No. 840,464.

PATENTED JAN. 8, 1907.

B. C. BATCHELLER.

PNEUMATIC TUBE SYSTEM.

APPLICATION FILED MAY 1, 1905.

5 SHEETS—SHEET 1.

FIG. 1.

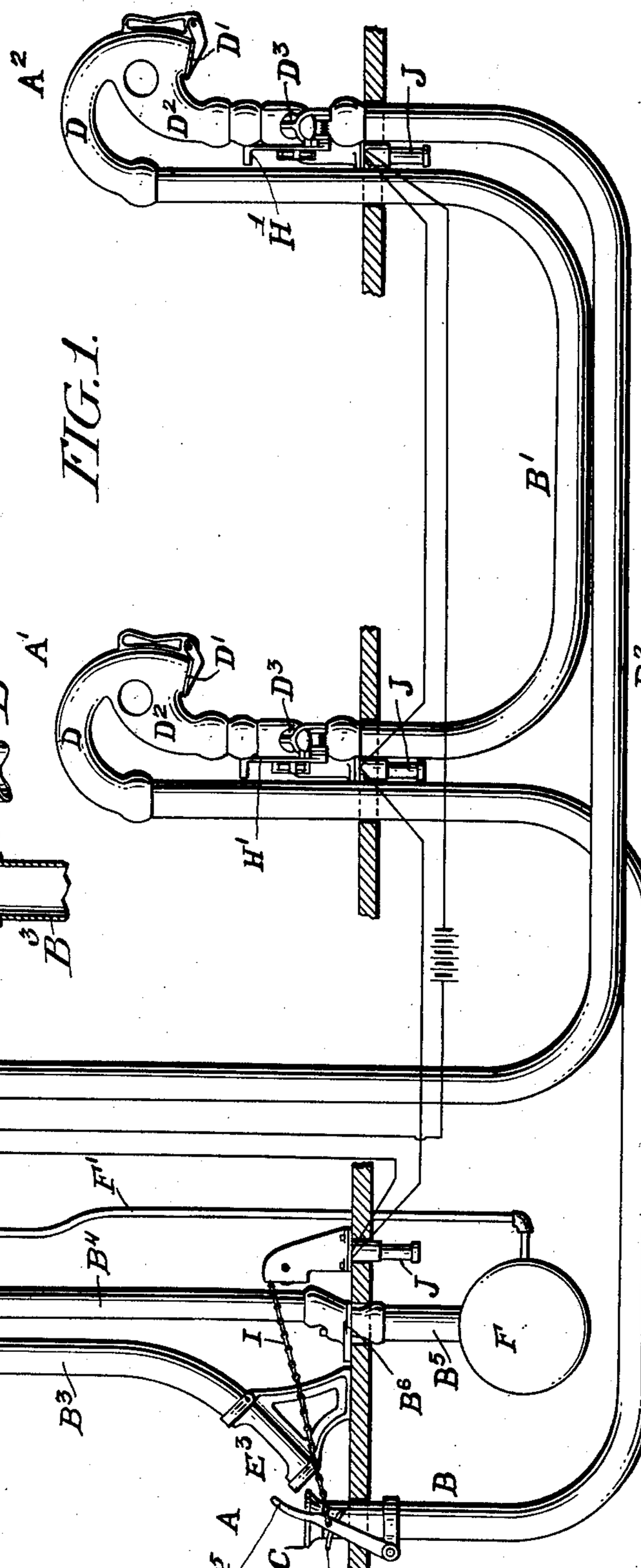
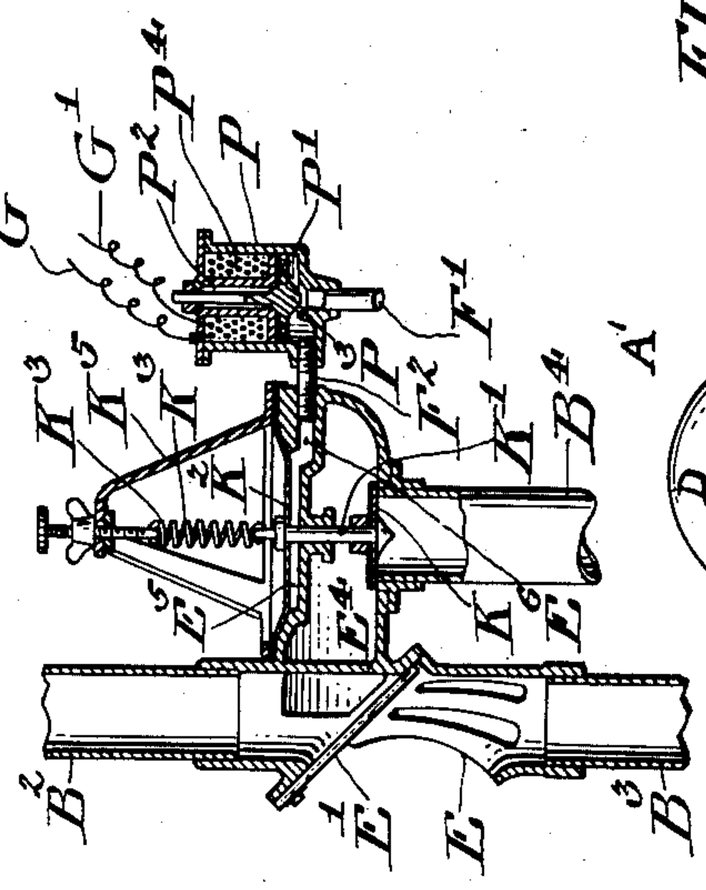


FIG. 1a.



WITNESSES:

S. Stewart

D. L. Williams

INVENTOR

Birney C. Batcheller

BY

Francis D. Chambers

his ATTORNEY.

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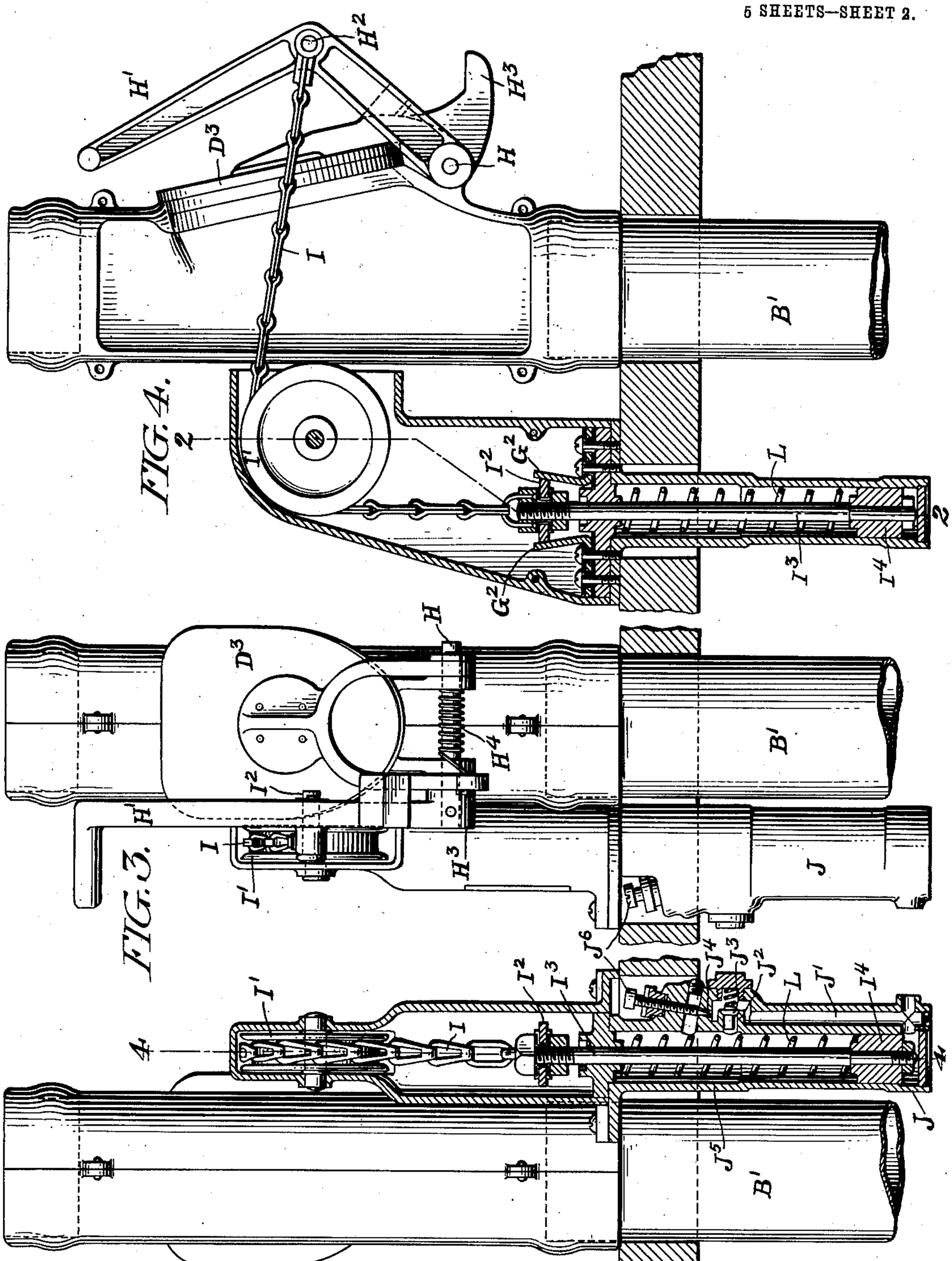

FIG. 4.

FIG. 3.

FIG. 2.

WITNESSES:

INVENTOR

Benj. C. Batcheller

BY

Francis D. Chambers

HIS ATTORNEY.

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5 SHEETS—SHEET 3.

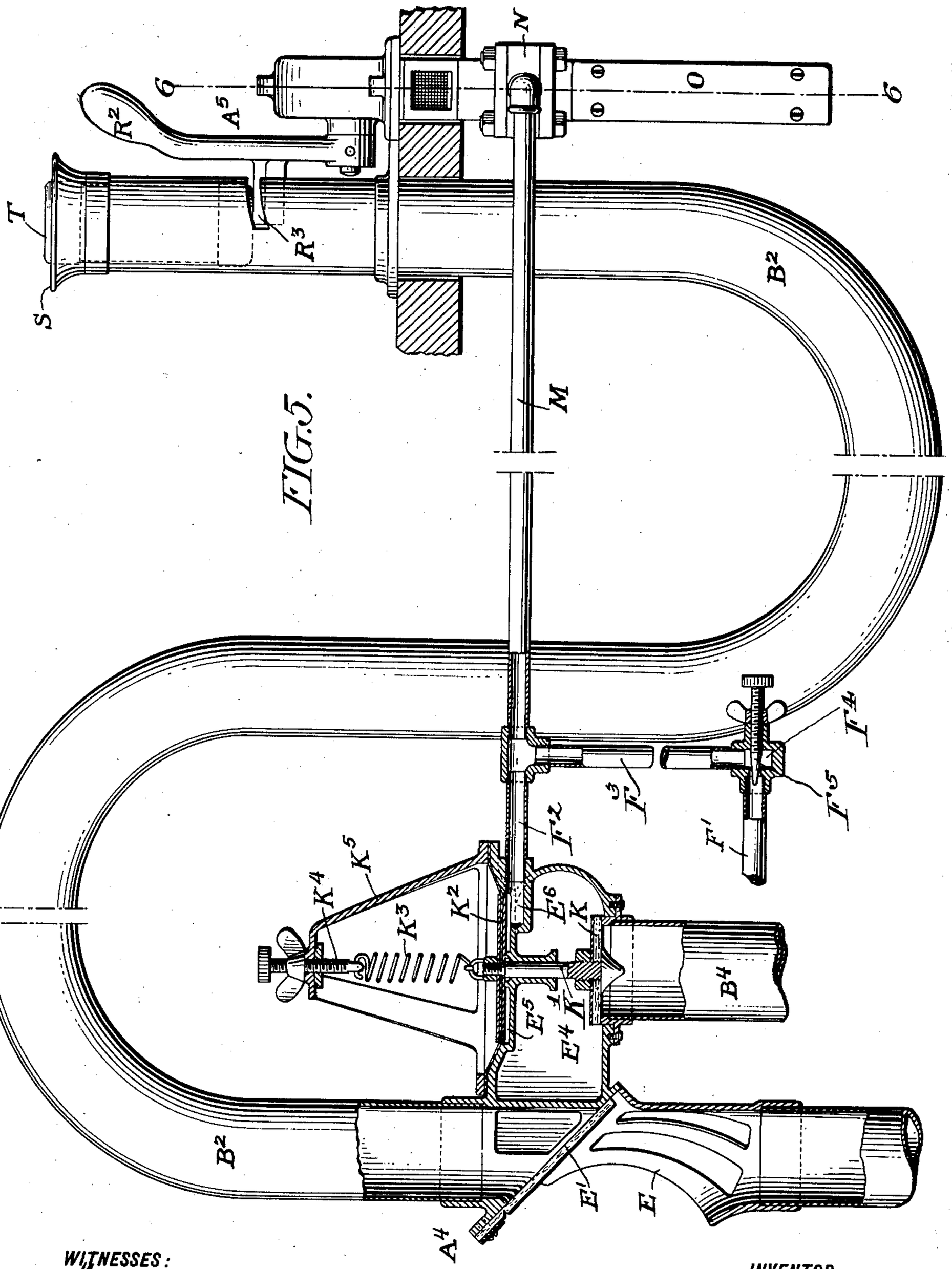

FIG. 5.

WITNESSES:

D. Stewart

D. L. Williams

INVENTOR

Benny C. Batcheller

BY

Francis D. Chambers

his ATTORNEY.

No. 840,464. PATENTED JAN. 8, 1907.

B. C. BATCHELLER.

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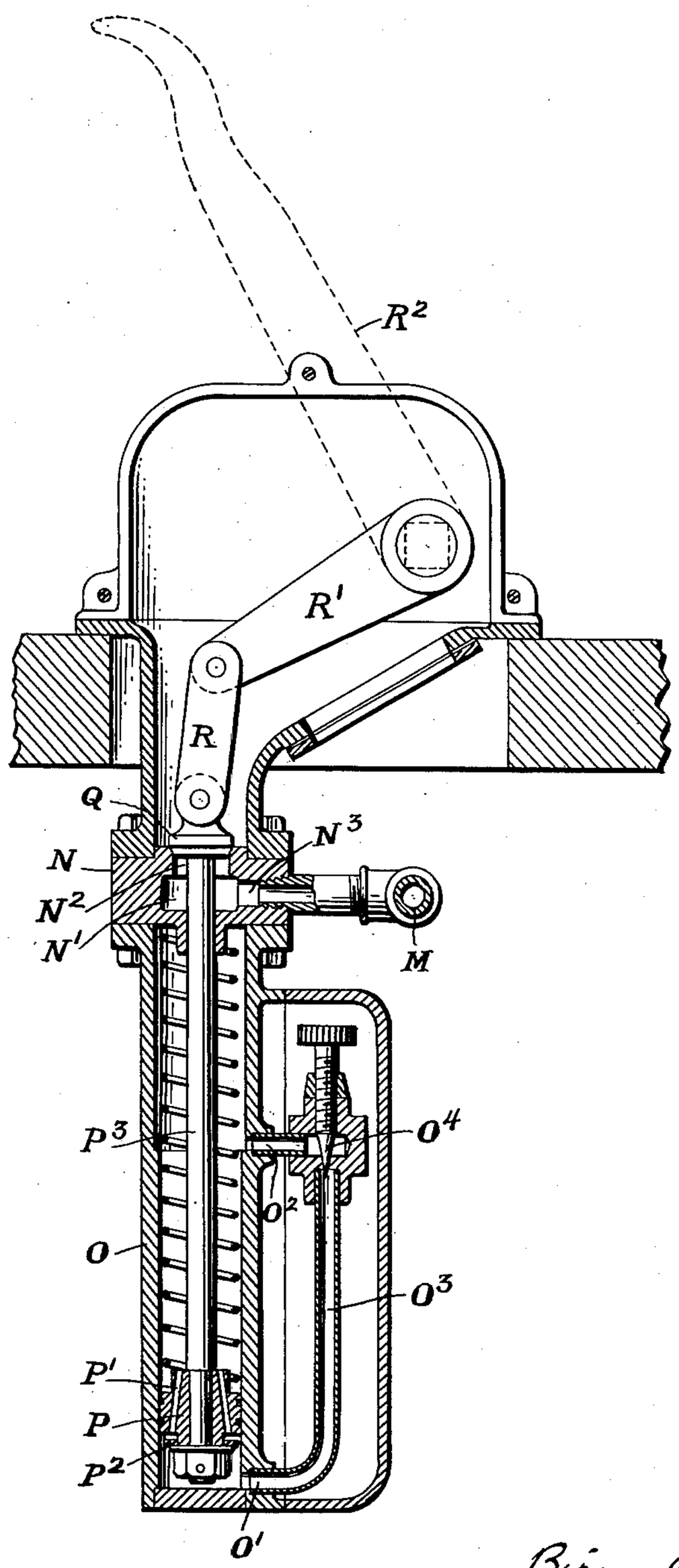
5 SHEETS—SHEET 4.

FIG. 6.



WITNESSES:

D. L. Williams

INVENTOR

Birney C. Batcheller

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5 SHEETS—SHEET 5.

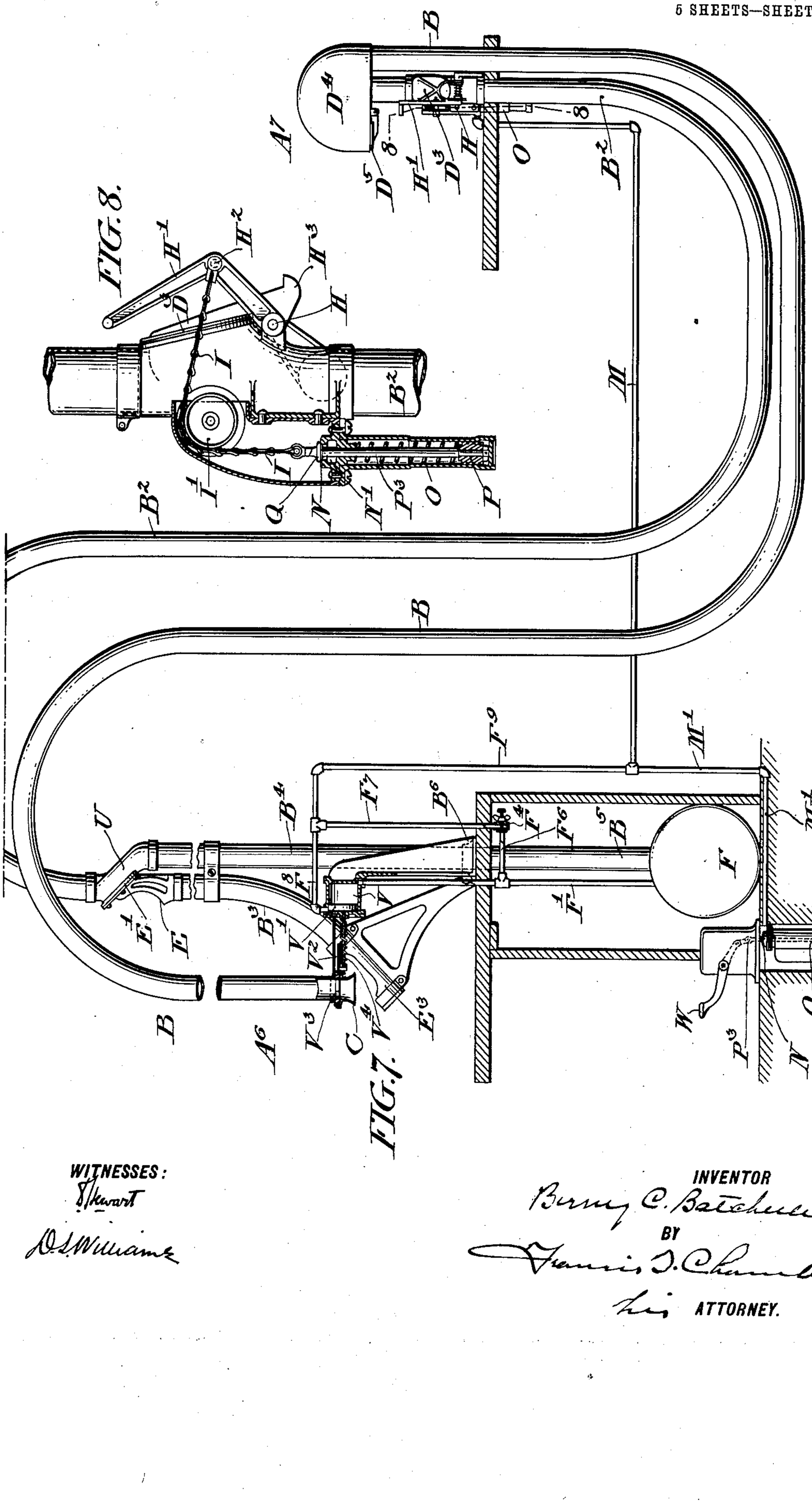

FIG. 8.

FIG. 7.

WITNESSES:

S. Stewart

D. S. Williams

INVENTOR

Benny C. Batcheller

BY

Francis D. Chambers

his ATTORNEY.

UNITED STATES PATENT OFFICE.

BIRNEY C. BATCHELLER, OF PHILADELPHIA, PENNSYLVANIA, ASSIGNOR TO THE PEARSALL PNEUMATIC TUBE AND POWER COMPANY, OF NEW YORK, N. Y., A CORPORATION OF NEW YORK.

PNEUMATIC-TUBE SYSTEM.

No. 840,464. Specification of Letters Patent. Patented Jan. 8, 1907.

Application filed May 1, 1905. Serial No. 258,288.

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 drawings, which form a part thereof.

My invention relates to pneumatic-tube systems of the kind known as "vacuum" systems, and has for its object to provide for the flow of air through the tube to the vacuum pipe or reservoir and the tube system only when a carrier is inserted and in transit by means which are set in operation at each station of the system and by the use of appliances which will insure the maintenance of the vacuum connection for a determined time after the insertion of each carrier at any station of the system.

A further object of my invention is to provide means whereby the operative connection of the tube and vacuum-pipe is necessarily made before a carrier is committed to the tube.

My invention is in the nature of an improvement on the general system shown and described in my application for Letters Patent, filed March 11, 1905, Serial No. 249,569, and in its employment of time-escapements operated from each station of the line it is intended to include and dominate, as a broader patent, my other application for Letters Patent, filed March 21, 1905, Serial No. 251,208, which application is concerned particularly with the utilization of electromagnetic mechanism for actuating the air-valve.

The nature of my improvements will be best understood as described in connection with the drawings in which they are illustrated, and in which—

Figure 1 is a diagrammatic elevation of a system provided with my improvements and in which an electromagnet and circuit-wires reaching through the different stations of the system is employed as a means for actuating the air-valve, as is also the case with my last-mentioned application, Serial No. 251,208. Fig. 1^a is a sectional view of the air-valve mechanism of Fig. 1. Fig. 2 is a rear elevation of one of the intermediate station devices of Fig. 1, showing the circuit-breaker and time-escapement in section on the line 2 2 of Fig. 4. Fig. 3 is a front view of the same appliances; Fig. 4, a side elevation of the same appliances with the circuit-breaking and time-escapement devices shown in section on the line 4 4 of Fig. 2. Fig. 5 is a diagrammatic side elevation showing my system as applied to a line having two stations and in which a vacuum-pipe connecting the stations is utilized for actuating the air-valve in place of an electric circuit and electromagnet connected therewith; and Fig. 6 is a sectional elevation of the time-escapement devices indicated in Fig. 5, taken on the section-line 6 6 of Fig. 5. Fig. 7 is a view illustrating another modification of my system and Fig. 8 is a side elevation, partially in section, of the time-escapement and connected appliances shown at the right side of Fig. 7.

A, Fig. 1, indicates the terminal station; A′ and A^2, intermediate stations on a loop line, pneumatic tubes being indicated at B B′ and B^2 B^3 being a terminal section of the tube at the terminal station, while B^4 indicates the vacuum-pipe connecting through a regulating-valve chamber (indicated at B^6) with a pipe-section B^5, leading to a reservoir F.

C indicates the open end of the tube through which carriers are inserted at the terminal station, while at each intermediate station I have indicated at D D^2 station appliances similar to those described in the patent to Stuart, No. 713,924, of November 18, 1902, selective carriers issuing through the gates D′, while those intended for stations in advance pass through the sections D^2 to the next succeeding station. Each station appliance also has a gate, as indicated at D^3, for the insertion of carriers.

At E, I have indicated a grid, connecting the ends of the tube-sections B^2 and B^3, the end of the section B^2 being closed by a flap-valve, as indicated at E′, and connected through lateral openings to the chamber E^4. At E^3, I have shown a receiving-chamber at the end of the pipe B^3. The chamber E^4 (see Fig. 1^a) is connected with the upper end of the vacuum-tube B^4 and is formed with a diaphragm-chamber E^5 at its top, having a lateral port, as indicated at E^6. The diaphragm K^2 is connected by rod K′ with the air-valve K and by spring K^3 with the adjusting-screw K^4, supported on arms K^5.

The vacuum-chamber F is connected by a pipe F′ with a chamber P′ in the casing P, said chamber opening to the atmosphere through a passage P^2 and through a pipe F^2 and port E^6 to the diaphragm-chamber E^5. The ports P^2, and at the top of pipe F′, are controlled by a valve P^3 in the chamber P′, and an electromagnet P^4, actuating said valve, the said electromagnet being connected by circuit-wires G′ with the battery and the said circuit-wires connecting through each station of the system and having circuit opening and closing devices at each station. This appliance is similar to the electromagnetic mechanism described in my former application, Serial No. 251,208.

At each station the wire G′ connects with spring-terminals, as indicated at G^2 G^2 in Fig. 4, electric connection being made by a metallic plate I^2, which plate is connected by a piston-rod I^3 with a piston I^4, working in a cylinder J^5 and pressed down toward the bottom of the cylinder by a spring L. J′ is a port opening into the bottom of the cylinder at J and again, at a higher point, opening into the cylinder at J^2, this port being closed by a non-return valve J^3. The port J′ also connects with the upper passage J^4, leading to the cylinder J^6, being a needle-valve for regulating the size of the port J^4.

In the intermediate stations the circuit-closing plate I^2 is actuated by a chain I, passing over a chain-wheel I′ and connected with the elbow H^2 of crooked lever H′, pivoted at H on the hinge-pin of the gate D^3, which gate has a projecting finger H^3 in position to be engaged by the lever H′ after it is pressed down and after it has actuated the closing-plate I^2 to open the circuit. Practically the same arrangement is provided at the terminal station A except that the chain I is actuated by a hand-lever H^5, not directly connected with any gate-opening device. By preference, the lever H^5 is provided with an arm or gate H^6, which closes the tube-mouth C against the insertion of a carrier when the lever is in normal position and opens it when the lever is actuated to open the circuit and set the time-escapement.

In the modified construction shown in Figs. 5 and 6 the port E^6 is directly connected through tube F^2 with a pipe F^3, connecting through a valve-chamber F^4 with the vacuum-pipe F′, the valve-chamber being provided with a needle-regulating valve F^5, as indicated. A continuation of the pipe F^2 (indicated at M) leads to the succeeding station or stations, where it is connected (see Fig. 6) with a port N^3, leading into a chamber N′ in a casing N, having also a port N^2 opening to the atmosphere. Below the casing N, in which the chamber N′ is formed, is secured the cylinder O, having a conduit O^3 connecting with port O′ at the lower end of the cylinder and provided with the valve-box having a needle-valve working in it, as indicated at O^4, said valve box or chamber connecting with the port O^2 in the cylinder O. Q is a valve normally seated on the port N^2 and connecting through a piston-rod P^3 with a piston P, working in the cylinder O, said piston being formed with openings P′, which during the downward motion of the piston are closed by the annular valve P^2, said valve opening when the piston moves upward. The valve and piston are connected through a connecting-rod R with the bell-crank lever R′ R^2, the arm R^2 being preferably provided with a finger or gate R^3, which extends through an opening in the side of the pneumatic tube below the opening S therein, so as to support a carrier, as indicated at T, until the lever is moved to open the valve Q and draw up the piston P.

In the modification illustrated in Figs. 7 and 8 the vacuum-pipe B^4 is in permanent connection with the tube B^2, as indicated at U, and the air-valve which regulates the flow of air through the tube system is shown at V^3, working just inside the mouth C of the sending-tube B at the same station. The valve V^3 is connected by a rod V^2 with a piston V′, moving in a cylinder V, a spring V^4 acting to normally keep the valve closed. The air-pipe F′ connects directly with the right-hand end of the cylinder V and through branch pipe F^6, regulating-valve F^4, and pipe connections F^7 and F^8 with the left-hand side of cylinder V. The pipe-section F^8 also connects through pipe-sections F^9 and M with a valve-casing N, generally similar to that shown in Fig. 6 and shown in Fig. 8, and also through a branch pipe M′ with a similar casing and time-escapement O, which, as shown, is provided with a treadle W for actuating it.

The operation of the electromagnetic mechanism is easily followed. The operator inserting a carrier draws up by the lever H′ or H^5 the circuit-closing plate I^2 and the attached piston I^4. The breaking of the circuit deënergizes the electromagnet P^4, permitting the valve P^3 to fall, opening port P^2 and closing pipe F′. Air is thus admitted to the diaphragm-chamber E^5, whereupon the spring K^3 draws up the diaphragm and opens the valve K, placing the tube in communication with the vacuum-pipe, the inrushing air carrying the cylindrical carrier to the next succeeding station or stations. As soon as the operator has released the starting-lever the spring L begins the work of returning the circuit-closing plate to contact with the spring-terminals of the circuit-wires; but the return is gradual, owing to the restricted opening of the port J^4, the needle-valve J^6 being adjusted so that sufficient and only sufficient time will elaspe before the closing of the circuit to insure the transit of the carrier. As soon as the circuit is again closed and the magnet energized the atmospheric connec-

tion is cut off and the vacuum restored in the diaphragm-chamber E^6, sucking down the diaphragm, this action, together with the suction of the pipe B^4, receding the valve K and cutting off the vacuum connection.

In the special plans of Figs. 5 and 6 the opening of the valve Q permits the entrance of air through the casing N to the pipe M and to the vacuum-chamber E^5, with precisely the same results as already described. Here also the return of the valve to seated position is regulated by the time-escapement cylinder O in practically the same way as that already described, and it will be seen that as soon as the valve Q is returned to its seat the pipe M will be exhausted by its connection with the pipe F'. The needle-valve casing F^4 is provided to restrict the flow to the vacuum-pipe, so that when the valve Q is open the pipe M will remain full of air at atmospheric pressure, while on the closing of valve Q the pipe will be exhausted with sufficient rapidity.

In the modification of Fig. 7 the tube B^2 is in constant communication with a vacuum-chamber F, as is also the tube B, through the station-head (indicated at D^4) at station marked A^7, the flow of air through the system being prevented by the normally closed gate-valve (indicated at V^3) situated at the mouth of the pipe B in station A^6. When it is desired to insert a carrier at the station A^6, the operator presses down the treadle W, opening the valve Q connected therewith, and setting the time-escapement. Air at atmospheric pressure then enters the casing N and through the pipe connections M' F^9 F^8 to the left-hand side of the cylinder V, the right-hand side of said cylinder being in free communication with the vacuum-chamber F through the pipe F'. The piston B' then moves toward the right, opening the gate V^3, and the carrier is inserted at C and passes through the pipe B and head D^4, issuing through the gate D^5. The time-escapement operated by the treadle W then closes the valve Q and normal vacuum is restored to the left-hand side of the cylinder V by the exhaustion of the air through the pipes F^8 F^7, valve-box F^4, and pipe F^6, connecting with the pipe F'.

When a carrier is inserted at the station A^7, the local valve Q and connected time-escapement is opened and set in operation by the angular lever H', the gate-valve D^3 being opened only after the air-valve is opened. The atmospheric air then passes through the pipes M F^9 F^8 to the left-hand side of the cylinder V, with the same result as already described for the operation of the similar parts at the station A^6.

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, a normally closed air-valve for controlling the flow of air through the tube, means for opening said valve, means for setting the valve-opening mechanism in operation situated at each station, and a time-escapement device also situated at each station and connected with the local device for actuating the valve-operating mechanism whereby said local valve-opening mechanism is maintained in position to keep the air-valve open for a determined time after it is set in operation from the station when said local device is actuated.

2. In a pneumatic-tube system, the combination of a pneumatic tube, two or more stations thereon, a vacuum-pipe connected to said tube, a normally closed air-valve for controlling the flow of air through the tube, means for opening said valve, a conduit extending from the valve-opening mechanism to each station, means, consisting of a device for opening and closing said conduit, situated at each station and whereby the valve-opening device is set in operation, and time-escapement devices at each station and actuated by the initial movement for opening and closing the conduit whereby the local devices for opening and closing the conduit are returned to normal position after a determined interval.

3. In a pneumatic-tube system the combination of a pneumatic tube, a vacuum pipe or chamber connected therewith and a normally closed air-valve controlling said connection, with means for actuating said valve, having connection to the vacuum-pipe and to the atmosphere, a valve for controlling said connection to the atmosphere normally held in and returned to one position by resilient means, means for moving said valve from normal position, and a time-escapement connected to said valve and whereby its return to normal position is retarded for a determined period,

4. In a pneumatic-tube system, the combination of a pneumatic tube, two or more stations thereon, a vacuum-pipe connected to said tube, a normally closed air-valve for controlling the flow of air through the tube, means for opening said valve, means for setting the valve-opening mechanism in operation situated at each station, movable barriers for preventing the insertion of the carriers in the tube at each station said barriers being connected to and actuated by the local means for setting the valve-opening mechanism in operation so as to permit of the insertion of a carrier only after the valve-actuating mechanism is set in operation.

BIRNEY C. BATCHELLER.

Witnesses:
GEO. O. MURRAY,
N. E. STEVENSON.