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LT AND PHOTOGRAPHY

A recent change in London Transport policy with reference to taking photographs on the premises of the Board is of considerable interest to railway enthusiasts generally, and to members of the Society in particular.

An amendment to the Working Timetables Appendix, Section 10, which was published in April this year, allows Station Masters to use their own discretion in giving permission for photos to be taken with hand cameras. It must be noted that this discretion does not extend to the use of either tripods or flash equipment, and it may not be used in circumstances where either inconvenience or obstruction will be caused to staff or passengers.

This relaxation of the rules is likely to be of great value to all who are interested in railway photography, and it is to be hoped that those who seek to take advantage of the widened scope now available will not abuse the facilities offered. It must always be remembered that LT do not run railways for the benefit of enthusiasts - the trains and track are there to serve passengers, who may have no interest whatever in the railway except as a means of getting from one place to another. These people must not be "inconvenienced" nor "obstructed" by the mere enthusiast.

THE 'WATFORD EXTENSION' STOCK 'Technicus'

Unusual in most of its features, and unique in some, was this batch of 72 cars, designed in 1915, and delivered in 1920-21, for the Watford services of the Bakerloo Line, which started in 1917 with borrowed Central and Piccadilly stock. The broad overall story is in 'Rails through the Clay': details of the Watford line are in 'London's North Western Electric'.

Originally intended to give ten 6-car trains, the number of cars was later increased to give twelve such trains: eight were London and North Western Railway-owned, four London Electric Railway, though they were not kept together in trains of specific ownership. Except to give relief by operating 'local' trains, this increase to twelve is thought to be pointless. With a one-hour run and quarter-hour service interval (or four-an-hour frequency, for those who prefer this phrasing), a maximum of nine trains plus one spare in the depot would suffice - a total of ten! Why, therefore, two whole trains were needed to cover maintenance requirements is at present a mystery.

The stock was the first on the tubes in which centre motor coaches were allowed, hence the first to have control jumpers at the outer ends of the motors. Six-car trains of MPTM:CM were operated. The four-car portion was always the south end. Two-car portions, not used in public service, were detached at Watford Junction. Two or three were left in the east while long extension to platform 5, and the others, coupled in threes, taken to Croxley Shed for their midday break. The control trailers were thus unique in having no provision for destination blinds. The motors had top-centre destination blinds - the first on the tubes.

The stock was to almost the maximum tube profile, with a nominally arch roof (having a suspicion of a clerestory) and very bulgy sides giving a maximum width at waist level. The floor, however, was "4½" higher than usual" - all the writer can find at

present. Since 'usual' was certainly no more than 2ft, and was 1ft 10 $\frac{1}{2}$ in on the Bakerloo, a 2ft 3in floor is at present deduced - very little higher than on the later tube stock of today. Compromise-height platforms had not then been invented!

With six long windows each side, and end and centre swing doors, the trains (in the former feature) set standards not again attained until the 'Craven' prototype stock appeared. The stock was the first type to be all-enclosed (the Central London Railway 'Ealing' motor cars had no matching trailers) and the last type (up to 1938) in which the rear half of a motor was an exact match to half a trailer.

It was the first tube stock to have two-panel louvres of the more modern type flanking the equipment compartment. It was unique in having a really small master controller (with otherwise-standard B.T.H. automatic e.m. control equipment): the master controller handle was so small that a thumb-grip was provided, around which the driver could twist his thumb to keep the handle comfortably in the full parallel position.

The seating and interior appointments followed LNWR practice to some extent. With only three longitudinal seats over the wheel boxes at each end, the wheel boxes were also under the adjacent transverse seats, of which there were two bays each side of the centre vestibule. Grab handles on the seat backs were preferred to straps, for standees, and luggage racks - probably, really, merely hat racks, were at eave level. With 2 x 240 h.p. motors, 42in driving wheels, and 7ft motor and 6ft trailer wheelbase; and with three motor cars in a six-car train, the trains were the most powerful, fastest (45 m.p.h. is mentioned) and possibly best-riding of their day (on the tubes). (Motor bogies of those days were normally 6ft wheelbase with 3ft wheels: trailer bogies had 5ft wheelbase).

By 1930, airworked doors on the tubes were universal (unless the fussies are going to mention the Great Northern and City and the Waterloo and City), and to work this hand-door stock through the Bakerloo rush hour caused significant delay. Rebuilding was

not possible - an unfortunate consequence of the all-steel construction - so the stock was replaced in 1930-31 by the 'Watford Replacement' tube stock - and the LMS put a bit more ballast in at its stations to give compromise platform height!

The LMS kept a few of the cars for its Watford local services - these cars were withdrawn in 1939. Unusual souvenirs were the GE 212 motors - a very advanced design when first introduced in 1914 (on the Bakerloo stock of that date, if not even earlier on the District) - which motors were used on the refurbished Circle stock (about 1935) which lasted until about 1956: and, even more unusual were train line pressure gauges, lettered 'LNW & LER', which appeared on a wide variety of pre-1934 tube motor cars, and some of which may possibly have lasted to the end of this type!

The writer encourages that others will "dot i's and cross t's in the above essay. It is probable that those with access to "inside information" can more tactfully use it for correction than for writing their own essays.

LETTERS TO THE EDITOR

Dear Mr. David,

I have a few odiments of information to offer on two of the queries posed in the May issue of "Underground". I have not written earlier as I hoped that other readers would have fuller information.

Red Brake-ends to Met Coaches.

I first began taking a detailed interest in the Met Line in 1948 when I became a regular traveller between Aylesbury and Harrow, and I can state definitely that until 1953 brake ends were always in a shade of brown. In October 1953 I had a note published in another Society's journal recording my observation of the first two vehicles with red-painted brake-ends (exact month unrecorded). These were 442, whose sides were still in imitation graining (other end plain brown), and 444, whose sides were in the

fairly new standard tan shade, ungrained, like the non-brake end.

The wide variation in dates of red end-painting so far suggested, and the scrappiness of my own notes, shows how essential it is for enthusiasts to get details notes onto paper whenever possible, however trivial they may seem.

Signalling on the Brill Branch

Baker, in his "Metropolitan Railway", states that "the branch was never equipped with any form of signalling", although a photograph of Brill terminus in Casserley's "Service Suspended" shows what appears to be a Great Central Railway disc-signal.

Verney Line Signals

At the end of the war, most signals north of MP 28 $\frac{1}{2}$ were of G.C.R. origin, and those at Verney Junction were no exception, save for the odd surviving Met. example or LNER upper quadrant replacements. A 1936 shot of Verney Junction, also in "Service Suspended", shows that no major change seemed to have occurred from that date until the signalling was dismantled in 1956.

In December 1955 the Railway Magazine published a 1933 view of Winslow Road showing what appears to be a GC starting signal like the one recently demolished at Stoke Mandeville.

Yours sincerely,

16 Nightingale Road,
Aylesbury.

A.J.Reed (LURS No. 32)

Editor's Note

It is clear, as John Reed indicates, that further information is needed on this matter of end-painting of Met brakes; further information will be welcome. With regard to the general problem of recording any information of value, the Society intends to give a lead here - see Notices this month.

VICTORIA LINE
PROGRESS REPORT - 4
P.R.Davis

As indicated in the last instalment of this Report (Underground, July 1966, p.107), some information on the rolling stock proposed for the new line was released by London Transport on 31st March 1965. This article will be devoted to summary of that information, and full acknowledgement is given to LT accordingly.

In outline, it may be said that the trains will be of unpainted aluminium alloy panelling, with "wrap-round" windscreens to the driving cabs, double-width and double-glazed windows in the passenger saloons, with the glass sections of the doors carried up high enough to enable standing passengers to see station names without stooping, and 40 seats in each motor car, trailers only having 36 each to provide enough standing room for the short-distance passengers who are likely to make up a large proportion of those travelling on the new line. All trains will be of eight cars, and will be automatically operated, being manned by a train operator only. Longer distances between stations, and easier curves as compared with other tube lines will enable trains to run at speeds up to 50 m.p.h. - maximum tunnel speed on existing tubes rarely exceeding 40 m.p.h.

The trains will have rheostatic braking, all driving motor cars will have four motors and a hydraulic hand brake. Plastics are used to a considerable extent in the interior finishing, and another innovation will be illuminated advertisement panels.

A full technical description of the new trains cannot be given yet, as the detailed design of much of the equipment has not been published, but the following notes give the main features as known at present.

General

The cars on order are divided into equal numbers of driving motor and trailer cars and will be made up into four-car units of two driving motor cars with two trailers marshalled between them. As there will be

no loops or reversing triangles on the Victoria Line, driving motor cars and trailers are both arranged to be coupled in a fixed position in the unit, so that there are "A" end and "D" end driving motor and trailer cars, none of which is reversible end for end. Trains will be made up of two four-car units at all times and the units will not normally operate independently. Automatic couplers will be provided at the outer ends of the four-car units with permanent coupling between the cars of the unit. Leading dimensions are:

	<u>ft.</u>	<u>in.</u>
Length over body end panels -		
driving motors	52	9½
trailers	52	5
Width over lower panels	8	8
Height from rail over carlines	9	5 1/8
Height from rail to top of solebar	2	2 7/8
Bogie centres	33	11
Bogie Wheelbase	6	3
Diameter of solid disc wheels	2	7

The motor cars are expected to weigh about 31 tons and the trailers about 21 tons.

Body Construction

The carbody consists of a steel underframe of riveted and welded construction, with steel floor-plates, and aluminium alloy body framing, roof sheets and body panels. Previous tube stock with aluminium alloy body panels has had steel body framing, and the use of aluminium alloy extruded body frame members is a new departure which opens up the possibility of welding the body panels to the frame - which may reduce costs and should improve appearance.

The body pillars are of double Z section, the body panels being fixed to the front flanges. These flanges are machined locally so that the waist rail extrusion can run unbroken between doorway pillars. Body pillars are riveted to the solebar web. The cantrails are also aluminium alloy extrusions with slots machined in them to suit the ventilator design. The main longit-

udinal strength above the solebars is provided by the header rails. These are each formed of two extrusions, one half of which forms the top of the body side assembly and the other half the boundary member of the roof. The completed body thus has two continuous longitudinal members to which are securely attached the body pillars and the carlines.

The exterior panels are of 1/8 in. aluminium alloy and can be secured to the framing either by special flush countersunk rivets or by modern fine wire welding techniques. The exterior of the panels will be treated by a finishing process to give a "satin" finish to the cars.

The roof structure consists of the two half header rails already mentioned spaced by extruded carlines of Z section and clad with aluminium alloy roof sheets.

The appearance of the driving end of the driving cars has been considerably modified as compared with that of other Underground stock. The new cars have "Wrap-round" windscreens at each side without corner pillars, and the cabs have no side doors, curved droplights being fitted in their place. Another feature of the driving cars is that the driving end canopy, which incorporates provision for the destination indicator and ventilation duct, is a reinforced resin-bonded glass fibre moulding. The trailing end sub-assemblies are of similar construction to the body sides and have the usual central doorway to give access to the other cars.

Interior Arrangement

There are three bays in each car, separated by door vestibules with double sliding doors on each side. The smaller end vestibules have a single sliding door on each side, so that there are two double and two single sliding doors on each side of trailer cars and two double and one single door on each side of the driving motor cars, one single door on each side being omitted at the driving compartment end of these cars. The glass in these doors is extended upwards so that standing passengers can see station names without stooping. Each bay has two main windows, 4'6" wide,

on each side, part of which form door pockets with an outer window and an inner hinged casement window to the same general body profile. This produces double glazing which in addition will help to keep noise down. The glazing is by rubber mouldings.

Above the windows are passenger-operated ventilators also fitted as a pan unit and hinged at the bottom. They have anodised aluminium frames to match those of the casement windows and have space on the inner side for displaying route diagrams.

A public address system, with loudspeakers in each car, is provided so that the train operator can give information to the passengers. The interior body side panels are of melamine-faced hardboard, a kicking strip being applied at foot level. The interior finish panels are secured by polished and anodised aluminium alloy mouldings. Ceilings are of melamine-faced hardboard. Twin lines of fluorescent tubes are used for lighting. These are on each side of the car at the monitor rail position and may be recessed into the ceiling. They are supplied from motor alternator rectifier sets mounted on the trailer cars, at 115 V.a.c. Normal type handgrips are fitted along the monitor rails, with stainless steel handgrip rails at the doorways.

The floors are covered with the standard grooved maple boards bedded on canvas impregnated with red lead. The longitudinal seats in the end bays of the motor cars each seat six. The cross seats take advantage of the slightly greater width of these cars and are 28 1/2" wide. Arm rests of the new two-level type are fitted and are trimmed in red leather. All seats are sprung and upholstered in moquette with red leather facings. The trailer cars are generally similar but all seats are longitudinal. Motor cars seat 40 passengers and the trailer cars 36. Low temperature panel heaters - 16 per car - are fitted on the gangway faces of all seat risers.

The draught screens at the doorways are of reinforced glass fibre mouldings with the upper sections glazed with toughened plate glass. The screens are stepped back more than on the present trains to give

better passenger access and the glass has been arranged to merge smoothly into the ceiling profile, dispensing with the present eye-level glazing bar and improving the interior appearance. A grabpole, of polished stainless steel, provides support at the gangway side of the draught-screen.

Underframe

The underframe for driving motor and trailer cars are similar except for the driving end headstocks and the equipment mountings. The design follows closely that of the present Central and Piccadilly Line cars with some improvements and modifications. The solebars and longitudes are continuous members from headstock to headstock, the longitudes being formed from cold-formed and hot pressed sections assembled as hitherto by welding in a jig. The flanged plate crossbar sections between the bolsters are welded to longitudes and solebars, but main structural connections at bolsters and headstocks are riveted to simplify the repair of accidental damage. A feature is that the height of the centre saloon floor has been raised into line with the end saloons to permit a straight top flange for the centre section of the longitudes.

The bulb angle solebars have been reversed from their usual position and arranged with the flange facing inwards. This allows an open type door track to be carried on brackets mounted on the solebar web and should reduce risks of door obstruction by small objects dropped by passengers.

Headstock assemblies are fabricated by welding with riveted connections to solebars and longitudes. A slight reduction of depth at the driving end headstock makes it easier to withdraw the auto-coupler for maintenance. The drawgear incorporates a rubber springing system. The bolsters are welded sub-assemblies, subsequently stress relieved. Floor sheets are of 3/32 in. mild steel, penetration welded to the underframe members.

Bogies

The bogies are symmetrical in style with welded sub-assemblies stress relieved before riveting to form the main assembly. Bolster and axlebox suspension are of the rubber type as in all recent LT stock. Hydraulic

suspension control units are fitted to control both vertical and lateral movement of the secondary springing. Bolsters are of fabricated construction, stress relieved. Consideration is being given to replacing the normal roller side bearers and plain centre bearings by a non-wearing suspension using rubber bonded pads. Axle box springs are of the rubber bonded "chevron" type, housed in aluminium alloy yokes. Taper roller bearing axleboxes are used. All four axles of the driving motors are motored, using 300 V. motors in series in pairs as used in the prototype 1960 tube stock. The motors have a continuous rating of approximately 80 h.p. and are of the normal axle-hung nose-suspended type, the nose being connected to the bogie by means of a resilient link. Wheel spin protective devices of the differential voltage relay type are fitted.

Traction Control and Braking

The trains use rheostatic braking on the motor cars supplemented as necessary by normal electro-pneumatic braking on the motor and trailer cars and have single block braking on all wheels. The non-metallic brake blocks are carried in cast steel brake heads and there are individual brake cylinders and slack adjuster units for each block.

The traction control and rheostatic braking equipment is of new design but uses as many standard PCM equipment components as possible. To determine the best system, tests are currently being carried out on the Hainault-Woodford line. This equipment is mounted under the driving motor car on each side and the braking resistances are mounted under the centre bay of the car; natural ventilation cooling of the resistance is arranged. The trains also incorporate the usual automatic Westinghouse air brakes for emergency use.

The braking system combines rheostatic and air braking in three stagesm (1) rheostatic braking on the motored wheels only, (2) rheostatic braking on the motored wheels and air braking on the trailer wheels, and (3) rheostatic and air braking on the motored wheels and air braking on the trailer wheels.

These combinations can give any one of three predetermined rates of braking by the use of mercury retardation controllers. The system is arranged always to give preference to the rheostatic brake, air braking being added if necessary until the required degree, as indicated by the retarder contacts, has been applied. The system is well suited to working with automatic control and gives reasonable precision in stopping.

The hand brake is of the "leak-proof" hydraulic type and operates on both bogies of the driving motor cars through hydraulic actuators on the brake cylinders: the hydraulic pressure is produced by a pump in the cab. The "leak-proof" effect is obtained by arranging that the mechanism will lock-on mechanically when once applied hydraulically. When required to be released this operation is also effected hydraulically from the same control in the cab.

Cab and Controls

Automatic train operation has involved considerable changes in the cab as compared with that of a standard train. The train operator has a folding seat on the rear bulkhead on the near side, with the more important controls and dials grouped on a desk in front of him. The desk has a black plastic top fitted with edge lighting to show the dial and other indications without affecting forward vision in the tunnels.

Immediately in front of the operator and duplicated on both sides of the cab are the twin push-button switches for use in starting the train - the only driving control required in normal automatic working. For use when the train is being operated manually, as in entering the depot or in the event of a failure of the automatic system, there is a combined master/brake controller to the left of the desk. The handle is pushed forward for motoring and pulled back for braking and gives the facility for the Westinghouse emergency as well as the EP brake. On the right hand side is the key for selecting manual, automatic or shutdown. This key will also select forward or reverse in manual.

To operate the train manually, where no signalling

codes are being fed to the track, the operator must first raise the "slow manual" switch on the right of the cab which restricts speed to approximately 10 m.p.h. While he is driving, he must keep depressed a vigilance control positioned on the front of the driving desk. If this is released the brakes are automatically applied. When signalling codes are being picked up by the train the operator can drive with the manual control at up to 25 m.p.h.

Other new features at the front of the cab include miniature circuit breakers instead of fuses for various functions and push-button reset switches for the trip valve, saloon lighting and heating etc. There is also a hand operated uncoupler unit for use in conjunction with Wedglock couplings between units. As trains will not be regularly divided it was felt that full automatic coupling was not necessary. In the new system, the operator manually works a lever which releases the coupling, and to complete the movement he walks through into the adjoining cab of the other unit where he also operates the corresponding lever. Either unit can then be driven away from the cabs at the far ends. Coupling is by the reverse procedure.

The left hand and right hand door controllers are mounted on the rear and bulkhead, and are in the form of levers which can be worked while the operator is looking out of the cab drop window back down his train. Also on the rear wall are fuse boxes etc., an occasional seat, and the hydraulic handbrake pump - which will provide power enough to hold an 8-car train on the steepest gradient when the brake is operated from one cab only.

As automatic operation will mean few visual signals, the new trains will be fitted with headlights, and one unusual feature is a "calling-on" light. If an existing train with a two-man crew develops a defect and has to be pushed forward by the following train, the driver of that train is called on by the guard of the disabled train, who waves a white light horizontally to show that he needs assistance. As the Victoria Line trains will have a one-man crew, this will be impossible. Therefore, a "calling-on" light is fitted outside each cab, which can be switched on from the operator's position, the light at the leading end of the train acting as a repeater to show the rear light as working.

It is intended that the operators of the two trains will be able to communicate by radio or inductive link before coupling so that the man in the following train can be told the nature of the front train's fault. and to avoid say, an electrical fault being transmitted from the disabled train to the one behind as the couplers make contact, provision is made for switching out the electric connections. Also, in the cab above the operator to the rear is the combined train telephone and carrier wave telephone unit to enable the operator to contact the traffic controller at any time, even when moving.

Auxiliary Equipment

Control circuits are supplied at 50 V.d.c., and this and the 115 V.a.c. for lighting are obtained from the motor alternator rectifier sets on the trailers. A 46 V. battery is also carried on the motor cars and floats permanently across the rectifier output.

Interlocks are provided for all sliding doors and fault detector lights are fitted to the exterior of each car to locate doors not properly closed; the doors are also interlocked with the automatic control gear to prevent the train being started in automatic with the doors open. The electro-pneumatic door equipment operates on a 50 V.d.c. supply and air is supplied at reduced pressure from the main reservoir system, which is in turn supplied by motor driven compressor units on the trailer cars.

The new trains have been designed as a result of joint studies by LT's Chief Mechanical Engineer (Railways), Mr A.W.Manser, Operating Manager (Railways), Mr F.G.Maxwell, and Metropolitan-Cammell Limited of Birmingham (who are building the bodies and bogies under a £2 $\frac{1}{2}$ m. contract), in consultation with Professor Misha Black, the design consultant. The design has been approved by London Transport's Design Panel, the Chairman of which is Mr. E.C.Ottaway, a Member of the Board.

Orders for the other equipment - motors, doors, automatic control equipment etc. are the subject of separate contracts, and will be referred to in other instalments of these notes.

SOCIETY NOTICES

Journal Please note that, due to an editorial error, the last issue of the Journal was incorrectly numbered in its volume - it should of course be Volume 5 No 7, not No 6 as printed. The error is regretted.

Officers

Librarian J.P.Wirth has resigned as Librarian to the Society, and the Committee has appointed N.E.W.Fuller in his place. It is Norman Fuller's intention, as soon as he can make the necessary arrangement and in any case within the next few months, to open the library to members once a month at his home; a further note will appear in The Timetable giving the date of the first open night. Library address - 62 Devonshire Rd, W.5.

Assistant Editor The Committee has appointed S.P.Bissell, of 20 Beech Avenue, Upminster, Essex as Assistant Editor. The Editor has been under great pressure for some time, and this appointment will be of considerable help to him in maintaining the standard of the Journal.

Photograph Sales Manager The Society urgently requires someone to fill this office, which entails dealing with all photograph sales matters, including joint lists with other Societies. If any member feels that his efforts for the Society could be devoted to this job, please write to G.P.Jasieniecki, 6 Redcliffe Street, London, S.W.10 for further details.

Research Subcommittee The Committee has been giving consideration to the directing and recording of research activities, and has come to the conclusion that this would be best handled by a subcommittee concerned with this matter alone. Accordingly, this subcommittee has been duly constituted, and the first members appointed to it are :- K.R.Benest, S.P.Bissell, P.R.Davis, G.P.Jasieniecki and E.Shaw.

Meeting Place Thanks to the assistance of one of our members, we have been able to obtain use of a room in Hammersmith Town Hall for Society meetings at a very reasonable charge. This room has been booked for a few months on an experimental basis, to find out if the venue is convenient for members. A further announcement will appear in due course - when the first meeting to be held there has been arranged. In the meantime, we can advise members that the Hall is a

few minutes^o walk from Ravenscourt Park station (District Line), and a little further from Hammersmith (District and Piccadilly Lines). Refreshments are available in the building until about 19.00 at very reasonable prices (Tea 2d per cup and hot meals also available pro rata.)

Photographic Competition It is intended to hold a competition again this year, and details of the rules governing entries will be given in the next issue; but in the meantime members are asked to note that this time the contest will include classes for both black-and-white prints and colour slides

THE TIMETABLE

Saturday 13th August An afternoon in Aylesbury, which will include a Tour of the Station, Visits to the Signal Boxes, etc., followed by an Exhibition of Relics owned by the Society and our member John Reed at John's home. Party will meet by Stationmaster's Office, Aylesbury at 14.00. Names to A.J.Reed, 16 Nightingale Road, Aylesbury, Bucks. Only unsuccessful applicants will be notified.

Saturday, 10th September Visit to Stewart's Lane Depot, Southern Region - where it is hoped to see the tube stock being prepared for service in the Isle of Wight. Names to the Secretary at 62 Devonshire Road, Ealing, London, W.5. as soon as possible. Meet at Wandsworth Road station at 09.31 - only unsuccessful applicants will be notified.

Thursday 15th September Visit to Lots Road Power Station (postponed from earlier this year). This visit is almost fully booked, but anyone who had not applied for the earlier visit but would like to be considered for the present one, please write to the Editor at 62 Billet Lane, Hornchurch, Essex at once. Only those unsuccessful will be notified; those going will meet at 14.30 outside the entrance to the Power Station in Lots Road.

Friday 16th September Illustrated Talk by Alan Cruikshank on "Metropolitan Steam Locomotives": to be given at Keen House commencing at 19.00. Refreshments are available here, and visitors will be welcome.

Advance Notice Members of the Society are invited by The E.M.Gauge Society to an informal meeting and Film Show at the Abbey Community Centre on Saturday 26th November at 19.00. Please notify Secretary at the address above if you wish to attend.

Lithoed by The Celtic Bureau, 93-94 Chancery Lane, London, W.C.2. and published by The London Underground Railway Society, 62, Billet Lane, Hornchurch, Essex.