No. 648,137. Patented Apr. 24, 1900.

G. H. WOODMAN.

PNEUMATIC TUBE.

(Application filed May 21, 1898.)

(No Model.) 2 Sheets—Sheet 1.

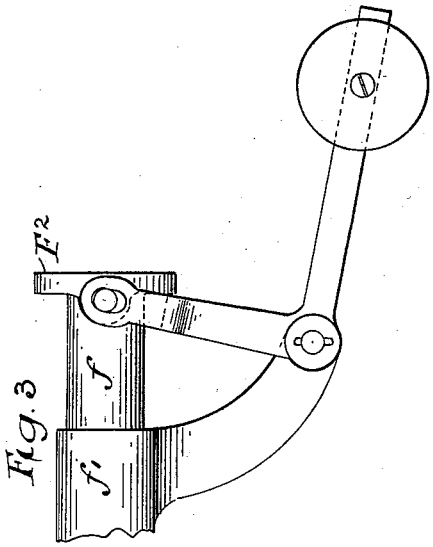


Fig. 3

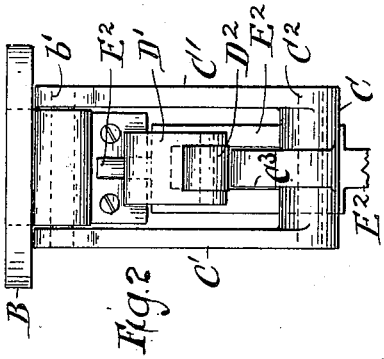


Fig. 2

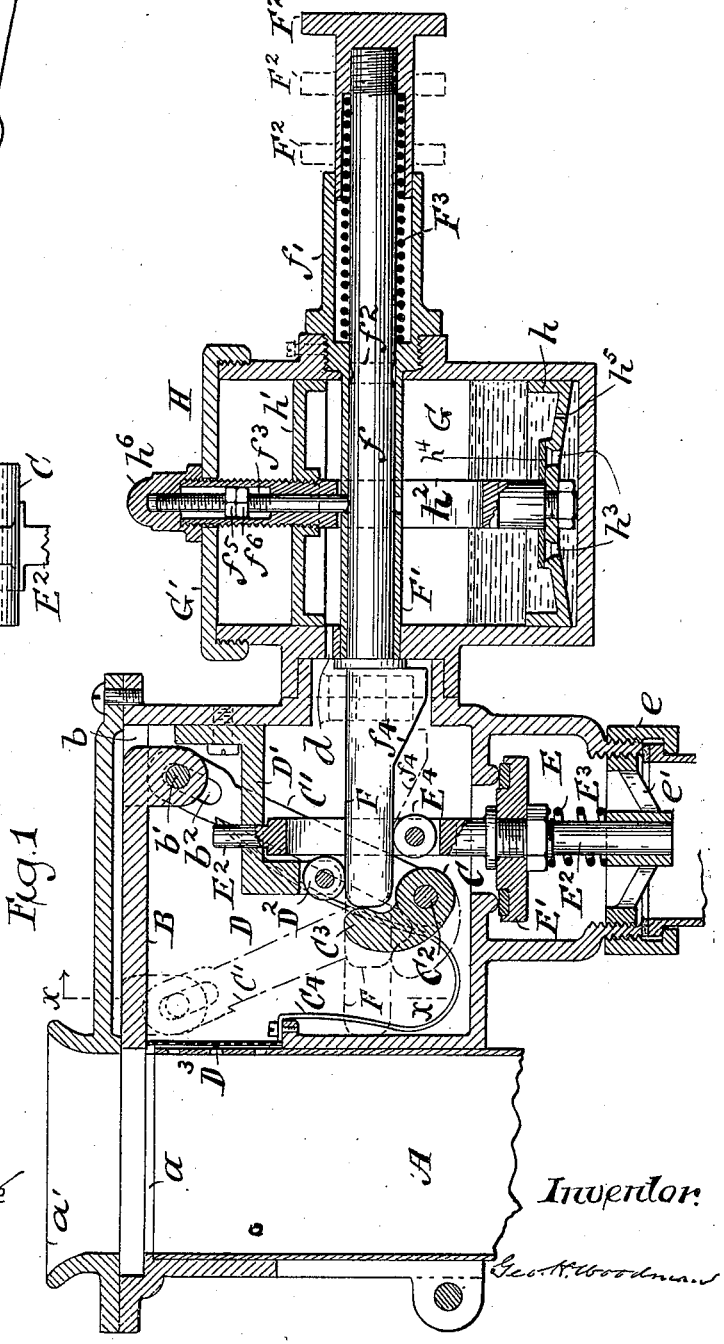


Fig. 1

Witnesses.
Thos. M. Beckwith
A. M. Jones.

Inventor.
Geo. H. Woodman.

No. 648,137. Patented Apr. 24, 1900.

G. H. WOODMAN.

PNEUMATIC TUBE.

(Application filed May 21, 1898.)

(No Model.) 2 Sheets—Sheet 2.

Fig. 4

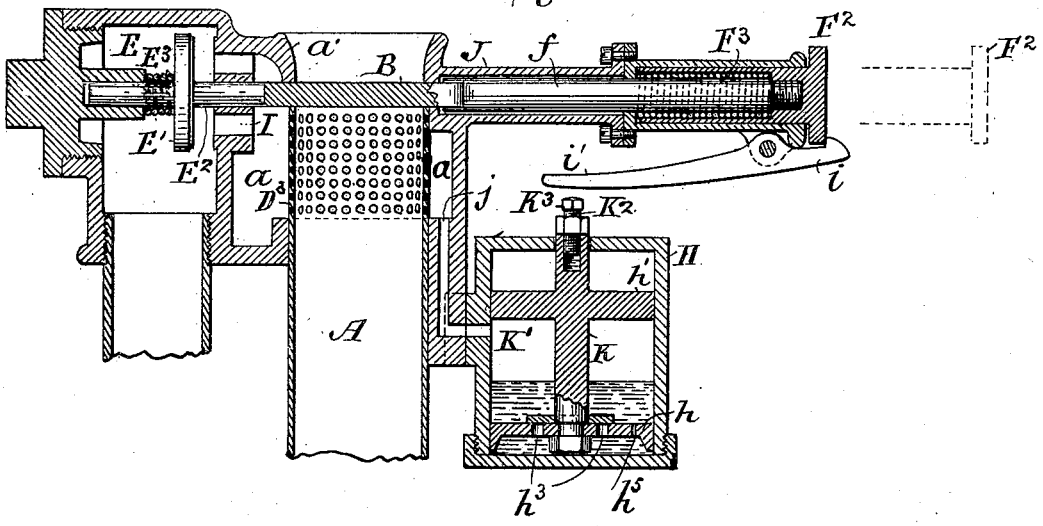
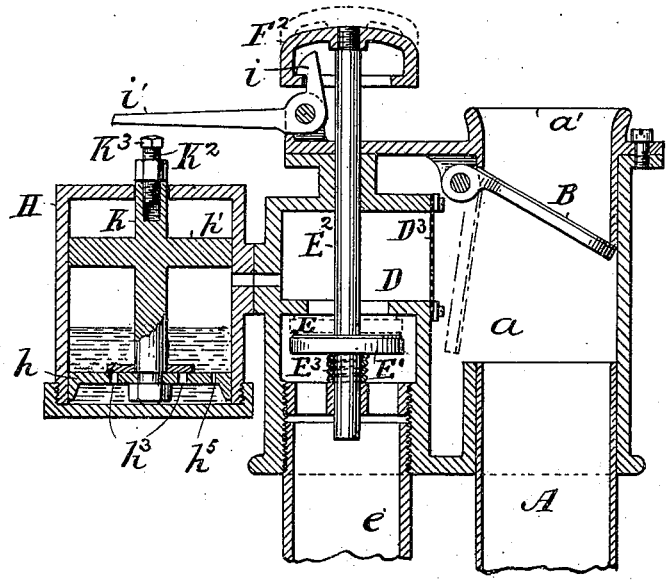


Fig. 5



Witnesses.
Thos. H. Belknap
A. M. Jones.

Inventor.
Geo. H. Woodman

UNITED STATES PATENT OFFICE.

GEORGE H. WOODMAN, OF NEW YORK, N. Y.

PNEUMATIC TUBE.

SPECIFICATION forming part of Letters Patent No. 648,137, dated April 24, 1900.

Application filed May 21, 1898. Serial No. 681,284. (No model.)

To all whom it may concern:

Be it known that I, GEORGE H. WOODMAN, of the city, county, and State of New York, have invented certain Improvements in Pneumatic Tubes, of which the following is a specification.

These improvements relate to pneumatic tubes operated by compressed air wherein the despatch-tubes contain normally only atmospheric pressure and compressed air is introduced into a tube when it is desired to effect the transmission of a carrier.

The invention embraces means for introducing and mechanically maintaining a flow of compressed air into a despatch-tube, means operated by air pressure for automatically shutting off said flow of compressed air as soon after it has been so introduced as a sufficient volume of compressed air has been received into the tube to effect the transmission of a carrier through the tube, means for preventing any escape of compressed air into the atmosphere at the end of the tube where it is introduced, and, finally, means for diminishing noise at the farther open end thereof.

The method of operating pneumatic tubes by compressed air has decided advantages over the ordinary method of maintaining a constantly-flowing current of air through a tube-circuit by creating a partial vacuum therein. A single tube can be used between two stations. The supply plant can be under automatic regulation. Stronger force of pressure is available. Greater economy and reliability are secured. The heretofore-existing objections to the use of compressed air—namely, the lack of simple and reliable means for automatically governing the liberation of just the requisite volume of compressed air needed for the intermittent despatch of carriers and the disagreeable noise at both ends of the tube—are overcome by this invention. By the invention the desired results are attained solely by the operation of apparatus located at the stations from which the carrier is despatched and without the aid of any instrumentality requiring to be tripped into action by the carrier or of any connections either electrical or mechanical between the opposite ends of the tube. The mechanism for accomplishing these purposes consists, preferably, of a terminal structure, forming the end of the despatch-tube, having an aperture in alinement with the tube for receiving carriers into the tube. This terminal has a connection with a compressed-air-supply pipe, a valve-chamber, a self-closing valve, an intermediate chamber connecting the port of said valve with the despatch-tube, and a self-opening cover for closing the aperture of the terminal from the atmosphere. A manually-operative self-retracting valve controller or stem extending into the terminal and projecting outside the shell is adapted to close said cover by its initial movement when manually actuated, and by a further movement after the cover has become closed to unseat said self-closing valve. A stop acting automatically serves to hold the valve-controller in its extreme inward position, and hence to keep the cover closed and the self-closing valve open, thus admitting compressed air into the tube. The said valve-controller is automatically released to the influence of its retracting-spring by a releasing-piston seated in a piston-chamber connected to the terminal and having a passage for air-pressure communicating with the intermediate chamber of the terminal. When the self-closing valve in the intermediate chamber is opened, the air-pressure passes immediately into the releasing-piston chamber, wherein it actuates the releasing-piston, which moves slowly as the oil contained in it is expelled through a leak-passage into the lower end of the release-piston chamber. The oil keeps the piston lubricated and insures a positive slow movement thereof. The length of its movement is adjustable in relation to the stop, and hence the duration of its movement can be limited to any period of time desired. It is accordingly regulated to make its movement in just the time consumed by a carrier in making a complete excursion through the tube. At the conclusion of its stroke the releasing-piston disengages said stop, and said valve-controller is thereupon returned to its normal position by its retracting-spring. Simultaneously the compressed air in the chamber of the releasing-piston exhausts into the terminal and the releasing-piston returns to its starting-point by gravitation. While oil is preferred as a retarding agent, it is obvious that glycerin, mercury, and a variety of other

liquids can be used instead of oil, and hence are to be regarded as equivalents for oil for the purposes of the present invention.

The invention, broadly considered, can be carried out in various ways. For example, a terminal may be used wherein the stop has the form of an exposed latch adapted to be tripped by the releasing device and wherein a swinging hinged cover is employed, and again in an organization wherein the cover itself is the valve-controller.

The accompanying drawings, embodying the invention, are as follows:

Figure I is a longitudinal section of the end of the despatch-tube, the terminal, opening, cover, valve, valve-chamber, intermediate chamber, the releasing device, the valve-controller, and stop, showing the cover, valve, releasing device, and valve-controller in their respective normal positions when the tube is not in operation. Fig. II is a section taken through the plane indicated by the dotted line $x\,x$ in Fig. I. Fig. III is a side view of the outer end of the valve-controller and its supporting-sleeve, showing a modification in the organization by the addition of an arm and a lever and weight, adapting the valve-controller to be retracted by gravity instead of by a spring. Fig. IV is a transverse sectional view of a modification of the terminal, showing the adaptation of the releasing device to operate an exposed latch and a cover, so organized as to perform the function of valve-controller. Fig. V is a transverse sectional view of another modification, wherein the valve-stem is adapted to be the valve-controller without any connection with the cover.

In the drawings, Figs. I, II, and III represent the end of a despatch-tube A, inserted in the chamber a, having the flaring mouth a'. The cover B is adapted to slide in the recesses b and is connected by its pin b' with the slots b^2 of the upright arms C', affixed to the hollow rock-shaft C, which is pivotally connected to lugs on the sides of the chamber D by its pin C^2. The rock-shaft C has a short arm C^3, adapted to be engaged by the inner end of the valve-controller F for the purpose of rocking the arms C' into the position shown in dotted lines in Fig. I, and thereby forcing the cover B to its closed position, closing the mouth a'. The cover is moved back to its open position when the force exerted upon the short arm C^3 is released by the expanding spring C^4, attached at one end to the wall of the chamber D and bearing at its other end against one of the arms C'.

The valve-chamber E is provided on its lower outer wall with the pipe-union e for connecting it with a compressed-air-supply pipe. The valve E' has its stem E^2 projecting below it and above it. A guide for its lower end is furnished by the bridge e' and for its upper end by the bracket D'. It is held seated by its spiral spring E^3 abutting at one end against the jam-nut under the valve and at the other end against the hub of the bridge e'. The upper portion of the stem E^2 has a slot provided with the roller E^4 for bearing upon the under edge of the valve-controller F. Another roller D^2, mounted upon the bracket D', bears upon the upper edge of the valve-controller F. The stem f of the valve-controller F projects through the tube F', which is inserted transversely across the releasing-piston chamber G and has its outwardly-projecting portion f' enlarged in diameter, as shown, for the purpose of adapting it for receiving the tubular portion of the knob F^2, which is screwed on the outer end of the valve-controller F, said tubular portion being of sufficient diameter to loosely contain a portion of the expanding spiral spring F^3. The valve-controller has a transverse perforation f^2, adapting it to receive and be locked by the pin or stop f^3 when moved to its extreme inward position. When the valve-controller is pushed inward, its first movement effects the closing of the cover B, as has been explained. By its further movement the cam f^4 upon the under edge of the controller rides over the roller E^4, and thereby pushes down the valve-stem E^2, unseating the valve E' and admitting compressed air from the supply-pipe into the chamber D and thence into the despatch-tube. In the meantime the locking-pin f^3, by dropping into the perforation f^2, locks the valve-controller in position. Immediately upon the introduction of compressed air into the chamber D it passes through the small passage d into the releasing-piston chamber G, between the two pistons h and h', affixed to the piston-stem h^3. The lower piston h is provided with the passages h^3, normally closed by the valve h^4, which by yielding in an upward direction when the releasing-piston falls permits oil to flow from the lower end of the chamber G into the space between the two pistons h and h'. The lower piston h is also provided with a passage h^5 of prescribed small cross-area, through which passage the oil from above lower piston h is slowly forced when the compressed air is admitted into the space between the two pistons. As the oil thus escapes the releasing-piston moves slowly upward.

The piston-stem h^2 is slotted to allow the passage through it of the tube F'. The upper portion of the piston-stem h^2 is vertically perforated to receive the locking-pin f^3 and is counterbored to enable it to contain the jam-nuts f^5 and f^6, which are screwed on the locking-pin and by their position thereon determine the depth to which the locking-pin is permitted to descend into the perforation f^2 in the valve-controller, and hence the duration of the period during which the valve-controller is permitted to occupy its innermost position and hold the compressed-air valve open. When the releasing-piston has risen sufficiently to withdraw the locking-pin f^3 from the perforation f^2, the valve-controller is released and is then retracted by its

spring F^3. The backward movement of the valve-controller is followed first by the closing of the compressed-air-supply valve E', and subsequently by the opening of the cover B after the pressure in the despatch-tube has subsided.

The compressed air, or, as it is colloquially designated, the "pressure," in the releasing-piston chamber G, immediately upon the closing of the compressed-air-supply valve E', exhausts into the chamber D, and thereupon the pistons h h' drop by gravity.

During the upward movement of the pistons h h' the air above the piston h' is permitted to escape through the opening in the cap G', through which the piston-stem h^2 is loosely inserted.

It will be seen that the compressed air is prevented from escaping from the space between the two pistons through the aperture f^2 and the hollow upper portion of the piston-stem h^2 by the cap h^6, screwed tightly upon the upper end of the piston-stem h^2.

As the cover B is adapted to be completely closed before the compressed-air-supply valve is opened and remains closed until after said valve is closed again (not being able to reopen after the valve-controller releases it while there is pressure under it) there can be no escape of compressed air into the atmosphere from the terminal, and hence no noise. The sudden blast of pressure on opening said valve and its inrush into the tube would, however, make a disagreeable noise at the distant open end of the tube unless controlled. This control is accomplished by providing a multiplicity of passages D^3 for the flow of air between the chambers D and a, which by obstructing the free passage of air between the intermediate chamber D and the despatch-tube A raises the air-pressure available in the intermediate and piston chambers for operating the releasing-piston. A partition of fine-mesh wire-cloth is arranged across the path of the compressed air supplied from the chamber D to the despatch-tube. The despatch-tube being smooth inside and several inches in diameter, freely transmits sounds, and in pneumatic tubes as heretofore constructed the inrush of compressed air at the sending end of the tube generates a roaring sound, which is carried through the tube and into the room where the carrier is to be delivered. The foraminous structure described breaks up the air-current and almost entirely prevents the generation of such sound.

In the modification illustrated in Fig. IV the chamber a communicates on one side with the air-supply-valve chamber E through passages I and on the opposite side is provided with a lateral extension J. The expanding spring F^3 on the stem f tends to hold the cover B in the extension J. When a carrier is to be despatched, it is deposited in the tube A and the cover B is pushed inward by manually-exerted pressure upon the knob F^2. In its inward movement the cover B, after having closed the mouth a', encounters and pushes backward the stem E^2 of the air-supply valve E', thereby opening the valve E' and admitting pressure from the valve-chamber E into the chamber a behind the carrier. During the concluding portion of the inward excursion of the cover B the under edge of the knob F^2 rides over and is caught by the latch i, pivoted to a bracket on the under side of the extension J. It will be perceived that the latch i is the equivalent of the stop-pin f^3, hereinbefore described. In this modification the releasing device is arranged beneath the extension J and is operated by compressed air supplied through the narrow passage j from the chamber a. The releasing device is composed of the solid stem K, having affixed to it the hereinbefore-described pistons h and h', seated in the piston-chamber K'. At its upper end the stem K is provided with a vertically-adjustable screw K^2. When the releasing device is operated, the head K^3 of the screw K^2 bears against and lifts the longer arm i' of the latch i, and thereby disengages the latch i from the knob F^2 and releases the cover B to the retracting action of its spring F^3. Varying the adjustment of the screw K^2 serves to vary the duration of the period during which the cover B remains in its closing position and keeps the air-supply valve E' open.

In the modification illustrated in Fig. V the cover B is hinged, and in its open position hangs vertically downward in the chamber a, out of the path of travel of the carrier and across the opening of the chamber D. This position adapts it to be blown into its closing position by the compressed air introduced into the chamber D. Until relieved from said air-pressure the cover B is held against the oblique under end of the flaring mouth a', thus shutting off the despatch-tube A from communication with the atmosphere through said flaring mouth. The air-pressure is introduced into the chamber D through the valve E' of the valve-chamber E, which is connected with the compressed-air-supply pipe e. The stem E^2 of the air-pressure valve E' is elongated sufficiently to extend vertically through the chamber D and through the cap at the top of the terminal. At its upper end the stem E^2 is provided with the knob F^2, which has a downwardly-projecting hook adapted to catch under the latch i, suitably pivoted to lugs on the cap of the terminal. The arm i' of the latch i extends laterally outward in position to be engaged and lifted by the head K^3 of the adjusting-screw K^2, inserted in the stem K of the releasing-piston, which in construction and mode of operation is similar to the releasing device shown in Fig. IV. When the valve-stem E^2 is moved downward by manually-exerted pressure upon the knob F^2, the valve E' is unseated and is held open so long as the knob F^2 remains in engagement with the latch i. The force of the compressed air introduced into the chamber D closes the

cover B and the compressed air continues to flow from the supply-pipe through the chamber D into the despatch-tube A until the releasing-piston trips the latch *i* in the manner previously described. It will be noticed in this modification that the elongated valve-stem E^2, which serves as the valve-controller, is rendered self-retracting by the spring of the self-closing valve E', which makes unnecessary a special spring for the purpose, as is provided in the construction shown in Fig. I.

The modifications hereinbefore described furnish illustrations of some of the various forms of mechanical construction in which these improvements may be usefully applied without departing from the broad invention.

Another important advantage afforded by the invention is that a second carrier or a number of carriers in succession can be transmitted through the despatch-tube without waiting for a carrier previously started to complete its journey.

By the present invention, as illustrated in Figs. IV and V, the valve-controller may be manually released to secure the opening of the cover for starting another carrier at any time while the tube is in operation, and immediately the releasing-piston will drop to its normal position. Upon the valve-controller being again operated the releasing-piston will make its full movement, releasing the valve-controller, and thereby shutting off the air-pressure after the carrier last started has been expelled from the tube.

What is claimed as the invention is—

1. A pneumatic-despatch tube; connections for supplying compressed air thereto; a self-closing valve for controlling the supply of compressed air; a stop for holding said valve open; a releasing device including a pressure-actuated piston for releasing said stop; and a liquid-escapement device for compelling a predetermined slow operative movement of said piston, during the flight of the carrier.

2. A pneumatic-despatch tube, connections for supplying compressed air thereto, a self-closing valve for controlling the supply of compressed air, a stop for holding said valve open, a releasing device including a pressure-actuated piston for releasing said stop, a liquid-escapement device for compelling a predetermined slow operative movement of said piston, and means to provide for a quick return movement of said piston.

3. A pneumatic-despatch tube, connections for supplying compressed air thereto, a self-closing valve for controlling the supply of compressed air, a stop for holding said valve open, a releasing device for said stop operative by the compressed air upon opening said valve and a liquid-escapement device for controlling the movement of said releasing device and to determine the time for releasing the stop.

4. A despatch-tube: a supply-pipe for supplying compressed air thereto: a self-closing valve for controlling the compressed-air supply: a self-retracting valve-controller for opening said valve by its movement in one direction: a stop for holding said valve-controller stationary at the end of its said movement: means for automatically releasing said valve-controller from said stop: a self-opening cover for said despatch-tube: means for closing said cover and for opening said air-supply valve at different prescribed stages in the operative movement of said valve-controller: and means for releasing said air-supply valve and said cover at different prescribed stages in the retracting movement of said valve-controller.

5. A pneumatic-despatch tube; a conduit for supplying compressed air thereto; a valve for admitting compressed air to said conduit; and a finely-perforated screen arranged across the path of travel of the compressed air between said valve and said despatch-tube, for the purpose of creating increased air-pressure in the valve-chamber and preventing the loud sound ordinarily generated by the inrush of the compressed air into the sending end of the despatch-tube.

6. A pneumatic-despatch tube; connections for supplying compressed air thereto; a self-closing valve for controlling the supply of compressed air; a stop for holding said valve open; a piston for throwing said stop out of action; and means for varying the range of the operative stroke of said piston.

7. A pneumatic-despatch tube; connections for supplying compressed air thereto; a self-closing valve for controlling the supply of compressed air; a stop for holding said valve open; a releasing device for releasing said stop embracing a pressure-operated piston; a chamber for containing a liquid; connections for supplying compressed air to said chamber while said valve is open; a restricted passage affording an escapement for said liquid in one direction under the pressure of compressed air introduced into said chamber, for the purpose of compelling a predetermined slow operative stroke of said piston; and a passage of relatively-larger area provided with a check-valve adapted to yield and permit a copious flow of liquid in the opposite direction for insuring a rapid return stroke of said piston.

GEO. H. WOODMAN.

Witnesses:
C. M. POWER,
R. K. GOODLIFFE.