where it is transformed to 3,000 volts and supplies twelve independent sections of the R.R. system.

These sub-stations each contain one three core three phase air blast transformer, of 300 K.W. normal rating, but capable of working for short periods up to 900 K.W. The cooling apparatus, a fan, is driven by a small induction motor. The sub-stations are about 6¼ miles apart.

Passenger and freight traffic are operated independently, passenger traffic by motor driven cars, freight trains by electric locomotives.

The passenger cars weigh 53 tons and are capable of hauling, beside their own weights, 5 trailers of 10 tons each on a 2% grade at a speed of 40 miles an hour.

These cars are mounted on two four-wheel trucks. Fig. 1 gives a general idea of the construction of a truck. Two motors of 150 H.P. each, are provided for each truck, giving four motors per car. These motors are gearless, the rotor axle is hollow and permits the car axle to pass through it. The rotor shaft or sleeves is connected to the car axle by a flexible coupling, a modified form of a drag link. Jar and vibration are thus prevented. Control of the motors is made from both ends of the car, a controller being provided to each platform, to which the passengers have no access. These controllers are mechanically interconnected and have only three positions.

Each motor car is fitted with two primary and two secondary motors. The primary motors have six poles and are rated to develop 150 B.H.P. at 300 revs. per min. under 3,000 volts, 15 cycles. The diameter of the car wheels being 3.84 feet, the maximum speed of the car is close to forty miles an hour. The maximum torque these motors can develop is from four to five times their normal torque. There is practically no difference in weight and design between the primary and secondary motors, which are also rated at 150 H.P. under 300 volts and 15 cycles.

Fig. 2 gives a diagram of connections of one of these cars. In starting the two motors M_1 and M'_1 on a truck, are connected in concatenation or cascade. The stator winding of motors M_1 and M_2, the primary motors, are connected to the 3,000 volt line A through the high tension switch D. The rotor of these motors (ratio 10 to 1), thus giving 300 volts, are connected through the controller C to the stator windings of the secondary motors M'_1 M'_2. The rotor of these motors (ratio 1 to 1), are each connected to a three phase liquid rheostat R, containing an alkaline solution, the