No. 862,601. PATENTED AUG. 6, 1907.

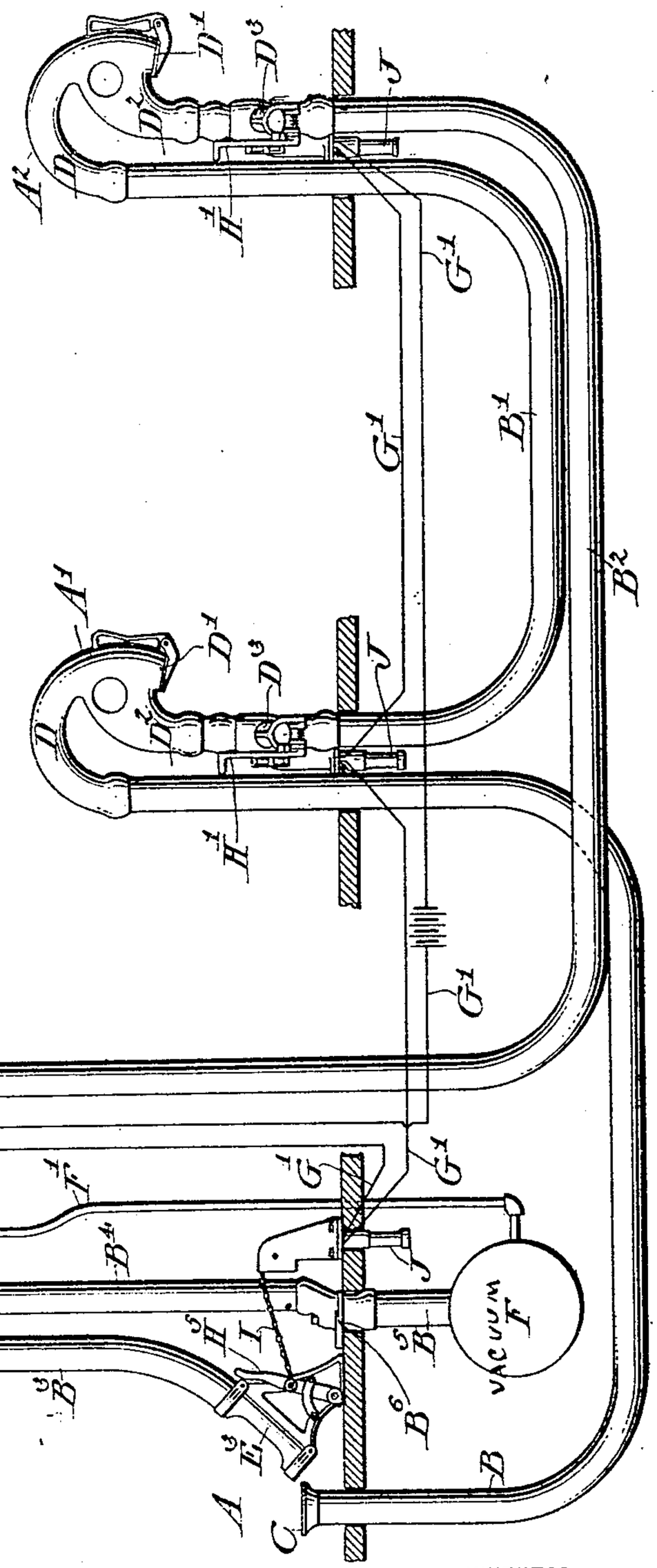
B. C. BATCHELLER.

PNEUMATIC TUBE SYSTEM.

APPLICATION FILED MAR. 21, 1905.

4 SHEETS—SHEET 1.

FIG. 1.



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4 SHEETS—SHEET 2.

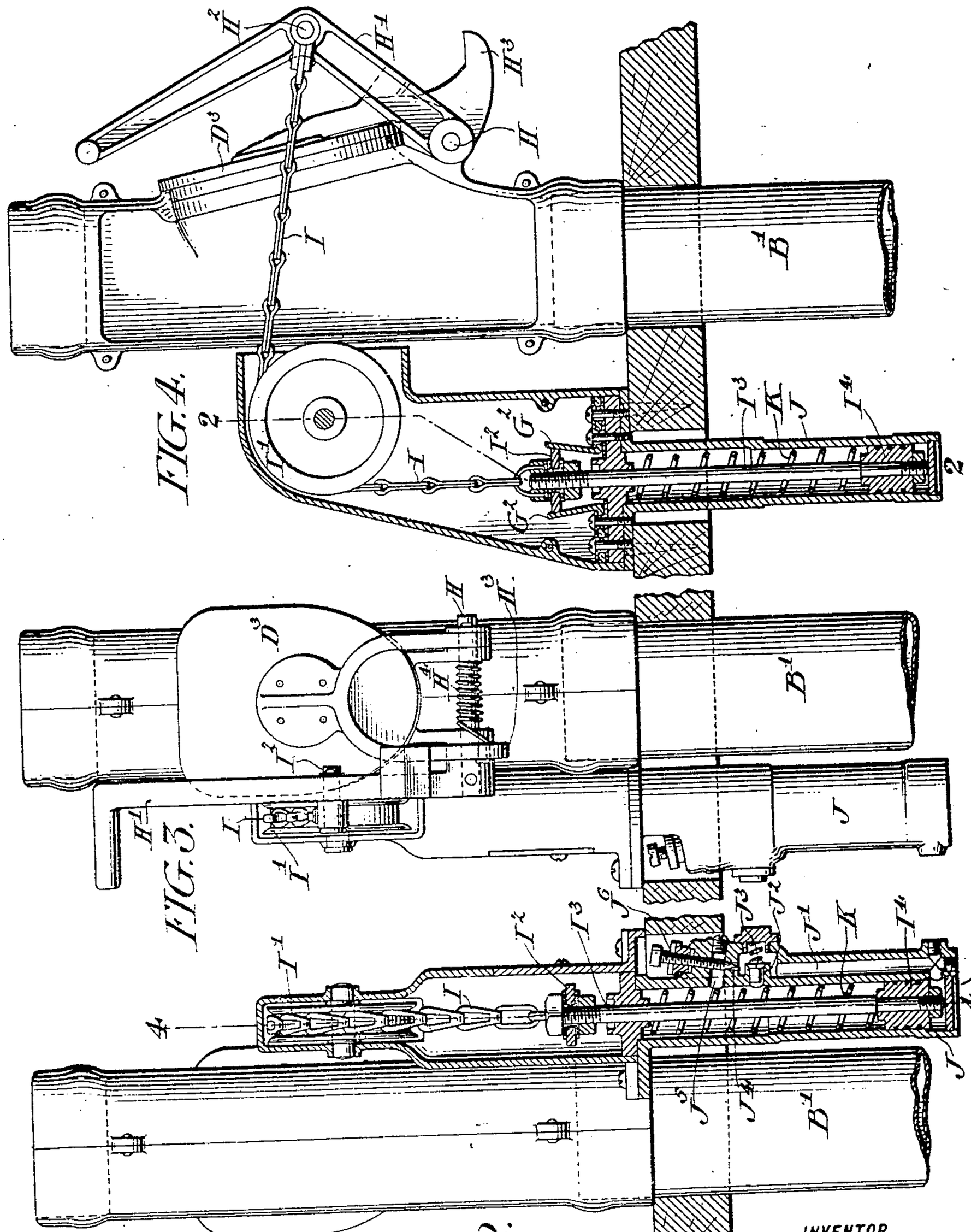

FIG. 4.

FIG. 3.

FIG. 2.

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4 SHEETS—SHEET 3.

FIG. 5.

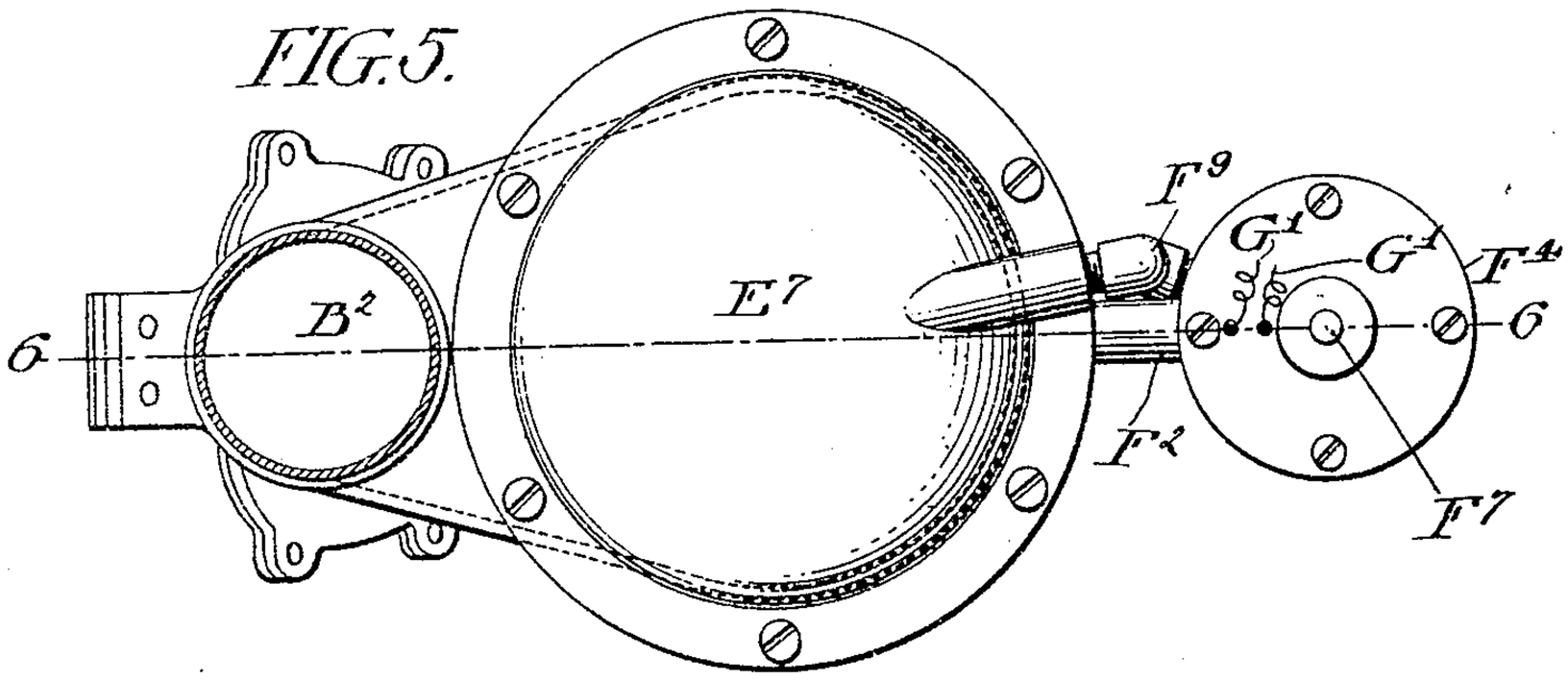
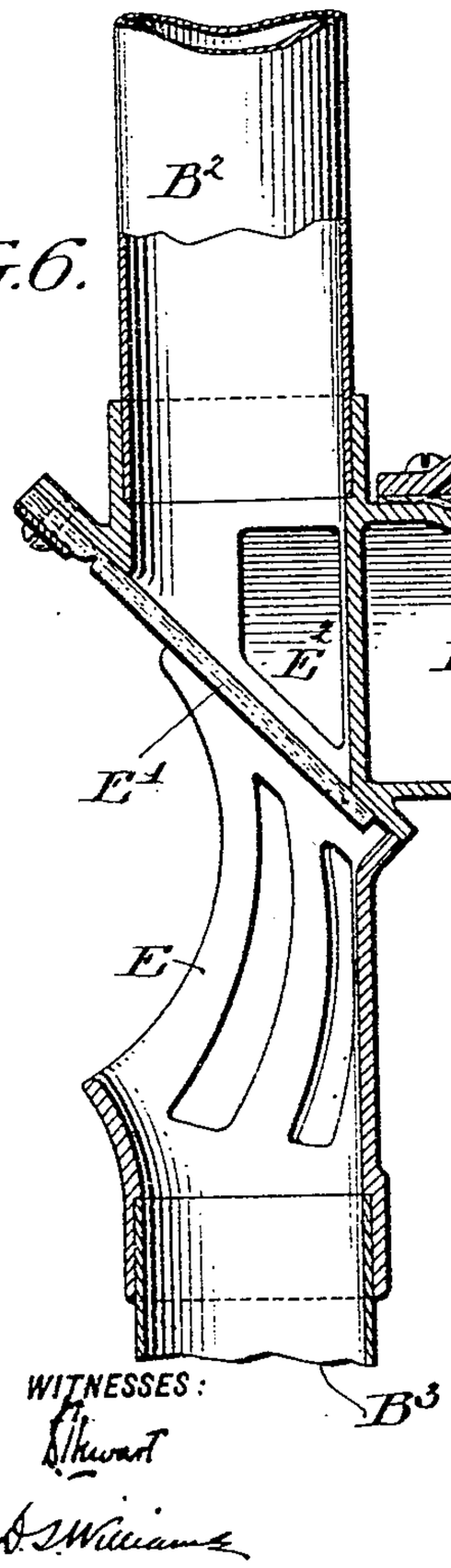


FIG. 6.



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4 SHEETS—SHEET 4.

FIG. 7.

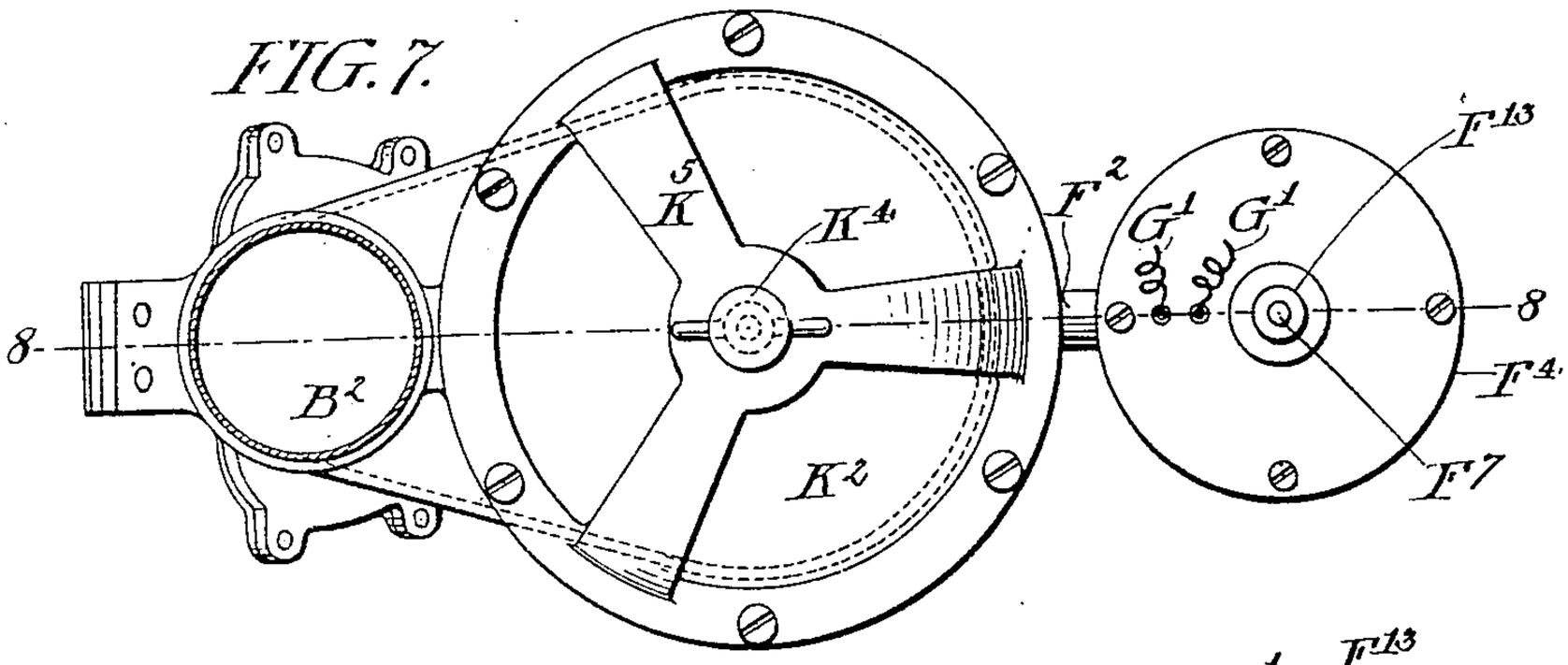
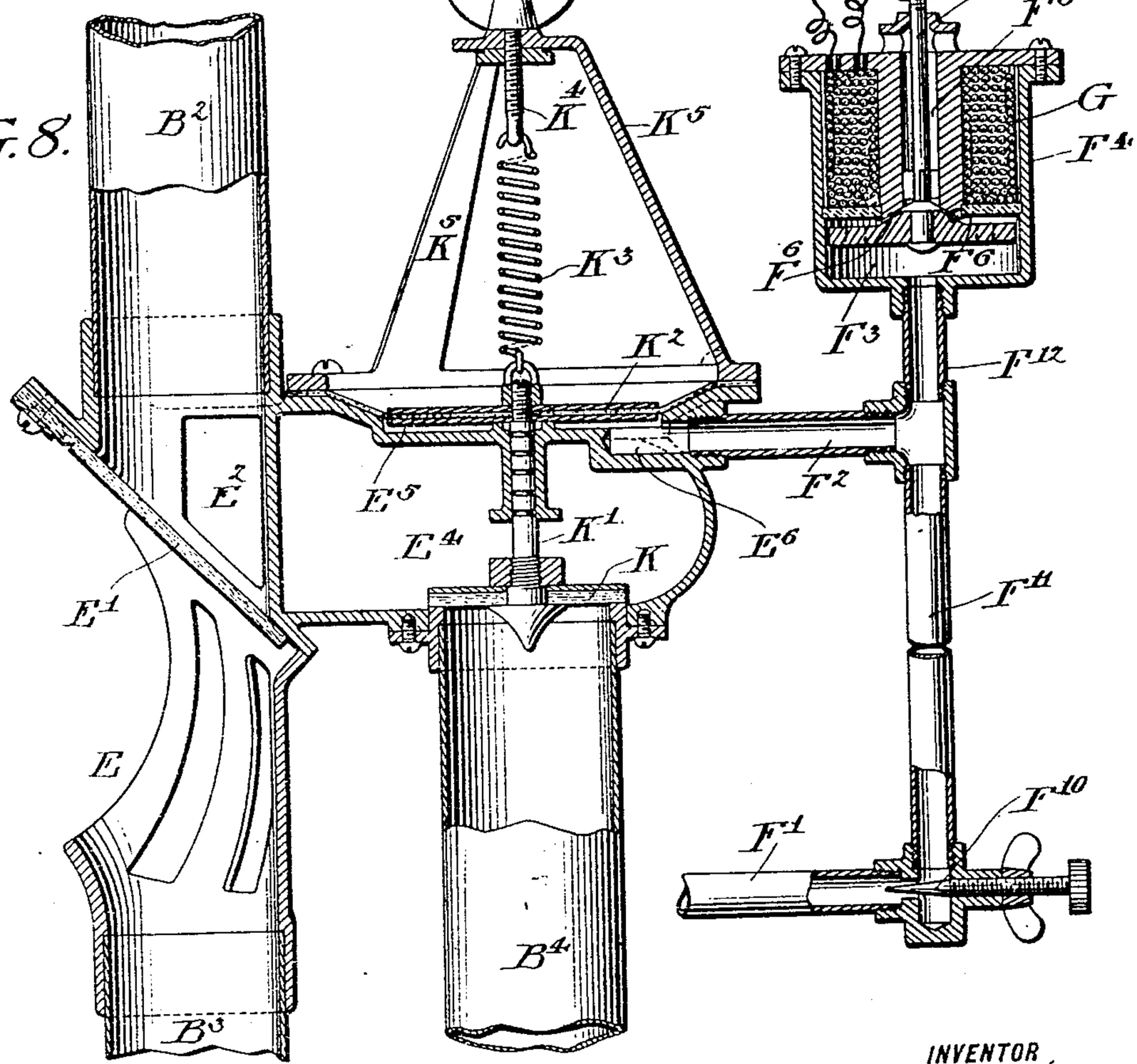


FIG. 8.



WITNESSES:

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UNITED STATES PATENT OFFICE.

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PNEUMATIC-TUBE SYSTEM.

No. 862,601. Specification of Letters Patent. Patented Aug. 6, 1907.

Application filed March 21, 1905. Serial No. 251,208.

To all whom it may concern:

Be it known that I, BIRNEY C. BATCHELLER, a citizen of the United States of America, residing in the city and county of Philadelphia, in the State of Pennsylvania, have invented a certain new and useful Improvement in Pneumatic-Tube Systems, of which the following is a true and exact description, reference being had to the accompanying drawing, which forms a part thereof.

My invention relates to pneumatic tube systems of the kind known as vacuum systems, the object of my invention being to provide improved appliances for connecting and disconnecting the transit tube with the vacuum pipe or reservoir and my invention further being in the nature of an improvement or modification of the general system which forms the subject matter of my pending application for Letters Patent filed 11th March, 1905, Serial Number 249,569.

My present invention, broadly speaking, consists of electromagnetic mechanism arranged to actuate, or rather, control a valve for opening and closing the vacuum connection.

The nature of my present invention will be best understood as described in connection with the drawings in which it is illustrated with its various parts and features, and in which

Figure 1, is a diagrammatic elevation of a system provided with my improvements in what I consider to be their best practicable form. Figs. 2, 3 and 4, are respectively rear, front and side elevations of one of the intermediate stations on the tube, the circuit opening and closing mechanism and time escapement device being shown in Fig. 2, in section on the line 2—2 of Fig. 4 and in Fig. 4 in section on the line 4—4 of Fig. 2. Fig. 5, is a plan view of my preferred form of mechanism for opening and closing the vacuum or air valve. Fig. 6, is a side elevation on the line 6—6 of Fig. 5. Fig. 7, is a plan view of a modified mechanism for opening and closing the air valve, and Fig. 8, a side elevation on the section line 8—8 of Fig. 7.

A, Fig. 1, indicates the terminal station of the tube system, A' and A^2, intermediate stations on the tube, the tube system being made up of sections B, leading from station A, to station A'; B', leading from station A', to station A^2, and B^2, leading from station A^2, to station A.

B^3, is in effect a continuation of the pipe B^2, at the home station.

B^4, is a vacuum tube connecting through a regulating gate B^6 with a section B^5, leading to a vacuum reservoir F.

C, is the open end of the tube B, at station A; D, D^2, A^3, D', D', indicating the gates by which carriers are delivered at said stations, the purpose of the intermediate stations being in substance similar to that described in the patent to Kenneth E. Stuart on the 18th November, 1902, No. 713,924.

D^3, D^3, indicate the gates by which the intermediate stations are opened for the insertion of carriers.

E, is a guideway freely open to the atmosphere and connecting the tubes B^2, and B^3.

E', is a flat valve closing the end of the tube B^2, E^2, indicating openings through the end of the pipe B^2, into the casing E^4, and E^3, the receiving box at the end of the tube B^3. The casing E^4, receives the upper end of the vacuum tube B^4, and is formed with a diaphragm chamber E^5, at its top into which leads the port E^6.

E^7, Fig. 6, is a casing or cap forming a diaphragm chamber E^8, situated above the diaphragm chamber E^5, and having a port E^9, leading into it.

K, is the vacuum or air valve normally closing the vacuum pipe B^4, and connected by a spindle K', to a diaphragm K^2, situated between the diaphragm chambers E^5, and E^8.

The vacuum pipe, either directly or through the reservoir F, is connected with a pipe F', which, as shown in Figs. 1 and 6, connects through a chamber F^3, of a casing F^4, with the pipe F^2, leading to the port E^6, of the diaphragm chamber E^5, said pipe F', also connecting in the construction of Fig. 6 through a branch pipe F^9, with the port E^9, of the chamber E^8. The chamber F^3, has also a port F^5, leading to the atmosphere which port, in the construction illustrated, is normally closed by a valve F^6, a spindle F^7, of which extends through the port F^5, and through a perforation and a guide cap at the top of the casing F^4. In the construction of Fig. 6, a valve F^8, is provided to close the port leading to the vacuum pipe F', when the valve F^6, opens the port F^5.

G, is an electromagnet secured in the casing F^4, G', G' indicating the circuit wires leading therefrom which wires, as shown in Fig. 1, lead through the system of stations on the tube and should be provided with a circuit opening and closing device at each station and for best results with a time escapement also situated at each station for regulating the time during which the circuit shall remain open.

In Figs. 7 and 8 I have indicated a modification of the mechanism shown in Figs. 5 and 6, in which, in place of the diaphragm chamber E^8, a spring K^3, is connected with the diaphragm K^2, to draw it upward, said spring being secured to an adjusting screw K^4, supported on arms K^5. In this modified construction, the vacuum pipe F', is in constant communication with

the port E^6, of the vacuum chamber E^5, through a regulating valve F^{10}, and pipe section F^{11}, said pipe section F^{11}, connecting through a branch F^{12}, with the chamber F^3, of the casing F^4, in which casing, as before, a valve F^6, is provided for opening and closing the port F^5, but no valve F^8, is provided for opening and closing the port in the chamber F^3, leading to the vacuum pipe, the valve F^6, being prevented from moving down far enough to close or impede the vacuum port by stop nuts, as indicated at F^{13}.

H, see Figs. 3 and 4, indicates a pivot to which is secured the gate D^3, having a projecting arm or finger H^3.

H′, is a lever preferably crooked as shown and pivoted on the pivot pin H, said lever being connected at its angle H^2, to a chain or cord I, passing over a guide pulley I′, and connected to a metal disk or plate I^2, which normally serves to electrically connect the springs G^2, G^2, which form terminals of the electric circuit G′, G′, at each station. The plate I^2, is also connected by a rod I^3, with a piston I^4, moving in the cylinder J, which cylinder, see Fig. 2, has a port J′, leading from its bottom and opening through the side of the cylinder, through a port J^2, and also through a port J^4, and lateral port J^5. The port J^2, is closed by means of a spring valve J^3, and the port J^4, is of regulable area by means of an adjusting spindle indicated at J^6.

K, indicates a spring in the cylinder J, acting to push the piston I^4, and circuit closing plate I^2, downward.

H^5, Fig. 1, indicates a lever used at the terminal station for actuating the plate I^2, and its connected parts.

Referring first to the construction shown in Figs. 1 to 6, and assuming that the circuit G, G′, is normally closed and the magnet G, energized, the said magnet will draw and hold the valve F^6, upward and in position to close the port F^5, thereby cutting off atmospheric connection with the diaphragm chamber E^5, and leaving said chamber in free communication with the vacuum pipe F′, as is also the case with regard to the diaphragm chamber E^8. Under these circumstances the valve K, will be closed and held securely to its seat by the vacuum in the pipe B^4. Assuming now that a carrier is inserted in the open end C of the tube B, the operator by shifting the lever H^5, at the terminal station draws up the circuit closing plate I^2 ,at that station, opening the circuit and at the same time drawing the piston I^4, into the cylinder J, the fluid with which that cylinder is filled passing freely through the port J^2, and J′, to the bottom of the cylinder. The breaking of the circuit deënergizes the magnet G, whereupon the valve F^6, will open, and the valve F^8, at the same time close the port connecting the chamber F^3, with the vacuum pipe F′, this permits air at atmospheric pressure to pass in through the port F^5, the chamber F^3, pipe F^2, and port E^6, to the diaphragm chamber E^5, and as the diaphragm chamber E^8, remains in communication with the vacuum pipe, the atmospheric pressure acting on the diaphragm moves it and the connected valve K, permitting the air to pass into the casing E^4, and openings E^2, to pipe B^2, exhausting the air from the pipe B^2, and through the connected pipes so that the inrushing air at the open end C, of the pipe B, will transport the carrier cylinder through the tubes to, whatever station may be desired. As soon as the operator releases the lever H^5, the spring K, acting on the piston I^4, causes it to move downward, but with only regulated speed as the fluid in the bottom of the cylinder cannot escape backward through the valve J^3, but must pass the regulated opening between the spindle J^6, and port J^4, the device serving as a time escapement which prevents the return of the circuit closing plate I^2, to contact with the spring terminals G^2, G^2, for such time as may be determined upon which of course will be sufficient to insure the carrier passing through such portion of the tube system as may be desired. As soon, however, as the circuit is again closed the magnet G, is energized, the vacuum port of chamber F^3, opened and its atmospheric port closed, whereupon the air is immediately exhausted from the diaphragm chamber E^5, so that the valve K, returns to its normally seated position on the pipe B^4, cutting off the connection of said pipe with the tube system. The action at the intermediate stations is practically the same, the operator desiring to insert a carrier through one of the gates D^3, having hold of the lever H′, and through said lever and its connections moving the plate I^2, and the piston I^4, connected with it so as to open the circuit. It is only when the lever H′, comes in contact with the finger H^3, that the gate is actually opened and the shape of the lever and its mode of connection with the chain I, is such as to insure that the circuit shall be fully opened and the piston I^4, moved upward to the proper degree before the gate is opened for the insertion of the carrier.

It is an important feature of my invention that each station should be provided with the circuit opening and closing mechanism and connected time escapement devices, as by means of this construction and arrangement I insure that the circuit shall remain open for a definite time after the insertion of any carrier.

Referring now to the modification shown in Figs. 7 and 8, it will be noted that the diaphragm is moved upward not by vacuum, as in the first described construction, but by the action of the spring K^3. This, generally speaking, is equivalent to the action of the vacuum in the upper chamber E^8, though I prefer the use of the said chamber E^8 for the reason that the vacuum therein and the consequent force tending to lift the diaphragm and valve K, varies with the vacuum so that even if for some temporary reason the vacuum falls off the valve K, will remain closed except when it is desired to open it which might not be the case if the power tending to open had remained constant. It will also be noticed that in the construction of Figs. 7 and 8, there is a constant though regulated communication between the diaphragm chamber E^5, and the vacuum pipe F′. This communication is so restricted by the needle valve F^{10}, that it is disregardable when the atmospheric action through the port F, is opened, but immediately upon the closing of that port by the valve F^6, the air in the chamber E^5, begins to be withdrawn though only gradually and in this way the adjustment of the regulating needle valve F^{10}, serves as a time escapement and may even take the place of the escapement consisting of the cylinder J, and connected parts. In all other respects the modified construction is practically the same as that first described.

It will be understood that in referring to the use of a diaphragm and diaphragm chamber, I do not wish to be understood as limiting myself to the use of these specific devices to the exclusion of their well known equivalents, such as a piston and cylinder.

Having now described my invention, what I claim as new and desire to secure by Letters Patent is

1. In a pneumatic tube system, the combination of a pneumatic tube, two or more stations thereon, a vacuum pipe connected to said tube, an air valve controlling said connection and normally closed, an electrically controlled mechanism for opening said valve, a circuit wire for said mechanism, means set at each station for opening and closing said crank and energizing or deënergizing the valve actuating magnet, and a time escapement acting to restore the circuit to normal condition with regulated speed.

2. In a pneumatic tube system, the combination of a pneumatic tube, two or more stations thereon, a vacuum pipe connected to said tube, an air valve controlling said connection and normally closed, an electrically controlled mechanism for opening said valve, a circuit wire for said mechanism, means set at each station for opening and closing said circuit and energizing or deënergizing the valve actuating magnet, and a time escapement at each station and set in action by the opening or closing of the circuit at that station.

3. In a pneumatic tube system, the combination of a pneumatic tube, a vacuum pipe, a valve normally closing the connection between the tube and vacuum pipe, means tending to open the valve, means, including a diaphragm chamber having connection with the vacuum pipe and with the atmosphere tending to operate the valve in opposite directions when said chamber is in communication with the vacuum or with the atmosphere, a valve for opening and closing the atmospheric connection of the chamber, an electromagnet for actuating said valve, means for opening and closing the circuit of said electromagnet situated at one or more stations on the tube, and time escapement devices for regulating the time of the return motion of the circuit closers.

4. In a pneumatic tube system, the combination of a pneumatic tube, a vacuum pipe, a valve normally closing a connection between the tube and vacuum pipe, means tending to open the valve, means, including the diaphragm chamber having connection with the vacuum pipe and with the atmosphere tending to operate the valve in opposite directions when said chamber is in connection with the vacuum or with the atmosphere, a valve for opening and closing the atmospheric connection of the chamber, an electromagnet for actuating said valve, a circuit extending from said magnet through two or more stations on the tube, means for opening and closing said circuit situated at said stations on the tube and time escapement devices for regulating the time of the return motion of the circuit closers.

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