THE NEW PENNSYLVANIA RAILROAD ELECTRIC LOCOMOTIVES.

It is a curious instance of what might be called the vagaries of mechanical evolution that the latest and most powerful electric locomotives, of which we present illustrations, should be furnished with those side rods and connecting rods, the abolition of which from the electric locomotive was considered to be one of its principal points of improvement.

Theoretically, to get rid of the reciprocating movements and unbalanced rotating weights of the steam locomotive was eminently desirable, for these unbalanced weights were the cause of much destructive wear upon the track and roadbed. Furthermore, the substitution of the compact electric motor, encircling the driving axle, was considered to be an ideal arrangement of compactness and efficiency.

When the electric drive came to be applied to steam railroads, as in the case of the electrification of the New York Central and the New Haven roads, it was found that the above mentioned advantages were obtained at the expense of collateral disadvantages of a very serious character, for the low center of gravity, the rigid wheel base, and the large amount of non-spring-supported weight combined to make the locomotives very destructive of the track. Both locomotives met with serious accidents, the former bursting open the track on a curve near Woodlawn, and the latter doing the same thing when hauling the White Mountain express at high speed through Greenwich, Connecticut. The running of both types of locomotive has since been greatly improved by the substitution of four-wheeled leading trucks on the New York Central locomotive, and the introduction of pony trucks on the locomotives of the New Haven road.

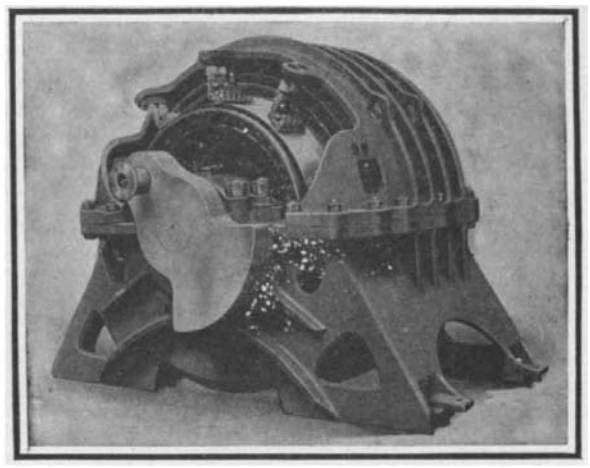
In designing the locomotives to be used in the New York tunnel extension of the Pennsylvania Railroad, the engineers of the railroad company and of the Westinghouse Electrical Manufacturing Company have profited by the valuable experience of the past few years, and have designed an engine which will have the high center of gravity and flexibility of wheel base which characterize the steam locomotive. It consists of two duplicate sections. The wheel plan of each section is the same as that of the old eight-wheel American steam locomotive, and consists of four coupled drivers and a four-wheeled truck.

The sections are permanently coupled back to back by a special arrangement of Westinghouse friction draft gear and levers, so that the leading section effectually pilots the rear one. This obviates all necessity of turning the engine, which runs equally well in either direction. All manipulating levers are duplicated in each section, so the operator simply changes ends.

The most original feature of this engine, at least in American practice, is the removal of the motors from the wheel axles and the substitution of a single motor which is placed above the frames and within the cab. This motor weighs, without gear, 45,000 pounds, and in weight and power it is the largest railway motor ever constructed. At each end of the rotor shaft is a crank, the two being set, as in steam locomotive practice, at ninety degrees. From these cranks a pair of coupling rods lead down to a crank-shaft (known as a jack shaft) which is carried in the frame in a horizontal line with the axles of the driving wheels. The jack shaft cranks are coupled to the drivers.

Now it will readily be seen that this arrangement avoids all the difficulties of counter-balancing which have been such a nightmare to the steam locomotive designer and to the track superintendent, for, since the motor crank revolves uniformly and at constant effort, differing therein from steam practice, the turning effort of the drive wheels is the same as for the motor, and is constant throughout each revolution. Moreover, it will be seen that since the movements of all rods and moving parts are those of pure rotation only, it is possible to secure perfect counterbalance, and the engine delivers no more shock to the track and roadbed than a passenger car of equal weight.

The motor and massive side frame, the jack shaft, and all other gear, are spring supported from the driver and truck wheels, so that there is no track stress other than that local to a single pair of wheels. In this arrangement of motor support and connection,



One of the 2,000 horse-power motors of the Pennsylvania electric locomotives.

the center of gravity height closely approximates that in the best high-speed locomotives.

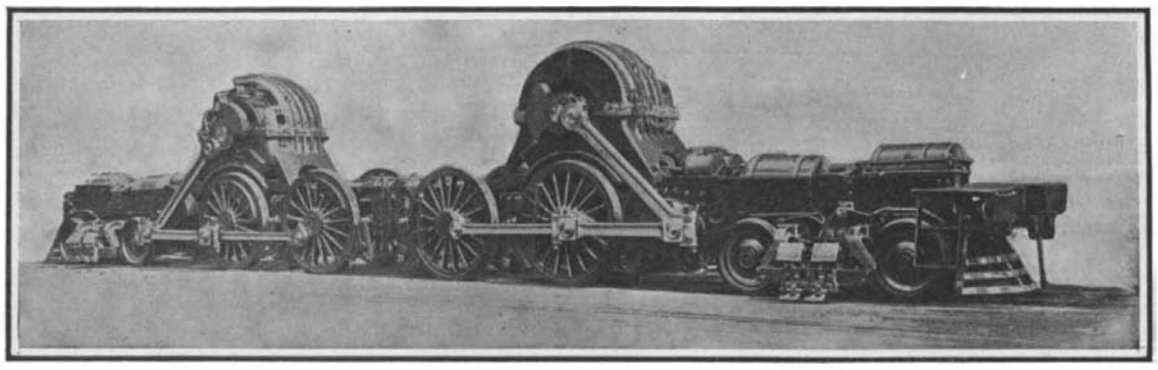
A decided improvement in the "Pennsylvania" type is the use of a single motor for two pairs of drivers, and the benefits secured by its position. The motor is located high up from the roadbed, secure from snow, dirt and water, and its design embodies electrical features never before secured on an electric locomotive.

The first twenty-four locomotives to be built will have the following dimensions:

Total weight, 166 tons; total horse-power, 4,000; maximum draw bar pull, 60,000 pounds; maximum speed, 60 to 70 miles per hour under load; diameter of drive wheels, 68 inches; diameter of truck wheels, 36 inches; weight on drivers, 104 tons; length over all, 65 feet; total wheel base, 56 feet.

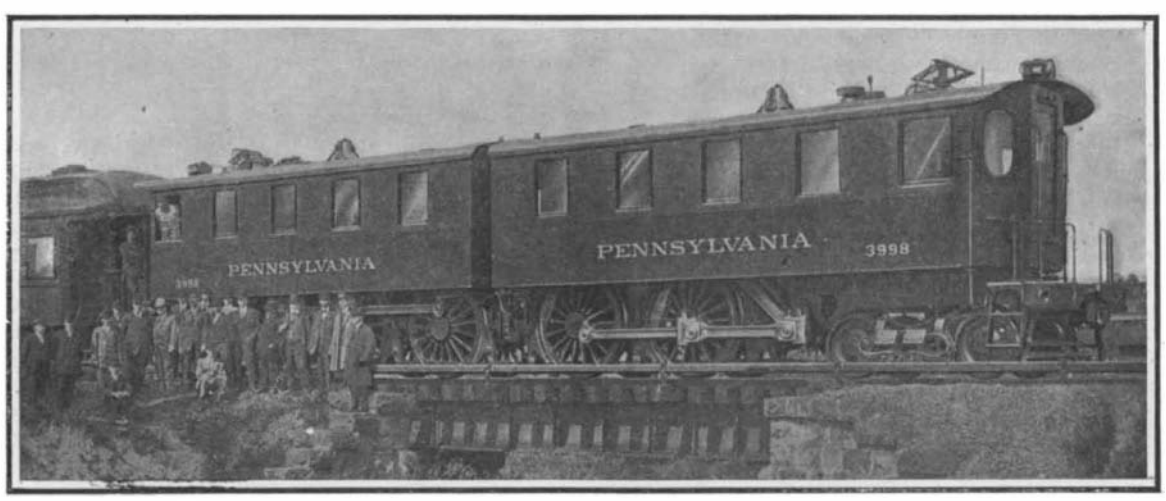
The controller on the "Pennsylvania" type is scarcely as large as that on a Hoe printing press. None of the main power passes through it, as it is really a switch corresponding to a telegrapher's key, operated by electro-pneumatic means. With a lever which can be moved with one finger, the engineer can admit to the locomotive a current equal to that available in a hundred trolley cars.

The electric supply will be secured from an electric conductor, or third rail, by four contact shoes on each locomotive. At some points where the great number of track switches will not permit this, power will be secured from an overhead conductor through an air-operated overhead contact shoe, of which there are two on each locomotive. The first locomotive, which is now being tested both as to speed and hauling power on the Long Island Railroad, is giving satisfactory results.



Drive wheels, 68 inches diameter. Truck wheels, 36 inches. Length over all, 65 feet.

Chassis of the new electric locomotive.



Weight, 166 tons. Horse-power, 4000. Drawbar pull, 60,000 pounds.

THE NEW PENNSYLVANIA RAILROAD ELECTRIC LOCOMOTIVE

Electric Traction in Tunis.

In the region of Tunis there has been installed an extensive system of electric traction lines. The new electric sections, which are now in regular running, are designed to replace the former steam railroad. This latter comprised three lines, one of these running from Tunis to La Goulette, about 10 miles distance, the second from the city to Marsa, 11 miles, and the third from La Goulette to Marsa, about 5 miles. The region covered by the lines is of interest as being the site of ancient Carthage and its extensive suburbs. The first two sections had a common portion of about 6 miles between Tunis and Aouina. The steam lines had been conceded in 1871 to an English company which turned them over to the Florio Rubattino company ten years later, and they afterward passed into the hands of the Bone-Gullma railroad company. The government made an arrangement in 1905 with the Tunis traction company to have the lines changed to the electric system. This was carried out by the Paris Thomson-Houston firm, and the government wished to profit by the jetty which had been laid across the Tunis Lake so as to use it for the line as far as La Goulette and thus run in a straight path. The old traject is kept between La Goulette and Marsa, but there is also a second branch which runs nearer the sea coast, traversing the site of Carthage and reaching the elevated locality of Sidi-bou-Saïd, then descending to the terminus at Marsa.

The object of the new line is to enable the population of Tunis to reach the seashore easily and rapidly, and the new shore branch could not be realized by the steam road on account of the irregular ground covered here. It is expected that the suburban region will be much more developed by the use of the electric line. At present the trains are made up on the multiple-unit system of two motor cars and from one to three trailers. The motor cars are fitted with two motors of the G E-66 type which run on 600 volts on the overhead wire or third rail, and give 125 horse-power, using two series-parallel controllers. With front and rear motorman's cabins, the cars have first and second-class compartments and also a baggage or light freight compartment. The chassis has two bogies, one of which carries the motors. Current is taken by third rail for the suburban part of the line, and it is only within the city that the trolley is used. The motor cars weigh 28 tons and contain 100 places, while the trailers, of an equal capacity, weigh 22 tons.

The Great St. Petersburg Ozone Plant.

In view of the very satisfactory results obtained by the purification of the water of the Neva in ordinary sand filters, when the epidemic of cholera was prevalent in St. Petersburg about a year ago, the municipal douma and the authorities of the city have decided to erect a large plant for ozonizing water. It is only just to say that the cholera infection is to be attributed in this recent outbreak to the defective nature of the actual system of distribution, which is incapable of retaining the bacteria. On the other hand, the sanitary authorities of the government, as well as those of the city of St. Petersburg, are of the opinion that sterilization by ozone is the only method which is able to assure a radical purification of the drinking water of the city, their investigations, as well as those of the Instituts Pasteur and Koch, having demonstrated the perfect bactericidal quality of ozone as the best means for completely destroying the microbes contained in water. This large ozone plant, combined with an installation of rapid filtration (Howatson system) will be laid out according to the combined systems Siemens-de-Frise-Otto. The electrical portions of the ozone apparatus will be constructed by the Siemens & Halske Company and the plant of Felten Guilleaume-Lahmeyer.—La Nature.