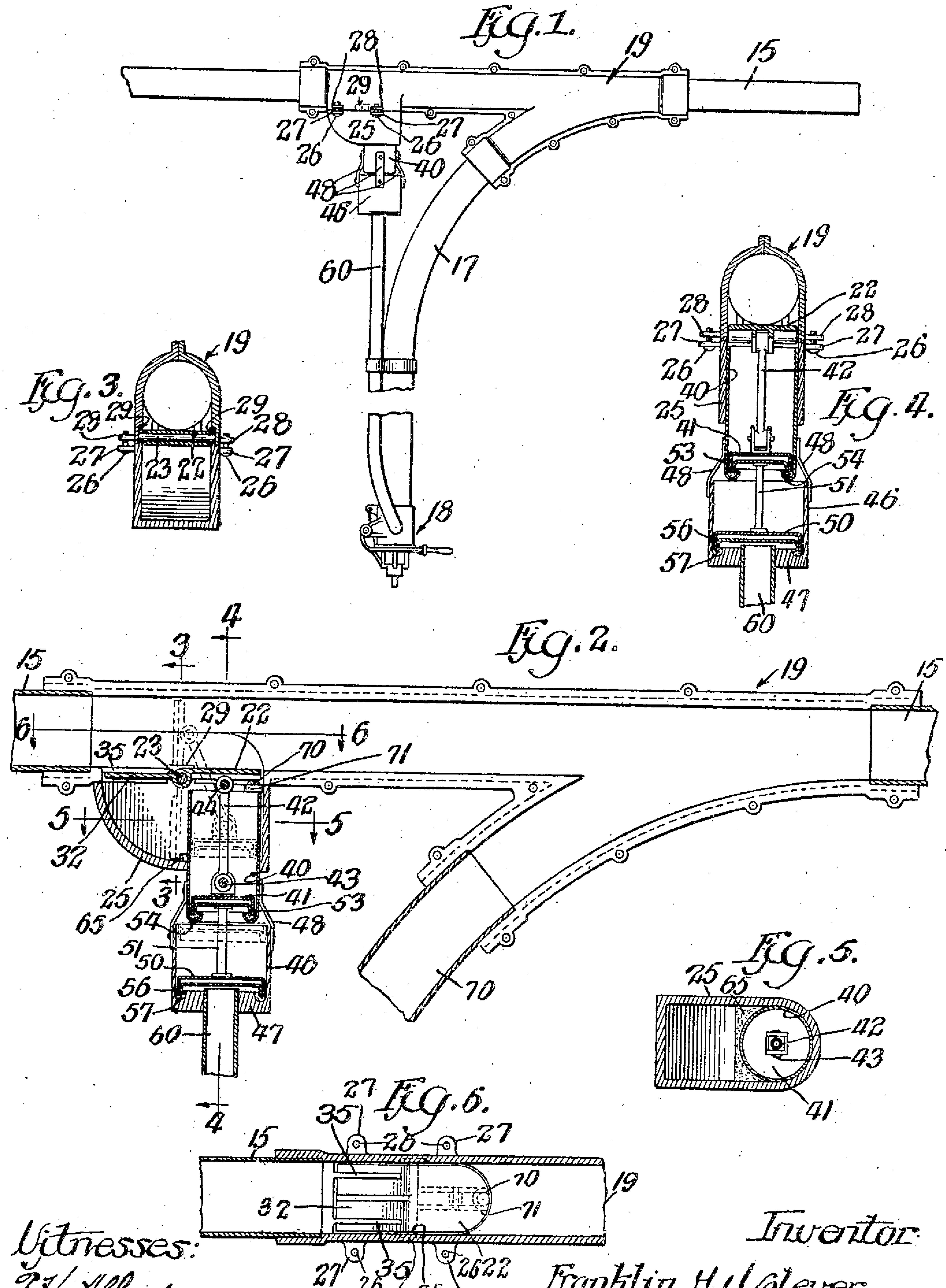
F. H. WOLEVER.

AUTOMATIC CUT-OFF FOR PNEUMATIC DESPATCH TUBE SYSTEMS.

APPLICATION FILED JULY 9, 1908.

929,909. **Patented Aug. 3, 1909.**

2 SHEETS—SHEET 1.



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2 SHEETS—SHEET 2.

Fig. 7.

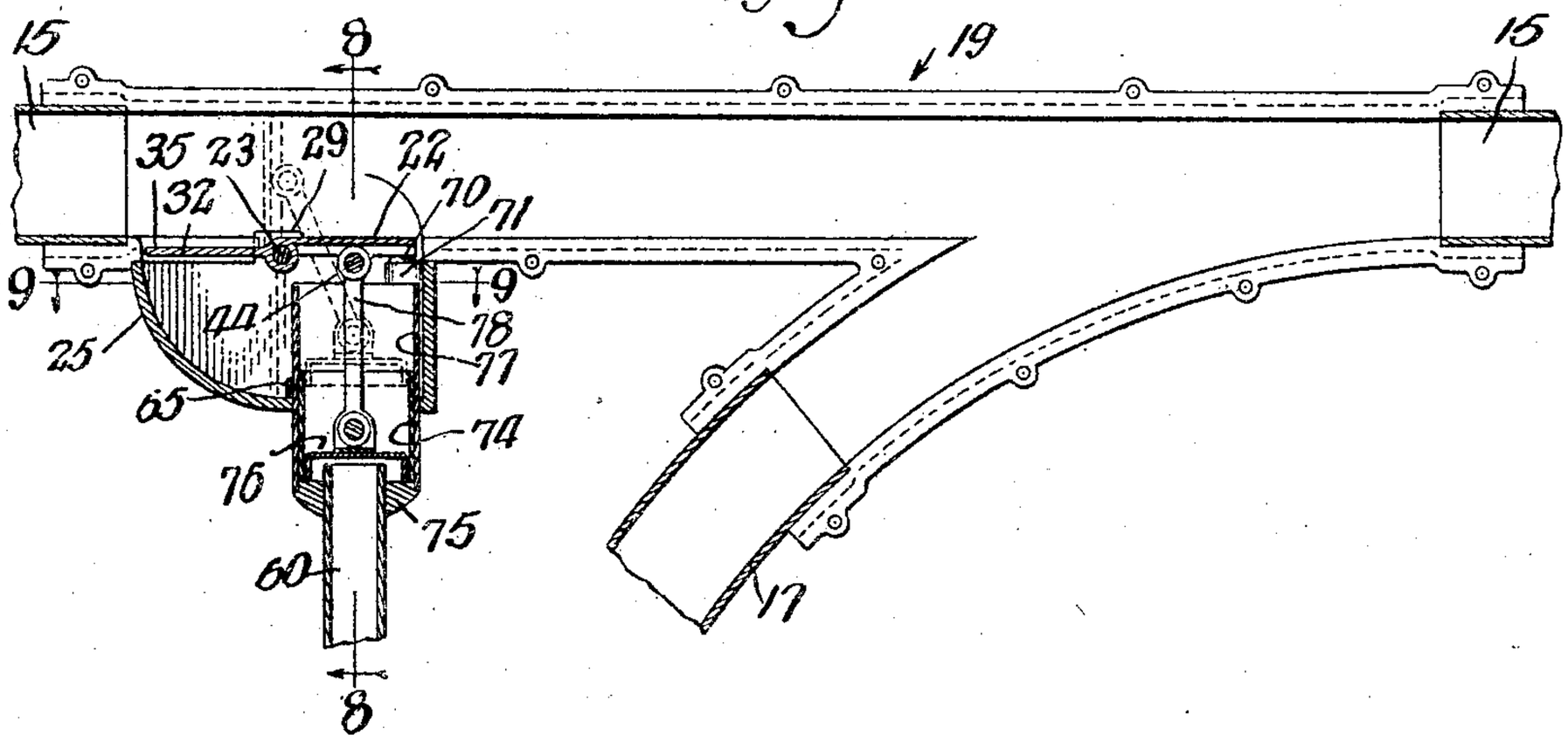


Fig. 8.

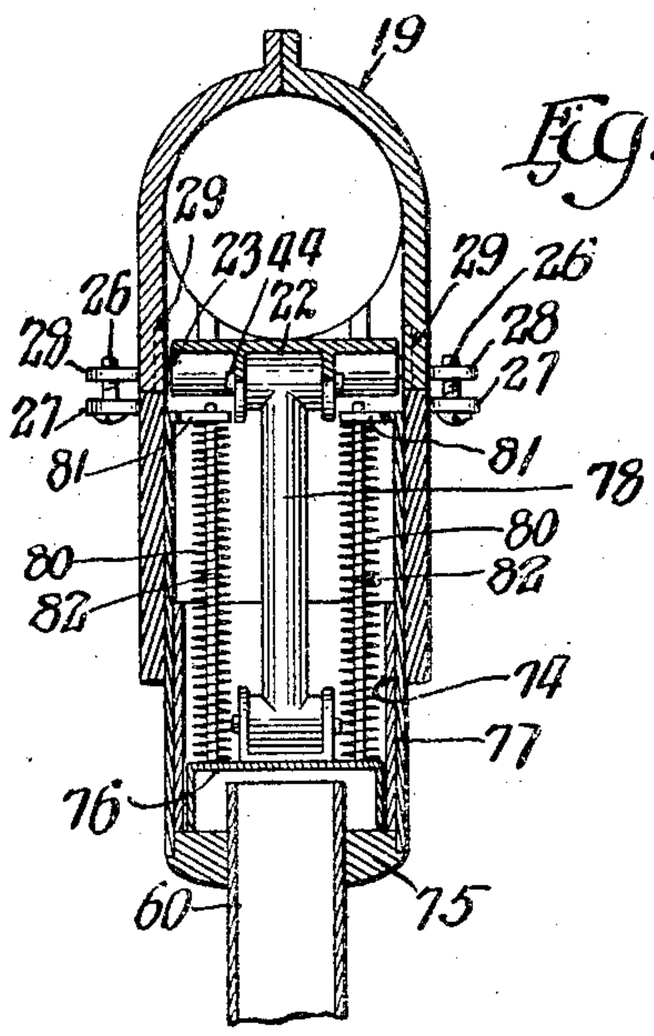
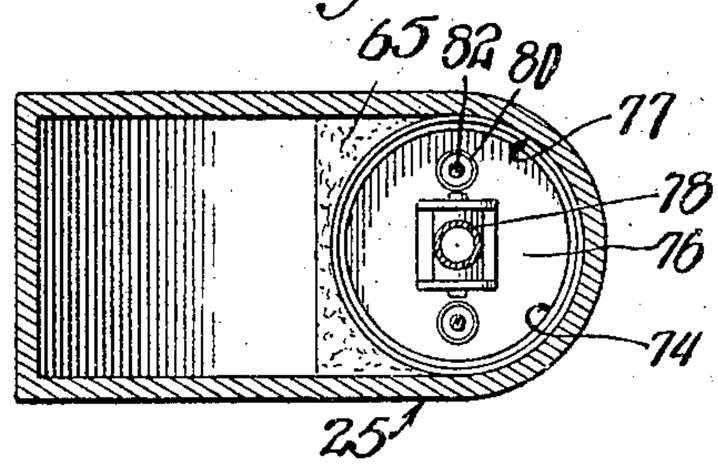


Fig. 9.



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UNITED STATES PATENT OFFICE.

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AUTOMATIC CUT-OFF FOR PNEUMATIC-DESPATCH-TUBE SYSTEMS.

No. 929,909. Specification of Letters Patent. Patented Aug. 3, 1909.

Application filed July 9, 1908. Serial No. 442,647.

To all whom it may concern:

Be it known that I, FRANKLIN H. WOLEVER, a citizen of the United States, and a resident of Chicago, in the county of Cook and State of Illinois, have invented certain new and useful Improvements in Automatic Cut-Offs for Pneumatic-Despatch-Tube Systems; and I do hereby declare that the following is a full, clear, and exact description thereof, reference being had to the accompanying drawings, and to the figures of reference marked thereon, which form a part of this specification.

This invention relates to improvements in sending devices for pneumatic despatch tube systems, and refers more specifically to a valve and operating device therefor that is arranged to close one part of the tube from the other in a manner to vary the pressure with the tube on one side of the valve relatively to the other side thereof. The valve herein shown is located in rear of a sending branch or opening and arranged to cut that part of the despatch tube and its sending branches in rear of the valve out of communication with the current inducing means, so that the pressure in that part of the tube thus cut off from the current inducing means will be reduced and thereby avoid cartridges contained within the despatch tube in rear of said valve clashing with cartridges entering said tube through the branch or opening associated with the valve. In other words, the mechanism herein shown constitutes an air shunting device which is arranged to increase the velocity of the air in the sending branch through which the cartridge is introduced to the tube relatively to the velocity of air in the tube in rear of the valve mechanism so as to insure the delivery of such cartridges to the tube without danger of clashing thereof with cartridges already in the tube and in rear thereof.

My improvements are herein shown as embodied in a vacuum or low pressure system.

The construction herein shown is an improvement of the similar construction illustrated in my prior application for U. S. Letters Patent, Serial No. 697,157, filed October 12th, 1907.

In the drawings:—Figure 1 is a side elevation of a portion of a despatch tube and a sending branch, showing my air shunting valve applied thereto. Fig. 2 is a longitudinal axial view of the parts shown in Fig. 1. Fig. 3 is a cross section, taken on line 3—3 of Fig. 2. Fig. 4 is a cross section, taken on line 4—4 of Fig. 2. Fig. 5 is a horizontal section, taken on line 5—5 of Fig. 2. Fig. 6 is a horizontal section, taken on line 6—6 of Fig. 2. Fig. 7 is a longitudinal vertical section of a despatch tube and receiving branch, showing a modified form of my improvements applied thereto. Fig. 8 is a vertical section, taken on line 8—8 of Fig. 7. Fig. 9 is a horizontal section, taken on line 9—9 of Fig. 7.

As shown in the drawings, 15 designates the main trunk line of a despatch tube system arranged to extend from the several salesmen's stations to a cashier's station, and 17 designates a sending branch provided at its lower end with a sending box 18 of any suitable form. The said branch is joined to the despatch tube through the medium of a junction fitting 19 which may be made of cast metal and is shown as composed of two halves or sections bolted together at their central line of junction.

Located within the junction fitting 19, or it may be located in the tube itself, and in rear of the sending branch 17, with respect to the direction of passage of the cartridges through the line, is a valve 22 which is pivotally mounted on a transverse rock shaft 23, shown as located below the path of the cartridges. As herein shown, the said rock shaft 23 is mounted in the upper part of the side walls of a chamber or box 25 which is fitted and attached to the under side of the junction fitting. The said box is open at its upper side and fits at its margins against the lower side of the junction fitting around an opening therein, whereby it is in communication with the tube. The parts are fastened together by bolts or screws 26, 26 extending through overlapping lugs 27, 28 of the box and junction fitting. The upper margins of the side walls of the box are provided with lugs 29, 29 in which the ends of the rock shaft 23 are mounted, and said lugs fit in sockets formed in the inner faces of the side walls of the junction fitting, as shown in Fig. 3. Thus the shaft does not extend through the walls of the fitting and no provision is required to provide air tight joints for the shaft to prevent the leakage of air into the system at these points.

The valve normally occupies a horizontal

position, as shown in Figs. 2, 4 and 6, below the path of the cartridge. Means are provided which operate to swing the valve in a vertical position across the bore of the fitting, as indicated in dotted lines in Fig. 2, at a time when a cartridge is placed in the sending box 18 of the branch 17, so as to cut off the part of the tube in rear of said valve from the vacuum or current inducing means. Said valve is a balanced valve, it being provided on the remote side of its pivot with a pneumatically controlled balancing wing 32 which is subjected to the same pressure as the valve proper. The balancing wing of the valve swings downwardly into the box 25 when the valve is swung into its vertical or closing position. Said wing lies horizontal when the valve is open in a plane slightly lower than the plane of the valve, as herein shown. The balancing wing 32 is made relatively longer than the valve so as to counterbalance the force of the air current passing through the tube when the valve is swung upwardly to its closing position.

In order to prevent a cartridge dropping into the upper end of the box 25, should the cartridge be forced to this point at a time when the valve is in its closing position, I provide horizontal bridge bars 35, 35 which extend from the rear wall of the said box, at its upper margin, toward the valve, said bridge bars being in position to support the forward end of a cartridge which may reach this point.

As shown in Figs. 1 to 6, inclusive, the valve is pneumatically operated both to open and close the same. I have herein shown one form of pneumatically operated mechanism for effecting the opening and closing of the valve which is made as follows: 40 designates a cylinder which extends upwardly into the box 25 from the lower side thereof and is fitted with an air tight joint between the same and said box. Said cylinder is open at its lower end to the atmosphere and communicates at its upper end with the valve. It contains a piston 41 which reciprocates therein and is connected by a link 42 with the valve 22. Said link is pivotally connected at its lower end with the piston through the medium of a pivot pin 43 extending through lugs on the upper end of the piston, and is likewise connected with the lower side of the valve through the medium of a pivot pin 44 affixed to the lugs on the lower face of the valve. Located below and in axial alinement with the cylinder 40 is a larger cylinder 46 which is open at its upper end and is closed at its lower end by a wall 47. Said cylinder is herein shown as carried by and suspended from the smaller cylinder by hangers 48. Contained in the larger cylinder is a piston 50 which is connected with the smaller piston 41 by a connecting rod 51. The smaller piston 41 is provided with a depending marginal flange 53 which engages a packing contained in an annular groove 54 at the lower end of the smaller cylinder, formed as herein shown, by turning the lower end margins of the cylinder wall inwardly. When said piston 41 is in its lowermost position an air tight joint is provided between the piston and cylinder which prevents the leakage of air past the same into the system. A like air tight joint is provided for the lower or larger piston 50, comprising a marginal depending flange 56 thereon which engages a packing in an upwardly facing annular groove 57 in the bottom wall 47 of the cylinder.

The valve actuating mechanism is controlled to close the valve by devices which are operated by the opening of the sending box 18, or otherwise introducing a cartridge into the system. Said valve may be operated by hand. The controlling devices for the valve actuating mechanism herein shown is made as follows: The larger cylinder 46 is connected, beneath the piston 50 therein, with the sending branch or its sending box by a small pipe 60. When the sending box is closed, therefore, the lower side of the larger piston 50 is subjected to the lower pressure of the system, while the upper side thereof is subjected to atmospheric pressure. The upper side of the smaller piston 41 is also subjected to the lower pressure of the system, while the lower side is subjected to atmospheric pressure. By reason, however, of the differential areas of the pistons 50 and 41, the lower pressure acting on the lower side of the larger piston 51 serves to hold the piston in its lowermost position and thereby to hold the valve open. When, however, the sending gate of the branch 17 is opened, the vacuum is broken, or atmospheric pressure established, in said pipe 60 so that the pressure on both sides of the larger piston is equalized. Atmospheric pressure acting on the lower side of the smaller piston, however, is greater than the pressure acting on the upper side of the piston, which is the normal pressure of the system. Therefore, when the pipe 60 is open to the atmosphere the atmospheric pressure acting on the lower side of the smaller piston raises said piston in the cylinder and swings the valve to its closed position, indicated in dotted lines in Fig. 2. After the cartridge has been delivered from the branch to the trunk line 15, the sending box is closed and the lower pressure of the system is again established in the pipe 60 and on the lower side of the larger piston 51. At this time atmospheric pressure acts on the upper side of said larger piston and the lower side of the smaller piston against the lower pressure of the system acting on the other sides of the pistons; but by reason of the greater area of the lower or larger piston, the higher pressure on the

lower piston overcomes that acting on the upper piston and moves said pistons downwardly to open the valve.

The balancing wing of the valve is adapted to engage, when the valve is in its closed position, a seat 65 which lies against the cylinder 41 and extends from side to side of the box 25, as shown in Figs. 2 and 5. Said seat may be made of a yielding material to constitute a buffer to yieldingly arrest the movement of the valve. The face of said seat engaged by the wing has an area substantially equal to the area added to the wing to counterbalance the force of the air current. When the valve is in its closed position, therefore, a part of its area equal to the area of the contacting space of the seat is cut off from the influence of the lower pressure and the effective areas of the valve and wing subjected to the pressures on both sides of the valve and wing are equalized. Therefore, when the valve is closed, it is balanced. The balancing of the valve has the important advantage of enabling the valve to be quickly moved from its closed position when the lower pressure is again reëstablished in the lower end of the larger cylinder 46, as compared to a valve which is not balanced, thus shortening the period to close the valve and to reëstablish the working pressure throughout the system.

A buffer 70 is provided against which the valve strikes when it is moved to its open position, said buffer being herein shown as mounted on a lug 71 extending inwardly from the upper end of the casing or box 25 in position to engage the free end of the valve, as best shown in Fig. 2.

In Figs. 7, 8 and 9 I have shown a construction wherein the valve 22 is closed by air pressure when the pipe 60 is open to the atmosphere, and is swung to its horizontal or open position by spring pressure. As shown in said figures, 74 designates a cylinder which is in open communication at its upper end with the tube and is closed at its lower end by an end wall 75 through which the air pipe 60 enters for communication with the lower end of said cylinder below the piston 76 thereof. The said cylinder fits closely within a cylindric casing 77 that extends upwardly through an opening in the bottom wall of the box 25 and fits tightly in said opening. Said piston 76 is connected with the valve 22 by a link 78 which is pivotally connected with the cylinder in a manner similar to the construction before described. The piston is moved upwardly to swing the valve in its closed position, as indicated in dotted lines, by atmospheric pressure entering the lower end of the cylinder through the pipe 60 at a time when said pipe is opened, as when the sending box is opened for the admission of a cartridge. Said piston is moved upwardly at this time against the action of the closing springs 80, 80 which, when the lower pressure is reëstablished in the pipe 60 and in the lower end of the cylinder, returns the piston and valve to their normal lowermost positions to open the valve. The said springs 80, 80 have the form of spiral, expansively acting springs which are interposed between the upper end of the piston 76 and lugs 81, 81 extending inwardly from the upper end of the cylinder casing 77. Said springs are held in place by means of rods 82, 82 extending therethrough, said rods being attached at their lower ends to the piston and sliding at their upper ends through guide apertures in said lugs. When the piston moves upwardly to close the valve 22 it compresses the springs 80 between the piston and the lugs 81, and when lower pressure is reëstablished in the lower end of the cylinder the springs act on the piston to quickly turn the valve to its horizontal or open position.

The sending box is herein shown as provided with a hinged sending gate like that shown in my prior application before mentioned. The said gate, whether of the construction here shown or of other construction, is preferably equipped with means for slowly cutting off admission of air to the branch after a cartridge has been inserted thereinto, in order to insure the complete delivery of the cartridge to the despatch tube. For this purpose said gate may be provided with a check valve similar to that shown in my aforesaid application.

I claim as my invention:—

1. In a pneumatic despatch tube system, the combination with a despatch tube provided with a terminal to receive a cartridge, of an air valve adapted to close the tube in rear of said terminal and arranged to be pneumatically balanced, when closed, and means operating to close the valve upon the opening of said terminal.

2. In a pneumatic despatch tube system, the combination with a despatch tube provided with a terminal to receive a cartridge and a gate for normally closing said terminal, of an air valve adapted to close the tube in rear of said terminal and arranged to be pneumatically balanced, when closed, and pneumatic means operating, upon insertion of a cartridge into the terminal, to close said valve.

3. In a pneumatic despatch tube system the combination with a despatch tube and its sending terminal, of an air valve for closing the tube, a chamber at one side of and communicating with said tube, said valve being provided with a wing which, when the valve is closed, occupies said chamber and is arranged to pneumatically balance the valve, and means for operating said valve upon the opening of said terminal.

4. In a pneumatic despatch tube system,

the combination with a despatch tube and its sending terminal provided with a gate, of an air valve arranged to close the tube in rear of said terminal, a chamber located at the side of and in communication with said tube, said valve being provided with a balancing wing which, when the valve is in its closed position, occupies said chamber and is arranged to pneumatically balance the valve and pneumatic means for operating said valve by the opening and closing of said gate.

5. In a pneumatic despatch system, the combination with a main tube, and its sending branch or opening of an air valve arranged to close the tube in rear of said air branch or opening and provided with a balancing wing, a chamber located inside of and in communication with said tube to receive the balancing wing when the valve is in its closing position, and means for operating said valve, said balancing wing being made of greater area than the valve to counterbalance the force of the air current acting against the valve when it is being closed.

6. In a pneumatic despatch system, the combination with a main tube and its sending branch or opening, of an air valve arranged to close the tube in rear of said branch or opening and provided with a balancing wing, a chamber located at the side of and in communication with said tube to receive the balancing wing when the valve is in its closing position, and means for operating said valve, said balancing wing being made of greater area than the valve to counterbalance the force of the air current acting against the valve when it is being closed, and a seat in said chamber which said wing engages when the valve is in its closing position, operating to decrease the effective area of the balancing wing.

7. In a pneumatic despatch tube system the combination with a main tube and its sending terminal, of an air valve located in rear of said terminal, and means controlled by the opening and closing of said terminal, acting in opposite directions to positively open and close said valve.

8. In a pneumatic despatch tube system, the combination with a main tube and its sending terminal provided with a sending gate, of an air valve located in rear of said sending terminal, and pneumatically operated means, controlled by the opening and closing of said gate, acting in opposite directions to positively open and close said valve.

9. In a pneumatic despatch tube system, the combination with a main tube and its sending branch or opening, of an air valve for closing the tube in rear of said branch or opening comprising two pistons of differential areas operatively connected with said valve, and cylinders in which said pistons are contained.

10. In a pneumatic despatch tube system, the combination with a main tube and its sending branch or opening, of an air valve for closing the tube in rear of said branch or opening comprising two pistons of differential areas operatively connected with said valve, and cylinders in which said pistons are contained, each of said cylinders being subjected at one end to the operating pressure of the system and being subjected at its other end to atmospheric pressure.

11. In a pneumatic despatch tube system, the combination with a main tube and its sending branches or openings, of air valves associated with said branches or openings, each arranged when closed, to retard the velocity of the air in the tube in rear of the same and to thereby accelerate the velocity of the air through its branch to the tube, and means for operating the valves upon the insertion of cartridges in the system comprising two pistons of differential areas associated with each valve and cylinders in which said pistons are contained.

12. In a pneumatic despatch tube system, the combination with a main tube and its sending branches or openings, provided with sending gates, of air valves associated with said branches, each arranged, when closed, to retard the velocity of air in the tube in rear of the same and to thereby accelerate the velocity of air through its branch to the tube and means for operating said valves, each comprising two cylinders of different diameters and pistons reciprocating therein and connected with the valve, said two pistons being each subjected at one side to the operating pressure of the system and at the other side thereof to atmospheric pressure, and means operated by the opening of the gate for equalizing the pressure on both sides of the larger piston to permit the smaller piston to close said valve.

13. In a pneumatic despatch tube system, the combination with a main tube and its sending branch or opening, of a valve for closing the tube in rear of said branch or opening and means for operating the valve comprising a cylinder communicating with the said tube, a piston in said cylinder connected with said valve, a second larger cylinder axially in line with the said first cylinder, and a piston reciprocating in the larger cylinder, connected with the piston of the smaller cylinder.

14. In a pneumatic despatch tube system, the combination with a main tube and its sending branch or opening, of a valve for closing the tube in rear of said branch or opening, and means for operating the valve comprising a cylinder communicating at one end with the tube and at its other end with the atmosphere, a piston in said cylinder connected with said valve, a larger cylinder axially in line with the said first cylinder, a

piston reciprocating in the larger cylinder, connected with the piston of the smaller cylinder, said larger cylinder communicating at one end with the atmosphere, an air pipe communicating at one end with the other end of said larger cylinder and at its other end with the air space and system, and means for breaking the communication between the latter end of said larger cylinder and the air space of the system to close the valve, the valve being opened when the pressure of the system is reëstablished in said latter end of the larger cylinder.

15. In a pneumatic despatch tube system the combination with a main tube and its sending branch provided with a sending gate, of an air valve for closing the tube in rear of said branch and means for actuating said valve comprising a cylinder communicating at one end with the said tube, and at its other end with the atmosphere, a piston in said cylinder connected with said air valve, a larger cylinder open at one end to the atmosphere and closed at its other end, a piston in said larger cylinder connected with the piston of the smaller cylinder, a pipe communicating at one end with the closed end of said larger cylinder and at its other end with said sending branch, whereby when the sending gate is open atmospheric pressure is established in the closed end of the cylinder to equalize the pressure on both sides of the larger piston, and the atmospheric pressure acts on the smaller cylinder to close the valve, said valve being opened when the pressure of the system is reëstablished in the closed end of the larger cylinder.

16. In a pneumatic despatch tube system the combination with a main tube and its sending branch or opening, of an air valve adapted to close the tube in rear of said branch or opening, a balancing wing connected to the valve, a chamber beneath said tube into which said balancing wing swings as the air valve is swung upwardly in its closing position and bridge bars extending across the space above said wing.

In testimony, that I claim the foregoing as my invention I affix my signature in the presence of two witnesses, this 1st day of July A. D. 1908.

FRANKLIN H. WOLEVER.

Witnesses:
W. L. Hall,
G. R. Wilkins.