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OFFICE OF STRATEGIC SERVICES  
Research and Analysis Branch

ROLLING STOCK IN BURMA & THAILAND

R & A 2711

Description

A description of Rolling Stock  
in the Railroads of Burma and  
Thailand with emphasis on con-  
structional details

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SUMMARY

The locomotives and cars on the meter gauge railroads of Burma and Thailand at the start of hostilities were largely of British design and construction, embracing a variety of types suited to the particular needs of the terrain over which they were operated. Garratt types were used in the mountainous area, and Pacifics, Mikados, and Prairie types elsewhere. In Thailand diesel-electric locomotives purchased in Switzerland and Denmark were extensively used in main-line service. The Japanese imported quantities of their own rolling stock into Burma. They have also transferred motive power and cars from the Thailand State Railways to the lines of the Burma Railways, and from the Federated Malay States Railways to the Burma and Thai Railway lines.

The freight car equipment of these countries was largely composed of the small four-wheeled cars similar to those used in England, and in general conformed to British specifications and practice in construction details. In capacity, they average about thirteen tons per car. The four-wheel cars had the axles fixed to the car frames and were provided with springs - usually semi-elliptical, sometimes coiled - over the axles. Some of these cars were covered, but in most cases were simply small gondolas or open-top cars. The majority were constructed on wooden underframes.

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The passenger cars were usually constructed of a wooden super-structure and a steel underframe. The underframes were imported from England. The passenger cars were largely equipped with four-wheel (bogie) trucks.

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RAILROAD EQUIPMENT IN BURMA AND THAILAND

I. General

Since the Japanese occupation of Burma and Thailand, much railroad equipment has been destroyed or damaged. Some has probably been imported from Japan and other occupied regions, particularly Malaya.

Nothing is known of the condition of the equipment in service. For these reasons, it is impossible to give specific information regarding all the motive power and rolling stock in operation in these countries. Available data refers to pre-war conditions.

The railroads of Burma and Thailand have followed British operating methods. Most of the motive power and cars in operation prior to the war were imported from British builders. European influence is evident in the motive power in use in Thailand, particularly Diesel-electric power. American car builders have built cars for the Thailand State Railways but were unable to make delivery on account of the war. The character and amount of Japanese equipment in use in Burma and Thailand are unknown. The present study is therefore primarily concerned with British-built motive power and cars known to have been in use in these countries before the war. Photographs of the above-mentioned American-built cars have, however, also been



included and are shown in Figures 14,15,16,17.

The vast majority of freight cars were of the small four-wheel type, similar to those used in England. In capacity, they average about thirteen tons per car. There were also some 3-wheel bogie types; both types include box cars, gondolas, flat, hopper, tank, and other cars. Many of the lighter cars are provided only with hand brakes, but the use of power brakes--either vacuum or air -- is common on the heavier equipment. The screw type of coupler, supplemented by side buffers, is in extensive use. The link-and-pin coupler, and various designs of hooks and springs are also used on the lighter equipment. (Figure 3)

The four-wheel cars have the axles fixed to the car frames and are provided with springs--usually semi-elliptical, sometimes coil--over the axles. Some of these cars are covered, but in most cases they are simply small gondolas or open-top cars, (provision being made to cover with a tarpaulin goods which are liable to damage from the weather.) The heavier eight-wheel cars are constructed along lines more closely following American practice and are equipped with many of the same appliances. (Figure 5)

## II. Burma

### 1. Locomotives

Estimates of the number of locomotives in Burma in 1943-44 vary between 354 and 369. Again it must be emphasized that any quoted



figures are at best tentative and unreliable insofar as they pertain to a combat area. Table 1. gives a brief summary of the motive power situation prior to the War.

TABLE 1. Locomotives in Use on Burma Railways (1942)

Class	Wheel Arrange.	Dia. Drivers inches	Tract. Effort pounds	Max. Axle Load tons	No. in Service	Type
B	2-8-0 plus 0-8-2	39	41,889	10 1/2	12	Garratt
B	"	"	37,966	10 1/2	1	"
Ns	0-6-6-0	"	27,646	10	22	Mallet Compound (Fig. 2)
Js	4-6-0	57	14,187	9	38	Tender (Fig. 1)
Yc	4-6-2	57	19,729	12	13	Tender
YD	2-8-2	48	22,108	10	98	Tender
K	4-6-0	48	17,952	9	95	Tender
TOTAL MAIN LINE . . . . .					279	

In addition to locomotives shown in the table, some 75 engines were listed as suburban and shunting engines. All locomotives are said to be equipped with vacuum brakes.



According to a report dated November 1, 1942, 232 Burmese locomotives were immobilized by the retreating forces. On the original estimate of 358 locomotives, this would leave 126 engines available to the enemy. Unfortunately, the word "immobilized" is not defined. The degree of immobilization would have to be clearly indicated before a close estimate of the possible serviceability of the locomotives in question could be made. In one sense, the steam locomotive is an almost indestructible machine, because its salvage possibilities are very great. The service life of a steam locomotive in a combat area would be almost entirely determined by the ingenuity of the maintenance forces. The practice of removing parts from one locomotive to install them on another, is very common among railroad mechanical men in America, and it can be assumed that this form of ingenuity will prevail in the area under discussion.

The age of the motive power in service must be considered as a factor in the determination of the efficiency of the locomotive. Varying maintenance standards affect the performance of motive power more than age or obsolescence. Available information indicates that twenty years is the average age of the Garratt and Mallet types of locomotives in use in this area. In the United States, thousands of twenty-year old Mikados are in main-line service at the present time, and Mallet types of the same age are still hauling iron ore.

The Japanese have not made any outstanding contribution to the



field of motive power development during the time that they have been using modern motive power. It is therefore not likely that locomotives which they might import into the Burma region would include any revolutionary designs or improvements that are not now known to American and British builders. Japanese motive power would be subject to the same weight limitations, clearances and axle loads that applied to the operation of locomotives before the occupation.

Locomotive miles per active locomotive day are an important indication of motive power performance. Although the figures in the following Table are not strictly comparable because of a variance in British classification of assigned locomotive mileage, they give some indication as to what may be expected in the way of locomotive performance.

The following table indicates the comparative utilization of Locomotives in the United States and in Burma:

Burma Rys. (1942)	Locomotive miles per locomotive day (averages)	U.S.A. (1944)
Passenger	176	221.4
Freight	103	124.0

The percentage of locomotives in or awaiting shop for repairs is given as 10.8% for the Burma Railways, compared with 5.6% for the railways of the United States. The latter figure represents a high degree of utilization of motive power.



The importance of the Burma-Siam Railway (Thaimen Ry.) is indicated by the following table of equipment:

<u>Equipment</u>	<u>Units</u>
Locomotives . . . . .	117
Cars (Passenger) . . . . .	10
Cars (Freight) . . . . .	1173

The locomotives are of the 0-6-2, 2-10-0, and the 2-6-0 types and were manufactured by the Mitsubishi and Kawasaki Companies of Japan. No details are available. These locomotives are said to be equipped with center buffers and couplers.

In summary, it may be said that the motive power in use on the Burma railways before the occupation was entirely of British design.

It is known, however, that the Japanese have imported quantities of their own rolling stock into Burma. They have also transferred motive power and cars from the Thailand State Railways to the lines of the Burma Railways. Undoubtedly, quantities of Malayan Rolling Stock may be found in service in Burma.

B. Cars

The cars in use in this area before the war were of conventional British designs. The small 4-wheel type predominated in freight service. Table 2 summarizes passenger car equipment.



TABLE 2. PASSENGER CARS - BURMA RAILWAYS 1942

---

1st class bogie . . . . .	2
3rd class 4-wheeled . . . . .	4
3rd class bogie . . . . .	349
Composite bogie . . . . .	74
1st, 2nd, 3rd composite bogie . . . . .	54
2nd and 3rd composite bogie . . . . .	34
3rd Class, with brake compartment . . . . .	169
"    "    Ambulance . . . . .	5
"    "    With mail compartment . . . . .	45
Other composite carriages, bogie . . . . .	8
Dining car, bogie . . . . .	1
Royal Saloons, bogie . . . . .	2
Reserved carriages for use of the public, bogie . . . . .	15
Miscellaneous passenger cars . . . . .	<u>187</u>
TOTAL PASSENGER CARS . . . . .	949

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In general the passenger cars had teakwood bodies.

The car underframes, heavy castings and trucks were imported from English manufacturers.

Some car construction is carried on in the shops of the Burmese railroads, such construction conforming to British practice.

The freight cars of the Burma Railways are principally of the four-wheel type and are described in Table 3 below;



TABLE 3. Freight Car Equipment on Burmese Rys. (1942)

Description	Capacity (tons)	4-wheeled	Bogie
Covered Cars	13.0 (Bogie 30)	6372	195
Lowsiders	14.8 (Bogie 22.9)	932	84 (Fig. 5)
Livestock Cars	11.5	666	
Explosive Cars	14.5	20	
Timber Cars	11.7 (Bogie 28.9)	203	478 (Fig. 3)
Tank Cars	(Bogie 22.9)		6
Misc. Tank Cars	8.5 (26.6)	44	21
		<u>78237</u>	<u>784</u>
GRAND TOTAL . . . . .			9,021

It is reported that 93.2% of the passenger cars are fitted with vacuum brakes, 5.2% are piped for use on vacuum brake trains and 1.6% are not equipped with brakes. Of the freight cars, 46% are fitted with vacuum brakes, 13% are piped for use on vacuum brake trains, and 41% are not equipped. The same report states that the carbuilding facilities at the Myitnge car shops (prior to the occupation) were able to turn out about 500 two-axle cars annually complete except for castings and wheels. The same shops had facilities for the construction of 400 coach bodies per year. These bodies are mounted on imported trucks and underframes.



III. Thailand

A. Locomotives

The information given in Table 4. gives the locomotive situation before the occupation. Again it must be stated that caution must be exercised in appraising these figures. However, any motive power in serviceable condition or capable of being repaired would be utilized to fullest capacity by the enemy.



TABLE 4. Locomotives in Service on Thailand Rys. (1941)

Builder and Year Built	Type and Wheel Arr.	No. of Locos. in 1940
Egestoff 1897-1900	Tender 2-6-0	13
Baldwin 1926-1930	3-Cyl. Tender 4-6-2	26 (Fig. 6)
Hanomag 1929-1940	3-Cyl. Tender 4-6-2	23
N. British 1914-1922	Tender 4-6-0	38
Baldwin 1924	Tender 2-8-2	2
Baldwin 1926	3-Cyl. Tender 2-8-2	4
Batignolles 1925	Tender 2-8-2	2
Winterthur 1927-28	Tender 2-8-0	8
Henschel 1930	Garratt 2-8-2 plus 2-8-2	8
Batignolles 1935-40	2-8-0	3
Japanese 1935-40	2-8-0	8
Japanese 1935-40	2-8-0	8
Total Steam Locomotives . . . . .		143
Diesel-Electric Locomotives		
Frichs (Denmark) 1923-40	1500 B.H.P. Freight	23
Frichs (Denmark) 1932-40	1000 B.H.P.	4
Sulzer (Switzerland)	450 H.P. Switching	7
TOTAL DIESEL*ELECTRIC . . . . .		34



The steam motive power listed above does not include any revolutionary types. The three cylinder types in use are of a design familiar to motive power experts of America and Great Britain. It is reported that in 1935 the Siamese Government inquired for bids on 8 Mikado type Locomotives. It is not known whether these engines were ordered in Japan. The Diesel-electric locomotives used on the Thailand Railroads are, by comparison with the types used in the United States, of small or medium horsepower.

B. Thailand Cars

Available information indicates that the Siamese rolling stock existing prior to the occupation was well maintained, and adequate for peace time needs. Table 5 gives a summary of the rolling stock in service in 1940.



TABLE 5. Freight and Passenger Cars in Service on Thailand Rys. (1940)

Passenger cars (Bogie) . . . . .	240	Figs. 12 - 13
"    "    (4-wheel) . . . . .	60	
Total Passenger Cars . . . . .	<u>300</u>	

Freight Cars

a. Bogie Wagons

Hopper cars . . . . .	25	Fig. 11
Flat cars . . . . .	105	
Tank cars . . . . .	7	
Well car . . . . .	1	
Total Bogie Wagons . . . . .	<u>138</u>	

b. 4-Wheeled cars

Covered box cars . . . . .	1600	
Covered High-sided cars . . . . .	350	
Cattle cars . . . . .	305	Fig. 10
High-sided cars . . . . .	38	
Carriage trucks . . . . .	7	
Fuel trucks . . . . .	49	
Timber cars . . . . .	22	
Salt cars . . . . .	52	
Low-sided cars . . . . .	1052	
Prison cars . . . . .	4	
Total 4-wheeled cars . . . . .	<u>3529</u>	

Although the Makasan shops are in operation, it is probable that under Japanese occupation, pre-fabricated car underframes, wheels, and heavy castings will have to be imported for new car or locomotive construction in Thailand.

The existing equipment closely conforms to British practice in construction details. There is nothing to indicate that the Japanese can or will modify the existing designs to any great extent.



APPENDIX I.

The pictures of the American export equipment shown in this report are a composite of designs suggested by the American builder and the Royal State Railways of Siam. These cars were built in 1941. They never reached Thailand. The pictures and drawings illustrate the best type of construction for cars of this type. It is not expected that the equipment actually in operation in these areas will measure up to the American standards. If the Royal State Railways of Siam have asked for bids on rolling stock from Japanese builders, it is entirely possible that some of the construction details of the appended American designs may also exist in cars imported from Japan.



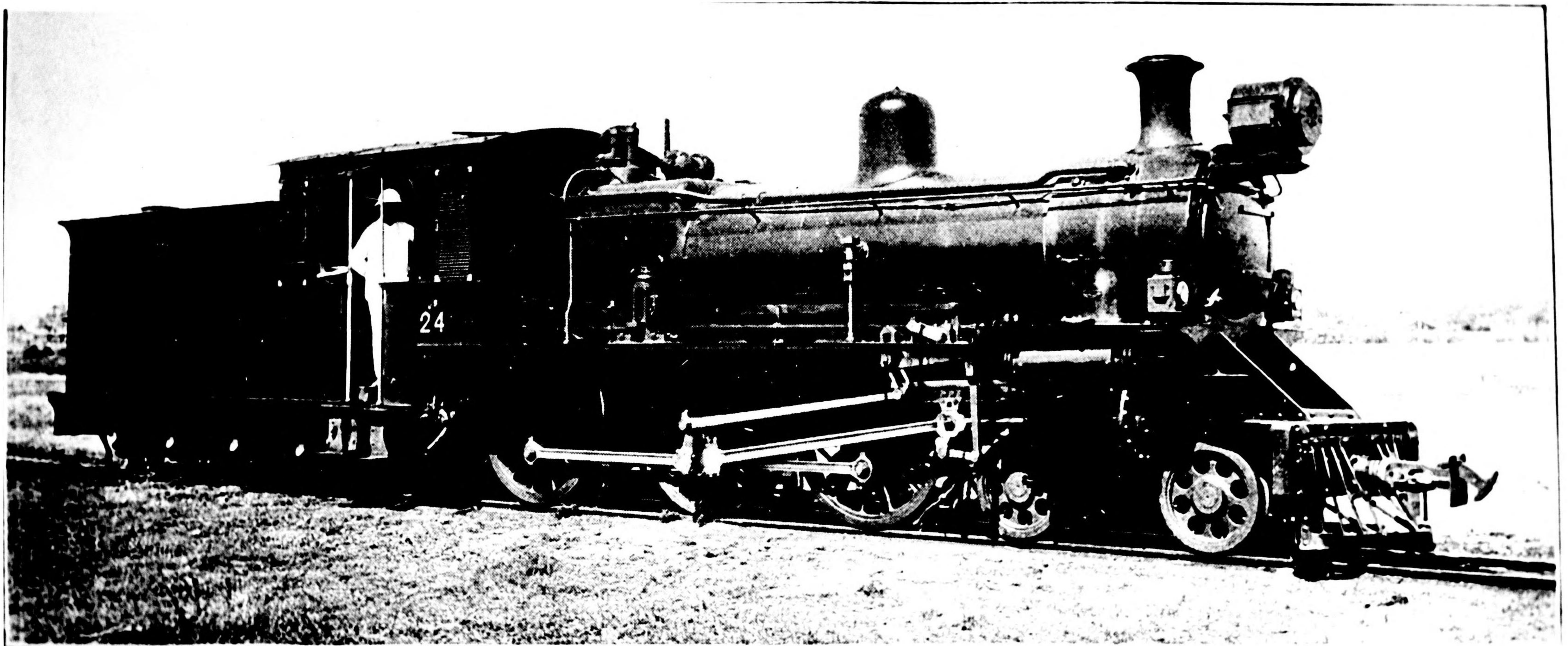


Figure 1. 4-6-0 Type Locomotive, Burma Railways. Pub. 1929.

OSS R 762922



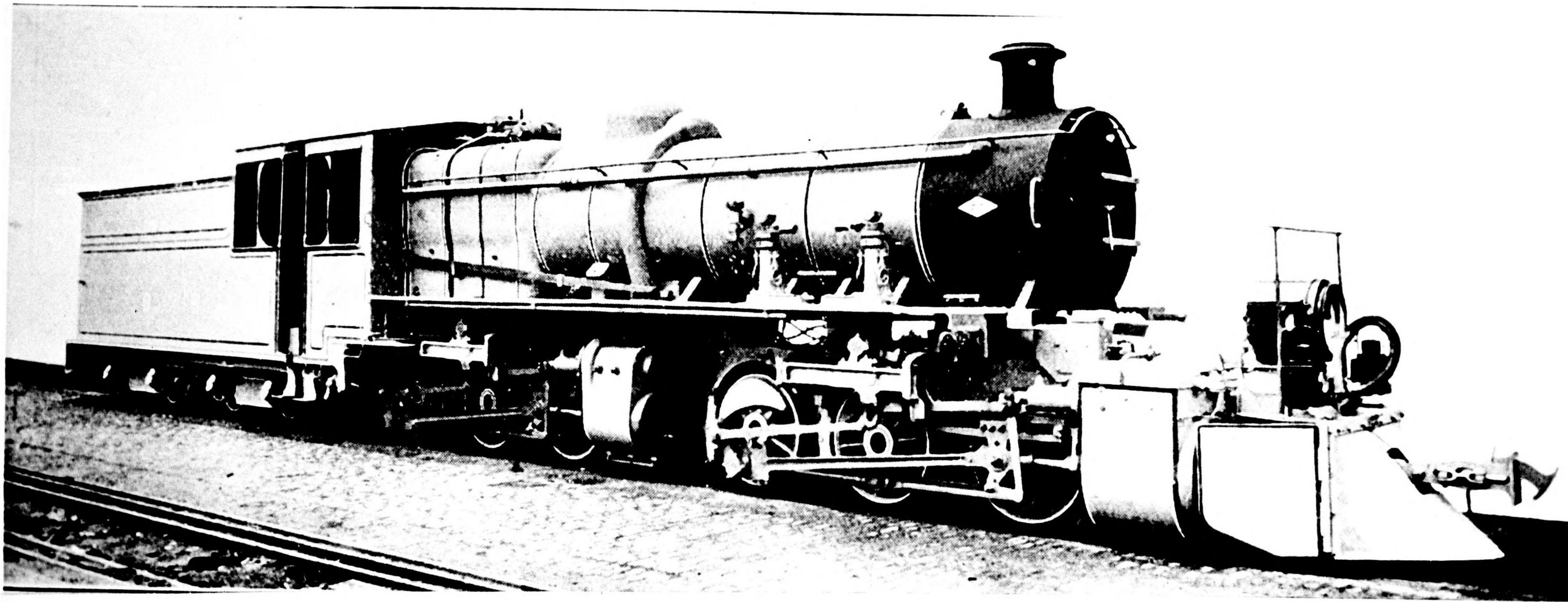


Figure 2. 0-6-6-0 Mallet Type Locomotive, Burma Railways. Pub. 1923.

OSS R 762915



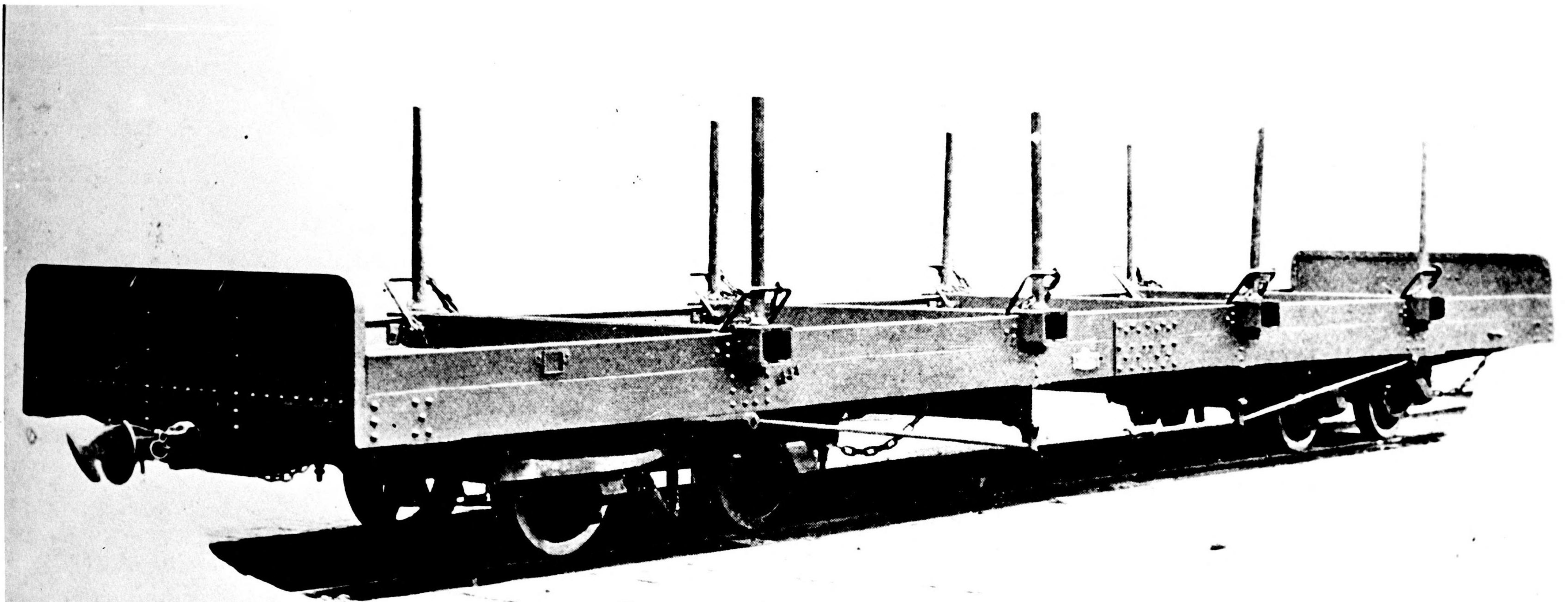


Figure 3. Rail and Timber Car, Burma Railways. Pub. 1923.

OSS R 762916





Figure 4. First and Second-Class Coach (4-Wheel Trucks) Burma Rys. 1929

OSS R 762921



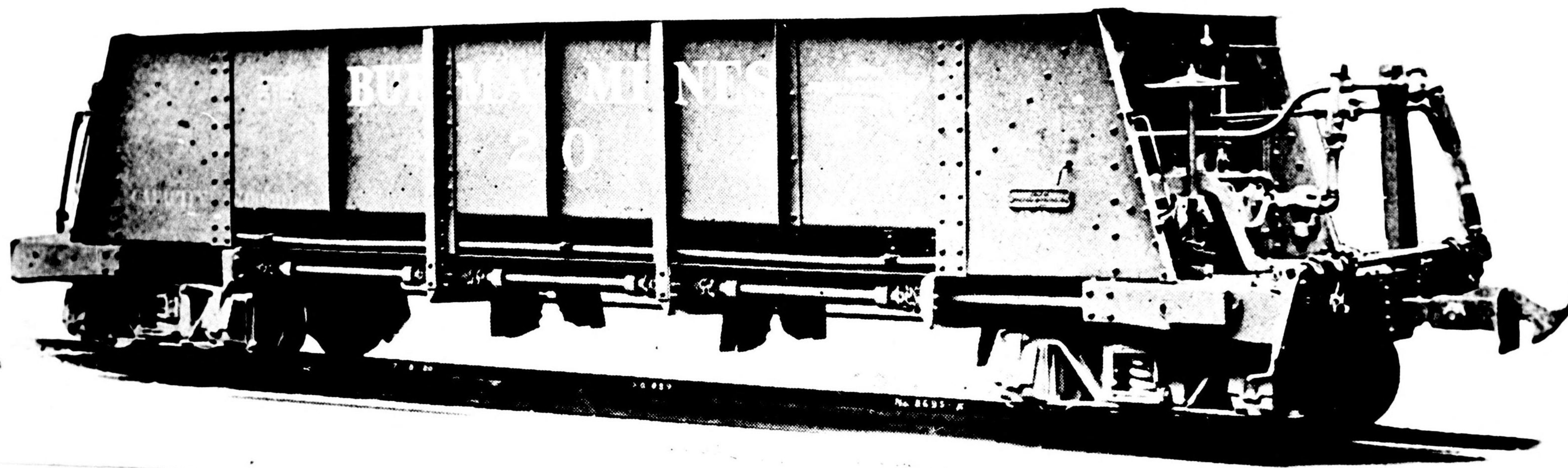


Figure 5. Gondola (4-Wheel Trucks) 1923. Burma Railways.

OSS R 762914



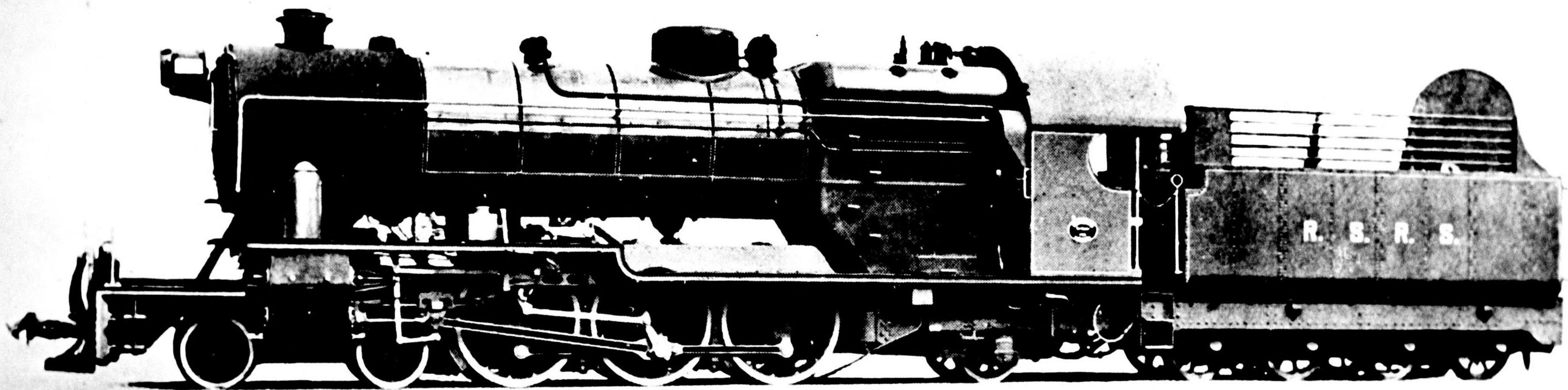


Figure 6. 3-Cylinder 4-6-2 Type Superheated Steam Locomotive. Thailand State  
Railways. Pub. 1929.

OSS R 762926



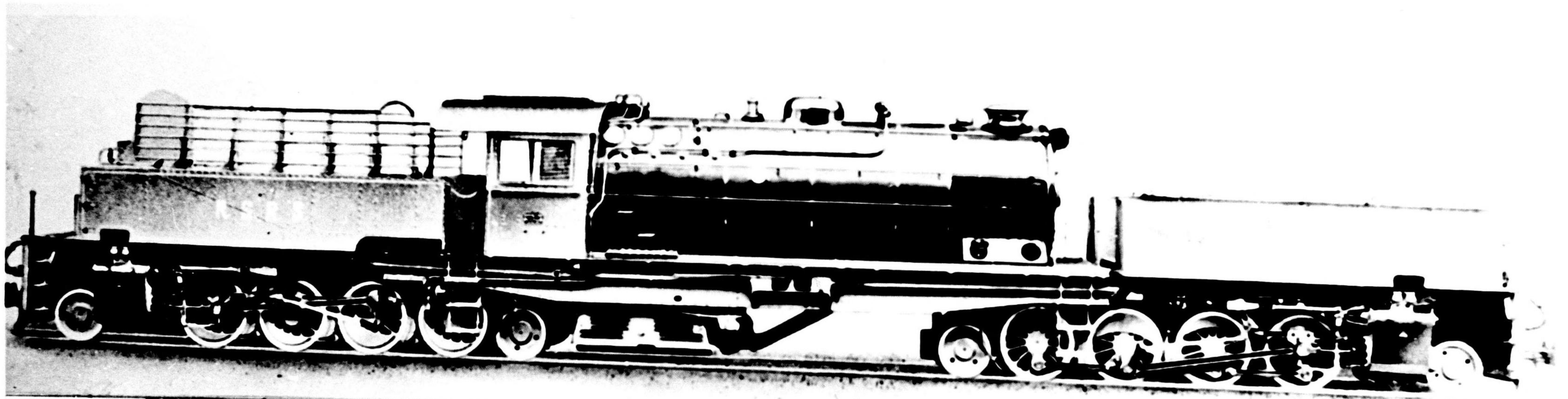


Figure 7. Eight-coupled Garratt engine for heavy freight service. Thailand  
State Railways. Pub. 1935.

OSS R 762911



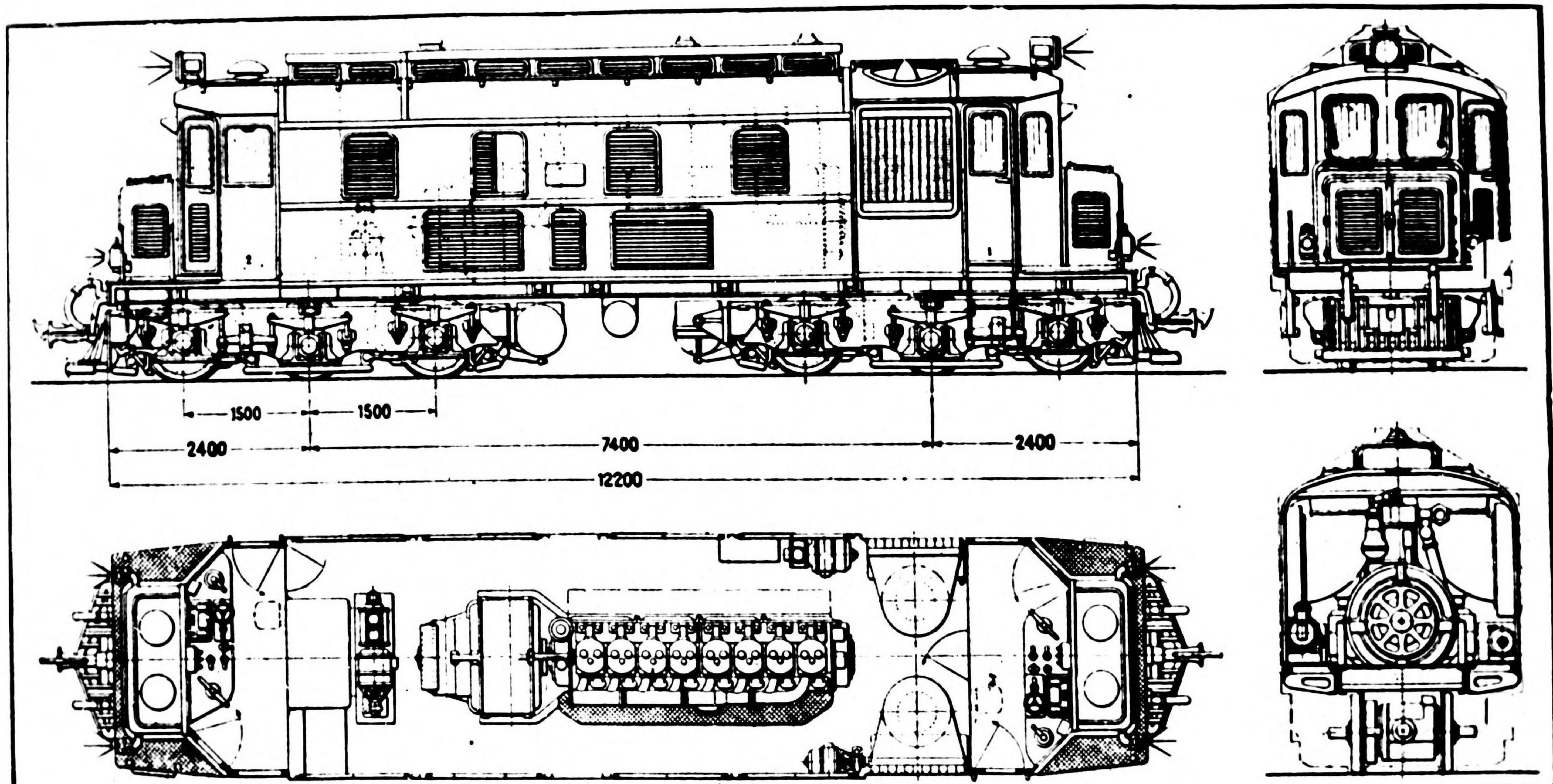


Figure 8. Elevations, cross-section and plans of 450 B.H.P. Sulzer Diesel-electric Locomotive. Thailand State Railways. 1931.

OSS R 764002



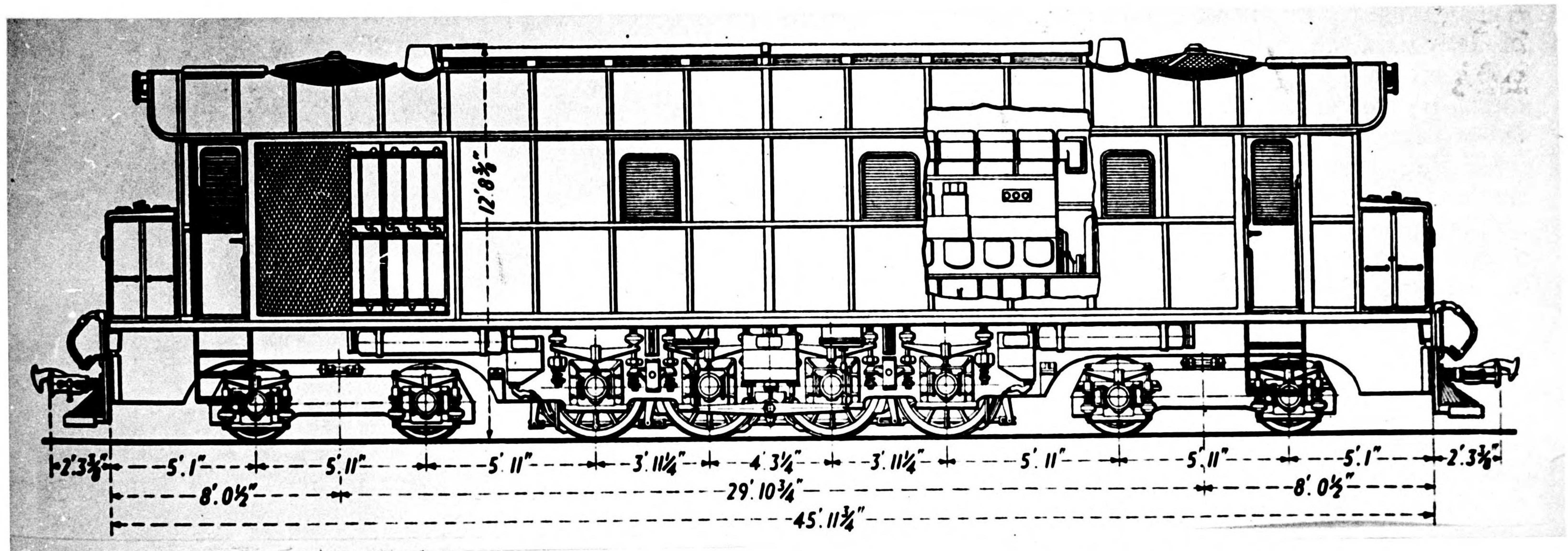


Figure 9. Frichs 1,000 B.H.P. 4-8-4 Type Diesel-electric passenger locomotive. Thailand State Railways. OSS R 764009



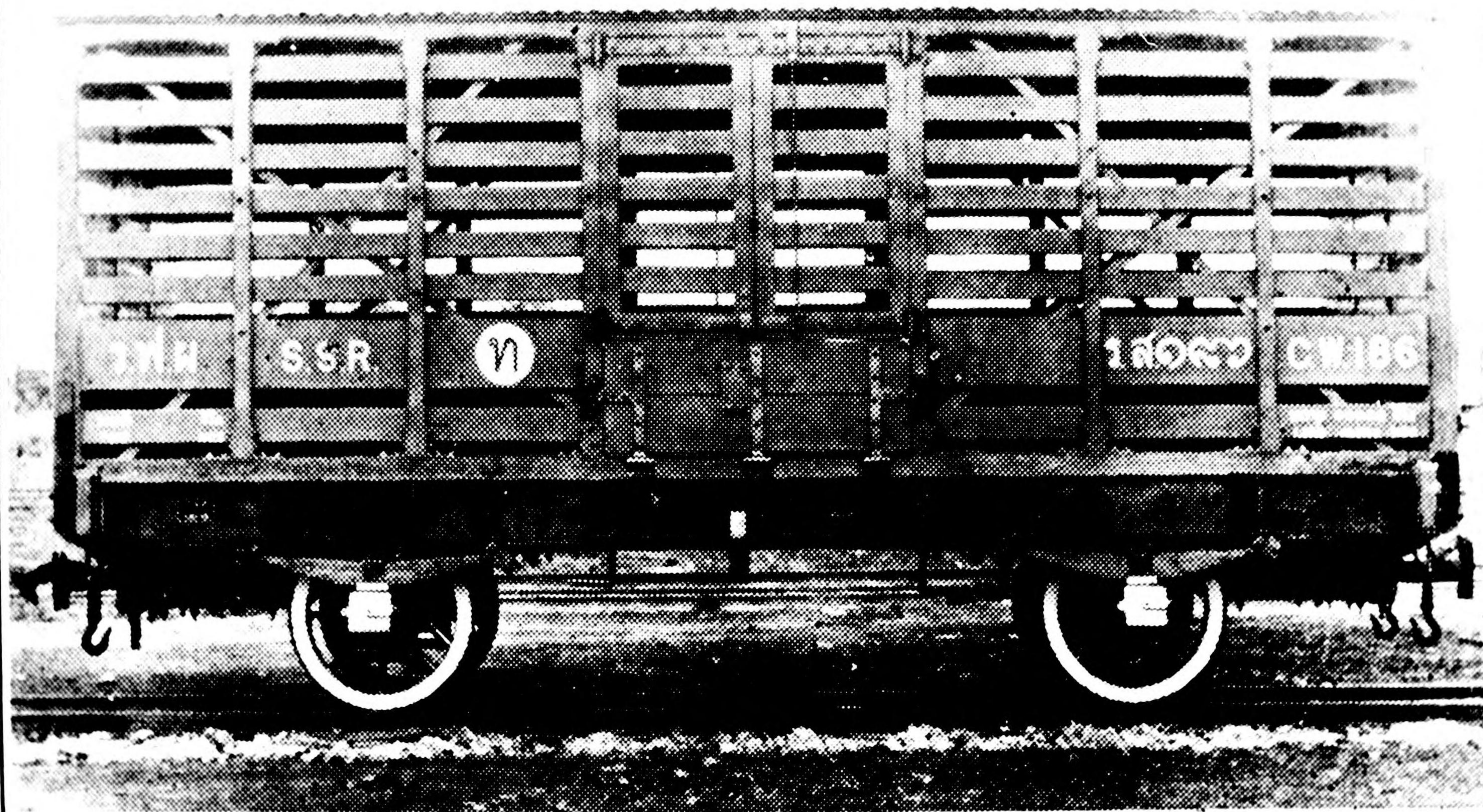


Figure 10. 10-Ton cattle car (4-wheel) with timber underframe. Thailand State Railways. 1929.  
OSS R 762931



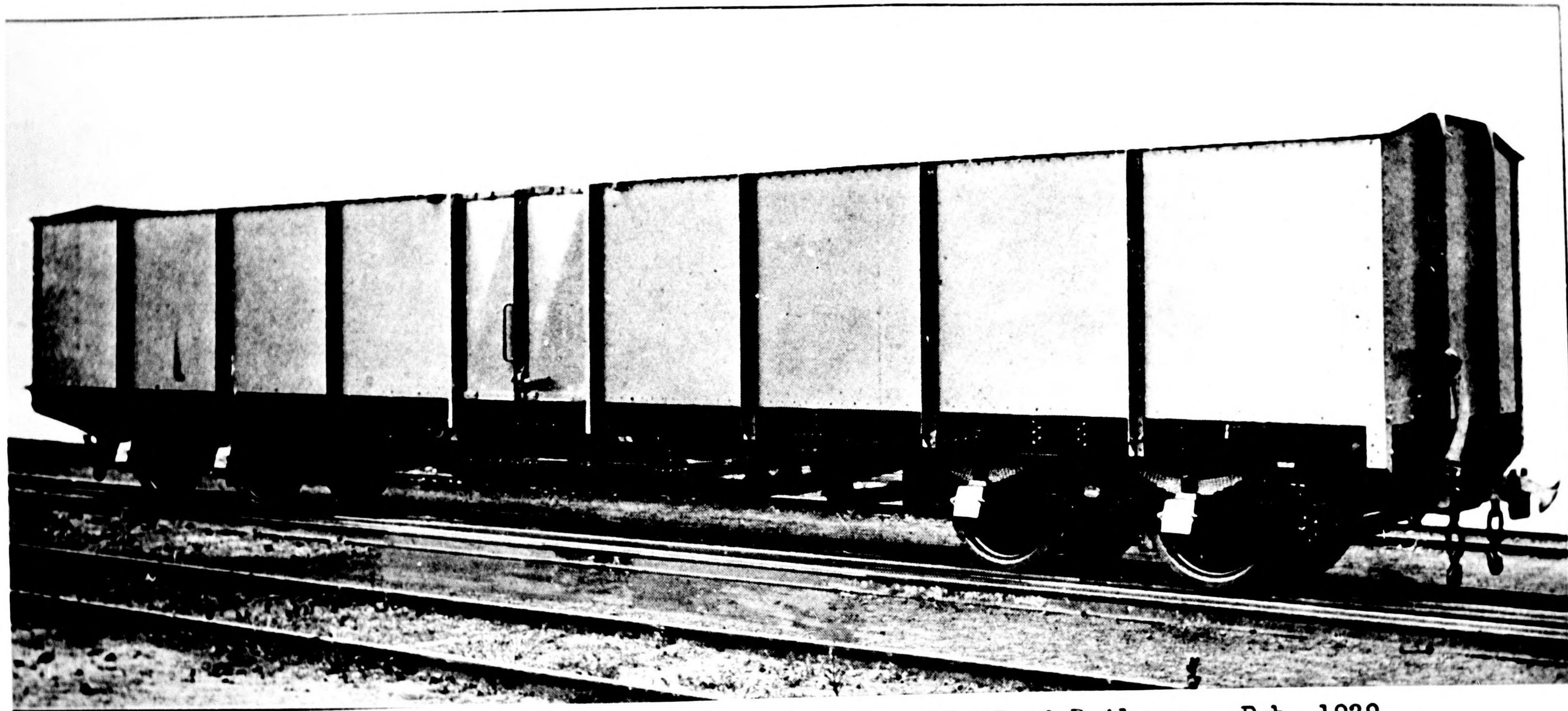


Figure 11. 28-Ton (4-Wheel Truck) high-sided gondola. Thailand Railways. Pub. 1929.  
OSS R 762927



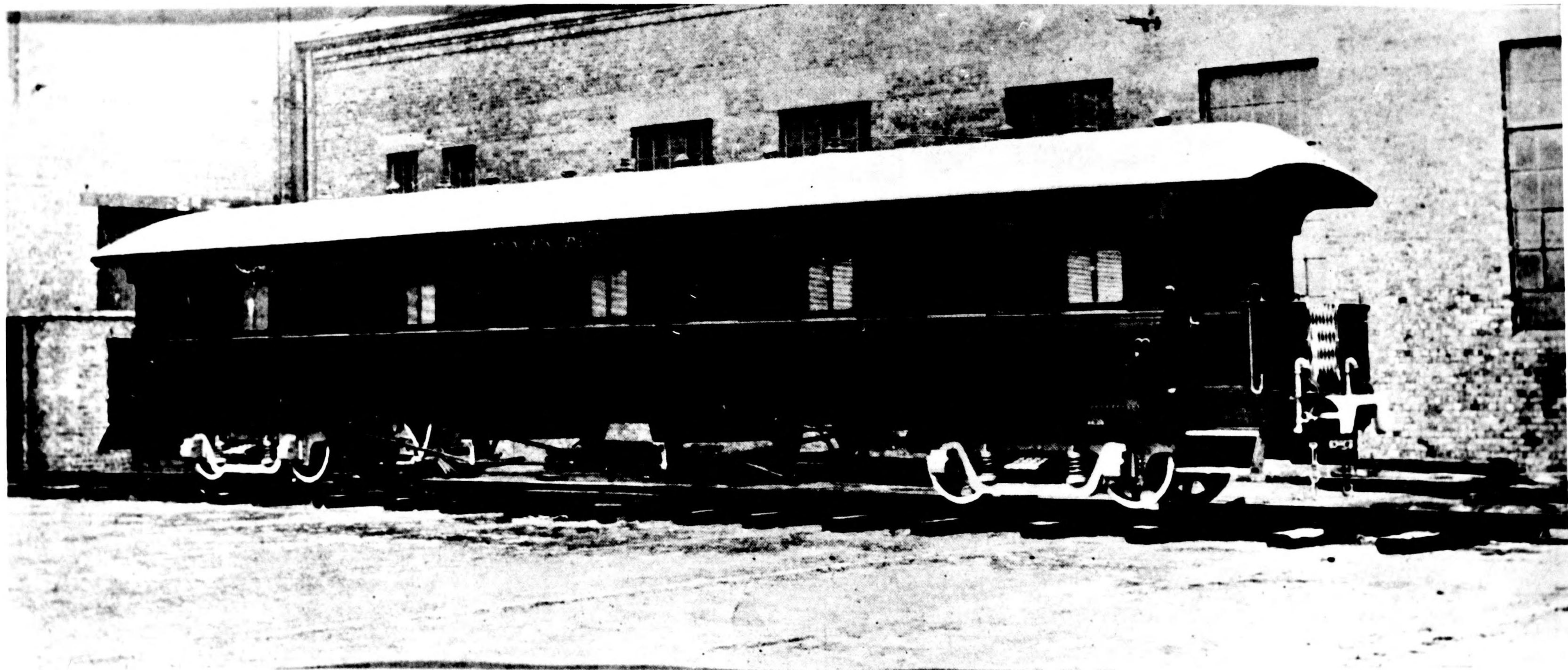


Figure 12. Third-Class Coach (4-Wheel Trucks). Thailand State Rys. 1929.

OSS R 762929



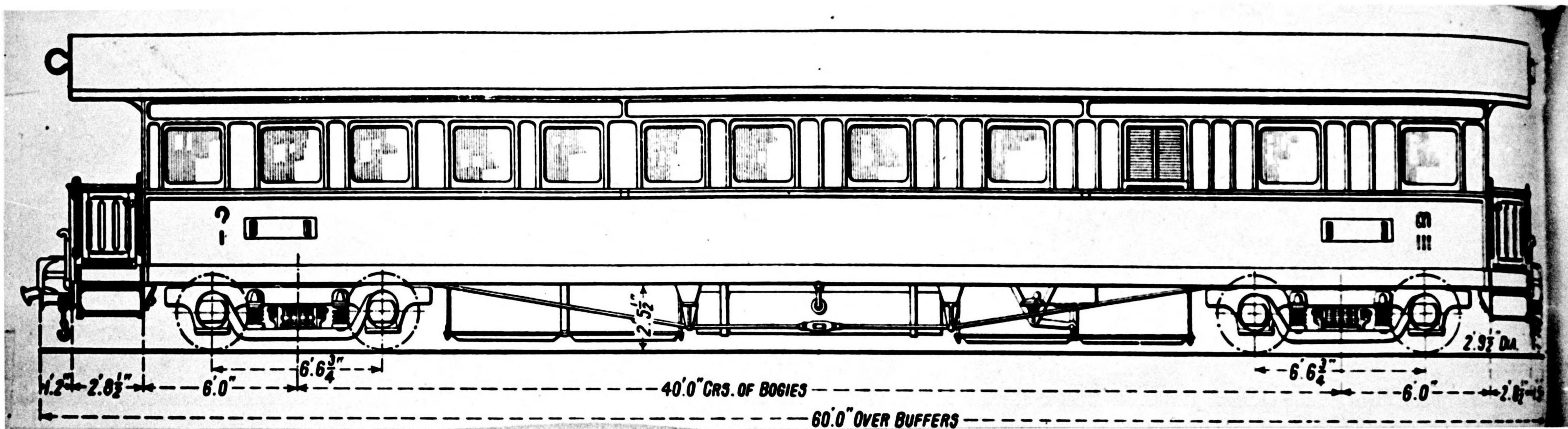


Figure 13. Elevation diagram of composite coach. Thailand State Rys. 1931.

OSS R 764026



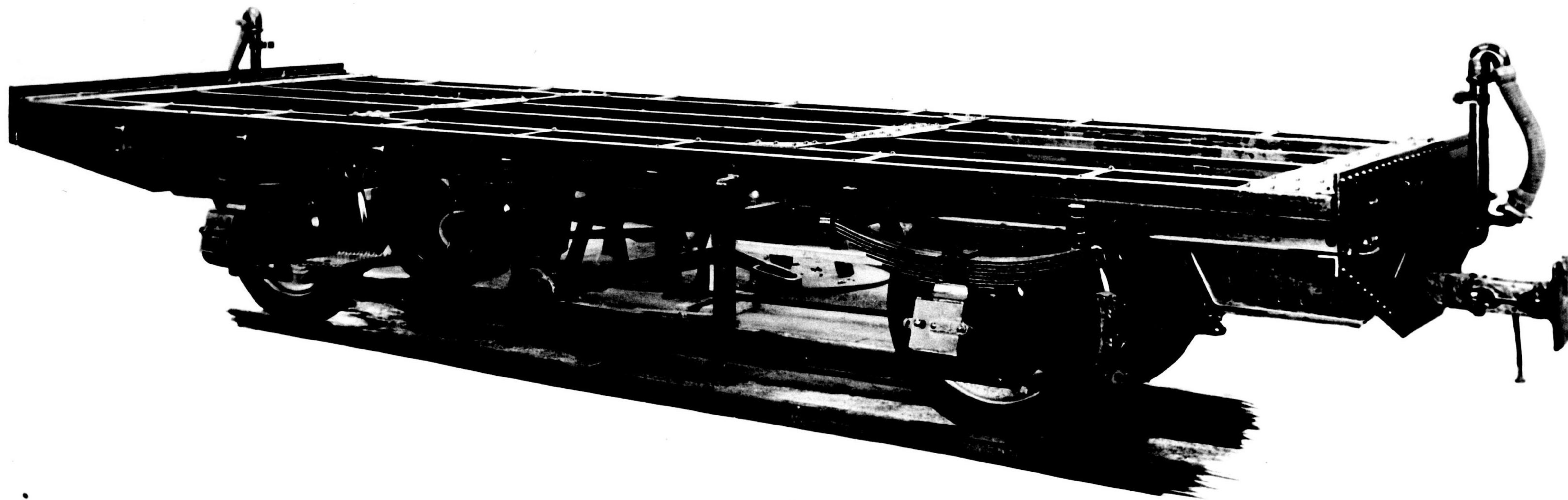


Figure 14. All-Steel underframe for  $12\frac{1}{2}$  metric ton 4-wheel car. Thailand State  
Railways. Magor Car Corporation New York. OSS R 765071



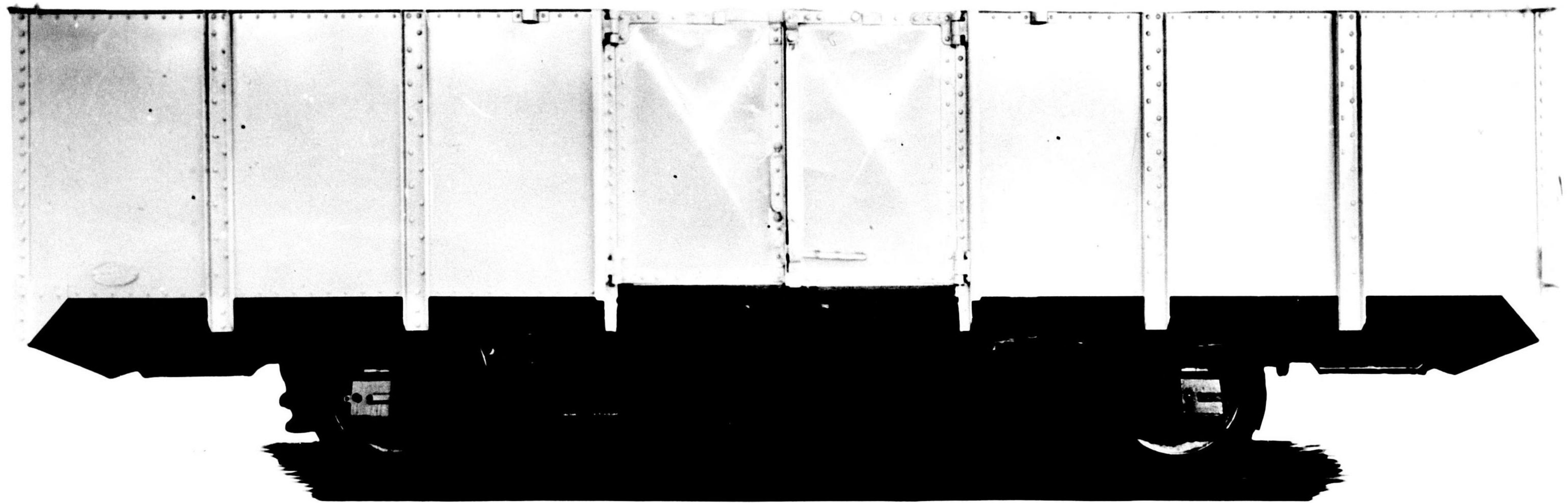
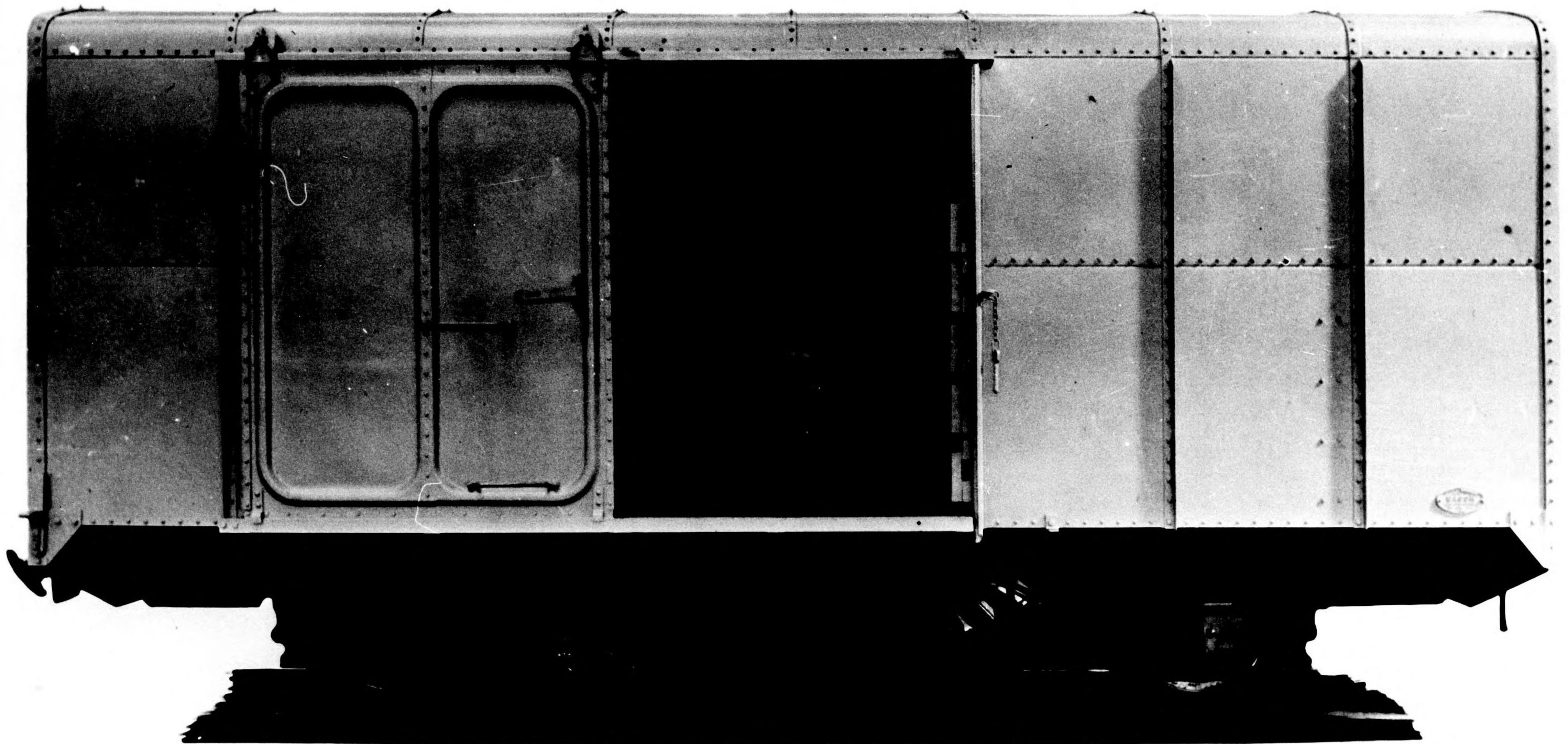


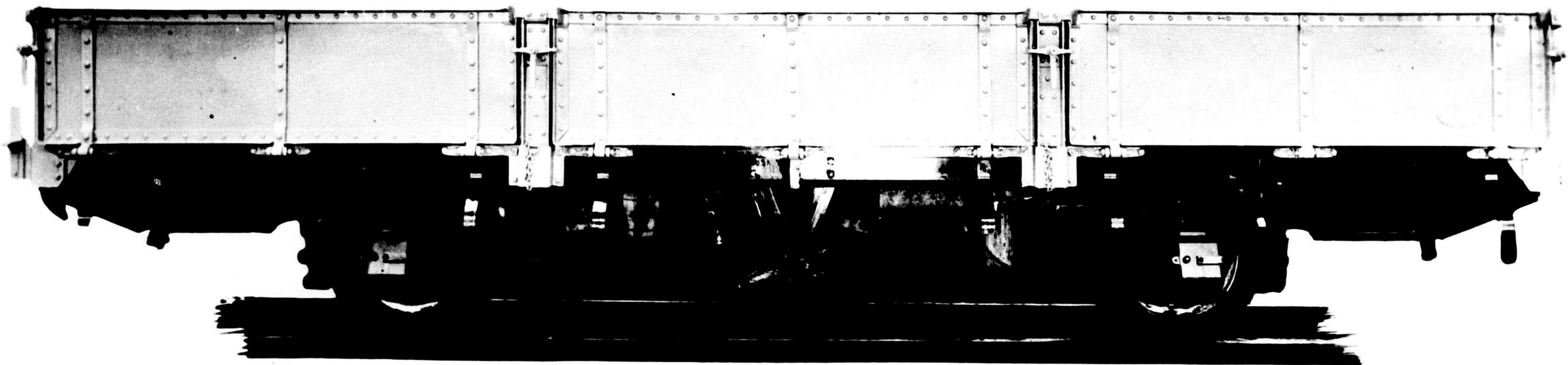
Figure 15. All-Steel 4-wheel High-sided gondola. 27,550 Lbs. Capacity. Thailand  
State Railways. Magor Car Corporation New York. OSS R 765072





**Figure 16. All-Steel 4-wheel box car. 27,500 Lbs. Capacity. Thailand State  
Railways. Magor Car Corporation New York. OSS R 765073**





**Figure 17. All-Steel 4-wheeled low drop-sided gondola. 27,550 Lbs. Capacity.**  
**Thailand State Railways. Magor Car Corp. New York. OSS R 765074**