

# RUNNING TRAINS ON ONE RAIL

WITHIN a few months the term monorail-road has acquired a new significance which is likely to become exclusive, in the successful operation of the gyroscope cars upon a single rail laid upon the level of the ground.

In the older application of the name to the cars or trains suspended from a single overhead rail no new principle was involved. The balance of the moving car was nothing more than the usual result of the attraction of gravity.

In the Elberfeld to Barmen railway, which runs along the valley of the Wupper, in Rhenish Prussia, the monorail, or single rail, is carried on steel girders supported by A-shaped trestles, the cars hanging downward and running between the legs of the A. This road is something over eight miles long, and proceeds partly through the main streets of the towns it traverses, and partly suspended over the River Wupper.

Its steepest grade is one foot in twenty-two feet, and the sharpest curve is a radial swing of 295 feet. The working speed is about thirty miles an hour.

The cars are 87.5 feet long and 6.5 feet wide, with a capacity of fifty passengers. Each car has its independent motive power, but the entire train is controlled by the motorman in the front car.

Each car is hung from two two-wheeled trucks, or bogies, 26 feet apart, the wheels of which are 35 inches in diameter. These wheels are driven by electric motors mounted on the bogies. A car when loaded with fifty passengers makes up a total weight of fourteen tons, or an average weight of about 620 pounds per passenger, which compares favorably with the weight per passenger carried by the ordinary type of elevated electric railroad.

Another class of railway to which the term monorail-road has been applied is that in which the cars are arranged in pairs, after the fashion of saddle-bags, hanging on opposite sides of the central elevated single rail, carried on A-shaped trestles, as in the Elberfeld road, but running on the outside of the legs of the A, instead of between them. In addition to the supporting rail at the top there are two bearing rails on each leg of the A to steady the cars when in motion.

Such a road is projected between Liverpool and Manchester, and at the proposed speed of 120 miles per hour the distance, 32 miles, would be covered in but a little over a quarter of an hour, including stops. A road built on this principle, with some variations, is projected to run through Pelham Bay Park to City Island, in the Bronx, New York City.

A third class of monorail-road consists of a single rail laid on the level of the ground, being essentially half of an ordinary two-rail road. The balance of the cars is maintained by arms, which reach out laterally, and are supported by a man or a horse walking at one side and supplying the motive power at the same time. It is a simple and effective mode of transportation for loads which would require much more expensive power proportionally to move by usual methods.

To form a fourth class comes the gyroscope car running on a single rail, and preserving its own balance—the germ of the monorail-road par excellence. The types of the gyroscope car have been produced, the first by Louis Brennan of England, who exhibited a model car early in 1907, and a practical service car 40 feet long and 10 feet wide, and weighing 22 tons, which successfully carried 40 passengers, in December, 1909.

The force made use of in maintaining the balance of the gyroscope cars is the resistance which a rapidly revolving wheel exerts against any change of the plane in which it is rotating.

In the Brennan car the upright position upon a single rail is preserved by two wheels revolving side by side in parallel vertical planes. These wheels are 3.5 feet

in diameter and weigh 1,500 pounds each, and are placed in vacuum chambers to escape friction. They are made to revolve in contrary directions to counteract certain tendencies to wobbling, and at a speed of 3,000 revolutions per minute.

The other gyroscope car was invented in Germany by Richard Scherl. It differs from the Brennan car in that the gyroscope wheels rotate edge to edge in the horizontal plane of the floor of the car, are very much smaller than the Brennan wheels, weighing only 125 pounds each, and are made to rotate at a speed of 8,000 revolutions per minute.

The latent power of these gyroscopes is so great that a force sufficient to overthrow them when in motion would be sufficient to crush the material out of which the cars are built, and their momentum is such that after the motive power is cut off, as might happen in case of an accident to the machinery, they will continue to revolve for many hours.

The adaptation of this principle to practical railroading is yet to be accomplished. Obviously, if cars are to be run at the speed attained by ordinary trains, and carry the same loads, they would have to be practically the same strength and weight. To concentrate upon one rail the weight now divided upon two necessitates a much stronger rail than is now in use, and a more substantial form of roadbed.

The bearing surface of the rail will doubtless become more circular in sectional outline, to receive the thrust of the cars when rounding curves, and the curves themselves must assume the form of parabolas, that the inward leaning may be acquired gradually, and as gradually released.

If a perfect roadbed can be secured the argument for safety is altogether on the side of the gyroscope car. All accidents due to the spreading of the two rails in the present form of railroad must necessarily be eliminated; the concentration of weight upon the single rail will mean greater tractive power; the construction expense of the road and bridges must be greatly reduced, the upkeep much more so, and a very substantial lowering of the cost of transportation result.