

THE METROPOLITAN RAILWAY ELECTRIC TRAIN

by Piers Connor
with Charles Horsey
19. MORE TRAINS

DILEMMAS

As we've seen before in this series, there was, in the early 1900s, widespread dissatisfaction with the 'Americanisation' of the new electric Underground railways in London. The Metropolitan, in particular, having longer distance services that ran out into the countryside and carried a more affluent type of passenger, was a particular target for such criticism. The complaints were largely based on the open saloon type of vehicle that electrification brought with it. Passengers complained that the new cars were cold and draughty and that there weren't enough seats. People were having to stand! Passengers were happy to see the smoke and steam of the old regime disappear but they weren't happy about the loss of their compartment stock.

The Metropolitan board was aware of this. Indeed, many of them had wondered if their continuing purchases of 234 saloon type vehicles between 1904 and 1906 had been the right decision. They even considered converting them all to compartment type coaches. The conversion of the two shuttle motor coaches and the 10 Saloon Stock driving trailers to Dreadnought style coaches in 1910 was as far as they got with this idea but the feeling that the compartment style coach was the proper design for a railway with main line aspirations like the Metropolitan never really went away and this was demonstrated in their purchase of more Dreadnoughts in 1912 for locomotive haulage as described in Article 15. More compartment stock was to come, as we shall see.

The Metropolitan was in that dilemma where they needed to satisfy the needs of the crowded urban section of their railway south of Harrow and round the Circle but also the needs of their longer distance commuters from Aylesbury, Harrow and Uxbridge. The urban stock needed lots of standing space, lots

of doors and, as a result, fewer seats, while the longer distance passengers wanted a compartment and a seat and a comfortable one at that. That meant slam doors and slower operation at the busier stations. In an attempt to solve the problem, in 1919 the Metropolitan tried an experiment – the Hustle train that I described in Article 14 – but they found it wasn't the answer. Getting a design to cover both circumstances was impossible and the Metropolitan, as far as possible, stuck to their formula of saloon bodies for the Circle and Harrow services and compartment stock for the Aylesbury line so they ordered new trains in 1920 according to this strategy.

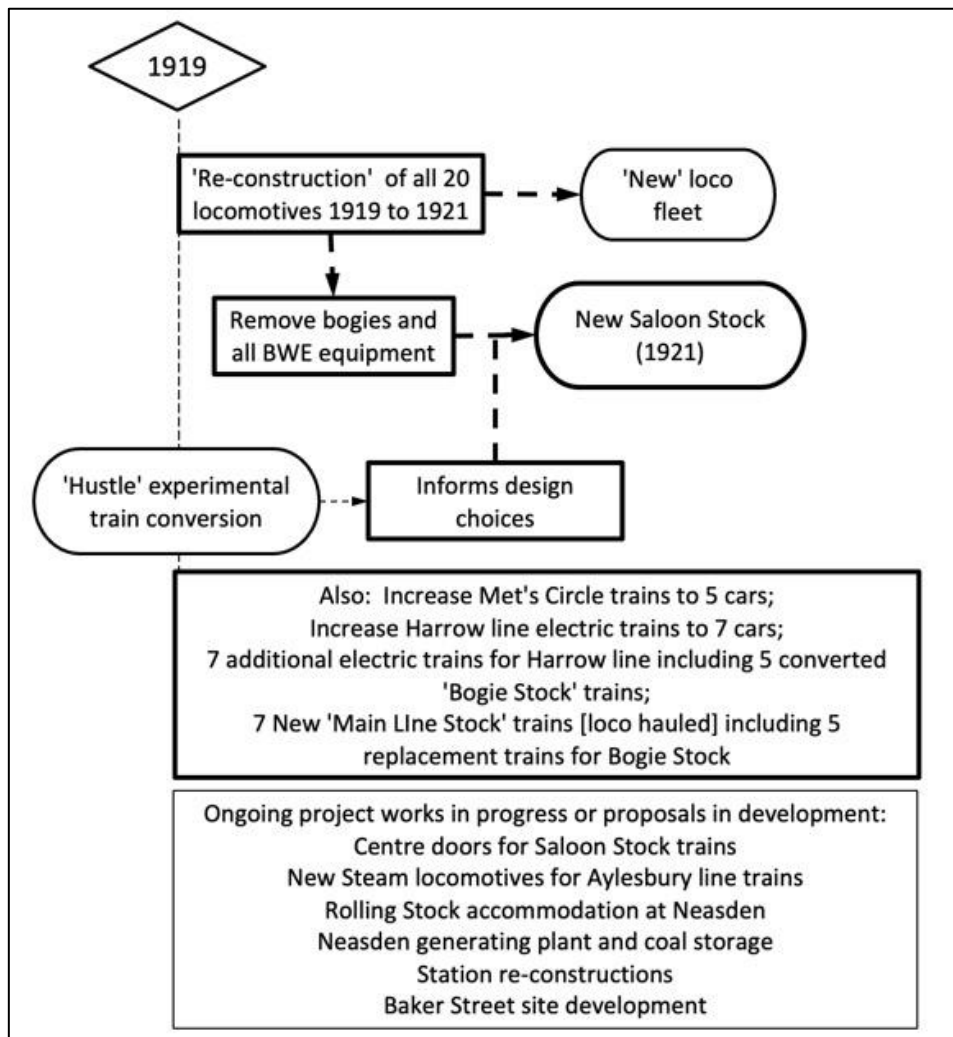


Figure 1: A chart showing the Metropolitan board's plans of April 1919 for upgrading the railway to meet increased traffic. The plan was followed over the next three years. Diagram modified from original prepared by Charles Horsey.

THE 1919 PLAN

Early in 1919, shortly after the end of the First World War in November 1918, the Metropolitan developed an expansion plan. It was driven by rising traffic levels and an increase in suburban housing expansion. Traffic had increased by 27% since before the war and they were expecting further increases as house building in started in earnest in areas north of Neasden¹. In looking at future traffic requirements, more trains would be needed on the Extension line and, at the same time, more capacity on the Circle. The plan included increasing train lengths, some rolling stock modifications and some train reformations.

An early stage of the plan was the reformation of the Circle trains by removing the single 200hp motor car powering each train and replacing it with two BW 150hp cars. This increased the train length from four cars to five. The Metropolitan had noticed that the District had already begun to lengthen their Circle trains and agreed that they had to do the same. It was decided to use BW 150hp cars exclusively on the Circle to standardise the equipment and to complete the modification to provide middle doors to these cars. This work was completed in January 1921. The released 200hp cars were transferred to the Extension line to provide the extra power needed to allow Saloon Stock train lengths to be increased from 6-car to 7-car sets.

The expansion plan also included that the five converted Bogie Stock trains, mentioned in Figure 1 as intended for the Extension line, were to be made up of the 5 x 6-coach trains working on steam hauled services. These were to be converted to electric operation (as described in Article 9) after their replacement by seven new 6-coach Dreadnought trains (The 1920 Stock, described in Article 17). Ten new Saloon Stock motor cars were purchased to power them.

The plans required the purchase of new Saloon Stock (Figure 1). This included the 10 motor cars mentioned above, two 7-car trains for the Harrow/Uxbridge line, plus a third train and four extra motor cars to cover the spares requirements. There were to be a total of 20 new motor cars and 39 trailers. Six of the trailers were 1st driving trailers for the new trains, together with 12 x 3rd trailers. The remaining 21 x 3rd trailers were used to lengthen existing 6-car trains into 7-car trains.

THE 1921 SALOON STOCK

The new Saloon Stock was ordered early in 1920. The order comprised 59 new cars from the Metropolitan Railway Carriage, Wagon and Finance Co. and it was built at their Ashbury works². It was made up of 20 motor cars and 39 trailers. The first six trailers were delivered in December 1920 and the remainder in batches throughout 1921. The completion of the motor cars was very slow, largely because most of their electrical equipment was being reclaimed from the old electric locomotives. The last of them didn't enter service until April 1923.

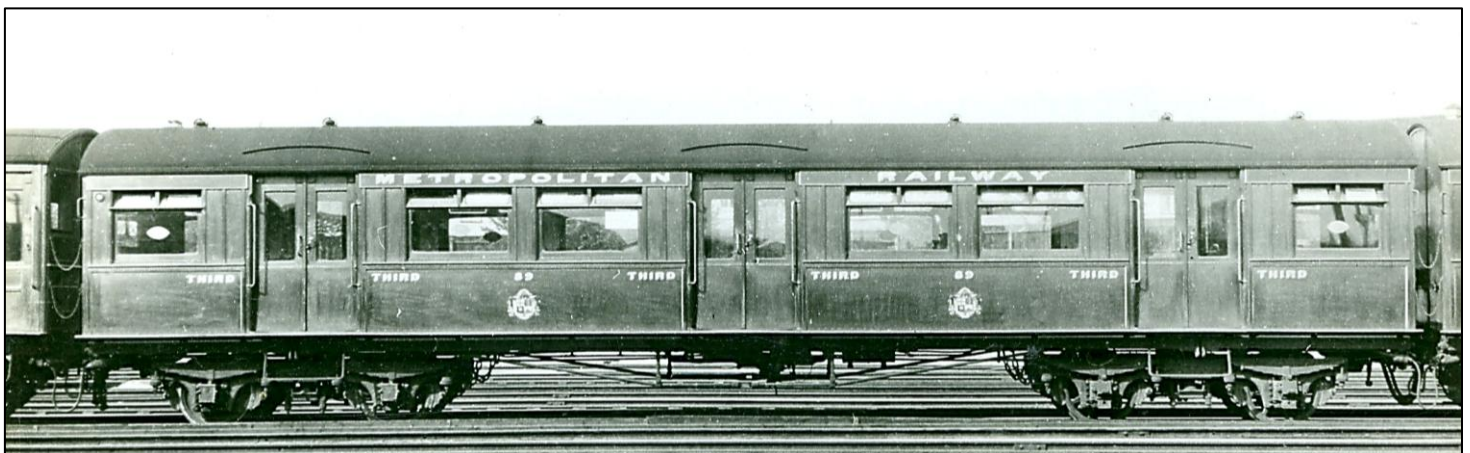


Figure 2 above: 1921 Stock 3rd Class trailer car No.89. The three sets of double doors on each side made it ideal for work on the Circle and it is a design that has survived to the current S Stock. Photo: LT Museum.

The fleet became known as the 1921 Stock. Although broadly based on the 1913 Stock profile, the cars had more doors, a separate driver's cab for the driving trailers and, like the 1919 'Hustle' train, no end communicating doors. The interior seating layout was also revised (Figures 4 & 5).

¹ Selbie, R.H. Report to Metropolitan Railway Board, 1 April 1919 regarding rolling stock requirements.

² Railway Magazine, January 1921 p.59.



Figure 3 left: 1921 Stock motor car No.117. Note, the car number is displayed on the centre of the cab front. Photo: LT Museum.

The 3rd Class trailer cars were symmetrical in layout. There were three sets of double sliding doors on each side of the car, each set in a 4-foot wide bodyside opening with a 3ft-6in clear opening. The doors were hand operated by the passengers. The station staff and guards were supposed to ensure they were closed before the trains started but this was rarely enforced, particularly in the warmer months. The cars had a mix of transverse and longitudinal seats with draught screens provided at the doorways.

The doors were hand operated by the passengers. The station staff and guards were supposed to ensure they were closed before the trains started but this was rarely enforced, particularly in the warmer months. The cars had a mix of transverse and longitudinal seats with draught screens provided at the doorways.

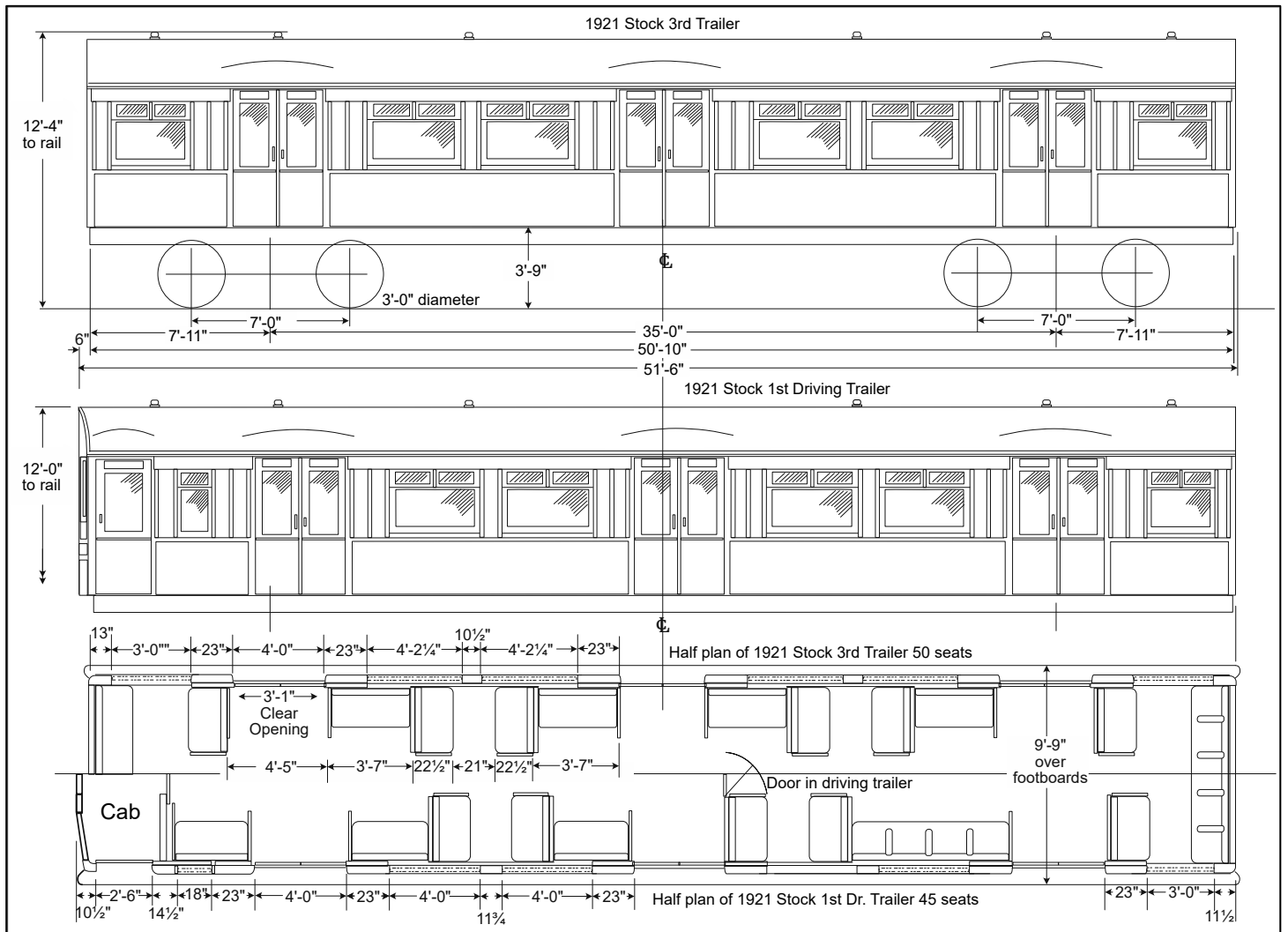


Figure 4: Side elevations and plans of 1921 Saloon Stock trailer cars. The top diagram shows the side elevation of the 3rd class trailer. The centre diagram shows the 1st class driving trailer, where the door and seating layout has been reconfigured to provide for a separate driver's cab. The interior is partitioned to divide the car into smoking and non-smoking areas. The bottom diagram shows half plans for both types of trailer car and demonstrates the differences between them. The 3rd class trailer had 50 seats while the 1st class driving trailer had 45 seats. Drawing: P. Connor.

A new feature was that the car ends did not have communicating doors. This introduced a new policy. It was followed in January 1922, by a suggestion that the end communicating doors at non-driving ends of Saloon Stock should be fixed closed. They were regarded as a maintenance liability. The Metropolitan had decided that they didn't need end doors for evacuation purposes. The steam stock didn't have them so why the rest of the stock? The order to fix the doors was issued in February 1922

then, just over 10 years later, after the London Passenger Transport Board took over the Metropolitan in 1933, the end doors were re-instated and the 1921 Stock was fitted with them as part of the Circle Stock rehabilitation. This despite the inability to alter the compartment stock.³

The new body design of the 1921 Stock didn't have end vestibules, which meant that the Driving Trailers had to have a separate cab. Strangely, although cab doors on earlier motor cars were always hinged and inward swinging, those on the 1921 Stock driving trailers were sliding (Figure 4). Quite why this was done isn't clear but there is a thought that it might have been considered useful to provide an additional entrance for passengers, at the design stage at least.

Another innovation for this stock was the provision of some additional comfort for the drivers in the form of a seat in the cab. Up to this time, employees working on most Metropolitan electric trains were expected to stand all the time, regardless of how long the trips were. As a driver, I preferred to sit most of the time. I certainly wouldn't want to stand for the 3½ hours it took to do four Circles. Older cars were fitted with various forms of cab seats from around this time, usually with some sort of folding arrangement. Drawings of the period show various designs, most of which look rather uncomfortable.

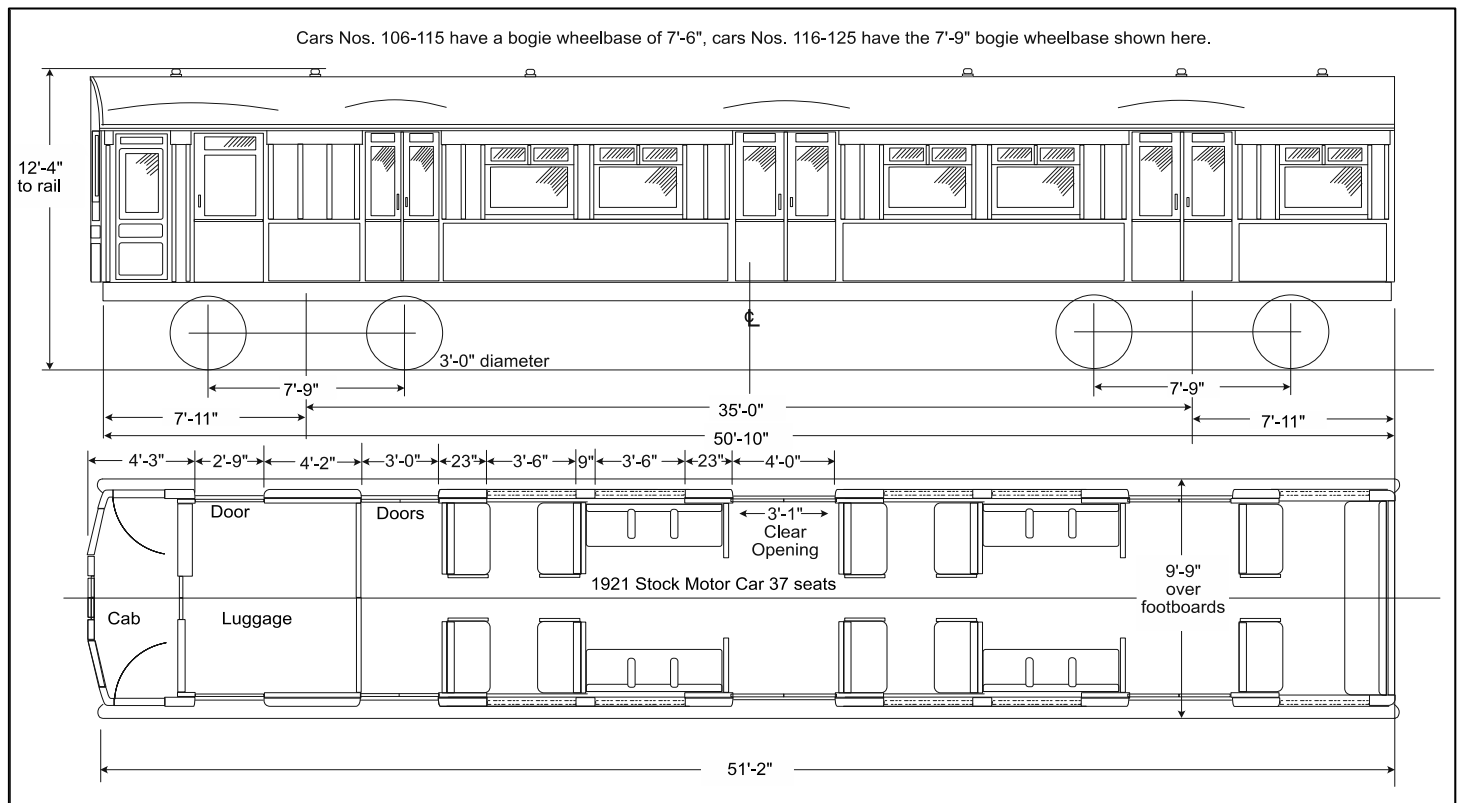


Figure 5: Side elevation and plan of 1921 Saloon Stock motor car. The leading pair of double doors was narrower at 3ft-0ins than the standard 4-foot doorways provided on this stock. The current S Stock has a similar door arrangement, with narrower leading end doors on the driving doors. The driver's cab had the usual hinged doors. The cars had 37 seats. Drawing: P. Connor.

1921 MOTOR CARS

As we've seen earlier in this series, the Metropolitan's 20 electric locomotives were 'rebuilt' and their equipment removed and recycled. The story of the replacement of the electric locomotives is told in detail in Charles Horsey's series of articles for this journal⁴ and in the book by Ken Benest⁵ so we don't need to repeat it here. However, the reconstruction involved removing the existing motors, electric traction equipment and bogies and procuring new equipment in its place. The displaced equipment was installed in the twenty 1921 Saloon Stock motor cars. It included British Westinghouse (BW) Type 86M 200hp traction motors.

The equipment for the 20 motor cars had two different origins. Ten sets of equipment came from the 1905-built BW locomotives Nos.1-10. They included the original pressed steel bogies with a 7ft-6in

³ It was noted by G. Thorne, writing in 'Underground' No.134, February 1973, that, at some point in the days of the side door compartment stock, walkways were provided in the single track tunnels north of Baker Street in case it proved necessary to detain passengers. With the arrival of the A stock with end communicating doors, the need for the walkways disappeared and they were later put to use as cable runs.

⁴ Horsey, C.I. 'The Twenty Metropolitan-Vickers Locomotives One Hundred Years On – An Appendix to the Story' Underground News, 2019-23.

⁵ Benest, K. (1984), 'Metropolitan Electric Locomotives', Second edition published by LURS 1984.

wheelbase and 3-foot wheels. They were fitted to cars Nos.106-115. The remaining ten cars (Nos.116-125) had the equipment from the former 1907-built BTH locomotives Nos.11-20. This was also BW equipment but it wasn't the original. It was bought in 1912 as part of a set of 23 cars' worth of new traction kit and bogies ordered for the 1913 Saloon Stock. It was installed on the locos in place of the original BTH equipment. This meant that the second group of 1921 motor cars (Nos.116-125) had BW equipment and plate frame bogies with a 7ft-9in wheelbase but still with 3-foot diameter wheels.

The layout of the new motor car bodies was a combination of the previous designs with a luggage compartment behind the driver's cab but with the new design having three sets of passenger doors. However, the leading passenger doors were fitted into a 3ft-6in wide opening as opposed to the usual 4ft wide opening provided for the other doorways. The leading doors provided access to the front end of the passenger compartment only, as the area was separated from the luggage compartment next to it. The luggage compartment door was immediately behind the driver's door. As usual for the Saloon Stock, there was no separate guard's compartment. The guard was supposed to travel in the rear cab on this stock.



Figure 6: A 4-car set of mixed Metropolitan Railway Saloon Stock containing a complete selection of the range. The leading vehicle is a 1905 Stock driving trailer (note the asymmetrical cab window arrangement), the second car is a 1921 Stock trailer, then a 1904 Stock trailer and finally a 1913 Stock motor car. The 1913 Stock 200hp BW motor car had just about enough grunt to push a 4-car set, which was probably uncoupled from a 7-car or 8-car train at the end of the morning peak period. On 7-car trains, it was normal to run the 4-car portion at the Up end (Baker Street end) as seen here and to use this for off-peak working. Note that the driving trailer has shoe gear on the leading end. Originally, it was not thought necessary to provide shoe gear on the driving trailers. Power for lighting and heating could be obtained through the power train line provided to connect the 600-volt supply on the motor car throughout the train. On BTH trains, power for the master controller was tapped off the car lighting circuits. On BW trains, the 14-volt control power was supplied from the motor generator on the motor car via the control cable. The shoe gear was eventually added to provide an alternative contact with the current rails in case the shoes on the motor car were 'gapped'. The photo was taken some time between 1926 and 1933. Photo: Collection B.R. Hardy.

As I've commented on before (in Article 6 in this series), it is strange to me that Westinghouse were still selling the 86M motor in 1912 when more modern designs were available and it's also strange that the Metropolitan were content with it. Mind you, as a company, British Westinghouse was always in financial trouble and perhaps, they offered the Met. a very good deal on their old 86M motor design. Also, the only realistic alternative was BTH and BTH were known to be expensive, even if more reliable in terms of equipment design. Whatever the reason, the equipment was considered still good enough to fit under the brand new bodies of the 1921 Stock and it worked reasonably satisfactorily until all the motors were replaced in the late 1930s by GE212 motors – yes, the BTH product that the Met. could have had in 1912.

Although structurally most suited to work on the Circle, the 1921 Stock appeared all over the Metropolitan, indiscriminately mixed in with other BW equipped cars as was the Met's rolling stock management style of 'as long as it works, send it out' (Figure 6).

MORE MIDDLE DOORS

The 1919 improvement plan included the resumption of the fitting of centre doors in the Saloon Stock. As we saw in Article 11, this had begun back in 1910 but had stalled during the war and was only resumed in 1918. The doors were to be provided first on 16 BW 150 Saloon Stock motor cars, for use on the Circle fleet. They already had ten 150hp motor cars with centre doors but the service required 15 trains, plus two additional trains needed for the regular 'shed day' maintenance cycle. They also had two more motor cars slated for conversion to cover what they called 'partial overhaul', a 10-day long period for major equipment refurbishment work, which was done every six months. Nowadays, we would call it a 'programme lift' and it would take place every three to five years, depending on the stock. Once the BW 150hp cars were done, the addition of centre doors spread to the rest of the fleet. There were still over 80 Met. cars left to do plus the 120 cars of H&C Stock. Work proceeded at a rate of up to 12 cars a month, with the work shared between Neasden and Hammersmith depots. Some of the H&C cars were done at Neasden, as Hammersmith was, as always, short of space for maintenance work. The work was completed in September 1921.

TRIPCOCK MODS

In parallel with the work on the fitting of centre doors, a programme of modification work was being applied to the tripcock system (see box). It involved a device known as the tripcock pressure switch. This was a device added to Metropolitan driving cars to provide a means of ensuring that the tripcock was operative on the leading car (see box). On other Underground lines, it was known as the 'Control Governor'. It acted as a monitor for the operation of the tripcock and to ensure there was sufficient air pressure in the brake pipe to stop the train when required. On the Met. it went through two stages of development.

The first development began around 1914 with a simple switch mounted on the tripcock isolating cock (TCIC) handle⁶. The Metropolitan called it the "Tripcock Interlocking Switch". It ensured that the tripcock on the front of the train was operative. The switch was in the control supply circuit and it had to be closed to start the train. It was introduced to ensure that the leading tripcock was not isolated while the train was being driven.

At around the same time, it was decided to move the TCIC from its existing position, tucked away under the solebar or inside the cab, depending on the stock, to the front of the cab so it could be seen. Drivers had a habit of isolating the tripcock, since it was awkward to reset if the train had been tripped. If his train got tripped, the driver had to climb down onto the track, move around to the side of the bogie and then push the tripcock arm back into its vertical position. This was not for the faint hearted if the positive current rail was on that side of the train and it was easier to just isolate it, especially since the TCIC was in the cab. Once it was moved to the front of the train, supervisors could see if it had been isolated.

TRIPCOCKS AND TRAINSTOPS

On all the Underground lines, a tripcock was provided on the right hand side of the leading bogie at each driving position. If a train passed a signal at danger, the tripcock was opened by a trainstop on the track to cause a brake application. Since the train had a driving position at each end, the rear tripcock was on the other side of the train. At any location where there were signals for working in both directions on the same track, like a terminus, the rear tripcock on an arriving train would be activated by the trainstop of the signal at the exit end of the platform (showing "stop" as it would) as the arriving train ran in. The train would be "back tripped". If the train had driving trailers as well, the middle tripcocks were also in line for spurious operation.

As a result, tripcocks at non driving positions had to be isolated. A cock on the pipe leading to the tripcock was provided for this purpose. The driver had to isolate the tripcock at his end upon arrival at each terminus and then, after changing ends, cut in the one at the new driving end and reset the trip arm. Resetting the trip arm was a nuisance as it had to be reset manually and it involved getting down on the track. This was a hostage to fortune and it is evident that some drivers didn't bother with it and left it isolated. To overcome the problem a scheme known as 'trainstop release' was introduced in the years up to 1911. Track circuits were arranged so that the trainstops of signals working in the opposite direction to the train were lowered as the train passed and then immediately restored to the stop position once the rear had cleared it. It removed the need for rear tripcocks to be cut out, and it became normal for the tripcocks at both ends of the train to remain operative.

⁶ Metropolitan Railway, Neasden Works, Drawing No.7262, 1916.



Figure 7: This photo of a train being rescued after a buffer stop collision at Moorgate shows the pipework on the front of the train for the tripcock isolating cock. The cock handle can be seen at the bottom of the switchbox. This modification was introduced sometime around 1914-1916 on the Metropolitan's electric stock. Photo: Collection B.R. Hardy.

The earliest version of the alteration appears to have combined the two modifications so that the TCIC and interlock switch were mounted in a small box on the front of the cab. It was easily visible because a loop of piping had to be added to connect the tripcock to the cock and its interlock box (Figure 8).

In its original form, the handle of the cock appeared at the bottom of the box to show it was cut in. However, it soon became

apparent that the design wasn't robust enough. Being on the front of the train meant the switch suffered from water and dirt getting into the electrical contacts. It soon became necessary to add a bypass switch. The bypass switch was fitted inside the cab and it was protected by a glass cover that had to be broken to get to the switch. The glass cover was a 'tell-tale' device to show that someone had got at it. The Underground Group lines used a lead seal for this purpose and they were still using it when I was driving in the 1960s and 1970s. For later versions of the modification, the interlock switch itself was moved inside the cab so that only the TCIC handle was visible on the front. Some of these original fittings survived into London Transport days.

The next step in the development of tripcock safety was the introduction of the pressure switch. It was reported in the Railway Magazine as being introduced in 1921 (August 1921, p.111) but Metropolitan railway drawings suggest it was earlier, probably 1918. It replaced the mechanical switch attached to the TCIC handle. The TCIC was modified with the addition of a bleed hole on the downstream side of the cock so that, if it was isolated, the air bled away from the pipe leading to the tripcock. The pressure switch was added to this pipe so that, if the cock was closed, the switch lost pressure and opened the contact for the control circuit supply. It also doubled as the monitor for brake pipe pressure. Thus, if the train had been tripped or there wasn't enough pressure in the brake pipe to close the pressure switch, the train wouldn't start. You had to reset the tripcock and restore the brake pipe air pressure to get going again.

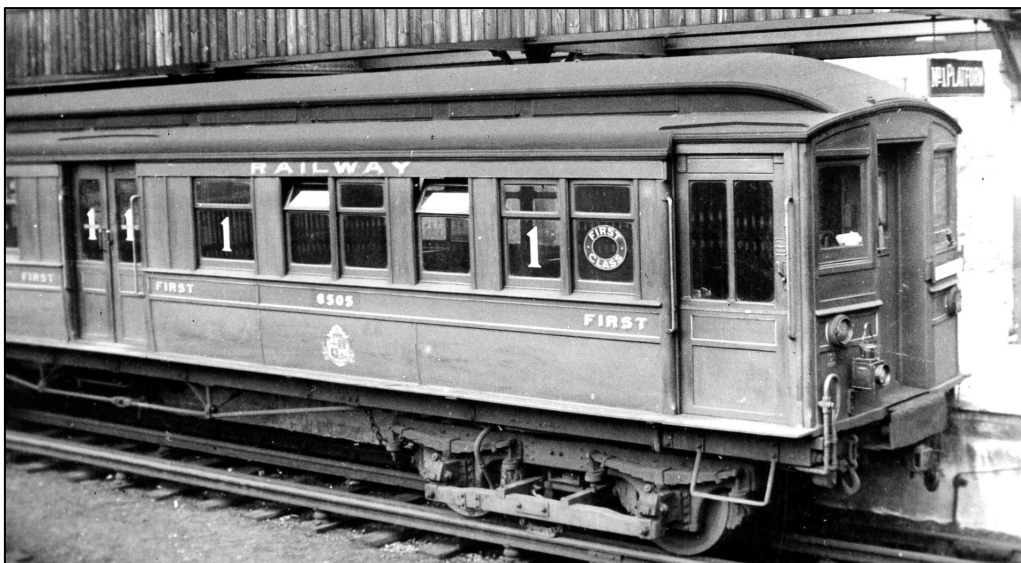


Figure 8: A 1904 Saloon Stock 1st class driving trailer at Watford in the days immediately after the takeover by the LPTB in 1933. The pipework for the tripcock isolating cock can be seen next to the tail lamp. Note that the car has been renumbered but it still retains its Metropolitan Railway graphics. Photo: Collection B. R. Hardy.

To be continued ...