(No Model.) 2 Sheets—Sheet 1.

C. BARDWELL & P. W. NOLAN.

PNEUMATIC RAILROAD.

No. 244,524. Patented July 19, 1881.

Fig. 1

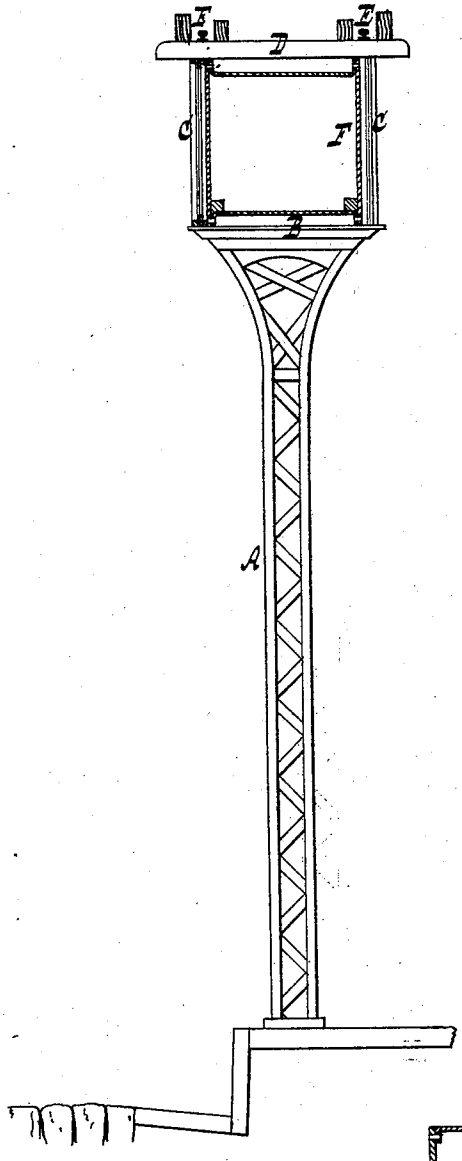


Fig. 2.

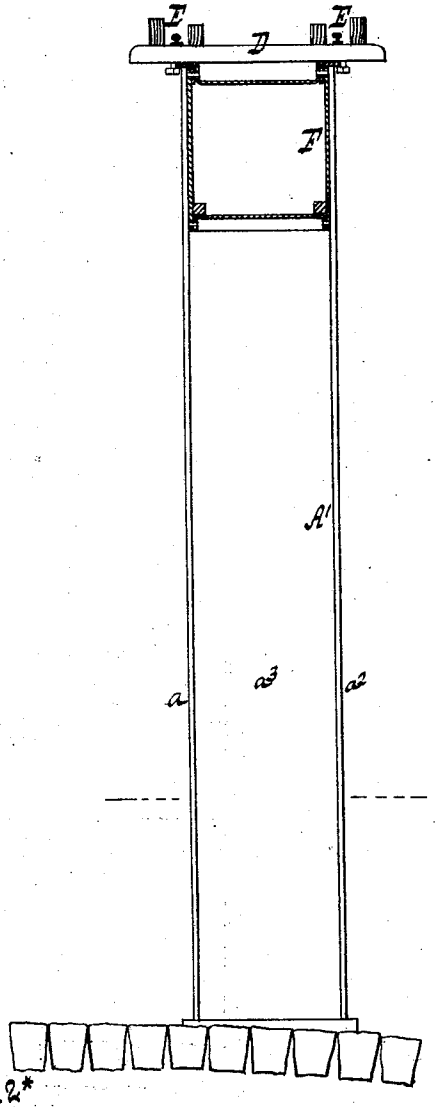
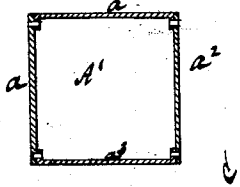


Fig. 2*



Witnesses
~~Otto Schupland~~
William Miller.

Inventors
Carlos Bardwell
Patrick W. Nolan.
by
Van Santwood & Hauff
their attorneys

N. PETERS. Photo-Lithographer, Washington, D. C.

(No Model.) 2 Sheets—Sheet 2

C. BARDWELL & P. W. NOLAN.

PNEUMATIC RAILROAD.

No. 244,524. Patented July 19, 1881.

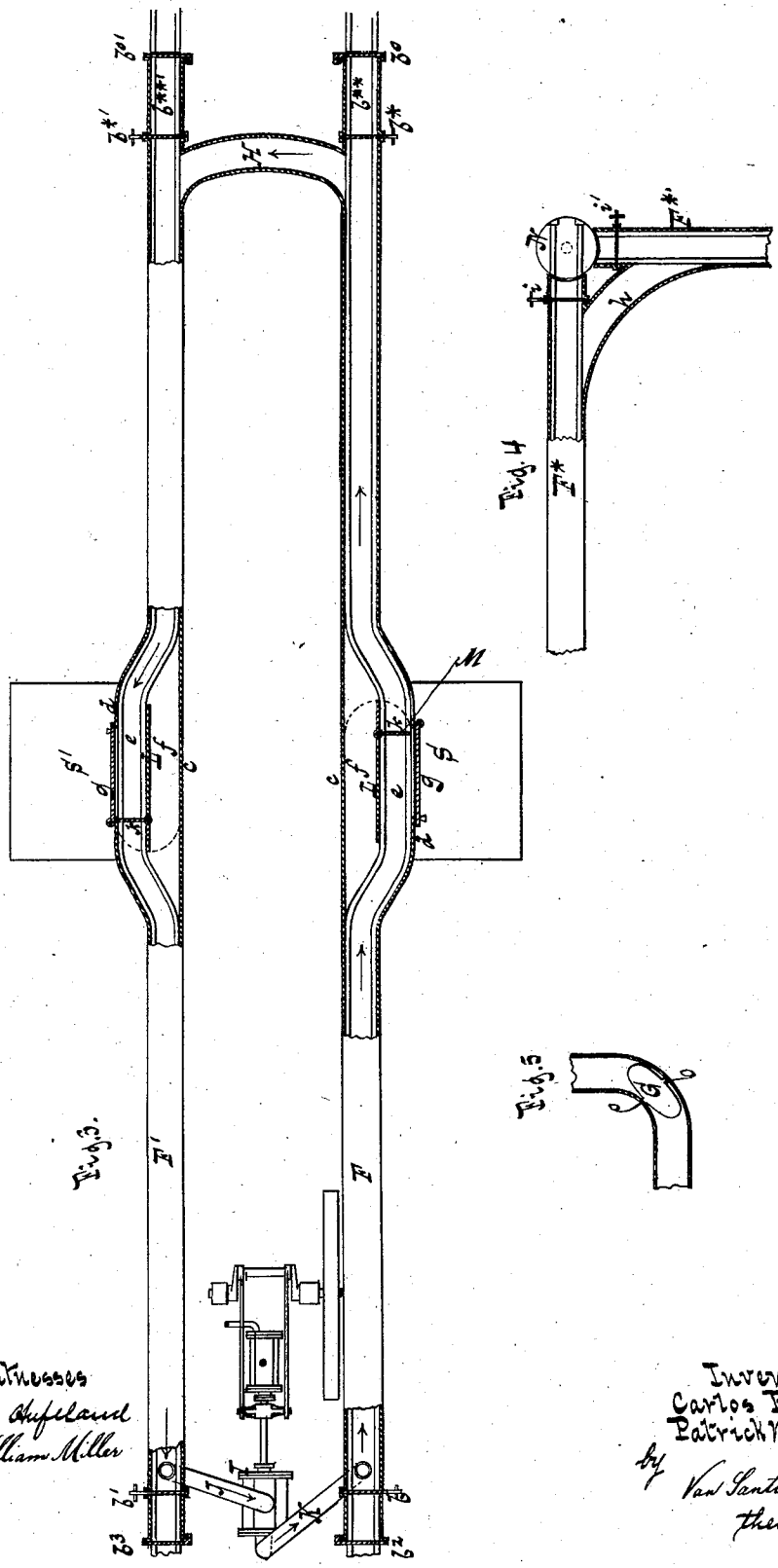


Fig. 3.

Fig. 4

Fig. 5

Witnesses
Otto Hufeland
William Miller

Inventors.
Carlos Bardwell.
Patrick W. Nolan.
by Van Santvoord & Hauff
their attys.

N. PETERS, Photo-Lithographer, Washington, D. C.

UNITED STATES PATENT OFFICE.

CARLOS BARDWELL, OF SUMMIT, NEW JERSEY, AND PATRICK W. NOLAN, OF NEW YORK, N. Y.

PNEUMATIC RAILROAD.

SPECIFICATION forming part of Letters Patent No. 244,524, dated July 19, 1881.

Application filed March 24, 1881. (No model.)

To all whom it may concern:

Be it known that we, CARLOS BARDWELL, a citizen of the United States, residing at Summit, in the county of Union and State of New Jersey, and PATRICK W. NOLAN, a citizen of the United States, residing at New York, in the county and State of New York, have invented new and useful Improvements in Pneumatic Railroads, of which the following is a specification.

This invention relates to that class of elevated railways in which a pneumatic tube forms a portion of the structure thereof, and the main object of our invention is to so construct and arrange the pneumatic tube that it serves to support the exterior railway-track between the upright columns.

Our invention is illustrated in the accompanying drawings, in which Figure 1 represents a transverse section of our pneumatic road as combined with the structure of an elevated railroad. Fig. 2 is a similar section of a modification thereof. Fig. 2* is a horizontal section thereof. Fig. 3 is a plan or top view of our pneumatic railroad, partly in section. Fig. 4 is a sectional plan of our pneumatic railroad, showing the arrangement for turning sharp corners. Fig. 5 is a plan or top view of one of our cars, showing it in position to turn a curve.

Similar letters indicate corresponding parts.

In Fig. 1 of the drawings the letter A designates a column of that construction which is generally used for elevated railroads. On the top of this column rests a cross-bar or platform, B, that forms the support for the metallic frames or beams C, on which rest the sleepers D, which support the rails E E. In structures of this class we place our pneumatic tube F between the frames or beams C, but if we construct the elevated railroad expressly for our purpose we prefer to use columns A′, such as shown in Fig. 2, and constructed of four metal plates, a a' a^2 a^3, which are connected as shown in Fig. 2*. In this case the metal plates a a^2 are made to extend beyond the plates a' a^3, and the top edges of these last-named plates form the supports for the pneumatic tube F, which fits between the upper ends of the plates a a', and on which rest the sleepers D.

The pneumatic tubes F are provided with rails b b, and they are made sufficiently large for the passage of the cars G, which may be used for transporting passengers or freight, or both, and which can be made of any convenient size for the purpose for which they are to be used. The pneumatic tube F, Fig. 3, which forms, say, the up track, connects near the terminus of the road with the pneumatic tube F′, which forms the down track, by a tube, H, of any convenient size, and at the opposite terminus of the road is situated an air-suction and forcing apparatus, I, the suction-pipe J of which connects with the pneumatic tube F′, while its discharge-pipe K connects with the pneumatic tube F.

Any suitable air-suction and forcing apparatus may be employed, such as a pump or a fan-blower, and we prefer to locate this apparatus, together with the engine or other motor for driving the same, beneath the surface of the ground, and to make the connection with the pneumatic tubes through the columns A A′.

The ends of the pneumatic tubes F F′ are closed by gates b b^0 b' $b^{0\prime}$, which are raised for the introduction or removal of the cars, but which must be closed when motion is to be imparted to the cars.

S S′ represent two stations. At each of these stations the inner wall, c, of the pneumatic tube F or F′ remains unchanged, but the outer wall, d, of said tube is curved outward, and a partition, L, is inserted between the inner wall, c, and the outer wall, d, of the pneumatic tube. To one end of this partition is hinged an L-shaped gate, M, which can be turned so as to close the space e between the partition L and wall d, or so as to close the space f between the walls L and c. In the wall d is a door, g, to give access to or egress from the space e. The rails are curved to correspond to the outer wall, d, and extend through the space e. When a car is driven forward by the air through the tube F and begins to enter the space e the current of air moving in said tube passes straight forward and ceases to act on the car, and the air between the front end of the car and gate M is gradually compressed, so as to form an air-cushion and to stop the forward motion of the car opposite to the door

g. When the gate M is swung around so as to close the space *f* the air acts on the car in the space *e* and propels the same as before. When a car has been stopped in the space *e* the door *g* is opened, and the persons desiring to leave the car can step out, and those desiring to enter can do so without the least inconvenience. When a car has reached the terminus at one end the gate *b* or *b'* is opened and the car is moved out of the tube F or F'. At the opposite terminus additional gates *b** *b*'* are provided, which are opened first, so as to allow the cars to move or to be moved into the spaces *b*** *b**'* respectively, and then said additional gates are closed before the gates *b*⁰ *b*⁰' are opened, so that the force of the air in the tubes F F' and the motion of the cars therein is not disturbed. Similar gates *b*² *b*³ must be combined with the gates *b b'*, so that the cars can be removed from the pneumatic tubes without allowing access of the external air to them.

The bottom parts of the L-shaped gates M are, by preference, constructed of india-rubber or other flexible and elastic material, so that they can freely swing over the rails.

Whenever it becomes necessary to turn a sharp corner, as shown in Fig. 4, the pneumatic tubes F* F*' are connected by a branch tube, *h*, and beyond this branch tube are situated gates *i i'*, one in each of the tubes F* F*'. The corner itself is occupied by a turn-table, N.

When the gate *i* is opened a car which has been moving in the tube F* will be forced out upon the turn-table, and by turning this table the car can readily be brought in the required position to enter the tube F*'. The gate *i* is then closed, the gate *i'* is opened, and after the car has been pushed into the tube F*' and the gate *i'* has been closed again the current of air propels the car through the tube F*'.

We have constructed our cars G in the manner shown in Fig. 5, so that they can run round curves without becoming jammed in the pneumatic tubes. For this purpose their ends are rounded and their sides are provided with projections *o o*, which bear closely against the sides of the pneumatic tube and form, so to speak, packings to prevent the free escape of the air.

From this description it will be readily understood that by our invention the structure of an elevated railroad can be utilized for the support of pneumatic tubes, or the pneumatic tubes can be so arranged that they form the principal parts of the structure of an elevated railroad. Furthermore, by connecting the pneumatic tubes F F' at one terminus by a pipe, H, and at the other terminus to an air-suction and forcing apparatus, the cars placed into said tubes are exposed to the pressure of the air from behind and to the suction in front, and a very small pressure of air is sufficient to propel the cars with the desired velocity.

For long lines, where more air-pressure is needed, additional air-suction and forcing apparatuses may be applied at one or more intermediate stations.

What we claim as new, and desire to secure by Letters Patent, is—

1. An elevated railway combining in its structure a pneumatic tube provided with an interior railway-track, *b b*, and an exterior railway-track, E, arranged above the pneumatic tube, substantially as shown and described.

2. The combination, substantially as described, of a pneumatic tube supported by a series of columns, a railway-track formed in the interior of the said tube, and an exterior railroad-track arranged above and sustained solely by the pneumatic tube, as herein set forth.

3. The combination, substantially as hereinbefore described, of the partition L, the hinged L-shaped gate M, the spaces *e f*, formed between the walls of a pneumatic tube and the partition L, and the door *g*.

4. The combination, substantially as hereinbefore described, of two pneumatic tubes, F* F*', meeting at right angles, a pipe, *h*, connecting these tubes, gates *i i'*, and a turn-table, N.

5. A car, G, for a pneumatic railroad, constructed with rounded ends and with projections *o o* from its sides, substantially as shown and described.

In testimony whereof we have hereunto set our hands and seals in the presence of two subscribing witnesses.

CARLOS BARDWELL. [L. S.]
PATRICK W. NOLAN. [L. S.]

Witnesses:
W. HAUFF,
WILLIAM MILLER.