, a great designer of the steam age. ... he had a flair for effective and even brilliant engineering. Without anything much by way of academic achievement, and abhorring public speaking, ... he nevertheless, by some hidden instinct, was able to hit the target of practical and effective design in nearly everything he undertook.

However, it is worth remembering that he had had a thorough engineering apprenticeship and had a keen analytical mind, collecting much data about locomotive performance of his own and others' engines, and put great store on engine testing.

Tom Coleman had a very close and mutually trusting relationship with Stanier and when the latter was seconded to the Government's Ministry of Production in 1942, he continued as Chief Draughtsman to Charles Fairburn and then, after his premature death, to Henry Ivatt. It would appear that his freedom for creation and innovation was somewhat curbed under Fairburn, though his working with Ivatt went back to his North Staffordshire days. He was very involved in the choice of the 8F for War Department service and their building – in all over 500 by various manufacturers. After the war he was involved in the design of the last two Stanier pacifics as modified by Ivatt and some work in the design of the two main line diesels, 10000 and 10001. Experiments with Caprotti valve gear, roller bearings and other modifications to the 'Black 5s' were also within his sphere of work.

Then in January 1948 personal tragedy overtook him when his 34-year-old son died suddenly of peritonitis. Grieving, he retired more into his shell, but promised Ivatt he would stay until the new appointments under the nationalised railway took shape. Through 1948-49 he was involved in the testing of locomotives and had a hand in the redesign of the Turbomotive, his drawings being resurrected after his retirement, although the career of the rebuilt engine was cut short in the Harrow accident of 1952. His Derby Drawing Office was involved in the design of the BR Standard locomotives, specifically the 'Britannias', the 'Clans', the 8P 'Duke', and the class 2 2-6-0 and 2-6-2T, both the latter developments of the Ivatt LMS designs. However, continuing grief at the death of his son and the changes at nationalisation decided him to retire in August 1949 at the age of 64. In his retirement he enjoyed photography and fishing and a quiet family life with his wife Harriet. She died in 1957 and he moved from Littleover in Derby to Bridgnorth to be with his daughter, but he suffered from heart problems and died there on 27 May 1958, aged 72. He was buried in Bridgnorth.

Charles Edward Fairburn

Charles Fairburn was born in Bradford on 5 September 1887. He had an exceptional academic career, gaining 1st class honours in Mathematics and Engineering Science at Oxford and studying technical drawing at Derby and metallurgy at Sheffield and obtaining an MA in 1912. He spent time under Fowler at Derby before joining Siemens in Stafford.

He married Eleanor Cadman of Bradford in 1914. He was Resident Engineer for the North Eastern Railway electrification schemes between 1913 and 1916 before joining the RAF. In 1919 he joined English Electric, again engaged in electrification work. Between 1929 and 1931 he was a member of English Electric's Executive Committee and in 1931 became the Chief Engineer of English Electric's Traction Department which was then undertaking electrification work on behalf of forty-nine projects in countries as diverse as New Zealand, India, Denmark and the Southern Railway in Britain. He joined the LMS in 1934 as Chief Electrical Engineer, becoming Deputy CME in 1938.

In 1942, he became acting CME when Stanier was seconded to the Ministry of Production and permanent CME when he retired in 1944. It was during this period that further streamlined (6245-6248) and non-streamlined (6249-6252) 'Princess Coronations' were completed although they had been authorised during Stanier's period in office. However, he was more active in electric and diesel traction, initiating the design and building of diesel shunting locomotives and merely continued

Stanier/Coleman's building programme of 'Black 5s', '8Fs' and the eight pacifics. The main steam design bearing his name was of a modified version of the Stanier 2-6-4T with shortened wheelbase that was perpetuated after nationalisation. He was a member of the Institutions of Mechanical Engineering, Civil Engineering and Electrical Engineering. He suffered a heart attack and died suddenly on 12 October 1945 aged 58, being survived by his wife and two children.

Henry George Ivatt

Henry Ivatt was born on 4 May 1886, the son of Henry Alfred Ivatt, Locomotive Engineer of the Great Southern and Western Railway of Ireland and later of the Great Northern Railway. The younger Henry was educated at Uppingham Public School and was apprenticed at Crewe Works from 1904 to 1907. In 1909 he was Assistant Foreman at Crewe North shed and Assistant Outdoor Machinery Superintendent the following year. He married Dorothy Sarah Harrison in 1913. He was appointed Assistant Works Manager at Crewe in 1914 and subsequently Assistant Manager of the Locomotive Outdoors Department. During the latter part

of the war, he served in France as a major on the staff of the Director of Transport.

On his return to the UK in 1919 he became Assistant Locomotive Superintendent of the North Staffordshire Railway at Stoke where he worked closely with Tom Coleman. Then, in 1928, he was appointed Works Superintendent at Derby and in 1937, Divisional Mechanical Engineer in Glasgow. In 1937 he became Stanier's Principal Assistant for Locomotives. When Fairburn died suddenly in 1945, he was appointed CME of the LMS, a post he held until nationalisation although he continued on the London Midland Region in charge of mechanical engineering, retiring in 1951 aged 65. He was seen by others as a friendly man, never apparently in a hurry who insisted that his staff kept disciplined hours ensuring they went home at the appropriate time and did not work excessive overtime. He communicated by word of mouth keeping paperwork to a minimum and requiring essential reports and papers to be brief and to the point. He subsequently worked as a consultant to Brush Bagnall Traction becoming finally their Director and General Manager. He died on 4 October 1972 aged 86.

Chapter 2

THE PRECURSORS

The first decade after the Grouping had been a particularly difficult time for the London Midland and Scottish Railway. It was a huge company, the largest of the four with 7,790 route miles, 230,000 staff and 10,346 steam locomotives. In the field of locomotive design and construction, the Great Western had progressed from Churchward to Collett without any disturbance to the routine, just picking up ownership of the profitable Welsh Valley railways. The LNER and the Southern both had dominant Chief Mechanical Engineers, Gresley and Maunsell, who slid seamlessly into their wider roles without any great resistance from the personalities in the former constituent companies. It was not so on the LMS.

The London & North Western Railway had amalgamated with the Lancashire and Yorkshire Railway in 1922, just a year before the Grouping. Charles Bowen-Cooke, Chief Mechanical Engineer of the L&NWR, had died in 1920 and had been replaced by his assistant, H.P.M. Beames, but George Hughes, Chief Mechanical Engineer of the L&Y, had assumed control as the senior mechanical engineer of the two companies and the same logic held sway when the combined company was amalgamated with

the Midland and Scottish companies into the London Midland & Scottish Railway in 1923, when he became its first CME.

The LMS had inherited a number of 4-4-0 and 4-6-0 classes for express passenger train work and a number had been designed and constructed in relatively recent times and were in charge of the main passenger services on their respective companies' routes. George Hughes as an L&Y man looked first at his own designs, particularly his 1919 rebuild of the earlier 4-cylinder 4-6-0s of 1908. Fifteen of the twenty of these 6ft 3in coupled wheel engines had been rebuilt and Horwich was in the middle of building fifty-five new engines to this design, thirty-five of which had been completed before the Grouping. The remaining twenty already authorised were completed by the end of 1924. They weighed 77 tons, were superheated, had Walschaerts valve gear. At the time (and until the building of the first Gresley pacific in 1922 and the Collett Castle in 1923) they were Britain's most powerful express passenger locomotive, with a tractive effort of 28,880lb though their performance on the road and coal consumption did not match that of Churchward's 'Saints' or 'Stars'. In 1921 they

were trialled on the Crewe-Carlisle section against a 4-6-0 'Claughton', resulting in the decision to build more of the L&Y rather than the LNWR class. However, E.S. Cox, in a paper in 1946, referred to them as 'poor steamers, with heavy coal consumption and not outstanding reliability'. The last one (BR No.50455) was withdrawn in 1951. Horwich had been preparing a pacific design in 1923 based on the 4-6-0 with 6ft 9in wheels, taper boiler and Belpaire firebox (see drawing in Appendix, page 169).

When decisions had to be made about future locomotive construction policy after Henry Fowler replaced Hughes, the heavy coal consumption of the Hughes 4-6-0s counted against them. The 'Claughtons' had already been tested and found wanting in 1921. 130 had been built by the LNWR between 1913 and 1921 to the design of Charles Bowen-Cooke, 4-cylinder engines with 6ft 9in coupled wheels, superheated and with Walschaerts valve gear. Boiler pressure was 175lb psi, and tractive effort 27,072lb, though twenty were later (1928) rebuilt with larger 200lb psi boilers. Nearly all had been withdrawn by 1937, some had been reconstituted into the LMS 'Patriot' class, and the last one, large-boilered 6004, was the only one



George Hughes'
'Dreadnought' 4-6-0
10423, built in 1921
to the 1919 rebuilding
design of the 1908
four-cylinder L&Y 4-6-0,
c1925. It was withdrawn
in 1948. (R.K. Blencowe /
MLS Collections)



Hughes 4-6-0 10423
leaving Audsall station
with a Halifax-Blackpool
train, c1930.
(MLS Collection)

Charles Bowen-Cooke's 4-cylinder 'Claughton' of 1913 design and built in 1916, No.5923, *Guy Calthrop*, at Nottingham, 1 September 1934. It was withdrawn less than a year later in June 1935. (G. Barlow/MLS Collection)



The prototype Bowen-Cooke 2222 *Sir Gilbert Claughton* at speed with a Down Scotch express at Dillicar troughs in the Lune Valley, c1914. It was built in January 1913, renumbered 5900 by the LMS and withdrawn in March 1935. (Real Photographs/MLS Collection)





One of the twenty 'Claughtons' equipped with a larger boiler after 1928, 5975 *Talisman*, at Manchester Longsight depot, c1930. It was built in April 1920 and withdrawn in May 1937. (W. Potter/MLS Collection)



Large boilered 'Claughton' 5948 *Baltic* with a lightweight Down express on Bushey troughs, c1932. 5948 was built in 1917 and withdrawn in April 1937. (H. Gordon Tidey/MLS Collection)

owned by BR, and was scrapped in 1949.

An LNWR 4-6-0 that was given more consideration was Bowen-Cooke's 'Prince of Wales' developed from George Whales' 'Experiment' 4-6-0 of 1905. 245 had been constructed between 1911 and 1922. They were two inside-cylinder engines, with 6ft 3in coupled wheels, and Joy's valve gear, had 175lb psi boiler pressure, were superheated and had a tractive effort of 21,760lb. No.388 of the class was tested against the Midland's 4-4-0s 998 and 1008 in December 1923, and although it matched the performance of the Midland engines on the road between Leeds and Carlisle, its coal consumption was heavier.

The passenger engines of the Scottish railways seem to have been given scant consideration. Probably the best was the Pickersgill class '72' 4-4-0s developed from the

McIntosh Dunalastairs, which in turn were really developments of Drummond's original 4-4-0s of 1884. The prestige passenger engines of the Caledonian Railway were of the 'Cardean' 4-6-0 class, but they were few in number and of 1902/6 design, superb in appearance and publicity, theoretically powerful, but unremarkable in performance and subject to frequent overheating problems. Pickersgill also built a number of class '60' 4-6-0s, with 180lb psi boiler and 6ft 1in coupled wheels, but these were used more on heavy mixed traffic duties with the Dunalastair and Pickersgill 4-4-0s (often double-headed) retaining most of the CR's express work. The class '72s' had 6ft 6in coupled wheels, 180lb psi boilers and had a tractive effort of 21,435lb. The Highland Railway had the Peter Drummond 'Castle' 4-6-0s built between 1900 and 1917 for the heavy gradients of the Highland

main line rather than fast running. Christopher Cummings' 'Clan' 4-6-0s of 1919 looked impressive, but with 6ft coupled wheels were equally best suitable for heavily graded lines. The Glasgow & South Western Railway's expresses were still in the hands of Manson 4-6-0s dating from 1910, with just a few Drummond and Whitelegg 4-4-0s and seventeen Manson 4-4-0s rebuilt in 1920-21.

Henry Fowler had been a member of the Association of Railway Locomotive Engineers (ARLE) in the First World War, a design committee chaired by Richard Maunsell, and in 1918 the group, which had included Churchward also, produced drawings of a number of potential post-war standard designs as the nationalisation of the railways was then being actively considered. Derby produced two passenger designs in 1918, a 4-4-0 and a 4-6-0.

Bowen-Cooke 'Prince of Wales' 4-6-0, No.5631 *Felicia Hemans*, seen at Crewe, July 1933. 5631 was built as LNWR 1400 in 1914 and was withdrawn in June 1936. (J.G.A. Coltas/MLS Collection)

