No. 703,120. Patented June 24, 1902.

W. W. DANLEY.

PNEUMATIC CARRIER SYSTEM.

(Application filed July 30, 1900.)

(No Model.) 2 Sheets—Sheet 1.

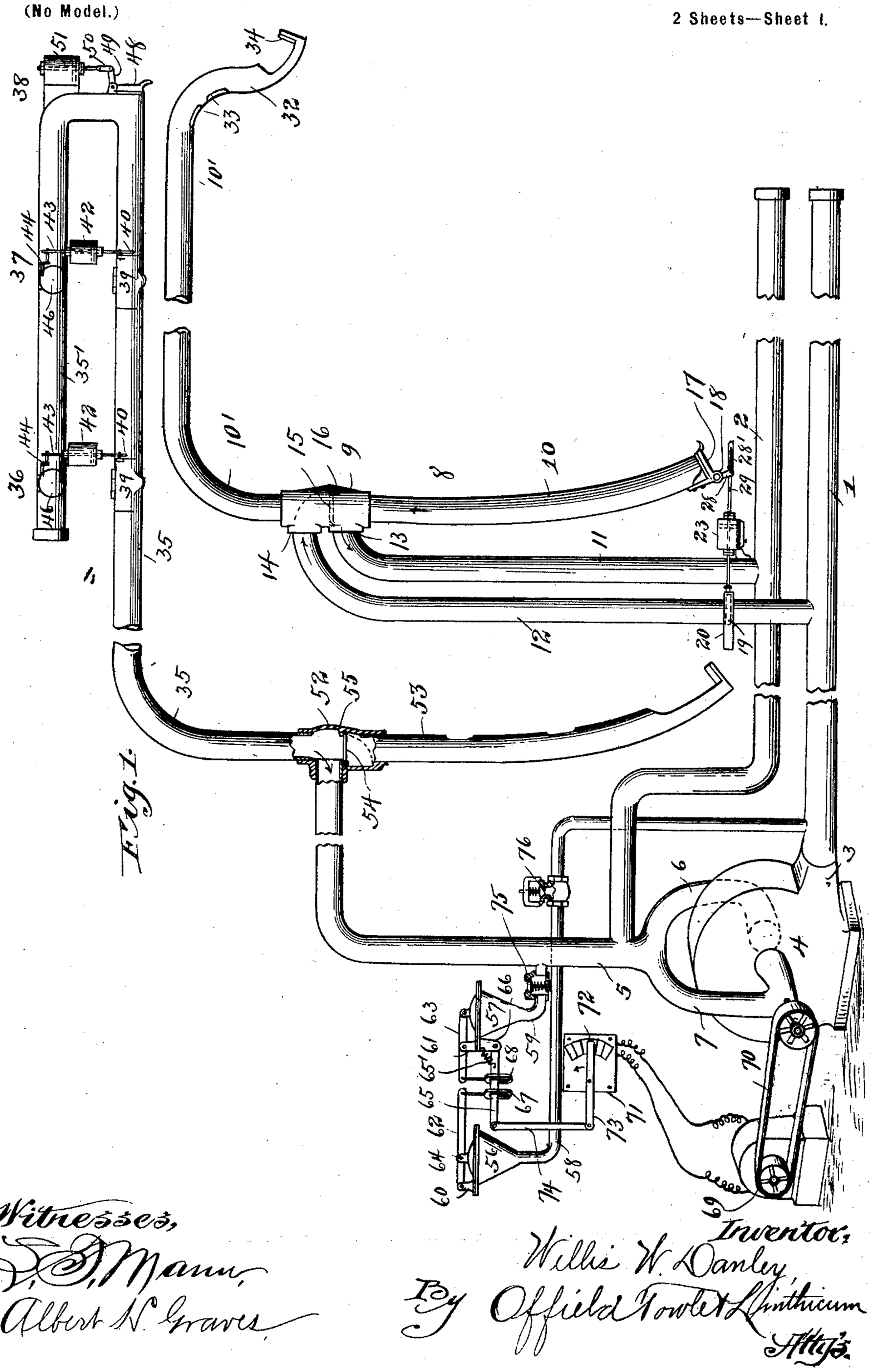

Fig. 1.

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(No Model.) 2 Sheets—Sheet 2.

Fig. 2.

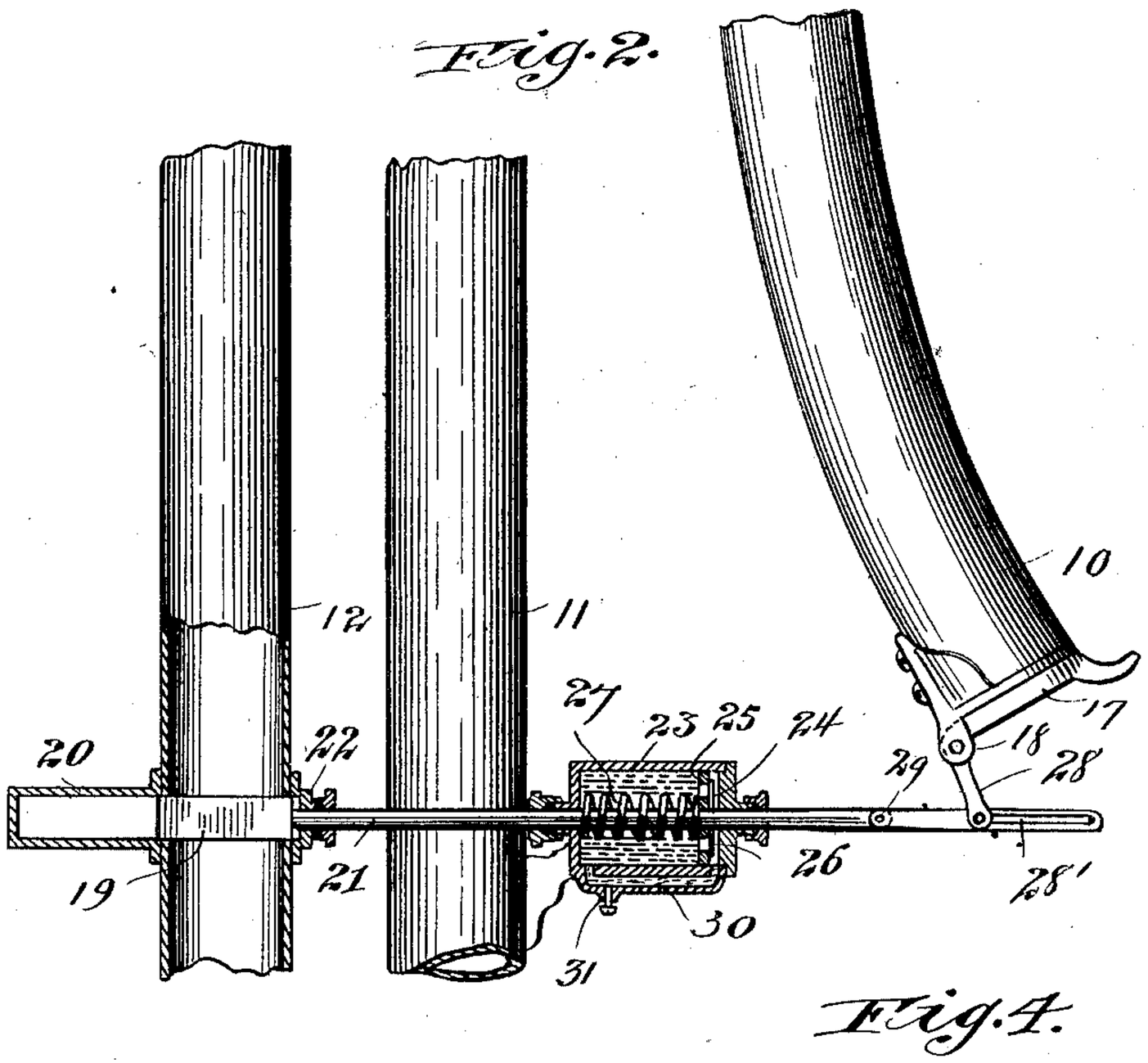
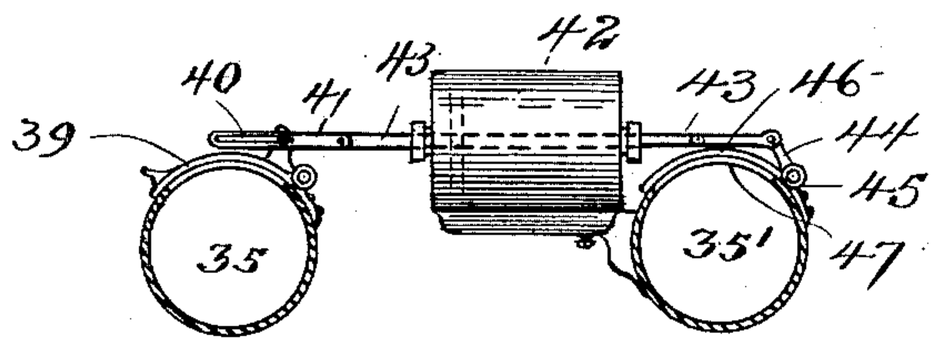
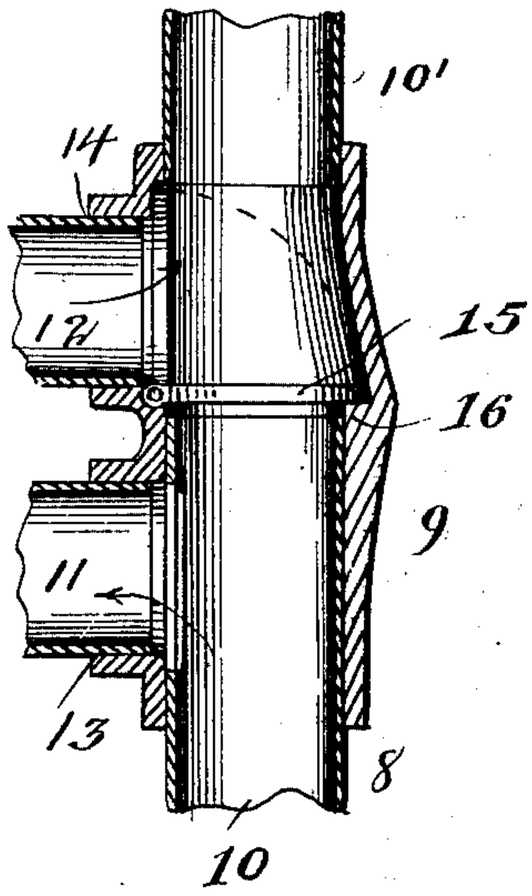


Fig. 4.

Fig. 3.





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PNEUMATIC-CARRIER SYSTEM.

SPECIFICATION forming part of Letters Patent No. 703,120, dated June 24, 1902.

Application filed July 30, 1900. Serial No. 25,246. (No model.)

To all whom it may concern:

Be it known that I, WILLIS W. DANLEY, of Chicago, Illinois, have invented certain new and useful Improvements in Pneumatic-Carrier Systems, of which the following is a specification.

This invention relates to improvements in pneumatic-carrier systems of that type commonly employed for transmitting cash, sales, bills, and the like between distant points in stores and other business houses.

Among the salient objects of the invention are to provide an improved arrangement and combination of parts in a system of the general character referred to whereby the power required to operate the system is economized or reduced to a minimum; to provide an arrangement wherein one part of the system works under plenum and the other under vacuum pressure interconnected in such manner as to enable a single pressure-supplying mechanism or motor to supply both sides of the system; to provide means whereby said motor will be automatically governed and under the control of both sides of the system and will only be operated to the extent necessary to maintain the requisite pressure; to provide improved means for transferring the carriers from one side of the system to the other during their travel; to provide improved means for controlling the ventage of the system brought into operation automatically by the opening of the closures of the transmitting or sending terminals, and in general to provide improvements in the details of arrangement and construction contributing to the economy, simplicity, and efficiency of the system.

The invention consists in the matters hereinafter described, and more particularly pointed out in the appended claims, and will be readily understood from the following description, reference being had to the accompanying drawings, in which—

Figure 1 is a view, partly diagrammatic, of a system embodying my invention, certain parts being broken out to reduce the size of the figure. Fig. 2 is a detail of one of the sending-terminals and adjacent portions of the system, showing more particularly the mechanism whereby the ventage is automatically controlled by the closure of the said sending-terminal. Fig. 3 is a detail of the sending mechanism of one of the intermediate stations, showing more particularly the mechanism whereby the ventage is automatically controlled by the closure of the sending-trunk. Fig. 4 is an axial sectional view of one of those portions of the system wherein the carriers are transferred from the vacuum to the plenum sides.

Referring to said drawings, 1 and 2 respectively designate the main pressure and vacuum trunks of the system, the former being connected with the outlet 3 of any suitable blower 4 and the latter with the inlet side of the blower, in the present instance by means of a branched pipe or trunk 5, the branches 6 and 7 of which communicate with the inlets at the opposite sides.

8 designates as a whole one of the transmitting or sending terminals, it being understood that as many of such sending-terminals as are necessary in the system will be furnished at proper points along the trunks 1 and 2, each of said terminals comprising a connection piece or box 9, with which are connected a transmitting-terminal 10, an exhaust-pipe 11 connecting the box with the vacuum side of the system, and a pressure-pipe 12, likewise connecting the box with plenum-trunk 1. In the preferred embodiment shown herein the box 9 consists of a vertically-disposed straight tubular member, with the lower end of which the terminal 10 communicates and with the opposite end of which the carrier-tube 10′ is connected, so that the outgoing carrier passes through the box in a direct line. The branch pipes 11 and 12 are connected with the box 9 through lateral openings 13 and 14, located, respectively, near the lower and upper ends of the same, the connecting ends of said pipes being bent or deflected so as to communicate with said box at an abrupt angle to the main vertical passage therethrough.

At a point between the branch pipes 11 and 12 a flap-valve 15 is arranged to control the main passage through the box, said valve being hinged and arranged to open upwardly and normally resting against the seat 16, formed in the wall of the passage. The in-

let end of the sending-terminal 10 is provided with a hinged closure or despatching-door 17, which is pivoted at one side, as indicated at 18, and is normally held closed, as usual.

One of the features of improvement of the present invention consists in providing means whereby the system is vented automatically, so as to induce a flow of air through the particular trunk or pipe concerned each time one of the closures of a sending-station is opened to insert a carrier. In the preferred embodiment illustrated the mechanism for accomplishing this end employed at the terminal stations is constructed and arranged as follows:

Referring more particularly to detail Fig. 2, 19 designates a slide-valve arranged to control the branch pipe 12, said valve being arranged to reciprocate transversely across said pipe and the pipe being provided with a valve-casing 20, arranged to receive the valve when the latter is shifted to its open position, as indicated clearly in the drawings. With the valve 19 is connected a time-regulator comprising a valve-stem 21, which extends out through a suitable stuffing-box 22 and axially through a dash-pot 23, mounted upon a suitable support—as, for example, upon the adjacent branch pipe 11. At a point within the dash-pot 23 a valved piston 24 is mounted upon said piston-rod, said piston comprising a perforated main body 25 and a flap-valve 26, arranged to control the ports therethrough. Between the piston 24 and that end of the dash-pot chamber toward the slide-valve is interposed a coiled expansion-spring 27, which tends to maintain the slide-valve 19 in a position to close the passage through the pipe 12, and in order to operate said valve from the closure 17 of the sending-terminal said closure is provided with a rigidly downwardly depending arm 28, with the free end of which the end of the piston-rod which extends through the dash-pot is connected by a connecting-link 29. The particular type of dash-pot illustrated herein is a liquid or oil dash-pot, and in order to insure a gradual return of the piston of the same after it has been shifted by the opening of the terminal door a by-passage or tube 30 is arranged to extend between the opposite ends of the chamber of the dash-pot to provide a restricted passage for the oil from one side of the piston to the other. In order that the flow of oil through this passage may be regulated, an adjustable throttle-valve 31 is arranged to control the same, located at a point intermediate the length of said passage, as indicated clearly in said Fig. 2. In order that the door of the receiving terminal may be, however, closed at once without waiting for the gradual return of the piston of the dash-pot, the link 29 is connected with the arm 28 of said door by means of a slot-and-pin connection, as indicated at 28′.

In the operation of the system the carriers are transmitted throughout the principal part of their outgoing journey by means of pressure and are delivered at their destination through terminals which may of any ordinary or preferred construction, such a terminal being indicated at 32 as consisting of a suitably-curved end portion of the transmitting-pipe 10′, provided in its curved portion with a plurality of vents 33 and with a suitable receiver 34, from which the carrier may be removed.

35 designates as a whole the return-pipe of the system, through which the carriers are returned from the outlying stations under vacuum-pressure. 36, 37, and 38, respectively, designate as a whole a plurality of such outlying stations, each of which comprises mechanism whereby the system is automatically vented each time a carrier is inserted. Describing first the construction employed at the intermediate stations, as at 36 or 37, and referring more particularly to detail Fig. 3, 39 designates a trap-door hinged at one side and arranged to form a side section of the transmitting-tube 35 of sufficient length to receive a carrier readily and adapted to be lifted up to admit the latter. The door 39 is provided with a rigid arm 40, which is connected by means of a slotted link 41 with the piston-rod 43 of the dash-pot 42, which may be and is shown herein as of the same construction as the dash-pot 23, hereinbefore described. The opposite end of said piston-rod 43 is connected with a crank-arm 44, rigid with the pivot 45 of a door 46, which is arranged to control a vent-opening 47, communicating with a returned loop portion 35′ of the transmitting-pipe 35, said returned loop portion being arranged to extend parallel with the transmitting-pipe 35 throughout the entire length of that portion of the latter which is provided with transmitting-stations, or, in other words, being arranged to extend parallel with the transmitting-pipe from the farthermost station back to a point opposite the nearest station to the main transmitting-station. The operation of this mechanism is substantially the same as the operation of the venting mechanism of the terminal previously described with the exception that in the present instance the vent is controlled by a pivoted door instead of a slide-valve, the dash-pot acting in both instances to insure a gradual closing of the vent-passage, while permitting the closure through which the carrier is inserted to close immediately.

The mechanism at the most remote terminal, as 38, may conveniently be of a somewhat simplified construction, consisting, as shown, of a flap-door or closure 48, arranged to admit the carrier to the transmitting pipe or tube 35 at the angle formed by the junction therewith of the returned loop portion 35′, said door being provided with an angular rigid arm 49, connected by means of a link 50 with a dash-pot 51, substantially like the dash-pots hereinbefore described. In this instance, however, the slotted connection is omitted and the door 48 is controlled by the

dash-pot, so as to close gradually, thus affording the necessary ventage to insure the transmission of the carrier to its proper destination.

Upon the arrival of the carrier at the main or cashier's station it may be received in any suitable delivery-terminal, that illustrated herein being of a well-known type so far as its general features are concerned and constructed and arranged as follows: 52 designates as a whole a terminal box or connection piece consisting of a tubular member, with the upper end of which the transmitting-pipe 35 is connected and with the lower end of which the delivery-terminal 53 is connected, the passage through the box from the transmitting-pipe 35 to the delivery-terminal being desirably and, as shown herein, straight, so that the carrier is not retarded in this part of its travel. At a point intermediate of the length of the terminal box 52 the exhaust-pipe 5 communicates, as indicated clearly in Fig. 1, and immediately below the point of connection of said pipe 5 the box is provided with a downwardly-opening flap-valve 54, which yields to permit the passage of the carriers, but is normally held pressed upwardly against its seat 55 by the exhaust-pressure in the transmitting-pipes 35 and 5, which communicate with the box above said valve. The delivery-terminal 53 illustrated is of common and well-known construction, being essentially like the delivery-terminal 32, hereinbefore described.

As hereinbefore stated, the blower 4 is connected so as to afford the requisite pressure to both the plenum and vacuum sides of the system, and in order that the blower may be automatically controlled, so as to operate only when the pressure in either side falls below the necessary standard, means are provided, arranged, and constructed in the present instance as follows: 56 and 57 respectively designate diaphragm-governors connected by means of pipes 58 and 59 with the plenum and vacuum sides of the system, respectively, these governors being of any usual or well-known construction of this general type and being arranged at a short distance from each other and desirably in approximately the same horizontal position. Each of the casings of the governors is provided with a bracket, as 60 61, respectively, upon which is mounted a lever, as 62 63. The lever 62 is pivoted at one end to the lug 60 and is connected at a point intermediate of its length, as indicated at 64, with the center of the diaphragm of the governor, the free end of said lever being arranged to extend above an arm 65, which is pivoted at one end upon a suitable support, as upon a bracket 66, depending from the casing of the governor 57. The arm 65 is normally held in horizontal position by means of a contractile spring 65′, connected at one end with the bracket 66 and at its opposite end with the arm at a point intermediate of the length of the latter. From the free end of the lever 62 is arranged to depend a slotted weight 67, the slotted portion of which embraces the arm 65 and in the normal position of the lever 62 is held free from the arm 65 or so that its weight does not rest thereon. The lever 63 is pivotally mounted upon the bracket 61 at a point intermediate of its length, one end of the lever being connected with the center of the diaphragm of the governor 57, while its opposite free end is provided with a slotted weight 68, which is also arranged to engage the arm 65 in substantially the same manner as does the weight 67.

It will be seen from the foregoing description that when the pressure in the plenum-governor falls the diaphragm thereof will descend, thus permitting the slotted weight of its lever to bear upon the arm 65, and likewise when the vacuum-pressure within the vacuum-governor 57 falls, and therefore permits the diaphragm of this governor to rise, the weight 68 thereof will bear upon the arm 65.

The free end of the arm 65 is connected with a governor which is arranged to control the motor whereby the blower 47 is driven, it being understood that the particular type of motor employed for this purpose is entirely immaterial and that the type of governor arranged to control the same will of course be a suitable one. In the particular instance shown herein the blower is arranged to be driven by means of an electric motor, (designated as a whole 69,) suitably connected with the blower by means of a belt connection 70. The governor or controller (designated as a whole 71) may be of any suitable type, consisting in the present instance of a rheostat provided with the usual series of contacts 72, over which is arranged to sweep a contact-arm 73, whereby the current to the motor may be increased or decreased or turned entirely off, as may be required. In the position shown in the drawings the switch-arm 73 of the rheostat is shown as connected directly with the arm 65 of the diaphragm-governors by means of a link 74 and as occupying an intermediate position on the rheostat, indicating that the motor will be running at a rate only sufficient to maintain the pressure in the system at a normal or standard point.

It will be seen from the foregoing description that the dropping of the pressure on either side of the system will operate to shift the switch-arm of the rheostat so as to increase the supply of current to the motor, and therefore increase the speed of the latter, and inasmuch as the blower is connected with both sides of the system it is obvious that if one side be already raised to the standard pressure the increase of speed of the blower would produce an abnormal pressure in this side unless means were provided for preventing this result. I have therefore shown each side of the system as provided with a relief-valve, as indicated at 75 and 76,

respectively, these valves being simply ordinary puppet-valves, one of which, 75, connected with the vacuum side of the system, being arranged to open inwardly, while the other, 76, which is connected with the plenum side, is arranged to open outwardly, as obviously necessary.

The operation of the apparatus constructed and arranged as described is probably entirely obvious from the foregoing description, but may be briefly recapitulated as follows: Assuming that the apparatus is in its normal working condition, the parts will be in the several positions indicated in Fig. 1 of the drawings—*i. e.*, the pressure in both sides of the system will be normal, the diaphragm-governors in such position as to hold their slotted weights free from the governor-arm 65, which actuates the switch-arm of the rheostat, and said switch-arm occupying a position which will supply just sufficient current to the motor to keep the blower running at a speed sufficient to maintain the pressure in the system when no carriers are being transmitted. If now a carrier is to be sent out—say through the terminal 8—the operator will open the door 17 thereof and insert the carrier. The transmitting-terminal 10 is under exhaust-pressure, being connected with the main exhaust-trunk 2 through the lower part of the terminal-box 9 and branch pipe 11, so that the carrier will be instantly drawn in and carried to the box 9, acquiring sufficient momentum before it reaches the latter to carry it past the valve 15 of said box, and thus into the pressure side of the system. As the door 17 was opened to admit the carrier the slide-valve 19 was opened, thus venting the pressure side and insuring a flow therethrough which serves to carry the carrier to its destination. The dash-pot which controls the slide-valve will be so regulated that the said valve will remain open just long enough to insure the delivery of the carrier at its destination; but the door 17, as hereinbefore described, is permitted to close immediately after the carrier has been inserted, and in practice the operator will simply take care that it remains open the very short interval necessary to insure the delivery of the carrier into the pressure side at the box 9 before said door is permitted to completely close.

When a carrier is sent toward the main station from one of the outlying stations, it is dropped directly into the transmitting-pipe 35 of the vacuum side through any one of the doors 39 or 48, its insertion serving to vent said pipe 35 through the vent-doors 46, or in the case of the most remote station through the door 48 itself, in the manner hereinbefore fully described. It is to be noted in this connection that from whichever one of the outlying stations the carrier is sent the transmitting-pipe will be so vented as to not interfere with the sending of another carrier from any one of the other stations along the same line simultaneously, this result being secured by reason of the fact that the ventage will always be in a part of the system located at or beyond the outermost station.

The sending of the carrier in either direction will obviously lower the pressure on that side of the system through which it is sent, and this through the diaphragm-governor of that side will at once act upon the controller to increase the speed of the motor and blower, and thus again raise the pressure to the standard, whereupon the weight being removed from the spring-actuated arm 65 the latter will rise and reduce the speed of the motor to the normal. By reason of the fact that both diaphragm-governors act upon the controlling device of the motor the requisite pressure is insured in both sides of the system, and in case of excess pressure in either side the relief-valve of that side will immediately act to relieve such surplus pressure.

Among the advantages obtained by the use of my invention I may mention the following: Owing to the fact that the system is divided into two sides, one plenum and the other vacuum pressure, a blower having only one-half the capacity which would otherwise be necessary may be used, it being obvious that if one side of the blower discharge into the plenum side and the other side of the blower exhausts from the vacuum side it will secure the same results as though a blower of twice the capacity were discharging into or exhausting a single-side system of equal dimensions to the double system.

Another advantage is that by this arrangement I am enabled to use a closed system on both sides, both the plenum and vacuum sides being entirely closed except during the time only when the carriers are actually in transit. It is to be noted in this connection that that feature of the invention which involves the use of a normally closed system which is automatically vented only long enough to insure the transmission of the carrier to its destination may be embodied in a system wherein both sides work under vacuum or under plenum pressure, and I therefore claim this feature broadly as well as in combination with the present system, wherein, however, it has special features of importance.

Owing to the fact that the actual traveling time of the carriers is but a small percentage of the total time of operation of the system the controlling of the motor automatically, so that the blower is operated only to an extent sufficient to maintain the requisite pressure, results in a material saving of power.

The system furthermore possesses additional advantages, which need not, however, be specified in detail.

I claim as my invention—

1. In a pneumatic-carrier system, the combination of a plenum side, a vacuum side, mechanism for maintaining the pressure in both sides and automatic governing devices arranged to control said pressure-supplying mechanism, whereby the operation of the lat-

ter is accelerated whenever the pressure falls below a determined point on either side.

2. In a pneumatic-carrier system, the combination of a plenum side, a vacuum side, a blower having its inlet connected with the vacuum side and its outlet discharging into the plenum side, a motor actuating said blower, a governor controlling said motor and a pressure-actuated governor connected with each side of the system and both adapted to act upon the motor-controller, substantially as described.

3. In a pneumatic-carrier system, the combination of a plenum side and vacuum side, and means for transferring a carrier from one side to the other during its travel.

4. In a pneumatic-carrier system, the combination of a plenum side, a vacuum side, and means for transferring a carrier from one side to the other during its travel, comprising intersecting passages, the delivery-passage of which is arranged to discharge the carrier into the receiving-passage in substantial alinement with the latter, and a valve adapted to be opened by impact of the carrier, normally forming a closure between the two sides.

5. In a pneumatic-carrier system, the combination of a transmitting-terminal operated by vacuum-pressure, a transmitting system into which said transmitting-terminal discharges operated by plenum-pressure, and a valve operated by impact interposed between the pressure and vacuum sides.

6. In a pneumatic-carrier system, the combination with a transmitting-pipe and a closure arranged to close the carrier-inlet thereof, of means operated automatically by the operation of sending the carrier for venting the transmitting-pipe for a limited period and during the transmission of the carrier through said pipe.

7. In a pneumatic-carrier system, the combination with a transmitting-pipe and a closure arranged to close the carrier-inlet thereof, of means operated by the opening of said closure for venting said transmitting-pipe, and a dash-pot acting to retard the return of said venting device to its normally closed position.

8. In a pneumatic-carrier system, the combination with a transmitting-pipe and a closure arranged to close the carrier-inlet thereof, of a return or branch pipe communicating with said transmitting-pipe, a vent in said communicating pipe, a closure controlling said vent, operative connections between the closure of the carrier-inlet and the vent-closure, whereby the latter will be opened with the former, and means acting automatically to delay the closing of the vent after a carrier has been inserted.

9. In a pneumatic-carrier system, the combination with a transmitting-pipe and a hinged closure arranged to close the carrier-inlet thereof, of a return or branch pipe communicating with said transmitting-pipe, a vent in said communicating pipe, a closure controlling said vent, a reciprocatory rod arranged to act upon said vent-closure to open the same, a crank-arm rigid with the hinged closure of the carrier-inlet operatively connected with said reciprocatory rod, and a dash-pot arranged to control the return reciprocation of said rod, substantially as described.

10. In a pneumatic-carrier system, the combination with a transmitting-pipe and a hinged closure arranged to close the carrier-inlet thereof, of a return or branch pipe communicating with said transmitting-pipe, a vent in said communicating pipe, a closure controlling said vent, a reciprocatory rod arranged to act upon said vent-closure to open the same, a crank-arm rigid with the hinged closure of the carrier-inlet operatively connected with said reciprocatory rod, and a dash-pot arranged to control the return reciprocation of said rod, the connections between said closure of the carrier-inlet and the reciprocatory rod being constructed to afford lost motion whereby the carrier-inlet closure is free to close independently of the movement of the vent-closure, substantially as described.

11. In a pneumatic-carrier system, the combination with a plenum side and a vacuum side, of a pressure-actuated mechanism connected with each of said sides, a weighted arm operatively connected with each pressure-actuated mechanism, a common arm upon which both of said weights are adapted to act and a pressure-supplying mechanism controlled by the movement of said common arm, substantially as described.

12. In a pneumatic conveyer, the combination of a conveying-tube, means for producing a movement of air therethrough, a normally closed admisssion-valve for the tube which may be opened to admit air, and a time-regulator connected with said valve and controlling its period of closing, said regulator operating independently of the pressure in the conveying-tube and independently of the means for producing said movement of air.

13. In a pneumatic conveyer, the combination of a conveying-tube, means for producing a movement of air therethrough, a normally closed admission-valve which may be opened to admit air, a time-regulator connected with said valve and controlling its period of closing, said regulator operating independently of the pressure in the conveying-tube, and independently of the means for producing said movement of air, and means for adjusting the period of action of said regulator.

14. In a pneumatic conveying apparatus, the combination of a conveying-tube, an air-supply pipe connected therewith, an outwardly-seating valve between the junction of said air-supply pipe with said conveying-tube and the despatching end of said conveying-tube, a valve for admitting air from said supply-pipe to said conveying-tube, and a time-regulator connected with said valve and con-

trolling its period of closing, said time-regulator operating independently of the pressure in said conveying-tube and air-supply pipe.

15. In a pneumatic conveying apparatus, the combination of a conveying-tube, an air-supply pipe connected therewith, an outwardly-seating valve in said conveying-tube located between the junction of the air-supply pipe therewith and the despatching end of the tube, a valve for admitting air from the supply-pipe to the conveying-tube, a time-regulator connected with said air-valve having a spring tending to keep the valve closed, said time-regulator operating independently of the pressure in said conveying-tube and in the air-supply pipe, and means for opening said air-valve and setting said time-regulator.

16. In a pneumatic conveying apparatus, the combination of a conveying-tube, an air-supply pipe connected with said tube, an outwardly-seating valve located in said conveying-tube between the junction of the air-supply pipe therewith and the admission end of said conveying-tube, an air-valve for admitting air from said supply-pipe to the conveying-tube, an admission-door on the conveying-tube, and a time-regulator connected with and operating said air-valve and admission-door, said time-regulator operating independently of the pressure in the conveying-tube and in the air-supply pipe.

17. In a pneumatic conveying apparatus, the combination of a conveying-tube, means connected with the delivery end of said tube for reducing the pressure thereat, a despatching-door, means for closing said door and a time-regulator connected with said despatching-door for controlling its period of closing.

18. In a pneumatic conveyer, the combination of an outgoing distributing-tube, an incoming collecting-tube, means for supplying pressure to the distributing-tube, and suction to the collecting-tube, a normally closed air-admission valve for said collecting-tube, and a time-regulator controlling the period of closing of said valve, said regulator operating independently of the pressure in said tube, and independently of the current-producing means.

19. In a pneumatic conveyer, a collecting-tube provided with a station intermediate of its length, and which is extended back from its extremity back to said intermediate station, a door at said intermediate station on the incoming or carrying portion of said collecting-tube, an air-admission valve on the backward extension of said collecting-tube connected with said door, means for controlling the period of closing of said air-admission valve, and means for applying suction to said air-collecting tube near its delivery end.

20. In a pneumatic conveyer, the combination of a plurality of distributing-tubes, a collecting-tube provided with an outlying loop-station and an intermediate station, said collecting-tube being extended from said loop-station back to said intermediate station, an air-admission valve connected with said collecting-tube at said loop, a door at said intermediate station on the incoming or carrying portion of said collecting-tube, an air-admission valve on said backward extension of said collecting-tube connected with said intermediate-station door, means for controlling the period of closing of said air-admission valve, and means for applying suction to said collecting-tube adjacent to its delivery end.

21. In a pneumatic conveyer, an air-compressor, a plurality of distributing-tubes connected with the high-pressure side of said compressor, valves controlling the admission of air from said compressor to said distributing-tubes, doors near the despatching end of said distributing-tubes connected with said valves, a collecting-tube connected at its delivery end with the low-pressure side of said compressor, an inwardly-seating valve near the delivery end of said collecting-tube, a plurality of dispatching-doors for said collecting-tube, and means for controlling the admission of air to said collecting-tube at the several stations.

22. In a pneumatic conveyer, the combination of a conveying-tube provided with a valve seating toward the admission end of the tube and adapted to be opened by a carrier, an air-supply pipe connected with said tube inside of said valve, and means for giving an initial impulse to the carrier whereby it is carried past said valve and into the path of the air-current from the air-supply pipe.

23. In a pneumatic conveyer, the combination of a conveying-tube provided with a valve seating toward the admission end of the tube and adapted to be opened by a carrier, an air-supply pipe connected with said tube inside of said valve, and means for producing an inward flow of air through the part of said conveying-tube between the admission end thereof and the said valve whereby an initial impulse is given to the carrier for carrying it past said valve and into the path of the air-current from said supply-pipe.

24. In a pneumatic conveyer, the combination with a conveying-tube, provided with a valve which seats toward the despatching end of the tube, an exhaust-pipe connected with said tube between said valve and its despatching end, an air-supply pipe connected with said tube inside of said valve and means supplying air to said air-supply pipe and producing suction in said exhaust-pipe whereby carriers inserted at the delivery end of said tube are first carried past said valve by atmospheric pressure and then carried to their destination by the force of the compresssed air.

25. In a pneumatic conveyer, the combination of an air-compressor, a distributing-tube provided with a despatching-door and inside of said door with an outwardly-seating valve capable of actuation by a carrier, an exhaust-pipe connecting said tube at a point between said valve and the despatching-door with the

low-pressure side of said compressor, an air-supply pipe joining said tube inside of said valve with the high-pressure side of said compressor, and a valve controlling the flow of compressed air through said air-supply pipe.

26. In a pneumatic conveyer, the combination of a distributing-tube provided with a despatching-door and inside of said door with an outwardly-seating valve, an exhaust-pipe joining said tube between said valve and the despatching-door, an air-supply pipe joining said tube inside of said valve, a valve in said air-supply pipe connected with said despatching-door, means for controlling the period of closing of said despatching-door and air-valve, and means for supplying air to said air-supply pipe and for producing suction in said exhaust-pipe.

27. In a pneumatic conveyer, the combination of a compressor, a distributing-tube provided with a despatching-door, and inside of said door with a valve which seats toward the door and is adapted to be opened by a carrier, an exhaust-pipe joining said tube between said valve and the door with the low-pressure side of said compressor, an air-supply pipe joining said tube inside of said valve with the high-pressure side of said compressor, a valve in said supply-pipe connected with said despatching-door, a collecting-tube provided with a despatching-door and adjacent to its delivery end with a valve which seats toward said delivery end and is adapted to be opened by a carrier, and an exhaust-pipe connecting said collecting-tube inside of said valve with the low-pressure side of said compressor.

28. In a pneumatic conveyer, the combination of a compressor, a conveying-tube connected at its end toward which the carrier moves with the said compressor, a normally closed despatching-door for the conveying-tube, a valve in the conveying-tube which seats toward the despatching end of the tube and is adapted to be opened by a carrier, and pressure-actuated means connected with the low-pressure side of the compressor for regulating the action of said compressor.

29. In a pneumatic conveyer, the combination of a compressor, a collecting-tube connected adjacent to its delivery end with the low-pressure side of said compressor, a valve adjacent to the delivery end of the collecting-tube, movable by a carrier, a normally closed despatching-door in the collecting-tube, and pressure-actuated means connected with the low-pressure side of the compressor for regulating the action of said compressor.

30. In a pneumatic conveying apparatus, the combination of a compressor, a destributing-tube provided with a normally closed despatching-door and inside of said door with an outwardly-seating valve, an exhaust-pipe joining said tube between said valve and the despatching-door with the low-pressure side of said compressor, an air-supply pipe joining said tube inside of said valve with the high-pressure side of said compressor, and pressure-actuated means connected with the low-pressure side of the compressor for regulating the action of the said compressor.

31. In a pneumatic conveying apparatus, the combination of a compressor, a distributing-tube provided with a normally closed despatching-door and inside of said door with an outwardly-seating valve, an exhaust-pipe joining said tube between the said valve and the despatching-door with the low-pressure side of said compressor, an air-supply pipe joining said tube inside of said valve with the high-pressure side of said compressor, a collecting-tube connected with the exhaust side of said compressor, a normally closed despatching-door for said collecting-tube, an inwardly-seating valve at the delivery end of said collecting-tube and pressure-actuated means connected with the low-pressure side of said compressor for regulating the action of said compressor.

32. In a pneumatic conveying apparatus, the combination of a conveying-tube provided with a despatching-door, a valve in said tube adapted to be opened by a carrier, and which opens away from the despatching-door, an exhaust-pipe connected with said tube inside of said valve, means for closing said door embracing a time-regulator which operates independently of the pressure in said tube or in the exhaust-pipe and controls its period of closing and means producing suction in said exhaust-pipe.

WILLIS W. DANLEY.

Witnesses:
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ADA H. BARNES.