No. 869,337. PATENTED OCT. 29, 1907.

C. F. STODDARD.

PNEUMATIC DESPATCH TUBE APPARATUS.

APPLICATION FILED JULY 28, 1906.

4 SHEETS—SHEET 1.

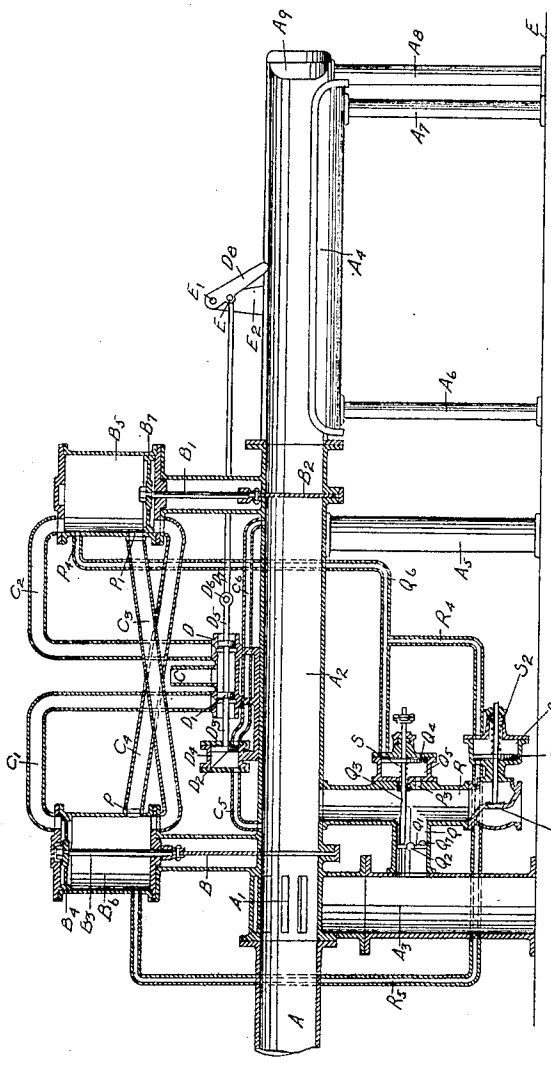

Fig. 1.

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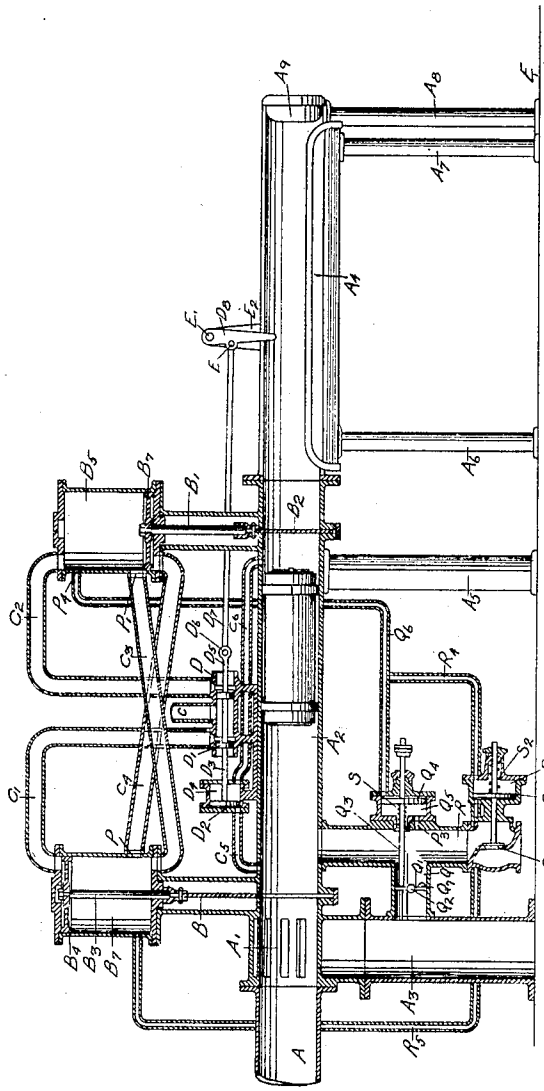

Fig. 2

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PNEUMATIC DESPATCH TUBE APPARATUS.

APPLICATION FILED JULY 23, 1906.

4 SHEETS—SHEET 3.

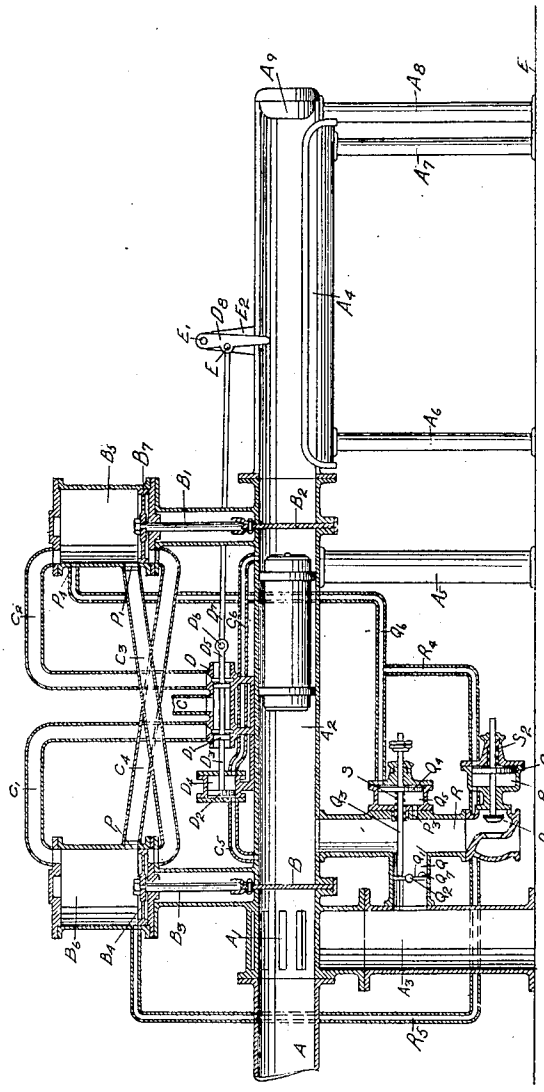

Fig. 3.

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APPLICATION FILED JULY 28, 1906.

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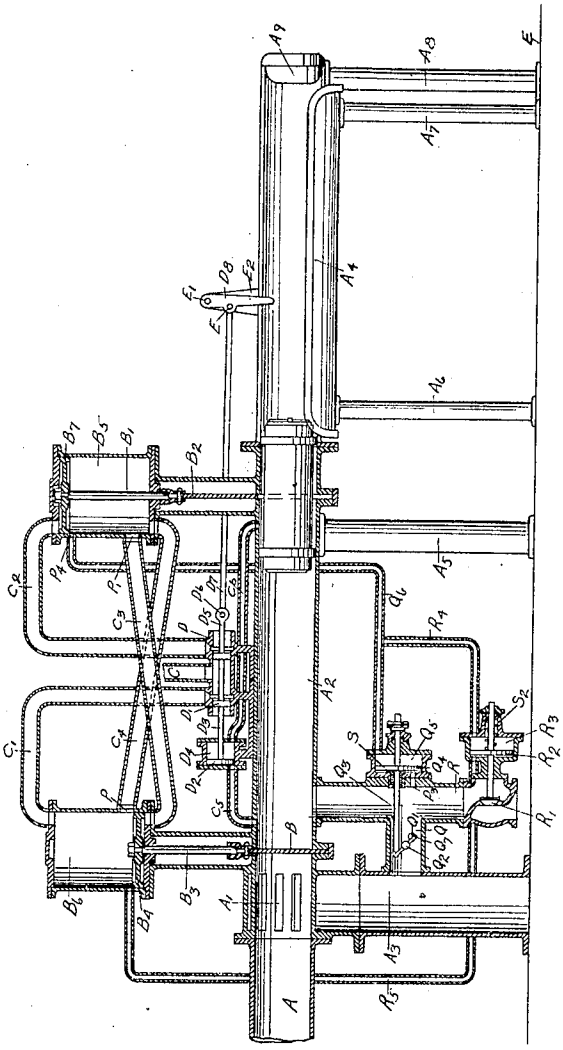

Fig. 4.

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UNITED STATES PATENT OFFICE.

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PNEUMATIC-DESPATCH-TUBE APPARATUS.

No. 869,337. Specification of Letters Patent. Patented Oct. 29, 1907.

Application filed July 28, 1906. Serial No. 328,195.

To all whom it may concern:

Be it known that I, CHARLES F. STODDARD, of Boston, in the county of Suffolk and State of Massachusetts, have invented certain new and useful Improvements in Pneumatic-Despatch-Tube Apparatus, of which the following is a specification.

My invention relates to improvements in receiving terminals for pneumatic despatch tube apparatus, and especially to a device for controlling the position of the carrier between the gates until the front or outer gate is wide open ready to discharge the carrier.

In the accompanying drawings which illustrate a construction embodying my invention, Figure 1 is a longitudinal section of the double-sluice gate closed receiver showing the different members of the terminal in their relative positions when the terminal is ready to receive the carrier. Fig. 2 is a longitudinal section of the same terminal showing the different members in their relative positions just after a carrier has entered the terminal. Fig. 3 is a longitudinal section of the same terminal showing the different members in their relative positions after a carrier has entered the terminal and the back gate is closed but the front gate has not opened. Fig. 4 is a longitudinal section of the same terminal showing the different members in their relative positions as the terminal is discharging a carrier.

Like letters of reference refer to like parts throughout the several views:

The main transmission tube A is located in alinement with the compression or receiving chamber A^2 of the terminal and beyond the slotted casing A′ through which the pressure passes into the return tube A^3. Located on the upper side of the compression or receiving chamber A^2 is the cylinder D^4 connected with the compression or receiving chamber A^2 by the pipes C^5 and C^6 and located within said cylinder is the piston D^2, connected by the rod D^3 with the piston valve D′ which in turn is connected by the rod D^5 to the rod D^7 by the pivot joint D^6. The rod D^7 is pivotally connected with the finger D^8 at E and this finger D^8 swings on the bracket E^2 to which it is pivotally connected at E′ and said finger extends into the path of travel of the discharging carrier (Fig. 3).

The air supply for operating the inner and outer gates B and B^2 in the terminal enters through the pipe C into the valve casing D and is conveyed to the tops of the inner and outer cylinders B^6 and B^5 by the pipes C′ and C^2, and operates the pistons B^4 and B^7 to which are respectively connected the gates B and B^2 by the piston rods B^3 and B′. The carrier coming into the compression chamber A^2 is brought to a stop by the compression of the air in front of it as the gate B^2 is closed. This pressure passes through the pipe C^6 into the cylinder D^4 and forces the piston D^2 to the end of the cylinder D^4 as shown in Fig. 2. This movement of the piston D^2 moves the piston valve D′ from the position shown in Fig. 1 to that shown in Fig. 2 and also moves the finger D^8 into the position shown in Fig. 2.

The air supply entering the valve casing D through the pipe C passes through the pipe C′ to the upper side of the piston B^4 in the cylinder B^6 and closes the gate B. As the piston B^4 reaches the lower end of the cylinder B^6, it passes the port P′ which admits the pressure to the under side of the piston B^7 in the cylinder B^5 through the pipe C^4. This pressure raises the piston B^7 to the upper side of the cylinder B^5, causing the raising of the gate B^2 which is connected to piston B^7 by the piston rod B′. From the return tube A^3 is a pipe or by-pass Q leading to the compression or receiving chamber A^2. The opening in this pipe Q is controlled by the butterfly valve Q′ pivoted at Q^2 and operated by the piston rod Q^3 which is secured to the piston Q^4 which operates in the cylinder Q^5. The front side of the cylinder Q^5 is connected with the pipe Q by means of the port P^3 on the side of the butterfly valve Q′ nearest the compression or receiving chamber A^2. The opposite side of the cylinder Q^5 is connected by the pipe Q^6 to the cylinder B^5 and this pipe Q^6 enters the cylinder B^5 at a point P^4 which is just below the under side of the piston B^7 when the piston B^7 is in its extreme upper position as shown in Fig. 4. The spring S tends to force the piston Q^4 into the position shown in Fig. 1.

Referring to Fig. 1, it will be seen that the pressure coming through the pipe C into the valve casing D is transmitted through the pipe C^2 to the upper side of the cylinder B^5 and through the pipe Q^6 to the cylinder Q^5 tending to hold the piston Q^4 in the position shown in Fig. 4, and the pressure in the receiving chamber A^2 is communicated to the opposite side of the piston Q^4 through port P^3, and as the pressure in the receiving chamber A^2 and the supply pipe C are the same, the piston Q^4 is in balance as far as the pressure on either side of it is concerned, and the spring S holds it in the position shown in Fig. 1.

When the carrier enters the terminal, the valve D′ is thrown into the position shown in Fig. 2 as before explained, and the top of the cylinder B^5 is connected to the atmosphere through the pipe C^2 and the valve case D, the ends of which are open to the atmosphere. The pressure in the side of the cylinder Q^5 to which the pipe Q^6 is attached is always the same as at the point in the cylinder B^5 where the pipe Q^6 enters the same, so that as soon as a carrier enters the terminal and the pressure in the upper part of the cylinder B^5 is reduced to atmospheric pressure, the pressure on the side of the cylinder Q^5 to which the pipe Q^6 is attached, is also reduced to atmospheric. As the piston Q^4 was

already in the position shown in Fig. 1, this reduction of the pressure on the side of the cylinder Q^5 to which the pipe Q^6 is attached, does not change the position of the piston Q^4 but allows the pressure in the pipe Q which is the same as in the receiving chamber A^2 to augment the pressure of the spring S and tends to hold the piston Q^4 more securely to the side of the cylinder Q^5 on which the pipe Q^6 is attached. As soon as the gate B is closed, communication between the transmission tube A and the receiving chamber A^2 is shut off. Communication between the return tube A^3 and the receiving chamber A^2 is already closed by the butterfly valve Q′ in the pipe Q. As soon as the gate B^2 opens slightly, the pressure in the receiving chamber A^2 is precipitated into the atmosphere through this slight opening and the pressure in the part of the tube Q on the side of the butterfly valve Q′ nearest the receiving chamber A^2 is also reduced to atmospheric. The piston Q^4 is now in balance as far as the pressure is concerned and the spring S holds it in the position shown in Figs. 1 and 2. When the piston B^7 reaches the position shown in Fig. 4, the gate B^2 entirely opens the passage between the receiving chamber A^2 and the table A^4. When the piston B^7 is in its uppermost position, the pressure under the piston B^7 is communicated to the cylinder Q^5 through the pipe Q^6 and the piston Q^4 is forced into the position shown in Fig. 4 thereby opening the butterfly valve Q′ and admitting pressure from the return tube A^3 to the receiving chamber A^2 back of the carrier, and this pressure discharges the carrier from the receiving chamber A^2 onto the table A^4.

In the position of the parts shown in Fig. 3, the finger D^8 is in the path of the carrier which strikes it as it comes onto the table A^4. This finger D^8 moves the piston D′ from the position shown in Fig. 2 to that shown in Fig. 1 thereby opening the pipe C′ to the atmosphere to allow the pressure in it and the cylinder B^6 to exhaust to the atmosphere. The pressure in the pipe C then passes through the pipe C^2 to the cylinder B^5 above the piston B^7 and forces it down into the position shown in Fig. 1. As the piston B^7 reaches the lower end of the cylinder B^5 it passes the port P′ which allows the pressure to pass through the pipe C^3 to the under side of the piston B^4 in the cylinder B^6, thereby raising the piston B^4 to the position shown in Fig. 1 which places the apparatus in a position to receive another carrier, and the pressure on each side of the piston Q^4 being equal, the spring S throws the piston Q^4 to the position shown in Fig. 1 and the counterweight Q^7 attached to the butterfly valve Q′ returns the butterfly valve Q′ to the position shown in Fig. 1. The pipe C^5 is connected with the cylinder D^4 and is for the purpose of balancing the piston D^2 when the machine is not in operation, and is in communication with the inner end of the receiving chamber A^2. A^9 is a suitable bumper to stop the carrier as it reaches the end of the table A^4. E is the floor line. A^5, A^6, A^7 and A^8 are suitable supports.

The operation and construction so far described are similar to that shown and described in my application Serial No. 328,194 filed July 28, 1906.

The pipe R is connected on one side with the pipe Q between the butterfly valve Q′ and the receiving chamber A^2. This is an indirect means of connecting the pipe R with the back end of the receiving chamber A^2. At the other end, the pipe R is connected with the atmosphere through the valve R′ which is controlled by the piston R^2 which operates in the cylinder R^3. The spring S^2 tends to hold the piston R^2 in the position shown in Fig. 1. The side of the cylinder R^3 upon which is placed the spring S^2 is connected with the top of the cylinder B^5 through the pipe R^4 to the pipe Q^6. The opposite side of the cylinder R^3 is connected with the lower side of the cylinder B^6 by the pipe R^5 which enters the cylinder B^6 at a point just above the piston B^4 when it is in the position shown in Fig. 3. When this receiving terminal is used at a point of the pneumatic tube line where the pressure is excessively high, a condition arises which is not met with except under high pressure, and this condition is as follows: After the carrier is stopped in the receiving chamber, as shown in Fig. 3, the pressure, both in front of the carrier and back of the carrier, is the same. When the gate B reaches the position shown in Fig. 3, the pressure in front of the carrier and back of the carrier, provided there is no valve R′, is the same as in the transmission tube A. As soon as the front or outer gate B^2 opens slightly, the pressure in front of the carrier is dissipated into the atmosphere, and the air back of the carrier which is at the same pressure (as before explained,) as in the transmission tube A, suddenly expands and forces the carrier against the gate B^2 before the gate B^2 can rise to the position shown in Fig. 4 to allow the carrier to discharge under it. It is to overcome the striking of the carrier against this gate that the valve R′ is placed in the position shown.

The operation of the valve R′ is as follows: When the terminal is in its normal position as shown in Fig. 1, the pressure in the pipe Q^6 which is in communication with the upper end of the cylinder B^5 is the same as the pressure in the pipe R^5 which is in communication with the lower side of the cylinder B^6 and the piston R^2 is in balance as far as the pressure is concerned. The valve R′, however, is held to its seat by the pressure from the receiving chamber A^2 and by the spring S^2. When a carrier enters the terminal and throws the valve D′ to the position shown in Fig. 2, the pressure in the pipe R^4 through Q^6 and the pipe R^5 is reduced to atmospheric, leaving the piston R^2 still in balance. When the piston B^4 reaches the position shown in Fig. 3, the pressure on top of the piston B^4 is communicated through the pipe R^5 to the side of the piston R^2 which is nearest the valve R′ and this pressure throws the piston R^2 to the position shown in Fig. 3, thereby opening the valve R′ and reducing the pressure in the rear end of the receiving chamber A^2 to atmospheric. At practically the same instant the gate B^2 opens, thereby allowing the pressure in front of the carrier to precipitate into the atmosphere and reducing the pressure in front of the carrier to atmospheric pressure, thereby leaving the carrier in balance with no tendency to force it against the gate B^2 while it is opening. When the piston B^7 reaches the position shown in Fig. 4, the pressure under the piston B^7 passes through the pipe Q^6 to the pipe R^4 to the side of the piston R^2 on which is located the spring S^2, thereby bringing the piston R^2 into balance as far as pressure is concerned. The spring S^2 then throws the piston R^2 into the position shown in Fig. 1 closing the valve R′. At this same instant, the pressure in the pipe Q^6 forces

the piston Q^4 into the position shown in Fig. 4 and the carrier is discharged upon the table, as before explained, by the pressure from the tube A^3 through the pipe or by-pass Q.

Having thus described the nature of my invention and set forth a construction embodying the same, what I claim as new and desire to secure by Letters Patent of the United States:

1. In an apparatus of the character described, a transmission tube, a terminal communicating with said tube, an inner and an outer gate closing the same, a source of air pressure for operating said gates, a by-pass for leading the pressure of the transit tube to the terminal between said gates, a valve controlling said by-pass, an opening from said by-pass to the atmosphere, a valve controlling said air opening and adapted to open to relieve the pressure behind the carrier in the terminal upon the closing of the inner gate and to close upon the opening of the outer gate, and mechanism for operating said by-pass valve to admit the pressure of the transit tube to the terminal to discharge a carrier upon the outer gate reaching its open position.

2. In an apparatus of the character described, a transit tube, a terminal communicating with said tube, an inner and an outer gate closing the same, an inner and an outer cylinder each having a piston connected to said gates, a source of air-pressure for operating said pistons, communication between said cylinders and said source of air pressure, a valve for opening and closing said communication to each cylinder alternately, mechanism operated by the pressure in the tube for normally closing communication between said source of compressed air and the inner cylinder, a connection between the inner cylinder and the outer cylinder for leading the pressure from the outer cylinder to the inner cylinder to open the inner gate after the outer gate is closed, a by-pass leaving the pressure of the transit tube to the terminal between said gates, a valve controlling said by-pass, an opening from said by-pass to the atmosphere, a valve controlling said air opening and adapted to open to relieve the pressure behind the carrier in the terminal upon the closing of the inner gate and to close upon the opening of the outer gate, and mechanism for operating said by-pass to admit the pressure of the transit tube to the terminal to discharge a carrier upon the outer gate reaching its open position.

3. In an apparatus of the character described, a transmission tube, a terminal communicating with said tube, an inner and an outer gate closing the same, an inner and an outer cylinder each having a piston connected to said gates, a source of air pressure for operating said pistons, communication between said cylinders and said source of air pressure, a valve for opening and closing said communication to each cylinder alternately, mechanism operated by the pressure in the tube for normally closing communication between said source of compressed air and the inner cylinder, mechanism operated by air compressed by the carrier for operating said valve to open communication between said source of compressed air and the inner cylinder to close the inner gate and to close communication between said source of compressed air and the outer cylinder to open the outer gate, a connection between the inner cylinder and the outer cylinder for leading the pressure from the outer cylinder to the inner cylinder to open the inner gate after the outer gate is closed, a by-pass for leading the pressure of the transit tube to the terminal between said gates, a valve controlling said by-pass, an opening from said by-pass to the atmosphere, a valve controlling said air opening and adapted to open to relieve the pressure behind the carrier in the terminal upon the closing of the inner gate and to close upon the opening of the outer gate, and mechanism for operating said by-pass valve to admit the pressure of the transit tube to the terminal to discharge a carrier upon the outer gate reaching its open position.

4. In an apparatus of the character described, a transmission tube, a terminal communicating with said tube, an inner and an outer gate closing the same, an inner and an outer cylinder each having a piston connected to said gates, a source of air pressure for operating said pistons, communication between said cylinders and said source of air pressure, a valve for opening and closing said communication to each cylinder alternately, mechanism operated by the pressure in the tube for normally closing communication between said source of compressed air and the inner cylinder, connections between said cylinders for leading the pressure therefrom alternately to one another, a by-pass for leading the pressure of the transit tube to the terminal between said gates, a valve controlling said by-pass, an opening from said by-pass to the atmosphere, a valve controlling said air opening and adapted to open to relieve the pressure behind the carrier in the terminal upon the closing of the inner gate and to close upon the opening of the outer gate, and mechanism for operating said by-pass valve to admit the pressure of the transit tube to the terminal to discharge a carrier upon the outer gate reaching its open position.

5. In an apparatus of the character described, a transmission tube, a terminal communicating with said tube, an inner and an outer gate closing the same, an inner and an outer cylinder each having a piston connected to said gates, a source of air pressure for operating said pistons, communication between said cylinders and said source of air pressure, a valve for opening and closing said communication to each cylinder alternately, mechanism operated by the pressure in the tube for normally closing communication between said source of compressed air and the inner cylinder, mechanism operated by air compressed by the carrier for operating said valve to open communication between said source of compressed air and the inner cylinder to close the inner gate and to close communication between said source of compressed air and the outer cylinder to open the outer gate, a connection between the inner cylinder and the outer cylinder for leading the pressure from the inner cylinder to the outer cylinder after the inner gate is closed to open the outer gate, a by-pass for leading the pressure of the transit tube to the terminal between said gates, a valve controlling said by-pass, an opening from said by-pass to the atmosphere, a valve controlling said air opening and adapted to open to relieve the pressure behind the carrier in the terminal upon the closing of the inner gate and to close upon the opening of the outer gate, and mechanism for operating said by-pass valve to admit the pressure of the transit tube to the terminal to discharge a carrier upon the outer gate reaching its open position.

In testimony whereof, I have signed my name to this specification in the presence of two subscribing witnesses, this twenty-first day of July A. D. 1906.

CHARLES F. STODDARD.

Witnesses:
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