



## ISAMBARD KINGDOM AND THE ATMOSPHERIC RAILWAY

Those of you who are GWR fans and devotees of I.K. Brunel may wish to contemplate another of Brunel's enterprises - a financial disaster where, once more, the principle was right, but the project foundered on the details.

The South Devon Railway was to run from Exeter to Plymouth and it would clearly need either steep gradients or very expensive earthworks in cuttings and tunnels. At its first meeting, following Royal Assent on 4 July 1844 to the Act approving construction of the railway, the South Devon Railway Company issued the following report.

“Since the passing of the Act, a proposal has been received by your Directors from Messrs Samuda Brothers, the patentees of the Atmospheric Railway, to apply their system of traction to the South Devon Line. After much deliberation the Board were induced to refer the question to the Engineer, Mr Brunel, for his opinion thereon as well, in reference to the application of the principle as to the economy stated to be the consequence of its adoption. It was likewise deemed desirable that a Deputation of the Directors should visit the Atmospheric Railway now in operation from Kingstown to Dalkey, with a view to informing themselves and their colleagues of its peculiar mode of working and of the actual expenses attendant thereupon.

“From the careful consideration given to the subject by Mr Brunel, as well as from the deliberate and very decided opinion in favour of the system which he has expressed to the Board, added to the favourable report of the Deputation, and also keeping in view the fact that at many points of the line both gradients and curves will render the application of this principle particularly

advantageous, your Directors, in the belief that it will be greatly to the interest of the Company, have resolved that the Atmospheric System, including the construction of an Electric Telegraph, should be adopted upon the whole Line of the South Devon Railway

The main idea was to obtain better traction than could be had from iron wheels on iron rails. But there was also merit in removing the power source from the train by having fixed power stations along the track at intervals. The principle had already been used extensively for drawing trains up steep inclines by rope haulage, Now it was proposed that a chain of pumping stations be used to provide the motive power by the pressure of the atmosphere. A 15-inch diameter pipe laid between the rails was evacuated by the pumping stations and a close fitting piston in the pipe was attached to the train through a continuous slot in the top of the pipe. The slot was made airtight by a leather flap reinforced with iron which was opened automatically by the passage of the train and immediately re-sealed.

Jacob and Joseph Samuda had already constructed a test track for such a system and had built the system into a small length of working line on the Dublin and Kingstown Railway. As a means of transmitting power, the system was undoubtedly effective and the efficiency may have been higher than that of any other traction method then available.

Most readers will have heard of the atmospheric railway and perhaps even swallowed the story that its demise was caused by rats which ate the tallow-covered leather seals. Well, the things that you're liable to read ... aint necessarily so.

However, there were troubles. Pannell tells us,<sup>1</sup> “From the first, the atmospheric pipe was liable to accumulate a large amount of water, but the first winter of use brought great difficulty with deterioration of the leather flap from various causes. Frost stiffened the leather which then cracked, the vacuum of the pipe drew out the natural oils in the leather, corrosion and chemical effects due to the interaction of the iron reinforcing plate with the leather all caused so much damage and cost so much in repair that by June 1848, Brunel reported

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<sup>1</sup> Pannell J.P.M., An Illustrated History of Civil Engineering, Thames and Hudson London 1964

to the directors that a complete renewal of the seal/valve would be necessary at a cost of over £25,000. The directors then resolved to cut their losses and to run the line with locomotive power only, a loss of about £375,000. In principle, Brunel was right in his choice of separate power stations; the problem has now been solved by electrification, by far the best means of propulsion under the conditions of the South Devon Line.”

Brunel failed to foresee the mechanical shortcomings of the system As we say today - the technological risk for the long term had not been properly assessed.

Pilot projects are rarely satisfactory for this purpose. They do not reveal reliability and durability problems. Instead, engineers of clear vision are needed. Engineers who can extrapolate the experience of the past. We might very well wonder what Daniel Gooch would have said about the atmospheric railway.