J. S. BLACK.

PNEUMATIC TUBE SYSTEM.

APPLICATION FILED MAR. 31, 1919.

1,316,077.

Patented Sept. 16, 1919.

3 SHEETS—SHEET 1.

FIG. 1.

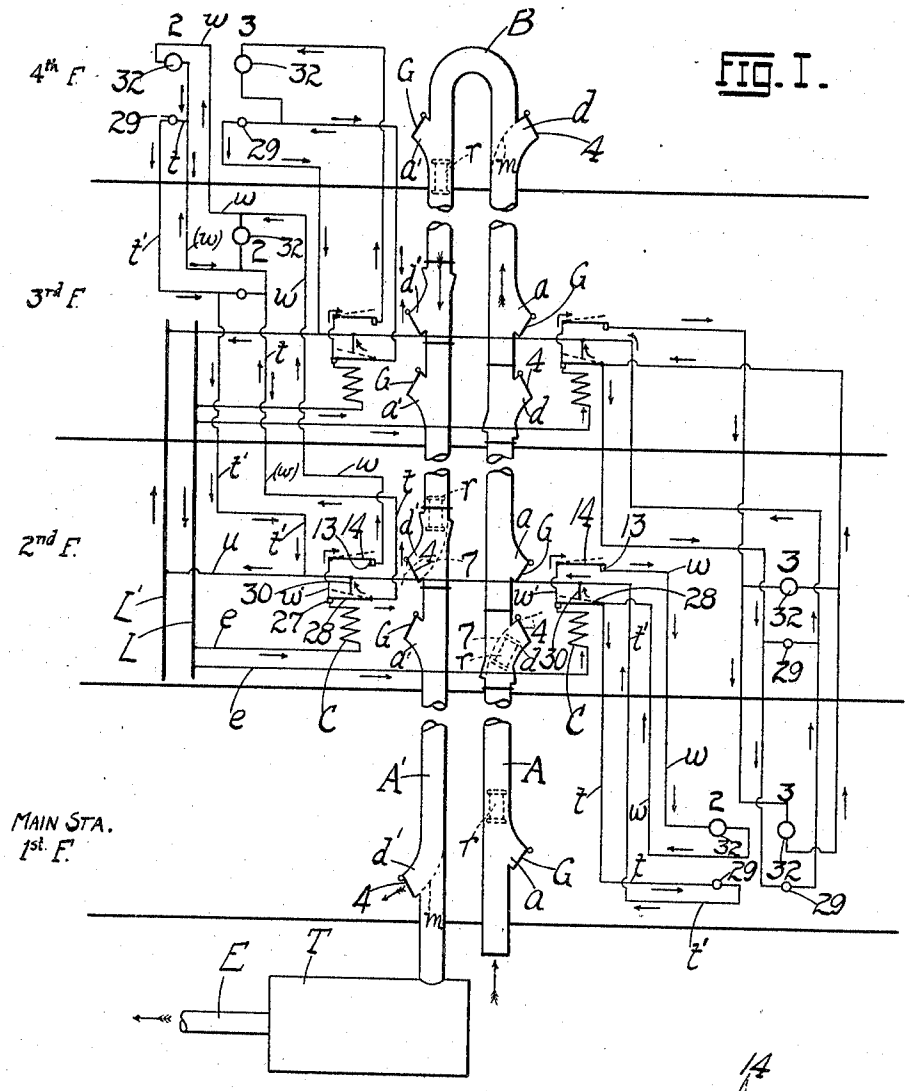
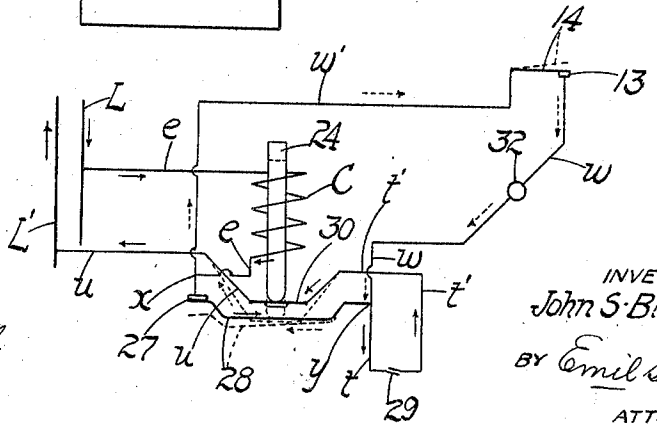


FIG. 2.



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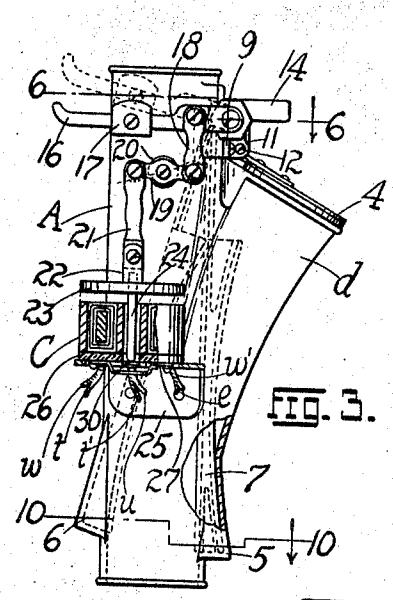


FIG. 3.

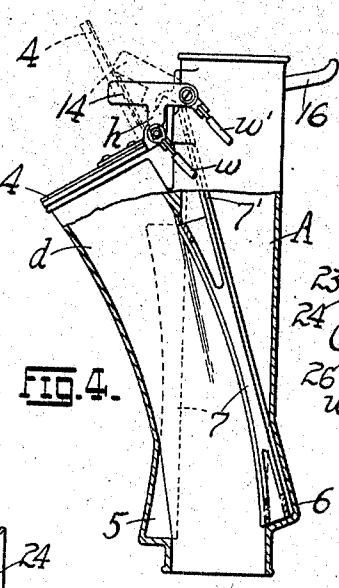


FIG. 4.

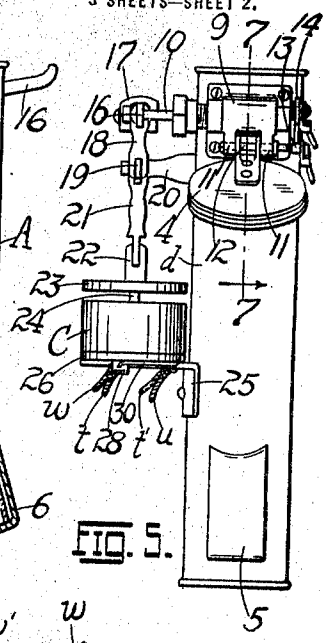


FIG. 5.

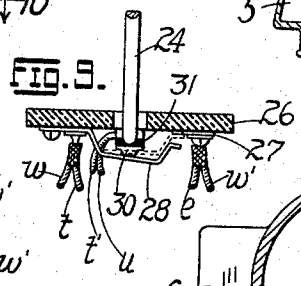


FIG. 9.

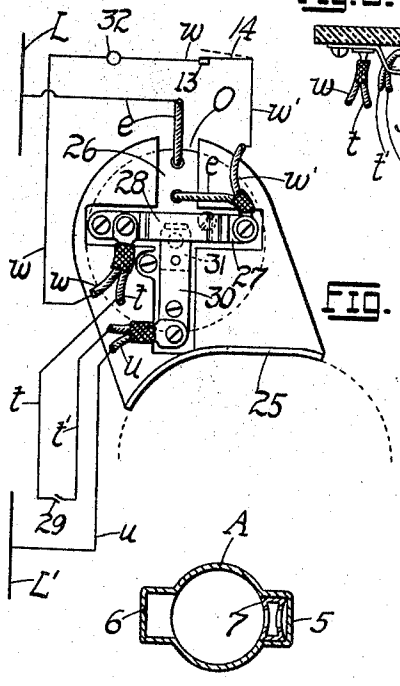


FIG. 8.

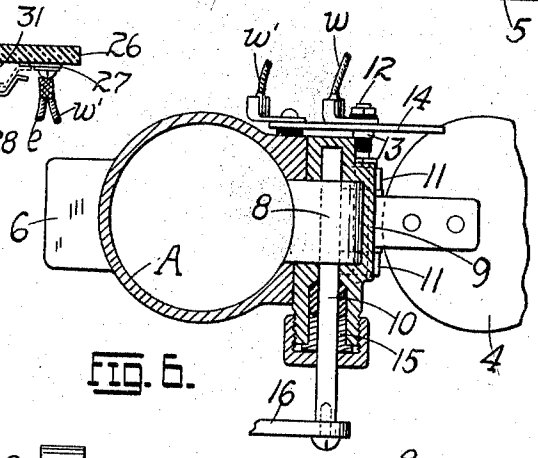


FIG. 6.

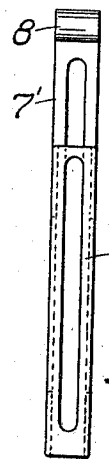


FIG. 11.

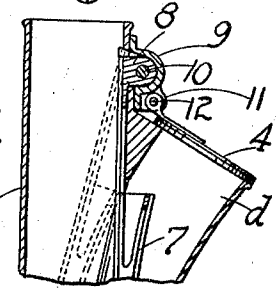


FIG. 7.

FIG. 10.

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3 SHEETS—SHEET 3.

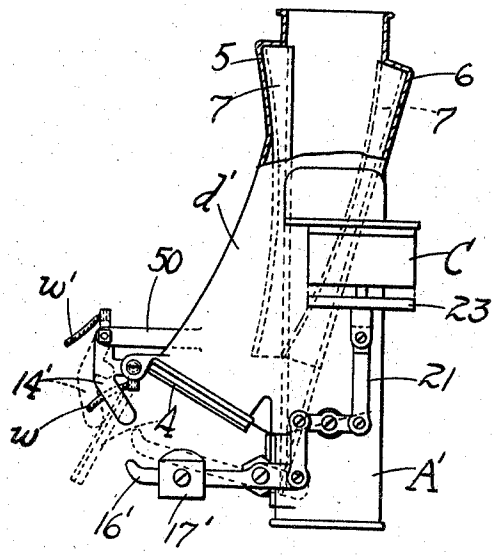


FIG. 12.

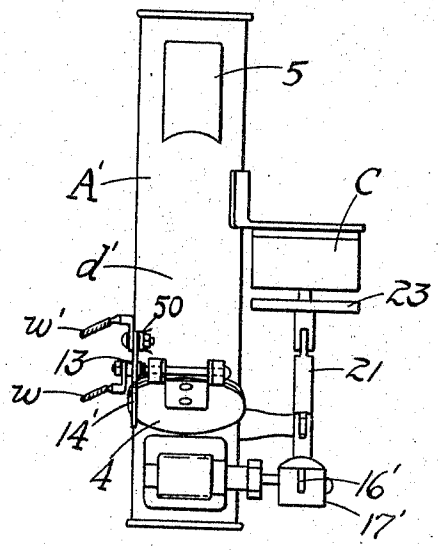


FIG. 13.

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UNITED STATES PATENT OFFICE.

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PNEUMATIC-TUBE SYSTEM.

1,316,077. Specification of Letters Patent. **Patented Sept. 16, 1919.**

Application filed March 31, 1919. Serial No. 286,470.

To all whom it may concern:

Be it known that I, JOHN S. BLACK, a citizen of the United States, residing at Clayton, in the county of St. Louis and State of Missouri, have invented certain new and useful Improvements in Pneumatic-Tube Systems, of which the following is a full, clear, and exact description, reference being had to the accompanying drawings, forming a part hereof.

The present invention is directed to improvements in pneumatic despatch tubes, and has for its object to install a system involving a plurality of stations between any two of which a carrier may be despatched in either direction. To attain this object, provision is made whereby the sender may electrically operate a switch at any predetermined branch tube serving as a discharge or incoming tube, to cause the carrier despatched by the sender through the main tube to be shunted or diverted from said main tube into the discharge branch which is under the immediate control of that particular switch. In the present embodiment of the invention the system is shown applied to store service as a cash and package carrier; and in this connection it may be stated that a carrier may be despatched from any floor of the store to any other floor and in either direction, and from any floor to the main station on the ground floor or in the basement, and from the main station to any floor of the building, a single main tube with incoming and outgoing branches comprising all the piping involved in the system. One of the objects sought is simplicity of construction, thereby reducing cost of installation and rendering the system compact, and reducing the cost of up-keep. The advantages of the improvement will be readily apparent from the following detailed description in connection with the accompanying drawings in which—

Figure 1 is a diagrammatic representation of a pneumatic tube system showing my invention applied thereto, the parts being in elevation; Fig. 2 is a diagrammatic representation of an electric circuit as applied to a single discharge or incoming branch tube; Fig. 3 is a side elevation of one of the discharge units or sections of pipe entering into the construction of the main through which the carrier is despatched, the switch being in normal position or in parallelism with the axis of the main tube to provide an uninterrupted passage through the tube; Fig. 4 is a side elevation of the same viewed from the opposite side to that shown in Fig. 3, with the switch swung across the axis of the main tube to side-track the carrier into the discharge branch, parts being broken away; Fig. 5 is a front elevation of the unit shown in Figs. 3 and 4; Fig. 6 is an enlarged cross-sectional detail through the main tube on the line 6—6 of Fig. 3; Fig. 7 is a longitudinal sectional detail on the line 7—7 of Fig. 5; Fig. 8 is a bottom plan of the angle bracket supporting the energizing coil showing the wire connections and shunt switch and spring contact therefor; Fig. 9 is a sectional detail through the insulating disk at the bottom of the energizing coil showing the shunt switch, spring contact and armature plunger actuating the contact, said section being an enlargement of the corresponding parts illustrated in Fig. 3; Fig. 10 is a cross-sectional detail on the line 10—10 of Fig. 3; Fig. 11 is an elevation of the oscillating switch mounted in the main tube viewed from the side facing the discharge branch leading from the main; Fig. 12 is a view similar to Fig. 3 showing the operating parts when mounted on the descending leg of the main as used in store service; and Fig. 13 is a front elevation of the parts shown in Fig. 12.

Referring to the drawings, and for the present to the diagram shown in Fig. 1 which represents the system applied to store service involving four floors, the main tube comprises an ascending leg A and a descending leg A′ connected by a top bend B, the leg A being employed for despatching a carrier from any floor to any floor above it, and the leg A′ being employed for despatching a carrier from any floor to any floor below it. The tube or leg A is provided on each floor with an outgoing or sending branch *a* (the same being herein shown abbreviated though it may be lengthened to suit), the leg A′ being provided with similar branches *a′* as shown. Likewise, the leg A is provided with incoming or discharge branches *d* where necessary, corresponding discharge branches *d′* being formed on the leg A′. As well understood in the art, a carrier *r* is charged or inserted through a feed or sending branch *a* (*a′*) into the main tube A, (A′) and is carried through the tube and finally discharged

through an incoming or discharge branch *d* (*d'*), the carrier being propelled by atmospheric air behind it, there being a vacuum or low pressure maintained in front of the carrier. In the present embodiment of my invention I provide in the basement a vacuum tank T having an exhaust pipe E leading to a suitable vacuum pump or exhauster (not shown), the free end of the leg A being open to the atmosphere. This causes a driving current to traverse the legs A, A', it being understood of course that each sending branch *a* (*a'*) is provided with a gate G, and each discharge branch *d*, (*d'*) with a gate or flap 4 to exclude the air.

In the system as illustrated (Fig. 1) it is apparent that a carrier inserted into the tube A at any floor will be carried up through the tube and discharge through the branch *d* on the top floor; and likewise a carrier inserted into the tube or leg A' at any floor will be carried downward and discharge through the branch *d'* at the main station (herein shown on the ground floor). One of the objects of the present invention however is to provide means for causing the discharge of a carrier at any point along either leg A, A', that is to say, at any floor desired. For example, a carrier may be charged into the main A at the main station and be discharged on the second or third floor; or the carrier may start on the second floor and be discharged on the third floor; again, a carrier may start on the top or fourth floor and be discharged on the third or second floor; or the carrier may start on the third floor and be discharged on the second floor. In other words, the object sought is to effect a discharge of the carrier at points between the terminal sending and discharge branches *a*, *d*, *a'*, *d'*, of either leg A, A', to accomplish which some provision must be made to shunt or switch the carrier from the main tube (A, A'), into the branch *d*, *d'*, at the particular floor where the discharge is to take place. In the present embodiment of my invention this shunting is effected by the electric control of a suitable switch mounted in the main tube (A, A'), said switch operating on the order of a railway switch, permitting the carrier for one position of the switch to pass without deflection or interruption through the main, and for another position to be side-tracked or shunted into the particular branch (*d*, *d'*,) through which the carrier is to be discharged. The details of the switch and the electric control thereof may be best described in connection with Figs. 3 to 11, to which reference will now be made. The tubes A, A', are preferably built up of short sections as shown in Fig. 1 but obviously this is merely a matter of expediency as a single pipe might be cast if circumstances favored it. For this reason the same reference letter is employed to designate a section of the tube as is employed to designate the whole tube. The branches *a*, *a'*, *d*, *d'*, merge with the peripheral walls of the main tube A, (A') substantially on a tangent so that the passage from the main tube into the branch may be gradual. With the branches *a*, *a'*, we need not concern ourselves as these are not involved in the consideration of the present invention. With the exception of the terminal stations (main station and top floor), the sections of the tubes A, A', provided with the discharge branches *d*, *d'*, are equipped with switches capable of diverting or side-tracking the carrier from the main tube into the discharge branch at any particular floor or station, the details of the mechanism controlling said switches being the same for all sections. Accordingly, a description of a single switch and controlling mechanism therefor will suffice for the entire system. Formed in the wall of the main tube A at the base of the concave peripheral wall of the discharge branch *d* is a pocket 5, a similar pocket 6 being formed in the wall of the main tube A opposite the pocket 5. The end walls of these pockets are disposed substantially on the arc described by the free end of the oscillating switch or shunt rail 7, the depths of the pockets being sufficient to admit the full thickness of the switch when the latter has been swung to either of its extreme positions. The switch is in the shape of a slotted bar or rail curved transversely on one side to conform to the bore of the tube A, and curved both transversely and longitudinally on the opposite side to conform to the curvature of the bore of the branch *d* (Figs. 3, 4, and 10), the slots serving to lighten the weight of the switch. The side of the switch facing the tube A is provided with an extension 7' terminating in a lug 8 facing the branch *d*, the lug being rounded and received by a cap piece or cover plate 9 secured to the tube A, said plate forming a bearing or mounting for the rocking spindle or rock-shaft 10 to which the lug 8 is secured with a drive fit. The plate 9 is likewise provided with a pair of lugs 11, 11, for the support of the hinge pin 12 of the discharge flap or gate 4. The hinge pin 12 projects at one end past the plate 9, said projecting end having mounted thereon an insulated contact 13 to which leads the wire *w*, said contact 13 being normally engaged by the contact leg *h* of a gravity switch 14 hinged to the wall of the tube A and properly insulated therefrom, the hinge pin of said switch being connected to the wire *w'* in the same circuit with the wire *w* as will hereinafter more fully appear. The rock-shaft 10 passes through a stuffing box 15 on the plate 9 at the end opposite from the gravity

switch 14 said rock-shaft projecting beyond the stuffing-box, and having rigidly secured thereto an arm 16 provided with a sliding or adjustable weight 17 between which and the fulcrum axis of the arm (the axis of the rock-shaft 10) there is pivotally secured to the arm one end of a link 18 whose opposite end is pivotally coupled to the end of the adjacent arm of a lever 19 fulcrumed in the middle to a bracket or arm 20 leading from the wall of the tube A, the end of the opposite arm of the lever 19 being pivotally secured to the upper terminal of a link 21 the lower end whereof is pivotally secured to the central post or stud 22 leading from the disk armature 23 carrying the plunger 24 which is free to reciprocate in the solenoid or energizing coil C supported on the horizontal leg of the angle bracket 25 secured to the wall of the tube A near the base of the branch *d*. Interposed between the coil C and the supporting leg of the bracket 25 is an insulating disk 26, said supporting leg having a cross-shaped cut-away portion or opening O to expose the disk. The wire *e* leading from the line wire L and forming the windings of the coil C, on emerging from the coil is secured to the disk 26 opposite the cross-slot or opening O (Fig. 8), said wire and the wire *w'* meeting at a common contact 27. This contact is normally engaged by the free end of a spring shunt switch 28 extending across the disk 26, the fixed end of the shunt being secured to the disk at a point diametrically opposite from the contact 27. Secured to the fixed end of the shunt is the adjacent end of the wire *w* previously referred to, and the wire *t* leading to one pole of a push button 29, the wire *t'* terminating at the other pole, leading to the fixed end of a spring contact 30 secured to the disk 26, the free end of said contact being disposed between the shunt 28 and the free end of the plunger 24, and normally out of contact with the shunt. When the coil C is energized the armature 23 is attracted to the coil, causing the plunger to drive the free end of the contact 30 against the shunt 28 and force the free end of the latter out of engagement with the contact 27 (Fig. 9). Likewise secured to the fixed end of the contact 30 is the adjacent end of the return wire *u* which leads to the line wire L'. The contact 30 is provided with an insulated piece 31 against which the plunger 24 may bear or impinge. In the path of the wire *w* is a light 32 (or equivalent signal device) for a purpose to presently appear.

The operation is very simple and may be readily understood by a reference to Fig. 2 which represents diagrammatically the parts referred to in connection with Figs. 3 to 8 and Fig. 9. Referring to said Fig. 2, it is perfectly obvious that by closing the circuit by manipulation of the push button 29 the coil C will become energized, the current flowing as shown by the full and dotted arrows, the latter arrows being more particularly identified with the light section of the circuit and the full arrows with the starting end or push button section of the circuit, the current at the moment of the closing of the circuit parting at the point *x*, a portion flowing through the light section of the circuit and likewise through the starting or push button section, and another portion shunting across the shunt switch 28, thence through the push-button section and back to the line L', the two portions joining at the point *y* whence they return to the line L' as clearly indicated by the arrows. The paths of the current above described are obviously of short duration because after the coil C is energized the plunger 24 of the armature 23 drives the contact 30 against the shunt switch 28 thereby breaking electric connection between the free end of the latter and the contact 27. If after the connection has been broken the operator is still pressing on the push-button to close the push-button or starting end of the circuit, the current will flow from the point *x* as indicated by the dotted arrows to the point *y*, whence a portion will follow the full line arrows along the wires *t*, *t'*, to the contact 30, and another portion along the shunt 28 to the contact 30, thence along the wire *u* back to the line L'. In practice however, the push-button is operated for a very short interval only, or just long enough to insure energization of the coil C, and then immediately released so as to break the circuit at the push-button. Under the circumstances the current when it reaches the point *y* will simply pass along the members 28 and 30, thence along the wire *u* back to the line L', it being understood that the starting point of the current is in the line wire L from which it is conducted into the coil C through the wire *e*. Upon release of the push button the current will flow as indicated, keeping the light 32 burning until something happens to break the circuit. This breaking is effected by the carrier *r* in the following manner: It will be remembered that a closing of the circuit at the push button 29 energizes the coil C, this having the effect of attracting the armature 23 to the coil. In this movement the armature draws on the link 21, the intermediate connections 19 and 18 serving to oscillate the weighted arm 16 upwardly and thereby rock the rock-shaft 10 in proper direction to oscillate the switch 7 across the axis of the tube A, or into position to side-track or divert the carrier traveling through the tube A, into the branch *d* (Fig. 4) the carrier eventually striking the discharge flap 4 which is forced to open position, the outward swing of the flap causing it to strike

the gravity switch 14 and trip the latter out of electric connection with the contact 13. This breaks the circuit, causing the coil C to be deënergized, whereupon the weight 17 on the arm 16 pulls down the arm and restores the armature 23 and its plunger to normal position, after which the same operation may be repeated. Referring now to Fig. 1 which shows the specific application of my system to store service, let us assume that a clerk on the first floor or main station desires to despatch a carrier to the second floor. He first inserts the carrier into the sending branch *a* on the first floor by lifting the gate G and at the same time manipulates the push button 29 (1st floor) so as to close the circuit. The coil C on the second floor thereby becomes energized and the switch 7 in the leg A controlling the discharge branch *d* on the second floor is caused to oscillate into proper position to intercept the upwardly traveling carrier and side-track or divert it into said branch *d*. As the carrier is being discharged it strikes the flap 4, said flap in turn tripping the switch 14 and breaking the circuit. Until the circuit was broken by the carrier, the lamp 32 on the first floor continued to burn, indicating that the carrier had not yet reached its destination. For convenience said lamp is marked by the numeral "2" (or by a suitably colored bulb) to indicate the floor toward which the carrier is being despatched. It follows from the electric connections shown that as long as the lamp burns it serves as a signal or warning that the tube is in service and that the system is in perfect order. The same operation takes place when a carrier is despatched from the first floor to the third floor. In that case the lamps marked "3" on the first and second floors warn that a carrier is being despatched to the third floor. The moment the carrier reaches its destination it trips the flap 4, breaking the circuit thereby restoring the system and the parts actuating the switch 7 to normal position, so that another carrier may be despatched through the leg A. The wiring on the right of the leg or riser A corresponds substantially to the diagram shown in Fig. 2, corresponding parts bearing the same reference letters, the arrows indicating the path of the current.

Again, let us assume that a clerk on the fourth floor desires to despatch a carrier to the second floor. He first inserts the carrier into the sending branch *a'* (4th floor) by lifting the gate G, and at the same time manipulates the push button 29 (on the fourth floor) so as to close the circuit. The coil C on the second floor is thereby energized and the switch 7 in the leg A' controlling the discharge branch *d'* on the second floor is caused to oscillate into proper position to intercept the downwardly traveling carrier and side-track or divert it into said branch *d'*. As the carrier is being discharged it strikes the flap 4, said flap in turn tripping the switch 14 and breaking the circuit. Until the circuit was broken by the carrier, the lamp 32 on the fourth floor continued to burn, indicating that the carrier had not yet reached its destination. It will be observed however (Fig. 1) that on the third floor there is a lamp 32 connected (preferably) in parallel with the wires *t*, *w*, of the circuit of the lamp 32 on the fourth floor, both lamps being marked or identified by the numeral "2" or by globes of distinctive color. It follows from the electric connections shown that as long as one lamp burns, the other will likewise burn, the lamps thus serving to notify or warn the clerks on floors four and three that the despatch tube is being used to deliver a carrier from an upper floor to floor number two. Under the circumstances the clerks on the main floor need no warning since to send a carrier to the second or any upper floor they would use the leg A and not the leg A'. In Fig. 1 the diagram of the above wiring is slightly different from that shown in Fig. 2. In Fig. 1 the lamp 32 (fourth floor) is so far removed from the shunt switch 28 that it would be inconvenient to lead a separate stretch of wire corresponding to the wire *w* in Fig. 2, from the lamp to said switch, and accordingly, the wire *t* is used for the traverse of the current when the circuit is broken at the push button 29 (fourth floor). The moment the operator therefore releases the push button on the fourth floor so as to break the circuit at that point, the current from the lamp simply follows in the opposite direction along the wire *t*, thence through the switch 28, contact 30 and wire *u* back to the line L'. In other words, the wire *t* in the lettered circuit to the left of the leg A' in Fig. 1 (or that whose lamps are identified by the numerals "2") also serves the purpose of the wire *w* shown in Fig. 2. The same is true of the adjacent circuit whose lamp is identified by the numeral "3" on the fourth floor. On the other hand, and as previously pointed out, the circuits on the right of the leg A whose lamps are identified by the numerals "2" and "3" are substantially identical with the diagram shown in Fig. 2, the latter corresponding to the wiring shown in Figs. 3 and 8.

It will be seen from the foregoing that when a carrier is despatched from any floor or station to another floor or station, other than the main station or top floor, that is to say, to any station other than the terminal stations, the clerks or occupants on the several floors or at the several stations are duly notified by the signal lights 32 or their equivalents, the color or number of the light or other identifying means indi-

cating to which floor the carrier is being despatched, it being understood that each floor is identified by a light of some predetermined color or number or equivalent designation. Thus, the lights marked "2" (Fig. 1) may be red, and those marked "3" may be green. The color of the light corresponds to the floor or station to which the carrier is being despatched. If, for example, the clerk on the fourth floor is to despatch a carrier to the second floor, he inserts the carrier into the charging or sending branch *a'* on the fourth floor, closes the circuit identified with the red light lamp ("2") by manipulating the push button 29 of said circuit, this operation resulting in energizing the coil C on the second floor and breaking the circuit at the shunt switch 28, whereby, upon release of the push button said shunt switch coöperating with the spring contact 30 keeps the light section of the circuit closed, thereby causing the red lights to burn on all intermediate floors and warning the clerks that a carrier is being despatched to the second floor. This warning means that the particular leg A, A', through which the carrier is being despatched is not to be used by any other clerk until that carrier reaches its destination which is indicated by the extinguishment of the lights when the circuit is broken by the carrier forcing the discharge flap 4 at the receiving station against the gravity switch 14, the tripping of the switch breaking the circuit, deënergizing the coil C, and restoring the members 28 and 30 to their normal disconnected relation. The tube (A, A',) is now ready for the despatch of another carrier. It will be observed (Fig. 1) that the clerks on the floor to which the carrier is being despatched need not necessarily be warned, the employment of two dispatch legs A, A', making this unnecessary. For example, a carrier coming down the leg A' from the fourth floor to the second, need give no warning to the clerk on the second floor, because the only other station to which he could despatch a carrier in the same direction or through the leg A' is the main or bottom station, and the descending carrier coming down the tube A' would not interfere with his inserting a carrier into the branch *a'* to be delivered to the bottom station. So, a clerk on the second floor need not be warned of a carrier coming from the first floor, as it can not interfere with his sending one to the bottom floor. The main idea of a signal or warning is to call the attention of the clerks on the intermediate floors that the tube is being traversed by a carrier past their stations and cautioning them to wait until the lights go out before they use the tube. Under the system of wiring here shown, it is apparent that the purpose of the shunt switch 28 is to keep the lamp or signal portion of the circuit closed when the operator breaks the circuit at the push button terminal. The shunt automatically closes what the push button serves to break. If the push button could be closed the entire time the carrier was traveling there would be no occasion for the shunt 28. This would of course be quite impractical. The circuit closed by the shunt switch is finally broken by the tripping of the gravity (or equivalent) switch 14, the said switch dropping back against its contact 13 when the flap 4 is closed, the latter being held closed on the ascending leg A by gravity and vacuum and on the descending leg by vacuum. The top discharge *d* (4th floor) and the bottom discharge *d'* bottom floor are provided with a perforated inner guide wall *m* (a single bar will answer) for directing the carriers out of the discharge branches, the perforations (or open spaces on either side of the bar) permitting the air to flow freely through both legs in response to the vacuum in the tank T.

The operating parts in connection with the riser A are mounted as shown in Figs. 3 to 11 inclusive. Necessarily these parts must be mounted in a slightly different way on the descending leg A' because the discharge mouths or branches *d'* point downward instead of upward. An example of such modified mounting is shown in Figs. 12 and 13. In these figures it will be seen that a special bracket 50 is provided for the mounting of the gravity latch 14' which is slightly modified over the structure of the latch 14 previously described, to permit the same to be impinged by the opening movement of the flap 4, the latch (14') operating in all respects the same as the latch 14. Again, in this last modification the weighted arm or lever 16' is necessarily extended in the opposite direction from that of the arm 16, to permit the weight 17' thereon to restore the parts to normal position upon deënergization of the coil C. In all other respects the installation in Figs. 12 and 13 is identical with that described in connection with Figs. 3 to 11, and corresponding parts are identified by the same reference numerals. Obviously, the mountings in Figs. 12 and 13 need not be adhered to, and may in fact be changed, depending on conditions to be met in practice.

Having described my invention what I claim is:

1. In a pneumatic tube system, a main tube provided with an incoming or discharge branch leading from the peripheral wall thereof and communicating with the passage-way of the tube, a discharge flap at the outer end of the branch, a switch hinged in the tube at a point beyond the discharge end of the branch and free to oscillate

across the axis of the passage-way of the tube opposite the intake end of the branch, said switch being curved transversely and longitudinally to preserve the continuity of the passage-way of the tube when occupying its normal position and to interrupt said passage-way and bring the latter into continuity with the passage-way of the branch for another position of the switch, suitable pocket formations formed on the walls of the tube at points diametrically opposite one another for receiving the free end of the switch in either of its extreme positions, a rock-shaft forming the hinge axis for the switch rigidly secured to the switch, an energizing coil, an armature therefor, intermediate connections between the armature and rock-shaft for actuating the switch in one direction upon energization of the coil, means coupled to the rock-shaft for restoring the switch to normal position upon the breaking of the circuit of the coil-energizing current, an electric switch in the path of movement of the discharge flap for breaking the circuit aforesaid upon impact of the discharging carrier against the flap, the parts operating substantially as, and for the purpose set forth.

2. In a pneumatic tube system, a despatch tube provided with a plurality of stations, each station comprising an incoming and outgoing branch or opening communicating with the passage-way of the tube, means for causing a carrier inserted through the outgoing branch of any station to traverse the passage-way of the tube, a switch movable across the tube at each of a predetermined number of incoming branches for side-tracking the carrier into any branch, a source of electric energy, a circuit leading from said source to each station and continued to a predetermined number of adjacent stations, a manually operated switch in the circuit at each station, an energizing coil in the circuit at each station, an armature for the coil, a spring contact having a fixed end in said circuit, a member on the armature for engaging and deflecting said contact, a shunt switch having a fixed and a free end and disposed in parallel with the circuit aforesaid, said shunt switch being positioned in the path of the spring contact whereby upon energization of the coil the member on the armature strikes the spring contact and breaks the circuit at the free end of the shunt switch, causing the current upon the breaking of the circuit at the manually operated switch to return by way of the spring contact and shunt switch, signal lights in the circuit disposed at points between the coil and shunt switch, and a switch in the circuit positioned to be opened by the movement of the carrier in its passage into and through the incoming branch toward which the same has been despatched.

3. In a pneumatic tube system, a main tube provided with an incoming or discharge branch leading from the peripheral wall thereof and communicating with the passage-way of the tube, a rock-shaft mounted on the tube at a point beyond the outer end of said discharge branch, a switch secured at one end to said rock-shaft and oscillating across the axis of the tube opposite the intake of the discharge branch, said switch being curved transversely and longitudinally to form a continuation of the passage-way of the tube for one position, and to form a curved rail or switch to complete the continuity of the walls of the discharge branch and side-track into said branch a carrier approaching the switch for another position, a weighted arm leading from one end of the rock-shaft, a link pivotally secured at one end to said arm in proximity to the axis of the rock-shaft, a lever oscillating about a fulcrum disposed at the center thereof, one arm of the lever being pivotally coupled to the adjacent end of the link aforesaid, a link secured at one end to the opposite arm of the oscillating lever, an armature pivotally coupled to the opposite end of the last mentioned link, an energizing coil, a plunger leading from the armature and freely traversing the coil, an insulated spring contact having a fixed and a free end mounted in the path of the plunger, a spring shunt-switch mounted in the path of movement of the spring contact, a source of electric energy, a discharge flap for the discharge branch aforesaid, a hinged switch mounted to be engaged and tripped by said flap, a push-button, an electric signal, and a wire circuit leading from the line to and through the energizing coil to a suitable contact engaging the free end of the shunt switch, thence to the flap-operated switch and to the aforesaid signal, thence to the fixed end of the shunt switch, through the push-button and fixed end of the spring contact and back to the line, the parts operating substantially as and for the purpose set forth.

In testimony whereof I affix my signature, in presence of two witnesses.

JOHN S. BLACK.

Witnesses:
EMIL STAREK,
ELSE M. SIEGEL.

Copies of this patent may be obtained for five cents each, by addressing the "Commissioner of Patents, Washington, D. C."