(No Model.) 3 Sheets—Sheet 1.

H. W. WILEY.

PNEUMATIC RAILWAY.

No. 454,318. Patented June 16, 1891.

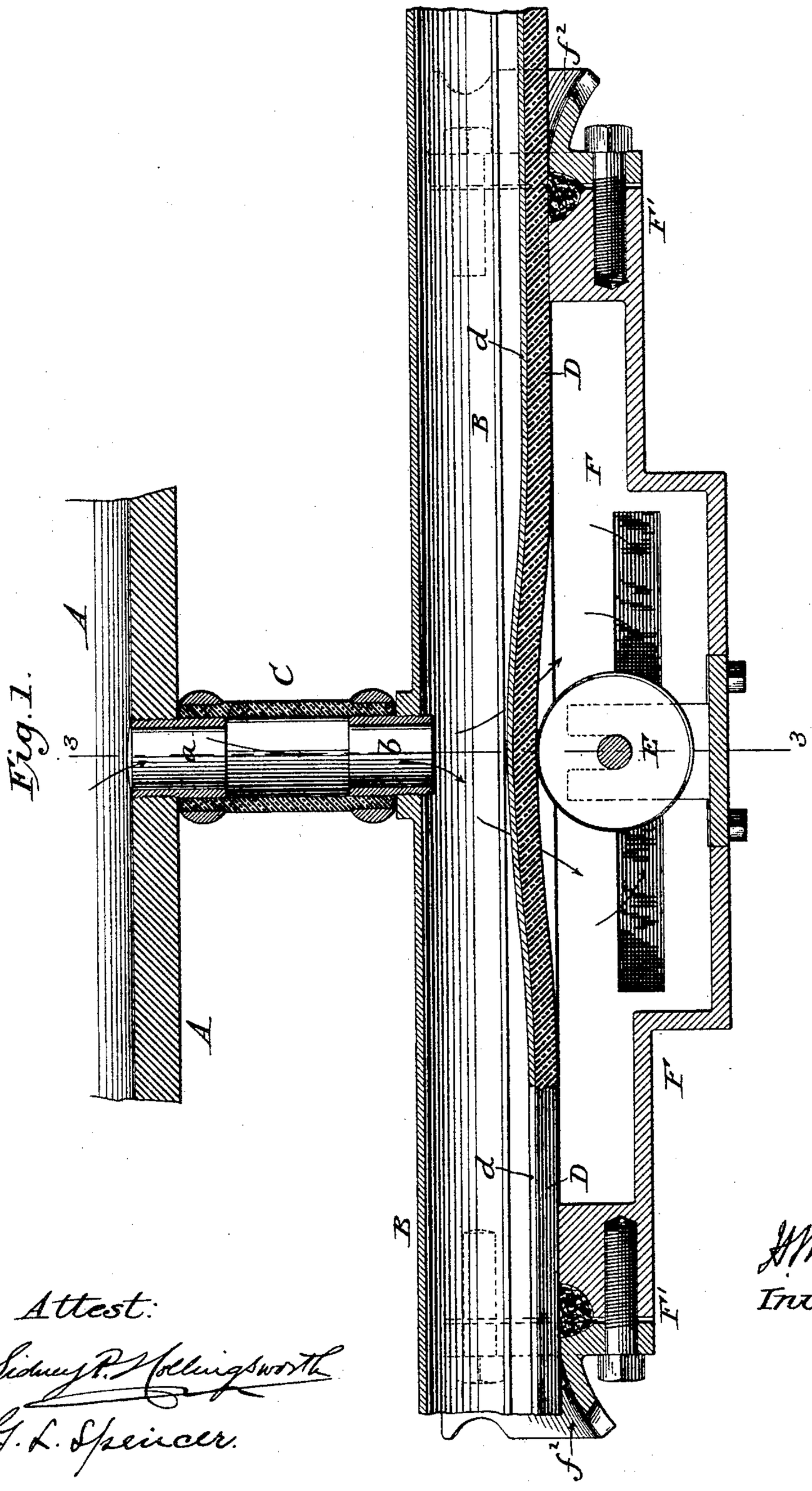

Fig. 1.

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Fig. 2.

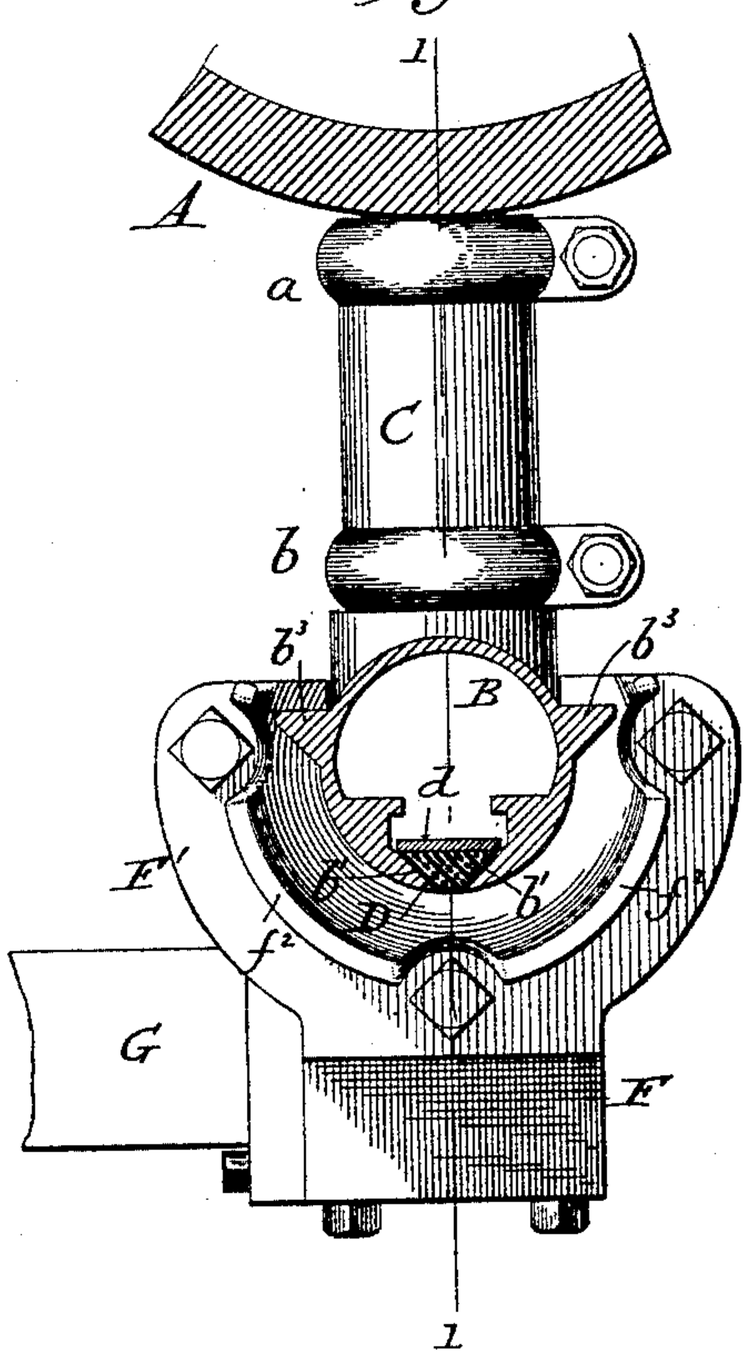


Fig. 3.

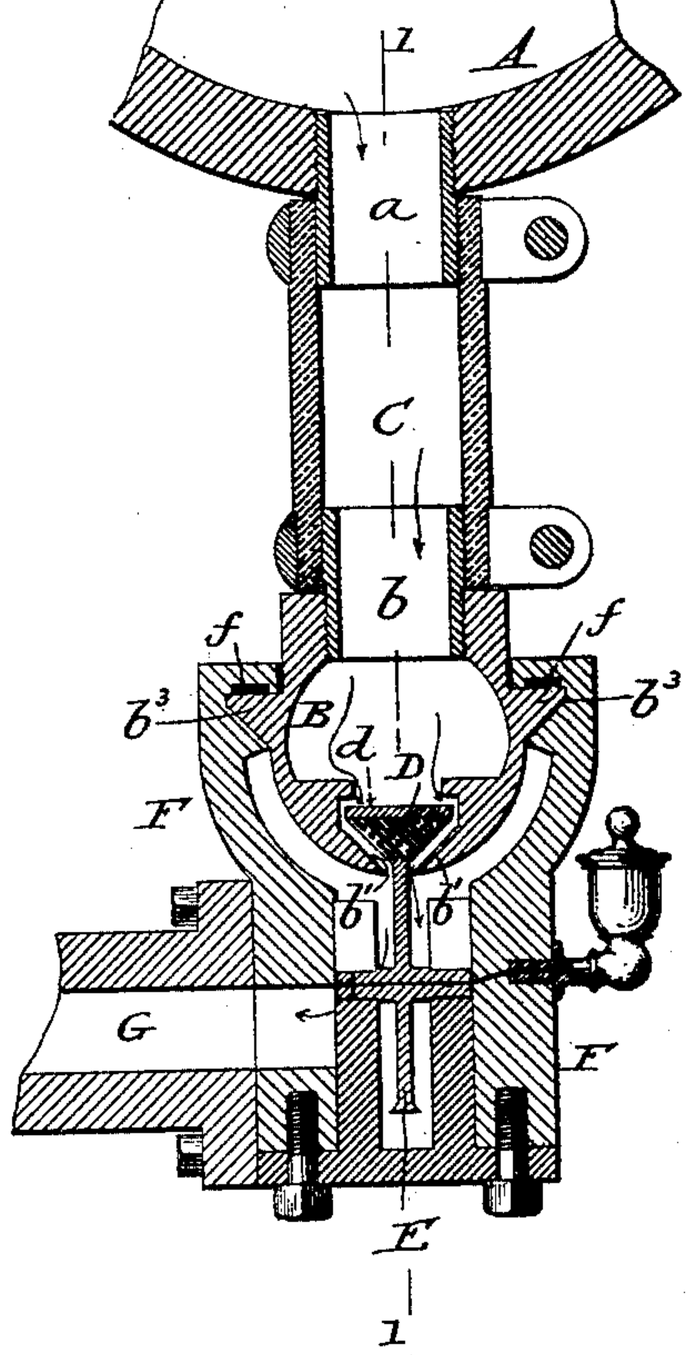
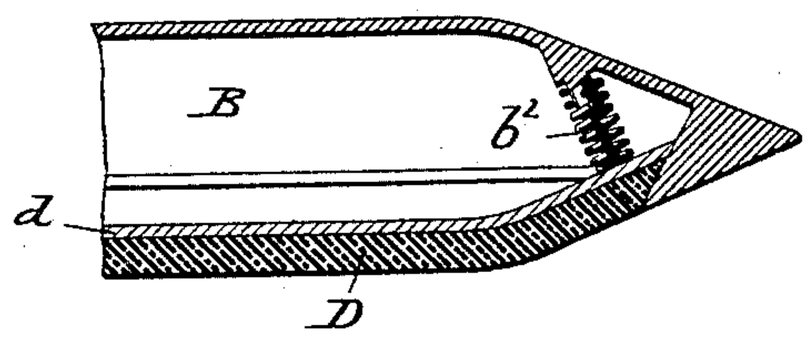


Fig. 4.



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(No Model.) 3 Sheets—Sheet 3.

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PNEUMATIC RAILWAY.

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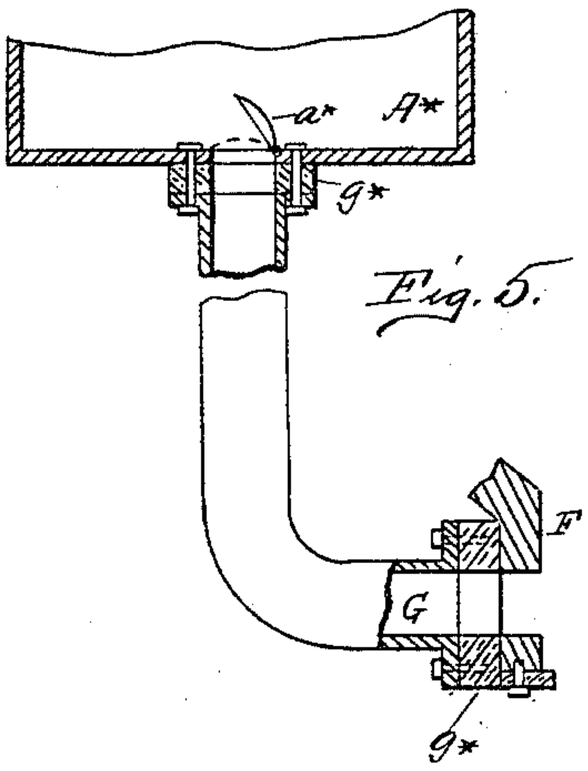
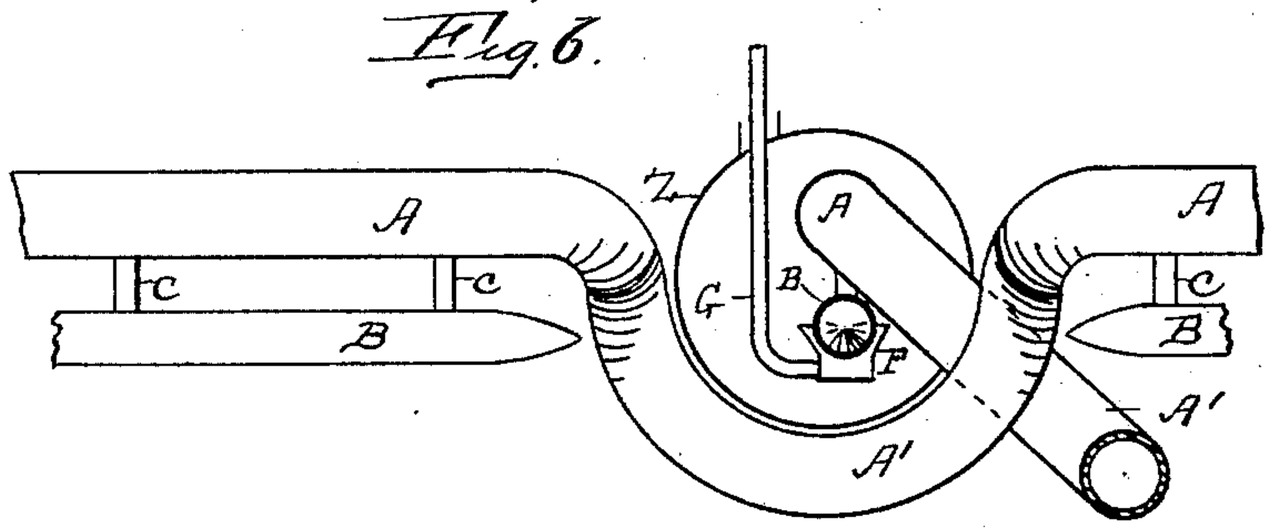


Fig. 5.

Fig. 6.



WITNESSES

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PNEUMATIC RAILWAY.

SPECIFICATION forming part of Letters Patent No. 454,318, dated June 16, 1891.

Application filed September 3, 1890. Serial No. 363,828. (No model.)

To all whom it may concern:

Be it known that I, HARVEY W. WILEY, a citizen of the United States, residing at Washington, in the District of Columbia, have invented certain new and useful Improvements in Pneumatic-Railway Systems; and I do declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same, reference being had to the accompanying drawings, and to the letters of reference marked thereon, which form a part of this specification.

My invention relates to pneumatic motor systems, and has for its object the provision of means for supplying a motor for driving cars with a continuous or partially-continuous supply of air by an entirely novel arrangement, and of various novel adaptations and combinations of other pieces of mechanism calculated to facilitate the above result and to make the whole process simple, practical, and economical.

My invention comprehends the use with an ordinary engine and appropriate machinery which forms the motor or locomotor, which has a small storage-tank for compressed air, of a new and useful mechanism for supplying it with air under sufficient pressure to operate said motor and haul passenger or other cars attached thereto, or the motor itself may be adapted to carry passengers or cargoes.

My invention consists, in brief, in a novel continuous or practically-continuous valve system for delivering compressed air to a locomotor in action, combined with a novel supply-valve pipe with flexible supports and a novel method of continually opening a longitudinal valve lying in a beveled slot in the under part of the valve-pipe without having to open said valve against atmospheric pressure, and combined, further, with a movable hood or chamber of novel construction, which fits with air-tight connections to the valve-supply tube and is supported in a novel manner, allowing it to be carried by its supports in proper position over crossings, curves, and switches where the tube over which it moves is disconnected and yet having a flexibility which will permit it to respond to sudden jars and jolts incident to a moving car, and combined, further, with flaring openings at the ends, which render certain its proper engagement with the tapering ends of the valve-supply tube at the farther side of such crossings, &c. The whole of the above system is further combined with a small storage-tank on the locomotor large enough to carry said locomotor over said crossings, &c., said storage-tank being provided with an automatic cut-off or check valve to prevent loss of air when said crossings, &c., are made, forming, as a whole, a novel, economical, and practical system for moving street and other cars, as claimed.

By referring to the accompanying drawings a better understanding will be had of the essential parts of my invention; but these drawings are not intended to give the mechanical details of the whole apparatus, but are only for the purpose of illustrating more fully the chief novelties which I claim and will now proceed to describe.

Figure 1 is a vertical longitudinal section through my device on line 1 1, Fig. 2. Fig. 2 is an end view of the same. Fig. 3 is a vertical cross-section through the flexible tubular support on the line 3 3, Fig. 1; and Fig. 4 is a detail view on one end of the valve-supply pipe. Fig. 5 is a detail view showing the connection from the hood to the small storage-tank which is carried by the motor-car. Fig. 6 is a view showing a crossing of two lines.

Similar letters of reference refer to corresponding parts in the drawings.

My novel mechanism consists of an elongated storage-cylinder A, conveniently made of a strong water pipe or pipes, and which extends the whole length of the railroad or street-railway under the surface. The position which I prefer for this storage-cylinder is beneath the surface of the track and immediately to one side of the center thereof. It is evident, however, that this cylinder may be placed in any other position found to be more convenient. This cylinder has at convenient distances (from two to four feet) openings provided with threads by which the valve-pipe B is attached by the flexible connections C. The valve-supply pipe B is hung directly

under the center of the storage-cylinder A and is suspended by the flexible connections mentioned, for the purpose of allowing it to respond to the vibrations incident to the running of the motor. These flexible connections are conveniently made of strong hose and are firmly attached to metal-threaded unions *a b* at each end for the purpose of fastening to the cylinder and valve-pipe. The valve-pipe is slotted on its under side and the slot is beveled, as indicated at *b'*, the narrowest part of the bevel being at the outer surface of the pipe. This pipe or slotted valve-tube may be of any convenient size from one-and one-half to three inches internal diameter, according to the load which the motor is destined to haul.

The valve D extends throughout the length of the pipe B and consists of a firm packing, best of some rubber compound, the sides of which are molded to fit accurately the surface of the beveled slot. The back or broad surface of the valve should be made of a ribbon of brass or steel *d* for convenience in joining the pieces of which the valve is composed and of sufficient thickness to prevent the valve being forced through the slot by the pressure of the air, but not too thick to prevent the easy opening and closing of the valve in the manner to be described. The outer narrow surface of the valve is curved, so that when in place it forms a part of the circumference of the valve-pipe. The ends of the valve are depressed where the valve-tube tapers at the ends and are held by a spring b^2 against an appropriate cushion, as shown in Fig. 4, by which arrangement the valve-opener is allowed to pass from one valve-pipe to another with the greatest facility and without loss of compressed air from the valve-pipe or storage-tank of the motor.

The valve-opener consists of a wheel E, placed inside and carried by a hood F, which is moved along the valve-pipe by the motor and which forms part of the connection to the motor. The hood is held by longitudinal lugs b^3, cast on the valve-pipe, and the joint is rendered air-tight by the packing *f*. The ends of the hood are also rendered air-tight by the packing-box F'. The lugs b^3 and the tube B, which must be smooth, are kept well oiled, and their position protects them from dust. As the hood is moved by the motor, the wheel E raises the valve D and allows the compressed air to flow from the storage-cylinder A through the tubular flexible supports C and valve-pipe B into the interior of the hood, whence it is conveyed by a lateral narrow elongated slot *g* to the flattened connecting-pipe G, which is curved upward and passes through the slot in the center of the railway to the storage-tank of the motor. As the hood passes, the valve at once falls into place, both from its own weight and elasticity and from the pressure of the air, it being made of sufficient length to insure this action, so that there is no escape of compressed air except into the interior of the hood itself. The pressure, however, in the interior of the hood is almost the same as in the valve-pipe, so that the valve is almost constantly opened without having to overcome the pressure of the air, the only force required to be exerted by the wheel E being that necessary to overcome the elasticity and gravity of the valve. The ends of the hood beyond the packing-box F' are made divergent, as shown at f^2, and the ends of the valve-pipe tapering, (see Fig. 4,) and the supporting-pipe G, which attaches the hood F to the motor, is made strong enough to carry the hood in its proper position over crossings and switches and around curves and secure its perfect engagement with the tapering end of the valve-pipe beyond. The hood may be made flexible laterally by constructing its metal parts of flexible steel or brass held by a spring against the lugs or guides of the valve-pipe and the rest of it of the material of which strong hose is made or of some other suitable material, and by this arrangement the valve-pipe may be continued around curves and switches. Further, by adjustment of the packing by means of a spring-bed the hood is permitted to adapt itself to curves in the supply-pipe incident to changes in grade of street, thus avoiding loss of compressed air; but I prefer to make the hood inflexible laterally and to discontinue the valve-pipe around curves and at switches and crossings, the small storage-cylinder A* carried on the motor being sufficient to take motor and attached cars over the places mentioned.

At a crossing the valve-pipe is discontinued, as above stated, and the storage-cylinder A is bent to one side and carried down and under the crossing and brought into proper position on the other side. This arrangement is shown in Fig. 6, where Z indicates a tunnel in which the main length of pipe is carried, and A' A' the bends in the two crossing lines of pipe A. The hood is carried by its supporting-pipe G and engaged upon the valve-pipe again in the manner described.

In order to prevent loss of compressed air from the storage-cylinder A* of the motor when making curves, switches, or crossings, the flattened conducting-pipe, from the hood to the motor, is furnished with an automatic cut-off or check valve *a**, which will close as soon as the pressure in the hood is less than in the motor storage-tank A* and thus prevent escape of air. The only air lost, therefore, is the small amount contained in the interior of the hood and in the flattened pipe connecting it to the motor storage-tank, and this amount is insignificant.

The pipe connecting the hood with the motor storage-tank is set at both ends with rubber packings *g** *g**, which permit it, in connection with the flexible supports of the valve-pipe, to be adapted to the necessary jars and

jolts of a moving car. At the same time this support is firm enough to carry the hood in proper position around curves, &c., and fix it in its proper position on the valve-pipe at the other side. If necessary, additional solid supports may be fixed at the ends of the hood F.

The underground storage-cylinder with its pendent valve-pipe and the movable hood attached thereto do not require extensive excavations, and thus much economy is secured in constructing the underground system.

The road-bed and excavations are made on the principle of the ordinary cable road, and this system forms no part of my present claim for Letters Patent except in so far as it makes a part of the combination described.

It is evident that some other form of valve may be adopted which would carry out the function required and that changes can be made in many of the details of construction without departing from the spirit or sacrificing the advantages of my invention.

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

1. A compressed-air valve-pipe having a continuous valve opening inwardly and held normally closed by the pressure in the pipe, in combination with a traveling hood hermetically embracing the valve-pipe, and a valve-opener carried by the hood, which opens the valve within the hood without resistance of the compressed air, the pressure within the hood and the supply-pipe being equal, as set forth.

2. The combination, with a main storage-pipe and a connected valve-pipe for compressed air, having a continuous valve opening inward, of a traveling hood hermetically embracing the lower portion of the valve-pipe, and a valve-opener carried by the hood and opening the valve within the hood only, as set forth.

3. A conduit for compressed-air lines, consisting of a main pipe, a valve-pipe on which a traveling hood moves, and short flexible pipes connecting the two at intervals, as set forth.

4. A conduit for compressed-air lines, consisting of a main storage-pipe, short flexible pipes connecting thereto, a valve-pipe connected to the flexible pipes, having a continuous valve therein, and track-lugs upon the side, in combination with a hood traveling on said track-lugs and having a valve-opener operating within it.

5. The combination, with a storage-cylinder, of a valve tube or pipe having flexible connections by which it is suspended therefrom and provided with a continuous valve, and a valve-opener and fluid-chamber traveling on said valve-pipe, as set forth.

6. In a locomotor for carrying passengers and moving cars or for other purposes on a street or other railway, a storage-cylinder, combined with a slotted pendent valve-pipe B, having valve D, a wheel E for operating said valve, and a movable hood or chamber passing along said pipe and carrying said wheel, thus permitting the practically-continuous opening of the valve without hinderance from the compressed air, said hood being connected by a flattened tube which also serves as its support with the storage-tank of the motor or locomotor designed for moving passenger or other cars, substantially as described.

7. In a locomotor for carrying passengers, a valve-supply pipe B, suspended from a storage air-cylinder A, extending the entire length of the railway, by flexible tubular supports C, permitting a free flow of compressed air from the storage system to the valve-supply pipe and allowing the said pipe to adapt itself to the sudden jolts and jars of the motor in action, substantially as described.

8. In a locomotor for carrying passengers, provided with a pendent flexible supply-pipe B for delivering compressed air, a movable hood or chamber F, fitted to slide with air-tight packing along the tube B, and a flattened tube G, connecting it with the storage-tank of the motor, said tube being set in rubber or other elastic sockets of sufficient firmness to carry the hood or chamber in proper position over spaces where the valve-supply tube is disconnected and yet of sufficient flexibility to yield to sudden jars and jolts incident to the motor in action, substantially as described.

9. In a compressed-air locomotor, a valve-pipe B, having an inwardly-flaring slot *b'*, a longitudinal flexible valve D, formed to fit the slot and having a rounded outer surface to conform to the circumference of the pipe, and a metallic ribbon on the back of the valve, as set forth.

10. In a pneumatic-railway system, a storage cylinder or pipe having a sideward bend and being carried down under the tunnel at crossings and switches, and a valve-pipe made in sections terminating at said crossings and switches.

11. In a compressed-air locomotor for carrying passengers, a storage-tank on the motor to hold sufficient compressed air to carry said motor over said switches, curves, and crossings, and furnished with an automatic cut-off or check valve which prevents the escape of compressed air at crossings, curves, and switches, substantially as described.

12. In a compressed-air locomotor for carrying passengers, the combination of a storage-cylinder A with a pendent flexible supply-tube B, furnished with a beveled slot *b'*, fitted with longitudinal valve D, and carrying a movable hood or chamber F, within which the valve D is constantly opened by the wheel E, the hood F being supported by the flattened pipe G, communicating through the slot in the center of the track with the storage-tank of the motor, said tank being furnished with

an automatic check-valve to prevent loss of air at crossings, curves, and switches, substantially as described.

13. In a pneumatic pipe-line, a sectional valve-pipe having pointed or rounded ends at the termini of a section and provided with a beveled bottom slot and a correspondingly-shaped valve fitting in said slot and provided with springs, as described, for holding the ends of said valve, as set forth.

In testimony whereof I affix my signature in presence of two witnesses.

HARVEY W. WILEY.

Witnesses:
I. N. KALB,
T. T. F. JOHNSON.