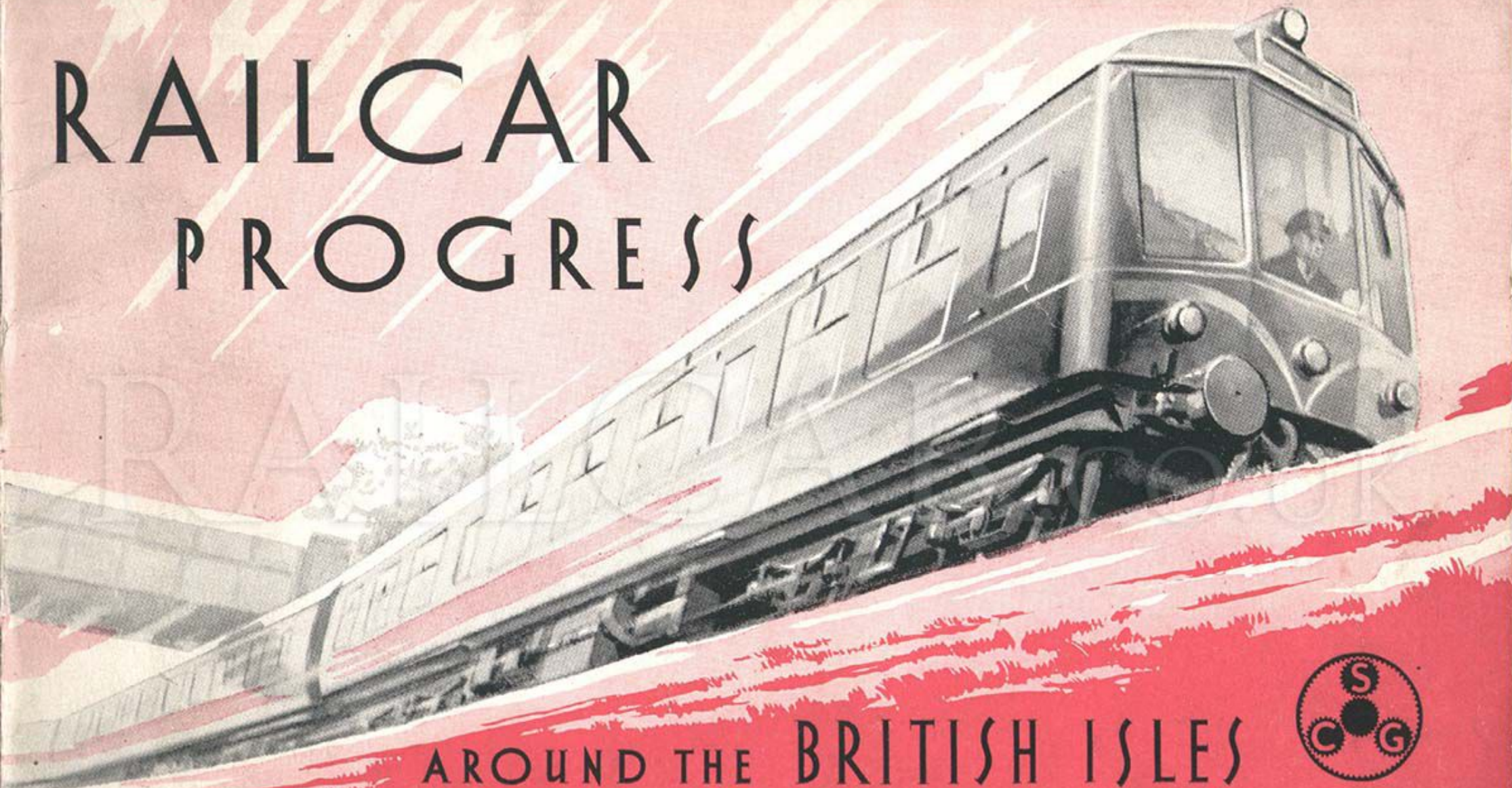


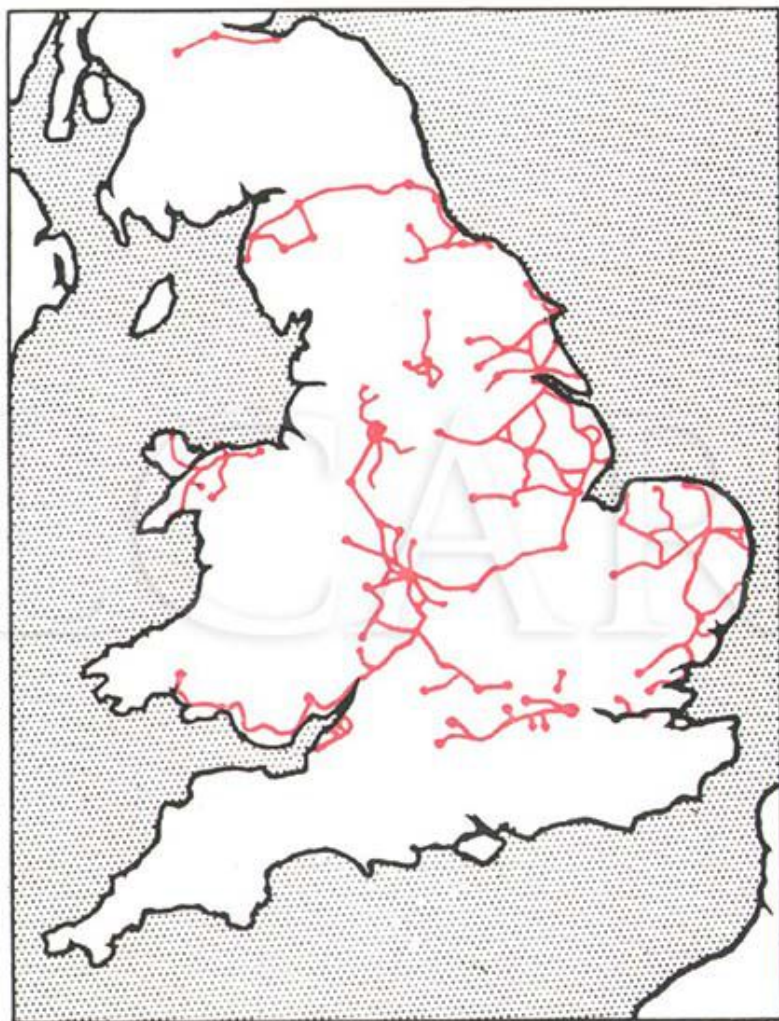
RAILCAR PROGRESS



AROUND THE BRITISH ISLES



SELF-CHANGING GEARS LTD. . . . PATENTEES & MAKERS OF WILSON GEARBOXES



DIESEL CAR ROUTES ON BRITISH RAILWAYS.



Self-Changing Gears Ltd. have invited a celebrated railway technical author to write this impartial, interesting description of diesel railway workings throughout the British Isles.

RAILCAR PROGRESS AROUND THE BRITISH ISLES

(Photographs by courtesy of British Railways and M. W. Earley, Esq.)

A SHORT SURVEY OF RAILCAR PROGRESS

From 1934 until nationalisation the Great Western Railway gained considerable traffic experience with A.E.C. diesel railcars operating solo or in pairs and at times, in three car trains. Over the past twenty years these railcars, all fitted with Self-Changing Gears Ltd., gearboxes, have given excellent service. The vehicles were maintained on a contract-mileage basis by the A.E.C. at railway depots and when intermediate or major overhauls were required, at the Company's works.

Various experiments with passenger diesel trains on other main line railways in Britain were not sustained and it was twenty years after the introduction of the first G.W.R. diesel railcar that British Railways built at their Derby works a number of bogie cars employing B.U.T.* traction equipment. Sixteen diesel power cars, fitted with hydro-mechanical transmission, were built and sent to the West Riding of Yorkshire to operate a short intensive service between Leeds and Bradford where they worked in pairs, with a gangway connection between each pair, a total of 500 b.h.p. being available to each set. A further thirteen twin-sets consisting of a power car and driving-trailer of the same basic design but with mechanical drive

* British United Traction Ltd.

incorporating Self-Changing Gearboxes, were produced and allocated to West Cumberland.

A period of operation in the two selected areas followed and as a result British Railways decided to build large numbers of railcars of the second type in their Works at Derby and Swindon and through contractors, including Metro-Cammell, Cravens, Birmingham C & W, in association with Drewry Car Co. Ltd., Gloucester C & W and Wickhams. Of the 4,600 diesel multiple units projected under the modernisation plan the majority constructed to date are fitted with B.U.T. traction equipment including Self-Changing Gears Ltd., gearboxes.

The basic design of these railcars consists of an integral underframe-body carried on two four-wheeled bogies of conventional design the innermost axles of which are driven through a B.U.T. final drive mounted between the wheels and incorporating a reversing mechanism. The final drive of the double reduction type has a ratio of 2.81 to 1 and the wheel formation of the cars is 1A-A1. Two 150b.h.p. B.U.T. horizontal six-cylinder four-stroke diesels are suspended below the frame almost nose to nose, the drive being taken through a fluid coupling to a short

RA

**British Railways
Scottish Region**

*Inter-City dieselcar express
leaving Edinburgh (Waverley)
for Glasgow (Queen St.)
These trains were constructed
at the Swindon Works of British Railways.*



propellor shaft incorporating a freewheel and thence to the input side of the Self-Changing Gearbox.

The type R.14 Gearbox, produced at the Coventry Works of Self-Changing Gears Limited, is of proved design and embodies the well known Wilson epicyclic principle and direct air-operated brake bands controlled by electro-pneumatic valves under the influence of a gear selector in the driving compartment. A 24 volt electric generator is driven by means of vee pulleys and belts from the output end of one gearbox. The R.14 unit employs a first speed ratio of 4.28 to 1 whilst the second and third speeds have ratios of 2.43 and 1.59 respectively, fourth speed being a direct drive. From the output side of the gearbox the drive is transmitted to the axle by means of a propellor shaft of orthodox design.

At the works of Self-Changing Gears Ltd., Coventry, Railway personnel are instructed at the special school by means of Film Shows, dismantling and assembling of R.14 Gearboxes, Lectures, etc.

The railcar trains now entering service in increasing numbers have standardised traction equipment and controls although they originate from several works and have somewhat different exteriors, these are operated as two or three car basic formations which can also be marshalled into four, six, eight or nine car trains, whilst certain units with driving compartments at each end can be operated singly. Through the medium of the electro-pneumatic control system, utilising air pressure at 90 lbs. per square inch, (reduced to 65 lbs. for gearbox

operation), and 24 volt jumper connections between the cars, control of all engines, gear boxes and reversing mechanisms is obtained from a single driving compartment.

In addition to the type of train described there are Inter-City trains and Parcels cars—all of which will be seen as the extensive British Railways dieselisation programme materialises. It is also planned to operate a number of two axle 'railbuses' some of which will incorporate the successful Self-Changing Gearbox. Diesel-mechanical trains operate in the Scottish, Eastern, North Eastern, London Midland and Western Regions of British Railways and increases in passenger traffic, following their introduction, are well illustrated by the figures published from time to time.

In Scotland, six-car Inter-City trains comprising 2nd Class open motor cars, together with 1st Class Compartment and 1st Class Buffet-Composite trailer cars are in operation between Edinburgh (Waverley) and Glasgow (Queen St.) where they have proved popular and reliable timekeepers. The total distance is 47 miles but the service involves the ascent of a 1 in 42 bank almost from platform start at Glasgow, through the tunnel to Cowlairs, as well as an intermediate passenger stop at Haymarket. The present terminal to terminal timing of 60 minutes is well within the capabilities of the diesels. Other Inter-City expresses are employed on the 154 mile route between Birmingham (Snow Hill) and Swansea (High St.) over Western Region metals. These trains are routed by way of Stratford-upon-Avon, Cheltenham,

Gloucester and Cardiff, although some terminate at the latter point. The timing calls for the 117 miles between Birmingham and Cardiff to be covered in 150 minutes, 15 minutes faster than the best previous steam train.

Cross country services between such points as Carlisle and Newcastle-on-Tyne and between Birmingham and Peterborough have benefited from the introduction of railcar trains the versatility of which is proverbial. The morning express out of New Street, Birmingham, for instance, comprises three two-car sets operating in multiple under the control of one driver. This express proceeds by way of Coventry to Rugby (Midland) where it splits into two trains, two two-car sets working forward by way of Market Harborough to Peterborough (East) and a two-car set returning to Birmingham semi-fast. Similar use is made of this advantageous multi-unit principle to meet fluctuating traffic demands over suburban routes such as those radiating from the London Midland station in Birmingham to Lichfield, Four Oaks, Wolverhampton, Stafford and Coventry.

The Tyne-Tees services between Newcastle and Middlesborough are normally worked by eight-car trains on a popular and fast schedule. Services operated in East Anglia by thirty-four two-car Norwich based sets are employed on journeys to Kings Lynn, Yarmouth, Wells-on-Sea, Hunstanton, Cromer, Ely, Ipswich, Harwich, Lowestoft and Chelmsford. The area scheme centred on the cathedral city of Lincoln reaches out to serve places as widely separated as Peterborough and

Cleethorpes, Grantham and New Holland, Sheffield and Boston, and Nottingham and Skegness.

During the first three and a half months' operation in the West Riding of Yorkshire an *additional* 80,000 passengers were carried by railcar trains between Leeds and Bradford alone whilst on the short but heavily graded Bury-Bacup line in South Lancashire a 152% increase in passengers using the route followed their introduction. It will be appreciated that these are results from highly industrial areas, nevertheless commendable increases have been achieved as well in sparsely populated regions, take for example East Anglia where complete dieselisation of one particular route resulted in an increase of 30% in the receipts obtained.

Over the truly rural Banbury-Buckingham line there has been an increase of 434% in the number of passengers since solo-type railcars took over. North Wales has made good use of its railcar trains operating from Llandudno Junction and, on the service to Blaenau Festiniog, a 39% increase was achieved. Diesel railcar trains in the Midlands between Birmingham and Lichfield carried 178% more passengers than the steam trains they superseded and in West Cumberland, one of the earliest areas to have passenger train services dieselised, an increase from 59,000 to 91,600 passengers was realised during a single three monthly period from February until April.

The railcar train has many advantages over carriages



**British Railways
Eastern Region**

Metropolitan-Cammell two-car set leaving Cromer Beach station for Norwich.

**British Railways
North Eastern Region**

*Two-car set comprising a
power car and driving trailer
constructed by Cravens Ltd.
for services radiating from
Hull.*



hauled by a locomotive, for instance an engine failure on the former does not necessarily result in a complete failure of the train but should a locomotive fail, be it steam, diesel or electric, the complete train is brought to a standstill. Fully laden railcar trains have been tested, with one of the engines isolated on the steep 1 in 42 incline out of Glasgow and have arrived at their destinations punctually.

To introduce, operate and maintain these successful units British Railways have organised their resources within several departments. The Chief Mechanical and Electrical Engineers are responsible for complete overhaul and repair of the railcar traction equipment, whilst intermediate and major overhauls of the vehicles themselves are the concern of the Carriage & Wagon Department at various main works. The Motive Power Department together with the Carriage and Wagon Engineers' Department, are primarily concerned with day to day preparation, operation and maintenance of the diesel-cars.

Workshops have been erected or adapted to suit the new type of motive power, for instance, a magnificent new diesel maintenance depot has been erected at Lincoln in the Eastern Region one of several on this and the North Eastern Region equipped with the very latest facilities for stabling, servicing, maintenance and inspection of diesel multiple-unit trains. At Leith, near Edinburgh, the Scottish Region are using the original passenger terminus of Leith Central which has been

expertly converted into a first class maintenance centre for the Inter-City railcar trains employed on the Edinburgh-Glasgow route.

Routine examinations have been laid down by the Chief Officers concerned of British Railways Central Staff covering work schedules for the staff at motive power depots to carry out. These duties ranging from a simple daily preparation to examinations at every 1,500, 3,000, 6,000 and 12,000 miles culminate in a comprehensive examination and servicing at 36,000 mile intervals. Motive Power Depots, each under the supervision of a shedmaster and mechanical foreman, are responsible for the replacement of complete traction units which, for one reason or another, become casualties. Lubricating and fuel oils are held in bulk storage at the depots and dispensed through the most modern equipment—some of which has been specially manufactured or adapted to meet British Railways' requirements. Stocks of certain sub-assemblies, such as engine cylinder heads, are held at depot level, thus avoiding considerable delay and maintaining vehicle availability at a high level. Comprehensive records are maintained covering all examinations as well as running repairs.

Much thought and planning has gone into this scheme which may differ slightly from Region to Region but through the medium of a free exchange of information and experiences at regular regional and inter-regional meetings, difficulties encountered, which are inherent with the introduction of any new form of motive power,

are smoothed out. This is all to the benefit of British Railways and serves to illustrate the essential team spirit without which any great organisation could hardly expect to remain in business.

Multiple-unit diesel trains in service with British Railways are going from strength to strength and rarely a month goes by without these modern units, with their luxurious seating and smart green livery, appearing 'in pastures new'. By mid-summer of 1957 no less than 440 diesel-mechanical power-cars were in operation on British Railways, all fitted with Self-Changing Gearboxes. All the time experience is being gained and modifications found necessary are applied to new construction as well as those going to Main Works for repair. Multiple-unit railcar trains have an important role to play in the modernisation of Britain's railway system and to date

they have excelled as revenue earners of no mean accomplishment.

Services operated by multiple-unit diesel trains will extend as additional vehicles are delivered and further exploitation of them is possible in the fields of express-passenger, excursion and "cruise" services. Typical of excursion-working with diesel units during the summer of 1957 were the Sunday trips from Southend and Tilbury on the Eastern Region with trains composed of two, two-car units, to Hunstanton, Ipswich and Colchester in the parent region as well as to Arundel and Littlehampton in the Southern Region. With refreshment facilities and brochures describing the route and places of interest, these diesel-railcar excursions have proved increasingly popular with the public.

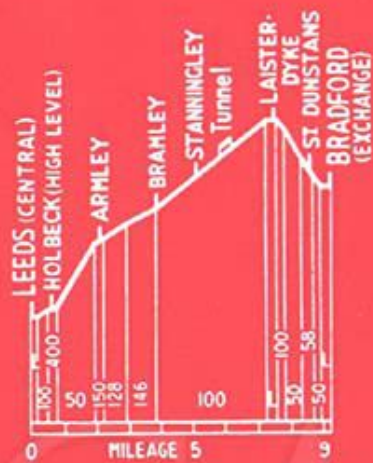


**British Railways
North Eastern Region**

*Interior of Cravens' built
two-car set, one of a number
working in the Hull area.*



PENRITH - CARLISLE (L.M.R.)



LEEDS - BRADFORD (N.E.R.)



LEEDS - HARROGATE (L.M.R.)



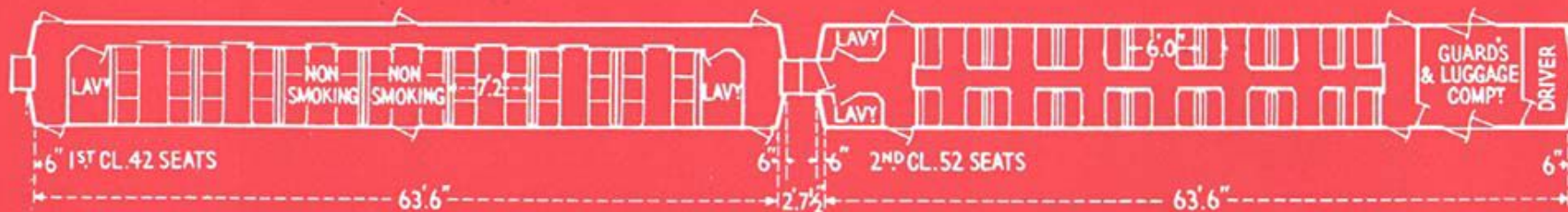
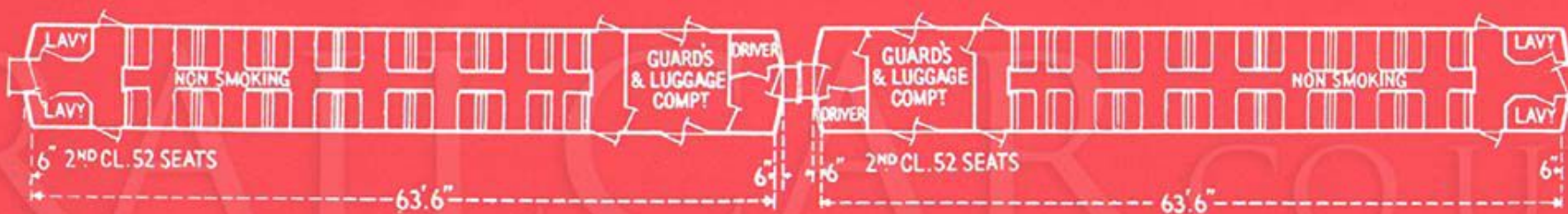
EDINBURGH - GLASGOW (S.C.R.)

British Railways *Some typical Railcar routes with gradient profiles.*

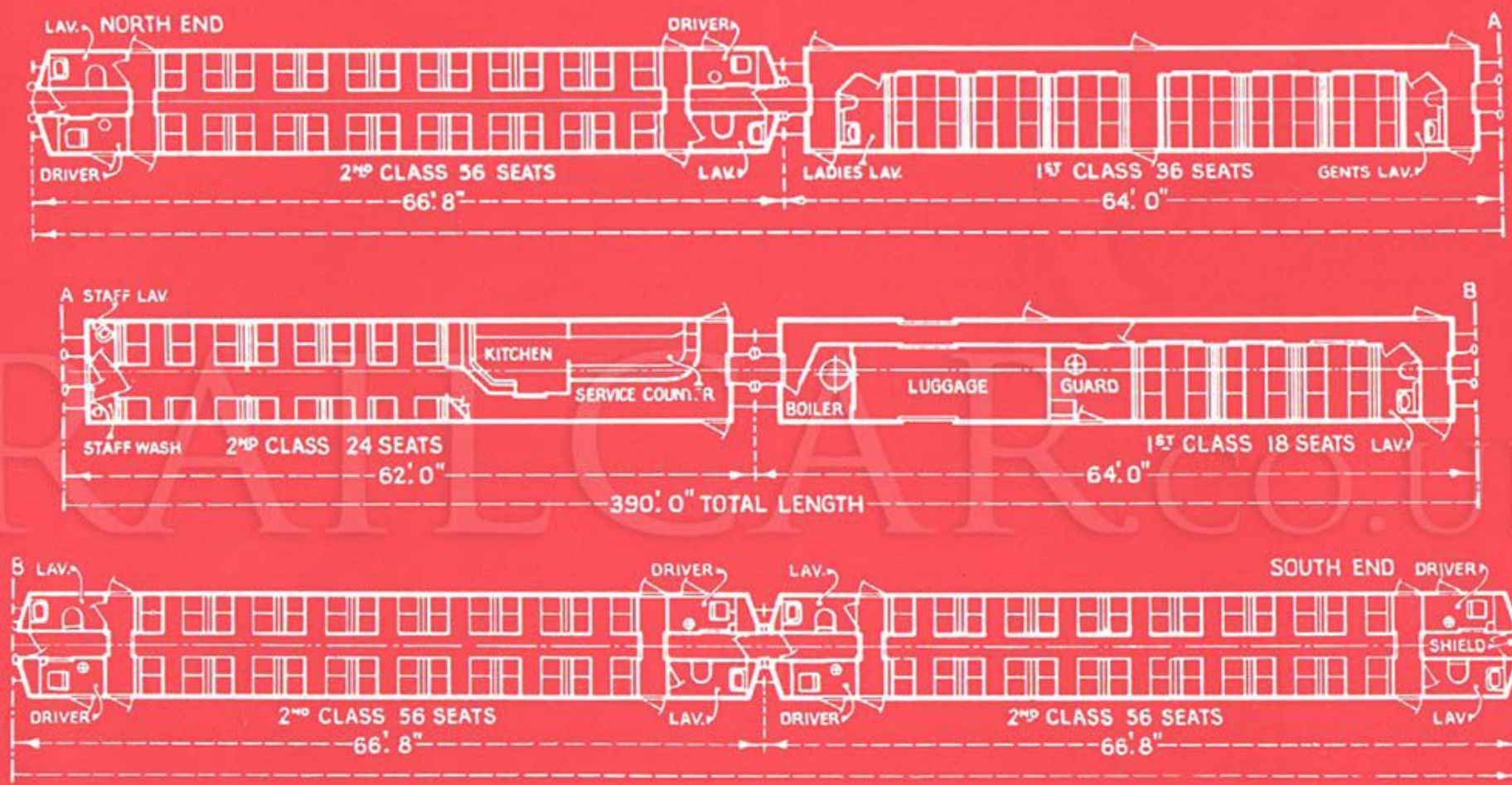


**British Railways
Eastern Region**

The latest type of railcar train operating in the Lincoln area is seen here near Melton Constable. The cars were built at the Derby Works of British Railways.



British Railways Scottish Region *Composition of a Swindon-built Inter-City 6-car Express for use between Glasgow and Edinburgh.*



Great Northern Railway Board *Composition of a new 6-car "Diesel Enterprise" Express.*

RA

**British Railways
London Midland
Region**

*One of the original Derby
built two-car sets which have
been serving West Cumber-
land since January, 1954.*





BRITISH RAILWAYS
DIPLOMA.UK

**British Railways
London Midland
Region**

Two-car set at Betws-y-Coed on the branch to Blaenau Festiniog. This particular train is fitted with Self-Changing Gears Ltd., gear-boxes and fully automatic driver's control.

RA

**British Railways
Scottish Region**

*Interior of Leith Diesel
maintenance depot showing
one of the Swindon built
Inter-City trains over the
servicing pits.*

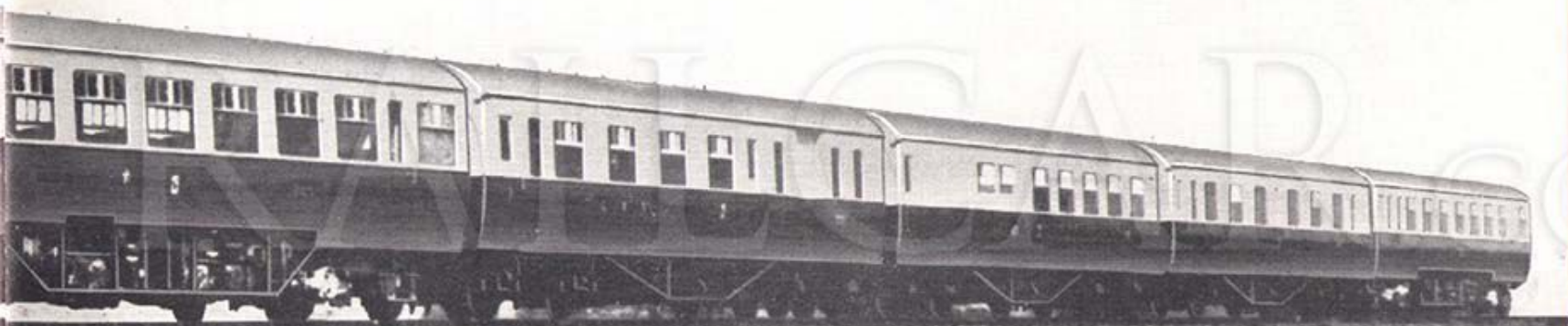




**British Railways
London Midland
Region**

*Diesel Railcar Bulk Oil
Fuel Storage Installation at
Birmingham (Monument
Lane).*





**Great Northern
Railway Board**

Latest development in Ireland is the introduction of new diesel "Enterprise" trains between Belfast and Dublin.

The County Donegal Railways can be credited with pioneering the first regular diesel railcar service in the British Isles which they accomplished towards the close of 1931. The first C.D.R. diesel cars were designed with a single trailing bogie and a fixed driving axle powered by a 74 bhp Gardner engine and they operated on a 3 ft. gauge system having many severe curves and two per cent gradients up to five miles in length. The railcar bodies were typical of the omnibus designs of that period with the engine housed beneath the traditional 'bonnet'.

Considerable popularity was achieved by these narrow gauge diesel cars and it is generally conceded that they were the first reliable self-propelled diesel rail passenger vehicles. Further designs followed and these were of the double-bogie type, the leading bogie forming an easily detachable unit complete with engine and transmission.

Small cars of the Walker type were employed on the narrow gauge Clogher Valley Railway and successful diesel operation followed although gradients and curvature more severe than in the case of the County Donegal lines were encountered.

Diesel railcar operation quickly spread to the Irish broad gauge and in 1938 the L.M.S. Northern Counties Committee put into service a number of bogie railcars

equipped with two Leyland 130 bhp diesels each driving the innermost axles of the bogies through the medium of torque convertors. These cars had a characteristic driving position located in a 'conning tower' arranged above roof level diagonally at either end. The units are still in service now with the Ulster Transport Authority, who operate them over former N.C.C. routes.

Several examples of single-engined diesel railcars appeared on the Great Northern Railway in 1934-5 using A.E.C. vertical diesel engines and they were employed on duties around Belfast and Dublin. During 1950-1 the Great Northern placed in service twenty broad gauge cars of a new type, the design of which was based on the G.W.R.-A.E.C. railcars in England. The complete power-cars were supplied by A.E.C. whilst trailers were constructed at the G.N.R.'s Dundalk shops. Each power-car had two A.E.C. 9.6 litre diesels together with Self-Changing gearboxes. Only the innermost axles of the bogies were driven and the final drives were mounted on the outside of the bogie frames.

The cars were arranged for multi-unit operation quickly becoming established on the 112½ mile route linking Belfast with Dublin. Over this line the new trains operated a "Diesel Enterprise" service contemporary with the steam-hauled "Enterprise" expresses which had been running since August 1947. The route concerned involves several severe speed restrictions and



Coras Iopmair Eireann

*A multiple-unit diesel train
at work in Eire, sixty cars
of this type are in service
with C.I.E.*

RA

**Great Northern
Railway Board**

Some of the original three-car diesel trains which pioneered fast services between Belfast and Dublin.



the negotiation of the Gorragehwood bank, which, both northbound and southbound, includes grades of one per cent for considerable distances together with a total inclination of ten miles. The diesel services were worked at an average speed of 50 mph in each direction and the punctuality and reliability of the trains is clearly demonstrated by the records which reveal that the "Diesel Enterprise" over a period of two and half years was never late. The normal formation of these trains was three cars—two motor cars and an intermediate trailer whilst buffet facilities were also provided.

In the south, Coras Iompair Eireann—the Irish Transport Company, entered the diesel railcar field in 1952-3 when initial units of a batch of sixty broad gauge A.E.C. railcars entered service. The successful combination of A.E.C. diesels, fluid couplings and final drives, together with Self-Changing gearboxes was employed. Experience with this combination on the Great Western Railway led to its adoption for long distance services across the Irish Sea. Trailer cars converted from existing rolling stock by the Inchicore Works of C.I.E. were included in formations of four and eight cars employed on the principal routes between Dublin and Cork (165½ miles) and Dublin and Tralee via Killarney (207 miles). Other services operated with these trains involved journeys from Dublin to Limerick, Waterford, Galway, Sligo, Westport and Rosslare.

Availability of these railcars has been stated to be in

the neighbourhood of 90% and the average fuel consumption for a four-car set to be 2½ miles per gallon. C.I.E. maintenance is concentrated at main works and engines are removed at 60,000 miles on a unit exchange basis. The removed engines only receive a top-overhaul and at every other 60,000 mile service (i.e. 120,000 miles) engines removed have the cylinder bores honed. The advent of the extensive diesel-electric locomotive programme of C.I.E. caused the transfer of railcars to other lines and services, but the performance of the units was such that a repeat order for power cars was placed in 1955. These cars have since been delivered and put into service and are of the same basic design as the earlier units although the bodies, built by C.I.E., are somewhat different. The complete chassis were supplied by the contractor, British United Traction Ltd. and again featured the reliable Self-Changing gearbox.

On their 3 ft. gauge lines C.I.E. use four Walker type railcars of 107 bhp which entered service in 1952. An interesting experiment took place in 1953 when the Company converted at their Inchicore Works an A.E.C. "Regal" road motor bus into a railbus by fitting wheels of the Howden-Meredith type. This vehicle was for use on broad gauge branch lines.

In Ulster the Ulster Transport Authority turned to complete dieselisation of the Bangor line in 1952 with multi-unit trains utilising twin Leyland horizontal engines

together with hydro-mechanical transmission. These trains operate the services between Belfast and Bangor and with their modern equipment which includes air-operated doors and other rapid-transit features, they have proved a very sound investment. The general layout of these railcars is similar to that used by British Railways when they produced their first diesel cars at Derby in 1954.

To bring this brief story of railcar traction in Ireland up to date we must now look at the year 1957 which witnessed the introduction, on the Great Northern system, of the first multiple-unit train comprising new power cars from a batch of twenty-four ordered from B.U.T. Ltd. These railcars have engines of greater power than the original 'Diesel Enterprise' sets and the

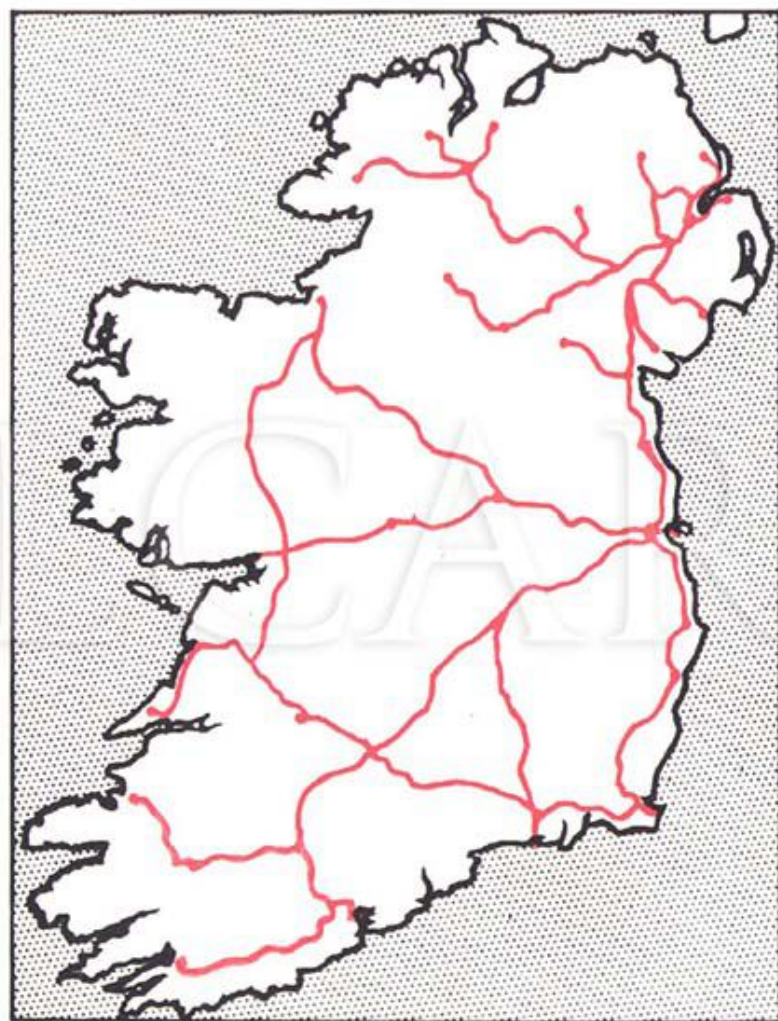
latest type of Self-Changing gearbox which is direct air operated instead of preselective as with the earlier cars. A maximum speed of approximately 80 mph is attainable by these trains the axleboxes of which have bonded-rubber suspension in place of the usual laminated steel springs. It is intended that these trains will replace the steam-hauled "Enterprise" from Belfast in the morning and the corresponding afternoon train northbound from Dublin.

The C.I.E. and Great Northern railway systems operate a total of 110 main line diesel railcars all of which are fitted with Self-Changing gearboxes proving the reliability and robust construction of these units and their ability to stand up to long distance daily service throughout the Emerald Isle.

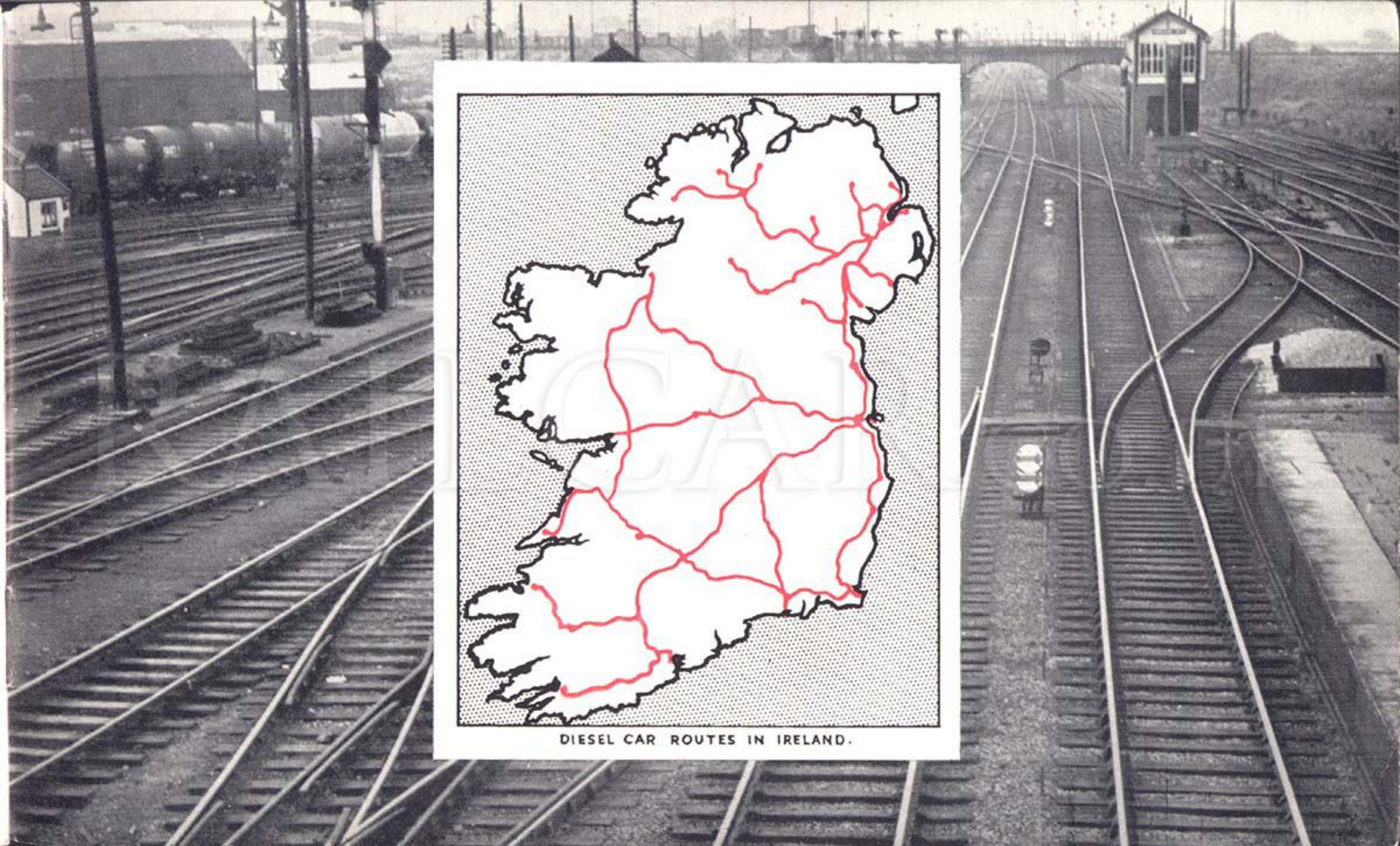


ALL THE DIESEL TRAINS ILLUSTRATED IN THIS BROCHURE
ARE FITTED WITH SELF-CHANGING GEARS LTD. GEARBOXES

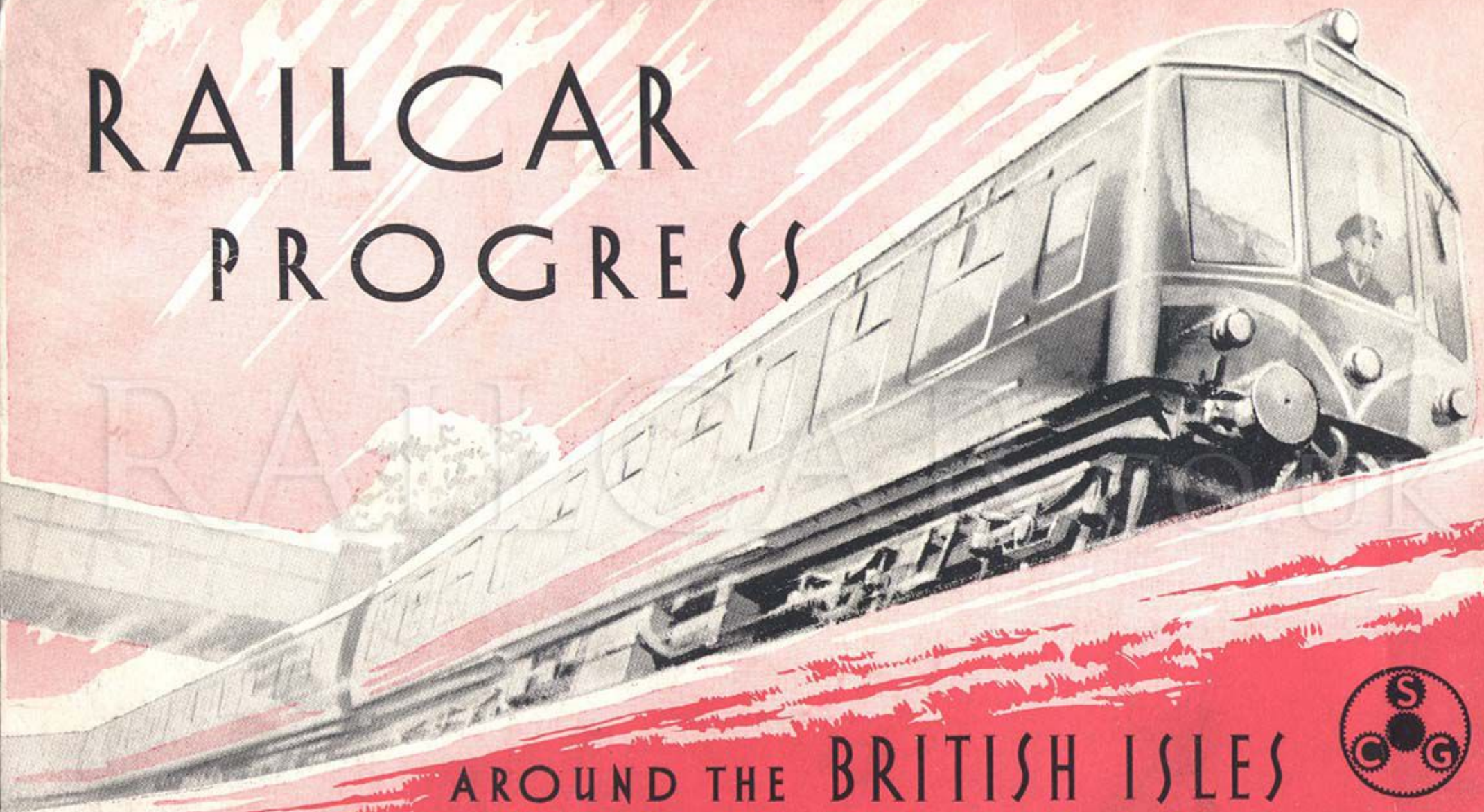




DIESEL CAR ROUTES IN IRELAND.



RAILCAR PROGRESS



AROUND THE BRITISH ISLES



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