



**A Review of  
Activities by one of  
the World's Largest  
Suppliers of Diesel  
Train Units . . . .**



**BRITISH UNITED TRACTION**





Leyland

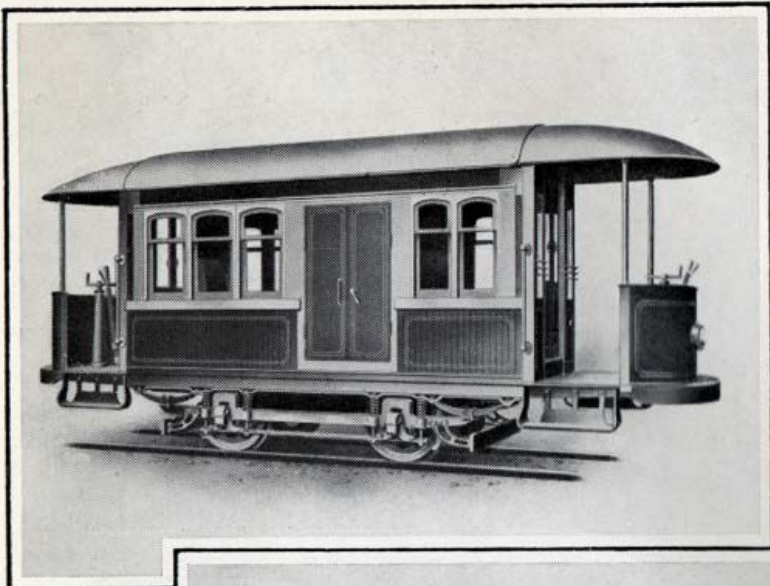
**T**WO notable diesel engine manufacturers merged their rail traction experience and resources to form the Diesel Train Division of **BRITISH UNITED TRACTION LIMITED**.

The Associated Equipment Company were among the pioneers who introduced the automotive compression-ignition oil engine and lost no time in applying the unit to rail traction. Since 1910 A.E.C. products have earned an enviable reputation for reliability and sturdiness and the Company has remained in the forefront of the transport industry. Some A.E.C. railway achievements are revealed in the pages that follow. Most executives will agree that men of a certain calibre contribute largely to any successful concern and some of the men who pioneered and maintained A.E.C. diesel railcars for well over twenty-five years are to-day with **BRITISH UNITED TRACTION LIMITED**. A.E.C. is the senior partner in a large industrial group known as Associated Commercial Vehicles, embracing the Maudslay Motor Company Ltd., Park Royal Vehicles Ltd., and other leading concerns who have played their part in the application of the internal combustion engine to railways. The activities of A.E.C. have spread throughout the world and companies such as A.E.C. (Australia) Pty. Ltd., and A.E.C. Central Africa (Pvt) Ltd., are early and recent examples of this policy.

Founded in 1896 as the Lancashire Steam Motor Company, Leyland Motors Limited adopted the present title in 1907. Leyland early developed an automotive diesel and in 1933 produced this type of engine in quantity. It was inevitable that a company associated with petrol-engined railcars as far back as 1910 should seek to apply the oil engine to rail traction — a story unfolded in this booklet. Since the war Leyland Motors have considerably extended their manufacturing interests and to-day the Leyland Group embraces the well-known concerns Albion Motors Ltd., and Scammell Lorries Limited. A progressive overseas policy has been implemented through the medium of such companies as Ashok Leyland Limited in India and Leyland Albion (Africa) Ltd. The formation of a sales, spares and service organisation in the United States was recently announced.

Shortly after the war Leyland and A.E.C. agreed to pool their resources in the field of electric passenger vehicles, resulting in the formation of **BRITISH UNITED TRACTION LIMITED**. Increasing railway business necessitated the formation of a Diesel Train Division of B.U.T. in 1953. All rail traction commitments of A.E.C. and Leyland — design, research, development, marketing and service are undertaken by **BRITISH UNITED TRACTION LIMITED** whose headquarters are at 96, Piccadilly, London, W.1.





**1905**

Cape Government  
Railways.

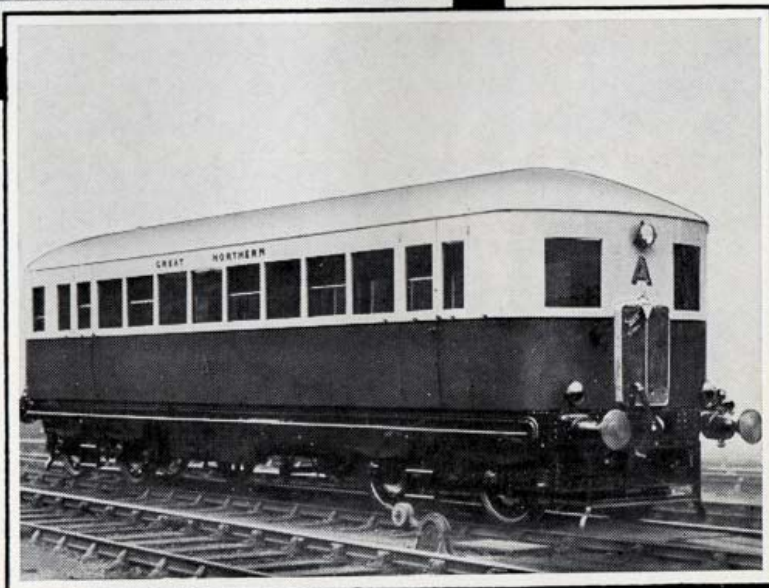


**1912**

Great Western  
Railway.

**1932**

Great Northern  
Railway (Ireland).





# PIONEERS

**A**TTEMPTS to provide cleaner, more flexible and economical rail traction were made early in the twentieth century. With petrol engines readily available, petrol-electric power and transmission units began to be introduced on the rail.

The forebears of BRITISH UNITED TRACTION were much in evidence among the early equipment manufacturers. In 1905 Maudslay were building petrol-engined railcoaches several of which, featuring epicyclic gearboxes and 27 h.p. engines, were supplied to the Cape Government Railways. Shunting locomotives were also numbered among Maudslay products of 1905, a notable example being a steple-cab 0-4-0 for the City of London Corporation. From 1910 Leyland were producing petrol-powered tramcars. A fleet supplied to Morecambe (Lancs.) featured gearbox drive and similar units were exported to several light railways overseas.

An outstanding example of an early railbus appeared in 1912 on the Great Western Railway being employed on the Windsor and Brentford branches. A 14 ton four-wheeler, it was powered by a Maudslay 40 h.p. petrol engine of advanced design. About this time Leyland Motors were producing 6-cylinder 150 h.p. engines for railcoaches equipped with the Thomas system of electric transmission, for operation at home and abroad.

During the next twenty years several

British firms engaged in the building of internal combustion engined railway vehicles and petrol engines of Leyland and A.E.C. design were frequently employed. Some overseas railways carried out conversions of the reliable and robust road vehicles produced by the two companies and adapted them to run on rails. Even to this day vehicles thus evolved are in operation in some of the far corners of the railway world — and not a few of them have been fitted with A.E.C. and Leyland diesel engines, thus ensuring a new lease of life.

In 1932 the then Great Northern Railway (Ireland) constructed a 44 ft. bogie car incorporating a 120 h.p. A.E.C. automotive diesel engine and fluid coupling. A year later the N.C.C. section of the L.M.S. (now U.T.A.) built the first of its Leyland-engined bogie cars at Belfast — Car No. 1 being fitted with twin Leyland petrol engines and torque converters. The first diesel-engined N.C.C. car was outshopped the following year — Leyland power units being again selected.

The interest of railway managements in the economies of diesel coach operation were aroused and specially designed rolling stock began to appear on the main line railways of Britain. Automotive high-speed diesels of light weight and allied transmissions were employed. The cars were produced at the A.E.C. and Leyland plants . . .



# PROGRESS

**I**N 1933 two of the main line railways in Britain took delivery of diesel railcars. These vehicles, totally different in design, nevertheless shared one feature in common — the use of automotive engines and transmissions.

A.E.C. car No. 1 was built at Southall, fitted with a Park Royal Vehicles body and delivered to the Great Western Railway for service in the Thames Valley, it was a fully streamlined 63½ ft. long vehicle of striking appearance and performance seating 69 passengers. No. 1 had in fact a single six-cylinder diesel engine although subsequent cars were double-engined. The vertical 8.8 litre 105 b.h.p. A.E.C. diesel drove through a fluid coupling and epicyclic gearbox the axles of one bogie. A feature of the design was the mounting of all units below floor level supported on cantilevers outside the main frame. The design permitted ease of power-transmission servicing and maintenance without recourse to pits between the rails. This first G.W.R. diesel car weighed 24 tons and was capable of speeds up to 60 m.p.h. the excellence of its design and construction may be judged by the fact that when withdrawn from service in 1955 the car had logged almost 715,000 miles — a remarkable record for a prototype.

Three London Midland and Scottish Railway diesel cars were built by Leyland Motors and were each fitted with a six-cylinder 130 b.h.p. Leyland diesel. Lys-holm-Smith hydro-mechanical transmis-

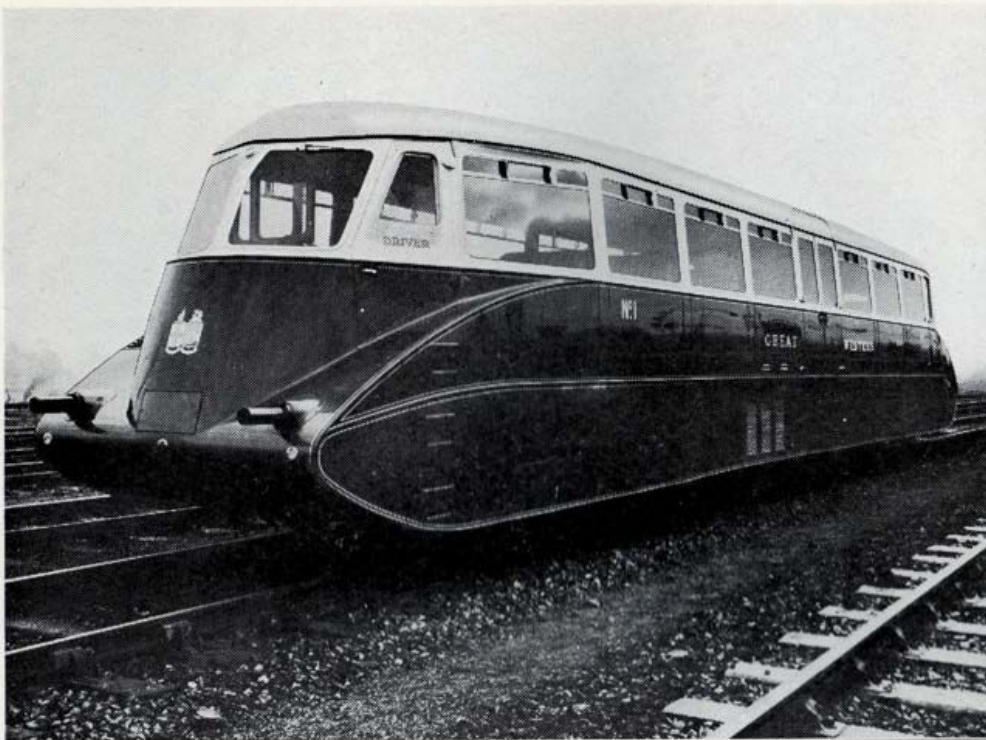
sion of the type used for the Leyland “gearless bus” was employed and control was exceptionally simple. A reversing unit was incorporated in the axle-mounted final drive, direction selection being achieved by a simple switch in the driving cab. Through the medium of magnet valves vacuum was applied to either side of a two-way vacuum cylinder which controlled the reversing mechanism.

L.M.S. cars 22950-2 ran trials over the Preston-Carlisle main line and to quote a contemporary report “their acceleration and climbing abilities over Shap summit proved quite remarkable”. These four-wheelers weighed only 10½ tons and seated forty passengers, they were allocated to Blackburn and provided a frequent service between Spring Vale, Blackburn and Clitheroe, subsequently working from Hamilton, Scotland where they pioneered the way for to-day’s railbuses.

G.W.R. cars Nos. 2, 3 and 4 commenced express passenger operation between Birmingham and Cardiff in 1934 and by 1936 seventeen A.E.C. diesel cars were running on Great Western metals. In Northern Ireland the N.C.C. were operating three Leyland-engined cars by 1936, two of them with raised ‘conning tower’ cabs enabling push-pull working of trailers.

A.E.C. and Leyland experience of main line diesel car design, construction and maintenance initiated well over a quarter century ago has provided BRITISH UNITED TRACTION LIMITED with unparalleled opportunities for research and design improvement. It is an historical fact that the early diesel cars from both plants engendered the vast fleet of British multiple-unit trains running to-day.





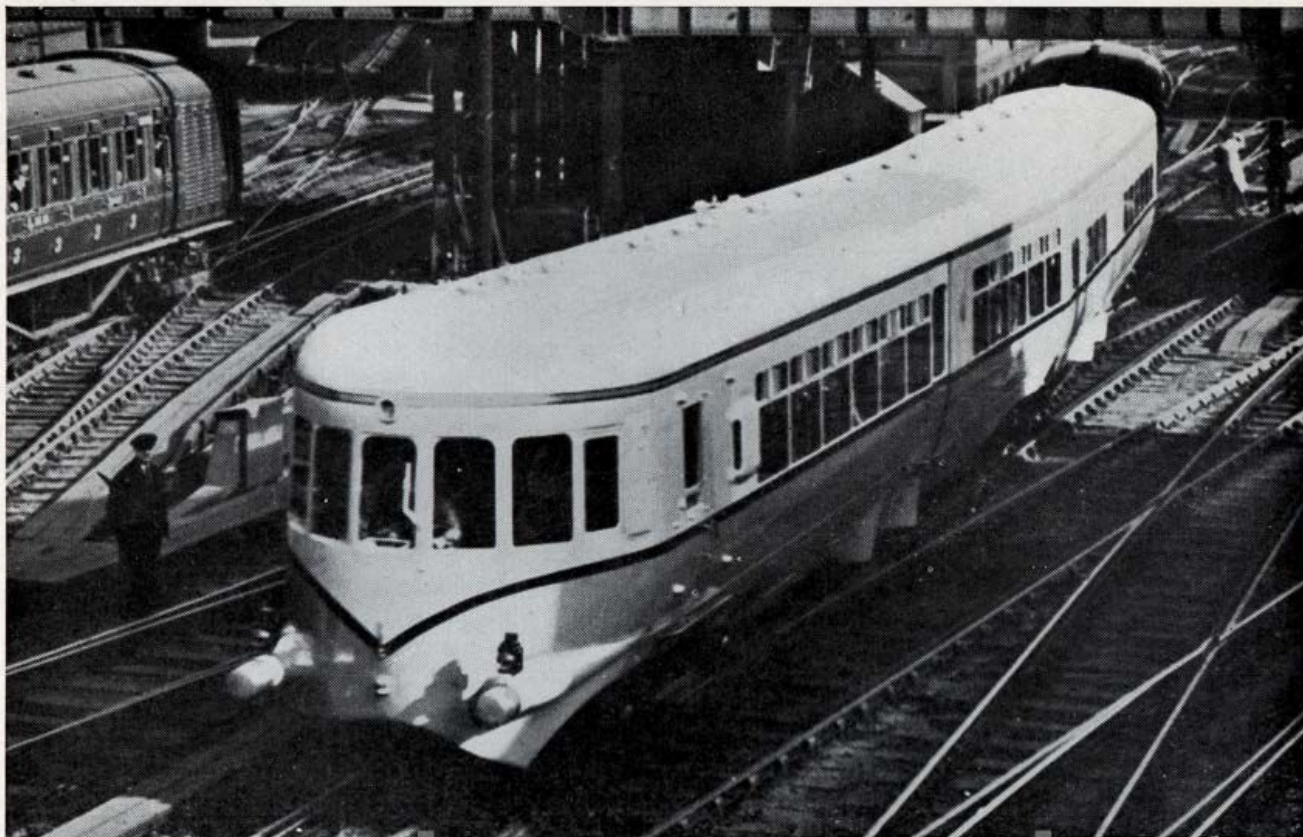
**1933**

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**Leyland**







△ 1938 L.M. & S.R. 3-car articulated train.

1942 G.W.R. 3-car set. ▽





## OPERATING EXPERIENCE



EARLY in 1936 the New Zealand Railways placed their first railcars in traffic and these "Wairapa" Class cars with Leyland petrol engines (later converted to Leyland diesel power) worked over the 1 in 15 grade of the Rimutaka Incline. Later in 1936 cars RM20-21 appeared, being converted Leyland 'Tiger' diesel bus chassis, when withdrawn in 1940 the engines of these cars showed little wear following a half-million miles of arduous service on the 3ft. 6in. gauge. More powerful double-bogie cars using Leyland engines followed.

In England, the Great Western Fleet of solo cars soon attracted more traffic than could be coped with, but A.E.C. designers had considered this possibility and plans were well advanced for the next development. 1937 saw the completion of the 18th car which forecast future trends, being equipped with standard draw and buffing gear and electro-pneumatic controls, enabling multi-unit working and the haulage of tail traffic. The London Midland and Scottish Railway re-entered the diesel train field in 1938 building at Derby a 3-car articulated streamline train powered by six Leyland diesel engines. This train was placed in service on the Oxford-Cambridge line and later on the Midland route between St. Pancras-Nottingham until withdrawn with all other diesel passenger trains at the outbreak of war.

Between 1939 and 1942 the G.W.R. fleet was augmented by 20 new A.E.C. bogie cars and by 1954 well over 17 million miles had been run. Soon after the advent of diesel cars on the G.W.R.

the A.E.C. Co. entered into an agreement with the railway and undertook to maintain the railcars on a mileage basis using A.E.C. staff. This agreement continued long after Nationalisation, ending as recently as 1957 and it is unlikely that any diesel railcar builder can equal this experience.

The Great Northern Railway of Ireland ordered 20 A.E.C. 5ft. 3in. gauge power cars for use with locally converted trailer cars and revenue earning services commenced in June, 1950, some of the steam "Enterprise" services becoming diesel workings in September. Further south, the state transport system of Eire entered the diesel field in a spectacular manner in 1951 with the first of 60 new A.E.C. power cars and by March, 1955, C.I.E. cars were running 1,887,000 miles annually.

In August, 1951 the Ulster Transport Authority placed in service on the Belfast-Bangor Line a three coach experimental train, the end cars of which were fitted with twin A.E.C. 125 b.h.p. *horizontal* diesels. This was followed in 1952 by a successful demonstration run over the same route of a 6-car formation converted from existing centre corridor coaches. The four power cars of this set were equipped with eight horizontal Leyland diesels giving an installed h.p. of 1,000. Results with this train led to the complete dieselisation by 1954 of the Bangor Line using seven 6-car trains, all Leyland powered.



## ACTIVITIES EXTEND

**A**LLEN & CO. N.V. of Rotterdam, Holland, built 30 single and 46 twin-coach articulated railcars with a designed top speed of 75 mph, which were introduced on the Netherlands Railways in 1953. The single cars were fitted with a pair of horizontal A.E.C. 200 bhp pressure-charged diesels whilst the twin sets had a single engine per car. Electric transmission was employed with high-speed traction motors driving the axles through cardan shafts.

1953 witnessed the formation of the Diesel Train Division of BRITISH UNITED TRACTION LIMITED and the extensive knowledge and experience gained over the years by A.E.C. and Leyland in the specialised field of rail traction was merged under one control.

Allen & Co. supplied in 1954 a fleet of diesel-electric railcars to Portugal, 25 cars for the 5ft. 6in. gauge and 10 for the metre gauge lines of the Cia dos Caminhos de Ferro Portugueses — B.U.T. 200 b.h.p. diesels being selected.

The Western Australian Government Railways took delivery in 1954 of 22 class ADG and ADH diesel cars for suburban and country services respectively. The power for each of these 3ft. 6in. gauge railcars was provided by twin 9.6 litre B.U.T. horizontal diesels. The cars replaced steam trains on the Fremantle-Perth-Bellevue and Perth-Armadale services in November of 1954.

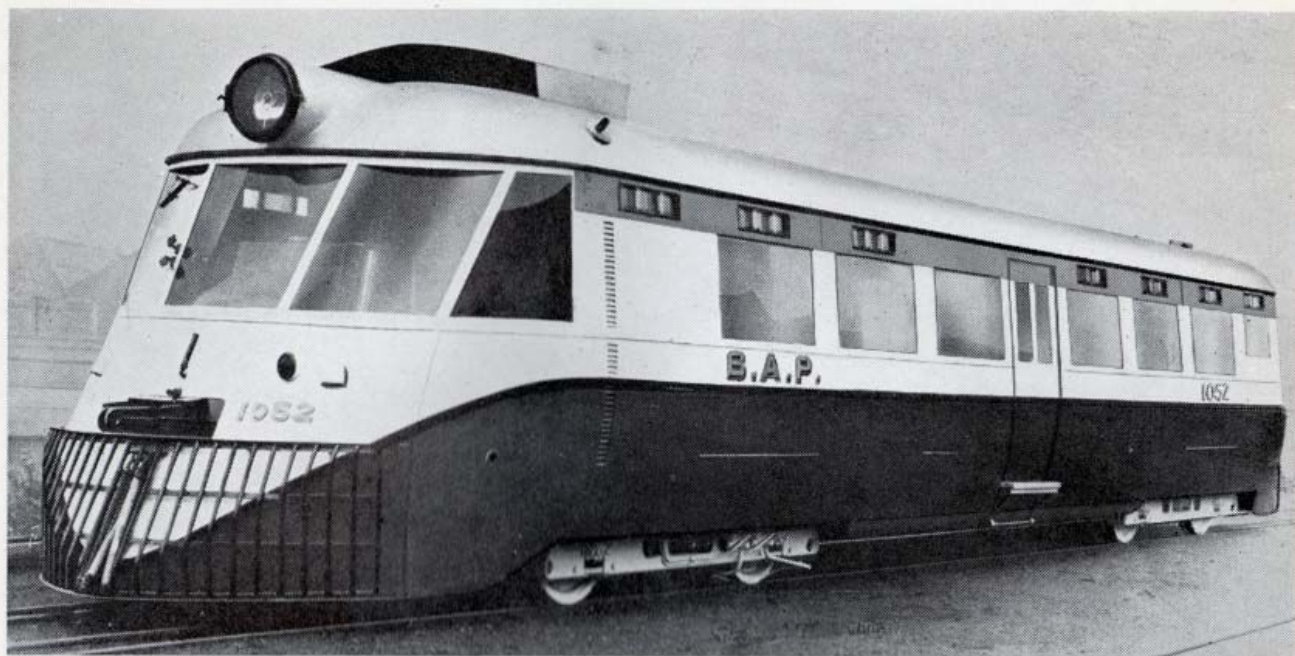
Introduction of B.U.T. diesels to an-

other 3ft. 6in. gauge Australian railway followed in 1956 when Queensland Railways placed in service two stainless steel "1900" series hydraulic-drive railcars powered by twin B.U.T. A219 engines, followed by two "2000" class aluminium cars built at Ipswich Shops each equipped with a single B.U.T. 9.6 litre horizontal diesel driving through an epicyclic gearbox.

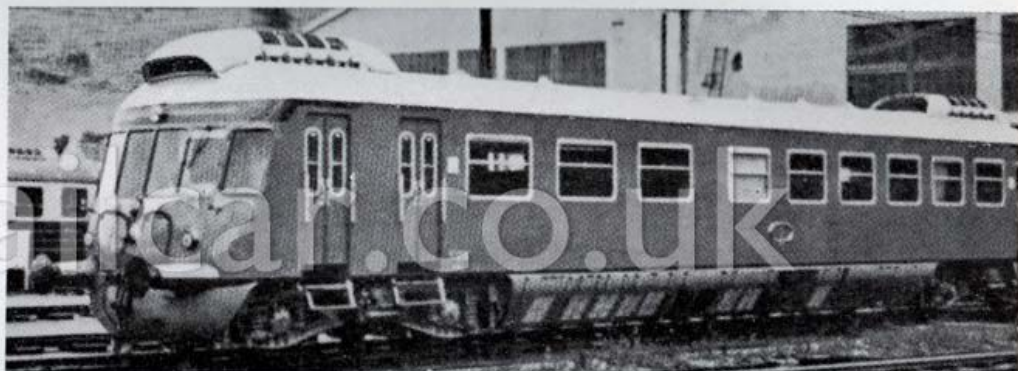
The introduction of Ulster Transport Authority diesel trains between Belfast and Londonderry took place during 1958. Each railcar was fitted with a B.U.T. 275 b.h.p. horizontal turbo-charged diesel. These "multi-purpose" railcars can work passenger and mixed-traffic during the day and goods trains by night. The specially developed transmission system driving both axles of one bogie ensures constant rail horse-power at all car speeds. Initially, eight power cars were built, a further nineteen being authorised at the end of 1958 followed by three more in 1959 and increased operating flexibility has been realised over a line where freight traffic did not justify the use of diesel locomotives. Fast diesel expresses now cover the distance of 92.8 miles of heavily graded line two-thirds of which are single track, in 110 minutes inclusive of five stops.

Increased suburban traffic in the Perth area of Western Australia is now being met by ten new class ADX railcars built at Midland Junction workshops incorporating twin B.U.T. 150 b.h.p. diesels. The first of these entered service in August, 1959. Co-operation between W.A.G.R. and B.U.T. Ltd. has made possible multi-unit operation of new and earlier types of cars.





1937  
Argentina



1954  
Portugal

1959  
Western Australia



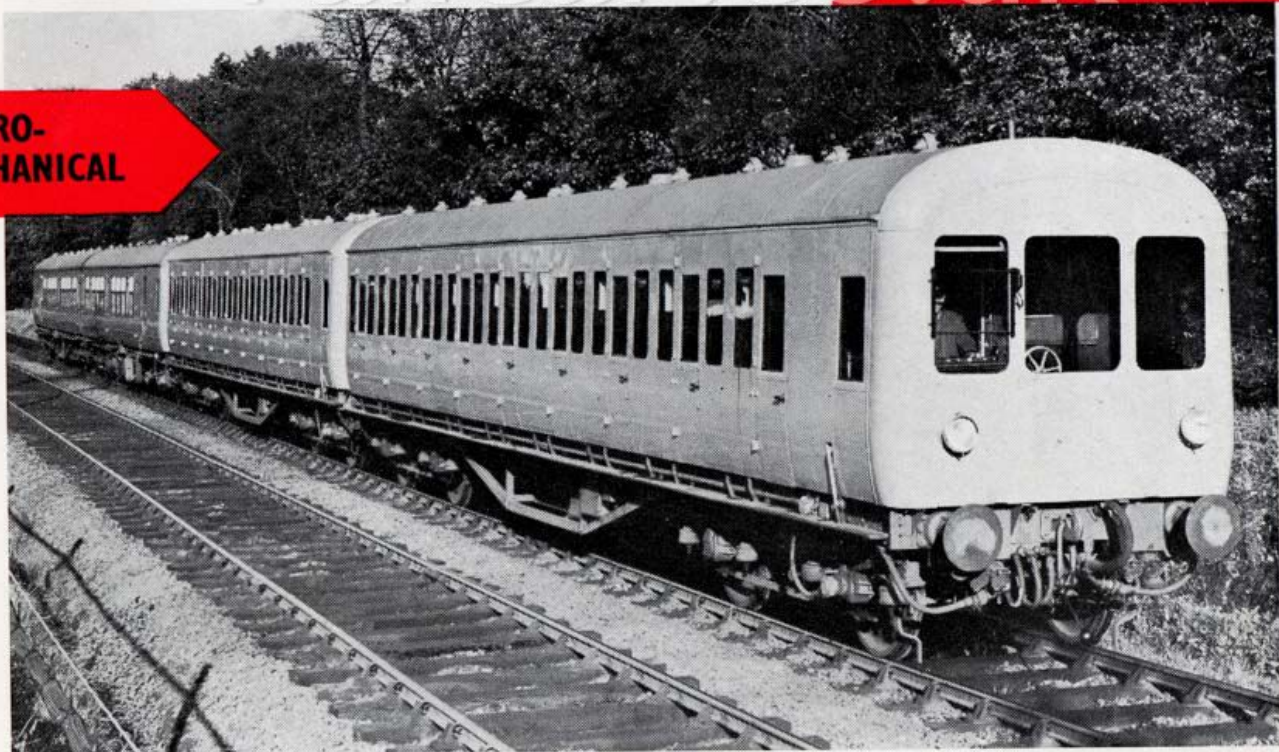


**HYDRAULIC**



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**HYDRO-MECHANICAL**







**MECHANICAL**

**MISSIONS**

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**ELECTRIC**



# BRITISH RAILWAYS

**T**WENTY-ONE years after the first A.E.C. and Leyland diesel railcars commenced operating, new diesel trains left the Derby Works of British Railways. In 1954 B.U.T.-equipped trains for the West Riding of Yorkshire were built followed early in 1955 by similar sets for West Cumberland. Today there remains hardly an area which has not seen this new type of passenger train. The traction equipment comprises twin under-floor horizontal engines and transmissions driving the inner axle of each bogie.

The majority of British Railways' multiple-unit diesels are fitted with engines, transmissions and controls supplied by **BRITISH UNITED TRACTION LTD.**

Single-engined railbuses, single unit parcels and passenger cars and twin-engined power cars with trailers operating in 2, 3 or 4 car sets as trains of up to 12 cars all have this standard equipment.

Extensive suburban schemes are in operation around most of the great cities whilst the latest cars are fitted with twin B.U.T. 230 bhp engines. Branch lines are served from Inverness in Scotland to Penzance in the south-west of England and there are Inter-City type cars operating between Edinburgh, Glasgow and Stranraer, as well as Liverpool and Hull. Long distance journeys between Birmingham and Carmarthen, 183 miles, are undertaken daily throughout the year.

From the very commencement of the diesel car services their revenue earning

ability has been outstanding, during the initial year's operation of the Leeds-Barnsley service for example receipts rose by 400%. On the line between Darlington and Saltburn passenger journeys rose by 28% and receipts by 40%. Traffic is often increased annually. Sir Brian Robertson, speaking at Birmingham in 1959 made it known that the number of passengers using the Birmingham diesel suburban services of the London Midland Region rose by 31,000 in January 1959 compared with January 1958. Where diesel car trains are being used British Railways passenger receipts despite competition are more than holding their own.

Diesel cars of the London Midland Region during the course of a recent month carried 1,202,000 passengers — an increase of 234,000 on the total for the same services in the corresponding month of the previous year, whilst in Scotland the Glasgow-Edinburgh buffet car trains carried no less than 700,000 *extra* passengers during the first year of operation.

At the end of 1954 there were 16 B.U.T.-powered diesel cars in British Railways service whilst today there are over 1,700. The 9th Annual Report of the Central Transport Consultative Committee recorded that where diesel trains have been brought into operation "remarkable improvements have nearly always occurred in the frequency of the service, in time-keeping, in receipts and reduction of costs".





RESULTS

“Quality Means Business” — so said the Chairman of the British Transport Commission visiting Birmingham in 1959. On the Birmingham-Lichfield line he announced, journeys had increased from 32,000 monthly when there were steam trains, to more than 95,000.



RESULTS

Receipts Continue to Rise — diesel multiple-unit trains on the London Midland Region, in a particular month of 1959 carried 1,202,000 passengers, an increase of 234,000 on the total for the same services in the corresponding month of 1958.

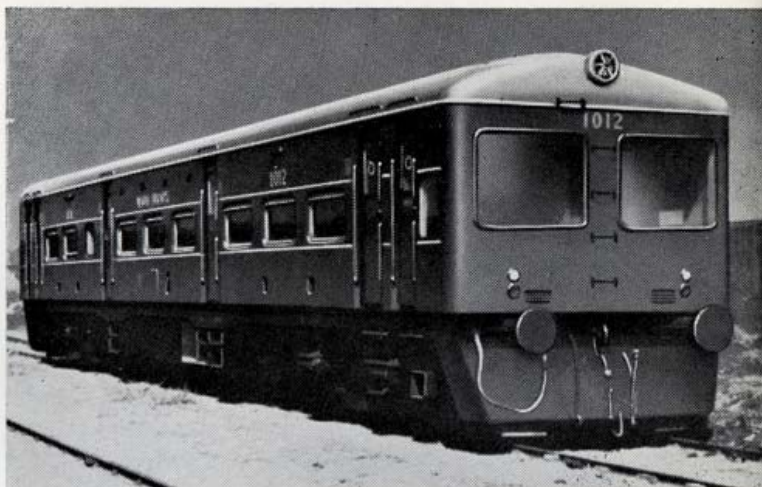
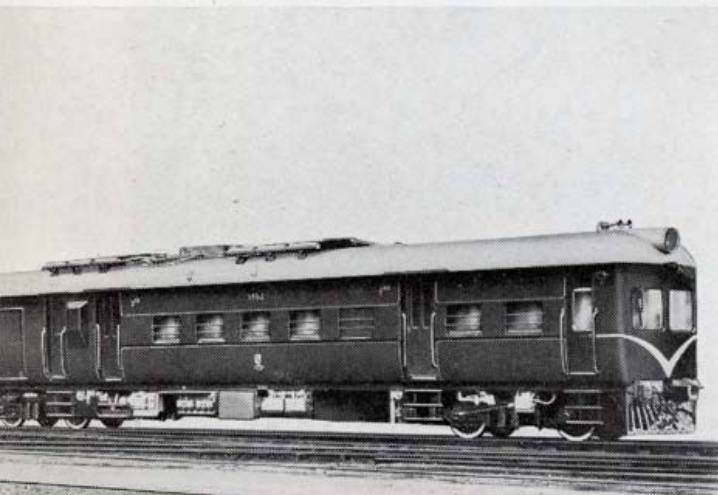


## OVERSEAS

AS mentioned earlier **BRITISH UNITED TRACTION LIMITED** and its associate companies have supplied railcar power, transmission and control equipment to many overseas railways. B.U.T. railway diesels are today operating under the varied conditions existing in Africa, India, Australia, Europe, South America as well as within the Arctic Circle.

Recent contracts include complete power and transmission sets for broad gauge railcars for the Southern and Northern Railways of India. Each 70 ft. long motor car accommodates 82 seated passengers and is powered by two 900 Series B.U.T. horizontal diesels. The Southern Railway cars work extensive services over main and branch lines in the Bezwada Division, being maintained at Cocanada in the State of Andhra Pradesh. Cars on the Northern Railway are serviced at Shakurbasti (Delhi) and at Jullundur in the Punjab. Availability figures of 99% have been recorded by

1960 Nigeria.



1958 India

the Northern Railway.

Two-car trains for the Nigerian Railways 3ft. 6in. gauge system have recently been delivered by the Drewry Car Co. Ltd. in association with the Birmingham Railway Carriage & Wagon Co. Ltd. and comprise a motor car and driving trailer car. These are the first diesel multiple-unit sets to enter service in British West Africa and the traction equipment was supplied by **BRITISH UNITED TRACTION LTD.** The powered cars are fitted with twin 230 h.p. B.U.T. horizontal diesels and Wilson gearboxes similar to the Indian railcars.

Across the South Atlantic the Brazil-Bolivia and Venezuela National Railways both operate railcars built in England and powered by twin B.U.T. diesels.

The Queensland (Australia) Plant of Commonwealth Engineering have under construction twenty 2000 class 3ft. 6in. gauge railcars for the Queensland Government Railways, each with single 150 b.h.p. B.U.T. diesel, transmission and control equipment. Co-operation between carriage builders, railway and B.U.T. has ensured that the new cars will operate in conjunction with the two earlier 2000 Series cars.



# SHUNTERS



175 h.p. 0-4-0.

FIFTY-FIVE years ago a Maudslay 0-4-0 shunting locomotive built for the City of London Corporation entered service at Deptford. Powered by an 80 h.p. three-cylinder petrol engine this locomotive was equipped with Westinghouse brakes. This early industrial shunter featured a centre cab and low bonnets, an arrangement now finding considerable favour for transfer and yard work. During the intervening half-century A.E.C. and Leyland have supplied power units for industrial shunters and a 1938 A.E.C.-built oil-engined shunting locomotive is still at work at the Southall Plant where it has carried out all works shunting requirements for over 22 years.

Among varied locomotive applications can be mentioned the Leyland 0350 diesels supplied by B.U.T. and fitted into North British flame-proof mines locomotives for service underground with the Rhokhana Corporation Ltd. in Rhodesia, and the auxiliary A.E.C. engines fitted to the Fell main line locomotive built at Derby Works in 1951. In 1953 the New Zealand Government Railways placed in

service five class "Eb" diesel-electric shunting locomotives all of which were equipped with A.E.C. six cylinder vertical diesels coupled to 65 kW generators.

Recent locomotive installations of B.U.T. diesels have included a considerable number of normally aspirated and turbo-charged series 900 vertical engines to 4 and 6-coupled shunters built by the old established concerns — John Fowler & Co. (Leeds) Ltd., and F. C. Hibberd & Co. Ltd. Recently B.U.T. have been awarded a contract to supply 44 900 Series diesels for diesel-electric shunting locomotives to be built by the New Zealand Government Railways. Each of these shunters will be fitted with two diesel engines and the locomotives are to be erected in the Railways' own workshops.

The B.U.T. range of diesels can be studied by turning the page . . . . .

230 h.p. 0-4-0.





# POWER

THE present range of B.U.T. diesel engines produced for rail traction duties is tabled on the opposite page. All



engines are of the four - stroke single-acting type and the majority are available in vertical or horizontal form. BRITISH UNITED TRACTION LIMITED supply complete transmission and control sets and B.U.T. diesels are supplied with any form of transmission—electric, mechanical, hydraulic or hydro-mechanical.

B.U.T. engines reflect the extensive diesel experience of their associate companies A.E.C. and Leyland, designs having been thoroughly proved under the most arduous conditions before being made available for traction purposes.

Several engines in the range are available in normally-aspirated or turbo-charged versions, B.U.T. turbo-charged diesels have been employed successfully in traction service both at home and overseas.

With unrivalled experience of the problems facing railcar and locomotive builders BRITISH UNITED TRACTION LIMITED have established a reputation for close co-operation with designers and have staff available to assist both railcar and locomotive builders.

Prices of power units vary according to the auxiliary equipment required but can always be obtained against specific enquiry.

**150**



**230**

**275**





# CURRENT RANGE

\*Weight with oil, water and fluid coupling.

†Turbo-charged.

Series	Form Vertical Horizontal	Cylinders		Max. BHP	Max. RPM	Torque lb/ft.		Approx. Weight lbs.
		No.	Bore & Stroke Ins.			Max. at r.p.m.		
A312	V	4	4.41 5.12	75	2000	218	1200	1008
UE350	V & H	6	3.96 4.75	96	2400	250	1400	1210
UE375	V	6	4.1 4.75	106	2400	280	1200	1250
RE600	V & H	6	4.8 5.5	125	1800	380	1400	1900
A590	V & H	6	4.72 5.59	136	2000	430	1000	1670
RE680	V & H	6	5.0 5.75	150	1800	475	1150	2082*
A220	H	6	5.12 5.59	150	1800	490	1300	2082*
AV690	V	6	5.12 5.59	150	1800	512	1100	1670
RE902	V & H	6	5.5 6.5	230	1900	708	1150	2828
A1100	V & H	6	6.125 6.125	275	1900	890	1300	2912
RETS902†	V & H	6	5.5 6.5	275	1800	840	1200	3000
ATS1100†	V & H	6	6.125 6.125	360	1900	1180	1200	3000



# SERVICE

## AFTER SALES

THE standard of B.U.T. after-sales service is in accord with the high traditions of Leyland and A.E.C. and the Service Department is staffed principally by engineers from the associate companies. B.U.T. field staff are well versed in the operation of diesel traction units in many parts of the world and have contributed in no small measure to the success of the 4,400 B.U.T. diesel engines ordered by British Railways.

At Leyland, Southall and several other centres BRITISH UNITED TRACTION LIMITED operates training schools each with a curriculum specially arranged for railway staff. In recent years several hundred railway artisans and supervisors have passed through these schools. In some instances where it proved impracticable to send overseas railway staff to England, B.U.T. took the school to the railways concerned and provided instruction courses 'on site' a gesture that was greatly appreciated by all concerned.

Service staff are always available at the

request of B.U.T. operators at home and overseas whilst service executives of the Company are prepared to give advice and practical information to those responsible for the operation, maintenance and overhaul of equipment. A comprehensive range of technical literature has been produced from maintenance handbooks to complete management guides whilst wall charts illustrating engines, gearboxes and other transmission units are readily obtainable.

A world-wide organisation offering service facilities exists and over 200 A.E.C. or Leyland overseas branches, distributors and official repairers are established throughout the world. B.U.T. provide a comprehensive spare parts service both at home and overseas and 'off the shelf' supplies are available for all standard unit spares. For railways who prefer to hold their own stocks, special spares scalings to cover any period required are provided.

B.U.T. rail traction diesel engines can be supplied on a unit-exchange basis at attractive prices which can be quoted against specific enquiries. Through this scheme the railway receives at a special price a re-manufactured diesel engine built to the same rigid standards as a new unit and carrying a guarantee 'as new', in exchange for the used engine.



SERVICE



# PLANTS



One of the four main plants.

**Leyland**

Chorley Service Dept. Stores.





# PLANTS



Southall main plant.



Engine Reconditioning Shop, Service Dept.





**BRITISH UNITED TRACTION  
LIMITED**  
**96 PICCADILLY, LONDON,  
ENGLAND**

*Cables: BRITROL, LONDON. Telephone: GROsvenor 7121*