

Locomotives of the North British Railway in the 19th century

Background Notes to CAD Drawings

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General Introduction

I am grateful to the North British Railway Study Group for the invitation to link their website to my gallery of CAD drawings, 'North British Railway Locomotives in CAD' at:

<http://euankcameron.fotopic.net/c838077.html>

Over the past few years I have been working on a project to produce accurate digital drawings of the locomotives of the N. B. R., chiefly those built before 1900. These drawings are based as far as possible on authentic official records, and are intended to re-create the appearance of the railway's colourful and varied locomotive stock as it appeared in an era before colour photography was available.

1. Principles of selection

The present collection is a work in progress, and more locomotives will be added to it as time passes. In general the emphasis reflects personal choices: passenger locomotives more than goods, tender engines rather than tanks, relatively few shunting 'pugs' so far. As work continues more goods engines and more tanks will be added. The emphasis here is on the older engines rather than the later and larger products of the Reid era. In particular I confess to finding the 2-2-2s and 2-4-0s of the North British Railway absolutely fascinating. They have an individuality and even eccentricity which, in the later years, was only partially concealed under the standard Cowlairs style of the 1890s. It should be remembered that the older locomotives remained in use, in many instances, until the 1910-1914 period. A representation of the North British in the Edwardian era that included only the locomotives of Holmes and Reid would be seriously lacking. Around the time that the six Atlantics of 1911 were ordered, senior managers were observing how many old locomotives – meaning those built in the 1860s – were still in use, despite being marked down as of no capital value. One of the reasons for the infamous locomotive shortage of the N. B. R. at grouping was that too many trains had been pulled, for years, by locomotives that were not part of capital plant. Fortunately, between the original drawings prepared by outside contract builders and the rebuilding drawings prepared by Cowlairs, the rate of survival of many of these older designs is quite high. Some reconstruction and deduction is required, but many of these unusual and interesting designs can be retrieved.

As far as possible these drawings are complete. However, there are certain limits even to the most detailed drawing. The small-bore pipes for the Westinghouse brake system are a case in point, as these rarely if ever appeared in a General Arrangement (they were represented on separate drawings known as 'pipe arrangements' which have a much lower rate of survival). Similarly, fall-plates between engine and tender have not been shown, chiefly because most of the official drawings do not represent these either. The hinged doors fitted between engines and tender handrails in the 1890s are likewise missing from most official sources, and not all locomotives had them anyway. I usually omit the toolboxes on the tops of tender tanks, because these (a) are not shown on most drawings and (b) were moved around quite often. Finally, on many of the older locomotives with four-wheeled tenders, additional brake rigging was fitted inside the tender

mainframes when Westinghouse equipment was added: usually an additional crank arm attached to the existing brake shaft, linked to a horizontal air brake cylinder of the type used on carriages and situated amidships on the tender under the tank. This is never drawn out on any drawing that I have seen. In general modellers should always supplement drawings, even those from official sources, with careful scrutiny of surviving photographs. Many changes were made to locomotives in service which were recorded only partially or unofficially if at all.

One final point about locomotive history needs to be made. Locomotive enthusiasts sometimes have a romantic notion that each locomotive had an 'identity' and a distinct 'life' of its own. The reality was that when a locomotive entered works, its plateway and the numberplate were soon removed, and if another class of locomotive were in works at the same time it was perfectly possible for the identities to be switched. It was only in the 20th century that some railways took to stamping parts with the number of the locomotive and keeping a detailed 'record card' for each engine, and even then there are recent examples of a locomotive's identity having been mistaken for years – the preserved G.W.R. No. 4965 Rood Ashton Hall is a case in point. One railway company in England is reputed to have had a spare set of frames and boiler for a class of locomotives in excess of the 'official' number of engines in the class: the spare set was 'cycled' through the identities of all the 'official' members of the class as they passed through repairs. On the North British, the replacement and switching around of components created the proverbial 'grandfather's hammer' out of some engines. The famous 'Abbotsford' No. 479/1324 – shown in my gallery – is a case in point. By the time of its withdrawal No. 1324 had received replacements of its mainframes, boiler, cab and splashers, and at least one each of its driving and bogie wheelsets – more likely all of them. All of the above major components were substantially different from those originally fitted. Similarly, by their withdrawal in the 1930s the last of the original 1906 batch of Reid Atlantics had received new frames, boilers, running-plates and cabs. Among the older N. B. R. locomotives, there is substantial reason to believe that Wheatley 4-4-0s Nos. 224 and 264 experienced an unrecorded switch of identities in the 1870s. Among the earlier locomotives, engines were 'rebuilt' into new identities in the 1860s and 1870s that had almost nothing in common with the previous holder of the same number. Locomotive history should never be written, however great the temptation, as though it were the history of living beings.

2. Sources of information

These drawings are all, to some extent or another, based on official evidence. At the very least one has the series of engine diagram books, which specify such basic facts as wheelbase, boiler pitch, overall length, and so forth, though the dimensions in some diagram books appear to have been retrieved using tape-measures and should be used with care. More typical is the official works general arrangement drawing, which was usually drawn to 1/8th full size, i.e. 1½" to 1 foot, and allows calculation of the details to a high level of accuracy. Some contractors' drawings have dimensions written on them to a very fine degree of detail. In general the

drawings from Cowlairs are more rough-and-ready, but still useful. Over the years the level of detail in the Cowlairs general arrangements varied. The best of Drummond's drawings, such as the detail drawings for the unbuilt 17" 4-4-0, are drawn with very fine lines and are internally consistent. In the 1890s under Holmes the drawing office became somewhat easy-going: written dimensions on the drawings are minimal, and some of the rebuilds were drawn out at one stage and dimensioned at another, with inconsistency between the lines as drawn and the marking up. In the early 20th century standards improved radically: the best drawings, of the rebuilds of the Drummond 4-4-0s and of the Holmes 4-4-0s and 0-6-0s, are extremely fine. However, only someone who has tried to draw a locomotive from archival sources with total accuracy can realize just how much comparison, deduction, and calculation is required to establish accuracy within any one drawing, and mutual consistency between the 'standard' components common between one design and another.

3. Liveries

Since these drawings are in colour, inevitably I stray into the minefield of controversy that is the history of North British Railway locomotive liveries. I do not claim to reconcile all the various accounts in different allegedly authoritative sources, nor shall I attempt to do so. Here are the schemes that I have deduced, inferred, or just plain guessed from the various sources of information available. I am somewhat reluctant to enter into any correspondence or debate regarding these, and simply offer them for what they are worth. Please note that the process of generating these colours in the computer was as complex, and the results as unpredictable, as the mixing of pigments in Cowlairs paint shop. Different computer monitors will show the colours in different hues according to their settings; sometimes even the same printer makes a different job of the same drawing after the ink cartridge is changed! So the fluidity and fugitive quality of N. B. R. colours continues even into the digital age.

3.1. Early locomotive liveries

There is very little specific information on the liveries used in the North British and its constituents before c.1867. Locomotives built by outside contractors were usually painted by the contractors in their own house style: the age of the absolutely uniform railway company livery had not yet arrived. In the case of Beyer, Peacock and Neilson and Co. we have builders' works photographs in real paint (not 'shop grey') which at the very least depict the lining pattern and the range of tones used. While no account should be taken of the absolute level of dark or light in a photographic half-tone (that can vary from one print to another from the same negative according to the printing process) the evidence of a difference between tones in the same print is significant and should be attended to, although given the erratic responses of contemporary emulsions to different pigments, even here one is always stabbing a little bit in the dark.

There was however a mid-Victorian convention that the upper parts of a locomotive were painted mid- to dark green, and the lower parts a middle red-brown or 'Indian red'. Where locomotives had substantial external framing there could be quite an expanse of red. This livery convention lasted almost until the grouping on a range of railways, notably the Great Western (think of City of Truro), the Great Central and, nearest to home, the Glasgow and South Western Railways. Incidentally, it was outside frames that were painted red; inside frames, at least below the running-plate, were more usually black. Accordingly some variant of this red-and-green

scheme has been used here for the very early drawings, consistent with the photographic evidence where available.

3.2. Thomas Wheatley

There is a generally received opinion that Thomas Wheatley used a bright chrome green colour for his locomotives, and this has been replicated on some paintings and models in circulation. Since first posting these drawings, however, I have concluded that Wheatley probably took his style of green from Ramsbottom's locomotive green on the London and North-Western Railway, where Wheatley worked before coming to Cowlairs. I have therefore amended my earlier drawings to show Wheatley engines with a mid-green tending slightly to olive. From various photographs (the Dübs works photo of 0-6-0 No. 363, and photographs of 2-4-0 No. 418 and 'Longback' 0-6-0 No. 154) it is evident that Wheatley developed a complex pattern of panelling and lining characterized by inverted pointed curves at the corners of the panels of cabs and tenders. The lining-out was quite complex, at least on the later engines.

Wheatley was also the first locomotive superintendent to have the initials 'NBR' painted on the tenders. The first style, seen on the Neilson 0-6-0s of 1868, was without dots: subsequently the familiar full stops after the initials were added. However, not all locomotives had initials: even late in Wheatley's time some engines appeared without tender initials. Wheatley was also the first N. B. R. superintendent to standardize on a form of oval cast numberplate, 16" long by 12" high, with the company name between a double ridge surrounding the number. This pattern closely resembles the Great Eastern Railway numberplates applied to some Neilson 2-4-0s diverted from the N. B. R. to the G. E. R. in 1867, during the boardroom crisis just before Wheatley was made superintendent: I wonder whether the G. E. R. plate may have given him the idea. Wheatley perpetuated the final form of the Cowlairs worksplate from E. & G. R. days, though with the initials changed. St Margaret's Works had its own pattern of worksplate which was used for the first few years of the Wheatley era and is roughly replicated here on 2-2-2 No. 55.

3.3. Dugald Drummond

Much has been made of Drummond's debt to his mentor William Stroudley. However, the degree of dependence in this relationship can be overstated both in engineering and design terms. In the case of the majority of his passenger locomotive liveries it is definitely misleading. Drummond adopted for his locomotives a body colour of dark olive-green tending to brown, which shows up as nearly black in many early photographs, and weathered to a very dark olive (see the Drummond model 4-4-0 locomotive in the Royal Museum of Scotland, built and painted in the Drummond era). The upper bodywork was panelled in black, edged with two light-coloured lines which may have been either straw yellow or truly plain white. Here I have changed my mind somewhat, and now prefer a very, very pale, nearly white cream, which would result from lead white paint being covered with layers of copal varnish. Outside the black panelling band was a distinctly darker olive green colour: the difference between the body colour and the edging is quite slight in Drummond-livery engines, but some good quality photographs prove that it was definitely there. The footplate valances and external frames of tenders and engines (as appropriate) were a deep dark red (sometimes called 'claret' though I find that a little misleading). These were edged in the fine light lines and a small edging of black. In rare cases where the upper plating did not permit the full panelling, double-lining and edging treatment (e.g. The paddlebox splashers of the Wheatley 4-4-

0s) the dark red was carried above the running plate to the driving splashers as well as the footplate valances. These splashers also had the single light-coloured line and black edging. No. 224's red splashers are depicted in a nearly contemporary painting by E. W. Twining published in Alfred Rosling Bennett, *Historic Locomotives and "Moving accidents" by Steam and Rail* (London: Cassell, 1906).

Drummond adopted from c. 1876 onwards a new pattern of brass numberplate, the familiar solid polished brass oval, 18" long by 11¼" high, with inset letters and numerals filled in with black wax. Initially Drummond used 4" high numerals and 2" high lettering for engines built at Cowlairs, but the numerals were later reduced slightly in height as the plates became rather cramped. Works plates, 8¾" long by 5" high, were fitted either to the driving splashers or, in the case of the 4-4-0s, to the coupling-rod splashers. These carried the building or rebuilding date and the name of Cowlairs works, but there were no works numbers as on some other railways. The style of these plates was echoed on the engines built by Neilsons and other contractors for the N. B. R. from 1876 onwards. Passenger engines new and old alike were assigned place-names in fully edged and shadowed lettering, wherever the superstructure permitted it. Some locomotives, e.g. Wheatley's 4-4-0s with their paddlebox splashers, remained unnamed.

The researches of Mr. Allan Rodgers, recently published in the *North British Railway Study Group Journal*, have yielded evidence that Drummond had an alternate secondary livery that was used for many (but not all) goods locomotives and for a minority of secondary passenger locomotives. The body colour was a dark olive green, possibly (if Drummond was here following Stroudley's lead) the same as the dark olive edging used on the passenger livery. The black bands were in this case edged in a red line either side, which all but disappeared into the black in most contemporary photographs. In a very few early instances the right-angled corners in the lining were turned into double curves meeting in a long point, as on the Stroudley Brighton livery; however, the majority of the corners were simple quarter-circle curves as on the passenger engines. The dark olive lined in black and red was a 'prestige' livery for the older engines, applied to some Wheatley and older passenger as well as goods locomotives. In some cases the Wheatley cast numberplate was painted in a much brighter base colour than the locomotive body colour. Given the bright effect on contemporary emulsions, I am tempted to guess that it may have been bright blue as on Stroudley's numberplates for the LB&SCR. Other sources support this supposition.

Not all secondary locomotives in Drummond's time were lined out. There are numerous photographs of locomotives where, even although the paint appears reasonably clean, there is no evidence whatsoever of any detail painting. I assume that these locomotives were plain dark olive green. These instances may simply be the result of an older livery scheme becoming invisible under layers of soot, oil and varnish, but I rather doubt it.

3.4. Matthew Holmes (early style)

For his very earliest locomotives Matthew Holmes followed exactly the Drummond livery, although he stopped applying names immediately. So, for instance, early photographs of 4-4-0 No. 579 and some of the last batches of small 4-4-0Ts show the Drummond livery with the double light lines on the upper panelling. The same will have been true of the first Holmes 17" goods engines, although no photographs survive of them in this livery. However, by 1886 at the very latest Holmes had adopted a style of his own, which was (curiously) rather closer to Stroudley's Brighton practice than Drummond's had been.

The engine body colour was lightened significantly to a sort of warm dark mustard or even yellowy olive (an early endorsement on an old print of Wheatley's No. 420 just after its 1887 rebuilding refers to 'yellow paint'). The difference between the body colour and the dark olive edging therefore showed up much more clearly. The fine line between the black and the dark olive was changed to a medium red colour, as at Brighton. The dark red valance colour with its yellow and black edging was perpetuated, though the tints seem to have varied quite a lot, and of course red pigments are notoriously fugitive at the best of times. Inside mainframes were (I believe) usually black as on the LB&SCR, although some 4-4-0s were given special treatment in which the inside frames around the cylinders were lined out. That detail disappeared quite soon in the grime of regular use. Holmes perpetuated Drummond's styles of numberplate and worksplate, though the numberplate numerals were reduced in height from 4" to 3⅝". When he removed the names from many of the passenger engines he moved the small worksplate to the middle of the driving-wheel splashers, in many cases altering the lining pattern in the process. This pattern of livery continued until the early 1890s, though the body colour probably became somewhat darker over time.

Unlike Drummond, Holmes does not appear to have given goods locomotives a different livery style from passenger engines. Indeed the combining of yellow and red lines, fusing the two Drummond colour schemes in one livery, may testify to Holmes's desire for uniformity across all the locomotive stock. Even quite old locomotives received the full Holmes livery treatment during his superintendency: an interesting case in point was Beyer, Peacock 2-2-2 No. 213, which retained full early period Holmes livery over its Wheatley-era platework until it was finally rebuilt to Holmes's design in 1897.

3.5. Matthew Holmes (later style)

From the early 1890s Holmes made a quite striking change in the locomotive livery, partly at least inspired by new transfer technology. A complex piece of heraldry was devised for the N. B. R., a circular medallion ringed by the words 'The North British Railway Company' in white letters on a blue band. In the centre were the shields of Edinburgh and Berwick-upon-Tweed surrounded by roses and thistles. This medallion emblem was made up as a transfer and could then be quickly and identically applied to all kinds of N. B. R. equipment. Holmes began to apply it to the middle of locomotive driving wheel splashers and to some of the tanks of his side-tank engines. The worksplates were moved down and out of the way back to Drummond's preferred locations. At the same time the body colour appears to have been darkened to a dark olive brown. The 'claret' colour on valances and outside frames was abandoned entirely in favour of the main body colour, and the light yellow line previously seen on footplate valances, tenders and the wheel-rims of high-status locomotives was replaced with a red line. My personal belief is that these changes took place in 1893, when Wheatley's engines Nos. 38 and 264 appeared after rebuilding in the new style, as did several of the new Holmes 633 class 4-4-0s.

The first West Highland bogies of 1893/4 had medallion emblems from the start and presumably the new livery style. In the late Holmes period the first 3,500 gallon tenders constructed for Holmes's 4-4-0s had a larger size of 'N. B. R.' initials on the tender tank. Previously the standard had been 6" high letters exclusive of the ¾" shading; the new larger letters were 9" high with deeper shading, although there would be some variation as to how the letters were hand-painted. In the late 1890s there were some subtle changes to the way that the initial letters were highlighted, which are

reflected on the drawings on this site. The 'medallion' style of heraldic emblem continued in use at least until the 729 class 4-4-0s of 1898-9. Around 1900, however, the blue ring around the heraldry for the splashers and tank sides was changed to a garter pattern with an elaborate buckle and 'tail' hanging downwards, which sometimes overlapped with the lining. The earliest representation of the garter emblem that I know is on the Sharp, Stewart works photograph of Holmes 0-6-0T No. 832, built in 1901. That photograph also shows the earliest occurrence of the lettering pattern 'N. [emblem] B.' with larger initials. (I have generally not imposed the garter coat of arms on the drawings even where it should be there: it consumes a huge amount of digital space and does not render well at the size shown.) With some (continual!) variation in the body colour, this arrangement would continue, on passenger engines at least, until the eve of grouping.

3.6. William Paton Reid and Walter Chalmers

W.P. Reid was a practical rather than artistic superintendent, and he made few changes to the by now traditional N. B. R. livery until the First World War. The locomotive body colour varied between dark brown with a slight greenish tinge to a dark olive green, the latter becoming prevalent by later 1910s though not consistently so. One of Hamilton Ellis's few genuinely eyewitness reports, of seeing some N. B. R. engines in the Borders as a small child c. 1921, refers to the engine colours varying from dark ochre brown through to green. Postcards printed in the 1900s tended to represent (e.g.) the Reid Atlantics in nearly pure umber brown. Once in my childhood innocence I painted a model of a Holmes 0-6-0T in umber, and my grandmother, born in Dundee in 1896, recalled immediately that this matched her childhood recollections of the engines seen there.

In some cases the tender or tank initials were changed from 'N. B. R.' to 'N. [emblem] B.' as on the Holmes 0-6-0Ts, though not consistently and not always as one might expect. For instance, the first 'Scotts' had N. B. R. on the tender and no heraldry anywhere. In some cases the large N. B. R. initial letters came to be applied even to smaller sized 2,500 gallon tenders and to tank sides. Then, during the First World War, some significant changes occurred. First, the system of 'control numbers' was adopted to make identification of the now often filthy and worn locomotives easier for signal staff. These numbers were very large, 14" high with a 2" thick line plus edging and shading, and changed the appearance of the locomotives quite visibly. They were initially applied to goods locomotives; there is some disagreement as to when they first appeared on passenger locomotives. Certainly the 1906 series of Atlantics, which were rebuilt from 1915 onwards, appeared with 'N. B. R.' large letters on the tenders. Control numbers were incompatible with the heraldic device on named 4-4-0s, which in due course lost their heraldry. With some effort I have reconstructed the appearance of all ten digits: they are visible here on 2-4-0 No. 1247, 4-4-0s Nos. 1387 and 641, and 0-4-4T No. 589, so nearly all the numerals are represented here except 0. Recently my drawings of the control numerals have been licensed to be used for a set of 7mm transfers to assist modellers in that scale.

Secondly, around 1915 the overall black livery with two fine straw-yellow lines was adopted for nearly all new or repainted goods engines. This does not look good on digital images, and so the goods engines that I have depicted from the Reid era are all from before this date. Around this period also some initials and numerals appeared in yellow rather than gold paint, though many locomotives went around with various permutations of the two styles, e.g. yellow letters and gold control numbers or vice versa. Finally, on duplicate list engines, and then on some new capital list locomotives also,

the traditional Drummond-Holmes cast numberplate was replaced with a revived version of the cheaper Wheatley cast-iron variety, including in many cases the exaggerated hairlines and serifs of the Wheatley period numerals. In the early days of the four-digit duplicate list after 1897 Cowlairs had produced a slightly larger solid brass numberplate for engines in the 1001+ series, and these costly plates were moved from engine to engine (ironically engines that were already formally 'written off' as of no value!) as the duplicate list numbers were reallocated after scrapping. (For instance, the brass plates from 2-2-2 No. 1009 were transferred to ex-E. & G. R. 2-4-0 No. 353.) This confusing procedure was later abandoned in favour of simply allocating a new duplicate list number every time a locomotive was replaced in capital stock, and casting a new, cheaper numberplate. Eventually the numbers allocated to the 'duplicated' Drummond engines reached into the high 1400s. There was, incidentally, no clear dividing point at which the brass numberplates were superseded by the Wheatley cast type; both kinds were issued overlapping with each other over some years.

In the Chalmers years just before grouping things began to slacken, and goods and even some passenger locomotives appeared without lining or in hybrid liveries. One interesting hybrid was rebuilt Drummond 4-4-0 No. 1323 (formerly 478) which appeared in 1923 with a small LNER cast numberplate in place of the large N. B. R. version and no heraldry on the splashers, but otherwise in full late North British passenger livery.

4. Finally ...

These drawings have been prepared over several years using a simple CAD program, which nevertheless allows for a high standard of accuracy in a 2-dimensional drawing. The digital images shown on this site are 'captures' of the graphic on-screen representation generated by the CAD, and there is a significant falling-off in quality due to the conversion process, which is aggravated slightly in the uploading to the <http://euankcameron.fotopic.net/> site. Let me reassure members and visitors to the site that the original drawings enlarge to a much finer level of detail. Unfortunately, to make those originals available in their pristine forms would require complex and expensive licensing arrangements to allow viewers to download specialist software (as is done, for instance, on the American SteamCAD site at <http://steamcad.railfan.net/>) and that is just not practicable here. These drawings can be viewed on any standard image-viewing software able to handle JPEG images. Over time it is hoped to upgrade the facility and to convert some of these drawings to 3-dimensional images. So watch this space.

5. Acknowledgements

This ongoing project to digitise the drawings of the 19th-century North British Railway locomotive stock would not be possible without the cooperation and assistance of numerous archives and libraries and their ever-patient and helpful staff. In no particular order of merit, I wish to express my thanks to the staff of the National Archives of Scotland in Edinburgh, the Science Museum, the National Railway Museum at York (especially Philip Atkins), the Greater Manchester Museum of Science and Industry, and the archives and officers of the North British Railway Study Group, especially W. Marshall Shaw and Archie Noble.