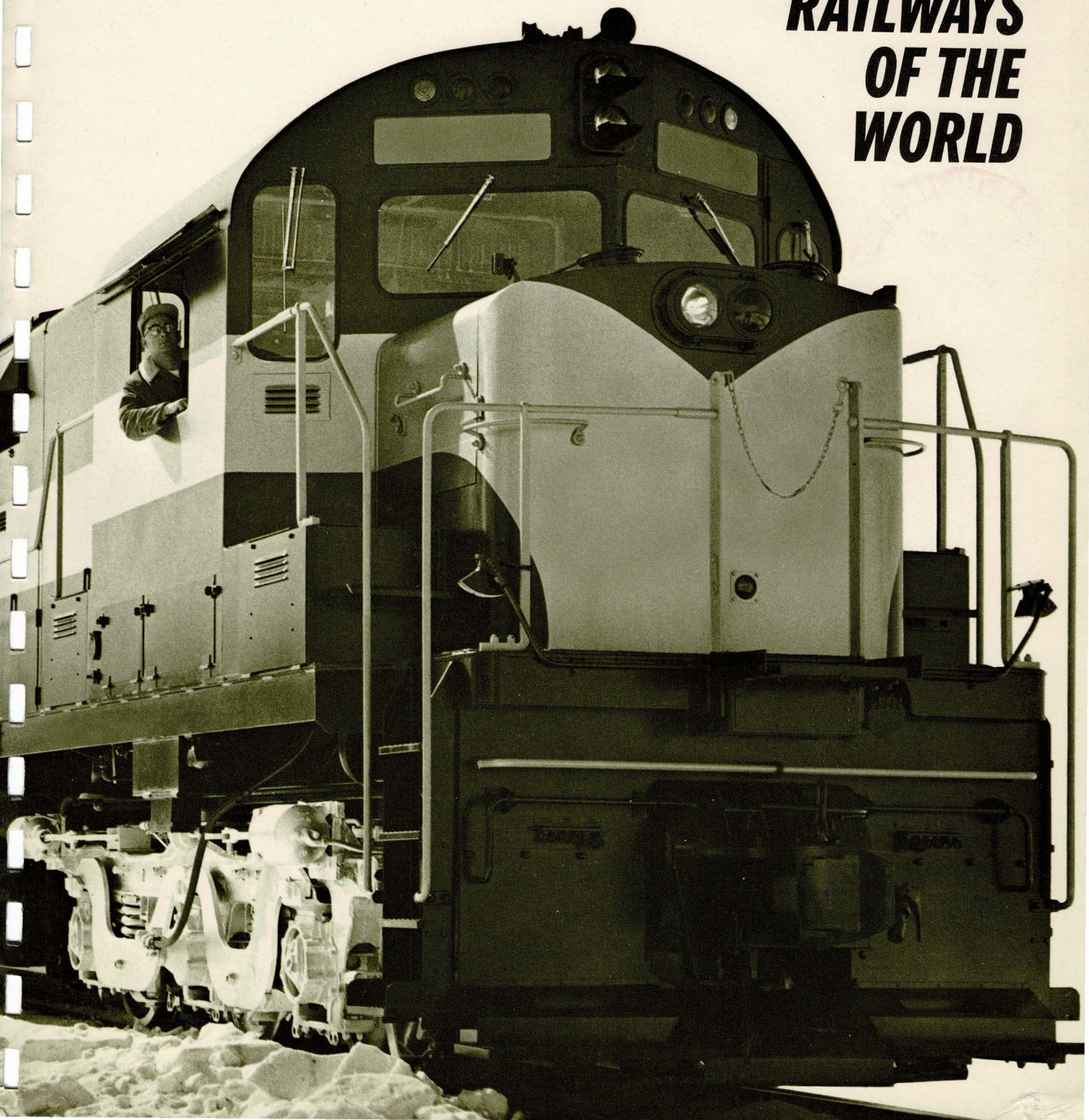
ALCO

ALCO LOCOMOTIVES FOR THE RAILWAYS OF THE WORLD



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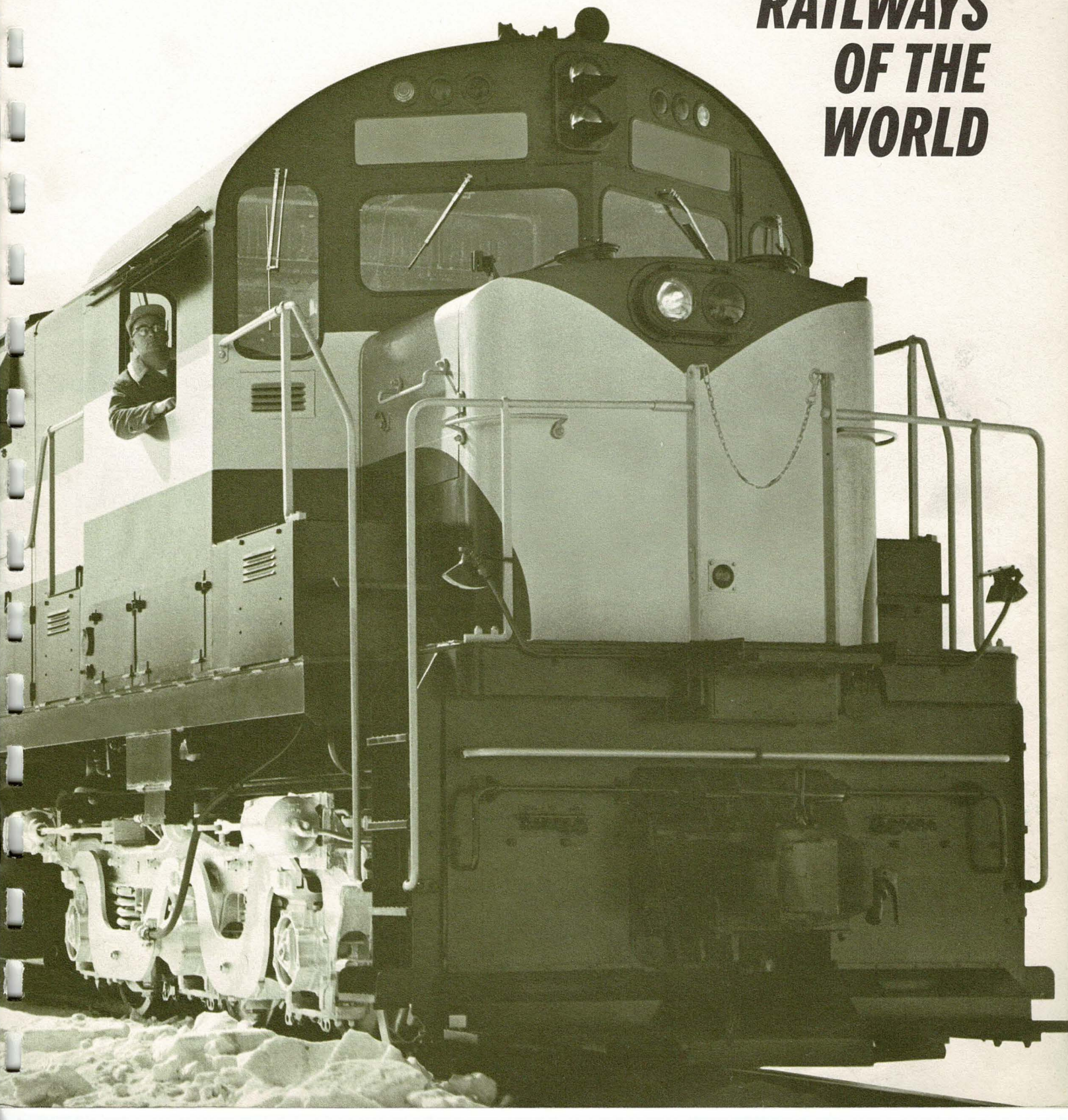


An Alco DL-560 locomotive, wrapped in a protective cocoon, is hoisted from a Port of New York pier. Destination: India.

ALCO POWER FOR THE RAILWAYS OF THE WORLD

The ALCO line of diesel-electric locomotives ranges from 1065 CV (1050 HP) to 3090 CV (3050 HP).

40 years of experience in building diesel-electric locomotives and 116 years of continuous locomotive production stand behind the ALCO name. During this period of time, ALCO has contributed a number of significant "firsts" to locomotive technology.

Currently, ALCO is producing the world's most powerful diesel-electric locomotive, the Century 855. Powered by two 251-C diesel engines, it will develop 6100/5500 HP (6180/5580 CV).

In 1964, ALCO will produce, road test and deliver the first American-built diesel-hydraulic locomotive to a major U. S. railroad. The unit, powered by two ALCO 251C diesel engines, is rated at 4300/4000 HP (4360/4060 CV).

Major railways on every continent are using ALCO standard diesel-electric locomotives in ever-increasing numbers. Actually, more than 1600 ALCO diesels have been shipped to railways outside the continental United States and Canada.

Significantly, over 3,800,000 CV of ALCO mainline power is presently at work on railways of the world.

CONTENTS

ALCO...WORLD'S LARGEST EXPORTER OF MAINLINE LOCOMOTIVES

ALCO's leadership in designing and building high-power locomotives for the world is unchallenged. By the beginning of 1964, ALCO, its associates and licensees had installed more than 2100 mainline units averaging 1815 CV (1790 HP), a total of more than 3.8 million CV currently in service overseas.

In recognition of this achievement, the United States Government presented ALCO with the coveted "E"—for —Export Award. To quote the citation in part: "By developing, manufacturing and exporting diesel-electric locomotives to free world nations, ALCO Products, Inc. is making a notable contribution to the industrialization and economic growth of five continents."

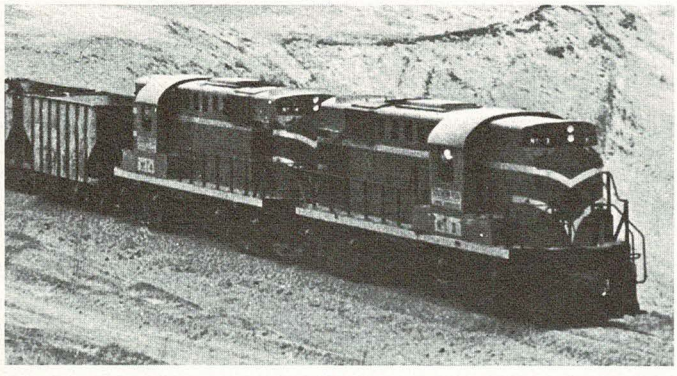
Users of ALCO Locomotives:

Algeria	Algerian Railways
Arabia	Saudi Arabia Government Railways
Argentina	F.C. General Belgrano
	F.C. General Mitre
	F.C. General Sarmiento
	F.C. General San Martin
Australia	Silverton Railways
	New South Wales Government Railways
	South Australia Government Railways
Brasil	F.C. Central do Brasil
	E.F. Cearense
	E.F. Nordeste
	E.F. Leste Brasileiro
	E.F. Goias
Chile	State Railways
Cuba	Consolidated Railways of Cuba
	Nickel Processing Company
Greece	Hellenic State Railways
India	Central Railway
	Eastern Railway
	Northeast Frontier Railway
	Southern Railway
	South East Railway
Mexico	National Railways of Mexico
Mexico (cont.)	Ferrocarril Mexicano
	Altos Hornos de Mexico S. A.
	Cia. Fundidora de Hierro y Acero de Monterrey
	F.C. del Sureste
	F.C. Sonora Baja California
	F.C. Pacifico
	F.C. Chihuahua-Pacifico
	Secretaría de Marina
	Cia, de Cementos de Mixcoac
Pakistan	Pakistan Western Railway
Panama	Panama Canal Company
Peru	F.C. del Sur (Peruvian Corporation)
	F.C. Central (Peruvian Corporation)
	Southern Peru Copper Corporation
Portugal	Portuguese State Railways
Sierra Leone	Sierra Leone Development Co., Ltd.
Spain	Red Nacional de los Ferrocarriles Españoles
The United Kingdom	Steel Company of Wales
Uruguay	State Railways Administration

Users of ALCO Diesel Engines on Locomotives Built by Other Manufacturers:

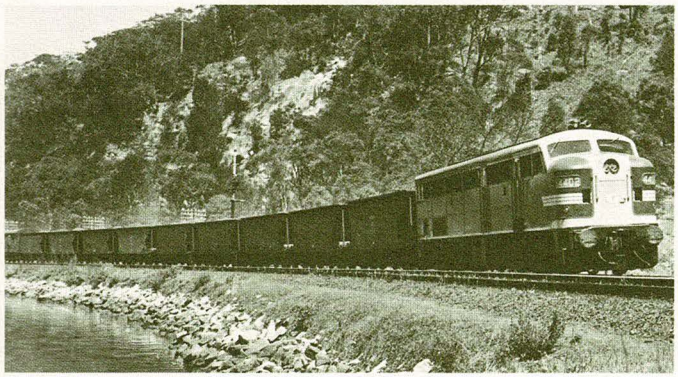
U.S. Army
Yukon and White Pass Ry. (Alaska)
New South Wales Government Railways (Australia)
United Fruit Company (Guatemala)
Otraco, (Belgian Congo)
State Railways, (Uruguay)
Indonesian Railways
Central Railway of Brasil
Parana Santa Catarina Railway, (Brasil)
General Belgrano Railway, (Argentina)
Consolidated Railroads of Cuba
State Railways of Chile
Ferrocarril del Pacifico, (Colombia)

ALCO DL-531 unit hauling a passenger express across the Peruvian Andes at 14,688 feet above sea level. Other ALCO units operate efficiently in Peru at altitudes in excess of 16,500 feet.

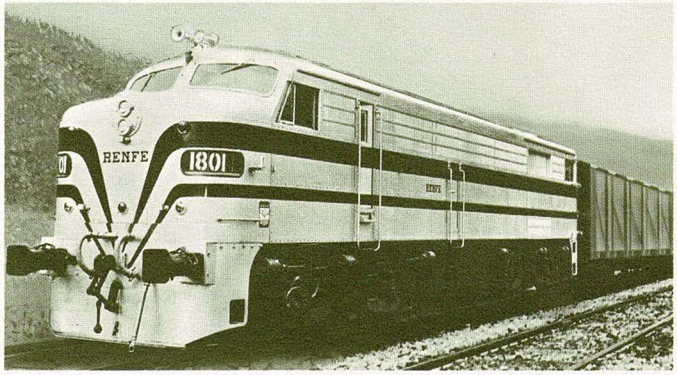


Two ALCO DL-701 locomotives haul long copper mineral train on the lines of Southern Peru Copper Corp., at 10,000 ft. altitude.

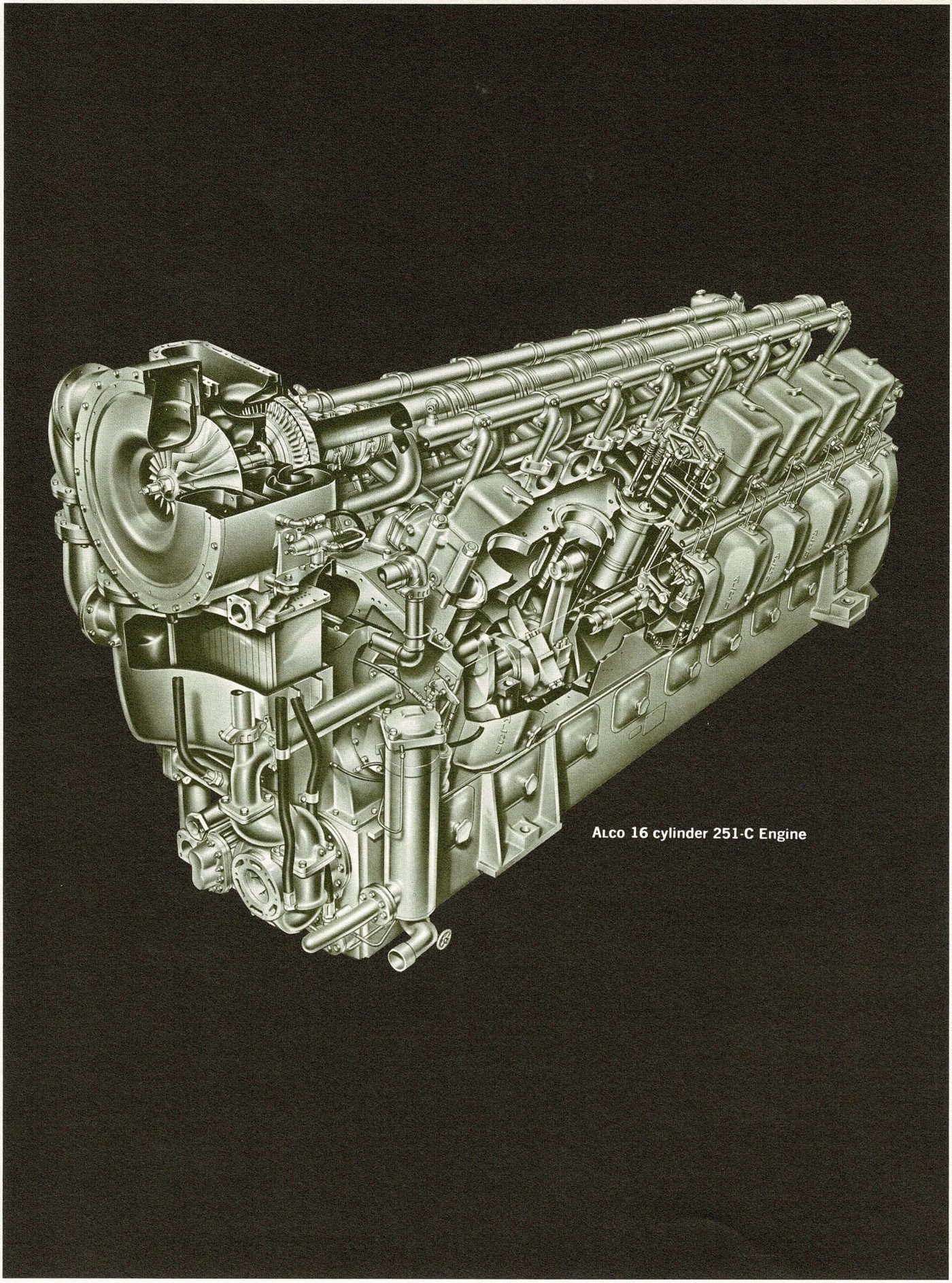
Heavy passenger express, hauled by ALCO "World" locomotive, leaves Retiro Station in Buenos Aires, Argentina.



DL-500 "World" locomotive hauls mineral train up 2½ per cent grade on Hawkesbury River bank, New South Wales, Australia Government Railway.



ALCO DL-500 "World" locomotive in heavy freight service in Spain.



ALCO 16 cylinder 251-C Engine

ALCO 251 DIESEL ENGINES

Universally recognized as a reliable source of power, the ALCO 251 diesel engine affords high specific output with low specific fuel consumption. It employs the four-stroke cycle, is highly turbosupercharged and aftercooled. Its bore is 9 in.; stroke, 10½ in.

The 251 engine is built in three sizes, as follows:

In-line six cylinders, rated from 1065 CV to 1370 CV (1050 BHP to 1350 BHP).

Vee 12 cylinders, rated from 1980 CV to 2180 CV (1950 BHP to 2150 BHP).

Vee 16 cylinders, rated from 2630 CV to 3090 CV (2600 BHP to 3050 BHP).

Since 1956, all ALCO locomotives have been powered by Model 251 diesel engines . . . the end result of forty years experience in designing and building medium and large size four-stroke cycle engines.

To date, more than 3,000 251's have been built. Together with its famed predecessor, the ALCO 244, they jointly account for over 15,000,000 HP in service on railways on every continent.

In heavy duty service, ALCO 251 engines have logged approximately 800,000 Km. (500,000 miles) before original piston rings, main and connecting rod bearings were replaced.

Advance-designed for anticipated future requirements, the 251 satisfies an increasing demand for higher specific outputs.

Engines of the "D" series, rated at 225 hp per cylinder, have performed exceedingly well under both extreme desert and high altitude conditions, without any loss of reliability or increase in wear rate.

These gratifying performances result from such engineered features as:

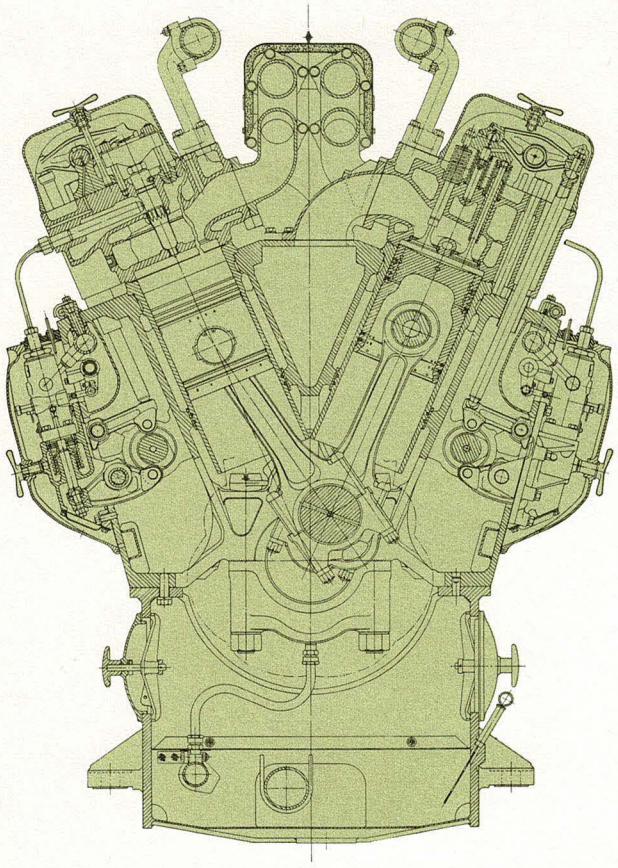
Exhaust gas turbine driven turbosuperchargers of high adiabatic efficiency.

Effective charge air cooling, by finned tube air to water heat exchangers in the B and C Series; and cross-flow, cell-shaped passages air to air aftercoolers in the D Series. All resulting in optimum air to fuel ratios. Lower mean and peak cycle temperatures. Improved combustion efficiency. Lower fuel consumption.

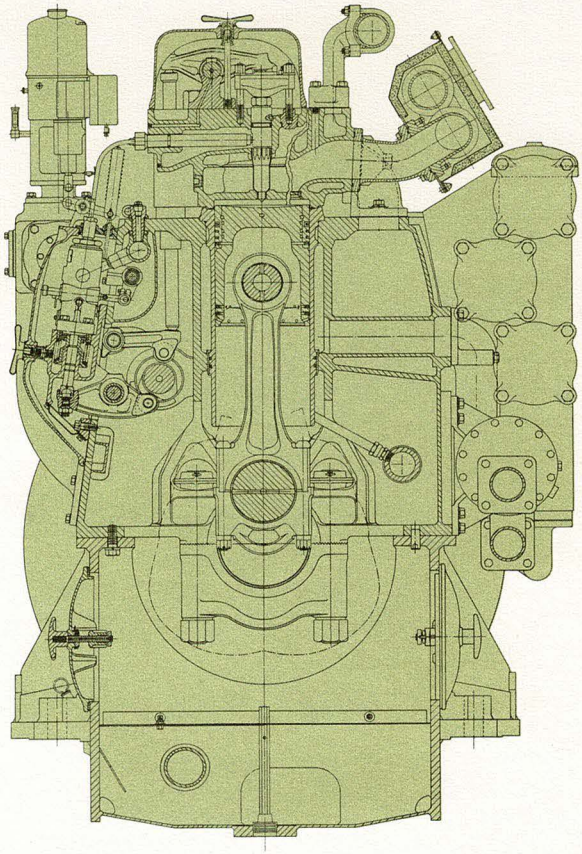
Honeycomb chrome-plated cylinder liners contribute significantly to low wear rates. Inside dimensions within manufacturing tolerances have been repeatedly recorded even after 1,000,000 Km. (620,000 miles) of heavy duty service.

Head to liner joint is a metal to metal fit. Avoiding the use of gaskets or softer joints in an area where they are subject to extreme pressure and temperature conditions. A ring sleeve is applied at the lower liner-to-block seat, allowing easy replacement and greatly increasing the economic life of the cylinder block.

Valves, whether intake or exhaust are interchangeable. Stellite valve heads and replaceable seat inserts on the cylinder heads ensure long service between maintenance periods. Easy and inexpensive replacement of cylinder components where maximum wear takes place.



ALCO 12 cylinder 251 Vee Model Cutaway



ALCO 251 In-line 6 Model Cutaway

Fuel pumps and drives are mounted outside the block, preventing dilution of crankcase oil in the case of a leaky pump. Rocker arms are readily accessible for easy adjustment of valve tip clearances. Each cylinder assembly has individual, single-knob-closed, aluminum covers both for fuel pump and for cylinder head assemblies. The result: maximum protection against foreign matter. Minimum time lost during maintenance operations.

Oil-cooled aluminum pistons reduce crown temperatures. Internal grooves, in which cooling oil circulates, act as heat shields that protect compression rings and prevent sticking.

Replaceable ring carrier with wear resistant Ni-Resist top ring seat insert is shrunk on the piston body. This insert provides maximum ring carrier life. The replaceable carrier extending through the area of maximum wear permits re-use of the piston body, reducing piston replacement cost by as much as 75%.

Cylinder heads are made of close-grain cast iron nickel alloy. Easily removable without disturbing other components of the power assemblies.

Engine block is a fabricated structure of forged and fabricated steel, of exceptionally high rigidity, machine welded and stress relieved. Jig boring of camshaft and crankshaft seats in a special machine, ensures perfect alignment of these components.

Engine base is a welded steel structure, with individual inspection cover and oil sump screen.

Steel-backed copper-lead alloy bearings are used throughout. Grooveless bearing shells are used where oil film thickness is important for long engine life, such as the upper and lower center main bearing shells and the upper half of the connecting rod shells. Center main journal is longer than others to provide for the higher inertia forces that act on it.

Forged steel single-piece crankshaft is surface-hardened and counterbalanced, has oil passages from journals to crankpins, except for the more heavily loaded center main bearing which has its own oil supply for additional film thickness.

Four point mounting utilizes pairs of engine support pads located at the nodal points of the engine deflection curve. No vertical reactions occur at these points. The engine is isolated from its supporting structure for dynamic effects.

Camshafts are made of several carbon steel sections with hardened cams and replaceable bearings.

New exhaust manifolds improve the flow of exhaust gas to the turbosupercharger inlets. Result: Lower temperature and increased combustion efficiency. Together with these performance gains, metallurgical and section-to-section design advances result in longer life, easier application and less maintenance.

General Characteristics, ALCO 251 Diesel Engine

Cycle	Bore	Stroke
4 Stroke, turbosupercharged with charge air cooling	228 mm (9 inches)	267 mm (10½ inches)

Engine Characteristics and Ratings* for Railway Service

Series	B			C		D
No. of Cylinders	**6**	**12**	**16**	**12**	**16**	**6**
Horsepower (Gross)	1050	1950	2600	2150	3050	1350
CV (Gross)	1065	1980	2635	2180	3090	1370
HP/Cylinder	175	162.5	162.5	179.2	190.6	225
CV/Cylinder	177.4	164.8	164.8	181.7	193.2	228
RPM	1025	1000	1000	1025	1050	1100
Piston Speed fpm	1795	1750	1750	1795	1838	1925
Piston Speed m/s	9.12	8.89	8.89	9.12	9.34	9.78
Brake Mean Effective Pressure, psi	202.5	192.5	192.5	207	215	242
Kg/cm²	14.24	13.54	13.54	14.56	15.12	17.02
Swept Vol. per Cylinder, in.³	668	668	668	668	668	668
litres	10.95	10.95	10.95	10.95	10.95	10.95
Total Swept Vol., in.³	4008	8016	10688	8016	10688	4008
litres	65.70	131.40	175.20	131.40	175.20	65.70
Weight, engine alone, dry-lbs.	22,100	32,650	42,000	33,000	42,000	23,250
Kg.	10 011	14 790	19 026	14 950	19 026	10 532
Compression Ratio	12.5:1	12.5:1	12.5:1	12.5:1	12.5:1	12.5:1

*The above ratings are based on sea level, 736 mm. Hg. (29.92 in.), 16°C. intake temperature (60°F.) and fuel of 10 850 Cal/kg. higher calorific value (19,500 BTU/lb. higher calorific value) meeting ASTM 2-D specification.

ALCO CAST STEEL FULLY EQUALIZED TRUCKS FOR EVERY TYPE OF SERVICE

High adhesion and fine riding quality is a feature of all ALCO locomotives. This is accomplished through the use of cast steel fully equalized trucks, a basic component of each ALCO locomotive.

Trimount trucks are being used on 996 ALCO locomotives that are in service throughout the world.

Two Axle, Two Motor Truck

ALCO's two axle, two motor truck with cast steel frame and bolster and double suspension, offers excellent riding qualities up to very high speeds.

A simpler, lighter, swing-swivel single suspension design provides an economical solution for lighter weight locomotives in moderate speed service.

Trimount Type Truck

Built in various sizes, with several foundation brake arrangements, the ALCO Trimount Truck offers several advantages. Short wheel base. Light weight. Excellent riding qualities up to 128 Km/h (80 mph).

The cast-steel frame receives the locomotive weight on a conventional pivot toward one end, and on two loading surfaces at the other. The effect of this three-point loading is that of a large-diameter center pivot. It greatly minimizes the weight transfer caused by motor-torque reaction.

The locomotive loading pads, riding in an oil bath, have a marked dampening effect. This feature makes this truck outstanding for its lack of lateral or "hunting" motion.

Locomotives equipped with the Trimount truck have maintained up to 35 per cent adhesion at start, without sand, and up to 27 per cent running. This means that with moderate and low axle loadings, Trimount trucks allow tractive efforts substantially higher than those obtainable with other running gear.

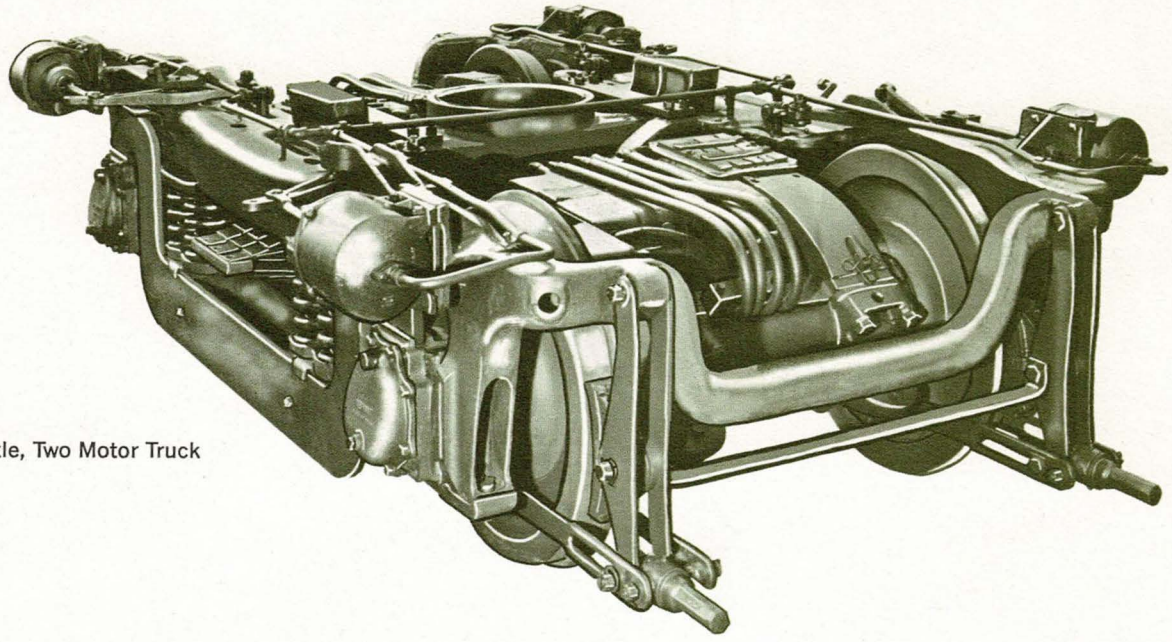
ALCO "World" Type Truck

The ALCO "World" locomotive truck is the ultimate in high-speed double-suspension, fully-equalized design. Yet it is remarkable for its simple construction and readily accessible components.

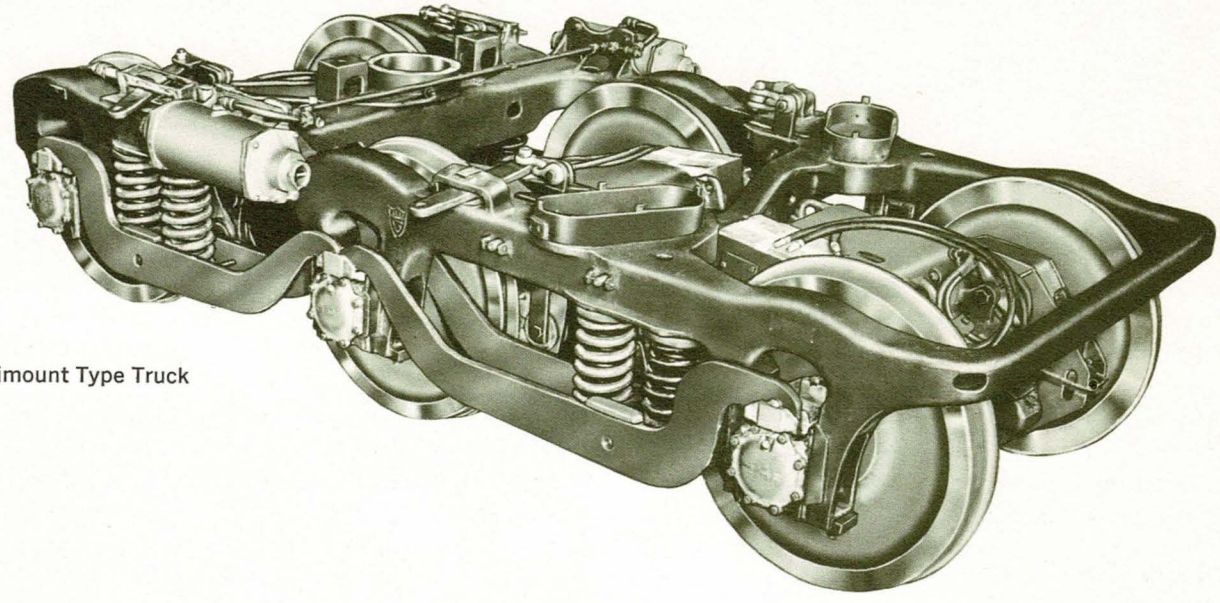
The truck is of conventional swing-swivel design, with cast-steel bolster and main frame. Long deflection coil springs, between equalizers and frame, and elliptic springs between frame and bolster in the secondary suspension, contribute outstanding riding qualities.

It also provides satisfactory adhesion characteristics for moderate-speed freight-train working.

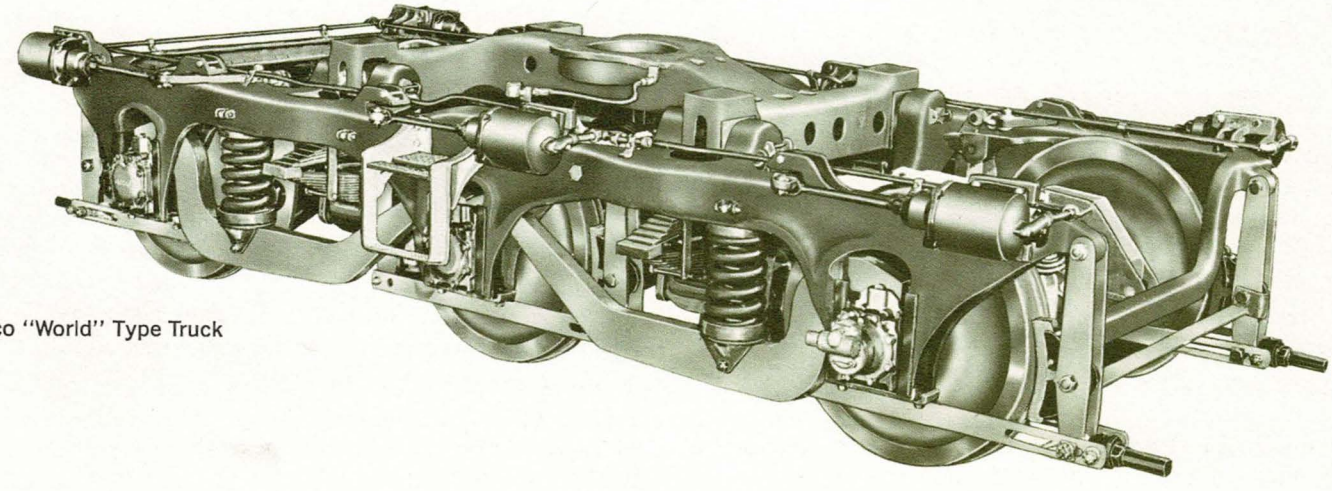
Over four hundred and fifty ALCO locomotives on four continents are running on "World" trucks, in every conceivable track condition.



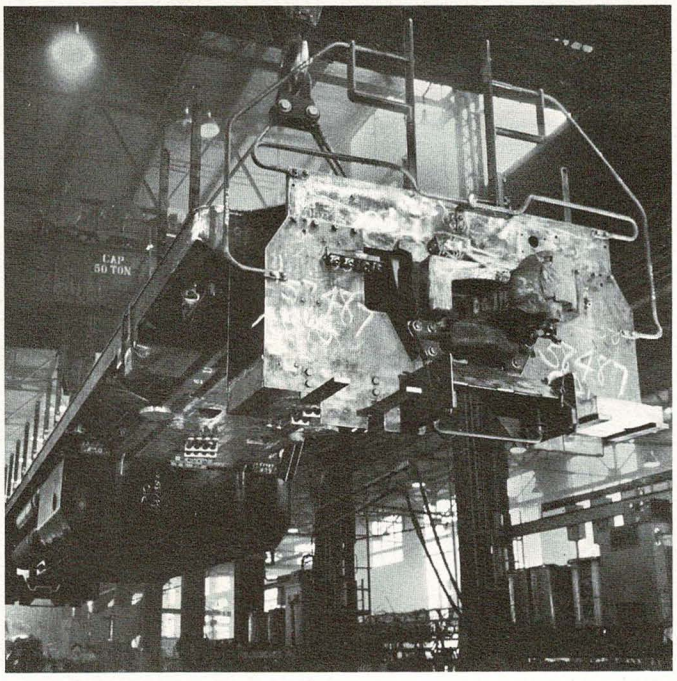
ALCO Two Axle, Two Motor Truck



ALCO Trimount Type Truck

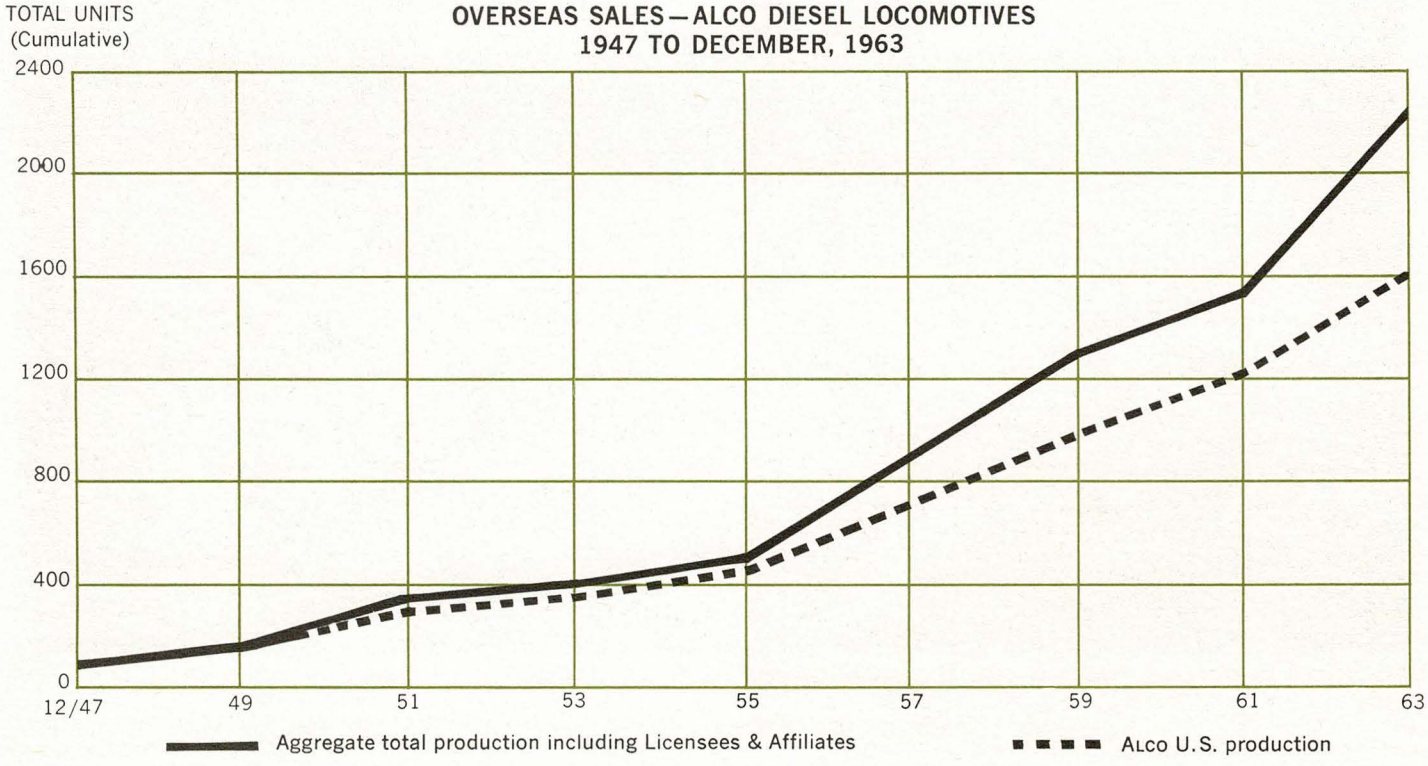


ALCO "World" Type Truck

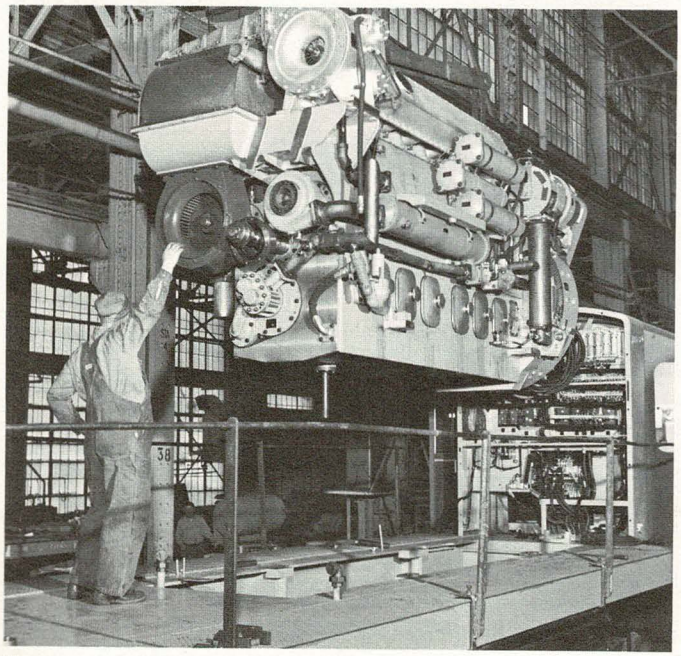


A partially completed locomotive frame being moved by two 50-ton cranes to the next assembly station.

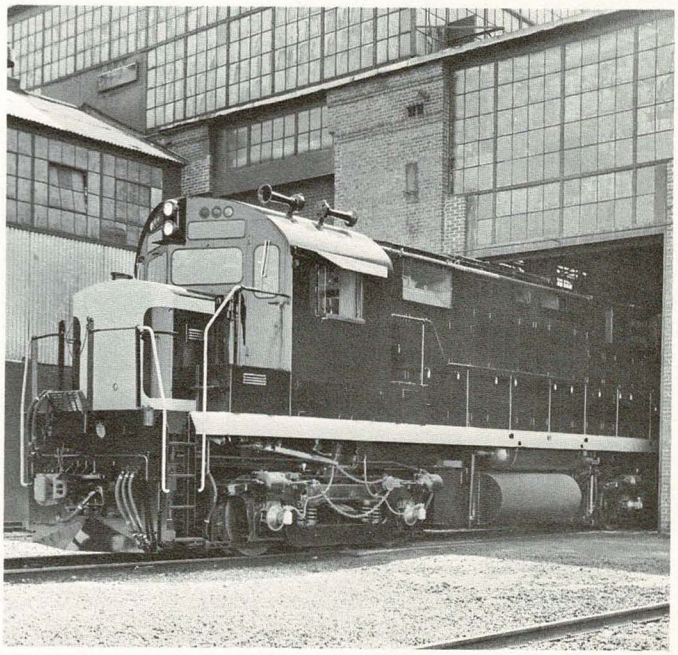
ALCO LOCOMOTIVE PRODUCTION AT SCHENECTADY



Modern facilities and new automation techniques are in evidence at ALCO — Schenectady, New York, the world's only straight-line, progressive-station locomotive assembly plant.

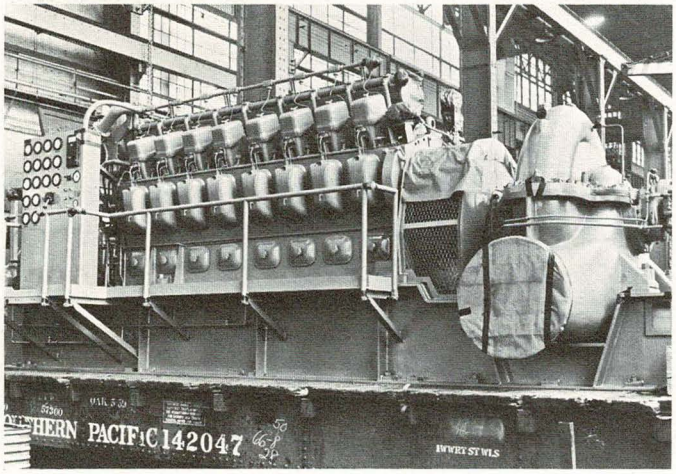


Heavy crane lowers ALCO six-cylinder 251 engine onto locomotive chassis at a primary station on Schenectady assembly line.

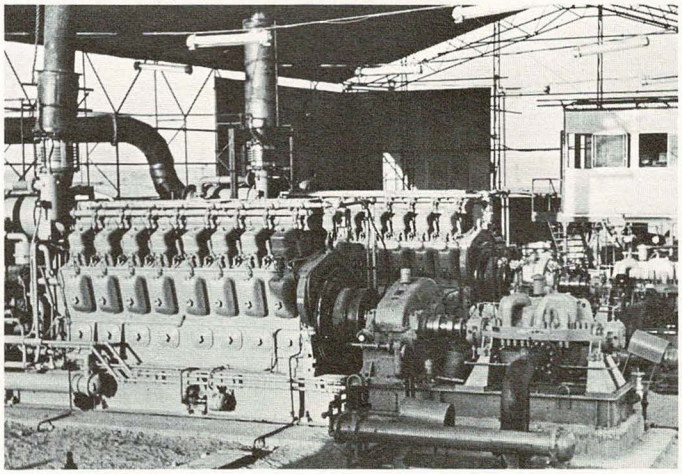


"Birth of a Century". The first DL-640-A (Century 424) locomotive emerges from ALCO's Schenectady, New York assembly plant.

Three ALCO 251 diesel-electric engine power packages are installed on this off-shore oil drilling platform. Universally recognized as a reliable source of both prime and auxiliary power, ALCO engines are in use in scores of petroleum drilling and pipeline operations throughout the world.



One of 13 ALCO 16-cylinder 251-C diesel engines ready for shipment to NASA's Flight Center at Huntsville, Ala. Used to pump cooling water at the new Saturn missile test stand.



Five 16-cylinder ALCO 251 engines, each rated at 2250 bhp at 1000 rpm, have been in service for several years on the SOPEG petroleum pipeline through the Sahara Desert in Algeria.

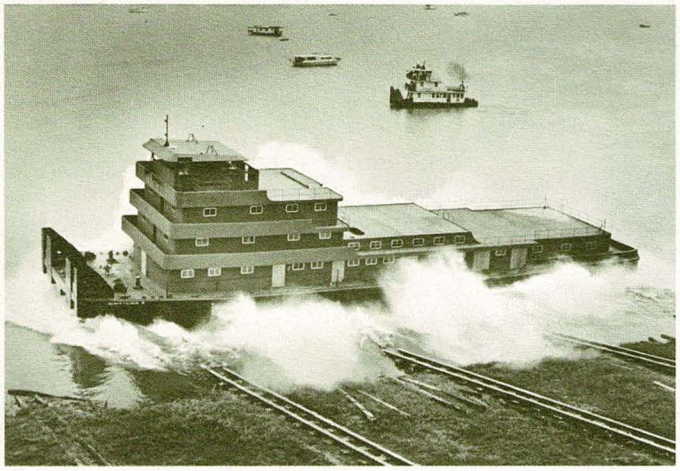
ALCO 251 DIESEL ENGINES FOR STATIONARY AND MARINE APPLICATIONS

The ALCO 251 diesel engine is designed to permit a wide range of uses: marine, pumping, power generation, oil-well drilling, as well as flexible "packages" for varied stationary applications. The basic engine is readily adapted to any of these services simply by the addition of auxiliary equipment.

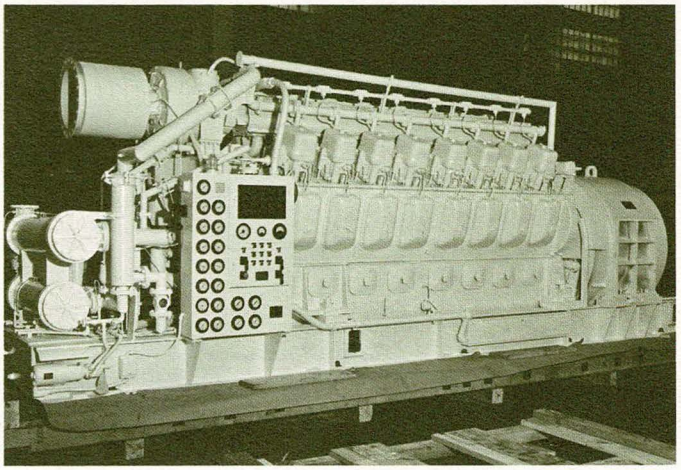
As a medium for power-generation, ALCO's 9" x 10½" diesel engine has demonstrated its high load-carrying capability in many applications all over the globe.

For stationary applications, the rigidity of the 251's design—its four point mounting at zero amplitude of the elastic curve—means that large costly foundations are unnecessary.

In hospitals, power generating plants, telegraph and telephone facilities, ALCO diesel engines are proving their value in daily application.



Launching of the Patrick Calhoun, Jr., a modern Mississippi River towboat that is powered by four ALCO 12-cylinder Model 251 diesel engines.



At Roi Namur atoll in the Marshall Islands, seven 16-cylinder 251 diesel engines are providing both transmission and housekeeping power for the Project Press missile tracking installation.

ALCO OFFERS COMPLETE CUSTOMER SERVICE

Motive Power Studies

ALCO's application engineers analyze every phase of your present or proposed operation to determine the optimum type and number of locomotives, and predict the resulting economies. To do this quickly and accurately, ALCO employs electronic digital computers for the solution of equations leading to schedule determination, fuel consumption, and all other factors affecting locomotive operation.

Recommendations for new or rebuilt facilities for locomotive maintenance, and for tool, machine or laboratory equipment can be readily prepared to suit your specific requirements.

Technical Training

To insure the use of proper locomotive operating and maintenance procedures, ALCO conducts a comprehensive technical training program for railway personnel, who receive instruction in ALCO equipment from experts in the motive-power field. At both the Schenectady and Auburn, New York plants every phase of locomotive and engine construction, assembly and testing is thoroughly examined and explained.

Of course, ALCO publishes all necessary manuals and bulletins to cover the operation and maintenance of each locomotive component. Adequate quantities of literature are supplied to each customer.

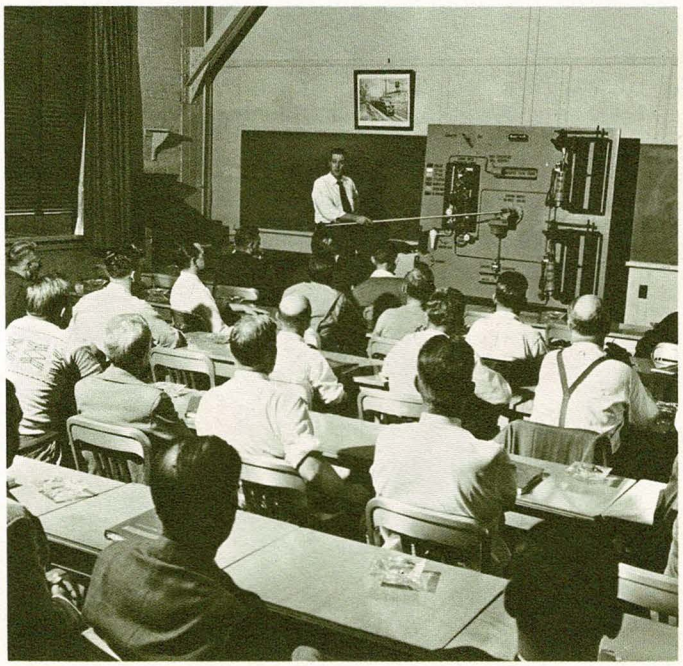
Parts Facilities

ALCO locomotive performance is backed by ALCO's well-organized spare parts service. Parts are available off the shelf, for shipment anywhere in the world, from strategically located warehouses. From the experience gained in world-wide ALCO locomotive and diesel engine operation, our representatives are able to make parts recommendations for optimum protection with low inventory.

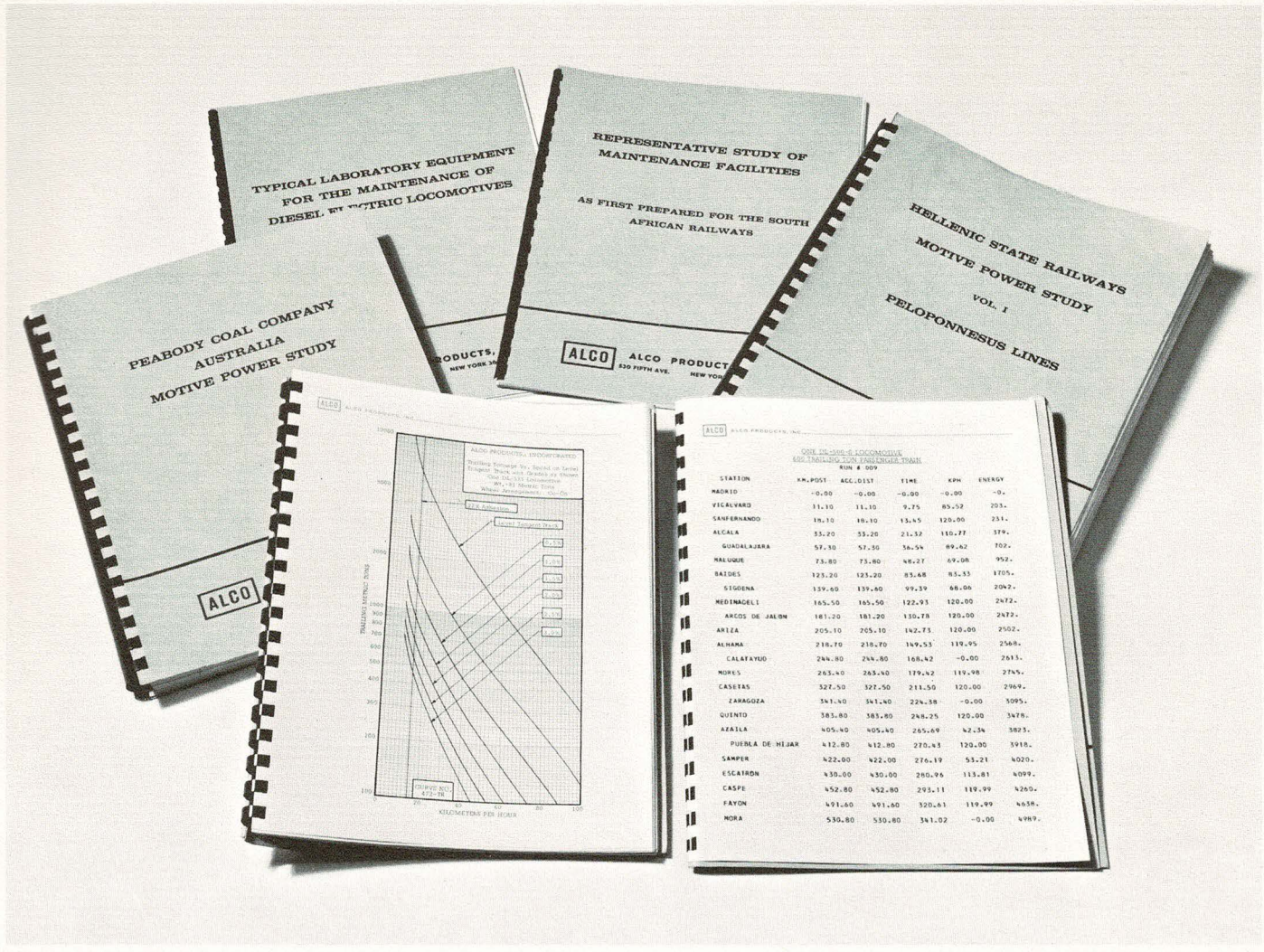
Field Service

ALCO's field engineers are trained in every phase of locomotive and diesel engine operation and maintenance. Seasoned by experience in many countries, they are available to help you put new locomotives as well as stationary and marine engines in service, establish maintenance programs, and train your operating and maintenance personnel.

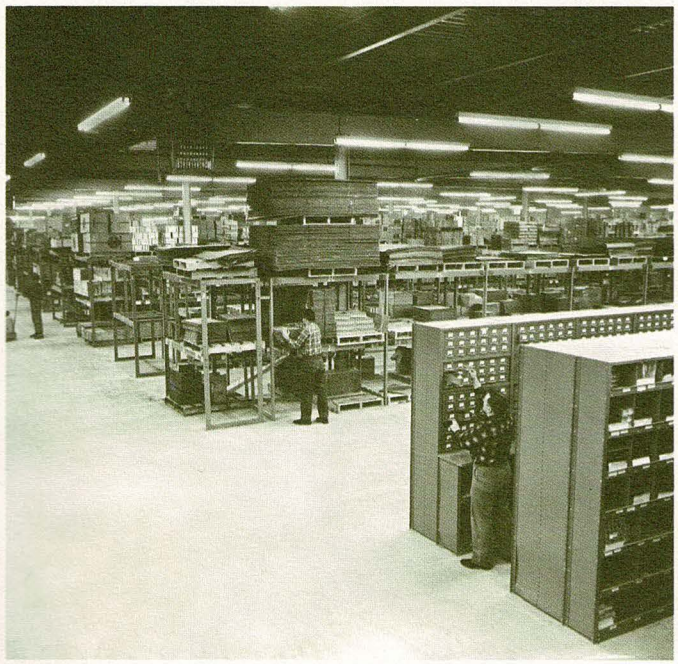
As the overhaul period arrives, or for any service reason, ALCO service engineers are always available to assist you in maintenance and general overhauling procedures.



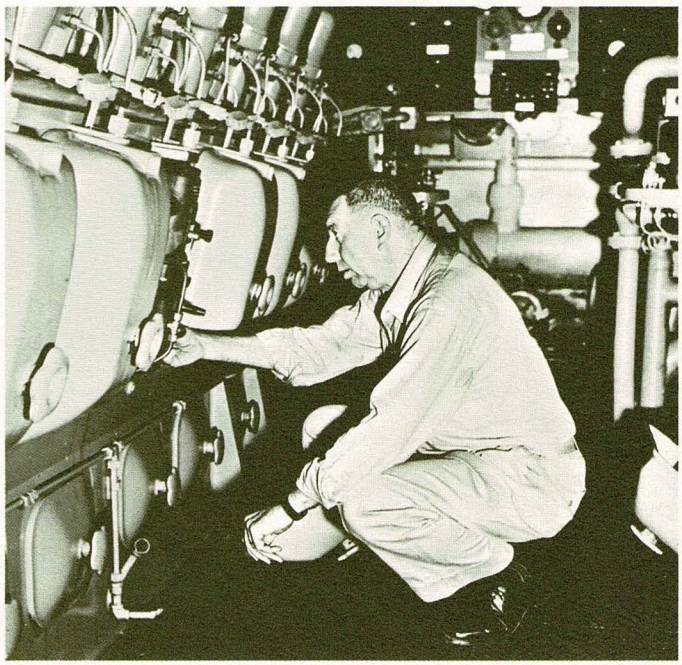
Technical training, a continuing ALCO customer-service, provides railway personnel with first-hand knowledge pertinent to efficient operation of ALCO locomotives and diesel engines.



Typical of the comprehensive studies of all phases of operation which ALCO supplies prospective railway customers as an aid in evaluating locomotive purchase decisions, and to recommend specific railroad operating procedures.



One of ALCO's warehouse facilities at North Bergen, New Jersey, where 24-hour "Turn-Around" service is available for the speedy shipment of spare parts to anywhere in the world.



Expertly trained ALCO field service engineers are readily available to provide customer service in every phase of locomotive and diesel engine operation and maintenance.

FOREIGN ASSOCIATES AND LICENSEES

Australia: A. E. Goodwin, Ltd., Sydney, N.S.W., Australia
Canada: Montreal Locomotive Works, Montreal, Quebec
England: A.E.I. (Associated Electrical Industries), Manchester, England
France: Forges et Chantiers de la Mediterranée, Paris, France
India: Diesel Locomotive Works, Varanasi, U.P., India
Spain: Cia. Euskalduna, Madrid, Spain

ALCO

ALCO PRODUCTS, INC., 530 FIFTH AVENUE, NEW YORK, N.Y., 10036

Cable Address: Locomotive, New York

Printed in U.S.A. LO4-464-3M

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India: Diesel Locomotive Works, Varanasi, U.P., India
Spain: Cia. Euskalduna, Madrid, Spain

ALCO

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