

**A TREATISE ON THE  
ADAPTATION OF ATMOSPHERIC  
PRESSURE TO THE PURPOSES OF  
LOCOMOTION ON RAILWAYS**

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A treatise on the adaptation of atmospheric pressure to the purposes of locomotion on railways  
by Joseph d'A. Samuda

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**JOSEPH D'A. SAMUDA**

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## CONTENTS.

	PAGE
Introduction . . . . .	1
Description of Clegg and Samuda's Atmospheric Railway . . . . .	2
Workings of Atmospheric Railway on the Birmingham, Bristol, and Thames Junction Railway . . . . .	8
Objections answered . . . . .	12
Reduction in cost of Railways . . . . .	20
Defects of Locomotive system . . . . .	21
New system free from these defects . . . . .	25
Safety of new system . . . . .	26
Comparative cost of new and old systems . . . . .	28
Railway accidents attributable to faulty system . . . . .	30
Railway accidents, &c. . . . .	32
Safety of new system . . . . .	38
Economy of system . . . . .	40
System applied to Turnpike Roads . . . . .	48
Power of Locomotive Engines . . . . .	50

## A TREATISE

ON THE

### ADAPTATION OF ATMOSPHERIC PRESSURE TO THE PURPOSES OF LOCOMOTION,

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We last year published a pamphlet containing some remarks and calculations on the Atmospheric Railway; on the comparative expense of employing this system and locomotive power, and the general results to be anticipated from its introduction.

That work was published a few weeks after we had commenced working by atmospheric traction on a portion of the Birmingham, Bristol, and Thames Junction Railway; and the principal object sought was to give publicity to the results of these experiments.

From the 11th June, 1840, when we first called public attention to this system, we have regularly continued working it, never less than two days every week, up to the present time; and the experience obtained by actual workings during several months has established the solidity of the system. As a

## 2 DESCRIPTION OF ATMOSPHERIC RAILWAY.

detail of these results cannot fail to be interesting to the public, we have been induced to publish this edition, for the purpose of giving an account of our operations, which will show the steady and gradual improvements which have been developed ; we shall also review such parts of the railway system as are affected by the now established principle of atmospheric traction.

In order to render this pamphlet complete in itself, without reference to the previous edition, and for the information of those who have not seen the system in operation, we have thought it necessary to annex a full description of the nature and action of the invention.

### *Description of Clegg and Samuda's Atmospheric Railway.*

On this system of working railways the moving power is communicated to the train by means of a continuous pipe or main A, laid between the rails, and divided by separating valves into suitable and convenient lengths for exhaustion ; a partial vacuum is formed in this pipe either by steam engines and air-pumps fixed at intervals along the road, or by water power, if the nature of the country be such as to afford it. These valves are opened by the train as it advances, without stoppage or reduction of speed. A piston B, which is made to fit air-tight



by means of a leather packing, is introduced into the main pipe\* and connected to the leading carriage of each train by an iron plate C, which travels through a lateral opening the whole length of the pipe. This lateral opening is covered by a valve G, extending the whole length, formed of a strip of leather riveted between iron plates; the top plates are wider than the groove, and serve to prevent the external air forcing the leather into the pipe when the vacuum is formed; the lower plates fit the groove when the valve is shut, and making up the circle of the pipe, prevent the air passing the piston; as shown in Plate I. figs. 2, 3, and 4. One edge of this valve is securely held down by iron bars *a a*, fastened by screw bolts *b b* to a longitudinal rib *c*, cast on the pipe on one side of the lateral opening, and the leather between the plates and the bar being flexible, forms a hinge as in a common pump valve; the other edge of the valve falls on the surface of the pipe on the opposite side of the opening, thus forming one side of a trough F, as shown in Plate, figs. 2, 3, 4. This trough is filled with a composition of bees'-wax and tallow, which substance is solid at the temperature of the atmosphere, and becomes

\* When the first division or section is exhausted, the separating valve is opened, and the front of the piston being thus exposed to the exhausted portion of the pipe, the atmospheric air pressing on the back of it propels it forward in the pipe, and with it the train to which it is attached.

#### 4 DESCRIPTION OF ATMOSPHERIC RAILWAY.

fluid when heated a few degrees above it. This composition adheres to the edge of the valve, which forms one side of the trough, and to that part of the pipe which forms the other, and produces perfect contact between them; but as the piston advances, the valve G must be raised to allow the connecting plate C to pass, and this is effected by four wheels H H H H fixed to the piston-rod behind the piston, and the aperture thus formed serves also for the free admission of air to press on the back of the piston: by this operation of raising the valve out of the trough, the composition between it and the pipe is broken, and the air-tight contact must be reproduced. To effect this, another steel wheel R is attached to the carriage, regulated by a spring which serves to insure the perfect closing of the valve by running over the top plates immediately after the arm has passed, and a copper tube or heater N, about 5 feet long, filled with burning charcoal, is also fixed to the under side of the carriage, and passes over and re-melts the surface of the composition which has been broken by lifting the valve, and which upon cooling becomes solid, hermetically sealing the valve as before. Thus each train in passing leaves the pipe in a fit state to receive the next train. A protecting cover, I, formed of thin plates of iron about 5 feet long, hinged with leather, is placed over the valve, and serves to preserve it from snow or rain; the end of each plate underlaps

the next in the direction of the piston's motion, thus insuring the lifting of each in succession, which is effected by the wheels D fixed under the carriage.

The separating valves are shown in the annexed diagram.

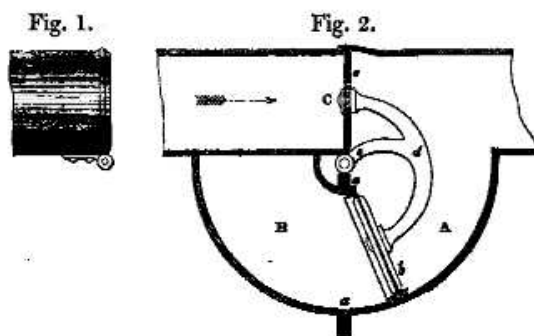


Fig. 1 is the *exit* separating valve, or that, at the end of the section nearest to its steam engine; this valve is opened by the compression of air caused by the piston after it has passed the branch which communicates with the air-pump.

Fig. 2 is the equilibrium or *entrance* separating valve. The arrow denotes the direction in which the trains advance. The pipe is exhausted on the side of the valve lettered C, and is only prolonged on the other side to allow the piston to enter the pipe before the valve is opened. Attached to one side of the main is a semicircular box B A, divided into two compartments by a partition, of which