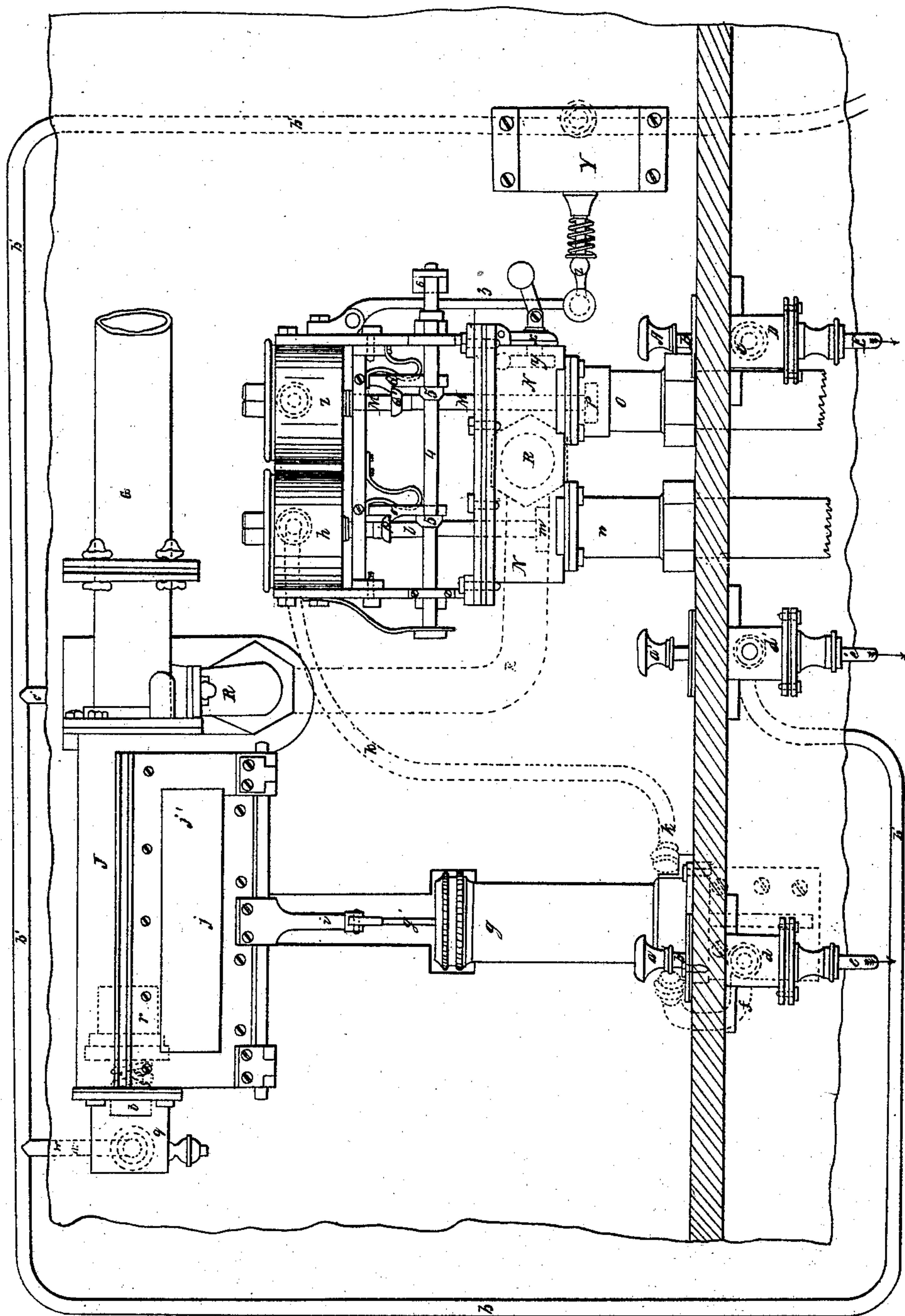


C. F. VARLEY.

Electro Pneumatic Apparatus for Transmitting Dispatches.

No. 78,845.

Patented June 9, 1868.



Witnesses:  
*Walter Bailey*  
*Clasage jr.*

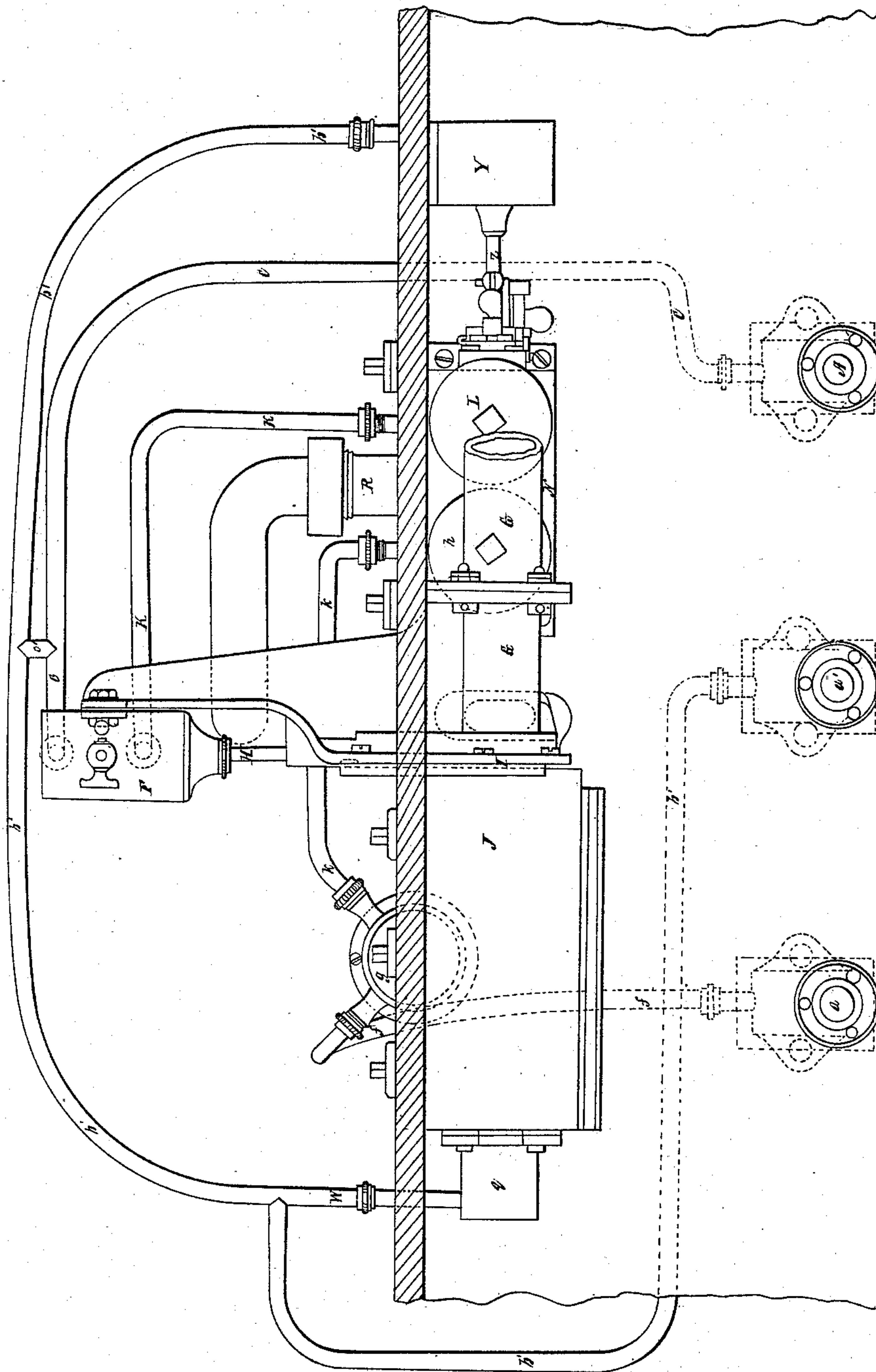
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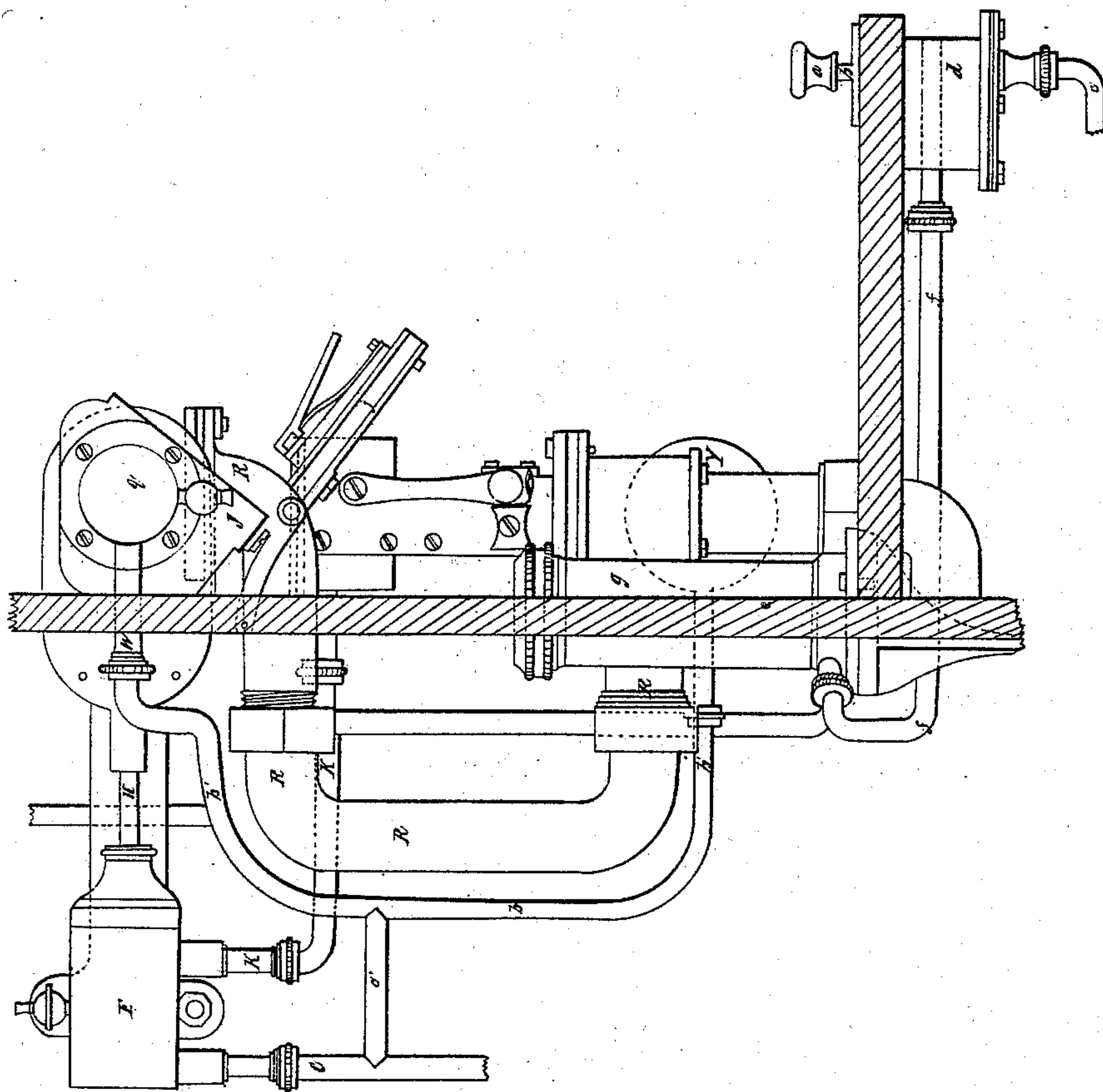
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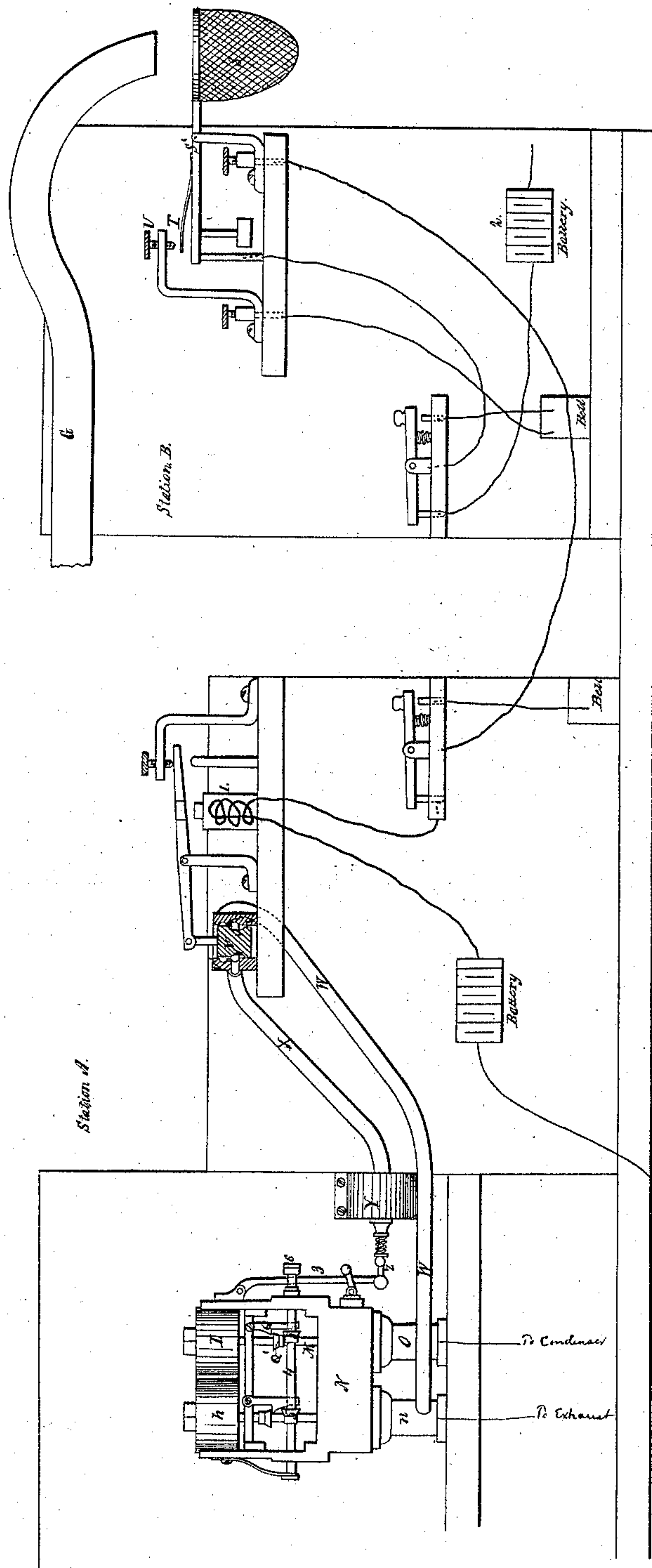


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Witnesses:

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Cl. Page Jr.

*Inventor:*

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# UNITED STATES PATENT OFFICE.

C. F. VARLEY, OF LONDON, ENGLAND.

## ELECTRO-PNEUMATIC APPARATUS FOR TRANSMITTING DISPATCHES.

Specification forming part of Letters Patent No. 78,845, dated June 9, 1868.

*To all whom it may concern:*

Be it known that I, CROMWELL FLEETWOOD VARLEY, of London, England, temporarily residing in New York, in the county and State of New York, have invented certain new and useful Improvements in Electro-Pneumatic Apparatus for Transmitting Messages, &c., Through Tubes; and I do hereby declare the following to be a full, clear, and exact description of the same, reference being had to the accompanying drawings, in which—

Figure 1 is a front elevation of an apparatus made in accordance with my invention. Fig. 2 is an end elevation, and Fig. 3 is a plan or top view, of the same. Fig. 4 represents the arrangement of the message-tube at the distant end of the line and the mechanism for effecting automatically the cut-off of the compressed air by which the message is transmitted to that end.

The apparatus the subject of the present patent is composed of three distinct mechanisms—the first for introducing into the message-pipe the compressed air by which the message carriers or pistons are transmitted in the one direction; the second for opening communication between the said pipe and the air-exhaust, by means of which the carriers are drawn in the opposite direction, and the third for cutting off communication at any moment with both the compressed-air and the exhaust chambers of the apparatus. In addition to these there is a fourth mechanism, located at the other end of the message-pipe and communicating with the cut-off mechanism above named by means of electricity, in such manner that the arrival of the message-carrier at the distant end of the pipe shall cause the said cut-off mechanism to instantaneously shut off the compressed air by which the carrier has been driven to its destination.

In illustrating the manner in which this invention is or may be carried into effect, by reference to the accompanying drawings, I shall describe the different mechanisms of which the apparatus is composed, in the order above named—the first and fourth, for convenience' sake, being considered together.

I. *The mechanism for sending messages, &c.*—The apparatus of which this mechanism forms part is, of course, located at the central or main station from which the message-pipes radiate,

and it is combined with any ordinary or suitable air-exhaust and air-condensing apparatus. A button, A, is attached to valve-rod B, which passes into a box, D, and carries on its lower end a valve which closes the mouth of a pipe, E, leading to the compressed-air chamber. The valve-rod is held up by a suitable spring, which will yield when the button A is pressed on, so as to allow the valve to open. To the rear of the box D is secured a pipe, C, which, as indicated in the drawings, extends to and opens into a small cylinder, F, placed in rear of the message-pipe G. Within the cylinder is a piston attached to the rod H, which rod passes out from the front end of the cylinder, and carries a slide-valve, I, placed between the pipe G and the receiving-chamber or carrier-box J. This valve is employed to shut off communication between the receiving-chamber and the message-pipe before the admission of compressed air to the latter. A second pipe, K, leads from the cylinder F to another cylinder, L, mounted on a stand in the front part of the apparatus, as shown in Fig. 1. The arrangement of the two pipes C and K is such that the compressed air entering the cylinder F through the pipe C must force the piston within the cylinder forward, so as to completely close, by means of the valve I, all communication between the message-pipe and receiving-chamber before it can pass out through the pipe K. The cylinder L contains a piston and a piston-rod, M, which passes down into the chest N, into which the main conducting-pipe O from the compressed-air chamber opens. A valve, P, attached to the lower end of the piston-rod and applied to the under side of the chest or chamber N, closes the mouth of the compressed-air pipe. Between the chest and the cylinder is a space in which is placed the spring-detent Q, which, when the piston-rod is forced down so as to open the valve, engages with a stop or catch, Q', on the rod, and thus holds the rod down and the valve open, so as to allow compressed air to pass from the pipe O into the chest. From the rear of the latter extends a large pipe, R, which opens into the message-pipe G in advance of the slide-valve I.

The operation of the above-described portion of the apparatus is as follows: When a message is to be sent it is placed in an ordinary or suitable carrier or piston, which is inserted



through the door of the receiving-chamber J into the message-pipe in front of the point where the mouth of the pipe R is located. The attendant now presses down the button A, thus opening the mouth of the pipe E and allowing compressed air to escape therefrom into the box D, whence it is conducted through the pipe C to the cylinder F, the piston within which is thereby driven forward until the slide-valve I has completely closed all communication between the message-pipe and receiving-chamber. By the time this is accomplished the piston will have moved far enough to open the pipe K, through which the air now passes into the upper part of the cylinder L, whose piston and piston-rod are thus forced down, so as to open the valve P, the piston-rod in this position being firmly held by means of the detent and catch Q Q'. This action of the compressed air from the pipe E upon the valve P is almost instantaneous, and the button A need therefore be depressed but for a second. As the valve P is thus held open the compressed air rushes up through the pipe O, the box N, and the pipe R into the message-pipe G, and, all communication with the receiving-chamber being cut off by the slide-valve, necessarily drives forward the message-carrier or piston to the terminus or other end of the message-pipe.

The method of effecting the automatic cut-off of the compressed air as soon as the carrier reaches its destination is represented in Fig. 4, in which station A is the main station, where the apparatus above described is located. The end of the message-pipe G, at station B, is bent downward, as shown in the figure referred to, so as to prevent articles from being dropped accidentally or from design into the pipe.

Immediately under the mouth of the pipe is a stout bag, S, of suitable material, which is attached to a beam, S', pivoted upon a standard and balanced or held down by means of a weight or spring secured to its other end. Upon the end of the balanced beam opposite the bag S is a plate-spring, T, and a little distance above the spring is a set-screw, U, held in a bracket so as to be adjustable at various distances above the spring. The standard upon which the beam S is supported is connected by a wire with an electro-magnet, 1, at station A at the other end of the line, and the bracket which holds the set-screw U is in like manner put in communication with a battery, 2, at station B.

The armature of the electro-magnet is secured to a lever similar to that of an ordinary Morse instrument, the opposite end of which is attached to a rod which carries a piston, V. This piston is placed within a cylinder, V', and has formed on it an annular groove, *v*. In the opposite sides of the cylinder are two pipes, which when the armature is removed from the electro-magnet 1 are closed by the piston, but when the armature is drawn toward its magnet the piston V, by the tilting of the armature-

lever, is elevated until the groove *v* is brought opposite the two pipes, which are thus put in communication. Of these two pipes the one, W, leads to the vacuum or air-exhaust chamber of the apparatus. The other, X, opens into a cylinder, Y, in which there is a piston and a piston-rod, Z. The latter is jointed to a vertical swinging arm, 3, pivoted at its upper end to the frame or stand in which the cylinder L is held. A sliding or reciprocating rod, 4, mounted horizontally in the same frame and provided with stops 5, which engage with the detents Q, has a stop or shoulder, 6, on its end, against which the arm 3 strikes when moved outwardly, and the sliding rod 4 can thus be moved so as to draw back the detent Q and release the piston or valve rod M and valve P.

The operation of this portion of the apparatus is as follows: The carrier, with its inclosed message, when shot out from the tube at station B, falls into the bag S. The beam S' is by this means tilted so as to bring its other end in contact with the set-screw U, the spring T causing the contact to be somewhat prolonged. The circuit is thus closed between the electro-magnet 1 and the battery 2, and the former is consequently excited so as to attract its armature. The other end of the lever to which the armature is attached is consequently raised so as to draw up the piston V until the annular groove *v* connects the two pipes W X, between which communication is now opened. The vacuum or air-exhaust chamber is thus, through the medium of the pipes W X, in communication with the cylinder Y, whose piston-rod is drawn back. The swinging arm 3 follows the movement of the rod and, striking against the shoulder 6 of the sliding rod 4, causes the latter to follow its movement until the detent Q, by means of the stop 5, is disengaged from the piston-rod M. The valve P, when this takes place, will at once be forced up against its seat, and the flow of compressed air consequently will be cut off. As the cylinder F and the cylinder Y are connected together by the tubes *b' c'*, the slide-valve I is drawn back at the same time that the compressed air is cut off, and the pipe G is left ready to transmit another carrier.

It will be, of course, understood that the valve-pistons and packing for the same may be made in any ordinary or suitable manner and of the materials usually employed for the purpose. It will be found of great advantage to attach india-rubber or other elastic buffers to each face of the pistons, in order to lessen the effect of the blows received by them in moving forward or backward in their cylinders.

II. *The mechanism for receiving messages from the distant station.*—The button *a*, valve, and valve-rod *b* are combined with the box *d* and pipe *e* in a manner similar to that already described in the case of the air-compressing mechanism. The pipe *e*, however, instead of



being connected with the condenser leads to the air-exhaust chamber. From the box *d* there extends a pipe, *f*, which opens into the lower part of the upright cylinder *g*, which contains a piston and piston-rod, *g'*, the upper end of the latter being hinged to an arm, *i*, which in turn is jointed to the cover or door, *j*, of the receiving-chamber J. The cover is hinged to the lower part of the chamber, and is arranged, as shown in Fig. 2, so as to drop and swing open of its own weight when not held up by a superior force. In the cover there may be a glass window, *j'*, through which the attendant can inspect the operation of the carriers. Adjoining the pipe *f* another pipe, *k*, leads from the cylinder *g* and opens into the cylinder *h*, mounted in a frame by the side of the cylinder L, already described. The cylinder contains a piston and a piston-rod, *l*, which extends down into the chest N, and carries on its lower end a valve, *m*, which closes the large pipe *n* leading to the vacuum or air-exhaust apparatus. These parts, as regards both their construction and arrangement, do not differ materially from the cylinder L, piston and piston-rod M, &c., already described, excepting that the position of the valve *m* is reversed, it being applied so as to press down over the mouth of the pipe *n*. The detent *o* and catch *p* also occupy a reversed position, so that the valve-rod *l* shall be held up instead of down, as in the case of the rod M. The pipe R, already described, serves also to put the vacuum-chamber in communication with the message-pipe G. When notification is telegraphed from the other end of the line—from station B, for instance—that a message is to be received, the attendant at station A depresses the button *a*, thus opening communication through the pipes *e* and *f* between the vacuum apparatus and the cylinder *g*. The piston in the latter is by this means drawn down, which movement, through the medium of the piston-rod *g'* and jointed arm *i*, causes the door *j* to be tightly closed. Through the pipe *k*, which extends from the cylinder *g*, a vacuum is induced in the cylinder *h*, which causes the piston contained therein to rise, together with the piston-rod *l*, until the detent *o* and catch *p* engage with one another, so as to hold the valve *m* up away from the pipe *n*. The vacuum or air-exhaust apparatus is now in direct communication with the message-pipe G through the tube R, and a sufficient vacuum is created therein to draw the carrier with its inclosed message from station B. As in the case of the sending-button A, the button *a* need be depressed but a second or two. The valves, pistons, packing, &c., of this mechanism also may be of any suitable form, construction, and material. When the carrier arrives at the receiving-chamber J it strikes forcibly against an elastic buffer, *r*, on the opposite end of which is a rod, *s*, and a valve, *t*, which is situated within a box or cylinder, *q*, on the exterior of the receiving-chamber. The valve is held against the end of the chamber by means of a spring,

*s'*, so as to close a series of apertures around the valve-rod *s*. A pipe, *w*, leads from the chest *q*, and communicates through the pipe *b'* with the cylinder Y. The buffer *r*, by the impact of the carrier, is forced back so as to open the valve *t*, and a vacuum is thus created in the cylinder Y, the piston in which is drawn back, and this movement of the piston, as already explained, disengages the detent *o* from the piston-rod *l*, which instantly drops, causing the valve *m* to close the pipe leading to the air-exhaust. In order to render this cut-off the more instantaneous and to sooner destroy the vacuum, a valve, *x*, is arranged on the outside of the chest N so as to be opened by the movement of the arm 3, and thus admit air to the chest and to the pipe R. There is also, necessarily, another valve, *y*, on the inside, to prevent the escape of compressed air when the chest is in communication with the condenser. The door *j* will now drop of its own weight, as indicated in Fig. 2, and the carrier, with inclosed message, will fall from the receiving-chamber into a basket placed beneath for its reception.

It may sometimes happen that when the carrier is moving back the message, by the force of the exhaust, will be drawn out from the carrier and down into the pipe R. To guard against this contingency I cover the mouth of the pipe which opens into G with wire-gauze or a perforated plate, which will admit the passage of air in either direction, but will prevent the message from being carried down.

III. *The cut-off mechanism.*—Whenever it becomes necessary to cut off from the pipe G either the exhaust or the compressed air, I make use of a thin button, *a'*, and valve, valve-rod, and pipe communicating with the vacuum made, and operating in a manner similar to those already described. This mechanism, by means of a pipe, *b'*, communicates directly with the cylinder Y, so that when the button *a'* is depressed the air in the cylinder is exhausted and its piston consequently drawn back, thus effecting the release of either piston-rod, *l* or M, which may happen to be engaged with its detent; and also, through the medium of the pipes *b'* and *c'*, the latter entering the cylinder F, the piston in said cylinder is drawn back, together with the slide-valve I, should the latter have closed the pipe G.

In the apparatus thus described it will be seen that the carrier is sent away from the station A by means of compressed air and brought back by means of a vacuum, thus admitting of but one exhaust and air-compressing apparatus being used, from which can radiate as many lines of tubes G as desired. The arrival of the carrier at either end of the line also effects automatically the cut-off of the agency by which it is moved, while the whole apparatus in all its parts is operated by means of the three stops A, *a*, and *a'* with extreme simplicity and ease, and with a great saving of labor and expense. One person, for instance, may at-



tend to seven or more pipes G. As the source of power is at one end only, all confusion is prevented, while by connecting the different stations by telegraph-lines notice can at once be given when a message is to be received or sent through the message-tube, one wire between each two stations being sufficient for this purpose, as is evident from an inspection of the drawings.

Having now described my invention and the manner in which the same is or may be carried into effect, what I claim, and desire to secure by Letters Patent, is—

1. Operating the pistons and valves of the main compressed-air and exhaust pipes *o* and *n* by means of a series of auxiliary valves and pistons and pipes connecting the exhaust and compressed-air chambers with the cylinder, and arranged to be operated by the keys or buttons A *a*, substantially in the manner and for the purposes herein set forth.

2. The combination, with the valve-rods M and *l* and their detents, of the sliding rod 4, arm 3, and piston-rod of the cut-off cylinder V, substantially as herein shown and described.

3. The combination, with the cylinder V and its piston, of the cut-off mechanism herein described, arranged in such manner that either the depression of the stop or key *a'* or the arrival of the carrier at the distant end of the message-pipe shall connect the said cylinder with the exhaust, substantially as and for the purposes herein shown and set forth.

4. The use of the valves *x y*, arranged in chest N so as to be operated by the movement of the arm 3, for the purpose of destroying the vacuum in the chest and message-tube, as set forth.

5. The combination, with the message-tube and mechanism for connecting the same with the air-compressing apparatus, of the cylinder F and piston and slide-valve arranged to cut off communication between the message-tube and receiving-chamber, substantially as herein shown and set forth.

6. Connecting the slide-valve cylinder F with both the compressed-air and the cut-off mechanism, substantially in the manner and for the purposes specified.

7. The combination, with the message-tube, of the herein-described mechanism for connecting the same with either the compressed-air or exhaust apparatus, and for cutting off the said connections under the arrangement described so that all the operative parts of such mechanism shall be actuated by means of the buttons A, *a*, and *a'*, in the manner and for the purposes set forth.

In testimony whereof I have signed my name to this specification before two subscribing witnesses.

C. F. VARLEY.

Witnesses:

MARCELLUS BAILEY,  
C. G. PAGE, Jr.