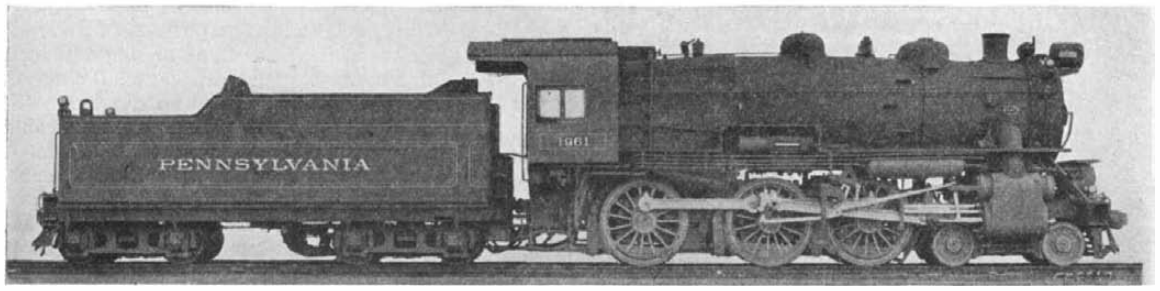
Turning the Wheels of the Railroad: Steam Locomotives

FROM a comparatively simple machine of one hundred years ago, the steam locomotive has evolved into a monster of steel, draped with some 15,000 parts each of which must be transported up and down the railroad, inspected with untiring regularity and replaced frequently. These monsters range from 200 to 400 tons in weight, and do well if they drag three or four times their weight of paying freight on a comparatively level road. If efficiently handled a steam locomotive may earn a gross revenue a little more than its cost in a year, which is a matter of $65,000 or more. As far as the modern passenger steam locomotive is concerned, the climax is reached in the Mountain type locomotive with its eight huge drivers each 72 inches in diameter, capable of hauling twelve steel coaches weighing 875 tons over mountain, desert and plain at high speed for a distance of 815 miles! This is the performance of the Los Angeles Limited of the Union Pacific Railroad.

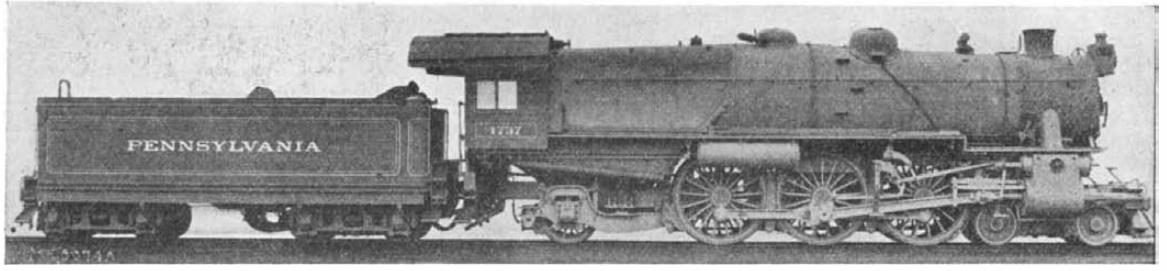
It is rather surprising to learn that the usual steam locomotive is a firm believer in the eight-hour working day. The carefully-prepared statistics of the leading railroads disclose the startling fact that only about one-third of the life of the average steam locomotive is actually spent in productive work, namely, the moving of cars. The balance of the time which the usual steam locomotive spends in the terminal, in engine houses and so on is non-productive time, not to mention the long periods spent in the repair shops. Taking the Class I railroads in the United States during 1921, the average non-productive time of freight locomotives amounted to somewhat more than 17 hours out of the 24; hence the locomotives were idle and not earning two-thirds of the time. In fact, during this time they are not only non-productive, but are actually costing the railroads considerable sums of money for attention and fuel in keeping them hot and otherwise taking care of them at terminals. During the same year the average monthly mileage of freight locomotives in active service on all classes of railroads was only about 2400 miles, and for passenger locomotives only 4100 miles. Approximately 40 per cent of the average locomotive's time is spent with the mechanical department, caring for running repairs, turning, its monthly boiler wash, and its annual vacation of 20 to 30 days for complete overhauling. Thus it will be seen that the average locomotive works hard when on the job, but it loafs at least two-thirds of the time.

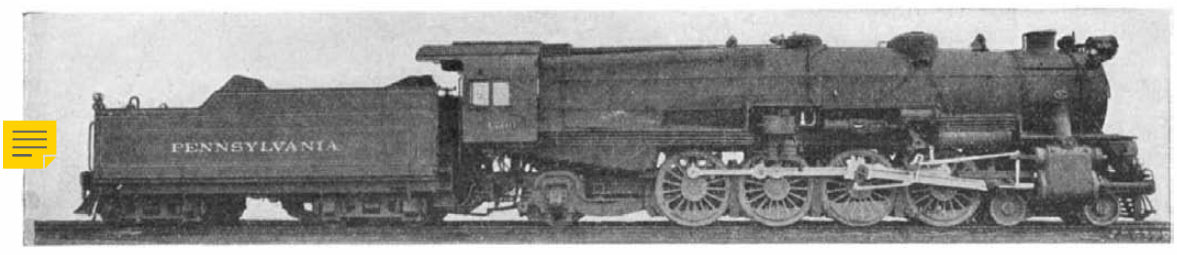
The average life of the steam locomotive is from fifteen to twenty years, and if proper care is given to the replacement of parts, it should constantly give satisfactory service. The usual practice on the leading railroads is to place the latest and largest locomotives on the main line, while relegating the displaced locomotives to suburban trains and branch lines. However, during recent years steam locomotives have ordinarily been retired on account of constant changes in operation, resulting in changes in design and size, making an engine obsolete far before the time it was actually worn out in service.



Medium weight engine for heavy local passenger service. Especially designed to develop relatively high tractive power in starting, in order to gain speed rapidly and thus maintain high average speed over runs where many stops must be made. Driving wheels 68 inches in diameter. Weight, with tender, 413,500 pounds. Starting tractive effort, 41,328 pounds

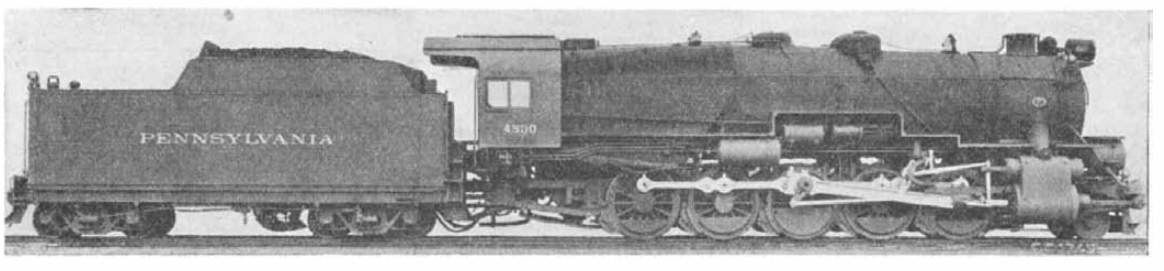
Passenger engine built to produce the most effective practical combination of sustained speed and great tractive power. Driving wheels 80 inches in diameter. Weight, with tender, 467,890 pounds. Starting tractive effort, 44,460 pounds. This is the Pennsylvania Railroad's standard engine for heavy through passenger service, except where conditions require the heavier type immediately following

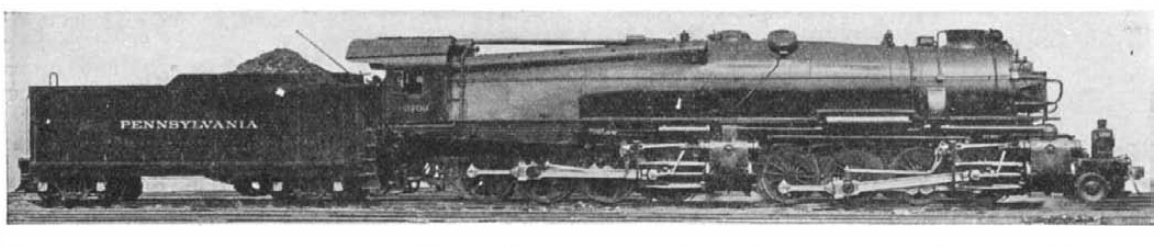




A newly designed "Mountain" type engine for through passenger service where maximum power is the chief consideration. Also adaptable to special uses in the fast freight service, such as the handling of preference trains with perishable and other high-class freight. Driving wheels 72 inches in diameter. Weight, with tender, 559,600 pounds. Starting tractive effort, 64,550 pounds

Pennsylvania Railroad's standard heavy freight locomotive. Weight in working order, with tender, 582,100 pounds. Driving wheels 62 inches in diameter. Starting tractive effort, 90,024 pounds. The engine here shown was built by the Baldwin Locomotive Works from the Pennsylvania Railroad design. Many locomotives of this type have also been constructed by the Pennsylvania Railroad at the Altoona Works





Special type simple Mallet articulated engine of extraordinary power, constructed specially for use in "pusher" service to help heavy freight trains over the long, steep grades on the east and west slopes of the Allegheny Mountains. Driving wheels 62 inches in diameter. Weight, with tender, 805,500 pounds. Starting tractive effort, 135,000 pounds. Designed by the Pennsylvania Railroad and built at the Altoona Works

Turning the Wheels of the Railroad: Electricity and Gasoline

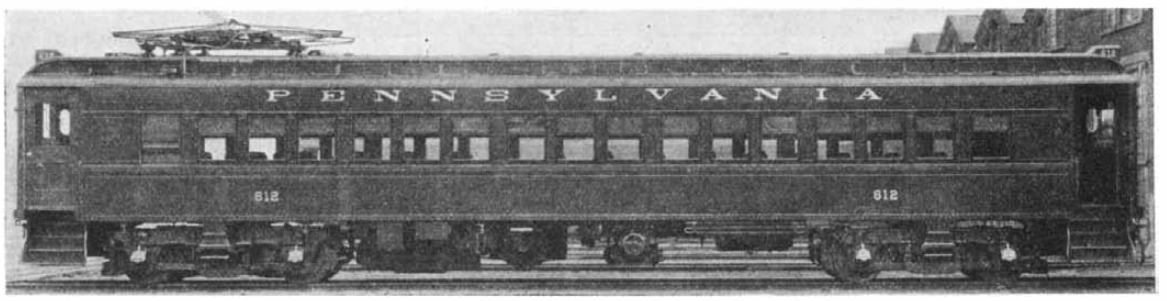
ADMITTING that the steam locomotive is an advocate of the eight-hour working day and that it never misses an opportunity to loaf, all the while costing the railroads large sums of money for fuel, maintenance and operating staff, the fact remains that the steam locomotive is still very much in evidence. Time and again it has been threatened by the electric locomotive; but after all the facts and figures are in, the decision of the railroads is to retain the steam locomotive as the good old reliable motive power, while employing electric locomotives and multiple-unit trains for those sections entering large cities and for suburban service. Also, railroads have found electrification advantageous in localities where water power is abundant and cheap, while coal is scarce and expensive.

The accompanying collection of steam, electric and gasoline rolling stock of a typical American railroad, in this instance the Pennsylvania, gives some idea of the wide variety of services to be handled and the corresponding types of rolling stock. Still, such types as switching locomotives and the smaller eight-wheelers for branch line operation have not been shown here for want of space.

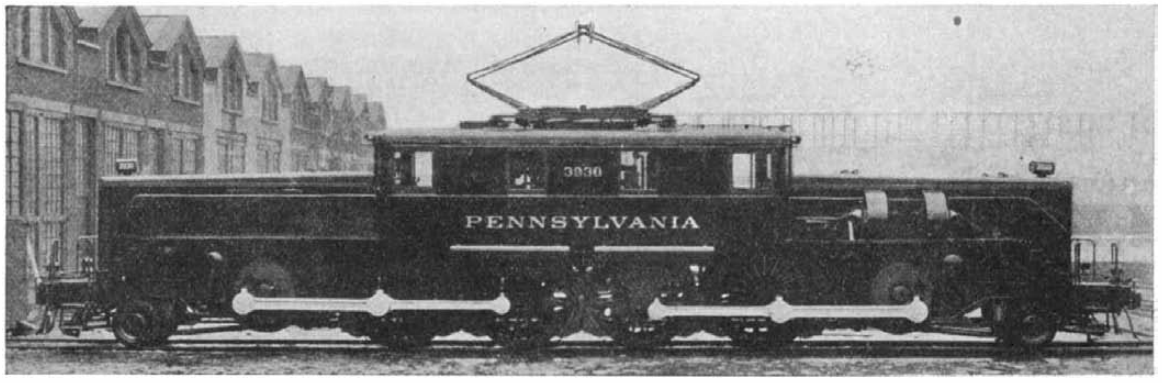
The main application of electricity as the motive power for railroads is for those sections entering and leaving large cities, where the smoke nuisance is to be avoided. Furthermore, over such sections there is certain to be considerable suburban traffic, and electric operation has a decided advantage in this type of service. For suburban service the standard practice is to employ the multiple-unit coach, which has its own electric motors and controlling equipment, and which is combined with other similar coaches to form a train under the control of a single motorman. The flexibility of the multiple-unit train is remarkable. Not only can a train be made up of any number of coaches to accommodate the fluctuations of traffic, but such a train accelerates rapidly and thus makes for a minimum of lost time for stops, as compared with the comparatively long stops of the locomotive-drawn train.

Electric locomotives are no longer a rarity, being used on a large number of American railroads. Where electricity may be generated at a reasonable cost, the electric locomotive is quite economical to operate and electrification becomes economically sound, despite the heavy investment in generating equipment, power plants, transmission lines, and the trolley or third rail. One thing certain about the electric locomotive, and that is its steady performance. An electric locomotive goes on working day after day with little attention as compared with the pampered locomotive. It puts in a far greater number of working hours than the steam locomotive, and when it does happen to be idle, it is not consuming fuel nor does it require an engine crew in attendance.

The last word in railroad motive power is the gasoline car. Originally this type was little more than a motor bus provided with flanged wheels, but it has now developed into a passenger coach with the same general lines as the usual coach. Gasoline cars are finding a real field of utility on the branch lines of the railroads, where the traffic is too light to make steam or electric operation profitable.

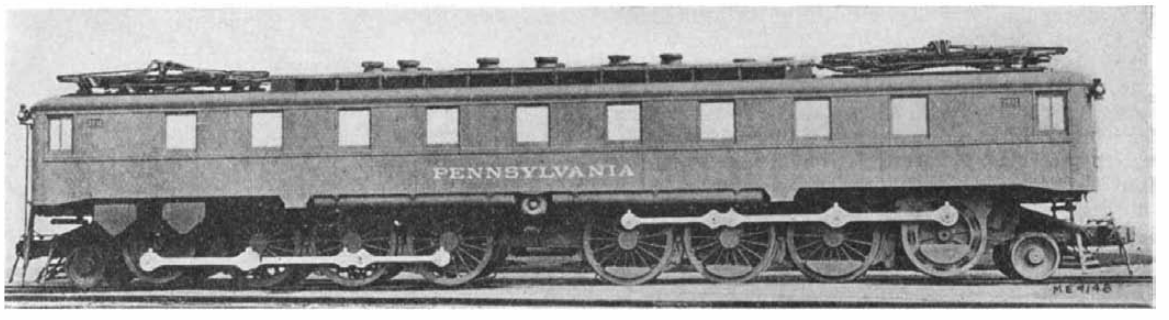


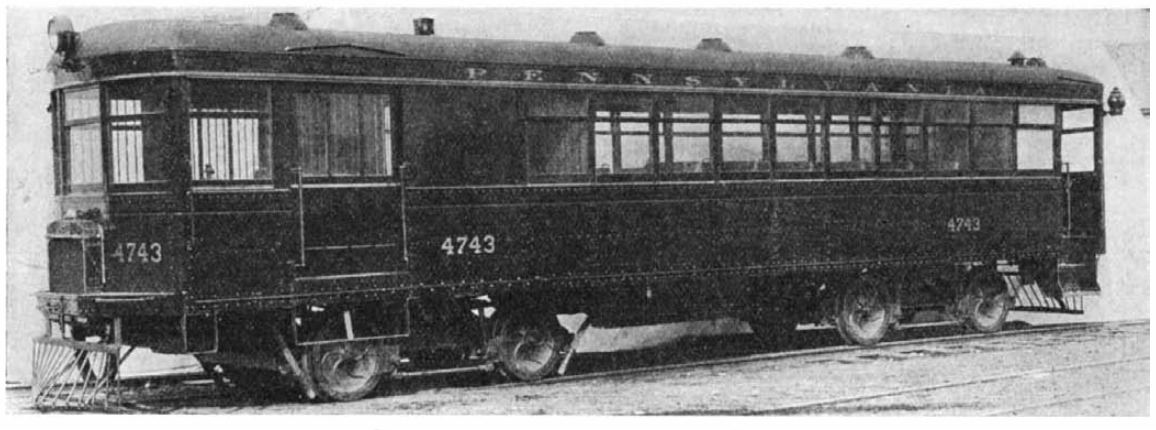
Multiple-unit electric passenger coach, standardized by the Pennsylvania Railroad for suburban electric passenger service. Used extensively on the electrified suburban lines in the Philadelphia district. Seats 72 passengers. Weighs 118,600 pounds. Operates from either end. Each car carries its own power. Two or more cars may be combined into a train controlled by a single motorman



Entirely new type of electric locomotive. Highly standardized for general utility work. With high gear between motor and wheels, it operates as a high-speed passenger engine; with low gear, it develops great tractive power required for freight service. Works on either alternating or direct current supply, with slight change in control apparatus. Weighs 408,000 pounds. Develops starting tractive effort of 100,000 pounds in low gear and 54,000 pounds with high gear

Most powerful single-unit electric locomotive ever built for any railroad. Designed especially to give maximum efficiency for heavy, slow-speed freight service. Weight, 516,000 pounds. Starting tractive effort, or straightaway pull on level track, 140,000 pounds. At speed of 20 miles per hour, this engine is capable of producing continuously and for an indefinite period a tractive effort of 73,000 pounds





Type of gasoline-propelled passenger car designed for use on certain Pennsylvania Railroad branch lines in connection with light traffic. The weight of this car is 30,000 pounds. Seating capacity is 38 passengers, with emergency seats for eight more in the baggage compartment. It measures 42 feet 8 inches long. This design is more like a railroad coach and less like a motor bus than the usual run of gasoline-propelled passenger cars now being introduced for branch line service of other railroads