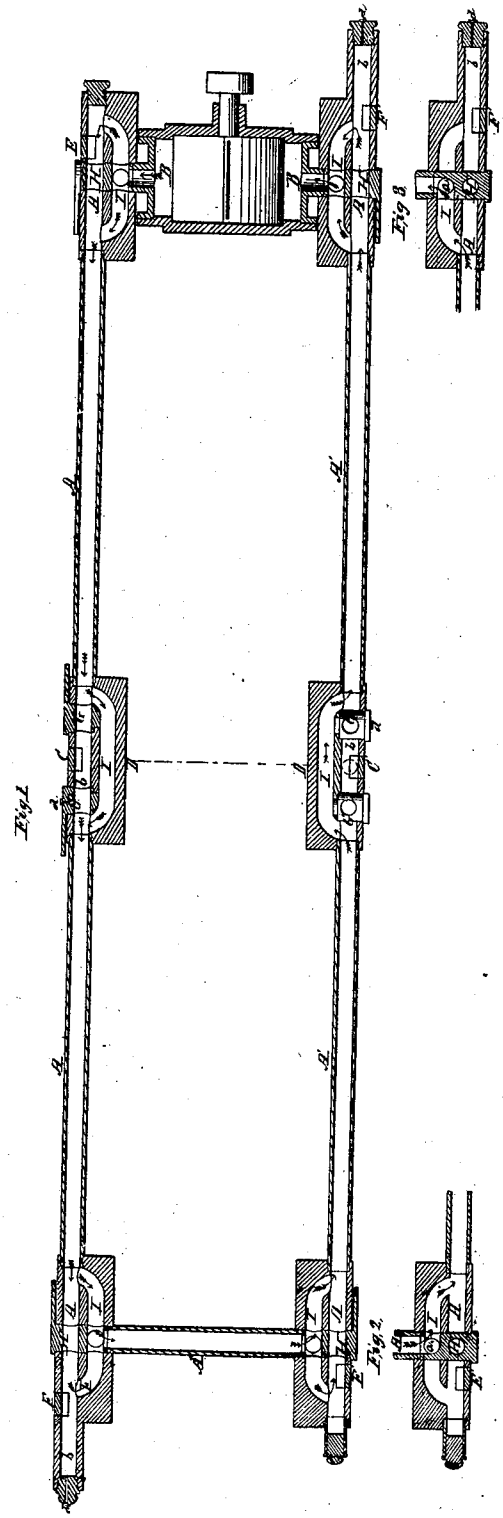
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PNEUMATIC WAYS FOR TRANSMISSION OF PARCELS, &c.

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IMPROVEMENT IN PNEUMATIC WAYS FOR TRANSMISSION OF PARCELS, &c.

Specification forming part of Letters Patent No. **44,107**, dated September 6, 1864.

To all whom it may concern:

Be it known that I, E. P. NEEDHAM, of the city, county, and State of New York, have invented certain new and useful Improvements in Pneumatic Ways for the Transmission of Letters, Merchandise, and Passengers; and I do hereby declare that the following is a full, clear, and exact description of the same, reference being had to the accompanying drawings, forming part of this specification, in which—

Figure 1 is a horizontal section of a pneumatic way constructed and worked according to my invention. Figs. 2 and 3 are similar sections of portions of the termini, showing the gates in different positions from those represented in Fig. 1.

Similar letters of reference indicate corresponding parts in the several figures.

In the pneumatic ways heretofore constructed for the transmission of letters, merchandise, &c., it has been most common to exhaust the tube in front of the carriage or of the piston attached thereto, and allow the carriage to be driven through it by the pressure of the atmosphere. It has also been proposed to drive the carriage by admitting compressed air into the tube behind it, the portion of the tube in front being open to the atmosphere.

The object of this invention is to obviate some objections to which both of these plans are liable, to bring the whole system under more perfect control, and to economize power; and to these ends it consists in the employment of a continuous viaduct or system of tubing, forming a complete circuit, arranged to form two lines between the termini of the way, and an air-pump so arranged in the said circuit and so operated by power suitably applied that the whole volume or body of air separated within said viaduct or tubes from the external atmosphere and free from its influence may be made to revolve like an endless belt throughout the entire circuit of the tubes, passing and repassing continually through the pump, and returning to the exhausting side thereof with the same velocity that it is delivered from the opposite side, without any tendency to a vacuum, and being constantly direct-acting and retroactive to an equal extent, so that it operates with equal force in the two lines of tubing, and enables one to be used for carriages to run in one direction and the other for carriages to run in the other direction between the termini of the way.

The invention also consists in the employment, in combination with a pneumatic way, of branch tubes connecting with the main tube on opposite sides of a station or point where it is desired to stop the carriages for the purpose of conducting the current around such station or point without interfering with its continuity, and thereby rendering the operation continuous.

It also consists in the employment, in combination with the viaduct or system of tubing, of a system of receiving and delivery gates and stop-gates, so arranged that the stop-gates may shut the receiving and delivery gates out of the circuit and permit them to be opened for reception and delivery without interrupting the circuit.

It also consists in providing in the tubes at the stations and termini of the way chambers in which air is compressed by the carriage or its piston running into them, for the purpose of overcoming the momentum of the carriage and stopping it.

It further consists in so providing vents to the above-mentioned air-chambers as to regulate the compression of the air therein, and so control the stoppage of the carriage that it may take place at the desired point.

To enable others skilled in the art to make and use my invention, I will proceed to describe its construction and operation.

A A′ are two tubes or lines of tubing of any length, arranged near together or at any distance apart, and connected at their termini to make a continuous circuit, the connection of the left-hand terminus being made by a transverse tube, A^2, and that at the right-hand terminus by or through a rotary or other continuously-operating air-pump or blower, B, by which air is made to circulate continuously through the whole system of tubes in an unbroken current, as indicated by arrows in Fig. 1, the current being in opposite directions in the two tubes, as may be seen by referring to the arrows above mentioned, and hence one tube or line serves for all the traffic in one direction and the other for all the traffic in the other direction. At each terminus there is a receiving-gate in one line of tubing and a delivery-gate in the other line. E, Fig. 1, is the

receiving-gate of the right-hand terminus in the line A, and F′ the delivery-gate of the same terminus in the line A′.

E′ is the receiving-gate of the left-hand terminus in the line A′, and F the delivery-gate of the same terminus in the line A. These gates are beyond or nearer the ends of the tubes than the connections with the air-pump and with the transverse tube A^2, as shown in Fig. 1. There may be as many stations as desired between the termini, and generally both lines of tubing will pass through each station, so that each station may be both a delivery and receiving station for traffic in either direction. D D represent a station at which there are provided a gate, C, in the line A, and a gate, C′, in the line A′. These gates both serve for reception and delivery. The several gates at the termini and stations may be of any suitable construction that will provide for entrance into and exit from the tube, and that will not in any way obstruct the passage of the tube. The tubes may be furnished with rail tracks for cars or carriages containing the letters, goods, or passengers.

On one side of each reception and delivery gate C C′ there is in its respective line or tubing what may be termed a "stop-gate," G, and on the other side a similar gate, G*. These gates are represented in the drawings as common stop-cocks; but they may be of any suitable construction that will, when they are open, leave an unobstructed passage through the line of tubing, as shown in the line A, and that will enable them to close the passage entirely, as shown in the line A′. At each terminus there is in each line of tubing a stop-gate, H, of similar character, to close the passage of the tubing close to the receiving and delivery gate and on that side of the said gate which is farthest from the ends of the line.

I I are branch tubes provided in each tube or line of tubing at each station and terminus to form a continuous communication through the tube at either terminus or station when its stop-gates are closed, for entrance to or exit from the tube. These branch pipes pass around the reception and delivery gates and stop-gates, as shown in Fig. 1. Those at the station D are always open, but those at the termini are closed, as shown at *a* in Figs. 2 and 3, at the same time that their respective stop-gates H H close the main tube. The gates which thus close the branch tubes only close them beyond the transverse tube A^2 and air-pump connections, but leave open portions of the said branch tubes, which form the communications between the main tubes and the said transverse tubes and air-pump, as will be seen in Figs. 2 and 3, where the passage of the air is indicated by arrows. The gates *a*, which close the branch tubes at the termini, may be separate from the gates H H; but they are represented as being connected therewith, or, more strictly speaking, as forming parts of the same five-way cocks.

By the system of gates hereinabove specified, or any other system operating in the same manner, the necessity for the stoppage of the operation of the pneumatic way, except for repairs, is entirely obviated, and the way may be opened at either terminus or any station for entrance or exit without interfering with the continuity of the current. I will now suppose, for example, that a carriage is to be introduced or loaded at the receiving-gate E′ of the left-hand terminus. The stop-gates H *a* are first closed, as shown in Fig. 2, and then the gate E′ is opened, and as the portion of the tube in which E′ is situated is shut out of the circuit the current is not interfered with. When the carriage has been introduced or loaded, the gate E′ is closed and the gates H *a* opened, and the air then circulating, as shown by the arrows, through that part of the tube in which the carriage is contained, immediately starts the carriage, which is then carried along the line of tubing A′ until it is stopped by the closing of the stop-gate at one of the stations or until it arrives at the terminus. I will suppose it is desired to stop it at the station D. The stop-gate G* is closed, and when the carriage has arrived there, which may be known by its striking a bell, or by other means, the gate G is also closed to shut the gate C′ out of the circuit, and the latter gate is then opened without interfering with the continuity of the current, and the carriage taken out, unloaded or loaded. When this is done, the gate C′ is closed and the gates G G′ both opened, and the carriage, if left in the tube, starts again, and other carriages coming along are free to pass. On its arrival at the terminus the carriage runs beyond the gate H, and before opening the gate F′ to take it out or unload it the stop-gate H′ must be closed to put the said gate F′ out of the circuit.

The momentum of the carriage is overcome, as it approaches the closed stop-gate G* at a station, by the compression of the air in a portion, *b*, of the tube between the receiving and delivery gate and the stop-gate. This portion of the tube should be long enough to contain the requisite quantity of air for this purpose, and there should be provided in the stop-gate a vent to the atmosphere, consisting of a small valve or cock, by which to regulate the compression of the air in such a manner that the carriage will stop exactly opposite to the receiving and delivery gate. Similar chambers *b* are provided between the delivery-gates F F′, at the termini, and the ends of the line of tubing, with vents *d* in the ends of the line of tubing.

This system of tubes may have branches leaving the main line and returning thereto at suitable points for the conveyance of letters, goods, or passengers to stations or points distant from the main line, the said branches being worked by branch currents of air from the same circuit passing and repassing through the air-pump B.

The system of tubes may be so arranged

that, strictly speaking, it will have no termini, taking such a course as to form one continuous tube. Two or more air-pumps may be used on the way at different parts of length.

What I claim as my invention, and desire to secure by Letters Patent, is—

1. The employment, as a pneumatic way for the transmission of letters, merchandise, passengers, &c., of a continuous viaduct or system of tubes in which air separated from and out of the influence of the surrounding atmosphere is caused to circulate by means of an air pump in such a manner at to pass and repass uninterruptedly in a complete circuit, substantially as herein described.

2. The employment, in combination with a pneumatic way, of branch viaducts or tubes I I, for the purpose of conducting the current of air around the stations or points where it is desired to stop the carriages, substantially as and for the purpose herein specified.

3. The employment, in combination with a pneumatic way, of a system of receiving and delivery gates and stop-gates, so arranged that the stop-gates will shut the receiving and delivery gates out of the circuit of the air in the viaduct or tubes and allow them to be opened without interrupting the circuit, substantially as herein set forth.

4. Providing air chambers *b b* at the stations and termini of the way, substantially as and for the purpose herein specified.

5. Furnishing the air-chambers *b b* with vents *d d*, substantially as and for the purpose herein specified.

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