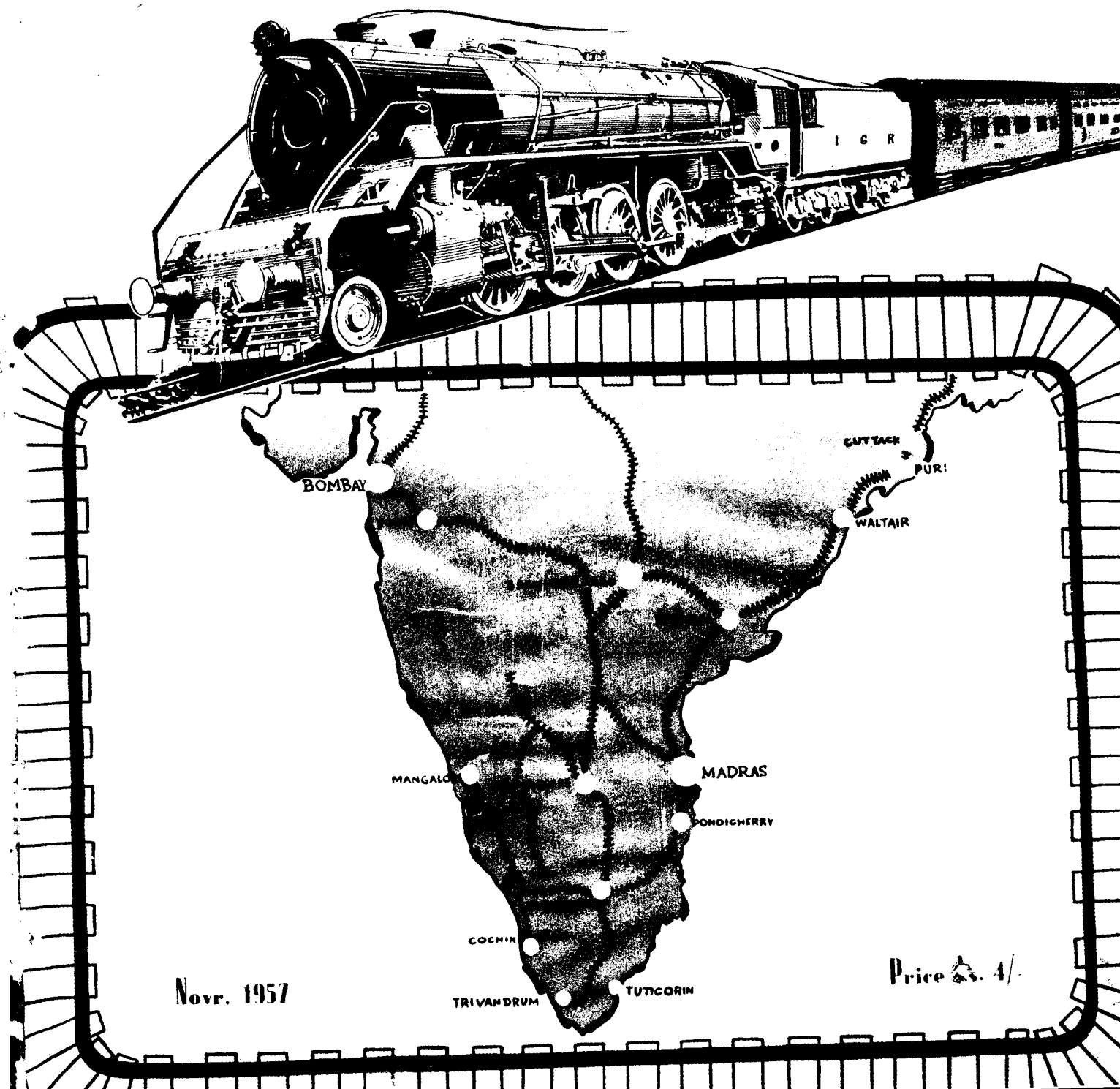


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SOUTHERN RAILWAYS

Magazine



IN YOUR OWN INTERESTS

HOW TO PURCHASE TICKETS

Buy your tickets only at the proper place. The authorised offices are (i) the Booking offices at the railway stations, (ii) the Town or City Booking Offices, (iii) the out-Agencies, (iv) Travel Agent. Never buy tickets from any other source as that may lead you to trouble. Please note that tickets are not transferable.

Buy your tickets in the proper time. You can avoid unnecessary excitement and trouble if you come to the station in good time, that is at least half an hour before the scheduled departure of your train. The Time Tables of the Railway are on sale at Booking Offices and Bookstalls.

Buy your tickets in the proper manner. Queue up at the Booking Window and you can get your ticket easier and quicker than by crowding at the counter.

By handing in the exact fare in good coins or currency you get the ticket easier and quicker and save for yourself and the Booking Clerk time and trouble.

Check up your ticket and money before leaving the counter and draw the attention of the Booking Clerk to any discrepancy you may notice.

(Inserted in the interests of Travelling Public)

The S.N.C.F. (French Railways) will help to equip the Indian Railroads

BEFORE leaving for India after a two and a half months stay in Europe, Mr. Karnail Singh, one of the principal directors of the Indian railways, met Mr. Louis Armand, president of the S. N. C. F., and talked about extending the recent agreement on large scale technical assistance by the S. N. C. F. in electrifying with a single-phase system (25,000 volts, 50 cycles) 1,000 kilometres of main line in the Calcutta region.

The S. N. C. F. is being helped by the Sofrerail Engineering Company, which was created and is presided over by Mr. Armand Forchez, for the spreading French railroad technique abroad.

The electrification of the suburban lines around Calcutta, and then, during the Second Indian Plan, of the 2,000 kilometres of main line around Madras and Bombay, can be done with the same technique. In addition, India has ordered 50 electric locomotives from a group of European builders, including Belgian, Swiss and French. Forty percent of this order, amounting to a total of 4 milliard francs, will be done by French builders.

Mr. Karnail Singh said, about the agreement which was just reached, "It is much more than a simple technical agreement. French engineers have acted as pioneers in the use of alternating current, it is true, but the collaboration established must be infused with the French railwayman's spirit which has produced such noteworthy results, particularly under the direction of Mr. Louis Armand".

"The French engineers who have gone to India have already prepared this cooperation. It is only one aspect among many others, of the renewing agreements between the French and Indian governments".

HIGH VOLTAGE A. C. TRACTION FOR
RAILWAYS

Mr. M. N. Chakravarti, General Manager of the Central Railway, Bombay said that a high-level team of engineers, led by a technical member of the Railway

Board, which visited France and other European countries recently had come to the conclusion that electric traction on the 25,000 volts alternating single phase current would be eminently suitable for India.

Mr. Chakravarti said the system was working faultlessly on railways in France and the Government had accepted the recommendations of the team of experts and had decided to increase the mileage for electrification under the second five-year plan from 816 to about 1,300, raising the cost to about Rs. 111 crores.

The General Manager of the Central Railway was presiding over a photographic exhibition and screening of films highlighting the achievements of the French railways held by the French Trade Commissioner in Bombay.

Discussing the future of electric traction in India, Mr. Chakravarti said in the field of modern motive power on the heavy traffic lines in India, the choice fell more on electric than on diesel traction. The advantage of electric power was the great potential India possessed for generating hydro-electric power at low cost. The main disadvantages of diesel power was that it made vital sections of the railway almost solely dependent on imported fuel for operation. It was for this reason that sections carrying the heaviest volume of traffic would have to be operated by electric traction, he said.

Mr. Chakravarti said the French Government had readily agreed to assist India in regard to electrification of sections of the railways and some French experts were already in the country. A three-member French team led by Mr. Nouvion came to India last year entirely at the cost of the French Government to advise the Indian Railways, he said.

In the post-war period, Mr. Chakravarti said, 3,000 volts D. C. had been initially adopted as the standard as it was more economical than the 1,500 volts D. C. system at present in vogue in Madras and Bombay regions. In the meanwhile, high voltage single phase alternating current traction was developed and its economies both in respect of first cost as well as in respect of maintenance and operation costs established its superiority over the 3,000 volts D. C. system.

General Manager's Press Conference

STEPS TAKEN TO MEET INCREASED TRAFFIC AND REDUCE OVERCROWDING

SHRI M. GANAPATI, General Manager, Western Railway, addressing a Press Conference in the Board Room at the General Offices, Churchgate, Bombay, announced the measures adopted to clear the increased traffic and reduce overcrowding. He stated that important Mail and Express trains on the Broad Gauge have been already strengthened within the maximum permissible load and important trains on the Metre Gauge were also being strengthened.

The possibility of increasing the maximum permissible load, reducing the speed if necessary, to clear a large number of passengers was also being examined.

On the Metre Gauge, the partially air-conditioned coach on the Ahmedabad-Delhi Express which was introduced in July 1957, was withdrawn and replaced by a third class coach. The Dining Car on the Ahmedabad-Delhi Express was being withdrawn and replaced by third class accommodation.

On the Broad Gauge, the Dining Car running on the Flying Rancee between Bombay Central and Surat was being replaced by third class accommodation.

Referring to the Railway's Plan for increased movement during the First Five-Year Plan, Shri Ganapati revealed that during 1955-56, the last year of the First Five-Year Plan, a total of 11.40 million tons of originating goods traffic was lifted and at the end of the Second Five-Year Plan this traffic is expected to increase to the order of 18.80 million tons. The average daily wagon loading as well as loading at transshipment points during 1956-57 as compared to the previous year, had also shown an increase. Similarly a 15% increase in passenger traffic is being planned for. In 1955-56, 305 million passengers were carried and at the end of the Second Plan period about 350 million passengers are expected to be carried on this Railway.

The General Manager stated that during the first year of the Second Plan as compared to the previous

year, gross traffic receipts had increased from Rs. 50.24 crores in 1955-56 to Rs. 55.30 crores in 1956-57, thus indicating a substantial increase of Rs. 5.06 crores in 1956-57.

While pointing out the important features of the new Time Table to come into force from 1st October 1957, the General Manager said that trains would be speeded up in the Saurashtra area.

Referring to the Bombay Suburban Section, he said that the number of trains had been progressively increased from 301 in October 1955 to 333 in June 1957 and will be increased to 347 from 1st October 1957. He also stated that punctuality of suburban trains was well over 90%.

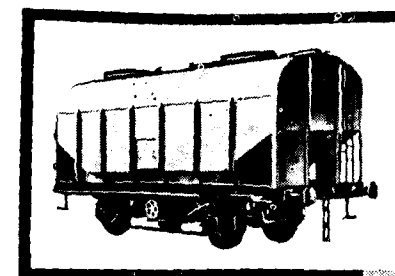
With regard to compensation claims on the Western Railway, Shri Ganapati expressed satisfaction that during the year 1956-57, the number of outstanding claims at the end of the year was 6745 as against 6,958 at the commencement of the year. Regarding disposal of claims, the average time taken was 45 days. This figure has subsequently been improved and the present average time taken for settlement of a claim is about 40 days.

With regard to the construction of new lines, Shri Ganapati said that the 26.93 mile Fatehpur Shekhawati-Churu line had been opened for all descriptions of traffic from July 1, 1957. The estimated cost of this project was Rs. 64.92 lakhs.

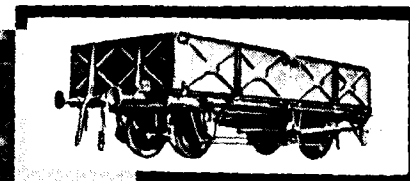
The 49.23 mile Indore-Dewas-Ujjain Line would be ready to be opened for all descriptions of traffic by the end of the Calendar year. The estimated cost of this project would be Rs. 290.35 lakhs. The 43.6 mile Bhildi-Raniwara line undertaken at an estimated cost of Rs. 119.45 lakhs, is also to be opened by the end of the Calendar year.

The metre gauge link between Gandhidham and New Kandla was opened for all descriptions of traffic on October 1, 1956 with a temporary station building. The length of this line was 7.51 miles and the estimated

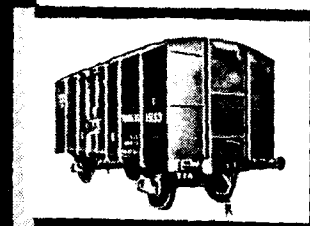
*the source of
their strength
is **PRESSED STEEL***



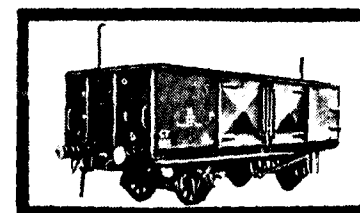
20-ton capacity Bulk Grain Van to the order of British Railways.



F.J.S. Low-sided Open type Wagon as used by Queensland Government Railways, Australia.



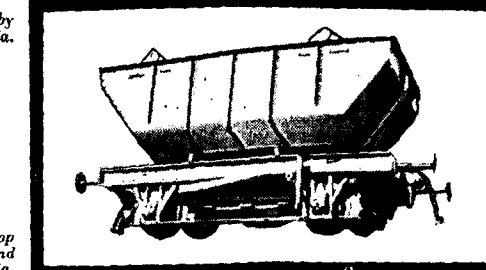
Broad gauge covered Wagon type C.R. as used by Indian Railways.



22-ton G.V. type Wagon as used by Victoria Government Railways, Australia.



16-ton all steel Mineral Wagon, 50,000 of which have already been built in our Paisley works to the order of British Railways.



V. J. M. Hopper type Wagon with Drop Bottom Door as used by Queensland Government Railways, Australia.

PRESSED STEEL COMPANY LIMITED

RAILWAY DIVISION, PAISLEY, SCOTLAND **Manufacturers also of**
HEAD OFFICE: COWLEY, OXFORD **Motor Car Bodies, Prestcold**

London Office: Sceptre House, 169 Regent Street, W. 1 **Refrigeration Equipment**
and Pressings of all kinds

cost Rs. 81.52 lakhs. A new station was being provided.

Referring to the projects of doubling the lines, Shri Ganapati pointed out that the work of doubling of the line between Godhra and Ratlam (116 miles) was expected to be completed by about the end of 1958. The estimated cost of this project was Rs. 850 lakhs. The doubling of Baroda-Anand line (20 miles) costing Rs. 99.71 lakhs, has been sanctioned and the work had started. It would take two years for completion. The Nagda-Ratlam (25.50 miles) section was also proposed to be doubled at an estimated cost of Rs. 210 lakhs.

Remodelling of Marshalling Yards had also been undertaken. The project of remodelling the Sabarmati Yard at an estimated cost of Rs. 157 lakhs was almost complete. A scheme for the remodelling of the Metre Gauge Yard at Ahmedabad at an estimated cost of Rs. 1.7 crores had been sanctioned and the work was expected to be taken in hand shortly.

During the Second Plan period improved goods facilities were planned at 19 stations on the Broad Gauge and 40 stations on the Metre Gauge at a cost of Rs. 106 lakhs.

During the Second Plan work in connection with the

expansion facilities in workshops is expected to cost Rs. 572 lakhs. A new wagon Repair Shop at Kotah and Carriage Repair Shop at Rajkot are being provided. The existing Locomotive and Carriage and Wagon Shops at Ajmer, the Loco Shop at Dohad and the workshops at Jaipur, Mahalaxmi and Parel are being remodelled.

Apart from the improvements in the mechanical shops, a new signal shop was being provided at Sabarmati for the manufacture of signalling and interlocking equipment.

A Civil Engineering Workshop was also under construction at Sabarmati for dealing with fabrication of steel work, manufacture of Points and Crossings, manufacture of Concrete Products, repairs of engineering plant and machinery.

An amount of Rs. 250 lakhs had been earmarked for the provision of amenities to staff out of which a major portion would be spent on the provision of medical facilities. A substantial amount of Rs. 6 crores had been earmarked for the provision of quarters which were being provided to staff on the line to the maximum extent possible. An amount of Rs. 300 lakhs had been earmarked as provision in the Plan for increased amenities to passengers.

INDIAN RAILWAY FOREMAN LEARNS BRITISH TECHNIQUES

STUDY COURSE UNDER COLOMBO PLAN

Various aspects of the construction and maintenance of rolling stock are being studied by Mr. Anil Kumar Ghosal, engineering foreman with Western Railway in India, who is now in the United Kingdom as an advanced trainee under the Technical Co-operation Scheme of the Colombo Plan.

In the first six weeks since he arrived in Britain at the end of September, Mr. Ghosal has been studying design work with the Metropolitan-Cammell Carriage & Wagon Co. Ltd. at Birmingham.

"I have already seen a lot and learned a lot", Mr. Ghosal said in an interview. "Rolling stock in the future in India, both imported and indigenous, will be

of modern design, necessitating a thorough knowledge of construction, repair and maintenance. It is, therefore, most valuable to me to come to Britain to study new techniques on the spot. I can only say again that the experience I am gaining wherever I go is extremely valuable".

From Birmingham Mr. Ghosal has now moved to Luton, Bedfordshire, where he is attached to the Skefko Ball Bearing Co. Ltd. There he is studying rolling contact bearings and also lubricants.

After finishing the Luton section of his Colombo Plan course, Mr. Ghosal goes on to the Estleigh Carriage and Wagon Works and will spend three months in this Hampshire construction and maintenance section of British Railways' southern region.

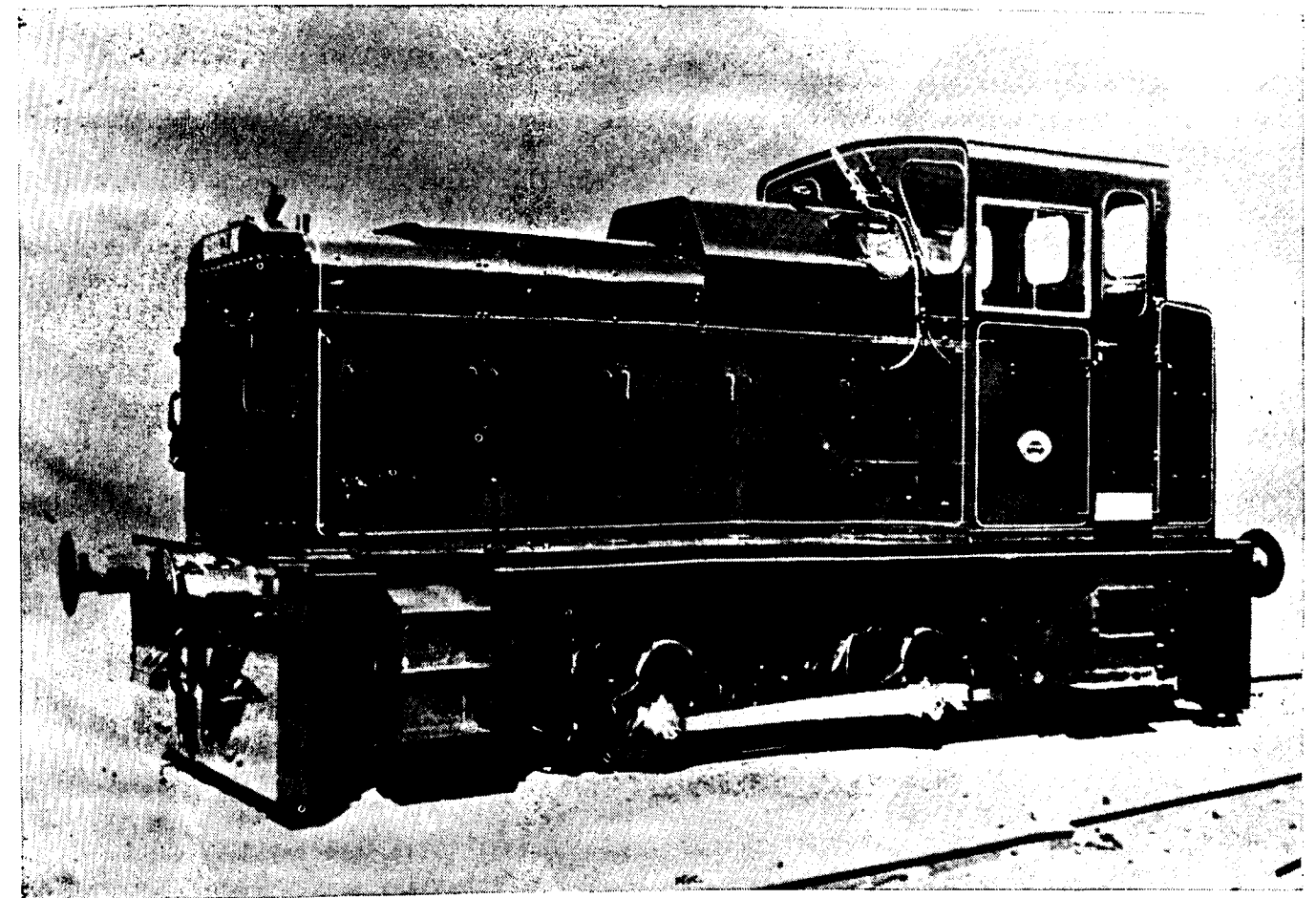
A New Diesel Hydraulic Locomotive

THE diesel hydraulic locomotive is now well established and several types are in operation using hydraulic torque converters of various designs. A new type, the principal feature of which is its simplicity, has been introduced by Messrs. Andrew Barclay, Sons & Co. Ltd., of Kilmarnock, for whom, Parry & Co. Ltd. are Agents in India. This locomotive is fitted up with a British Twin Disc torque converter, the first to be applied to a locomotive in this country.

The locomotive is of the 0-4-0 type and is fitted with a National five cylinder diesel engine developing a maximum of 200 B.H.P. at 1500 r.p.m. The locomotive is intended for shunting duties and for this class of work, the most desirable characteristic is a high tractive effort for starting combined with a steady pull to minimise wheel slip and with the possibility of accelerating steadily up to a moderate speed.

Most diesel hydraulic transmissions have hitherto embodied two or more converters or a converter and fluid coupling or a converter and change speed gearbox

in order to provide a sufficient range of torque variation but the British Twin Disc three-stage torque converter is capable of giving a maximum range of 5 or 6 to 1 and can therefore be used as a single unit in a shunting locomotive. The operation of the converter is entirely automatic, depending on the speeds of the input and output shafts. Actually the full range of 5 or 6 to 1 torque multiplication is not used as the efficiency is low when the multiplication is as high as this but part of the range is used giving a torque multiplication of approximately 4 to 1. This is equivalent to that obtainable from a normal 4-speed gearbox. This wide range is not obtained from any serious loss of efficiency, the efficiency of the converter being 70% at each end of this range and at its best speed the efficiency rises to a maximum of 82%. It will be observed that the tractive effort is perfectly smooth there being no breaks or steps in it such as in the graph of a change speed gear box. It is thus possible to fit the tractive effort of the locomotive exactly to that called for by the load and to utilise the full power of the engine at all times. This is not always possible with a change speed



gearbox as the tractive effort required by the conditions may not be exactly obtainable without adopting a lower gear and running the locomotive at a lower speed than might otherwise be obtainable. The smooth variation in the tractive effort of a hydraulic locomotive ensures that there is no jerking of the transmission or train such as occurs when changing gear on a diesel mechanical locomotive. This is of particular importance when working with loose coupled rolling stock. Compared with a two or three stage hydraulic transmission, there is no governor or arrangement of valves to control the change-over from one stage to the other. In addition to this, there is no free wheel.

The application of power when starting from rest is perfectly smooth and the locomotive can therefore be of the minimum weight to give the maximum tractive effort. The maximum tractive effort of this locomotive is 20,000 lbs. It is 18,000 lbs. at 2.4 m.p.h. and 4,500 lbs. at 9.6 m.p.h., this being the range of speed in which the efficiency of the converter is 70% or over. The weight of the locomotive is 31 tons giving an adhesion ratio of 3.5 to 1 with the 20,000 lbs. tractive effort. The locomotive will run up to a maximum speed of 11 m.p.h.

The engine is of the National M4AA5 type having five cylinders 6" bore by 8½" stroke. It is set to develop a maximum of 200 B.H.P. at 1500 r.p.m. this being a 12-hour rating. It is of advance design and incorporates four-valve cylinder heads with controlled turbulence resulting in high thermal efficiency with good combustion at all loads. Solid injection into an open combustion chamber is used. Starting is by electric motor engaging with a toothed ring on the flywheel.

Electric lighting is provided on the locomotive consisting of head and tail lamps, a cab lamp, a lamp under the engine casing, two lamps over the instrument panel and a portable inspection lamp. These are supplied from the starting batteries which are of ample capacity.

The mechanical construction of the locomotive is extremely simple. The Twin Disc torque converter is rigidly mounted on the engine crankcase, in addition to which it is supported at the output end from one of the locomotive frame stays. From the output shaft of the torque converter the drive is taken by a propeller shaft with Layrub flexible couplings at each end and the drive is taken from these to the rail wheels by means of connecting and coupling rods. The reverse gear is of the bevel type consisting of a bevel pinion running between two crown wheels which are mounted on roller

bearings on a cross shaft. Either of these crown wheels can be connected to the cross shaft by means of a multiple toothed clutch which slides between them on splines on the shaft. From this cross shaft the drive is taken by means of double reduction spur gears to the jackshaft. All shafts in the reverse and final drive unit including the jackshaft are mounted on roller bearings. The casing of the gearbox is of cast iron and is bolted to the frame by fitted bolts so that in addition to forming a rigid mounting for the jackshaft, it acts as an effective frame stay. It is possible to dismantle the gearbox and remove all shafts including the jackshaft without disconnecting the principal casting from the frames of the locomotive.

A friction clutch is embodied in the torque converter casing between the engine and the torque converter. This clutch is only fitted to provide a free engine when the locomotive is standing and to facilitate operation of the reverse gear. It is of the over-centre type and is therefore either fully engaged or disengaged. It is not used for taking up a load and the wear on it is consequently negligible. It must be engaged to connect the engine to the torque converter and must be disengaged momentarily to eliminate the drag torque of the converter to allow the reverse gear clutch to be moved. It is operated by a hand lever and requires very little effort. An interlock of a simple mechanical type is provided to prevent the reverse gear handle being moved unless the clutch is disengaged.

Another interlock, patented by Messrs. Barclay, is also provided to prevent the reverse gear handle being moved unless the locomotive is stationary. This is operated by the flow of oil circulating in the final drive gearbox. So long as the locomotive is moving, and consequently the oil is circulating, a plunger is held up to intercept a sector on the reversing handle shaft, so that it cannot be moved. When the locomotive stops and the oil flow ceases, this plunger recedes and the reverse gear handle can be moved, provided at the same time the clutch is disengaged.

The frames are exceptionally rigid being 1½" thick and are built up with frame stays bolted to them with turned driven bolts. The engine and torque converter are mounted on a rigid sub-frame. The buffer beams are steel 6" thick to provide the necessary weight for adhesion. The ballast weight is thus in its most effective position for absorbing shunting shocks. The locomotive was built for 4'—8½" gauge with a wheelbase of 6 ft. The wheels are 3'—2" diameter. A sectional radiator of Messrs. Reliance Manufacturing Company's make is fitted at the front of the locomotive

and contains separate sections for engine cooling water and lubricating oil. An auxiliary radiator is fitted in front of this to cool the fluid from the Twin Disc torque converter. A sheet steel casing is fitted over the engine with provision for ventilation at the top. A large fuel tank of 275 gallons capacity is fitted at the top of the casing, close to the cab so that it does not obstruct the driver's view. This fuel supply should be sufficient to keep the locomotive running for about four weeks if working on day shift work only. The cab is of welded construction with large windows giving the driver an excellent view all round. The side windows are of Beclawat type arrange to slide to open. The doors are divided, the top half, which is glazed, being arranged to open independently of the bottom half.

The driving controls consisting of throttle lever, clutch, brake lever and sanding levers are duplicated so that they can be operated from either side of the cab. The throttle, brake and reversing handle are conveniently grouped on a desk in front of the driver. An adjustable seat is provided for the driver at each side of the cab. A Clayton S12 type heater is fitted in the cab. It is operated from the engine cooling water system and the warm air is circulated by an electric fan.

The brakes are of the Westinghouse compressed air type, supplied from air compressors driven by Vee-belt from an extension shaft at the front of the engine. This extension shaft is drive through a flexible coupling and it carries also a pulley for the Vee-belt drive to the radiator fan. The compressed air for the brake system is also used to operate the reverse gear by means of diaphragm cylinders.

A gauge and instrument panel is fitted above the driver's desk and carries the following instruments.

Westinghouse Duplex air pressure gauge, gearbox air pressure gauge engine oil pressure gauge, gearbox oil pressure gauge, converter oil pressure gauge, engine oil

temperature gauge, water temperature gauge, converter oil temperature gauge, tachometer, speedometer with mileage recorder, ammeter, lighting switches and starting button. A lock-type switch is also provided to prevent unauthorised starting of the engine. A fuel gauge is fitted in the end of the fuel tank and is visible above the instrument panel. A warning light is also fitted on the instrument panel to indicate when the temperature of the fluid in the torque converter is approaching the high limit.

The driving of the locomotive is simplicity itself. To start, after the engine is running, it is only necessary to engage the clutch and gradually ion the throttle. The engine will speed up and the torque converter will take up the load and it will start with perfect smoothness. If the throttle is fully opened, the speed will rise to the maximum which the power of the engine and the weight of the train will permit and the locomotive will run at this speed indefinitely without overheating of the torque converter, provided the load is within the maximum capacity of the locomotive. It should be noted that it is impossible to stall the engine by overloading the locomotive or by mishandling. The only controls which the driver needs to operate are the throttle, brake, reversign handle and clutch. As in all diesel locomotives, except the diesel electric type, it is necessary to bring the locomotives to a standstill before the reverse gear is changed. As explained above, a patented interlock is fitted to ensure that this is done.

It has been the aim of Andrew Barclay, Sons & Co. Ltd., to produce the simplest possible form of diesel shunting locomotive, both in construction and handling. This aim has been very successfully accomplished in this prototype locomotive, which has already undergone successful tests. It is the forerunner of a range of similar locomotives with powers up to 400 H. P. and the Company has already received orders for locomotives of 302 H. P. with British Twin Disc torque converters.

MANGANESE ORE

It is reported that shortage of railway wagons at some mine heads have seriously affected the export trade in Indian manganese ore in recent times. According to this report, the Madhya Pradesh Mineral Industry Association has, in a memorandum to the Union Minister for Commerce and Industry pointed out that unless immediate arrangements for wagons are made, the members of the Association may not be able to transport all the quota before the date of expiry i.e. June 30, 1958. The Association is further reported to have represented to the Government that "out of about 10.85 lakh tons of manganese ore for export registered with the Eastern Railway authorities the quota of State Trading Corporation alone amounts to 6 lakh tons".

Total imports of manganese ore in France during the month of August last totalled 67,999.6 tons compared with 54,237.8 tons in the preceding month out of which imports from India totalled 25,406.6 tons against 28,238.3 tons in the preceding month.

PRESS CONFERENCE AT SECUNDERABAD BY THE GENERAL MANAGER, CENTRAL RAILWAY

AT a press conference held in Secunderabad Shri M. N. Chakravarti, General Manager of the Central Railway, reviewed the working of the Secunderabad Division. An analysis had been drawn up covering generally the period from 1951-52, the first year of the First Five-Year Plan, to 1956-57, the first year of the Second Plan, and a copy of this analysis covering the salient aspects of this Division's working was handed over to the pressmen.

Furnishing statistics of passengers, Shri Chakravarti stated that train occupancy in the last pre-war year 1938-39 showed that an average of 162 passengers travelled per train on the ex-N. S. Railway whilst on the ex-G. I. P. Railway main line section and the Bombay Suburban electrified section the corresponding figures were lower at 146 and 111. The occupation had risen appreciably since then in spite of more trains being added and more coaches being put on per train. The traffic offering had outstripped the capacity and this led to overcrowding. Nevertheless, between 1951-52, the first year of the First Five-Year Plan and 1956-57 the first year of the Second Five-Year Plan, the overcrowding had eased, he explained, for the occupancy per train, taking 100 as base for the year 1951-52 had dropped to 94 on the main line section of the Central Railway as a whole and to 88 on the Secunderabad Division. This had been the result of progressive addition to the passenger train services on this Division which had raised the passenger train miles by 15.5%. He also announced the several improvements in the passenger services on the Secunderabad Division including an extra express train which have since come into effect from October 1, 1957.

Referring to movement of goods traffic over the Secunderabad Division, Shri Chakravarti stated that this had gone up by 52.9% in the year 1956-57 when compared with 1951-52 as measured by the freight ton miles carried which rose from 684 millions to 1,056 millions. The increase in the number of wagons during the same period for moving this traffic was 32.8%.

Continuing his address the General Manager stated that the result of the sustained efforts made during the last few years had been remarkable as reflected in the steady decline in the goods on ground registered at stations for which wagons were indented. This figure of goods on ground represented the arrears of traffic to be moved. On the broad gauge there were 5,438 wagon-loads of goods traffic on ground on September 1, 1955 and on September 1, 1957, there was less than one-tenth of this traffic on ground, the actual figure being 510 wagon-loads which represented just two days' loadings. On the metre gauge there were 2,699 wagon-loads of goods traffic on ground on

September 1, 1955 and on September 1, 1957 there were just 97 wagon-loads which was less than half a day's loading. Wagons were now idling on the metre gauge for want of traffic and an appeal had been made to the trading public to come forward and move their traffic now while the wagon position was so easy.

Speaking of efficiency in the usage of wagons and engines, Shri Chakravarti stated that effectiveness of steps taken could be gauged from the recognised user indices for measuring operational efficiency. The extent of wagon usage as assessed by the wagon miles moved per wagon day and the net ton miles carried per wagon day showed increases on the broad gauge of 12.2% and 24.5% but on the metre gauge there had been a decline of 11.2% and 4.4% respectively. Engine usage, which was rated on the number of engine hours per day per goods engine in use and on the net ton miles carried per goods locomotive day in use, showed increases on both the broad and the metre gauges ranging from 6.1% to 24.5%.

Referring to the creation of additional transport capacity under the Second Plan, he said that even more of a problem than putting into service of extra wagons, engines and coaches would be the creation of additional line capacity to enable new trains being run. This was particularly important as some sections of the line had already reached saturation capacity, Shri Chakravarti stated.

Among the more important of such works to be undertaken on the Secunderabad Division to increase line capacity would be the remodelling of 12 yards, some of which were already heavily congested, the construction of additional loop lines at 24 stations and the building of 24 new crossing stations.

The Mechanical Workshops at Lallaguda would be expanded. The Signal Workshops at Mettuguda were also to be expanded and modernised so that a lot of signalling equipment at present being imported would be manufactured locally. An All-India Signal and Telecommunication School was shortly to be opened at Secunderabad where staff of All Indian Railways would be trained. Secunderabad itself might be provided with modern colour light signalling, whilst Multiple Aspect Upper Quadrant Signalling would be introduced over the whole of the Grand Trunk route from Balharshah to Bezwada so as to speed up the movement of trains on this Section. There would also be several works to expand and improve the facilities at Goods Sheds, Parcel Offices and Tranship Sheds. More and better amenities would be provided for passengers particularly where these were at present either wanting or were sub-standard.

Staff welfare, too would be looked after to the maximum extent possible, Shri Chakravarti said, within the resources available.

A Nailable Floor with a Backbone of Steel

By W. E. McFee,

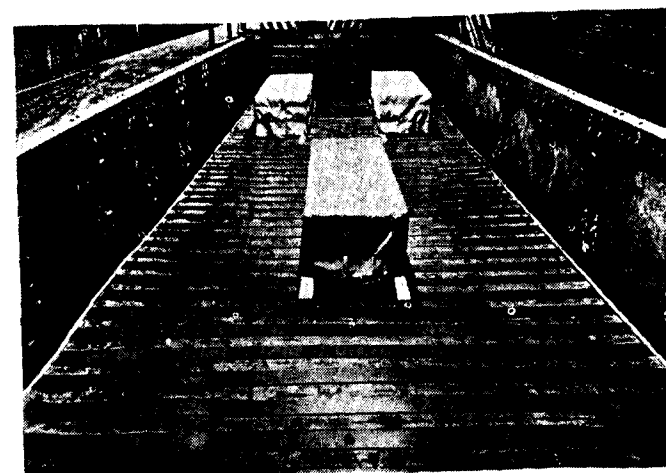
Supervisor, Product Information Service, Armco Steel Corporation,
Middletown, Ohio

ARMCO freight car floor is a composite steel and wood flooring for gondola, box and flat cars. It is designed both for new construction and for replacement of worn-out wood or steel-plate floors in existing cars. The Armco floor consists of formed steel ribs and wood planks laid alternately. The steel ribs are hat-sections and their top surfaces form part of the floor. The heavy wood planks are nailing strips. They are supported by the flanges of the steel ribs and are fastened with bolts. The ribs themselves are welded to the underframe.

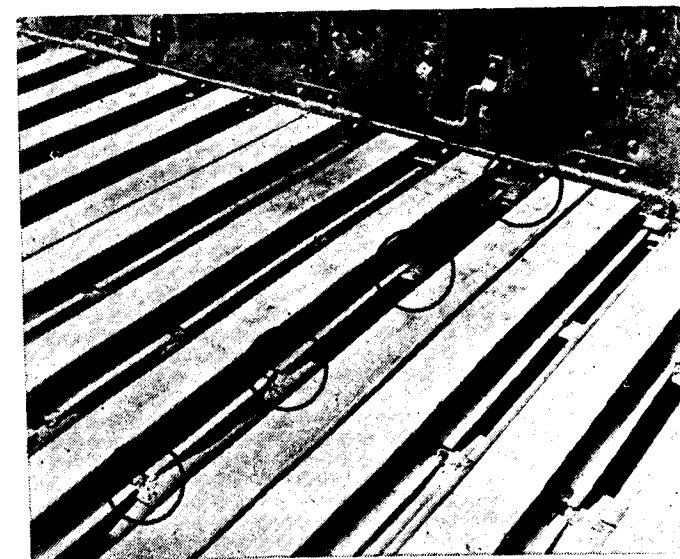
STRENGTH FOR BOX CAR LOADS

Today, there is an increasing use of fork lift trucks for loading and unloading palletized freight in box cars. Wheel loads from lift trucks of 10,000 pounds (20,000 pound axle loads) are common. When a single box car floor plank 1-3/4 inches thick is called upon to resist such a concentrated load, the result is often a break-through. The hat section Armco steel rib has several times the strength of the wood plank under comparable loading.

When there is a concentrated load on the wood nailing strip, the load is transferred to a pair of steel



Three weatherproofed lifts of steel sheets in an old gondola car with new Armco floor. Note skids nailed to floor planks. This method of loading is ideal for quick unloading with crane.



This is how Armco steel ribs strengthen the car frame. Circled welds are four of the ten points at which rib is welded to frame.

ribs through their flanges. Consequently there is no point of weakness in the Armco freight car floor.

Damage is often caused to open car floors from dropped loads and the impact of clamshell buckets when unloading aggregates. Wood plank floors cannot withstand it; plate floors become deformed and unsuited for many types of lading.

Wood planks in gondola and flat car floors are usually 2-3/8 inches thick by 5-1/2 inches wide. The corresponding Armco steel rib is several times as strong as the wood plank and can take a more severe beating longer.

Steel plate floors in gondola cars are good for bulk lading, but plates have little beam strength and become bellied even from normal service. The steel ribs of the Armco floor are designed strong enough to remain flat under most service loads.

Concentrated loads and impacts shorten the life of floors. Each plank in a wood floor must serve as a beam. Standard wood floor planks do not have the

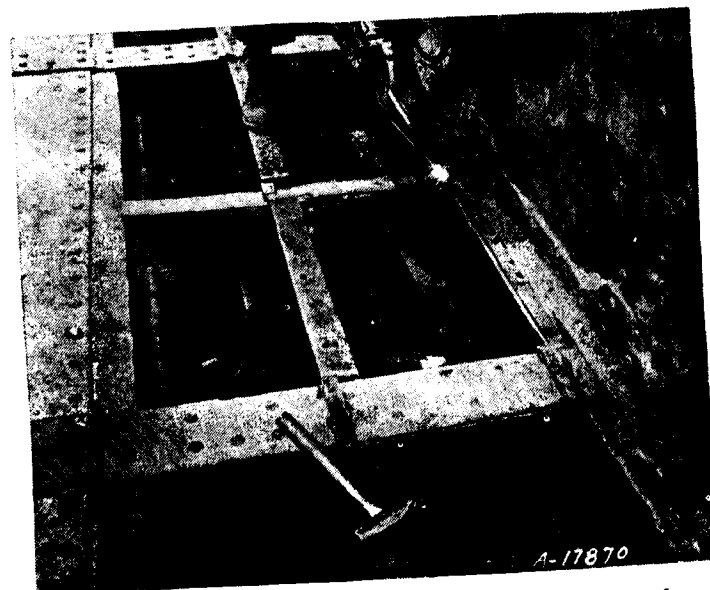


Steel plate floors become bellied, perforated and unsuitable for even bulk loads.



Stripping gondola car floor by cutting out old plate between sills and crossbearers in order to install the stringers. It is unnecessary to remove bolster or center sill cover plate.

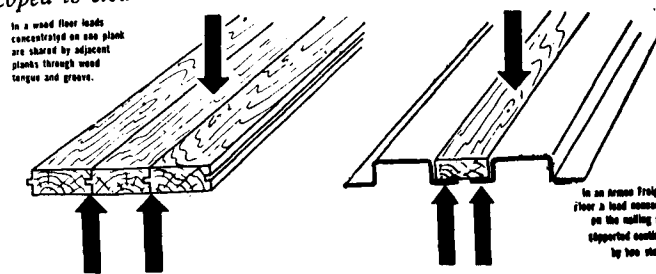
necessary beam strength. The Armco hat-section rib has the strength that is needed. It gives the best-known



Welding fillers to side sill of old car. Note installation of stringers made of old 5-inch bulb angles riveted to crossbearers.



Unloading Armco ribs directly from car by conveyor and laying preparatory to spacing. Note ribs in foreground coped to clear center sill rivets.

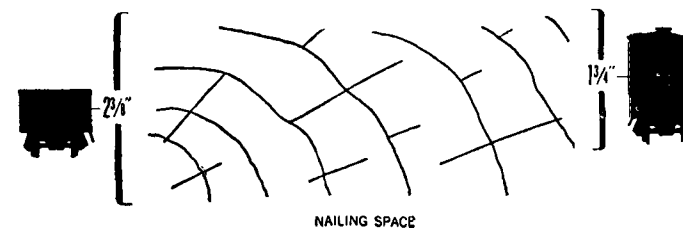


combination of beam strength and floor surface per pound of steel.

EXCELLENT NAILABILITY

Here are actual-size cross-sections of the nailing strips used in Armco freight car floors. The 1-3/4 inch thickness

Real Nailability



is for box cars, the 2-3/8 inch for gondola and flat cars. These nailing strips are spaced alternately with the steel ribs the full length of the car, except over bolsters or crossbearers where bolting is impractical. Here Armco standard steel planks or special ribs, designed to fit the car underframe, are fastened by welding.

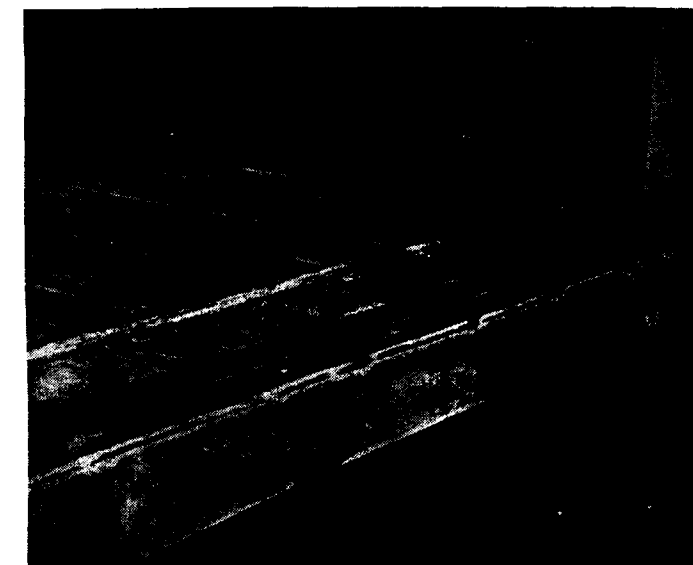


Spacing ribs with template. The one shown is half the length of the car, of welded construction and made to clear special ribs over bolster.

The sturdy wood planks permit easy fastening of skids and bracing and provide the floor with real nailability.

A MULTI-PURPOSE FLOOR

The Armco floor will handle bulk—or unit-lading equally well. This eliminates the problem of selecting a car by floor type. It saves time and money for both the railroad and the shipper in switching empty cars.



Template of welded pipe used for spacing box car ribs.

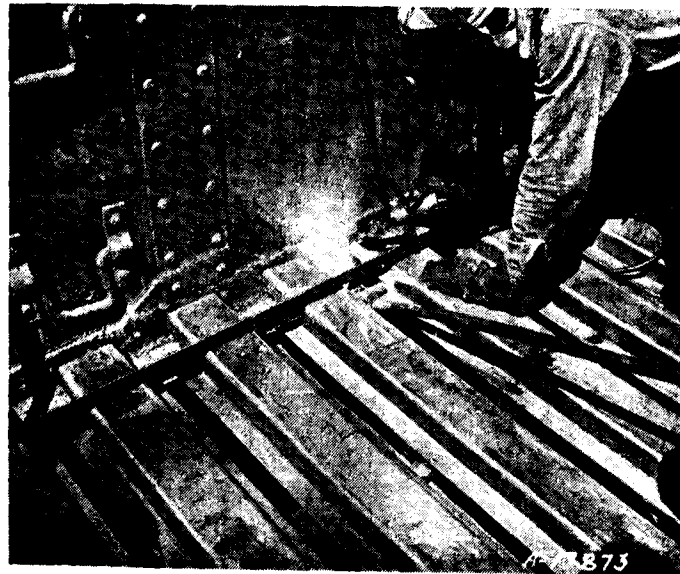


In this new box car installation steel ribs are being centered before welding to provide sealing space at car sides.

This is of particular importance in the case of gondola cars. The same car that brings bulk loads into a plant can carry away the manufactured product. Armco freight car flooring is made for fastening using and skids in the proper way with nails. There is no invitation to weld fasteners to plate floor or bulb angles for bolts.

RIBS REINFORCE CAR UNDERFRAME

The Armco ribs not only bear the weight of the shipment but reinforce the underframe. Each individual rib is welded to the frame in at least ten places.



Tack welding Armco ribs while spaced with template. Note special pinch bar for holding ribs tightly to side sill while welding.



Laying treated wood planks between spray-painted ribs.



Welding special ribs over bolster.

Welds are made on both sides of the ribs, two at center sill and two each at stringers and side sill angles. Resistance of the car underframe to twisting and racking is increased greatly by this strong welded lattice.

A SOUND INVESTMENT

The life of an ordinary wood-plank floor is limited to an average of about five years. The Armco floor will last much longer. Its steel ribs should be good for the life of the car.



Centering wood planks with pinch bar. Note chalk marks on steel ribs and car sides to locate bolt holes.

The wood nailing strips are not required to resist concentrated loading or heavy impact. That is the function of the steel ribs. The wood planks wear chiefly from abrasion, and from this they are partly protected by the top section of the steel ribs.

This protection of the wood plank from mechanical damage is favorable to the use of wood preservatives. They will extend plank life.



Drilling planks to match existing bolt holes.

Armco freight car floors help create satisfied shippers, reduce costly claims for damage and loss. The danger of heavy concentrated loads breaking through a weakened car floor and causing a serious accident is eliminated.

Armco freight car flooring will also reduce shopping time and consequent loss of revenue from out-of-order cars.

DESIGN DETAILS

Sketch 1

Sketch 1 gives dimensions of standard gondola car ribs and planks. Method of bolting wood plank to side sills and stringers shown at left is used when existing bolt holes match wood planks. At center is bolt with floor clip, another method of fastening wood plank. At right is an Armco steel plank used over bolsters and cross-bearers where it is not practical to bolt wood planks.

Sketch 2

This drawing shows how steel ribs are welded to side sills, stringers and center sill. The arrangement shown to left of center line is used in older cars. Here, a steel filler strip is welded to the center sill and the steel ribs in turn are welded to the filler strip.

Drawing indicates how wood planks are fastened by bolts through side sills and stringers as previously shown in Sketch 1.

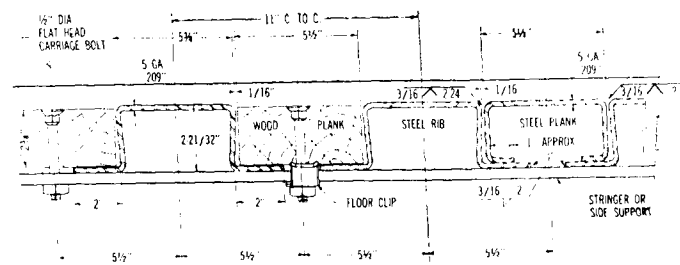


This box car installation uses floor clips similar to type shown in Sketch 1, to fasten wood planks to steel ribs and stringers.

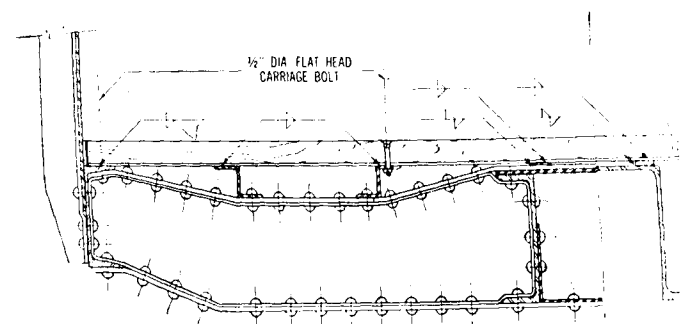


Pouring car cement after inserting galvanized closure strip and filling crevice with sawdust.

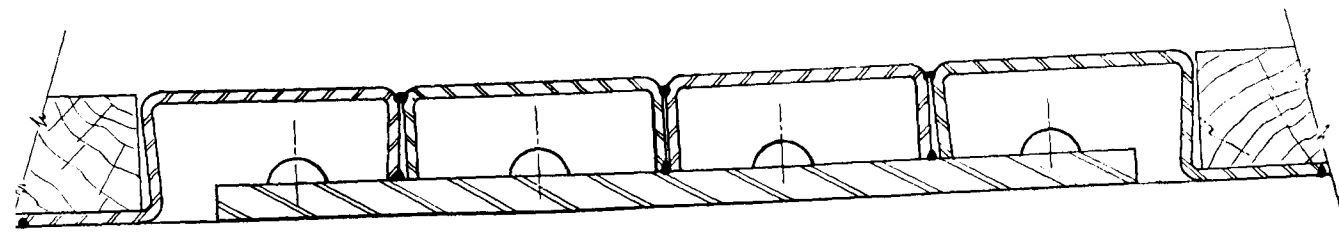
The arrangement to the right of centerline of car shows the half-section of center sill used in newer cars.



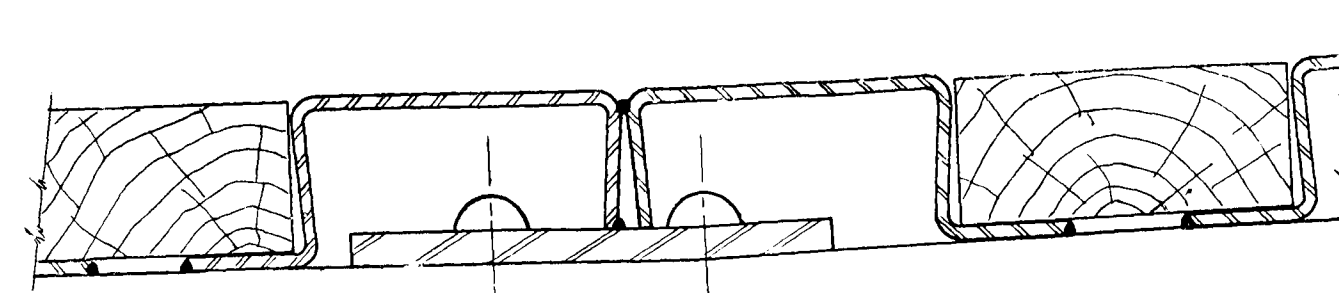
Sketch 1



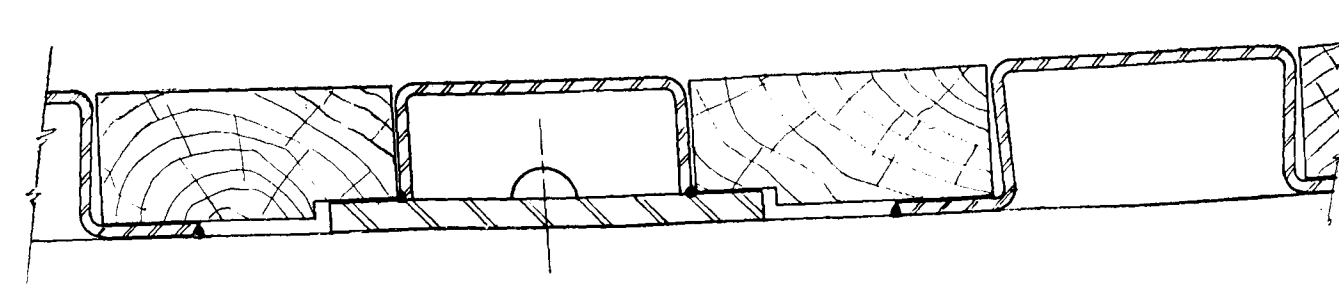
Sketch 2



Sketch 3



Sketch 4-A



Sketch 4-B

Sketch 3

Sketch 3 shows special ribs supplied for use over gondola cars bolsters. Note how floor level is maintained and rivet heads avoided. Armco supplies these ribs made to measure for your cars and ready for installation.

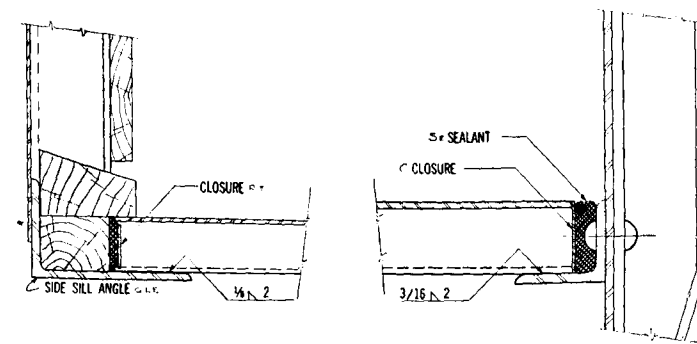
Sketches 4-A and 4-B

(4—A) Two single flange ribs with one short leg to fit cross-bearer cover plate used in one gondola car installation.

(4—B) Channel shaped rib in another gondola car installation. Design by Armco engineers from drawings of car.

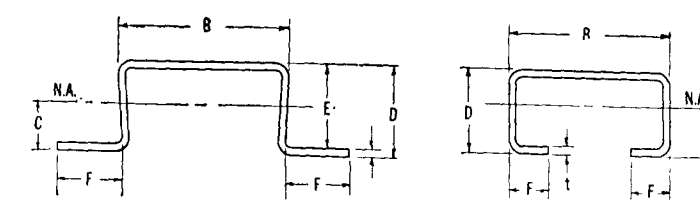
Sketch 5

To seal sills, space between floor and side sill angle is filled with car cement. Sketch at left shows seal for



Sketch 5

box car with wood filler strip and grain strip. The rib is supplied with the closure welded in place. Detail at right shows sill seal for gondola car. The sheet metal closure strip is laid against the edge of the floor before the car cement is applied.



Sketch 6

(DIMENSIONS & PROPERTIES)

Sketch 6 and Table

Here are the cross-sectional dimensions and structural properties of standard Armco steel ribs and planks. Lengths are supplied to suit requirements. Armco engineers will design any special or modified ribs needed.

	<i>t</i> in.	<i>B</i> in.	<i>D</i> in.	<i>E</i> in.	<i>F</i> in.	<i>I</i> in. ⁴	<i>S</i> in. ³	<i>C</i> in.	Weight lbs. per 1 in. ft.
Ribs for Gondola and Flat Cars	.209	5- $\frac{3}{8}$	2- $\frac{21}{32}$	2- $\frac{15}{32}$	2	3.21	2.26	1.42	9.83
Plank* for Gondola Flat Cars	.209	5- $\frac{1}{2}$	2- $\frac{15}{32}$	—	1- $\frac{5}{32}$	1.94	1.25	1.55	8.10
Ribs for Box Cars	.135	4- $\frac{1}{2}$	1- $\frac{15}{16}$	1- $\frac{15}{16}$	2	1.02	1.03	.99	5.47
Plank* for Box Cars	.135	5- $\frac{1}{2}$	1- $\frac{3}{8}$	—	1- $\frac{3}{32}$	.66	.56	1.18	4.82

*Steel planks are for use over bolsters or other cross members when wood planks cannot be bolted at these points.

I = Moment of Inertia

S = Section Modulus (*I*/*c*)

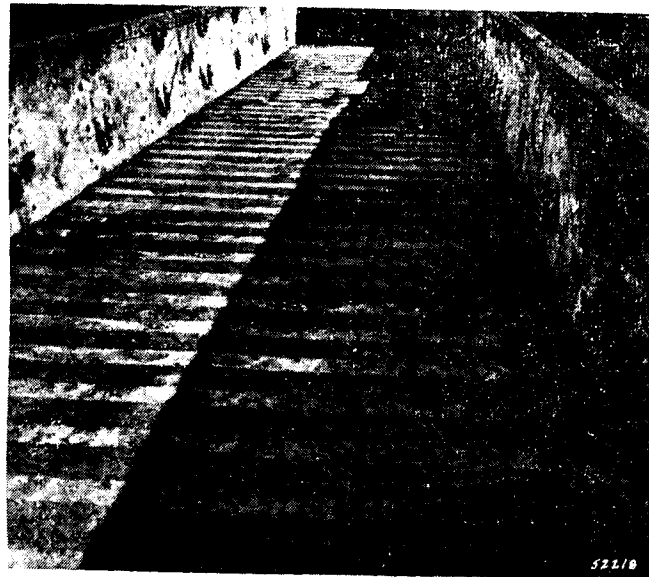
C = Distance from extreme outer surface to neutral axis

GENERAL COMMENTS ON DESIGN

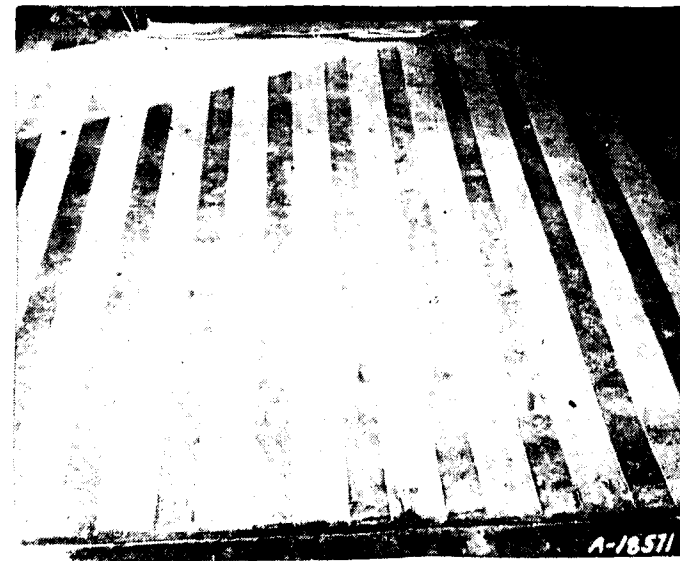
1. When replacing worn-out wood floors, the car underframe requires few or no changes. When applying the Armco floor to gondola cars with worn-out steel plate floors, stringers must sometimes be installed between cross-bearers. This requires stripping of the old plate floor with cutting torch. In many cases, depending on car design, filler strips or shims must be welded to center sill, and occasionally to side sill angles, to provide a level foundation for the new floor.
2. Armco steel ribs and planks are usually supplied in hot-rolled open-hearth steel. Copper-bearing steel will be used if specified.
3. Welding symbols in Sketches 1 and 5 indicate location of fillet welds, their size, length and spacing.
4. All welding required in installing the Armco

freight car floor can be performed downhand (from above).

5. Dimensions of steel ribs and planks shown on sketches are for gondola cars. Standard ribs and planks for box cars are thinner and lighter. For dimensions see Table of Dimensions and Properties.
6. Where it is necessary to clear rivet heads in cross members, ribs will be supplied coped (holes punched for clearance) or part of the flange and leg may be omitted as shown in Sketches 3, 4—A and 4—B.
7. In drop-end gondola cars, the last one or two flooring members at both ends of car can be wood planks to more easily accommodate the hinges for the drop-ends.
8. Clips and bolts shown in sketches are representative and satisfactory types. Others may be used at the discretion of the railroad or car builder.



The proof of the pudding. This is the Armco freight car floor shown in photo 1 after 3 years of hard service.



An Armco box car floor after two years of service.

HOW TO INSTALL ARMCO FLOORS

Here is the general procedure for the installation of Armco freight car flooring :

1. When replacing a worn-out floor, the old one must first be removed. Then, if necessary, top surfaces of side sill angles, stringers and center sill are levelled to permit steel ribs to make full contact at all supports. This is done by welding steel filler strips to those surfaces low in elevation to bring them into line. Location and dimensions of these fillers is determined in advance from blueprints of car frame to eliminate on-the-job figuring.
2. Lay all ribs required for car in correct relative position. Make sure that any special or coped ribs are at the points for which they are designed.
3. Tack welding the first steel ribs at bolster or other point at which precise location is required. Then work toward center and both ends of car using templates to space ribs.
4. While spaced accurately by templates, weld ribs

wherever they make solid contact with side sills, stringers and center sill.

5. If necessary, jack up stringers so that they meet the bottom surfaces of the rib flanges before welding. In old cars ends of steel ribs may have to be forced down to bear against side sill angles.
6. After finish-welding ribs, lay any steel planks that may be required, as over bolster, and weld in place.
7. Spray-paint ribs and steel planks. While this is not essential it is quite desirable.
8. Lay wood planks in place between ribs, and center so that equal space is left at sides of car for closure strip and seal.
9. Drill planks for bolts. Location of existing holes in side sill angles can be marked with chalk on side of car and ribs.
10. When required, set sheet metal closure strip at sills and use filler and black car cement to seal sides of car.

GOLDEN RULES OF CONDUCT FOR RAILWAYMEN

1. Maintain proper relations with officers and others in the Department in which you work.
2. Use good human relations in your contact with subordinates. Do not make them feel their position.
3. Maintain good public relations with callers and passengers.
4. Be resourceful and find ways and means of doing a job well.
5. Discard the idea of 'Give me some more men to do the job'.
6. Learn the art of getting along with people.
7. Remember the most important thing is to get a job done—not just to do it anyway and somehow but to do it efficiently, safely, economically and expeditiously.
8. Develop the attitude of 'Give me plenty of rock and plenty of wood and just get out of my way'. This typifies loyalty and enthusiasm for work and responsibility.



1. Get down to the man on the JOB.
2. Move on the line as often as you can as MEMBERS OF THE PUBLIC and not only as officials.
3. Remember pre-arranged and announced expeditions cannot have the same informative value as surprise inspections.
4. Every railwayman has to be convinced that the work that he does is to his own advantage. He should not think and measure his effort merely in terms of wages which is only a motive force.
5. Every railwayman does a specialised job which has no meaning or usefulness by ITSELF unless it is cohered with each other. There is no meaning or value to the work of a permanent way gang unless there are trains to run over the track.

RAILWAY SIGNALLING CIRCUITS

By B. K. Cooper

Methods Adopted for Steam and Electric Lines

SIGNALLING, in its widest sense, of the control of train movements, was the first sphere of railway working to benefit from electrical apparatus. Originally, this was in the form of the electric telegraph, for as early as 1837 Cooke and Wheatstone demonstrated the use of telegraphy for communicating between Euston Station and the top of the Camden incline, up which trains at that time were hauled by a steam winding engine. In 1844 the telegraph was installed on the Norwich and Yarmouth Railway, two years after Cooke had published a pamphlet urging the importance of a telegraph system in ensuring safe working over single lines.

In later years the railway telegraph developed in two forms, one being the ordinary Morse single-needle telegraph and the other a specialised instrument for "offering" and "accepting" trains from signal box to signal box by a code of bell signals, and for giving a visual indication of whether a section of line was clear or occupied.

To-day the mention of electricity in railway signalling usually suggests the use of colour-light signals and power-operated points, but electrical safeguards associated with mechanical signalling and the operation of the signal box telegraph instruments are of much earlier origin than the first power schemes. Their modern developments are still to be seen on many miles of main and branch lines.

ELECTRIC LOCKS

The principle of the block system of railway signalling, in which the line is divided into block sections and only one train is normally admitted to a section at a time, is generally familiar. An electric lock on the signal lever giving admission to a section, released only by receiving "line clear" from the box ahead, is one of the methods of ensuring compliance with the rules of block working. A further step is necessary in this electrical safeguard, however, for when the signal has been pulled "off" (i.e. to show "line clear") and restored to "on" (danger) after the train has passed, it must be locked again until the signalman ahead has sent "line clear" for a second train.

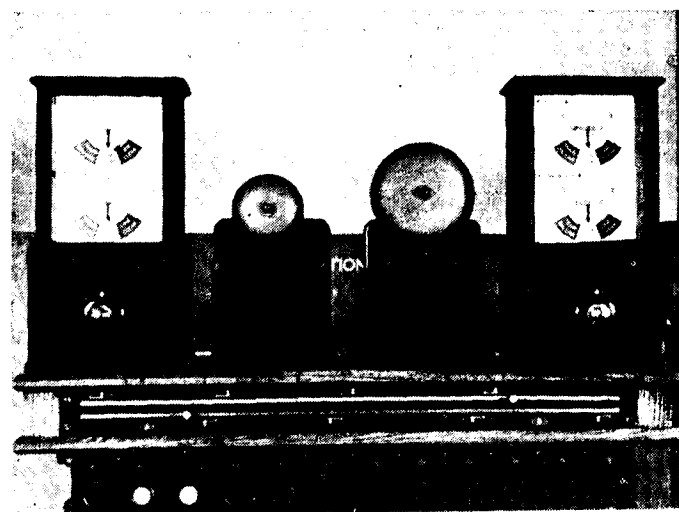


Fig. 1. Block telegraph instruments and bells

Block telegraph instruments and bells of the type used for exchanging messages between signal boxes are shown in Fig. 1. In the type illustrated the bell code is transmitted by operating a plunger, the head of which can be seen on the front of the case. It is concentric with a commutator handle which is turned to right or left to change the indicating pointer from its central "line closed" position so as to show "line clear" or "train on line." The instruments are connected by a three-wire circuit and energised by 10 V batteries.

Considering two successive signal boxes, A and B: when the signalman at B is able to accept a train from A he operates the commutator handle of his block telegraph instrument to set it, and A's also at "line clear." A circuit by which this action can be made to unlock signal 1 is shown in Fig. 3.

The circuit which energises A's block telegraph instrument to "line clear" also energises the relay LC, causing its contact to change over and make a circuit through the coil of the lock on the lever for signal 1. When this lever is pulled, contacts A, which may be controlled by the signal operating rod, are opened and the release relay is de-energised. The feed to the lever lock coil is therefore broken at contact 2, so that the lock is no longer held released and will drop back into

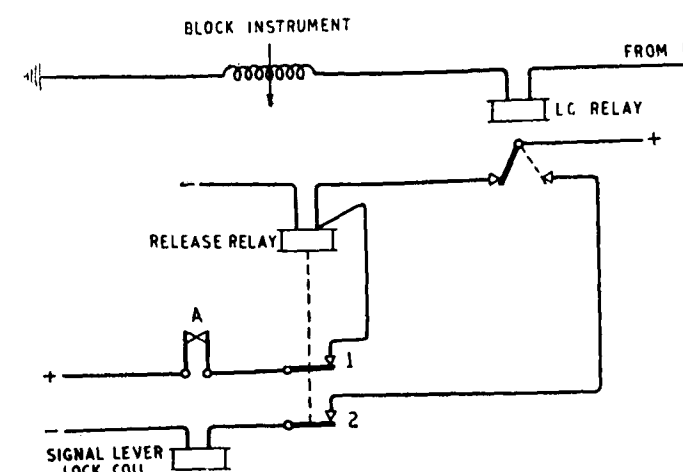


Fig. 3.—Locking circuit for signal lever controlling entry to a block section

position as soon as the lever is returned to the "danger" position. In this condition the feed to the release relay is still broken at contact 1. The release relay cannot be re-energised to prepare the circuit for unlocking the signal lever until the LC relay has been returned to normal by B restoring his block instrument to "line

closed", as a preliminary to sending the next "line clear".

In B box, when "train entering section" is received by bell signal from A, the signalman sets the block instrument at "train on line", the indication being repeated at A. This action energises and releases a lock on B's signal 2 and enables him to pull it "off." The block instrument is now locked at "train on line" and remains so until the train has passed out of the section. Consequently, B cannot again give "line clear" to A until the section is unoccupied.

One method of proving that a train has passed a given point—in this case the end of the section—is a rail treadle. The type of treadle illustrated in Fig. 4 operates by the flexure of the rails under the weight of a train causing mercury to be pumped into a float chamber so that contacts attached to the top face of the float are operated. In this way a circuit can be made to the coil of the lock on the block instrument commutator handle.

RELAY INTERLOCKING

When electrical methods were applied to the actual

ANNOUNCEMENT

We have pleasure in announcing to all our Readers and Advertisers that we propose to bring out a special Number to our Magazine entitled "EIGHTH ANNIVERSARY TRANSPORT & ENGINEERING" sometime in January 1958.

Editor

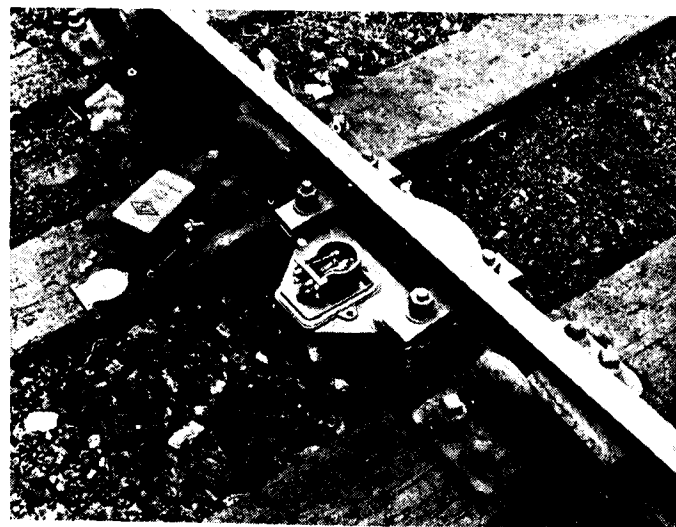


Fig. 4. Mercury type treadle attached to rail, with cover removed to show contacts operated by the passage of trains

operation of signals and points, it was no longer necessary to provide the large levers required to give the necessary purchase with mechanical working. Consequently, miniature levers controlling electrical contacts were used. Electric locks of the type described already were applied to the levers, but often the interlocking between levers which controls the sequence in which they can be operated remained mechanical. An example would be the interlocking of the levers controlling signals 2A and 2 in Fig. 2 to ensure that the distant (or warning) signal 2A could not be pulled "off" before the "stop" signal 2. Eventually the use of electrical controls for interlocking as well resulted in the replacement of levers by key switches of various types and the application of relays to produce the effects of interlocking. This principle is known as relay interlocking. No physical locks are required on the key switches because the relays prevent dangerous conditions being created in the event of incorrect operation.

A separate key switch may be provided for each function, such as the control of signals and of points, but it was a logical step forward to make a single relay set the points and then clear the signal for a particular route. Schemes based on this principle are known as route relay interlockings, and are the usual form of new power signalling to-day.

Fig. 5 shows the elements of route relay interlocking. A and B are key switches, shown in the "normal" position in which the signals are at "danger" and the points are set for the straight-through route (route

B). In this condition the N coil of the signal relay is energised and both coils of the point relay are de-energised, although its contacts remain latched in the position to which they were last operated.

If a train is to be signalled to route A, the A switch is turned. Although this breaks the feed to the N coil of the signal relay, contacts 1 and 2 remain latched in. Consequently a circuit is made to the R coil of the point relay, causing the points to be reversed (i. e. set for the diverging route). Energisation of the R coil also closes contact 3, so that a feed is made to the R coil of the signal relay. This clears the signal for route A and simultaneously unlatches contacts 1 and 2. It will be seen that even if switch B is now inadvertently operated there will be no feed to the point relay N coil and consequently the points cannot be changed. Similarly, the signal for the straight-through route cannot be cleared, for the energisation of the point relay R coil has released contact 4.

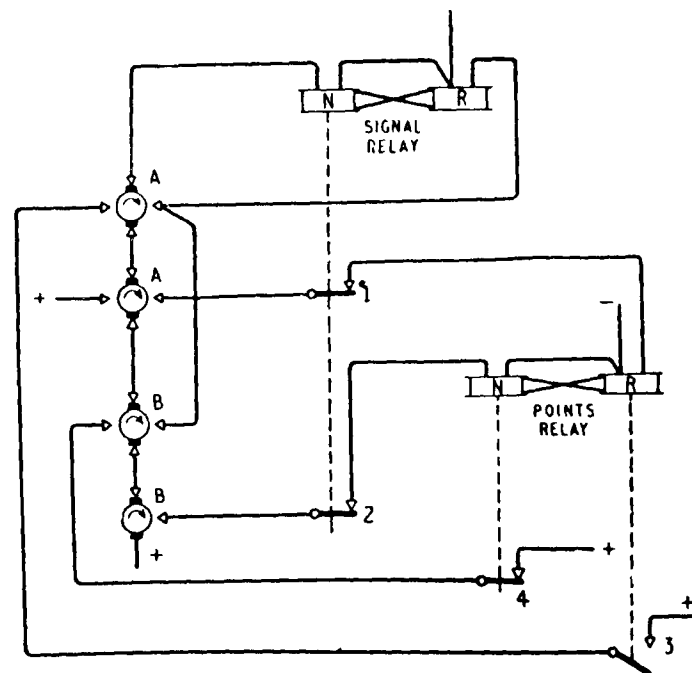


Fig. 5.—Elements of route relay interlocking.

The form taken by the control switches and their arrangement in the signal box have several variations. A separate key may be provided for setting up each route, or a single key in conjunction with a selector may control two or more routes. An alternative arrangement is for a separate key to be allotted to the beginning and the end of a route, both having to be operated in order to set it up. The keys may be located on a diagram of the tracks in positions corresponding to those of the actual signals and points they control (Fig. 6), or on a desk in front of the diagram.

In practice many control circuits additional to the simple ones described in the above example are involved in relay interlocking. Some of these are track circuits which detect the presence of trains and prevent premature clearing of signals or changing of points. Electric point machines, having thrown the points, bolt them in position, and detector contacts associated with the bolts ensure that the circuits controlling the signal are not completed until the bolt is home.

The track circuit takes various forms and has an extremely wide range of functions which it exercises through multi-contact relays. In addition to its safety controls when signals and points are operated by signalmen, it is the basis of automatic signalling in which, over long distances, signals are controlled, and the requirements of the block system maintained, by the passage of the trains themselves. In the simple d. c. case on steam-worked lines, the track-circuited sections of line are isolated electrically by means of insulated rail joints from their neighbours. A battery is connected across the rails at one end of the track circuit and a relay at the other end. When no train is present the relay is energised, but when a train enters the track circuit its wheels and axles shunt the relay coil and cause its contacts to be released. One application would be to use a track circuit instead of a treadle of the type described earlier in connection with electrical safeguards in mechanical signalling. Release of the relay by the passage of a train could then be made to unlock a block telegraph instrument from "train-on-line" and so enable a second train to be accepted.

On d. c. electrified lines where the running rails are used as traction current return conductors, simple track-circuit systems of the type just described need modification so that the apparatus will be immune from the effect of the return current from the trains. Recent examples of modifications for this purpose have been seen on the Chelmsford and Southend extensions of the British Railways, Eastern Region, 1,500 V d. c. electrification in the London area, where a.c. track circuits have been substituted for d. c.

AUTO-IMPEDANCE BONDS

If only one rail is needed for the traction current, it can serve as a common traction and track circuit return conductor. The track circuits are then formed by the insertion of insulated joints in the second rail and are known as single-rail track circuits. Where both rails are needed for the traction return, as on



Fig. 6. Route relay interlocking control panels at Liverpool Street Station signal box.

densely-occupied or steeply-graded sections of line, means must be provided for the d. c. to by-pass the insulated rail joints necessary for defining the a. c. track circuits. A method of effecting this by the use of auto-impedance bonds is shown in Fig. 7.

Referring to the figure, it will be seen that the d. c. flows in opposite directions through each half of the bond windings so that the magnetic fluxes cancel each other and the impedance presented to changing current is zero. On the other hand, the bonds present their normal impedance to the track-circuit a. c.

In the typical arrangement shown, T is a 1:1 transformer and the feed capacitor C_1 is adjusted so that the voltage across the rails is between 3 and 9 V, this low value being necessary to ensure that the relay is not shunted by leakage through damp sleepers or ballast. R is known as a two-element relay, being held operated by a state of balance between the torques of two coils, a condition obtained by adjustment of the phasing capacitor C_2 . Shunting of the track by a train disturbs the equilibrium and causes the relay to be released.

Where lines already equipped with power signalling suitable for use in conjunction with d. c. traction are to be converted for industrial frequency a. c., the choice of track-circuit frequency will demand a sufficient difference between the signalling and traction frequencies for reliable discrimination. This may be achieved by generating and distributing a special signalling supply at 83.3 c/s. New signalling schemes for industrial-frequency lines where there is no risk of extraneous

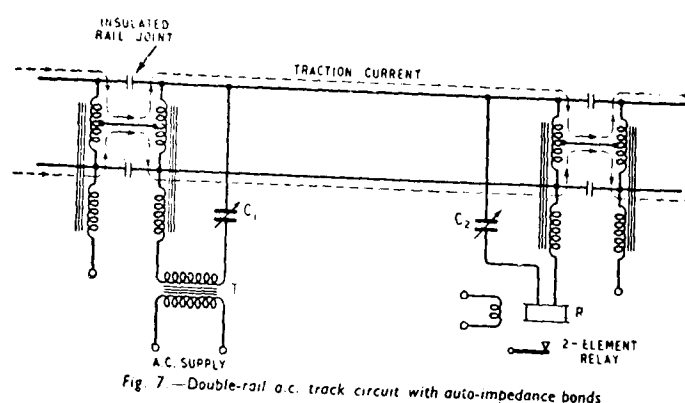


Fig. 7—Double-rail a.c. track circuit with auto-impedance bonds

interference from direct current are likely to be d. c., but a. c. at 83.3 c/s might be adopted where such a risk exists.

A contract awarded in February to the Siemens and General Electric Railway Signal Co., Ltd., was the first to be announced since the 50 c/s traction system was adopted by British Railways, for signalling modifications arising out of it. On the lines concerned, from Colchester to Clacton and Walton, single-rail d. c. track circuits and protection of d. c. signalling apparatus by series inductances will be suitable for the most part, but two-rail track circuits and a special frequency will be required on routes such as Liverpool Street to Chelmsford and Southend-on-Sea. Here the 50 c/s signalling circuits installed recently for immunity from d. c. traction current interference will have to be adapted for immunity from a future traction supply at their present frequency. In addition, before the change-over to industrial-frequency traction takes place, the modified circuits will be required to operate for a time in conjunction with the existing 1,500 V d. c. supply and not be affected by it.

The natural desire to use the industrial supply for all purposes has led in France to the development of an alternative method with valve oscillators generating a frequency of 1,000 c/s. The oscillators are fed through transformers from the 50 c/s mains and incorporate a grid-blocking circuit which breaks up the output into wave trains of 13 millisec duration, followed by interruptions of 37 millisec. Consequently the basic 1,000 c/s frequency carries a 20 c/s coding. In this way additional security is gained from interference with the signalling circuits by harmonics of the traction frequency, a point of particular importance when rectifier locomotives and motor coaches are used. Amplifiers are used at the relay ends of the circuits to ensure satisfactory holding of the relays in spite of the attenuation of the track-circuit frequency in the rails on long sections.

POWER SUPPLIES

It was shown at the beginning of this article that electrical circuits and apparatus are widely used in many circumstances other than those of complete power signalling schemes. While at one time primary batteries were a common source of supply for items such as block instruments, lever locks and isolated colour-light signals (often installed between existing semaphore signals to break up long sections and so help to keep the traffic moving), it is general to-day to use secondary battery and trickle-charging equipment, operating on a normal single-phase supply. Individual batteries, located as close as possible to their associated apparatus, are installed for working signals and points remote from a signal box. Supplies for lever locks, block instruments and nearby outdoor equipment are located in the signal box itself. Colour-light signal lamps are operated at 12 V or 24 V as this enables a short, sturdy filament to be used and makes it easier for the optical system to concentrate the light into a long-range beam. Often the lamps are two-filament types so that, if the main filament fails, a second, lower-rated filament maintains the signal in operation at reduced brilliance—a fact which would be noted by passing drivers and reported. It is now becoming more usual on British Railways to provide two single-filament lamps of the same rating and to bring the second into operation automatically by a relay in case of failure, a warning being given simultaneously in the signal box.

Point machines installed for convenience of long-distance control are often operated from a local 30 V supply, but in complete power interlocking schemes they generally work at 110 V d. c. Where it is inconvenient or impracticable to install trickle-charging equipment and a local battery at points too far from a signal box for mechanical operation, hand-operated generators are often used overseas and to some extent in this country. Although operation of the points is slower than when a battery or mains supply is available, hand generators may save the expense of providing additional signal boxes and staff. Existing semaphore signals may be modified for electric working by means of signal machines comprising a d. c. motor and a reduction gear train for driving the signal arm spindle direct or, if the machine is to be mounted at the bottom of the post, through rodding.

In large colour-light signalling installations to-day power is generally taken direct from the mains and every effort is made to obtain supplies from two sources with the largest possible measure of independence. One of these would be a normal and the other

a standby supply, generally with automatic change-over in the event of either failing. It is now becoming increasingly common to provide in addition a standby diesel-alternator set with automatic starting arrangements.

At the signal box to which the power is fed, duplicate transformers are installed to provide a 110 V supply for control circuits, point machines and colour-light signals, the colour-light lamps being connected to local step-down transformers. In the larger installations it is usual for several signal boxes and other places to need a power supply, and the method preferred is to install duplicate step-up transformers feeding a ring main or duplicate cables. A distribution voltage of 650 V is chosen when possible in the interests of economy in the size of cabling.

The extension of power signalling, a major item in the expenditure of £100 million allotted to signalling and telecommunications generally in the British Railways' modernisation programme of 1955, increases the concern of the signal engineer with supply and distribution questions. As in the field of traction, therefore, there is taking place a progressive overlapping of interests between the railway specialist and the general power engineer. The applications of electricity in railway signalling are so numerous and varied that a single article can do no more than prepare the way for further study of a subject of growing interest to many sections of the industry.

Acknowledgment is made to the Siemens and General Electric Railway Signal Co., Ltd., for assistance in the preparation of this article and supplying illustrations.

IMPORT OF STEEL ITEMS FROM JAPAN

A Japanese steel mill is reported to have signed a contract for the export to India of 9,500 tons of steel plates and 4,300 tons of steel rail which constitute a part of the 560,000 tons of steel products being sought by the Indian Government for the railways. Negotiations reportedly are under way between some Japanese companies and the Government of India for the supply of 120,000 tons of steel products for rolling stock. Besides, a Japanese trading firm is reported to have accepted a contract for the supply of 11,000 tons of steel plate to India.

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GOLDEN RULES OF CONDUCT FOR RAILWAYMEN

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2. Do not express casually careless opinion. Never venture forth an opinion unless asked for it.
3. Remember that most of our mental worries come either from trying to fight life hard or from trying to run away from life. Do neither.
4. Learn to accept people as they are, love them, respect them, praise them, encourage them, differ with them, but above all, learn the priceless art of give and take.
5. Cry neither for the moon, nor over spilt milk.
6. Accept the things that you cannot change; have the courage to change the things that you can, and possess the wisdom to know the difference.
7. Do not drive too hard a bargain with yourself.
8. Accept life as it is—its wonders, changes, disappointments, frustrations etc., etc.



HOW TO RESERVE ACCOMMODATION

Unless you reserve your berth (I Class) or Seats (II and 3rd Class long distance) in advance, you may not be sure of getting accommodation on the train you wish to travel by.

Application should be made to the Station Master of your starting station at least 3 days in advance specifying the date and train by which you intend travelling and the tickets must be bought in advance. The reservation fee leviable is 8 Annas per seat or berth.

Reservation by I and II Class from intermediate stations by Express trains can also be made similarly, but reservation ticket can be issued only after getting an advice from the Reservation Centre that the reservation has been made.

Tickets will be issued only if accommodation is available.

If the reserved seats or berths are not occupied at least 5 minutes before the booked departure of the train the reservation will be cancelled and the seat or berth given away to another.

Reservation fee is not refundable.

192221

III Class seats are also reservable on Express and certain other important trains for long distance passengers from the train-starting stations on payment of a reservation fee of 4 Annas per seat.

Do not occupy a berth or seat reserved for another, as you are liable to be displaced at the last moment.

If you find another person occupying the berth or seat reserved for you and if he will not vacate it on demand, report it to the Guard or Station Master. They will help you.

(Inserted in the interests of Travelling Public)

CLEANLINESS LEADS TO HEALTH AND HAPPINESS

Clean orderly habits contribute to general health and welfare and as such to happiness and prosperity; they are more important than medicines.

Cleanliness prevents disease; medicine only attempts to cure.

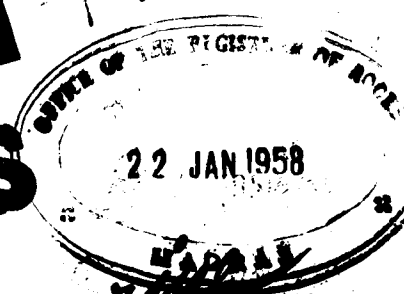
Cleanliness of the person, of the houses and colonies, reflects discipline in the individual and the community. Discipline is the foundation stone for progress of oneself and the country. Cleanliness is a good habit. It is also cheap.

All Railwaymen should set an example of cleanliness. This will help others and themselves.

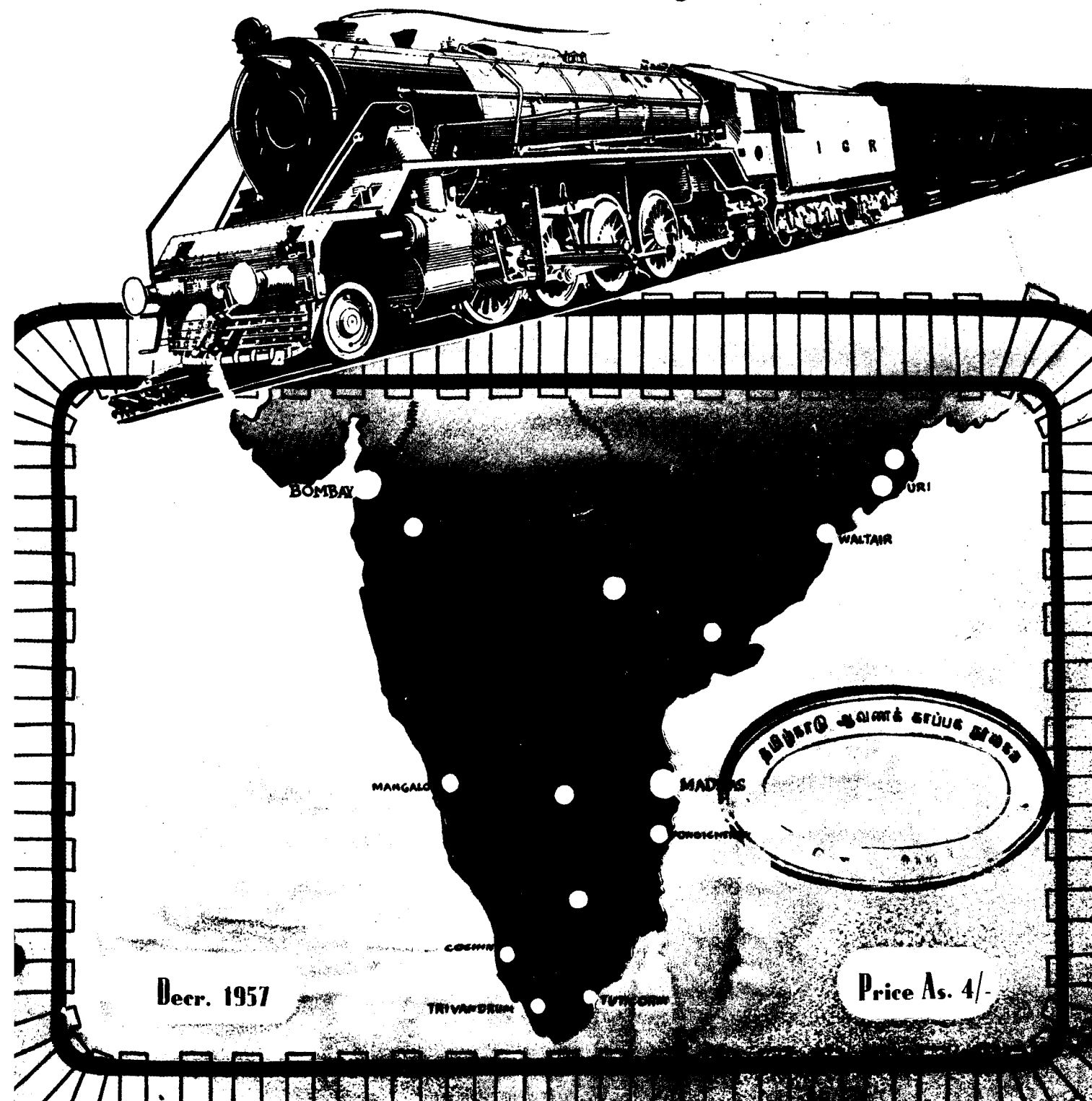
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SOUTHERN RAILWAYS



Magazine 129



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December 1957

SOUTHERN RAILWAYS MAGAZINE

1

CRANES OF ADVANCED DESIGN FOR INDIAN STEELWORKS

DEMONSTRATION GIVEN BY BRITISH FIRM

Demonstrations illustrating many advances in design have been given at the works of a British engineering company which has recently completed orders for self-propelled and rail-mounted cranes for the new Indian steelworks at Durgapur and other Indian iron and steel plants.

A four-minute operation by one crane involved the hoisting of an overhead travelling crane weighing 10 tons to a height of 35 ft. and then, with great precision, placing it delicately upon the tracks. The crane was a 25-ton-capacity, self-propelled type fitted with a 60 ft. strut jib.

On all the cranes used in the demonstration, the Diesel-electric transmission system was featured. This consists of a Diesel prime mover driving a shunt-wound generator which, in turn, supplies current to separate motors for each of the crane motions. It is stated that one great advantage of this system is the resulting reduction in fuel consumption, since the engine is not kept running at high speeds, power being developed according to needs.

This variable-voltage system provides an infinite variation of speeds, smooth acceleration, controlled lowering under power, and a high degree of accuracy. As an indication of the degree of precision, a five-ton-capacity crane lifted a steel tube and lowered it into another with such fineness of control that it did not unbalance or move in any way. There was only one-eighth of an inch clearance between the two tubes.

The British company concerned (Steels Engineering Products Ltd., of Sunderland), besides the seven cranes supplied for Durgapur, has delivered one self-propelled crane for the Indian Iron & Steel Co., of Burnpur, two rail cranes for the Tata Iron & Steel Co., of Jamshedpur, and several others for constructional companies carrying out work at Indian iron and steel plants.

U.K. FIRM TO SUPPLY 3,000-VOLT ELECTRIC LOCOS TO INDIA

The first 3,000-volt electric locomotives to be commissioned for service in India, it is announced in London, will be supplied by the English Electric Co. Ltd., which previously provided the South Indian Rail-

way with its first electric rolling-stock and is, therefore, working on familiar ground.

The new locomotives, made for a maximum service speed of 70 mph, will be used for express and passenger trains and also for goods trains.

This type of locomotive especially designed for India has an up-to-date, streamlined look. With a driving-cab at each end, fitted with buffers and a cattle-guard, the locomotive can be driven in either direction. Two pantographs — sprung metal frames — make contact with the electric wires overhead.

The superstructure, which is constructed from rolled steel with all joints seam-welded, has a smooth and pleasing appearance. All the electrical equipment, with the exception of traction motors, pantographs, and lightning-protection equipment, is mounted in the superstructure.

ISI LICENCE FOR ALUMINIUM MANUFACTURING CO.

The Indian Standards Institution has granted one more licence to the Aluminium Manufacturing Co. Private Ltd., Calcutta, for the use of the certification marks of the ISI on wrought aluminium utensils. The number of such licences granted to the aluminium industry now reaches 15.

The following standard marks, consisting of the monogram of the Indian Standards Institution super-scribed by the number designation of the Indian Standard together with the relevant grades of the material, will indicate that aluminium utensils manufactured by the firm satisfy all requirements for the respective grade given in the Indian Standard Specification for wrought aluminium for utensils, IS : 21-1953 :

Aluminium utensils are being increasingly used in the household in the country and India has also developed an export market for them in the Near East and the Far East.

To ensure a standard quality of aluminium utensils, the Government of India has banned the export of aluminium utensils not bearing the Standard Certification Mark of the Indian Standards Institution.

192221

Diesel Railcar for Swedish State Railways

*Compiled by AB Svenska Järnvägsverkstadsnerna,
Linköping, Sweden*

A QUARTER of a century has now passed since the Swedish State Railways began to prepare the light, fast railcars as a replacement for trains hauled by steam locomotives on non-electrified lines.

These first railcars made an aluminium-covered superstructure of wood on an underframe of steel, the design being taken from road buses of that time.

But already in the years before world war II, a number of collision-proof all steel diesel railcars could be taken in service, the war, however, causing an interruption in the dieselization programme. After the war all the steam trains on the non-electrified lines

have been replaced by diesel railcars, very often coupled together to train units, in which way great advantages have been gained both from operating and economical points of view. Among these advantages, in comparison with trains driven by steam or diesel locomotives, should be mentioned superior traction dynamics as well as the fact that the multiple-unit diesel train offers the great economy of flexibility. The superior traction dynamics comes from a better adhesion relation, i. e. a larger part of the total weight of the train lays on the traction wheels and, furthermore, the diesel railcar can generally be designed to have a greater effect per ton of train weight, meaning that the diesel railcar train can accelerate faster and get a higher average speed than the train driven by a locomotive.

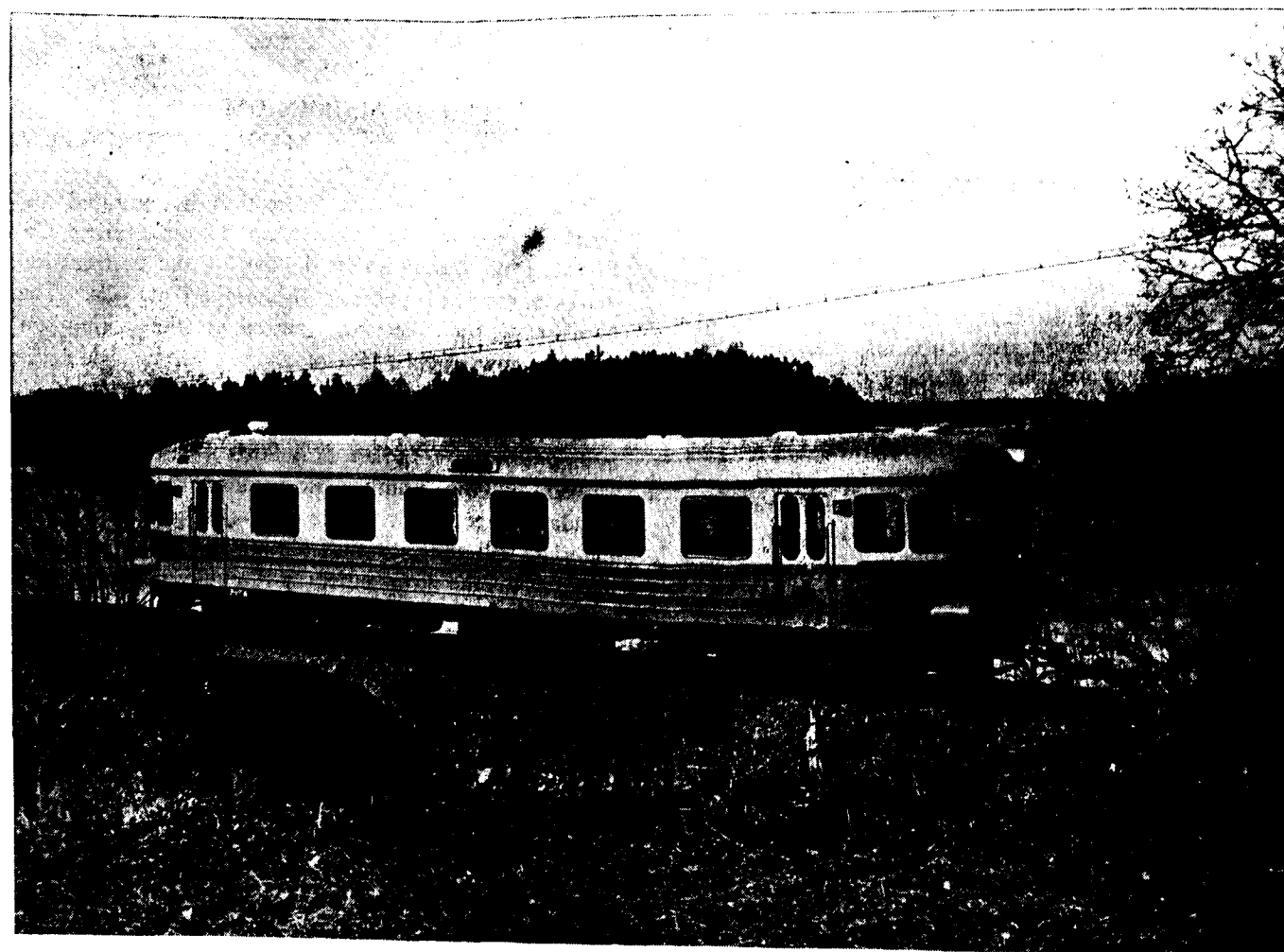


Fig. 1. Diesel railcars for Swedish State Railways.

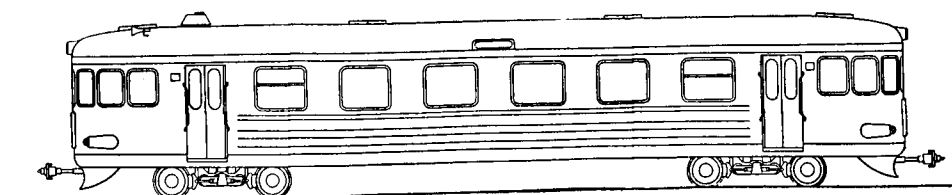


Fig. 2. Principle drawing of the railcar.

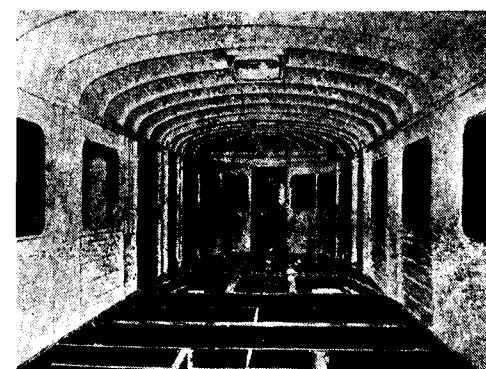
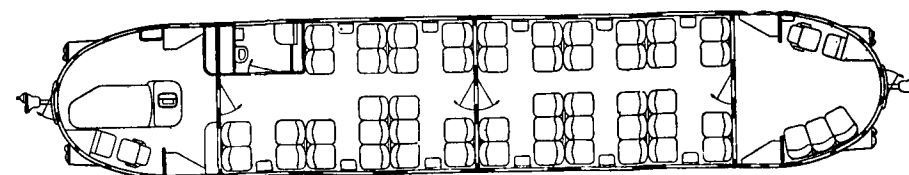


Fig. 3. Interior of steel body.

A great economy of flexibility is attained by the distribution of the traction force on several units and by the use of remote electric contacts, in which way the capacity of the diesel railcar train can easily be adjusted with regard to the varying requirements. This means a better use of men and material as well as savings as to fuel and maintenance.

In this connection perhaps ought to be mentioned the high importance of the modern easy and fast diesel engine with direct injection and with a supercharger, this type of engine being very much appropriate when designing railway equipment with small costs for operation and maintenance.

As the Swedish State Railways are carrying out a considerable programme for railcars, especially diesel-driven ones, the Swedish railway industry has acquired a very good experience in designing and building modern, light but collision-proof railway vehicles.

We think that our railway friends in India are interested in a short description of the type of diesel

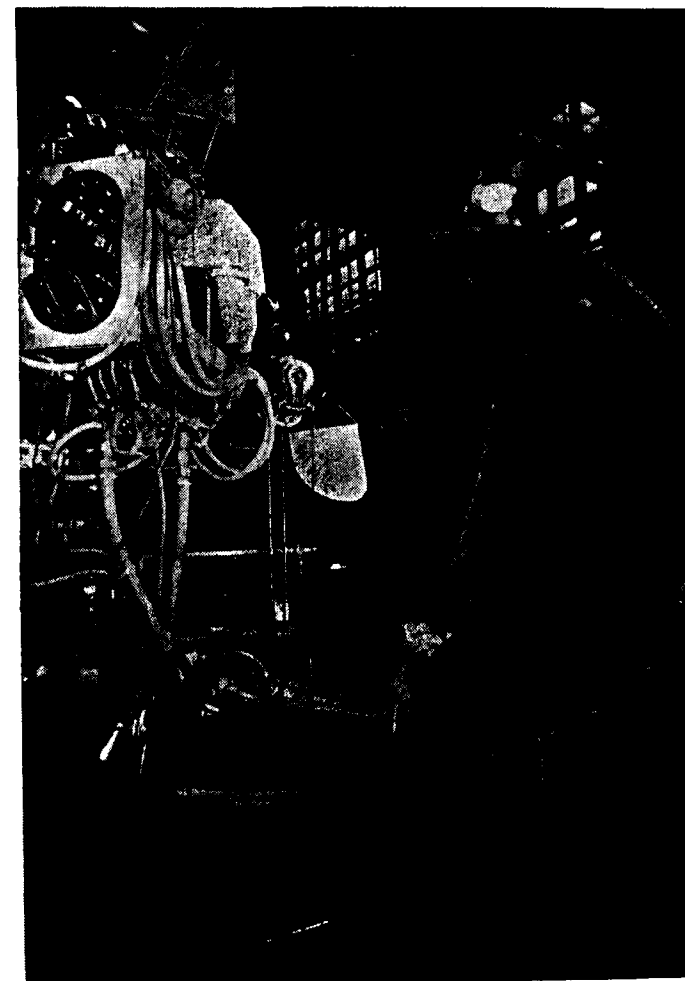


Fig. 4. Spot welding of end of roof.

railcar, a great number of which has been bought by the Swedish State Railways during the last five years and of which our company has hitherto delivered abt. 200 units.

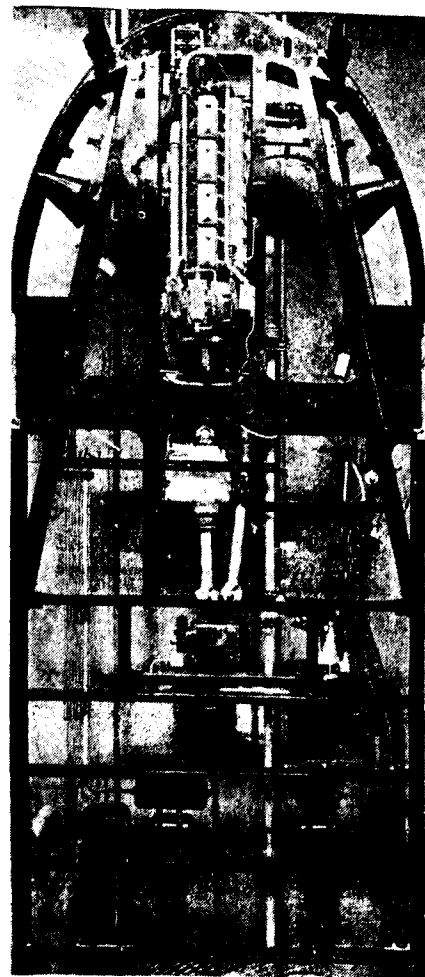


Fig. 5. View of the underframe with diesel engine and gear boxes.

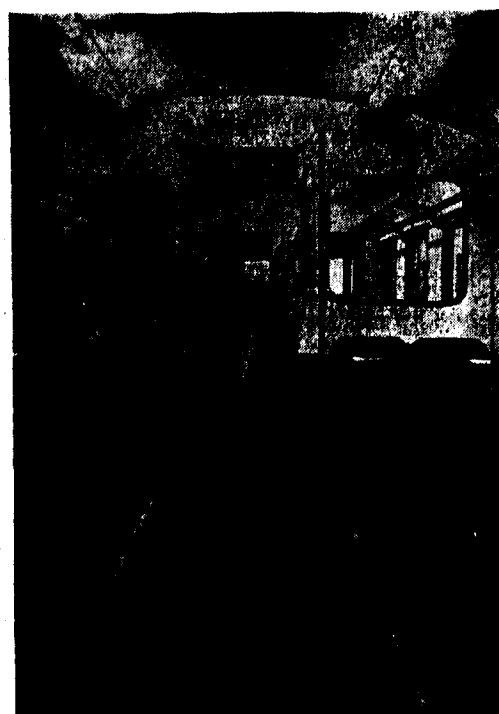
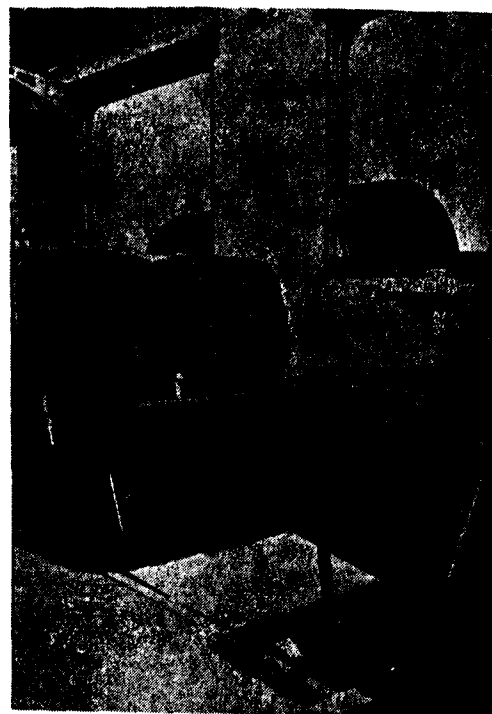


Fig. 6 and 7.
Interior of passenger compartment.

These cars have fully complied to the requirements of the State Railways, having made service in very different climatic conditions from a summer temperature of $+90^{\circ}\text{F}$ to arctic climate north of the Pole circle, where the temperature in winter can sink to -50°F .

This railcar is an exquisite achievement in the field of light-load traction. Meant for suburban and cross-country services, it has been designed for speeds as high as 72 m. p. h./115 km/tim./, giving satisfactory service on all track conditions. In spite of high passenger capacity, the car is one of the lightest among the rolling stock of this size ever produced.

The outside view of the railcar is shown on figure 1, and figure 2 indicates the interior arrangements with one vestibule in each end of the car with driver's equipment and space for luggage. There are two passenger compartments.

Main data :

Track gauge	1.435 m.
Length over ends	16.55 m.
Breadth	3.1 m.
Height of car above rail	3.24 m.
Height of floor above rail	0.88 m.
Distance between bogie centres	10.7 m.
Distance between axles in bogies	2 m.
Weight in working order	17.4 ton.
Number of seats 2nd class	53
Engine	205 hk.
Number of traction axles	2
Maximum speed	115 km/h



Fig. 8. Interior of toilet.

The sides, ends, roofing, and underframe of the steel body form a self-supporting unit in a light integral design. The underframe consists of pressed steel profiles joined together by arc welding. Sides, ends, and roofing are manufactured in complete units mainly by spot welding and strengthened by ribs and posts of z-profiles. The joining roof (walls and walls) underframe is made by means of riveting. The weight of the steel body is only 3.5 tons. The design of the steel framework can be seen on figure 3, 4, and 5.

The insides of the walls are clad with Formica boards or similar, and the roof of painted wall board. Space between the ceiling and roof, as well as between inside and outside walls is filled with Isoflex, a plastic material, or glass fibre panels for temperature insulation and for accoustic purposes. The floor is laid with linoleum or rubber mats on plastic glued $\frac{1}{2}$ " plywood resting on wooden beams on a steel underframe. Under the plywood there is a layer of Isoflex or glass fibre panels on a wallboard sheet.

The entrance doors, of an all pressed steel construction, are placed in each of the driver's cabs. They are of the folding type, automatically operated by door machines working on the compressed air system. The doors can be operated either from inside or from outside of the car and the driving gear provides

control to prevent the opening of the doors when the car is in motion. The doors in the ends of the car are of the swinging type, turning outwards, and the doors between driver's cab and passengers compartment are turning to both sides.

All windows have double glass and the front windows are equipped with safety glass. In each passenger compartment there are two openable windows of the half-drop type. All the window panes are fastened by means of rubber profiles.

The seats are made of enamelled steel tubes and furnished with seats and backs of foam rubber, which are clad with specially made fabric. The cars are provided with other amenities for passengers such as tables, ashtrays, luggage racks, curtains, etc.

The toilet is fairly spacious, self-flushing and well equipped.

The interior of the car will be seen on figure 6, 7, 8, and 9.

The interior lighting of the passenger compartments is supplied by 1000 V 50 c/s cold cathode tubes mounted in two rows in the ceiling in shock proof mountings. Each end of the car is provided with one headlight of 50 watts and two sidelights of 50 watts each.



Fig. 9. Driver's cab.

The car is heated by hot air from the fan for the engine radiator. The air is thoroughly filtered. The driver's cab is additionally heated by aero-temperers in front of the driver's seat. In this way the car is well ventilated, but to increase this, the platforms and the passenger compartments are equipped with hand operated roof ventilators.

As stand-by, and for extra cold days, an oil burning heater is inserted in the water system.

Figure 10 shows the design of the bogies. They are all welded and equipped with resilient SAB wheels on SKF roller bearings, see figure 11. The axles are held parallel by long swing arms connected to the central bogie frame by rubber-bushes. The spring system consists of involute springs between the swing arms and the bogie-frame. The driving bogie has a differential gear box fitted to its central frame. The gear box is connected to the conical gears mounted directly on the wheel axles by universal driving shafts. The car body rests on rubber pads on side brackets attached to the central bogie frame. The rubber pads

permits the car body to make lateral movements and the bogie to turn by passing curves. The traction and braking forces between the bogies and the underframe are transformed by a rubberbushed rod not shown on figure 10. The wheel diameter is 670 mm.

The brakes are electro-pneumatically operated and of a self-adjusted hydraulic type with one block per wheel. The car is further equipped with a mechanical handbrake for parking.

Traction power is supplied by a Swedish direct injected diesel engine, Scania Vabis 815, 8 cylinders supercharged to give 205 HP at 1750 RPM for railway service. The engine is rubber mounted direct to the underframe in one end.

The radiator is situated below the floor and the fan is driven by an auxiliary shaft from the diesel engine.

The transmission consists of a hydraulic coupling Daimler 18", a five speed epicyclic Wilson gearbox R 11 B, a reversing unit, the differential gear box

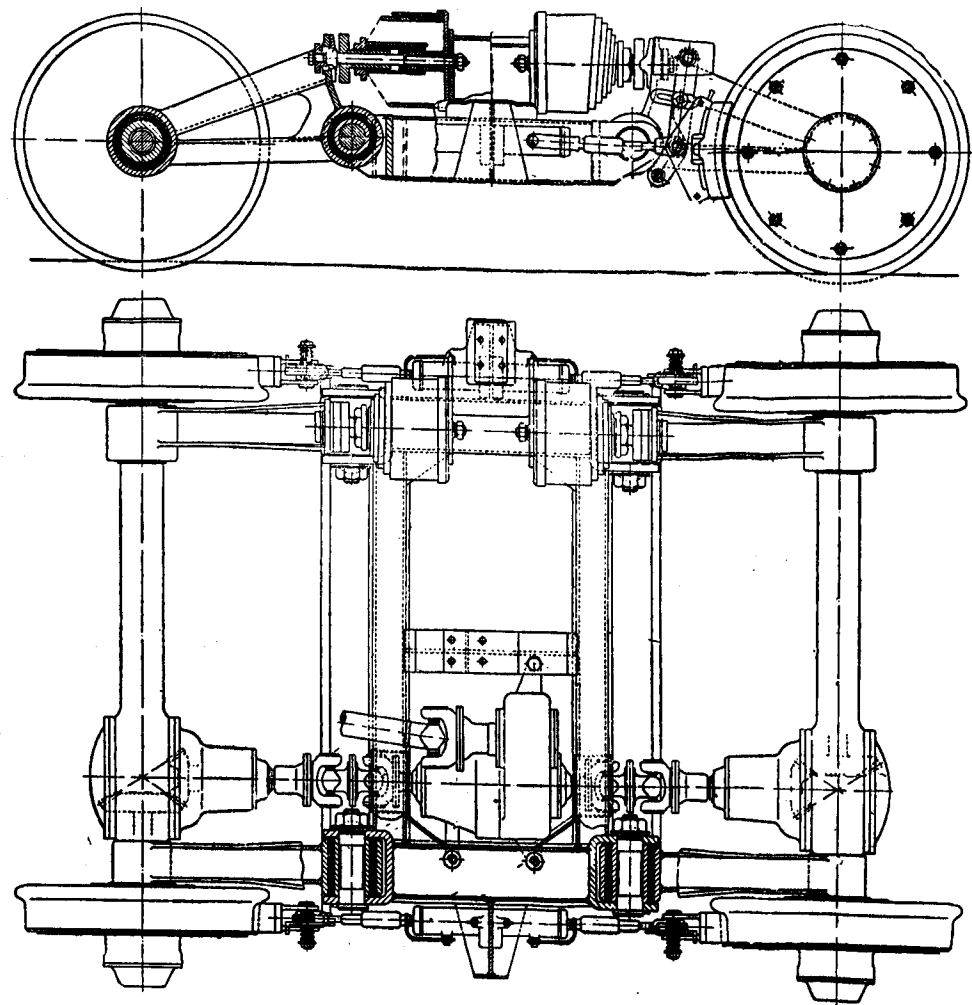


Fig. 10. Principle drawings of driving bogie.

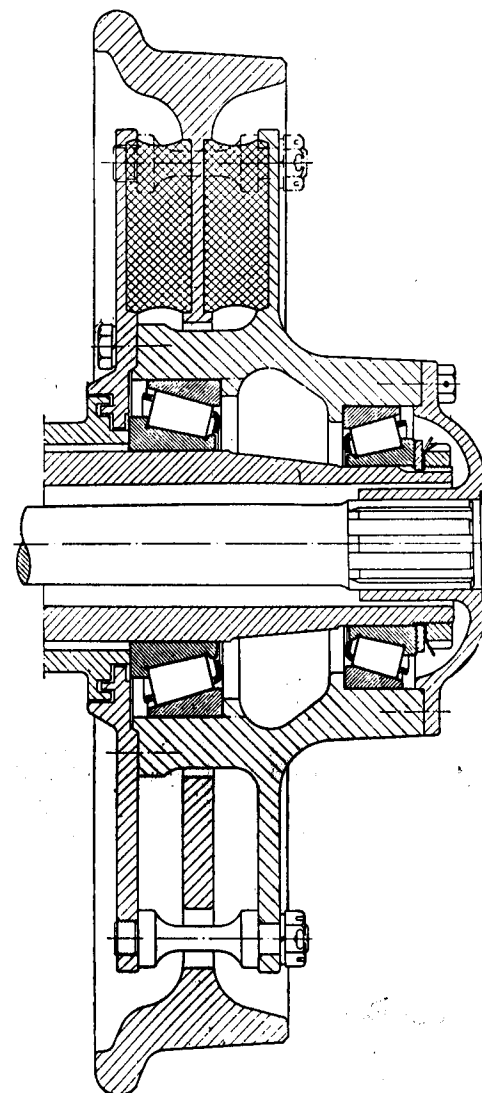


Fig. 11. SAB resilient wheel with SKF roller bearings.

mentioned above and the conical axle gears. See figure 5 and 10. The Wilson gear box and the reversing unit are operated by compressed air by means of E. P.-valves controlled from the driver's stands in both ends.

The air compressor Knorr V 70/155 is belt-driven from the engine. A 24 V 1600 W DC generator and an accumulator battery of 200 amp. hrs. capacity supplies power to the engine starter, lighting and signalling equipment, auxiliary heating fans sirens, sanding, door machines, electropneumatic control system etc. E. P.-valves, relays, switches etc. are easily accessible in the apparatus box in one of the driver's cabs as can be seen from figure 12.

The driver's controls are much simplified. The operations for accelerating, braking, and coasting are carried out by one handle, operating a master-controller of the drum type. The starting of the engine, gear changing, reversing, sanding, and blowing of the sirens

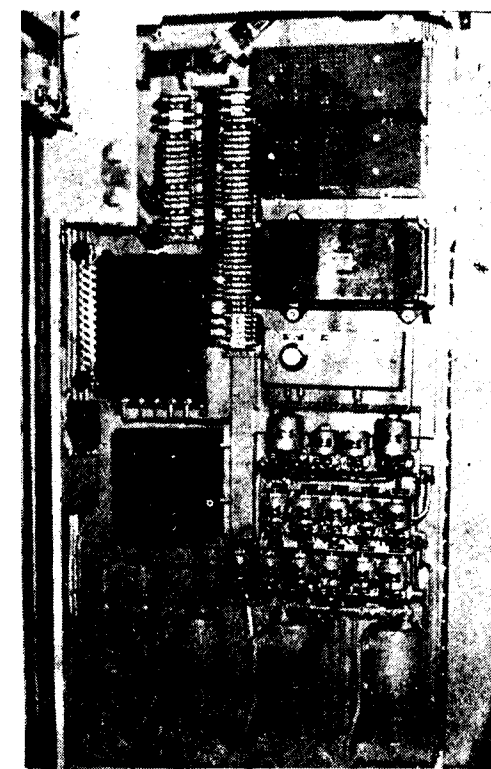


Fig. 12. Apparatus box in driver's cab.

can all be done through press-button switches situated on the driver's control-panel, which is further equipped with various indicator lamps and door locking switches. In view of the variations in the traffic intensities during the different hours of the day, the cars are so designed that any number up to 10 can be coupled together through automatic couplers and the whole train can be driven from any one of the very easily operated driver's controls.

The automatic couplers are of Scharfenberg type with built-in pneumatic connections. The car is in both ends provided with hand-operated junction boxes for control current.

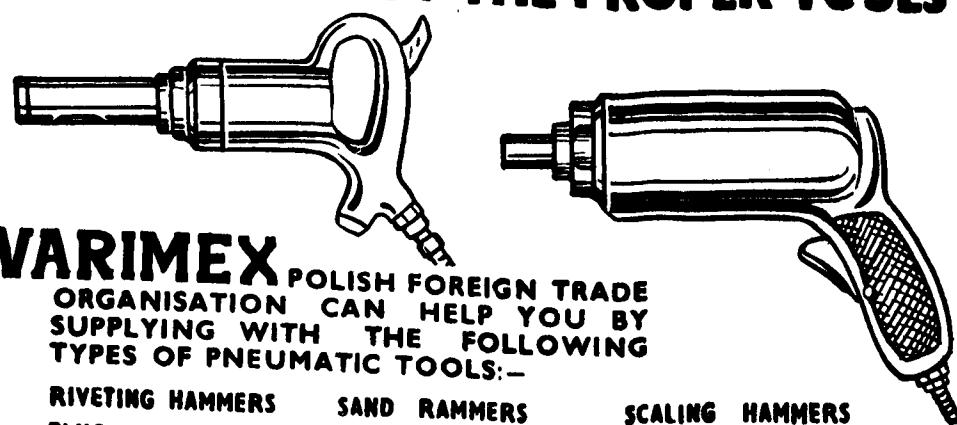
The Swedish State Railways have also a great number of trailer cars in the same size as the engine cars, in multiple service generally coupled at a number corresponding to the proportions 3 : 2 or 2 : 1 between engine cars and trailer cars.

These trailer cars are arranged in the same way as the engine car described, i. e. with driver's cabs in both ends, or with half the car adapted to luggage space and with one driver's cab, or, finally, as combined luggage and post cars, without driver's cab.

The same type of cars, but with reduced breadth is used also on the narrow track lines with a track of 0,891 m.



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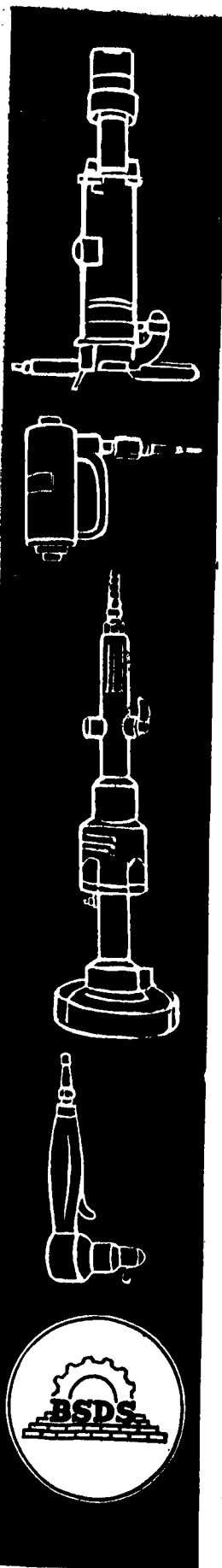


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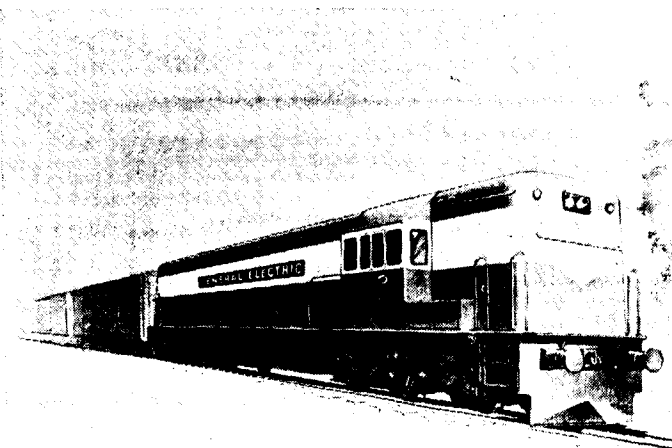
General Electric Locomotives

GENERAL ELECTRIC is marketing a complete line of industrial haulage and road locomotives for the world's railways. Approximately one year ago this company introduced a universal type locomotive that is readily adaptable to varying gauges, braking systems and couplers. By using standard, precision built components which have been tested in millions of miles of railroad service, the world's railways have been furnished with a locomotive that may be used in all types of service—passenger, freight or switching.

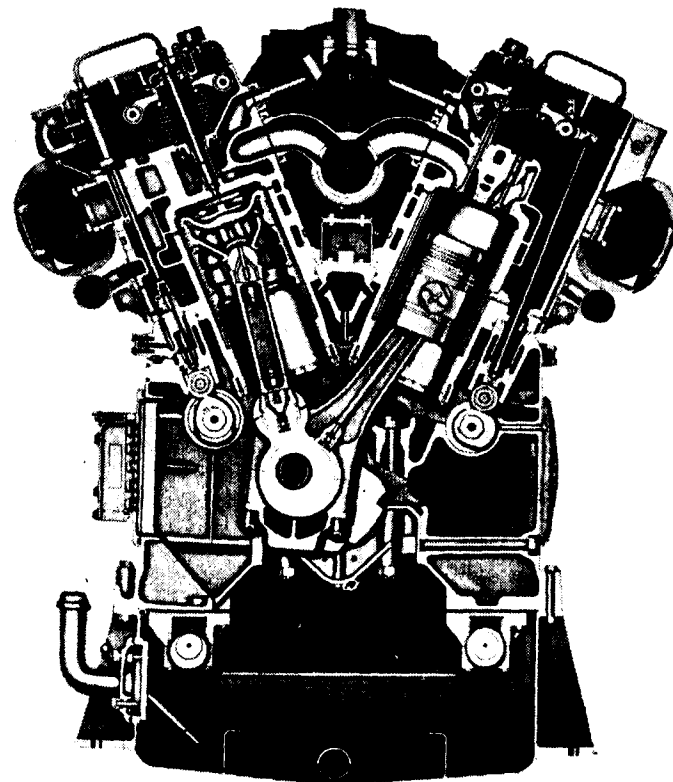
A complete line of industrial and mining locomotives is also marketed by this company. Three steel mills in India alone have recently purchased over 38 of these General Electric industrial haulage locomotives. India Iron & Steel Company recently purchased five diesel electric locomotives, two rated at 80 ton, one at 72 tons and two at 31 tons for its plant at Burnpur.

Hindustan Steel Company is currently putting 20 General Electric diesel electric locomotives into service at its new plant in Rourkela.

The third Indian Steel Mill to recently purchase General Electric locomotives was Tata Iron & Steel Company. Two of these are rated at 115 tons and 720 hp. and are the largest size industrial locomotives built by General Electric. Four are 80 ton diesel



U18C—1980 hp. General Electric Diesel-electric Locomotive.



Cut away view of "V" type diesel engine—1320 hp. (8 cylinder) and 1980 hp.

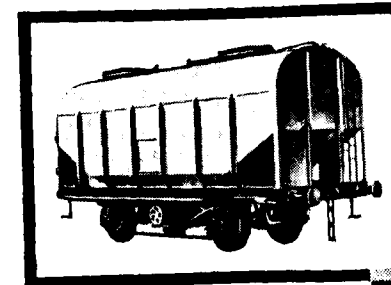
electrics and one is a 25 ton diesel electric. All the locomotives for the three steel mills are broad (66 inch) gauge and have special equipment allowing them to operate under extremely dusty conditions, heat and humidity that is encountered in the blast furnace area of steel mills. General Electric is also furnishing traction motors, generators, and the diesel electric control systems for 100 ALCO locomotives ordered by India for service on the Eastern Railways.

As part of its standard line of industrial switching locomotives the General Electric Company will furnish customers with locomotives weighing from 25 tons and rating 150 hp. up to locomotives which weigh 88 tons and rate at 1200 hp.

The company has always been well known for its export road locomotives and now is selling a complete line of high horsepower universal-type locomotives. These locomotives use a rugged, 4-cycle diesel engine in six models of the line. All together nine models are available. They range from 990 hp. up to and including 1980 hp. and weigh from 148,500 lb. up to

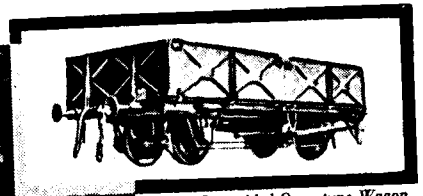
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The strength of steel pays valuable dividends. In length of service. In fewer running repairs and maintenance. In longer operative life. In overall economy. From the Scottish factory of Pressed Steel Company Limited, steel wagons many thousands strong pass year by year to the railways of the world . . . for a hard and long life of service.

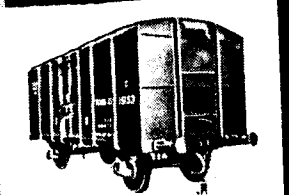


20-ton capacity Bulk Grain Van to the order of British Railways.

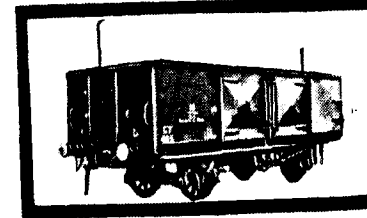
their
service
is world
wide



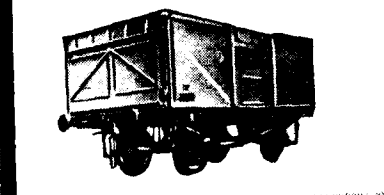
F.J.S. Low-sided Open type Wagon as used by Queensland Government Railways, Australia.



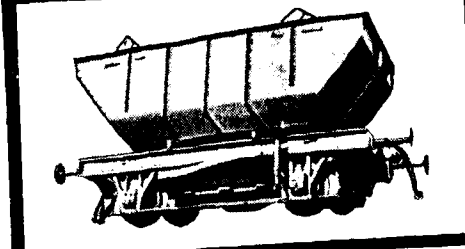
Broad gauge covered Wagon type C.R. as used by Indian Railways.



22-ton G.Y. type Wagon as used by Victoria Government Railways, Australia.



16-ton all steel Mineral Wagon, 50,000 of which have already been built in our Paisley works to the order of British Railways.



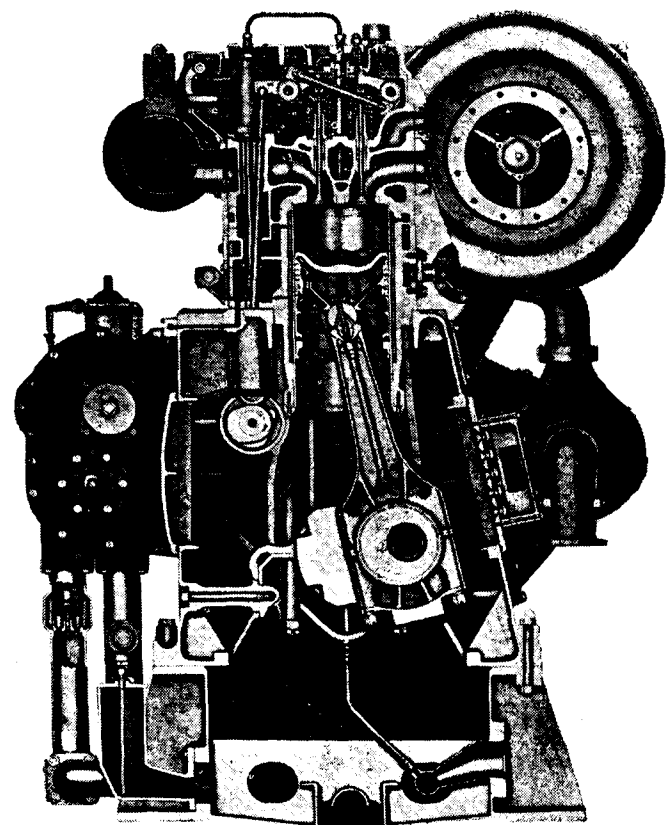
V. J. M. Hopper type Wagon with Drop Bottom Door as used by Queensland Government Railways, Australia.

PRESSED STEEL COMPANY LIMITED

RAILWAY DIVISION, PAISLEY, SCOTLAND Manufacturers also of
HEAD OFFICE: COWLEY, OXFORD Motor Car Bodies, Prestcold
Refrigeration Equipment

London Office: Sceptre House, 169 Regent Street, W.1

and Pressings of all kinds



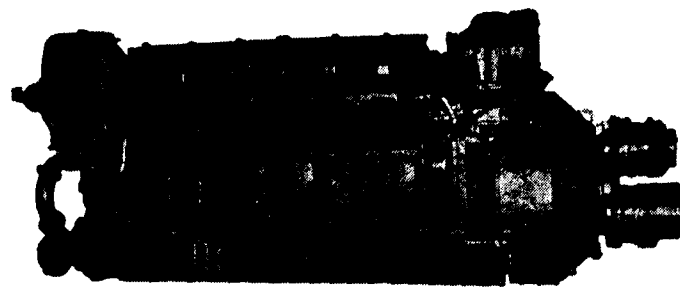
FW engine used in U9B and U9C Locomotives.

211,000 lb. Since the line was introduced in March, 1956, orders have been received from Chile, Mexico, Argentina, and Brazil. According to the manufacturer this new line of locomotives provides superior performance because of the higher horsepower and tractive effort obtainable.

The versatility of the new line is demonstrated in the fact that the locomotives may be used for switching, freight or passenger service. Visibility is excellent in both directions and no turning is necessary. Various braking systems and coupler heights may be specified. The universal locomotives may be used on track gauges from 36 to 66 inches. Dynamic braking and train heating equipment may be installed at a small additional cost. World-wide composite clearance diagrams are also met.

In the medium horsepower range four models of locomotives are being sold. These rate at 990 and 1320 hp. and can be equipped with two 2-axle trucks or two 3-axle trucks. All axles are motored with the reliable GE-761 traction motor.

Higher horsepower and axle loading is also provided in the locomotives rating 1980 hp. This is the U18B or the U18C which weighs 211,000 lb. and 203,000 lb.



12 cylinder "V" type engine used in U18B and U18C General Electric Locomotives—1980 hp. (165 hp. per cylinder)

respectively.

All the universal type locomotives are equipped with the General Electric high speed bogie. A floating bolster suspension system is used, which reduces the number of complicated and often inaccessible support members found on most conventional lateral motion trucks. The truck is fully equalized and the weight of the locomotive is distributed through four curved rubber blocks on each bogie. The FV and FW series of engines, which are rated at 165 hp. per cylinder, are used in the heavy duty locomotives. These engines are of a sturdy construction and have been able to achieve their high rating by effectively dissipating engine heat. A unit cylinder with a thin walled, chrome-plated, wet liner is used. This is one of the most advanced developments in the diesel field today. The four cycle engine is easily super charged and a large volume of cooling air is available to the cylinder. Because of valve overlap and the four cycle operation, the cylinder is swept free of the products of combustion and time is allowed for fresh air actually to cool the cylinder.

Effective bearing area on the main bearing is doubled by the use of an articulated connecting rod which is joined to the master connecting rod by means of a special construction that has long been a feature of this FV type engine. The main bearings are interchangeable, precision type aluminum.

Frame and cylinders are made from Meehanite which is a close grained metal bridging the gap between cast iron and tool steel. It combines the high damping capacity, self-lubricating properties and better wear of cast iron with the greater strength, higher resilience and toughness of tool steel.

Agents of the International General Electric Company should be contacted for further information on these locomotives.

More NOHAB-GM locomotives to the Danish State Railways

NYDQVIST & Holm Aktiebolag (NOHAB), Trollhattan, Sweden, delivered on August 16 the first locomotive of the last order from the Danish State Railways.

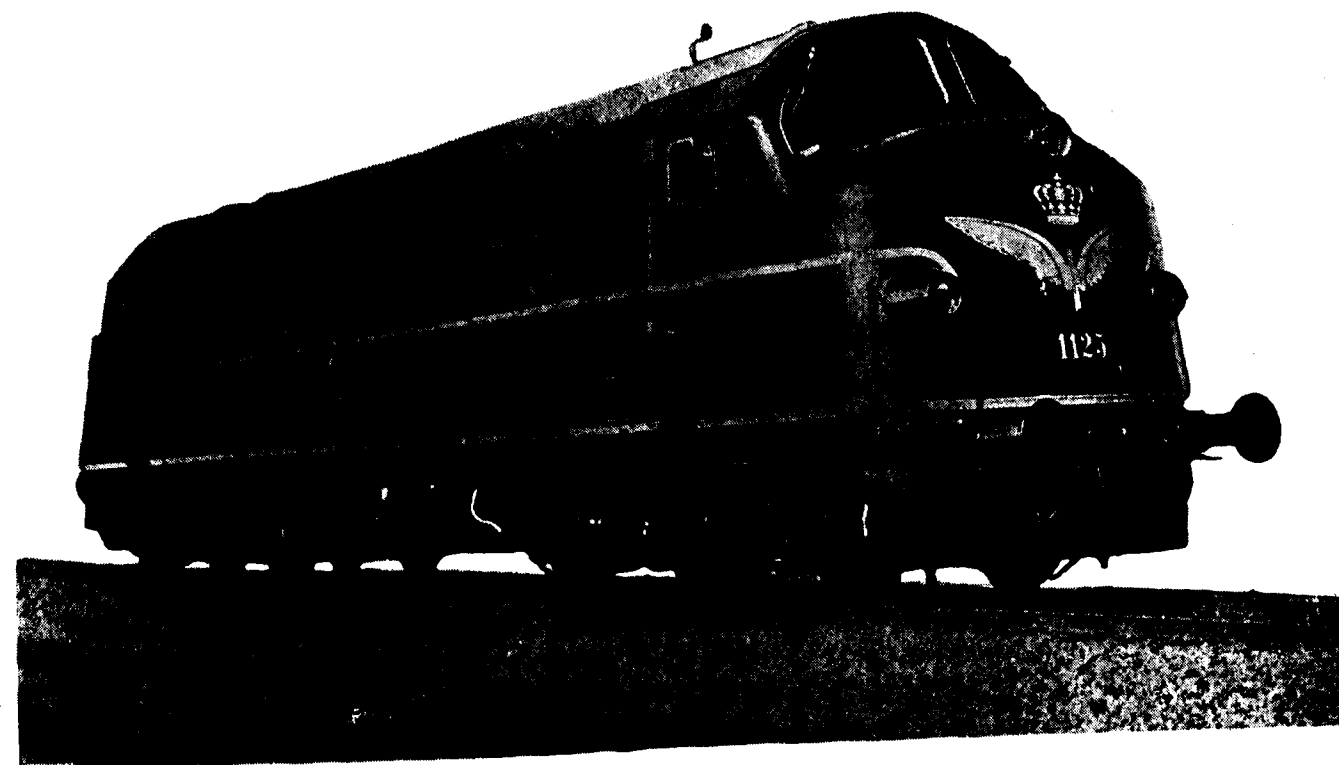
Earlier NOHAB has delivered 24 locomotives of this type to the Danish State Railways (DSB).

The DSB has made a summary of the expenses for the first four locomotives, delivered by NOHAB in 1954 and they registered savings amounting to £ 35,300:- (Danish Crs. 678,000 :-) per locomotive per year in comparison with their steam locomotives.

Some months ago the DSB published a summary of the expenses for the second series of 20 locomotives. In this there is stated that only the fuel savings amount to about half a million Danish Crs. per locomotive per year.

The locomotives are diesel-electric and are manufactured by NOHAB in collaboration with General Motors, U.S.A.

They have two driving axles in each bogie. The bogies are made according to the so called flexi-coil principle with the axles displaceable in the journal



boxes which gives the locomotive an extremely smooth and even running.

The driving machinery consists of one V-shaped 1900 hp. 16-cylinder, 2-cycle diesel engine, manufactured by General Motors, U.S.A.

The power transmission is electric and consists of a generator, direct driven from the diesel engine, regulation equipment, and D. C. motors, which by gears transmit the tractive power to the driving wheels.

The principle technical data are

Max. speed	133 km/h
Max. tractive effort	18 tons
Length over buffers	18,900 mm.
Total wheelbase	14,300 "
Bogie	4,000 "
Wheel diameter	1,015 "
Weight in working order	106 tons

For heating the train, an automatically working steam generator has been installed.

1800 H.P. Diesel-Electric Locomotives for Indian Railways

Until April 1955, ALCO was known throughout the world as the American Locomotive Company—for more than 100 years a foremost builder of railroad locomotives. During the days of steam locomotives—and since 1948, the diesel-electric unit—the company has built power for nearly every railroad in the world. It has 7,652 diesel locomotives in service today.

The corporate name of the company was changed in 1955 in order to reflect a diversification program that has given ALCO a product line of more than 56 separate items for 11 major markets. All of this, of course, while the company continues to produce diesel locomotives.

Among ALCO's present product line are drilling rig power packages for the oil production industry, diesel engines, special steels (including a new leaded-steel that has been tested and proved), guided missile components, pre-fabricated pipe, rings and forgings, heat exchangers, all types of pressure vessels, atomic power plants and nuclear components.

ALCO operates seven manufacturing plants in this country and is affiliated in Canada with the Montreal Locomotive Works. Domestic plants are at Schenectady, Auburn and Dunkirk, N. Y.; Latrobe, Pa.; Chicago Heights, Ill.; Cincinnati, Ohio and Beaumont, Texas. The company employs approximately 10,000 workers.

ALCO diesel engines through the years have been used in nearly all types of applications where reliable, powerful motive force is required. In addition to powering ALCO diesel-electric locomotives in use by nearly every railroad in the United States and many railroads overseas, they have been adopted also for many stationary and marine applications where dependability is a requisite.

IN March, 1957, the Government of India entered into an agreement with ALCO Products, Inc., of New York, N. Y., U. S. A., for the supply of 100 broad gauge main-line diesel-electric locomotives, having an output of 1800 HP to the generator. The first lot of 20 locomotives will be delivered in India in 1957 and the balance of 80 units will be supplied during the second half of 1958.

ALCO Products, Inc., formerly the American Locomotive Company, is a well known firm of locomotive builders whose first plant was established at Schenectady, N. Y., in 1848. Since that date the company has delivered in excess of 80,000 locomotives to railways of the world. ALCO was one of the diesel-locomotive pioneer companies and its first commercial diesel-electric locomotive was sold in 1925. The diesel-electric locomotives put into service by the firm in the thirty years since elapsed have passed the 8,000 mark, most of which were built since the Second World War, when dieselization began its upswing.

One of the noteworthy features of ALCO's diesel-electric locomotive manufacturing program lies in the thoroughgoing standardization which the company employs. ALCO's ten different types of locomotives make use of three different engine sizes, with outputs of 900, 1800 and 2400 HP. Interchangeable parts are used in all three diesel engines, the difference in output being obtained by varying the number of cylinders. The same braking equipment is available in all units and electrical control components are standardized as well. Only two sizes of traction motors are used to

cover the full spread in locomotive size.

In its locomotive roster ALCO differentiates between the heavy domestic type locomotives built for use primarily on U. S. railroads, where the high rail weight enables locomotives to run with axle loadings up to 27.5 tons, and the lighter weight designs intended for use abroad on systems where much lighter rail is employed. The axle loading of the latter units varies from 11 to 18.5 tons.

In addition to being called upon to meet the lower weight limitation of railways outside of the American continent, the company's export units also are built to fit within the international clearance diagram. A further requirement which ALCO has aimed to meet in its design is that the bogie design be conceived to enable satisfactory riding even on track in indifferent or poor condition.

The ALCO "World" locomotive, which is the type ordered by the Indian Government, is ALCO's representative design in the 1800 HP class for use in railways outside of the U. S. A.

DESCRIPTION OF THE LOCOMOTIVE

A view of the first of the locomotives built for India is shown in Figure I, a photograph taken at the builder's works. Buffers and couplers are not shown, as they will be applied in India.

With the minor modifications required by the Indian

Railways gauge, the basic dimensions of the locomotive are as follows:

Height (Roof)	12' 9-1/2"
Height (Maximum)	13' 1-3/4"
Width (Over Cab Handrails)	9' 4"
Length (Over Body)	55' 7/8"
Length (Overall)	58' 11"
Weight on Driving Wheels	246,000 Lbs.
Weight on Total Locomotive	246,000 Lbs.
Supplies: Lubricating Oil Capacity	200 Gallons
Fuel Oil Capacity	1600 Gallons
Engine Cooling Water	260 Gallons
Sand	14 Cu. Ft.

The frame of the locomotive is built of steel sections electrically welded and it consists of a main frame made of two H section beams running the length of the locomotive and two side frames of welded truss construction. The nose of the locomotive is reinforced specially to give additional protection

to the engine crew in case of a collision.

The main transverse members of the locomotives carry the bogie pivot castings. The general arrangement of the components is seen in Figure 2, which is the longitudinal cross section of the locomotive.

The major components identifiable in this Figure 2 are the following:

1. Diesel Engine
2. Main Generator
3. Exciter
4. Auxiliary Generator
5. Bogie
6. Electrical Control Compartment
7. Turbosupercharger
8. Oil Bath Type Air Intake Filters
11. Traction Motor Blowers
13. Radiators
14. Radiator Fan
15. Radiator Fan Drive Magnetic Coupling

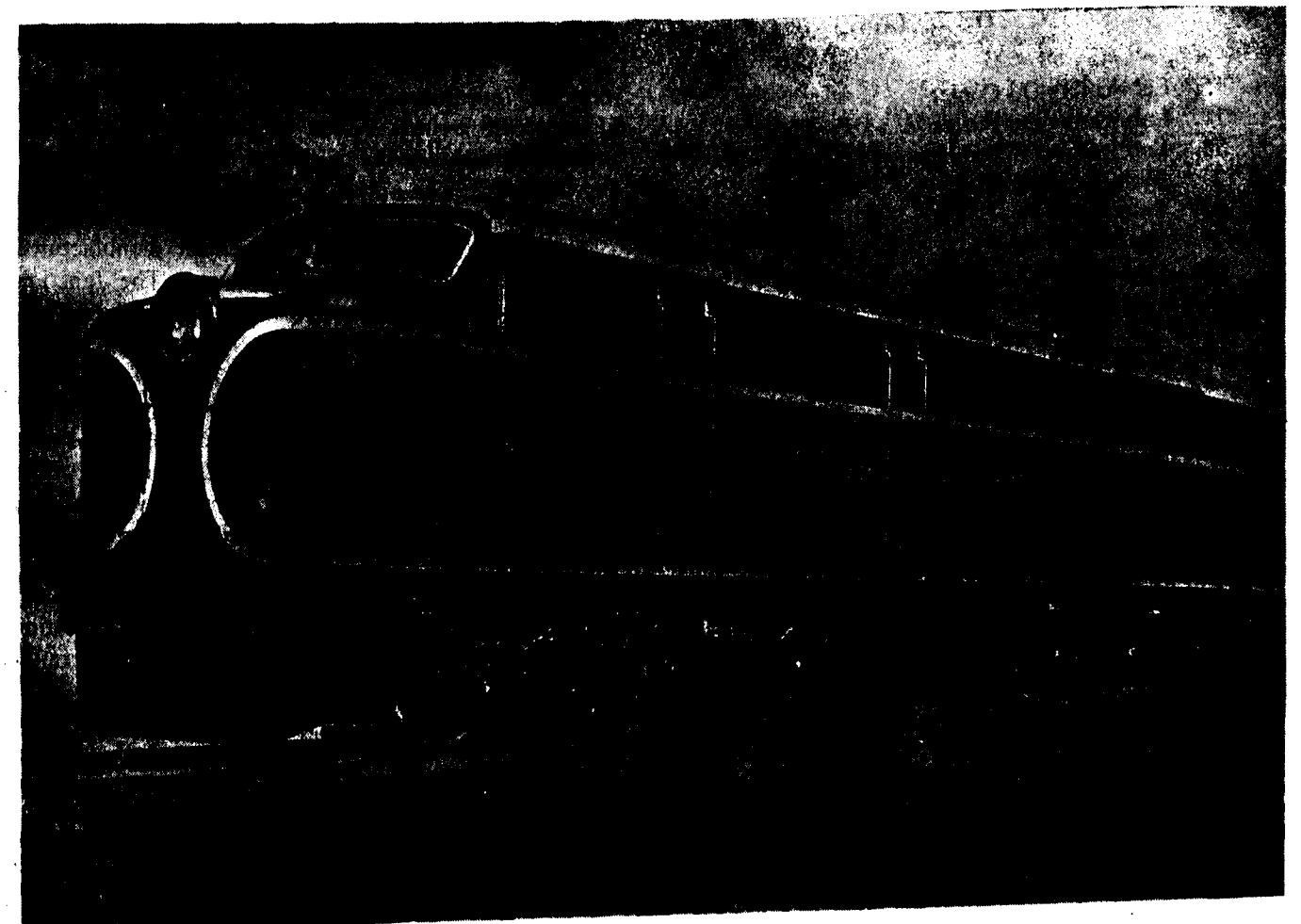


Fig. 1. One of the ALCO "World" DL-500 locomotives built by ALCO Products, Inc. for the Railway Board of India.

An alarm located in the cooling water system returns the engine idling and lights a warning light on the driver's control stand when the water temperature reaches 195°F.

LUBRICATING OIL SYSTEM

The diesel engine is equipped with a gear type lubricating oil pump driven from the crankshaft with a maximum displacement of 314 U. S. gallons per minute at full engine speed.

The lubricating oil from the engine is forced through a battery of cotton waste packed filters, then through a heat exchanger, where it is cooled by the diesel engine cooling water, and finally through a metallic strainer. After the strainer, it is returned to the engine where it feeds the working parts at pressure as explained in the article covering the diesel engine.

The total capacity of the system is 200 gallons.

FUEL OIL SYSTEM

These locomotives have a capacity of 1600 U. S. gallons of fuel oil (1340 gallons) in a single tank located between the two bogies and suspended from the mail frame.

An electrically driven pump forces fuel oil from this tank through primary and secondary filters and feeds the engine main headers from which the fuel is taken by the individual Bosch type fuel pumps.

Excess fuel oil used to lubricate the moving parts of the pumps and injectors is returned to the main tank by means of drain lines.

CONTROL

The standard control used in ALCO locomotives is installed in these units for India.

The driver controls the operation of the locomotive by two levers located in the engineman's stand.

A throttle lever with eight motor notches and one idle notch regulates engine speed and maximum generator excitation at the same time, thus for each throttle notch, a fixed engine power and fixed horse power are transmitted to the traction motors.

The reverse handle has three positions, forward
(Continued on page 19)

neutral and reverse and it is suitable interlocked with the throttle to prevent reversing of the motors with power on.

The traction motors are connected across the generator in two major connections, each of which has a shunted field step. The reconnections or transitions are made automatically according to locomotive speed, the action being governed by an axle driven AC generator and a relay panel.

The transitions are two parallel series of three motors, shunted fields, three parallel series of two motors and shunted fields.

A third handle in the engine man's stand provides supervisory control over these connections and, in the case of the locomotives equipped with dynamic braking, controls the excitation of the traction motors which for these purposes are connected as DC generators against a resistor grid.

Traction motor load is indicated by a colored band meter located at the engine man's position. A green band in this meter indicates the loads under which continuous operation without time limit is permissible.

Time limited operation is shown in yellow with numbers indicating the maximum number of minutes for which the load in question can be held.

With the 65 miles per hour gearing used in the locomotives for India, the continuous tractive effort is 45,900 Lbs. at 12 miles per hour corresponding to a factor of adhesion of 18.6%. This means that the full capacity of the locomotives can be utilized for hauling heavy loads at low track speed.

DYNAMIC BRAKING

Some of the locomotives for the Indian Railways are equipped with Dynamic braking, which consists in reconnecting the traction motors across suitable resistors, as separately excited direct current motors. For this purpose, the traction motor fields are connected in series with the main generator. The driver may control the intensity of the braking effort by regulating the excitation. This is achieved by moving the selector handle across the braking range at the controller. By placing this handle as far forward as possible, self-regulating maximum braking effort is obtained at all locomotive speeds, reaching a peak of 37,500 lbs. at 20 mph.

New Diesel-Electric Locomotives for the Indian Railways

THE order for 100 diesel-electric locomotives of 1800 HP which the Railway Board has placed with ALCO Products, Inc., New York, N. Y., has been reported in the previous article. The first lot of locomotives is to be supplied during the fourth quarter of 1957 and the balance will be shipped to India during the second half of 1958. In recording this order, we should take note that this is a new milestone in the modernization of the Indian Railways which is being vigorously carried out by the Railway Board, as these locomotives will be the first main line diesel-electric units to operate in India.

The need for this new type of power arises from the traffic congestions which are developing on the Southeastern Railway and on the Eastern Railway in connection with the enlargement of existing steel mills and the establishment of three new integrated steel mill plants in Rourkela, Durgapur and Bhilai. Plans are going ahead to electrify the railway divisions which will service these various industrial centers, but until these plans materialize it is intended that the diesel-electric locomotives will fill the gap and meet the mounting traffic pressure. After completion of the electrification, the diesel-electric locomotives will be used to alleviate traffic problems in other congested areas of the sub-continent.

The Southeastern Railway will bear the brunt of the traffic created by the erection of three new steel mills, as the plants at Rourkela and Bhilai are situated on its main route from Howrah to Nagpur. In view of this, it is intended by the Railway Board that 80 of the ALCO units be assigned to that Railway. The third steel plant, located at Durgapur, is on the main line of the Eastern Railway but it also will draw most of its supplies of iron ore and limestone from areas served by the Southeastern Railway. However, the Eastern Railway is meeting constantly rising traffic

density on the line to Moghal Sarai and 20 of the ALCO units will be put into service on that section, operating out of Gaya, to assist in speeding up the heavy coal traffic.

The diesel-electric locomotive serves ideally in eliminating traffic congestion due to the outstanding flexibility of the unit. The modern diesel-electric locomotive delivers constant horsepower at all speeds, while the horsepower output of a conventional steam locomotive is quite small at low speeds and rises as the speed increases. As a result, the modern diesel-electric locomotive can haul far heavier trains at the usual operating speeds, or handle the usual trains at higher speeds over the grades that restrict steam operation.

Another favorable characteristic of the diesel-electric locomotive, equally important, is its rapid turn-around time. After delivering a train at a given point of the system, the diesel locomotive is immediately available for coupling to another train and for continuing work twenty-four hours of the day. The steam locomotive, by contrast, will need to take time out at terminals for running maintenance at the running shed and for cleaning of the fires. Also, while enroute, the average steam locomotive is required to stop at intervals of 40 to 50 miles in order to take on fresh water and fuel.

The diesel locomotive does not require watering except for the occasional few gallons which may evaporate from the cooling system of the diesel engine, and its large fuel tank and high efficiency enables it to operate over a distance of 800 to 1,000 miles without taking on new diesel oil. Heavy overhauls on diesel locomotives are likewise performed at longer intervals than for steam locomotives, and the time required to carry out such repairs is greatly reduced.

(Continued from page 18)

This means that a trailing load of 2050 tonnes may be brought down a one in 100 grade by one of these locomotives, at 20 mph, without requiring the use of vacuum or air brakes to hold the speed constant.

This feature is used by a majority of the loco-

motives that must operate in territories with severe grades. It results in longer wheel life, a decreased consumption of brake shoes, and a greater safety in operation. The smooth handling of the train provided by dynamic brake results also in less damage to the goods carried.

All these properties make the diesel locomotive available for actual transport use over a far greater period than the steam locomotive. Experience has shown that the availability of the diesel locomotive can easily be maintained at 90%, while a considerable effort is required to achieve 50% with steam locomotives. The greater availability enables the diesel locomotive to average over 10,000 miles per month hauling trains, while the average for steam locomotives in India currently is around 3,000 miles per month. It is generally found that a modern main line diesel-electric locomotive will perform the same work as 2 or 2.5 steam locomotives.

The high overall efficiency of the diesel locomotive makes it an economic unit to operate. A modern unit, such as the ALCO locomotive purchased by the Railway Board, will easily attain an efficiency of 28% measured at the wheel rims, as against an average efficiency of 5% maximum for steam locomotives. The advantage in fuel economy of the diesel-electric locomotive may not be a significant factor on railways serving the coal fields, as Indian coal is favorably priced. However, freight rates on coal have risen considerably in recent years and the diesel locomotive will show a distinct savings in fuel costs in areas away from the coal fields, such as in central and southern India. Other substantial savings are found in the lower maintenance cost of the diesel-electric locomotive. These savings in repair costs are due primarily to the absence of steam locomotive boiler repairs.

The collaboration agreement which the Railway Board has entered into with ALCO Products, Inc., also covers for the training of railway personnel on the part of ALCO, and engineering assistance in the design and layout of maintenance facilities. The study of the latter facilities, in cooperation with the manufacturer's engineers, has already been completed and running repair sheds are under construction at Gaya on the Eastern Railway and at Anara on the Southeastern Railway. Some items of maintenance

FACTORY TO BE SET UP AT SALEM

Some tentative proposals for extending technical collaboration and the broad terms of deferred payment which were under further negotiations, had been received from a French firm of non-ferrous metals manufacturers to establish an aluminium project at Mettur in Salem, Madras State, said the Union Minister of Industry, Mr. Manubhai Shah, in the Lok Sabha on December 14. Asked by Mr. Raghunath Singh as to the estimated cost of the project and the anticipated output, the Minister said it might be about Rs. 12 crores and the production would be of the order of 10,000 tons of aluminium per annum. Mr. Shah told Mr. Ramanathan Chettiar that a firm in the U. S. A. had also made an offer to put up a plant. The Minister stated in reply to another supplementary that the annual requirements of aluminium in the country were 40,000 tons and the present production was about 12,500 tons.

equipment are being imported from the U. S. A.

For the advance training of personnel, the Eastern and the Southeastern Railways have each sent a group of eight men to the U. S. A. for training at builder's plant and for observation of maintenance practices on some of the U. S. railways. The manufacturer operates a special Locomotive School in which crews from all over the world are given courses on the maintenance and operation of the ALCO locomotive. Training periods in the U. S. A. last about three to four months. Other groups will follow the first two sent to the U. S. A. and it is expected that a total of about forty men will have been trained by the time the 100 locomotives are in service.

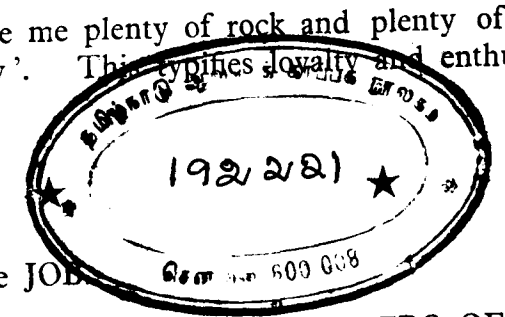
Training in the U. S. A. is supplemented by instruction imparted in India by ALCO engineers sent out for the purpose and by Railway engineers previously trained in the U. S. A. The manufacturer will send three experienced engineers to India for the instruction of Railway personnel.

The diesel-electric locomotive has been subject to intense development and considerable improvement over the past ten years, notably in the U. S. A., so that it represents a highly reliable machine in its modern form. The high operating efficiency and excellent reliability have combined to make the diesel-electric locomotive a strong economic factor in the modernization of railways around the world.

In the U. S. A. over 90% of all steam locomotives have been replaced by diesel-electric units. Dieselization has progressed in other countries, although at a slower rate. It is not likely that full dieselization will ever be contemplated in India where coal is abundant. However, the Railway Board has decided to embark upon a course of partial dieselization in order to benefit of the advantages of this type power in areas where the Indian Railway system will profit most.

GOLDEN RULES OF CONDUCT FOR RAILWAYMEN

1. Maintain proper relations with officers and others in the Department in which you work.
2. Use good human relations in your contact with subordinates. Do not make them feel their position.
3. Maintain good public relations with callers and passengers.
4. Be resourceful and find ways and means of doing a job well.
5. Discard the idea of 'Give me some more men to do the job'.
6. Learn the art of getting along with people.
7. Remember the most important thing is to get a job done—not just to do it anyway and somehow but to do it efficiently, safely, economically and expeditiously.
8. Develop the attitude of 'Give me plenty of rock and plenty of wood and just get out of my way'. This typifies loyalty and enthusiasm for work and responsibility.



1. Get down to the man on the JOB.
2. Move on the line as often as you can as MEMBERS OF THE PUBLIC and not only as officials.
3. Remember pre-arranged and announced expeditions cannot have the same informative value as surprise inspections.
4. Every railwayman has to be convinced that the work that he does is to his own advantage. He should not think and measure his effort merely in terms of wages which is only a motive force.
5. Every railwayman does a specialised job which has no meaning or usefulness by ITSELF unless it is cohered with each other. There is no meaning or value to the work of a permanent way gang unless there are trains to run over the track.

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CLEANLINESS LEADS TO HEALTH AND HAPPINESS

Clean orderly habits contribute to general health and welfare and as such to happiness and prosperity; they are more important than medicines.

Cleanliness prevents disease; medicine only attempts to cure.

Cleanliness of the person, of the houses and colonies, reflects discipline in the individual and the community. Discipline is the foundation stone for progress of oneself and the country. Cleanliness is a good habit. It is also cheap.

All Railwaymen should set an example of cleanliness. This will help others and themselves.