

PASSENGER CARS OF PRE-REVOLUTIONARY RUSSIA

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ABSTRACT

A retrospective review of the initial period of formation of the passenger car fleet on domestic

railways shows the transformation of technical ideas, design features of railway vehicles, comfort conditions, travel convenience for passengers.

Keywords: railway, passenger car, history, technical progress, common comfort.

Background. The first passenger cars were called in England coaches (carriage). The carriage was put on a platform, which was connected to a train.

Passenger cars were built in England and brought to St. Petersburg in 1836 for the first in Russia Tsarskoye Selo railway.

The first cars were biaxial, had a wooden frame and body. For their coupling coupling as a chain was used. A car buffer that protected cars from colliding when manual braking was fastened to a frame.

Cars—«Berlin» were of a special comfort. In each compartment, designed for 8 people, four armchairs with armrests were located opposite each other. In the compartment of «Stagecoach» soft seats for five people each without armrests were located that allowed to put 10 passengers in one compartment.

The I class cars were built with solid longitudinal walls, had glazed doors and windows. In II class cars longitudinal walls reached up to half the height of the body. Transverse walls were blank, lateral gangways were absent, the cars did not have communication with each other. They could accommodate up to 12 people on hard benches. The cars had no heating and lighting, only since 1840 candles began to be used.

Objective. The objective of the authors is to give a brief overview of construction and modernization of passenger cars in the pre-revolutionary Russia.

Methods. The authors use historical retrospective method, scientific description, comparative method.

Results. Construction of the passenger fleet in Russia was first organized at the Alexander mechanical plant for St. Petersburg–Moscow railway. An American passenger car on two-axle bogies was taken as a basis. In 1865, the engineer Rekhnevsky developed a new design of a biaxial bogie, which applied double spring suspension providing a better ride comfort than in case of single suspension. The first cars did not provide for the convenience of passengers. In 1850, the Alexander plant built two cars of improved design with comfortable conditions for passengers.

Hard-seated cars of III class were built on wooden bars, coupling was central and at the same time buffer. Inside the car there was a passage on the sides of which paired benches were put. On each side of the car about six or nine windows were located. In the car there were 90 seats up to 400 mm deep and 1000 mm in length. The first cars did not have shelves for clothes and luggage, heating, bathrooms and toilets. Lighting of cars at night was made with tallow candles. Ventilation was carried out through single windows, the lower half of which was raised up.

The II class cars were built of the same size, but the benches and their backs were soft, spring, with the outer cloth covering. The benches, on which two passengers could sit, were divided with armrests. Seat depth was 640 mm and the distance between two opposing benches was 550–575 mm, so the number of seats for passengers was 52.

The I class cars had a lateral gangway with a width of 676 mm near one of the walls of cars. Near the other wall 14 transverse soft sofas with a length of 1944 mm were placed, on each of which two passengers could sit. The cars had 7 windows that were placed between the sofas. The width of the sofas in cars of I class was 740 mm and the distance between them was 640 mm. All cars were brake, with the chain brake and one-sided internal inhibition in each bogie, carried out with the help of aspen wood blocks enclosed in iron shoes.

In the period from 1857 to 1862 for domestic state-owned and private railway passenger cars were purchased abroad, as the Alexander mechanical plant was loaded with repair works. At the same time, cars of European plants did not have a pass-through, were compact and light, which was achieved due to excessive compaction of passengers. The cars of the Alexander plant, on the other hand, had a pass-through along the length of the car, a larger floor space and a larger air volume attributable to each passenger.

Prior to the 1860s neither domestic, nor foreign cars have restrooms and heating, lighting and ventilation of passenger cars were not enough and required improvements. Warming of passengers' feet was made only in the severe frosts in the cars of I and II class. For this purpose the extremely hot bricks were used that were placed in flat boxes of sheet iron and before the train departure were installed on the floor under the passengers' feet. After 3–4 hours after the train movement started, cooled heaters were removed and were substituted with other hot bricks.

In the period from 1865 to 1880 began the production of triaxial cars (using bogies of triple suspension), with three forms of roof (flat, semi-circular and with lantern); water heating was introduced in soft cars and stove heating – in hard-seated; doors that opened into the body, and internal sliding door; swing backs of sofas were designed for beds organization, dimensions of the interior layout of cars were standardized; all cars were equipped with restrooms and wash stands were in most of them; above-the-window and under-the-window sliding fans and overhead deflectors (exhaust wind vane) were applied; double drop-side windows with large massive glass were introduced; space for passengers was standardized in width (2 seats in I class cars, 3 seats in II class cars and 4 seats in III class cars, uniform depth of seats was set (750 mm in I class cars, 650 mm in II class cars and 450 mm in III class cars); lighting of cars was improved by increasing the size of windows and their location between the benches, installation of wall lamps and introduction of gas lighting of cars.

Complicated covering of II class cars and luxurious covering of I class cars were simplified through the use of oilcloth for ceilings and walls, woolen and linen curtains for windows and lamps, red and green trip for sofas of I class, cloth or a dense furniture denim for II class cars.

In 1879, for external differences of cars the following outdoor painting of cars of passenger fleet was

introduced: blue – for I class cars, yellow-gold – for II class cars, green – for III class cars.

In the period of 1881–1917 triaxial cars began to be substituted with more advanced two-axle, and then four-axle cars. Two-axle bogies, which were most often present in the construction of passenger cars of the early XX century were characterized by improved performance of spring suspension, side buffers and central towing couplers.

Four-axle passenger cars were the last developed in Russia before the First World War. The car body length had been increased to 20 m, full iron frame was applied. For the first time since 1912 on these cars electric lighting was installed, which had been previously used only in parlor cars.

The original design of cars of various types was created within this series:

- soft cars of I and II classes with a variety of layout and equipment;

- four- and six-axle cars with metal semi-walls, carrying the main load;

- hard-seated, including of IV class, which could significantly reduce the cost of passenger travel at the expense of increased capacity;

- double-deck cars, which made it possible to significantly increase the number of passenger seats per unit length of the car (see, e.g. Double-deck passenger car on bogies of Rykovsky system);

- postal, baggage, service and other special cars in various designs (see, e.g. Migration (Stolypin) car, Tsar's car-garage, Car-church of the early XX century);

- two-axle cars with improved smoothness (with bogies of Fett system, of triple suspension and others.);

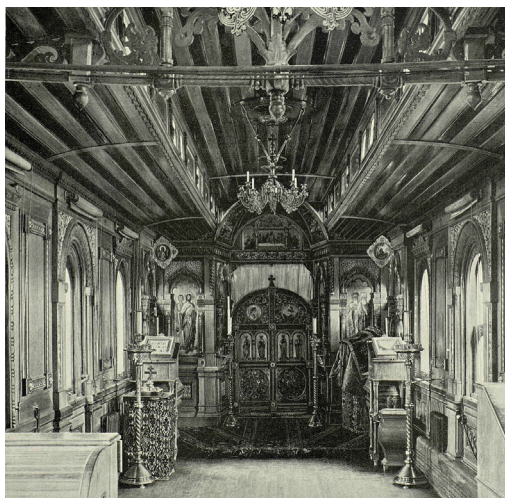
- cars with air-conditioning systems.

Passenger four-axle car of II class received from the experts the name «car of Polonso system» on the last name of the French engineer, designed a special body for it. These cars were built for Vladikavkaz, East China and St. Petersburg–Warsaw railways. The thickness of the sheet metal of the underbody was 5 mm. Body length was 12–14 m, width – 3200 mm. The cars had 6 windows along the length, a softer suspension, axle boxes of more modern type. Number of seats in the cars had been increased by reducing passenger amenities. In I class car there were 24, in II class car – day seats, of which reserved (sleeping) seats (sleeping) 16 and 24, respectively.

Hard-seated passenger cars of III–IV classes appeared on domestic railways in the second half of the 1880s, when a need arose to provide a cheaper travel fare for peat mining workers, factory and mining-industrial areas.

Hard-seated two-axle cars of II–III class were rarely built, and had limited distribution on short branches.

Widespread migration movement arose in connection with the commissioning of the Siberian railway. For passenger transportation, IV class cars were built, known as «migration» of the Siberian type. These cars were built as two-axle and four-axle. Two-axle cars had a body length of 12030 mm, 7 windows and 40 seats. They were suspended on two-row flat springs with tension buffer plate suspension rods. Four-axle cars of 20060 mm long with 13 windows had 81 seats and were placed on bogies with transverse three-row vehicle-type



springs. Both cars had a convex-plane roof, exterior wood paneling, two dry kilns and two restrooms were installed inside.

Double-deck cars of IV class of original design were built in small quantities. This car had a body length of 20000 mm, resting on special bogies with one longitudinal flat springs and four spiral – on each side, 12 windows. To access the upper floor, there were outer end two sided stairs, the lower – the door on each side in the middle of the length of the body. The car was designed for 106 seats. The car had bogies of Rykovsky system with triple spring suspension.

In 1911, the long-distance cars were built with a length of 20 m with bogies of Fett construction instead of Pullman bogies. In 1912–1913 these cars were equipped with autonomous electric lighting, which had been previously applied only for service cars. In passenger cars built in the pre-revolutionary period, timber was widely used and the bodies were sheathed with sheet metal outside.

Conclusion. A study of the historical process of creation and improvement of a domestic passenger car, improvement of its technical and technological characteristics, structural links with other objects and achievements of scientific and technological progress in the railway transport and transport machinery allows to determine its competitiveness criteria while meeting public transportation needs.

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