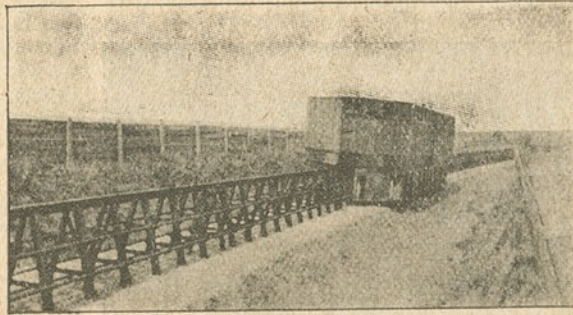


## THE HIGH-SPEED RAILWAY OF THE FUTURE.

### AN INTERESTING ACCOUNT OF THE PIONEER MONO-RAIL SYSTEM.

By H. G. ARCHER.

ON March 1st, 1888, a select company of scientists and local gentry were invited to take part in the opening of an unique railway in a wild and, as it was then, little known part of Ireland. This railway, originally known as the Latigue, after the name of the inventor of the system, connects the important town of Listowel, in the County Kerry, with a delightful seaside resort, named Ballybunnion, picturesquely situated on the beautiful west coast of Ireland. The Latigue railway, now better known as the Behr mono-rail, owing to the refinements which have been effected by Mr. F. B. Behr, the enterprising manager of the Latigue Railway Construction Company, is, as we have said, unique in every respect; and, in fact, without seeing the railway and how the rolling stock runs over it, it is no easy matter to grasp the details of the system. However, the principle of the mono-rail may be briefly explained as follows: The rolling

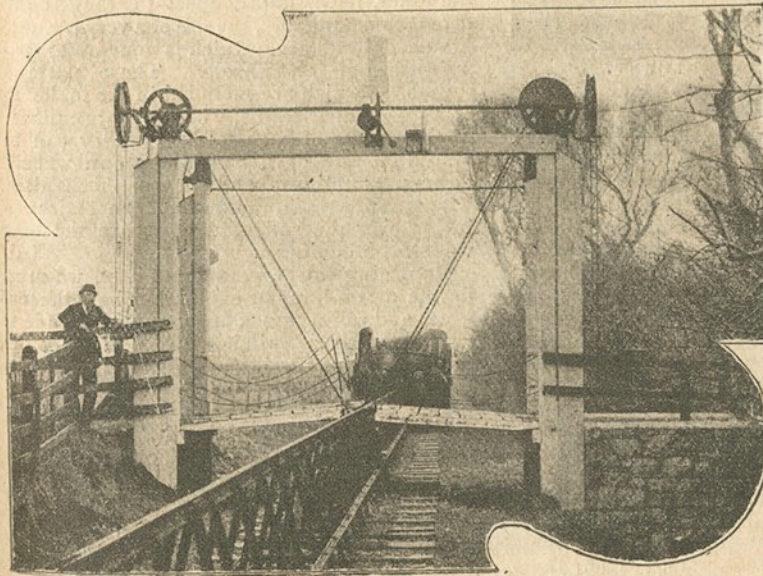


A CAR TRAVELLING AT 90 MILES AN HOUR.  
(Photo supplied by Mr. F. B. Behr.)

stock, instead of resting on a track formed by a pair of rails, is suspended from one, a carrying rail, while it is kept in position by a pair of guide or check rails, which take the lateral pressure and so prevent oscillation. The reader, therefore, will realise at once that the permanent way of a mono-rail railway must be very different from the everyday article, so we

may proceed to explain the system of the former's construction.

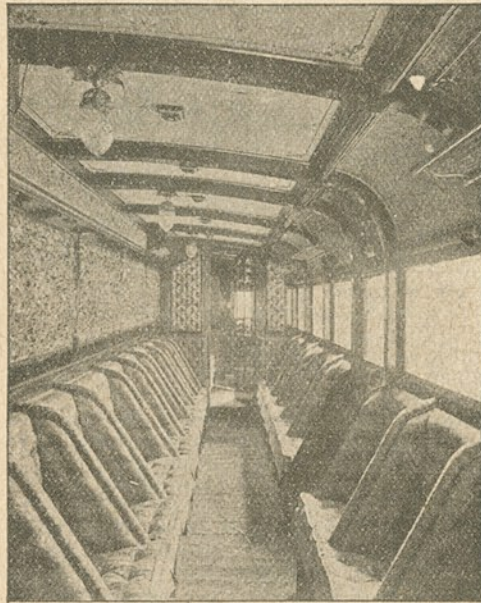
The mono-rail track consists of A-shaped trestles, 3 ft. 3 in. in height, and placed 3 ft. 3 in. apart, supporting a double-headed rail, weighing 27 lb. per yard. The trestles, it should be added, are supported by metal plates, which are secured to transverse wooden sleepers. Light guiding or check rails are fixed on each side of the trestles at a distance of 2 ft. 4 in. below the level of the carrying rail. From the foregoing descrip-



A DRAWBRIDGE ON THE BALLYBUNNION LINE.  
(Photo supplied by Mr. F. B. Behr.)

tion it will be seen that the term mono-rail is rather a misnomer. Strictly speaking, the system is a three-rail line, one rail being carried on each side of an A frame, and one on the top, while the rolling-stock straddles across the A frame on the camel-back principle.

Such is the permanent way of the famous Listowel and Ballybunnion Railway, which is  $9\frac{1}{2}$  miles in length, and was constructed in



A SALOON COMPARTMENT.  
(Photo supplied by Mr. F. B. Behr.)

nine months' time at the remarkably low cost of £3,000 per mile, including the purchase of land, the cost of rolling stock, and all other equipments. Now let us describe the rolling stock which plies on this curious railway. First there are the steam locomotives, which have two boilers, two funnels, two fireboxes, etc., all placed parallel one to the other, the twin boilers being connected with pipes, thereby equalising the water-level and steam-pressure. Each of the "L. and B." locomotives, and the company possess four, is carried on three coupled wheels of 2 ft. diameter (the central wheel being the driving one), which are situated between the boilers; while, lower down, there are four guide wheels, two on each side, of 10 in. diameter. These guide wheels or rollers are arranged on vertical axles with spiral springs, and they engage with the guide rail on either side of the trestle. Their function is merely to guide, for they carry no weight; and have nothing to do with the work

of propulsion; while they cause very little friction. Attached to the locomotive is a double tender, with a capacity for 200 gallons of water and 10 cwt. of coal. The double tender is carried on two wheels of 2 ft. diameter, situated between the twin receptacles, and it also has two guide wheels of 10 in. diameter on each side. In short, every type of vehicle running on this railway has the same number of guide wheels—viz. two on each side, and all guide wheels are of 10 in. diameter.

The remainder of the company's rolling stock, which comprises passenger coaches, guards' vans, covered and open goods waggons, and timber, coal, and sand trucks, is all arranged in two divisions and carried on a single row of wheels. The passenger coaches (first and third class only) are 7 ft. high, 8 ft. 6 in. wide, and 18 ft. long, each coach accommodating twenty-four passengers, who sit back to back, twelve a side; but there is no internal communication between the two halves of the carriage. Each of these coaches is suspended on four wheels of 10 in. diameter, arranged in a pair at each end of the vehicle, so that they act as a pair of bogeys and thus enable the coach to round sharp curves with ease. The guards' vans, goods waggons, and timber and sand trucks are precisely similar as regards divisions, but the first named have internal communication from one side to the other for obvious reasons. It should be explained that the elevated mono-rail system is a bar to getting from one side of a train to the other, necessitating special arrangements to overcome, notably, the use of a very peculiar kind of rolling stock, which is none other than a foot-bridge on wheels. These portable staircases, which are included in the make up of all passenger trains, where they are placed in the centre of each, although they can be placed in any part, have their own wheels, buffers, couplings, and brake mechanism. The guards' vans, however, have staircases inside over the rail, and these are the only vehicles so equipped.

Returning to the permanent way, we must devote a few lines to explaining how the engines and rolling stock are shunted or made to change tracks. Switches are manifestly out of the question, and the problem is solved by having movable sections of rail of 20 ft. diameter. The latter are really turn-tables, and all are slightly curved in the shape of the letter S, for if the movable section were straight only one through road could be obtained, whereas with this refinement as many as four distinct branches or changes of track can be made at any one point. These movable sections of the rail are fastened to the line at each end by interlocking apparatus, which forbids any contradictory movement, while they are

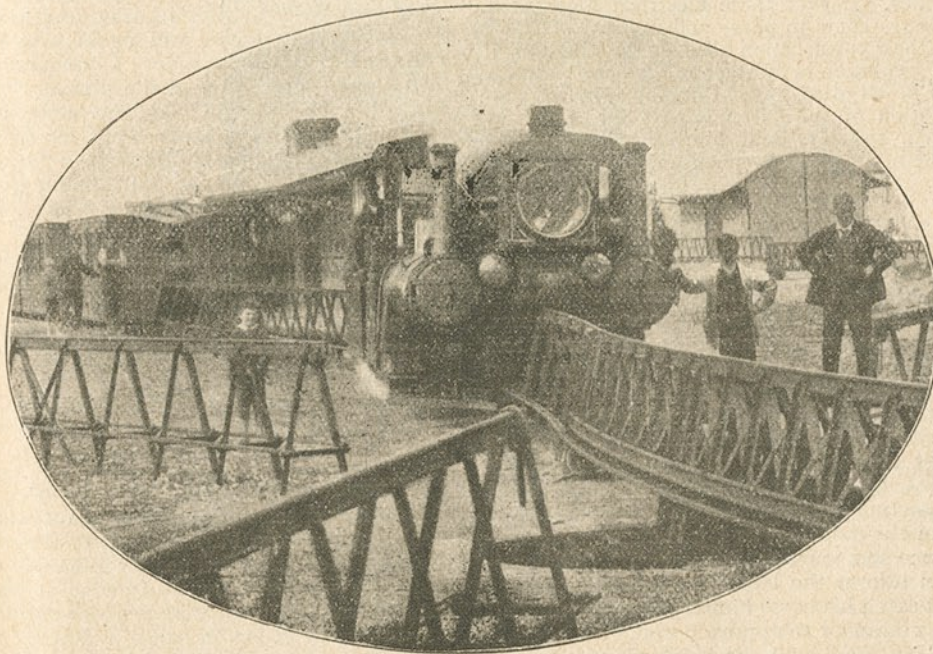
also interlocked with the signals. Another track curiosity is furnished by the fly- or draw-bridges, which exist for facilitating the crossing of the line at occupation crossings.

These drawbridges are so simple that they can be raised or lowered by a child, but to lower them one requires a key, and only the farmers who live nearest the crossing are provided with keys. Having utilised the crossing, the individual is bound, under penalty of legal proceedings, to see that all is right before leaving, and when the traffic is passed over the bridge the latter is raised by pulling a chain, which is securely fastened by a patent process. The working of the machinery of a drawbridge regulates a signal placed above, by which the driver of a train is able to see from some distance away whether or not the track is clear. It should be added that the public roads are carried over the track by means of ordinary fixed bridges. The speed of the trains on the Listowel and Ballybunnion Railway is only humdrum. The locomotives can attain a rate of speed of thirty miles per hour, but the average working speed is not above eighteen. It is impossible for the rolling stock to be derailed, even in a collision. But if the locomotives cannot be termed fast, they are very powerful machines. On the level they are capable of hauling a load of 240 tons, while up an incline of 1 in 50—and the latter is the

severest gradient on this quaint Irish railway—they can manage a load of 40 tons, which in the case of an ordinary light railway would have to be reduced by one-half.

It is no exaggeration to state that this, the pioneer of mono-railways, has proved of inestimable service to the locality which it serves, and converted Ballybunnion from a desolate seaside hamlet into the popular pleasure resort which its natural advantages, in the way of excellent bathing and magnificent cliff and rock scenery, qualified it to be. The traffic, in fact, is mainly derived from excursionists to this lovely bay during the summer months, although there is also the transport of thousands of tons of sea-sand annually from that place, the article being largely used by the farmers of Kerry for top-dressing and manuring their land. The sand trucks are small iron vehicles, and are the only ones that have but two wheels, one at each end.

But Mr. Behr has vastly improved on the Ballybunnion Railway where speed is concerned, his ambitious intention being to revolutionise travel by running single carriages electrically on the mono-rail system at the rate of speed of from 110 to 130 miles per hour. At the Brussels International Exhibition of 1897 he installed a mono-rail track three miles in length, and over this high-speed railway an electrically driven, steel-framed car, 59 ft.



A SECTION OF THE BALLYBUNNION LINE.

(Photo supplied by Mr. F. B. Behr.)

long, 11 ft. wide, and 70 tons in weight, and with seating accommodation for 100 passengers, attained a rate of speed of nearly 90 miles per hour. The running was quite satisfactory, both from the constructor's and passengers' point of view, for the special shape of each seat in the car, which was of prow-shaped design in front and behind, in order to minimise air resistance and air suction respectively, obviated the unpleasant results of centrifugal force in passing round curves.

Since the Brussels experiments, Mr. Behr has arranged for the construction of an electrical high-speed mono-rail line between Manchester and Liverpool. The first scheme was rejected in Parliament, but another bill was brought in for the session of 1901 on the following basis: Length of line, 34 miles 3 furlongs, a service of 204 one-carriage trains per day, running at about 110 miles per hour, and thus completing the journey in twenty minutes. The Lords Committee passed the bill with the proviso that the centre of gravity should be at least 12 in. below the carrying rail, and the Commons Committee also sanctioned it. With a railway of this description the carrying rail would have to be far stronger and heavier than is the case with the Ballybunnion line, and the curves of far larger radius than is permissible on existing railways, while there will probably be two guide rails, instead of one, on each side of the A-shaped trestles. If ever these electrical high-speed railways come to pass—and we hear of plans for their construction all over the kingdom—the revolution in our means of communication will be as great as that produced by the substitution of the "iron horse" for the mail coach, and Mr. Behr himself will attain the fame of a second Stephenson.



#### He Kept Cool.

ONE of the pluckiest things I have ever witnessed (says a traveller) happened when I was staying for the night at a country inn. I was on a cycling tour at the time, and I had just put up my machine when a man on horseback galloped up to the inn door. The horse was a splendid animal, young and spirited, but its rider managed it with the most perfect ease. On dismounting, he asked that his steed might be turned out to pasture—a request which was granted.

In the morning, as I was about to recommence my journey, I overheard the horseman inform the landlord that he would go and catch his horse himself, as it was difficult for a stranger to approach him.

"No, no," said the landlord, pointing to the meadow. "D'ye see that bull?"

We both turned and saw a red-eyed, savage-looking bull regarding us from over the hedge. Not far away from him, the horse was placidly feeding.

"He looks nasty," said the stranger. "Nevertheless, I'm going to fetch my horse. I should also advise your bull to keep his distance."

We both looked at him. There was something in his cool assurance that was very taking.

"A pair of spurs," said the stranger calmly. "The larger the better."

The perplexed landlord passively obeyed the order. Having fastened on the spurs, the man pushed open the gate leading to the pasture, and advanced with long strides to his horse. When the bull caught sight of him, it commenced to paw at the ground, and bellowed with fury.

"Look out!" we both cried simultaneously.

The enraged bull had lowered its head and charged at the daring stranger with the force of a battering-ram.

The man coolly awaited the onset, and at the moment when I had given him up for lost he jumped aside, and with a movement so adroit that I know not how to describe it wheeled round and sprang right on to the back of the bull.

He gripped the latter's horns, and drove the great spurs again and again into the maddened creature's side. I understood then the true meaning of the phrase, "the roar of a stricken bull." The noise was appalling. How the fellow kept his seat I cannot imagine, but he refused to be dislodged, and at length the bull became quite quiet and still, conquered by sheer pain and terror.

When it was all over, the rider dismounted, patted the animal's side, saying in a soothing voice:

"Good fellow! Good fellow! That was something like a ride!"

"You see," he observed to us, as he prepared to ride away, "five years of cowboy life teach one a thing or two—eh?"



#### Insects that Steal India-rubber.

THERE is a species of large black ant which steals rubber from Para trees after they are tapped. Bees also find use for india-rubber, and some species in South America actually cut the bark of trees that produce resinous substances in order to cause a flow of the sap. The gum is employed by the bees as a ready-made wax for their nests.