

length than on ordinary railways. Brakes capable of being operated by pneumatic or manual power are provided for all the wheels. The rail, which is of curved top, only requires to be the same weight as one of the rails on an ordinary line in order to carry the same load on the same number of wheels in each case. The ties also only require to give the same area of support to the vehicle.

Flying lines of railway, says Mr. Brennan, can be laid with great rapidity over uneven ground with slight expenditure of labor. Specially designed building vehicles, also designed on the mono-rail principle, equipped with electric gear for handling the rails, are kept at the rail head for the purpose. It is confidently anticipated that working in this manner it will be possible to keep up with an army on the march and supply them with all their requirements.

Bridges are of the simplest possible construction, a single wire hawser stretched across a ravine or river being all that is necessary for temporary work. These hawsers can be built up on the spot from separate wire rope strands, so that the transportation of them becomes an easy matter. Strange to say, the lateral swaying of the hawser does not disturb the balance of the vehicles, and the strongest winds will fail to blow them off. In other cases of bridge building a single row of piles, with a rail on top, suffices, or a single girder carrying the rail may be conveniently used.

The complete success of the invention almost seems to have been taken for granted. Successful experiments, a successful model, and the unanimous approbation and delight of the Royal Society are not necessarily sufficient endorsement of the commercial value of the railroad. It is difficult sometimes to decide whether we ought to trust a man until we prove him the thief, or to treat him as dishonest until we prove him otherwise. Similarly, one hardly knows whether to treat a model with scepticism until the real thing has proved itself a success. That members of the Royal Society think Mr. Brennan's name may be bracketed with those of Newton, Watt, and Stephenson is not extraordinary. Mr. Louis de Rougemont's marvellous natural history stories were accepted by some members of the same body. For some time De Rougemont lived in an atmosphere of scientific notoriety, but when it came to actual and practical demonstration, his discoveries in the natural history world were found to be mythical.

Mr. Brennan has completed his model. It has proved successful, but the far-seeing man will wait until a further and more practical demonstration has been made. It would appear that the law of gravitation is to be defied to some extent. In engineering enterprises it is necessary as far as possible to work with, and not against, nature. When you throw a ball into the air, the force you exert allows the sphere temporarily to defy gravitation. But finally the ball will fall to earth. And so with many inventions which attempt absolutely to defy nature's laws.

An invention considered from a strictly scientific standpoint most frequently assumes a very different aspect when commercial issues are involved. But theories have materialized into models; the models have been decried. Critics have been merciless. Yet in many instances these same inventions have triumphed, scientifically and commercially. It is always dangerous, of course, to prophesy failure, for, in the event of success, your fame as a prophet has passed forever. No one would condemn hastily Mr. Brennan's remarkable invention. But the average man will wait, certainly with interest, for future developments.

Sir Hiram Maxim, who has seen many of his inventions successfully evolve from models, is sceptical of this mono-rail system. He admits that a charming and highly scientific toy has been perfected. As to it being practicable to construct and operate a railroad by

means of it, Sir Hiram is not in agreement. He is an authority on the gyroscope, and Lord Kelvin said recently that Sir Hiram was one of only three men in the world who really understood it.

"Mr. Brennan's proposal to construct a mono-rail system," said Sir Hiram, "differs from other such systems in that the rail is placed below the centre of gravity instead of above it. I think his plan to keep the carriages from tipping by the action of the gyroscope will be beset with a great many difficult problems, so difficult, in fact, as to make the whole scheme absolutely impracticable. It is quite safe to say that if Mr. Brennan's train was running east or west, and there was a strong wind from the north, the wind would exert considerable force on the train in the same direction, and I think under those conditions the plane of the gyroscope would gradually yield, capsizing the train. Perhaps I can best illustrate gyroscopic action by recalling the construction thirty years ago by Sir Henry Bessemer of a ship to take passengers across the British Channel, which he proposed to keep in a horizontal position by the use of large gyroscopes. Sir Henry had thought of the gyroscope the same as other engineers, but there was one engineer and mathematician of that time who really understood the gyroscope. That was Professor MacFarland Grey, who wrote, in the scientific press, that gyroscopes in Sir Henry's ship would not work. He was attacked for this by a large number of engineers. However, when the ship was tried it behaved just as Professor Grey predicted. The gyroscopes had no effect at all in steadying the craft, and, as the gyroscope failed to meet Sir Henry's expectations, so, without doubt, will it fail to meet Mr. Brennan's if he ever undertakes to steady a full-sized car on a mono-rail road."

Some of our readers will remember that in 1904 Otto Schlick invented what he called a gyrostat. A full-sized one was tested on a German torpedo boat on July 17th, 1906, with some moderate success. Last year a description of the gyrostat was published in a German paper. It showed facsimiles of tracings or indicator cards taken in tests at sea, showing how the vessel, rolling heavily—twenty-five degrees—in a cross sea, was steadied by starting the gyrostat until the movement of the vessel was reduced to less than one degree. The Hamburg-American steamship line have fitted one into one of their excursion steamers.

Mr. Brennan has been working on ideas that are not altogether new. Mr. Behr, a German inventor, has been a mono-rail enthusiast for many years. His system is not quite the same as that of the latest inventor. A trial track was laid in the Brussels Exhibition grounds, Belgium, and very satisfactory demonstrations given with a full-sized car, which attained a speed of 120 miles an hour. The Behr mono-rail is laid on a V-shaped trestle, with guide-rails half way down the trestle, which prevent derailment. The motors are carried on either side of the trestle, below the floor of the car. Between Manchester and Liverpool there is, perhaps, the greatest inter-urban business passenger traffic in the world; and Mr. Behr, beginning in 1899, interested business men in a scheme for a road that was to bring those two cities, thirty-two miles apart, within a trifle over fifteen minutes' travel of each other. A syndicate first failed to get the necessary bill through Parliament, and then, having obtained the bill, failed to finance the scheme, which is in abeyance. Since then Mr. Behr has been working for a bill providing for a line from London to Brighton, by which he claims the journey will be reduced from some two hours to thirty minutes. His strongest opposition has been the steam railroad, which already covers the ground. This illustrates that the mono-rail at least is feared as a competitor in transportation circles. But to the outsider it would seem that, were the mono-rail schemes as successful as have been their