

DISTRICT ELECTRIC TRAINS

6 – LEARNING ON THE JOB

by Piers Connor

SOME EARLY MODS

Once full electric services on the District Railway had settled down from their troubled start in July 1905, various issues began to arise with the trains and their operation – the usual teething troubles one can expect with a brand new system. Some were minor and some more serious, like the difficulties with the door system which we saw in Article No.4. One issue concerned the arrangement of driver's cabs.

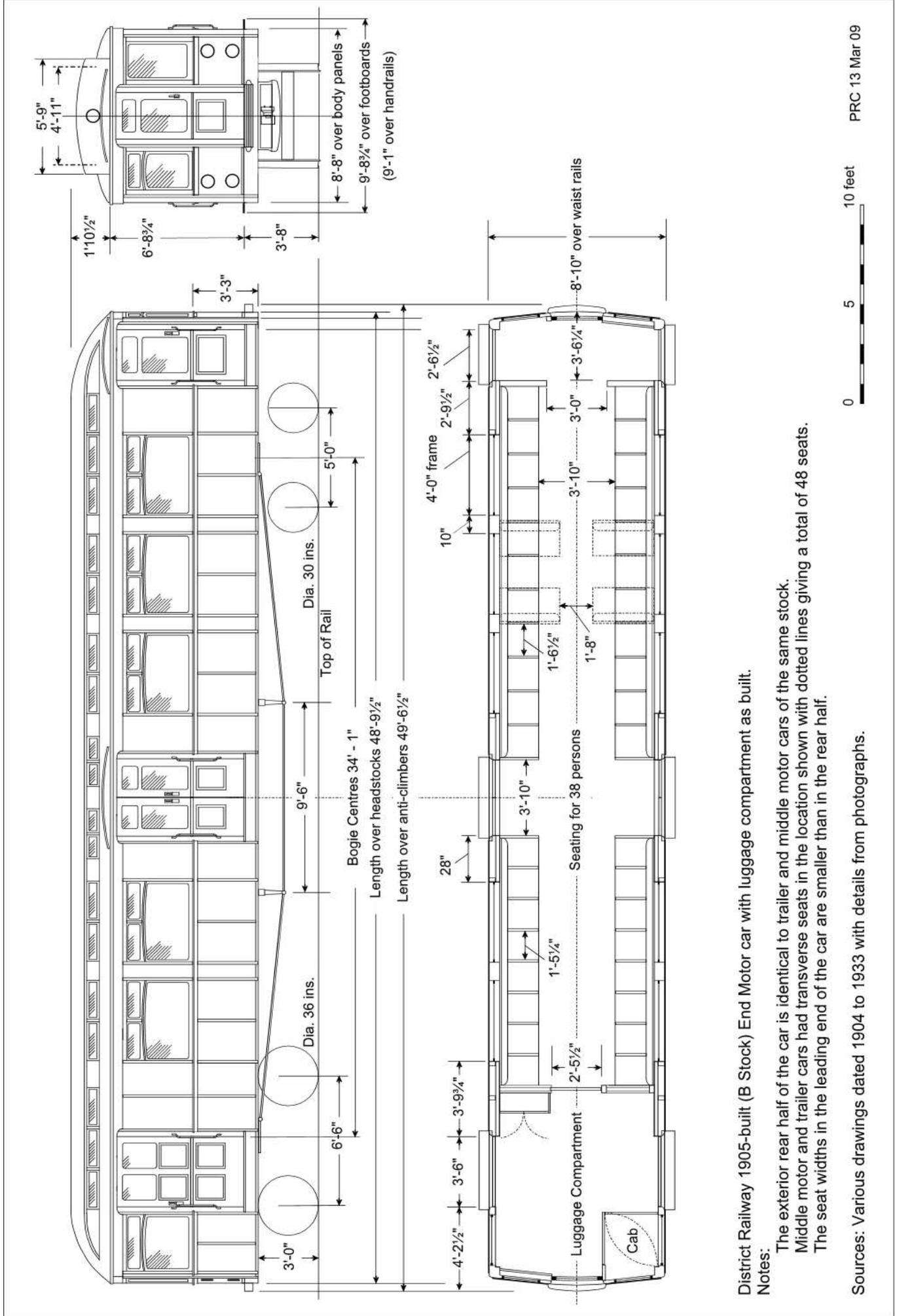
Originally, the front vestibules (except the ones with luggage compartments) were accessible from the saloon and passengers could stand at the front next to the cab. The driver was enclosed in a small cubicle on the left of the centre communicating door – the one we now call “M” door. Since this was accepted practice in Chicago, it was not seen as much of a problem here until complaints, both about the lack of space and about annoyance from passengers, began to trickle back to management. Passengers were naturally curious about what it looked like from the front of the train but this could be irritating and distracting for the driver. There was also the risk of someone interfering with the communicating door, since they don't seem to have had locks. Drivers must have complained and they would have been able, quite justifiably, to have used distraction as an excuse for any mistakes they might have made. The complaints seem to have been regarded seriously because the board decided, in October 1906, that cabs should be closed off from the passenger saloon, so a door was installed at between the cab and the saloon in the position we now call “J” door. The modification gave the drivers a full-width cab and space for their possessions and tools.

Another addition to driving positions at this time was rear view mirrors. These were added to the outside of the cab on the left hand side from the driver's point of view. Although the starting signal for the driver was a bell rung by the front guard stationed on the rear platform of the front car, operating rules over the main line railways' territory on the Wimbledon, Richmond and East Ham lines required a flag signal from the guard at the rear. The mirrors seem to have been introduced to aid with seeing this. Whatever the reason for them, the mirrors were retained on District stock until the re-introduction of air-operated doors in 1938.

A problem which appeared soon after the start of operations was ice forming on the top of the conductor rails. As early as December 1905, many of the motor cars had sleet brushes added to the shoebeams in front of the leading current collector shoes and trains were provided with ice scrapers in cabs so the front guard could get down on the track and scrape the ice off as necessary to get the train moving. Anyone who has had to do that will tell you that it is hard work and you have to be careful that you don't dislocate your shoulder when the scraper hits a rail joint. Ice was to remain a problem for the Underground forever onwards. On the District, having all the shoes on the train connected by the power busline was a bonus in that it reduced the risk of going “off-juice” completely.

B STOCK DIMENSIONS

As we have space this month, I have added a scale drawing (opposite) of the B Stock in 1905 "as built" condition, with dimensions. Apart from the obvious visual differences between this stock and the A Stock, there were certain other changes. The car body was shorter by 1ft 1½ins, largely as a result of flattening the rather pronounced curve of the A Stock ends. The B Stock end platforms were enclosed but, unlike contemporary Metropolitan cars, there were no vestibule doors to separate the seating area from the end entrances. Crews were constantly reminded to keep the end communicating doors closed as far as possible during cold weather. Of course, they had to have them open at stations to operate the door valves.



District Railway 1905-built (B Stock) End Motor car with luggage compartment as built.

Notes:

- The exterior rear half of the car is identical to trailer and middle motor cars of the same stock.
- Middle motor and trailer cars had transverse seats in the location shown with dotted lines giving a total of 48 seats.
- The seat widths in the leading end of the car are smaller than in the rear half.

Sources: Various drawings dated 1904 to 1933 with details from photographs.

Seat widths varied between 17½ and 19 inches so as to get the maximum number of seats in the available space. Transverse seats (shown in dotted outline) were provided on middle motor and trailer cars. Footboards were originally provided only at doorways. Full length footboards were added in 1910.

The cab was designed to fold away, even in the luggage compartment. The rear wall folded against the side, while the side door folded over the driving controls. Cabs on other cars had one door, which closed over the driving controls and, when open, formed a wall on the driver's right.

PAINT – RED OR GREEN?

By the early part of 1907, the stock had been in service for almost two years and many cars were showing signs of wear and tear. They were ready for a repaint. Paint quality was obviously not what it is today and repainting railway vehicles was a regular occurrence, originally taking place more often than mechanical overhauls. The two processes were not synchronised on the District until the late 1920s. After doing a few cars, the board decided, in April 1907, to repaint cars in green. This was cost-cutting exercise, the green paint being 15% cheaper than the red. We have no idea today what sort of green this was, nor what happened to the plain varnished doors and window frames but we do know that it proved a mistake. Cheap, as we all know, is not usually better and, in this case, it proved the point for the board who, as early as October 1907, decided to go back to the "vermillion". The green proved not to last so well and the cost of its maintenance was said to be "heavier". Within the period the green was being used, I reckon they would have painted about 120 cars. It would have taken about another 20 months to get rid of the green, so green cars would have been seen on the District up to mid-summer 1909. Interestingly, it confirms a statement in an article in *Railway & Travel Monthly* of 1913 which refers to the painting cycle at that time as 20 months.

An interesting legend has circulated from time to time as a result of this rash of green paint on the District. The story arose as a result of the District board's efforts to persuade the London Tilbury & Southend Railway to buy some of their electric cars. The LTSR-owned cars were supposed to represent the portion of the fleet needed to work the joint line east of Whitechapel. The District concluded the deal in November 1908, which resulted in the LTSR paying £130,000 for 37 motor cars and 37 trailers, although the District retained operational and maintenance control over the cars. It wasn't a bad deal for the District, especially since although the cars were only three years old they were already showing signs of wear and tear, as we shall see. In spite of that, the District managed to wring a price of just over their original cost out of the LTSR. In later years, the LTSR bought more cars from time to time to reflect increases in the fleet size and, on top of this, the District always charged them for any alterations made to their stock. They were certainly on top of their cost management.

Going back to our legend, it was suggested that the green cars were painted that colour because they were the ones owned by the LTSR. Of course, this could not have been true, since the original decision to go for green was taken before the LTSR owned any District cars and because the second decision to go back to red was also adopted before the LTSR purchase was agreed.

Some cars (which could randomly have been red or green) were lettered "LTS RAILWAY" along the "letter board" over the side windows in place of the usual

“DISTRICT RAILWAY”. I expect the company’s signwriter just painted out DISTRICT and put LTS instead. I recall seeing, many years ago, a postcard photo of a car labelled like this but I can’t remember where and, despite a search, I haven’t turned it up again. About 1909-10, the District gave up putting its name on its cars and henceforth just labelled them with car numbers in the centre of each side panel.

POLES AND PADDLES

By 1910, experience had shown that, in addition to the ice scraper mentioned earlier, it was necessary to equip each cab with various bits and pieces as follows:

- Coupling pole: A wooden pole with a steel hook on the end to allow the latches on the top of the Ward couplers to be pulled back to the release position from the side of the train during uncoupling operations.
- Paddles: Narrow, light wooden planks about 2ft long with wedge-shaped ends which were intended for sliding under shoes to isolate them from the current rails in emergency. They also came in useful for testing the tripcock, wedging windows and doors shut, providing a flat surface for your tea can and, in extremis, self defence.
- Cover boards: As we saw in Article No.4, to be placed over the current rails if you had to crawl under the train to isolate a triple valve, change a blown main fuse or hit a stuck contactor with a paddle to get it to work properly.
- Sand: Kept in a box (later a bag) and originally intended for assisting traction in poor railhead conditions but most often used to soak up late-night vomit and put out small smoulderings. Nowadays they take the train out of service with a slipping hazard or call the fire brigade.
- Emergency (evacuation) ladders: End motor cars were originally provided with them and they were added to middle motors in 1910. They were stored under a longitudinal seating bench. At that time, all seats were open to the floor underneath but they didn’t always get swept properly around where the emergency ladders were stored and, in December 1918, one car, No.229, had the seat front and sides boarded over to keep the dirt out. The board was called a “heel board”. Nowadays we call it a “seat riser”. With the heel board in place, the ladder couldn’t be seen, so a star was painted on the board to indicate its location. This is the first instance I have come across of interior symbols being used on the Underground to indicate equipment locations. These days, of course, there is a liberal sprinkling of symbols or letters in every car.
- Brake valve handle: In deference to the American tradition, this was not originally fixed to the driver’s brake valve. Drivers carried their own brake handle and reverser key until it was decided that brake handles were better left in situ and, in a weekend “once round” changeover on 5-6 February 1910, all drivers were instructed to hand in their brake handles on the Saturday night. On the Sunday morning, trains entering service had them fixed in place in each cab¹.
- Hand brush: For “tidying up trains” – as noted in a Traffic Notice instruction to guards who suddenly found themselves taking on the duties of part-time car cleaners.

¹ When I worked on New York City Subway in the early 1980s, the motormen still carried their own brake handles.

- Draught strips along door edges: The annual winter scourge of electric train drivers everywhere, the draughty cab had already manifested itself during the first winter. It was never going to go away. In this first installation, they used seating moquette as draught strips.

As part of the modification works, conductor's positions at the rear of motor cars were equipped with air gauges to help them to test the brake pipe continuity² before the train left the depot and after uncoupling or coupling. In the following year, 1911, conductor's positions were equipped with a shelf to allow writing of journals and somewhere to put the hand lamp. I should also mention here that motormen were supposed to carry a bag of tools with spare keys, detonators, fuses, hammer, chisel and spanner. Later, canvas straps were added for strapping up shoes and "tarred string", most often used for tying up contactor interlocks which had failed.

As I mentioned earlier, a modification introduced in 1910 was the fitting of continuous footboards. When new, the B Stock had a footboard – a wooden step board – at each side doorway. This "oversailed" the platform edge to prevent passengers stepping into the gap between the platform and the doorway. With the introduction of hand-operated doors it became easy to board the train once it was moving if you jumped onto the footboard, hung on to the handrail and dragged open the doors yourself. This was hazardous to say the least and led to a number of "incidents", including some where passengers fell and slipped into the gap between the train and the platform. To try to reduce the incidents, it was decided to fit continuous footboards along all cars. Even so, there were still occasions when passengers contrived to get trapped between the footboards and the platform and stations were later issued with poles specially designed to allow the footboard to be levered up to release a trapped limb.

BOGIE TROUBLES

The B Stock was equipped with bogies designed in the US. The motor bogies were the same cast steel design offered by Frank Hedley for the A Stock (See Article No.3 in this series). The trailer bogies were not Hedley's but were based on the American "Master Car Builders" (MCB) standard design used on a number of elevated lines in the US, the District's being similar to those on the original Chicago South Side Elevated trailer cars. The B Stock's MCB bogies, which later became known as the K Type on the District, were designed to what is known as the "equaliser bar" system, where the axles are joined on each side by a bar and the bogie frame sits on springs resting on the bar³.

² This ensures the train line (the brake pipe) was properly connected between the driver's position, through all the cars and the hoses between them and the rear guard's position.

³ Details of equaliser bar construction are in "The Underground Electric Train" Article No.15, *Underground News* No.537, September 2006.

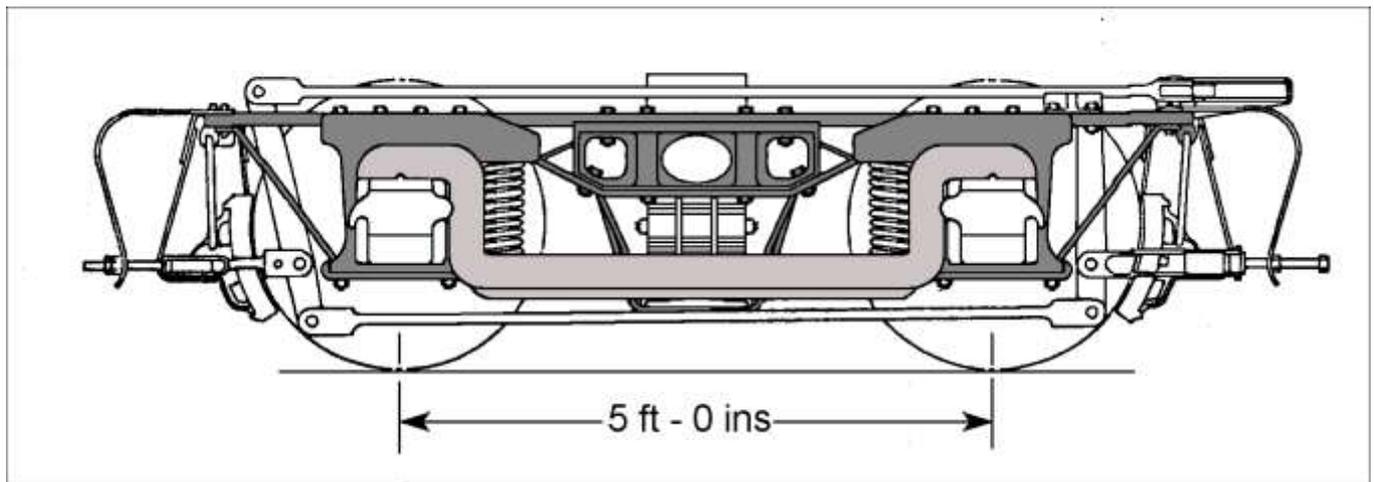


Fig. 2: District Railway type K trailer bogie as used on the 1905 B Stock, based on the MCB design for the Chicago South Side Elevated line. It had 2 ft 6 in wheels. The design was the equaliser bar type but its construction as interpreted in this form was rather light (the two areas of grey) and it did not last for long on the District's rather poor track bed. The drawing is based on one from the series by the late Stuart Harris.

The District's new bogies were not a success. After only a year of operation, several bogie frames had fractured and they had to order 25 new frames. Things then went bad so quickly with a rash of fractures that they decided to invite tenders for new bogie designs in November 1906. Whether any were actually ordered at this time or not is doubtful. No mention is made in the Board minutes and it seems that they survived with the existing stock of frames for the time being. Then, in October 1910, it was agreed to build two trailer trucks based on Frank Hedley's A Stock trailer bogie design but with the wheelbase increased from 5ft to 6ft. No record survives that this was done but the company quickly decided that the situation was becoming desperate and that they had to make their own. They proceeded to build 180 new pressed steel trailer bogie frames during 1911, which they referred to later as Type M. The design had a 7ft wheelbase but used the same 2ft 6in wheels as the original bogies. Half a dozen new motor bogies were also tried – called Type D – which had a 7ft 3in wheelbase, 9 inches longer than the old A Type.

There was also a lot of trouble with axles. They were fracturing at an alarming rate, particularly on the trailer bogies of the motor cars, allegedly because of the weight. In 1907 they had to buy 200 new axles and in 1908 this rose to 700. By 1911, they had bought enough axles to replace the originals on the whole fleet.

NEW SIGNALLING

Most readers are probably familiar with the District's new signalling system as installed in the early 1900s since it is little changed from today's⁴. The line was equipped with track circuits, electro-pneumatically operated semaphore signals⁵ and points, and new miniature lever framed signal cabins at junctions. Intermediate sections between junctions were automatic, the signals being operated by the passage of trains through track circuits. To complete the ensemble, each stop signal had a trainstop which was raised when the stop indication was shown and which

⁴ For more information see "The Underground Electric Train", Article No.29, *Underground News* No.551, November 2007.

⁵ Now, of course we have colour lights. The last District semaphores were replaced at Hanger Lane Junction in 1952.

operated a tripcock on the leading end of the train. This would cause the train to get an emergency brake application and bring it to a stand. The new signalling was another huge technical achievement but it did have some problems initially, mostly technical, but at least one of which affected train operations.

The operational difficulty arose over the rear tripcocks. A tripcock was provided on the right hand side of the leading bogie at each driving position. Since the train had to have a driving position at both ends, 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 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", as we say. Sidings and other places where trains were shunted, uncoupled or routed through bi-directional tracks would all cause this problem. If the train had Middle Motor cars as well, the middle tripcocks were also in line for spurious operation.

The Middle Motor car solution was easy – you isolated the tripcock by closing a cock on the connecting pipe when you coupled the train and cut it back in when you uncoupled. Originally this TripCock Isolating Cock (TCIC) as we called it, was originally tucked away inside the driving cab but it was later mounted on the front headstock as we will see. Isolating middle trips became a ritual on the Underground for many years.

To deal with the train ends, were drivers instructed to isolate the tripcock at the rear. This meant that 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. This was a hostage to fortune and it is evident that some drivers forgot about it and some just didn't bother with it. "We never needed this with the old steam locos, why do we have to bother with it now?". Seeing that the company had invested a lot of money in a very expensive safety system, they weren't about to let this laissez-faire situation continue for long. They began arranging track circuit operations 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 as it cleared. It required the trainstops to be close to the block joints separating the track circuits for it to work properly. The system was referred to as "trainstop release". Work on arranging this was carried out gradually from west to east and seems to have been completed around 1911. It removed the need for rear tripcocks to be cut out, so it became normal for the tripcocks at both ends of the train to be operative.

CONTROL TRAILERS

Returning to October 1906, it was decided to introduce control trailers on the District. A control trailer is a trailer car with driving controls. It's simple to make one. You just add driver's controls to a bog standard trailer car and wire the controls into the control cable and the air pipes already running through the car.

A cab of sorts would be provided, depending on how generous your railway management was. For the District version, it was a full-width cab (except on the A Stock which had a cubicle on the end platform) and a set of current collector shoes was added at the driving end and wired in to the car buslines so that there was a) a direct source of current for the control system and b) to reduce the risk of the train becoming gapped. Many of the District's control trailer cars were double-ended, having cabs and collector shoes at both ends.

Using a control trailer, you didn't need to have a motor car at the front of the train. The use of two motor cars on 2-car trains could be reduced, if not eliminated. Up to this time, a 2-car train required two motor cars simply because the train needed a cab at both ends, a rather extravagant waste of power and resources. Replacing a motor car with a control trailer was a much more economical prospect and this seems to have been the original motivation. You could even have a 3-car CT-T-M train formation, although this was less common, being rather under powered. Control trailers also allowed splitting of trains in service with both halves continuing in service instead of leaving the T-T-EM east end portion in a siding. Indeed, this was done, but only occasionally. The first example I have been able to find was a special train starting from East Ham at 14.02 on Saturday 4 May 1907 in the formation, from west to east, EM-1T-1T-MM+CT-1T-EM. The two first class trailers in the front 4-car portion were reserved for a special party travelling to some sort of "junket" at Osterley. The train worked in passenger service from East Ham to Chiswick Park, with the 4-car portion reserved for the party. At Chiswick Park it was divided. The 4-car "main" portion was then run non-stop to Osterley where the party detrained and the train was stabled in the siding located to the east of the station⁶. The rear 3-car CT-1T-EM unit followed, in normal service, to Hounslow Barracks (now Hounslow West). Later, the 4-car was used to take the party back into town. What became of the 3-car after it arrived at Hounslow isn't recorded but it was probably sent back to Mill Hill Park to stable at the depot. In other examples of special uses, a control trailer was added to the end of a normal service train for one trip to provide an extra car for a special party. Additional cars or trains for special parties were a feature of District Railway operations until the 1930s.

Control Trailers – Numerical Data

A Stock

Car	Type	To Tr. Car	W/drawn
301	Single	–	1925
302	Single	–	1923
303	Single	–	1925
304	Single	–	1925
305	Single	–	1925
306	Single	–	1925
307	Single	–	1925
308	Single	–	1925

B Stock

315	Double	–	1945
327	Double	–	1940
329	Double	–	1922
333	Single	–	1940
337	Double	–	1921
340	Double	–	1938
342	Single	–	1940
345	Single	–	1938
346	Single	–	1930
349	Double	–	1940
353	Double	–	1940
354	Double	–	1938
358	Single	–	1939
360	Double	–	1939
362	Single	–	1935
364	Single	–	1939
370	Single	–	1940
371	Double	–	1921
377	Double	–	1923
380	Double	–	1938
382	Double	–	1940
387	Double	–	1940
389	Single	1928	1940
391	Double	1929	1936
397	Double	1929	1940
407	Single	1930	1939
445	Double	1929	1939
448	Double	1929	1936
450	Double	–	1926
451	Single	1929	1940
459	Double	–	1022
470	Double	1929	1933

⁶ Osterley was then the now disused station east of the present station and a siding was provided to the east, on the other side of the road bridge.

Then there was another use for control trailers, described as “Control Trailer Working”. This involved adding a control trailer to a service train for one or two trips and then taking it off again. Later in the day, the same control trailer would be added to another train for a trip or two. The first recorded occasion was on 1 July 1907 when an eastbound train had a control trailer coupled to it at Hammersmith at 09.04 and then went on to Bow Road. It reversed there and then dropped off the control trailer at Hammersmith on the return trip. There is no mention of why this was done nor of how the control trailer got to Hammersmith in the first place. There was no accompanying empty stock working in the timetable. It had to have been done “ad hoc” with suitable motive power provided, since a control trailer has no motors of its own. Control Trailer working was gradually expanded.

By the start of 1908, three trains were having control trailers attached at the east end for occasional trips. This went on with the number of trains gradually increasing until 1 October 1908 when it was stopped for the new timetable introduced on that date with increased services and reduced running times.



Fig. 3: An example of the idiosyncratic train formation practice on the District is in this photo of a 4-car train of B Stock approaching North Ealing en route to South Harrow, taken sometime in the mid-1920s. It represents a typical District train, complete with odd formation. Trains were made up of what was required by the timetable, modified by what was available. In this case, there are three motor cars and a control trailer in the formation M-M-CT-M. Of course, there is no need for three motor cars in such a train and it is likely that one of the end cars had its traction motors cut out. The Control Trailer is a composite 1st/3rd Class vehicle. It has two sets of shoe gear, so it is a double-ended car. Another point of interest in this photo is that the control trailer has deeper solebars than normal. This was the result of a body-strengthening programme carried out in the mid 1920s on a number of trailer and control trailer bodies to counteract the deterioration of the wooden body shells. More on this in a future article.

A year later, the operation appeared again. This time 10 x 6-car peak-period trains were made up to seven cars with a control trailer at one end. The control trailer was uncoupled at the end of the peak. Some of the moves were complex. In one

example, during 1910, a 6-car train arrived at Ealing Broadway and had a control trailer added at the east end to make it 7-cars. It departed for Barking⁷ at 09.09. When it got to Barking, 3 cars were uncoupled to leave a 4-car set in service. For the evening peak, the 3-car was added to a different 4-car train at Barking, which ended up at Ealing at 18.24. There, it dropped off the control trailer car and became a 6-car. The use of control trailers in this way continued on various trains, mostly during off-peak periods, latterly reaching 15 cars a day. Then, in 1915, it suddenly stopped, never to appear again.

I have wondered at length why this operation was done in this way. The only reasonable explanation seems to be an attempt to match train lengths exactly to demand. The standard main line formation from 1 October 1908 was 4 + 2 cars, (replacing the previous 3+3 formation) with the 2-car being uncoupled if required. It seems that the 4-car off-peak formation was not always considered sufficient, so a control trailer was added. Train loadings were regularly monitored with frequent instructions to station supervisors to report conditions, so detailed information was available, although how accurate it was might be debatable. Have you ever tried counting the passengers on a passing train? Still, it must have been considered valid enough for the operation to have gone on for so long. I suspect that shortages of both men and cars, brought on by the First World War of 1914-18, caused its withdrawal. After that, control trailers continued to be used on local services and as substitutes for trailers when necessary.

There seems to have been an effort to ensure that the stock was balanced after each day of these workings. Almost every control trailer ended up where it started from or was replaced by another. Where this didn't happen, there would have been empty stock moves to correct the imbalance. Every timetable had a number of empty stock moves, particularly between Ealing Broadway and Mill Hill Park depot, where uncoupled units were moved to and from the depot in blocks, sometimes making trains as long as 12 cars. But strangely, specific moves for control trailers were not included. They would have required a motor car (or cars) to provide power so perhaps they were attached to a passing late night train on its last run.

THE CONVERSION PROGRAMME

Looking at the control trailer conversion work programme, the first ten trailers was started late in 1906 and ten more were converted during 1907. Fourteen were recorded as done in 1909, bringing the total to 34. Eventually a total of 40 cars were done, including 21 double-enders (see box above with list) but the dates that the additional six were done is not recorded. My suspicion is that they were done in 1910. They would have needed them by then to cover all the "Control Trailer Working".

The board minutes record that the cost of doing each car was £100. No record appears of the purchase of master controllers, brake valves or the necessary bits and pieces. This may not be as strange as it seems. If I had been running the railway then, I would have pointed out that our fleet of 72 double-ended middle motor cars was far in excess of what was really needed, particularly since we were uncoupling most of the trains at the east end, so their west end cabs were rarely used as originally intended. With this in mind, we could afford to take the cab

⁷ Electrification was extended the one station beyond East Ham to Barking on 1 April 1908. The delay was caused by the need to alter the layout at Barking and to provide three electrified sidings.

controls, tripcocks, marker lights and other bits and pieces off one end of an MM car and use them on a trailer to convert it to a control trailer. I doubt that, for offering this idea, I would have been condemned to be burnt at the stake as a dangerous radical. They would have to have done 61 middle motors cars like that to get the number of control trailer cabs they did. And why not? They only needed a maximum of about 10 double-ended motor cars for the local services, including spares. However, there is absolutely no evidence that it was done this way. And you could get into an interesting debate over which were more useful, double-ended motor cars or double-ended control trailers. The District had both.