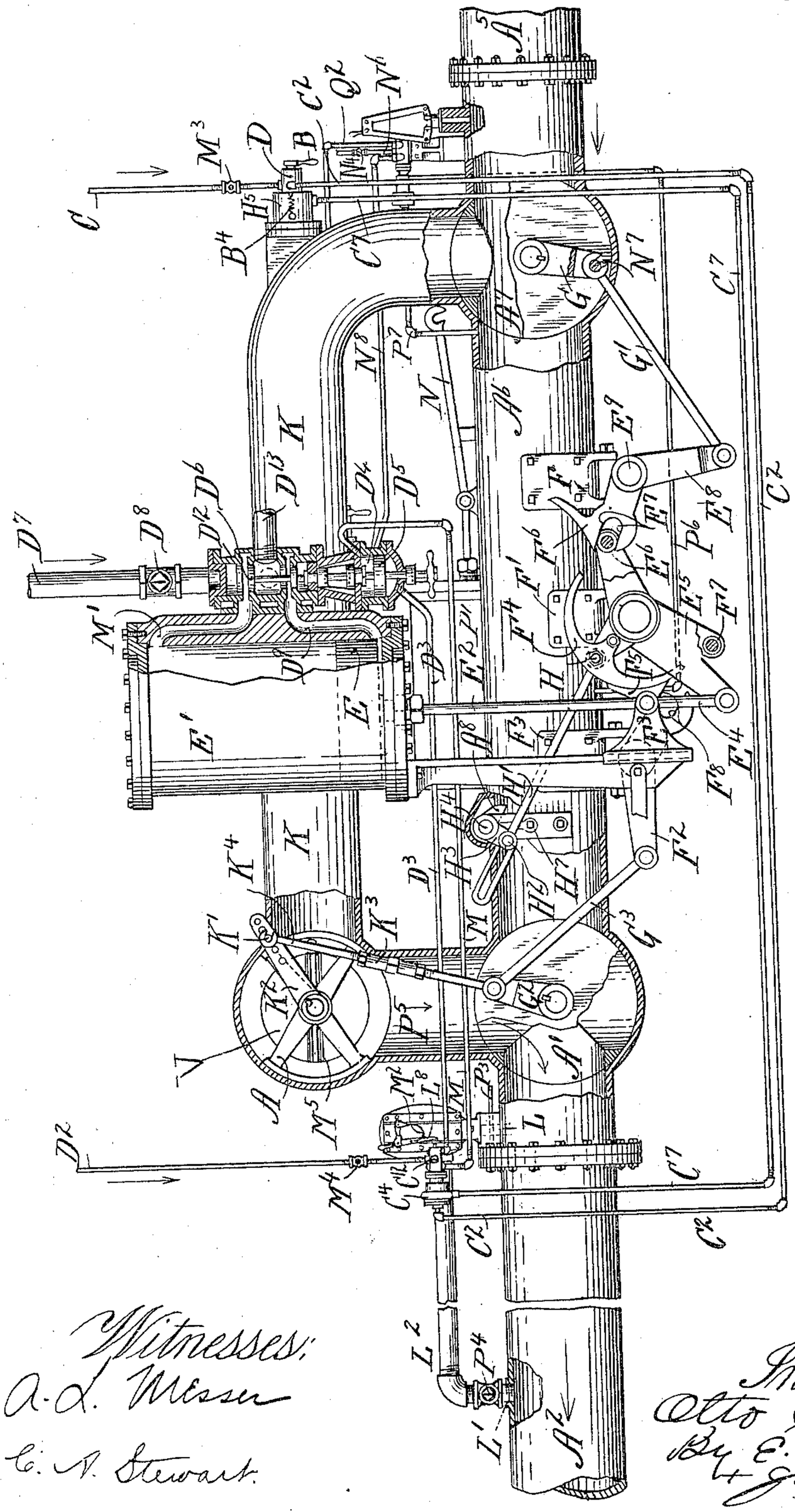
No. 684,715. Patented Oct. 15, 1901.

O. S. PIKE.

COMPOUND PNEUMATIC DESPATCH TUBE TERMINAL.

(Application filed Feb. 4, 1901.)

(No Model.) 6 Sheets—Sheet 1.



Witnesses:
A. D. Wesson
C. N. Stewart.

Inventor:
Otto S. Pike
By E. C. Gilman
& J. S. Rusk
Atty

THE NORRIS PETERS CO., PHOTO-LITHO., WASHINGTON, D. C.

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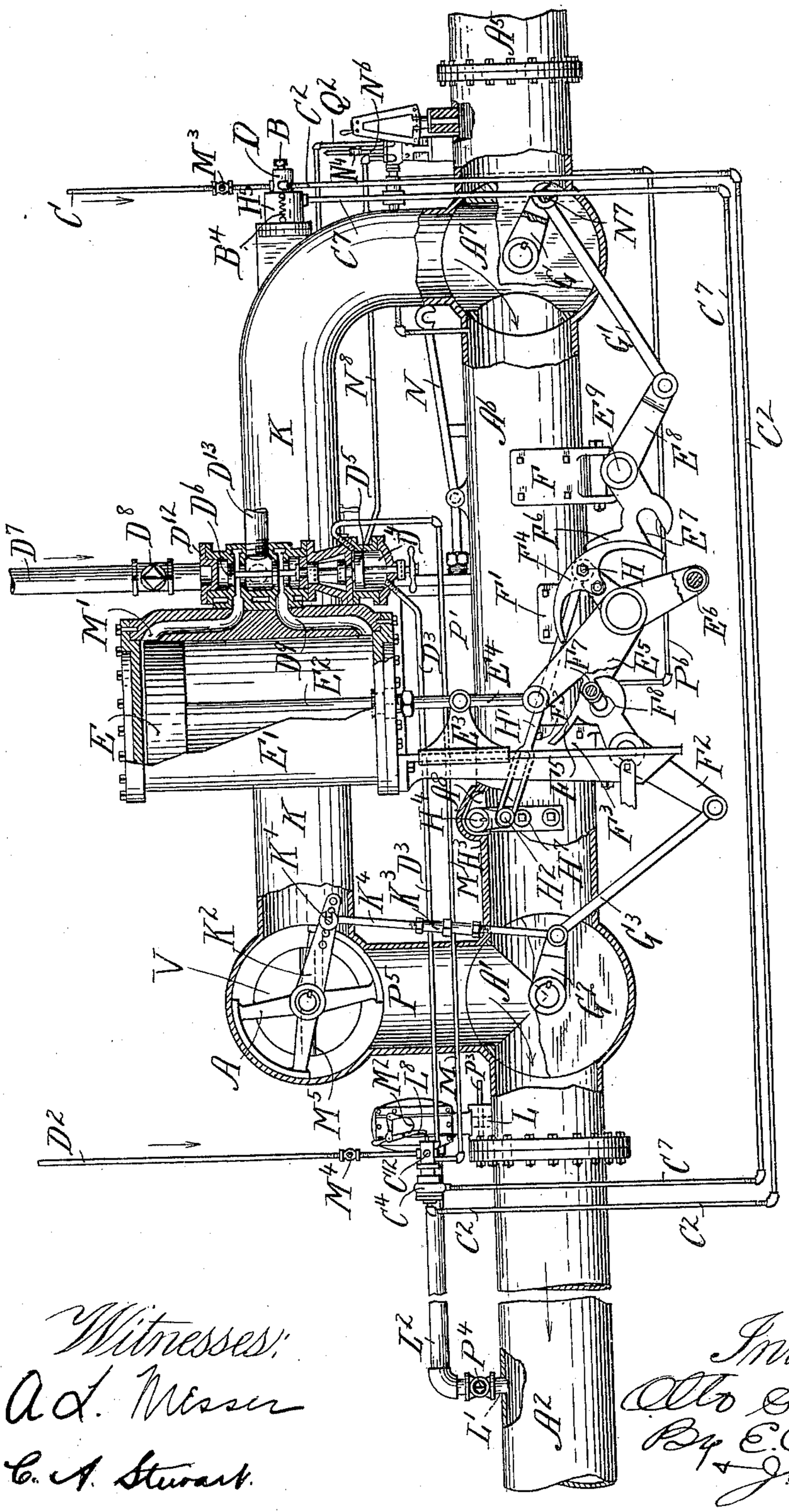

Witnesses:
A. L. Wesson
C. A. Stewart.

Inventor:
Otto S. Pike
By E. C. Gilman
& J. S. Rusk
Atty.

THE NORRIS PETERS CO., PHOTO-LITHO., WASHINGTON, D. C.

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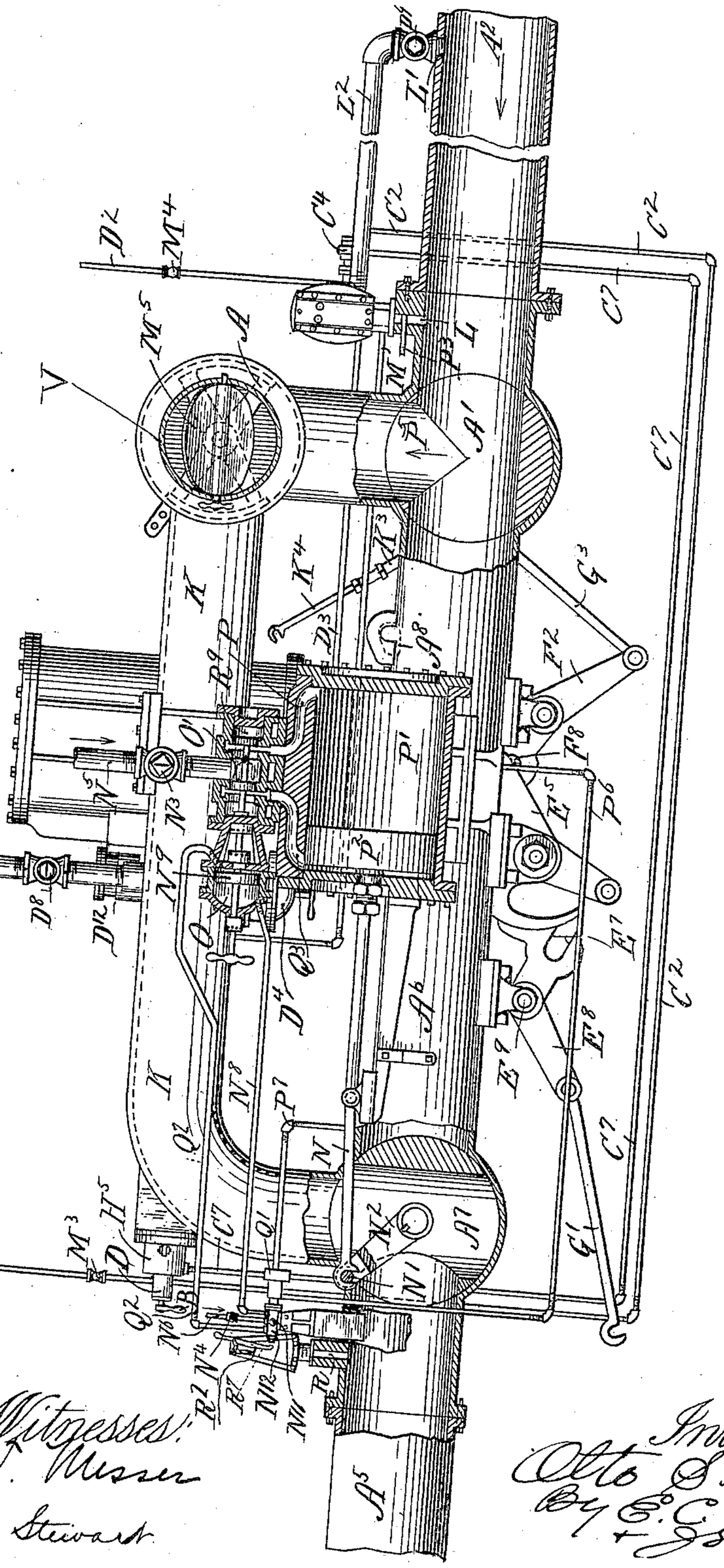
(No Model.) 6 Sheets—Sheet 3.



Witnesses:
A. D. Musser
C. N. Stewart

Inventor:
Otto S. Pike
By E. C. Gilman
& J. S. Rusk
Attys

THE NORRIS PETERS CO., PHOTO-LITHO., WASHINGTON, D. C.

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O. S. PIKE.

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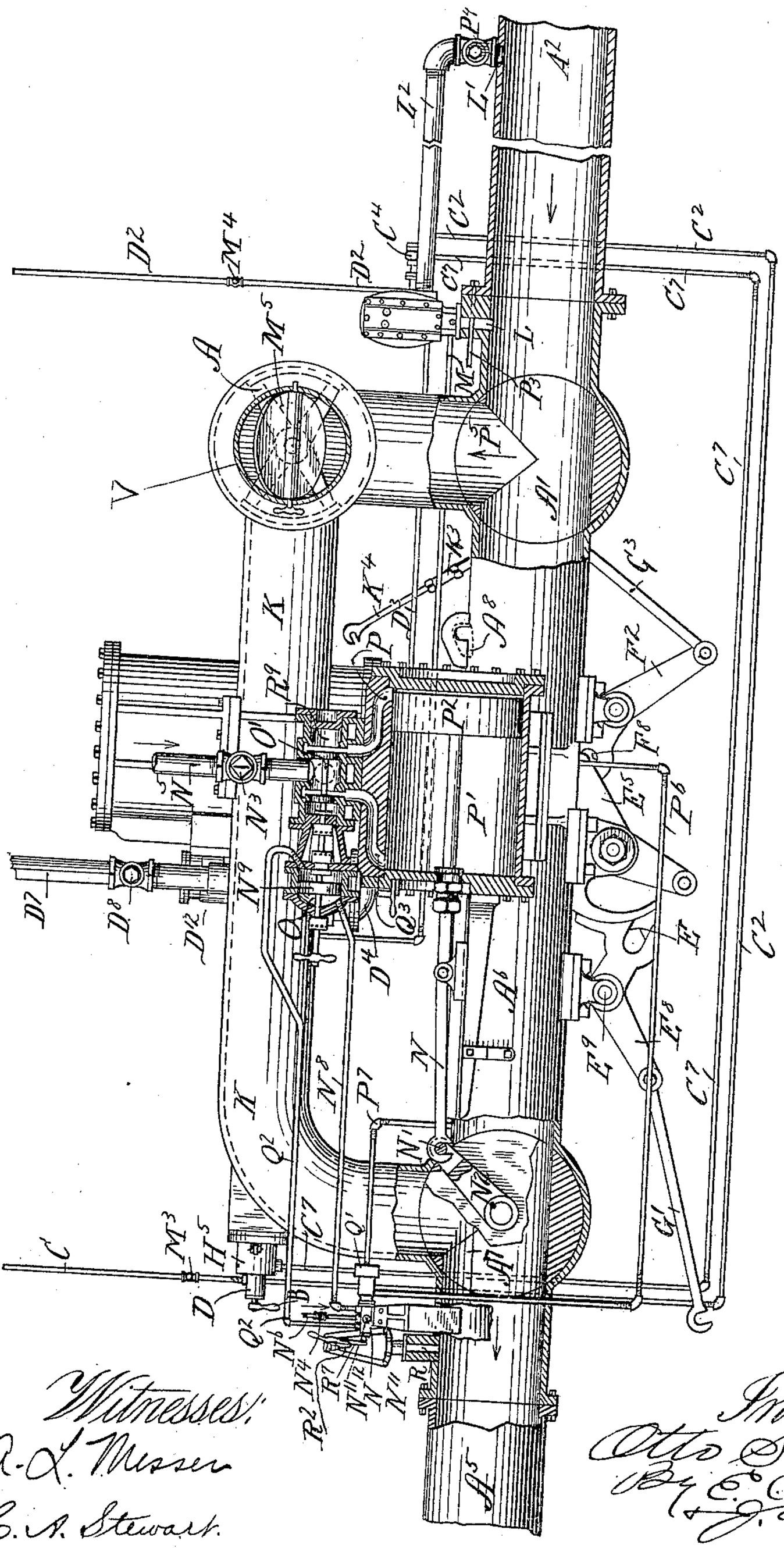
(No Model.) 6 Sheets—Sheet 4.



Witnesses:
A. L. Mason
C. A. Stewart.

Inventor:
Otto S. Pike
By E. C. Gibson
& J. S. Rusk
Atty

THE NORRIS PETERS CO., PHOTO-LITHO., WASHINGTON, D. C.

No. 684,715. Patented Oct. 15, 1901.

O. S. PIKE.

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(No Model.)

6 Sheets—Sheet 5.

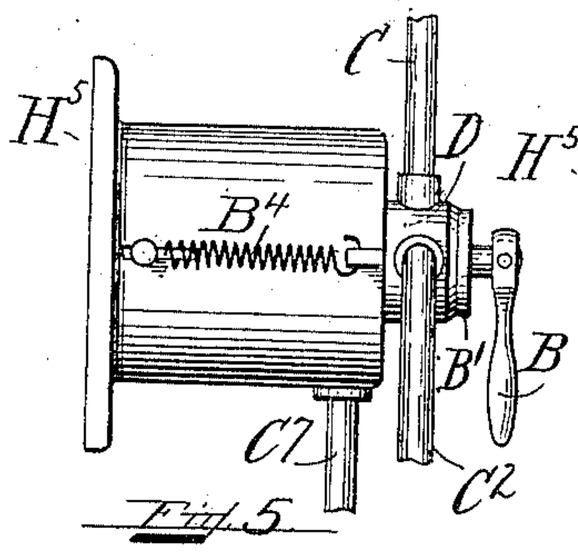

Fig. 5.

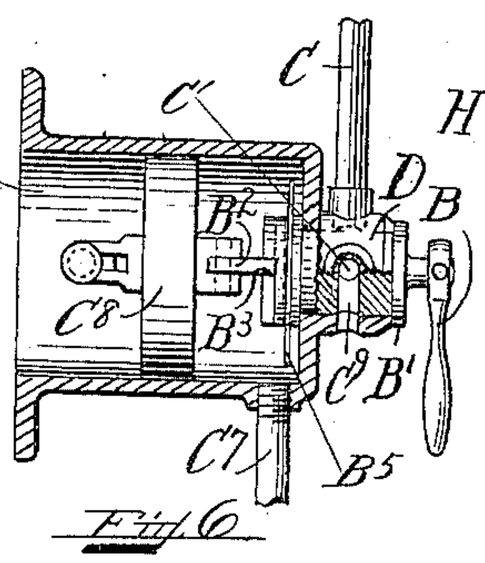

Fig. 6.

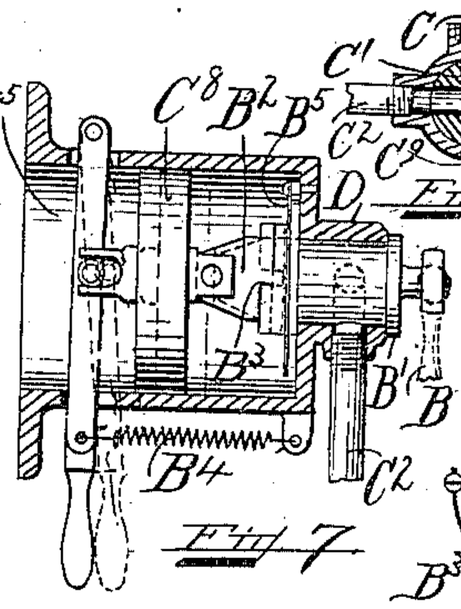

Fig. 7.

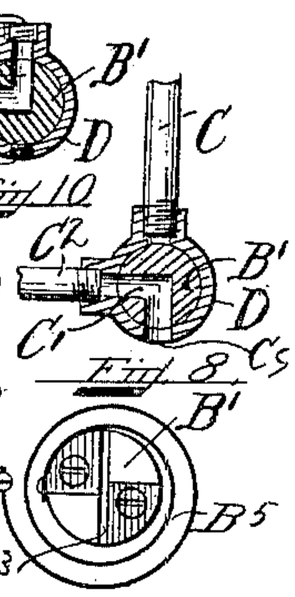

Fig. 9.

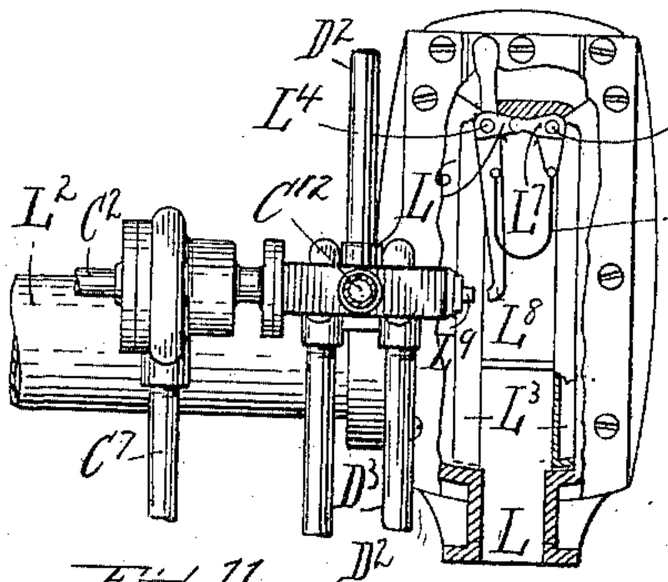

Fig. 11.

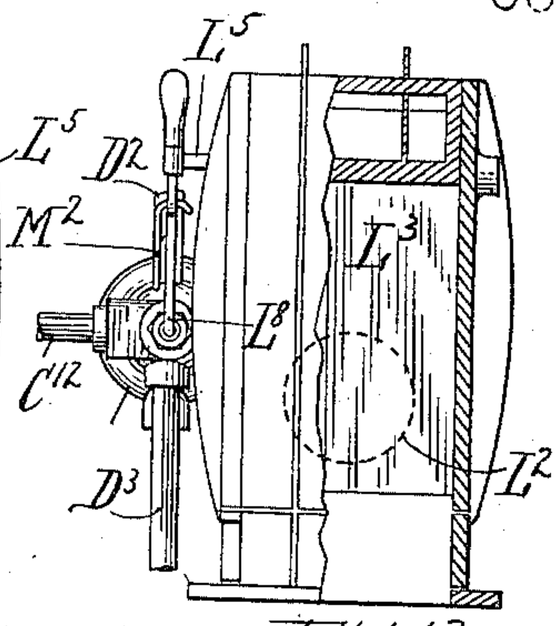

Fig. 12.

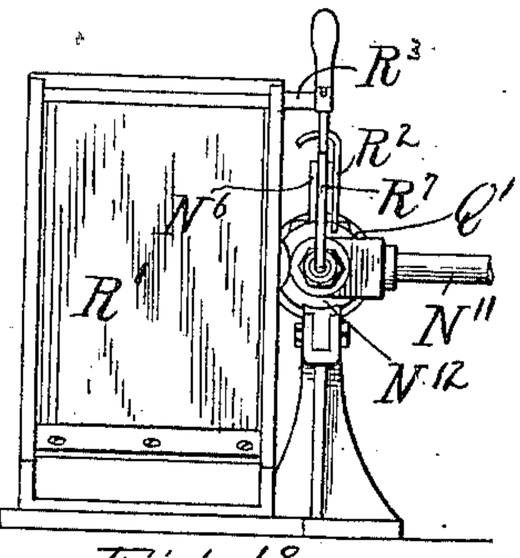

Fig. 18.

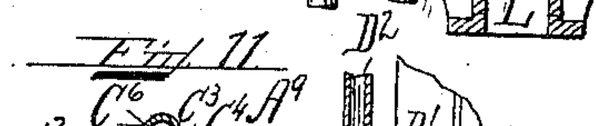

Fig. 13.

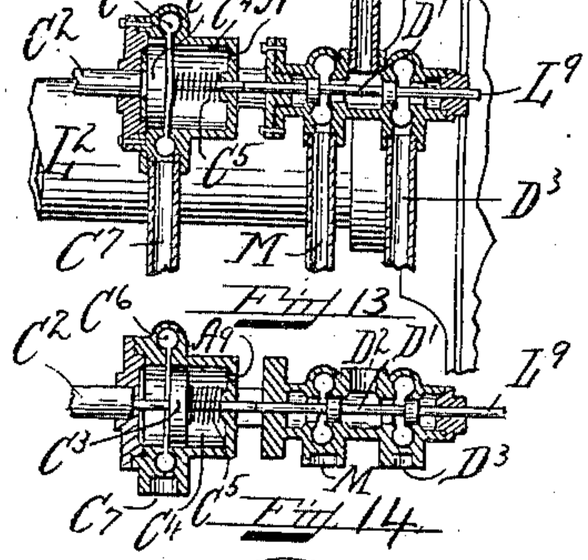

Fig. 14.

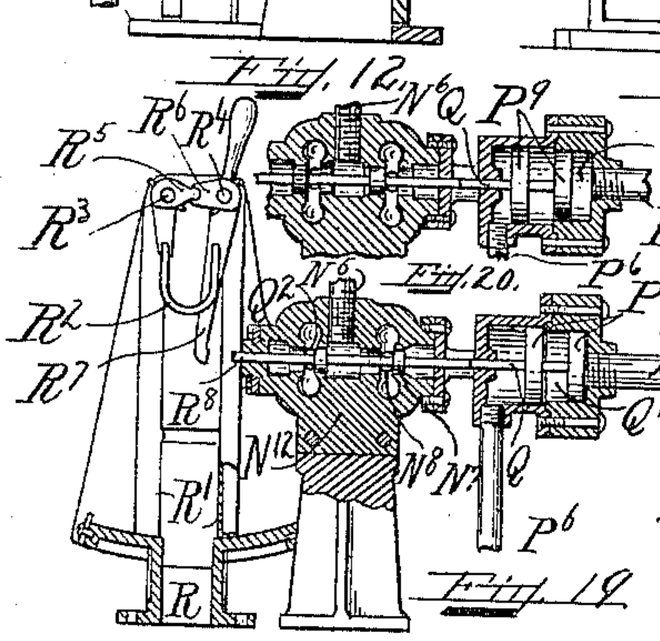

Fig. 19.

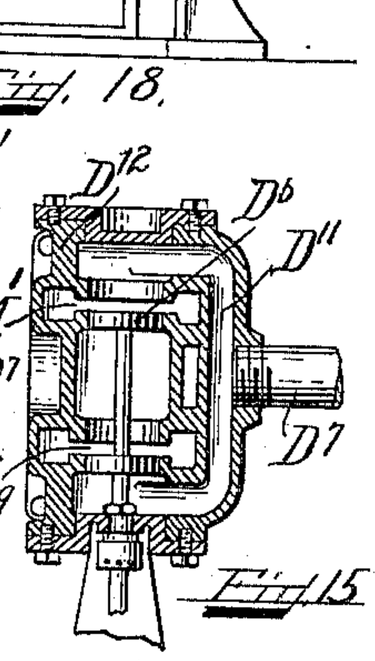

Fig. 15.

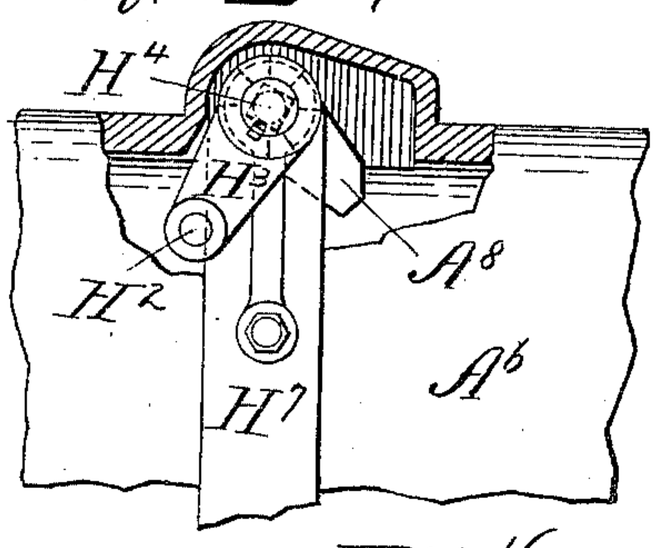

Fig. 16.

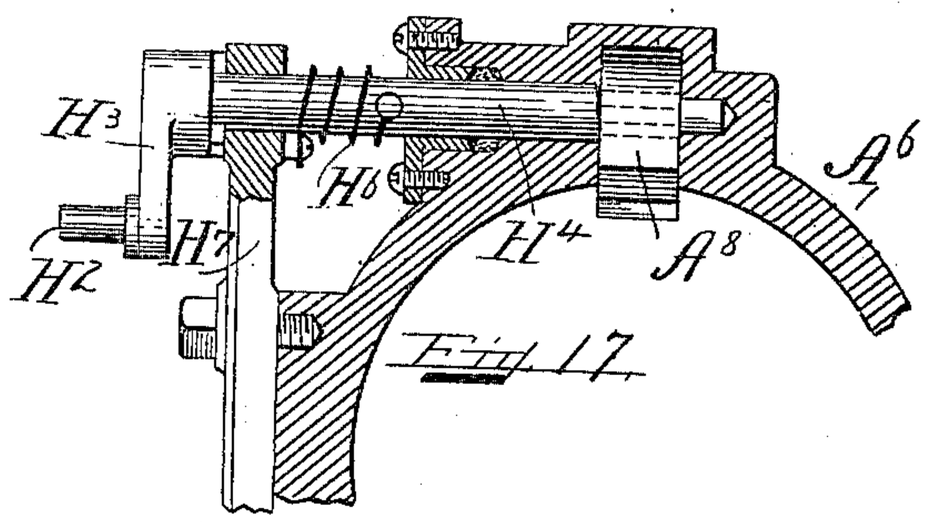

Fig. 17.

Fig. 17a. Fig. 17b.

Witnesses:
A. L. Wisner
C. A. Stewart.

Inventor:
Otto S. Pike
By E. C. Ellis
& J. S. Rusk
Atty

THE NORRIS PETERS CO., PHOTO-LITHO., WASHINGTON, D. C.

No. 684,715. Patented Oct. 15, 1901.

O. S. PIKE.

COMPOUND PNEUMATIC DESPATCH TUBE TERMINAL.

(Application filed Feb. 4, 1901.)

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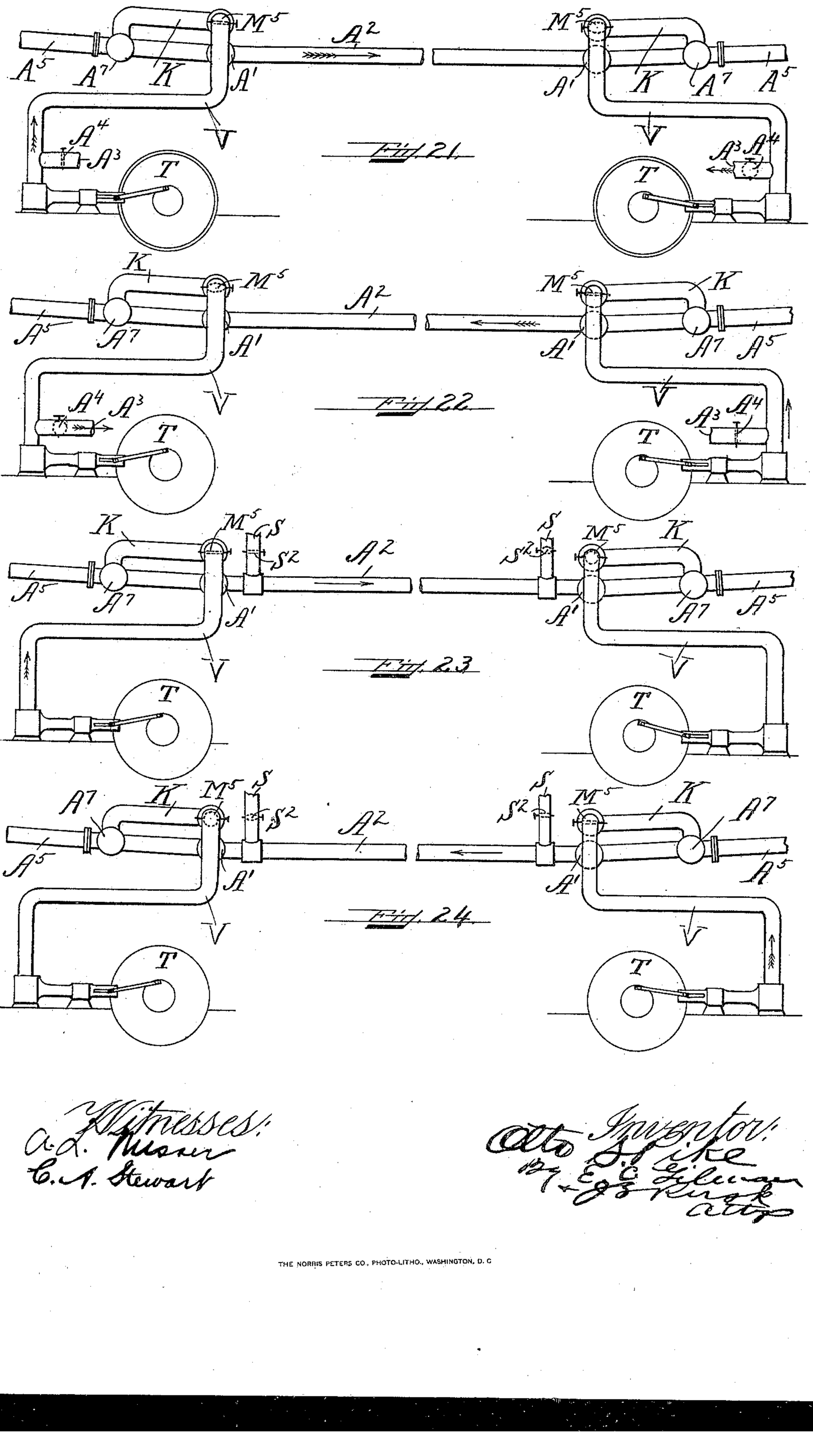

Fig. 21.

Fig. 22.

Fig. 23.

Fig. 24.

Witnesses:
A. L. Thurer
C. A. Stewart

Inventor:
O. S. Pike
By E. G. Gilman
& E. S. Hirsch
Attys

THE NORRIS PETERS CO., PHOTO-LITHO., WASHINGTON, D. C

UNITED STATES PATENT OFFICE.

OTTO S. PIKE, OF MALDEN, MASSACHUSETTS, ASSIGNOR TO AMERICAN PNEUMATIC SERVICE COMPANY, OF DOVER, DELAWARE, A CORPORATION OF DELAWARE.

COMPOUND PNEUMATIC-DESPATCH-TUBE TERMINAL.

SPECIFICATION forming part of Letters Patent No. 684,715, dated October 15, 1901.

Application filed February 4, 1901. Serial No. 45,866. (No model.)

To all whom it may concern:

Be it known that I, OTTO S. PIKE, of Malden, in the county of Middlesex and State of Massachusetts, have invented certain new and useful Improvements in Compound Pneumatic-Despatch-Tube Terminals, of which the following is a specification.

My invention relates to new and useful improvements in compound pneumatic-despatch-tube terminals, in which the same terminal may be used for sending or for receiving carriers.

The object of my invention is to provide a pneumatic system in which carriers may be sent in one direction at one time and in the opposite direction at another time through the same tube, the compound terminals at each end being similar in construction and adapted at one time to act as transmitters and at another time as receivers.

My invention consists of certain novel features hereinafter described, and particularly pointed out in the claims.

In the accompanying drawings, which illustrate a construction embodying my invention, Figure 1 is a side view, partly in section, of my improved compound terminal, showing the parts in position for the insertion of a carrier to be transmitted to the opposite end of the line. Fig. 2 is a similar view, but showing the parts in the position that they assume as the carrier leaves the terminal, the carrier being forced out of the terminal by the pressure behind it. Fig. 3 is a side view, partly in section, of the opposite side of the terminal shown in Figs. 1 and 2 with the parts in position to receive and cushion a carrier coming from the opposite end of the line preparatory to its being discharged onto the receiving-table. Fig. 4 is a view similar to Fig. 3 with the parts in position to allow the carrier to pass from the terminal onto the receiving-table. Figs. 5, 6, 7, 8, 9, and 10 are detail views of the operating-valve for transmitting a carrier, Figs. 5, 6, 8, and 9 showing the valve in its normal position, and the full lines, Fig. 7, also showing the valve in its normal position. The broken lines, Fig. 7, and full lines, Fig. 10, show the valve in the sending position. Figs. 11, 12, 13, and 14 are detail views showing the mechanism for returning the operating-valve of the transmitting portions of the apparatus to its normal position after the work of the operating-valve has been accomplished. Figs. 11, 12, and 13 show the normal position, and Fig. 14 shows a portion of the mechanism in the position assumed after the attendant turns the operating-valve, as hereinafter described. Fig. 15 is a section of one of the piston-valves and valve-chests which control the admission of air to one of the cylinders. Figs. 16 and 17 are detail views of the movable finger and a portion of the operating mechanism for the same which prevents the carrier from striking the forward valve when the attendant pushes the carrier into the terminal for transmission. This finger also prevents the premature starting of the carrier. Figs. 17^a and 17^b are perspective views showing stops on the crank and bearing, respectively, which form part of the mechanism for operating the movable finger shown in Figs. 16 and 17. Figs. 18, 19, and 20 show the details of a portion of the mechanism which closes the valve of the terminal when the terminal is used as a receiver. Figure 21 is a diagrammatic view of the terminals, compressors, and tube-lines, showing the arrangement of some of the valves when the left-hand station is used as a sending-station and the right-hand station is used as a receiving-station. Fig. 22 shows a similar arrangement when the right-hand station is used for a sending-station and the left-hand station is used for a receiving-station. Figs. 23 and 24 are similar diagrams, corresponding, respectively, to Figs. 21 and 22, showing a somewhat-different arrangement of the terminals designed to give a longer cushion for the carrier.

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

The compressed air supplied from the main tube is introduced through tube V at the rear of the valve A, as shown in Figs. 1 and 2. When the terminal is in its normal position, the air passes from the valve A downwardly through the pipe P^5 and the three-way valve A′ and out into the main line, as shown by the arrow on transmission-tube A^2. The air passes

to the other end of the tube-line through the other terminal and out at the opening A^3, controlled by the valve A^4, as shown in Fig. 21.

The terminal when used as a transmitter is operated as follows: The carrier is inserted by the attendant at A^5. The terminal may be inclined, as shown, although this is not necessary. The carrier either by force of gravity or by the impulse given by the attendant passes into and through the valve A^7, into the drum A^6, and against the finger A^8, where it temporarily rests. The attendant turns the lever B and with it the transmitting-valve B' a one-quarter turn from the position shown in Fig. 8 to that shown in Fig. 10 against the spring B^5. When the valve B' reaches the position shown in Fig. 10, the stop B^2 is forced into the notch B^3 on the valve B' by the spring B^4, as shown by dotted lines, Fig. 7. The air in the cylinder H^5 to the right of the piston C^8 can escape through the pipe C^7, through the port C^6, Fig. 13, and the opening A^9 into the atmosphere. Compressed air or other motive fluid is supplied through the pipe C. In the normal position of the valve B' this supply of compressed air is cut off, as shown in Fig. 8. When the valve B' is rotated to the position shown in Fig. 10, the compressed air supplied from the pipe C passes through the passage C' in the valve B' into the pipe C^2 and thence to the rear of the piston C^3 in the cylinder C^4. (Shown in Fig. 13.) The compressed air from the pipe C^2 forces the piston C^3 to the right against the spring C^5, Fig. 14. The air inclosed in the cylinder C^4 to the right of the piston C^3 escapes into the atmosphere through the opening A^9 in the cylinder C^4. When the piston C^3 has passed the port C^6, (shown in Figs. 13 and 14,) the compressed air passes into the pipe C^7 and returns thence to the right of the piston C^8 in the cylinder H^5 and forces the piston C^8 to the left against the spring B^4, thus withdrawing the stop B^2 from the slot B^3 in the valve B'. This allows the spring B^5 to return the valve B' to its normal position, (shown in Fig. 8,) thus cutting off the air-supply from the pipe C. At the same time the compressed air entrapped in the cylinder C^4 to the left of the piston C^3 and in the pipe C^2 can escape to the atmosphere through the passage C' in the valve B' and the opening C^9 in the bottom of the cylinder D. When the compressed air escapes to the atmosphere, as above stated, the spring C^5 returns the piston C^3 to the position shown in Fig. 13. When the piston C^3 is forced to the right, as above described, it moves with it the three-way piston-valve D'. Compressed air or other motive fluid is supplied through the pipe D^2. When the piston-valve D' moves to the right, the compressed air from the pipe D^2 passes into the pipe D^3 and thence to the cylinder D^4. In this cylinder D^4 is located the piston D^5. The compressed air from the pipe D^3 moves the piston D^5 upward, carrying with it the three-way piston-valve D^6. The air in the cylinder D^4 above the piston D^5 escapes through the pipe M and the three-way auxiliary valve D' into the atmosphere through the opening C^{12}. This opening is connected with the spaces outside of the disks of the three-way piston-valve D' by a passage exactly similar to the passage D^{11} in Fig. 15. Compressed air or other motive fluid is supplied through the pipe D^7. The cock D^8 is always open when the compound terminal is used as a transmitter. The upward movement of the valve D^6 admits compressed air from the pipe D^7 through the port D^9 to the under side of the piston E in the cylinder E'. The compressed air under the piston E forces the piston to the top of the cylinder E'. The air in the cylinder E' above the piston E escapes into the atmosphere through the port M', the three-way valve D^6, and the opening D^{13}. As the piston E moves it carries with it the piston-rod E^2, cross-head E^3, connecting-rod E^4, and wrist-plate E^5. On the wrist-plate E^5 is mounted a roller E^6, working in the jaws E^7 of the bell-crank E^8, pivoted at E^9 to a suitable hanger F, bolted or screwed to the drum A^6. On a similar hanger F' is pivoted the wrist-plate E^5. At the left of the wrist-plate E^5 is shown the bell-crank F^2, pivoted and supported on the hanger F^3 similarly to the bell-crank E^8. On the wrist-plate E^5 is mounted the crescent-shaped piece or "locking-arc" F^4. This locking-arc F^4 fits the curved portions F^5 F^6, respectively, of the bell-cranks F^2 and E^8.

In the position in which the mechanism is shown in Fig. 1 the wrist-plate E^5 and with it the locking-arc F^4 can revolve without moving the bell-crank F^2 until the roller F^7, mounted on the wrist-plate E^5, strikes the jaws F^8 of the bell-crank F^2. The locking-arc F^4 locks the bell-crank F^2 rigidly in position until the roller F^7 strikes the jaws F^8 of the bell-crank F^2. The valve A^7 is connected with the bell-crank E^8 by the crank G and the gab-rod G'. The valve A' is similarly connected, by means of the crank G^2 and the connecting-rod G^3, to the bell-crank F^2. As the piston E moves upward the wrist-plate E^5 rotates to the right. The bell-crank E^8 is thus rotated to the left, carrying with it the valve A^7, and the mechanism is so proportioned that when the valve A^7 reaches the position shown in Fig. 2 the roller E^6 on the wrist-plate E^5 will roll by the point of the lower jaw E^7 on the bell-crank E^8. At the same time the locking-arc F^4 comes in coincidence with the curved portion F^6 on the bell-crank E^8 and prevents further motion of the bell-crank E^8 and the valve A^7. The wrist-plate continues its right-hand movement, and just as the roller E^6 is released from the jaws E^7 on the bell-crank E^8 the roller F^7 strikes the jaws F^8 of the bell-crank F^2, the locking-arc F^4 having by this time rotated out of the way of the curved portion F^5 of the bell-crank F^2, and thus the wrist-plate E^5 causes the bell-crank F^2 to rotate to the left and the valve A' to the right. The stroke of the piston and the mechanism are so

proportioned that at the end of the stroke of the piston E the valve A′ will assume the position shown in Fig. 2. Attached to the stud H, mounted on the wrist-plate E^5, is the rod H′, slotted for a considerable distance at one end, the slotted portion passing over the crank-pin H^2 on the crank H^3, mounted on the spindle H^4, on which is also mounted the finger A^8, extending down into the drum A^6, as shown in Figs. 1, 16, and 17. The finger A^8 is held down in the drum by the helical spring H^6, attached to the spindle H^4 and to the bearing H^7 of the spindle H^4. As the piston moves upward the slotted portion of the rod H′ slides over the crank-pin H^2 without moving the crank; but shortly before the piston E reaches the end of its upward stroke the end of the slotted portion of the rod H′ strikes the crank-pin H^2, rotating it sufficiently to raise the finger A^8 out of the interior of the drum A^6 against the spring H^6. The downward motion of the finger A^8 is limited by the stops H^8 H^9, as shown in Figs. 17^a and 17^b, respectively. This prevents the spring H^6 from forcing the finger A^8 beyond its proper position to hold the carrier before transmission. The valve A is connected to the crank G^2 by the crank K^2 and the gab-rod K^4. When the valve A′ revolves, the valve A also revolves, and the mechanism is proportioned so that the motion of the valve A will be very slight during the first portion of the movement of the valve A′, but as the valve A′ reaches the end of its movement the movement of the valve A rapidly increases until the valve A reaches the position shown in Fig. 2.

When the valve A is in the position shown in Fig. 2, a portion of the compressed air supplied at the rear of the valve A can enter the pipe K, the remaining portion of the air passing downward, as before, through the pipe P^5 and the three-way valve A′. That portion of the compressed air which passes into the pipe K passes through the three-way valve A^7 into the drum A^6 back of the carrier, as the valve A^7 in the position shown in Fig. 2 cuts off the opening to the atmosphere. In the position of the parts as shown in Fig. 2 the carrier can start on its outward journey. The opening into the pipe K, controlled by the valve A, is adjusted by means of the different positions of the crank-pin K′ on the crank K^2 and by the turnbuckle K^3 on the gab-rod K^4, so that compressed air sufficient to just move the carrier is admitted to the drum A^6 behind the carrier. The mechanism for adjusting the valve has sufficient range so that, if desirable, the downward opening from the valve A can be entirely cut off and the entire supply of compressed air forced through the pipe K into the drum A^6 behind the carrier. At the end of the motion of the mechanism and valves, as above described, the carrier passes out through the valve A′ into the tube-line A^2, being forced out by the compressed air. At L is an opening in the drum A^6, beyond the valve A′, this opening leading to the valve-reversing mechanism. (Shown in Figs. 11, 12, 13, and 14.) At L′ is connected to the tube-line A^2 the pipe L^2, also leading to the above-mentioned valve-reversing mechanism, the distance between the openings L and L′ being somewhat greater than the length of the carrier. In the normal position of the apparatus the compressed air in the tube-line can act with equal pressure on the opposite sides of the vanes L^3, (shown in Fig. 11,) so that the vanes remain stationary. After the carrier has passed the opening L in the drum A^6 the excess of pressure behind the carrier required to drive the carrier passes up through the opening L between the vanes L^3. This pressure being greater than the pressure on the outside of the vanes forces the vanes outward against the spring M^2. The vanes L^3 are pivoted, respectively, at L^4 and L^5. The pivots are connected by levers L^6 and L^7, so that the vanes can act together to move the lever L^8. As the vanes move outwardly the lever L^8 strikes the end L^9 of the valve-spindle of the three-way piston-valve D′. This forces the piston-valve D′ to its normal position, as shown in Fig. 13, thus allowing the supply of compressed air from the pipe D^2 to flow into the pipe M. This pipe M connects with the cylinder D^4 above the piston D^5. When the compressed air is admitted to the cylinder D^4 above the piston D^5, said piston is forced downward, carrying with it the three-way valve D^6, thus admitting compressed air from the pipe D^7 through the port M′ to the cylinder E′ above the piston E. The piston E is thus forced downward to its normal position, (shown in Fig. 1,) carrying with it the mechanism above described—the valves A, A^7, and A′—and the other parts assume the position shown in Fig. 1, the motion of the parts being in reverse order from that described from Fig. 1 to Fig. 2. The air in the cylinder E′ below the piston E escapes through the port D^9 and the opening D^{13} into the atmosphere. When the carrier has passed the opening L′ in the tube A^2, the pressure on the outside and inside, respectively, of the vanes L^3 is again equalized and the spring M^2 pulls the vanes inward to their normal position, as shown in Fig. 11. The cocks M^3 M^4 in the pipes C and D^2, respectively, the butterfly-valve M^5, the cock P^4, and the sliding gate P^3 are always open when the terminal is used as a transmitter, as shown in Figs. 1 and 2. When the terminal is being used as a transmitter, the mechanism for operating the receiving portion of the terminal (shown in the foreground of Figs. 3 and 4) is entirely disconnected by lifting the gab-rod N from the crank-pin N′ of the crank N^2, which is keyed to the trunnion of the valve A^7, as shown in Figs. 3 and 4, and by closing the cocks N^3 and N^4 in pipes N^5 N^6, respectively. It is not absolutely necessary that the cocks N^3 N^4 be closed while the re-

ceiving portion of the terminal is out of use; but it is desirable in order to prevent accidental movement of the receiving mechanism.

When the terminal is to be used as a receiver, the operation of the mechanism is as follows: Compressed air or other motive fluid is supplied to the pipes N^5 N^6. The portion of the terminal to be used as a transmitter is thrown into the position shown in Fig. 2, so as to bring the straightway of the three-way valve A′ into alinement with the drum A^6 and the tube-line A^2, as shown in Figs. 2, 3, and 4, after which the cocks M^3, M^4, and D^8, in the pipes C, D^2, and D^7, respectively, may be closed, so as to prevent accidental moving of the transmitting mechanism. The gab-rod G′ is then lifted from the crank-pin N^7 of the crank G and the gab-rod K^4 is lifted from the crank-pin K′ of the crank K^2. The valve A is thrown into the position shown in Figs. 1, 3, and 4 by hand. The valve A^7 is turned by hand into the position shown in Fig. 4, and the gab-rod N is dropped over the crank-pin N′ on the crank N^2, which is keyed to the trunnion of the valve A^7. The cocks N^3 N^4 in the pipes N^5 N^6, respectively, are then opened (if previously closed) and compressed air from the pipe N^6 flows through the three-way piston-valve N^7, which is in the position shown in Fig. 19, passing from thence through the pipe N^8 to the left-hand face of the piston N^9 in the cylinder O. The piston N^9 is thus forced to the right, admitting compressed air from the pipe N^5 through the three-way piston-valve O′ and the port P into the cylinder P′ to the left of the piston P^2, thus forcing the piston P^2 to the left, as shown in Fig. 3, and rotating the valve A^7, so as to close the drum A^6 to the atmosphere. The air in the cylinder P′ to the right of the piston P^2 escapes through the port Q^3, the three-way piston-valve O′, and a passage exactly like the passage D^{11}, Fig. 15, into the atmosphere. The air in the cylinder O to the right of the piston N^9 escapes through the pipe Q^2, the three-way valve N^7, and opening N^{11} into the atmosphere. The valve-chest N^{12} and the three-way valve N^7 are similar to the valve-chest and the three-way valve shown in Fig. 15. The sliding valve P^3 and the cock P^4 are closed, and the butterfly-valve M^5 is partially closed, for purposes to be hereinafter described. It will of course be understood that the main air-supply through the back of the valve A (shown in Fig. 1) is shut off before the apparatus is changed from a transmitter to a receiver. The direction of the main compressed-air supply is reversed, the supply now coming from the distant station, where the apparatus is now being used as a transmitter. This main supply of compressed air travels in the direction shown by the arrows in Fig. 3 through the three-way valve A′ upward through the pipe P^5 and out past the butterfly-valve M^5 into the atmosphere, as indicated in Figs. 21 and 22. The apparatus is now ready to receive carriers. When the carrier arrives at the receiver in the direction shown by the arrow in the main tube-line A^2 in Fig. 3, it passes through the valve A′ into the drum A^6. Air is entrapped in the drum A^6 as the carrier passes by the vertical pipe P^5 above the valve A′. This air being confined is compressed by the momentum of the carrier and serves to lessen the velocity of the carrier or even to bring it to a standstill. The pressure in the drum A^6 is transmitted by the pipes P^6 and P^7 to the left-hand and right-hand faces, respectively, of the double piston P^9. (Shown in Figs. 19 and 20.) Attention is called to the fact that the left-hand disk of the double piston P^9 is enough larger than the right-hand disk of the piston P^9 to more than offset the loss of area due to the stem Q of the piston P^9, so that as long as the pressure is transmitted through the pipes P^6 and P^7 the piston will remain in the position shown in Fig. 19. When the carrier passes into the drum A^6, as above described, and travels by the end of the pipe P^6, where said pipe is connected into the drum A^6, the air-pressure passing into the pipe P^6 is wholly or in part cut off, so that the pressure passing into the pipe P^7 is appreciably greater than that passing into the pipe P^6, this pressure being produced, as above stated, by the momentum of the carrier as it cushions on the air entrapped in the drum A^6. The excess of pressure coming from the pipe P^7 into the cylinder Q′ to the right-hand face of the piston P^9 forces said piston into the position shown in Fig. 20, carrying with it the three-way piston-valve N^7. This movement of the piston-valve N^7 allows compressed air from the pipe N^6 to pass through the three-way valve N^7 into the pipe Q^2 and thence to the right of the piston N^9 in the cylinder O, forcing the piston N^9 and the piston-valve O′ into the position shown in Fig. 4. Compressed air is thus admitted from the pipe N^5, through the port Q^3, into the cylinder P′ to the left of the piston P^2, thus forcing the piston P^2 to the right, as shown in Fig. 4, revolving the valve A^7 and opening the drum A^6 to the tube A^5 and atmosphere, as shown in Fig. 4. Air in the cylinder P′, on the right of the piston P^2, escapes through the port P and three-way valve O′ into the atmosphere. Air in the cylinder O, to the left of the piston N^9, escapes through the pipe N^8, three-way valve N^7, and opening N^{11} into the atmosphere. The carrier as it passes over the opening from the drum A^6 to the pipe P^6 is moving at a reduced rate of speed, due to the cushioning of the carrier. The valve M^5 is adjusted previously, so that the flow of air by the valve M^5 is throttled, so that sufficient pressure remains in the main tube-line A^2 and the drum A^6 to force the carrier through the valve A^7 into the tube A^5 and out onto the receiving-table in case the original momentum is too nearly exhausted to force the carrier out. Experience determines the amount that the valve M^5 must be closed in order to move the car-

rier at the proper rate of speed to discharge the same, depending on the weight of the carrier, the friction, the remaining momentum, and the inclination of the terminal. As the carrier passes under the opening R in the portion of the drum A^6 to the left of the valve A^7 the pressure behind the carrier necessary for propelling the carrier out of the drum A^6 and the tube A^5 passes into the opening R between the vanes R′ and forces the vanes outwardly and apart against the spring R^2. In the normal position of the receiver the atmospheric pressure is on both sides of the vanes R, so that said vanes are retained in position shown in Fig. 19 by the spring R^2. The vanes R R′ are pivoted, respectively, at R^3 R^4, the vanes being attached to levers R^5 R^6, which mesh together, thus allowing both vanes to act together on the lever R^7. As the vanes move outwardly the lever R^7 strikes the end R^8 of the spindle of the three-way valve N^7 and forces the piston-valve N^7, and with it the double piston P^9, into the position shown in Fig. 19. The movement to the right of the piston-valve N^7 allows compressed air to pass from the pipe N^6 to the pipe N^8, thence to the left-hand face of the piston N^9 in the cylinder O, thus forcing the piston-valve O′ to the right, as shown in Fig. 3, and admitting compressed air from the pipe N^5, through the port P, to the right of the piston P^2 in the cylinder P′. This compressed air forces the piston P^2 to the left and rotates the valve A^7 into the position shown in Fig. 3, thus closing the drum A^6 to the atmosphere and to the tube A^5 and leaving the terminal ready for the reception and cushioning of another incoming carrier. Air in the cylinder O to the right of the piston N^9 and in the cylinder P′ to the left of the piston P^2 escapes as heretofore described. As the carrier passes out of the tube A^5 to the receiving-table the pressure in the tube A^5 is released into the atmosphere. As this equalizes the pressure on the inside and outside of the vanes R′ the springs R^2 immediately draw the vanes R′ by means of the levers R^5 R^6 into the position shown in Fig. 19. The piston-valve O′ and the valve-chest R^9 are exactly similar to the piston-valves D^6 and valve-chest D^{12}, (shown in Fig. 15,) with the exception that in Fig. 15 compressed air is supplied to the outside of the disks of the piston-valve, whereas in Figs. 3 and 4 compressed air is supplied between the disks of the valve.

Fig. 21 shows in diagrammatic form the arrangement of the terminals, compressors, and tube-lines when the terminal shown on the left is used as a transmitter and the terminal on the right as a receiver. In this case the compressor T on the left is in use and the compressor T on the right is idle. The valve A^4 at the left-hand station closes the opening A^3 to the atmosphere, and the valve M^5 on the left-hand terminal is open, as previously stated. The valve M^5 on the right-hand terminal is partially closed, as previously described, and the valve A^4 at the right-hand station is open, allowing the compressed air from the main tube-line to escape into the atmosphere through the opening A^3. Fig. 22 shows an exactly similar arrangement when the left-hand terminal is used as a receiver and the right-hand as a transmitter, the valves being reversed from their position, as shown in Fig. 21, and the right-hand compressor being in use while the left-hand compressor is idle.

Figs. 23 and 24 are diagrammatic views similar, respectively, to Figs. 21 and 22, showing an arrangement to give a long cushion to stop the incoming carrier without increasing the dimensions of the terminal mechanism. In Figs. 23 and 24, S represents the outlets in the main tube-line near the valve A′. When the left-hand terminal is used as a transmitter, as shown in Fig. 23, the valve S^2 at the left-hand station is closed. At the right-hand station it is partly closed, so that the air in the main tube-line is throttled sufficiently to furnish pressure for forcing the carrier out of the terminal onto a receiving-table, as above described. The valve M on the left-hand terminal is open, as described. At the right-hand terminal the valve M^5 is closed. The valve A of the terminal which is being used as a receiver has been previously turned by hand, so as to cut off the pipe P^5. The compressed air from the compressor T on the left-hand station now passes into the main tube-line, as previously described, and escapes through the outlet S by the valve S^2 at the right-hand station into the atmosphere. Fig. 24 shows the same tube system with the right-hand station used as a terminal station and the left-hand as a receiving-station, with the respective valves in the reversed position to that shown in Fig. 23.

From the foregoing it will be understood that there is a continuous flow of compressed air through the terminal which is used as a transmitter to despatch the carriers through the transmission-tube, while the supply of compressed air at the opposite terminal, which is then used as a receiver, is entirely cut off.

I do not limit myself to the arrangement and construction shown, as the same may be varied without departing from the spirit of my invention.

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, is—

1. In an apparatus of the character described, a terminal, a transmission-tube, a valve for closing said terminal to the atmosphere and normally open, a valve for closing communication between the terminal and the transmission-tube and normally closed, mechanism common to said valves for operating the same, a cylinder, a piston in said cylin-

der connected to said mechanism, an air-supply for operating said piston to move said valves, a valve controlling the flow of air from said air-supply to said cylinder for operating said piston, a transmitting-valve controlling the flow of air which operates said cylinder-controlling valve, means for locking said transmitting-valve in position to which moved, and means for returning said valve to its normal position after it is released from its locked position.

2. In an apparatus of the character described, a terminal, a transmission-tube, a valve for closing said terminal to the atmosphere and normally open, a valve for closing communication between said terminal and the transmission-tube and normally closed, mechanism common to said valves for operating the same, a cylinder, a piston in said cylinder connected to said mechanism, an air-supply for operating said piston to move said valves, a valve operated by compressed air and controlling the flow of air from said air-supply to said cylinder for operating said piston, an air-supply for operating said cylinder-controlling valve, and a valve controlling the air-supply which operates said cylinder-controlling valve.

3. In an apparatus of the character described, a terminal, a transmission-tube, a valve for closing said terminal to the atmosphere and normally open, a valve for closing communication between the terminal and the transmission-tube and normally closed, mechanism common to said valves for operating the same, a cylinder, a piston in said cylinder connected to said mechanism, an air-supply for operating said piston, a valve controlling the flow of air from said air-supply to said cylinder for operating said piston, an air-supply for operating said cylinder-controlling valve, a valve controlling the air-supply which operates said cylinder-controlling valve, an air-supply for operating the valve which controls the flow of air to operate the cylinder-controlling valve, and a valve controlling the supply of air which operates the cylinder-controlling valve.

4. In an apparatus of the character described, a terminal, a transmission-tube, a valve controlling communication between the terminal and the atmosphere and normally open, a valve controlling communication between the terminal and the transmission-tube and normally closed, mechanism common to said valves for operating the same, a cylinder, a piston in said cylinder connected to said mechanism, an air-supply for operating said piston to move said valves, and mechanism operated by the variation of pressure produced by the traveling carrier for operating said valve-controlling mechanism to return said valves to their normal positions.

5. In an apparatus of the character described, a terminal, a transmission-tube, a valve controlling communication between the terminal and the atmosphere and normally open, a valve controlling communication between the terminal and the transmission-tube and normally closed, mechanism common to said valves for operating the same, a cylinder, a piston in said cylinder connected to said mechanism, an air-supply for operating said piston to move said valves, and mechanism operated by the pressure at the rear of the traveling carrier for operating said valve-operating mechanism to return said valves to their normal positions.

6. In an apparatus of the character described, a terminal, a transmission-tube, a valve controlling communication between the terminal and the atmosphere and normally open, a valve controlling communication between the terminal and the transmission-tube and normally closed, mechanism common to said valves for operating the same, a cylinder, a piston in said cylinder and connected to said mechanism, an air-supply for operating said piston to move said valves, a locking device for holding said valves in the position to which they are moved by the operation of the piston, and mechanism operated by the traveling carrier for operating said valve-operating mechanism to return said valves to their normal positions.

7. In an apparatus of the character described, a terminal, a transmission-tube, a valve controlling communication between the terminal and the atmosphere and normally open, a valve controlling communication between the terminal and the transmission-tube and normally closed, mechanism common to said valves for operating the same, a cylinder, a piston in said cylinder and connected to said mechanism, an air-supply for operating said piston to move said valves, a locking device for holding said valves in the position to which they are moved by the operation of the piston, and mechanism operated by the pressure at the rear of the traveling carrier for operating said valve-operating mechanism to return said valves to their normal positions.

8. In an apparatus of the character described, a terminal, a transmission-tube, a valve controlling communication between the terminal and the atmosphere and normally open, a valve controlling communication between the terminal and the transmission-tube and normally closed, mechanism common to said valves for operating the same, a cylinder, a piston in said cylinder and connected to said mechanism, an air-supply for operating said piston to move said valves, a locking device for holding said valves in the position to which they are moved by the operation of the piston, and mechanism consisting of two vanes normally exposed on both sides to the pressure in the transmission-tube and operated by the pressure at the rear of the traveling carrier to operate said valve-operating mechanism to return said valves to their normal positions.

9. In an apparatus of the character de-

scribed, a terminal, a transmission-tube, a valve controlling communication between the terminal and the atmosphere and normally open, a valve controlling communication between the terminal and the transmission-tube and normally closed, mechanism common to said valves for operating the same, a cylinder, a piston in said cylinder and connected to said mechanism, an air-supply for operating said piston to move said valves, a locking device for holding said valves in the position to which they are moved by the operation of the piston, mechanism consisting of two vanes normally exposed on both sides to the pressure in the transmission-tube and operated by the pressure in the rear of the traveling carrier to operate said valve-operating mechanism to return said valves to their normal positions, and means for returning said vanes to their normal positions.

10. In an apparatus of the character described, a terminal having a trunk into which carriers are introduced for transmission, a transmission-tube communicating with said trunk, a valve in said trunk controlling communication between said trunk and the atmosphere and normally open, a valve in said trunk controlling communication between said trunk and the transmission-tube and normally closed, mechanism common to said trunk-valves for operating the same, a cylinder, a piston in said cylinder connected to said mechanism, an air-supply for operating said piston to move said trunk-valves, a valve controlling the flow of air from said air-supply to said cylinder for operating said piston, an air-supply for operating said cylinder-controlling valve, an auxiliary valve controlling the air-supply which operates the cylinder-controlling valve, an air-supply for operating said auxiliary valve, a transmitting-valve controlling the flow of the air from said air-supply which operates said auxiliary valve, a handle for operating said transmitting-valve to allow the flow of air to said auxiliary valve and said transmitting-valve and adapted to be automatically shut off by said flow of air, and mechanism operated by the traveling carrier for operating said auxiliary valve to allow the flow of air to move the cylinder-controlling valve thereby allowing air to enter said cylinder to move the piston therein for operating said valve-operating mechanism to return said trunk-valves to their normal positions.

11. In an apparatus of the character described, a terminal having a trunk into which carriers are introduced for transmission, a transmission-tube communicating with said trunk, a valve in said trunk controlling communication between said trunk and the atmosphere and normally open, a valve in said trunk controlling communication between said trunk and the transmission-tube and normally closed, mechanism common to said trunk-valves for operating the same, a cylinder, a piston in said cylinder connected to said mechanism, an air-supply for operating said piston to move said trunk-valves, a valve controlling the flow of air from said air-supply to said cylinder for operating said piston, an air-supply for operating said cylinder-controlling valve, an auxiliary valve controlling the air-supply which operates the cylinder-controlling valve, an air-supply for operating said auxiliary valve, a transmitting-valve controlling the flow of air from said air-supply which operates said auxiliary valve, a handle for operating said transmitting-valve to allow the flow of air to said auxiliary valve and said transmitting-valve and adapted to be automatically shut off by said flow of air, and mechanism operated by the pressure at the rear of the traveling carrier for operating said auxiliary valve to allow the flow of air to move the cylinder-controlling valve thereby allowing air to enter said cylinder to move the piston therein for operating said valve-operating mechanism to return said trunk-valves to their normal positions.

12. In an apparatus of the character described, a terminal, a transmission-tube, a valve controlling communication between the terminal and the atmosphere and normally open, mechanism for operating said valve, a cylinder, a piston in said cylinder connected to said mechanism, an air-supply for operating said piston to move said valve, a valve controlling the flow of air from said air-supply to said cylinder for operating said piston, an air-supply for operating said cylinder-controlling valve, and a transmitting-valve for controlling the operation of said cylinder-controlling valve to admit air to said cylinder for the operation of the said valve which controls communication between the terminal and the atmosphere.

13. In an apparatus of the character described, a terminal, a transmission-tube, a valve controlling communication between the terminal and the atmosphere and normally open, mechanism for operating said valve, a cylinder, a piston in said cylinder connected to said mechanism, an air-supply for operating said piston to move said valve, a valve operated by compressed air and controlling the flow of air from said air-supply to said cylinder for operating said piston, an air-supply for operating said cylinder-controlling valve, a transmitting-valve for controlling the operation of said cylinder-controlling valve to admit air to said cylinder for the operation of the said valve which controls communication between the terminal and the atmosphere, a device extending into the terminal in the path of the traveling carrier, and mechanism connected to said device and to the mechanism which operates the valve controlling communication between the terminal and the atmosphere and adapted upon the movement of said valve-controlling mechanism to be moved out of the path of the traveling carrier.

14. In an apparatus of the character de-

scribed, a terminal, a transmission-tube, a source of compressed air for despatching a carrier, a valve controlling the flow of compressed air through the terminal, valves in said terminal controlling the despatch of the carrier, mechanism for operating said carrier-despatching-controlling valves, an air-supply for operating said mechanism, a transmitting-valve controlling the flow of air which operates said valve-operating mechanism, means for locking said transmitting-valve in position to which moved, and means for returning said valve to its normal position after it is released by compressed air from its locked position.

15. In an apparatus of the character described, a terminal, a transmission-tube, a source of compressed air for despatching a carrier, a valve controlling the flow of compressed air through the terminal, valves in said terminal controlling the despatch of the carrier, mechanism for operating said carrier-despatching-controlling valves, an air-supply for operating said mechanism, and a transmitting-valve controlling the flow of air which operates said valve-operating mechanism, means for locking said transmitting-valve in the position to which moved, and means for returning said valve to its normal position after it is released by compressed air from its locked position.

16. In an apparatus of the character described, a terminal, a transmission-tube, a source of compressed air for despatching a carrier, a valve controlling the flow of compressed air through the terminal, valves in said terminal controlling the despatch of the carrier, mechanism for operating said carrier-despatching-controlling valves, an air-supply for operating said mechanism, a transmitting-valve controlling the flow of air which operates said valve-operating mechanism, and mechanism operated by the pressure at the rear of the traveling carrier for returning said carrier-controlling valves to their normal positions.

17. In an apparatus of the character described, a terminal, a transmission-tube, a source of compressed air for despatching a carrier, a valve controlling the flow of compressed air through the terminal, valves in said terminal controlling the despatch of the carrier, mechanism for operating said carrier-despatching-controlling valves, an air-supply for operating said mechanism, a transmitting-valve controlling the flow of air which operates said valve-operating mechanism, and mechanism operated by the pressure at the rear of the traveling carrier for returning said carrier-controlling valves to their normal positions.

18. In an apparatus of the character described, a terminal, a transmission-tube, valves in said terminal for controlling the despatching and receiving of carriers, mechanism for operating said valves when the terminal is used as a transmitter and adapted to be disconnected when the terminal is used as a receiver, and independent mechanism adapted to be connected to one of said valves for operating said valves when the terminal is used as a receiver.

19. In an apparatus of the character described, a terminal, a transmission-tube, a source of compressed air for despatching the carrier, a valve controlling the flow of compressed air through the terminal, valves in said terminal controlling the despatch of the carrier, mechanism for operating said carrier-despatching-controlling valves and the valve which controls the flow of compressed air through the terminal, an air-supply for operating said mechanism, a transmitting-valve controlling the flow of air which operates said valve-operating mechanism, and mechanism operated by the pressure at the rear of the traveling carrier for returning said carrier-controlling valves and the valve controlling the flow of compressed air to their normal positions.

20. In an apparatus of the character described, a terminal, a transmission-tube, a source of compressed air for despatching a carrier, a pipe for leading compressed air to the rear of the carrier, a valve controlling the flow of compressed air through said pipe, valves in said terminal controlling the despatch of the carrier, mechanism for operating said carrier-despatching-controlling valves and the valve which controls the flow of compressed air through said pipe, an air-supply for operating said mechanism, a transmitting-valve controlling the flow of air which operates said valve-operating mechanism, and mechanism operated by the pressure at the rear of the traveling carrier for returning said carrier-controlling valves and the valve for controlling the flow of compressed air to their normal positions.

21. In an apparatus of the character described, a terminal, a transmission-tube, a valve for closing said terminal to the atmosphere and normally open, mechanism for operating said valve when the terminal is used as a transmitter and adapted to be disconnected from said valve when the terminal is used as a receiver, and independent mechanism adapted to be connected to said valve for operating said valve when the terminal is used as a receiver.

22. In an apparatus of the character described, a terminal, a transmission-tube, a valve for closing said terminal to the atmosphere and normally open, mechanism for operating said valve when the terminal is used as a transmitter, and mechanism for operating said valve when the terminal is used as a receiver.

23. In an apparatus of the character described, a terminal, a transmission-tube, a valve for closing said terminal to the atmosphere and normally open, mechanism for operating said valve when the terminal is used as a transmitter, and independent mechan-

ism for operating said valve when the terminal is used as a receiver.

24. In an apparatus of the character described, a terminal, a transmission-tube, a source of compressed air for despatching carriers through said transmission-tube and in continuous communication therewith when the terminal is used as a transmitter, mechanism for operating said terminal as a transmitter, and mechanism for operating said terminal as a receiver when said air communication is cut off.

25. In an apparatus of the character described, a terminal, a transmission-tube, a source of compressed air for despatching carriers through said transmission-tube and in continuous communication therewith when the terminal is used as a transmitter, mechanism for operating said terminal as a transmitter, and independent mechanism for operating said terminal as a receiver when said air communication is cut off.

In testimony whereof I have signed my name to this specification, in the presence of two subscribing witnesses, this 1st day of February, A. D. 1901.

OTTO S. PIKE.

Witnesses:
A. L. MESSER,
C. A. STEWART.