DISTRICT ELECTRIC TRAINS

14 – NEW FOR OLD

by Piers Connor

BODY SHOCK

On 21 October 1921 a conference was convened by the Chairman of the Underground group, Sir Albert Stanley, to consider various issues relating to the operation of the group's lines. Such conferences took place from time to time to discuss the railways in the group, make decisions on problems and prepare for future changes and expansions. At this one, many of the issues discussed related to rolling stock and the fact that there was insufficient available to operate the levels of service being called for by the traffic offering. There were persistent complaints of overcrowding and of passengers not being able to board trains due to the press of people already inside. This phenomenon had begun during the war. The war had marked a step change in the Underground's business, with big increases in traffic but, after the war, although traffic fell off a little, it showed no signs of returning to the gentler, almost Victorian travel patterns of the pre-war era. Whilst overcrowding was accepted during the war as a penalty for the circumstances the nation found itself in at the time, after the war people were no longer prepared to put up with it. Questions were asked in Parliament and the pressure was now on the Underground group to do something. Now, the Underground found that it was truly in the rapid transit business and they needed the equipment to handle it. Unfortunately, much of the stock wasn't up to it.

At the top of Sir Albert's agenda was the increasingly desperate situation on the District. Over the previous two years, huge amounts of money had been sunk into repairing the wooden B Stock trailer cars, as described in Article 12 of this series[1]. By the time of the conference, October 1921, about 80 cars had been through the rebuilding programme but the time being taken to do it and the cost of the work, was causing serious concern. There were still another 150 or so trailers to do and 35 of these were scattered around the yards, out of service or "stopped"[2] because of body condition. Some were never to work again.

Discussions during the conference quickly showed that there were those who believed that continuing the programme was just throwing good money after bad. Coupled with this was the view that it was time to be increasing the power of trains, using the scheme that had been developed to reform the stock into trains based on an 8-car set with 5 motor cars and 3 trailers instead of the existing ratio of 50/50. On top of all this, the original, cast steel, A Type bogies fitted to the B Stock were unreliable structurally and were costing too much to keep in service and William Agnew, the Mechanical Engineer, wanted to continue the bogie replacement programme which had been started back in 1910. This had petered out during the war and Agnew wanted to get it going again. His chief draughtsman, H.T. Dowling, who had come from Leeds Forge, had some new bogie designs which they planned to use to replace the original bogies.

OPTIONS

Prior to the conference, a number of upgrade schemes were prepared and doubtless tossed around the offices at Ealing Common in the hope that a decision could be reached on the recommendation to be offered. One result of this optioneering was the confirmation that the rebuilding work on the trailers was not going to give value for money in the long term, largely because of the poor body design and bad quality control when they were originally built. On top of that, some of the earlier repair work had not weathered too well, and this led to the later refurbishments having their original side panels replaced by larger steel sheets to eliminate many of the vertical joints, in addition to the strengthening of the underframes.

Replacing the trailers was seen as a better option but the way they proposed to do it seems, at first sight, a bit odd.

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[1] "War and Tanks", *Underground News* No.578, February 2010.

[2] A common term used on railways for cars not permitted to run in service due to defects.

The simplest and cheapest option would have been to order new trailers. These would have simply replaced the old cars in the existing trains. Instead, they proposed to buy new motor car bodies and use them to replace the existing B Stock motor car bodies and these would then be converted to trailers so that the remaining unrefurbished trailers could be scrapped. Using the motor car bodies as trailers was considered a reasonable option because they were more solidly built and would last longer than the original trailers. They had steel-strengthened underframes which had prevented the body shell from sagging as it had done on the trailers. It was proposed that the new bodies would have new bogies but they would be fitted with the traction equipment and motors removed from the old motor cars as they underwent conversion to trailers. New trailer bogies were to be fitted under these cars as part of their conversion.

To me, these proposals seem a bit strange. Why go to the expense of transferring old traction equipment from one set of cars to another? Why not just buy new trailers and save all that work? Trailer car bodies would be cheaper too. I puzzled over this for a while and the only reason I could come up with was the need for a new door layout. I think that they wanted more and wider double doors and they wanted them at the ends of trains to improve passenger boarding and alighting on 8-car trains stopping at short platforms. The motor cars at the ends of trains each carried a guard and the front one, of course, also had the driver. On the pre-war stock, this meant that the front and rear cars only had one double doorway in the centre of the car available for passengers. This restricted access and increased dwell times, particularly on 8-car trains. The end cars were not always stopped fully within the platform so passengers had to be ushered through to the inner end doorway or the next car. This wasted time. More doors on the end cars would help to alleviate this problem.

The F Stock had shown the value of more doors, although their width wasn't quite right. The 3ft 6in doorways were too narrow to let two persons board at the same time. They realised that a wider doorway provided twice was better than three narrower doorways. The wider doorway allowed two people to board or alight at the same time. So, to get the wider and extra doors, they needed a new car design and, to get them at train ends, they needed them on motor cars; thus the plan for refurbishing the fleet included getting new motor cars with a better door arrangement. As we shall see, the Achilles heel of the plan was to be in the use of the salvaged electrical equipment on the new cars.

The plans were accepted by the conference roughly as I've described but the idea of reforming trains with 5 motor cars was rejected partly, I think, on the grounds of the expense and because of the lack of enough power at the substations. The plan, as finally agreed at the conference, was as follows:

- 20 wooden trailer car bodies, which were past hope, were to be scrapped immediately.
- 20 wooden car bodies were to be scrapped each year between 1923 and 1929 (140 cars).
- 20 new steel bodies to be purchased each year over the same period.
- The remaining wooden car bodies were to be refurbished at the rate of 22 per year until 1929 (176 cars) – most of these were to come from motor cars converted to trailers.
- Replacement of the old type bogies to be "expedited" for completion in 1929.

At the same time, Agnew was asked to consider doing the programme in a shorter time if this would offer an "appreciable saving" in maintenance costs. In April 1922, he offered to finish the work by 1928 and got the funding to do it but, although he started on that basis, a number of things changed over the next few years and the programme wasn't finally completed until 1930.

For the time being, the existing trailer refurbishment work continued. As I've described before, cars were substantially rebuilt, with new steel solebars added below the existing wooden ones and with large replacement steel panels provided along the lower bodysides to add strength and reduce water ingress. The programme carried on well into 1923, when they switched to converting motor cars to trailers. The motor cars were first stripped of their traction equipment and motors and then the body panelling was overhauled and given new side panels like the refurbished trailers. When they made the switch to conversion work, they had refurbished probably around 130 trailers. We don't know exactly how many because they didn't distinguish

them by renumbering at the time of their refurbishment. There is further confusion because the scrapping programme as carried out actually included some of the refurbished cars.

The new programme was eventually completed roughly according to the plan agreed at the conference but, as evident from the table below, rather less consistently, with quite severe peaks and troughs in the execution. Because of the delay in getting new motor car bodies, they had to refurbish more trailers than expected at the planning stage so they scrapped at a slower rate. No doubt, the float was useful in keeping things going. Later, the programme was hijacked by substantial changes made in the mid-1920s, when it was agreed to upgrade the traction equipment and coupling arrangements of much of the existing fleet. This also led to more trailers being retained than originally planned. It is useful now to see how the programme actually worked out compared with the original plan. The table below shows the known data for each of the types of cars involved in the motor to trailer conversion project.

CONVERSION AND WITHDRAWAL PROGRAMME FOR DISTRICT RAILWAY STANDARD WOODEN (A & B) STOCK 1911 – 1930

Year	Trailers withdrawn	Motors to trailers	Original Motors left	Motors withdrawn
By 1916	1		197[1]	1
By 1922	20			
1923	2	6	189[2]	2
1924	5	15	174	
1925	15	21	147[3]	6
1926	14		147	
1927	3		147	
1928	2	8	139	
1929	45	93	46	
1930	15[5]	9	37	
Totals	**122**	**152[4]**	**37**	**9**

Notes:

1. Original wooden stock build was 236 trailers and 198 motor cars. 1 trailer scrapped in 1906 and 1 motor car scrapped after Ealing Broadway accident of 1909.
2. 2 x 1905 B Stock motor cars scrapped in 1923.
3. 6 x 1903 A Stock motor cars scrapped in 1925.
4. 151 new motor cars were purchased to replace them in 2 batches – 50 x 1923 (G) Stock and 101 x 1927 (K) Stock.
5. Includes 4 trailers which became stores vehicles in June 1930.

It took some time from getting the formal authority to do the work (obtained on 3 November 1921) to prepare the drawings for the conversion work and to complete the specification for the new motor car bodies. While this was going on, a couple of significant modifications appeared on motor cars. One of these was the removal of the live 600-volt main switches from driver's cabs to the underframe of the wooden cars. This might be seen to us as a safety move, removing high voltage equipment from the cab but it was more likely to have been due to the weakening of the wiring insulation between the cab and the underframe equipment. It was not done on all cars, presumably because they knew many of them were up for conversion to trailers.

A new device fitted to all pre-war cars, steel and wooden, was the control governor. Work on this had started some years earlier but it was completed in 1921. It was a pneumatic switch designed

to prevent the train from being driven unless there was enough air in the train line to allow the brakes to be applied. It was connected to the train line pipe leading to the tripcock so that it ensured that the tripcock was cut in as well. It was introduced as a result of a number of incidents[3] where trains had been moved with brakes not properly charged up or with tripcocks not cut in. This latter problem was a particular issue with all the uncoupling which went on. Tripcocks had to be isolated at middle coupling positions to remove the risk of spurious operation and shunters sometimes forgot to cut them back in when trains were uncoupled. For many years also, the rear tripcock had to be isolated east of Bow Road because the signalling, supplied by the LT&SR (and its successor, the Midland Railway) didn't provide "trainstop release[4]". The control governors were originally rather large devices and were fitted under the cars, unlike those provided for trains built from the late 1930s, where they were small pressure switches fitted under a passenger seat near the driver's cab. The F Stock was the first District stock to have control governors from new. A cut out switch was provided in the cab.

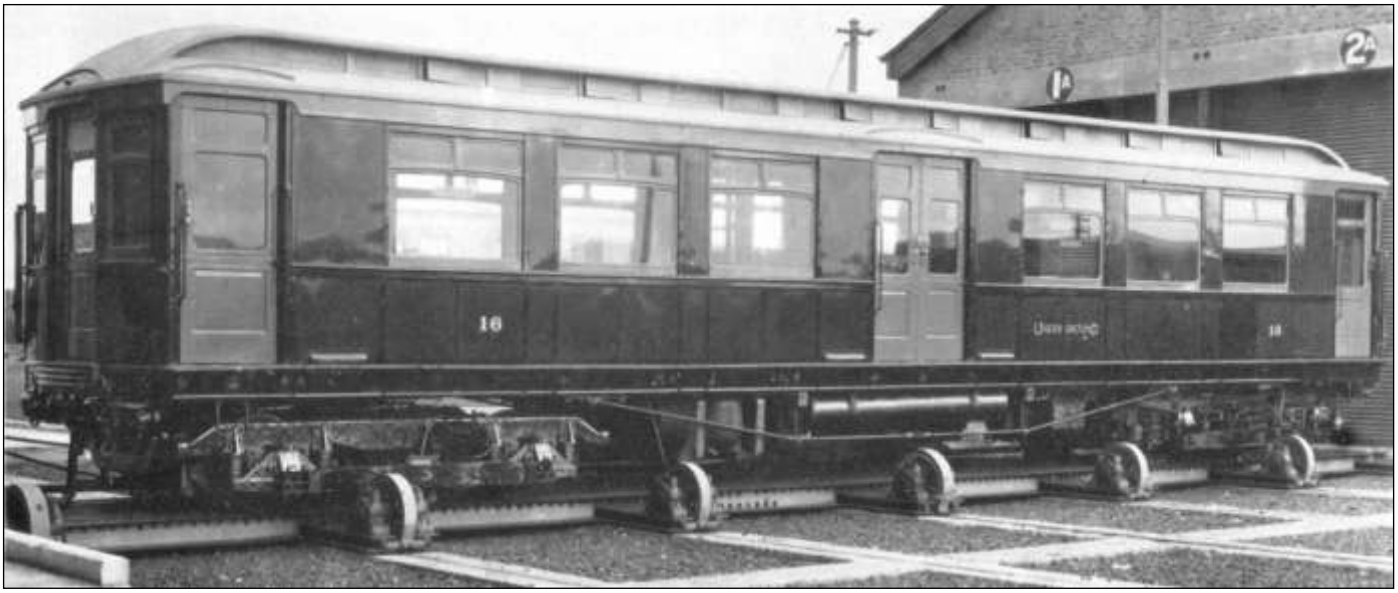

Fig. 1: 1905-built B Stock motor car on the traverser at Acton Works in about 1923 with the trial bogies intended as the new standard for the District. Nearest the camera is the trailing bogie, a one-off design which was not adopted. At the driving end is the motor bogie, known as Type A2, which was to become the last District-designed bogie and which was ordered for all new stock up to 1935. The car body is also interesting as it displays the new colour scheme with grey doors and letterboard and black corner posts and waist rails introduced on the District at about this time. It also shows two different types of lettering – the older style car number with the new "Johnston" style UndergrounD label. It also has the same ventilation slots at the base of the door pockets as the trailer cars which were being refurbished at this time.

Another modification which appeared about this time was the cutting of ventilation slots at the base of side sliding door pockets (Fig.1 above). This was designed to provide drainage and ventilation in an area where water collected, causing rusting and rotting. It was first done on wooden cars during refurbishment[5] and was later extended to the pre-war steel (C, D & E Stocks) cars but its application was inconsistent. Some cars weren't done at all, some only had one doorway done and some seem to have had it done and then removed. Some of the steel cars survived to be scrapped without them. Later, the same modification was applied to the 1924 G Stock motor cars.

THE BIG SWAP

In May 1923 the work on converting the wooden B Stock motor cars to trailers was started. This was more than a year before they had any new bodies to replace them but they had the authority

[3] The accident at Ealing Broadway on 18 November 1909, where the driver and conductor were killed when their train ran into the buffer stops due to lack of air pressure available to stop the train, was the worst incident of this type. It took over ten years from this incident to get the control governor fitted on the District.

[4] For an explanation of how this works, see Article No.6 in this series, *Underground News* No.572, August 2009.

[5] See Article No.12 in this series, *Underground News* No.578, February 2010.

for the work and they obviously wanted to get on with it, particularly because they had to start removing the traction equipment, compressor, 600-volt links and fuses, driver's controls and various bits and pieces from at least a few of the existing motor cars before the new cars arrived so they could start the transfer of equipment. The withdrawal of 1905 Stock trains from service because of this work was covered largely by the introduction of the 1920 Stock.

The former motor car bodies were repainted and, to replace composite trailers which had been scrapped, many were divided internally and re-upholstered to provide 1st and 3rd class seating areas in the usual District arrangement[6]. They probably used the interior doors and screens taken from withdrawn trailers. We don't know which ones were done at this stage since they didn't differentiate trailer types until the 1933 renumbering. However, as they were converted, cars were renumbered into the 14xx and 16xx series according to their ownership. A total of 42 motor cars were converted to trailers between 1923 and 1925, with the 32 of them that were owned by the District given new numbers between 1400 and 1431 while the other 10, owned by the LT&SR, were renumbered between 1600 and 1609. At this point, as we will see, they ran into a serious problem and work stopped in September 1925 for 2½ years and didn't restart until March 1928.

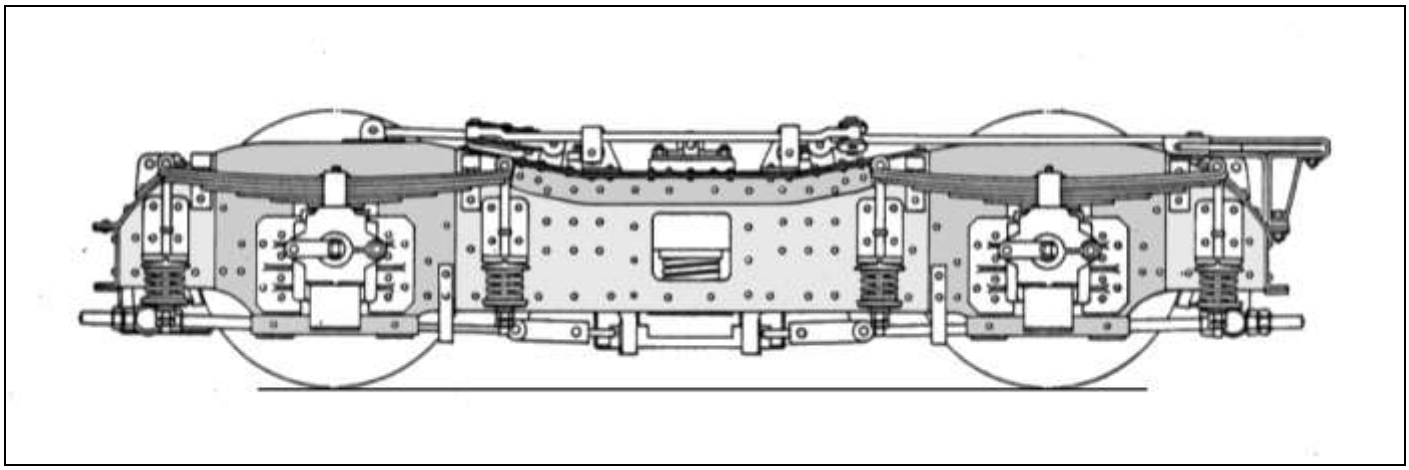

Fig. 2: The new District motor bogie known as the A2 Type with a wheelbase of 7ft 10ins and 36 inch motor wheels. The bogie was designed with a conventional steel plate frame but strengthened as shown in the drawing by the darker areas. This bogie became last District design and was ordered for all new motor cars built up to 1936. The bogie, like most of this era, was "handed" to allow it to be connected to the brake rigging at the inside end – the right hand end on this drawing.

NEW BOGIES

An important part of the upgrade project was to get the bogie replacement programme sorted out. There were weaknesses in the L Type trailer bogies which had been provided in 1911-12 as a replacement for the original cast steel bogies[7] and the Ealing Common drawing office had done some work on new versions of both motor and trailer bogies. As part of the search for a suitable design, a "sample" bogie of each type was produced in 1922 and these were fitted to B Stock motor car No 16, (Fig.1, opposite).

The new motor bogie (drawing Fig.2) was massive. It weighed 12.37 tons, half a ton heavier than the F Stock's E Type motor bogie. It had steel plate side frames strengthened with angle plates across the bolster mounting area and additional plates around the axlebox openings where the horn block guides were riveted to the side frames. Massive, channel section steel headstocks were fitted at each end. The suspension design was traditional, with leaf spring primary and steel coil secondary suspension. It had the now standard District motor bogie wheelbase of 7ft 10ins. Presumably because it was originally intended as a replacement for all remaining A Type bogies, the new bogie was referred to as the A2 Type. In the end, it wasn't used to replace the original bogies under all the existing motor cars but it was to become the new standard for future cars. It first appeared under the G Stock motor cars ordered from the Gloucester Railway Carriage & Wagon Co. in February 1924.

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[6] See Article No.4 in this series, *Underground News* No.570, June 2009.
[7] See Article No.9, *Underground News* No.575, November 2009.

A total of 60 bogies were ordered, 30 from the Birmingham Railway Carriage & Wagon Co. and 30 from Gloucester. This provided 50 for the new Gloucester cars and 10 as replacements for existing bogies.

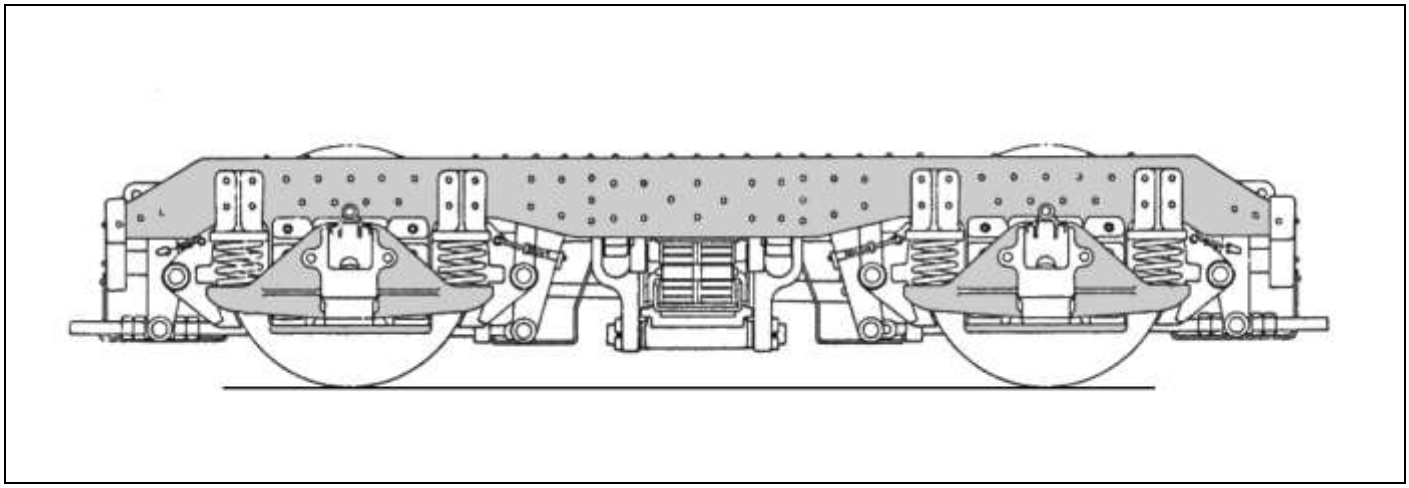

Fig. 3: The prototype trailer bogie designed in 1922 as a replacement for the old cast steel bogies. The bogie had a conventional steel plate frame but steel coil primary suspension and leaf bolster springs. The primary suspension looks a bit like the BR B4 design of 1963 but it wasn't adopted by the District in 1922, probably because of the light frame. Only one example of it was built and it was put under B Stock motor car No.16, together with the first A2 motor bogie.

The prototype trailer bogie fitted to car No.16 was an interesting experiment. It had a conventional steel plate frame and swing bolster but with American-style leaf-spring secondary suspension. The steel coil primary suspension was a new design, which wouldn't look out of place today. It was similar in arrangement to that adopted on British Rail's B4 bogie some forty years later in 1963, a design which later became common under Mk2 and Mk3 coaches and multiple units. However, the District version seems to have been ahead of its time. Although the idea was sound, the frame looks very light (Fig 3 above), quite unsuitable for the terrible track on most of the District and I suspect this was the reason why it wasn't adopted.

Very soon afterwards, a new, more traditional design was produced and this became known as the K2 bogie (Fig.4 below). It was specifically designed to replace the original K Type bogie under the wooden stock and it was later ordered for new stock as well. It had the usual plate frame, leaf spring primary and coil spring bolster suspension system. The frame was much more substantial than the prototype design. The wheelbase was set at the District standard of 7ft 3ins for new trailer bogies. Because the bogie was designed both as a replacement for old bogies and for use under new cars, it had to be designed to allow either the 2ft 6in wheels of the old stock or the 3ft 0in wheels of new stock to be fitted. From the introduction of the 1920 F Stock, all new District stock had 3ft 0in wheels on both the motor and trailer bogies.

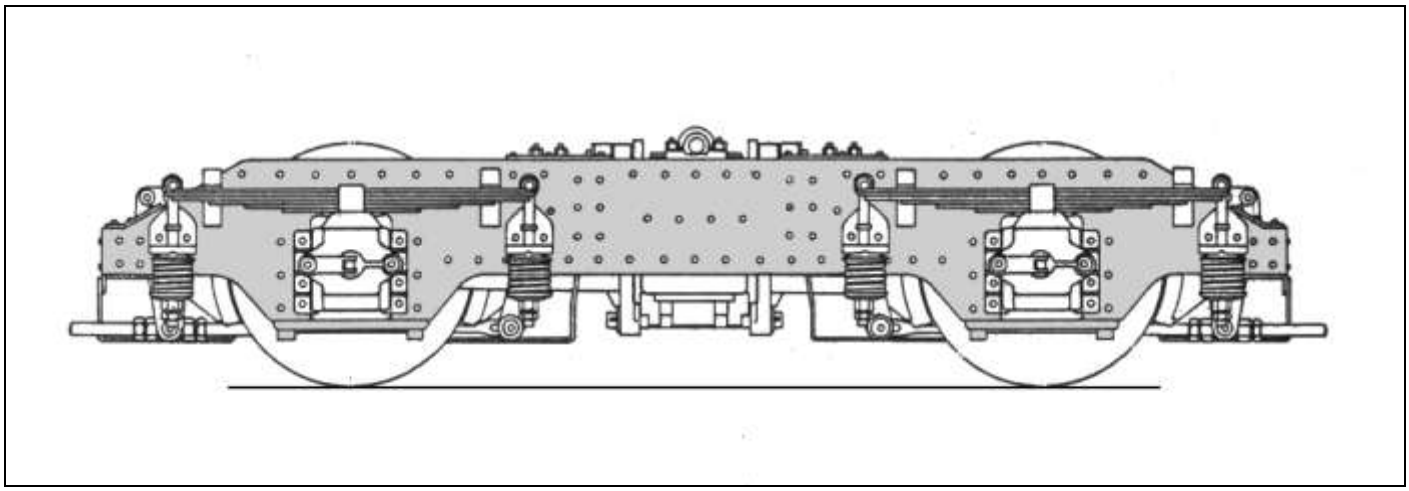

Fig. 4: District Railway K2 Type bogie. This became the standard bogie for the District up to 1935 and was later successful enough to be used to replace bogies on some Metropolitan Railway vehicles. The design was standard British, with steel plate side frames and leaf spring primary suspension. It was designed to be used with 2ft 6in or 3ft 0in wheels.

The first order for 50 of the new trailer bogies were placed with the Birmingham Railway Carriage & Wagon Company in July 1922. More were ordered from Leeds Forge. They were asked to provide two batches, one in October 1923 of 80 bogies and another, unknown number in December 1924. One might wonder whether they got these orders because Dowling, the District's Chief Draughtsman, was formerly employed by them and that he used his influence to get a better price.

THE 1924 STOCK

While the refurbishment work progressed, there was some discussion about how exactly how to design the new cars with more and wider doors. Eventually a mock-up was built, apparently at Golders Green[8] late in 1922, to test the ideas. Readers may remember that, as far back as 1919 when the F Stock design was being prepared, proposals for both "2-door" and "3-door" designs were put forward and in May of that year, the 3-door option was chosen. Now, some four years later, in January 1923, the 2-door option re-appeared but with wider doorways than the F Stock, at 4ft 8½ins instead of 3ft 6ins. It was also decided to have separate cabs at each end of the car, like the F Stock.

The new bodies were ordered from Gloucester in July 1923 and they began to arrive a year later. The stock was referred to by the District as the 1924 Stock and was later classified as "G Stock", although only the engineering fraternity seems to have used this and only on an irregular basis. As early as the mid-1920s, people began referring to it as 1923 Stock. I think this was the result of the practice by the board to refer to cars by the date they had placed the order rather than the date they entered service. This pattern has remained to this day.

A total of 50 bodies and 30 motor bogies were ordered from Gloucester. The motor bogies were the A2 Type. Of course, they needed 50 of them for the 50 cars so the other 20 were sent to Gloucester out of the batch being built in Birmingham that I mentioned above. I suspect the trailer bogies also came from Birmingham too. The original order for 50 neatly fits in with the requirement for the new cars. There seems to have been a cash crisis around this time as post-war reconstruction money from the government was falling away. As a result, it seems probable that it was decided to save money by not ordering all the new bogies from Gloucester but to siphon some off from the Birmingham and Leeds Forge orders. They were probably cheaper than Gloucester.

WORTH NOTING – 4

Another District related gem found in the archives.

THROUGH TRIPS TO UXBRIDGE

Before the First World War through trips from the City to Uxbridge were rare enough on the District and were mostly confined to summer Sundays and Bank Holidays but, from the new timetable of 1 June 1912, a through train to Uxbridge was introduced on Thursday afternoons only.

This unusual working is worth recording and our esteemed editor kindly noted it for me in a session at the archives. In WTT No.48 (1 June 1912), Set 5 started 04.46 at Acton Town and worked the west end shuttles on the Harrow line until stabling at 09.59 Ealing Common depot. The "to form" says 15.52 but 12.43 on Thursdays. On Thursdays it worked 12.43 Ealing Common depot to Ealing Broadway where it coupled to Set 49, making it 5 cars and formed 12.57 Ealing Broadway to Bow Road, then the 13.49 Bow Road to Richmond but uncouples one car at 14.25 Hammersmith westbound. The one car forms train 5 and works to Uxbridge. At Uxbridge, passengers could connect with "Brake Trips" to Stoke Poges and Burnham Beeches. The train then returns 15.11 Uxbridge to Ealing Common then to depot so it could form its usual 15.52 (MF) working.

Our editor's trawl through the timetables of the period suggests that this operation only lasted for two summers in 1912 and 1913.

There were some odd features about this batch of cars, which I will refer to as the G Stock for now. For one thing, they were a step back in terms of looks. There has been much speculation about this over the years, particularly as the previous batch of cars, the F Stock, showed a radical design approach, with an arched roof, wide body, open interior, lots of standing room and three sets of double doors to get people on and off the train quickly.

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[8] See an article "Underground Trains at Gloucester" by Ben Pope, Railway Archive, Issue 6, March 2004.

But, as we have seen, the doors were not quite right and the radical design of the interior was too much, or perhaps, too little for the public, who hated it and who had to be mollified, as far as they could be, with a new, softer interior decor and much reduced ventilation. This was, no doubt, the reason why the G Stock was much more conservative, more traditional and, to be blunt, ugly. The car roof reverted to a clerestory design, which the District hadn't had on new cars for over ten years and the car ends were almost flat, even to the extent of leaving out a roof dome. The roof just stopped. The gently curving ends of the 1905-11 cars were much more stylish.

Then there was the door arrangement. As we saw earlier, the G Stock had two sets of double doors on each side, instead of the F Stock's three. Like the F Stock, the ends of the cars were reserved for the crew, with a cab for the driver at one end and one for the guard at the other end. Each cab had its own side doors, which had to be locked when not occupied by the crew. The new door arrangement meant that there had to be a new arrangement of seating. They managed to squeeze in 44 seats per car, the same number as an F Stock control trailer with a cab at one end but the standing space was reduced.

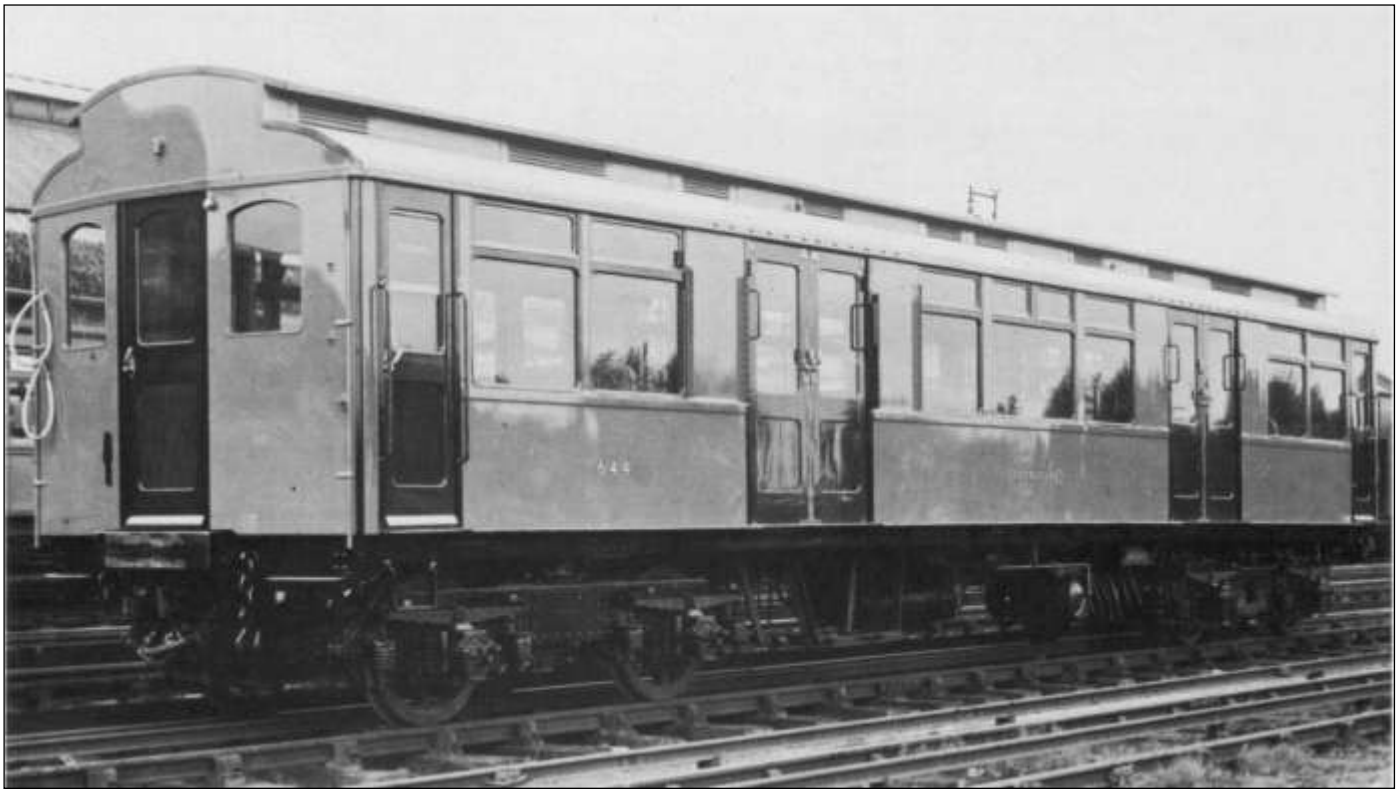

Fig. 5: 1924 (G) Stock motor car as delivered from Gloucester in July 1924. It has its bogies of course but no electrical equipment. This view is of the trailing end, the cab is at the other end. Interestingly, the motor bogie, at the far end, has shoebeam brackets already fitted but the trailer bogie at this end doesn't. The trailer bogies for this stock were manufactured by Birmingham or Leeds Forge as part of their large orders and sent to Gloucester for fitting under the new cars. The car is showing the red and maroon door livery adopted in 1924. This car was originally numbered 644 and later renumbered as 4248 and it survived to be displayed in the LT Museum. It's still there. This photo shows it in the yard at Ealing Common Depot, with the cab facing east. It later became registered as west facing and has remained that way to this day.

As the new cars had to work with the older stocks (except the F Stock of course), they had to have the same coupling and equipment arrangements. For the traction equipment, this was easy. It was simply transferred from the old cars and fitted to the new ones on a sub-frame hung from the underframe. Cabs were equipped with the old, button-type master controllers, the original brake valves and the rest of the salvaged cab equipment. The jumper arrangements were the same as the old stock too, with control and busline jumpers duplicated on either side so cars could be coupled either way round. They were also provided with lighting control sockets in the new positions on either side of the headstock like the F Stock but, as none of the older cars had them, they had to have a second jumper socket fitted over the end doorway to match the older cars. Hoses were under the coupler, as on older cars.

The new design of inter-car barriers appeared on this stock. These were the same leather covered chains as provided on the F Stock but they wouldn't work with the older cars, which still had the original collapsible folding barriers, so they had to fit the new car body ends with a bracket to allow the old-type barrier to be hooked up. I have not found a photo of a trailer that shows that they were fitted with the corresponding hooks for the chains. Perhaps they realised this was too much of a bother. The chains were considered a nuisance by the staff and were often left disconnected. The G Stock was the last District stock to get inter-car safety chains and they were abandoned completely after 1928.

The new stock was originally supposed to be equipped with air compressors taken off the converted motor cars. These were mostly of the B T-H CP30 type that had been fitted to a number of the wooden cars during a programme to replace the bulk of the original National compressors. Records show that 20 of the new cars had Westinghouse CM38 compressors. I suspect that these were bought at the time of the new stock order to replace National compressors taken off those B Stock motor cars that had not been replaced by CP30s.

There were 50 new motor cars to equip, so 50 sets of traction equipment had to be released from wooden motor cars. Eight sets came from six 1903-built A Stock motor cars and two B Stock cars which were scrapped. The A Stock cars were scrapped because they were non-standard and I suspect the two B Stock vehicles were written off due to collision damage. The other 42 sets were removed from 42 motor cars which were then converted to trailers. It was an exact calculation, the whole exercise obviously being regarded as a single project. It was completed in December 1925, when the last of the new cars was recorded as available for service.

To be continued ……..