No. 817,016. PATENTED APR. 3, 1906.

J. J. STOETZEL.

PNEUMATIC DESPATCHING TUBE SYSTEM.

APPLICATION FILED NOV. 20, 1905.

3 SHEETS—SHEET 1.

Fig. 1.

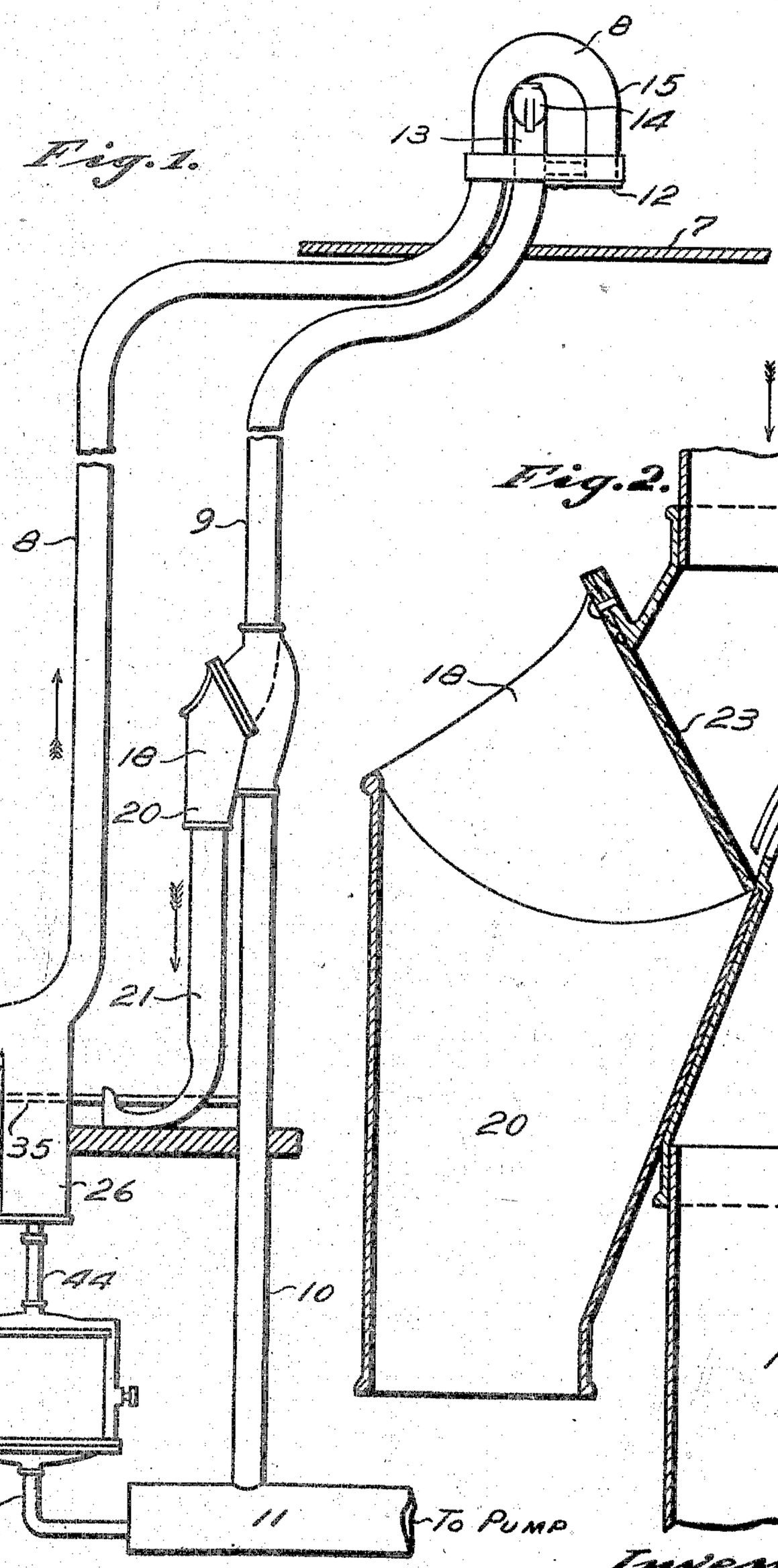

Fig. 2.

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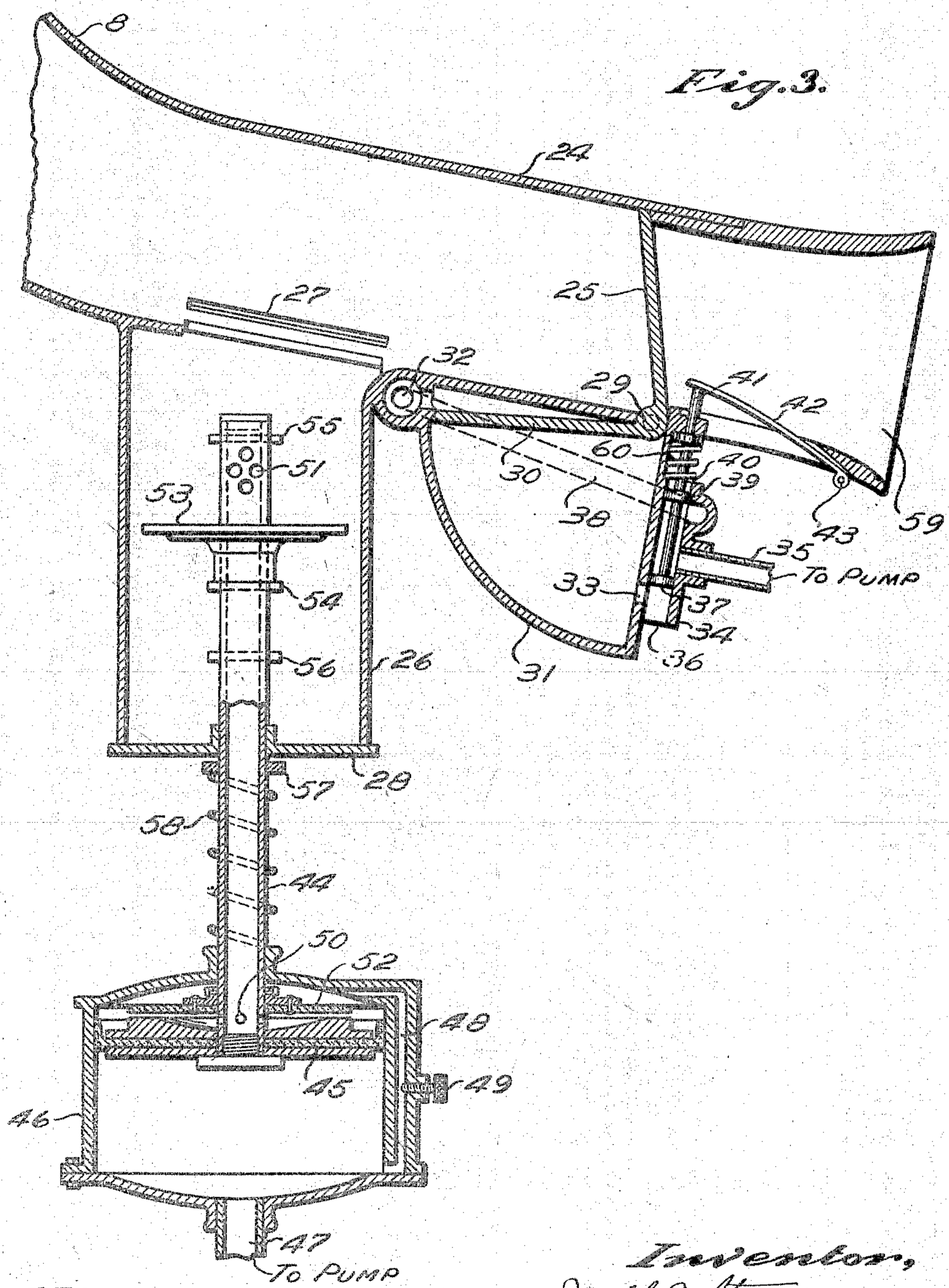
3 SHEETS—SHEET 2

Fig. 3.



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3 SHEETS—SHEET 3.

Fig. 5.

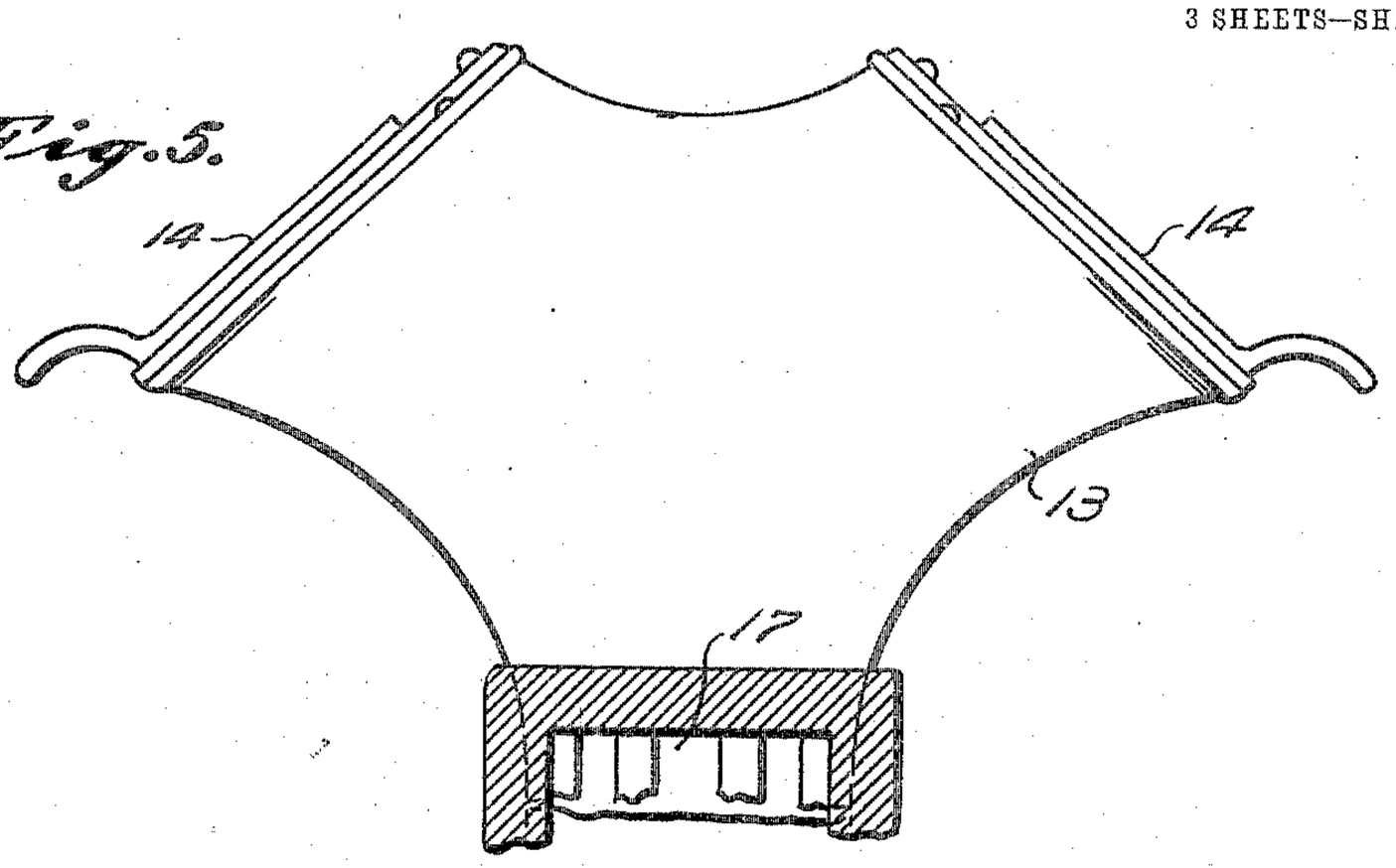
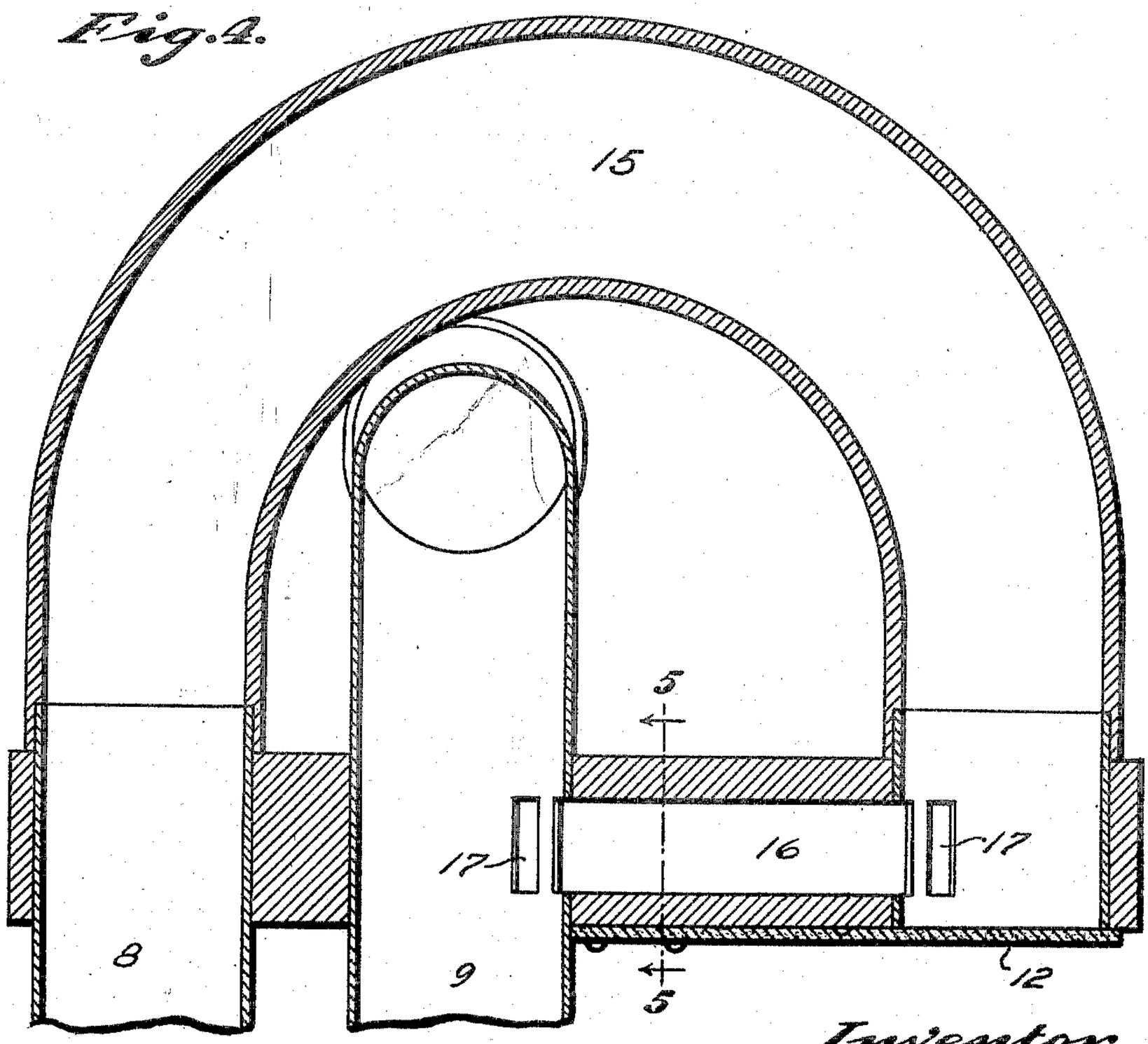


Fig. 4.



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UNITED STATES PATENT OFFICE.

JOSEPH J. STOETZEL, OF CHICAGO, ILLINOIS, ASSIGNOR TO UNIVERSAL PNEUMATIC TRANSMISSION COMPANY, OF MAINE.

PNEUMATIC-DESPATCHING-TUBE SYSTEM.

No. 817,016. Specification of Letters Patent. Patented April 3, 1906.

Application filed November 20, 1905. Serial No. 288,175.

To all whom it may concern:

Be it known that I, JOSEPH J. STOETZEL, a citizen of the United States of America, and a resident of Chicago, in the county of Cook and State of Illinois, have invented certain new and useful Improvements in Pneumatic-Despatching-Tube Systems, of which the following is a specification.

This invention relates to pneumatic-despatch-tube systems of the vacuum type, and has particular reference to systems in which the stations are comparatively close together, as in store systems.

The main objects of this invention are to provide an improved type of pneumatic transmission system in which the tubes are normally closed, the air being exhausted therefrom and the carriers driven along the tubes by means of air admitted behind the carrier, to provide in systems of this class improved means for controlling the air admission, so as to economize power and admit only sufficient air to accomplish the work which is to be performed, and to provide an improved form of gate at the receiving-terminal adapted to be controlled pneumatically, so as to open automatically in advance of the carrier and instantly close as soon as the carrier has passed.

A further object is to provide an improved form of air-admission mechanism which may be located at one part of the system and will control the movement of carriers inserted into the transit-tubes at any other point along the same, said air-controlling means being adapted to operate automatically under the fluctuation of pressure throughout the system due to the inrush of air when a carrier is inserted therein.

These objects are accomplished by the device shown in the accompanying drawings, in which—

Figure 1 is a diagrammatic view of a store system of pneumatic transmission apparatus constructed according to this invention. Fig. 2 is a longitudinal section of the combined delivery-terminal and suction branch at the cashier's end of the system. Fig. 3 is a longitudinal section of the receiving-terminal at the cashier's end of the system. Fig. 4 is a section of the combined receiving and delivery terminal at the salesman's end of the line. Fig. 5 is a transverse section on the line 5 5 of Fig. 4, showing in elevation the Y-shaped receiving-terminal.

In the system shown in the drawings, the cashier's desk and the salesman's counter are connected by two transmission-tubes for transmitting carriers in opposite directions. These are connected together by an air-passage at the salesman's terminal, so as to form a continuous passage for air. At the cashier's end of the line the incoming tube is connected with a suction apparatus, while the outgoing tube is provided with an air-inlet valve for admitting air to the system for the purpose of driving carriers along either of the tubes.

In the construction shown in the drawings the cashier's desk is indicated at 6 and the salesman's counter is indicated at 7. These stations are connected by the parallel transit-tubes 8 and 9, which are respectively the outgoing and incoming tubes at the cashier's end of the line. These tubes are provided with valves at their terminals, which are normally closed, so that the system is sealed during the periods of disuse. Air is exhausted from the system through the suction-tube 10, which connects with a suction drum or header 11, which is connected with the pumping mechanism, this pumping mechanism being arranged to adapt itself to the demands of the system, as is usual in devices of this class.

At the salesman's station the incoming tube 8 is arched upward, so as to discharge the carriers in a downward direction upon the counter 7. The delivery-terminal at this point is closed by means of a leather flap-valve 12, which is normally held in a closed position by the pressure of the outer air. The receiving-terminal at the salesman's station is in the form of a vertically-disposed Y-shaped branch having gates 14 opening toward each side of the arched delivery-terminal 15 of the tube 8. The tubes 8 and 9 are connected together at the salesman's station by means of the branch passage 16, thus providing a continuous passage for air throughout the system when all of the gates are closed. The apertures 17, which connect the passage 15 with the tubes 8 and 9, are preferably bridged to prevent their edges from obstructing the free passage of a carrier.

The delivery-terminal 18 at the cashier's

sation is provided with a curved partition 19 for deflecting the carriers into the funnel 20 at the upper end of the delivery-tube 21. The partition 19 is provided with bridged apertures which connect the tube 9 with the suction branch 22. The tube 9 is normally closed against the entrance of air at the terminal 18 by means of the valve 23, which is held in a closed position by outer air-pressure. This valve is arranged to open outwardly through contact with a carrier when the same is delivered from the tube 9.

The receiving-terminal at the cashier's end of the line consists of a horizontally-disposed tubular part 24, normally closed against the admission of air by means of a gate-valve 25. A branch tube 26 extends vertically downward from the tubular part 24 and communicates therewith through a bridged aperture 27. The lower end of the tube 26 is normally closed by means of a valve 28, which will be hereinafter described.

The gate 25 is pivoted at 29 at the lower part of the tube 24 and opens inwardly of said tube. This gate is rigidly connected with a piston 30, which is surrounded by a casing in the form of a sector of a cylinder 31, having its center in the axis 29. The cylinder 31 has ports 32 and 33 at respectively opposite sides of the piston 30. These ports communicate with a valve-casing 34, which in the form shown is integral with the cylinder 31. The valve-casing 34 is connected by the pipe 35 with the suction-pipe 10 and is open to the atmosphere at 36 and 40. A piston-valve 37 controls the port 33 and is arranged to be shifted in the valve-casing, so as to permit said port 33 to be either in communication with the air-inlet 36 or with the suction-pipe 35. The valve-casing 34 is connected with the port 32 by means of a cored passage or pipe 38. The piston-valve 39 controls the port 32. The pistons 37 and 39 are both mounted upon the stem 41, which extends upwardly into the receiving-terminal 24 and serves as a trip for shifting the pistons 37 and 39 when a carrier is inserted into the receiving-terminal. An inclined arm 42, pivoted at 43, serves to depress the trip 41 when a carrier is inserted.

The valve 28 is operated by means of a rod 44, which extends vertically upward through the center of said valve into the branch tube 26. The rod 44 is connected with a piston 45, which is vertically slidable in the cylinder 46. This cylinder is connected at its lower end with the suction-drum 11 by means of the pipe 47, and the spaces in the cylinder above and below the piston 45 are connected together by means of a by-pass passage 48, controlled by a valve 49. The rod 44 is hollow and communicates with the space above the piston 45 through apertures 50. The interior of the rod 44 also communicates at its upper end with the interior of the tube 26 through apertures 51. A leather check-valve 52 is mounted above the piston 45, so as to permit air to flow from the apertures 50 into the cylinder, but to prevent a return-flow. The apertures 51 at the upper end of the rod 44 are controlled by means of a floating valve 53, which is loosely slidable upon the rod 44, being adapted to normally fall to an open position, as shown in Fig. 3, and to be carried upward to close the apertures 51 by the inrush of air when the valve 28 is open. The stops 54 and 55 limit the movement of the valve 53 on the rod 44. The valve 28 is also loosely slidable on the rod 44, and its movement is limited by stops 56 and 57. The spring 58 normally urges the piston 45 to its upper position, as shown in Fig. 3.

The operation of the device shown is as follows: In the drawings all of the parts of the system are shown in their normal position of inactivity. It is assumed that the action of the pumps connected with the suction-drum 11 is continuous and is so controlled to instantly take care of the varying demands made upon it between periods of disuse of the system and periods during which carriers are transmitted along the transit-tubes. When a carrier is inserted into the mouth 59 of the receiving-terminal 24 at the cashier's station, said carrier will depress the trip 41 and shift the pistons 39 and 37 downward. This will open the pipe 38 to the air at 40 and will connect the port 33 with the suction-pipe 35. The piston 30 will therefore instantly swing the gate 25 out of the path of the carrier and will permit the same to be drawn into the transit-tube 8. As soon as the carrier leaves the trip 41 the spring 60 will return the pistons 37 and 39 to their normal positions. The suction through the port 32, which is in communication with the upper end of the cylinder 31, will coöperate with the air entering the port 33 for instantly closing the valve 25. At the instant when the valve 25 opens the inrush of air with the carrier causes a sudden rise in the pressure in the tube 8. This causes air to enter the branch tube 26 and pass into the apertures 51, through the hollow rod 44, and into the upper part of the cylinder 46. The pressure of this air instantly forces the piston 45 downward and opens the valve 28 in case said valve has not already opened under the action of gravity when the inrushing air has for an instant brought the pressure inside of the tube 26 to approximately that of the atmosphere. In case the valve 28 has not opened by gravity the descent of the piston 45 causes the stop 56 to engage the valve 28 and force it from its seat. As soon as the valve 28 has opened the inrush of air at the lower end of the tube 26 will carry with it the floating valve 53, closing the apertures 51. The air above the piston will then pass through the by-pass passage 48 into the lower part of the cylinder until all of

the air in said cylinder is at the same pressure as the suction-drum 11. The piston 45 will be returned to its upper position by means of the spring 58, this upward movement of the piston being timed by the flow of air through the by-pass 48. The valve 49 permits of regulating such timing. In order to prevent the escape of air from the upper part of the cylinder through the rod 44 before the valve 53 has closed the apertures 51, (thus permitting the piston to rise too rapidly and disturbing the timing calculation,) the check-valve 52 is provided to prevent such return-flow of air. The closing of the gate 25 is assisted by the opening of the valve 28, since the air rushing into the tube 8 from the tube 26 would tend to equalize the pressure on each side of the gate 25. The piston 30 is of greater area than the gate 25, so as to normally hold said gate in a closed position when the pressures in the tube 8 and in the port 32 are approximately equal. The valve 49 is so regulated as to cause the valve 28 to close as soon as sufficient air has been admitted to transmit the carrier to its destination at the desired speed. This avoids the entrance of any excess of air which would require unnecessary pumping energy, and therefore reduce the economy of the system. When a carrier is inserted at the salesman's receiving-terminal 13, the inrush of air would for an instant destroy the vacuum in the tube 8 and cause a sudden increase of pressure throughout the lengt. of such tube. This increase of pressure has the same effect as the opening of the gate 25 and accordingly causes the piston 45 to descend and the valve 28 to open. Air is again admitted in sufficient quantity to drive the carrier through the transit-tube 9 and deliver it to the cashier's desk. The gates 14 close instantly after the admission of the carrier, so that in this case again the amount of air admitted to the system would be exactly sufficient for transmitting the carrier. In case a series of carriers are inserted in the system in rapid succession each would have the effect of operating the mechanism for opening the valve 28, so that the said valve would remain open a sufficient length of time after the last carrier has been inserted into the system to insure the carrying of said carrier to its destination.

It will be seen that by this arrangement a single air-admitting device controls the entire system, thus simplifying and cheapening the construction of the system.

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

1. In a pneumatic-despatch-tube system, the combination of a normally closed transit-tube through which carriers are transmitted, a sending-station arranged to permit a carrier to be inserted into the tube, means for exhausting air from the tube, and a valve adapted to admit air into the tube for driving carriers, said valve being adapted to open through a fluctuation of the pressure within said tube, means normally urging the closing of said valve, and means for timing the closing of said valve.

2. In a pneumatic-despatch-tube system, the combination of a normally closed transit-tube through which carriers are transmitted, an air-inlet valve at one end of the tube and being normally closed, means for exhausting air from the tube near its other end, a plurality of receiving-stations through which carriers may be inserted into the tube, and mechanism for opening said air-valve to admit air for driving a carrier along the tube when the carrier is inserted at either of said receiving-stations.

3. In a pneumatic-despatch-tube system, the combination of a normally closed transit-tube through which carriers are transmitted, an air-inlet valve at one end of the tube and normally closed, means for exhausting air from the tube near its other end, a plurality of receiving-stations through which carriers may be inserted into the tube, and pneumatic means for opening said air-valve to admit air for driving a carrier along the tube when a carrier is inserted at either of said receiving-stations.

4. In a pneumatic-despatch-tube system, the combination of a pair of normally closed transit-tubes connecting two stations and having their receiving and delivery terminals at respectively opposite stations, an air-passage connecting said tubes at one of said stations, suction apparatus communicating with the delivery-terminal at the other station, an air-inlet valve communicating with the receiving-terminal at said other station, said air-valve being normally closed, and mechanism adapted to open said air-valve when a carrier is inserted into either of said transit-tubes.

5. In a pneumatic-despatch-tube system, the combination of a pair of normally closed transit-tubes connecting two stations and having their receiving and delivery terminals at respectively opposite stations, an air-passage connecting said tubes at one of said stations, suction apparatus communicating with the delivery-terminal at the other station, an air-inlet valve communicating with the receiving-terminal at said other station, said air-valve being normally closed, and mechanism adapted to open said air-valve through a change of the pressure in the transit-tubes.

6. In a pneumatic-despatch-tube system, the combination of a pair of normally closed transit-tubes connecting two stations and having their receiving and delivery terminals at respectively opposite stations, an air-passage connecting said tubes at one of said stations, suction apparatus communicating with the delivery-terminal at the other station, an air-inlet valve communicating with the re-

ceiving-terminal at said other station, said air-valve being normally closed, and mechanism adapted to open said air-valve when air is admitted to the transit-tubes at either of said stations.

7. In a pneumatic-despatch-tube system, the combination of a transit-tube through which carriers are transmitted, a receiving-terminal arranged to permit the insertion of carriers into said transit-tube, a gate adapted to normally close the tube against the admission of air at the receiving-terminal, said gate being arranged to open inwardly of the tube to permit the passage of a carrier, and pneumatic means controlled by a carrier and adapted to open said gate in advance of the carrier and close said gate when the carrier has passed.

8. In a pneumatic-despatch-tube system, the combination of a transit-tube through which carriers are transmitted, a receiving-terminal arranged to permit the insertion of carriers into said transit-tube, a gate adapted to normally close the tube against the admission of air at the receiving-terminal, said gate being arranged to open inwardly of the tube to permit the passage of a carrier, a trip extending into said terminal in front of said valve and adapted to be engaged by a carrier when inserted into the tube, and pneumatic means controlled by said trip and adapted to close said gate when the carrier has passed.

9. The combination of a transit-tube through which carriers are transmitted, a gate extending across the tube and normally closed to prevent the passage of air through the tube, pneumatic means for opening said gate, a trip extending into the path of the carriers in front of said gate, and said trip being adapted when engaged by a carrier to cause the operation of said pneumatic means for opening the gate to permit the free passage of the carrier.

10. The combination of a transit-tube through which carriers are transmitted, a receiving-terminal at one end of said tube, a gate extending across said tube near the terminal and being normally closed to prevent the entrance of air through said terminal, a piston connected with said gate, a casing inclosing said piston, suction apparatus for exhausting the air from said transit-tube, and means controlled by the insertion of a carrier into said terminal and adapted to alternately connect said casing at opposite sides of said piston with the suction apparatus to cause said gate to open in advance of the passage of a carrier and to close immediately thereafter.

11. The combination of a transit-tube through which carriers are transmitted, a gate extending across said tube to prevent the passage of air therethrough, said gate being pivotally mounted and adapted to swing in the direction of the travel of the carriers to permit the passage of a carrier, a piston connected with said gate, pneumatic means for controlling the position of said piston-gate, and a trip controlling the action of said pneumatic means and extending into the tube in front of said gate, said trip being adapted when engaged by a carrier to cause said means to open the gate.

12. The combination of a transit-tube through which carriers are transmitted, a gate extending across the tube for controlling the passage of air therethrough, said gate being pivoted at one side of the tube and adapted to swing to permit the passage of a carrier along the tube, a sector of a cylinder secured outside of the tube and arranged concentrically with the pivotal axis of the gate, a piston rigidly connected with said gate and adapted to swing in said sector for controlling the position of the gate and pneumatic connections with said sector at opposite sides of said piston for operating said piston.

13. The combination of a transit-tube through which carriers are transmitted, a gate extending across the tube for controlling the passage of air therethrough, said gate being pivoted at one side of the tube and adapted to swing to permit the passage of a carrier along the tube, a sector of a cylinder secured outside of the tube and arranged concentrically with the pivotal axis of the gate, a piston connected with said gate and adapted to swing in said sector for controlling the position of the gate, pneumatic connections with said sector at opposite sides of said piston for operating said piston, valves controlling said pneumatic connections, and a trip extending into the tube in front of said gate and adapted to operate said valves to open the gate when said trip is engaged by a carrier.

14. The combination of a transit-tube through which carriers are transmitted, a gate extending across the tube for controlling the passage of air therethrough, said gate being pivoted at one side of the tube and adapted to swing to permit the passage of a carrier along the tube, a sector of a cylinder secured outside of the tube and arranged concentrically with the pivotal axis of the gate, a piston connected with said gate and adapted to swing in said sector for controlling the position of the gate, suction apparatus for exhausting the air from said tube, said sector being adapted to be connected with said suction apparatus at each side of said piston or with an air-inlet at each side of said piston, one or more valves controlling said air-inlets and suction connections and normally urged into position for closing said gate, and a trip extending into the tube in front of said gate and adapted when engaged by a carrier to operate said valve or valves to open the gate, substantially as described.

15. The combination of a transit-tube through which carriers are transmitted, a branch passage communicating with said

tube and extending toward one side of the path of the carriers and having therein an opening for admitting air to the tube for driving a carrier along the same, suction apparatus for exhausting the air in advance of the carrier, a valve controlling the opening in said branch passage, said valve being normally urged to its closed position, means controlled by a change of air-pressure in said passage for causing said air-valve to open, and means for timing the closing of said air-valve.

16. The combination of a transit-tube through which carriers are transmitted; a valve adapted to admit air into the tube for driving the carriers; a cylinder and piston for controlling the opening and closing of said valve; suction apparatus for exhausting the air from said tube and cylinder; a by-pass connecting the spaces in said cylinder which are at opposite sides of said piston; and an air-passage connecting one end of said cylinder with the interior of said transit-tube and adapted, when air is admitted to the transit-tube, to permit said air to enter the cylinder and shift said piston for opening said air-valve.

17. The combination of a transit-tube through which carriers are transmitted; a valve adapted to admit air into the tube for driving carriers; a cylinder and piston for controlling the opening and closing of said valve; suction apparatus for exhausting the air from said tube and cylinder; a by-pass connecting the spaces in said cylinder which are at opposite sides of said piston; an air-passage connecting one end of said cylinder with the interior of said transit-tube, to permit said air to enter the cylinder and cause said piston to shift for opening said air-valve; and a valve controlling the flow of air from the transit-tube into the cylinder, said valve being normally open and being adapted to be closed by a current of air entering the transit-tube from said air-inlet valve.

18. The combination of a transit-tube through which carriers are transmitted; a valve adapted to admit air into the tube for driving carriers; a cylinder and piston for controlling the opening and closing of said valve; suction apparatus for exhausting the air from said tube and cylinder; a by-pass connecting the spaces in said cylinder which are at opposite sides of said piston; an air-passage connecting one end of said cylinder with the interior of said transit-tube and adapted, when air is admitted to the transit-tube, to permit said air to enter the cylinder and cause said piston to shift for opening said air-valve; and a check-valve adapted to prevent a return-flow of air from said cylinder toward the transit-tube.

19. The combination of a transit-tube through which carriers are transmitted; a branch passage communicating with said tube and extending toward one side of the path of the carriers and having therein an opening for admitting air to the tube for driving a carrier along the same; suction apparatus for exhausting the air in advance of the carrier; a valve controlling the opening in said branch passage; a hollow rod extending into said branch passage through said valve and adapted to open and close said valve; a piston and cylinder for shifting said rod; suction connection for exhausting the air from said cylinder at one side of said piston, the interior of said cylinder on the other side of the piston being in communication with the interior of said branch passage through said hollow rod; and a by-pass connecting the opposite ends of said cylinder, all arranged to cause said air-valve to open through an increase of air-pressure in said branch passage and to time the closing of said air-valve, substantially as described.

20. The combination of a transit-tube through which carriers are transmitted; a downwardly-disposed branch tube communicating with the interior of said transit-tube and open at its lower end; a vertically-disposed cylinder below said branch and in alinement therewith; a piston movably mounted in said cylinder and having a hollow rod extending upwardly into said branch tube, said rod having an opening at its upper end communicating with the interior of said tube and having an opening communicating with the interior of the cylinder above the piston; means for exhausting the air from said cylinder below the piston; a by-pass connecting the ends of said cylinder; a valve mounted on said rod and movable into and out of position for closing the open end of said branch tube through the movement of said piston; and a valve adapted to close the opening at the upper end of said rod, said last valve being normally urged to an open position and being adapted to be closed by a current of air flowing upwardly through said branch tube.

21. The combination of a transit-tube through which carriers are transmitted; a downwardly-disposed branch tube communicating with the interior of said transit-tube and open at its lower end; a vertically-disposed cylinder below said branch tube and in alinement therewith; a piston movably mounted in said cylinder and having a hollow rod extending upwardly into said branch tube, said rod having an opening communicating with the interior of said branch tube and having an opening communicating with the interior of the cylinder above the piston; means for exhausting the air from said cylinder below the piston; a by-pass connecting the ends of said cylinder; an air-inlet valve mounted on said rod and movable into and out of position for closing the open end of said branch tube through the movement of said piston; and a check-valve adapted to cut off the communication between said cylinder

and branch tube when the pressure in said branch tube falls below that in the upper end of the cylinder.

22. The combination of a transit-tube through which carriers are transmitted; a valve adapted to admit air into the tube for driving carriers; a cylinder and piston for controlling the opening and closing of said valve; suction apparatus for exhausting the air from said tube and cylinder; a by-pass connecting the spaces in said cylinder which are at opposite sides of said piston; an air-passage connecting one end of said cylinder with the interior of said transit-tube and adapted, when air is admitted to the transit-tube, to permit said air to enter the cylinder and shift said piston for opening said valve; a rod connecting said piston and air-valve, said rod having sliding connection with said valve to permit of considerable movement of said piston before the opening of said valve; and stops for limiting the relative sliding of said rod and valve.

23. The combination of a transit-tube through which carriers are transmitted; a downwardly-disposed branch tube communicating with the interior of said transit-tube and open at its lower end; a vertically-disposed cylinder below said branch tube and in alinement therewith; a piston movably mounted in said cylinder and having a hollow rod extending upwardly into said branch tube, said rod having an opening communicating with the interior of said branch tube and having an opening communicating with the interior of said cylinder above the piston; means for exhausting the air from the cylinder below the piston; a by-pass connecting the ends of said cylinder; an air-inlet valve having a limited longitudinal movement on said rod and adapted to open and close the open end of said branch tube through the movement of said piston; a second valve located within said branch tube, having a limited longitudinal sliding movement on said rod and adapted to control the communication between said branch tube and cylinder; said second valve being normally urged by gravity to open such communication and being adapted to be carried upward to cut off such communication by the inrushing air-current when said air-inlet valve is open, and a spring normally urging said piston upward to close said air-inlet valve.

Signed by me at Chicago this 11th day of November, A. D. 1905.

JOSEPH J. STOETZEL.

Witnesses:
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A. J. A. WILLIAMS.